

OMAP™

Public Version

OMAP4470 Multimedia Device Silicon Revision 1.0

Texas Instruments OMAP™ Family of Products

Version E

Technical Reference Manual



Literature Number: SWPU270E
November 2011–Revised December 2011

WARNING: EXPORT NOTICE

Recipient agrees to not knowingly export or re-export, directly or indirectly, any product or technical data (as defined by the U.S., EU, and other Export Administration Regulations) including software, or any controlled product restricted by other applicable national regulations, received from Disclosing party under this Agreement, or any direct product of such technology, to any destination to which such export or re-export is restricted or prohibited by U.S. or other applicable laws, without obtaining prior authorisation from U.S. Department of Commerce and other competent Government authorities to the extent required by those laws. This provision shall survive termination or expiration of this Agreement.

According to our best knowledge of the state and end-use of this product or technology, and in compliance with the export control regulations of dual-use goods in force in the origin and exporting countries, this technology is classified as follows:

US ECCN: 3E991

EU ECCN: EAR99

And may require export or re-export license for shipping it in compliance with the applicable regulations of certain countries.



Contents

| | |
|--|------------|
| Preface | 251 |
| 1 Introduction | 261 |
| 1.1 Overview | 262 |
| 1.2 Environment | 263 |
| 1.3 Description | 264 |
| 1.3.1 Cortex-A9 MPU Subsystem Description | 266 |
| 1.3.2 IVA-HD Subsystem Description | 266 |
| 1.3.3 Cortex-M3 MPU Subsystem Description | 267 |
| 1.3.4 Display Subsystem Description | 267 |
| 1.3.5 ABE Subsystem Description | 268 |
| 1.3.6 ISS Description | 269 |
| 1.3.7 3D Graphics Accelerators Description | 270 |
| 1.3.8 2D Graphics Accelerators | 271 |
| 1.3.9 Face Detect Module Description | 271 |
| 1.3.10 On-Chip Debug Support Description | 271 |
| 1.3.11 Power, Reset, and Clock Management Description | 272 |
| 1.3.12 On-Chip Memory Description | 273 |
| 1.3.13 Memory Management Description | 273 |
| 1.3.14 External Memory Interface Description | 273 |
| 1.3.15 System and Connection Peripherals | 273 |
| 1.3.15.1 System Peripherals | 273 |
| 1.3.15.2 Connection Peripherals | 274 |
| 1.4 Package-On-Package Concept | 275 |
| 1.5 OMAP4470 Family and Device Identification | 276 |
| 2 Memory Mapping | 279 |
| 2.1 Introduction | 280 |
| 2.2 L3 Memory Space Mapping | 282 |
| 2.2.1 L3_EMU Memory Space Mapping | 284 |
| 2.3 L4 Memory Space Mapping | 285 |
| 2.3.1 L4_CFG Memory Space Mapping | 285 |
| 2.3.2 L4_WKUP Memory Space Mapping | 287 |
| 2.3.3 L4_PER Memory Space Mapping | 288 |
| 2.3.4 L4_ABE Memory Space Mapping | 290 |
| 2.4 Dual Cortex-M3 Subsystem Memory Space Mapping | 295 |
| 2.5 DSP Subsystem Memory Space Mapping | 296 |
| 2.6 Display Subsystem Memory Space Mapping | 298 |
| 2.6.1 L3 Interconnect View of the Display Memory Space | 298 |
| 2.6.2 L4 Interconnect View of the Display Memory Space | 298 |
| 3 Power, Reset, and Clock Management | 299 |
| 3.1 Device Power Management Introduction | 300 |
| 3.1.1 Device Power-Management Architecture Building Blocks | 300 |
| 3.1.1.1 Clock Management | 300 |
| 3.1.1.1.1 Module Interface and Functional Clocks | 300 |

| | | |
|-----------|--|-----|
| 3.1.1.1.2 | Module-Level Clock Management | 301 |
| 3.1.1.1.3 | Clock Domain | 306 |
| 3.1.1.1.4 | Clock Domain-Level Clock Management | 307 |
| 3.1.1.1.5 | Clock Domain HW_AUTO Mode Sequences | 309 |
| 3.1.1.1.6 | Clock Domain Sleep/Wakeup | 312 |
| 3.1.1.1.7 | Clock Domain Dependency | 312 |
| 3.1.1.2 | Power Management | 315 |
| 3.1.1.2.1 | Power Domain | 315 |
| 3.1.1.2.2 | Module Logic and Memory Context | 317 |
| 3.1.1.2.3 | Retention-Till-Access Memory Feature | 317 |
| 3.1.1.2.4 | Power Domain Management | 317 |
| 3.1.1.3 | Voltage Management | 319 |
| 3.1.1.3.1 | Voltage Domain | 319 |
| 3.1.1.3.2 | Voltage Domain Management | 321 |
| 3.1.1.3.3 | AVS Overview | 322 |
| 3.1.2 | Power-Management Techniques | 324 |
| 3.1.2.1 | Standby Leakage Management | 324 |
| 3.1.2.2 | Dynamic Voltage and Frequency Scaling | 324 |
| 3.1.2.3 | Dynamic Power Switching | 325 |
| 3.1.2.4 | Adaptive Voltage Scaling | 326 |
| 3.1.2.5 | Adaptive Body Bias | 326 |
| 3.1.2.6 | Combining Power-Management Techniques | 327 |
| 3.1.2.6.1 | DPS Versus SLM | 328 |
| 3.2 | PRCM Subsystem Overview | 329 |
| 3.2.1 | Introduction | 329 |
| 3.2.2 | Power-Management Framework Features | 330 |
| 3.3 | PRCM Subsystem Environment | 331 |
| 3.3.1 | External Clock Signals | 331 |
| 3.3.2 | External Boot Signals | 332 |
| 3.3.3 | External Reset Signals | 332 |
| 3.3.4 | External Power Control Signals | 333 |
| 3.3.5 | External Voltage Inputs | 333 |
| 3.3.6 | External Wake-Up Signals | 334 |
| 3.4 | PRCM Subsystem Integration | 335 |
| 3.4.1 | Device Power-Management Layout | 335 |
| 3.4.2 | Power-Management Scheme, Reset, and Interrupt Requests | 337 |
| 3.4.2.1 | Power Domain | 337 |
| 3.4.2.2 | Resets | 338 |
| 3.4.2.3 | Interrupt Requests | 338 |
| 3.5 | Reset Management Functional Description | 339 |
| 3.5.1 | Overview | 339 |
| 3.5.1.1 | SCRM Reset Management Functional Description | 339 |
| 3.5.1.1.1 | Power-On Reset | 339 |
| 3.5.1.1.2 | Warm Reset | 339 |
| 3.5.1.2 | PRM Reset Management Functional Description | 339 |
| 3.5.2 | General Characteristics of Reset Signals | 340 |
| 3.5.2.1 | Scope | 340 |
| 3.5.2.2 | Occurrence | 340 |
| 3.5.2.3 | Source Type | 341 |
| 3.5.2.4 | Retention Type | 341 |
| 3.5.3 | Reset Sources | 341 |
| 3.5.3.1 | Global Reset Sources | 341 |
| 3.5.3.2 | Local Reset Sources | 342 |

| | | |
|-----------|---|-----|
| 3.5.4 | Reset Domains | 342 |
| 3.5.5 | Reset Logging | 356 |
| 3.5.5.1 | PRCM Module Reset Logging Mechanism | 356 |
| 3.5.6 | Reset Sequences | 357 |
| 3.5.6.1 | SCRM Power-on Reset Sequence | 357 |
| 3.5.6.2 | PRCM Module Power-On Reset Sequence | 357 |
| 3.5.6.3 | Cortex-A9 MPU Subsystem Power-On Reset Sequence | 359 |
| 3.5.6.4 | Cortex-A9 MPU Subsystem Warm Reset Sequence | 360 |
| 3.5.6.5 | Cortex-A9 MPU Subsystem Reset Sequence On Sleep and Wake-Up Transitions From RETENTION or OFF State | 361 |
| 3.5.6.6 | IVAHD Subsystem Power-On Reset Sequence | 361 |
| 3.5.6.7 | IVAHD Subsystem Software Warm Reset Sequence | 362 |
| 3.5.6.8 | DSP Subsystem Power-On Reset Sequence | 363 |
| 3.5.6.9 | DSP Subsystem Software Warm Reset Sequence | 364 |
| 3.5.6.10 | DSP Subsystem Reset Sequence On Wake-Up Transitions From OSWR RETENTION State | 364 |
| 3.5.6.11 | Cortex-M3 MPU Subsystem Power-On Reset Sequence | 365 |
| 3.5.6.12 | Cortex-M3 MPU Subsystem Software Warm Reset Sequence | 366 |
| 3.5.6.13 | Global Warm Reset Sequence | 368 |
| 3.6 | Clock Management Functional Description | 370 |
| 3.6.1 | Overview | 370 |
| 3.6.2 | External Clock Inputs | 371 |
| 3.6.2.1 | sys_32k Clock Input | 371 |
| 3.6.2.2 | High-Frequency System Clock Input | 371 |
| 3.6.3 | Internal Clock Sources/Generators | 371 |
| 3.6.3.1 | PRM Clock Source | 371 |
| 3.6.3.2 | CM Clock Source | 374 |
| 3.6.3.2.1 | CM1 Clock Generator | 374 |
| 3.6.3.2.2 | CM1_USB Clock Generator | 375 |
| 3.6.3.2.3 | CM1_ABE Clock Generator | 377 |
| 3.6.3.2.4 | CM2 Clock Generator | 378 |
| 3.6.3.3 | Generic DPLL Overview | 381 |
| 3.6.3.3.1 | DPLLs Output Clocks Parameters | 382 |
| 3.6.3.3.2 | Enable Control, Status, and Low-Power Operation Mode | 384 |
| 3.6.3.3.3 | DPLL Power Modes | 384 |
| 3.6.3.3.4 | DPLL Recalibration | 385 |
| 3.6.3.3.5 | DPLL Spread Spectrum Clocking | 386 |
| 3.6.3.3.6 | DPLL Output Power Down | 393 |
| 3.6.3.3.7 | DPLL Output Clock Gating | 393 |
| 3.6.3.4 | DPLL_PER Description | 393 |
| 3.6.3.4.1 | Overview | 393 |
| 3.6.3.4.2 | Synthesized Clock Parameters | 394 |
| 3.6.3.4.3 | Power Modes | 395 |
| 3.6.3.4.4 | Recalibration | 396 |
| 3.6.3.4.5 | Spread Spectrum Clocking | 396 |
| 3.6.3.4.6 | Output Power Down | 396 |
| 3.6.3.4.7 | DPLL_PER Preferred Settings | 397 |
| 3.6.3.5 | DPLL_CORE Description | 400 |
| 3.6.3.5.1 | Overview | 400 |
| 3.6.3.5.2 | Synthesized Clock Parameters | 400 |
| 3.6.3.5.3 | Power Modes | 401 |
| 3.6.3.5.4 | Recalibration | 402 |
| 3.6.3.5.5 | Spread Spectrum Clocking | 402 |
| 3.6.3.5.6 | Output Power-Down | 403 |

| | | |
|-----------|--------------------------------------|-----|
| 3.6.3.5.7 | DPLL_CORE Preferred Settings | 404 |
| 3.6.3.6 | DPLL_ABE Description | 407 |
| 3.6.3.6.1 | Overview | 407 |
| 3.6.3.6.2 | Synthesized Clock Parameters | 407 |
| 3.6.3.6.3 | Power Modes | 408 |
| 3.6.3.6.4 | Recalibration | 408 |
| 3.6.3.6.5 | Spread Spectrum Clocking | 408 |
| 3.6.3.6.6 | DPLL_ABE Preferred Settings | 408 |
| 3.6.3.7 | DPLL_MPU Description | 410 |
| 3.6.3.7.1 | Overview | 410 |
| 3.6.3.7.2 | Tactical Clocking Adjustment | 410 |
| 3.6.3.7.3 | Synthesized Clock Parameters | 411 |
| 3.6.3.7.4 | Power Modes | 411 |
| 3.6.3.7.5 | Recalibration | 412 |
| 3.6.3.7.6 | Spread Spectrum Clocking | 412 |
| 3.6.3.7.7 | DPLL_MPU Preferred Settings | 412 |
| 3.6.3.8 | DPLL_IVA Description | 414 |
| 3.6.3.8.1 | Overview | 414 |
| 3.6.3.8.2 | Synthesized Clock Parameters | 414 |
| 3.6.3.8.3 | Power Modes | 415 |
| 3.6.3.8.4 | Recalibration | 415 |
| 3.6.3.8.5 | Spread Spectrum Clocking | 415 |
| 3.6.3.8.6 | Output Power Down | 416 |
| 3.6.3.8.7 | DPLL_IVA Preferred Settings | 416 |
| 3.6.3.9 | DPLL_USB Description | 417 |
| 3.6.3.9.1 | Overview | 417 |
| 3.6.3.9.2 | Synthesized Clock Parameters | 417 |
| 3.6.3.9.3 | Power Modes | 418 |
| 3.6.3.9.4 | Spread Spectrum Clocking | 418 |
| 3.6.3.9.5 | DPLL_USB Preferred Settings | 419 |
| 3.6.3.10 | DPLLs Cascading | 420 |
| 3.6.4 | CD_WKUP Clock Domain | 421 |
| 3.6.4.1 | Overview | 421 |
| 3.6.4.2 | Clock Domain Modes | 421 |
| 3.6.4.3 | Clock Domain Dependency | 422 |
| 3.6.4.3.1 | Wake-Up Dependency | 422 |
| 3.6.4.4 | Clock Domain Module Attributes | 422 |
| 3.6.5 | CD_DSP Clock Domain | 424 |
| 3.6.5.1 | Overview | 424 |
| 3.6.5.2 | Clock Domain Modes | 425 |
| 3.6.5.3 | Clock Domain Dependency | 425 |
| 3.6.5.3.1 | Static Dependency | 425 |
| 3.6.5.3.2 | Dynamic Dependency | 426 |
| 3.6.5.4 | Clock Domain Module Attributes | 426 |
| 3.6.6 | CD_STD_EFUSE Clock Domain | 427 |
| 3.6.6.1 | Overview | 427 |
| 3.6.6.2 | Clock Domain Module Attributes | 427 |
| 3.6.7 | CD_CORTEXA9 Clock Domain | 428 |
| 3.6.7.1 | Overview | 428 |
| 3.6.7.2 | Clock Domain Modes | 428 |
| 3.6.7.3 | Clock Domain Dependency | 428 |
| 3.6.7.3.1 | Static Dependency | 428 |
| 3.6.7.3.2 | Dynamic Dependency | 429 |

| | | |
|------------|--------------------------------------|-----|
| 3.6.7.4 | Clock Domain Module Attributes | 429 |
| 3.6.8 | CD_L4_PER Clock Domain | 430 |
| 3.6.8.1 | Overview | 430 |
| 3.6.8.2 | Clock Domain Modes | 431 |
| 3.6.8.3 | Clock Domain Dependency | 432 |
| 3.6.8.3.1 | Dynamic Dependency | 432 |
| 3.6.8.3.2 | Wake-Up Dependency | 432 |
| 3.6.8.4 | Clock Domain Module Attributes | 437 |
| 3.6.9 | CD_L3_INIT Clock Domain | 442 |
| 3.6.9.1 | Overview | 442 |
| 3.6.9.2 | Clock Domain Modes | 443 |
| 3.6.9.3 | Clock Domain Dependency | 444 |
| 3.6.9.3.1 | Static Dependency | 444 |
| 3.6.9.3.2 | Dynamic Dependency | 444 |
| 3.6.9.3.3 | Wake-Up Dependency | 444 |
| 3.6.9.4 | Clock Domain Module Attributes | 446 |
| 3.6.10 | CD_IVAHD Clock Domain | 448 |
| 3.6.10.1 | Overview | 448 |
| 3.6.10.2 | Clock Domain Modes | 448 |
| 3.6.10.3 | Clock Domain Dependency | 449 |
| 3.6.10.3.1 | Static Dependency | 449 |
| 3.6.10.3.2 | Dynamic Dependency | 449 |
| 3.6.10.4 | Clock Domain Module Attributes | 449 |
| 3.6.11 | CD_SGX Clock Domain | 450 |
| 3.6.11.1 | Overview | 450 |
| 3.6.11.2 | Clock Domain Modes | 451 |
| 3.6.11.3 | Clock Domain Dependency | 451 |
| 3.6.11.3.1 | Static Dependency | 451 |
| 3.6.11.3.2 | Dynamic Dependency | 451 |
| 3.6.11.4 | Clock Domain Module Attributes | 451 |
| 3.6.12 | CD_EMU Clock Domain | 452 |
| 3.6.12.1 | Overview | 452 |
| 3.6.12.2 | Clock Domain Modes | 453 |
| 3.6.12.3 | Clock Domain Dependency | 454 |
| 3.6.12.3.1 | Dynamic Dependency | 454 |
| 3.6.12.4 | Clock Domain Module Attributes | 454 |
| 3.6.13 | CD_DSS Clock Domain | 454 |
| 3.6.13.1 | Overview | 454 |
| 3.6.13.2 | Clock Domain Modes | 455 |
| 3.6.13.3 | Clock Domain Dependency | 455 |
| 3.6.13.3.1 | Static Dependency | 455 |
| 3.6.13.3.2 | Dynamic Dependency | 456 |
| 3.6.13.3.3 | Wake-Up Dependency | 456 |
| 3.6.13.4 | Clock Domain Module Attributes | 457 |
| 3.6.14 | CD_L4_CFG Clock Domain | 458 |
| 3.6.14.1 | Overview | 458 |
| 3.6.14.2 | Clock Domain Modes | 459 |
| 3.6.14.3 | Clock Domain Dependency | 459 |
| 3.6.14.3.1 | Dynamic Dependency | 459 |
| 3.6.14.4 | Clock Domain Module Attributes | 459 |
| 3.6.15 | CD_L3_INSTR Clock Domain | 461 |
| 3.6.15.1 | Overview | 461 |
| 3.6.15.2 | Clock Domain Modes | 461 |

| | | |
|------------|--------------------------------------|-----|
| 3.6.15.3 | Clock Domain Dependency | 461 |
| 3.6.15.4 | Clock Domain Module Attributes | 461 |
| 3.6.16 | CD_L3_2 Clock Domain | 462 |
| 3.6.16.1 | Overview | 462 |
| 3.6.16.2 | Clock Domain Modes | 463 |
| 3.6.16.3 | Clock Domain Dependency | 463 |
| 3.6.16.3.1 | Dynamic Dependency | 463 |
| 3.6.16.4 | Clock Domain Module Attributes | 464 |
| 3.6.17 | CD_L3_1 Clock Domain | 465 |
| 3.6.17.1 | Overview | 465 |
| 3.6.17.2 | Clock Domain Modes | 465 |
| 3.6.17.3 | Clock Domain Dependency | 465 |
| 3.6.17.3.1 | Dynamic Dependency | 465 |
| 3.6.17.4 | Clock Domain Module Attributes | 466 |
| 3.6.18 | CD_EMIF Clock Domain | 466 |
| 3.6.18.1 | Overview | 466 |
| 3.6.18.2 | Clock Domain Modes | 467 |
| 3.6.18.3 | Clock Domain Dependency | 467 |
| 3.6.18.4 | Clock Domain Module Attributes | 467 |
| 3.6.19 | CD_CORTEXM3 Clock Domain | 469 |
| 3.6.19.1 | Overview | 469 |
| 3.6.19.2 | Clock Domain Modes | 469 |
| 3.6.19.3 | Clock Domain Dependency | 470 |
| 3.6.19.3.1 | Static Dependency | 470 |
| 3.6.19.3.2 | Dynamic Dependency | 470 |
| 3.6.19.4 | Clock Domain Module Attributes | 470 |
| 3.6.20 | CD_DMA Clock Domain | 471 |
| 3.6.20.1 | Overview | 471 |
| 3.6.20.2 | Clock Domain Modes | 472 |
| 3.6.20.3 | Clock Domain Dependency | 472 |
| 3.6.20.4 | Clock Domain Module Attributes | 472 |
| 3.6.21 | CD_C2C Clock Domain | 473 |
| 3.6.21.1 | Overview | 473 |
| 3.6.21.2 | Clock Domain Modes | 473 |
| 3.6.21.3 | Clock Domain Dependency | 474 |
| 3.6.21.3.1 | Static Dependency | 474 |
| 3.6.21.3.2 | Dynamic Dependency | 474 |
| 3.6.21.4 | Clock Domain Module Attributes | 474 |
| 3.6.22 | CD_CAM Clock Domain | 475 |
| 3.6.22.1 | Overview | 475 |
| 3.6.22.2 | Clock Domain Modes | 476 |
| 3.6.22.3 | Clock Domain Dependency | 476 |
| 3.6.22.3.1 | Static Dependency | 476 |
| 3.6.22.3.2 | Dynamic Dependency | 477 |
| 3.6.22.4 | Clock Domain Module Attributes | 477 |
| 3.6.23 | CD_ABE Clock Domain | 478 |
| 3.6.23.1 | Overview | 478 |
| 3.6.23.2 | Clock Domain Modes | 478 |
| 3.6.23.3 | Clock Domain Dependency | 479 |
| 3.6.23.3.1 | Wake-Up Dependency | 479 |
| 3.6.23.4 | Clock Domain Module Attributes | 481 |
| 3.6.24 | CD_L4_ALWON_CORE Clock Domain | 484 |
| 3.6.24.1 | Overview | 484 |

| | | |
|------------|--|-----|
| 3.6.24.2 | Clock Domain Modes | 484 |
| 3.6.24.3 | Clock Domain Dependency | 485 |
| 3.6.24.3.1 | Wake-Up Dependency | 485 |
| 3.6.24.4 | Clock Domain Module Attributes | 485 |
| 3.7 | Power Management Functional Description | 487 |
| 3.7.1 | PD_WKUP Description | 487 |
| 3.7.1.1 | Power Domain Modes | 487 |
| 3.7.2 | PD_DSP Description | 487 |
| 3.7.2.1 | Power Domain Modes | 488 |
| 3.7.2.1.1 | Logic and Memory Area Power Modes | 488 |
| 3.7.2.1.2 | Logic and Memory Area Power Modes Control and Status | 488 |
| 3.7.3 | PD_STD_EFUSE Description | 489 |
| 3.7.3.1 | Power Domain Modes | 489 |
| 3.7.4 | PD_MPU Description | 489 |
| 3.7.4.1 | Power Domain Modes | 490 |
| 3.7.4.1.1 | Logic and Memory Area Power Modes | 490 |
| 3.7.4.1.2 | Logic and Memory Area Power Modes Control and Status | 490 |
| 3.7.5 | PD_L4_PER Description | 491 |
| 3.7.5.1 | Power Domain Modes | 492 |
| 3.7.5.1.1 | Logic and Memory Area Power Modes | 493 |
| 3.7.5.1.2 | Logic and Memory Area Power Modes Control and Status | 493 |
| 3.7.6 | PD_L3_INIT Description | 494 |
| 3.7.6.1 | Power Domain Modes | 494 |
| 3.7.6.1.1 | Logic and Memory Area Power Modes | 494 |
| 3.7.6.1.2 | Logic and Memory Area Power Modes Control and Status | 495 |
| 3.7.7 | PD_IVAHD Description | 496 |
| 3.7.7.1 | Power Domain Modes | 496 |
| 3.7.7.1.1 | Logic and Memory Area Power Modes | 496 |
| 3.7.7.1.2 | Logic and Memory Area Power Modes Control and Status | 497 |
| 3.7.8 | PD_SGX Description | 497 |
| 3.7.8.1 | Power Domain Modes | 498 |
| 3.7.8.1.1 | Logic and Memory Area Power Modes | 498 |
| 3.7.8.1.2 | Logic and Memory Area Power Modes Control and Status | 498 |
| 3.7.9 | PD_EMU Description | 499 |
| 3.7.9.1 | Power Domain Modes | 499 |
| 3.7.9.1.1 | Logic and Memory Area Power Modes | 499 |
| 3.7.9.1.2 | Logic and Memory Area Power Modes Control and Status | 499 |
| 3.7.10 | PD_DSS Description | 500 |
| 3.7.10.1 | Power Domain Modes | 500 |
| 3.7.10.1.1 | Logic and Memory Area Power Modes | 500 |
| 3.7.10.1.2 | Logic and Memory Area Power Modes Control and Status | 501 |
| 3.7.11 | PD_CORE Description | 501 |
| 3.7.11.1 | Power Domain Modes | 502 |
| 3.7.11.1.1 | Logic and Memory Area Power Modes | 502 |
| 3.7.11.1.2 | Logic and Memory Area Power Modes Control and Status | 503 |
| 3.7.12 | PD_CAM Description | 504 |
| 3.7.12.1 | Power Domain Modes | 505 |
| 3.7.12.1.1 | Logic and Memory Area Power Modes | 505 |
| 3.7.12.1.2 | Logic and Memory Area Power Modes Control and Status | 505 |
| 3.7.13 | PD_AUDIO Description | 506 |
| 3.7.13.1 | Power Domain Modes | 506 |
| 3.7.13.1.1 | Logic and Memory Area Power Modes | 506 |
| 3.7.13.1.2 | Logic and Memory Area Power Modes Control and Status | 507 |

| | | |
|-----------|--|-----|
| 3.7.14 | PD_ALWON_MPU Description | 508 |
| 3.7.14.1 | Power Domain Modes | 508 |
| 3.7.15 | PD_ALWON_DSP Description | 508 |
| 3.7.15.1 | Power Domain Modes | 508 |
| 3.7.16 | PD_ALWON_CORE Description | 508 |
| 3.7.16.1 | Power Domain Modes | 509 |
| 3.8 | Voltage Management Functional Description | 510 |
| 3.8.1 | Overview | 510 |
| 3.8.2 | Voltage-Control Architecture | 511 |
| 3.8.3 | VDD_MPU_L, VDD_CORE_L, and VDD_IVA_L Control | 512 |
| 3.8.3.1 | PRM Dedicated I ² C Control | 512 |
| 3.8.3.2 | Adaptive Voltage Scaling | 513 |
| 3.8.3.2.1 | SmartReflex in the Device | 513 |
| 3.8.3.2.2 | SmartReflex Module | 514 |
| 3.8.3.2.3 | SmartReflex Submodules | 515 |
| 3.8.3.2.4 | Status Register | 517 |
| 3.8.3.2.5 | SmartReflex Parameters Set After Silicon Characterization | 518 |
| 3.8.3.2.6 | Voltage Processor Module | 518 |
| 3.8.3.2.7 | SMPS-Dependent Parameter Configuration | 521 |
| 3.8.3.2.8 | Communication Between SmartReflex, Voltage Processor, Voltage Controller, and SMPS | 521 |
| 3.8.4 | Internal LDOs Control | 522 |
| 3.8.4.1 | Memory LDOs | 522 |
| 3.8.4.2 | LDO_WAKEUP | 522 |
| 3.8.4.3 | ABB LDOs Control | 523 |
| 3.8.4.3.1 | ABB Strategy for the Cortex-A9 MPU Operating at OPP_TURBO | 523 |
| 3.8.4.3.2 | ABB Strategy for the IVA-HD Operating at OPP_TURBO | 523 |
| 3.8.4.4 | Bandgap Control | 524 |
| 3.8.5 | Voltage Domain State Transitions | 524 |
| 3.8.5.1 | VDD_x_L Transitions | 524 |
| 3.8.5.2 | Memory LDOs Transitions | 525 |
| 3.8.5.3 | LDO_WAKEUP Transitions | 525 |
| 3.8.6 | DVFS | 526 |
| 3.8.6.1 | EMIF Clocks Frequency Scaling Constraints | 526 |
| 3.8.6.2 | GPWC Clocks Frequency Scaling Constraints | 527 |
| 3.8.6.3 | CORE DVFS Versus Subsystem Functionality | 528 |
| 3.8.6.3.1 | Display Subsystem | 528 |
| 3.8.6.3.2 | IVAHD | 528 |
| 3.8.6.3.3 | Imaging Subsystem | 529 |
| 3.8.6.4 | DVFS Voting Mechanism (VDD_CORE_L and VDD_IVA_L Voltage Domains) | 529 |
| 3.8.6.4.1 | CORE OPP Voting Architecture | 529 |
| 3.8.6.4.2 | IVA OPP Voting Architecture | 529 |
| 3.8.6.4.3 | Voting Mechanism | 530 |
| 3.9 | Device Low-Power States | 531 |
| 3.9.1 | Device Wake-Up Source Summary | 531 |
| 3.9.2 | Device RETENTION State Management | 533 |
| 3.9.3 | Device OFF State Management | 533 |
| 3.9.3.1 | Device Off Mode Sleep Sequence | 534 |
| 3.9.3.2 | Device Off Mode Wake-Up Sequences | 536 |
| 3.9.3.2.1 | Wake Up From a Wake-Up Event | 536 |
| 3.9.3.2.2 | Wakeup Upon Global Warm Reset | 538 |
| 3.9.3.3 | Global Warm Reset During a Device Wake-Up Sequence | 538 |
| 3.9.4 | I/O Management | 538 |
| 3.9.4.1 | Hardware-Controlled I/O Isolation Sequences | 540 |

| | | |
|------------|--|-----|
| 3.9.4.2 | Software-Controlled I/O Isolation | 540 |
| 3.10 | PRCM Module Programming Guide | 541 |
| 3.10.1 | DPLLs Low-Level Programming Models | 541 |
| 3.10.1.1 | Global Initialization | 541 |
| 3.10.1.1.1 | Surrounding Module Global Initialization | 541 |
| 3.10.1.1.2 | DPLL Global Initialization | 541 |
| 3.10.1.2 | DPLL Output Frequency Change | 543 |
| 3.10.2 | Clock Management Low-Level Programming Models | 546 |
| 3.10.2.1 | Global Initialization | 546 |
| 3.10.2.1.1 | Surrounding Module Global Initialization | 546 |
| 3.10.2.1.2 | Clock Management Global Initialization | 546 |
| 3.10.2.2 | Clock Domain Sleep Transition and Troubleshooting | 547 |
| 3.10.2.3 | Enable/Disable Software-Programmable Static Dependency | 547 |
| 3.10.3 | Power Management Low-Level Programming Models | 548 |
| 3.10.3.1 | Global Initialization | 548 |
| 3.10.3.1.1 | Surrounding Module Global Initialization | 548 |
| 3.10.3.1.2 | Power Management Global Initialization | 548 |
| 3.10.3.2 | Forced Memory Area State Change With Power Domain ON | 548 |
| 3.10.3.3 | Forced Power Domain Low-Power State Transition | 548 |
| 3.10.4 | Voltage Management Low-Level Programming Models | 549 |
| 3.10.4.1 | Global Initialization | 549 |
| 3.10.4.1.1 | Surrounding Module Global Initialization | 549 |
| 3.10.4.1.2 | Voltage Management Global Initialization | 549 |
| 3.10.4.1.3 | SmartReflex Module Initialization | 549 |
| 3.10.4.1.4 | Voltage Processor Initialization | 551 |
| 3.10.4.1.5 | Voltage Controller Initialization | 552 |
| 3.10.4.2 | Disable Sequence for AVS (SmartReflex) and VP | 553 |
| 3.10.4.2.1 | Disable the Error Generator Module | 553 |
| 3.10.4.2.2 | Disable the Voltage Processor | 553 |
| 3.10.4.2.3 | Disable AVS (SmartReflex) | 553 |
| 3.10.4.3 | Changing OPP | 554 |
| 3.11 | PRCM Register Manual | 557 |
| 3.11.1 | PRM Instance Summary | 557 |
| 3.11.2 | INTRCONN_SOCKET_PRM Registers | 557 |
| 3.11.2.1 | INTRCONN_SOCKET_PRM Register Summary | 557 |
| 3.11.2.2 | INTRCONN_SOCKET_PRM Register Description | 557 |
| 3.11.3 | CKGEN_PRM Registers | 576 |
| 3.11.3.1 | CKGEN_PRM Register Summary | 576 |
| 3.11.3.2 | CKGEN_PRM Register Description | 576 |
| 3.11.4 | MPU_PRM Registers | 578 |
| 3.11.4.1 | MPU_PRM Register Summary | 578 |
| 3.11.4.2 | MPU_PRM Register Description | 578 |
| 3.11.5 | DSP_PRM Registers | 582 |
| 3.11.5.1 | DSP_PRM Register Summary | 582 |
| 3.11.5.2 | DSP_PRM Register Description | 582 |
| 3.11.6 | ABE_PRM Registers | 588 |
| 3.11.6.1 | ABE_PRM Register Summary | 588 |
| 3.11.6.2 | ABE_PRM Register Description | 588 |
| 3.11.7 | ALWAYS_ON_PRM Registers | 610 |
| 3.11.7.1 | ALWAYS_ON_PRM Register Summary | 610 |
| 3.11.7.2 | ALWAYS_ON_PRM Register Description | 610 |
| 3.11.8 | CORE_PRM Registers | 614 |
| 3.11.8.1 | CORE_PRM Register Summary | 614 |

| | | |
|-----------|--|-----|
| 3.11.8.2 | CORE_PRM Register Description | 615 |
| 3.11.9 | IWAHD_PRM Registers | 634 |
| 3.11.9.1 | IWAHD_PRM Register Summary | 634 |
| 3.11.9.2 | IWAHD_PRM Register Description | 635 |
| 3.11.10 | CAM_PRM Registers | 641 |
| 3.11.10.1 | CAM_PRM Register Summary | 641 |
| 3.11.10.2 | CAM_PRM Register Description | 641 |
| 3.11.11 | DSS_PRM Registers | 645 |
| 3.11.11.1 | DSS_PRM Register Summary | 645 |
| 3.11.11.2 | DSS_PRM Register Description | 645 |
| 3.11.12 | SGX_PRM Registers | 651 |
| 3.11.12.1 | SGX_PRM Register Summary | 651 |
| 3.11.12.2 | SGX_PRM Register Description | 651 |
| 3.11.13 | L3INIT_PRM Registers | 654 |
| 3.11.13.1 | L3INIT_PRM Register Summary | 654 |
| 3.11.13.2 | L3INIT_PRM Register Description | 654 |
| 3.11.14 | L4PER_PRM Registers | 667 |
| 3.11.14.1 | L4PER_PRM Register Summary | 667 |
| 3.11.14.2 | L4PER_PRM Register Description | 669 |
| 3.11.15 | WKUP_PRM Registers | 716 |
| 3.11.15.1 | WKUP_PRM Register Summary | 716 |
| 3.11.15.2 | WKUP_PRM Register Description | 716 |
| 3.11.16 | WKUP_CM Registers | 723 |
| 3.11.16.1 | WKUP_CM Register Summary | 723 |
| 3.11.16.2 | WKUP_CM Register Description | 724 |
| 3.11.17 | EMU_PRM Registers | 732 |
| 3.11.17.1 | EMU_PRM Register Summary | 732 |
| 3.11.17.2 | EMU_PRM Register Description | 732 |
| 3.11.18 | EMU_CM Registers | 734 |
| 3.11.18.1 | EMU_CM Register Summary | 734 |
| 3.11.18.2 | EMU_CM Register Description | 734 |
| 3.11.19 | DEVICE_PRM Registers | 738 |
| 3.11.19.1 | DEVICE_PRM Register Summary | 738 |
| 3.11.19.2 | DEVICE_PRM Register Description | 739 |
| 3.11.20 | INSTR_PRM Registers | 787 |
| 3.11.20.1 | INSTR_PRM Register Summary | 787 |
| 3.11.20.2 | INSTR_PRM Register Description | 787 |
| 3.11.21 | CM1 Instance Summary | 791 |
| 3.11.22 | INTRCONN_SOCKET_CM1 Registers | 791 |
| 3.11.22.1 | INTRCONN_SOCKET_CM1 Register Summary | 791 |
| 3.11.22.2 | INTRCONN_SOCKET_CM1 Register Description | 792 |
| 3.11.23 | CKGEN_CM1 Registers | 793 |
| 3.11.23.1 | CKGEN_CM1 Register Summary | 793 |
| 3.11.23.2 | CKGEN_CM1 Register Description | 795 |
| 3.11.24 | MPU_CM1 Registers | 832 |
| 3.11.24.1 | MPU_CM1 Register Summary | 832 |
| 3.11.24.2 | MPU_CM1 Register Description | 833 |
| 3.11.25 | DSP_CM1 Registers | 837 |
| 3.11.25.1 | DSP_CM1 Register Summary | 837 |
| 3.11.25.2 | DSP_CM1 Register Description | 837 |
| 3.11.26 | ABE_CM1 Registers | 841 |
| 3.11.26.1 | ABE_CM1 Register Summary | 841 |
| 3.11.26.2 | ABE_CM1 Register Description | 842 |

| | | |
|-----------|--|------|
| 3.11.27 | RESTORE_CM1 Registers | 859 |
| 3.11.27.1 | RESTORE_CM1 Register Summary | 859 |
| 3.11.27.2 | RESTORE_CM1 Register Description | 860 |
| 3.11.28 | INSTR_CM1 Registers | 875 |
| 3.11.28.1 | INSTR_CM1 Register Summary | 875 |
| 3.11.28.2 | INSTR_CM1 Register Description | 875 |
| 3.11.29 | CM2 Instance Summary | 879 |
| 3.11.30 | INTRCONN_SOCKET_CM2 Registers | 879 |
| 3.11.30.1 | INTRCONN_SOCKET_CM2 Register Summary | 879 |
| 3.11.30.2 | INTRCONN_SOCKET_CM2 Register Description | 879 |
| 3.11.31 | CKGEN_CM2 Registers | 881 |
| 3.11.31.1 | CKGEN_CM2 Register Summary | 881 |
| 3.11.31.2 | CKGEN_CM2 Register Description | 882 |
| 3.11.32 | ALWAYS_ON_CM2 Registers | 904 |
| 3.11.32.1 | ALWAYS_ON_CM2 Register Summary | 904 |
| 3.11.32.2 | ALWAYS_ON_CM2 Register Description | 905 |
| 3.11.33 | CORE_CM2 Registers | 909 |
| 3.11.33.1 | CORE_CM2 Register Summary | 909 |
| 3.11.33.2 | CORE_CM2 Register Description | 910 |
| 3.11.34 | IVAHD_CM2 Registers | 943 |
| 3.11.34.1 | IVAHD_CM2 Register Summary | 943 |
| 3.11.34.2 | IVAHD_CM2 Register Description | 943 |
| 3.11.35 | CAM_CM2 Registers | 947 |
| 3.11.35.1 | CAM_CM2 Register Summary | 947 |
| 3.11.35.2 | CAM_CM2 Register Description | 948 |
| 3.11.36 | DSS_CM2 Registers | 952 |
| 3.11.36.1 | DSS_CM2 Register Summary | 952 |
| 3.11.36.2 | DSS_CM2 Register Description | 953 |
| 3.11.37 | SGX_CM2 Registers | 957 |
| 3.11.37.1 | SGX_CM2 Register Summary | 957 |
| 3.11.37.2 | SGX_CM2 Register Description | 958 |
| 3.11.38 | L3INIT_CM2 Registers | 961 |
| 3.11.38.1 | L3INIT_CM2 Register Summary | 961 |
| 3.11.38.2 | L3INIT_CM2 Register Description | 962 |
| 3.11.39 | L4PER_CM2 Registers | 974 |
| 3.11.39.1 | L4PER_CM2 Register Summary | 974 |
| 3.11.39.2 | L4PER_CM2 Register Description | 976 |
| 3.11.40 | RESTORE_CM2 Registers | 1007 |
| 3.11.40.1 | RESTORE_CM2 Register Summary | 1007 |
| 3.11.40.2 | RESTORE_CM2 Register Description | 1007 |
| 3.11.41 | INSTR_CM2 Registers | 1034 |
| 3.11.41.1 | INSTR_CM2 Register Summary | 1034 |
| 3.11.41.2 | INSTR_CM2 Register Description | 1035 |
| 3.12 | SCRM Register Manual | 1039 |
| 3.12.1 | SCRM Instance Summary | 1039 |
| 3.12.2 | SCRM Registers | 1039 |
| 3.12.2.1 | SCRM Register Summary | 1039 |
| 3.12.2.2 | SCRM Register Description | 1040 |
| 3.13 | SR Register Manual | 1063 |
| 3.13.1 | SR Instance Summary | 1063 |
| 3.13.2 | SR Registers | 1063 |
| 3.13.2.1 | SR Register Summary | 1063 |
| 3.13.2.2 | SR Register Description | 1063 |

| | | |
|-----------|--|-------------|
| 4 | Dual Cortex-A9 MPU Subsystem | 1075 |
| 4.1 | Dual Cortex-A9 MPU Subsystem Overview | 1076 |
| 4.1.1 | Introduction | 1076 |
| 4.1.2 | Features | 1078 |
| 4.2 | Dual Cortex-A9 MPU Subsystem Integration | 1079 |
| 4.2.1 | Clock Distribution | 1080 |
| 4.2.2 | Reset Distribution | 1081 |
| 4.3 | Dual Cortex-A9 MPU Subsystem Functional Description | 1084 |
| 4.3.1 | Cortex-A9 MPU Subsystem Block Diagram | 1084 |
| 4.3.2 | ARM Core | 1085 |
| 4.3.3 | Local Interconnect | 1086 |
| 4.3.4 | Memory Adapter | 1087 |
| 4.3.4.1 | MA Functional Description | 1089 |
| 4.3.4.1.1 | Input Interface | 1089 |
| 4.3.4.1.2 | Interleaving | 1089 |
| 4.3.4.1.3 | CMU Access Squelching | 1090 |
| 4.3.4.1.4 | MA Firewall | 1090 |
| 4.3.4.1.5 | MA Power and Reset Management | 1091 |
| 4.3.5 | Cache Management Unit | 1091 |
| 4.3.5.1 | Overview | 1091 |
| 4.3.5.1.1 | Integration in the Cortex-A9 MPU Subsystem | 1091 |
| 4.3.5.1.2 | Functionality | 1092 |
| 4.3.5.1.3 | Clean/Clean-Invalidate/Invalidate Flow | 1093 |
| 4.3.5.2 | Architecture | 1093 |
| 4.3.5.2.1 | Range Sets | 1094 |
| 4.3.5.2.2 | Parallelism and Pipelining | 1095 |
| 4.3.5.2.3 | Completion Handling | 1095 |
| 4.3.5.2.4 | Allocation | 1096 |
| 4.3.5.3 | Address Sequence Generation | 1096 |
| 4.3.5.4 | Using the CMU | 1096 |
| 4.3.5.4.1 | Allocating a Range Set | 1097 |
| 4.3.5.4.2 | Storing Starting Physical Address and Length | 1097 |
| 4.3.5.4.3 | Activate the Range Set by Storing the Operation Register | 1097 |
| 4.3.5.4.4 | Monitoring Completion | 1097 |
| 4.3.5.4.5 | Freeing a Range Set | 1098 |
| 4.3.5.4.6 | Paged Memory | 1098 |
| 4.3.5.4.7 | Large Buffers | 1099 |
| 4.3.5.5 | Micro-Architecture of CMU | 1099 |
| 4.3.5.5.1 | Range Set DMEM | 1100 |
| 4.3.5.5.2 | Data Line Buffers | 1100 |
| 4.3.5.5.3 | Range Walker | 1100 |
| 4.3.5.5.4 | Main Control | 1100 |
| 4.3.5.5.5 | Interrupt Index Queue | 1100 |
| 4.3.5.5.6 | Configuration Registers | 1101 |
| 4.3.5.5.7 | Read/Write Transaction Block | 1101 |
| 4.3.5.6 | Free Set Management, Operation Queue Functionality, and Main Control | 1101 |
| 4.3.5.6.1 | Allocation and Free Set Management | 1101 |
| 4.3.5.6.2 | Activation and Operation Queue Functionality | 1102 |
| 4.3.5.6.3 | Main Control | 1103 |
| 4.3.5.7 | Priority of Range Set DMEM Accesses | 1103 |
| 4.3.5.8 | Interrupt Index Queue | 1103 |
| 4.3.5.9 | Important Programming Notes for Users of CMU | 1103 |
| 4.3.5.10 | Notes on Corner Cases – Hardware and Software Notes | 1104 |

| | | |
|------------|--|-------------|
| 4.3.6 | Power Management | 1105 |
| 4.3.6.1 | Power Domains | 1105 |
| 4.3.6.2 | Power States of CPU0 and CPU1 | 1107 |
| 4.3.6.3 | WUGEN | 1109 |
| 4.3.6.4 | Power Transition Sequence | 1109 |
| 4.3.6.5 | CPU0 and CPU1 Power Domains Description | 1109 |
| 4.3.6.5.1 | Power Domain Modes | 1110 |
| 4.4 | Dual Cortex-A9 MPU Subsystem Register Manual | 1112 |
| 4.4.1 | Cortex-A9 MPU Subsystem Instance Summary | 1112 |
| 4.4.2 | SCU Registers | 1112 |
| 4.4.3 | Interrupt Controller Registers | 1112 |
| 4.4.4 | Timer Registers | 1112 |
| 4.4.5 | PL310 Registers | 1112 |
| 4.4.6 | Local PRCM Revision Register | 1112 |
| 4.4.6.1 | Local PRCM Revision Register Summary | 1112 |
| 4.4.6.2 | Local PRCM Revision Register Description | 1113 |
| 4.4.7 | Local PRCM Registers | 1113 |
| 4.4.7.1 | Local PRCM Register Summary | 1113 |
| 4.4.7.2 | Local PRCM Log Register Description | 1113 |
| 4.4.8 | Local PRCM CPU0 and CPU1 Registers | 1114 |
| 4.4.8.1 | Local PRCM CPU0 and CPU1 Register Summary | 1114 |
| 4.4.8.2 | Local PRCM CPU0 Register Description | 1115 |
| 4.4.9 | Wake-Up Generator Registers | 1119 |
| 4.4.9.1 | CORTEXA9_WUGEN Register Summary | 1119 |
| 4.4.9.2 | CORTEXA9_WUGEN Register Description | 1120 |
| 4.4.10 | CMU Registers | 1133 |
| 4.4.10.1 | CMU Register Summary | 1133 |
| 4.4.10.2 | CMU Register Description | 1133 |
| 4.4.11 | Local Interconnect Registers | 1140 |
| 4.4.11.1 | Local Interconnect Register Summary | 1140 |
| 4.4.11.2 | Local Interconnect Register Description | 1140 |
| 4.4.12 | MA Registers | 1141 |
| 4.4.12.1 | MA Register Summary | 1141 |
| 4.4.12.2 | MA Register Description | 1141 |
| 5 | DSP Subsystem | 1143 |
| 6 | IVA-HD Subsystem | 1145 |
| 6.1 | IVA-HD Overview | 1146 |
| 6.1.1 | IVA-HD Integration | 1148 |
| 6.1.2 | IVA-HD Functional Description | 1149 |
| 6.1.2.1 | IVA-HD Block Diagram | 1149 |
| 6.1.2.1.1 | SyncBox | 1150 |
| 6.1.2.1.2 | iCONTs | 1150 |
| 6.1.2.1.3 | vDMA | 1150 |
| 6.1.2.1.4 | iME3 | 1150 |
| 6.1.2.1.5 | iPE3 | 1151 |
| 6.1.2.1.6 | MC3 | 1151 |
| 6.1.2.1.7 | CALC3 | 1151 |
| 6.1.2.1.8 | iLF3 | 1151 |
| 6.1.2.1.9 | ECD3 | 1151 |
| 6.1.2.1.10 | SL2 Interface | 1151 |
| 6.1.2.1.11 | Message Bus | 1152 |
| 6.1.2.1.12 | IVA-HD Local Interconnect | 1152 |
| 6.1.2.1.13 | MailBox | 1152 |

| | | |
|------------|---|-------------|
| 6.1.2.1.14 | IVA-HD System Control | 1152 |
| 6.1.2.2 | IVA-HD Power Management | 1152 |
| 6.1.2.3 | IVA-HD Memory Mapping | 1152 |
| 6.1.3 | IVA-HD Register Manual | 1156 |
| 6.1.3.1 | IVA-HD Instance Summary | 1157 |
| 6.1.3.2 | SYSCTRL Registers | 1157 |
| 6.1.3.2.1 | SYSCTRL Register Summary | 1157 |
| 6.1.3.2.2 | SYSCTRL Register Description | 1157 |
| 7 | Dual Cortex-M3 MPU Subsystem | 1169 |
| 7.1 | Dual Cortex-M3 MPU Subsystem Overview | 1170 |
| 7.1.1 | Introduction | 1170 |
| 7.1.2 | Features | 1171 |
| 7.2 | Dual Cortex-M3 MPU Subsystem Integration | 1172 |
| 7.2.1 | Dual Cortex-M3 MPU Subsystem Clock and Reset Distribution | 1173 |
| 7.2.1.1 | Clock Distribution | 1173 |
| 7.2.1.2 | Reset Distribution | 1174 |
| 7.3 | Dual Cortex-M3 MPU Subsystem Functional Description | 1176 |
| 7.3.1 | Dual Cortex-M3 MPU Subsystem Block Diagram | 1176 |
| 7.3.2 | Power Management | 1177 |
| 7.3.2.1 | Local Power Management | 1178 |
| 7.3.2.2 | Power Domains | 1178 |
| 7.3.2.3 | Voltage Domain | 1178 |
| 7.3.2.4 | Power States and Modes | 1179 |
| 7.3.2.5 | Wake-Up Generator | 1180 |
| 7.3.2.5.1 | WUGEN Main Features | 1180 |
| 7.3.3 | Shared Cache | 1181 |
| 7.3.4 | Shared Cache MMU | 1182 |
| 7.3.5 | L2 MMU | 1182 |
| 7.3.5.1 | L2 MMU Behavior on Page-Fault in Dual Cortex-M3 MPU | 1183 |
| 7.3.6 | Interprocessor Communication (IPC) | 1183 |
| 7.3.6.1 | Use of WFE and SEV | 1183 |
| 7.3.6.2 | Use of Interrupt for IPC | 1184 |
| 7.3.6.3 | Use of the Bit-Band Feature for Semaphore Operations | 1184 |
| 7.3.6.4 | Private Memory Space | 1184 |
| 7.4 | Dual Cortex-M3 MPU Subsystem Register Manual | 1186 |
| 7.4.1 | Dual Cortex-M3 Subsystem Instance Summary | 1186 |
| 7.4.2 | Shared Cache Configuration Registers | 1186 |
| 7.4.3 | Shared Cache SCTM Registers | 1186 |
| 7.4.4 | Shared Cache MMU Registers | 1186 |
| 7.4.5 | Cortex-M3 L2 MMU Registers | 1187 |
| 7.4.6 | Cortex-M3 NVIC Registers | 1187 |
| 7.4.7 | Cortex-M3 Wake-Up Generator Registers | 1187 |
| 7.4.7.1 | CORTEXM3_WKUP Register Summary | 1187 |
| 7.4.7.2 | Dual Cortex-M3 MPU Wake-Up Generator Register Description | 1187 |
| 7.4.8 | Cortex-M3 RW Table Registers | 1191 |
| 7.4.8.1 | CM3_RW_Table Register Summary | 1191 |
| 7.4.8.2 | Cortex-M3 RW Table Register Description | 1191 |
| 8 | Imaging Subsystem | 1193 |
| 8.1 | ISS Overview | 1194 |
| 8.1.1 | ISS Integration | 1197 |
| 8.1.1.1 | ISS PRCM Interface Integration | 1199 |
| 8.1.1.1.1 | ISS Clock Domains | 1199 |
| 8.1.2 | ISS Functional Description | 1200 |

| | | |
|-----------|--|------|
| 8.1.2.1 | ISS Interrupts | 1200 |
| 8.1.2.1.1 | ISS Interrupt Merger | 1200 |
| 8.1.2.1.2 | ISS Submodule Interrupts | 1201 |
| 8.1.2.2 | ISS Clocks | 1211 |
| 8.1.2.3 | ISS Reset | 1212 |
| 8.1.2.4 | ISS Power Management | 1213 |
| 8.1.2.4.1 | ISS Power-Management Infrastructure Overview | 1213 |
| 8.1.2.4.2 | ISS STANDBY Mechanism | 1213 |
| 8.1.2.4.3 | ISS IDLE Mechanism | 1215 |
| 8.1.3 | ISS Register Manual | 1216 |
| 8.1.3.1 | ISS Instance Summary | 1216 |
| 8.1.3.2 | ISS Registers | 1216 |
| 8.1.3.2.1 | ISS TOP Register Summary | 1216 |
| 8.1.3.2.2 | ISS TOP Register Description | 1216 |
| 8.2 | ISS Interfaces | 1232 |
| 8.2.1 | ISS Interfaces Overview | 1232 |
| 8.2.1.1 | ISS Interface Features | 1234 |
| 8.2.2 | ISS Interfaces Environment | 1236 |
| 8.2.2.1 | ISS Interfaces Signal Descriptions | 1236 |
| 8.2.2.2 | ISS Interfaces Modes | 1237 |
| 8.2.2.3 | ISS Interfaces CPI Data Formats | 1240 |
| 8.2.2.3.1 | ISS Interfaces CPI Generic Configuration Protocol and Data Format (8, 10, 12, 16 Bits) | 1240 |
| 8.2.2.3.2 | ISS Interfaces CPI ITU-R BT.656/1120 422 Protocol and Data Formats (8, 10 Bits) | 1241 |
| 8.2.3 | ISS CSI2 PHY | 1243 |
| 8.2.3.1 | ISS CSI2 PHY Overview | 1243 |
| 8.2.3.2 | ISS CSI2 PHY Functional Description | 1244 |
| 8.2.3.2.1 | ISS CSI2 PHY Functional Configuration | 1244 |
| 8.2.3.2.2 | ISS CSI2 PHY and Link Initialization Sequence | 1245 |
| 8.2.3.2.3 | ISS CCP2 and Link Initialization Sequence | 1249 |
| 8.2.3.2.4 | ISS CSI PHY Error Signals | 1250 |
| 8.2.3.3 | ISS CSI2 PHY Register Manual | 1250 |
| 8.2.3.3.1 | ISS CSI2 PHY Instance Summary | 1250 |
| 8.2.3.3.2 | ISS CSI2 PHY Registers | 1251 |
| 8.2.4 | ISS CCP2 | 1253 |
| 8.2.4.1 | ISS CCP2 Environment | 1253 |
| 8.2.4.1.1 | ISS CCP2 Protocol and Data Formats | 1253 |
| 8.2.4.2 | ISS CCP2 Integration | 1266 |
| 8.2.4.3 | ISS CCP2 Functional Description | 1268 |
| 8.2.4.3.1 | ISS CCP2 Overview | 1268 |
| 8.2.4.3.2 | ISS CCP2 PHY | 1268 |
| 8.2.4.3.3 | ISS CCP2 VP Interface | 1269 |
| 8.2.4.3.4 | ISS CCP2 Data Compression | 1271 |
| 8.2.4.3.5 | ISS CCP2 Memory Read Channel | 1271 |
| 8.2.4.4 | ISS CCP2 Programming Model | 1279 |
| 8.2.4.4.1 | ISS CCP2 Programming Hardware Setup/Initialization | 1279 |
| 8.2.4.4.2 | ISS CCP2 Programming Event and Status Checking | 1279 |
| 8.2.4.4.3 | ISS CCP2 Programming Register Accessibility During Frame Processing | 1280 |
| 8.2.4.4.4 | ISS CCP2 Programming Enable/Disable the Hardware | 1280 |
| 8.2.4.4.5 | ISS CCP2 Programming Select the Signaling Scheme | 1281 |
| 8.2.4.4.6 | ISS CCP2 Programming Select the Mode: MIPI CSI1 or CCP2 | 1281 |
| 8.2.4.4.7 | ISS CCP2 Programming Burst Settings | 1281 |
| 8.2.4.4.8 | ISS CCP2 Programming Debug Mode | 1282 |
| 8.2.4.4.9 | ISS CCP2 Programming Video Port | 1282 |

| | | |
|------------|--|------|
| 8.2.4.4.10 | ISS CCP2 Programming Logical Channels | 1283 |
| 8.2.4.4.11 | ISS CCP2 Programming Controls | 1283 |
| 8.2.4.4.12 | ISS CCP2 Programming Region-of-Interest | 1284 |
| 8.2.4.4.13 | ISS CCP2 Programming CRC | 1284 |
| 8.2.4.4.14 | ISS CCP2 Programming Destination Format | 1284 |
| 8.2.4.4.15 | ISS CCP2 Programming Frame Acquisition | 1285 |
| 8.2.4.4.16 | ISS CCP2 Programming Synchronization Codes | 1285 |
| 8.2.4.4.17 | ISS CCP2 Programming Status Data | 1285 |
| 8.2.4.4.18 | ISS CCP2 Programming Pixel Data Region | 1286 |
| 8.2.4.4.19 | ISS CCP2 Programming Memory Read Channel | 1288 |
| 8.2.4.5 | ISS CCP2 Register Manual | 1289 |
| 8.2.4.5.1 | ISS CCP2 Instance Summary | 1289 |
| 8.2.4.5.2 | ISS CCP2 Registers | 1290 |
| 8.2.5 | ISS CSI2 | 1324 |
| 8.2.5.1 | ISS CSI2 Environment | 1324 |
| 8.2.5.1.1 | ISS CSI2 Protocol and Data Format | 1324 |
| 8.2.5.2 | ISS CSI2 Integration | 1360 |
| 8.2.5.3 | ISS CSI2 Functional Description | 1362 |
| 8.2.5.3.1 | ISS CSI2 Overview | 1362 |
| 8.2.5.3.2 | ISS CSI2 Features | 1362 |
| 8.2.5.3.3 | ISS CSI2 Functional Description | 1363 |
| 8.2.5.4 | ISS CSI2 Programming Model | 1372 |
| 8.2.5.4.1 | ISS CSI2 Programming Reset Management | 1372 |
| 8.2.5.4.2 | ISS CSI2 Programming Enable Video/Picture Acquisition | 1373 |
| 8.2.5.4.3 | ISS CSI2 Programming Disable Video/Picture Acquisition | 1374 |
| 8.2.5.4.4 | ISS CSI2 Programming Capture a Finite Number of Frames | 1374 |
| 8.2.5.4.5 | ISS CSI2 Programming a Periodic Event During Frame Acquisition | 1374 |
| 8.2.5.4.6 | ISS CSI2 Programming a Context to a Virtual Channel and a Data Type | 1375 |
| 8.2.5.4.7 | ISS CSI2 Programming Progressive and Interleaved Frame Configuration | 1375 |
| 8.2.5.4.8 | ISS CSI2 Programming Progressive and Interleaved Frame Configuration | 1375 |
| 8.2.5.5 | ISS CSI2 Register Manual | 1376 |
| 8.2.5.5.1 | ISS CSI2 Instance Summary | 1376 |
| 8.2.5.5.2 | ISS CSI2 REGS1 Registers | 1376 |
| 8.2.5.5.3 | ISS CSI2 REGS2 Registers | 1406 |
| 8.2.6 | ISS TCTRL | 1408 |
| 8.2.6.1 | ISS TCTRL Environment | 1408 |
| 8.2.6.2 | ISS TCTRL Integration | 1408 |
| 8.2.6.3 | ISS TCTRL Functional Description | 1410 |
| 8.2.6.3.1 | ISS TCTRL Features | 1410 |
| 8.2.6.3.2 | ISS TCTRL Control-Signal Generator | 1410 |
| 8.2.6.4 | ISS TCTRL Programming Model | 1413 |
| 8.2.6.4.1 | ISS TCTRL Camera-Control Signal Generator | 1413 |
| 8.2.6.5 | ISS TCTRL Register Manual | 1416 |
| 8.2.6.5.1 | ISS TCTRL Instance Summary | 1416 |
| 8.2.6.5.2 | ISS TCTRL Registers | 1416 |
| 8.2.7 | ISS BTE | 1426 |
| 8.2.7.1 | ISS BTE Environment | 1426 |
| 8.2.7.2 | ISS BTE Integration | 1427 |
| 8.2.7.2.1 | ISS BTE PRCM Interface | 1428 |
| 8.2.7.3 | ISS BTE Functional Description | 1428 |
| 8.2.7.3.1 | ISS BTE Features | 1428 |
| 8.2.7.3.2 | ISS BTE Functional Description Details | 1428 |
| 8.2.7.4 | ISS BTE Programming Model | 1439 |

| | | |
|-----------|---|------|
| 8.2.7.4.1 | ISS BTE Reset | 1439 |
| 8.2.7.4.2 | ISS BTE Interrupts | 1439 |
| 8.2.7.4.3 | ISS BTE Context Configuration | 1440 |
| 8.2.7.4.4 | ISS BTE Change Context Configuration | 1441 |
| 8.2.7.5 | ISS BTE Register Manual | 1441 |
| 8.2.7.5.1 | ISS BTE Instance Summary | 1441 |
| 8.2.7.5.2 | ISS BTE Registers | 1442 |
| 8.2.8 | ISS CBUFF | 1459 |
| 8.2.8.1 | ISS CBUFF Environment | 1459 |
| 8.2.8.2 | ISS CBUFF Integration | 1459 |
| 8.2.8.2.1 | ISS CBUFF PRCM Interface | 1460 |
| 8.2.8.2.2 | ISS CBUFF Interrupts | 1461 |
| 8.2.8.3 | ISS CBUFF Functional Description | 1462 |
| 8.2.8.3.1 | ISS CBUFF Features | 1462 |
| 8.2.8.3.2 | ISS CBUFF Functional Description | 1462 |
| 8.2.8.4 | ISS CBUFF Programming Model | 1477 |
| 8.2.8.4.1 | ISS CBUFF Reset Behavior | 1477 |
| 8.2.8.4.2 | ISS CBUFF Register Setup | 1477 |
| 8.2.8.5 | ISS CBUFF Register Manual | 1477 |
| 8.2.8.5.1 | ISS CBUFF Instance Summary | 1477 |
| 8.2.8.5.2 | ISS CBUFF Registers | 1478 |
| 8.3 | ISS ISP | 1500 |
| 8.3.1 | ISS ISP Overview | 1500 |
| 8.3.1.1 | ISS ISP Features | 1500 |
| 8.3.1.2 | ISS ISP Block Diagram | 1501 |
| 8.3.2 | ISS ISP Integration | 1503 |
| 8.3.2.1 | ISS ISP PRCM Interface | 1503 |
| 8.3.2.1.1 | ISS ISP Clocks | 1503 |
| 8.3.2.1.2 | ISS ISP Reset | 1503 |
| 8.3.2.2 | ISS ISP Interrupt Tree | 1503 |
| 8.3.2.3 | ISS ISP PG Integration | 1504 |
| 8.3.2.4 | ISS ISP IPIPEIF Integration | 1504 |
| 8.3.2.4.1 | ISS ISP IPIPEIF Interrupts | 1504 |
| 8.3.2.5 | ISS ISP IPIPE Integration | 1505 |
| 8.3.2.5.1 | ISS ISP IPIPE Interrupts | 1505 |
| 8.3.2.5.2 | ISS ISP DMA Requests | 1505 |
| 8.3.2.6 | ISS ISP RSZ Integration | 1506 |
| 8.3.2.6.1 | ISS ISP RSZ PRCM Interface | 1506 |
| 8.3.2.6.2 | ISS ISP RSZ Interrupts | 1506 |
| 8.3.2.7 | ISS ISP H3A Integration | 1507 |
| 8.3.2.7.1 | ISS ISP H3A Interrupts | 1507 |
| 8.3.2.8 | ISS ISP ISIF Integration | 1507 |
| 8.3.2.8.1 | ISS ISP ISIF Interrupts | 1507 |
| 8.3.2.9 | ISS ISP BL Integration | 1508 |
| 8.3.3 | ISS ISP Functional Description | 1509 |
| 8.3.3.1 | ISS ISP VP Functional Description | 1509 |
| 8.3.3.1.1 | ISS ISP VP Overview | 1509 |
| 8.3.3.1.2 | ISS ISP VP Data Formats | 1510 |
| 8.3.3.1.3 | ISS ISP VP Top-Level Communication With CCP2 RX and CSI2 RX | 1512 |
| 8.3.3.1.4 | ISS ISP VP Pixel Clock Inversion | 1512 |
| 8.3.3.2 | ISS ISP PG Functional Description | 1513 |
| 8.3.3.2.1 | ISS ISP PG Overview | 1513 |
| 8.3.3.2.2 | ISS ISP PG Functional Description | 1514 |

| | | |
|------------|--|------|
| 8.3.3.3 | ISS ISP IPIPEIF Functional Description | 1515 |
| 8.3.3.3.1 | ISS ISP IPIPEIF Overview | 1515 |
| 8.3.3.3.2 | ISS ISP IPIPEIF Top-Level Block Diagram | 1516 |
| 8.3.3.3.3 | ISS ISP IPIPEIF Input Interface | 1517 |
| 8.3.3.3.4 | ISS ISP IPIPEIF Data Path Selection | 1520 |
| 8.3.3.3.5 | ISS ISP IPIPEIF Timing Generation | 1529 |
| 8.3.3.3.6 | ISS ISP IPIPEIF Decompression (DCPM) Subblock: Unpack and Decompression Function | 1530 |
| 8.3.3.3.7 | ISS ISP IPIPEIF Dark-Frame Subtraction Functionality | 1532 |
| 8.3.3.3.8 | ISS ISP IPIPEIF (1, 2, 1) Averaging Filter for IPIPE Data Path | 1533 |
| 8.3.3.3.9 | ISS ISP IPIPEIF Horizontal Pixel Decimator (Downsizer) for IPIPE Data Path | 1534 |
| 8.3.3.3.10 | ISS ISP IPIPEIF RAW Data Gain for IPIPE Data Path | 1535 |
| 8.3.3.3.11 | ISS ISP IPIPEIF (1, 2, 1) Averaging Filter for H3A Data Path | 1535 |
| 8.3.3.3.12 | ISS ISP IPIPEIF Horizontal Pixel Decimator (Downsizer) for H3A Data Path | 1535 |
| 8.3.3.3.13 | ISS ISP IPIPEIF YUV4:2:2 8-bits Packed Data Input Coming From ISIF Module | 1535 |
| 8.3.3.3.14 | ISS ISP IPIPEIF YUV4:2:0 Data Input for Memory-to-Memory Resize Operations | 1536 |
| 8.3.3.3.15 | ISS ISP IPIPEIF Module Events and Status Checking | 1537 |
| 8.3.3.4 | ISS ISP IPIPE Functional Description | 1537 |
| 8.3.3.4.1 | ISS ISP IPIPE Overview | 1537 |
| 8.3.3.4.2 | ISS ISP IPIPE Top-Level Block Diagram | 1539 |
| 8.3.3.4.3 | ISS ISP IPIPE Input Interface | 1540 |
| 8.3.3.4.4 | ISS ISP IPIPE Defect Pixel Correction | 1541 |
| 8.3.3.4.5 | ISS ISP IPIPE White Balance | 1543 |
| 8.3.3.4.6 | ISS ISP IPIPE RGB2RGB Blending Module | 1544 |
| 8.3.3.4.7 | ISS ISP IPIPE Gamma Correction Module | 1544 |
| 8.3.3.4.8 | ISS ISP IPIPE 2nd RGB2RGB Conversion Matrix | 1546 |
| 8.3.3.4.9 | ISS ISP IPIPE RGB2YCbCr Conversion Matrix | 1546 |
| 8.3.3.4.10 | ISS ISP IPIPE 4:2:2 Conversion Module | 1547 |
| 8.3.3.4.11 | ISS ISP IPIPE 2D Edge Enhancer | 1547 |
| 8.3.3.4.12 | ISS ISP IPIPE Histogram | 1550 |
| 8.3.3.4.13 | ISS ISP IPIPE Boxcar | 1551 |
| 8.3.3.5 | ISS ISP RSZ Functional Description | 1553 |
| 8.3.3.5.1 | ISS ISP RSZ Overview | 1553 |
| 8.3.3.5.2 | ISS ISP RSZ Top-Level Block Diagram | 1555 |
| 8.3.3.5.3 | ISS ISP RSZ Interfaces | 1556 |
| 8.3.3.5.4 | ISS ISP RSZ Integration | 1558 |
| 8.3.3.5.5 | ISS ISP RSZ Functional Description | 1560 |
| 8.3.3.6 | ISS ISP H3A Functional Description | 1574 |
| 8.3.3.6.1 | ISS ISP H3A Overview | 1574 |
| 8.3.3.6.2 | ISS ISP H3A Top-Level Block Diagram | 1576 |
| 8.3.3.6.3 | ISS ISP H3A Line Framing Logic | 1577 |
| 8.3.3.6.4 | ISS ISP H3A Optional Preprocessing | 1578 |
| 8.3.3.6.5 | ISS ISP H3A Autofocus Engine | 1578 |
| 8.3.3.6.6 | ISS ISP H3A AE/AWB Engine | 1583 |
| 8.3.3.6.7 | ISS ISP H3A DMA Interface | 1585 |
| 8.3.3.6.8 | ISS ISP H3A Events and Status Checking | 1592 |
| 8.3.3.7 | ISS ISP ISIF Functional Description | 1593 |
| 8.3.3.7.1 | ISS ISP ISIF Overview | 1593 |
| 8.3.3.7.2 | ISS ISP ISIF Top-Level Block Diagram | 1594 |
| 8.3.3.7.3 | ISS ISP ISIF Input Interface | 1596 |
| 8.3.3.7.4 | ISS ISP ISIF Interface | 1596 |
| 8.3.3.7.5 | ISS ISP ISIF Sensor Linearization | 1597 |
| 8.3.3.7.6 | ISS ISP ISIF Input Data Formatter | 1599 |
| 8.3.3.7.7 | ISS ISP ISIF Color Space Converter | 1607 |

| | | |
|------------|--|------|
| 8.3.3.7.8 | ISS ISP ISIF Black Clamp | 1610 |
| 8.3.3.7.9 | ISS ISP ISIF Vertical Line Defect Correction (VDFC) | 1614 |
| 8.3.3.7.10 | ISS ISP ISIF Lens Shading Correction (2D-LSC) | 1617 |
| 8.3.3.7.11 | ISS ISP ISIF White Balance | 1622 |
| 8.3.3.7.12 | ISS ISP ISIF Low-Pass Filter (LPF) | 1623 |
| 8.3.3.7.13 | ISS ISP ISIF A-Law Compression | 1623 |
| 8.3.3.7.14 | ISS ISP ISIF Culling | 1626 |
| 8.3.3.7.15 | ISS ISP ISIF 12-to-8 bit DCPM Compression Block | 1627 |
| 8.3.3.7.16 | ISP ISIF Storage Formatter | 1628 |
| 8.3.3.7.17 | ISS ISP ISIF YCbCr signal Processing | 1630 |
| 8.3.3.7.18 | ISS ISP ISIF Expected Bandwidth on BL Ports | 1630 |
| 8.3.3.7.19 | ISS ISP ISIF Events and Status Checking | 1632 |
| 8.3.3.8 | ISS ISP BL Functional Description | 1633 |
| 8.3.3.8.1 | ISS ISP BL Overview | 1633 |
| 8.3.3.8.2 | ISS ISP BL Functional Description | 1633 |
| 8.3.3.8.3 | ISS ISP BL Address Alignment | 1636 |
| 8.3.3.8.4 | ISS ISP BL Out-of-Order Responses | 1636 |
| 8.3.3.8.5 | ISS ISP BL Stalling | 1636 |
| 8.3.3.8.6 | ISS ISP BL Dynamic and Static MFlag Generation | 1637 |
| 8.3.3.8.7 | ISS ISP BL VBUSM2OCP Last Beat Command Delay | 1638 |
| 8.3.3.8.8 | ISS ISP BL Peak Memory Bandwidth Reduction | 1638 |
| 8.3.3.9 | ISS ISP Memory Mapping | 1638 |
| 8.3.4 | ISS ISP Programming Model | 1640 |
| 8.3.4.1 | ISS ISP PG Programming Model | 1640 |
| 8.3.4.2 | ISS ISP ISIF Programming Model | 1640 |
| 8.3.4.2.1 | ISS ISP ISIF Hardware Setup/Initialization | 1640 |
| 8.3.4.2.2 | ISS ISP ISIF Enable/Disable Hardware | 1647 |
| 8.3.4.2.3 | ISS ISP ISIF Register Accessibility During Frame Processing | 1648 |
| 8.3.4.2.4 | ISS ISP ISIF Interframe Operations | 1648 |
| 8.3.4.2.5 | ISS ISP ISIF Summary of Constraints | 1648 |
| 8.3.4.3 | ISS ISP IPIPEIF Programming Model | 1649 |
| 8.3.4.3.1 | ISS ISP IPIPEIF Hardware Setup/Initialization | 1649 |
| 8.3.4.3.2 | ISS ISP IPIPEIF Enable/Disable Hardware | 1651 |
| 8.3.4.3.3 | ISS ISP IPIPEIF Register Accessibility During Frame Processing | 1651 |
| 8.3.4.3.4 | ISS ISP IPIPEIF Interframe Operations | 1652 |
| 8.3.4.3.5 | ISS ISP IPIPEIF Summary of Constraints | 1652 |
| 8.3.4.4 | ISS ISP IPIPE Programming Model | 1652 |
| 8.3.4.4.1 | Global Initialization | 1652 |
| 8.3.4.4.2 | ISS ISP IPIPE Operational Modes Configuration | 1657 |
| 8.3.4.5 | ISS ISP RSZ Programming Model | 1658 |
| 8.3.4.5.1 | ISS ISP RSZ Hardware Setup/Initialization | 1658 |
| 8.3.4.5.2 | ISS ISP RSZ Global Image Processing Settings | 1660 |
| 8.3.4.5.3 | ISS ISP RSZ Engines Interframe Image Processing Settings | 1664 |
| 8.3.4.5.4 | ISS ISP RSZ Programming Constraints | 1668 |
| 8.3.4.6 | ISS ISP H3A Programming Model | 1668 |
| 8.3.4.6.1 | ISS ISP H3A Hardware Setup/Initialization | 1668 |
| 8.3.4.6.2 | ISS ISP H3A Enable/Disable Hardware | 1671 |
| 8.3.4.6.3 | ISS ISP H3A Register Accessibility During Frame Processing | 1671 |
| 8.3.4.6.4 | ISS ISP H3A Interframe Operations | 1671 |
| 8.3.4.6.5 | ISS ISP H3A Summary of Constraints | 1672 |
| 8.3.4.7 | ISS ISP BL Programming Model | 1674 |
| 8.3.5 | ISS ISP Register Manual | 1675 |
| 8.3.5.1 | ISS ISP Instance Summary | 1675 |

| | | |
|-----------|---|------|
| 8.3.5.2 | ISS ISP5 SYS1 Registers | 1675 |
| 8.3.5.2.1 | ISS ISP5 SYS1 Register Summary | 1675 |
| 8.3.5.2.2 | ISS ISP5 SYS1 Register Description | 1675 |
| 8.3.5.3 | ISS ISP5 SYS2 Registers | 1710 |
| 8.3.5.3.1 | ISS ISP5 SYS2 Register Summary | 1710 |
| 8.3.5.3.2 | ISS ISP5 SYS2 Register Description | 1711 |
| 8.3.5.4 | ISS RESIZER Registers | 1719 |
| 8.3.5.4.1 | ISS RESIZER Register Summary | 1719 |
| 8.3.5.4.2 | ISS RESIZER Register Description | 1721 |
| 8.3.5.5 | ISS IPIPE registers | 1777 |
| 8.3.5.5.1 | ISS IPIPE Register Summary | 1777 |
| 8.3.5.5.2 | ISS IPIPE Register Description | 1780 |
| 8.3.5.6 | ISS ISIF Registers | 1846 |
| 8.3.5.6.1 | ISS ISIF Register Summary | 1846 |
| 8.3.5.6.2 | ISS ISIF Register Description | 1849 |
| 8.3.5.7 | ISS IPIPEIF Registers | 1919 |
| 8.3.5.7.1 | ISS IPIPEIF Register Summary | 1919 |
| 8.3.5.7.2 | ISS IPIPEIF Register Description | 1920 |
| 8.3.5.8 | ISS H3A Registers | 1934 |
| 8.3.5.8.1 | ISS H3A Register Summary | 1934 |
| 8.3.5.8.2 | ISS H3A Register Description | 1935 |
| 8.4 | ISS Still Image Coprocessor | 1955 |
| 8.4.1 | ISS SIMCOP Overview | 1955 |
| 8.4.1.1 | ISS SIMCOP Integration | 1956 |
| 8.4.1.2 | ISS SIMCOP Functional Description | 1957 |
| 8.4.1.2.1 | ISS SIMCOP Local Power and Clock Management | 1957 |
| 8.4.1.2.2 | Software Reset | 1959 |
| 8.4.1.2.3 | Interrupt Merger | 1959 |
| 8.4.1.2.4 | ISS SIMCOP Modules Description | 1961 |
| 8.4.1.3 | ISS SIMCOP Programming Models | 1961 |
| 8.4.1.3.1 | Global Initialization | 1961 |
| 8.4.1.3.2 | ISS SIMCOP Operational Modes Configuration | 1962 |
| 8.4.1.4 | ISS SIMCOP Register Manual | 1964 |
| 8.4.1.4.1 | SIMCOP Instance Summary | 1964 |
| 8.4.1.4.2 | SIMCOP Registers | 1964 |
| 8.4.1.5 | ISS SIMCOP Memory Mapping | 1984 |
| 8.4.2 | ISS SIMCOP Hardware Sequencer and Buffers | 1984 |
| 8.4.2.1 | ISS SIMCOP Hardware Sequencer and Buffers Overview | 1984 |
| 8.4.2.2 | ISS SIMCOP Hardware Sequencer and Buffer Integration | 1985 |
| 8.4.2.3 | ISS SIMCOP Hardware Sequencer and Buffers Functional Description | 1988 |
| 8.4.2.3.1 | ISS SIMCOP Hardware Sequencer and Buffers Software Reset | 1988 |
| 8.4.2.3.2 | ISS SIMCOP Hardware Sequencer and Buffers Power Management | 1988 |
| 8.4.2.3.3 | ISS SIMCOP Hardware Sequencer and Buffer Interrupt Requests | 1988 |
| 8.4.2.3.4 | ISS SIMCOP Hardware Sequencer Buffer Description | 1988 |
| 8.4.2.3.5 | ISS SIMCOP Hardware Sequencer | 1995 |
| 8.4.2.4 | ISS SIMCOP Hardware Sequencer and Buffers Basic Programming Model | 1999 |
| 8.4.2.4.1 | ISS SIMCOP Application Programming Principle | 1999 |
| 8.4.2.4.2 | External CPU Use for Data Processing | 2000 |
| 8.4.2.4.3 | Rotation Operational Mode Configuration | 2000 |
| 8.4.2.4.4 | LDC Operational Mode Configuration | 2002 |
| 8.4.2.4.5 | Concurrent Software and Hardware Sequencing | 2003 |
| 8.4.2.5 | ISS SIMCOP Hardware Sequencer and Buffers Register Manual | 2004 |
| 8.4.2.5.1 | Hardware Sequencer Instance Summary | 2004 |

| | | |
|------------|--|------|
| 8.4.2.5.2 | Hardware Sequencer Registers | 2004 |
| 8.4.3 | ISS SIMCOP DMA Module | 2022 |
| 8.4.3.1 | ISS SIMCOP DMA Overview | 2022 |
| 8.4.3.2 | ISS SIMCOP DMA Integration | 2023 |
| 8.4.3.3 | ISS SIMCOP DMA Functional Description | 2025 |
| 8.4.3.3.1 | ISS SIMCOP DMA Block Diagram | 2025 |
| 8.4.3.3.2 | ISS SIMCOP DMA Power Management | 2025 |
| 8.4.3.3.3 | ISS SIMCOP DMA Interrupt Requests | 2025 |
| 8.4.3.3.4 | ISS SIMCOP DMA Logical Channels | 2026 |
| 8.4.3.3.5 | Transaction Generation | 2029 |
| 8.4.3.4 | ISS SIMCOP DMA Basic Programming Model | 2030 |
| 8.4.3.4.1 | Initialization of Surrounding Modules | 2030 |
| 8.4.3.4.2 | ISS SIMCOP DMA Channel Configuration and Hardware Synchronization | 2031 |
| 8.4.3.4.3 | Software Synchronization | 2033 |
| 8.4.3.5 | ISS SIMCOP DMA Register Manual | 2034 |
| 8.4.3.5.1 | ISS SIMCOP DMA Instance Summary | 2034 |
| 8.4.3.5.2 | ISS SIMCOP DMA Registers | 2034 |
| 8.4.4 | ISS SIMCOP LDC Module | 2053 |
| 8.4.4.1 | ISS SIMCOP LDC Overview | 2053 |
| 8.4.5 | ISS SIMCOP Discrete Cosine Transform Module | 2055 |
| 8.4.5.1 | ISS SIMCOP DCT Overview | 2055 |
| 8.4.5.2 | ISS SIMCOP DCT Integration | 2056 |
| 8.4.5.3 | ISS SIMCOP DCT Functional Description | 2058 |
| 8.4.5.3.1 | ISS SIMCOP DCT Block Diagram | 2058 |
| 8.4.5.3.2 | ISS SIMCOP DCT Power Management | 2058 |
| 8.4.5.3.3 | ISS SIMCOP DCT Interrupt Requests | 2058 |
| 8.4.5.3.4 | Control and Status | 2059 |
| 8.4.5.3.5 | Data Format | 2060 |
| 8.4.5.4 | ISS SIMCOP DCT Basic Programming Model | 2063 |
| 8.4.5.4.1 | Initialization of Surrounding Modules | 2063 |
| 8.4.5.4.2 | Using the DCT for DCT Processing | 2063 |
| 8.4.5.4.3 | Using the DCT for IDCT Processing | 2063 |
| 8.4.5.5 | ISS SIMCOP DCT Register Manual | 2065 |
| 8.4.5.5.1 | ISS SIMCOP DCT Instance Summary | 2065 |
| 8.4.5.5.2 | DCT Registers | 2065 |
| 8.4.6 | ISS SIMCOP Variable Length Coder/Decoder for JPEG Module | 2069 |
| 8.4.6.1 | ISS SIMCOP VLCDJ Overview | 2069 |
| 8.4.6.2 | ISS SIMCOP VLCDJ Integration | 2070 |
| 8.4.6.3 | ISS SIMCOP VLCDJ Functional Description | 2072 |
| 8.4.6.3.1 | ISS SIMCOP VLCDJ Block Diagram | 2072 |
| 8.4.6.3.2 | ISS SIMCOP VLCDJ Power Management | 2072 |
| 8.4.6.3.3 | ISS SIMCOP VLCDJ Interrupt Requests | 2072 |
| 8.4.6.3.4 | ISS SIMCOP VLCDJ in JPEG Encoding Flow | 2073 |
| 8.4.6.3.5 | ISS SIMCOP VLCDJ in JPEG Decoding Flow | 2073 |
| 8.4.6.3.6 | Memory Interfaces | 2074 |
| 8.4.6.3.7 | Huffman Table Organization | 2076 |
| 8.4.6.3.8 | Restart Marker | 2077 |
| 8.4.6.3.9 | Encode/Decode Context Switching | 2077 |
| 8.4.6.3.10 | Using Sequential Block Mode for YUV4:4:4 Encoding/Decoding | 2078 |
| 8.4.6.3.11 | Error Reporting | 2078 |
| 8.4.6.4 | ISS SIMCOP VLCDJ Basic Programming Model | 2079 |
| 8.4.6.4.1 | Initialization of Surrounding Modules | 2079 |
| 8.4.6.4.2 | ISS SIMCOP VLCDJ Start and Register Modification During Processing | 2079 |

| | | |
|-----------|---|-------------|
| 8.4.6.4.3 | JPEG Encoding | 2079 |
| 8.4.6.4.4 | JPEG Decoding | 2080 |
| 8.4.6.4.5 | Concurrent JPEG Encoding and Decoding | 2082 |
| 8.4.6.4.6 | Example of YUV4:4:4 Encoding | 2085 |
| 8.4.6.4.7 | Example of Huffman Encode and Decode Tables | 2085 |
| 8.4.6.5 | ISS SIMCOP VLCDJ Register Manual | 2087 |
| 8.4.6.5.1 | ISS SIMCOP VLCDJ Instance Summary | 2087 |
| 8.4.6.5.2 | VLCDJ Registers | 2087 |
| 8.4.7 | ISS SIMCOP Rotation Accelerator Module | 2100 |
| 8.4.7.1 | ISS SIMCOP ROT Overview | 2100 |
| 8.4.7.2 | ISS SIMCOP ROT Integration | 2101 |
| 8.4.7.3 | ISS SIMCOP ROT Functional Description | 2104 |
| 8.4.7.3.1 | ISS SIMCOP ROT Block Diagram | 2104 |
| 8.4.7.3.2 | ISS SIMCOP ROT Clock Configuration | 2104 |
| 8.4.7.3.3 | ISS SIMCOP ROT Reset | 2104 |
| 8.4.7.3.4 | ISS SIMCOP ROT Power Management | 2104 |
| 8.4.7.3.5 | ISS SIMCOP ROT Interrupt Requests | 2104 |
| 8.4.7.3.6 | ISS SIMCOP ROT DMA Requests | 2104 |
| 8.4.7.3.7 | ISS SIMCOP ROT Synchronization | 2105 |
| 8.4.7.3.8 | ISS SIMCOP ROT Formats and Operations | 2105 |
| 8.4.7.4 | ISS SIMCOP ROT Module Programming Guide | 2111 |
| 8.4.7.4.1 | ISS SIMCOP ROT Low-Level Programming Models | 2111 |
| 8.4.7.5 | ISS SIMCOP ROT Register Manual | 2113 |
| 8.4.7.5.1 | ISS SIMCOP ROT Instance Summary | 2113 |
| 8.4.7.5.2 | ISS SIMCOP ROT Registers | 2113 |
| 9 | Face Detect | 2119 |
| 9.1 | Face Detect Overview | 2120 |
| 9.1.1 | Main Features | 2120 |
| 9.2 | FDIF Integration | 2122 |
| 9.3 | FDIF Functional Description | 2124 |
| 9.3.1 | FDIF Block Description | 2124 |
| 9.3.2 | Software Reset | 2124 |
| 9.3.3 | System Power Management | 2125 |
| 9.3.3.1 | Autogating | 2125 |
| 9.3.3.2 | PRCM Hardware Handshake | 2125 |
| 9.3.3.2.1 | Protocol Transitions | 2125 |
| 9.3.4 | Interrupts and Events | 2126 |
| 9.3.5 | Typical Use | 2127 |
| 9.3.6 | Performance Parameters | 2127 |
| 9.3.7 | L3 Interconnect Parameters | 2127 |
| 9.4 | FDIF Programming Guide | 2128 |
| 9.4.1 | FDIF Low-level Programming Models | 2128 |
| 9.4.1.1 | Global Initialization | 2128 |
| 9.4.1.1.1 | Surrounding Modules Global Initialization | 2128 |
| 9.4.1.1.2 | FDIF Global Initialization | 2128 |
| 9.4.1.2 | FD Operational Modes Configuration | 2129 |
| 9.4.1.2.1 | FD Processing Modes | 2129 |
| 9.5 | FDIF Register Manual | 2131 |
| 9.5.1 | FDIF Instance Summary | 2131 |
| 9.5.2 | FDIF Registers | 2131 |
| 9.5.2.1 | FDIF Register Summary | 2131 |
| 9.5.2.2 | FDIF Register Description | 2132 |
| 10 | Display Subsystem | 2147 |

| | | |
|------------|---|------|
| 10.1 | Display Subsystem Overview | 2148 |
| 10.1.1 | DSS Environment | 2150 |
| 10.1.1.1 | DSS LCD Support | 2152 |
| 10.1.1.1.1 | Parallel Interface | 2152 |
| 10.1.1.1.2 | Serial Interfaces | 2152 |
| 10.1.1.2 | DSS TV Display Support | 2153 |
| 10.1.1.2.1 | HDMI | 2153 |
| 10.1.2 | DSS Integration | 2154 |
| 10.1.2.1 | DSS Clocks | 2154 |
| 10.1.2.2 | DSS Resets | 2157 |
| 10.1.2.2.1 | Hardware Reset | 2158 |
| 10.1.2.3 | DSS Power Management | 2158 |
| 10.1.2.3.1 | Standby Mode | 2159 |
| 10.1.2.3.2 | Wake-Up Mode | 2160 |
| 10.1.2.4 | DSS Interrupt Requests | 2161 |
| 10.1.2.5 | DSS DMA Requests | 2163 |
| 10.1.3 | DSS Register Manual | 2165 |
| 10.1.3.1 | DSS Instance Summary | 2165 |
| 10.1.3.2 | DSS Registers | 2165 |
| 10.1.3.2.1 | DSS Registers Mapping Summary | 2165 |
| 10.1.3.2.2 | DSS Register Description | 2165 |
| 10.2 | Display Controller | 2171 |
| 10.2.1 | Display Controller Overview | 2171 |
| 10.2.2 | Display Controller Environment | 2174 |
| 10.2.2.1 | LCD Output and Data Format for the Parallel Interface | 2176 |
| 10.2.2.2 | Transaction Timing Diagrams | 2180 |
| 10.2.2.3 | TV Output and Data Format for the Parallel Interface | 2185 |
| 10.2.3 | Display Controller Integration | 2187 |
| 10.2.4 | Display Controller Functional Description | 2190 |
| 10.2.4.1 | Clock Configuration | 2191 |
| 10.2.4.2 | Software Reset | 2191 |
| 10.2.4.3 | Power Management | 2191 |
| 10.2.4.3.1 | Idle Mode | 2192 |
| 10.2.4.3.2 | StandBy Mode | 2192 |
| 10.2.4.3.3 | Wakeup | 2193 |
| 10.2.4.4 | Interrupt Requests | 2193 |
| 10.2.4.5 | sDMA Requests | 2195 |
| 10.2.4.6 | DMA Engine | 2195 |
| 10.2.4.6.1 | Addressing and Bursts | 2196 |
| 10.2.4.6.2 | Immediate Base Address Flip Mechanism | 2197 |
| 10.2.4.6.3 | DMA Buffers | 2198 |
| 10.2.4.6.4 | MFLAG Mechanism and Arbitration | 2200 |
| 10.2.4.6.5 | Predecimation | 2201 |
| 10.2.4.6.6 | Progressive-to-Interlaced Format Conversion | 2202 |
| 10.2.4.6.7 | Arbitration | 2203 |
| 10.2.4.6.8 | DMA Power Modes | 2203 |
| 10.2.4.7 | Rotation and Mirroring | 2204 |
| 10.2.4.8 | Memory Format | 2206 |
| 10.2.4.9 | Graphics Pipeline | 2209 |
| 10.2.4.9.1 | Replication Logic | 2209 |
| 10.2.4.9.2 | Antiflicker Filter | 2210 |
| 10.2.4.9.3 | Color Look-Up Table (CLUT) | 2211 |
| 10.2.4.9.4 | Expansion to ARGB40 | 2212 |

| | | |
|-------------|---|------|
| 10.2.4.10 | Video Pipelines | 2212 |
| 10.2.4.10.1 | Replication Logic | 2213 |
| 10.2.4.10.2 | VC-1 Range Mapping Unit | 2214 |
| 10.2.4.10.3 | CSC Unit YUV to RGB | 2214 |
| 10.2.4.10.4 | Scaler Unit | 2217 |
| 10.2.4.11 | Write-Back Pipeline | 2226 |
| 10.2.4.11.1 | CSC Unit RGB to YUV | 2227 |
| 10.2.4.11.2 | Scaler Unit | 2227 |
| 10.2.4.11.3 | RGB Truncation Logic | 2232 |
| 10.2.4.12 | LCD Outputs | 2232 |
| 10.2.4.12.1 | Overlay Manager | 2233 |
| 10.2.4.12.2 | Gamma Correction Unit | 2241 |
| 10.2.4.12.3 | CPR Unit | 2242 |
| 10.2.4.12.4 | Passive Matrix | 2243 |
| 10.2.4.12.5 | Active Matrix | 2243 |
| 10.2.4.12.6 | Synchronized Buffer Update | 2248 |
| 10.2.4.12.7 | Timing Generator and Panel Settings | 2249 |
| 10.2.4.12.8 | Stall Mode | 2250 |
| 10.2.4.13 | TV Output | 2251 |
| 10.2.4.13.1 | Overlay Manager | 2252 |
| 10.2.4.13.2 | Gamma Correction Unit | 2252 |
| 10.2.4.13.3 | Synchronized Buffer Update | 2252 |
| 10.2.4.13.4 | Timing and TV Format Settings | 2252 |
| 10.2.4.14 | Shadow Registers | 2254 |
| 10.2.5 | Display Controller Programming Guide | 2260 |
| 10.2.5.1 | Display Controller Low-Level Programming Models | 2260 |
| 10.2.5.1.1 | Global Initialization | 2260 |
| 10.2.5.1.2 | Operational Modes Configuration | 2261 |
| 10.2.6 | Display Controller Use Cases and Tips | 2276 |
| 10.2.6.1 | Hardware Cursor | 2276 |
| 10.2.7 | Display Controller Register Manual | 2276 |
| 10.2.7.1 | Display Controller Instance Summary | 2276 |
| 10.2.7.2 | Display Controller Logical Register Mapping | 2276 |
| 10.2.7.3 | Display Controller Registers | 2282 |
| 10.2.7.3.1 | Display Controller Register Summary | 2282 |
| 10.2.7.3.2 | Display Controller Register Description | 2288 |
| 10.3 | MIPI Display Serial Interface | 2423 |
| 10.3.1 | MIPI DSI Overview | 2423 |
| 10.3.2 | DSI Environment | 2426 |
| 10.3.2.1 | DSI PHY | 2427 |
| 10.3.2.1.1 | Data/Clock Configuration | 2428 |
| 10.3.2.1.2 | ULPS | 2430 |
| 10.3.2.2 | DSI Protocol Layer | 2430 |
| 10.3.2.2.1 | Short Packet | 2431 |
| 10.3.2.2.2 | Long Packet | 2431 |
| 10.3.2.2.3 | Data Identifier | 2433 |
| 10.3.2.2.4 | Synchronization Codes | 2433 |
| 10.3.2.2.5 | Blanking | 2434 |
| 10.3.2.2.6 | Frame Structures | 2438 |
| 10.3.2.2.7 | VCs | 2442 |
| 10.3.2.3 | DSI Multilane Layer | 2442 |
| 10.3.2.3.1 | SoT and EoT in Multilane Configurations | 2443 |
| 10.3.2.3.2 | Lane Splitter | 2443 |

| | | |
|-------------|--|------|
| 10.3.2.4 | DSI Pixel Data Formats | 2446 |
| 10.3.2.4.1 | Pixel Data Formats in Video Mode | 2446 |
| 10.3.2.4.2 | 24 bpp – RGB Color Format, Long Packet (Video Mode) | 2447 |
| 10.3.2.4.3 | 24 Bits per Pixel - RGB Color Format, Long Packet (Command Mode) | 2447 |
| 10.3.2.4.4 | 18 bpp (Loosely Packed) – RGB Color Format, Long Packet (Transparent for DSI Protocol Engine) (Video Mode) | 2448 |
| 10.3.2.4.5 | 18-bpp (Loosely Packed) – RGB Color Format, Long Packet (Command Mode) | 2449 |
| 10.3.2.4.6 | 18-bpp (Packed) – RGB Color Format, Long Packet (Video Mode) | 2450 |
| 10.3.2.4.7 | 16 bpp – RGB Color Format, Long Packet (Video Mode) | 2451 |
| 10.3.2.4.8 | 16 bpp – RGB Color Format, Long Packet (Command Mode) | 2452 |
| 10.3.3 | DSI Integration | 2454 |
| 10.3.4 | DSI Functional Description | 2457 |
| 10.3.4.1 | DSI Block Diagram | 2457 |
| 10.3.4.2 | DSI Clock Configuration | 2457 |
| 10.3.4.3 | DSI Interrupt Requests | 2459 |
| 10.3.4.4 | DSI Protocol Engine | 2460 |
| 10.3.4.4.1 | DSI Protocol Overview | 2460 |
| 10.3.4.4.2 | DSI Global Register Controls | 2460 |
| 10.3.4.4.3 | DSI Transfer Modes | 2461 |
| 10.3.4.4.4 | Clock Requirements | 2473 |
| 10.3.4.4.5 | Video Port Interface | 2480 |
| 10.3.4.4.6 | SCP Interface | 2489 |
| 10.3.4.4.7 | Timers | 2490 |
| 10.3.4.4.8 | Bus Turnaround | 2494 |
| 10.3.4.4.9 | PHY Triggers | 2495 |
| 10.3.4.4.10 | ECC Generation | 2498 |
| 10.3.4.4.11 | Checksum Generation for Long Packet Payloads | 2499 |
| 10.3.4.4.12 | EOT Packet | 2499 |
| 10.3.4.4.13 | Software Reset | 2500 |
| 10.3.4.4.14 | Power Management | 2500 |
| 10.3.4.4.15 | Power Control of DSI PHY Complex I/O and DSI PLL | 2500 |
| 10.3.4.4.16 | Ultralow-Power State Configuration | 2504 |
| 10.3.4.4.17 | Interrupts | 2505 |
| 10.3.4.5 | DSI PLL Controllers | 2506 |
| 10.3.4.5.1 | DSI PLL Controllers Overview | 2506 |
| 10.3.4.5.2 | DSI PLL Controllers Architecture | 2507 |
| 10.3.4.5.3 | DSI PLL Operations | 2509 |
| 10.3.4.5.4 | DSI PLL Controllers Shadowing Mechanism | 2509 |
| 10.3.4.5.5 | Error Handling | 2510 |
| 10.3.4.5.6 | Software Reset | 2510 |
| 10.3.4.5.7 | Power Management | 2510 |
| 10.3.4.5.8 | DSI PLL Clock-Gating Sequence | 2511 |
| 10.3.4.5.9 | DSI PLL Clock Sequence | 2513 |
| 10.3.4.5.10 | DSI PLL Go Sequence | 2515 |
| 10.3.4.5.11 | DSI PLL Recommended Values | 2516 |
| 10.3.4.5.12 | How to Configure the DSI PLL in Video Mode | 2518 |
| 10.3.4.6 | DSI Complex I/O | 2520 |
| 10.3.4.6.1 | DSI Complex I/O Overview | 2520 |
| 10.3.4.6.2 | Software Reset | 2521 |
| 10.3.4.6.3 | Reset-Done Bits | 2521 |
| 10.3.4.6.4 | Pad Configuration | 2521 |
| 10.3.4.6.5 | Display Timing Configuration | 2522 |
| 10.3.4.6.6 | Power Management | 2526 |
| 10.3.4.6.7 | Error Handling | 2527 |

| | | |
|-------------|--|------|
| 10.3.5 | DSI Programming Model | 2530 |
| 10.3.5.1 | DSI Global Initialization | 2530 |
| 10.3.5.1.1 | Surrounding Modules Global Initialization | 2530 |
| 10.3.5.1.2 | DSI Global Initialization | 2530 |
| 10.3.5.2 | DSI Operational Modes Configuration | 2531 |
| 10.3.5.2.1 | DSI Video Mode Using the DISPC Video Port | 2531 |
| 10.3.5.2.2 | DSI Command Mode Using the DISPC Video Port | 2534 |
| 10.3.6 | DSI Register Manual | 2539 |
| 10.3.6.1 | DSI Instance Summary | 2539 |
| 10.3.6.2 | DSI_PROTOCOL_ENGINE Registers | 2539 |
| 10.3.6.2.1 | DSI_PROTOCOL_ENGINE Register Summary | 2539 |
| 10.3.6.2.2 | DSI_PROTOCOL_ENGINE Register Description | 2542 |
| 10.3.6.3 | DSI_PHY Registers | 2599 |
| 10.3.6.3.1 | DSI_PHY Register Summary | 2599 |
| 10.3.6.3.2 | DSI_PHY Register Description | 2599 |
| 10.3.6.4 | DSI_PLLCTRL Registers | 2605 |
| 10.3.6.4.1 | DSI_PLLCTRL Register Summary | 2605 |
| 10.3.6.4.2 | DSI_PLLCTRL Register Description | 2606 |
| 10.4 | High-Definition Multimedia Interface | 2616 |
| 10.4.1 | High-Definition Multimedia Interface (HDMI) Overview | 2616 |
| 10.4.1.1 | HDMI Main Features | 2616 |
| 10.4.1.2 | HDMI Video Formats and Timings | 2617 |
| 10.4.1.2.1 | CEA-861-D video formats and timings | 2617 |
| 10.4.1.2.2 | VESA DMT video formats and timings | 2617 |
| 10.5 | Remote Frame Buffer Interface | 2619 |
| 10.5.1 | Remote Frame Buffer Interface Overview | 2619 |
| 10.5.2 | RFBI Environment | 2621 |
| 10.5.2.1 | RFBI Parallel Interface (MIPI DBI Protocol) | 2621 |
| 10.5.2.1.1 | Description of the Tearing Effect Pulse Signal | 2622 |
| 10.5.2.2 | Transaction Timing Diagrams | 2623 |
| 10.5.3 | RFBI Integration | 2626 |
| 10.5.3.1 | DMA Requests | 2627 |
| 10.5.4 | RFBI Functional Description | 2628 |
| 10.5.4.1 | Block Diagram | 2628 |
| 10.5.4.2 | Clock Configuration | 2628 |
| 10.5.4.3 | Software Reset | 2628 |
| 10.5.4.4 | Power Management | 2628 |
| 10.5.4.5 | Interrupt Requests | 2629 |
| 10.5.4.6 | DMA Requests | 2630 |
| 10.5.4.7 | Video Port FIFO | 2630 |
| 10.5.4.7.1 | Description | 2630 |
| 10.5.4.7.2 | RFBI Input Formats | 2630 |
| 10.5.4.7.3 | Stall Mechanism | 2631 |
| 10.5.4.8 | Interconnect FIFO | 2632 |
| 10.5.4.8.1 | Description | 2632 |
| 10.5.4.8.2 | Using DMA Request With Interconnect FIFO | 2632 |
| 10.5.4.9 | RFBI Output Parallel Modes | 2634 |
| 10.5.4.9.1 | Cycle Mode Selection | 2634 |
| 10.5.4.9.2 | Unmodified Bits | 2636 |
| 10.5.4.9.3 | Number of Pixels to Transfer | 2637 |
| 10.5.4.10 | RFBI Timing Generator | 2637 |
| 10.5.4.10.1 | Configuration Selection | 2637 |
| 10.5.4.10.2 | Read/Write | 2637 |

| | | |
|-------------|---|-------------|
| 10.5.4.10.3 | RFBI State-Machine | 2638 |
| 10.5.4.10.4 | RFBI Timings | 2638 |
| 10.5.4.11 | Trigger Detection Logic | 2640 |
| 10.5.4.11.1 | Trigger Mode | 2640 |
| 10.5.4.11.2 | Internal Trigger Mode | 2640 |
| 10.5.4.11.3 | External Trigger Mode | 2640 |
| 10.5.5 | RFBI Programming Guide | 2642 |
| 10.5.5.1 | RFBI Low-Level Programming Models | 2642 |
| 10.5.5.1.1 | Global Initialization | 2642 |
| 10.5.5.1.2 | Operational Modes Configuration | 2647 |
| 10.5.5.1.3 | RFBI Events Servicing | 2650 |
| 10.5.6 | RFBI Hardware Status Features | 2651 |
| 10.5.7 | RFBI Register Manual | 2652 |
| 10.5.7.1 | RFBI Instance Summary | 2652 |
| 10.5.7.2 | RFBI Registers | 2652 |
| 10.5.7.2.1 | RFBI Register Summary | 2652 |
| 10.5.7.2.2 | RFBI Register Description | 2653 |
| 11 | 3D Graphics Accelerator | 2667 |
| 11.1 | SGX Overview | 2668 |
| 11.1.1 | SGX Features Overview | 2668 |
| 11.1.2 | Graphics Feature Overview | 2669 |
| 11.2 | SGX Integration | 2670 |
| 11.3 | SGX Functional Description | 2672 |
| 11.3.1 | SGX Block Diagram | 2672 |
| 11.3.2 | SGX Clock Configuration | 2672 |
| 11.3.3 | SGX Software Reset | 2672 |
| 11.3.4 | SGX Power Management | 2673 |
| 11.3.5 | SGX Interrupt Requests | 2673 |
| 11.4 | SGX Register Manual | 2674 |
| 11.4.1 | SGX Instance Summary | 2674 |
| 11.4.2 | SGX Registers | 2674 |
| 11.4.2.1 | SGX Register Summary | 2674 |
| 11.4.2.2 | SGX Register Description | 2674 |
| 12 | 2D Graphics Accelerator | 2691 |
| 12.1 | BB2D Overview | 2692 |
| 12.1.1 | BB2D Features Overview | 2692 |
| 12.2 | BB2D Integration | 2694 |
| 12.3 | BB2D Functional Description | 2696 |
| 12.3.1 | BB2D Block Diagram | 2696 |
| 12.3.2 | BB2D Clock Configuration | 2696 |
| 12.3.3 | BB2D Software Reset | 2697 |
| 12.3.4 | BB2D Power Management | 2697 |
| 12.3.5 | BB2D Interrupt Requests | 2697 |
| 12.4 | BB2D Register Manual | 2698 |
| 12.4.1 | BB2D Instance Summary | 2698 |
| 12.4.2 | BB2D Registers | 2698 |
| 12.4.2.1 | BB2D Register Summary | 2698 |
| 12.4.2.2 | BB2D Register Description | 2700 |
| 13 | Audio Back End | 2741 |
| 13.1 | ABE Overview | 2742 |
| 13.1.1 | AE Subsystem | 2743 |
| 13.1.2 | Local Audio Interconnect | 2744 |
| 13.1.3 | GP Timers | 2744 |

| | | |
|------------|--|-------------|
| 13.1.4 | Watchdog Timer | 2744 |
| 13.1.5 | Digital Microphone Controller | 2745 |
| 13.1.6 | SLIMbus | 2745 |
| 13.1.7 | Multichannel Audio Serial Port | 2746 |
| 13.1.8 | Multichannel Buffered Serial Port | 2746 |
| 13.1.9 | Multichannel Pulse Density Modulation Module | 2747 |
| 14 | Interconnect | 2749 |
| 14.1 | Interconnect Overview | 2750 |
| 14.1.1 | Terminology | 2750 |
| 14.1.2 | Architecture Overview | 2752 |
| 14.1.3 | Module Distribution | 2753 |
| 14.1.3.1 | L3 Interconnect Module Distribution | 2753 |
| 14.1.3.2 | L4 Interconnect Module Distribution | 2754 |
| 14.1.3.2.1 | L4_PER Interconnect Agents | 2754 |
| 14.1.3.2.2 | L4_CFG Interconnect Agents | 2755 |
| 14.1.3.2.3 | L4_WKUP Interconnect Agents | 2756 |
| 14.1.4 | Connectivity Matrix | 2757 |
| 14.2 | L3 Interconnect | 2758 |
| 14.2.1 | L3 Interconnect Overview | 2758 |
| 14.2.2 | L3 Interconnect Integration | 2760 |
| 14.2.3 | L3 Interconnect Functional Description | 2761 |
| 14.2.3.1 | Module Use in L3 Interconnect | 2761 |
| 14.2.3.2 | Module Distribution | 2761 |
| 14.2.3.2.1 | L3 Interconnect Agents | 2761 |
| 14.2.3.2.2 | L3 Connectivity Matrix | 2762 |
| 14.2.3.2.3 | Master NIU Identification | 2764 |
| 14.2.3.3 | Bandwidth Regulators | 2765 |
| 14.2.3.4 | Bandwidth Limiter | 2765 |
| 14.2.3.5 | Flag Mux Generators | 2766 |
| 14.2.3.6 | Rate Adapter Generators | 2766 |
| 14.2.3.7 | Statistic Collectors Group | 2766 |
| 14.2.3.8 | L3 Protection and Firewalls | 2767 |
| 14.2.3.8.1 | L3 Firewall Reset | 2767 |
| 14.2.3.8.2 | Power Management | 2768 |
| 14.2.3.8.3 | L3 Firewall Functionality | 2769 |
| 14.2.3.9 | L3 Interconnect Error Handling | 2776 |
| 14.2.3.9.1 | Global Error-Routing Scheme | 2776 |
| 14.2.3.9.2 | Slave NIU Error Logging | 2777 |
| 14.2.3.9.3 | Flag Mux Error Logging | 2779 |
| 14.2.3.9.4 | Severity Level of Standard and Custom Errors | 2779 |
| 14.2.4 | L3 Interconnect Programming Guide | 2780 |
| 14.2.4.1 | L3 Interconnect Low-Level Programming Models | 2780 |
| 14.2.4.1.1 | Global Initialization | 2780 |
| 14.2.4.2 | Operational Modes Configuration | 2780 |
| 14.2.4.2.1 | L3 Interconnect Error Analysis Mode | 2780 |
| 14.2.5 | L3 Interconnect Register Manual | 2785 |
| 14.2.5.1 | L3 Register Group Summary | 2785 |
| 14.2.5.1.1 | L3 Firewall Registers Summary and Description | 2785 |
| 14.2.5.1.2 | L3 Host Register Summary and Description | 2796 |
| 14.2.5.1.3 | L3 TARG Register Summary and Description | 2809 |
| 14.2.5.1.4 | L3 PWR_DISC Register Summary and Description | 2833 |
| 14.2.5.1.5 | L3 FLAGMUX Register Summary and Description | 2842 |
| 14.2.5.1.6 | L3 BW Regulator Register Summary and Description | 2848 |

| | | |
|------------|--|-------------|
| 14.2.5.1.7 | L3 BW Limiter Register Summary and Description | 2854 |
| 14.2.5.1.8 | L3 Rate Adapt Register Summary and Description | 2859 |
| 14.2.5.1.9 | L3 STATCOLL Register Summary and Description | 2863 |
| 14.3 | L4 Interconnects | 2902 |
| 14.3.1 | L4 Interconnect Overview | 2902 |
| 14.3.2 | L4 Interconnect Integration | 2904 |
| 14.3.3 | L4 Interconnect Functional Description | 2905 |
| 14.3.3.1 | Module Distribution | 2905 |
| 14.3.3.1.1 | L4_PER Interconnect Agents | 2905 |
| 14.3.3.1.2 | L4_CFG Interconnect Agents | 2906 |
| 14.3.3.1.3 | L4_WKUP Interconnect Agents | 2907 |
| 14.3.3.2 | Power Management | 2907 |
| 14.3.3.3 | L4 Firewalls | 2907 |
| 14.3.3.3.1 | Protection Group | 2909 |
| 14.3.3.3.2 | Segments and Regions | 2912 |
| 14.3.3.3.3 | L4 Firewall Address and Protection Register Settings | 2918 |
| 14.3.3.4 | L4 Error Detection and Reporting | 2918 |
| 14.3.3.4.1 | IA and TA Error Detection and Logging | 2918 |
| 14.3.3.4.2 | Time-Out | 2919 |
| 14.3.3.4.3 | Error Reporting | 2920 |
| 14.3.3.4.4 | Error Recovery | 2921 |
| 14.3.3.4.5 | Firewall Error Logging in the Control Module | 2922 |
| 14.3.4 | L4 Interconnect Programming Guide | 2923 |
| 14.3.4.1 | L4 Interconnect Low-level Programming Models | 2923 |
| 14.3.4.1.1 | Global Initialization | 2923 |
| 14.3.4.1.2 | Operational Modes Configuration | 2923 |
| 14.3.5 | L4 Interconnects Register Manual | 2928 |
| 14.3.5.1 | L4 Interconnects Instance Summary | 2928 |
| 14.3.5.2 | L4 Initiator Agent (L4 IA) | 2930 |
| 14.3.5.2.1 | L4 Initiator Agent (L4 IA) Register Summary | 2930 |
| 14.3.5.2.2 | L4 Initiator Agent (L4 IA) Register Description | 2930 |
| 14.3.5.3 | L4 Target Agent (L4 TA) | 2937 |
| 14.3.5.3.1 | L4 Target Agent (L4 TA) Register Summary | 2937 |
| 14.3.5.3.2 | L4 Target Agent (L4 TA) Register Description | 2948 |
| 14.3.5.4 | L4 Link Agent (L4 LA) | 2953 |
| 14.3.5.4.1 | L4 Link Agent (L4 LA) Register Summary | 2953 |
| 14.3.5.4.2 | L4 Link Agent (L4 LA) Register Description | 2953 |
| 14.3.5.5 | L4 Address Protection (L4 AP) | 2958 |
| 14.3.5.5.1 | L4 Address Protection (L4 AP) Register Summary | 2958 |
| 14.3.5.5.2 | L4 Address Protection (L4 AP) Register Description | 2959 |
| 15 | Chip-to-Chip Interface (C2C) | 2971 |
| 15.1 | C2C Overview | 2972 |
| 15.2 | C2C Integration | 2974 |
| 15.3 | C2C Power, Reset, and Clock Management | 2975 |
| 15.3.1 | PRCM Overview | 2975 |
| 15.3.2 | Reset Manager Functional Description | 2975 |
| 15.3.2.1 | Reset Sources | 2975 |
| 15.3.2.1.1 | Global Reset Sources | 2975 |
| 15.3.2.2 | Reset Domains | 2975 |
| 15.3.3 | Clock Manager Functional Description | 2983 |
| 15.3.3.1 | CD_C2C Clock Domain | 2983 |
| 15.3.3.1.1 | Overview | 2983 |
| 15.3.3.1.2 | Clock Domain Modes | 2983 |

| | | |
|------------|--|------|
| 15.3.3.1.3 | Clock Domain Dependency | 2984 |
| 15.3.3.1.4 | Clock Domain Module Attributes | 2984 |
| 15.3.3.2 | CD_CORTEXA9 Clock Domain | 2985 |
| 15.3.3.2.1 | Clock Domain Dependency | 2985 |
| 15.3.3.3 | CD_L4_CFG Clock Domain | 2985 |
| 15.3.3.3.1 | Clock Domain Dependency | 2985 |
| 15.3.3.4 | CD_L3_2 Clock Domain | 2986 |
| 15.3.3.4.1 | Clock Domain Dependency | 2986 |
| 15.3.4 | Power Management Functional Description | 2986 |
| 15.3.4.1 | PD_CORE Description | 2986 |
| 15.3.5 | PRCM Register Manual | 2987 |
| 15.3.5.1 | PRM Instance Summary | 2987 |
| 15.3.5.2 | CORE_PRM Registers | 2987 |
| 15.3.5.2.1 | CORE_PRM Register Summary | 2987 |
| 15.3.5.2.2 | CORE_PRM Register Description | 2987 |
| 15.3.5.3 | CORE_CM2 Registers | 2989 |
| 15.3.5.3.1 | CORE_CM2 Register Summary | 2989 |
| 15.3.5.3.2 | CORE_CM2 Register Description | 2989 |
| 15.3.5.4 | SCRM Instance Summary | 2995 |
| 15.3.5.5 | SCRM Registers | 2995 |
| 15.3.5.5.1 | SCRM Register Summary | 2995 |
| 15.3.5.5.2 | SCRM Register Description | 2996 |
| 15.4 | C2C L3 Interconnect | 3001 |
| 15.4.1 | C2C Interconnect Overview | 3001 |
| 15.4.2 | C2C Interconnect Integration | 3003 |
| 15.4.2.1 | Clocking, Reset, and Power-Management Scheme | 3003 |
| 15.4.2.1.1 | Clocks | 3003 |
| 15.4.2.1.2 | Resets | 3003 |
| 15.4.2.1.3 | Power Management | 3003 |
| 15.4.3 | C2C Interconnect Functional Description | 3004 |
| 15.4.3.1 | Slave NIU Configuration | 3004 |
| 15.4.3.2 | Global Error Routing Scheme | 3004 |
| 15.5 | C2C SSCM | 3006 |
| 15.5.1 | SSCM Overview | 3006 |
| 15.5.2 | SSCM Interrupts | 3007 |
| 15.5.2.1 | SSCM GPI Interrupt Mapping | 3007 |
| 15.5.3 | SSCM GPO | 3007 |
| 15.6 | Intersystem Communication Register Module | 3008 |
| 15.6.1 | intersystem Communication Register Overview | 3008 |
| 15.6.2 | ICR Functional Description | 3008 |
| 15.6.2.1 | ICR Clocking Scheme | 3008 |
| 15.6.2.2 | Flag Management | 3008 |
| 15.6.2.3 | Setting and Resetting a Flag | 3009 |
| 15.6.2.4 | Interrupt Management | 3009 |
| 15.6.3 | ICR Register Manual | 3009 |
| 15.6.3.1 | ICR Instance Summary | 3009 |
| 15.6.3.2 | ICR_MDM and ICR_MPU Registers | 3010 |
| 15.6.3.2.1 | ICR Register Summary | 3010 |
| 15.6.3.2.2 | ICR Register Description | 3010 |
| 15.7 | C2C Register Manual | 3016 |
| 15.7.1 | C2C Instance Summary | 3016 |
| 15.7.2 | C2C Registers | 3016 |
| 15.7.2.1 | C2C Register Summary | 3016 |

| | | |
|------------|--|-------------|
| 15.7.2.2 | C2C Register Description | 3016 |
| 16 | Memory Subsystem | 3047 |
| 16.1 | Memory Subsystem Overview | 3048 |
| 16.1.1 | DMM Overview | 3048 |
| 16.1.1.1 | DMM Features | 3048 |
| 16.1.2 | TILER Overview | 3049 |
| 16.1.2.1 | TILER Features | 3049 |
| 16.1.3 | EMIF Overview | 3049 |
| 16.1.3.1 | Main Features | 3050 |
| 16.1.4 | GPMC Overview | 3050 |
| 16.1.4.1 | GPMC Features | 3050 |
| 16.1.5 | ELM Overview | 3051 |
| 16.1.5.1 | ELM Features | 3052 |
| 16.1.6 | OCM Overview | 3052 |
| 16.1.6.1 | SAR ROM | 3052 |
| 16.1.6.2 | SAR RAM | 3052 |
| 16.1.6.3 | L3 OCM_RAM | 3052 |
| 16.2 | Dynamic Memory Manager | 3053 |
| 16.2.1 | DMM Overview | 3053 |
| 16.2.2 | DMM Integration | 3054 |
| 16.2.2.1 | DMM Configuration | 3056 |
| 16.2.3 | DMM Functional Description | 3057 |
| 16.2.3.1 | DMM Block Diagram | 3057 |
| 16.2.3.2 | DMM Clock Configuration | 3058 |
| 16.2.3.3 | DMM Power Management | 3058 |
| 16.2.3.4 | DMM Interrupt Requests | 3058 |
| 16.2.3.5 | DMM | 3060 |
| 16.2.3.5.1 | DMM Concepts | 3060 |
| 16.2.3.5.2 | DMM Transaction Flows | 3064 |
| 16.2.3.5.3 | DMM Internal Macro-Architecture | 3065 |
| 16.2.3.6 | TILER | 3068 |
| 16.2.3.6.1 | TILER Concepts | 3068 |
| 16.2.3.6.2 | TILER Macro-Architecture | 3084 |
| 16.2.3.6.3 | TILER Guidelines for Initiators | 3087 |
| 16.2.4 | DMM Use Cases and Tips | 3089 |
| 16.2.4.1 | PAT Use Cases | 3089 |
| 16.2.4.1.1 | Simple Manual Area Refill | 3089 |
| 16.2.4.1.2 | Single Auto-Configured Area Refill | 3089 |
| 16.2.4.1.3 | Chained Auto-Configured Area Refill | 3090 |
| 16.2.4.1.4 | Synchronized Auto-Configured Area Refill | 3091 |
| 16.2.4.1.5 | Cyclic Synchronized Auto-Configured Area Refill | 3092 |
| 16.2.4.2 | Addressing Management with LISA | 3093 |
| 16.2.4.2.1 | Case 1: Use of One Memory Controller | 3093 |
| 16.2.4.2.2 | Case 2: Use of Two Memory Controllers | 3094 |
| 16.2.5 | DMM Basic Programming Model | 3097 |
| 16.2.5.1 | Global Initialization | 3097 |
| 16.2.5.2 | DMM Module Global Initialization | 3097 |
| 16.2.5.3 | DMM Operational Modes Configuration | 3097 |
| 16.2.5.3.1 | Different Operational Modes | 3097 |
| 16.2.5.3.2 | Configuration Settings and LUT Refill | 3097 |
| 16.2.5.3.3 | Interleaving Settings | 3098 |
| 16.2.5.3.4 | Aliased Tiled View Orientation Settings and LUT Refill | 3098 |
| 16.2.5.3.5 | Priority Settings | 3099 |

| | | |
|------------|--|------|
| 16.2.5.3.6 | Error Handling | 3099 |
| 16.2.5.3.7 | PAT Programming Model | 3099 |
| 16.2.5.4 | Addressing an Object in Tiled Mode | 3100 |
| 16.2.5.4.1 | Frame-Buffer Addressing | 3100 |
| 16.2.5.4.2 | TILER Page Mapping | 3101 |
| 16.2.5.5 | Addressing an Object in Page Mode | 3101 |
| 16.2.5.6 | Sharing Containers Between Different Modes | 3102 |
| 16.2.6 | DMM Register Manual | 3103 |
| 16.2.6.1 | DMM Instance Summary | 3103 |
| 16.2.6.2 | DMM Registers | 3103 |
| 16.2.6.2.1 | DMM Register Summary | 3103 |
| 16.2.6.2.2 | DMM Register Description | 3104 |
| 16.3 | EMIF Controller | 3133 |
| 16.3.1 | EMIF Module Overview | 3133 |
| 16.3.1.1 | EMIF Module Main Features | 3133 |
| 16.3.1.2 | Not Supported Features | 3134 |
| 16.3.1.3 | EMIF Overall Architecture | 3134 |
| 16.3.2 | EMIF Environment | 3134 |
| 16.3.2.1 | EMIF Signals | 3135 |
| 16.3.3 | EMIF Integration | 3137 |
| 16.3.4 | EMIF Functional Description | 3140 |
| 16.3.4.1 | Block Diagram | 3140 |
| 16.3.4.1.1 | L3 Interface | 3140 |
| 16.3.4.1.2 | FIFO Description | 3140 |
| 16.3.4.1.3 | MPU Port Restrictions | 3142 |
| 16.3.4.1.4 | Arbitration | 3143 |
| 16.3.4.2 | Clock Management | 3144 |
| 16.3.4.3 | Software Reset | 3144 |
| 16.3.4.4 | System Power Management | 3144 |
| 16.3.4.4.1 | Read Idle Window | 3144 |
| 16.3.4.4.2 | LPDDR2-SDRAM Power-Down Mode | 3145 |
| 16.3.4.4.3 | LPDDR2-SDRAM Deep Power-Down Mode | 3145 |
| 16.3.4.4.4 | LPDDR2-SDRAM Self-Refresh Mode | 3145 |
| 16.3.4.4.5 | Save and Restore | 3146 |
| 16.3.4.4.6 | Retention Mode | 3146 |
| 16.3.4.5 | Interrupt Requests | 3146 |
| 16.3.4.6 | SDRAM Output Impedance Calibration | 3147 |
| 16.3.4.7 | SDRAM Temperature Monitoring | 3147 |
| 16.3.4.8 | SDRAM Refresh Scheduling | 3147 |
| 16.3.4.8.1 | Performance Counters Description | 3148 |
| 16.3.4.8.2 | Performance Counters General Examples | 3149 |
| 16.3.4.9 | EMIF Access Cycles | 3150 |
| 16.3.4.9.1 | SDRAM Read | 3151 |
| 16.3.4.9.2 | SDRAM Write | 3151 |
| 16.3.4.10 | Turnaround Time | 3151 |
| 16.3.4.11 | SDRAM Address Mapping | 3152 |
| 16.3.4.12 | LPDDR2 SDRAM Initialization | 3163 |
| 16.3.5 | EMIF Programming Guide | 3164 |
| 16.3.5.1 | EMIF Low-Level Programming Models | 3164 |
| 16.3.5.1.1 | Global Initialization | 3164 |
| 16.3.5.1.2 | Operational Modes Configuration | 3166 |
| 16.3.5.1.3 | EMIF Events Servicing | 3169 |
| 16.3.6 | EMIF Register Manual | 3170 |

| | | |
|--------------|--|------|
| 16.3.6.1 | EMIF Instance Summary | 3170 |
| 16.3.6.2 | EMIF Registers | 3171 |
| 16.3.6.2.1 | EMIF Register Summary | 3171 |
| 16.3.6.2.2 | EMIF Register Description | 3172 |
| 16.4 | General-Purpose Memory Controller | 3206 |
| 16.4.1 | GPMC Overview | 3206 |
| 16.4.2 | GPMC Environment | 3206 |
| 16.4.2.1 | GPMC Modes | 3206 |
| 16.4.2.2 | GPMC Signals | 3208 |
| 16.4.3 | GPMC Integration | 3211 |
| 16.4.4 | GPMC Functional Description | 3213 |
| 16.4.4.1 | GPMC Block Diagram | 3213 |
| 16.4.4.2 | GPMC Clock Configuration | 3214 |
| 16.4.4.3 | GPMC Software Reset | 3215 |
| 16.4.4.4 | GPMC Power Management | 3215 |
| 16.4.4.5 | GPMC Interrupt Requests | 3216 |
| 16.4.4.6 | GPMC DMA Requests | 3216 |
| 16.4.4.7 | L3 Interconnect Interface | 3216 |
| 16.4.4.8 | GPMC Address and Data Bus | 3217 |
| 16.4.4.8.1 | GPMC I/O Configuration Setting | 3217 |
| 16.4.4.8.2 | GPMC CS0 Default Configuration at IC Reset | 3218 |
| 16.4.4.9 | Address Decoder and Chip-Select Configuration | 3219 |
| 16.4.4.9.1 | Chip-Select Base Address and Region Size | 3220 |
| 16.4.4.9.2 | Access Protocol | 3221 |
| 16.4.4.9.3 | External Signals | 3221 |
| 16.4.4.9.4 | Error Handling | 3230 |
| 16.4.4.10 | Timing Setting | 3231 |
| 16.4.4.10.1 | Read Cycle Time and Write Cycle Time (RDCYCLETIME / WRCYCLETIME) | 3231 |
| 16.4.4.10.2 | nCS: Chip-Select Signal Control Assertion/Deassertion Time (CSONTIME / CSRDOFFTIME / CSWROFFTIME / CSEXTRADELAY) | 3232 |
| 16.4.4.10.3 | nADV/ALE: Address Valid/Address Latch Enable Signal Control Assertion/Deassertion Time (ADVONTIME / ADVRDOFFTIME / ADVWROFFTIME / ADVEXTRADELAY/ADVAADMUXONTIME/ADVAADMUXRDOFFTIME/ADVAADMUXWROFFTIME) | 3232 |
| 16.4.4.10.4 | nOE/nRE: Output Enable / Read Enable Signal Control Assertion / Deassertion Time (OEONTIME / OEOFFTIME / OEEXTRADELAY / OEAADMUXONTIME / OEAADMUXOFFTIME) | 3233 |
| 16.4.4.10.5 | nWE: Write Enable Signal Control Assertion / Deassertion Time (WEONTIME / WEOFFTIME / WEEXTRADELAY) | 3233 |
| 16.4.4.10.6 | GPMC_CLK | 3234 |
| 16.4.4.10.7 | GPMC_CLK and Control Signals Setup and Hold | 3234 |
| 16.4.4.10.8 | Access Time (RDACCESSTIME / WRACCESSTIME) | 3234 |
| 16.4.4.10.9 | Page Burst Access Time (PAGEBURSTACCESSTIME) | 3235 |
| 16.4.4.10.10 | Bus Keeping Support | 3235 |
| 16.4.4.11 | NOR Access Description | 3236 |
| 16.4.4.11.1 | Asynchronous Access Description | 3236 |
| 16.4.4.11.2 | Synchronous Access Description | 3243 |
| 16.4.4.11.3 | Asynchronous and Synchronous Accesses in Nonmultiplexed Mode | 3252 |
| 16.4.4.11.4 | Page and Burst Support | 3256 |
| 16.4.4.11.5 | System Burst Versus External Device Burst Support | 3256 |
| 16.4.4.12 | pSRAM Access Specificities | 3257 |
| 16.4.4.13 | NAND Access Description | 3257 |
| 16.4.4.13.1 | NAND Memory Device in Byte or 16-bit Word Stream Mode | 3257 |
| 16.4.4.13.2 | NAND Device-Ready Pin | 3263 |
| 16.4.4.13.3 | ECC Calculator | 3264 |

| | | |
|-------------|--|-------------|
| 16.4.4.13.4 | Prefetch and Write-Posting Engine | 3281 |
| 16.4.5 | GPMC Basic Programming Model | 3288 |
| 16.4.5.1 | GPMC High-Level Programming Model Overview | 3288 |
| 16.4.5.2 | GPMC Initialization | 3290 |
| 16.4.5.3 | GPMC Configuration in NOR Mode | 3290 |
| 16.4.5.4 | GPMC Configuration in NAND Mode | 3291 |
| 16.4.5.5 | Set Memory Access | 3293 |
| 16.4.5.6 | GPMC Timing Parameters | 3294 |
| 16.4.5.6.1 | GPMC Timing Parameters Formulas | 3297 |
| 16.4.6 | GPMC Use Cases And Tips | 3305 |
| 16.4.6.1 | How to Set GPMC Timing Parameters for Typical Accesses | 3305 |
| 16.4.6.1.1 | External Memory Attached to the GPMC Module | 3305 |
| 16.4.6.1.2 | Typical GPMC Setup | 3305 |
| 16.4.6.2 | How to choose a suitable memory to use with the GPMC | 3311 |
| 16.4.6.2.1 | Supported Memories or Devices | 3311 |
| 16.4.6.2.2 | GPMC Features and Settings | 3313 |
| 16.4.7 | GPMC Register Manual | 3314 |
| 16.4.7.1 | GPMC Register Summary | 3314 |
| 16.4.7.2 | GPMC Register Descriptions | 3315 |
| 16.5 | Error Location Module | 3346 |
| 16.5.1 | Error Location Module Overview | 3346 |
| 16.5.1.1 | ELM Features | 3346 |
| 16.5.2 | ELM Integration | 3347 |
| 16.5.3 | ELM Functional Description | 3348 |
| 16.5.3.1 | ELM Software Reset | 3348 |
| 16.5.3.2 | ELM Power Management | 3348 |
| 16.5.3.3 | ELM Interrupt Requests | 3349 |
| 16.5.3.4 | Processing Initialization | 3349 |
| 16.5.3.5 | Processing Sequence | 3350 |
| 16.5.3.6 | Processing Completion | 3351 |
| 16.5.4 | ELM Basic Programming Model | 3351 |
| 16.5.4.1 | ELM Low Level Programming Model | 3351 |
| 16.5.4.1.1 | Processing Initialization | 3351 |
| 16.5.4.1.2 | Read Results | 3352 |
| 16.5.4.2 | Use Case: ELM Used in Continuous Mode | 3353 |
| 16.5.4.3 | Use Case: ELM Used in Page Mode | 3354 |
| 16.5.5 | ELM Register Manual | 3356 |
| 16.5.5.1 | ELM Instance Summary | 3356 |
| 16.5.5.2 | ELM Registers | 3356 |
| 16.5.5.2.1 | ELM Register Summary | 3356 |
| 16.5.5.2.2 | ELM Register Description | 3357 |
| 16.6 | On-Chip Memory (OCM) Subsystem | 3373 |
| 16.6.1 | OCM Subsystem Overview | 3373 |
| 16.6.2 | OCM Subsystem Integration | 3373 |
| 16.6.3 | OCM Subsystem Functional Description | 3375 |
| 16.6.3.1 | SAR ROM | 3375 |
| 16.6.3.2 | SAR RAM | 3375 |
| 16.6.3.3 | L3 OCM_RAM | 3376 |
| 17 | sDMA | 3377 |
| 17.1 | sDMA Module Overview | 3378 |
| 17.2 | sDMA Controller Environment | 3380 |
| 17.3 | sDMA Module Integration | 3382 |
| 17.3.1 | DMA Requests to the sDMA Controller | 3384 |

| | | |
|-------------|---|------|
| 17.4 | sDMA Functional Description | 3387 |
| 17.4.1 | sDMA Controller Power Management | 3387 |
| 17.4.2 | sDMA Controller Interrupt Requests | 3388 |
| 17.4.2.1 | Interrupt Generation | 3389 |
| 17.4.3 | Logical Channel Transfer Overview | 3389 |
| 17.4.4 | FIFO Queue Memory Pool | 3391 |
| 17.4.5 | Addressing Modes | 3391 |
| 17.4.6 | Packed Accesses | 3395 |
| 17.4.7 | Burst Transactions | 3396 |
| 17.4.8 | Endianism Conversion | 3396 |
| 17.4.9 | Transfer Synchronization | 3396 |
| 17.4.9.1 | Software Synchronization | 3396 |
| 17.4.9.2 | Hardware Synchronization | 3397 |
| 17.4.10 | Thread Budget Allocation | 3399 |
| 17.4.11 | FIFO Budget Allocation | 3399 |
| 17.4.12 | Chained Logical Channel Transfers | 3400 |
| 17.4.13 | Reprogramming an Active Channel | 3400 |
| 17.4.14 | Packet Synchronization | 3401 |
| 17.4.15 | Graphics Acceleration Support | 3401 |
| 17.4.16 | Supervisor Modes | 3402 |
| 17.4.17 | Posted and Nonposted Writes | 3402 |
| 17.4.18 | Disabling a Channel During Transfer | 3402 |
| 17.4.19 | FIFO Draining Mechanism | 3403 |
| 17.4.20 | Linked List | 3403 |
| 17.4.20.1 | Overview | 3403 |
| 17.4.20.2 | Link-List Transfer Profile | 3403 |
| 17.4.20.3 | Descriptors | 3404 |
| 17.4.20.3.1 | Type 1 | 3404 |
| 17.4.20.3.2 | Type 2 | 3405 |
| 17.4.20.3.3 | Type 3 | 3406 |
| 17.4.20.4 | Linked-List Control and Monitoring | 3406 |
| 17.4.20.4.1 | Transfer Mode Setting | 3406 |
| 17.4.20.4.2 | Starting a Linked List | 3407 |
| 17.4.20.4.3 | Monitoring a Linked-List Progression | 3407 |
| 17.4.20.4.4 | Interrupt During Linked-List Execution | 3407 |
| 17.4.20.4.5 | Pause a Linked List | 3407 |
| 17.4.20.4.6 | Stop a Linked List (Abort or Drain) | 3407 |
| 17.4.20.4.7 | Status Bit Behavior | 3408 |
| 17.4.20.4.8 | Linked-List Channel Linking | 3408 |
| 17.4.21 | Auto-Restore Feature | 3409 |
| 17.4.21.1 | Save Process | 3410 |
| 17.4.21.2 | Restore Process | 3411 |
| 17.4.21.2.1 | PRCM and sDMA interaction During Restore Phase | 3411 |
| 17.4.21.2.2 | sDMA Descriptors Description | 3411 |
| 17.4.21.3 | SAR RAM | 3412 |
| 17.4.21.4 | SAR ROM | 3412 |
| 17.4.21.5 | SAR RAM Memory Allocation Reserved for Save and Restore | 3413 |
| 17.4.21.6 | Register Mapping in SAR RAM | 3413 |
| 17.5 | sDMA Basic Programming Model | 3422 |
| 17.5.1 | Setup Configuration | 3422 |
| 17.5.2 | Software-Triggered (Nonsynchronized) Transfer | 3422 |
| 17.5.3 | Hardware-Synchronized Transfer | 3424 |
| 17.5.4 | Synchronized Transfer Monitoring Using CDAC | 3426 |

| | | |
|------------|--|-------------|
| 17.5.5 | Concurrent Software and Hardware Synchronization | 3427 |
| 17.5.6 | Chained Transfer | 3427 |
| 17.5.7 | 90-Degree Clockwise Image Rotation | 3428 |
| 17.5.8 | Graphic Operations | 3429 |
| 17.5.9 | Linked-List Programming Guidelines | 3429 |
| 17.6 | sDMA Register Manual | 3431 |
| 17.6.1 | sDMA Instance Summary | 3431 |
| 17.6.2 | sDMA Registers | 3431 |
| 17.6.2.1 | sDMA Register Summary | 3431 |
| 17.6.2.2 | sDMA Register Description | 3432 |
| 18 | Interrupt Controllers | 3461 |
| 18.1 | Interrupt Controller Overview | 3462 |
| 18.2 | INTC Environment | 3464 |
| 18.3 | INTC Integration | 3465 |
| 18.3.1 | Interrupt Mapping | 3465 |
| 18.3.2 | Interrupt Requests to Cortex-A9 MPU INTC | 3465 |
| 18.3.3 | Interrupt Requests to Cortex-M3 MPU INTC | 3468 |
| 18.4 | INTC Functional Description | 3471 |
| 18.4.1 | Cortex-A9 MPU INTC Functional Description | 3471 |
| 18.4.2 | Cortex-M3 MPU INTC Functional Description | 3471 |
| 18.5 | INTC Register Manual | 3472 |
| 18.5.1 | INTC Instance Summary | 3472 |
| 18.5.2 | Cortex-A9 MPU INTC Registers | 3472 |
| 18.5.3 | Cortex-M3 MPU INTC Registers | 3472 |
| 19 | Control Module | 3473 |
| 19.1 | Control Module Overview | 3474 |
| 19.2 | Control Module Environment | 3476 |
| 19.2.1 | Control Module Signals | 3476 |
| 19.3 | Control Module Integration | 3477 |
| 19.4 | Control Module Functional Description | 3481 |
| 19.4.1 | Control Module Block Diagram | 3481 |
| 19.4.2 | Control Module Clock Configuration | 3483 |
| 19.4.3 | Control Module Software Reset | 3485 |
| 19.4.4 | Control Module Power Management | 3485 |
| 19.4.4.1 | Retention | 3485 |
| 19.4.4.2 | Power Management Protocols | 3485 |
| 19.4.4.3 | Save-and-Restore Mechanism | 3485 |
| 19.4.5 | Hardware Requests | 3485 |
| 19.4.6 | Control Module Initialization | 3485 |
| 19.4.7 | General Control Module Instances | 3486 |
| 19.4.7.1 | General Core Control Module Instance | 3486 |
| 19.4.7.2 | General Wakeup Control Module Instance | 3486 |
| 19.4.7.3 | Device Core Control Module Instance | 3486 |
| 19.4.7.4 | Device Wake-Up Control Module Instance | 3487 |
| 19.4.8 | Pad Functional Multiplexing and Configuration | 3487 |
| 19.4.8.1 | Mode Selection | 3490 |
| 19.4.8.2 | Pull Selection | 3491 |
| 19.4.8.2.1 | Generic Pad Configuration Bit Fields vs I/O Cell Mapping | 3491 |
| 19.4.8.3 | Pad Multiplexing Register Fields | 3493 |
| 19.4.8.4 | Off Mode Pad Control Overview | 3510 |
| 19.4.8.4.1 | Wake-Up Event Detection | 3510 |
| 19.4.8.4.2 | I/O Power Optimization | 3512 |
| 19.4.9 | Extended-Drain I/O and PBIAS Cell | 3515 |

| | | |
|--------------|--|------|
| 19.4.9.1 | PBIAS Cell | 3516 |
| 19.4.9.2 | Extended-Drain I/O | 3517 |
| 19.4.9.3 | PBIAS Error Generation | 3520 |
| 19.4.9.4 | Critical Timing Requirements | 3520 |
| 19.4.10 | Band Gap Voltage and Temperature Sensor | 3521 |
| 19.4.10.1 | Band Gap Voltage Reference | 3523 |
| 19.4.10.2 | Temperature Sensor | 3523 |
| 19.4.10.2.1 | Single Conversion Mode | 3524 |
| 19.4.10.2.2 | Repeated Single Conversion Mode | 3525 |
| 19.4.10.2.3 | Thermal Data Post-Processing Logic | 3527 |
| 19.4.10.2.4 | Thermal Alert Functionality Comparators | 3530 |
| 19.4.10.2.5 | Thermal Shutdown Functionality Comparators | 3532 |
| 19.4.10.2.6 | ADC Codes Versus Temperature | 3534 |
| 19.4.11 | Hardware Observability | 3536 |
| 19.4.11.1 | Device Internal Signals Observability Overview | 3536 |
| 19.4.11.2 | Observability Gating Capabilities | 3538 |
| 19.4.11.3 | Observability Signals Multiplexing at General Core/Wake-Up Control Level | 3540 |
| 19.4.11.4 | Observability Signals Multiplexing at Device Control Module Level | 3549 |
| 19.4.11.4.1 | Observability Signals Muxed on Pads in Core Power Domain | 3549 |
| 19.4.11.4.2 | Observability Signals Muxed on Pads in WKUP Power Domain | 3549 |
| 19.4.11.5 | Observability Signals Sourced at Module Level | 3550 |
| 19.4.11.5.1 | Dual Cortex-A9 Subsystem Observable Signals | 3550 |
| 19.4.11.5.2 | IVA-HD Subsystem Observable Signals | 3557 |
| 19.4.11.5.3 | BB2D Accelerator Observable Signals | 3558 |
| 19.4.11.5.4 | DSP Subsystem Observable Signals | 3559 |
| 19.4.11.5.5 | ABE Subsystem Observable Signals | 3559 |
| 19.4.11.5.6 | USBOTGHS Subsystem Observable Signals | 3560 |
| 19.4.11.5.7 | CM2 Subsystem Observable Signals | 3560 |
| 19.4.11.5.8 | CM1 Subsystem Observable Signals | 3591 |
| 19.4.11.5.9 | PRM Subsystem Observable Signals | 3611 |
| 19.4.11.5.10 | PRCM FSM State Observable Signals Description | 3649 |
| 19.4.11.5.11 | DPLL Clockview Channel Observable Signals Multiplexing | 3658 |
| 19.4.11.5.12 | Other CORE DPLL Observable Signals | 3658 |
| 19.4.11.5.13 | Other ABE DPLL Observable Signals | 3658 |
| 19.4.11.5.14 | Other PERIPH DPLL Observable Signals | 3659 |
| 19.4.11.5.15 | Other DSI1 DPLL Observable Signals | 3659 |
| 19.4.11.5.16 | Other DSI2 DPLL Observable Signals | 3660 |
| 19.4.11.5.17 | Other USB DPLL Observable Signals | 3660 |
| 19.4.12 | Functional Register Description | 3661 |
| 19.4.12.1 | DSP Boot Register | 3661 |
| 19.4.12.1.1 | PBIASLITE Control Register | 3661 |
| 19.4.12.2 | Temperature Sensor Control Registers | 3661 |
| 19.4.12.2.1 | CSI Receiver Control Register | 3661 |
| 19.4.12.3 | Protection Status Registers | 3662 |
| 19.4.12.4 | Protection SDRAM Configuration Registers | 3663 |
| 19.4.12.5 | Register Controls for the LPDDR2IO1/LPDDR2IO2 I/O Buffer Modes | 3663 |
| 19.4.12.6 | EMIF DLL Master/Slave Specific Registers | 3664 |
| 19.4.12.6.1 | EMIF DLL Slaves Individual Offset Compensation | 3664 |
| 19.4.12.6.2 | EMIF DLL Master Code Monitoring Registers | 3666 |
| 19.4.12.7 | Force MPU Write Nonposted Transactions Control Register | 3666 |
| 19.4.12.8 | Signal Integrity Parameter Control Registers With Pad Group Assignment | 3666 |
| 19.4.12.8.1 | Signal Integrity Parameter Controls Overview | 3666 |
| 19.4.12.8.2 | High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings | 3668 |

| | | |
|-------------|---|-------------|
| 19.4.12.8.3 | Low-Speed I/Os Combined Slew Rate vs TL Length and Load Settings | 3672 |
| 19.4.12.8.4 | I/Os With Combined Mode and Load Settings | 3673 |
| 19.4.12.8.5 | I/O Cells With Configurable Impedance Mode | 3674 |
| 19.4.12.8.6 | C2CI/O Cells With Load Setting Adjustable According to Interface Requirement Voltage Mode | 3675 |
| 19.4.12.8.7 | SDMMC1 Pullup Strength Control | 3677 |
| 19.4.12.8.8 | I2Cx I/Os Group Pullupresx Controls and Load Range Settings | 3677 |
| 19.4.12.8.9 | Device Interfaces Signal Group Controls Mapping | 3678 |
| 19.4.12.9 | Dual Voltage-Supplied Peripheral Controls | 3694 |
| 19.5 | Control Module Programming Guide | 3697 |
| 19.5.1 | Control Module Low-Level Programming Models | 3697 |
| 19.5.1.1 | Global Initialization | 3697 |
| 19.5.1.1.1 | Surrounding Modules Global Initialization | 3697 |
| 19.5.1.1.2 | Control Module Global Initialization | 3697 |
| 19.5.1.2 | Operational Modes Configuration | 3697 |
| 19.5.1.2.1 | Extended-Drain I/Os and PBIAS Cells Programming Guide | 3697 |
| 19.5.1.2.2 | Hardware Observability Settings | 3700 |
| 19.5.1.2.3 | Off Mode Preliminary Settings | 3701 |
| 19.5.1.2.4 | Pad Configuration Programming Points | 3701 |
| 19.6 | Control Module Register Manual | 3704 |
| 19.6.1 | Control Module Instance Summary | 3704 |
| 19.6.2 | SYSCTRL_GENERAL_CORE Register Summary | 3704 |
| 19.6.3 | SYSCTRL_GENERAL_CORE Register Description | 3707 |
| 19.6.4 | SYSCTRL_GENERAL_WKUP Register Summary | 3793 |
| 19.6.5 | SYSCTRL_GENERAL_WKUP Register Description | 3794 |
| 19.6.6 | SYSCTRL_PADCONF_CORE Register Summary | 3803 |
| 19.6.7 | SYSCTRL_PADCONF_CORE Register Description | 3809 |
| 19.6.8 | SYSCTRL_PADCONF_WKUP Register Summary | 4128 |
| 19.6.9 | SYSCTRL_PADCONF_WKUP Register Description | 4130 |
| 20 | Mailbox | 4169 |
| 20.1 | Mailbox Overview | 4170 |
| 20.2 | Mailbox Integration | 4172 |
| 20.2.1 | System Mailbox Integration | 4172 |
| 20.2.2 | IVA-HD Mailbox Integration | 4173 |
| 20.3 | Mailbox Functional Description | 4176 |
| 20.3.1 | Mailbox Block Diagram | 4177 |
| 20.3.2 | Mailbox Software Reset | 4177 |
| 20.3.3 | Mailbox Power Management | 4177 |
| 20.3.4 | Mailbox Interrupt Requests | 4178 |
| 20.3.5 | Mailbox Assignment | 4179 |
| 20.3.5.1 | Description | 4179 |
| 20.3.6 | Sending and Receiving Messages | 4180 |
| 20.3.6.1 | Description | 4180 |
| 20.3.7 | 16-Bit Register Access | 4180 |
| 20.3.7.1 | Description | 4180 |
| 20.3.8 | Example of Communication | 4181 |
| 20.4 | Mailbox Programming Guide | 4182 |
| 20.4.1 | Mailbox Low-level Programming Models | 4182 |
| 20.4.1.1 | Global Initialization | 4182 |
| 20.4.1.1.1 | Surrounding Modules Global Initialization | 4182 |
| 20.4.1.1.2 | Mailbox Global Initialization | 4182 |
| 20.4.1.2 | Mailbox Operational Modes Configuration | 4183 |
| 20.4.1.2.1 | Mailbox Processing modes | 4183 |

| | | |
|------------|--|-------------|
| 20.4.1.3 | Mailbox Events Servicing | 4184 |
| 20.4.1.3.1 | Events Servicing in Sending Mode | 4184 |
| 20.4.1.3.2 | Events Servicing in Receiving Mode | 4184 |
| 20.5 | Mailbox Register Manual | 4185 |
| 20.5.1 | Mailbox Instance Summary | 4185 |
| 20.5.2 | Mailbox Registers | 4185 |
| 20.5.2.1 | Mailbox Register Summary | 4185 |
| 20.5.2.2 | Mailbox Register Description | 4186 |
| 21 | Memory Management Units | 4201 |
| 21.1 | MMU Overview | 4202 |
| 21.2 | MMU Integration | 4203 |
| 21.3 | MMU Functional Description | 4206 |
| 21.3.1 | MMU Block Diagram | 4206 |
| 21.3.1.1 | MMU Address Translation Process | 4206 |
| 21.3.1.2 | Translation Tables | 4207 |
| 21.3.1.2.1 | Translation Table Hierarchy | 4207 |
| 21.3.1.2.2 | First-Level Translation Table | 4208 |
| 21.3.1.2.3 | Two-Level Translation | 4211 |
| 21.3.1.3 | Translation Lookaside Buffer | 4214 |
| 21.3.1.3.1 | TLB Entry Format | 4215 |
| 21.3.2 | MMU Clock Configuration | 4216 |
| 21.3.3 | MMU Software Reset | 4216 |
| 21.3.4 | MMU Power Management | 4216 |
| 21.3.5 | MMU Interrupt Requests | 4217 |
| 21.3.6 | MMU Error Handling | 4217 |
| 21.4 | MMU Low-level Programming Models | 4219 |
| 21.4.1 | Global Initialization | 4219 |
| 21.4.1.1 | Surrounding Modules Global Initialization | 4219 |
| 21.4.1.2 | MMU Global Initialization | 4219 |
| 21.4.1.2.1 | Main Sequence—MMU Global Initialization | 4219 |
| 21.4.1.2.2 | Subsequence—Configure a TLB entry | 4220 |
| 21.4.1.3 | Operational Modes Configuration | 4220 |
| 21.4.1.3.1 | Main Sequence—Writing TLB Entries Statically | 4220 |
| 21.4.1.3.2 | Main Sequence—Protecting TLB Entries | 4221 |
| 21.4.1.3.3 | Main Sequence—Deleting TLB Entries | 4221 |
| 21.4.1.3.4 | Main Sequence—Read TLB Entries | 4221 |
| 21.5 | MMU Register Manual | 4223 |
| 21.5.1 | MMU Instance Summary | 4223 |
| 21.5.2 | MMU Registers | 4223 |
| 21.5.2.1 | MMU Register Summary | 4223 |
| 21.5.2.2 | MMU Register Description | 4223 |
| 22 | Spinlock | 4239 |
| 22.1 | Spinlock Overview | 4240 |
| 22.2 | Spinlock Integration | 4241 |
| 22.3 | Spinlock Functional Description | 4242 |
| 22.3.1 | Spinlock Software Reset | 4242 |
| 22.3.2 | Spinlock Power Management | 4242 |
| 22.3.3 | About Spinlocks | 4243 |
| 22.3.4 | Spinlock Functional Operation | 4243 |
| 22.4 | Spinlock Programming Guide | 4245 |
| 22.4.1 | Spinlock Low-level Programming Models | 4245 |
| 22.4.1.1 | Surrounding Modules Global Initialization | 4245 |
| 22.4.1.2 | Basic Spinlock Operations | 4245 |

| | | |
|-------------|---|-------------|
| 22.4.1.2.1 | Spinlocks Clearing After a System Bug Recovery | 4245 |
| 22.4.1.2.2 | Take and Release Spinlock | 4245 |
| 22.5 | Spinlock Register Manual | 4248 |
| 22.5.1 | Spinlock Instance Summary | 4248 |
| 22.5.2 | Spinlock Registers | 4248 |
| 22.5.2.1 | Spinlock Register Summary | 4248 |
| 22.5.2.2 | Spinlock Register Description | 4248 |
| 23 | Timers | 4253 |
| 23.1 | Timers Overview | 4254 |
| 23.2 | General-Purpose Timers | 4255 |
| 23.2.1 | General-Purpose Timers Overview | 4255 |
| 23.2.1.1 | GP Timer Features | 4255 |
| 23.2.2 | GP Timer Environment | 4257 |
| 23.2.2.1 | GP Timer External System Interface | 4257 |
| 23.2.3 | GP Timer Integration | 4259 |
| 23.2.4 | GP Timer Functional Description | 4262 |
| 23.2.4.1 | GP Timer Block Diagram | 4262 |
| 23.2.4.2 | GPTIMER1, GPTIMER2, and GPTIMER10 Power Management | 4265 |
| 23.2.4.2.1 | Wake-Up Capability | 4266 |
| 23.2.4.3 | Power Management of Other GP Timers | 4267 |
| 23.2.4.3.1 | Wake-Up Capability | 4267 |
| 23.2.4.4 | Software Reset | 4268 |
| 23.2.4.5 | GP Timer Interrupts | 4268 |
| 23.2.4.6 | Timer Mode Functionality | 4268 |
| 23.2.4.6.1 | 1-ms Tick Generation (Only GPTIMER1, GPTIMER2, and GPTIMER10) | 4269 |
| 23.2.4.7 | Capture Mode Functionality | 4271 |
| 23.2.4.8 | Compare Mode Functionality | 4272 |
| 23.2.4.9 | Prescaler Functionality | 4273 |
| 23.2.4.10 | Pulse-Width Modulation | 4273 |
| 23.2.4.11 | Timer Counting Rate | 4274 |
| 23.2.4.12 | Timer Under Emulation | 4275 |
| 23.2.4.13 | Accessing GP Timer Registers | 4276 |
| 23.2.4.13.1 | Writing to Timer Registers | 4277 |
| 23.2.4.13.2 | Reading From Timer Counter Registers | 4278 |
| 23.2.5 | GP Timer Low-Level Programming Models | 4278 |
| 23.2.5.1 | Global Initialization | 4278 |
| 23.2.5.1.1 | Global Initialization of Surrounding Modules | 4278 |
| 23.2.5.1.2 | GP Timer Module Global Initialization | 4279 |
| 23.2.5.2 | Operational Mode Configuration | 4279 |
| 23.2.5.2.1 | GP Timer Mode | 4279 |
| 23.2.5.2.2 | GP Timer Compare Mode | 4279 |
| 23.2.5.2.3 | GP Timer Capture Mode | 4280 |
| 23.2.5.2.4 | GP Timer PWM Mode | 4281 |
| 23.2.6 | GP Timer Register Manual | 4282 |
| 23.2.6.1 | GP Timer Instance Summary | 4282 |
| 23.2.6.2 | GP Timer Registers | 4282 |
| 23.2.6.2.1 | GP Timer Register Summary | 4282 |
| 23.2.6.2.2 | GP Timer Register Description | 4286 |
| 23.2.6.2.3 | GPTIMER1, GPTIMER2, and GPTIMER10 Register Description | 4304 |
| 23.3 | Watchdog Timers | 4311 |
| 23.3.1 | Watchdog Timers Overview | 4311 |
| 23.3.1.1 | Watchdog Timers Features | 4312 |
| 23.3.2 | Watchdog Timer Environment | 4312 |

| | | |
|------------|---|-------------|
| 23.3.3 | Watchdog Timer Integration | 4313 |
| 23.3.4 | Watchdog Timers Functional Description | 4315 |
| 23.3.4.1 | Power Management | 4315 |
| 23.3.4.1.1 | Wake-Up Capability | 4315 |
| 23.3.4.2 | Interrupts | 4315 |
| 23.3.4.3 | General Watchdog Timer Operation | 4316 |
| 23.3.4.4 | Reset Context | 4316 |
| 23.3.4.5 | Overflow/Reset Generation | 4317 |
| 23.3.4.6 | Prescaler Value/Timer Reset Frequency | 4317 |
| 23.3.4.7 | Triggering a Timer Reload | 4318 |
| 23.3.4.8 | Start/Stop Sequence for Watchdog Timers (Using the WDT_WSPR Register) | 4319 |
| 23.3.4.9 | Modifying Timer Count/Load Values and Prescaler Setting | 4319 |
| 23.3.4.10 | Watchdog Counter Register Access Restriction (WDT_WCRR Register) | 4319 |
| 23.3.4.11 | Watchdog Timer Interrupt Generation | 4319 |
| 23.3.4.12 | Watchdog Timers Under Emulation | 4320 |
| 23.3.4.13 | Accessing Watchdog Timer Registers | 4320 |
| 23.3.5 | Watchdog Timer Low-Level Programming Model | 4321 |
| 23.3.5.1 | Global Initialization | 4321 |
| 23.3.5.1.1 | Surrounding Modules Global Initialization | 4321 |
| 23.3.5.1.2 | Watchdog Timer Module Global Initialization | 4323 |
| 23.3.5.2 | Operational Mode Configuration | 4323 |
| 23.3.5.2.1 | Watchdog Timer Basic Configuration | 4323 |
| 23.3.6 | Watchdog Timer Register Manual | 4324 |
| 23.3.6.1 | Watchdog Timer Instance Summary | 4324 |
| 23.3.6.2 | Watchdog Timer Registers | 4324 |
| 23.3.6.2.1 | Watchdog Timer Register Summary | 4324 |
| 23.3.6.2.2 | Watchdog Timer Register Description | 4326 |
| 23.4 | 32-kHz Synchronized Timer | 4339 |
| 23.4.1 | 32-kHz Synchronized Timer Overview | 4339 |
| 23.4.1.1 | 32-kHz Synchronized Timer Features | 4339 |
| 23.4.2 | 32-kHz Synchronized Timer Environment | 4339 |
| 23.4.3 | 32-kHz Synchronized Timer Integration | 4339 |
| 23.4.4 | 32-kHz Synchronized Timer Functional Description | 4340 |
| 23.4.4.1 | Reading the 32-kHz Synchronized Timer | 4341 |
| 23.4.5 | 32KTimer Register Manual | 4342 |
| 23.4.5.1 | 32KTimer Register Mapping Summary | 4342 |
| 23.4.5.2 | 32KTimer Register Description | 4342 |
| 24 | Serial Communication Interface | 4345 |
| 24.1 | Multimaster High-Speed I ² C Controller | 4346 |
| 24.1.1 | HS I ² C Overview | 4346 |
| 24.1.2 | HS I ² C Environment | 4349 |
| 24.1.2.1 | HS I ² C in I ² C Mode | 4349 |
| 24.1.2.1.1 | HS I ² C Pins for Typical Connections in I ² C Mode | 4349 |
| 24.1.2.1.2 | HS I ² C Interface Typical Connections | 4349 |
| 24.1.2.1.3 | HS I ² C Typical Connection Protocol and Data Format | 4350 |
| 24.1.2.2 | HS I ² C in SCCB Mode | 4354 |
| 24.1.2.2.1 | HS I ² C Pins for Typical Connections in SCCB Mode | 4355 |
| 24.1.2.2.2 | HS I ² C SCCB Interface Typical Connections | 4356 |
| 24.1.2.2.3 | HS I ² C SCCB Typical Connection Protocol and Data Format | 4357 |
| 24.1.2.3 | HS I ² C for Communication With Power Chip(s) | 4359 |
| 24.1.2.3.1 | HS I ² C I2C5 Pins for Typical Connections | 4359 |
| 24.1.2.3.2 | HS I ² C I2C5 Interface Typical Connections | 4359 |
| 24.1.2.3.3 | HS I ² C Typical Connections Protocol and Data Format for I2C5 | 4360 |

| | | |
|------------|---|------|
| 24.1.3 | HS I ² C Integration | 4363 |
| 24.1.4 | HS I ² C Functional Description | 4366 |
| 24.1.4.1 | HS I ² C Block Diagram | 4366 |
| 24.1.4.2 | HS I ² C Clocks | 4367 |
| 24.1.4.2.1 | HS I ² C Clocking | 4367 |
| 24.1.4.2.2 | HS I ² C Automatic Blocking of the I ² C Clock Feature (I ² C Mode Only) | 4371 |
| 24.1.4.3 | HS I ² C Software Reset | 4371 |
| 24.1.4.4 | HS I ² C Power Management | 4371 |
| 24.1.4.5 | HS I ² C Interrupt Requests | 4372 |
| 24.1.4.6 | HS I ² C DMA Requests | 4373 |
| 24.1.4.7 | HS I ² C Programmable Multislave Channel Feature (I ² C Mode Only) | 4374 |
| 24.1.4.8 | HS I ² C FIFO Management | 4374 |
| 24.1.4.8.1 | HS I ² C FIFO Interrupt Mode | 4374 |
| 24.1.4.8.2 | HS I ² C FIFO Polling Mode | 4376 |
| 24.1.4.8.3 | HS I ² C FIFO DMA Mode (I ² C Mode Only) | 4376 |
| 24.1.4.8.4 | HS I ² C Draining Feature (I ² C Mode Only) | 4378 |
| 24.1.4.9 | HS I ² C Noise Filter | 4378 |
| 24.1.4.10 | HS I ² C Write and Read Operations in SCCB Mode | 4378 |
| 24.1.4.11 | HS I ² C System Test Mode | 4379 |
| 24.1.5 | HS I ² C Programming Guide | 4380 |
| 24.1.5.1 | HS I ² C Low-Level Programming Models | 4380 |
| 24.1.5.1.1 | HS I ² C Programming Model in I ² C Mode | 4380 |
| 24.1.5.1.2 | HS I ² C (I2C5) Programming Model for Communication With Power Chips | 4396 |
| 24.1.5.1.3 | HS I ² C Basic Programming Model in SCCB Mode | 4397 |
| 24.1.6 | HS I ² C Register Manual | 4406 |
| 24.1.6.1 | HS I ² C Instance Summary | 4406 |
| 24.1.6.2 | HS I ² C Registers | 4406 |
| 24.1.6.2.1 | HS I ² C Register Summary | 4406 |
| 24.1.6.2.2 | HS I ² C Register Description | 4408 |
| 24.2 | HDQ/1-Wire | 4438 |
| 24.2.1 | HDQ/1-Wire Overview | 4438 |
| 24.2.2 | HDQ/1-Wire Environment | 4439 |
| 24.2.2.1 | HDQ/1-Wire Functional Modes | 4439 |
| 24.2.2.2 | HDQ and 1-Wire (SDQ) Protocols | 4439 |
| 24.2.2.2.1 | HDQ Protocol Initialization (Default) | 4439 |
| 24.2.2.2.2 | 1-Wire (SDQ) Protocol Initialization | 4440 |
| 24.2.2.2.3 | Communication Sequence (HDQ and 1-Wire Protocols) | 4440 |
| 24.2.3 | HDQ/1-Wire Integration | 4442 |
| 24.2.4 | HDQ/1-Wire Functional Description | 4443 |
| 24.2.4.1 | HDQ/1-Wire Block Diagram | 4443 |
| 24.2.4.2 | HDQ/1-Wire Clocking Configuration | 4444 |
| 24.2.4.2.1 | HDQ/1-Wire Clocks | 4444 |
| 24.2.4.3 | HDQ/1-Wire Hardware and Software Reset | 4445 |
| 24.2.4.4 | HDQ/1-Wire Power Management | 4445 |
| 24.2.4.4.1 | Auto-Idle Mode | 4445 |
| 24.2.4.4.2 | Power-Down Mode | 4445 |
| 24.2.4.5 | HDQ Interrupt Requests | 4446 |
| 24.2.4.6 | HDQ Mode (Default) | 4446 |
| 24.2.4.6.1 | HDQ Mode Features | 4446 |
| 24.2.4.6.2 | Description | 4446 |
| 24.2.4.6.3 | Single-Bit Mode | 4447 |
| 24.2.4.6.4 | Interrupt Conditions | 4447 |
| 24.2.4.7 | 1-Wire Mode | 4448 |

| | | |
|------------|---|------|
| 24.2.4.7.1 | 1-Wire Mode Features | 4448 |
| 24.2.4.7.2 | Description | 4448 |
| 24.2.4.7.3 | 1-Wire Single-Bit Mode Operation | 4448 |
| 24.2.4.7.4 | Interrupt Conditions | 4449 |
| 24.2.4.7.5 | Status Flags | 4449 |
| 24.2.5 | HDQ/1-Wire Programming Models | 4450 |
| 24.2.5.1 | Global Initialization | 4450 |
| 24.2.5.1.1 | Surrounding Modules Global Initialization | 4450 |
| 24.2.5.1.2 | HDQ/1-Wire Module Global Initialization | 4450 |
| 24.2.5.2 | HDQ Operational Modes Configuration | 4450 |
| 24.2.5.2.1 | Main Sequence – HDQ Write Operation Mode | 4450 |
| 24.2.5.2.2 | Main Sequence - HDQ Read Operation Mode | 4451 |
| 24.2.5.3 | 1-Wire Operational Modes Configuration | 4451 |
| 24.2.5.3.1 | Main Sequence - 1-Wire Write Operation Mode | 4451 |
| 24.2.5.3.2 | Main Sequence - 1-Wire Read Operation Mode | 4452 |
| 24.2.5.3.3 | Sub-sequence - Initialize 1-Wire Slave | 4452 |
| 24.2.6 | HDQ/1-Wire Register Manual | 4453 |
| 24.2.6.1 | HDQ/1-Wire Instance Summary | 4453 |
| 24.2.6.2 | HDQ/1-Wire Registers | 4453 |
| 24.2.6.2.1 | HDQ/1-Wire Register Summary | 4453 |
| 24.2.6.2.2 | HDQ/1-Wire Register Description | 4453 |
| 24.3 | UART/IrDA/CIR | 4459 |
| 24.3.1 | UART/IrDA/CIR Overview | 4459 |
| 24.3.1.1 | UART Features | 4459 |
| 24.3.1.2 | IrDA Features | 4460 |
| 24.3.1.3 | CIR Features | 4461 |
| 24.3.2 | UART/IrDA/CIR Environment | 4462 |
| 24.3.2.1 | System Using UART Communication With Hardware Handshake | 4462 |
| 24.3.2.2 | System Using IrDA Communication Protocol | 4462 |
| 24.3.2.3 | System Using CIR Communication Protocol With Remote Control | 4462 |
| 24.3.2.4 | UART Interface | 4463 |
| 24.3.2.4.1 | Description | 4463 |
| 24.3.2.4.2 | UART Protocol and Data Format | 4463 |
| 24.3.2.5 | IrDA Functional Interfaces | 4464 |
| 24.3.2.5.1 | UART3 Interface Description | 4464 |
| 24.3.2.5.2 | IrDA Protocol and Data Format | 4465 |
| 24.3.2.6 | CIR Functional Interfaces | 4471 |
| 24.3.2.6.1 | CIR Interface Description | 4471 |
| 24.3.2.6.2 | CIR Protocol and Data Format | 4472 |
| 24.3.3 | UART/IrDA/CIR Integration | 4476 |
| 24.3.4 | UART/IrDA/CIR Functional Description | 4478 |
| 24.3.4.1 | Block Diagram | 4478 |
| 24.3.4.2 | Clock Configuration | 4479 |
| 24.3.4.3 | Software Reset | 4479 |
| 24.3.4.4 | Power Management | 4479 |
| 24.3.4.4.1 | UART Mode Power Management | 4479 |
| 24.3.4.4.2 | IrDA Mode Power Management (UART3 Only) | 4480 |
| 24.3.4.4.3 | CIR Mode Power Management (UART3 Only) | 4480 |
| 24.3.4.4.4 | Local Power Management | 4481 |
| 24.3.4.5 | Interrupt Requests | 4481 |
| 24.3.4.5.1 | UART Mode Interrupt Management | 4481 |
| 24.3.4.5.2 | IrDA Mode Interrupt Management | 4482 |
| 24.3.4.5.3 | CIR Mode Interrupt Management | 4483 |

| | | |
|------------|--|------|
| 24.3.4.6 | FIFO Management | 4484 |
| 24.3.4.6.1 | FIFO Trigger | 4486 |
| 24.3.4.6.2 | FIFO Interrupt Mode | 4486 |
| 24.3.4.6.3 | FIFO Polled Mode Operation | 4488 |
| 24.3.4.6.4 | FIFO DMA Mode Operation | 4488 |
| 24.3.4.7 | Mode Selection | 4493 |
| 24.3.4.7.1 | Register Access Modes | 4493 |
| 24.3.4.7.2 | UART/IrDA (SIR, MIR, FIR)/CIR Mode Selection | 4495 |
| 24.3.4.8 | Protocol Formatting | 4499 |
| 24.3.4.8.1 | UART Mode | 4499 |
| 24.3.4.8.2 | IrDA Mode (UART3 Only) | 4505 |
| 24.3.4.8.3 | CIR Mode (UART3 Only) | 4509 |
| 24.3.5 | UART/IrDA/CIR Basic Programming Model | 4511 |
| 24.3.5.1 | UART Programming Model | 4511 |
| 24.3.5.1.1 | Quick Start | 4511 |
| 24.3.5.1.2 | Hardware and Software Flow Control Configuration | 4514 |
| 24.3.5.2 | IrDA Programming Model (UART3 Only) | 4517 |
| 24.3.5.2.1 | SIR Mode | 4517 |
| 24.3.5.2.2 | MIR Mode | 4518 |
| 24.3.5.2.3 | FIR Mode | 4519 |
| 24.3.6 | UART/IrDA/CIR Register Manual | 4520 |
| 24.3.6.1 | UART/IrDA/CIR Instance Summary | 4520 |
| 24.3.6.2 | UART/IrDA/CIR Registers | 4520 |
| 24.3.6.2.1 | UART/IrDA/CIR Register Summary | 4520 |
| 24.3.6.2.2 | UART/IrDA/CIR Registers | 4522 |
| 24.4 | Multichannel Serial Port Interface | 4567 |
| 24.4.1 | MCSPi Overview | 4567 |
| 24.4.2 | MCSPi Environment | 4569 |
| 24.4.2.1 | MCSPi Interface | 4571 |
| 24.4.2.1.1 | Basic MCSPi Pins for Master Mode | 4571 |
| 24.4.2.1.2 | Basic MCSPi Pins for Slave Mode | 4571 |
| 24.4.2.1.3 | Multichannel SPI Protocol and Data Format | 4572 |
| 24.4.2.2 | SPI in Master Mode | 4575 |
| 24.4.2.3 | SPI in Slave Mode | 4576 |
| 24.4.3 | MCSPi Integration | 4577 |
| 24.4.4 | MCSPi Functional Description | 4580 |
| 24.4.4.1 | MCSPi Block Diagram | 4580 |
| 24.4.4.2 | Master Mode | 4581 |
| 24.4.4.2.1 | Master Mode Features | 4581 |
| 24.4.4.2.2 | Master Transmit-and-Receive Mode (Full Duplex) | 4581 |
| 24.4.4.2.3 | Master Transmit-Only Mode (Half Duplex) | 4582 |
| 24.4.4.2.4 | Master Receive-Only Mode (Half Duplex) | 4582 |
| 24.4.4.2.5 | Single-Channel Master Mode | 4583 |
| 24.4.4.2.6 | Start-Bit Mode | 4585 |
| 24.4.4.2.7 | Chip-Select Timing Control | 4585 |
| 24.4.4.2.8 | Programmable SPI Clock (mcspim_clk) | 4586 |
| 24.4.4.3 | Slave Mode | 4588 |
| 24.4.4.3.1 | Dedicated Resources | 4588 |
| 24.4.4.3.2 | Slave Transmit-and-Receive Mode | 4590 |
| 24.4.4.3.3 | Slave Transmit-Only Mode | 4590 |
| 24.4.4.3.4 | Slave Receive-Only Mode | 4591 |
| 24.4.4.4 | FIFO Buffer Management | 4592 |
| 24.4.4.4.1 | Buffer Almost Full | 4594 |

| | | |
|------------|---|------|
| 24.4.4.4.2 | Buffer Almost Empty | 4594 |
| 24.4.4.4.3 | End of Transfer Management | 4595 |
| 24.4.4.5 | Interrupts | 4595 |
| 24.4.4.5.1 | Interrupt Events in Master Mode | 4595 |
| 24.4.4.5.2 | Interrupt Events in Slave Mode | 4597 |
| 24.4.4.5.3 | Interrupt-Driven Operation | 4598 |
| 24.4.4.5.4 | Polling | 4598 |
| 24.4.4.6 | DMA Requests | 4598 |
| 24.4.4.7 | Power Saving Management | 4599 |
| 24.4.4.7.1 | Normal Mode | 4599 |
| 24.4.4.7.2 | Idle Mode | 4599 |
| 24.4.5 | MCSPi Programming Guide | 4602 |
| 24.4.5.1 | MCSPi Low-Level Programming Models | 4602 |
| 24.4.5.1.1 | Global Initialization | 4602 |
| 24.4.5.1.2 | Operational Mode Configuration | 4602 |
| 24.4.5.1.3 | Common Transfer Procedures With FIFO – Polling Method | 4604 |
| 24.4.6 | MCSPi Register Manual | 4607 |
| 24.4.6.1 | MCSPi Instance Summary | 4607 |
| 24.4.6.2 | MCSPi Registers | 4607 |
| 24.4.6.2.1 | MCSPi Register Summary | 4607 |
| 24.4.6.2.2 | MCSPi Register Description | 4608 |
| 24.5 | Multichannel Buffered Serial Port (McBSP) | 4632 |
| 24.5.1 | McBSP Overview | 4632 |
| 24.5.1.1 | McBSP Features | 4632 |
| 24.5.2 | McBSP Environment | 4634 |
| 24.5.2.1 | McBSP Functions | 4634 |
| 24.5.2.2 | McBSP Signals Descriptions | 4634 |
| 24.5.2.3 | McBSP Functions Description | 4636 |
| 24.5.2.3.1 | McBSP Modes | 4636 |
| 24.5.2.3.2 | McBSP Functions | 4637 |
| 24.5.2.4 | McBSP Protocols and Data Formats | 4638 |
| 24.5.2.4.1 | Words, Frames, and Phases Definitions | 4639 |
| 24.5.2.4.2 | Serial Protocol and Data Formats | 4640 |
| 24.5.2.4.3 | Audio Protocol and Data Formats | 4641 |
| 24.5.2.4.4 | Voice Protocol and Data Formats | 4643 |
| 24.5.3 | McBSP Integration | 4644 |
| 24.5.4 | McBSP Functional Description | 4651 |
| 24.5.4.1 | Block Diagram | 4651 |
| 24.5.4.2 | Signal Source Control | 4651 |
| 24.5.4.3 | McBSP Clock Configuration | 4652 |
| 24.5.4.3.1 | McBSP1 Clocks | 4652 |
| 24.5.4.3.2 | McBSP2 Clocks | 4652 |
| 24.5.4.3.3 | McBSP3 Clocks | 4653 |
| 24.5.4.3.4 | McBSP4 Clocks | 4654 |
| 24.5.4.4 | McBSP Software Reset | 4655 |
| 24.5.4.5 | McBSP Power Management | 4655 |
| 24.5.4.5.1 | McBSP Operating States | 4655 |
| 24.5.4.5.2 | McBSP Acknowledgment Modes | 4655 |
| 24.5.4.5.3 | Wake-Up Capability | 4657 |
| 24.5.4.5.4 | Analysis of the Receiver Smart-Idle Behavior | 4658 |
| 24.5.4.6 | McBSP Interrupt Requests | 4660 |
| 24.5.4.7 | McBSP DMA Requests | 4660 |
| 24.5.4.8 | McBSP Data Transfer Process | 4661 |

| | | |
|-------------|--|------|
| 24.5.4.8.1 | Data Transfer Process for 8-/12-/16-/20-/24-/32-Bit-Long Words | 4661 |
| 24.5.4.8.2 | Bit Reordering (Option to Transfer LSB First) | 4661 |
| 24.5.4.8.3 | Clocking and Framing Data | 4662 |
| 24.5.4.8.4 | Frame Phases (Dual-Phase Frame I2S Support) | 4666 |
| 24.5.4.8.5 | McBSP Reception | 4668 |
| 24.5.4.8.6 | McBSP Transmission | 4669 |
| 24.5.4.8.7 | Enable/Disable the Transmit and Receive Processes | 4670 |
| 24.5.4.8.8 | MCBSP Data Transfer Mode | 4671 |
| 24.5.4.9 | McBSP SRG | 4672 |
| 24.5.4.9.1 | Clock Generation in the SRG | 4674 |
| 24.5.4.9.2 | Frame-Sync Generation in the SRG | 4675 |
| 24.5.4.9.3 | Synchronizing SRG Outputs to an External Clock | 4676 |
| 24.5.4.10 | McBSP Exception/Error Conditions | 4677 |
| 24.5.4.10.1 | Introduction | 4677 |
| 24.5.4.10.2 | Overrun in the Receiver | 4678 |
| 24.5.4.10.3 | Unexpected Receive Frame-Sync Pulse | 4679 |
| 24.5.4.10.4 | Underflow in the Receiver | 4680 |
| 24.5.4.10.5 | Underflow in the Transmitter | 4680 |
| 24.5.4.10.6 | Unexpected Transmit Frame-Sync Pulse | 4681 |
| 24.5.4.10.7 | Overflow in the Transmitter | 4682 |
| 24.5.4.11 | McBSP DMA Configuration | 4682 |
| 24.5.4.12 | Multichannel Selection Modes | 4683 |
| 24.5.4.12.1 | Channels, Blocks and Partitions | 4683 |
| 24.5.4.12.2 | Multichannel Selection | 4683 |
| 24.5.4.12.3 | Configuring a Frame for Multichannel Selection | 4683 |
| 24.5.4.12.4 | Using Eight Partitions | 4684 |
| 24.5.4.12.5 | Receive Multichannel Selection Mode | 4685 |
| 24.5.4.12.6 | Using Two Partitions (Legacy Only) | 4685 |
| 24.5.4.12.7 | Transmit Multichannel Selection Modes | 4686 |
| 24.5.5 | McBSP Basic Programming Model | 4690 |
| 24.5.5.1 | McBSP Initialization Procedure | 4690 |
| 24.5.5.2 | Reset and Initialization Procedure for the SRG | 4693 |
| 24.5.5.3 | Data Transfer DMA Request Configuration | 4695 |
| 24.5.5.4 | Interrupt Configuration | 4695 |
| 24.5.5.5 | Receiver Configuration | 4695 |
| 24.5.5.5.1 | Place the Receiver in Reset (Step 1) | 4695 |
| 24.5.5.5.2 | Programming the McBSP Registers for the Desired Receiver Configuration (Step 2) | 4696 |
| 24.5.5.5.3 | Take the Receiver Out of Reset (Step 3) | 4697 |
| 24.5.5.6 | Transmitter Configuration | 4697 |
| 24.5.5.6.1 | Place the Transmitter in Reset (Step 1) | 4697 |
| 24.5.5.6.2 | Programming the McBSP Registers for the Desired Transmitter Operation (Step 2) | 4698 |
| 24.5.5.6.3 | Take the Receiver Out of Reset (Step 3) | 4699 |
| 24.5.5.7 | GPIO on the McBSP Pins (Legacy Only) | 4699 |
| 24.5.6 | MCBSP Register Manual | 4701 |
| 24.5.6.1 | MCBSP Instance Summary | 4701 |
| 24.5.6.2 | MCBSP Registers | 4701 |
| 24.5.6.2.1 | MCBSP Register Summary | 4701 |
| 24.5.6.2.2 | MCBSP Register Description | 4706 |
| 24.6 | Multichannel PDM Controller | 4747 |
| 24.6.1 | McPDM Overview | 4747 |
| 24.6.2 | McPDM Environment | 4748 |
| 24.6.2.1 | McPDM Modes | 4748 |
| 24.6.2.2 | McPDM Signals | 4748 |

| | | |
|------------|--|------|
| 24.6.2.3 | McPDM Configurations | 4749 |
| 24.6.2.4 | Protocols and Data Formats | 4749 |
| 24.6.2.4.1 | Protocols and Data Formats in Normal Mode | 4749 |
| 24.6.2.4.2 | Protocols and Data Formats in Command Mode | 4750 |
| 24.6.2.4.3 | Protocols and Data Formats in Status Mode | 4752 |
| 24.6.3 | McPDM Integration | 4755 |
| 24.6.4 | McPDM Functional Description | 4757 |
| 24.6.4.1 | McPDM Block Diagram | 4757 |
| 24.6.4.2 | McPDM Clock Configuration | 4757 |
| 24.6.4.3 | McPDM Software Reset | 4757 |
| 24.6.4.4 | McPDM Power Management | 4758 |
| 24.6.4.5 | McPDM Interrupt Requests | 4758 |
| 24.6.4.6 | McPDM DMA Requests | 4761 |
| 24.6.4.7 | Uplink Path | 4761 |
| 24.6.4.7.1 | Uplink Path Features | 4763 |
| 24.6.4.7.2 | Uplink Path Description | 4763 |
| 24.6.4.8 | Downlink Path | 4766 |
| 24.6.4.8.1 | Downlink Path Features | 4767 |
| 24.6.4.8.2 | Downlink Path Description | 4767 |
| 24.6.4.9 | Error Reporting | 4770 |
| 24.6.5 | McPDM Programming Guide | 4771 |
| 24.6.5.1 | McPDM Low-Level Programming Models | 4771 |
| 24.6.5.1.1 | Global Initialization | 4771 |
| 24.6.5.1.2 | McPDM Events Servicing | 4774 |
| 24.6.6 | McPDM Register Manual | 4777 |
| 24.6.6.1 | McPDM Instance Summary | 4777 |
| 24.6.6.2 | McPDM Registers | 4777 |
| 24.6.6.2.1 | McPDM Register Summary | 4777 |
| 24.6.6.2.2 | McPDM Register Description | 4777 |
| 24.7 | Digital Microphone Module | 4793 |
| 24.7.1 | DMIC Overview | 4793 |
| 24.7.2 | DMIC Environment | 4795 |
| 24.7.2.1 | DMIC Interface With External MIC | 4795 |
| 24.7.2.1.1 | DMIC Interface Overview | 4795 |
| 24.7.2.1.2 | DMIC Signals | 4796 |
| 24.7.2.1.3 | Serial Data Format | 4796 |
| 24.7.2.2 | DMIC Functional Path | 4797 |
| 24.7.3 | DMIC Integration | 4798 |
| 24.7.4 | DMIC Functional Description | 4800 |
| 24.7.4.1 | Block Diagram | 4800 |
| 24.7.4.2 | DMIC Clock Configuration | 4800 |
| 24.7.4.3 | DMIC Software Reset | 4801 |
| 24.7.4.4 | DMIC Power Management | 4801 |
| 24.7.4.5 | DMIC Interrupt Requests | 4802 |
| 24.7.4.6 | DMIC DMA Requests | 4804 |
| 24.7.4.7 | Audio Data Processing | 4805 |
| 24.7.4.7.1 | Filtering | 4805 |
| 24.7.4.8 | FIFO Management | 4805 |
| 24.7.4.8.1 | FIFO General Description | 4805 |
| 24.7.4.8.2 | FIFO Operations | 4806 |
| 24.7.4.8.3 | FIFO Output Range Definition | 4807 |
| 24.7.5 | DMIC Programming Guide | 4808 |
| 24.7.5.1 | DMIC Low-Level Programming Models | 4808 |

| | | |
|-------------|--|------|
| 24.7.5.1.1 | Global Initialization | 4808 |
| 24.7.5.1.2 | Operational Mode Configuration | 4809 |
| 24.7.5.1.3 | DMIC Events Servicing | 4810 |
| 24.7.6 | DMIC Register Manual | 4812 |
| 24.7.6.1 | DMIC Instance Summary | 4812 |
| 24.7.6.2 | DMIC Registers | 4812 |
| 24.7.6.2.1 | DMIC Register Summary | 4812 |
| 24.7.6.2.2 | DMIC Register Descriptions | 4813 |
| 24.8 | Multichannel Audio Serial Port | 4826 |
| 24.8.1 | McASP Overview | 4826 |
| 24.8.2 | McASP Environment | 4827 |
| 24.8.2.1 | McASP Signals | 4827 |
| 24.8.2.2 | Protocols and Data Formats | 4827 |
| 24.8.2.2.1 | Protocols Supported | 4827 |
| 24.8.2.2.2 | Definition of Terms | 4828 |
| 24.8.2.2.3 | S/PDIF Coding Format | 4830 |
| 24.8.3 | McASP Integration | 4833 |
| 24.8.4 | McASP Functional Description | 4835 |
| 24.8.4.1 | Block Diagram | 4835 |
| 24.8.4.2 | McASP Clock and Frame-Sync Configuration | 4835 |
| 24.8.4.2.1 | Transmit Clock | 4836 |
| 24.8.4.2.2 | Frame-Sync Generator | 4836 |
| 24.8.4.3 | Serializers | 4837 |
| 24.8.4.4 | Format Unit | 4837 |
| 24.8.4.5 | Transmit State-Machine | 4839 |
| 24.8.4.6 | Transmit TDM Sequencer | 4839 |
| 24.8.4.7 | McASP Software Reset | 4839 |
| 24.8.4.8 | McASP Power Management | 4839 |
| 24.8.4.9 | Transfer Modes | 4839 |
| 24.8.4.9.1 | DIT Transfer Mode | 4839 |
| 24.8.4.10 | Data Transmission | 4842 |
| 24.8.4.10.1 | Data Ready Status and Event/Interrupt Generation | 4842 |
| 24.8.4.11 | Interrupt Requests | 4844 |
| 24.8.4.11.1 | Transmit Data Ready Interrupt | 4845 |
| 24.8.4.11.2 | Error Interrupt | 4845 |
| 24.8.4.12 | DMA Requests | 4845 |
| 24.8.4.13 | Audio Mute (AMUTE) Function | 4845 |
| 24.8.4.14 | Error Reporting | 4846 |
| 24.8.4.14.1 | Buffer Underrun Error –Transmitter | 4847 |
| 24.8.4.14.2 | DMA Error –Transmitter | 4847 |
| 24.8.4.14.3 | Clock Failure Detection | 4847 |
| 24.8.5 | McASP Low-Level Programming Model | 4849 |
| 24.8.5.1 | Global Initialization | 4849 |
| 24.8.5.1.1 | Surrounding Modules Global Initialization | 4849 |
| 24.8.5.1.2 | McASP Global Initialization | 4849 |
| 24.8.5.2 | Operational Modes Configuration | 4852 |
| 24.8.5.2.1 | McASP DIT Transmission Mode | 4852 |
| 24.8.5.2.2 | McASP Event Servicing | 4856 |
| 24.8.6 | McASP Register Manual | 4859 |
| 24.8.6.1 | McASP Instance Summary | 4859 |
| 24.8.6.2 | McASP Registers | 4859 |
| 24.8.6.2.1 | McASP Register Summary | 4859 |
| 24.8.6.2.2 | McASP Register Description | 4860 |

| | | |
|-------------|--|------|
| 24.9 | Serial Low-Power Inter-Chip Media Bus Controller | 4885 |
| 24.9.1 | SLIMbus Overview | 4885 |
| 24.9.1.1 | Terminology | 4886 |
| 24.9.1.2 | Main Features | 4887 |
| 24.9.2 | SLIMbus Environment | 4888 |
| 24.9.2.1 | SLIMbus Component Connection Example | 4888 |
| 24.9.2.2 | SLIMbus Functional Interface | 4889 |
| 24.9.2.3 | SLIMbus Protocols and Data Formats | 4889 |
| 24.9.2.3.1 | Frame Structure | 4889 |
| 24.9.2.3.2 | Control and Data Channels | 4890 |
| 24.9.2.3.3 | SLIMbus Transfer Protocols | 4895 |
| 24.9.2.3.4 | Half-Duplex Versus Full-Duplex Asynchronous Configurations | 4897 |
| 24.9.3 | SLIMbus Integration | 4898 |
| 24.9.4 | SLIMbus Functional Description | 4903 |
| 24.9.4.1 | SLIMbus Block Description | 4903 |
| 24.9.4.2 | SLIMbus Clock Configuration | 4904 |
| 24.9.4.3 | Software Reset | 4904 |
| 24.9.4.4 | System Power Management and Wakeup | 4904 |
| 24.9.4.4.1 | Wake-Up Request | 4904 |
| 24.9.4.4.2 | Power Management | 4904 |
| 24.9.4.4.3 | SLIMbus Boot and Reset Procedures | 4904 |
| 24.9.4.4.4 | SLIMbus Reconfigure Parameters | 4907 |
| 24.9.4.5 | Data Channels (Ports) Management | 4908 |
| 24.9.4.5.1 | Data input/output: manual mode | 4909 |
| 24.9.4.5.2 | Data Input/Output: DMA Request Mode | 4910 |
| 24.9.4.5.3 | Data Channel Agent FIFO Control and Status | 4910 |
| 24.9.4.6 | FIFO Management | 4910 |
| 24.9.4.6.1 | FIFO Mapping | 4910 |
| 24.9.4.6.2 | FIFO Status | 4911 |
| 24.9.4.6.3 | FIFO Configuration | 4913 |
| 24.9.4.7 | SLIMbus Transfer Protocols | 4915 |
| 24.9.4.7.1 | Isochronous Transfer Protocol | 4915 |
| 24.9.4.7.2 | Pushed Transfer Protocol | 4916 |
| 24.9.4.7.3 | Pulled Transfer Protocol | 4917 |
| 24.9.4.7.4 | Asynchronous Transfer Protocol | 4918 |
| 24.9.4.7.5 | Extended Asynchronous Transfer Protocol | 4920 |
| 24.9.4.8 | Paired-up channels | 4922 |
| 24.9.4.8.1 | Paired-up behaviour for Isochronous TP | 4923 |
| 24.9.4.8.2 | Paired-up behaviour for Pushed TP | 4923 |
| 24.9.4.8.3 | Paired-up behaviour for Pulled TP | 4923 |
| 24.9.4.9 | Device and Addressing Management | 4923 |
| 24.9.4.10 | Message Management | 4924 |
| 24.9.4.10.1 | Transmission | 4924 |
| 24.9.4.10.2 | Message reception | 4925 |
| 24.9.4.11 | Interrupt Service Routines | 4926 |
| 24.9.4.11.1 | Interrupt Requests | 4927 |
| 24.9.4.11.2 | Possible Interrupts | 4927 |
| 24.9.4.11.3 | Interface Device ISRs | 4928 |
| 24.9.4.11.4 | Framer Device ISRs | 4931 |
| 24.9.4.11.5 | Shared Message Channel Transmit ISRs | 4933 |
| 24.9.4.11.6 | Shared Message Channel Receive ISRs | 4935 |
| 24.9.4.11.7 | Data Channel Port ISRs | 4936 |
| 24.9.5 | SLIMbus Programming Guide | 4938 |

| | | |
|-------------|--|------|
| 24.9.5.1 | SLIMbus Low-Level Programming Models | 4938 |
| 24.9.5.1.1 | Global Initialization | 4938 |
| 24.9.5.1.2 | SLIMbus Component Boot | 4939 |
| 24.9.5.1.3 | Data Agent Assignment | 4939 |
| 24.9.5.1.4 | Device Enumeration | 4940 |
| 24.9.5.1.5 | Operational Modes Configuration | 4940 |
| 24.9.5.1.6 | SLIMbus Transfer Procedures | 4943 |
| 24.9.5.1.7 | Event Handling | 4946 |
| 24.9.6 | SLIMbus Register Manual | 4947 |
| 24.9.6.1 | SLIMbus Register Overview | 4947 |
| 24.9.6.2 | SLIMbus Instance Summary | 4947 |
| 24.9.6.3 | SLIMbus Registers | 4947 |
| 24.9.6.3.1 | SLIMBUS1 Register Summary | 4947 |
| 24.9.6.3.2 | SLIMBUS2 Register Summary | 4949 |
| 24.9.6.3.3 | SLIMbus Register Descriptions | 4950 |
| 24.10 | MIPI-HSI | 5010 |
| 24.10.1 | HSI Overview | 5010 |
| 24.10.2 | HSI Environment | 5011 |
| 24.10.2.1 | HSI Signals | 5011 |
| 24.10.2.2 | HSI Typical Application | 5012 |
| 24.10.3 | HSI Integration | 5012 |
| 24.10.4 | HSI Functional Description | 5015 |
| 24.10.4.1 | Block Diagram | 5015 |
| 24.10.4.2 | Clock Configuration | 5016 |
| 24.10.4.2.1 | Interface Clock Domain | 5017 |
| 24.10.4.2.2 | Functional Clock Domain | 5017 |
| 24.10.4.2.3 | Receive Clock Domain (Port 1 and Port 2) | 5017 |
| 24.10.4.3 | Software Reset | 5017 |
| 24.10.4.4 | Power Management | 5017 |
| 24.10.4.4.1 | HSI Module Power-Management Modes | 5018 |
| 24.10.4.5 | Interrupt Requests | 5019 |
| 24.10.4.5.1 | Interrupts | 5020 |
| 24.10.4.6 | DMA Module | 5022 |
| 24.10.4.6.1 | DMA Overview | 5022 |
| 24.10.4.6.2 | DMA Memories | 5022 |
| 24.10.4.6.3 | DMA Basic Operation Outline | 5022 |
| 24.10.4.6.4 | DMA Configuration | 5023 |
| 24.10.4.7 | HSR Module | 5023 |
| 24.10.4.7.1 | Receive Data | 5023 |
| 24.10.4.7.2 | Transmission Detection | 5024 |
| 24.10.4.7.3 | Receive Buffers | 5025 |
| 24.10.4.7.4 | Receive Operations | 5025 |
| 24.10.4.7.5 | Receive Exceptions | 5026 |
| 24.10.4.8 | HST Block | 5027 |
| 24.10.4.8.1 | Configuration | 5027 |
| 24.10.4.8.2 | Mapping | 5029 |
| 24.10.4.8.3 | Transmission Buffer | 5029 |
| 24.10.4.8.4 | Break Pattern Transmission | 5029 |
| 24.10.4.8.5 | Transmission Operations | 5030 |
| 24.10.4.8.6 | Transmission Exceptions | 5030 |
| 24.10.4.9 | HSI Wake Generator | 5030 |
| 24.10.4.9.1 | Software Management of HSI Wake Generator | 5031 |
| 24.10.4.9.2 | Automatic Management of HSI Wake Generator | 5031 |

| | | |
|--------------|---|------|
| 24.10.4.10 | FIFO Subsystem | 5032 |
| 24.10.4.10.1 | FIFO Subsystem Architecture | 5032 |
| 24.10.4.10.2 | Transmit FIFO Architecture | 5033 |
| 24.10.4.10.3 | Receive FIFO Architecture | 5034 |
| 24.10.4.10.4 | FIFO Addressing | 5035 |
| 24.10.4.11 | Error Reporting | 5035 |
| 24.10.4.11.1 | Detection of Errors | 5035 |
| 24.10.4.11.2 | Error Counters | 5036 |
| 24.10.4.11.3 | Error Registers | 5036 |
| 24.10.5 | HSI Programming Guide | 5038 |
| 24.10.5.1 | HSI Low-Level Programming Models | 5038 |
| 24.10.5.1.1 | Global Initialization | 5038 |
| 24.10.5.1.2 | HSI Operational Modes Configuration | 5038 |
| 24.10.6 | HSI Register Manual | 5047 |
| 24.10.6.1 | HSI Instance Summary | 5047 |
| 24.10.6.2 | HSI_TOP Registers | 5047 |
| 24.10.6.2.1 | HSI_TOP Register Summary | 5047 |
| 24.10.6.2.2 | HSI_TOP Register Description | 5048 |
| 24.10.6.3 | HSI_DMA_CHANNELS Registers | 5063 |
| 24.10.6.3.1 | HSI_DMA_CHANNELS Register Summary | 5063 |
| 24.10.6.3.2 | HSI_DMA_CHANNELS Register Description | 5063 |
| 24.10.6.4 | HSI_PORTS Registers | 5067 |
| 24.10.6.4.1 | HSI_PORTS Register Summary | 5067 |
| 24.10.6.4.2 | HSI_PORTS Register Description | 5068 |
| 24.11 | High-Speed Multiport USB Host Subsystem | 5086 |
| 24.11.1 | High-Speed Multiport USB Host Subsystem Overview | 5086 |
| 24.11.1.1 | Main Features | 5087 |
| 24.11.2 | HS Multiport USB Host Subsystem Environment | 5089 |
| 24.11.2.1 | ULPIs | 5089 |
| 24.11.2.1.1 | Transceiver Interface Configuration in ULPI Mode | 5091 |
| 24.11.2.1.2 | TLL Interface Configuration in ULPI Mode | 5093 |
| 24.11.2.2 | FS/LS Serial Interfaces | 5095 |
| 24.11.2.2.1 | Encoding in Serial Mode | 5096 |
| 24.11.2.2.2 | Sideband Signals for Serial Modes | 5098 |
| 24.11.2.2.3 | External USB Transceiver Interface Configurations in Serial Modes | 5099 |
| 24.11.2.2.4 | TLL Interface Configurations in Serial Modes | 5103 |
| 24.11.2.2.5 | Interface Description in Serial Modes | 5109 |
| 24.11.2.3 | HSIC Interface | 5111 |
| 24.11.3 | HS Multiport USB Host Subsystem Integration | 5112 |
| 24.11.4 | HS Multiport USB Host Subsystem Functional Description | 5115 |
| 24.11.4.1 | USB Host Controller Functionality | 5115 |
| 24.11.4.1.1 | HS USB Host Controller Software Reset | 5116 |
| 24.11.4.1.2 | HS USB Host Controller Power Management | 5117 |
| 24.11.4.1.3 | HS USB Host Controller Save and Restore | 5118 |
| 24.11.4.1.4 | HS USB Host Controller Port Status | 5118 |
| 24.11.4.1.5 | HS USB Host Controller Burst Control | 5118 |
| 24.11.4.1.6 | OHCI Implementation Specifications | 5118 |
| 24.11.4.1.7 | UTMI Interface | 5119 |
| 24.11.4.1.8 | ULPI Interface | 5119 |
| 24.11.4.2 | USBTLL Module Functionality | 5119 |
| 24.11.4.2.1 | USBTLL Software Reset | 5119 |
| 24.11.4.2.2 | USBTLL Power Management | 5119 |
| 24.11.4.2.3 | USBTLL Save and Restore | 5120 |

| | | |
|-------------|--|------|
| 24.11.4.2.4 | USBTLL Channels and Ports | 5120 |
| 24.11.4.2.5 | USBTLL Channel Configuration | 5121 |
| 24.11.4.2.6 | USBTLL VBUS Management and Emulations | 5122 |
| 24.11.4.2.7 | USBTLL Multimode Serial Port | 5124 |
| 24.11.4.2.8 | USBTLL Attach/Connect Emulation for Serial Modes | 5126 |
| 24.11.5 | HS Multiport USB Host Subsystem Low-Level Programming Model | 5127 |
| 24.11.5.1 | Global Initialization | 5127 |
| 24.11.5.1.1 | Surrounding Modules Global Initialization | 5127 |
| 24.11.5.1.2 | HS Multiport USB Host Subsystem Global Initialization | 5127 |
| 24.11.5.2 | Operational Modes Configuration (Selecting and Configuring USB Connectivity) | 5128 |
| 24.11.5.3 | USBTLL Registers | 5128 |
| 24.11.5.3.1 | TLL Control and Status Registers | 5128 |
| 24.11.5.3.2 | ULPI PHY-Side Registers | 5129 |
| 24.11.6 | HS USB Host Subsystem Register Manual | 5130 |
| 24.11.6.1 | USB_Host_HS Instance Summary | 5130 |
| 24.11.6.2 | USBTLLHS_config Registers | 5130 |
| 24.11.6.2.1 | USBTLLHS_config Register Summary | 5130 |
| 24.11.6.2.2 | USBTLLHS_config Register Description | 5130 |
| 24.11.6.3 | USBTLLHS_ULPI Registers | 5138 |
| 24.11.6.3.1 | USBTLLHS_ULPI Register Summary | 5138 |
| 24.11.6.3.2 | USBTLLHS_ULPI Register Description | 5139 |
| 24.11.6.4 | HSUSBHOST Controller Registers | 5167 |
| 24.11.6.4.1 | HSUSBHOST Controller Register Summary | 5167 |
| 24.11.6.4.2 | HSUSB Controller Register Description | 5167 |
| 24.11.6.5 | OHCI Registers | 5173 |
| 24.11.6.5.1 | OHCI Register Summary | 5173 |
| 24.11.6.5.2 | OHCI Register Description | 5174 |
| 24.11.6.6 | EHCI Registers | 5191 |
| 24.11.6.6.1 | EHCI Register Summary | 5191 |
| 24.11.6.6.2 | EHCI Register Description | 5191 |
| 24.12 | High-Speed USB OTG Controller | 5209 |
| 24.12.1 | High-Speed USB OTG Controller Overview | 5209 |
| 24.12.1.1 | Main Features | 5211 |
| 24.12.2 | High-Speed USB OTG Controller Environment | 5211 |
| 24.12.2.1 | High-Speed USB OTG Controller Functional Interfaces | 5212 |
| 24.12.3 | High-Speed USB OTG Controller Integration | 5213 |
| 24.12.4 | High-Speed USB OTG Controller Functional Description | 5216 |
| 24.12.4.1 | Software Reset | 5216 |
| 24.12.4.2 | Power Management | 5216 |
| 24.12.4.2.1 | Overview | 5216 |
| 24.12.4.2.2 | System Power Management | 5216 |
| 24.12.4.2.3 | Local Power Management | 5218 |
| 24.12.4.3 | Inventra MUSBMHDC | 5219 |
| 24.12.4.4 | Configuration | 5219 |
| 24.12.4.5 | Basic Operation | 5220 |
| 24.12.4.5.1 | Module Initialization | 5220 |
| 24.12.4.5.2 | Transaction Handling | 5220 |
| 24.12.4.6 | Optional Features | 5221 |
| 24.12.4.6.1 | Double Packet Buffering | 5221 |
| 24.12.4.6.2 | USBOTGHS Support for Big Endian | 5221 |
| 24.12.4.6.3 | DMA | 5222 |
| 24.12.4.7 | Automatic Packet Splitting/Combining for Bulk Transfers | 5223 |
| 24.12.4.8 | High-Bandwidth Isochronous Endpoints | 5223 |

| | | |
|-------------|--|-------------|
| 24.12.4.9 | Carkit Implementation | 5224 |
| 24.12.4.10 | USB PHY | 5224 |
| 24.12.5 | High-Speed USB OTG Controller Basic Programming Model | 5225 |
| 24.12.5.1 | Global Initialization | 5225 |
| 24.12.5.1.1 | Surrounding Modules Global Initialization | 5225 |
| 24.12.5.1.2 | High-Speed USB OTG Controller Global Initialization | 5225 |
| 24.12.5.2 | High-Speed USB OTG Controller Interface Modes | 5226 |
| 24.12.5.3 | High-Speed USB OTG Controller Power Management Configuration | 5226 |
| 24.12.5.3.1 | No Application Mode | 5226 |
| 24.12.5.3.2 | Host or Peripheral Mode | 5226 |
| 24.12.5.3.3 | Switching Between Host and Peripheral Mode | 5226 |
| 24.12.6 | High-Speed USB OTG Controller Register Manual | 5227 |
| 24.12.6.1 | HSUSBOTG Registers | 5227 |
| 24.12.6.1.1 | HSUSBOTG Register Summary | 5227 |
| 24.12.6.1.2 | HSUSBOTG Register Description | 5227 |
| 24.12.6.2 | OCP2SCP Registers | 5231 |
| 24.12.6.2.1 | OCP2SCP Register Summary | 5231 |
| 24.12.6.2.2 | OCP2SCP Register Description | 5232 |
| 24.12.6.3 | USBPHY Registers | 5234 |
| 24.12.6.3.1 | USBPHY Register Summary | 5234 |
| 24.12.6.3.2 | USBPHY Register Description | 5235 |
| 25 | MMC/SD/SDIO | 5255 |
| 25.1 | MMC/SD/SDIO Overview | 5256 |
| 25.1.1 | MMC/SD/SDIO Features | 5259 |
| 25.2 | MMC/SD/SDIO Environment | 5263 |
| 25.2.1 | MMC/SD/SDIO Functional Modes | 5263 |
| 25.2.1.1 | MMC/SD/SDIO Connected to an MMC, an SD, or an SDIO Card | 5263 |
| 25.2.1.2 | MMC/SD/SDIO Connected to an MMC, an SD, or an SDIO Card Through an External Transceiver Device | 5264 |
| 25.2.2 | Protocol and Data Format | 5265 |
| 25.2.2.1 | Protocol | 5265 |
| 25.2.2.2 | Data Format | 5267 |
| 25.3 | MMC/SD/SDIO Integration | 5271 |
| 25.4 | MMC/SD/SDIO Functional Description | 5274 |
| 25.4.1 | Block Diagram | 5274 |
| 25.4.2 | Resets | 5274 |
| 25.4.2.1 | Hardware Reset | 5274 |
| 25.4.2.2 | Software Reset | 5274 |
| 25.4.3 | Power Management | 5275 |
| 25.4.4 | Interrupt Requests | 5278 |
| 25.4.4.1 | Interrupt-Driven Operation | 5281 |
| 25.4.4.2 | Polling | 5281 |
| 25.4.5 | DMA Modes | 5282 |
| 25.4.5.1 | Master DMA Operations | 5282 |
| 25.4.5.1.1 | Descriptor Table Description | 5283 |
| 25.4.5.1.2 | Requirements for Descriptors | 5284 |
| 25.4.5.1.3 | Advanced DMA Description | 5285 |
| 25.4.5.2 | Slave DMA Operations | 5286 |
| 25.4.5.2.1 | DMA Receive Mode | 5286 |
| 25.4.5.2.2 | DMA Transmit Mode | 5287 |
| 25.4.6 | Mode Selection | 5288 |
| 25.4.7 | Buffer Management | 5288 |
| 25.4.7.1 | Data Buffer | 5288 |

| | | |
|------------|---|-------------|
| 25.4.7.1.1 | Memory Size, Block Length, and Buffer-Management Relationship | 5291 |
| 25.4.7.1.2 | Data Buffer Status | 5292 |
| 25.4.8 | Transfer Process | 5292 |
| 25.4.8.1 | Different Types of Commands | 5292 |
| 25.4.8.2 | Different Types of Responses | 5292 |
| 25.4.9 | Transfer or Command Status and Errors Reporting | 5293 |
| 25.4.9.1 | Busy Time-Out for R1b, R5b Response Type | 5293 |
| 25.4.9.2 | Busy Time-Out After Write CRC Status | 5294 |
| 25.4.9.3 | Write CRC Status Time-Out | 5294 |
| 25.4.9.4 | Read Data Time-Out | 5295 |
| 25.4.9.5 | Boot Acknowledge Time-Out | 5296 |
| 25.4.10 | Auto Command 12 Timings | 5297 |
| 25.4.10.1 | ACMD12 Timings During Write Transfer | 5297 |
| 25.4.10.2 | ACMD12 Timings During Read Transfer | 5297 |
| 25.4.11 | Transfer Stop | 5297 |
| 25.4.12 | Retention Mode | 5298 |
| 25.4.13 | Output Signals Generation | 5299 |
| 25.4.13.1 | Generation on Falling Edge of MMC Clock | 5299 |
| 25.4.13.2 | Generation on Rising Edge of MMC Clock | 5299 |
| 25.4.14 | Card Boot Mode Management | 5300 |
| 25.4.14.1 | Boot Mode Using CMD0 | 5300 |
| 25.4.14.2 | Boot Mode With CMD Line Tied to 0 | 5300 |
| 25.4.15 | MMC CE-ATA Command Completion Disable Management | 5301 |
| 25.4.16 | Test Registers | 5301 |
| 25.4.17 | MMC/SD/SDIO Hardware Status Features | 5302 |
| 25.5 | MMC/SD/SDIO Programming Guide | 5303 |
| 25.5.1 | Low-Level Programming Models | 5303 |
| 25.5.1.1 | Global Initialization | 5303 |
| 25.5.1.1.1 | Surrounding Modules Global Initialization | 5303 |
| 25.5.1.1.2 | MMC/SD/SDIO Host Controller Initialization Flow | 5303 |
| 25.5.1.2 | Operational Modes Configuration | 5306 |
| 25.5.1.2.1 | Basic Operations for MMC/SD/SDIO Host Controller | 5306 |
| 25.5.1.2.2 | Bus Voltage Selection | 5323 |
| 25.5.1.2.3 | Boot Mode Configuration | 5325 |
| 25.6 | MMC/SD/SDIO Register Manual | 5329 |
| 25.6.1 | MMC/SD/SDIO Instance Summary | 5329 |
| 25.6.2 | MMC/SD/SDIO Registers | 5329 |
| 25.6.2.1 | MMC/SD/SDIO Register Summary | 5329 |
| 25.6.2.2 | MMC/SD/SDIO Register Description | 5330 |
| 26 | General-Purpose Interface | 5389 |
| 26.1 | General-Purpose Interface Overview | 5390 |
| 26.2 | General-Purpose Interface Environment | 5393 |
| 26.2.1 | General-Purpose Interface as a Keyboard Interface | 5393 |
| 26.2.2 | General-Purpose Interface Signals | 5394 |
| 26.3 | General-Purpose Interface Integration | 5399 |
| 26.4 | General-Purpose Interface Functional Description | 5402 |
| 26.4.1 | General-Purpose Interface Description | 5402 |
| 26.4.2 | General-Purpose Interface Interrupt and Wake-Up Features | 5403 |
| 26.4.2.1 | Synchronous Path: Interrupt Request Generation | 5403 |
| 26.4.2.2 | Asynchronous Path: Wake-Up Request Generation | 5404 |
| 26.4.2.3 | Wake-Up Event Conditions During Transition To and From IDLE State | 5405 |
| 26.4.2.4 | Interrupt (or Wake-Up) Line Release | 5406 |
| 26.4.3 | General-Purpose Interface Clock Configuration | 5406 |

| | | |
|------------|---|-------------|
| 26.4.3.1 | Clocking | 5406 |
| 26.4.4 | General-Purpose Interface Hardware and Software Reset | 5407 |
| 26.4.5 | General-Purpose Interface Power Management | 5407 |
| 26.4.5.1 | Power Domain | 5407 |
| 26.4.5.2 | Power Management | 5407 |
| 26.4.5.2.1 | Idle Scheme | 5407 |
| 26.4.5.2.2 | Operating Modes | 5408 |
| 26.4.5.2.3 | System Power Management and Wakeup | 5408 |
| 26.4.5.2.4 | Module Power Saving | 5409 |
| 26.4.6 | General-Purpose Interface Interrupt and Wake-Up Requests | 5411 |
| 26.4.6.1 | Interrupt Request Generation | 5411 |
| 26.4.6.2 | Wake-Up Request Generation | 5412 |
| 26.4.7 | General-Purpose Interface Channel Description | 5412 |
| 26.4.8 | General-Purpose Interface Data Input/Output Capabilities | 5414 |
| 26.4.9 | General-Purpose Interface Set-and-Clear Protocol | 5414 |
| 26.4.9.1 | Description | 5414 |
| 26.4.9.2 | Clear Instruction | 5415 |
| 26.4.9.2.1 | Clear Register Addresses | 5415 |
| 26.4.9.2.2 | Clear Instruction Example | 5415 |
| 26.4.9.3 | Set Instruction | 5415 |
| 26.4.9.3.1 | Set Register Addresses | 5415 |
| 26.4.9.3.2 | Set Instruction Example | 5416 |
| 26.5 | General-Purpose Interface Programming Guide | 5417 |
| 26.5.1 | General-Purpose Interface Low-Level Programming Models | 5417 |
| 26.5.1.1 | Global Initialization | 5417 |
| 26.5.1.1.1 | Surrounding Modules Global Initialization | 5417 |
| 26.5.1.1.2 | General-Purpose Interface Module Global Initialization | 5417 |
| 26.5.1.2 | General-Purpose Interface Operational Modes Configuration | 5418 |
| 26.5.1.2.1 | General-Purpose Interface Read Input Register | 5418 |
| 26.5.1.2.2 | General-Purpose Interface Write Output Register | 5418 |
| 26.5.1.2.3 | General-Purpose Interface Set Bit Function | 5418 |
| 26.5.1.2.4 | General-Purpose Interface Clear Bit Function | 5418 |
| 26.6 | General-Purpose Interface Register Manual | 5419 |
| 26.6.1 | General-Purpose Interface Instance Summary | 5419 |
| 26.6.2 | General-Purpose Interface Registers | 5419 |
| 26.6.2.1 | General-Purpose Interface Register Summary | 5419 |
| 26.6.2.2 | General-Purpose Interface Register Description | 5421 |
| 27 | Keyboard Controller | 5439 |
| 27.1 | Keyboard Controller Overview | 5440 |
| 27.2 | Keyboard Controller Environment | 5442 |
| 27.2.1 | Keyboard Controller Functions/Modes | 5442 |
| 27.2.2 | Keyboard Controller Signals | 5443 |
| 27.2.3 | Protocols and Data Formats | 5443 |
| 27.3 | Keyboard Controller Integration | 5445 |
| 27.4 | Keyboard Controller Functional Description | 5447 |
| 27.4.1 | Keyboard Controller Block Diagram | 5447 |
| 27.4.2 | Keyboard Controller Software Reset | 5448 |
| 27.4.3 | Keyboard Controller Power Management | 5448 |
| 27.4.4 | Keyboard Controller Interrupt Requests | 5449 |
| 27.4.5 | Keyboard Controller Software Mode | 5449 |
| 27.4.6 | Keyboard Controller Hardware Decoding Modes | 5449 |
| 27.4.6.1 | Functional Modes | 5449 |
| 27.4.6.2 | Keyboard Controller Timer | 5450 |

| | | |
|------------|--|-------------|
| 27.4.6.3 | State-Machine Status | 5451 |
| 27.4.6.4 | Keyboard Controller Interrupt Generation | 5452 |
| 27.4.6.4.1 | Interrupt-Generation Scheme | 5452 |
| 27.4.6.4.2 | Keyboard Buffer and Missed Events (Overrun Feature) | 5454 |
| 27.4.7 | Keyboard Controller Key Coding Registers | 5454 |
| 27.4.8 | Keyboard Controller Register Access | 5455 |
| 27.4.8.1 | Write Registers Access | 5455 |
| 27.4.8.2 | Read Registers Access | 5456 |
| 27.5 | Keyboard Controller Programming Guide | 5457 |
| 27.5.1 | Keyboard Controller Low-Level Programming Models | 5457 |
| 27.5.1.1 | Global Initialization | 5457 |
| 27.5.1.1.1 | Surrounding Modules Global Initialization | 5457 |
| 27.5.1.1.2 | Keyboard Controller Global Initialization | 5457 |
| 27.5.1.2 | Operational Modes Configuration | 5458 |
| 27.5.1.2.1 | Keyboard Controller in Hardware Decoding Mode (Default Mode) | 5458 |
| 27.5.1.2.2 | Keyboard Controller Software Scanning Mode | 5459 |
| 27.5.1.2.3 | Using the Timer | 5459 |
| 27.5.1.2.4 | State-Machine Status Register | 5459 |
| 27.5.1.3 | Keyboard Controller Events Servicing | 5459 |
| 27.6 | Keyboard Controller Register Manual | 5461 |
| 27.6.1 | Keyboard Controller Instance Summary | 5461 |
| 27.6.2 | Keyboard Controller Registers | 5461 |
| 27.6.2.1 | Keyboard Controller Register Summary | 5461 |
| 27.6.2.2 | Keyboard Controller Register Description | 5461 |
| 28 | Initialization | 5477 |
| 28.1 | Initialization Overview | 5478 |
| 28.1.1 | Terminology | 5478 |
| 28.1.2 | Initialization Process | 5478 |
| 28.2 | Preinitialization | 5480 |
| 28.2.1 | Power Requirements | 5480 |
| 28.2.2 | Access to Power-Management IC | 5483 |
| 28.2.2.1 | PMIC Detection | 5484 |
| 28.2.2.2 | Summary of the I ² C Transactions | 5485 |
| 28.2.3 | Clock, Reset, and Control | 5487 |
| 28.2.3.1 | Overview | 5487 |
| 28.2.3.2 | Clocking Scheme | 5488 |
| 28.2.3.2.1 | Required System Input Clocks | 5488 |
| 28.2.3.2.2 | Optional System Output Clocks | 5489 |
| 28.2.3.3 | Reset Configuration | 5489 |
| 28.2.3.3.1 | ON/OFF Interconnect and Power-On-Reset | 5489 |
| 28.2.3.3.2 | Warm Reset | 5489 |
| 28.2.3.3.3 | Peripheral Reset by sys_pwron_reset_out | 5489 |
| 28.2.3.3.4 | Peripheral Reset by GPIO | 5489 |
| 28.2.3.3.5 | Warm Reset Impact on GPIOs | 5490 |
| 28.2.3.4 | PMIC and Audio IC Control | 5490 |
| 28.2.3.5 | TWL6032 Power Request Signals | 5490 |
| 28.2.4 | Boot Configuration | 5491 |
| 28.2.4.1 | System Clock Source Selection | 5491 |
| 28.2.4.2 | Bootling Device Order Selection | 5493 |
| 28.2.4.3 | Boot Peripheral Pin Multiplexing | 5495 |
| 28.3 | Reset Sequences | 5497 |
| 28.4 | Device Initialization by ROM Code | 5498 |
| 28.4.1 | Bootling Overview | 5498 |

| | | |
|------------|---|------|
| 28.4.1.1 | Bootling Types | 5498 |
| 28.4.1.2 | ROM Code Architecture | 5498 |
| 28.4.2 | Memory Maps | 5500 |
| 28.4.2.1 | ROM Memory Map | 5500 |
| 28.4.2.2 | RAM Memory Map | 5501 |
| 28.4.3 | Overall Bootling Sequence | 5503 |
| 28.4.4 | Startup and Configuration | 5505 |
| 28.4.4.1 | Startup | 5505 |
| 28.4.4.2 | Clocking Configuration | 5507 |
| 28.4.4.3 | Bootling Device List Setup | 5508 |
| 28.4.4.4 | Software Bootling Configuration | 5508 |
| 28.4.4.4.1 | Public Use of SAR RAM | 5508 |
| 28.4.4.4.2 | Software Bootling Configuration Structure | 5509 |
| 28.4.5 | Peripheral Bootling | 5511 |
| 28.4.5.1 | Description | 5511 |
| 28.4.5.2 | UART | 5516 |
| 28.4.5.3 | USB | 5516 |
| 28.4.5.3.1 | Overview | 5516 |
| 28.4.5.3.2 | PrevStartOk Status Flag Check | 5518 |
| 28.4.5.3.3 | Charger Detection | 5519 |
| 28.4.5.3.4 | SUSPEND and RESUME Handling | 5519 |
| 28.4.5.3.5 | USB Driver Descriptors | 5519 |
| 28.4.5.3.6 | USB Customized Descriptors | 5523 |
| 28.4.5.3.7 | System Interconnection – Integrated Transceiver | 5524 |
| 28.4.5.3.8 | System Interconnection – External Transceiver | 5524 |
| 28.4.5.3.9 | USB Driver Functionality | 5524 |
| 28.4.6 | Fast External Bootling | 5525 |
| 28.4.6.1 | Overview | 5525 |
| 28.4.6.2 | Fast External Bootling Procedure | 5525 |
| 28.4.7 | Memory Bootling | 5526 |
| 28.4.7.1 | Overview | 5526 |
| 28.4.7.2 | Non-XIP Memory | 5528 |
| 28.4.7.3 | XIP Memory | 5530 |
| 28.4.7.3.1 | GPMC Initialization | 5530 |
| 28.4.7.4 | NAND | 5531 |
| 28.4.7.4.1 | Initialization and NAND Detection | 5531 |
| 28.4.7.4.2 | Read Sector Procedure | 5536 |
| 28.4.7.5 | OneNAND/Flex-OneNAND | 5538 |
| 28.4.7.5.1 | Initialization and OneNAND/Flex-OneNAND Detection | 5539 |
| 28.4.7.5.2 | OneNAND/Flex-OneNAND Read Sector Procedure | 5539 |
| 28.4.7.5.3 | OneNAND/Flex-OneNAND Support Limitations | 5540 |
| 28.4.7.6 | eMMC/eSD Embedded Memories and MMC/SD Cards | 5540 |
| 28.4.7.6.1 | eMMC/eSD Memories | 5542 |
| 28.4.7.6.2 | MMC/SD Cards | 5545 |
| 28.4.7.6.3 | Initialization and Detection | 5546 |
| 28.4.7.6.4 | Read Sector Procedure | 5547 |
| 28.4.7.6.5 | File System Handling | 5548 |
| 28.4.8 | Image Format | 5554 |
| 28.4.8.1 | Overview | 5554 |
| 28.4.8.2 | Configuration Header | 5555 |
| 28.4.8.2.1 | CHSETTINGS Item | 5556 |
| 28.4.8.2.2 | CHRAM Item | 5557 |
| 28.4.8.2.3 | CHFLASH Item | 5558 |

| | | |
|------------|--|-------------|
| 28.4.8.2.4 | CHMMCS D Item | 5559 |
| 28.4.8.3 | GP Header | 5559 |
| 28.4.8.4 | Image Execution | 5560 |
| 28.4.9 | Tracing | 5561 |
| 28.5 | Services for HLOS Support | 5564 |
| 28.5.1 | L2 Cache Maintenance | 5564 |
| 28.5.2 | Multicore Infrastructure Maintenance | 5565 |
| 28.5.3 | Snoop Control Unit (SCU) | 5567 |
| 28.5.4 | Lockdown Translation Lookaside Buffers (TLBs) | 5567 |
| 29 | On-Chip Debug Support | 5571 |
| 29.1 | Introduction | 5572 |
| 29.2 | Debug Ports | 5573 |
| 29.2.1 | IEEE1149.1 | 5573 |
| 29.2.2 | IEEE1149.7 | 5573 |
| 29.2.3 | Trace Port | 5575 |
| 29.2.4 | End Product | 5576 |
| 29.2.5 | Trace Connector and Board Layout Considerations | 5577 |
| 29.3 | Debugger Connection | 5578 |
| 29.3.1 | ICEPick Module | 5578 |
| 29.3.2 | Boot Modes | 5578 |
| 29.3.2.1 | Default Boot Mode | 5579 |
| 29.3.2.2 | Wait-In-Reset | 5579 |
| 29.3.3 | Dynamic TAP Insertion | 5579 |
| 29.3.3.1 | ICEPick Secondary TAPs | 5579 |
| 29.4 | Primary Debug Support | 5582 |
| 29.4.1 | Processor Native Debug Support | 5582 |
| 29.4.1.1 | Cortex-A9 MPU | 5582 |
| 29.4.1.2 | Cortex-M3 MPU | 5582 |
| 29.4.1.3 | DSP | 5582 |
| 29.4.1.4 | IVA-HD ARM968 | 5582 |
| 29.4.1.5 | IVA-HD Hardware Accelerators | 5582 |
| 29.4.2 | Cross-Triggering | 5583 |
| 29.4.2.1 | SoC Level Cross-Triggering | 5584 |
| 29.4.3 | Suspend | 5585 |
| 29.4.3.1 | Debug Aware Peripherals and Host Processors | 5585 |
| 29.5 | Power, Reset, and Clock Management Debug Support | 5587 |
| 29.6 | Performance Monitoring | 5588 |
| 29.6.1 | Cortex-A9 MPU Subsystem Performance Monitoring | 5588 |
| 29.6.1.1 | Performance Monitoring Unit | 5588 |
| 29.6.1.2 | Snoop Control Unit | 5589 |
| 29.6.1.3 | L2 Cache (PL310) | 5589 |
| 29.6.2 | Cortex-M3 MPU Subsystem Performance Monitoring | 5590 |
| 29.6.2.1 | Subsystem Counter Timer Module | 5590 |
| 29.6.2.2 | Cache Events | 5590 |
| 29.6.3 | DSP Subsystem Performance Monitoring | 5591 |
| 29.6.3.1 | Subsystem Counter Timer Module | 5591 |
| 29.6.3.2 | L1 and L2 Events | 5592 |
| 29.7 | Processor Trace | 5593 |
| 29.8 | System Instrumentation | 5594 |
| 29.8.1 | MIPI STM | 5594 |
| 29.8.2 | Software Instrumentation | 5595 |
| 29.8.3 | OCP Watch-Point | 5595 |
| 29.8.4 | IVA-HD Pipeline | 5597 |

| | | |
|------------|---|-------------|
| 29.8.5 | NoC Statistics Collector | 5597 |
| 29.8.5.1 | L3 Target Load Monitoring | 5599 |
| 29.8.5.2 | L3 Master Latency Monitoring | 5599 |
| 29.8.5.2.1 | SC_LAT0 Configuration | 5600 |
| 29.8.5.2.2 | SC_LAT1 Configuration | 5601 |
| 29.8.5.3 | Statistics Collector Alarm Mode | 5602 |
| 29.8.5.4 | Statistics Collector Suspend Mode | 5602 |
| 29.8.6 | PM Instrumentation (PMI) | 5602 |
| 29.8.7 | CM Instrumentation (CMI) | 5602 |
| 29.9 | Concurrent Debug Modes | 5604 |
| 29.10 | Memory Mapping | 5606 |
| A | Glossary | 5607 |

List of Figures

| | | |
|-------|--|-----|
| 1-1. | OMAP4470 High-Tier Environment..... | 263 |
| 1-2. | OMAP4470 Block Diagram | 265 |
| 1-3. | POP Concept..... | 275 |
| 1-4. | Stacked Memory Package on the POP Device | 275 |
| 2-1. | Interconnect Overview..... | 281 |
| 3-1. | Functional and Interface Clocks | 301 |
| 3-2. | Generic Clock Domain | 307 |
| 3-3. | Clock Domain State Transitions | 308 |
| 3-4. | Clock Domain/Slave Module Clock-Management Interaction Sequence 1..... | 309 |
| 3-5. | Clock Domain/Slave Module Clock-Management Interaction Sequence 2..... | 310 |
| 3-6. | Clock Domain/Slave Module Clock-Management Interaction Sequence 3..... | 311 |
| 3-7. | Sliding window for Dynamic Dependency | 313 |
| 3-8. | Generic Power Domain | 315 |
| 3-9. | Power Domain Transitions..... | 318 |
| 3-10. | Generic Voltage Domain | 320 |
| 3-11. | Generic Logic Voltage Management | 321 |
| 3-12. | Generic Memory Voltage Management | 322 |
| 3-13. | SmartReflex Static Voltage Adjustment..... | 323 |
| 3-14. | SmartReflex Voltage Control Functional Overview..... | 323 |
| 3-15. | Comparison of Energy Consumed With/Without DVFS..... | 325 |
| 3-16. | Comparison of Energy Consumed With/Without DPS | 326 |
| 3-17. | Performance Level and Applied Power-Management Techniques..... | 328 |
| 3-18. | PMFW Overview | 330 |
| 3-19. | SCRM Power-On Reset Sequence..... | 357 |
| 3-20. | PRCM Module Power-On Reset Sequence | 358 |
| 3-21. | Cortex-A9 MPU Power-On Reset Sequence..... | 359 |
| 3-22. | Cortex-A9 MPU Warm Reset Sequence..... | 360 |
| 3-23. | Cortex-A9 MPU Reset Sequence on Sleep and Wake-Up Transition | 361 |
| 3-24. | IVAHD Power-On Reset Sequence | 362 |
| 3-25. | IVAHD Software Warm Reset Sequence | 362 |
| 3-26. | DSP Subsystem Power-On Reset Sequence | 363 |
| 3-27. | DSP Subsystem Software Warm Reset Sequence | 364 |
| 3-28. | DSP Subsystem Reset Sequence On Wake-Up Transitions From OSWR RETENTION State..... | 365 |
| 3-29. | Cortex-M3 MPU Power-On Reset Sequence | 365 |
| 3-30. | Cortex-M3 MPU Subsystem Software Warm Reset Sequence..... | 366 |
| 3-31. | Global Warm Reset Sequence..... | 368 |
| 3-32. | PRCM Module Clock Manager Overview..... | 370 |
| 3-33. | PRM Clock Manager Overview (a) | 372 |
| 3-34. | PRM Clock Manager Overview (b) | 373 |
| 3-35. | CM1 Overview | 374 |
| 3-36. | CM1_USB Clock Manager Overview..... | 376 |
| 3-37. | CM1_ABE Clock Manager Overview..... | 377 |
| 3-38. | CM2 Overview (a)..... | 379 |
| 3-39. | CM2 Overview (b)..... | 380 |
| 3-40. | Generic DPLL Functional Diagram | 382 |
| 3-41. | DPLL With SSC Reduction Feature | 386 |
| 3-42. | Spreading Generation Block Diagram..... | 387 |

| | | |
|-------|--|------|
| 3-43. | Modulation Profiles | 389 |
| 3-44. | Effect of the SSC in Frequency | 390 |
| 3-45. | Effect of the SSC in the Time Domain | 390 |
| 3-46. | Peaks Reduction Due to Spreading | 391 |
| 3-47. | DPLL_PER Overview..... | 394 |
| 3-48. | DPLL_CORE Overview | 400 |
| 3-49. | DPLL_ABE Overview..... | 407 |
| 3-50. | DPLL_MPU Overview | 410 |
| 3-51. | DPLL_IVA Overview | 414 |
| 3-52. | DPLL_USB Overview..... | 417 |
| 3-53. | DPLLs Cascading Overview | 420 |
| 3-54. | CD_WKUP Overview | 421 |
| 3-55. | CD_DSP Overview | 425 |
| 3-56. | CD_STD_EFUSE Overview | 427 |
| 3-57. | CD_CORTEXA9 Overview | 428 |
| 3-58. | CD_L4_PER Overview | 431 |
| 3-59. | CD_L3_INIT Overview | 443 |
| 3-60. | CD_IVAHD Overview..... | 448 |
| 3-61. | CD_SGX Overview | 450 |
| 3-62. | CD_EMU Overview | 453 |
| 3-63. | CD_DSS Overview | 455 |
| 3-64. | CD_L4_CFG Overview..... | 458 |
| 3-65. | CD_L3_INSTR Overview | 461 |
| 3-66. | CD_L3_2 Overview | 463 |
| 3-67. | CD_L3_1 Overview | 465 |
| 3-68. | CD_EMIF Overview..... | 467 |
| 3-69. | CD_CORTEXM3 Overview | 469 |
| 3-70. | CD_DMA Overview | 472 |
| 3-71. | CD_C2C Overview..... | 473 |
| 3-72. | CD_CAM Overview | 476 |
| 3-73. | CD_ABE Overview..... | 478 |
| 3-74. | CD_L4_ALWON_CORE Overview | 484 |
| 3-75. | PRM Voltage Control Architecture..... | 512 |
| 3-76. | SmartReflex Integration | 514 |
| 3-77. | SmartReflex Module Functional Overview..... | 515 |
| 3-78. | Voltage Processor Functional Overview | 519 |
| 3-79. | SmartReflex – SMPS Communication for Automatic Voltage Adjustments | 522 |
| 3-80. | I/O Pads Daisy-Chain Configuration..... | 539 |
| 3-81. | DPLL Output-Frequency Change | 544 |
| 4-1. | Cortex-A9 MPU Subsystem Overview | 1077 |
| 4-2. | Cortex-A9 MPU Subsystem Integration | 1079 |
| 4-3. | Cortex-A9 MPU Subsystem Clocking Scheme | 1081 |
| 4-4. | Cortex-A9 MPU Subsystem Reset Scheme | 1082 |
| 4-5. | Cortex-A9 MPU Block Diagram..... | 1085 |
| 4-6. | MA Block Diagram..... | 1088 |
| 4-7. | Integration of CMU in Cortex-A9 MPU Subsystem | 1092 |
| 4-8. | Cache Maintenance Unit Blocks..... | 1094 |
| 4-9. | Start and Length of Range Set | 1095 |
| 4-10. | Range Set States..... | 1096 |

| | | |
|-------|---|------|
| 4-11. | Range in Paged Virtual Memory | 1098 |
| 4-12. | Large Buffer in Physical Memory | 1099 |
| 4-13. | CMU Micro-Architecture | 1100 |
| 4-14. | Free Set Allocation out of Reset..... | 1101 |
| 4-15. | Allocation in Steady State | 1102 |
| 4-16. | Operation Queue Functionality | 1103 |
| 4-17. | Cortex-A9 MPU Subsystem Power Domain Overview | 1106 |
| 4-18. | Cortex-A9 MPU Subsystem WUGEN..... | 1109 |
| 6-1. | IVA-HD in the Device | 1146 |
| 6-2. | IVA-HD Integration | 1148 |
| 6-3. | IVA-HD Block Diagram | 1150 |
| 7-1. | Dual Cortex-M3 MPU Subsystem Overview | 1170 |
| 7-2. | Dual Cortex-M3 MPU Subsystem Integration Overview | 1172 |
| 7-3. | Dual Cortex-M3 MPU Subsystem Clocking Scheme | 1174 |
| 7-4. | Dual Cortex-M3 MPU Subsystem Reset Scheme | 1175 |
| 7-5. | Dual Cortex-M3 MPU Block Diagram..... | 1177 |
| 7-6. | WUGEN Overview..... | 1181 |
| 7-7. | Event Communication Connection in Dual Cortex-M3 MPU Subsystem | 1184 |
| 8-1. | ISS Overview..... | 1194 |
| 8-2. | ISS Integration | 1197 |
| 8-3. | ISS Interrupt Merger | 1201 |
| 8-4. | ISS Power Management..... | 1213 |
| 8-5. | ISS Interfaces and Interconnects Highlight | 1233 |
| 8-6. | ISS CSI2-A, CSI2-B/CCP2 Serial Interface Configuration | 1238 |
| 8-7. | ISS Interfaces CPI Synchronization Signals and Frame Timing in SYNC Mode | 1240 |
| 8-8. | ISS Interfaces CPI Synchronization Signals and Data Timing in SYNC Mode | 1240 |
| 8-9. | ISS Interfaces CPI SYNC Mode Clock Gating | 1241 |
| 8-10. | ISS Interfaces CPI Data Timing With Embedded Synchronization Signals (8-Bit Case) | 1241 |
| 8-11. | ISS Interfaces CSI2-A PHY Diagram Four D-PHY Data Lane Configuration | 1243 |
| 8-12. | ISS CSI2 Complex I/O Power FSM | 1244 |
| 8-13. | ISS CSI2 RxMode and StopState FSM | 1245 |
| 8-14. | ISS CCP2 YUV4:2:2 Big Endian | 1257 |
| 8-15. | ISS CCP2 YUV4:2:2 Little Endian..... | 1257 |
| 8-16. | ISS CCP2 YUV4:2:0 | 1258 |
| 8-17. | ISS CCP2 RGB888 | 1259 |
| 8-18. | ISS CCP2 RGB565 | 1260 |
| 8-19. | ISS CCP2 RGB444 | 1260 |
| 8-20. | ISS CCP2 RAW6 | 1261 |
| 8-21. | ISS CCP2 RAW7 | 1262 |
| 8-22. | ISS CCP2 RAW8 | 1263 |
| 8-23. | ISS CCP2 RAW10 | 1264 |
| 8-24. | ISS CCP2 RAW12 | 1265 |
| 8-25. | ISS CCP2 JPEG8 and JPEG8 FSP..... | 1266 |
| 8-26. | ISS CCP2 Integration | 1267 |
| 8-27. | ISS CCP2 Receiver Block Diagram..... | 1268 |
| 8-28. | ISS CCP2 VP_PCLK Gating During Blanking Periods | 1270 |
| 8-29. | ISS CCP2 Data Organization in Memory..... | 1275 |
| 8-30. | ISS CCP2 Data Organization Packing in Memory | 1276 |
| 8-31. | ISS CCP2 Data Organization in Memory..... | 1277 |

| | | |
|-------|---|------|
| 8-32. | CCP2_CTRL.VP_CLK_POL Settings..... | 1283 |
| 8-33. | ISS CCP2 SOF and EOF Region Settings..... | 1286 |
| 8-34. | ISS CCP2 Pixel Data Region Settings..... | 1287 |
| 8-35. | ISS CCP2 Pixel Data Destination Settings..... | 1288 |
| 8-36. | ISS CSI2 One Data-Lane Configuration..... | 1326 |
| 8-37. | ISS CSI2 Two Data-Lane Merger Configuration | 1327 |
| 8-38. | ISS CSI2 Three Data-Lane Merger Configuration | 1328 |
| 8-39. | ISS CSI2 Four Data-Lane Merger Configuration | 1329 |
| 8-40. | ISS CSI2 Protocol Layer With Short and Long Packets..... | 1330 |
| 8-41. | ISS CSI2 Short Packet Structure..... | 1330 |
| 8-42. | ISS CSI2 Long Packet Structure | 1331 |
| 8-43. | ISS CSI2 Data Identifier Structure | 1332 |
| 8-44. | ISS CSI2 Virtual Channel | 1332 |
| 8-45. | ISS CSI2 General Frame Structure (Informative) | 1334 |
| 8-46. | ISS CSI2 Digital Interlaced Video Frame (Informative)..... | 1335 |
| 8-47. | ISS CSI2 YUV4:2:0 8-Bit | 1336 |
| 8-48. | ISS CSI2 YUV4:2:0 10-Bit..... | 1337 |
| 8-49. | ISS CSI2 YUV4:2:0 8-Bit Legacy..... | 1338 |
| 8-50. | ISS CSI2 YUV4:2:0 8-Bit + CSPS..... | 1339 |
| 8-51. | Camera ISP CSI2 Byte Swap..... | 1340 |
| 8-52. | ISS CSI2 YUV4:2:0 10-Bit + CSPS | 1341 |
| 8-53. | ISS CSI2 YUV4:2:2 8-Bit | 1342 |
| 8-54. | ISS CSI2 YUV4:2:2 10-Bit..... | 1343 |
| 8-55. | ISS CSI2 RGB565..... | 1343 |
| 8-56. | ISS CSI2 RGB888..... | 1344 |
| 8-57. | ISS CSI2 RGB666..... | 1345 |
| 8-58. | ISS CSI2 RGB444..... | 1346 |
| 8-59. | ISS CSI2 RGB555..... | 1346 |
| 8-60. | ISS CSI2 RAW6 | 1348 |
| 8-61. | ISS CSI2 RAW7 | 1350 |
| 8-62. | ISS CSI2 RAW8 | 1352 |
| 8-63. | ISS CSI2 RAW10..... | 1353 |
| 8-64. | ISS CSI2 RAW12..... | 1354 |
| 8-65. | ISS CSI2 RAW14..... | 1355 |
| 8-66. | ISS CSI2 JPEG8 | 1356 |
| 8-67. | ISS CSI2 Generic Format | 1356 |
| 8-68. | ISS CSI2-A/CSI2-B Integration | 1361 |
| 8-69. | ISS CSI2-A Receiver Block Diagram | 1362 |
| 8-70. | ISS CSI2 SHORT_PACKET Bit Field Format | 1364 |
| 8-71. | ISS CSI2 Virtual Channel to Context | 1365 |
| 8-72. | ISS CSI2 Pixel Data Destination Setting in Progressive and Interlaced Mode..... | 1367 |
| 8-73. | ISS CSI2 Frame Processing | 1368 |
| 8-74. | ISS CSI2 Frame Cropping | 1369 |
| 8-75. | ISS CSI2 Horizontal Scaler | 1370 |
| 8-76. | ISS CSI2 Receiver Global Reset Flow Chart..... | 1372 |
| 8-77. | ISS TCTRL Integration..... | 1409 |
| 8-78. | TCTRL Control-Signal Generation | 1410 |
| 8-79. | ISS TCTRL Use of cam_global_reset With Global Reset Release Camera Modules..... | 1412 |
| 8-80. | cam_strobe Signal-Generation for Red-Eye Removal..... | 1416 |

| | |
|---|------|
| 8-81. ISS BTE Integration | 1427 |
| 8-82. ISS BTE Burst Translation Principle | 1429 |
| 8-83. ISS BTE Context Mapping | 1430 |
| 8-84. ISS BTE Expected Access Locations in the Virtual Space | 1431 |
| 8-85. ISS BTE Context Alignment Constraints | 1432 |
| 8-86. ISS BTE TILER Mode Addressing in 90- or 270-Degree Orientation | 1433 |
| 8-87. BTE Bandwidth Limiter Example | 1434 |
| 8-88. ISS BTE Buffer Fill-Level Padding | 1435 |
| 8-89. ISS BTE 2D Burst Generation | 1438 |
| 8-90. ISS BTE Tiled Mode Addressing in 90- or 270-Degree Orientation (S = 1) | 1440 |
| 8-91. ISS CBUFF Integration | 1460 |
| 8-92. ISS CBUFF Top-Level Diagram | 1463 |
| 8-93. ISS CBUFF Write Mode CPU Interaction Example | 1464 |
| 8-94. ISS CBUFF CPU Writes Data Faster Than it Is Read by the OCPI Initiator | 1465 |
| 8-95. CBUFF Read Mode CPU Interaction Example | 1465 |
| 8-96. ISS CBUFF Read/Write Mode Example..... | 1466 |
| 8-97. ISS CBUFF Write Mode CPU Interaction Example BCF Used..... | 1468 |
| 8-98. ISS CBUFF Read Mode CPU Interaction Example (1)..... | 1468 |
| 8-99. ISS CBUFF Read Mode CPU Interaction Example (2)..... | 1469 |
| 8-100. ISS CBUFF BCF Pretrigger Example: Write Mode | 1470 |
| 8-101. ISS CBUFF BCF Pretrigger Example: Read Mode | 1470 |
| 8-102. ISS CBUFF Single-Slice Buffer (Write Mode) | 1474 |
| 8-103. ISS CBUFF Single-Slice Buffer Example (Write Mode) | 1475 |
| 8-104. ISS CBUFF Extended-Slice Buffer Example..... | 1475 |
| 8-105. ISS CBUFF FIFO Mode | 1476 |
| 8-106. ISS CBUFF FIFO Use Example | 1476 |
| 8-107. ISS ISP Block Diagram | 1502 |
| 8-108. ISS ISP High-Level Diagram..... | 1509 |
| 8-109. ISS ISP VP High-Level Diagram | 1510 |
| 8-110. ISS ISP VP VD Pulse..... | 1512 |
| 8-111. ISS ISP PG High-Level Diagram | 1514 |
| 8-112. ISS ISP IPIPEIF High-Level Diagram..... | 1516 |
| 8-113. ISS ISP IPIPEIF Top-Level Block Diagram | 1517 |
| 8-114. ISS ISP IPIPEIF Global Frame Definition in SDRAM Input Modes (Except Dark Frame) | 1518 |
| 8-115. ISS ISP IPIPEIF Global Frame Definition in Dark Frame Subtract Mode..... | 1519 |
| 8-116. ISS ISP IPIPEIF Double-Buffer Functionality | 1520 |
| 8-117. ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 0 Data Path..... | 1522 |
| 8-118. ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 1 Data Path..... | 1523 |
| 8-119. ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 2 Data Paths | 1524 |
| 8-120. ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 3 Data Paths: First Case..... | 1525 |
| 8-121. ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 3 Data Paths: Second Case..... | 1526 |
| 8-122. ISS ISP IPIPEIF INPSRC1 = 1 and INPSRC2 = 0 Data Path..... | 1527 |
| 8-123. ISS ISP IPIPEIF INPSRC1 = 2 and INPSRC2 = 0 Data Path..... | 1528 |
| 8-124. ISS ISP IPIPEIF INPSRC1 = 3 and INPSRC2 = 0 Data Path..... | 1529 |
| 8-125. ISS ISP IPIPEIF Timing Generator Submodule | 1529 |
| 8-126. ISS ISP IPIPEIF DCPM Subblock..... | 1530 |
| 8-127. ISS ISP IPIPEIF Dark-Frame Subtraction Subblock..... | 1532 |
| 8-128. ISS ISP IPIPEIF Resizer Offset Definition | 1534 |
| 8-129. ISS ISP IPIPEIF YUV8P Settings | 1536 |

| | |
|--|------|
| 8-130. ISS ISP IPIPE High-Level Diagram | 1539 |
| 8-131. ISS ISP IPIPE Supported CFA Format | 1539 |
| 8-132. ISS ISP IPIPE Module Block Diagram | 1540 |
| 8-133. ISS ISP IPIPE Module Input Format | 1541 |
| 8-134. ISS ISP IPIPE Module Processing Window Settings | 1541 |
| 8-135. ISS ISP IPIPE Defect Pixel Correction | 1542 |
| 8-136. ISS ISP IPIPE Pixel Numbering in Defect Correction Algorithm | 1543 |
| 8-137. ISS ISP IPIPE Mirroring in Defect Correction and Noise Filter | 1543 |
| 8-138. ISS ISP IPIPE White Balance | 1544 |
| 8-139. ISS ISP IPIPE RGB2RGB Conversion Formula | 1544 |
| 8-140. ISS ISP IPIPE Gamma Correction Module Block Diagram | 1545 |
| 8-141. ISS ISP IPIPE Gamma Curve Example | 1545 |
| 8-142. ISS ISP IPIPE Gamma Table Offset/Slope Packing | 1545 |
| 8-143. ISS ISP IPIPE RGB2RGB 2nd Conversion Formula | 1546 |
| 8-144. ISS ISP IPIPE RGB2RGB 2nd Conversion Formula | 1546 |
| 8-145. ISS ISP IPIPE RGB2YCbCr Module Block Diagram | 1546 |
| 8-146. ISS ISP IPIPE Chroma Subsampling Position | 1547 |
| 8-147. ISS ISP IPIPE 4:2:2 Conversion Module Block Diagram | 1547 |
| 8-148. ISS ISP IPIPE 2D Edge-Enhancer Indexing | 1548 |
| 8-149. ISS ISP IPIPE 2D Edge Intensity LUT Formula | 1548 |
| 8-150. ISS ISP IPIPE 2D Edge-Enhancer LUT Packing | 1549 |
| 8-151. ISS ISP IPIPE 2D Edge-Enhancer Block Diagram | 1549 |
| 8-152. ISS ISP IPIPE Edge Sharpener Details | 1549 |
| 8-153. ISS ISP IPIPE 2D Edge-Intensity Clipping Formula | 1550 |
| 8-154. ISS ISP IPIPE 2D Edge Enhancer and Sharpener Merger Formula | 1550 |
| 8-155. ISS ISP IPIPE 2D Edge Chroma-Suppression Coefficient Sets | 1550 |
| 8-156. ISS ISP IPIPE 2D Edge-Brightness and Contrast Adjustments Formula | 1550 |
| 8-157. ISS ISP IPIPE Boxcar Operation (8 × 8 Block) | 1552 |
| 8-158. ISS ISP IPIPE Boxcar Operation (16 × 16 Block) | 1552 |
| 8-159. ISS ISP IPIPE Boxcar Data Packing in SDRAM | 1552 |
| 8-160. ISS ISP RSZ High-Level Diagram | 1555 |
| 8-161. ISS ISP RSZ Top-Level Block Diagram | 1556 |
| 8-162. ISS ISP RSZ MTC DMA Bandwidth Control | 1557 |
| 8-163. ISS ISP RSZ MTC Image Data Storage Pixel Order | 1558 |
| 8-164. ISS ISP RSZ Typical Module Integration: High-Level Summary | 1559 |
| 8-165. ISS ISP RSZ Operating Modes | 1562 |
| 8-166. ISS ISP RSZ Input Data Cropper Block Diagram | 1563 |
| 8-167. ISS ISP RSZ Input Data Cropping | 1564 |
| 8-168. ISS ISP RSZ Averager Memory Utilization | 1565 |
| 8-169. ISS ISP RSZ Averager Border Conditions | 1565 |
| 8-170. ISS ISP RSZ Basic Interpolation Method | 1566 |
| 8-171. ISS ISP RSZ Interpolation Filtering | 1567 |
| 8-172. ISS ISP RSZ-A/RSZ-B Phase Averager Effect | 1569 |
| 8-173. ISS ISP RSZ Chroma Position and Upsampling | 1571 |
| 8-174. ISS ISP RSZ and Circular Buffer Settings | 1573 |
| 8-175. ISS ISP RSZ and Circular Buffer Settings – Example 1 | 1573 |
| 8-176. ISS ISP RSZ and Circular Buffer Settings – Example 2 | 1574 |
| 8-177. ISS ISP H3A High-Level Diagram | 1576 |
| 8-178. ISS ISP H3A Top-Level Block Diagram | 1577 |

| | |
|--|------|
| 8-179. ISS ISP H3A Frame Format Settings | 1577 |
| 8-180. ISS ISP H3A Red, Green, and Blue Pixel Extraction Examples | 1579 |
| 8-181. ISS ISP H3A Horizontal/Vertical FV Pixel Configuration | 1580 |
| 8-182. ISS ISP H3A IIR Filter Model | 1581 |
| 8-183. ISS ISP H3A AE/AWB Window Configurations | 1583 |
| 8-184. ISS ISP H3A Black Row of Windows Before Regular Rows of Windows..... | 1584 |
| 8-185. ISS ISP H3A AE/AWB Window and Subsample Definition | 1587 |
| 8-186. ISS ISP ISIF High-Level Diagram | 1594 |
| 8-187. ISS ISP ISIF Top-Level Block Diagram | 1595 |
| 8-188. ISS ISP ISIF Interface Block Diagram | 1596 |
| 8-189. ISS ISP ISIF Sensor Linearization Block Diagram | 1597 |
| 8-190. ISS ISP ISIF Linearization LUT Memories | 1598 |
| 8-191. ISS ISP ISIF Linearization Block Diagram | 1599 |
| 8-192. ISS ISP ISIF Input Data Formatter Block Diagram | 1599 |
| 8-193. ISS ISP ISIF Splits an Input Line Into Three Output Lines | 1600 |
| 8-194. ISS ISP ISIF Input Data Formatter Area Settings | 1601 |
| 8-195. ISS ISP ISIF Data Formatter Output Control Example | 1602 |
| 8-196. ISS ISP ISIF Conventional Read-Out Pattern | 1603 |
| 8-197. ISS ISP ISIF Conventional Read-Out Pattern With 2-tap AFE | 1604 |
| 8-198. ISS ISP ISIF Combine Three Input Lines Into Single Line..... | 1604 |
| 8-199. ISS ISP ISIF Example of Combining Three Input Lines Into a Single Line | 1605 |
| 8-200. ISS ISP ISIF Color Space Converter Block Diagram | 1607 |
| 8-201. ISS ISP ISIF Color Space Converter Operation..... | 1607 |
| 8-202. ISS ISP ISIF Color Space Converter Operation: CMYG to RGBG | 1608 |
| 8-203. ISS ISP ISIF Color Space Conversion Example | 1608 |
| 8-204. ISS ISP ISIF 1st Pixel/1st Line Generation | 1608 |
| 8-205. ISS ISP ISIF 2nd Pixel/1st Line Generation | 1609 |
| 8-206. ISS ISP ISIF 2nd Last Pixel/1st Line Generation | 1609 |
| 8-207. ISS ISP ISIF Last Pixel/1st Line Generation..... | 1609 |
| 8-208. ISS ISP ISIF 1st Pixel/Last Line Generation..... | 1609 |
| 8-209. ISS ISP ISIF 2nd Pixel/Last Line Generation | 1610 |
| 8-210. ISS ISP ISIF 2nd Last Pixel/Last Line Generation | 1610 |
| 8-211. ISS ISP ISIF Last Pixel/Last Line Generation | 1610 |
| 8-212. ISS ISP ISIF Black Clamp Block Diagram | 1611 |
| 8-213. ISS ISP ISIF Clamp Value for Horizontal Direction | 1612 |
| 8-214. ISS ISP ISIF Clamp Value for Vertical Direction Calculation | 1613 |
| 8-215. ISS ISP ISIF Clamp Value for Vertical Direction With OB Region at the Left | 1614 |
| 8-216. ISS ISP ISIF Clamp Value for Vertical Direction With OB Region at the Right | 1614 |
| 8-217. ISS ISP ISIF Vertical Line Defect Correction Block Diagram..... | 1615 |
| 8-218. ISS ISP ISIF Vertical Line Defects | 1615 |
| 8-219. ISS ISP ISIF Vertical Line Defects | 1616 |
| 8-220. ISS ISP ISIF 2D-LSC Block Diagram | 1617 |
| 8-221. ISS ISP ISIF 2D-LSC Active Region for ISIF Input Frame..... | 1618 |
| 8-222. ISS ISP ISIF Gain and Offset Mask Upsampling via Bilinear Interpolation | 1619 |
| 8-223. ISS ISP ISIF White Balance Block Diagram | 1622 |
| 8-224. ISS ISP ISIF Low-Pass Filter Block Diagram | 1623 |
| 8-225. ISS ISP ISIF A-Law Compression Block Diagram | 1623 |
| 8-226. ISS ISP ISIF A-Law Table Diagram..... | 1624 |
| 8-227. ISS ISP ISIF A-Law Table Values..... | 1625 |

| | |
|---|------|
| 8-228. ISS ISP ISIF Culling Block Diagram | 1627 |
| 8-229. ISS ISP ISIF Example for Decimation Pattern..... | 1627 |
| 8-230. ISS ISP ISIF Storage Formatter Block Diagram..... | 1628 |
| 8-231. ISS ISP ISIF Frame Image Format Conversion | 1630 |
| 8-232. ISS ISP ISIF VDINT0/VDINT1/VDINT2 Interrupt Behavior When VDPOL = 0 | 1632 |
| 8-233. ISS ISP ISIF VDINT0/VDINT1/VDINT2 Interrupt Behavior When VDPOL = 1 | 1632 |
| 8-234. ISS ISP BL High-Level Diagram..... | 1633 |
| 8-235. ISS ISP BL Block Diagram | 1635 |
| 8-236. ISS ISP BL Address Alignment..... | 1636 |
| 8-237. ISS ISP ISIF Initialization Flow Chart – Part One | 1641 |
| 8-238. ISS ISP ISIF Initialization Flow Chart – Part Two | 1642 |
| 8-239. ISS ISP RSZ Global Image Processing Settings – Subsequence 1..... | 1663 |
| 8-240. ISS ISP RSZ Global Image Processing Settings – Subsequence 2..... | 1664 |
| 8-241. ISS ISP RSZ Engines Interframe Image Processing Settings – Subsequence 1..... | 1666 |
| 8-242. ISS ISP RSZ Engines Interframe Image Processing Settings – Subsequence 2..... | 1667 |
| 8-243. SIMCOP Subsystem Overview | 1955 |
| 8-244. SIMCOP Integration..... | 1956 |
| 8-245. SIMCOP Interrupt Merger Overview | 1960 |
| 8-246. JPEG Encode Pipeline..... | 1962 |
| 8-247. Hardware Sequencer and Buffers in the SIMCOP Subsystem..... | 1985 |
| 8-248. Hardware Sequencer and Buffer Integration..... | 1986 |
| 8-249. SIMCOP Static Crossbar Overview | 1988 |
| 8-250. Image Buffer Width Translation..... | 1991 |
| 8-251. Coefficient Memory Width Translation | 1992 |
| 8-252. SIMCOP Hardware Sequencer Overview | 1995 |
| 8-253. Hardware Sequencing Example | 1996 |
| 8-254. Hardware Sequencer Operation Example | 1997 |
| 8-255. Typical Hardware Sequencer-Controlled Sequencer With Pipe-Up and Pipe-Down | 1999 |
| 8-256. Pipe-Up and Pipe-Down | 2000 |
| 8-257. Rotation Macrobblock Pipeline | 2001 |
| 8-258. LDC Transformation Pipeline | 2002 |
| 8-259. DMA in the SIMCOP Subsystem | 2022 |
| 8-260. DMA Engine Integration | 2023 |
| 8-261. DMA Block Diagram..... | 2025 |
| 8-262. DMA Logical Channel States | 2027 |
| 8-263. DMA Addressing..... | 2029 |
| 8-264. 2-Block Large Transfer Example | 2029 |
| 8-265. YUV4:2:0-NV12 Read/Write Chain..... | 2032 |
| 8-266. Temporal Channel Sequence..... | 2032 |
| 8-267. LDC in the SIMCOP Subsystem | 2053 |
| 8-268. DCT in the SIMCOP Subsystem | 2055 |
| 8-269. DCT Engine Integration..... | 2056 |
| 8-270. DCT Block Diagram | 2058 |
| 8-271. DCT I/O Address Configuration | 2059 |
| 8-272. YUV4:2:0 Format Data Order..... | 2060 |
| 8-273. YUV4:2:2 Format Data Order..... | 2061 |
| 8-274. VLCDJ in the SIMCOP Subsystem | 2069 |
| 8-275. VLCDJ Engine Integration..... | 2070 |
| 8-276. VLCDJ Block Diagram | 2072 |

| | |
|--|------|
| 8-277. JPEG Encoding Flow | 2073 |
| 8-278. JPEG Decoding Flow | 2074 |
| 8-279. JPEG Zigzag Order | 2075 |
| 8-280. VLCDJ Ring Buffer | 2076 |
| 8-281. Huffman Encode Table Organization | 2077 |
| 8-282. Concurrence Schedule for JPEG Encoding and Decoding | 2083 |
| 8-283. Concurrence Schedule for JPEG Transcoding | 2084 |
| 8-284. ISS SIMCOP ROT Module Overview | 2101 |
| 8-285. ISS SIMCOP ROT Engine Integration | 2102 |
| 8-286. ISS SIMCOP ROT Module Block Diagram..... | 2104 |
| 8-287. ISS SIMCOP ROT 90-Degree Rotation of YUV4:2:2 Data | 2105 |
| 8-288. ISS SIMCOP ROT 270-Degree Rotation of YUV4:2:2 Data | 2106 |
| 8-289. ISS SIMCOP ROT 180-Degree Rotation of YUV4:2:2 Data | 2106 |
| 8-290. ISS SIMCOP ROT Block Representation Before Rotation..... | 2107 |
| 8-291. ISS SIMCOP ROT 90-Degree Block Rotation | 2107 |
| 8-292. ISS SIMCOP ROT 180-Degree Block Rotation | 2107 |
| 8-293. ISS SIMCOP ROT 270-Degree Block Rotation | 2107 |
| 8-294. ISS SIMCOP ROT Data-Block Shifting Example..... | 2108 |
| 8-295. ISS SIMCOP ROT Horizontal Circular Shifting Example | 2109 |
| 8-296. ISS SIMCOP ROT Using Horizontal Circular Shifting to Manage Misaligned Data | 2110 |
| 9-1. Face Detect Highlight | 2120 |
| 9-2. FDIF Integration | 2122 |
| 9-3. FDIF Block Diagram..... | 2124 |
| 9-4. FDIF Power-Management Transitions | 2126 |
| 10-1. DSS Overview | 2149 |
| 10-2. DSS Environment | 2151 |
| 10-3. DSS Integration | 2154 |
| 10-4. DSS Clock Tree | 2155 |
| 10-5. DSS Reset Scheme | 2158 |
| 10-6. DSS SIdleAck/MStandby Generation | 2160 |
| 10-7. DSS Wake-Up Generation | 2161 |
| 10-8. DSS Interrupt Generation | 2162 |
| 10-9. DSS DMA Request Generation..... | 2163 |
| 10-10. Display Subsystem Highlight..... | 2171 |
| 10-11. LCD Support Parallel Interface | 2175 |
| 10-12. LCD Pixel Data Monochrome4 Passive Matrix | 2176 |
| 10-13. LCD Pixel Data Monochrome8 Passive Matrix | 2177 |
| 10-14. LCD Pixel Data 8-Bit Color Passive Matrix | 2177 |
| 10-15. LCD Pixel Data Color12 Active Matrix | 2178 |
| 10-16. LCD Pixel Data Color16 Active Matrix | 2179 |
| 10-17. LCD Pixel Data Color18 Active Matrix | 2179 |
| 10-18. LCD Pixel Data Color24 Active Matrix | 2180 |
| 10-19. Active Matrix Timing Diagram of Configuration 1 (Start of Frame) | 2181 |
| 10-20. Active Matrix Timing Diagram of Configuration 1 (Between Lines) | 2181 |
| 10-21. Active Matrix Timing Diagram of Configuration 1 (Between Frames) | 2181 |
| 10-22. Active Matrix Timing Diagram of Configuration 1 (End of Frame) | 2181 |
| 10-23. Active Matrix Timing Diagram of Configuration 2 (Start of Frame) | 2182 |
| 10-24. Active Matrix Timing Diagram of Configuration 2 (Between Lines) | 2182 |
| 10-25. Active Matrix Timing Diagram of Configuration 2 (Between Frames) | 2182 |

| | |
|---|------|
| 10-26. Active Matrix Timing Diagram of Configuration 2 (End of Frame) | 2182 |
| 10-27. Active Matrix Timing Diagram of Configuration 3 (Start of Frame) | 2183 |
| 10-28. Active Matrix Timing Diagram of Configuration 3 (Between Lines) | 2183 |
| 10-29. Active Matrix Timing Diagram of Configuration 3 (Between Frames) | 2183 |
| 10-30. Active Matrix Timing Diagram of Configuration 3 (End of Frame) | 2184 |
| 10-31. Passive Matrix Timing Diagram (Start of Frame) | 2184 |
| 10-32. Passive Matrix Timing Diagram (Between Lines) | 2184 |
| 10-33. Passive Matrix Timing Diagram (Between Frames) | 2185 |
| 10-34. Passive Matrix Timing Diagram (End of Frame) | 2185 |
| 10-35. TV Output Pixel Data | 2186 |
| 10-36. Display Controller Integration | 2187 |
| 10-37. DISPC Architecture Overview | 2190 |
| 10-38. DISPC Clock Tree Overview | 2191 |
| 10-39. DMA Engine Overview | 2196 |
| 10-40. YUV4:2:2 Predecimation | 2202 |
| 10-41. 90-Degree Rotation With Mirroring | 2204 |
| 10-42. Graphics Pipeline | 2209 |
| 10-43. Palette/Gamma Correction Architecture | 2211 |
| 10-44. Data Memory Organization: Color Mode | 2211 |
| 10-45. Data Memory Organization: Gray Mode | 2211 |
| 10-46. Expansion to ARGB40 | 2212 |
| 10-47. Configuration 1: Video Pipeline | 2213 |
| 10-48. Configuration 2: Video Pipeline | 2213 |
| 10-49. YCbCr to RGB Registers (FULLRANGE = 0), 8-Bit Outputs | 2215 |
| 10-50. YCbCr to RGB Registers (FULLRANGE = 1), 8-Bit Outputs | 2215 |
| 10-51. YCbCr to RGB Registers (FULLRANGE = 0), 10-Bit Outputs | 2216 |
| 10-52. YCbCr to RGB Registers (FULLRANGE = 1), 10-Bit Outputs | 2216 |
| 10-53. Averaging of the Chrominance Formula | 2216 |
| 10-54. Averaging of the Chrominance Representation | 2216 |
| 10-55. YUV4:2:2 to RGB30 Using Averaging of the Chrominance | 2217 |
| 10-56. YUV4:2:0 to RGB30 Using Scaler Unit for Resampling Chrominance | 2217 |
| 10-57. YUV4:2:2 to RGB30 Using Scaler Unit for Resampling Chrominance | 2217 |
| 10-58. Video Upsampling | 2218 |
| 10-59. Macro-Architecture of the Vertical Scaling for A, R, G, B, and Y Component | 2220 |
| 10-60. Macro-Architecture of the Horizontal Scaling for A, R, G, B and Y Component | 2220 |
| 10-61. Macro-Architecture of the Vertical Scaling for Cr and Cb Component | 2220 |
| 10-62. Macro-Architecture of the Horizontal Scaling for Cr and Cb Component | 2221 |
| 10-63. Vertical Up/Downsampling Algorithm | 2224 |
| 10-64. Horizontal Up/Downsampling Algorithm | 2225 |
| 10-65. Write-Back Pipeline | 2226 |
| 10-66. RGB to YCbCr (FULLRANGE = 0) | 2227 |
| 10-67. RGB to YCbCr (FULLRANGE = 1) | 2227 |
| 10-68. Macro-Architecture of the Vertical Scaling for A, R, G, B, and Y Component | 2228 |
| 10-69. Macro-Architecture of the Horizontal Scaling for A, R, G, B, and Y Component | 2228 |
| 10-70. Macro-Architecture of the Vertical Scaling for Cr and Cb Component | 2229 |
| 10-71. Macro-Architecture of the Horizontal Scaling for Cr and Cb Component | 2229 |
| 10-72. LCD Output Architecture | 2233 |
| 10-73. Priority Rule Architecture | 2235 |
| 10-74. Example of Priority Rule: From Lower to Higher VID1, VID2, VID3, GFX | 2236 |

| | |
|--|------|
| 10-75. Alpha Blending Architecture With Premultiplied Alpha Support | 2237 |
| 10-76. Source Transparency Color Key Example | 2240 |
| 10-77. Destination Transparency Color Key Example | 2241 |
| 10-78. Data Memory Organization for Gamma Mode in LCD Output..... | 2242 |
| 10-79. CPR Matrix | 2242 |
| 10-80. CPR Macro-Architecture..... | 2243 |
| 10-81. 8-Bit Interface Settings..... | 2245 |
| 10-82. 9-Bit Interface Settings..... | 2246 |
| 10-83. 12-Bit Interface Settings | 2247 |
| 10-84. 16-Bit Interface Settings | 2248 |
| 10-85. Timing Values (Active Matrix Display) | 2249 |
| 10-86. RFBI Data Stall Signal Diagram | 2250 |
| 10-87. RFBI Data Stall Signal Diagram With Handcheck | 2251 |
| 10-88. STALL Signal | 2251 |
| 10-89. TV Output Architecture | 2252 |
| 10-90. Data Memory Organization for Gamma Mode in TV Output..... | 2252 |
| 10-91. TV Formats..... | 2253 |
| 10-92. Video Pipeline Processing Configuration..... | 2265 |
| 10-93. Video Pipeline Processing Configuration..... | 2268 |
| 10-94. Scaler Unit Programming Flow | 2270 |
| 10-95. DSI Overview | 2424 |
| 10-96. DSI Environment..... | 2426 |
| 10-97. DSI Transmitter/Receiver Data Flow..... | 2427 |
| 10-98. Protocol Layer With Short and Long Packets..... | 2430 |
| 10-99. Short Packet Structure..... | 2431 |
| 10-100. Long Packet Structure | 2431 |
| 10-101. Data Identifier Structure | 2433 |
| 10-102. VC Controller | 2433 |
| 10-103. DSI Video Mode: Nonburst Transfer With VE and HE | 2436 |
| 10-104. DSI Video Mode: Nonburst Transfer Without VE and HE | 2437 |
| 10-105. DSI Video Mode: Burst Transfer Without VE and HE | 2438 |
| 10-106. DSI General Frame Structure | 2439 |
| 10-107. DSI General Frame Structure Using Burst Mode | 2440 |
| 10-108. DSI General Frame Structure Using Burst Mode and Interleaving..... | 2441 |
| 10-109. Four-Data Lane Configuration | 2443 |
| 10-110. Three-Data Lane Configuration | 2444 |
| 10-111. Two-Data Lane Configuration | 2445 |
| 10-112. One-Data Lane Configuration | 2445 |
| 10-113. Two Packets Using Two-Data Lane Configuration (Example) | 2445 |
| 10-114. 24-bpp RGB Color Format, Long Packet (Video Mode) | 2447 |
| 10-115. 24-bpp RGB Color Format, Long Packet (Command Mode)..... | 2448 |
| 10-116. 18-bpp (Loosely Packed) RGB Color Format, Long Packet (Transparent for DSI Protocol Engine) (Video Mode)..... | 2449 |
| 10-117. 18-bpp (Loosely Packed) RGB Color Format, Long Packet (Command Mode) | 2450 |
| 10-118. 18-bpp (Packed) RGB Color Format, Long Packet (Video Mode)..... | 2451 |
| 10-119. 16-bpp RGB Color Format, Long Packet (Video Mode) | 2452 |
| 10-120. 16-bpp RGB Color Format, Long Packet (Command Mode)..... | 2453 |
| 10-121. DSI Integration..... | 2454 |
| 10-122. DSI Schematic..... | 2457 |

| | |
|---|------|
| 10-123. DSI Clock Tree | 2458 |
| 10-124. DSI Protocol Engine | 2460 |
| 10-125. Interface Data Configuration | 2463 |
| 10-126. HS Command Mode Interleaving | 2469 |
| 10-127. LP Command Mode Interleaving | 2472 |
| 10-128. LP to HS Timing | 2474 |
| 10-129. HS to LP Timing | 2477 |
| 10-130. DSI Video Mode Without Burst (No-Line Buffer) | 2483 |
| 10-131. DSI Video Mode Without Burst (One-Line Buffer) | 2484 |
| 10-132. DSI Video Mode With Burst (Two-Line Buffers) | 2485 |
| 10-133. Stall Timing With Pixel on Rising Edge | 2487 |
| 10-134. Stall Timing With Pixel on Falling Edge | 2487 |
| 10-135. Data Flow in Command Mode Using the Video Port | 2488 |
| 10-136. Ping-Pong Mode | 2489 |
| 10-137. ForceTxStopMode FSM | 2491 |
| 10-138. TurnRequest FSM | 2492 |
| 10-139. HS TX Timer FSM | 2493 |
| 10-140. LP RX Timer FSM | 2494 |
| 10-141. 64-Bit ECC Generation on TX Side | 2498 |
| 10-142. Checksum Transmission | 2499 |
| 10-143. 16 Bit CRC Generation Using a Shift Register | 2499 |
| 10-144. Complex I/O Power FSM | 2501 |
| 10-145. DSI PLL Power FSM | 2502 |
| 10-146. DSI PLL HS Clock FSM | 2503 |
| 10-147. DSI PLL Controller Overview | 2506 |
| 10-148. DSI PLL Reference Diagram | 2507 |
| 10-149. DSI PLL Functional Block Diagram | 2508 |
| 10-150. Power State Diagram | 2511 |
| 10-151. Gated Mode Sequence | 2512 |
| 10-152. DSI PLL Programming Sequence | 2514 |
| 10-153. DSI PLL Go Sequence (Manual Mode) | 2515 |
| 10-154. DSI PLL Go Sequence (Automatic Mode) | 2516 |
| 10-155. DSI Clock Tree in Video Mode | 2518 |
| 10-156. HS Clock Transmission | 2522 |
| 10-157. HS Data Transmission | 2524 |
| 10-158. Turnaround Request in Transmit Mode | 2525 |
| 10-159. Turnaround Request in Receive Mode | 2526 |
| 10-160. Power State Diagram | 2527 |
| 10-161. HDMI Overview | 2616 |
| 10-162. RFBI Highlight | 2619 |
| 10-163. RFBI LCD Support Interface | 2621 |
| 10-164. External Generation of TE Signal Based on Logical OR Operation Between HSYNC and VSYNC (Active-High) | 2623 |
| 10-165. Command Data Write | 2624 |
| 10-166. Display Data Read | 2624 |
| 10-167. Read to Write and Write to Read | 2625 |
| 10-168. RFBI Integration | 2626 |
| 10-169. RFBI Architecture Overview | 2628 |
| 10-170. RFBI Data Stall Signal Diagram With PCD=3 | 2632 |

| | |
|--|------|
| 10-171. RFBI Data Stall Signal Diagram With Handshake With PCD=3 | 2632 |
| 10-172. 8-Bit Interface Settings | 2634 |
| 10-173. 9-Bit Interface Settings | 2635 |
| 10-174. 16-Bit Interface Settings | 2636 |
| 10-175. DMA Mode Configuration | 2644 |
| 10-176. Trigger Mode Settings | 2646 |
| 10-177. RFBI Output Enable Flow Chart | 2648 |
| 10-178. FRAMEDONE Event Servicing Flow Chart | 2650 |
| 11-1. SGX Overview | 2668 |
| 11-2. SGX Integration | 2670 |
| 11-3. SGX Block Diagram | 2672 |
| 12-1. BB2D Overview | 2692 |
| 12-2. BB2D Integration | 2694 |
| 12-3. BB2D Block Diagram | 2696 |
| 13-1. Audio Back End | 2743 |
| 14-1. Interconnect Overview | 2752 |
| 14-2. L3 Connectivity Matrix | 2757 |
| 14-3. L3 Interconnect Overview | 2759 |
| 14-4. L3 Connectivity Matrix | 2764 |
| 14-5. L3 Interconnect Region Overlay and Priority Level Overview | 2771 |
| 14-6. L3 Global Error-Routing Scheme | 2777 |
| 14-7. Typical Error Analysis Sequence | 2781 |
| 14-8. L4 Interconnect Overview | 2903 |
| 14-9. L4 Initiator-Target Connectivity | 2908 |
| 14-10. Example of CONNID_BIT_VECTOR L4_AP_PROT_GROUP_MEMBERS_k | 2910 |
| 14-11. L4 Segmentation | 2913 |
| 14-12. L4 Error Reporting | 2921 |
| 14-13. Protection Violation Out-of-Band Error Reporting | 2922 |
| 14-14. Typical Error Analysis Sequence | 2924 |
| 14-15. Typical Error Analysis Sequence | 2925 |
| 15-1. C2C Implementation Mirror Mode Example | 2972 |
| 15-2. PRCM Overview | 2975 |
| 15-3. CD_C2C Overview | 2983 |
| 15-4. C2C L3 Interface | 3002 |
| 15-5. C2C Global Error Routing Scheme | 3005 |
| 15-6. C2C SSCM Block Diagram | 3006 |
| 15-7. ICR Block Diagram | 3008 |
| 16-1. Memory Subsystem Functional Diagram | 3048 |
| 16-2. DMM and Tiler Overview | 3054 |
| 16-3. DMM Integration | 3055 |
| 16-4. DMM Block Diagram | 3057 |
| 16-5. DMM Sections and Memory Mapping | 3060 |
| 16-6. PAT Direct Access Translation | 3063 |
| 16-7. PAT Indirect Access Translation | 3063 |
| 16-8. Physical Address Translation Table | 3064 |
| 16-9. PAT Descriptors | 3066 |
| 16-10. TILER Address Space Structure for Tiled Modes | 3069 |
| 16-11. TILER Object Containers and Views | 3072 |
| 16-12. TILER Memory Footprint With PAT and Shared Physical Address Translation LUT | 3072 |

| | |
|---|------|
| 16-13. Object Container Geometry With 4-KB Pages..... | 3073 |
| 16-14. TILER Page Mapping When Using 4-KB Pages | 3073 |
| 16-15. Isometric Transforms in the TILER Container | 3074 |
| 16-16. Page Mode Virtual Addressing | 3075 |
| 16-17. Tiled Mode Addressing in 0- or 180-Degree Orientation ($S = 0$) | 3076 |
| 16-18. Tiled Mode Addressing in 90- or 270-Degree Orientation ($S = 1$) | 3076 |
| 16-19. Tiled Mode Ordering of Elements in Natural View | 3077 |
| 16-20. Page Mode Ordering of Elements in Natural View..... | 3077 |
| 16-21. Tiled Mode Ordering of Elements in 0-Degree View With Vertical Mirror..... | 3078 |
| 16-22. Page Mode Ordering of Elements in 0-Degree View With Vertical Mirror | 3078 |
| 16-23. Tiled Mode Ordering of Elements in 0-Degree View With Horizontal Mirror..... | 3079 |
| 16-24. Page Mode Ordering of Elements in 0-Degree View With Horizontal Mirror | 3079 |
| 16-25. Tiled Mode Ordering of Elements in 180-Degree View..... | 3080 |
| 16-26. Page Mode Ordering of Elements in 180-Degree View | 3080 |
| 16-27. Tiled Mode Ordering of Elements in 90-Degree View With Vertical Mirror | 3081 |
| 16-28. Page Mode Ordering of Elements in 90-Degree View With Vertical Mirror..... | 3081 |
| 16-29. Tiled Mode Ordering of Elements in 270-Degree View..... | 3082 |
| 16-30. Page Mode Ordering of Elements in 270-Degree View | 3082 |
| 16-31. Tiled Mode Ordering of Elements in 90-Degree View | 3083 |
| 16-32. Page Mode Ordering of Elements in 90-Degree View..... | 3083 |
| 16-33. Tiled Mode Ordering of Elements in 90-Degree View With Horizontal Mirror | 3084 |
| 16-34. Page Mode Ordering of Elements in 90-Degree View With Horizontal Mirror..... | 3084 |
| 16-35. TILER Port Address Map | 3085 |
| 16-36. TILER Aliased View Orientation | 3086 |
| 16-37. Simple Manual Area Refill Scheme | 3089 |
| 16-38. Single Auto-Configured Area Refill Scheme | 3090 |
| 16-39. Chained Auto-Configured Area Refill Scheme | 3091 |
| 16-40. Synchronized Auto-Configured Area Refill Scheme | 3092 |
| 16-41. Cyclic Synchronized Auto-Configured Area Refill Scheme | 3093 |
| 16-42. Example of 8-Bit Frame-Buffer Addressing in any Orientation | 3100 |
| 16-43. EMIF Module Overview | 3133 |
| 16-44. EMIF Overall Architecture | 3134 |
| 16-45. EMIF Generic Configuration | 3135 |
| 16-46. EMIF1 Integration | 3137 |
| 16-47. EMIF2 Integration | 3138 |
| 16-48. EMIF Block Diagram | 3140 |
| 16-49. FIFO Block Diagram | 3141 |
| 16-50. GPMC to 16-Bit Address/Data-Multiplexed Memory..... | 3207 |
| 16-51. GPMC to 16-Bit Nonmultiplexed Memory | 3207 |
| 16-52. GPMC to 8-Bit NAND Device | 3208 |
| 16-53. GPMC Integration | 3211 |
| 16-54. GPMC Block Diagram | 3214 |
| 16-55. Chip-Select Address Mapping and Decoding Mask | 3220 |
| 16-56. Wait Behavior During an Asynchronous Single Read Access ($GPMCFCLKDivider = 1$) | 3223 |
| 16-57. Wait Behavior During a Synchronous Read Burst Access..... | 3225 |
| 16-58. Read to Read for an Address-Data Multiplexed Device, on Different CS, without Bus Turnaround (nCS0 attached to a fast device)..... | 3227 |
| 16-59. Read to Read / Write for an Address-Data Multiplexed Device, on Different CS, with Bus Turnaround ... | 3227 |
| 16-60. Read to Read / Write for a Address-Data or AAD-multiplexed device, on the Same CS, with Bus | |

| | |
|---|------|
| Turnaround | 3228 |
| 16-61. Asynchronous Single Read on an Address/Data-Multiplexed Device | 3237 |
| 16-62. Two Asynchronous Single Read Accesses on an Address/Data Multiplexed Device (32-bit read split into 2 x 16-bit read) | 3238 |
| 16-63. Asynchronous Single Write on an Address/Data-Multiplexed Device | 3239 |
| 16-64. Asynchronous Single Read on an AAD-Multiplexed Device | 3241 |
| 16-65. Asynchronous Single Write on an AAD-Multiplexed Device | 3242 |
| 16-66. Synchronous Single Read (GPMCFCLKDIVIDER = 0) | 3244 |
| 16-67. Synchronous Single Read (GPMCFCLKDIVIDER = 1) | 3245 |
| 16-68. Synchronous Multiple (Burst) Read (GPMCFCLKDIVIDER = 0) | 3247 |
| 16-69. Synchronous Multiple (Burst) Read (GPMCFCLKDIVIDER = 1) | 3248 |
| 16-70. Synchronous Single Write on an Address/Data-Multiplexed Device | 3249 |
| 16-71. Synchronous Multiple Write (Burst Write) in Address/Data-Multiplexed Mode | 3250 |
| 16-72. Synchronous Multiple Write (Burst Write) in Address/Address/Data-Multiplexed Mode | 3251 |
| 16-73. Asynchronous Single Read on an Address/Data-Nonmultiplexed Device | 3253 |
| 16-74. Asynchronous Single Write on an Address/Data-Nonmultiplexed Device | 3254 |
| 16-75. Asynchronous Multiple (Page Mode) Read | 3255 |
| 16-76. NAND Command Latch Cycle | 3260 |
| 16-77. NAND Address Latch Cycle | 3261 |
| 16-78. NAND Data Read Cycle | 3262 |
| 16-79. NAND Data Write Cycle | 3262 |
| 16-80. Hamming Code Accumulation Algorithm (1/2) | 3267 |
| 16-81. Hamming Code Accumulation Algorithm (2/2) | 3267 |
| 16-82. ECC Computation for a 256-Byte Data Stream (Read or Write) | 3268 |
| 16-83. ECC Computation for a 512-Byte Data Stream (Read or Write) | 3268 |
| 16-84. 128 Word16 ECC Computation | 3269 |
| 16-85. 256 Word16 ECC Computation | 3270 |
| 16-86. Manual Mode Sequence and Mapping | 3275 |
| 16-87. NAND Page Mapping and ECC: Per-Sector Schemes | 3279 |
| 16-88. NAND Page Mapping and ECC: Pooled Spare Schemes | 3280 |
| 16-89. NAND Page Mapping and ECC: Per-Sector Schemes, with Separate ECC | 3281 |
| 16-90. NAND Read Cycle Optimization Timing Description | 3287 |
| 16-91. Programming Model Top Level Diagram | 3289 |
| 16-92. NOR Interfacing Timing Parameters Diagram | 3294 |
| 16-93. NAND Command Latch Cycle Timing Simplified Example | 3298 |
| 16-94. Synchronous NOR Single Read Simplified Example | 3302 |
| 16-95. Asynchronous NOR Single Write Simplified Example | 3304 |
| 16-96. GPMC Connection to an External NOR Flash Memory | 3306 |
| 16-97. Synchronous Burst Read Access (Timing Parameters in Clock Cycles) | 3308 |
| 16-98. Asynchronous Single Read Access (Timing Parameters in Clock Cycles) | 3309 |
| 16-99. Asynchronous Single Write Access (Timing Parameters in Clock Cycles) | 3310 |
| 16-100. ELM Integration | 3347 |
| 16-101. OCM Subsystem Integration to the Device | 3374 |
| 17-1. sDMA Overview | 3379 |
| 17-2. Example of External DMA Requests Use | 3380 |
| 17-3. Transition-Sensitive DMA Request Scheme | 3381 |
| 17-4. sDMA Controller Integration | 3382 |
| 17-5. sDMA Controller Top-Level Block Diagram | 3387 |
| 17-6. Example Showing Double-Index Addressing, Elements, Frames, and Strides | 3393 |

| | |
|---|------|
| 17-7. Addressing Mode Example (a) | 3393 |
| 17-8. Addressing Mode Example (b) | 3393 |
| 17-9. Addressing Mode Example (c)..... | 3394 |
| 17-10. Example of a 90-Degree Clockwise Image Rotation | 3395 |
| 17-11. 2D Graphic Transparent Color Block Diagram | 3402 |
| 17-12. Overview of Save-and-Restore Mechanism Using SAR RAM and SAR ROM..... | 3410 |
| 17-13. Type-3 SAR ROM Code Example..... | 3411 |
| 17-14. Type-3 SAR ROM Last Transfer Example | 3412 |
| 18-1. INTC Overview..... | 3463 |
| 18-2. Interrupts From External Devices | 3464 |
| 19-1. Control Module Overview | 3475 |
| 19-2. Control Module Environment..... | 3476 |
| 19-3. Control Module Integration | 3479 |
| 19-4. Control Module Block Diagram | 3482 |
| 19-5. Control Module Internal Clock Paths..... | 3484 |
| 19-6. Pad Configuration Register Functionality | 3488 |
| 19-7. Pad Configuration Diagram | 3489 |
| 19-8. Active Mode Pad Configuration Bit Fields vs I/O Cell Mapping | 3492 |
| 19-9. Off Mode Pad Control Overview..... | 3510 |
| 19-10. Wake-Up Event Detection Overview | 3511 |
| 19-11. I/O Power Optimization Flow Chart | 3513 |
| 19-12. Functional Block Diagram | 3515 |
| 19-13. Extended-Drain I/O | 3517 |
| 19-14. VDDS Ramps Up Before VDD2 | 3521 |
| 19-15. Functional Block Diagram | 3522 |
| 19-16. Single Conversion Mode | 3525 |
| 19-17. Fixed-Delay Repeated Single Conversions | 3526 |
| 19-18. Programmable-Delay Repeated Single Conversions | 3527 |
| 19-19. Thermal Management Schema..... | 3528 |
| 19-20. Thermal Alert Generation Signals..... | 3531 |
| 19-21. Thermal Shutdown Generation Signals | 3532 |
| 19-22. TSHUT Output Mapping Diagram | 3533 |
| 19-23. Overview of the Hardware Observability Functionality | 3538 |
| 19-24. DLL Slave Delay Control Schema..... | 3665 |
| 19-25. Configuring PBIAS Cell to Operate in Different Modes, Interrupt Method | 3698 |
| 20-1. Mailbox Overview..... | 4170 |
| 20-2. System Mailbox Integration | 4172 |
| 20-3. IVA-HD Mailbox Integration | 4174 |
| 20-4. Mailbox Block Diagram | 4177 |
| 20-5. Example of Communication..... | 4181 |
| 21-1. Device MMU Instances | 4202 |
| 21-2. MMU Integration | 4203 |
| 21-3. DSP MMU Integration..... | 4204 |
| 21-4. MMU Block Diagram | 4206 |
| 21-5. Translation Process | 4207 |
| 21-6. Translation Hierarchy | 4208 |
| 21-7. First-level Descriptor Address Calculation | 4208 |
| 21-8. Detailed First-Level Descriptor Address Calculation..... | 4209 |
| 21-9. Section Translation Summary | 4210 |

| | |
|---|------|
| 21-10. Supersection Translation Summary | 4211 |
| 21-11. Two-Level Translation | 4212 |
| 21-12. Small Page Translation Summary | 4213 |
| 21-13. Large Page Translation Summary | 4214 |
| 21-14. TLB Entry Lock Mechanism | 4215 |
| 21-15. TLB Entry Structure | 4216 |
| 21-16. MMU Global Initialization | 4220 |
| 22-1. Spinlock Module | 4240 |
| 22-2. Spinlock Integration | 4241 |
| 22-3. Lock Register State Diagram | 4244 |
| 22-4. Take and Release Spinlock | 4246 |
| 23-1. Timers | 4254 |
| 23-2. GP Timers Overview | 4255 |
| 23-3. GP Timers External System Interface | 4257 |
| 23-4. GP Timer Integration | 4259 |
| 23-5. Block Diagram of GPTIMER3 Through GPTIMER9, and GPTIMER11 | 4263 |
| 23-6. Block Diagram of GPTIMER1, GPTIMER2, and GPTIMER10 | 4264 |
| 23-7. Wake-Up Request Generation | 4266 |
| 23-8. Wake-Up Request Generation | 4268 |
| 23-9. GPT_TCCR Timing Value | 4269 |
| 23-10. Block Diagram of the 1-ms Tick Module | 4270 |
| 23-11. Capture Wave Example for GPT_TCLR[13] CAPT_MODE = 0 | 4272 |
| 23-12. Capture Wave Example for GPT_TCLR[13] CAPT_MODE = 1 | 4272 |
| 23-13. Timing Diagram of PWM With GPT_TCLR[7] SCPWM Bit = 0 | 4274 |
| 23-14. Timing Diagram of PWM With GPT_TCLR[7] SCPWM Bit = 1 | 4274 |
| 23-15. Watchdog Timers Block Diagram | 4311 |
| 23-16. Watchdog Timers Integration | 4313 |
| 23-17. 32-Bit Watchdog Timer Functional Block Diagram | 4316 |
| 23-18. Watchdog Timers General Functional View | 4317 |
| 23-19. 32-kHz Synchronized Timer Block Diagram | 4339 |
| 23-20. Reset Resynchronization Timing Diagram | 4340 |
| 23-21. SYNCTIMER32K Block Diagram | 4341 |
| 24-1. HS I ² C Controllers | 4347 |
| 24-2. HS I ² C and Typical Connections to I ² C Devices | 4349 |
| 24-3. HS I ² C Interface Signals in I ² C Mode | 4349 |
| 24-4. HS I ² C Data Transfer | 4350 |
| 24-5. HS I ² C Bit Transfer on the I ² C Bus | 4350 |
| 24-6. HS I ² C S and P Condition Events | 4351 |
| 24-7. HS I ² C Data Transfer Formats in F/S Mode | 4351 |
| 24-8. HS I ² C Data Transfer in HS Mode | 4352 |
| 24-9. HS I ² C Arbitration Between Master Transmitters | 4353 |
| 24-10. HS I ² C Clock Generators Synchronization | 4354 |
| 24-11. HS I ² C and Typical Connections to SCCB Devices | 4355 |
| 24-12. HS I ² C Interface Signals in SCCB Mode | 4356 |
| 24-13. HS I ² C 3-wire SCCB Transmission Timing Diagram | 4357 |
| 24-14. HS I ² C SCCB Transmission Data Formats | 4357 |
| 24-15. HS I ² C and Typical Connection Between the HS I ² C and Power Chip(s) | 4359 |
| 24-16. HS I ² C I2C5 Interface Signals | 4359 |
| 24-17. HS I ² C Data Transfer Format in F/S Mode for I2C5 | 4361 |

| | |
|---|------|
| 24-18. HS I ² C Data Transfer Format in HS Mode for I2C5..... | 4362 |
| 24-19. HS I ² C Integration | 4363 |
| 24-20. HS I ² C I2C5 Integration | 4364 |
| 24-21. HS I ² C Block Diagram | 4366 |
| 24-22. HS I ² C Clock Generation | 4367 |
| 24-23. HS I ² C Receive FIFO Interrupt Request Generation | 4375 |
| 24-24. HS I ² C Transmit FIFO Interrupt Request Generation..... | 4375 |
| 24-25. HS I ² C Receive FIFO DMA Request Generation..... | 4376 |
| 24-26. HS I ² C Transmit FIFO Request Generation (High Threshold)..... | 4377 |
| 24-27. HS I ² C Transmit FIFO Request Generation (Low Threshold) | 4377 |
| 24-28. HS I ² C Setup Procedure..... | 4383 |
| 24-29. HS I ² C Master Transmitter Mode, Polling Method, in F/S and HS Modes | 4384 |
| 24-30. HS I ² C Master Receiver Mode, Polling Method, in F/S and HS Modes | 4386 |
| 24-31. HS I ² C Master Transmitter Mode, Interrupt Method, in F/S and HS Modes | 4388 |
| 24-32. HS I ² C Master Receiver Mode, Interrupt Method, in F/S and HS Modes | 4390 |
| 24-33. HS I ² C Master Transmitter Mode, DMA Method in F/S and HS Modes..... | 4392 |
| 24-34. HS I ² C Master Receiver Mode, DMA Method in F/S and HS Modes..... | 4394 |
| 24-35. HS I ² C Slave Transmitter/Receiver Mode, Polling | 4395 |
| 24-36. HS I ² C Slave Transmitter/Receiver Mode, Interrupt | 4396 |
| 24-37. HS I ² C SCCB Setup Procedure | 4399 |
| 24-38. HS I ² C SCCB Master Transmitter Mode, Polling..... | 4400 |
| 24-39. HS I ² C SCCB Master Receiver Mode, Polling..... | 4401 |
| 24-40. HS I ² C SCCB Master Transmitter Mode, Interrupt..... | 4403 |
| 24-41. HS I ² C SCCB Master Receiver Mode, Interrupt..... | 4405 |
| 24-42. HDQ/1-Wire Overview | 4438 |
| 24-43. HDQ/1-Wire Typical Application System Overview | 4439 |
| 24-44. HDQ Break-Pulse Timing Diagram..... | 4440 |
| 24-45. 1-Wire (SDQ) Reset Timing Diagram..... | 4440 |
| 24-46. HDQ/1-Wire Transmitted Bit Timing | 4441 |
| 24-47. HDQ/1-Wire Communication Sequence..... | 4441 |
| 24-48. HDQ/1-Wire Integration..... | 4442 |
| 24-49. HDQ/1-Wire Block Diagram | 4443 |
| 24-50. Protocol Registers Description..... | 4444 |
| 24-51. UART Module | 4459 |
| 24-52. UART Mode Bus System Overview..... | 4462 |
| 24-53. IrDA System Overview | 4462 |
| 24-54. CIR System Overview | 4463 |
| 24-55. UART Frame Data Format | 4464 |
| 24-56. IrDA SIR Frame Format | 4466 |
| 24-57. IrDA SIR Encoding Mechanism..... | 4467 |
| 24-58. IrDA SIR Decoding Mechanism | 4467 |
| 24-59. SIR FF Mode..... | 4468 |
| 24-60. MIR Transmit Frame Format..... | 4469 |
| 24-61. MIR Baud Rate Adjustment Mechanism | 4470 |
| 24-62. SIP..... | 4470 |
| 24-63. FIR Transmit Frame Format | 4470 |
| 24-64. CIR Pulse Modulation..... | 4472 |
| 24-65. CIR Modulation Duty Cycle | 4473 |
| 24-66. RC-5 Bit Encoding..... | 4473 |

| | |
|---|------|
| 24-67. SIRC Bit Encoding | 4474 |
| 24-68. RC-5 Standard Packet Format | 4474 |
| 24-69. SIRC Packet Format | 4475 |
| 24-70. SIRC Bit Transmission Example | 4475 |
| 24-71. UART/IrDA/CIR Integration..... | 4476 |
| 24-72. UART/IrDA/CIR Functional Specification Block Diagram | 4479 |
| 24-73. FIFO Management Registers | 4485 |
| 24-74. RX FIFO Interrupt Request Generation | 4487 |
| 24-75. TX FIFO Interrupt Request Generation..... | 4487 |
| 24-76. Receive FIFO DMA Request Generation (32 Characters) | 4489 |
| 24-77. Transmit FIFO DMA Request Generation (56 Spaces) | 4489 |
| 24-78. Transmit FIFO DMA Request Generation (8 Spaces)..... | 4490 |
| 24-79. Transmit FIFO DMA Request Generation (1 Space) | 4491 |
| 24-80. Transmit FIFO DMA Request Generation Using Direct TX DMA Threshold Programming. (Threshold = 3; Spaces = 8) | 4492 |
| 24-81. DMA Transmission | 4492 |
| 24-82. DMA Reception | 4493 |
| 24-83. Baud Rate Generation | 4499 |
| 24-84. Baud Rate Generator | 4505 |
| 24-85. CIR Mode Block Components | 4509 |
| 24-86. Multichannel Modules SPI1, SPI2, SPI3, and SPI4..... | 4568 |
| 24-87. Typical Application Using the MCSPI..... | 4570 |
| 24-88. MCSPI Interface Signals in Master Mode..... | 4571 |
| 24-89. MCSPI Interface Signals in Slave Mode | 4571 |
| 24-90. Phase and Polarity Combinations..... | 4573 |
| 24-91. Full-Duplex Transfer Format With PHA = 0..... | 4574 |
| 24-92. Extended SPI Transfer With a Start-Bit (SBE = 1)..... | 4575 |
| 24-93. MCSPI Master Mode (Full Duplex)..... | 4575 |
| 24-94. MCSPI Master Single Mode (Receive Only)..... | 4576 |
| 24-95. MCSPI Slave Mode (Full Duplex) | 4576 |
| 24-96. MCSPI Slave Single Mode (Transmit Only)..... | 4577 |
| 24-97. MCSPI Integration | 4577 |
| 24-98. MCSPI Block Diagram | 4580 |
| 24-99. SPI Full-Duplex Transmission (Example) | 4582 |
| 24-100. Continuous Transfers With mcspim_csx Maintained Active (Single-Data-Pin Interface Mode) | 4584 |
| 24-101. Continuous Transfers With mcspim_csx Maintained Active (Dual-Data-Pin Interface Mode) | 4584 |
| 24-102. CS SPIEN Timing Controls | 4585 |
| 24-103. Example of MCSPI Slave With One Master and Multiple Slave Devices on Channel 0..... | 4589 |
| 24-104. SPI Half-Duplex Transmission (Transmit-Only Slave) | 4591 |
| 24-105. SPI Half-Duplex Transmission (Receive-Only Slave) | 4592 |
| 24-106. Buffer Used in Transmit Direction Only | 4593 |
| 24-107. Buffer Used in Receive Direction Only | 4593 |
| 24-108. Buffer Used for Transmit and Receive Directions | 4593 |
| 24-109. Buffer Almost Full Level (AFL) | 4594 |
| 24-110. Buffer Almost Empty Level (AEL) | 4595 |
| 24-111. McBSP Highlight | 4632 |
| 24-112. Mode Overview of McBSP4 | 4636 |
| 24-113. Mode Overview of McBSPi | 4637 |
| 24-114. Midi Data Application | 4637 |

| | |
|---|------|
| 24-115. Audio Data Application | 4638 |
| 24-116. Voice Data Application | 4638 |
| 24-117. McBSP Reception/Transmission Signal Activity | 4640 |
| 24-118. Serial Data Formats | 4640 |
| 24-119. TDM Data Format; Word Width: 32 Bits; Data Length: 24 Bits | 4641 |
| 24-120. I2S Data Format; Word Width: 32 Bits; Data Length: 24 Bits | 4642 |
| 24-121. Left-Justified Data Format; Word Width: 32 Bits; Data Length: 24 Bits | 4642 |
| 24-122. Right-Justified Data Format; Word Width: 32 Bits; Data Length: 24 Bits | 4642 |
| 24-123. PCM Protocol – Mode 1 Data Format | 4643 |
| 24-124. PCM Protocol – Mode 2 Data Format | 4643 |
| 24-125. McBSP1 Integration..... | 4645 |
| 24-126. McBSP2 Integration..... | 4646 |
| 24-127. McBSP3 Integration..... | 4647 |
| 24-128. McBSP4 Integration..... | 4648 |
| 24-129. McBSPi Block Diagram..... | 4651 |
| 24-130. McBSP Data Transfer Paths..... | 4661 |
| 24-131. Conceptual Block Diagram for Clock and Frame Generation When MCBSP_LP_SPCR1_REG[15] ALB = 0 | 4662 |
| 24-132. Clock Signal Control of Bit Transfer Timing | 4664 |
| 24-133. McBSP Operating at Maximum Packet Frequency | 4666 |
| 24-134. Single-Phase Frame for a McBSP Data Transfer | 4668 |
| 24-135. Dual-Phase Frame for a McBSP Data Transfer | 4668 |
| 24-136. McBSP Reception Physical Data Path | 4669 |
| 24-137. McBSP Reception Signal Activity | 4669 |
| 24-138. McBSP Transmission Physical Data Path | 4670 |
| 24-139. McBSP Transmission Signal Activity | 4670 |
| 24-140. Transmit Full-Cycle Timing Diagram | 4671 |
| 24-141. Transmit Half-Cycle Timing Diagram | 4672 |
| 24-142. Receive Full-Cycle Timing Diagram | 4672 |
| 24-143. Receive Half-Cycle Timing Diagram..... | 4672 |
| 24-144. Conceptual Block Diagram of the SRG | 4673 |
| 24-145. CLKG Synchronization and FSG Generation (GSYNC = 1 and CLKGDV = 0x1)..... | 4677 |
| 24-146. CLKG Synchronization and FSG Generation (GSYNC = 1 and CLKGDV = 0x3)..... | 4677 |
| 24-147. Overrun in the McBSP Receiver | 4679 |
| 24-148. Unexpected Frame-Sync Pulse During a McBSP Reception | 4679 |
| 24-149. Proper Positioning of Receive Frame-Sync Pulses | 4680 |
| 24-150. Unexpected Frame-Sync Pulse During a McBSP Transmission | 4681 |
| 24-151. Proper Positioning of Transmit Frame-Sync Pulses..... | 4682 |
| 24-152. McBSP Data Transfer in 8-Partition Mode..... | 4685 |
| 24-153. Alternating Between Partitions A and B Channels..... | 4686 |
| 24-154. Activity on McBSP Pins When XMCM = 0b00 | 4688 |
| 24-155. Activity on McBSP Pins When XMCM = 0b01 | 4688 |
| 24-156. Activity on McBSP Pins When XMCM = 0b10 | 4688 |
| 24-157. Activity on McBSP Pins When XMCM = 0b11 | 4689 |
| 24-158. Flow Diagram of McBSP Initialization Procedure for Master Mode | 4691 |
| 24-159. Flow Diagram of McBSP Initialization Procedure for Slave Mode..... | 4692 |
| 24-160. Flow Diagram for the SRG Registers Programming | 4694 |
| 24-161. McPDM Overview | 4747 |
| 24-162. McPDM Generic Configuration | 4749 |

| | |
|--|------|
| 24-163. Protocols and Data Formats in Normal Mode | 4750 |
| 24-164. Protocols and Data Formats in Command Mode | 4751 |
| 24-165. Protocols and Data Formats in Status Mode | 4753 |
| 24-166. McPDM Integration | 4755 |
| 24-167. McPDM Block Diagram..... | 4757 |
| 24-168. Interrupt Tree | 4760 |
| 24-169. Uplink Path Detailed Block Diagram..... | 4762 |
| 24-170. FIFO Uplink Overview | 4764 |
| 24-171. Downlink Path Detailed Block Diagram | 4766 |
| 24-172. FIFO Downlink Overview..... | 4767 |
| 24-173. McPDM Watchdog Logic..... | 4770 |
| 24-174. McPDM Global Initialization Flow Chart..... | 4772 |
| 24-175. DMIC..... | 4794 |
| 24-176. DMIC With Three Stereo DMICs..... | 4795 |
| 24-177. DMIC With Six Mono DMICs | 4796 |
| 24-178. DMIC Interface Diagram With External DMICs | 4797 |
| 24-179. DMIC Integration | 4798 |
| 24-180. DMIC Block Diagram | 4800 |
| 24-181. DMIC Clock Selection | 4800 |
| 24-182. Interrupt Tree | 4804 |
| 24-183. DMIC FIFO..... | 4806 |
| 24-184. Polling Mode | 4809 |
| 24-185. Interrupt Handler | 4810 |
| 24-186. McASP Module | 4826 |
| 24-187. Definition of Bit, Word, and Slot..... | 4829 |
| 24-188. Bit Order and Word Alignment Within a Slot Examples..... | 4829 |
| 24-189. Definition of Frame and Frame-Sync Width | 4830 |
| 24-190. Biphas-Mark Code..... | 4831 |
| 24-191. S/PDIF Subframe Format | 4832 |
| 24-192. S/PDIF Frame Format | 4832 |
| 24-193. McASP Integration | 4833 |
| 24-194. McASP Block Diagram | 4835 |
| 24-195. Transmit Clock Generator Block Diagram | 4836 |
| 24-196. Individual Serializer and Connections Within McASP | 4837 |
| 24-197. Transmit Format Unit | 4838 |
| 24-198. MPU Service Time Upon Transmit DMA Event (AXEVT) | 4843 |
| 24-199. DMA Transmit Event in an Audio Example – One Event..... | 4844 |
| 24-200. Audio Mute (AMUTE) Block Diagram | 4846 |
| 24-201. Transmit Clock Failure Detection Circuit Block Diagram | 4848 |
| 24-202. McASP DIT Transmission Polling Method..... | 4853 |
| 24-203. Subsequence – DIT Transmission Startup Procedure | 4854 |
| 24-204. Subsequence – DIT DMA Transmission Procedure..... | 4856 |
| 24-205. McASP Interrupt Events Servicing..... | 4857 |
| 24-206. McASP Error Handling | 4858 |
| 24-207. SLIMbus1 Highlight | 4885 |
| 24-208. SLIMbus2 Highlight | 4886 |
| 24-209. SLIMbus1 Typical Application System Overview | 4888 |
| 24-210. SLIMbus2 Typical Application System Overview | 4888 |
| 24-211. SLIMbus Frame Structure Overview..... | 4890 |

| | |
|--|------|
| 24-212. Segment Organization..... | 4891 |
| 24-213. SLIMBUS1 Integration..... | 4898 |
| 24-214. SLIMBUS2 Integration..... | 4899 |
| 24-215. SLIMbus Block Diagram..... | 4903 |
| 24-216. Example of FIFO Mapping in Shared Buffer | 4911 |
| 24-217. HSI Overview | 5010 |
| 24-218. HSI Typical Application..... | 5012 |
| 24-219. HSI Integration..... | 5013 |
| 24-220. HSI Controller Architecture Overview | 5016 |
| 24-221. Receive FSM | 5024 |
| 24-222. HSR_SWAPBUFFER_Pp_CHN_i Register..... | 5025 |
| 24-223. Transmit FSM..... | 5027 |
| 24-224. MAPPING Register | 5029 |
| 24-225. HSI_Pp_WAKE Control in Case of Managed Wake | 5031 |
| 24-226. Overall FIFO Architecture | 5032 |
| 24-227. Transmission FIFO Architecture | 5033 |
| 24-228. Reception FIFO Architecture | 5034 |
| 24-229. HSI Transmit in Polling Method | 5040 |
| 24-230. Event Servicing in HSI Transmission Mode | 5042 |
| 24-231. Event Servicing in HSI Reception Mode | 5044 |
| 24-232. HS USB Host Controller..... | 5087 |
| 24-233. HS Multiport USB Host Subsystem Environment..... | 5089 |
| 24-234. External USB Transceiver ULPIs | 5090 |
| 24-235. ULPI TLL Interfaces | 5091 |
| 24-236. ULPIs – 12-Pin/8-Bit Data SDR Version | 5092 |
| 24-237. ULPI TLL Interfaces – 12-Pin/8-Bit Data SDR Version | 5094 |
| 24-238. Serial Interface Sideband Integration – Transceiver Configuration..... | 5099 |
| 24-239. Serial Interface Sideband Integration – TLL Configuration | 5099 |
| 24-240. 6-Pin Unidirectional Using DAT/SE0 Signaling | 5100 |
| 24-241. 6-Pin Unidirectional Using DP/DM Signaling | 5101 |
| 24-242. 3-Pin Bidirectional Using DAT/SE0 Signaling | 5102 |
| 24-243. 4-Pin Bidirectional Using DP/DM Signaling..... | 5103 |
| 24-244. 6-Pin Unidirectional TLL Using DAT/SE0 Signaling | 5104 |
| 24-245. 6-Pin Unidirectional TLL Using DP/DM Signaling..... | 5105 |
| 24-246. 3-Pin Bidirectional TLL Using DAT/SE0 Signaling..... | 5106 |
| 24-247. 4-Pin Bidirectional TLL Using DP/DM Signaling | 5107 |
| 24-248. 2-Pin Bidirectional TLL Using DP/DM Encoding, With 4-Pin Bidirectional USB Device | 5108 |
| 24-249. 2-Pin Bidirectional TLL Using DAT/SE0 Encoding, With 3-Pin Bidirectional USB Device..... | 5109 |
| 24-250. HSIC Interface..... | 5111 |
| 24-251. HS USB Subsystem Integration..... | 5113 |
| 24-252. HS USB Host Controller Architecture | 5116 |
| 24-253. Per-Configuration Data Path Through USBTLL..... | 5122 |
| 24-254. Selecting and Configuring HS USB Host Subsystem Connectivity..... | 5128 |
| 24-255. High-Speed USB OTG Controller Highlight..... | 5210 |
| 24-256. High-Speed USB Controller Typical Application System | 5212 |
| 24-257. High-Speed USB Controller Integration | 5214 |
| 24-258. High-Speed USB OTG Controller..... | 5219 |
| 24-259. High-Speed USB OTG Controller Endianness..... | 5221 |
| 25-1. MMC/SD/SDIO1 Overview (where i = 1) | 5257 |

| | |
|--|------|
| 25-2. MMC/SD/SDIO2 Overview (where i = 2) | 5258 |
| 25-3. MMC/SD/SDIO3 Through MMC/SD/SDIO5 Overview (where i = 3, 4, or 5) | 5259 |
| 25-4. MMC/SD/SDIOi Controller Connected to an MMC, an SD, or an SDIO Card Without External Transceiver (where i = 1 through 5) | 5263 |
| 25-5. MMC/SD/SDIOi Controller Connected to an MMC, an SD, or an SDIO Card With External Transceiver (where i = 2) | 5264 |
| 25-6. Sequential Read Operation (MMC Cards Only) | 5266 |
| 25-7. Sequential Write Operation (MMC Cards Only) | 5266 |
| 25-8. Multiple Block Read Operation | 5266 |
| 25-9. Multiple Block Write Operation With Card Busy Signal | 5267 |
| 25-10. Command Token Format | 5267 |
| 25-11. Response Token Format (R1, R3, R4, R5, R6, R7) | 5268 |
| 25-12. Response Token Format (R2) | 5268 |
| 25-13. Data Token Format for 1-Bit Transfers | 5269 |
| 25-14. Data Token Format for 4-Bit Transfers | 5269 |
| 25-15. Data Token Format for 8-Bit Transfers | 5270 |
| 25-16. MMC/SD/SDIO Controllers Integration | 5271 |
| 25-17. MMC/SD/SDIO Diagram | 5274 |
| 25-18. ADMA Block Diagram Overview | 5283 |
| 25-19. ADMA Finite State-Machine | 5285 |
| 25-20. DMA Receive Mode | 5287 |
| 25-21. DMA Transmit Mode | 5288 |
| 25-22. Buffer Management for a Write | 5290 |
| 25-23. Buffer Management for a Read | 5291 |
| 25-24. Busy Time-Out for R1b, R5b Response Type | 5294 |
| 25-25. Busy Time-Out After Write CRC Status | 5294 |
| 25-26. Write CRC Status Time-Out | 5295 |
| 25-27. Read Data Time-Out | 5295 |
| 25-28. Boot Acknowledge Time-Out When Using CMD0 | 5296 |
| 25-29. Boot Acknowledge Time-Out When CMD Line Tied to 0 | 5296 |
| 25-30. ACMD12 Timings During Write Transfer | 5297 |
| 25-31. ACMD12 Timings During Read Transfer | 5297 |
| 25-32. Output Driven on Falling Edge | 5299 |
| 25-33. Output Driven on Rising Edge | 5300 |
| 25-34. Boot Mode Using the CMD0 Timing Diagram | 5300 |
| 25-35. Boot Mode With CMD Line Tied to 0 Timing Diagram | 5301 |
| 25-36. MMC/SD/SDIO Controller Software Reset Flow | 5304 |
| 25-37. MMC/SD/SDIO Controller Bus Configuration | 5305 |
| 25-38. MMC/SD/SDIO Controller Card Identification and Selection – Part 1 | 5307 |
| 25-39. MMC/SD/SDIO Controller Card Identification and Selection – Part 2 | 5308 |
| 25-40. MMC/SD/SDIO Controller Read/Write Transfer Flow in DMA Slave Mode With interrupt | 5310 |
| 25-41. MMC/SD/SDIO Controller Read/Write Transfer Flow in DMA Mode With Polling | 5311 |
| 25-42. MMC/SD/SDIO Controller Read/Write Transfer Flow Without DMA and With Polling | 5313 |
| 25-43. MMC/SD/SDIO Controller Read/Write in CE-ATA Mode | 5314 |
| 25-44. MMC/SD/SDIO Controller Suspend Flow | 5316 |
| 25-45. MMC/SD/SDIO Controller Resume Flow | 5317 |
| 25-46. MMC/SD/SDIO Controller Command Transfer Flow With Polling | 5318 |
| 25-47. MMC/SD/SDIO Controller Command Transfer Flow With interrupts | 5320 |
| 25-48. MMC/SD/SDIO Controller Clock Frequency Change Flow | 5321 |

| | |
|--|------|
| 25-49. MMC/SD/SDIO Controller Bus Width Configuration Flow..... | 5322 |
| 25-50. MMC/SD/SDIO Power Switching Procedure..... | 5324 |
| 25-51. MMC/SD/SDIO Controller Boot Using CMD0..... | 5325 |
| 25-52. MMC/SD/SDIO Controller Boot With CMD Line Tied to 0 | 5327 |
| 26-1. General-Purpose Interface Overview | 5391 |
| 26-2. General-Purpose Interface Typical Application..... | 5393 |
| 26-3. General-Purpose Interface Used as a Keyboard Interface | 5394 |
| 26-4. GPIO1 Signal Connections..... | 5395 |
| 26-5. GPIO2 Through GPIO6 Signal Connections..... | 5397 |
| 26-6. GPIO Integration..... | 5399 |
| 26-7. General-Purpose Interface Block Diagram..... | 5402 |
| 26-8. Synchronous Path..... | 5402 |
| 26-9. Asynchronous Path..... | 5403 |
| 26-10. Interrupt Request Generation | 5404 |
| 26-11. Wake-Up Request Generation..... | 5405 |
| 26-12. Wake-Up Event Conditions | 5406 |
| 26-13. GPIO_CLEARDATAOUT Register Example..... | 5415 |
| 26-14. Write in GPIO_IRQSTATUS_SET_0 Register Example | 5416 |
| 27-1. Keyboard Controller Overview | 5440 |
| 27-2. Typical Keyboard Environment | 5442 |
| 27-3. Multikey Limitation Example | 5443 |
| 27-4. Keyboard Controller Integration | 5445 |
| 27-5. Keyboard Controller Block Diagram | 5447 |
| 27-6. Functional Modes and Related Interrupt Events | 5453 |
| 27-7. Key Coding Registers..... | 5454 |
| 28-1. Initialization Process | 5479 |
| 28-2. Power Supply Connections | 5481 |
| 28-3. Clock, Reset and Control Environment..... | 5487 |
| 28-4. System Clock Selection Diagram | 5492 |
| 28-5. ROM Code Architecture | 5499 |
| 28-6. ROM Memory Map | 5500 |
| 28-7. RAM Memory Map | 5501 |
| 28-8. Overall Booting Sequence | 5504 |
| 28-9. ROM Code Multiprocessor Start-Up Sequence | 5506 |
| 28-10. Device List Setup..... | 5508 |
| 28-11. Synchronization Phase for UART | 5512 |
| 28-12. Synchronization Phase for USB | 5512 |
| 28-13. Peripheral Booting Procedure | 5515 |
| 28-14. USB Initialization Procedure | 5517 |
| 28-15. PrevStartOk Mechanism..... | 5518 |
| 28-16. Charger Detection | 5519 |
| 28-17. Customer USB Descriptor Selection | 5523 |
| 28-18. USB System Using Internal Transceiver | 5524 |
| 28-19. Fast External Boot Procedure | 5526 |
| 28-20. Memory Booting Procedure | 5528 |
| 28-21. Image Shadowing on GP Device..... | 5529 |
| 28-22. NAND Device Detection | 5535 |
| 28-23. Bad NAND Invalid Block Detection | 5536 |
| 28-24. ECC Data Mapping for 2-KB Page and 8b BCH Encoding | 5537 |

| | |
|---|------|
| 28-25. ECC Data Mapping for 4-KB Page and 16b BCH Encoding..... | 5538 |
| 28-26. OneNAND/Flex-OneNAND Read Sector | 5540 |
| 28-27. eMMC/eSD and MMC/SD Booting | 5542 |
| 28-28. eMMC/eSD Connection..... | 5544 |
| 28-29. MMC/SD Card Connection | 5546 |
| 28-30. MMC/SD Detection Procedure..... | 5547 |
| 28-31. SD/MMC Get Booting File..... | 5549 |
| 28-32. MBR Detection Procedure..... | 5551 |
| 28-33. MBR, Get Partition | 5552 |
| 28-34. Image Formats..... | 5555 |
| 28-35. CH Format..... | 5556 |
| 29-1. ICEPick Scan Chain..... | 5579 |
| 29-2. Processor Trace Flow..... | 5593 |
| 29-3. System Instrumentation Framework | 5594 |

List of Tables

| | | |
|-------|---|-----|
| 1-1. | Device Identification Registers | 276 |
| 1-2. | STD_FUSE_DIE_ID | 276 |
| 1-3. | ID_CODE | 276 |
| 1-4. | Ramp System Number Values | 276 |
| 1-5. | Revision Number Values | 276 |
| 1-6. | ID_CODE Values | 277 |
| 1-7. | STD_FUSE_PROD_ID_0 | 277 |
| 1-8. | STD_FUSE_PROD_ID_1 | 277 |
| 2-1. | Global Memory Space Mapping | 283 |
| 2-2. | L3_EMU Memory Space Mapping | 284 |
| 2-3. | L4_CFG Memory Space Mapping | 285 |
| 2-4. | L4_WKUP Peripheral Space Mapping | 287 |
| 2-5. | L4_PER Memory Space Mapping | 289 |
| 2-6. | ABE Cortex-A9 MPU Memory Space Mapping | 291 |
| 2-7. | ABE L3 Memory Space Mapping | 292 |
| 2-8. | ABE DSP Memory Space Mapping | 293 |
| 2-9. | Dual Cortex-M3 Memory Space Mapping | 295 |
| 2-10. | DSP Subsystem Memory Space Mapping | 296 |
| 2-11. | L3 Access – Display Subsystem Space Mapping | 298 |
| 2-12. | L4_PER Access – Display Subsystem Space Mapping | 298 |
| 3-1. | Master Module Standby Mode Settings | 302 |
| 3-2. | Master Module Standby Status | 302 |
| 3-3. | Master Module Clock Enabling Conditions | 302 |
| 3-4. | Module Idle Mode Settings | 303 |
| 3-5. | Slave Module Idle Status | 303 |
| 3-6. | Slave Module Clock Activity Settings | 304 |
| 3-7. | Slave Module Mode Settings in PRCM | 305 |
| 3-8. | Slave Module Interface Clock Enabling Conditions | 305 |
| 3-9. | Slave Module Functional Clock Enabling Conditions | 305 |
| 3-10. | Clock Domain Functional Clock States | 307 |
| 3-11. | Clock Domain Clock States | 308 |
| 3-12. | Clock Domain Clock Transition Mode Settings | 308 |
| 3-13. | Clock Domain Wake-Up Conditions | 312 |
| 3-14. | Clock Domain Sleep Conditions | 312 |
| 3-15. | States of a Logic Area in a Power Domain | 316 |
| 3-16. | States of a Memory Area in a Power Domain | 316 |
| 3-17. | Power Domain Wake-Up Conditions | 318 |
| 3-18. | Power Domain Sleep Conditions | 318 |
| 3-19. | Power Domain Control and Status Registers | 319 |
| 3-20. | States of Logic Voltage Domain | 320 |
| 3-21. | External Clock Signals | 331 |
| 3-22. | External Boot Signals | 332 |
| 3-23. | External Reset Signals | 333 |
| 3-24. | Power Control Interface | 333 |
| 3-25. | Voltage Sources | 333 |
| 3-26. | Wake-Up Signals | 334 |
| 3-27. | PMFW Device-Level Layout | 335 |

| | | |
|-------|--|-----|
| 3-28. | PMFW Module Power Domains | 338 |
| 3-29. | PMFW Module Reset Signals | 338 |
| 3-30. | PMFW Module Interrupts | 338 |
| 3-31. | Global Reset Sources | 341 |
| 3-32. | Local Reset Sources | 342 |
| 3-33. | Modules, Power Domains and Reset Domains Association | 342 |
| 3-34. | Reset Sources For the Reset Domains | 345 |
| 3-35. | Reset Domains Attributes | 354 |
| 3-36. | PRM Clock Division and Muxing Control | 373 |
| 3-37. | CM1 Clock Division and Muxing Control..... | 375 |
| 3-38. | CM1_USB Clock Division and Muxing Control..... | 376 |
| 3-39. | CM1_ABE Clock Division and Muxing Control..... | 378 |
| 3-40. | CM2 Clock Division and Muxing Control..... | 380 |
| 3-41. | CLKOUT_M2, CLKOUTX2_M2, and CLKOUTX2_M3Frequencies With DPLL State | 382 |
| 3-42. | CLKOUTX2_Mn Frequencies With DPLL State | 383 |
| 3-43. | DPLL Power Modes | 384 |
| 3-44. | DPLL Recalibration Control Parameters | 386 |
| 3-45. | DPLL SSC Control Parameters | 388 |
| 3-46. | DPLL Power-Down Control Parameters | 393 |
| 3-47. | DPLL_PER Clock Synthesis Parameters | 394 |
| 3-48. | DPLL_PER Clock Output Parameters | 394 |
| 3-49. | DPLL_PER Modes..... | 395 |
| 3-50. | DPLL_PER Mode Control Parameters | 396 |
| 3-51. | DPLL_PER Recalibration Feature Parameters | 396 |
| 3-52. | DPLL_PER Spread-Spectrum Clocking Feature Parameters..... | 396 |
| 3-53. | DPLL_PER Clock Output Power-down Parameters..... | 396 |
| 3-54. | DPLL_PER Preferred Settings for SYS_CLK = 38.4 MHz | 397 |
| 3-55. | DPLL_PER Preferred Settings for SYS_CLK = 26.0 MHz | 397 |
| 3-56. | DPLL_PER Preferred Settings for SYS_CLK = 19.2 MHz | 398 |
| 3-57. | DPLL_PER Preferred Settings for SYS_CLK = 16.8 MHz | 398 |
| 3-58. | DPLL_PER Preferred Settings for SYS_CLK = 12.0 MHz | 398 |
| 3-59. | DPLL_CORE Clock Synthesis Parameters..... | 400 |
| 3-60. | DPLL_CORE Clock Output Parameters | 400 |
| 3-61. | DPLL_CORE Modes..... | 401 |
| 3-62. | DPLL_CORE Mode Control Parameters..... | 402 |
| 3-63. | DPLL_CORE Recalibration Feature Parameters | 402 |
| 3-64. | DPLL_CORE Spread-Spectrum Clocking Feature Parameters | 402 |
| 3-65. | DPLL_CORE Clock Output Power-Down Parameters | 403 |
| 3-66. | DPLL_CORE Preferred Settings for SYS_CLK = 38.4 MHz | 404 |
| 3-67. | DPLL_CORE Preferred Settings for SYS_CLK = 26.0 MHz | 404 |
| 3-68. | DPLL_CORE Preferred Settings for SYS_CLK = 19.2 MHz | 405 |
| 3-69. | DPLL_CORE Preferred Settings for SYS_CLK = 16.8 MHz | 405 |
| 3-70. | DPLL_CORE Preferred Settings for SYS_CLK = 12.0 MHz | 406 |
| 3-71. | DPLL_ABE Clock Synthesis Parameters | 407 |
| 3-72. | DPLL_ABE Clock Output Parameters..... | 407 |
| 3-73. | DPLL_ABE Modes | 408 |
| 3-74. | DPLL_ABE Mode Control Parameters | 408 |
| 3-75. | DPLL_ABE Recalibration Feature Parameters | 408 |
| 3-76. | DPLL_ABE Spread-Spectrum Clocking Feature Parameters | 408 |

| | |
|---|-----|
| 3-77. DPLL_ABE Preferred Settings for SYS_CLK = 38.4 MHz | 409 |
| 3-78. DPLL_ABE Preferred Settings for SYS_CLK = 26.0 MHz | 409 |
| 3-79. DPLL_ABE Preferred Settings for SYS_CLK = 19.2 MHz | 409 |
| 3-80. DPLL_ABE Preferred Settings for SYS_CLK = 16.8 MHz | 409 |
| 3-81. DPLL_ABE Preferred Settings for SYS_CLK = 12.0 MHz | 410 |
| 3-82. MPU SS Clock Division Control | 410 |
| 3-83. DPLL_MPU Clock Synthesis Parameters | 411 |
| 3-84. DPLL_MPU Clock Output Parameters | 411 |
| 3-85. DPLL_MPU Modes | 411 |
| 3-86. DPLL_MPU Mode Control Parameters | 412 |
| 3-87. DPLL_MPU Recalibration Feature Parameters | 412 |
| 3-88. DPLL_MPU Spread-Spectrum Clocking Feature Parameters | 412 |
| 3-89. DPLL_MPU Preferred Settings for SYS_CLK = 38.4 MHz | 412 |
| 3-90. DPLL_MPU Preferred Settings for SYS_CLK = 26.0 MHz | 413 |
| 3-91. DPLL_MPU Preferred Settings for SYS_CLK = 19.2 MHz | 413 |
| 3-92. DPLL_MPU Preferred Settings for SYS_CLK = 16.8 MHz | 413 |
| 3-93. DPLL_MPU Preferred Settings for SYS_CLK = 12.0 MHz | 413 |
| 3-94. DPLL_IVA Clock Synthesis Parameters | 414 |
| 3-95. DPLL_IVA Clock Output Parameters | 414 |
| 3-96. DPLL_IVA Modes | 415 |
| 3-97. DPLL_IVA Mode Control Parameters | 415 |
| 3-98. DPLL_IVA Recalibration Feature Parameters | 415 |
| 3-99. DPLL_IVA Spread-Spectrum Clocking Feature Parameters | 415 |
| 3-100. DPLL_IVA Clock Output Power-down Parameters | 416 |
| 3-101. DPLL_IVA Preferred Settings for SYS_CLK = 38.4 MHz | 416 |
| 3-102. DPLL_IVA Preferred Settings for SYS_CLK = 26.0 MHz | 416 |
| 3-103. DPLL_IVA Preferred Settings for SYS_CLK = 19.2 MHz | 416 |
| 3-104. DPLL_IVA Preferred Settings for SYS_CLK = 16.8 MHz | 417 |
| 3-105. DPLL_IVA Preferred Settings for SYS_CLK = 12.0 MHz | 417 |
| 3-106. DPLL_USB Clock Synthesis Parameters | 418 |
| 3-107. DPLL_USB Clock Output Parameters | 418 |
| 3-108. DPLL_USB Modes | 418 |
| 3-109. DPLL_USB Mode Control Parameters | 418 |
| 3-110. DPLL_USB Spread-Spectrum Clocking Feature Parameters | 418 |
| 3-111. DPLL_USB Preferred Settings for SYS_CLK = 38.4 MHz | 419 |
| 3-112. DPLL_USB Preferred Settings for SYS_CLK = 26.0 MHz | 419 |
| 3-113. DPLL_USB Preferred Settings for SYS_CLK = 19.2 MHz | 419 |
| 3-114. DPLL_USB Preferred Settings for SYS_CLK = 16.8 MHz | 419 |
| 3-115. DPLL_USB Preferred Settings for SYS_CLK = 12.0 MHz | 419 |
| 3-116. CD_WKUP Clock Domain Modes | 422 |
| 3-117. CD_WKUP Control and Status Parameters | 422 |
| 3-118. CD_WKUP Wake-Up Dependency Association Parameters | 422 |
| 3-119. CD_WKUP Modules Clocks Association | 423 |
| 3-120. CD_WKUP Modules Wake-Up Request | 423 |
| 3-121. CD_WKUP Modules Clock-Management Modes and Control | 423 |
| 3-122. CD_WKUP Modules Slave Clock-Management Modes and Control | 424 |
| 3-123. CD_DSP Clock Domain Modes | 425 |
| 3-124. CD_DSP Control and Status Parameters | 425 |
| 3-125. CD_DSP Static Dependency Association Parameters | 425 |

| | |
|---|-----|
| 3-126. CD_DSP Dynamic Dependency Association Parameters | 426 |
| 3-127. CD_DSP Modules Clocks Association | 426 |
| 3-128. CD_DSP Modules Wake-Up Request..... | 426 |
| 3-129. CD_DSP Modules Clock-Management Modes and Control..... | 426 |
| 3-130. CD_DSP Modules Slave Clock-Management Modes and Control | 427 |
| 3-131. CD_STD_EFUSE Modules Clocks Association..... | 427 |
| 3-132. CD_STD_EFUSE Modules Wake-Up Request | 428 |
| 3-133. CD_CORTEXA9 Clock Domain Modes | 428 |
| 3-134. CD_CORTEXA9 Control and Status Parameters | 428 |
| 3-135. CD_CORTEXA9 Static Dependency Association Parameters..... | 429 |
| 3-136. CD_CORTEXA9 Dynamic Dependency Association Parameters | 429 |
| 3-137. CD_CORTEXA9 Modules Clocks Association | 429 |
| 3-138. CD_CORTEXA9 Modules Wake-Up Request..... | 430 |
| 3-139. CD_CORTEXA9 Modules Clock-Management Modes and Control..... | 430 |
| 3-140. CD_CORTEXA9 Modules Slave Clock-Management Modes and Control | 430 |
| 3-141. CD_L4_PER Clock Domain Modes | 431 |
| 3-142. CD_L4_PER Control and Status Parameters | 431 |
| 3-143. CD_L4_PER Dynamic Dependency Association Parameters | 432 |
| 3-144. CD_L4_PER Wake-Up Dependency Association Parameters..... | 432 |
| 3-145. CD_L4_PER Modules Clocks Association..... | 437 |
| 3-146. CD_L4_PER Modules Wake-Up Request | 438 |
| 3-147. CD_L4_PER Modules Clock-Management Modes and Control | 439 |
| 3-148. CD_L4_PER Modules Slave Clock-Management Modes and Control..... | 440 |
| 3-149. CD_L3_INIT Clock Domain Modes | 443 |
| 3-150. CD_L3_INIT Control and Status Parameters | 443 |
| 3-151. CD_L3_INIT Static Dependency Association Parameters..... | 444 |
| 3-152. CD_L3_INIT Dynamic Dependency Association Parameters | 444 |
| 3-153. CD_L3_INIT Wake-Up Dependency Association Parameters | 445 |
| 3-154. CD_L3_INIT Modules Clocks Association | 446 |
| 3-155. CD_L3_INIT Modules Wake-Up Request..... | 447 |
| 3-156. CD_L3_INIT Modules Clock-Management Modes and Control..... | 447 |
| 3-157. CD_L3_INIT Modules Slave Clock-Management Modes and Control | 448 |
| 3-158. CD_IVAHD Clock Domain Modes | 449 |
| 3-159. CD_IVAHD Control and Status Parameters | 449 |
| 3-160. CD_IVAHD Static Dependency Association Parameters | 449 |
| 3-161. CD_IVAHD Dynamic Dependency Association Parameters | 449 |
| 3-162. CD_IVAHD Modules Clocks Association | 449 |
| 3-163. CD_IVAHD Modules Wake-Up Request..... | 450 |
| 3-164. CD_IVAHD Modules Clock-Management Modes and Control | 450 |
| 3-165. CD_IVAHD Modules Slave Clock-Management Modes and Control | 450 |
| 3-166. CD_SGX Clock Domain Modes | 451 |
| 3-167. CD_SGX Control and Status Parameters | 451 |
| 3-168. CD_SGX Static Dependency Association Parameters | 451 |
| 3-169. CD_SGX Dynamic Dependency Association Parameters..... | 451 |
| 3-170. CD_SGX Modules Clocks Association | 452 |
| 3-171. CD_SGX Modules Wake-Up Request | 452 |
| 3-172. CD_SGX Modules Clock-Management Modes and Control | 452 |
| 3-173. CD_SGX Modules Slave Clock-Management Modes and Control | 452 |
| 3-174. CD_EMU Clock Division and Muxing Control | 453 |

| | |
|---|-----|
| 3-175. CD_EMU Clock Domain Modes..... | 453 |
| 3-176. CD_EMU Control and Status Parameters | 454 |
| 3-177. CD_EMU Dynamic Dependency Association Parameters | 454 |
| 3-178. CD_EMU Modules Clocks Association..... | 454 |
| 3-179. CD_EMU Modules Wake-Up Request | 454 |
| 3-180. CD_DSS Clock Domain Modes | 455 |
| 3-181. CD_DSS Control and Status Parameters | 455 |
| 3-182. CD_DSS Static Dependency Association Parameters..... | 456 |
| 3-183. CD_DSS Dynamic Dependency Association Parameters | 456 |
| 3-184. CD_DSS Wake-Up Dependency Association Parameters | 456 |
| 3-185. CD_DSS Modules Clocks Association | 457 |
| 3-186. CD_DSS Modules Wake-Up Request..... | 458 |
| 3-187. CD_DSS Modules Clock-Management Modes and Control..... | 458 |
| 3-188. CD_DSS Modules Slave Clock-Management Modes and Control | 458 |
| 3-189. CD_L4_CFG Clock Domain Modes | 459 |
| 3-190. CD_L4_CFG Control and Status Parameters | 459 |
| 3-191. CD_L4_CFG Dynamic Dependency Association Parameters | 459 |
| 3-192. CD_L4_CFG Modules Clocks Association | 459 |
| 3-193. CD_L4_CFG Modules Wake-Up Request | 460 |
| 3-194. CD_L4_CFG Modules Clock-Management Modes and Control | 460 |
| 3-195. CD_L4_CFG Modules Slave Clock-Management Modes and Control | 460 |
| 3-196. CD_L3_INSTR Clock Domain Modes | 461 |
| 3-197. CD_L3_INSTR Control and Status Parameters | 461 |
| 3-198. CD_L3_INSTR Modules Clocks Association | 461 |
| 3-199. CD_L3_INSTR Modules Wake-Up Request..... | 462 |
| 3-200. CD_L3_INSTR Modules Clock-Management Modes and Control..... | 462 |
| 3-201. CD_L3_INSTR Modules Slave Clock-Management Modes and Control | 462 |
| 3-202. CD_L3_2 Clock Domain Modes | 463 |
| 3-203. CD_L3_2 Control and Status Parameters | 463 |
| 3-204. CD_L3_2 Dynamic Dependency Association Parameters | 463 |
| 3-205. CD_L3_2 Modules Clocks Association..... | 464 |
| 3-206. CD_L3_2 Modules Wake-Up Request | 464 |
| 3-207. CD_L3_2 Modules Clock-Management Modes and Control | 464 |
| 3-208. CD_L3_2 Modules Slave Clock Management Modes and Control..... | 464 |
| 3-209. CD_L3_1 Clock Domain Modes | 465 |
| 3-210. CD_L3_1 Control and Status Parameters | 465 |
| 3-211. CD_L3_1 Dynamic Dependency Association Parameters | 466 |
| 3-212. CD_L3_1 Modules Clocks Association..... | 466 |
| 3-213. CD_L3_1 Modules Wake-Up Request | 466 |
| 3-214. CD_L3_1 Modules Clock Management Modes and Control | 466 |
| 3-215. CD_L3_1 Modules Slave Clock Management Modes and Control..... | 466 |
| 3-216. CD_EMIF Clock Domain Modes | 467 |
| 3-217. CD_EMIF Control and Status Parameters..... | 467 |
| 3-218. CD_EMIF Modules Clocks Association | 467 |
| 3-219. CD_EMIF Modules Wake-Up Request..... | 468 |
| 3-220. CD_EMIF Modules Clock-Management Modes and Control..... | 468 |
| 3-221. CD_EMIF Modules Slave Clock-Management Modes and Control | 468 |
| 3-222. CD_CORTEXM3 Clock Domain Modes..... | 469 |
| 3-223. CD_CORTEXM3 Control and Status Parameters | 469 |

| | |
|--|-----|
| 3-224. CD_CORTEXM3 Static Dependency Association Parameters | 470 |
| 3-225. CD_CORTEXM3 Dynamic Dependency Association Parameters | 470 |
| 3-226. CD_CORTEXM3 Modules Clocks Association..... | 471 |
| 3-227. CD_CORTEXM3 Modules Wake-Up Request | 471 |
| 3-228. CD_CORTEXM3 Modules Clock-Management Modes and Control | 471 |
| 3-229. CD_CORTEXM3 Modules Slave Clock-Management Modes and Control..... | 471 |
| 3-230. CD_DMA Clock Domain Modes..... | 472 |
| 3-231. CD_DMA Control and Status Parameters | 472 |
| 3-232. CD_DMA Modules Clocks Association..... | 472 |
| 3-233. CD_DMA Modules Wake-Up Request | 472 |
| 3-234. CD_DMA Modules Clock-Management Modes and Control | 473 |
| 3-235. CD_DMA Modules Slave Clock Management Modes and Control..... | 473 |
| 3-236. CD_C2C Clock Domain Modes | 473 |
| 3-237. CD_C2C Control and Status Parameters..... | 474 |
| 3-238. CD_C2C Static Dependency Association Parameters..... | 474 |
| 3-239. CD_C2C Dynamic Dependency Association Parameters | 474 |
| 3-240. CD_C2C Modules Clocks Association | 475 |
| 3-241. CD_C2C Modules Wake-Up Request..... | 475 |
| 3-242. CD_C2C Modules Clock-Management Modes and Control | 475 |
| 3-243. CD_C2C Modules Slave Clock-Management Modes and Control | 475 |
| 3-244. CD_CAM Clock Domain Modes..... | 476 |
| 3-245. CD_CAM Control and Status Parameters | 476 |
| 3-246. CD_CAM Static Dependency Association Parameters | 476 |
| 3-247. CD_CAM Dynamic Dependency Association Parameters | 477 |
| 3-248. CD_CAM Modules Clocks Association..... | 477 |
| 3-249. CD_CAM Modules Wake-Up Request | 477 |
| 3-250. CD_CAM Modules Clock-Management Modes and Control | 477 |
| 3-251. CD_CAM Modules Slave Clock-Management Modes and Control..... | 478 |
| 3-252. CD_ABE Clock Domain Modes | 478 |
| 3-253. CD_ABE Control and Status Parameters..... | 479 |
| 3-254. CD_ABE Wake-Up Dependency Association Parameters | 479 |
| 3-255. CD_ABE Modules Clocks Association | 481 |
| 3-256. CD_ABE Modules Wake-Up Request..... | 482 |
| 3-257. CD_ABE Modules Clock-Management Modes and Control | 483 |
| 3-258. CD_ABE Modules Slave Clock-Management Modes and Control | 483 |
| 3-259. CD_L4_ALWON_CORE Wake-Up Dependency Association Parameters | 485 |
| 3-260. CD_L4_ALWON_CORE Modules Clocks Association | 485 |
| 3-261. CD_L4_ALWON_CORE Modules Wake-Up Request | 485 |
| 3-262. CD_L4_ALWON_CORE Modules Clock-Management Modes and Control | 486 |
| 3-263. CD_L4_ALWON_CORE Modules Slave Clock-Management Modes and Control | 486 |
| 3-264. PD_WKUP Modules Power Attributes | 487 |
| 3-265. PD_DSP Modules Power Attributes | 488 |
| 3-266. PD_DSP Logic Area Power Modes..... | 488 |
| 3-267. PD_DSP Memory Area Power Modes | 488 |
| 3-268. PD_DSP Power Modes Control Parameters | 488 |
| 3-269. PD_DSP Power Modes Status Parameters | 489 |
| 3-270. PD_STD_EFUSE Modules Power Attributes..... | 489 |
| 3-271. PD_MPU Modules Power Attributes..... | 490 |
| 3-272. PD_MPU Logic Area Power Modes | 490 |

| | |
|--|-----|
| 3-273. PD_MPU Memory Area Power Modes | 490 |
| 3-274. PD_MPU Power Modes Control Parameters..... | 490 |
| 3-275. PD_MPU Power Modes Status Parameters..... | 491 |
| 3-276. PD_L4_PER Modules Power Attributes | 491 |
| 3-277. PD_L4_PER Logic Area Power Modes | 493 |
| 3-278. PD_L4_PER Memory Area Power Modes..... | 493 |
| 3-279. PD_L4_PER Power Modes Control Parameters..... | 493 |
| 3-280. PD_L4_PER Power Modes Status Parameters..... | 494 |
| 3-281. PD_L3_INIT Modules Power Attributes | 494 |
| 3-282. PD_L3_INIT Logic Area Power Modes | 495 |
| 3-283. PD_L3_INIT Memory Area Power Modes | 495 |
| 3-284. PD_L3_INIT Power Modes Control Parameters | 495 |
| 3-285. PD_L3_INIT Power Modes Status Parameters | 495 |
| 3-286. PD_IVAHD Modules Power Attributes | 496 |
| 3-287. PD_IVAHD Logic Area Power Modes | 496 |
| 3-288. PD_IVAHD Memory Area Power Modes..... | 496 |
| 3-289. PD_IVAHD Power Modes Control Parameters | 497 |
| 3-290. PD_IVAHD Power Modes Status Parameters | 497 |
| 3-291. PD_SGX Modules Power Attributes | 498 |
| 3-292. PD_SGX Logic Area Power Modes | 498 |
| 3-293. PD_SGX Memory Area Power Modes | 498 |
| 3-294. PD_SGX Power Modes Control Parameters..... | 498 |
| 3-295. PD_SGX Power Modes Status Parameters | 498 |
| 3-296. PD_EMU Modules Power Attributes..... | 499 |
| 3-297. PD_EMU Logic Area Power Modes | 499 |
| 3-298. PD_EMU Memory Area Power Modes..... | 499 |
| 3-299. PD_EMU Power Modes Control Parameters..... | 499 |
| 3-300. PD_EMU Power Modes Status Parameters..... | 500 |
| 3-301. PD_DSS Modules Power Attributes | 500 |
| 3-302. PD_DSS Logic Area Power Modes..... | 500 |
| 3-303. PD_DSS Memory Area Power Modes | 500 |
| 3-304. PD_DSS Power Modes Control Parameters | 501 |
| 3-305. PD_DSS Power Modes Status Parameters | 501 |
| 3-306. PD_CORE Modules Power Attributes | 502 |
| 3-307. PD_CORE Logic Area Power Modes | 503 |
| 3-308. PD_CORE Memory Area Power Modes | 503 |
| 3-309. PD_CORE Power Modes Control Parameters..... | 503 |
| 3-310. PD_CORE Power Modes Status Parameters | 504 |
| 3-311. PD_CAM Modules Power Attributes..... | 505 |
| 3-312. PD_CAM Logic Area Power Modes | 505 |
| 3-313. PD_CAM Memory Area Power Modes..... | 505 |
| 3-314. PD_CAM Power Modes Control Parameters..... | 505 |
| 3-315. PD_CAM Power Modes Status Parameters..... | 505 |
| 3-316. PD_AUDIO Modules Power Attributes | 506 |
| 3-317. PD_AUDIO Logic Area Power Modes..... | 507 |
| 3-318. PD_AUDIO Memory Area Power Modes | 507 |
| 3-319. PD_AUDIO Power Modes Control Parameters | 507 |
| 3-320. PD_AUDIO Power Modes Status Parameters | 507 |
| 3-321. PD_ALWON_MPU Modules Power Attributes | 508 |

| | |
|--|-----|
| 3-322. PD_ALWON_DSP Modules Power Attributes | 508 |
| 3-323. PD_ALWON_CORE Modules Power Attributes | 509 |
| 3-324. Supported DVFS OPPs Summary | 510 |
| 3-325. SmartReflex Interrupt Events | 517 |
| 3-326. SmartReflex Interrupt Events Enable and Status Bits | 517 |
| 3-327. Voltage Processor Interrupt Events | 519 |
| 3-328. Voltage Processor Interrupt Event Enable and Status Bits | 520 |
| 3-329. Voltage Processor Status | 520 |
| 3-330. Voltage Processor Parameters | 520 |
| 3-331. Wake-Up Sources During Device Low Power Mode | 532 |
| 3-332. Device Off Wake-Up and Hardware Restore Phases | 536 |
| 3-333. Global Initialization of Surrounding Modules | 541 |
| 3-334. DPLL Global Initialization | 541 |
| 3-335. DPLL SSC Parameter Configuration | 541 |
| 3-336. DPLL Recalibration Parameter Configuration | 542 |
| 3-337. DPLL Synthesized Clock Parameter Configuration | 542 |
| 3-338. DPLL Output Clock Parameter Configuration | 542 |
| 3-339. Register Call Summary for Sequence – DPLL Output Frequency Change | 546 |
| 3-340. Subprocess Call Summary for Sequence – DPLL Output Frequency Change | 546 |
| 3-341. Global Initialization of Surrounding Modules | 546 |
| 3-342. Clock Domain Global Initialization | 546 |
| 3-343. Slave Module Clock-Management Parameter Configuration | 547 |
| 3-344. Clock Domain Sleep Transition and Troubleshooting | 547 |
| 3-345. Enable/Disable Software-Programmable Static Dependency | 547 |
| 3-346. Power Domain Global Initialization | 548 |
| 3-347. Forced Memory Area State Change With Power Domain ON | 548 |
| 3-348. Forced Memory Area State Change With Power Domain On | 549 |
| 3-349. Power Domain Global Initialization | 549 |
| 3-350. SmartReflex Module Configuration | 549 |
| 3-351. SmartReflex Module Clock Configuration | 550 |
| 3-352. SmartReflex Module Sensor Configuration | 550 |
| 3-353. Accumulator and Min/Max/Avg Configuration | 550 |
| 3-354. Error Generator Configuration | 550 |
| 3-355. Interrupt Generator Configuration | 551 |
| 3-356. Voltage Processor Module Initialization | 551 |
| 3-357. Error-to-Voltage Converter Configuration | 551 |
| 3-358. FSM Configuration | 552 |
| 3-359. Voltage Controller Module Initialization | 552 |
| 3-360. VDD Channel Pointer Configuration | 552 |
| 3-361. I ² C Configuration | 553 |
| 3-362. Disable the Error Generator | 553 |
| 3-363. Disable the Voltage Processor | 553 |
| 3-364. Disable the SmartReflex Module | 553 |
| 3-365. Initial Settings | 554 |
| 3-366. Transition From Lower OPP to Higher OPP | 554 |
| 3-367. Transition From Higher OPP to Lower OPP | 555 |
| 3-368. PRM Instance Summary | 557 |
| 3-369. INTRCONN_SOCKET_PRM Registers Mapping Summary | 557 |
| 3-370. REVISION_PRM | 558 |

| | |
|--|-----|
| 3-371. Register Call Summary for Register REVISION_PRM..... | 558 |
| 3-372. PRM_IRQSTATUS_MPU_A9 | 558 |
| 3-373. Register Call Summary for Register PRM_IRQSTATUS_MPU_A9..... | 561 |
| 3-374. PRM_IRQSTATUS_MPU_A9_2 | 561 |
| 3-375. Register Call Summary for Register PRM_IRQSTATUS_MPU_A9_2..... | 562 |
| 3-376. PRM_IRQENABLE_MPU_A9 | 562 |
| 3-377. Register Call Summary for Register PRM_IRQENABLE_MPU_A9..... | 565 |
| 3-378. PRM_IRQENABLE_MPU_A9_2 | 565 |
| 3-379. Register Call Summary for Register PRM_IRQENABLE_MPU_A9_2..... | 566 |
| 3-380. PRM_IRQSTATUS_MPU_M3..... | 566 |
| 3-381. Register Call Summary for Register PRM_IRQSTATUS_MPU_M3 | 569 |
| 3-382. PRM_IRQENABLE_MPU_M3..... | 569 |
| 3-383. Register Call Summary for Register PRM_IRQENABLE_MPU_M3 | 571 |
| 3-384. PRM_IRQSTATUS_DSP | 572 |
| 3-385. Register Call Summary for Register PRM_IRQSTATUS_DSP | 572 |
| 3-386. PRM_IRQENABLE_DSP | 572 |
| 3-387. Register Call Summary for Register PRM_IRQENABLE_DSP | 573 |
| 3-388. CM_PRM_PROFILING_CLKCTRL | 573 |
| 3-389. Register Call Summary for Register CM_PRM_PROFILING_CLKCTRL | 574 |
| 3-390. PRM_DEBUG_CFG | 574 |
| 3-391. Register Call Summary for Register PRM_DEBUG_CFG..... | 574 |
| 3-392. CKGEN_PRM Registers Mapping Summary..... | 576 |
| 3-393. CM_ABE_DSS_SYS_CLKSEL..... | 576 |
| 3-394. Register Call Summary for Register CM_ABE_DSS_SYS_CLKSEL | 576 |
| 3-395. CM_L4_WKUP_CLKSEL | 576 |
| 3-396. Register Call Summary for Register CM_L4_WKUP_CLKSEL..... | 577 |
| 3-397. CM_ABE_PLL_REF_CLKSEL | 577 |
| 3-398. Register Call Summary for Register CM_ABE_PLL_REF_CLKSEL..... | 577 |
| 3-399. CM_SYS_CLKSEL..... | 577 |
| 3-400. Register Call Summary for Register CM_SYS_CLKSEL | 578 |
| 3-401. MPU_PRM Registers Mapping Summary | 578 |
| 3-402. PM_MPU_PWRSTCTRL..... | 578 |
| 3-403. Register Call Summary for Register PM_MPU_PWRSTCTRL | 579 |
| 3-404. PM_MPU_PWRSTST | 580 |
| 3-405. Register Call Summary for Register PM_MPU_PWRSTST | 581 |
| 3-406. RM_MPU_RSTST | 581 |
| 3-407. Register Call Summary for Register RM_MPU_RSTST | 581 |
| 3-408. RM_MPU_MPU_CONTEXT | 581 |
| 3-409. Register Call Summary for Register RM_MPU_MPU_CONTEXT | 582 |
| 3-410. DSP_PRM Registers Mapping Summary..... | 582 |
| 3-411. PM_DSP_PWRSTCTRL | 583 |
| 3-412. Register Call Summary for Register PM_DSP_PWRSTCTRL..... | 584 |
| 3-413. PM_DSP_PWRSTST..... | 584 |
| 3-414. Register Call Summary for Register PM_DSP_PWRSTST | 585 |
| 3-415. RM_DSP_RSTCTRL | 585 |
| 3-416. Register Call Summary for Register RM_DSP_RSTCTRL..... | 586 |
| 3-417. RM_DSP_RSTST | 586 |
| 3-418. Register Call Summary for Register RM_DSP_RSTST | 587 |
| 3-419. RM_DSP_DSP_CONTEXT | 587 |

| | |
|---|-----|
| 3-420. Register Call Summary for Register RM_DSP_DSP_CONTEXT | 588 |
| 3-421. ABE_PRM Registers Mapping Summary | 588 |
| 3-422. PM_ABE_PWRSTCTRL | 589 |
| 3-423. Register Call Summary for Register PM_ABE_PWRSTCTRL | 590 |
| 3-424. PM_ABE_PWRSTST | 590 |
| 3-425. Register Call Summary for Register PM_ABE_PWRSTST | 591 |
| 3-426. RM_ABE_AESS_CONTEXT | 591 |
| 3-427. Register Call Summary for Register RM_ABE_AESS_CONTEXT | 591 |
| 3-428. PM_ABE_PDM_WKDEP | 592 |
| 3-429. Register Call Summary for Register PM_ABE_PDM_WKDEP | 592 |
| 3-430. RM_ABE_PDM_CONTEXT | 593 |
| 3-431. Register Call Summary for Register RM_ABE_PDM_CONTEXT | 593 |
| 3-432. PM_ABE_DMIC_WKDEP | 593 |
| 3-433. Register Call Summary for Register PM_ABE_DMIC_WKDEP | 594 |
| 3-434. RM_ABE_DMIC_CONTEXT | 594 |
| 3-435. Register Call Summary for Register RM_ABE_DMIC_CONTEXT | 595 |
| 3-436. PM_ABE_MCASP_WKDEP | 595 |
| 3-437. Register Call Summary for Register PM_ABE_MCASP_WKDEP | 596 |
| 3-438. RM_ABE_MCASP_CONTEXT | 596 |
| 3-439. Register Call Summary for Register RM_ABE_MCASP_CONTEXT | 597 |
| 3-440. PM_ABE_MCBSP1_WKDEP | 597 |
| 3-441. Register Call Summary for Register PM_ABE_MCBSP1_WKDEP | 597 |
| 3-442. RM_ABE_MCBSP1_CONTEXT | 598 |
| 3-443. Register Call Summary for Register RM_ABE_MCBSP1_CONTEXT | 598 |
| 3-444. PM_ABE_MCBSP2_WKDEP | 598 |
| 3-445. Register Call Summary for Register PM_ABE_MCBSP2_WKDEP | 599 |
| 3-446. RM_ABE_MCBSP2_CONTEXT | 599 |
| 3-447. Register Call Summary for Register RM_ABE_MCBSP2_CONTEXT | 600 |
| 3-448. PM_ABE_MCBSP3_WKDEP | 600 |
| 3-449. Register Call Summary for Register PM_ABE_MCBSP3_WKDEP | 601 |
| 3-450. RM_ABE_MCBSP3_CONTEXT | 601 |
| 3-451. Register Call Summary for Register RM_ABE_MCBSP3_CONTEXT | 601 |
| 3-452. PM_ABE_SLIMBUS_WKDEP | 602 |
| 3-453. Register Call Summary for Register PM_ABE_SLIMBUS_WKDEP | 602 |
| 3-454. RM_ABE_SLIMBUS_CONTEXT | 603 |
| 3-455. Register Call Summary for Register RM_ABE_SLIMBUS_CONTEXT | 603 |
| 3-456. PM_ABE_GPTIMER5_WKDEP | 603 |
| 3-457. Register Call Summary for Register PM_ABE_GPTIMER5_WKDEP | 604 |
| 3-458. RM_ABE_GPTIMER5_CONTEXT | 604 |
| 3-459. Register Call Summary for Register RM_ABE_GPTIMER5_CONTEXT | 604 |
| 3-460. PM_ABE_GPTIMER6_WKDEP | 605 |
| 3-461. Register Call Summary for Register PM_ABE_GPTIMER6_WKDEP | 605 |
| 3-462. RM_ABE_GPTIMER6_CONTEXT | 605 |
| 3-463. Register Call Summary for Register RM_ABE_GPTIMER6_CONTEXT | 606 |
| 3-464. PM_ABE_GPTIMER7_WKDEP | 606 |
| 3-465. Register Call Summary for Register PM_ABE_GPTIMER7_WKDEP | 606 |
| 3-466. RM_ABE_GPTIMER7_CONTEXT | 607 |
| 3-467. Register Call Summary for Register RM_ABE_GPTIMER7_CONTEXT | 607 |
| 3-468. PM_ABE_GPTIMER8_WKDEP | 607 |

| | |
|--|-----|
| 3-469. Register Call Summary for Register PM_ABE_GPTIMER8_WKDEP | 608 |
| 3-470. RM_ABE_GPTIMER8_CONTEXT | 608 |
| 3-471. Register Call Summary for Register RM_ABE_GPTIMER8_CONTEXT | 608 |
| 3-472. PM_ABE_WDTIMER3_WKDEP | 609 |
| 3-473. Register Call Summary for Register PM_ABE_WDTIMER3_WKDEP | 609 |
| 3-474. RM_ABE_WDTIMER3_CONTEXT | 609 |
| 3-475. Register Call Summary for Register RM_ABE_WDTIMER3_CONTEXT | 610 |
| 3-476. ALWAYS_ON_PRM Registers Mapping Summary | 610 |
| 3-477. PM_ALWON_SR_MPU_WKDEP | 610 |
| 3-478. Register Call Summary for Register PM_ALWON_SR_MPU_WKDEP | 611 |
| 3-479. RM_ALWON_SR_MPU_CONTEXT | 611 |
| 3-480. Register Call Summary for Register RM_ALWON_SR_MPU_CONTEXT | 611 |
| 3-481. PM_ALWON_SR_IVA_WKDEP | 611 |
| 3-482. Register Call Summary for Register PM_ALWON_SR_IVA_WKDEP | 612 |
| 3-483. RM_ALWON_SR_IVA_CONTEXT | 612 |
| 3-484. Register Call Summary for Register RM_ALWON_SR_IVA_CONTEXT | 613 |
| 3-485. PM_ALWON_SR_CORE_WKDEP | 613 |
| 3-486. Register Call Summary for Register PM_ALWON_SR_CORE_WKDEP | 613 |
| 3-487. RM_ALWON_SR_CORE_CONTEXT | 614 |
| 3-488. Register Call Summary for Register RM_ALWON_SR_CORE_CONTEXT | 614 |
| 3-489. CORE_PRM Registers Mapping Summary | 614 |
| 3-490. PM_CORE_PWRSTCTRL | 615 |
| 3-491. Register Call Summary for Register PM_CORE_PWRSTCTRL | 617 |
| 3-492. PM_CORE_PWRSTST | 617 |
| 3-493. Register Call Summary for Register PM_CORE_PWRSTST | 618 |
| 3-494. RM_L3_1_L3_1_CONTEXT | 618 |
| 3-495. Register Call Summary for Register RM_L3_1_L3_1_CONTEXT | 619 |
| 3-496. RM_L3_2_L3_2_CONTEXT | 619 |
| 3-497. Register Call Summary for Register RM_L3_2_L3_2_CONTEXT | 619 |
| 3-498. RM_L3_2_GPMC_CONTEXT | 620 |
| 3-499. Register Call Summary for Register RM_L3_2_GPMC_CONTEXT | 620 |
| 3-500. RM_L3_2_OCMC_RAM_CONTEXT | 620 |
| 3-501. Register Call Summary for Register RM_L3_2_OCMC_RAM_CONTEXT | 621 |
| 3-502. RM_MPU_M3_RSTCTRL | 621 |
| 3-503. Register Call Summary for Register RM_MPU_M3_RSTCTRL | 621 |
| 3-504. RM_MPU_M3_RSTST | 622 |
| 3-505. Register Call Summary for Register RM_MPU_M3_RSTST | 623 |
| 3-506. RM_MPU_M3_MPU_M3_CONTEXT | 623 |
| 3-507. Register Call Summary for Register RM_MPU_M3_MPU_M3_CONTEXT | 623 |
| 3-508. RM_SDMA_SDMA_CONTEXT | 624 |
| 3-509. Register Call Summary for Register RM_SDMA_SDMA_CONTEXT | 624 |
| 3-510. RM_MEMIF_DMM_CONTEXT | 624 |
| 3-511. Register Call Summary for Register RM_MEMIF_DMM_CONTEXT | 625 |
| 3-512. RM_MEMIF_EMIF_FW_CONTEXT | 626 |
| 3-513. Register Call Summary for Register RM_MEMIF_EMIF_FW_CONTEXT | 626 |
| 3-514. RM_MEMIF_EMIF_1_CONTEXT | 626 |
| 3-515. Register Call Summary for Register RM_MEMIF_EMIF_1_CONTEXT | 627 |
| 3-516. RM_MEMIF_EMIF_2_CONTEXT | 627 |
| 3-517. Register Call Summary for Register RM_MEMIF_EMIF_2_CONTEXT | 627 |

| | |
|---|-----|
| 3-518. RM_MEMIF_DLL_CONTEXT | 628 |
| 3-519. Register Call Summary for Register RM_MEMIF_DLL_CONTEXT | 628 |
| 3-520. RM_C2C_C2C_CONTEXT | 628 |
| 3-521. Register Call Summary for Register RM_C2C_C2C_CONTEXT | 629 |
| 3-522. RM_C2C_C2C_FW_CONTEXT | 629 |
| 3-523. Register Call Summary for Register RM_C2C_C2C_FW_CONTEXT | 629 |
| 3-524. RM_L4CFG_L4_CFG_CONTEXT | 630 |
| 3-525. Register Call Summary for Register RM_L4CFG_L4_CFG_CONTEXT | 630 |
| 3-526. RM_L4CFG_SPINLOCK_CONTEXT | 630 |
| 3-527. Register Call Summary for Register RM_L4CFG_SPINLOCK_CONTEXT | 631 |
| 3-528. RM_L4CFG_MAILBOX_CONTEXT | 631 |
| 3-529. Register Call Summary for Register RM_L4CFG_MAILBOX_CONTEXT | 631 |
| 3-530. RM_L4CFG_SAR_ROM_CONTEXT | 632 |
| 3-531. Register Call Summary for Register RM_L4CFG_SAR_ROM_CONTEXT | 632 |
| 3-532. RM_L3INSTR_L3_3_CONTEXT | 632 |
| 3-533. Register Call Summary for Register RM_L3INSTR_L3_3_CONTEXT | 633 |
| 3-534. RM_L3INSTR_L3_INSTR_CONTEXT | 633 |
| 3-535. Register Call Summary for Register RM_L3INSTR_L3_INSTR_CONTEXT | 633 |
| 3-536. RM_L3INSTR_OCP_WP1_CONTEXT | 634 |
| 3-537. Register Call Summary for Register RM_L3INSTR_OCP_WP1_CONTEXT | 634 |
| 3-538. IVAHD_PRM Registers Mapping Summary | 634 |
| 3-539. PM_IVAHD_PWRSTCTRL | 635 |
| 3-540. Register Call Summary for Register PM_IVAHD_PWRSTCTRL | 636 |
| 3-541. PM_IVAHD_PWRSTST | 636 |
| 3-542. Register Call Summary for Register PM_IVAHD_PWRSTST | 637 |
| 3-543. RM_IVAHD_RSTCTRL | 638 |
| 3-544. Register Call Summary for Register RM_IVAHD_RSTCTRL | 638 |
| 3-545. RM_IVAHD_RSTST | 638 |
| 3-546. Register Call Summary for Register RM_IVAHD_RSTST | 639 |
| 3-547. RM_IVAHD_IVAHD_CONTEXT | 639 |
| 3-548. Register Call Summary for Register RM_IVAHD_IVAHD_CONTEXT | 640 |
| 3-549. RM_IVAHD_SL2_CONTEXT | 640 |
| 3-550. Register Call Summary for Register RM_IVAHD_SL2_CONTEXT | 641 |
| 3-551. CAM_PRM Registers Mapping Summary | 641 |
| 3-552. PM_CAM_PWRSTCTRL | 641 |
| 3-553. Register Call Summary for Register PM_CAM_PWRSTCTRL | 642 |
| 3-554. PM_CAM_PWRSTST | 642 |
| 3-555. Register Call Summary for Register PM_CAM_PWRSTST | 643 |
| 3-556. RM_CAM_ISS_CONTEXT | 643 |
| 3-557. Register Call Summary for Register RM_CAM_ISS_CONTEXT | 644 |
| 3-558. RM_CAM_FDIF_CONTEXT | 644 |
| 3-559. Register Call Summary for Register RM_CAM_FDIF_CONTEXT | 644 |
| 3-560. DSS_PRM Registers Mapping Summary | 645 |
| 3-561. PM_DSS_PWRSTCTRL | 645 |
| 3-562. Register Call Summary for Register PM_DSS_PWRSTCTRL | 646 |
| 3-563. PM_DSS_PWRSTST | 646 |
| 3-564. Register Call Summary for Register PM_DSS_PWRSTST | 647 |
| 3-565. PM_DSS_DSS_WKDEP | 647 |
| 3-566. Register Call Summary for Register PM_DSS_DSS_WKDEP | 649 |

| | |
|--|-----|
| 3-567. RM_DSS_DSS_CONTEXT | 649 |
| 3-568. Register Call Summary for Register RM_DSS_DSS_CONTEXT | 650 |
| 3-569. RM_DSS_BB2D_CONTEXT | 650 |
| 3-570. Register Call Summary for Register RM_DSS_BB2D_CONTEXT | 650 |
| 3-571. SGX_PRM Registers Mapping Summary..... | 651 |
| 3-572. PM_SGX_PWRSTCTRL | 651 |
| 3-573. Register Call Summary for Register PM_SGX_PWRSTCTRL | 652 |
| 3-574. PM_SGX_PWRSTST..... | 652 |
| 3-575. Register Call Summary for Register PM_SGX_PWRSTST | 653 |
| 3-576. RM_SGX_SGX_CONTEXT | 653 |
| 3-577. Register Call Summary for Register RM_SGX_SGX_CONTEXT | 653 |
| 3-578. L3INIT_PRM Registers Mapping Summary | 654 |
| 3-579. PM_L3INIT_PWRSTCTRL..... | 655 |
| 3-580. Register Call Summary for Register PM_L3INIT_PWRSTCTRL | 655 |
| 3-581. PM_L3INIT_PWRSTST | 656 |
| 3-582. Register Call Summary for Register PM_L3INIT_PWRSTST..... | 657 |
| 3-583. PM_L3INIT_MMC1_WKDEP | 657 |
| 3-584. Register Call Summary for Register PM_L3INIT_MMC1_WKDEP..... | 657 |
| 3-585. RM_L3INIT_MMC1_CONTEXT | 658 |
| 3-586. Register Call Summary for Register RM_L3INIT_MMC1_CONTEXT | 658 |
| 3-587. PM_L3INIT_MMC2_WKDEP | 658 |
| 3-588. Register Call Summary for Register PM_L3INIT_MMC2_WKDEP..... | 659 |
| 3-589. RM_L3INIT_MMC2_CONTEXT | 659 |
| 3-590. Register Call Summary for Register RM_L3INIT_MMC2_CONTEXT | 660 |
| 3-591. PM_L3INIT_HSI_WKDEP | 660 |
| 3-592. Register Call Summary for Register PM_L3INIT_HSI_WKDEP | 661 |
| 3-593. RM_L3INIT_HSI_CONTEXT | 661 |
| 3-594. Register Call Summary for Register RM_L3INIT_HSI_CONTEXT | 662 |
| 3-595. PM_L3INIT_HSUSBHOST_WKDEP | 662 |
| 3-596. Register Call Summary for Register PM_L3INIT_HSUSBHOST_WKDEP | 662 |
| 3-597. RM_L3INIT_HSUSBHOST_CONTEXT | 663 |
| 3-598. Register Call Summary for Register RM_L3INIT_HSUSBHOST_CONTEXT..... | 663 |
| 3-599. PM_L3INIT_HSUSBOTG_WKDEP | 663 |
| 3-600. Register Call Summary for Register PM_L3INIT_HSUSBOTG_WKDEP | 664 |
| 3-601. RM_L3INIT_HSUSBOTG_CONTEXT..... | 664 |
| 3-602. Register Call Summary for Register RM_L3INIT_HSUSBOTG_CONTEXT | 665 |
| 3-603. PM_L3INIT_HSUSBTLL_WKDEP | 665 |
| 3-604. Register Call Summary for Register PM_L3INIT_HSUSBTLL_WKDEP..... | 665 |
| 3-605. RM_L3INIT_HSUSBTLL_CONTEXT | 666 |
| 3-606. Register Call Summary for Register RM_L3INIT_HSUSBTLL_CONTEXT | 666 |
| 3-607. RM_L3INIT_USBPHY_CONTEXT | 666 |
| 3-608. Register Call Summary for Register RM_L3INIT_USBPHY_CONTEXT | 667 |
| 3-609. L4PER_PRM Registers Mapping Summary..... | 667 |
| 3-610. PM_L4PER_PWRSTCTRL | 669 |
| 3-611. Register Call Summary for Register PM_L4PER_PWRSTCTRL..... | 670 |
| 3-612. PM_L4PER_PWRSTST..... | 670 |
| 3-613. Register Call Summary for Register PM_L4PER_PWRSTST | 671 |
| 3-614. PM_L4PER_GPTIMER10_WKDEP | 671 |
| 3-615. Register Call Summary for Register PM_L4PER_GPTIMER10_WKDEP..... | 672 |

| | |
|---|-----|
| 3-616. RM_L4PER_GPTIMER10_CONTEXT | 672 |
| 3-617. Register Call Summary for Register RM_L4PER_GPTIMER10_CONTEXT..... | 673 |
| 3-618. PM_L4PER_GPTIMER11_WKDEP | 673 |
| 3-619. Register Call Summary for Register PM_L4PER_GPTIMER11_WKDEP..... | 673 |
| 3-620. RM_L4PER_GPTIMER11_CONTEXT | 674 |
| 3-621. Register Call Summary for Register RM_L4PER_GPTIMER11_CONTEXT..... | 674 |
| 3-622. PM_L4PER_GPTIMER2_WKDEP..... | 674 |
| 3-623. Register Call Summary for Register PM_L4PER_GPTIMER2_WKDEP | 675 |
| 3-624. RM_L4PER_GPTIMER2_CONTEXT..... | 675 |
| 3-625. Register Call Summary for Register RM_L4PER_GPTIMER2_CONTEXT | 675 |
| 3-626. PM_L4PER_GPTIMER3_WKDEP..... | 676 |
| 3-627. Register Call Summary for Register PM_L4PER_GPTIMER3_WKDEP | 676 |
| 3-628. RM_L4PER_GPTIMER3_CONTEXT..... | 676 |
| 3-629. Register Call Summary for Register RM_L4PER_GPTIMER3_CONTEXT | 677 |
| 3-630. PM_L4PER_GPTIMER4_WKDEP..... | 677 |
| 3-631. Register Call Summary for Register PM_L4PER_GPTIMER4_WKDEP | 677 |
| 3-632. RM_L4PER_GPTIMER4_CONTEXT..... | 678 |
| 3-633. Register Call Summary for Register RM_L4PER_GPTIMER4_CONTEXT | 678 |
| 3-634. PM_L4PER_GPTIMER9_WKDEP..... | 678 |
| 3-635. Register Call Summary for Register PM_L4PER_GPTIMER9_WKDEP | 679 |
| 3-636. RM_L4PER_GPTIMER9_CONTEXT..... | 679 |
| 3-637. Register Call Summary for Register RM_L4PER_GPTIMER9_CONTEXT | 679 |
| 3-638. RM_L4PER_ELM_CONTEXT | 680 |
| 3-639. Register Call Summary for Register RM_L4PER_ELM_CONTEXT | 680 |
| 3-640. PM_L4PER_GPIO2_WKDEP | 680 |
| 3-641. Register Call Summary for Register PM_L4PER_GPIO2_WKDEP | 681 |
| 3-642. RM_L4PER_GPIO2_CONTEXT | 681 |
| 3-643. Register Call Summary for Register RM_L4PER_GPIO2_CONTEXT..... | 682 |
| 3-644. PM_L4PER_GPIO3_WKDEP | 682 |
| 3-645. Register Call Summary for Register PM_L4PER_GPIO3_WKDEP | 682 |
| 3-646. RM_L4PER_GPIO3_CONTEXT | 683 |
| 3-647. Register Call Summary for Register RM_L4PER_GPIO3_CONTEXT..... | 683 |
| 3-648. PM_L4PER_GPIO4_WKDEP | 683 |
| 3-649. Register Call Summary for Register PM_L4PER_GPIO4_WKDEP..... | 684 |
| 3-650. RM_L4PER_GPIO4_CONTEXT | 684 |
| 3-651. Register Call Summary for Register RM_L4PER_GPIO4_CONTEXT..... | 684 |
| 3-652. PM_L4PER_GPIO5_WKDEP | 685 |
| 3-653. Register Call Summary for Register PM_L4PER_GPIO5_WKDEP..... | 685 |
| 3-654. RM_L4PER_GPIO5_CONTEXT | 685 |
| 3-655. Register Call Summary for Register RM_L4PER_GPIO5_CONTEXT..... | 686 |
| 3-656. PM_L4PER_GPIO6_WKDEP | 686 |
| 3-657. Register Call Summary for Register PM_L4PER_GPIO6_WKDEP..... | 686 |
| 3-658. RM_L4PER_GPIO6_CONTEXT | 687 |
| 3-659. Register Call Summary for Register RM_L4PER_GPIO6_CONTEXT..... | 687 |
| 3-660. RM_L4PER_HDQ1W_CONTEXT | 687 |
| 3-661. Register Call Summary for Register RM_L4PER_HDQ1W_CONTEXT..... | 688 |
| 3-662. PM_L4PER_I2C1_WKDEP | 688 |
| 3-663. Register Call Summary for Register PM_L4PER_I2C1_WKDEP | 689 |
| 3-664. RM_L4PER_I2C1_CONTEXT..... | 689 |

| | |
|---|-----|
| 3-665. Register Call Summary for Register RM_L4PER_I2C1_CONTEXT | 689 |
| 3-666. PM_L4PER_I2C2_WKDEP | 689 |
| 3-667. Register Call Summary for Register PM_L4PER_I2C2_WKDEP | 690 |
| 3-668. RM_L4PER_I2C2_CONTEXT | 690 |
| 3-669. Register Call Summary for Register RM_L4PER_I2C2_CONTEXT | 691 |
| 3-670. PM_L4PER_I2C3_WKDEP | 691 |
| 3-671. Register Call Summary for Register PM_L4PER_I2C3_WKDEP | 692 |
| 3-672. RM_L4PER_I2C3_CONTEXT | 692 |
| 3-673. Register Call Summary for Register RM_L4PER_I2C3_CONTEXT | 692 |
| 3-674. PM_L4PER_I2C4_WKDEP | 692 |
| 3-675. Register Call Summary for Register PM_L4PER_I2C4_WKDEP | 693 |
| 3-676. RM_L4PER_I2C4_CONTEXT | 693 |
| 3-677. Register Call Summary for Register RM_L4PER_I2C4_CONTEXT | 694 |
| 3-678. RM_L4PER_L4_PER_CONTEXT | 694 |
| 3-679. Register Call Summary for Register RM_L4PER_L4_PER_CONTEXT | 694 |
| 3-680. PM_L4PER_MCBSP4_WKDEP | 695 |
| 3-681. Register Call Summary for Register PM_L4PER_MCBSP4_WKDEP | 695 |
| 3-682. RM_L4PER_MCBSP4_CONTEXT | 695 |
| 3-683. Register Call Summary for Register RM_L4PER_MCBSP4_CONTEXT | 696 |
| 3-684. PM_L4PER_MCSPI1_WKDEP | 696 |
| 3-685. Register Call Summary for Register PM_L4PER_MCSPI1_WKDEP | 697 |
| 3-686. RM_L4PER_MCSPI1_CONTEXT | 697 |
| 3-687. Register Call Summary for Register RM_L4PER_MCSPI1_CONTEXT | 698 |
| 3-688. PM_L4PER_MCSPI2_WKDEP | 698 |
| 3-689. Register Call Summary for Register PM_L4PER_MCSPI2_WKDEP | 698 |
| 3-690. RM_L4PER_MCSPI2_CONTEXT | 699 |
| 3-691. Register Call Summary for Register RM_L4PER_MCSPI2_CONTEXT | 699 |
| 3-692. PM_L4PER_MCSPI3_WKDEP | 699 |
| 3-693. Register Call Summary for Register PM_L4PER_MCSPI3_WKDEP | 700 |
| 3-694. RM_L4PER_MCSPI3_CONTEXT | 700 |
| 3-695. Register Call Summary for Register RM_L4PER_MCSPI3_CONTEXT | 700 |
| 3-696. PM_L4PER_MCSPI4_WKDEP | 701 |
| 3-697. Register Call Summary for Register PM_L4PER_MCSPI4_WKDEP | 701 |
| 3-698. RM_L4PER_MCSPI4_CONTEXT | 701 |
| 3-699. Register Call Summary for Register RM_L4PER_MCSPI4_CONTEXT | 702 |
| 3-700. PM_L4PER_MMCS3D3_WKDEP | 702 |
| 3-701. Register Call Summary for Register PM_L4PER_MMCS3D3_WKDEP | 703 |
| 3-702. RM_L4PER_MMCS3D3_CONTEXT | 703 |
| 3-703. Register Call Summary for Register RM_L4PER_MMCS3D3_CONTEXT | 703 |
| 3-704. PM_L4PER_MMCS4D4_WKDEP | 704 |
| 3-705. Register Call Summary for Register PM_L4PER_MMCS4D4_WKDEP | 704 |
| 3-706. RM_L4PER_MMCS4D4_CONTEXT | 705 |
| 3-707. Register Call Summary for Register RM_L4PER_MMCS4D4_CONTEXT | 705 |
| 3-708. PM_L4PER_SLIMBUS2_WKDEP | 705 |
| 3-709. Register Call Summary for Register PM_L4PER_SLIMBUS2_WKDEP | 706 |
| 3-710. RM_L4PER_SLIMBUS2_CONTEXT | 707 |
| 3-711. Register Call Summary for Register RM_L4PER_SLIMBUS2_CONTEXT | 707 |
| 3-712. PM_L4PER_UART1_WKDEP | 707 |
| 3-713. Register Call Summary for Register PM_L4PER_UART1_WKDEP | 708 |

| | |
|--|-----|
| 3-714. RM_L4PER_UART1_CONTEXT | 708 |
| 3-715. Register Call Summary for Register RM_L4PER_UART1_CONTEXT | 709 |
| 3-716. PM_L4PER_UART2_WKDEP | 709 |
| 3-717. Register Call Summary for Register PM_L4PER_UART2_WKDEP | 710 |
| 3-718. RM_L4PER_UART2_CONTEXT | 710 |
| 3-719. Register Call Summary for Register RM_L4PER_UART2_CONTEXT | 710 |
| 3-720. PM_L4PER_UART3_WKDEP | 711 |
| 3-721. Register Call Summary for Register PM_L4PER_UART3_WKDEP | 711 |
| 3-722. RM_L4PER_UART3_CONTEXT | 712 |
| 3-723. Register Call Summary for Register RM_L4PER_UART3_CONTEXT | 712 |
| 3-724. PM_L4PER_UART4_WKDEP | 712 |
| 3-725. Register Call Summary for Register PM_L4PER_UART4_WKDEP | 713 |
| 3-726. RM_L4PER_UART4_CONTEXT | 713 |
| 3-727. Register Call Summary for Register RM_L4PER_UART4_CONTEXT | 714 |
| 3-728. PM_L4PER_MMCS5_WKDEP | 714 |
| 3-729. Register Call Summary for Register PM_L4PER_MMCS5_WKDEP | 715 |
| 3-730. RM_L4PER_MMCS5_CONTEXT | 715 |
| 3-731. Register Call Summary for Register RM_L4PER_MMCS5_CONTEXT | 715 |
| 3-732. WKUP_PRM Registers Mapping Summary | 716 |
| 3-733. RM_WKUP_L4WKUP_CONTEXT | 716 |
| 3-734. Register Call Summary for Register RM_WKUP_L4WKUP_CONTEXT | 717 |
| 3-735. PM_WKUP_WDTIMER2_WKDEP | 717 |
| 3-736. Register Call Summary for Register PM_WKUP_WDTIMER2_WKDEP | 717 |
| 3-737. RM_WKUP_WDTIMER2_CONTEXT | 718 |
| 3-738. Register Call Summary for Register RM_WKUP_WDTIMER2_CONTEXT | 718 |
| 3-739. PM_WKUP_GPIO1_WKDEP | 718 |
| 3-740. Register Call Summary for Register PM_WKUP_GPIO1_WKDEP | 719 |
| 3-741. RM_WKUP_GPIO1_CONTEXT | 719 |
| 3-742. Register Call Summary for Register RM_WKUP_GPIO1_CONTEXT | 719 |
| 3-743. PM_WKUP_GPTIMER1_WKDEP | 720 |
| 3-744. Register Call Summary for Register PM_WKUP_GPTIMER1_WKDEP | 720 |
| 3-745. RM_WKUP_GPTIMER1_CONTEXT | 720 |
| 3-746. Register Call Summary for Register RM_WKUP_GPTIMER1_CONTEXT | 721 |
| 3-747. RM_WKUP_32KTIMER_CONTEXT | 721 |
| 3-748. Register Call Summary for Register RM_WKUP_32KTIMER_CONTEXT | 721 |
| 3-749. RM_WKUP_SARRAM_CONTEXT | 721 |
| 3-750. Register Call Summary for Register RM_WKUP_SARRAM_CONTEXT | 722 |
| 3-751. PM_WKUP_KEYBOARD_WKDEP | 722 |
| 3-752. Register Call Summary for Register PM_WKUP_KEYBOARD_WKDEP | 722 |
| 3-753. RM_WKUP_KEYBOARD_CONTEXT | 723 |
| 3-754. Register Call Summary for Register RM_WKUP_KEYBOARD_CONTEXT | 723 |
| 3-755. WKUP_CM Registers Mapping Summary | 723 |
| 3-756. CM_WKUP_CLKSTCTRL | 724 |
| 3-757. Register Call Summary for Register CM_WKUP_CLKSTCTRL | 725 |
| 3-758. CM_WKUP_L4WKUP_CLKCTRL | 725 |
| 3-759. Register Call Summary for Register CM_WKUP_L4WKUP_CLKCTRL | 726 |
| 3-760. CM_WKUP_WDTIMER2_CLKCTRL | 726 |
| 3-761. Register Call Summary for Register CM_WKUP_WDTIMER2_CLKCTRL | 726 |
| 3-762. CM_WKUP_GPIO1_CLKCTRL | 727 |

| | |
|--|-----|
| 3-763. Register Call Summary for Register CM_WKUP_GPIO1_CLKCTRL..... | 727 |
| 3-764. CM_WKUP_GPTIMER1_CLKCTRL..... | 728 |
| 3-765. Register Call Summary for Register CM_WKUP_GPTIMER1_CLKCTRL | 728 |
| 3-766. CM_WKUP_32KTIMER_CLKCTRL | 729 |
| 3-767. Register Call Summary for Register CM_WKUP_32KTIMER_CLKCTRL..... | 729 |
| 3-768. CM_WKUP_SARRAM_CLKCTRL | 729 |
| 3-769. Register Call Summary for Register CM_WKUP_SARRAM_CLKCTRL | 730 |
| 3-770. CM_WKUP_KEYBOARD_CLKCTRL | 730 |
| 3-771. Register Call Summary for Register CM_WKUP_KEYBOARD_CLKCTRL | 731 |
| 3-772. CM_WKUP_BANDGAP_CLKCTRL | 731 |
| 3-773. Register Call Summary for Register CM_WKUP_BANDGAP_CLKCTRL..... | 732 |
| 3-774. EMU_PRM Registers Mapping Summary | 732 |
| 3-775. PM_EMU_PWRSTCTRL..... | 732 |
| 3-776. Register Call Summary for Register PM_EMU_PWRSTCTRL | 732 |
| 3-777. PM_EMU_PWRSTST | 733 |
| 3-778. Register Call Summary for Register PM_EMU_PWRSTST | 733 |
| 3-779. RM_EMU_DEBUGSS_CONTEXT..... | 734 |
| 3-780. Register Call Summary for Register RM_EMU_DEBUGSS_CONTEXT | 734 |
| 3-781. EMU_CM Registers Mapping Summary | 734 |
| 3-782. CM_EMU_CLKSTCTRL..... | 735 |
| 3-783. Register Call Summary for Register CM_EMU_CLKSTCTRL | 735 |
| 3-784. CM_EMU_DYNAMICDEP | 736 |
| 3-785. Register Call Summary for Register CM_EMU_DYNAMICDEP..... | 736 |
| 3-786. CM_EMU_DEBUGSS_CLKCTRL | 736 |
| 3-787. Register Call Summary for Register CM_EMU_DEBUGSS_CLKCTRL..... | 738 |
| 3-788. DEVICE_PRM Registers Mapping Summary | 738 |
| 3-789. PRM_RSTCTRL..... | 740 |
| 3-790. Register Call Summary for Register PRM_RSTCTRL | 740 |
| 3-791. PRM_RSTST | 740 |
| 3-792. Register Call Summary for Register PRM_RSTST..... | 742 |
| 3-793. PRM_RSTTIME | 742 |
| 3-794. Register Call Summary for Register PRM_RSTTIME..... | 742 |
| 3-795. PRM_CLKREQCTRL..... | 742 |
| 3-796. Register Call Summary for Register PRM_CLKREQCTRL | 743 |
| 3-797. PRM_VOLTCTRL..... | 743 |
| 3-798. Register Call Summary for Register PRM_VOLTCTRL | 744 |
| 3-799. PRM_PWRREQCTRL..... | 745 |
| 3-800. Register Call Summary for Register PRM_PWRREQCTRL | 745 |
| 3-801. PRM_PSCON_COUNT | 745 |
| 3-802. Register Call Summary for Register PRM_PSCON_COUNT | 746 |
| 3-803. PRM_IO_COUNT | 746 |
| 3-804. Register Call Summary for Register PRM_IO_COUNT..... | 746 |
| 3-805. PRM_IO_PMCTRL..... | 746 |
| 3-806. Register Call Summary for Register PRM_IO_PMCTRL | 747 |
| 3-807. PRM_VOLTSETUP_WARMRESET | 747 |
| 3-808. Register Call Summary for Register PRM_VOLTSETUP_WARMRESET | 748 |
| 3-809. PRM_VOLTSETUP_CORE_OFF | 748 |
| 3-810. Register Call Summary for Register PRM_VOLTSETUP_CORE_OFF | 749 |
| 3-811. PRM_VOLTSETUP_MPU_OFF..... | 749 |

| | |
|--|-----|
| 3-812. Register Call Summary for Register PRM_VOLTSETUP_MPU_OFF | 750 |
| 3-813. PRM_VOLTSETUP_IVA_OFF | 750 |
| 3-814. Register Call Summary for Register PRM_VOLTSETUP_IVA_OFF | 751 |
| 3-815. PRM_VOLTSETUP_CORE_RET_SLEEP | 751 |
| 3-816. Register Call Summary for Register PRM_VOLTSETUP_CORE_RET_SLEEP | 752 |
| 3-817. PRM_VOLTSETUP_MPU_RET_SLEEP | 752 |
| 3-818. Register Call Summary for Register PRM_VOLTSETUP_MPU_RET_SLEEP | 753 |
| 3-819. PRM_VOLTSETUP_IVA_RET_SLEEP | 753 |
| 3-820. Register Call Summary for Register PRM_VOLTSETUP_IVA_RET_SLEEP | 754 |
| 3-821. PRM_VP_CORE_CONFIG | 754 |
| 3-822. Register Call Summary for Register PRM_VP_CORE_CONFIG | 755 |
| 3-823. PRM_VP_CORE_STATUS | 755 |
| 3-824. Register Call Summary for Register PRM_VP_CORE_STATUS | 755 |
| 3-825. PRM_VP_CORE_VLIMITTO | 756 |
| 3-826. Register Call Summary for Register PRM_VP_CORE_VLIMITTO | 756 |
| 3-827. PRM_VP_CORE_VOLTAGE | 756 |
| 3-828. Register Call Summary for Register PRM_VP_CORE_VOLTAGE | 756 |
| 3-829. PRM_VP_CORE_VSTEPMAX | 757 |
| 3-830. Register Call Summary for Register PRM_VP_CORE_VSTEPMAX | 757 |
| 3-831. PRM_VP_CORE_VSTEPMIN | 757 |
| 3-832. Register Call Summary for Register PRM_VP_CORE_VSTEPMIN | 757 |
| 3-833. PRM_VP_MPU_CONFIG | 758 |
| 3-834. Register Call Summary for Register PRM_VP_MPU_CONFIG | 758 |
| 3-835. PRM_VP_MPU_STATUS | 759 |
| 3-836. Register Call Summary for Register PRM_VP_MPU_STATUS | 759 |
| 3-837. PRM_VP_MPU_VLIMITTO | 759 |
| 3-838. Register Call Summary for Register PRM_VP_MPU_VLIMITTO | 759 |
| 3-839. PRM_VP_MPU_VOLTAGE | 760 |
| 3-840. Register Call Summary for Register PRM_VP_MPU_VOLTAGE | 760 |
| 3-841. PRM_VP_MPU_VSTEPMAX | 760 |
| 3-842. Register Call Summary for Register PRM_VP_MPU_VSTEPMAX | 760 |
| 3-843. PRM_VP_MPU_VSTEPMIN | 761 |
| 3-844. Register Call Summary for Register PRM_VP_MPU_VSTEPMIN | 761 |
| 3-845. PRM_VP_IVA_CONFIG | 761 |
| 3-846. Register Call Summary for Register PRM_VP_IVA_CONFIG | 762 |
| 3-847. PRM_VP_IVA_STATUS | 762 |
| 3-848. Register Call Summary for Register PRM_VP_IVA_STATUS | 762 |
| 3-849. PRM_VP_IVA_VLIMITTO | 762 |
| 3-850. Register Call Summary for Register PRM_VP_IVA_VLIMITTO | 763 |
| 3-851. PRM_VP_IVA_VOLTAGE | 763 |
| 3-852. Register Call Summary for Register PRM_VP_IVA_VOLTAGE | 763 |
| 3-853. PRM_VP_IVA_VSTEPMAX | 763 |
| 3-854. Register Call Summary for Register PRM_VP_IVA_VSTEPMAX | 763 |
| 3-855. PRM_VP_IVA_VSTEPMIN | 764 |
| 3-856. Register Call Summary for Register PRM_VP_IVA_VSTEPMIN | 764 |
| 3-857. PRM_VC_SMPS_SA | 764 |
| 3-858. Register Call Summary for Register PRM_VC_SMPS_SA | 764 |
| 3-859. PRM_VC_VAL_SMPS_RA_VOL | 765 |
| 3-860. Register Call Summary for Register PRM_VC_VAL_SMPS_RA_VOL | 765 |

| | |
|---|-----|
| 3-861. PRM_VC_VAL_SMPS_RA_CMD | 765 |
| 3-862. Register Call Summary for Register PRM_VC_VAL_SMPS_RA_CMD | 766 |
| 3-863. PRM_VC_VAL_CMD_VDD_CORE_L | 766 |
| 3-864. Register Call Summary for Register PRM_VC_VAL_CMD_VDD_CORE_L | 766 |
| 3-865. PRM_VC_VAL_CMD_VDD_MPU_L | 766 |
| 3-866. Register Call Summary for Register PRM_VC_VAL_CMD_VDD_MPU_L | 766 |
| 3-867. PRM_VC_VAL_CMD_VDD_IVA_L | 767 |
| 3-868. Register Call Summary for Register PRM_VC_VAL_CMD_VDD_IVA_L | 767 |
| 3-869. PRM_VC_VAL_BYPASS | 767 |
| 3-870. Register Call Summary for Register PRM_VC_VAL_BYPASS | 767 |
| 3-871. PRM_VC_CFG_CHANNEL | 768 |
| 3-872. Register Call Summary for Register PRM_VC_CFG_CHANNEL | 770 |
| 3-873. PRM_VC_CFG_I2C_MODE | 770 |
| 3-874. Register Call Summary for Register PRM_VC_CFG_I2C_MODE | 770 |
| 3-875. PRM_VC_CFG_I2C_CLK | 771 |
| 3-876. Register Call Summary for Register PRM_VC_CFG_I2C_CLK | 771 |
| 3-877. PRM_SRAM_COUNT | 771 |
| 3-878. Register Call Summary for Register PRM_SRAM_COUNT | 772 |
| 3-879. PRM_SRAM_WKUP_SETUP | 772 |
| 3-880. Register Call Summary for Register PRM_SRAM_WKUP_SETUP | 772 |
| 3-881. PRM_LDO_SRAM_CORE_SETUP | 772 |
| 3-882. Register Call Summary for Register PRM_LDO_SRAM_CORE_SETUP | 774 |
| 3-883. PRM_LDO_SRAM_CORE_CTRL | 774 |
| 3-884. Register Call Summary for Register PRM_LDO_SRAM_CORE_CTRL | 774 |
| 3-885. PRM_LDO_SRAM_MPU_SETUP | 775 |
| 3-886. Register Call Summary for Register PRM_LDO_SRAM_MPU_SETUP | 776 |
| 3-887. PRM_LDO_SRAM_MPU_CTRL | 776 |
| 3-888. Register Call Summary for Register PRM_LDO_SRAM_MPU_CTRL | 776 |
| 3-889. PRM_LDO_SRAM_IVA_SETUP | 777 |
| 3-890. Register Call Summary for Register PRM_LDO_SRAM_IVA_SETUP | 778 |
| 3-891. PRM_LDO_SRAM_IVA_CTRL | 778 |
| 3-892. Register Call Summary for Register PRM_LDO_SRAM_IVA_CTRL | 778 |
| 3-893. PRM_LDO_ABB_MPU_SETUP | 779 |
| 3-894. Register Call Summary for Register PRM_LDO_ABB_MPU_SETUP | 779 |
| 3-895. PRM_LDO_ABB_MPU_CTRL | 780 |
| 3-896. Register Call Summary for Register PRM_LDO_ABB_MPU_CTRL | 780 |
| 3-897. PRM_LDO_ABB_IVA_SETUP | 781 |
| 3-898. Register Call Summary for Register PRM_LDO_ABB_IVA_SETUP | 781 |
| 3-899. PRM_LDO_ABB_IVA_CTRL | 782 |
| 3-900. Register Call Summary for Register PRM_LDO_ABB_IVA_CTRL | 782 |
| 3-901. PRM_LDO_BANDGAP_SETUP | 783 |
| 3-902. Register Call Summary for Register PRM_LDO_BANDGAP_SETUP | 783 |
| 3-903. PRM_DEVICE_OFF_CTRL | 783 |
| 3-904. Register Call Summary for Register PRM_DEVICE_OFF_CTRL | 784 |
| 3-905. PRM_PHASE1_CNDP | 784 |
| 3-906. Register Call Summary for Register PRM_PHASE1_CNDP | 784 |
| 3-907. PRM_PHASE2A_CNDP | 784 |
| 3-908. Register Call Summary for Register PRM_PHASE2A_CNDP | 784 |
| 3-909. PRM_PHASE2B_CNDP | 785 |

| | |
|---|-----|
| 3-910. Register Call Summary for Register PRM_PHASE2B_CNDP | 785 |
| 3-911. PRM_VC_ERRST..... | 785 |
| 3-912. Register Call Summary for Register PRM_VC_ERRST | 787 |
| 3-913. INSTR_PRM Registers Mapping Summary | 787 |
| 3-914. PMI_IDENTICATION | 788 |
| 3-915. Register Call Summary for Register PMI_IDENTICATION..... | 788 |
| 3-916. PMI_SYS_CONFIG..... | 788 |
| 3-917. Register Call Summary for Register PMI_SYS_CONFIG | 788 |
| 3-918. PMI_STATUS..... | 789 |
| 3-919. Register Call Summary for Register PMI_STATUS | 789 |
| 3-920. PMI_CONFIGURATION..... | 789 |
| 3-921. Register Call Summary for Register PMI_CONFIGURATION | 790 |
| 3-922. PMI_CLASS_FILTERING..... | 790 |
| 3-923. Register Call Summary for Register PMI_CLASS_FILTERING | 790 |
| 3-924. PMI_TRIGGERING | 790 |
| 3-925. Register Call Summary for Register PMI_TRIGGERING..... | 791 |
| 3-926. PMI_SAMPLING | 791 |
| 3-927. Register Call Summary for Register PMI_SAMPLING..... | 791 |
| 3-928. CM1 Instance Summary | 791 |
| 3-929. INTRCONN_SOCKET_CM1 Registers Mapping Summary | 791 |
| 3-930. REVISION_CM1 | 792 |
| 3-931. Register Call Summary for Register REVISION_CM1 | 792 |
| 3-932. CM_CM1_PROFILING_CLKCTRL | 792 |
| 3-933. Register Call Summary for Register CM_CM1_PROFILING_CLKCTRL..... | 793 |
| 3-934. CM1_DEBUG_CFG | 793 |
| 3-935. Register Call Summary for Register CM1_DEBUG_CFG | 793 |
| 3-936. CKGEN_CM1 Registers Mapping Summary | 793 |
| 3-937. CM_CLKSEL_CORE | 795 |
| 3-938. Register Call Summary for Register CM_CLKSEL_CORE..... | 795 |
| 3-939. CM_CLKSEL_ABE..... | 796 |
| 3-940. Register Call Summary for Register CM_CLKSEL_ABE | 796 |
| 3-941. CM_DLL_CTRL | 796 |
| 3-942. Register Call Summary for Register CM_DLL_CTRL..... | 797 |
| 3-943. CM_CLKMODE_DPLL_CORE | 797 |
| 3-944. Register Call Summary for Register CM_CLKMODE_DPLL_CORE | 798 |
| 3-945. CM_IDLEST_DPLL_CORE..... | 798 |
| 3-946. Register Call Summary for Register CM_IDLEST_DPLL_CORE | 799 |
| 3-947. CM_AUTOIDLE_DPLL_CORE..... | 799 |
| 3-948. Register Call Summary for Register CM_AUTOIDLE_DPLL_CORE | 800 |
| 3-949. CM_CLKSEL_DPLL_CORE | 800 |
| 3-950. Register Call Summary for Register CM_CLKSEL_DPLL_CORE | 801 |
| 3-951. CM_DIV_M2_DPLL_CORE | 801 |
| 3-952. Register Call Summary for Register CM_DIV_M2_DPLL_CORE | 801 |
| 3-953. CM_DIV_M3_DPLL_CORE | 802 |
| 3-954. Register Call Summary for Register CM_DIV_M3_DPLL_CORE | 802 |
| 3-955. CM_DIV_M4_DPLL_CORE | 803 |
| 3-956. Register Call Summary for Register CM_DIV_M4_DPLL_CORE | 803 |
| 3-957. CM_DIV_M5_DPLL_CORE | 804 |
| 3-958. Register Call Summary for Register CM_DIV_M5_DPLL_CORE | 804 |

| | |
|---|-----|
| 3-959. CM_DIV_M6_DPLL_CORE | 805 |
| 3-960. Register Call Summary for Register CM_DIV_M6_DPLL_CORE | 805 |
| 3-961. CM_DIV_M7_DPLL_CORE | 806 |
| 3-962. Register Call Summary for Register CM_DIV_M7_DPLL_CORE | 806 |
| 3-963. CM_SSC_DELTAMSTEP_DPLL_CORE | 807 |
| 3-964. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_CORE | 807 |
| 3-965. CM_SSC_MODFREQDIV_DPLL_CORE | 807 |
| 3-966. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_CORE | 808 |
| 3-967. CM_EMU_OVERRIDE_DPLL_CORE | 808 |
| 3-968. Register Call Summary for Register CM_EMU_OVERRIDE_DPLL_CORE | 808 |
| 3-969. CM_CLKMODE_DPLL_MPU | 808 |
| 3-970. Register Call Summary for Register CM_CLKMODE_DPLL_MPU | 810 |
| 3-971. CM_IDLEST_DPLL_MPU | 810 |
| 3-972. Register Call Summary for Register CM_IDLEST_DPLL_MPU | 810 |
| 3-973. CM_AUTOIDLE_DPLL_MPU | 810 |
| 3-974. Register Call Summary for Register CM_AUTOIDLE_DPLL_MPU | 811 |
| 3-975. CM_CLKSEL_DPLL_MPU | 811 |
| 3-976. Register Call Summary for Register CM_CLKSEL_DPLL_MPU | 812 |
| 3-977. CM_DIV_M2_DPLL_MPU | 812 |
| 3-978. Register Call Summary for Register CM_DIV_M2_DPLL_MPU | 813 |
| 3-979. CM_SSC_DELTAMSTEP_DPLL_MPU | 813 |
| 3-980. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_MPU | 813 |
| 3-981. CM_SSC_MODFREQDIV_DPLL_MPU | 813 |
| 3-982. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_MPU | 814 |
| 3-983. CM_BYPCLK_DPLL_MPU | 814 |
| 3-984. Register Call Summary for Register CM_BYPCLK_DPLL_MPU | 814 |
| 3-985. CM_CLKMODE_DPLL_IVA | 815 |
| 3-986. Register Call Summary for Register CM_CLKMODE_DPLL_IVA | 816 |
| 3-987. CM_IDLEST_DPLL_IVA | 816 |
| 3-988. Register Call Summary for Register CM_IDLEST_DPLL_IVA | 816 |
| 3-989. CM_AUTOIDLE_DPLL_IVA | 817 |
| 3-990. Register Call Summary for Register CM_AUTOIDLE_DPLL_IVA | 817 |
| 3-991. CM_CLKSEL_DPLL_IVA | 817 |
| 3-992. Register Call Summary for Register CM_CLKSEL_DPLL_IVA | 818 |
| 3-993. CM_DIV_M4_DPLL_IVA | 818 |
| 3-994. Register Call Summary for Register CM_DIV_M4_DPLL_IVA | 819 |
| 3-995. CM_DIV_M5_DPLL_IVA | 820 |
| 3-996. Register Call Summary for Register CM_DIV_M5_DPLL_IVA | 820 |
| 3-997. CM_SSC_DELTAMSTEP_DPLL_IVA | 821 |
| 3-998. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_IVA | 821 |
| 3-999. CM_SSC_MODFREQDIV_DPLL_IVA | 821 |
| 3-1000. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_IVA | 821 |
| 3-1001. CM_BYPCLK_DPLL_IVA | 822 |
| 3-1002. Register Call Summary for Register CM_BYPCLK_DPLL_IVA | 822 |
| 3-1003. CM_CLKMODE_DPLL_ABE | 822 |
| 3-1004. Register Call Summary for Register CM_CLKMODE_DPLL_ABE | 823 |
| 3-1005. CM_IDLEST_DPLL_ABE | 824 |
| 3-1006. Register Call Summary for Register CM_IDLEST_DPLL_ABE | 824 |
| 3-1007. CM_AUTOIDLE_DPLL_ABE | 824 |

| | |
|---|-----|
| 3-1008. Register Call Summary for Register CM_AUTOIDLE_DPLL_ABE | 825 |
| 3-1009. CM_CLKSEL_DPLL_ABE | 825 |
| 3-1010. Register Call Summary for Register CM_CLKSEL_DPLL_ABE | 826 |
| 3-1011. CM_DIV_M2_DPLL_ABE | 826 |
| 3-1012. Register Call Summary for Register CM_DIV_M2_DPLL_ABE | 827 |
| 3-1013. CM_DIV_M3_DPLL_ABE | 827 |
| 3-1014. Register Call Summary for Register CM_DIV_M3_DPLL_ABE | 828 |
| 3-1015. CM_SSC_DELTAMSTEP_DPLL_ABE | 828 |
| 3-1016. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_ABE | 828 |
| 3-1017. CM_SSC_MODFREQDIV_DPLL_ABE | 828 |
| 3-1018. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_ABE | 829 |
| 3-1019. CM_SHADOW_FREQ_CONFIG1 | 829 |
| 3-1020. Register Call Summary for Register CM_SHADOW_FREQ_CONFIG1 | 830 |
| 3-1021. CM_SHADOW_FREQ_CONFIG2 | 830 |
| 3-1022. Register Call Summary for Register CM_SHADOW_FREQ_CONFIG2 | 831 |
| 3-1023. CM_DYN_DEP_PRESCAL | 831 |
| 3-1024. Register Call Summary for Register CM_DYN_DEP_PRESCAL | 832 |
| 3-1025. CM_RESTORE_ST | 832 |
| 3-1026. Register Call Summary for Register CM_RESTORE_ST | 832 |
| 3-1027. MPU_CM1 Registers Mapping Summary | 832 |
| 3-1028. CM_MPU_CLKSTCTRL | 833 |
| 3-1029. Register Call Summary for Register CM_MPU_CLKSTCTRL | 834 |
| 3-1030. CM_MPU_STATICDEP | 834 |
| 3-1031. Register Call Summary for Register CM_MPU_STATICDEP | 835 |
| 3-1032. CM_MPU_DYNAMICDEP | 835 |
| 3-1033. Register Call Summary for Register CM_MPU_DYNAMICDEP | 836 |
| 3-1034. CM_MPU_MPU_CLKCTRL | 836 |
| 3-1035. Register Call Summary for Register CM_MPU_MPU_CLKCTRL | 837 |
| 3-1036. DSP_CM1 Registers Mapping Summary | 837 |
| 3-1037. CM_DSP_CLKSTCTRL | 838 |
| 3-1038. Register Call Summary for Register CM_DSP_CLKSTCTRL | 838 |
| 3-1039. CM_DSP_STATICDEP | 839 |
| 3-1040. Register Call Summary for Register CM_DSP_STATICDEP | 840 |
| 3-1041. CM_DSP_DYNAMICDEP | 840 |
| 3-1042. Register Call Summary for Register CM_DSP_DYNAMICDEP | 840 |
| 3-1043. CM_DSP_DSP_CLKCTRL | 841 |
| 3-1044. Register Call Summary for Register CM_DSP_DSP_CLKCTRL | 841 |
| 3-1045. ABE_CM1 Registers Mapping Summary | 842 |
| 3-1046. CM1_ABE_CLKSTCTRL | 842 |
| 3-1047. Register Call Summary for Register CM1_ABE_CLKSTCTRL | 843 |
| 3-1048. CM1_ABE_L4ABE_CLKCTRL | 844 |
| 3-1049. Register Call Summary for Register CM1_ABE_L4ABE_CLKCTRL | 844 |
| 3-1050. CM1_ABE_AESS_CLKCTRL | 844 |
| 3-1051. Register Call Summary for Register CM1_ABE_AESS_CLKCTRL | 845 |
| 3-1052. CM1_ABE_PDM_CLKCTRL | 845 |
| 3-1053. Register Call Summary for Register CM1_ABE_PDM_CLKCTRL | 846 |
| 3-1054. CM1_ABE_DMIC_CLKCTRL | 846 |
| 3-1055. Register Call Summary for Register CM1_ABE_DMIC_CLKCTRL | 847 |
| 3-1056. CM1_ABE_MCASP_CLKCTRL | 848 |

| | |
|--|-----|
| 3-1057. Register Call Summary for Register CM1_ABE_MCASP_CLKCTRL | 849 |
| 3-1058. CM1_ABE_MCBSP1_CLKCTRL | 849 |
| 3-1059. Register Call Summary for Register CM1_ABE_MCBSP1_CLKCTRL..... | 850 |
| 3-1060. CM1_ABE_MCBSP2_CLKCTRL | 850 |
| 3-1061. Register Call Summary for Register CM1_ABE_MCBSP2_CLKCTRL..... | 851 |
| 3-1062. CM1_ABE_MCBSP3_CLKCTRL | 852 |
| 3-1063. Register Call Summary for Register CM1_ABE_MCBSP3_CLKCTRL..... | 853 |
| 3-1064. CM1_ABE_SLIMBUS_CLKCTRL | 853 |
| 3-1065. Register Call Summary for Register CM1_ABE_SLIMBUS_CLKCTRL..... | 854 |
| 3-1066. CM1_ABE_GPTIMER5_CLKCTRL | 854 |
| 3-1067. Register Call Summary for Register CM1_ABE_GPTIMER5_CLKCTRL..... | 855 |
| 3-1068. CM1_ABE_GPTIMER6_CLKCTRL | 855 |
| 3-1069. Register Call Summary for Register CM1_ABE_GPTIMER6_CLKCTRL..... | 856 |
| 3-1070. CM1_ABE_GPTIMER7_CLKCTRL | 856 |
| 3-1071. Register Call Summary for Register CM1_ABE_GPTIMER7_CLKCTRL..... | 857 |
| 3-1072. CM1_ABE_GPTIMER8_CLKCTRL | 857 |
| 3-1073. Register Call Summary for Register CM1_ABE_GPTIMER8_CLKCTRL..... | 858 |
| 3-1074. CM1_ABE_WDTIMER3_CLKCTRL..... | 858 |
| 3-1075. Register Call Summary for Register CM1_ABE_WDTIMER3_CLKCTRL..... | 859 |
| 3-1076. RESTORE_CM1 Registers Mapping Summary | 859 |
| 3-1077. CM_CLKSEL_CORE_RESTORE | 860 |
| 3-1078. Register Call Summary for Register CM_CLKSEL_CORE_RESTORE..... | 860 |
| 3-1079. CM_DIV_M2_DPLL_CORE_RESTORE..... | 860 |
| 3-1080. Register Call Summary for Register CM_DIV_M2_DPLL_CORE_RESTORE | 861 |
| 3-1081. CM_DIV_M3_DPLL_CORE_RESTORE..... | 861 |
| 3-1082. Register Call Summary for Register CM_DIV_M3_DPLL_CORE_RESTORE | 862 |
| 3-1083. CM_DIV_M4_DPLL_CORE_RESTORE..... | 862 |
| 3-1084. Register Call Summary for Register CM_DIV_M4_DPLL_CORE_RESTORE | 863 |
| 3-1085. CM_DIV_M5_DPLL_CORE_RESTORE..... | 863 |
| 3-1086. Register Call Summary for Register CM_DIV_M5_DPLL_CORE_RESTORE | 864 |
| 3-1087. CM_DIV_M6_DPLL_CORE_RESTORE..... | 864 |
| 3-1088. Register Call Summary for Register CM_DIV_M6_DPLL_CORE_RESTORE | 865 |
| 3-1089. CM_DIV_M7_DPLL_CORE_RESTORE..... | 865 |
| 3-1090. Register Call Summary for Register CM_DIV_M7_DPLL_CORE_RESTORE | 866 |
| 3-1091. CM_CLKSEL_DPLL_CORE_RESTORE | 866 |
| 3-1092. Register Call Summary for Register CM_CLKSEL_DPLL_CORE_RESTORE | 867 |
| 3-1093. CM_SSC_DELTAMSTEP_DPLL_CORE_RESTORE | 867 |
| 3-1094. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_CORE_RESTORE..... | 867 |
| 3-1095. CM_SSC_MODFREQDIV_DPLL_CORE_RESTORE | 868 |
| 3-1096. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_CORE_RESTORE | 868 |
| 3-1097. CM_CLKMODE_DPLL_CORE_RESTORE | 868 |
| 3-1098. Register Call Summary for Register CM_CLKMODE_DPLL_CORE_RESTORE | 869 |
| 3-1099. CM_SHADOW_FREQ_CONFIG2_RESTORE | 870 |
| 3-1100. Register Call Summary for Register CM_SHADOW_FREQ_CONFIG2_RESTORE..... | 870 |
| 3-1101. CM_SHADOW_FREQ_CONFIG1_RESTORE | 871 |
| 3-1102. Register Call Summary for Register CM_SHADOW_FREQ_CONFIG1_RESTORE..... | 872 |
| 3-1103. CM_AUTOIDLE_DPLL_CORE_RESTORE..... | 872 |
| 3-1104. Register Call Summary for Register CM_AUTOIDLE_DPLL_CORE_RESTORE | 873 |
| 3-1105. CM_MPU_CLKSTCTRL_RESTORE..... | 873 |

| | |
|---|-----|
| 3-1106. Register Call Summary for Register CM_MPU_CLKSTCTRL_RESTORE | 873 |
| 3-1107. CM_CM1_PROFILING_CLKCTRL_RESTORE | 874 |
| 3-1108. Register Call Summary for Register CM_CM1_PROFILING_CLKCTRL_RESTORE | 874 |
| 3-1109. CM_DYN_DEP_PRESCAL_RESTORE | 874 |
| 3-1110. Register Call Summary for Register CM_DYN_DEP_PRESCAL_RESTORE..... | 875 |
| 3-1111. INSTR_CM1 Registers Mapping Summary | 875 |
| 3-1112. CMI1_IDENTICATION | 875 |
| 3-1113. Register Call Summary for Register CMI1_IDENTICATION..... | 875 |
| 3-1114. CMI1_SYS_CONFIG | 876 |
| 3-1115. Register Call Summary for Register CMI1_SYS_CONFIG | 876 |
| 3-1116. CMI1_STATUS | 876 |
| 3-1117. Register Call Summary for Register CMI1_STATUS | 876 |
| 3-1118. CMI1_CONFIGURATION | 877 |
| 3-1119. Register Call Summary for Register CMI1_CONFIGURATION | 877 |
| 3-1120. CMI1_CLASS_FILTERING | 877 |
| 3-1121. Register Call Summary for Register CMI1_CLASS_FILTERING | 878 |
| 3-1122. CMI1_TRIGGERING | 878 |
| 3-1123. Register Call Summary for Register CMI1_TRIGGERING..... | 878 |
| 3-1124. CMI1_SAMPLING | 878 |
| 3-1125. Register Call Summary for Register CMI1_SAMPLING..... | 879 |
| 3-1126. CM2 Instance Summary | 879 |
| 3-1127. INTRCONN_SOCKET_CM2 Registers Mapping Summary | 879 |
| 3-1128. REVISION_CM2 | 880 |
| 3-1129. Register Call Summary for Register REVISION_CM2..... | 880 |
| 3-1130. CM_CM2_PROFILING_CLKCTRL | 880 |
| 3-1131. Register Call Summary for Register CM_CM2_PROFILING_CLKCTRL | 881 |
| 3-1132. CM2_DEBUG_CFG | 881 |
| 3-1133. Register Call Summary for Register CM2_DEBUG_CFG..... | 881 |
| 3-1134. CKGEN_CM2 Registers Mapping Summary..... | 881 |
| 3-1135. CM_CLKSEL_MPU_M3_ISS_ROOT | 882 |
| 3-1136. Register Call Summary for Register CM_CLKSEL_MPU_M3_ISS_ROOT..... | 882 |
| 3-1137. CM_CLKSEL_USB_60MHZ..... | 883 |
| 3-1138. Register Call Summary for Register CM_CLKSEL_USB_60MHZ | 883 |
| 3-1139. CM_SCALE_FCLK | 883 |
| 3-1140. Register Call Summary for Register CM_SCALE_FCLK..... | 884 |
| 3-1141. CM_CORE_DVFS_PERF1 | 884 |
| 3-1142. Register Call Summary for Register CM_CORE_DVFS_PERF1 | 884 |
| 3-1143. CM_CORE_DVFS_PERF2..... | 884 |
| 3-1144. Register Call Summary for Register CM_CORE_DVFS_PERF2 | 884 |
| 3-1145. CM_CORE_DVFS_PERF3..... | 885 |
| 3-1146. Register Call Summary for Register CM_CORE_DVFS_PERF3 | 885 |
| 3-1147. CM_CORE_DVFS_PERF4..... | 885 |
| 3-1148. Register Call Summary for Register CM_CORE_DVFS_PERF4 | 885 |
| 3-1149. CM_CORE_DVFS_CURRENT | 885 |
| 3-1150. Register Call Summary for Register CM_CORE_DVFS_CURRENT..... | 886 |
| 3-1151. CM_IVA_DVFS_PERF_DSP..... | 886 |
| 3-1152. Register Call Summary for Register CM_IVA_DVFS_PERF_DSP | 886 |
| 3-1153. CM_IVA_DVFS_PERF_IVAHD | 886 |
| 3-1154. Register Call Summary for Register CM_IVA_DVFS_PERF_IVAHD | 886 |

| | |
|---|-----|
| 3-1155. CM_IVA_DVFS_PERF_ABE | 887 |
| 3-1156. Register Call Summary for Register CM_IVA_DVFS_PERF_ABE | 887 |
| 3-1157. CM_IVA_DVFS_CURRENT | 887 |
| 3-1158. Register Call Summary for Register CM_IVA_DVFS_CURRENT | 887 |
| 3-1159. CM_CLKMODE_DPLL_PER | 887 |
| 3-1160. Register Call Summary for Register CM_CLKMODE_DPLL_PER | 889 |
| 3-1161. CM_IDLEST_DPLL_PER | 889 |
| 3-1162. Register Call Summary for Register CM_IDLEST_DPLL_PER | 889 |
| 3-1163. CM_AUTOIDLE_DPLL_PER | 889 |
| 3-1164. Register Call Summary for Register CM_AUTOIDLE_DPLL_PER | 890 |
| 3-1165. CM_CLKSEL_DPLL_PER | 890 |
| 3-1166. Register Call Summary for Register CM_CLKSEL_DPLL_PER | 891 |
| 3-1167. CM_DIV_M2_DPLL_PER | 891 |
| 3-1168. Register Call Summary for Register CM_DIV_M2_DPLL_PER | 892 |
| 3-1169. CM_DIV_M3_DPLL_PER | 892 |
| 3-1170. Register Call Summary for Register CM_DIV_M3_DPLL_PER | 893 |
| 3-1171. CM_DIV_M4_DPLL_PER | 893 |
| 3-1172. Register Call Summary for Register CM_DIV_M4_DPLL_PER | 894 |
| 3-1173. CM_DIV_M5_DPLL_PER | 894 |
| 3-1174. Register Call Summary for Register CM_DIV_M5_DPLL_PER | 895 |
| 3-1175. CM_DIV_M6_DPLL_PER | 895 |
| 3-1176. Register Call Summary for Register CM_DIV_M6_DPLL_PER | 896 |
| 3-1177. CM_DIV_M7_DPLL_PER | 896 |
| 3-1178. Register Call Summary for Register CM_DIV_M7_DPLL_PER | 897 |
| 3-1179. CM_SSC_DELTAMSTEP_DPLL_PER | 897 |
| 3-1180. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_PER | 897 |
| 3-1181. CM_SSC_MODFREQDIV_DPLL_PER | 898 |
| 3-1182. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_PER | 898 |
| 3-1183. CM_CLKMODE_DPLL_USB | 898 |
| 3-1184. Register Call Summary for Register CM_CLKMODE_DPLL_USB | 899 |
| 3-1185. CM_IDLEST_DPLL_USB | 899 |
| 3-1186. Register Call Summary for Register CM_IDLEST_DPLL_USB | 900 |
| 3-1187. CM_AUTOIDLE_DPLL_USB | 900 |
| 3-1188. Register Call Summary for Register CM_AUTOIDLE_DPLL_USB | 900 |
| 3-1189. CM_CLKSEL_DPLL_USB | 901 |
| 3-1190. Register Call Summary for Register CM_CLKSEL_DPLL_USB | 901 |
| 3-1191. CM_DIV_M2_DPLL_USB | 902 |
| 3-1192. Register Call Summary for Register CM_DIV_M2_DPLL_USB | 902 |
| 3-1193. CM_SSC_DELTAMSTEP_DPLL_USB | 902 |
| 3-1194. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_USB | 903 |
| 3-1195. CM_SSC_MODFREQDIV_DPLL_USB | 903 |
| 3-1196. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_USB | 903 |
| 3-1197. CM_CLKDCOLDO_DPLL_USB | 904 |
| 3-1198. Register Call Summary for Register CM_CLKDCOLDO_DPLL_USB | 904 |
| 3-1199. ALWAYS_ON_CM2 Registers Mapping Summary | 904 |
| 3-1200. CM_ALWON_CLKSTCTRL | 905 |
| 3-1201. Register Call Summary for Register CM_ALWON_CLKSTCTRL | 906 |
| 3-1202. CM_ALWON_SR_MPU_CLKCTRL | 906 |
| 3-1203. Register Call Summary for Register CM_ALWON_SR_MPU_CLKCTRL | 907 |

| | |
|---|-----|
| 3-1204. CM_ALWON_SR_IVA_CLKCTRL..... | 907 |
| 3-1205. Register Call Summary for Register CM_ALWON_SR_IVA_CLKCTRL | 907 |
| 3-1206. CM_ALWON_SR_CORE_CLKCTRL | 908 |
| 3-1207. Register Call Summary for Register CM_ALWON_SR_CORE_CLKCTRL..... | 908 |
| 3-1208. CM_ALWON_USBPHY_CLKCTRL | 908 |
| 3-1209. Register Call Summary for Register CM_ALWON_USBPHY_CLKCTRL..... | 909 |
| 3-1210. CORE_CM2 Registers Mapping Summary | 909 |
| 3-1211. CM_L3_1_CLKSTCTRL | 910 |
| 3-1212. Register Call Summary for Register CM_L3_1_CLKSTCTRL..... | 911 |
| 3-1213. CM_L3_1_DYNAMICDEP | 911 |
| 3-1214. Register Call Summary for Register CM_L3_1_DYNAMICDEP | 912 |
| 3-1215. CM_L3_1_L3_1_CLKCTRL | 912 |
| 3-1216. Register Call Summary for Register CM_L3_1_L3_1_CLKCTRL..... | 912 |
| 3-1217. CM_L3_2_CLKSTCTRL | 913 |
| 3-1218. Register Call Summary for Register CM_L3_2_CLKSTCTRL..... | 913 |
| 3-1219. CM_L3_2_DYNAMICDEP | 914 |
| 3-1220. Register Call Summary for Register CM_L3_2_DYNAMICDEP | 914 |
| 3-1221. CM_L3_2_L3_2_CLKCTRL | 915 |
| 3-1222. Register Call Summary for Register CM_L3_2_L3_2_CLKCTRL..... | 915 |
| 3-1223. CM_L3_2_GPMC_CLKCTRL | 915 |
| 3-1224. Register Call Summary for Register CM_L3_2_GPMC_CLKCTRL..... | 916 |
| 3-1225. CM_L3_2_OCMC_RAM_CLKCTRL | 916 |
| 3-1226. Register Call Summary for Register CM_L3_2_OCMC_RAM_CLKCTRL | 917 |
| 3-1227. CM_MPU_M3_CLKSTCTRL | 917 |
| 3-1228. Register Call Summary for Register CM_MPU_M3_CLKSTCTRL | 918 |
| 3-1229. CM_MPU_M3_STATICDEP | 918 |
| 3-1230. Register Call Summary for Register CM_MPU_M3_STATICDEP | 919 |
| 3-1231. CM_MPU_M3_DYNAMICDEP..... | 919 |
| 3-1232. Register Call Summary for Register CM_MPU_M3_DYNAMICDEP | 920 |
| 3-1233. CM_MPU_M3_MPU_M3_CLKCTRL..... | 920 |
| 3-1234. Register Call Summary for Register CM_MPU_M3_MPU_M3_CLKCTRL | 921 |
| 3-1235. CM_SDMA_CLKSTCTRL | 921 |
| 3-1236. Register Call Summary for Register CM_SDMA_CLKSTCTRL | 921 |
| 3-1237. CM_SDMA_STATICDEP | 922 |
| 3-1238. Register Call Summary for Register CM_SDMA_STATICDEP | 923 |
| 3-1239. CM_SDMA_DYNAMICDEP | 923 |
| 3-1240. Register Call Summary for Register CM_SDMA_DYNAMICDEP..... | 923 |
| 3-1241. CM_SDMA_SDMA_CLKCTRL..... | 924 |
| 3-1242. Register Call Summary for Register CM_SDMA_SDMA_CLKCTRL | 924 |
| 3-1243. CM_MEMIF_CLKSTCTRL | 925 |
| 3-1244. Register Call Summary for Register CM_MEMIF_CLKSTCTRL | 926 |
| 3-1245. CM_MEMIF_DMM_CLKCTRL | 926 |
| 3-1246. Register Call Summary for Register CM_MEMIF_DMM_CLKCTRL | 926 |
| 3-1247. CM_MEMIF_EMIF_FW_CLKCTRL | 927 |
| 3-1248. Register Call Summary for Register CM_MEMIF_EMIF_FW_CLKCTRL..... | 927 |
| 3-1249. CM_MEMIF_EMIF_1_CLKCTRL | 927 |
| 3-1250. Register Call Summary for Register CM_MEMIF_EMIF_1_CLKCTRL | 928 |
| 3-1251. CM_MEMIF_EMIF_2_CLKCTRL | 928 |
| 3-1252. Register Call Summary for Register CM_MEMIF_EMIF_2_CLKCTRL | 929 |

| | |
|--|-----|
| 3-1253. CM_MEMIF_DLL_CLKCTRL | 929 |
| 3-1254. Register Call Summary for Register CM_MEMIF_DLL_CLKCTRL | 929 |
| 3-1255. CM_C2C_CLKSTCTRL | 930 |
| 3-1256. Register Call Summary for Register CM_C2C_CLKSTCTRL | 930 |
| 3-1257. CM_C2C_STATICDEP | 931 |
| 3-1258. Register Call Summary for Register CM_C2C_STATICDEP | 931 |
| 3-1259. CM_C2C_DYNAMICDEP | 932 |
| 3-1260. Register Call Summary for Register CM_C2C_DYNAMICDEP | 932 |
| 3-1261. CM_C2C_C2C_CLKCTRL | 932 |
| 3-1262. Register Call Summary for Register CM_C2C_C2C_CLKCTRL | 933 |
| 3-1263. CM_C2C_C2C_FW_CLKCTRL | 933 |
| 3-1264. Register Call Summary for Register CM_C2C_C2C_FW_CLKCTRL | 934 |
| 3-1265. CM_L4CFG_CLKSTCTRL | 934 |
| 3-1266. Register Call Summary for Register CM_L4CFG_CLKSTCTRL | 935 |
| 3-1267. CM_L4CFG_DYNAMICDEP | 935 |
| 3-1268. Register Call Summary for Register CM_L4CFG_DYNAMICDEP | 936 |
| 3-1269. CM_L4CFG_L4_CFG_CLKCTRL | 936 |
| 3-1270. Register Call Summary for Register CM_L4CFG_L4_CFG_CLKCTRL | 937 |
| 3-1271. CM_L4CFG_SPINLOCK_CLKCTRL | 937 |
| 3-1272. Register Call Summary for Register CM_L4CFG_SPINLOCK_CLKCTRL | 938 |
| 3-1273. CM_L4CFG_MAILBOX_CLKCTRL | 938 |
| 3-1274. Register Call Summary for Register CM_L4CFG_MAILBOX_CLKCTRL | 938 |
| 3-1275. CM_L4CFG_SAR_ROM_CLKCTRL | 939 |
| 3-1276. Register Call Summary for Register CM_L4CFG_SAR_ROM_CLKCTRL | 939 |
| 3-1277. CM_L3INSTR_CLKSTCTRL | 939 |
| 3-1278. Register Call Summary for Register CM_L3INSTR_CLKSTCTRL | 940 |
| 3-1279. CM_L3INSTR_L3_3_CLKCTRL | 940 |
| 3-1280. Register Call Summary for Register CM_L3INSTR_L3_3_CLKCTRL | 941 |
| 3-1281. CM_L3INSTR_L3_INSTR_CLKCTRL | 941 |
| 3-1282. Register Call Summary for Register CM_L3INSTR_L3_INSTR_CLKCTRL | 942 |
| 3-1283. CM_L3INSTR_OCP_WP1_CLKCTRL | 942 |
| 3-1284. Register Call Summary for Register CM_L3INSTR_OCP_WP1_CLKCTRL | 943 |
| 3-1285. IVAHD_CM2 Registers Mapping Summary | 943 |
| 3-1286. CM_IVAHD_CLKSTCTRL | 943 |
| 3-1287. Register Call Summary for Register CM_IVAHD_CLKSTCTRL | 944 |
| 3-1288. CM_IVAHD_STATICDEP | 944 |
| 3-1289. Register Call Summary for Register CM_IVAHD_STATICDEP | 945 |
| 3-1290. CM_IVAHD_DYNAMICDEP | 945 |
| 3-1291. Register Call Summary for Register CM_IVAHD_DYNAMICDEP | 945 |
| 3-1292. CM_IVAHD_IVAHD_CLKCTRL | 945 |
| 3-1293. Register Call Summary for Register CM_IVAHD_IVAHD_CLKCTRL | 946 |
| 3-1294. CM_IVAHD_SL2_CLKCTRL | 946 |
| 3-1295. Register Call Summary for Register CM_IVAHD_SL2_CLKCTRL | 947 |
| 3-1296. CAM_CM2 Registers Mapping Summary | 947 |
| 3-1297. CM_CAM_CLKSTCTRL | 948 |
| 3-1298. Register Call Summary for Register CM_CAM_CLKSTCTRL | 949 |
| 3-1299. CM_CAM_STATICDEP | 949 |
| 3-1300. Register Call Summary for Register CM_CAM_STATICDEP | 949 |
| 3-1301. CM_CAM_DYNAMICDEP | 950 |

| | |
|--|-----|
| 3-1302. Register Call Summary for Register CM_CAM_DYNAMICDEP | 950 |
| 3-1303. CM_CAM_ISS_CLKCTRL | 950 |
| 3-1304. Register Call Summary for Register CM_CAM_ISS_CLKCTRL | 951 |
| 3-1305. CM_CAM_FDIF_CLKCTRL | 951 |
| 3-1306. Register Call Summary for Register CM_CAM_FDIF_CLKCTRL | 952 |
| 3-1307. DSS_CM2 Registers Mapping Summary | 952 |
| 3-1308. CM_DSS_CLKSTCTRL | 953 |
| 3-1309. Register Call Summary for Register CM_DSS_CLKSTCTRL | 954 |
| 3-1310. CM_DSS_STATICDEP | 954 |
| 3-1311. Register Call Summary for Register CM_DSS_STATICDEP | 955 |
| 3-1312. CM_DSS_DYNAMICDEP | 955 |
| 3-1313. Register Call Summary for Register CM_DSS_DYNAMICDEP | 955 |
| 3-1314. CM_DSS_DSS_CLKCTRL | 955 |
| 3-1315. Register Call Summary for Register CM_DSS_DSS_CLKCTRL | 956 |
| 3-1316. CM_DSS_BB2D_CLKCTRL | 956 |
| 3-1317. Register Call Summary for Register CM_DSS_BB2D_CLKCTRL | 957 |
| 3-1318. SGX_CM2 Registers Mapping Summary | 958 |
| 3-1319. CM_SGX_CLKSTCTRL | 958 |
| 3-1320. Register Call Summary for Register CM_SGX_CLKSTCTRL | 959 |
| 3-1321. CM_SGX_STATICDEP | 959 |
| 3-1322. Register Call Summary for Register CM_SGX_STATICDEP | 959 |
| 3-1323. CM_SGX_DYNAMICDEP | 960 |
| 3-1324. Register Call Summary for Register CM_SGX_DYNAMICDEP | 960 |
| 3-1325. CM_SGX_SGX_CLKCTRL | 960 |
| 3-1326. Register Call Summary for Register CM_SGX_SGX_CLKCTRL | 961 |
| 3-1327. L3INIT_CM2 Registers Mapping Summary | 961 |
| 3-1328. CM_L3INIT_CLKSTCTRL | 962 |
| 3-1329. Register Call Summary for Register CM_L3INIT_CLKSTCTRL | 964 |
| 3-1330. CM_L3INIT_STATICDEP | 965 |
| 3-1331. Register Call Summary for Register CM_L3INIT_STATICDEP | 965 |
| 3-1332. CM_L3INIT_DYNAMICDEP | 966 |
| 3-1333. Register Call Summary for Register CM_L3INIT_DYNAMICDEP | 966 |
| 3-1334. CM_L3INIT_HSMMC1_CLKCTRL | 966 |
| 3-1335. Register Call Summary for Register CM_L3INIT_HSMMC1_CLKCTRL | 967 |
| 3-1336. CM_L3INIT_HSMMC2_CLKCTRL | 967 |
| 3-1337. Register Call Summary for Register CM_L3INIT_HSMMC2_CLKCTRL | 968 |
| 3-1338. CM_L3INIT_HSI_CLKCTRL | 968 |
| 3-1339. Register Call Summary for Register CM_L3INIT_HSI_CLKCTRL | 969 |
| 3-1340. CM_L3INIT_HSUSBHOST_CLKCTRL | 969 |
| 3-1341. Register Call Summary for Register CM_L3INIT_HSUSBHOST_CLKCTRL | 971 |
| 3-1342. CM_L3INIT_HSUSBOTG_CLKCTRL | 971 |
| 3-1343. Register Call Summary for Register CM_L3INIT_HSUSBOTG_CLKCTRL | 972 |
| 3-1344. CM_L3INIT_HSUSBTLL_CLKCTRL | 972 |
| 3-1345. Register Call Summary for Register CM_L3INIT_HSUSBTLL_CLKCTRL | 973 |
| 3-1346. CM_L3INIT_USBPHY_CLKCTRL | 974 |
| 3-1347. Register Call Summary for Register CM_L3INIT_USBPHY_CLKCTRL | 974 |
| 3-1348. L4PER_CM2 Registers Mapping Summary | 975 |
| 3-1349. CM_L4PER_CLKSTCTRL | 976 |
| 3-1350. Register Call Summary for Register CM_L4PER_CLKSTCTRL | 978 |

| | |
|---|------|
| 3-1351. CM_L4PER_DYNAMICDEP | 978 |
| 3-1352. Register Call Summary for Register CM_L4PER_DYNAMICDEP | 979 |
| 3-1353. CM_L4PER_GPTIMER10_CLKCTRL | 979 |
| 3-1354. Register Call Summary for Register CM_L4PER_GPTIMER10_CLKCTRL | 979 |
| 3-1355. CM_L4PER_GPTIMER11_CLKCTRL | 980 |
| 3-1356. Register Call Summary for Register CM_L4PER_GPTIMER11_CLKCTRL | 980 |
| 3-1357. CM_L4PER_GPTIMER2_CLKCTRL | 981 |
| 3-1358. Register Call Summary for Register CM_L4PER_GPTIMER2_CLKCTRL | 981 |
| 3-1359. CM_L4PER_GPTIMER3_CLKCTRL | 982 |
| 3-1360. Register Call Summary for Register CM_L4PER_GPTIMER3_CLKCTRL | 982 |
| 3-1361. CM_L4PER_GPTIMER4_CLKCTRL | 983 |
| 3-1362. Register Call Summary for Register CM_L4PER_GPTIMER4_CLKCTRL | 983 |
| 3-1363. CM_L4PER_GPTIMER9_CLKCTRL | 984 |
| 3-1364. Register Call Summary for Register CM_L4PER_GPTIMER9_CLKCTRL | 984 |
| 3-1365. CM_L4PER_ELM_CLKCTRL | 985 |
| 3-1366. Register Call Summary for Register CM_L4PER_ELM_CLKCTRL | 985 |
| 3-1367. CM_L4PER_GPIO2_CLKCTRL | 985 |
| 3-1368. Register Call Summary for Register CM_L4PER_GPIO2_CLKCTRL | 986 |
| 3-1369. CM_L4PER_GPIO3_CLKCTRL | 986 |
| 3-1370. Register Call Summary for Register CM_L4PER_GPIO3_CLKCTRL | 987 |
| 3-1371. CM_L4PER_GPIO4_CLKCTRL | 987 |
| 3-1372. Register Call Summary for Register CM_L4PER_GPIO4_CLKCTRL | 988 |
| 3-1373. CM_L4PER_GPIO5_CLKCTRL | 988 |
| 3-1374. Register Call Summary for Register CM_L4PER_GPIO5_CLKCTRL | 989 |
| 3-1375. CM_L4PER_GPIO6_CLKCTRL | 989 |
| 3-1376. Register Call Summary for Register CM_L4PER_GPIO6_CLKCTRL | 990 |
| 3-1377. CM_L4PER_HDQ1W_CLKCTRL | 990 |
| 3-1378. Register Call Summary for Register CM_L4PER_HDQ1W_CLKCTRL | 991 |
| 3-1379. CM_L4PER_I2C1_CLKCTRL | 991 |
| 3-1380. Register Call Summary for Register CM_L4PER_I2C1_CLKCTRL | 992 |
| 3-1381. CM_L4PER_I2C2_CLKCTRL | 992 |
| 3-1382. Register Call Summary for Register CM_L4PER_I2C2_CLKCTRL | 993 |
| 3-1383. CM_L4PER_I2C3_CLKCTRL | 993 |
| 3-1384. Register Call Summary for Register CM_L4PER_I2C3_CLKCTRL | 993 |
| 3-1385. CM_L4PER_I2C4_CLKCTRL | 994 |
| 3-1386. Register Call Summary for Register CM_L4PER_I2C4_CLKCTRL | 994 |
| 3-1387. CM_L4PER_L4PER_CLKCTRL | 994 |
| 3-1388. Register Call Summary for Register CM_L4PER_L4PER_CLKCTRL | 995 |
| 3-1389. CM_L4PER_MCBSP4_CLKCTRL | 995 |
| 3-1390. Register Call Summary for Register CM_L4PER_MCBSP4_CLKCTRL | 996 |
| 3-1391. CM_L4PER_MCSP11_CLKCTRL | 996 |
| 3-1392. Register Call Summary for Register CM_L4PER_MCSP11_CLKCTRL | 997 |
| 3-1393. CM_L4PER_MCSP12_CLKCTRL | 997 |
| 3-1394. Register Call Summary for Register CM_L4PER_MCSP12_CLKCTRL | 998 |
| 3-1395. CM_L4PER_MCSP13_CLKCTRL | 998 |
| 3-1396. Register Call Summary for Register CM_L4PER_MCSP13_CLKCTRL | 999 |
| 3-1397. CM_L4PER_MCSP14_CLKCTRL | 999 |
| 3-1398. Register Call Summary for Register CM_L4PER_MCSP14_CLKCTRL | 999 |
| 3-1399. CM_L4PER_MMCS3_CLKCTRL | 1000 |

| | |
|--|------|
| 3-1400. Register Call Summary for Register CM_L4PER_MMCSDB3_CLKCTRL | 1000 |
| 3-1401. CM_L4PER_MMCSDB4_CLKCTRL | 1000 |
| 3-1402. Register Call Summary for Register CM_L4PER_MMCSDB4_CLKCTRL | 1001 |
| 3-1403. CM_L4PER_SLIMBUS2_CLKCTRL | 1001 |
| 3-1404. Register Call Summary for Register CM_L4PER_SLIMBUS2_CLKCTRL | 1002 |
| 3-1405. CM_L4PER_UART1_CLKCTRL | 1003 |
| 3-1406. Register Call Summary for Register CM_L4PER_UART1_CLKCTRL | 1003 |
| 3-1407. CM_L4PER_UART2_CLKCTRL | 1003 |
| 3-1408. Register Call Summary for Register CM_L4PER_UART2_CLKCTRL | 1004 |
| 3-1409. CM_L4PER_UART3_CLKCTRL | 1004 |
| 3-1410. Register Call Summary for Register CM_L4PER_UART3_CLKCTRL | 1005 |
| 3-1411. CM_L4PER_UART4_CLKCTRL | 1005 |
| 3-1412. Register Call Summary for Register CM_L4PER_UART4_CLKCTRL | 1006 |
| 3-1413. CM_L4PER_MMCSDB5_CLKCTRL | 1006 |
| 3-1414. Register Call Summary for Register CM_L4PER_MMCSDB5_CLKCTRL | 1007 |
| 3-1415. RESTORE_CM2 Registers Mapping Summary | 1007 |
| 3-1416. CM_L3_1_CLKSTCTRL_RESTORE | 1008 |
| 3-1417. Register Call Summary for Register CM_L3_1_CLKSTCTRL_RESTORE | 1008 |
| 3-1418. CM_L3_2_CLKSTCTRL_RESTORE | 1008 |
| 3-1419. Register Call Summary for Register CM_L3_2_CLKSTCTRL_RESTORE | 1009 |
| 3-1420. CM_L4CFG_CLKSTCTRL_RESTORE | 1009 |
| 3-1421. Register Call Summary for Register CM_L4CFG_CLKSTCTRL_RESTORE | 1010 |
| 3-1422. CM_MEMIF_CLKSTCTRL_RESTORE | 1010 |
| 3-1423. Register Call Summary for Register CM_MEMIF_CLKSTCTRL_RESTORE | 1011 |
| 3-1424. CM_L4PER_CLKSTCTRL_RESTORE | 1011 |
| 3-1425. Register Call Summary for Register CM_L4PER_CLKSTCTRL_RESTORE | 1013 |
| 3-1426. CM_L3INIT_CLKSTCTRL_RESTORE | 1014 |
| 3-1427. Register Call Summary for Register CM_L3INIT_CLKSTCTRL_RESTORE | 1016 |
| 3-1428. CM_L3INSTR_L3_3_CLKCTRL_RESTORE | 1016 |
| 3-1429. Register Call Summary for Register CM_L3INSTR_L3_3_CLKCTRL_RESTORE | 1017 |
| 3-1430. CM_L3INSTR_L3_INSTR_CLKCTRL_RESTORE | 1017 |
| 3-1431. Register Call Summary for Register CM_L3INSTR_L3_INSTR_CLKCTRL_RESTORE | 1018 |
| 3-1432. CM_L3INSTR_OCP_WP1_CLKCTRL_RESTORE | 1018 |
| 3-1433. Register Call Summary for Register CM_L3INSTR_OCP_WP1_CLKCTRL_RESTORE | 1019 |
| 3-1434. CM_CM2_PROFILING_CLKCTRL_RESTORE | 1019 |
| 3-1435. Register Call Summary for Register CM_CM2_PROFILING_CLKCTRL_RESTORE | 1019 |
| 3-1436. CM_C2C_STATICDEP_RESTORE | 1020 |
| 3-1437. Register Call Summary for Register CM_C2C_STATICDEP_RESTORE | 1020 |
| 3-1438. CM_L3_1_DYNAMICDEP_RESTORE | 1021 |
| 3-1439. Register Call Summary for Register CM_L3_1_DYNAMICDEP_RESTORE | 1021 |
| 3-1440. CM_L3_2_DYNAMICDEP_RESTORE | 1021 |
| 3-1441. Register Call Summary for Register CM_L3_2_DYNAMICDEP_RESTORE | 1022 |
| 3-1442. CM_C2C_DYNAMICDEP_RESTORE | 1023 |
| 3-1443. Register Call Summary for Register CM_C2C_DYNAMICDEP_RESTORE | 1023 |
| 3-1444. CM_L4CFG_DYNAMICDEP_RESTORE | 1023 |
| 3-1445. Register Call Summary for Register CM_L4CFG_DYNAMICDEP_RESTORE | 1024 |
| 3-1446. CM_L4PER_DYNAMICDEP_RESTORE | 1025 |
| 3-1447. Register Call Summary for Register CM_L4PER_DYNAMICDEP_RESTORE | 1025 |
| 3-1448. CM_L4PER_GPIO2_CLKCTRL_RESTORE | 1025 |

| | |
|--|------|
| 3-1449. Register Call Summary for Register CM_L4PER_GPIO2_CLKCTRL_RESTORE | 1026 |
| 3-1450. CM_L4PER_GPIO3_CLKCTRL_RESTORE | 1026 |
| 3-1451. Register Call Summary for Register CM_L4PER_GPIO3_CLKCTRL_RESTORE | 1027 |
| 3-1452. CM_L4PER_GPIO4_CLKCTRL_RESTORE | 1027 |
| 3-1453. Register Call Summary for Register CM_L4PER_GPIO4_CLKCTRL_RESTORE | 1028 |
| 3-1454. CM_L4PER_GPIO5_CLKCTRL_RESTORE | 1028 |
| 3-1455. Register Call Summary for Register CM_L4PER_GPIO5_CLKCTRL_RESTORE | 1029 |
| 3-1456. CM_L4PER_GPIO6_CLKCTRL_RESTORE | 1029 |
| 3-1457. Register Call Summary for Register CM_L4PER_GPIO6_CLKCTRL_RESTORE | 1030 |
| 3-1458. CM_L3INIT_HSUSBHOST_CLKCTRL_RESTORE | 1030 |
| 3-1459. Register Call Summary for Register CM_L3INIT_HSUSBHOST_CLKCTRL_RESTORE | 1032 |
| 3-1460. CM_L3INIT_HSUSBTLL_CLKCTRL_RESTORE | 1032 |
| 3-1461. Register Call Summary for Register CM_L3INIT_HSUSBTLL_CLKCTRL_RESTORE | 1033 |
| 3-1462. CM_SDMA_STATICDEP_RESTORE | 1033 |
| 3-1463. Register Call Summary for Register CM_SDMA_STATICDEP_RESTORE | 1034 |
| 3-1464. INSTR_CM2 Registers Mapping Summary | 1034 |
| 3-1465. CMI2_IDENTICATION | 1035 |
| 3-1466. Register Call Summary for Register CMI2_IDENTICATION | 1035 |
| 3-1467. CMI2_SYS_CONFIG | 1035 |
| 3-1468. Register Call Summary for Register CMI2_SYS_CONFIG | 1036 |
| 3-1469. CMI2_STATUS | 1036 |
| 3-1470. Register Call Summary for Register CMI2_STATUS | 1036 |
| 3-1471. CMI2_CONFIGURATION | 1036 |
| 3-1472. Register Call Summary for Register CMI2_CONFIGURATION | 1037 |
| 3-1473. CMI2_CLASS_FILTERING | 1037 |
| 3-1474. Register Call Summary for Register CMI2_CLASS_FILTERING | 1037 |
| 3-1475. CMI2_TRIGGERING | 1037 |
| 3-1476. Register Call Summary for Register CMI2_TRIGGERING | 1038 |
| 3-1477. CMI2_SAMPLING | 1038 |
| 3-1478. Register Call Summary for Register CMI2_SAMPLING | 1038 |
| 3-1479. SCRM Instance Summary | 1039 |
| 3-1480. SCRM Registers Mapping Summary | 1039 |
| 3-1481. REVISION_SCRM | 1040 |
| 3-1482. Register Call Summary for Register REVISION_SCRM | 1040 |
| 3-1483. CLKSETUPTIME | 1040 |
| 3-1484. Register Call Summary for Register CLKSETUPTIME | 1040 |
| 3-1485. PMICSETUPTIME | 1041 |
| 3-1486. Register Call Summary for Register PMICSETUPTIME | 1041 |
| 3-1487. ALTCLKSRC | 1041 |
| 3-1488. Register Call Summary for Register ALTCLKSRC | 1042 |
| 3-1489. C2CCLKM | 1042 |
| 3-1490. Register Call Summary for Register C2CCLKM | 1042 |
| 3-1491. EXTCLKREQ | 1043 |
| 3-1492. Register Call Summary for Register EXTCLKREQ | 1043 |
| 3-1493. ACCCLKREQ | 1043 |
| 3-1494. Register Call Summary for Register ACCCLKREQ | 1043 |
| 3-1495. PWRREQ | 1044 |
| 3-1496. Register Call Summary for Register PWRREQ | 1044 |
| 3-1497. AUXCLKREQ0 | 1044 |

| | |
|---|------|
| 3-1498. Register Call Summary for Register AUXCLKREQ0 | 1045 |
| 3-1499. AUXCLKREQ1 | 1045 |
| 3-1500. Register Call Summary for Register AUXCLKREQ1 | 1046 |
| 3-1501. AUXCLKREQ2 | 1046 |
| 3-1502. Register Call Summary for Register AUXCLKREQ2 | 1047 |
| 3-1503. AUXCLKREQ3 | 1047 |
| 3-1504. Register Call Summary for Register AUXCLKREQ3 | 1048 |
| 3-1505. AUXCLKREQ4 | 1048 |
| 3-1506. Register Call Summary for Register AUXCLKREQ4 | 1049 |
| 3-1507. AUXCLKREQ5 | 1049 |
| 3-1508. Register Call Summary for Register AUXCLKREQ5 | 1050 |
| 3-1509. C2CCLKREQ | 1050 |
| 3-1510. Register Call Summary for Register C2CCLKREQ..... | 1051 |
| 3-1511. AUXCLK0 | 1051 |
| 3-1512. Register Call Summary for Register AUXCLK0 | 1052 |
| 3-1513. AUXCLK1 | 1052 |
| 3-1514. Register Call Summary for Register AUXCLK1 | 1053 |
| 3-1515. AUXCLK2 | 1054 |
| 3-1516. Register Call Summary for Register AUXCLK2 | 1055 |
| 3-1517. AUXCLK3 | 1055 |
| 3-1518. Register Call Summary for Register AUXCLK3 | 1056 |
| 3-1519. AUXCLK4 | 1056 |
| 3-1520. Register Call Summary for Register AUXCLK4 | 1057 |
| 3-1521. AUXCLK5 | 1057 |
| 3-1522. Register Call Summary for Register AUXCLK5 | 1058 |
| 3-1523. RSTTIME_REG | 1058 |
| 3-1524. Register Call Summary for Register RSTTIME_REG | 1058 |
| 3-1525. C2CRSTCTRL | 1059 |
| 3-1526. Register Call Summary for Register C2CRSTCTRL | 1059 |
| 3-1527. EXTPWRONRSTCTRL | 1059 |
| 3-1528. Register Call Summary for Register EXTPWRONRSTCTRL | 1060 |
| 3-1529. EXTWARMRSTST_REG | 1060 |
| 3-1530. Register Call Summary for Register EXTWARMRSTST_REG | 1060 |
| 3-1531. APEWARMRSTST_REG | 1061 |
| 3-1532. Register Call Summary for Register APEWARMRSTST_REG | 1061 |
| 3-1533. C2CWARMRSTST_REG | 1061 |
| 3-1534. Register Call Summary for Register C2CWARMRSTST_REG | 1062 |
| 3-1535. SR Instance Summary | 1063 |
| 3-1536. SR Registers Mapping Summary | 1063 |
| 3-1537. SRCONFIG | 1064 |
| 3-1538. Register Call Summary for Register SRCONFIG | 1064 |
| 3-1539. SRSTATUS | 1065 |
| 3-1540. Register Call Summary for Register SRSTATUS | 1065 |
| 3-1541. SENVAL | 1065 |
| 3-1542. Register Call Summary for Register SENVAL | 1066 |
| 3-1543. SENMIN | 1066 |
| 3-1544. Register Call Summary for Register SENMIN | 1066 |
| 3-1545. SENMAX | 1066 |
| 3-1546. Register Call Summary for Register SENMAX | 1066 |

| | |
|---|------|
| 3-1547. SENAVG | 1067 |
| 3-1548. Register Call Summary for Register SENAVG | 1067 |
| 3-1549. AVGWEIGHT | 1067 |
| 3-1550. Register Call Summary for Register AVGWEIGHT | 1067 |
| 3-1551. NVALUERECIPROCAL | 1068 |
| 3-1552. Register Call Summary for Register NVALUERECIPROCAL | 1068 |
| 3-1553. IRQSTATUS_RAW | 1068 |
| 3-1554. Register Call Summary for Register IRQSTATUS_RAW | 1069 |
| 3-1555. IRQSTATUS | 1069 |
| 3-1556. Register Call Summary for Register IRQSTATUS | 1070 |
| 3-1557. IRQENABLE_SET | 1070 |
| 3-1558. Register Call Summary for Register IRQENABLE_SET | 1071 |
| 3-1559. IRQENABLE_CLR | 1071 |
| 3-1560. Register Call Summary for Register IRQENABLE_CLR | 1071 |
| 3-1561. SENERROR | 1072 |
| 3-1562. Register Call Summary for Register SENERROR | 1072 |
| 3-1563. ERRCONFIG | 1072 |
| 3-1564. Register Call Summary for Register ERRCONFIG | 1073 |
| 4-1. Integration Attributes | 1079 |
| 4-2. Clocks and Resets | 1080 |
| 4-3. ARM Core Key Features | 1085 |
| 4-4. MA Registers Duplicated From the DMM Register Map | 1089 |
| 4-5. CPUx Supported Power States | 1107 |
| 4-6. Available CPU Power States in Single and Coherency Mode | 1108 |
| 4-7. MPU Power States Handled by the Local and Global (Device) PRCM Modules | 1108 |
| 4-8. PD_CPUx Modules Power Attributes | 1110 |
| 4-9. PD_CPUx Logic Area Power Modes | 1110 |
| 4-10. PD_CPUx Memory Area Power Modes | 1110 |
| 4-11. PD_CPUx Power Mode Control Parameters | 1110 |
| 4-12. PD_CPUx Power Mode Status Parameters | 1111 |
| 4-13. Module Clock Management Modes and Control | 1111 |
| 4-14. Module Slave Clock Management Modes and Control | 1111 |
| 4-15. Cortex-A9 MPU Instance Summary | 1112 |
| 4-16. Local PRCM Revision Register Mapping Summary | 1112 |
| 4-17. CORTEXA9_PRCM_REVISION | 1113 |
| 4-18. Register Call Summary for Register CORTEXA9_PRCM_REVISION | 1113 |
| 4-19. Local PRCM Registers Mapping Summary | 1113 |
| 4-20. PRM_RSTST | 1113 |
| 4-21. Register Call Summary for Register PRM_RSTST | 1114 |
| 4-22. PRM_PSCON_COUNT | 1114 |
| 4-23. Register Call Summary for Register PRM_PSCON_COUNT | 1114 |
| 4-24. Local PRCM CPU0 and CPU1 Register Mapping Summary | 1114 |
| 4-25. PM_PDA_CPUi_PWRSTCTRL | 1115 |
| 4-26. Register Call Summary for Register PM_PDA_CPUi_PWRSTCTRL | 1116 |
| 4-27. PM_PDA_CPUi_PWRSTST | 1116 |
| 4-28. Register Call Summary for Register PM_PDA_CPUi_PWRSTST | 1117 |
| 4-29. RM_PDA_CPUi_CONTEXT | 1117 |
| 4-30. Register Call Summary for Register RM_PDA_CPUi_CONTEXT | 1117 |
| 4-31. RM_PDA_CPUi_RSTCTRL | 1118 |

| | | |
|-------|--|------|
| 4-32. | Register Call Summary for Register RM_PDA_CPUi_RSTCTRL..... | 1118 |
| 4-33. | CM_PDA_CPUi_CLKCTRL | 1118 |
| 4-34. | Register Call Summary for Register CM_PDA_CPUi_CLKCTRL..... | 1118 |
| 4-35. | CM_PDA_CPUi_CLKSTCTRL..... | 1119 |
| 4-36. | Register Call Summary for Register CM_PDA_CPUi_CLKSTCTRL | 1119 |
| 4-37. | CORTEXA9_WUGEN Registers Mapping Summary | 1119 |
| 4-38. | WKG_CONTROL_0..... | 1120 |
| 4-39. | Register Call Summary for Register WKG_CONTROL_0 | 1121 |
| 4-40. | WKG_ENB_A_0 | 1121 |
| 4-41. | Register Call Summary for Register WKG_ENB_A_0..... | 1122 |
| 4-42. | WKG_ENB_B_0 | 1123 |
| 4-43. | Register Call Summary for Register WKG_ENB_B_0..... | 1124 |
| 4-44. | WKG_ENB_C_0 | 1124 |
| 4-45. | Register Call Summary for Register WKG_ENB_C_0..... | 1125 |
| 4-46. | WKG_ENB_D_0 | 1125 |
| 4-47. | Register Call Summary for Register WKG_ENB_D_0..... | 1126 |
| 4-48. | WKG_CONTROL_1..... | 1126 |
| 4-49. | Register Call Summary for Register WKG_CONTROL_1 | 1127 |
| 4-50. | WKG_ENB_A_1 | 1127 |
| 4-51. | Register Call Summary for Register WKG_ENB_A_1..... | 1128 |
| 4-52. | WKG_ENB_B_1 | 1128 |
| 4-53. | Register Call Summary for Register WKG_ENB_B_1 | 1129 |
| 4-54. | WKG_ENB_C_1 | 1129 |
| 4-55. | Register Call Summary for Register WKG_ENB_C_1..... | 1130 |
| 4-56. | WKG_ENB_D_1 | 1131 |
| 4-57. | Register Call Summary for Register WKG_ENB_D_1..... | 1132 |
| 4-58. | AUX_CORE_BOOT_0 | 1132 |
| 4-59. | Register Call Summary for Register AUX_CORE_BOOT_0 | 1132 |
| 4-60. | AUX_CORE_BOOT_1 | 1132 |
| 4-61. | Register Call Summary for Register AUX_CORE_BOOT_1 | 1132 |
| 4-62. | CMU Register Mapping Summary | 1133 |
| 4-63. | CMUCONFIGREG | 1133 |
| 4-64. | Register Call Summary for Register CMUCONFIGREG | 1134 |
| 4-65. | CMUSTATUSREG | 1134 |
| 4-66. | Register Call Summary for Register CMUSTATUSREG | 1134 |
| 4-67. | CMUINTRACK | 1135 |
| 4-68. | Register Call Summary for Register CMUINTRACK..... | 1135 |
| 4-69. | CMUALLOCATE..... | 1135 |
| 4-70. | Register Call Summary for Register CMUALLOCATE | 1136 |
| 4-71. | CMUDEALLOCATE | 1136 |
| 4-72. | Register Call Summary for Register CMUDEALLOCATE..... | 1136 |
| 4-73. | CMUDEBUG | 1136 |
| 4-74. | Register Call Summary for Register CMUDEBUG..... | 1137 |
| 4-75. | CMUOPERATION_i..... | 1137 |
| 4-76. | Register Call Summary for Register CMUOPERATION_i | 1138 |
| 4-77. | CMUSTARTPA_i | 1139 |
| 4-78. | Register Call Summary for Register CMUSTARTPA_i..... | 1139 |
| 4-79. | CMULENGTH_i..... | 1139 |
| 4-80. | Register Call Summary for Register CMULENGTH_i | 1139 |

| | | |
|-------|---|------|
| 4-81. | CMURANGESTATE_i | 1140 |
| 4-82. | Register Call Summary for Register CMURANGESTATE_i | 1140 |
| 4-83. | Local interconnect Register Mapping Summary | 1140 |
| 4-84. | MA_PRIORITY | 1141 |
| 4-85. | Register Call Summary for Register MA_PRIORITY | 1141 |
| 4-86. | MA Register Mapping Summary | 1141 |
| 6-1. | IVA-HD Integration Attributes | 1148 |
| 6-2. | IVA-HD Clocks and Resets | 1148 |
| 6-3. | Hardware Requests | 1149 |
| 6-4. | Local Power-Management Features | 1152 |
| 6-5. | iCONT Memory Mapping Regions | 1153 |
| 6-6. | iCONT1 Memory Mapping | 1153 |
| 6-7. | iCONT2 Memory Mapping | 1154 |
| 6-8. | DSP and L3 Interconnect Memory Mapping | 1156 |
| 6-9. | IVA-HD Instance Summary | 1157 |
| 6-10. | SYSCTRL Registers Mapping Summary | 1157 |
| 6-11. | IWAHD_REVISION | 1158 |
| 6-12. | Register Call Summary for Register IWAHD_REVISION | 1158 |
| 6-13. | IWAHD_HWINFO | 1158 |
| 6-14. | Register Call Summary for Register IWAHD_HWINFO | 1159 |
| 6-15. | IWAHD_SYSCONFIG | 1159 |
| 6-16. | Register Call Summary for Register IWAHD_SYSCONFIG | 1160 |
| 6-17. | IWAHD_IRQSTATUS_RAW | 1160 |
| 6-18. | Register Call Summary for Register IWAHD_IRQSTATUS_RAW | 1161 |
| 6-19. | IWAHD_IRQSTATUS | 1161 |
| 6-20. | Register Call Summary for Register IWAHD_IRQSTATUS | 1161 |
| 6-21. | IWAHD_IRQENABLE_SET | 1162 |
| 6-22. | Register Call Summary for Register IWAHD_IRQENABLE_SET | 1162 |
| 6-23. | IWAHD_IRQENABLE_CLR | 1162 |
| 6-24. | Register Call Summary for Register IWAHD_IRQENABLE_CLR | 1163 |
| 6-25. | IWAHD_SYNC_IRQSTATUS_RAW | 1163 |
| 6-26. | Register Call Summary for Register IWAHD_SYNC_IRQSTATUS_RAW | 1163 |
| 6-27. | IWAHD_SYNC_IRQSTATUS | 1164 |
| 6-28. | Register Call Summary for Register IWAHD_SYNC_IRQSTATUS | 1164 |
| 6-29. | IWAHD_SYNC_IRQENABLE_SET | 1164 |
| 6-30. | Register Call Summary for Register IWAHD_SYNC_IRQENABLE_SET | 1164 |
| 6-31. | IWAHD_SYNC_IRQENABLE_CLR | 1165 |
| 6-32. | Register Call Summary for Register IWAHD_SYNC_IRQENABLE_CLR | 1165 |
| 6-33. | IWAHD_CLKCTRL | 1165 |
| 6-34. | Register Call Summary for Register IWAHD_CLKCTRL | 1166 |
| 6-35. | IWAHD_CLKST | 1166 |
| 6-36. | Register Call Summary for Register IWAHD_CLKST | 1167 |
| 6-37. | IWAHD_STDBYST | 1167 |
| 6-38. | Register Call Summary for Register IWAHD_STDBYST | 1168 |
| 7-1. | Integration Attributes | 1172 |
| 7-2. | Hardware Requests | 1172 |
| 7-3. | Clocks and Resets | 1173 |
| 7-4. | Local Clock Gating | 1178 |
| 7-5. | Dual Cortex-M3 MPU Power Modes | 1179 |

| | | |
|-------|---|------|
| 7-6. | Power Mode Transitions | 1179 |
| 7-7. | Shared Cache Configuration | 1181 |
| 7-8. | Shared Cache MMU Configuration | 1182 |
| 7-9. | L2 MMU Behavior on Page-Fault | 1183 |
| 7-10. | Dual Cortex-M3 MPU Subsystem Instance Summary | 1186 |
| 7-11. | CORTEXM3_WKUP Register Mapping Summary | 1187 |
| 7-12. | CORTEXM3_CTRL_REG | 1187 |
| 7-13. | Register Call Summary for Register CORTEXM3_CTRL_REG | 1188 |
| 7-14. | STANDBY_CORE_SYSCONFIG | 1188 |
| 7-15. | Register Call Summary for Register STANDBY_CORE_SYSCONFIG | 1188 |
| 7-16. | IDLE_CORE_SYSCONFIG | 1188 |
| 7-17. | Register Call Summary for Register IDLE_CORE_SYSCONFIG | 1189 |
| 7-18. | WUGEN_MEVT0 | 1189 |
| 7-19. | Register Call Summary for Register WUGEN_MEVT0 | 1190 |
| 7-20. | WUGEN_MEVT1 | 1190 |
| 7-21. | Register Call Summary for Register WUGEN_MEVT1 | 1191 |
| 7-22. | CM3_RW_Table Register Summary | 1191 |
| 7-23. | CORTEXM3_RW_PID1 | 1191 |
| 7-24. | Register Call Summary for Register CORTEXM3_RW_PID1 | 1191 |
| 7-25. | CORTEXM3_RW_PID2 | 1192 |
| 7-26. | Register Call Summary for Register CORTEXM3_RW_PID2 | 1192 |
| 8-1. | ISS Integration Attributes | 1198 |
| 8-2. | ISS Clocks and Resets | 1198 |
| 8-3. | ISS Hardware Requests | 1198 |
| 8-4. | ISS Local Clock Domains | 1199 |
| 8-5. | ISS Interrupts | 1200 |
| 8-6. | ISS ISP Interrupts | 1202 |
| 8-7. | ISS CSI2-A and CSI2-B Interrupts | 1203 |
| 8-8. | ISS CSI2-A and CSI2-B Receivers Complex I/O Interrupts | 1204 |
| 8-9. | ISS CSI2-A/CSI2-B Receivers CONTEXT Interrupts | 1204 |
| 8-10. | ISS CCP2 Receiver Interrupts | 1205 |
| 8-11. | ISS CBUFF Interrupts | 1207 |
| 8-12. | ISS BTE Interrupts | 1207 |
| 8-13. | ISS SIMCOP High-Level Interrupts | 1210 |
| 8-14. | ISS Submodule Clock Gating | 1211 |
| 8-15. | ISS Instance Summary | 1216 |
| 8-16. | ISS TOP Register Mapping Summary | 1216 |
| 8-17. | ISS_HL_REVISION | 1217 |
| 8-18. | Register Call Summary for Register ISS_HL_REVISION | 1217 |
| 8-19. | ISS_HL_SYSCONFIG | 1217 |
| 8-20. | Register Call Summary for Register ISS_HL_SYSCONFIG | 1218 |
| 8-21. | ISS_HL_IRQSTATUS_RAW_i | 1218 |
| 8-22. | Register Call Summary for Register ISS_HL_IRQSTATUS_RAW_i | 1219 |
| 8-23. | ISS_HL_IRQSTATUS_i | 1220 |
| 8-24. | Register Call Summary for Register ISS_HL_IRQSTATUS_i | 1221 |
| 8-25. | ISS_HL_IRQENABLE_SET_i | 1221 |
| 8-26. | Register Call Summary for Register ISS_HL_IRQENABLE_SET_i | 1224 |
| 8-27. | ISS_HL_IRQENABLE_CLR_i | 1224 |
| 8-28. | Register Call Summary for Register ISS_HL_IRQENABLE_CLR_i | 1226 |

| | | |
|-------|--|------|
| 8-29. | ISS_CTRL | 1226 |
| 8-30. | Register Call Summary for Register ISS_CTRL..... | 1227 |
| 8-31. | ISS_CLKCTRL..... | 1227 |
| 8-32. | Register Call Summary for Register ISS_CLKCTRL | 1228 |
| 8-33. | ISS_CLKSTAT | 1229 |
| 8-34. | Register Call Summary for Register ISS_CLKSTAT | 1229 |
| 8-35. | ISS_PM_STATUS | 1230 |
| 8-36. | Register Call Summary for Register ISS_PM_STATUS | 1230 |
| 8-37. | ISS I/O Description | 1236 |
| 8-38. | ISS Interfaces Connectivity Scheme Example Scenarios..... | 1239 |
| 8-39. | ISS Interfaces CPI Video Timing Reference Codes for SAV and EAV | 1241 |
| 8-40. | ISS Interfaces CPI F, V, H Signal Descriptions | 1242 |
| 8-41. | ISS Interfaces CPI F, V, H Protection (Error-Correction) Bits | 1242 |
| 8-42. | ISS Interfaces CPI ITU-R BT.656 Mode Data Format in SDRAM | 1242 |
| 8-43. | ISS CSI2 Possible Time-Out Value for RxMode Counter..... | 1245 |
| 8-44. | ISS CSI2 PHY Instance Summary | 1250 |
| 8-45. | ISS CSI2 PHY Registers Mapping Summary..... | 1251 |
| 8-46. | REGISTER0..... | 1251 |
| 8-47. | Register Call Summary for Register REGISTER0 | 1252 |
| 8-48. | REGISTER1..... | 1252 |
| 8-49. | Register Call Summary for Register REGISTER1 | 1253 |
| 8-50. | REGISTER2..... | 1253 |
| 8-51. | Register Call Summary for Register REGISTER2 | 1253 |
| 8-52. | I/O Description for Serial Interface CCP2 | 1254 |
| 8-53. | ISS CCP2 Image Data Operating Modes and Alignment Constraints..... | 1254 |
| 8-54. | ISS CCP2 Video interface Signals | 1269 |
| 8-55. | ISS CCP2 Video Port Data Mapping | 1270 |
| 8-56. | ISS CCP2 Memory-to-Memory Supported Operations | 1272 |
| 8-57. | ISS CCP2 Memory-to-Video Port Supported Formats | 1273 |
| 8-58. | ISS CCP2 Data Packing Benefit and Constraints..... | 1276 |
| 8-59. | ISS CCP2 Output Width Restrictions in Memory-to-Memory Operation | 1278 |
| 8-60. | ISS CCP2 Interface Enable | 1280 |
| 8-61. | ISS CCP2 Interface Disable | 1281 |
| 8-62. | ISS CCP2 Select the Signaling Scheme | 1281 |
| 8-63. | ISS CCP2 Select MIPI CSI1 or CCP2 Mode | 1281 |
| 8-64. | ISS CCP2 Configure Burst Settings | 1281 |
| 8-65. | ISS CCP2 Enable Debug Mode | 1282 |
| 8-66. | ISS CCP2 Configure Video Port..... | 1282 |
| 8-67. | ISS CCP2 Enable Logical Channels..... | 1284 |
| 8-68. | ISS CCP2 Enable Region-of-Interest | 1284 |
| 8-69. | ISS CCP2 Enable the CRC | 1284 |
| 8-70. | ISS CCP2 Frame Acquisition | 1285 |
| 8-71. | ISS CCP2 Configure Read Data From Memory..... | 1288 |
| 8-72. | ISS CCP2 Instance Summary | 1289 |
| 8-73. | ISS CCP2 Registers Mapping Summary | 1290 |
| 8-74. | CCP2_REVISION | 1291 |
| 8-75. | Register Call Summary for Register CCP2_REVISION..... | 1291 |
| 8-76. | CCP2_SYSCONFIG | 1291 |
| 8-77. | Register Call Summary for Register CCP2_SYSCONFIG | 1292 |

| | | |
|--------|---|------|
| 8-78. | CCP2_SYSSTATUS | 1292 |
| 8-79. | Register Call Summary for Register CCP2_SYSSTATUS | 1292 |
| 8-80. | CCP2_LC01_IRQENABLE | 1293 |
| 8-81. | Register Call Summary for Register CCP2_LC01_IRQENABLE | 1294 |
| 8-82. | CCP2_LC01_IRQSTATUS | 1295 |
| 8-83. | Register Call Summary for Register CCP2_LC01_IRQSTATUS | 1297 |
| 8-84. | CCP2_LC23_IRQENABLE | 1297 |
| 8-85. | Register Call Summary for Register CCP2_LC23_IRQENABLE | 1299 |
| 8-86. | CCP2_LC23_IRQSTATUS | 1300 |
| 8-87. | Register Call Summary for Register CCP2_LC23_IRQSTATUS | 1302 |
| 8-88. | CCP2_LCM_IRQENABLE | 1302 |
| 8-89. | Register Call Summary for Register CCP2_LCM_IRQENABLE | 1303 |
| 8-90. | CCP2_LCM_IRQSTATUS | 1303 |
| 8-91. | Register Call Summary for Register CCP2_LCM_IRQSTATUS | 1304 |
| 8-92. | CCP2_CTRL | 1304 |
| 8-93. | Register Call Summary for Register CCP2_CTRL | 1306 |
| 8-94. | CCP2_DBG | 1306 |
| 8-95. | Register Call Summary for Register CCP2_DBG | 1306 |
| 8-96. | CCP2_GNQ | 1307 |
| 8-97. | Register Call Summary for Register CCP2_GNQ | 1307 |
| 8-98. | CCP2_CTRL1 | 1307 |
| 8-99. | Register Call Summary for Register CCP2_CTRL1 | 1308 |
| 8-100. | CCP2_LCx_CTRL | 1308 |
| 8-101. | Register Call Summary for Register CCP2_LCx_CTRL | 1311 |
| 8-102. | CCP2_LCx_CODE | 1311 |
| 8-103. | Register Call Summary for Register CCP2_LCx_CODE | 1312 |
| 8-104. | CCP2_LCx_STAT_START | 1312 |
| 8-105. | Register Call Summary for Register CCP2_LCx_STAT_START | 1312 |
| 8-106. | CCP2_LCx_STAT_SIZE | 1312 |
| 8-107. | Register Call Summary for Register CCP2_LCx_STAT_SIZE | 1313 |
| 8-108. | CCP2_LCx_SOF_ADDR | 1313 |
| 8-109. | Register Call Summary for Register CCP2_LCx_SOF_ADDR | 1313 |
| 8-110. | CCP2_LCx_EOF_ADDR | 1313 |
| 8-111. | Register Call Summary for Register CCP2_LCx_EOF_ADDR | 1313 |
| 8-112. | CCP2_LCx_DAT_START | 1314 |
| 8-113. | Register Call Summary for Register CCP2_LCx_DAT_START | 1314 |
| 8-114. | CCP2_LCx_DAT_SIZE | 1314 |
| 8-115. | Register Call Summary for Register CCP2_LCx_DAT_SIZE | 1314 |
| 8-116. | CCP2_LCx_DAT_PING_ADDR | 1315 |
| 8-117. | Register Call Summary for Register CCP2_LCx_DAT_PING_ADDR | 1315 |
| 8-118. | CCP2_LCx_DAT_PONG_ADDR | 1315 |
| 8-119. | Register Call Summary for Register CCP2_LCx_DAT_PONG_ADDR | 1315 |
| 8-120. | CCP2_LCx_DAT_OFST | 1316 |
| 8-121. | Register Call Summary for Register CCP2_LCx_DAT_OFST | 1316 |
| 8-122. | CCP2_LCM_CTRL | 1316 |
| 8-123. | Register Call Summary for Register CCP2_LCM_CTRL | 1319 |
| 8-124. | CCP2_LCM_VSIZE | 1319 |
| 8-125. | Register Call Summary for Register CCP2_LCM_VSIZE | 1319 |
| 8-126. | CCP2_LCM_HSIZE | 1319 |

| | |
|--|------|
| 8-127. Register Call Summary for Register CCP2_LCM_HSIZE | 1320 |
| 8-128. CCP2_LCM_PREFETCH..... | 1320 |
| 8-129. Register Call Summary for Register CCP2_LCM_PREFETCH | 1320 |
| 8-130. CCP2_LCM_SRC_ADDR | 1321 |
| 8-131. Register Call Summary for Register CCP2_LCM_SRC_ADDR | 1321 |
| 8-132. CCP2_LCM_SRC_OFST | 1321 |
| 8-133. Register Call Summary for Register CCP2_LCM_SRC_OFST | 1321 |
| 8-134. CCP2_LCM_DST_ADDR..... | 1322 |
| 8-135. Register Call Summary for Register CCP2_LCM_DST_ADDR | 1322 |
| 8-136. CCP2_LCM_DST_OFST | 1322 |
| 8-137. Register Call Summary for Register CCP2_LCM_DST_OFST..... | 1322 |
| 8-138. CCP2_LCM_HISTORY | 1323 |
| 8-139. Register Call Summary for Register CCP2_LCM_HISTORY..... | 1323 |
| 8-140. ISS CSI2 Pixel Format Modes | 1324 |
| 8-141. ISS CSI2-A I/O Description | 1325 |
| 8-142. ISS CSI2-B I/O Description | 1326 |
| 8-143. ISS CSI2 Long Packet Structure Description | 1331 |
| 8-144. ISS CSI2 Synchronization Codes | 1332 |
| 8-145. ISS CSI2 MIPI Format Supported by the Protocol Engine..... | 1357 |
| 8-146. ISS CSI2 ECC Event Logging | 1364 |
| 8-147. ISS CSI2 Supported Transcoding Input Formats | 1368 |
| 8-148. ISS CSI2 Transcode Alignment Constraints | 1369 |
| 8-149. ISS CSI2-Supported Transcoding Output Formats | 1370 |
| 8-150. ISS CSI2 Global Initialization | 1373 |
| 8-151. ISS CSI2 Capture a Finite Number of Frames | 1374 |
| 8-152. ISS CSI2 Enable Debug Mode | 1375 |
| 8-153. ISS CSI2 Instance Summary | 1376 |
| 8-154. ISS CSI2 REGS1 Registers Mapping Summary | 1376 |
| 8-155. CSI2_REVISION..... | 1377 |
| 8-156. Register Call Summary for Register CSI2_REVISION | 1377 |
| 8-157. CSI2_SYSCONFIG..... | 1377 |
| 8-158. Register Call Summary for Register CSI2_SYSCONFIG | 1378 |
| 8-159. CSI2_SYSSTATUS | 1378 |
| 8-160. Register Call Summary for Register CSI2_SYSSTATUS | 1379 |
| 8-161. CSI2_IRQSTATUS | 1379 |
| 8-162. Register Call Summary for Register CSI2_IRQSTATUS..... | 1380 |
| 8-163. CSI2_IRQENABLE | 1381 |
| 8-164. Register Call Summary for Register CSI2_IRQENABLE..... | 1382 |
| 8-165. CSI2_CTRL | 1382 |
| 8-166. Register Call Summary for Register CSI2_CTRL | 1384 |
| 8-167. CSI2_DBG_H | 1384 |
| 8-168. Register Call Summary for Register CSI2_DBG_H..... | 1384 |
| 8-169. CSI2_COMPLEXIO_CFG | 1385 |
| 8-170. Register Call Summary for Register CSI2_COMPLEXIO_CFG..... | 1387 |
| 8-171. CSI2_COMPLEXIO_IRQSTATUS | 1387 |
| 8-172. Register Call Summary for Register CSI2_COMPLEXIO_IRQSTATUS | 1390 |
| 8-173. CSI2_SHORT_PACKET | 1391 |
| 8-174. Register Call Summary for Register CSI2_SHORT_PACKET | 1391 |
| 8-175. CSI2_COMPLEXIO_IRQENABLE | 1391 |

| | |
|---|------|
| 8-176. Register Call Summary for Register CSI2_COMPLEXIO_IRQENABLE | 1393 |
| 8-177. CSI2_DBG_P | 1393 |
| 8-178. Register Call Summary for Register CSI2_DBG_P | 1393 |
| 8-179. CSI2_TIMING | 1394 |
| 8-180. Register Call Summary for Register CSI2_TIMING..... | 1394 |
| 8-181. CSI2_CTX_CTRL1_i | 1395 |
| 8-182. Register Call Summary for Register CSI2_CTX_CTRL1_i | 1397 |
| 8-183. CSI2_CTX_CTRL2_i | 1398 |
| 8-184. Register Call Summary for Register CSI2_CTX_CTRL2_i | 1401 |
| 8-185. CSI2_CTX_DAT_OFST_i | 1401 |
| 8-186. Register Call Summary for Register CSI2_CTX_DAT_OFST_i | 1402 |
| 8-187. CSI2_CTX_DAT_PING_ADDR_i | 1402 |
| 8-188. Register Call Summary for Register CSI2_CTX_DAT_PING_ADDR_i | 1402 |
| 8-189. CSI2_CTX_DAT_PONG_ADDR_i | 1402 |
| 8-190. Register Call Summary for Register CSI2_CTX_DAT_PONG_ADDR_i | 1403 |
| 8-191. CSI2_CTX_IRQENABLE_i | 1403 |
| 8-192. Register Call Summary for Register CSI2_CTX_IRQENABLE_i..... | 1404 |
| 8-193. CSI2_CTX_IRQSTATUS_i | 1404 |
| 8-194. Register Call Summary for Register CSI2_CTX_IRQSTATUS_i..... | 1405 |
| 8-195. CSI2_CTX_CTRL3_i | 1405 |
| 8-196. Register Call Summary for Register CSI2_CTX_CTRL3_i | 1406 |
| 8-197. ISS CSI2 REGS2 Registers Mapping Summary | 1406 |
| 8-198. CSI2_CTX_TRANSCODEH_i..... | 1406 |
| 8-199. Register Call Summary for Register CSI2_CTX_TRANSCODEH_i | 1407 |
| 8-200. CSI2_CTX_TRANSCODEV_i..... | 1407 |
| 8-201. Register Call Summary for Register CSI2_CTX_TRANSCODEV_i | 1407 |
| 8-202. ISS TCTRL Control-Signal Generator: CNTCLK Frequencies | 1411 |
| 8-203. ISS TCTRL Enabling the Control-Signal Generation in First Configuration | 1413 |
| 8-204. ISS TCTRL Enabling the Control-Signal Generation in Second Configuration | 1414 |
| 8-205. ISS TCTRL Instance Summary | 1416 |
| 8-206. ISS TCTRL Registers Mapping Summary | 1416 |
| 8-207. TCTRL_REVISION | 1417 |
| 8-208. Register Call Summary for Register TCTRL_REVISION | 1417 |
| 8-209. TCTRL_SYSCONFIG | 1417 |
| 8-210. Register Call Summary for Register TCTRL_SYSCONFIG | 1418 |
| 8-211. TCTRL_SYSSTATUS..... | 1418 |
| 8-212. Register Call Summary for Register TCTRL_SYSSTATUS | 1418 |
| 8-213. TCTRL_STRB_LENGTH | 1419 |
| 8-214. Register Call Summary for Register TCTRL_STRB_LENGTH..... | 1419 |
| 8-215. TCTRL_PSTRB_LENGTH | 1419 |
| 8-216. Register Call Summary for Register TCTRL_PSTRB_LENGTH | 1419 |
| 8-217. TCTRL_SHUT_LENGTH | 1420 |
| 8-218. Register Call Summary for Register TCTRL_SHUT_LENGTH..... | 1420 |
| 8-219. TCTRL_GRESET_LENGTH | 1420 |
| 8-220. Register Call Summary for Register TCTRL_GRESET_LENGTH..... | 1420 |
| 8-221. TCTRL_STRB_DELAY | 1421 |
| 8-222. Register Call Summary for Register TCTRL_STRB_DELAY | 1421 |
| 8-223. TCTRL_PSTRB_DELAY | 1421 |
| 8-224. Register Call Summary for Register TCTRL_PSTRB_DELAY | 1421 |

| | |
|--|------|
| 8-225. TCTRL_SHUT_DELAY | 1422 |
| 8-226. Register Call Summary for Register TCTRL_SHUT_DELAY | 1422 |
| 8-227. TCTRL_CTRL | 1422 |
| 8-228. Register Call Summary for Register TCTRL_CTRL | 1424 |
| 8-229. TCTRL_PSTRB_REPLAY | 1424 |
| 8-230. Register Call Summary for Register TCTRL_PSTRB_REPLAY | 1424 |
| 8-231. TCTRL_FRAME | 1425 |
| 8-232. Register Call Summary for Register TCTRL_FRAME | 1425 |
| 8-233. ISS BTE TILER Context Configuration Example | 1432 |
| 8-234. ISS BTE Supported TILER Formats and Views | 1437 |
| 8-235. ISS BTE Interrupt Events | 1439 |
| 8-236. ISS BTE Configure/Manage Interrupts | 1440 |
| 8-237. TILER Address Format | 1440 |
| 8-238. ISS BTE Change Context Configuration | 1441 |
| 8-239. ISS BTE Instance Summary | 1441 |
| 8-240. ISS BTE Registers Mapping Summary | 1442 |
| 8-241. BTE_HL_REVISION | 1442 |
| 8-242. Register Call Summary for Register BTE_HL_REVISION | 1442 |
| 8-243. BTE_HL_HWINFO | 1443 |
| 8-244. Register Call Summary for Register BTE_HL_HWINFO | 1443 |
| 8-245. BTE_HL_SYSCONFIG | 1443 |
| 8-246. Register Call Summary for Register BTE_HL_SYSCONFIG | 1444 |
| 8-247. BTE_HL_IRQSTATUS_RAW | 1444 |
| 8-248. Register Call Summary for Register BTE_HL_IRQSTATUS_RAW | 1446 |
| 8-249. BTE_HL_IRQSTATUS | 1446 |
| 8-250. Register Call Summary for Register BTE_HL_IRQSTATUS | 1448 |
| 8-251. BTE_HL_IRQENABLE_SET | 1449 |
| 8-252. Register Call Summary for Register BTE_HL_IRQENABLE_SET | 1451 |
| 8-253. BTE_HL_IRQENABLE_CLR | 1451 |
| 8-254. Register Call Summary for Register BTE_HL_IRQENABLE_CLR | 1453 |
| 8-255. BTE_CTRL | 1453 |
| 8-256. Register Call Summary for Register BTE_CTRL | 1454 |
| 8-257. BTE_CTRL1 | 1454 |
| 8-258. Register Call Summary for Register BTE_CTRL1 | 1454 |
| 8-259. BTE_CONTEXT_CTRL_i | 1455 |
| 8-260. Register Call Summary for Register BTE_CONTEXT_CTRL_i | 1456 |
| 8-261. BTE_CONTEXT_BASE_i | 1456 |
| 8-262. Register Call Summary for Register BTE_CONTEXT_BASE_i | 1456 |
| 8-263. BTE_CONTEXT_START_i | 1457 |
| 8-264. Register Call Summary for Register BTE_CONTEXT_START_i | 1457 |
| 8-265. BTE_CONTEXT_END_i | 1457 |
| 8-266. Register Call Summary for Register BTE_CONTEXT_END_i | 1457 |
| 8-267. ISS CBUFF Interrupt Management | 1461 |
| 8-268. ISS CBUFF-Generated Events | 1461 |
| 8-269. ISS CBUFF Functional Modes | 1463 |
| 8-270. ISS CBUFF Internal Variables | 1471 |
| 8-271. ISS CBUFF Internal State After Reset | 1471 |
| 8-272. ISS CBUFF Address identification | 1471 |
| 8-273. ISS CBUFF Address Translation | 1472 |

| | |
|---|------|
| 8-274. ISS CBUFF Window-Level Increment | 1473 |
| 8-275. ISS CBUFF Window-Level Comparison | 1473 |
| 8-276. ISS CBUFF Setup Register | 1477 |
| 8-277. ISS CBUFF Instance Summary | 1478 |
| 8-278. ISS CBUFF Registers Mapping Summary | 1478 |
| 8-279. CBUFF_HL_REVISION..... | 1479 |
| 8-280. Register Call Summary for Register CBUFF_HL_REVISION | 1479 |
| 8-281. CBUFF_HL_HWINFO..... | 1479 |
| 8-282. Register Call Summary for Register CBUFF_HL_HWINFO | 1479 |
| 8-283. CBUFF_HL_SYSCONFIG..... | 1480 |
| 8-284. Register Call Summary for Register CBUFF_HL_SYSCONFIG | 1480 |
| 8-285. CBUFF_HL_IRQSTATUS_RAW | 1481 |
| 8-286. Register Call Summary for Register CBUFF_HL_IRQSTATUS_RAW..... | 1484 |
| 8-287. CBUFF_HL_IRQSTATUS | 1484 |
| 8-288. Register Call Summary for Register CBUFF_HL_IRQSTATUS..... | 1487 |
| 8-289. CBUFF_HL_IRQENABLE_SET | 1487 |
| 8-290. Register Call Summary for Register CBUFF_HL_IRQENABLE_SET..... | 1491 |
| 8-291. CBUFF_HL_IRQENABLE_CLR | 1491 |
| 8-292. Register Call Summary for Register CBUFF_HL_IRQENABLE_CLR..... | 1494 |
| 8-293. CBUFF_FRAG_ADDR_j..... | 1494 |
| 8-294. Register Call Summary for Register CBUFF_FRAG_ADDR_j | 1494 |
| 8-295. CBUFF_CTX_CTRL_i | 1495 |
| 8-296. Register Call Summary for Register CBUFF_CTX_CTRL_i..... | 1496 |
| 8-297. CBUFF_CTX_START_i..... | 1496 |
| 8-298. Register Call Summary for Register CBUFF_CTX_START_i | 1496 |
| 8-299. CBUFF_CTX_END_i..... | 1497 |
| 8-300. Register Call Summary for Register CBUFF_CTX_END_i | 1497 |
| 8-301. CBUFF_CTX_WINDOWSIZE_i..... | 1497 |
| 8-302. Register Call Summary for Register CBUFF_CTX_WINDOWSIZE_i | 1497 |
| 8-303. CBUFF_CTX_THRESHOLD_F_i..... | 1498 |
| 8-304. Register Call Summary for Register CBUFF_CTX_THRESHOLD_F_i | 1498 |
| 8-305. CBUFF_CTX_THRESHOLD_S_i..... | 1498 |
| 8-306. Register Call Summary for Register CBUFF_CTX_THRESHOLD_S_i | 1498 |
| 8-307. CBUFF_CTX_STATUS_i..... | 1499 |
| 8-308. Register Call Summary for Register CBUFF_CTX_STATUS_i | 1499 |
| 8-309. CBUFF_CTX_PHY_i..... | 1499 |
| 8-310. Register Call Summary for Register CBUFF_CTX_PHY_i | 1499 |
| 8-311. ISS ISP Interrupt Tree Table..... | 1503 |
| 8-312. ISS ISP VP Format Mapping..... | 1511 |
| 8-313. ISS ISP VP GCK_MMR to PCLK Clock Resynchronization | 1513 |
| 8-314. ISS ISP IPIPEIF IPIPEIF_CFG1[15:14] INPSRC1 and IPIPEIF_CFG1[3:2] INPSRC2 Possible Combinations | 1520 |
| 8-315. ISS ISP IPIPEIF DCPM Block Possible Configuration | 1530 |
| 8-316. ISS ISP IPIPEIF DFS Modes Supported | 1533 |
| 8-317. ISS ISP IPIPEIF Averaging Filter Conditions for YUV4:2:2 Data | 1533 |
| 8-318. ISS ISP IPIPE Input and Output Selections | 1541 |
| 8-319. ISS ISP IPIPE Defect Information Packing | 1542 |
| 8-320. ISS ISP IPIPE Correction Method Description | 1542 |
| 8-321. ISS ISP IPIPE Edge-Enhancer LUT Mapping | 1548 |

| | |
|--|------|
| 8-322. ISS ISP RSZ VP Supported Formats | 1556 |
| 8-323. ISS ISP RSZ Data Flow vs. Input Data Format Constraints | 1559 |
| 8-324. ISS ISP RSZ Module Modes: Register Settings..... | 1560 |
| 8-325. ISS ISP RSZ Module Input Control: Register Settings | 1561 |
| 8-326. ISS ISP RSZ-A/RSZ-B Output Format Selection..... | 1561 |
| 8-327. ISS ISP RSZ Output Interface: Data Formats | 1571 |
| 8-328. ISS ISP H3A Poxel Register Field Descriptions..... | 1580 |
| 8-329. ISS ISP H3A AE/AWB Window Register Field Descriptions..... | 1583 |
| 8-330. ISS ISP H3A AE/AWB Window with Additional Black Row Register Field Descriptions..... | 1584 |
| 8-331. ISS ISP H3A AF Packet Format With Vertical AF Disabled | 1585 |
| 8-332. ISS ISP H3A AF Packet Format With Vertical AF Enabled..... | 1586 |
| 8-333. ISS ISP H3A AE/AWB Packet Format for Sum of Square Mode | 1587 |
| 8-334. ISS ISP H3A AE/AWB Packet Format for Minimum-Maximum Mode..... | 1589 |
| 8-335. ISS ISP H3A AE/AWB Packet Format for Sum-Only Mode | 1591 |
| 8-336. ISS ISP ISIF Input Interface Signals | 1596 |
| 8-337. ISS ISP ISIF Data Input Formats..... | 1596 |
| 8-338. ISS ISP ISIF Raw Data Connection: Selects MSB Position of Input Data..... | 1597 |
| 8-339. ISS ISP ISIF Linearization LUT | 1598 |
| 8-340. ISS ISP ISIF LUT Memory Region | 1598 |
| 8-341. ISS ISP ISIF Input Data Formatter Area Setting Registers | 1601 |
| 8-342. ISS ISP ISIF Output Data Formatter Area Setting Registers..... | 1601 |
| 8-343. ISS ISP ISIF Example of Combining Three Input Lines Into a Single Line: Register Setting Example..... | 1605 |
| 8-344. ISS ISP ISIF Vertical Line Defect Table in Memory | 1616 |
| 8-345. ISS ISP ISIF Supported On-the-Fly LSC Configurations..... | 1622 |
| 8-346. ISS ISP ISIF RAW Data Shifting | 1629 |
| 8-347. ISS ISP ISIF SDRAM Data Format | 1629 |
| 8-348. ISS ISP ISIF SDRAM Data Format for 12-bit Packed | 1629 |
| 8-349. ISS ISP ISIF Memory Output Format for YUV Data | 1630 |
| 8-350. ISS ISP ISIF Module: Write Port Bandwidth | 1631 |
| 8-351. ISS ISP ISIF Read Port Bandwidth | 1631 |
| 8-352. ISS ISP BL cpriority to MFlag With ISP5_CTRL[21] MFLAG = 1 | 1637 |
| 8-353. ISS ISP BL MFlag Write Low- and High-Level Priority Thresholds..... | 1637 |
| 8-354. ISS ISP BL MFlag Read Low- and High-Level Priority Thresholds..... | 1638 |
| 8-355. ISS ISP Memory Mapping..... | 1638 |
| 8-356. ISS ISP PG Settings | 1640 |
| 8-357. ISS ISP ISIF Required Configuration Parameters | 1642 |
| 8-358. ISS ISP ISIF Maximum Line Width Versus M Value..... | 1649 |
| 8-359. ISS ISP IPIPEIF Required Configuration Parameters | 1649 |
| 8-360. ISS Global Initialization | 1653 |
| 8-361. ISS ISP IPIPE LUT Defect Pixel Correction (LUT DPC) | 1653 |
| 8-362. ISS ISP IPIPE White Balance Initialization..... | 1653 |
| 8-363. ISS ISP IPIPE RGB2RGB Blending Module Initialization | 1654 |
| 8-364. ISS ISP IPIPE Gamma Correction Module Initialization..... | 1654 |
| 8-365. ISS ISP IPIPE 2nd RGB2RGB Conversion Matrix Initialization..... | 1654 |
| 8-366. ISS ISP IPIPE RGB2YCbCr Conversion Matrix Initialization | 1654 |
| 8-367. ISS ISP IPIPE 4:2:2 Conversion Module Initialization | 1655 |
| 8-368. ISS ISP IPIPE 2D Edge Enhancer Initialization | 1655 |
| 8-369. ISS ISP IPIPE Histogram Initialization..... | 1655 |
| 8-370. ISS ISP IPIPE Boxcar Initialization..... | 1656 |

| | |
|---|------|
| 8-371. ISS ISP IPIPE Processing Path: Case 1 Configuration | 1657 |
| 8-372. ISS ISP IPIPE Processing Path: Case 2 Configuration | 1657 |
| 8-373. ISS ISP IPIPE Processing Path: Case 3 Configuration | 1657 |
| 8-374. ISS ISP IPIPE Processing Path: Case 4 Configuration | 1657 |
| 8-375. ISS ISP RSZ Surrounding Modules Global Initialization | 1658 |
| 8-376. ISS ISP RSZ Initial Register Setup | 1659 |
| 8-377. ISS ISP RSZ Reset Behavior | 1660 |
| 8-378. ISS ISP RSZ Global Image Processing Settings..... | 1660 |
| 8-379. Register Call Summary for ISS ISP RSZ Global Image Processing Settings – Subsequence 1 | 1664 |
| 8-380. Register Call Summary for ISS ISP RSZ Global Image Processing Settings – Subsequence 2 | 1664 |
| 8-381. ISS ISP RSZ Engines Interframe Image Processing Settings..... | 1665 |
| 8-382. Register Call Summary for ISS ISP RSZ Engines Interframe Image Processing Settings – Subsequence 1 | 1667 |
| 8-383. Register Call Summary for ISS ISP RSZ Engines Interframe Image Processing Settings – Subsequence 2 | 1667 |
| 8-384. ISS ISP RSZ Nonshadowed Registers | 1668 |
| 8-385. ISS ISP H3A AF Engine Required Configuration Parameters..... | 1669 |
| 8-386. ISS ISP H3A AEW Engine Required Configuration Parameters | 1670 |
| 8-387. ISS ISP H3A Constraints When PCLK < ISP_FCLK/2 and Vertical Focus Enabled | 1672 |
| 8-388. ISS ISP H3A Constraints When PCLK < ISP_FCLK/2 and Vertical Focus Disabled | 1672 |
| 8-389. ISS ISP H3A Constraints When PCLK >= ISP_FCLK/2 and Vertical Focus Enabled | 1672 |
| 8-390. ISS ISP H3A Constraints When PCLK >= ISP_FCLK/2 and Vertical Focus Disabled | 1672 |
| 8-391. ISS ISP BL Settings..... | 1674 |
| 8-392. ISS ISP Instance Summary | 1675 |
| 8-393. ISS ISP5 SYS1 Registers Mapping Summary..... | 1675 |
| 8-394. ISP5_REVISION..... | 1676 |
| 8-395. Register Call Summary for Register ISP5_REVISION | 1676 |
| 8-396. ISP5_HWINFO1 | 1676 |
| 8-397. Register Call Summary for Register ISP5_HWINFO1 | 1676 |
| 8-398. ISP5_HWINFO2 | 1677 |
| 8-399. Register Call Summary for Register ISP5_HWINFO2..... | 1677 |
| 8-400. ISP5_SYSCONFIG | 1677 |
| 8-401. Register Call Summary for Register ISP5_SYSCONFIG | 1678 |
| 8-402. ISP5_IRQSTATUS_RAW_i | 1678 |
| 8-403. Register Call Summary for Register ISP5_IRQSTATUS_RAW_i..... | 1683 |
| 8-404. ISP5_IRQSTATUS_i | 1683 |
| 8-405. Register Call Summary for Register ISP5_IRQSTATUS_i..... | 1687 |
| 8-406. ISP5_IRQENABLE_SET_i | 1688 |
| 8-407. Register Call Summary for Register ISP5_IRQENABLE_SET_i..... | 1692 |
| 8-408. ISP5_IRQENABLE_CLR_i | 1693 |
| 8-409. Register Call Summary for Register ISP5_IRQENABLE_CLR_i..... | 1697 |
| 8-410. ISP5_DMAENABLE_SET | 1698 |
| 8-411. Register Call Summary for Register ISP5_DMAENABLE_SET | 1699 |
| 8-412. ISP5_DMAENABLE_CLR | 1699 |
| 8-413. Register Call Summary for Register ISP5_DMAENABLE_CLR..... | 1700 |
| 8-414. ISP5_CTRL..... | 1700 |
| 8-415. Register Call Summary for Register ISP5_CTRL | 1704 |
| 8-416. ISP5_PG..... | 1704 |
| 8-417. Register Call Summary for Register ISP5_PG | 1705 |

| | |
|---|------|
| 8-418. ISP5_PG_PULSE_CTRL | 1705 |
| 8-419. Register Call Summary for Register ISP5_PG_PULSE_CTRL | 1705 |
| 8-420. ISP5_PG_FRAME_SIZE | 1705 |
| 8-421. Register Call Summary for Register ISP5_PG_FRAME_SIZE | 1705 |
| 8-422. ISP5_MPSR | 1706 |
| 8-423. Register Call Summary for Register ISP5_MPSR | 1709 |
| 8-424. ISP5_BL_MTC_1 | 1709 |
| 8-425. Register Call Summary for Register ISP5_BL_MTC_1 | 1709 |
| 8-426. ISP5_BL_MTC_2 | 1709 |
| 8-427. Register Call Summary for Register ISP5_BL_MTC_2 | 1709 |
| 8-428. ISP5_BL_VBUSM | 1710 |
| 8-429. Register Call Summary for Register ISP5_BL_VBUSM | 1710 |
| 8-430. ISS ISP5 SYS2 Registers Mapping Summary..... | 1711 |
| 8-431. ISP5_KEY_EN1 | 1711 |
| 8-432. Register Call Summary for Register ISP5_KEY_EN1 | 1711 |
| 8-433. ISP5_KEY_EN2 | 1712 |
| 8-434. Register Call Summary for Register ISP5_KEY_EN2 | 1712 |
| 8-435. ISP5_KEY_EN3 | 1712 |
| 8-436. Register Call Summary for Register ISP5_KEY_EN3 | 1712 |
| 8-437. ISP5_KEY_EN4 | 1713 |
| 8-438. Register Call Summary for Register ISP5_KEY_EN4 | 1713 |
| 8-439. ISP5_KEY_EN5 | 1713 |
| 8-440. Register Call Summary for Register ISP5_KEY_EN5 | 1713 |
| 8-441. ISP5_KEY_EN6 | 1714 |
| 8-442. Register Call Summary for Register ISP5_KEY_EN6 | 1714 |
| 8-443. ISP5_IRQSTATUS_RAW2_i..... | 1714 |
| 8-444. Register Call Summary for Register ISP5_IRQSTATUS_RAW2_i | 1715 |
| 8-445. ISP5_IRQSTATUS2_i..... | 1715 |
| 8-446. Register Call Summary for Register ISP5_IRQSTATUS2_i | 1716 |
| 8-447. ISP5_IRQENABLE_SET2_i..... | 1717 |
| 8-448. Register Call Summary for Register ISP5_IRQENABLE_SET2_i | 1717 |
| 8-449. ISP5_IRQENABLE_CLR2_i..... | 1718 |
| 8-450. Register Call Summary for Register ISP5_IRQENABLE_CLR2_i | 1719 |
| 8-451. ISS RESIZER Registers Mapping Summary | 1719 |
| 8-452. RSZ_REVISION | 1721 |
| 8-453. Register Call Summary for Register RSZ_REVISION..... | 1721 |
| 8-454. RSZ_SYSCONFIG | 1722 |
| 8-455. Register Call Summary for Register RSZ_SYSCONFIG | 1722 |
| 8-456. RSZ_IN_FIFO_CTRL | 1723 |
| 8-457. Register Call Summary for Register RSZ_IN_FIFO_CTRL..... | 1723 |
| 8-458. RSZ_GNC | 1723 |
| 8-459. Register Call Summary for Register RSZ_GNC..... | 1724 |
| 8-460. RSZ_FRACDIV | 1724 |
| 8-461. Register Call Summary for Register RSZ_FRACDIV..... | 1724 |
| 8-462. RSZ_SRC_EN | 1724 |
| 8-463. Register Call Summary for Register RSZ_SRC_EN..... | 1725 |
| 8-464. RSZ_SRC_MODE..... | 1725 |
| 8-465. Register Call Summary for Register RSZ_SRC_MODE | 1726 |
| 8-466. RSZ_SRC_FMT0..... | 1726 |

| | |
|---|------|
| 8-467. Register Call Summary for Register RSZ_SRC_FMT0 | 1726 |
| 8-468. RSZ_SRC_FMT1 | 1727 |
| 8-469. Register Call Summary for Register RSZ_SRC_FMT1 | 1727 |
| 8-470. RSZ_SRC_VPS | 1727 |
| 8-471. Register Call Summary for Register RSZ_SRC_VPS | 1728 |
| 8-472. RSZ_SRC_VSZ | 1728 |
| 8-473. Register Call Summary for Register RSZ_SRC_VSZ | 1728 |
| 8-474. RSZ_SRC_HPS | 1728 |
| 8-475. Register Call Summary for Register RSZ_SRC_HPS | 1729 |
| 8-476. RSZ_SRC_HSZ | 1729 |
| 8-477. Register Call Summary for Register RSZ_SRC_HSZ | 1729 |
| 8-478. RSZ_DMA_RZA | 1730 |
| 8-479. Register Call Summary for Register RSZ_DMA_RZA | 1730 |
| 8-480. RSZ_DMA_RZB | 1730 |
| 8-481. Register Call Summary for Register RSZ_DMA_RZB | 1730 |
| 8-482. RSZ_DMA_STA | 1731 |
| 8-483. Register Call Summary for Register RSZ_DMA_STA | 1731 |
| 8-484. RSZ_GCK_MMR | 1731 |
| 8-485. Register Call Summary for Register RSZ_GCK_MMR | 1731 |
| 8-486. RSZ_GCK_SDR | 1732 |
| 8-487. Register Call Summary for Register RSZ_GCK_SDR | 1732 |
| 8-488. RSZ_IRQ_RZA | 1732 |
| 8-489. Register Call Summary for Register RSZ_IRQ_RZA | 1733 |
| 8-490. RSZ_IRQ_RZB | 1733 |
| 8-491. Register Call Summary for Register RSZ_IRQ_RZB | 1733 |
| 8-492. RSZ_YUV_Y_MIN | 1733 |
| 8-493. Register Call Summary for Register RSZ_YUV_Y_MIN | 1734 |
| 8-494. RSZ_YUV_Y_MAX | 1734 |
| 8-495. Register Call Summary for Register RSZ_YUV_Y_MAX | 1734 |
| 8-496. RSZ_YUV_C_MIN | 1734 |
| 8-497. Register Call Summary for Register RSZ_YUV_C_MIN | 1734 |
| 8-498. RSZ_YUV_C_MAX | 1735 |
| 8-499. Register Call Summary for Register RSZ_YUV_C_MAX | 1735 |
| 8-500. RSZ_YUV_PHS | 1735 |
| 8-501. Register Call Summary for Register RSZ_YUV_PHS | 1735 |
| 8-502. RSZ_SEQ | 1736 |
| 8-503. Register Call Summary for Register RSZ_SEQ | 1736 |
| 8-504. RZA_EN | 1736 |
| 8-505. Register Call Summary for Register RZA_EN | 1737 |
| 8-506. RZA_MODE | 1737 |
| 8-507. Register Call Summary for Register RZA_MODE | 1737 |
| 8-508. RZA_420 | 1737 |
| 8-509. Register Call Summary for Register RZA_420 | 1738 |
| 8-510. RZA_I_VPS | 1738 |
| 8-511. Register Call Summary for Register RZA_I_VPS | 1738 |
| 8-512. RZA_I_HPS | 1739 |
| 8-513. Register Call Summary for Register RZA_I_HPS | 1739 |
| 8-514. RZA_O_VSZ | 1739 |
| 8-515. Register Call Summary for Register RZA_O_VSZ | 1739 |

| | |
|---|------|
| 8-516. RZA_O_HSZ | 1740 |
| 8-517. Register Call Summary for Register RZA_O_HSZ..... | 1740 |
| 8-518. RZA_V_PHS_Y | 1740 |
| 8-519. Register Call Summary for Register RZA_V_PHS_Y | 1741 |
| 8-520. RZA_V_PHS_C | 1741 |
| 8-521. Register Call Summary for Register RZA_V_PHS_C | 1741 |
| 8-522. RZA_V_DIF | 1741 |
| 8-523. Register Call Summary for Register RZA_V_DIF | 1742 |
| 8-524. RZA_V_TYP..... | 1742 |
| 8-525. Register Call Summary for Register RZA_V_TYP | 1742 |
| 8-526. RZA_V_LPF | 1742 |
| 8-527. Register Call Summary for Register RZA_V_LPF | 1742 |
| 8-528. RZA_H_PHS | 1743 |
| 8-529. Register Call Summary for Register RZA_H_PHS..... | 1743 |
| 8-530. RZA_H_PHS_ADJ | 1743 |
| 8-531. Register Call Summary for Register RZA_H_PHS_ADJ | 1743 |
| 8-532. RZA_H_DIF | 1744 |
| 8-533. Register Call Summary for Register RZA_H_DIF..... | 1744 |
| 8-534. RZA_H_TYP | 1744 |
| 8-535. Register Call Summary for Register RZA_H_TYP..... | 1744 |
| 8-536. RZA_H_LPF..... | 1745 |
| 8-537. Register Call Summary for Register RZA_H_LPF | 1745 |
| 8-538. RZA_DWN_EN | 1745 |
| 8-539. Register Call Summary for Register RZA_DWN_EN..... | 1745 |
| 8-540. RZA_DWN_AV..... | 1746 |
| 8-541. Register Call Summary for Register RZA_DWN_AV | 1746 |
| 8-542. RZA_RGB_EN | 1746 |
| 8-543. Register Call Summary for Register RZA_RGB_EN | 1747 |
| 8-544. RZA_RGB_TYP | 1747 |
| 8-545. Register Call Summary for Register RZA_RGB_TYP | 1747 |
| 8-546. RZA_RGB_BLD | 1748 |
| 8-547. Register Call Summary for Register RZA_RGB_BLD | 1748 |
| 8-548. RZA_SDR_Y_BAD_H..... | 1748 |
| 8-549. Register Call Summary for Register RZA_SDR_Y_BAD_H | 1748 |
| 8-550. RZA_SDR_Y_BAD_L | 1749 |
| 8-551. Register Call Summary for Register RZA_SDR_Y_BAD_L..... | 1749 |
| 8-552. RZA_SDR_Y_SAD_H..... | 1750 |
| 8-553. Register Call Summary for Register RZA_SDR_Y_SAD_H | 1750 |
| 8-554. RZA_SDR_Y_SAD_L | 1750 |
| 8-555. Register Call Summary for Register RZA_SDR_Y_SAD_L..... | 1751 |
| 8-556. RZA_SDR_Y_OFT | 1751 |
| 8-557. Register Call Summary for Register RZA_SDR_Y_OFT..... | 1752 |
| 8-558. RZA_SDR_Y_PTR_S..... | 1752 |
| 8-559. Register Call Summary for Register RZA_SDR_Y_PTR_S | 1752 |
| 8-560. RZA_SDR_Y_PTR_E | 1752 |
| 8-561. Register Call Summary for Register RZA_SDR_Y_PTR_E | 1753 |
| 8-562. RZA_SDR_C_BAD_H | 1753 |
| 8-563. Register Call Summary for Register RZA_SDR_C_BAD_H | 1753 |
| 8-564. RZA_SDR_C_BAD_L | 1753 |

| | |
|---|------|
| 8-565. Register Call Summary for Register RZA_SDR_C_BAD_L | 1754 |
| 8-566. RZA_SDR_C_SAD_H | 1754 |
| 8-567. Register Call Summary for Register RZA_SDR_C_SAD_H | 1754 |
| 8-568. RZA_SDR_C_SAD_L | 1754 |
| 8-569. Register Call Summary for Register RZA_SDR_C_SAD_L | 1755 |
| 8-570. RZA_SDR_C_OFT | 1755 |
| 8-571. Register Call Summary for Register RZA_SDR_C_OFT | 1755 |
| 8-572. RZA_SDR_C_PTR_S | 1756 |
| 8-573. Register Call Summary for Register RZA_SDR_C_PTR_S | 1756 |
| 8-574. RZA_SDR_C_PTR_E | 1756 |
| 8-575. Register Call Summary for Register RZA_SDR_C_PTR_E | 1756 |
| 8-576. RZB_EN | 1757 |
| 8-577. Register Call Summary for Register RZB_EN | 1757 |
| 8-578. RZB_MODE | 1757 |
| 8-579. Register Call Summary for Register RZB_MODE | 1757 |
| 8-580. RZB_420 | 1758 |
| 8-581. Register Call Summary for Register RZB_420 | 1758 |
| 8-582. RZB_I_VPS | 1758 |
| 8-583. Register Call Summary for Register RZB_I_VPS | 1759 |
| 8-584. RZB_I_HPS | 1759 |
| 8-585. Register Call Summary for Register RZB_I_HPS | 1759 |
| 8-586. RZB_O_VSZ | 1759 |
| 8-587. Register Call Summary for Register RZB_O_VSZ | 1759 |
| 8-588. RZB_O_HSZ | 1760 |
| 8-589. Register Call Summary for Register RZB_O_HSZ | 1760 |
| 8-590. RZB_V_PHS_Y | 1760 |
| 8-591. Register Call Summary for Register RZB_V_PHS_Y | 1760 |
| 8-592. RZB_V_PHS_C | 1761 |
| 8-593. Register Call Summary for Register RZB_V_PHS_C | 1761 |
| 8-594. RZB_V_DIF | 1761 |
| 8-595. Register Call Summary for Register RZB_V_DIF | 1761 |
| 8-596. RZB_V_TYP | 1762 |
| 8-597. Register Call Summary for Register RZB_V_TYP | 1762 |
| 8-598. RZB_V_LPF | 1762 |
| 8-599. Register Call Summary for Register RZB_V_LPF | 1762 |
| 8-600. RZB_H_PHS | 1763 |
| 8-601. Register Call Summary for Register RZB_H_PHS | 1763 |
| 8-602. RZB_H_PHS_ADJ | 1763 |
| 8-603. Register Call Summary for Register RZB_H_PHS_ADJ | 1763 |
| 8-604. RZB_H_DIF | 1764 |
| 8-605. Register Call Summary for Register RZB_H_DIF | 1764 |
| 8-606. RZB_H_TYP | 1764 |
| 8-607. Register Call Summary for Register RZB_H_TYP | 1764 |
| 8-608. RZB_H_LPF | 1765 |
| 8-609. Register Call Summary for Register RZB_H_LPF | 1765 |
| 8-610. RZB_DWN_EN | 1765 |
| 8-611. Register Call Summary for Register RZB_DWN_EN | 1765 |
| 8-612. RZB_DWN_AV | 1766 |
| 8-613. Register Call Summary for Register RZB_DWN_AV | 1766 |

| | |
|---|------|
| 8-614. RZB_RGB_EN | 1766 |
| 8-615. Register Call Summary for Register RZB_RGB_EN | 1767 |
| 8-616. RZB_RGB_TYP | 1767 |
| 8-617. Register Call Summary for Register RZB_RGB_TYP | 1767 |
| 8-618. RZB_RGB_BLD | 1768 |
| 8-619. Register Call Summary for Register RZB_RGB_BLD | 1768 |
| 8-620. RZB_SDR_Y_BAD_H..... | 1768 |
| 8-621. Register Call Summary for Register RZB_SDR_Y_BAD_H | 1768 |
| 8-622. RZB_SDR_Y_BAD_L | 1769 |
| 8-623. Register Call Summary for Register RZB_SDR_Y_BAD_L..... | 1769 |
| 8-624. RZB_SDR_Y_SAD_H..... | 1770 |
| 8-625. Register Call Summary for Register RZB_SDR_Y_SAD_H | 1770 |
| 8-626. RZB_SDR_Y_SAD_L | 1770 |
| 8-627. Register Call Summary for Register RZB_SDR_Y_SAD_L..... | 1771 |
| 8-628. RZB_SDR_Y_OFT | 1771 |
| 8-629. Register Call Summary for Register RZB_SDR_Y_OFT | 1772 |
| 8-630. RZB_SDR_Y_PTR_S..... | 1772 |
| 8-631. Register Call Summary for Register RZB_SDR_Y_PTR_S | 1772 |
| 8-632. RZB_SDR_Y_PTR_E | 1772 |
| 8-633. Register Call Summary for Register RZB_SDR_Y_PTR_E | 1773 |
| 8-634. RZB_SDR_C_BAD_H | 1773 |
| 8-635. Register Call Summary for Register RZB_SDR_C_BAD_H | 1773 |
| 8-636. RZB_SDR_C_BAD_L | 1773 |
| 8-637. Register Call Summary for Register RZB_SDR_C_BAD_L | 1774 |
| 8-638. RZB_SDR_C_SAD_H | 1774 |
| 8-639. Register Call Summary for Register RZB_SDR_C_SAD_H | 1774 |
| 8-640. RZB_SDR_C_SAD_L | 1774 |
| 8-641. Register Call Summary for Register RZB_SDR_C_SAD_L | 1775 |
| 8-642. RZB_SDR_C_OFT | 1775 |
| 8-643. Register Call Summary for Register RZB_SDR_C_OFT | 1775 |
| 8-644. RZB_SDR_C_PTR_S..... | 1776 |
| 8-645. Register Call Summary for Register RZB_SDR_C_PTR_S | 1776 |
| 8-646. RZB_SDR_C_PTR_E..... | 1776 |
| 8-647. Register Call Summary for Register RZB_SDR_C_PTR_E | 1776 |
| 8-648. ISS IPIPE Registers Mapping Summary | 1777 |
| 8-649. IPIPE_SRC_EN..... | 1780 |
| 8-650. Register Call Summary for Register IPIPE_SRC_EN | 1781 |
| 8-651. IPIPE_SRC_MODE | 1781 |
| 8-652. Register Call Summary for Register IPIPE_SRC_MODE | 1781 |
| 8-653. IPIPE_SRC_FMT | 1781 |
| 8-654. Register Call Summary for Register IPIPE_SRC_FMT | 1782 |
| 8-655. IPIPE_SRC_COL | 1782 |
| 8-656. Register Call Summary for Register IPIPE_SRC_COL | 1783 |
| 8-657. IPIPE_SRC_VPS | 1783 |
| 8-658. Register Call Summary for Register IPIPE_SRC_VPS | 1783 |
| 8-659. IPIPE_SRC_VSZ | 1783 |
| 8-660. Register Call Summary for Register IPIPE_SRC_VSZ..... | 1784 |
| 8-661. IPIPE_SRC_HPS | 1784 |
| 8-662. Register Call Summary for Register IPIPE_SRC_HPS | 1784 |

| | |
|---|------|
| 8-663. IPIPE_SRC_HSZ | 1785 |
| 8-664. Register Call Summary for Register IPIPE_SRC_HSZ | 1785 |
| 8-665. IPIPE_SEL_SBU | 1785 |
| 8-666. Register Call Summary for Register IPIPE_SEL_SBU | 1785 |
| 8-667. IPIPE_SRC_STA | 1786 |
| 8-668. Register Call Summary for Register IPIPE_SRC_STA..... | 1786 |
| 8-669. IPIPE_GCK_MMR..... | 1786 |
| 8-670. Register Call Summary for Register IPIPE_GCK_MMR | 1787 |
| 8-671. IPIPE_GCK_PIX..... | 1787 |
| 8-672. Register Call Summary for Register IPIPE_GCK_PIX | 1787 |
| 8-673. IPIPE_DPC_LUT_EN | 1788 |
| 8-674. Register Call Summary for Register IPIPE_DPC_LUT_EN..... | 1788 |
| 8-675. IPIPE_DPC_LUT_SEL..... | 1788 |
| 8-676. Register Call Summary for Register IPIPE_DPC_LUT_SEL | 1788 |
| 8-677. IPIPE_DPC_LUT_ADR | 1789 |
| 8-678. Register Call Summary for Register IPIPE_DPC_LUT_ADR..... | 1789 |
| 8-679. IPIPE_DPC_LUT_SIZ..... | 1789 |
| 8-680. Register Call Summary for Register IPIPE_DPC_LUT_SIZ | 1789 |
| 8-681. IPIPE_LSC_VOFT..... | 1790 |
| 8-682. Register Call Summary for Register IPIPE_LSC_VOFT | 1790 |
| 8-683. IPIPE_LSC_VA2..... | 1790 |
| 8-684. Register Call Summary for Register IPIPE_LSC_VA2 | 1790 |
| 8-685. IPIPE_LSC_VA1..... | 1791 |
| 8-686. Register Call Summary for Register IPIPE_LSC_VA1 | 1791 |
| 8-687. IPIPE_LSC_VS | 1791 |
| 8-688. Register Call Summary for Register IPIPE_LSC_VS..... | 1791 |
| 8-689. IPIPE_LSC_HOFT | 1792 |
| 8-690. Register Call Summary for Register IPIPE_LSC_HOFT | 1792 |
| 8-691. IPIPE_LSC_HA2..... | 1792 |
| 8-692. Register Call Summary for Register IPIPE_LSC_HA2 | 1792 |
| 8-693. IPIPE_LSC_HA1..... | 1793 |
| 8-694. Register Call Summary for Register IPIPE_LSC_HA1 | 1793 |
| 8-695. IPIPE_LSC_HS | 1793 |
| 8-696. Register Call Summary for Register IPIPE_LSC_HS..... | 1793 |
| 8-697. IPIPE_LSC_GAN_R..... | 1794 |
| 8-698. Register Call Summary for Register IPIPE_LSC_GAN_R | 1794 |
| 8-699. IPIPE_LSC_GAN_GR | 1794 |
| 8-700. Register Call Summary for Register IPIPE_LSC_GAN_GR | 1794 |
| 8-701. IPIPE_LSC_GAN_GB..... | 1794 |
| 8-702. Register Call Summary for Register IPIPE_LSC_GAN_GB | 1795 |
| 8-703. IPIPE_LSC_GAN_B..... | 1795 |
| 8-704. Register Call Summary for Register IPIPE_LSC_GAN_B | 1795 |
| 8-705. IPIPE_LSC_OFT_R | 1795 |
| 8-706. Register Call Summary for Register IPIPE_LSC_OFT_R | 1795 |
| 8-707. IPIPE_LSC_OFT_GR | 1796 |
| 8-708. Register Call Summary for Register IPIPE_LSC_OFT_GR | 1796 |
| 8-709. IPIPE_LSC_OFT_GB | 1796 |
| 8-710. Register Call Summary for Register IPIPE_LSC_OFT_GB..... | 1796 |
| 8-711. IPIPE_LSC_OFT_B | 1796 |

| | |
|---|------|
| 8-712. Register Call Summary for Register IPIPE_LSC_OFT_B..... | 1797 |
| 8-713. IPIPE_LSC_SHF | 1797 |
| 8-714. Register Call Summary for Register IPIPE_LSC_SHF | 1797 |
| 8-715. IPIPE_LSC_MAX | 1797 |
| 8-716. Register Call Summary for Register IPIPE_LSC_MAX | 1797 |
| 8-717. IPIPE_WB2_OFT_R | 1798 |
| 8-718. Register Call Summary for Register IPIPE_WB2_OFT_R | 1798 |
| 8-719. IPIPE_WB2_OFT_GR | 1798 |
| 8-720. Register Call Summary for Register IPIPE_WB2_OFT_GR..... | 1798 |
| 8-721. IPIPE_WB2_OFT_GB | 1799 |
| 8-722. Register Call Summary for Register IPIPE_WB2_OFT_GB | 1799 |
| 8-723. IPIPE_WB2_OFT_B..... | 1799 |
| 8-724. Register Call Summary for Register IPIPE_WB2_OFT_B | 1799 |
| 8-725. IPIPE_WB2_WGN_R | 1800 |
| 8-726. Register Call Summary for Register IPIPE_WB2_WGN_R..... | 1800 |
| 8-727. IPIPE_WB2_WGN_GR | 1800 |
| 8-728. Register Call Summary for Register IPIPE_WB2_WGN_GR..... | 1800 |
| 8-729. IPIPE_WB2_WGN_GB | 1801 |
| 8-730. Register Call Summary for Register IPIPE_WB2_WGN_GB..... | 1801 |
| 8-731. IPIPE_WB2_WGN_B | 1801 |
| 8-732. Register Call Summary for Register IPIPE_WB2_WGN_B..... | 1801 |
| 8-733. IPIPE_RGB1_MUL_RR..... | 1802 |
| 8-734. Register Call Summary for Register IPIPE_RGB1_MUL_RR | 1802 |
| 8-735. IPIPE_RGB1_MUL_GR | 1802 |
| 8-736. Register Call Summary for Register IPIPE_RGB1_MUL_GR | 1802 |
| 8-737. IPIPE_RGB1_MUL_BR | 1803 |
| 8-738. Register Call Summary for Register IPIPE_RGB1_MUL_BR | 1803 |
| 8-739. IPIPE_RGB1_MUL_RG | 1803 |
| 8-740. Register Call Summary for Register IPIPE_RGB1_MUL_RG | 1803 |
| 8-741. IPIPE_RGB1_MUL_GG | 1803 |
| 8-742. Register Call Summary for Register IPIPE_RGB1_MUL_GG | 1804 |
| 8-743. IPIPE_RGB1_MUL_BG..... | 1804 |
| 8-744. Register Call Summary for Register IPIPE_RGB1_MUL_BG | 1804 |
| 8-745. IPIPE_RGB1_MUL_RB | 1804 |
| 8-746. Register Call Summary for Register IPIPE_RGB1_MUL_RB | 1804 |
| 8-747. IPIPE_RGB1_MUL_GB..... | 1805 |
| 8-748. Register Call Summary for Register IPIPE_RGB1_MUL_GB | 1805 |
| 8-749. IPIPE_RGB1_MUL_BB | 1805 |
| 8-750. Register Call Summary for Register IPIPE_RGB1_MUL_BB | 1805 |
| 8-751. IPIPE_RGB1_OFT_OR..... | 1806 |
| 8-752. Register Call Summary for Register IPIPE_RGB1_OFT_OR | 1806 |
| 8-753. IPIPE_RGB1_OFT_OG..... | 1806 |
| 8-754. Register Call Summary for Register IPIPE_RGB1_OFT_OG | 1806 |
| 8-755. IPIPE_RGB1_OFT_OB | 1807 |
| 8-756. Register Call Summary for Register IPIPE_RGB1_OFT_OB | 1807 |
| 8-757. IPIPE_GMM_CFG..... | 1807 |
| 8-758. Register Call Summary for Register IPIPE_GMM_CFG | 1808 |
| 8-759. IPIPE_RGB2_MUL_RR..... | 1808 |
| 8-760. Register Call Summary for Register IPIPE_RGB2_MUL_RR | 1808 |

| | |
|---|------|
| 8-761. IPIPE_RGB2_MUL_GR | 1809 |
| 8-762. Register Call Summary for Register IPIPE_RGB2_MUL_GR | 1809 |
| 8-763. IPIPE_RGB2_MUL_BR | 1809 |
| 8-764. Register Call Summary for Register IPIPE_RGB2_MUL_BR | 1809 |
| 8-765. IPIPE_RGB2_MUL_RG | 1809 |
| 8-766. Register Call Summary for Register IPIPE_RGB2_MUL_RG | 1810 |
| 8-767. IPIPE_RGB2_MUL_GG | 1810 |
| 8-768. Register Call Summary for Register IPIPE_RGB2_MUL_GG | 1810 |
| 8-769. IPIPE_RGB2_MUL_BG | 1810 |
| 8-770. Register Call Summary for Register IPIPE_RGB2_MUL_BG | 1810 |
| 8-771. IPIPE_RGB2_MUL_RB | 1811 |
| 8-772. Register Call Summary for Register IPIPE_RGB2_MUL_RB | 1811 |
| 8-773. IPIPE_RGB2_MUL_GB | 1811 |
| 8-774. Register Call Summary for Register IPIPE_RGB2_MUL_GB | 1811 |
| 8-775. IPIPE_RGB2_MUL_BB | 1811 |
| 8-776. Register Call Summary for Register IPIPE_RGB2_MUL_BB | 1812 |
| 8-777. IPIPE_RGB2_OFT_OR | 1812 |
| 8-778. Register Call Summary for Register IPIPE_RGB2_OFT_OR | 1812 |
| 8-779. IPIPE_RGB2_OFT_OG | 1812 |
| 8-780. Register Call Summary for Register IPIPE_RGB2_OFT_OG | 1813 |
| 8-781. IPIPE_RGB2_OFT_OB | 1813 |
| 8-782. Register Call Summary for Register IPIPE_RGB2_OFT_OB | 1813 |
| 8-783. IPIPE_YUV_ADJ | 1813 |
| 8-784. Register Call Summary for Register IPIPE_YUV_ADJ | 1814 |
| 8-785. IPIPE_YUV_MUL_RY | 1814 |
| 8-786. Register Call Summary for Register IPIPE_YUV_MUL_RY | 1814 |
| 8-787. IPIPE_YUV_MUL_GY | 1814 |
| 8-788. Register Call Summary for Register IPIPE_YUV_MUL_GY | 1814 |
| 8-789. IPIPE_YUV_MUL_BY | 1815 |
| 8-790. Register Call Summary for Register IPIPE_YUV_MUL_BY | 1815 |
| 8-791. IPIPE_YUV_MUL_RCB | 1815 |
| 8-792. Register Call Summary for Register IPIPE_YUV_MUL_RCB | 1815 |
| 8-793. IPIPE_YUV_MUL_GCB | 1816 |
| 8-794. Register Call Summary for Register IPIPE_YUV_MUL_GCB | 1816 |
| 8-795. IPIPE_YUV_MUL_BCB | 1816 |
| 8-796. Register Call Summary for Register IPIPE_YUV_MUL_BCB | 1816 |
| 8-797. IPIPE_YUV_MUL_RCR | 1816 |
| 8-798. Register Call Summary for Register IPIPE_YUV_MUL_RCR | 1817 |
| 8-799. IPIPE_YUV_MUL_GCR | 1817 |
| 8-800. Register Call Summary for Register IPIPE_YUV_MUL_GCR | 1817 |
| 8-801. IPIPE_YUV_MUL_BCR | 1817 |
| 8-802. Register Call Summary for Register IPIPE_YUV_MUL_BCR | 1817 |
| 8-803. IPIPE_YUV_OFT_Y | 1818 |
| 8-804. Register Call Summary for Register IPIPE_YUV_OFT_Y | 1818 |
| 8-805. IPIPE_YUV_OFT_CB | 1818 |
| 8-806. Register Call Summary for Register IPIPE_YUV_OFT_CB | 1818 |
| 8-807. IPIPE_YUV_OFT_CR | 1819 |
| 8-808. Register Call Summary for Register IPIPE_YUV_OFT_CR | 1819 |
| 8-809. IPIPE_YUV_PHS | 1819 |

| | |
|---|------|
| 8-810. Register Call Summary for Register IPIPE_YUV_PHS | 1820 |
| 8-811. IPIPE_YEE_EN | 1820 |
| 8-812. Register Call Summary for Register IPIPE_YEE_EN | 1820 |
| 8-813. IPIPE_YEE_TYP | 1821 |
| 8-814. Register Call Summary for Register IPIPE_YEE_TYP | 1821 |
| 8-815. IPIPE_YEE_SHF | 1821 |
| 8-816. Register Call Summary for Register IPIPE_YEE_SHF | 1821 |
| 8-817. IPIPE_YEE_MUL_00 | 1822 |
| 8-818. Register Call Summary for Register IPIPE_YEE_MUL_00 | 1822 |
| 8-819. IPIPE_YEE_MUL_01 | 1822 |
| 8-820. Register Call Summary for Register IPIPE_YEE_MUL_01 | 1822 |
| 8-821. IPIPE_YEE_MUL_02 | 1823 |
| 8-822. Register Call Summary for Register IPIPE_YEE_MUL_02 | 1823 |
| 8-823. IPIPE_YEE_MUL_10 | 1823 |
| 8-824. Register Call Summary for Register IPIPE_YEE_MUL_10 | 1823 |
| 8-825. IPIPE_YEE_MUL_11 | 1823 |
| 8-826. Register Call Summary for Register IPIPE_YEE_MUL_11 | 1824 |
| 8-827. IPIPE_YEE_MUL_12 | 1824 |
| 8-828. Register Call Summary for Register IPIPE_YEE_MUL_12 | 1824 |
| 8-829. IPIPE_YEE_MUL_20 | 1824 |
| 8-830. Register Call Summary for Register IPIPE_YEE_MUL_20 | 1824 |
| 8-831. IPIPE_YEE_MUL_21 | 1825 |
| 8-832. Register Call Summary for Register IPIPE_YEE_MUL_21 | 1825 |
| 8-833. IPIPE_YEE_MUL_22 | 1825 |
| 8-834. Register Call Summary for Register IPIPE_YEE_MUL_22 | 1825 |
| 8-835. IPIPE_YEE_THR | 1825 |
| 8-836. Register Call Summary for Register IPIPE_YEE_THR | 1826 |
| 8-837. IPIPE_YEE_E_GAN | 1826 |
| 8-838. Register Call Summary for Register IPIPE_YEE_E_GAN | 1826 |
| 8-839. IPIPE_YEE_E_THR_1 | 1826 |
| 8-840. Register Call Summary for Register IPIPE_YEE_E_THR_1 | 1827 |
| 8-841. IPIPE_YEE_E_THR_2 | 1827 |
| 8-842. Register Call Summary for Register IPIPE_YEE_E_THR_2 | 1827 |
| 8-843. IPIPE_YEE_G_GAN | 1827 |
| 8-844. Register Call Summary for Register IPIPE_YEE_G_GAN | 1827 |
| 8-845. IPIPE_YEE_G_OFT | 1828 |
| 8-846. Register Call Summary for Register IPIPE_YEE_G_OFT | 1828 |
| 8-847. IPIPE_BOX_EN | 1828 |
| 8-848. Register Call Summary for Register IPIPE_BOX_EN | 1829 |
| 8-849. IPIPE_BOX_MODE | 1829 |
| 8-850. Register Call Summary for Register IPIPE_BOX_MODE | 1829 |
| 8-851. IPIPE_BOX_TYP | 1829 |
| 8-852. Register Call Summary for Register IPIPE_BOX_TYP | 1830 |
| 8-853. IPIPE_BOX_SHF | 1830 |
| 8-854. Register Call Summary for Register IPIPE_BOX_SHF | 1830 |
| 8-855. IPIPE_BOX_SDR_SAD_H | 1830 |
| 8-856. Register Call Summary for Register IPIPE_BOX_SDR_SAD_H | 1830 |
| 8-857. IPIPE_BOX_SDR_SAD_L | 1831 |
| 8-858. Register Call Summary for Register IPIPE_BOX_SDR_SAD_L | 1831 |

| | |
|--|------|
| 8-859. IPIPE_HST_EN | 1831 |
| 8-860. Register Call Summary for Register IPIPE_HST_EN | 1831 |
| 8-861. IPIPE_HST_MODE | 1832 |
| 8-862. Register Call Summary for Register IPIPE_HST_MODE | 1832 |
| 8-863. IPIPE_HST_SEL | 1832 |
| 8-864. Register Call Summary for Register IPIPE_HST_SEL | 1833 |
| 8-865. IPIPE_HST_PARA | 1833 |
| 8-866. Register Call Summary for Register IPIPE_HST_PARA | 1834 |
| 8-867. IPIPE_HST_0_VPS | 1834 |
| 8-868. Register Call Summary for Register IPIPE_HST_0_VPS | 1834 |
| 8-869. IPIPE_HST_0_VSZ | 1835 |
| 8-870. Register Call Summary for Register IPIPE_HST_0_VSZ | 1835 |
| 8-871. IPIPE_HST_0_HPS | 1835 |
| 8-872. Register Call Summary for Register IPIPE_HST_0_HPS | 1836 |
| 8-873. IPIPE_HST_0_HSZ | 1836 |
| 8-874. Register Call Summary for Register IPIPE_HST_0_HSZ | 1836 |
| 8-875. IPIPE_HST_1_VPS | 1836 |
| 8-876. Register Call Summary for Register IPIPE_HST_1_VPS | 1837 |
| 8-877. IPIPE_HST_1_VSZ | 1837 |
| 8-878. Register Call Summary for Register IPIPE_HST_1_VSZ | 1838 |
| 8-879. IPIPE_HST_1_HPS | 1838 |
| 8-880. Register Call Summary for Register IPIPE_HST_1_HPS | 1838 |
| 8-881. IPIPE_HST_1_HSZ | 1838 |
| 8-882. Register Call Summary for Register IPIPE_HST_1_HSZ | 1839 |
| 8-883. IPIPE_HST_2_VPS | 1839 |
| 8-884. Register Call Summary for Register IPIPE_HST_2_VPS | 1839 |
| 8-885. IPIPE_HST_2_VSZ | 1840 |
| 8-886. Register Call Summary for Register IPIPE_HST_2_VSZ | 1840 |
| 8-887. IPIPE_HST_2_HPS | 1840 |
| 8-888. Register Call Summary for Register IPIPE_HST_2_HPS | 1841 |
| 8-889. IPIPE_HST_2_HSZ | 1841 |
| 8-890. Register Call Summary for Register IPIPE_HST_2_HSZ | 1841 |
| 8-891. IPIPE_HST_3_VPS | 1841 |
| 8-892. Register Call Summary for Register IPIPE_HST_3_VPS | 1842 |
| 8-893. IPIPE_HST_3_VSZ | 1842 |
| 8-894. Register Call Summary for Register IPIPE_HST_3_VSZ | 1843 |
| 8-895. IPIPE_HST_3_HPS | 1843 |
| 8-896. Register Call Summary for Register IPIPE_HST_3_HPS | 1843 |
| 8-897. IPIPE_HST_3_HSZ | 1843 |
| 8-898. Register Call Summary for Register IPIPE_HST_3_HSZ | 1844 |
| 8-899. IPIPE_HST_TBL | 1844 |
| 8-900. Register Call Summary for Register IPIPE_HST_TBL | 1844 |
| 8-901. IPIPE_HST_MUL_R | 1845 |
| 8-902. Register Call Summary for Register IPIPE_HST_MUL_R | 1845 |
| 8-903. IPIPE_HST_MUL_GR | 1845 |
| 8-904. Register Call Summary for Register IPIPE_HST_MUL_GR | 1845 |
| 8-905. IPIPE_HST_MUL_GB | 1845 |
| 8-906. Register Call Summary for Register IPIPE_HST_MUL_GB | 1846 |
| 8-907. IPIPE_HST_MUL_B | 1846 |

| | |
|---|------|
| 8-908. Register Call Summary for Register IPIPE_HST_MUL_B | 1846 |
| 8-909. ISS ISIF Registers Mapping Summary | 1846 |
| 8-910. ISIF_SYNCEN | 1849 |
| 8-911. Register Call Summary for Register ISIF_SYNCEN | 1850 |
| 8-912. ISIF_MODESET | 1850 |
| 8-913. Register Call Summary for Register ISIF_MODESET | 1852 |
| 8-914. ISIF_HDW | 1852 |
| 8-915. Register Call Summary for Register ISIF_HDW | 1852 |
| 8-916. ISIF_VDW | 1852 |
| 8-917. Register Call Summary for Register ISIF_VDW | 1853 |
| 8-918. ISIF_PPLN | 1853 |
| 8-919. Register Call Summary for Register ISIF_PPLN | 1853 |
| 8-920. ISIF_LPFR | 1853 |
| 8-921. Register Call Summary for Register ISIF_LPFR | 1854 |
| 8-922. ISIF_SPH | 1854 |
| 8-923. Register Call Summary for Register ISIF_SPH | 1854 |
| 8-924. ISIF_LNH | 1854 |
| 8-925. Register Call Summary for Register ISIF_LNH | 1855 |
| 8-926. ISIF_LNV | 1855 |
| 8-927. Register Call Summary for Register ISIF_LNV | 1855 |
| 8-928. ISIF_CULH | 1855 |
| 8-929. Register Call Summary for Register ISIF_CULH | 1856 |
| 8-930. ISIF_CULV | 1856 |
| 8-931. Register Call Summary for Register ISIF_CULV | 1856 |
| 8-932. ISIF_HSIZE | 1857 |
| 8-933. Register Call Summary for Register ISIF_HSIZE | 1857 |
| 8-934. ISIF_CADU | 1857 |
| 8-935. Register Call Summary for Register ISIF_CADU | 1858 |
| 8-936. ISIF_CADL | 1858 |
| 8-937. Register Call Summary for Register ISIF_CADL | 1858 |
| 8-938. ISIF_LINCFG0 | 1858 |
| 8-939. Register Call Summary for Register ISIF_LINCFG0 | 1859 |
| 8-940. ISIF_LINCFG1 | 1859 |
| 8-941. Register Call Summary for Register ISIF_LINCFG1 | 1859 |
| 8-942. ISIF_CCOLP | 1860 |
| 8-943. Register Call Summary for Register ISIF_CCOLP | 1861 |
| 8-944. ISIF_CRGAIN | 1861 |
| 8-945. Register Call Summary for Register ISIF_CRGAIN | 1862 |
| 8-946. ISIF_CGRGAIN | 1862 |
| 8-947. Register Call Summary for Register ISIF_CGRGAIN | 1862 |
| 8-948. ISIF_CGBGAIN | 1862 |
| 8-949. Register Call Summary for Register ISIF_CGBGAIN | 1863 |
| 8-950. ISIF_CBGAIN | 1863 |
| 8-951. Register Call Summary for Register ISIF_CBGAIN | 1863 |
| 8-952. ISIF_COFSTA | 1863 |
| 8-953. Register Call Summary for Register ISIF_COFSTA | 1864 |
| 8-954. ISIF_VDINT0 | 1864 |
| 8-955. Register Call Summary for Register ISIF_VDINT0 | 1864 |
| 8-956. ISIF_VDINT1 | 1864 |

| | |
|--|------|
| 8-957. Register Call Summary for Register ISIF_VDINT1 | 1865 |
| 8-958. ISIF_VDINT2 | 1865 |
| 8-959. Register Call Summary for Register ISIF_VDINT2 | 1865 |
| 8-960. ISIF_MISC | 1865 |
| 8-961. Register Call Summary for Register ISIF_MISC | 1866 |
| 8-962. ISIF_CGAMMAWD | 1866 |
| 8-963. Register Call Summary for Register ISIF_CGAMMAWD | 1867 |
| 8-964. ISIF_REC656IF | 1868 |
| 8-965. Register Call Summary for Register ISIF_REC656IF | 1868 |
| 8-966. ISIF_CCDCFG | 1868 |
| 8-967. Register Call Summary for Register ISIF_CCDCFG | 1870 |
| 8-968. ISIF_DFCCTL | 1870 |
| 8-969. Register Call Summary for Register ISIF_DFCCTL | 1871 |
| 8-970. ISIF_VDFSATLV | 1871 |
| 8-971. Register Call Summary for Register ISIF_VDFSATLV | 1871 |
| 8-972. ISIF_DFCMEMCTL | 1871 |
| 8-973. Register Call Summary for Register ISIF_DFCMEMCTL | 1872 |
| 8-974. ISIF_DFCMEM0 | 1872 |
| 8-975. Register Call Summary for Register ISIF_DFCMEM0 | 1872 |
| 8-976. ISIF_DFCMEM1 | 1873 |
| 8-977. Register Call Summary for Register ISIF_DFCMEM1 | 1873 |
| 8-978. ISIF_DFCMEM2 | 1873 |
| 8-979. Register Call Summary for Register ISIF_DFCMEM2 | 1873 |
| 8-980. ISIF_DFCMEM3 | 1874 |
| 8-981. Register Call Summary for Register ISIF_DFCMEM3 | 1874 |
| 8-982. ISIF_DFCMEM4 | 1874 |
| 8-983. Register Call Summary for Register ISIF_DFCMEM4 | 1874 |
| 8-984. ISIF_CLAMP_CFG | 1875 |
| 8-985. Register Call Summary for Register ISIF_CLAMP_CFG | 1875 |
| 8-986. ISIF_CLDCOFST | 1876 |
| 8-987. Register Call Summary for Register ISIF_CLDCOFST | 1876 |
| 8-988. ISIF_CLSV | 1876 |
| 8-989. Register Call Summary for Register ISIF_CLSV | 1876 |
| 8-990. ISIF_CLHWIN0 | 1877 |
| 8-991. Register Call Summary for Register ISIF_CLHWIN0 | 1877 |
| 8-992. ISIF_CLHWIN1 | 1878 |
| 8-993. Register Call Summary for Register ISIF_CLHWIN1 | 1878 |
| 8-994. ISIF_CLHWIN2 | 1878 |
| 8-995. Register Call Summary for Register ISIF_CLHWIN2 | 1878 |
| 8-996. ISIF_CLVRV | 1879 |
| 8-997. Register Call Summary for Register ISIF_CLVRV | 1879 |
| 8-998. ISIF_CLVWIN0 | 1879 |
| 8-999. Register Call Summary for Register ISIF_CLVWIN0 | 1880 |
| 8-1000. ISIF_CLVWIN1 | 1880 |
| 8-1001. Register Call Summary for Register ISIF_CLVWIN1 | 1880 |
| 8-1002. ISIF_CLVWIN2 | 1881 |
| 8-1003. Register Call Summary for Register ISIF_CLVWIN2 | 1881 |
| 8-1004. ISIF_CLVWIN3 | 1881 |
| 8-1005. Register Call Summary for Register ISIF_CLVWIN3 | 1881 |

| | |
|--|------|
| 8-1006. ISIF_LSCHOFST | 1882 |
| 8-1007. Register Call Summary for Register ISIF_LSCHOFST | 1882 |
| 8-1008. ISIF_LSCVOFST | 1882 |
| 8-1009. Register Call Summary for Register ISIF_LSCVOFST | 1882 |
| 8-1010. ISIF_LSCHVAL | 1883 |
| 8-1011. Register Call Summary for Register ISIF_LSCHVAL | 1883 |
| 8-1012. ISIF_LSCVVAL | 1883 |
| 8-1013. Register Call Summary for Register ISIF_LSCVVAL | 1883 |
| 8-1014. ISIF_2DLSCCFG | 1884 |
| 8-1015. Register Call Summary for Register ISIF_2DLSCCFG | 1885 |
| 8-1016. ISIF_2DLSCOFST | 1885 |
| 8-1017. Register Call Summary for Register ISIF_2DLSCOFST | 1886 |
| 8-1018. ISIF_2DLSCINI | 1886 |
| 8-1019. Register Call Summary for Register ISIF_2DLSCINI | 1886 |
| 8-1020. ISIF_2DLSCGRBU | 1887 |
| 8-1021. Register Call Summary for Register ISIF_2DLSCGRBU | 1887 |
| 8-1022. ISIF_2DLSCGRBL | 1887 |
| 8-1023. Register Call Summary for Register ISIF_2DLSCGRBL | 1887 |
| 8-1024. ISIF_2DLSCGROF | 1888 |
| 8-1025. Register Call Summary for Register ISIF_2DLSCGROF | 1888 |
| 8-1026. ISIF_2DLSCORBU | 1888 |
| 8-1027. Register Call Summary for Register ISIF_2DLSCORBU | 1888 |
| 8-1028. ISIF_2DLSCORBL | 1889 |
| 8-1029. Register Call Summary for Register ISIF_2DLSCORBL | 1889 |
| 8-1030. ISIF_2DLSCOROF | 1889 |
| 8-1031. Register Call Summary for Register ISIF_2DLSCOROF | 1889 |
| 8-1032. ISIF_2DLSCIRQEN | 1890 |
| 8-1033. Register Call Summary for Register ISIF_2DLSCIRQEN | 1890 |
| 8-1034. ISIF_2DLSCIRQST | 1891 |
| 8-1035. Register Call Summary for Register ISIF_2DLSCIRQST | 1892 |
| 8-1036. ISIF_FMTCFG | 1892 |
| 8-1037. Register Call Summary for Register ISIF_FMTCFG | 1892 |
| 8-1038. ISIF_FMTPLEN | 1893 |
| 8-1039. Register Call Summary for Register ISIF_FMTPLEN | 1893 |
| 8-1040. ISIF_FMTSPH | 1893 |
| 8-1041. Register Call Summary for Register ISIF_FMTSPH | 1894 |
| 8-1042. ISIF_FMTLNH | 1894 |
| 8-1043. Register Call Summary for Register ISIF_FMTLNH | 1894 |
| 8-1044. ISIF_FMTLSV | 1894 |
| 8-1045. Register Call Summary for Register ISIF_FMTLSV | 1895 |
| 8-1046. ISIF_FMTLNV | 1895 |
| 8-1047. Register Call Summary for Register ISIF_FMTLNV | 1895 |
| 8-1048. ISIF_FMTRLEN | 1895 |
| 8-1049. Register Call Summary for Register ISIF_FMTRLEN | 1895 |
| 8-1050. ISIF_FMTHCNT | 1896 |
| 8-1051. Register Call Summary for Register ISIF_FMTHCNT | 1896 |
| 8-1052. ISIF_FMTAPTR0 | 1896 |
| 8-1053. Register Call Summary for Register ISIF_FMTAPTR0 | 1896 |
| 8-1054. ISIF_FMTAPTR1 | 1897 |

| | |
|--|------|
| 8-1055. Register Call Summary for Register ISIF_FMTAPTR1 | 1897 |
| 8-1056. ISIF_FMTAPTR2 | 1897 |
| 8-1057. Register Call Summary for Register ISIF_FMTAPTR2 | 1897 |
| 8-1058. ISIF_FMTAPTR3 | 1898 |
| 8-1059. Register Call Summary for Register ISIF_FMTAPTR3 | 1898 |
| 8-1060. ISIF_FMTAPTR4 | 1898 |
| 8-1061. Register Call Summary for Register ISIF_FMTAPTR4 | 1898 |
| 8-1062. ISIF_FMTAPTR5 | 1899 |
| 8-1063. Register Call Summary for Register ISIF_FMTAPTR5 | 1899 |
| 8-1064. ISIF_FMTAPTR6 | 1899 |
| 8-1065. Register Call Summary for Register ISIF_FMTAPTR6 | 1899 |
| 8-1066. ISIF_FMTAPTR7 | 1900 |
| 8-1067. Register Call Summary for Register ISIF_FMTAPTR7 | 1900 |
| 8-1068. ISIF_FMTAPTR8 | 1900 |
| 8-1069. Register Call Summary for Register ISIF_FMTAPTR8 | 1900 |
| 8-1070. ISIF_FMTAPTR9 | 1901 |
| 8-1071. Register Call Summary for Register ISIF_FMTAPTR9 | 1901 |
| 8-1072. ISIF_FMTAPTR10 | 1901 |
| 8-1073. Register Call Summary for Register ISIF_FMTAPTR10 | 1901 |
| 8-1074. ISIF_FMTAPTR11 | 1902 |
| 8-1075. Register Call Summary for Register ISIF_FMTAPTR11 | 1902 |
| 8-1076. ISIF_FMTAPTR12 | 1902 |
| 8-1077. Register Call Summary for Register ISIF_FMTAPTR12 | 1902 |
| 8-1078. ISIF_FMTAPTR13 | 1903 |
| 8-1079. Register Call Summary for Register ISIF_FMTAPTR13 | 1903 |
| 8-1080. ISIF_FMTAPTR14 | 1903 |
| 8-1081. Register Call Summary for Register ISIF_FMTAPTR14 | 1903 |
| 8-1082. ISIF_FMTAPTR15 | 1904 |
| 8-1083. Register Call Summary for Register ISIF_FMTAPTR15 | 1904 |
| 8-1084. ISIF_FMTPGMVFO | 1904 |
| 8-1085. Register Call Summary for Register ISIF_FMTPGMVFO | 1905 |
| 8-1086. ISIF_FMTPGMVF1 | 1906 |
| 8-1087. Register Call Summary for Register ISIF_FMTPGMVF1 | 1907 |
| 8-1088. ISIF_FMTPGMAPU0 | 1907 |
| 8-1089. Register Call Summary for Register ISIF_FMTPGMAPU0 | 1908 |
| 8-1090. ISIF_FMTPGMAPU1 | 1909 |
| 8-1091. Register Call Summary for Register ISIF_FMTPGMAPU1 | 1910 |
| 8-1092. ISIF_FMTPGMAPS0 | 1910 |
| 8-1093. Register Call Summary for Register ISIF_FMTPGMAPS0 | 1910 |
| 8-1094. ISIF_FMTPGMAPS1 | 1911 |
| 8-1095. Register Call Summary for Register ISIF_FMTPGMAPS1 | 1911 |
| 8-1096. ISIF_FMTPGMAPS2 | 1911 |
| 8-1097. Register Call Summary for Register ISIF_FMTPGMAPS2 | 1911 |
| 8-1098. ISIF_FMTPGMAPS3 | 1912 |
| 8-1099. Register Call Summary for Register ISIF_FMTPGMAPS3 | 1912 |
| 8-1100. ISIF_FMTPGMAPS4 | 1912 |
| 8-1101. Register Call Summary for Register ISIF_FMTPGMAPS4 | 1912 |
| 8-1102. ISIF_FMTPGMAPS5 | 1913 |
| 8-1103. Register Call Summary for Register ISIF_FMTPGMAPS5 | 1913 |

| | |
|--|------|
| 8-1104. ISIF_FMTPGMAPS6..... | 1913 |
| 8-1105. Register Call Summary for Register ISIF_FMTPGMAPS6 | 1913 |
| 8-1106. ISIF_FMTPGMAPS7..... | 1914 |
| 8-1107. Register Call Summary for Register ISIF_FMTPGMAPS7 | 1914 |
| 8-1108. ISIF_CSCCTL | 1914 |
| 8-1109. Register Call Summary for Register ISIF_CSCCTL | 1914 |
| 8-1110. ISIF_CSCM0..... | 1915 |
| 8-1111. Register Call Summary for Register ISIF_CSCM0 | 1915 |
| 8-1112. ISIF_CSCM1..... | 1915 |
| 8-1113. Register Call Summary for Register ISIF_CSCM1 | 1915 |
| 8-1114. ISIF_CSCM2..... | 1916 |
| 8-1115. Register Call Summary for Register ISIF_CSCM2 | 1916 |
| 8-1116. ISIF_CSCM3..... | 1916 |
| 8-1117. Register Call Summary for Register ISIF_CSCM3 | 1916 |
| 8-1118. ISIF_CSCM4..... | 1917 |
| 8-1119. Register Call Summary for Register ISIF_CSCM4 | 1917 |
| 8-1120. ISIF_CSCM5..... | 1917 |
| 8-1121. Register Call Summary for Register ISIF_CSCM5 | 1917 |
| 8-1122. ISIF_CSCM6..... | 1918 |
| 8-1123. Register Call Summary for Register ISIF_CSCM6 | 1918 |
| 8-1124. ISIF_CSCM7..... | 1918 |
| 8-1125. Register Call Summary for Register ISIF_CSCM7 | 1918 |
| 8-1126. ISIF_CLKCTL..... | 1919 |
| 8-1127. Register Call Summary for Register ISIF_CLKCTL | 1919 |
| 8-1128. ISS IPIPEIF Registers Mapping Summary | 1919 |
| 8-1129. IPIPEIF_ENABLE | 1920 |
| 8-1130. Register Call Summary for Register IPIPEIF_ENABLE..... | 1920 |
| 8-1131. IPIPEIF_CFG1..... | 1921 |
| 8-1132. Register Call Summary for Register IPIPEIF_CFG1 | 1922 |
| 8-1133. IPIPEIF_PPLN..... | 1922 |
| 8-1134. Register Call Summary for Register IPIPEIF_PPLN | 1923 |
| 8-1135. IPIPEIF_LPFR..... | 1923 |
| 8-1136. Register Call Summary for Register IPIPEIF_LPFR | 1923 |
| 8-1137. IPIPEIF_HNUM..... | 1924 |
| 8-1138. Register Call Summary for Register IPIPEIF_HNUM | 1924 |
| 8-1139. IPIPEIF_VNUM..... | 1924 |
| 8-1140. Register Call Summary for Register IPIPEIF_VNUM | 1924 |
| 8-1141. IPIPEIF_ADDRU | 1925 |
| 8-1142. Register Call Summary for Register IPIPEIF_ADDRU..... | 1925 |
| 8-1143. IPIPEIF_ADDRL..... | 1925 |
| 8-1144. Register Call Summary for Register IPIPEIF_ADDRL | 1925 |
| 8-1145. IPIPEIF_ADOFS | 1926 |
| 8-1146. Register Call Summary for Register IPIPEIF_ADOFS | 1926 |
| 8-1147. IPIPEIF_RSZ | 1926 |
| 8-1148. Register Call Summary for Register IPIPEIF_RSZ | 1926 |
| 8-1149. IPIPEIF_GAIN | 1927 |
| 8-1150. Register Call Summary for Register IPIPEIF_GAIN..... | 1927 |
| 8-1151. IPIPEIF_DPCM..... | 1927 |
| 8-1152. Register Call Summary for Register IPIPEIF_DPCM | 1928 |

| | |
|---|------|
| 8-1153. IPIPEIF_CFG2..... | 1928 |
| 8-1154. Register Call Summary for Register IPIPEIF_CFG2 | 1929 |
| 8-1155. IPIPEIF_INIRSZ | 1930 |
| 8-1156. Register Call Summary for Register IPIPEIF_INIRSZ | 1930 |
| 8-1157. IPIPEIF_OCLIP | 1930 |
| 8-1158. Register Call Summary for Register IPIPEIF_OCLIP | 1930 |
| 8-1159. IPIPEIF_DTUDF | 1931 |
| 8-1160. Register Call Summary for Register IPIPEIF_DTUDF | 1931 |
| 8-1161. IPIPEIF_CLKDIV | 1931 |
| 8-1162. Register Call Summary for Register IPIPEIF_CLKDIV..... | 1931 |
| 8-1163. IPIPEIF_DPC1..... | 1932 |
| 8-1164. Register Call Summary for Register IPIPEIF_DPC1 | 1932 |
| 8-1165. IPIPEIF_DPC2..... | 1932 |
| 8-1166. Register Call Summary for Register IPIPEIF_DPC2 | 1932 |
| 8-1167. IPIPEIF_RSZ3A | 1933 |
| 8-1168. Register Call Summary for Register IPIPEIF_RSZ3A..... | 1933 |
| 8-1169. IPIPEIF_INIRSZ3A..... | 1933 |
| 8-1170. Register Call Summary for Register IPIPEIF_INIRSZ3A | 1934 |
| 8-1171. ISS H3A Registers Mapping Summary | 1934 |
| 8-1172. H3A_PID | 1935 |
| 8-1173. Register Call Summary for Register H3A_PID | 1935 |
| 8-1174. H3A_PCR | 1935 |
| 8-1175. Register Call Summary for Register H3A_PCR..... | 1937 |
| 8-1176. H3A_AFPAX1 | 1937 |
| 8-1177. Register Call Summary for Register H3A_AFPAX1 | 1937 |
| 8-1178. H3A_AFPAX2 | 1938 |
| 8-1179. Register Call Summary for Register H3A_AFPAX2 | 1938 |
| 8-1180. H3A_AFPAXSTART | 1939 |
| 8-1181. Register Call Summary for Register H3A_AFPAXSTART..... | 1939 |
| 8-1182. H3A_AFIIRSH | 1939 |
| 8-1183. Register Call Summary for Register H3A_AFIIRSH..... | 1940 |
| 8-1184. H3A_AFBUFST..... | 1940 |
| 8-1185. Register Call Summary for Register H3A_AFBUFST | 1940 |
| 8-1186. H3A_AFCOEF010 | 1941 |
| 8-1187. Register Call Summary for Register H3A_AFCOEF010..... | 1941 |
| 8-1188. H3A_AFCOEF032 | 1941 |
| 8-1189. Register Call Summary for Register H3A_AFCOEF032..... | 1941 |
| 8-1190. H3A_AFCOEF054 | 1942 |
| 8-1191. Register Call Summary for Register H3A_AFCOEF054..... | 1942 |
| 8-1192. H3A_AFCOEF076 | 1942 |
| 8-1193. Register Call Summary for Register H3A_AFCOEF076..... | 1942 |
| 8-1194. H3A_AFCOEF098 | 1943 |
| 8-1195. Register Call Summary for Register H3A_AFCOEF098..... | 1943 |
| 8-1196. H3A_AFCOEF0010 | 1943 |
| 8-1197. Register Call Summary for Register H3A_AFCOEF0010 | 1943 |
| 8-1198. H3A_AFCOEF110 | 1944 |
| 8-1199. Register Call Summary for Register H3A_AFCOEF110..... | 1944 |
| 8-1200. H3A_AFCOEF132 | 1944 |
| 8-1201. Register Call Summary for Register H3A_AFCOEF132..... | 1944 |

| | |
|---|------|
| 8-1202. H3A_AFCOEF154 | 1945 |
| 8-1203. Register Call Summary for Register H3A_AFCOEF154 | 1945 |
| 8-1204. H3A_AFCOEF176 | 1945 |
| 8-1205. Register Call Summary for Register H3A_AFCOEF176 | 1945 |
| 8-1206. H3A_AFCOEF198 | 1946 |
| 8-1207. Register Call Summary for Register H3A_AFCOEF198 | 1946 |
| 8-1208. H3A_AFCOEF1010 | 1946 |
| 8-1209. Register Call Summary for Register H3A_AFCOEF1010 | 1946 |
| 8-1210. H3A_AEWWIN1 | 1947 |
| 8-1211. Register Call Summary for Register H3A_AEWWIN1 | 1947 |
| 8-1212. H3A_AEWINSTART | 1948 |
| 8-1213. Register Call Summary for Register H3A_AEWINSTART | 1948 |
| 8-1214. H3A_AEWINBLK | 1948 |
| 8-1215. Register Call Summary for Register H3A_AEWINBLK | 1949 |
| 8-1216. H3A_AEWSUBWIN | 1949 |
| 8-1217. Register Call Summary for Register H3A_AEWSUBWIN | 1949 |
| 8-1218. H3A_AEWBUFST | 1950 |
| 8-1219. Register Call Summary for Register H3A_AEWBUFST | 1950 |
| 8-1220. H3A_AEWCFG | 1950 |
| 8-1221. Register Call Summary for Register H3A_AEWCFG | 1951 |
| 8-1222. H3A_LINE_START | 1951 |
| 8-1223. Register Call Summary for Register H3A_LINE_START | 1951 |
| 8-1224. H3A_VFV_CFG1 | 1952 |
| 8-1225. Register Call Summary for Register H3A_VFV_CFG1 | 1952 |
| 8-1226. H3A_VFV_CFG2 | 1952 |
| 8-1227. Register Call Summary for Register H3A_VFV_CFG2 | 1952 |
| 8-1228. H3A_VFV_CFG3 | 1953 |
| 8-1229. Register Call Summary for Register H3A_VFV_CFG3 | 1953 |
| 8-1230. H3A_VFV_CFG4 | 1953 |
| 8-1231. Register Call Summary for Register H3A_VFV_CFG4 | 1953 |
| 8-1232. H3A_HVF_THR | 1954 |
| 8-1233. Register Call Summary for Register H3A_HVF_THR | 1954 |
| 8-1234. H3A_ADVANCED | 1954 |
| 8-1235. Register Call Summary for Register H3A_ADVANCED | 1954 |
| 8-1236. Integration Attributes | 1956 |
| 8-1237. Clocks and Resets | 1957 |
| 8-1238. Hardware Requests | 1957 |
| 8-1239. ISS SIMCOP Clock Control Register Settings | 1958 |
| 8-1240. Autoclock Gating Bit Control | 1958 |
| 8-1241. SIMCOP Interrupts | 1960 |
| 8-1242. Global Initialization of Surrounding Modules | 1961 |
| 8-1243. ISS SIMCOP Global Initialization | 1961 |
| 8-1244. JPEG Encode Pipeline | 1963 |
| 8-1245. SIMCOP Instance Summary | 1964 |
| 8-1246. SIMCOP_CONTROL Register Mapping Summary | 1964 |
| 8-1247. SIMCOP_HL_REVISION | 1965 |
| 8-1248. Register Call Summary for Register SIMCOP_HL_REVISION | 1965 |
| 8-1249. SIMCOP_HL_HWINFO | 1965 |
| 8-1250. Register Call Summary for Register SIMCOP_HL_HWINFO | 1966 |

| | |
|--|------|
| 8-1251. SIMCOP_HL_SYSCONFIG..... | 1966 |
| 8-1252. Register Call Summary for Register SIMCOP_HL_SYSCONFIG | 1967 |
| 8-1253. SIMCOP_HL_IRQSTATUS_RAW_i | 1967 |
| 8-1254. Register Call Summary for Register SIMCOP_HL_IRQSTATUS_RAW_i..... | 1970 |
| 8-1255. SIMCOP_HL_IRQSTATUS_i | 1970 |
| 8-1256. Register Call Summary for Register SIMCOP_HL_IRQSTATUS_i | 1973 |
| 8-1257. SIMCOP_HL_IRQENABLE_SET_i | 1973 |
| 8-1258. Register Call Summary for Register SIMCOP_HL_IRQENABLE_SET_i..... | 1976 |
| 8-1259. SIMCOP_HL_IRQENABLE_CLR_i | 1976 |
| 8-1260. Register Call Summary for Register SIMCOP_HL_IRQENABLE_CLR_i..... | 1979 |
| 8-1261. SIMCOP_CTRL | 1979 |
| 8-1262. Register Call Summary for Register SIMCOP_CTRL | 1981 |
| 8-1263. SIMCOP_CLKCTRL | 1981 |
| 8-1264. Register Call Summary for Register SIMCOP_CLKCTRL..... | 1983 |
| 8-1265. SIMCOP Memory Mapping | 1984 |
| 8-1266. Integration Attributes..... | 1986 |
| 8-1267. Clocks and Resets | 1986 |
| 8-1268. Hardware Requests..... | 1987 |
| 8-1269. Static Crossbar Control Summary | 1989 |
| 8-1270. Static Crossbar Control Summary (2/2) | 1989 |
| 8-1271. Image Buffer Address Map | 1990 |
| 8-1272. Coefficient Buffer Organization..... | 1992 |
| 8-1273. Quantization Table Storage in QUANT Memory | 1992 |
| 8-1274. QUANT Memory Organization | 1993 |
| 8-1275. HUFF Memory Organization..... | 1993 |
| 8-1276. Bitstream Buffer Mapping to SIMCOP DMA..... | 1994 |
| 8-1277. LDC_LUT Memory Organization | 1994 |
| 8-1278. LUT Memory Format on 32-Bit Words | 1994 |
| 8-1279. Rotation Macroblock Pipeline..... | 2001 |
| 8-1280. LDC Transformation | 2002 |
| 8-1281. Concurrent Software and Hardware Sequencing | 2003 |
| 8-1282. Hardware Sequencer Instance Summary..... | 2004 |
| 8-1283. HWSEQ Register Mapping Summary | 2004 |
| 8-1284. SIMCOP_HWSEQ_CTRL..... | 2005 |
| 8-1285. Register Call Summary for Register SIMCOP_HWSEQ_CTRL | 2006 |
| 8-1286. SIMCOP_HWSEQ_STATUS | 2007 |
| 8-1287. Register Call Summary for Register SIMCOP_HWSEQ_STATUS..... | 2007 |
| 8-1288. SIMCOP_HWSEQ_OVERRIDE | 2007 |
| 8-1289. Register Call Summary for Register SIMCOP_HWSEQ_OVERRIDE | 2008 |
| 8-1290. SIMCOP_HWSEQ_STEP_CTRL_OVERRIDE..... | 2008 |
| 8-1291. Register Call Summary for Register SIMCOP_HWSEQ_STEP_CTRL_OVERRIDE | 2011 |
| 8-1292. SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE | 2011 |
| 8-1293. Register Call Summary for Register SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE | 2013 |
| 8-1294. SIMCOP_HWSEQ_STEP_CTRL2_OVERRIDE | 2013 |
| 8-1295. Register Call Summary for Register SIMCOP_HWSEQ_STEP_CTRL2_OVERRIDE..... | 2014 |
| 8-1296. SIMCOP_HWSEQ_STEP_CTRL_i | 2014 |
| 8-1297. Register Call Summary for Register SIMCOP_HWSEQ_STEP_CTRL_i..... | 2016 |
| 8-1298. SIMCOP_HWSEQ_STEP_SWITCH_i | 2017 |
| 8-1299. Register Call Summary for Register SIMCOP_HWSEQ_STEP_SWITCH_i | 2019 |

| | |
|--|------|
| 8-1300. SIMCOP_HWSEQ_STEP_IMX_CTRL_i..... | 2019 |
| 8-1301. Register Call Summary for Register SIMCOP_HWSEQ_STEP_IMX_CTRL_i | 2019 |
| 8-1302. SIMCOP_HWSEQ_STEP_CTRL2_i..... | 2020 |
| 8-1303. Register Call Summary for Register SIMCOP_HWSEQ_STEP_CTRL2_i | 2021 |
| 8-1304. Integration Attributes..... | 2023 |
| 8-1305. Clocks and Resets | 2023 |
| 8-1306. Hardware Requests..... | 2024 |
| 8-1307. Local Power-Management Features..... | 2025 |
| 8-1308. SIMCOP DMA Events List | 2026 |
| 8-1309. Allowed Maximum Burst Size | 2030 |
| 8-1310. Initialization of Surrounding Modules | 2030 |
| 8-1311. SIMCOP DMA Instance Summary..... | 2034 |
| 8-1312. DMA Register Mapping Summary | 2034 |
| 8-1313. SIMCOP_DMA_REVISION | 2035 |
| 8-1314. Register Call Summary for Register SIMCOP_DMA_REVISION..... | 2035 |
| 8-1315. SIMCOP_DMA_HWINFO | 2035 |
| 8-1316. Register Call Summary for Register SIMCOP_DMA_HWINFO..... | 2035 |
| 8-1317. SIMCOP_DMA_SYSCONFIG | 2036 |
| 8-1318. Register Call Summary for Register SIMCOP_DMA_SYSCONFIG..... | 2036 |
| 8-1319. SIMCOP_DMA_CTRL | 2036 |
| 8-1320. Register Call Summary for Register SIMCOP_DMA_CTRL | 2037 |
| 8-1321. SIMCOP_DMA_IRQSTATUS_RAW_j..... | 2037 |
| 8-1322. Register Call Summary for Register SIMCOP_DMA_IRQSTATUS_RAW_j | 2039 |
| 8-1323. SIMCOP_DMA_IRQSTATUS_j | 2040 |
| 8-1324. Register Call Summary for Register SIMCOP_DMA_IRQSTATUS_j..... | 2042 |
| 8-1325. SIMCOP_DMA_IRQENABLE_SET_j..... | 2042 |
| 8-1326. Register Call Summary for Register SIMCOP_DMA_IRQENABLE_SET_j | 2044 |
| 8-1327. SIMCOP_DMA_IRQENABLE_CLR_j..... | 2044 |
| 8-1328. Register Call Summary for Register SIMCOP_DMA_IRQENABLE_CLR_j..... | 2047 |
| 8-1329. SIMCOP_DMA_CHAN_CTRL_i..... | 2047 |
| 8-1330. Register Call Summary for Register SIMCOP_DMA_CHAN_CTRL_i | 2049 |
| 8-1331. SIMCOP_DMA_CHAN_SMEM_ADDR_i | 2049 |
| 8-1332. Register Call Summary for Register SIMCOP_DMA_CHAN_SMEM_ADDR_i | 2049 |
| 8-1333. SIMCOP_DMA_CHAN_SMEM_OFST_i..... | 2049 |
| 8-1334. Register Call Summary for Register SIMCOP_DMA_CHAN_SMEM_OFST_i | 2049 |
| 8-1335. SIMCOP_DMA_CHAN_BUF_OFST_i..... | 2050 |
| 8-1336. Register Call Summary for Register SIMCOP_DMA_CHAN_BUF_OFST_i | 2050 |
| 8-1337. SIMCOP_DMA_CHAN_BUF_ADDR_i | 2050 |
| 8-1338. Register Call Summary for Register SIMCOP_DMA_CHAN_BUF_ADDR_i..... | 2050 |
| 8-1339. SIMCOP_DMA_CHAN_BLOCK_SIZE_i | 2051 |
| 8-1340. Register Call Summary for Register SIMCOP_DMA_CHAN_BLOCK_SIZE_i..... | 2051 |
| 8-1341. SIMCOP_DMA_CHAN_FRAME_j | 2051 |
| 8-1342. Register Call Summary for Register SIMCOP_DMA_CHAN_FRAME_j..... | 2051 |
| 8-1343. SIMCOP_DMA_CHAN_CURRENT_BLOCK_i..... | 2052 |
| 8-1344. Register Call Summary for Register SIMCOP_DMA_CHAN_CURRENT_BLOCK_i | 2052 |
| 8-1345. SIMCOP_DMA_CHAN_BLOCK_STEP_i | 2052 |
| 8-1346. Register Call Summary for Register SIMCOP_DMA_CHAN_BLOCK_STEP_i..... | 2053 |
| 8-1347. Integration Attributes..... | 2056 |
| 8-1348. Clocks and Resets | 2057 |

| | |
|---|------|
| 8-1349. Hardware Requests | 2057 |
| 8-1350. Local Power-Management Features | 2058 |
| 8-1351. Events | 2059 |
| 8-1352. Initialization of Surrounding Modules | 2063 |
| 8-1353. DCT Processing Procedure | 2063 |
| 8-1354. IDCT Processing Procedure | 2063 |
| 8-1355. ISS SIMCOP DCT Instance Summary | 2065 |
| 8-1356. DCT Register Mapping Summary | 2065 |
| 8-1357. DCT_VERSION | 2066 |
| 8-1358. Register Call Summary for Register DCT_VERSION | 2066 |
| 8-1359. DCT_CTRL | 2066 |
| 8-1360. Register Call Summary for Register DCT_CTRL | 2066 |
| 8-1361. DCT_CFG | 2067 |
| 8-1362. Register Call Summary for Register DCT_CFG | 2067 |
| 8-1363. DCT_SPTR | 2068 |
| 8-1364. Register Call Summary for Register DCT_SPTR | 2068 |
| 8-1365. DCT_FPTR | 2068 |
| 8-1366. Register Call Summary for Register DCT_FPTR | 2068 |
| 8-1367. Integration Attributes | 2070 |
| 8-1368. Clocks and Resets | 2070 |
| 8-1369. Hardware Requests | 2071 |
| 8-1370. Local Power-Management Feature | 2072 |
| 8-1371. Events | 2072 |
| 8-1372. Image Buffer Block Format | 2074 |
| 8-1373. Recommended QMEM Allocation for YUV4:2:0 and YUV4:2:2 | 2075 |
| 8-1374. Initialization of Surrounding Modules | 2079 |
| 8-1375. JPEG Encoding Procedure | 2079 |
| 8-1376. JPEG Decoding Procedure | 2080 |
| 8-1377. Concurrent JPEG Encoding and Decoding | 2082 |
| 8-1378. Sample Luma DC Huffman Code Table | 2085 |
| 8-1379. ISS SIMCOP VLCDJ Instance Summary | 2087 |
| 8-1380. VLCDJ Register Mapping Summary | 2087 |
| 8-1381. VLCDJ_REVISION | 2088 |
| 8-1382. Register Call Summary for Register VLCDJ_REVISION | 2088 |
| 8-1383. VLCDJ_CTRL | 2088 |
| 8-1384. Register Call Summary for Register VLCDJ_CTRL | 2089 |
| 8-1385. VLCDJE_CFG | 2089 |
| 8-1386. Register Call Summary for Register VLCDJE_CFG | 2090 |
| 8-1387. VLCDJE_DCPREDY | 2090 |
| 8-1388. Register Call Summary for Register VLCDJE_DCPREDY | 2090 |
| 8-1389. VLCDJE_DCPREDUV | 2090 |
| 8-1390. Register Call Summary for Register VLCDJE_DCPREDUV | 2090 |
| 8-1391. VLCDJE_BSPTR | 2091 |
| 8-1392. Register Call Summary for Register VLCDJE_BSPTR | 2091 |
| 8-1393. VLCDJE_CBUF | 2091 |
| 8-1394. Register Call Summary for Register VLCDJE_CBUF | 2092 |
| 8-1395. VLCDJE_RSTCFG | 2092 |
| 8-1396. Register Call Summary for Register VLCDJE_RSTCFG | 2092 |
| 8-1397. VLCDJE_DCTQM | 2092 |

| | |
|---|------|
| 8-1398. Register Call Summary for Register VLCDJE_DCTQM | 2093 |
| 8-1399. VLCDJE_VLCTBL..... | 2093 |
| 8-1400. Register Call Summary for Register VLCDJE_VLCTBL | 2093 |
| 8-1401. VLCDJE_RSTPTR | 2093 |
| 8-1402. Register Call Summary for Register VLCDJE_RSTPTR | 2094 |
| 8-1403. VLCDJE_RSTOFST | 2094 |
| 8-1404. Register Call Summary for Register VLCDJE_RSTOFST..... | 2094 |
| 8-1405. VLCDJD_CFG | 2094 |
| 8-1406. Register Call Summary for Register VLCDJD_CFG | 2095 |
| 8-1407. VLCDJD_DCPREDY | 2095 |
| 8-1408. Register Call Summary for Register VLCDJD_DCPREDY | 2095 |
| 8-1409. VLCDJD_DCPREDUV | 2095 |
| 8-1410. Register Call Summary for Register VLCDJD_DCPREDUV | 2095 |
| 8-1411. VLCDJD_BSPTR..... | 2096 |
| 8-1412. Register Call Summary for Register VLCDJD_BSPTR | 2096 |
| 8-1413. VLCDJD_CBUF | 2096 |
| 8-1414. Register Call Summary for Register VLCDJD_CBUF..... | 2097 |
| 8-1415. VLCDJD_DCTQM..... | 2097 |
| 8-1416. Register Call Summary for Register VLCDJD_DCTQM | 2097 |
| 8-1417. VLCDJD_CTRLTBL..... | 2097 |
| 8-1418. Register Call Summary for Register VLCDJD_CTRLTBL | 2098 |
| 8-1419. VLCDJD_DCDTBL01 | 2098 |
| 8-1420. Register Call Summary for Register VLCDJD_DCDTBL01 | 2098 |
| 8-1421. VLCDJD_DCDTBL23..... | 2098 |
| 8-1422. Register Call Summary for Register VLCDJD_DCDTBL23 | 2099 |
| 8-1423. VLCDJD_DCTERR | 2099 |
| 8-1424. Register Call Summary for Register VLCDJD_DCTERR | 2099 |
| 8-1425. ISS SIMCOP ROT Integration Attributes..... | 2102 |
| 8-1426. ISS SIMCOP ROT Clocks and Resets..... | 2102 |
| 8-1427. ISS SIMCOP ROT Hardware Requests..... | 2103 |
| 8-1428. ISS SIMCOP ROT Global Initialization of Surrounding Modules | 2111 |
| 8-1429. ISS SIMCOP ROT Global Initialization of the ROT..... | 2111 |
| 8-1430. ISS SIMCOP ROT Trigger Source Bit Value | 2111 |
| 8-1431. ISS SIMCOP ROT Data-Block Shifting | 2112 |
| 8-1432. ISS SIMCOP ROT Instance Summary | 2113 |
| 8-1433. ROT Register Mapping Summary..... | 2113 |
| 8-1434. ROT_REVISION | 2113 |
| 8-1435. Register Call Summary for Register ROT_REVISION | 2114 |
| 8-1436. ROT_CTRL | 2114 |
| 8-1437. Register Call Summary for Register ROT_CTRL..... | 2114 |
| 8-1438. ROT_CFG..... | 2114 |
| 8-1439. Register Call Summary for Register ROT_CFG | 2115 |
| 8-1440. ROT_BLKSZ | 2115 |
| 8-1441. Register Call Summary for Register ROT_BLKSZ | 2116 |
| 8-1442. ROT_SRC_START1 | 2116 |
| 8-1443. Register Call Summary for Register ROT_SRC_START1 | 2116 |
| 8-1444. ROT_SRC_LOFST | 2116 |
| 8-1445. Register Call Summary for Register ROT_SRC_LOFST | 2116 |
| 8-1446. ROT_DST_START1 | 2117 |

| | |
|--|------|
| 8-1447. Register Call Summary for Register ROT_DST_START1..... | 2117 |
| 8-1448. ROT_DST_LOFST..... | 2117 |
| 8-1449. Register Call Summary for Register ROT_DST_LOFST | 2117 |
| 8-1450. ROT_SRC_START2..... | 2118 |
| 8-1451. Register Call Summary for Register ROT_SRC_START2 | 2118 |
| 8-1452. ROT_DST_START2 | 2118 |
| 8-1453. Register Call Summary for Register ROT_DST_START2..... | 2118 |
| 9-1. 3rd Party IP Features | 2120 |
| 9-2. Integration Attributes | 2122 |
| 9-3. Clocks and Resets | 2122 |
| 9-4. Hardware Requests | 2123 |
| 9-5. Local Power-Management Features | 2125 |
| 9-6. Interrupts and Events Description | 2126 |
| 9-7. Performance Parameters | 2127 |
| 9-8. Global Initialization of Surrounding Modules..... | 2128 |
| 9-9. FDIF Global Initialization | 2128 |
| 9-10. FDIF Instance Summary..... | 2131 |
| 9-11. FDIF Registers Mapping Summary | 2131 |
| 9-12. FDIF_REVISION..... | 2132 |
| 9-13. Register Call Summary for Register FDIF_REVISION | 2132 |
| 9-14. FDIF_HWINFO..... | 2132 |
| 9-15. Register Call Summary for Register FDIF_HWINFO | 2132 |
| 9-16. FDIF_SYSCONFIG..... | 2133 |
| 9-17. Register Call Summary for Register FDIF_SYSCONFIG | 2133 |
| 9-18. FDIF_IRQSTATUS_RAW_j | 2134 |
| 9-19. Register Call Summary for Register FDIF_IRQSTATUS_RAW_j..... | 2134 |
| 9-20. FDIF_IRQSTATUS_j | 2135 |
| 9-21. Register Call Summary for Register FDIF_IRQSTATUS_j | 2135 |
| 9-22. FDIF_IRQENABLE_SET_j | 2135 |
| 9-23. Register Call Summary for Register FDIF_IRQENABLE_SET_j..... | 2136 |
| 9-24. FDIF_IRQENABLE_CLR_j | 2136 |
| 9-25. Register Call Summary for Register FDIF_IRQENABLE_CLR_j..... | 2137 |
| 9-26. FDIF_PICADDR | 2137 |
| 9-27. Register Call Summary for Register FDIF_PICADDR | 2137 |
| 9-28. FDIF_CTRL | 2137 |
| 9-29. Register Call Summary for Register FDIF_CTRL | 2138 |
| 9-30. FDIF_WKADDR | 2139 |
| 9-31. Register Call Summary for Register FDIF_WKADDR | 2139 |
| 9-32. FD_CTRL | 2139 |
| 9-33. Register Call Summary for Register FD_CTRL | 2140 |
| 9-34. FD_DNUM..... | 2140 |
| 9-35. Register Call Summary for Register FD_DNUM | 2140 |
| 9-36. FD_DCOND | 2140 |
| 9-37. Register Call Summary for Register FD_DCOND | 2141 |
| 9-38. FD_STARTX | 2141 |
| 9-39. Register Call Summary for Register FD_STARTX..... | 2141 |
| 9-40. FD_STARTY | 2142 |
| 9-41. Register Call Summary for Register FD_STARTY..... | 2142 |
| 9-42. FD_SIZEX | 2142 |

| | |
|--|------|
| 9-43. Register Call Summary for Register FD_SIZEX..... | 2142 |
| 9-44. FD_SIZEY | 2143 |
| 9-45. Register Call Summary for Register FD_SIZEY..... | 2143 |
| 9-46. FD_LHIT | 2143 |
| 9-47. Register Call Summary for Register FD_LHIT..... | 2143 |
| 9-48. FD_CENTERX_i..... | 2144 |
| 9-49. Register Call Summary for Register FD_CENTERX_i | 2144 |
| 9-50. FD_CENTERY_i..... | 2144 |
| 9-51. Register Call Summary for Register FD_CENTERY_i | 2144 |
| 9-52. FD_CONFSIZE_i | 2145 |
| 9-53. Register Call Summary for Register FD_CONFSIZE_i..... | 2145 |
| 9-54. FD_ANGLE_i..... | 2145 |
| 9-55. Register Call Summary for Register FD_ANGLE_i | 2145 |
| 10-1. Display Parallel Interface Signals Mapping | 2152 |
| 10-2. DSS Clocks..... | 2156 |
| 10-3. DSS Modules Clock Sources | 2156 |
| 10-4. DSS Clock Frequencies | 2157 |
| 10-5. DSS Resets | 2158 |
| 10-6. DSS Power Domains..... | 2158 |
| 10-7. DSS Interrupts | 2162 |
| 10-8. DSS DMA Requests | 2163 |
| 10-9. DSS Instance Summary | 2165 |
| 10-10. DSS Registers Mapping Summary..... | 2165 |
| 10-11. DSS_REVISION | 2165 |
| 10-12. Register Call Summary for Register DSS_REVISION..... | 2166 |
| 10-13. DSS_SYSSTATUS | 2166 |
| 10-14. Register Call Summary for Register DSS_SYSSTATUS | 2166 |
| 10-15. DSS_CTRL..... | 2166 |
| 10-16. Register Call Summary for Register DSS_CTRL | 2167 |
| 10-17. DSS_STATUS | 2168 |
| 10-18. Register Call Summary for Register DSS_STATUS..... | 2170 |
| 10-19. Parallel Interface Signals | 2175 |
| 10-20. Number of Displayed Pixels per Pixel Clock Cycle Based on Display Type | 2176 |
| 10-21. Programmable Fields in Bypass Mode | 2180 |
| 10-22. Integration Attributes | 2187 |
| 10-23. Clocks and Resets | 2188 |
| 10-24. Hardware Requests | 2188 |
| 10-25. DISPC Interrupts..... | 2194 |
| 10-26. DMA Buffer Size | 2196 |
| 10-27. Register Settings for Accessing Image in Internal Memory..... | 2197 |
| 10-28. Register Settings for Rotation Using TILER | 2205 |
| 10-29. Mode Definition | 2205 |
| 10-30. Orientation Definition..... | 2206 |
| 10-31. Memory Formats Supported | 2206 |
| 10-32. Replication Enabled: RGB Pixel Formats Remapping Into ARGB40-10.10.10.10..... | 2210 |
| 10-33. Replication Disabled: RGB Pixel Formats Remapping Into ARGB40-10.10.10.10 | 2210 |
| 10-34. Replication Enabled: RGB Pixel Formats Remapping Into ARGB32-8888..... | 2214 |
| 10-35. Replication Disabled: RGB Pixel Formats Remapping Into ARGB32-8888 | 2214 |
| 10-36. Color Space Conversion YUV to RGB Bit Field Setting..... | 2215 |

| | |
|---|------|
| 10-37. Line Buffer Width for Scaler Unit | 2219 |
| 10-38. Register Bit Field Associated to Coefficient for ARGB and Y Configuration in VIDp Scaler | 2221 |
| 10-39. Register Bit Field Associated to Coefficient for Cb and Cr Configuration in VIDp Scaler | 2221 |
| 10-40. Vertical/Horizontal Accumulator Phase | 2223 |
| 10-41. Pixel Clock Frequency Limitations (Any Pixel Format), Active Matrix Display | 2225 |
| 10-42. Pixel Clock Frequency Limitations (Any Pixel Format), Passive Matrix Display – Mono4 | 2225 |
| 10-43. Pixel Clock Frequency Limitations (Any Pixel Format), Passive Matrix Display – Mono8 | 2226 |
| 10-44. Pixel Clock Frequency Limitations (Any Pixel Format), Passive Matrix Display – Color | 2226 |
| 10-45. CSC RGB to YUV Bit Field Setting | 2227 |
| 10-46. Register Bit Field Associated With Coefficient for ARGB and Y Configuration in WB Scaler | 2229 |
| 10-47. Register Bit Field Associated With Coefficient for Cb and Cr Configuration in WB Scaler | 2230 |
| 10-48. Vertical/Horizontal Accumulator Phase | 2231 |
| 10-49. Truncation Logic | 2232 |
| 10-50. Pipeline Connection to LCD, TV, or WB Output | 2233 |
| 10-51. Z-Order Register Settings and Default Configuration | 2234 |
| 10-52. Alpha Blending – ARGB | 2238 |
| 10-53. CPR or RGB to YUV Coefficients With Associated Bit Fields | 2242 |
| 10-54. Programming Rules | 2249 |
| 10-55. PPL and LLP Value for HD Standard | 2253 |
| 10-56. PPL and LLP Value for 3D Standard | 2253 |
| 10-57. Shadow Registers | 2255 |
| 10-58. Global Initialization of Surrounding Modules | 2261 |
| 10-59. DISPC Configuration | 2261 |
| 10-60. Configure the GFX DMA Channel | 2261 |
| 10-61. Configure the Video DMA Channel | 2262 |
| 10-62. Configure the WB DMA Channel | 2262 |
| 10-63. Configure the GFX Pipeline | 2264 |
| 10-64. Configure the GFX Window | 2264 |
| 10-65. Configure the GFX Pipeline Processing | 2264 |
| 10-66. Configure the Palette Table | 2265 |
| 10-67. Configure the GFX Pipeline Layer Output | 2266 |
| 10-68. Configure the Video Pipeline | 2266 |
| 10-69. Configure the Video Window | 2266 |
| 10-70. Configure the Video Pipeline Processing | 2267 |
| 10-71. Configure the VC-1 Range Mapping | 2268 |
| 10-72. Configure the Video Color Space Conversion | 2269 |
| 10-73. Configure the Video Scaler Unit for RGB Pixel Formats or Y Component | 2269 |
| 10-74. Configure the Video Scaler Unit for Cb and Cr Components | 2269 |
| 10-75. Configure the Video Pipeline Layer Output | 2270 |
| 10-76. Configure the WB Pipeline | 2271 |
| 10-77. Configure the Capture Window | 2271 |
| 10-78. Configure the WB Scaler Unit for RGB Pixel Formats or Y Component | 2271 |
| 10-79. Configure the WB Scaler Unit for Cb and Cr Components | 2272 |
| 10-80. Configure the WB Color Space Conversion Unit | 2272 |
| 10-81. Configure the LCD Output | 2272 |
| 10-82. Configure the LCD Overlay Manager | 2273 |
| 10-83. Configure the Gamma Table for LCD1 | 2273 |
| 10-84. Configure the Gamma Table for LCD2 | 2273 |
| 10-85. Configure the Color Phase Rotation | 2273 |

| | |
|---|------|
| 10-86. Configure the LCD Panel Timings and Parameters | 2274 |
| 10-87. Configure the TV Output..... | 2275 |
| 10-88. Configure the TV Overlay Manager..... | 2275 |
| 10-89. Configure the Gamma Table for TV Output..... | 2275 |
| 10-90. Configure the TV Panel Timings and Parameters | 2276 |
| 10-91. DISPC_SIZE_TV Values HD Standard..... | 2276 |
| 10-92. DISPC Instance Summary | 2276 |
| 10-93. DISPC_VIDp_BA_j Logical Register Mapping..... | 2277 |
| 10-94. DISPC_VIDp_BA_UV_j Logical Register Mapping | 2277 |
| 10-95. DISPC_VIDp_POSITION Logical Register Mapping | 2277 |
| 10-96. DISPC_VIDp_SIZE Logical Register Mapping | 2277 |
| 10-97. DISPC_VIDp_ATTRIBUTES Logical Register Mapping..... | 2277 |
| 10-98. DISPC_VIDp_ATTRIBUTES2 Logical Register Mapping | 2277 |
| 10-99. DISPC_VIDp_BUF_THRESHOLD Logical Register Mapping..... | 2277 |
| 10-100. DISPC_VIDp_ROW_INC Logical Register Mapping | 2278 |
| 10-101. DISPC_VIDp_PIXEL_INC Logical Register Mapping | 2278 |
| 10-102. DISPC_VIDp_FIR Logical Register Mapping..... | 2278 |
| 10-103. DISPC_VIDp_PICTURE_SIZE Logical Register Mapping..... | 2278 |
| 10-104. DISPC_VIDp_ACCU_j Logical Register Mapping | 2278 |
| 10-105. DISPC_VIDp_FIR_COEF_H_i Logical Register Mapping | 2278 |
| 10-106. DISPC_VIDp_FIR_COEF_HV_i Logical Register Mapping | 2278 |
| 10-107. DISPC_VIDp_FIR_COEF_V_i Logical Register Mapping | 2279 |
| 10-108. DISPC_VIDp_FIR_COEF_H2_i Logical Register Mapping..... | 2279 |
| 10-109. DISPC_VIDp_FIR_COEF_HV2_i Logical Register Mapping..... | 2279 |
| 10-110. DISPC_VIDp_FIR_COEF_V2_i Logical Register Mapping..... | 2279 |
| 10-111. DISPC_VIDp_CONV_COEF0 Logical Register Mapping..... | 2279 |
| 10-112. DISPC_VIDp_CONV_COEF1 Logical Register Mapping..... | 2279 |
| 10-113. DISPC_VIDp_CONV_COEF2 Logical Register Mapping..... | 2280 |
| 10-114. DISPC_VIDp_CONV_COEF3 Logical Register Mapping..... | 2280 |
| 10-115. DISPC_VIDp_CONV_COEF4 Logical Register Mapping..... | 2280 |
| 10-116. DISPC_CONTROLo Logical Register Mapping | 2280 |
| 10-117. DISPC_CONFIGo Logical Register Mapping | 2280 |
| 10-118. DISPC_DEFAULT_COLORo Logical Register Mapping..... | 2280 |
| 10-119. DISPC_TRANS_COLORo Logical Register Mapping..... | 2280 |
| 10-120. DISPC_GAMMA_TABLEo Logical Register Mapping..... | 2281 |
| 10-121. DISPC_TIMING_Ho Logical Register Mapping | 2281 |
| 10-122. DISPC_TIMING_Vo Logical Register Mapping | 2281 |
| 10-123. DISPC_POL_FREQo Logical Register Mapping..... | 2281 |
| 10-124. DISPC_DIVISORo Logical Register Mapping | 2281 |
| 10-125. DISPC_SIZE_LCDo Logical Register Mapping | 2281 |
| 10-126. DISPC_SIZE Logical Register Mapping | 2281 |
| 10-127. DISPC_DATAo_CYCLE1 Logical Register Mapping..... | 2281 |
| 10-128. DISPC_DATAo_CYCLE2 Logical Register Mapping..... | 2282 |
| 10-129. DISPC_DATAo_CYCLE3 Logical Register Mapping..... | 2282 |
| 10-130. DISPC_CPRo_COEF_R Logical Register Mapping..... | 2282 |
| 10-131. DISPC_CPRo_COEF_G Logical Register Mapping..... | 2282 |
| 10-132. DISPC_CPRo_COEF_B Logical Register Mapping | 2282 |
| 10-133. Display Controller Registers Mapping Summary..... | 2282 |
| 10-134. DISPC_REVISION | 2288 |

| | |
|--|------|
| 10-135. Register Call Summary for Register DISPC_REVISION | 2288 |
| 10-136. DISPC_SYSCONFIG | 2288 |
| 10-137. Register Call Summary for Register DISPC_SYSCONFIG | 2289 |
| 10-138. DISPC_SYSSTATUS | 2290 |
| 10-139. Register Call Summary for Register DISPC_SYSSTATUS | 2290 |
| 10-140. DISPC_IRQSTATUS | 2290 |
| 10-141. Register Call Summary for Register DISPC_IRQSTATUS | 2293 |
| 10-142. DISPC_IRQENABLE | 2293 |
| 10-143. Register Call Summary for Register DISPC_IRQENABLE | 2296 |
| 10-144. DISPC_CONTROL1 | 2296 |
| 10-145. Register Call Summary for Register DISPC_CONTROL1 | 2299 |
| 10-146. DISPC_CONFIG1 | 2299 |
| 10-147. Register Call Summary for Register DISPC_CONFIG1 | 2302 |
| 10-148. DISPC_DEFAULT_COLOR0 | 2302 |
| 10-149. Register Call Summary for Register DISPC_DEFAULT_COLOR0 | 2303 |
| 10-150. DISPC_DEFAULT_COLOR1 | 2303 |
| 10-151. Register Call Summary for Register DISPC_DEFAULT_COLOR1 | 2303 |
| 10-152. DISPC_TRANS_COLOR0 | 2303 |
| 10-153. Register Call Summary for Register DISPC_TRANS_COLOR0 | 2304 |
| 10-154. DISPC_TRANS_COLOR1 | 2304 |
| 10-155. Register Call Summary for Register DISPC_TRANS_COLOR1 | 2304 |
| 10-156. DISPC_LINE_STATUS | 2305 |
| 10-157. Register Call Summary for Register DISPC_LINE_STATUS | 2305 |
| 10-158. DISPC_LINE_NUMBER | 2305 |
| 10-159. Register Call Summary for Register DISPC_LINE_NUMBER | 2305 |
| 10-160. DISPC_TIMING_H1 | 2306 |
| 10-161. Register Call Summary for Register DISPC_TIMING_H1 | 2306 |
| 10-162. DISPC_TIMING_V1 | 2306 |
| 10-163. Register Call Summary for Register DISPC_TIMING_V1 | 2307 |
| 10-164. DISPC_POL_FREQ1 | 2307 |
| 10-165. Register Call Summary for Register DISPC_POL_FREQ1 | 2308 |
| 10-166. DISPC_DIVISOR1 | 2308 |
| 10-167. Register Call Summary for Register DISPC_DIVISOR1 | 2308 |
| 10-168. DISPC_GLOBAL_ALPHA | 2309 |
| 10-169. Register Call Summary for Register DISPC_GLOBAL_ALPHA | 2309 |
| 10-170. DISPC_SIZE_TV | 2309 |
| 10-171. Register Call Summary for Register DISPC_SIZE_TV | 2310 |
| 10-172. DISPC_SIZE_LCD1 | 2310 |
| 10-173. Register Call Summary for Register DISPC_SIZE_LCD1 | 2310 |
| 10-174. DISPC_GFX_BA_j | 2311 |
| 10-175. Register Call Summary for Register DISPC_GFX_BA_j | 2311 |
| 10-176. DISPC_GFX_POSITION | 2311 |
| 10-177. Register Call Summary for Register DISPC_GFX_POSITION | 2312 |
| 10-178. DISPC_GFX_SIZE | 2312 |
| 10-179. Register Call Summary for Register DISPC_GFX_SIZE | 2312 |
| 10-180. DISPC_GFX_ATTRIBUTES | 2313 |
| 10-181. Register Call Summary for Register DISPC_GFX_ATTRIBUTES | 2316 |
| 10-182. DISPC_GFX_BUF_THRESHOLD | 2316 |
| 10-183. Register Call Summary for Register DISPC_GFX_BUF_THRESHOLD | 2316 |

| | |
|---|------|
| 10-184. DISPC_GFX_BUF_SIZE_STATUS | 2316 |
| 10-185. Register Call Summary for Register DISPC_GFX_BUF_SIZE_STATUS | 2317 |
| 10-186. DISPC_GFX_ROW_INC | 2317 |
| 10-187. Register Call Summary for Register DISPC_GFX_ROW_INC | 2317 |
| 10-188. DISPC_GFX_PIXEL_INC | 2318 |
| 10-189. Register Call Summary for Register DISPC_GFX_PIXEL_INC | 2318 |
| 10-190. DISPC_GFX_TABLE_BA | 2318 |
| 10-191. Register Call Summary for Register DISPC_GFX_TABLE_BA | 2319 |
| 10-192. DISPC_VID1_BA_j | 2319 |
| 10-193. Register Call Summary for Register DISPC_VID1_BA_j | 2319 |
| 10-194. DISPC_VID1_POSITION | 2320 |
| 10-195. Register Call Summary for Register DISPC_VID1_POSITION | 2320 |
| 10-196. DISPC_VID1_SIZE | 2320 |
| 10-197. Register Call Summary for Register DISPC_VID1_SIZE | 2321 |
| 10-198. DISPC_VID1_ATTRIBUTES | 2321 |
| 10-199. Register Call Summary for Register DISPC_VID1_ATTRIBUTES | 2324 |
| 10-200. DISPC_VID1_BUF_THRESHOLD | 2324 |
| 10-201. Register Call Summary for Register DISPC_VID1_BUF_THRESHOLD | 2325 |
| 10-202. DISPC_VID1_BUF_SIZE_STATUS | 2325 |
| 10-203. Register Call Summary for Register DISPC_VID1_BUF_SIZE_STATUS | 2325 |
| 10-204. DISPC_VID1_ROW_INC | 2325 |
| 10-205. Register Call Summary for Register DISPC_VID1_ROW_INC | 2325 |
| 10-206. DISPC_VID1_PIXEL_INC | 2326 |
| 10-207. Register Call Summary for Register DISPC_VID1_PIXEL_INC | 2326 |
| 10-208. DISPC_VID1_FIR | 2326 |
| 10-209. Register Call Summary for Register DISPC_VID1_FIR | 2327 |
| 10-210. DISPC_VID1_PICTURE_SIZE | 2327 |
| 10-211. Register Call Summary for Register DISPC_VID1_PICTURE_SIZE | 2327 |
| 10-212. DISPC_VID1_ACCU_j | 2328 |
| 10-213. Register Call Summary for Register DISPC_VID1_ACCU_j | 2328 |
| 10-214. DISPC_VID1_FIR_COEF_H_i | 2328 |
| 10-215. Register Call Summary for Register DISPC_VID1_FIR_COEF_H_i | 2329 |
| 10-216. DISPC_VID1_FIR_COEF_HV_i | 2329 |
| 10-217. Register Call Summary for Register DISPC_VID1_FIR_COEF_HV_i | 2329 |
| 10-218. DISPC_VID1_CONV_COEF0 | 2329 |
| 10-219. Register Call Summary for Register DISPC_VID1_CONV_COEF0 | 2330 |
| 10-220. DISPC_VID1_CONV_COEF1 | 2330 |
| 10-221. Register Call Summary for Register DISPC_VID1_CONV_COEF1 | 2330 |
| 10-222. DISPC_VID1_CONV_COEF2 | 2330 |
| 10-223. Register Call Summary for Register DISPC_VID1_CONV_COEF2 | 2331 |
| 10-224. DISPC_VID1_CONV_COEF3 | 2331 |
| 10-225. Register Call Summary for Register DISPC_VID1_CONV_COEF3 | 2331 |
| 10-226. DISPC_VID1_CONV_COEF4 | 2332 |
| 10-227. Register Call Summary for Register DISPC_VID1_CONV_COEF4 | 2332 |
| 10-228. DISPC_VID2_BA_j | 2332 |
| 10-229. Register Call Summary for Register DISPC_VID2_BA_j | 2333 |
| 10-230. DISPC_VID2_POSITION | 2333 |
| 10-231. Register Call Summary for Register DISPC_VID2_POSITION | 2333 |
| 10-232. DISPC_VID2_SIZE | 2333 |

| | |
|--|------|
| 10-233. Register Call Summary for Register DISPC_VID2_SIZE | 2334 |
| 10-234. DISPC_VID2_ATTRIBUTES..... | 2334 |
| 10-235. Register Call Summary for Register DISPC_VID2_ATTRIBUTES | 2337 |
| 10-236. DISPC_VID2_BUF_THRESHOLD | 2337 |
| 10-237. Register Call Summary for Register DISPC_VID2_BUF_THRESHOLD | 2338 |
| 10-238. DISPC_VID2_BUF_SIZE_STATUS | 2338 |
| 10-239. Register Call Summary for Register DISPC_VID2_BUF_SIZE_STATUS..... | 2338 |
| 10-240. DISPC_VID2_ROW_INC..... | 2338 |
| 10-241. Register Call Summary for Register DISPC_VID2_ROW_INC | 2338 |
| 10-242. DISPC_VID2_PIXEL_INC..... | 2339 |
| 10-243. Register Call Summary for Register DISPC_VID2_PIXEL_INC | 2339 |
| 10-244. DISPC_VID2_FIR | 2339 |
| 10-245. Register Call Summary for Register DISPC_VID2_FIR..... | 2340 |
| 10-246. DISPC_VID2_PICTURE_SIZE | 2340 |
| 10-247. Register Call Summary for Register DISPC_VID2_PICTURE_SIZE..... | 2340 |
| 10-248. DISPC_VID2_ACCU_j..... | 2341 |
| 10-249. Register Call Summary for Register DISPC_VID2_ACCU_j | 2341 |
| 10-250. DISPC_VID2_FIR_COEF_H_i | 2341 |
| 10-251. Register Call Summary for Register DISPC_VID2_FIR_COEF_H_i | 2342 |
| 10-252. DISPC_VID2_FIR_COEF_HV_i..... | 2342 |
| 10-253. Register Call Summary for Register DISPC_VID2_FIR_COEF_HV_i | 2342 |
| 10-254. DISPC_VID2_CONV_COEF0 | 2342 |
| 10-255. Register Call Summary for Register DISPC_VID2_CONV_COEF0..... | 2343 |
| 10-256. DISPC_VID2_CONV_COEF1 | 2343 |
| 10-257. Register Call Summary for Register DISPC_VID2_CONV_COEF1..... | 2343 |
| 10-258. DISPC_VID2_CONV_COEF2 | 2343 |
| 10-259. Register Call Summary for Register DISPC_VID2_CONV_COEF2..... | 2344 |
| 10-260. DISPC_VID2_CONV_COEF3 | 2344 |
| 10-261. Register Call Summary for Register DISPC_VID2_CONV_COEF3..... | 2344 |
| 10-262. DISPC_VID2_CONV_COEF4 | 2345 |
| 10-263. Register Call Summary for Register DISPC_VID2_CONV_COEF4..... | 2345 |
| 10-264. DISPC_DATA1_CYCLE1 | 2345 |
| 10-265. Register Call Summary for Register DISPC_DATA1_CYCLE1..... | 2346 |
| 10-266. DISPC_DATA1_CYCLE2 | 2346 |
| 10-267. Register Call Summary for Register DISPC_DATA1_CYCLE2..... | 2346 |
| 10-268. DISPC_DATA1_CYCLE3 | 2347 |
| 10-269. Register Call Summary for Register DISPC_DATA1_CYCLE3..... | 2347 |
| 10-270. DISPC_VID1_FIR_COEF_V_i..... | 2348 |
| 10-271. Register Call Summary for Register DISPC_VID1_FIR_COEF_V_i | 2348 |
| 10-272. DISPC_VID2_FIR_COEF_V_i..... | 2348 |
| 10-273. Register Call Summary for Register DISPC_VID2_FIR_COEF_V_i | 2348 |
| 10-274. DISPC_CPR1_COEF_R | 2349 |
| 10-275. Register Call Summary for Register DISPC_CPR1_COEF_R..... | 2349 |
| 10-276. DISPC_CPR1_COEF_G | 2349 |
| 10-277. Register Call Summary for Register DISPC_CPR1_COEF_G..... | 2350 |
| 10-278. DISPC_CPR1_COEF_B | 2350 |
| 10-279. Register Call Summary for Register DISPC_CPR1_COEF_B..... | 2350 |
| 10-280. DISPC_GFX_PRELOAD | 2350 |
| 10-281. Register Call Summary for Register DISPC_GFX_PRELOAD | 2351 |

| | |
|--|------|
| 10-282. DISPC_VID1_PRELOAD | 2351 |
| 10-283. Register Call Summary for Register DISPC_VID1_PRELOAD | 2351 |
| 10-284. DISPC_VID2_PRELOAD | 2351 |
| 10-285. Register Call Summary for Register DISPC_VID2_PRELOAD | 2352 |
| 10-286. DISPC_CONTROL2 | 2352 |
| 10-287. Register Call Summary for Register DISPC_CONTROL2..... | 2354 |
| 10-288. DISPC_VID3_ACCU_j..... | 2355 |
| 10-289. Register Call Summary for Register DISPC_VID3_ACCU_j | 2355 |
| 10-290. DISPC_VID3_BA_j..... | 2355 |
| 10-291. Register Call Summary for Register DISPC_VID3_BA_j | 2356 |
| 10-292. DISPC_VID3_FIR_COEF_H_i | 2356 |
| 10-293. Register Call Summary for Register DISPC_VID3_FIR_COEF_H_i..... | 2356 |
| 10-294. DISPC_VID3_FIR_COEF_HV_i..... | 2357 |
| 10-295. Register Call Summary for Register DISPC_VID3_FIR_COEF_HV_i..... | 2357 |
| 10-296. DISPC_VID3_FIR_COEF_V_i..... | 2357 |
| 10-297. Register Call Summary for Register DISPC_VID3_FIR_COEF_V_i..... | 2358 |
| 10-298. DISPC_VID3_ATTRIBUTES..... | 2358 |
| 10-299. Register Call Summary for Register DISPC_VID3_ATTRIBUTES | 2361 |
| 10-300. DISPC_VID3_CONV_COEF0 | 2361 |
| 10-301. Register Call Summary for Register DISPC_VID3_CONV_COEF0..... | 2362 |
| 10-302. DISPC_VID3_CONV_COEF1 | 2362 |
| 10-303. Register Call Summary for Register DISPC_VID3_CONV_COEF1..... | 2362 |
| 10-304. DISPC_VID3_CONV_COEF2 | 2362 |
| 10-305. Register Call Summary for Register DISPC_VID3_CONV_COEF2..... | 2363 |
| 10-306. DISPC_VID3_CONV_COEF3 | 2363 |
| 10-307. Register Call Summary for Register DISPC_VID3_CONV_COEF3..... | 2363 |
| 10-308. DISPC_VID3_CONV_COEF4 | 2363 |
| 10-309. Register Call Summary for Register DISPC_VID3_CONV_COEF4..... | 2364 |
| 10-310. DISPC_VID3_BUF_SIZE_STATUS | 2364 |
| 10-311. Register Call Summary for Register DISPC_VID3_BUF_SIZE_STATUS..... | 2364 |
| 10-312. DISPC_VID3_BUF_THRESHOLD..... | 2364 |
| 10-313. Register Call Summary for Register DISPC_VID3_BUF_THRESHOLD | 2364 |
| 10-314. DISPC_VID3_FIR | 2365 |
| 10-315. Register Call Summary for Register DISPC_VID3_FIR..... | 2365 |
| 10-316. DISPC_VID3_PICTURE_SIZE | 2365 |
| 10-317. Register Call Summary for Register DISPC_VID3_PICTURE_SIZE..... | 2366 |
| 10-318. DISPC_VID3_PIXEL_INC..... | 2366 |
| 10-319. Register Call Summary for Register DISPC_VID3_PIXEL_INC | 2366 |
| 10-320. DISPC_VID3_POSITION | 2367 |
| 10-321. Register Call Summary for Register DISPC_VID3_POSITION | 2367 |
| 10-322. DISPC_VID3_PRELOAD | 2367 |
| 10-323. Register Call Summary for Register DISPC_VID3_PRELOAD | 2367 |
| 10-324. DISPC_VID3_ROW_INC..... | 2368 |
| 10-325. Register Call Summary for Register DISPC_VID3_ROW_INC | 2368 |
| 10-326. DISPC_VID3_SIZE | 2368 |
| 10-327. Register Call Summary for Register DISPC_VID3_SIZE | 2369 |
| 10-328. DISPC_DEFAULT_COLOR2 | 2369 |
| 10-329. Register Call Summary for Register DISPC_DEFAULT_COLOR2 | 2369 |
| 10-330. DISPC_TRANS_COLOR2 | 2369 |

| | |
|---|------|
| 10-331. Register Call Summary for Register DISPC_TRANS_COLOR2..... | 2369 |
| 10-332. DISPC_CPR2_COEF_B | 2370 |
| 10-333. Register Call Summary for Register DISPC_CPR2_COEF_B | 2370 |
| 10-334. DISPC_CPR2_COEF_G | 2370 |
| 10-335. Register Call Summary for Register DISPC_CPR2_COEF_G..... | 2371 |
| 10-336. DISPC_CPR2_COEF_R | 2371 |
| 10-337. Register Call Summary for Register DISPC_CPR2_COEF_R..... | 2371 |
| 10-338. DISPC_DATA2_CYCLE1 | 2371 |
| 10-339. Register Call Summary for Register DISPC_DATA2_CYCLE1..... | 2372 |
| 10-340. DISPC_DATA2_CYCLE2 | 2372 |
| 10-341. Register Call Summary for Register DISPC_DATA2_CYCLE2..... | 2373 |
| 10-342. DISPC_DATA2_CYCLE3 | 2373 |
| 10-343. Register Call Summary for Register DISPC_DATA2_CYCLE3..... | 2373 |
| 10-344. DISPC_SIZE_LCD2 | 2374 |
| 10-345. Register Call Summary for Register DISPC_SIZE_LCD2 | 2374 |
| 10-346. DISPC_TIMING_H2 | 2374 |
| 10-347. Register Call Summary for Register DISPC_TIMING_H2 | 2375 |
| 10-348. DISPC_TIMING_V2..... | 2375 |
| 10-349. Register Call Summary for Register DISPC_TIMING_V2 | 2375 |
| 10-350. DISPC_POL_FREQ2 | 2376 |
| 10-351. Register Call Summary for Register DISPC_POL_FREQ2 | 2376 |
| 10-352. DISPC_DIVISOR2 | 2377 |
| 10-353. Register Call Summary for Register DISPC_DIVISOR2..... | 2377 |
| 10-354. DISPC_WB_ACCU_j | 2377 |
| 10-355. Register Call Summary for Register DISPC_WB_ACCU_j..... | 2378 |
| 10-356. DISPC_WB_BA_j | 2378 |
| 10-357. Register Call Summary for Register DISPC_WB_BA_j..... | 2378 |
| 10-358. DISPC_WB_FIR_COEF_H_i | 2379 |
| 10-359. Register Call Summary for Register DISPC_WB_FIR_COEF_H_i..... | 2379 |
| 10-360. DISPC_WB_FIR_COEF_HV_i | 2379 |
| 10-361. Register Call Summary for Register DISPC_WB_FIR_COEF_HV_i..... | 2380 |
| 10-362. DISPC_WB_FIR_COEF_V_i | 2380 |
| 10-363. Register Call Summary for Register DISPC_WB_FIR_COEF_V_i..... | 2380 |
| 10-364. DISPC_WB_ATTRIBUTES | 2380 |
| 10-365. Register Call Summary for Register DISPC_WB_ATTRIBUTES..... | 2384 |
| 10-366. DISPC_WB_CONV_COEF0..... | 2384 |
| 10-367. Register Call Summary for Register DISPC_WB_CONV_COEF0 | 2384 |
| 10-368. DISPC_WB_CONV_COEF1..... | 2385 |
| 10-369. Register Call Summary for Register DISPC_WB_CONV_COEF1 | 2385 |
| 10-370. DISPC_WB_CONV_COEF2..... | 2385 |
| 10-371. Register Call Summary for Register DISPC_WB_CONV_COEF2 | 2386 |
| 10-372. DISPC_WB_CONV_COEF3..... | 2386 |
| 10-373. Register Call Summary for Register DISPC_WB_CONV_COEF3 | 2386 |
| 10-374. DISPC_WB_CONV_COEF4..... | 2386 |
| 10-375. Register Call Summary for Register DISPC_WB_CONV_COEF4 | 2387 |
| 10-376. DISPC_WB_BUF_SIZE_STATUS | 2387 |
| 10-377. Register Call Summary for Register DISPC_WB_BUF_SIZE_STATUS | 2387 |
| 10-378. DISPC_WB_BUF_THRESHOLD | 2387 |
| 10-379. Register Call Summary for Register DISPC_WB_BUF_THRESHOLD | 2388 |

| | |
|---|------|
| 10-380. DISPC_WB_FIR..... | 2388 |
| 10-381. Register Call Summary for Register DISPC_WB_FIR | 2388 |
| 10-382. DISPC_WB_PICTURE_SIZE..... | 2389 |
| 10-383. Register Call Summary for Register DISPC_WB_PICTURE_SIZE | 2389 |
| 10-384. DISPC_WB_PIXEL_INC | 2389 |
| 10-385. Register Call Summary for Register DISPC_WB_PIXEL_INC..... | 2390 |
| 10-386. DISPC_WB_ROW_INC | 2390 |
| 10-387. Register Call Summary for Register DISPC_WB_ROW_INC | 2390 |
| 10-388. DISPC_WB_SIZE | 2391 |
| 10-389. Register Call Summary for Register DISPC_WB_SIZE..... | 2391 |
| 10-390. DISPC_VID1_BA_UV_j | 2391 |
| 10-391. Register Call Summary for Register DISPC_VID1_BA_UV_j | 2392 |
| 10-392. DISPC_VID2_BA_UV_j | 2392 |
| 10-393. Register Call Summary for Register DISPC_VID2_BA_UV_j | 2392 |
| 10-394. DISPC_VID3_BA_UV_j | 2393 |
| 10-395. Register Call Summary for Register DISPC_VID3_BA_UV_j | 2393 |
| 10-396. DISPC_WB_BA_UV_j | 2393 |
| 10-397. Register Call Summary for Register DISPC_WB_BA_UV_j..... | 2394 |
| 10-398. DISPC_CONFIG2 | 2394 |
| 10-399. Register Call Summary for Register DISPC_CONFIG2 | 2396 |
| 10-400. DISPC_VID1_ATTRIBUTES2 | 2396 |
| 10-401. Register Call Summary for Register DISPC_VID1_ATTRIBUTES2..... | 2397 |
| 10-402. DISPC_VID2_ATTRIBUTES2 | 2397 |
| 10-403. Register Call Summary for Register DISPC_VID2_ATTRIBUTES2..... | 2398 |
| 10-404. DISPC_VID3_ATTRIBUTES2 | 2398 |
| 10-405. Register Call Summary for Register DISPC_VID3_ATTRIBUTES2..... | 2399 |
| 10-406. DISPC_GAMMA_TABLE0 | 2399 |
| 10-407. Register Call Summary for Register DISPC_GAMMA_TABLE0..... | 2399 |
| 10-408. DISPC_GAMMA_TABLE1 | 2399 |
| 10-409. Register Call Summary for Register DISPC_GAMMA_TABLE1..... | 2400 |
| 10-410. DISPC_GAMMA_TABLE2 | 2400 |
| 10-411. Register Call Summary for Register DISPC_GAMMA_TABLE2..... | 2400 |
| 10-412. DISPC_VID1_FIR2 | 2401 |
| 10-413. Register Call Summary for Register DISPC_VID1_FIR2 | 2401 |
| 10-414. DISPC_VID1_ACCU2_j | 2402 |
| 10-415. Register Call Summary for Register DISPC_VID1_ACCU2_j..... | 2402 |
| 10-416. DISPC_VID1_FIR_COEF_H2_i | 2402 |
| 10-417. Register Call Summary for Register DISPC_VID1_FIR_COEF_H2_i | 2403 |
| 10-418. DISPC_VID1_FIR_COEF_HV2_i | 2403 |
| 10-419. Register Call Summary for Register DISPC_VID1_FIR_COEF_HV2_i..... | 2403 |
| 10-420. DISPC_VID1_FIR_COEF_V2_i | 2404 |
| 10-421. Register Call Summary for Register DISPC_VID1_FIR_COEF_V2_i..... | 2404 |
| 10-422. DISPC_VID2_FIR2 | 2404 |
| 10-423. Register Call Summary for Register DISPC_VID2_FIR2 | 2405 |
| 10-424. DISPC_VID2_ACCU2_j | 2405 |
| 10-425. Register Call Summary for Register DISPC_VID2_ACCU2_j..... | 2405 |
| 10-426. DISPC_VID2_FIR_COEF_H2_i | 2406 |
| 10-427. Register Call Summary for Register DISPC_VID2_FIR_COEF_H2_i | 2406 |
| 10-428. DISPC_VID2_FIR_COEF_HV2_i | 2406 |

| | |
|--|------|
| 10-429. Register Call Summary for Register DISPC_VID2_FIR_COEF_HV2_i | 2407 |
| 10-430. DISPC_VID2_FIR_COEF_V2_i | 2407 |
| 10-431. Register Call Summary for Register DISPC_VID2_FIR_COEF_V2_i | 2407 |
| 10-432. DISPC_VID3_FIR2 | 2408 |
| 10-433. Register Call Summary for Register DISPC_VID3_FIR2 | 2408 |
| 10-434. DISPC_VID3_ACCU2_j | 2409 |
| 10-435. Register Call Summary for Register DISPC_VID3_ACCU2_j | 2409 |
| 10-436. DISPC_VID3_FIR_COEF_H2_i | 2409 |
| 10-437. Register Call Summary for Register DISPC_VID3_FIR_COEF_H2_i | 2410 |
| 10-438. DISPC_VID3_FIR_COEF_HV2_i | 2410 |
| 10-439. Register Call Summary for Register DISPC_VID3_FIR_COEF_HV2_i | 2410 |
| 10-440. DISPC_VID3_FIR_COEF_V2_i | 2411 |
| 10-441. Register Call Summary for Register DISPC_VID3_FIR_COEF_V2_i | 2411 |
| 10-442. DISPC_WB_FIR2 | 2411 |
| 10-443. Register Call Summary for Register DISPC_WB_FIR2 | 2412 |
| 10-444. DISPC_WB_ACCU2_j | 2412 |
| 10-445. Register Call Summary for Register DISPC_WB_ACCU2_j | 2412 |
| 10-446. DISPC_WB_FIR_COEF_H2_i | 2413 |
| 10-447. Register Call Summary for Register DISPC_WB_FIR_COEF_H2_i | 2413 |
| 10-448. DISPC_WB_FIR_COEF_HV2_i | 2413 |
| 10-449. Register Call Summary for Register DISPC_WB_FIR_COEF_HV2_i | 2414 |
| 10-450. DISPC_WB_FIR_COEF_V2_i | 2414 |
| 10-451. Register Call Summary for Register DISPC_WB_FIR_COEF_V2_i | 2414 |
| 10-452. DISPC_GLOBAL_BUFFER | 2415 |
| 10-453. Register Call Summary for Register DISPC_GLOBAL_BUFFER | 2416 |
| 10-454. DISPC_DIVISOR | 2417 |
| 10-455. Register Call Summary for Register DISPC_DIVISOR | 2417 |
| 10-456. DISPC_WB_ATTRIBUTES2 | 2417 |
| 10-457. Register Call Summary for Register DISPC_WB_ATTRIBUTES2 | 2418 |
| 10-458. DISPC_BA0_FLIPIMMEDIATE_EN | 2418 |
| 10-459. Register Call Summary for Register DISPC_BA0_FLIPIMMEDIATE_EN | 2418 |
| 10-460. DISPC_GLOBAL_MFLAG_ATTRIBUTE | 2419 |
| 10-461. Register Call Summary for Register DISPC_GLOBAL_MFLAG_ATTRIBUTE | 2419 |
| 10-462. DISPC_GFX_MFLAG_THRESHOLD__1 | 2419 |
| 10-463. Register Call Summary for Register DISPC_GFX_MFLAG_THRESHOLD__1 | 2420 |
| 10-464. DISPC_VID1_MFLAG_THRESHOLD | 2420 |
| 10-465. Register Call Summary for Register DISPC_VID1_MFLAG_THRESHOLD | 2420 |
| 10-466. DISPC_VID2_MFLAG_THRESHOLD__1 | 2420 |
| 10-467. Register Call Summary for Register DISPC_VID2_MFLAG_THRESHOLD__1 | 2421 |
| 10-468. DISPC_VID3_MFLAG_THRESHOLD__1 | 2421 |
| 10-469. Register Call Summary for Register DISPC_VID3_MFLAG_THRESHOLD__1 | 2421 |
| 10-470. DISPC_WB_MFLAG_THRESHOLD | 2421 |
| 10-471. Register Call Summary for Register DISPC_WB_MFLAG_THRESHOLD | 2422 |
| 10-472. I/O Description of DSI1 | 2427 |
| 10-473. I/O Description of DSI2 | 2428 |
| 10-474. DSI Lane Configuration | 2429 |
| 10-475. Synchronization Codes | 2434 |
| 10-476. Sync Short Packet Values | 2435 |
| 10-477. VC Values | 2442 |

| | |
|---|------|
| 10-478. Pixel Data Format in Video Mode | 2446 |
| 10-479. Integration Attributes..... | 2455 |
| 10-480. Clocks and Resets | 2455 |
| 10-481. Interrupt Requests | 2455 |
| 10-482. DMA Requests | 2456 |
| 10-483. DSI Multiplexer Controls | 2458 |
| 10-484. DSI Global Interrupts | 2459 |
| 10-485. Register Access Width Limitations..... | 2461 |
| 10-486. VC TX FIFO Size Values..... | 2465 |
| 10-487. VC TX FIFO Start Address | 2465 |
| 10-488. VC RX FIFO Size Values | 2466 |
| 10-489. VC RX FIFO Start Address | 2466 |
| 10-490. LP to HS Timing Parameters | 2475 |
| 10-491. LP to HS Timing Parameters Example for 400-MHz DDR Clock | 2475 |
| 10-492. HS to LP Timing Parameters | 2478 |
| 10-493. HS to LP Timing Parameters Example for 400-MHz DDR Clock and Two Data Lanes | 2478 |
| 10-494. Extra NULL PH | 2479 |
| 10-495. Extra NULL Packet Payload | 2480 |
| 10-496. Video Port 1 Signals for DSI1 and DSI2 Protocol Engines..... | 2480 |
| 10-497. Video Port 2 Signals for DSI1 Protocol Engine | 2481 |
| 10-498. Video Port 1 for DSI1 and DSI2 in the Context of Video Mode | 2482 |
| 10-499. Video Port 2 for DSI1 in the Context of Video Mode | 2482 |
| 10-500. Video Port 1 for DSI1 and DSI2 in the Context of Command Mode | 2486 |
| 10-501. Video Port 2 for DSI1 in the Context of Command Mode | 2486 |
| 10-502. DSI VC Interrupts | 2506 |
| 10-503. DSI PLL Operation Modes When Not Locked..... | 2509 |
| 10-504. Register Call Summary for Gated Mode Sequence | 2512 |
| 10-505. Register Call Summary for DSI PLL Programming Sequence | 2514 |
| 10-506. Register Call Summary for DSI PLL Go Sequence (Automatic Mode) | 2516 |
| 10-507. Recommended Programming Values | 2516 |
| 10-508. Ratio R..... | 2519 |
| 10-509. DSI Complex I/O Interrupts | 2528 |
| 10-510. Global Initialization of Surrounding Modules | 2530 |
| 10-511. DSI Global Initialization..... | 2530 |
| 10-512. DSI PLL Configuration Registers | 2531 |
| 10-513. DSI Control Registers | 2531 |
| 10-514. DSI Complex I/O Registers | 2532 |
| 10-515. DSI Timing Registers | 2532 |
| 10-516. Calculate DSI_PHY Timing | 2533 |
| 10-517. Drive STOP State | 2534 |
| 10-518. Enable Video Mode | 2534 |
| 10-519. Configure DSI PLL | 2534 |
| 10-520. Switch to DSI PLL Clock Source..... | 2535 |
| 10-521. DSI Control Registers | 2535 |
| 10-522. DSI Complex I/O Registers | 2535 |
| 10-523. DSI Timing Registers | 2536 |
| 10-524. Configure DSI_PHY Timing..... | 2537 |
| 10-525. Drive STOP State | 2537 |
| 10-526. Enable Command Mode and Automatic TE | 2537 |

| | |
|--|------|
| 10-527. Send Frame Data to LCD Panel Using Automatic TE | 2538 |
| 10-528. DSI Instance Summary | 2539 |
| 10-529. DSI1_PROTOCOL_ENGINE Registers Mapping Summary | 2539 |
| 10-530. DSI2_PROTOCOL_ENGINE Registers Mapping Summary | 2540 |
| 10-531. DSI_REVISION | 2542 |
| 10-532. Register Call Summary for Register DSI_REVISION | 2542 |
| 10-533. DSI_SYSCONFIG | 2543 |
| 10-534. Register Call Summary for Register DSI_SYSCONFIG | 2544 |
| 10-535. DSI_SYSSTATUS | 2544 |
| 10-536. Register Call Summary for Register DSI_SYSSTATUS | 2544 |
| 10-537. DSI_IRQSTATUS | 2545 |
| 10-538. Register Call Summary for Register DSI_IRQSTATUS | 2547 |
| 10-539. DSI_IRQENABLE | 2547 |
| 10-540. Register Call Summary for Register DSI_IRQENABLE | 2549 |
| 10-541. DSI_CTRL | 2549 |
| 10-542. Register Call Summary for Register DSI_CTRL | 2553 |
| 10-543. DSI_GNQ | 2553 |
| 10-544. Register Call Summary for Register DSI_GNQ | 2555 |
| 10-545. DSI_COMPLEXIO_CFG1 | 2555 |
| 10-546. Register Call Summary for Register DSI_COMPLEXIO_CFG1 | 2558 |
| 10-547. DSI_COMPLEXIO_IRQSTATUS | 2558 |
| 10-548. Register Call Summary for Register DSI_COMPLEXIO_IRQSTATUS | 2562 |
| 10-549. DSI_COMPLEXIO_IRQENABLE | 2562 |
| 10-550. Register Call Summary for Register DSI_COMPLEXIO_IRQENABLE | 2565 |
| 10-551. DSI_CLK_CTRL | 2565 |
| 10-552. Register Call Summary for Register DSI_CLK_CTRL | 2567 |
| 10-553. DSI_TIMING1 | 2567 |
| 10-554. Register Call Summary for Register DSI_TIMING1 | 2568 |
| 10-555. DSI_TIMING2 | 2569 |
| 10-556. Register Call Summary for Register DSI_TIMING2 | 2570 |
| 10-557. DSI_VM_TIMING1 | 2570 |
| 10-558. Register Call Summary for Register DSI_VM_TIMING1 | 2570 |
| 10-559. DSI_VM_TIMING2 | 2571 |
| 10-560. Register Call Summary for Register DSI_VM_TIMING2 | 2571 |
| 10-561. DSI_VM_TIMING3 | 2572 |
| 10-562. Register Call Summary for Register DSI_VM_TIMING3 | 2572 |
| 10-563. DSI_CLK_TIMING | 2572 |
| 10-564. Register Call Summary for Register DSI_CLK_TIMING | 2573 |
| 10-565. DSI_TX_FIFO_VC_SIZE | 2573 |
| 10-566. Register Call Summary for Register DSI_TX_FIFO_VC_SIZE | 2574 |
| 10-567. DSI_RX_FIFO_VC_SIZE | 2574 |
| 10-568. Register Call Summary for Register DSI_RX_FIFO_VC_SIZE | 2575 |
| 10-569. DSI_COMPLEXIO_CFG2 | 2575 |
| 10-570. Register Call Summary for Register DSI_COMPLEXIO_CFG2 | 2579 |
| 10-571. DSI_RX_FIFO_VC_FULLNESS | 2579 |
| 10-572. Register Call Summary for Register DSI_RX_FIFO_VC_FULLNESS | 2579 |
| 10-573. DSI_VM_TIMING4 | 2580 |
| 10-574. Register Call Summary for Register DSI_VM_TIMING4 | 2580 |
| 10-575. DSI_TX_FIFO_VC_EMPTYNESS | 2580 |

| | |
|---|------|
| 10-576. Register Call Summary for Register DSI_TX_FIFO_VC_EMPTYNESS..... | 2581 |
| 10-577. DSI_VM_TIMING5 | 2581 |
| 10-578. Register Call Summary for Register DSI_VM_TIMING5..... | 2581 |
| 10-579. DSI_VM_TIMING6 | 2582 |
| 10-580. Register Call Summary for Register DSI_VM_TIMING6..... | 2582 |
| 10-581. DSI_VM_TIMING7 | 2582 |
| 10-582. Register Call Summary for Register DSI_VM_TIMING7..... | 2583 |
| 10-583. DSI_STOPCLK_TIMING | 2583 |
| 10-584. Register Call Summary for Register DSI_STOPCLK_TIMING..... | 2583 |
| 10-585. DSI_CTRL2 | 2584 |
| 10-586. Register Call Summary for Register DSI_CTRL2..... | 2585 |
| 10-587. DSI_VM_TIMING8 | 2585 |
| 10-588. Register Call Summary for Register DSI_VM_TIMING8..... | 2585 |
| 10-589. DSI_TE_HSYNC_WIDTH_j..... | 2586 |
| 10-590. Register Call Summary for Register DSI_TE_HSYNC_WIDTH_j | 2586 |
| 10-591. DSI_TE_VSYNC_WIDTH_j | 2586 |
| 10-592. Register Call Summary for Register DSI_TE_VSYNC_WIDTH_j | 2587 |
| 10-593. DSI_TE_HSYNC_NUMBER_j | 2587 |
| 10-594. Register Call Summary for Register DSI_TE_HSYNC_NUMBER_j | 2587 |
| 10-595. DSI_VC_CTRL_i | 2587 |
| 10-596. Register Call Summary for Register DSI_VC_CTRL_i..... | 2591 |
| 10-597. DSI_VC_TE_i..... | 2592 |
| 10-598. Register Call Summary for Register DSI_VC_TE_i | 2593 |
| 10-599. DSI_VC_LONG_PACKET_HEADER_i..... | 2593 |
| 10-600. Register Call Summary for Register DSI_VC_LONG_PACKET_HEADER_i | 2594 |
| 10-601. DSI_VC_LONG_PACKET_PAYLOAD_i | 2594 |
| 10-602. Register Call Summary for Register DSI_VC_LONG_PACKET_PAYLOAD_i..... | 2594 |
| 10-603. DSI_VC_SHORT_PACKET_HEADER_i..... | 2595 |
| 10-604. Register Call Summary for Register DSI_VC_SHORT_PACKET_HEADER_i | 2595 |
| 10-605. DSI_VC_IRQSTATUS_i..... | 2595 |
| 10-606. Register Call Summary for Register DSI_VC_IRQSTATUS_i | 2597 |
| 10-607. DSI_VC_IRQENABLE_i..... | 2597 |
| 10-608. Register Call Summary for Register DSI_VC_IRQENABLE_i | 2598 |
| 10-609. DSI1_PHY Registers Mapping Summary | 2599 |
| 10-610. DSI2_PHY Registers Mapping Summary | 2599 |
| 10-611. DSI_PHY_REGISTER0 | 2600 |
| 10-612. Register Call Summary for Register DSI_PHY_REGISTER0..... | 2600 |
| 10-613. DSI_PHY_REGISTER1 | 2601 |
| 10-614. Register Call Summary for Register DSI_PHY_REGISTER1 | 2602 |
| 10-615. DSI_PHY_REGISTER2 | 2602 |
| 10-616. Register Call Summary for Register DSI_PHY_REGISTER2..... | 2603 |
| 10-617. DSI_PHY_REGISTER3 | 2603 |
| 10-618. Register Call Summary for Register DSI_PHY_REGISTER3..... | 2603 |
| 10-619. DSI_PHY_REGISTER4 | 2604 |
| 10-620. Register Call Summary for Register DSI_PHY_REGISTER4..... | 2604 |
| 10-621. DSI_PHY_REGISTER5 | 2604 |
| 10-622. Register Call Summary for Register DSI_PHY_REGISTER5..... | 2605 |
| 10-623. DSI1_PLLCTRL Registers Mapping Summary..... | 2605 |
| 10-624. DSI2_PLLCTRL Registers Mapping Summary..... | 2606 |

| | |
|---|------|
| 10-625. DSI_PLL_CONTROL | 2606 |
| 10-626. Register Call Summary for Register DSI_PLL_CONTROL..... | 2607 |
| 10-627. DSI_PLL_STATUS..... | 2607 |
| 10-628. Register Call Summary for Register DSI_PLL_STATUS | 2609 |
| 10-629. DSI_PLL_GO | 2609 |
| 10-630. Register Call Summary for Register DSI_PLL_GO..... | 2609 |
| 10-631. DSI_PLL_CONFIGURATION1 | 2610 |
| 10-632. Register Call Summary for Register DSI_PLL_CONFIGURATION1..... | 2610 |
| 10-633. DSI_PLL_CONFIGURATION2 | 2611 |
| 10-634. Register Call Summary for Register DSI_PLL_CONFIGURATION2..... | 2612 |
| 10-635. DSI_PLL_CONFIGURATION3 | 2613 |
| 10-636. Register Call Summary for Register DSI_PLL_CONFIGURATION3..... | 2613 |
| 10-637. DSI_PLL_SSC_CONFIGURATION1 | 2613 |
| 10-638. Register Call Summary for Register DSI_PLL_SSC_CONFIGURATION1..... | 2614 |
| 10-639. DSI_PLL_SSC_CONFIGURATION2 | 2614 |
| 10-640. Register Call Summary for Register DSI_PLL_SSC_CONFIGURATION2..... | 2614 |
| 10-641. DSI_PLL_CONFIGURATION4 | 2614 |
| 10-642. Register Call Summary for Register DSI_PLL_CONFIGURATION4..... | 2615 |
| 10-643. HDMI Video Timings (CEA-861-D) | 2617 |
| 10-644. HDMI Video timings (VESA DMT) | 2618 |
| 10-645. I/O Pad Mode Selection | 2621 |
| 10-646. LCD Interface Signals | 2621 |
| 10-647. Programmable Timing Fields in RFBI Mode..... | 2623 |
| 10-648. Integration Attributes..... | 2626 |
| 10-649. Clocks and Resets | 2627 |
| 10-650. Hardware Requests..... | 2627 |
| 10-651. RFBI DMA Request Description | 2627 |
| 10-652. Local Power Management Features..... | 2629 |
| 10-653. DMA Requests Events | 2630 |
| 10-654. Read/Write Function Description..... | 2637 |
| 10-655. Minimum Cycle Time for CS0/WE Always Asserted | 2637 |
| 10-656. RFBI Timings Configuration | 2640 |
| 10-657. Minimum Pulse Width (HSYNC/VSYNC) | 2641 |
| 10-658. Global Initialization of Surrounding Modules | 2642 |
| 10-659. RFBI Global Initialization | 2643 |
| 10-660. DISPC Configuration in RFBI Mode | 2643 |
| 10-661. RFBI Configuration – Main Sequence..... | 2643 |
| 10-662. Register Call Summary for Subsequence: DMA Mode Configuration | 2645 |
| 10-663. Timing and Polarity Signals Configuration | 2645 |
| 10-664. Register Call Summary for Subsequence: Trigger Mode Settings | 2646 |
| 10-665. RFBI Command Interface: Writing Command to the LCD Panel | 2646 |
| 10-666. RFBI Command Interface: Reading Command From the LCD Panel | 2647 |
| 10-667. RFBI Start Transfer With Polling Method | 2647 |
| 10-668. RFBI Start Transfer With Interrupts Method..... | 2647 |
| 10-669. DISPC Interrupts Enable | 2647 |
| 10-670. DISPC Output Enable | 2648 |
| 10-671. Register Call Summary for Subsequence: RFBI Output Enable..... | 2649 |
| 10-672. RFBI Behavior | 2649 |
| 10-673. Detect Event | 2649 |

| | |
|--|------|
| 10-674. Register Call Summary for RFBI Events Servicing: FRAMEDONE Interrupt Servicing | 2650 |
| 10-675. RFBI Hardware Status Features | 2651 |
| 10-676. RFBI Instance Summary | 2652 |
| 10-677. RFBI Registers Mapping Summary | 2652 |
| 10-678. RFBI_REVISION | 2653 |
| 10-679. Register Call Summary for Register RFBI_REVISION | 2653 |
| 10-680. RFBI_SYSCONFIG | 2653 |
| 10-681. Register Call Summary for Register RFBI_SYSCONFIG | 2654 |
| 10-682. RFBI_SYSSTATUS | 2654 |
| 10-683. Register Call Summary for Register RFBI_SYSSTATUS | 2655 |
| 10-684. RFBI_CONTROL | 2655 |
| 10-685. Register Call Summary for Register RFBI_CONTROL | 2656 |
| 10-686. RFBI_PIXEL_CNT | 2656 |
| 10-687. Register Call Summary for Register RFBI_PIXEL_CNT | 2657 |
| 10-688. RFBI_LINE_NUMBER | 2657 |
| 10-689. Register Call Summary for Register RFBI_LINE_NUMBER | 2657 |
| 10-690. RFBI_CMD | 2657 |
| 10-691. Register Call Summary for Register RFBI_CMD | 2657 |
| 10-692. RFBI_PARAM | 2658 |
| 10-693. Register Call Summary for Register RFBI_PARAM | 2658 |
| 10-694. RFBI_DATA | 2658 |
| 10-695. Register Call Summary for Register RFBI_DATA | 2658 |
| 10-696. RFBI_READ | 2659 |
| 10-697. Register Call Summary for Register RFBI_READ | 2659 |
| 10-698. RFBI_STATUS | 2659 |
| 10-699. Register Call Summary for Register RFBI_STATUS | 2659 |
| 10-700. RFBI_CONFIG | 2660 |
| 10-701. Register Call Summary for Register RFBI_CONFIG | 2661 |
| 10-702. RFBI_ONOFF_TIME | 2662 |
| 10-703. Register Call Summary for Register RFBI_ONOFF_TIME | 2662 |
| 10-704. RFBI_CYCLE_TIME | 2662 |
| 10-705. Register Call Summary for Register RFBI_CYCLE_TIME | 2663 |
| 10-706. RFBI_DATA_CYCLEi | 2663 |
| 10-707. Register Call Summary for Register RFBI_DATA_CYCLEi | 2664 |
| 10-708. RFBI_VSYNC_WIDTH | 2664 |
| 10-709. Register Call Summary for Register RFBI_VSYNC_WIDTH | 2664 |
| 10-710. RFBI_HSYNC_WIDTH | 2664 |
| 10-711. Register Call Summary for Register RFBI_HSYNC_WIDTH | 2665 |
| 11-1. Integration Attributes | 2670 |
| 11-2. Clocks and Resets | 2670 |
| 11-3. Hardware Requests | 2671 |
| 11-4. SGX Instance Summary | 2674 |
| 11-5. SGX Registers Mapping Summary | 2674 |
| 11-6. SGX_REVISION | 2675 |
| 11-7. Register Call Summary for Register SGX_REVISION | 2675 |
| 11-8. SGX_HWINFO | 2675 |
| 11-9. Register Call Summary for Register SGX_HWINFO | 2675 |
| 11-10. SGX_SYSCONFIG | 2676 |
| 11-11. Register Call Summary for Register SGX_SYSCONFIG | 2676 |

| | |
|---|------|
| 11-12. SGX_IRQSTATUS_RAW_0..... | 2676 |
| 11-13. Register Call Summary for Register SGX_IRQSTATUS_RAW_0 | 2677 |
| 11-14. SGX_IRQSTATUS_RAW_1..... | 2677 |
| 11-15. Register Call Summary for Register SGX_IRQSTATUS_RAW_1 | 2677 |
| 11-16. SGX_IRQSTATUS_RAW_2..... | 2677 |
| 11-17. Register Call Summary for Register SGX_IRQSTATUS_RAW_2 | 2678 |
| 11-18. SGX_IRQSTATUS_0 | 2678 |
| 11-19. Register Call Summary for Register SGX_IRQSTATUS_0 | 2678 |
| 11-20. SGX_IRQSTATUS_1 | 2679 |
| 11-21. Register Call Summary for Register SGX_IRQSTATUS_1 | 2679 |
| 11-22. SGX_IRQSTATUS_2 | 2679 |
| 11-23. Register Call Summary for Register SGX_IRQSTATUS_2 | 2680 |
| 11-24. SGX_IRQENABLE_SET_0..... | 2680 |
| 11-25. Register Call Summary for Register SGX_IRQENABLE_SET_0 | 2680 |
| 11-26. SGX_IRQENABLE_SET_1..... | 2680 |
| 11-27. Register Call Summary for Register SGX_IRQENABLE_SET_1 | 2681 |
| 11-28. SGX_IRQENABLE_SET_2..... | 2681 |
| 11-29. Register Call Summary for Register SGX_IRQENABLE_SET_2 | 2681 |
| 11-30. SGX_IRQENABLE_CLR_0 | 2682 |
| 11-31. Register Call Summary for Register SGX_IRQENABLE_CLR_0 | 2682 |
| 11-32. SGX_IRQENABLE_CLR_1 | 2682 |
| 11-33. Register Call Summary for Register SGX_IRQENABLE_CLR_1 | 2683 |
| 11-34. SGX_IRQENABLE_CLR_2 | 2683 |
| 11-35. Register Call Summary for Register SGX_IRQENABLE_CLR_2 | 2683 |
| 11-36. SGX_PAGE_CONFIG | 2683 |
| 11-37. Register Call Summary for Register SGX_PAGE_CONFIG | 2684 |
| 11-38. SGX_INTERRUPT_EVENT | 2684 |
| 11-39. Register Call Summary for Register SGX_INTERRUPT_EVENT | 2686 |
| 11-40. SGX_DEBUG_CONFIG | 2686 |
| 11-41. Register Call Summary for Register SGX_DEBUG_CONFIG | 2687 |
| 11-42. SGX_DEBUG_STATUS_0 | 2687 |
| 11-43. Register Call Summary for Register SGX_DEBUG_STATUS_0..... | 2688 |
| 11-44. SGX_DEBUG_STATUS_1 | 2689 |
| 11-45. Register Call Summary for Register SGX_DEBUG_STATUS_1..... | 2690 |
| 12-1. Integration Attributes | 2694 |
| 12-2. Clocks and Resets | 2694 |
| 12-3. Hardware Requests | 2695 |
| 12-4. BB2D Instance Summary..... | 2698 |
| 12-5. BB2D Registers Mapping Summary | 2698 |
| 12-6. AQHICLOCKCONTROL..... | 2700 |
| 12-7. Register Call Summary for Register AQHICLOCKCONTROL | 2700 |
| 12-8. AQHIIDLE | 2701 |
| 12-9. Register Call Summary for Register AQHIIDLE | 2701 |
| 12-10. AQAXICONFIG | 2701 |
| 12-11. Register Call Summary for Register AQAXICONFIG | 2702 |
| 12-12. AQAXISTATUS | 2702 |
| 12-13. Register Call Summary for Register AQAXISTATUS..... | 2702 |
| 12-14. AQINTRACKNOWLEDGE | 2702 |
| 12-15. Register Call Summary for Register AQINTRACKNOWLEDGE | 2702 |

| | |
|--|------|
| 12-16. AQINTRENBL | 2703 |
| 12-17. Register Call Summary for Register AQINTRENBL | 2703 |
| 12-18. AQIDENT | 2703 |
| 12-19. Register Call Summary for Register AQIDENT | 2703 |
| 12-20. GCFEATURES..... | 2704 |
| 12-21. Register Call Summary for Register GCFEATURES | 2705 |
| 12-22. GCCHIPID | 2705 |
| 12-23. Register Call Summary for Register GCCHIPID | 2705 |
| 12-24. GCCHIPREV | 2705 |
| 12-25. Register Call Summary for Register GCCHIPREV | 2705 |
| 12-26. GCCHIPDATE | 2706 |
| 12-27. Register Call Summary for Register GCCHIPDATE | 2706 |
| 12-28. GCCHIPTIME | 2706 |
| 12-29. Register Call Summary for Register GCCHIPTIME..... | 2706 |
| 12-30. GCCHIPCUSTOMER | 2706 |
| 12-31. Register Call Summary for Register GCCHIPCUSTOMER..... | 2707 |
| 12-32. GCMINORFEATURES0 | 2707 |
| 12-33. Register Call Summary for Register GCMINORFEATURES0..... | 2708 |
| 12-34. GCRESETMEMCOUNTERS | 2708 |
| 12-35. Register Call Summary for Register GCRESETMEMCOUNTERS | 2708 |
| 12-36. GCTOTALREADS | 2709 |
| 12-37. Register Call Summary for Register GCTOTALREADS | 2709 |
| 12-38. GCTOTALWRITES..... | 2709 |
| 12-39. Register Call Summary for Register GCTOTALWRITES | 2709 |
| 12-40. GCCHIPSPECS | 2709 |
| 12-41. Register Call Summary for Register GCCHIPSPECS | 2710 |
| 12-42. GCTOTALWRITEBURSTS..... | 2710 |
| 12-43. Register Call Summary for Register GCTOTALWRITEBURSTS | 2710 |
| 12-44. GCTOTALWRITEREQS | 2710 |
| 12-45. Register Call Summary for Register GCTOTALWRITEREQS | 2711 |
| 12-46. GCTOTALWRITELASTS | 2711 |
| 12-47. Register Call Summary for Register GCTOTALWRITELASTS..... | 2711 |
| 12-48. GCTOTALREADBURSTS..... | 2711 |
| 12-49. Register Call Summary for Register GCTOTALREADBURSTS | 2711 |
| 12-50. GCTOTALREADREQS | 2711 |
| 12-51. Register Call Summary for Register GCTOTALREADREQS..... | 2712 |
| 12-52. GCTOTALREADLASTS | 2712 |
| 12-53. Register Call Summary for Register GCTOTALREADLASTS..... | 2712 |
| 12-54. GCGPOUT0..... | 2712 |
| 12-55. Register Call Summary for Register GCGPOUT0 | 2713 |
| 12-56. GCGPOUT1 | 2713 |
| 12-57. Register Call Summary for Register GCGPOUT1 | 2713 |
| 12-58. GCGPOUT2..... | 2713 |
| 12-59. Register Call Summary for Register GCGPOUT2 | 2713 |
| 12-60. GCAXICONTROL | 2713 |
| 12-61. Register Call Summary for Register GCAXICONTROL | 2714 |
| 12-62. GCMINORFEATURES1 | 2714 |
| 12-63. Register Call Summary for Register GCMINORFEATURES1..... | 2715 |
| 12-64. GCTOTALCYCLES | 2715 |

| | |
|--|------|
| 12-65. Register Call Summary for Register GCTOTALCYCLES | 2716 |
| 12-66. GCTOTALIDLECYCLES | 2716 |
| 12-67. Register Call Summary for Register GCTOTALIDLECYCLES | 2716 |
| 12-68. GCCHIPSPECS2 | 2716 |
| 12-69. Register Call Summary for Register GCCHIPSPECS2 | 2716 |
| 12-70. GCMINORFEATURES2 | 2716 |
| 12-71. Register Call Summary for Register GCMINORFEATURES2 | 2718 |
| 12-72. GCMODULEPOWERCONTROLS | 2718 |
| 12-73. Register Call Summary for Register GCMODULEPOWERCONTROLS | 2718 |
| 12-74. GCMODULEPOWERMODULECONTROL | 2718 |
| 12-75. Register Call Summary for Register GCMODULEPOWERMODULECONTROL | 2719 |
| 12-76. GCMODULEPOWERMODULESTATUS | 2719 |
| 12-77. Register Call Summary for Register GCMODULEPOWERMODULESTATUS | 2720 |
| 12-78. GCREGMMUSTATUS | 2720 |
| 12-79. Register Call Summary for Register GCREGMMUSTATUS | 2721 |
| 12-80. GCREGMMUCONTROL | 2721 |
| 12-81. Register Call Summary for Register GCREGMMUCONTROL | 2721 |
| 12-82. GCREGMMUEXCEPTION0 | 2721 |
| 12-83. Register Call Summary for Register GCREGMMUEXCEPTION0 | 2722 |
| 12-84. GCREGMMUEXCEPTION1 | 2722 |
| 12-85. Register Call Summary for Register GCREGMMUEXCEPTION1 | 2722 |
| 12-86. GCREGMMUEXCEPTION2 | 2722 |
| 12-87. Register Call Summary for Register GCREGMMUEXCEPTION2 | 2722 |
| 12-88. GCREGMMUEXCEPTION3 | 2722 |
| 12-89. Register Call Summary for Register GCREGMMUEXCEPTION3 | 2723 |
| 12-90. AQMEMORYDEBUG | 2723 |
| 12-91. Register Call Summary for Register AQMEMORYDEBUG | 2724 |
| 12-92. AQREGISTERTIMINGCONTROL | 2724 |
| 12-93. Register Call Summary for Register AQREGISTERTIMINGCONTROL | 2724 |
| 12-94. GCMEMORYRESERVED | 2724 |
| 12-95. Register Call Summary for Register GCMEMORYRESERVED | 2724 |
| 12-96. GCDISPLAYPRIORITY | 2725 |
| 12-97. Register Call Summary for Register GCDISPLAYPRIORITY | 2725 |
| 12-98. GCDBGCYCLECOUNTER | 2725 |
| 12-99. Register Call Summary for Register GCDBGCYCLECOUNTER | 2725 |
| 12-100. GCOUTSTANDINGREADS0 | 2725 |
| 12-101. Register Call Summary for Register GCOUTSTANDINGREADS0 | 2726 |
| 12-102. GCOUTSTANDINGREADS1 | 2726 |
| 12-103. Register Call Summary for Register GCOUTSTANDINGREADS1 | 2726 |
| 12-104. GCOUTSTANDINGWRITES | 2726 |
| 12-105. Register Call Summary for Register GCOUTSTANDINGWRITES | 2727 |
| 12-106. GCDEBUGSIGNALSRA | 2727 |
| 12-107. Register Call Summary for Register GCDEBUGSIGNALSRA | 2727 |
| 12-108. GCDEBUGSIGNALSTX | 2727 |
| 12-109. Register Call Summary for Register GCDEBUGSIGNALSTX | 2727 |
| 12-110. GCDEBUGSIGNALSFE | 2728 |
| 12-111. Register Call Summary for Register GCDEBUGSIGNALSFE | 2728 |
| 12-112. GCDEBUGSIGNALSPE | 2728 |
| 12-113. Register Call Summary for Register GCDEBUGSIGNALSPE | 2728 |

| | |
|---|------|
| 12-114. GCDEBUGSIGNALSDE | 2728 |
| 12-115. Register Call Summary for Register GCDEBUGSIGNALSDE | 2729 |
| 12-116. GCDEBUGSIGNALSSH | 2729 |
| 12-117. Register Call Summary for Register GCDEBUGSIGNALSSH | 2729 |
| 12-118. GCDEBUGSIGNALSPA | 2729 |
| 12-119. Register Call Summary for Register GCDEBUGSIGNALSPA | 2730 |
| 12-120. GCDEBUGSIGNALSSE | 2730 |
| 12-121. Register Call Summary for Register GCDEBUGSIGNALSSE | 2730 |
| 12-122. GCDEBUGSIGNALSMC | 2730 |
| 12-123. Register Call Summary for Register GCDEBUGSIGNALSMC | 2731 |
| 12-124. GCDEBUGSIGNALSHI | 2731 |
| 12-125. Register Call Summary for Register GCDEBUGSIGNALSHI | 2731 |
| 12-126. GCDEBUGCONTROL0 | 2731 |
| 12-127. Register Call Summary for Register GCDEBUGCONTROL0 | 2732 |
| 12-128. GCDEBUGCONTROL1 | 2732 |
| 12-129. Register Call Summary for Register GCDEBUGCONTROL1 | 2732 |
| 12-130. GCDEBUGCONTROL2 | 2732 |
| 12-131. Register Call Summary for Register GCDEBUGCONTROL2 | 2733 |
| 12-132. GCDEBUGCONTROL3 | 2733 |
| 12-133. Register Call Summary for Register GCDEBUGCONTROL3 | 2733 |
| 12-134. GCBUSCONTROL | 2734 |
| 12-135. Register Call Summary for Register GCBUSCONTROL | 2734 |
| 12-136. GCREGENDIANNESS0 | 2734 |
| 12-137. Register Call Summary for Register GCREGENDIANNESS0 | 2734 |
| 12-138. GCREGENDIANNESS1 | 2735 |
| 12-139. Register Call Summary for Register GCREGENDIANNESS1 | 2735 |
| 12-140. GCREGENDIANNESS2 | 2735 |
| 12-141. Register Call Summary for Register GCREGENDIANNESS2 | 2735 |
| 12-142. GCREGDRAWPRIMITIVESTARTTIMESTAMP | 2735 |
| 12-143. Register Call Summary for Register GCREGDRAWPRIMITIVESTARTTIMESTAMP | 2736 |
| 12-144. GCREGDRAWPRIMITIVEENDTIMESTAMP | 2736 |
| 12-145. Register Call Summary for Register GCREGDRAWPRIMITIVEENDTIMESTAMP | 2736 |
| 12-146. GCREGCONTROL0 | 2736 |
| 12-147. Register Call Summary for Register GCREGCONTROL0 | 2737 |
| 12-148. AQCMDBUFFERADDR | 2737 |
| 12-149. Register Call Summary for Register AQCMDBUFFERADDR | 2737 |
| 12-150. AQCMDBUFFERCTRL | 2737 |
| 12-151. Register Call Summary for Register AQCMDBUFFERCTRL | 2738 |
| 12-152. AQFESTATUS | 2738 |
| 12-153. Register Call Summary for Register AQFESTATUS | 2738 |
| 12-154. AQFEDEBUGSTATE | 2738 |
| 12-155. Register Call Summary for Register AQFEDEBUGSTATE | 2739 |
| 12-156. AQFEDEBUGCURCMDADR | 2739 |
| 12-157. Register Call Summary for Register AQFEDEBUGCURCMDADR | 2739 |
| 12-158. AQFEDEBUGCMDLOWREG | 2739 |
| 12-159. Register Call Summary for Register AQFEDEBUGCMDLOWREG | 2740 |
| 12-160. AQFEDEBUGCMDHIREG | 2740 |
| 12-161. Register Call Summary for Register AQFEDEBUGCMDHIREG | 2740 |
| 14-1. MCcmd Qualifier Description | 2750 |

| | |
|---|------|
| 14-2. MReqInfo Qualifier Description | 2751 |
| 14-3. SResp Qualifier Description..... | 2751 |
| 14-4. Master NIUs | 2753 |
| 14-5. Slave NIUs | 2753 |
| 14-6. L4_PER TAs | 2754 |
| 14-7. L4_PER IAs | 2755 |
| 14-8. L4_CFG TAs | 2755 |
| 14-9. L4_CFG IAs | 2756 |
| 14-10. L4_WKUP TAs..... | 2756 |
| 14-11. L4_WKUP IAs..... | 2757 |
| 14-12. Integration Attributes | 2760 |
| 14-13. Clocks and Resets | 2760 |
| 14-14. Hardware Requests | 2760 |
| 14-15. Master NIUs | 2761 |
| 14-16. Slave NIUs | 2762 |
| 14-17. L3 Clock Domains and Elements..... | 2762 |
| 14-18. ConnID Values..... | 2764 |
| 14-19. L3 Firewall Exported Reset Values | 2768 |
| 14-20. L3 Firewall Exported Values Mapping | 2768 |
| 14-21. MReqInfo Values | 2769 |
| 14-22. L3 ReqInfo Mapping..... | 2769 |
| 14-23. Slave NIU Firewall and Region Configuration | 2770 |
| 14-24. L3 Firewall Read/Write Permission-Setting Register | 2772 |
| 14-25. L3 Firewall Permission-Setting Register..... | 2772 |
| 14-26. L3 Firewall Error-Logging Registers | 2774 |
| 14-27. L3 Firewalls Default Configurations | 2775 |
| 14-28. Control Module Register – Factorization | 2776 |
| 14-29. L3 Connectivity and Holes Error Routing..... | 2778 |
| 14-30. Interconnect Flag Mapping | 2779 |
| 14-31. Global Initialization of Surrounding Modules..... | 2780 |
| 14-32. Register Call Summary: Main Sequence – Error Analysis Mode | 2782 |
| 14-33. Subprocess Call Summary for Main Sequence – Error Analysis Mode..... | 2782 |
| 14-34. Custom Error Identification | 2782 |
| 14-35. Protection Violation Error Identification | 2782 |
| 14-36. L3 Standard Error Identification | 2783 |
| 14-37. FLAGMUX Configuration | 2783 |
| 14-38. L3 Firewall Instance Summary | 2785 |
| 14-39. L3 Firewall Registers Summary | 2785 |
| 14-40. L3 Firewall Registers Mapping Summary | 2786 |
| 14-41. L3 Firewall Registers Mapping Summary | 2787 |
| 14-42. L3 Firewall Registers Mapping Summary | 2787 |
| 14-43. L3 Firewall Registers Mapping Summary | 2787 |
| 14-44. ERROR_LOG_k | 2789 |
| 14-45. Register Call Summary for Register ERROR_LOG_k..... | 2790 |
| 14-46. LOGICAL_ADDR_ERRLOG_k | 2790 |
| 14-47. Register Call Summary for Register LOGICAL_ADDR_ERRLOG_k..... | 2790 |
| 14-48. REGUPDATE_CONTROL | 2791 |
| 14-49. Register Call Summary for Register REGUPDATE_CONTROL | 2791 |
| 14-50. START_REGION_i | 2791 |

| | |
|---|------|
| 14-51. Register Call Summary for Register START_REGION_i | 2792 |
| 14-52. Size of START_REGION_i[] START_REGION Bit Field | 2792 |
| 14-53. END_REGION_i | 2792 |
| 14-54. Register Call Summary for Register END_REGION_i..... | 2793 |
| 14-55. Size of END_REGION_i[] END_REGION Bit Field | 2793 |
| 14-56. MRM_PERMISSION_REGION_HIGH_j..... | 2794 |
| 14-57. Register Call Summary for Register MRM_PERMISSION_REGION_HIGH_j | 2795 |
| 14-58. MRM_PERMISSION_REGION_LOW_j | 2795 |
| 14-59. Register Call Summary for Register MRM_PERMISSION_REGION_LOW_j..... | 2795 |
| 14-60. Reset Value for MRM_PERMISSION_REGION_LOW_j..... | 2796 |
| 14-61. HOST Instance Summary | 2796 |
| 14-62. HOST Registers Summary | 2797 |
| 14-63. L3_HOST_STDHSTHDR_COREREG..... | 2798 |
| 14-64. Register Call Summary for Register L3_HOST_STDHSTHDR_COREREG | 2798 |
| 14-65. L3_HOST_STDHSTHDR_VERSIONREG | 2799 |
| 14-66. Register Call Summary for Register L3_HOST_STDHSTHDR_VERSIONREG | 2799 |
| 14-67. L3_HOST_STDHSTHDR_MAINCTLREG..... | 2799 |
| 14-68. Register Call Summary for Register L3_HOST_STDHSTHDR_MAINCTLREG | 2800 |
| 14-69. L3_HOST_STDERRLOG_SVRTSTDLVL..... | 2800 |
| 14-70. Register Call Summary for Register L3_HOST_STDERRLOG_SVRTSTDLVL | 2801 |
| 14-71. L3_HOST_STDERRLOG_SVRTCUSTOMLVL | 2801 |
| 14-72. Register Call Summary for Register L3_HOST_STDERRLOG_SVRTCUSTOMLVL | 2801 |
| 14-73. L3_HOST_STDERRLOG_MAIN | 2802 |
| 14-74. Register Call Summary for Register L3_HOST_STDERRLOG_MAIN | 2802 |
| 14-75. L3_HOST_STDERRLOG_HDR | 2803 |
| 14-76. Register Call Summary for Register L3_HOST_STDERRLOG_HDR | 2803 |
| 14-77. L3_HOST_STDERRLOG_MSTADDR | 2804 |
| 14-78. Register Call Summary for Register L3_HOST_STDERRLOG_MSTADDR | 2804 |
| 14-79. L3_HOST_STDERRLOG_SLVADDR | 2804 |
| 14-80. Register Call Summary for Register L3_HOST_STDERRLOG_SLVADDR | 2804 |
| 14-81. L3_HOST_STDERRLOG_INFO..... | 2805 |
| 14-82. Register Call Summary for Register L3_HOST_STDERRLOG_INFO | 2805 |
| 14-83. L3_HOST_STDERRLOG_SLVOFSLSB | 2805 |
| 14-84. Register Call Summary for Register L3_HOST_STDERRLOG_SLVOFSLSB | 2805 |
| 14-85. L3_HOST_STDERRLOG_SLVOFSMSB..... | 2806 |
| 14-86. Register Call Summary for Register L3_HOST_STDERRLOG_SLVOFSMSB | 2806 |
| 14-87. L3_HOST_STDERRLOG_CUSTOMINFO_MSTADDR | 2806 |
| 14-88. Register Call Summary for Register L3_HOST_STDERRLOG_CUSTOMINFO_MSTADDR..... | 2807 |
| 14-89. L3_HOST_STDERRLOG_CUSTOMINFO_INFO | 2807 |
| 14-90. Register Call Summary for Register L3_HOST_STDERRLOG_CUSTOMINFO_INFO..... | 2807 |
| 14-91. L3_HOST_STDERRLOG_CUSTOMINFO_WR | 2808 |
| 14-92. Register Call Summary for Register L3_HOST_STDERRLOG_CUSTOMINFO_WR..... | 2808 |
| 14-93. L3_HOST_STDERRLOG_CUSTOMINFO_ADDR..... | 2808 |
| 14-94. Register Call Summary for Register L3_HOST_STDERRLOG_CUSTOMINFO_ADDR | 2808 |
| 14-95. L3_HOST_STDERRLOG_CUSTOMINFO_DECERR | 2809 |
| 14-96. Register Call Summary for Register L3_HOST_STDERRLOG_CUSTOMINFO_DECERR..... | 2809 |
| 14-97. TARG Instance Summary | 2809 |
| 14-98. TARG Registers Summary | 2811 |
| 14-99. TARG Registers Summary | 2811 |

| | |
|---|------|
| 14-100. TARG Registers Summary..... | 2812 |
| 14-101. TARG Registers Summary..... | 2813 |
| 14-102. TARG Registers Summary..... | 2814 |
| 14-103. TARG Registers Summary..... | 2814 |
| 14-104. TARG Registers Summary..... | 2815 |
| 14-105. L3_TARG_STDHOSTHDR_COREREG | 2817 |
| 14-106. Register Call Summary for Register L3_TARG_STDHOSTHDR_COREREG | 2817 |
| 14-107. L3_TARG_STDHOSTHDR_VERSIONREG | 2818 |
| 14-108. Register Call Summary for Register L3_TARG_STDHOSTHDR_VERSIONREG | 2818 |
| 14-109. L3_TARG_STDHOSTHDR_MAINCTLREG | 2819 |
| 14-110. Register Call Summary for Register L3_TARG_STDHOSTHDR_MAINCTLREG | 2819 |
| 14-111. L3_TARG_STDHOSTHDR_NTTPADDR_0 | 2820 |
| 14-112. Register Call Summary for Register L3_TARG_STDHOSTHDR_NTTPADDR_0 | 2820 |
| 14-113. L3_TARG_STDERRLOG_SVRTSTDLVL | 2821 |
| 14-114. Register Call Summary for Register L3_TARG_STDERRLOG_SVRTSTDLVL | 2821 |
| 14-115. L3_TARG_STDERRLOG_SVRTCUSTOMLVL | 2822 |
| 14-116. Register Call Summary for Register L3_TARG_STDERRLOG_SVRTCUSTOMLVL | 2822 |
| 14-117. L3_TARG_STDERRLOG_MAIN | 2823 |
| 14-118. Register Call Summary for Register L3_TARG_STDERRLOG_MAIN | 2824 |
| 14-119. L3_TARG_STDERRLOG_HDR | 2824 |
| 14-120. Register Call Summary for Register L3_TARG_STDERRLOG_HDR | 2825 |
| 14-121. L3_TARG_STDERRLOG_MSTADDR | 2825 |
| 14-122. Register Call Summary for Register L3_TARG_STDERRLOG_MSTADDR | 2825 |
| 14-123. L3_TARG_STDERRLOG_SLVADDR | 2826 |
| 14-124. Register Call Summary for Register L3_TARG_STDERRLOG_SLVADDR | 2826 |
| 14-125. L3_TARG_STDERRLOG_INFO | 2827 |
| 14-126. Register Call Summary for Register L3_TARG_STDERRLOG_INFO | 2827 |
| 14-127. L3_TARG_STDERRLOG_SLVOFSLSB | 2828 |
| 14-128. Register Call Summary for Register L3_TARG_STDERRLOG_SLVOFSLSB | 2828 |
| 14-129. L3_TARG_STDERRLOG_SLVOFSMSB | 2829 |
| 14-130. Register Call Summary for Register L3_TARG_STDERRLOG_SLVOFSMSB | 2829 |
| 14-131. L3_TARG_STDERRLOG_CUSTOMINFO_INFO | 2830 |
| 14-132. Register Call Summary for Register L3_TARG_STDERRLOG_CUSTOMINFO_INFO | 2830 |
| 14-133. L3_TARG_STDERRLOG_CUSTOMINFO_MSTADDR | 2831 |
| 14-134. Register Call Summary for Register L3_TARG_STDERRLOG_CUSTOMINFO_MSTADDR | 2831 |
| 14-135. L3_TARG_STDERRLOG_CUSTOMINFO_OPCODE | 2832 |
| 14-136. Register Call Summary for Register L3_TARG_STDERRLOG_CUSTOMINFO_OPCODE | 2832 |
| 14-137. L3_TARG_ADDRSPACESIZELOG | 2833 |
| 14-138. Register Call Summary for Register L3_TARG_ADDRSPACESIZELOG | 2833 |
| 14-139. PWR_DISC Instance Summary | 2833 |
| 14-140. PWR_DISC Registers Summary | 2834 |
| 14-141. L3_PWR_DISC_STDHOSTHDR_COREREG | 2835 |
| 14-142. Register Call Summary for Register L3_PWR_DISC_STDHOSTHDR_COREREG | 2835 |
| 14-143. L3_PWR_DISC_STDHOSTHDR_VERSIONREG | 2836 |
| 14-144. Register Call Summary for Register L3_PWR_DISC_STDHOSTHDR_VERSIONREG | 2836 |
| 14-145. L3_PWR_DISC_STDHOSTHDR_MAINCTLREG | 2836 |
| 14-146. Register Call Summary for Register L3_PWR_DISC_STDHOSTHDR_MAINCTLREG | 2837 |
| 14-147. L3_PWR_DISC_STDERRLOG_SVRTSTDLVL | 2837 |
| 14-148. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_SVRTSTDLVL | 2838 |

| | |
|---|------|
| 14-149. L3_PWR_DISC_STDERRLOG_MAIN | 2838 |
| 14-150. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_MAIN | 2839 |
| 14-151. L3_PWR_DISC_STDERRLOG_HDR | 2839 |
| 14-152. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_HDR | 2839 |
| 14-153. L3_PWR_DISC_STDERRLOG_MSTADDR | 2840 |
| 14-154. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_MSTADDR | 2840 |
| 14-155. L3_PWR_DISC_STDERRLOG_SLVADDR | 2840 |
| 14-156. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_SLVADDR | 2840 |
| 14-157. L3_PWR_DISC_STDERRLOG_INFO | 2841 |
| 14-158. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_INFO | 2841 |
| 14-159. L3_PWR_DISC_STDERRLOG_SLVOFSLSB | 2841 |
| 14-160. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_SLVOFSLSB | 2841 |
| 14-161. L3_PWR_DISC_STDERRLOG_SLVOFSMSB | 2842 |
| 14-162. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_SLVOFSMSB | 2842 |
| 14-163. FLAGMUX Instance Summary | 2842 |
| 14-164. FLAGMUX Registers Summary | 2842 |
| 14-165. FLAGMUX Registers Summary | 2844 |
| 14-166. L3_FLAGMUX_STDHOSTHDR_COREREG | 2845 |
| 14-167. Register Call Summary for Register L3_FLAGMUX_STDHOSTHDR_COREREG | 2845 |
| 14-168. L3_FLAGMUX_STDHOSTHDR_VERSIONREG | 2846 |
| 14-169. Register Call Summary for Register L3_FLAGMUX_STDHOSTHDR_VERSIONREG | 2846 |
| 14-170. L3_FLAGMUX_MASK0 | 2846 |
| 14-171. Register Call Summary for Register L3_FLAGMUX_MASK0 | 2847 |
| 14-172. L3_FLAGMUX_REGERR0 | 2847 |
| 14-173. Register Call Summary for Register L3_FLAGMUX_REGERR0 | 2847 |
| 14-174. L3_FLAGMUX_MASK1 | 2847 |
| 14-175. Register Call Summary for Register L3_FLAGMUX_MASK1 | 2847 |
| 14-176. L3_FLAGMUX_REGERR1 | 2848 |
| 14-177. Register Call Summary for Register L3_FLAGMUX_REGERR1 | 2848 |
| 14-178. BW_REGULATOR Instance Summary | 2848 |
| 14-179. BW_REGULATOR Registers Summary | 2849 |
| 14-180. BW_REGULATOR Registers Summary | 2849 |
| 14-181. L3_BW_R_STDHOSTHDR_COREREG | 2850 |
| 14-182. Register Call Summary for Register L3_BW_R_STDHOSTHDR_COREREG | 2850 |
| 14-183. L3_BW_R_STDHOSTHDR_VERSIONREG | 2851 |
| 14-184. Register Call Summary for Register L3_BW_R_STDHOSTHDR_VERSIONREG | 2851 |
| 14-185. L3_BW_R_BANDWIDTH | 2852 |
| 14-186. Register Call Summary for Register L3_BW_R_BANDWIDTH | 2852 |
| 14-187. L3_BW_R_WATERMARK | 2852 |
| 14-188. Register Call Summary for Register L3_BW_R_WATERMARK | 2852 |
| 14-189. L3_BW_R_PRESS | 2853 |
| 14-190. Register Call Summary for Register L3_BW_R_PRESS | 2853 |
| 14-191. L3_BW_R_CLEARHISTORY | 2853 |
| 14-192. Register Call Summary for Register L3_BW_R_CLEARHISTORY | 2854 |
| 14-193. BW Limiter Instance Summary | 2854 |
| 14-194. BW_LIMITER Registers Summary | 2855 |
| 14-195. L3_BW_L_STDHOSTHDR_COREREG | 2856 |
| 14-196. Register Call Summary for Register L3_BW_L_STDHOSTHDR_COREREG | 2856 |
| 14-197. L3_BW_L_STDHOSTHDR_VERSIONREG | 2856 |

| | |
|---|------|
| 14-198. Register Call Summary for Register L3_BW_L_STDHOSTHDR_VERSIONREG..... | 2857 |
| 14-199. L3_BW_L_BANDWIDTH_FRACTIONAL | 2857 |
| 14-200. Register Call Summary for Register L3_BW_L_BANDWIDTH_FRACTIONAL | 2858 |
| 14-201. L3_BW_L_BANDWIDTH_INTEGER | 2858 |
| 14-202. Register Call Summary for Register L3_BW_L_BANDWIDTH_INTEGER | 2858 |
| 14-203. L3_BW_L_WATERMARK_0..... | 2858 |
| 14-204. Register Call Summary for Register L3_BW_L_WATERMARK_0 | 2858 |
| 14-205. L3_BW_L_CLEARHISTORY | 2859 |
| 14-206. Register Call Summary for Register L3_BW_L_CLEARHISTORY..... | 2859 |
| 14-207. Rate Adapt Instance Summary..... | 2859 |
| 14-208. Rate Adapt Register Summary | 2860 |
| 14-209. L3_RA_STDHOSTHDR_COREREG | 2861 |
| 14-210. Register Call Summary for Register L3_RA_STDHOSTHDR_COREREG | 2861 |
| 14-211. L3_RA_STDHOSTHDR_VERSIONREG..... | 2862 |
| 14-212. Register Call Summary for Register L3_RA_STDHOSTHDR_VERSIONREG | 2862 |
| 14-213. L3_RA_CNF | 2862 |
| 14-214. Register Call Summary for Register L3_RA_CNF..... | 2863 |
| 14-215. STATCOLL Instance Summary | 2863 |
| 14-216. STATCOLL Register Summary | 2864 |
| 14-217. L3_STCOL_STDHOSTHDR_COREREG..... | 2867 |
| 14-218. Register Call Summary for Register L3_STCOL_STDHOSTHDR_COREREG | 2867 |
| 14-219. L3_STCOL_STDHOSTHDR_VERSIONREG | 2868 |
| 14-220. Register Call Summary for Register L3_STCOL_STDHOSTHDR_VERSIONREG | 2868 |
| 14-221. L3_STCOL_EN..... | 2868 |
| 14-222. Register Call Summary for Register L3_STCOL_EN | 2869 |
| 14-223. L3_STCOL_SOFTEN..... | 2869 |
| 14-224. Register Call Summary for Register L3_STCOL_SOFTEN | 2869 |
| 14-225. L3_STCOL_IGNORESUSPEND..... | 2869 |
| 14-226. Register Call Summary for Register L3_STCOL_IGNORESUSPEND | 2870 |
| 14-227. L3_STCOL_TRIGEN | 2870 |
| 14-228. Register Call Summary for Register L3_STCOL_TRIGEN | 2870 |
| 14-229. L3_STCOL_REQEVT | 2870 |
| 14-230. Register Call Summary for Register L3_STCOL_REQEVT | 2871 |
| 14-231. L3_STCOL_RSPEVT | 2871 |
| 14-232. Register Call Summary for Register L3_STCOL_RSPEVT | 2872 |
| 14-233. L3_STCOL_EVTMUX_SEL0 | 2872 |
| 14-234. Register Call Summary for Register L3_STCOL_EVTMUX_SEL0..... | 2872 |
| 14-235. L3_STCOL_EVTMUX_SEL1 | 2872 |
| 14-236. Register Call Summary for Register L3_STCOL_EVTMUX_SEL1..... | 2873 |
| 14-237. L3_STCOL_EVTMUX_SEL2 | 2873 |
| 14-238. Register Call Summary for Register L3_STCOL_EVTMUX_SEL2..... | 2873 |
| 14-239. L3_STCOL_EVTMUX_SEL3 | 2873 |
| 14-240. Register Call Summary for Register L3_STCOL_EVTMUX_SEL3..... | 2873 |
| 14-241. L3_STCOL_EVTMUX_SEL4 | 2874 |
| 14-242. Register Call Summary for Register L3_STCOL_EVTMUX_SEL4..... | 2874 |
| 14-243. L3_STCOL_EVTMUX_SEL5 | 2874 |
| 14-244. Register Call Summary for Register L3_STCOL_EVTMUX_SEL5..... | 2874 |
| 14-245. L3_STCOL_EVTMUX_SEL6 | 2875 |
| 14-246. Register Call Summary for Register L3_STCOL_EVTMUX_SEL6..... | 2875 |

| | |
|---|------|
| 14-247. L3_STCOL_EVTMUX_SEL7 | 2875 |
| 14-248. Register Call Summary for Register L3_STCOL_EVTMUX_SEL7 | 2875 |
| 14-249. L3_STCOL_DUMP_IDENTIFIER | 2876 |
| 14-250. Register Call Summary for Register L3_STCOL_DUMP_IDENTIFIER | 2876 |
| 14-251. L3_STCOL_DUMP_COLLECTTIME | 2876 |
| 14-252. Register Call Summary for Register L3_STCOL_DUMP_COLLECTTIME | 2876 |
| 14-253. L3_STCOL_DUMP_SLVADDR | 2877 |
| 14-254. Register Call Summary for Register L3_STCOL_DUMP_SLVADDR | 2877 |
| 14-255. L3_STCOL_DUMP_MSTADDR | 2877 |
| 14-256. Register Call Summary for Register L3_STCOL_DUMP_MSTADDR | 2877 |
| 14-257. L3_STCOL_DUMP_SLVOFS | 2878 |
| 14-258. Register Call Summary for Register L3_STCOL_DUMP_SLVOFS | 2878 |
| 14-259. L3_STCOL_DUMP_MODE | 2878 |
| 14-260. Register Call Summary for Register L3_STCOL_DUMP_MODE | 2878 |
| 14-261. L3_STCOL_DUMP_SEND | 2879 |
| 14-262. Register Call Summary for Register L3_STCOL_DUMP_SEND | 2879 |
| 14-263. L3_STCOL_DUMP_DISABLE | 2879 |
| 14-264. Register Call Summary for Register L3_STCOL_DUMP_DISABLE | 2880 |
| 14-265. L3_STCOL_DUMP_ALARM_TRIG | 2880 |
| 14-266. Register Call Summary for Register L3_STCOL_DUMP_ALARM_TRIG | 2880 |
| 14-267. L3_STCOL_DUMP_ALARM_MINVAL | 2880 |
| 14-268. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MINVAL | 2880 |
| 14-269. L3_STCOL_DUMP_ALARM_MAXVAL | 2881 |
| 14-270. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MAXVAL | 2881 |
| 14-271. L3_STCOL_DUMP_ALARM_MODE0 | 2881 |
| 14-272. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE0 | 2881 |
| 14-273. L3_STCOL_DUMP_ALARM_MODE1 | 2882 |
| 14-274. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE1 | 2882 |
| 14-275. L3_STCOL_DUMP_ALARM_MODE2 | 2882 |
| 14-276. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE2 | 2883 |
| 14-277. L3_STCOL_DUMP_ALARM_MODE3 | 2883 |
| 14-278. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE3 | 2883 |
| 14-279. L3_STCOL_DUMP_ALARM_MODE4 | 2883 |
| 14-280. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE4 | 2884 |
| 14-281. L3_STCOL_DUMP_ALARM_MODE5 | 2884 |
| 14-282. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE5 | 2885 |
| 14-283. L3_STCOL_DUMP_ALARM_MODE6 | 2885 |
| 14-284. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE6 | 2885 |
| 14-285. L3_STCOL_DUMP_ALARM_MODE7 | 2885 |
| 14-286. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE7 | 2886 |
| 14-287. L3_STCOL_DUMP_CNT0 | 2886 |
| 14-288. Register Call Summary for Register L3_STCOL_DUMP_CNT0 | 2886 |
| 14-289. L3_STCOL_DUMP_CNT1 | 2886 |
| 14-290. Register Call Summary for Register L3_STCOL_DUMP_CNT1 | 2887 |
| 14-291. L3_STCOL_DUMP_CNT2 | 2887 |
| 14-292. Register Call Summary for Register L3_STCOL_DUMP_CNT2 | 2887 |
| 14-293. L3_STCOL_DUMP_CNT3 | 2887 |
| 14-294. Register Call Summary for Register L3_STCOL_DUMP_CNT3 | 2887 |
| 14-295. L3_STCOL_DUMP_CNT4 | 2888 |

| | |
|---|------|
| 14-296. Register Call Summary for Register L3_STCOL_DUMP_CNT4..... | 2888 |
| 14-297. L3_STCOL_DUMP_CNT5 | 2888 |
| 14-298. Register Call Summary for Register L3_STCOL_DUMP_CNT5..... | 2888 |
| 14-299. L3_STCOL_DUMP_CNT6 | 2888 |
| 14-300. Register Call Summary for Register L3_STCOL_DUMP_CNT6..... | 2889 |
| 14-301. L3_STCOL_DUMP_CNT7 | 2889 |
| 14-302. Register Call Summary for Register L3_STCOL_DUMP_CNT7..... | 2889 |
| 14-303. L3_STCOL_FILTER_i_GLOBALEN | 2889 |
| 14-304. Register Call Summary for Register L3_STCOL_FILTER_i_GLOBALEN..... | 2889 |
| 14-305. L3_STCOL_FILTER_i_ADDRMIN | 2890 |
| 14-306. Register Call Summary for Register L3_STCOL_FILTER_i_ADDRMIN..... | 2890 |
| 14-307. CLK3_STCOL_FILTER_i_ADDRMAX | 2890 |
| 14-308. L3_STCOL_FILTER_i_ADDREN | 2890 |
| 14-309. Register Call Summary for Register L3_STCOL_FILTER_i_ADDREN..... | 2891 |
| 14-310. L3_STCOL_FILTER_i_EN_k | 2891 |
| 14-311. Register Call Summary for Register L3_STCOL_FILTER_i_EN_k..... | 2891 |
| 14-312. L3_STCOL_FILTER_i_MASK_m_MSTADDR | 2891 |
| 14-313. Register Call Summary for Register L3_STCOL_FILTER_i_MASK_m_MSTADDR | 2892 |
| 14-314. L3_STCOL_FILTER_i_MASK_m_RD | 2892 |
| 14-315. Register Call Summary for Register L3_STCOL_FILTER_i_MASK_m_RD | 2892 |
| 14-316. L3_STCOL_FILTER_i_MASK_m_WR | 2892 |
| 14-317. Register Call Summary for Register L3_STCOL_FILTER_i_MASK_m_WR..... | 2893 |
| 14-318. L3_STCOL_FILTER_i_MASK_m_ERR | 2893 |
| 14-319. Register Call Summary for Register L3_STCOL_FILTER_i_MASK_m_ERR..... | 2893 |
| 14-320. L3_STCOL_FILTER_i_MASK_m_USERINFO | 2893 |
| 14-321. Register Call Summary for Register L3_STCOL_FILTER_i_MASK_m_USERINFO | 2894 |
| 14-322. L3_STCOL_FILTER_i_MASK_m_SLVADDR | 2894 |
| 14-323. L3_STCOL_FILTER_i_MASK_m_REQUUSERINFO | 2894 |
| 14-324. L3_STCOL_FILTER_i_MASK_m_RSPUSERINFO | 2894 |
| 14-325. L3_STCOL_FILTER_i_MATCH_m_MSTADDR..... | 2895 |
| 14-326. Register Call Summary for Register L3_STCOL_FILTER_i_MATCH_m_MSTADDR | 2895 |
| 14-327. L3_STCOL_FILTER_i_MATCH_m_SLVADDR | 2895 |
| 14-328. L3_STCOL_FILTER_i_MATCH_m_RD | 2896 |
| 14-329. Register Call Summary for Register L3_STCOL_FILTER_i_MATCH_m_RD | 2896 |
| 14-330. L3_STCOL_FILTER_i_MATCH_m_WR | 2897 |
| 14-331. Register Call Summary for Register L3_STCOL_FILTER_i_MATCH_m_WR..... | 2897 |
| 14-332. L3_STCOL_FILTER_i_MATCH_m_ERR | 2897 |
| 14-333. Register Call Summary for Register L3_STCOL_FILTER_i_MATCH_m_ERR..... | 2898 |
| 14-334. L3_STCOL_FILTER_i_MATCH_m_USERINFO | 2898 |
| 14-335. Register Call Summary for Register L3_STCOL_FILTER_i_MATCH_m_USERINFO | 2898 |
| 14-336. L3_STCOL_FILTER_i_MATCH_m_REQUUSERINFO | 2898 |
| 14-337. L3_STCOL_FILTER_i_MATCH_m_RSPUSERINFO | 2898 |
| 14-338. L3_STCOL_OP_i_THRESHOLD_MINVAL | 2899 |
| 14-339. Register Call Summary for Register L3_STCOL_OP_i_THRESHOLD_MINVAL | 2899 |
| 14-340. L3_STCOL_OP_i_THRESHOLD_MAXVAL | 2899 |
| 14-341. Register Call Summary for Register L3_STCOL_OP_i_THRESHOLD_MAXVAL..... | 2900 |
| 14-342. L3_STCOL_OP_i_EVTINFOSEL | 2900 |
| 14-343. Register Call Summary for Register L3_STCOL_OP_i_EVTINFOSEL | 2900 |
| 14-344. L3_STCOL_OP_i_SEL | 2900 |

| | |
|---|------|
| 14-345. Register Call Summary for Register L3_STCOL_OP_i_SEL..... | 2901 |
| 14-346. Integration Attributes..... | 2904 |
| 14-347. Clocks and Resets | 2904 |
| 14-348. L4_PER TAs..... | 2905 |
| 14-349. L4_PER IAs | 2906 |
| 14-350. L4_CFG TAs..... | 2906 |
| 14-351. L4_CFG IAs..... | 2907 |
| 14-352. L4_WKUP TAs | 2907 |
| 14-353. L4_WKUP IA..... | 2907 |
| 14-354. L4 ConnID Definition..... | 2909 |
| 14-355. L4_PER Firewall Default Configuration | 2911 |
| 14-356. L4_CFG Firewall Default Configuration | 2911 |
| 14-357. Region Allocations for L4_PER Interconnect..... | 2913 |
| 14-358. Region Allocations for L4_CFG Interconnect..... | 2915 |
| 14-359. Region Allocations for L4_WKUP Interconnect | 2917 |
| 14-360. L4 Firewall Register Description Overview | 2918 |
| 14-361. L4 CODE Bit Field Definition | 2919 |
| 14-362. L4 Time-Out Link and TA Programming | 2920 |
| 14-363. Global Initialization of Surrounding Modules | 2923 |
| 14-364. Main Sequence – Error Analysis Mode | 2925 |
| 14-365. Subprocess Call Summary for Main Sequence – Error Analysis Mode | 2925 |
| 14-366. Protection Violation Error Identification..... | 2926 |
| 14-367. Unsupported Command/Address Hole Error Identification | 2926 |
| 14-368. Reset TA and Module | 2926 |
| 14-369. Time-Out Configuration | 2927 |
| 14-370. Firewall Configuration | 2927 |
| 14-371. L4_PER Instance Summary | 2928 |
| 14-372. L4_CFG Instance Summary | 2929 |
| 14-373. L4_WKUP Instance Summary..... | 2929 |
| 14-374. IA Registers Mapping Summary | 2930 |
| 14-375. L4_IA_COMPONENT_L | 2931 |
| 14-376. Register Call Summary for Register L4_IA_COMPONENT_L | 2931 |
| 14-377. L4_IA_COMPONENT_H | 2931 |
| 14-378. Register Call Summary for Register L4_IA_COMPONENT_H..... | 2931 |
| 14-379. L4_IA_CORE_L | 2932 |
| 14-380. Register Call Summary for Register L4_IA_CORE_L..... | 2932 |
| 14-381. L4_IA_CORE_H..... | 2932 |
| 14-382. Register Call Summary for Register L4_IA_CORE_H | 2932 |
| 14-383. L4_IA_AGENT_CONTROL_L | 2933 |
| 14-384. Register Call Summary for Register L4_IA_AGENT_CONTROL_L..... | 2933 |
| 14-385. L4_IA_AGENT_CONTROL_H..... | 2934 |
| 14-386. Register Call Summary for Register L4_IA_AGENT_CONTROL_H | 2934 |
| 14-387. L4_IA_AGENT_STATUS_L..... | 2934 |
| 14-388. Register Call Summary for Register L4_IA_AGENT_STATUS_L | 2935 |
| 14-389. L4_IA_AGENT_STATUS_H | 2935 |
| 14-390. Register Call Summary for Register L4_IA_AGENT_STATUS_H..... | 2935 |
| 14-391. L4_IA_ERROR_LOG_L | 2935 |
| 14-392. Register Call Summary for Register L4_IA_ERROR_LOG_L..... | 2936 |
| 14-393. L4_IA_ERROR_LOG_H..... | 2936 |

| | |
|---|------|
| 14-394. Register Call Summary for Register L4_IA_ERROR_LOG_H | 2936 |
| 14-395. L4_IA_ERROR_LOG_ADDR_L | 2936 |
| 14-396. Register Call Summary for Register L4_IA_ERROR_LOG_ADDR_L | 2937 |
| 14-397. L4_IA_ERROR_LOG_ADDR_H | 2937 |
| 14-398. Register Call Summary for Register L4_IA_ERROR_LOG_ADDR_H | 2937 |
| 14-399. CFG_TA Register Mapping Summary 1 | 2937 |
| 14-400. CFG_TA Register Mapping Summary 2 | 2938 |
| 14-401. CFG_TA Register Mapping Summary 3 | 2938 |
| 14-402. CFG_TA Register Mapping Summary 4 | 2938 |
| 14-403. CFG_TA Register Mapping Summary 5 | 2939 |
| 14-404. CFG_TA Register Mapping Summary 6 | 2939 |
| 14-405. CFG_TA Register Mapping Summary 7 | 2939 |
| 14-406. CFG_TA Register Mapping Summary 8 | 2940 |
| 14-407. CFG_TA Register Mapping Summary 9 | 2940 |
| 14-408. CFG_TA Register Mapping Summary 10 | 2940 |
| 14-409. CFG_TA Register Mapping Summary 11 | 2941 |
| 14-410. CFG_TA Register Mapping Summary 12 | 2941 |
| 14-411. CFG_TA Register Mapping Summary 13 | 2942 |
| 14-412. PER_TA Register Mapping Summary 1 | 2942 |
| 14-413. PER_TA Register Mapping Summary 2 | 2942 |
| 14-414. PER_TA Register Mapping Summary 3 | 2943 |
| 14-415. PER_TA Register Mapping Summary 4 | 2943 |
| 14-416. PER_TA Register Mapping Summary 5 | 2944 |
| 14-417. PER_TA Register Mapping Summary 6 | 2944 |
| 14-418. PER_TA Register Mapping Summary 7 | 2944 |
| 14-419. PER_TA Register Mapping Summary 8 | 2945 |
| 14-420. PER_TA Register Mapping Summary 9 | 2945 |
| 14-421. PER_TA Register Mapping Summary 10 | 2945 |
| 14-422. PER_TA Register Mapping Summary 11 | 2946 |
| 14-423. PER_TA Register Mapping Summary 12 | 2946 |
| 14-424. PER_TA Register Mapping Summary 13 | 2946 |
| 14-425. WKUP_TA Register Mapping Summary 1 | 2947 |
| 14-426. WKUP_TA Register Mapping Summary 2 | 2947 |
| 14-427. WKUP_TA Register Mapping Summary 3 | 2947 |
| 14-428. WKUP_TA Register Mapping Summary 4 | 2948 |
| 14-429. WKUP_TA Register Mapping Summary 5 | 2948 |
| 14-430. L4_TA_COMPONENT_H | 2949 |
| 14-431. Register Call Summary for Register L4_TA_COMPONENT_H | 2949 |
| 14-432. L4_TA_COMPONENT_L | 2949 |
| 14-433. Register Call Summary for Register L4_TA_COMPONENT_L | 2949 |
| 14-434. L4_TA_CORE_L | 2949 |
| 14-435. Register Call Summary for Register L4_TA_CORE_L | 2950 |
| 14-436. L4_TA_CORE_H | 2950 |
| 14-437. Register Call Summary for Register L4_TA_CORE_H | 2950 |
| 14-438. L4_TA_AGENT_CONTROL_L | 2950 |
| 14-439. Register Call Summary for Register L4_TA_AGENT_CONTROL_L | 2951 |
| 14-440. L4_TA_AGENT_CONTROL_H | 2951 |
| 14-441. Register Call Summary for Register L4_TA_AGENT_CONTROL_H | 2951 |
| 14-442. L4_TA_AGENT_STATUS_L | 2952 |

| | |
|---|------|
| 14-443. Register Call Summary for Register L4_TA_AGENT_STATUS_L | 2952 |
| 14-444. L4_TA_AGENT_STATUS_H | 2952 |
| 14-445. Register Call Summary for Register L4_TA_AGENT_STATUS_H..... | 2952 |
| 14-446. LA Register Mapping Summary | 2953 |
| 14-447. L4_LA_COMPONENT_L..... | 2953 |
| 14-448. Register Call Summary for Register L4_LA_COMPONENT_L | 2953 |
| 14-449. L4_LA_COMPONENT_H | 2954 |
| 14-450. Register Call Summary for Register L4_LA_COMPONENT_H..... | 2954 |
| 14-451. L4_LA_NETWORK_L | 2954 |
| 14-452. Register Call Summary for Register L4_LA_NETWORK_L | 2954 |
| 14-453. L4_LA_NETWORK_H | 2954 |
| 14-454. Register Call Summary for Register L4_LA_NETWORK_H..... | 2955 |
| 14-455. L4_LA_INITIATOR_INFO_L | 2955 |
| 14-456. Register Call Summary for Register L4_LA_INITIATOR_INFO_L..... | 2955 |
| 14-457. Reset value for L4_LA_INITIATOR_INFO_L | 2956 |
| 14-458. L4_LA_INITIATOR_INFO_H..... | 2956 |
| 14-459. Register Call Summary for Register L4_LA_INITIATOR_INFO_H | 2956 |
| 14-460. Reset Value for L4_LA_INITIATOR_INFO_H | 2957 |
| 14-461. L4_LA_NETWORK_CONTROL_L..... | 2957 |
| 14-462. Register Call Summary for Register L4_LA_NETWORK_CONTROL_L | 2957 |
| 14-463. L4_LA_NETWORK_CONTROL_H | 2958 |
| 14-464. Register Call Summary for Register L4_LA_NETWORK_CONTROL_H..... | 2958 |
| 14-465. L4 AP Register Summary | 2958 |
| 14-466. L4_AP_COMPONENT_L | 2959 |
| 14-467. Register Call Summary for Register L4_AP_COMPONENT_L | 2959 |
| 14-468. L4_AP_COMPONENT_H | 2960 |
| 14-469. Register Call Summary for Register L4_AP_COMPONENT_H..... | 2960 |
| 14-470. L4_AP_SEGMENT_i_L..... | 2960 |
| 14-471. Register Call Summary for Register L4_AP_SEGMENT_i_L | 2960 |
| 14-472. L4_AP_SEGMENT_i_H | 2960 |
| 14-473. Register Call Summary for Register L4_AP_SEGMENT_i_H..... | 2961 |
| 14-474. Reset Value for L4_AP_SEGMENT_i | 2961 |
| 14-475. L4_AP_PROT_GROUP_MEMBERS_k_L | 2961 |
| 14-476. Register Call Summary for Register L4_AP_PROT_GROUP_MEMBERS_k_L..... | 2962 |
| 14-477. Reset Value for L4_AP_PROT_GROUP_MEMBERS_k..... | 2963 |
| 14-478. L4_AP_PROT_GROUP_MEMBERS_k_H..... | 2963 |
| 14-479. Register Call Summary for Register L4_AP_PROT_GROUP_MEMBERS_k_H | 2963 |
| 14-480. L4_AP_PROT_GROUP_ROLES_k_L..... | 2963 |
| 14-481. Register Call Summary for Register L4_AP_PROT_GROUP_ROLES_k_L | 2964 |
| 14-482. Reset Value for L4_AP_PROT_GROUP_ROLES_k | 2964 |
| 14-483. L4_AP_PROT_GROUP_ROLES_k_H | 2964 |
| 14-484. Register Call Summary for Register L4_AP_PROT_GROUP_ROLES_k_H..... | 2964 |
| 14-485. L4_AP_REGION_I_L | 2965 |
| 14-486. Register Call Summary for Register L4_AP_REGION_I_L..... | 2965 |
| 14-487. L4_AP_REGION_I_H..... | 2965 |
| 14-488. Register Call Summary for Register L4_AP_REGION_I_H | 2966 |
| 14-489. L4_AP_REGION_I Reset Value for L4_PER..... | 2966 |
| 14-490. L4_AP_REGION_I Reset Value for L4_CFG..... | 2968 |
| 15-1. Integration Attributes | 2974 |

| | | |
|--------|--|------|
| 15-2. | Clocks and Resets | 2974 |
| 15-3. | Hardware Requests | 2974 |
| 15-4. | Global Reset Sources..... | 2975 |
| 15-5. | C2C Power and Reset Domain Association | 2976 |
| 15-6. | Reset Sources For the Reset Domains | 2976 |
| 15-7. | CD_C2C Clock Domain Modes..... | 2984 |
| 15-8. | CD_C2C Control and Status Parameters | 2984 |
| 15-9. | CD_C2C Static Dependency Association Parameters | 2984 |
| 15-10. | CD_C2C Dynamic Dependency Association Parameters..... | 2984 |
| 15-11. | CD_C2C Module Clocks Association | 2984 |
| 15-12. | CD_C2C Module Wake-Up Request..... | 2985 |
| 15-13. | CD_C2C Module Clock Management Modes and Control..... | 2985 |
| 15-14. | CD_C2C Modules Slave Clock Management Modes and Control..... | 2985 |
| 15-15. | CD_CORTEXA9 Static Dependency Association Parameters | 2985 |
| 15-16. | CD_L4_CFG Dynamic Dependency Association Parameters..... | 2986 |
| 15-17. | CD_L3_2 Dynamic Dependency Association Parameters | 2986 |
| 15-18. | PD_CORE C2C Power Attributes | 2986 |
| 15-19. | PRM Instance Summary..... | 2987 |
| 15-20. | CORE_PRM Registers Mapping Summary | 2987 |
| 15-21. | RM_C2C_C2C_CONTEXT..... | 2988 |
| 15-22. | Register Call Summary for Register RM_C2C_C2C_CONTEXT | 2988 |
| 15-23. | RM_C2C_C2C_FW_CONTEXT | 2988 |
| 15-24. | Register Call Summary for Register RM_C2C_C2C_FW_CONTEXT | 2989 |
| 15-25. | CORE_CM2 Registers Mapping Summary | 2989 |
| 15-26. | CM_C2C_CLKSTCTRL..... | 2989 |
| 15-27. | Register Call Summary for Register CM_C2C_CLKSTCTRL | 2990 |
| 15-28. | CM_C2C_STATICDEP | 2991 |
| 15-29. | Register Call Summary for Register CM_C2C_STATICDEP | 2991 |
| 15-30. | CM_C2C_DYNAMICDEP | 2992 |
| 15-31. | Register Call Summary for Register CM_C2C_DYNAMICDEP | 2992 |
| 15-32. | CM_C2C_C2C_CLKCTRL | 2992 |
| 15-33. | Register Call Summary for Register CM_C2C_C2C_CLKCTRL..... | 2993 |
| 15-34. | CM_C2C_C2C_FW_CLKCTRL | 2993 |
| 15-35. | Register Call Summary for Register CM_C2C_C2C_FW_CLKCTRL | 2994 |
| 15-36. | CM_L4CFG_DYNAMICDEP | 2994 |
| 15-37. | Register Call Summary for Register CM_L4CFG_DYNAMICDEP..... | 2995 |
| 15-38. | SCRM Instance Summary..... | 2995 |
| 15-39. | SCRM Registers Mapping Summary | 2995 |
| 15-40. | C2CCLKM | 2996 |
| 15-41. | Register Call Summary for Register C2CCLKM..... | 2996 |
| 15-42. | C2CCLKREQ | 2996 |
| 15-43. | Register Call Summary for Register C2CCLKREQ | 2997 |
| 15-44. | C2CRSTCTRL | 2997 |
| 15-45. | Register Call Summary for Register C2CRSTCTRL..... | 2997 |
| 15-46. | EXTWARMRSTCTRL..... | 2998 |
| 15-47. | Register Call Summary for Register EXTWARMRSTCTRL | 2998 |
| 15-48. | APEWARMRSTCTRL..... | 2998 |
| 15-49. | Register Call Summary for Register APEWARMRSTCTRL | 2999 |
| 15-50. | C2CWARMRSTCTRL..... | 2999 |

| | |
|---|------|
| 15-51. Register Call Summary for Register C2CWARMRSTCTRL | 2999 |
| 15-52. C2CWARMRSTST_REG | 3000 |
| 15-53. Register Call Summary for Register C2CWARMRSTST_REG | 3000 |
| 15-54. Clocks | 3003 |
| 15-55. Resets | 3003 |
| 15-56. C2C Connectivity | 3004 |
| 15-57. C2C ReqInfo Mapping | 3004 |
| 15-58. SSCM GPI Interrupt Mapping | 3007 |
| 15-59. C2C Instance Summary | 3009 |
| 15-60. ICR Registers Mapping Summary | 3010 |
| 15-61. ICR_REVISION | 3010 |
| 15-62. Register Call Summary for Register ICR_REVISION | 3010 |
| 15-63. SYS_CONFIG | 3010 |
| 15-64. Register Call Summary for Register SYS_CONFIG | 3011 |
| 15-65. SYS_STATUS | 3011 |
| 15-66. Register Call Summary for Register SYS_STATUS | 3012 |
| 15-67. M_IRQ_STATUS | 3012 |
| 15-68. Register Call Summary for Register M_IRQ_STATUS | 3012 |
| 15-69. G_IRQ_STATUS | 3013 |
| 15-70. Register Call Summary for Register G_IRQ_STATUS | 3013 |
| 15-71. M_ICR | 3013 |
| 15-72. Register Call Summary for Register M_ICR | 3014 |
| 15-73. G_ICR | 3014 |
| 15-74. Register Call Summary for Register G_ICR | 3014 |
| 15-75. M_CTL | 3014 |
| 15-76. Register Call Summary for Register M_CTL | 3015 |
| 15-77. G_CTL | 3015 |
| 15-78. Register Call Summary for Register G_CTL | 3015 |
| 15-79. C2C Instance Summary | 3016 |
| 15-80. C2C Registers Mapping Summary | 3016 |
| 15-81. C2C_REVISION | 3017 |
| 15-82. Register Call Summary for Register C2C_REVISION | 3017 |
| 15-83. C2C_SYSCONFIG | 3017 |
| 15-84. Register Call Summary for Register C2C_SYSCONFIG | 3017 |
| 15-85. C2C_SYSSTATUS | 3017 |
| 15-86. Register Call Summary for Register C2C_SYSSTATUS | 3017 |
| 15-87. C2C_PORTCONFIG | 3018 |
| 15-88. Register Call Summary for Register C2C_PORTCONFIG | 3018 |
| 15-89. C2C_MIRRORMODE | 3018 |
| 15-90. Register Call Summary for Register C2C_MIRRORMODE | 3018 |
| 15-91. C2C_IRQ_RAW_STATUS_0 | 3019 |
| 15-92. Register Call Summary for Register C2C_IRQ_RAW_STATUS_0 | 3019 |
| 15-93. C2C_IRQ_RAW_STATUS_1 | 3020 |
| 15-94. Register Call Summary for Register C2C_IRQ_RAW_STATUS_1 | 3023 |
| 15-95. C2C_IRQ_ENABLE_STATUS_0 | 3023 |
| 15-96. Register Call Summary for Register C2C_IRQ_ENABLE_STATUS_0 | 3023 |
| 15-97. C2C_IRQ_ENABLE_STATUS_1 | 3024 |
| 15-98. Register Call Summary for Register C2C_IRQ_ENABLE_STATUS_1 | 3026 |
| 15-99. C2C_IRQ_ENABLE_SET_0 | 3027 |

| | |
|---|------|
| 15-100. Register Call Summary for Register C2C_IRQ_ENABLE_SET_0..... | 3027 |
| 15-101. C2C_IRQ_ENABLE_SET_1 | 3027 |
| 15-102. Register Call Summary for Register C2C_IRQ_ENABLE_SET_1..... | 3029 |
| 15-103. C2C_IRQ_ENABLE_CLEAR_0 | 3029 |
| 15-104. Register Call Summary for Register C2C_IRQ_ENABLE_CLEAR_0..... | 3029 |
| 15-105. C2C_IRQ_ENABLE_CLEAR_1 | 3030 |
| 15-106. Register Call Summary for Register C2C_IRQ_ENABLE_CLEAR_1 | 3031 |
| 15-107. C2C_FCLK_FREQ..... | 3031 |
| 15-108. Register Call Summary for Register C2C_FCLK_FREQ | 3031 |
| 15-109. C2C_RX_MAX_FREQ..... | 3032 |
| 15-110. Register Call Summary for Register C2C_RX_MAX_FREQ | 3032 |
| 15-111. C2C_TX_MAX_FREQ | 3032 |
| 15-112. Register Call Summary for Register C2C_TX_MAX_FREQ | 3032 |
| 15-113. C2C_RX_MAX_FREQ_ACK..... | 3032 |
| 15-114. Register Call Summary for Register C2C_RX_MAX_FREQ_ACK | 3033 |
| 15-115. C2C_WAKE_REQ | 3033 |
| 15-116. Register Call Summary for Register C2C_WAKE_REQ | 3033 |
| 15-117. C2C_WAKE_ACK..... | 3033 |
| 15-118. Register Call Summary for Register C2C_WAKE_ACK | 3033 |
| 15-119. C2C_STANDBY | 3034 |
| 15-120. Register Call Summary for Register C2C_STANDBY | 3034 |
| 15-121. C2C_STANDBY_IN..... | 3034 |
| 15-122. Register Call Summary for Register C2C_STANDBY_IN | 3034 |
| 15-123. C2C_WAIT | 3035 |
| 15-124. Register Call Summary for Register C2C_WAIT | 3035 |
| 15-125. C2C_GENI_CONTROL | 3035 |
| 15-126. Register Call Summary for Register C2C_GENI_CONTROL | 3038 |
| 15-127. C2C_GENI_MASK | 3038 |
| 15-128. Register Call Summary for Register C2C_GENI_MASK | 3039 |
| 15-129. C2C_GENO_STATUS..... | 3040 |
| 15-130. Register Call Summary for Register C2C_GENO_STATUS | 3040 |
| 15-131. C2C_GENO_INTERRUPT..... | 3041 |
| 15-132. Register Call Summary for Register C2C_GENO_INTERRUPT | 3043 |
| 15-133. C2C_GENO_LEVEL | 3044 |
| 15-134. Register Call Summary for Register C2C_GENO_LEVEL | 3045 |
| 16-1. DMM Integration Attributes..... | 3055 |
| 16-2. DMM Clocks and Resets | 3055 |
| 16-3. Hardware Requests | 3056 |
| 16-4. DMM TILER Container Geometry | 3056 |
| 16-5. DMM Clocks..... | 3058 |
| 16-6. DMM Local Power-Management Features..... | 3058 |
| 16-7. DMM Hardware Status Features | 3058 |
| 16-8. Events..... | 3059 |
| 16-9. Well-Formed Tiled Mode 2D Block Requests | 3071 |
| 16-10. Coding and Description of TILER Modes | 3075 |
| 16-11. Coding and Description of TILER Orientations | 3075 |
| 16-12. Tiled Mode Container Characteristics | 3076 |
| 16-13. TILER Aliased View in the L3 Interconnect Mapping | 3085 |
| 16-14. Address Format in the TILER-Specific Address Map..... | 3085 |

| | |
|--|------|
| 16-15. Address Format of the TILER Aliased View in the System Address Map | 3086 |
| 16-16. Minimum Buffer Size to Efficiently Handle Lines of up to N Elements | 3087 |
| 16-17. Memory Data Payload for Buffered Raster-Based Initiators on Up-to-32-Bit DDR, lpDDR, or lpDDR2 | 3088 |
| 16-18. Memory Data Payload for Buffered Raster-Based Initiators on 32-Bit DDR2 or DDR3..... | 3088 |
| 16-19. Address Definition | 3093 |
| 16-20. Configuration | 3093 |
| 16-21. Address Definition | 3094 |
| 16-22. Configuration | 3095 |
| 16-23. Address Upper Bits Shifting..... | 3096 |
| 16-24. Global Initialization of Surrounding Modules..... | 3097 |
| 16-25. DMM Global Initialization | 3097 |
| 16-26. Coding and Description of TILER Modes | 3097 |
| 16-27. Configuration Settings and LUT Refill | 3098 |
| 16-28. Interleaving Settings | 3098 |
| 16-29. Aliased Tiled View Orientation Settings and LUT Refill | 3098 |
| 16-30. Priority Settings | 3099 |
| 16-31. Error Handling..... | 3099 |
| 16-32. 29-Bit View Address Offset and 33-Bit Full TILER Address for an 8-Bit Frame-Buffer | 3101 |
| 16-33. 29-Bit View Address Offset and 33-Bit Full TILER Address for a 1D Object | 3102 |
| 16-34. DMM Instance Summary | 3103 |
| 16-35. DMM Registers Mapping Summary..... | 3103 |
| 16-36. DMM_REVISION | 3104 |
| 16-37. Register Call Summary for Register DMM_REVISION..... | 3104 |
| 16-38. DMM_HWINFO | 3104 |
| 16-39. Register Call Summary for Register DMM_HWINFO..... | 3104 |
| 16-40. DMM_LISA_HWINFO..... | 3105 |
| 16-41. Register Call Summary for Register DMM_LISA_HWINFO | 3105 |
| 16-42. DMM_SYSCONFIG | 3105 |
| 16-43. Register Call Summary for Register DMM_SYSCONFIG..... | 3106 |
| 16-44. DMM_LISA_LOCK | 3106 |
| 16-45. Register Call Summary for Register DMM_LISA_LOCK..... | 3106 |
| 16-46. DMM_LISA_MAP_i..... | 3106 |
| 16-47. Register Call Summary for Register DMM_LISA_MAP_i | 3107 |
| 16-48. DMM_TILER_HWINFO | 3107 |
| 16-49. Register Call Summary for Register DMM_TILER_HWINFO | 3108 |
| 16-50. DMM_TILER_OR0 | 3108 |
| 16-51. Register Call Summary for Register DMM_TILER_OR0 | 3109 |
| 16-52. DMM_TILER_OR1 | 3109 |
| 16-53. Register Call Summary for Register DMM_TILER_OR1 | 3110 |
| 16-54. DMM_PAT_HWINFO | 3110 |
| 16-55. Register Call Summary for Register DMM_PAT_HWINFO..... | 3111 |
| 16-56. DMM_PAT_GEOMETRY | 3111 |
| 16-57. Register Call Summary for Register DMM_PAT_GEOMETRY | 3112 |
| 16-58. DMM_PAT_CONFIG..... | 3112 |
| 16-59. Register Call Summary for Register DMM_PAT_CONFIG | 3112 |
| 16-60. DMM_PAT_VIEW0 | 3113 |
| 16-61. Register Call Summary for Register DMM_PAT_VIEW0 | 3114 |
| 16-62. DMM_PAT_VIEW1 | 3114 |
| 16-63. Register Call Summary for Register DMM_PAT_VIEW1 | 3115 |

| | |
|---|------|
| 16-64. DMM_PAT_VIEW_MAP_i | 3115 |
| 16-65. Register Call Summary for Register DMM_PAT_VIEW_MAP_i | 3116 |
| 16-66. DMM_PAT_VIEW_MAP_BASE | 3117 |
| 16-67. Register Call Summary for Register DMM_PAT_VIEW_MAP_BASE | 3117 |
| 16-68. DMM_PAT_IRQSTATUS_RAW | 3117 |
| 16-69. Register Call Summary for Register DMM_PAT_IRQSTATUS_RAW | 3119 |
| 16-70. DMM_PAT_IRQSTATUS | 3120 |
| 16-71. Register Call Summary for Register DMM_PAT_IRQSTATUS | 3122 |
| 16-72. DMM_PAT_IRQENABLE_SET | 3122 |
| 16-73. Register Call Summary for Register DMM_PAT_IRQENABLE_SET | 3124 |
| 16-74. DMM_PAT_IRQENABLE_CLR | 3124 |
| 16-75. Register Call Summary for Register DMM_PAT_IRQENABLE_CLR | 3127 |
| 16-76. DMM_PAT_STATUS_i | 3127 |
| 16-77. Register Call Summary for Register DMM_PAT_STATUS_i | 3128 |
| 16-78. DMM_PAT_DESCR_i | 3128 |
| 16-79. Register Call Summary for Register DMM_PAT_DESCR_i | 3128 |
| 16-80. DMM_PAT_AREA_i | 3128 |
| 16-81. Register Call Summary for Register DMM_PAT_AREA_i | 3129 |
| 16-82. DMM_PAT_CTRL_i | 3129 |
| 16-83. Register Call Summary for Register DMM_PAT_CTRL_i | 3130 |
| 16-84. DMM_PAT_DATA_i | 3130 |
| 16-85. Register Call Summary for Register DMM_PAT_DATA_i | 3130 |
| 16-86. DMM_PEG_HWINFO | 3130 |
| 16-87. Register Call Summary for Register DMM_PEG_HWINFO | 3131 |
| 16-88. DMM_PEG_PRIO_k | 3131 |
| 16-89. Register Call Summary for Register DMM_PEG_PRIO_k | 3132 |
| 16-90. DMM_PEG_PRIO_PAT | 3132 |
| 16-91. Register Call Summary for Register DMM_PEG_PRIO_PAT | 3132 |
| 16-92. I/O Signals | 3135 |
| 16-93. Integration Attributes | 3138 |
| 16-94. Clocks and Resets | 3138 |
| 16-95. Hardware Requests | 3139 |
| 16-96. MAddrSpace Mapping to Chip-Selects | 3140 |
| 16-97. FIFO Allocation | 3141 |
| 16-98. Events | 3146 |
| 16-99. Performance Counter Filter Configuration | 3149 |
| 16-100. 64-Byte Linear Read Starting at Address 0x0 | 3150 |
| 16-101. 64-Byte Linear Read Starting at Address 0x8 (LPDDR2-S2) | 3151 |
| 16-102. 64-Byte Linear Read Starting at Address 0x8 (LPDDR2-S4) | 3151 |
| 16-103. 64-Byte Linear Read Starting at Address 0x10 | 3151 |
| 16-104. 64-Byte Linear Read Starting at Address 0x18 | 3151 |
| 16-105. Turnaround Time | 3151 |
| 16-106. SDRAM Addressing Space | 3152 |
| 16-107. L3 Address to SDRAM Address Mapping for 16-Bit SDRAM (EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 0) | 3154 |
| 16-108. L3 Address to SDRAM Address Mapping for 32-Bit SDRAM (EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 0) | 3155 |
| 16-109. L3 Address to SDRAM Address Mapping for EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 1 and EMIF_SDRAM_CONFIG_2[27] REG_EBANK_POS = 0 | 3157 |
| 16-110. L3 Address to SDRAM Address Mapping for EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 2 | |

| | |
|---|------|
| and EMIF_SDRAM_CONFIG_2[27] REG_EBANK_POS = 0 | 3158 |
| 16-111. L3 Address to SDRAM Address Mapping for EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 3 and EMIF_SDRAM_CONFIG_2[27] REG_EBANK_POS = 0 | 3159 |
| 16-112. L3 Address to SDRAM Address Mapping for EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 1 and EMIF_SDRAM_CONFIG_2[27] REG_EBANK_POS = 1 | 3160 |
| 16-113. L3 Address to SDRAM Address Mapping for EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 2 and EMIF_SDRAM_CONFIG_2[27] REG_EBANK_POS = 1 | 3161 |
| 16-114. L3 Address to SDRAM Address Mapping for EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 3 and EMIF_SDRAM_CONFIG_2[27] REG_EBANK_POS = 1 | 3162 |
| 16-115. Global Initialization of Surrounding Modules | 3164 |
| 16-116. EMIF Global Initialization..... | 3164 |
| 16-117. Subprocess Call Summary for Main Sequence – EMIF Global Initialization..... | 3165 |
| 16-118. Subsequence – EMIF Timing Initialization..... | 3165 |
| 16-119. EMIF Output Impedance Calibration Mode..... | 3166 |
| 16-120. EMIF Read..... | 3166 |
| 16-121. EMIF Write | 3167 |
| 16-122. EMIF SDRAM Refresh | 3167 |
| 16-123. EMIF SDRAM Self-Refresh..... | 3167 |
| 16-124. EMIF SDRAM Power-Down Mode..... | 3167 |
| 16-125. EMIF LPDDR2-SDRAM Deep Power-Down Mode | 3168 |
| 16-126. EMIF Global Warm Reset (Software Reset)..... | 3168 |
| 16-127. EMIF Temperature Monitoring Mode | 3168 |
| 16-128. EMIF Event Servicing..... | 3169 |
| 16-129. EMIF Instance Summary..... | 3171 |
| 16-130. EMIF Registers Mapping Summary | 3171 |
| 16-131. EMIF_MOD_ID_REV | 3173 |
| 16-132. Register Call Summary for Register EMIF_MOD_ID_REV..... | 3173 |
| 16-133. EMIF_STATUS | 3173 |
| 16-134. Register Call Summary for Register EMIF_STATUS..... | 3174 |
| 16-135. EMIF_SDRAM_CONFIG..... | 3174 |
| 16-136. Register Call Summary for Register EMIF_SDRAM_CONFIG | 3175 |
| 16-137. EMIF_SDRAM_CONFIG_2..... | 3175 |
| 16-138. Register Call Summary for Register EMIF_SDRAM_CONFIG_2 | 3176 |
| 16-139. EMIF_SDRAM_REF_CTRL | 3176 |
| 16-140. Register Call Summary for Register EMIF_SDRAM_REF_CTRL | 3177 |
| 16-141. EMIF_SDRAM_REF_CTRL_SHDW..... | 3177 |
| 16-142. Register Call Summary for Register EMIF_SDRAM_REF_CTRL_SHDW | 3177 |
| 16-143. EMIF_SDRAM_TIM_1..... | 3178 |
| 16-144. Register Call Summary for Register EMIF_SDRAM_TIM_1 | 3178 |
| 16-145. EMIF_SDRAM_TIM_1_SHDW | 3178 |
| 16-146. Register Call Summary for Register EMIF_SDRAM_TIM_1_SHDW..... | 3179 |
| 16-147. EMIF_SDRAM_TIM_2..... | 3179 |
| 16-148. Register Call Summary for Register EMIF_SDRAM_TIM_2 | 3180 |
| 16-149. EMIF_SDRAM_TIM_2_SHDW | 3180 |
| 16-150. Register Call Summary for Register EMIF_SDRAM_TIM_2_SHDW..... | 3181 |
| 16-151. EMIF_SDRAM_TIM_3..... | 3181 |
| 16-152. Register Call Summary for Register EMIF_SDRAM_TIM_3 | 3182 |
| 16-153. EMIF_SDRAM_TIM_3_SHDW | 3182 |
| 16-154. Register Call Summary for Register EMIF_SDRAM_TIM_3_SHDW..... | 3182 |
| 16-155. EMIF_LPDDR2_NVM_TIM | 3183 |

| | |
|--|------|
| 16-156. Register Call Summary for Register EMIF_LPDDR2_NVM_TIM | 3183 |
| 16-157. EMIF_LPDDR2_NVM_TIM_SHDW | 3183 |
| 16-158. Register Call Summary for Register EMIF_LPDDR2_NVM_TIM_SHDW | 3184 |
| 16-159. EMIF_PWR_MGMT_CTRL | 3184 |
| 16-160. Register Call Summary for Register EMIF_PWR_MGMT_CTRL | 3185 |
| 16-161. EMIF_PWR_MGMT_CTRL_SHDW | 3186 |
| 16-162. Register Call Summary for Register EMIF_PWR_MGMT_CTRL_SHDW | 3186 |
| 16-163. EMIF_LPDDR2_MODE_REG_DATA | 3186 |
| 16-164. Register Call Summary for Register EMIF_LPDDR2_MODE_REG_DATA | 3187 |
| 16-165. EMIF_LPDDR2_MODE_REG_CFG | 3187 |
| 16-166. Register Call Summary for Register EMIF_LPDDR2_MODE_REG_CFG | 3187 |
| 16-167. EMIF_L3_CONFIG | 3187 |
| 16-168. Register Call Summary for Register EMIF_L3_CONFIG | 3188 |
| 16-169. EMIF_L3_CFG_VAL_1 | 3189 |
| 16-170. Register Call Summary for Register EMIF_L3_CFG_VAL_1 | 3189 |
| 16-171. EMIF_L3_CFG_VAL_2 | 3189 |
| 16-172. Register Call Summary for Register EMIF_L3_CFG_VAL_2 | 3190 |
| 16-173. EMIF_PERF_CNT_1 | 3190 |
| 16-174. Register Call Summary for Register EMIF_PERF_CNT_1 | 3190 |
| 16-175. EMIF_PERF_CNT_2 | 3190 |
| 16-176. Register Call Summary for Register EMIF_PERF_CNT_2 | 3190 |
| 16-177. EMIF_PERF_CNT_CFG | 3191 |
| 16-178. Register Call Summary for Register EMIF_PERF_CNT_CFG | 3191 |
| 16-179. EMIF_PERF_CNT_SEL | 3191 |
| 16-180. Register Call Summary for Register EMIF_PERF_CNT_SEL | 3192 |
| 16-181. EMIF_PERF_CNT_TIM | 3192 |
| 16-182. Register Call Summary for Register EMIF_PERF_CNT_TIM | 3192 |
| 16-183. EMIF_READ_IDLE_CTRL | 3193 |
| 16-184. Register Call Summary for Register EMIF_READ_IDLE_CTRL | 3193 |
| 16-185. EMIF_READ_IDLE_CTRL_SHDW | 3193 |
| 16-186. Register Call Summary for Register EMIF_READ_IDLE_CTRL_SHDW | 3194 |
| 16-187. EMIF_IRQSTATUS_RAW_SYS | 3194 |
| 16-188. Register Call Summary for Register EMIF_IRQSTATUS_RAW_SYS | 3195 |
| 16-189. EMIF_IRQSTATUS_RAW_LL | 3195 |
| 16-190. Register Call Summary for Register EMIF_IRQSTATUS_RAW_LL | 3195 |
| 16-191. EMIF_IRQSTATUS_SYS | 3196 |
| 16-192. Register Call Summary for Register EMIF_IRQSTATUS_SYS | 3196 |
| 16-193. EMIF_IRQSTATUS_LL | 3196 |
| 16-194. Register Call Summary for Register EMIF_IRQSTATUS_LL | 3197 |
| 16-195. EMIF_IRQENABLE_SET_SYS | 3197 |
| 16-196. Register Call Summary for Register EMIF_IRQENABLE_SET_SYS | 3198 |
| 16-197. EMIF_IRQENABLE_SET_LL | 3198 |
| 16-198. Register Call Summary for Register EMIF_IRQENABLE_SET_LL | 3199 |
| 16-199. EMIF_IRQENABLE_CLR_SYS | 3199 |
| 16-200. Register Call Summary for Register EMIF_IRQENABLE_CLR_SYS | 3199 |
| 16-201. EMIF_IRQENABLE_CLR_LL | 3200 |
| 16-202. Register Call Summary for Register EMIF_IRQENABLE_CLR_LL | 3200 |
| 16-203. EMIF_ZQ_CONFIG | 3200 |
| 16-204. Register Call Summary for Register EMIF_ZQ_CONFIG | 3201 |

| | |
|--|------|
| 16-205. EMIF_TEMP_ALERT_CONFIG | 3201 |
| 16-206. Register Call Summary for Register EMIF_TEMP_ALERT_CONFIG | 3202 |
| 16-207. EMIF_L3_ERR_LOG | 3202 |
| 16-208. Register Call Summary for Register EMIF_L3_ERR_LOG | 3203 |
| 16-209. EMIF_DDR_PHY_CTRL_1 | 3203 |
| 16-210. Register Call Summary for Register EMIF_DDR_PHY_CTRL_1 | 3204 |
| 16-211. EMIF_DDR_PHY_CTRL_1_SHDW | 3204 |
| 16-212. Register Call Summary for Register EMIF_DDR_PHY_CTRL_1_SHDW | 3205 |
| 16-213. EMIF_DDR_PHY_CTRL_2 | 3205 |
| 16-214. Register Call Summary for Register EMIF_DDR_PHY_CTRL_2 | 3205 |
| 16-215. GPMC I/O Description | 3208 |
| 16-216. GPMC Pin Multiplexing Options | 3209 |
| 16-217. GPMC Integration Attributes | 3212 |
| 16-218. GPMC Clocks and Resets | 3212 |
| 16-219. GPMC Hardware Requests | 3212 |
| 16-220. GPMC Clocks | 3215 |
| 16-221. gpmc_clk Configuration | 3215 |
| 16-222. GPMC Local Power Management Features | 3215 |
| 16-223. GPMC Interrupt Events | 3216 |
| 16-224. Boot Control Interface Input Signals Description | 3218 |
| 16-225. Idle Cycle Insertion Configuration | 3229 |
| 16-226. Chip-Select Configuration for NAND Interfacing | 3258 |
| 16-227. ECC Enable Settings | 3266 |
| 16-228. Flattened BCH Codeword Mapping (512 Bytes + 104 Bits) | 3271 |
| 16-229. Aligned Message Byte Mapping in 8-bit NAND | 3272 |
| 16-230. Aligned Message Byte Mapping in 16-bit NAND | 3272 |
| 16-231. Aligned Nibble Mapping of Message in 8-bit NAND | 3272 |
| 16-232. Misaligned Nibble Mapping of Message in 8-bit NAND | 3273 |
| 16-233. Aligned Nibble Mapping of Message in 16-bit NAND | 3273 |
| 16-234. Misaligned Nibble Mapping of Message in 16-bit NAND (1 Unused Nibble) | 3273 |
| 16-235. Misaligned Nibble Mapping of Message in 16-bit NAND (2 Unused Nibbles) | 3273 |
| 16-236. Misaligned Nibble Mapping of Message in 16-bit NAND (3 Unused Nibbles) | 3274 |
| 16-237. Prefetch Mode Configuration | 3283 |
| 16-238. Write-Posting Mode Configuration | 3285 |
| 16-239. GPMC Initialization | 3290 |
| 16-240. GPMC Configuration in NOR Mode | 3290 |
| 16-241. GPMC Configuration in NAND Mode | 3290 |
| 16-242. Reset GPMC | 3290 |
| 16-243. NOR Memory Type | 3290 |
| 16-244. NOR Chip-Select Configuration | 3291 |
| 16-245. NOR Timings Configuration | 3291 |
| 16-246. Wait Pin Configuration | 3291 |
| 16-247. Enable Chip-Select | 3291 |
| 16-248. NAND Memory Type | 3291 |
| 16-249. NAND Chip-Select Configuration | 3292 |
| 16-250. Asynchronous Read and Write Operations | 3292 |
| 16-251. ECC Engine | 3292 |
| 16-252. Prefetch and Write-Posting Engine | 3292 |
| 16-253. Wait Pin Configuration | 3293 |

| | |
|---|------|
| 16-254. Enable Chip-Select | 3293 |
| 16-255. Mode Parameters Check List Table | 3293 |
| 16-256. Access Type Parameters Check List Table | 3293 |
| 16-257. Timing Parameters | 3295 |
| 16-258. NAND Formulas Description Table | 3297 |
| 16-259. Synchronous NOR Formulas Description Table | 3298 |
| 16-260. Asynchronous NOR Formulas Description Table | 3302 |
| 16-261. GPMC Signals | 3305 |
| 16-262. Useful Timing Parameters on the Memory Side | 3306 |
| 16-263. Calculating GPMC Timing Parameters | 3307 |
| 16-264. AC Characteristics for Asynchronous Read Access | 3308 |
| 16-265. GPMC Timing Parameters for Asynchronous Read Access | 3309 |
| 16-266. AC Characteristics for Asynchronous Single Write (Memory Side) | 3310 |
| 16-267. GPMC Timing parameters for Asynchronous Single Write | 3310 |
| 16-268. Supported memories interfaces | 3311 |
| 16-269. NAND Interface Bus Operations Summary | 3312 |
| 16-270. NOR Interface Bus Operations Summary | 3313 |
| 16-271. GPMC Instance Summary | 3314 |
| 16-272. GPMC Registers Mapping Summary | 3314 |
| 16-273. GPMC_REVISION | 3315 |
| 16-274. Register Call Summary for Register GPMC_REVISION | 3315 |
| 16-275. GPMC_SYSCONFIG | 3315 |
| 16-276. Register Call Summary for Register GPMC_SYSCONFIG | 3316 |
| 16-277. GPMC_SYSSTATUS | 3316 |
| 16-278. Register Call Summary for Register GPMC_SYSSTATUS | 3316 |
| 16-279. GPMC_IRQSTATUS | 3316 |
| 16-280. Register Call Summary for Register GPMC_IRQSTATUS | 3318 |
| 16-281. GPMC_IRQENABLE | 3318 |
| 16-282. Register Call Summary for Register GPMC_IRQENABLE | 3319 |
| 16-283. GPMC_TIMEOUT_CONTROL | 3319 |
| 16-284. Register Call Summary for Register GPMC_TIMEOUT_CONTROL | 3319 |
| 16-285. GPMC_ERR_ADDRESS | 3319 |
| 16-286. Register Call Summary for Register GPMC_ERR_ADDRESS | 3320 |
| 16-287. GPMC_ERR_TYPE | 3320 |
| 16-288. Register Call Summary for Register GPMC_ERR_TYPE | 3321 |
| 16-289. GPMC_CONFIG | 3321 |
| 16-290. Register Call Summary for Register GPMC_CONFIG | 3322 |
| 16-291. GPMC_STATUS | 3322 |
| 16-292. Register Call Summary for Register GPMC_STATUS | 3323 |
| 16-293. GPMC_CONFIG1_i | 3323 |
| 16-294. Register Call Summary for Register GPMC_CONFIG1_i | 3325 |
| 16-295. GPMC_CONFIG2_i | 3326 |
| 16-296. Register Call Summary for Register GPMC_CONFIG2_i | 3326 |
| 16-297. GPMC_CONFIG3_i | 3327 |
| 16-298. Register Call Summary for Register GPMC_CONFIG3_i | 3328 |
| 16-299. GPMC_CONFIG4_i | 3328 |
| 16-300. Register Call Summary for Register GPMC_CONFIG4_i | 3329 |
| 16-301. GPMC_CONFIG5_i | 3329 |
| 16-302. Register Call Summary for Register GPMC_CONFIG5_i | 3330 |

| | |
|--|------|
| 16-303. GPMC_CONFIG6_i | 3330 |
| 16-304. Register Call Summary for Register GPMC_CONFIG6_i | 3331 |
| 16-305. GPMC_CONFIG7_i | 3331 |
| 16-306. Register Call Summary for Register GPMC_CONFIG7_i | 3332 |
| 16-307. GPMC_NAND_COMMAND_i | 3332 |
| 16-308. Register Call Summary for Register GPMC_NAND_COMMAND_i | 3332 |
| 16-309. GPMC_NAND_ADDRESS_i | 3332 |
| 16-310. Register Call Summary for Register GPMC_NAND_ADDRESS_i | 3333 |
| 16-311. GPMC_NAND_DATA_i | 3333 |
| 16-312. Register Call Summary for Register GPMC_NAND_DATA_i | 3333 |
| 16-313. GPMC_PREFETCH_CONFIG1 | 3333 |
| 16-314. Register Call Summary for Register GPMC_PREFETCH_CONFIG1 | 3335 |
| 16-315. GPMC_PREFETCH_CONFIG2 | 3335 |
| 16-316. Register Call Summary for Register GPMC_PREFETCH_CONFIG2 | 3335 |
| 16-317. GPMC_PREFETCH_CONTROL | 3336 |
| 16-318. Register Call Summary for Register GPMC_PREFETCH_CONTROL | 3336 |
| 16-319. GPMC_PREFETCH_STATUS | 3336 |
| 16-320. Register Call Summary for Register GPMC_PREFETCH_STATUS | 3337 |
| 16-321. GPMC_ECC_CONFIG | 3337 |
| 16-322. Register Call Summary for Register GPMC_ECC_CONFIG | 3338 |
| 16-323. GPMC_ECC_CONTROL | 3338 |
| 16-324. Register Call Summary for Register GPMC_ECC_CONTROL | 3339 |
| 16-325. GPMC_ECC_SIZE_CONFIG | 3339 |
| 16-326. Register Call Summary for Register GPMC_ECC_SIZE_CONFIG | 3340 |
| 16-327. GPMC_ECCj_RESULT | 3341 |
| 16-328. Register Call Summary for Register GPMC_ECCj_RESULT | 3341 |
| 16-329. GPMC_BCH_RESULT0_i | 3342 |
| 16-330. Register Call Summary for Register GPMC_BCH_RESULT0_i | 3342 |
| 16-331. GPMC_BCH_RESULT1_i | 3342 |
| 16-332. Register Call Summary for Register GPMC_BCH_RESULT1_i | 3342 |
| 16-333. GPMC_BCH_RESULT2_i | 3342 |
| 16-334. Register Call Summary for Register GPMC_BCH_RESULT2_i | 3343 |
| 16-335. GPMC_BCH_RESULT3_i | 3343 |
| 16-336. Register Call Summary for Register GPMC_BCH_RESULT3_i | 3343 |
| 16-337. GPMC_BCH_RESULT4_i | 3343 |
| 16-338. Register Call Summary for Register GPMC_BCH_RESULT4_i | 3343 |
| 16-339. GPMC_BCH_RESULT5_i | 3344 |
| 16-340. Register Call Summary for Register GPMC_BCH_RESULT5_i | 3344 |
| 16-341. GPMC_BCH_RESULT6_i | 3344 |
| 16-342. Register Call Summary for Register GPMC_BCH_RESULT6_i | 3344 |
| 16-343. GPMC_BCH_SWDATA | 3344 |
| 16-344. Register Call Summary for Register GPMC_BCH_SWDATA | 3345 |
| 16-345. Integration Attributes | 3347 |
| 16-346. Clocks and Resets | 3348 |
| 16-347. Hardware Requests | 3348 |
| 16-348. Local Power Management Features | 3348 |
| 16-349. Events | 3349 |
| 16-350. ELM_LOCATION_STATUS_i Value Decoding Table | 3350 |
| 16-351. ELM Processing Initialization | 3351 |

| | |
|--|------|
| 16-352. ELM Processing Completion for Continuous Mode | 3352 |
| 16-353. ELM Processing Completion for Page Mode | 3352 |
| 16-354. Use Case: Continuous Mode | 3353 |
| 16-355. 16-bit NAND Sector Buffer Address Map | 3354 |
| 16-356. Use Case: Page Mode | 3355 |
| 16-357. ELM Instance Summary | 3356 |
| 16-358. ELM Registers Mapping Summary | 3357 |
| 16-359. ELM_REVISION | 3357 |
| 16-360. Register Call Summary for Register ELM_REVISION | 3358 |
| 16-361. ELM_SYSCONFIG | 3358 |
| 16-362. Register Call Summary for Register ELM_SYSCONFIG | 3359 |
| 16-363. ELM_SYSSTATUS | 3359 |
| 16-364. Register Call Summary for Register ELM_SYSSTATUS | 3359 |
| 16-365. ELM_IRQSTATUS | 3360 |
| 16-366. Register Call Summary for Register ELM_IRQSTATUS | 3360 |
| 16-367. ELM_IRQENABLE | 3361 |
| 16-368. Register Call Summary for Register ELM_IRQENABLE | 3361 |
| 16-369. ELM_LOCATION_CONFIG | 3361 |
| 16-370. Register Call Summary for Register ELM_LOCATION_CONFIG | 3362 |
| 16-371. ELM_PAGE_CTRL | 3362 |
| 16-372. Register Call Summary for Register ELM_PAGE_CTRL | 3363 |
| 16-373. ELM_SYNDROME_FRAGMENT_0_i | 3363 |
| 16-374. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_0_i | 3363 |
| 16-375. ELM_SYNDROME_FRAGMENT_1_i | 3363 |
| 16-376. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_1_i | 3364 |
| 16-377. ELM_SYNDROME_FRAGMENT_2_i | 3364 |
| 16-378. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_2_i | 3364 |
| 16-379. ELM_SYNDROME_FRAGMENT_3_i | 3364 |
| 16-380. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_3_i | 3364 |
| 16-381. ELM_SYNDROME_FRAGMENT_4_i | 3365 |
| 16-382. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_4_i | 3365 |
| 16-383. ELM_SYNDROME_FRAGMENT_5_i | 3365 |
| 16-384. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_5_i | 3365 |
| 16-385. ELM_SYNDROME_FRAGMENT_6_i | 3365 |
| 16-386. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_6_i | 3366 |
| 16-387. ELM_LOCATION_STATUS_i | 3366 |
| 16-388. Register Call Summary for Register ELM_LOCATION_STATUS_i | 3366 |
| 16-389. ELM_ERROR_LOCATION_0_i | 3367 |
| 16-390. Register Call Summary for Register ELM_ERROR_LOCATION_0_i | 3367 |
| 16-391. ELM_ERROR_LOCATION_1_i | 3367 |
| 16-392. Register Call Summary for Register ELM_ERROR_LOCATION_1_i | 3367 |
| 16-393. ELM_ERROR_LOCATION_2_i | 3368 |
| 16-394. Register Call Summary for Register ELM_ERROR_LOCATION_2_i | 3368 |
| 16-395. ELM_ERROR_LOCATION_3_i | 3368 |
| 16-396. Register Call Summary for Register ELM_ERROR_LOCATION_3_i | 3368 |
| 16-397. ELM_ERROR_LOCATION_4_i | 3368 |
| 16-398. Register Call Summary for Register ELM_ERROR_LOCATION_4_i | 3369 |
| 16-399. ELM_ERROR_LOCATION_5_i | 3369 |
| 16-400. Register Call Summary for Register ELM_ERROR_LOCATION_5_i | 3369 |

| | |
|--|------|
| 16-401. ELM_ERROR_LOCATION_6_i | 3369 |
| 16-402. Register Call Summary for Register ELM_ERROR_LOCATION_6_i | 3369 |
| 16-403. ELM_ERROR_LOCATION_7_i | 3370 |
| 16-404. Register Call Summary for Register ELM_ERROR_LOCATION_7_i | 3370 |
| 16-405. ELM_ERROR_LOCATION_8_i | 3370 |
| 16-406. Register Call Summary for Register ELM_ERROR_LOCATION_8_i | 3370 |
| 16-407. ELM_ERROR_LOCATION_9_i | 3370 |
| 16-408. Register Call Summary for Register ELM_ERROR_LOCATION_9_i | 3371 |
| 16-409. ELM_ERROR_LOCATION_10_i | 3371 |
| 16-410. Register Call Summary for Register ELM_ERROR_LOCATION_10_i | 3371 |
| 16-411. ELM_ERROR_LOCATION_11_i | 3371 |
| 16-412. Register Call Summary for Register ELM_ERROR_LOCATION_11_i | 3371 |
| 16-413. ELM_ERROR_LOCATION_12_i | 3372 |
| 16-414. Register Call Summary for Register ELM_ERROR_LOCATION_12_i | 3372 |
| 16-415. ELM_ERROR_LOCATION_13_i | 3372 |
| 16-416. Register Call Summary for Register ELM_ERROR_LOCATION_13_i | 3372 |
| 16-417. ELM_ERROR_LOCATION_14_i | 3372 |
| 16-418. Register Call Summary for Register ELM_ERROR_LOCATION_14_i | 3373 |
| 16-419. ELM_ERROR_LOCATION_15_i | 3373 |
| 16-420. Register Call Summary for Register ELM_ERROR_LOCATION_15_i | 3373 |
| 16-421. Integration Attributes | 3374 |
| 16-422. Clocks and Resets | 3374 |
| 17-1. External sDMA Request Signals | 3380 |
| 17-2. Integration Attributes | 3382 |
| 17-3. Clocks and Resets | 3383 |
| 17-4. Hardware Requests | 3383 |
| 17-5. sDMA Controller Request Mapping | 3384 |
| 17-6. Local Power-Management Features | 3388 |
| 17-7. Clock Activity Settings | 3388 |
| 17-8. Logical DMA Channel Events | 3389 |
| 17-9. Parameter Values for Addressing Mode Examples (a), (b), and (c) | 3394 |
| 17-10. Equations for Rotation | 3394 |
| 17-11. Example Parameter Values for a 90-Degree Clockwise Image Rotation | 3395 |
| 17-12. Buffering Disable | 3398 |
| 17-13. Type 1 | 3405 |
| 17-14. Type 2 With Source and Destination Address Updates | 3405 |
| 17-15. Type 2 With Source or Destination Address Update | 3406 |
| 17-16. Type 3 With Source and Destination Address Updates | 3406 |
| 17-17. Type 3 With Source or Destination Address Update | 3406 |
| 17-18. SAR RAM Allocation | 3412 |
| 17-19. SAR_RAM_1 Memory Mapping | 3413 |
| 17-20. SAR_RAM_2 Memory Mapping | 3418 |
| 17-21. SAR_RAM_3 Memory Mapping | 3418 |
| 17-22. sDMA Instance Summary | 3431 |
| 17-23. sDMA Registers Mapping Summary | 3431 |
| 17-24. DMA4_REVISION | 3432 |
| 17-25. Register Call Summary for Register DMA4_REVISION | 3433 |
| 17-26. DMA4_IRQSTATUS_Lj | 3433 |
| 17-27. Register Call Summary for Register DMA4_IRQSTATUS_Lj | 3433 |

| | |
|--|------|
| 17-28. DMA4_IRQENABLE_Lj | 3433 |
| 17-29. Register Call Summary for Register DMA4_IRQENABLE_Lj | 3434 |
| 17-30. DMA4_SYSSTATUS | 3434 |
| 17-31. Register Call Summary for Register DMA4_SYSSTATUS | 3434 |
| 17-32. DMA4_OCP_SYSCONFIG | 3434 |
| 17-33. Register Call Summary for Register DMA4_OCP_SYSCONFIG | 3435 |
| 17-34. DMA4_CAPS_0 | 3436 |
| 17-35. Register Call Summary for Register DMA4_CAPS_0 | 3436 |
| 17-36. DMA4_CAPS_2 | 3436 |
| 17-37. Register Call Summary for Register DMA4_CAPS_2 | 3438 |
| 17-38. DMA4_CAPS_3 | 3438 |
| 17-39. Register Call Summary for Register DMA4_CAPS_3 | 3439 |
| 17-40. DMA4_CAPS_4 | 3439 |
| 17-41. Register Call Summary for Register DMA4_CAPS_4 | 3440 |
| 17-42. DMA4_GCR | 3441 |
| 17-43. Register Call Summary for Register DMA4_GCR | 3442 |
| 17-44. DMA4_CCRi | 3442 |
| 17-45. Register Call Summary for Register DMA4_CCRi | 3445 |
| 17-46. DMA4_CLNK_CTRLi | 3445 |
| 17-47. Register Call Summary for Register DMA4_CLNK_CTRLi | 3446 |
| 17-48. DMA4_CICRi | 3446 |
| 17-49. Register Call Summary for Register DMA4_CICRi | 3447 |
| 17-50. DMA4_CSRi | 3447 |
| 17-51. Register Call Summary for Register DMA4_CSRi | 3449 |
| 17-52. DMA4_CSDPi | 3449 |
| 17-53. Register Call Summary for Register DMA4_CSDPi | 3451 |
| 17-54. DMA4_CENi | 3451 |
| 17-55. Register Call Summary for Register DMA4_CENi | 3451 |
| 17-56. DMA4_CFNi | 3452 |
| 17-57. Register Call Summary for Register DMA4_CFNi | 3452 |
| 17-58. DMA4_CSSAi | 3452 |
| 17-59. Register Call Summary for Register DMA4_CSSAi | 3452 |
| 17-60. DMA4_CDSAi | 3453 |
| 17-61. Register Call Summary for Register DMA4_CDSAi | 3453 |
| 17-62. DMA4_CSEli | 3453 |
| 17-63. Register Call Summary for Register DMA4_CSEli | 3453 |
| 17-64. DMA4_CSFli | 3454 |
| 17-65. Register Call Summary for Register DMA4_CSFli | 3454 |
| 17-66. DMA4_CDEli | 3454 |
| 17-67. Register Call Summary for Register DMA4_CDEli | 3454 |
| 17-68. DMA4_CDFli | 3455 |
| 17-69. Register Call Summary for Register DMA4_CDFli | 3455 |
| 17-70. DMA4_CSACi | 3455 |
| 17-71. Register Call Summary for Register DMA4_CSACi | 3455 |
| 17-72. DMA4_CDACi | 3456 |
| 17-73. Register Call Summary for Register DMA4_CDACi | 3456 |
| 17-74. DMA4_CCENi | 3456 |
| 17-75. Register Call Summary for Register DMA4_CCENi | 3456 |
| 17-76. DMA4_CCFNi | 3457 |

| | |
|---|------|
| 17-77. Register Call Summary for Register DMA4_CCFNi | 3457 |
| 17-78. DMA4_COLORi..... | 3457 |
| 17-79. Register Call Summary for Register DMA4_COLORi | 3457 |
| 17-80. DMA4_CDPi..... | 3458 |
| 17-81. Register Call Summary for Register DMA4_CDPi | 3459 |
| 17-82. DMA4_CNDPi..... | 3459 |
| 17-83. Register Call Summary for Register DMA4_CNDPi | 3459 |
| 17-84. DMA4_CCDNi..... | 3460 |
| 17-85. Register Call Summary for Register DMA4_CCDNi | 3460 |
| 18-1. INTC I/O Signals..... | 3464 |
| 18-2. Cortex-A9 MPU INTC Interrupt Mapping | 3465 |
| 18-3. Cortex-M3 MPU INTC Interrupt Mapping | 3468 |
| 19-1. Control Module I/O Description | 3476 |
| 19-2. Clocks and Resets | 3477 |
| 19-3. Hardware Requests | 3477 |
| 19-4. Integration Attributes | 3480 |
| 19-5. Internal Clock Gating Options..... | 3484 |
| 19-6. Bit Meanings for CONTROL_(CORE/WKUP)_PAD0_X_PAD1_Y Registers..... | 3490 |
| 19-7. Mode Selection | 3490 |
| 19-8. Pull Selection..... | 3491 |
| 19-9. Device Wake-Up Control Module Pad Configuration Register Fields | 3493 |
| 19-10. Device Core Control Module Pad Configuration Register Fields..... | 3495 |
| 19-11. Pin Types | 3512 |
| 19-12. Recommended Configuration For Unconnected Device Pads | 3514 |
| 19-13. PBIAS Cell and Extended-Drain I/O Pin CONTROL_PBIAS_LITE Bit Control | 3515 |
| 19-14. Power Supplies | 3516 |
| 19-15. PBIAS/Extended-Drain I/O Cells Control Signals | 3518 |
| 19-16. Voltage Configuration | 3519 |
| 19-17. PBIAS Error Signal Truth Table | 3520 |
| 19-18. Band Gap Voltage and Temperature Sensor Signal Description | 3522 |
| 19-19. General Core Control Thermal Logic Outputs Description..... | 3523 |
| 19-20. Bandgap Counter Programming Examples | 3527 |
| 19-21. ADC Code Versus Temperature..... | 3534 |
| 19-22. CORE Power Domain Observability Signals Multiplexing | 3541 |
| 19-23. DPLL Signal Observability Controls..... | 3547 |
| 19-24. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 0 | 3550 |
| 19-25. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 1 | 3551 |
| 19-26. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 2 | 3551 |
| 19-27. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level - Mode 3..... | 3552 |
| 19-28. CPU0/CPU1 PM Profiling Bus Observable Signals Description | 3553 |
| 19-29. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 4 | 3553 |
| 19-30. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 5 | 3554 |
| 19-31. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 6 | 3555 |
| 19-32. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 7 | 3555 |
| 19-33. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 8 | 3556 |
| 19-34. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 9 | 3556 |
| 19-35. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 10..... | 3557 |
| 19-36. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 11..... | 3557 |
| 19-37. Observability Signals at IVA-HD Subsystem Level | 3557 |

| | |
|---|------|
| 19-38. Observability Signals at Display Subsystem Level..... | 3558 |
| 19-39. Observability Signals at ABE Subsystem Level | 3559 |
| 19-40. CM2 Observable Signals | 3560 |
| 19-41. CM1 Observable Signals | 3592 |
| 19-42. PRM Observable Signals..... | 3612 |
| 19-43. SAR FSM State Description | 3650 |
| 19-44. DPLLCtrl FSM State Description | 3651 |
| 19-45. EMIF FSM State Description..... | 3653 |
| 19-46. I/O Controller FSM State Description | 3654 |
| 19-47. PM FSM State Description | 3655 |
| 19-48. Warm Reset FSM State Description | 3657 |
| 19-49. CM FSM State Description | 3657 |
| 19-50. Different DPLL Observable Clock Output Signals | 3658 |
| 19-51. Other CORE DPLL Observability Signals | 3658 |
| 19-52. Other ABE DPLL Observability Signals | 3659 |
| 19-53. Other PERIPH DPLL Observability Signals..... | 3659 |
| 19-54. Other DSI1 DPLL Observability Signals..... | 3659 |
| 19-55. Other DSI2 DPLL Observability Signals..... | 3660 |
| 19-56. Other USB DPLL Observability Signals | 3660 |
| 19-57. PBIAS Control Register..... | 3661 |
| 19-58. Temperature Sensor Register | 3661 |
| 19-59. CSI Receiver Control Register..... | 3661 |
| 19-60. Protection Status Registers | 3662 |
| 19-61. Protection SDRAM Configuration Registers for EMIF1 and EMIF2 | 3663 |
| 19-62. LPDDR2IO Buffer Control Register | 3664 |
| 19-63. EMIF DLL Slave Offset Compensation Registers..... | 3666 |
| 19-64. EMIF DLL Master Code-Monitoring Registers..... | 3666 |
| 19-65. Force MPU Write Nonposted Transactions Control Register..... | 3666 |
| 19-66. Signal Integrity Parameter Control Registers | 3667 |
| 19-67. Weak Driver PUPD/Latch Mode | 3669 |
| 19-68. LPDDR2 Internal Reference Configuration | 3670 |
| 19-69. LPDDR2 Vref Cells State Description | 3672 |
| 19-70. LPDDR2 Vref Cell Decoupling Cap Selection | 3672 |
| 19-71. Slew Control Mode (Coarse) Settings | 3673 |
| 19-72. Load Bit (Fine) Settings..... | 3673 |
| 19-73. Software Controls for I/Os With Combined Mode and Load Settings | 3673 |
| 19-74. C2C Vref Cell State Description | 3676 |
| 19-75. C2C Vref Cell Decoupling Cap Selection | 3677 |
| 19-76. EMIF (LPDDR2IO) Signal Group Parameter Controls to Different Interface I/O Pads Mapping..... | 3678 |
| 19-77. GPMC I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping..... | 3681 |
| 19-78. CAMERA I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3682 |
| 19-79. USBB1 I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3682 |
| 19-80. USBB2 I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3684 |
| 19-81. Core Domain GPIO I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3684 |
| 19-82. KEYPAD I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3685 |
| 19-83. HDQ I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3685 |
| 19-84. Wake-Up Domain GPIO Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3685 |
| 19-85. SDMMC1 Signal Group Parameter Controls to Different Interface I/O Pads Mapping..... | 3685 |
| 19-86. SDMMC5 Signal Group Parameter Controls to Different Interface I/O Pads Mapping..... | 3686 |

| | |
|---|------|
| 19-87. ABE McBSP1 Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3687 |
| 19-88. ABE McBSP2 Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3687 |
| 19-89. ABE McPDM Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3687 |
| 19-90. ABE DMIC Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3687 |
| 19-91. ABE Shared Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3688 |
| 19-92. UART2 Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3688 |
| 19-93. UART3 Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3688 |
| 19-94. UART4 Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3688 |
| 19-95. McSPI1 Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3688 |
| 19-96. McSPI4 Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3689 |
| 19-97. I2C1 Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3689 |
| 19-98. I2C2 Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3690 |
| 19-99. I2C3 Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3690 |
| 19-100. I2C4 Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3691 |
| 19-101. SR Signal Group Parameter Controls to Different Interface I/O Pads Mapping | 3691 |
| 19-102. System Signals Group Parameter Controls to Different Interface I/O Pads Mapping | 3692 |
| 19-103. DPM Signals Group Parameter Controls to Different Interface I/O Pads Mapping | 3693 |
| 19-104. Dual-Voltage Peripheral Control Bits vs Pad Mapping | 3694 |
| 19-105. Global Initialization of Surrounding Modules | 3697 |
| 19-106. Configure Clock Gating for Different Control Module Instances | 3697 |
| 19-107. Register Settings for Configuring the MMC1_PBIAS and MMC1 I/O Cells | 3698 |
| 19-108. Configure Hardware Observability Features | 3700 |
| 19-109. Setting Pad Off Mode Through Padconfiguration Registers | 3701 |
| 19-110. ACTIVE PADS Configuration Points | 3703 |
| 19-111. Control Module Instance Summary | 3704 |
| 19-112. SYSCTRL_GENERAL_CORE Register Mapping Summary | 3704 |
| 19-113. CONTROL_GEN_CORE_REVISION | 3708 |
| 19-114. Register Call Summary for Register CONTROL_GEN_CORE_REVISION | 3708 |
| 19-115. CONTROL_GEN_CORE_HWINFO | 3708 |
| 19-116. Register Call Summary for Register CONTROL_GEN_CORE_HWINFO | 3708 |
| 19-117. CONTROL_GEN_CORE_SYSCONFIG | 3708 |
| 19-118. Register Call Summary for Register CONTROL_GEN_CORE_SYSCONFIG | 3709 |
| 19-119. CONTROL_STD_FUSE_DIE_ID_0 | 3709 |
| 19-120. Register Call Summary for Register CONTROL_STD_FUSE_DIE_ID_0 | 3709 |
| 19-121. CONTROL_ID_CODE | 3710 |
| 19-122. Register Call Summary for Register CONTROL_ID_CODE | 3710 |
| 19-123. CONTROL_STD_FUSE_DIE_ID_1 | 3710 |
| 19-124. Register Call Summary for Register CONTROL_STD_FUSE_DIE_ID_1 | 3710 |
| 19-125. CONTROL_STD_FUSE_DIE_ID_2 | 3710 |
| 19-126. Register Call Summary for Register CONTROL_STD_FUSE_DIE_ID_2 | 3711 |
| 19-127. CONTROL_STD_FUSE_DIE_ID_3 | 3711 |
| 19-128. Register Call Summary for Register CONTROL_STD_FUSE_DIE_ID_3 | 3711 |
| 19-129. CONTROL_STD_FUSE_PROD_ID_0 | 3711 |
| 19-130. Register Call Summary for Register CONTROL_STD_FUSE_PROD_ID_0 | 3711 |
| 19-131. CONTROL_STD_FUSE_PROD_ID_1 | 3712 |
| 19-132. Register Call Summary for Register CONTROL_STD_FUSE_PROD_ID_1 | 3712 |
| 19-133. CONTROL_STD_FUSE_USB_CONF | 3712 |
| 19-134. Register Call Summary for Register CONTROL_STD_FUSE_USB_CONF | 3712 |
| 19-135. CONTROL_STD_FUSE_CONF | 3713 |

| | |
|--|------|
| 19-136. Register Call Summary for Register CONTROL_STD_FUSE_CONF | 3714 |
| 19-137. CONTROL_STD_FUSE_OPP_VDD_WKUP | 3714 |
| 19-138. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_WKUP | 3715 |
| 19-139. CONTROL_STD_FUSE_OPP_VDD_IVA_0..... | 3715 |
| 19-140. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_IVA_0 | 3715 |
| 19-141. CONTROL_STD_FUSE_OPP_VDD_IVA_1..... | 3716 |
| 19-142. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_IVA_1 | 3716 |
| 19-143. CONTROL_STD_FUSE_OPP_VDD_IVA_2..... | 3716 |
| 19-144. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_IVA_2 | 3717 |
| 19-145. CONTROL_STD_FUSE_OPP_VDD_IVA_3..... | 3717 |
| 19-146. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_IVA_3 | 3718 |
| 19-147. CONTROL_STD_FUSE_OPP_VDD_MPU_0 | 3718 |
| 19-148. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_MPU_0 | 3719 |
| 19-149. CONTROL_STD_FUSE_OPP_VDD_MPU_1 | 3719 |
| 19-150. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_MPU_1 | 3719 |
| 19-151. CONTROL_STD_FUSE_OPP_VDD_MPU_2 | 3720 |
| 19-152. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_MPU_2 | 3720 |
| 19-153. CONTROL_STD_FUSE_OPP_VDD_MPU_3..... | 3721 |
| 19-154. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_MPU_3 | 3721 |
| 19-155. CONTROL_STD_FUSE_OPP_VDD_CORE_0 | 3721 |
| 19-156. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_CORE_0..... | 3722 |
| 19-157. CONTROL_STD_FUSE_OPP_VDD_CORE_1 | 3722 |
| 19-158. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_CORE_1..... | 3723 |
| 19-159. CONTROL_STD_FUSE_OPP_VDD_CORE_2 | 3723 |
| 19-160. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_CORE_2..... | 3723 |
| 19-161. CONTROL_STD_FUSE_OPP_BGAP..... | 3724 |
| 19-162. Register Call Summary for Register CONTROL_STD_FUSE_OPP_BGAP | 3724 |
| 19-163. CONTROL_STD_FUSE_OPP_DPLL_0 | 3724 |
| 19-164. Register Call Summary for Register CONTROL_STD_FUSE_OPP_DPLL_0..... | 3724 |
| 19-165. CONTROL_STD_FUSE_OPP_DPLL_1 | 3724 |
| 19-166. Register Call Summary for Register CONTROL_STD_FUSE_OPP_DPLL_1 | 3725 |
| 19-167. CONTROL_STATUS | 3725 |
| 19-168. Register Call Summary for Register CONTROL_STATUS..... | 3726 |
| 19-169. CONTROL_SEC_ERR_STATUS_FUNC | 3726 |
| 19-170. Register Call Summary for Register CONTROL_SEC_ERR_STATUS_FUNC..... | 3727 |
| 19-171. CONTROL_SEC_ERR_STATUS_DEBUG | 3728 |
| 19-172. Register Call Summary for Register CONTROL_SEC_ERR_STATUS_DEBUG | 3729 |
| 19-173. CONTROL_DEV_CONF | 3729 |
| 19-174. Register Call Summary for Register CONTROL_DEV_CONF..... | 3730 |
| 19-175. CONTROL_LDOVBB_IVA_VOLTAGE_CTRL | 3730 |
| 19-176. Register Call Summary for Register CONTROL_LDOVBB_IVA_VOLTAGE_CTRL..... | 3730 |
| 19-177. CONTROL_LDOVBB_MPU_VOLTAGE_CTRL..... | 3731 |
| 19-178. Register Call Summary for Register CONTROL_LDOVBB_MPU_VOLTAGE_CTRL | 3731 |
| 19-179. CONTROL_LDOSRAM_IVA_VOLTAGE_CTRL..... | 3731 |
| 19-180. Register Call Summary for Register CONTROL_LDOSRAM_IVA_VOLTAGE_CTRL | 3732 |
| 19-181. CONTROL_LDOSRAM_MPU_VOLTAGE_CTRL | 3732 |
| 19-182. Register Call Summary for Register CONTROL_LDOSRAM_MPU_VOLTAGE_CTRL..... | 3733 |
| 19-183. CONTROL_LDOSRAM_CORE_VOLTAGE_CTRL | 3733 |
| 19-184. Register Call Summary for Register CONTROL_LDOSRAM_CORE_VOLTAGE_CTRL | 3734 |

| | |
|--|------|
| 19-185. CONTROL_TEMP_SENSOR | 3734 |
| 19-186. Register Call Summary for Register CONTROL_TEMP_SENSOR | 3735 |
| 19-187. CONTROL_DPLL_NWELL_TRIM_0 | 3735 |
| 19-188. Register Call Summary for Register CONTROL_DPLL_NWELL_TRIM_0 | 3736 |
| 19-189. CONTROL_DPLL_NWELL_TRIM_1 | 3737 |
| 19-190. Register Call Summary for Register CONTROL_DPLL_NWELL_TRIM_1 | 3737 |
| 19-191. CONTROL_USBOTGHS_CONTROL | 3738 |
| 19-192. Register Call Summary for Register CONTROL_USBOTGHS_CONTROL | 3739 |
| 19-193. CONTROL_DSS_CONTROL | 3739 |
| 19-194. Register Call Summary for Register CONTROL_DSS_CONTROL | 3739 |
| 19-195. CONTROL_CORTEX_M3_MMUADDRTRANSLTR | 3739 |
| 19-196. Register Call Summary for Register CONTROL_CORTEX_M3_MMUADDRTRANSLTR | 3740 |
| 19-197. CONTROL_CORTEX_M3_MMUADDRLOGICTR | 3740 |
| 19-198. Register Call Summary for Register CONTROL_CORTEX_M3_MMUADDRLOGICTR | 3740 |
| 19-199. CONTROL_HWOBS_CONTROL | 3740 |
| 19-200. Register Call Summary for Register CONTROL_HWOBS_CONTROL | 3742 |
| 19-201. CONTROL_EMIF1_OFFSET | 3742 |
| 19-202. Register Call Summary for Register CONTROL_EMIF1_OFFSET | 3742 |
| 19-203. CONTROL_EMIF2_OFFSET | 3742 |
| 19-204. Register Call Summary for Register CONTROL_EMIF2_OFFSET | 3743 |
| 19-205. CONTROL_EMIF1_MASTER_CODE_0 | 3743 |
| 19-206. Register Call Summary for Register CONTROL_EMIF1_MASTER_CODE_0 | 3743 |
| 19-207. CONTROL_EMIF1_MASTER_CODE_1 | 3743 |
| 19-208. Register Call Summary for Register CONTROL_EMIF1_MASTER_CODE_1 | 3744 |
| 19-209. CONTROL_EMIF2_MASTER_CODE_0 | 3744 |
| 19-210. Register Call Summary for Register CONTROL_EMIF2_MASTER_CODE_0 | 3744 |
| 19-211. CONTROL_EMIF2_MASTER_CODE_1 | 3744 |
| 19-212. Register Call Summary for Register CONTROL_EMIF2_MASTER_CODE_1 | 3744 |
| 19-213. CONTROL_BANDGAP_CTRL | 3745 |
| 19-214. Register Call Summary for Register CONTROL_BANDGAP_CTRL | 3745 |
| 19-215. CONTROL_BANDGAP_COUNTER | 3745 |
| 19-216. Register Call Summary for Register CONTROL_BANDGAP_COUNTER | 3746 |
| 19-217. CONTROL_BANDGAP_THRESHOLD | 3746 |
| 19-218. Register Call Summary for Register CONTROL_BANDGAP_THRESHOLD | 3746 |
| 19-219. CONTROL_TSHUT_THRESHOLD | 3746 |
| 19-220. Register Call Summary for Register CONTROL_TSHUT_THRESHOLD | 3747 |
| 19-221. CONTROL_BANDGAP_STATUS | 3747 |
| 19-222. Register Call Summary for Register CONTROL_BANDGAP_STATUS | 3747 |
| 19-223. CONTROL_FORCEWRNP | 3748 |
| 19-224. Register Call Summary for Register CONTROL_FORCEWRNP | 3748 |
| 19-225. CONTROL_GEN_CORE_OCPREG_SPARE | 3748 |
| 19-226. Register Call Summary for Register CONTROL_GEN_CORE_OCPREG_SPARE | 3749 |
| 19-227. CONTROL_DEBOBS_FINAL_MUX_SEL | 3749 |
| 19-228. Register Call Summary for Register CONTROL_DEBOBS_FINAL_MUX_SEL | 3749 |
| 19-229. CONTROL_DEBOBS_MMR_MPU | 3750 |
| 19-230. Register Call Summary for Register CONTROL_DEBOBS_MMR_MPU | 3750 |
| 19-231. CONTROL_CONF_SDMA_REQ_SEL0 | 3750 |
| 19-232. Register Call Summary for Register CONTROL_CONF_SDMA_REQ_SEL0 | 3753 |
| 19-233. CONTROL_CONF_SDMA_REQ_SEL1 | 3753 |

| | |
|--|------|
| 19-234. Register Call Summary for Register CONTROL_CONF_SDMA_REQ_SEL1 | 3756 |
| 19-235. CONTROL_CONF_SDMA_REQ_SEL2..... | 3756 |
| 19-236. Register Call Summary for Register CONTROL_CONF_SDMA_REQ_SEL2 | 3759 |
| 19-237. CONTROL_CONF_SDMA_REQ_SEL3..... | 3759 |
| 19-238. Register Call Summary for Register CONTROL_CONF_SDMA_REQ_SEL3 | 3762 |
| 19-239. CONTROL_CONF_CLK_SEL0 | 3762 |
| 19-240. Register Call Summary for Register CONTROL_CONF_CLK_SEL0 | 3762 |
| 19-241. CONTROL_CONF_CLK_SEL1 | 3763 |
| 19-242. Register Call Summary for Register CONTROL_CONF_CLK_SEL1 | 3763 |
| 19-243. CONTROL_CONF_CLK_SEL2 | 3763 |
| 19-244. Register Call Summary for Register CONTROL_CONF_CLK_SEL2 | 3764 |
| 19-245. CONTROL_CONF_DPLL_FREQLOCK_SEL | 3764 |
| 19-246. Register Call Summary for Register CONTROL_CONF_DPLL_FREQLOCK_SEL..... | 3765 |
| 19-247. CONTROL_CONF_DPLL_TINITZ_SEL..... | 3765 |
| 19-248. Register Call Summary for Register CONTROL_CONF_DPLL_TINITZ_SEL | 3765 |
| 19-249. CONTROL_CONF_DPLL_PHASELOCK_SEL | 3765 |
| 19-250. Register Call Summary for Register CONTROL_CONF_DPLL_PHASELOCK_SEL | 3766 |
| 19-251. CONTROL_CONF_DPLL_TENABLE_SEL..... | 3766 |
| 19-252. Register Call Summary for Register CONTROL_CONF_DPLL_TENABLE_SEL | 3766 |
| 19-253. CONTROL_CONF_DPLL_TENABLEDIV_SEL | 3767 |
| 19-254. Register Call Summary for Register CONTROL_CONF_DPLL_TENABLEDIV_SEL..... | 3767 |
| 19-255. CONTROL_CONF_DPLL_BYPASSACK_SEL..... | 3767 |
| 19-256. Register Call Summary for Register CONTROL_CONF_DPLL_BYPASSACK_SEL | 3768 |
| 19-257. CONTROL_CONF_DPLL_IDLE_SEL | 3768 |
| 19-258. Register Call Summary for Register CONTROL_CONF_DPLL_IDLE_SEL | 3769 |
| 19-259. CONTROL_CORE_CONF_DEBUG_SEL_TST_0..... | 3769 |
| 19-260. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_0 | 3769 |
| 19-261. CONTROL_CORE_CONF_DEBUG_SEL_TST_1..... | 3770 |
| 19-262. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_1 | 3770 |
| 19-263. CONTROL_CORE_CONF_DEBUG_SEL_TST_2..... | 3770 |
| 19-264. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_2 | 3771 |
| 19-265. CONTROL_CORE_CONF_DEBUG_SEL_TST_3..... | 3771 |
| 19-266. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_3 | 3772 |
| 19-267. CONTROL_CORE_CONF_DEBUG_SEL_TST_4..... | 3772 |
| 19-268. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_4 | 3772 |
| 19-269. CONTROL_CORE_CONF_DEBUG_SEL_TST_5..... | 3773 |
| 19-270. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_5 | 3773 |
| 19-271. CONTROL_CORE_CONF_DEBUG_SEL_TST_6..... | 3773 |
| 19-272. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_6 | 3774 |
| 19-273. CONTROL_CORE_CONF_DEBUG_SEL_TST_7..... | 3774 |
| 19-274. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_7 | 3775 |
| 19-275. CONTROL_CORE_CONF_DEBUG_SEL_TST_8..... | 3775 |
| 19-276. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_8 | 3775 |
| 19-277. CONTROL_CORE_CONF_DEBUG_SEL_TST_9..... | 3776 |
| 19-278. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_9 | 3776 |
| 19-279. CONTROL_CORE_CONF_DEBUG_SEL_TST_10 | 3776 |
| 19-280. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_10..... | 3777 |
| 19-281. CONTROL_CORE_CONF_DEBUG_SEL_TST_11 | 3777 |
| 19-282. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_11..... | 3778 |

| | |
|--|------|
| 19-283. CONTROL_CORE_CONF_DEBUG_SEL_TST_12 | 3778 |
| 19-284. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_12..... | 3778 |
| 19-285. CONTROL_CORE_CONF_DEBUG_SEL_TST_13 | 3779 |
| 19-286. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_13..... | 3779 |
| 19-287. CONTROL_CORE_CONF_DEBUG_SEL_TST_14 | 3779 |
| 19-288. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_14..... | 3780 |
| 19-289. CONTROL_CORE_CONF_DEBUG_SEL_TST_15 | 3780 |
| 19-290. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_15..... | 3781 |
| 19-291. CONTROL_CORE_CONF_DEBUG_SEL_TST_16 | 3781 |
| 19-292. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_16..... | 3781 |
| 19-293. CONTROL_CORE_CONF_DEBUG_SEL_TST_17 | 3782 |
| 19-294. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_17..... | 3782 |
| 19-295. CONTROL_CORE_CONF_DEBUG_SEL_TST_18 | 3782 |
| 19-296. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_18..... | 3783 |
| 19-297. CONTROL_CORE_CONF_DEBUG_SEL_TST_19 | 3783 |
| 19-298. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_19..... | 3784 |
| 19-299. CONTROL_CORE_CONF_DEBUG_SEL_TST_20 | 3784 |
| 19-300. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_20..... | 3784 |
| 19-301. CONTROL_CORE_CONF_DEBUG_SEL_TST_21 | 3785 |
| 19-302. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_21..... | 3785 |
| 19-303. CONTROL_CORE_CONF_DEBUG_SEL_TST_22 | 3785 |
| 19-304. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_22..... | 3786 |
| 19-305. CONTROL_CORE_CONF_DEBUG_SEL_TST_23 | 3786 |
| 19-306. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_23..... | 3787 |
| 19-307. CONTROL_CORE_CONF_DEBUG_SEL_TST_24 | 3787 |
| 19-308. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_24..... | 3787 |
| 19-309. CONTROL_CORE_CONF_DEBUG_SEL_TST_25 | 3787 |
| 19-310. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_25..... | 3788 |
| 19-311. CONTROL_CORE_CONF_DEBUG_SEL_TST_26 | 3788 |
| 19-312. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_26..... | 3789 |
| 19-313. CONTROL_CORE_CONF_DEBUG_SEL_TST_27 | 3789 |
| 19-314. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_27..... | 3789 |
| 19-315. CONTROL_CORE_CONF_DEBUG_SEL_TST_28 | 3790 |
| 19-316. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_28..... | 3790 |
| 19-317. CONTROL_CORE_CONF_DEBUG_SEL_TST_29 | 3790 |
| 19-318. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_29..... | 3791 |
| 19-319. CONTROL_CORE_CONF_DEBUG_SEL_TST_30 | 3791 |
| 19-320. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_30..... | 3792 |
| 19-321. CONTROL_CORE_CONF_DEBUG_SEL_TST_31 | 3792 |
| 19-322. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_31..... | 3793 |
| 19-323. SYSCtrl_GENERAL_WKUP Register Mapping Summary | 3793 |
| 19-324. CONTROL_GEN_WKUP_REVISION | 3794 |
| 19-325. Register Call Summary for Register CONTROL_GEN_WKUP_REVISION..... | 3794 |
| 19-326. CONTROL_GEN_WKUP_HWINFO | 3794 |
| 19-327. Register Call Summary for Register CONTROL_GEN_WKUP_HWINFO..... | 3794 |
| 19-328. CONTROL_GEN_WKUP_SYSCONFIG | 3794 |
| 19-329. Register Call Summary for Register CONTROL_GEN_WKUP_SYSCONFIG..... | 3795 |
| 19-330. CONTROL_OCPREG_SPARE..... | 3795 |
| 19-331. Register Call Summary for Register CONTROL_OCPREG_SPARE | 3796 |

| | |
|--|------|
| 19-332. CONTROL_WKUP_PROT_EMIF1_SDRAM_CONFIG_REG | 3796 |
| 19-333. Register Call Summary for Register CONTROL_WKUP_PROT_EMIF1_SDRAM_CONFIG_REG | 3798 |
| 19-334. CONTROL_WKUP_PROT_EMIF1_SDRAM_CONFIG2_REG | 3799 |
| 19-335. Register Call Summary for Register CONTROL_WKUP_PROT_EMIF1_SDRAM_CONFIG2_REG | 3799 |
| 19-336. CONTROL_WKUP_PROT_EMIF2_SDRAM_CONFIG_REG | 3800 |
| 19-337. Register Call Summary for Register CONTROL_WKUP_PROT_EMIF2_SDRAM_CONFIG_REG | 3802 |
| 19-338. CONTROL_WKUP_PROT_EMIF2_SDRAM_CONFIG2_REG | 3802 |
| 19-339. Register Call Summary for Register CONTROL_WKUP_PROT_EMIF2_SDRAM_CONFIG2_REG | 3803 |
| 19-340. CONTROL_WKUP_CONF_DEBUG_SEL_TST_i | 3803 |
| 19-341. Register Call Summary for Register CONTROL_WKUP_CONF_DEBUG_SEL_TST_i | 3803 |
| 19-342. SYSCTRL_PADCONF_CORE Register Mapping Summary | 3803 |
| 19-343. CONTROL_PADCONF_CORE_REVISION | 3809 |
| 19-344. Register Call Summary for Register CONTROL_PADCONF_CORE_REVISION | 3809 |
| 19-345. CONTROL_PADCONF_CORE_HWINFO | 3810 |
| 19-346. Register Call Summary for Register CONTROL_PADCONF_CORE_HWINFO | 3810 |
| 19-347. CONTROL_PADCONF_CORE_SYSCONFIG | 3810 |
| 19-348. Register Call Summary for Register CONTROL_PADCONF_CORE_SYSCONFIG | 3810 |
| 19-349. CONTROL_CORE_PAD0_GPMC_AD0_PAD1_GPMC_AD1 | 3811 |
| 19-350. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_AD0_PAD1_GPMC_AD1 | 3813 |
| 19-351. CONTROL_CORE_PAD0_GPMC_AD2_PAD1_GPMC_AD3 | 3813 |
| 19-352. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_AD2_PAD1_GPMC_AD3 | 3815 |
| 19-353. CONTROL_CORE_PAD0_GPMC_AD4_PAD1_GPMC_AD5 | 3815 |
| 19-354. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_AD4_PAD1_GPMC_AD5 | 3817 |
| 19-355. CONTROL_CORE_PAD0_GPMC_AD6_PAD1_GPMC_AD7 | 3817 |
| 19-356. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_AD6_PAD1_GPMC_AD7 | 3819 |
| 19-357. CONTROL_CORE_PAD0_GPMC_AD8_PAD1_GPMC_AD9 | 3820 |
| 19-358. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_AD8_PAD1_GPMC_AD9 | 3822 |
| 19-359. CONTROL_CORE_PAD0_GPMC_AD10_PAD1_GPMC_AD11 | 3822 |
| 19-360. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_AD10_PAD1_GPMC_AD11 | 3824 |
| 19-361. CONTROL_CORE_PAD0_GPMC_AD12_PAD1_GPMC_AD13 | 3824 |
| 19-362. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_AD12_PAD1_GPMC_AD13 | 3826 |
| 19-363. CONTROL_CORE_PAD0_GPMC_AD14_PAD1_GPMC_AD15 | 3826 |
| 19-364. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_AD14_PAD1_GPMC_AD15 | 3829 |
| 19-365. CONTROL_CORE_PAD0_GPMC_A16_PAD1_GPMC_A17 | 3829 |
| 19-366. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_A16_PAD1_GPMC_A17 | 3831 |
| 19-367. CONTROL_CORE_PAD0_GPMC_A18_PAD1_GPMC_A19 | 3831 |
| 19-368. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_A18_PAD1_GPMC_A19 | 3833 |
| 19-369. CONTROL_CORE_PAD0_GPMC_A20_PAD1_GPMC_A21 | 3833 |
| 19-370. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_A20_PAD1_GPMC_A21 | 3836 |
| 19-371. CONTROL_CORE_PAD0_GPMC_A22_PAD1_GPMC_A23 | 3836 |
| 19-372. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_A22_PAD1_GPMC_A23 | 3838 |
| 19-373. CONTROL_CORE_PAD0_GPMC_A24_PAD1_GPMC_A25 | 3838 |
| 19-374. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_A24_PAD1_GPMC_A25 | 3840 |
| 19-375. CONTROL_CORE_PAD0_GPMC_NCS0_PAD1_GPMC_NCS1 | 3840 |
| 19-376. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_NCS0_PAD1_GPMC_NCS1 ... | 3842 |
| 19-377. CONTROL_CORE_PAD0_GPMC_NCS2_PAD1_GPMC_NCS3 | 3843 |
| 19-378. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_NCS2_PAD1_GPMC_NCS3 ... | 3845 |
| 19-379. CONTROL_CORE_PAD0_GPMC_NWP_PAD1_GPMC_CLK | 3845 |
| 19-380. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_NWP_PAD1_GPMC_CLK | 3847 |

| | |
|---|------|
| 19-381. CONTROL_CORE_PAD0_GPMC_NADV_ALE_PAD1_GPMC_NOE | 3847 |
| 19-382. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_NADV_ALE_PAD1_GPMC_NOE | 3850 |
| 19-383. CONTROL_CORE_PAD0_GPMC_NWE_PAD1_GPMC_NBE0_CLE | 3850 |
| 19-384. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_NWE_PAD1_GPMC_NBE0_CLE | 3852 |
| 19-385. CONTROL_CORE_PAD0_GPMC_NBE1_PAD1_GPMC_WAIT0..... | 3852 |
| 19-386. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_NBE1_PAD1_GPMC_WAIT0 .. | 3854 |
| 19-387. CONTROL_CORE_PAD0_GPMC_WAIT1_PAD1_GPMC_WAIT2 | 3854 |
| 19-388. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_WAIT1_PAD1_GPMC_WAIT2 .. | 3857 |
| 19-389. CONTROL_CORE_PAD0_GPMC_NCS4_PAD1_GPMC_NCS5 | 3857 |
| 19-390. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_NCS4_PAD1_GPMC_NCS5 ... | 3859 |
| 19-391. CONTROL_CORE_PAD0_GPMC_NCS6_PAD1_GPMC_NCS7 | 3860 |
| 19-392. Register Call Summary for Register CONTROL_CORE_PAD0_GPMC_NCS6_PAD1_GPMC_NCS7 ... | 3862 |
| 19-393. CONTROL_CORE_PAD0_GPIO63_PAD1_GPIO64..... | 3862 |
| 19-394. Register Call Summary for Register CONTROL_CORE_PAD0_GPIO63_PAD1_GPIO64 | 3864 |
| 19-395. CONTROL_CORE_PAD0_GPIO65_PAD1_GPIO66..... | 3864 |
| 19-396. Register Call Summary for Register CONTROL_CORE_PAD0_GPIO65_PAD1_GPIO66 | 3866 |
| 19-397. CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0..... | 3867 |
| 19-398. Register Call Summary for Register CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0 | 3868 |
| 19-399. CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1..... | 3868 |
| 19-400. Register Call Summary for Register CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1 | 3869 |
| 19-401. CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2..... | 3870 |
| 19-402. Register Call Summary for Register CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2 | 3871 |
| 19-403. CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3..... | 3871 |
| 19-404. Register Call Summary for Register CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3 | 3872 |
| 19-405. CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4..... | 3873 |
| 19-406. Register Call Summary for Register CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4 | 3874 |
| 19-407. CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0..... | 3874 |
| 19-408. Register Call Summary for Register CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0 | 3875 |
| 19-409. CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1..... | 3876 |
| 19-410. Register Call Summary for Register CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1 | 3877 |
| 19-411. CONTROL_CORE_PAD0_CAM_SHUTTER_PAD1_CAM_STROBE | 3877 |
| 19-412. Register Call Summary for Register CONTROL_CORE_PAD0_CAM_SHUTTER_PAD1_CAM_STROBE..... | 3879 |
| 19-413. CONTROL_CORE_PAD0_CAM_GLOBALRESET_PAD1_USBB1_ULPITLL_CLK | 3879 |
| 19-414. Register Call Summary for Register CONTROL_CORE_PAD0_CAM_GLOBALRESET_PAD1_USBB1_ULPITLL_CLK | 3882 |
| 19-415. CONTROL_CORE_PAD0_USBB1_ULPITLL_STP_PAD1_USBB1_ULPITLL_DIR | 3882 |
| 19-416. Register Call Summary for Register CONTROL_CORE_PAD0_USBB1_ULPITLL_STP_PAD1_USBB1_ULPITLL_DIR..... | 3884 |
| 19-417. CONTROL_CORE_PAD0_USBB1_ULPITLL_NXT_PAD1_USBB1_ULPITLL_DAT0..... | 3885 |
| 19-418. Register Call Summary for Register CONTROL_CORE_PAD0_USBB1_ULPITLL_NXT_PAD1_USBB1_ULPITLL_DAT0 | 3887 |
| 19-419. CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT1_PAD1_USBB1_ULPITLL_DAT2 | 3887 |
| 19-420. Register Call Summary for Register CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT1_PAD1_USBB1_ULPITLL_DAT2..... | 3890 |
| 19-421. CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT3_PAD1_USBB1_ULPITLL_DAT4 | 3890 |
| 19-422. Register Call Summary for Register CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT3_PAD1_USBB1_ULPITLL_DAT4..... | 3892 |
| 19-423. CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT5_PAD1_USBB1_ULPITLL_DAT6 | 3893 |

| | |
|---|------|
| 19-424. Register Call Summary for Register CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT5_PAD1_USBB1_ULPITLL_DAT6..... | 3895 |
| 19-425. CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT7_PAD1_USBB1_HSIC_DATA | 3895 |
| 19-426. Register Call Summary for Register CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT7_PAD1_USBB1_HSIC_DATA..... | 3897 |
| 19-427. CONTROL_CORE_PAD0_USBB1_HSIC_STROBE_PAD1_GPIO_98 | 3898 |
| 19-428. Register Call Summary for Register CONTROL_CORE_PAD0_USBB1_HSIC_STROBE_PAD1_GPIO_98..... | 3899 |
| 19-429. CONTROL_CORE_PAD0_GPIO_99_PAD1_SDMMC1_CLK | 3900 |
| 19-430. Register Call Summary for Register CONTROL_CORE_PAD0_GPIO_99_PAD1_SDMMC1_CLK..... | 3902 |
| 19-431. CONTROL_CORE_PAD0_SDMMC1_CMD_PAD1_SDMMC1_DAT0..... | 3902 |
| 19-432. Register Call Summary for Register CONTROL_CORE_PAD0_SDMMC1_CMD_PAD1_SDMMC1_DAT0 | 3904 |
| 19-433. CONTROL_CORE_PAD0_SDMMC1_DAT1_PAD1_SDMMC1_DAT2..... | 3904 |
| 19-434. Register Call Summary for Register CONTROL_CORE_PAD0_SDMMC1_DAT1_PAD1_SDMMC1_DAT2 | 3907 |
| 19-435. CONTROL_CORE_PAD0_SDMMC1_DAT3_PAD1_SDMMC1_DAT4..... | 3907 |
| 19-436. Register Call Summary for Register CONTROL_CORE_PAD0_SDMMC1_DAT3_PAD1_SDMMC1_DAT4 | 3909 |
| 19-437. CONTROL_CORE_PAD0_SDMMC1_DAT5_PAD1_SDMMC1_DAT6..... | 3909 |
| 19-438. Register Call Summary for Register CONTROL_CORE_PAD0_SDMMC1_DAT5_PAD1_SDMMC1_DAT6 | 3912 |
| 19-439. CONTROL_CORE_PAD0_SDMMC1_DAT7_PAD1_ABE_MCBSP2_CLKX | 3912 |
| 19-440. Register Call Summary for Register CONTROL_CORE_PAD0_SDMMC1_DAT7_PAD1_ABE_MCBSP2_CLKX..... | 3914 |
| 19-441. CONTROL_CORE_PAD0_ABE_MCBSP2_DR_PAD1_ABE_MCBSP2_DX | 3914 |
| 19-442. Register Call Summary for Register CONTROL_CORE_PAD0_ABE_MCBSP2_DR_PAD1_ABE_MCBSP2_DX..... | 3917 |
| 19-443. CONTROL_CORE_PAD0_ABE_MCBSP2_FSX_PAD1_ABE_MCBSP1_CLKX..... | 3917 |
| 19-444. Register Call Summary for Register CONTROL_CORE_PAD0_ABE_MCBSP2_FSX_PAD1_ABE_MCBSP1_CLKX | 3919 |
| 19-445. CONTROL_CORE_PAD0_ABE_MCBSP1_DR_PAD1_ABE_MCBSP1_DX | 3919 |
| 19-446. Register Call Summary for Register CONTROL_CORE_PAD0_ABE_MCBSP1_DR_PAD1_ABE_MCBSP1_DX..... | 3922 |
| 19-447. CONTROL_CORE_PAD0_ABE_MCBSP1_FSX_PAD1_ABE_PDM_UL_DATA..... | 3922 |
| 19-448. Register Call Summary for Register CONTROL_CORE_PAD0_ABE_MCBSP1_FSX_PAD1_ABE_PDM_UL_DATA | 3924 |
| 19-449. CONTROL_CORE_PAD0_ABE_PDM_DL_DATA_PAD1_ABE_PDM_FRAME..... | 3924 |
| 19-450. Register Call Summary for Register CONTROL_CORE_PAD0_ABE_PDM_DL_DATA_PAD1_ABE_PDM_FRAME | 3926 |
| 19-451. CONTROL_CORE_PAD0_ABE_PDM_LB_CLK_PAD1_ABE_CLKS..... | 3926 |
| 19-452. Register Call Summary for Register CONTROL_CORE_PAD0_ABE_PDM_LB_CLK_PAD1_ABE_CLKS | 3928 |
| 19-453. CONTROL_CORE_PAD0_ABE_DMIC_CLK1_PAD1_ABE_DMIC_DIN1..... | 3928 |
| 19-454. Register Call Summary for Register CONTROL_CORE_PAD0_ABE_DMIC_CLK1_PAD1_ABE_DMIC_DIN1 | 3931 |
| 19-455. CONTROL_CORE_PAD0_ABE_DMIC_DIN2_PAD1_ABE_DMIC_DIN3 | 3931 |
| 19-456. Register Call Summary for Register CONTROL_CORE_PAD0_ABE_DMIC_DIN2_PAD1_ABE_DMIC_DIN3..... | 3933 |
| 19-457. CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS..... | 3933 |
| 19-458. Register Call Summary for Register CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS | 3935 |
| 19-459. CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX | 3936 |
| 19-460. Register Call Summary for Register CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX..... | 3938 |

| | |
|--|------|
| 19-461. CONTROL_CORE_PAD0_HDQ_SIO_PAD1_I2C1_SCL | 3938 |
| 19-462. Register Call Summary for Register CONTROL_CORE_PAD0_HDQ_SIO_PAD1_I2C1_SCL | 3940 |
| 19-463. CONTROL_CORE_PAD0_I2C1_SDA_PAD1_I2C2_SCL | 3940 |
| 19-464. Register Call Summary for Register CONTROL_CORE_PAD0_I2C1_SDA_PAD1_I2C2_SCL | 3942 |
| 19-465. CONTROL_CORE_PAD0_I2C2_SDA_PAD1_I2C3_SCL | 3942 |
| 19-466. Register Call Summary for Register CONTROL_CORE_PAD0_I2C2_SDA_PAD1_I2C3_SCL | 3944 |
| 19-467. CONTROL_CORE_PAD0_I2C3_SDA_PAD1_I2C4_SCL | 3944 |
| 19-468. Register Call Summary for Register CONTROL_CORE_PAD0_I2C3_SDA_PAD1_I2C4_SCL | 3946 |
| 19-469. CONTROL_CORE_PAD0_I2C4_SDA_PAD1_MCSP1_CLK | 3946 |
| 19-470. Register Call Summary for Register CONTROL_CORE_PAD0_I2C4_SDA_PAD1_MCSP1_CLK | 3948 |
| 19-471. CONTROL_CORE_PAD0_MCSP1_SOMI_PAD1_MCSP1_SIMO | 3948 |
| 19-472. Register Call Summary for Register CONTROL_CORE_PAD0_MCSP1_SOMI_PAD1_MCSP1_SIMO | 3951 |
| 19-473. CONTROL_CORE_PAD0_MCSP1_CS0_PAD1_MCSP1_CS1 | 3951 |
| 19-474. Register Call Summary for Register CONTROL_CORE_PAD0_MCSP1_CS0_PAD1_MCSP1_CS1 ... | 3953 |
| 19-475. CONTROL_CORE_PAD0_MCSP1_CS2_PAD1_MCSP1_CS3 | 3953 |
| 19-476. Register Call Summary for Register CONTROL_CORE_PAD0_MCSP1_CS2_PAD1_MCSP1_CS3 ... | 3955 |
| 19-477. CONTROL_CORE_PAD0_UART3_CTS_RCTX_PAD1_UART3_RTS_SD | 3955 |
| 19-478. Register Call Summary for Register CONTROL_CORE_PAD0_UART3_CTS_RCTX_PAD1_UART3_RTS_SD | 3958 |
| 19-479. CONTROL_CORE_PAD0_UART3_RX_IRRX_PAD1_UART3_TX_IRTX | 3958 |
| 19-480. Register Call Summary for Register CONTROL_CORE_PAD0_UART3_RX_IRRX_PAD1_UART3_TX_IRTX | 3960 |
| 19-481. CONTROL_CORE_PAD0_SDMC5_CLK_PAD1_SDMC5_CMD | 3960 |
| 19-482. Register Call Summary for Register CONTROL_CORE_PAD0_SDMC5_CLK_PAD1_SDMC5_CMD | 3962 |
| 19-483. CONTROL_CORE_PAD0_SDMC5_DAT0_PAD1_SDMC5_DAT1 | 3963 |
| 19-484. Register Call Summary for Register CONTROL_CORE_PAD0_SDMC5_DAT0_PAD1_SDMC5_DAT1 | 3965 |
| 19-485. CONTROL_CORE_PAD0_SDMC5_DAT2_PAD1_SDMC5_DAT3 | 3965 |
| 19-486. Register Call Summary for Register CONTROL_CORE_PAD0_SDMC5_DAT2_PAD1_SDMC5_DAT3 | 3967 |
| 19-487. CONTROL_CORE_PAD0_MCSP4_CLK_PAD1_MCSP4_SIMO | 3967 |
| 19-488. Register Call Summary for Register CONTROL_CORE_PAD0_MCSP4_CLK_PAD1_MCSP4_SIMO . | 3970 |
| 19-489. CONTROL_CORE_PAD0_MCSP4_SOMI_PAD1_MCSP4_CS0 | 3970 |
| 19-490. Register Call Summary for Register CONTROL_CORE_PAD0_MCSP4_SOMI_PAD1_MCSP4_CS0 . | 3972 |
| 19-491. CONTROL_CORE_PAD0_UART4_RX_PAD1_UART4_TX | 3972 |
| 19-492. Register Call Summary for Register CONTROL_CORE_PAD0_UART4_RX_PAD1_UART4_TX | 3974 |
| 19-493. CONTROL_CORE_PAD0_USBB2_ULPITLL_CLK_PAD1_USBB2_ULPITLL_STP | 3974 |
| 19-494. Register Call Summary for Register CONTROL_CORE_PAD0_USBB2_ULPITLL_CLK_PAD1_USBB2_ULPITLL_STP | 3977 |
| 19-495. CONTROL_CORE_PAD0_USBB2_ULPITLL_DIR_PAD1_USBB2_ULPITLL_NXT | 3977 |
| 19-496. Register Call Summary for Register CONTROL_CORE_PAD0_USBB2_ULPITLL_DIR_PAD1_USBB2_ULPITLL_NXT | 3979 |
| 19-497. CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT0_PAD1_USBB2_ULPITLL_DAT1 | 3980 |
| 19-498. Register Call Summary for Register CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT0_PAD1_USBB2_ULPITLL_DAT1 | 3982 |
| 19-499. CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT2_PAD1_USBB2_ULPITLL_DAT3 | 3982 |
| 19-500. Register Call Summary for Register CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT2_PAD1_USBB2_ULPITLL_DAT3 | 3985 |
| 19-501. CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT4_PAD1_USBB2_ULPITLL_DAT5 | 3985 |

| | |
|---|------|
| 19-502. Register Call Summary for Register CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT4_PAD1_USBB2_ULPITLL_DAT5..... | 3987 |
| 19-503. CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT6_PAD1_USBB2_ULPITLL_DAT7 | 3988 |
| 19-504. Register Call Summary for Register CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT6_PAD1_USBB2_ULPITLL_DAT7..... | 3990 |
| 19-505. CONTROL_CORE_PAD0_USBB2_HSIC_DATA_PAD1_USBB2_HSIC_STROBE | 3990 |
| 19-506. Register Call Summary for Register CONTROL_CORE_PAD0_USBB2_HSIC_DATA_PAD1_USBB2_HSIC_STROBE..... | 3992 |
| 19-507. CONTROL_CORE_PAD0_KPD_COL3_PAD1_KPD_COL4 | 3992 |
| 19-508. Register Call Summary for Register CONTROL_CORE_PAD0_KPD_COL3_PAD1_KPD_COL4 | 3994 |
| 19-509. CONTROL_CORE_PAD0_KPD_COL5_PAD1_KPD_COL0 | 3995 |
| 19-510. Register Call Summary for Register CONTROL_CORE_PAD0_KPD_COL5_PAD1_KPD_COL0 | 3997 |
| 19-511. CONTROL_CORE_PAD0_KPD_COL1_PAD1_KPD_COL2 | 3997 |
| 19-512. Register Call Summary for Register CONTROL_CORE_PAD0_KPD_COL1_PAD1_KPD_COL2 | 3999 |
| 19-513. CONTROL_CORE_PAD0_KPD_ROW3_PAD1_KPD_ROW4 | 4000 |
| 19-514. Register Call Summary for Register CONTROL_CORE_PAD0_KPD_ROW3_PAD1_KPD_ROW4 | 4002 |
| 19-515. CONTROL_CORE_PAD0_KPD_ROW5_PAD1_KPD_ROW0 | 4002 |
| 19-516. Register Call Summary for Register CONTROL_CORE_PAD0_KPD_ROW5_PAD1_KPD_ROW0 | 4004 |
| 19-517. CONTROL_CORE_PAD0_KPD_ROW1_PAD1_KPD_ROW2 | 4005 |
| 19-518. Register Call Summary for Register CONTROL_CORE_PAD0_KPD_ROW1_PAD1_KPD_ROW2 | 4007 |
| 19-519. CONTROL_CORE_PAD0_USBA0_OTG_CE_PAD1_USBA0_OTG_DP | 4007 |
| 19-520. Register Call Summary for Register CONTROL_CORE_PAD0_USBA0_OTG_CE_PAD1_USBA0_OTG_DP | 4008 |
| 19-521. CONTROL_CORE_PAD0_USBA0_OTG_DM_PAD1_FREF_CLK1_OUT | 4008 |
| 19-522. Register Call Summary for Register CONTROL_CORE_PAD0_USBA0_OTG_DM_PAD1_FREF_CLK1_OUT | 4010 |
| 19-523. CONTROL_CORE_PAD0_FREF_CLK2_OUT_PAD1_SYS_NIRQ1 | 4010 |
| 19-524. Register Call Summary for Register CONTROL_CORE_PAD0_FREF_CLK2_OUT_PAD1_SYS_NIRQ1 | 4012 |
| 19-525. CONTROL_CORE_PAD0_SYS_NIRQ2_PAD1_SYS_BOOT0 | 4012 |
| 19-526. Register Call Summary for Register CONTROL_CORE_PAD0_SYS_NIRQ2_PAD1_SYS_BOOT0 | 4014 |
| 19-527. CONTROL_CORE_PAD0_SYS_BOOT1_PAD1_SYS_BOOT2 | 4015 |
| 19-528. Register Call Summary for Register CONTROL_CORE_PAD0_SYS_BOOT1_PAD1_SYS_BOOT2 | 4017 |
| 19-529. CONTROL_CORE_PAD0_SYS_BOOT3_PAD1_SYS_BOOT4 | 4017 |
| 19-530. Register Call Summary for Register CONTROL_CORE_PAD0_SYS_BOOT3_PAD1_SYS_BOOT4 | 4019 |
| 19-531. CONTROL_CORE_PAD0_SYS_BOOT5_PAD1_DPM_EMU0 | 4019 |
| 19-532. Register Call Summary for Register CONTROL_CORE_PAD0_SYS_BOOT5_PAD1_DPM_EMU0 | 4021 |
| 19-533. CONTROL_CORE_PAD0_DPM_EMU1_PAD1_DPM_EMU2 | 4021 |
| 19-534. Register Call Summary for Register CONTROL_CORE_PAD0_DPM_EMU1_PAD1_DPM_EMU2 | 4023 |
| 19-535. CONTROL_CORE_PAD0_DPM_EMU3_PAD1_DPM_EMU4 | 4024 |
| 19-536. Register Call Summary for Register CONTROL_CORE_PAD0_DPM_EMU3_PAD1_DPM_EMU4 | 4026 |
| 19-537. CONTROL_CORE_PAD0_DPM_EMU5_PAD1_DPM_EMU6 | 4026 |
| 19-538. Register Call Summary for Register CONTROL_CORE_PAD0_DPM_EMU5_PAD1_DPM_EMU6 | 4028 |
| 19-539. CONTROL_CORE_PAD0_DPM_EMU7_PAD1_DPM_EMU8 | 4028 |
| 19-540. Register Call Summary for Register CONTROL_CORE_PAD0_DPM_EMU7_PAD1_DPM_EMU8 | 4031 |
| 19-541. CONTROL_CORE_PAD0_DPM_EMU9_PAD1_DPM_EMU10 | 4031 |
| 19-542. Register Call Summary for Register CONTROL_CORE_PAD0_DPM_EMU9_PAD1_DPM_EMU10 | 4033 |
| 19-543. CONTROL_CORE_PAD0_DPM_EMU11_PAD1_DPM_EMU12 | 4033 |
| 19-544. Register Call Summary for Register CONTROL_CORE_PAD0_DPM_EMU11_PAD1_DPM_EMU12 | 4036 |
| 19-545. CONTROL_CORE_PAD0_DPM_EMU13_PAD1_DPM_EMU14 | 4036 |

| | |
|---|------|
| 19-546. Register Call Summary for Register CONTROL_CORE_PAD0_DPM_EMU13_PAD1_DPM_EMU14.... | 4038 |
| 19-547. CONTROL_CORE_PAD0_DPM_EMU15_PAD1_DPM_EMU16 | 4039 |
| 19-548. Register Call Summary for Register CONTROL_CORE_PAD0_DPM_EMU15_PAD1_DPM_EMU16.... | 4041 |
| 19-549. CONTROL_CORE_PAD0_DPM_EMU17_PAD1_DPM_EMU18 | 4041 |
| 19-550. Register Call Summary for Register CONTROL_CORE_PAD0_DPM_EMU17_PAD1_DPM_EMU18.... | 4043 |
| 19-551. CONTROL_CORE_PAD0_DPM_EMU19_PAD1_CSI22_DX2 | 4044 |
| 19-552. Register Call Summary for Register CONTROL_CORE_PAD0_DPM_EMU19_PAD1_CSI22_DX2 | 4045 |
| 19-553. CONTROL_PADCONF_WAKEUPEVENT_0..... | 4046 |
| 19-554. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_0 | 4049 |
| 19-555. CONTROL_PADCONF_WAKEUPEVENT_1..... | 4049 |
| 19-556. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_1 | 4052 |
| 19-557. CONTROL_PADCONF_WAKEUPEVENT_2..... | 4052 |
| 19-558. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_2 | 4055 |
| 19-559. CONTROL_PADCONF_WAKEUPEVENT_3..... | 4055 |
| 19-560. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_3 | 4058 |
| 19-561. CONTROL_PADCONF_WAKEUPEVENT_4..... | 4058 |
| 19-562. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_4 | 4061 |
| 19-563. CONTROL_PADCONF_WAKEUPEVENT_5..... | 4061 |
| 19-564. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_5 | 4064 |
| 19-565. CONTROL_PADCONF_WAKEUPEVENT_6..... | 4064 |
| 19-566. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_6 | 4065 |
| 19-567. CONTROL_CORE_PAD0_CSI22_DY2 | 4065 |
| 19-568. Register Call Summary for Register CONTROL_CORE_PAD0_CSI22_DY2 | 4066 |
| 19-569. CONTROL_PADCONF_GLOBAL | 4067 |
| 19-570. Register Call Summary for Register CONTROL_PADCONF_GLOBAL | 4067 |
| 19-571. CONTROL_CORE_PADCONF_MODE | 4067 |
| 19-572. Register Call Summary for Register CONTROL_CORE_PADCONF_MODE | 4068 |
| 19-573. CONTROL_SMART1IO_PADCONF_0 | 4069 |
| 19-574. Register Call Summary for Register CONTROL_SMART1IO_PADCONF_0 | 4070 |
| 19-575. CONTROL_SMART1IO_PADCONF_1 | 4070 |
| 19-576. Register Call Summary for Register CONTROL_SMART1IO_PADCONF_1 | 4072 |
| 19-577. CONTROL_SMART2IO_PADCONF_0 | 4072 |
| 19-578. Register Call Summary for Register CONTROL_SMART2IO_PADCONF_0 | 4073 |
| 19-579. CONTROL_SMART2IO_PADCONF_1 | 4073 |
| 19-580. Register Call Summary for Register CONTROL_SMART2IO_PADCONF_1 | 4073 |
| 19-581. CONTROL_SMART3IO_PADCONF_0 | 4073 |
| 19-582. Register Call Summary for Register CONTROL_SMART3IO_PADCONF_0 | 4074 |
| 19-583. CONTROL_SMART3IO_PADCONF_1 | 4075 |
| 19-584. Register Call Summary for Register CONTROL_SMART3IO_PADCONF_1 | 4076 |
| 19-585. CONTROL_SMART3IO_PADCONF_2 | 4076 |
| 19-586. Register Call Summary for Register CONTROL_SMART3IO_PADCONF_2 | 4078 |
| 19-587. CONTROL_USBB_HSIC..... | 4078 |
| 19-588. Register Call Summary for Register CONTROL_USBB_HSIC | 4080 |
| 19-589. CONTROL_SMART3IO_PADCONF_3 | 4080 |
| 19-590. Register Call Summary for Register CONTROL_SMART3IO_PADCONF_3 | 4082 |
| 19-591. CONTROL_SMART2IO_PADCONF_2 | 4082 |
| 19-592. Register Call Summary for Register CONTROL_SMART2IO_PADCONF_2 | 4083 |
| 19-593. CONTROL_SMART1IO_PADCONF_2 | 4084 |
| 19-594. Register Call Summary for Register CONTROL_SMART1IO_PADCONF_2 | 4085 |

| | |
|---|------|
| 19-595. CONTROL_SMART1IO_PADCONF_3 | 4085 |
| 19-596. Register Call Summary for Register CONTROL_SMART1IO_PADCONF_3 | 4086 |
| 19-597. CONTROL_C2CIO_PADCONF_0 | 4086 |
| 19-598. Register Call Summary for Register CONTROL_C2CIO_PADCONF_0 | 4089 |
| 19-599. CONTROL_PBIASLITE | 4089 |
| 19-600. Register Call Summary for Register CONTROL_PBIASLITE | 4090 |
| 19-601. CONTROL_I2C_0 | 4090 |
| 19-602. Register Call Summary for Register CONTROL_I2C_0 | 4093 |
| 19-603. CONTROL_CAMERA_RX | 4093 |
| 19-604. Register Call Summary for Register CONTROL_CAMERA_RX | 4094 |
| 19-605. CONTROL_MMC2 | 4094 |
| 19-606. Register Call Summary for Register CONTROL_MMC2 | 4095 |
| 19-607. CONTROL_DSIPHY | 4095 |
| 19-608. Register Call Summary for Register CONTROL_DSIPHY | 4096 |
| 19-609. CONTROL_MCBSPLP | 4096 |
| 19-610. Register Call Summary for Register CONTROL_MCBSPLP | 4097 |
| 19-611. CONTROL_USB2PHYCORE | 4097 |
| 19-612. Register Call Summary for Register CONTROL_USB2PHYCORE | 4099 |
| 19-613. CONTROL_I2C_1 | 4099 |
| 19-614. Register Call Summary for Register CONTROL_I2C_1 | 4100 |
| 19-615. CONTROL_MMC1 | 4100 |
| 19-616. Register Call Summary for Register CONTROL_MMC1 | 4101 |
| 19-617. CONTROL_HSI | 4101 |
| 19-618. Register Call Summary for Register CONTROL_HSI | 4102 |
| 19-619. CONTROL_USB | 4102 |
| 19-620. Register Call Summary for Register CONTROL_USB | 4102 |
| 19-621. CONTROL_HDQ | 4103 |
| 19-622. Register Call Summary for Register CONTROL_HDQ | 4103 |
| 19-623. CONTROL_LPDDR2IO1_0 | 4103 |
| 19-624. Register Call Summary for Register CONTROL_LPDDR2IO1_0 | 4105 |
| 19-625. CONTROL_LPDDR2IO1_1 | 4105 |
| 19-626. Register Call Summary for Register CONTROL_LPDDR2IO1_1 | 4107 |
| 19-627. CONTROL_LPDDR2IO1_2 | 4107 |
| 19-628. Register Call Summary for Register CONTROL_LPDDR2IO1_2 | 4108 |
| 19-629. CONTROL_LPDDR2IO1_3 | 4109 |
| 19-630. Register Call Summary for Register CONTROL_LPDDR2IO1_3 | 4111 |
| 19-631. CONTROL_LPDDR2IO2_0 | 4111 |
| 19-632. Register Call Summary for Register CONTROL_LPDDR2IO2_0 | 4113 |
| 19-633. CONTROL_LPDDR2IO2_1 | 4113 |
| 19-634. Register Call Summary for Register CONTROL_LPDDR2IO2_1 | 4115 |
| 19-635. CONTROL_LPDDR2IO2_2 | 4115 |
| 19-636. Register Call Summary for Register CONTROL_LPDDR2IO2_2 | 4117 |
| 19-637. CONTROL_LPDDR2IO2_3 | 4117 |
| 19-638. Register Call Summary for Register CONTROL_LPDDR2IO2_3 | 4119 |
| 19-639. CONTROL_BUS_HOLD | 4120 |
| 19-640. Register Call Summary for Register CONTROL_BUS_HOLD | 4120 |
| 19-641. CONTROL_C2C | 4120 |
| 19-642. Register Call Summary for Register CONTROL_C2C | 4120 |
| 19-643. CONTROL_CORE_CONTROL_SPARE_RW | 4120 |

| | |
|--|------|
| 19-644. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW | 4121 |
| 19-645. CONTROL_CORE_CONTROL_SPARE_R | 4121 |
| 19-646. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_R | 4121 |
| 19-647. CONTROL_CORE_CONTROL_SPARE_R_C0 | 4121 |
| 19-648. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_R_C0 | 4122 |
| 19-649. CONTROL_CORE_CONTROL_SPARE_RW1 | 4122 |
| 19-650. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW1 | 4122 |
| 19-651. CONTROL_CORE_CONTROL_SPARE_RW2 | 4122 |
| 19-652. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW2 | 4123 |
| 19-653. CONTROL_CORE_CONTROL_SPARE_RW3 | 4123 |
| 19-654. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW3 | 4123 |
| 19-655. CONTROL_CORE_CONTROL_SPARE_RW4 | 4123 |
| 19-656. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW4 | 4123 |
| 19-657. CONTROL_CORE_CONTROL_SPARE_RW5 | 4123 |
| 19-658. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW5 | 4124 |
| 19-659. CONTROL_CORE_CONTROL_SPARE_RW6 | 4124 |
| 19-660. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW6 | 4124 |
| 19-661. CONTROL_CORE_CONTROL_SPARE_RW7 | 4124 |
| 19-662. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW7 | 4125 |
| 19-663. CONTROL_CORE_CONTROL_SPARE_RW8 | 4125 |
| 19-664. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW8 | 4125 |
| 19-665. CONTROL_CORE_CONTROL_SPARE_RW9 | 4125 |
| 19-666. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW9 | 4125 |
| 19-667. CONTROL_CORE_CONTROL_SPARE_R1 | 4125 |
| 19-668. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_R1 | 4126 |
| 19-669. CONTROL_EFUSE_2 | 4126 |
| 19-670. Register Call Summary for Register CONTROL_EFUSE_2 | 4127 |
| 19-671. CONTROL_EFUSE_3 | 4127 |
| 19-672. Register Call Summary for Register CONTROL_EFUSE_3 | 4128 |
| 19-673. CONTROL_EFUSE_4 | 4128 |
| 19-674. Register Call Summary for Register CONTROL_EFUSE_4 | 4128 |
| 19-675. SYSCTRL_PADCONF_WKUP Register Mapping Summary | 4128 |
| 19-676. CONTROL_PADCONF_WKUP_REVISION | 4130 |
| 19-677. Register Call Summary for Register CONTROL_PADCONF_WKUP_REVISION | 4130 |
| 19-678. CONTROL_PADCONF_WKUP_HWINFO | 4130 |
| 19-679. Register Call Summary for Register CONTROL_PADCONF_WKUP_HWINFO | 4130 |
| 19-680. CONTROL_PADCONF_WKUP_SYSCONFIG | 4131 |
| 19-681. Register Call Summary for Register CONTROL_PADCONF_WKUP_SYSCONFIG | 4131 |
| 19-682. CONTROL_WKUP_PAD0_GPIO_WK0_PAD1_GPIO_WK1 | 4131 |
| 19-683. Register Call Summary for Register CONTROL_WKUP_PAD0_GPIO_WK0_PAD1_GPIO_WK1 | 4133 |
| 19-684. CONTROL_WKUP_PAD0_GPIO_WK2_PAD1_GPIO_WK3 | 4133 |
| 19-685. Register Call Summary for Register CONTROL_WKUP_PAD0_GPIO_WK2_PAD1_GPIO_WK3 | 4134 |
| 19-686. CONTROL_WKUP_PAD0_GPIO_WK4_PAD1_SR_SCL | 4135 |
| 19-687. Register Call Summary for Register CONTROL_WKUP_PAD0_GPIO_WK4_PAD1_SR_SCL | 4136 |
| 19-688. CONTROL_WKUP_PAD0_SR_SDA_PAD1_FREF_XTAL_IN | 4136 |
| 19-689. Register Call Summary for Register CONTROL_WKUP_PAD0_SR_SDA_PAD1_FREF_XTAL_IN | 4137 |
| 19-690. CONTROL_WKUP_PAD0_FREF_SLICER_IN_PAD1_FREF_CLK_IOREQ | 4137 |
| 19-691. Register Call Summary for Register CONTROL_WKUP_PAD0_FREF_SLICER_IN_PAD1_FREF_CLK_IOREQ | 4138 |

| | |
|--|------|
| 19-692. CONTROL_WKUP_PAD0_FREF_CLK0_OUT_PAD1_FREF_CLK3_REQ..... | 4138 |
| 19-693. Register Call Summary for Register CONTROL_WKUP_PAD0_FREF_CLK0_OUT_PAD1_FREF_CLK3_REQ | 4140 |
| 19-694. CONTROL_WKUP_PAD0_FREF_CLK3_OUT_PAD1_FREF_CLK4_REQ..... | 4140 |
| 19-695. Register Call Summary for Register CONTROL_WKUP_PAD0_FREF_CLK3_OUT_PAD1_FREF_CLK4_REQ | 4141 |
| 19-696. CONTROL_WKUP_PAD0_FREF_CLK4_OUT_PAD1_SYS_32K..... | 4142 |
| 19-697. Register Call Summary for Register CONTROL_WKUP_PAD0_FREF_CLK4_OUT_PAD1_SYS_32K .. | 4143 |
| 19-698. CONTROL_WKUP_PAD0_SYS_NRESPWRON_PAD1_SYS_NRESWARM | 4143 |
| 19-699. Register Call Summary for Register CONTROL_WKUP_PAD0_SYS_NRESPWRON_PAD1_SYS_NRESWARM | 4144 |
| 19-700. CONTROL_WKUP_PAD0_SYS_PWR_REQ_PAD1_SYS_PWRON_RESET_OUT | 4144 |
| 19-701. Register Call Summary for Register CONTROL_WKUP_PAD0_SYS_PWR_REQ_PAD1_SYS_PWRON_RESET_OUT | 4145 |
| 19-702. CONTROL_WKUP_PAD0_SYS_BOOT6_PAD1_SYS_BOOT7..... | 4146 |
| 19-703. Register Call Summary for Register CONTROL_WKUP_PAD0_SYS_BOOT6_PAD1_SYS_BOOT7 | 4147 |
| 19-704. CONTROL_WKUP_PAD0_JTAG_NTRST_PAD1_JTAG_TCK..... | 4147 |
| 19-705. Register Call Summary for Register CONTROL_WKUP_PAD0_JTAG_NTRST_PAD1_JTAG_TCK | 4148 |
| 19-706. CONTROL_WKUP_PAD0_JTAG_RTCK_PAD1_JTAG_TMS_TMSC..... | 4149 |
| 19-707. Register Call Summary for Register CONTROL_WKUP_PAD0_JTAG_RTCK_PAD1_JTAG_TMS_TMSC | 4150 |
| 19-708. CONTROL_WKUP_PAD0_JTAG_TDI_PAD1_JTAG_TDO | 4150 |
| 19-709. Register Call Summary for Register CONTROL_WKUP_PAD0_JTAG_TDI_PAD1_JTAG_TDO | 4151 |
| 19-710. CONTROL_WKUP_PADCONF_WAKEUPEVENT_0 | 4151 |
| 19-711. Register Call Summary for Register CONTROL_WKUP_PADCONF_WAKEUPEVENT_0 | 4154 |
| 19-712. CONTROL_SMART1NOPMIO_PADCONF_0 | 4154 |
| 19-713. Register Call Summary for Register CONTROL_SMART1NOPMIO_PADCONF_0 | 4155 |
| 19-714. CONTROL_SMART1NOPMIO_PADCONF_1 | 4155 |
| 19-715. Register Call Summary for Register CONTROL_SMART1NOPMIO_PADCONF_1 | 4156 |
| 19-716. CONTROL_WKUP_PADCONF_MODE..... | 4156 |
| 19-717. Register Call Summary for Register CONTROL_WKUP_PADCONF_MODE | 4157 |
| 19-718. CONTROL_XTAL_OSCILLATOR..... | 4157 |
| 19-719. Register Call Summary for Register CONTROL_XTAL_OSCILLATOR | 4157 |
| 19-720. CONTROL_SMART3NOPMIO_PADCONF_0 | 4157 |
| 19-721. Register Call Summary for Register CONTROL_SMART3NOPMIO_PADCONF_0 | 4158 |
| 19-722. CONTROL_SMART3NOPMIO_PADCONF_1 | 4158 |
| 19-723. Register Call Summary for Register CONTROL_SMART3NOPMIO_PADCONF_1 | 4159 |
| 19-724. CONTROL_I2C_2..... | 4159 |
| 19-725. Register Call Summary for Register CONTROL_I2C_2 | 4160 |
| 19-726. CONTROL_JTAG | 4160 |
| 19-727. Register Call Summary for Register CONTROL_JTAG..... | 4161 |
| 19-728. CONTROL_SYS | 4161 |
| 19-729. Register Call Summary for Register CONTROL_SYS | 4161 |
| 19-730. CONTROL_WKUP_CONTROL_SPARE_RW | 4162 |
| 19-731. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW | 4162 |
| 19-732. CONTROL_WKUP_CONTROL_SPARE_R | 4162 |
| 19-733. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_R..... | 4162 |
| 19-734. CONTROL_WKUP_CONTROL_SPARE_R_C0 | 4162 |
| 19-735. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_R_C0..... | 4163 |
| 19-736. CONTROL_WKUP_CONTROL_SPARE_RW1 | 4163 |

| | |
|---|------|
| 19-737. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW1 | 4164 |
| 19-738. CONTROL_WKUP_CONTROL_SPARE_RW2 | 4164 |
| 19-739. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW2 | 4164 |
| 19-740. CONTROL_WKUP_CONTROL_SPARE_RW3 | 4164 |
| 19-741. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW3 | 4164 |
| 19-742. CONTROL_WKUP_CONTROL_SPARE_RW4 | 4165 |
| 19-743. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW4 | 4165 |
| 19-744. CONTROL_WKUP_CONTROL_SPARE_RW5 | 4165 |
| 19-745. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW5 | 4165 |
| 19-746. CONTROL_WKUP_CONTROL_SPARE_RW6 | 4165 |
| 19-747. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW6 | 4166 |
| 19-748. CONTROL_WKUP_CONTROL_SPARE_RW7 | 4166 |
| 19-749. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW7 | 4166 |
| 19-750. CONTROL_WKUP_CONTROL_SPARE_RW8 | 4166 |
| 19-751. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW8 | 4166 |
| 19-752. CONTROL_WKUP_CONTROL_SPARE_RW9 | 4167 |
| 19-753. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW9 | 4167 |
| 19-754. CONTROL_WKUP_CONTROL_SPARE_R1..... | 4167 |
| 19-755. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_R1 | 4167 |
| 20-1. Integration Attributes | 4172 |
| 20-2. Clocks and Resets | 4173 |
| 20-3. Hardware Requests | 4173 |
| 20-4. Integration Attributes | 4174 |
| 20-5. Clocks and Resets | 4174 |
| 20-6. Hardware Requests | 4174 |
| 20-7. Local Power Management Features | 4178 |
| 20-8. Interrupt Events | 4178 |
| 20-9. Global Initialization of Surrounding Modules for System Mailbox..... | 4182 |
| 20-10. Global Initialization of Surrounding Modules for IVA-HD Mailbox..... | 4182 |
| 20-11. Mailbox Global Initialization | 4182 |
| 20-12. Sending a Message (Polling Method) | 4183 |
| 20-13. Sending a Message (Interrupt Method) | 4183 |
| 20-14. Receiving a Message (Polling Method)..... | 4183 |
| 20-15. Receiving a Message (Interrupt Method) | 4183 |
| 20-16. Events Servicing in Sending Mode..... | 4184 |
| 20-17. Events Servicing in Receiving Mode..... | 4184 |
| 20-18. System Mailbox Instance Summary | 4185 |
| 20-19. IVAHD Mailbox Instance Summary | 4185 |
| 20-20. System Mailbox Registers Mapping Summary | 4185 |
| 20-21. IVAHD Mailbox Registers Mapping Summary | 4185 |
| 20-22. MAILBOX_REVISION..... | 4186 |
| 20-23. Register Call Summary for Register MAILBOX_REVISION | 4186 |
| 20-24. MAILBOX_SYSCONFIG..... | 4186 |
| 20-25. Register Call Summary for Register MAILBOX_SYSCONFIG | 4187 |
| 20-26. MAILBOX_MESSAGE_m | 4187 |
| 20-27. Register Call Summary for Register MAILBOX_MESSAGE_m..... | 4187 |
| 20-28. MAILBOX_FIFOSTATUS_m..... | 4188 |
| 20-29. Register Call Summary for Register MAILBOX_FIFOSTATUS_m | 4188 |
| 20-30. MAILBOX_MSGSTATUS_m..... | 4188 |

| | |
|--|------|
| 20-31. Register Call Summary for Register MAILBOX_MSGSTATUS_m | 4189 |
| 20-32. MAILBOX_IRQSTATUS_RAW_u | 4189 |
| 20-33. Register Call Summary for Register MAILBOX_IRQSTATUS_RAW_u | 4191 |
| 20-34. MAILBOX_IRQSTATUS_CLR_u | 4191 |
| 20-35. Register Call Summary for Register MAILBOX_IRQSTATUS_CLR_u | 4194 |
| 20-36. MAILBOX_IRQENABLE_SET_u | 4194 |
| 20-37. Register Call Summary for Register MAILBOX_IRQENABLE_SET_u | 4196 |
| 20-38. MAILBOX_IRQENABLE_CLR_u | 4196 |
| 20-39. Register Call Summary for Register MAILBOX_IRQENABLE_CLR_u | 4199 |
| 21-1. Integration Attributes | 4204 |
| 21-2. Clocks and Resets | 4204 |
| 21-3. Hardware Requests | 4205 |
| 21-4. First-Level Descriptor Format | 4209 |
| 21-5. Second-Level Descriptor Format | 4212 |
| 21-6. MMU Local Power Management Features | 4217 |
| 21-7. Events | 4217 |
| 21-8. Error Handling | 4217 |
| 21-9. Global Initialization of Surrounding Modules | 4219 |
| 21-10. Register Call Summary for Main Sequence—MMU Global Initialization | 4220 |
| 21-11. Configure a TLB Entry | 4220 |
| 21-12. MMU Writing TLB Entries Statically | 4221 |
| 21-13. Protecting TLB Entries | 4221 |
| 21-14. Deleting TLB Entries | 4221 |
| 21-15. Read TLB Entries | 4221 |
| 21-16. MMU Instance Summary | 4223 |
| 21-17. MMU Registers Mapping Summary | 4223 |
| 21-18. MMU_REVISION | 4224 |
| 21-19. Register Call Summary for Register MMU_REVISION | 4224 |
| 21-20. MMU_SYSCONFIG | 4224 |
| 21-21. Register Call Summary for Register MMU_SYSCONFIG | 4225 |
| 21-22. MMU_SYSSTATUS | 4225 |
| 21-23. Register Call Summary for Register MMU_SYSSTATUS | 4225 |
| 21-24. MMU_IRQSTATUS | 4226 |
| 21-25. Register Call Summary for Register MMU_IRQSTATUS | 4226 |
| 21-26. MMU_IRQENABLE | 4227 |
| 21-27. Register Call Summary for Register MMU_IRQENABLE | 4227 |
| 21-28. MMU_WALKING_ST | 4228 |
| 21-29. Register Call Summary for Register MMU_WALKING_ST | 4228 |
| 21-30. MMU_CNTL | 4228 |
| 21-31. Register Call Summary for Register MMU_CNTL | 4229 |
| 21-32. MMU_FAULT_AD | 4229 |
| 21-33. Register Call Summary for Register MMU_FAULT_AD | 4229 |
| 21-34. MMU_TTB | 4229 |
| 21-35. Register Call Summary for Register MMU_TTB | 4229 |
| 21-36. MMU_LOCK | 4230 |
| 21-37. Register Call Summary for Register MMU_LOCK | 4230 |
| 21-38. MMU_LD_TLB | 4230 |
| 21-39. Register Call Summary for Register MMU_LD_TLB | 4231 |
| 21-40. MMU_CAM | 4231 |

| | |
|--|------|
| 21-41. Register Call Summary for Register MMU_CAM..... | 4231 |
| 21-42. MMU_RAM | 4232 |
| 21-43. Register Call Summary for Register MMU_RAM..... | 4232 |
| 21-44. MMU_GFLUSH | 4232 |
| 21-45. Register Call Summary for Register MMU_GFLUSH..... | 4233 |
| 21-46. MMU_FLUSH_ENTRY..... | 4233 |
| 21-47. Register Call Summary for Register MMU_FLUSH_ENTRY | 4233 |
| 21-48. MMU_READ_CAM | 4234 |
| 21-49. Register Call Summary for Register MMU_READ_CAM..... | 4234 |
| 21-50. MMU_READ_RAM | 4234 |
| 21-51. Register Call Summary for Register MMU_READ_RAM..... | 4235 |
| 21-52. MMU_EMU_FAULT_AD..... | 4235 |
| 21-53. Register Call Summary for Register MMU_EMU_FAULT_AD | 4235 |
| 21-54. MMU_FAULT_PC | 4236 |
| 21-55. Register Call Summary for Register MMU_FAULT_PC..... | 4236 |
| 21-56. MMU_FAULT_STATUS | 4236 |
| 21-57. Register Call Summary for Register MMU_FAULT_STATUS | 4237 |
| 21-58. MMU_GP_REG..... | 4237 |
| 21-59. Register Call Summary for Register MMU_GP_REG | 4238 |
| 21-60. DSPSS_MMU_GPR..... | 4238 |
| 21-61. Register Call Summary for Register DSPSS_MMU_GPR | 4238 |
| 22-1. Integration Attributes | 4241 |
| 22-2. Clocks and Resets | 4241 |
| 22-3. Local Power Management Features | 4242 |
| 22-4. Global Initialization of Surrounding Modules..... | 4245 |
| 22-5. Spinlock System Bug Recovery | 4245 |
| 22-6. Register Call Summary | 4246 |
| 22-7. Subprocess Call Summary | 4246 |
| 22-8. Spinlock Instance Summary | 4248 |
| 22-9. Spinlock Registers Mapping Summary | 4248 |
| 22-10. SPINLOCK_REVISION | 4248 |
| 22-11. Register Call Summary for Register SPINLOCK_REVISION | 4248 |
| 22-12. SPINLOCK_SYSCONFIG | 4249 |
| 22-13. Register Call Summary for Register SPINLOCK_SYSCONFIG | 4249 |
| 22-14. SPINLOCK_SYSTATUS..... | 4250 |
| 22-15. Register Call Summary for Register SPINLOCK_SYSTATUS | 4250 |
| 22-16. SPINLOCK_LOCK_REG_i | 4251 |
| 22-17. Register Call Summary for Register SPINLOCK_LOCK_REG_i..... | 4251 |
| 23-1. Input/Output Description | 4257 |
| 23-2. Integration Attributes | 4259 |
| 23-3. Clocks and Resets | 4259 |
| 23-4. Hardware Requests | 4260 |
| 23-5. IDLEMODE Settings | 4265 |
| 23-6. CLOCKACTIVITY Settings | 4265 |
| 23-7. IDLEMODE Settings | 4267 |
| 23-8. Value Loaded in GPT_TCR to Generate 1-ms Tick | 4270 |
| 23-9. Prescaler/Timer Reload Values Versus Contexts..... | 4273 |
| 23-10. Prescaler Clock Ratio Values | 4274 |
| 23-11. Value and Corresponding Interrupt Period | 4275 |

| | |
|---|------|
| 23-12. Global Initialization of Surrounding Modules | 4278 |
| 23-13. GP Timer Module Global Initialization | 4279 |
| 23-14. GP Timer Mode Configuration | 4279 |
| 23-15. GP Timer Compare Mode Configuration | 4279 |
| 23-16. GP Timer Capture Mode Configuration | 4280 |
| 23-17. Initialize Capture Mode | 4280 |
| 23-18. Detect Event | 4280 |
| 23-19. GP Timer PWM Mode Configuration | 4281 |
| 23-20. GP Timer Instance Summary | 4282 |
| 23-21. GPTIMER1, GPTIMER2, and GPTIMER10 Register Mapping Summary | 4283 |
| 23-22. GPTIMER3 and GPTIMER4 Register Mapping Summary | 4283 |
| 23-23. GPTIMER5 Register Mapping Summary | 4284 |
| 23-24. GPTIMER6 Register Mapping Summary | 4284 |
| 23-25. GPTIMER7 Register Mapping Summary | 4285 |
| 23-26. GPTIMER8 Register Mapping Summary | 4285 |
| 23-27. GPTIMER9 and GPTIMER11 Register Mapping Summary | 4286 |
| 23-28. GPT_TIDR | 4286 |
| 23-29. Register Call Summary for Register GPT_TIDR | 4287 |
| 23-30. GPT_TIOCP_CFG | 4287 |
| 23-31. Register Call Summary for Register GPT_TIOCP_CFG | 4288 |
| 23-32. GPT1MS_TIOCP_CFG | 4288 |
| 23-33. Register Call Summary for Register GPT1MS_TIOCP_CFG | 4289 |
| 23-34. GPT_IRQSTATUS_RAW | 4290 |
| 23-35. Register Call Summary for Register GPT_IRQSTATUS_RAW | 4290 |
| 23-36. GPT_IRQSTATUS | 4291 |
| 23-37. Register Call Summary for Register GPT_IRQSTATUS | 4291 |
| 23-38. GPT_IRQENABLE_SET | 4292 |
| 23-39. Register Call Summary for Register GPT_IRQENABLE_SET | 4292 |
| 23-40. GPT_IRQENABLE_CLR | 4293 |
| 23-41. Register Call Summary for Register GPT_IRQENABLE_CLR | 4293 |
| 23-42. GPT_IRQWAKEEN | 4294 |
| 23-43. Register Call Summary for Register GPT_IRQWAKEEN | 4294 |
| 23-44. GPT_TCLR | 4295 |
| 23-45. Register Call Summary for Register GPT_TCLR | 4296 |
| 23-46. GPT_TCRR | 4297 |
| 23-47. Register Call Summary for Register GPT_TCRR | 4297 |
| 23-48. GPT_TLDR | 4298 |
| 23-49. Register Call Summary for Register GPT_TLDR | 4298 |
| 23-50. GPT_TTGR | 4299 |
| 23-51. Register Call Summary for Register GPT_TTGR | 4299 |
| 23-52. GPT_TWPS | 4300 |
| 23-53. Register Call Summary for Register GPT_TWPS | 4300 |
| 23-54. GPT_TMAR | 4301 |
| 23-55. Register Call Summary for Register GPT_TMAR | 4301 |
| 23-56. GPT_TCAR1 | 4302 |
| 23-57. Register Call Summary for Register GPT_TCAR1 | 4302 |
| 23-58. GPT_TSICR | 4303 |
| 23-59. Register Call Summary for Register GPT_TSICR | 4303 |
| 23-60. GPT_TCAR2 | 4304 |

| | |
|--|------|
| 23-61. Register Call Summary for Register GPT_TCAR2..... | 4304 |
| 23-62. GPT_TISTAT..... | 4304 |
| 23-63. Register Call Summary for Register GPT_TISTAT | 4305 |
| 23-64. GPT_TISR..... | 4305 |
| 23-65. Register Call Summary for Register GPT_TISR | 4305 |
| 23-66. GPT_TIER..... | 4306 |
| 23-67. Register Call Summary for Register GPT_TIER | 4306 |
| 23-68. GPT_TWER | 4307 |
| 23-69. Register Call Summary for Register GPT_TWER | 4307 |
| 23-70. GPT_TPIR..... | 4307 |
| 23-71. Register Call Summary for Register GPT_TPIR | 4308 |
| 23-72. GPT_TNIR..... | 4308 |
| 23-73. Register Call Summary for Register GPT_TNIR | 4308 |
| 23-74. GPT_TCVR..... | 4308 |
| 23-75. Register Call Summary for Register GPT_TCVR | 4309 |
| 23-76. GPT_TOCR | 4309 |
| 23-77. Register Call Summary for Register GPT_TOCR..... | 4309 |
| 23-78. GPT_TOWR..... | 4309 |
| 23-79. Register Call Summary for Register GPT_TOWR | 4309 |
| 23-80. Watchdog Timers Default State | 4311 |
| 23-81. Integration Attributes | 4313 |
| 23-82. Clocks and Resets | 4313 |
| 23-83. Hardware Requests | 4314 |
| 23-84. IDLEMODE Settings | 4315 |
| 23-85. Watchdog Timer Events | 4316 |
| 23-86. Count and Prescaler Default Reset Values | 4316 |
| 23-87. Prescaler Clock Ratio Values..... | 4317 |
| 23-88. Reset Period Examples..... | 4318 |
| 23-89. Default Watchdog Timer Reset Periods..... | 4318 |
| 23-90. Global Initialization of Surrounding Modules..... | 4321 |
| 23-91. Watchdog Timer Module Global Initialization | 4323 |
| 23-92. Watchdog Timer Basic Configuration..... | 4323 |
| 23-93. Disable the Watchdog Timer..... | 4323 |
| 23-94. Enable the Watchdog Timer | 4323 |
| 23-95. Watchdog Timer Instance Summary..... | 4324 |
| 23-96. WDTIMER2 Register Mapping Summary | 4324 |
| 23-97. WDTIMER3 Register Mapping Summary | 4325 |
| 23-98. WDT_WIDR | 4326 |
| 23-99. Register Call Summary for Register WDT_WIDR..... | 4326 |
| 23-100. WDT_WDSC..... | 4326 |
| 23-101. Register Call Summary for Register WDT_WDSC | 4327 |
| 23-102. WDT_WDST | 4327 |
| 23-103. Register Call Summary for Register WDT_WDST..... | 4328 |
| 23-104. WDT_WISR | 4328 |
| 23-105. Register Call Summary for Register WDT_WISR | 4328 |
| 23-106. WDT_WIER | 4329 |
| 23-107. Register Call Summary for Register WDT_WIER | 4329 |
| 23-108. WDT_WWER | 4329 |
| 23-109. Register Call Summary for Register WDT_WWER..... | 4330 |

| | |
|---|------|
| 23-110. WDT_WCLR | 4330 |
| 23-111. Register Call Summary for Register WDT_WCLR..... | 4330 |
| 23-112. WDT_WCRR..... | 4331 |
| 23-113. Register Call Summary for Register WDT_WCRR | 4331 |
| 23-114. WDT_WLDR | 4331 |
| 23-115. Register Call Summary for Register WDT_WLDR..... | 4331 |
| 23-116. WDT_WTGR..... | 4332 |
| 23-117. Register Call Summary for Register WDT_WTGR | 4332 |
| 23-118. WDT_WWPS | 4332 |
| 23-119. Register Call Summary for Register WDT_WWPS | 4333 |
| 23-120. WDT_WDLY | 4333 |
| 23-121. Register Call Summary for Register WDT_WDLY..... | 4333 |
| 23-122. WDT_WSPR..... | 4334 |
| 23-123. Register Call Summary for Register WDT_WSPR | 4334 |
| 23-124. WDT_WIRQSTATRAW | 4334 |
| 23-125. Register Call Summary for Register WDT_WIRQSTATRAW | 4335 |
| 23-126. WDT_WIRQSTAT..... | 4335 |
| 23-127. Register Call Summary for Register WDT_WIRQSTAT | 4335 |
| 23-128. WDT_WIRQENSET..... | 4336 |
| 23-129. Register Call Summary for Register WDT_WIRQENSET | 4336 |
| 23-130. WDT_WIRQENCLR | 4337 |
| 23-131. Register Call Summary for Register WDT_WIRQENCLR | 4337 |
| 23-132. WDT_WIRQWAKEEN | 4337 |
| 23-133. Register Call Summary for Register WDT_WIRQWAKEEN | 4338 |
| 23-134. Integration Attributes..... | 4340 |
| 23-135. Clocks and Resets | 4340 |
| 23-136. Hardware Requests..... | 4340 |
| 23-137. 32KTimer Instance Summary..... | 4342 |
| 23-138. 32KTimer Register Summary..... | 4342 |
| 23-139. 32KSYNCNT_REV..... | 4342 |
| 23-140. Register Call Summary for Register 32KSYNCNT_REV | 4342 |
| 23-141. 32KSYNCNT_SYSCONFIG | 4343 |
| 23-142. Register Call Summary for Register 32KSYNCNT_SYSCONFIG..... | 4343 |
| 23-143. 32KSYNCNT_CR | 4343 |
| 23-144. Register Call Summary for Register 32KSYNCNT_CR..... | 4343 |
| 24-1. HS I ² C Input/Output | 4349 |
| 24-2. HS I ² C Input/Output | 4356 |
| 24-3. HS I ² C Input/Output Description | 4359 |
| 24-4. HS I ² C Integration Attributes | 4364 |
| 24-5. HS I ² C Clocks and Resets | 4364 |
| 24-6. HS I ² C Hardware Requests | 4365 |
| 24-7. HS I ² C Operation Mode Selection..... | 4366 |
| 24-8. HS I ² C T _{LOW} and T _{HIGH} Values of the I ² C Clock..... | 4367 |
| 24-9. HS I ² C Register Values for Maximum I ² C Bit Rates in I ² C F/S, I ² C HS, and SCCB Modes | 4369 |
| 24-10. HS I ² C Local Power-Management Features | 4371 |
| 24-11. HS I ² C Clock Activity Settings | 4372 |
| 24-12. HS I ² C Events..... | 4372 |
| 24-13. HS I ² C DMA Requests..... | 4373 |
| 24-14. HS I ² C List of Tests | 4379 |

| | |
|---|------|
| 24-15. HS I ² C Subprocess call summary for Sequence - Setup Procedure | 4383 |
| 24-16. HS I ² C Register call summary for Sequence - Setup Procedure..... | 4384 |
| 24-17. HS I ² C Register call summary for Sequence - Master Transmitter Mode, Polling Method, in F/S and HS Modes..... | 4385 |
| 24-18. HS I ² C Register call summary for Sequence - Master Receiver Mode, Polling Method, in F/S and HS Modes..... | 4387 |
| 24-19. HS I ² C Register call summary for Sequence - Master Transmitter Mode, Interrupt Method, in F/S and HS Modes..... | 4389 |
| 24-20. HS I ² C Register call summary for Sequence - Master Receiver Mode, Interrupt Method, in F/S and HS Modes..... | 4391 |
| 24-21. HS I ² C Register call summary for Sequence - Master Transmitter Mode, DMA Method in F/S and HS Modes..... | 4393 |
| 24-22. HS I ² C Register call summary for Sequence - Master Receiver Mode, DMA Method in F/S and HS Modes..... | 4395 |
| 24-23. HS I ² C Register call summary for Sequence - Slave Transmitter/Receiver Mode, Polling | 4395 |
| 24-24. HS I ² C Register call summary for Sequence - Slave Transmitter/Receiver Mode, Interrupt | 4396 |
| 24-25. HS I ² C Register call summary for Sequence - SCCB Setup Procedure | 4399 |
| 24-26. HS I ² C Register call summary for Sequence - SCCB Master Transmitter Mode, Polling..... | 4400 |
| 24-27. HS I ² C Register call summary for Sequence - SCCB Master Receiver Mode, Polling..... | 4402 |
| 24-28. HS I ² C Register call summary for Sequence - SCCB Master Transmitter Mode, Interrupt..... | 4404 |
| 24-29. HS I ² C Register call summary for Sequence - SCCB Master Receiver Mode, Interrupt..... | 4406 |
| 24-30. HS I ² C Instance Summary..... | 4406 |
| 24-31. HS I ² C Registers Mapping Summary 1 | 4406 |
| 24-32. HS I ² C Registers Mapping Summary 2 | 4407 |
| 24-33. I2C_REVNB_LO | 4408 |
| 24-34. Register Call Summary for Register I2C_REVNB_LO | 4408 |
| 24-35. I2C_REVNB_HI..... | 4409 |
| 24-36. Register Call Summary for Register I2C_REVNB_HI | 4409 |
| 24-37. I2C_SYSC..... | 4409 |
| 24-38. Register Call Summary for Register I2C_SYSC | 4410 |
| 24-39. I2C_IRQSTATUS_RAW | 4410 |
| 24-40. Register Call Summary for Register I2C_IRQSTATUS_RAW..... | 4411 |
| 24-41. I2C_IRQSTATUS | 4412 |
| 24-42. Register Call Summary for Register I2C_IRQSTATUS | 4413 |
| 24-43. I2C_IRQENABLE_SET | 4413 |
| 24-44. Register Call Summary for Register I2C_IRQENABLE_SET..... | 4415 |
| 24-45. I2C_IRQENABLE_CLR | 4415 |
| 24-46. Register Call Summary for Register I2C_IRQENABLE_CLR | 4416 |
| 24-47. I2C_WE | 4416 |
| 24-48. Register Call Summary for Register I2C_WE | 4417 |
| 24-49. I2C_DMARXENABLE_SET | 4418 |
| 24-50. Register Call Summary for Register I2C_DMARXENABLE_SET..... | 4418 |
| 24-51. I2C_DMATXENABLE_SET | 4418 |
| 24-52. Register Call Summary for Register I2C_DMATXENABLE_SET | 4419 |
| 24-53. I2C_DMARXENABLE_CLR | 4419 |
| 24-54. Register Call Summary for Register I2C_DMARXENABLE_CLR..... | 4419 |
| 24-55. I2C_DMATXENABLE_CLR | 4419 |
| 24-56. Register Call Summary for Register I2C_DMATXENABLE_CLR | 4420 |
| 24-57. I2C_DMARXWAKE_EN | 4420 |
| 24-58. Register Call Summary for Register I2C_DMARXWAKE_EN..... | 4421 |

| | |
|--|------|
| 24-59. I2C_DMATXWAKE_EN | 4421 |
| 24-60. Register Call Summary for Register I2C_DMATXWAKE_EN | 4422 |
| 24-61. I2C_IE | 4422 |
| 24-62. Register Call Summary for Register I2C_IE | 4424 |
| 24-63. I2C_STAT | 4424 |
| 24-64. Register Call Summary for Register I2C_STAT | 4426 |
| 24-65. I2C_SYSS | 4426 |
| 24-66. Register Call Summary for Register I2C_SYSS | 4426 |
| 24-67. I2C_BUF | 4426 |
| 24-68. Register Call Summary for Register I2C_BUF | 4427 |
| 24-69. I2C_CNT | 4427 |
| 24-70. Register Call Summary for Register I2C_CNT | 4428 |
| 24-71. I2C_DATA | 4428 |
| 24-72. Register Call Summary for Register I2C_DATA | 4428 |
| 24-73. I2C_CON | 4428 |
| 24-74. Register Call Summary for Register I2C_CON | 4430 |
| 24-75. I2C_OA | 4430 |
| 24-76. Register Call Summary for Register I2C_OA | 4430 |
| 24-77. I2C_SA | 4431 |
| 24-78. Register Call Summary for Register I2C_SA | 4431 |
| 24-79. I2C_PSC | 4431 |
| 24-80. Register Call Summary for Register I2C_PSC | 4431 |
| 24-81. I2C_SCLL | 4432 |
| 24-82. Register Call Summary for Register I2C_SCLL | 4432 |
| 24-83. I2C_SCLH | 4432 |
| 24-84. Register Call Summary for Register I2C_SCLH | 4432 |
| 24-85. I2C_SYSTEST | 4433 |
| 24-86. Register Call Summary for Register I2C_SYSTEST | 4434 |
| 24-87. I2C_BUFSTAT | 4434 |
| 24-88. Register Call Summary for Register I2C_BUFSTAT | 4434 |
| 24-89. I2C_OA1 | 4435 |
| 24-90. Register Call Summary for Register I2C_OA1 | 4435 |
| 24-91. I2C_OA2 | 4435 |
| 24-92. Register Call Summary for Register I2C_OA2 | 4435 |
| 24-93. I2C_OA3 | 4436 |
| 24-94. Register Call Summary for Register I2C_OA3 | 4436 |
| 24-95. I2C_ACTOA | 4436 |
| 24-96. Register Call Summary for Register I2C_ACTOA | 4437 |
| 24-97. I2C_SBLOCK | 4437 |
| 24-98. Register Call Summary for Register I2C_SBLOCK | 4437 |
| 24-99. Functional Modes | 4439 |
| 24-100. I/O Description | 4439 |
| 24-101. HDQ/1-Wire Command Byte | 4441 |
| 24-102. Integration Attributes | 4442 |
| 24-103. Clocks and Resets | 4442 |
| 24-104. Hardware Requests | 4442 |
| 24-105. Local Power-Management Features | 4445 |
| 24-106. Events | 4446 |
| 24-107. Global Initialization of Surrounding Modules | 4450 |

| | |
|---|------|
| 24-108. HDQ/1-Wire Module Global Initialization..... | 4450 |
| 24-109. HDQ Mode Selection | 4450 |
| 24-110. HDQ Write Operation Mode | 4450 |
| 24-111. HDQ Read Operation Mode | 4451 |
| 24-112. Initialize HDQ Slave | 4451 |
| 24-113. 1-Wire Mode Selection | 4451 |
| 24-114. 1-Wire Write Operation Mode | 4451 |
| 24-115. 1-Wire Read Operation Mode | 4452 |
| 24-116. Initialize 1-Wire Slave..... | 4452 |
| 24-117. HDQ/1-Wire Instance Summary..... | 4453 |
| 24-118. HDQ/1-Wire Registers Mapping Summary | 4453 |
| 24-119. HDQ_REVISION | 4454 |
| 24-120. Register Call Summary for Register HDQ_REVISION..... | 4454 |
| 24-121. HDQ_TX_DATA | 4454 |
| 24-122. Register Call Summary for Register HDQ_TX_DATA | 4454 |
| 24-123. HDQ_RX_DATA..... | 4454 |
| 24-124. Register Call Summary for Register HDQ_RX_DATA | 4455 |
| 24-125. HDQ_CTRL_STATUS | 4455 |
| 24-126. Register Call Summary for Register HDQ_CTRL_STATUS | 4456 |
| 24-127. HDQ_INT_STATUS..... | 4456 |
| 24-128. Register Call Summary for Register HDQ_INT_STATUS | 4457 |
| 24-129. HDQ_SYSCONFIG | 4457 |
| 24-130. Register Call Summary for Register HDQ_SYSCONFIG..... | 4457 |
| 24-131. HDQ_SYSSTATUS | 4458 |
| 24-132. Register Call Summary for Register HDQ_SYSSTATUS..... | 4458 |
| 24-133. UART Mode Baud Rates, Divisor Values, and Error Rates | 4460 |
| 24-134. UART IrDA Mode Baud Rates, Divisor Values, and Error Rates | 4461 |
| 24-135. UART I/O Pins..... | 4463 |
| 24-136. UART3 I/O Signals..... | 4464 |
| 24-137. UART_EFR[1:0] IR Address Checking Options..... | 4468 |
| 24-138. 4-PPM Format | 4471 |
| 24-139. FIR Preamble, Start Flag, and Stop Flag | 4471 |
| 24-140. FIR Data Byte Transmission Order Example..... | 4471 |
| 24-141. CIR I/O Signals..... | 4471 |
| 24-142. Integration Attributes..... | 4476 |
| 24-143. Clocks and Resets | 4477 |
| 24-144. Hardware Requests..... | 4477 |
| 24-145. Local Power-Management Features..... | 4481 |
| 24-146. UART Mode Interrupts | 4481 |
| 24-147. IrDA Mode Interrupts | 4482 |
| 24-148. CIR Mode Interrupts | 4483 |
| 24-149. TX FIFO Trigger Level Setting Summary | 4486 |
| 24-150. RX FIFO Trigger Level Setting Summary..... | 4486 |
| 24-151. UART/IrDA/CIR Register Access Mode Programming (Using UART_LCR) | 4493 |
| 24-152. Subconfiguration Mode A Summary | 4494 |
| 24-153. Subconfiguration Mode B Summary..... | 4494 |
| 24-154. Suboperational Mode Summary..... | 4494 |
| 24-155. UART/IrDA/CIR Register Access Mode Overview..... | 4494 |
| 24-156. UART Mode Selection..... | 4495 |

| | |
|--|------|
| 24-157. UART Mode Register Overview | 4496 |
| 24-158. IrDA Mode Register Overview | 4497 |
| 24-159. CIR Mode Register Overview | 4498 |
| 24-160. UART Baud Rate Settings (48-MHz Clock) | 4500 |
| 24-161. UART Parity Bit Encoding..... | 4501 |
| 24-162. UART_EFR[3:0] Software Flow Control Options..... | 4502 |
| 24-163. IrDA Baud Rate Settings | 4506 |
| 24-164. Duty Cycle | 4511 |
| 24-165. UART/IrDA/CIR Instance Summary | 4520 |
| 24-166. UART/IrDA/CIR Register Mapping Summary (UART1 and UART2) | 4520 |
| 24-167. UART/IrDA/CIR Register Mapping Summary (UART3 and UART4) | 4521 |
| 24-168. UART_THR | 4522 |
| 24-169. Register Call Summary for Register UART_THR..... | 4523 |
| 24-170. UART_RHR | 4523 |
| 24-171. Register Call Summary for Register UART_RHR | 4523 |
| 24-172. UART_DLL | 4524 |
| 24-173. Register Call Summary for Register UART_DLL | 4524 |
| 24-174. UART_IER | 4524 |
| 24-175. Register Call Summary for Register UART_IER..... | 4525 |
| 24-176. UART_IIR | 4527 |
| 24-177. Register Call Summary for Register UART_IIR..... | 4527 |
| 24-178. UART_DLH | 4529 |
| 24-179. Register Call Summary for Register UART_DLH..... | 4529 |
| 24-180. UART_FCR | 4530 |
| 24-181. Register Call Summary for Register UART_FCR..... | 4531 |
| 24-182. UART_EFR | 4531 |
| 24-183. Register Call Summary for Register UART_EFR..... | 4532 |
| 24-184. UART_LCR | 4532 |
| 24-185. Register Call Summary for Register UART_LCR..... | 4533 |
| 24-186. UART_XON1_ADDR1..... | 4534 |
| 24-187. Register Call Summary for Register UART_XON1_ADDR1 | 4534 |
| 24-188. UART_MCR..... | 4534 |
| 24-189. Register Call Summary for Register UART_MCR | 4535 |
| 24-190. UART_LSR | 4535 |
| 24-191. Register Call Summary for Register UART_LSR | 4536 |
| 24-192. UART_XON2_ADDR2..... | 4538 |
| 24-193. Register Call Summary for Register UART_XON2_ADDR2 | 4538 |
| 24-194. UART_TCR | 4538 |
| 24-195. Register Call Summary for Register UART_TCR..... | 4539 |
| 24-196. UART_XOFF1 | 4539 |
| 24-197. Register Call Summary for Register UART_XOFF1..... | 4539 |
| 24-198. UART_MSR..... | 4540 |
| 24-199. Register Call Summary for Register UART_MSR | 4540 |
| 24-200. UART_SPR | 4541 |
| 24-201. Register Call Summary for Register UART_SPR..... | 4541 |
| 24-202. UART_TLR..... | 4541 |
| 24-203. Register Call Summary for Register UART_TLR | 4542 |
| 24-204. UART_XOFF2 | 4542 |
| 24-205. Register Call Summary for Register UART_XOFF2..... | 4542 |

| | |
|--|------|
| 24-206. UART_MDR1 | 4543 |
| 24-207. Register Call Summary for Register UART_MDR1 | 4544 |
| 24-208. UART_MDR2 | 4544 |
| 24-209. Register Call Summary for Register UART_MDR2 | 4545 |
| 24-210. UART_SFLSR | 4546 |
| 24-211. Register Call Summary for Register UART_SFLSR | 4546 |
| 24-212. UART_TXFLL | 4547 |
| 24-213. Register Call Summary for Register UART_TXFLL | 4547 |
| 24-214. UART_RESUME | 4547 |
| 24-215. Register Call Summary for Register UART_RESUME | 4548 |
| 24-216. UART_TXFLH | 4548 |
| 24-217. Register Call Summary for Register UART_TXFLH | 4548 |
| 24-218. UART_SFREGL | 4549 |
| 24-219. Register Call Summary for Register UART_SFREGL | 4549 |
| 24-220. UART_RXFLL | 4549 |
| 24-221. Register Call Summary for Register UART_RXFLL | 4550 |
| 24-222. UART_SFREGH | 4550 |
| 24-223. Register Call Summary for Register UART_SFREGH | 4550 |
| 24-224. UART_RXFLH | 4551 |
| 24-225. Register Call Summary for Register UART_RXFLH | 4551 |
| 24-226. UART_BLR | 4551 |
| 24-227. Register Call Summary for Register UART_BLR | 4552 |
| 24-228. UART_UASR | 4552 |
| 24-229. Register Call Summary for Register UART_UASR | 4553 |
| 24-230. UART_ACREG | 4553 |
| 24-231. Register Call Summary for Register UART_ACREG | 4554 |
| 24-232. UART_SCR | 4554 |
| 24-233. Register Call Summary for Register UART_SCR | 4555 |
| 24-234. UART_SSR | 4556 |
| 24-235. Register Call Summary for Register UART_SSR | 4556 |
| 24-236. UART_EBLR | 4557 |
| 24-237. Register Call Summary for Register UART_EBLR | 4557 |
| 24-238. UART_MVR | 4558 |
| 24-239. Register Call Summary for Register UART_MVR | 4558 |
| 24-240. UART_SYSC | 4558 |
| 24-241. Register Call Summary for Register UART_SYSC | 4559 |
| 24-242. UART_SYSS | 4559 |
| 24-243. Register Call Summary for Register UART_SYSS | 4560 |
| 24-244. UART_WER | 4560 |
| 24-245. Register Call Summary for Register UART_WER | 4561 |
| 24-246. UART_CFPS | 4561 |
| 24-247. Register Call Summary for Register UART_CFPS | 4562 |
| 24-248. UART_RXFIFO_LVL | 4562 |
| 24-249. Register Call Summary for Register UART_RXFIFO_LVL | 4562 |
| 24-250. UART_TXFIFO_LVL | 4562 |
| 24-251. Register Call Summary for Register UART_TXFIFO_LVL | 4562 |
| 24-252. UART_IER2 | 4563 |
| 24-253. Register Call Summary for Register UART_IER2 | 4563 |
| 24-254. UART_ISR2 | 4563 |

| | |
|---|------|
| 24-255. Register Call Summary for Register UART_ISR2 | 4564 |
| 24-256. UART_FREQ_SEL..... | 4564 |
| 24-257. Register Call Summary for Register UART_FREQ_SEL | 4564 |
| 24-258. UART_MDR3 | 4565 |
| 24-259. Register Call Summary for Register UART_MDR3..... | 4565 |
| 24-260. UART_TX_DMA_THRESHOLD..... | 4565 |
| 24-261. Register Call Summary for Register UART_TX_DMA_THRESHOLD | 4566 |
| 24-262. MCSPI I/O Description (Master Mode) | 4571 |
| 24-263. MCSPI I/O Description (Slave Mode) | 4571 |
| 24-264. SPI Master Clock Rates | 4572 |
| 24-265. Phase and Polarity Combinations..... | 4573 |
| 24-266. Integration Attributes..... | 4578 |
| 24-267. Clocks and Resets | 4578 |
| 24-268. Hardware Requests..... | 4578 |
| 24-269. Wake-Up Requests | 4579 |
| 24-270. SPI Master Clock Rates | 4586 |
| 24-271. CLKSPIO High/Low Time Computation | 4586 |
| 24-272. Clock Granularity Examples | 4588 |
| 24-273. FIFO Writes, Word Length Relationship | 4593 |
| 24-274. Smart-Idle Mode and Wake-Up Capabilities | 4600 |
| 24-275. Global Initialization of Surrounding Modules | 4602 |
| 24-276. MCSPI Global Initialization..... | 4602 |
| 24-277. MCSPI Receive Mode Initialization | 4602 |
| 24-278. MCSPI Transmit Mode Initialization | 4603 |
| 24-279. MCSPI Transmit-and-Receive Mode Initialization | 4603 |
| 24-280. Receive-Only Procedure – Polling Method | 4603 |
| 24-281. Receive-Only Procedure – Interrupt Method | 4604 |
| 24-282. Transmit-Only Procedure – Polling Method | 4604 |
| 24-283. Transmit-and-Receive Procedure – Polling Method..... | 4604 |
| 24-284. Receive-Only Procedure With Word Count – Polling Method..... | 4604 |
| 24-285. Transmit-Only Procedure Without Word Count – Polling Method | 4605 |
| 24-286. Transmit-Only Procedure With Word Count – Interrupt Method..... | 4605 |
| 24-287. Transmit-and-Receive Procedure With Word Count – Polling Method | 4605 |
| 24-288. Transmit-and-Receive Procedure With Word Count – Interrupt Method | 4605 |
| 24-289. Transmit-and-Receive Procedure Without Word Count – Polling Method..... | 4606 |
| 24-290. MCSPI Instance Summary..... | 4607 |
| 24-291. MCSPI Register Summary..... | 4607 |
| 24-292. MCSPI_HL_REV | 4608 |
| 24-293. Register Call Summary for Register MCSPI_HL_REV..... | 4608 |
| 24-294. MCSPI_HL_HWINFO..... | 4608 |
| 24-295. Register Call Summary for Register MCSPI_HL_HWINFO | 4609 |
| 24-296. MCSPI_HL_SYSCONFIG..... | 4609 |
| 24-297. Register Call Summary for Register MCSPI_HL_SYSCONFIG | 4610 |
| 24-298. MCSPI_REVISION..... | 4610 |
| 24-299. Register Call Summary for Register MCSPI_REVISION | 4610 |
| 24-300. MCSPI_SYSCONFIG..... | 4611 |
| 24-301. Register Call Summary for Register MCSPI_SYSCONFIG | 4612 |
| 24-302. MCSPI_SYSSTATUS | 4612 |
| 24-303. Register Call Summary for Register MCSPI_SYSSTATUS | 4612 |

| | |
|--|------|
| 24-304. MCSPI_IRQSTATUS | 4612 |
| 24-305. Register Call Summary for Register MCSPI_IRQSTATUS..... | 4615 |
| 24-306. MCSPI_IRQENABLE | 4616 |
| 24-307. Register Call Summary for Register MCSPI_IRQENABLE..... | 4617 |
| 24-308. MCSPI_WAKEUPENABLE | 4618 |
| 24-309. Register Call Summary for Register MCSPI_WAKEUPENABLE..... | 4618 |
| 24-310. MCSPI_SYST | 4618 |
| 24-311. Register Call Summary for Register MCSPI_SYST | 4620 |
| 24-312. MCSPI_MODULCTRL..... | 4620 |
| 24-313. Register Call Summary for Register MCSPI_MODULCTRL | 4621 |
| 24-314. MCSPI_CHxCONF..... | 4622 |
| 24-315. Register Call Summary for Register MCSPI_CHxCONF | 4626 |
| 24-316. MCSPI_CHxSTAT | 4626 |
| 24-317. Register Call Summary for Register MCSPI_CHxSTAT | 4627 |
| 24-318. MCSPI_CHxCTRL | 4628 |
| 24-319. Register Call Summary for Register MCSPI_CHxCTRL..... | 4628 |
| 24-320. MCSPI_TXx..... | 4629 |
| 24-321. Register Call Summary for Register MCSPI_TXx | 4629 |
| 24-322. MCSPI_RXx | 4629 |
| 24-323. Register Call Summary for Register MCSPI_RXx..... | 4630 |
| 24-324. MCSPI_XFERLEVEL | 4630 |
| 24-325. Register Call Summary for Register MCSPI_XFERLEVEL | 4631 |
| 24-326. Functions Description..... | 4634 |
| 24-327. I/O Description..... | 4635 |
| 24-328. Integration Attributes..... | 4649 |
| 24-329. Clocks and Resets | 4649 |
| 24-330. Hardware Requests..... | 4649 |
| 24-331. Software Reset Signals to All McBSP Modules..... | 4655 |
| 24-332. State of Clocks When the Module is in Idle State | 4656 |
| 24-333. McBSP Smart-Idle Mode Configuration Behavior | 4659 |
| 24-334. Receiver Clock Mode..... | 4663 |
| 24-335. Phases, Words and Bits per Frame Control Bit..... | 4667 |
| 24-336. Assumptions for the Single-Phase Frame Example..... | 4667 |
| 24-337. Assumptions for the Dual-Phase Frame Example..... | 4668 |
| 24-338. Effects of DLB and ALB Bits on Clock Modes | 4674 |
| 24-339. McBSP Channels | 4683 |
| 24-340. Eight Partitions – Receive Channel Assignment and Control | 4684 |
| 24-341. Eight Partitions – Transmit Channel Assignment and Control | 4684 |
| 24-342. Selecting a Transmit Multichannel Selection Mode With the XMCM Bit Field | 4686 |
| 24-343. McBSP Channel Control Options | 4687 |
| 24-344. Register Call Summary for Flow Diagram of McBSP Initialization Procedure | 4693 |
| 24-345. Register Call Summary for Flow Diagram for the SRG Registers Programming..... | 4694 |
| 24-346. Data Transfer DMA Request Configuration..... | 4695 |
| 24-347. Interruption Configuration | 4695 |
| 24-348. Receiver Reset | 4695 |
| 24-349. Global Configuration | 4696 |
| 24-350. Data Configuration | 4696 |
| 24-351. Frame-Sync Configuration | 4697 |
| 24-352. Clock Configuration | 4697 |

| | |
|---|------|
| 24-353. Take the Receiver Out of Reset | 4697 |
| 24-354. Transmitter Reset | 4697 |
| 24-355. Global Configuration | 4698 |
| 24-356. Data Configuration | 4698 |
| 24-357. Frame-Sync Configuration | 4699 |
| 24-358. Clock Configuration | 4699 |
| 24-359. Take the Receiver Out of Reset | 4699 |
| 24-360. Use Serial Receive Pins as GPIO Pins | 4699 |
| 24-361. Use Serial Transmit Pins as GPIO Pins | 4700 |
| 24-362. Use External Clock Pin as GPIO Pin | 4700 |
| 24-363. MCBSP Instance Summary | 4701 |
| 24-364. MCBSP1 Register Summary | 4701 |
| 24-365. MCBSP2 Register Summary | 4702 |
| 24-366. MCBSP3 Register Summary | 4703 |
| 24-367. MCBSP4 Register Summary | 4705 |
| 24-368. MCBSP_LP_DRR_REG | 4706 |
| 24-369. Register Call Summary for Register MCBSP_LP_DRR_REG | 4706 |
| 24-370. MCBSP_LP_DXR_REG | 4706 |
| 24-371. Register Call Summary for Register MCBSP_LP_DXR_REG | 4707 |
| 24-372. MCBSP_LP_SPCR2_REG | 4707 |
| 24-373. Register Call Summary for Register MCBSP_LP_SPCR2_REG | 4708 |
| 24-374. MCBSP_LP_SPCR1_REG | 4709 |
| 24-375. Register Call Summary for Register MCBSP_LP_SPCR1_REG | 4710 |
| 24-376. MCBSP_LP_RCR2_REG | 4710 |
| 24-377. Register Call Summary for Register MCBSP_LP_RCR2_REG | 4711 |
| 24-378. MCBSP_LP_RCR1_REG | 4712 |
| 24-379. Register Call Summary for Register MCBSP_LP_RCR1_REG | 4712 |
| 24-380. MCBSP_LP_XCR2_REG | 4713 |
| 24-381. Register Call Summary for Register MCBSP_LP_XCR2_REG | 4714 |
| 24-382. MCBSP_LP_XCR1_REG | 4714 |
| 24-383. Register Call Summary for Register MCBSP_LP_XCR1_REG | 4715 |
| 24-384. MCBSP_LP_SRGR2_REG | 4715 |
| 24-385. Register Call Summary for Register MCBSP_LP_SRGR2_REG | 4716 |
| 24-386. MCBSP_LP_SRGR1_REG | 4716 |
| 24-387. Register Call Summary for Register MCBSP_LP_SRGR1_REG | 4717 |
| 24-388. MCBSP_LP_MCR2_REG | 4717 |
| 24-389. Register Call Summary for Register MCBSP_LP_MCR2_REG | 4718 |
| 24-390. MCBSP_LP_MCR1_REG | 4718 |
| 24-391. Register Call Summary for Register MCBSP_LP_MCR1_REG | 4719 |
| 24-392. MCBSP_LP_RCERA_REG | 4720 |
| 24-393. Register Call Summary for Register MCBSP_LP_RCERA_REG | 4720 |
| 24-394. MCBSP_LP_RCERB_REG | 4720 |
| 24-395. Register Call Summary for Register MCBSP_LP_RCERB_REG | 4721 |
| 24-396. MCBSP_LP_XCERA_REG | 4721 |
| 24-397. Register Call Summary for Register MCBSP_LP_XCERA_REG | 4721 |
| 24-398. MCBSP_LP_XCERB_REG | 4721 |
| 24-399. Register Call Summary for Register MCBSP_LP_XCERB_REG | 4722 |
| 24-400. MCBSP_LP_PCR_REG | 4722 |
| 24-401. Register Call Summary for Register MCBSP_LP_PCR_REG | 4724 |

| | |
|---|------|
| 24-402. MCBSP_LP_RCERC_REG | 4724 |
| 24-403. Register Call Summary for Register MCBSP_LP_RCERC_REG | 4725 |
| 24-404. MCBSP_LP_RCERD_REG | 4725 |
| 24-405. Register Call Summary for Register MCBSP_LP_RCERD_REG | 4725 |
| 24-406. MCBSP_LP_XCERC_REG | 4725 |
| 24-407. Register Call Summary for Register MCBSP_LP_XCERC_REG | 4726 |
| 24-408. MCBSP_LP_XCERD_REG | 4726 |
| 24-409. Register Call Summary for Register MCBSP_LP_XCERD_REG | 4726 |
| 24-410. MCBSP_LP_RCERE_REG | 4727 |
| 24-411. Register Call Summary for Register MCBSP_LP_RCERE_REG | 4727 |
| 24-412. MCBSP_LP_RCERF_REG | 4727 |
| 24-413. Register Call Summary for Register MCBSP_LP_RCERF_REG | 4728 |
| 24-414. MCBSP_LP_XCERE_REG | 4728 |
| 24-415. Register Call Summary for Register MCBSP_LP_XCERE_REG | 4728 |
| 24-416. MCBSP_LP_XCERF_REG | 4728 |
| 24-417. Register Call Summary for Register MCBSP_LP_XCERF_REG | 4729 |
| 24-418. MCBSP_LP_RCERG_REG | 4729 |
| 24-419. Register Call Summary for Register MCBSP_LP_RCERG_REG | 4729 |
| 24-420. MCBSP_LP_RCERH_REG | 4730 |
| 24-421. Register Call Summary for Register MCBSP_LP_RCERH_REG | 4730 |
| 24-422. MCBSP_LP_XCERG_REG | 4730 |
| 24-423. Register Call Summary for Register MCBSP_LP_XCERG_REG | 4731 |
| 24-424. MCBSP_LP_XCERH_REG | 4731 |
| 24-425. Register Call Summary for Register MCBSP_LP_XCERH_REG | 4731 |
| 24-426. MCBSP_LP_REV_REG | 4731 |
| 24-427. Register Call Summary for Register MCBSP_LP_REV_REG | 4732 |
| 24-428. MCBSP_LP_RINTCLR_REG | 4732 |
| 24-429. Register Call Summary for Register MCBSP_LP_RINTCLR_REG | 4732 |
| 24-430. MCBSP_LP_XINTCLR_REG | 4732 |
| 24-431. Register Call Summary for Register MCBSP_LP_XINTCLR_REG | 4733 |
| 24-432. MCBSP_LP_ROVFLCLR_REG | 4733 |
| 24-433. Register Call Summary for Register MCBSP_LP_ROVFLCLR_REG | 4733 |
| 24-434. MCBSP_LP_SYSCONFIG_REG | 4733 |
| 24-435. Register Call Summary for Register MCBSP_LP_SYSCONFIG_REG | 4734 |
| 24-436. MCBSP_LP_THRSH2_REG | 4735 |
| 24-437. Register Call Summary for Register MCBSP_LP_THRSH2_REG | 4735 |
| 24-438. MCBSP_LP_THRSH1_REG | 4735 |
| 24-439. Register Call Summary for Register MCBSP_LP_THRSH1_REG | 4736 |
| 24-440. MCBSP_LP_IRQSTATUS_REG | 4736 |
| 24-441. Register Call Summary for Register MCBSP_LP_IRQSTATUS_REG | 4738 |
| 24-442. MCBSP_LP_IRQENABLE_REG | 4739 |
| 24-443. Register Call Summary for Register MCBSP_LP_IRQENABLE_REG | 4740 |
| 24-444. MCBSP_LP_WAKEUPEN_REG | 4740 |
| 24-445. Register Call Summary for Register MCBSP_LP_WAKEUPEN_REG | 4741 |
| 24-446. MCBSP_LP_XCCR_REG | 4742 |
| 24-447. Register Call Summary for Register MCBSP_LP_XCCR_REG | 4743 |
| 24-448. MCBSP_LP_RCCR_REG | 4744 |
| 24-449. Register Call Summary for Register MCBSP_LP_RCCR_REG | 4744 |
| 24-450. MCBSP_LP_XBUFFSTAT_REG | 4745 |

| | |
|---|------|
| 24-451. Register Call Summary for Register MCBSP_LP_XBUFFSTAT_REG | 4745 |
| 24-452. MCBSP_LP_RBUFFSTAT_REG | 4745 |
| 24-453. Register Call Summary for Register MCBSP_LP_RBUFFSTAT_REG | 4746 |
| 24-454. Modes | 4748 |
| 24-455. I/O | 4748 |
| 24-456. Integration Attributes..... | 4755 |
| 24-457. Clocks and Resets | 4755 |
| 24-458. Hardware Requests..... | 4756 |
| 24-459. Local Power-Management Features..... | 4758 |
| 24-460. Interrupt Events | 4759 |
| 24-461. McPDM DMA Requests | 4761 |
| 24-462. Global Initialization of Surrounding Modules | 4771 |
| 24-463. McPDM Downlink Path Global Initialization | 4773 |
| 24-464. McPDM Uplink Path Global Initialization | 4773 |
| 24-465. FIFO-Downlink-Full Event Servicing..... | 4774 |
| 24-466. FIFO-Downlink-Empty Event Servicing | 4774 |
| 24-467. FIFO-Downlink-Almost-Empty Event Servicing | 4775 |
| 24-468. FIFO Downlink Write-Request Event Servicing | 4775 |
| 24-469. FIFO-Uplink-Full Event Servicing | 4775 |
| 24-470. FIFO-Uplink-Almost-Full Event Servicing | 4776 |
| 24-471. FIFO-Uplink-Empty Event Servicing | 4776 |
| 24-472. FIFO-Uplink-Read-Request Event Servicing | 4776 |
| 24-473. McPDM Instance Summary..... | 4777 |
| 24-474. McPDM Register Mapping Summary..... | 4777 |
| 24-475. MCPDM_REVISION | 4778 |
| 24-476. Register Call Summary for Register MCPDM_REVISION..... | 4778 |
| 24-477. MCPDM_SYSCONFIG | 4778 |
| 24-478. Register Call Summary for Register MCPDM_SYSCONFIG..... | 4779 |
| 24-479. MCPDM_IRQSTATUS_RAW..... | 4779 |
| 24-480. Register Call Summary for Register MCPDM_IRQSTATUS_RAW | 4780 |
| 24-481. MCPDM_IRQSTATUS | 4780 |
| 24-482. Register Call Summary for Register MCPDM_IRQSTATUS | 4782 |
| 24-483. MCPDM_IRQENABLE_SET..... | 4782 |
| 24-484. Register Call Summary for Register MCPDM_IRQENABLE_SET | 4783 |
| 24-485. MCPDM_IRQENABLE_CLR..... | 4784 |
| 24-486. Register Call Summary for Register MCPDM_IRQENABLE_CLR | 4785 |
| 24-487. MCPDM_IRQWAKEEN | 4785 |
| 24-488. Register Call Summary for Register MCPDM_IRQWAKEEN | 4786 |
| 24-489. MCPDM_DMAENABLE_SET | 4786 |
| 24-490. Register Call Summary for Register MCPDM_DMAENABLE_SET | 4786 |
| 24-491. MCPDM_DMAENABLE_CLR | 4787 |
| 24-492. Register Call Summary for Register MCPDM_DMAENABLE_CLR | 4787 |
| 24-493. MCPDM_DMAWAKEEN | 4787 |
| 24-494. Register Call Summary for Register MCPDM_DMAWAKEEN..... | 4788 |
| 24-495. MCPDM_CTRL..... | 4788 |
| 24-496. Register Call Summary for Register MCPDM_CTRL | 4789 |
| 24-497. MCPDM_DN_DATA | 4789 |
| 24-498. Register Call Summary for Register MCPDM_DN_DATA..... | 4789 |
| 24-499. MCPDM_UP_DATA | 4790 |

| | |
|---|------|
| 24-500. Register Call Summary for Register MCPDM_UP_DATA | 4790 |
| 24-501. MCPDM_FIFO_CTRL_DN | 4790 |
| 24-502. Register Call Summary for Register MCPDM_FIFO_CTRL_DN | 4790 |
| 24-503. MCPDM_FIFO_CTRL_UP | 4791 |
| 24-504. Register Call Summary for Register MCPDM_FIFO_CTRL_UP | 4791 |
| 24-505. MCPDM_DN_OFFSET | 4791 |
| 24-506. Register Call Summary for Register MCPDM_DN_OFFSET | 4792 |
| 24-507. Input/Output | 4796 |
| 24-508. Integration Attributes | 4798 |
| 24-509. Clocks and Resets | 4799 |
| 24-510. Hardware Requests | 4799 |
| 24-511. abe_dmic_clkx Generation | 4801 |
| 24-512. Reset Description | 4801 |
| 24-513. Local Power-Management Features | 4801 |
| 24-514. Interrupt Events | 4803 |
| 24-515. DMIC DMA Request | 4805 |
| 24-516. Audio Data Path Registers | 4807 |
| 24-517. Global Initialization of Surrounding Modules | 4808 |
| 24-518. DMIC Global Initialization | 4808 |
| 24-519. Register Call Summary for Polling Mode | 4809 |
| 24-520. Interrupt Mode | 4809 |
| 24-521. DMA Mode | 4810 |
| 24-522. Register Call Summary for the Interrupt Handler | 4811 |
| 24-523. DMIC Instance Summary | 4812 |
| 24-524. DMIC Register Mapping Summary | 4812 |
| 24-525. DMIC_REVISION | 4813 |
| 24-526. Register Call Summary for Register DMIC_REVISION | 4813 |
| 24-527. DMIC_SYSCONFIG | 4813 |
| 24-528. Register Call Summary for Register DMIC_SYSCONFIG | 4814 |
| 24-529. DMIC_IRQSTATUS_RAW | 4814 |
| 24-530. Register Call Summary for Register DMIC_IRQSTATUS_RAW | 4815 |
| 24-531. DMIC_IRQSTATUS | 4815 |
| 24-532. Register Call Summary for Register DMIC_IRQSTATUS | 4816 |
| 24-533. DMIC_IRQENABLE_SET | 4816 |
| 24-534. Register Call Summary for Register DMIC_IRQENABLE_SET | 4817 |
| 24-535. DMIC_IRQENABLE_CLR | 4817 |
| 24-536. Register Call Summary for Register DMIC_IRQENABLE_CLR | 4818 |
| 24-537. DMIC_IRQWAKEEN | 4818 |
| 24-538. Register Call Summary for Register DMIC_IRQWAKEEN | 4818 |
| 24-539. DMIC_DMAENABLE_SET | 4818 |
| 24-540. Register Call Summary for Register DMIC_DMAENABLE_SET | 4819 |
| 24-541. DMIC_DMAENABLE_CLR | 4819 |
| 24-542. Register Call Summary for Register DMIC_DMAENABLE_CLR | 4819 |
| 24-543. DMIC_DMAWAKEEN | 4820 |
| 24-544. Register Call Summary for Register DMIC_DMAWAKEEN | 4820 |
| 24-545. DMIC_CTRL | 4820 |
| 24-546. Register Call Summary for Register DMIC_CTRL | 4821 |
| 24-547. DMIC_DATA_REG | 4821 |
| 24-548. Register Call Summary for Register DMIC_DATA_REG | 4821 |

| | |
|---|------|
| 24-549. DMIC_FIFO_CTRL | 4822 |
| 24-550. Register Call Summary for Register DMIC_FIFO_CTRL | 4822 |
| 24-551. DMIC_FIFO_DMIC1R_DATA..... | 4822 |
| 24-552. Register Call Summary for Register DMIC_FIFO_DMIC1R_DATA | 4822 |
| 24-553. DMIC_FIFO_DMIC1L_DATA | 4823 |
| 24-554. Register Call Summary for Register DMIC_FIFO_DMIC1L_DATA | 4823 |
| 24-555. DMIC_FIFO_DMIC2R_DATA..... | 4823 |
| 24-556. Register Call Summary for Register DMIC_FIFO_DMIC2R_DATA | 4823 |
| 24-557. DMIC_FIFO_DMIC2L_DATA | 4824 |
| 24-558. Register Call Summary for Register DMIC_FIFO_DMIC2L_DATA | 4824 |
| 24-559. DMIC_FIFO_DMIC3R_DATA..... | 4824 |
| 24-560. Register Call Summary for Register DMIC_FIFO_DMIC3R_DATA | 4824 |
| 24-561. DMIC_FIFO_DMIC3L_DATA | 4825 |
| 24-562. Register Call Summary for Register DMIC_FIFO_DMIC3L_DATA | 4825 |
| 24-563. I/O | 4827 |
| 24-564. Biphas-Mark Encoder | 4831 |
| 24-565. Preamble Codes | 4832 |
| 24-566. Integration Attributes..... | 4834 |
| 24-567. Clocks and Resets | 4834 |
| 24-568. Hardware Requests..... | 4834 |
| 24-569. Local Power-Management Features..... | 4839 |
| 24-570. Channel Status and User Data for Each DIT Block | 4841 |
| 24-571. TX Events | 4844 |
| 24-572. Global Initialization of Surrounding Modules | 4849 |
| 24-573. McASP Global Initialization | 4849 |
| 24-574. Transmit Format Unit Configuration | 4850 |
| 24-575. Transmit Frame-Synchronization Generator Configuration..... | 4850 |
| 24-576. Transmit Clock Generator Configuration..... | 4851 |
| 24-577. McASP Pins Functional Configuration | 4851 |
| 24-578. McASP Mute Input/Output Trigger Condition Settings | 4851 |
| 24-579. DIT-Specific Subframe Fields Configuration..... | 4852 |
| 24-580. Register Call Summary for Main Sequence – McASP DIT Transmission Polling Method | 4853 |
| 24-581. Subprocess Call Summary for Main Sequence – McASP DIT Transmission Polling Method | 4853 |
| 24-582. McASP Interrupt Transmission Model..... | 4855 |
| 24-583. Register Call Summary for Subsequence – McASP DIT Transmission Startup Procedure..... | 4855 |
| 24-584. McASP DMA Transmission Model with Interrupt Events Servicing | 4855 |
| 24-585. Register Call Summary for Subsequence – McASP DMA Transmission Procedure | 4856 |
| 24-586. Register Call Summary for McASP Interrupt Events Servicing | 4857 |
| 24-587. Subprocess Call Summary for Interrupt Events Servicing..... | 4857 |
| 24-588. Register Call Summary for McASP Error Handling..... | 4858 |
| 24-589. McASP Instance Summary | 4859 |
| 24-590. McASP Register Mapping Summary | 4859 |
| 24-591. MCASP_PID | 4861 |
| 24-592. Register Call Summary for Register MCASP_PID..... | 4861 |
| 24-593. MCASP_SYSCONFIG..... | 4861 |
| 24-594. Register Call Summary for Register MCASP_SYSCONFIG | 4861 |
| 24-595. MCASP_PFUNC | 4862 |
| 24-596. Register Call Summary for Register MCASP_PFUNC..... | 4862 |
| 24-597. MCASP_PDIR | 4863 |

| | |
|--|------|
| 24-598. Register Call Summary for Register MCASP_PDIR..... | 4863 |
| 24-599. MCASP_PDOUT | 4864 |
| 24-600. Register Call Summary for Register MCASP_PDOUT..... | 4865 |
| 24-601. MCASP_PDIN | 4865 |
| 24-602. Register Call Summary for Register MCASP_PDIN..... | 4865 |
| 24-603. MCASP_PDSET | 4866 |
| 24-604. Register Call Summary for Register MCASP_PDSET | 4866 |
| 24-605. MCASP_PDCLR | 4867 |
| 24-606. Register Call Summary for Register MCASP_PDCLR | 4867 |
| 24-607. MCASP_GBLCTL | 4868 |
| 24-608. Register Call Summary for Register MCASP_GBLCTL..... | 4869 |
| 24-609. MCASP_AMUTE | 4869 |
| 24-610. Register Call Summary for Register MCASP_AMUTE..... | 4870 |
| 24-611. MCASP_TXDITCTL..... | 4870 |
| 24-612. Register Call Summary for Register MCASP_TXDITCTL | 4871 |
| 24-613. MCASP_TXMASK | 4871 |
| 24-614. Register Call Summary for Register MCASP_TXMASK..... | 4871 |
| 24-615. MCASP_TXFMT | 4871 |
| 24-616. Register Call Summary for Register MCASP_TXFMT | 4872 |
| 24-617. MCASP_TXFMCTL | 4873 |
| 24-618. Register Call Summary for Register MCASP_TXFMCTL..... | 4873 |
| 24-619. MCASP_ACLKXCTL..... | 4874 |
| 24-620. Register Call Summary for Register MCASP_ACLKXCTL | 4874 |
| 24-621. MCASP_AHCLKXCTL..... | 4874 |
| 24-622. Register Call Summary for Register MCASP_AHCLKXCTL | 4875 |
| 24-623. MCASP_TXTDM | 4875 |
| 24-624. Register Call Summary for Register MCASP_TXTDM..... | 4875 |
| 24-625. MCASP_EVTCTLX | 4876 |
| 24-626. Register Call Summary for Register MCASP_EVTCTLX | 4877 |
| 24-627. MCASP_TXSTAT | 4877 |
| 24-628. Register Call Summary for Register MCASP_TXSTAT..... | 4878 |
| 24-629. MCASP_TXTDMSLOT | 4879 |
| 24-630. Register Call Summary for Register MCASP_TXTDMSLOT..... | 4879 |
| 24-631. MCASP_TXCLKCHK | 4879 |
| 24-632. Register Call Summary for Register MCASP_TXCLKCHK..... | 4880 |
| 24-633. MCASP_TXEVTCTL..... | 4880 |
| 24-634. Register Call Summary for Register MCASP_TXEVTCTL | 4880 |
| 24-635. MCASP_DITCSRAi | 4881 |
| 24-636. Register Call Summary for Register MCASP_DITCSRAi..... | 4881 |
| 24-637. MCASP_DITCSRBi | 4881 |
| 24-638. Register Call Summary for Register MCASP_DITCSRBi..... | 4881 |
| 24-639. MCASP_DITUDRAi | 4882 |
| 24-640. Register Call Summary for Register MCASP_DITUDRAi | 4882 |
| 24-641. MCASP_DITUDRBi | 4882 |
| 24-642. Register Call Summary for Register MCASP_DITUDRBi | 4882 |
| 24-643. MCASP_XRSRCTL0 | 4883 |
| 24-644. Register Call Summary for Register MCASP_XRSRCTL0..... | 4883 |
| 24-645. MCASP_TXBUF0 | 4883 |
| 24-646. Register Call Summary for Register MCASP_TXBUF0..... | 4884 |

| | |
|---|------|
| 24-647. SLIMbus1 Signals Description | 4889 |
| 24-648. SLIMbus2 Signals Description | 4889 |
| 24-649. Segment Composition | 4893 |
| 24-650. Data Segment Field Size Calculations | 4895 |
| 24-651. SLIMbus Transfer Protocols | 4895 |
| 24-652. Integration Attributes..... | 4899 |
| 24-653. Clocks and Resets | 4900 |
| 24-654. Hardware Requests..... | 4900 |
| 24-655. Local Power-Management Features..... | 4904 |
| 24-656. Reset and Boot Control Summary | 4905 |
| 24-657. Examples of AUX + DATA Mapping in 32-bit Read/Write Accesses..... | 4909 |
| 24-658. HILEVEL/Empty Status of a 4-Word Receive FIFO, for all DMA Threshold Values | 4913 |
| 24-659. LOLEVEL/Full Status of a 4-Word Transmit FIFO, for all DMA Threshold Values | 4913 |
| 24-660. Register Fields Used to Configure Transfer Protocols | 4915 |
| 24-661. Register Fields Used for Isochronous Transfer Protocol | 4915 |
| 24-662. Register Fields Used for Pushed Transfer Protocol | 4916 |
| 24-663. Register fields used for Pulled Transfer Protocol | 4917 |
| 24-664. "Plain" Asynchronous Endpoint Configurations | 4919 |
| 24-665. Register fields used for "Plain" Asynchronous Transfer Protocol | 4919 |
| 24-666. Extended Asynchronous Endpoint Configurations..... | 4920 |
| 24-667. Register fields used for Extended Asynchronous Transfer Protocol | 4921 |
| 24-668. Enumeration Address (EA) makeup | 4924 |
| 24-669. Interrupts | 4927 |
| 24-670. Event Summary | 4927 |
| 24-671. Global Initialization of Surrounding Modules | 4938 |
| 24-672. SLIMbus Module Software Reset | 4938 |
| 24-673. SLIMbus Power Management | 4938 |
| 24-674. Clock Source Component Boot | 4939 |
| 24-675. Clock Receiver Component Boot | 4939 |
| 24-676. Data Agent Assignment | 4939 |
| 24-677. Manager Device Enumeration | 4940 |
| 24-678. Non-Manager Device Enumeration | 4940 |
| 24-679. SLIMbus Transfer Protocol Configuration..... | 4940 |
| 24-680. SLIMbus Data FIFO Mapping and Setup | 4942 |
| 24-681. Message Transmit Procedure, Polling Method..... | 4943 |
| 24-682. Message Transmit Procedure, Interrupt Method..... | 4943 |
| 24-683. Message Receive Procedure, Polling Method | 4943 |
| 24-684. Message Receive, Interrupt Method..... | 4944 |
| 24-685. Receiving Data, Polling Method..... | 4944 |
| 24-686. Receiving Data, Interrupt Method | 4945 |
| 24-687. Receiving Data, DMA Enable | 4945 |
| 24-688. Transmitting Data, Polling Method..... | 4945 |
| 24-689. Transmitting Data, Interrupt Method | 4945 |
| 24-690. Transmitting Data, DMA Enable | 4946 |
| 24-691. SLIMbus Instance Summary..... | 4947 |
| 24-692. SLIMBUS1 Register Mapping Summary | 4947 |
| 24-693. SLIMBUS2 Register Mapping Summary | 4949 |
| 24-694. SLIMBUS_CMP_REVISION | 4951 |
| 24-695. Register Call Summary for Register SLIMBUS_CMP_REVISION | 4951 |

| | |
|--|------|
| 24-696. SLIMBUS_CMP_HWINFO | 4951 |
| 24-697. Register Call Summary for Register SLIMBUS_CMP_HWINFO | 4952 |
| 24-698. Reset values for SLIMBUS_CMP_HWINFO | 4952 |
| 24-699. SLIMBUS_CMP_SYSCONFIG | 4952 |
| 24-700. Register Call Summary for Register SLIMBUS_CMP_SYSCONFIG | 4953 |
| 24-701. SLIMBUS_CMP_IRQSTATUS_RAW | 4953 |
| 24-702. Register Call Summary for Register SLIMBUS_CMP_IRQSTATUS_RAW | 4956 |
| 24-703. SLIMBUS_CMP_IRQSTATUS | 4956 |
| 24-704. Register Call Summary for Register SLIMBUS_CMP_IRQSTATUS | 4959 |
| 24-705. SLIMBUS_CMP_IRQENABLE_SET | 4959 |
| 24-706. Register Call Summary for Register SLIMBUS_CMP_IRQENABLE_SET | 4962 |
| 24-707. SLIMBUS_CMP_IRQENABLE_CLR | 4962 |
| 24-708. Register Call Summary for Register SLIMBUS_CMP_IRQENABLE_CLR | 4964 |
| 24-709. SLIMBUS_CMP_DMAENABLE_SET | 4965 |
| 24-710. Register Call Summary for Register SLIMBUS_CMP_DMAENABLE_SET | 4967 |
| 24-711. SLIMBUS_CMP_DMAENABLE_CLR | 4967 |
| 24-712. Register Call Summary for Register SLIMBUS_CMP_DMAENABLE_CLR | 4969 |
| 24-713. SLIMBUS_CMP_IV | 4969 |
| 24-714. Register Call Summary for Register SLIMBUS_CMP_IV | 4969 |
| 24-715. SLIMBUS_CMP_MI_PC | 4970 |
| 24-716. Register Call Summary for Register SLIMBUS_CMP_MI_PC | 4970 |
| 24-717. SLIMBUS_SMT_INFO | 4970 |
| 24-718. Register Call Summary for Register SLIMBUS_SMT_INFO | 4971 |
| 24-719. SLIMBUS_SMT_MESSAGE | 4972 |
| 24-720. Register Call Summary for Register SLIMBUS_SMT_MESSAGE | 4972 |
| 24-721. SLIMBUS_SMT_CONTROL | 4972 |
| 24-722. Register Call Summary for Register SLIMBUS_SMT_CONTROL | 4973 |
| 24-723. SLIMBUS_SMT_FIFO_SETUP | 4973 |
| 24-724. Register Call Summary for Register SLIMBUS_SMT_FIFO_SETUP | 4974 |
| 24-725. SLIMBUS_SMR_INFO | 4974 |
| 24-726. Register Call Summary for Register SLIMBUS_SMR_INFO | 4975 |
| 24-727. SLIMBUS_SMR_MESSAGE | 4975 |
| 24-728. Register Call Summary for Register SLIMBUS_SMR_MESSAGE | 4976 |
| 24-729. SLIMBUS_SMR_CONTROL | 4976 |
| 24-730. Register Call Summary for Register SLIMBUS_SMR_CONTROL | 4976 |
| 24-731. SLIMBUS_SMR_FIFO_SETUP | 4977 |
| 24-732. Register Call Summary for Register SLIMBUS_SMR_FIFO_SETUP | 4977 |
| 24-733. SLIMBUS_FL_INFO | 4978 |
| 24-734. Register Call Summary for Register SLIMBUS_FL_INFO | 4979 |
| 24-735. SLIMBUS_FL_CONTROL | 4979 |
| 24-736. Register Call Summary for Register SLIMBUS_FL_CONTROL | 4981 |
| 24-737. SLIMBUS_FL_SM | 4981 |
| 24-738. Register Call Summary for Register SLIMBUS_FL_SM | 4982 |
| 24-739. SLIMBUS_FL_CG | 4983 |
| 24-740. Register Call Summary for Register SLIMBUS_FL_CG | 4983 |
| 24-741. SLIMBUS_FL_RF | 4984 |
| 24-742. Register Call Summary for Register SLIMBUS_FL_RF | 4984 |
| 24-743. SLIMBUS_FR_INFO | 4984 |
| 24-744. Register Call Summary for Register SLIMBUS_FR_INFO | 4985 |

| | |
|--|------|
| 24-745. SLIMBUS_FR_CLOCK_SOURCE | 4986 |
| 24-746. Register Call Summary for Register SLIMBUS_FR_CLOCK_SOURCE | 4986 |
| 24-747. SLIMBUS_FR_CONTROL | 4987 |
| 24-748. Register Call Summary for Register SLIMBUS_FR_CONTROL | 4987 |
| 24-749. SLIMBUS_FR_FRAMER_HANOVER | 4988 |
| 24-750. Register Call Summary for Register SLIMBUS_FR_FRAMER_HANOVER | 4988 |
| 24-751. SLIMBUS_FR_CLOCK_PAUSE | 4988 |
| 24-752. Register Call Summary for Register SLIMBUS_FR_CLOCK_PAUSE | 4989 |
| 24-753. SLIMBUS_DEV_LA_i | 4989 |
| 24-754. Register Call Summary for Register SLIMBUS_DEV_LA_i | 4990 |
| 24-755. SLIMBUS_DEV_EA_LO_i | 4990 |
| 24-756. Register Call Summary for Register SLIMBUS_DEV_EA_LO_i | 4990 |
| 24-757. SLIMBUS_DEV_EA_HI_i | 4991 |
| 24-758. Register Call Summary for Register SLIMBUS_DEV_EA_HI_i | 4991 |
| 24-759. SLIMBUS_DCT_INFO_j | 4991 |
| 24-760. Register Call Summary for Register SLIMBUS_DCT_INFO_j | 4992 |
| 24-761. SLIMBUS_DCT_FIFO_SETUP1_j | 4992 |
| 24-762. Register Call Summary for Register SLIMBUS_DCT_FIFO_SETUP1_j | 4993 |
| 24-763. SLIMBUS_DCT_FIFO_SETUP2_j | 4993 |
| 24-764. Register Call Summary for Register SLIMBUS_DCT_FIFO_SETUP2_j | 4994 |
| 24-765. SLIMBUS_DCT_FIFO_STATUS_j | 4994 |
| 24-766. Register Call Summary for Register SLIMBUS_DCT_FIFO_STATUS_j | 4996 |
| 24-767. SLIMBUS_DCT_MAP_j | 4996 |
| 24-768. Register Call Summary for Register SLIMBUS_DCT_MAP_j | 4996 |
| 24-769. SLIMBUS_DCT_CONFIG1_j | 4996 |
| 24-770. Register Call Summary for Register SLIMBUS_DCT_CONFIG1_j | 4999 |
| 24-771. SLIMBUS_DCT_CONFIG2_j | 4999 |
| 24-772. Register Call Summary for Register SLIMBUS_DCT_CONFIG2_j | 4999 |
| 24-773. SLIMBUS_DCT_DATA_j | 5000 |
| 24-774. Register Call Summary for Register SLIMBUS_DCT_DATA_j | 5000 |
| 24-775. SLIMBUS_DCR_INFO_j | 5000 |
| 24-776. Register Call Summary for Register SLIMBUS_DCR_INFO_j | 5001 |
| 24-777. SLIMBUS_DCR_FIFO_SETUP1_j | 5001 |
| 24-778. Register Call Summary for Register SLIMBUS_DCR_FIFO_SETUP1_j | 5002 |
| 24-779. SLIMBUS_DCR_FIFO_SETUP2_j | 5002 |
| 24-780. Register Call Summary for Register SLIMBUS_DCR_FIFO_SETUP2_j | 5003 |
| 24-781. SLIMBUS_DCR_FIFO_STATUS_j | 5003 |
| 24-782. Register Call Summary for Register SLIMBUS_DCR_FIFO_STATUS_j | 5005 |
| 24-783. SLIMBUS_DCR_MAP_j | 5005 |
| 24-784. Register Call Summary for Register SLIMBUS_DCR_MAP_j | 5005 |
| 24-785. SLIMBUS_DCR_CONFIG1_j | 5005 |
| 24-786. Register Call Summary for Register SLIMBUS_DCR_CONFIG1_j | 5008 |
| 24-787. SLIMBUS_DCR_CONFIG2_j | 5008 |
| 24-788. Register Call Summary for Register SLIMBUS_DCR_CONFIG2_j | 5008 |
| 24-789. SLIMBUS_DCR_DATA_j | 5009 |
| 24-790. Register Call Summary for Register SLIMBUS_DCR_DATA_j | 5009 |
| 24-791. HSI I/O Signals | 5011 |
| 24-792. Integration Attributes | 5013 |
| 24-793. Clocks and Resets | 5014 |

| | |
|--|------|
| 24-794. Hardware Requests | 5014 |
| 24-795. Local Power-Management Features..... | 5018 |
| 24-796. Events | 5019 |
| 24-797. Threshold for Transmit FIFO Interrupt/DMA Request | 5033 |
| 24-798. Global Initialization of Surrounding Modules for HSI | 5038 |
| 24-799. HSI Global Initialization..... | 5038 |
| 24-800. HSI Configure HSI Transmitter | 5039 |
| 24-801. HSI Configure HSI Receiver | 5039 |
| 24-802. Register Call Summary for Subsequence – HSI Transmit in Polling Method | 5040 |
| 24-803. Event Servicing in HSI Receive in Polling Method | 5040 |
| 24-804. HSI Interrupt Mode..... | 5041 |
| 24-805. Enable HSI Transmit Interrupts | 5041 |
| 24-806. Register Call Summary for Subsequence – Event Servicing in HSI Transmission Mode | 5042 |
| 24-807. Enable HSI Receive Interrupts | 5043 |
| 24-808. Register Call Summary for Subsequence – Event Servicing in HSI Reception Mode | 5044 |
| 24-809. HSI DMA Configuration | 5045 |
| 24-810. Configure DMA Receive Mode | 5045 |
| 24-811. Configure DMA Transmit Mode | 5046 |
| 24-812. Enable DMA Interrupts | 5046 |
| 24-813. Event Servicing in DMA Transmit/Receive Mode..... | 5046 |
| 24-814. Enable HSI Error Interrupts | 5047 |
| 24-815. Event Servicing Error | 5047 |
| 24-816. HSI Instance Summary | 5047 |
| 24-817. HSI_TOP Registers Mapping Summary | 5047 |
| 24-818. HSI_REVISION..... | 5048 |
| 24-819. Register Call Summary for Register HSI_REVISION | 5049 |
| 24-820. HSI_HWINFO..... | 5049 |
| 24-821. Register Call Summary for Register HSI_HWINFO | 5049 |
| 24-822. HSI_SYSCONFIG..... | 5049 |
| 24-823. Register Call Summary for Register HSI_SYSCONFIG | 5050 |
| 24-824. HSI_SYSSTATUS..... | 5050 |
| 24-825. Register Call Summary for Register HSI_SYSSTATUS | 5050 |
| 24-826. HSI_Pp_M_IRQrU_STATUS | 5051 |
| 24-827. Register Call Summary for Register HSI_Pp_M_IRQrU_STATUS | 5051 |
| 24-828. HSI_Pp_M_IRQrU_ENABLE | 5052 |
| 24-829. Register Call Summary for Register HSI_Pp_M_IRQrU_ENABLE | 5052 |
| 24-830. HSI_Pp_D_IRQrU_STATUS..... | 5053 |
| 24-831. Register Call Summary for Register HSI_Pp_D_IRQrU_STATUS | 5053 |
| 24-832. HSI_Pp_D_IRQrU_ENABLE..... | 5054 |
| 24-833. Register Call Summary for Register HSI_Pp_D_IRQrU_ENABLE | 5054 |
| 24-834. HSI_DMA_M_IRQSTATUS | 5054 |
| 24-835. Register Call Summary for Register HSI_DMA_M_IRQSTATUS | 5055 |
| 24-836. HSI_DMA_M_IRQENABLE | 5055 |
| 24-837. Register Call Summary for Register HSI_DMA_M_IRQENABLE | 5055 |
| 24-838. HSI_Pp_M_IRQr_STATUS | 5056 |
| 24-839. Register Call Summary for Register HSI_Pp_M_IRQr_STATUS..... | 5056 |
| 24-840. HSI_Pp_M_IRQr_ENABLE | 5057 |
| 24-841. Register Call Summary for Register HSI_Pp_M_IRQr_ENABLE | 5057 |
| 24-842. HSI_DMA_D_IRQSTATUS | 5057 |

| | |
|---|------|
| 24-843. Register Call Summary for Register HSI_DMA_D_IRQSTATUS | 5058 |
| 24-844. HSI_DMA_D_IRQENABLE | 5058 |
| 24-845. Register Call Summary for Register HSI_DMA_D_IRQENABLE | 5058 |
| 24-846. HSI_Pp_D_IRQr_STATUS | 5058 |
| 24-847. Register Call Summary for Register HSI_Pp_D_IRQr_STATUS | 5059 |
| 24-848. HSI_Pp_D_IRQr_ENABLE | 5059 |
| 24-849. Register Call Summary for Register HSI_Pp_D_IRQr_ENABLE | 5060 |
| 24-850. HSI_Pp_WAKE | 5060 |
| 24-851. Register Call Summary for Register HSI_Pp_WAKE | 5060 |
| 24-852. HSI_Pp_CLEAR_WAKE | 5060 |
| 24-853. Register Call Summary for Register HSI_Pp_CLEAR_WAKE | 5061 |
| 24-854. HSI_Pp_SET_WAKE | 5061 |
| 24-855. Register Call Summary for Register HSI_Pp_SET_WAKE | 5061 |
| 24-856. DMA_GCR | 5062 |
| 24-857. Register Call Summary for Register DMA_GCR | 5062 |
| 24-858. DMA_GRST | 5062 |
| 24-859. Register Call Summary for Register DMA_GRST | 5063 |
| 24-860. HSI_DMA_CHANNELS Registers Mapping Summary | 5063 |
| 24-861. DMA_CCR_CSDP_i | 5063 |
| 24-862. Register Call Summary for Register DMA_CCR_CSDP_i | 5064 |
| 24-863. DMA_CSR_CCIR_i | 5064 |
| 24-864. Register Call Summary for Register DMA_CSR_CCIR_i | 5065 |
| 24-865. DMA_CSSA_i | 5065 |
| 24-866. Register Call Summary for Register DMA_CSSA_i | 5066 |
| 24-867. DMA_CDSA_i | 5066 |
| 24-868. Register Call Summary for Register DMA_CDSA_i | 5066 |
| 24-869. DMA_CEN_i | 5066 |
| 24-870. Register Call Summary for Register DMA_CEN_i | 5066 |
| 24-871. DMA_CDAC_CSAC_i | 5067 |
| 24-872. Register Call Summary for Register DMA_CDAC_CSAC_i | 5067 |
| 24-873. HSI_PORTS Registers Mapping Summary | 5067 |
| 24-874. HST_ID_Pp | 5069 |
| 24-875. Register Call Summary for Register HST_ID_Pp | 5069 |
| 24-876. HST_MODE_Pp | 5069 |
| 24-877. Register Call Summary for Register HST_MODE_Pp | 5070 |
| 24-878. HST_FRAMESIZE_Pp | 5070 |
| 24-879. Register Call Summary for Register HST_FRAMESIZE_Pp | 5070 |
| 24-880. HST_TXSTATE_Pp | 5070 |
| 24-881. Register Call Summary for Register HST_TXSTATE_Pp | 5071 |
| 24-882. HST_BUFSTATE_Pp | 5071 |
| 24-883. Register Call Summary for Register HST_BUFSTATE_Pp | 5071 |
| 24-884. HST_DIVISOR_Pp | 5072 |
| 24-885. Register Call Summary for Register HST_DIVISOR_Pp | 5072 |
| 24-886. HST_BREAK_Pp | 5072 |
| 24-887. Register Call Summary for Register HST_BREAK_Pp | 5072 |
| 24-888. HST_CHANNELS_Pp | 5073 |
| 24-889. Register Call Summary for Register HST_CHANNELS_Pp | 5073 |
| 24-890. HST_ARBMODE_Pp | 5073 |
| 24-891. Register Call Summary for Register HST_ARBMODE_Pp | 5074 |

| | |
|--|------|
| 24-892. HST_BUFFER_Pp_CHN_i..... | 5074 |
| 24-893. Register Call Summary for Register HST_BUFFER_Pp_CHN_i | 5074 |
| 24-894. HST_SWAPBUFFER_Pp_CHN_i..... | 5075 |
| 24-895. Register Call Summary for Register HST_SWAPBUFFER_Pp_CHN_i | 5075 |
| 24-896. HST_MAPPINGf | 5075 |
| 24-897. Register Call Summary for Register HST_MAPPINGf | 5076 |
| 24-898. HSR_ID_Pp | 5076 |
| 24-899. Register Call Summary for Register HSR_ID_Pp | 5076 |
| 24-900. HSR_MODE_Pp | 5077 |
| 24-901. Register Call Summary for Register HSR_MODE_Pp | 5077 |
| 24-902. HSR_FRAME_SIZE_Pp | 5077 |
| 24-903. Register Call Summary for Register HSR_FRAME_SIZE_Pp..... | 5078 |
| 24-904. HSR_RXSTATE_Pp | 5078 |
| 24-905. Register Call Summary for Register HSR_RXSTATE_Pp..... | 5078 |
| 24-906. HSR_BUFSTATE_Pp | 5078 |
| 24-907. Register Call Summary for Register HSR_BUFSTATE_Pp | 5079 |
| 24-908. HSR_BREAK_Pp | 5079 |
| 24-909. Register Call Summary for Register HSR_BREAK_Pp | 5079 |
| 24-910. HSR_ERROR_Pp | 5079 |
| 24-911. Register Call Summary for Register HSR_ERROR_Pp | 5080 |
| 24-912. HSR_ERRORACK_Pp | 5080 |
| 24-913. Register Call Summary for Register HSR_ERRORACK_Pp..... | 5081 |
| 24-914. HSR_CHANNELS_Pp | 5081 |
| 24-915. Register Call Summary for Register HSR_CHANNELS_Pp | 5081 |
| 24-916. HSR_OVERRUN_Pp | 5081 |
| 24-917. Register Call Summary for Register HSR_OVERRUN_Pp..... | 5082 |
| 24-918. HSR_OVERRUNACK_Pp..... | 5082 |
| 24-919. Register Call Summary for Register HSR_OVERRUNACK_Pp | 5082 |
| 24-920. HSR_COUNTERS_Pp | 5082 |
| 24-921. Register Call Summary for Register HSR_COUNTERS_Pp | 5083 |
| 24-922. HSR_BUFFER_Pp_CHN_i | 5083 |
| 24-923. Register Call Summary for Register HSR_BUFFER_Pp_CHN_i..... | 5083 |
| 24-924. HSR_SWAPBUFFER_Pp_CHN_i | 5083 |
| 24-925. Register Call Summary for Register HSR_SWAPBUFFER_Pp_CHN_i..... | 5084 |
| 24-926. HSR_MAPPINGf | 5084 |
| 24-927. Register Call Summary for Register HSR_MAPPINGf..... | 5084 |
| 24-928. HSR_DIVISOR_Pp | 5085 |
| 24-929. Register Call Summary for Register HSR_DIVISOR_Pp | 5085 |
| 24-930. ULPI – 12-Pin/8-Bit Data SDR Version I/O Description..... | 5093 |
| 24-931. ULPI TLL Interfaces – 12-Pin/8-Bit Data SDR Version I/O Description..... | 5095 |
| 24-932. Signaling Between HS USB Host Subsystem and 6-Pin Unidirectional USB Transceiver (DAT/SE0 Signaling) | 5096 |
| 24-933. Signaling Between HS USB Host Subsystem and 6-Pin Unidirectional USB Transceiver (DP/DM Signaling) | 5096 |
| 24-934. Signaling Between HS USB Host Subsystem and 3-Pin Bidirectional USB Transceiver Using DAT/SE0 Signaling..... | 5097 |
| 24-935. Signaling Between HS USB Host Subsystem and 4-Pin Bidirectional USB Transceiver Using DP/DM Signaling..... | 5097 |
| 24-936. Pullup/Pulldown Configuration for DP/DM Encoding | 5108 |
| 24-937. Pullup/Pulldown Configuration for DAT/SE0 Encoding | 5109 |

| | |
|--|------|
| 24-938. I/O Description..... | 5110 |
| 24-939. HSIC Interface..... | 5111 |
| 24-940. Integration Attributes..... | 5114 |
| 24-941. Clocks and Resets..... | 5114 |
| 24-942. Hardware Requests..... | 5115 |
| 24-943. HS USB Host Controller Standby Mode Settings..... | 5117 |
| 24-944. HS USB Host Controller SIDLEMODE Settings..... | 5118 |
| 24-945. HS USBTLL Module SIDLEMODE Settings..... | 5119 |
| 24-946. USBTLL Registers Affected by the SAR Context..... | 5120 |
| 24-947. USBTLL Channel Configuration..... | 5121 |
| 24-948. VBUS Level Software Reporting for Serial Transceiver Configuration..... | 5123 |
| 24-949. Emulation of VBUS Levels for UTMI-to-ULPI TLL Mode..... | 5124 |
| 24-950. Serial Mode Description, Signal Functionality..... | 5125 |
| 24-951. Pullup Enable Emulation in Serial TLL Modes..... | 5126 |
| 24-952. Global Initialization of Surrounding Modules..... | 5127 |
| 24-953. HS Multiport USB Host Subsystem Global Initialization..... | 5127 |
| 24-954. Register Call Summary for Selecting and Configuring High-Speed USB Host Subsystem Connectivity.. | 5128 |
| 24-955. USB_Host_HS Instance Summary..... | 5130 |
| 24-956. USBTLLHS_config Register Mapping Summary..... | 5130 |
| 24-957. USBTLL_REVISION..... | 5131 |
| 24-958. Register Call Summary for Register USBTLL_REVISION..... | 5131 |
| 24-959. USBTLL_HWINFO..... | 5131 |
| 24-960. Register Call Summary for Register USBTLL_HWINFO..... | 5131 |
| 24-961. USBTLL_SYSCONFIG..... | 5131 |
| 24-962. Register Call Summary for Register USBTLL_SYSCONFIG..... | 5132 |
| 24-963. USBTLL_SYSSTATUS..... | 5132 |
| 24-964. Register Call Summary for Register USBTLL_SYSSTATUS..... | 5133 |
| 24-965. USBTLL_IRQSTATUS..... | 5133 |
| 24-966. Register Call Summary for Register USBTLL_IRQSTATUS..... | 5133 |
| 24-967. USBTLL_IRQENABLE..... | 5133 |
| 24-968. Register Call Summary for Register USBTLL_IRQENABLE..... | 5134 |
| 24-969. TLL_SHARED_CONF..... | 5134 |
| 24-970. Register Call Summary for Register TLL_SHARED_CONF..... | 5135 |
| 24-971. TLL_CHANNEL_CONF_i..... | 5135 |
| 24-972. Register Call Summary for Register TLL_CHANNEL_CONF_i..... | 5138 |
| 24-973. USBTLL_SAR_CNTX_j..... | 5138 |
| 24-974. Register Call Summary for Register USBTLL_SAR_CNTX_j..... | 5138 |
| 24-975. USBTLLHS_ULPI Register Mapping Summary..... | 5138 |
| 24-976. VENDOR_ID_LO_i..... | 5139 |
| 24-977. Register Call Summary for Register VENDOR_ID_LO_i..... | 5140 |
| 24-978. VENDOR_ID_HI_i..... | 5140 |
| 24-979. Register Call Summary for Register VENDOR_ID_HI_i..... | 5140 |
| 24-980. PRODUCT_ID_LO_i..... | 5140 |
| 24-981. Register Call Summary for Register PRODUCT_ID_LO_i..... | 5140 |
| 24-982. PRODUCT_ID_HI_i..... | 5141 |
| 24-983. Register Call Summary for Register PRODUCT_ID_HI_i..... | 5141 |
| 24-984. FUNCTION_CTRL_i..... | 5141 |
| 24-985. Register Call Summary for Register FUNCTION_CTRL_i..... | 5142 |
| 24-986. FUNCTION_CTRL_SET_j..... | 5142 |

| | |
|--|------|
| 24-987. Register Call Summary for Register FUNCTION_CTRL_SET_i..... | 5142 |
| 24-988. FUNCTION_CTRL_CLR_i | 5143 |
| 24-989. Register Call Summary for Register FUNCTION_CTRL_CLR_i..... | 5143 |
| 24-990. INTERFACE_CTRL_i..... | 5143 |
| 24-991. Register Call Summary for Register INTERFACE_CTRL_i | 5144 |
| 24-992. INTERFACE_CTRL_SET_i..... | 5145 |
| 24-993. Register Call Summary for Register INTERFACE_CTRL_SET_i | 5145 |
| 24-994. INTERFACE_CTRL_CLR_i..... | 5146 |
| 24-995. Register Call Summary for Register INTERFACE_CTRL_CLR_i | 5146 |
| 24-996. OTG_CTRL_i | 5147 |
| 24-997. Register Call Summary for Register OTG_CTRL_i..... | 5147 |
| 24-998. OTG_CTRL_SET_i | 5148 |
| 24-999. Register Call Summary for Register OTG_CTRL_SET_i..... | 5148 |
| 24-1000. OTG_CTRL_CLR_i..... | 5149 |
| 24-1001. Register Call Summary for Register OTG_CTRL_CLR_i | 5149 |
| 24-1002. USB_INT_EN_RISE_i..... | 5150 |
| 24-1003. Register Call Summary for Register USB_INT_EN_RISE_i | 5150 |
| 24-1004. USB_INT_EN_RISE_SET_i..... | 5151 |
| 24-1005. Register Call Summary for Register USB_INT_EN_RISE_SET_i | 5151 |
| 24-1006. USB_INT_EN_RISE_CLR_i..... | 5152 |
| 24-1007. Register Call Summary for Register USB_INT_EN_RISE_CLR_i | 5152 |
| 24-1008. USB_INT_EN_FALL_i | 5153 |
| 24-1009. Register Call Summary for Register USB_INT_EN_FALL_i | 5153 |
| 24-1010. USB_INT_EN_FALL_SET_i..... | 5153 |
| 24-1011. Register Call Summary for Register USB_INT_EN_FALL_SET_i | 5154 |
| 24-1012. USB_INT_EN_FALL_CLR_i | 5155 |
| 24-1013. Register Call Summary for Register USB_INT_EN_FALL_CLR_i | 5155 |
| 24-1014. USB_INT_STATUS_i | 5156 |
| 24-1015. Register Call Summary for Register USB_INT_STATUS_i | 5156 |
| 24-1016. USB_INT_LATCH_i | 5157 |
| 24-1017. Register Call Summary for Register USB_INT_LATCH_i..... | 5157 |
| 24-1018. DEBUG_i | 5157 |
| 24-1019. Register Call Summary for Register DEBUG_i..... | 5158 |
| 24-1020. SCRATCH_REGISTER_i..... | 5158 |
| 24-1021. Register Call Summary for Register SCRATCH_REGISTER_i | 5158 |
| 24-1022. SCRATCH_REGISTER_SET_i..... | 5158 |
| 24-1023. Register Call Summary for Register SCRATCH_REGISTER_SET_i | 5159 |
| 24-1024. SCRATCH_REGISTER_CLR_i..... | 5159 |
| 24-1025. Register Call Summary for Register SCRATCH_REGISTER_CLR_i | 5159 |
| 24-1026. EXTENDED_SET_ACCESS_i..... | 5159 |
| 24-1027. Register Call Summary for Register EXTENDED_SET_ACCESS_i | 5159 |
| 24-1028. UTMI_VCONTROL_EN_i..... | 5160 |
| 24-1029. Register Call Summary for Register UTMI_VCONTROL_EN_i | 5160 |
| 24-1030. UTMI_VCONTROL_EN_SET_i..... | 5160 |
| 24-1031. Register Call Summary for Register UTMI_VCONTROL_EN_SET_i | 5161 |
| 24-1032. UTMI_VCONTROL_EN_CLR_i..... | 5161 |
| 24-1033. Register Call Summary for Register UTMI_VCONTROL_EN_CLR_i | 5161 |
| 24-1034. UTMI_VCONTROL_STATUS_i..... | 5162 |
| 24-1035. Register Call Summary for Register UTMI_VCONTROL_STATUS_i | 5162 |

| | |
|---|------|
| 24-1036. UTMI_VCONTROL_LATCH_i..... | 5162 |
| 24-1037. Register Call Summary for Register UTMI_VCONTROL_LATCH_i | 5162 |
| 24-1038. UTMI_VSTATUS_i | 5163 |
| 24-1039. Register Call Summary for Register UTMI_VSTATUS_i | 5163 |
| 24-1040. UTMI_VSTATUS_SET_i..... | 5163 |
| 24-1041. Register Call Summary for Register UTMI_VSTATUS_SET_i | 5163 |
| 24-1042. UTMI_VSTATUS_CLR_i..... | 5164 |
| 24-1043. Register Call Summary for Register UTMI_VSTATUS_CLR_i | 5164 |
| 24-1044. USB_INT_LATCH_NOCLR_i | 5164 |
| 24-1045. Register Call Summary for Register USB_INT_LATCH_NOCLR_i | 5165 |
| 24-1046. VENDOR_INT_EN_i | 5165 |
| 24-1047. Register Call Summary for Register VENDOR_INT_EN_i | 5165 |
| 24-1048. VENDOR_INT_EN_SET_i..... | 5165 |
| 24-1049. Register Call Summary for Register VENDOR_INT_EN_SET_i | 5165 |
| 24-1050. VENDOR_INT_EN_CLR_i | 5166 |
| 24-1051. Register Call Summary for Register VENDOR_INT_EN_CLR_i | 5166 |
| 24-1052. VENDOR_INT_STATUS_i | 5166 |
| 24-1053. Register Call Summary for Register VENDOR_INT_STATUS_i | 5166 |
| 24-1054. VENDOR_INT_LATCH_i | 5167 |
| 24-1055. Register Call Summary for Register VENDOR_INT_LATCH_i | 5167 |
| 24-1056. HSUSBHOST Register Mapping Summary | 5167 |
| 24-1057. UHH_REVISION | 5168 |
| 24-1058. Register Call Summary for Register UHH_REVISION | 5168 |
| 24-1059. UHH_HWINFO | 5168 |
| 24-1060. Register Call Summary for Register UHH_HWINFO | 5168 |
| 24-1061. UHH_SYSCONFIG | 5168 |
| 24-1062. Register Call Summary for Register UHH_SYSCONFIG | 5169 |
| 24-1063. UHH_SYSSTATUS..... | 5169 |
| 24-1064. Register Call Summary for Register UHH_SYSSTATUS | 5170 |
| 24-1065. UHH_HOSTCONFIG | 5170 |
| 24-1066. Register Call Summary for Register UHH_HOSTCONFIG | 5171 |
| 24-1067. UHH_DEBUG_CSR | 5172 |
| 24-1068. Register Call Summary for Register UHH_DEBUG_CSR | 5172 |
| 24-1069. UHH_SAR_CNTX_i | 5173 |
| 24-1070. Register Call Summary for Register UHH_SAR_CNTX_i | 5173 |
| 24-1071. OHCI Register Mapping Summary | 5173 |
| 24-1072. HCREVISION | 5174 |
| 24-1073. Register Call Summary for Register HCREVISION | 5174 |
| 24-1074. HCCONTROL | 5174 |
| 24-1075. Register Call Summary for Register HCCONTROL..... | 5175 |
| 24-1076. HCCOMMANDSTATUS | 5175 |
| 24-1077. Register Call Summary for Register HCCOMMANDSTATUS | 5176 |
| 24-1078. HCINTERRUPTSTATUS | 5176 |
| 24-1079. Register Call Summary for Register HCINTERRUPTSTATUS..... | 5177 |
| 24-1080. HCINTERRUPTENABLE | 5177 |
| 24-1081. Register Call Summary for Register HCINTERRUPTENABLE..... | 5178 |
| 24-1082. HCINTERRUPTDISABLE | 5179 |
| 24-1083. Register Call Summary for Register HCINTERRUPTDISABLE | 5179 |
| 24-1084. HCHCCA..... | 5180 |

| | |
|--|------|
| 24-1085. Register Call Summary for Register HCHCCA | 5180 |
| 24-1086. HCPERIODCURRENTED | 5180 |
| 24-1087. Register Call Summary for Register HCPERIODCURRENTED | 5180 |
| 24-1088. HCCONTROLHEADED | 5180 |
| 24-1089. Register Call Summary for Register HCCONTROLHEADED | 5181 |
| 24-1090. HCCONTROLCURRENTED | 5181 |
| 24-1091. Register Call Summary for Register HCCONTROLCURRENTED | 5181 |
| 24-1092. HCBULKHEADED | 5181 |
| 24-1093. Register Call Summary for Register HCBULKHEADED | 5181 |
| 24-1094. HCBULKCURRENTED | 5182 |
| 24-1095. Register Call Summary for Register HCBULKCURRENTED | 5182 |
| 24-1096. HCDONEHEAD | 5182 |
| 24-1097. Register Call Summary for Register HCDONEHEAD | 5182 |
| 24-1098. HCFMINTERVAL | 5182 |
| 24-1099. Register Call Summary for Register HCFMINTERVAL | 5183 |
| 24-1100. HCFMREMAINING | 5183 |
| 24-1101. Register Call Summary for Register HCFMREMAINING | 5183 |
| 24-1102. HCFMNUMBER | 5184 |
| 24-1103. Register Call Summary for Register HCFMNUMBER | 5184 |
| 24-1104. HCPERIODICSTART | 5184 |
| 24-1105. Register Call Summary for Register HCPERIODICSTART | 5184 |
| 24-1106. HCLSTHRESHOLD | 5185 |
| 24-1107. Register Call Summary for Register HCLSTHRESHOLD | 5185 |
| 24-1108. HCRHDESCRIPTORA | 5185 |
| 24-1109. Register Call Summary for Register HCRHDESCRIPTORA | 5186 |
| 24-1110. HCRHDESCRIPTORB | 5186 |
| 24-1111. Register Call Summary for Register HCRHDESCRIPTORB | 5186 |
| 24-1112. HCRHSTATUS | 5186 |
| 24-1113. Register Call Summary for Register HCRHSTATUS | 5187 |
| 24-1114. HCRHPORTSTATUS_1 | 5187 |
| 24-1115. Register Call Summary for Register HCRHPORTSTATUS_1 | 5189 |
| 24-1116. HCRHPORTSTATUS_2 | 5189 |
| 24-1117. Register Call Summary for Register HCRHPORTSTATUS_2 | 5191 |
| 24-1118. EHCI Register Mapping Summary | 5191 |
| 24-1119. HCCAPBASE | 5192 |
| 24-1120. Register Call Summary for Register HCCAPBASE | 5192 |
| 24-1121. HCSPARAMS | 5192 |
| 24-1122. Register Call Summary for Register HCSPARAMS | 5193 |
| 24-1123. HCCPARAMS | 5193 |
| 24-1124. Register Call Summary for Register HCCPARAMS | 5194 |
| 24-1125. USBCMD | 5194 |
| 24-1126. Register Call Summary for Register USBCMD | 5196 |
| 24-1127. USBSTS | 5196 |
| 24-1128. Register Call Summary for Register USBSTS | 5197 |
| 24-1129. USBINTR | 5198 |
| 24-1130. Register Call Summary for Register USBINTR | 5198 |
| 24-1131. FRINDEX | 5199 |
| 24-1132. Register Call Summary for Register FRINDEX | 5199 |
| 24-1133. CTRLDSSEGMENT | 5199 |

| | |
|--|------|
| 24-1134. Register Call Summary for Register CTRLDSSEGMENT | 5199 |
| 24-1135. PERIODICLISTBASE | 5199 |
| 24-1136. Register Call Summary for Register PERIODICLISTBASE | 5200 |
| 24-1137. ASYNCLISTADDR | 5200 |
| 24-1138. Register Call Summary for Register ASYNCLISTADDR | 5200 |
| 24-1139. CONFIGFLAG | 5200 |
| 24-1140. Register Call Summary for Register CONFIGFLAG | 5201 |
| 24-1141. PORTSC_i | 5201 |
| 24-1142. Register Call Summary for Register PORTSC_i | 5203 |
| 24-1143. INSNREG00 | 5203 |
| 24-1144. Register Call Summary for Register INSNREG00 | 5203 |
| 24-1145. INSNREG01 | 5204 |
| 24-1146. Register Call Summary for Register INSNREG01 | 5204 |
| 24-1147. INSNREG02 | 5204 |
| 24-1148. Register Call Summary for Register INSNREG02 | 5204 |
| 24-1149. INSNREG03 | 5204 |
| 24-1150. Register Call Summary for Register INSNREG03 | 5205 |
| 24-1151. INSNREG04 | 5205 |
| 24-1152. Register Call Summary for Register INSNREG04 | 5205 |
| 24-1153. INSNREG05_UTMI | 5206 |
| 24-1154. Register Call Summary for Register INSNREG05_UTMI | 5206 |
| 24-1155. INSNREG05_ULPI | 5206 |
| 24-1156. Register Call Summary for Register INSNREG05_ULPI | 5207 |
| 24-1157. INSNREG06 | 5207 |
| 24-1158. Register Call Summary for Register INSNREG06 | 5208 |
| 24-1159. INSNREG07 | 5208 |
| 24-1160. Register Call Summary for Register INSNREG07 | 5208 |
| 24-1161. INSNREG08 | 5208 |
| 24-1162. Register Call Summary for Register INSNREG08 | 5208 |
| 24-1163. Input/Output Description | 5213 |
| 24-1164. Integration Attributes | 5215 |
| 24-1165. Clocks and Resets | 5215 |
| 24-1166. Hardware Requests | 5215 |
| 24-1167. HSUSBOTG Host Controller STANDBYMODE Settings | 5217 |
| 24-1168. HSUSBOTG Host Controller SIDLEMODE Settings | 5218 |
| 24-1169. Interconnect Data and MByteEn in Little- and Big-Endian Modes | 5222 |
| 24-1170. Global Initialization of Surrounding Modules | 5225 |
| 24-1171. High-Speed USB OTG Software Reset | 5225 |
| 24-1172. Power Management Configuration | 5225 |
| 24-1173. High-Speed USB Controller Interface Selection | 5226 |
| 24-1174. Power Management Configuration - No Application Mode | 5226 |
| 24-1175. Power Management Configuration - Host or Peripheral Mode | 5226 |
| 24-1176. Power Management Configuration - Switching Between Host and Peripheral Mode | 5226 |
| 24-1177. High-Speed USB OTG Controller Instance Summary | 5227 |
| 24-1178. HSUSBOTG Registers Mapping Summary | 5227 |
| 24-1179. OTG_REVISION | 5227 |
| 24-1180. Register Call Summary for Register OTG_REVISION | 5227 |
| 24-1181. OTG_SYSCONFIG | 5228 |
| 24-1182. Register Call Summary for Register OTG_SYSCONFIG | 5229 |

| | |
|--|------|
| 24-1183. OTG_SYSSTATUS..... | 5229 |
| 24-1184. Register Call Summary for Register OTG_SYSSTATUS | 5229 |
| 24-1185. OTG_INTERFSEL | 5229 |
| 24-1186. Register Call Summary for Register OTG_INTERFSEL | 5230 |
| 24-1187. OTG_SIMENABLE | 5230 |
| 24-1188. Register Call Summary for Register OTG_SIMENABLE | 5230 |
| 24-1189. OTG_FORCESTDBY | 5230 |
| 24-1190. Register Call Summary for Register OTG_FORCESTDBY | 5231 |
| 24-1191. OTG_BIGENDIAN | 5231 |
| 24-1192. Register Call Summary for Register OTG_BIGENDIAN | 5231 |
| 24-1193. OCP2SCP Registers Mapping Summary | 5231 |
| 24-1194. OCP2SCP_REVISION | 5232 |
| 24-1195. Register Call Summary for Register OCP2SCP_REVISION | 5232 |
| 24-1196. OCP2SCP_SYSCONFIG | 5232 |
| 24-1197. Register Call Summary for Register OCP2SCP_SYSCONFIG | 5233 |
| 24-1198. OCP2SCP_SYSSTATUS..... | 5233 |
| 24-1199. Register Call Summary for Register OCP2SCP_SYSSTATUS | 5233 |
| 24-1200. OCP2SCP_TIMING | 5233 |
| 24-1201. Register Call Summary for Register OCP2SCP_TIMING | 5234 |
| 24-1202. USBPHY Registers Mapping Summary | 5234 |
| 24-1203. USBPHY_TERMINATION_CONTROL | 5235 |
| 24-1204. Register Call Summary for Register USBPHY_TERMINATION_CONTROL | 5236 |
| 24-1205. USBPHY_RX_CALIB | 5236 |
| 24-1206. Register Call Summary for Register USBPHY_RX_CALIB | 5237 |
| 24-1207. USBPHY_DLLHS_2 | 5237 |
| 24-1208. Register Call Summary for Register USBPHY_DLLHS_2 | 5237 |
| 24-1209. USBPHY_RX_TEST_2 | 5238 |
| 24-1210. Register Call Summary for Register USBPHY_RX_TEST_2 | 5238 |
| 24-1211. USBPHY_TX_TEST_CHRG_DET | 5238 |
| 24-1212. Register Call Summary for Register USBPHY_TX_TEST_CHRG_DET | 5239 |
| 24-1213. USBPHY_CHRG_DET | 5239 |
| 24-1214. Register Call Summary for Register USBPHY_CHRG_DET | 5240 |
| 24-1215. USBPHY_PWR_CNTL | 5240 |
| 24-1216. Register Call Summary for Register USBPHY_PWR_CNTL | 5241 |
| 24-1217. USBPHY_UTMI_INTERFACE_CNTL_1 | 5242 |
| 24-1218. Register Call Summary for Register USBPHY_UTMI_INTERFACE_CNTL_1 | 5242 |
| 24-1219. USBPHY_UTMI_INTERFACE_CNTL_2 | 5242 |
| 24-1220. Register Call Summary for Register USBPHY_UTMI_INTERFACE_CNTL_2 | 5244 |
| 24-1221. USBPHY_BIST | 5244 |
| 24-1222. Register Call Summary for Register USBPHY_BIST | 5245 |
| 24-1223. USBPHY_BIST_CRC | 5245 |
| 24-1224. Register Call Summary for Register USBPHY_BIST_CRC | 5245 |
| 24-1225. USBPHY_CDR_BIST2 | 5245 |
| 24-1226. Register Call Summary for Register USBPHY_CDR_BIST2 | 5245 |
| 24-1227. USBPHY_GPIO | 5246 |
| 24-1228. Register Call Summary for Register USBPHY_GPIO | 5246 |
| 24-1229. USBPHY_DLLHS | 5246 |
| 24-1230. Register Call Summary for Register USBPHY_DLLHS | 5247 |
| 24-1231. USBPHY_USB2PHYCM_TRIM | 5247 |

| | |
|---|------|
| 24-1232. Register Call Summary for Register USBPHY_USB2PHYCM_TRIM | 5248 |
| 24-1233. USBPHY_USB2PHYCM_CONFIG | 5248 |
| 24-1234. Register Call Summary for Register USBPHY_USB2PHYCM_CONFIG | 5248 |
| 24-1235. USBPHY_USBOTG | 5248 |
| 24-1236. Register Call Summary for Register USBPHY_USBOTG | 5249 |
| 24-1237. USBPHY_AD_INTERFACE_REG1 | 5249 |
| 24-1238. Register Call Summary for Register USBPHY_AD_INTERFACE_REG1 | 5250 |
| 24-1239. USBPHY_AD_INTERFACE_REG2 | 5250 |
| 24-1240. Register Call Summary for Register USBPHY_AD_INTERFACE_REG2 | 5251 |
| 24-1241. USBPHY_AD_INTERFACE_REG3 | 5251 |
| 24-1242. Register Call Summary for Register USBPHY_AD_INTERFACE_REG3 | 5252 |
| 24-1243. USBPHY_ANA_CONFIG1 | 5252 |
| 24-1244. Register Call Summary for Register USBPHY_ANA_CONFIG1 | 5252 |
| 24-1245. USBPHY_ANA_CONFIG2 | 5252 |
| 24-1246. Register Call Summary for Register USBPHY_ANA_CONFIG2 | 5253 |
| 25-1. Standard 4.41 Supported Features | 5261 |
| 25-2. MMC/SD/SDIOi I/O Description Without External Transceiver (where i = 1 through 5) | 5263 |
| 25-3. MMC/SD/SDIOi I/O Description With External Transceiver (where i = 2) | 5264 |
| 25-4. Relationship Between Configuration and Name of Response Type | 5269 |
| 25-5. Integration Attributes | 5272 |
| 25-6. Clocks and Resets | 5272 |
| 25-7. Hardware Requests | 5273 |
| 25-8. Smart-Idle Mode and Wake-Up Capabilities | 5276 |
| 25-9. Local Power-Management Features | 5277 |
| 25-10. Clock Activity Settings | 5278 |
| 25-11. Events | 5279 |
| 25-12. Descriptor Line Overview | 5283 |
| 25-13. Available Actions of a Descriptor Line | 5284 |
| 25-14. Additional Parameters of a Descriptor Line | 5284 |
| 25-15. ADMA2 States Description | 5285 |
| 25-16. ADMA FSM Symbol Definition | 5286 |
| 25-17. Memory Size, BLEN, and Buffer Relationship | 5291 |
| 25-18. MMC, SD, SDIO Responses in the MMCHS_RSPxx Registers | 5292 |
| 25-19. CC and TC Values Upon Error Detected | 5293 |
| 25-20. MMC/SD/SDIO Controller Transfer Stop Command Summary | 5298 |
| 25-21. MMC/SD/SDIO Hardware Status Features | 5302 |
| 25-22. Global Initialization of Surrounding Modules | 5303 |
| 25-23. MMC/SD/SDIO Controller Meta Initialization Steps | 5303 |
| 25-24. Register Call Summary for Main Sequence – Software Reset Flow | 5304 |
| 25-25. MMC/SD/SDIO Controller Wake-Up Configuration | 5304 |
| 25-26. Register Call Summary for Main Sequence – Bus Configuration | 5306 |
| 25-27. Register Call Summary for Main Sequence – Card Identification and Selection | 5308 |
| 25-28. Subprocess Call Summary for Main Sequence – Card Identification and Selection | 5309 |
| 25-29. CMD Line Reset | 5309 |
| 25-30. Register Call Summary for Main Sequence – Read/Write Transfer Flow in DMA Mode With interrupt | 5310 |
| 25-31. Subprocess Call Summary for Main Sequence – MMC/SD/SDIO Controller Read/Write Transfer Flow in DMA Mode With Interrupt | 5310 |
| 25-32. DATA Lines Reset | 5311 |
| 25-33. Register Call Summary for Main Sequence – Read/Write Transfer Flow in DMA Mode With Polling | 5311 |

| | |
|---|------|
| 25-34. Subprocess Call Summary for Main Sequence – Read/Write Transfer Flow in DMA Mode With Polling .. | 5312 |
| 25-35. Register Call Summary for Main Sequence – Read/Write Transfer Flow Without DMA With Polling..... | 5314 |
| 25-36. Subprocess Call Summary for Main Sequence – Read/Write Transfer Flow Without DMA With Polling .. | 5314 |
| 25-37. Register Call Summary for Main Sequence – Read/Write in CE-ATA Mode..... | 5315 |
| 25-38. Subprocess Call Summary for Main Sequence – Read/Write in CE-ATA Mode..... | 5315 |
| 25-39. Register Call Summary for Main Sequence – Suspend Flow | 5316 |
| 25-40. Subprocess Call Summary for Main Sequence – Suspend Flow | 5317 |
| 25-41. Register Call Summary for Main Sequence - Resume Flow | 5317 |
| 25-42. Subprocess Call Summary for Main Sequence - Resume Flow | 5317 |
| 25-43. Register Call Summary for Main Sequence – Command Transfer Flow With Polling..... | 5319 |
| 25-44. Subprocess Call Summary for Main Sequence – Command Transfer Flow With Polling | 5319 |
| 25-45. Register Call Summary for Main Sequence – Command Transfer Flow With Interrupts | 5321 |
| 25-46. Subprocess Call Summary for Main Sequence – Command Transfer Flow With Interrupts | 5321 |
| 25-47. Register Call Summary for Main Sequence – Clock Frequency Change Flow | 5321 |
| 25-48. Register Call Summary for Main Sequence – Bus Width Configuration Flow..... | 5322 |
| 25-49. Subprocess Call Summary for Main Sequence – Bus Width Configuration Flow..... | 5322 |
| 25-50. Register Call Summary for Main Sequence – Power Switching Procedure | 5324 |
| 25-51. Subprocess Call Summary for Main Sequence – Power Switching Procedure | 5325 |
| 25-52. Register Call Summary for Main Sequence – Boot Using CMD0..... | 5326 |
| 25-53. Subprocess Call Summary for Main Sequence – Boot Using CMD0..... | 5326 |
| 25-54. Register Call Summary for Main Sequence – Boot Using CMD0..... | 5327 |
| 25-55. Subprocess Call Summary for Main Sequence – Boot Using CMD0..... | 5328 |
| 25-56. MMC/SD/SDIO Instance Summary | 5329 |
| 25-57. MMC/SD/SDIO Registers Mapping Summary 1..... | 5329 |
| 25-58. MMC/SD/SDIO Registers Mapping Summary 2..... | 5330 |
| 25-59. MMCHS_HL_REV | 5331 |
| 25-60. Register Call Summary for Register MMCHS_HL_REV | 5331 |
| 25-61. MMCHS_HL_HWINFO | 5331 |
| 25-62. Register Call Summary for Register MMCHS_HL_HWINFO | 5332 |
| 25-63. Reset value for MMCHS_HL_HWINFO | 5332 |
| 25-64. Reset value for MADMA_EN..... | 5332 |
| 25-65. MMCHS_HL_SYSCONFIG | 5333 |
| 25-66. Register Call Summary for Register MMCHS_HL_SYSCONFIG | 5334 |
| 25-67. MMCHS_SYSCONFIG | 5334 |
| 25-68. Register Call Summary for Register MMCHS_SYSCONFIG | 5336 |
| 25-69. MMCHS_SYSSTATUS | 5336 |
| 25-70. Register Call Summary for Register MMCHS_SYSSTATUS..... | 5337 |
| 25-71. MMCHS_CSRE | 5337 |
| 25-72. Register Call Summary for Register MMCHS_CSRE | 5337 |
| 25-73. MMCHS_SYSTEST | 5338 |
| 25-74. Register Call Summary for Register MMCHS_SYSTEST..... | 5342 |
| 25-75. MMCHS_CON | 5342 |
| 25-76. Register Call Summary for Register MMCHS_CON..... | 5347 |
| 25-77. MMCHS_PWCNT | 5347 |
| 25-78. Register Call Summary for Register MMCHS_PWCNT | 5347 |
| 25-79. MMCHS_SDMASA | 5348 |
| 25-80. MMCHS_BLK | 5348 |
| 25-81. Register Call Summary for Register MMCHS_BLK..... | 5349 |
| 25-82. MMCHS_ARG | 5350 |

| | |
|---|------|
| 25-83. Register Call Summary for Register MMCHS_ARG | 5350 |
| 25-84. MMCHS_CMD | 5350 |
| 25-85. Register Call Summary for Register MMCHS_CMD | 5354 |
| 25-86. MMCHS_RSP10 | 5354 |
| 25-87. Register Call Summary for Register MMCHS_RSP10 | 5355 |
| 25-88. MMCHS_RSP32 | 5355 |
| 25-89. Register Call Summary for Register MMCHS_RSP32 | 5355 |
| 25-90. MMCHS_RSP54 | 5355 |
| 25-91. Register Call Summary for Register MMCHS_RSP54 | 5356 |
| 25-92. MMCHS_RSP76 | 5356 |
| 25-93. Register Call Summary for Register MMCHS_RSP76 | 5356 |
| 25-94. MMCHS_DATA | 5357 |
| 25-95. Register Call Summary for Register MMCHS_DATA | 5357 |
| 25-96. MMCHS_PSTATE | 5358 |
| 25-97. Register Call Summary for Register MMCHS_PSTATE | 5361 |
| 25-98. MMCHS_HCTL | 5361 |
| 25-99. Register Call Summary for Register MMCHS_HCTL | 5364 |
| 25-100. MMCHS_SYSCTL | 5365 |
| 25-101. Register Call Summary for Register MMCHS_SYSCTL | 5367 |
| 25-102. MMCHS_STAT | 5367 |
| 25-103. Register Call Summary for Register MMCHS_STAT | 5373 |
| 25-104. MMCHS_IE | 5373 |
| 25-105. Register Call Summary for Register MMCHS_IE | 5375 |
| 25-106. MMCHS_ISE | 5376 |
| 25-107. Register Call Summary for Register MMCHS_ISE | 5378 |
| 25-108. MMCHS_AC12 | 5378 |
| 25-109. Register Call Summary for Register MMCHS_AC12 | 5379 |
| 25-110. MMCHS_CAPA | 5379 |
| 25-111. Register Call Summary for Register MMCHS_CAPA | 5381 |
| 25-112. MMCHS_CUR_CAPA | 5382 |
| 25-113. Register Call Summary for Register MMCHS_CUR_CAPA | 5382 |
| 25-114. MMCHS_FE | 5383 |
| 25-115. Register Call Summary for Register MMCHS_FE | 5384 |
| 25-116. MMCHS_ADMAES | 5385 |
| 25-117. Register Call Summary for Register MMCHS_ADMAES | 5385 |
| 25-118. MMCHS_ADMASAL | 5386 |
| 25-119. Register Call Summary for Register MMCHS_ADMASAL | 5386 |
| 25-120. MMCHS_REV | 5386 |
| 25-121. Register Call Summary for Register MMCHS_REV | 5387 |
| 26-1. I/O Description | 5394 |
| 26-2. Integration Attributes | 5400 |
| 26-3. Clocks and Resets | 5400 |
| 26-4. Hardware Requests | 5400 |
| 26-5. Functional Clock Configuration | 5407 |
| 26-6. Local Power-Management Features | 5410 |
| 26-7. Clock Activity Settings | 5410 |
| 26-8. Events | 5411 |
| 26-9. Wake-Up Signals | 5412 |
| 26-10. GPIO Channel Description | 5412 |

| | |
|---|------|
| 26-11. Global Initialization of Surrounding Modules | 5417 |
| 26-12. General-Purpose Interface Global Initialization..... | 5417 |
| 26-13. General-Purpose Interface Read Input Register | 5418 |
| 26-14. General-Purpose Interface Write Output Register | 5418 |
| 26-15. General-Purpose Interface Set Bit Function | 5418 |
| 26-16. General-Purpose Interface Clear Bit Function..... | 5418 |
| 26-17. Instance Summary | 5419 |
| 26-18. General-Purpose Interface GPIO1 to GPIO3 Registers Summary | 5419 |
| 26-19. General-Purpose Interface GPIO4 to GPIO6 Registers Summary | 5420 |
| 26-20. GPIO_REVISION | 5421 |
| 26-21. Register Call Summary for Register GPIO_REVISION | 5421 |
| 26-22. GPIO_SYSCONFIG | 5421 |
| 26-23. Register Call Summary for Register GPIO_SYSCONFIG | 5422 |
| 26-24. GPIO_IRQSTATUS_RAW_0 | 5422 |
| 26-25. Register Call Summary for Register GPIO_IRQSTATUS_RAW_0 | 5422 |
| 26-26. GPIO_IRQSTATUS_RAW_1 | 5423 |
| 26-27. Register Call Summary for Register GPIO_IRQSTATUS_RAW_1 | 5423 |
| 26-28. GPIO_IRQSTATUS_0 | 5423 |
| 26-29. Register Call Summary for Register GPIO_IRQSTATUS_0 | 5423 |
| 26-30. GPIO_IRQSTATUS_1 | 5424 |
| 26-31. Register Call Summary for Register GPIO_IRQSTATUS_1 | 5424 |
| 26-32. GPIO_IRQSTATUS_SET_0..... | 5424 |
| 26-33. Register Call Summary for Register GPIO_IRQSTATUS_SET_0 | 5425 |
| 26-34. GPIO_IRQSTATUS_SET_1..... | 5425 |
| 26-35. Register Call Summary for Register GPIO_IRQSTATUS_SET_1 | 5425 |
| 26-36. GPIO_IRQSTATUS_CLR_0 | 5426 |
| 26-37. Register Call Summary for Register GPIO_IRQSTATUS_CLR_0 | 5426 |
| 26-38. GPIO_IRQSTATUS_CLR_1 | 5426 |
| 26-39. Register Call Summary for Register GPIO_IRQSTATUS_CLR_1 | 5427 |
| 26-40. GPIO_IRQWAKEN_0 | 5427 |
| 26-41. Register Call Summary for Register GPIO_IRQWAKEN_0..... | 5427 |
| 26-42. GPIO_IRQWAKEN_1 | 5428 |
| 26-43. Register Call Summary for Register GPIO_IRQWAKEN_1..... | 5428 |
| 26-44. GPIO_SYSSTATUS..... | 5428 |
| 26-45. Register Call Summary for Register GPIO_SYSSTATUS | 5429 |
| 26-46. GPIO_WAKEUPENABLE | 5429 |
| 26-47. Register Call Summary for Register GPIO_WAKEUPENABLE | 5429 |
| 26-48. GPIO_CTRL..... | 5430 |
| 26-49. Register Call Summary for Register GPIO_CTRL | 5430 |
| 26-50. GPIO_OE | 5431 |
| 26-51. Register Call Summary for Register GPIO_OE | 5431 |
| 26-52. GPIO_DATAIN | 5431 |
| 26-53. Register Call Summary for Register GPIO_DATAIN | 5431 |
| 26-54. GPIO_DATAOUT | 5432 |
| 26-55. Register Call Summary for Register GPIO_DATAOUT | 5432 |
| 26-56. GPIO_LEVELDETECT0 | 5432 |
| 26-57. Register Call Summary for Register GPIO_LEVELDETECT0..... | 5433 |
| 26-58. GPIO_LEVELDETECT1 | 5433 |
| 26-59. Register Call Summary for Register GPIO_LEVELDETECT1..... | 5433 |

| | |
|---|------|
| 26-60. GPIO_RISINGDETECT | 5434 |
| 26-61. Register Call Summary for Register GPIO_RISINGDETECT | 5434 |
| 26-62. GPIO_FALLINGDETECT | 5434 |
| 26-63. Register Call Summary for Register GPIO_FALLINGDETECT | 5434 |
| 26-64. GPIO_DEBOUNCENABLE | 5435 |
| 26-65. Register Call Summary for Register GPIO_DEBOUNCENABLE | 5435 |
| 26-66. GPIO_DEBOUNCINGTIME | 5435 |
| 26-67. Register Call Summary for Register GPIO_DEBOUNCINGTIME | 5435 |
| 26-68. GPIO_CLEARWKUPENA | 5436 |
| 26-69. Register Call Summary for Register GPIO_CLEARWKUPENA | 5436 |
| 26-70. GPIO_SETWKUENA | 5436 |
| 26-71. Register Call Summary for Register GPIO_SETWKUENA | 5437 |
| 26-72. GPIO_CLEARDATAOUT | 5437 |
| 26-73. Register Call Summary for Register GPIO_CLEARDATAOUT | 5437 |
| 26-74. GPIO_SETDATAOUT | 5438 |
| 26-75. Register Call Summary for Register GPIO_SETDATAOUT | 5438 |
| 27-1. I/O External Keyboard Signals | 5443 |
| 27-2. Integration Attributes | 5445 |
| 27-3. Clocks and Resets | 5445 |
| 27-4. Hardware Requests | 5446 |
| 27-5. Local Power-Management Features | 5448 |
| 27-6. Clock Activity Settings | 5448 |
| 27-7. Events | 5449 |
| 27-8. Keyboard Controller Functional Modes | 5449 |
| 27-9. Keyboard Controller Timer Values | 5450 |
| 27-10. Timer Prescale Values | 5451 |
| 27-11. State-Machine Values | 5452 |
| 27-12. Global Initialization of Surrounding Modules | 5457 |
| 27-13. Keyboard Controller Global Initialization | 5457 |
| 27-14. Keyboard Controller Hardware Mode | 5458 |
| 27-15. Keyboard Controller Software Mode | 5459 |
| 27-16. Keyboard Controller Event Servicing | 5460 |
| 27-17. Keyboard Controller Instance Summary | 5461 |
| 27-18. Keyboard Controller Register Mapping Summary | 5461 |
| 27-19. KBD_REVISION | 5462 |
| 27-20. Register Call Summary for Register KBD_REVISION | 5462 |
| 27-21. KBD_SYSCONFIG | 5462 |
| 27-22. Register Call Summary for Register KBD_SYSCONFIG | 5463 |
| 27-23. KBD_SYSSTATUS | 5463 |
| 27-24. Register Call Summary for Register KBD_SYSSTATUS | 5464 |
| 27-25. KBD_IRQSTATUS | 5464 |
| 27-26. Register Call Summary for Register KBD_IRQSTATUS | 5464 |
| 27-27. KBD_IRQENABLE | 5465 |
| 27-28. Register Call Summary for Register KBD_IRQENABLE | 5465 |
| 27-29. KBD_WAKEUPENABLE | 5466 |
| 27-30. Register Call Summary for Register KBD_WAKEUPENABLE | 5466 |
| 27-31. KBD_PENDING | 5466 |
| 27-32. Register Call Summary for Register KBD_PENDING | 5467 |
| 27-33. KBD_CTRL | 5467 |

| | |
|--|------|
| 27-34. Register Call Summary for Register KBD_CTRL | 5468 |
| 27-35. KBD_DEBOUNCINGTIME | 5468 |
| 27-36. Register Call Summary for Register KBD_DEBOUNCINGTIME | 5469 |
| 27-37. KBD_KEYLONGTIME | 5469 |
| 27-38. Register Call Summary for Register KBD_KEYLONGTIME | 5469 |
| 27-39. KBD_TIMEOUT | 5469 |
| 27-40. Register Call Summary for Register KBD_TIMEOUT | 5470 |
| 27-41. KBD_STATEMACHINE | 5470 |
| 27-42. Register Call Summary for Register KBD_STATEMACHINE | 5470 |
| 27-43. KBD_ROWINPUTS | 5470 |
| 27-44. Register Call Summary for Register KBD_ROWINPUTS | 5471 |
| 27-45. KBD_COLUMNOUTPUTS | 5471 |
| 27-46. Register Call Summary for Register KBD_COLUMNOUTPUTS | 5471 |
| 27-47. KBD_FULLCODE31_0 | 5471 |
| 27-48. Register Call Summary for Register KBD_FULLCODE31_0 | 5471 |
| 27-49. KBD_FULLCODE63_32 | 5472 |
| 27-50. Register Call Summary for Register KBD_FULLCODE63_32 | 5472 |
| 27-51. KBD_FULLCODE17_0 | 5472 |
| 27-52. Register Call Summary for Register KBD_FULLCODE17_0 | 5473 |
| 27-53. KBD_FULLCODE35_18 | 5473 |
| 27-54. Register Call Summary for Register KBD_FULLCODE35_18 | 5473 |
| 27-55. KBD_FULLCODE53_36 | 5473 |
| 27-56. Register Call Summary for Register KBD_FULLCODE53_36 | 5474 |
| 27-57. KBD_FULLCODE71_54 | 5474 |
| 27-58. Register Call Summary for Register KBD_FULLCODE71_54 | 5474 |
| 27-59. KBD_FULLCODE80_72 | 5474 |
| 27-60. Register Call Summary for Register KBD_FULLCODE80_72 | 5475 |
| 28-1. OMAP Power Balls | 5482 |
| 28-2. USB Booting Options | 5485 |
| 28-3. Register Accesses to PMIC | 5485 |
| 28-4. Mapping for Input Sources | 5488 |
| 28-5. TWL6032 Clock Requirements | 5489 |
| 28-6. System Clock Selection Summary | 5492 |
| 28-7. Memory Preferred Booting | 5494 |
| 28-8. Peripheral Preferred Booting | 5495 |
| 28-9. Pin Multiplexing According to Boot Peripheral | 5495 |
| 28-10. ROM Exception Vectors | 5500 |
| 28-11. Dead Loops | 5501 |
| 28-12. RAM Exception Vectors | 5502 |
| 28-13. Tracing Data | 5502 |
| 28-14. ROM Code Default Clock Settings | 5507 |
| 28-15. Public Use of SAR RAM | 5508 |
| 28-16. Software Booting Configuration Structure | 5510 |
| 28-17. ASIC ID Structure | 5513 |
| 28-18. Items | 5513 |
| 28-19. ID Subblock | 5513 |
| 28-20. Checksum Subblock | 5513 |
| 28-21. Booting Messages | 5514 |
| 28-22. Device Descriptor | 5520 |

| | |
|--|------|
| 28-23. Device-Qualifier Descriptor | 5520 |
| 28-24. Configuration Descriptor | 5520 |
| 28-25. Other Speed Configuration Descriptor | 5521 |
| 28-26. Interface Descriptor | 5521 |
| 28-27. BULK IN Endpoint Descriptor | 5521 |
| 28-28. BULK OUT Endpoint Descriptor | 5522 |
| 28-29. Language ID String Descriptor | 5522 |
| 28-30. Manufacturer ID String Descriptor | 5522 |
| 28-31. Product ID String Descriptor | 5522 |
| 28-32. Configuration String Descriptor | 5522 |
| 28-33. Interface String Descriptor | 5523 |
| 28-34. Customized Descriptor Parameters | 5523 |
| 28-35. Standard Device Requests Supported | 5524 |
| 28-36. Blocks and Sectors Searched on Non-XIP Memories | 5529 |
| 28-37. XIP Timing Parameters | 5530 |
| 28-38. NAND Timing Parameters | 5531 |
| 28-39. ONFI Parameters Page Description | 5532 |
| 28-40. Supported NAND Devices | 5532 |
| 28-41. Fourth NAND ID Data Byte | 5533 |
| 28-42. Master Boot Record Structure | 5550 |
| 28-43. Partition Table Entry | 5550 |
| 28-44. FAT Directory Entry | 5553 |
| 28-45. FAT Entry Description | 5554 |
| 28-46. CH TOC Item | 5556 |
| 28-47. CHSETTINGS Item | 5556 |
| 28-48. CHRAM Item | 5557 |
| 28-49. CHFLASH Item | 5558 |
| 28-50. CHMMCS D Item | 5559 |
| 28-51. GP Header Format | 5559 |
| 28-52. Booting Parameter Structure | 5560 |
| 28-53. Tracing Vector 1 | 5561 |
| 28-54. Tracing Vector 2 | 5562 |
| 28-55. Tracing Vector 3 | 5563 |
| 28-56. L2 Cache Write Debug Register | 5564 |
| 28-57. L2 Cache Clean and Invalidate Range of Physical Address | 5564 |
| 28-58. Enable/Disable L2 Cache | 5564 |
| 28-59. Write Auxiliary Control Register | 5565 |
| 28-60. Write Tag and Data RAM Latency Control Register | 5565 |
| 28-61. Write Prefetch Control Register | 5565 |
| 28-62. Read AUX_CORE_BOOT_0 and AUX_CORE_BOOT_1 Registers | 5565 |
| 28-63. Modify AUX_CORE_BOOT_0 | 5566 |
| 28-64. Write AUX_CORE_BOOT_1 | 5566 |
| 28-65. Read WKG_CONTROL_0/1 Register | 5566 |
| 28-66. Clear WKG_CONTROL_0/1 Register | 5567 |
| 28-67. Set Power Status Register | 5567 |
| 28-68. Select the TLB Entry for Read | 5567 |
| 28-69. Select the TLB Entry for Write | 5567 |
| 28-70. Read the TLB VA Entry | 5568 |
| 28-71. Write the TLB VA Entry | 5568 |

| | |
|---|------|
| 28-72. Read the TLB PA Entry | 5568 |
| 28-73. Write the TLB PA Entry | 5568 |
| 28-74. Read the TLB Attributes Entry | 5568 |
| 28-75. Write the TLB Attributes Entry | 5569 |
| 29-1. IEEE1149.1 Signals | 5573 |
| 29-2. IEEE1149.7 Signals | 5574 |
| 29-3. IEEE1149.7 Features Subset | 5574 |
| 29-4. Trace Port Signals..... | 5575 |
| 29-5. NIDnT Port Reusing MMC Interface Pins | 5576 |
| 29-6. ICEPick Boot Modes Upon POR | 5578 |
| 29-7. ICEPick Secondary Debug TAP Mapping..... | 5580 |
| 29-8. ICEPick Debug Core Mapping..... | 5580 |
| 29-9. Hardware Accelerator Debug Capability Options | 5583 |
| 29-10. XTRIGGER | 5584 |
| 29-11. Debug Subsystem Suspend Input Lines | 5585 |
| 29-12. Debug Subsystem Suspend Output Lines | 5585 |
| 29-13. PMU Events..... | 5588 |
| 29-14. PL310 L2 Cache Events..... | 5589 |
| 29-15. Cortex-M3 SCTM Counters Repartition | 5590 |
| 29-16. SCTM Events for Cortex-M3 MPU Subsystem | 5590 |
| 29-17. DSP SCTM Counters Repartition | 5591 |
| 29-18. SCTM Events for DSP Subsystem | 5592 |
| 29-19. L3 Interconnect Functional Probe Mapping | 5596 |
| 29-20. ConnID Mapping (Debug View) | 5596 |
| 29-21. Performance Monitoring Events Detection..... | 5598 |
| 29-22. Performance Filtering Options | 5598 |
| 29-23. Aggregation Modes..... | 5598 |
| 29-24. SC_SDRAM Configuration | 5599 |
| 29-25. SC_LAT0 Configuration | 5601 |
| 29-26. SC_LAT1 Configuration | 5601 |
| 29-27. Trace Port Configuration | 5604 |
| 29-28. Concurrent Debug and Trace..... | 5605 |
| 29-29. Debug Modules Memory Mapping | 5606 |

PRELIMINARY



Read This First

NOTE: OMAP™ 4 processors are intended for manufacturers of Smartphones and other mobile devices.

Community Resources

The following link connects to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

[TI Embedded Processors Wiki](#) — Texas Instruments Embedded Processors Wiki

Established to assist developers using the many Embedded Processors from Texas Instruments to get started, help each other innovate, and foster the growth of general knowledge about the hardware and software surrounding these devices.

If You Need Assistance. . .

| If you want to . . . | Do this . . . |
|---|--|
| Request more information about Texas Instruments Digital Signal Processing (DSP) products | Call the CRC ⁽¹⁾ hotline: (800) 336-5236 Or write to: Texas Instruments Incorporated Market Communications Manager, MS 736 P.O. Box 1443 Houston, Texas 77251-1443 |
| Order Texas Instruments documentation | Call the CRC ⁽¹⁾ hotline: (800) 336-5236 |

⁽¹⁾ Texas Instruments Customer Response Center

About This Manual

FCC Warning

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

Information About Cautions and Warnings

This book may contain cautions and warnings.

CAUTION

This is an example of a caution statement.

A caution statement describes a situation that could potentially damage your software or equipment.

WARNING

This is an example of a warning statement.

A warning statement describes a situation that could potentially cause harm to you.

The information in a caution or a warning is provided for your protection. Please read each caution and warning carefully.

Register, Field, and Bit Calls

The naming convention applied for a call consists of:

- For a register call: `<Module name>.<Register name>`; for example: UART.UASR
- For a bit field call:
 - `<Module name>.<Register name>[End:Start] <Field name> field`; for example, UART.UASR[4:0] SPEED bit field
 - `<Field name> field <Module name>.<Register name>[End:Start]`; for example, SPEED bit field UART.UASR[4:0]
- For a bit call:
 - `<Module name>.<Register name>[pos] <Bit name> bit`; for example, UART.UASR[5] BIT_BY_CHAR bit
 - `<Bit name> bit <Module name>.<Register name>[pos]`; for example, BIT_BY_CHAR bit UART.UASR[5]

To help the reader navigate the document, each register call is hyperlinked to its register description in the register manual section. After each register description, a table summarizes all hyperlinked register calls.

To navigate in the PDF documents, see [Acrobat Reader Tips](#).













Coding Rules

The programming models or code listings follow the rules:

| Type | Definition | Example |
|-------------|--|---|
| File | Starts with the module name | PRCM_test1.c MCBSP1_init.h |
| Variable | Global variables are prefixed by "g_" Pointers are prefixed by "p" Global pointers are prefixed by "g_p" | g_SDMA_LogicalChan pAddrCounter g_pSDMA_LogicalChan |
| Function | Starts with the module name | PRCM_SetupClocks() ArmIntC_MaskInterrupts() |
| Typedef | Ends with "_t" | PRCM_Struct_t |
| Definition | Starts with the module name and is followed by the register name | #define SMS_ERR_TYPE *((volatile Uint32*)0x680080F4) #define MCBSP2_RCR1_REG *((volatile Uint32*)0x4807401C) |
| Enumeration | Starts with the module name | Typedef enum DMA_Mode_Label { INPUT_MODE OUTPUT_MODE } DMA_Mode_t; |

Flow Chart Rules

Flow charts follow the following rules:

| Shape | Name | Definition |
|---|-----------------------------------|---|
|  | Process | Any computational steps or processing function of a program; defined operation(s) causing change in value, form, or location of information |
|  | Decision | A decision or switching-type operation that determines which of a number of alternate paths is followed |
|  | Predefined process or sub-process | One or more named operations or program steps specified in a subroutine or another set of flow charts |
|  | Data or I/O | General I/O function; information available for processing (input) or recording of processed information (output) |
|  | Terminator | Terminal point in a flow chart: start, stop, halt, delay, or interrupt; may show exit from a closed subroutine |
|  | Annotation | Additional descriptive clarification, comment |
|  | On page connector (reference) | Exit to, or entry from, another part of chart in the same page |
|  | Off page connector (reference) | The flow continues on a different page. |
|  | Summing Junction | Logical AND |
|  | Or | Logical OR |
|  | Parallel mode (ISO) | Beginning or end of two or more simultaneous operations |
|  | Flow Line | Lines indicate the sequence of steps and the direction of flow. |

Acrobat Reader Tips

Acrobat includes two methods to search for words in a PDF:

- The Find toolbar provides a basic set of options to locate a word in the current PDF.
- The Search window lists words or partial words that match your text in the current PDF.

These guidelines apply to Acrobat Reader 5.x, 6.0, and 7.0.

For more information on Acrobat Reader search features, see the Adobe Reader Help.

To search for words in a document using the Find dialog box:

1. Open the document.
2. To display the Find toolbar, right-click in the toolbar area and select Find.
3. In the Find box, type the word, words, or partial words for which you want to search.
4. From the Find Options menu, select options as desired.
5. To view each search result, click the Find toolbar, the Find Previous button, or the Find Next button to go backward or forward through the document.

To search for words in a document using the Search PDF window:

1. Open the document.
2. Click the Search button on the File toolbar or right-click on your document and select Search.
3. Type the word, words, or part of a word for which you want to search.
4. Click Search.
5. The results appear in page order and, if applicable, show a few words of context. Each result displays an icon to identify the type of occurrence. All other searchable areas display the Search Result icon.
6. To display the page that contains a search result, click an item in the Results list. The occurrence is highlighted.
7. To navigate to the next result, choose Edit > Search Results > Next Result (or Ctrl+G).
8. To navigate to the previous result, choose Edit > Search Results > Previous Result (or Shift+Ctrl+G).

Navigate through your previous view

To retrace your path within an Adobe PDF document:

- For the previous view: Choose View > Go To > Previous View or Alt+Left Arrow.
- For the next view: Choose View > Go To > Next View or Alt+Right Arrow. The Next View command is available only if you have chosen Previous View.

If you view the PDF document in a browser, use options on the Navigation toolbar to move between views.

- Right-click the toolbar area, and then choose *Navigation*.
- Click the Go To Previous View button or the Go To Next View button.

NOTE: This navigation tip is useful to return to your previous view after clicking on a register call hyperlink.

OMAP4470 MIPI® Disclaimer

The material contained herein is not a license, either expressly or impliedly, to any IPR owned or controlled by any of the authors or developers of this material or MIPI. The material contained herein is provided on an "AS IS" basis and to the maximum extent permitted by applicable law, this material is provided AS IS AND WITH ALL FAULTS, and the authors and developers of this material and MIPI hereby disclaim all other warranties and conditions, either express, implied or statutory, including, but not limited to, any (if any) implied warranties, duties or conditions of merchantability, of fitness for a particular purpose, of accuracy or completeness of responses, of results, of workmanlike effort, of lack of viruses, and of lack of negligence.

ALSO, THERE IS NO WARRANTY OF CONDITION OF TITLE, QUIET ENJOYMENT, QUIET POSSESSION, CORRESPONDENCE TO DESCRIPTION OR NON-INFRINGEMENT WITH REGARD TO THIS MATERIAL OR THE CONTENTS OF THIS DOCUMENT. IN NO EVENT WILL ANY AUTHOR OR DEVELOPER OF THIS MATERIAL OR THE CONTENTS OF THIS DOCUMENT OR MIPI BE LIABLE TO ANY OTHER PARTY FOR THE COST OF PROCURING SUBSTITUTE GOODS OR SERVICES, LOST PROFITS, LOSS OF USE, LOSS OF DATA, OR ANY INCIDENTAL, CONSEQUENTIAL, DIRECT, INDIRECT, OR SPECIAL DAMAGES WHETHER UNDER CONTRACT, TORT, WARRANTY, OR OTHERWISE, ARISING IN ANY WAY OUT OF THIS OR ANY OTHER AGREEMENT, SPECIFICATION OR DOCUMENT RELATING TO THIS MATERIAL, WHETHER OR NOT SUCH PARTY HAD ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

Without limiting the generality of this Disclaimer stated above, the user of the contents of this Document is further notified that MIPI: (a) does not evaluate, test or verify the accuracy, soundness or credibility of the contents of this Document; (b) does not monitor or enforce compliance with the contents of this Document; and (c) does not certify, test, or in any manner investigate products or services or any claims of compliance with the contents of this Document. The use or implementation of the contents of this Document may involve or require the use of intellectual property rights ("IPR") including (but not limited to) patents, patent applications, or copyrights owned by one or more parties, whether or not Members of MIPI. MIPI does not make any search or investigation for IPR, nor does MIPI require or request the disclosure of any IPR or claims of IPR as respects the contents of this Document or otherwise. Questions pertaining to this document, or the terms or conditions of its provision, should be addressed to:

MIPI Alliance, Inc. c/o IEEE-ISTO 445 Hoes Lane Piscataway, NJ 08854 Attn: Board Secretary

Trademarks

OMAP, TMS320DMC64x, TMS320C64x, C64x, C64x+, ICECrusher, ICEPick, ICEPick-D, and SmartReflex are trademarks of Texas Instruments Incorporated. PicoDLP is a registered trademark of Texas Instruments Incorporated.

ARM, Jazelle, and Thumb are registered trademarks of ARM Limited. ETM, ETB, ARM9, CoreSight, ISA, Cortex, and Neon are trademarks of ARM Limited.

Oracle and Java are registered trademarks of Oracle and/or its affiliates.

Bluetooth is a registered trademark of Bluetooth SIG, Inc. and is licensed to Texas Instruments.

HDQ is a trademark of Benchmark.

1-Wire is a registered trademark of Dallas Semiconductor.

Windows, WinMobile, Direct3D, DirectDraw, and DirectX are trademarks or registered trademarks of Microsoft Corporation in the United States and other countries.

USSE and POWERVR are trademarks or registered trademarks of Imagination Technologies Ltd.

Mentor Graphics is a registered trademark of Mentor Graphics Corporation or its affiliated companies in the United States and other countries.

OpenGL is a registered trademark of Silicon Graphics, Inc.

OpenVG, OpenWF, and OpenMAX are trademarks of Khronos Group, Inc.

Adobe and Flash are registered trademarks of Adobe Systems, Inc.

Arteris is a trademark of Arteris, Inc.

RealVideo is a registered trademark of RealNetworks, Inc.

SD is a registered trademark of Toshiba Corporation.

eSD is a trademark of SD Association.

MMC and eMMC are trademarks of MultiMediaCard Association.

SonicsMX, Sonics3220 are trademarks or registered trademarks of Sonics, Inc.

JTAG is a registered trademark of JTAG Technologies, Inc.

Linux is a registered trademark of Linus Torvalds.

On2 is a registered trademark of On2 Technologies.

Symbian and all Symbian-based trademarks and logos are trademarks of Symbian Software Limited.

Synopsys is a registered trademark of Synopsys, Inc.

I²S is a trademark of Phillips Electronics.

I²C is a trademark of Phillips Semiconductor Corp.

SLIMbus and MIPI are registered trademarks of the Mobile Industry Processor Interface (MIPI) Alliance.

Flex-OneNAND and OneNAND are trademarks of SAMSUNG Electronics, Corporation.

Palm OS is a registered trademark of Palm Inc.

All other trademarks are the property of their respective owners.

History

The following table summarizes the OMAP4470 Public TRM versions.

| Version | Literature Number | Date | Notes |
|---------|-------------------|---------------|--------------------|
| C | SWPU270 | November 2011 | See ⁽¹⁾ |
| D | SWPU270 | December 2011 | See ⁽²⁾ |
| E | SWPU270 | December 2011 | See ⁽³⁾ |

⁽¹⁾ Public Version of *OMAP4470 Multimedia Device Silicon Revision 1.0 Technical Reference Manual*, version C (SWPU270C) - Initial release to the public domain.

⁽²⁾ Public Version of *OMAP4470 Multimedia Device Silicon Revision 1.0 Technical Reference Manual*, version D (SWPU270D)
Chapters impacted by the update to version D:

- Chapter 1: Introduction
- Chapter 3: Power, Reset, and Clock Management
- Chapter 4: Dual Cortex-A9 MPU Subsystem
- Chapter 8: Imaging Subsystem
- Chapter 9: Face Detect
- Chapter 10: Display Subsystem
- Chapter 11: 3D Graphics Accelerator
- Chapter 12: 2D Graphics Accelerator - Initial release to the public domain.
- Chapter 14: Interconnect
- Chapter 16: Memory Subsystem
- Chapter 18: Interrupt Controllers
- Chapter 19: Control Module
- Chapter 24: Serial Communication Interfaces
- Chapter 26: General-Purpose Interface
- Chapter 28: Initialization
- Chapter 29: On-Chip Debug Support

⁽³⁾ *OMAP4470 Multimedia Device Silicon Revision 1.0 Technical Reference Manual*, version E (SWPU270E)

Chapters impacted by the update to version E:

- Chapter 3: Power, Reset, and Clock Management

Introduction

This chapter introduces the features, subsystems, and architecture of the OMAP4470 high-performance multimedia device.

| Topic | Page |
|---|------|
| 1.1 Overview | 262 |
| 1.2 Environment | 263 |
| 1.3 Description | 264 |
| 1.4 Package-On-Package Concept | 275 |
| 1.5 OMAP4470 Family and Device Identification | 276 |

1.1 Overview

The OMAP4470 high-performance multimedia application device is based on enhanced OMAP™ architecture and uses 45-nm technology.

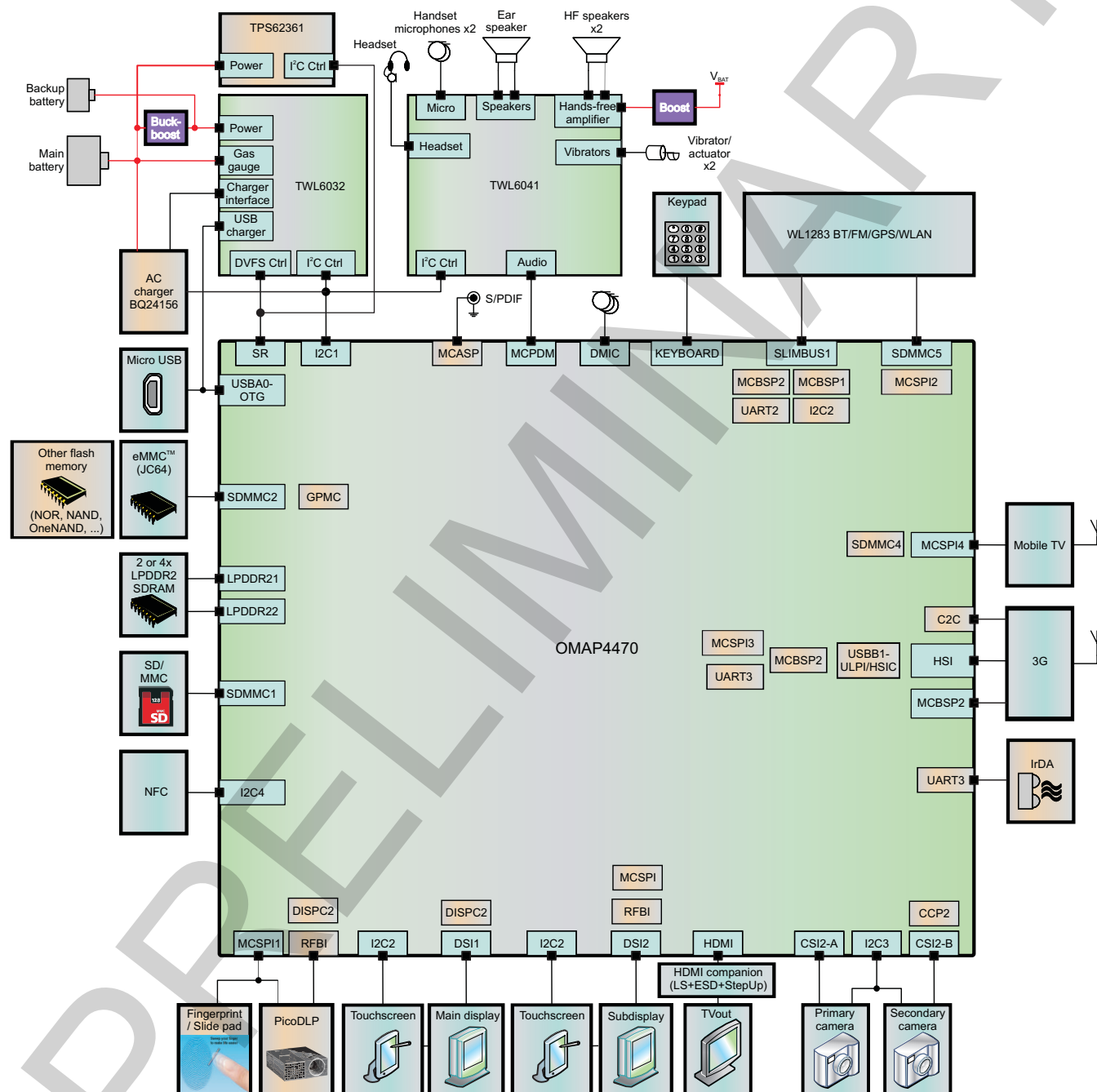
- The architecture is designed to provide best-in-class video, image, and graphics processing for 2.5/3G wireless terminals and high-performance personal digital assistants (PDAs). For that purpose, the device supports the following functions:
 - Streaming video up to full high definition (HD) (1920 × 1080, 30 fps)
 - 2-dimensional (2D)/3-dimensional (3D) mobile gaming
 - Video conferencing
 - High-resolution still image (up to 16 MP)
- The device supports high-level operating systems (OSs) such as:
 - Linux®
 - Palm OS®
 - Symbian OS™
 - Windows™ CE, WinMobile™
- The device is composed of the following subsystems:
 - Cortex™-A9 microprocessor unit (MPU) subsystem, including two ARM® Cortex-A9 cores
 - Digital signal processor (DSP) subsystem
 - Image and video accelerator high-definition (IVA-HD) subsystem
 - Cortex-M3 MPU subsystem, including two ARM Cortex-M3 microprocessors
 - Display subsystem
 - Audio back-end (ABE) subsystem
 - Imaging subsystem (ISS), consisting of image signal processor (ISP) and still image coprocessor (SIMCOP) block
 - 2D/3D graphic accelerator subsystems (SGX and BB2D)
 - Emulation (EMU) subsystem
- The device includes state-of-art power-management techniques required for high-performance mobile products.
- Comprehensive power management is integrated into the device.
- The device also integrates:
 - On-chip memory
 - External memory interfaces
 - Memory management
 - Level 3 (L3) and level 4 (L4) interconnects
 - System and connecting peripherals

1.2 Environment

This section provides an overview of the OMAP environment. The device is associated with power and audio integrated circuits (ICs). TI provides a global solution with the TWL6032/TWL6041 devices.

Figure 1-1 is an overview of a nonexhaustive environment for the high-tier OMAP4470 device.

Figure 1-1. OMAP4470 High-Tier Environment



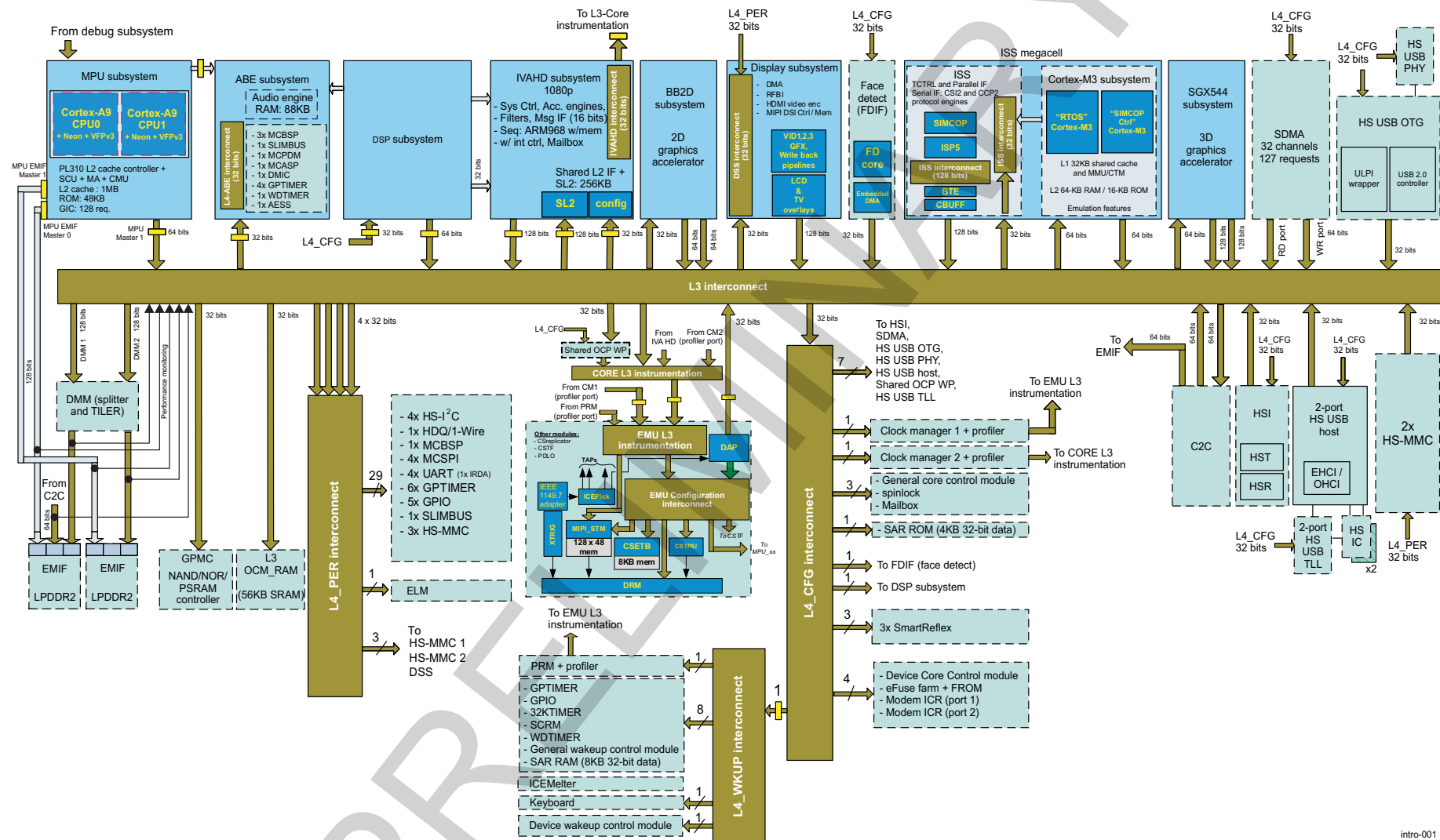
intro-002

1.3 Description

The device is offered in a 547-ball, $12 \times 12 \times 0.73$ -mm, 0.4-mm (bottom) ball pitch package. Some balls are available at the top of the device to allow memory stacking.

[Figure 1-2](#) is the block diagram of the OMAP4470 device.

Figure 1-2. OMAP4470 Block Diagram



intro-001

1.3.1 Cortex-A9 MPU Subsystem Description

The Cortex-A9 MPU subsystem integrates the following submodules:

- ARM Cortex-A9 MPCore
 - Two ARM Cortex-A9 central processing units (CPUs)
 - ARM Version 7 ISA™: Standard ARM instruction set plus Thumb®-2, Jazelle® RCT and Jazelle DBX Java™ accelerators
 - Neon™ SIMD coprocessor and VFPv3 per CPU
 - Interrupt controller (Cortex-A9 MPU INTC) with up to 128 interrupt requests
 - One general-purpose timer and one watchdog timer per CPU
 - Debug and trace features
 - 32-KB instruction and 32-KB data level 1 (L1) caches per CPU
- Shared 1-MB level 2 (L2) cache
- 48-KB bootable ROM
- Local power, reset, and clock management (PRCM) module
- Emulation features
- Digital phase-locked loop (DPLL)

1.3.2 IVA-HD Subsystem Description

The IVA-HD subsystem is a set of video encoder/decoder hardware accelerators. It supports the following features:

- Video up to 1080p at 30 fps
- Slow-motion camcorder
- Triple play (HD, SD, and JPEG capture)
- Real-time transcoding up to 720p
- Video conferencing up to 720p

The IVA-HD subsystem is composed of:

- Improved motion estimation acceleration engine (iME3), which is used in encode processing
- Improved loop filter acceleration engine (iLF3), which performs deblocking filtering
- Improved sequencer (iCONT1) based on the ARM968E-S™ microcontroller. It includes memory and INTC and is used as a primary sequencer.
- Intraprediction estimation engine (iPE3). It is used in encode processing.
- Calculation engine (CALC3), which performs transform and quantization calculations
- Motion compensation engine (MC3), which creates an interprediction macroblock with given motion vectors and modes from the reference data
- Entropy coder/decoder (ECD3), which uses Huffman and arithmetic codes during the process of encoding and decoding the stream
- Video DMA processor (iCONT2), which is also based on the ARM968E-S microcontroller and can be used as secondary sequencer
- Video DMA engine (vDMA), which is a DMA engine for data transmission between external memories and shared L2 memory
- Synchronization box (SYNCBOX) embedded in each hardware accelerator and in both iCONTs
- Mailbox for communication between IVA-HD and external to it processors (DSP, Cortex-A9, and Cortex-M3)
- Shared L2 interface and memory
- Video local interconnect for connection between the submodules of the IVA-HD, and between the IVA-HD and DSP subsystems
- IVA-HD system control module (SYSCTRL), which controls the clocks in the subsystem and PRCM handshaking

The IVA-HD subsystem can process three data formats for internal data: picture or slice, macroblock header, and residual data.

The IVA-HD supports the following formats:

- MPEG-1/-2/-4 such as MPEG-2 MP, ML, and MPEG-4 as SP/ASP
- Divx 5.02 and above
- Sorenson Spark (decode)
- H.263 P0 (encode and decode) and P3 (decode)
- H.264 Annex G (scalable baseline profile up to 720p)
- H.264 BL/MP/HP
- H.264 Annex H (partial)
- Stereoscopic video
- JPEG (encode/decode)
- VC-1 SP/MP/AP
- AVS-1.0
- RealVideo® 8/9/10 (decode only)
- On2® VP6.2/VP7 (decode only)

1.3.3 Cortex-M3 MPU Subsystem Description

The Cortex-M3 MPU subsystem includes the following components:

- Two Cortex-M3 CPUs: One for SIMCOP control, and the other for RTOS, ISP, and display subsystem control
- ARMv7-M and Thumb-2 instruction set architecture
- Dedicated INTC with up to 64 physical interrupt events
- Two-level memory subsystem hierarchy:
 - L1
 - 32-KB shared cache memory
 - L2 ROM + RAM
 - 64-KB RAM
 - 16-KB bootable ROM
- Cortex-M3 system bus directly connected to the ISS interconnect
- MMU for address translation
- Integrated power management
- Emulation feature embedded in the Cortex-M3

1.3.4 Display Subsystem Description

The display subsystem provides the control signals required to interface the OMAP system memory frame buffer (SDRAM) directly to the displays. It supports hardware cursor, independent gamma curve on all interfaces, multiple-buffer, and programmable color phase rotation (CPR). The display subsystem allows low-power display refresh and arbitration between normal and low-priority pipelines.

The display subsystem consists of the following sections:

- Display controller: It can read and display the encoded pixel data stored in memory and write the output of one of the overlays or one of the pipelines into the system memory. It supports the following components:
 - Three video pipelines, one graphic pipeline, and one write-back pipeline. The graphic pipeline supports pixel formats such as: ARGB16-4444, RGB16-565, ARGB16-1555, ARGB32-8888, RGBA32-8888, RGB24-888, and BITMAP (1, 2, 4, or 8 bits per pixel). It allows selection of the color-depth expansion.
 - Write-back pipeline uses poly-phase filtering for independent horizontal and vertical resampling

(upsampling and downsampling). It allows programmable color space conversion of RGB24 into YUV4:2:2-UYVY, YUV4:2:2-YUV2, or YUV4:2:0-NV12, and selection of color-depth reduction from RGB24 to RGB16.

- Two LCD outputs, each one with dedicated overlay manager, for support of passive matrix color and monochrome displays (up to 8-bit interface) and active matrix color displays (up to 24-bit interface). Secondary LCD output is available through parallel CMOS interface for MIPI®-DPI 1.0 support.
- One TV output with dedicated overlay manager
- Own direct memory access (DMA) engine
- Remote frame buffer interface (RFBI) module:
 - Support for MIPI-DBI protocol
 - 8-/9-/16-bit parallel interface
 - Programmable pixel modes and output formats
- Two MIPI display serial interfaces (DSIs) with the following main features:
 - Support for MIPI-DSI (four data-lane complex inputs/outputs (I/Os) for DSI1 and two data-lane complex I/Os for DSI2)
 - Support for video mode and command mode
 - Data interleaving support for synchronous and asynchronous streams
 - Bidirectional data link support
- High-definition multimedia interface (HDMI) encoder with the following main features:
 - HDMI 1.3, HDCP 1.2, and DVI 1.0 compliant
 - Including support for the 3D Stereoscopic frame-packing formats of HDMI v1.4 standard (720p, 50 Hz, 720p, 60 Hz and 1080p, 24 Hz)
 - Deep-color mode support (10-bit for up to 1080p and up to 12-bit for 1080i/720p)
 - Support for uncompressed multichannel audio
 - Integrated high-bandwidth digital content protection (HDCP) encryption engine for transmitting protected audio and video content
 - Integrated transition minimized differential signaling (TMDS) and TERC4 encoders for data island support

1.3.5 ABE Subsystem Description

The ABE subsystem handles audio processing for the application. It manages the audio and voice streams between the Cortex-A9 MPU subsystem and/or DSP, and the physical interfaces.

The ABE subsystem allows:

- Buffering of audio samples
- Mixing audio with voice downstream and/or microphone upstream (sidetone)
- Postprocessing of equalization, 3D effects, bass-boost

The ABE subsystem consists of:

- Audio engine (AE) subsystem, which performs real-time signal processing such as:
 - Muxing and mixing voice and data streams
 - Postprocessing operations such as sampling rate conversion, volume control, 3D effects
 - Execution of whole data transfers in the ABE subsystem using audio traffic controller (ATC)

The AE subsystem includes an AE and has the following on-chip memories available: 64-KB data memory (DMEM); 6-KB coefficient memory (CMEM); and 18-KB sample memory (SMEM).

The ATC manages the data movement in the ABE subsystem and is in charge of interrupt generation to the DSP and Cortex-A9 MPU subsystems.

- Four general-purpose timers (GPTIMERS) and one watchdog timer (WDTIMER)
- Peripheral interfaces:

- Three multichannel buffered serial ports (McBSPs) for inter-IC sound (I2S™) external connectivity
- One multichannel audio serial port (McASP) supporting Sony/Philips digital interconnect format (S/PDIF) output
- One MIPI SLIMbus interface to support new generations of MIPI-compliant components
- One digital microphone (DMIC) for three stereo digital microphones support
- One multichannel pulse-density modulation (McPDM) interface, which ensures communication with the TWL6041 audio companion chip
- Internal interfaces for connection with the DSP and Cortex-A9 MPU subsystems and other modules in the device
- Dedicated power domain (ABE power domain)

1.3.6 ISS Description

The ISS processes data coming from the image sensor, memory, and IVA-HD subsystem. The ISS is responsible for multimedia applications such as camera viewfinders; video recording with up to 1080p at 30 fps; digital zoom; and still image processing, including image capture up to 16 MP with digital zoom and rotation. The ISS supports a pixel throughput of up to 200 MP/s. It assures good performance with sensors up to 16 MP and more (higher resolution can be achieved through multiple passes). The ISS can implement third-party algorithms for further flexibility when working with image sensors.

The ISS consists of:

- The ISP, which deals with on-the-fly or memory-to-memory data processing. It allows data collection for autoexposure, autowhite balance, autofocus, resizing, and histogram generation. The ISP consists of:
 - Image pipe interface (IPIPEIF) for synchronization signals (HD, VD) for the ISIF, IPIPE, RSZ, and hardware 3A (H3A) modules, data transfer from video port, SDRAM, ISIF, and various pixel data manipulation functions.
 - Image pipe (IPIPE) front-end and back-end modules for raw-data processing and RGB and YUV data processing, respectively. They support:
 - Sensor data linearization for dynamic range extension
 - Programmable 2D lens shading compensation correction
 - Black-level compensation
 - Gamma correction
 - RGB color correction
 - RGB-to-YUV4:2:2 color conversion
 - 3D look up table (LUT) for color correction
 - 2D edge enhancement
 - False Chroma suppression
 - H3A for autowhite balance, autoexposure, and autofocus
 - Pattern generator (PG) for internal test-data generation. It provides the ability to test some of the ISP submodules without the use of an external image sensor.
 - Two independent resizers, which allow YUV4:2:2 to YUV4:2:0 planar Chroma filtering and downsampling. The resizers support input and output flows with up to 200 MP/s, and memory-to-memory rescaling in the range $\times 1/4096$ scale down, and $\times 20$ scale up.
 - Image sensor interface (ISIF) can process the incoming data and supports the following main functions:
 - Sensor data linearization
 - Supports VGA read out mode
 - Color space conversion
 - Digital clamp with horizontal/vertical offset drift compensation
 - Vertical line defect correction

- Programmable 2D-matrix lens shading correction
- 10-to-8 bits A-Law compression table inside
- Buffer logic (BL), which processes and manages the requests to the module and memory subsystem
- Peripheral serial interfaces for connection with sensors and memories:
 - Two PHYs, CSIPHY1 and CSIPHY2, for physical connection to external sensors
 - Peripheral serial interfaces CSI2-A and CSI2-B/CCP2 for image data transfer from sensors to memory or ISP
- Peripheral 16-bit parallel interface, BT656 and SYNC mode
- SIMCOP module for memory-to-memory operation; JPEG encode/decode hardware acceleration; high-ISO filtering; block-based rotation; warping and fusion; and general-purpose imaging acceleration. The SIMCOP includes the following main submodules:
 - Two imaging extension (iMX) modules – programmable image and video processing engines
 - Noise filter 2 (NSF2) – for advanced noise filtering and edge-enhancement
 - Variable-length coder/decoder for JPEG (VLCDJ) module
 - Discrete cosine transform (DCT) module
 - Lens distortion correction (LDC) module
 - Rotation accelerator (ROT) engine
 - Hardware sequencer, which offloads sequencing tasks from the MPU
 - Shared buffers/memories
 - DMA controller
- Timing control module for CAM global reset control, CAM flash strobe, and CAM shutter
- System interfaces and interconnects comprising:
 - Two configuration interfaces
 - One 128-bit master data interface
 - Internal ISS interconnects for image data and configuration
 - On-chip RAM interface
 - Circular buffer (CBUFF) and burst-translation engine (BTE) for efficient communication with external memory (SDRAM/TILER support)

1.3.7 3D Graphics Accelerators Description

The 3D graphics accelerator subsystem is based on POWERVR® SGX544 core from Imagination Technologies. It supports phone/PDA and hand-held gaming applications. The SGX can process different data types simultaneously, such as: pixel data, vertex data, video data, and general-purpose data processing.

The SGX subsystem has the following features:

- API support for industry standards:
 - OGL-ES 1.1 and 2.0
 - OpenVG™ 1.1
 - OpenCL™-EP 1.1
 - Direct3D™ Feature Level 9.3
- Tile-based deferred rendering architecture reduces external bandwidth to SDRAM.
- Second-generation Universal Scalable Shader Engines (USSE2™):
 - Multithreaded engine incorporating vertex and pixel shader functionality
 - Automatic load balancing of vertex and pixel processing tasks
- Present and texture load accelerator (PTLA):
 - Enables to move, rotate, twiddle, and scale texture surfaces

- Supports RGB, ARGB, YUV4:2:2, and YUV4:2:0 surface formats
- Supports bilinear upscale
- Supports source color key
- Fully virtualized memory addressing for OS in a unified memory architecture:
 - MMU
 - Up to 4-GB virtual address space

1.3.8 2D Graphics Accelerators

The 2D graphics accelerator (BB2D) subsystem is based on the GC320 2D core from Vivante Corporation and has the following features:

- API support:
 - OpenWF™, DirectFB
 - GDI/DirectDraw
 - Adobe® Flash®
- BB2D architecture:
 - BitBlt and StretchBlt
 - DirectFB hardware acceleration
 - ROP2, ROP3, ROP4 full alpha blending and transparency
 - Clipping rectangle support
 - Alpha blending includes Java 2 Porter-Duff compositing rules
 - 90-, 180-, 270-degree rotation on every primitive
 - YUV-to-RGB color space conversion
 - Programmable display format conversion with 14 source and 7 destination formats
 - High-quality 9-tap, 32-phase filter for image and video scaling at 1080p
 - Monochrome expansion for text rendering
 - 32 K × 32 K coordinate system

1.3.9 Face Detect Module Description

The face detect module is a stand-alone module that performs face detection and tracking on a picture stored in the SDRAM memory. It communicates with the Cortex-A9 MPU, DSP, and Cortex-M3 MPU subsystems.

Face detect is typically used on:

- Video encoding
- Face-based priority auto-focusing
- Red-eye removal

The face detect module comprises:

- Face detection core with embedded DMA engine for data memory access
- RAM and ROM memories
- L3 and L4 port interfaces

1.3.10 On-Chip Debug Support Description

The on-chip debug support has the following features:

- Multiprocessor debugging lets users control multiple CPU cores embedded in the device, such as:
 - Global starting and stopping of individual or multiple processors
 - Each processor can generate triggers that can be used to alter the execution flow of other processors

- System clocking and power down
- Interconnection of multiple devices
- Channel triggering
- Target debugging, using IEEE 1149.1 (JTAG®), or IEEE 1149.7 (complementary superset of JTAG) port
- Reduction of power consumption in normal operating mode
- Real-time software trace allows the OMAP software masters to transmit trace data from OS processes or tasks on 256 different channels.

The debug subsystem includes:

- IEEE 1149.7 adapter
- Generic TAP for emulation and test control (ICEPick-D™)
- Debug access port (DAP)
- Processor trace subsystem
- System trace subsystem
- EMU configuration interconnect
- Cross-triggering unit (XTRIGGER)
- Debug resource manager (DRM)

ICEMelter:

- Controls the wake-up and power-down of the EMU power domain

CORE instrumentation interconnect:

- Initiator ports:
 - L3 interconnect (for software instrumentation and performance probes)
 - OCP-WP
 - IVA-HD instrumentation (HWA profiling)
 - CM2 instrumentation
- Target port:
 - EMU instrumentation interconnect

OCP watch-point (OCP-WP):

- Monitors L3 interconnect transaction when target transaction attributes match the user-defined attributes or trigger on external debug event
- Only one instance, shared among the following L3 targets:
 - GPMC
 - L4_PER
 - L4_CFG

Power management events profiler (PM instrumentation)

Clock management events profiler (CM instrumentation)

Statistics collector (performance probes)

1.3.11 Power, Reset, and Clock Management Description

The PRCM module allows efficient control of clocks and power according to the required performance, and reduction of power consumption.

The PRCM module is divided into:

- Power and reset management (PRM), based on the SmartReflex™ framework with the following features:
 - Dynamic clock gating

- Dynamic voltage and frequency scaling (DVFS)
- Dynamic power switching (DPS)
- Static leakage management (SLM)
- Adaptive body bias (ABB)
- Retention-till-access (RTA) for memories
- Clock management 1 (CM1) for clock generation, distribution, and management for the Cortex-A9 MPU, ABE, and CORE always-on power domains. The clock management allows reduction of dynamic consumption.
- Clock management 2 (CM2) for clock generation, distribution, and management for other modules

1.3.12 On-Chip Memory Description

The on-chip memory is divided into L3 OCM RAM, SAR ROM, SAR RAM, and memories in the subsystems (Cortex-A9, Cortex-M3, ABE, and IVA-HD).

- The L3 OCM RAM consists of 56 KB of on-chip SRAM.
- The save-and-restore (SAR) ROM consists of 4 KB and contains a linked list of descriptors used by the system DMA (sDMA).
- The SAR RAM consists of 8 KB divided into four blocks. It is used as context-saving memory when the device goes into off mode.

1.3.13 Memory Management Description

The memory management is performed from:

- sDMA controller with up to 127 requests, 32 prioritizable logical channels, and 256 × 64-bit FIFO
- Dynamic memory management (DMM) module, which performs global address translation, address rotation (tiling), and access interleaving

1.3.14 External Memory Interface Description

There are two main interfaces for connection to external memories: general-purpose memory controller (GPMC) and dual-channel SDRAM controller (external memory interface [EMIF]).

The GPMC supports:

- Asynchronous SRAM memories
- Asynchronous/synchronous NOR flash memories
- NAND flash memories
- Pseudo-SRAM devices

The two EMIFs allow:

- Connection between the device and LPDDR2-SDRAM memories. Support two CSs per EMIF controller.
- PHY is the DDR physical interface, which implements data-rate conversion in compliance with LPDDR2 JEDEC requirements.
- Memory density up to 8 Gbits supported per CS. Total address space is limited to 2GB = 16 Gbits

1.3.15 System and Connection Peripherals

The OMAP device supports a comprehensive set of peripherals to provide flexible and high-speed (HS) interfacing and on-chip programming resources.

1.3.15.1 System Peripherals

- Seven general-purpose timers (GPTIMER)
- One watchdog timer (WDTIMER)
- One 32-kHz synchronization timer (32KTIMER)

- System control module, which contains registers for the following functions:
 - Static device configuration
 - Debug and observability
 - Status
 - Pad configuration
 - I/O configuration
 - eFuse logic
 - Analog function control
 - System boot decoding logic
- System mailbox with eight mailbox message queues
- One SPINLOCK module with 32 hardware semaphores, which can service tasks between the Cortex-A9 MPU, DSP, and Cortex-M3 MPU subsystems
- One chip-to-chip (C2C) interface, which services the communication between the OMAP device and external devices

1.3.15.2 Connection Peripherals

- Three universal asynchronous receiver/transmitter (UART) modules as serial-communication interfaces
- One UART + IrDA SIR up to FIR + TV remote control interface (CIR)
- McBSP module to provide full-duplex serial communication between the OMAP device and other applications chips and codecs
- Five HS I²C™ controller modules; four of them are general-purpose modules with rates up to 3.4 Mbps, and the fifth one, in the PRCM module, performs dynamic voltage control and power sequencing with an external power IC.
- HDQ™/ 1-Wire® – Benchmarq HDQ and Dallas Semiconductor 1-Wire protocols interface
- Two HS MMC/SD/SDIO modules with 8-bit data bus interface, that can act as an initiator on L3 interconnect thanks to an embedded DMA
- Three HS MMC/SD/SDIO modules with 4-bit data bus interface
- Six general-purpose input/output (GPIO) modules with 32 I/Os each
- One keyboard controller, which supports up to 9 × 9 matrix keypads
- One MIPI SLIMbus interface
- Four multichannel serial peripheral interface (MCSPI) modules
- One HS universal serial bus (USB) on-the-go (OTG) module with embedded PHY, compliant with the USB2.0 (up to 480 Mbps) standard for HS functions and with the OTG supplement
- One HS multiport USB host module, which can be used for interchip connection or with an off-chip transceiver. It is compliant with the USB2.0 standard. The USB host module allows communication with USB peripherals with data rates up to 480 Mbps for HS, up to 12 Mbps for full-speed, and up to 1.5 Mbps for low-speed.
- One MIPI high-speed synchronous serial interface (HSI) module with two full-duplex serial communication interfaces. It is used for communication between the OMAP device and an external device, with data rates up to 192 Mbps for transmission, and up to 225 Mbps for reception. The MIPI HSI supports 16 logical channels on each destination (RX/TX).

1.4 Package-On-Package Concept

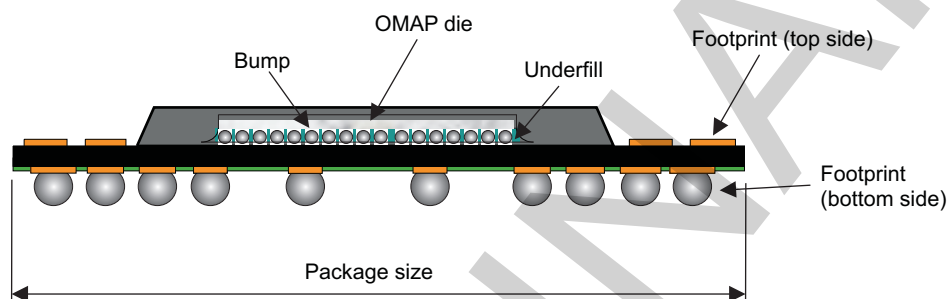
The OMAP4470 die uses flip-chip technology. The OMAP4470 package-on-package (POP) device supports memory stacking using a POP implementation.

The OMAP4470 die provides two LPDDR2 interfaces. Because each interface supports up to two chip-selects (CSs), up to four LPDDR2 memory dies are supported. Those interfaces are available only on device top ball out.

The two stacked memory packages are directly connected to the two LPDDR2 EMIF interfaces of the OMAP4470 die.

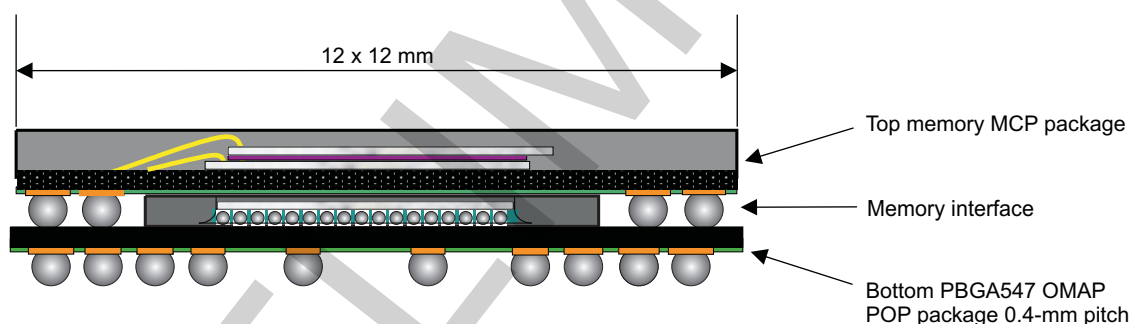
Figure 1-3 shows the concept of the POP solution, and Figure 1-4 shows stacked memory package on the POP device.

Figure 1-3. POP Concept



intro-003

Figure 1-4. Stacked Memory Package on the POP Device



intro-004

Two types of LPDDR-SDRAM memories are supported in the POP package: S4 and S2, with total size up to 2 GB and 32-bit data width.

The POP device includes feedthroughs. The feedthroughs are defined from the bottom ball-grid array (BGA) to the stacked memory. The purpose of some of the feedthroughs is to provide power supply to the stacked memories.

1.5 OMAP4470 Family and Device Identification

The OMAP4470 family is composed of the following devices:

- OMAP4470-1300
- OMAP4470-1500

Table 1-1 describes the identification registers.

The identification registers include the data registers listed in Table 1-2 and Table 1-3. These registers are read-only accessed ports that are programmed into eFuses FARM FROM.

Table 1-1. Device Identification Registers

| Register Name | Alias Name | Physical Address | Address Offset | Size |
|--------------------------|----------------|------------------|----------------|------|
| STD_FUSE_DIE_ID_0[31:0] | DIE_ID[31:0] | 0x4A00 2200 | 0x200 | 32 |
| ID_CODE[31:0] | ID_CODE[31:0] | 0x4A00 2204 | 0x204 | 32 |
| STD_FUSE_DIE_ID_1[31:0] | DIE_ID[63:32] | 0x4A00 2208 | 0x208 | 32 |
| STD_FUSE_DIE_ID_2[31:0] | DIE_ID[95:64] | 0x4A00 220C | 0x20C | 32 |
| STD_FUSE_DIE_ID_3[31:0] | DIE_ID[127:96] | 0x4A00 2210 | 0x210 | 32 |
| STD_FUSE_PROD_ID_0[31:0] | PROD_ID[31:0] | 0x4A00 2214 | 0x214 | 32 |
| STD_FUSE_PROD_ID_1[31:0] | PROD_ID[63:32] | 0x4A00 2218 | 0x218 | 32 |

Table 1-2. STD_FUSE_DIE_ID

| Field | Alias Name | Bits | Value |
|-------------------------|----------------|------|-----------------------|
| STD_FUSE_DIE_ID_0[31:0] | DIE_ID[31:0] | – | Single die identifier |
| STD_FUSE_DIE_ID_1[31:0] | DIE_ID[63:32] | – | Single die identifier |
| STD_FUSE_DIE_ID_2[31:0] | DIE_ID[95:64] | – | Single die identifier |
| STD_FUSE_DIE_ID_3[31:0] | DIE_ID[127:96] | – | Single die identifier |

The product type can be read in the value of the RAMP_SYSTEM bit field of the Table 1-3 register. The silicon revision can be read in the value of the VERSION bit field of the Table 1-3 register.

Table 1-3. ID_CODE

| Field | Bits | Value | Comment |
|----------------|-------------|----------------|----------------------------|
| ID_CODE[31:28] | VERSION | See Table 1-5. | Revision number |
| ID_CODE[27:12] | RAMP_SYSTEM | See Table 1-4. | Ramp system number |
| ID_CODE[11:1] | TI_IDM | 0x17 | Manufacturer identity (TI) |
| ID_CODE[0] | – | 0x1 | Always set to 1 |

The ramp system number is hardcoded in the design. Table 1-4 lists the ramp system number values, Table 1-5 lists the revision number values, and Table 1-6 lists ID_CODE values.

Table 1-4. Ramp System Number Values

| Silicon Type | Field | Value |
|----------------|----------------|--------|
| OMAP4470 ES1.0 | ID_CODE[27:12] | 0xB975 |

Table 1-5. Revision Number Values

| Silicon Type | Field | Value |
|----------------|----------------|-------|
| OMAP4470 ES1.0 | ID_CODE[31:28] | 0x0 |

Table 1-6. ID CODE Values

| Silicon Type | Field | Value |
|----------------|---------------|------------|
| OMAP4470 ES1.0 | ID_CODE[31:0] | 0x0B97502F |

The device type can be read in the [Table 1-7](#) register.

Table 1-7. STD FUSE PROD ID 0

| | | |
|-------------------------|--------------------------------------|-----------------|
| Address Offset | 0x0000 0214 | |
| Physical Address | 0x4A00 2214 | Instance |
| Description | This register shows the device type. | GENERAL |
| Type | R | |

[illegible]

| Bits | Field Name | Description | Type | Reset Value |
|------|-------------|---|------|-------------|
| 31:8 | RESERVED | Reserved | R | 0x- |
| 7:0 | DEVICE_TYPE | Define the device type 0xF0 = GP device Other values = Reserved | R | 0x- |

NOTE: The CONTROL_STATUS[10:0] DEVICE_TYPE bit field can also be used as a source for device type identification.

The silicon type can be read in the [Table 1-8](#) register.

Table 1-8. STD_FUSE_PROD_ID_1

| | | | |
|-------------------------|--------------------------------------|-----------------|---------|
| Address Offset | 0x0000 0218 | | |
| Physical Address | 0x4A00 2218 | Instance | GENERAL |
| Description | This register shows the device type. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 10 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SILICON_TYPE | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset Value |
|-------|--------------|--|------|-------------|
| 31:18 | RESERVED | Reserved | R | 0x- |
| 17:16 | SILICON_TYPE | Define the silicon performance type: 0x1: Standard performance (1.3 GHz) 0x2: High performance (1.5 GHz) Other values: Reserved | R | 0x- |
| 15:0 | RESERVED | Reserved | R | 0x- |

PRELIMINARY

Memory Mapping

This chapter describes the memory mapping in the device.

| Topic | Page |
|---|------|
| 2.1 Introduction | 280 |
| 2.2 L3 Memory Space Mapping | 282 |
| 2.3 L4 Memory Space Mapping | 285 |
| 2.4 Dual Cortex-M3 Subsystem Memory Space Mapping | 295 |
| 2.5 DSP Subsystem Memory Space Mapping | 296 |
| 2.6 Display Subsystem Memory Space Mapping | 298 |

2.1 Introduction

The Cortex™-A9 microprocessor unit (MPU) has a 32-bit address port, which allows it to handle a 4-GB space divided into several regions, depending on the target type.

The memory map comprises the following features that are shared among the initiators (for example, the Cortex-A9 MPU subsystem or the image and video accelerator [IVA-HD] subsystem).

- Memory space: General-purpose memory controller (GPMC)
- Dynamic memory management (DMM) controller
- Register spaces: Level 3 (L3) and level 4 (L4) interconnects
- Dedicated spaces: IVA-HD subsystem, graphic accelerator (SGX), etc.

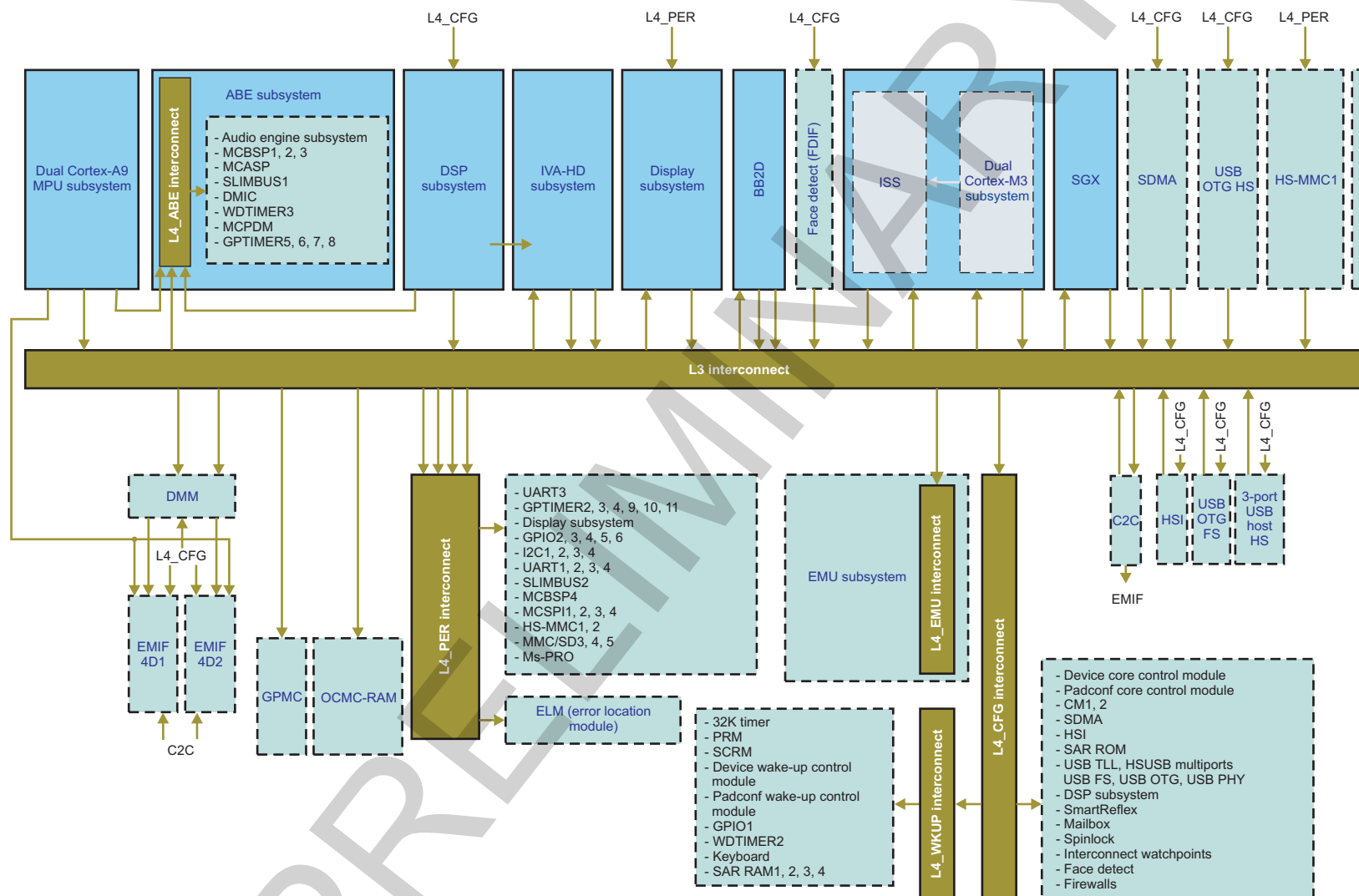
The GPMC and DMM are dedicated to memory connection. The GPMC is used for NOR/NAND flash and static RAM (SRAM) memories. The DMM is used for synchronous dynamic random access memory (SDRAM) memories, such as regular SDR (single-data rate)-SDRAM or mobile DDR (double-data rate)-SDRAM. For more information, see [Section 16.2, *Dynamic Memory Manager*](#), and [Section 16.3, *EMIF Controller*](#).

The L3 interconnect allows the sharing of resources, such as peripherals and external or on-chip memories, among all the initiators of the platform. The L4 interconnects control access to the peripherals.

Transfers across the platform between initiators and targets are physically conditioned by the chip interconnect and can be logically conditioned by firewalls. For more information about the intercommunication (L3 and L4 interconnects) and protection mechanisms implemented in the device, see [Section 14.2, *L3 Interconnect*](#), and [Section 14.3, *L4 Interconnects*](#).

[Figure 2-1](#) shows the interconnect of the device and the main modules and subsystems in the platform.

Figure 2-1. Interconnect Overview



2.2 L3 Memory Space Mapping

The memory space system is hierarchical: level 1 (L1), level 2 (L2), L3, and L4. L1 and L2 are memories in the Cortex-A9 MPU, Cortex™-M3 MPU, and the digital signal processor (DSP) subsystems. L3 handles many types of data transfers, including data exchange with system on-chip/external memories. The chip-level interconnect, which consists of one L3 and four L4s, enables communication among all modules and subsystems.

This section provides a global view of the memory mapping of the device at the L3 interconnect and describes the boot, GPMC, and SDRAM controller (SDRC) (EMIF/DMM) spaces.

The system memory mapping is flexible, with two levels of granularity for target address space allocation:

- L1: Four quarters are labeled Q0, Q1, Q2, and Q3. Each quarter corresponds to a 1-GB address space (total address space is 4GB).
- L2: Each quarter is divided into eight blocks of 32MB, with target spaces mapped in the blocks.

This organization allows all target spaces to be decoded based on the 7 most-significant bits (MSBs) of the 32-bit address ([31:25]).

- Boot space:

The system has a 48-KB boot space in the on-chip boot ROM or on the GPMC space.

When booting from the on-chip ROM with the appropriate external sys_boot pin configuration, the 48-KB memory space is redirected to the on-chip boot ROM address space [0x4002 0000–0x4002 BFFF].

When booting from the GPMC with the appropriate external sys_boot pins configuration, the memory space is part of the GPMC space. At reset, the 0x0000 0000 address is available on chip-select 0 (CS0) for a memory size of 16MB.

For more information about sys_boot pins configuration, see [Section 16.4, General-Purpose Memory Controller](#), and [Chapter 28, Initialization](#).

- GPMC space:

Eight independent GPMC chip-selects (gpmc_ncs0 to gpmc_ncs7) are available in the first quarter (Q0) of the addressing space to access NOR/NAND flash and SRAM. The chip-selects have a programmable start address and programmable size (16, 32, 64, or 128MB) in a total memory space of 1GB.

- EMIF1/EMIF2 CS0 space:

Q2 addressing space is interleaved on two LPDDR-memory controllers (EMIF1 and EMIF2), each activating its CS0 line (lpddr21_ncs0 and lpddr22_ncs0). These chip-selects can address 64, 128, 256, 512, 1024, and 2048MB. Interleaving occurs from 128-byte granularity up to 512-byte granularity.

The EMIF1-CS0 base address is always 0x8000 0000 at reset, and occupies a 1-GB address space at reset (interleaving disabled at reset).

- EMIF1/EMIF2 CS1 space:

Q3 addressing space is interleaved on two LPDDR-memory controllers (EMIF1 and EMIF2), each activating its CS1 line (lpddr21_ncs1 and lpddr22_ncs1). These chip-selects can be programmed to 64, 128, 256, 512, and 1024MB. Interleaving occurs at 128-MB granularity.

EMIF1-CS1 and EMIF2-CS1 are disabled at reset. Their base address is programmable to achieve a continuous address space with the respective CS0, regardless of the address range programmed.

EMIF1-CS1 is disabled if EMIF1-CS0 memory density is set to 2048MB (2GB) when interleaving is disabled, or if EMIF1-CS0 + EMIF2-CS0 memory density are set to 1024MB (1GB) when interleaving is enabled.

- TILER space:

Q3 addressing space is also used to access the tiling and isometric lightweight engine for rotation (TILER). This space is visible only for the imaging subsystem (ISS) and display subsystem.

[Table 2-1](#) describes the global memory space mapping.

Table 2-1. Global Memory Space Mapping

| Quarter | Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|----------|---|---------------------|-------------------|-------|---|
| Q0 (1GB) | Boot space GPMC ⁽¹⁾ | 0x0000 0000 | 0x3FFF FFFF | 1GB | |
| | GPMC | 0x0000 0000 | 0x3FFF FFFF | 1GB | 8/16 Ex ⁽²⁾ /R/W |
| Q1 (1GB) | On-chip memory | 0x4000 0000 | 0x7FFF FFFF | 1GB | ROM/SRAM address space |
| | Reserved | 0x4000 0000 | 0x4002 FFFF | 192KB | Reserved |
| | Boot ROM internal | 0x4003_0000 | 0x4003_BFFF | 48KB | 32-bit Ex ⁽²⁾ /R Boot ROM |
| | Reserved | 0x4003 C000 | 0x400F FFFF | 784KB | Reserved |
| | Audio back-end (ABE) | 0x4010 0000 | 0x401F FFFF | 1MB | ABE domain (direct Cortex-A9 MPU access). See Table 2-6 . |
| | Reserved | 0x4020 0000 | 0x402F FFFF | 1MB | Reserved |
| | L3 OCMC_RAM | 0x4030 0000 | 0x4030 DFFF | 56KB | 32-bit Ex/R/W |
| | Reserved | 0x4030 E000 | 0x43FF FFFF | 61MB | Reserved |
| | L3 configuration registers | 0x4400 0000 | 0x47FF FFFF | 64MB | L3 configuration registers |
| | L4_PER domain | 0x4800 0000 | 0x48FF FFFF | 16MB | Peripheral domain (see Table 2-5) |
| | L4_ABE domain | 0x4900 0000 | 0x49FF FFFF | 16MB | ABE domain (double-mapped for Cortex-A9 MPU) |
| | L4_CFG domain | 0x4A00 0000 | 0x4AFF FFFF | 16MB | Configuration register domain (see Section 2.2, L3 Memory Space Mapping). Also includes L4_WKUP. |
| | Reserved | 0x4B00 0000 | 0x4BFF FFFF | 16MB | Reserved |
| | EMIF1 registers | 0x4C00 0000 | 0x4CFF FFFF | 16MB | Configuration registers |
| | EMIF2 registers | 0x4D00 0000 | 0x4DFF FFFF | 16MB | Configuration registers |
| | DMM registers | 0x4E00 0000 | 0x4FFF FFFF | 32MB | Configuration registers |
| | GPMC | 0x5000 0000 | 0x51FF FFFF | 32MB | Configuration registers |
| | ISS | 0x5200 0000 | 0x53FF FFFF | 32MB | ISP5 (128KB) + SIMCOP (128KB) |
| | L3_EMU domain | 0x5400 0000 | 0x54FF FFFF | 16MB | Emulation domain (see Table 2-2) |
| | Dual Cortex-M3 subsystem target | 0x5500 0000 | 0x55FF FFFF | 16MB | Dual Cortex-M3 subsystem target |
| | SGX | 0x5600 0000 | 0x57FF FFFF | 32MB | 3D SGX544 domain |
| | Display subsystem | 0x5800 0000 | 0x58FF FFFF | 16MB | Display subsystem domain |
| | BB2D | 0x5900 0000 | 0x59FF FFFF | 16MB | 2D Blitter (GC3x0) domain |
| | IVA-HD configuration | 0x5A00 0000 | 0x5AFF FFFF | 16MB | IVA-HD domain |
| | IVA-HD SL2 | 0x5B00 0000 | 0x5BFF FFFF | 16MB | IVA-HD SL2 domain |
| | C2C | 0x5C00 0000 | 0x5FFF FFFF | 64MB | Chip-to-chip domain |
| | TILER | 0x6000 0000 | 0x7FFF FFFF | 512MB | TILER address mapping |
| Q2 (1GB) | DRAM address space | 0x8000 0000 | 0xBFFF FFFF | 1GB | DDR-SDRAM CS0 address space |
| | EMIF1-CS0 SDRAM | 0x8000 0000 | 0xBFFF FFFF | 1GB | DDR Ctrl1 chip-select 0 |
| | EMIF2-CS0 SDRAM | 0x8000 0000 | 0xBFFF FFFF | 1GB | DDR Ctrl2 chip-select 0 |
| Q3 (1GB) | DRAM address space | 0xC000 0000 | 0xFFFF FFFF | 1 GB | DDR-SDRAM CS1 address space |
| | EMIF1-CS1 SDRAM | 0xC000 0000 | 0xFFFF FFFF | 1GB | DDR Ctrl1 chip-select 1 |
| | EMIF2-CS1 SDRAM | 0xC000 0000 | 0xFFFF FFFF | 1GB | DDR Ctrl2 chip-select 1 |
| | TILER view (visible only for ISS and display subsystem) | | | | |
| | TILER view 0 | 0x1 0000 0000 | 0x1 1FFF FFFF | 512MB | Natural view |
| | TILER view 1 | 0x1 2000 0000 | 0x1 3FFF FFFF | 512MB | 0-degree view with vertical mirror |
| | TILER view 2 | 0x1 4000 0000 | 0x1 5FFF FFFF | 512MB | 0-degree view with horizontal mirror |
| | TILER view 3 | 0x1 6000 0000 | 0x1 7FFF FFFF | 512MB | 180-degree view |
| | TILER view 4 | 0x1 8000 0000 | 0x1 9FFF FFFF | 512MB | 90-degree view with vertical mirror |

⁽¹⁾ Boot space location depends on the external sys_boot[5:0] pins.

⁽²⁾ Ex = Executable

Table 2-1. Global Memory Space Mapping (continued)

| Quarter | Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|---------|--------------|---------------------|-------------------|-------|---------------------------------------|
| | TILER view 5 | 0x1 A000 0000 | 0x1 BFFF FFFF | 512MB | 270-degree view |
| | TILER view 6 | 0x1 C000 0000 | 0x1 DFFF FFFF | 512MB | 90-degree view |
| | TILER view 7 | 0x1 E000 0000 | 0x1 FFFF FFFF | 512MB | 90-degree view with horizontal mirror |

2.2.1 L3_EMU Memory Space Mapping

The L3_EMU interconnect is a 2-MB space composed of the L3_EMU interconnect configuration registers and module registers.

[Table 2-2](#) describes the mapping of the registers for the L3_EMU interconnect.

Table 2-2. L3_EMU Memory Space Mapping

| Region Name | Start Address (hex) | End Address (hex) | Size |
|--|---------------------|-------------------|-------|
| MIPI_STM [256 × 4K channels] (address space 0) | 0x5400 0000 | 0x540F FFFF | 1MB |
| MIPI_STM [256 × 1K channels] (address space 1) | 0x5410 0000 | 0x5413 FFFF | 256KB |
| Cortex-A9 CPU0 debug/PMU | 0x5414 0000 | 0x5414 1FFF | 8KB |
| Cortex-A9 CPU1 debug/PMU | 0x5414 2000 | 0x5414 3FFF | 8KB |
| Reserved | 0x5414 4000 | 0x5414 7FFF | 16KB |
| CTI0 component | 0x5414 8000 | 0x5414 8FFF | 4KB |
| CTI1 component | 0x5414 9000 | 0x5414 9FFF | 4KB |
| Reserved | 0x5414 A000 | 0x5414 BFFF | 8KB |
| PTM0 component | 0x5414 C000 | 0x5414 CFFF | 4KB |
| PTM1 component | 0x5414 D000 | 0x5414 DFFF | 4KB |
| Reserved | 0x5414 E000 | 0x5415 7FFF | 8KB |
| Trace funnel | 0x5415 8000 | 0x5415 8FFF | 4KB |
| DAP_PC | 0x5415 9000 | 0x5415 9FFF | 4KB |
| Reserved | 0x5415 A000 | 0x5415 EFFF | 20KB |
| APB bridge control and time-out register | 0x5415 F000 | 0x5415 FFFF | 4KB |
| DRM (interconnect) | 0x5416 0000 | 0x5416 0FFF | 4KB |
| MIPI_STM (interconnect) | 0x5416 1000 | 0x5416 1FFF | 4KB |
| ETB (APBv3) | 0x5416 2000 | 0x5416 2FFF | 4KB |
| CS_TPIU (APBv3) | 0x5416 3000 | 0x5416 3FFF | 4KB |
| CS_TF0 (APBv3) | 0x5416 4000 | 0x5416 4FFF | 4KB |
| Reserved | 0x5416 5000 | 0x5416 6FFF | 8KB |
| Technology-specific interconnect registers | 0x5416 7000 | 0x5416 7FFF | 4KB |
| Reserved | 0x5416 8000 | 0x5417 FFFF | 96KB |
| Technology-specific interconnect registers | 0x5418 0000 | 0x5418 0FFF | 4KB |
| Reserved | 0x5418 1000 | 0x541F FFFF | 508KB |

2.3 L4 Memory Space Mapping

Four L4 interconnects handle transfers with peripherals. Each interconnect is in a distinct power domain:

- L4_CFG: CORE power domain
- L4_WKUP: WKUP power domain
- L4_PER: PER power domain
- L4_ABE: ABE power domain

As with the L3 interconnect, the L4 interconnect can be configured to tune the access according to the characteristics of each module.

The following sections describe the register mapping of the L4 interconnect. Software configures these registers.

2.3.1 L4_CFG Memory Space Mapping

The L4_CFG interconnect is a 16-MB space composed of the L4_CFG interconnect configuration registers and the module registers.

[Table 2-3](#) describes the mapping of the registers for the L4_CFG interconnect.

NOTE: All memory spaces described as modules provide direct access to module registers outside the L4_CFG interconnect. All other accesses are internal to the L4_CFG interconnect.

Table 2-3. L4_CFG Memory Space Mapping

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|---|---------------------|-------------------|-------|-------------------------|
| L4_CFG configuration | 0x4A00 0000 | 0x4A00 07FF | 2KB | Address/protection (AP) |
| | 0x4A00 0800 | 0x4A00 0FFF | 2KB | Link agent (LA) |
| | 0x4A00 1000 | 0x4A00 1FFF | 4KB | Initiator port (IP0) |
| SYSCTRL_GENERAL_CORE | 0x4A00 2000 | 0x4A00 2FFF | 4KB | Module |
| | 0x4A00 3000 | 0x4A00 3FFF | 4KB | L4 interconnect |
| CM1: Manages Cortex-A9 MPU, DSP, IVA, ABE, memory interface, digital phase-locked loops (DPLLs) for Cortex-A9 MPU, DSP, ABE, CORE | 0x4A00 4000 | 0x4A00 4FFF | 4KB | Module region A |
| | 0x4A00 5000 | 0x4A00 5FFF | 4KB | L4 interconnect |
| Reserved | 0x4A00 6000 | 0x4A00 7FFF | 8KB | Reserved |
| CM2 (manages all others) | 0x4A00 8000 | 0x4A00 9FFF | 8KB | Module |
| | 0x4A00 A000 | 0x4A00 AFFF | 4KB | L4 interconnect |
| Reserved | 0x4A00 B000 | 0x4A05 5FFF | 300KB | Reserved |
| SDMA | 0x4A05 6000 | 0x4A05 6FFF | 4KB | Module |
| | 0x4A05 7000 | 0x4A05 7FFF | 4KB | L4 interconnect |
| | 0x4A05 8000 | 0x4A05 8FFF | 4KB | HSI top |
| HSI | 0x4A05 9000 | 0x4A05 9FFF | 4KB | HSI DMA |
| | 0x4A05 A000 | 0x4A05 AFFF | 4KB | HSI port 1 |
| | 0x4A05 B000 | 0x4A05 BFFF | 4KB | HSI port 2 |
| | 0x4A05 C000 | 0x4A05 CFFF | 4KB | L4 interconnect |
| Reserved | 0x4A05 D000 | 0x4A05 DFFF | 4KB | Reserved |
| SAR_ROM (save and restore) | 0x4A05 E000 | 0x4A05 FFFF | 8KB | Module |
| | 0x4A06 0000 | 0x4A06 0FFF | 4KB | L4 interconnect |
| Reserved | 0x4A06 1000 | 0x4A06 1FFF | 4KB | Reserved |
| HSUSBTLL | 0x4A06 2000 | 0x4A06 2FFF | 4KB | Module |
| | 0x4A06 3000 | 0x4A06 3FFF | 4KB | L4 interconnect |

Table 2-3. L4_CFG Memory Space Mapping (continued)

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|----------------------------|---------------------|-------------------|-------|--|
| HSUSBHOST | 0x4A06 4000 | 0x4A06 4FFF | 4KB | Module |
| | 0x4A06 5000 | 0x4A06 5FFF | 4KB | L4 interconnect |
| DSP subsystem | 0x4A06 6000 | 0x4A06 6FFF | 4KB | Module |
| | 0x4A06 7000 | 0x4A06 7FFF | 4KB | L4 interconnect |
| Reserved | 0x4A06 8000 | 0x4A0A 8FFF | 266KB | Reserved |
| FSUSB | 0x4A0A 9000 | 0x4A0A 9FFF | 4KB | Module |
| | 0x4A0A A000 | 0x4A0A AFFF | 4KB | L4 interconnect |
| HSUSBOTG | 0x4A0A B000 | 0x4A0A BFFF | 4KB | Module |
| | 0x4A0A C000 | 0x4A0A CFFF | 4KB | L4 interconnect |
| USBPHY | 0x4A0A D000 | 0x4A0A D07F | 128B | OCP2SCP module |
| | 0x4A0A D080 | 0x4A0A DFFF | 3968B | USB PHY module |
| | 0x4A0A E000 | 0x4A0A EFFF | 4KB | L4 interconnect |
| Reserved | 0x4A0A F000 | 0x4A0B 5FFF | 28KB | Reserved |
| MODEM_ICR port A | 0x4A0B 6000 | 0x4A0B 6FFF | 4KB | Module |
| | 0x4A0B 7000 | 0x4A0B 7FFF | 4KB | L4 interconnect |
| Reserved | 0x4A0B 8000 | 0x4A0C CFFF | 16KB | Reserved |
| MODEM_ICR port B | 0x4A0C D000 | 0x4A0C DFFF | 4KB | Module |
| | 0x4A0C E000 | 0x4A0C EFFF | 4KB | L4 interconnect |
| Reserved | 0x4A0C F000 | 0x4A0D 8FFF | 40KB | Reserved |
| SR_MPU (SmartReflex™ MPU) | 0x4A0D 9000 | 0x4A0D 9FFF | 4KB | Port SR MPU |
| | 0x4A0D A000 | 0x4A0D AFFF | 4KB | L4 interconnect |
| SR_IVA (SmartReflex IVA) | 0x4A0D B000 | 0x4A0D BFFF | 4KB | Port SR IVA |
| | 0x4A0D C000 | 0x4A0D CFFF | 4KB | L4 interconnect |
| SR_CORE (SmartReflex core) | 0x4A0D D000 | 0x4A0D DFFF | 4KB | Port SR core |
| | 0x4A0D E000 | 0x4A0D EFFF | 4KB | L4 interconnect |
| Reserved | 0x4A0D F000 | 0x4A0D FFFF | 86KB | Reserved |
| Reserved | 0x4A0E 2000 | 0x4A0F 3FFF | 72KB | Reserved |
| Mailbox | 0x4A0F 4000 | 0x4A0F 4FFF | 4KB | Module |
| | 0x4A0F 5000 | 0x4A0F 5FFF | 4KB | L4 interconnect |
| Spinlock | 0x4A0F 6000 | 0x4A0F 6FFF | 4KB | Module |
| | 0x4A0F 7000 | 0x4A0F 7FFF | 4KB | L4 interconnect |
| Reserved | 0x4A0F 8000 | 0x4A0F FFFF | 32KB | Reserved |
| SYSCTRL_PADCONF_CORE | 0x4A10 0000 | 0x4A10 0FFF | 4KB | Module |
| | 0x4A10 1000 | 0x4A10 1FFF | 4KB | L4 interconnect |
| OCP-WP – Shared | 0x4A10 2000 | 0x4A10 2FFF | 4KB | Module |
| | 0x4A10 3000 | 0x4A10 3FFF | 4KB | L4 interconnect |
| Reserved | 0x4A10 4000 | 0x4A10 9FFF | 24KB | Reserved |
| Face detect | 0x4A10 A000 | 0x4A10 AFFF | 4KB | Module |
| | 0x4A10 B000 | 0x4A10 BFFF | 4KB | L4 interconnect |
| Reserved | 0x4A10 C000 | 0x4A20 3FFF | 992KB | Reserved |
| C2C-Init firewall | 0x4A20 4000 | 0x4A20 4FFF | 4KB | Module |
| | 0x4A20 5000 | 0x4A20 5FFF | 4KB | L4 interconnect |
| C2C-Target firewall | 0x4A20 6000 | 0x4A20 6FFF | 4KB | Module |
| | 0x4A20 7000 | 0x4A20 7FFF | 4KB | L4 interconnect |
| Reserved | 0x4A20 8000 | 0x4A20 9FFF | 8KB | Reserved |
| MA firewall | 0x4A20 A000 | 0x4A20 AFFF | 4KB | Memory adapter configuration registers |
| | 0x4A20 B000 | 0x4A20 BFFF | 4KB | L4 interconnect |

Table 2-3. L4_CFG Memory Space Mapping (continued)

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|---------------------------|---------------------|-------------------|---------|--|
| EMIF firewall | 0x4A20 C000 | 0x4A20 CFFF | 4KB | Configuration registers |
| | 0x4A20 D000 | 0x4A20 DFFF | 4KB | L4 interconnect |
| Reserved | 0x4A20 E000 | 0x4A20 FFFF | 8KB | Reserved |
| GPMC firewall | 0x4A21 0000 | 0x4A21 0FFF | 4KB | Configuration registers |
| | 0x4A21 1000 | 0x4A21 1FFF | 4KB | L4 interconnect |
| OCMC RAM firewall | 0x4A21 2000 | 0x4A21 2FFF | 4KB | Module |
| | 0x4A21 3000 | 0x4A21 3FFF | 4KB | L4 interconnect |
| GFX-T firewall | 0x4A21 4000 | 0x4A21 4FFF | 4KB | Module |
| | 0x4A21 5000 | 0x4A21 5FFF | 4KB | L4 interconnect |
| ISS-T firewall | 0x4A21 6000 | 0x4A21 6FFF | 4KB | Module |
| | 0x4A21 7000 | 0x4A21 7FFF | 4KB | L4 interconnect |
| Dual Cortex-M3-T firewall | 0x4A21 8000 | 0x4A21 8FFF | 4KB | Module |
| | 0x4A21 9000 | 0x4A21 9FFF | 4KB | L4 interconnect |
| BB2D | 0x4A21 A000 | 0x4A21 AFFF | 4KB | Module |
| | 0x4A21 B000 | 0x4A21 BFFF | 4KB | L4 interconnect |
| DSS-T firewall | 0x4A21 C000 | 0x4A21 CFFF | 4KB | Module |
| | 0x4A21 D000 | 0x4A21 DFFF | 4KB | L4 interconnect |
| SL2-T firewall | 0x4A21 E000 | 0x4A21 EFFF | 4KB | Module |
| | 0x4A21 F000 | 0x4A21 FFFF | 4KB | L4 interconnect |
| IVAHD-CFG-T firewall | 0x4A22 0000 | 0x4A22 0FFF | 4KB | Module |
| | 0x4A22 1000 | 0x4A22 1FFF | 4KB | L4 interconnect |
| Reserved | 0x4A22 2000 | 0x4A22 5FFF | 16KB | Reserved |
| L4-EMU firewall | 0x4A22 6000 | 0x4A22 6FFF | 4KB | Module |
| | 0x4A22 7000 | 0x4A22 7FFF | 4KB | L4 interconnect |
| L4_ABE firewall | 0x4A22 8000 | 0x4A22 8FFF | 4KB | Module |
| | 0x4A22 9000 | 0x4A22 9FFF | 4KB | L4 interconnect |
| Reserved | 0x4A22 A000 | 0x4A2F FFFF | 856KB | Reserved |
| L4_WKUP | 0x4A30 0000 | 0x4A33 FFFF | 256KB | WKUP domain (see Section 2.3.2, L4_WKUP Memory Space Mapping) |
| | 0x4A34 0000 | 0x4A34 0FFF | 4KB | L4 interconnect |
| Reserved | 0x4A34 1000 | 0x4AFF FFFF | 13052KB | Reserved |

2.3.2 L4_WKUP Memory Space Mapping

The L4_WKUP interconnect is a 256-KB space composed of the L4_WKUP interconnect configuration registers and the module registers.

[Table 2-4](#) describes the mapping of the registers for the L4_WKUP interconnect.

NOTE: All memory spaces described as modules provide direct access to module registers outside the L4_WKUP interconnect. All other accesses are internal to the L4_WKUP interconnect.

Table 2-4. L4_WKUP Peripheral Space Mapping

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|-----------------------|---------------------|-------------------|------|-------------------------|
| L4_WKUP configuration | 0x4A30 0000 | 0x4A30 07FF | 2KB | Address/protection (AP) |
| | 0x4A30 0800 | 0x4A30 0FFF | 2KB | Link agent (LA) |
| | 0x4A30 1000 | 0x4A30 1FFF | 4KB | Initiator port (IP0) |
| Reserved | 0x4A30 2000 | 0x4A30 3FFF | 8KB | Reserved |

Table 2-4. L4_WKUP Peripheral Space Mapping (continued)

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|-------------------------------|---------------------|-------------------|------|--------------------------|
| 32KTIMER | 0x4A30 4000 | 0x4A30 4FFF | 4KB | Module |
| | 0x4A30 5000 | 0x4A30 5FFF | 4KB | L4 interconnect |
| PRM (power and reset manager) | 0x4A30 6000 | 0x4A30 7FFF | 8KB | Module |
| | 0x4A30 8000 | 0x4A30 8FFF | 4KB | L4 interconnect |
| Reserved | 0x4A30 9000 | 0x4A30 9FFF | 4KB | Reserved |
| SCRM | 0x4A30 A000 | 0x4A30 AFFF | 4KB | Module |
| | 0x4A30 B000 | 0x4A30 BFFF | 4KB | L4 interconnect |
| SYSCTRL_GENERAL_WKUP | 0x4A30 C000 | 0x4A30 CFFF | 4KB | Module |
| | 0x4A30 D000 | 0x4A30 DFFF | 4KB | L4 interconnect |
| Reserved | 0x4A30 E000 | 0x4A30 FFFF | 8KB | Reserved |
| GPIO1 | 0x4A31 0000 | 0x4A31 0FFF | 4KB | Module |
| | 0x4A31 1000 | 0x4A31 1FFF | 4KB | L4 interconnect |
| Reserved | 0x4A31 2000 | 0x4A31 3FFF | 8KB | Reserved |
| WDTIMER2 | 0x4A31 4000 | 0x4A31 4FFF | 4KB | Module |
| | 0x4A31 5000 | 0x4A31 5FFF | 4KB | L4 interconnect |
| Reserved | 0x4A31 6000 | 0x4A31 7FFF | 8KB | Reserved |
| GPTIMER1 | 0x4A31 8000 | 0x4A31 8FFF | 4KB | Module |
| | 0x4A31 9000 | 0x4A31 9FFF | 4KB | L4 interconnect |
| Reserved | 0x4A31 A000 | 0x4A31 BFFF | 8KB | Module – Address space 0 |
| Keyboard | 0x4A31 C000 | 0x4A31 CFFF | 4KB | Module |
| | 0x4A31 D000 | 0x4A31 DFFF | 4KB | L4 interconnect |
| SYSCTRL_PADCONF_WKUP | 0x4A31 E000 | 0x4A31 EFFF | 4KB | Module |
| | 0x4A31 F000 | 0x4A31 FFFF | 4KB | L4 interconnect |
| Reserved | 0x4A32 0000 | 0x4A32 5FFF | 24KB | Reserved |
| SAR_RAM | 0x4A32 6000 | 0x4A32 6FFF | 4KB | Module – SAR space 1 |
| | 0x4A32 7000 | 0x4A32 73FF | 1KB | Module – SAR space 2 |
| | 0x4A32 7400 | 0x4A32 7FFF | 3KB | Reserved |
| | 0x4A32 8000 | 0x4A32 87FF | 2KB | Module – SAR space 3 |
| | 0x4A32 8800 | 0x4A32 8FFF | 2KB | Reserved |
| | 0x4A32 9000 | 0x4A32 93FF | 1KB | Module – SAR space 4 |
| | 0x4A32 9400 | 0x4A32 9FFF | 3KB | Reserved |
| | 0x4A32 A000 | 0x4A32 AFFF | 4KB | L4 interconnect |
| Reserved | 0x4A32 B000 | 0x4A33 FFFF | 84KB | Reserved |

NOTE: 8-bit and 16-bit peripherals are aligned on 32-bit address boundaries.

2.3.3 L4_PER Memory Space Mapping

The L4_PER interconnect is a 16-MB space composed of the L4_PER interconnect configuration registers and the module registers.

Table 2-5 describes the mapping of the registers for the L4_PER interconnect.

NOTE: All memory spaces described as modules provide direct access to module registers outside the L4_PER interconnect. All other accesses are internal to the L4_PER interconnect.

Table 2-5. L4_PER Memory Space Mapping

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|-------------------|---------------------|-------------------|--------|--|
| L4_PER | 0x4800 0000 | 0x4800 07FF | 2 KB | Address protection (AP) |
| | 0x4800 0800 | 0x4800 0FFF | 2 KB | Link agent (LA) |
| | 0x4800 1000 | 0x4800 13FF | 1 KB | Initiator port 0 (IP0) |
| | 0x4800 1400 | 0x4800 17FF | 1 KB | Initiator port 1 (IP1) |
| | 0x4800 1800 | 0x4800 1BFF | 1 KB | Initiator port 2 (IP2) |
| | 0x4800 1C00 | 0x4800 1FFF | 1 KB | Initiator port 3 (IP3) |
| Reserved | 0x4800 2000 | 0x4801 FFFF | 120 KB | Reserved |
| UART3 | 0x4802 0000 | 0x4802 0FFF | 4 KB | Module |
| | 0x4802 1000 | 0x4802 1FFF | 4 KB | L4 interconnect |
| Reserved | 0x4802 2000 | 0x4803 1FFF | 64 KB | Reserved |
| GPTIMER2 | 0x4803 2000 | 0x4803 2FFF | 4 KB | Module |
| | 0x4803 3000 | 0x4803 3FFF | 4 KB | L4 interconnect |
| GPTIMER3 | 0x4803 4000 | 0x4803 4FFF | 4 KB | Module |
| | 0x4803 5000 | 0x4803 5FFF | 4 KB | L4 interconnect |
| GPTIMER4 | 0x4803 6000 | 0x4803 6FFF | 4 KB | Module |
| | 0x4803 7000 | 0x4803 7FFF | 4 KB | L4 interconnect |
| Reserved | 0x4803 8000 | 0x4803 DFFF | 24 KB | Reserved |
| GPTIMER9 | 0x4803 E000 | 0x4803 EFFF | 4 KB | Module |
| | 0x4803 F000 | 0x4803 FFFF | 4 KB | L4 interconnect |
| Display subsystem | 0x4804 0000 | 0x4804 FFFF | 64 KB | Display subsystem – Configuration + data |
| | 0x4805 0000 | 0x4805 0FFF | 4 KB | L4 interconnect |
| Reserved | 0x4805 1000 | 0x4805 4FFF | 16 KB | Reserved |
| GPIO2 | 0x4805 5000 | 0x4805 5FFF | 4 KB | Module |
| | 0x4805 6000 | 0x4805 6FFF | 4 KB | L4 interconnect |
| GPIO3 | 0x4805 7000 | 0x4805 7FFF | 4 KB | Module |
| | 0x4805 8000 | 0x4805 8FFF | 4 KB | L4 interconnect |
| GPIO4 | 0x4805 9000 | 0x4805 9FFF | 4 KB | Module |
| | 0x4805 A000 | 0x4805 AFFF | 4 KB | L4 interconnect |
| GPIO5 | 0x4805 B000 | 0x4805 BFFF | 4 KB | Module |
| | 0x4805 C000 | 0x4805 CFFF | 4 KB | L4 interconnect |
| GPIO6 | 0x4805 D000 | 0x4805 DFFF | 4 KB | Module |
| | 0x4805 E000 | 0x4805 EFFF | 4 KB | L4 interconnect |
| Reserved | 0x4805 F000 | 0x4805 FFFF | 4 KB | Reserved |
| I2C3 | 0x4806 0000 | 0x4806 0FFF | 4 KB | Module |
| | 0x4806 1000 | 0x4806 1FFF | 4 KB | L4 interconnect |
| Reserved | 0x4806 2000 | 0x4806 9FFF | 32 KB | Reserved |
| UART1 | 0x4806 A000 | 0x4806 AFFF | 4 KB | Module |
| | 0x4806 B000 | 0x4806 BFFF | 4 KB | L4 interconnect |
| UART2 | 0x4806 C000 | 0x4806 CFFF | 4 KB | Module |
| | 0x4806 D000 | 0x4806 DFFF | 4 KB | L4 interconnect |
| UART4 | 0x4806 E000 | 0x4806 EFFF | 4 KB | Module |
| | 0x4806 F000 | 0x4806 FFFF | 4 KB | L4 interconnect |
| I2C1 | 0x4807 0000 | 0x4807 0FFF | 4 KB | Module |
| | 0x4807 1000 | 0x4807 1FFF | 4 KB | L4 interconnect |
| I2C2 | 0x4807 2000 | 0x4807 2FFF | 4 KB | Module |
| | 0x4807 3000 | 0x4807 3FFF | 4 KB | L4 interconnect |
| Reserved | 0x4807 4000 | 0x4807 5FFF | 8 KB | Reserved |

Table 2-5. L4_PER Memory Space Mapping (continued)

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|----------------------------|---------------------|-------------------|---------|-----------------|
| SLIMBUS2 | 0x4807 6000 | 0x4807 6FFF | 4 KB | Module |
| | 0x4807 7000 | 0x4807 7FFF | 4 KB | L4 interconnect |
| ELM (error locator module) | 0x4807 8000 | 0x4807 8FFF | 4 KB | Module |
| | 0x4807 9000 | 0x4807 9FFF | 4 KB | L4 interconnect |
| Reserved | 0x4807 A000 | 0x4808 5FFF | 48 KB | Reserved |
| GPTIMER10 | 0x4808 6000 | 0x4808 6FFF | 4 KB | Module |
| | 0x4808 7000 | 0x4808 7FFF | 4 KB | L4 interconnect |
| GPTIMER11 | 0x4808 8000 | 0x4808 8FFF | 4 KB | Module |
| | 0x4808 9000 | 0x4808 9FFF | 4 KB | L4 interconnect |
| Reserved | 0x4808 A000 | 0x4809 5FFF | 48 KB | Reserved |
| MCBSP4 | 0x4809 6000 | 0x4809 6FFF | 4 KB | Module |
| | 0x4809 7000 | 0x4809 7FFF | 4 KB | L4 interconnect |
| MCSPI1 | 0x4809 8000 | 0x4809 8FFF | 4 KB | Module |
| | 0x4809 9000 | 0x4809 9FFF | 4 KB | L4 interconnect |
| MCSPI2 | 0x4809 A000 | 0x4809 AFFF | 4 KB | Module |
| | 0x4809 B000 | 0x4809 BFFF | 4 KB | L4 interconnect |
| HSMC1 | 0x4809 C000 | 0x4809 CFFF | 4 KB | Module |
| | 0x4809 D000 | 0x4809 DFFF | 4 KB | L4 interconnect |
| Reserved | 0x4809 E000 | 0x480A CFFF | 60 KB | Reserved |
| MMC/SD3 | 0x480A D000 | 0x480A DFFF | 4 KB | Module |
| | 0x480A E000 | 0x480A EFFF | 4 KB | L4 interconnect |
| Reserved | 0x480A F000 | 0x480B 1FFF | 12 KB | Reserved |
| HDQ™ (1-Wire®) | 0x480B 2000 | 0x480B 2FFF | 4 KB | Module |
| | 0x480B 3000 | 0x480B 3FFF | 4 KB | L4 interconnect |
| HSMC2 | 0x480B 4000 | 0x480B 4FFF | 4 KB | Module |
| | 0x480B 5000 | 0x480B 5FFF | 4 KB | L4 interconnect |
| Reserved | 0x480B 6000 | 0x480B 7FFF | 8 KB | Reserved |
| MCSPI3 | 0x480B 8000 | 0x480B 8FFF | 4 KB | Module |
| | 0x480B 9000 | 0x480B 9FFF | 4 KB | L4 interconnect |
| MCSPI4 | 0x480B A000 | 0x480B AFFF | 4 KB | Module |
| | 0x480B B000 | 0x480B BFFF | 4 KB | L4 interconnect |
| Reserved | 0x480B C000 | 0x480D 0FFF | 84 KB | Reserved |
| MMC/SD4 | 0x480D 1000 | 0x480D 1FFF | 4 KB | Module |
| | 0x480D 2000 | 0x480D 2FFF | 4 KB | L4 interconnect |
| Reserved | 0x480D 3000 | 0x480D 4FFF | 8 KB | Reserved |
| MMC/SD5 | 0x480D 5000 | 0x480D 5FFF | 4 KB | Module |
| | 0x480D 6000 | 0x480D 6FFF | 4 KB | L4 interconnect |
| Reserved | 0x480D 7000 | 0x4834 FFFF | 2532 KB | Reserved |
| I2C4 | 0x4835 0000 | 0x4835 0FFF | 4 KB | Module |
| | 0x4835 1000 | 0x4835 1FFF | 4 KB | L4 interconnect |
| Reserved | 0x4835 2000 | 0x48FF FFFF | 13 MB | Reserved |

2.3.4 L4_ABE Memory Space Mapping

The L4_ABE interconnect is a 16-MB space composed of the L4_ABE interconnect configuration registers and the module registers.

ABE modules are dual-mapped inside the Cortex-A9 MPU/DSP address space:

- Mapped in L3 as the L4 ABE space
- Mapped in Cortex-A9 MPU and DSP nonshared device map

NOTE: All memory spaces described as modules provide direct access to module registers outside the L4_ABE interconnect. All other accesses are internal to the L4_ABE interconnect.

Table 2-6 describes the mapping of the registers for the L4_ABE interconnect in the Cortex-A9 MPU nonshared (private) device address range (L4_ABE).

Table 2-6. ABE Cortex-A9 MPU Memory Space Mapping

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|-------------|---------------------|-------------------|--------|--------------------------------|
| L4_ABE | 0x4010 0000 | 0x4010 3FFF | 16 KB | ABE domain (direct MPU access) |
| Reserved | 0x4010 4000 | 0x4012 1FFF | 120 KB | Reserved |
| MCBSP1 | 0x4012 2000 | 0x4012 2FFF | 4 KB | Module |
| | 0x4012 3000 | 0x4012 3FFF | 4 KB | L4 interconnect |
| MCBSP2 | 0x4012 4000 | 0x4012 4FFF | 4 KB | Module |
| | 0x4012 5000 | 0x4012 5FFF | 4 KB | L4 interconnect |
| MCBSP3 | 0x4012 6000 | 0x4012 6FFF | 4 KB | Module |
| | 0x4012 7000 | 0x4012 7FFF | 4 KB | L4 interconnect |
| MCASP | 0x4012 8000 | 0x4012 8FFF | 4 KB | MCASP CFG port |
| | 0x4012 9000 | 0x4012 9FFF | 4 KB | L4 interconnect |
| | 0x4012 A000 | 0x4012 AFFF | 4 KB | MCASP data port |
| | 0x4012 B000 | 0x4012 BFFF | 4 KB | L4 interconnect |
| SLIMBUS1 | 0x4012 C000 | 0x4012 CFFF | 4 KB | Module |
| | 0x4012 D000 | 0x4012 DFFF | 4 KB | L4 interconnect |
| DMIC | 0x4012 E000 | 0x4012 EFFF | 4 KB | Module |
| | 0x4012 F000 | 0x4012 FFFF | 4 KB | L4 interconnect |
| WDTIMER3 | 0x4013 0000 | 0x4013 0FFF | 4 KB | Module |
| | 0x4013 1000 | 0x4013 1FFF | 4 KB | L4 interconnect |
| MCPDM | 0x4013 2000 | 0x4013 2FFF | 4 KB | Module |
| | 0x4013 3000 | 0x4013 3FFF | 4 KB | L4 interconnect |
| Reserved | 0x4013 4000 | 0x4013 7FFF | 16 KB | Reserved |
| GPTIMER5 | 0x4013 8000 | 0x4013 8FFF | 4 KB | Module |
| | 0x4013 9000 | 0x4013 9FFF | 4 KB | L4 interconnect |
| GPTIMER6 | 0x4013 A000 | 0x4013 AFFF | 4 KB | Module |
| | 0x4013 B000 | 0x4013 BFFF | 4 KB | L4 interconnect |
| GPTIMER7 | 0x4013 C000 | 0x4013 CFFF | 4 KB | Module |
| | 0x4013 D000 | 0x4013 DFFF | 4 KB | L4 interconnect |
| GPTIMER8 | 0x4013 E000 | 0x4013 EFFF | 4 KB | Module |
| | 0x4013 F000 | 0x4013 FFFF | 4 KB | L4 interconnect |
| Reserved | 0x4014 0000 | 0x4017 FFFF | 256 KB | Reserved |
| DMEM (64KB) | 0x4018 0000 | 0x4018 FFFF | 64 KB | Data memory |
| | 0x4019 0000 | 0x4019 0FFF | 4 KB | L4 interconnect |
| Reserved | 0x4019 1000 | 0x4019 FFFF | 60 KB | Reserved |
| CMEM (4KB) | 0x401A 0000 | 0x401A FFFF | 64 KB | Coefficient memory |
| | 0x401B 0000 | 0x401B 0FFF | 4 KB | L4 interconnect |
| Reserved | 0x401B 1000 | 0x401B FFFF | 60 KB | Reserved |
| SMEM (32KB) | 0x401C 0000 | 0x401C FFFF | 64 KB | Module |
| | 0x401D 0000 | 0x401D 0FFF | 4 KB | L4 interconnect |
| Reserved | 0x401D 1000 | 0x401F 0FFF | 128 KB | Reserved |

Table 2-6. ABE Cortex-A9 MPU Memory Space Mapping (continued)

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|--------------------|---------------------|-------------------|-------|-----------------|
| AESS configuration | 0X401F 1000 | 0x401F 1FFF | 4 KB | Module |
| | 0X401F 2000 | 0x401F 2FFF | 4 KB | L4 interconnect |
| Reserved | 0x401F 3000 | 0x401F FFFF | 52 KB | Reserved |

Table 2-7 describes the mapping of the registers for the L3 interconnect.

Table 2-7. ABE L3 Memory Space Mapping

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|-------------|---------------------|-------------------|--------|------------------------------------|
| L4 ABE | 0x4900 0000 | 0x4900 3FFF | 16 KB | ABE domain (double-mapped for MPU) |
| Reserved | 0x4900 4000 | 0x4902 1FFF | 120 KB | Reserved |
| MCBSP1 | 0x4902 2000 | 0x4902 2FFF | 4 KB | Module |
| | 0x4902 3000 | 0x4902 3FFF | 4 KB | L4 interconnect |
| MCBSP2 | 0x4902 4000 | 0x4902 4FFF | 4 KB | Module |
| | 0x4902 5000 | 0x4902 5FFF | 4 KB | L4 interconnect |
| MCBSP3 | 0x4902 6000 | 0x4902 6FFF | 4 KB | Module |
| | 0x4902 7000 | 0x4902 7FFF | 4 KB | L4 interconnect |
| MCASP | 0x4902 8000 | 0x4902 8FFF | 4 KB | MCASP CFG port |
| | 0x4902 9000 | 0x4902 9FFF | 4 KB | L4 interconnect |
| | 0x4902 A000 | 0x4902 AFFF | 4 KB | MCASP data port |
| | 0x4902 B000 | 0x4902 BFFF | 4 KB | L4 interconnect |
| SLIMBUS1 | 0x4902 C000 | 0x4902 CFFF | 4 KB | Module |
| | 0x4902 D000 | 0x4902 DFFF | 4 KB | L4 interconnect |
| DMIC | 0x4902 E000 | 0x4902 EFFF | 4 KB | Module |
| | 0x4902 F000 | 0x4902 FFFF | 4 KB | L4 interconnect |
| WDTIMER3 | 0x4903 0000 | 0x4903 0FFF | 4 KB | Module |
| | 0x4903 1000 | 0x4903 1FFF | 4 KB | L4 interconnect |
| MCPDM | 0x4903 2000 | 0x4903 2FFF | 4 KB | Module |
| | 0x4903 3000 | 0x4903 3FFF | 4 KB | L4 interconnect |
| Reserved | 0x4903 4000 | 0x4903 7FFF | 16 KB | Reserved |
| GPTIMER5 | 0x4903 8000 | 0x4903 8FFF | 4 KB | Module |
| | 0x4903 9000 | 0x4903 9FFF | 4 KB | L4 interconnect |
| GPTIMER6 | 0x4903 A000 | 0x4903 AFFF | 4 KB | Module |
| | 0x4903 B000 | 0x4903 BFFF | 4 KB | L4 interconnect |
| GPTIMER7 | 0x4903 C000 | 0x4903 CFFF | 4 KB | Module |
| | 0x4903 D000 | 0x4903 DFFF | 4 KB | L4 interconnect |
| GPTIMER8 | 0x4903 E000 | 0x4903 EFFF | 4 KB | Module |
| | 0x4903 F000 | 0x4903 FFFF | 4 KB | L4 interconnect |
| Reserved | 0x4904 0000 | 0x4907 FFFF | 256 KB | Reserved |
| DMEM (64KB) | 0x4908 0000 | 0x4908 FFFF | 64 KB | Data memory |
| | 0x4909 0000 | 0x4909 0FFF | 4 KB | L4 interconnect |
| Reserved | 0x4909 1000 | 0x4909 FFFF | 60 KB | Reserved |
| CMEM (4KB) | 0x490A 0000 | 0x490A FFFF | 64 KB | Coefficient memory |
| | 0x490B 0000 | 0x490B 0FFF | 4 KB | L4 interconnect |
| Reserved | 0x490B 1000 | 0x490B FFFF | 60 KB | Reserved |
| SMEM (32KB) | 0x490C 0000 | 0x490C FFFF | 64 KB | Module |
| | 0x490D 0000 | 0x490D 0FFF | 4 KB | L4 interconnect |
| Reserved | 0x490D 1000 | 0x490F 0FFF | 128 KB | Reserved |

Table 2-7. ABE L3 Memory Space Mapping (continued)

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|--------------------|---------------------|-------------------|-------|-----------------|
| AESS configuration | 0x490F 1000 | 0x490F 1FFF | 4 KB | Module |
| | 0x490F 2000 | 0x490F 2FFF | 4 KB | L4 interconnect |
| Reserved | 0x490F 3000 | 0x490F FFFF | 52 KB | Reserved |

Table 2-8 describes the mapping of the registers for the DSP subsystem.

Table 2-8. ABE DSP Memory Space Mapping

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|-------------|---------------------|-------------------|--------|--------------------|
| L4 ABE | 0x0000 0000 | 0x0000 3FFF | 16 KB | Boot space |
| Reserved | 0x0000 4000 | 0x0002 1FFF | 120 KB | Reserved |
| MCBSP1 | 0x0002 2000 | 0x0002 2FFF | 4 KB | Module |
| | 0x0002 3000 | 0x0002 3FFF | 4 KB | L4 interconnect |
| MCBSP2 | 0x0002 4000 | 0x0002 4FFF | 4 KB | Module |
| | 0x0002 5000 | 0x0002 5FFF | 4 KB | L4 interconnect |
| MCBSP3 | 0x0002 6000 | 0x0002 6FFF | 4 KB | Module |
| | 0x0002 7000 | 0x0002 7FFF | 4 KB | L4 interconnect |
| MCASP | 0x0002 8000 | 0x0002 8FFF | 4 KB | MCASP CFG port |
| | 0x0002 9000 | 0x0002 9FFF | 4 KB | L4 interconnect |
| | 0x0002 A000 | 0x0002 AFFF | 4 KB | MCASP data port |
| | 0x0002 B000 | 0x0002 BFFF | 4 KB | L4 interconnect |
| SLIMBUS1 | 0x0002 C000 | 0x0002 CFFF | 4 KB | Module |
| | 0x0002 D000 | 0x0002 DFFF | 4 KB | L4 interconnect |
| DMIC | 0x0002 E000 | 0x0002 EFFF | 4 KB | Module |
| | 0x0002 F000 | 0x0002 FFFF | 4 KB | L4 interconnect |
| WDTIMER3 | 0x0003 0000 | 0x0003 0FFF | 4 KB | Module |
| | 0x0003 1000 | 0x0003 1FFF | 4 KB | L4 interconnect |
| MCPDM | 0x0003 2000 | 0x0003 2FFF | 4 KB | Module |
| | 0x0003 3000 | 0x0003 3FFF | 4 KB | L4 interconnect |
| Reserved | 0x0003 4000 | 0x0003 7FFF | 16 KB | Reserved |
| GPTIMER5 | 0x0003 8000 | 0x0003 8FFF | 4 KB | Module |
| | 0x0003 9000 | 0x0003 9FFF | 4 KB | L4 interconnect |
| GPTIMER6 | 0x0003 A000 | 0x0003 AFFF | 4 KB | Module |
| | 0x0003 B000 | 0x0003 BFFF | 4 KB | L4 interconnect |
| GPTIMER7 | 0x0003 C000 | 0x0003 CFFF | 4 KB | Module |
| | 0x0003 D000 | 0x0003 DFFF | 4 KB | L4 interconnect |
| GPTIMER8 | 0x0003 E000 | 0x0003 EFFF | 4 KB | Module |
| | 0x0003 F000 | 0x0003 FFFF | 4 KB | L4 interconnect |
| Reserved | 0x0004 0000 | 0x0007 FFFF | 256 KB | Reserved |
| DMEM (64KB) | 0x0008 0000 | 0x0008 FFFF | 64 KB | Data memory |
| | 0x0009 0000 | 0x0009 0FFF | 4 KB | L4 interconnect |
| Reserved | 0x0009 1000 | 0x0009 FFFF | 60 KB | Reserved |
| CMEM (4KB) | 0x000A 0000 | 0x000A FFFF | 64 KB | Coefficient memory |
| | 0x000B 0000 | 0x000B 0FFF | 4 KB | L4 interconnect |
| Reserved | 0x490B 1000 | 0x490B FFFF | 60 KB | Reserved |
| SMEM (32KB) | 0x000C 0000 | 0x000C FFFF | 64 KB | Module |
| | 0x000D 0000 | 0x000D 0FFF | 4 KB | L4 interconnect |
| Reserved | 0x000D 1000 | 0x000F 0FFF | 128 KB | Reserved |

Table 2-8. ABE DSP Memory Space Mapping (continued)

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|--------------------|---------------------|-------------------|-------|-----------------|
| AEES configuration | 0x000F 1000 | 0x000F 1FFF | 4 KB | Module |
| | 0x000F 2000 | 0x000F 2FFF | 4 KB | L4 interconnect |
| Reserved | 0x000F 3000 | 0x000F FFFF | 52 KB | Reserved |

2.4 Dual Cortex-M3 Subsystem Memory Space Mapping

Table 2-9 describes the mapping of the registers for the dual Cortex-M3.

Table 2-9. Dual Cortex-M3 Memory Space Mapping

| Module Name | Start Address (hex) | End Address (hex) | Size |
|---|---------------------|-------------------|--------------|
| Private Memory Map (can also be accessed by the slave port) | | | |
| ROM (16KB) | 0x5500 0000 | 0x5500 3FFF | 16 KB |
| RAM (64KB) | 0x5502 0000 | 0x5502 FFFF | 64 KB |
| Shared cache/MMU configuration registers | 0x5508 0000 | 0x5508 0FFF | 4 KB |
| WKUGEN masks | 0x5508 1000 | 0x5508 1FFF | 4 KB |
| Reserved | 0x5503 0000 | 0x5503 FFFF | 64 KB |
| 32-Bit OCP Port (master port to ISS) | | | |
| ISP5 | 0x5504 0000 | 0x5505 FFFF | 128 KB |
| SIMCOP | 0x5506 0000 | 0x5507 FFFF | 128 KB |
| Reserved | 0x5508 2000 | 0x55FF FFFF | 16 MB–384 KB |
| Bit-Band Mapping (supported at the dual Cortex-M3 interface) | | | |
| Bit band region 1 | 0x2000 0000 | 0x200F FFFF | 1 MB |
| Bit band alias 1 | 0x2200 0000 | 0x23FF FFFF | 32 MB |
| Bit band region 2 | 0x4000 0000 | 0x400F FFFF | 1 MB |
| Bit band alias 2 | 0x4200 0000 | 0x43FF FFFF | 32 MB |
| Private Peripheral Map (accessible only from the dual Cortex-M3) | | | |
| Reserved | 0xE000 0000 | 0xE000 0FFF | 4 KB |
| DWT | 0xE000 1000 | 0xE000 1FFF | 4 KB |
| FPB | 0xE000 2000 | 0xE000 2FFF | 4 KB |
| Reserved | 0xE000 3000 | 0xE000 DFFF | 44 KB |
| NVIC | 0xE000 E000 | 0xE000 EFFF | 4 KB |
| Reserved | 0xE000 F000 | 0xE004 1FFF | 204 KB |
| ICECrusher space | 0xE004 2000 | 0xE004 2FFF | 4 KB |
| External private peripheral bus | 0xE004 3000 | 0xE00F DFFF | 756 KB |
| RW table | 0xE00F E000 | 0xE00F EFFF | 4 KB |
| ROM table (registers) | 0xE00F F000 | 0xE00F FFFF | 4 KB |
| 64-Bit Interconnect Master Port (to L3) | | | |
| Boot space ⁽¹⁾ | 0x0000 0000 | 0x0000 3FFF | – |
| L3 | 0x0000 0000 | 0x5FFF FFFF | 1.5 GB–1 MB |
| TILER | 0x6000 0000 | 0x7FFF FFFF | 512 MB |

⁽¹⁾ At reset, the MMU is loaded with page 0, which forces the L2 ROM or L2 RAM to be at address 0x0. The reset page also includes the L2 ROM, L2 RAM, shared cache MMU register, and WUGEN registers.

2.5 DSP Subsystem Memory Space Mapping

The DSP subsystem can access the ABE and IVA-HD blocks.

ABE has three different address spaces:

- **ABE NC:** This region is for accesses to registers in ABE. For more information about ABE peripheral memory mapping, see [Table 2-6](#).
- **ABE:** This region is for accesses to memory in ABE. Memory in the ABE subsystem can be cached in DSP L1 and L2. When enhanced direct memory access (eDMA) tries to access this space, L1/L2 is snooped and if data is present in DSP subsystem caches, data is provided to eDMA from DSP caches. However, if data is not present in DSP caches, the shared cache sends the access to ABE and data returned is not allocated into DSP cache; instead, it is sent to eDMA.
- **ABE locked region:** This region is similar to the ABE region, except that data from ABE is allocated into DSP caches and returned to eDMA.

The IVA-HD region is for accesses to IVA-HD accelerator memories and registers in IVA-HD. SL2 is the L2 cache in IVA-HD. There are three ways to access the IVA-HD accelerator memories:

- **SL2 - L1 region:** This region is for accesses to SL2 memory that can be mapped to DSP L1. When eDMA tries to access this space, L1/L2 is snooped and if data is present in DSP caches, the data is provided to eDMA from DSP caches. However, if data is not present in DSP caches, the shared cache sends the access to SL2 and data returned is not allocated into DSP L1 cache; instead, it is sent to eDMA.
- **SL2 - L2 region:** This region is for accesses to SL2 memory that can be mapped to DSP L2. When eDMA tries to access this space, L1/L2 is snooped and if data is present in DSP caches, the data is provided to eDMA from DSP caches. However, if data is not present in DSP caches, the shared cache sends the access to SL2 and data returned is not allocated into DSP L2 cache; instead, it is sent to eDMA.
- **SL2 locked region:** This region is similar to the previous regions, except that data is allocated into DSP caches and returned to eDMA.

[Table 2-10](#) describes the mapping of the registers for the DSP subsystem.

Table 2-10. DSP Subsystem Memory Space Mapping

| Region Name | Start Address (hex) | End Address (hex) | Size |
|--|---------------------|-------------------|--------|
| DSP EDM registers | 0x01BC 0000 | 0x01BC 0FFF | 4 KB |
| 3PCC_CONFIG | 0x01C0 0000 | 0x01C0 FFFF | 64 KB |
| 3PTC0_CONFIG | 0x01C1 0000 | 0x01C1 03FF | 1 KB |
| 3PTC1_CONFIG | 0x01C1 0400 | 0x01C1 07FF | 1 KB |
| SYSC_CONFIG | 0x01C2 0000 | 0x01C2 0FFF | 4 KB |
| WUGEN | 0x01C2 1000 | 0x01C2 1FFF | 4 KB |
| L1 configuration registers | 0x01C3 0000 | 0x01C3 00FF | 256 B |
| L2 configuration registers | 0x01C3 0200 | 0x01C3 02FF | 256 B |
| Shared cache debug | 0x01C3 0400 | 0x01C3 05FF | 512 B |
| Attr MMU | 0x01C3 0800 | 0x01C3 0FFF | 2 KB |
| DSP CPU configuration registers | 0x01C4 0000 | 0x01C4 0FFF | 4 KB |
| Interrupt controller | 0x01C5 0000 | 0x01C5 FFFF | 64 KB |
| DSP unique ID | 0x01C6 1000 | 0x01C6 1FFF | 4 KB |
| DSP revision ID | 0x01C6 2000 | 0x01C6 2FFF | 4 KB |
| ABE NC region | 0x01D0 0000 | 0x01DF FFFF | 1 MB |
| IVA-HD (accelerator memories, NC region) | 0x01E0 0000 | 0x01EF FFFF | 1 MB |
| Interconnect registers | 0x01F0 0000 | 0x01FF FFFF | 1 MB |
| SL2 - L1 | 0x1080 0000 | 0x1081 FFFF | 128 KB |
| SL2 - L2 | 0x1082 0000 | 0x1083 FFFF | 128 KB |
| SL2 locked region - L2/ L1 locked | 0x1090 0000 | 0x1093 FFFF | 256 KB |
| ABE | 0x10D0 0000 | 0x10DF FFFF | 1 MB |

Table 2-10. DSP Subsystem Memory Space Mapping (continued)

| Region Name | Start Address (hex) | End Address (hex) | Size |
|---------------------------------------|----------------------------|--------------------------|-------------|
| ABE locked region | 0x10E0 0000 | 0x10EF FFFF | 1 MB |
| External SOC memories and peripherals | 0x2000 0000 | 0xFFFF FFFF | 3584 MB |

2.6 Display Subsystem Memory Space Mapping

The display subsystem integrates a display controller (DISPC), a remote frame buffer interface (RFBI), two MIPI® display serial interfaces (DSI1 with four data lanes, and DSI2 with two data lanes) and HDMI link with its PHY (high-definition multimedia interface, digital part).

The DISPC is connected through an interconnect master port to the L3 interconnect and has its own DMAs to fetch the data from the system memory.

There are two views (from the L3_PER and L4_PER interconnects) of the display subsystem memory space mapping.

2.6.1 L3 Interconnect View of the Display Memory Space

[Table 2-11](#) lists the display subsystem memory space mapping from the perspective of the Cortex-A9 MPU subsystem through the L3 interconnect.

Table 2-11. L3 Access – Display Subsystem Space Mapping

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|-----------------------------|---------------------|-------------------|-------|-------------------------------------|
| Display subsystem registers | 0x5800 0000 | 0x5800 0FFF | 4 KB | Display subsystem and DSI registers |
| DISPC | 0x5800 1000 | 0x5800 1FFF | 4 KB | Display controller |
| RFBI | 0x5800 2000 | 0x5800 2FFF | 4 KB | Remote frame buffer interface |
| DSI1 | 0x5800 4000 | 0x5800 4FFF | 4 KB | Display serial interface 1 |
| DSI2 | 0x5800 5000 | 0x5800 5FFF | 4 KB | Display serial interface 2 |
| HDMI | 0x5800 6000 | 0x5800 6FFF | 4 KB | HDMI configuration registers |
| HDCP | 0x5800 7000 | 0x5800 7FFF | 4 KB | HDCP registers |
| Reserved | 0x5800 8000 | 0x58FF FFFF | 16 MB | Reserved |

2.6.2 L4 Interconnect View of the Display Memory Space

[Table 2-12](#) lists the display subsystem memory space mapping internally from the perspective of the Cortex-A9 MPU subsystem through the L4 interconnect.

Table 2-12. L4_PER Access – Display Subsystem Space Mapping

| Module Name | Start Address (hex) | End Address (hex) | Size | Description |
|-----------------------------|---------------------|-------------------|-------|-------------------------------------|
| Display subsystem registers | 0x4804 0000 | 0x4804 0FFF | 4 KB | Display subsystem and DSI registers |
| DISPC | 0x4804 1000 | 0x4804 1FFF | 4 KB | Display controller |
| RFBI | 0x4804 2000 | 0x4804 2FFF | 4 KB | Remote frame buffer interface |
| DSI1 | 0x4804 4000 | 0x4804 4FFF | 4 KB | Display serial interface 1 |
| DSI2 | 0x4804 5000 | 0x4804 5FFF | 4 KB | Display serial interface 2 |
| HDMI | 0x4804 6000 | 0x4804 6FFF | 4 KB | HDMI configuration registers |
| HDCP | 0x4804 7000 | 0x4804 7FFF | 4 KB | HDCP registers |
| Reserved | 0x4804 8000 | 0x4804 FFFF | 32 KB | Reserved |

Power, Reset, and Clock Management

This chapter describes the power, reset and clock management in the device.

| Topic | Page |
|---|------|
| 3.1 Device Power Management Introduction | 300 |
| 3.2 PRCM Subsystem Overview | 329 |
| 3.3 PRCM Subsystem Environment | 331 |
| 3.4 PRCM Subsystem Integration | 335 |
| 3.5 Reset Management Functional Description | 339 |
| 3.6 Clock Management Functional Description | 370 |
| 3.7 Power Management Functional Description | 487 |
| 3.8 Voltage Management Functional Description | 510 |
| 3.9 Device Low-Power States | 531 |
| 3.10 PRCM Module Programming Guide | 541 |
| 3.11 PRCM Register Manual | 557 |
| 3.12 SCRM Register Manual | 1039 |
| 3.13 SR Register Manual | 1063 |

3.1 Device Power Management Introduction

Power management (efficient use of the limited battery resources on a mobile device) is one of the most important design aspects of any mobile system. It imposes strong control over limited available power resources to ensure they function for the longest possible length of time.

The device power-management architecture ensures maximum performance and operation time for user satisfaction (audio/video support) while offering versatile power-management techniques for maximum design flexibility, depending on application requirements.

This introduction contains the following information:

- Power-management architecture building blocks for the device
- State-of-the-art power-management techniques supported by the power-management architecture of the device

3.1.1 Device Power-Management Architecture Building Blocks

To provide a versatile architecture supporting multiple power-management techniques, the power-management framework is built with three levels of resource management:

- Clock
- Power
- Voltage management

These management levels are enforced by defining the managed entities or building blocks of the power-management architecture, called the clock, power, and voltage domains.

A domain is a group of modules or subsections of the device that share a common entity (for example, common clock source, common voltage source, or a common power switch). The group forming the domain is managed by a policy manager. For example, a clock for a clock domain is managed by a dedicated clock manager within the power, reset, and clock management (PRCM) module. The clock manager takes into consideration the joint clocking constraints of all the modules belonging to that clock domain (and, hence, receiving that clock).

NOTE: In the following sections, the term *module* is used to represent the device IPs (that is, modules or subsystems), other than the PRCM module, that receive clock, reset, or power signals from the PRCM module.

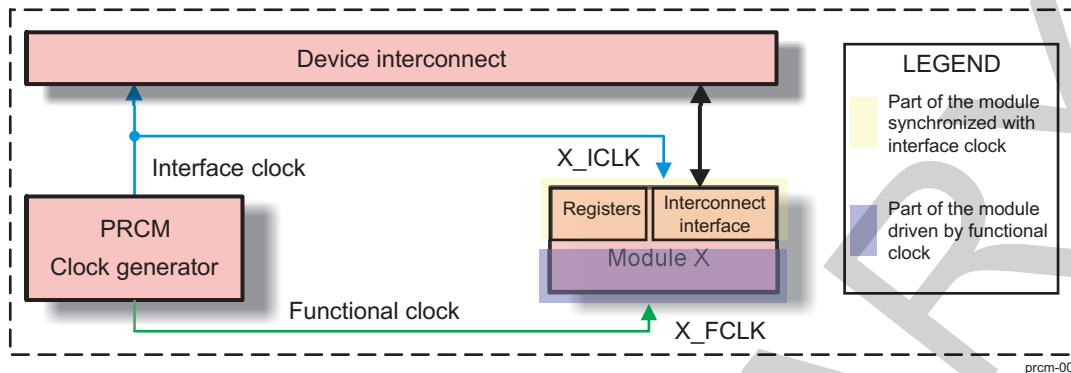
3.1.1.1 Clock Management

The PRCM module manages the gating (that is, switching off) and enabling of the clocks to the device modules. The clocks are managed based on the requirement constraints of the associated modules. The following sections identify the module clock characteristics, management policy, clock domains, and clock domain management.

3.1.1.1.1 Module Interface and Functional Clocks

Each module within the device has specific clock input characteristics requirements. Based on the characteristics of the clocks delivered to the modules, the clocks are divided into two categories: interface clocks and functional clocks (see [Figure 3-1](#)).

Figure 3-1. Functional and Interface Clocks



The interface clocks have the following characteristics:

- They ensure proper communication between any module/subsystem and the interconnect.
- In most cases, they supply the system interconnect interface and registers of the module.
- A typical module has one interface clock, but modules with multiple interface clocks may also exist (that is, when connected to multiple interconnect buses).
- Interface clock management is done at the device level.
- From the standpoint of the PRCM module, an interface clock is identified with an `_ICLK` suffix.

Functional clocks have the following characteristics:

- They supply the functional part of a module or a subsystem.
- A module can have one or more functional clocks. Some functional clocks are mandatory, while others are optional for its functioning. The mandatory clock(s) of a module must be operational. The optional clocks are used for specific features and can be shut down without stopping the module activity (for example, the clock for the camera).
- From the standpoint of the PRCM module, a functional clock is directly distributed to the related modules through a dedicated clock tree. It is identified with an `_FCLK` suffix.

NOTE: At the module level, the interface clocks are always fed by the interface clock outputs of the PRCM module. The functional clocks are fed either by a PRCM module functional clock output, or by a PRCM module interface clock output. In the latter case, the functional and interface module clocks inherit the clock-management features (autoidle features) of the PRCM module interface clock.

3.1.1.1.2 Module-Level Clock Management

Each module in the device may also have specific clock requirements. Certain module clocks must be *active* when operating in specific modes, or may be gated otherwise. Globally, the activation and gating of the module clocks are managed by the PRCM module. Hence, the PRCM module must be aware of when to activate and when to gate the module clocks.

The PRCM module differentiates the clock-management behavior for device modules based on whether the module can initiate transactions on the device interconnect (called master module) or it cannot initiate transactions and only responds to the transactions initiated by the master (called slave module). Thus, two hardware-based power-management protocols are used:

- Master standby protocol: Clock-management protocol between the PRCM and master modules
- Slave idle protocol: Clock-management protocol between the PRCM and slave modules

Master standby protocol:

This protocol is used to indicate that a master module must initiate a transaction on the device interconnect and requests specific (functional and interface) clocks for the purpose. The PRCM module ensures that the required clocks are active when the master module requests the PRCM module to enable them. This is called a module wake-up transition and the module is said to be functional after this transition completes.

Similarly, when the master module no longer requires the clocks, it informs the PRCM module, and the PRCM module can then gate the clocks to the module. The master module is then said to be in standby mode.

Although the protocol is completely hardware-controlled, software must configure the clock management behavior for the module. This is done by setting the **Module_SYSCONFIG.MIDLEMODE** or **Module_SYSCONFIG.STANDBYMODE** bit field, as presented in [Table 3-1](#). The behavior, identified by the Standby Mode Values column, must be configured.

Table 3-1. Master Module Standby Mode Settings

| Standby Mode Value | Selected Mode | Description |
|--------------------|------------------------------|--|
| 0x0 | Force-standby | The module unconditionally asserts the standby request to the PRCM module, regardless of its internal operations. The PRCM module may gate the functional and interface clocks to the module. This mode must be used carefully because it does not prevent any loss of data when the clocks are gated. |
| 0x1 | No-standby | The module never asserts the standby request to the PRCM module. This mode is safe from a module point of view because it ensures that the clocks remain active; however, it is not efficient from a power-saving perspective because it never allows the PRCM module output clocks to be gated. |
| 0x2 | Smart-standby | The module asserts the standby request based on its internal activity status. The standby signal is asserted only when all ongoing transactions are complete and the module is idled. The PRCM module can then gate the clocks to the module. |
| 0x3 | Smart-standby wakeup-capable | The module asserts the standby request based on its internal activity status. The standby signal is asserted only when all ongoing transactions are complete and the module is idle. The PRCM module can then gate the clocks to the module. The module may generate (master-related) wake-up events when in STANDBY state. The mode is relevant only if the appropriate module mwakeup output is implemented. |

NOTE:

- Smart-standby mode is the preferred mode of operation, while force-standby and no-standby modes are intended for debugging purposes.
- A master module may support all or some of the standby modes listed in [Table 3-1](#). See the power-management section in the module chapter to identify the supported standby mode.

The standby status of a master module is indicated by the **CM_Power domain_Module_CLKCTRL[x] STBYST** bit in the PRCM module. [Table 3-2](#) describes the master module standby status.

Table 3-2. Master Module Standby Status

| STBYST Bit Value | Description |
|------------------|--------------------------------|
| 0x0 | The module is functional. |
| 0x1 | The module is in standby mode. |

[Table 3-3](#) lists the enabling conditions for the master module clocks managed by the standby protocol.

Table 3-3. Master Module Clock Enabling Conditions

| Relation | | Condition |
|----------|----|--|
| AND | | Clock domain is ready. |
| | OR | Master module standby request is deasserted. |

Table 3-3. Master Module Clock Enabling Conditions (continued)

| Relation | Condition |
|----------|--|
| | Master module wake-up request is asserted. |

Slave idle protocol:

This hardware protocol allows the PRCM module to control the state of a slave module. The PRCM module informs the slave module, through assertion of an idle request, when its clocks (interface and functional) can be gated. The slave can then acknowledge the request from the PRCM module and the PRCM module is then allowed to gate the clocks to the module. A slave module is said to be in IDLE state when its clocks are gated by the PRCM module.

Similarly, an idled slave module may need to be woken up because of a service request from a master module or as a result of an event (called a wake-up event, for example, interrupt or DMA request) received by the slave module. In this situation the PRCM module enables the clocks to the module and then deasserts the idle request to signal the module to wake up.

Although the protocol is completely hardware-controlled, software must configure the clock management behavior for the slave module. This is done by setting the Module_SYSCONFIG.SIDLEMODE or Module_SYSCONFIG.IDLEMODE bit field, as presented in [Table 3-4](#). The behavior, identified by the Idle Mode Value column, must be configured by software.

Table 3-4. Module Idle Mode Settings

| Idle Mode Value | Selected Mode | Description |
|-----------------|---------------------------|--|
| 0x0 | Force-idle | The module unconditionally acknowledges the idle request from the PRCM module, regardless of its internal operations. This mode must be used carefully because it does not prevent any loss of data when the clock is switched off. |
| 0x1 | No-idle | The module never acknowledges any idle request from the PRCM module. This mode is safe from a module point of view because it ensures the clocks remain active; however, it is not efficient from a power-saving perspective because it does not allow the PRCM module output clock to be shut off, and thus the power domain to be set to a lower power state. |
| 0x2 | Smart-idle | The module acknowledges the idle request basing its decision on its internal activity. Namely, the acknowledge signal is asserted only when all pending transactions, interrupts, or direct memory access (DMA) requests are processed. This is the best approach to an efficient system power management. |
| 0x3 | Smart-idle wakeup-capable | The module acknowledges the idle request basing its decision on its internal activity. Namely, the acknowledge signal is asserted only when all pending transactions, interrupts, or DMA requests are processed. This is the best approach to efficient system power management. The module may generate (IRQ- or DMA-request-related) wake-up events when in IDLE state. The mode is relevant only if the appropriate module wakeup output(s) is implemented. |

NOTE:

- Smart-idle mode is the preferred mode of operation, while force-idle and no-idle modes are intended for debugging purposes.
- A slave module may support all or some of the idle modes listed in [Table 3-4](#). See the power-management section in the module chapter to identify the supported idle modes.

The idle status of a slave module is indicated by the CM_Power domain_Module_CLKCTRL[x] IDLEST bit in the PRCM module. [Table 3-5](#) lists the possible idle statuses for a slave module.

Table 3-5. Slave Module Idle Status

| IDLEST Bit Value | Idle Status | Description |
|------------------|---------------|---|
| 0x0 | Functional | The module is fully functional. The interface and functional clocks are active. |
| 0x1 | In transition | The module is performing a wake-up or a sleep transition. |

Table 3-5. Slave Module Idle Status (continued)

| IDLEST Bit Value | Idle Status | Description |
|------------------|----------------|---|
| 0x2 | Interface idle | The module interface clock is idled. The module may remain functional if using a separate functional clock. |
| 0x3 | Full idle | The module is fully idle. the interface and functional clocks are gated. |

When configured in smart-idle mode, the slave module may acknowledge the idle request of the PRCM module based on the activity of its interface and/or functional clocks. To define which module clocks (that is, interface and/or functional) should be considered when responding to the PRCM module request, software must configure the Module_SYSCONFIG[x] CLOCKACTIVITY bit field.

The CLOCKACTIVITY setting is used internally by the module to determine on which part of the module the conditions to acknowledge the PRCM module idle request is tested. As an example, if the functional clock must remain active when the module is in idle mode, then the module must acknowledge PRCM module idle request by only considering the interface clock gating conditions (that is, there is no pending activity on the interconnect).

NOTE: See the power-management section in the module chapter to identify whether this feature is configurable.

Using the CLOCKACTIVITY setting along with the smart-idle mode ensures that the clock remains active for the module features that must remain available during the module idle mode. [Table 3-6](#) describes the possible CLOCKACTIVITY settings for a module:

Table 3-6. Slave Module Clock Activity Settings

| CLOCKACTIVITY Bit Value | Module Interface Clock | Module Functional Clock | Description |
|-------------------------|------------------------|-------------------------|---|
| 0x0 | Gated | Gated | The interface and functional clocks are considered when generating the acknowledgement. This setting also means both clocks may be gated upon a PRCM module idle request. |
| 0x1 | Active | Gated | The interface clock is not shut down and is not considered when generating the acknowledgement to the PRCM module idle request. Only the functional clock is considered. |
| 0x2 | Gated | Active | The functional clock is not shut down and is not considered when generating the acknowledgement to the PRCM module idle request. Only the interface clock is considered. |
| 0x3 | Active | Active | The interface and functional clocks are not shut down. The module can acknowledge the idle request without checking the internal functionalities linked to its clocks. |

NOTE:

- The software configuration of the CLOCKACTIVITY settings may not be available for a given module. For some modules, the CLOCKACTIVITY settings can be hardwired.
- A slave module may support all or some of the CLOCKACTIVITY settings listed in [Table 3-6](#).

See the power-management section in the specific module chapter to identify the supported idle feature and settings.

CAUTION

The PRCM module does not have any hardware means to read the CLOCKACTIVITY settings of the module. Software must ensure a consistent programming between the CLOCKACTIVITY settings of the module and the PRCM module clock gating control bits. The PRCM module must be configured (where software control is available) not to gate the module clock, which should remain active according to the CLOCKACTIVITY settings of the module.

For the idle protocol management on the PRCM module side, the behavior of PRCM module is configured in the CM_Power domain_module_CLKCTRL[x] MODULEMODE bit. Based on the configured behavior, the PRCM module asserts the idle request to the module either unconditionally (that is, immediately when the software requests), or through hardware control when the module idle conditions are satisfied.

Table 3-7 describes the configurable behavior of the MODULEMODE bit.

Table 3-7. Slave Module Mode Settings in PRCM

| MODULEMODE Bit Value | Selected Mode | Description |
|----------------------|---------------|--|
| 0x0 | Disabled | The PRCM module unconditionally asserts the module idle request. This request applies to the gating of the functional and interface clocks to the module. If acknowledged by the module, the PRCM module can gate all clocks to the module (that is, the module is completely disabled). It can only react to an asynchronous wake-up event (that is, a wake-up event that does not require the module functional clock to be active). |
| 0x1 | Auto | This mode applies to a module when the PRCM module only manages its interface clock and not its functional clock. The PRCM module automatically asserts/deasserts the module idle request based on the clock-domain transitions. If acknowledged by the module, the PRCM module can gate the interface clock to the module. |
| 0x2 | Enabled | This mode applies to a module when the PRCM module manages its interface and functional clocks. The functional clock to the module remains active unconditionally, while the PRCM module automatically asserts/deasserts the module idle request based on the clock-domain transitions. If acknowledged by the module, the PRCM module can only gate the interface clock to the module. |
| 0x3 | Reserved | Not available |

NOTE: The PRCM module may support all or some of the MODULEMODE module settings listed in Table 3-7. See the CM_Power domain_module_CLKCTRL[x] MODULEMODE bit description for the module to identify the supported settings.

Table 3-8 and Table 3-9 list the enabling conditions for the slave module clocks managed by the Idle protocol.

Table 3-8. Slave Module Interface Clock Enabling Conditions

| Relation | Condition |
|----------|---|
| AND | Clock domain is ready. |
| | Slave module idle status is 0x0 (fully functional). |
| | Slave module idle status is 0x1 (in transition). |
| | Slave module wake-up request is asserted. |

Table 3-9. Slave Module Functional Clock Enabling Conditions

| Relation | Condition |
|----------|---|
| AND | Clock domain is ready. |
| | Slave module idle status is 0x0 (fully functional). |
| | Slave module idle status is 0x1 (in transition). |

Table 3-9. Slave Module Functional Clock Enabling Conditions (continued)

| Relation | | Condition |
|----------|--|---|
| | | Slave module idle status is 0x2 (interface clock is idled). |
| | | Slave module wake-up request is asserted. |

The module clock domain must be ready for the optional clocks to the module, and any associated clock-enable control is asserted.

NOTE: A given clock can be used by more than one module. Clock enabling conditions are then ORed together (that is, the clock is provided as soon as one of the enabling conditions is true). As a consequence, the clock is disabled only when all related enabling conditions are false.

Module wake-up request:

In IDLE state, a slave module may have to wake up to generate an interrupt or a DMA request. This may be the result of an external request (for example, to the I/O port of a general-purpose input/output [GPIO] module) or an internally generated event (for example, WDTIMER time-up). The slave module, with wake-up capability, sends a wake-up request to the PRCM module. The PRCM module then activates the module clocks and acknowledges the module wake-up request.

In IDLE state, some slave modules may require functional clock(s) to generate a wake-up event. Such requests are called synchronous wake-up events on the PRCM module side, while the events generated when the functional or interface module clocks are gated are called asynchronous wake-up events.

NOTE: See the power-management section in the module chapter to identify whether its wake-up event is synchronous or asynchronous.

The standby and idle clock-management protocols allow the configuration of the module-level clock-management interaction between the PRCM module and individual modules of the device. However, the PRCM module may not necessarily gate the clock to the module immediately after the module switches to standby or idle mode at the end of this interaction. This is because the same clock can be shared by other modules that are active and need this shared clock to complete their activity. As a result, the PRCM module provides a second level of clock management called the clock domain level, as explained in [Section 3.1.1.1.3](#).

3.1.1.1.3 Clock Domain

A clock domain is a group of modules fed by clock signals controlled by the same clock manager in the PRCM module (see [Figure 3-2](#)). By gating the clocks in a clock domain, the clocks to all the modules belonging to that clock domain can be cut to lower their active power consumption (that is, the device is on and the clocks to the modules are dynamically switched to ACTIVE or INACTIVE [gated] states). Thus, a clock domain allows control of the dynamic power consumption of the device.

The device is partitioned into multiple clock domains and each clock domain is controlled by an associated clock manager within the PRCM module. This allows the PRCM module to individually activate and gate each clock domain of the device.

Figure 3-2. Generic Clock Domain

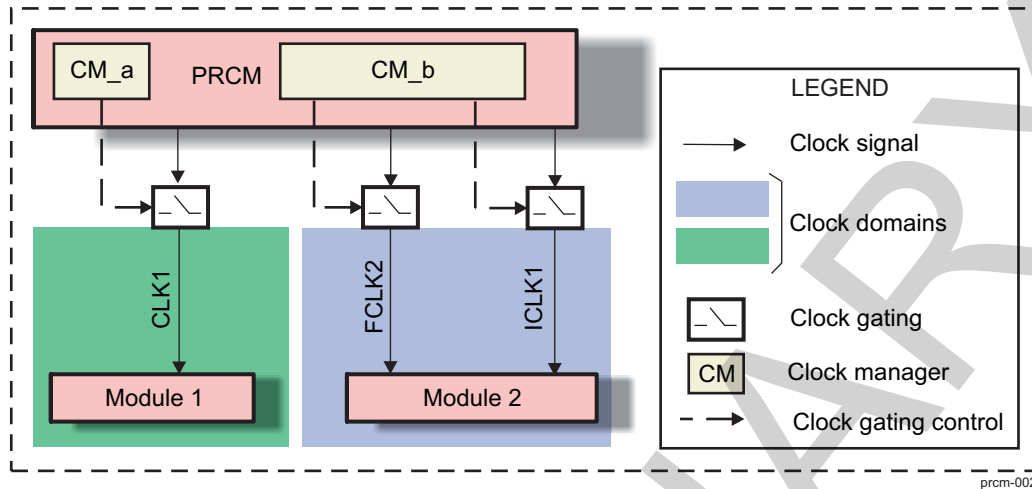


Figure 3-2 presents an example of two clock managers: CM_a and CM_b. Each clock manager manages a clock domain. The clock domain of CM_b is composed of two clocks: a functional clock (FCLK2) and an interface clock (ICLK1), while that of CM_a consists of a clock (CLK1) that is used by the module as functional and interface clock. The clocks to Module 2 can be gated independently of the clock to Module 1, thus ensuring power savings when Module 2 is not in use.

The PRCM module lets software check the status of the clock domain functional clocks. The CM_Clock domain_CLKSTCTRL[x] CLKACTIVITY_FCLK/Clock name_FCLK bit in the PRCM module identifies the state of the functional clock(s) within the clock domain. Table 3-10 lists the two possible states of the functional clock.

Table 3-10. Clock Domain Functional Clock States

| CLKACTIVITY Bit Value | Status | Description |
|-----------------------|--------|---|
| 0x0 | Gated | The functional clock of the clock domain is inactive. |
| 0x1 | Active | The functional clock of the clock domain is running. |

3.1.1.1.4 Clock Domain-Level Clock Management

The domain clock manager can automatically (that is, based on hardware conditions) and jointly manage the interface clocks within the clock domain. The functional clocks within the clock domain are managed through software settings.

A clock domain can switch between three possible states: ACTIVE, IDLE_TRANSITION, or INACTIVE. Figure 3-3 identifies the sleep and wake-up transitions of the clock domain between the ACTIVE and INACTIVE states.

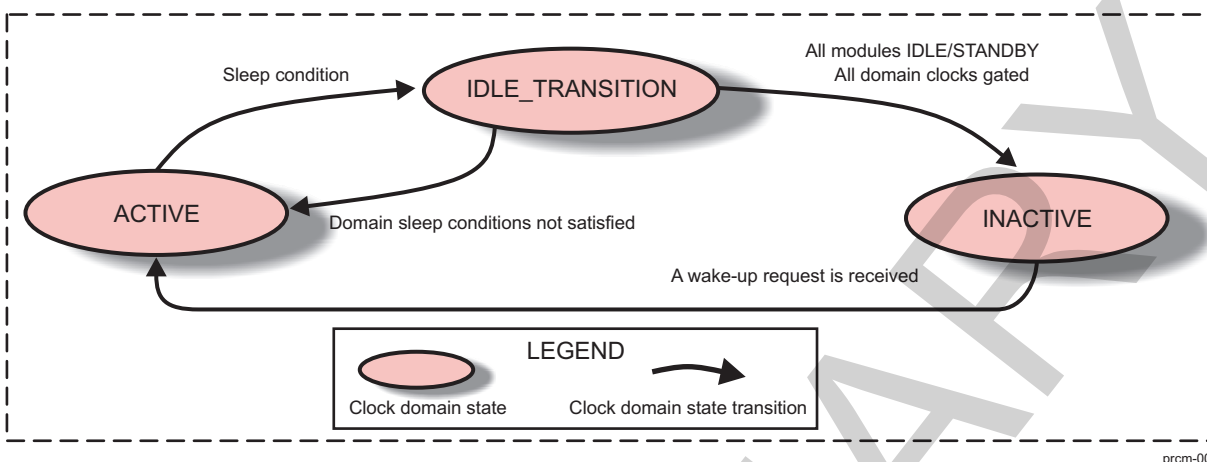
Figure 3-3. Clock Domain State Transitions

Table 3-11 defines the clock domain states.

Table 3-11. Clock Domain Clock States

| State | Description |
|-----------------|--|
| ACTIVE | <ul style="list-style-type: none"> Every nondisabled slave module (that is, those whose MODULEMODE value is not set to disabled) is put out of IDLE state. All functional clocks to the active slave modules (that is, not idled) of the clock domain are provided. All interface clocks to the nondisabled slave modules in the clock domain are provided. All functional and interface clocks to the active master modules (that is, not in STANDBY state) in the clock domain are provided. Every enabled optional clocks to the modules in the clock domain are provided. |
| IDLE_TRANSITION | <p>This is a transitory state.</p> <ul style="list-style-type: none"> Every master module in the clock domain is in STANDBY state. Every idle request to all the slave modules in the clock domain is asserted. The functional clocks to the slave module in enabled state (that is, those whose MODULEMODE values are set to enabled) remain active. Every enabled optional clocks to the modules in the clock domain are provided. |
| INACTIVE | <p>All clocks within the clock domain are gated.</p> <ul style="list-style-type: none"> Every slave module in the clock domain (that is, those whose MODULEMODE is set to disabled or auto) is in IDLE state and set to disabled or auto mode. Every master module in the clock domain is in STANDBY state. Every optional functional clock in the clock domain is gated. |

Each clock domain transition behavior is managed by an associated register bit field in the CM_Clock domain_CLKSTCTRL[x] CLKTRCTRL PRCM module.

Table 3-12 describes the clock domain clock transition mode settings.

Table 3-12. Clock Domain Clock Transition Mode Settings

| CLKTRCTRL Bit Value | Selected Mode | Description |
|---------------------|---------------|---|
| 0x0 | NO_SLEEP | A clock domain sleep transition is never initiated, irrespective of the hardware conditions. |
| 0x1 | SW_SLEEP | A software-forced sleep transition. The transition is initiated when the associated hardware conditions are satisfied (see Table 3-14). |
| 0x2 | SW_WKUP | A software-forced clock domain wake-up transition is initiated, irrespective of the hardware conditions identified in Table 3-13. |

Table 3-12. Clock Domain Clock Transition Mode Settings (continued)

| CLKTRCTRL Bit Value | Selected Mode | Description |
|---------------------|---------------|--|
| 0x3 | HW_AUTO | Hardware-controlled automatic sleep and wake-up transition is initiated by the PRCM module when the associated hardware conditions are satisfied (see Table 3-14 and Table 3-13). |

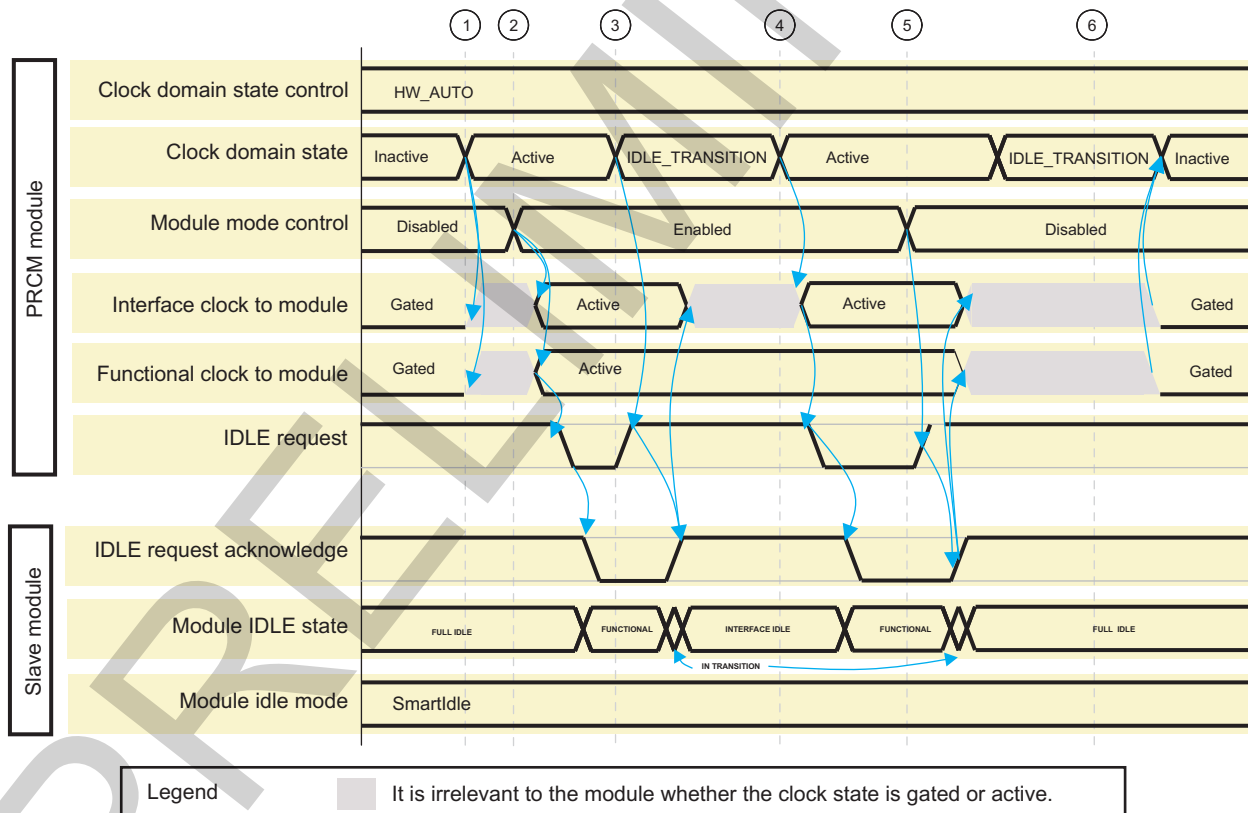
NOTE: Depending on the characteristics of a clock domain, it may or may not support all the clock transition mode settings described in [Table 3-12](#). See the clock domain clock management section of the specific clock domain to identify the supported clock transition mode settings.

3.1.1.1.5 Clock Domain HW_AUTO Mode Sequences

The sequence diagrams in [Figure 3-4](#) through [Figure 3-6](#) identify the PRCM module hardware-controlled enabling and gating of the functional and interface clocks to the module. They highlight the changes in the module state based on the changes to the clock domain state and module mode settings.

[Figure 3-4](#) highlights the behavior of a slave module receiving the interface and functional clocks and having two configurable module modes: Disabled and Enabled.

Figure 3-4. Clock Domain/Slave Module Clock-Management Interaction Sequence 1



prcm-004

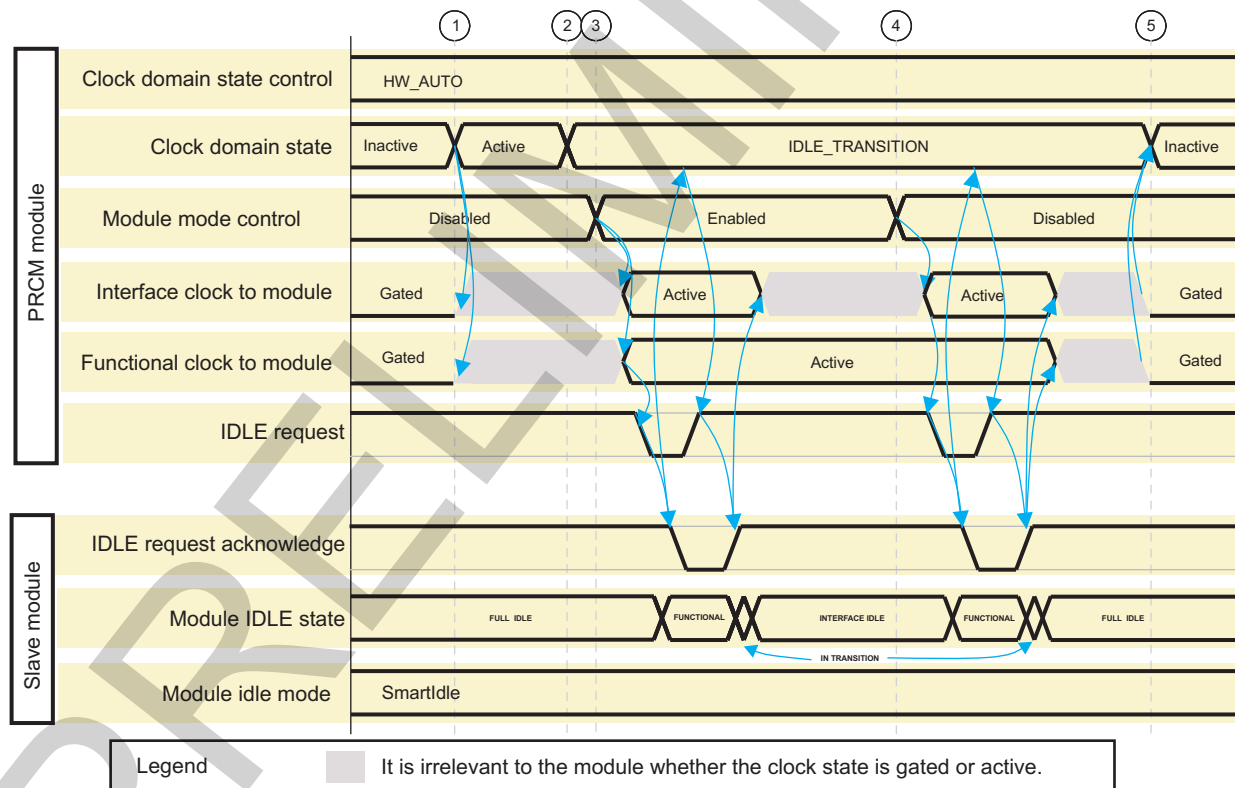
Initially, the clock domain, which includes the slave module, is inactive. The module is in FULL-IDLE state and its functional and interface clocks are gated.

1. The clock domain wakes up and changes state to ACTIVE. As the module mode control is still disabled, this event has no effect on the module state. The functional and interface clocks may still be restarted automatically, based on the requirements of other modules sharing these clocks.

- Software changes the module mode to enabled. The clocks to the module are restarted automatically. The PRCM module then deasserts a hardware idle request signal to the module. The module sends an idle request acknowledge to the PRCM module. The module is now effectively awake. The module IDLE state is functional. If the module is enabled before the clock domain wakes up, Steps 1 and 2 are simultaneous.
- The clock domain switches to IDLE_TRANSITION state. In turn, the PRCM module requests the module to go into IDLE state by asserting the idle request signal. When acknowledged, the clock to the module can be gated, depending on other modules sharing the same clock. The functional clock of the module remains enabled as the module is in enabled mode.
- The clock domain does not have all conditions to complete the sleep transition, and wakes up again. In turn, the interface clock to the module is automatically restarted, if applicable, then the module is put out of IDLE state.
- Software disables the module. The PRCM module requests the module to go to IDLE state by asserting the idle request signal. When acknowledged, the clock to the module can be gated, depending on other modules sharing the same clock.
- The clock domain switches to the IDLE_TRANSITION state. When the clock domain sleep transition conditions are satisfied, the clocks (functional and interface) are gated. The clock domain then switches to INACTIVE state. This has no effect on the module, which is already in FULL-IDLE state.

Figure 3-5 highlights the behavior of the same slave module, receiving the interface and functional clocks, when the module mode is changed while the clock domain state is IDLE_TRANSITION.

Figure 3-5. Clock Domain/Slave Module Clock-Management Interaction Sequence 2



prcm-005

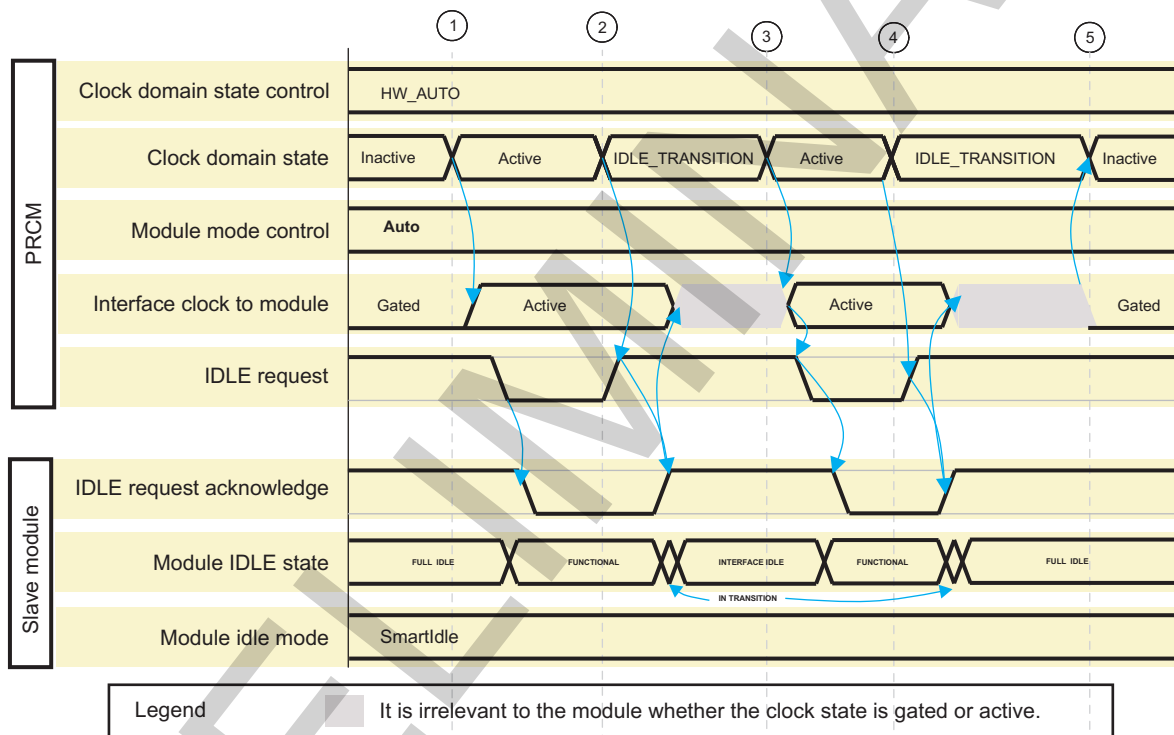
Initially, the clock domain, which includes the slave module, is inactive. The module is in FULL-IDLE state and its functional and interface clocks are gated.

- The clock domain wakes up and changes state to ACTIVE. As the module mode control is disabled, this event has no effect on the module state. The functional and interface clocks may still be restarted automatically, based on the requirements of other modules sharing these clocks.
- The clock domain goes into the IDLE_TRANSITION state. As the module mode control is disabled, this event has no effect on the state of the module.

- Software changes the module mode to enabled. The clocks to the module are restarted automatically and then the module is put out of IDLE state. As soon as acknowledged, the module is requested to go back to IDLE state with gating of the interface clock only (that is, the INTERFACE IDLE state). The interface clock to the module can be gated, depending on other modules sharing the same clocks.
- Software disables the module. The interface clock to the module is restarted automatically. The PRCM module requests the module to go to IDLE state by asserting the idle request signal. When acknowledged, the interface and the functional clocks to the module can be gated, depending on other modules sharing the same clock.
- When the clock domain sleep transition conditions are satisfied and the functional and interface clocks are gated, the clock domain switches to INACTIVE state. This has no effect on the module, which is already in FULL-IDLE state.

Figure 3-6 highlights the behavior of a slave module receiving only interface clock and supporting the configurable auto module mode.

Figure 3-6. Clock Domain/Slave Module Clock-Management Interaction Sequence 3



prcm-006

Initially, the clock domain, which includes the slave module, is inactive. The module is in FULL-IDLE state and its interface clock is gated.

- The clock domain wakes up and changes state to ACTIVE. In turn, the interface clock to the module is automatically restarted. The PRCM module then deasserts a hardware idle request signal to the module. The module sends an idle request acknowledge to the PRCM module. The module is now effectively awake (that is, the module IDLE state is functional).
- The clock domain switches to the IDLE_TRANSITION state. The PRCM module requests the module to go to IDLE state by asserting the idle request signal. When acknowledged, the interface clock to the module can be gated, depending on other modules sharing the same clock.
- The clock domain does not have all conditions to complete the sleep transition, and wakes up again. In turn, the interface clock to the module is automatically restarted if applicable, then the module is put out of IDLE state.
- Step 4 is the same as Step 2. The clock domain switches to the IDLE_TRANSITION state. The PRCM module requests the module to go to IDLE state by asserting the idle request signal. When acknowledged, the interface clock to the module can be gated, depending on other modules sharing the same clock.

5. The clock domain has all conditions to complete the sleep transition. The module is in IDLE state and its clock is gated.

3.1.1.1.6 Clock Domain Sleep/Wakeup

The clock domain manager initiates a domain wake-up transition when the conditions listed in [Table 3-13](#) are satisfied.

Table 3-13. Clock Domain Wake-Up Conditions

| Relation | Condition |
|----------|---|
| OR | The SW_WKUP clock transition mode for the clock domain is set (CLKTRCTRL = 0x2). |
| | At least one wake-up request is asserted by one of the modules of the clock domain. |
| | At least one dynamic dependency ⁽¹⁾ from another clock domain is active. |
| | At least one static dependency ⁽¹⁾ from another clock domain is active. |
| | At least one wake-up dependency ⁽¹⁾ from a module in another clock domain is active. |

⁽¹⁾ The dynamic, static dependency and the wake-up dependency are explained in [Section 3.1.1.1.7, Clock Domain Dependency](#).

The clock domain manager initiates a domain sleep transition when the conditions listed in [Table 3-14](#) are satisfied.

Table 3-14. Clock Domain Sleep Conditions

| Relation | | Condition |
|----------|-----|---|
| AND | | All master modules in the clock domain are in STANDBY state. |
| | | No wake-up request is asserted by any module of the clock domain. |
| | | No dynamic domain dependency ⁽¹⁾ from any other domain is active. |
| | | No wake-up dependency ⁽¹⁾ from any module in another domain is active. |
| | OR | The SW_SLEEP clock transition mode is set for the clock domain (CLKTRCTRL = 0x1). |
| | AND | The HW_AUTO clock transition mode is set for the clock domain (CLKTRCTRL = 0x3). |
| | | No static domain dependency ⁽¹⁾ from any other domain is active. |

⁽¹⁾ The dynamic, static dependency and the wake-up dependency are explained in [Section 3.1.1.1.7, Clock Domain Dependency](#).

3.1.1.1.7 Clock Domain Dependency

A domain dependency is a binary relationship between two clock domains. For example, clock domain A depends on clock domain B when a module in clock domain B provides services to a module in clock domain A. As a result, clock domain B must be active when clock domain A is active so that the module in clock domain B is accessible by the module in clock domain A.

The dependency between two clock domains may also exist if one clock domain serves to ensure communication between two modules (for example, the clock domain of the device interconnect).

Thus, a clock domain may support the types of clock domain dependencies described in the following subsections.

3.1.1.1.7.1 Static Dependency

If clock domain A has a master module that can access a slave module in clock domain B, then clock domain A can have a static dependency with clock domain B. Similarly, a static dependency can also exist between domains A and B if domain B conveys the transactions from domain A module toward a module in any other domain. For example, CD_DSP can have a static dependency with CD_L3_1 because this domain has the L3 interconnect to carry the transactions from the DSP module.

This static dependency consists of forcing clock domain B to stay active, as long as there is at least one master module of clock domain A that is not in STANDBY state. If clock domains A and B are initially in GATED state, then clock domain B becomes active as soon as clock domain A becomes active when a wake-up request from the master module is received by the PRCM module.

Similarly, as a result of the static dependency, clock domain B can be gated only if all the master modules of clock domain A that can access the slave modules in clock domain B are in STANDBY state.

The static dependency between a source clock domain and a destination clock domain is configured in the PRCM module by setting the CM_Source Clock domain_STATICDEP[x] Destination Clock domain_STATDEP bit. As a result, the source clock domain forces the destination clock domain to become active and stay active as long as the source clock domain is active.

3.1.1.1.7.2 Dynamic Dependency

When clock domains A and B contain modules directly linked to a common device interconnect, these clock domains can have a dynamic dependency.

A dynamic dependency consists of forcing clock domain B to stay active as long as a module from clock domain A is communicating with the module in clock domain B through the interconnect. Clock domain B becomes active as soon as the communication is initiated. This is automatically managed by the PRCM module by monitoring the communication on the interconnect between the modules of the two clock domains.

Similarly, the inverse condition of this dependency can be stated: Clock domain B can be inactive only if all modules between clock domains A and B are quiet for a given sampling delay, identified as a sliding window duration on the interconnect activity status.

The size of the sliding window is based on the number of cycles of a prescaled L4 clock whose frequency is configured by setting the CM_DYN_DEP_PRESCAL[5:0] PRESCAL bit field. The prescaled clock frequency is given as:

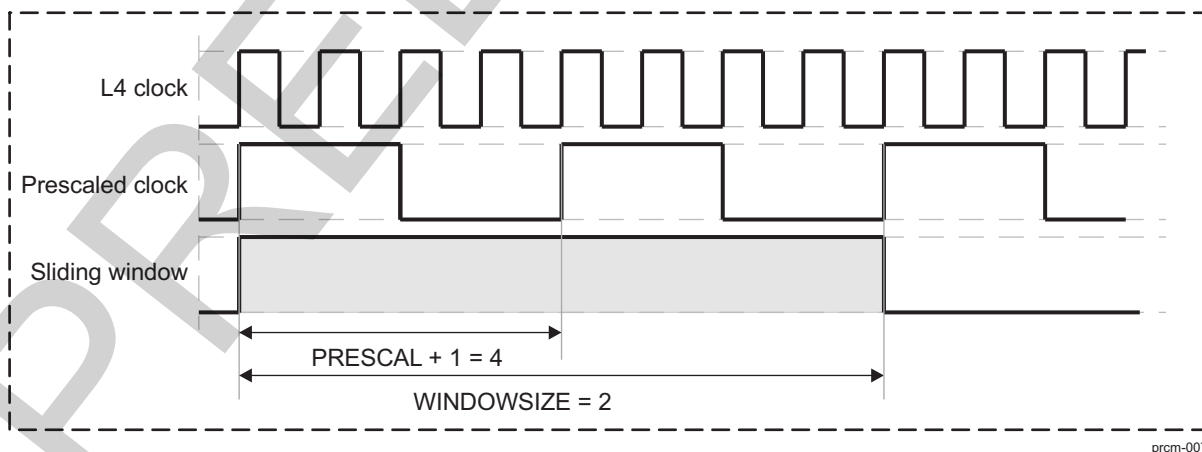
$$\text{Prescaled clock frequency} = \text{L4 interface clock frequency} / (\text{PRESCAL} + 1)$$

The size of the sliding window is fixed by setting the CM_Clock domain_DYNAMICDEP[27:24] WINDOWSIZE bit field. It is given as:

$$\text{Sliding window duration} = \text{WINDOWSIZE Period of Prescaled clock cycle}$$

Figure 3-7 presents an example of the sliding window duration equal to eight clock cycles of L4 clock when PRESCAL is set to 3 and WINDOWSIZE is set to 2.

Figure 3-7. Sliding window for Dynamic Dependency



This dynamic dependency is also referred to as the autosleep/autowake-up feature.

NOTE:

- The static dependency between two clock domains can be configured by software (PRCM module registers) or hardwired in the PRCM module.
- The dynamic dependency between two clock domains is hardwired in the PRCM module.

A dynamic dependency is said to be active when the following conditions exist:

- At least one master module or a slave interconnect module from clock domain A to domain B is active (that is, the master module is not in STANDBY state and/or the interconnect slave module is not in IDLE state).
- There has been one or more transaction on the interconnect within the sliding window duration.

Otherwise, dynamic dependency is said to be inactive.

The dynamic dependency between a source clock domain and a destination clock domain can be read in the PRCM module from the corresponding read-only CM_Source Clock domain_DYNAMICDEP[x] Destination Clock domain_DYNDEP bit.

3.1.1.1.7.3 Wake-Up Dependency

A wake-up dependency is a dependency between the clock domain of a module that owns one or several wake-up signals, toward the clock domain of another module needed to service the associated wake-up event. As a result of this dependency, the wake-up event to a module not only activates its clock domain, but also the clock domain of the servicing module.

NOTE: The wake-up signal that triggers a wake-up dependency stays active as long as the source of the event is not serviced, to ensure that clock domain of the servicing module remains active.

Wake-up dependencies allow acceleration of the wake-up transition of multiple domains needed to service the wake-up event by initiating their transition in parallel. The static and dynamic dependencies can allow the wake up of related domains but the complete wake-up transition of all the associated domains is slower because of the sequential cascading of their wake-up transitions.

In the device, the source event of the wake-up signal to a slave module can be one of the following types:

- Interrupt request to microprocessor unit (MPU) or digital signal processor (DSP) interrupt controller (INTC)
- DMA request to a DMA controller

Upon wakeup by these types of wake-up events, and for as long as they remain asserted, the PRCM module takes the following actions:

- The power domain of the servicing module (for example, MPU, DSP, or DMA) is forced to POWER ON state and the clock domain becomes active.
- The power domain of the device interconnect between servicing module and the module originator of the wake-up event is forced to POWER ON state and the clock domain becomes active.
- The power domain of the slave module originator of the wake-up event is forced to POWER ON state and the clock domain becomes active.
- The slave module originator of the wake-up event is switched from IDLE to ACTIVE state.

On assertion of a wake-up event of a stand-alone master module, and as long as it remains asserted, the PRCM module takes the following action: The power domain of the master module originator of the wake-up event is forced to POWER ON state and the clock domain becomes active.

NOTE: For slave modules, the static and dynamic dependencies of a clock domain are not impacted by its wake-up dependency settings. For master modules, the static dependencies are not impacted.

Hence, in addition to the activation of the clock domains identified in [Section 3.1.1.1.7.3](#) above, all clock domains associated by static dependencies are also activated.

However, the clock domains associated with the waking up clock domain through dynamic dependencies are only activated if a transaction is initiated to these clock domains.

For each wake-up signal coming from a slave module, the type of the corresponding event can be configured in the PM_Power domain_Originator Module_WKDEP[x] WKUPDEP_Originator Module_Servicing Module bit of the PRCM module, where Power domain is the name of the power domain of the originator module of the wake-up event identified as Originator Module. Servicing Module refers to the module servicing the wake-up event.

NOTE: When only one event type is associated with the wake-up signal of a slave module, the WKUPDEP wake-up dependency for the module clock domain is not configurable and may be hardwired in the PRCM module.

In case of the master modules, there is no configurable wake-up dependency. Their power domain is switched on and their clock domain is activated by the PRCM module when they assert their wake-up signal.

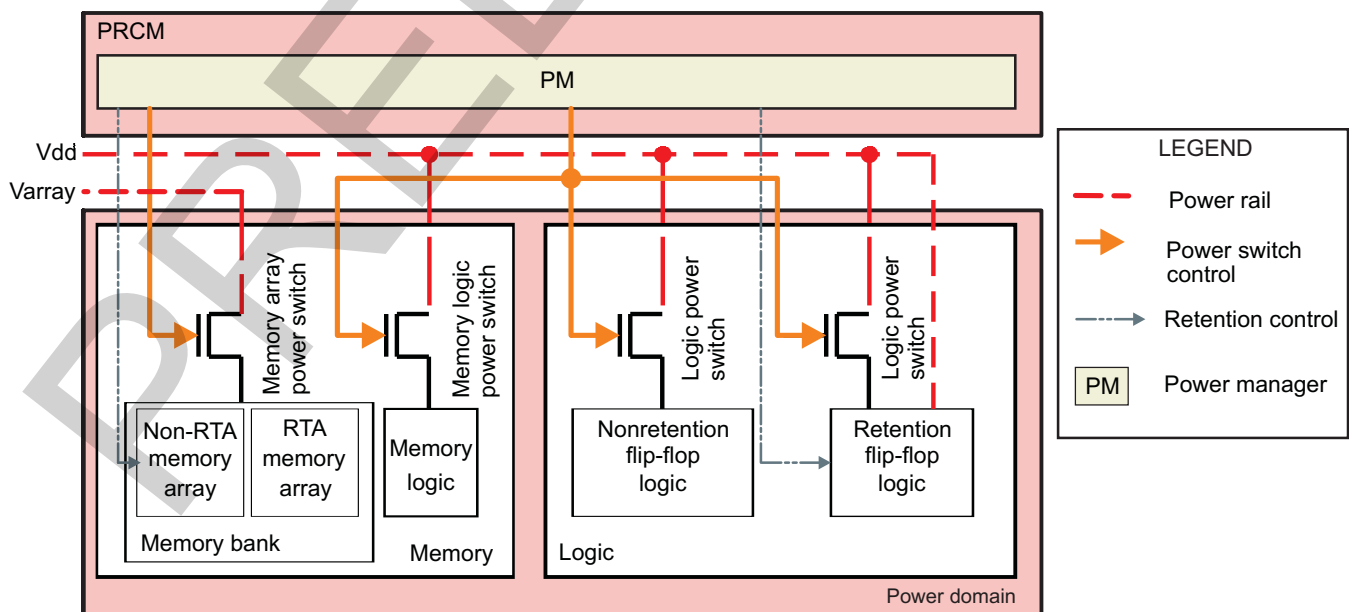
3.1.1.2 Power Management

The PRCM module manages the switching on and off of the power supply to the device modules. The power to the modules can be switched off when they are not in use to minimize device power consumption. Independent power control of sections of the device allow the PRCM module to turn on and off specific sections of the device without affecting the others.

3.1.1.2.1 Power Domain

A power domain is a section (that is, a group of modules) of the device with independent and dedicated power manager (see [Figure 3-8](#)). A power domain can be turned on and off without affecting the other parts of the device.

Figure 3-8. Generic Power Domain



prcm-008

To minimize device power consumption, the modules are grouped into power domains. A power domain can be split into some logic area and some memory area.

The memory area contains two entities:

- **Memory bank:** The memory bank is composed of memory arrays. It is powered by a dedicated voltage rail and an associated power switch (for example, Varray and memory array power switches). The memory array within the memory bank can be of RTA (retention-till-access), see [Section 3.1.1.2.2, Module Logic and Memory Context](#), or non-RTA type.
- **Memory logic:** The memory logic is powered by the same voltage source as the logic area of the power domain, but has its dedicated power switch (for example, Vdd and memory logic power switches).

The logic area in the power domain can also be split between retention flip-flops (RFFs) or nonretention flip-flops (DFFs).

[Table 3-15](#) lists the possible states and substates of the logic area in a power domain.

Table 3-15. States of a Logic Area in a Power Domain

| State | Substate | Description |
|-----------|----------------------------------|--|
| ON | ON-ACTIVE | Logic is fully powered and at least one enclosed clock domain is active. |
| | ON-INACTIVE | Logic is fully powered and all enclosed clock domains are idled. |
| RETENTION | CSWR (close switch retention) | Logic is fully powered and all enclosed clock domains are idled. |
| | OSWR (open switch retention) | Logic is powered down, except the RFF-based logic retains its value. The DFF is lost and reset. Vdd can be lowered to its retention voltage level if all power domains associated are in this or lower states. |
| OFF | | Logic power switches are off. All the logic (DFF and RFF) is lost except for the context, which has been saved in the scratchpad memory of an always-on power domain. Vdd can be set to 0 V if all associated power domains are in this state. |

NOTE: A power domain that does not have RFF logic may still support the OSWR power state. In this case, all its logic context is lost, yet its memory area context may remain valid if programmed to retention mode (see [Table 3-16](#) and [Table 3-19](#)).

The RETENTION states are useful for quick switching to low-power idle mode (in which the domain clocks are gated and the domain voltage is less than the on-voltage level) without losing the context, and then quickly switching back to ON-ACTIVE state when necessary. In a RETENTION state, power consumption is less than in ON power state.

CSWR state has the advantage of faster turn-on times over OSWR state, because in the latter case the entire context is maintained. However, CSWR state has the disadvantage of higher leakage currents over OSWR state.

The behavior of the memory array power switch and memory logic power switch can be selected through software settings in the PRCM module, or can be hardwired. Once the behavior is selected, the PRCM module hardware automatically handles these elements to ensure correct power transition sequencing between the power domain states.

Software can also initiate the memory array power state changes when the associated power domain is in On Power state. This allows the memory array to be turned off and on as needed.

The memory area can be configured to any power state identified in [Table 3-16](#).

Table 3-16. States of a Memory Area in a Power Domain

| State | Description |
|-------|---|
| ON | The memory array is powered and fully functional. Additionally, the RTA feature may put part or all of the memory array automatically into one of the retention states when not accessed, if this feature exists and is enabled on a given memory instance. |

Table 3-16. States of a Memory Area in a Power Domain (continued)

| State | Description |
|-----------|--|
| RETENTION | The memory array is fully powered, but memory is not accessible. The array can be put into one of the retention states, either through applicable direct retention control signal, or automatically if the RTA feature exists and is enabled on a given memory instance. Data in memory are always retained. |
| OFF | The memory array is powered down. Data in memory are lost. |

3.1.1.2.2 Module Logic and Memory Context

In case of a power state transition in the logic area or the memory area, the context of the module may no longer be valid. This can also be the case when the domain resets are asserted by the device. A specific RM_Clock Domain Name_Module Name_CONTEXT register provides the status of the device logic and memory context.

- The module logic context is made of simple flip-flops (DFFs) if the module has no logic RFFs.
- If the module has logic retention (full or partial), it is assumed that the context is made only of RFFs.

NOTE: The display subsystem (DSS) is an exception where the status of DFF and RFF context is presented, because only HMDI keys are retained, while most of the DSS is nonretained.

These context status bits must be cleared by software.

3.1.1.2.3 Retention-Till-Access Memory Feature

Most high-density memories within the device support the RTA feature. It consists of automatically putting part of or the entire memory array into retention when no access is made to the corresponding locations. This is managed within the memory bank by hardware and is transparent to the user software. As a consequence, RTA memories do not have any retention mode control signal coming from the PRCM module.

The RTA feature is controlled (enabled and disabled) from:

- eFuse bits configuration in the system control module, automatically loaded to the PRCM module.
- Software-controlled override capability through a bit field per voltage domain in the PRCM module (that is, PRM_LDO_SRAM_Memory Voltage Domain_SETUP[0] DISABLE_RTA_EXPORT).
- Hardware override capability controlled by the PRCM module through control of embedded static random-access memory (SRAM) low-dropout linear regulator (LDO) controller.

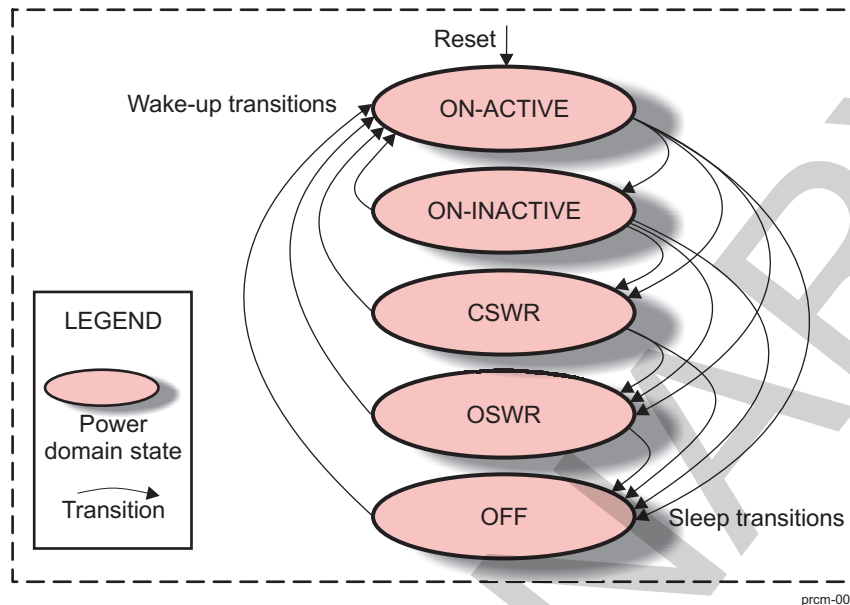
3.1.1.2.4 Power Domain Management

The power manager associated with each power domain is assigned the task of managing the domain power transitions. It ensures that all hardware conditions are satisfied before it can initiate a power domain transition from a source to a target power state (for example, from ON-ACTIVE state to OSWR state).

The hardware condition for power domain transition from ON-ACTIVE to any other transition state is:

- All clock domain managers in the power domain are in INACTIVE state: All modules in the domain are in IDLE or STANDBY state, and there is no constraining dependency (static, dynamic, or wake-up dependency) between the clock domains blocking the clock domain sleep transition.

Figure 3-9 shows all possible power domain state transitions.

Figure 3-9. Power Domain Transitions

Successive power-down transitions can be performed by lowering the power state from ON-ACTIVE to ON-INACTIVE to RETENTION, and then to OFF, as long as the hardware condition is satisfied.

However, the power domain wake-up transition from any low-power state (ON-INACTIVE, CSWR, OSWR, or OFF) to ON-ACTIVE is always direct. For example, user software cannot request a power domain transition from OSWR state to CSWR state, but only to ON-ACTIVE state.

The power domain manager initiates a power domain wake-up transition when the conditions listed in [Table 3-17](#) are satisfied.

Table 3-17. Power Domain Wake-Up Conditions

| Relation | | Condition |
|----------|----|---|
| AND | OR | Voltage domain is on. |
| | | There is at least a wake-up condition for one enclosed functional clock domain. |
| | | There is a request for clock generation or distribution enclosed in the power domain. |
| | | There is a PRCM module service request (applicable only to power domains, including PRCM module logic). |

The power domain manager initiates a domain sleep transition when the conditions listed in [Table 3-18](#) are satisfied.

Table 3-18. Power Domain Sleep Conditions

| Relation | Condition |
|----------|--|
| AND | All functional clock domains enclosed in the power domain are idled. |
| | All clock generation or distribution enclosed in the power domain is quiet, and corresponding input clocks are gated. For example, DPLL, if present, must be in stop mode. |
| | There is no PRCM module service request (applicable only to power domains, including PRCM module logic). |

[Table 3-19](#) lists the PRCM module power domain control and status features.

Table 3-19. Power Domain Control and Status Registers

| Register/Bit Field | Type | Description |
|---|---------|--|
| PM_Power domain_PWRSTCTRL[1:0] POWERSTATE | Control | Selects the target power state of the power domain among OFF, ON-ACTIVE, ON-INACTIVE, and RETENTION. |
| PM_Power domain_PWRSTCTRL[x] LOWPOWERSTATECHANGE | Control | Power state change request when domain has already performed a sleep transition. Allows going into deeper LOW-POWER state without waking up the power domain. |
| PM_Power domain_PWRSTCTRL[2] LOGICRETSTATE | Control | Selects whether the Power domain logic is in CSWR or OSWR state when the domain transitions to one of the RETENTION states. |
| PM_Power domain_PWRSTCTRL[x] memory bank_RETSTATE | Control | Selects whether the memory bank in the power domain is in ON or RETENTION state when the power domain is in RETENTION state. The memory bank can not be in ON state when the power domain is in RETENTION state. |
| PM_Power domain_PWRSTCTRL[x] memory bank_ONSTATE | Control | Selects whether the memory bank is in ON, RETENTION, or OFF state when the power domain is in ON state. |
| PM_Power domain_PWRSTST[1:0] POWERSTATEST | Status | Identifies the current state of the power domain. It can be OFF, RETENTION, ON-INACTIVE, or ON-ACTIVE. |
| PM_Power domain_PWRSTST[2] LOGICSTATEST | Status | Identifies the current state of the logic area in the power domain. It can be OFF or ON. |
| PM_Power domain_PWRSTST[20] INTRANSITION | Status | Identifies whether a power domain power state transition is in progress or there is no ongoing transition. |
| PM_Power domain_PWRSTST[x] memory bank_STATEST | Status | Identifies the current power state of the memory bank in the power domain. It can be OFF, RETENTION, or ON. For memory with RTA feature, the ON and RETENTION memory states are equivalent. |

3.1.1.3 Voltage Management

The PRCM module controls the voltage scaling (that is, switching the voltage in discrete steps or in a continuum within a range of possible values) of the power sources of the device. This allows control of the device power consumption according to the performance criteria defined. Higher performance is ensured with higher voltage and clock frequencies (and hence higher power consumption), while lower performance can be supported with lowered power consumption by reducing or completely gating the power supply to specific areas of the device and gating the associated clocks.

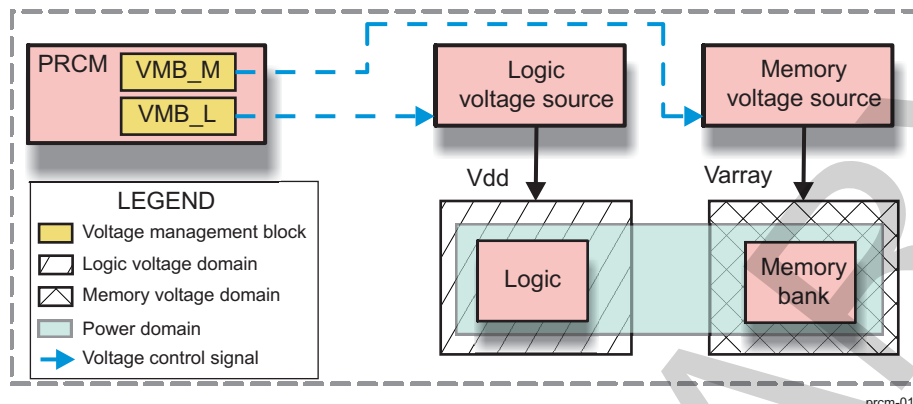
3.1.1.3.1 Voltage Domain

A voltage domain is a section of the device supplied by a dedicated voltage source (that is, an internal LDO or external switched mode power supply [SMPS]). A voltage domain may or may not be controlled by the PRCM module. When a voltage domain is controlled by the PRCM module, a dedicated voltage manager is associated. The voltage manager allows regulation of the voltage level of the source for the voltage domain, independently of other voltage domains of the device.

The voltage managers in the PRCM module can be of two types:

- Dynamically configurable by software to scale the domain voltage level to specific values within the device operational voltage range. This is called adaptive voltage scaling (AVS).
- Hardware controlled to automatically switch the domain voltage levels according to the associated hardware conditions

Figure 3-10 shows a voltage domain.

Figure 3-10. Generic Voltage Domain

By partitioning the device into independent voltage domains, different operating voltages can be assigned to the different sections of the device (that is, group of modules or memory banks). The independent voltage control allows voltage scaling of device subsections to ensure that each module or memory bank operates at the optimized operating voltage level based on the application performance requirements. When all modules within a voltage domain are idle (that is, have no ongoing transaction), the domain voltage can be lowered to reduce power consumption and then switched back to normal operating voltage level when a wake-up event is received by one of the modules of the voltage domain. Similarly, when a memory bank is not in use, it may be switched to retention or off voltage levels to ensure power savings.

Table 3-20 describes the different states of the logic voltage domain.

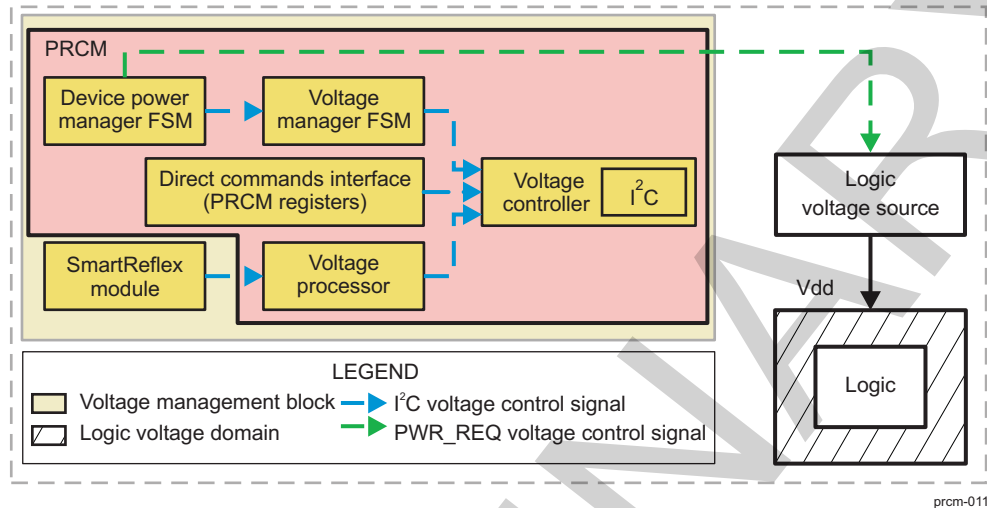
Table 3-20. States of Logic Voltage Domain

| State | Description |
|-----------|---|
| ON | The voltage regulator source for the voltage domain is active and operating in its normal voltage range for the current operating performance point (OPP) and can deliver up to the maximum load current defined for the current OPP. |
| SLEEP | The voltage regulator source is operating in its normal voltage range but it can only deliver a limited load current (no logic activity on this voltage domain). In sleep mode, regulator power consumption is reduced. |
| RETENTION | The voltage regulator source is operating at retention voltage level. It delivers the minimal load current required to maintain the voltage domain logic context. |
| OFF | The voltage regulator source is inactive and its output voltage is 0 volts. No supply current is provided in this mode. |

3.1.1.3.2 Voltage Domain Management

Figure 3-11 highlights the different voltage control paths available within a generic logic voltage management block to control the voltage supply to the device logic voltage domains.

Figure 3-11. Generic Logic Voltage Management



3.1.1.3.2.1 Logic Voltage PWR_REQ Voltage Control

A PWR_REQ signal is deasserted when the device enters the OFF state. The external power integrated circuit (IC) can use it to properly manage turn-off or turn-on of the logic voltage source.

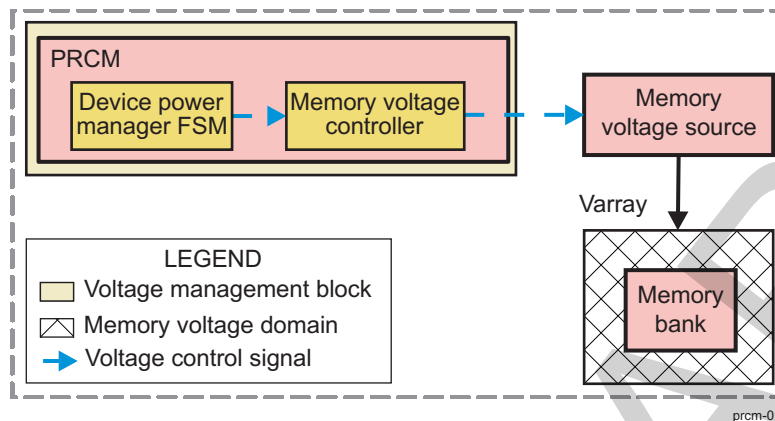
3.1.1.3.2.2 Logic Voltage I²C Voltage Control

The PRM module allows three voltage control paths to a dedicated inter-integrated circuit (I²C™) interface for the logic voltage domains managed by it.

1. The PRM module hardware-managed voltage changes from device power manager voltage finite state-machine (FSM) through voltage manager FSM based on hardware conditions. It sends the voltage commands when the device enters in RETENTION or OFF state and upon device wakeup.
2. Direct control by user software through the PRM module registers for voltage scaling.
3. Adaptive voltage scaling (see [Section 3.1.1.3.3, AVS Overview](#)) with SmartReflex™ voltage control commands through the voltage processor.

NOTE: An I²C host module (not controlled by the PRM module) can be used to program the external power IC. Because this procedure completely bypasses the PRM module, see [Section 24.1 I²C](#).

Figure 3-12 highlights the voltage control path available within a generic memory voltage management block to control the voltage supply to the device memory voltage domains.

Figure 3-12. Generic Memory Voltage Management

The PRCM hardware supports automatic scaling down of the memory array supply whenever they transition to RETENTION or OFF power state. The device power manager FSM manages the voltage scaling of memory voltage domains through memory voltage controller (or LDO).

3.1.1.3.3 AVS Overview

SmartReflex is a power-management technique used for controlling the operating voltage of a device to reduce its active power consumption.

With SmartReflex, the power-supply voltage is adapted to the silicon performance in two ways:

- Statically adapted to the manufacturing process of a given device
- Dynamically adapted to the temperature-induced current performance of the device

SmartReflex achieves optimal performance/power trade-off for all devices across the technology process spectrum and across temperature variations.

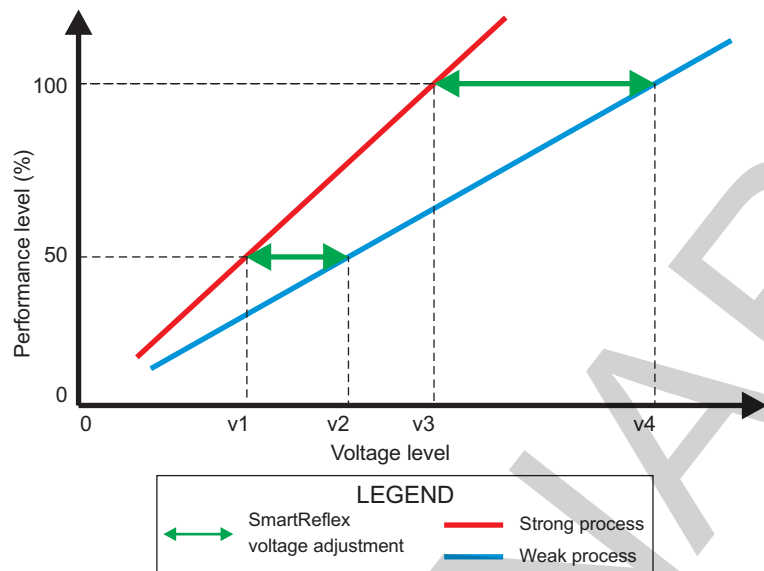
The static correction of the device voltage level (see [Figure 3-13](#)) is based on the desired performance level and silicon performance characteristics of the device. Due to process dispersion, each die has its specific silicon performance. The range of the process distribution defines the weak devices (low-performance silicon) and the strong devices (high-performance silicon).

A weak device is a device with the lowest performance tolerated for a process distribution; that is, at the typical voltage, the inherent maximum frequency is the lowest frequency of the chip distribution. Considered as the worst case, weak devices are used to constrain the target frequency of all the chips (OPP definition).

A strong device is a device with the highest performance tolerated for a process distribution. The inherent maximum frequency at the typical voltage is greater than the targeted frequency.

[Figure 3-13](#) identifies the fact that, with SmartReflex voltage-control architecture, it is possible to compensate for the device silicon characteristics and obtain optimal performance characteristics. Based on the device characteristics, the device voltage level can be adjusted for specific performance level.

Figure 3-13. SmartReflex Static Voltage Adjustment



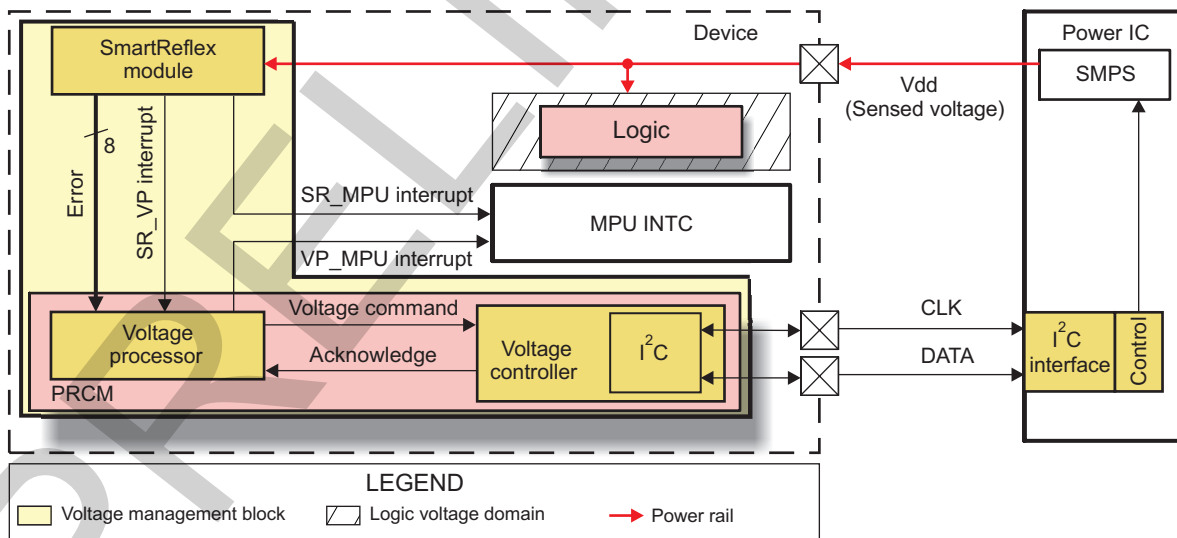
prcm-013

The dynamic correction of the device voltage is based on the real-time comparison of predefined performance points to the on-chip measured performance level. The device voltage level is raised or lowered to compensate for temperature-induced performance variations.

Without SmartReflex, the voltage variation is around the nominal voltage level and not controlled through any active dynamic compensation. This leads to power waste.

Figure 3-14 is a functional overview of the SmartReflex voltage-control architecture of the device connected to an external power IC.

Figure 3-14. SmartReflex Voltage Control Functional Overview



prcm-015

SmartReflex voltage control consists of the following modules:

- SmartReflex
- MPU INTC
- Voltage processor
- Voltage controller

- I²C interface
- SMPS

The SmartReflex module senses input voltage (V_{dd}) and generates an error value that identifies the difference between the desired optimal voltage and the actual value of the SMPS. This error value is set in an internal register (for software read, if necessary) and is also passed to the voltage processor.

The voltage processor converts the error value to a voltage command that defines the change in the output voltage of the SMPS required to bring it to the desired voltage level.

The voltage command is sent to the voltage controller, which passes it to the power IC through the dedicated I²C interface. The power IC then adjusts the output voltage of the SMPS according to the command.

In this way, the SmartReflex module dynamically adjusts the SMPS voltage to compensate for voltage variations.

The device supports Class-1.5 or software-controlled operational mode for SmartReflex voltage control.

3.1.1.3.3.1 Class-1.5 SmartReflex Voltage Control

In SmartReflex Class-1.5, the calibration procedure is triggered by the user software (for example once per day or week) to account for device aging. Additional temperature margins are fused, thus no user software is involved. .

3.1.2 Power-Management Techniques

The following sections describe the state-of-the-art power-management techniques supported by the device.

NOTE: The values in [Figure 3-15](#) through [Figure 3-17](#), which show power-management techniques, are hypothetical. They do not represent valid test results on the device.

3.1.2.1 Standby Leakage Management

Standby leakage management (SLM) is a power-management technique that reduces standby power consumption by reducing power leakage.

With SLM, the device switches into low-power system modes automatically or in response to user requests during system standby (that is, in situations when no application is started and system activity is negligible or limited).

When applying SLM, the system remains in the lowest static power mode compatible with the system response time requirement.

This technique trades static power consumption for wake-up latency.

3.1.2.2 Dynamic Voltage and Frequency Scaling

Dynamic voltage and frequency scaling (DVFS) consists of minimizing the idle time of the system. The DVFS technique uses dynamic selection of the optimal operating frequency and voltage to allow a task to be performed in the required length of time. This reduces the active power consumption (power consumed while executing a task) of the device while still meeting task requirements.

NOTE: The values in [Figure 3-15](#) are hypothetical. They are meant only to clarify the concept and do not represent valid test results on the device.

Figure 3-15. Comparison of Energy Consumed With/Without DVFS

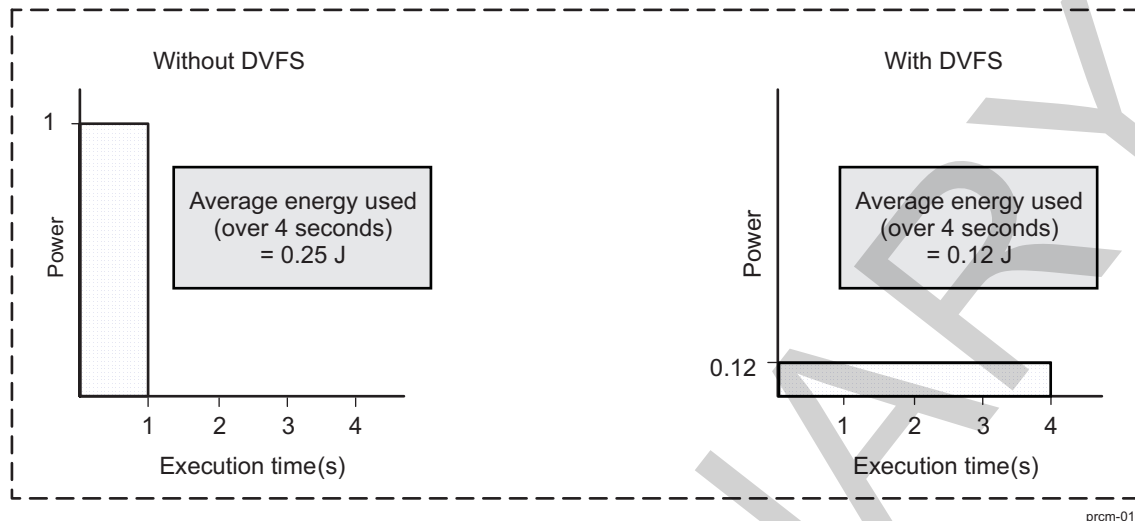


Figure 3-15 shows the DVFS technique by comparing a process executed at maximum frequency and operating voltage without applying DVFS to the same process executed at optimal frequency and voltage using DVFS, based on the task requirements. If a task that must terminate in 4 seconds is performed at maximum operating frequency (left side of the figure), it terminates in 1 second, and the remaining 3 seconds are spent in idle mode. With DVFS (right side of the figure), the operating frequency is reduced to an optimal level; the task takes the full 4 seconds to complete, but power consumption is reduced. In addition, the voltage can be reduced further to save power so the dynamic and leakage power consumption are reduced.

DVFS requires control over the clock frequency and the operating voltage of the device elements. By intelligently switching the individual elements of the device to their OPPs, the power consumption of the device for a given task can be minimized.

For practical reasons related to device making (flow, tools), DVFS can be used only for a few discrete steps, not over a continuum of voltage and frequency values. Each step, or OPP, is composed of a voltage (V) and frequency (F) pair. For an OPP, the frequency corresponds to the maximum frequency allowed at a voltage, or reciprocally; the voltage corresponds to the minimum voltage allowed for a frequency.

When applying DVFS, a processor or system always runs at the lowest OPP that meets the performance requirement at a given time. The user determines the optimal OPP for a given task and then switches to that OPP to save power.

3.1.2.3 Dynamic Power Switching

Like DVFS, dynamic power switching (DPS) is a power-management technique aimed at reducing active power consumption of a device. However, whereas DVFS reduces the dynamic and leakage power consumption, DPS reduces only leakage power consumption, at the expense of a slight overhead in dynamic power consumption.

With DPS, the system switches dynamically between high- and low-consumption system power modes during system active time. When DPS is applied, a processor or system runs at the highest OPP (maximum frequency and voltage) to complete its tasks quickly, followed by an automatic switch to a low-power mode, for minimum power consumption. DPS is useful when a real-time application is waiting for an event. The system can switch into a low-power system mode if the wake-up latency conditions allow it.

This technique consists of maximizing the idle period of the system to reduce its power consumption.

NOTE: The values in Figure 3-16 are hypothetical. They are meant to clarify the concept only and do not represent valid test results on the device.

Figure 3-16. Comparison of Energy Consumed With/Without DPS

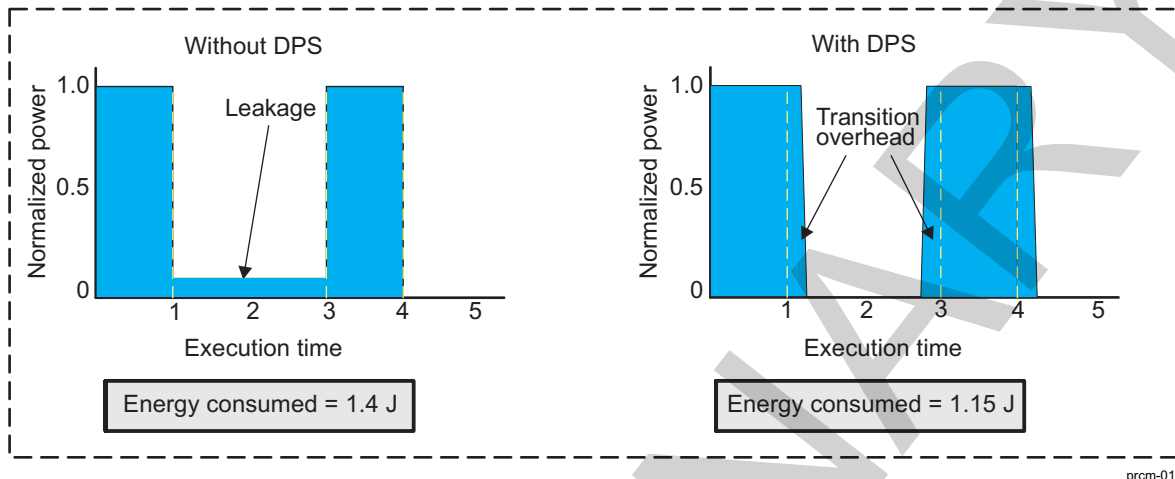


Figure 3-16 compares the behavior of power consumption for the same device operation without DPS (left side of the figure) and with DPS (right side of the figure). When operating without DPS, the device has a constant leakage current in idle mode. By using DPS, the system reduces the leakage current to zero. However, the transitions between system power modes may require storing the information before entering a low-power inactive state and restoring the information after a wake-up event (see Figure 3-16). This results in additional dynamic power consumption, referred to as the transition overhead (see Figure 3-16). Transition overhead must be considered for a DPS operation.

For efficient deployment of DPS techniques, it is necessary to predict dynamically the performance requirement of the applications running on the processor. The DPS controller must account for the overhead of wake-up latencies related to domain switching and ensure that they do not significantly affect the performance of the device. Even with transition overhead, however, the user can identify an optimal idle-time limit, after which the DPS is useful for dynamic power-saving.

3.1.2.4 Adaptive Voltage Scaling

SmartReflex-based AVS is a power-management technique for automatic control of the operating voltages of the device to reduce active power consumption.

With SmartReflex, power-supply voltage is adapted to silicon performance, either statically (based on performance points predefined in the manufacturing process of a given device) or dynamically (based on the temperature-induced real-time performance of the device). A comparison of these predefined performance points to the real-time on-chip measured performance determines whether to raise or lower the power-supply voltage.

AVS achieves the optimal performance/power trade-off for all devices across the technology process spectrum and across temperature variation. The device voltage is automatically adapted to maintain performance of the device. This ensures optimal power consumption for a given OPP.

With AVS, the frequency steps are identified and the voltage is adapted according to the silicon performance of the device. In this case, instead of a voltage step for each frequency step, there is a corresponding range of voltages. The range depends on the fabrication process of the device and its real-time operating state (temperature) at a given frequency.

3.1.2.5 Adaptive Body Bias

The device implements transistor body bias techniques for optimizing the performance and power of some operating points.

Adaptive body bias (ABB) is based on the process corner and the current OPP. This is configured in the efuse at the device characterization and is not continuously updated. A dedicated LDO, that is, VDDLDO, is used to produce the voltage bias.

3.1.2.6 Combining Power-Management Techniques

The power-management techniques previously described have specific features and are most effective when used under the specific operating conditions of the device. Hence, the best active power savings are obtained by combining the DVFS, DPS, SLM, and AVS techniques. For a given operating state, one or more of the power-saving techniques can be applied to ensure optimal operation with maximum power saving.

AVS can be used at boot time to adapt the voltage to device process characteristics (strong/weak) and then used continuously to compensate temperature variations. AVS can also ensure maximum available application performance of the device at a given OPP.

When medium application performance is required, or when application performance requirements vary, DVFS can be applied. The voltage and frequency can be scaled to match the closest OPP that meets the performance requirement.

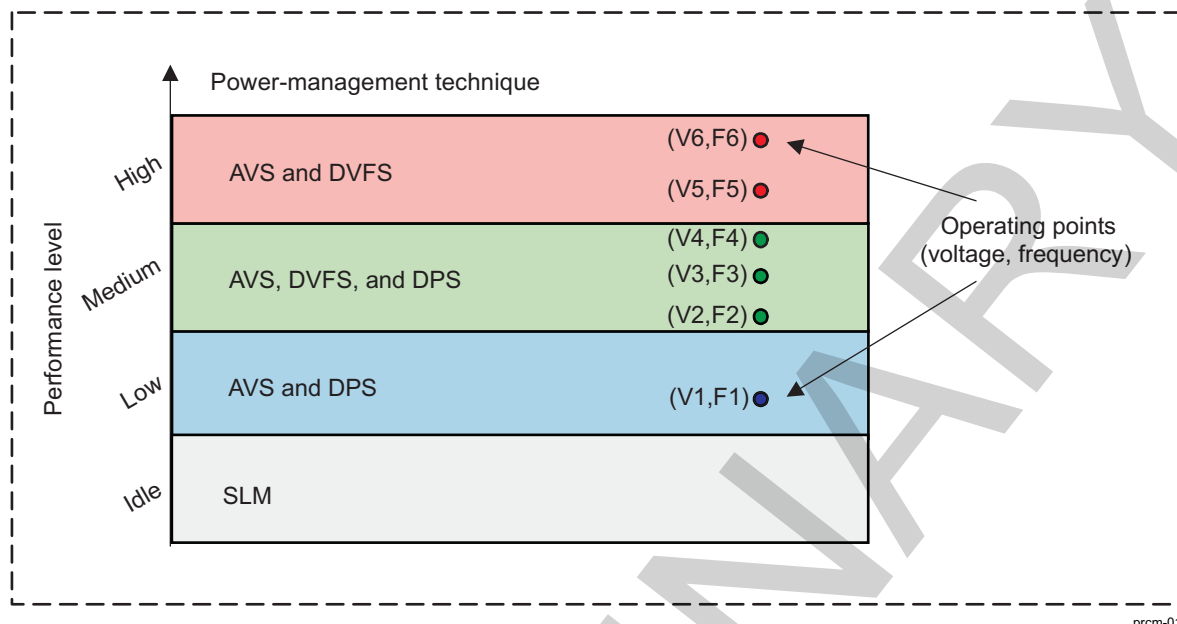
When application performance requirements fall between two OPPs, or when a low application performance is required that is below the lowest performance OPP, DPS can be applied to switch to low-power mode.

When combining DVFS and DPS, the operating frequency must not be scaled to match the performance requirement without scaling the voltage. Lower operating frequency increases task completion time and reduces idle time. This prevents DPS or reduces its efficiency (DPS becomes more effective as idle time increases). Unless DPS cannot be applied for other reasons, for a given operating point of DVFS the operating frequency must always be set to the maximum allowed at a given voltage. This ensures optimal process completion time and application of DPS.

If DPS cannot be applied in a given context, scaling the frequency while keeping the voltage constant does not save energy; it does, however, reduce peak power consumption. This can have a positive effect on temperature dissipation and battery life.

SLM must be used when no applications are running and performance requirement drops to zero.

NOTE: The OPPs shown in [Figure 3-17](#) are only for indication and clarity of text. They do not correspond to validated OPPs of the device.

Figure 3-17. Performance Level and Applied Power-Management Techniques**3.1.2.6.1 DPS Versus SLM**

DPS and SLM are similar concepts: they consist of switching the system between high- and low-power consumption modes. However, their operating timescales differ, principally in the latency allowed for mode transitions.

DPS is generally used in an applicative context (tasks are started). Therefore, mode transitions are related to system performance requirements or the processor load. DPS transition latencies must be small (typically between 10 μ s and 100 μ s) compared to the time constraints or deadlines of the application so that they do not degrade application performance. DPS requires performance prediction to ensure that transition latencies do not deteriorate device performance to the point that real-time application deadlines are missed or the user experience degrades too much for an interactive application.

SLM is not used in an applicative context (no task started). Mode transitions are related more to system responsiveness, and the transition latencies must be small compared to user sensitivity so that they do not degrade the user experience. For SLM, transition latencies are typically 1 ms to 10 ms or more.

DPS and SLM also differ in the type of wake-up event used to exit low-power idle mode. For DPS, wake-up events are application-related (timer, DMA request, peripheral interrupt, etc.); for SLM, wake-up events are user-related (touch screen, key pressed, peripheral connections, etc.).

3.2 PRCM Subsystem Overview

3.2.1 Introduction

The power-management framework of the device significantly reduces dynamic power consumption and static leakage current to extend the life of the battery in the end product. This framework incorporates support for state-of-the-art power-management techniques. It ensures optimal device operation with significantly reduced power consumption. The power-management framework (PMFW) of the device is split over the following modules:

- SCRM: Handles system-level (with one or more devices) clock and reset distribution and management.
- PRCM: A logical module composed of following three physical submodules:
 - PRM: Handles device-level power and reset management. It also handles some clocks in the device. This module always remains on, unless no power is supplied to the device pads.
 - CM1: Handles device-level clock management 1. This module remains always on unless the device is switched to off mode or no power is supplied to the device pads.
 - CM2: Handles device-level clock management 2. This module does not remain always on. It is switched to full-retention mode when its power domain (PD_CORE) is in RETENTION state. It is off when either the device is switched to off mode or no power is supplied to the device pads.
- SR_MPU, SR_IVA, and SR_CORE (SmartReflex): Handle AVS features

Together, these modules provide enhanced power-management features with the centralized control for the clock, reset, and power-management signals in the device.

The device supports the power-management techniques with the following features:

- Partitioning of the device into voltage, power, clock, and reset domains
- Domain isolation that allows any combination of domain on/off states
- Clock tree with selective clock-gating conditions
- Hardware-controlled reset sequencing management
- Power, reset, and clock control hardware mechanism to manage sleep and wake-up dependencies of power domains
- Support for hardware-controlled autogating of module clocks
- Memory retention capability for preserving memory contents in low-power sleep mode
- DVFS support for the processor and peripherals
- AVS support for the processor and peripherals, for real-time performance adjustments
- Support for low-power device off mode input/output (I/O) pad configuration for minimum power consumption when in OFF power state

The PMFW interfaces with all the components of the device for power, clock, and reset management through associated control signals. It integrates enhanced features to let the device adapt energy consumption dynamically according to changing application and performance requirements. The innovative hardware architecture allows a substantial reduction in leakage current.

The power-management modules are fully configurable through their level 4 (L4) interface ports.

[Figure 3-18](#) is an overview of the power-management modules and their internal connections with a generic power domain.

Figure 3-18. PMFW Overview



3.2.2 Power-Management Framework Features

The power-management modules have the following features:

- Manage independent power domains
- Control scalable logic voltage domains and selectable voltage modes for memory voltage domains
- Handle standby, idle, and wake-up procedures for the modules of the device
- Allow software and partial hardware control
- Monitor and handle wake-up events
- Control system clock and reset input sources
- Manage and distribute clocks and resets with high control granularity
- Handle power-up sequences
- Debug and emulation features
- Allow adaptive and dynamic voltage scaling feature through dedicated high-speed (HS) master I²C interface
- Control of RFF of device modules to support DPS

3.3 PRCM Subsystem Environment

The modules of the PMFW receive the external reset, clock, and power signals. See [Figure 3-18](#).

NOTE: In the remainder of this chapter, power IC refers to a peripheral power source IC that is interfaced with the device. It receives power control commands (voltage scaling and power switching) from the device and provides the necessary voltages and reset signals.

The following sections describe the interfaces for external clock, reset, and power sources.

3.3.1 External Clock Signals

The SCRM module receives a low-frequency clock input, sys_32k, at 32-kHz frequency. It can receive high-frequency system clock through two possible inputs: fref_slicer_in or fref_xtal_in. The fref_slicer_in supplies the input clock to an on-chip slicer, while fref_xtal_in can be used as external crystal connection for internal high-frequency clock generation through an on-chip oscillator.

The SCRM can output six alternate clocks, fref_clk[0:5]_out. Output clocks 1 to 4 can be gated or enabled through associated clock request signals, fref_clk[1:4]_req.

[Table 3-21](#) lists the external clock pins, signal names, their direction, associated modules, description, and reset values of the signals. If the signal is input to the device, the module is the destination module for the signal. If the signal is an output from the device, the module is the source module of the signal.

Table 3-21. External Clock Signals

| Pin | Signal | I/O ⁽¹⁾ | PMFW Module | Description | Module Reset Value |
|-------------------|--------------|--------------------|-------------|---|--------------------|
| sys_32k | SYS_32K | I | SCRM | 32-kHz clock input | Z |
| fref_clk_ioreq | SYSClk_REQ | I/O | SCRM | System clock request. Input when pins sysboot6=0 and sysboot7=0. Otherwise output. | Z |
| fref_slicer_in | SLICER_IN | I | SCRM | System clock input to the slicer. It can be a sinusoidal or square input signal. Otherwise, it may serve as an alternate clock input (SYS_ALTCLK) to an internal peripheral. ⁽²⁾ | Z |
| fref_slicer_AZ | SLICER_AZ | I | SCRM | Connected to ground at package level | Z |
| fref_xtal_in | XTAL_IN | I/O | SCRM | Oscillator drive input from crystal or alternate square clock input (SYS_ALTCLK) ⁽²⁾ | Z |
| fref_xtal_out | XTAL_OUT | O | SCRM | Oscillator drive output to crystal | Unknown |
| fref_clk[1:4]_req | CLK[1:4]_REQ | I | SCRM | Auxiliary clocks request | Z |
| fref_clk[0:5]_out | CLK[0:5]_OUT | O | SCRM | Auxiliary clocks outputs 0 to 5 | 0 |

⁽¹⁾ I = Input; O = Output; I/O = bidirectional

⁽²⁾ SYS_ALTCLK can be sourced by fref_slicer_in or fref_xtal_in based on SYSBOOT[7:6] settings. For more information, see [Section 28.2.4.1, Clock Source Selection](#).

The auxiliary clocks are controlled by the configuration of the SCRM.AUXCLK <clock id> (where clock ID can be 0 to 5); for example, fref_clk1_out is controlled by the SCRM.AUXCLK0 register. It controls the following features:

- Select the clock off output polarity
- Source clock input:
 - System clock
 - Clock from DPLL_CORE
 - Clock from DPLL_PER
- Initiate software-generated request
- Software-controlled clock gating
- Divide factor configuration from 1 to 16

The bidirectional fref_clk_ioreq pad can be used to manage the external system clock request and

auxiliary clock request 0. With this implementation, it is not expected to externally drive the system clock request when the SoC is the clock requester. This implementation requires programming the SCRM accordingly, in case the SoC needs the external system clock request. The programming consists in setting the [AUXCLK0\[9\]](#) DISABLECLK bit to 1 and the [AUXCLKREQ0\[4:2\]](#) MAPPING bit to 0. Without these settings the SCRM would incorrectly interpret an external clock request as an auxiliary clock request 0.

The SCRM must enable the output buffer of this bidirectional pad as long as it needs to request the external clock source, and the output buffer must be put in HiZ when it no longer needs the system clock source.

3.3.2 External Boot Signals

The PRM receives SYSBOOT[5:0] information by external pins sys_boot[5:0]. They are used to select interfaces or devices for the booting list. For more information, see [Section 28.2.4.2, Booting Device Order Selection](#).

The PRM receives SYSBOOT[7:6] information by external pins sys_boot[7:6]. It defines device source clock configuration. For more information, see [Section 28.2.4.1, Clock Source Selection](#).

[Table 3-22](#) lists the external boot pins, signal names, their direction, associated modules, description, and reset values of the signals. If the signal is input to the device, the module is the destination module for the signal. If the signal is an output from the device, the module is the source module of the signal.

Table 3-22. External Boot Signals

| Pin | Signal | I/O ⁽¹⁾ | PMFW Module | Description | Module Reset Value |
|-----------|----------|--------------------|-------------|---------------------------------|--------------------|
| sys_boot0 | SYSBOOT0 | I | PRM | System boot configuration pin 0 | Z |
| sys_boot1 | SYSBOOT1 | I | PRM | System boot configuration pin 1 | Z |
| sys_boot2 | SYSBOOT2 | I | PRM | System boot configuration pin 2 | Z |
| sys_boot3 | SYSBOOT3 | I | PRM | System boot configuration pin 3 | Z |
| sys_boot4 | SYSBOOT4 | I | PRM | System boot configuration pin 4 | Z |
| sys_boot5 | SYSBOOT5 | I | PRM | System boot configuration pin 5 | Z |
| sys_boot6 | SYSBOOT6 | I | SCRM | System boot configuration pin 6 | Z |
| sys_boot7 | SYSBOOT7 | I | SCRM | System boot configuration pin 7 | Z |

⁽¹⁾ I = Input; O = Output; I/O = bidirectional

3.3.3 External Reset Signals

The SCRM manages three reset signals:

- Power-on reset input on sys_nrespwron pin
- Power-on reset output on sys_pwron_reset_out pin
- Warm reset on sys_nreswarm pin

sys_nrespwron is asserted at device power up to reset the full logic in the device. The SCRM asserts the sys_pwron_reset_out signal to reset any associated external peripherals.

sys_nreswarm is a bidirectional pin. It can be activated at any time by an external device or an external reset push button action to cause a global warm reset event. The SCRM then holds sys_nreswarm to be driven out and maintained for a limited length of time at the boundary of the device. In this way, the device and its related peripherals are reset together.

The sys_reswarm and sys_nrespwron signals are active low. The sys_pwron_reset_out signal is also active low, and active means that the peripheral is under reset.

[Table 3-23](#) lists the external reset pins, signal names, their direction, associated modules, description and reset values of the signals. If the signal is input to the device, the module is the destination module for the signal. If the signal is an output from the device, the module is the source module of the signal.

Table 3-23. External Reset Signals

| Pin | Signal | I/O ⁽¹⁾ | PMFW Module | Description | Module Reset Value |
|---------------------|-------------------|--------------------|-------------|--|--------------------|
| sys_nreswarm | SYS_WARM_RST | I/O | SCRM | Warm reset input and output | 0 |
| sys_nrespwron | SYS_PWRON_RST_IN | I | SCRM | Power-on reset input | Z |
| sys_pwron_reset_out | SYS_PWRON_RST_OUT | O | SCRM | Power-on reset to external peripherals | 0 |

(1) I = Input; O = Output; I/O = Bidirectional

3.3.4 External Power Control Signals

The power control signals let the PMFW modules control the device voltage levels.

The voltage level of the scalable voltage sources in the external power IC can be scaled by sending commands to the power IC through a PRCM module dedicated I²C interface. The sr_scl and sr_sda are the clock and data pins, respectively, for this I²C interface.

The PRCM module can also command the external power IC to switch the device voltages to off level when the device is in off mode and reactivate them when it wakes up. This is managed through the signal on the sys_pwr_req pin.

Table 3-24 lists the signals, I/Os, and module reset values for the signals to the external power IC.

Table 3-24. Power Control Interface

| Pin | Signal | I/O ⁽¹⁾ | PMFW Module | Description | Module Reset Value |
|-------------|---------|--------------------|-------------|---|--------------------|
| sr_scl | SR_SCL | I/O | PRM | The SmartReflex dedicated I ² C interface clock line | 1 |
| sr_sda | SR_SDA | I/O | PRM | The SmartReflex dedicated I ² C interface data line | 1 |
| sys_pwr_req | PWR_REQ | O | PRM | Power request to external power IC, to exit device off mode. | 1 |

(1) I = Input; O = Output; I/O = bidirectional

3.3.5 External Voltage Inputs

Table 3-25 lists the external voltage sources related to the PRCM module.

NOTE: Table 3-25 highlights only the voltage sources that are either directly managed by the PRCM module or are received by parts of the PRCM module (for example, DPLLs, LDOs, etc.). It does not give the device voltage sources not directly associated with the PRCM module.

Table 3-25. Voltage Sources

| Pin | Signal | Managed by the PRCM | Description |
|----------------|----------------|---------------------|--|
| vdd | VDD_CORE_L | Yes (AVS and DVFS) | Supplies VDD_CORE_L logic voltage domain |
| vdd_mpu | VDD_MPU_L | Yes (AVS and DVFS) | Supplies VDD_MPU_L logic voltage domain |
| vdd_iva_audio | VDD_IVA_L | Yes (AVS and DVFS) | Supplies VDD_IVA_L logic voltage domain (that is, DSP and IVAHD) |
| vdda_dpll_core | VDDA_DPLL_CORE | No (fixed) | DPLL_CORE analog power supply |
| vdda_dpll_mpu | VDDA_DPLL_MPU | No (fixed) | DPLL_MPU analog power supply |
| vdda_dpll_iva | VDDA_DPLL_IVA | No (fixed) | DPLL_IVA analog power supply |
| vdda_dpll_per | VDDA_DPLL_PER | No (fixed) | DPLL_PER analog power supply |

Table 3-25. Voltage Sources (continued)

| Pin | Signal | Managed by the PRCM | Description |
|-------------------------|-------------------------|---------------------|---|
| vdda_dpll_audio | VDDA_DPLL_AUDIO | No (fixed) | DPLL_AUDIO analog power supply |
| vdda_slicer | VDDA_SLICER | No (fixed) | Clock slicer power supply |
| vdd_osc | VDD_OSC | No (fixed) | Clock oscillator core power supply |
| vdda_ldo_sram_mpu | VDDA_LDO_SRAM_MPU | No | Supplies LDO_MPU_M for MPU Cortex-A9 SRAM |
| vdda_ldo_sram_iva_audio | VDDA_LDO_SRAM_IVA_AUDIO | No | Supplies LDO_IVA_M for IVA SRAM |
| vdda_ldo_sram_core | VDDA_LDO_SRAM_CORE | No | Supplies LDO_CORE_M for CORE SRAM |
| vdda_ldo_emu_wkup | VDDA_LDO_EMU_WKUP | No | Supplies LDO_WAKEUP for WAKEUP/EMU logic |
| vdda_bdgp | VDDA_BDGP | No (fixed) | Bandgap supply input |
| vdda_vbldo_mpu | VDDA_VBBLDO_MPU | No | MPU VBB LDO supply input |
| vdda_vbldo_iva_audio | VDDA_VBBLDO_IVA | No | IVA VBB LDO supply input |

3.3.6 External Wake-Up Signals

A pre-wakeup request input goes directly to the PRCM module. It is used to wake up the device before the C2C_WAKEREQ_IN is asserted.

Table 3-26 lists the wake-up signal information.

Table 3-26. Wake-Up Signals

| Pin | Signal | Description |
|-----------|-----------|----------------|
| c2c_pwkup | C2C_PWKUP | C2C pre-wakeup |

3.4 PRCM Subsystem Integration

The internal configuration registers of the power-management modules can be accessed for configuration and control through their respective WKUP_L4 interconnect. In addition to the L4 interconnect, the internal modules interface contains the following interfaces and signals:

- A set of signals for idle/wake-up control for each module
- Clocks and reset signals for the modules
- Power control signals (switches and memories) to the power domains
- Interrupts to the MPU Cortex-A9, MPU Cortex-M3, and DSP INTCs
- Voltage error commands from the SmartReflex modules to the external power IC
- Phase-locked loop (PLL) control commands for recalibration and bypass of the digital phase-locked loops (DPLLs)

Figure 3-18 shows details of the control interface to a generic power domain.

3.4.1 Device Power-Management Layout

The PMFW sees the device split into voltage domains, power domain, and clock domains. Table 3-27 lists the device-level view with modules association to clock domains, power domains, and voltage domains.

Table 3-27. PMFW Device-Level Layout

| Voltage Domain | Power Domain | Clock Domain | Module |
|----------------|---------------|-------------------------------|----------------------|
| LDO_WAKEUP | PD_EMU | CD_EMU | DEBUG |
| | | N/A (the PRCM module itself) | CM1_EMU |
| | PD_WKUP | CD_WKUP | SYSCTRL_PADCONF_WKUP |
| | | | BANDGAP |
| | | | SYSCTRL_GENERAL_WKUP |
| | | | GPIO1 |
| | | | Keyboard |
| | | | SAR_RAM |
| | | | 32KTIMER |
| | | | GPTIMER1 |
| | | | WDTIMER2 |
| | | | L4_WKUP interconnect |
| | | N/A (the PRCM module itself) | PRM |
| | | N/A (the PRCM module itself) | SCRM |
| VDD_CORE_L | PD_ALWON_CORE | CD_L4_ALWON_CORE | SR_CORE |
| | | | SR_IVA |
| | | | SR_MPU |
| | | N/A (the PRCM module itself) | CM1 |
| | | N/A (clock generator) | DPLL_ABE |
| | | N/A (clock generator) | DPLL_CORE |
| | | N/A (clock generator) | DPLL_PER |
| | | N/A (not clocked by the PRCM) | CORTEXM3_WKUPGEN |
| | | N/A (not clocked by the PRCM) | SDMA_WKUPGEN |
| | | N/A (not clocked by the PRCM) | SPINNER |
| | PD_CAM | CD_CAM | Face detect |
| | | | ISS |
| | PD_CORE | CD_L4_CFG | SYSCTRL_PADCONF_CORE |
| | | | SYSCTRL_GENERAL_CORE |
| | | | SPINLOCK |
| | | | L4_CFG interconnect |

Table 3-27. PMFW Device-Level Layout (continued)

| Voltage Domain | Power Domain | Clock Domain | Module |
|----------------|--------------|------------------------------|-----------------------|
| | | | Mailbox |
| | | | SAR_ROM |
| | | CD_EMIF | DDRPHY |
| | | | DLL |
| | | | DMM |
| | | | EMIF1 |
| | | | EMIF2 |
| | | | EMIF_FW |
| | | CD_CORTEXM3 | CORTEXM3 |
| | | CD_L3_2 | GPMC |
| | | | L3_2 interconnect |
| | | | OCMC_RAM |
| | | CD_L3_INSTR | L3_3 interconnect |
| | | | L3_INSTR interconnect |
| | | | OCP_WP1 |
| | | CD_L3_1 | L3_1 interconnect |
| | | CD_C2C | C2C |
| | | | C2C_FW |
| | | CD_DMA | sDMA |
| | | N/A (the PRCM module itself) | CM2 |
| | PD_DSS | CD_DSS | DSS |
| | | | BB2D |
| | PD_SGX | CD_SGX | SGX |
| | PD_L3_INIT | CD_L3_INIT | HSI |
| | | | HSMC1 |
| | | | HSMC2 |
| | | | USBPHY |
| | | | HSUSBHOST |
| | | | HSUSBOTG |
| | | | HSUSBTLL |
| | | N/A (the PRCM module itself) | CM1_USB |
| | | N/A (clock generator) | DPLL_USB |
| | PD_L4_PER | CD_L4_PER | GPTIMER10 |
| | | | GPTIMER11 |
| | | | GPTIMER2 |
| | | | GPTIMER3 |
| | | | GPTIMER4 |
| | | | GPTIMER9 |
| | | | ELM |
| | | | GPIO2 |
| | | | GPIO3 |
| | | | GPIO4 |
| | | | GPIO5 |
| | | | GPIO6 |
| | | | HDQ |
| | | | I2C1 |
| | | | I2C2 |

Table 3-27. PMFW Device-Level Layout (continued)

| Voltage Domain | Power Domain | Clock Domain | Module |
|----------------|--------------|-------------------------------|---------------------|
| | | | I2C3 |
| | | | I2C4 |
| | | | L4_PER interconnect |
| | | | MCBSP4 |
| | | | MCSP11 |
| | | | MCSP12 |
| | | | MCSP13 |
| | | | MCSP14 |
| | | | HSMMC3 |
| | | | HSMMC4 |
| | | | HSMMC5 |
| | | | SLIMBUS2 |
| | | | UART1 |
| | | | UART2 |
| | | | UART3 |
| | | | UART4 |
| | PD_STD_EFUSE | CD_STD_EFUSE | STD_EFUSE |
| VDD_IVA_L | PD_ALWON_DSP | N/A (clock generator) | DPLL_IVA |
| | | N/A (not clocked by the PRCM) | DSP_WKUPGEN |
| | PD_AUDIO | CD_ABE | Audio engine |
| | | | DMIC |
| | | | L4_ABE interconnect |
| | | | MCASP1 |
| | | | MCBSP1 |
| | | | MCBSP2 |
| | | | MCBSP3 |
| | | | MCPDM |
| | | | SLIMBUS1 |
| | | | GPTIMER5 |
| | | | GPTIMER6 |
| | | | GPTIMER7 |
| | | | GPTIMER8 |
| | | | WDTIMER3 |
| | | N/A (the PRCM module itself) | CM1_ABE |
| | PD_IVAHD | CD_IVAHD | IVAHD |
| | | | SL2 |
| | PD_DSP | CD_DSP | DSP |
| VDD_MPU_L | PD_ALWON_MPU | N/A (clock generator) | DPLL_MPU |
| | | N/A (not clocked by the PRCM) | CORTEXA9_MPU_INTC |
| | PD_MPU | CD_CORTEXA9 | CORTEXA9 |

3.4.2 Power-Management Scheme, Reset, and Interrupt Requests

3.4.2.1 Power Domain

Table 3-28 lists the PMFW modules and their associated power domains.

Table 3-28. PMFW Module Power Domains

| PMFW Module | Power Domain |
|-------------|---------------|
| SCRM | PD_WKUP |
| PRM | PD_WKUP |
| CM1 | PD_ALWON_CORE |
| CM2 | PD_CORE |
| SR_MPU | PD_ALWON_CORE |
| SR_IVA | PD_ALWON_CORE |
| SR_CORE | PD_ALWON_CORE |

The PRM part of the PRCM module is in the PD_WKUP power domain, which is continuously active. It is composed of the logic that must be permanently supplied to manage domain power-state transitions and detect wake-up events.

The CM1 part of the PRCM module is in the PD_ALWON_CORE power domain, which is an always-on power domain, while the CM2 part of the PRCM module is in the PD_CORE power domain, which can be activated and deactivated according to the requirements of the executing applications.

3.4.2.2 Resets

The PMFW modules are reset by independent reset signals (see [Table 3-29](#)).

Table 3-29. PMFW Module Reset Signals

| PMFW Module | Reset Signal |
|-------------|--------------------------------------|
| SCRM | SYS_PWRON_RST_IN |
| PRM | SYS_PWRON_RST_IN |
| CM1 | ALWON_CM1_PWRON_RST ALWON_CM1_RST |
| CM2 | CM2_PWRON_RET_RST CM2_RET_RST |
| SR_MPU | ALWON_CORE_RST |
| SR_IVA | ALWON_CORE_RST |
| SR_CORE | ALWON_CORE_RST |

NOTE: See [Section 3.5.3, Reset Sources](#) for details on the reset trigger sources and assertion conditions.

3.4.2.3 Interrupt Requests

The PMFW modules can generate following interrupts listed in [Table 3-30](#).

Table 3-30. PMFW Module Interrupts

| Source PMFW Module | Source Signal Name | Destination Interrupt Controller | Destination Signal Name |
|--------------------|--------------------|----------------------------------|-------------------------|
| PRCM | PRCM_MPU_IRQ | CORTEX-A9_MPU_INTC | MA_IRQ_11 |
| PRCM | PRCM_M3_IRQ | CORTEX-M3_MPU_INTC | MM_IRQ_31 |
| PRCM | PRCM_DSP_IRQ | DSP_INTC | D_IRQ_57 |
| SR_IVA | SR_IVA_IRQ | CORTEX-A9_MPU_INTC | MA_IRQ_102 |
| SR_MPU | SR_MPU_IRQ | CORTEX-A9_MPU_INTC | MA_IRQ_18 |
| SR_CORE | SR_CORE_IRQ | CORTEX-A9_MPU_INTC | MA_IRQ_19 |

3.5 Reset Management Functional Description

3.5.1 Overview

In the device the reset scheme is managed by the following modules:

- SCRM: System-level reset management. It provides correct reset routing and sequencing when one or more devices are stacked together in the same package.
- PRM: Device-level reset management

3.5.1.1 SCRM Reset Management Functional Description

The SCRM handles the device power-on and warm reset pads: sys_nrespwron and sys_nreswarm resets. Its tasks basically consist of:

- Extending reset duration beyond the pad reset release
- Routing the device pad resets to the reset manager in the PRM module

The SCRM is functionally sensitive to the device power-on reset. However, some of the register bits of SCRM registers are reset when a device warm reset occurs.

3.5.1.1.1 Power-On Reset

The SCRM receives the device power-on reset on the sys_nrespwron reset pad of the device. It extends the power-on reset duration to the device PRM module at least until a stable 32-kHz clock can be provided to it. The 32-kHz clock version of the device is active once the SCRM releases the internal power-on reset. The SCRM automatically deasserts the reset.

The SCRM automatically requests the system clock under a power-on reset condition. This mechanism is functionally active on the 32-kHz clock.

The power-on reset can also be asserted through software control. Software must enable the software reset assertion feature by setting the SCRM.[EXTPWONRSTCTRL](#)[0] ENABLE bit and then by setting the SCRM.[EXTPWONRSTCTRL](#)[1] PWRONRST bit to assert the reset.

3.5.1.1.2 Warm Reset

The device warm reset can be received from an external source through:

- warm reset pad sys_nreswarm
- from the device PRM module as a result of internal event
- general core Control Module thermal shutdown output - TSHUT

The SCRM extends the device pad warm reset duration to the device PRM module.

The SCRM routes a warm reset source (that is, sys_nreswarm pad/PRM module) to a warm reset destination (that is, PRM module).

This routing of reset from the device pad to the PRM is enabled and disabled using the SCRM.[EXTWARMRSTCTRL](#) register. It is enabled by default.

The source of a warm reset, for each destination is logged in the corresponding SCRM.[EXTWARMRSTST_REG](#) register. The status of the reset source is logged when the destination reset is released. This is done at 32-kHz clock.

Software must clear the reset status bit.

The general core Control Module thermal shutdown output (TSHUT) can be programmed as a source of a hardware warm reset, which is triggered when the device die temperature crosses a programmable FATAL threshold. For more information about the TSHUT warm reset generation, see section **Thermal Shutdown Functionality Comparators** of the **Control Module** chapter.

3.5.1.2 PRM Reset Management Functional Description

The PRM module manages the resets to all power domains inside the device.

NOTE: The PRM module has no knowledge or control over resets generated locally within a module (for example, through configuration register bit Module name_SYSCONFIG[x] SOFTRESET). Software reset has the same effect on the module logic as a hardware reset.

All PRM reset outputs are asynchronously asserted, while the deassertion is synchronous to the SYS_CLK clock. The reset managers in PRM use this clock for internal stall (delay) counter to delay deassertion of reset when the input reset source is deasserted.

In each power domain, one or more reset domains are defined. A reset domain is defined by a unique reset signal that originates from the reset manager and is connected to one or more modules of the device. All the connected modules of the reset domain are reset simultaneously when the reset signal is asserted. Independent control of these reset domains allows sequencing of the release of resets and ensures a safe reset of the entire power domain.

NOTE: All internal reset signals are active low, except for the DPLL reset signals, which are active high.

3.5.2 General Characteristics of Reset Signals

Reset signals can be categorized based on four criteria:

- Scope: Global or local reset
- Occurrence: Cold or warm reset
- Source type: Software or hardware triggered reset
- Retention type: Retention reset or nonretention reset

3.5.2.1 Scope

A reset signal can be categorized according to its scope (the area of the device affected by the reset):

- Global reset: Affects the entire logic of the device; all modules are reset. Generally, occurs when the device powers up or an abnormal operation is detected (the eFuse bad device is detected, etc.).
- Local reset: Affects one power domain, reset domain, or module. Generally, when a power domain transitions from off mode to active mode, or when a software-reset control bit for a domain is set, only the group of modules within that domain is affected.

3.5.2.2 Occurrence

A reset signal can be categorized depending on when the reset occurs:

- Cold reset: Occurs only on device power up or in certain emulation modes. The cold reset is a global reset that affects every module in the device. It usually corresponds to the initial power-on reset.
- Warm reset: Occurs when the device is in normal operating state. A module may use a warm reset to reset a subset of its logic. This is often done to speed up reset recovery time; that is, the time to transition to a safe operating state, compared to the time required upon receipt of a cold reset. Warm reset events include software-triggered reset per power domain, watchdog time-out, externally triggered and emulation initiated.

Modules that behave differently in cold reset and warm reset have two reset signals: RST and PWRON_RST. These reset signals reconstruct warm reset and cold reset in modules that require them.

The following modules are reset upon global cold reset events and not upon global warm reset events:

- All DPLLs associated with the PRCM
- All eFuses
- EMIF
- Control module – All the module instances in the PD_WKUP power domain

NOTE: For information about the PRCM module registers affected by the global warm reset, see the register description in [Section 3.11](#), *PRCM Register Manual*.

3.5.2.3 Source Type

A reset can be categorized depending on whether it is software-controlled or hardware-triggered:

- Software reset: Triggered by setting a bit in a configuration register of the PRCM module
- Hardware reset: Triggered by a signal from a hardware module inside or outside the PRCM module

3.5.2.4 Retention Type

The Power Domain Manager in PRM controls the assertion of two types of local cold reset sources, retention and nonretention reset. They are identified by the naming convention PowerDomain_DOM_RET_RST and PowerDomain_DOM_RST, respectively.

Upon transitioning a power domain to the ON-ACTIVE power state from the OFF power state:

- Retention type reset source is always asserted.
- Nonretention type reset source is always asserted.

Upon transitioning a power domain to the ON-ACTIVE power state from the RETENTION power state:

- Retention type reset source is never asserted.
- Nonretention type reset source is optionally asserted. The software-selectable option enables the PRM to support two retention mechanisms: CSWRET and OSWRET. Nonretention type reset source has following behavior:
 - It is asserted in-case of power domain state transition from OSWR-RETENTION state.
 - It is not asserted in-case of power domain state transition from CSWR-RETENTION state.

3.5.3 Reset Sources

The reset sources triggering the reset managers in the PRM are listed in this section.

3.5.3.1 Global Reset Sources

[Table 3-31](#) lists the global reset sources of the device. The global reset source signals received by the reset manager trigger the reset of all the device modules. For all hardware reset signals, the source of the reset is identified; for the software reset signals, the reset triggering bit is identified.

Table 3-31. Global Reset Sources

| Type ⁽¹⁾ | Name | Source/Control | Description |
|---------------------|-----------------------|---|--|
| H/C | SYS_PWRON_RST | Received from SCRM through input pin or through software control | The entire device is reset on power up. |
| H/W | SYS_WARMIN_RST | Received from SCRM through input pin or through software control | External hardware warm reset |
| S/C | GLOBAL_COLD_SW_RST | PRCM module. PRM_RSTCTRL[1] RST_GLOBAL_COLD_SW | Global software cold reset |
| S/W | GLOBAL_WARM_SW_RST | PRCM module. PRM_RSTCTRL[0] RST_GLOBAL_WARM_SW | Global software warm reset |
| H/W | VDD_CORE_VOLT_MGR_RST | PRCM | Asserted by the voltage manager FSMs when no response from the power IC is received during wake-up transition from retention or off mode |
| H/W | VDD_IVA_VOLT_MGR_RST | PRCM | |
| H/W | VDD_MPU_VOLT_MGR_RST | PRCM | |
| H/W | ICEPICK_RST | ICEPick module | It is used in emulation mode only. |
| H/W | ICEPICKPOR_RST | ICEPick module | It is used in emulation mode only. |
| H/W | CORTEXA9_WDT_RST | Either WDTIMER2 or MPU_A9 subsystem | It is triggered by a time-out event. |
| H/W | C2C_WARM_RST | C2C module | Global hardware warm reset. |

(1) H = Hardware reset, S = Software reset, C = Cold reset, W = Warm reset

3.5.3.2 Local Reset Sources

In addition to the global reset sources the device can have a number of local reset sources for each power domain. The local reset sources can be cold or warm reset sources. They can be software or hardware triggered. [Table 3-32](#) identifies the possible types of hardware-triggered local cold reset sources. Some power domains may support one or both of these local cold reset sources. The table does not highlight the software-triggered local warm reset sources which are listed in the reset management section of the respective power domains. A local reset source signal received by the reset manager resets only a specific part of the device (for example, some modules/subsystems within the power domain).

Table 3-32. Local Reset Sources

| Type ⁽¹⁾ | Name | Source/Control | Description |
|---------------------|----------------------|----------------|--|
| H/C | Power domain_RET_RST | PRCM | Asserted only for a power domain state transition from OFF to ON-ACTIVE state |
| H/C | Power domain_RST | PRCM | Asserted for any power domain transition from OFF or OSWR-RETENTION state to ON-ACTIVE state |

(1) H = Hardware reset, C = Cold reset

3.5.4 Reset Domains

A power domain may receive power-on reset (PWRON_RST) and/or normal reset (RST) signals. These signals reset nonretention logic and behave as follows:

- On any global or local cold reset, RST and PWRON_RST are asserted.
- On any global or local warm reset, only RST is asserted.

A power domain may receive two additional retention logic reset signals: power-on retention reset (PWRON_RET_RST) and/or retention reset (RET_RST). These signals behave as follows:

- On any global cold reset or wakeup from OFF state to ON-ACTIVE state, RET_RST and PWRON_RET_RST are asserted.
- On any global warm reset, only RET_RST is asserted.
- On wakeup from RETENTION state, these signals are not asserted.

This section presents the trigger sources and attributes for all reset domains of the device. See [Section 3.5.3, Reset Sources](#), for an explanation of each reset trigger source of the device.

[Table 3-33](#) identifies the associated power and reset domains for each module.

Table 3-33. Modules, Power Domains and Reset Domains Association

| Module | Power Domain | Reset Domains |
|------------------|---------------|---------------------------------------|
| CM1 | PD_ALWON_CORE | ALWON_CM1_PWRON_RST, ALWON_CM1_RST |
| DPLL_ABE | PD_ALWON_CORE | ALWON_CORE_PWRON_RST |
| DPLL_CORE | PD_ALWON_CORE | ALWON_CORE_PWRON_RST |
| DPLL_PER | PD_ALWON_CORE | ALWON_CORE_PWRON_RST |
| CORTEXM3_WKUPGEN | PD_ALWON_CORE | None |
| SDMA_WKUPGEN | PD_ALWON_CORE | None |
| SR_CORE | PD_ALWON_CORE | ALWON_CORE_RST |
| SR_IVA | PD_ALWON_CORE | ALWON_CORE_RST |
| SR_MPU | PD_ALWON_CORE | ALWON_CORE_RST |
| SPINNER | PD_ALWON_CORE | None |
| DPLL_IVA | PD_ALWON_DSP | DPLL_IVA_PWRON_RST |
| DSP_WKUPGEN | PD_ALWON_DSP | ALWON_IVA_RST |

Table 3-33. Modules, Power Domains and Reset Domains Association (continued)

| Module | Power Domain | Reset Domains |
|-----------------------|--------------|--|
| DPLL_MPU | PD_ALWON_MPU | DPLL_MPU_PWRON_RST |
| CORTEXA9_MPU_INTC | PD_ALWON_MPU | ALWON_MPU_RST |
| AUDIO ENGINE | PD_AUDIO | AUDIO_RST |
| CM1_ABE | PD_AUDIO | AUDIO_PWRON_RST |
| DMIC | PD_AUDIO | AUDIO_RST |
| L4_ABE interconnect | PD_AUDIO | AUDIO_RST |
| MCASP1 | PD_AUDIO | AUDIO_RST |
| MCBSP1 | PD_AUDIO | AUDIO_RST |
| MCBSP2 | PD_AUDIO | AUDIO_RST |
| MCBSP3 | PD_AUDIO | AUDIO_RST |
| MCPDM | PD_AUDIO | AUDIO_RST |
| SLIMBUS1 | PD_AUDIO | AUDIO_RST |
| GPTIMER5 | PD_AUDIO | AUDIO_RST |
| GPTIMER6 | PD_AUDIO | AUDIO_RST |
| GPTIMER7 | PD_AUDIO | AUDIO_RST |
| GPTIMER8 | PD_AUDIO | AUDIO_RST |
| WDTIMER3 | PD_AUDIO | AUDIO_RST |
| FACE DETECT | PD_CAM | CAM_RST |
| ISS | PD_CAM | CAM_RST |
| SYSCTRL_PADCONF_CORE | PD_CORE | CORE_PWRON_RET_RST |
| CM2 | PD_CORE | CM2_PWRON_RET_RST, CM2_RET_RST |
| DDRPHY | PD_CORE | EMIF_PWRON_RST |
| SYSCTRL_GENERAL_CORE | PD_CORE | CORE_PWRON_RET_RST |
| DLL | PD_CORE | DLL_RST |
| DMM | PD_CORE | CORE_RET_RST, CORE_RST |
| CORTEXM3 | PD_CORE | CORTEXM3_PWRON_RST, CORTEXM3_RET_RST, CORTEXM3_RST1, CORTEXM3_RST2, CORTEXM3_RST3 |
| EMIF1 | PD_CORE | CORE_PWRON_RET_RST |
| EMIF2 | PD_CORE | CORE_PWRON_RET_RST |
| EMIF_FW | PD_CORE | CORE_PWRON_RET_RST, CORE_RST |
| GPMC | PD_CORE | CORE_RET_RST |
| SPINLOCK | PD_CORE | CORE_RET_RST |
| L3_2 interconnect | PD_CORE | CORE_PWRON_RET_RST, CORE_RST |
| L3_3 interconnect | PD_CORE | CORE_PWRON_RET_RST, CORE_RST |
| L3_1 interconnect | PD_CORE | CORE_PWRON_RET_RST, CORE_RST |
| L3_INSTR interconnect | PD_CORE | CORE_RST |
| OCP_WP1 | PD_CORE | CORE_PWRON_RET_RST, CORE_RST |
| L4_CFG interconnect | PD_CORE | CORE_PWRON_RET_RST, CORE_RST |
| Mailbox | PD_CORE | CORE_RET_RST |
| OCMC_RAM | PD_CORE | CORE_RST |
| C2C | PD_CORE | CORE_RET_RST, CORE_RST |
| C2C_FW | PD_CORE | CORE_PWRON_RET_RST, CORE_RST |
| SAR_ROM | PD_CORE | CORE_RST |
| sDMA | PD_CORE | SDMA_RET_RST |
| DSS | PD_DSS | DSS_RET_RST, DSS_RST |
| BB2D | PD_DSS | DSS_RST |

Table 3-33. Modules, Power Domains and Reset Domains Association (continued)

| Module | Power Domain | Reset Domains |
|---------------------|--------------|---|
| CM1_EMU | PD_EMU | EMU_PWRON_RST |
| DEBUG | PD_EMU | EMU_EARLY_PWRON_RST, EMU_PWRON_RST, EMU_RST |
| SGX | PD_SGX | SGX_RST |
| IWAHD | PD_IWAHD | IWAHD_PWRON_RST, IWAHD_RST, IWAHD_SEQ1_RST, IWAHD_SEQ2_RST |
| SL2 | PD_IWAHD | IWAHD_RST |
| CM1_USB | PD_L3_INIT | L3_INIT_PWRON_RST |
| DPLL_USB | PD_L3_INIT | DPLL_L3_INIT_PWRON_RET_RST |
| HSI | PD_L3_INIT | L3_INIT_RET_RST |
| HSMMC1 | PD_L3_INIT | L3_INIT_RET_RST |
| HSMMC2 | PD_L3_INIT | L3_INIT_RET_RST |
| USBPHY | PD_L3_INIT | L3_INIT_RST |
| HSUSBHOST | PD_L3_INIT | L3_INIT_RET_RST |
| HSUSBOTG | PD_L3_INIT | L3_INIT_RET_RST |
| HSUSBTLL | PD_L3_INIT | L3_INIT_RET_RST |
| GPTIMER10 | PD_L4_PER | L4_PER_RST |
| GPTIMER11 | PD_L4_PER | L4_PER_RST |
| GPTIMER2 | PD_L4_PER | L4_PER_RST |
| GPTIMER3 | PD_L4_PER | L4_PER_RST |
| GPTIMER4 | PD_L4_PER | L4_PER_RST |
| GPTIMER9 | PD_L4_PER | L4_PER_RST |
| ELM | PD_L4_PER | L4_PER_RST |
| GPIO2 | PD_L4_PER | L4_PER_RET_RST |
| GPIO3 | PD_L4_PER | L4_PER_RET_RST |
| GPIO4 | PD_L4_PER | L4_PER_RET_RST |
| GPIO5 | PD_L4_PER | L4_PER_RET_RST |
| GPIO6 | PD_L4_PER | L4_PER_RET_RST |
| HDQ | PD_L4_PER | L4_PER_RST |
| I2C1 | PD_L4_PER | L4_PER_RET_RST |
| I2C2 | PD_L4_PER | L4_PER_RST |
| I2C3 | PD_L4_PER | L4_PER_RST |
| I2C4 | PD_L4_PER | L4_PER_RST |
| L4_PER interconnect | PD_L4_PER | L4_PER_PWRON_RET_RST, L4_PER_RST |
| MCBSP4 | PD_L4_PER | L4_PER_RST |
| MCSP11 | PD_L4_PER | L4_PER_RST |
| MCSP12 | PD_L4_PER | L4_PER_RST |
| MCSP13 | PD_L4_PER | L4_PER_RST |
| MCSP14 | PD_L4_PER | L4_PER_RST |
| HSMMC3 | PD_L4_PER | L4_PER_RST |
| HSMMC4 | PD_L4_PER | L4_PER_RST |
| HSMMC5 | PD_L4_PER | L4_PER_RST |
| SLIMBUS2 | PD_L4_PER | L4_PER_RST |
| UART1 | PD_L4_PER | L4_PER_RET_RST |
| UART2 | PD_L4_PER | L4_PER_RET_RST |
| UART3 | PD_L4_PER | L4_PER_RET_RST |
| UART4 | PD_L4_PER | L4_PER_RET_RST |

Table 3-33. Modules, Power Domains and Reset Domains Association (continued)

| Module | Power Domain | Reset Domains |
|----------------------|--------------|---|
| CORTEXA9 | PD_MPU | CORTEXA9_PWRON_RST, CORTEXA9_RST, MPU_MA_RST, MPU_MA_RET_RST, MPU_MA_PWRON_RET_RST |
| STD_EFUSE | PD_STD_EFUSE | STD_EFUSE_PWRON_RST |
| DSP | PD_DSP | DSP_RST, DSP_PWRON_RST, DSP_RET_RST, DSP_SYS_RST |
| SYSCTRL_PADCONF_WKUP | PD_WKUP | WKUP_PWRON_RST |
| BANDGAP | PD_WKUP | WKUP_PWRON_RST |
| SYSCTRL_GENERAL_WKUP | PD_WKUP | WKUP_PWRON_RST |
| GPIO1 | PD_WKUP | WKUP_RST |
| Keyboard | PD_WKUP | WKUP_RST |
| SAR_RAM | PD_WKUP | WKUP_RST |
| 32KTIMER | PD_WKUP | WKUP_RST, WKUP_SYS_PWRON_RST |
| GPTIMER1 | PD_WKUP | WKUP_RST |
| WDTIMER2 | PD_WKUP | WKUP_RST |
| L4_WKUP interconnect | PD_WKUP | WKUP_RST |

Table 3-34 lists the reset sources that trigger the reset domains of the device.

Table 3-34. Reset Sources For the Reset Domains

| Reset Domain | Reset Source | Reset Source Type |
|---------------------|-----------------------|-------------------|
| AUDIO_PWRON_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| AUDIO_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| ALWON_CM1_PWRON_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| ALWON_CM1_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |

Table 3-34. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|----------------------|-----------------------|-------------------|
| ALWON_CORE_PWRON_RST | ICEPICK_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| ALWON_CORE_RST | SYS_PWRON_RST | Global cold |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| ALWON_IVA_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| ALWON_MPU_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| CAM_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |

Table 3-34. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|--------------------|-----------------------|-------------------|
| CM2_PWRON_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| CM2_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| CORE_PWRON_RET_RST | ICEPICK_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| CORE_RET_RST | ICEPICK_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| CORE_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| | ICEPICK_RST | Global warm |
| DLL_RST | DLL_FREQCHANGE_RST | Local Warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |

Table 3-34. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|----------------------------|--------------------------|-------------------|
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| DPLL_IVA_PWRON_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| DPLL_L3_INIT_PWRON_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| DPLL_MPU_PWRON_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| DSS_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| DSS_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| CORTEXM3_PWRON_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| CORTEXM3_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_CORTEXM3_RSTCTRL_RST3 | Local Warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |

Table 3-34. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|---------------------|--------------------------|-------------------|
| CORTEXM3_RST1 | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| | CORTEXM3_ICECRUSHER1_RST | Local Warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_CORTEXM3_RSTCTRL_RST1 | Local Warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| CORTEXM3_RST2 | CORTEXM3_ICECRUSHER2_RST | Local Warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_CORTEXM3_RSTCTRL_RST2 | Local Warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| CORTEXM3_RST3 | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_CORTEXM3_RSTCTRL_RST3 | Local Warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| EMIF_PWRON_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| EMU_EARLY_PWRON_RST | GLOBAL_COLD_SW_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| EMU_PWRON_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |

Table 3-34. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|-----------------|-----------------------|-------------------|
| EMU_RST | SYS_PWRON_RST | Global cold |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| SGX_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| IVAHD_PWRON_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| IVAHD_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_IVAHD_RSTCTRL_RST3 | Local Warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| IVAHD_SEQ1_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | IVAHD_ICECRUSHER1_RST | Local Warm |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_IVAHD_RSTCTRL_RST1 | Local Warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |

Table 3-34. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|----------------------|-----------------------|-------------------|
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| IVAHD_SEQ2_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | IVAHD_ICECRUSHER2_RST | Local Warm |
| | CORTXA9_WDT_RST | Global warm |
| | RM_IVAHD_RSTCTRL_RST2 | Local Warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| | | |
| L3_INIT_PWRON_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| L3_INIT_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| L3_INIT_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| | | |
| L4_PER_PWRON_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| L4_PER_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |

Table 3-34. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|----------------------|-------------------------|-------------------|
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| L4_PER_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| | | |
| CORTEXA9_PWRON_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| CORTEXA9_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_ICECRUSHER_RST | Local Warm |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| MPU_MA_PWRON_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| MPU_MA_RET_RST | GLOBAL_WARM_SW_RST | Global warm |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_WARMIN_ARST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |

Table 3-34. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|---------------------|-----------------------|-------------------|
| MPU_MA_RST | SYS_PWRON_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_WARMIN_ARST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| SDMA_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SDMA_RESTORE_RST | Local Warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| STD_EFUSE_PWRON_RST | SYS_PWRON_RST | Global cold |
| DSP_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_DSP_RSTCTRL_RST1 | Local Warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | DSP_EMU_RESET_REQ_TR | Local Warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| DSP_PWRON_RST | ICEPICK_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| DSP_RET_RST | ICEPICK_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_DSP_RSTCTRL_RST2 | Local Warm |

Table 3-34. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|--------------------|-----------------------|-------------------|
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| DSP_SYS_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_DSP_RSTCTRL_RST2 | Local Warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| | | |
| WKUP_PWRON_RST | GLOBAL_COLD_SW_RST | Global cold |
| | ICEPICKPOR_RST | Global cold |
| | SYS_PWRON_RST | Global cold |
| WKUP_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | ICEPICK_RST | Global warm |
| WKUP_SYS_PWRON_RST | SYS_PWRON_RST | Global cold |

[Table 3-35](#) lists the attributes of the reset manager associated with the reset domains. The clock to the reset manager, the delay count before release of reset, and the reset release stall conditions for the reset domains are listed. Apart from the identified reset release stall conditions, a universal release stall condition (that is, applicable to all reset signals) is the eFuse scan completion.

Table 3-35. Reset Domains Attributes

| Reset Domain | RM Clock | RM Clock Count | Release Stall Conditions |
|----------------------|----------|----------------|----------------------------------|
| AUDIO_PWRON_RST | SYS_CLK | 0x0 | None |
| AUDIO_RST | SYS_CLK | 0x0 | None |
| ALWON_CM1_PWRON_RST | SYS_CLK | 0x2 | None |
| ALWON_CM1_RST | SYS_CLK | 0x2 | L4_ROOT_CLK clock is not active. |
| ALWON_CORE_PWRON_RST | SYS_CLK | 0x0 | None |

Table 3-35. Reset Domains Attributes (continued)

| Reset Domain | RM Clock | RM Clock Count | Release Stall Conditions |
|----------------------------|----------|---------------------------|---|
| ALWON_CORE_RST | SYS_CLK | 0x0 | None |
| ALWON_IVA_RST | SYS_CLK | 0x0 | None |
| ALWON_MPU_RST | SYS_CLK | 0x0 | MPU_CLK is not active. |
| CAM_RST | SYS_CLK | 0x0 | None |
| CM2_PWRON_RET_RST | SYS_CLK | 0x2 | None |
| CM2_RET_RST | SYS_CLK | 0x2 | L4_ICLK clock is not active. |
| CORE_PWRON_RET_RST | SYS_CLK | 0x0 | None |
| CORE_RET_RST | SYS_CLK | 0x0 | None |
| CORE_RST | SYS_CLK | 0x0 | None |
| DLL_RST | SYS_CLK | 0x3 | None |
| DPLL_IVA_PWRON_RST | SYS_CLK | 0x0 | None |
| DPLL_L3_INIT_PWRON_RET_RST | SYS_CLK | 0x0 | None |
| DPLL_MPU_PWRON_RST | SYS_CLK | 0x0 | None |
| DSS_RET_RST | SYS_CLK | 0x0 | None |
| DSS_RST | SYS_CLK | 0x0 | None |
| CORTEXM3_PWRON_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | MPU_M3_CLK clock is not active, RM_MPU_M3_RSTCTRL[2] RST3 is cleared, and automatic restore is complete. |
| CORTEXM3_RET_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | MPU_M3_CLK clock is not active and subsystem is reset. |
| CORTEXM3_RST1 | SYS_CLK | ResetTime2 ⁽¹⁾ | MPU_M3_CLK clock is not active and subsystem is reset. |
| CORTEXM3_RST2 | SYS_CLK | ResetTime2 ⁽¹⁾ | MPU_M3_CLK clock is not active. |
| CORTEXM3_RST3 | SYS_CLK | ResetTime2 ⁽¹⁾ | MPU_M3_CLK clock is not active and subsystem is reset. |
| EMIF_PWRON_RST | SYS_CLK | 0x0 | None |
| EMU_EARLY_PWRON_RST | SYS_CLK | 0x2 | None |
| EMU_PWRON_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | EMU_SYS_CLK clock is not active. |
| EMU_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | EMU_SYS_CLK clock is not active. |
| SGX_RST | SYS_CLK | 0x0 | None |
| IVAHD_PWRON_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | IVAHD_ROOT_CLK clock is not active and RM_IVAHD_RSTCTRL[2] RST3 is cleared. |
| IVAHD_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | IVAHD_ROOT_CLK clock is not active. |
| IVAHD_SEQ1_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | IVAHD_ROOT_CLK clock is not active and IVAHD and SL2 are not idle. |
| IVAHD_SEQ2_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | IVAHD_ROOT_CLK clock is not active and IVAHD and SL2 are not idle. |
| L3_INIT_PWRON_RST | SYS_CLK | 0x0 | None |
| L3_INIT_RET_RST | SYS_CLK | 0x0 | None |
| L3_INIT_RST | SYS_CLK | 0x0 | None |
| L4_PER_PWRON_RET_RST | SYS_CLK | 0x0 | None |
| L4_PER_RET_RST | SYS_CLK | 0x0 | None |

Table 3-35. Reset Domains Attributes (continued)

| Reset Domain | RM Clock | RM Clock Count | Release Stall Conditions |
|---------------------|----------|---------------------------|--|
| L4_PER_RST | SYS_CLK | 0x0 | None |
| CORTEXA9_PWRON_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | MPU_DPLL_CLK clock is not active. |
| CORTEXA9_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | MPU_DPLL_CLK clock is not active, subsystem is reset, and automatic restore is complete. |
| SDMA_RET_RST | SYS_CLK | 0x0 | None |
| STD_EFUSE_PWRON_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | STDEFUSE_SYS_CLK clock is not active and logic voltages are in ON state. |
| DSP_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | DSP_ROOT_CLK clock is not active and subsystem is reset. |
| DSP_PWRON_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | DSP_ROOT_CLK clock is not active, RM_DSP_RSTCTRL [1] RST2 is cleared, and automatic restore is complete. |
| DSP_RET_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | DSP_ROOT_CLK clock is not active and subsystem is reset. |
| DSP_SYS_RST | SYS_CLK | ResetTime2 ⁽¹⁾ | DSP_ROOT_CLK clock is not active and subsystem is reset. |
| WKUP_PWRON_RST | SYS_CLK | 0x0 | None |
| WKUP_RST | SYS_CLK | 0x0 | None |
| WKUP_SYS_PWRON_RST | None | N/A | None |

(1) ResetTime2 is set in the [PRM_RSTTIME](#)[14:10] RSTTIME2 bit field.

NOTE: WKUP_SYS_PWRON_RST is directly connected to SYS_PWRON_RST source reset.

3.5.5 Reset Logging

A reset of the device is logged in two ways. First, dedicated registers in the PRCM module (the RM_Power domain_RSTST) log the reset sources to power domain. Second, the Control Module logs the device reset activity in dedicated registers.

3.5.5.1 PRCM Module Reset Logging Mechanism

The reset status registers RM_power domain_RSTST and RM_RSTST are reset asynchronously on assertion of a global cold reset. However, a reset status bit is always logged when the reset is released to the domain.

For this reason, after the assertion of a global cold reset, the reset status register is cleared to 0. When the domain reset is released, the register bit to log the global cold reset (the RM_Power domain_RSTST[0] GLOBALCOLD_RST bit) is updated to 1. For the same reason, the reset status register of domains released from reset by software is updated only when software releases the domain reset.

The assertion of a global cold reset prevents logging any other source of reset until after the release of the domain reset. This is valid in the following situations:

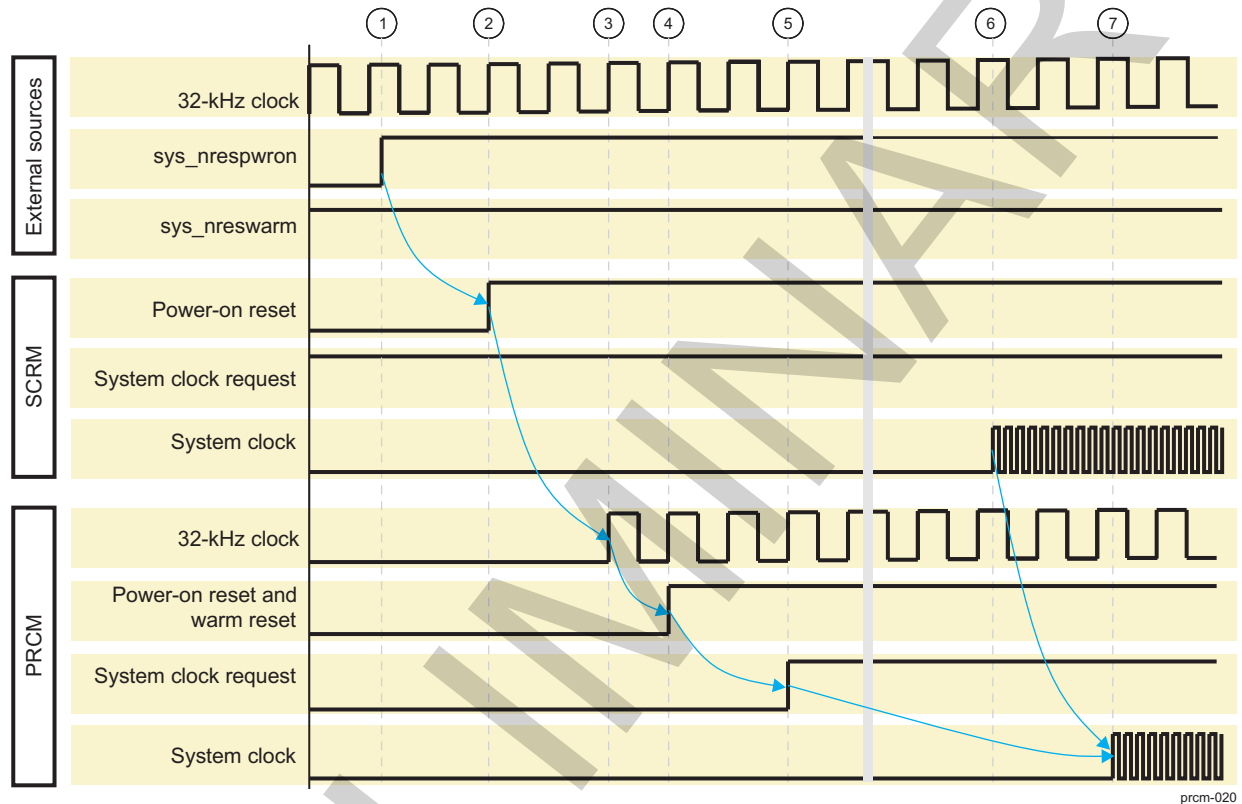
- A source of reset other than global cold reset is asserted before, during, or after the active period of a global cold source of reset and before the release of the domain reset signal.
- A source of reset other than global cold reset was asserted and then released, but a global cold reset source was asserted before the release of the domain reset signal.

3.5.6 Reset Sequences

3.5.6.1 SCRM Power-on Reset Sequence

Figure 3-19 shows the power-on reset sequence as the reset is received by the SCRM and resulting interaction between SCRM and PRCM modules. Figure 3-20 shows the power-on reset sequence within the PRCM module.

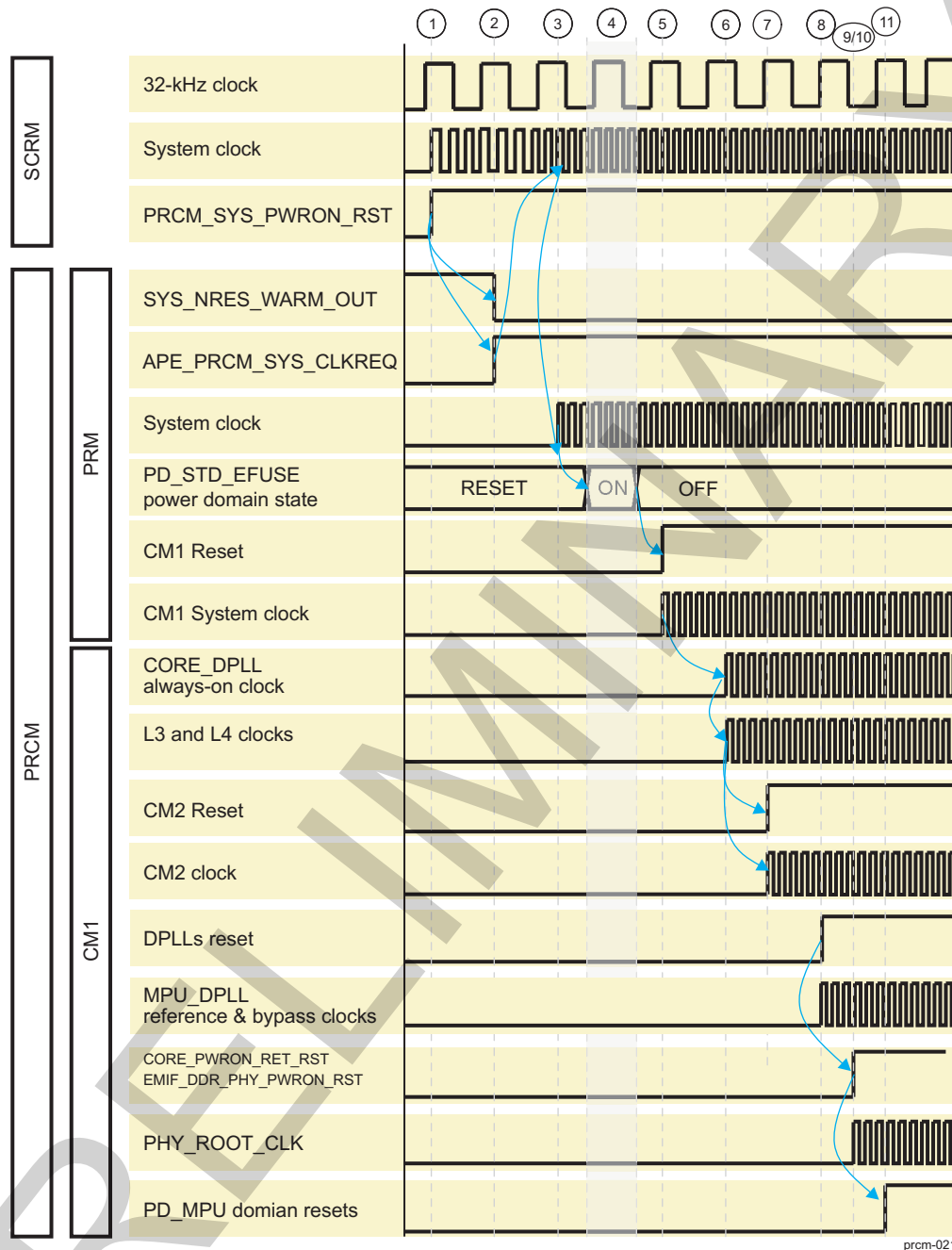
Figure 3-19. SCRM Power-On Reset Sequence



1. The power-on reset pad is released from reset while the 32 kHz is already active.
2. SCRM releases its internal power-on reset clocked at the 32-kHz clock.
3. SCRM delays the release of PRCM module resets to account for the stabilization time of the system clock source. It routes the 32-kHz clock to the PRCM module.
4. SCRM releases from reset (both power-on and warm reset) the PRCM module.
5. The PRCM module asserts a system clock request to the SCRM.
6. Once the system clock setup time counter overflows, the internal system clock version of SCRM is stable.
7. SCRM ungates the system clock to the PRCM module.

3.5.6.2 PRCM Module Power-On Reset Sequence

Figure 3-20 shows the power-on reset sequence.

Figure 3-20. PRCM Module Power-On Reset Sequence

The assumptions are:

- All the logic and memory voltage sources are at their nominal voltage levels.
- The SCRM module is supplying the 32-kHz clock to the PRCM module and the clock is stable.
- The power-on reset SYS_PWRON_RST_IN has been released by the external power IC.

The power-up sequence is:

1. The SCRM releases global power-on reset to the PRCM module (that is, PRCM_SYS_PWRON_RST). As a result, the PRCM module starts the power-on reset sequence.
2. The PRCM module releases the SYS_NRES_WARM_OUT to the SCRM (only after all voltage domains have ramped-up) after some 32-kHz clock cycles, and it also asserts the APE_PRCM_SYS_CLKREQ to the SCRM module to request the system clock.

3. SCRM provides the system clock to the PRCM module when the system clock source is stable.
4. Once the Standard eFuse controller clock has been enabled by the PRCM module, the PRM releases the standard eFuse controller domain from reset. This starts the eFuse sensing sequence. Upon completion of the eFuse auto load sequence, the PRM turns off the Standard eFuse controller clock. It also powers down the standard efuse controller power domain PD_STD_EFUSE.
5. The PRM logic is then released from reset. The PRM provides the CM1 with a version of the system clock and releases the CM1 from reset.
6. The CM1 starts the reference clock (and also bypass clock) of the CORE DPLL. In turn, the CORE DPLL, which is configured in bypass mode, generates the L3 clock (running at the system clock frequency at this stage). Now the CM1 logic is fully operational: CM1 logic is released from reset and L3 clock is running.
7. The CM1 starts the L4 clock version for the CM2 and the PRM deasserts the reset of the CM2.
8. The DPLLs are released from reset. The DPLLs can be released from reset before the L3 clock is running. The DPLL being under reset does not prevent the output clock from running. The CM1 starts the reference and bypass clocks to the DPLL_MPU.
9. The CORE is released from reset, provided the L3 clock is running. The EMIF comes out of reset as soon as CORE power domain power on retention reset (CORE_PWRON_RET_RST, see [Table 3-35](#)) is released by the PRCM module. The PRCM module also releases the EMIF_DDR_PHY_PWRON_RST. The PHY_ROOT_CLK is not running at this point, hence all the PHYs are asynchronously reset at the same time. The DDR_PHY_CLK clock is started later.
10. The PRCM module releases the idle request signal to the EMIF module once the EMIF functional clock is enabled. The EMIF then acknowledges the deassertion of idle request and becomes active.
11. The Cortex-A9 MPU subsystem is released from reset provided its clock is active and the L3 interconnect is operational.

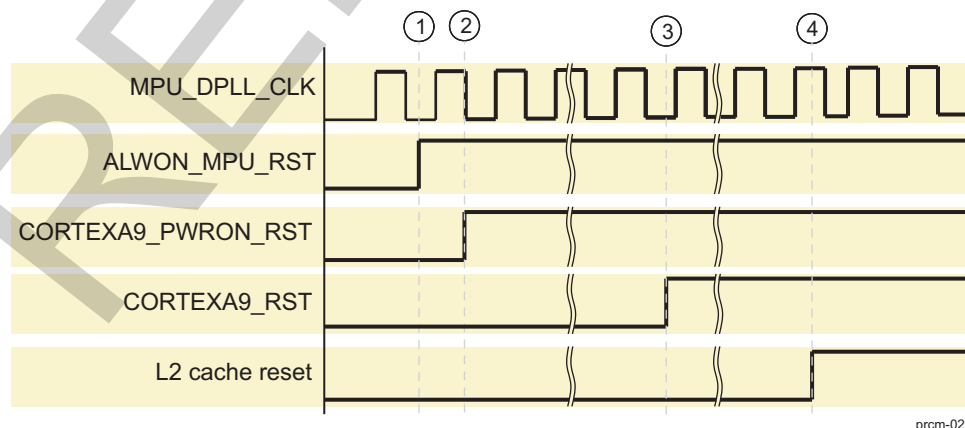
NOTE:

- PD_DSP and PD_IVAHD power domains are held under reset after power up by the assertion of software source of reset.
- PD_DSS, PD_SGX, PD_AUDIO, and PD_CAM are held under reset after power up until the PRCM module enables their interface clock.

3.5.6.3 Cortex-A9 MPU Subsystem Power-On Reset Sequence

[Figure 3-21](#) shows the power-on reset sequence of the Cortex-A9 MPU subsystem.

Figure 3-21. Cortex-A9 MPU Power-On Reset Sequence



The assumptions after power-on reset assertion are:

- The PRCM module provides the DPLL_MPU reference clock and the bypass clock.
- The PRCM module has released DPLL_MPU reset and the DPLL_MPU is in bypass mode providing the clock (that is, bypass clock) to all the modules inside the Cortex-A9 MPU subsystem.

The power-on reset sequence is:

1. The PRCM module releases asynchronously in PD_ALWON_MPU the ALWON_MPU_RST reset to the CORTEXA9_MPU_INTC module inside the Cortex-A9 MPU subsystem.
2. The PRCM module releases in PD_MPU the CORTEXA9_PWRON_RST (only after the MPU_DPLL_CLK is active) to the Cortex-A9 MPU subsystem and waits until the subsystem completes its internal reset sequence.
3. Once the Cortex-A9 MPU subsystem internal reset sequence completes, the PRCM module releases in PD_MPU the CORTEXA9_RST signal and the Cortex-A9 MPU starts booting.
4. The PRCM module releases the reset to L2 cache memory in the Cortex-A9 MPU subsystem 16 MPU_DPLL_CLK cycles after the release of CORTEXA9_PWRON_RST and CORTEXA9_RST.

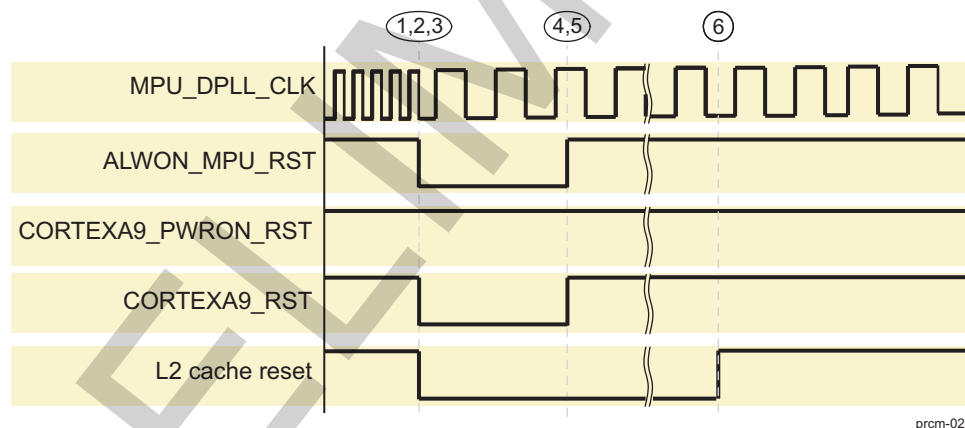
NOTE:

- The reset to the L2 cache memory in the Cortex-A9 MPU subsystem is asserted during initial power-on reset (that is, when the PD_MPU wakes-up from OFF state). It is also asserted during local or global warm reset. However, it is not asserted when the PD_MPU wakes-up from RETENTION state, that is (when the logic is off and L2 memory is in RETENTION state). This ensures that the L2 cache is retained on wake-up.
- The L1 cache memory in the Cortex-A9 MPU subsystem is not retained on PD_MPU wake-up.

3.5.6.4 Cortex-A9 MPU Subsystem Warm Reset Sequence

Figure 3-22 shows the warm reset sequence of the Cortex-A9 MPU subsystem.

Figure 3-22. Cortex-A9 MPU Warm Reset Sequence



The assumptions are:

- The DPLL_MPU is locked and providing the clock to the Cortex-A9 MPU subsystem.
- A global or local warm reset to the Cortex-A9 MPU subsystem is asserted.

The warm reset sequence is:

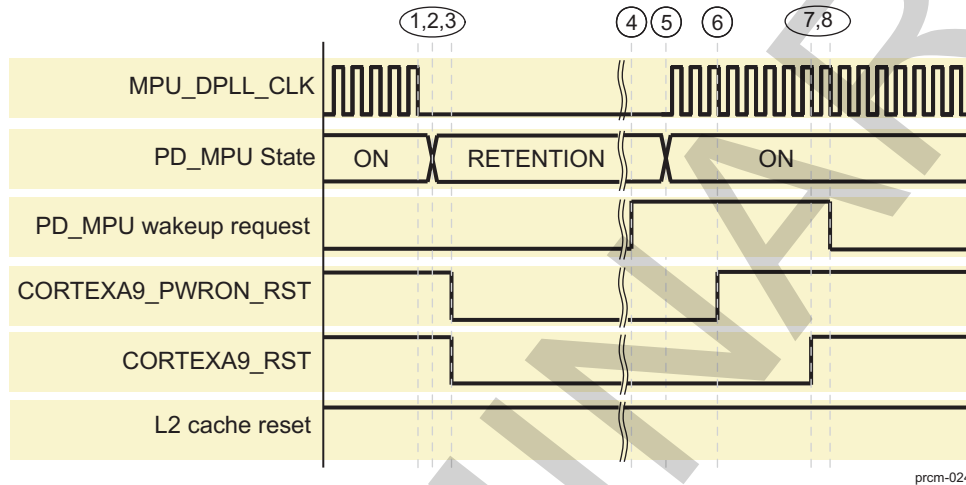
1. The PRCM module asserts in PD_ALWON_MPU the ALWON_MPU_RST reset to the CORTEXA9_MPU_INTC module inside Cortex-A9 MPU subsystem.
2. The PRCM module asserts in PD_MPU the CORTEXA9_RST reset to the Cortex-A9 MPU subsystem.
3. The PRCM module resets the L2 cache memory in the Cortex-A9 MPU subsystem by asserting its reset.
4. The PRCM module releases the ALWON_MPU_RST reset to the CORTEXA9_MPU_INTC module.
5. The PRCM module releases the CORTEXA9_RST, only after the DPLL_MPU is in bypass mode and MPU_DPLL_CLK is stable and active.
6. The PRCM module releases the reset to L2 cache memory in the Cortex-A9 MPU subsystem 16

MPU_DPLL_CLK cycles after the release of CORTEXA9_RST.

3.5.6.5 Cortex-A9 MPU Subsystem Reset Sequence On Sleep and Wake-Up Transitions From RETENTION or OFF State

Figure 3-22 shows the sleep and wake-up transitions reset sequence from RETENTION or OFF state of the Cortex-A9 MPU subsystem.

Figure 3-23. Cortex-A9 MPU Reset Sequence on Sleep and Wake-Up Transition



The assumption is:

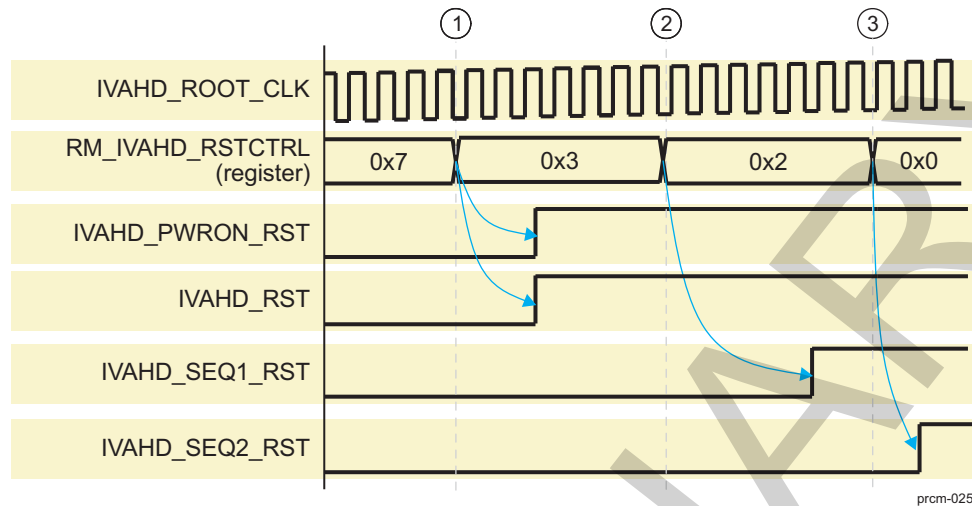
- The DPLL_MPU is locked and providing the clock to the Cortex-A9 MPU subsystem.

The sleep and wake-up transitions reset sequence is:

1. The PRCM module gates the MPU_DPLL_CLK to Cortex-A9 MPU subsystem.
2. The PRCM module switches the PD_MPU to RETENTION state.
3. The PRCM module asserts CORTEXA9_PWRON_RST and CORTEXA9_RST resets to Cortex-A9 MPU subsystem. The entire logic in the PD_MPU is held in reset. The reset to the L2 cache memory in the Cortex-A9 MPU subsystem is not asserted if the logic in the PD_MPU is held in reset.
4. The PRCM module resets the L2 cache memory in the Cortex-A9 MPU subsystem by asserting its reset.
5. The PRCM module releases the ALWON_MPU_RST reset to the CORTEXA9_MPU_INTC module.
6. The PRCM module releases the CORTEXA9_RST, only after the DPLL_MPU is in bypass mode and MPU_DPLL_CLK is stable and active.
7. The PRCM module releases the reset to L2 cache memory in the Cortex-A9 MPU subsystem 16 MPU_DPLL_CLK cycles after the release of CORTEXA9_RST.

3.5.6.6 IVAHD Subsystem Power-On Reset Sequence

Figure 3-24 shows the power-on reset sequence of the IVAHD subsystem.

Figure 3-24. IVAHD Power-On Reset Sequence

The power-on reset to IVAHD is applied when PD_IVAHD is powered. The assumptions after power-on reset assertion are:

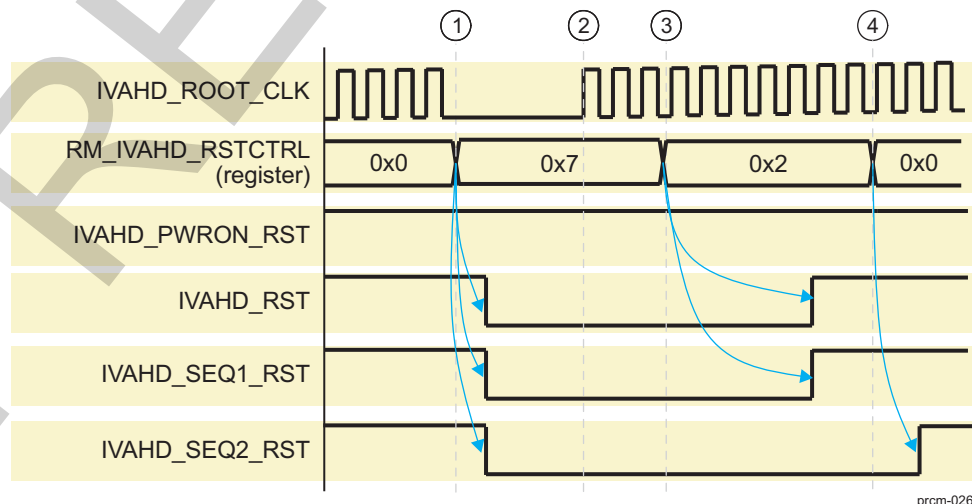
- The PRCM module provides the functional clock IVAHD_ROOT_CLK to the IVAHD subsystem and it has been enabled by the software control.

The power-on reset sequence is:

1. Software clears the [RM_IVAHD_RSTCTRL](#)[2] RST3 bit. This causes the PRCM module to release the IVAHD_PWRON_RST reset used inside IVAHD to reset mainly the emulation logic and the IVAHD_RST reset used to reset all logic inside IVAHD. Then software can download data into TCM memory while keeping the sequencer CPUs under reset.
2. Software clears the [RM_IVAHD_RSTCTRL](#)[0] RST1 bit. This releases the IVAHD_SEQ1_RST reset to the Sequencer1 CPU.
3. Similarly, software can clear the [RM_IVAHD_RSTCTRL](#)[1] RST2 bit. This releases the IVAHD_SEQ2_RST reset to the Sequencer2 CPU.

3.5.6.7 IVAHD Subsystem Software Warm Reset Sequence

[Figure 3-25](#) shows the software warm reset sequence of the IVAHD Subsystem.

Figure 3-25. IVAHD Software Warm Reset Sequence

Before asserting the software reset to the IVAHD subsystem the MPU software must ensure that:

- IVAHD sequencer CPUs are in IDLE state ([CM_IVAHD_IVAHD_CLKCTRL](#)[17:16] IDLEST).
- The IVA HD subsystem is in STANDBY state ([CM_IVAHD_IVAHD_CLKCTRL](#)[18] STBYST).
- The functional clock to the IVAHD subsystem has been gated by the PRCM module ([CM_IVAHD_CLKSTCTRL](#)[8] CLKACTIVITY_IVAHD_CLK).

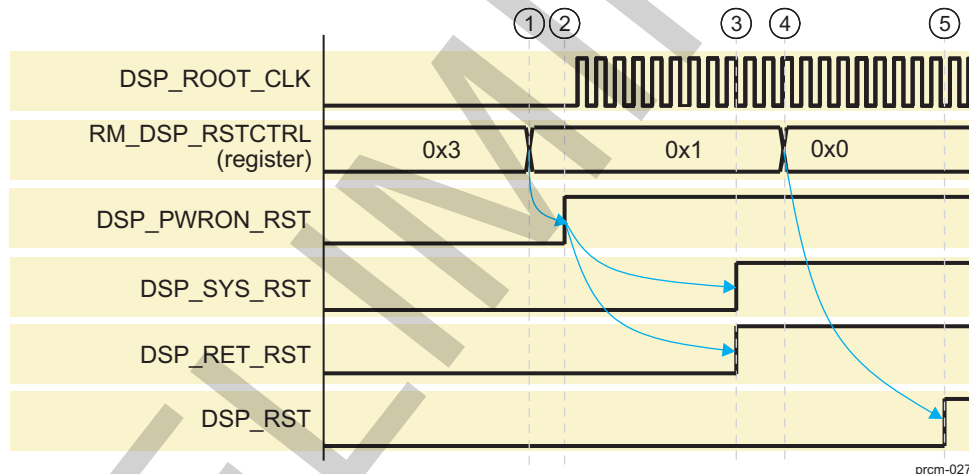
The software reset sequence is:

1. The MPU software sets the [RM_IVAHD_RSTCTRL](#)[2] RST3, [RM_IVAHD_RSTCTRL](#)[1] RST2, and [RM_IVAHD_RSTCTRL](#)[0] RST1 bits. This causes the PRCM module to assert the IVAHD_RST, IVAHD_SEQ1_RST, and IVAHD_SEQ2_RST resets to the IVAHD subsystem. The IVAHD_PWRON_RST remains deasserted.
2. The MPU software enables the functional clock to the IVAHD subsystem.
3. The MPU software clears the [RM_IVAHD_RSTCTRL](#)[2] RST3 and [RM_IVAHD_RSTCTRL](#)[0] RST1 bits. This causes the PRCM module to release the IVAHD_RST and IVAHD_SEQ1_RST resets to the IVAHD subsystem.
4. The MPU software clears the [RM_IVAHD_RSTCTRL](#)[1] RST2 bit. This releases the IVAHD_SEQ2_RST reset to the Sequencer2 CPU.

3.5.6.8 DSP Subsystem Power-On Reset Sequence

[Figure 3-26](#) shows the power-on reset sequence of the DSP subsystem.

Figure 3-26. DSP Subsystem Power-On Reset Sequence



The assumptions on power-on reset assertion are:

- The PD_DSP is on.
- The MPU software sets the [CM_DSP_DSP_CLKCTRL](#)[1:0] MODULEMODE bit field to Auto.
- The MPU software sets the [CM_DSP_CLKSTCTRL](#)[1:0] CLKTRCTRL bit field to SW_WKUP or HW_AUTO.
- The DPLL_IVA is active and providing the DSP_ROOT_CLK. It can be locked prior to this sequence.

The power-on reset sequence is:

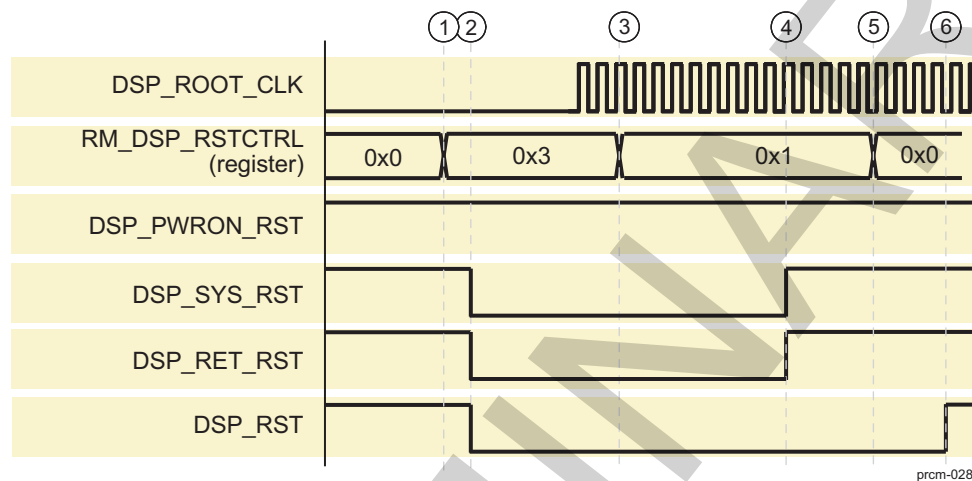
1. The MPU software clears the [RM_DSP_RSTCTRL](#)[1] RST2 bit in the PRCM module register to release from reset the DSP, MMU, and CACHE interface.
2. The PRCM module releases DSP_PWRON_RST once the reset manager counter ([PRM_RSTTIME](#)[14:10] RSTTIME2) has reached its limit. Upon the deassertion of power-on reset signal, the DSP subsystem starts the initialization sequence. During this initialization sequence all the internal registers inside DSP are properly reset and it also completes the reset for DSP, MMU, and CACHE interface.
3. Once the reset sequence of Step 2 completes and the reset manager counter ([PRM_RSTTIME](#)[14:10] RSTTIME2) has expired, the PRCM module releases DSP_SYS_RST and DSP_RET_RST signals.

4. The MPU software must configure the MMU once the MMU is out of reset. After MMU configuration is done, the MPU software clears the [RM_DSP_RSTCTRL\[0\]](#) RST1 bit in the PRCM module register.
5. The PRCM module releases DSP_RST, which causes the DSP to start booting.

3.5.6.9 DSP Subsystem Software Warm Reset Sequence

[Figure 3-27](#) shows the software warm reset sequence of the DSP subsystem.

Figure 3-27. DSP Subsystem Software Warm Reset Sequence



The assumptions on power-on reset assertion are:

- The DSP is in IDLE state.
- The DSP_ROOT_CLK is gated.

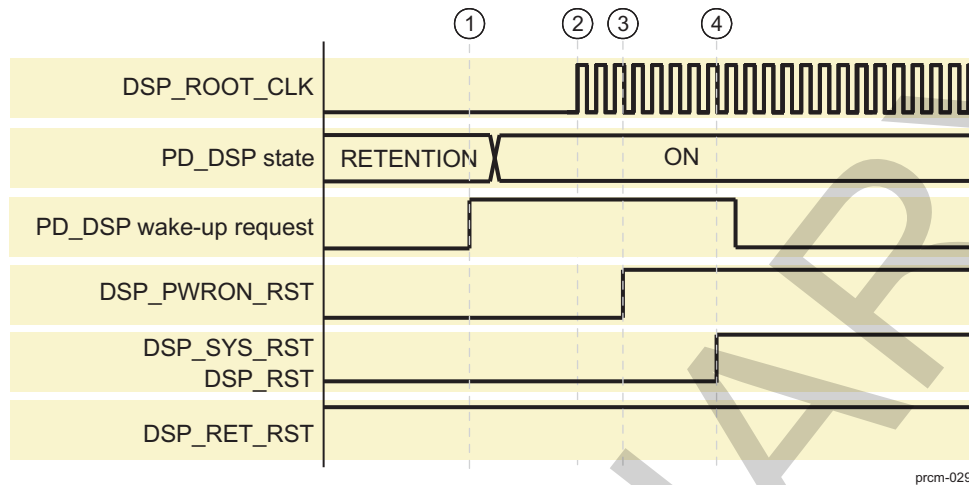
The power-on reset sequence is:

1. The MPU software sets the [RM_DSP_RSTCTRL\[1\]](#) RST2 and [RM_DSP_RSTCTRL\[0\]](#) RST1 bits.
2. The PRCM module asserts the DSP_SYS_RST, DSP_RET_RST, and DSP_RST reset signals. DSP_PWRON_RST remains deasserted in this case.
3. The MPU software re-enables the DSP_ROOT_CLK and clears the [RM_DSP_RSTCTRL\[1\]](#) RST2 bit in the PRCM module register to reset DSP, MMU, and CACHE interface. The DSP subsystem starts the partial initialization sequence for the warm reset.
4. Once the reset sequence of Step 3 completes and the reset manager counter ([PRM_RSTTIME\[14:10\]](#) RSTTIME2) has expired, the PRCM module releases the DSP_SYS_RST and DSP_RET_RST signals.
5. The MPU software clears the [RM_DSP_RSTCTRL\[0\]](#) RST1 bit in the PRCM module register.
6. The PRCM module releases DSP_RST, which causes the DSP to start booting.

3.5.6.10 DSP Subsystem Reset Sequence On Wake-Up Transitions From OSWR RETENTION State

[Figure 3-28](#) shows the reset sequence of the DSP subsystem on wake-up transitions from OSWR RETENTION state.

Figure 3-28. DSP Subsystem Reset Sequence On Wake-Up Transitions From OSWR RETENTION State



The assumptions on power-on reset assertion are:

- The DSP is in INACTIVE state.
- The DSP_ROOT_CLK is gated.
- The PD_DSP is in OSWR RETENTION state.
- The DSP_PWRON_RST, DSP_SYS_RST, and DSP_RST resets are held asserted, while DSP_RET_RST is not asserted by the PRCM module.

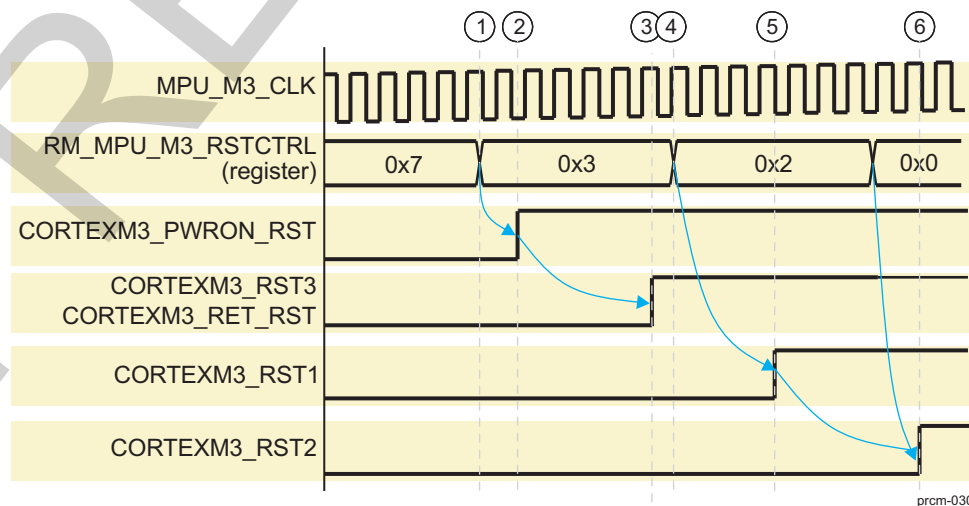
The power-on reset sequence is:

1. A wake-up request is received by the PRCM module and it switches the PD_DSP to ON state
2. The PRCM module then enables the DSP_ROOT_CLK and switches the CD_DSP to ACTIVE state.
3. The PRCM module releases DSP_PWRON_RST once the reset manager counter (PRM_RSTTIME[14:10] RSTTIME2) has reached its limit. Upon the deassertion of the power-on reset signal, the DSP subsystem starts the initialization sequence.
4. Once the reset sequence of Step 3 completes the PRCM module releases the DSP_SYS_RST and DSP_RST signals.

3.5.6.11 Cortex-M3 MPU Subsystem Power-On Reset Sequence

Figure 3-29 shows the power-on reset sequence of the Cortex-M3 MPU subsystem.

Figure 3-29. Cortex-M3 MPU Power-On Reset Sequence



The assumptions on power-on reset assertion are:

- The Cortex-M3 MPU subsystem is held in reset by the PRCM module and the CORTEXM3_PWRON_RST, CORTEXM3_RET_RST, CORTEXM3_RST1, CORTEXM3_RST2, and CORTEXM3_RST3 are asserted.

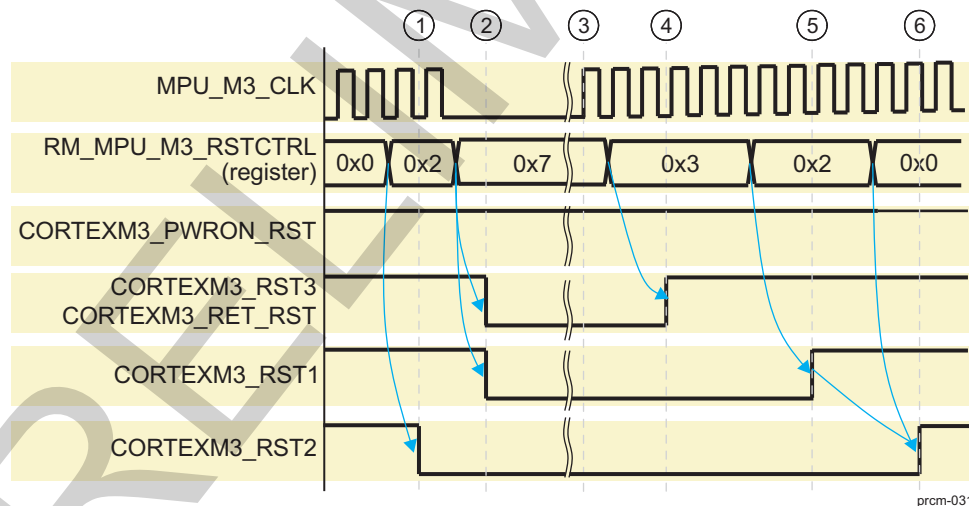
The power-on reset sequence is:

1. Software clears the [RM_MPU_M3_RSTCTRL\[2\]](#) RST3 bit in the PRCM module register to release from reset the MPU M3 Cache and MMU.
2. The PRCM module releases CORTEXM3_PWRON_RST once the reset manager counter ([PRM_RSTTIME\[14:10\]](#) RSTTIME2) has reached its limit and the MPU_M3_CLK is running. Upon the deassertion of the power-on reset signal, the Cortex-M3 MPU subsystem starts the CPU and MMU initialization sequence.
3. Once the reset sequence of Step 2 completes and the reset manager counter ([PRM_RSTTIME\[14:10\]](#) RSTTIME2) has expired, the PRCM module releases the CORTEXM3_RST3 and CORTEXM3_RET_RST signals.
4. The MPU software must configure the MMU once the MMU is out of reset. After MMU configuration and cache initialization is done, the MPU software clears the [RM_MPU_M3_RSTCTRL\[0\]](#) RST1 bit in the PRCM module register.
5. The PRCM module releases CORTEXM3_RST1, which causes the Cortex-M3 MPU Core 1 to start booting.
6. The MPU software can clear the [RM_MPU_M3_RSTCTRL\[1\]](#) RST2 bit in the PRCM module register so that the PRCM module releases the CORTEXM3_RST2 to the Cortex-M3 MPU Core 2.

3.5.6.12 Cortex-M3 MPU Subsystem Software Warm Reset Sequence

[Figure 3-30](#) shows the software warm reset sequence of the Cortex-M3 MPU subsystem.

Figure 3-30. Cortex-M3 MPU Subsystem Software Warm Reset Sequence



The assumptions on power-on reset assertion are:

- The Cortex-M3 MPU Core 2 is in Idle state.

The power-on reset sequence is:

1. The Cortex-M3 MPU Core 1 software or Cortex-A9 MPU software sets the [RM_MPU_M3_RSTCTRL\[1\]](#) RST2 bit. The PRCM module asserts the CORTEXM3_RST2 reset signal to the Cortex-M3 Core 2.
2. The Cortex-A9 MPU cuts the MPU_M3_CLK and software sets the [RM_MPU_M3_RSTCTRL\[2\]](#) RST3 and [RM_MPU_M3_RSTCTRL\[0\]](#) RST1 bits.
3. The PRCM module asserts the CORTEXM3_RST3, CORTEXM3_RET_RST, and CORTEXM3_RST1 reset signals. The CORTEXM3_PWRON_RST remains deasserted in this case.
4. The MPU software re-enables the MPU_M3_CLK and the initialization sequence starts inside

Cortex-M3 subsystem. Software clears the [RM_MPU_M3_RSTCTRL\[2\]](#) RST3 bit in the PRCM module register.

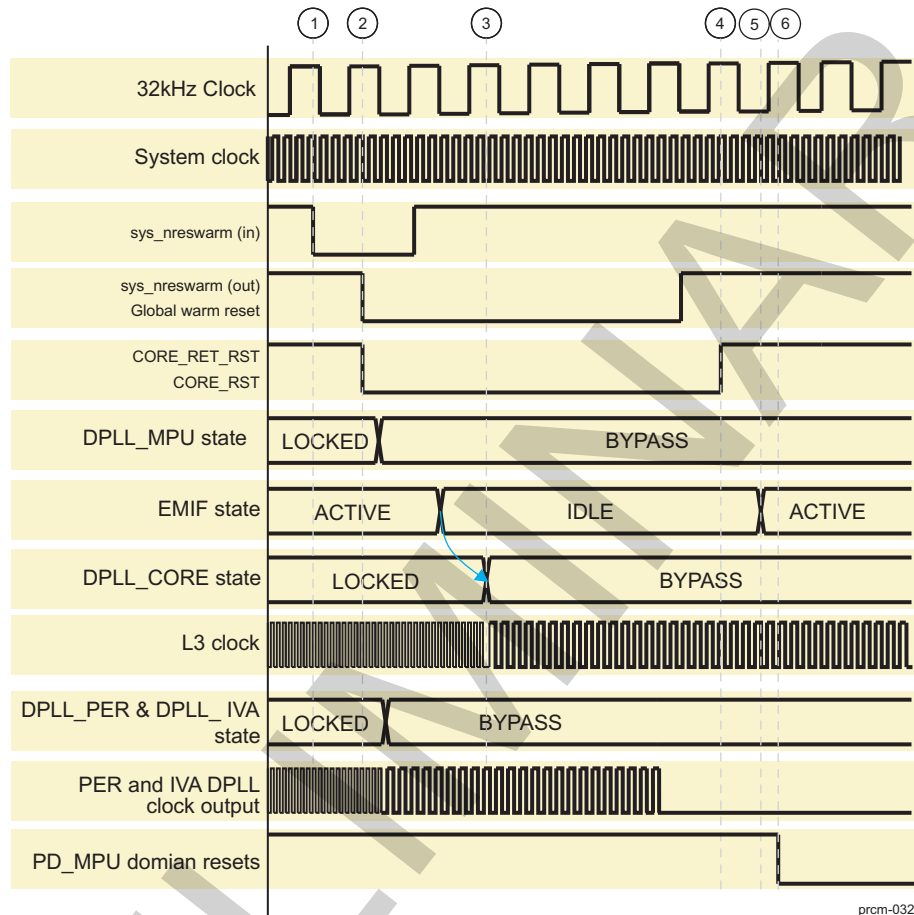
5. Once the reset sequence of Step 4 completes and the reset manager counter ([PRM_RSTTIME\[14:10\]](#) RSTTIME2) has expired, the PRCM module releases CORTEXM3_RST3, CORTEXM3_RET_RST, and CORTEXM3_RST1 reset signals. The Cortex-M3 MPU Core 1 starts rebooting.
6. Software can then clear the [RM_MPU_M3_RSTCTRL\[1\]](#) RST2 bit in the PRCM module register.. The PRCM module releases the CORTEXM3_RST2 reset signal to the Cortex-M3 MPU Core 2 to start booting.

3.5.6.13 Global Warm Reset Sequence

This section describes the global warm reset sequence.

Figure 3-31 shows the global warm reset sequence.

Figure 3-31. Global Warm Reset Sequence



The assumptions are:

- All the logic and memory voltage sources are at their nominal voltage levels.
- The device is active:
 - All resets are released.
 - MPU, CORE, and DSP DPLLs are locked.

The steps of a global warm reset sequence are:

1. On assertion of any global warm reset source the PRM signals the EMIF that a global warm reset event has occurred. The EMIF initiates IDLE state transition. The PRCM module delays global warm reset to the device for minimum 16 L3 clock cycles so that the EMIF switches to IDLE state and switches the external SDRAM memory to self-refresh mode.
2. The reset managers in PRM assert the following resets:
 - The external warm reset SYS_WARM_RST (output) to the SCRM.
 - All power domain warm resets are asserted.
 - DPLL resets are not asserted.
 - DPLL_MPU transitions to bypass mode.
 - DPLL_CORE transitions to bypass mode once the EMIF has switched to IDLE state.
 - DPLL_IVA and DPLL_PER transition to bypass mode.

- DPLL_ABE configuration is not changed.
 - The system clock remains active.
 - The PRM and CM registers, sensitive to warm reset, are asynchronously reset.
 - CM gates the clocks not needed, as per their default reset setting in the associated registers.
3. After the warm reset source is released, the global warm reset and extended until the following conditions are met:
- Device reset manager counter overflows. It is set up by the [PRM_RSTTIME](#)[9:0] RSTTIME1 bit field.
- During this time, the DPLL_ABE control registers are reset and DPLL_ABE transitions to bypass mode when the system clock restarts and the DPLL_ABE outputs are no longer used.
- All logic voltage sources (VDD_IVA, VDD_MPU, and VDD_CORE) are stable.

NOTE: Voltage stabilization is an additional condition if voltage scaling was performed before the assertion of the warm reset.

- 4. The CORE power domain is released from reset (that is, warm reset sensitive modules in the CORE power domain).
- 5. The PRCM module switches the EMIF back to ACTIVE state from IDLE state.
- 6. PD_MPU is released from reset when the clocks to the Cortex-A9 MPU subsystem are active. The Cortex-A9 MPU reboots.

NOTE:

- PD_DSP and PD_IVAHD power domains are held under reset after global warm reset by assertion of the software source of the reset.
 - PD_L4_PER, PD_L3_INIT, PD_DSS, PD_SGX, and PD_CAM are held under reset after global warm reset until the PRCM module enables their interface clock.
 - The reset to the standard eFuse power domain, PD_STD_EFUSE, is not asserted on a global warm reset.
-

3.6 Clock Management Functional Description

3.6.1 Overview

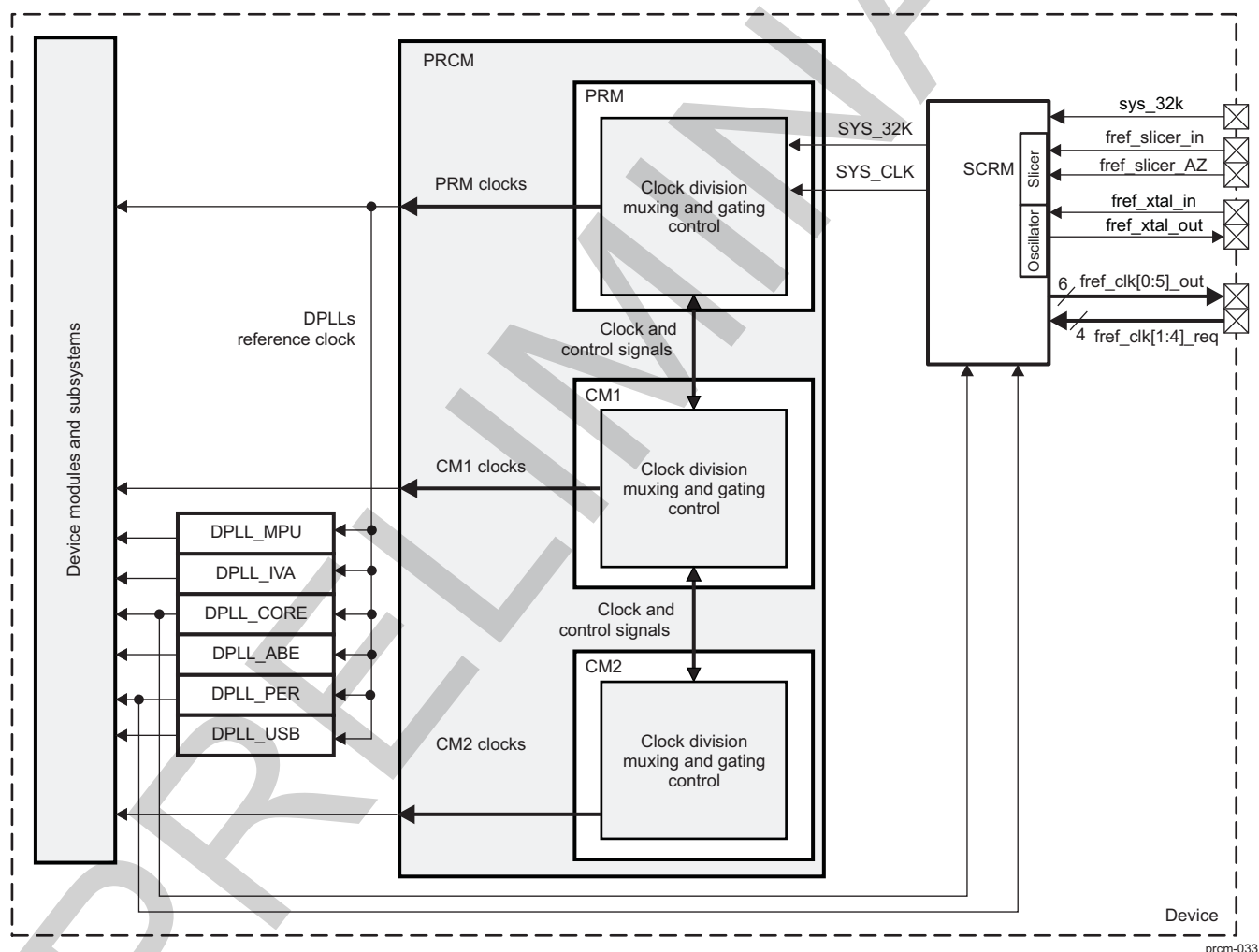
The PRCM module provides control for clock generation, division, distribution, synchronization, and gating. It distributes the clock sources to all modules in the device. See [Section 3.1.1.1, Clock Management](#), for information on the clock-management functional architecture of the device.

The high-frequency system clock is received by the device from an external source or generated within the device (internal oscillator) by the SCRM. The SCRM also receives the 32-kHz low-frequency clock from the external source.

The stable versions of the system and 32-kHz clock are provided by the SCRM to the PRCM module. The PRCM module provides clocks to the internal DPLLs for internal high-frequency clocks generation. Clock division and gating are handled by the PRM, the CM1 and CM2 sections of the PRCM module.

[Figure 3-32](#) shows the high-level clock-management scheme in the device.

Figure 3-32. PRCM Module Clock Manager Overview



prcm-033

3.6.2 External Clock Inputs

3.6.2.1 sys_32k Clock Input

The 32-kHz frequency is used for low-frequency operation (timer, debouncing, etc.). It supplies the wake-up domain for operation in lowest power mode and as clock source to the DPLL_ABE module (for audio back-end [ABE]).

3.6.2.2 High-Frequency System Clock Input

The system clock, SYS_CLK, is the main source clock of the device. SYS_CLK is received directly from the SCRM by the PRM subsection of the PRCM module. It is supplied as the reference clock to the DPLLs as well as functional clock to several modules.

3.6.3 Internal Clock Sources/Generators

The PRCM module clock sources/generators are split into the following parts:

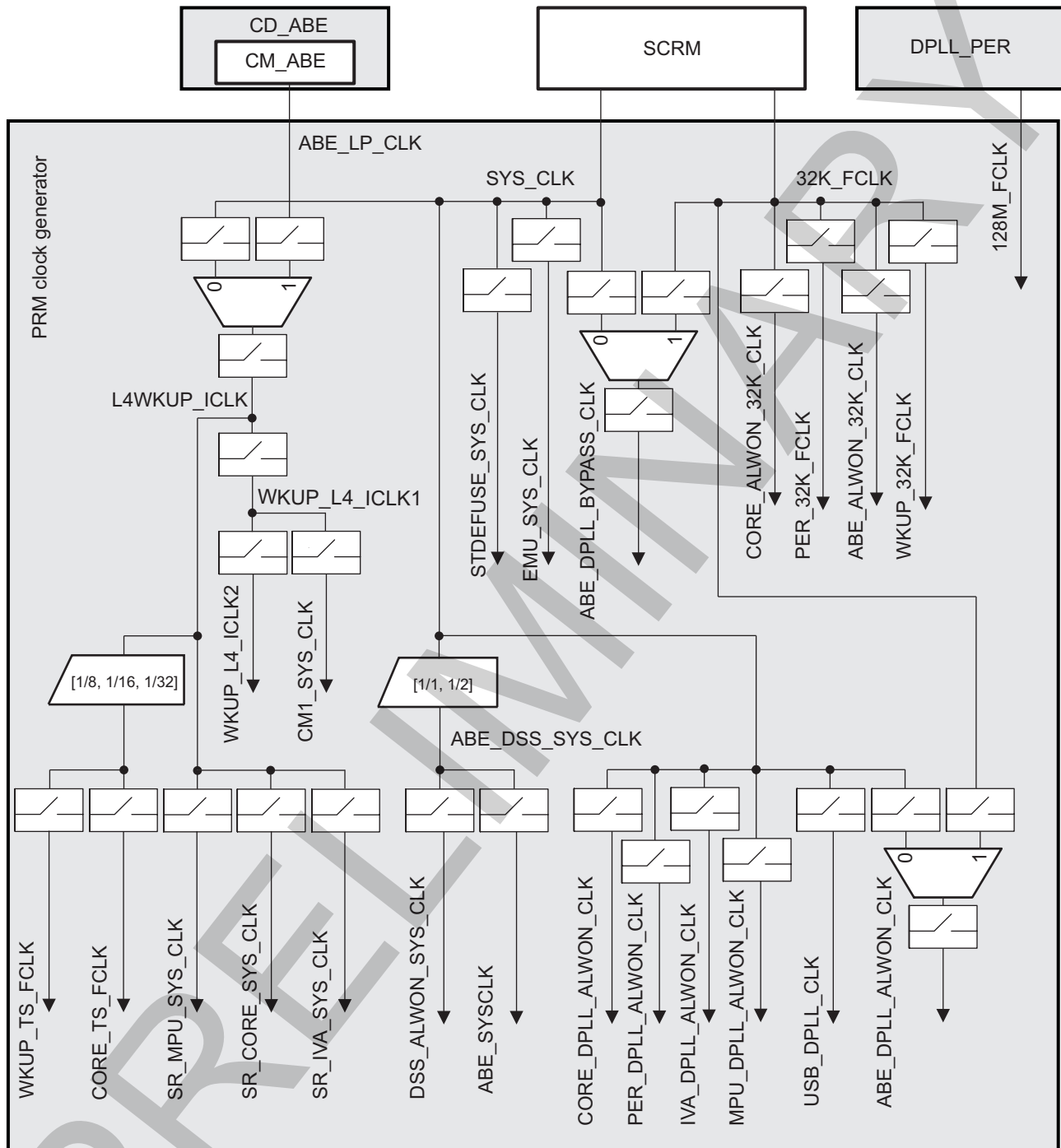
- PRM clock source that receives the 32-kHz and system clocks from SCRM
- CM1 and CM2 clock sources that distribute high-frequency clocks
- DPLL clock generators that synthesize high-frequency clocks for the device

3.6.3.1 PRM Clock Source

The PRM clock source receives the SYS_32K and SYS_CLK clocks from the SCRM. It sources various versions (through gating controls) of these clocks to supply:

- PRCM-managed DPLLs with a reference clock, which is permanently supplied with always-on buffers
- The SR modules with a reference clock, which is permanently supplied with always-on buffers
- The DSS with a reference clock, which is permanently supplied with always-on buffers
- eFuse controller clocks (gated SYS_CLK clock), which are permanently supplied with always-on buffers
- The clocks for CM clock generator and the CORE power domain
- A version of SYS_CLK to ABE supplied by always-on buffers

[Figure 3-33](#) and [Figure 3-34](#) present a logical representation of the PRM clock source.

Figure 3-33. PRM Clock Manager Overview (a)

prcm-034

Figure 3-34. PRM Clock Manager Overview (b)

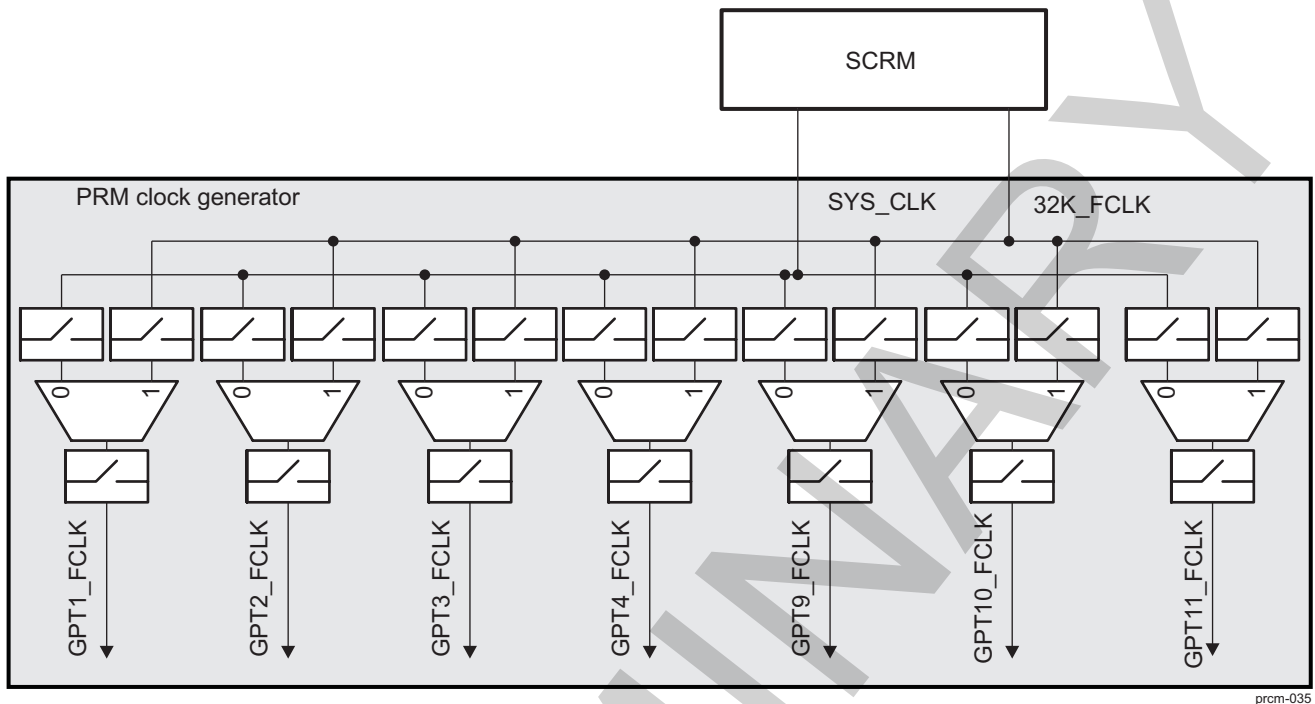


Table 3-36 identifies controls for clock dividers or muxes in the PRM.

Table 3-36. PRM Clock Division and Muxing Control

| Divider/Mux | Control Bit Field |
|------------------------------------|---------------------------------------|
| Mux ABE_DPLL_ALWON_CLK | CM_ABE_PLL_REF_CLKSEL[0] CLKSEL |
| Mux GPT1_FCLK | CM_WKUP_GPTIMER1_CLKCTRL[24] CLKSEL |
| Mux GPT2_FCLK | CM_L4PER_GPTIMER2_CLKCTRL[24] CLKSEL |
| Mux GPT3_FCLK | CM_L4PER_GPTIMER3_CLKCTRL[24] CLKSEL |
| Mux GPT4_FCLK | CM_L4PER_GPTIMER4_CLKCTRL[24] CLKSEL |
| Mux GPT9_FCLK | CM_L4PER_GPTIMER9_CLKCTRL[24] CLKSEL |
| Mux GPT10_FCLK | CM_L4PER_GPTIMER10_CLKCTRL[24] CLKSEL |
| Mux GPT11_FCLK | CM_L4PER_GPTIMER11_CLKCTRL[24] CLKSEL |
| Mux L4WKUP_ICLK | CM_L4_WKUP_CLKSEL[0] CLKSEL |
| Mux ABE_DPLL_BYPASS_CLK | CM_L4_WKUP_CLKSEL[0] CLKSEL |
| Divider WKUP_TS_FCLK, CORE_TS_FCLK | CM_WKUP_BANDGAP_CLKCTRL[25:24] CLKSEL |

NOTE: For clock signals control (gating/ungating management), see [Section 3.1.1.1, Clock Management](#).

PRM provides 32-kHz gated and ungated clock for use by portions of PD_WKUP power domain and some peripherals outside the PD_WKUP power domain.

It also provides the system clock to the display subsystem (DSS), and gated and buffered version to L4WKUP_ICLK interconnect clock, and the DPLLs controlled by the PRCM module. The gated version of the SYS_CLK is also provided to the SmartReflex modules of the device.

3.6.3.2 CM Clock Source

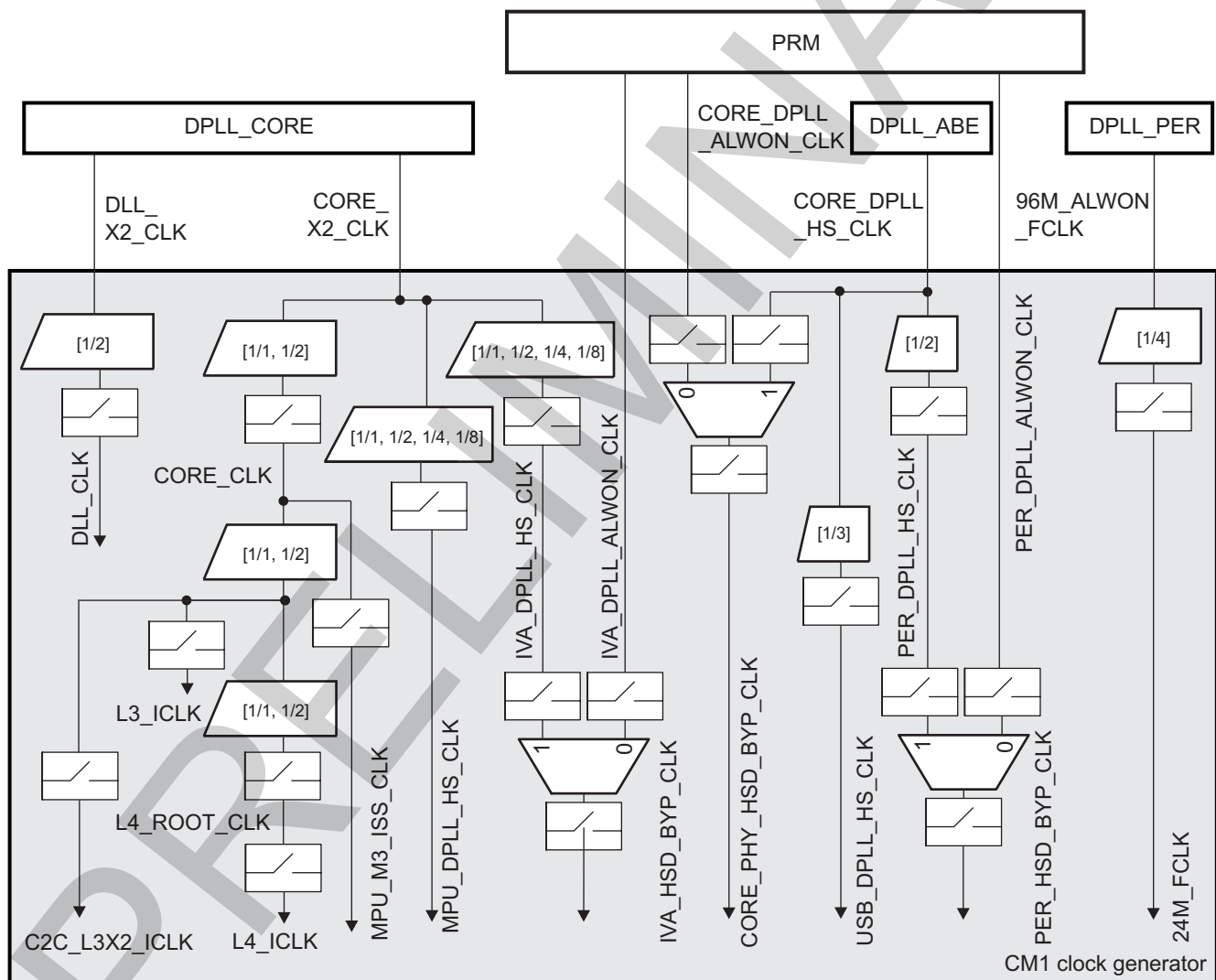
The clock manager (CM) is primarily responsible for generating interface and functional clocks from the internal clocks provided by DPLL_CORE and DPLL_PER. The CM is physically divided into two independent entities, CM1 placed in PD_ALWON_CORE always-on power domain and CM2 placed in PD_CORE switchable power domain. The split is done to provide control over various entities like modules, DPLLs and clocks during low power use case scenarios when the PD_CORE power domain can be switched to RETENTION state.

3.6.3.2.1 CM1 Clock Generator

CM1 receives system clock from the PRM, which serves as its functional clock. CM1 provides gated clock to PD_AUDIO and some DPLLs. It also provides clock to the L3 and L4 interconnects in the device.

Figure 3-35 shows the various functional and interface clocks generated by CM1:

Figure 3-35. CM1 Overview



prcm-036

Table 3-37 identifies controls for clock dividers or muxes in the CM1 clock source.

Table 3-37. CM1 Clock Division and Muxing Control

| Divider/Mux | Control Bit Field |
|--------------------------|--|
| Divider CORE_CLK | CM_CLKSEL_CORE [0] CLKSEL_CORE |
| Divider L3_ICLK | CM_CLKSEL_CORE [4] CLKSEL_L3 |
| Divider L4_ROOT_CLK | CM_CLKSEL_CORE [8] CLKSEL_L4 |
| Divider MPU_DPLL_HS_CLK | CM_BYPCLK_DPLL_MPU [1:0] CLKSEL |
| Divider IVA_DPLL_HS_CLK | CM_BYPCLK_DPLL_IVA [1:0] CLKSEL |
| Mux IVA_HSD_BYP_CLK | CM_CLKSEL_DPLL_IVA [23] DPLL_BYP_CLKSEL |
| Mux PER_HSD_BYP_CLK | CM_CLKSEL_DPLL_PER [23] DPLL_BYP_CLKSEL |
| Mux CORE_PHY_HSD_BYP_CLK | CM_CLKSEL_DPLL_CORE [23] DPLL_BYP_CLKSEL |

NOTE: For clock signals control (gating/ungating management), see [Section 3.1.1.1, Clock Management](#).

3.6.3.2.2 CM1_USB Clock Generator

CM_USB receives system clock from USBPHY and DPLL_USB. It provides gated clock to CD_L3_INIT.

[Figure 3-36](#) shows the various functional and interface clocks generated by CM1_USB:

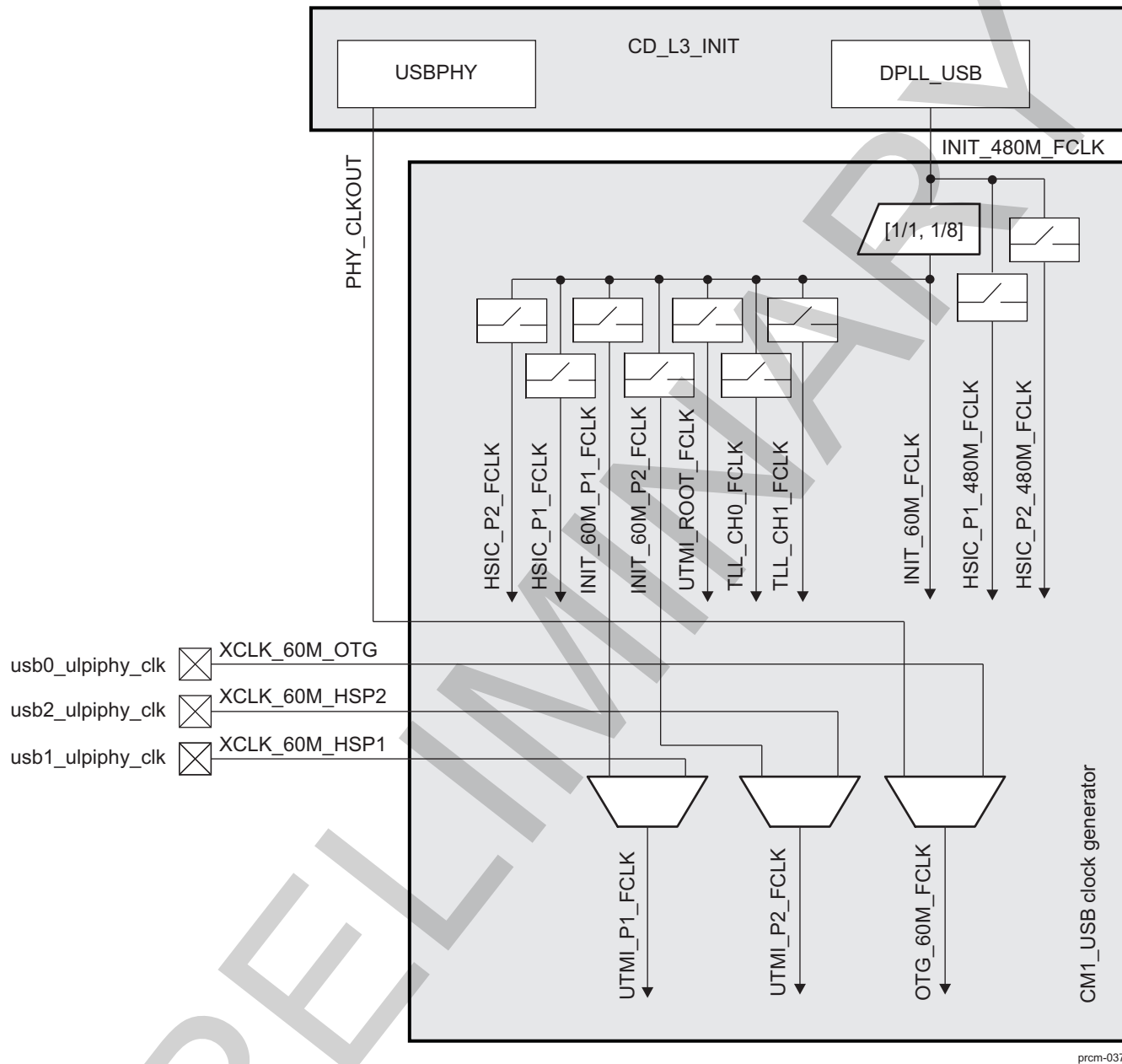
Figure 3-36. CM1_USB Clock Manager Overview

Table 3-38 identifies controls for clock dividers or muxes in the CM1_USB clock source.

Table 3-38. CM1_USB Clock Division and Muxing Control

| Divider/Mux | Control Bit Field |
|-----------------------|--|
| Divider INIT_60M_FCLK | CM_CLKSEL_USB_60MHZ[0] CLKSEL |
| Mux UTMI_P1_FCLK | CM_L3INIT_HSUSBHOST_CLKCTRL[24] CLKSEL_U TMI_ P1 |
| Mux UTMI_P2_FCLK | CM_L3INIT_HSUSBHOST_CLKCTRL[25] CLKSEL_U TMI_ P2 |
| Mux OTG_60M_FCLK | CM_L3INIT_HSUSBOTG_CLKCTRL[24] CLKSEL_6 0M |

NOTE: For the clock status bits see [Table 3-150](#)

NOTE: For clock signals control (gating/ungating management), see [Section 3.1.1.1, Clock Management](#).

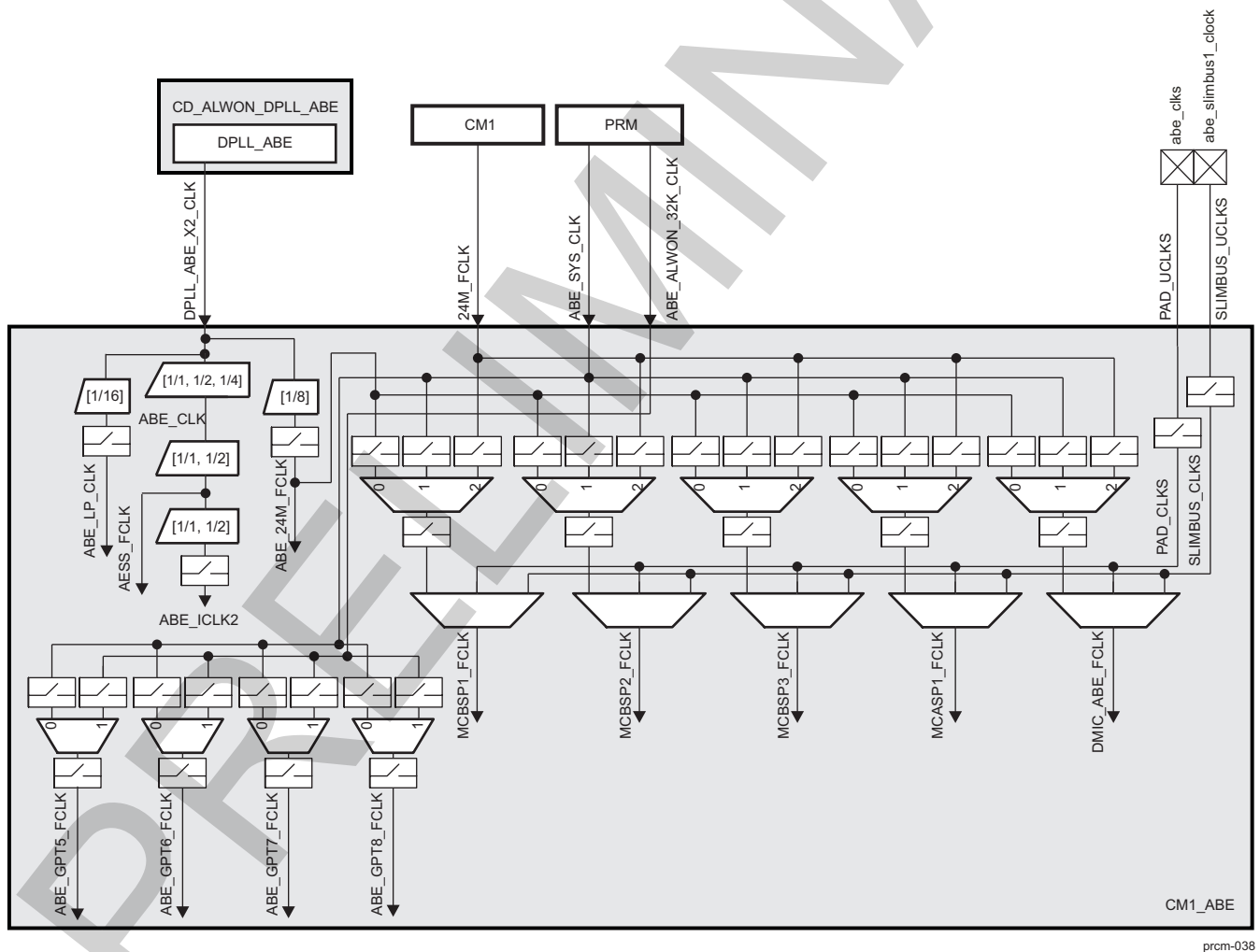
NOTE: For information about the CM1_USB clock signals control and status, see [Section 3.6.9, CD_L3_INIT Clock Domain](#).

3.6.3.2.3 CM1_ABE Clock Generator

CM1_ABE receives system clock from PRM. It provides gated clock to CD_L4_PER.

[Figure 3-37](#) show the various functional and interface clocks generated by CM1_ABE clock source.

Figure 3-37. CM1_ABE Clock Manager Overview



[Table 3-39](#) identifies controls for clock dividers or muxes in the CM1_ABE.

Table 3-39. CM1_ABE Clock Division and Muxing Control

| Divider/Mux | Control Bit Field |
|--|--|
| Clock switch PAD_CLKS | CM_CLKSEL_ABE[8] PAD_CLKS_GATE |
| Clock switch SLIMBUS_CLKS | CM_CLKSEL_ABE[10] SLIMBUS_CLK_GATE |
| Divider ABE_CLK | CM_CLKSEL_ABE[1:0] CLKSEL_OPP |
| Divider AESS_FCLK and ABE_ICLK2 ⁽¹⁾ | CM1_ABE_AESS_CLKCTRL[24] CLKSEL_AESS_FCLK |
| Mux ABE_GPT5_FCLK | CM1_ABE_GPTIMER5_CLKCTRL[24] CLKSEL |
| Mux ABE_GPT6_FCLK | CM1_ABE_GPTIMER6_CLKCTRL[24] CLKSEL |
| Mux ABE_GPT7_FCLK | CM1_ABE_GPTIMER7_CLKCTRL[24] CLKSEL |
| Mux ABE_GPT8_FCLK | CM1_ABE_GPTIMER8_CLKCTRL[24] CLKSEL |
| Mux DMIC_FCLK | CM1_ABE_DMIC_CLKCTRL[25:24] CLKSEL_SOURCE |
| Mux DMIC_INT_FCLK | CM1_ABE_DMIC_CLKCTRL[27:26] CLKSEL_INTERNAL_SOURCE |
| Mux MCASP_INT_FCLK | CM1_ABE_MCASP_CLKCTRL[27:26] CLKSEL_INTERNAL_SOURCE |
| Mux MCASP_FCLK | CM1_ABE_MCASP_CLKCTRL[25:24] CLKSEL_SOURCE |
| Mux MCBSP1_FCLK | CM1_ABE_MCBSP1_CLKCTRL[25:24] CLKSEL_SOURCE |
| Mux MCBSP1_INT_FCLK | CM1_ABE_MCBSP1_CLKCTRL[27:26] CLKSEL_INTERNAL_SOURCE |
| Mux MCBSP2_FCLK | CM1_ABE_MCBSP2_CLKCTRL[25:24] CLKSEL_SOURCE |
| Mux MCBSP2_INT_FCLK | CM1_ABE_MCBSP2_CLKCTRL[27:26] CLKSEL_INTERNAL_SOURCE |
| Mux MCBSP3_FCLK | CM1_ABE_MCBSP3_CLKCTRL[25:24] CLKSEL_SOURCE |
| Mux MCBSP3_INT_FCLK | CM1_ABE_MCBSP3_CLKCTRL[27:26] CLKSEL_INTERNAL_SOURCE |

- (1) ABE_ICLK2 depends on the divider settings of the AESS_FCLK and is always divided by 2 of the ABE_CLK. So when AESS_FCLK divider is set to 1, then ABE_ICLK2 divider is set to 2 and vice versa.

NOTE: For the ABE subsystem, functional clock DPLL_ABE_X2_CLK must be set to 196.608 MHz in DPLL_ABE. ABE_CLK, which is sourced by the DPLL_ABE_X2_CLK, can be configured in the CM_CLKSEL_ABE[1:0] CLKSEL_OPP bit field according to the OPP. AESS_FCLK can be the same as ABE_CLK or ABE_CLK divided by 2, depending on the CM1_ABE_AESS_CLKCTRL[24] CLKSEL_AESS_FCLK bit.

For more information about setting DPLL parameters, see Section [Section 3.6.3.3.1](#).

NOTE: For clock signals control (gating/ungating management), see [Section 3.1.1.1, Clock Management](#).

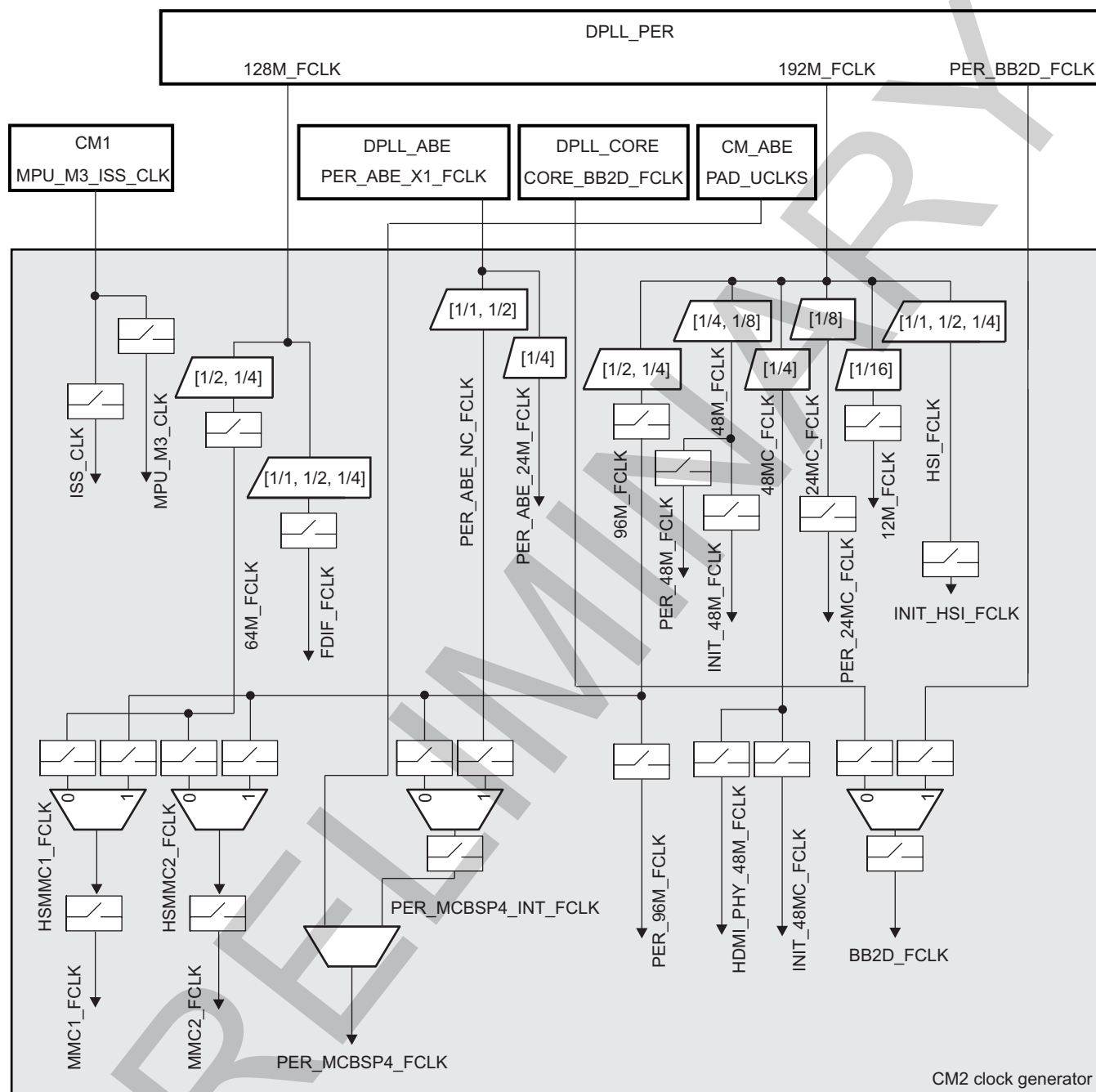
NOTE: For information about the CM1_ABE clock signals control and status, see [Section 3.6.23, CD_ABE Clock Domain](#).

3.6.3.2.4 CM2 Clock Generator

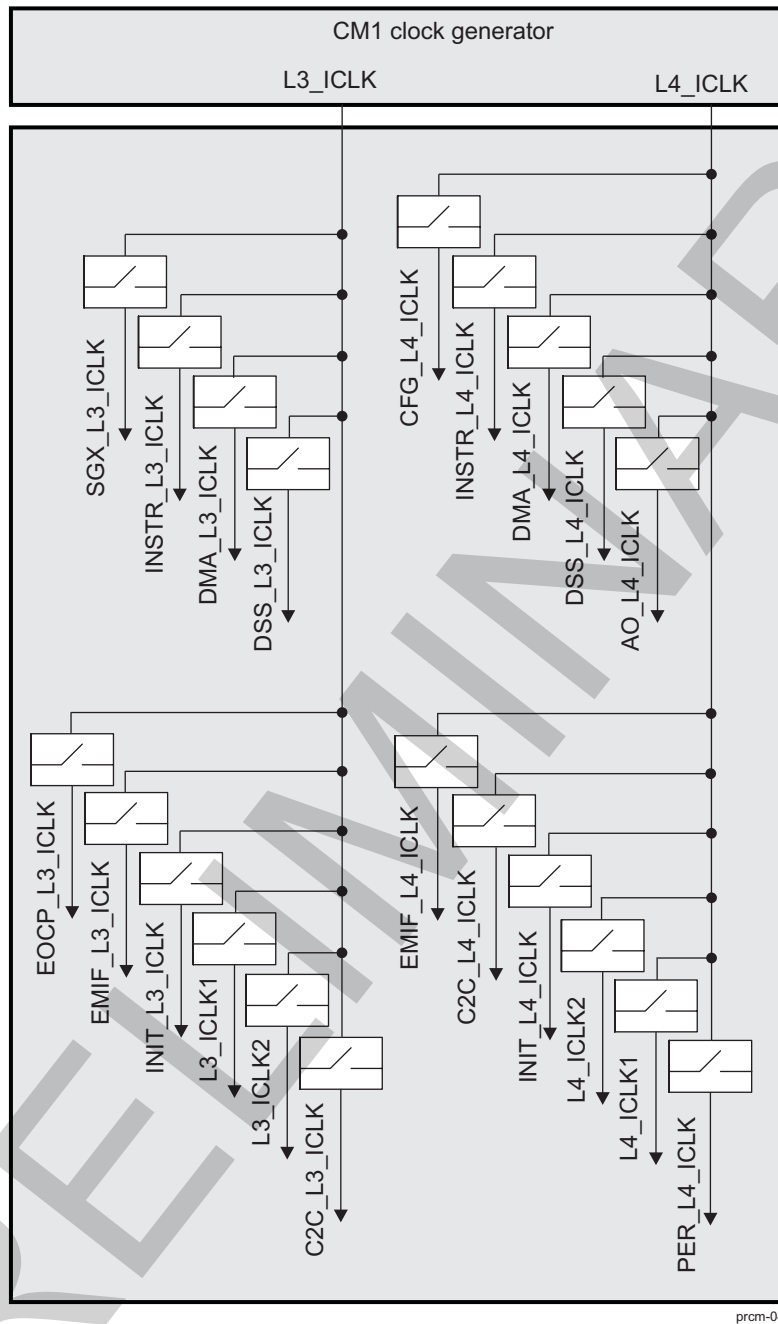
CM2 provides gated functional clocks to various modules of the device.

[Figure 3-38](#) and [Figure 3-39](#) show the various functional and interface clocks generated by CM2:

Figure 3-38. CM2 Overview (a)



prcm-039

Figure 3-39. CM2 Overview (b)

[Table 3-40](#) identifies controls for clock dividers or muxes in the CM2 clock source.

Table 3-40. CM2 Clock Division and Muxing Control

| Divider/Mux | Control Bit Field |
|---------------------|--|
| Divider FDIF_FCLK | CM_CAM_FDIF_CLKCTRL [25:24] CLKSEL_FCLK |
| Divider HSI_FCLK | CM_L3INIT_HSI_CLKCTRL [25:24] CLKSEL |
| Mux HSMMC1_FCLK | CM_L3INIT_HSMMC1_CLKCTRL [24] CLKSEL |
| Mux HSMMC2_FCLK | CM_L3INIT_HSMMC2_CLKCTRL [24] CLKSEL |
| Mux PER_MCBSP4_FCLK | CM_L4PER_MCBSP4_CLKCTRL [24] CLKSEL_SOURCE |

Table 3-40. CM2 Clock Division and Muxing Control (continued)

| Divider/Mux | Control Bit Field |
|--|---|
| Mux PER_MCBSP4_INT_FCLK | CM_L4PER_MCBSP4_CLKCTRL [25] CLKSEL_INTERNAL_SOURCE |
| Mux BB2D_FCLK | CM_DSS_BB2D_CLKCTRL [24] CLKSEL_BB2D_FCLK |
| Divider PER_ABE_NC_FCLK, 96M_FCLK, 64M_FCLK and 48M_FCLK | CM_SCALE_FCLK [0] SCALE_FCLK |

NOTE: For clock signals control (gating/ungating management), see [Section 3.1.1.1, Clock Management](#).

3.6.3.3 Generic DPLL Overview

To generate high-frequency clocks, the device supports multiple on-chip DPLLs controlled directly by the PRCM module. They are of two types, identified as type A and type B DPLLs.

Following DPLLs belong to type A:

- DPLL_MPU
- DPLL_IVA
- DPLL_CORE
- DPLL_PER
- DPLL_ABE

Following DPLL belongs to type B:

- DPLL_USB

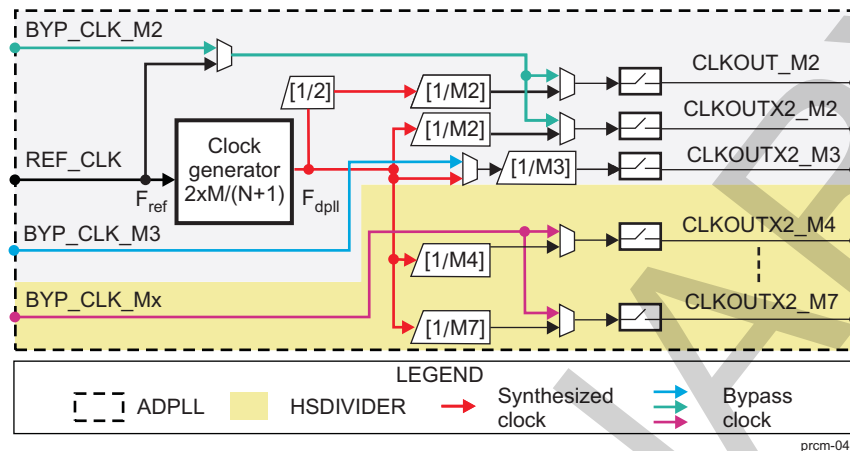
All DPLLs support the features presented in the following sections, unless identified otherwise.

NOTE: This chapter discusses only the DPLLs that are directly controlled by the PRCM module. The other DPLLs embedded in and managed by other subsystems are covered in the description of their respective subsystems. For example, [Chapter 10, Display Subsystem](#), discusses the DPLL in the display subsystem.

3.6.3.3.1 DPLLs Output Clocks Parameters

Figure 3-40 shows the functional architecture of a generic DPLL.

Figure 3-40. Generic DPLL Functional Diagram



The DPLL has three input clocks:

- REF_CLK: used to generate the synthesized clock but can also be used as the bypass clock for two outputs of the DPLL, whenever the DPLL enters a bypass mode. It is mandatory for the DPLL clock synthesis.
- BYP_CLK_M2: Selectable bypass clock for the output of an M2 post-divider (optional).
- BYP_CLK_M3: Selectable bypass clock for the output of an M3 post-divider (optional).

The DPLL can be programmed to be locked at any frequency given by the following equation:

- $F_{dpll} = F_{ref} \times 2 \times M / (N + 1)$ or
- $F_{dpll} = F_{ref} \times 2 \times (4 \times M / (N + 1))$ in case REGM4XEN bit field is set (only applicable to DPLL_ABE).

Where:

- F_{dpll} is the DPLL lock frequency.
- F_{ref} is the REF_CLK frequency.
- M is the software-configured multiplication ratio binary value.
- N is the software-configured division ratio binary value.

It internally generates three main clocks: CLKOUT_M2, CLKOUTX2_M2, and CLKOUTX2_M3 as presented in Table 3-41.

Table 3-41. CLKOUT_M2, CLKOUTX2_M2, and CLKOUTX2_M3 Frequencies With DPLL State

| Output | Equation | DPLL Mode |
|-------------|------------------------------------|------------------------------|
| CLKOUT_M2 | $F_{dpll} / (2 \times M2)$ | Locked |
| | F_{ref} or BYP_CLK_M2 | Before lock or during relock |
| CLKOUTX2_M2 | $F_{dpll} / M2$ | Locked |
| | F_{ref} or BYP_CLK_M2 | Before lock or during relock |
| CLKOUTX2_M3 | $F_{dpll} / M3$ or BYP_CLK_M3 / M3 | Locked |
| | 0 | Before lock or during relock |

Where:

- M2 is the software-configured division ratio binary value.
- M3 is the software-configured division ratio binary value.
- CLKOUT_M2 and CLKOUTX2_M2 bypass clock input can be switched when the DPLL is not in locked state, using the M2 Bypass Clock Select Control bit.

- CLKOUTX2_M3 output clock can be switched when the DPLL is in locked state, using the M3 Clock Select Control bit.

NOTE:

- Zero-value for M2 and M3 division ratios is not allowed. They are set to 1 after reset.
- CLKOUT_M2 is generated based on a fix divide-by-2 ratio, except in bypass mode.

NOTE: The following rules apply for the DPLL internal clock, $F_{int} = CLKINP / (N + 1)$:

- $CLKINP / (N + 1)$ must be between 0.032 and 52 MHz for DPLL_MPU, DPLL_IVA, DPLL_ABE, DPLL_CORE, and DPLL_PER.
- $CLKINP / (N + 1)$ must be between 0.5 and 2.5 MHz for DPLL_USB.

The DPLL may contain an HSDIVIDER module to produce more clocks with divided ratio based on the DPLL synthesized clock frequency. HSDIVIDER provides four extra post-dividers from M4 to M7. The HSDIVIDER output clocks frequency is given by the equations in [Table 3-42](#):

Table 3-42. CLKOUTX2_Mn Frequencies With DPLL State

| Equation | DPLL Mode |
|--------------------------------------|------------------------------|
| $CLKOUTX2_Mn = F_{dpll} / (Mn + 1)$ | Locked |
| $CLKOUTX2_Mn = BYP_CLK_Mx$ | Before lock or during reload |

Where:

- F_{dpll} is the DPLL lock frequency.
- $Mn + 1$ is the software configured division ratio binary value.
- n is in the range from 4 to 7.

NOTE: The $Mn + 1$ division ratio is set to 1 after reset and 31 (0x1f) is an illegal value.

All clock outputs of the DPLL can be gated. The PRCM module provides the DPLL with a clock gating control signal to enable or disable the clock, and the DPLL provides the PRCM module with a clock activity status signal to let the PRCM module hardware know when the clock is effectively running or effectively gated.

The type B DPLL (only DPLL_USB) has two outputs: CLKOUT and CLKDCOLDO. The DPLL can be programmed to be locked with the output clock frequencies given by the following equation:

- $F_{clkout} = F_{ref} \times (M / (N + 1)) \times (1 / M2)$
- $F_{clkdcoldo} = F_{ref} \times (M / (N + 1))$

Where:

- F_{clkout} is the frequency of the clock at output CLKOUT.
- $F_{clkdcoldo}$ is the frequency of the clock at output CLKDCOLDO.
- F_{ref} is the REF_CLK frequency.
- M is the software-configured multiplication ratio binary value.
- N is the software-configured division ratio binary value.
- $M2$ is the software-configured division ratio binary value.

CLKOUT supports the same bypass modes as identified earlier. CLKDCOLDO does not support bypass mode.

3.6.3.3.2 Enable Control, Status, and Low-Power Operation Mode

The DPLL has a Manual Mode Control bit field, which allows the setting of the different operating modes of the DPLL. When the DPLL is switched to lock mode the current values of the multiplication ratio (M) and the division ratio (N) are latched in the DPLL. The DPLL then starts the lock or relock sequence, to synthesize the corresponding output frequency clock.

The status of the synthesized clock output of the DPLL is represented by the CLKOUT status bit. It can be gated or active.

The DPLL can be switched to low-power operation mode (also called LPMODE) to optimize DPLL power consumption when the input and output clock frequencies are low. This mode can be software enabled using the low-power mode control bit of the DPLL.

It must only be enabled if both of the following operating conditions are satisfied:

- $F_{ref}/(N+1)$ is less than or equal to 1 MHz.
- $F_{ref} \times M/(N+1)$ is less than or equal to 100 MHz.

With:

- F_{ref} is the REF_CLK frequency.
- M is the software-configured multiplication ratio binary value.
- N is the software-configured division ratio binary value.

3.6.3.3.3 DPLL Power Modes

DPLL may supports several power modes. Each mode results in a tradeoff between power savings and relock time.

[Table 3-43](#) shows the DPLL power modes.

Table 3-43. DPLL Power Modes

| Power Mode | CLKOUT State | Logic Current (mA) | Analog Current (mA) | Freq Lock Time | Phase Lock Time |
|--------------------|----------------------------|--------------------|---------------------|--------------------------------------|---------------------------------------|
| Low-power stop | Clock stopped | 0.05 (leakage) | 0.001 (leakage) | $1.5 \mu s + (20 \times 1/F_{ref})$ | $1.5 \mu s + (100 \times 1/F_{ref})$ |
| Fast-relock stop | Clock stopped | 0.05 (leakage) | 0.25 (leakage) | $0.05 \mu s + (20 \times 1/F_{ref})$ | $0.05 \mu s + (100 \times 1/F_{ref})$ |
| MN bypass | Bypass clock | 0.05 (leakage) | 0.001 (leakage) | $1.5 \mu s + (350 \times 1/F_{ref})$ | $1.5 \mu s + (500 \times 1/F_{ref})$ |
| Low-power bypass | Bypass clock/Clock stopped | 0.05 (leakage) | 0.001 (leakage) | $1.5 \mu s + (20 \times 1/F_{ref})$ | $1.5 \mu s + (100 \times 1/F_{ref})$ |
| Fast-relock bypass | Bypass clock/Clock stopped | 0.05 (leakage) | 0.25 (leakage) | $0.05 \mu s + (20 \times 1/F_{ref})$ | $0.05 \mu s + (100 \times 1/F_{ref})$ |
| Lock | Synthesized clock | 0.55 (active) | 1.95 (active) | N/A | N/A |

Where:

- F_{ref} is the REF_CLK frequency.

A DPLL power mode can be achieved on a software request (manual) and/or automatically (automatic), depending on the specific hardware conditions.

A DPLL can switch from one mode to the other as a result of the following:

- Software-programmed transition (manual): The software configures the dedicated DPLL Manual Mode Control feature for the next desired DPLL mode. It must ensure that the transition can be performed based on the clock activity on the device.
- Combined software-programmed and hardware-conditions-based transition (auto): This mode allows the DPLL to automatically transition to a low-power state (that is, any state other than MN BYPASS and the LOCK state) when the output clocks are gated or the destination clock domain is inactive. And to switch back to the LOCK state when the output clock is needed (that is, the clock is ungated or the clock domain becomes active). The desired low-power state for the automatic transition is configured in

dedicated Auto Mode Control parameter of the DPLL.

NOTE: With REF_CLK period = $1/\text{Fref} = (N + 1)/\text{CLKINP}$; ($\text{Fref} = \text{CLKINP}/(N + 1)$):

This formula indicates that a smaller N divider value provides a smaller time for switching the clock after an M2 post-divider change.

A compromise is necessary between the clock switching latency and power consumption. Having a smaller N value:

- Requires a higher M2 post-divider value to obtain the same target frequency.
 - Results in a higher DPLL lock frequency, and then higher power consumption.
-

NOTE:

- A manual transition can be performed from any power mode to any other power mode.
 - An automatic transition can be performed from lock mode to any low-power mode, except for the MN bypass mode.
-

3.6.3.3.4 DPLL Recalibration

Each time the DPLL is reset or performs a lock sequence (following a change in multiplier M or divider N value), it performs a recalibration of the output frequency, based on voltage and temperature conditions. In the locked mode the DPLL maintains a steady lock frequency output by compensating for voltage and temperature changes within a certain range. However, if the voltage or temperature drifts outside the range or shows a significant or fast change, the DPLL may not be able to track and compensate it. It would need a recalibration, which is signaled by assertion of a recalibration flag.

NOTE:

- The recalibration mechanism is active only while the DPLL is in locked mode. When the DPLL is in off or bypass mode (low-power or fast-relock), it does not assert the recalibration flag.
 - If the DPLL drifts out of the operating range limits while not locked, then when it tries to relock it fails to lock within the normal delay and recalibrates automatically before eventually locking. The only difference between this case and a standard relock is the recalibration delay.
-

During recalibration, the DPLL loses lock and output clock switches to the bypass clock.

The DPLL can automatically start recalibration when the recalibration flag is asserted, or recalibration can be triggered by software control. The trigger setting of the recalibration can be configured by the corresponding registers of the DPLL in the PRCM module. The software-controlled recalibration mode is selected by default.

Software-controlled recalibration: The DPLL continues its tracking mechanism as long as the recalibration is not triggered by software (that is, by enabling the Recalibration-Enable control parameter). If the DPLL reaches upper or lower bounds of the DCO control code and software has still not triggered recalibration, the DPLL stops its tracking mechanism. The output clock remains active, but frequency and jitter are not ensured to meet the requirement.

Automatic recalibration: The DPLL immediately starts the recalibration as soon as the recalibration flag is asserted.

NOTE: Automatic recalibration of the DPLL can start at any time. While relocking, the DPLL switches to bypass mode, which introduces a frequency change. For modules that are sensitive to frequency change while operating, this can introduce operational instability. For example, the external memory (EMIF) controller is sensitive to a frequency change on the DPLL because its embedded DLL relocks on a frequency change. Any EMIF access during this DLL relock period can be corrupted. It is, therefore, important to stall EMIF access during DPLL recalibration.

To allow the software to recalibrate the DPLL at the correct time depending on the device activity, the PRCM module can generate a wake-up event on processor power domain followed by an interrupt on the processor subsystem when the DPLL recalibration flag is asserted.

Table 3-44 shows the DPLL recalibration and control parameters.

Table 3-44. DPLL Recalibration Control Parameters

| Parameter | Description |
|--------------------------------------|--|
| Recalibration-Enable control | Enable/disable the DPLL automatic recalibration feature. |
| Recalibration-Interrupt mask control | Mask/unmask the DPLL recalibration interrupt to processor. |
| Recalibration-Interrupt status | Status of the DPLL recalibration interrupt to processor |

3.6.3.3.5 DPLL Spread Spectrum Clocking

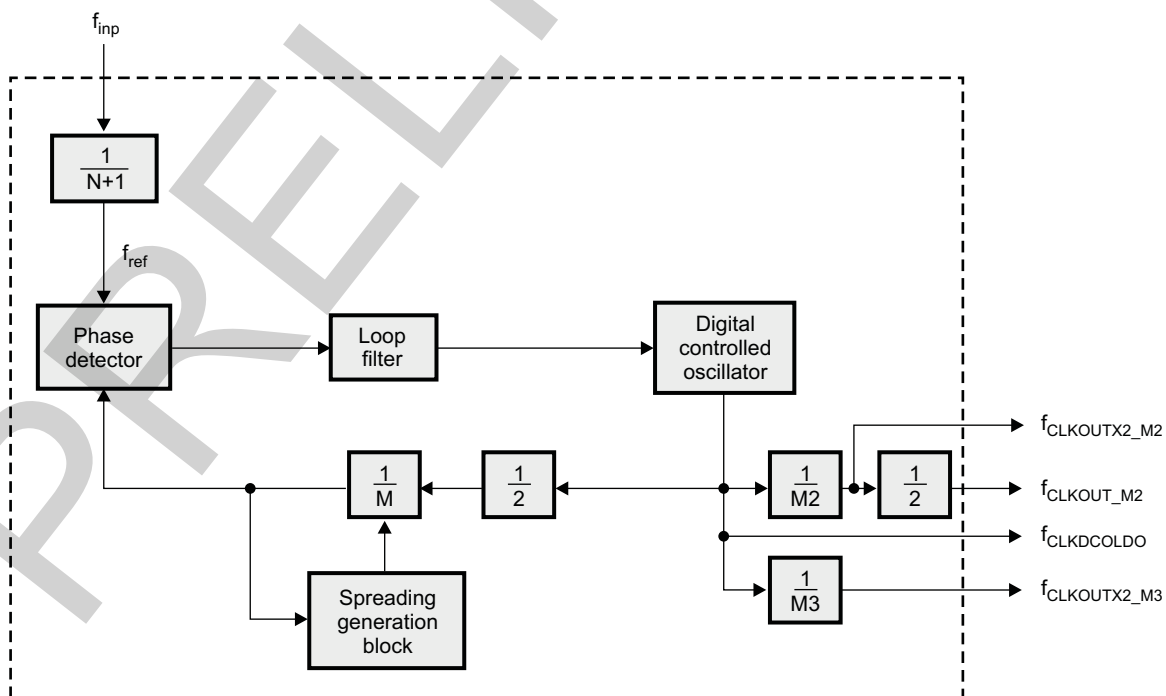
The synthesized clock output of the DPLL has a stable frequency. This periodicity generates a significant power peak at the selected frequency, which in turn causes an electromagnetic interference (EMI) disturbance to the environment. In communication devices, this clock signal generates unwanted spurious signals that interfere with the decoding of information received. It results in performance degradation, for example, in the form of high bit-error rates in case of a wireless communication interface.

To reduce the power peaks (and the electromagnetic noise generated at a specific frequency), an internal frequency modulation of the DPLL is used to distribute the energy to many different frequencies, thus reducing the power peaks. This is called spread spectrum clocking (SSC).

SSC in the DPLL is performed by changing the feedback divider (M) in a triangular pattern. This varies the frequency of the output clock in a triangular pattern. The frequency of this pattern is the modulation frequency (f_m). It is programmed as a ratio of the REF_CLK/4. This frequency modulation feature is integrated directly into some DPLLs of the device.

Figure 3-41 is a diagram of a DPLL that supports the SSC feature.

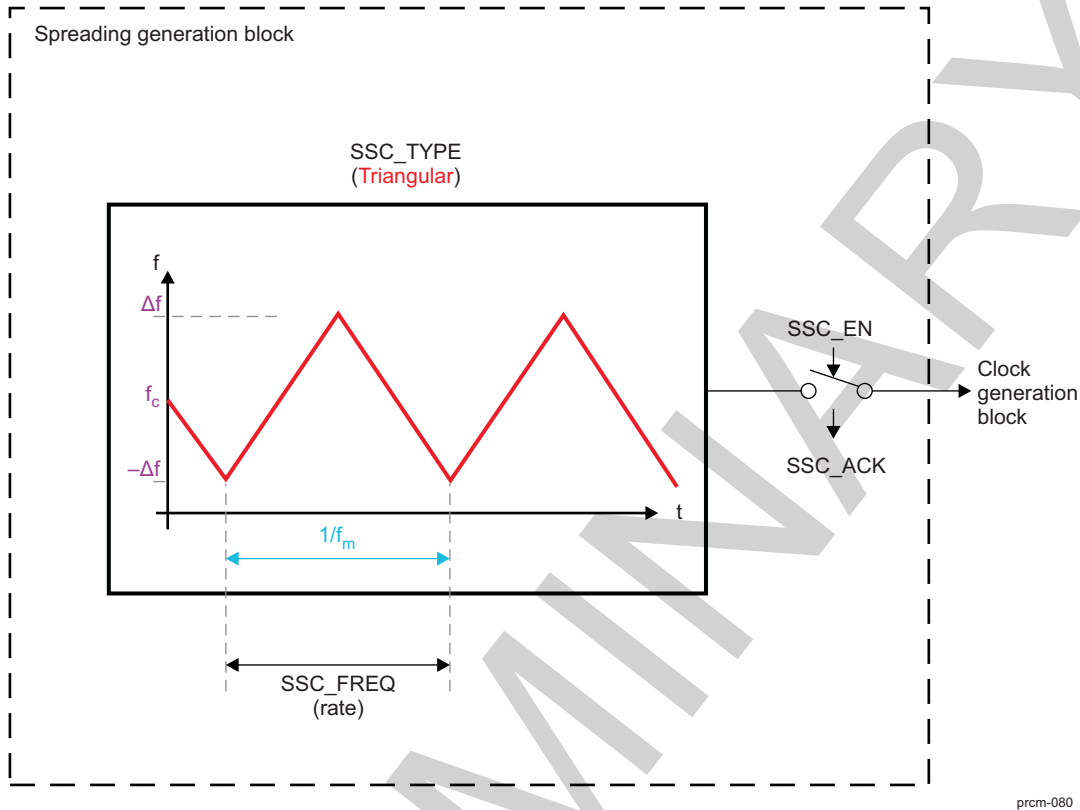
Figure 3-41. DPLL With SSC Reduction Feature



prcm-079

Figure 3-42 shows the spreading generation block diagram.

Figure 3-42. Spreading Generation Block Diagram



NOTE: Δf is the deviation from the center frequency. The total spreading deviation is equal to twice Δf . The peak (ΔM) or the amplitude of the triangular/square pattern as a percent of M is equal to the percent of the frequency spread (Δf), $\Delta M/M = \Delta f/f_c$.

f_c is the original output clock frequency.

f_m is the spreading frequency.

This additional block generates the required waveform used to reduce EMI. This waveform is then modulated with the initial signal to add some controlled deviation to the clock signal frequency, which spreads the energy of the clock and its harmonics into a band of frequencies, and then reduces EMI. **SSC_DOWNSPREAD** can control the position of the generated signal. It is controlled by the **CM_CLKMODE_DPLL_<module>[14] DPLL_SSC_DOWNSPREAD** bit of the corresponding registers (where <module> is the name of the concerned DPLLs). If the **DOWNSPREAD** bit is set to 1, the frequency spread on the lower side is twice the programmed value. The frequency spread on the higher side is 0.

The value of **SSC_FREQ** controls the rate of the generated signal. It can be programmed as a ratio of the reference clock: $f_{ref}/4$. The value that must be programmed is calculated as follows:

$$\text{ModFreqDivider} = f_{ref}/(4 \times f_m)$$

where $f_m < f_{ref}/70$, $f_{ref} = f_{inp}/(1 + N)$, and f_{inp} is the input clock for the DPLL

The **ModFreqDivider** is split into mantissa and exponent:

$$\text{ModFreqDivider} = \text{Mantissa} \times 2^{\text{Exponent}}$$

The same value of ModFreqDivider can be obtained by different combinations of mantissa and exponent values. However, it is recommended to set the target ModFreqDivider by programming a maximum mantissa and a minimum exponent. This is controlled by the CM_SSC_MODFREQDIV_DPLL_<module>[10:8] MODFREQDIV_EXPONENT and CM_SSC_MODFREQDIV_DPLL_<module>[6:0] MODFREQDIV_MANTISSA bit fields of the corresponding registers (where <module> is the name of the concerned DPLL).

To define the modulation-frequency divider step size (ΔM) for triangular SSC, a DeltaMStep parameter must be programmed. DeltaMStep is split into integer and fractional parts. The step size can be calculated as follows:

$\Delta M = \text{ModFreqDivider} \times \text{DeltaMStep}$, if Exponent ≤ 3

$\Delta M = 8 \times \text{Mantissa} \times \text{DeltaMStep}$, if Exponent > 3

It is controlled by the PRCM_CM_SSC_DELTAMSTEP_DPLL_<module>[19:0] DELTAMSTEP bit field of the corresponding register (where <module> is the name of the concerned DPLL). The PRCM_CM_SSC_DELTAMSTEP_DPLL_<module>[19:18] bit field defines the integer part, while the PRCM_CM_SSC_DELTAMSTEP_DPLL_<module>[17:0] bit field defines the fractional part. The DeltaMStep parameter must be programmed to define the modulation-frequency divider step size for trapezoidal SSC. It is split into integer and fractional parts. The step size can be calculated as follows:

$\Delta M = \text{DeltaMStep}$

The DeltaMStep integer part is controlled by the CM_SSC_DELTAMSTEP_DPLL_<module>[19:14] bit field, while the fractional part is controlled by the CM_SSC_DELTAMSTEP_DPLL_<module>[13:0] bit field (where <module> is the name of the concerned DPLL).

The SSC_EN signal enables and disables the frequency modulation feature of the DPLL. It is controlled by the PRCM_CM_CLKMODE_DPLL_<module>[12] DPLL_SSC_EN bit of the corresponding registers (where <module> is the name of the concerned DPLL).

The SSC_ACK signal notifies of the exact start and SSC end of the DPLL. It can be read by the PRCM_CM_CLKMODE_DPLL_<module>[13] DPLL_SSC_ACK bit of the corresponding registers (where <module> is the name of the concerned DPLL).

The following restriction applies to the range of M values: $M - \Delta M$ must be ≥ 20 . Also, $M + \Delta M$ must be ≤ 2045 . If DOWNSPREAD is enabled, $M - 2 \times \Delta M$ must be ≥ 20 , and $M \leq 2045$. In any case, the frequency modulation is programmed and does not generally have to be changed in real time.

Table 3-45 shows the DPLL SSC control parameters.

Table 3-45. DPLL SSC Control Parameters

| Parameter | Description |
|--|--|
| SSC enable control | Enable/disable the DPLL SSC feature. When set to disable, SSC is disabled only after completion of one full cycle of the modulation pattern to maintain the average frequency. |
| SSC acknowledge | Notifies the exact start and end of SSC |
| Modulation Frequency Divider setting (Mantissa and Exponent) | Set the ratio of the modulation frequency with respect to the REF_CLK/4 frequency. |
| M step size setting (DeltaMStepInteger and DeltaMStepFraction) | Set the feedback divider variation step-size. |

3.6.3.3.5.1 Definition

The SSC adds a variation to the frequency of an original clock, which spreads the generated interference over a larger band of frequencies.

In theory, SSC means that the clock signal is varied around the desired frequency. For example, for a 1-GHz clock, the frequency may be 999.5 MHz at one time and 1.0005 GHz at another time. Doing this constantly causes the power of the tone to be spread out more over a broader band of tight frequencies (centered at the desired tone). To realize this constant variation on the original signal, a modulation with an additional signal (called spreading waveform) is realized.

Creating an SSC by spreading the initial clock frequency is done by defining the following parameters:

- The spreading frequency (deviation), which is the ratio of the range of spreading frequency over the original clock frequency
- The modulation rate (f_m), which is used to determine the clock-frequency spreading-cycling rate, and is the time during which the generated clock frequency varies through f and returns to the original frequency
- The modulation waveform, which describes the variation curve over time

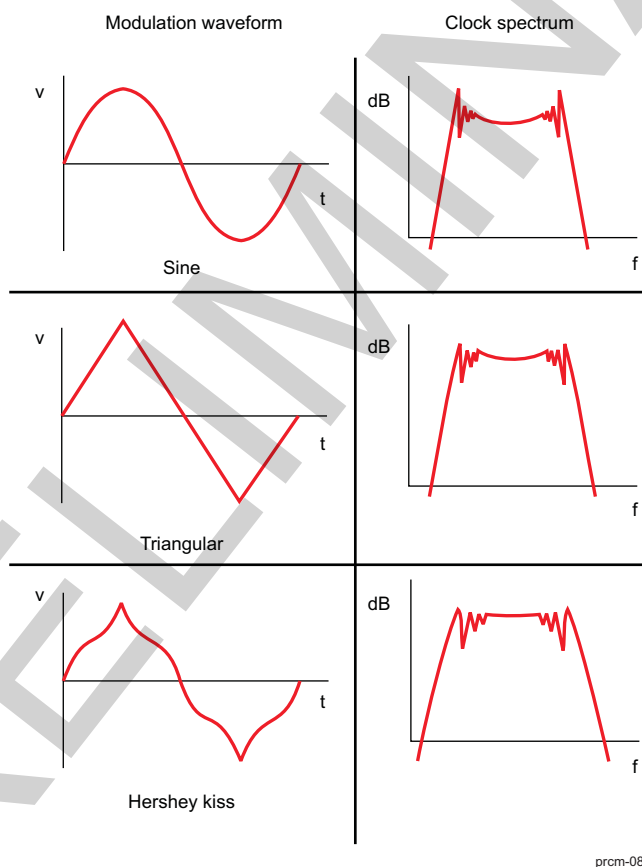
The spectral power reduction in the DPLL clocks is dependent on the modulation index (K), which is a ratio of spreading frequency, calculated from the frequency deviation (f) and the modulation rate (f_m).

3.6.3.3.5.2 Modulation Waveforms

The shape (profile) of the generated clock signal depends on the modulation waveform used during the frequency modulation. Several profiles can be used, according to the desired shaping for the energy spreading.

Figure 3-43 shows three examples of modulation waveforms and the spectrum of the corresponding modulated clock signal.

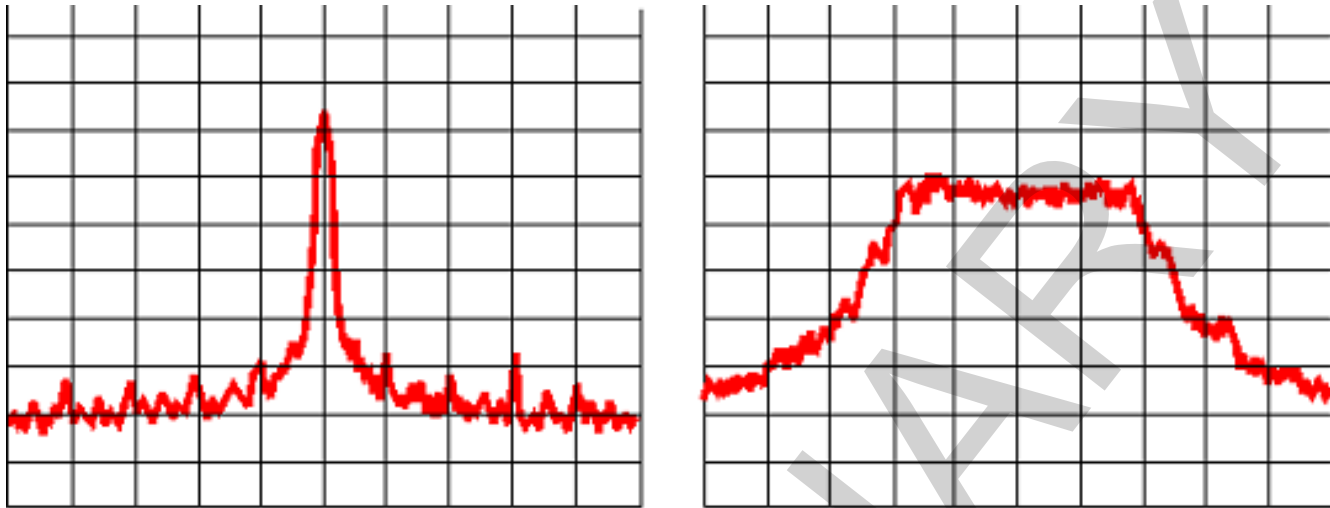
Figure 3-43. Modulation Profiles



The triangular wave gives a relatively flat spectrum and is easy to generate.

3.6.3.3.5.3 Effects on the Clock Signal

Figure 3-44 shows an example of the effect of triangular spreading on a clock signal.

Figure 3-44. Effect of the SSC in Frequency

Spectrum of signal without spreading

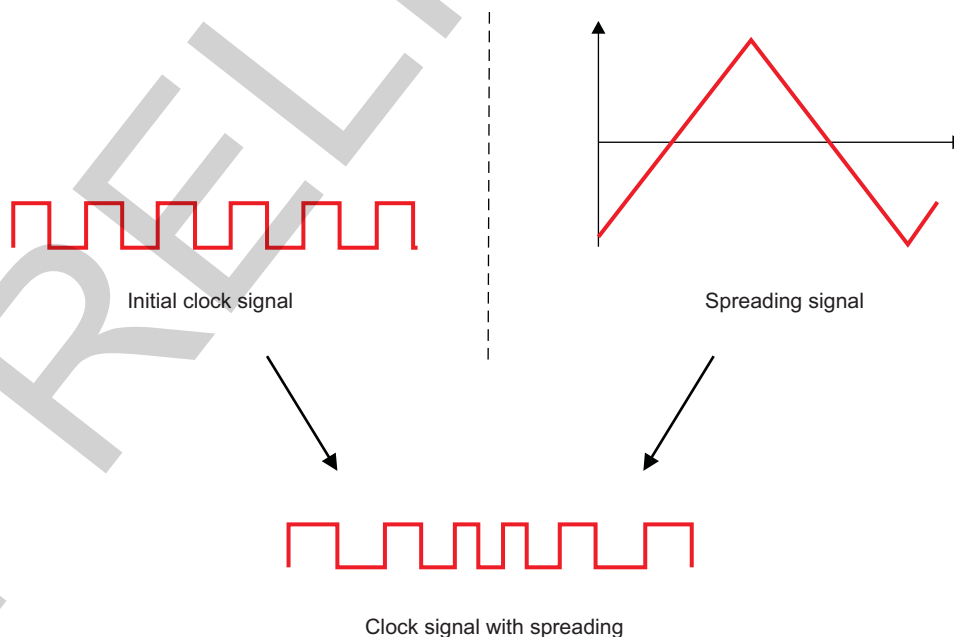
Spectrum of signal with triangular spreading

prcm-082

Figure 3-44 shows the power reduction of the main peak, and also the flatter aspect of the modulated signal. The minimum level of the second signal is higher than the first one. This effect is normal and is due to the noise added for the modulation.

NOTE: The spreading technique scatters the energy of the peaks on the other frequencies, which reduces the power of the peaks, but also increases the global noise of the signal.

Figure 3-45 shows the effect of triangular spreading on a clock signal in the time domain.

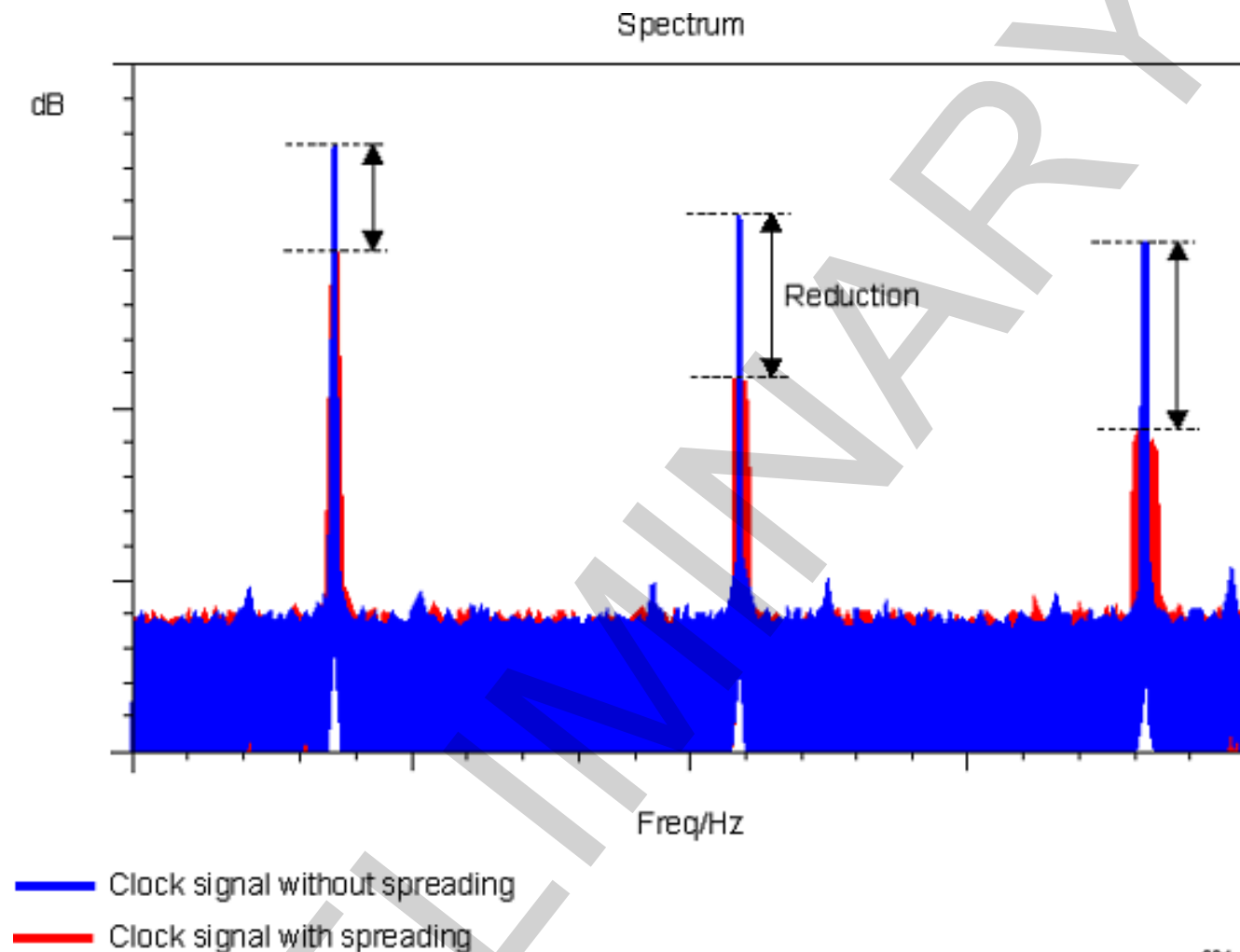
Figure 3-45. Effect of the SSC in the Time Domain

prcm-083

3.6.3.3.5.4 Estimation of the EMI Reduction Level

Figure 3-46 shows the effect of spreading on a clock and its harmonics.

Figure 3-46. Peaks Reduction Due to Spreading



EMI reduction can be estimated using the following equation:

$$(1) \text{ Peak_power_reduction} = 10 \times \log \left(\frac{(\text{Deviation} \times f_c)}{f_m} \right) - 10$$

Where:

- Peak_power_reduction in dB
- Deviation in percentage of the initial clock frequency (f_c), is equal to $\Delta f/f_c$.
- f_c is the original clock frequency, in MHz.
- f_m is the spreading frequency, in MHz.

According to equation (1), the deviation can also be calculated, and then f for a required reduction in peak-power:

$$(2) \text{ Deviation} = \left(\frac{f_m}{f_c} \right) \times 10^{((\text{Peak_power_reduction} + 10)/10)}$$

Example:

For $f_c = 160$ MHz, Deviation = 1% peak from f_c ($\Delta f = 1.6$ MHz) and $f_m = 16$ kHz, the estimated peak power reduction is 10 dB.

3.6.3.3.5.5 Bandwidth Calculation (Carson's Bandwidth Rule)

Carson's bandwidth rule defines the approximate bandwidth requirements of communications system components for a carrier signal that is frequency-modulated by a continuous or broad spectrum of frequencies rather than by a single frequency.

Carson's bandwidth rule is expressed by the relation $CBR = 2 \times (f + f_m)$, where CBR is the bandwidth requirement, f is the peak frequency deviation, and f_m is the highest frequency in the modulating signal. For example, an FM signal with a 5-kHz peak deviation and a maximum audio frequency of 3 kHz requires an approximate bandwidth of $2 \times (5 + 3) = 16$ kHz.

Theoretically, any FM signal has an infinite number of sidebands and, hence, an infinite bandwidth. In practice, all significant sideband energy (98 percent or more) is concentrated within the bandwidth defined by Carson's bandwidth rule.

3.6.3.3.5.6 SSC Configuration

The configuration of the spreading feature is not mandatory when programming the DPLL. This feature is usually enabled when the DPLL clocks generate harmonics, which can potentially interfere with the GSM carrier frequencies.

Once the clock generation control registers are configured, the spreading on the clock signal can be configured as follows:

1. Calculate ModFreqDivider and DeltaMStep based on the desired peak-power reduction.
2. Configure the MODFREQDIV_EXPONENT, MODFREQDIV_MANTISSA, and DELTAMSTEP bit fields according to the calculated values.
3. Enable the spreading using the DPLL_SSC_EN bit.

NOTE: Spreading on a clock must be carefully configured to avoid adding noise on frequencies that are used by another module. For example, adding spreading on a clock to reduce noise on GSM frequencies can move the generated noise to the frequency of the memory controller and thus degrade its performance.

Example:

For $f_c = 160$ MHz, Deviation = 1% peak from f_c ($\Delta f = 1.6$ MHz) and $f_m = 16$ kHz, the estimated peak power reduction is 10 dB.

The output clock can be calculated using the following equation: $f_c = (f_{in} \times M) / ((N + 1) \times M2)$ (where M is a software-controlled multiplier, N is a software-controlled divider, $M2$ is a software-controlled output divider, f_c stands for f_{CLKOUT_M2} ; for the calculation of other output clock frequencies and for more information, see [DPLLs Output Clocks Parameters](#), and the Clock Tree Tool).

The input clock is $f_{in} = 38.4$ MHz. The following settings of the DPLL are required to have $f_c = 160$ MHz: $M = 25$, $N = 2$, $M2 = 2$. The value of M satisfies the restrictions: $M - \Delta M \geq 20$. Also, $M + \Delta M \leq 2045$.

f_{ref} can be calculated using the following equation:

$$f_{ref} = f_{in} / (1 + N) = 12.8 \text{ MHz}$$

ModFreqDivider can be calculated using the following equation:

$$\text{ModFreqDivider} = f_{ref} / (4 \times f_m) = 200$$

The exponent and mantissa of ModFreqDivider can now be calculated (where ModFreqDivider = Mantissa $\times 2^{\text{Exponent}}$ and it must be used as the minimal value for the exponent):

$$\text{Mantissa} = 100, \text{Exponent} = 1$$

Knowing the deviation and M , ΔM can now be calculated:

$$\Delta M / M = 1\% \geq \Delta M = 0.01 \times 25 = 0.25$$

DeltaMStep can be calculated as follows:

$$\text{DeltaMStep} = \Delta M / \text{ModFreqDivider} = 0.00125$$

The integer and fractional part of DeltaMStep can now be determined:

Integer part = 0, Fractional part = $0.00125 \times 2^{18} = 327$ (for an 18-bit fractional part)

The DPLL can be configured as follows:

- MODFREQDIV_EXPONENT = 1
- MODFREQDIV_MANTISSA = 100
- DELTAMSTEP = 327

The state of the modulation feature can be monitored with the DPLL_SSC_ACK bit of the corresponding register.

NOTE: Because this is in-band modulation for the DPLL, the modulation frequency must be within the DPLL loop bandwidth ($f_m < f_{ref}/70$). A higher modulation frequency results in less spreading in the output clock.

When deactivating the spreading (DPLL_SSC_EN = 0), the end-of-spreading is synchronous to the internal spreading cycle. Thus, there is no residual average frequency error.

3.6.3.3.6 DPLL Output Power Down

The DCO clock LDO (DCOCLKLDO) of the DPLL can be powered down if all output dividers of the DPLL are powered down. The PRCM module automatically re-enables the power to the LDO when an output divider is powered up or the DPLL switches to bypass mode.

Similarly, all the output dividers (M2, M3, and the Mn) can be powered down when their output clocks are gated and powered up when the clocks are needed again.

Table 3-46. DPLL Power-Down Control Parameters

| Parameter | Description |
|-----------------------------------|--|
| DCO clock LDO power down control | Enable/disable automatic power-down feature if the all the output dividers are powered down. |
| M2, M3, and Mn (where n = 4 to 7) | Enables/disables automatic power-down feature of the corresponding output divider if the output clocks of the divider are gated. |

3.6.3.3.7 DPLL Output Clock Gating

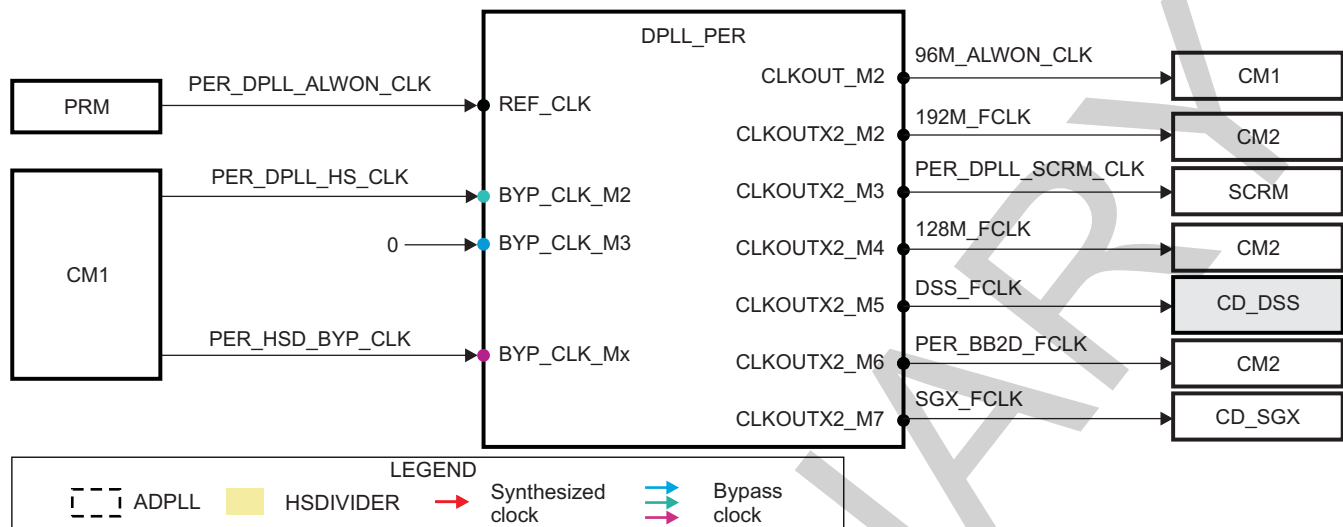
A clock gating control for DPLL output clocks allows selection between automatic clock gating and forcing the clock state. This control is done by the DPLL_CLKOUT_GATE_CTRL bit of the CM_DIV_Mn_DPLL name registers.

These bits are used for debug purposes. They are not required by any high-level operating system (HLOS). This does not apply to the [CM_DIV_M3_DPLL_CORE\[8\]](#) DPLL_CLKOUTHIF_GATE_CTRL and [CM_DIV_M3_DPLL_PER\[8\]](#) DPLL_CLKOUTHIF_GATE_CTRL bits. They enable the CORE_DPLL_SCRM_CLK and PER_DPLL_SCRM_CLK clocks that can be used as an SCRM auxiliary clock source.

3.6.3.4 DPLL_PER Description

3.6.3.4.1 Overview

[Figure 3-47](#) shows the overview of the DPLL. See [Section 3.6.3.3, Generic DPLL Overview](#), for a functional overview of a generic DPLL module.

Figure 3-47. DPLL_PER Overview

prcm-042

3.6.3.4.2 Synthesized Clock Parameters

This section presents the clock synthesis and clock out divider parameters of the DPLL. See [Section 3.6.3.3, Generic DPLL Overview](#), for an explanation of the clock synthesis and output divider parameters of the DPLL module.

[Table 3-47](#) lists the clock synthesis parameters of the DPLL.

Table 3-47. DPLL_PER Clock Synthesis Parameters

| Parameter Name | Control Bit Field |
|----------------|--|
| M | CM_CLKSEL_DPLL_PER[18:8] DPLL_MULT |
| N | CM_CLKSEL_DPLL_PER[6:0] DPLL_DIV |

[Table 3-48](#) lists the clock output divider parameters of the DPLL.

Table 3-48. DPLL_PER Clock Output Parameters

| Clock Output/Divider | Parameter Name | Control/Status Bit Field |
|----------------------|---------------------|---|
| CLKOUT_M2 | Status | CM_DIV_M2_DPLL_PER[9] ST_DPLL_CLKOUT |
| CLKOUT_M2 | Gating Control | CM_DIV_M2_DPLL_PER[8] DPLL_CLKOUT_GATE_CTRL |
| CLKOUT_M2 | Divider Acknowledge | CM_DIV_M2_DPLL_PER[5] DPLL_CLKOUT_DIVCHACK |
| CLKOUTX2_M2 | Status | CM_DIV_M2_DPLL_PER[11] ST_DPLL_CLKOUTX2 |
| CLKOUTX2_M2 | Gating Control | CM_DIV_M2_DPLL_PER[10] DPLL_CLKOUTX2_GATE_CTRL |
| CLKOUT_M2 | Divider Control | CM_DIV_M2_DPLL_PER[4:0] DPLL_CLKOUT_DIV |
| CLKOUTX2_M3 | Status | CM_DIV_M3_DPLL_PER[9] ST_DPLL_CLKOUTHIF |
| CLKOUTX2_M3 | Gating Control | CM_DIV_M3_DPLL_PER[8] DPLL_CLKOUTHIF_GATE_CTRL |
| CLKOUTX2_M3 | Divider Acknowledge | CM_DIV_M3_DPLL_PER[5] DPLL_CLKOUTHIF_DIVCHACK |

Table 3-48. DPLL_PER Clock Output Parameters (continued)

| Clock Output/Divider | Parameter Name | Control/Status Bit Field |
|----------------------|---------------------|---|
| CLKOUTX2_M3 | Divider Control | CM_DIV_M3_DPLL_PER [4:0] DPLL_CLKOUTHIF_DIV |
| CLKOUTX2_M4 | Status | CM_DIV_M4_DPLL_PER [9] ST_HSDIVIDER_CLKOUT1 |
| CLKOUTX2_M4 | Gating Control | CM_DIV_M4_DPLL_PER [8] HSDIVIDER_CLKOUT1_GATE_CTRL |
| CLKOUTX2_M4 | Divider Acknowledge | CM_DIV_M4_DPLL_PER [5] HSDIVIDER_CLKOUT1_DIVCHACK |
| CLKOUTX2_M4 | Divider Control | CM_DIV_M4_DPLL_PER [4:0] HSDIVIDER_CLKOUT1_DIV |
| CLKOUTX2_M5 | Status | CM_DIV_M5_DPLL_PER [9] ST_HSDIVIDER_CLKOUT2 |
| CLKOUTX2_M5 | Gating Control | CM_DIV_M5_DPLL_PER [8] HSDIVIDER_CLKOUT2_GATE_CTRL |
| CLKOUTX2_M5 | Divider Acknowledge | CM_DIV_M5_DPLL_PER [5] HSDIVIDER_CLKOUT2_DIVCHACK |
| CLKOUTX2_M5 | Divider Control | CM_DIV_M5_DPLL_PER [4:0] HSDIVIDER_CLKOUT2_DIV |
| CLKOUTX2_M6 | Status | CM_DIV_M6_DPLL_PER [9] ST_HSDIVIDER_CLKOUT3 |
| CLKOUTX2_M6 | Gating Control | CM_DIV_M6_DPLL_PER [8] HSDIVIDER_CLKOUT3_GATE_CTRL |
| CLKOUTX2_M6 | Divider Acknowledge | CM_DIV_M6_DPLL_PER [5] HSDIVIDER_CLKOUT3_DIVCHACK |
| CLKOUTX2_M6 | Divider Control | CM_DIV_M6_DPLL_PER [4:0] HSDIVIDER_CLKOUT3_DIV |
| CLKOUTX2_M7 | Status | CM_DIV_M7_DPLL_PER [9] ST_HSDIVIDER_CLKOUT4 |
| CLKOUTX2_M7 | Gating Control | CM_DIV_M7_DPLL_PER [8] HSDIVIDER_CLKOUT4_GATE_CTRL |
| CLKOUTX2_M7 | Divider Acknowledge | CM_DIV_M7_DPLL_PER [5] HSDIVIDER_CLKOUT4_DIVCHACK |
| CLKOUTX2_M7 | Divider Control | CM_DIV_M7_DPLL_PER [4:0] HSDIVIDER_CLKOUT4_DIV |

3.6.3.4.3 Power Modes

This section identifies the operating modes supported by the DPLL and also identify the control bit fields to set its operating modes. See [Section 3.6.3.3.2, Enable Control, Status and Low-Power Operation Mode](#), and [Section 3.6.3.3.3, DPLL Power Modes](#), for an explanation of the DPLL operating modes, and associated control and status features.

[Table 3-49](#) lists the operating modes supported by the DPLL.

Table 3-49. DPLL_PER Modes

| Low-Power Stop | Fast-Relock Stop | MN Bypass | Low-Power Bypass | Fast-Relock Bypass | Lock |
|----------------|------------------|---------------------|------------------|--------------------|-----------|
| Not available | Not available | Available (default) | Available | Available | Available |

[Table 3-50](#) lists the control bit fields for the operating mode control of the DPLL.

Table 3-50. DPLL_PER Mode Control Parameters

| Parameter Name | Control Bit Field |
|------------------------|--|
| Low-Power Mode Control | CM_CLKMODE_DPLL_PER[10] DPLL_LPMODE_EN |
| Manual Mode Control | CM_CLKMODE_DPLL_PER[2:0] DPLL_EN |
| Auto Mode Control | CM_AUTOIDLE_DPLL_PER[2:0] AUTO_DPLL_MODE |

3.6.3.4.4 Recalibration

Table 3-51 lists the control bit fields for the recalibration feature enable and interrupts of the DPLL. See Section 3.6.3.3.4, *DPLL Recalibration*, for an explanation of the DPLL recalibration feature.

Table 3-51. DPLL_PER Recalibration Feature Parameters

| Parameter Name | Control/Status Bit Field |
|--|---|
| Recalibration - Enable Control | CM_CLKMODE_DPLL_PER[8] DPLL_DRIFTGUARD_EN |
| Recalibration - Interrupt Status | PRM_IRQSTATUS_MPU_A9[3] DPLL_PER_RECAL_ST |
| Recalibration - Interrupt MASK Control | PRM_IRQENABLE_MPU_A9[3] DPLL_PER_RECAL_EN |
| Recalibration - Interrupt Status | PRM_IRQSTATUS_MPU_M3[3] DPLL_PER_RECAL_ST |
| Recalibration - Interrupt MASK Control | PRM_IRQENABLE_MPU_M3[3] DPLL_PER_RECAL_EN |

3.6.3.4.5 Spread Spectrum Clocking

Table 3-52 lists the control bit fields associated with the SSC features of the DPLL. See Section 3.6.3.3.5, *DPLL Spread Spectrum Clocking*, for an explanation of the DPLL SSC feature.

Table 3-52. DPLL_PER Spread-Spectrum Clocking Feature Parameters

| Parameter Name | Control Bit Field |
|---|--|
| SSC Downspread | CM_CLKMODE_DPLL_PER[14] DPLL_SSC_DOWNSPREAD |
| SSC Acknowledge | CM_CLKMODE_DPLL_PER[13] DPLL_SSC_ACK |
| SSC Enable Control | CM_CLKMODE_DPLL_PER[12] DPLL_SSC_EN |
| Modulation Step Size Setting | CM_SSC_DELTAMSTEP_DPLL_PER[19:0] DELTAMSTEP |
| Modulation Frequency Divider - Exponent | CM_SSC_MODFREQDIV_DPLL_PER[10:8] MODFREQDIV_EXPONENT |
| Modulation Frequency Divider - Mantissa | CM_SSC_MODFREQDIV_DPLL_PER[6:0] MODFREQDIV_MANTISSA |

3.6.3.4.6 Output Power Down

Table 3-53 lists the control bit fields for the output power down features of the DPLL. See Section 3.6.3.3.6, *DPLL Output Power-Down*, for an explanation of the DPLL output power down feature.

Table 3-53. DPLL_PER Clock Output Power-down Parameters

| Parameter Name | Control/Status Bit Field |
|--|---|
| Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M4_DPLL_PER[12] HSDIVIDER_CLKOUT1_PWDN |
| Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M5_DPLL_PER[12] HSDIVIDER_CLKOUT2_PWDN |
| Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M6_DPLL_PER[12] HSDIVIDER_CLKOUT3_PWDN |
| Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M7_DPLL_PER[12] HSDIVIDER_CLKOUT4_PWDN |

3.6.3.4.7 DPLL_PER Preferred Settings

For SYS_CLK = 38.4 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x7), the DPLL_PER preferred settings are listed in [Table 3-54](#).

Table 3-54. DPLL_PER Preferred Settings for SYS_CLK = 38.4 MHz

| CORE OPPs | | PER DPLL | | | Peripheral Clocks | | | | | | | | | | | |
|---------------------|--------|--------------------------------------|----|---|-------------------|---|------|---|------|--|------|--|------|--|----|---|
| OPPs | | DPLL Locked Frequency (MHz) | M | N | M2 | 96M_ALWO N_CLK Actual Frequency (MHz) | M4+1 | 128M_FCLK Actual Frequency (MHz) | M5+1 | DSS_FCLK Actual Frequency (MHz) | M6+1 | PER_BB2D FCLK Max Frequency (MHz) | M7+1 | SGX_FCLK Actual Frequency (MHz) | M3 | PER_DPLL SCRM_CLK Max Frequency (MHz) |
| High ⁽¹⁾ | OPP119 | 1536 | 40 | 1 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 4 | 384, 0 | 4 | 384, 0 | 6 | 256, 0 |
| | OPP50 | 1536 | 40 | 1 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 8 | 192, 0 | 8 | 192, 0 | 8 | 192, 0 |
| Low ⁽²⁾ | OPP119 | 1536 | 40 | 1 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 4 | 384, 0 | 4 | 384, 0 | 6 | 256, 0 |
| | OPP100 | 1536 | 40 | 1 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 5 | 307, 2 | 5 | 307,2 | 6 | 256, 0 |
| | OPP50 | 1536 | 40 | 1 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 8 | 192, 0 | 8 | 192, 0 | 8 | 192, 0 |

⁽¹⁾ High performance OPPs

⁽²⁾ Low performance OPPs

For SYS_CLK = 26.0 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x5), the DPLL_PER preferred settings are listed in [Table 3-55](#).

Table 3-55. DPLL_PER Preferred Settings for SYS_CLK = 26.0 MHz

| CORE OPPs | | PER DPLL | | | Peripheral Clocks | | | | | | | | | | | |
|---------------------|--------|--------------------------------------|-----|----|-------------------|---|------|---|------|--|------|---|------|--|----|---|
| OPPs | | DPLL Locked Frequency (MHz) | M | N | M2 | 96M_ALWO N_CLK Actual Frequency (MHz) | M4+1 | 128M_FCLK Actual Frequency (MHz) | M5+1 | DSS_FCLK Actual Frequency (MHz) | M6+1 | PER_BB2D _FCLK Max Frequency (MHz) | M7+1 | SGX_FCLK Actual Frequency (MHz) | M3 | PER_DPLL SCRM_CLK Max Frequency (MHz) |
| High ⁽¹⁾ | OPP119 | 1536 | 384 | 12 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 4 | 384, 0 | 4 | 384, 0 | 6 | 256, 0 |
| | OPP50 | 1536 | 384 | 12 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 8 | 192, 0 | 8 | 192, 0 | 8 | 192, 0 |
| Low ⁽²⁾ | OPP119 | 1536 | 384 | 12 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 4 | 384, 0 | 4 | 384, 0 | 6 | 256, 0 |
| | OPP100 | 1536 | 384 | 12 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 5 | 307, 2 | 5 | 307,2 | 6 | 256, 0 |
| | OPP50 | 1536 | 384 | 12 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 8 | 192, 0 | 8 | 192, 0 | 8 | 192, 0 |

⁽¹⁾ High performance OPPs

⁽²⁾ Low performance OPPs

For SYS_CLK = 19.2 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x4), the DPLL_PER preferred settings are listed in [Table 3-56](#).

Table 3-56. DPLL_PER Preferred Settings for SYS_CLK = 19.2 MHz

| CORE OPPs | | PER DPLL | | | Peripheral Clocks | | | | | | | | | | | |
|---------------------|--------|--------------------------------------|----|---|-------------------|---|------|---|------|--|------|--|------|--|----|---|
| OPPs | | DPLL Locked Frequency (MHz) | M | N | M2 | 96M_ALWO N_CLK Actual Frequency (MHz) | M4+1 | 128M_FCLK Actual Frequency (MHz) | M5+1 | DSS_FCLK Actual Frequency (MHz) | M6+1 | PER_BB2D FCLK Max Frequency (MHz) | M7+1 | SGX_FCLK Actual Frequency (MHz) | M3 | PER_DPLL SCRM_CLK Max Frequency (MHz) |
| High ⁽¹⁾ | OPP119 | 1536 | 40 | 0 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 4 | 384, 0 | 4 | 384, 0 | 6 | 256, 0 |
| | OPP50 | 1536 | 40 | 0 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 8 | 192, 0 | 8 | 192, 0 | 8 | 192, 0 |
| Low ⁽²⁾ | OPP119 | 1536 | 40 | 0 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 4 | 384, 0 | 4 | 384, 0 | 6 | 256, 0 |
| | OPP100 | 1536 | 40 | 0 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 5 | 307, 2 | 5 | 307,2 | 6 | 256, 0 |
| | OPP50 | 1536 | 40 | 0 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 8 | 192, 0 | 8 | 192, 0 | 8 | 192, 0 |

⁽¹⁾ High performance OPPs⁽²⁾ Low performance OPPs

For SYS_CLK = 16.8 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x3), the DPLL_PER preferred settings are listed in [Table 3-57](#).

Table 3-57. DPLL_PER Preferred Settings for SYS_CLK = 16.8 MHz

| CORE OPPs | | PER DPLL | | | Peripheral Clocks | | | | | | | | | | | |
|---------------------|--------|--------------------------------------|-----|---|-------------------|---|------|---|------|--|------|---|------|--|----|---|
| OPPs | | DPLL Locked Frequency (MHz) | M | N | M2 | 96M_ALWO N_CLK Actual Frequency (MHz) | M4+1 | 128M_FCLK Actual Frequency (MHz) | M5+1 | DSS_FCLK Actual Frequency (MHz) | M6+1 | PER_BB2D _FCLK Max Frequency (MHz) | M7+1 | SGX_FCLK Actual Frequency (MHz) | M3 | PER_DPLL SCRM_CLK Max Frequency (MHz) |
| High ⁽¹⁾ | OPP119 | 1536 | 320 | 6 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 4 | 384, 0 | 4 | 384, 0 | 6 | 256, 0 |
| | OPP50 | 1536 | 320 | 6 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 8 | 192, 0 | 8 | 192, 0 | 8 | 192, 0 |
| Low ⁽²⁾ | OPP119 | 1536 | 320 | 6 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 4 | 384, 0 | 4 | 384, 0 | 6 | 256, 0 |
| | OPP100 | 1536 | 320 | 6 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 5 | 307, 2 | 5 | 307,2 | 6 | 256, 0 |
| | OPP50 | 1536 | 320 | 6 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 8 | 192, 0 | 8 | 192, 0 | 8 | 192, 0 |

⁽¹⁾ High performance OPPs⁽²⁾ Low performance OPPs

For SYS_CLK = 12.0 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x1), the DPLL_PER preferred settings are listed in [Table 3-58](#).

Table 3-58. DPLL_PER Preferred Settings for SYS_CLK = 12.0 MHz

| CORE OPPs | | PER DPLL | | | Peripheral Clocks | | | | | | | | | | |
|-----------|--------------------------------------|----------|---|----|---|------|---|------|--|------|---|------|--|----|---|
| OPPs | DPLL Locked Frequency (MHz) | M | N | M2 | 96M_ALWO N_CLK Actual Frequency (MHz) | M4+1 | 128M_FCLK Actual Frequency (MHz) | M5+1 | DSS_FCLK Actual Frequency (MHz) | M6+1 | PER_BB2D _FCLK Max Frequency (MHz) | M7+1 | SGX_FCLK Actual Frequency (MHz) | M3 | PER_DPLL SCRM_CLK Max Frequency (MHz) |

Table 3-58. DPLL_PER Preferred Settings for SYS_CLK = 12.0 MHz (continued)

| CORE OPPs | | PER DPLL | | | Peripheral Clocks | | | | | | | | | | | |
|---------------------|--------|----------|-----|---|-------------------|-------|----|--------|---|--------|---|--------|---|--------|---|--------|
| High ⁽¹⁾ | OPP119 | 1536 | 192 | 2 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 4 | 384, 0 | 4 | 384, 0 | 6 | 256, 0 |
| | OPP50 | 1536 | 192 | 2 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 8 | 192, 0 | 8 | 192, 0 | 8 | 192, 0 |
| Low ⁽²⁾ | OPP119 | 1536 | 192 | 2 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 4 | 384, 0 | 4 | 384, 0 | 6 | 256, 0 |
| | OPP100 | 1536 | 192 | 2 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 5 | 307, 2 | 5 | 307, 2 | 6 | 256, 0 |
| | OPP50 | 1536 | 192 | 2 | 8 | 96, 0 | 12 | 128, 0 | 9 | 170, 7 | 8 | 192, 0 | 8 | 192, 0 | 8 | 192, 0 |

⁽¹⁾ High performance OPPs

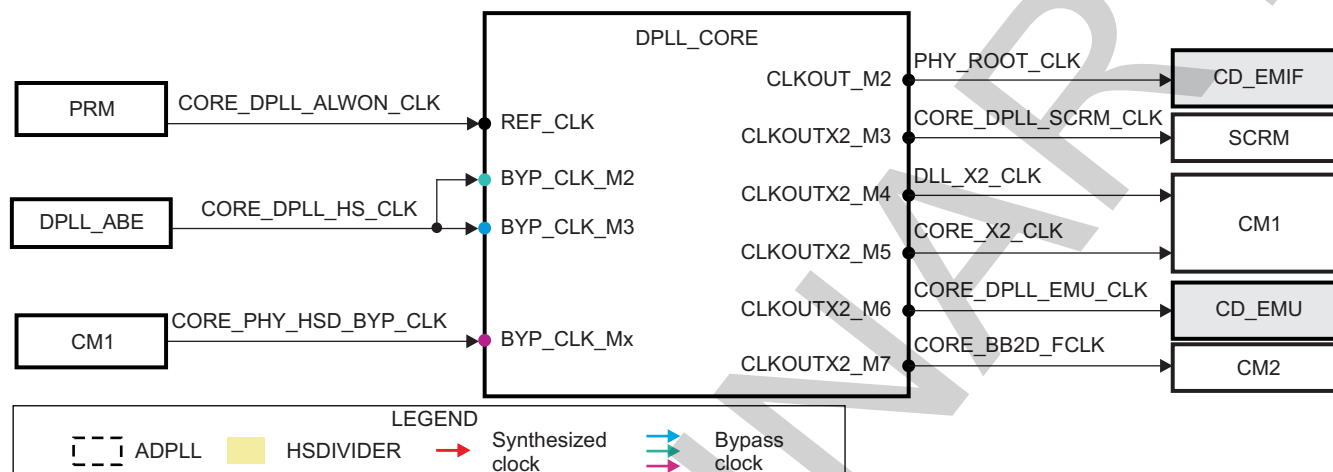
⁽²⁾ Low performance OPPs

3.6.3.5 DPLL_CORE Description

3.6.3.5.1 Overview

Figure 3-48 shows the overview of the DPLL. See [Section 3.6.3.3, Generic DPLL Overview](#), for a functional overview of a generic DPLL module.

Figure 3-48. DPLL_CORE Overview



prcm-043

3.6.3.5.2 Synthesized Clock Parameters

This section presents the clock synthesis and clock out divider parameters of the DPLL. See [Section 3.6.3.3, Generic DPLL Overview](#), for an explanation of the clock synthesis and output divider parameters of the DPLL module.

[Table 3-59](#) lists the clock synthesis parameters of the DPLL.

Table 3-59. DPLL_CORE Clock Synthesis Parameters

| Parameter Name | Control Bit Field |
|----------------|---|
| M | CM_CLKSEL_DPLL_CORE[18:8] DPLL_MULT |
| N | CM_CLKSEL_DPLL_CORE[6:0] DPLL_DIV |
| M (Restore) | CM_CLKSEL_DPLL_CORE_RESTORE[18:8] DPLL_MULT |
| N (Restore) | CM_CLKSEL_DPLL_CORE_RESTORE[6:0] DPLL_DIV |

[Table 3-60](#) lists the clock output divider parameters of the DPLL.

Table 3-60. DPLL_CORE Clock Output Parameters

| Clock Output/Divider | Parameter Name | Control/Status Bit Field |
|----------------------|---------------------|--|
| CLKOUT_M2 | Status | CM_DIV_M2_DPLL_CORE[9] ST_DPLL_CLKOUT |
| CLKOUT_M2 | Gating Control | CM_DIV_M2_DPLL_CORE[8] DPLL_CLKOUT_GATE_CTRL |
| CLKOUT_M2 | Divider Acknowledge | CM_DIV_M2_DPLL_CORE[5] DPLL_CLKOUT_DIVCHACK |
| CLKOUT_M2 | Divider Control | CM_DIV_M2_DPLL_CORE[4:0] DPLL_CLKOUT_DIV |
| CLKOUTX2_M3 | Status | CM_DIV_M3_DPLL_CORE[9] ST_DPLL_CLKOUTHIF |
| CLKOUTX2_M3 | Gating Control | CM_DIV_M3_DPLL_CORE[8] DPLL_CLKOUTHIF_GATE_CTRL |

Table 3-60. DPLL_CORE Clock Output Parameters (continued)

| Clock Output/Divider | Parameter Name | Control/Status Bit Field |
|----------------------|---------------------|--|
| CLKOUTX2_M3 | Divider Acknowledge | CM_DIV_M3_DPLL_CORE [5] DPLL_CLKOUTHIF_DIVCHACK |
| CLKOUTX2_M3 | Divider Control | CM_DIV_M3_DPLL_CORE [4:0] DPLL_CLKOUTHIF_DIV |
| CLKOUTX2_M4 | Status | CM_DIV_M4_DPLL_CORE [9] ST_HSDIVIDER_CLKOUT1 |
| CLKOUTX2_M4 | Gating Control | CM_DIV_M4_DPLL_CORE [8] HSDIVIDER_CLKOUT1_GATE_CTRL |
| CLKOUTX2_M4 | Divider Acknowledge | CM_DIV_M4_DPLL_CORE [5] HSDIVIDER_CLKOUT1_DIVCHACK |
| CLKOUTX2_M4 | Divider Control | CM_DIV_M4_DPLL_CORE [4:0] HSDIVIDER_CLKOUT1_DIV |
| CLKOUTX2_M5 | Status | CM_DIV_M5_DPLL_CORE [9] ST_HSDIVIDER_CLKOUT2 |
| CLKOUTX2_M5 | Gating Control | CM_DIV_M5_DPLL_CORE [8] HSDIVIDER_CLKOUT2_GATE_CTRL |
| CLKOUTX2_M5 | Divider Acknowledge | CM_DIV_M5_DPLL_CORE [5] HSDIVIDER_CLKOUT2_DIVCHACK |
| CLKOUTX2_M5 | Divider Control | CM_DIV_M5_DPLL_CORE [4:0] HSDIVIDER_CLKOUT2_DIV |
| CLKOUTX2_M6 | Status | CM_DIV_M6_DPLL_CORE [9] ST_HSDIVIDER_CLKOUT3 |
| CLKOUTX2_M6 | Gating Control | CM_DIV_M6_DPLL_CORE [8] HSDIVIDER_CLKOUT3_GATE_CTRL |
| CLKOUTX2_M6 | Divider Acknowledge | CM_DIV_M6_DPLL_CORE [5] HSDIVIDER_CLKOUT3_DIVCHACK |
| CLKOUTX2_M6 | Divider Control | CM_DIV_M6_DPLL_CORE [4:0] HSDIVIDER_CLKOUT3_DIV |
| CLKOUTX2_M7 | Status | CM_DIV_M7_DPLL_CORE [9] ST_HSDIVIDER_CLKOUT4 |
| CLKOUTX2_M7 | Gating Control | CM_DIV_M7_DPLL_CORE [8] HSDIVIDER_CLKOUT4_GATE_CTRL |
| CLKOUTX2_M7 | Divider Acknowledge | CM_DIV_M7_DPLL_CORE [5] HSDIVIDER_CLKOUT4_DIVCHACK |
| CLKOUTX2_M7 | Divider Control | CM_DIV_M7_DPLL_CORE [4:0] HSDIVIDER_CLKOUT4_DIV |

3.6.3.5.3 Power Modes

This section identifies the operating modes supported by the DPLL and also identifies the control bit fields to set its operating modes. See [Section 3.6.3.3.2, Enable Control, Status and Low-Power Operation Mode](#), and [Section 3.6.3.3.3, DPLL Power Modes](#), for an explanation of the DPLL operating modes, and associated control and status features.

[Table 3-61](#) lists the operating modes supported by the DPLL.

Table 3-61. DPLL_CORE Modes

| Low-Power Stop | Fast-Relock Stop | MN Bypass | Low-Power Bypass | Fast-Relock Bypass | Lock |
|----------------|------------------|---------------------|------------------|--------------------|-----------|
| Not available | Not available | Available (default) | Available | Available | Available |

[Table 3-62](#) lists the control bit fields for the operating mode control of the DPLL.

Table 3-62. DPLL_CORE Mode Control Parameters

| Parameter Name | Control Bit Field |
|----------------------------------|--|
| Low-Power Mode Control | CM_CLKMODE_DPLL_CORE[10] DPLL_LPMODE_EN |
| Manual Mode Control | CM_CLKMODE_DPLL_CORE[2:0] DPLL_EN |
| Auto Mode Control | CM_AUTOIDLE_DPLL_CORE[2:0] AUTO_DPLL_MODE |
| Low-Power Mode Control (Restore) | CM_CLKMODE_DPLL_CORE_RESTORE[10] DPLL_LPMODE_EN |
| Manual Mode Control (Restore) | CM_CLKMODE_DPLL_CORE_RESTORE[2:0] DPLL_EN |
| Auto Mode Control (Restore) | CM_AUTOIDLE_DPLL_CORE_RESTORE[2:0] AUTO_DPLL_MODE |

3.6.3.5.4 Recalibration

[Table 3-63](#) lists the control bit fields for the recalibration feature enable and interrupts of the DPLL. See [Section 3.6.3.3.4, DPLL Recalibration](#), for an explanation of the DPLL recalibration feature.

Table 3-63. DPLL_CORE Recalibration Feature Parameters

| Parameter Name | Control/Status Bit Field |
|--|---|
| Recalibration - Enable Control | CM_CLKMODE_DPLL_CORE[8] DPLL_DRIFTGUARD_EN |
| Recalibration - Enable Control | CM_CLKMODE_DPLL_CORE_RESTORE[8] DPLL_DRIFTGUARD_EN |
| Recalibration - Interrupt Status | PRM_IRQSTATUS_MPU_A9[0] DPLL_CORE_RECAL_ST |
| Recalibration - Interrupt mask Control | PRM_IRQENABLE_MPU_A9[0] DPLL_CORE_RECAL_EN |
| Recalibration - Interrupt Status | PRM_IRQSTATUS_MPU_M3[0] DPLL_CORE_RECAL_ST |
| Recalibration - Interrupt Mask Control | PRM_IRQENABLE_MPU_M3[0] DPLL_CORE_RECAL_EN |

3.6.3.5.5 Spread Spectrum Clocking

[Table 3-64](#) lists the control bit fields associated with the SSC features of the DPLL. See [Section 3.6.3.3.5, DPLL Spread Spectrum Clocking](#), for an explanation of the DPLL SSC feature.

Table 3-64. DPLL_CORE Spread-Spectrum Clocking Feature Parameters

| Parameter Name | Control Bit Field |
|---|--|
| SSC Downspread | CM_CLKMODE_DPLL_CORE[14] DPLL_SSC_DOWNSPREAD |
| SSC Acknowledge | CM_CLKMODE_DPLL_CORE[13] DPLL_SSC_ACK |
| SSC Enable Control | CM_CLKMODE_DPLL_CORE[12] DPLL_SSC_EN |
| Modulation Step Size Setting | CM_SSC_DELTAMSTEP_DPLL_CORE[19:0] DELTAMSTEP |
| Modulation Frequency Divider - Exponent | CM_SSC_MODFREQDIV_DPLL_CORE[10:8] MODFREQDIV_EXPONENT |
| Modulation Frequency Divider - Mantissa | CM_SSC_MODFREQDIV_DPLL_CORE[6:0] MODFREQDIV_MANTISSA |
| Restore Modulation Step Size setting | CM_SSC_DELTAMSTEP_DPLL_CORE_RESTORE[19:0] DELTAMSTEP |
| Restore Modulation Frequency Divider - Exponent | CM_SSC_MODFREQDIV_DPLL_CORE_RESTORE[10:8] MODFREQDIV_EXPONENT |
| Restore Modulation Frequency Divider - Mantissa | CM_SSC_MODFREQDIV_DPLL_CORE_RESTORE[6:0] MODFREQDIV_MANTISSA |
| Restore SSC Downspread | CM_CLKMODE_DPLL_CORE_RESTORE[14] DPLL_SSC_DOWNSPREAD |
| Restore SSC Acknowledge | CM_CLKMODE_DPLL_CORE_RESTORE[13] DPLL_SSC_ACK |
| Restore SSC Enable Control | CM_CLKMODE_DPLL_CORE_RESTORE[12] DPLL_SSC_EN |

3.6.3.5.6 Output Power-Down

Table 3-65 lists the control bit fields for the output power down features of the DPLL. See Section 3.6.3.3.6, *DPLL Output Power Down*, for an explanation of the DPLL output power-down feature.

Table 3-65. DPLL_CORE Clock Output Power-Down Parameters

| Parameter Name | Control/Status Bit Field |
|--|--|
| Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M4_DPLL_CORE [12] HSDIVIDER_CLKOUT1_PWDN |
| Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M5_DPLL_CORE [12] HSDIVIDER_CLKOUT2_PWDN |
| Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M6_DPLL_CORE [12] HSDIVIDER_CLKOUT3_PWDN |
| Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M7_DPLL_CORE [12] HSDIVIDER_CLKOUT4_PWDN |
| Restore Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M4_DPLL_CORE_RESTORE [12] HSDIVIDER_CLKOUT1_PWDN |
| Restore Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M5_DPLL_CORE_RESTORE [12] HSDIVIDER_CLKOUT2_PWDN |
| Restore Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M6_DPLL_CORE_RESTORE [12] HSDIVIDER_CLKOUT3_PWDN |
| Restore Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M7_DPLL_CORE_RESTORE [12] HSDIVIDER_CLKOUT4_PWDN |

3.6.3.5.7 DPLL_CORE Preferred Settings

For SYS_CLK = 38.4 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x7), the DPLL_CORE preferred settings are listed in [Table 3-66](#).

Table 3-66. DPLL_CORE Preferred Settings for SYS_CLK = 38.4 MHz

| CORE OPPs | | CORE DPLL | | | CORE Clocks | | | | | | | | | | | |
|---------------------|--------|-----------------------------|-----|---|-------------|-------------------------------------|------|-----------------------------------|------|------------------------------------|------|---------------------------------------|------|---------------------------------------|----|--|
| OPPs | | DPLL Locked Frequency (MHz) | M | N | M2 | PHY_ROOT_CLK Actual Frequency (MHz) | M4+1 | DLL_X2_CLK Actual Frequency (MHz) | M5+1 | CORE_X2_CLK Actual Frequency (MHz) | M6+1 | CORE_DPLL_EMU_CLK Max Frequency (MHz) | M7+1 | CORE_BB2D_FCLK Actual Frequency (MHz) | M3 | CORE_DPLL_SCRM_CLK Max Frequency (MHz) |
| High ⁽¹⁾ | OPP119 | 1862, 4 | 97 | 3 | 1 | 931, 2 | 8 | 232, 8 | 4 | 465, 6 | 6 | 310, 4 | 5 | 372, 5 | 6 | 310, 4 |
| | OPP50 | 1862, 4 | 97 | 3 | 2 | 465, 6 | 8 | 232, 8 | 8 | 232, 8 | 9 | 206, 9 | 10 | 186, 2 | 9 | 206, 9 |
| Low ⁽²⁾ | OPP119 | 1600 | 125 | 5 | 1 | 800, 0 | 8 | 200, 0 | 4 | 400, 0 | 6 | 266, 7 | 5 | 320, 0 | 5 | 320, 0 |
| | OPP100 | 1600 | 125 | 5 | 1 | 800, 0 | 8 | 200, 0 | 4 | 400, 0 | 6 | 266, 7 | 6 | 266, 7 | 5 | 320, 0 |
| | OPP50 | 1600 | 125 | 5 | 2 | 400, 0 | 8 | 200, 0 | 8 | 200, 0 | 8 | 200, 0 | 9 | 177, 8 | 8 | 200, 0 |

⁽¹⁾ High performance OPPs

⁽²⁾ Low performance OPPs

For SYS_CLK = 26.0 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x5), the DPLL_CORE preferred settings are listed in [Table 3-67](#).

Table 3-67. DPLL_CORE Preferred Settings for SYS_CLK = 26.0 MHz

| CORE OPPs | | CORE DPLL | | | CORE Clocks | | | | | | | | | | | |
|---------------------|--------|-----------------------------|-----|---|-------------|-------------------------------------|------|-----------------------------------|------|------------------------------------|------|---------------------------------------|------|---------------------------------------|----|--|
| OPPs | | DPLL Locked Frequency (MHz) | M | N | M2 | PHY_ROOT_CLK Actual Frequency (MHz) | M4+1 | DLL_X2_CLK Actual Frequency (MHz) | M5+1 | CORE_X2_CLK Actual Frequency (MHz) | M6+1 | CORE_DPLL_EMU_CLK Max Frequency (MHz) | M7+1 | CORE_BB2D_FCLK Actual Frequency (MHz) | M3 | CORE_DPLL_SCRM_CLK Max Frequency (MHz) |
| High ⁽¹⁾ | OPP119 | 1863, 3 | 215 | 5 | 1 | 931, 7 | 8 | 232, 9 | 4 | 465, 8 | 6 | 310, 6 | 5 | 372, 7 | 6 | 310, 6 |
| | OPP50 | 1863, 3 | 215 | 5 | 2 | 465, 8 | 8 | 232, 9 | 8 | 232, 9 | 9 | 207, 0 | 10 | 186, 3 | 9 | 207, 0 |
| Low ⁽²⁾ | OPP119 | 1599 | 123 | 3 | 1 | 799, 5 | 8 | 199, 9 | 4 | 399, 8 | 6 | 266, 5 | 5 | 319, 8 | 5 | 319, 8 |
| | OPP100 | 1599 | 123 | 3 | 1 | 799, 5 | 8 | 199, 9 | 4 | 399, 8 | 6 | 266, 5 | 6 | 266, 5 | 5 | 319, 8 |
| | OPP50 | 1599 | 123 | 3 | 2 | 399, 8 | 8 | 199, 9 | 8 | 199, 9 | 8 | 199, 9 | 9 | 177, 7 | 8 | 199, 9 |

⁽¹⁾ High performance OPPs

⁽²⁾ Low performance OPPs

For SYS_CLK = 19.2 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x4), the DPLL_CORE preferred settings are listed in [Table 3-68](#).

Table 3-68. DPLL_CORE Preferred Settings for SYS_CLK = 19.2 MHz

| CORE OPPs | | CORE DPLL | | | CORE Clocks | | | | | | | | | | | |
|---------------------|--------|-----------------------------|-----|---|-------------|-------------------------------------|------|-----------------------------------|------|------------------------------------|------|---------------------------------------|------|---------------------------------------|----|--|
| OPPs | | DPLL Locked Frequency (MHz) | M | N | M2 | PHY_ROOT_CLK Actual Frequency (MHz) | M4+1 | DLL_X2_CLK Actual Frequency (MHz) | M5+1 | CORE_X2_CLK Actual Frequency (MHz) | M6+1 | CORE_DPLL_EMU_CLK Max Frequency (MHz) | M7+1 | CORE_BB2D_FCLK Actual Frequency (MHz) | M3 | CORE_DPLL_SCRM_CLK Max Frequency (MHz) |
| High ⁽¹⁾ | OPP119 | 1862, 4 | 97 | 1 | 1 | 931, 2 | 8 | 232, 8 | 4 | 465, 6 | 6 | 310, 4 | 5 | 372, 5 | 6 | 310, 4 |
| | OPP50 | 1862, 4 | 97 | 1 | 2 | 465, 6 | 8 | 232, 8 | 8 | 232, 8 | 9 | 206, 9 | 10 | 186, 2 | 9 | 206, 9 |
| Low ⁽²⁾ | OPP119 | 1600 | 125 | 2 | 1 | 800, 0 | 8 | 200, 0 | 4 | 400, 0 | 6 | 266, 7 | 5 | 320, 0 | 5 | 320, 0 |
| | OPP100 | 1600 | 125 | 2 | 1 | 800, 0 | 8 | 200, 0 | 4 | 400, 0 | 6 | 266, 7 | 6 | 266, 7 | 5 | 320, 0 |
| | OPP50 | 1600 | 125 | 2 | 2 | 400, 0 | 8 | 200, 0 | 8 | 200, 0 | 8 | 200, 0 | 9 | 177, 8 | 8 | 200, 0 |

⁽¹⁾ High performance OPPs

⁽²⁾ Low performance OPPs

For SYS_CLK = 16.8 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x3), the DPLL_CORE preferred settings are listed in [Table 3-69](#).

Table 3-69. DPLL_CORE Preferred Settings for SYS_CLK = 16.8 MHz

| CORE OPPs | | CORE DPLL | | | CORE Clocks | | | | | | | | | | | |
|---------------------|--------|-----------------------------|-----|---|-------------|-------------------------------------|------|-----------------------------------|------|------------------------------------|------|---------------------------------------|------|---------------------------------------|----|--|
| OPPs | | DPLL Locked Frequency (MHz) | M | N | M2 | PHY_ROOT_CLK Actual Frequency (MHz) | M4+1 | DLL_X2_CLK Actual Frequency (MHz) | M5+1 | CORE_X2_CLK Actual Frequency (MHz) | M6+1 | CORE_DPLL_EMU_CLK Max Frequency (MHz) | M7+1 | CORE_BB2D_FCLK Actual Frequency (MHz) | M3 | CORE_DPLL_SCRM_CLK Max Frequency (MHz) |
| High ⁽¹⁾ | OPP119 | 1864, 8 | 111 | 1 | 1 | 932, 4 | 8 | 233, 1 | 4 | 466, 2 | 6 | 310, 8 | 5 | 373, 0 | 6 | 310, 8 |
| | OPP50 | 1864, 8 | 111 | 1 | 2 | 466, 2 | 8 | 233, 1 | 8 | 233, 1 | 9 | 207, 2 | 10 | 186, 5 | 9 | 207, 2 |
| Low ⁽²⁾ | OPP119 | 1599, 36 | 238 | 4 | 1 | 799, 7 | 8 | 199, 9 | 4 | 399, 8 | 6 | 266, 6 | 5 | 319, 9 | 5 | 319, 9 |
| | OPP100 | 1599, 36 | 238 | 4 | 1 | 799, 7 | 8 | 199, 9 | 4 | 399, 8 | 6 | 266, 6 | 6 | 266, 6 | 5 | 319, 9 |
| | OPP50 | 1599, 36 | 238 | 4 | 2 | 399, 8 | 8 | 199, 9 | 8 | 199, 9 | 8 | 199, 9 | 9 | 177, 7 | 8 | 199, 9 |

⁽¹⁾ High performance OPPs

⁽²⁾ Low performance OPPs

For SYS_CLK = 12.0 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x1), the DPLL_CORE preferred settings are listed in [Table 3-70](#).

Table 3-70. DPLL_CORE Preferred Settings for SYS_CLK = 12.0 MHz

| CORE OPPs | | CORE DPLL | | | CORE Clocks | | | | | | | | | | | |
|---------------------|--------|--------------------------------------|-----|---|-------------|---|------|---|------|---|------|---|------|--|----|--|
| OPP | | DPLL Locked Frequency (MHz) | M | N | M2 | PHY_ROOT _CLK Actual Frequency (MHz) | M4+1 | DLL_X2_CL K Actual Frequency (MHz) | M5+1 | CORE_X2 CLK Actual Frequency (MHz) | M6+1 | CORE_DPL L_EMU_CL K Max Frequency (MHz) | M7+1 | CORE_BB2 D_FCLK Actual Frequency (MHz) | M3 | CORE_DPL L_SCRM_C LK Max Frequency (MHz) |
| High ⁽¹⁾ | OPP119 | 1864 | 233 | 2 | 1 | 932, 0 | 8 | 233, 0 | 4 | 466, 0 | 6 | 310, 7 | 5 | 372, 8 | 6 | 310, 7 |
| | OPP50 | 1864 | 233 | 2 | 2 | 466, 0 | 8 | 233, 0 | 8 | 233, 0 | 9 | 207, 1 | 10 | 186, 4 | 9 | 207, 1 |
| Low ⁽²⁾ | OPP119 | 1600 | 200 | 2 | 1 | 800, 0 | 8 | 200, 0 | 4 | 400, 0 | 6 | 266, 7 | 5 | 320, 0 | 5 | 320, 0 |
| | OPP100 | 1600 | 200 | 2 | 1 | 800, 0 | 8 | 200, 0 | 4 | 400, 0 | 6 | 266, 7 | 6 | 266, 7 | 5 | 320, 0 |
| | OPP50 | 1600 | 200 | 2 | 2 | 400, 0 | 8 | 200, 0 | 8 | 200, 0 | 8 | 200, 0 | 9 | 177, 8 | 8 | 200, 0 |

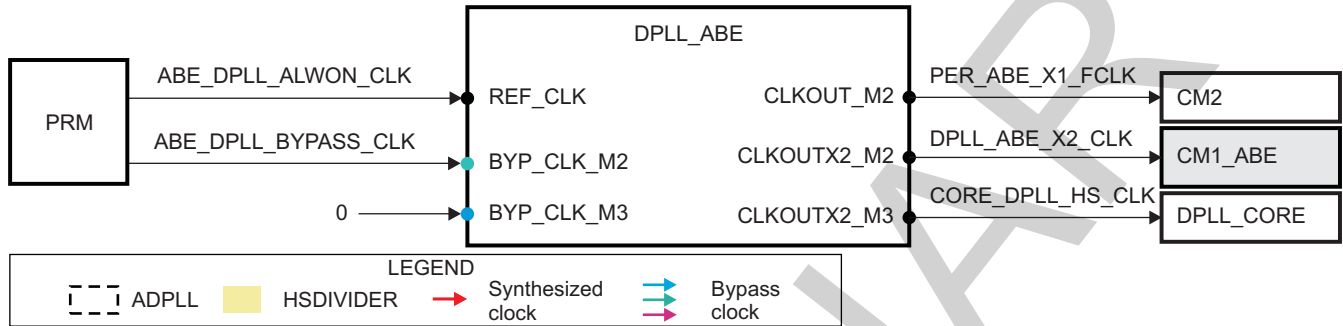
⁽¹⁾ High performance OPPs⁽²⁾ Low performance OPPs

3.6.3.6 DPLL_ABE Description

3.6.3.6.1 Overview

Figure 3-49 shows the overview of the DPLL. See [Section 3.6.3.3, Generic DPLL Overview](#), for a functional overview of a generic DPLL module.

Figure 3-49. DPLL_ABE Overview



prcm-044

3.6.3.6.2 Synthesized Clock Parameters

This section presents the clock synthesis and clock out divider parameters of the DPLL. See [Section 3.6.3.3, Generic DPLL Overview](#), for an explanation of the clock synthesis and output divider parameters of the DPLL module.

Table 3-71 lists the clock synthesis parameters of the DPLL.

Table 3-71. DPLL_ABE Clock Synthesis Parameters

| Parameter Name | Control Bit Field |
|----------------|------------------------------------|
| M | CM_CLKSEL_DPLL_ABE[18:8] DPLL_MULT |
| N | CM_CLKSEL_DPLL_ABE[6:0] DPLL_DIV |

Table 3-72 lists the clock output divider parameters of the DPLL.

Table 3-72. DPLL_ABE Clock Output Parameters

| Clock Output/Divider | Parameter Name | Control/Status Bit Field |
|----------------------|---------------------|---|
| CLKOUT_M2 | Status | CM_DIV_M2_DPLL_ABE[9] ST_DPLL_CLKOUT |
| CLKOUT_M2 | Gating Control | CM_DIV_M2_DPLL_ABE[8] DPLL_CLKOUT_GATE_CTRL |
| CLKOUT_M2 | Divider Acknowledge | CM_DIV_M2_DPLL_ABE[5] DPLL_CLKOUT_DIVCHACK |
| CLKOUTX2_M2 | Status | CM_DIV_M2_DPLL_ABE[11] ST_DPLL_CLKOUTX2 |
| CLKOUTX2_M2 | Gating Control | CM_DIV_M2_DPLL_ABE[10] DPLL_CLKOUTX2_GATE_CTRL |
| CLKOUT_M2 | Divider Control | CM_DIV_M2_DPLL_ABE[4:0] DPLL_CLKOUT_DIV |
| CLKOUTX2_M3 | Status | CM_DIV_M3_DPLL_ABE[9] ST_DPLL_CLKOUTHIF |
| CLKOUTX2_M3 | Gating Control | CM_DIV_M3_DPLL_ABE[8] DPLL_CLKOUTHIF_GATE_CTRL |
| CLKOUTX2_M3 | Divider Acknowledge | CM_DIV_M3_DPLL_ABE[5] DPLL_CLKOUTHIF_DIVCHACK |
| CLKOUTX2_M3 | Divider Control | CM_DIV_M3_DPLL_ABE[4:0] DPLL_CLKOUTHIF_DIV |

3.6.3.6.3 Power Modes

This section identifies the operating modes supported by the DPLL and also identify the control bit fields to set its operating modes. See [Section 3.6.3.3.2, Enable Control, Status and Low-Power Operation Mode](#), and [Section 3.6.3.3.3, DPLL Power Mode](#), for an explanation of the DPLL operating modes, and associated control and status features.

[Table 3-73](#) lists the operating modes supported by the DPLL.

Table 3-73. DPLL_ABE Modes

| Low-Power Stop | Fast-Relock Stop | MN Bypass | Low-Power Bypass | Fast-Relock Bypass | Lock |
|----------------|------------------|---------------------|------------------|--------------------|-----------|
| Not available | Not available | Available (Default) | Available | Available | Available |

[Table 3-74](#) lists the control bit fields for the operating mode control of the DPLL.

Table 3-74. DPLL_ABE Mode Control Parameters

| Parameter Name | Control Bit Field |
|------------------------|---|
| Low-Power Mode Control | CM_CLKMODE_DPLL_ABE [10] DPLL_LP_MODE_EN |
| Manual Mode Control | CM_CLKMODE_DPLL_ABE [2:0] DPLL_EN |
| Auto Mode Control | CM_AUTOIDLE_DPLL_ABE [2:0] AUTO_DPLL_MODE |

3.6.3.6.4 Recalibration

[Table 3-75](#) lists the control bit fields for the recalibration feature enable and interrupts of the DPLL. See [Section 3.6.3.3.4, DPLL Recalibration](#), for an explanation of the DPLL recalibration feature.

Table 3-75. DPLL_ABE Recalibration Feature Parameters

| Parameter Name | Control/Status Bit Field |
|--|--|
| Recalibration - Enable Control | CM_CLKMODE_DPLL_ABE [8] DPLL_DRIFTGUARD_EN |
| Recalibration - Interrupt Status | PRM_IRQSTATUS_MPU_A9 [4] DPLL_ABE_RECAL_ST |
| Recalibration - Interrupt Mask Control | PRM_IRQENABLE_MPU_A9 [4] DPLL_ABE_RECAL_EN |

3.6.3.6.5 Spread Spectrum Clocking

[Table 3-76](#) lists the control bit fields associated with the SSC features of the DPLL. See [Section 3.6.3.3.5, DPLL Spread Spectrum Clocking](#), for an explanation of the DPLL SSC feature.

Table 3-76. DPLL_ABE Spread-Spectrum Clocking Feature Parameters

| Parameter Name | Control Bit Field |
|---|---|
| SSC Downspread | CM_CLKMODE_DPLL_ABE [14] DPLL_SSC_DOWNSPREAD |
| SSC Acknowledge | CM_CLKMODE_DPLL_ABE [13] DPLL_SSC_ACK |
| SSC Enable Control | CM_CLKMODE_DPLL_ABE [12] DPLL_SSC_EN |
| Modulation Step Size Setting | CM_SSC_DELTAMSTEP_DPLL_ABE [19:0] DELTAMSTEP |
| Modulation Frequency Divider - Exponent | CM_SSC_MODFREQDIV_DPLL_ABE [10:8] MODFREQDIV_EXPONENT |
| Modulation Frequency Divider - Mantissa | CM_SSC_MODFREQDIV_DPLL_ABE [6:0] MODFREQDIV_MANTISSA |

3.6.3.6.6 DPLL_ABE Preferred Settings

For SYS_CLK = 38.4 MHz (configured in [CM_SYS_CLKSEL](#)[2:0] SYS_CLKSEL = 0x7), the DPLL_ABE preferred settings are listed in [Table 3-77](#).

Table 3-77. DPLL_ABE Preferred Settings for SYS_CLK = 38.4 MHz

| IVA OPPs | ABE DPLL | | | ABE Clocks | | | |
|-----------|---------------------------|-----|---|------------|--|----|---------------------------------------|
| | DPLL Locked Freq (MHz) | M | N | M2 | DPLL_ABE_X2_CLK Actual Freq (MHz) – M2X2 o/p | M3 | CORE_DPLL_HS_CLK Actual Freq (MHz) |
| OPP_NTSB | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP_NITRO | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP_TURBO | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP100 | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP50 | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |

For SYS_CLK = 26.0 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x5), the DPLL_ABE preferred settings are listed in [Table 3-78](#).

Table 3-78. DPLL_ABE Preferred Settings for SYS_CLK = 26.0 MHz

| IVA OPPs | ABE DPLL | | | ABE Clocks | | | |
|-----------|---------------------------|-----|---|------------|--|----|---------------------------------------|
| | DPLL Locked Freq (MHz) | M | N | M2 | DPLL_ABE_X2_CLK Actual Freq (MHz) – M2X2 o/p | M3 | CORE_DPLL_HS_CLK Actual Freq (MHz) |
| OPP_NTSB | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP_NITRO | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP_TURBO | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP100 | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP50 | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |

For SYS_CLK = 19.2 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x4), the DPLL_ABE preferred settings are listed in [Table 3-79](#).

Table 3-79. DPLL_ABE Preferred Settings for SYS_CLK = 19.2 MHz

| IVA OPPs | ABE DPLL | | | ABE Clocks | | | |
|-----------|---------------------------|-----|---|------------|--|----|---------------------------------------|
| | DPLL Locked Freq (MHz) | M | N | M2 | DPLL_ABE_X2_CLK Actual Freq (MHz) – M2X2 o/p | M3 | CORE_DPLL_HS_CLK Actual Freq (MHz) |
| OPP_NTSB | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP_NITRO | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP_TURBO | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP100 | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP50 | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |

For SYS_CLK = 16.8 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x3), the DPLL_ABE preferred settings are listed in [Table 3-80](#).

Table 3-80. DPLL_ABE Preferred Settings for SYS_CLK = 16.8 MHz

| IVA OPPs | ABE DPLL | | | ABE Clocks | | | |
|-----------|---------------------------|-----|---|------------|--|----|---------------------------------------|
| | DPLL Locked Freq (MHz) | M | N | M2 | DPLL_ABE_X2_CLK Actual Freq (MHz) – M2X2 o/p | M3 | CORE_DPLL_HS_CLK Actual Freq (MHz) |
| OPP_NTSB | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP_NITRO | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP_TURBO | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP100 | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP50 | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |

For SYS_CLK = 12.0 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x1), the DPLL_ABE preferred settings are listed in [Table 3-81](#).

Table 3-81. DPLL_ABE Preferred Settings for SYS_CLK = 12.0 MHz

| IVA OPPs | ABE DPLL | | | ABE Clocks | | | |
|-----------|---------------------------|-----|---|------------|--|----|---------------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M2 | DPLL_ABE_X2_CLK Actual Freq (MHz) – M2X2 o/p | M3 | CORE_DPLL_HS_CLK Actual Freq (MHz) |
| OPP_NTSB | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP_NITRO | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP_TURBO | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP100 | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |
| OPP50 | 196,608 | 750 | 0 | 1 | 196,608 | 1 | 196,6 |

3.6.3.7 DPLL_MPU Description

3.6.3.7.1 Overview

[Figure 3-50](#) shows the overview of the DPLL. See [Section 3.6.3.3](#), *Generic DPLL Overview*, for a functional overview of a generic DPLL module.

Figure 3-50. DPLL_MPU Overview

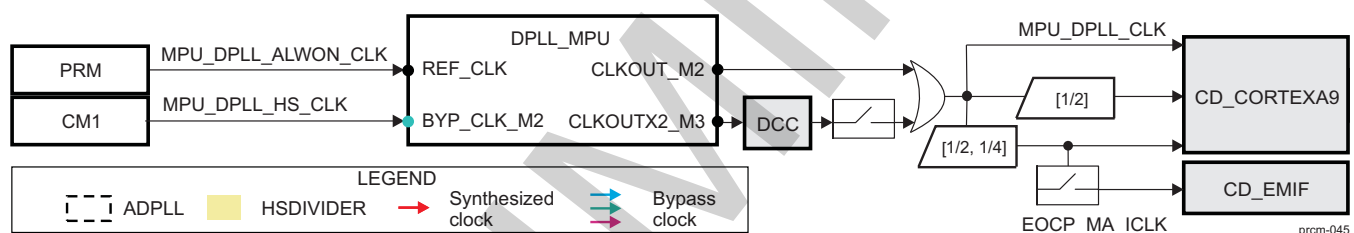


Table 3-82. MPU SS Clock Division Control

| Divider/Mux | Control Bit Field |
|-----------------------|---|
| Divider EOC_P_MA_ICLK | CM_MPU_MPU_CLKCTRL[24] CLKSEL_EMIF_DIV_MODE |

NOTE: For more information about setting the [CM_MPU_MPU_CLKCTRL\[24\]](#) CLKSEL_EMIF_DIV_MODE and [CM_MPU_MPU_CLKCTRL\[25\]](#) CLKSEL_ABE_DIV_MODE bits, see the *Data Manual Operating Condition Addendum*.

3.6.3.7.2 Tactical Clocking Adjustment

[Figure 3-50](#) includes the clocking adjustment scheme for DPLL_MPU. To obtain MPU_DPLL_CLK frequency higher than 1 GHz, the CLKOUTX2_M3 output is used instead of the CLKOUT_M2 output. The M3 output divider is hardwired to value 1 and a duty cycle correction circuit (DCC) is used to recover a correct duty cycle (48–52 percent maximum). The [CM_CLKSEL_DPLL_MPU\[22\]](#) DCC_EN bit must be set for DPLL_MPU for the DCC to be used.

There is a subsequent clock gating element after the DCC instance. The selection between CLKOUT_M2 and CLKOUTX2_M3 source clock is performed in a glitch-free manner using an OR gate and non-overlapping input clock technique. Additional FSM is added into the CM1 to control the clock switching sequence. The FSM includes a counter for a clock ramp step (configured by the [CM_CLKSEL_DPLL_MPU\[31:24\]](#) DCC_COUNT_MAX bit field) during which the output frequency is $F_{dpll}/(2 \cdot M2)$. This clock ramp step is used for two purposes:

- Allows enough time for DCC to lock (2.5 μ s)

- Eventually avoids a transient load issue on the power IC by programming a bigger value (up to 81.6 μ s)

Principles:

- When DCC_EN = 0, the DCC FSM is transparent and the CLKOUTX2_M3 gating element and the gating element after the DCC instance are off.
- When DCC_EN = 1:
 - CLKOUT_M2 is ungated as soon as the MPU clock is requested. The two other gating elements are off.
 - CLKOUTX2_M3 is ungated as soon as the DPLL is locked and the FSM starts the counter.
 - When the counter ends, CLKOUT_M2 is gated, and the DCC clock output is ungated with an assured 10-ns minimal nonoverlap time.
 - In case MPU clock is no longer requested, the DCC clock output is gated, and then the CLKOUTX2_M3 is gated.

3.6.3.7.3 Synthesized Clock Parameters

This section describes the clock synthesis and clock out divider parameters of the DPLL. See [Section 3.6.3.3, Generic DPLL Overview](#), for an explanation of the clock synthesis and output divider parameters of the DPLL module.

[Table 3-83](#) lists the clock synthesis parameters of the DPLL.

Table 3-83. DPLL_MPU Clock Synthesis Parameters

| Parameter Name | Control Bit Field |
|----------------|---|
| M | CM_CLKSEL_DPLL_MPU [18:8] DPLL_MULT |
| N | CM_CLKSEL_DPLL_MPU [6:0] DPLL_DIV |

[Table 3-84](#) lists the clock output divider parameters of the DPLL.

Table 3-84. DPLL_MPU Clock Output Parameters

| Clock Output/Divider | Parameter Name | Control/Status Bit Field |
|----------------------|---------------------|---|
| CLKOUT_M2 | Status | CM_DIV_M2_DPLL_MPU [9] ST_DPLL_CLKOUT |
| CLKOUT_M2 | Gating Control | CM_DIV_M2_DPLL_MPU [8] DPLL_CLKOUT_GATE_CTRL |
| CLKOUT_M2 | Divider Acknowledge | CM_DIV_M2_DPLL_MPU [5] DPLL_CLKOUT_DIVCHACK |
| CLKOUT_M2 | Divider Control | CM_DIV_M2_DPLL_MPU [4:0] DPLL_CLKOUT_DIV |

3.6.3.7.4 Power Modes

This section identifies the operating modes supported by the DPLL and also identify the control bit fields to set its operating modes. See [Section 3.6.3.3.2, Enable Control, Status and Low-Power Operation Mode](#), and [Section 3.6.3.3.3, DPLL Power Modes](#), for an explanation of the DPLL operating modes and associated control and status features.

[Table 3-85](#) lists the operating modes supported by the DPLL.

Table 3-85. DPLL_MPU Modes

| Low-Power Stop | Fast-Relock Stop | MN Bypass | Low-Power Bypass | Fast-Relock Bypass | Lock |
|----------------|------------------|---------------------|------------------|--------------------|-----------|
| Not available | Not available | Available (Default) | Available | Available | Available |

Table 3-86 lists the control bit fields for the operating mode control of the DPLL.

Table 3-86. DPLL_MPU Mode Control Parameters

| Parameter Name | Control Bit Field |
|------------------------|--|
| Low-Power Mode Control | CM_CLKMODE_DPLL_MPU[10] DPLL_LPMODE_EN |
| Manual Mode Control | CM_CLKMODE_DPLL_MPU[2:0] DPLL_EN |
| Auto Mode Control | CM_AUTOIDLE_DPLL_MPU[2:0] AUTO_DPLL_MODE |

3.6.3.7.5 Recalibration

Table 3-87 lists the control bit fields for the recalibration feature enable and interrupts of the DPLL. See Section 3.6.3.3.4, *DPLL Recalibration*, for an explanation of the DPLL recalibration feature.

Table 3-87. DPLL_MPU Recalibration Feature Parameters

| Parameter Name | Control/Status Bit Field |
|--|---|
| Recalibration - Enable Control | CM_CLKMODE_DPLL_MPU[8] DPLL_DRIFTGUARD_EN |
| Recalibration - Interrupt Status | PRM_IRQSTATUS_MPU_A9[1] DPLL_MPU_RECAL_ST |
| Recalibration - Interrupt Mask Control | PRM_IRQENABLE_MPU_A9[1] DPLL_MPU_RECAL_EN |

3.6.3.7.6 Spread Spectrum Clocking

Table 3-88 lists the control bit fields associated with the SSC features of the DPLL. See Section 3.6.3.3.5, *DPLL Spread Spectrum Clocking*, for an explanation of the DPLL SSC feature.

Table 3-88. DPLL_MPU Spread-Spectrum Clocking Feature Parameters

| Parameter Name | Control Bit Field |
|---|--|
| SSC Downspread | CM_CLKMODE_DPLL_MPU[14] DPLL_SSC_DOWNSPREAD |
| SSC Acknowledge | CM_CLKMODE_DPLL_MPU[13] DPLL_SSC_ACK |
| SSC Enable Control | CM_CLKMODE_DPLL_MPU[12] DPLL_SSC_EN |
| Modulation Step Size Setting | CM_SSC_DELTAMSTEP_DPLL_MPU[19:0] DELTAMSTEP |
| Modulation Frequency Divider - Exponent | CM_SSC_MODFREQDIV_DPLL_MPU[10:8] MODFREQDIV_EXPONENT |
| Modulation Frequency Divider - Mantissa | CM_SSC_MODFREQDIV_DPLL_MPU[6:0] MODFREQDIV_MANTISSA |

3.6.3.7.7 DPLL_MPU Preferred Settings

For SYS_CLK = 38.4 MHz (configured in CM_SYS_CLKSEL[2:0] SYS_CLKSEL = 0x7), the DPLL_MPU preferred settings are listed in Table 3-89.

Table 3-89. DPLL_MPU Preferred Settings for SYS_CLK = 38.4 MHz

| MPU OPPs | MPU DPLL | | | MPU | | | |
|-----------|---------------------------|-----|---|-----|---|----|-----------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M2 | | M3 | MPU_DPLL_CLK Actual Freq (MHz) |
| OPP_NTSB | 1497, 6 | 39 | 1 | | Use M3 output + Duty Cycle Correction | 1 | 1497, 6 |
| OPP_NITRO | 1297, 9 | 169 | 9 | | | 1 | 1297, 9 |
| OPP_TURBO | 1100, 8 | 43 | 2 | | | 1 | 1100, 8 |
| OPP100 | 1600, 0 | 125 | 5 | 1 | Use M2 output | | 800, 0 |
| OPP50 | 1600, 0 | 125 | 5 | 2 | | | 400, 0 |

For SYS_CLK = 26.0 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x5), the DPLL_MPU preferred settings are listed in [Table 3-90](#).

Table 3-90. DPLL_MPU Preferred Settings for SYS_CLK = 26.0 MHz

| MPU OPPs | MPU DPLL | | | MPU | | | |
|-----------|---------------------------|-----|---|-----|---|----|-----------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M2 | | M3 | MPU_DPLL_CLK Actual Freq (MHz) |
| OPP_NTSB | 1499, 3 | 173 | 5 | | Use M3 output + Duty Cycle Correction | 1 | 1499, 3 |
| OPP_NITRO | 1300, 0 | 25 | 0 | | | 1 | 1300, 0 |
| OPP_TURBO | 1099, 4 | 148 | 6 | | | 1 | 1099, 4 |
| OPP100 | 1599, 0 | 123 | 3 | 1 | | | 799, 5 |
| OPP50 | 1599, 0 | 123 | 3 | 2 | | | 399, 8 |

For SYS_CLK = 19.2 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x4), the DPLL_MPU preferred settings are listed in [Table 3-91](#).

Table 3-91. DPLL_MPU Preferred Settings for SYS_CLK = 19.2 MHz

| MPU OPPs | MPU DPLL | | | MPU | | | |
|-----------|---------------------------|-----|---|-----|---|----|-----------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M2 | | M3 | MPU_DPLL_CLK Actual Freq (MHz) |
| OPP_NTSB | 1497, 6 | 39 | 0 | | Use M3 output + Duty Cycle Correction | 1 | 1497, 6 |
| OPP_NITRO | 1297, 92 | 169 | 4 | | | 1 | 1297, 9 |
| OPP_TURBO | 1100, 8 | 86 | 2 | | | 1 | 1100, 8 |
| OPP100 | 1600 | 125 | 2 | 1 | Use M2 output | | 800, 0 |
| OPP50 | 1600 | 125 | 2 | 2 | | | 400, 0 |

For SYS_CLK = 16.8 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x3), the DPLL_MPU preferred settings are listed in [Table 3-92](#).

Table 3-92. DPLL_MPU Preferred Settings for SYS_CLK = 16.8 MHz

| MPU OPPs | MPU DPLL | | | MPU | | | |
|-----------|---------------------------|-----|---|-----|---|----|-----------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M2 | | M3 | MPU_DPLL_CLK Actual Freq (MHz) |
| OPP_NTSB | 1498, 6 | 223 | 4 | | Use M3 output + Duty Cycle Correction | 1 | 1498, 6 |
| OPP_NITRO | 1299, 2 | 116 | 2 | | | 1 | 1299, 2 |
| OPP_TURBO | 1100, 4 | 131 | 3 | | | 1 | 1100, 4 |
| OPP100 | 1599, 4 | 238 | 4 | 1 | Use M2 output | | 799, 7 |
| OPP50 | 1599, 4 | 238 | 4 | 2 | | | 399, 8 |

For SYS_CLK = 12.0 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x1), the DPLL_MPU preferred settings are listed in [Table 3-93](#).

Table 3-93. DPLL_MPU Preferred Settings for SYS_CLK = 12.0 MHz

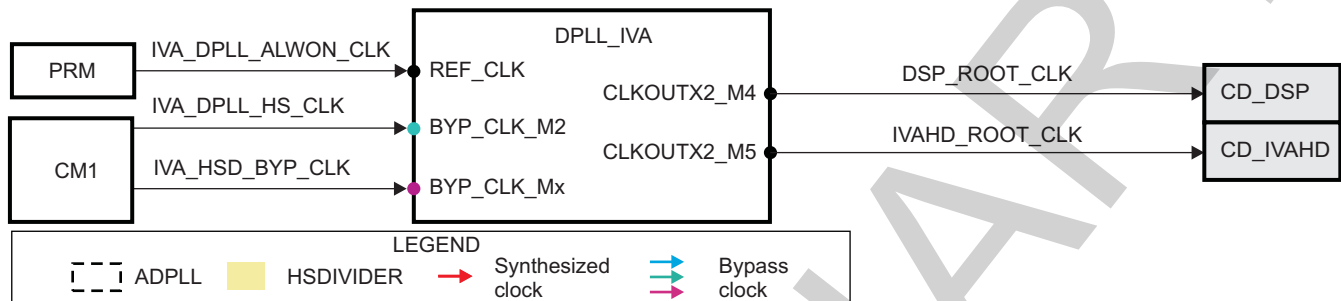
| MPU OPPs | MPU DPLL | | | MPU | | | |
|-----------|---------------------------|-----|---|-----|---|----|-----------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M2 | | M3 | MPU_DPLL_CLK Actual Freq (MHz) |
| OPP_NTSB | 1500 | 125 | 1 | | Use M3 output + Duty Cycle Correction | 1 | 1500 |
| OPP_NITRO | 1300 | 325 | 5 | | | 1 | 1300 |
| OPP_TURBO | 1100 | 275 | 5 | | | 1 | 1100 |
| OPP100 | 1600 | 200 | 2 | 1 | Use M2 output | | 800 |
| OPP50 | 1600 | 200 | 2 | 2 | | | 400 |

3.6.3.8 DPLL_IVA Description

3.6.3.8.1 Overview

Figure 3-51 shows the overview of the DPLL. See [Section 3.6.3.3, Generic DPLL Overview](#), for a functional overview of a generic DPLL module.

Figure 3-51. DPLL_IVA Overview



prcm-046

3.6.3.8.2 Synthesized Clock Parameters

This section presents the clock synthesis and clock out divider parameters of the DPLL. See [Section 3.6.3.3, Generic DPLL Overview](#), for an explanation of the clock synthesis and output divider parameters of the DPLL module.

[Table 3-94](#) lists the clock synthesis parameters of the DPLL.

Table 3-94. DPLL_IVA Clock Synthesis Parameters

| Parameter Name | Control Bit Field |
|----------------|--|
| M | CM_CLKSEL_DPLL_IVA[18:8] DPLL_MULT |
| N | CM_CLKSEL_DPLL_IVA[6:0] DPLL_DIV |

[Table 3-95](#) lists the clock output divider parameters of the DPLL.

Table 3-95. DPLL_IVA Clock Output Parameters

| Clock Output/Divider | Parameter Name | Control/Status Bit Field |
|----------------------|---------------------|--|
| CLKOUTX2_M4 | Status | CM_DIV_M4_DPLL_IVA[9] ST_HSDIVIDER_CLKOUT1 |
| CLKOUTX2_M4 | Gating Control | CM_DIV_M4_DPLL_IVA[8] HSDIVIDER_CLKOUT1_GATE_CTRL |
| CLKOUTX2_M4 | Divider Acknowledge | CM_DIV_M4_DPLL_IVA[5] HSDIVIDER_CLKOUT1_DIVCHACK |
| CLKOUTX2_M4 | Divider Control | CM_DIV_M4_DPLL_IVA[4:0] HSDIVIDER_CLKOUT1_DIV |
| CLKOUTX2_M5 | Status | CM_DIV_M5_DPLL_IVA[9] ST_HSDIVIDER_CLKOUT2 |
| CLKOUTX2_M5 | Gating Control | CM_DIV_M5_DPLL_IVA[8] HSDIVIDER_CLKOUT2_GATE_CTRL |
| CLKOUTX2_M5 | Divider Acknowledge | CM_DIV_M5_DPLL_IVA[5] HSDIVIDER_CLKOUT2_DIVCHACK |
| CLKOUTX2_M5 | Divider Control | CM_DIV_M5_DPLL_IVA[4:0] HSDIVIDER_CLKOUT2_DIV |

3.6.3.8.3 Power Modes

This section identifies the operating modes supported by the DPLL and also identify the control bit fields to set its operating modes. See [Section 3.6.3.3.2, Enable Control, Status and Low-Power Operation Mode](#) and [Section 3.6.3.3.3, DPLL Power Modes](#) for explanation on the DPLL operating modes, and associated control and status features.

[Table 3-96](#) presents the operating modes supported by the DPLL.

Table 3-96. DPLL_IVA Modes

| Low-Power Stop | Fast-Relock Stop | MN Bypass | Low-Power Bypass | Fast-Relock Bypass | Lock |
|----------------|------------------|---------------------|------------------|--------------------|-----------|
| Not available | Not available | Available (Default) | Available | Available | Available |

[Table 3-97](#) presents the control bit fields for the operating mode control of the DPLL.

Table 3-97. DPLL_IVA Mode Control Parameters

| Parameter Name | Control Bit Field |
|------------------------|---|
| Low-Power Mode Control | CM_CLKMODE_DPLL_IVA [10] DPLL_LPMODE_EN |
| Manual Mode Control | CM_CLKMODE_DPLL_IVA [2:0] DPLL_EN |
| Auto Mode Control | CM_AUTOIDLE_DPLL_IVA [2:0] AUTO_DPLL_MODE |

3.6.3.8.4 Recalibration

[Table 3-98](#) lists the control bit fields for the recalibration feature enable and interrupts of the DPLL. See [Section 3.6.3.3.4, DPLL Recalibration](#), for an explanation of the DPLL recalibration feature.

Table 3-98. DPLL_IVA Recalibration Feature Parameters

| Parameter Name | Control/Status Bit Field |
|--|--|
| Recalibration - Enable Control | CM_CLKMODE_DPLL_IVA [8] DPLL_DRIFTGUARD_EN |
| Recalibration - Interrupt Status | PRM_IRQSTATUS_MPU_A9 [2] DPLL_IVA_RECAL_ST |
| Recalibration - Interrupt Mask Control | PRM_IRQENABLE_MPU_A9 [2] DPLL_IVA_RECAL_EN |
| Recalibration - Interrupt Status | PRM_IRQSTATUS_MPU_M3 [2] DPLL_IVA_RECAL_ST |
| Recalibration - Interrupt Mask Control | PRM_IRQENABLE_MPU_M3 [2] DPLL_IVA_RECAL_EN |

3.6.3.8.5 Spread Spectrum Clocking

[Table 3-99](#) lists the control bit fields associated with the SSC features of the DPLL. See [Section 3.6.3.3.5, DPLL Spread Spectrum Clocking](#), for an explanation of the DPLL SSC feature.

Table 3-99. DPLL_IVA Spread-Spectrum Clocking Feature Parameters

| Parameter Name | Control Bit Field |
|---|---|
| SSC Downspread | CM_CLKMODE_DPLL_IVA [14] DPLL_SSC_DOWNSPREAD |
| SSC Acknowledge | CM_CLKMODE_DPLL_IVA [13] DPLL_SSC_ACK |
| SSC Enable Control | CM_CLKMODE_DPLL_IVA [12] DPLL_SSC_EN |
| Modulation Step Size Setting | CM_SSC_DELTAMSTEP_DPLL_IVA [19:0] DELTAMSTEP |
| Modulation Frequency Divider - Exponent | CM_SSC_MODFREQDIV_DPLL_IVA [10:8] MODFREQDIV_EXPONENT |
| Modulation Frequency Divider - Mantissa | CM_SSC_MODFREQDIV_DPLL_IVA [6:0] MODFREQDIV_MANTISSA |

3.6.3.8.6 Output Power Down

Table 3-100 lists the control bit fields for the output power down features of the DPLL. See Section 3.6.3.3.6, *DPLL Output Power-Down*, for an explanation of the DPLL output power-down feature.

Table 3-100. DPLL_IVA Clock Output Power-down Parameters

| Parameter Name | Control/Status Bit Field |
|--|---|
| Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M4_DPLL_IVA[12] HSDIVIDER_CLKOUT1_PWDN |
| Clock Divider - HSDIVIDER-Power Down Control | CM_DIV_M5_DPLL_IVA[12] HSDIVIDER_CLKOUT2_PWDN |

3.6.3.8.7 DPLL_IVA Preferred Settings

For SYS_CLK = 38.4 MHz (configured in CM_SYS_CLKSEL[2:0] SYS_CLKSEL = 0x7), the DPLL_IVA preferred settings are listed in Table 3-101.

Table 3-101. DPLL_IVA Preferred Settings for SYS_CLK = 38.4 MHz

| IVA OPPs | IVA DPLL | | | IVA Clocks | | | |
|-----------|---------------------------|-----|----|------------|-----------------------------------|------|-------------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M4+1 | DSP_ROOT_CLK Actual Freq (MHz) | M5+1 | IVAHD_ROOT_CLK Actual Freq (MHz) |
| OPP_NTSB | 998, 4 | 13 | 0 | 2 | 499, 2 | 2 | 499, 2 |
| OPP_NITRO | 860, 2 | 56 | 4 | 2 | 430, 1 | 2 | 430, 1 |
| OPP_TURBO | 992, 0 | 155 | 11 | 2 | 496, 0 | 3 | 330, 7 |
| OPP100 | 1862, 4 | 97 | 3 | 4 | 465, 6 | 7 | 266, 1 |
| OPP50 | 1862, 4 | 97 | 3 | 8 | 232, 8 | 14 | 133, 0 |

For SYS_CLK = 26.0 MHz (configured in CM_SYS_CLKSEL[2:0] SYS_CLKSEL = 0x5), the DPLL_IVA preferred settings are listed in Table 3-102.

Table 3-102. DPLL_IVA Preferred Settings for SYS_CLK = 26.0 MHz

| IVA OPPs | IVA DPLL | | | IVA Clocks | | | |
|-----------|---------------------------|-----|----|------------|-----------------------------------|------|-------------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M4+1 | DSP_ROOT_CLK Actual Freq (MHz) | M5+1 | IVAHD_ROOT_CLK Actual Freq (MHz) |
| OPP_NTSB | 998, 4 | 96 | 4 | 2 | 499, 2 | 2 | 499, 2 |
| OPP_NITRO | 860, 9 | 149 | 8 | 2 | 430, 4 | 2 | 430, 4 |
| OPP_TURBO | 992, 0 | 248 | 12 | 2 | 496, 0 | 3 | 330, 7 |
| OPP100 | 1861, 6 | 179 | 4 | 4 | 465, 4 | 7 | 265, 9 |
| OPP50 | 1861, 6 | 179 | 4 | 8 | 232, 7 | 14 | 133, 0 |

For SYS_CLK = 19.2 MHz (configured in CM_SYS_CLKSEL[2:0] SYS_CLKSEL = 0x4), the DPLL_IVA preferred settings are listed in Table 3-103.

Table 3-103. DPLL_IVA Preferred Settings for SYS_CLK = 19.2 MHz

| IVA OPPs | IVA DPLL | | | IVA Clocks | | | |
|-----------|---------------------------|-----|---|------------|-----------------------------------|------|-------------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M4+1 | DSP_ROOT_CLK Actual Freq (MHz) | M5+1 | IVAHD_ROOT_CLK Actual Freq (MHz) |
| OPP_NTSB | 998, 4 | 26 | 0 | 2 | 499, 2 | 2 | 499, 2 |
| OPP_NITRO | 860, 16 | 112 | 4 | 2 | 430, 1 | 2 | 430, 1 |
| OPP_TURBO | 992 | 155 | 5 | 2 | 496, 0 | 3 | 330, 7 |
| OPP100 | 1862, 4 | 97 | 1 | 4 | 465, 6 | 7 | 266, 1 |
| OPP50 | 1862, 4 | 97 | 1 | 8 | 232, 8 | 14 | 133, 0 |

For SYS_CLK = 16.8 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x3), the DPLL_IVA preferred settings are listed in [Table 3-104](#).

Table 3-104. DPLL_IVA Preferred Settings for SYS_CLK = 16.8 MHz

| IVA OPPs | IVA DPLL | | | IVA Clocks | | | |
|-----------|---------------------------|-----|---|------------|-----------------------------------|------|-------------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M4+1 | DSP_ROOT_CLK Actual Freq (MHz) | M5+1 | IVAHD_ROOT_CLK Actual Freq (MHz) |
| OPP_NTSB | 999, 6 | 119 | 3 | 2 | 499, 8 | 2 | 499, 8 |
| OPP_NITRO | 860, 2 | 128 | 4 | 2 | 430, 1 | 2 | 430, 1 |
| OPP_TURBO | 991, 2 | 59 | 1 | 2 | 495, 6 | 3 | 330, 4 |
| OPP100 | 1861, 4 | 277 | 4 | 4 | 465, 4 | 7 | 265, 9 |
| OPP50 | 1861, 4 | 277 | 4 | 8 | 232, 7 | 14 | 133, 0 |

For SYS_CLK = 12.0 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x1), the DPLL_IVA preferred settings are listed in [Table 3-105](#).

Table 3-105. DPLL_IVA Preferred Settings for SYS_CLK = 12.0 MHz

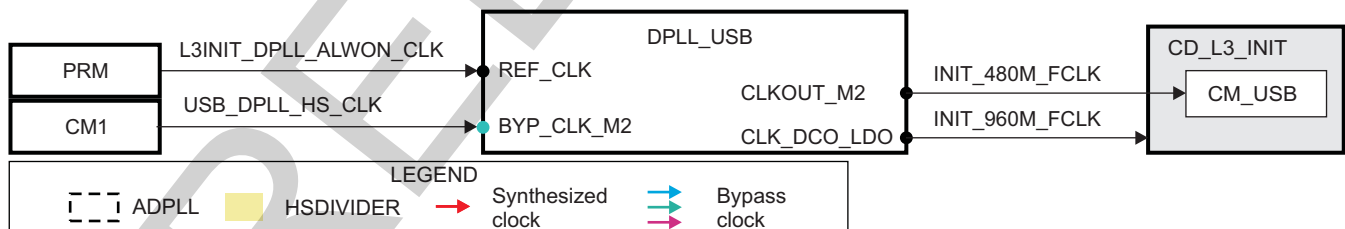
| IVA OPPs | IVA DPLL | | | IVA Clocks | | | |
|-----------|---------------------------|-----|---|------------|-----------------------------------|------|-------------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M4+1 | DSP_ROOT_CLK Actual Freq (MHz) | M5+1 | IVAHD_ROOT_CLK Actual Freq (MHz) |
| OPP_NTSB | 1000 | 125 | 2 | 2 | 500, 0 | 2 | 500, 0 |
| OPP_NITRO | 860 | 215 | 5 | 2 | 430, 0 | 2 | 430, 0 |
| OPP_TURBO | 992 | 124 | 2 | 2 | 496, 0 | 3 | 330, 7 |
| OPP100 | 1862, 4 | 388 | 4 | 4 | 465, 6 | 7 | 266, 1 |
| OPP50 | 1862, 4 | 388 | 4 | 8 | 232, 8 | 14 | 133, 0 |

3.6.3.9 DPLL_USB Description

3.6.3.9.1 Overview

[Figure 3-52](#) shows the overview of the DPLL. See [Section 3.6.3.3](#), *Generic DPLL Overview*, for a functional overview of a generic DPLL module.

Figure 3-52. DPLL_USB Overview



prcm-047

3.6.3.9.2 Synthesized Clock Parameters

This section presents the clock synthesis and clock out divider parameters of the DPLL. See [Section 3.6.3.3](#), *Generic PDLL Overview*, for an explanation of the clock synthesis and output divider parameters of the DPLL module.

[Table 3-106](#) lists the clock synthesis parameters of the DPLL.

Table 3-106. DPLL_USB Clock Synthesis Parameters

| Parameter Name | Control Bit Field |
|----------------|------------------------------------|
| M | CM_CLKSEL_DPLL_USB[19:8] DPLL_MULT |
| N | CM_CLKSEL_DPLL_USB[7:0] DPLL_DIV |

Table 3-107 lists the clock output divider parameters of the DPLL.

Table 3-107. DPLL_USB Clock Output Parameters

| Clock Output/Divider | Parameter Name | Control/Status Bit Field |
|----------------------|---------------------|--|
| CLKOUT_M2 | Status | CM_DIV_M2_DPLL_USB[9] ST_DPLL_CLKOUT |
| CLKOUT_M2 | Gating Control | CM_DIV_M2_DPLL_USB[8] DPLL_CLKOUT_GATE_CTRL |
| CLKOUT_M2 | Divider Acknowledge | CM_DIV_M2_DPLL_USB[7] DPLL_CLKOUT_DIVCHACK |
| CLKOUT_M2 | Divider Control | CM_DIV_M2_DPLL_USB[6:0] DPLL_CLKOUT_DIV |

3.6.3.9.3 Power Modes

This section identifies the operating modes supported by the DPLL and also identifies the control bit fields to set its operating modes. See [Section 3.6.3.3.2, Enable Control, Status and Low-Power Operation Mode](#), and [Section 3.6.3.3.3, DPLL Power Modes](#), for an explanation of the DPLL operating modes, and associated control and status features.

Table 3-108 lists the operating modes supported by the DPLL.

Table 3-108. DPLL_USB Modes

| Low-Power Stop | Fast-Relock Stop | MN Bypass | Low-Power Bypass | Fast-Relock Bypass | Lock |
|----------------|------------------|---------------------|------------------|--------------------|-----------|
| Available | Not available | Available (Default) | Available | Not available | Available |

Table 3-109 lists the control bit fields for the operating mode control of the DPLL.

Table 3-109. DPLL_USB Mode Control Parameters

| Parameter Name | Control Bit Field |
|---------------------|--|
| Manual Mode Control | CM_CLKMODE_DPLL_USB[2:0] DPLL_EN |
| Auto Mode Control | CM_AUTOIDLE_DPLL_USB[2:0] AUTO_DPLL_MODE |

3.6.3.9.4 Spread Spectrum Clocking

Table 3-110 lists the control bit fields associated with the SSC features of the DPLL. See [Section 3.6.3.3.5, DPLL Spread Spectrum Clocking](#), for an explanation of the DPLL SSC feature.

Table 3-110. DPLL_USB Spread-Spectrum Clocking Feature Parameters

| Parameter Name | Control Bit Field |
|---|---|
| SSC Downspread | CM_CLKMODE_DPLL_USB[14] DPLL_SSC_DOWNSPREAD |
| SSC Acknowledge | CM_CLKMODE_DPLL_USB[13] DPLL_SSC_ACK |
| SSC Enable Control | CM_CLKMODE_DPLL_USB[12] DPLL_SSC_EN |
| Modulation Step Size Setting | CM_SSC_DELTAMSTEP_DPLL_USB[19:0] DELTAMSTEP |
| Modulation Frequency Divider - Exponent | CM_SSC_MODFREQDIV_DPLL_USB[10:8] MODFREQDIV_EXPONENT |
| Modulation Frequency Divider - Mantissa | CM_SSC_MODFREQDIV_DPLL_USB[6:0] MODFREQDIV_MANTISSA |

3.6.3.9.5 DPLL_USB Preferred Settings

For SYS_CLK = 38.4 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x7), the DPLL_USB preferred settings are listed in [Table 3-111](#).

Table 3-111. DPLL_USB Preferred Settings for SYS_CLK = 38.4 MHz

| CORE OPPs | USB DPLL | | | USB | |
|-----------|---------------------------|-----|----|-----|-------------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M2 | INIT_480M_FCLK Actual Freq (MHz) |
| OPP119 | 960 | 400 | 15 | 2 | 480, 0 |
| OPP100 | 960 | 400 | 15 | 2 | 480, 0 |
| OPP50 | 960 | 400 | 15 | 2 | 480, 0 |

For SYS_CLK = 26.0 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x5), the DPLL_USB preferred settings are listed in [Table 3-112](#).

Table 3-112. DPLL_USB Preferred Settings for SYS_CLK = 26.0 MHz

| CORE OPPs | USB DPLL | | | USB | |
|-----------|---------------------------|-----|----|-----|-------------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M2 | INIT_480M_FCLK Actual Freq (MHz) |
| OPP119 | 960 | 480 | 12 | 2 | 480, 0 |
| OPP100 | 960 | 480 | 12 | 2 | 480, 0 |
| OPP50 | 960 | 480 | 12 | 2 | 480, 0 |

For SYS_CLK = 19.2 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x4), the DPLL_USB preferred settings are listed in [Table 3-113](#).

Table 3-113. DPLL_USB Preferred Settings for SYS_CLK = 19.2 MHz

| CORE OPPs | USB DPLL | | | USB | |
|-----------|---------------------------|-----|---|-----|-------------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M2 | INIT_480M_FCLK Actual Freq (MHz) |
| OPP119 | 960 | 400 | 7 | 2 | 480, 0 |
| OPP100 | 960 | 400 | 7 | 2 | 480, 0 |
| OPP50 | 960 | 400 | 7 | 2 | 480, 0 |

For SYS_CLK = 16.8 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x3), the DPLL_USB preferred settings are listed in [Table 3-114](#).

Table 3-114. DPLL_USB Preferred Settings for SYS_CLK = 16.8 MHz

| CORE OPPs | USB DPLL | | | USB | |
|-----------|---------------------------|-----|---|-----|-------------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M2 | INIT_480M_FCLK Actual Freq (MHz) |
| OPP119 | 960 | 400 | 6 | 2 | 480, 0 |
| OPP100 | 960 | 400 | 6 | 2 | 480, 0 |
| OPP50 | 960 | 400 | 6 | 2 | 480, 0 |

For SYS_CLK = 12.0 MHz (configured in [CM_SYS_CLKSEL\[2:0\]](#) SYS_CLKSEL = 0x1), the DPLL_USB preferred settings are listed in [Table 3-115](#).

Table 3-115. DPLL_USB Preferred Settings for SYS_CLK = 12.0 MHz

| CORE OPPs | USB DPLL | | | USB | |
|-----------|---------------------------|---|---|-----|-------------------------------------|
| OPPs | DPLL Locked Freq (MHz) | M | N | M2 | INIT_480M_FCLK Actual Freq (MHz) |

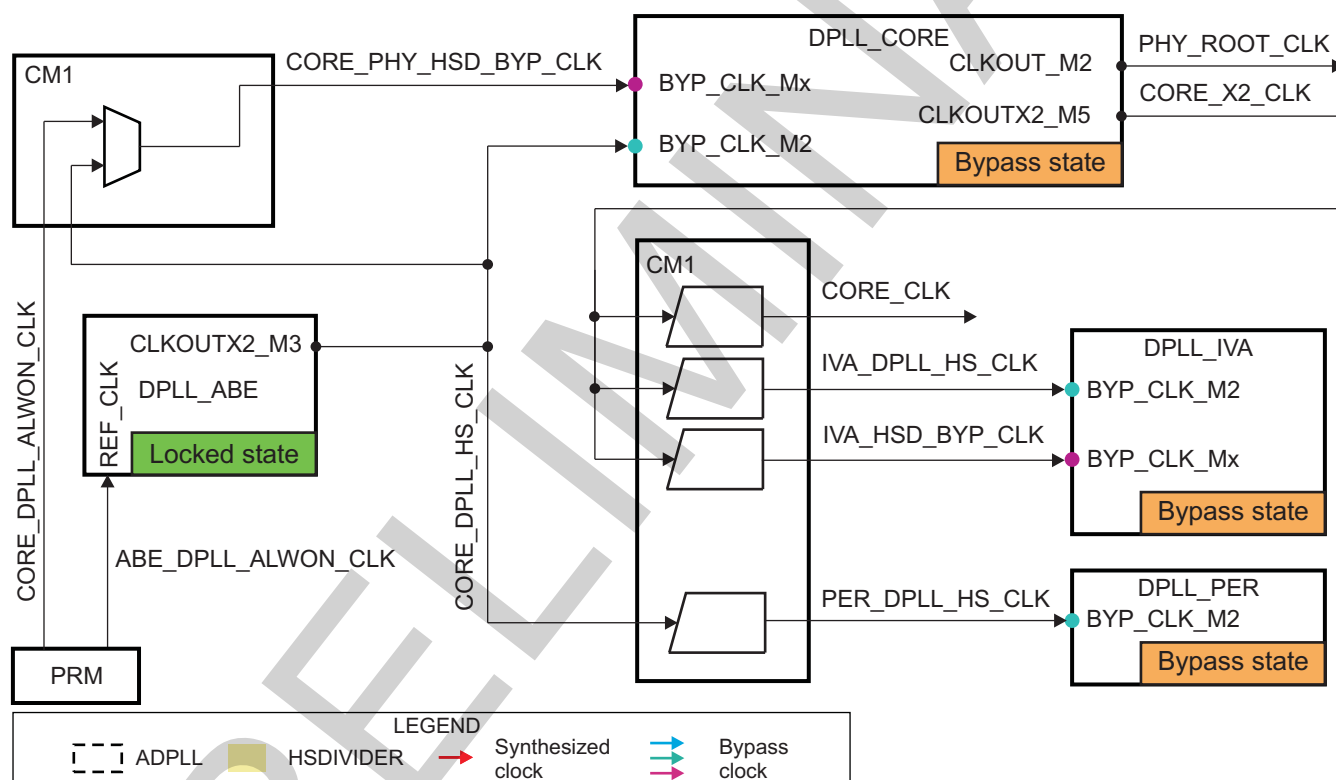
Table 3-115. DPLL_USB Preferred Settings for SYS_CLK = 12.0 MHz (continued)

| CORE OPPs | USB DPLL | | | USB | |
|-----------|----------|-----|---|-----|--------|
| OPP119 | 960 | 400 | 4 | 2 | 480, 0 |
| OPP100 | 960 | 400 | 4 | 2 | 480, 0 |
| OPP50 | 960 | 400 | 4 | 2 | 480, 0 |

3.6.3.10 DPLLs Cascading

To reduce the device power consumption in certain low-power use cases of the device, the DPLLs in the device can be cascaded so that functional clock to a power domain is provided by a DPLL upstream without locking the DPLL associated with the domain. In such a case, the unlocked DPLLs can be kept in the low-power bypass mode shows the scheme for cascading DPLLs.

Figure 3-53 shows a generic scheme for cascading DPLLs.

Figure 3-53. DPLLs Cascading Overview

prcm-049

The sequence of enabling the DPLL cascading is given below:

1. DPLL_ABE is locked by software request. Other DPLLs down stream must not be moved to bypass mode before DPLL_ABE is locked. This ensures that the output clocks of these DPLLs are not stopped when they switch to the DPLL_ABE output clock.
2. Internal EMIF shadow registers are set to take PHY clock and DLL reference clock derived from DPLL_ABE.
3. Bypass paths for DPLL_IVA is set up by configuring the programmable dividers in CM1 responsible for providing the bypass clock. The setting is based upon the OPP requirements.
4. DPLL_IVA is put into bypass mode by software (any of the bypass mode is allowed) and the output of the DPLL, if already enabled, switches from locked clock to bypass clock from DPLL_CORE.
5. DPLL_PER is put into bypass mode as well by software, if required. The outputs of the DPLL, if enabled, switch to the divided clock of DPLL_ABE CLKOUTX2_M3.

6. DPLL_CORE is set in bypass mode by configuring the bypass clocks input mux and the [CM_SHADOW_FREQ_CONFIG1](#)[10:8] DPLL_CORE_DPLL_EN bit field to a bypass mode in the DVFS shadow register in CM1 and setting [CM_SHADOW_FREQ_CONFIG1](#)[0] FREQ_UPDATE = 1 by software. This step triggers the handshake with EMIF to safely unlock the DPLL and move the output clock of DPLL_CORE to CORE_DPLL_HS_CLK. Ensure that the CORE_CLK divider in CM1 is correctly programmed to handle the OPP needs of the CORE power domain before this step.
7. Software can then switch the L4_WKUP interface clock from SYS_CLK to ABE_LP_CLK to allow for deasserting of the SYS_CLK request line to SCRM, if SYS_CLK is not requested by any other dependency.

The sequence of disabling the DPLL cascading is given below:

1. Software switches the L4_WKUP interface clock from ABE_LP_CLK to SYS_CLK requesting the restart of SYS_CLK by the SCRM, if not already present.
2. Software programs the EMIF internal shadow registers to prepare the switchback of EMIF interface from using DPLL_ABE clock to DPLL_CORE clock.
3. DPLL_IVA bypass path is correctly set for the targeted DPLL_CORE frequency by programming the bypass dividers for the DPLL in CM1.
4. DPLL_CORE is relocked using the DVFS shadow register in CM1. The PRCM module ensures that this step is executed with proper handshake with EMIF to allow for a frequency update on the EMIF interface.
5. Other DPLLs are locked as well if required, to fully exit from the DPLL cascading mode.
6. DPLL_ABE might be forced into STOPMODE or bypass mode by software or may enter one of the auto modes if so programmed.

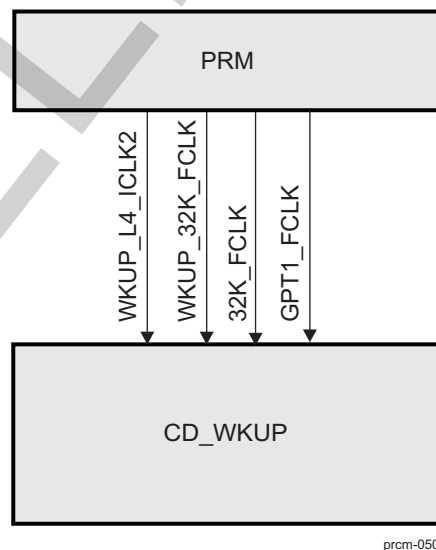
3.6.4 CD_WKUP Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.4.1 Overview

[Figure 3-54](#) shows the overview of the clock domain.

Figure 3-54. CD_WKUP Overview



prcm-050

3.6.4.2 Clock Domain Modes

[Table 3-116](#) lists the clock domain modes supported by the clock domain.

Table 3-116. CD_WKUP Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|---------------|---------------|-----------|
| Available | Not available | Not available | Available |

Table 3-117 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-117. CD_WKUP Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|---|
| ABE_LP_CLK clock status | CM_WKUP_CLKSTCTRL[9] CLKACTIVITY_ABE_LP_CLK |
| WKUP_L4_ICLK2 clock status | CM_WKUP_CLKSTCTRL[12] CLKACTIVITY_WKUP_L4_ICLK2 |
| SYS_CLK clock status | CM_WKUP_CLKSTCTRL[8] CLKACTIVITY_SYS_CLK |
| WKUP_32K_FCLK clock status | CM_WKUP_CLKSTCTRL[11] CLKACTIVITY_WKUP_32K_FCLK |
| Clock Domain State Transition Control | CM_WKUP_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.4.3 Clock Domain Dependency

CD_WKUP has no static dependency or dynamic dependency with any other clock domain of the device.

3.6.4.3.1 Wake-Up Dependency

Table 3-118 lists the wake-up dependency settings for the modules of this clock domain.

Table 3-118. CD_WKUP Wake-Up Dependency Association Parameters

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|------------------------|-----------------|---|-------------|
| GPIO1 | CD_WKUP | CD_DSP | Always enabled | PM_WKUP_GPIO1_WKDEP[6] WKUPDEP_GPIO1_IRQ2_DSP | Read only |
| GPIO1 | CD_WKUP | CD_CORTEXM3 | Disabled | PM_WKUP_GPIO1_WKDEP[1] WKUPDEP_GPIO1_IRQ1_MPU_M3 | Read/Write |
| GPIO1 | CD_WKUP | CD_CORTEXA9 | Disabled | PM_WKUP_GPIO1_WKDEP[0] WKUPDEP_GPIO1_IRQ1_MPU | Read/Write |
| KEYBOARD | CD_WKUP | CD_CORTEXA9 | Always enabled | PM_WKUP_KEYBOARD_WKDEP[0] WKUPDEP_KEYBOARD_MPU | Read only |
| GPTIMER1 | CD_WKUP | CD_CORTEXA9 | Always enabled | PM_WKUP_GPTIMER1_WKDEP[0] WKUPDEP_TIMER1_MPU | Read only |
| WDTIMER2 | CD_WKUP | CD_CORTEXM3 | Disabled | PM_WKUP_WDTIMER2_WKDEP[1] WKUPDEP_WDT2_MPU_M3 | Read/Write |
| WDTIMER2 | CD_WKUP | CD_CORTEXA9 | Disabled | PM_WKUP_WDTIMER2_WKDEP[0] WKUPDEP_WDT2_MPU | Read/Write |

3.6.4.4 Clock Domain Module Attributes

Table 3-119 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-119. CD_WKUP Modules Clocks Association

| Module | Clock | Clock Type |
|----------------------|---------------|------------|
| SYSCTRL_PADCONF_WKUP | WKUP_L4_ICLK2 | Functional |
| BANDGAP | WKUP_TS_FCLK | Functional |
| SYSCTRL_GENERAL_WKUP | WKUP_L4_ICLK2 | Functional |
| GPIO1 | WKUP_L4_ICLK2 | Interface |
| | WKUP_32K_FCLK | Functional |
| Keyboard | WKUP_L4_ICLK2 | Interface |
| | WKUP_32K_FCLK | Functional |
| SAR_RAM | WKUP_L4_ICLK2 | Interface |
| 32KTIMER | 32K_FCLK | Functional |
| | WKUP_L4_ICLK2 | Interface |
| GPTIMER1 | GPT1_FCLK | Functional |
| | WKUP_L4_ICLK2 | Interface |
| WDTIMER2 | WKUP_L4_ICLK2 | Interface |
| | WKUP_32K_FCLK | Functional |
| L4_WKUP interconnect | WKUP_L4_ICLK2 | Interface |

Table 3-120 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-120. CD_WKUP Modules Wake-Up Request

| Module | Wake-Up Feature |
|----------------------|--|
| SYSCTRL_PADCONF_WKUP | None |
| BANDGAP | None |
| SYSCTRL_GENERAL_WKUP | None |
| GPIO1 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, DSP -IRQ) |
| Keyboard | Slave wake-up request (MPU_A9 -IRQ) |
| SAR_RAM | None |
| 32KTIMER | None |
| GPTIMER1 | Slave wake-up request (MPU_A9 -IRQ) |
| WDTIMER2 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ) |
| L4_WKUP interconnect | None |

Table 3-121 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-121. CD_WKUP Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|----------|---------------------------|---|-------------|
| GPIO1 | Slave | CM_WKUP_GPIO1_CLKCTRL [17:16] IDLEST | Idle status |
| KEYBOARD | Slave | CM_WKUP_KEYBOARD_CLKCTRL [17:16] IDLEST | Idle status |
| SAR_RAM | Slave | CM_WKUP_SARRAM_CLKCTRL [17:16] IDLEST | Idle status |
| 32KTIMER | Slave | CM_WKUP_32KTIMER_CLKCTRL [17:16] IDLEST | Idle status |
| GPTIMER1 | Slave | CM_WKUP_GPTIMER1_CLKCTRL [17:16] IDLEST | Idle status |
| WDTIMER2 | Slave | CM_WKUP_WDTIMER2_CLKCTRL [17:16] IDLEST | Idle status |

Table 3-121. CD_WKUP Modules Clock-Management Modes and Control (continued)

| Module | Clock-Management Protocol | Status Bit Field | Role |
|----------------------|---------------------------|---|-------------|
| L4_WKUP interconnect | Slave | CM_WKUP_L4WKUP_CLKCTRL [17:16] IDLEST | Idle status |

[Table 3-122](#) lists the supported clock management modes and associated software control bit fields for each module of the power domain.

Table 3-122. CD_WKUP Modules Slave Clock-Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|----------------------|-----------|-----------|-----------|---|-------------|
| GPIO1 | Available | Available | N/A | CM_WKUP_GPIO1_CLKCTRL [1:0] MODULEMODE | Read/Write |
| KEYBOARD | Available | N/A | Available | CM_WKUP_KEYBOARD_CLKCTRL [1:0] MODULEMODE | Read/Write |
| SAR_RAM | N/A | Available | N/A | CM_WKUP_SARRAM_CLKCTRL [1:0] MODULEMODE | Read only |
| 32KTIMER | N/A | Available | N/A | CM_WKUP_32KTIMER_CLKCTRL [1:0] MODULEMODE | Read only |
| GPTIMER1 | Available | N/A | Available | CM_WKUP_GPTIMER1_CLKCTRL [1:0] MODULEMODE | Read/Write |
| WDTIMER2 | Available | N/A | Available | CM_WKUP_WDTIMER2_CLKCTRL [1:0] MODULEMODE | Read/Write |
| L4_WKUP interconnect | N/A | Available | N/A | CM_WKUP_L4WKUP_CLKCTRL [1:0] MODULEMODE | Read only |

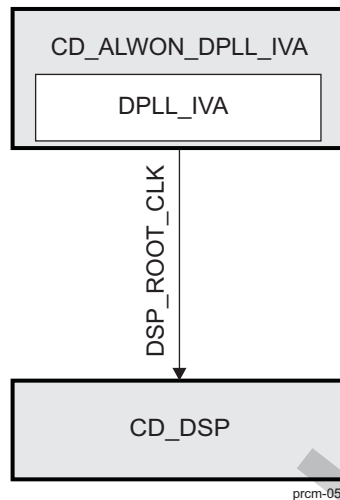
3.6.5 CD_DSP Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.5.1 Overview

[Figure 3-55](#) shows the overview of the clock domain.

Figure 3-55. CD_DSP Overview



3.6.5.2 Clock Domain Modes

Table 3-123 lists the clock domain modes supported by the clock domain.

Table 3-123. CD_DSP Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|-----------|-----------|-----------|
| Available | Available | Available | Available |

Table 3-124 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-124. CD_DSP Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|--|
| DSP_ROOT_CLK clock status | CM_DSP_CLKSTCTRL[8] CLKACTIVITY_DSP_ROOT_CLK |
| Clock Domain State Transition Control | CM_DSP_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.5.3 Clock Domain Dependency

CD_DSP has no module wake-up dependency with any other clock domain of the device.

3.6.5.3.1 Static Dependency

Table 3-125 lists the static dependency of the clock domain with respect to other clock domains of the device.

Table 3-125. CD_DSP Static Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|-----------------------------------|-------------|
| CD_ABE | Disabled | CM_DSP_STATICDEP[3] ABE_STATDEP | Read/Write |
| CD_CAM | Always disabled | CM_DSP_STATICDEP[9] ISS_STATDEP | Read only |
| CD_IVAHD | Disabled | CM_DSP_STATICDEP[2] IVAHD_STATDEP | Read/Write |
| CD_L3_1 | Disabled | CM_DSP_STATICDEP[5] L3_1_STATDEP | Read/Write |
| CD_L3_2 | Disabled | CM_DSP_STATICDEP[6] L3_2_STATDEP | Read/Write |

Table 3-125. CD_DSP Static Dependency Association Parameters (continued)

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--|-------------|
| CD_L3_INIT | Disabled | CM_DSP_STATICDEP [7] L3INIT_STATDEP | Read/Write |
| CD_L4_CFG | Disabled | CM_DSP_STATICDEP [12] L4CFG_STATDEP | Read/Write |
| CD_L4_PER | Disabled | CM_DSP_STATICDEP [13] L4PER_STATDEP | Read/Write |
| CD_EMIF | Disabled | CM_DSP_STATICDEP [4] MEMIF_STATDEP | Read/Write |

3.6.5.3.2 Dynamic Dependency

[Table 3-126](#) lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-126. CD_DSP Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|---|-------------|
| CD_ABE | Always enabled | CM_DSP_DYNAMICDEP [3] ABE_DYNDEP | Read only |
| CD_IVAHD | Always enabled | CM_DSP_DYNAMICDEP [2] IVAHD_DYNDEP | Read only |
| CD_L3_1 | Always enabled | CM_DSP_DYNAMICDEP [5] L3_1_DYNDEP | Read only |

3.6.5.4 Clock Domain Module Attributes

[Table 3-127](#) lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-127. CD_DSP Modules Clocks Association

| Module | Clock | Clock Type |
|--------|--------------|--------------------------|
| DSP | DSP_ROOT_CLK | Interface and functional |

[Table 3-128](#) lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-128. CD_DSP Modules Wake-Up Request

| Module | Wake-Up Feature |
|--------|------------------------|
| DSP | Master wake-up request |

[Table 3-129](#) lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-129. CD_DSP Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|--------|---------------------------|---|----------------|
| DSP | Master/Slave | CM_DSP_DSP_CLKCTRL [18] STBYST | Standby status |
| | | CM_DSP_DSP_CLKCTRL [17: 16] IDLEST | Idle status |

Table 3-130 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-130. CD_DSP Modules Slave Clock-Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|--------|-----------|-----------|---------|-----------------------------------|-------------|
| DSP | Available | Available | N/A | CM_DSP_DSP_CLKCTRL[1:0]MODULEMODE | Read/Write |

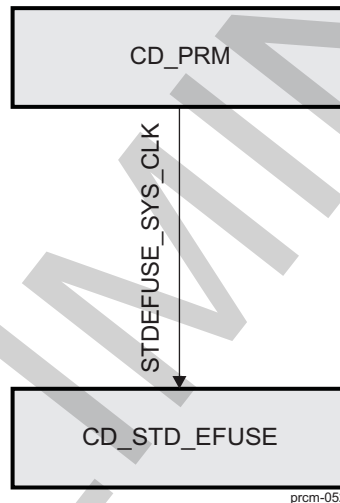
3.6.6 CD_STD_EFUSE Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.6.1 Overview

Figure 3-56 shows the overview of the clock domain.

Figure 3-56. CD_STD_EFUSE Overview



CD_STD_EFUSE is hardware-controlled by the PRCM module and has no software control or status bit fields. Similarly, it has no static, dynamic and wake-up dependency with respect to other clock domains of the device.

3.6.6.2 Clock Domain Module Attributes

The STD_EFUSE module of the clock domain is automatically controlled by the PRCM module hardware and has no software configurable module mode control or status bit fields.

Table 3-131 identifies for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-131. CD_STD_EFUSE Modules Clocks Association

| Module | Clock | Clock Type |
|-----------|------------------|------------|
| STD_EFUSE | STDEFUSE_SYS_CLK | Functional |

Table 3-132 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-132. CD_STD_EFUSE Modules Wake-Up Request

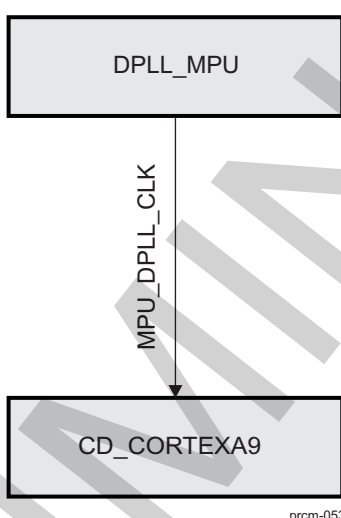
| Module | Wake-Up Feature |
|-----------|-----------------|
| STD_EFUSE | None |

3.6.7 CD_CORTEXA9 Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.7.1 Overview

Figure 3-57 shows the overview of the clock domain.

Figure 3-57. CD_CORTEXA9 Overview

3.6.7.2 Clock Domain Modes

Table 3-133 lists the clock domain modes supported by the clock domain.

Table 3-133. CD_CORTEXA9 Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|---------------|-----------|-----------|
| Available | Not available | Available | Available |

Table 3-134 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-134. CD_CORTEXA9 Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|--|
| MPU_DPLL_CLK clock status | CM_MPU_CLKSTCTRL[9] CLKACTIVITY_MPU_DPLL_CLK |
| Clock Domain State Transition Control | CM_MPU_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.7.3 Clock Domain Dependency

CD_CORTEXA9 has no module wake-up dependency with any other clock domain of the device.

3.6.7.3.1 Static Dependency

Table 3-135 lists the static dependency of the clock domain with respect to other clock domains of the device.

Table 3-135. CD_CORTEXA9 Static Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|---------------------------------------|-------------|
| CD_ABE | Disabled | CM_MPU_STATICDEP[3] ABE_STATDEP | Read/Write |
| CD_C2C | Always disabled | CM_MPU_STATICDEP[18] C2C_STATDEP | Read only |
| CD_DSS | Disabled | CM_MPU_STATICDEP[8] DSS_STATDEP | Read/Write |
| CD_CORTEXM3 | Disabled | CM_MPU_STATICDEP[0] MPU_M3_STATDEP | Read/Write |
| CD_SGX | Disabled | CM_MPU_STATICDEP[10] SGX_STATDEP | Read/Write |
| CD_CAM | Always disabled | CM_MPU_STATICDEP[9] ISS_STATDEP | Read only |
| CD_IVAHD | Disabled | CM_MPU_STATICDEP[2] IVAHD_STATDEP | Read/Write |
| CD_L3_1 | Enabled | CM_MPU_STATICDEP[5] L3_1_STATDEP | Read/Write |
| CD_L3_2 | Enabled | CM_MPU_STATICDEP[6] L3_2_STATDEP | Read/Write |
| CD_L3_INIT | Enabled | CM_MPU_STATICDEP[7] L3INIT_STATDEP | Read/Write |
| CD_L4_CFG | Enabled | CM_MPU_STATICDEP[12] L4CFG_STATDEP | Read/Write |
| CD_L4_PER | Enabled | CM_MPU_STATICDEP[13] L4PER_STATDEP | Read/Write |
| CD_EMIF | Enabled | CM_MPU_STATICDEP[4] MEMIF_STATDEP | Read/Write |
| CD_DMA | Always disabled | CM_MPU_STATICDEP[11] SDMA_STATDEP | Read only |
| CD_DSP | Disabled | CM_MPU_STATICDEP[1] DSP_STATDEP | Read/Write |

3.6.7.3.2 Dynamic Dependency

Table 3-136 lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-136. CD_CORTEXA9 Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--------------------------------------|-------------|
| CD_ABE | Always enabled | CM_MPU_DYNAMICDEP[3] ABE_DYNDEP | Read only |
| CD_L3_1 | Always enabled | CM_MPU_DYNAMICDEP[5] L3_1_DYNDEP | Read only |
| CD_EMIF | Always enabled | CM_MPU_DYNAMICDEP[4] MEMIF_DYNDEP | Read only |

3.6.7.4 Clock Domain Module Attributes

Table 3-137 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-137. CD_CORTEXA9 Modules Clocks Association

| Module | Clock | Clock Type |
|----------|--------------|--------------------------|
| CORTEXA9 | MPU_DPLL_CLK | Interface and Functional |

Table 3-138 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-138. CD_CORTEXA9 Modules Wake-Up Request

| Module | Wake-Up Feature |
|----------|------------------------|
| CORTEXA9 | Master wake-up request |

Table 3-139 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-139. CD_CORTEXA9 Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|----------|---------------------------|----------------------------------|----------------|
| CORTEXA9 | Master/Slave | CM_MPU_MPU_CLKCTRL[18] STBYST | Standby status |
| | | CM_MPU_MPU_CLKCTRL[17:16] IDLEST | Idle status |

Table 3-140 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-140. CD_CORTEXA9 Modules Slave Clock-Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|----------|----------|-----------|---------|------------------------------------|-------------|
| CORTEXA9 | N/A | Available | N/A | CM_MPU_MPU_CLKCTRL[1:0] MODULEMODE | Read only |

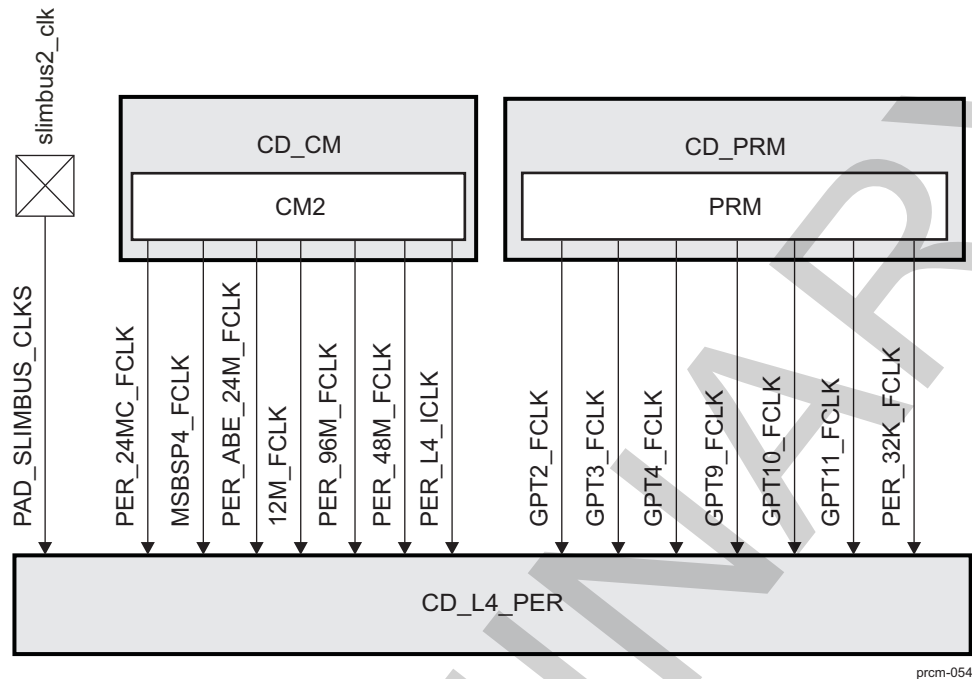
3.6.8 CD_L4_PER Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.8.1 Overview

Figure 3-58 shows the overview of the clock domain.

Figure 3-58. CD_L4_PER Overview



3.6.8.2 Clock Domain Modes

Table 3-141 lists the clock domain modes supported by the clock domain.

Table 3-141. CD_L4_PER Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|-----------|-----------|-----------|
| Available | Available | Available | Available |

Table 3-142 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-142. CD_L4_PER Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|-------------------------------|---|
| GPT10_FCLK clock status | CM_L4PER_CLKSTCTRL[9] CLKACTIVITY_GPT10_FCLK |
| GPT11_FCLK clock status | CM_L4PER_CLKSTCTRL[10] CLKACTIVITY_GPT11_FCLK |
| GPT2_FCLK clock status | CM_L4PER_CLKSTCTRL[11] CLKACTIVITY_GPT2_FCLK |
| GPT3_FCLK clock status | CM_L4PER_CLKSTCTRL[12] CLKACTIVITY_GPT3_FCLK |
| GPT4_FCLK clock status | CM_L4PER_CLKSTCTRL[13] CLKACTIVITY_GPT4_FCLK |
| GPT9_FCLK clock status | CM_L4PER_CLKSTCTRL[14] CLKACTIVITY_GPT9_FCLK |
| 12M_FCLK clock status | CM_L4PER_CLKSTCTRL[15] CLKACTIVITY_12M_FCLK_FCLK |
| PER_L4_ICLK clock status | CM_L4PER_CLKSTCTRL[8] CLKACTIVITY_L4_PER_ICLK |
| PER_24MC_FCLK clock status | CM_L4PER_CLKSTCTRL[16] CLKACTIVITY_PER_24MC_FCLK |
| PER_32K_FCLK clock status | CM_L4PER_CLKSTCTRL[17] CLKACTIVITY_PER_32K_FCLK |
| PER_48M_FCLK clock status | CM_L4PER_CLKSTCTRL[18] CLKACTIVITY_PER_48M_FCLK |
| PER_96M_FCLK clock status | CM_L4PER_CLKSTCTRL[19] CLKACTIVITY_PER_96M_FCLK |
| PER_ABE_24M_FCLK clock status | CM_L4PER_CLKSTCTRL[25] CLKACTIVITY_PER_ABE_24M_FCLK |
| MCBSP4_FCLK clock status | CM_L4PER_CLKSTCTRL[22] CLKACTIVITY_PER_MCBSP4_FCLK |

Table 3-142. CD_L4_PER Control and Status Parameters (continued)

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|-----------------------------------|
| Clock Domain State Transition Control | CM_L4PER_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.8.3 Clock Domain Dependency

CD_L4_PER has no static dependency with any other clock domain of the device.

3.6.8.3.1 Dynamic Dependency

Table 3-143 lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-143. CD_L4_PER Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--|-------------|
| CD_DSS | Always enabled | CM_L4PER_DYNAMICDEP[8] DSS_DYNDEP | Read only |
| CD_L3_INIT | Always enabled | CM_L4PER_DYNAMICDEP[7] L3_INIT_DYNDEP | Read only |

3.6.8.3.2 Wake-Up Dependency

Table 3-144 lists the wake-up dependency settings for the modules of this clock domain.

Table 3-144. CD_L4_PER Wake-Up Dependency Association Parameters

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|------------------------|-----------------|---|-------------|
| GPTIMER10 | CD_L4_PER | CD_CORTEXA9 | Always enabled | PM_L4PER_GPTIMER10_WKDEP[0] WKUPDEP_DMTIMER10_MPU | Read only |
| GPTIMER11 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_GPTIMER11_WKDEP[1] WKUPDEP_DMTIMER11_MPU_M3 | Read/Write |
| GPTIMER11 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_GPTIMER11_WKDEP[0] WKUPDEP_DMTIMER11_MPU | Read/Write |
| GPTIMER2 | CD_L4_PER | CD_CORTEXA9 | Always enabled | PM_L4PER_GPTIMER2_WKDEP[0] WKUPDEP_DMTIMER2_MPU | Read only |
| GPTIMER3 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_GPTIMER3_WKDEP[1] WKUPDEP_DMTIMER3_MPU_M3 | Read/Write |
| GPTIMER3 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_GPTIMER3_WKDEP[0] WKUPDEP_DMTIMER3_MPU | Read/Write |
| GPTIMER4 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_GPTIMER4_WKDEP[1] WKUPDEP_DMTIMER4_MPU_M3 | Read/Write |
| GPTIMER4 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_GPTIMER4_WKDEP[0] WKUPDEP_DMTIMER4_MPU | Read/Write |

Table 3-144. CD_L4_PER Wake-Up Dependency Association Parameters (continued)

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|-----------------------------|-----------------|---|-------------|
| GPTIMER9 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_GPTIMER9_WKDEP[1] WKUPDEP_DMTIMER9_MPU_M3 | Read/Write |
| GPTIMER9 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_GPTIMER9_WKDEP[0] WKUPDEP_DMTIMER9_MPU | Read/Write |
| GPIO2 | CD_L4_PER | CD_DSP | Always enabled | PM_L4PER_GPIO2_WKDEP[6] WKUPDEP_GPIO2_IRQ2_DSP | Read only |
| GPIO2 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_GPIO2_WKDEP[1] WKUPDEP_GPIO2_IRQ1_MPU_M3 | Read/Write |
| GPIO2 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_GPIO2_WKDEP[0] WKUPDEP_GPIO2_IRQ1_MPU | Read/Write |
| GPIO3 | CD_L4_PER | CD_DSP | Always enabled | PM_L4PER_GPIO3_WKDEP[6] WKUPDEP_GPIO3_IRQ2_DSP | Read only |
| GPIO3 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_GPIO3_WKDEP[0] WKUPDEP_GPIO3_IRQ1_MPU | Read only |
| GPIO4 | CD_L4_PER | CD_DSP | Always enabled | PM_L4PER_GPIO4_WKDEP[6] WKUPDEP_GPIO4_IRQ2_DSP | Read only |
| GPIO4 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_GPIO4_WKDEP[0] WKUPDEP_GPIO4_IRQ1_MPU | Read only |
| GPIO5 | CD_L4_PER | CD_DSP | Always enabled | PM_L4PER_GPIO5_WKDEP[6] WKUPDEP_GPIO5_IRQ2_DSP | Read only |
| GPIO5 | CD_L4_PER | CD_CORTEXA9 | Always enabled | PM_L4PER_GPIO5_WKDEP[0] WKUPDEP_GPIO5_IRQ1_MPU | Read only |
| GPIO6 | CD_L4_PER | CD_DSP | Always enabled | PM_L4PER_GPIO6_WKDEP[6] WKUPDEP_GPIO6_IRQ2_DSP | Read only |
| GPIO6 | CD_L4_PER | CD_CORTEXA9 | Always enabled | PM_L4PER_GPIO6_WKDEP[0] WKUPDEP_GPIO6_IRQ1_MPU | Read only |
| I2C1 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Always enabled | PM_L4PER_I2C1_WKDEP[7] WKUPDEP_I2C1_DMA_SDMA | Read only |
| I2C1 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_I2C1_WKDEP[1] WKUPDEP_I2C1_IRQ_MPU_M3 | Read/Write |

Table 3-144. CD_L4_PER Wake-Up Dependency Association Parameters (continued)

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|-----------------------------|-----------------|---|-------------|
| I2C1 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_I2C1_WKDEP[0] WKUPDEP_I2C1_I RQ_MPU | Read/Write |
| I2C2 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Always enabled | PM_L4PER_I2C2_WKDEP[7] WKUPDEP_I2C2_D MA_SDMA | Read only |
| I2C2 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_I2C2_WKDEP[1] WKUPDEP_I2C2_I RQ_MPU_M3 | Read/Write |
| I2C2 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_I2C2_WKDEP[0] WKUPDEP_I2C2_I RQ_MPU | Read/Write |
| I2C3 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Always enabled | PM_L4PER_I2C3_WKDEP[7] WKUPDEP_I2C3_D MA_SDMA | Read only |
| I2C3 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_I2C3_WKDEP[1] WKUPDEP_I2C3_I RQ_MPU_M3 | Read/Write |
| I2C3 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_I2C3_WKDEP[0] WKUPDEP_I2C3_I RQ_MPU | Read/Write |
| I2C4 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Always enabled | PM_L4PER_I2C4_WKDEP[7] WKUPDEP_I2C4_D MA_SDMA | Read only |
| I2C4 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_I2C4_WKDEP[1] WKUPDEP_I2C4_I RQ_MPU_M3 | Read/Write |
| I2C4 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_I2C4_WKDEP[0] WKUPDEP_I2C4_I RQ_MPU | Read/Write |
| MCBSP4 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_MCBSP4_WKDEP[3] WKUPDEP_MCBSP4_SDMA | Read/Write |
| MCBSP4 | CD_L4_PER | CD_DSP | Disabled | PM_L4PER_MCBSP4_WKDEP[2] WKUPDEP_MCBSP4_DSP | Read/Write |
| MCBSP4 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_MCBSP4_WKDEP[0] WKUPDEP_MCBSP4_MPU | Read/Write |
| MCSP11 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_MCSP11_WKDEP[3] WKUPDEP_MCSP11_SDMA | Read/Write |
| MCSP11 | CD_L4_PER | CD_DSP | Disabled | PM_L4PER_MCSP11_WKDEP[2] WKUPDEP_MCSP11_DSP | Read/Write |

Table 3-144. CD_L4_PER Wake-Up Dependency Association Parameters (continued)

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|-----------------------------|-----------------|---|-------------|
| MCSP11 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_MCSP11_WKDEP[1] WKUPDEP_MCSP11_MPU_M3 | Read/Write |
| MCSP11 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_MCSP11_WKDEP[0] WKUPDEP_MCSP11_MPU | Read/Write |
| MCSP12 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_MCSP12_WKDEP[3] WKUPDEP_MCSP12_SDMA | Read/Write |
| MCSP12 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_MCSP12_WKDEP[1] WKUPDEP_MCSP12_MPU_M3 | Read/Write |
| MCSP12 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_MCSP12_WKDEP[0] WKUPDEP_MCSP12_MPU | Read/Write |
| MCSP13 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_MCSP13_WKDEP[3] WKUPDEP_MCSP13_SDMA | Read/Write |
| MCSP13 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_MCSP13_WKDEP[0] WKUPDEP_MCSP13_MPU | Read/Write |
| MCSP14 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_MCSP14_WKDEP[3] WKUPDEP_MCSP14_SDMA | Read/Write |
| MCSP14 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_MCSP14_WKDEP[0] WKUPDEP_MCSP14_MPU | Read/Write |
| HSMMC3 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_MMCS D3_WKDEP[3] WKUPDEP_MMCS D3_SDMA | Read/Write |
| HSMMC3 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_MMCS D3_WKDEP[1] WKUPDEP_MMCS D3_MPU_M3 | Read/Write |
| HSMMC3 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_MMCS D3_WKDEP[0] WKUPDEP_MMCS D3_MPU | Read/Write |
| HSMMC4 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_MMCS D4_WKDEP[3] WKUPDEP_MMCS D4_SDMA | Read/Write |
| HSMMC4 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_MMCS D4_WKDEP[1] WKUPDEP_MMCS D4_MPU_M3 | Read/Write |
| HSMMC4 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_MMCS D4_WKDEP[0] WKUPDEP_MMCS D4_MPU | Read/Write |

Table 3-144. CD_L4_PER Wake-Up Dependency Association Parameters (continued)

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|-----------------------------|-----------------|--|-------------|
| HSMMC5 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_MMCS D5_WKDEP [3] WKUPDEP_MMCS D5_SDMA | Read/Write |
| HSMMC5 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_MMCS D5_WKDEP [1] WKUPDEP_MMCS D5_MPU_M3 | Read/Write |
| HSMMC5 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_MMCS D5_WKDEP [0] WKUPDEP_MMCS D5_MPU | Read/Write |
| SLIMBUS2 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_SLIMB US2_WKDEP [7] WKUPDEP_SLIMB US2_DMA_SDMA | Read/Write |
| SLIMBUS2 | CD_L4_PER | CD_DSP | Disabled | PM_L4PER_SLIMB US2_WKDEP [6] WKUPDEP_SLIMB US2_DMA_DSP | Read/Write |
| SLIMBUS2 | CD_L4_PER | CD_DSP | Disabled | PM_L4PER_SLIMB US2_WKDEP [2] WKUPDEP_SLIMB US2_IRQ_DSP | Read/Write |
| SLIMBUS2 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_SLIMB US2_WKDEP [0] WKUPDEP_SLIMB US2_IRQ_MPU | Read/Write |
| UART1 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_UART1 _WKDEP [3] WKUPDEP_UART1 _SDMA | Read/Write |
| UART1 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_UART1 _WKDEP [0] WKUPDEP_UART1 _MPU | Read/Write |
| UART2 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_UART2 _WKDEP [3] WKUPDEP_UART2 _SDMA | Read/Write |
| UART2 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_UART2 _WKDEP [0] WKUPDEP_UART2 _MPU | Read/Write |
| UART3 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_UART3 _WKDEP [3] WKUPDEP_UART3 _SDMA | Read/Write |
| UART3 | CD_L4_PER | CD_DSP | Disabled | PM_L4PER_UART3 _WKDEP [2] WKUPDEP_UART3 _DSP | Read/Write |
| UART3 | CD_L4_PER | CD_CORTEXM3 | Disabled | PM_L4PER_UART3 _WKDEP [1] WKUPDEP_UART3 _MPU_M3 | Read/Write |
| UART3 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_UART3 _WKDEP [0] WKUPDEP_UART3 _MPU | Read/Write |

Table 3-144. CD_L4_PER Wake-Up Dependency Association Parameters (continued)

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|-----------------------------|-----------------|---|-------------|
| UART4 | CD_L4_PER | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L4PER_UART4_WKDEP[3] WKUPDEP_UART4_SDMA | Read/Write |
| UART4 | CD_L4_PER | CD_CORTEXA9 | Disabled | PM_L4PER_UART4_WKDEP[0] WKUPDEP_UART4_MPU | Read/Write |

3.6.8.4 Clock Domain Module Attributes

Table 3-145 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-145. CD_L4_PER Modules Clocks Association

| Module | Clock | Clock Type |
|-----------|--------------|--------------------------|
| GPTIMER10 | GPT10_FCLK | Functional |
| | PER_L4_ICLK | Interface |
| GPTIMER11 | GPT11_FCLK | Functional |
| | PER_L4_ICLK | Interface |
| GPTIMER2 | GPT2_FCLK | Functional |
| | PER_L4_ICLK | Interface |
| GPTIMER3 | GPT3_FCLK | Functional |
| | PER_L4_ICLK | Interface |
| GPTIMER4 | GPT4_FCLK | Functional |
| | PER_L4_ICLK | Interface |
| GPTIMER9 | GPT9_FCLK | Functional |
| | PER_L4_ICLK | Interface |
| ELM | PER_L4_ICLK | Interface |
| GPIO2 | PER_L4_ICLK | Interface |
| | PER_32K_FCLK | Functional |
| GPIO3 | PER_L4_ICLK | Interface |
| | PER_32K_FCLK | Functional |
| GPIO4 | PER_L4_ICLK | Interface |
| | PER_32K_FCLK | Functional |
| GPIO5 | PER_L4_ICLK | Interface |
| | PER_32K_FCLK | Functional |
| GPIO6 | PER_L4_ICLK | Interface |
| | PER_32K_FCLK | Functional |
| HDQ | 12M_FCLK | Functional |
| | PER_L4_ICLK | Interface and functional |
| I2C1 | PER_L4_ICLK | Interface |
| | PER_96M_FCLK | Functional |
| I2C2 | PER_L4_ICLK | Interface |
| | PER_96M_FCLK | Functional |
| I2C3 | PER_L4_ICLK | Interface |
| | PER_96M_FCLK | Functional |
| I2C4 | PER_L4_ICLK | Interface |
| | PER_96M_FCLK | Functional |

Table 3-145. CD_L4_PER Modules Clocks Association (continued)

| Module | Clock | Clock Type |
|---------------------|------------------|------------|
| L4_PER interconnect | PER_L4_ICLK | Interface |
| MCBSP4 | PER_L4_ICLK | Interface |
| | MCBSP4_FCLK | Functional |
| MCSP11 | PER_L4_ICLK | Interface |
| | PER_48M_FCLK | Functional |
| MCSP12 | PER_L4_ICLK | Interface |
| | PER_48M_FCLK | Functional |
| MCSP13 | PER_L4_ICLK | Interface |
| | PER_48M_FCLK | Functional |
| MCSP14 | PER_L4_ICLK | Interface |
| | PER_48M_FCLK | Functional |
| HSMMC3 | PER_L4_ICLK | Interface |
| | PER_48M_FCLK | Functional |
| HSMMC4 | PER_L4_ICLK | Interface |
| | PER_48M_FCLK | Functional |
| HSMMC5 | PER_L4_ICLK | Interface |
| | PER_48M_FCLK | Functional |
| SLIMBUS2 | PER_L4_ICLK | Interface |
| | PAD_SLIMBUS_CLKS | Functional |
| | PER_24MC_FCLK | Functional |
| | PER_ABE_24M_FCLK | Functional |
| UART1 | PER_L4_ICLK | Interface |
| | PER_48M_FCLK | Functional |
| UART2 | PER_L4_ICLK | Interface |
| | PER_48M_FCLK | Functional |
| UART3 | PER_L4_ICLK | Interface |
| | PER_48M_FCLK | Functional |
| UART4 | PER_L4_ICLK | Interface |
| | PER_48M_FCLK | Functional |

Table 3-146 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-146. CD_L4_PER Modules Wake-Up Request

| Module | Wake-Up Feature |
|-----------|--|
| GPTIMER10 | Slave wake-up request (MPU_A9 -IRQ) |
| GPTIMER11 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ) |
| GPTIMER2 | Slave wake-up request (MPU_A9 -IRQ) |
| GPTIMER3 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ) |
| GPTIMER4 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ) |
| GPTIMER9 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ) |
| ELM | None |
| GPIO2 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, DSP -IRQ) |
| GPIO3 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ) |
| GPIO4 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ) |
| GPIO5 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ) |
| GPIO6 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ) |

Table 3-146. CD_L4_PER Modules Wake-Up Request (continued)

| Module | Wake-Up Feature |
|---------------------|---|
| HDQ | None |
| I2C1 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, sDMA -DMA) |
| I2C2 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, sDMA -DMA) |
| I2C3 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, sDMA -DMA) |
| I2C4 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, sDMA -DMA) |
| L4_PER interconnect | None |
| MCBSP4 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ and DMA, sDMA -DMA) |
| MCSP11 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, DSP -IRQ, sDMA -DMA) |
| MCSP12 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, sDMA -DMA) |
| MCSP13 | Slave wake-up request (MPU_A9 -IRQ, sDMA -DMA) |
| MCSP14 | Slave wake-up request (MPU_A9 -IRQ, sDMA -DMA) |
| HSMMC3 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, sDMA -DMA) |
| HSMMC4 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, sDMA -DMA) |
| HSMMC5 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, sDMA -DMA) |
| SLIMBUS2 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ and DMA, sDMA -DMA) |
| UART1 | Slave wake-up request (MPU_A9 -IRQ, sDMA -DMA) |
| UART2 | Slave wake-up request (MPU_A9 -IRQ, sDMA -DMA) |
| UART3 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, DSP -IRQ and DMA, sDMA -DMA) |
| UART4 | Slave wake-up request (MPU_A9 -IRQ, sDMA -DMA) |

Table 3-147 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-147. CD_L4_PER Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|-----------|---------------------------|---|-------------|
| GPTIMER10 | Slave | CM_L4PER_GPTIMER10_CLK_CTRL[17:16] IDLEST | Idle status |
| GPTIMER11 | Slave | CM_L4PER_GPTIMER11_CLK_CTRL[17:16] IDLEST | Idle status |
| GPTIMER2 | Slave | CM_L4PER_GPTIMER2_CLK_CTRL[17:16] IDLEST | Idle status |
| GPTIMER3 | Slave | CM_L4PER_GPTIMER3_CLK_CTRL[17:16] IDLEST | Idle status |
| GPTIMER4 | Slave | CM_L4PER_GPTIMER4_CLK_CTRL[17:16] IDLEST | Idle status |
| GPTIMER9 | Slave | CM_L4PER_GPTIMER9_CLK_CTRL[17:16] IDLEST | Idle status |
| ELM | Slave | CM_L4PER_ELM_CLKCTRL[17:16] IDLEST | Idle status |
| GPIO2 | Slave | CM_L4PER_GPIO2_CLKCTRL[17:16] IDLEST | Idle status |
| GPIO3 | Slave | CM_L4PER_GPIO3_CLKCTRL[17:16] IDLEST | Idle status |
| GPIO4 | Slave | CM_L4PER_GPIO4_CLKCTRL[17:16] IDLEST | Idle status |
| GPIO5 | Slave | CM_L4PER_GPIO5_CLKCTRL[17:16] IDLEST | Idle status |
| GPIO6 | Slave | CM_L4PER_GPIO6_CLKCTRL[17:16] IDLEST | Idle status |

Table 3-147. CD_L4_PER Modules Clock-Management Modes and Control (continued)

| Module | Clock-Management Protocol | Status Bit Field | Role |
|---------------------|---------------------------|--|-------------|
| HDQ | Slave | CM_L4PER_HDQ1W_CLKCTRL [17:16] IDLEST | Idle status |
| I2C1 | Slave | CM_L4PER_I2C1_CLKCTRL [17:16] IDLEST | Idle status |
| I2C2 | Slave | CM_L4PER_I2C2_CLKCTRL [17:16] IDLEST | Idle status |
| I2C3 | Slave | CM_L4PER_I2C3_CLKCTRL [17:16] IDLEST | Idle status |
| I2C4 | Slave | CM_L4PER_I2C4_CLKCTRL [17:16] IDLEST | Idle status |
| L4_PER interconnect | Slave | CM_L4PER_L4PER_CLKCTRL [17:16] IDLEST | Idle status |
| MCBSP4 | Slave | CM_L4PER_MCBSP4_CLKCTRL [17:16] IDLEST | Idle status |
| MCSP11 | Slave | CM_L4PER_MCSP11_CLKCTRL [17:16] IDLEST | Idle status |
| MCSP12 | Slave | CM_L4PER_MCSP12_CLKCTRL [17:16] IDLEST | Idle status |
| MCSP13 | Slave | CM_L4PER_MCSP13_CLKCTRL [17:16] IDLEST | Idle status |
| MCSP14 | Slave | CM_L4PER_MCSP14_CLKCTRL [17:16] IDLEST | Idle status |
| HSMMC3 | Slave | CM_L4PER_MMCS3_CLKCTRL [17:16] IDLEST | Idle status |
| HSMMC4 | Slave | CM_L4PER_MMCS4_CLKCTRL [17:16] IDLEST | Idle status |
| HSMMC5 | Slave | CM_L4PER_MMCS5_CLKCTRL [17:16] IDLEST | Idle status |
| SLIMBUS2 | Slave | CM_L4PER_SLIMBUS2_CLKCTRL [17:16] IDLEST | Idle status |
| UART1 | Slave | CM_L4PER_UART1_CLKCTRL [17:16] IDLEST | Idle status |
| UART2 | Slave | CM_L4PER_UART2_CLKCTRL [17:16] IDLEST | Idle status |
| UART3 | Slave | CM_L4PER_UART3_CLKCTRL [17:16] IDLEST | Idle status |
| UART4 | Slave | CM_L4PER_UART4_CLKCTRL [17:16] IDLEST | Idle status |

[Table 3-148](#) lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-148. CD_L4_PER Modules Slave Clock-Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|-----------|-----------|------|-----------|---|-------------|
| GPTIMER10 | Available | N/A | Available | CM_L4PER_GPTIMER10_CLKCTRL [1:0] MODULEMODE | Read/Write |
| GPTIMER11 | Available | N/A | Available | CM_L4PER_GPTIMER11_CLKCTRL [1:0] MODULEMODE | Read/Write |
| GPTIMER2 | Available | N/A | Available | CM_L4PER_GPTIMER2_CLKCTRL [1:0] MODULEMODE | Read/Write |
| GPTIMER3 | Available | N/A | Available | CM_L4PER_GPTIMER3_CLKCTRL [1:0] MODULEMODE | Read/Write |

Table 3-148. CD_L4_PER Modules Slave Clock-Management Modes and Control (continued)

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|----------|-----------|-----------|-----------|---|-------------|
| GPTIMER4 | Available | N/A | Available | CM_L4PER_GPTIMER4_CLKCTRL[1:0] MODULEMODE | Read/Write |
| GPTIMER9 | Available | N/A | Available | CM_L4PER_GPTIMER9_CLKCTRL[1:0] MODULEMODE | Read/Write |
| ELM | N/A | Available | N/A | CM_L4PER_ELM_CLKCTRL[1:0] MODULEMODE | Read only |
| GPIO2 | Available | Available | N/A | CM_L4PER_GPIO2_CLKCTRL[1:0] MODULEMODE | Read/Write |
| GPIO2 | Available | Available | Available | CM_L4PER_GPIO2_CLKCTRL_RE[1:0] MODULEMODE | Read/Write |
| GPIO3 | Available | Available | N/A | CM_L4PER_GPIO3_CLKCTRL[1:0] MODULEMODE | Read/Write |
| GPIO3 | Available | Available | Available | CM_L4PER_GPIO3_CLKCTRL_RE[1:0] MODULEMODE | Read/Write |
| GPIO4 | Available | Available | N/A | CM_L4PER_GPIO4_CLKCTRL[1:0] MODULEMODE | Read/Write |
| GPIO4 | Available | Available | Available | CM_L4PER_GPIO4_CLKCTRL_RE[1:0] MODULEMODE | Read/Write |
| GPIO5 | Available | Available | N/A | CM_L4PER_GPIO5_CLKCTRL[1:0] MODULEMODE | Read/Write |
| GPIO5 | Available | Available | Available | CM_L4PER_GPIO5_CLKCTRL_RE[1:0] MODULEMODE | Read/Write |
| GPIO6 | Available | Available | N/A | CM_L4PER_GPIO6_CLKCTRL[1:0] MODULEMODE | Read/Write |
| GPIO6 | Available | Available | Available | CM_L4PER_GPIO6_CLKCTRL_RE[1:0] MODULEMODE | Read/Write |
| HDQ | Available | N/A | Available | CM_L4PER_HDQ1W_CLKCTRL[1:0] MODULEMODE | Read/Write |
| I2C1 | Available | N/A | Available | CM_L4PER_I2C1_CLKCTRL[1:0] MODULEMODE | Read/Write |
| I2C2 | Available | N/A | Available | CM_L4PER_I2C2_CLKCTRL[1:0] MODULEMODE | Read/Write |
| I2C3 | Available | N/A | Available | CM_L4PER_I2C3_CLKCTRL[1:0] MODULEMODE | Read/Write |
| I2C4 | Available | N/A | Available | CM_L4PER_I2C4_CLKCTRL[1:0] MODULEMODE | Read/Write |

Table 3-148. CD_L4_PER Modules Slave Clock-Management Modes and Control (continued)

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|---------------------|-----------|-----------|-----------|---|-------------|
| L4_PER interconnect | N/A | Available | N/A | CM_L4PER_L4PER_CLKCTRL[1:0] MODULEMODE | Read only |
| MCBSP4 | Available | N/A | Available | CM_L4PER_MCBSP4_CLKCTRL[1:0] MODULEMODE | Read/Write |
| MCSP11 | Available | N/A | Available | CM_L4PER_MCSP11_CLKCTRL[1:0] MODULEMODE | Read/Write |
| MCSP12 | Available | N/A | Available | CM_L4PER_MCSP12_CLKCTRL[1:0] MODULEMODE | Read/Write |
| MCSP13 | Available | N/A | Available | CM_L4PER_MCSP13_CLKCTRL[1:0] MODULEMODE | Read/Write |
| MCSP14 | Available | N/A | Available | CM_L4PER_MCSP14_CLKCTRL[1:0] MODULEMODE | Read/Write |
| HSMMC3 | Available | N/A | Available | CM_L4PER_MMCS D3_CLKCTRL[1:0] MODULEMODE | Read/Write |
| HSMMC4 | Available | N/A | Available | CM_L4PER_MMCS D4_CLKCTRL[1:0] MODULEMODE | Read/Write |
| HSMMC5 | Available | N/A | Available | CM_L4PER_MMCS D5_CLKCTRL[1:0] MODULEMODE | Read/Write |
| SLIMBUS2 | Available | N/A | Available | CM_L4PER_SLIMBUS2_CLKCTRL[1:0] MODULEMODE | Read/Write |
| UART1 | Available | N/A | Available | CM_L4PER_UART1_CLKCTRL[1:0] MODULEMODE | Read/Write |
| UART2 | Available | N/A | Available | CM_L4PER_UART2_CLKCTRL[1:0] MODULEMODE | Read/Write |
| UART3 | Available | N/A | Available | CM_L4PER_UART3_CLKCTRL[1:0] MODULEMODE | Read/Write |
| UART4 | Available | N/A | Available | CM_L4PER_UART4_CLKCTRL[1:0] MODULEMODE | Read/Write |

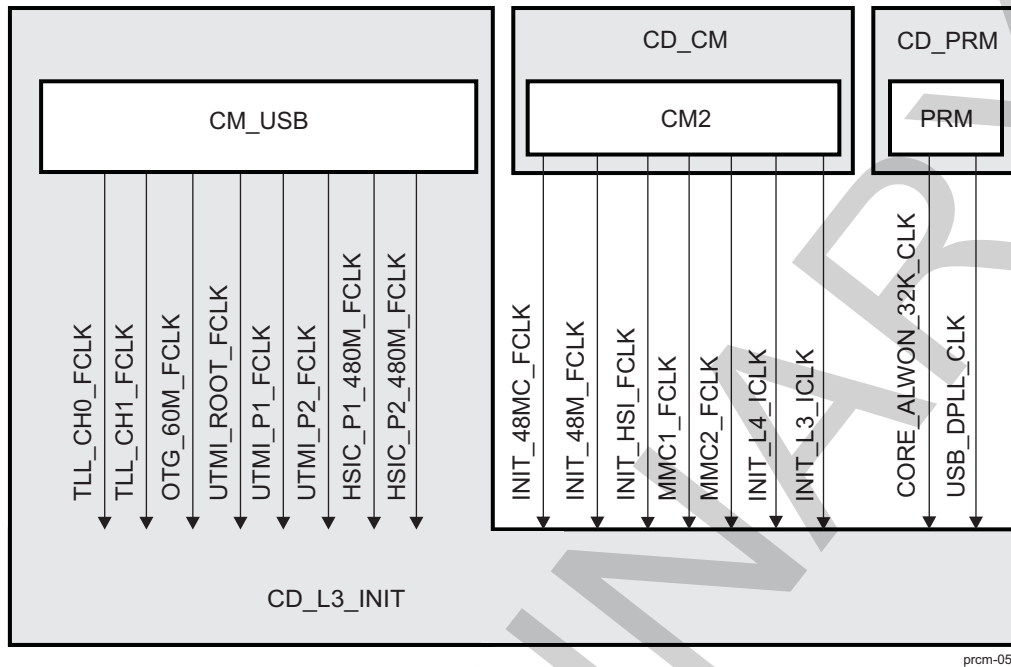
3.6.9 CD_L3_INIT Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.9.1 Overview

[Figure 3-59](#) shows the overview of the clock domain.

Figure 3-59. CD_L3_INIT Overview



3.6.9.2 Clock Domain Modes

Table 3-149 lists the clock domain modes supported by the clock domain.

Table 3-149. CD_L3_INIT Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|-----------|-----------|-----------|
| Available | Available | Available | Available |

Table 3-150 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-150. CD_L3_INIT Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|--------------------------------|--|
| HSIC_P1_480M_FCLK clock status | CM_L3INIT_CLKSTCTRL[20] CLKACTIVITY_HSIC_P1_480M_FCLK |
| HSIC_P1_FCLK clock status | CM_L3INIT_CLKSTCTRL[26] CLKACTIVITY_HSIC_P1_FCLK |
| HSIC_P2_480M_FCLK clock status | CM_L3INIT_CLKSTCTRL[21] CLKACTIVITY_HSIC_P2_480M_FCLK |
| HSIC_P2_FCLK clock status | CM_L3INIT_CLKSTCTRL[27] CLKACTIVITY_HSIC_P2_FCLK |
| INIT_48MC_FCLK clock status | CM_L3INIT_CLKSTCTRL[12] CLKACTIVITY_INIT_48MC_FCLK |
| INIT_48M_FCLK clock status | CM_L3INIT_CLKSTCTRL[13] CLKACTIVITY_INIT_48M_FCLK |
| INIT_60M_P1_FCLK clock status | CM_L3INIT_CLKSTCTRL[28] CLKACTIVITY_INIT_60M_P1_FCLK |
| INIT_60M_P2_FCLK clock status | CM_L3INIT_CLKSTCTRL[29] CLKACTIVITY_INIT_60M_P2_FCLK |
| INIT_HSI_FCLK clock status | CM_L3INIT_CLKSTCTRL[16] CLKACTIVITY_INIT_HSI_FCLK |
| MMC1_FCLK clock status | CM_L3INIT_CLKSTCTRL[17] CLKACTIVITY_INIT_HSMMC1_FCLK |
| MMC2_FCLK clock status | CM_L3INIT_CLKSTCTRL[18] CLKACTIVITY_INIT_HSMMC2_FCLK |
| INIT_L3_ICLK clock status | CM_L3INIT_CLKSTCTRL[8] CLKACTIVITY_INIT_L3_ICLK |
| INIT_L4_ICLK clock status | CM_L3INIT_CLKSTCTRL[9] CLKACTIVITY_INIT_L4_ICLK |

Table 3-150. CD_L3_INIT Control and Status Parameters (continued)

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|--|
| TLL_CH0_FCLK clock status | CM_L3INIT_CLKSTCTRL[22] CLKACTIVITY_TLL_CH0_FCLK |
| TLL_CH1_FCLK clock status | CM_L3INIT_CLKSTCTRL[23] CLKACTIVITY_TLL_CH1_FCLK |
| UTMI_ROOT_FCLK clock status | CM_L3INIT_CLKSTCTRL[25] CLKACTIVITY_UTMI_ROOT_FCLK |
| Clock Domain State Transition Control | CM_L3INIT_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.9.3 Clock Domain Dependency

3.6.9.3.1 Static Dependency

Table 3-151 lists the static dependency of the clock domain with respect to other clock domains of the device.

Table 3-151. CD_L3_INIT Static Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|---------------------------------------|-------------|
| CD_ABE | Disabled | CM_L3INIT_STATICDEP[3] ABE_STATDEP | Read/Write |
| CD_IVAHD | Disabled | CM_L3INIT_STATICDEP[2] IVAHD_STATDEP | Read/Write |
| CD_L3_1 | Always enabled | CM_L3INIT_STATICDEP[5] L3_1_STATDEP | Read only |
| CD_L3_2 | Always enabled | CM_L3INIT_STATICDEP[6] L3_2_STATDEP | Read only |
| CD_L4_CFG | Disabled | CM_L3INIT_STATICDEP[12] L4CFG_STATDEP | Read/Write |
| CD_L4_PER | Disabled | CM_L3INIT_STATICDEP[13] L4PER_STATDEP | Read/Write |
| CD_EMIF | Disabled | CM_L3INIT_STATICDEP[4] MEMIF_STATDEP | Read/Write |

3.6.9.3.2 Dynamic Dependency

Table 3-152 lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-152. CD_L3_INIT Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|-------------------------------------|-------------|
| CD_L3_1 | Always disabled | CM_L3INIT_DYNAMICDEP[5] L3_1_DYNDEP | Read only |
| CD_L3_2 | Always disabled | CM_L3INIT_DYNAMICDEP[6] L3_2_DYNDEP | Read only |

3.6.9.3.3 Wake-Up Dependency

Table 3-153 lists the wake-up dependency settings for the modules of this clock domain.

Table 3-153. CD_L3_INIT Wake-Up Dependency Association Parameters

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|-----------------------------|-----------------|--|-------------|
| HSI | CD_L3_INIT | CD_CORTEXA9 | Disabled | PM_L3INIT_HSI_WKDEP[8] WKUPDEP_WGM_HSI_WAKE_MPU | Read/Write |
| HSI | CD_L3_INIT | CD_DSP | Always enabled | PM_L3INIT_HSI_WKDEP[6] WKUPDEP_HSI_DSP_DSP | Read only |
| HSI | CD_L3_INIT | CD_CORTEXM3 | Disabled | PM_L3INIT_HSI_WKDEP[1] WKUPDEP_HSI_MCU_MPU_M3 | Read/Write |
| HSI | CD_L3_INIT | CD_CORTEXA9 | Disabled | PM_L3INIT_HSI_WKDEP[0] WKUPDEP_HSI_MCU_MPU | Read/Write |
| HSMMC1 | CD_L3_INIT | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L3INIT_MMC1_WKDEP[3] WKUPDEP_MMC1_SDMA | Read/Write |
| HSMMC1 | CD_L3_INIT | CD_DSP | Disabled | PM_L3INIT_MMC1_WKDEP[2] WKUPDEP_MMC1_DSP | Read/Write |
| HSMMC1 | CD_L3_INIT | CD_CORTEXM3 | Disabled | PM_L3INIT_MMC1_WKDEP[1] WKUPDEP_MMC1_MPU_M3 | Read/Write |
| HSMMC1 | CD_L3_INIT | CD_CORTEXA9 | Disabled | PM_L3INIT_MMC1_WKDEP[0] WKUPDEP_MMC1_MPU | Read/Write |
| HSMMC2 | CD_L3_INIT | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_L3INIT_MMC2_WKDEP[3] WKUPDEP_MMC2_SDMA | Read/Write |
| HSMMC2 | CD_L3_INIT | CD_DSP | Disabled | PM_L3INIT_MMC2_WKDEP[2] WKUPDEP_MMC2_DSP | Read/Write |
| HSMMC2 | CD_L3_INIT | CD_CORTEXM3 | Disabled | PM_L3INIT_MMC2_WKDEP[1] WKUPDEP_MMC2_MPU_M3 | Read/Write |
| HSMMC2 | CD_L3_INIT | CD_CORTEXA9 | Disabled | PM_L3INIT_MMC2_WKDEP[0] WKUPDEP_MMC2_MPU | Read/Write |
| HSUSBHOST | CD_L3_INIT | CD_CORTEXM3 | Disabled | PM_L3INIT_HSUSB_HOST_WKDEP[1] WKUPDEP_HSUSB_HOST_MPU_M3 | Read/Write |
| HSUSBHOST | CD_L3_INIT | CD_CORTEXA9 | Disabled | PM_L3INIT_HSUSB_HOST_WKDEP[0] WKUPDEP_HSUSB_HOST_MPU | Read/Write |
| HSUSBOTG | CD_L3_INIT | CD_CORTEXM3 | Disabled | PM_L3INIT_HSUSB_OTG_WKDEP[1] WKUPDEP_HSUSB_OTG_MPU_M3 | Read/Write |

Table 3-153. CD_L3_INIT Wake-Up Dependency Association Parameters (continued)

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|------------------------|-----------------|--|-------------|
| HSUSBOTG | CD_L3_INIT | CD_CORTEXA9 | Disabled | PM_L3INIT_HSUSB OTG_WKDEP[0] WKUPDEP_HSUSB OTG_MPU | Read/Write |
| HSUSBTLL | CD_L3_INIT | CD_CORTEXM3 | Disabled | PM_L3INIT_HSUSB TLL_WKDEP[1] WKUPDEP_HSUSB TLL_MPU_M3 | Read/Write |
| HSUSBTLL | CD_L3_INIT | CD_CORTEXA9 | Disabled | PM_L3INIT_HSUSB TLL_WKDEP[0] WKUPDEP_HSUSB TLL_MPU | Read/Write |

3.6.9.4 Clock Domain Module Attributes

Table 3-154 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-154. CD_L3_INIT Modules Clocks Association

| Module | Clock | Clock Type |
|-----------|---------------------|--------------------------|
| HSI | INIT_HSI_FCLK | Interface and functional |
| | INIT_L3_ICLK | Interface |
| | INIT_L4_ICLK | Interface |
| HSMC1 | MMC1_FCLK | Functional |
| | INIT_L3_ICLK | Interface |
| | INIT_L4_ICLK | Interface |
| HSMC2 | MMC2_FCLK | Functional |
| | INIT_L3_ICLK | Interface |
| | INIT_L4_ICLK | Interface |
| USBPHY | CORE_ALWON_32K_FCLK | Functional |
| | INIT_48M_FCLK | Functional |
| | INIT_L4_ICLK | Interface |
| | INIT_960M_FCLK | Functional |
| HSUSBHOST | HSIC_P1_480M_FCLK | Functional |
| | HSIC_P1_FCLK | Functional |
| | HSIC_P2_480M_FCLK | Functional |
| | HSIC_P2_FCLK | Functional |
| | INIT_48MC_FCLK | Functional (mandatory) |
| | INIT_48MC_FCLK | Functional (optional) |
| | INIT_L3_ICLK | Interface |
| | INIT_L4_ICLK | Interface |
| | UTMI_P1_FCLK | Functional |
| | UTMI_P2_FCLK | Functional |
| | UTMI_ROOT_FCLK | Functional |
| HSUSBOTG | INIT_L3_ICLK | Interface |
| | INIT_L4_ICLK | Interface |
| | OTG_60M_FCLK | Functional |
| HSUSBTLL | INIT_L4_ICLK | Interface |
| | TLL_CH0_FCLK | Functional |
| | TLL_CH1_FCLK | Functional |

Table 3-155 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-155. CD_L3_INIT Modules Wake-Up Request

| Module | Wake-Up Feature |
|-----------|---|
| HSI | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, DSP -IRQ)/Master wake-up request |
| HSMMC1 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, DSP -IRQ, sDMA -DMA) |
| HSMMC2 | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, DSP -IRQ, sDMA -DMA) |
| USBPHY | None |
| HSUSBHOST | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ) |
| HSUSBOTG | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ) |
| HSUSBTLL | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ) |

Table 3-156 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-156. CD_L3_INIT Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|-----------|---------------------------|---|----------------|
| HSI | Slave/Master | CM_L3INIT_HSI_CLKCTRL[18] STBYST | Standby status |
| | | CM_L3INIT_HSI_CLKCTRL[17:16] IDLEST | Idle status |
| HSMMC1 | Master/Slave | CM_L3INIT_HSMMC1_CLKCTRL[18] STBYST | Standby status |
| | | CM_L3INIT_HSMMC1_CLKCTRL[17:16] IDLEST | Idle status |
| HSMMC2 | Master/Slave | CM_L3INIT_HSMMC2_CLKCTRL[18] STBYST | Standby status |
| | | CM_L3INIT_HSMMC2_CLKCTRL[17:16] IDLEST | Idle status |
| USBPHY | Slave | CM_L3INIT_USBPHY_CLKCTRL[17:16] IDLEST | Idle status |
| HSUSBHOST | Slave/Master | CM_L3INIT_HSUSBHOST_CLKCTRL[18] STBYST | Standby status |
| | | CM_L3INIT_HSUSBHOST_CLKCTRL[17:16] IDLEST | Idle status |
| | | CM_L3INIT_HSUSBHOST_CLKCTRL_RESTORE[18] STBYST | Standby status |
| | | CM_L3INIT_HSUSBHOST_CLKCTRL_RESTORE[17:16] IDLEST | Idle status |
| HSUSBOTG | Slave/Master | CM_L3INIT_HSUSBOTG_CLKCTRL[18] STBYST | Standby status |
| | | CM_L3INIT_HSUSBOTG_CLKCTRL[17:16] IDLEST | Idle status |
| HSUSBTLL | Slave | CM_L3INIT_HSUSBTLL_CLKCTRL[17:16] IDLEST | Idle status |
| | | CM_L3INIT_HSUSBTLL_CLKCTRL_RESTORE[17:16] IDLEST | Idle status |

Table 3-157 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-157. CD_L3_INIT Modules Slave Clock-Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|-----------|-----------|-----------|-----------|---|-------------|
| HSI | Available | Available | N/A | CM_L3INIT_HSI_CLKCTRL[1:0] MODULEMODE | Read/Write |
| HSMMC1 | Available | N/A | Available | CM_L3INIT_HSMMC1_CLKCTRL[1:0] MODULEMODE | Read/Write |
| HSMMC2 | Available | N/A | Available | CM_L3INIT_HSMMC2_CLKCTRL[1:0] MODULEMODE | Read/Write |
| USBPHY | Available | Available | N/A | CM_L3INIT_USBPHY_CLKCTRL[1:0] MODULEMODE | Read/Write |
| HSUSBHOST | Available | N/A | Available | CM_L3INIT_HSUSBHOST_CLKCTRL[1:0] MODULEMODE | Read/Write |
| HSUSBOTG | Available | Available | N/A | CM_L3INIT_HSUSBOTG_CLKCTRL[1:0] MODULEMODE | Read/Write |
| HSUSBTLL | Available | Available | N/A | CM_L3INIT_HSUSBTLL_CLKCTRL[1:0] MODULEMODE | Read/Write |

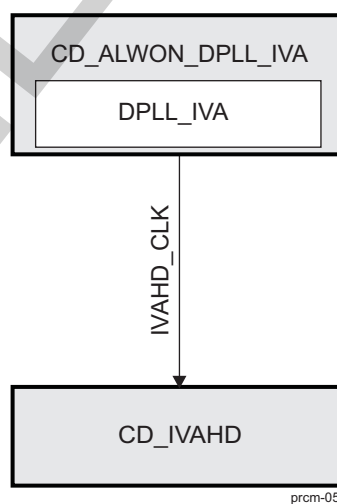
3.6.10 CD_IVAHD Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.10.1 Overview

Figure 3-60 shows the overview of the clock domain.

Figure 3-60. CD_IVAHD Overview



3.6.10.2 Clock Domain Modes

Table 3-158 lists the clock domain modes supported by the clock domain.

Table 3-158. CD_IVAHD Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|-----------|-----------|-----------|
| Available | Available | Available | Available |

Table 3-159 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-159. CD_IVAHD Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|---|
| IVAHD_ROOT_CLK clock status | CM_IVAHD_CLKSTCTRL[8] CLKACTIVITY_IVAHD_CLK |
| Clock Domain State Transition Control | CM_IVAHD_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.10.3 Clock Domain Dependency

CD_IVAHD has no module wake-up dependency with any other clock domain of the device

3.6.10.3.1 Static Dependency

Table 3-160 lists the static dependency of the clock domain with respect to other clock domains of the device.

Table 3-160. CD_IVAHD Static Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--|-------------|
| CD_L3_1 | Disabled | CM_IVAHD_STATICDEP[5] L3_1_STATDEP | Read/Write |
| CD_L3_2 | Always enabled | CM_IVAHD_STATICDEP[6] L3_2_STATDEP | Read only |
| CD_EMIF | Disabled | CM_IVAHD_STATICDEP[4] MEMIF_STATDEP | Read/Write |

3.6.10.3.2 Dynamic Dependency

Table 3-161 lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-161. CD_IVAHD Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|---------------------------------------|-------------|
| CD_L3_2 | Always disabled | CM_IVAHD_DYNAMICDEP[6] L3_2_DYNDEP | Read only |

3.6.10.4 Clock Domain Module Attributes

Table 3-162 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-162. CD_IVAHD Modules Clocks Association

| Module | Clock | Clock Type |
|--------|----------------|--------------------------|
| IVAHD | IVAHD_ROOT_CLK | Interface and Functional |
| SL2 | IVAHD_ROOT_CLK | Interface |

Table 3-163 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-163. CD_IVAHD Modules Wake-Up Request

| Module | Wake-Up Feature |
|--------|-----------------|
| IVAHD | None |
| SL2 | None |

Table 3-164 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-164. CD_IVAHD Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|--------|---------------------------|---------------------------------------|----------------|
| IVAHD | Master/Slave | CM_IVAHD_IVAHD_CLKCTRL [18] STBYST | Standby status |
| | | CM_IVAHD_IVAHD_CLKCTRL [17:16] IDLEST | Idle status |
| SL2 | Slave | CM_IVAHD_SL2_CLKCTRL [17:16] IDLEST | Idle status |

Table 3-165 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-165. CD_IVAHD Modules Slave Clock-Management Modes and Control

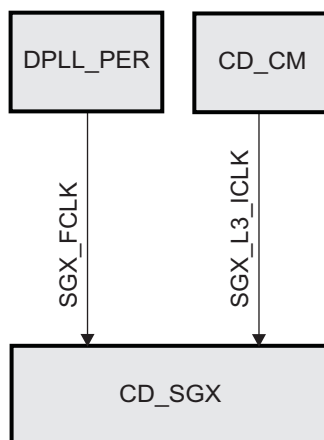
| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|--------|-----------|-----------|---------|--|-------------|
| IVAHD | Available | Available | N/A | CM_IVAHD_IVAHD_CLKCTRL[1:0] MODULEMODE | Read/Write |
| SL2 | Available | Available | N/A | CM_IVAHD_SL2_CLKCTRL[1:0] MODULEMODE | Read/Write |

3.6.11 CD_SGX Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.11.1 Overview

Figure 3-61 shows the overview of the clock domain.

Figure 3-61. CD_SGX Overview

prom-057

3.6.11.2 Clock Domain Modes

Table 3-166 lists the clock domain modes supported by the clock domain.

Table 3-166. CD_SGX Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|-----------|-----------|-----------|
| Available | Available | Available | Available |

Table 3-167 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-167. CD_SGX Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|---|
| SGX_L3_ICLK clock status | CM_SGX_CLKSTCTRL[8] CLKACTIVITY_SGX_L3_ICLK |
| SGX_FCLK clock status | CM_SGX_CLKSTCTRL[9] CLKACTIVITY_SGX_FCLK |
| Clock Domain State Transition Control | CM_SGX_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.11.3 Clock Domain Dependency

CD_SGX has no module wake-up dependency with any other clock domain of the device.

3.6.11.3.1 Static Dependency

Table 3-168 lists the static dependency of the clock domain with respect to other clock domains of the device.

Table 3-168. CD_SGX Static Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--------------------------------------|-------------|
| CD_IVAHD | Disabled | CM_SGX_STATICDEP[2] IVAHD_STATDEP | Read/Write |
| CD_L3_1 | Disabled | CM_SGX_STATICDEP[5] L3_1_STATDEP | Read/Write |
| CD_L3_2 | Always enabled | CM_SGX_STATICDEP[6] L3_2_STATDEP | Read only |
| CD_EMIF | Disabled | CM_SGX_STATICDEP[4] MEMIF_STATDEP | Read/Write |

3.6.11.3.2 Dynamic Dependency

Table 3-169 lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-169. CD_SGX Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|-------------------------------------|-------------|
| CD_L3_2 | Always disabled | CM_SGX_DYNAMICDEP[6] L3_2_DYNDEP | Read only |

3.6.11.4 Clock Domain Module Attributes

Table 3-170 identifies for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-170. CD_SGX Modules Clocks Association

| Module | Clock | Clock Type |
|--------|-------------|------------|
| SGX | SGX_L3_ICLK | Interface |
| | SGX_FCLK | Functional |

[Table 3-171](#) lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-171. CD_SGX Modules Wake-Up Request

| Module | Wake-Up Feature |
|--------|-----------------|
| SGX | None |

[Table 3-172](#) lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-172. CD_SGX Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|--------|---------------------------|---|----------------|
| SGX | Master/Slave | CM_SGX_SGX_CLKCTRL [18:STBYST] | Standby status |
| | | CM_SGX_SGX_CLKCTRL [17:16] IDLEST | Idle status |

[Table 3-173](#) lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-173. CD_SGX Modules Slave Clock-Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|--------|-----------|------|-----------|---|-------------|
| SGX | Available | N/A | Available | CM_SGX_SGX_CLKCTRL [1:0] MODULEMODE | Read/Write |

3.6.12 CD_EMU Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.12.1 Overview

[Figure 3-62](#) shows the overview of the clock domain.

Figure 3-62. CD_EMU Overview

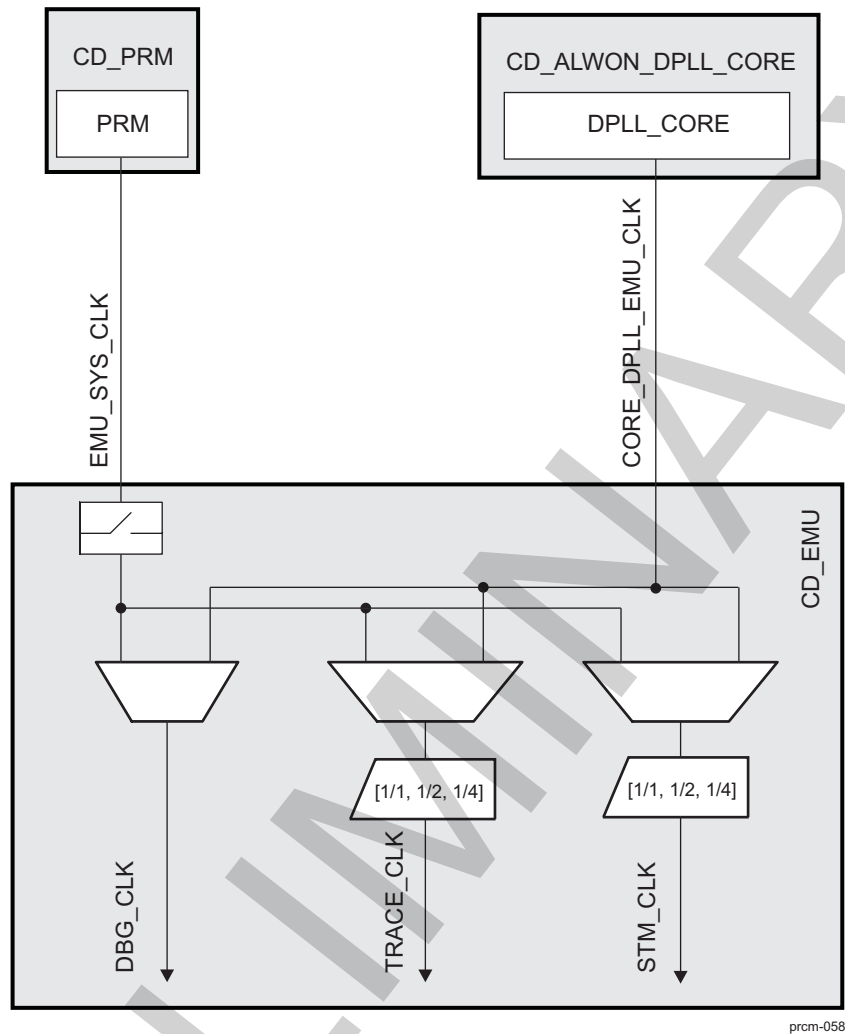


Table 3-174 lists controls for clock dividers or muxes in the clock domain.

Table 3-174. CD_EMU Clock Division and Muxing Control

| Divider/Mux | Control Bit Field |
|-------------------|---|
| Divider STM_CLK | CM_EMU_DEBUGSS_CLKCTRL[29:27] CLKSEL_PMD_STM_CLK |
| Divider TRACE_CLK | CM_EMU_DEBUGSS_CLKCTRL[26:24] CLKSEL_PMD_TRACE_CLK |

3.6.12.2 Clock Domain Modes

Table 3-175 lists the clock domain modes supported by the clock domain.

Table 3-175. CD_EMU Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|---------------|---------------|-----------|-----------|
| Not available | Not available | Available | Available |

Table 3-176 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-176. CD_EMU Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|--|
| CORE_DPLL_EMU_CLK clock status | CM_EMU_CLKSTCTRL[9] CLKACTIVITY_CORE_DPLL_EMU_CLK |
| EMU_SYS_CLK clock status | CM_EMU_CLKSTCTRL[8] CLKACTIVITY_EMU_SYS_CLK |
| Clock Domain State Transition Control | CM_EMU_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.12.3 Clock Domain Dependency

CD_EMU has no static or module wake-up dependency with any other clock domain of the device.

3.6.12.3.1 Dynamic Dependency

Table 3-177 lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-177. CD_EMU Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|-------------------------------------|-------------|
| CD_L3_2 | Always enabled | CM_EMU_DYNAMICDEP[6] L3_2_DYNDEP | Read only |

3.6.12.4 Clock Domain Module Attributes

Table 3-178 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-178. CD_EMU Modules Clocks Association

| Module | Clock | Clock Type |
|--------|-------------|--------------------------|
| DEBUG | DBG_CLK | Interface |
| | EMU_SYS_CLK | Interface and Functional |
| | STM_CLK | Interface and Functional |
| | TRACE_CLK | Interface and Functional |

Table 3-179 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-179. CD_EMU Modules Wake-Up Request

| Module | Wake-Up Feature |
|--------|------------------------|
| DEBUG | Master wake-up request |

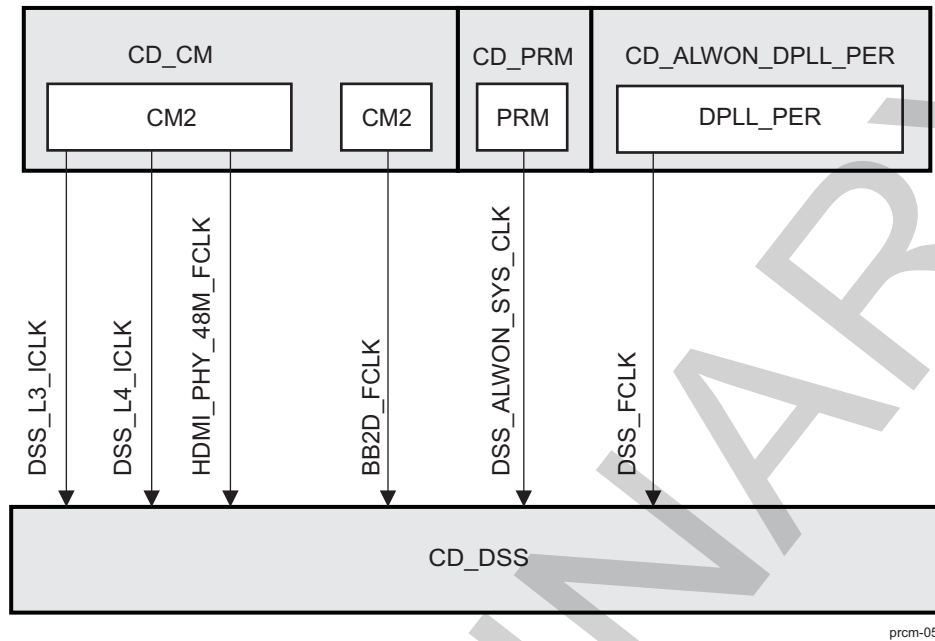
3.6.13 CD_DSS Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.13.1 Overview

Figure 3-63 shows the overview of the clock domain.

Figure 3-63. CD_DSS Overview



3.6.13.2 Clock Domain Modes

Table 3-180 lists the clock domain modes supported by the clock domain.

Table 3-180. CD_DSS Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|-----------|-----------|-----------|
| Available | Available | Available | Available |

Table 3-181 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-181. CD_DSS Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|--|
| DSS_ALWON_SYS_CLK clock status | CM_DSS_CLKSTCTRL[10] CLKACTIVITY_DSS_ALWON_SYS_CLK |
| DSS_FCLK clock status | CM_DSS_CLKSTCTRL[9] CLKACTIVITY_DSS_FCLK |
| HDMI_PHY_48M_FCLK clock status | CM_DSS_CLKSTCTRL[11] CLKACTIVITY_HDMI_PHY_48M_FCLK |
| DSS_L3_ICLK clock status | CM_DSS_CLKSTCTRL[8] CLKACTIVITY_DSS_L3_ICLK |
| BB2D_FCLK clock status | CM_DSS_CLKSTCTRL[12] CLKACTIVITY_BB2D_FCLK |
| Clock Domain State Transition Control | CM_DSS_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.13.3 Clock Domain Dependency

3.6.13.3.1 Static Dependency

Table 3-182 lists the static dependency of the clock domain with respect to other clock domains of the device.

Table 3-182. CD_DSS Static Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|---|-------------|
| CD_IVAHD | Disabled | CM_DSS_STATICDEP [2] IVAHD_STATDEP | Read/Write |
| CD_L3_1 | Always enabled | CM_DSS_STATICDEP [5] L3_1_STATDEP | Read only |
| CD_L3_2 | Always enabled | CM_DSS_STATICDEP [6] L3_2_STATDEP | Read only |
| CD_EMIF | Disabled | CM_DSS_STATICDEP [4] MEMIF_STATDEP | Read/Write |

3.6.13.3.2 Dynamic Dependency

[Table 3-183](#) lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-183. CD_DSS Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--|-------------|
| CD_L3_1 | Always disabled | CM_DSS_DYNAMICDEP [5] L3_1_DYNDEP | Read only |
| CD_L3_2 | Always disabled | CM_DSS_DYNAMICDEP [6] L3_2_DYNDEP | Read only |

3.6.13.3.3 Wake-Up Dependency

[Table 3-184](#) lists the wake-up dependency settings for the modules of this clock domain.

Table 3-184. CD_DSS Wake-Up Dependency Association Parameters

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|-----------------------------|-----------------|---|-------------|
| DSS-DSI1 | CD_DSS | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_DSS_DSS_WKDEP [7] WKUPDEP_DSI1_S DMA | Read/Write |
| DSS-DSI1 | CD_DSS | CD_DSP | Disabled | PM_DSS_DSS_WKDEP [6] WKUPDEP_DSI1_D SP | Read/Write |
| DSS-DSI1 | CD_DSS | CD_CORTEXM3 | Disabled | PM_DSS_DSS_WKDEP [5] WKUPDEP_DSI1_ MPU_M3 | Read/Write |
| DSS-DSI1 | CD_DSS | CD_CORTEXA9 | Disabled | PM_DSS_DSS_WKDEP [4] WKUPDEP_DSI1_ MPU | Read/Write |
| DSS-DSI2 | CD_DSS | CD_CORTEXM3 | Disabled | PM_DSS_DSS_WKDEP [9] WKUPDEP_DSI2_ MPU_M3 | Read/Write |
| DSS-DSI2 | CD_DSS | CD_CORTEXA9 | Disabled | PM_DSS_DSS_WKDEP [8] WKUPDEP_DSI2_ MPU | Read/Write |
| DSS-DSI2 | CD_DSS | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_DSS_DSS_WKDEP [11] WKUPDEP_DSI2_S DMA | Read/Write |

Table 3-184. CD_DSS Wake-Up Dependency Association Parameters (continued)

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|-----------------------------|-----------------|--|-------------|
| DSS-DSI2 | CD_DSS | CD_DSP | Disabled | PM_DSS_DSS_WK DEP[10] WKUPDEP_DSI2_D SP | Read/Write |
| DSS-HDMI | CD_DSS | CD_DMA, CD_L3_1, CD_L3_2 | Enabled | PM_DSS_DSS_WK DEP[19] WKUPDEP_HDMID MA_SDMA | Read/Write |
| DSS-HDMI | CD_DSS | CD_DSP | Disabled | PM_DSS_DSS_WK DEP[14] WKUPDEP_HDMII RQ_DSP | Read/Write |
| DSS-HDMI | CD_DSS | CD_CORTEXM3 | Disabled | PM_DSS_DSS_WK DEP[13] WKUPDEP_HDMII RQ_MPU_M3 | Read/Write |
| DSS-HDMI | CD_DSS | CD_CORTEXA9 | Disabled | PM_DSS_DSS_WK DEP[12] WKUPDEP_HDMII RQ_MPU | Read/Write |
| DSS-DISPC | CD_DSS | CD_CORTEXM3 | Disabled | PM_DSS_DSS_WK DEP[1] WKUPDEP_DISPC _MPU_M3 | Read/Write |
| DSS-DISPC | CD_DSS | CD_CORTEXA9 | Disabled | PM_DSS_DSS_WK DEP[0] WKUPDEP_DISPC _MPU | Read/Write |
| DSS-DISPC | CD_DSS | CD_DSP | Disabled | PM_DSS_DSS_WK DEP[2] WKUPDEP_DISPC _DSP | Read/Write |
| DSS-DISPC | CD_DSS | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_DSS_DSS_WK DEP[3] WKUPDEP_DISPC _SDMA | Read/Write |

3.6.13.4 Clock Domain Module Attributes

Table 3-185 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-185. CD_DSS Modules Clocks Association

| Module | Clock | Clock Type |
|--------|-------------------|------------|
| DSS | DSS_ALWON_SYS_CLK | Functional |
| | DSS_FCLK | Functional |
| | HDMI_PHY_48M_FCLK | Functional |
| | DSS_L3_ICLK | Interface |
| | DSS_L4_ICLK | Interface |
| BB2D | BB2D_FCLK | Functional |
| | DSS_L3_ICLK | Interface |

Table 3-186 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-186. CD_DSS Modules Wake-Up Request

| Module | Wake-Up Feature |
|--------|---|
| DSS | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ, DSP -IRQ, sDMA -DMA) |
| BB2D | None |

Table 3-187 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-187. CD_DSS Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|--------|---------------------------|-----------------------------------|----------------|
| DSS | Master/Slave | CM_DSS_DSS_CLKCTRL[18] STBYST | Standby status |
| | | CM_DSS_DSS_CLKCTRL[17:16] IDLEST | Idle status |
| BB2D | Master/Slave | CM_DSS_BB2D_CLKCTRL[18] STBYST | Standby status |
| | | CM_DSS_BB2D_CLKCTRL[17:16] IDLEST | Idle status |

Table 3-188 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-188. CD_DSS Modules Slave Clock-Management Modes and Control

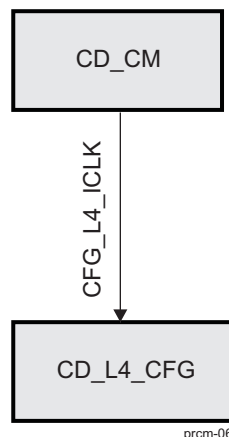
| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|--------|-----------|------|-----------|-------------------------------------|-------------|
| DSS | Available | N/A | Available | CM_DSS_DSS_CLKCTRL[1:0] MODULEMODE | Read/Write |
| BB2D | Available | N/A | Available | CM_DSS_BB2D_CLKCTRL[1:0] MODULEMODE | Read/Write |

3.6.14 CD_L4_CFG Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.14.1 Overview

Figure 3-64 shows the overview of the clock domain.

Figure 3-64. CD_L4_CFG Overview

3.6.14.2 Clock Domain Modes

Table 3-189 lists the clock domain modes supported by the clock domain.

Table 3-189. CD_L4_CFG Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|---------------|---------------|-----------|
| Available | Not available | Not available | Available |

Table 3-190 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-190. CD_L4_CFG Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|---|
| CFG_L4_ICLK clock status | CM_L4CFG_CLKSTCTRL[8] CLKACTIVITY_CFG_L4_ICLK |
| Clock Domain State Transition Control | CM_L4CFG_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.14.3 Clock Domain Dependency

CD_L4_CFG has no static or module wake-up dependency with any other clock domain of the device.

3.6.14.3.1 Dynamic Dependency

Table 3-191 lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-191. CD_L4_CFG Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--------------------------------------|-------------|
| CD_C2C | Always enabled | CM_L4CFG_DYNAMICDEP[18] C2C_DYNDEP | Read only |
| CD_DSS | Always enabled | CM_L4CFG_DYNAMICDEP[8] DSS_DYNDEP | Read only |
| CD_CAM | Always disabled | CM_L4CFG_DYNAMICDEP[9] ISS_DYNDEP | Read only |
| CD_L3_1 | Always enabled | CM_L4CFG_DYNAMICDEP[5] L3_1_DYNDEP | Read only |
| CD_L3_2 | Always enabled | CM_L4CFG_DYNAMICDEP[6] L3_2_DYNDEP | Read only |
| CD_L3_INIT | Always enabled | CM_L4CFG_DYNAMICDEP[7] L3INIT_DYNDEP | Read only |
| CD_EMIF | Always enabled | CM_L4CFG_DYNAMICDEP[4] MEMIF_DYNDEP | Read only |
| CD_DMA | Always enabled | CM_L4CFG_DYNAMICDEP[11] SDMA_DYNDEP | Read only |
| CD_DSP | Always enabled | CM_L4CFG_DYNAMICDEP[1] DSP_DYNDEP | Read only |

3.6.14.4 Clock Domain Module Attributes

Table 3-192 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-192. CD_L4_CFG Modules Clocks Association

| Module | Clock | Clock Type |
|----------------------|--------------|------------|
| SYSCTRL_PADCONF_CORE | CFG_L4_ICLK | Functional |
| SYSCTRL_GENERAL_CORE | CFG_L4_ICLK | Functional |
| | CORE_TS_FCLK | Functional |

Table 3-192. CD_L4_CFG Modules Clocks Association (continued)

| Module | Clock | Clock Type |
|---------------------|-------------|------------|
| SPINLOCK | CFG_L4_ICLK | Interface |
| L4_CFG interconnect | CFG_L4_ICLK | Interface |
| MAILBOX | CFG_L4_ICLK | Interface |
| SAR_ROM | CFG_L4_ICLK | Interface |

Table 3-193 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-193. CD_L4_CFG Modules Wake-Up Request

| Module | Wake-Up Feature |
|----------------------|-----------------|
| SYSCTRL_PADCONF_CORE | None |
| SYSCTRL_GENERAL_CORE | None |
| SPINLOCK | None |
| L4_CFG interconnect | None |
| MAILBOX | None |
| SAR_ROM | None |

Table 3-194 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-194. CD_L4_CFG Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|---------------------|---------------------------|---|-------------|
| SPINLOCK | Slave | CM_L4CFG_SPINLOCK_CLKCTRL[17:16] IDLEST | Idle status |
| L4_CFG interconnect | Slave | CM_L4CFG_L4_CFG_CLKCTRL[17:16] IDLEST | Idle status |
| MAILBOX | Slave | CM_L4CFG_MAILBOX_CLKCTRL[17:16] IDLEST | Idle status |
| SAR_ROM | Slave | CM_L4CFG_SAR_ROM_CLKCTRL[17:16] IDLEST | Idle status |

Table 3-195 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-195. CD_L4_CFG Modules Slave Clock-Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|---------------------|----------|-----------|---------|---|-------------|
| SPINLOCK | N/A | Available | N/A | CM_L4CFG_SPINLOCK_CLKCTRL[1:0] MODULEMODE | Read only |
| L4_CFG interconnect | N/A | Available | N/A | CM_L4CFG_L4_CFG_CLKCTRL[1:0] MODULEMODE | Read only |
| MAILBOX | N/A | Available | N/A | CM_L4CFG_MAILBOX_CLKCTRL[1:0] MODULEMODE | Read only |
| SAR_ROM | N/A | Available | N/A | CM_L4CFG_SAR_ROM_CLKCTRL[1:0] MODULEMODE | Read only |

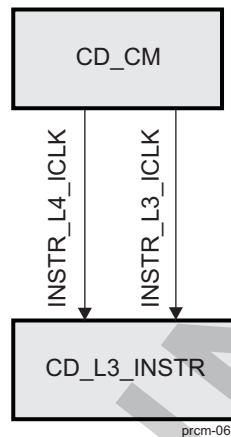
3.6.15 CD_L3_INSTR Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.15.1 Overview

Figure 3-65 shows the overview of the clock domain.

Figure 3-65. CD_L3_INSTR Overview



3.6.15.2 Clock Domain Modes

Table 3-196 lists the clock domain modes supported by the clock domain.

Table 3-196. CD_L3_INSTR Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|---------------|---------------|---------------|-----------|
| Not available | Not available | Not available | Available |

Table 3-197 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-197. CD_L3_INSTR Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|---|
| INSTR_L3_ICLK clock status | CM_L3INSTR_CLKSTCTRL[8] CLKACTIVITY_L3_INSTR_ICLK |
| Clock Domain State Transition Control | CM_L3INSTR_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.15.3 Clock Domain Dependency

CD_L3_INSTR has no static, dynamic, or module wake-up dependency with any other clock domain of the device.

3.6.15.4 Clock Domain Module Attributes

Table 3-198 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-198. CD_L3_INSTR Modules Clocks Association

| Module | Clock | Clock Type |
|-----------------------|---------------|------------|
| L3_3 interconnect | INSTR_L3_ICLK | Interface |
| | INSTR_L4_ICLK | Interface |
| L3_INSTR interconnect | INSTR_L3_ICLK | Interface |

Table 3-198. CD_L3_INSTR Modules Clocks Association (continued)

| Module | Clock | Clock Type |
|---------|---------------|------------|
| OCP_WP1 | INSTR_L3_ICLK | Interface |
| | INSTR_L4_ICLK | Interface |

Table 3-199 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-199. CD_L3_INSTR Modules Wake-Up Request

| Module | Wake-Up Feature |
|-----------------------|-----------------|
| L3_3 interconnect | None |
| L3_INSTR interconnect | None |

Table 3-200 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-200. CD_L3_INSTR Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|-----------------------|---------------------------|---|-------------|
| L3_3 interconnect | Slave | CM_L3INSTR_L3_3_CLKCTRL[17:16] IDLEST | Idle status |
| | | CM_L3INSTR_L3_3_CLKCTRL_RESTORE[17:16] IDLEST | Idle status |
| L3_INSTR interconnect | Slave | CM_L3INSTR_L3_INSTR_CLKCTRL[17:16] IDLEST | Idle status |
| | | CM_L3INSTR_L3_INSTR_CLKCTRL_RESTORE[17:16] IDLEST | Idle status |

Table 3-201 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-201. CD_L3_INSTR Modules Slave Clock-Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|-----------------------|-----------|-----------|---------|---|-------------|
| L3_3 interconnect | Available | Available | N/A | CM_L3INSTR_L3_3_CLKCTRL[1:0] MODULEMODE | Read/Write |
| L3_3 interconnect | Available | Available | N/A | CM_L3INSTR_L3_3_CLKCTRL_RESTORE[1:0] MODULEMODE | Read/Write |
| L3_INSTR interconnect | Available | Available | N/A | CM_L3INSTR_L3_INSTR_CLKCTRL[1:0] MODULEMODE | Read/Write |
| L3_INSTR interconnect | Available | Available | N/A | CM_L3INSTR_L3_INSTR_CLKCTRL_RESTORE[1:0] MODULEMODE | Read/Write |

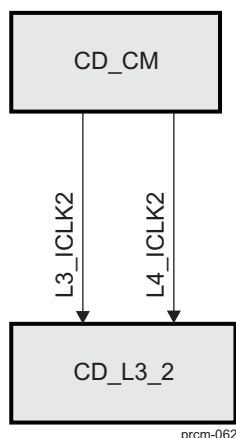
3.6.16 CD_L3_2 Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.16.1 Overview

Figure 3-66 shows the overview of the clock domain.

Figure 3-66. CD_L3_2 Overview



3.6.16.2 Clock Domain Modes

Table 3-202 lists the clock domain modes supported by the clock domain.

Table 3-202. CD_L3_2 Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|---------------|---------------|-----------|
| Available | Not available | Not available | Available |

Table 3-203 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-203. CD_L3_2 Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|--|
| L3_ICLK2 clock status | CM_L3_2_CLKSTCTRL[8] CLKACTIVITY_L3_2_ICLK |
| Clock Domain State Transition Control | CM_L3_2_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.16.3 Clock Domain Dependency

CD_L3_2 has no static or module wake-up dependency with any other clock domain of the device.

3.6.16.3.1 Dynamic Dependency

Table 3-204 lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-204. CD_L3_2 Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--|-------------|
| CD_C2C | Always enabled | CM_L3_2_DYNAMICDEP[18] C2C_DYNDEP | Read only |
| CD_DSS | Always enabled | CM_L3_2_DYNAMICDEP[8] DSS_DYNDEP | Read only |
| CD_CORTEXM3 | Always enabled | CM_L3_2_DYNAMICDEP[0] MPU_M3_DYNDEP | Read only |
| CD_SGX | Always enabled | CM_L3_2_DYNAMICDEP[10] SGX_DYNDEP | Read only |
| CD_CAM | Always disabled | CM_L3_2_DYNAMICDEP[9] ISS_DYNDEP | Read only |
| CD_IVAHD | Always enabled | CM_L3_2_DYNAMICDEP[2] IVAHD_DYNDEP | Read only |

Table 3-204. CD_L3_2 Dynamic Dependency Association Parameters (continued)

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|---|-------------|
| CD_L3_1 | Always enabled | CM_L3_2_DYNAMICDEP [5] L3_1_DYNDEP | Read only |
| CD_L3_INIT | Always enabled | CM_L3_2_DYNAMICDEP [7] L3INIT_DYNDEP | Read only |
| CD_L4_PER | Always enabled | CM_L3_2_DYNAMICDEP [13] L4PER_DYNDEP | Read only |

3.6.16.4 Clock Domain Module Attributes

[Table 3-205](#) lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-205. CD_L3_2 Modules Clocks Association

| Module | Clock | Clock Type |
|-------------------|----------|------------|
| GPMC | L3_ICLK2 | Interface |
| L3_2 interconnect | L3_ICLK2 | Interface |
| | L4_ICLK2 | Interface |
| OCMC_RAM | L3_ICLK2 | Interface |

[Table 3-206](#) lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-206. CD_L3_2 Modules Wake-Up Request

| Module | Wake-Up Feature |
|-------------------|-----------------|
| GPMC | None |
| L3_2 interconnect | None |
| OCMC_RAM | None |

[Table 3-207](#) lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-207. CD_L3_2 Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|-------------------|---------------------------|---|-------------|
| GPMC | Slave | CM_L3_2_GPMC_CLKCTRL [17:16] IDLEST | Idle status |
| L3_2 interconnect | Slave | CM_L3_2_L3_2_CLKCTRL [17:16] IDLEST | Idle status |
| OCMC_RAM | Slave | CM_L3_2_OCMC_RAM_CLKCTRL [17:16] IDLEST | Idle status |

[Table 3-208](#) lists the supported clock management modes and associated software control bit fields for each module of the power domain.

Table 3-208. CD_L3_2 Modules Slave Clock Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|-------------------|-----------|-----------|---------|---|-------------|
| GPMC | Available | Available | N/A | CM_L3_2_GPMC_CLKCTRL [1:0] MODULEMODE | Read/Write |
| L3_2 interconnect | N/A | Available | N/A | CM_L3_2_L3_2_CLKCTRL [1:0] MODULEMODE | Read only |

Table 3-208. CD_L3_2 Modules Slave Clock Management Modes and Control (continued)

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|----------|----------|-----------|---------|--|-------------|
| OCMC_RAM | N/A | Available | N/A | CM_L3_2_OCMC_RAM_CLKCTRL[1:0] MODULEMODE | Read only |

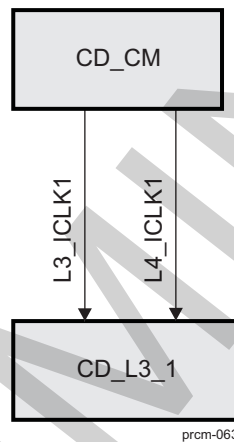
3.6.17 CD_L3_1 Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.17.1 Overview

Figure 3-67 shows the overview of the clock domain.

Figure 3-67. CD_L3_1 Overview



3.6.17.2 Clock Domain Modes

Table 3-209 lists the clock domain modes supported by the clock domain.

Table 3-209. CD_L3_1 Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|---------------|---------------|-----------|
| Available | Not available | Not available | Available |

Table 3-210 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-210. CD_L3_1 Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|--|
| L3_ICLK1 clock status | CM_L3_1_CLKSTCTRL[8] CLKACTIVITY_L3_1_ICLK |
| Clock Domain State Transition Control | CM_L3_1_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.17.3 Clock Domain Dependency

CD_L3_1 has no static or module wake-up dependency with any other clock domain of the device.

3.6.17.3.1 Dynamic Dependency

Table 3-211 lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-211. CD_L3_1 Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|---|-------------|
| CD_ABE | Always enabled | CM_L3_1_DYNAMICDEP [3] ABE_DYNDEP | Read only |
| CD_L3_2 | Always enabled | CM_L3_1_DYNAMICDEP [6] L3_2_DYNDEP | Read only |
| CD_L4_CFG | Always enabled | CM_L3_1_DYNAMICDEP [12] L4CFG_DYNDEP | Read only |
| CD_EMIF | Always enabled | CM_L3_1_DYNAMICDEP [4] MEMIF_DYNDEP | Read only |

3.6.17.4 Clock Domain Module Attributes

[Table 3-212](#) lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-212. CD_L3_1 Modules Clocks Association

| Module | Clock | Clock Type |
|-------------------|----------|------------|
| L3_1 interconnect | L3_ICLK1 | Interface |
| | L4_ICLK1 | Interface |

[Table 3-213](#) lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-213. CD_L3_1 Modules Wake-Up Request

| Module | Wake-Up Feature |
|-------------------|-----------------|
| L3_1 interconnect | None |

[Table 3-214](#) lists the supported clock management modes and associated software control bit fields for each module of the power domain.

Table 3-214. CD_L3_1 Modules Clock Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|-------------------|---------------------------|---|-------------|
| L3_1 interconnect | Slave | CM_L3_1_L3_1_CLKCTRL [17:16] IDLEST | Idle status |

[Table 3-215](#) lists the supported clock management modes and associated software control bit fields for each module of the power domain.

Table 3-215. CD_L3_1 Modules Slave Clock Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|-------------------|----------|-----------|---------|--|-------------|
| L3_1 interconnect | N/A | Available | N/A | CM_L3_1_L3_1_CLKCTRL [1:0] MODULEMODE | Read only |

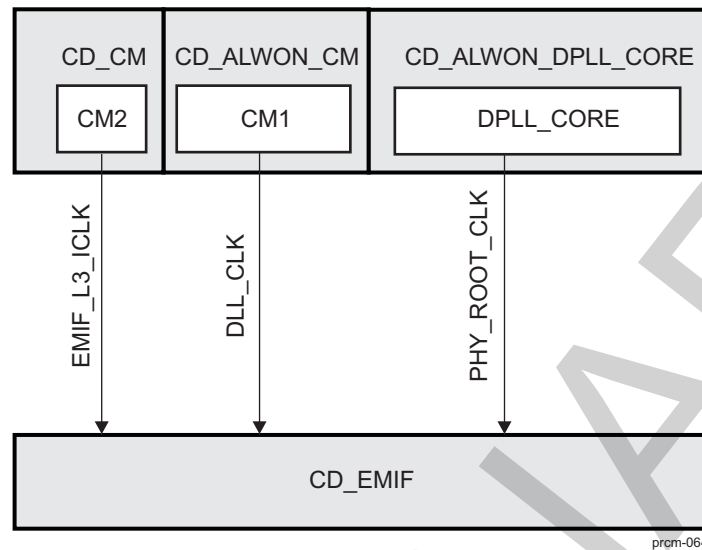
3.6.18 CD_EMIF Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.18.1 Overview

[Figure 3-68](#) shows the overview of the clock domain.

Figure 3-68. CD_EMIF Overview



3.6.18.2 Clock Domain Modes

Table 3-216 lists the clock domain modes supported by the clock domain.

Table 3-216. CD_EMIF Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|---------------|-----------|-----------|
| Available | Not available | Available | Available |

Table 3-217 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-217. CD_EMIF Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|---|
| DLL_CLK clock status | CM_MEMIF_CLKSTCTRL[9] CLKACTIVITY_DLL_CLK |
| EMIF_L3_ICLK clock status | CM_MEMIF_CLKSTCTRL[8] CLKACTIVITY_L3_EMIF_ICLK |
| PHY_ROOT_CLK clock status | CM_MEMIF_CLKSTCTRL[10] CLKACTIVITY_PHY_ROOT_CLK |
| Clock Domain State Transition Control | CM_MEMIF_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.18.3 Clock Domain Dependency

CD_EMIF has no static, dynamic, or module wake-up dependency with any other clock domain of the device.

3.6.18.4 Clock Domain Module Attributes

Table 3-218 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-218. CD_EMIF Modules Clocks Association

| Module | Clock | Clock Type |
|--------|--------------|------------|
| DLL | DLL_CLK | Functional |
| DMM | EMIF_L3_ICLK | Interface |
| EMIF1 | DLL_CLK | Interface |
| | EMIF_L3_ICLK | Interface |

Table 3-218. CD_EMIF Modules Clocks Association (continued)

| Module | Clock | Clock Type |
|---------|-----------------------------|------------|
| EMIF2 | EMIF_FCLK ⁽¹⁾ | Functional |
| | EOCP_MA_ICLK ⁽²⁾ | Interface |
| | EOCP_L3_ICLK ⁽²⁾ | Interface |
| | DLL_CLK | Interface |
| | EMIF_L3_ICLK | Interface |
| | EMIF_FCLK ⁽¹⁾ | Functional |
| | EOCP_MA_ICLK ⁽²⁾ | Interface |
| EMIF_FW | EOCP_L3_ICLK ⁽²⁾ | Interface |
| | EMIF_L3_ICLK | Interface |
| | EMIF_L4_ICLK | Interface |

⁽¹⁾ PHY_ROOT_CLK goes into DDRPHY. EMIF_FCLK comes out of DDRPHY and is PHY_ROOT_CLK divided by 4. DDR_PHY_CLK is PHY_ROOT_CLK divided by 2.

⁽²⁾ EMIF modules are clocked by EOCP_MA_ICLK when MPU is active, otherwise EOCP_L3_ICLK clock is used.

Table 3-219 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-219. CD_EMIF Modules Wake-Up Request

| Module | Wake-Up Feature |
|---------|-----------------|
| DDRPHY | None |
| DLL | None |
| DMM | None |
| EMIF1 | None |
| EMIF2 | None |
| EMIF_FW | None |

Table 3-220 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-220. CD_EMIF Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|---------|---------------------------|--|-------------|
| DMM | Slave | CM_MEMIF_DMM_CLKCTRL[17:16] IDLEST | Idle status |
| EMIF1 | Slave | CM_MEMIF_EMIF_1_CLKCTRL[17:16] IDLEST | Idle status |
| EMIF2 | Slave | CM_MEMIF_EMIF_2_CLKCTRL[17:16] IDLEST | Idle status |
| EMIF_FW | Slave | CM_MEMIF_EMIF_FW_CLKCTRL[17:16] IDLEST | Idle status |

Table 3-221 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-221. CD_EMIF Modules Slave Clock-Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|--------|-----------|-----------|---------|---|-------------|
| DMM | N/A | Available | N/A | CM_MEMIF_DMM_CLKCTRL[1:0] MODULEMODE | Read only |
| EMIF1 | Available | Available | N/A | CM_MEMIF_EMIF_1_CLKCTRL[1:0] MODULEMODE | Read/Write |

Table 3-221. CD_EMIF Modules Slave Clock-Management Modes and Control (continued)

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|---------|-----------|-----------|---------|--|-------------|
| EMIF2 | Available | Available | N/A | CM_MEMIF_EMIF_2_CLKCTRL[1:0] MODULEMODE | Read/Write |
| EMIF_FW | N/A | Available | N/A | CM_MEMIF_EMIF_FW_CLKCTRL[1:0] MODULEMODE | Read only |

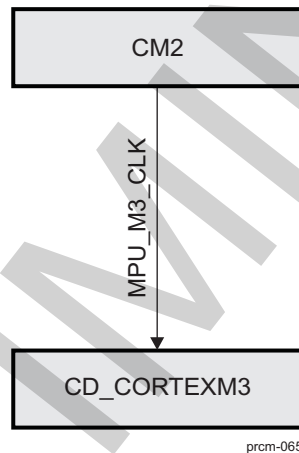
3.6.19 CD_CORTEXM3 Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.19.1 Overview

Figure 3-69 shows the overview of the clock domain.

Figure 3-69. CD_CORTEXM3 Overview



3.6.19.2 Clock Domain Modes

Table 3-222 lists the clock domain modes supported by the clock domain.

Table 3-222. CD_CORTEXM3 Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|-----------|-----------|-----------|
| Available | Available | Available | Available |

Table 3-223 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-223. CD_CORTEXM3 Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|---|
| MPU_M3_CLK clock status | CM_MPU_M3_CLKSTCTRL[8] CLKACTIVITY_MPU_M3_CLK |
| Clock Domain State Transition Control | CM_MPU_M3_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.19.3 Clock Domain Dependency

CD_CORTEXM3 has no module wake-up dependency with any other clock domain of the device.

3.6.19.3.1 Static Dependency

Table 3-224 lists the static dependency of the clock domain with respect to other clock domains of the device.

Table 3-224. CD_CORTEXM3 Static Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--|-------------|
| CD_ABE | Disabled | CM_MPU_M3_STATICDEP[3] ABE_STATDEP | Read/Write |
| CD_DSS | Disabled | CM_MPU_M3_STATICDEP[8] DSS_STATDEP | Read/Write |
| CD_SGX | Disabled | CM_MPU_M3_STATICDEP[10] SGX_STATDEP | Read/Write |
| CD_CAM | Always disabled | CM_MPU_M3_STATICDEP[9] ISS_STATDEP | Read only |
| CD_IVAHD | Disabled | CM_MPU_M3_STATICDEP[2] IVAHD_STATDEP | Read/Write |
| CD_L3_1 | Enabled | CM_MPU_M3_STATICDEP[5] L3_1_STATDEP | Read/Write |
| CD_L3_2 | Enabled | CM_MPU_M3_STATICDEP[6] L3_2_STATDEP | Read/Write |
| CD_L3_INIT | Disabled | CM_MPU_M3_STATICDEP[7] L3INIT_STATDEP | Read/Write |
| CD_L4_CFG | Enabled | CM_MPU_M3_STATICDEP[12] L4CFG_STATDEP | Read/Write |
| CD_L4_PER | Disabled | CM_MPU_M3_STATICDEP[13] L4PER_STATDEP | Read/Write |
| CD_EMIF | Enabled | CM_MPU_M3_STATICDEP[4] MEMIF_STATDEP | Read/Write |
| CD_DMA | Always disabled | CM_MPU_M3_STATICDEP[11] SDMA_STATDEP | Read only |
| CD_DSP | Disabled | CM_MPU_M3_STATICDEP[1] DSP_STATDEP | Read/Write |

3.6.19.3.2 Dynamic Dependency

Table 3-225 lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-225. CD_CORTEXM3 Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--|-------------|
| CD_CAM | Always disabled | CM_MPU_M3_DYNAMICDEP[9] ISS_DYNDEP | Read only |
| CD_L3_2 | Always enabled | CM_MPU_M3_DYNAMICDEP[6] L3_2_DYNDEP | Read only |

3.6.19.4 Clock Domain Module Attributes

Table 3-226 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-226. CD_CORTEXM3 Modules Clocks Association

| Module | Clock | Clock Type |
|----------|------------|--------------------------|
| CORTEXM3 | MPU_M3_CLK | Interface and functional |

Table 3-227 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-227. CD_CORTEXM3 Modules Wake-Up Request

| Module | Wake-Up Feature |
|----------|------------------------|
| CORTEXM3 | Master wake-up request |

Table 3-228 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-228. CD_CORTEXM3 Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|----------|---------------------------|---|----------------|
| CORTEXM3 | Master/Slave | CM_MPU_M3_MPU_M3_CLK_CTRL[18] STBYST | Standby status |
| | | CM_MPU_M3_MPU_M3_CLK_CTRL[17:16] IDLEST | Idle status |

Table 3-229 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-229. CD_CORTEXM3 Modules Slave Clock-Management Modes and Control

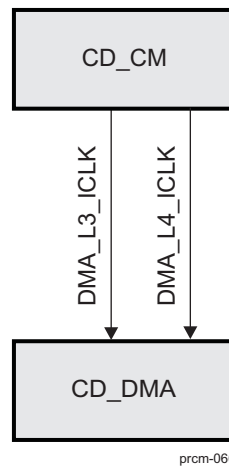
| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|----------|-----------|-----------|---------|--|-------------|
| CORTEXM3 | Available | Available | N/A | CM_MPU_M3_MPU_M3_CLKCTRL[1:0] MODULEMODE | Read/Write |

3.6.20 CD_DMA Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.20.1 Overview

Figure 3-70 shows the overview of the clock domain.

Figure 3-70. CD_DMA Overview

3.6.20.2 Clock Domain Modes

Table 3-230 lists the clock domain modes supported by the clock domain.

Table 3-230. CD_DMA Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|---------------|-----------|-----------|
| Available | Not available | Available | Available |

Table 3-231 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-231. CD_DMA Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|--|
| DMA_L3_ICLK clock status | CM_SDMA_CLKSTCTRL[8] CLKACTIVITY_DMA_L3_ICLK |
| Clock Domain State Transition Control | CM_SDMA_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.20.3 Clock Domain Dependency

CD_DMA has a permanently enabled static dependency to the CD_L3_2 clock domain. It has no dynamic or module wake-up dependency with any other clock domain of the device.

3.6.20.4 Clock Domain Module Attributes

Table 3-232 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-232. CD_DMA Modules Clocks Association

| Module | Clock | Clock Type |
|--------|-------------|--------------------------|
| sDMA | DMA_L3_ICLK | Interface and Functional |
| | DMA_L4_ICLK | Interface |

Table 3-233 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-233. CD_DMA Modules Wake-Up Request

| Module | Wake-Up Feature |
|--------|------------------------|
| sDMA | Master wake-up request |

Table 3-234 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-234. CD_DMA Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|--------|---------------------------|------------------------------------|----------------|
| sDMA | Master/Slave | CM_SDMA_SDMA_CLKCTRL[18] STBYST | Standby status |
| | | CM_SDMA_SDMA_CLKCTRL[17:16] IDLEST | Idle status |

Table 3-235 lists the supported clock management modes and associated software control bit fields for each module of the power domain.

Table 3-235. CD_DMA Modules Slave Clock Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|--------|----------|-----------|---------|--------------------------------------|-------------|
| sDMA | N/A | Available | N/A | CM_SDMA_SDMA_CLKCTRL[1:0] MODULEMODE | Read only |

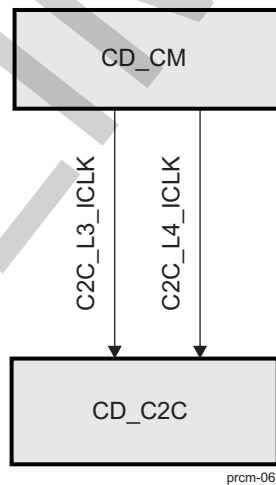
3.6.21 CD_C2C Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.21.1 Overview

Figure 3-71 shows the overview of the clock domain.

Figure 3-71. CD_C2C Overview



3.6.21.2 Clock Domain Modes

Table 3-236 lists the clock domain modes supported by the clock domain.

Table 3-236. CD_C2C Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|---------------|-----------|-----------|
| Available | Not available | Available | Available |

Table 3-237 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-237. CD_C2C Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|--|
| C2C_L3_ICLK clock status | CM_C2C_CLKSTCTRL[8] CLKACTIVITY_L3_C2C_ICLK |
| C2C_L3X2_ICLK clock status | CM_C2C_CLKSTCTRL[10] CLKACTIVITY_L3X2_C2C_ICLK |
| C2C_L4_ICLK clock status | CM_C2C_CLKSTCTRL[9] CLKACTIVITY_L4_C2C_ICLK |
| Clock Domain State Transition Control | CM_C2C_CLKSTCTRL[1:0] CLKTRCTRL |

3.6.21.3 Clock Domain Dependency

CD_C2C has no module wake-up dependency with any other clock domain of the device.

3.6.21.3.1 Static Dependency

Table 3-238 lists the static dependency of the clock domain with respect to other clock domains of the device.

Table 3-238. CD_C2C Static Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|---------------------------------------|-------------|
| CD_ABE | Disabled | CM_C2C_STATICDEP[3] ABE_STATDEP | Read/Write |
| CD_IVAHD | Disabled | CM_C2C_STATICDEP[2] IVAHD_STATDEP | Read/Write |
| CD_L3_1 | Disabled | CM_C2C_STATICDEP[5] L3_1_STATDEP | Read/Write |
| CD_L3_2 | Disabled | CM_C2C_STATICDEP[6] L3_2_STATDEP | Read/Write |
| CD_L3_INIT | Disabled | CM_C2C_STATICDEP[7] L3INIT_STATDEP | Read/Write |
| CD_L4_CFG | Disabled | CM_C2C_STATICDEP[12] L4CFG_STATDEP | Read/Write |
| CD_L4_PER | Disabled | CM_C2C_STATICDEP[13] L4PER_STATDEP | Read/Write |
| CD_EMIF | Enabled | CM_C2C_STATICDEP[4] MEMIF_STATDEP | Read/Write |

3.6.21.3.2 Dynamic Dependency

Table 3-239 lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-239. CD_C2C Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--------------------------------------|-------------|
| CD_L3_2 | Always enabled | CM_C2C_DYNAMICDEP[6] L3_2_DYNDEP | Read only |
| CD_EMIF | Always enabled | CM_C2C_DYNAMICDEP[4] MEMIF_DYNDEP | Read only |

3.6.21.4 Clock Domain Module Attributes

Table 3-240 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-240. CD_C2C Modules Clocks Association

| Module | Clock | Clock Type |
|--------|---------------|------------|
| C2C | C2C_L3X2_ICLK | Interface |
| | C2C_L3_ICLK | Interface |
| C2C_FW | C2C_L3_ICLK | Interface |
| | C2C_L4_ICLK | Interface |

[Table 3-241](#) lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-241. CD_C2C Modules Wake-Up Request

| Module | Wake-Up Feature |
|--------|------------------------|
| C2C | Master wake-up request |
| C2C_FW | None |

[Table 3-242](#) lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-242. CD_C2C Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|--------|---------------------------|--------------------------------------|----------------|
| C2C | Master/Slave | CM_C2C_C2C_CLKCTRL[18] STBYST | Standby status |
| | | CM_C2C_C2C_CLKCTRL[17:16] IDLEST | Idle status |
| C2C_FW | Slave | CM_C2C_C2C_FW_CLKCTRL [17:16] IDLEST | Idle status |

[Table 3-243](#) lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-243. CD_C2C Modules Slave Clock-Management Modes and Control

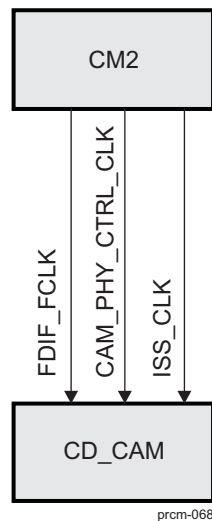
| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|--------|----------|-----------|---------|---------------------------------------|-------------|
| C2C | N/A | Available | N/A | CM_C2C_C2C_CLKCTRL[1:0] MODULEMODE | Read only |
| C2C_FW | N/A | Available | N/A | CM_C2C_C2C_FW_CLKCTRL[1:0] MODULEMODE | Read only |

3.6.22 CD_CAM Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.22.1 Overview

[Figure 3-72](#) shows the overview of the clock domain.

Figure 3-72. CD_CAM Overview

3.6.22.2 Clock Domain Modes

[Table 3-244](#) lists the clock domain modes supported by the clock domain.

Table 3-244. CD_CAM Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|-----------|-----------|-----------|
| Available | Available | Available | Available |

[Table 3-245](#) lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-245. CD_CAM Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|---|
| CAM_PHY_CTRL_CLK clock status | CM_CAM_CLKSTCTRL [9] CLKACTIVITY_CAM_PHY_CTRL_CLK |
| FDIF_FCLK clock status | CM_CAM_CLKSTCTRL [10] CLKACTIVITY_FDIF_FCLK |
| ISS_CLK clock status | CM_CAM_CLKSTCTRL [8] CLKACTIVITY_ISS_CLK |
| Clock Domain State Transition Control | CM_CAM_CLKSTCTRL [1:0] CLKTRCTRL |

3.6.22.3 Clock Domain Dependency

CD_CAM has no module wake-up dependency with any other clock domain of the device.

3.6.22.3.1 Static Dependency

[Table 3-246](#) lists the static dependency of the clock domain with respect to other clock domains of the device.

Table 3-246. CD_CAM Static Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--|-------------|
| CD_IVAHD | Disabled | CM_CAM_STATICDEP [2] IVAHD_STATDEP | Read/Write |
| CD_L3_1 | Disabled | CM_CAM_STATICDEP [5] L3_1_STATDEP | Read/Write |
| CD_L3_2 | Always enabled | CM_CAM_STATICDEP [6] L3_2_STATDEP | Read only |

Table 3-246. CD_CAM Static Dependency Association Parameters (continued)

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|--------------------------------------|-------------|
| CD_EMIF | Disabled | CM_CAM_STATICDEP[4] MEMIF_STATDEP | Read/Write |

3.6.22.3.2 Dynamic Dependency

Table 3-247 lists the dynamic dependency of the clock domain with respect to other clock domains of the device.

Table 3-247. CD_CAM Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|-------------------------------------|-------------|
| CD_L3_2 | Always disabled | CM_CAM_DYNAMICDEP[6] L3_2_DYNDEP | Read only |

3.6.22.4 Clock Domain Module Attributes

Table 3-248 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-248. CD_CAM Modules Clocks Association

| Module | Clock | Clock Type |
|-------------|------------------|--------------------------|
| FACE DETECT | FDIF_FCLK | Interface and Functional |
| ISS | CAM_PHY_CTRL_CLK | Functional |
| | ISS_CLK | Interface and Functional |

Table 3-249 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-249. CD_CAM Modules Wake-Up Request

| Module | Wake-Up Feature |
|-------------|-----------------|
| FACE DETECT | None |
| ISS | None |

Table 3-250 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-250. CD_CAM Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|-------------|---------------------------|---------------------------------------|----------------|
| FACE DETECT | Master/Slave | CM_CAM_FDIF_CLKCTRL[18] STBYST | Standby status |
| | | CM_CAM_FDIF_CLKCTRL[17: 16] IDLEST | Idle status |
| ISS | Master/Slave | CM_CAM_ISS_CLKCTRL[18] STBYST | Standby status |
| | | CM_CAM_ISS_CLKCTRL[17:1 6] IDLEST | Idle status |

Table 3-251 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-251. CD_CAM Modules Slave Clock-Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|-------------|-----------|------|-----------|------------------------------------|-------------|
| FACE DETECT | Available | N/A | Available | CM_CAM_FDIF_CLKCTRL[1:0]MODULEMODE | Read/Write |
| ISS | Available | N/A | Available | CM_CAM_ISS_CLKCTRL[1:0]MODULEMODE | Read/Write |

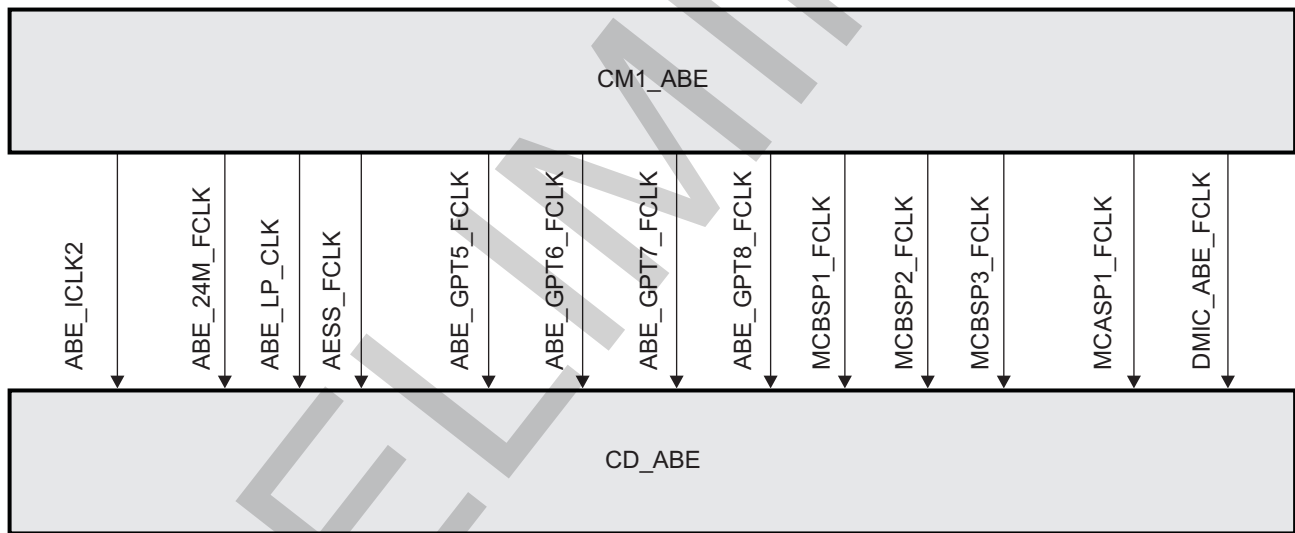
NOTE: To enable and access the ISS module, first the Cortex-M3 module must be enabled and the reset for Cortex-M3 CACHE and MMU must be cleared.

3.6.23 CD_ABE Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.23.1 Overview

Figure 3-73 shows the overview of the clock domain.

Figure 3-73. CD_ABE Overview

prcm-069

3.6.23.2 Clock Domain Modes

Table 3-252 lists the clock domain modes supported by the clock domain.

Table 3-252. CD_ABE Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|-----------|-----------|-----------|
| Available | Available | Available | Available |

Table 3-253 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 3-253. CD_ABE Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|--|
| ABE_24M_FCLK clock status | CM1_ABE_CLKSTCTRL [13] CLKACTIVITY_ABE_24M_FCLK |
| ABE_ALWON_32K_CLK clock status | CM1_ABE_CLKSTCTRL [12] CLKACTIVITY_ABE_ALWON_32K_CLK |
| ABE_SYSCLK clock status | CM1_ABE_CLKSTCTRL [11] CLKACTIVITY_ABE_SYSCLK |
| ABE_X2_CLK clock status | CM1_ABE_CLKSTCTRL [8] CLKACTIVITY_ABE_X2_CLK |
| 24M_FCLK clock status | CM1_ABE_CLKSTCTRL [10] CLKACTIVITY_24M_FCLK |
| ABE_ICLK2 clock status | CM1_ABE_CLKSTCTRL [9] CLKACTIVITY_ABE_ICLK2 |
| Clock Domain State Transition Control | CM1_ABE_CLKSTCTRL [1:0] CLKTRCTRL |

3.6.23.3 Clock Domain Dependency

CD_ABE has no static or dynamic dependency with any other clock domain of the device.

3.6.23.3.1 Wake-Up Dependency

[Table 3-254](#) lists the wake-up dependency settings for the modules of this clock domain.

Table 3-254. CD_ABE Wake-Up Dependency Association Parameters

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|-----------------------------|-----------------|---|-------------|
| DMIC | CD_ABE | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_ABE_DMIC_WKDEP [7] WKUPDEP_DMIC_DMA_SDMA | Read/Write |
| DMIC | CD_ABE | CD_DSP | Disabled | PM_ABE_DMIC_WKDEP [6] WKUPDEP_DMIC_DMA_DSP | Read/Write |
| DMIC | CD_ABE | CD_DSP | Disabled | PM_ABE_DMIC_WKDEP [2] WKUPDEP_DMIC_IRQ_DSP | Read/Write |
| DMIC | CD_ABE | CD_CORTXA9 | Disabled | PM_ABE_DMIC_WKDEP [0] WKUPDEP_DMIC_IRQ_MPU | Read/Write |
| MCASP1 | CD_ABE | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_ABE_MCASP_WKDEP [7] WKUPDEP_MCASP1_DMA_SDMA | Read/Write |
| MCASP1 | CD_ABE | CD_DSP | Disabled | PM_ABE_MCASP_WKDEP [6] WKUPDEP_MCASP1_DMA_DSP | Read/Write |
| MCASP1 | CD_ABE | CD_DSP | Disabled | PM_ABE_MCASP_WKDEP [2] WKUPDEP_MCASP1_IRQ_DSP | Read/Write |
| MCASP1 | CD_ABE | CD_CORTXA9 | Disabled | PM_ABE_MCASP_WKDEP [0] WKUPDEP_MCASP1_IRQ_MPU | Read/Write |
| MCBSP1 | CD_ABE | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_ABE_MCBSP1_WKDEP [3] WKUPDEP_MCBSP1_SDMA | Read/Write |

Table 3-254. CD_ABE Wake-Up Dependency Association Parameters (continued)

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|-----------------------------|-----------------|---|-------------|
| MCBSP1 | CD_ABE | CD_DSP | Disabled | PM_ABE_MCBSP1_WKDEP [2] WKUPDEP_MCBS P1_DSP | Read/Write |
| MCBSP1 | CD_ABE | CD_CORTEXA9 | Disabled | PM_ABE_MCBSP1_WKDEP [0] WKUPDEP_MCBS P1_MPU | Read/Write |
| MCBSP2 | CD_ABE | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_ABE_MCBSP2_WKDEP [3] WKUPDEP_MCBS P2_SDMA | Read/Write |
| MCBSP2 | CD_ABE | CD_DSP | Disabled | PM_ABE_MCBSP2_WKDEP [2] WKUPDEP_MCBS P2_DSP | Read/Write |
| MCBSP2 | CD_ABE | CD_CORTEXA9 | Disabled | PM_ABE_MCBSP2_WKDEP [0] WKUPDEP_MCBS P2_MPU | Read/Write |
| MCBSP3 | CD_ABE | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_ABE_MCBSP3_WKDEP [3] WKUPDEP_MCBS P3_SDMA | Read/Write |
| MCBSP3 | CD_ABE | CD_DSP | Disabled | PM_ABE_MCBSP3_WKDEP [2] WKUPDEP_MCBS P3_DSP | Read/Write |
| MCBSP3 | CD_ABE | CD_CORTEXA9 | Disabled | PM_ABE_MCBSP3_WKDEP [0] WKUPDEP_MCBS P3_MPU | Read/Write |
| MCPDM | CD_ABE | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_ABE_PDM_WKDEP [7] WKUPDEP_PDM_D MA_SDMA | Read/Write |
| MCPDM | CD_ABE | CD_DSP | Disabled | PM_ABE_PDM_WKDEP [6] WKUPDEP_PDM_D MA_DSP | Read/Write |
| MCPDM | CD_ABE | CD_DSP | Disabled | PM_ABE_PDM_WKDEP [2] WKUPDEP_PDM_I RQ_DSP | Read/Write |
| MCPDM | CD_ABE | CD_CORTEXA9 | Disabled | PM_ABE_PDM_WKDEP [0] WKUPDEP_PDM_I RQ_MPU | Read/Write |
| SLIMBUS1 | CD_ABE | CD_DMA, CD_L3_1, CD_L3_2 | Disabled | PM_ABE_SLIMBUS_WKDEP [7] WKUPDEP_SLIMB US1_DMA_SDMA | Read/Write |
| SLIMBUS1 | CD_ABE | CD_DSP | Disabled | PM_ABE_SLIMBUS_WKDEP [6] WKUPDEP_SLIMB US1_DMA_DSP | Read/Write |
| SLIMBUS1 | CD_ABE | CD_DSP | Disabled | PM_ABE_SLIMBUS_WKDEP [2] WKUPDEP_SLIMB US1_IRQ_DSP | Read/Write |

Table 3-254. CD_ABE Wake-Up Dependency Association Parameters (continued)

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|------------------------|-----------------|---|-------------|
| SLIMBUS1 | CD_ABE | CD_CORTEXA9 | Disabled | PM_ABE_SLIMBUS_WKDEP[0] WKUPDEP_SLIMBUS1_IRQ_MPU | Read/Write |
| GPTIMER5 | CD_ABE | CD_DSP | Disabled | PM_ABE_GPTIME_R5_WKDEP[2] WKUPDEP_TIMER5_DSP | Read/Write |
| GPTIMER5 | CD_ABE | CD_CORTEXA9 | Disabled | PM_ABE_GPTIME_R5_WKDEP[0] WKUPDEP_TIMER5_MPU | Read/Write |
| GPTIMER6 | CD_ABE | CD_DSP | Disabled | PM_ABE_GPTIME_R6_WKDEP[2] WKUPDEP_TIMER6_DSP | Read/Write |
| GPTIMER6 | CD_ABE | CD_CORTEXA9 | Disabled | PM_ABE_GPTIME_R6_WKDEP[0] WKUPDEP_TIMER6_MPU | Read/Write |
| GPTIMER7 | CD_ABE | CD_DSP | Disabled | PM_ABE_GPTIME_R7_WKDEP[2] WKUPDEP_TIMER7_DSP | Read/Write |
| GPTIMER7 | CD_ABE | CD_CORTEXA9 | Disabled | PM_ABE_GPTIME_R7_WKDEP[0] WKUPDEP_TIMER7_MPU | Read/Write |
| GPTIMER8 | CD_ABE | CD_DSP | Disabled | PM_ABE_GPTIME_R8_WKDEP[2] WKUPDEP_TIMER8_DSP | Read/Write |
| GPTIMER8 | CD_ABE | CD_CORTEXA9 | Disabled | PM_ABE_GPTIME_R8_WKDEP[0] WKUPDEP_TIMER8_MPU | Read/Write |
| WDTIMER3 | CD_ABE | CD_CORTEXA9 | Always enabled | PM_ABE_WDTIME_R3_WKDEP[0] WKUPDEP_WDT3_MPU | Read only |

3.6.23.4 Clock Domain Module Attributes

Table 3-255 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-255. CD_ABE Modules Clocks Association

| Module | Clock | Clock Type |
|---------------------|---------------|--------------------------|
| AUDIO ENGINE | AESS_FCLK | Functional |
| | ABE_ICLK2 | Interface |
| DMIC | DMIC_ABE_FCLK | Functional |
| | ABE_ICLK2 | Interface |
| L4_ABE interconnect | ABE_ICLK2 | Interface |
| MCASP1 | MCASP1_FCLK | Functional |
| | ABE_ICLK2 | Interface and functional |
| MCBSP1 | MCBSP1_FCLK | Functional |

Table 3-255. CD_ABE Modules Clocks Association (continued)

| Module | Clock | Clock Type |
|----------|-------------------|------------|
| | ABE_ICLK2 | Interface |
| MCBSP2 | MCBSP2_FCLK | Functional |
| | ABE_ICLK2 | Interface |
| MCBSP3 | MCBSP3_FCLK | Functional |
| | ABE_ICLK2 | Interface |
| MCPDM | ABE_ICLK2 | Interface |
| | PAD_CLKS | Functional |
| SLIMBUS1 | ABE_24M_FCLK | Functional |
| | 24M_FCLK | Functional |
| | ABE_ICLK2 | Interface |
| | PAD_CLKS | Functional |
| | SLIMBUS_UCLKS | Functional |
| GPTIMER5 | ABE_GPT5_FCLK | Functional |
| | ABE_ICLK2 | Interface |
| GPTIMER6 | ABE_GPT6_FCLK | Functional |
| | ABE_ICLK2 | Interface |
| GPTIMER7 | ABE_GPT7_FCLK | Functional |
| | ABE_ICLK2 | Interface |
| GPTIMER8 | ABE_GPT8_FCLK | Functional |
| | ABE_ICLK2 | Interface |
| WDTIMER3 | ABE_ALWON_32K_CLK | Functional |
| | ABE_ICLK2 | Interface |

Table 3-256 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-256. CD_ABE Modules Wake-Up Request

| Module | Wake-Up Feature |
|---------------------|--|
| AUDIO ENGINE | None |
| DMIC | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ and DMA, sDMA -DMA) |
| L4_ABE interconnect | None |
| MCASP1 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ and DMA, sDMA -DMA) |
| MCBSP1 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ and DMA, sDMA -DMA) |
| MCBSP2 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ and DMA, sDMA -DMA) |
| MCBSP3 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ and DMA, sDMA -DMA) |
| MCPDM | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ and DMA, sDMA -DMA) |
| SLIMBUS1 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ and DMA, sDMA -DMA) |
| GPTIMER5 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ) |
| GPTIMER6 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ) |
| GPTIMER7 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ) |
| GPTIMER8 | Slave wake-up request (MPU_A9 -IRQ, DSP -IRQ) |
| WDTIMER3 | Slave wake-up request (MPU_A9 -IRQ) |

Table 3-257 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-257. CD_ABE Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|---------------------|---------------------------|--|----------------|
| AUDIO ENGINE | Slave/Master | CM1_ABE_AESS_CLKCTRL[18] STBYST | Standby status |
| | | CM1_ABE_AESS_CLKCTRL[17:16] IDLEST | Idle status |
| DMIC | Slave | CM1_ABE_DMIC_CLKCTRL[17:16] IDLEST | Idle status |
| L4_ABE interconnect | Slave | CM1_ABE_L4ABE_CLKCTRL[17:16] IDLEST | Idle status |
| MCASP1 | Slave | CM1_ABE_MCASP_CLKCTRL[17:16] IDLEST | Idle status |
| MCBSP1 | Slave | CM1_ABE_MCBSP1_CLKCTRL[17:16] IDLEST | Idle status |
| MCBSP2 | Slave | CM1_ABE_MCBSP2_CLKCTRL[17:16] IDLEST | Idle status |
| MCBSP3 | Slave | CM1_ABE_MCBSP3_CLKCTRL[17:16] IDLEST | Idle status |
| MCPDM | Slave | CM1_ABE_PDM_CLKCTRL[17:16] IDLEST | Idle status |
| SLIMBUS1 | Slave | CM1_ABE_SLIMBUS_CLKCTRL[17:16] IDLEST | Idle status |
| GPTIMER5 | Slave | CM1_ABE_GPTIMER5_CLKCTRL[17:16] IDLEST | Idle status |
| GPTIMER6 | Slave | CM1_ABE_GPTIMER6_CLKCTRL[17:16] IDLEST | Idle status |
| GPTIMER7 | Slave | CM1_ABE_GPTIMER7_CLKCTRL[17:16] IDLEST | Idle status |
| GPTIMER8 | Slave | CM1_ABE_GPTIMER8_CLKCTRL[17:16] IDLEST | Idle status |
| WDTIMER3 | Slave | CM1_ABE_WDTIMER3_CLKCTRL[17:16] IDLEST | Idle status |

Table 3-258 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-258. CD_ABE Modules Slave Clock-Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|---------------------|-----------|-----------|-----------|--|-------------|
| AUDIO ENGINE | Available | N/A | Available | CM1_ABE_AESS_CLKCTRL[1:0] MODULEMODE | Read/Write |
| DMIC | Available | N/A | Available | CM1_ABE_DMIC_CLKCTRL[1:0] MODULEMODE | Read/Write |
| L4_ABE interconnect | N/A | Available | N/A | CM1_ABE_L4ABE_CLKCTRL[1:0] MODULEMODE | Read only |
| MCASP1 | Available | N/A | Available | CM1_ABE_MCASP_CLKCTRL[1:0] MODULEMODE | Read/Write |
| MCBSP1 | Available | N/A | Available | CM1_ABE_MCBSP1_CLKCTRL[1:0] MODULEMODE | Read/Write |
| MCBSP2 | Available | N/A | Available | CM1_ABE_MCBSP2_CLKCTRL[1:0] MODULEMODE | Read/Write |

Table 3-258. CD_ABE Modules Slave Clock-Management Modes and Control (continued)

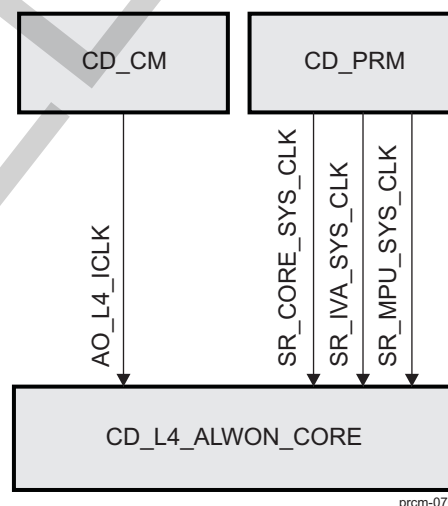
| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|----------|-----------|------|-----------|--|-------------|
| MCBSP3 | Available | N/A | Available | CM1_ABE_MCBSP3_CLKCTRL[1:0] MODULEMODE | Read/Write |
| MCPDM | Available | N/A | Available | CM1_ABE_PDM_CLKCTRL[1:0] MODULEMODE | Read/Write |
| SLIMBUS1 | Available | N/A | Available | CM1_ABE_SLIMBUS_CLKCTRL[1:0] MODULEMODE | Read/Write |
| GPTIMER5 | Available | N/A | Available | CM1_ABE_GPTIMER5_CLKCTRL[1:0] MODULEMODE | Read/Write |
| GPTIMER6 | Available | N/A | Available | CM1_ABE_GPTIMER6_CLKCTRL[1:0] MODULEMODE | Read/Write |
| GPTIMER7 | Available | N/A | Available | CM1_ABE_GPTIMER7_CLKCTRL[1:0] MODULEMODE | Read/Write |
| GPTIMER8 | Available | N/A | Available | CM1_ABE_GPTIMER8_CLKCTRL[1:0] MODULEMODE | Read/Write |
| WDTIMER3 | Available | N/A | Available | CM1_ABE_WDTIMER3_CLKCTRL[1:0] MODULEMODE | Read/Write |

3.6.24 CD_L4_ALWON_CORE Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits. It also identifies its dependencies with other clock domains of the device.

3.6.24.1 Overview

Figure 3-74 shows the overview of the clock domain.

Figure 3-74. CD_L4_ALWON_CORE Overview

3.6.24.2 Clock Domain Modes

CD_L4_ALWON_CORE is an always-on clock domain and has no software-controlled clock domain modes management associated.

3.6.24.3 Clock Domain Dependency

CD_L4_ALWON_CORE has no static or dynamic dependency with any other clock domain of the device.

3.6.24.3.1 Wake-Up Dependency

Table 3-259 lists the wake-up dependency settings for the modules of this clock domain.

Table 3-259. CD_L4_ALWON_CORE Wake-Up Dependency Association Parameters

| Originator Module | Originator Clock Domain | Servicing Clock Domain | Default Setting | Control Bit Field | Access Type |
|-------------------|-------------------------|------------------------|-----------------|---|-------------|
| SR_CORE | CD_L4_ALWON_CORE | CD_CORTEXM3 | Disabled | PM_ALWON_SR_CORE_WKDEP[1] WKUPDEP_SR_CORE_MPU_M3 | Read/Write |
| | CD_L4_ALWON_CORE | CD_CORTEXA9 | Disabled | PM_ALWON_SR_CORE_WKDEP[0] WKUPDEP_SR_CORE_MPU | Read/Write |
| SR_IVA | CD_L4_ALWON_CORE | CD_CORTEXM3 | Disabled | PM_ALWON_SR_IVA_WKDEP[1] WKUPDEP_SR_IVA_MPU_M3 | Read/Write |
| | CD_L4_ALWON_CORE | CD_CORTEXA9 | Disabled | PM_ALWON_SR_IVA_WKDEP[0] WKUPDEP_SR_IVA_MPU | Read/Write |
| SR_MPU | CD_L4_ALWON_CORE | CD_CORTEXA9 | Always enabled | PM_ALWON_SR_MPU_WKDEP[0] WKUPDEP_SR_MPU_MPU | Read only |

3.6.24.4 Clock Domain Module Attributes

Table 3-260 lists for each module of the clock domain the clocks received by it and the role (that is, functional or interface clock).

Table 3-260. CD_L4_ALWON_CORE Modules Clocks Association

| Module | Clock | Clock Type |
|---------|-----------------|------------|
| SR_CORE | AO_L4_ICLK | Interface |
| | SR_CORE_SYS_CLK | Functional |
| SR_IVA | AO_L4_ICLK | Interface |
| | SR_IVA_SYS_CLK | Functional |
| SR_MPU | AO_L4_ICLK | Interface |
| | SR_MPU_SYS_CLK | Functional |

Table 3-261 lists the supported wake-up request generation capability for each module of the clock domain.

Table 3-261. CD_L4_ALWON_CORE Modules Wake-Up Request

| Module | Wake-Up Feature |
|---------|--|
| SR_CORE | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ) |
| SR_IVA | Slave wake-up request (MPU_A9 -IRQ, MPU_M3 -IRQ) |
| SR_MPU | Slave wake-up request (MPU_A9 -IRQ) |

Table 3-262 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-262. CD_L4_ALWON_CORE Modules Clock-Management Modes and Control

| Module | Clock-Management Protocol | Status Bit Field | Role |
|---------|---------------------------|--|-------------|
| SR_CORE | Slave | CM_ALWON_SR_CORE_CLKCTRL[17:16] IDLEST | Idle status |
| SR_IVA | Slave | CM_ALWON_SR_IVA_CLKCTRL[17:16] IDLEST | Idle status |
| SR_MPU | Slave | CM_ALWON_SR_MPU_CLKCTRL[17:16] IDLEST | Idle status |

Table 3-263 lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 3-263. CD_L4_ALWON_CORE Modules Slave Clock-Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|---------|-----------|------|-----------|--|-------------|
| SR_CORE | Available | N/A | Available | CM_ALWON_SR_CORE_CLKCTRL[1:0] MODULEMODE | Read/Write |
| SR_IVA | Available | N/A | Available | CM_ALWON_SR_IVA_CLKCTRL[1:0] MODULEMODE | Read/Write |
| SR_MPU | Available | N/A | Available | CM_ALWON_SR_MPU_CLKCTRL[1:0] MODULEMODE | Read/Write |

3.7 Power Management Functional Description

This section highlights the functional concepts of power domain level power management in the device.

The following power domains support the DPS with switching times of less than 5 μ s.

- PD_CORE
- PD_DSP
- PD_MPU

3.7.1 PD_WKUP Description

PD_WKUP contains the following reset domains:

- WKUP_PWRON_RST
- WKUP_RST
- WKUP_SYS_PWRON_RST

PD_WKUP contains CD_WKUP clock domain.

Table 3-264 lists the logic retention capability for each module of the power domain.

Table 3-264. PD_WKUP Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|----------------------|-----------------|---|--------------------|
| SYSCTRL_PADCONF_WKUP | No | None | None |
| BANDGAP | No | None | None |
| SYSCTRL_GENERAL_WKUP | No | None | None |
| GPIO1 | No | RM_WKUP_GPIO1_CONTEXT[0] LOSTCONTEXT_DFF | None |
| KEYBOARD | No | RM_WKUP_KEYBOARD_CONTEXT[0] LOSTCONTEXT_DFF | None |
| PRM | No | None | None |
| SAR_RAM | No | RM_WKUP_SARRAM_CONTEXT[0] LOSTCONTEXT_DFF | None |
| SCRM | No | None | None |
| 32KTIMER | No | RM_WKUP_32KTIMER_CONTEXT[0] LOSTCONTEXT_DFF | None |
| GPTIMER1 | No | RM_WKUP_GPTIMER1_CONTEXT[0] LOSTCONTEXT_DFF | None |
| WDTIMER2 | No | RM_WKUP_WDTIMER2_CONTEXT[0] LOSTCONTEXT_DFF | None |
| L4_WKUP interconnect | No | RM_WKUP_L4WKUP_CONTEXT[0] LOSTCONTEXT_DFF | None |

3.7.1.1 Power Domain Modes

The PD_WKUP power domain is an always-on power domain and does not switch to RETENTION state. There is no logic power state control or status bit field for this power domain.

The PD_WKUP power domain has no memory banks.

3.7.2 PD_DSP Description

PD_DSP contains the following reset domains:

- DSP_RST
- DSP_PWRON_RST
- DSP_RET_RST
- DSP_SYS_RST

PD_DSP contains the CD_DSP clock domain.

Table 3-265 lists the logic retention capability for each module of the power domain.

Table 3-265. PD_DSP Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|--------|-----------------|--|--|
| DSP | Partial | RM_DSP_DSP_CONTEXT[0] LOSTCONTEXT_DFF | RM_DSP_DSP_CONTEXT[1] LOSTCONTEXT_RFF |

3.7.2.1 Power Domain Modes

This section highlights the various power modes supported by the logic and memory areas of the power domain. It also identifies the software control and status bit fields associated. See Section 3.1.1.2.1, for a functional description of the power-management architecture of a generic power domain.

3.7.2.1.1 Logic and Memory Area Power Modes

Table 3-266 lists the power modes supported by the logic area of the power domain.

Table 3-266. PD_DSP Logic Area Power Modes

| Off | Retention-OSWR | Retention-CSWR | On-Inactive | On-Active |
|-----------|----------------|----------------|-------------|-----------|
| Available | Available | Available | Available | Available |

Table 3-267 presents the power modes supported by the memory area of the power domain. A memory area power mode is identified with respect to a power state of the power domain. The Logic On, Logic Retention, and Logic Off columns identify the power states of the power domain. The values in these columns identify the supported power state of the memory area (identified in the Memory Bank column) or the module memory inside the memory area (identified in the Module - Memory column). The RTA Feature column identifies whether the memory supports the RTA feature.

Table 3-267. PD_DSP Memory Area Power Modes

| Memory Bank | Module - Memory | Logic On | Logic Retention | Logic Off | RTA Feature |
|-------------|-----------------|-----------|------------------|-----------|----------------|
| DSP_EDMA | | ON | RETENTION | OFF | |
| | DSP - DSP_EDMA | always_on | always_retention | | always_enabled |
| DSP_L1 | | ON | OFF, RETENTION | OFF | |
| | DSP - DSP_L1 | always_on | software_control | | None |
| DSP_L2 | | ON | OFF, RETENTION | OFF | |
| | DSP - DSP_L2 | always_on | software_control | | always_enabled |

3.7.2.1.2 Logic and Memory Area Power Modes Control and Status

Table 3-268 lists the power modes controls for the power domain.

Table 3-268. PD_DSP Power Modes Control Parameters

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|--|-------------|---|-------------|
| Memory Area - State Control (Logic in Retention state) | DSP_L2 | PM_DSP_PWRSTCTRL[9] DSP_L2_RETSTATE | Read/Write |
| Memory Area - State Control (Logic in Retention state) | DSP_L1 | PM_DSP_PWRSTCTRL[8] DSP_L1_RETSTATE | Read/Write |
| Power Domain - Low Power State Change Control | | PM_DSP_PWRSTCTRL[4] LOWPOWERSTATECHANGE | Read/Write |
| Memory Area - State Control (Logic in On state) | DSP_EDMA | PM_DSP_PWRSTCTRL[21:20] DSP_EDMA_ONSTATE | Read only |
| Logic Area - Retention State Control | | PM_DSP_PWRSTCTRL[2] LOGICRETSTATE | Read/Write |

Table 3-268. PD_DSP Power Modes Control Parameters (continued)

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|--|-------------|---|-------------|
| Memory Area - State Control (Logic in On state) | DSP_L2 | PM_DSP_PWRSTCTRL[19:18] DSP_L2_ONSTATE | Read only |
| Memory Area - State Control (Logic in On state) | DSP_L1 | PM_DSP_PWRSTCTRL[17:16] DSP_L1_ONSTATE | Read only |
| Memory Area - State Control (Logic in Retention state) | DSP_EDMA | PM_DSP_PWRSTCTRL[10] DSP_EDMA_RETSTATE | Read only |
| Power Domain - State Transition Control | | PM_DSP_PWRSTCTRL[1:0] POWERSTATE | Read/Write |

Table 3-269 lists the power modes status for the power domain.

Table 3-269. PD_DSP Power Modes Status Parameters

| Parameter Name | Memory Bank | Status Bit Field |
|--|-------------|--|
| Power Domain - Last Power State Entered Status | | PM_DSP_PWRSTST[25:24] LASTPOWERSTATEENTERED |
| Memory Area - State Status | DSP_EDMA | PM_DSP_PWRSTST[9:8] DSP_EDMA_STATEST |
| Memory Area - State Status | DSP_L2 | PM_DSP_PWRSTST[7:6] DSP_L2_STATEST |
| Memory Area - State Status | DSP_L1 | PM_DSP_PWRSTST[5:4] DSP_L1_STATEST |
| Power Domain - State Transition Status | | PM_DSP_PWRSTST[20] INTRANSITION |
| Logic Area - State Status | | PM_DSP_PWRSTST[2] LOGICSTATEST |
| Power Domain - State Status | | PM_DSP_PWRSTST[1:0] POWERSTATEST |

3.7.3 PD_STD_EFUSE Description

PD_STD_EFUSE contains the STD_EFUSE_PWRON_RST reset domain.

PD_STD_EFUSE contains the CD_STD_EFUSE clock domain.

Table 3-270 lists the logic retention capability for each module of the power domain.

Table 3-270. PD_STD_EFUSE Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|-----------|-----------------|--------------------|--------------------|
| STD_EFUSE | No | None | None |

3.7.3.1 Power Domain Modes

The PD_STD_EFUSE power domain is hardware-controlled by the PRCM module and has no software control associated. It is switched to ON power state when the device is powered on and switched to OFF power state after the power-up sequence of the device.

The PD_STD_EFUSE power domain has no memory banks.

3.7.4 PD_MPU Description

PD_MPU contains the following reset domains:

- CORTEXA9_PWRON_RST
- CORTEXA9_RST

PD_MPU contains the CD_CORTEXA9 clock domain.

Table 3-271 lists the logic retention capability for each module of the power domain.

Table 3-271. PD_MPU Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|----------|-----------------|---|--------------------|
| CORTEXA9 | No | RM_MPU_MPU_CONTEXT [0] LOSTCONTEXT_DFF | None |

3.7.4.1 Power Domain Modes

This section highlights the various power modes supported by the logic and memory areas of the power domain. It also identifies the software control and status bit fields associated. See [Section 3.1.1.2.1](#) for a functional description of the power-management architecture of a generic power domain.

3.7.4.1.1 Logic and Memory Area Power Modes

[Table 3-272](#) lists the power modes supported by the logic area of the power domain.

Table 3-272. PD_MPU Logic Area Power Modes

| Off | Retention-OSWR | Retention-CSWR | On-Inactive | On-Active |
|-----------|----------------|----------------|-------------|-----------|
| Available | Available | Available | Available | Available |

[Table 3-273](#) presents the power modes supported by the memory area of the power domain. A memory area power mode is identified with respect to a power state of the power domain. The Logic On, Logic Retention, and Logic Off columns identify the power states of the power domain. The values in these columns identify the supported power state of the memory area (identified in the Memory Bank column) or the module memory inside the memory area (identified in the Module - Memory column). The RTA Feature column identifies whether the memory supports the RTA feature.

Table 3-273. PD_MPU Memory Area Power Modes

| Memory Bank | Module - Memory | Logic On | Logic Retention | Logic Off | RTA Feature |
|-------------|--------------------|-----------|------------------|-----------|----------------|
| MPU_L1 | | ON | OFF, RETENTION | OFF | |
| | CORTEXA9 - MPU_L1 | always_on | software_control | | None |
| MPU_L2 | | ON | OFF, RETENTION | OFF | |
| | CORTEXA9 - MPU_L2 | always_on | software_control | | always_enabled |
| MPU_RAM | | ON | RETENTION | OFF | |
| | CORTEXA9 - MPU_RAM | always_on | always_retention | | always_enabled |

3.7.4.1.2 Logic and Memory Area Power Modes Control and Status

[Table 3-274](#) lists the power modes controls for the power domain.

Table 3-274. PD_MPU Power Modes Control Parameters

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|--|-------------|---|-------------|
| Memory Area - State Control (Logic in Retention state) | MPU_L2 | PM_MPU_PWRSTCTRL [9] MPU_L2_RETSTATE | Read/Write |
| Memory Area - State Control (Logic in Retention state) | MPU_L1 | PM_MPU_PWRSTCTRL [8] MPU_L1_RETSTATE | Read/Write |
| Power Domain - Low Power State Change Control | | PM_MPU_PWRSTCTRL [4] LOWPOWERSTATECHANGE | Read only |
| Memory Area - State Control (Logic in On state) | MPU_RAM | PM_MPU_PWRSTCTRL [21:20] MPU_RAM_ONSTATE | Read only |
| Logic Area - Retention State Control | | PM_MPU_PWRSTCTRL [2] LOGICRETSTATE | Read/Write |

Table 3-274. PD_MPU Power Modes Control Parameters (continued)

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|---|-------------|--|-------------|
| Memory Area - State Control (Logic in On state) | MPU_L2 | PM_MPU_PWRSTCTRL [19:18]] MPU_L2_ONSTATE | Read only |
| Memory Area - State Control (Logic in On state) | MPU_L1 | PM_MPU_PWRSTCTRL [17:16]] MPU_L1_ONSTATE | Read only |
| Memory Area - State Control (Logic in Retention state) | MPU_RAM | PM_MPU_PWRSTCTRL [10] MPU_RAM_RETSTATE | Read only |
| Power Domain - State Transition Control | | PM_MPU_PWRSTCTRL [1:0] POWERSTATE | Read/Write |

[Table 3-275](#) lists the power modes status for the power domain.

Table 3-275. PD_MPU Power Modes Status Parameters

| Parameter Name | Memory Bank | Status Bit Field |
|---|-------------|---|
| Power Domain - Last Power State Entered Status | | PM_MPU_PWRSTST [25:24] LASTPOWERSTATEENTERED |
| Memory Area - State Status | MPU_RAM | PM_MPU_PWRSTST [9:8] MPU_RAM_STATEST |
| Memory Area - State Status | MPU_L2 | PM_MPU_PWRSTST [7:6] MPU_L2_STATEST |
| Memory Area - State Status | MPU_L1 | PM_MPU_PWRSTST [5:4] MPU_L1_STATEST |
| Power Domain - State Transition Status | | PM_MPU_PWRSTST [20] INTRANSITION |
| Logic Area - State Status | | PM_MPU_PWRSTST [2] LOGICSTATEST |
| Power Domain - State Status | | PM_MPU_PWRSTST [1:0] POWERSTATEST |

3.7.5 PD_L4_PER Description

PD_L4_PER contains the following reset domains:

- L4_PER_PWRON_RET_RST
- L4_PER_RET_RST
- L4_PER_RST

PD_L4_PER contains the CD_L4_PER clock domain.

•

[Table 3-276](#) lists the logic retention capability for each module of the power domain.

Table 3-276. PD_L4_PER Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|-----------|-----------------|---|--------------------|
| GPTIMER10 | No | RM_L4PER_GPTIMER10_CONTEXT [0] LOSTCONTEXT_DFF | None |
| GPTIMER11 | No | RM_L4PER_GPTIMER11_CONTEXT [0] LOSTCONTEXT_DFF | None |
| GPTIMER2 | No | RM_L4PER_GPTIMER2_CONTEXT [0] LOSTCONTEXT_DFF | None |
| GPTIMER3 | No | RM_L4PER_GPTIMER3_CONTEXT [0] LOSTCONTEXT_DFF | None |
| GPTIMER4 | No | RM_L4PER_GPTIMER4_CONTEXT [0] LOSTCONTEXT_DFF | None |
| GPTIMER9 | No | RM_L4PER_GPTIMER9_CONTEXT [0] LOSTCONTEXT_DFF | None |

Table 3-276. PD_L4_PER Modules Power Attributes (continued)

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|---------------------|-----------------|--|--|
| ELM | No | RM_L4PER_ELM_CONTEXT[0] LOSTCONTEXT_DFF | None |
| GPIO2 | Full | None | RM_L4PER_GPIO2_CONTEXT[1] LOSTCONTEXT_RFF |
| GPIO3 | Full | None | RM_L4PER_GPIO3_CONTEXT[1] LOSTCONTEXT_RFF |
| GPIO4 | Full | None | RM_L4PER_GPIO4_CONTEXT[1] LOSTCONTEXT_RFF |
| GPIO5 | Full | None | RM_L4PER_GPIO5_CONTEXT[1] LOSTCONTEXT_RFF |
| GPIO6 | Full | None | RM_L4PER_GPIO6_CONTEXT[1] LOSTCONTEXT_RFF |
| HDQ | No | RM_L4PER_HDQ1W_CONTEXT[0] LOSTCONTEXT_DFF | None |
| I2C1 | Full | None | RM_L4PER_I2C1_CONTEXT[1] LOSTCONTEXT_RFF |
| I2C2 | No | RM_L4PER_I2C2_CONTEXT[0] LOSTCONTEXT_DFF | None |
| I2C3 | No | RM_L4PER_I2C3_CONTEXT[0] LOSTCONTEXT_DFF | None |
| I2C4 | No | RM_L4PER_I2C4_CONTEXT[0] LOSTCONTEXT_DFF | None |
| L4_PER interconnect | Partial | RM_L4PER_L4_PER_CONTEXT[0] LOSTCONTEXT_DFF | RM_L4PER_L4_PER_CONTEXT[1] LOSTCONTEXT_RFF |
| MCBSP4 | No | RM_L4PER_MCBSP4_CONTEXT[0] LOSTCONTEXT_DFF | None |
| MCSP11 | No | RM_L4PER_MCSP11_CONTEXT[0] LOSTCONTEXT_DFF | None |
| MCSP12 | No | RM_L4PER_MCSP12_CONTEXT[0] LOSTCONTEXT_DFF | None |
| MCSP13 | No | RM_L4PER_MCSP13_CONTEXT[0] LOSTCONTEXT_DFF | None |
| MCSP14 | No | RM_L4PER_MCSP14_CONTEXT[0] LOSTCONTEXT_DFF | None |
| HSMMC3 | No | RM_L4PER_MMCS3_CONTEXT[0] LOSTCONTEXT_DFF | None |
| HSMMC4 | No | RM_L4PER_MMCS4_CONTEXT[0] LOSTCONTEXT_DFF | None |
| HSMMC5 | No | RM_L4PER_MMCS5_CONTEXT[0] LOSTCONTEXT_DFF | None |
| SLIMBUS2 | No | RM_L4PER_SLIMBUS2_CONTEXT[0] LOSTCONTEXT_DFF | None |
| UART1 | Full | None | RM_L4PER_UART1_CONTEXT[1] LOSTCONTEXT_RFF |
| UART2 | Full | None | RM_L4PER_UART2_CONTEXT[1] LOSTCONTEXT_RFF |
| UART3 | Full | None | RM_L4PER_UART3_CONTEXT[1] LOSTCONTEXT_RFF |
| UART4 | Full | None | RM_L4PER_UART4_CONTEXT[1] LOSTCONTEXT_RFF |

3.7.5.1 Power Domain Modes

This section highlights the various power modes supported by the logic and memory areas of the power domain. It also identifies the software control and status bit fields associated. See [Section 3.1.1.2.1](#) for a functional description of the power-management architecture of a generic power domain.

3.7.5.1.1 Logic and Memory Area Power Modes

Table 3-277 lists the power modes supported by the logic area of the power domain.

Table 3-277. PD_L4_PER Logic Area Power Modes

| Off | Retention-OSWR | Retention-CSWR | On-Inactive | On-Active |
|-----------|----------------|----------------|-------------|-----------|
| Available | Available | Available | Available | Available |

Table 3-278 presents the power modes supported by the memory area of the power domain. A memory area power mode is identified with respect to a power state of the power domain. The Logic On, Logic Retention, and Logic Off columns identify the power states of the power domain. The values in these columns identify the supported power state of the memory area (identified in the Memory Bank column) or the module memory inside the memory area (identified in the Module - Memory column). The RTA Feature column identifies whether the memory supports the RTA feature.

Table 3-278. PD_L4_PER Memory Area Power Modes

| Memory Bank | Module - Memory | Logic On | Logic Retention | Logic Off | RTA Feature |
|------------------|-------------------------|-----------|------------------|-----------|-------------|
| NONRETAINED_BANK | | ON | OFF | OFF | |
| | MCBSP4 - MCBSP_BANK | always_on | always_off | | None |
| | HSMC3 - MMCHSSRAM | always_on | always_off | | None |
| | SLIMBUS2 - SLIMBUS_BANK | always_on | always_off | | None |
| RETAINED_BANK | | ON | RETENTION | OFF | |
| | UART1 - UART_MEM | always_on | always_retention | | None |

3.7.5.1.2 Logic and Memory Area Power Modes Control and Status

Table 3-279 lists the power modes controls for the power domain.

Table 3-279. PD_L4_PER Power Modes Control Parameters

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|--|------------------|--|-------------|
| Memory Area - State Control (Logic in Retention state) | NONRETAINED_BANK | PM_L4PER_PWRSTCTRL[9] NONRETAINED_BANK_RETSTATE | Read only |
| Memory Area - State Control (Logic in Retention state) | RETAINED_BANK | PM_L4PER_PWRSTCTRL[8] RETAINED_BANK_RETSTATE | Read only |
| Power Domain - Low Power State Change Control | | PM_L4PER_PWRSTCTRL[4] LOWPOWERSTATECHANGE | Read/Write |
| Logic Area - Retention State Control | | PM_L4PER_PWRSTCTRL[2] LOGICRETSTATE | Read/Write |
| Memory Area - State Control (Logic in On state) | NONRETAINED_BANK | PM_L4PER_PWRSTCTRL[19:18] NONRETAINED_BANK_ONSTATE | Read only |
| Memory Area - State Control (Logic in On state) | RETAINED_BANK | PM_L4PER_PWRSTCTRL[17:16] RETAINED_BANK_ONSTATE | Read only |
| Power Domain - State Transition Control | | PM_L4PER_PWRSTCTRL[1:0] POWERSTATE | Read/Write |

Table 3-280 lists the power modes status for the power domain.

Table 3-280. PD_L4_PER Power Modes Status Parameters

| Parameter Name | Memory Bank | Status Bit Field |
|--|------------------|--|
| Power Domain - Last Power State Entered Status | | PM_L4PER_PWRSTST[25:24] LASTPOWERSTATEENTERED |
| Memory Area - State Status | NONRETAINED_BANK | PM_L4PER_PWRSTST[7:6] NONRETAINED_BANK_STATEST |
| Memory Area - State Status | RETAINED_BANK | PM_L4PER_PWRSTST[5:4] RETAINED_BANK_STATEST |
| Power Domain - State Transition Status | | PM_L4PER_PWRSTST[20] INTRANSITION |
| Logic Area - State Status | | PM_L4PER_PWRSTST[2] LOGICSTATEST |
| Power Domain - State Status | | PM_L4PER_PWRSTST[1:0] POWERSTATEST |

3.7.6 PD_L3_INIT Description

PD_L3_INIT contains the following reset domains:

- DPLL_L3_INIT_PWRON_RET_RST
- L3_INIT_PWRON_RST
- L3_INIT_RET_RST
- L3_INIT_RST

PD_L3_INIT contains the CD_L3_INIT clock domain.

Table 3-281 lists the logic retention capability for each module of the power domain.

Table 3-281. PD_L3_INIT Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|-----------|-----------------|---|---|
| CM1_USB | No | None | None |
| DPLL_USB | Full | None | None |
| HSI | Full | None | RM_L3INIT_HSI_CONTEXT[1] LOSTCONTEXT_RFF |
| HSMMC1 | Full | None | RM_L3INIT_MMC1_CONTEXT[1] LOSTCONTEXT_RFF |
| HSMMC2 | Full | None | RM_L3INIT_MMC2_CONTEXT[1] LOSTCONTEXT_RFF |
| USBPHY | No | RM_L3INIT_USBPHY_CONTEXT[0] LOSTCONTEXT_DFF | None |
| HSUSBHOST | Full | None | RM_L3INIT_USB_HOST_CONTEXT[1] LOSTCONTEXT_RFF |
| HSUSBOTG | Full | None | RM_L3INIT_USB_OTG_CONTEXT[1] LOSTCONTEXT_RFF |
| HSUSBTLL | Full | None | RM_L3INIT_HSUSBTLL_CONTEXT[1] LOSTCONTEXT_RFF |

3.7.6.1 Power Domain Modes

This section highlights the various power modes supported by the logic and memory areas of the power domain. It also identifies the software control and status bit fields associated. See Section 3.1.1.2.1 for a functional description of the power-management architecture of a generic power domain.

3.7.6.1.1 Logic and Memory Area Power Modes

Table 3-282 lists the power modes supported by the logic area of the power domain.

Table 3-282. PD_L3_INIT Logic Area Power Modes

| Off | Retention-OSWR | Retention-CSWR | On-Inactive | On-Active |
|-----------|----------------|----------------|-------------|-----------|
| Available | Available | Available | Available | Available |

[Table 3-283](#) presents the power modes supported by the memory area of the power domain. A memory area power mode is identified with respect to a power state of the power domain. The Logic On, Logic Retention, and Logic Off columns identify the power states of the power domain. The values in these columns identify the supported power state of the memory area (identified in the Memory Bank column) or the module memory inside the memory area (identified in the Module - Memory column). The RTA Feature column identifies whether the memory supports the RTA feature.

Table 3-283. PD_L3_INIT Memory Area Power Modes

| Memory Bank | Module - Memory | Logic On | Logic Retention | Logic Off | RTA Feature |
|--------------|-------------------|-----------|-----------------|-----------|----------------|
| L3INIT_BANK1 | | ON | OFF | OFF | |
| | HSI - HSI_DMAFIFO | always_on | always_off | | None |
| | HSMC1 - HSMC1SRAM | always_on | always_off | | None |
| | HSUSBOTG - USBMEM | always_on | always_off | | always_enabled |

3.7.6.1.2 Logic and Memory Area Power Modes Control and Status

[Table 3-284](#) lists the power modes controls for the power domain.

Table 3-284. PD_L3_INIT Power Modes Control Parameters

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|--|--------------|--|-------------|
| Memory Area - State Control (Logic in Retention state) | L3INIT_BANK1 | PM_L3INIT_PWRSTCTRL [8] L3INIT_BANK1_RETSTATE | Read only |
| Power Domain - Low Power State Change Control | | PM_L3INIT_PWRSTCTRL [4] LOWPOWERSTATECHANGE | Read/Write |
| Logic Area - Retention State Control | | PM_L3INIT_PWRSTCTRL [2] LOGICRETSTATE | Read/Write |
| Memory Area - State Control (Logic in On state) | L3INIT_BANK1 | PM_L3INIT_PWRSTCTRL [17:16] L3INIT_BANK1_ONSTATE | Read only |
| Power Domain - State Transition Control | | PM_L3INIT_PWRSTCTRL [1:0] POWERSTATE | Read/Write |

[Table 3-285](#) lists the power modes status for the power domain.

Table 3-285. PD_L3_INIT Power Modes Status Parameters

| Parameter Name | Memory Bank | Status Bit Field |
|--|--------------|---|
| Power Domain - Last Power State Entered Status | | PM_L3INIT_PWRSTST [25:24] LASTPOWERSTATEENTERED |
| Memory Area - State Status | L3INIT_BANK1 | PM_L3INIT_PWRSTST [5:4] L3INIT_BANK1_STATEST |
| Power Domain - State Transition Status | | PM_L3INIT_PWRSTST [20] INTRANSITION |
| Logic Area - State Status | | PM_L3INIT_PWRSTST [2] LOGICSTATEST |
| Power Domain - State Status | | PM_L3INIT_PWRSTST [1:0] POWERSTATEST |

3.7.7 PD_IVAHD Description

PD_IVAHD contains the following reset domains:

- IVAHD_PWRON_RST
- IVAHD_RST
- IVAHD_SEQ1_RST
- IVAHD_SEQ2_RST

PD_IVAHD contains the CD_IVAHD clock domain.

[Table 3-286](#) lists the logic retention capability for each module of the power domain.

Table 3-286. PD_IVAHD Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|--------|-----------------|---|--------------------|
| IVAHD | No | RM_IVAHD_IVAHD_CONTEXT[0] LOSTCONTEXT_DFF | None |
| SL2 | No | RM_IVAHD_SL2_CONTEXT[0] LOSTCONTEXT_DFF | None |

3.7.7.1 Power Domain Modes

This section highlights the various power modes supported by the logic and memory areas of the power domain. It also identifies the software control and status bit fields associated. See [Section 3.1.1.2.1](#) for a functional description of the power-management architecture of a generic power domain.

3.7.7.1.1 Logic and Memory Area Power Modes

[Table 3-287](#) lists the power modes supported by the logic area of the power domain.

Table 3-287. PD_IVAHD Logic Area Power Modes

| Off | Retention-OSWR | Retention-CSWR | On-Inactive | On-Active |
|-----------|----------------|----------------|-------------|-----------|
| Available | Available | Not available | Available | Available |

[Table 3-288](#) presents the power modes supported by the memory area of the power domain. A memory area power mode is identified with respect to a power state of the power domain. The Logic On, Logic Retention, and Logic Off columns identify the power states of the power domain. The values in these columns identify the supported power state of the memory area (identified in the Memory Bank column) or the module memory inside the memory area (identified in the Module - Memory column). The RTA Feature column identifies whether the memory supports the RTA feature.

Table 3-288. PD_IVAHD Memory Area Power Modes

| Memory Bank | Module - Memory | Logic On | Logic Retention | Logic Off | RTA Feature |
|-------------|-----------------|-----------|------------------|-----------|----------------|
| HWA_MEM | | ON | OFF | OFF | |
| | IVAHD - HWA_MEM | always_on | always_off | | always_enabled |
| SL2_MEM | | ON | OFF, RETENTION | OFF | |
| | SL2 - SL2MEM | always_on | software_control | | always_enabled |
| TCM1_MEM | | ON | OFF, RETENTION | OFF | |
| | IVAHD - TCM_1 | always_on | software_control | | always_enabled |
| TCM2_MEM | | ON | OFF, RETENTION | OFF | |
| | IVAHD - TCM_2 | always_on | software_control | | always_enabled |

3.7.7.1.2 Logic and Memory Area Power Modes Control and Status

Table 3-289 lists the power modes controls for the power domain.

Table 3-289. PD_IVAHD Power Modes Control Parameters

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|---|-------------|---|-------------|
| Memory Area - State Control (Logic in Retention state) | SL2_MEM | PM_IVAHD_PWRSTCTRL [9] SL2_MEM_RETSTATE | Read/Write |
| Memory Area - State Control (Logic in Retention state) | HWA_MEM | PM_IVAHD_PWRSTCTRL [8] HWA_MEM_RETSTATE | Read only |
| Power Domain - Low Power State Change Control | | PM_IVAHD_PWRSTCTRL [4] LOWPOWERSTATECHANGE | Read/Write |
| Memory Area - State Control (Logic in On state) | TCM2_MEM | PM_IVAHD_PWRSTCTRL [23: 22] TCM2_MEM_ONSTATE | Read only |
| Memory Area - State Control (Logic in On state) | TCM1_MEM | PM_IVAHD_PWRSTCTRL [21: 20] TCM1_MEM_ONSTATE | Read only |
| Logic Area - Retention State Control | | PM_IVAHD_PWRSTCTRL [2] LOGICRETSTATE | Read only |
| Memory Area - State Control (Logic in On state) | SL2_MEM | PM_IVAHD_PWRSTCTRL [19: 18] SL2_MEM_ONSTATE | Read only |
| Memory Area - State Control (Logic in On state) | HWA_MEM | PM_IVAHD_PWRSTCTRL [17: 16] HWA_MEM_ONSTATE | Read only |
| Memory Area - State Control (Logic in Retention state) | TCM2_MEM | PM_IVAHD_PWRSTCTRL [11] TCM2_MEM_RETSTATE | Read/Write |
| Memory Area - State Control (Logic in Retention state) | TCM1_MEM | PM_IVAHD_PWRSTCTRL [10] TCM1_MEM_RETSTATE | Read/Write |
| Power Domain - State Transition Control | | PM_IVAHD_PWRSTCTRL [1:0] POWERSTATE | Read/Write |

Table 3-290 lists the power modes status for the power domain.

Table 3-290. PD_IVAHD Power Modes Status Parameters

| Parameter Name | Memory Bank | Status Bit Field |
|---|-------------|---|
| Power Domain - Last Power State Entered Status | | PM_IVAHD_PWRSTST [25:24] LASTPOWERSTATEENTERED |
| Memory Area - State Status | TCM1_MEM | PM_IVAHD_PWRSTST [9:8] TCM1_MEM_STATEST |
| Memory Area - State Status | SL2_MEM | PM_IVAHD_PWRSTST [7:6] SL2_MEM_STATEST |
| Memory Area - State Status | HWA_MEM | PM_IVAHD_PWRSTST [5:4] HWA_MEM_STATEST |
| Power Domain - State Transition Status | | PM_IVAHD_PWRSTST [20] INTRANSITION |
| Logic Area - State Status | | PM_IVAHD_PWRSTST [2] LOGICSTATEST |
| Memory Area - State Status | TCM2_MEM | PM_IVAHD_PWRSTST [11:10] TCM2_MEM_STATEST |
| Power Domain - State Status | | PM_IVAHD_PWRSTST [1:0] POWERSTATEST |

3.7.8 PD_SGX Description

PD_SGX contains the SGX_RST reset domain.

PD_SGX contains the CD_SGX clock domain.

Table 3-291 lists the logic retention capability for each module of the power domain.

Table 3-291. PD_SGX Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|--------|-----------------|---|--------------------|
| SGX | No | RM_SGX_SGX_CONTEXT [0] LOSTCONTEXT_DFF | None |

3.7.8.1 Power Domain Modes

This section highlights the various power modes supported by the logic and memory areas of the power domain. It also identifies the software control and status bit fields associated. See [Section 3.1.1.2.1](#) for a functional description of the power-management architecture of a generic power domain.

3.7.8.1.1 Logic and Memory Area Power Modes

[Table 3-292](#) lists the power modes supported by the logic area of the power domain.

Table 3-292. PD_SGX Logic Area Power Modes

| Off | Retention-OSWR | Retention-CSWR | On-Inactive | On-Active |
|-----------|----------------|----------------|-------------|-----------|
| Available | Not available | Not available | Available | Available |

[Table 3-293](#) presents the power modes supported by the memory area of the power domain. A memory area power mode is identified with respect to a power state of the power domain. The Logic On, Logic Retention, and Logic Off columns identify the power states of the power domain. The values in these columns identify the supported power state of the memory area (identified in the Memory Bank column) or the module memory inside the memory area (identified in the Module - Memory column). The RTA Feature column identifies whether the memory supports the RTA feature.

Table 3-293. PD_SGX Memory Area Power Modes

| Memory Bank | Module - Memory | Logic On | Logic Retention | Logic Off | RTA Feature |
|-------------|-----------------|-----------|-----------------|-----------|----------------|
| | SGX - SGX_MEM | always_on | always_off | | always_enabled |

3.7.8.1.2 Logic and Memory Area Power Modes Control and Status

[Table 3-294](#) lists the power modes controls for the power domain.

Table 3-294. PD_SGX Power Modes Control Parameters

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|---|-------------|---|-------------|
| Power Domain - Low Power State Change Control | | PM_SGX_PWRSTCTRL [4] LOWPOWERSTATECHANGE | Read/Write |
| Memory Area - State Control (Logic in On state) | SGX_MEM | PM_SGX_PWRSTCTRL [17:16] SGX_MEM_ONSTATE | Read only |
| Power Domain - State Transition Control | | PM_SGX_PWRSTCTRL [1:0] POWERSTATE | Read/Write |

[Table 3-295](#) lists the power modes status for the power domain.

Table 3-295. PD_SGX Power Modes Status Parameters

| Parameter Name | Memory Bank | Status Bit Field |
|--|-------------|---|
| Memory Area - State Status | SGX_MEM | PM_SGX_PWRSTST [5:4] SGX_MEM_STATEST |
| Power Domain - State Transition Status | | PM_SGX_PWRSTST [20] INTRANSITION |
| Logic Area - State Status | | PM_SGX_PWRSTST [2] LOGICSTATEST |
| Power Domain - State Status | | PM_SGX_PWRSTST [1:0] POWERSTATEST |

3.7.9 PD_EMU Description

PD_EMU contains the following reset domains:

- EMU_EARLY_PWRON_RST
- EMU_PWRON_RST
- EMU_RST

PD_EMU contains the CD_EMU clock domain.

Table 3-296 lists the logic retention capability for each module of the power domain.

Table 3-296. PD_EMU Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|---------|-----------------|--------------------|--------------------|
| CM1_EMU | No | None | None |
| DEBUG | No | None | None |

3.7.9.1 Power Domain Modes

This section highlights the various power modes supported by the logic and memory areas of the power domain. It also identifies the software control and status bit fields associated. See Section 3.1.1.2.1 for a functional description of the power-management architecture of a generic power domain.

3.7.9.1.1 Logic and Memory Area Power Modes

Table 3-297 lists the power modes supported by the logic area of the power domain.

Table 3-297. PD_EMU Logic Area Power Modes

| Off | Retention-OSWR | Retention-CSWR | On-Inactive | On-Active |
|-----------|----------------|----------------|---------------|-----------|
| Available | Not available | Not available | Not available | Available |

Table 3-298 presents the power modes supported by the memory area of the power domain. A memory area power mode is identified with respect to a power state of the power domain. The Logic On, Logic Retention, and Logic Off columns identify the power states of the power domain. The values in these columns identify the supported power state of the memory area (identified in the Memory Bank column) or the module memory inside the memory area (identified in the Module - Memory column). The RTA Feature column identifies whether the memory supports the RTA feature.

Table 3-298. PD_EMU Memory Area Power Modes

| Memory Bank | Module - Memory | Logic On | Logic Retention | Logic Off | RTA Feature |
|-------------|---------------------|-----------|-----------------|-----------|----------------|
| | DEBUG - DebugSS_MEM | always_on | always_off | | always_enabled |

3.7.9.1.2 Logic and Memory Area Power Modes Control and Status

Table 3-299 lists the power modes controls for the power domain.

Table 3-299. PD_EMU Power Modes Control Parameters

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|---|-------------|---|-------------|
| Memory Area - State Control (Logic in On state) | EMU_BANK | PM_EMU_PWRSTCTRL[17:16]] EMU_BANK_ONSTATE | Read only |
| Power Domain - State Transition Control | | PM_EMU_PWRSTCTRL[1:0] POWERSTATE | Read only |

Table 3-300 lists the power modes status for the power domain.

Table 3-300. PD_EMU Power Modes Status Parameters

| Parameter Name | Memory Bank | Status Bit Field |
|--|-------------|---|
| Memory Area - State Status | EMU_BANK | PM_EMU_PWRSTST[5:4] EMU_BANK_STATEST |
| Power Domain - State Transition Status | | PM_EMU_PWRSTST[20] INTRANSITION |
| Logic Area - State Status | | PM_EMU_PWRSTST[2] LOGICSTATEST |
| Power Domain - State Status | | PM_EMU_PWRSTST[1:0] POWERSTATEST |

3.7.10 PD_DSS Description

PD_DSS contains the following reset domains:

- DSS_RET_RST
- DSS_RST

PD_DSS contains the CD_DSS clock domain.

Table 3-301 lists the logic retention capability for each module of the power domain.

Table 3-301. PD_DSS Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|--------|-----------------|---|--|
| DSS | Partial | RM_DSS_DSS_CONTEXT[0] LOSTCONTEXT_DFF | RM_DSS_DSS_CONTEXT[1] LOSTCONTEXT_RFF |
| BB2D | No | RM_DSS_BB2D_CONTEXT[0] LOSTCONTEXT_DFF | N/A |

3.7.10.1 Power Domain Modes

This section highlights the various power modes supported by the logic and memory areas of the power domain. It also identifies the software control and status bit fields associated. See Section 3.1.1.2.1 for a functional description of the power-management architecture of a generic power domain.

3.7.10.1.1 Logic and Memory Area Power Modes

Table 3-302 lists the power modes supported by the logic area of the power domain.

Table 3-302. PD_DSS Logic Area Power Modes

| Off | Retention-OSWR | Retention-CSWR | On-Inactive | On-Active |
|-----------|----------------|----------------|-------------|-----------|
| Available | Available | Available | Available | Available |

Table 3-303 presents the power modes supported by the memory area of the power domain. A memory area power mode is identified with respect to a power state of the power domain. The Logic On, Logic Retention, and Logic Off columns identify the power states of the power domain. The values in these columns identify the supported power state of the memory area (identified in the Memory Bank column) or the module memory inside the memory area (identified in the Module - Memory column). The RTA Feature column identifies whether the memory supports the RTA feature.

Table 3-303. PD_DSS Memory Area Power Modes

| Memory Bank | Module - Memory | Logic On | Logic Retention | Logic Off | RTA Feature |
|-------------|-----------------|-----------|-----------------|-----------|----------------|
| DSS_MEM | | ON | OFF | OFF | |
| | DSS - DSSMEM | always_on | always_off | | always_enabled |
| BB2D_MEM | | ON | OFF | OFF | |
| | BB2D - BB2D_MEM | always_on | always_off | | always_enabled |

3.7.10.1.2 Logic and Memory Area Power Modes Control and Status

Table 3-304 lists the power modes controls for the power domain.

Table 3-304. PD_DSS Power Modes Control Parameters

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|---|-------------|--|-------------|
| Memory Area - State Control (Logic in Retention state) | DSS_MEM | PM_DSS_PWRSTCTRL[8] DSS_MEM_RETSTATE | Read only |
| Power Domain - Low Power State Change Control | | PM_DSS_PWRSTCTRL[4] LOWPOWERSTATECHANGE | Read/Write |
| Logic Area - Retention State Control | | PM_DSS_PWRSTCTRL[2] LOGICRETSTATE | Read/Write |
| Memory Area - State Control (Logic in On state) | DSS_MEM | PM_DSS_PWRSTCTRL[17:16] DSS_MEM_ONSTATE | Read only |
| Power Domain - State Transition Control | | PM_DSS_PWRSTCTRL[1:0] POWERSTATE | Read/Write |

Table 3-305 lists the power modes status for the power domain.

Table 3-305. PD_DSS Power Modes Status Parameters

| Parameter Name | Memory Bank | Status Bit Field |
|--|-------------|--|
| Memory Area - State Status | DSS_MEM | PM_DSS_PWRSTST[5:4] DSS_MEM_STATEST |
| Power Domain - State Transition Status | | PM_DSS_PWRSTST[20] INTRANSITION |
| Logic Area - State Status | | PM_DSS_PWRSTST[2] LOGICSTATEST |
| Power Domain - State Status | | PM_DSS_PWRSTST[1:0] POWERSTATEST |

3.7.11 PD_CORE Description

PD_CORE contains the following reset domains:

- CM2_PWRON_RET_RST
- CM2_RET_RST
- CORE_PWRON_RET_RST
- CORE_RET_RST
- CORE_RST
- DLL_RST
- CORTEXM3_PWRON_RST
- CORTEXM3_RET_RST
- CORTEXM3_RST1
- CORTEXM3_RST2
- CORTEXM3_RST3
- EMIF_PWRON_RST
- SDMA_RET_RST

PD_CORE contains the following clock domains:

- CD_C2C
- CD_DMA
- CD_CORTEXM3
- CD_EMIF
- CD_L3_1
- CD_L3_2
- CD_L3_INSTR

- CD_L4_CFG

[Table 3-306](#) lists the logic retention capability for each module of the power domain.

Table 3-306. PD_CORE Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|-----------------------|-----------------|--|--|
| SYSCTRL_PADCONF_CORE | Full | None | None |
| CM2 | Full | None | None |
| DDRPHY | No | None | None |
| SYSCTRL_GENERAL_CORE | Full | None | None |
| DLL | No | None | None |
| DMM | Partial | RM_MEMIF_DMM_CONTEXT[0] LOSTCONTEXT_DFF | RM_MEMIF_DMM_CONTEXT[1] LOSTCONTEXT_RFF |
| CORTEXM3 | Partial | RM_MPU_M3_MPU_M3_CONTEXT[0] LOSTCONTEXT_DFF | RM_MPU_M3_MPU_M3_CONTEXT[1] LOSTCONTEXT_RFF |
| EMIF1 | Full | RM_MEMIF_EMIF_1_CONTEXT[0] LOSTCONTEXT_DFF | RM_MEMIF_EMIF_1_CONTEXT[1] LOSTCONTEXT_RFF |
| EMIF2 | Full | RM_MEMIF_EMIF_2_CONTEXT[0] LOSTCONTEXT_DFF | RM_MEMIF_EMIF_2_CONTEXT[1] LOSTCONTEXT_RFF |
| EMIF_FW | Partial | RM_MEMIF_EMIF_FW_CONTEXT[0] LOSTCONTEXT_DFF | RM_MEMIF_EMIF_FW_CONTEXT[1] LOSTCONTEXT_RFF |
| GPMC | Full | None | RM_L3_2_GPMC_CONTEXT[1] LOSTCONTEXT_RFF |
| SPINLOCK | Full | None | RM_L4CFG_SPINLOCK_CONTEXT[1] LOSTCONTEXT_RFF |
| L3_2 interconnect | Partial | RM_L3_2_L3_2_CONTEXT[0] LOSTCONTEXT_DFF | RM_L3_2_L3_2_CONTEXT[1] LOSTCONTEXT_RFF |
| L3_3 interconnect | Partial | RM_L3INSTR_L3_3_CONTEXT[0] LOSTCONTEXT_DFF | RM_L3INSTR_L3_3_CONTEXT[1] LOSTCONTEXT_RFF |
| L3_1 interconnect | Partial | RM_L3_1_L3_1_CONTEXT[0] LOSTCONTEXT_DFF | RM_L3_1_L3_1_CONTEXT[1] LOSTCONTEXT_RFF |
| L3_INSTR interconnect | No | RM_L3INSTR_L3_INSTR_CONTEXT[0] LOSTCONTEXT_DFF | None |
| L4_CFG interconnect | Partial | RM_L4CFG_L4_CFG_CONTEXT[0] LOSTCONTEXT_DFF | RM_L4CFG_L4_CFG_CONTEXT[1] LOSTCONTEXT_RFF |
| Mailbox | Full | None | RM_L4CFG_MAILBOX_CONTEXT[1] LOSTCONTEXT_RFF |
| OCMC_RAM | No | RM_L3_2_OCMC_RAM_CONTEXT[0] LOSTCONTEXT_DFF | None |
| C2C | Partial | RM_C2C_C2C_CONTEXT[0] LOSTCONTEXT_DFF | RM_C2C_C2C_CONTEXT[1] LOSTCONTEXT_RFF |
| C2C_FW | Partial | RM_C2C_C2C_FW_CONTEXT[0] LOSTCONTEXT_DFF | RM_C2C_C2C_FW_CONTEXT[1] LOSTCONTEXT_RFF |
| SAR_ROM | No | RM_L4CFG_SAR_ROM_CONTEXT[0] LOSTCONTEXT_DFF | None |
| sDMA | Full | None | RM_SDMA_SDMA_CONTEXT[1] LOSTCONTEXT_RFF |

3.7.11.1 Power Domain Modes

This section highlights the various power modes supported by the logic and memory areas of the power domain. It also identifies the software control and status bit fields associated. See [Section 3.1.1.2.1](#) for a functional description of the power-management architecture of a generic power domain.

3.7.11.1.1 Logic and Memory Area Power Modes

[Table 3-307](#) lists the power modes supported by the logic area of the power domain.

Table 3-307. PD_CORE Logic Area Power Modes

| Off | Retention-OSWR | Retention-CSWR | On-Inactive | On-Active |
|-----------|----------------|----------------|-------------|-----------|
| Available | Available | Available | Available | Available |

Table 3-308 presents the power modes supported by the memory area of the power domain. A memory area power mode is identified with respect to a power state of the power domain. The Logic On, Logic Retention, and Logic Off columns identify the power states of the power domain. The values in these columns identify the supported power state of the memory area (identified in the Memory Bank column) or the module memory inside the memory area (identified in the Module - Memory column). The RTA Feature column identifies whether the memory supports the RTA feature.

Table 3-308. PD_CORE Memory Area Power Modes

| Memory Bank | Module - Memory | Logic On | Logic Retention | logic off | RTA Feature |
|-----------------|-------------------------------|--------------------|------------------|-----------|----------------|
| CORE_NRET_BANK | | ON | OFF | OFF | |
| | DMM - DMM_MEMBANK2 | always_on | always_off | | None |
| CORE_OCMRAM | | OFF, RETENTION, ON | OFF, RETENTION | OFF | |
| | OCMC_RAM - OCMC_RAM_Bank 1 | software_control | software_control | | always_enabled |
| CORE_OTHER_BANK | | ON | RETENTION | OFF | |
| | sDMA - DMA_MEM | always_on | always_retention | | None |
| | DMM - DMM_MEMBANK1 | always_on | always_retention | | always_enabled |
| MPU_M3_L2RAM | | ON | OFF, RETENTION | OFF | |
| | CORTEXM3 - MPU_M3_L2RAM_MEM | always_on | software_control | | always_enabled |
| MPU_M3_UNICACHE | | ON | OFF, RETENTION | OFF | |
| | CORTEXM3 - MPU_M3_Unicode_mem | always_on | software_control | | None |

3.7.11.1.2 Logic and Memory Area Power Modes Control and Status

Table 3-309 lists the power modes controls for the power domain.

Table 3-309. PD_CORE Power Modes Control Parameters

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|--|-----------------|--|-------------|
| Memory Area - State Control (Logic in Retention state) | CORE_OCMRAM | PM_CORE_PWRSTCTRL[9] CORE_OCMRAM_RETSTATE | Read/Write |
| Memory Area - State Control (Logic in Retention state) | CORE_OTHER_BANK | PM_CORE_PWRSTCTRL[8] CORE_OTHER_BANK_RETSTATE | Read only |
| Memory Area - State Control (Logic in On state) | CORE_NRET_BANK | PM_CORE_PWRSTCTRL[25:24] INTRCONN_NRET_BANK_ONSTATE | Read only |
| Memory Area - State Control (Logic in On state) | MPU_M3_UNICACHE | PM_CORE_PWRSTCTRL[23:22] MPU_M3_UNICACHE_ONSTATE | Read only |

Table 3-309. PD_CORE Power Modes Control Parameters (continued)

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|---|-----------------|---|-------------|
| Memory Area - State Control (Logic in On state) | MPU_M3_L2RAM | PM_CORE_PWRSTCTRL [21:20] MPU_M3_L2RAM_ONSTATE | Read only |
| Memory Area - State Control (Logic in On state) | CORE_OCMRAM | PM_CORE_PWRSTCTRL [19:18] CORE_OCMRAM_ONSTATE | Read/Write |
| Memory Area - State Control (Logic in On state) | CORE_OTHER_BANK | PM_CORE_PWRSTCTRL [17:16] CORE_OTHER_BANK_ONSTATE | Read only |
| Memory Area - State Control (Logic in Retention state) | CORE_NRET_BANK | PM_CORE_PWRSTCTRL [12] INTRCONN_NRET_BANK_RETSTATE | Read only |
| Memory Area - State Control (Logic in Retention state) | MPU_M3_UNICACHE | PM_CORE_PWRSTCTRL [11] MPU_M3_UNICACHE_RETSTATE | Read/Write |
| Memory Area - State Control (Logic in Retention) | MPU_M3_L2RAM | PM_CORE_PWRSTCTRL [10] MPU_M3_L2RAM_RETSTATE | Read/Write |
| Logic Area - Retention State Control | N/A | PM_CORE_PWRSTCTRL [2] LOGICRETSTATE | Read/Write |
| Power Domain - Low Power State Change Control | N/A | PM_CORE_PWRSTCTRL [4] LOWPOWERSTATECHANGE | Read/Write |
| Power Domain - State Transition Control | N/A | PM_CORE_PWRSTCTRL [1:0] POWERSTATE | Read/Write |

[Table 3-310](#) lists the power modes status for the power domain.

Table 3-310. PD_CORE Power Modes Status Parameters

| Parameter Name | Memory Bank | Status Bit Field |
|--|-----------------|---|
| Power Domain - Last Power State Entered Status | | PM_CORE_PWRSTST [25:24] LASTPOWERSTATEENTERED |
| Memory Area - State Status | MPU_M3_L2RAM | PM_CORE_PWRSTST [9:8] MPU_M3_L2RAM_STATEST |
| Memory Area - State Status | CORE_OCMRAM | PM_CORE_PWRSTST [7:6] CORE_OCMRAM_STATEST |
| Memory Area - State Status | CORE_OTHER_BANK | PM_CORE_PWRSTST [5:4] CORE_OTHER_BANK_STATEST |
| Memory Area - State Status | CORE_NRET_BANK | PM_CORE_PWRSTST [13:12] INTRCONN_NRET_BANK_STATEST |
| Memory Area - State Status | MPU_M3_UNICACHE | PM_CORE_PWRSTST [11:10] MPU_M3_UNICACHE_STATEST |
| Logic Area - State Status | | PM_CORE_PWRSTST [2] LOGICSTATEST |
| Power Domain - State Transition Status | | PM_CORE_PWRSTST [20] INTRANSITION |
| Power Domain - State Status | | PM_CORE_PWRSTST [1:0] POWERSTATEST |

3.7.12 PD_CAM Description

PD_CAM contains the CAM_RST reset domain.

PD_CAM contains the CD_CAM clock domain.

[Table 3-311](#) lists the logic retention capability for each module of the power domain.

Table 3-311. PD_CAM Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|-------------|-----------------|--|--------------------|
| FACE DETECT | No | RM_CAM_FDIF_CONTEXT [0] LOSTCONTEXT_DFF | None |
| ISS | No | RM_CAM_ISS_CONTEXT [0] LOSTCONTEXT_DFF | None |

3.7.12.1 Power Domain Modes

This section highlights the various power modes supported by the logic and memory areas of the power domain. It also identifies the software control and status bit fields associated. See [Section 3.1.1.2.1](#) for functional description of the power-management architecture of a generic power domain.

3.7.12.1.1 Logic and Memory Area Power Modes

[Table 3-312](#) lists the power modes supported by the logic area of the power domain.

Table 3-312. PD_CAM Logic Area Power Modes

| Off | Retention-OSWR | Retention-CSWR | On-Inactive | On-Active |
|-----------|----------------|----------------|-------------|-----------|
| Available | Not available | Not available | Available | Available |

[Table 3-313](#) presents the power modes supported by the memory area of the power domain. A memory area power mode is identified with respect to a power state of the power domain. The Logic On, Logic Retention, and Logic Off columns identify the power states of the power domain. The values in these columns identify the supported power state of the memory area (identified in the Memory Bank column) or the module memory inside the memory area (identified in the Module - Memory column). The RTA Feature column identifies whether the memory supports the RTA feature.

Table 3-313. PD_CAM Memory Area Power Modes

| Memory Bank | Module - Memory | Logic On | Logic Retention | Logic Off | RTA Feature |
|-------------|-----------------------|-----------|-----------------|-----------|----------------|
| | FACE DETECT - FDIFMEM | always_on | always_off | | always_enabled |
| | ISS - ISSMEM | always_on | always_off | | always_enabled |

3.7.12.1.2 Logic and Memory Area Power Modes Control and Status

[Table 3-314](#) lists the power modes controls for the power domain.

Table 3-314. PD_CAM Power Modes Control Parameters

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|---|-------------|--|-------------|
| Power Domain - Low Power State Change Control | | PM_CAM_PWRSTCTRL [4] LOWPOWERSTATECHANGE | Read/Write |
| Memory Area - State Control (Logic in On state) | CAM_MEM | PM_CAM_PWRSTCTRL [17:16]]CAM_MEM_ONSTATE | Read only |
| Power Domain - State Transition Control | | PM_CAM_PWRSTCTRL [1:0] POWERSTATE | Read/Write |

[Table 3-315](#) lists the power modes status for the power domain.

Table 3-315. PD_CAM Power Modes Status Parameters

| Parameter Name | Memory Bank | Status Bit Field |
|--|-------------|---|
| Memory Area - State Status | CAM_MEM | PM_CAM_PWRSTST [5:4] CAM_MEM_STATEST |
| Power Domain - State Transition Status | | PM_CAM_PWRSTST [20] INTRANSITION |

Table 3-315. PD_CAM Power Modes Status Parameters (continued)

| Parameter Name | Memory Bank | Status Bit Field |
|-----------------------------|-------------|---|
| Logic Area - State Status | | PM_CAM_PWRSTST [2] LOGICSTATEST |
| Power Domain - State Status | | PM_CAM_PWRSTST [1:0] POWERSTATEST |

3.7.13 PD_AUDIO Description

PD_AUDIO contains the following reset domains:

- AUDIO_PWRON_RST
- AUDIO_RST

PD_AUDIO contains the CD_ABE clock domain.

[Table 3-316](#) lists the logic retention capability for each module of the power domain.

Table 3-316. PD_AUDIO Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|---------------------|-----------------|---|--------------------|
| AUDIO ENGINE | No | RM_ABE_AESS_CONTEXT [0] LOSTCONTEXT_DFF | None |
| CM1_ABE | No | None | None |
| DMIC | No | RM_ABE_DMIC_CONTEXT [0] LOSTCONTEXT_DFF | None |
| L4_ABE interconnect | No | None | None |
| MCASP1 | No | RM_ABE_MCASP_CONTEXT [0] LOSTCONTEXT_DFF | None |
| MCBSP1 | No | RM_ABE_MCBSP1_CONTEXT [0] LOSTCONTEXT_DFF | None |
| MCBSP2 | No | RM_ABE_MCBSP2_CONTEXT [0] LOSTCONTEXT_DFF | None |
| MCBSP3 | No | RM_ABE_MCBSP3_CONTEXT [0] LOSTCONTEXT_DFF | None |
| MCPDM | No | RM_ABE_PDM_CONTEXT [0] LOSTCONTEXT_DFF | None |
| SLIMBUS1 | No | RM_ABE_SLIMBUS_CONTEXT [0] LOSTCONTEXT_DFF | None |
| GPTIMER5 | No | RM_ABE_GPTIMER5_CONTEXT [0] LOSTCONTEXT_DFF | None |
| GPTIMER6 | No | RM_ABE_GPTIMER6_CONTEXT [0] LOSTCONTEXT_DFF | None |
| GPTIMER7 | No | RM_ABE_GPTIMER7_CONTEXT [0] LOSTCONTEXT_DFF | None |
| GPTIMER8 | No | RM_ABE_GPTIMER8_CONTEXT [0] LOSTCONTEXT_DFF | None |
| WDTIMER3 | No | RM_ABE_WDTIMER3_CONTEXT [0] LOSTCONTEXT_DFF | None |

3.7.13.1 Power Domain Modes

This section highlights the various power modes supported by the logic and memory areas of the power domain. It also identifies the software control and status bit fields associated. See [Section 3.1.1.2.1](#) for a functional description of the power-management architecture of a generic power domain.

3.7.13.1.1 Logic and Memory Area Power Modes

[Table 3-317](#) lists the power modes supported by the logic area of the power domain.

Table 3-317. PD_AUDIO Logic Area Power Modes

| Off | Retention-OSWR | Retention-CSWR | On-Inactive | On-Active |
|-----------|----------------|----------------|-------------|-----------|
| Available | Available | Not available | Available | Available |

[Table 3-318](#) presents the power modes supported by the memory area of the power domain. A memory area power mode is identified with respect to a power state of the power domain. The Logic On, Logic Retention, and Logic Off columns identify the power states of the power domain. The values in these columns identify the supported power state of the memory area (identified in the Memory Bank column) or the module memory inside the memory area (identified in the Module - Memory column). The RTA Feature column identifies whether the memory supports the RTA feature.

Table 3-318. PD_AUDIO Memory Area Power Modes

| Memory Bank | Module - Memory | Logic On | Logic Retention | Logic Off | RTA Feature |
|-------------|------------------------------|-----------|------------------|-----------|----------------|
| AESSMEM | | ON | RETENTION | OFF | |
| | AUDIO ENGINE - AESS_MemBank1 | always_on | always_retention | | always_enabled |
| PERIPHEM | | ON | OFF | OFF | |
| | DMIC - DMIC_BANK | always_on | always_off | | None |
| | MCBSP1 - MCBSP_BANK | always_on | always_off | | None |
| | MCPDM - MCPDM_BANK | always_on | always_off | | None |
| | SLIMBUS1 - SLIMBUS_BANK | always_on | always_off | | None |

3.7.13.1.2 Logic and Memory Area Power Modes Control and Status

[Table 3-319](#) lists the power modes controls for the power domain.

Table 3-319. PD_AUDIO Power Modes Control Parameters

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|--|-------------|---|-------------|
| Memory Area - State Control (Logic in Retention state) | AESSMEM | PM_ABE_PWRSTCTRL[8] AESSMEM_RETSTATE | Read only |
| Memory Area - State Control (Logic in On state) | PERIPHEM | PM_ABE_PWRSTCTRL[21:20] PERIPHEM_ONSTATE | Read only |
| Memory Area - State Control (Logic in On state) | AESSMEM | PM_ABE_PWRSTCTRL[17:16] AESSMEM_ONSTATE | Read only |
| Memory Area - State Control (Logic in Retention state) | PERIPHEM | PM_ABE_PWRSTCTRL[10] PERIPHEM_RETSTATE | Read only |
| Logic Area - Retention State Control | | PM_ABE_PWRSTCTRL[2] LOGICRETSTATE | Read only |
| Power Domain - Low Power State Change Control | | PM_ABE_PWRSTCTRL[4] LOWPOWERSTATECHANGE | Read/Write |
| Power Domain - State Transition Control | | PM_ABE_PWRSTCTRL[1:0] POWERSTATE | Read/Write |

[Table 3-320](#) lists the power modes status for the power domain.

Table 3-320. PD_AUDIO Power Modes Status Parameters

| Parameter Name | Memory Bank | Status Bit Field |
|--|-------------|--|
| Power Domain - Last Power State Entered Status | | PM_ABE_PWRSTST[25:24] LASTPOWERSTATEENTERED |
| Memory Area - State Status | PERIPHEM | PM_ABE_PWRSTST[9:8] PERIPHEM_STATEST |

Table 3-320. PD_AUDIO Power Modes Status Parameters (continued)

| Parameter Name | Memory Bank | Status Bit Field |
|--|-------------|--|
| Memory Area - State Status | AESSMEM | PM_ABE_PWRSTST [5:4] AESSMEM_STATEST |
| Power Domain - State Transition Status | | PM_ABE_PWRSTST [20] INTRANSITION |
| Logic Area - State Status | | PM_ABE_PWRSTST [2] LOGICSTATEST |
| Power Domain - State Status | | PM_ABE_PWRSTST [1:0] POWERSTATEST |

3.7.14 PD_ALWON_MPU Description

PD_ALWON_MPU contains the following reset domains:

- ALWON_MPU_RST
- DPLL_MPU_PWRON_RST

PD_ALWON_MPU has no associated clock domains.

[Table 3-321](#) lists the logic retention capability for each module of the power domain.

Table 3-321. PD_ALWON_MPU Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|-------------------|-----------------|--------------------|--------------------|
| DPLL_MPU | No | None | None |
| CORTEXA9_MPU_INTC | No | None | None |

3.7.14.1 Power Domain Modes

The PD_ALWON_MPU power domain is an always-on power domain and does not switch to RETENTION state. There is no logic power state control or status bit field for this power domain.

The PD_ALWON_MPU power domain has no memory banks.

3.7.15 PD_ALWON_DSP Description

PD_ALWON_DSP contains the following reset domains:

- ALWON_IVA_RST
- DPLL_IVA_PWRON_RST

PD_ALWON_DSP has no clock domains associated.

[Table 3-322](#) lists the logic retention capability for each module of the power domain.

Table 3-322. PD_ALWON_DSP Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|-------------|-----------------|--------------------|--------------------|
| DPLL_IVA | No | None | None |
| DSP_WKUPGEN | No | None | None |

3.7.15.1 Power Domain Modes

The PD_ALWON_DSP power domain is an always-on power domain and does not switch to retention state. There is no logic power state control or status bit field for this power domain.

The PD_ALWON_DSP power domain has no memory banks.

3.7.16 PD_ALWON_CORE Description

PD_ALWON_CORE contains the following reset domains:

- ALWON_CM1_PWRON_RST

- ALWON_CM1_RST
- ALWON_CORE_PWRON_RST
- ALWON_CORE_RST

PD_ALWON_CORE contains the following clock domains:

- CD_ALWON_CM
- CD_L4_ALWON_CORE

Table 3-323 lists the logic retention capability for each module of the power domain.

Table 3-323. PD_ALWON_CORE Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|------------------|-----------------|---|--------------------|
| CM1 | No | None | None |
| DPLL_ABE | No | None | None |
| DPLL_CORE | No | None | None |
| DPLL_PER | No | None | None |
| CORTEXM3_WKUPGEN | No | None | None |
| SDMA_WKUPGEN | No | None | None |
| SR_CORE | No | RM_ALWON_SR_CORE_CONTEXT[0] LOSTCONTEXT_DFF | None |
| SR_IVA | No | RM_ALWON_SR_IVA_CONTEXT[0] LOSTCONTEXT_DFF | None |
| SR_MPU | No | RM_ALWON_SR_MPU_CONTEXT[0] LOSTCONTEXT_DFF | None |
| SPINNER | No | None | None |

3.7.16.1 Power Domain Modes

The PD_ALWON_CORE power domain is an always-on power domain and does not switch to RETENTION state. There is no logic power state control or status bit field for this power domain.

The PD_ALWON_CORE power domain has no memory banks.

3.8 Voltage Management Functional Description

This section describes the voltage domains and voltage control architecture. It also explains the interactions between the device and the external power IC.

3.8.1 Overview

The voltage-management architecture of the device is based on voltage sources managed by the PRCM module. They define the voltage domains within the device (see [Section 3.1.1.3, Voltage Management](#)). This partition of the voltage domains ensures independent voltage control of each voltage domain through dedicated SMPS or LDO. The following voltage domains are managed by the PRCM module:

- VDD_CORE_L
- VDD_MPU_L
- VDD_IVA_L
- LDO_CORE_M
- LDO_IVA_M
- LDO_MPU_M
- LDO_IVA_ABB
- LDO_MPU_ABB
- LDO_WAKEUP

NOTE: See [Table 3-25](#) for device power supply pin association to the power domain.

The PRCM module supports the AVS technique on the VDD_MPU_L, VDD_CORE_L, and VDD_IVA_L voltage domains, through automatic monitoring and adjustments of voltages by their dedicated SmartReflex modules. The VDD_MPU_L and VDD_IVA_L voltage domains support five DVFS OPPs. The VDD_CORE_L voltage domain supports two sets of DVFS OPPs: The first VDD_CORE_L set has two OPPs (OPP50 and OPP119); the second set has three OPPs (OPP50, OPP100 and OPP119) and is used in legacy mode (for old software compatability). The device cannot switch dynamically between these two sets of OPPs. The difference between the two sets (except the number of OPPs supported) is in the frequency that correspond to each OPP.

The PRCM module also supports ABB technique on the MPU and IVA voltage domains, through the LDO_MPU_ABB and LDO_IVA_ABB biasing voltages.

The PRCM module automatically scales down the LDO_MPU_M, LDO_CORE_M, and LDO_IVA_M voltage domains to retention voltage level whenever all memory banks on these domains have transitioned to the RETENTION or OFF power state.

[Table 3-324](#) lists the supported DVFS OPPs for each voltage domain. The exact values depend on the silicon; for more information, see the *Data Manual Operating Condition Addendum*.

Table 3-324. Supported DVFS OPPs Summary

| Voltage Domain | Operating Point | Control |
|---------------------|---|-----------------------|
| VDD_MPU_L (vdd_mpu) | OFF RETENTION OPP50 OPP100 OPP_TURBO OPP_NITRO OPP_NTSB | Hardware and software |
| VDD_IVA_L (vdd_iva) | OFF RETENTION OPP50 OPP100 | Hardware and software |

Table 3-324. Supported DVFS OPPs Summary (continued)

| Voltage Domain | Operating Point | Control |
|------------------|-----------------------|-----------------------|
| VDD_CORE_L (vdd) | OPP_TURBO | Hardware and software |
| | OPP_NITRO | |
| | OPP_NTSB | |
| | OFF | |
| | RETENTION | |
| | OPP50 | |
| | OPP100 ⁽¹⁾ | |
| | OPP119 | |

⁽¹⁾ VDD_CORE_L OPP100 is available only for second set of OPPs.

NOTE: For the supported OPPs for each device in the OMAP4470 family, see the *Data Manual Operating Condition Addendum*.

DVFS OPPs Dependencies

For detailed information about DVFS OPP dependencies, see the *Data Manual Operating Condition Addendum*.

For more information, see [Section 3.8.6.4](#), *DVFS Voting Mechanism (VDD_CORE_L and VDD_IVA_L Voltage Domains)*.

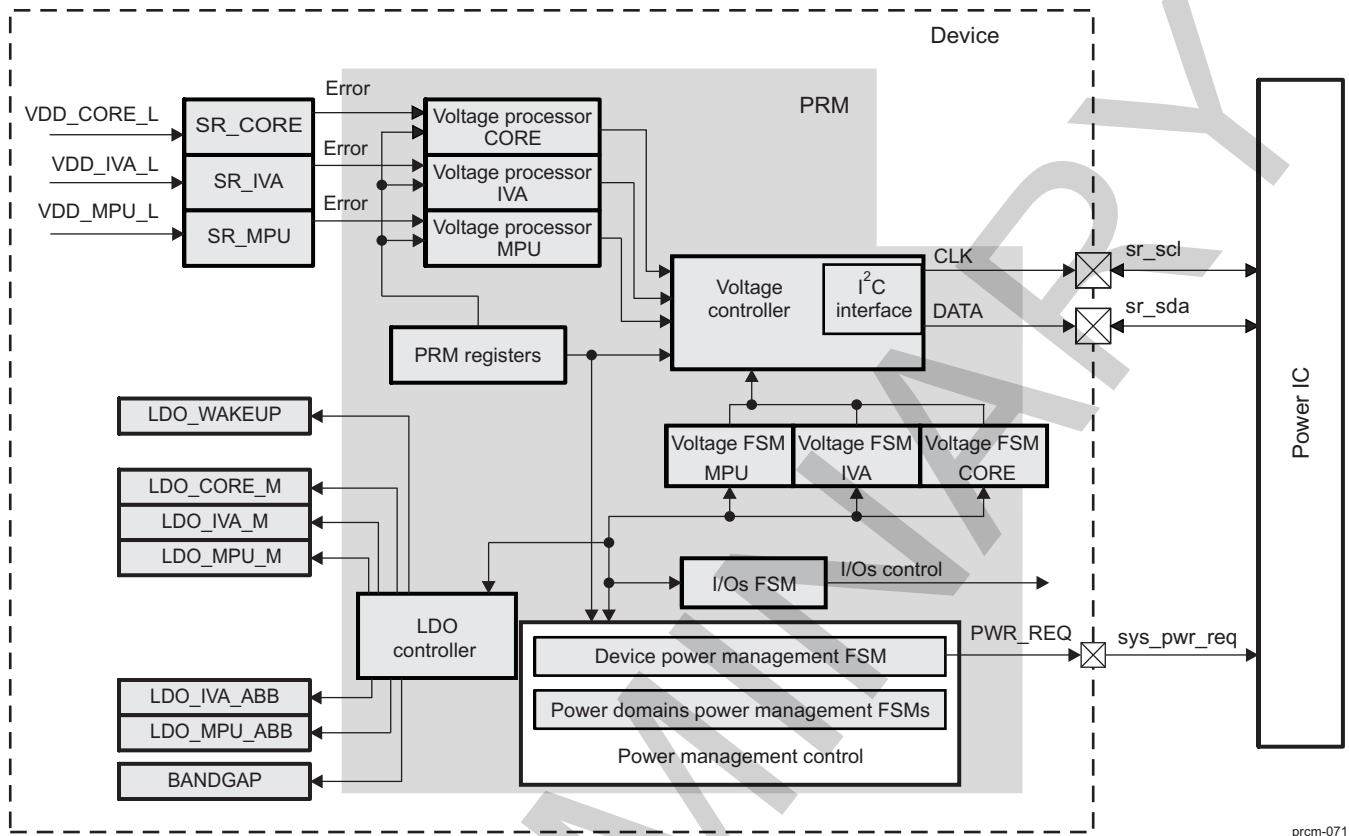
3.8.2 Voltage-Control Architecture

The PRM is split over several blocks that manage the different voltage sources.

- Voltage processors for converting SmartReflex data to voltage values before sending to the voltage controller
- Voltage FSMs for hardware control of voltages. They send commands to the voltage controller (I²C mode).
- A voltage controller for gathering commands from the PRCM module register (direct access), voltage processors, and voltage PRCMs. It then handles communication with the external power IC through the dedicated I²C interface.
- A device PRCM for managing the voltage PRCMs and I/O wake-up control and system clock control sequencing during device sleep and wake-up transitions.
- LDO regulator controllers for ABB management, memory arrays voltage management, and WAKEUP logic.
- Bandgap reference voltage sleep control

NOTE: The SmartReflex module allows dynamic voltage adjustments around an OPP voltage level to ensure target performance. It also allows switching from one OPP to another. However, it does not control voltage switching of the voltage domain to RETENTION or OFF level when all power domains within the power domain are in RETENTION or OFF power states. This is handled by the voltage PRCMs.

[Figure 3-75](#) shows the architecture for PRM voltage control.

Figure 3-75. PRM Voltage Control Architecture

prcm-071

3.8.3 VDD_MPU_L, VDD_CORE_L, and VDD_IVA_L Control

These power supply sources can be controlled using PRM dedicated I²C control.

3.8.3.1 PRM Dedicated I²C Control

The PRM I²C interface is dedicated to SmartReflex voltage control. It enables the voltage controller to send voltage commands to the external power IC. To reduce latency of voltage changes, the voltage controller is configurable to run in HS I²C mode. The PRM I²C interface supports multimaster mode.

The voltage controller receives voltage control commands from following input ports:

- Voltage processors ports: Each voltage processor sends voltage change commands to the voltage controller depending on the information received from the associated SmartReflex module.
- Voltage PRCMs ports: Each voltage PRCM sends commands to the voltage controller when the device enters RETENTION or OFF power state, and also when the device wakes up.
- PRM register port: The PRM registers give direct software control over the voltage levels of the external voltage sources.

An arbitration scheme in the voltage controller manages concurrent requests on different ports.

Each internal port has a handshake to indicate when the I²C frame resulting from the request on that port has been acknowledged by the external Power IC.

The PRM can also send external voltage source sleep commands that can be used to activate power IC sleep mode, where the voltage regulator maintains output voltage but only a small load is supported. This lets the external power IC reduce its power consumption as well.

NOTE: An I²C interface not controlled by the PRM can be used to program voltage levels of the external power IC. Because it is not a hardware-controlled interface its use is restricted to move the voltage level from one OPP to another.

In this case, the control software must operate voltage transition when the device activity allows one.

3.8.3.2 Adaptive Voltage Scaling

As explained in [Section 3.1.2.4, Adaptive Voltage Scaling](#), SmartReflex is a technology that uses adaptive power supply to reduce active power consumption. With SmartReflex, the power supply voltage can be adapted to the silicon performance either statically (for example, adapted to the manufacturing process of a given device), or dynamically (for example, adapted to the temperature-induced current performance of the device).

SmartReflex voltage control in the device is based on the dedicated SmartReflex modules and the voltage processors, in addition to the voltage controller with dedicated I²C interface, which are shared with the voltage PRCM modules and voltage control registers.

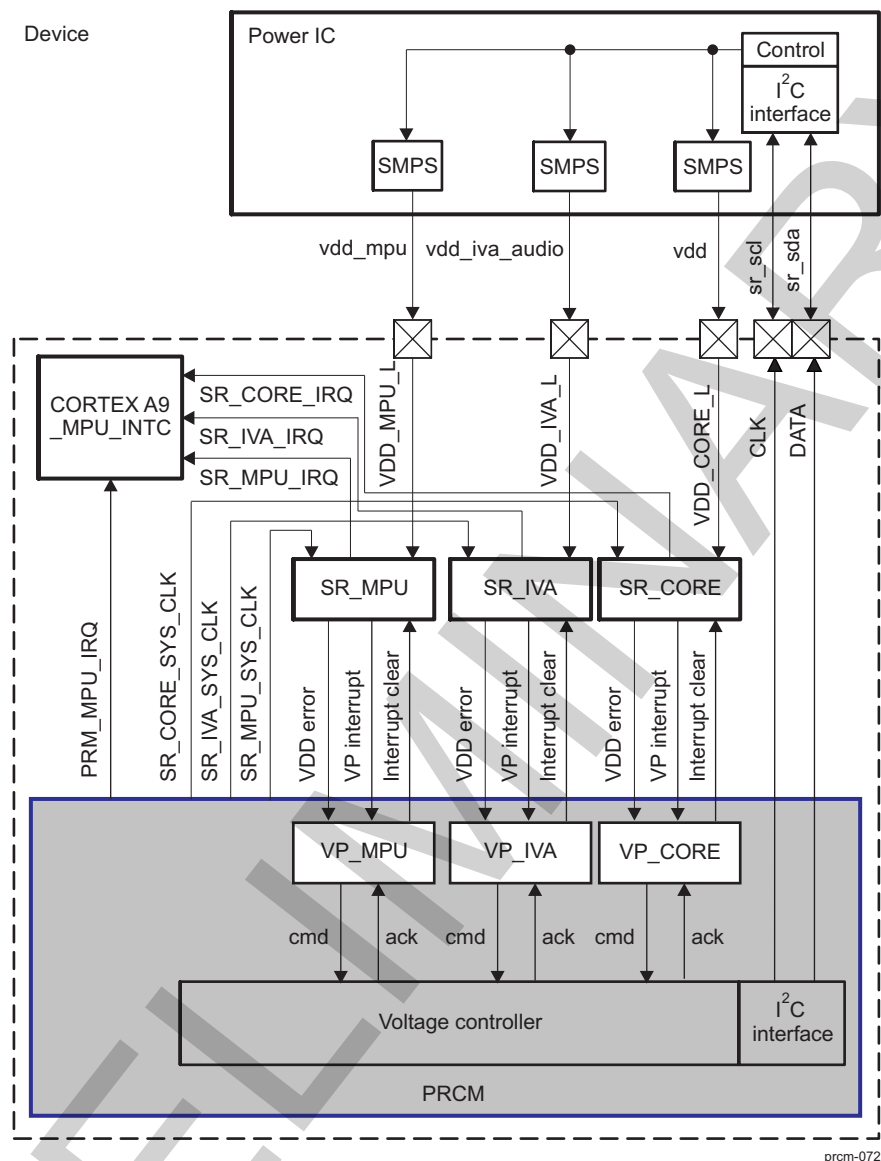
The SmartReflex modules allow a continuous real-time monitoring of voltage supply and device performance to do the following:

- Minimize the supply voltage to reduce the device power consumption.
- Maintain the desired device performance (by dynamically adjusting the device voltage) as the temperature of the device varies.

Because the SmartReflex modules and the voltage processors are dedicated to SmartReflex voltage control, they are described together in this section.

3.8.3.2.1 SmartReflex in the Device

[Figure 3-76](#) shows the SmartReflex integration.

Figure 3-76. SmartReflex Integration

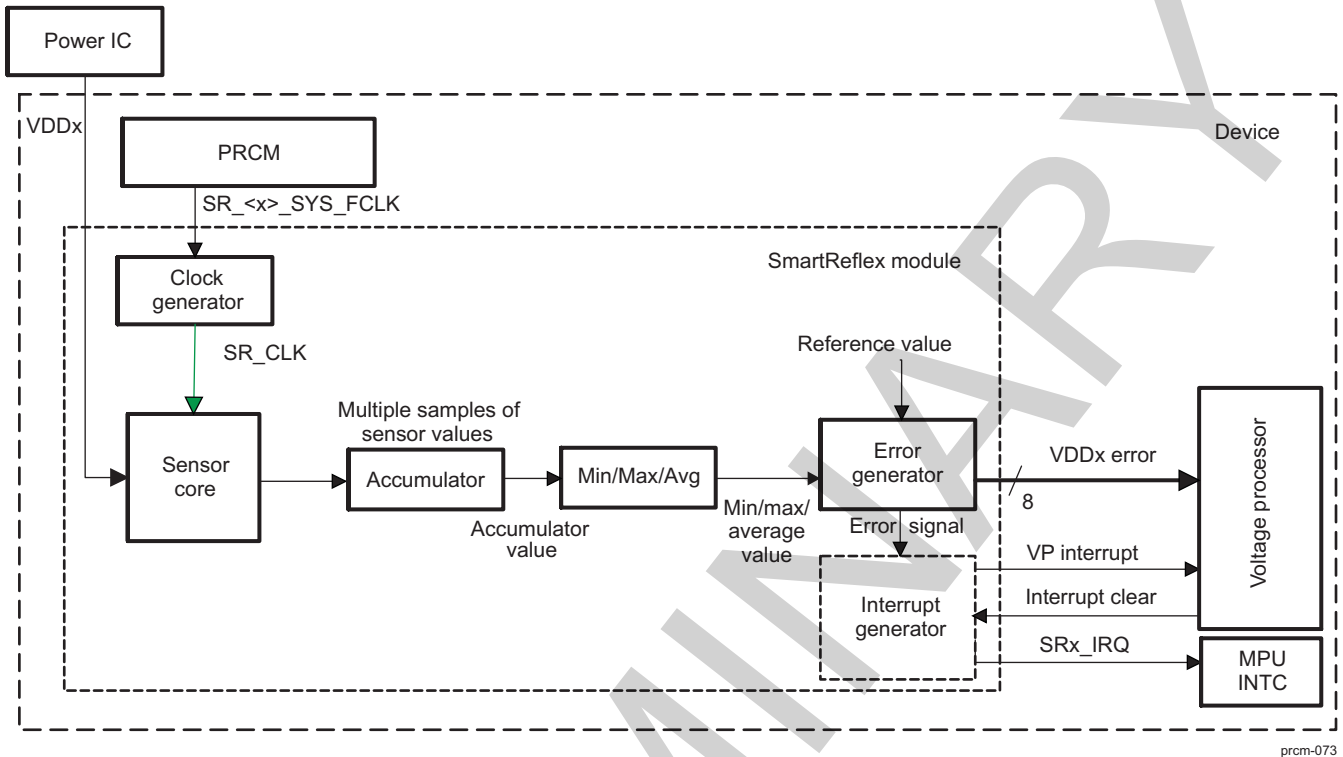
SmartReflex voltage control in the device is implemented for simultaneous control of three independent voltage sources. One SmartReflex module controls the VDD_CORE_L voltage, the second one is dedicated to VDD_IVA_L control, and the third controls the VDD_MPU_L voltage. Each SmartReflex module is connected to a voltage processor. Voltage commands from all voltage processors are passed to a voltage control, which sends them through a dedicated I²C master interface to the power IC.

SmartReflex modules are in the PD_ALWON_CORE power domain and supplied by the VDD_CORE_L voltage domain. Each module senses its own voltage domain (VDD_CORE_L, VDD_IVA_L, or VDD_MPU_L).

3.8.3.2.2 SmartReflex Module

Figure 3-77 is a functional overview of the SmartReflex module.

Figure 3-77. SmartReflex Module Functional Overview



3.8.3.2.3 SmartReflex Submodules

NOTE: In this section, SRn refers to SR_IVA, SR_MPU, and SR_CORE SmartReflex modules.

The SmartReflex module is enabled by setting the SRn.SRCONFIG[11] SR_EN bit. The SmartReflex module is composed of six blocks:

- Clock generator
- Sensor core
- Accumulator
- Minimum/maximum/average
- Error generator
- Interrupt generator

Clock Generator

The clock generator provides the internal SR_CLK sampling clock to the sensor core of the module. The SRn.SRCONFIG[21:12] SRCLKLENGTH bit field allows the setting of the frequency divider ratio between the SRn_SYS_CLK and the SR_CLK. It is calculated using Equation 1:

$$\text{SRn.SRCONFIG}[21:12] \text{ SRCLKLENGTH} = f_{\text{SRn_SYS_CLK}} / (2 \times f_{\text{SR_CLK}}) \quad (1)$$

Where $f_{\text{SRn_SYS_CLK}}$ is the frequency of the SRn_SYS_CLK, and $f_{\text{SR_CLK}}$ is the desired SR_CLK frequency.

To accurately use the target values programmed for SmartReflex modules in the device, the SRCLKLENGTH parameter must be set correctly. The target values for the SmartReflex modules are calculated with the SR_CLK frequency set at 100 kHz. It is thus mandatory that the value of the SRCLKLENGTH parameter is calculated from Equation 1 with $f_{\text{SR_CLK}}$ set at 100 kHz.

For example, if the system clock has a frequency of 38.4 MHz, and the target SR_CLK frequency is 100 kHz, the SRn.SRCONFIG[21:12] SRCLKLENGTH bit field is 192 (0x0C0).

Sensor Core

The sensor core receives the SR_CLK sampling clock and the voltage to be sensed. It generates sensor value samples proportional to the voltage sensed. For accuracy, a sensor core is composed of two sensors and generates two values per sample (one from each sensor).

The two sample values generated by the sensor core output can be read from the SRn.SENVAL[15:0] SENNVAL and SRn.SENVAL[31:16] SENPVAL bit fields.

The sensor core is enabled by the SRn.SRCONFIG[10] SENENABLE bit.

Accumulator

The accumulator consists of two stacks that store multiple samples of the two sensor values received from the sensor core.

The SRn.SRCONFIG[31:22] ACCUMDATA bit field defines the size of the accumulator in the number of samples to be stored. The allowable range is from 2 to 1023. The value of SRn.SRCONFIG[31:22] ACCUMDATA value is related to the desired sampling time window ($T_{\text{TimeWindow}}$) and the SR_CLK frequency ($f_{\text{SR_CLK}}$). It can be calculated using Equation 2:

$$\text{SRn.SRCONFIG[31:22] ACCUMDATA} = T_{\text{TimeWindow}} * f_{\text{SR_CLK}} \quad (2)$$

For example, for an accumulator time window of 10 ms and SR_CLK frequency of 32 kHz, the value of SRn.SRCONFIG[31:22] ACCUMDATA is 320 (0x140). The accumulation window must be large enough so that the minimum, maximum, and average counter values are accurate.

Minimum/Maximum/Average

The minimum/maximum/average block reads the samples stored in the accumulator and returns the minimum, maximum, and average values of the samples. Because the accumulator contains two separate groups of samples (one from each sensor of the sensor core), the minimum/maximum/average block also generates two sets of minimum, maximum, and average values.

The minimum, maximum, and average values of the samples of the first sensor can be read from the SRn.SENMIN[15:0] SENNMIN, SRn.SENMAX[15:0] SENNMAX, and SRn.SENAVG[15:0] SENNAVG bit fields, respectively.

For the sample values of the second sensor, the minimum, maximum, and average values can be read from the SRn.SENMIN[31:16] SENPMIN, SRn.SENMAX[31:16] SENPMAX, and SRn.SENAVG[31:16] SENPAVG bit fields, respectively.

The minimum/maximum/average block is enabled by the SRn.SRCONFIG[8] MINMAXAVGENABLE bit.

Error Generator

The error generator block reads the sample value generated by the sensor core and compares it with a reference value to calculate the error. This error is then passed to the voltage processor and the internal interrupt generator block.

The reference value for a given OPP of the device is configured by setting the SRn.NVALUERECIPROCAL[23:20] SENPGAIN, SRn.NVALUERECIPROCAL[19:16] SENNGAIN, SRn.NVALUERECIPROCAL[15:8] RSENPN, and SRn.NVALUERECIPROCAL[7:0] RSENENN bit fields by reading corresponding values from the eFuses (see Section 3.8.3.2.5, *SmartReflex Parameters Set After Silicon Characterization*).

The error generator sets the SRn.SRSTATUS[1] ERRGEN_VALID status bit when a valid error value is set in the SRn.SENERROR register.

The SRn.SENERROR register contains the average error (SRn.SENERROR[15:8] AVGERERROR) and the percentage of error (SRn.SENERROR[7:0] SENERROR).

The error generator block is enabled by the SRn.SRCONFIG[9] ERRORGENERATORENABLE bit.

Interrupt Generator

The interrupt generator block generates interrupts to the MPU INTC and the voltage processor module (if the corresponding interrupts are enabled) to indicate errors.

Table 3-325 and Table 3-326 list the interrupt events in the SmartReflex module and their enable and status bits.

Table 3-325. SmartReflex Interrupt Events

| Interrupt Type | Description |
|---------------------|--|
| Accumulator | The minimum/maximum/average module has completed computation over the accumulator data. |
| Valid | The average error is less than 2 percent of the true average error. |
| Disable acknowledge | The SmartReflex module is disabled and has cleared all MPU INTC and VP interrupts (internal registers are reset). This interrupt indicates to the software that the SmartReflex module is available for programming. |
| Bounds | The frequency error has crossed the maximum limit (ERRMAXLIMIT) or the minimum limit (ERRMINLIMIT). It is mapped to the voltage processor also. |

The SRn_CORTEX_M3_IRQs from SR_IVA and SR_CORE are mapped to the MM_IRQ_47 interrupt line of the CORTEXM3_MPU_INTC.

Table 3-326. SmartReflex Interrupt Events Enable and Status Bits

| Interrupt Type | Enable Bit | Status Bit |
|---------------------|---|---|
| Accumulator | SRn.IRQENABLE_SET[3] MCUACCUMINTENSET | SRn.IRQSTATUS[3] MCUACCUMINTSTATENA |
| | SRn.IRQENABLE_CLR[3] MCUACCUMINTENCLR | |
| Valid | SRn.IRQENABLE_SET[2] MCUVALIDINTENSET | SRn.IRQSTATUS[2] MCUVALIDINTSTATENA |
| | SRn.IRQENABLE_CLR[2] MCUVALIDINTENCLR | |
| Disable acknowledge | SRn.IRQENABLE_SET[0] MCUDISABLEACKINTENSET | SRn.IRQSTATUS[0] MCUDISABLEACKINTSTATENA |
| | SRn.IRQENABLE_CLR[0] MCUDISABLEACKINTENCLR | |
| Bounds | SRn.IRQENABLE_SET[1] MCUBOUNDSINTENSET | SRn.IRQSTATUS[1] MCUBOUNDSINTSTATENA |
| | SRn.IRQENABLE_CLR[1] MCUBOUNDSINTENCLR | |
| | SRn.ERRCONFIG[22] | SRn.ERRCONFIG[23] VPBOUNDSINTSTATENA |
| | VPBOUNDSINTENABLE | |

The minimum and maximum error limits for the bounds interrupt are configured in the SRn.ERRCONFIG[15:8] ERRMAXLIMIT and SRn.ERRCONFIG[7:0] ERRMINLIMIT bit fields.

Setting a bit to 1 in the IRQSTATUS register clears the interrupt pending status of each interrupt source whose corresponding bit is 1 in the value written. Other interrupt pending status bits are not affected (setting that bit to 0 does not affect the status).

3.8.3.2.4 Status Register

NOTE: In this section, SRn refers to SR_IVA, SR_MPU, and SR_CORE SmartReflex modules.

The status register (SRSTATUS) indicates the validity of the minimum/maximum/average and error generator output values.

SRSTATUS has the following bits and bit fields:

- SRn.[SRSTATUS](#)[3] [AVGERRVALID](#): Indicates the validity of the value in the SRn.[SENERREG](#)[15:8] [AVGERROR](#) bit field. When the value is 0, the average error is not valid. When the value is 1, the average error is within 2 percent of the valid average error.
- SRn.[SRSTATUS](#)[2] [MINMAXAVGVALID](#): Indicates the validity of the SRn.[SENVAL](#), SRn.[SENMIN](#), SRn.[SENMAX](#), and SRn.[SENAVG](#) registers. When the value is 0, the registers are not valid. When the value is 1, the registers contain valid values, although the values are not necessarily fully accumulated.
- SRn.[SRSTATUS](#)[1] [ERRGEN_VALID](#): Indicates the validity of the value in the SRn.[SENERREG](#)[7:0] [SENERREG](#) bit field. When the value is 0, the error value is invalid. When the value is 1, the error value is valid.
- SRn.[SRSTATUS](#)[0] [MINMAXAVGACCUMVALID](#): Indicates that the SRn.[SENVAL](#), SRn.[SENMIN](#), SRn.[SENMAX](#), and SRn.[SENAVG](#) registers contain their final values accumulated over the defined sample time period.

3.8.3.2.5 SmartReflex Parameters Set After Silicon Characterization

Certain parameters of the SmartReflex module are characterized and calibrated after silicon testing. These values are then either set in the eFuse farm of the device or provided separately. Users must configure these parameters according to their given values to ensure correct functioning of the module.

The values for the following parameters (explained in [Section 3.8.3.2.3, SmartReflex Submodules](#)) are set in the device eFuse after device silicon characterization:

- SRn.[SRCONFIG](#)[6:5] [SENNENABLE](#)
- SRn.[SRCONFIG](#)[4:3] [SENPENABLE](#)
- SRn.[NVALUERECIPROCAL](#)[23:20] [SENPAIN](#)
- SRn.[NVALUERECIPROCAL](#)[19:16] [SENNGAIN](#)
- SRn.[NVALUERECIPROCAL](#)[15:8] [RSENPN](#)
- SRn.[NVALUERECIPROCAL](#)[7:0] [RSENPN](#)

The eFuse values of these parameters must be read from the corresponding registers of the control module.

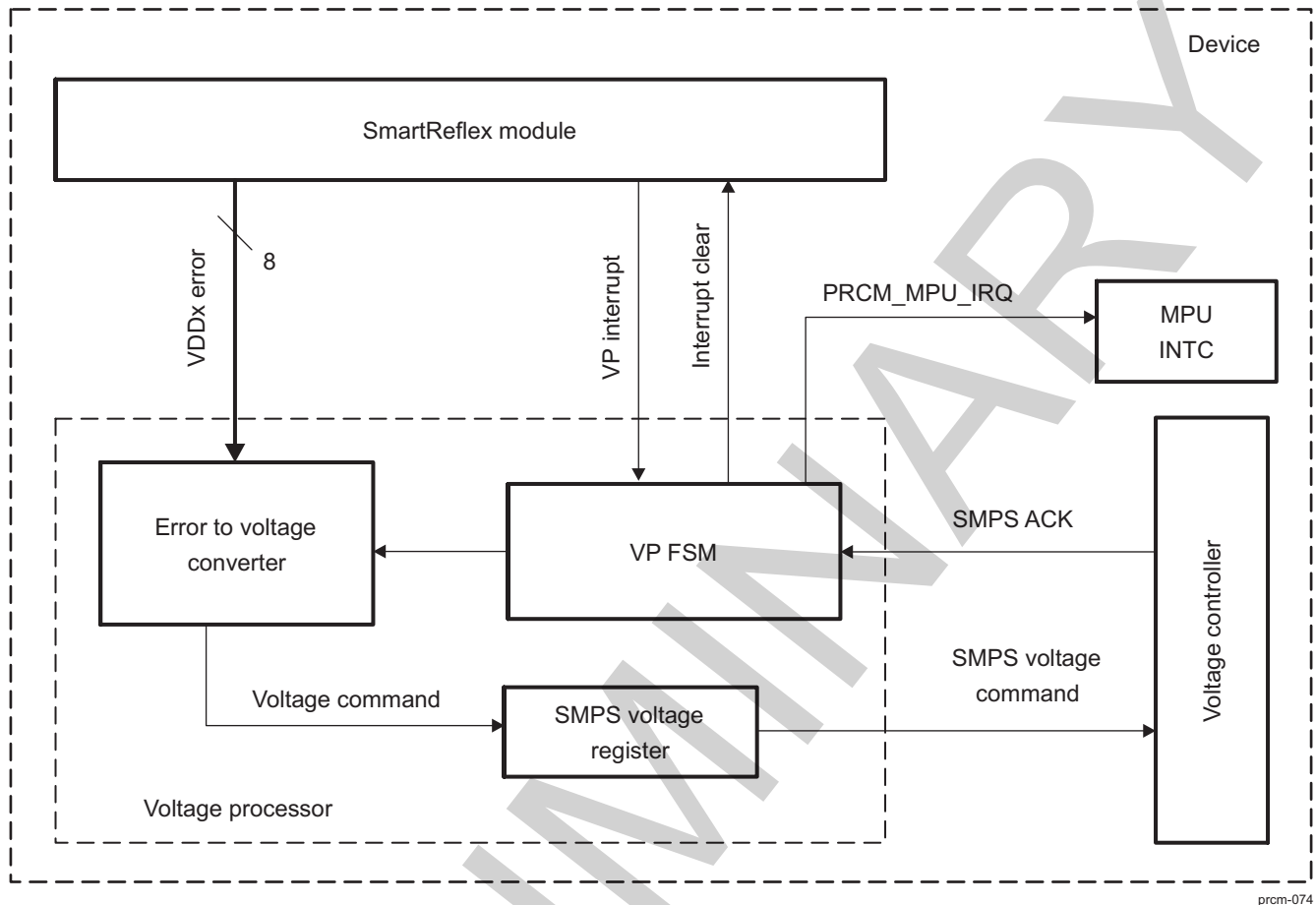
Information about the following parameters of the SmartReflex module is provided after silicon characterization:

- SRn.[AVGWEIGHT](#)[3:2] [SENP](#)[AVGWEIGHT](#)
- SRn.[AVGWEIGHT](#)[1:0] [SENN](#)[AVGWEIGHT](#)
- SRn.[ERRCONFIG](#)[18:16] [ERRWEIGHT](#)
- SRn.[ERRCONFIG](#)[15:8] [ERRMAXLIMIT](#)
- SRn.[ERRCONFIG](#)[7:0] [ERRMINLIMIT](#)

3.8.3.2.6 Voltage Processor Module

[Figure 3-78](#) is a functional overview of the voltage processor.

Figure 3-78. Voltage Processor Functional Overview



The voltage processor receives an error value and a VP interrupt signal from the SmartReflex module. Each time a new error value is sent, the SmartReflex module triggers an interrupt to inform the voltage processor. The voltage processor consists of an error-to-voltage command converter and a state controller. It processes an error and sends a voltage command to the voltage controller. It receives an acknowledge signal from the voltage controller when the SMPS receives the command. The voltage processor then acknowledges the SmartReflex module by clearing its interrupt.

The voltage processor is enabled by the PRM_VPn_CONFIG[0] VPENABLE bit.

Voltage Processor Interrupts

The voltage processor uses the PRCM_CORTEXM3_MPU_IRQ (MM_IRQ_46 of CORTEXM3_MPU_INTC) interrupt line of the CORTEXM3. [Table 3-327](#) and [Table 3-328](#) list the interrupt events in the voltage processor module and their enable and status bits.

Table 3-327. Voltage Processor Interrupt Events

| Interrupt Type | Description |
|---------------------|---|
| Transaction done | Voltage processor transaction is complete. |
| Equal value | Voltage requested in the new voltage command is the same as the current SMPS voltage. |
| No SMPS acknowledge | SMPS has not responded in a defined time interval to the transmitted voltage command. |
| Maximum VDD | New voltage requested in the voltage command is equal to or greater than maximum VDD. |
| Minimum VDD | New voltage requested in the voltage command is equal to or less than minimum VDD. |
| OPP change done | The average error is within the desired limit. |

NOTE: Transaction done and OPP change done interrupt events are generated under the same conditions (after voltage change).

Table 3-328. Voltage Processor Interrupt Event Enable and Status Bits

| Interrupt Type | Enable Bit | Status Bit |
|---------------------|--|--|
| Transaction done | PRM_IRQENABLE_MPU_M3[21] VP_CORE_TRANXDONE_EN | PRM_IRQSTATUS_MPU_M3[21] VP_CORE_TRANXDONE_ST |
| | PRM_IRQENABLE_MPU_M3[29] VP_IVA_TRANXDONE_EN | PRM_IRQSTATUS_MPU_M3[29] VP_IVA_TRANXDONE_ST |
| Equal value | PRM_IRQENABLE_MPU_M3[20] VP_CORE_EQVALUE_EN | PRM_IRQSTATUS_MPU_M3[20] VP_CORE_EQVALUE_ST |
| | PRM_IRQENABLE_MPU_M3[28] VP_CORE_EQVALUE_EN | PRM_IRQSTATUS_MPU_M3[28] VP_IVA_EQVALUE_ST |
| No SMPS acknowledge | PRM_IRQENABLE_MPU_M3[19] VP_CORE_NOSMPSACK_EN | PRM_IRQSTATUS_MPU_M3[19] VP_CORE_NOSMPSACK_ST |
| | PRM_IRQENABLE_MPU_M3[27] VP_IVA_NOSMPSACK_EN | PRM_IRQSTATUS_MPU_M3[27] VP_IVA_NOSMPSACK_ST |
| Maximum VDD | PRM_IRQENABLE_MPU_M3[18] VP_CORE_MAXVDD_EN | PRM_IRQSTATUS_MPU_M3[18] VP_CORE_MAXVDD_ST |
| | PRM_IRQENABLE_MPU_M3[26] VP_IVA_MAXVDD_EN | PRM_IRQSTATUS_MPU_M3[26] VP_IVA_MAXVDD_ST |
| Minimum VDD | PRM_IRQENABLE_MPU_M3[17] VP_CORE_MINVDD_EN | PRM_IRQSTATUS_MPU_M3[17] VP_CORE_MINVDD_ST |
| | PRM_IRQENABLE_MPU_M3[25] VP_IVA_MINVDD_EN | PRM_IRQSTATUS_MPU_M3[25] VP_IVA_MINVDD_ST |
| OPP change done | PRM_IRQENABLE_MPU_M3[16] VP_CORE_OPPCHANGEDONE_EN | PRM_IRQSTATUS_MPU_M3[16] VP_CORE_OPPCHANGEDONE_ST |
| | PRM_IRQENABLE_MPU_M3[24] VP_IVA_OPPCHANGEDONE_EN | PRM_IRQSTATUS_MPU_M3[24] VP_IVA_OPPCHANGEDONE_ST |

The status of the voltage processor is represented by the bits/bit fields shown in [Table 3-329](#).

Table 3-329. Voltage Processor Status

| Bit/Bit Field | Parameter | Description |
|---|-------------------------------------|---|
| PRCM module.PRM_VPn_VOLTAGE[7:0] VPVOLTAGE | Current voltage for SMPS | Value of the current voltage level requested by the voltage processor |
| PRCM module.PRM_VPn_STATUS[0] VPINIDLE | Voltage processor in INACTIVE state | The voltage processor is in idle mode. |

[Table 3-330](#) shows the parameters of the voltage processor that must be configured.

Table 3-330. Voltage Processor Parameters

| Bit/Bit Field | Parameter | Description |
|---|-------------------|--|
| PRCM.PRM_VPn_CONFIG[31:24] ERROROFFSET | Error offset | Error in voltage offset value |
| PRCM.PRM_VPn_CONFIG[23:16] ERRORGAIN | Error gain | Error in voltage gain value |
| PRCM.PRM_VPn_CONFIG[3] TIMEOUTEN | Time-out enable | Enables/disables the time-out set by the time-out delay parameter |
| PRCM.PRM_VPn_VSTEPMIN[7:0] VSTEPMIN | Minimum step size | Minimum voltage step size |
| PRCM.PRM_VPn_VSTEPMAX[7:0] VSTEPMAX | Maximum step size | Maximum voltage step size |
| PRCM.PRM_VPn_VLIMITTO[31:24] VDDMAX | Maximum VDD limit | Maximum voltage limit of the VDD |
| PRCM.PRM_VPn_VLIMITTO[23:16] VDDMIN | Minimum VDD limit | Minimum voltage limit of the VDD |
| PRCM.PRM_VPn_VLIMITTO[15:0] TIMEOUT | Time-out delay | Maximum delay between a voltage change command and its acknowledge |

Table 3-330. Voltage Processor Parameters (continued)

| Bit/Bit Field | Parameter | Description |
|---|------------------------|--|
| PRCM.PRM_VPn_CONFIG[15:8] INITVDD | Initial VDD voltage | Initial voltage set in the voltage processor |
| PRCM.PRM_VPn_CONFIG[2] INITVDD | Initialize VDD | Set initial voltage given in initial VDD voltage parameter in the voltage processor |
| PRCM.PRM_VPn_VSTEPMIN[23:8] SMPSWAITTIMEMIN | Minimum SMPS wait time | Slew rate for negative voltage steps |
| PRCM.PRM_VPn_VSTEPMAX[28:8] SMPSWAITTIMEMAX | Maximum SMPS wait time | Slew rate for positive voltage steps |
| PRCM.PRM_VPn_CONFIG[1] FORCEUPDATE | Force update | Sends the value of the VP current voltage parameter as the new voltage command to SMPS |

3.8.3.2.7 SMPS-Dependent Parameter Configuration

The values of the following parameters of the voltage processor module depend on the characteristics of the SMPS used:

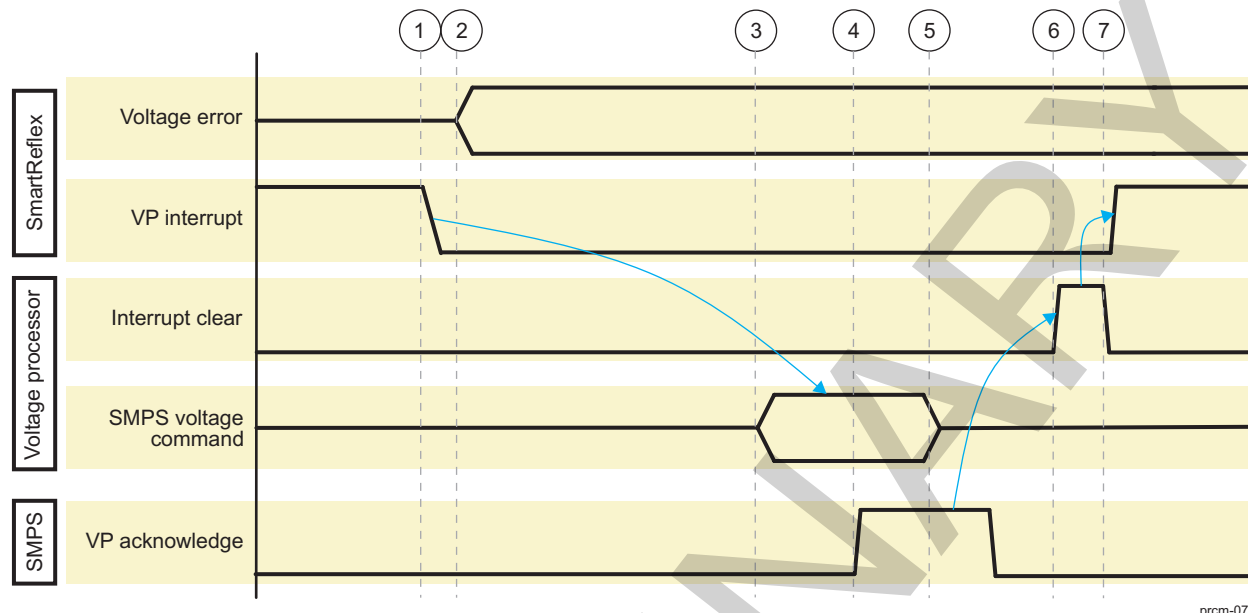
- PRCM.PRM_VPn_CONFIG[31:24] ERROROFFSET
- PRCM.PRM_VPn_CONFIG[23:16] ERRORGAIN
- PRCM.PRM_VPn_VSTEPMIN[7:0] VSTEPMIN
- PRCM.PRM_VPn_VSTEPMAX[7:0] VSTEPMAX
- PRCM.PRM_VPn_VLIMITTO[31:24] VDDMAX
- PRCM.PRM_VPn_VLIMITTO[23:16] VDDMIN
- PRCM.PRM_VPn_VLIMITTO[15:0] TIMEOUT
- PRCM.PRM_VPn_VSTEPMIN[23:8] SMPSWAITTIMEMIN
- PRCM.PRM_VPn_VSTEPMAX[28:8] SMPSWAITTIMEMAX

For information about the values of these parameters, see the specification document of the SMPS used.

3.8.3.2.8 Communication Between SmartReflex, Voltage Processor, Voltage Controller, and SMPS

The SmartReflex module, voltage processor, voltage controller, and SMPS implement a simple handshake protocol based on a request/acknowledge mechanism (see [Figure 3-79](#)):

1. The SmartReflex module generates a VP interrupt (clears to 0) when the average error crosses the minimum or maximum error bounds.
2. The average VDDx error is passed to the voltage processor when automatic voltage control is enabled.
3. The voltage processor reads the error and generates the voltage command for the SMPS. It then informs the voltage controller that a new voltage command is ready for the SMPS. The voltage controller sends the voltage command to the SMPS (external power IC) through the dedicated I²C interface.
4. The SMPS responds to the reception of the voltage command with an acknowledgement to the voltage controller.
5. The voltage controller sends the acknowledgement to the voltage processor.
6. The voltage processor sends the interrupt-clear signal to the SmartReflex module.
7. The SmartReflex module clears the VP interrupt. It is now again ready to send a new frequency-error interrupt to the voltage processor.

Figure 3-79. SmartReflex – SMPS Communication for Automatic Voltage Adjustments

3.8.4 Internal LDOs Control

3.8.4.1 Memory LDOs

Embedded SRAM LDOs (that is, LDO_CORE_M, LDO_IVA_M, and LDO_MPU_M) are used to supply power to the split-rail memory arrays. The PRM generates the controls used to select LDO operating mode: on-active, on-retention, or off.

Split-rail type SRAMs are used in the device to implement the larger memories. These SRAMs feature memory array and periphery logic which are on separate supplies to allow independent power management. Proper memory operation, however, requires the SRAM array voltage to never be operated at a level lower than the SRAM periphery logic.

Memory LDO can switch to on, retention, and off mode:

- On mode: 1.2 V is the normal voltage reference used through all functional OPPs, whenever memories must be functional. When logic voltage level VDD_x_L (where x can be MPU, CORE, or IVA) becomes higher than the associated memory voltage level VDD_x_M, the LDO operates in the tracking mode and follows its respective the VDD_x_L voltage level.
- Retention mode: 0.6 V is set when software allows and when all memory banks belonging to the LDO memory voltage are in RETENTION or OFF state. In this mode, the output voltage is generated from the corresponding VDD_x_L logic voltage source.
- Off mode: 0 V is set when the device switches to off mode.

[Section 3.8.5.2, Memory LDOs Transitions](#), presents the state transition conditions and sequence for the memory LDOs.

NOTE: The voltage levels associated with the different modes may depend on the device characteristics.

3.8.4.2 LDO_WAKEUP

LDO_WAKEUP supports three voltage states depending on the PD_WKUP and PD_EMU activity:

- EMULATION overdrive: 1.2 V is voltage level and the LDO is set in bypass mode.
- ON: 1.06 V is the voltage reference (default state).

- SLEEP: 0.83 V is the voltage reference. It is set when the device enters sleep mode.

[Section 3.8.5.3, LDO_WAKEUP Transitions](#), presents the state transition conditions and sequences for the LDO_WKUP.

NOTE: The voltage levels associated with the different modes may depend on the device characteristics.

At boot time, the LDO_WAKEUP LDO is started in emulation mode. It is a software command (that is, from OS or ROM code) to set it to a different mode.

3.8.4.3 ABB LDOs Control

The ABB LDO supports three voltage modes:

- Bypass mode: In this mode the x_ABB LDO is bypassed and outputs the VDD_x_L voltages (x refers to MPU and IVA). This mode is activated when ABB is not required, or when voltage domain enters low-power mode.
- ABB Set1: This mode is enabled at OPP_NITRO.
- ABB Set2: This mode is enabled at OPP_TURBO.

The PRCM module provides the [PRM_LDO_ABB_MPU_SETUP](#) and [PRM_LDO_ABB_IVA_SETUP](#) registers for configuration with the following controls:

- SR2EN – To enable or bypass the ABB power management
- ACTIVE_RBB_SEL – To enable or bypass ABB Set2 mode
- ACTIVE_FBB_SEL – To enable or bypass ABB Set1 mode
- SR2_WTCNT_VALUE – LDO settling delay on OPP change. The delay is in number of system clock cycles.

The PRCM module provides the [PRM_LDO_ABB_MPU_CTRL](#) and [PRM_LDO_ABB_IVA_CTRL](#) registers for control:

- OPP_SEL – Current operational OPP
- OPP_CHANGE – Initiate an OPP-based ABB LDO setting change
- SR2_STATUS – Current mode of operation of ABB LDO
- SR2_IN_TRANSITION – ABB LDO is in transition.

For the ABB LDO state change programming sequence, see [Section 3.10.4.3, Changing OPP](#).

3.8.4.3.1 ABB Strategy for the Cortex-A9 MPU Operating at OPP_TURBO

The ABB Set2 technique is used for leakage current reduction for operation at OPP_TURBO (VDD_MPU_L). The ABB Set2 voltage is trimmed to be used at OPP_TURBO. Software should do the following:

```
If (CONTROL_STD_FUSE_OPP_DPLL_1[20] MPU_RBB_TURBO == 1) then enable ABB Set2 at
OPP_TURBO (PRM\_LDO\_ABB\_MPU\_SETUP[1] ACTIVE_RBB_SEL = 0x1)
Else no ABB is available for OPP_TURBO
```

3.8.4.3.2 ABB Strategy for the IVA-HD Operating at OPP_TURBO

The ABB Set2 technique is used for leakage current reduction for operation at OPP_TURBO (VDD_IVA_L). The ABB Set2 voltage is trimmed to be used at OPP_TURBO. Software should do the following:

```
If (CONTROL_STD_FUSE_OPP_DPLL_1[21] IVA_RBB_TURBO == 1) then enable ABB Set2 at
OPP_TURBO (PRM\_LDO\_ABB\_IVA\_SETUP[1] ACTIVE_RBB_SEL = 0x1)
```

3.8.4.4 Bandgap Control

Bandgap provides voltage reference for internal LDOs. The PRCM module automatically controls the switching between ON and OFF states of the bandgap, based on the device power state. It is completely transparent to user software.

The PRM_LDO_BANDGAP_CTRL[0] OFF_ENABLE bit controls whether the bandgap remains on or is shut off when the device switches to OFF power state.

3.8.5 Voltage Domain State Transitions

In [Section 3.1.1.3.1, Voltage Domain](#), the supported states of a voltage domain were presented. This section describes the trigger conditions to enable and perform sleep and wake-up transitions on PRCM module-controlled voltage domains:

- VDD_MPU_L
- VDD_IVA_L
- VDD_CORE_L
- LDO_MPU_M
- LDO_IVA_M
- LDO_CORE_M

It also identifies state transition sequences for these voltage domains.

When the voltage domain state transition control is set to automatic, the PRCM module initiates the voltage domain state transition when the required hardware conditions are satisfied. These hardware conditions can be based on the power domain state conditions and/or system clock state conditions. The PRCM module prevents any transition when the associated conditions are not satisfied.

The LDO_MPU_M, LDO_IVA_M, or LDO_CORE_M memory voltage domain is automatically transitioned to the retention level whenever all memory arrays in the domain reach the RETENTION or OFF power state. Similarly, a transition back to the ON state is triggered upon one or more domain memory arrays requiring a transition back to the ON power state.

If a voltage command acknowledgement is not received within an allowed response time window (communications error over the I²C interface), an error status is logged, a global warm reset is generated, and the transition is skipped.

3.8.5.1 VDD_x_L Transitions

The transition trigger conditions for sleep transition from ON to SLEEP or RETENTION state are:

- Software setting: [PRM_VOLTCTRL](#)[a:b] AUTO_CTRL_VDD_x_L = SLEEP (0x1) or RETENTION (0x2)
- Power states conditions:
 - For voltage domain SLEEP state transition – all power domains in the voltage domain must be in ON-INACTIVE, RETENTION, or OFF state.
 - For voltage domain RETENTION state transition – all power domains in the voltage domain must be in RETENTION or OFF state.
- Clock states conditions: No clock activity on voltage domain

NOTE:

- In case of VDD_CORE_L sleep transition from ON to SLEEP state, the PD_CORE can be in ON-INACTIVE or RETENTION only.
 - In case of VDD_MPU_L and VDD_IVA_L sleep transition from ON to SLEEP state, the reference and bypass clocks to their respective DPLLs must also be gated.
-

The transition trigger condition for wake-up transition from SLEEP or RETENTION state to ON state is:

- Any wake-up event occurs on the voltage domain.

Transition sequence:

1. All transition trigger conditions are met.
2. The voltage controller sends an ON, SLEEP, or RETENTION command sequence over the I²C interface.
3. The PRCM module waits for I²C command sequence acknowledge.
4. The PRCM module starts the voltage transition counter.
5. When the counter expires, a voltage transition completion state is reached.

3.8.5.2 Memory LDOs Transitions

The transition trigger conditions for on to retention mode are:

- At least one memory bank associated with the LDO is in RETENTION state and the rest of the memory banks may be in RETENTION or OFF states.

The transition trigger condition for on/retention mode to off mode transition is:

- Device is switching to OFF state.

Transition sequence:

1. Transition trigger conditions are true (that is, satisfied).
2. Switch LDO reference to:
 - Retention mode value if on-to-retention mode transition
 - Off mode value if on/retention-to-off mode transition
3. Start counter for LDO stabilization.
4. When counter expires, voltage transition completion state is reached.

3.8.5.3 LDO_WAKEUP Transitions

The ON-to-SLEEP transition trigger conditions are:

- Power domain states: Device is in low-power state (STANDBY or OFF state) and the PD_EMU power domain is off.
- Clock states: Only the 32K clock is active in the CD_WKUP power domain (and system clock is gated at SCRM level)

The SLEEP-to-ON transition trigger condition is:

- Any device wake-up event other than emulation wake-up event

The EMULATION-to-ON transition trigger requires one of the following conditions:

- Power domain states: The PD_EMU power domain is OFF and device is in active mode
- Clock states: PD_EMU is OFF and any clock other than 32K clock is active in PD_WKUP

The EMULATION-to-SLEEP transition trigger conditions are:

- Power domain states: Device is in low-power state (STANDBY or OFF state) and the PD_EMU power domain is OFF.
- Clock states: Only the 32K clock is active in the CD_WKUP power domain (and system clock is gated at SCRM level)

The SLEEP or ON-to-EMULATION transition trigger condition is:

- Any wake-up event on PD_EMU

Transition sequence:

1. Transition trigger conditions are met.
2. LDO_WAKEUP initiates the transition.
3. Starts a counter for LDO_WAKEUP transition.
4. LDO_WAKEUP transition completes.

3.8.6 DVFS

Dynamic voltage and frequency scaling is a technique that can be used on the logic voltage domains (VDD_MPU_L, VDD_IVA-L, and VDD_CORE_L), independently of each other. Upon current or predictive performance request, determined by software according to ad hoc algorithms or heuristics, software can configure the PRCM module to change the OPP of a voltage domain. For an increase of performance, voltage is first raised, and then frequency is increased. For a decrease of performance, frequency is first decreased, and then voltage is dropped.

3.8.6.1 EMIF Clocks Frequency Scaling Constraints

The CD_EMIF clock domain is inside the PD_CORE power domain. The EMIF subsystem is getting several clocks:

- L3 interface clock
- DLL_CLK clock (that is, DLL clock): For the DLL only
- EMIF_FCLK clock: For external memory access and source of functional clock to EMIF. EMIF_FCLK frequency is DDR_PHY_CLK/2. DDR_PHY_CLK frequency is PHY_ROOT_CLK/2.

L3 interface clock frequency can be changed on the fly without affecting EMIF operations as long as DLL_CLK and PHY_ROOT_CLK clocks are not affected. EMIF has internal asynchronous bridge to handle different interface and functional clocks.

When DDR PHY clock frequency is to be changed, EMIF must be put into IDLE state. This ensures that external memory is in self-refresh mode.

Similarly, DLL frequency change implies that DLL must relock. It can be done only when EMIF is in IDLE state. Relock time is 400 DLL clock cycles.

The EMIF clocking scheme allows for change of OPP without DLL relock (that is, DLL is clocked by a relatively low frequency supported in all OPPs). Then change of OPP consists only of changing the DDR PHY clock frequency (and eventually L3 interface clock frequency).

NOTE: Software must ensure that no master module tries to access the registers of the EMIF during this sequence.

EMIF clocks control requirements in the PRCM module:

- EMIF clock frequency setting must be done through shadow registers for DLL_CLK and DDR_PHY clocks.
- EMIF clock frequency update bit field must be used to copy shadow register value as current values.
- The PRCM module hardware manages automatic EMIF clock frequency update sequence:
 1. Put the EMIF into IDLE state.
 2. Upload shadow register values in corresponding current register and wait for new EMIF clocks to be stable.
 3. Put the EMIF module back into ACTIVE state.

NOTE: The PRCM module must not gate the DLL_CLK and DDR_PHY clocks during automatic EMIF frequency change.

There is a programming model to perform automatic EMIF frequency changes as part of an OPP change (DVFS) or not. The automatic EMIF frequency change must always be performed while CD_EMIF is under software-forced wakeup (SW_WKUP).

VDD_CORE_L voltage fixed and only clock frequency switching

To change EMIF clock frequency without a voltage change (example, change of SYS_CLK divider value while DPLL_CORE is in bypass, change of DPLL_CORE mode between bypass and lock):

1. Software writes new EMIF timing parameters in shadow registers of the EMIF.
2. It then configures the clock selection and frequency setting shadow registers in the PRCM module.

3. The PRCM module sends an idle request to the EMIF (overriding the software settings of the MODULEMODE bit field for EMIF).
4. EMIF stalls transactions on internal interconnect, completes all committed transaction to the external memory and then puts the external memory in self-refresh mode.
5. The EMIF module then acknowledges the idle request of the PRCM module.
6. The PRCM module uploads the values configured in the shadow register bit fields to the corresponding current register bit fields.
7. The PRCM module waits for stabilization of the PHY_ROOT_CLK and DLL_CLK clocks through hardware monitoring, according to new settings.
8. The PRCM module requests the EMIF to exit idle (stops the overriding of the software settings of the MODULEMODE bit field for EMIF).
9. The PRCM module clears the frequency update field.
10. The EMIF copies the timing parameter configured in the shadow register as the current values.
11. The EMIF acknowledges that the PRCM module is functional, and starts accepting the transactions on the internal interconnect.
12. If DLL clock was changed, the EMIF waits for DLL to be relocked and transactions on internal interconnect, if required. The PRCM module is not aware of the DLL operations.
13. Accesses to SDRAM are serviced again.

Software execution can be stalled during the frequency change without harm as the critical hardware sequence is performed without software intervention. After having set the frequency update field, software should only poll for its clearing.

Accesses to external SDRAM are stalled for the following durations:

- 2 μ s maximum due to EMIF entering and exiting idle
- + 400 DLL clock cycles in case DLL clock frequency has changed.
- + DPLL lock time in case DPLL has been locked.

VDD_CORE_L voltage change for OPP switching

It is assumed that DLL clock frequency is not changed and that the DPLL_CORE mode is not changed and stays locked. Only the DDR_PHY clock frequency is changed using the post divider. L3 clock is likely also changed, but it does not affect the EMIF.

Accesses to external SDRAM must be stalled at maximum during 2 μ s due to this sequence.

Voltage scaling up consists of:

- Software indicates to EMIF that voltage change operation has started to allow EMIF to ensure regular code updates from DLL masters.
- Software disables SmartReflex for core voltage.
- Software performs direct VDD_CORE setting to new noncorrected value (for weak silicon) and wait for voltage stabilization.
- Software configures SmartReflex for corresponding OPP.
- Software re-enables SmartReflex for core voltage.
- Software indicates to EMIF that voltage change operation is complete and it does not need to control the code update from DLL masters directly.

3.8.6.2 GPMC Clocks Frequency Scaling Constraints

CD_L3_2 is inside the PD_CORE power domain. It supplies the L3_ICLK2 clock to the general-purpose memory controller (GPMC) module, which is used as interface and functional clock. GPMC timing parameters are supposed be programmed at boot for the nominal OPP. These timing parameters can be used for lower L3 frequency, at the downside of having slower access to external memory.

External memory connected to GPMC may not support on-the-fly L3 frequency changes. The following sequences are used to perform L3 frequency change as part or not of an OPP change (DVFS).

Hardware-controlled sequence

1. Software writes new L3 clock settings in the shadow register and sets the frequency update field.
2. The PRCM module requests idle to the GPMC.
3. The GPMC requests disconnection of its interconnect port and completes all outstanding transactions.
4. The GPMC acknowledges idle. Any access to the GPMC is then stalled.
5. The PRCM module uploads the values of the shadow register bit field in the corresponding current bit field.
6. The PRCM module waits for stabilization of the L3 clocks by monitoring the DPLL_CORE lock and/or divider acknowledge signals according to new settings.
7. The PRCM module clears the frequency update field.
8. The PRCM module requests the GPMC to exit idle.
9. The GPMC reallows interconnect connection and acknowledges it is functional.
10. Accesses to external memory are serviced again.

NOTE:

- The frequency update field is the same as the one for EMIF clock change. The same hardware in the PRCM module handles the frequency change of L3, DDR_PHY, and DLL clocks.
- If the GPMC supports on-the-fly L3 frequency change, then the [CM_SHADOW_FREQ_CONFIG2\[0\]](#) GPMC_FREQ_UPDATE bit can allow bypassing of the sequence.

Software-controlled sequence

1. Software configures the PRCM module to disable the GPMC.
2. The PRCM module requests idle to the GPMC.
3. The GPMC requests disconnection of its interconnect port and completes all outstanding transactions.
4. The GPMC acknowledges idle. Any access to the GPMC is then stalled.
5. Software programs the PRCM module to change L3 frequency and wait for L3 stabilization.
6. Software configures the PRCM module to re-enable the GPMC.
7. GPMC reallows interconnect connection and acknowledges it is functional.
8. Accesses to external memory are serviced again.

3.8.6.3 CORE DVFS Versus Subsystem Functionality**3.8.6.3.1 Display Subsystem**

The display subsystem is part of the CORE voltage domain. It has internal FIFOs that are sized to sustain a change of OPP on the CORE voltage domain with no DPLL relock and no DLL frequency change. Accesses to external SDRAM are stalled at maximum during 2 μ s in these conditions. The DSS functional clock is not affected by the change of OPP on CORE voltage domain. Hence, the DSS supports on-the-fly DVFS of the CORE voltage domain, assuming selected OPP remains compatible with the current DSS processing.

3.8.6.3.2 IVAHD

IVAHD is part of the IVA voltage domain. It can sustain a temporary stall of external SDRAM accesses because it is not real-time processing. IVAHD functional clock is not affected by the change of OPP on the CORE voltage domain; therefore, the IVAHD supports on-the-fly DVFS of the CORE voltage domain.

3.8.6.3.3 Imaging Subsystem

The Imaging subsystem (ISS) is part of the CORE voltage domain. It is real-time processing (or data flow). It cannot support a 2- μ s stall of external SDRAM access, due to the heavy data throughput (FIFO size increase is prohibitive). As a consequence, the ISS does not support on-the-fly change of OPP on CORE voltage domain. However, the CORE DVFS can be synchronized to the interframe idle window of ISS. During this window, ISS does not initiate transaction to external SDRAM. Core OPP can be changed safely assuming selected OPP remains compatible with the current ISS processing. ISS functional clock frequency can either remain unchanged, or be scaled according to the OPP change, assuming it remains compatible with the current ISS processing. This is the responsibility of software.

Example: CORE OPP change OPP50→OPP100, with functional clock frequency unchanged – OPP is 50%, ISS functional clock is at 50 MHz, clock coming from CORE DPLL, ISS clock divider is set to 4

Software performs OPP change: OPP50→OPP100, – ISS is now at 100 MHz, software sets the ISS clock divider to 8, ISS functional clock is back at 50 MHz.

3.8.6.4 DVFS Voting Mechanism (VDD_CORE_L and VDD_IVA_L Voltage Domains)

3.8.6.4.1 CORE OPP Voting Architecture

Core voltage domain operating point can be determined based on the following system masters:

- APE DSP processor
- APE Cortex-M3 MPU processor
- Modem

The PRCM module provides:

- Four read/write voting registers (that is, CM_CORE_DVFS_PERF_n, where n = 1 to 4). Software can use these to specify the performance level of the CORE voltage domain as requested by each system master (likely EMIF bandwidth only). Software must encode the bit fields; encoding is not interpreted by hardware.
- One read/write register (that is, CM_CORE_DVFS_CURRENT) to identify the current CORE voltage domain OPP setting. Software must configure this register based on current OPP setting of the register. It is not managed by hardware.

Voting Mechanism, For details on the voting mechanism for DVFS on the voltage domain, see [Section 3.8.6.4.3](#).

3.8.6.4.2 IVA OPP Voting Architecture

IVA voltage domain operating point can be determined based on the following subsystems performing different type of processing:

- DSP processor
- IVAHD accelerator
- ABE

The PRCM module provides:

- A read/write voting register (that is, CM_IVA_DVFS_PERF_Subsystem name) for each subsystem. Software can use these, to specify the performance level of the IVA voltage domain as requested by each subsystem. Software must encode the bit fields; encoding is not interpreted by hardware.
- One read/write register, that is, CM_IVA_DVFS_CURRENT, to identify the current IVA voltage domain OPP setting. It is again the software's responsibility to configure this register based on current OPP setting of the register. It is not managed by hardware.

See [Section 3.8.6.4.3, Voting Mechanism](#), to understand the voting mechanism for DVFS on the voltage domain.

3.8.6.4.3 Voting Mechanism

The operating point change for the CORE and IVA voltage domains can be performed by the respective masters or subsystems by executing the following steps:

1. Obtain ownership of the voltage domain DVFS semaphore using the SPINLOCK module.
2. Write new performance requirement value in its voting register.
3. Read the current OPP and the voting registers.
4. Compute the result of the voting using an ad hoc algorithm (for example, sum of performance requirements).
5. If the current OPP does not match the voting result (that is, either the OPP must be decreased in case of low performance demand, or the OPP must be increased in case of high performance demand) then the system master performs voltage domain OPP change to best match the voting result.
6. When change of OPP is completed, update the current voltage domain OPP register accordingly.
7. Release the voltage domain DVFS semaphore, using the SPINLOCK module.

3.9 Device Low-Power States

The device low-power states are the result of any valid combination of power domain states in which all the power domains are no longer in ACTIVE state. In such a situation the PRCM module hardware can trigger events to further lower the consumption of the device and the system.

Typically, the PRCM module can lower or even turn off the SMPS, shut down the system clock supplier, and allow the external power IC to turn off its internal resources.

These device low-power states are characterized by the system power consumption, the wake-up latency, and the required functionality.

The low-power states are:

- RETENTION: All the logic voltage domain (VDD_IVA_L and VDD_CORE_L) are in RETENTION state
- OFF: All the logic voltage domains are in OFF state
- LOW POWER: Any combination of logic voltage domains states (ON, SLEEP, and RETENTION state), other than those identified above.

Once the PRCM module hardware detects any valid combination of power domain state and if a proper programming model of the PRCM module has been set, the PRCM module automatically triggers the transition into the device low-power mode.

3.9.1 Device Wake-Up Source Summary

Each power domain in the device may contain modules that can generate the wake-up events. However, when the device is in OFF power state and all the logic voltage domains are off, only the modules with wake-up capability and that are in the PD_WKUP or PD_EMU power domain can generate the wake-up event. Modules in the other power domains require that their voltage domain be in RETENTION, SLEEP, or ON state to generate a wake-up event. Some modules may have a further constraint that their power domain should be in ON-INACTIVE or CSWR state to generate the wake-up event.

The wake-up events can be asynchronous or synchronous. Synchronous wake-up events require the 32-kHz clock or the system clock to be active, while asynchronous wake-up events do not require any active clock.

The Modules Attributes subsection of each clock domain in [Section 3.6, Clock Management Functional Description](#), presents the wake-up capability support for each module of the corresponding power domain.

While the device is in STANDBY mode, additional asynchronous wakeup events from other domains are able to wake up the device.

[Table 3-331](#) identifies which modules in which power domains can be configured to generate a wake-up while the device is in a low-power mode.

Table 3-331. Wake-Up Sources During Device Low Power Mode

| Device Power Mode | VDD_CORE_L state | VDD_MPU_L state | VDD_IVA_L state | Domain able to generate wakeup | Wakeup source |
|-------------------|---------------------------------------|-----------------|-----------------|--------------------------------|--|
| OFF | OFF | OFF | OFF | PD_WKUP | GPIO1 ⁽¹⁾ , Keyboard, GPTIMER1, WDT2, PRM interrupt requests towards Cortex-A9 MPU, C2C wake-up |
| | | | | PD_EMU | Any FORCEACTIVE directive |
| STANDBY | Any combination of RET or SLEEP state | | | PD_AUDIO ⁽²⁾ | DMIC, McASP, WDT3, |
| | | | | | McBSP1, McBSP2, McBSP3 |
| | | | | | McPDM, SLIMBUS1 |
| | | | | PD_CORE | Cortex-M3 MPU ⁽¹⁾⁽³⁾ |
| | | | | | SDMA ⁽¹⁾⁽³⁾ |
| | | | | | C2C ⁽²⁾⁽³⁾ |
| | | | | PD_L3_INIT | HSMMC1, HSMMC2 |
| | | | | | HSI |
| | | | | | HSUSBOTG ⁽⁴⁾ |
| | | | | | HSUSBHOST, HSUSBTLL |
| | | | | PD_L4_PER | GPIO2, GPIO3, GPIO4, GPIO5, GPIO6 |
| | | | | | I2C1, I2C2, I2C3, I2C4 |
| | | | | | McBSP4 |
| | | | | | McSPI1, McSPI2, McSPI3, McSPI4 |
| | | | | | HSMMC3, HSMMC4, HSMMC5 |
| | | | | | SLIMBUS2 |
| | | | | | UART1, UART2, UART3, UART4 |
| | | | | PD_MPU | Cortex-A9 MPU ⁽¹⁾⁽³⁾ |
| | | | | PD_DSP | DSP ⁽¹⁾⁽³⁾ |
| | | | | PD_WKUP | GPIO1, Keyboard |
| | | | | | GPTIMER1, WDT2 |
| | | | | | PRM interrupt request towards Cortex-A9 MPU, Cortex-M3 MPU, or DSP |
| | | | | | C2C wake-up |
| | | | | PD_EMU | Any FORCEACTIVE directive |

⁽¹⁾ True in every domain power state⁽²⁾ Only modules able to generate asynchronous wake-up have to be taken into account, and only when domain is in INACT or CSWRET state.⁽³⁾ These modules have master wake-up (mwakeup) capability⁽⁴⁾ These modules have both master wake-up and slave wake-up capability

Table 3-331. Wake-Up Sources During Device Low Power Mode (continued)

| Device Power Mode | VDD_CORE_L state | VDD_MPU_L state | VDD_IVA_L state | Domain able to generate wakeup | Wakeup source |
|-------------------|------------------|-----------------|-----------------|--------------------------------|------------------------------------|
| | | | | | Dynamic dependency towards CD_L3_2 |
| | | | | PD_ALWON_CORE | SR_CORE, SR_IVA, SR_MPU |

NOTE: Any GPIO module can be a source of wake-up from OFF mode. For more information, see [Section 3.9.4, I/O Management](#).

3.9.2 Device RETENTION State Management

In RETENTION state, the voltages to the device are lowered to their minimum value to retain only the logic build with RFFs, while all DFF logic is lost. The memory area may be retained, depending on software configuration.

The device integrates enhanced device wake-up management while in RETENTION state. This allows:

- Triggering wake-up with limited capabilities from almost all programmed input pads all around the device.
- Triggering wake-up with full capabilities by using few GPIO inputs in the PD_WKUP power domain.

The logic voltages VDD_CORE_L, VDD_MPU_L, and VDD_IVA_L can transition to their retention value independently. Once the voltage domain state transition conditions are met in compliance with the software configuration, the PRCM module hardware initiates the transition into RETENTION state by sending an I²C command for the corresponding SMPS.

When all the logic voltages are transitioned to their RETENTION state, the PRCM module hardware can, depending on a software configuration, toggle its system clock request and/or its power request to allow the SCRM to shut down the system clock source and to request the external power IC to shut down internal resources.

The PRCM module, SCRM, and the external power IC can also be programmed so that the voltage VDD_CORE_L is managed by the power request signal. This means the following:

- The power IC manages the ramp-down and ramp-up time of the VDD_CORE_L SMPS when the power request is toggled.
- The SCRM accounts for the overall setup of the PMIC resources (internal PMIC resources and VDD_CORE_L SMPS).
- The PRCM module sends RETENTION and ON commands through the I²C interface. The retention voltage value must be equal to the current voltage value and the value of the On voltage must be set to the expected voltage value following the wakeup. Also, the setup time periods corresponding to the SMPS ramp-up and ramp-down must be set to a zero value.

3.9.3 Device OFF State Management

The off mode is the device mode where all power domains except for PD_WKUP are in OFF state and the logic voltage domains (VDD_MPU_L, VDD_IVA_L, and VDD_CORE_L) are shut down by the external power IC. Other power sources, such as the DPLL supplies, can be shut down by the external power IC during the off mode period.

The device integrates enhanced device wake-up management while in RETENTION state. This allows:

- Saving I/Os leakage by settings pads in the lowest power state compatible with the device environment.
- Triggering wakeup with limited capabilities from almost all programmed input pads all around the device.
- Triggering wakeup with full capabilities by using few GPIO inputs in the PD_WKUP power domain.

This section details the way the PRM manages and sequences the control of the various off mode contributors:

- LDO_WAKEUP
- Memory LDOs
- ABB LDOs
- Voltage controller
- Hardware save-and-restore (SAR) mechanism
- Hardware power request signal

NOTE: For more information about the SAR mechanism, see [Section 17.4.21](#), *Auto-Restore Feature*, in [Chapter 17](#).

Once the hardware conditions is met and according to the software configuration, the PRCM module hardware initiates the transition into off mode by sending I²C commands for each SMPS and by respecting required sequencing between the voltage domains.

When all the logic voltages are transitioned to their RETENTION state, the PRCM module hardware can, depending on a software configuration, toggle its system clock request and/or its power request:

- to allow the SCRM to shut down the system clock source.
- to request the external power IC to shut down internal resources.

The PRCM module, SCRM, and the external power IC can also be programmed so that the voltage VDD_CORE_L is managed by the power request signal. This means the following:

- The power IC manages the ramp-down and ramp-up time of the VDD_CORE_L SMPS when the power request is toggled.
- The SCRM accounts for the overall setup of the PMIC resources (internal PMIC resources and VDD_CORE_L SMPS).
- The PRCM module sends OFF and ON commands through the I²C interface. The OFF voltage value must be equal to the current voltage value and the value of the On voltage must be set to the expected voltage value following the wakeup. Also, the setup time periods corresponding to the SMPS ramp-up and ramp-down must be set to a zero value.

3.9.3.1 Device Off Mode Sleep Sequence

This section describes the main steps of the device off mode sleep sequence. The OFF command to shut down the voltages VDD_MPU_L, VDD_IVA_L, and VDD_CORE_L can be sent through the I²C interface. VDD_CORE_L may also be controlled independently using the power request signal.

NOTE: The power request signal can be used to turn off other resources of the power-management IC, even when it is not used for the VDD_CORE_L management.

NOTE: LDOs in the power companion device (TWL60xx), which are turned off in ACTIVE state, are switched on when entering into SLEEP state with the default value.

After the first power on, all resources must be configured, especially the power resources that are not part of the power-up sequence. This must be done by sending a command through the I²C interface.

1. Software has completed preliminary settings such as:
 - Settings in the external power IC
 - Voltage transition settling time settings in the PRCM module
 - Context save for the relevant modules
 - System control module is configured with valid I/O pads off mode configuration.
 - Enable/disable the wake-up feature for each pad by programming the system control module.

- Enable/disable the automatic gating of the system clock (PRCM).
 - Enable the I/O wake-up scheme (PRCM).
 - Program a consistent power state for each power domain (that is, OFF state for domains without hardware restored modules and OSWR state for domains with hardware restored modules build with RFF logic).
 - All modules in the PD_WKUP power domain must have their interrupts to Cortex-M3 and DSP, and their DMA requests to sDMA disabled.
 - Program automatic transition of the CD_WKUP clock domain.
 - Enable the off mode scheme (PRCM).
 - Configure the VDD_CORE_L management option:
 - Disable the option if a power request signal is not used for VDD_CORE_L management.
 - Enable the option if a power request signal is used for VDD_CORE_L management.
2. The PRCM module initiates the transition into off mode upon all of the following conditions:
- All the programmable power domains have reached their targeted Low-Power state which can either be Off or OSWRET. It does not apply to always-on power domains and to the EMU power domain.
 - The CD_WKUP clock domain is idled.
 - OFF mode has been enabled by software.
- At this stage the I/O wake-up scheme through the I/O pad daisy-chain is already enabled. The I/O isolation scheme is managed in parallel with the following sequence (see [Section 3.9.4, I/O Management](#)).
3. The PRCM module triggers in parallel:
- Switch off all SRAM LDOs.
 - Bypass all ABB LDOs.
 - Isolate the analog area from digital supply removal.
4. The PRCM module then sends in a row the OFF command for the voltages VDD_IVA_L and the VDD_MPU_L, once the following conditions are met:
- I/O isolation scheme is complete.
 - SRAM LDOs have ramped down to 0 V.
 - ABB LDOs have switched in bypass.
- The order between the two OFF commands is irrelevant and managed by the voltage controller.
5. Once the voltages VDD_IVA_L and VDD_MPU_L are ramped down to 0 V the PRCM module sends the Off command for the voltage VDD_CORE_L:
- If power request signal is not used for VDD_CORE_L management then the VDD_CORE_L is ramped down to 0 V.
 - If power request signal is used for VDD_CORE_L management then the OFF command for the voltage VDD_CORE_L, through the I²C interface, has no effect and the voltage VDD_CORE_L remains unchanged.
6. Once the OFF command for VDD_CORE_L is sent and acknowledged, the PRCM module gates locally its system clock.
7. The PRCM module deasserts the signal system clock request to the SCRM, if so configured by software. Similarly, it deasserts the signal power request if configured by software.
- If power request signal is used for VDD_CORE_L management, then VDD_CORE_L is ramped down to 0 V.
8. The SCRM acknowledges the power request to the PRCM module. This acknowledge is required by the PRCM module before toggling the signal power request again.
9. The SCRM informs the PRCM module that all versions of the system clock have been gated; hence the PRCM module can transition the LDO_WAKEUP to SLEEP state if the PD_EMU power domain is in OFF state.
10. The DEVICE_OFFWKUP_CORERSTACTST signal intended for the core control module is asserted. The EMIF1_DEVICE_OFFWKUP_CORERSTACTST and

EMIF2_DEVICE_OFFWKUP_CORERSTACTST signals intended for EMIF1 and EMIF2, respectively, are asserted according to their associated register bit fields, EMIF1_OFFWKUP_DISABLE and EMIF2_OFFWKUP_DISABLE.

3.9.3.2 Device Off Mode Wake-Up Sequences

The wake-up sequence includes a phase of hardware restore. Depending on the wake-up event source the restore sequence completes in one or two phases. The first phase always occurs and is sufficient to serve some type of wake-up events; for other sources of event a second phase is required and occurs immediately after the first phase. Phase 2 is split into two subphases (phase 2a and phase 2b). The device returns to off mode after the first phase completes.

Table 3-332 lists the device off wake-up and hardware restore phases.

Table 3-332. Device Off Wake-Up and Hardware Restore Phases

| Wake-Up Event | Phase 1 | Phase 2 | Comment |
|--|---------|---------|--|
| Wake-up request from PD_WKUP | Yes | Yes | This event must wake up the PD_MPU power domain by dependency. |
| PRM interrupt toward MPU-A9 (includes I/O wake-up detection) | Yes | Yes | This event wakes up the PD_WKUP power domain. The PD_MPU power domain wakes up by broadcast of the wake-up event, and the MPU-A9 boots up. |
| Global warm reset | Yes | No | After voltage stabilization, phase 1 restoration is performed. Then MPU-A9 reboots, because global warm reset is a source of PD_MPU power domain wakeup. |

3.9.3.2.1 Wake Up From a Wake-Up Event

This section describes the main steps of the wake-up sequence to exit the device from off mode. The ON command to ramp-up the voltages VDD_MPU_L, VDD_IVA_L, and VDD_CORE_L can be sent through the I²C interface. VDD_CORE_L can also be controlled independently using the power request signal.

NOTE: The power request signal can be used to turn on other resources of the power-management IC, even when it is not used for the VDD_CORE_L management.

Additionally it is assumed in this sequence that the wake-up source is not a global warm reset.

1. The PRCM module switches the LDO_WAKEUP from SLEEP to ON state and waits for the setup time of the LDO_WAKEUP (that is, four clock cycles of the 32-kHz clock).
2. The PRCM module asserts the system clock request signal to the SCRM, which in turn sends the request to the external power IC. The SCRM accounts for the system clock stabilization time before enabling the clock to the PRCM module.
3. The PRCM module also asserts the power request signal to the SCRM. The PRCM module waits for the acknowledge of its power request signal and activation of the system clock before sending an I²C command for the voltage ramp-up sequence.
 - If power request signal is used for VDD_CORE_L management, then the power-management IC ramps up the voltage VDD_CORE_L.
 - If power request signal is not used for VDD_CORE_L management, then the voltage VDD_CORE_L is unchanged.
4. The PRCM module sends the ON command for the VDD_CORE_L voltage ramp up, through the I²C interface and waits for the setup time of the SMPS.
 - If power request signal is used for VDD_CORE_L management, then the voltage VDD_CORE_L is unchanged.
 - If power request signal is not used for VDD_CORE_L management, then the power-management IC ramps up the voltage VDD_CORE_L.
5. The PRCM module sends in a row the ON commands for the voltages VDD_MPU_L and VDD_IVA_L and waits for the setup time of the two SMPS.
6. The PRCM module enables the system clock to the eFuse controller and releases its reset line. It

holds the other asserted resets until completion of the EFUSE bits sensing.

7. The PRCM module waits for the stabilization of the bandgap, memory LDOs and ABB LDOs stabilization.
8. Hardware restore phase 1 starts:
 - (a) The PRCM module ensures that:
 - CORTEXA9, CORTEXM3, and DSP are held in reset.
 - C2C is kept in STANDBY state.
 - The sDMA receives the restore request.
 - Phase 1 descriptor start address is sent to the sDMA.
 - MODULEMODE bit field of the L3_3 module is overridden to auto mode. This ensures the successful restoration of its firewalls during phase 1 of the restore.
 - (b) The PRCM module generates a wake-up event on the CD_SDMA clock domain. As a result, the PD_CORE power domain and CD_SDMA wake up. This causes CD_L3_1, CD_L3_2, CD_L4_CFG, CD_MEMIF, CD_L4_PER, and CD_L3_INIT to wake up because of the wake-up broadcast due to static dependency and their respective reset are released once their clock is active. The clock domain L4_WKUP wakes up (due to a wake-up broadcast on static dependency).
 - (c) The sDMA switches from STANDBY to ACTIVE state and performs phase 1 of the hardware restore:
 - Firewalls
 - System control module
 - EMIF
 - Part of the CM1 and part of the CM2 (core clock configuration, registers CLKTRCTRL of the CD_MPU, CD_L3_1, CD_L3_2, CD_L4_CFG, CD_MEMIF, CD_L4_PER, and CD_L3_INIT clock domains)

The sDMA makes the last write into the PRCM module end of phase 1 bit field. The PRCM module then switches it to STANDBY state and resets it.
 - (d) The PRCM module releases I/O isolation of the EMIF. The other I/Os stay isolated.
 - (e) The PRCM module checks and waits if necessary for the DPLL_CORE to be in a stable state.
 - (f) In parallel, the PRCM module does the following:
 - Releases the condition preventing C2C to remain in STANDBY state
 - Releases the override of the MODULEMODE bit field of the L3_3 module
9. Upon a need to perform phase 2 of the hardware automatic restore (according to the wake-up source), the following sequence occurs:
 - (a) Phase 2a sequence.
 - (i) The PRCM module drives the phase 2a descriptor start address to the sDMA.
 - (ii) The PRCM module releases the sDMA from reset.
 - (iii) The PRCM module generates a wake-up event on the CD_SDMA clock domain (same as in Step 2 of phase 1).
 - (iv) The sDMA performs phase 2a of the hardware restore:
 - The MODULEMODE bit field of each module to be restored during phase 2b is set to Enabled or Auto and the SARMODE bit field is enable if applicable. Only modules that have just interface clock(s) can be restored automatically.
 - The **CM_SDMA_STATICDEP** register is set to enable all necessary static dependency To wake up all power domains having modules to be restored during phase 2b

The sDMA makes the last write into the PRCM module at the end of phase 2a bit field. The PRCM module then switches it to Standby state and resets it. This completes phase 2a.
 - (b) Phase 2b sequence:
 - (i) The PRCM module drives the phase 2b descriptor start address to the sDMA.
 - (ii) The PRCM module releases the sDMA from reset.
 - (iii) The PRCM module generates a wake-up event on the CD_SDMA clock domain (same as in

Step 2 of phase 1).

(iv) The sDMA performs phase 2b of the hardware restore:

- Restore of the relevant modules

The sDMA makes the last write into the PRCM module at the end of the phase 2b bit field. The PRCM module then switches it to STANDBY state and resets it. This completes phase 2b.

10. The PRCM module releases I/O isolation of the remaining I/O, only if the [PRM_IO_PMCTRL.ISOOVR_EXTEND](#) bit field is not set.
11. The PRCM module releases the reset stall conditions holding CORTEXA9, CORTEXM3, and DSP in reset.
12. The PD_MPU power domain is woken up if required according to the wake-up source.

3.9.3.2.2 Wakeup Upon Global Warm Reset

When global warm reset is the source of the device wakeup, the sequence referred in [Section 3.9.3.2.1, Wake Up From a Wake-Up Event](#), is modified as follows:

Steps 4 and 5 are replaced with:

- The PRCM module waits for the three voltages VDD_MPU_L, VDD_IVA_L, and VDD_CORE_L stabilization time. It uses the [PRM_VOLTSETUP_WARMRESET](#) register for that purpose.

Step 6 is replaced by:

- The PRCM module enables the system clock to the eFuse controller and releases its reset line. In parallel, the device reset manager counts for global reset extension (setup by the [PRM_RSTTIME\[9:0\]](#) RSTTIME1 bit field). The PRCM module holds the other asserted resets until eFuse bits sensing completes and the global reset counter overflow.

Phase 2 of the hardware restore sequence is skipped.

Hardware blocks and modifies the [FREQ_UPDATE](#) bit field of [CM_SHADOW_FREQ_CONFIG1](#) register during phase 1.

3.9.3.3 Global Warm Reset During a Device Wake-Up Sequence

If a global warm reset occurs before the PRCM module completes voltage stabilization count, the global warm reset is applied immediately. As a consequence, the sequence described in [Section 3.9.3.2.2, Wake Up Upon Global Warm Reset](#), is performed.

If the global warm reset occurs after the PRCM module completes voltage stabilization (during eFuse sensing or during phase 1 of automatic restore):

- Global warm reset is delayed and applied after of phase 1 restore completes.
- Phase 2 of restore is discarded.
- The MPU boots after the warm reset sequence completes.

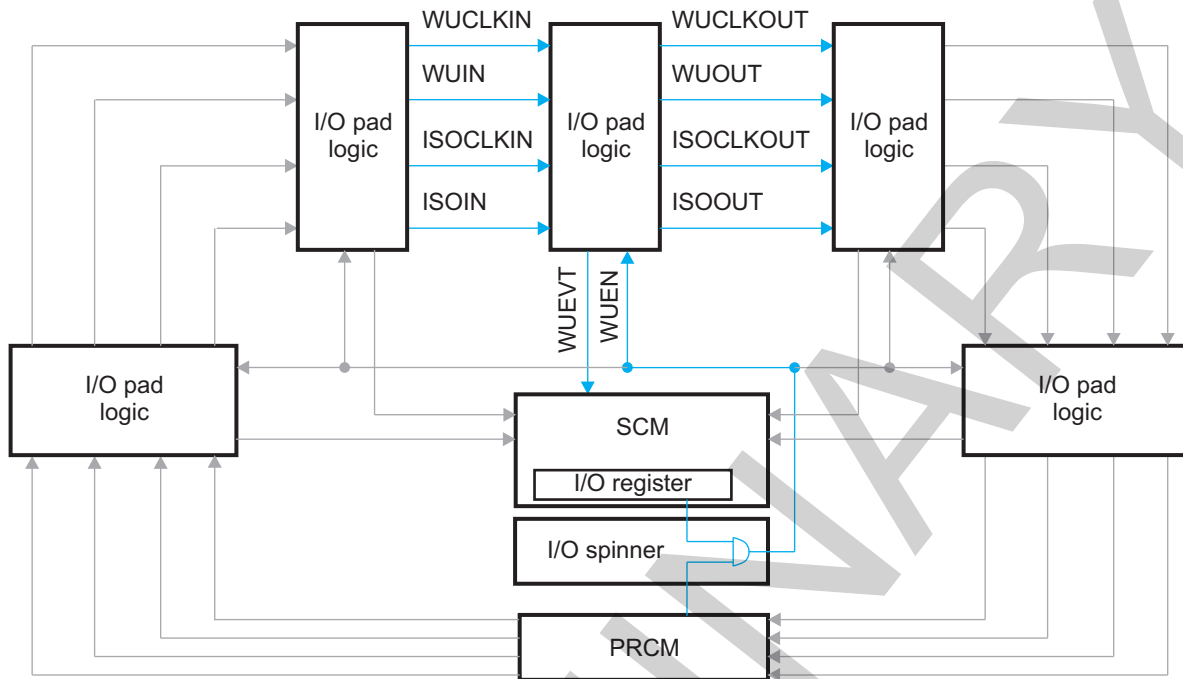
If the global warm reset occurs during phase 2 of automatic restore:

- Global warm reset is applied immediately.
- Phase 2 of restore is discarded.
- The MPU boots after the warm reset sequence completes.

3.9.4 I/O Management

[Figure 3-80](#) is an overview of the power-management modules and their internal connections with a generic power domain.

Figure 3-80. I/O Pads Daisy-Chain Configuration



prcm-076

Any I/O pad of the device can be configured to generate a wake-up event when the device is in off mode. This is managed by the configurations in the system control module and the PRM.

In the off mode, the I/O pads of the device form a daisy chain with the I/O pad logic output of one pad connected to the I/O pad logic input of the next one. The I/O pad logic at the two ends of the chain is connected to the PRM.

The I/O pad wake-up scheme must be enabled (WUEN signal) globally by setting the [PRM_IO_PMCTRL\[16\]](#) GLOBAL_WUEN bit and by also setting I/O pad wake-up enabled/disabled individually (WUEN signal) by writing to the following bit fields in the control module:

- CONTROL.CONTROL_(CORE/WKUP)_PAD0_X_PAD1_Y [14] WAKEUPENABLE
- CONTROL.CONTROL_(CORE/WKUP)_PAD0_X_PAD1_Y [30] WAKEUPENABLE

Once configured, the wake-up scheme within each I/O pad is enabled and disabled by triggering a control (WUCLKIN signal) of the I/O daisy chain. This is done thanks to a dedicated PRM module register bit [PRM_IO_PMCTRL\[8\]](#) WUCLK_CTRL. The software must enable the I/O wakeup prior entering a low-power mode and disable it following a wake-up event.

Setting the [PRM_IO_PMCTRL\[8\]](#) WUCLK_CTRL bit to 1 asserts the WUCLKIN signal high to reset spurious wake-up event and to latch the current pad input value. PRM module register [PRM_IO_PMCTRL\[9\]](#) WUCLK_STATUS logs the WUCLKOUT signal of the last pad of the I/O ring. Once this status is set to 1, software may clear the [PRM_IO_PMCTRL\[8\]](#) WUCLK_CTRL bit to effectively enable or disable the wake-up feature within each pad.

Additionally, it is required that the WUCLKIN is forced to 1 during global power-on reset. The I/O wake-up feature is enabled or disabled depending on a control (the WUEN signal) for each I/O pad. This control is generated by the Spinner logic resulting of the combination of a local enable/disable bit per pad in the control module and a global enable/disable bit located in the PRM module, that is, [PRM_IO_PMCTRL\[16\]](#) GLOBAL_WUEN.

When a wake-up event is detected by a wake-up enabled I/O pad in the daisy chain, it is logged within the I/O and is conveyed to the system control module (the WUEVT signal). All the I/O wake-up event statuses are mapped on memory-mapped registers in the system control module.

When the device wakes up, the MPU can determine all sources of the current wake-up event logged into the corresponding bit fields in the control module.

- CONTROL.CONTROL_(CORE/WKUP)_PAD0_X_PAD1_Y [15] WAKEUPEVENT
- CONTROL.CONTROL_(CORE/WKUP)_PAD0_X_PAD1_Y [31] WAKEUPEVENT

For information about the control module, see [Chapter 19, Control Module](#).

I/Os have two associated buffers, that is, 1.2 V and 1.8 V. A software configuration determines which one is used in normal operation. However, in the device off mode, the 1.2-V buffer is always disabled, and the 1.8-V buffer stays on but is powered by 1.2 V instead of 1.8 V to minimize leakage, if pad configure to drive the output.

3.9.4.1 Hardware-Controlled I/O Isolation Sequences

I/Os have two buffers: 1.2 V and 1.8 V.

The software configuration determines whether the 1.2-V buffer or the 1.8-V buffer is used. Regardless of the buffer used, in off mode the 1.2-V buffer is always disabled and the 1.8-V buffer stays on but is powered by 1.2 V instead of 1.8 V to minimize leakage (if the pad is configured to drive the output).

In addition to this, I/Os support the following features:

- Wake-up override: The PRCM module can control the I/Os that are wakened; that is, brought out of isolation from device off mode based on the source of wakeup. The primary application of this feature is to restore only the minimal context of the device for access to EMIF upon C2C request.
- Wakeup phased wakeup: The I/Os support a phased wake-up approach; that is, the I/Os can be brought out of off mode isolation in two phases without affecting the functional operation of the I/Os already out of isolation. This feature is used to wake up the I/Os still held in isolation without affecting the EMIF operations when a full device wakeup is requested.

The I/O transitions are:

- Full on to full isolation: Pad output controls are stable (A, GZ). Pad off mode configuration is activated.
- Full Isolation to EMIF on: EMIF I/O interface is brought out of isolation. Partial device context is restored.
- EMIF on to full on: EMIF I/O interface are already out of isolation and a new wake-up event requires a full device wakeup.
- EMIF on to full Isolation: EMIF I/O interface and some nonrestore sensitive I/Os are already out of isolation. The PRCM module puts the device back in off mode.

3.9.4.2 Software-Controlled I/O Isolation

In addition to the hardware-controlled I/O transitions, a dedicated PRCM module register bit, [PRM_IO_PMCTRL\[0\] ISOCLK_OVERRIDE](#), can be used by the software to force the ISOCLKIN signal to the I/O pad. It is then propagated from one pad to the other in the wake-up enabled daisy-chain of I/Os. The PRCM module register [PRM_IO_PMCTR\[1\] ISOCLK_STATUS](#) logs the ISOCLKOUT signal of the last pad of the I/O daisy-chain.

NOTE: Override is used at boot time only when software needs to change the mode of an I/O from 1.8-V default mode to 1.2-V mode. When not overridden, this signal is controlled only by hardware.

[PRM_IO_PMCTRL\[4\] ISOOVR_EXTEND](#) bit allows extending the non-EMIF I/O isolation. This feature can be used by software to restore modules driving output such as GPIO while non-EMIF I/Os are still isolated. Once software completes the relevant module restore, it clears the bit and hardware performs the full-isolation-to-EMIF transition on hardware-controlled I/O transition.

The [PRM_IO_PMCTRL\[5\] IO_ON_STATUS](#) status bit is available for software to check completion of the EMIF on transition.

3.10 PRCM Module Programming Guide

3.10.1 DPLLs Low-Level Programming Models

This section covers the low-level hardware programming sequences for configuration and use of the module.

3.10.1.1 Global Initialization

3.10.1.1.1 Surrounding Module Global Initialization

This section identifies the requirements of initializing the surrounding modules when the module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the DPLLs.

[Table 3-333](#) shows the global initialization of the surrounding modules.

Table 3-333. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|---|
| PRCM | Ensure that the DPLL reference clock (gated version of system clock) is active. |

3.10.1.1.2 DPLL Global Initialization

3.10.1.1.2.1 Main Sequence – DPLL Global Initialization

This procedure initializes the DPLL after a power-on or software reset and then locks it to the desired synthesized clock frequency.

Table 3-334. DPLL Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------------------|
| Configure SSC parameters | See Section 3.10.1.1.2.2 . | |
| Configure Recalibration parameters | See Section 3.10.1.1.2.3 . | |
| Set DPLL automatic idle mode | CM_AUTOIDLE_DPLL name[2:0] AUTO_DPLL_MODE | xx ⁽¹⁾ |
| Configure synthesized clock parameters | See Section 3.10.1.1.2.4 . | |
| Configure output clocks parameters | See Section 3.10.1.1.2.5 . | |
| Lock DPLL | CM_CLKMODE_DPLL name[0] DPLL_EN | 0x7 |

(1) It depends on the desired auto idle mode. See [Section 3.6.3.3.3](#), *DPLL Power Modes*.

3.10.1.1.2.2 Subsequence – SSC Parameter Configuration

This procedure configures the SSC parameters for the DPLL and enables the SSC feature.

Table 3-335. DPLL SSC Parameter Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------------------|
| Configure M Step Size | CM_SSC_DELTAMSTEP_DPLL name[19:0] DELTAMSTEP | xx ⁽¹⁾ |
| Configure modulation frequency divider exponent part | CM_SSC_MODFREQDIV_DPLL name[10:8] MODFREQDIV_EXPONENT | xx ⁽¹⁾ |
| Configure modulation frequency divider mantissa part | CM_SSC_MODFREQDIV_DPLL name[6:0] MODFREQDIV_MANTISSA | xx ⁽¹⁾ |
| Enable/disable frequency downspread | CM_CLKMODE_DPLL name[14] DPLL_SSC_DOWNSPREAD | xx ⁽²⁾ |
| Enable SSC feature | CM_CLKMODE_DPLL name[12] DPLL_SSC_EN | 0x1 |

Table 3-335. DPLL SSC Parameter Configuration (continued)

| Step | Register/Bit Field/Programming Model | Value |
|----------------------------------|---------------------------------------|-------|
| Wait until SSC start acknowledge | CM_CLKMODE_DPLL name[13] DPLL_SSC_ACK | 0x1 |

- (1) See SSC description in [Section 3.6.3.3.5, DPLL Spread Spectrum Clocking](#).
 (2) The selected value depends on the desired SSC feature settings.

3.10.1.1.2.3 Subsequence – Recalibration Parameter Configuration

This procedure enables the recalibration feature and the associated processor interrupt flag.

Table 3-336. DPLL Recalibration Parameter Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--------------------------------------|--|-------|
| Clear recalibration interrupt status | PRM_IRQSTATUS_Processor name[x] DPLL name_RECAL_ST | 0x0 |
| Unmask recalibration interrupt flag | PRM_IRQENABLE_Processor name[x] DPLL name_RECAL_EN | 0x1 |
| Enable recalibration feature | CM_CLKMODE_DPLL name[8] DPLL_DRIFTGUARD_EN | 0x1 |

3.10.1.1.2.4 Subsequence – Synthesized Clock Parameter Configuration

This procedure configures the settings for the synthesized clock of the DPLL.

Table 3-337. DPLL Synthesized Clock Parameter Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------------------|
| Set DPLL clock synthesis multiplier | CM_CLKSEL_DPLL name[2:0] DPLL_MULT | xx ⁽¹⁾ |
| Set DPLL clock synthesis divider | CM_CLKSEL_DPLL name[2:0] DPLL_DIV | xx ⁽¹⁾ |
| IF : Low-power mode operation conditions satisfied? | Software test condition. See Section 3.6.3.3.2 . | |
| Enable DPLL low-power operation mode | CM_CLKMODE_DPLL name[10] DPLL_LPMODE_EN | 0x1 |
| ENDIF | | |

- (1) It depends on the desired synthesized clock frequency. See [Section 3.6.3.3, Generic DPLL Overview](#).

3.10.1.1.2.5 Subsequence – Output Clock Parameter Configuration

This procedure configures the settings for the output clocks of the DPLL.

Table 3-338. DPLL Output Clock Parameter Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|---|----------------------------|
| Set output clock dividers (that is, M2, M3 and Mn), where n is from 4 to 7. It depends on the available clock output of the DPLL. | CM_DIV_M2_DPLL name[4:0] DPLL_CLKOUT_DIV CM_DIV_M3_DPLL name[4:0] DPLL_CLKOUTHIF_DIV CM_DIV_Mn_DPLL name[4:0] HSDIVIDER_CLKOUTn-3_DIV | xx ⁽¹⁾ |
| Wait until divider change acknowledged | CM_DIV_M2_DPLL name[5] DPLL_CLKOUT_DIVCHACK CM_DIV_M3_DPLL name[5] DPLL_CLKOUTHIF_DIVCHACK CM_DIV_Mn_DPLL name[5] HSDIVIDER_CLKOUTn-3_DIVCHACK | Bit toggled ⁽²⁾ |

Table 3-338. DPLL Output Clock Parameter Configuration (continued)

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------------------|
| Enable/disable output clock dividers auto power-down feature. It applies to M2, M3, and Mn dividers, where n is from 4 to 7. It depends on the available clock output dividers of the DPLL. | CM_DIV_M2_DPLL name[12] DPLL_M2_PWDN CM_DIV_M3_DPLL name[12] DPLL_CLKOUTHIF_PWDN CM_DIV_Mn_DPLL name[12] HSDIVIDER_CLKOUTn-3_PWDN | xx ⁽³⁾ |
| Enable/disable output clocks automatic gating feature. It applies to M2, M3, and Mn clock outputs, where n is from 4 to 7. It depends on the available clock output of the DPLL. | CM_DIV_M2_DPLL name[8] DPLL_CLKOUT_GATE_CTRL CM_DIV_M3_DPLL name[8] DPLL_CLKOUTHIF_GATE_CTRL CM_DIV_Mn_DPLL name[8] HSDIVIDER_CLKOUTn-3_GATE_CTRL | xx ⁽⁴⁾ |

(1) It depends on the desired output clock frequency. See [Section 3.6.3.3, Generic DPLL Overview](#).

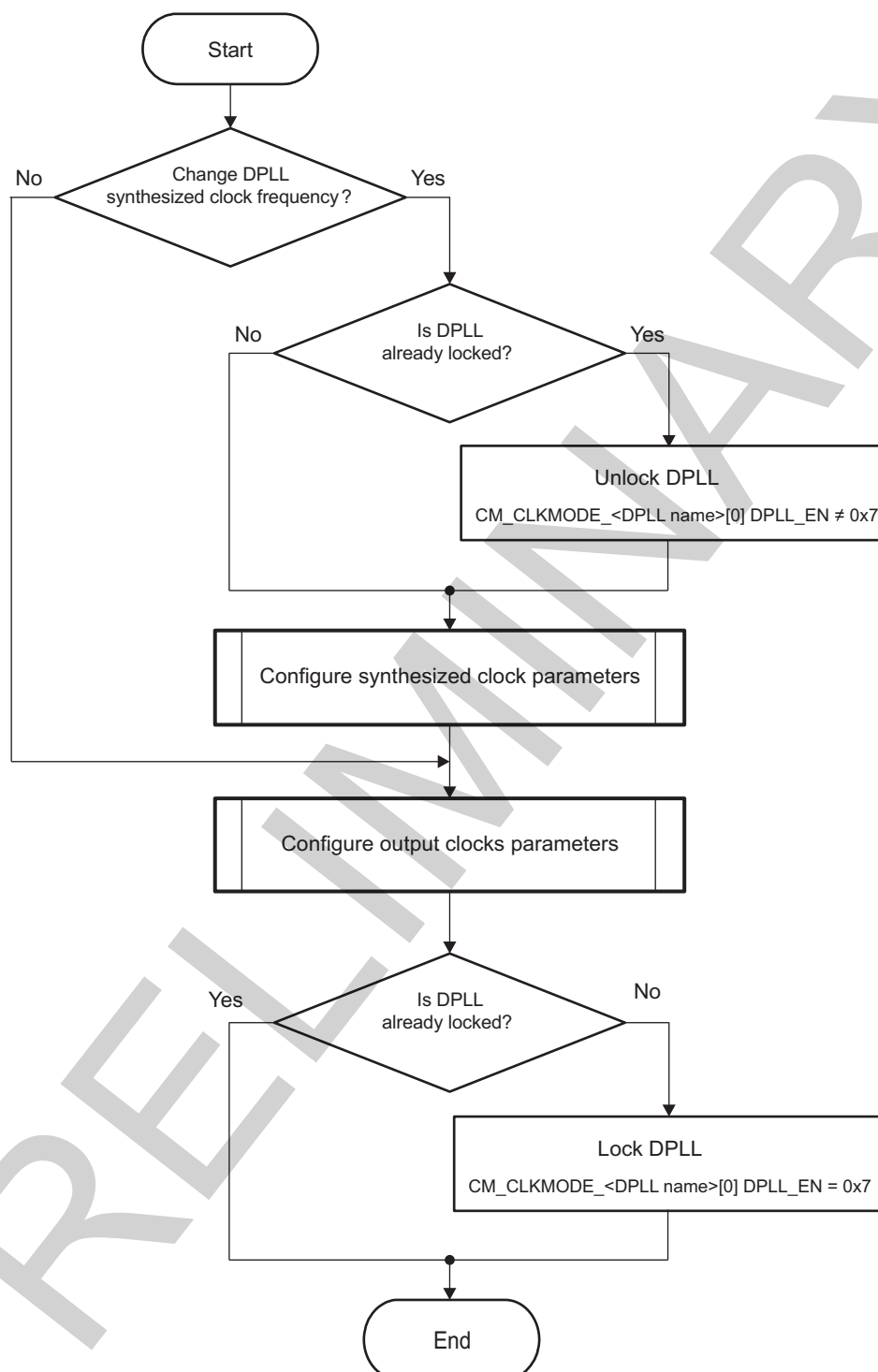
(2) It is toggled only if the programmed divider value differs from the previous one.

(3) It depends on whether output clock divider automatic power down feature is to be enabled or not. See [Section 3.6.3.3.6, DPLL Output Power-Down](#).

(4) It depends on whether output clock automatic gating feature is to be enabled or not.

3.10.1.2 DPLL Output Frequency Change

[Figure 3-81](#) shows the DPLL output-frequency change.

Figure 3-81. DPLL Output-Frequency Change

prcm-077

To unlock a DPLL, a mode other than the Lock Mode (0x7) should be programmed in the CM_CLKMODE_<DPLL name>[2:0] DPLL_EN bit field. The modes that can be programmed in the DPLL_EN bit field and unlock the DPLL are:

- For type A DPLLs:
 - MN bypass mode (0x4)

- Idle Low Power bypass mode (0x5)
- Idle Fast Relock bypass mode (0x6)
- For type B DLLs:
 - Low Power Stop mode (0x1)
 - MN bypass mode (0x4)
 - Idle Low Power bypass mode (0x5)

NOTE: DPLL_IVA does not support Idle Fast Relock bypass mode (0x6).

Table 3-339. Register Call Summary for Sequence – DPLL Output Frequency Change

| Register Name |
|----------------------|
| CM_CLKMODE_DPLL name |

Table 3-340. Subprocess Call Summary for Sequence – DPLL Output Frequency Change

| Subprocess Name | Cross-reference |
|--|--|
| Configure synthesized clock parameters | See Section 3.10.1.1.2.4 . |
| Configure output clocks parameters | See Section 3.10.1.1.2.5 . |

3.10.2 Clock Management Low-Level Programming Models

This section covers the low-level hardware programming sequences for configuration and use of the clocks in the device.

3.10.2.1 Global Initialization

3.10.2.1.1 Surrounding Module Global Initialization

This section identifies the requirements of initializing the surrounding modules when the module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the DPLLs.

[Table 3-341](#) shows the global initialization of the surrounding modules.

Table 3-341. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|---|
| PRCM DPLLs | Ensure that the DPLLs managed by the PRCM module are initialized. |

3.10.2.1.2 Clock Management Global Initialization

3.10.2.1.2.1 Main Sequence – Clock Domain Global Initialization

This procedure initializes the clock domain of the device after a power-on or software reset.

Table 3-342. Clock Domain Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|--|---------------------------------|
| Configure module clock-management feature of master modules in the clock domain | Module name_SYSCONFIG[x] MIDLEMODE Module name_SYSCONFIG[x] STANDBYMODE | xx ⁽¹⁾ |
| Configure module clock-management feature of slave modules in the clock domain | See Section 3.10.3.3 . | |
| Enable/disable Static Sleep Dependency with other clock domains (that is, destination clock domains). Not all dependencies are configurable. | CM_Clock Domain name_STATICDEP [x] Destination Clock Domain name_STATDEP | 0x0 to Disable 0x1 to Enable |
| Set Dynamic Dependency window size | CM_Clock Domain name_DYNAMICDEP[27:24] WINDOWSIZE | xx ⁽²⁾ |
| Enable/disable module wake-up dependency for the modules of the clock domain. It is available when the module can generate an interrupt or a DMA request to a service provider module (for example, a processor or DMA). | PM_Clock Domain name_Module name_WKDEP[x] WKUPDEP_Module name_DMA/IRQ request_DMA/Processor name | 0x0 to disable 0x1 to enable |
| Set clock domain state transition feature | CM_Clock Domain name_CLKSTCTRL[1:0]11 CLKTRCTRL | xx ⁽³⁾ |

- (1) See the module register for valid modes.
- (2) It depends on the desired size of the window. See [Section 3.1.1.1.7.2, Clock Domain Dependency](#).
- (3) It depends on the desired state of the clock domain. See [Table 3-11](#).

3.10.2.1.2.2 Subsequence – Slave Module Clock-Management Parameters Configuration

This procedure configures the SSC parameters for the DPLL and enables the SSC feature.

Table 3-343. Slave Module Clock-Management Parameter Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------------------|
| Configure module idle mode feature | Module name_SYSCONFIG[x] SIDLEMODE Module name_SYSCONFIG[x] IDLEMODE | xx ⁽¹⁾ |
| IF : Smart-idle mode is selected | Module name_SYSCONFIG[x] SIDLEMODE Module name_SYSCONFIG[x] IDLEMODE | 0x10 |
| Configure module clock requirement feature | Module name_SYSCONFIG[x] CLOCKACTIVITY | x ⁽¹⁾ |
| ENDIF | | |
| Configure module management behavior on the PRCM module side | CM_Clock Domain name_Module name_CLKCTRL[1:0] MODULEMODE | xx ⁽²⁾ |

- (1) See the module register for valid settings.
- (2) The selected value depends on the desired clock-management behavior.

3.10.2.2 Clock Domain Sleep Transition and Troubleshooting

This procedure initiates a sleep transition on a clock domain and allows to debug if the transition does not occur.

Table 3-344. Clock Domain Sleep Transition and Troubleshooting

| Step | Register/Bit Field/Programming Model | Value |
|---|---|---|
| Set clock domain sleep transition state | CM_Clock Domain name_CLKSTCTRL[1:0]11 CLKTRCTRL | 0x1: SW_SLEEP 0x3: HW_AUTO |
| IF : Clock domain sleep transition not initiated? | | |
| Check all clock domain master modules are in standby mode | CM_Clock Domain name_Module name_CLKCTRL[18] STBYST | 0x1: Module in standby |
| Check all clock domain slave modules are in idle mode | CM_Clock Domain name_Module name_CLKCTRL[17:16] IDLEST | 0x1: In transition 0x2: Interface clock idled 0x3: Module idled |
| ENDIF | | |

3.10.2.3 Enable/Disable Software-Programmable Static Dependency

To change the setting of a software-programmable static dependency use the procedure described in [Table 3-345](#).

Table 3-345. Enable/Disable Software-Programmable Static Dependency

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Force destination domain to be awake (SW_WKUP) | CM_Dest_CDname_CLKSTCTRL[1:0] CLKTRCTRL | 0x2 |
| Wait until power domain which encloses the destination domain is ON | PM_Dest_PDname_PWRSTST | =0x3 |
| Change the static dependency | CM_Src_CDname_STATICDEP[x] Dest_CDname_STATDEP | 0x1 |
| Put destination domain back to automatic transition (HW_AUTO) | CM_Dest_CDname_CLKSTCTRL[1:0] CLKTRCTRL | 0x3 |

3.10.3 Power Management Low-Level Programming Models

This section covers the low-level hardware programming sequences for configuration and control of the power domain in the device.

3.10.3.1 Global Initialization

3.10.3.1.1 Surrounding Module Global Initialization

It does not require any initialization sequence of any surrounding modules within the device. The external power IC and the device clocks should be active.

3.10.3.1.2 Power Management Global Initialization

3.10.3.1.2.1 Main Sequence – Power Domain Global Initialization and Setting

This procedure initializes the power domain of the device after a power-on or software reset.

Table 3-346. Power Domain Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|--|--|
| Configure memory area power state when the power domain is on. Not all memory area states are programmable. | PM_Power Domain name_PWRSTCTRL[x] Memory Bank name_ONSTATE | 0x0: Off 0x1: RETAINED 0x3: On |
| Configure memory area power state when the power domain transitions to RETENTION state. Not all memory area states are programmable. | PM_Power Domain name_PWRSTCTRL[x] Memory Bank name_RETSTATE | 0x0: Off 0x1: RETAINED |
| Configure logic area RETENTION power state when the power domain transitions to RETENTION state. | PM_Power Domain name_PWRSTCTRL[2] LOGICRETSTATE | 0x0: OSWR 0x1: CSWR |
| Select target power state of the power domain. Not all states are programmable. | PM_Power Domain name_PWRSTCTRL[1:0] POWERSTATE | 0x0: OFF 0x1: RETENTION 0x2: ON-INACTIVE 0x3: ON-ACTIVE |
| Wait until power state change is complete | PM_Power Domain name_PWRSTST[1:0] POWERSTATEST | 0x0: OFF 0x1: RETENTION 0x2: ON-INACTIVE 0x3: ON-ACTIVE |

3.10.3.2 Forced Memory Area State Change With Power Domain ON

This procedure initiates a forced memory area state change while the power domain is ON.

Table 3-347. Forced Memory Area State Change With Power Domain ON

| Step | Register/Bit Field/Programming Model | Value |
|--|---|--------------------------------------|
| Configure memory area target power state. Not all memory area states are programmable. | PM_Power Domain name_PWRSTCTRL[x] Memory Bank name_ONSTATE | 0x0: OFF 0x1: RETAINED 0x3: ON |
| Get memory area current state | PM_Power Domain name_PWRSTST[x] Memory Bank name_STATEST | 0x0: OFF 0x1: RETAINED 0x3: ON |

3.10.3.3 Forced Power Domain Low-Power State Transition

This procedure initiates a power state transition on a power domain from current low-power state (ON-INACTIVE or RETENTION) to a lower power state (RETENTION, OFF).

Table 3-348. Forced Memory Area State Change With Power Domain On

| Step | Register/Bit Field/Programming Model | Value |
|---|--|----------------------------|
| Select target low-power state of the power domain. Not all states are programmable. | PM_Power Domain name_PWRSTCTRL[1:0] POWERSTATE | 0x0: Off 0x1: Retention |
| Force power domain low-power state transition. | PM_Power Domain name_PWRSTCTRL[4] LOWPOWERSTATECHANGE | 0x1: Force change |
| Wait until state change is complete | PM_Power Domain name_PWRSTCTRL[4] LOWPOWERSTATECHANGE | 0x0: Change complete |
| Get current power state. | PM_Power Domain name_PWRSTST[1:0] POWERSTATEST | 0x0: Off 0x1: Retention |

3.10.4 Voltage Management Low-Level Programming Models

This section covers the low-level hardware programming sequences for configuration and management of the voltage domains of the device.

3.10.4.1 Global Initialization

3.10.4.1.1 Surrounding Module Global Initialization

It does not require any initialization sequence of any surrounding modules within the device. The external power IC and the device clocks should be active.

3.10.4.1.2 Voltage Management Global Initialization

3.10.4.1.2.1 Main Sequence – Voltage Management Global Initialization and Setting

This procedure initializes the voltage management framework in the device.

Table 3-349. Power Domain Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--------------------------------------|--|-------|
| Initialize SmartReflex modules | See Section 3.10.4.1.3 . | |
| Initialize voltage processor modules | See Section 3.10.4.1.4 . | |
| Initialize voltage controller module | See Section 3.10.4.1.5 . | |

3.10.4.1.3 SmartReflex Module Initialization

This procedure initializes the SmartReflex module.

Table 3-350. SmartReflex Module Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------------------|--|-------|
| Configure clock | See Section 3.10.4.1.3.1 . | |
| Configure sensor | See Section 3.10.4.1.3.2 . | |
| Configure accumulator and min/max/avg | See Section 3.10.4.1.3.3 . | |
| Configure error generator | See Section 3.10.4.1.3.4 . | |
| Configure interrupt generator | See Section 3.10.4.1.3.5 . | |
| Enable module | SRn.SRCONFIG[11] SR_EN | 0x1 |

3.10.4.1.3.1 Subsequence – Clock Configuration

This procedure configures the clock for the SmartReflex module.

Table 3-351. SmartReflex Module Clock Configuration

| Step | Register/Bit Field/Programming Model | Value |
|-----------------------------------|--|---|
| Configure desired clock frequency | SRn.SRCONFIG[21:12] SRCLKLENGTH | xx ⁽¹⁾ |
| Configure desired idle mode | SRn.ERRCONFIG[25:24] IDLEMODE | 0x0: Forced-idle 0x1: No-idle 0x2: Smart-idle 0x3: Smart-idle Wakeup |
| Enable/disable wake-up feature | SRn.ERRCONFIG[26] WAKEUPENABLE | 0x0: Disable 0x1: Enable |
| Enable clock | CM_ALWON_SR name_CLKCTRL[1:0] MODULEMODE | 0x2: Enable |

⁽¹⁾ See [Equation 1](#) for clock frequency calculation.

3.10.4.1.3.2 Subsequence – Sensor Configuration

This procedure configures the sensor in the SmartReflex module.

Table 3-352. SmartReflex Module Sensor Configuration

| Step | Register/Bit Field/Programming Model | Value |
|----------------------|--------------------------------------|-------|
| Enable sensor core A | SRn.SRCONFIG[1] SENENABLE | 0x1 |
| Enable sensor core B | SRn.SRCONFIG[0] SENPENABLE | 0x1 |
| Enable sensor core | SRn.SRCONFIG[10] SENENABLE | 0x1 |

3.10.4.1.3.3 Subsequence – Accumulator and Min/Max/Avg Configuration

This procedure configures the accumulator and min/max/avg part of the SmartReflex module.

Table 3-353. Accumulator and Min/Max/Avg Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|--------------------------------------|--------------------|
| Set size of the accumulator | SRn.SRCONFIG[31:22] ACCUMDATA | xxx ⁽¹⁾ |
| Set average weight parameter for the sensor A | SRn.AVGWEIGHT[1:0] SENNAVGWEIGHT | x ⁽¹⁾ |
| Set average weight parameter for the sensor B | SRn.AVGWEIGHT[3:2] SENPAVGWEIGHT | x ⁽¹⁾ |
| Enable minimum/maximum/average | SRn.SRCONFIG[8] MINMAXAVGENABLE | 0x1 |

⁽¹⁾ These parameters are calculated as given in [Section 3.8.3.2.3, SmartReflex Submodules](#).

3.10.4.1.3.4 Subsequence – Error Generator Configuration

This procedure configures the error generator part of the SmartReflex module.

Table 3-354. Error Generator Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|---------------------------------------|-------------------|
| Configure four reference value parameters | SRn.NVALUEREICIPROCAL[23:20] SENPGAIN | x ⁽¹⁾ |
| | SRn.NVALUEREICIPROCAL[19:16] SENNGAIN | x ⁽¹⁾ |
| | SRn.NVALUEREICIPROCAL[15:8] SENPRN | xx ⁽¹⁾ |
| | SRn.NVALUEREICIPROCAL[7:0] SENNRN | xx ⁽¹⁾ |
| Enable the error generator | SRn.SRCONFIG[9] ERRORGENERATORENABLE | 0x1 |

⁽¹⁾ Configured according to the values read for the current operating voltage level from the control module register in [Section 3.8.3.2.3, SmartReflex Submodules](#).

3.10.4.1.3.5 Subsequence – Interrupt Generator Configuration

This procedure configures the interrupt generator part of the SmartReflex module.

Table 3-355. Interrupt Generator Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Set the four reference value parameters | SRn.ERRCONFIG[18:16] ERRWEIGHT | x |
| | SRn.ERRCONFIG[15:8] ERRMAXLIMIT | xx |
| | SRn.ERRCONFIG[7:0] ERRMINLIMIT | xx |
| IF : Automatic voltage control using voltage processor | Software test condition | |
| Clear voltage processor bounds interrupt status | SRn.ERRCONFIG[23] VPBOUNDSINTSTATENA | 0x1 |
| Unmask voltage processor bounds interrupt | SRn.ERRCONFIG[22] VPBOUNDSINTENABLE | 0x1 |
| ELSE-IF : Software-controlled voltage management | Software test condition | |
| Unmask Processor interrupt events | SRn.IRQENABLE_SET[3] MCUACCUMINTENASET | 0x1 |
| | SRn.IRQENABLE_SET[2] MCUVALIDINTENASET | 0x1 |
| | SRn.IRQENABLE_SET[1] MCUBOUNDSINTENASET | 0x1 |
| ENDIF | | |

3.10.4.1.4 Voltage Processor Initialization

This procedure initializes the voltage processor.

Table 3-356. Voltage Processor Module Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--------------------------------------|--|-------|
| Configure error-to-voltage converter | See Section 3.10.4.1.4.1 . | |
| Configure PRCM | See Section 3.10.4.1.4.2 . | |
| Mask/unmask interrupt events | PRCM.PRM_IRQENABLE_Processor name | |
| Enable module | PRCM.PRM_Voltage Processor name_CONFIG[0] VPENABLE | 0x1 |

3.10.4.1.4.1 Subsequence – Error-to-Voltage Converter Configuration

This procedure configures the error-to-voltage converter of the voltage processor.

Table 3-357. Error-to-Voltage Converter Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------------------|
| Set error offset | PRCM.PRM_Voltage Processor name_CONFIG[31:24] ERROROFFSET | xx ⁽¹⁾ |
| Set error gain | PRCM.PRM_Voltage Processor name_CONFIG[23:16] ERRORGAIN | xx ⁽¹⁾ |
| Set SMPS negative voltage step slew rate | PRCM.PRM_Voltage Processor name_VSTEPMIN[23:8] SMPSWAITTIMEMIN | xx ⁽¹⁾ |
| Set SMPS minimum voltage step size | PRCM.PRM_Voltage Processor name_VSTEPMIN[7:0] VSTEPMIN | xx ⁽¹⁾ |
| Set SMPS positive voltage step slew rate | PRCM.PRM_Voltage Processor name_VSTEPMAX[23:8] SMPSWAITTIMEMAX | xx ⁽¹⁾ |
| Set SMPS maximum voltage step size | PRCM.PRM_Voltage Processor name_VSTEPMAX[7:0] VSTEPMAX | xx ⁽¹⁾ |
| Set SMPS minimum voltage limit | PRCM.PRM_Voltage Processor name_VLIMITTO[23:16] VDDMIN | xx ⁽¹⁾ |
| Set SMPS maximum voltage limit | PRCM.PRM_Voltage Processor name_VLIMITTO[31:24] VDDMAX | xx ⁽¹⁾ |

(1) Depend on the characteristics of the SMPS.

3.10.4.1.4.2 Subsequence – FSM Configuration

Ensure that VP voltage value is aligned with the current PMIC (external power IC) voltage value and if required perform the procedure in [Table 3-358](#).

Table 3-358. FSM Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Set target initial voltage level of the SMPS | PRCM.PRM_Voltage Processor name_CONFIG[15:8] INITVOLTAGE | xx |
| Assert the initial voltage into the voltage processor FSM | PRCM.PRM_Voltage Processor name_CONFIG[2] INITVDD | 0x1 |
| Clear the initialize bit | PRCM.PRM_Voltage Processor name_CONFIG[2] INITVDD | 0x0 |

3.10.4.1.5 Voltage Controller Initialization

This procedure initializes the voltage controller.

Table 3-359. Voltage Controller Module Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------------------|
| Configure power IC slave addresses | PRCM.PRM_VC_SMPS_SA[x] SA_Voltage Domain name | xx ⁽¹⁾ |
| Configure voltage configuration register addresses | PRCM.PRM_VC_VAL_SMPS_RA_VOL[x] VOLRA_Voltage Domain name | xx ⁽¹⁾ |
| Configure command configuration register addresses | PRCM.PRM_VC_VAL_SMPS_RA_CMD[x] CMDRA_Voltage Domain name | xx ⁽¹⁾ |
| Configure voltage domain command values | PRCM.PRM_VC_VAL_CMD_Voltage Domain name[x] Command name | xx ⁽¹⁾ |
| Configure pointers for the VDD channels | See Section 3.10.4.1.5.1 . | |
| Configure I ² C interface | See Section 3.10.4.1.5.2 . | |

(1) Depend on the characteristics of the SMPS.

3.10.4.1.5.1 Subsequence – VDD Channels Pointers Configuration

This procedure configures the FSM of the voltage processor.

Table 3-360. VDD Channel Pointer Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Set slave address pointer | PRCM.PRM_VC_CFG_CHANNEL[x] SA_Voltage Domain name | |
| Set voltage configuration register address pointer | PRCM.PRM_VC_CFG_CHANNEL[x] RAV_Voltage Domain name | |
| Set command configuration register address pointer | PRCM.PRM_VC_CFG_CHANNEL[x] RAC_Voltage Domain name | |
| Select voltage or command configuration register for FSM commands | PRCM.PRM_VC_CFG_CHANNEL[x] RACEN_Voltage Domain name | |
| Set command voltage level selection pointer | PRCM.PRM_VC_CFG_CHANNEL[x] CMD_Voltage Domain name | |

(1) Depend on the connectivity characteristics of the SMPS.

3.10.4.1.5.2 Subsequence – I²C Configuration

This procedure configures the I²C in the voltage controller.

Table 3-361. I²C Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|---------------------------------------|-----------------------------|
| Enable/disable I ² C bus double digital filter | PRCM.PRM_VC_CFG_I2C_MODE[6] DFILTEREN | |
| Set master code value for I ² C HS preamble | PRCM.PRM_VC_CFG_I2C_MODE[2:0] HSMCODE | |
| Enable/disable I ² C HS mode | PRCM.PRM_VC_CFG_I2C_MODE[3] HSMODEEN | 0x0: Disable 0x1: Enable |
| Enable/disable repeated start operation. | PRCM.PRM_VC_CFG_I2C_MODE[4] SRMODEEN | 0x0: Disable 0x1: Enable |

3.10.4.2 Disable Sequence for AVS (SmartReflex) and VP

3.10.4.2.1 Disable the Error Generator Module

Table 3-362. Disable the Error Generator

| Step | Register/Bit Field/Programming Model | Value |
|---|--------------------------------------|-------|
| Disable the VP BOUND IRQ ⁽¹⁾ | SRn.ERRCONFIG[22] VPBOUNDSINTENABLE | 0x0 |
| Disable the sensors | SRn.SRCONFIG[10] SENENABLE | 0x0 |
| Disable the Error Generator module | SRn.SRCONFIG[9] ERRORGENERATORENABLE | 0x0 |

⁽¹⁾ At this stage, it is important to not write 0x1 on bit SRn.ERRCONFIG[23] VPBOUNDSINTSTATENA

3.10.4.2.2 Disable the Voltage Processor

Table 3-363. Disable the Voltage Processor

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Disable the VP module | PRCM.PRM_Voltage Processor name_CONFIG[0] VPENABLE | 0x0 |
| Wait for VP being idled by pooling bit VPINIDLE to 0x1 | PRCM.PRM_Voltage Processor name_STATUS[0] VPINIDLE | ==0x1 |

3.10.4.2.3 Disable AVS (SmartReflex)

Table 3-364. Disable the SmartReflex Module

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Enable the MPU Disable Acknowledge IRQ | SRn.IRQENABLE_SET[0] MCUDISABLEACTINTENASET | 0x1 |
| Disable the SmartReflex module | SRn.SRCONFIG[11] SRENABLE | 0x0 |
| Clear the VP BOUND IRQ status bit only if it is set | SRn.ERRCONFIG[23] VPBOUNDSINTSTATENA | 0x1 |
| Disable the following MPU IRQs or at least check these IRQs are not enabled: ACCUM IRQ, VALID IRQ and BOUND IRQ | SRn.IRQENABLE_CLR[3] MCUACCUMINTENACLRL SRn.IRQENABLE_CLR[2] MCUVALIDINTENACLRL SRn.IRQENABLE_CLR[1] MCUBOUNDSINTENACLRL | 0x1 |

Table 3-364. Disable the SmartReflex Module (continued)

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Clear the following MPU IRQ statuses: ACCUM IRQ, VALID IRQ and BOUND IRQ | SRn.IRQSTATUS[3] MCUACCUMINTSTATENA SRn.IRQSTATUS[2] MCUVALIDINTSTATENA SRn.IRQSTATUS[1] MCUBOUNDSINTSTATENA | 0x1 |
| Wait for the MPU Disable Acknowledge IRQ | SRn.IRQSTATUS[0] MCUDISABLEACKINTSTATENA | ==0x1 |
| Disable the MPU Disable Acknowledge IRQ status | SRn.IRQENABLE_CLR[0] MCUDISABLEACKINTENACL | 0x1 |
| Clear the MPU Disable Acknowledge IRQ status | SRn.IRQSTATUS[0] MCUDISABLEACKINTSTATENA | 0x1 |

3.10.4.3 Changing OPP

This procedure allows changing of the voltage of the external SMPS from one OPP to the other. It also covers the programming sequence for ABB LDO if the OPP change requires a change in state of the ABB LDO.

NOTE: When switching from the current OPP to a target OPP, if the clock frequency of the target OPP is less than that of the current OPP, the clock frequency is first switched to the lower frequency of target OPP, and only then is the voltage scaling initiated. However, if the clock frequency of the target OPP is greater than that of the current OPP, voltage scaling is initiated before frequency scaling.

Table 3-365. Initial Settings

| Step Description | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Initial setting for activating ABB in OPP_NITRO mode | PRM_LDO_ABB_MPU_SETUP[2] or PRM_LDO_ABB_IVA_SETUP[2] ACTIVE_FBB_SEL | 0x1 |
| Initial setting for activating ABB in OPP_TURBO mode | PRM_LDO_ABB_MPU_SETUP[1] or PRM_LDO_ABB_IVA_SETUP[1] ACTIVE_RBB_SEL | 0x1 |
| Enable ABB power management of the ABB LDO | PRM_LDO_ABB_MPU_SETUP[0] or PRM_LDO_ABB_IVA_SETUP[0] SR2EN | 0x1 |

The above settings are sampled by activating OPP_CHANGE (that is, PRM_LDO_ABB_MPU_CTRL[2] OPP_CHANGE = 0x1 or PRM_LDO_ABB_IVA_CTRL[2] OPP_CHANGE = 0x1).

The programming steps in Table 3-366 and Table 3-367 assume the above settings are applied during the initialization phase.

Table 3-366. Transition From Lower OPP to Higher OPP

| Step ID | Step Description | Register/Register Bit Field/Programming Model | Value |
|---------|---|--|-------|
| 1 | Disable the SmartReflex module. | SRn.SRCONFIG[11] SR_EN | 0x0 |
| 2 | Mask SmartReflex interrupts | | |
| 3 | Disable the voltage processor module | PRM_Voltage Processor name_CONFIG[0] VPENABLE | 0x0 |
| 4 | Set the new OPP voltage value | PRM_Voltage Processor name_CONFIG[15:8] INITVOLTAGE | |
| 5 | Triggers a write of the value in the INITVOLTAGE into the voltage processor | PRM_Voltage Processor name_CONFIG[2] INITVDD | 0x1 |
| 6 | Force update of the SMPS | PRM_Voltage Processor name_CONFIG[1] FORCEUPDATE | 0x1 |

Table 3-366. Transition From Lower OPP to Higher OPP (continued)

| Step ID | Step Description | Register/Register Bit Field/Programming Model | Value |
|---------|---|---|--------------------------------------|
| 7 | Wait for voltage convergence to new OPP voltage (that is, wait for interrupt PRM_IRQSTATUS_MPU_A9_2 [5] VP_MPU_TRANXDONE_ST = 0x1 | PRM_IRQSTATUS_MPU_A9_2 [0] VP_MPU_OPPCHANGEDONE_ST | |
| 8 | Select the next OPP for the ABB LDO (Fast in case of ABB Set1) (Slow in case of ABB Set2) | PRM_LDO_ABB_MPU_CTRL [1:0] or PRM_LDO_ABB_IVA_CTRL [1:0] OPP_SEL | 0x1 for fast OPP 0x3 for slow OPP |
| 9 | Initiate the state change for the ABB LDO | PRM_LDO_ABB_MPU_CTRL [2] or PRM_LDO_ABB_IVA_CTRL [2] OPP_CHANGE | 0x1 |
| 10 | Wait until ABB LDO state transition completes | Pool PRM_LDO_ABB_MPU_CTRL [6]/ PRM_LDO_ABB_IVA_CTRL [6] SR2_IN_TRANSITION Or wait for interrupt PRM_IRQSTATUS_MPU_A9_2 [0] VP_MPU_OPPCHANGEDONE_ST | |
| 11 | Change MPU/IVA/CORE frequency to the new OPP frequency | | |
| 12 | Enable the SmartReflex module and interrupts | SRn.SRCONFIG [11] SR_EN | 0x1 |

NOTE: In [Table 3-366](#), steps 8 to 10 are only needed in case of ABB LDO state change. Steps 11 and 12 can be swapped.

Table 3-367. Transition From Higher OPP to Lower OPP

| Step ID | Step Description | Register/Register Bit Field/Programming Model | Value |
|---------|--|---|---|
| 1 | Change MPU/IVA/CORE frequency to new OPP frequency | | |
| 2 | Disable the SmartReflex module. | SRn.SRCONFIG [11] SR_EN | 0x0 |
| 3 | Mask SmartReflex interrupts | | |
| 4 | Disable the voltage processor module | PRM_Voltage Processor name_CONFIG [0] VPENABLE | 0x0 |
| 5 | Select the next OPP for the ABB LDO (Slow in case of ABB Set2) (Nominal in case of bypass) | PRM_LDO_ABB_MPU_CTRL [1:0] or PRM_LDO_ABB_IVA_CTRL [1:0] OPP_SEL | 0x0 for nominal OPP 0x3 for slow OPP |
| 6 | Initiate the state change for the ABB LDO | PRM_LDO_ABB_MPU_CTRL [2] or PRM_LDO_ABB_IVA_CTRL [2] OPP_CHANGE | 0x1 |
| 7 | Wait until ABB LDO state transition completes | Pool PRM_LDO_ABB_MPU_CTRL [6]/ PRM_LDO_ABB_IVA_CTRL [6] SR2_IN_TRANSITION Or wait for interrupt PRM_IRQSTATUS_MPU_A9_2 [0] VP_MPU_OPPCHANGEDONE_ST | |
| 8 | Set the new OPP voltage value | PRM_Voltage Processor name_CONFIG [15:8] INITVOLTAGE | |
| 9 | Triggers a write of the value in the INITVOLTAGE into the voltage processor | PRM_Voltage Processor name_CONFIG [2] INITVDD | 0x1 |
| 10 | Force update of the SMPS | PRM_Voltage Processor name_CONFIG [1] FORCEUPDATE | 0x1 |
| 11 | Wait for voltage convergence to new OPP voltage (that is, wait for interrupt PRM_IRQSTATUS_MPU_A9_2 [5] VP_MPU_TRANXDONE_ST = 0x1) | PRM_IRQSTATUS_MPU_A9_2 [0] VP_MPU_OPPCHANGEDONE_ST | |

Table 3-367. Transition From Higher OPP to Lower OPP (continued)

| Step ID | Step Description | Register/Register Bit Field/Programming Model | Value |
|---------|--|---|-------|
| 12 | Enable the SmartReflex module and interrupts | SRn.SRCONFIG[11] SR_EN | 0x1 |

NOTE: In [Table 3-367](#), steps 5 to 7 are only needed in case of ABB LDO state change.

3.11 PRCM Register Manual

3.11.1 PRM Instance Summary

Table 3-368. PRM Instance Summary

| Module Name | L4 Base Address | Size |
|---------------------|-----------------|-----------|
| INTRCONN_SOCKET_PRM | 0x4A30 6000 | 256 bytes |
| CKGEN_PRM | 0x4A30 6100 | 256 bytes |
| MPU_PRM | 0x4A30 6300 | 256 bytes |
| DSP_PRM | 0x4A30 6400 | 256 bytes |
| ABE_PRM | 0x4A30 6500 | 256 bytes |
| ALWAYS_ON_PRM | 0x4A30 6600 | 256 bytes |
| CORE_PRM | 0x4A30 6700 | 2KB |
| IVAHD_PRM | 0x4A30 6F00 | 256 bytes |
| CAM_PRM | 0x4A30 7000 | 256 bytes |
| DSS_PRM | 0x4A30 7100 | 256 bytes |
| SGX_PRM | 0x4A30 7200 | 256 bytes |
| L3INIT_PRM | 0x4A30 7300 | 256 bytes |
| L4PER_PRM | 0x4A30 7400 | 512 bytes |
| WKUP_PRM | 0x4A30 7700 | 256 bytes |
| WKUP_CM | 0x4A30 7800 | 256 bytes |
| EMU_PRM | 0x4A30 7900 | 256 bytes |
| EMU_CM | 0x4A30 7A00 | 256 bytes |
| DEVICE_PRM | 0x4A30 7B00 | 256 bytes |
| INSTR_PRM | 0x4A30 7F00 | 256 bytes |

3.11.2 INTRCONN_SOCKET_PRM Registers

3.11.2.1 INTRCONN_SOCKET_PRM Register Summary

Table 3-369. INTRCONN_SOCKET_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | INTRCONN_SOCKET_PRM L4 Base Address |
|--------------------------|------|-----------------------|----------------|-------------------------------------|
| REVISION_PRM | R | 32 | 0x0000 0000 | 0x4A30 6000 |
| PRM_IRQSTATUS_MPU_A9 | RW | 32 | 0x0000 0010 | 0x4A30 6010 |
| PRM_IRQSTATUS_MPU_A9_2 | RW | 32 | 0x0000 0014 | 0x4A30 6014 |
| PRM_IRQENABLE_MPU_A9 | RW | 32 | 0x0000 0018 | 0x4A30 6018 |
| PRM_IRQENABLE_MPU_A9_2 | RW | 32 | 0x0000 001C | 0x4A30 601C |
| PRM_IRQSTATUS_MPU_M3 | RW | 32 | 0x0000 0020 | 0x4A30 6020 |
| PRM_IRQENABLE_MPU_M3 | RW | 32 | 0x0000 0028 | 0x4A30 6028 |
| PRM_IRQSTATUS_DSP | RW | 32 | 0x0000 0030 | 0x4A30 6030 |
| PRM_IRQENABLE_DSP | RW | 32 | 0x0000 0038 | 0x4A30 6038 |
| CM_PRM_PROFILING_CLKCTRL | RW | 32 | 0x0000 0040 | 0x4A30 6040 |
| PRM_DEBUG_CFG | RW | 32 | 0x0000 00F0 | 0x4A30 60F0 |

3.11.2.2 INTRCONN_SOCKET_PRM Register Description

Table 3-370. REVISION_PRM

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 6000 | | | | | | | | | | | | | | | | InstanceINTRCONN_SOCKET_PRM | | | | | | | | | | | | | | | |
| Description | This register contains the IP revision code for the PRM part of the PRCM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|---------------------------|
| 31:0 | REV | Revision Number | R | 0x- - TI Internal data |

Table 3-371. Register Call Summary for Register REVISION_PRM

PRCM Register Manual

- [INTRCONN_SOCKET_PRM Register Summary: \[0\]](#)

Table 3-372. PRM_IRQSTATUS_MPU_A9

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0010 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 6010 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | INTRCONN_SOCKET_PRM | | | | | | | | | | | | | | | |
| Description | This register provides status on MPU interrupt events. Any event is logged independently of the corresponding IRQENABLE value. Software is required to clear a set bit by writing a 1 into the bit-position to be cleared. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|-----------------|---------------------|-------------------|---------------------|------------------|------------------|-------------------------|----------|------------------|----------------------|--------------------|----------------------|-------------------|-------------------|--------------------------|----------|-----------------|-------------|-------------|-------------|----------|-------|---------------|----------|-------------------|-------------------|-------------------|-------------------|--------------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ABB_IVA_DONE_ST | VC_IVA_VPACK_ST | VP_IVA_TRANXDONE_ST | VP_IVA_EQVALUE_ST | VP_IVA_NOSMPSACK_ST | VP_IVA_MAXVDD_ST | VP_IVA_MINVDD_ST | VP_IVA_OPPCHANGEDONE_ST | RESERVED | VC_CORE_VPACK_ST | VP_CORE_TRANXDONE_ST | VP_CORE_EQVALUE_ST | VP_CORE_NOSMPSACK_ST | VP_CORE_MAXVDD_ST | VP_CORE_MINVDD_ST | VP_CORE_OPPCHANGEDONE_ST | RESERVED | VC_BYPASSACK_ST | VC_TOERR_ST | VC_RAERR_ST | VC_SAERR_ST | RESERVED | IO_ST | TRANSITION_ST | RESERVED | DPLL_ABE_RECAL_ST | DPLL_PER_RECAL_ST | DPLL_IVA_RECAL_ST | DPLL_MPU_RECAL_ST | DPLL_CORE_RECAL_ST | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------|
| 31 | ABB_IVA_DONE_ST | IVA ABB mode change done. This status is set when OPP_CHANGE bit is cleared by hardware in PRM_LDO_ABB_IVA_CRTL register. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 30 | VC_IVA_VPACK_ST | Voltage Controller IVA voltage processor command acknowledge status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|---------------|-------|
| 29 | VP_IVA_TRANXDONE_ST | Voltage Processor IVA transaction completion status. This status is set when a transaction is completed in the voltage processor, including ABB mode change done if applicable (OPP_CHANGE bit cleared in PRM_LDO_ABB_IVA_CRTL). It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 28 | VP_IVA_EQVALUE_ST | Voltage Processor IVA voltage value change event. This status is set when an update has been requested but the new voltage value is the same as the current SMPS voltage value. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 27 | VP_IVA_NOSMPSACK_ST | Voltage Processor IVA timeout event status. This status is set when the timeout occurred before the SMPS acknowledge. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 26 | VP_IVA_MAXVDD_ST | Voltage Processor IVA voltage higher limit event status. This status is set when the voltage higher limit is reached. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 25 | VP_IVA_MINVDD_ST | Voltage Processor IVA voltage lower limit event status. This status is set when the voltage lower limit is reached. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 24 | VP_IVA_OPPCHANGEDONE_ST | Voltage Processor IVA OPP change done status, including ABB mode change done if applicable (OPP_CHANGE bit cleared in PRM_LDO_ABB_IVA_CRTL). It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 23 | RESERVED | | R | 0 |
| 22 | VC_CORE_VPACK_ST | Voltage Controller CORE voltage processor command acknowledge status 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 21 | VP_CORE_TRANXDONE_ST | Voltage Processor CORE transaction completion status. This status is set when a transaction is completed in the voltage processor. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 20 | VP_CORE_EQVALUE_ST | Voltage Processor CORE voltage value change event. This status is set when an update has been requested but the new voltage value is the same as the current SMPS voltage value. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 19 | VP_CORE_NOSMPSACK_ST | Voltage Processor CORE timeout event status. This status is set when the timeout occurred before the SMPS acknowledge. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|---------------|-------|
| 18 | VP_CORE_MAXVDD_ST | Voltage Processor CORE voltage higher limit event status. This status is set when the voltage higher limit is reached. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 17 | VP_CORE_MINVDD_ST | Voltage Processor CORE voltage lower limit event status. This status is set when the voltage lower limit is reached. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 16 | VP_CORE_OPPCHANGEDONE_ST | Voltage Processor CORE OPP change done status. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 15 | Reserved | | R | 0 |
| 14 | VC_BYPASSACK_ST | Voltage Controller bypass command acknowledge status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 13 | VC_TOERR_ST | Voltage Controller timeout error event status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 12 | VC_RAERR_ST | Voltage Controller register address acknowledge error event status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 11 | VC_SAERR_ST | Voltage Controller slave address acknowledge error event status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0x0 |
| 10 | RESERVED | | R | 0 |
| 9 | IO_ST | I/O pad event interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 8 | TRANSITION_ST | Software supervised transition completed event interrupt status (any domain). Asserted upon completion of any clock domain force wakeup transition or upon completion of any power domain sleep transition with at least one enclosed clock domain configured in forced-sleep. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPLL_ABE_RECAL_ST | ABE DPLL recalibration interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 3 | DPLL_PER_RECAL_ST | PER DPLL recalibration interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 2 | DPLL_IVA_RECAL_ST | IVA DPLL recalibration interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|---------------|-------|
| 1 | DPLL_MPU_RECAL_ST | MPU DPLL recalibration interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 0 | DPLL_CORE_RECAL_ST | CORE DPLL recalibration interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |

Table 3-373. Register Call Summary for Register PRM_IRQSTATUS_MPU_A9

Clock Management Functional Description

- [DPLL_PER Description: \[0\]](#)
- [DPLL_CORE Description: \[1\]](#)
- [DPLL_ABE Description: \[2\]](#)
- [DPLL_MPU Description: \[3\]](#)
- [DPLL_IVA Description: \[4\]](#)

PRCM Register Manual

- [INTRCONN_SOCKET_PRM Register Summary: \[5\]](#)

Table 3-374. PRM_IRQSTATUS_MPU_A9_2

| | | | |
|------------------|--|----------|---------------------|
| Address Offset | 0x0000 0014 | Instance | INTRCONN_SOCKET_PRM |
| Physical Address | 0x4A30 6014 | | |
| Description | This register provides status on MPU interrupt events. Any event is logged independently of the corresponding IRQENABLE value. Software is required to clear a set bit by writing a 1 into the bit-position to be cleared. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | ABB_MPU_DONE_ST | | | | | | | | | | | | | | | | VC_MPU_VPACK_ST | | | | | | | | | | | | | | | | VP_MPU_TRANXDONE_ST | | | | | | | | | | | | | | | | VP_MPU_EQVALUE_ST | | | | | | | | | | | | | | | | VP_MPU_NOSMPSACK_ST | | | | | | | | | | | | | | | | VP_MPU_MAXVDD_ST | | | | | | | | | | | | | | | | VP_MPU_MINVDD_ST | | | | | | | | | | | | | | | | VP_MPU_OPPCHANGEDONE_ST | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-----------|
| 31:8 | RESERVED | | R | 0x0000000 |
| 7 | ABB_MPU_DONE_ST | MPU ABB mode change done. This status is set when OPP_CHANGE bit is cleared by hardware in PRM_LDO_ABB_MPU_CRTL register. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 6 | VC_MPU_VPACK_ST | Voltage Controller MPU voltage processor command acknowledge status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|---------------|-------|
| 5 | VP_MPU_TRANXDONE_ST | Voltage Processor MPU transaction completion status. This status is set when a transaction is completed in the voltage processor, including ABB mode change done if applicable (OPP_CHANGE bit cleared in PRM_LDO_ABB_MPU_CRTL). It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 4 | VP_MPU_EQVALUE_ST | Voltage Processor MPU voltage value change event. This status is set when an update has been requested but the new voltage value is the same as the current SMPS voltage value. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 3 | VP_MPU_NOSMPSACK_ST | Voltage Processor MPU timeout event status. This status is set when the timeout occurred before the SMPS acknowledge. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 2 | VP_MPU_MAXVDD_ST | Voltage Processor MPU voltage higher limit event status. This status is set when the voltage higher limit is reached. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 1 | VP_MPU_MINVDD_ST | Voltage Processor MPU voltage lower limit event status. This status is set when the voltage lower limit is reached. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 0 | VP_MPU_OPPCHANGEDONE_ST | Voltage Processor MPU OPP change done status, including ABB mode change done if applicable (OPP_CHANGE bit cleared in PRM_LDO_ABB_MPU_CRTL). It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |

Table 3-375. Register Call Summary for Register PRM_IRQSTATUS_MPU_A9_2

PRCM Module Programming Guide

- [Changing OPP: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)

PRCM Register Manual

- [INTRCONN_SOCKET_PRM Register Summary: \[6\]](#)

Table 3-376. PRM_IRQENABLE_MPU_A9

| | | | |
|------------------|---|----------|---------------------|
| Address Offset | 0x0000 0018 | Instance | INTRCONN_SOCKET_PRM |
| Physical Address | 0x4A30 6018 | | |
| Description | This register is used to enable or disable MPU interrupt activation upon presence of corresponding IRQSTATUS bit. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|-----------------|---------------------|-------------------|---------------------|------------------|------------------|-------------------------|----------|------------------|----------------------|--------------------|----------------------|-------------------|-------------------|--------------------------|----------|-----------------|-------------|-------------|-------------|----------|-------|---------------|----------|----------|-------------------|-------------------|-------------------|-------------------|--------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ABB_IVA_DONE_EN | VC_IVA_VPACK_EN | VP_IVA_TRANXDONE_EN | VP_IVA_EQVALUE_EN | VP_IVA_NOSMPSACK_EN | VP_IVA_MAXVDD_EN | VP_IVA_MINVDD_EN | VP_IVA_OPPCHANGEDONE_EN | RESERVED | VC_CORE_VPACK_EN | VP_CORE_TRANXDONE_EN | VP_CORE_EQVALUE_EN | VP_CORE_NOSMPSACK_EN | VP_CORE_MAXVDD_EN | VP_CORE_MINVDD_EN | VP_CORE_OPPCHANGEDONE_EN | RESERVED | VC_BYPASSACK_EN | VC_TOERR_EN | VC_RAERR_EN | VC_SAERR_EN | RESERVED | IO_EN | TRANSITION_EN | RESERVED | RESERVED | DPLL_ABE_RECAL_EN | DPLL_PER_RECAL_EN | DPLL_IVA_RECAL_EN | DPLL_MPU_RECAL_EN | DPLL_CORE_RECAL_EN | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-------|
| 31 | ABB_IVA_DONE_EN | IIVA ABB mode change done enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 30 | VC_IVA_VPACK_EN | Voltage Controller IVA voltage processor command acknowledge enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 29 | VP_IVA_TRANXDONE_EN | Voltage Processor IVA transaction completion enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 28 | VP_IVA_EQVALUE_EN | Voltage Processor IVA voltage value change event enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 27 | VP_IVA_NOSMPSACK_EN | Voltage Processor IVA timeout event enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 26 | VP_IVA_MAXVDD_EN | Voltage Processor IVA voltage higher limit event enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 25 | VP_IVA_MINVDD_EN | Voltage Processor IVA voltage lower limit event enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 24 | VP_IVA_OPPCHANGEDONE_EN | Voltage Processor IVA OPP change done enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 23 | RESERVED | | R | 0 |
| 22 | VC_CORE_VPACK_EN | Voltage Controller CORE voltage processor command acknowledge enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 21 | VP_CORE_TRANXDONE_EN | Voltage Processor CORE transaction completion enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|------|-------|
| 20 | VP_CORE_EQVALUE_EN | Voltage Processor CORE voltage value change event enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 19 | VP_CORE_NOSMPSACK_EN | Voltage Processor CORE timeout event enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 18 | VP_CORE_MAXVDD_EN | Voltage Processor CORE voltage higher limit event enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 17 | VP_CORE_MINVDD_EN | Voltage Processor CORE voltage lower limit event enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 16 | VP_CORE_OPPCHANGEDONE_EN | Voltage Processor CORE OPP change done enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 15 | RESERVED | | R | 0 |
| 14 | VC_BYPASSACK_EN | Voltage Controller bypass command acknowledge enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 13 | VC_TOERR_EN | Voltage Controller timeout error event enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 12 | VC_RAERR_EN | Voltage Controller register address acknowledge error event enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 11 | VC_SAERR_EN | Voltage Controller slave address acknowledge error event enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0x0 |
| 10 | RESERVED | | R | 0 |
| 9 | IO_EN | I/O pad event interrupt enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 8 | TRANSITION_EN | Software supervised transition completed event interrupt enable (any domain). 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPLL_ABE_RECAL_EN | ABE DPLL recalibration interrupt enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 3 | DPLL_PER_RECAL_EN | PER DPLL recalibration interrupt enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|------|-------|
| 2 | DPLL_IVA_RECAL_EN | IVA DPLL recalibration interrupt enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 1 | DPLL_MPU_RECAL_EN | MPU DPLL recalibration interrupt enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 0 | DPLL_CORE_RECAL_EN | CORE DPLL recalibration interrupt enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |

Table 3-377. Register Call Summary for Register PRM_IRQENABLE_MPU_A9

Clock Management Functional Description

- [DPLL_PER Description: \[0\]](#)
- [DPLL_CORE Description: \[1\]](#)
- [DPLL_ABE Description: \[2\]](#)
- [DPLL_MPU Description: \[3\]](#)
- [DPLL_IVA Description: \[4\]](#)

PRCM Register Manual

- [INTRCONN_SOCKET_PRM Register Summary: \[5\]](#)

Table 3-378. PRM_IRQENABLE_MPU_A9_2

| | | | |
|-------------------------|---|-----------------|---------------------|
| Address Offset | 0x0000 001C | Instance | INTRCONN_SOCKET_PRM |
| Physical Address | 0x4A30 601C | | |
| Description | This register is used to enable or disable MPU interrupt activation upon presence of corresponding IRQSTATUS bit. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|-----------------|----|---------------------|----|-------------------|---|---------------------|---|------------------|---|------------------|---|-------------------------|---|
| RESERVED | | | | | | | | | | | | | | | | ABB_MPU_DONE_EN | | VC_MPU_VPACK_EB | | VP_MPU_TRANXDONE_EN | | VP_MPU_EQVALUE_EN | | VP_MPU_NOSMPSACK_EN | | VP_MPU_MAXVDD_EN | | VP_MPU_MINVDD_EN | | VP_MPU_OPPCHANGEDONE_EN | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|------------|
| 31:8 | RESERVED | | R | 0x00000000 |
| 7 | ABB_MPU_DONE_EN | MPU ABB mode change done enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 6 | VC_MPU_VPACK_EB | Voltage Controller MPU voltage processor command acknowledge enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------|
| 5 | VP_MPU_TRANXDONE_EN | Voltage Processor MPU transaction completion enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 4 | VP_MPU_EQVALUE_EN | Voltage Processor MPU voltage value change event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 3 | VP_MPU_NOSMPSACK_EN | Voltage Processor MPU timeout event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 2 | VP_MPU_MAXVDD_EN | Voltage Processor MPU voltage higher limit event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 1 | VP_MPU_MINVDD_EN | Voltage Processor MPU voltage lower limit event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 0 | VP_MPU_OPPCHANGEDONE_EN | Voltage Processor MPU OPP change done enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |

Table 3-379. Register Call Summary for Register PRM_IRQENABLE_MPU_A9_2

PRCM Register Manual

- [INTRCONN_SOCKET_PRM Register Summary: \[0\]](#)

Table 3-380. PRM_IRQSTATUS_MPU_M3

| | | | |
|------------------|--|---|--|
| Address Offset | | 0x0000 0020 | |
| Physical Address | | 0x4A30 6020 | |
| Instance | | INTRCONN_SOCKET_PRM | |
| Description | | This register provides status on MPU_A3 interrupt events. Any event is logged independently of the corresponding IRQENABLE value. Software is required to clear a set bit by writing a 1 into the bit-position to be cleared. | |
| Type | | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----|-----------------|----|---------------------|----|-------------------|----|---------------------|----|------------------|----|------------------|----|-------------------------|----|----------|------------------|----|----------------------|----|--------------------|---|----------------------|---|-------------------|---|-------------------|---|--------------------------|---|----------|-----------------|--|-------------|--|-------------|--|-------------|--|--------------|--|-------|--|---------------|--|----------|--|--|-------------------|--|-------------------|--|-------------------|--|----------|--|--------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ABB_IVA_DONE_ST | | VC_IVA_VPACK_ST | | VP_IVA_TRANXDONE_ST | | VP_IVA_EQVALUE_ST | | VP_IVA_NOSMPSACK_ST | | VP_IVA_MAXVDD_ST | | VP_IVA_MINVDD_ST | | VP_IVA_OPPCHANGEDONE_ST | | RESERVED | VC_CORE_VPACK_ST | | VP_CORE_TRANXDONE_ST | | VP_CORE_EQVALUE_ST | | VP_CORE_NOSMPSACK_ST | | VP_CORE_MAXVDD_ST | | VP_CORE_MINVDD_ST | | VP_CORE_OPPCHANGEDONE_ST | | RESERVED | VC_BYPASSACK_ST | | VC_TOERR_ST | | VC_RAERR_ST | | VC_SAERR_ST | | FORCEWKUP_ST | | IO_ST | | TRANSITION_ST | | RESERVED | | | DPLL_ABE_RECAL_ST | | DPLL_PER_RECAL_ST | | DPLL_IVA_RECAL_ST | | RESERVED | | DPLL_CORE_RECAL_ST | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|---------------|-------|
| 31 | ABB_IVA_DONE_ST | IVA ABB mode change done. This status is set when OPP_CHANGE bit is cleared by hardware in PRM_LDO_ABB_IVA_CTRL register. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 30 | VC_IVA_VPACK_ST | Voltage Controller IVA voltage processor command acknowledge status 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 29 | VP_IVA_TRANXDONE_ST | Voltage Processor IVA transaction completion status. This status is set when a transaction is completed in the voltage processor, including ABB mode change done if applicable (OPP_CHANGE bit cleared in PRM_LDO_ABB_IVA_CTRL). It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 28 | VP_IVA_EQVALUE_ST | Voltage Processor IVA voltage value change event. This status is set when an update has been requested but the new voltage value is the same as the current SMPS voltage value. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 27 | VP_IVA_NOSMPSACK_ST | Voltage Processor IVA timeout event status. This status is set when the timeout occurred before the SMPS acknowledge. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 26 | VP_IVA_MAXVDD_ST | Voltage Processor IVA voltage higher limit event status. This status is set when the voltage higher limit is reached. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 25 | VP_IVA_MINVDD_ST | Voltage Processor IVA voltage lower limit event status. This status is set when the voltage lower limit is reached. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 24 | VP_IVA_OPPCHANGEDONE_ST | Voltage Processor IVA OPP change done status, including ABB mode change done if applicable (OPP_CHANGE bit cleared in PRM_LDO_ABB_IVA_CTRL). It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 23 | RESERVED | | R | 0 |
| 22 | VC_CORE_VPACK_ST | Voltage Controller CORE voltage processor command acknowledge status 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 21 | VP_CORE_TRANXDONE_ST | Voltage Processor CORE transaction completion status. This status is set when a transaction is completed in the voltage processor. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|---------------|-------|
| 20 | VP_CORE_EQVALUE_ST | Voltage Processor CORE voltage value change event. This status is set when an update has been requested but the new voltage value is the same as the current SMPS voltage value. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 19 | VP_CORE_NOSMPSACK_ST | Voltage Processor CORE timeout event status. This status is set when the timeout occurred before the SMPS acknowledge. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 18 | VP_CORE_MAXVDD_ST | Voltage Processor CORE voltage higher limit event status. This status is set when the voltage higher limit is reached. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 17 | VP_CORE_MINVDD_ST | Voltage Processor CORE voltage lower limit event status. This status is set when the voltage lower limit is reached. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 16 | VP_CORE_OPPCHANGEDONE_ST | Voltage Processor CORE OPP change done status. It is cleared by software. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 15 | RESERVED | | R | 0 |
| 14 | VC_BYPASSACK_ST | Voltage Controller bypass command acknowledge status 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 13 | VC_TOERR_ST | Voltage Controller timeout error event status 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 12 | VC_RAERR_ST | Voltage Controller register address acknowledge error event status 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 11 | VC_SAERR_ST | Voltage Controller slave address acknowledge error event status 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 10 | FORCEWKUP_ST | CORTEXM3 domain software supervised wakeup transition completed event interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 9 | IO_ST | I/O pad event interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 8 | TRANSITION_ST | Software supervised transition completed event interrupt status (any domain). Asserted upon completion of any clock domain force wakeup transition or upon completion of any power domain sleep transition with at least one enclosed clock domain configured in forced-sleep. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|---------------|-------|
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPLL_ABE_RECAL_ST | ABE DPLL recalibration interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 3 | DPLL_PER_RECAL_ST | PER DPLL recalibration interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 2 | DPLL_IVA_RECAL_ST | IVA DPLL recalibration interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | DPLL_CORE_RECAL_ST | CORE DPLL recalibration interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |

Table 3-381. Register Call Summary for Register PRM_IRQSTATUS_MPU_M3

Clock Management Functional Description

- [DPLL_PER Description: \[0\]](#)
- [DPLL_CORE Description: \[1\]](#)
- [DPLL_IVA Description: \[2\]](#)

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)

PRCM Register Manual

- [INTRCONN_SOCKET_PRM Register Summary: \[15\]](#)

Table 3-382. PRM_IRQENABLE_MPU_M3

| | | | |
|-------------------------|--|-----------------|---------------------|
| Address Offset | 0x0000 0028 | Instance | INTRCONN_SOCKET_PRM |
| Physical Address | 0x4A30 6028 | | |
| Description | This register is used to enable or disable MPU_A3 interrupt activation upon presence of corresponding IRQSTATUS bit. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|-----------------|---------------------|-------------------|---------------------|------------------|------------------|-------------------------|----------|------------------|----------------------|--------------------|----------------------|-------------------|-------------------|--------------------------|----------|-----------------|-------------|-------------|-------------|--------------|-------|---------------|----------|----------|----------|-------------------|-------------------|-------------------|----------|--------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ABB_IVA_DONE_EN | VC_IVA_VPACK_EN | VP_IVA_TRANXDONE_EN | VP_IVA_EQVALUE_EN | VP_IVA_NOSMPSACK_EN | VP_IVA_MAXVDD_EN | VP_IVA_MINVDD_EN | VP_IVA_OPPCHANGEDONE_EN | RESERVED | VC_CORE_VPACK_EN | VP_CORE_TRANXDONE_EN | VP_CORE_EQVALUE_EN | VP_CORE_NOSMPSACK_EN | VP_CORE_MAXVDD_EN | VP_CORE_MINVDD_EN | VP_CORE_OPPCHANGEDONE_EN | RESERVED | VC_BYPASSACK_EN | VC_TOERR_EN | VC_RAERR_EN | VC_SAERR_EN | FORCEWKUP_EN | IO_EN | TRANSITION_EN | RESERVED | RESERVED | RESERVED | DPLL_ABE_RECAL_EN | DPLL_PER_RECAL_EN | DPLL_IVA_RECAL_EN | RESERVED | DPLL_CORE_RECAL_EN |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------|
| 31 | ABB_IVA_DONE_EN | IVA ABB mode change done enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------|
| 30 | VC_IVA_VPACK_EN | Voltage Controller IVA voltage processor command acknowledge enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 29 | VP_IVA_TRANXDONE_EN | Voltage Processor IVA transaction completion enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 28 | VP_IVA_EQVALUE_EN | Voltage Processor IVA voltage value change event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 27 | VP_IVA_NOSMPSACK_EN | Voltage Processor IVA timeout event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 26 | VP_IVA_MAXVDD_EN | Voltage Processor IVA voltage higher limit event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 25 | VP_IVA_MINVDD_EN | Voltage Processor IVA voltage lower limit event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 24 | VP_IVA_OPPCHANGEDONE_EN | Voltage Processor IVA OPP change done enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 23 | RESERVED | | R | 0 |
| 22 | VC_CORE_VPACK_EN | Voltage Controller CORE voltage processor command acknowledge enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 21 | VP_CORE_TRANXDONE_EN | Voltage Processor CORE transaction completion enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 20 | VP_CORE_EQVALUE_EN | Voltage Processor CORE voltage value change event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 19 | VP_CORE_NOSMPSACK_EN | Voltage Processor CORE timeout event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 18 | VP_CORE_MAXVDD_EN | Voltage Processor CORE voltage higher limit event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 17 | VP_CORE_MINVDD_EN | Voltage Processor CORE voltage lower limit event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 16 | VP_CORE_OPPCHANGEDONE_EN | Voltage Processor CORE OPP change done enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 15 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|------|-------|
| 14 | VC_BYPASSACK_EN | Voltage Controller bypass command acknowledge enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 13 | VC_TOERR_EN | Voltage Controller timeout error event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 12 | VC_RAERR_EN | Voltage Controller register address acknowledge error event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 11 | VC_SAERR_EN | Voltage Controller slave address acknowledge error event enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 10 | FORCEWKUP_EN | CORTEXM3 domain software supervised wakeup transition completed event interrupt enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 9 | IO_EN | I/O pad event interrupt enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 8 | TRANSITION_EN | Software supervised transition completed event interrupt enable (any domain) 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPLL_ABE_RECAL_EN | ABEDPLL recalibration interrupt enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 3 | DPLL_PER_RECAL_EN | PER DPLL recalibration interrupt enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 2 | DPLL_IVA_RECAL_EN | IVA DPLL recalibration interrupt enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | DPLL_CORE_RECAL_EN | CORE DPLL recalibration interrupt enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |

Table 3-383. Register Call Summary for Register PRM_IRQENABLE_MPU_M3

Clock Management Functional Description

- [DPLL_PER Description: \[0\]](#)
- [DPLL_CORE Description: \[1\]](#)
- [DPLL_IVA Description: \[2\]](#)

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)

PRCM Register Manual

- [INTRCONN_SOCKET_PRM Register Summary: \[15\]](#)

Table 3-384. PRM_IRQSTATUS_DSP

| | | | |
|------------------|--|----------|---------------------|
| Address Offset | 0x0000 0030 | Instance | INTRCONN_SOCKET_PRM |
| Physical Address | 0x4A30 6030 | | |
| Description | This register provides status on DSP interrupt events. Any event is logged independently of the corresponding IRQENABLE value. Software is required to clear a set bit by writing a 1 into the bit-position to be cleared. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----------|----|----|----|-------------------|---|----------|-------------------|---|----------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FORCEWKUP_ST | | RESERVED | | | | DPLL_ABE_RECAL_ST | | RESERVED | DPLL_IVA_RECAL_ST | | RESERVED | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|---------------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10 | FORCEWKUP_ST | DSP domain software supervised wakeup transition completed event interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 9:5 | RESERVED | | R | 0x00 |
| 4 | DPLL_ABE_RECAL_ST | ABE DPLL recalibration interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | DPLL_IVA_RECAL_ST | IVA DPLL recalibration interrupt status. 0x0: No interrupt 0x1: Interrupt is pending | RW W1toClr | 0 |
| 1:0 | RESERVED | | R | 0x0 |

Table 3-385. Register Call Summary for Register PRM_IRQSTATUS_DSP

PRCM Register Manual

- [INTRCONN_SOCKET_PRM Register Summary: \[0\]](#)

Table 3-386. PRM_IRQENABLE_DSP

| | | | |
|-------------------------|--|-----------------|---------------------|
| Address Offset | 0x0000 0038 | Instance | INTRCONN_SOCKET_PRM |
| Physical Address | 0x4A30 6038 | | |
| Description | This register is used to enable or disable DSP interrupt activation upon presence of corresponding IRQSTATUS bit. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----------|----|----|----|-------------------|---|----------|---|-------------------|---|----------|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | FORCEWKUP_EN | | RESERVED | | | | DPLL_ABE_RECAL_EN | | RESERVED | | DPLL_IVA_RECAL_EN | | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10 | FORCEWKUP_EN | DSP domain software supervised wakeup transition completed event interrupt enable. 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 9:5 | RESERVED | | R | 0x00 |
| 4 | DPLL_ABE_RECAL_EN | ABEDPLL recalibration interrupt enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | DPLL_IVA_RECAL_EN | IVA DPLL recalibration interrupt enable 0x0: Interrupt is masked 0x1: Interrupt is enabled | RW | 0 |
| 1:0 | RESERVED | | R | 0x0 |

Table 3-387. Register Call Summary for Register PRM_IRQENABLE_DSP

PRCM Register Manual

- [INTRCONN_SOCKET_PRM Register Summary: \[0\]](#)

Table 3-388. CM_PRM_PROFILING_CLKCTRL

| | | | |
|-------------------------|---|-----------------|---------------------|
| Address Offset | 0x0000 0040 | Instance | INTRCONN_SOCKET_PRM |
| Physical Address | 0x4A30 6040 | | |
| Description | This register manages the PRM_PROFILING clock. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|------------|--|
| RESERVED | | | | | | | | | | | | | | | | IDLEST | | RESERVED | | | | | | | | | | | | | | | | MODULEMODE | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status Read 0x0: Module is fully functional Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle Read 0x3: Module is disabled | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disabled by software. INTRCONN configuration port is not accessible. 0x1: Module is managed automatically by hardware along with EMU domain. INTRCONN configuration port is accessible only when EMU domain is on. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-389. Register Call Summary for Register CM_PRM_PROFILING_CLKCTRL

PRCM Register Manual

- [INTRCONN_SOCKET_PRM Register Summary: \[0\]](#)

Table 3-390. PRM_DEBUG_CFG

| | | | |
|-------------------------|---|-----------------|---------------------|
| Address Offset | 0x0000 00F0 | Instance | INTRCONN_SOCKET_PRM |
| Physical Address | 0x4A30 60F0 | | |
| Description | This register is used to configure the PRM's 32-bit debug output. There is one 7-bit source select field for selecting from a shared set of 8-bit internal signal blocks per byte. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|------|----|----|----|----|----|----|----------|------|----|----|----|----|----|----|----------|------|----|----|----|----|---|---|----------|------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | SEL3 | | | | | | | RESERVED | SEL2 | | | | | | | RESERVED | SEL1 | | | | | | | RESERVED | SEL0 | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31 | RESERVED | | R | 0 |
| 30:24 | SEL3 | Internal signal block select for debug word byte-3 | RW | 0x03 |
| 23 | RESERVED | | R | 0 |
| 22:16 | SEL2 | Internal signal block select for debug word byte-2 | RW | 0x02 |
| 15 | RESERVED | | R | 0 |
| 14:8 | SEL1 | Internal signal block select for debug word byte-1 | RW | 0x01 |
| 7 | RESERVED | | R | 0 |
| 6:0 | SEL0 | Internal signal block select for debug word byte-0 | RW | 0x00 |

Table 3-391. Register Call Summary for Register PRM_DEBUG_CFG

PRCM Register Manual

- [INTRCONN_SOCKET_PRM Register Summary: \[0\]](#)

PRELIMINARY

3.11.3 CKGEN_PRM Registers

3.11.3.1 CKGEN_PRM Register Summary

Table 3-392. CKGEN_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CKGEN_PRM L4 Base Address |
|---------------------------------------|------|-----------------------|----------------|---------------------------|
| CM_ABE_DSS_SYS_CLKSEL | RW | 32 | 0x0000 0000 | 0x4A30 6100 |
| RESERVED | RW | 32 | 0x0000 0004 | 0x4A30 6104 |
| CM_L4_WKUP_CLKSEL | RW | 32 | 0x0000 0008 | 0x4A30 6108 |
| CM_ABE_PLL_REF_CLKSEL | RW | 32 | 0x0000 000C | 0x4A30 610C |
| CM_SYS_CLKSEL | RW | 32 | 0x0000 0010 | 0x4A30 6110 |

3.11.3.2 CKGEN_PRM Register Description

Table 3-393. CM_ABE_DSS_SYS_CLKSEL

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0000 | Instance | CKGEN_PRM |
| Physical Address | 0x4A30 6100 | | |
| Description | Select the SYS CLK for ABE and DSS subsystems. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKSEL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | CLKSEL | Selects the divider value 0x0: Select SYS_CLK divided by 1 0x1: Select SYS_CLK divided by 2 Must be used for SYS_CLK > 26 MHz | RW | 0 |

Table 3-394. Register Call Summary for Register CM_ABE_DSS_SYS_CLKSEL

PRCM Register Manual

- [CKGEN_PRM Register Summary: \[0\]](#)

Table 3-395. CM_L4_WKUP_CLKSEL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0008 | Instance | CKGEN_PRM |
| Physical Address | 0x4A30 6108 | | |
| Description | Control the functional clock source of L4_WKUP, PRM and Smart Reflex functional clock. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKSEL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | CLKSEL | Select the clock source for L4WKUP_ICLK and for ABE_DPLL_BYPASS_CLK clocks. 0x0: Selects SYS_CLK for L4WKUP_ICLK Selects SYS_CLK for ABE_DPLL_BYPASS_CLK 0x1: Selects ABE_LP_CLK for L4WKUP_ICLK Selects 32K_FCLK for ABE_DPLL_BYPASS_CLK | RW | 0 |

Table 3-396. Register Call Summary for Register CM_L4_WKUP_CLKSEL

Clock Management Functional Description

- [PRM Clock Source: \[0\] \[1\]](#)

PRCM Register Manual

- [CKGEN_PRM Register Summary: \[2\]](#)

Table 3-397. CM_ABE_PLL_REF_CLKSEL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 000C | Instance | CKGEN_PRM |
| Physical Address | 0x4A30 610C | | |
| Description | Control the source of the reference clock for DPLL_ABE | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|--------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | CLKSEL | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | CLKSEL | Select the source for the DPLL_ABE reference clock. 0x0: Selects SYS_CLK 0x1: Selects SYS_32K | RW | 1 |

Table 3-398. Register Call Summary for Register CM_ABE_PLL_REF_CLKSEL

Clock Management Functional Description

- [PRM Clock Source: \[0\]](#)

PRCM Register Manual

- [CKGEN_PRM Register Summary: \[1\]](#)

Table 3-399. CM_SYS_CLKSEL

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0010 | Instance | CKGEN_PRM |
| Physical Address | 0x4A30 6110 | | |
| Description | Software sets the SYS_CLK configuration corresponding to the frequency of SYS_CLK. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SYS_CLKSEL | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | SYS_CLKSEL | System clock input selection. 0x0: Uninitialized 0x1: Input clock is 12 MHz 0x2: Reserved 0x3: Input clock is 16.8 MHz 0x4: Input clock is 19.2 MHz 0x5: Input clock is 26 MHz 0x6: Reserved 0x7: Input clock is 38.4 MHz | RW | 0x0 |

Table 3-400. Register Call Summary for Register CM_SYS_CLKSEL

Clock Management Functional Description

- [DPLL_PER Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [DPLL_CORE Description: \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [DPLL_ABE Description: \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [DPLL_MPU Description: \[15\] \[16\] \[17\] \[18\] \[19\]](#)
- [DPLL_IVA Description: \[20\] \[21\] \[22\] \[23\] \[24\]](#)
- [DPLL_USB Description: \[25\] \[26\] \[27\] \[28\] \[29\]](#)

PRCM Register Manual

- [CKGEN_PRM Register Summary: \[30\]](#)

3.11.4 MPU_PRM Registers

3.11.4.1 MPU_PRM Register Summary

Table 3-401. MPU_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | MPU_PRM L4 Base Address |
|------------------------------------|------|-----------------------|----------------|-------------------------|
| PM_MPU_PWRSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 6300 |
| PM_MPU_PWRSTST | R | 32 | 0x0000 0004 | 0x4A30 6304 |
| RM_MPU_RSTST | RW | 32 | 0x0000 0014 | 0x4A30 6314 |
| RM_MPU_MPU_CONTEXT | RW | 32 | 0x0000 0024 | 0x4A30 6324 |

3.11.4.2 MPU_PRM Register Description

Table 3-402. PM_MPU_PWRSTCTRL

| | | | |
|------------------|---|----------|---------|
| Address Offset | 0x0000 0000 | Instance | MPU_PRM |
| Physical Address | 0x4A30 6300 | | |
| Description | This register controls the MPU domain power state to reach upon a domain sleep transition | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----------------|----|----|----|----------|----|----|----|----|----|------------------|---|-----------------|---|----------|---|---|---------------------|---|----------|--|---------------|--|------------|--|
| RESERVED | | | | | | | | MPU_RAM_ONSTATE | | | | MPU_L2_ONSTATE | | | | RESERVED | | | | | | MPU_RAM_RETSTATE | | MPU_L2_RETSTATE | | RESERVED | | | LOWPOWERSTATECHANGE | | RESERVED | | LOGICRETSTATE | | POWERSTATE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|--------------------|-------|
| 31:22 | RESERVED | | R | 0x000 |
| 21:20 | MPU_RAM_ONSTATE | MPU_RAM memory state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R R returns 1s | 0x3 |
| 19:18 | MPU_L2_ONSTATE | MPU_L2 memory state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R R returns 1s | 0x3 |
| 17:11 | RESERVED | | R | 0x00 |
| 10 | MPU_RAM_RETSTATE | MPU_RAM memory state when domain is RETENTION. Read 0x1: Memory bank is retained when domain is in RETENTION state. | RO R returns 1s | 1 |
| 9 | MPU_L2_RETSTATE | MPU_L2 memory state when domain is RETENTION. 0x0: Memory bank is off when the domain is in the RETENTION state. 0x1: Memory bank is retained when domain is in RETENTION state. | RW | 1 |
| 8:5 | RESERVED | | R | 0x0 |
| 4 | LOWPOWERSTATECHANGE | Power state change request when domain has already performed a sleep transition. Allows going into deeper low power state without waking up the power domain. 0x0: Do not request a low power state change. 0x1: Request a low power state change. This bit is automatically cleared when the power state is effectively changed or when power state is ON. | RW WSpecial | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICRETSTATE | Logic state when power domain is RETENTION 0x0: Only retention registers are retained and remaining logic is off when the domain is in RETENTION state. 0x1: Whole logic is retained when domain is in RETENTION state. | RW | 1 |
| 1:0 | POWERSTATE | Power state control. 0x0: OFF state 0x1: RETENTION state 0x2: INACTIVE state 0x3: ON State | RW | 0x3 |

Table 3-403. Register Call Summary for Register PM_MPU_PWRSTCTRL

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)

PRCM Register Manual

- [MPU_PRM Register Summary: \[9\]](#)

Table 3-404. PM_MPU_PWRSTST

| | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0004 | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A30 6304 | | | | | | | | | | | | | | | |
| Instance | | MPU_PRM | | | | | | | | | | | | | | | |
| Description | | This register provides a status on the MPU domain current power state. [warm reset insensitive] | | | | | | | | | | | | | | | |
| Type | | R | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------|----|----------|----|--------------|----------|----|----|----|----|----|----|----|-----------------|---|----------------|---|----------|---|--------------|---|--------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | LASTPOWERSTATEENTERED | | RESERVED | | INTRANSITION | RESERVED | | | | | | | | MPU_RAM_STATEST | | MPU_L2_STATEST | | RESERVED | | LOGICSTATEST | | POWERSTATEST | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|---------------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | LASTPOWERSTATEENTERED | Last low power state entered. Set to 0x3 upon write of the same only. This register is intended for debug purpose only. Read 0x3: Power domain was previously ON-ACTIVE Read 0x2: Power domain was previously ON-INACTIVE Read 0x1: Power domain was previously in RETENTION Read 0x0: Power domain was previously OFF | RW W1toSet | 0x0 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | INTRANSITION | Domain transition status Read 0x0: No ongoing transition on power domain Read 0x1: Power domain transition is in progress. | R | 0 |
| 19:10 | RESERVED | | R | 0x000 |
| 9:8 | MPU_RAM_STATEST | MPU_RAM memory state status Read 0x0: Memory is OFF Read 0x1: Memory is RETENTION Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 7:6 | MPU_L2_STATEST | MPU_L2 memory state status Read 0x0: Memory is OFF Read 0x1: Memory is RETENTION Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 5:3 | RESERVED | | R | 0x0 |
| 2 | LOGICSTATEST | Logic state status Read 0x0: Logic in domain is OFF Read 0x1: Logic in domain is ON | R | 1 |
| 1:0 | POWERSTATEST | Current power state status Read 0x0: Power domain is OFF Read 0x1: Power domain is in RETENTION Read 0x2: Power domain is ON-INACTIVE Read 0x3: Power domain is ON-ACTIVE | R | 0x3 |

Table 3-405. Register Call Summary for Register PM_MPU_PWRSTST

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

PRCM Register Manual

- [MPU_PRM Register Summary: \[7\]](#)

Table 3-406. RM_MPU_RSTST

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0014 | Instance | MPU_PRM |
| Physical Address | 0x4A30 6314 | | |
| Description | This register logs the different reset sources of the MPU domain. Each bit is set upon release of the domain reset signal. Must be cleared by software. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | EMULATION_RST | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | EMULATION_RST | MPU domain has been reset due to emulation reset source e.g. assert reset command initiated by the icepick module 0x0: No emulation reset 0x1: The domain has been reset upon emulation reset | RW W1toClr | 0 |

Table 3-407. Register Call Summary for Register RM_MPU_RSTST

PRCM Register Manual

- [MPU_PRM Register Summary: \[0\]](#)

Table 3-408. RM_MPU_MPU_CONTEXT

| | | | |
|------------------|---|----------|---------|
| Address Offset | 0x0000 0024 | Instance | MPU_PRM |
| Physical Address | 0x4A30 6324 | | |
| Description | This register contains dedicated MPU context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----------------|----|----------|----|---|---|---|---|---|---|-----------------|---|-----------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_MPU_RAM | | LOSTMEM_MPU_L2 | | RESERVED | | | | | | | | LOSTCONTEXT_RFF | | LOSTCONTEXT_DFF | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|---------------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10 | LOSTMEM_MPU_RAM | Specify if memory-based context in MPU_RAM memory bank has been lost due to a previous power transition or other reset source (not affected by a global warm reset). 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 9 | LOSTMEM_MPU_L2 | Specify if memory-based context in MPU_L2 memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 8:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of MPU_MA_PWRON_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of MPU_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-409. Register Call Summary for Register RM_MPU_MPU_CONTEXT

Power Management Functional Description

- [PD_MPU Description: \[0\]](#)

PRCM Register Manual

- [MPU_PRM Register Summary: \[1\]](#)

3.11.5 DSP_PRM Registers

3.11.5.1 DSP_PRM Register Summary

Table 3-410. DSP_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DSP_PRM L4 Base Address |
|------------------------------------|------|-----------------------|----------------|-------------------------|
| PM_DSP_PWRSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 6400 |
| PM_DSP_PWRSTST | R | 32 | 0x0000 0004 | 0x4A30 6404 |
| RM_DSP_RSTCTRL | RW | 32 | 0x0000 0010 | 0x4A30 6410 |
| RM_DSP_RSTST | RW | 32 | 0x0000 0014 | 0x4A30 6414 |
| RM_DSP_DSP_CONTEXT | RW | 32 | 0x0000 0024 | 0x4A30 6424 |

3.11.5.2 DSP_PRM Register Description

Table 3-411. PM_DSP_PWRSTCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0000 | Instance | DSP_PRM |
| Physical Address | 0x4A30 6400 | | |
| Description | This register controls the DSP power state to reach upon a domain sleep transition | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------------------|----|----|----|----------------|----|----|----|----------------|----|----|----|----------|----|---|---|---|---|---|---|-------------------|---|---|---|-----------------|--|--|--|-----------------|--|--|--|----------|--|--|--|---------------------|--|--|--|----------|--|--|--|---------------|--|--|--|------------|--|--|--|
| RESERVED | | | | | | | | DSP_EDMA_ONSTATE | | | | DSP_L2_ONSTATE | | | | DSP_L1_ONSTATE | | | | RESERVED | | | | | | | | DSP_EDMA_RETSTATE | | | | DSP_L2_RETSTATE | | | | DSP_L1_RETSTATE | | | | RESERVED | | | | LOWPOWERSTATECHANGE | | | | RESERVED | | | | LOGICRETSTATE | | | | POWERSTATE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|--------------------|-------|
| 31:22 | RESERVED | | R | 0x000 |
| 21:20 | DSP_EDMA_ONSTATE | DSP_EDMA state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 19:18 | DSP_L2_ONSTATE | DSP_L2 state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 17:16 | DSP_L1_ONSTATE | DSP_L1 state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 15:11 | RESERVED | | R | 0x00 |
| 10 | DSP_EDMA_RETSTATE | DSP_EDMA state when domain is RETENTION. Read 0x1: Memory bank is retained when domain is in RETENTION state. | R Returns 1s | 1 |
| 9 | DSP_L2_RETSTATE | DSP_L2 state when domain is RETENTION. 0x0: Memory bank is off when the domain is in the RETENTION state. 0x1: Memory bank is retained when domain is in RETENTION state. | RW | 1 |
| 8 | DSP_L1_RETSTATE | DSP_L2 state when domain is RETENTION. 0x0: Memory bank is off when the domain is in the RETENTION state. 0x1: Memory bank is retained when domain is in RETENTION state. | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | LOWPOWERSTATECHANGE | Power state change request when domain has already performed a sleep transition. Allows going into deeper low power state without waking up the power domain. 0x0: Do not request a low power state change. 0x1: Request a low power state change. This bit is automatically cleared when the power state is effectively changed or when power state is ON. | RW WSpecial | 0 |
| 3 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 2 | LOGICRETSTATE | Logic state when power domain is RETENTION 0x0: Only retention registers are retained and remaining logic is off when the domain is in RETENTION state. 0x1: Whole logic is retained when domain is in RETENTION state. | RW | 1 |
| 1:0 | POWERSTATE | Power state control 0x0: OFF state 0x1: RETENTION state 0x2: INACTIVE state 0x3: ON State | RW | 0x3 |

Table 3-412. Register Call Summary for Register PM_DSP_PWRSTCTRL

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)

PRCM Register Manual

- [DSP_PRM Register Summary: \[9\]](#)

Table 3-413. PM_DSP_PWRSTST

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0004 | Instance | DSP_PRM |
| Physical Address | 0x4A30 6404 | | |
| Description | This register provides a status on the DSP domain current power state. [warm reset insensitive] | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|-----------------------|----------|--------------|----------|----|----|----|----|----|----|----------------|--------------|----|--------------|----|----------|------------|------------|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | LASTPOWERSTATEENTERED | RESERVED | INTRANSITION | RESERVED | | | | | | | DSP_EDMA_STATE | DSP_L2_STATE | | DSP_L1_STATE | | RESERVED | LOGICSTATE | POWERSTATE | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|---------------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | LASTPOWERSTATEENTERED | Last low power state entered. Set to 0x3 upon write of the same only. This register is intended for debug purpose only. Read 0x3: Power domain was previously ON-ACTIVE Read 0x2: Power domain was previously ON-INACTIVE Read 0x1: Power domain was previously in RETENTION Read 0x0: Power domain was previously OFF | RW W1toSet | 0x0 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | INTRANSITION | Domain transition status Read 0x0: No ongoing transition on power domain Read 0x1: Power domain transition is in progress. | R | 0 |
| 19:10 | RESERVED | | R | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------|
| 9:8 | DSP_EDMA_STATEST | DSP_EDMA memory state status Read 0x0: Memory is OFF Read 0x1: Memory is RETENTION Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 7:6 | DSP_L2_STATEST | DSP_L2 memory state status Read 0x0: Memory is OFF Read 0x1: Memory is RETENTION Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 5:4 | DSP_L1_STATEST | DSP_L1 memory state status Read 0x0: Memory is OFF Read 0x1: Memory is RETENTION Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICSTATEST | Logic state status Read 0x0: Logic in domain is OFF Read 0x1: Logic in domain is ON | R | 1 |
| 1:0 | POWERSTATEST | Current power state status Read 0x0: Power domain is OFF Read 0x1: Power domain is in RETENTION Read 0x2: Power domain is ON-INACTIVE Read 0x3: Power domain is ON-ACTIVE | R | 0x3 |

Table 3-414. Register Call Summary for Register PM_DSP_PWRSTST

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

PRCM Register Manual

- [DSP_PRM Register Summary: \[7\]](#)

Table 3-415. RM_DSP_RSTCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0010 | Instance | DSP_PRM |
| Physical Address | 0x4A30 6410 | | |
| Description | This register controls the release of the DSP sub-system resets. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RST2 | | RST1 | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | RST2 | DSP - MMU, cache and slave interface reset control 0x0: Reset is cleared for the MMU, cache and slave interface 0x1: Reset is asserted for the MMU, cache and slave interface | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | RST1 | DSP - DSP reset control 0x0: Reset is cleared for the DSP - DSP 0x1: Reset is asserted for the DSP - DSP | RW | 1 |

Table 3-416. Register Call Summary for Register RM_DSP_RSTCTRL

Reset Management Functional Description

- [Reset Domains: \[0\]](#)
- [DSP Subsystem Power-On Reset Sequence: \[1\] \[2\]](#)
- [DSP Subsystem Software Warm Reset Sequence: \[3\] \[4\] \[5\] \[6\]](#)

PRCM Register Manual

- [DSP_PRM Register Summary: \[7\]](#)

Table 3-417. RM_DSP_RSTST

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0014 | Instance | DSP_PRM |
| Physical Address | 0x4A30 6414 | | |
| Description | This register logs the different reset sources of the DSP domain. Each bit is set upon release of the domain reset signal. Must be cleared by software. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|-----------------|----|---|---|--------|---|---|---|--------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DSP_DSP_EMU_REQ_RSTST | | | | DSPSS_EMU_RSTST | | | | RST2ST | | | | RST1ST | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|---------------|-----------|
| 31:4 | RESERVED | | R | 0x0000000 |
| 3 | DSP_DSP_EMU_REQ_RSTST | DSP DSP processor has been reset due to DSP emulation reset request driven from DSPSS 0x0: No emulation reset 0x1: DSP DSP has been reset upon emulation reset request | RW W1toClr | 0 |
| 2 | DSPSS_EMU_RSTST | DSP domain has been reset due to emulation reset source e.g. assert reset command initiated by the icepick module 0x0: No emulation reset 0x1: DSP has been reset upon emulation reset | RW W1toClr | 0 |
| 1 | RST2ST | DSP MMU, cache and slave interface software reset status 0x0: No software reset occurred 0x1: MMU, cache and slave interface has been reset upon software reset | RW W1toClr | 0 |
| 0 | RST1ST | DSP DSP software reset 0x0: No software reset occurred 0x1: DSP has been reset upon software reset | RW W1toClr | 0 |

Table 3-418. Register Call Summary for Register RM_DSP_RSTST

PRCM Register Manual

- DSP_PRM Register Summary: [0]

Table 3-419. RM DSP DSP CONTEXT

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0024 | | |
| Physical Address | 0x4A30 6424 | Instance | DSP_PRM |
| Description | This register contains dedicated DSP context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|------------------|----|----|----------------|----|----|----------------|---|---|----------|---|---|---|---|---|---|--|-----------------|--|-----------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
| | | | | | | | | RESERVED | | | | | | | | LOSTMEM_DSP_EDMA | | | LOSTMEM_DSP_L2 | | | LOSTMEM_DSP_L1 | | | RESERVED | | | | | | | | LOSTCONTEXT_RFF | | LOSTCONTEXT_DFF | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|---------------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10 | LOSTMEM_DSP_EDMA | Specify if memory-based context in DSP_EDMA memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 9 | LOSTMEM_DSP_L2 | Specify if memory-based context in DSP_L2 memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 8 | LOSTMEM_DSP_L1 | Specify if memory-based context in DSP_L1 memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of DSP_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of DSP_SYS_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-420. Register Call Summary for Register RM_DSP_DSP_CONTEXT

Power Management Functional Description

- [PD_DSP Description: \[0\] \[1\]](#)

PRCM Register Manual

- [DSP_PRM Register Summary: \[2\]](#)

3.11.6 ABE_PRM Registers

3.11.6.1 ABE_PRM Register Summary

Table 3-421. ABE_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ABE_PRM L4 Base Address |
|---|------|-----------------------|----------------|-------------------------|
| PM_ABE_PWRSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 6500 |
| PM_ABE_PWRSTST | R | 32 | 0x0000 0004 | 0x4A30 6504 |
| RM_ABE_AESS_CONTEXT | RW | 32 | 0x0000 002C | 0x4A30 652C |
| PM_ABE_PDM_WKDEP | RW | 32 | 0x0000 0030 | 0x4A30 6530 |
| RM_ABE_PDM_CONTEXT | RW | 32 | 0x0000 0034 | 0x4A30 6534 |
| PM_ABE_DMIC_WKDEP | RW | 32 | 0x0000 0038 | 0x4A30 6538 |
| RM_ABE_DMIC_CONTEXT | RW | 32 | 0x0000 003C | 0x4A30 653C |
| PM_ABE_MCASP_WKDEP | RW | 32 | 0x0000 0040 | 0x4A30 6540 |
| RM_ABE_MCASP_CONTEXT | RW | 32 | 0x0000 0044 | 0x4A30 6544 |
| PM_ABE_MCBSP1_WKDEP | RW | 32 | 0x0000 0048 | 0x4A30 6548 |
| RM_ABE_MCBSP1_CONTEXT | RW | 32 | 0x0000 004C | 0x4A30 654C |
| PM_ABE_MCBSP2_WKDEP | RW | 32 | 0x0000 0050 | 0x4A30 6550 |
| RM_ABE_MCBSP2_CONTEXT | RW | 32 | 0x0000 0054 | 0x4A30 6554 |
| PM_ABE_MCBSP3_WKDEP | RW | 32 | 0x0000 0058 | 0x4A30 6558 |
| RM_ABE_MCBSP3_CONTEXT | RW | 32 | 0x0000 005C | 0x4A30 655C |
| PM_ABE_SLIMBUS_WKDEP | RW | 32 | 0x0000 0060 | 0x4A30 6560 |
| RM_ABE_SLIMBUS_CONTEXT | RW | 32 | 0x0000 0064 | 0x4A30 6564 |
| PM_ABE_GPTIMER5_WKDEP | RW | 32 | 0x0000 0068 | 0x4A30 6568 |
| RM_ABE_GPTIMER5_CONTEXT | RW | 32 | 0x0000 006C | 0x4A30 656C |
| PM_ABE_GPTIMER6_WKDEP | RW | 32 | 0x0000 0070 | 0x4A30 6570 |
| RM_ABE_GPTIMER6_CONTEXT | RW | 32 | 0x0000 0074 | 0x4A30 6574 |
| PM_ABE_GPTIMER7_WKDEP | RW | 32 | 0x0000 0078 | 0x4A30 6578 |
| RM_ABE_GPTIMER7_CONTEXT | RW | 32 | 0x0000 007C | 0x4A30 657C |
| PM_ABE_GPTIMER8_WKDEP | RW | 32 | 0x0000 0080 | 0x4A30 6580 |
| RM_ABE_GPTIMER8_CONTEXT | RW | 32 | 0x0000 0084 | 0x4A30 6584 |
| PM_ABE_WDTIMER3_WKDEP | R | 32 | 0x0000 0088 | 0x4A30 6588 |
| RM_ABE_WDTIMER3_CONTEXT | RW | 32 | 0x0000 008C | 0x4A30 658C |

3.11.6.2 ABE_PRM Register Description

Table 3-422. PM_ABE_PWRSTCTRL

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0000 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6500 | | |
| Description | This register controls the ABE domain power state to reach upon a domain sleep transition | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------------------|----|----|----|----------|----|----|----|----------------|----|----|----|----------|----|---|---|---|---|---|---|-------------------|---|---|---|----------|--|--|--|-----------------|--|--|--|----------|--|--|--|---------------------|--|--|--|----------|--|--|--|---------------|--|--|--|------------|--|--|--|
| RESERVED | | | | | | | | PERIPHEM_ONSTATE | | | | RESERVED | | | | AESMEM_ONSTATE | | | | RESERVED | | | | | | | | PERIPHEM_RETSTATE | | | | RESERVED | | | | AESMEM_RETSTATE | | | | RESERVED | | | | LOWPOWERSTATECHANGE | | | | RESERVED | | | | LOGICRETSTATE | | | | POWERSTATE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|--------------------|-------|
| 31:22 | RESERVED | | R | 0x000 |
| 21:20 | PERIPHMEM_ONSTATE | PERIPHMEM memory state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 19:18 | RESERVED | | R | 0x0 |
| 17:16 | AESSMEM_ONSTATE | AESSMEM memory state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 15:11 | RESERVED | | R | 0x00 |
| 10 | PERIPHMEM_RETSTATE | PERIPHMEM memory state when domain is RETENTION. Read 0x0: Memory bank is off when the domain is in the RETENTION state. | R | 0 |
| 9 | RESERVED | | R | 0 |
| 8 | AESSMEM_RETSTATE | AESSMEM memory state when domain is RETENTION. Read 0x1: Memory bank is retained when domain is in RETENTION state. | R Returns 1s | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | LOWPOWERSTATECHANGE | Power state change request when domain has already performed a sleep transition. Allows going into deeper low power state without waking up the power domain. 0x0: Do not request a low power state change. 0x1: Request a low power state change. This bit is automatically cleared when the power state is effectively changed or when power state is ON. | RW WSpecial | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICRETSTATE | Logic state when power domain is RETENTION Read 0x0: Whole logic is off when the domain is in RETENTION state. | R | 0 |
| 1:0 | POWERSTATE | Power state control 0x0: OFF state 0x1: RETENTION state 0x2: INACTIVE state 0x3: ON State | RW | 0x0 |

Table 3-423. Register Call Summary for Register PM_ABE_PWRSTCTRL

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[7\]](#)

Table 3-424. PM_ABE_PWRSTST

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0004 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6504 | | |
| Description | This register provides a status on the ABE domain current power domain state. [warm reset insensitive] | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|--------------|----------|----|----|----|----|----|----|----|----|----|------------------|---|----------|---|-----------------|---|----------|---|--------------|---|--------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | RESERVED | | INTRANSITION | RESERVED | | | | | | | | | | PERIPHEM_STATEST | | RESERVED | | AESSMEM_STATEST | | RESERVED | | LOGICSTATEST | | POWERSTATEST | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|---------------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | LASTPOWERSTATEENTERED | Last low power state entered. Set to 0x3 upon write of the same only. This register is intended for debug purpose only. Read 0x3: Power domain was previously ON-ACTIVE Read 0x2: Power domain was previously ON-INACTIVE Read 0x1: Power domain was previously in RETENTION Read 0x0: Power domain was previously OFF | RW W1toSet | 0x0 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | INTRANSITION | Domain transition status Read 0x0: No ongoing transition on power domain Read 0x1: Power domain transition is in progress. | R | 0 |
| 19:10 | RESERVED | | R | 0x000 |
| 9:8 | PERIPHEM_STATEST | PERIPHEM memory state status Read 0x0: Memory is OFF Read 0x1: Reserved Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 7:6 | RESERVED | | R | 0x0 |
| 5:4 | AESSMEM_STATEST | AESSMEM memory state status Read 0x0: Memory is OFF Read 0x1: Memory is RETENTION Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 3 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 2 | LOGICSTATEST | Logic state status Read 0x0: Logic in domain is OFF Read 0x1: Logic in domain is ON | R | 1 |
| 1:0 | POWERSTATEST | Current power state status Read 0x0: Power domain is OFF Read 0x1: Power domain is in RETENTION Read 0x2: Power domain is ON-INACTIVE Read 0x3: Power domain is ON-ACTIVE | R | 0x3 |

Table 3-425. Register Call Summary for Register PM_ABE_PWRSTST

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[6\]](#)

Table 3-426. RM_ABE_AESS_CONTEXT

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 002C | Instance | ABE_PRM |
| Physical Address | 0x4A30 652C | | |
| Description | This register contains dedicated AESS context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----------|----|----|----|----|---|---|---|---|---|-----------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_AESSMEM | RESERVED | | | | | | | | | | LOSTCONTEXT_DFF | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_AESSMEM | Specify if memory-based context in AESSMEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-427. Register Call Summary for Register RM_ABE_AESS_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-428. PM_ABE_PDM_WKDEP

| | | | |
|------------------|---|----------|---------|
| Address Offset | 0x0000 0030 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6530 | | |
| Description | This register controls wakeup dependency based on PDM service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------------|----|---------------------|----|----------|----|---------------------|---|----------|---|---------------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_PDM_DMA_SDMA | | WKUPDEP_PDM_DMA_DSP | | RESERVED | | WKUPDEP_PDM_IRQ_DSP | | RESERVED | | WKUPDEP_PDM_IRQ_MPU | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|-----------|
| 31:8 | RESERVED | | R | 0x0000000 |
| 7 | WKUPDEP_PDM_DMA_SDMA | Wakeup dependency from PDM module (softwareakeup_dma signal) towards SDMA + L3_2 + L3_1 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 6 | WKUPDEP_PDM_DMA_DSP | Wakeup dependency from PDM module (softwareakeup_dma signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 5:3 | RESERVED | | R | 0x0 |
| 2 | WKUPDEP_PDM_IRQ_DSP | Wakeup dependency from PDM module (softwareakeup_irq signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | WKUPDEP_PDM_IRQ_MPU | Wakeup dependency from PDM module (softwareakeup_irq signal) towards MPU domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-429. Register Call Summary for Register PM_ABE_PDM_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[4\]](#)

Table 3-430. RM_ABE_PDM_CONTEXT

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0034 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6534 | | |
| Description | This register contains dedicated PDM context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----------|----|----|----|---|---|---|---|-----------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_PERIHPMEM | | RESERVED | | | | | | | | LOSTCONTEXT_DFF | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_PERIHPMEM | Specify if memory-based context in PERIHPMEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-431. Register Call Summary for Register RM_ABE_PDM_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-432. PM_ABE_DMIC_WKDEP

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0038 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6538 | | |
| Description | This register controls wakeup dependency based on DMIC service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----------------------|----|----------|----|---|----------------------|---|----------|---|----------------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_DMIC_DMA_SDMA | | WKUPDEP_DMIC_DMA_DSP | | RESERVED | | | WKUPDEP_DMIC_IRQ_DSP | | RESERVED | | WKUPDEP_DMIC_IRQ_MPU | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7 | WKUPDEP_DMIC_DMA_SDMA | Wakeup dependency from DMIC module (softwareakeup_dma signal) towards SDMA + L3_2 + L3_1 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 6 | WKUPDEP_DMIC_DMA_DSP | Wakeup dependency from DMIC module (softwareakeup_dma signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 5:3 | RESERVED | | R | 0x0 |
| 2 | WKUPDEP_DMIC_IRQ_DSP | Wakeup dependency from DMIC module (softwareakeup_irq signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | WKUPDEP_DMIC_IRQ_MPU | Wakeup dependency from DMIC module (softwareakeup_irq signal) towards MPU domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-433. Register Call Summary for Register PM_ABE_DMIC_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[4\]](#)

Table 3-434. RM_ABE_DMIC_CONTEXT

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 003C | Instance | ABE_PRM |
| Physical Address | 0x4A30 653C | | |
| Description | This register contains dedicated DMIC context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|-----------------|
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_PERIHPMEM | | | | | | | | RESERVED | | | | | | | | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_PERIHPMEM | Specify if memory-based context in PERIHPMEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-435. Register Call Summary for Register RM_ABE_DMIC_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-436. PM_ABE_MCASP_WKDEP

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0040 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6540 | | |
| Description | This register controls wakeup dependency based on MCASP service requests. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------------|----|------------------------|----|----------|----|---|---|------------------------|---|----------|---|------------------------|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_MCASP1_DMA_SDMA | | WKUPDEP_MCASP1_DMA_DSP | | RESERVED | | | | WKUPDEP_MCASP1_IRQ_DSP | | RESERVED | | WKUPDEP_MCASP1_IRQ_MPU | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7 | WKUPDEP_MCASP1_DMA_SD MA | Wakeup dependency from MCASP1 module (softwareakeup_dma signal) towards SDMA + L3_2 + L3_1 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 6 | WKUPDEP_MCASP1_DMA_DS P | Wakeup dependency from MCASP1 module (softwareakeup_dma signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 5:3 | RESERVED | | R | 0x0 |
| 2 | WKUPDEP_MCASP1_IRQ_DSP | Wakeup dependency from MCASP1 module (softwareakeup_irq signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | WKUPDEP_MCASP1_IRQ_MPU | Wakeup dependency from MCASP1 module (softwareakeup_irq signal) towards MPU domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-437. Register Call Summary for Register PM_ABE_MCASP_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[4\]](#)

Table 3-438. RM_ABE_MCASP_CONTEXT

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0044 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6544 | | |
| Description | This register contains dedicated MCASP context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-439. Register Call Summary for Register RM_ABE_MCBSP1_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-440. PM_ABE_MCBSP1_WKDEP

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0048 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6548 | | |
| Description | This register controls wakeup dependency based on MCBSP1 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---------------------|---|---|---|--------------------|--|--|--|----------|--|--|--|--------------------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_MCBSP1_SDMA | | | | WKUPDEP_MCBSP1_DSP | | | | RESERVED | | | | WKUPDEP_MCBSP1_MPU | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MCBSP1_SDMA | Wakeup dependency from MCBSP1 module (softwareakeup signal) towards SDMA + L3_2 + L3_1 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | WKUPDEP_MCBSP1_DSP | Wakeup dependency from MCBSP1 module (softwareakeup signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | WKUPDEP_MCBSP1_MPU | Wakeup dependency from MCBSP1 module (softwareakeup signal) towards MPU domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-441. Register Call Summary for Register PM_ABE_MCBSP1_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[3\]](#)

Table 3-442. RM_ABE_MCBSP1_CONTEXT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 004C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 654C | | | | | | | | | | | | | | | | InstanceABE_PRM | | | | | | | | | | | | | | | |
| Description | This register contains dedicated MCBSP1 context statuses. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----------|----|----|----|----|---|---|-----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_PERIHPMEM | RESERVED | | | | | | | LOSTCONTEXT_DFF | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_PERIHPMEM | Specify if memory-based context in PERIHPMEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-443. Register Call Summary for Register RM_ABE_MCBSP1_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-444. PM_ABE_MCBSP2_WKDEP

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0050 | | |
| Physical Address | 0x4A30 6550 | Instance | ABE_PRM |
| Description | This register controls wakeup dependency based on MCBSP2 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_MCBSP2_SDMA WKUPDEP_MCBSP2_DSP RESERVED WKUPDEP_MCBSP2_MPU | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MCBSP2_SDMA | Wakeup dependency from MCBSP2 module (softwareakeup signal) towards SDMA + L3_2 + L3_1 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | WKUPDEP_MCBSP2_DSP | Wakeup dependency from MCBSP2 module (softwareakeup signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | WKUPDEP_MCBSP2_MPU | Wakeup dependency from MCBSP2 module (softwareakeup signal) towards MPU domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-445. Register Call Summary for Register PM_ABE_MCBSP2_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[3\]](#)

Table 3-446. RM_ABE_MCBSP2_CONTEXT

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0054 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6554 | | |
| Description | This register contains dedicated MCBSP2 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|-----------------|
| RESERVED | | | | | | | | | | | | | | | | LOSTMEN_PERIHPMEM | RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_PERIHPMEM | Specify if memory-based context in PERIHPMEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-447. Register Call Summary for Register RM_ABE_MCBSP2_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-448. PM_ABE_MCBSP3_WKDEP

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0058 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6558 | | |
| Description | This register controls wakeup dependency based on MCBSP3 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---------------------|--------------------|----------|--------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_MCBSP3_SDMA | WKUPDEP_MCBSP3_DSP | RESERVED | WKUPDEP_MCBSP3_MPU |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MCBSP3_SDMA | Wakeup dependency from MCBSP3 module (softwareakeup signal) towards SDMA + L3_2 + L3_1 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | WKUPDEP_MCBSP3_DSP | Wakeup dependency from MCBSP3 module (softwareakeup signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------|
| 0 | WKUPDEP_MCBSP3_MPU | Wakeup dependency from MCBSP3 module (softwareakeup signal) towards MPU domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-449. Register Call Summary for Register PM_ABE_MCBSP3_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[3\]](#)

Table 3-450. RM_ABE_MCBSP3_CONTEXT

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 005C | Instance | ABE_PRM |
| Physical Address | 0x4A30 655C | | |
| Description | This register contains dedicated MCBSP3 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----------|----|----|----|----|---|---|---|---|---|-----------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_PERIHPMEM | RESERVED | | | | | | | | | | LOSTCONTEXT_DFF | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_PERIHPMEM | Specify if memory-based context in PERIHPMEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-451. Register Call Summary for Register RM_ABE_MCBSP3_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-452. PM_ABE_SLIMBUS_WKDEP

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0060 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6560 | | |
| Description | This register controls wakeup dependency based on SLIMBUS service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------------|----|--------------------------|----|----------|----|--------------------------|---|----------|---|--------------------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_SLIMBUS1_DMA_SDMA | | WKUPDEP_SLIMBUS1_DMA_DSP | | RESERVED | | WKUPDEP_SLIMBUS1_IRQ_DSP | | RESERVED | | WKUPDEP_SLIMBUS1_IRQ_MPU | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7 | WKUPDEP_SLIMBUS1_DMA_S DMA | Wakeup dependency from SLIMBUS1 module (softwareakeup_dma signal) towards SDMA + L3_2 + L3_1 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 6 | WKUPDEP_SLIMBUS1_DMA_D SP | Wakeup dependency from SLIMBUS1 module (softwareakeup_dma signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 5:3 | RESERVED | | R | 0x0 |
| 2 | WKUPDEP_SLIMBUS1_IRQ_DS P | Wakeup dependency from SLIMBUS1 module (softwareakeup_irq signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | WKUPDEP_SLIMBUS1_IRQ_MP U | Wakeup dependency from SLIMBUS1 module (softwareakeup_irq signal) towards MPU domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-453. Register Call Summary for Register PM_ABE_SLIMBUS_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[4\]](#)

Table 3-454. RM_ABE_SLIMBUS_CONTEXT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0064 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 6564 | | | | | | | | | | | | | | | | Instance ABE_PRM | | | | | | | | | | | | | | | |
| Description | This register contains dedicated SLIMBUS context statuses. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_PERIHPMEM | RESERVED | | | | | | | | | | | | | | LOSTCONTEXT_DFF |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_PERIHPMEM | Specify if memory-based context in PERIHPMEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-455. Register Call Summary for Register RM_ABE_SLIMBUS_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-456. PM_ABE_GPTIMER5_WKDEP

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0068 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 6568 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ABE_PRM | | | | | | | | | | | | | | | |
| Description | This register controls wakeup dependency based on TIMER5 service requests. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_TIMER5_DSP | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | WKUPDEP_TIMER5_MPU | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | WKUPDEP_TIMER5_DSP | Wakeup dependency from TIMER5 module (softwareakeup signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | WKUPDEP_TIMER5_MPU | Wakeup dependency from TIMER5 module (softwareakeup signal) towards MPU domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-457. Register Call Summary for Register PM_ABE_GPTIMER5_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[2\]](#)

Table 3-458. RM_ABE_GPTIMER5_CONTEXT

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 006C | Instance | ABE_PRM |
| Physical Address | 0x4A30 656C | | |
| Description | This register contains dedicated TIMER5 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-459. Register Call Summary for Register RM_ABE_GPTIMER5_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-460. PM_ABE_GPTIMER6_WKDEP

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0070 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6570 | | |
| Description | This register controls wakeup dependency based on TIMER6 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|--------------------|----------|--------------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_TIMER6_DSP | RESERVED | WKUPDEP_TIMER6_MPU | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | WKUPDEP_TIMER6_DSP | Wakeup dependency from TIMER6 module (softwareakeup signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | WKUPDEP_TIMER6_MPU | Wakeup dependency from TIMER6 module (softwareakeup signal) towards MPU domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-461. Register Call Summary for Register PM_ABE_GPTIMER6_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[2\]](#)

Table 3-462. RM_ABE_GPTIMER6_CONTEXT

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0074 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6574 | | |
| Description | This register contains dedicated TIMER6 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-463. Register Call Summary for Register RM_ABE_GPTIMER6_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-464. PM_ABE_GPTIMER7_WKDEP

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0078 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6578 | | |
| Description | This register controls wakeup dependency based on TIMER7 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|--------------------|---|----------|---|--------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_TIMER7_DSP | | RESERVED | | WKUPDEP_TIMER7_MPU |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | WKUPDEP_TIMER7_DSP | Wakeup dependency from TIMER7 module (softwareakeup signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | WKUPDEP_TIMER7_MPU | Wakeup dependency from TIMER7 module (softwareakeup signal) towards MPU domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-465. Register Call Summary for Register PM_ABE_GPTIMER7_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[2\]](#)

Table 3-466. RM_ABE_GPTIMER7_CONTEXT

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 007C | Instance | ABE_PRM |
| Physical Address | 0x4A30 657C | | |
| Description | This register contains dedicated TIMER7 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-467. Register Call Summary for Register RM_ABE_GPTIMER7_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-468. PM_ABE_GPTIMER8_WKDEP

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0080 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6580 | | |
| Description | This register controls wakeup dependency based on TIMER8 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|--------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_TIMER8_DSP |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESERVED |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_TIMER8_MPU |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | WKUPDEP_TIMER8_DSP | Wakeup dependency from TIMER8 module (softwareakeup signal) towards DSP domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | WKUPDEP_TIMER8_MPU | Wakeup dependency from TIMER8 module (softwareakeup signal) towards MPU domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-469. Register Call Summary for Register PM_ABE_GPTIMER8_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[2\]](#)

Table 3-470. RM_ABE_GPTIMER8_CONTEXT

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0084 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6584 | | |
| Description | This register contains dedicated TIMER8 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-471. Register Call Summary for Register RM_ABE_GPTIMER8_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-472. PM_ABE_WDTIMER3_WKDEP

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0088 | Instance | ABE_PRM |
| Physical Address | 0x4A30 6588 | | |
| Description | This register controls wakeup dependency based on WDT3 service requests. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_WDT3_MPU |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | WKUPDEP_WDT3_MPU | Wakeup dependency from WDT3 module (softwareakeup signal) towards MPU domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |

Table 3-473. Register Call Summary for Register PM_ABE_WDTIMER3_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

Table 3-474. RM_ABE_WDTIMER3_CONTEXT

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 008C | Instance | ABE_PRM |
| Physical Address | 0x4A30 658C | | |
| Description | This register contains dedicated WDT3 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of AUDIO_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-475. Register Call Summary for Register RM_ABE_WDTIMER3_CONTEXT

Power Management Functional Description

- [PD_AUDIO Description: \[0\]](#)

PRCM Register Manual

- [ABE_PRM Register Summary: \[1\]](#)

3.11.7 ALWAYS_ON_PRM Registers

3.11.7.1 ALWAYS_ON_PRM Register Summary

Table 3-476. ALWAYS_ON_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ALWAYS_ON_PRM L4 Base Address |
|--|------|-----------------------|----------------|-------------------------------|
| RESERVED | RW | 32 | 0x0000 0024 | 0x4A30 6624 |
| PM_ALWON_SR_MPU_WKDEP | R | 32 | 0x0000 0028 | 0x4A30 6628 |
| RM_ALWON_SR_MPU_CONTEXT | RW | 32 | 0x0000 002C | 0x4A30 662C |
| PM_ALWON_SR_IVA_WKDEP | RW | 32 | 0x0000 0030 | 0x4A30 6630 |
| RM_ALWON_SR_IVA_CONTEXT | RW | 32 | 0x0000 0034 | 0x4A30 6634 |
| PM_ALWON_SR_CORE_WKDEP | RW | 32 | 0x0000 0038 | 0x4A30 6638 |
| RM_ALWON_SR_CORE_CONTEXT | RW | 32 | 0x0000 003C | 0x4A30 663C |

3.11.7.2 ALWAYS_ON_PRM Register Description

Table 3-477. PM_ALWON_SR_MPU_WKDEP

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0028 | Instance | ALWAYS_ON_PRM |
| Physical Address | 0x4A30 6628 | | |
| Description | This register controls wakeup dependency based on SR_MPU service requests. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_SR_MPU_MPU | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|-----------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | WKUPDEP_SR_MPU_MPU | Wakeup dependency from SR_MPU module (softwareakeup signal) towards MPU + L3_1 + L4_CFG domains Read 0x1: Dependency is enabled | R Returns 1s | 1 |

Table 3-478. Register Call Summary for Register PM_ALWON_SR_MPU_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\]](#)

PRCM Register Manual

- [ALWAYS_ON_PRM Register Summary: \[1\]](#)

Table 3-479. RM_ALWON_SR_MPU_CONTEXT

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 002C | Instance | ALWAYS_ON_PRM |
| Physical Address | 0x4A30 662C | | |
| Description | This register contains dedicated SR_MPU context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of Always_on_CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-480. Register Call Summary for Register RM_ALWON_SR_MPU_CONTEXT

Power Management Functional Description

- [PD_ALWON_CORE Description: \[0\]](#)

PRCM Register Manual

- [ALWAYS_ON_PRM Register Summary: \[1\]](#)

Table 3-481. PM_ALWON_SR_IVA_WKDEP

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0030 | Instance | ALWAYS_ON_PRM |
| Physical Address | 0x4A30 6630 | | |
| Description | This register controls wakeup dependency based on SR_IVA service requests. | | |
| Type | RW | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | WKUPDEP_SR_IVA_MPU_M3 | Wakeup dependency from SR_IVA module (softwareakeup signal) towards MPU_A3 + L3_2 + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_SR_IVA_MPU | Wakeup dependency from SR_IVA module (softwareakeup signal) towards MPU + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Clock Management Functional Description

- PRCM Register Manual

- ALWAYS_ON_PRM Register Summary: [2]

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0034 | | |
| Physical Address | 0x4A30 6634 | Instance | ALWAYS_ON_PRM |
| Description | This register contains dedicated SR_IVA context statuses. [warm reset insensitive] | | |
| Type | RW | | |

SWPU270E–November 2011–Revised December 2011

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of Always_on_CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-484. Register Call Summary for Register RM_ALWON_SR_IVA_CONTEXT

Power Management Functional Description

- [PD_ALWON_CORE Description: \[0\]](#)

PRCM Register Manual

- [ALWAYS_ON_PRM Register Summary: \[1\]](#)

Table 3-485. PM_ALWON_SR_CORE_WKDEP

| | | | |
|-------------------------|---|-----------------|---------------|
| Address Offset | 0x0000 0038 | Instance | ALWAYS_ON_PRM |
| Physical Address | 0x4A30 6638 | | |
| Description | This register controls wakeup dependency based on SR_CORE service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|------------------------|---------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_SR_CORE_MPU_M3 | WKUPDEP_SR_CORE_MPU |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | WKUPDEP_SR_CORE_MPU_M3 | Wakeup dependency from SR_CORE module (softwareakeup signal) towards MPU_A3 + L3_2 + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_SR_CORE_MPU | Wakeup dependency from SR_CORE module (softwareakeup signal) towards MPU + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-486. Register Call Summary for Register PM_ALWON_SR_CORE_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [ALWAYS_ON_PRM Register Summary: \[2\]](#)

Table 3-487. RM_ALWON_SR_CORE_CONTEXT

| | | | |
|------------------|---|----------|---------------|
| Address Offset | 0x0000 003C | | |
| Physical Address | 0x4A30 663C | Instance | ALWAYS_ON_PRM |
| Description | This register contains dedicated SR_CORE context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of Always_on_CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-488. Register Call Summary for Register RM_ALWON_SR_CORE_CONTEXT

Power Management Functional Description

- [PD_ALWON_CORE Description: \[0\]](#)

PRCM Register Manual

- [ALWAYS_ON_PRM Register Summary: \[1\]](#)

3.11.8 CORE_PRM Registers

3.11.8.1 CORE_PRM Register Summary

Table 3-489. CORE_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CORE_PRM L4 Base Address |
|--|------|-----------------------|----------------|--------------------------|
| PM_CORE_PWRSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 6700 |
| PM_CORE_PWRSTST | R | 32 | 0x0000 0004 | 0x4A30 6704 |
| RM_L3_1_L3_1_CONTEXT | RW | 32 | 0x0000 0024 | 0x4A30 6724 |
| RM_L3_2_L3_2_CONTEXT | RW | 32 | 0x0000 0124 | 0x4A30 6824 |
| RM_L3_2_GPMC_CONTEXT | RW | 32 | 0x0000 012C | 0x4A30 682C |
| RM_L3_2_OCMC_RAM_CONTEXT | RW | 32 | 0x0000 0134 | 0x4A30 6834 |
| RM_MPU_M3_RSTCTRL | RW | 32 | 0x0000 0210 | 0x4A30 6910 |
| RM_MPU_M3_RSTST | RW | 32 | 0x0000 0214 | 0x4A30 6914 |
| RM_MPU_M3_MPU_M3_CONTEXT | RW | 32 | 0x0000 0224 | 0x4A30 6924 |
| RM_SDMA_SDMA_CONTEXT | RW | 32 | 0x0000 0324 | 0x4A30 6A24 |
| RM_MEMIF_DMM_CONTEXT | RW | 32 | 0x0000 0424 | 0x4A30 6B24 |
| RM_MEMIF_EMIF_FW_CONTEXT | RW | 32 | 0x0000 042C | 0x4A30 6B2C |
| RM_MEMIF_EMIF_1_CONTEXT | RW | 32 | 0x0000 0434 | 0x4A30 6B34 |

Table 3-489. CORE_PRM Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | CORE_PRM L4 Base Address |
|---|------|-----------------------|----------------|--------------------------|
| RM_MEMIF_EMIF_2_CONTEXT | RW | 32 | 0x0000 043C | 0x4A30 6B3C |
| RM_MEMIF_DLL_CONTEXT | RW | 32 | 0x0000 0444 | 0x4A30 6B44 |
| RESERVED | RW | 32 | 0x0000 0454 | 0x4A30 6B54 |
| RESERVED | RW | 32 | 0x0000 045C | 0x4A30 6B5C |
| RESERVED | RW | 32 | 0x0000 0464 | 0x4A30 6B64 |
| RM_C2C_C2C_CONTEXT | RW | 32 | 0x0000 0524 | 0x4A30 6C24 |
| RESERVED | RW | 32 | 0x0000 052C | 0x4A30 6C2C |
| RM_C2C_C2C_FW_CONTEXT | RW | 32 | 0x0000 0534 | 0x4A30 6C34 |
| RM_L4CFG_L4_CFG_CONTEXT | RW | 32 | 0x0000 0624 | 0x4A30 6D24 |
| RM_L4CFG_SPINLOCK_CONTEXT | RW | 32 | 0x0000 062C | 0x4A30 6D2C |
| RM_L4CFG_MAILBOX_CONTEXT | RW | 32 | 0x0000 0634 | 0x4A30 6D34 |
| RM_L4CFG_SAR_ROM_CONTEXT | RW | 32 | 0x0000 063C | 0x4A30 6D3C |
| RM_L3INSTR_L3_3_CONTEXT | RW | 32 | 0x0000 0724 | 0x4A30 6E24 |
| RM_L3INSTR_L3_INSTR_CONTEXT | RW | 32 | 0x0000 072C | 0x4A30 6E2C |
| RM_L3INSTR_OCP_WP1_CONTEXT | RW | 32 | 0x0000 0744 | 0x4A30 6E44 |

3.11.8.2 CORE_PRM Register Description

Table 3-490. PM_CORE_PWRSTCTRL

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0000 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6700 | | |
| Description | This register controls the CORE power state to reach upon a domain sleep transition | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | |
|----------|----|----|----|----|----|----------------------------|----|-------------------------|----|----------------------|----|---------------------|----|-------------------------|----|----------|----|----|----|-----------------------------|----|--------------------------|---|-----------------------|---|----------------------|---|--------------------------|---|----------|---|--|--|---------------------|--|----------|--|---------------|--|------------|--|
| RESERVED | | | | | | INTRCONN_NRET_BANK_ONSTATE | | MPU_M3_UNICACHE_ONSTATE | | MPU_M3_L2RAM_ONSTATE | | CORE_OCMRAM_ONSTATE | | CORE_OTHER_BANK_ONSTATE | | RESERVED | | | | INTRCONN_NRET_BANK_RETSTATE | | MPU_M3_UNICACHE_RETSTATE | | MPU_M3_L2RAM_RETSTATE | | CORE_OCMRAM_RETSTATE | | CORE_OTHER_BANK_RETSTATE | | RESERVED | | | | LOWPOWERSTATECHANGE | | RESERVED | | LOGICRETSTATE | | POWERSTATE | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|---|-----------------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | INTRCONN_NRET_BANK_ONSTATE | INTRCONN_WP bank and DMM bank2 state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 23:22 | MPU_M3_UNICACHE_ONSTATE | MPU_A3 UNICACHE bank state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|---|---------------------|-------|
| 21:20 | MPU_M3_L2RAM_ONSTATE | MPU_A3 L2 bank state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Rreturns 1s | 0x3 |
| 19:18 | CORE_OCMRAM_ONSTATE | OCMRAM bank state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Rreturns 1s | 0x3 |
| 17:16 | CORE_OTHER_BANK_ONSTATE | DMA/ICR bank and DMM bank1 state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Rreturns 1s | 0x3 |
| 15:13 | RESERVED | | R | 0x0 |
| 12 | INTRCONN_NRET_BANK_RETSTATE | INTRCONN_WP bank and DMM bank2 state when domain is RETENTION. Read 0x0: Memory bank is off when the domain is in the RETENTION state. | R | 0 |
| 11 | MPU_M3_UNICACHE_RETSTATE | MPU_A3 UNICACHE bank state when domain is RETENTION. 0x0: Memory bank is off when the domain is in the RETENTION state. 0x1: Memory bank is retained when domain is in RETENTION state. | RW | 1 |
| 10 | MPU_M3_L2RAM_RETSTATE | MPU_A3 L2 bank state when domain is RETENTION. 0x0: Memory bank is off when the domain is in the RETENTION state. 0x1: Memory bank is retained when domain is in RETENTION state. | RW | 1 |
| 9 | CORE_OCMRAM_RETSTATE | OCMRAM bank state when domain is RETENTION. Read 0x1: Memory bank is retained when domain is in RETENTION state. | R Rreturns 1s | 1 |
| 8 | CORE_OTHER_BANK_RETSTATE | DMA/ICR bank and DMM bank1 state when domain is RETENTION. Read 0x1: Memory bank is retained when domain is in RETENTION state. | R Rreturns 1s | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | LOWPOWERSTATECHANGE | Power state change request when domain has already performed a sleep transition. Allows going into deeper low power state without waking up the power domain. 0x0: Do not request a low power state change. 0x1: Request a low power state change. This bit is automatically cleared when the power state is effectively changed or when power state is ON. | RW WSpecial | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICRETSTATE | Logic state when power domain is RETENTION 0x0: Only retention registers are retained and remaining logic is off when the domain is in RETENTION state. 0x1: Whole logic is retained when domain is in RETENTION state. | RW | 1 |
| 1:0 | POWERSTATE | Power state control Read 0x0: Reserved 0x1: RETENTION state 0x2: INACTIVE state 0x3: ON State | RW | 0x3 |

Table 3-491. Register Call Summary for Register PM_CORE_PWRSTCTRL

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[13\]](#)

Table 3-492. PM_CORE_PWRSTST

| | | | |
|------------------|--|----------|----------|
| Address Offset | 0x0000 0004 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6704 | | |
| Description | This register provides a status on the current CORE power domain state. [warm reset insensitive] | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|--------------|----------|----|----|----|----|----|--------------------------|----|-----------------------|----|--------------------|---|-------------------|---|-----------------------|---|----------|------------|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | INTRANSITION | RESERVED | | | | | | INTRCONN_NRET_BANK_STATE | | MPU_M3_UNICACHE_STATE | | MPU_M3_L2RAM_STATE | | CORE_OCMRAM_STATE | | CORE_OTHER_BANK_STATE | | RESERVED | LOGICSTATE | POWERSTATE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|---------------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | LASTPOWERSTATEENTERED | Last low power state entered. Set to 0x3 upon write of the same only. This register is intended for debug purpose only. Read 0x3: Power domain was previously ON-ACTIVE Read 0x2: Power domain was previously ON-INACTIVE Read 0x1: Power domain was previously in RETENTION Read 0x0: Power domain was previously OFF | RW W1toSet | 0x0 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | INTRANSITION | Domain transition status Read 0x0: No ongoing transition on power domain Read 0x1: Power domain transition is in progress. | R | 0 |
| 19:14 | RESERVED | | R | 0x00 |
| 13:12 | INTRCONN_NRET_BANK_STATE | INTRCONN_WP bank and DMM bank2 state status Read 0x0: Memory is OFF Read 0x1: Reserved Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 11:10 | MPU_M3_UNICACHE_STATES | MPU_A3 UNICACHE bank state status Read 0x0: Memory is OFF Read 0x1: Memory is RETENTION Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|--|------|-------|
| 9:8 | MPU_M3_L2RAM_STATEST | MPU_A3 L2 bank state status Read 0x0: Memory is OFF Read 0x1: Memory is RETENTION Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 7:6 | CORE_OCMRAM_STATEST | OCMRAM bank state status Read 0x0: Memory is OFF Read 0x1: Memory is RETENTION Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 5:4 | CORE_OTHER_BANK_STATES T | DMA/ICR bank and DMM bank1 state status Read 0x0: Memory is OFF Read 0x1: Memory is RETENTION Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICSTATEST | Logic state status Read 0x0: Logic in domain is OFF Read 0x1: Logic in domain is ON | R | 1 |
| 1:0 | POWERSTATEST | Current power state status Read 0x0: Reserved Read 0x1: Power domain is in RETENTION Read 0x2: Power domain is ON-INACTIVE Read 0x3: Power domain is ON-ACTIVE | R | 0x3 |

Table 3-493. Register Call Summary for Register PM_CORE_PWRSTST

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[9\]](#)

Table 3-494. RM_L3_1_L3_1_CONTEXT

| | | | |
|------------------|--|----------|----------|
| Address Offset | 0x0000 0024 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6724 | | |
| Description | This register contains dedicated L3_1 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_PWRON_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-495. Register Call Summary for Register RM_L3_1_L3_1_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[2\]](#)

Table 3-496. RM_L3_2_L3_2_CONTEXT

| | | | |
|------------------|--|----------|----------|
| Address Offset | 0x0000 0124 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6824 | | |
| Description | This register contains dedicated L3_2 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|-----------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | LOSTCONTEXT_DFF | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_PWRON_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-497. Register Call Summary for Register RM_L3_2_L3_2_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[2\]](#)

Table 3-498. RM_L3_2_GPMC_CONTEXT

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 012C | Instance | CORE_PRM |
| Physical Address | 0x4A30 682C | | |
| Description | This register contains dedicated GPMC context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-499. Register Call Summary for Register RM_L3_2_GPMC_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[1\]](#)

Table 3-500. RM_L3_2_OCMC_RAM_CONTEXT

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0134 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6834 | | |
| Description | This register contains dedicated OCMC_RAM context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_CORE_OCMRAM | RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_CORE_OCMRAM | Specify if memory-based context in CORE_OCMRAM memory bank has been lost due to a previous power transition or other reset source (not affected by a global warm reset). 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-501. Register Call Summary for Register RM_L3_2_OCMC_RAM_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[1\]](#)

Table 3-502. RM_MPU_M3_RSTCTRL

| | | | |
|------------------|---|----------|----------|
| Address Offset | 0x0000 0210 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6910 | | |
| Description | This register controls the release of the MPU_A3 sub-system resets. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|------|------|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | RST3 | RST2 | RST1 | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | RST3 | MPU_A3 MMU and CACHE interface reset control. 0x0: Reset is cleared for MPU_A3 CACHE MMU 0x1: Reset is asserted for the MPU_A3 CACHE MMU | RW | 1 |
| 1 | RST2 | MPU_A3 Cortex M3 CPU2 reset control. 0x0: Reset is cleared for the MPU_A3 Cortex M3 CPU2 0x1: Reset is asserted for the MPU_A3 Cortex M3 CPU2 | RW | 1 |
| 0 | RST1 | MPU_A3 Cortex M3 CPU1 reset control. 0x0: Reset is cleared for the MPU_A3 Cortex M3 CPU1 0x1: Reset is asserted for the MPU_A3 Cortex M3 CPU1 | RW | 1 |

Table 3-503. Register Call Summary for Register RM_MPU_M3_RSTCTRL

Reset Management Functional Description

- [Reset Domains: \[0\]](#)
- [Cortex-M3 MPU Subsystem Power-On Reset Sequence: \[1\] \[2\] \[3\]](#)
- [Cortex-M3 MPU Subsystem Software Warm Reset Sequence: \[4\] \[5\] \[6\] \[7\] \[8\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[9\]](#)

Table 3-504. RM_MPU_M3_RSTST

| | | | |
|------------------|---|----------|----------|
| Address Offset | 0x0000 0214 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6914 | | |
| Description | This register logs the different reset sources of the MPU_A3 SS. Each bit is set upon release of the domain reset signal. Must be cleared by software. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|-------------------|-------------------|------------------|------------------|--------|--------|--------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | ICECRUSHER_RST2ST | ICECRUSHER_RST1ST | EMULATION_RST2ST | EMULATION_RST1ST | RST3ST | RST2ST | RST1ST | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|---------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | ICECRUSHER_RST2ST | Cortex M3 CPU2 has been reset due to MPU_A3 ICECRUSHER2 reset source 0x0: No icecrusher reset 0x1: CPU2 has been reset upon icecrusher reset | RW W1toClr | 0 |
| 5 | ICECRUSHER_RST1ST | Cortex M3 CPU1 has been reset due to MPU_A3 ICECRUSHER1 reset source 0x0: No icecrusher reset 0x1: CPU1 has been reset upon icecrusher reset | RW W1toClr | 0 |
| 4 | EMULATION_RST2ST | Cortex M3 CPU2 has been reset due to emulation reset source e.g. assert reset command initiated by the icepick module 0x0: No emulation reset 0x1: CPU2 has been reset upon emulation reset | RW W1toClr | 0 |
| 3 | EMULATION_RST1ST | Cortex M3 CPU1 has been reset due to emulation reset source e.g. assert reset command initiated by the icepick module 0x0: No emulation reset 0x1: CPU1 has been reset upon emulation reset | RW W1toClr | 0 |
| 2 | RST3ST | MPU_A3 MMU and CACHE interface software reset status 0x0: No software reset occurred 0x1: MPU_A3 MMU and CACHE interface has been reset upon software reset | RW W1toClr | 0 |
| 1 | RST2ST | MPU_A3 Cortex-M3 CPU2 software reset status 0x0: No software reset occurred 0x1: Cortex M3 CPU2 has been reset upon software reset | RW W1toClr | 0 |
| 0 | RST1ST | MPU_A3 Cortex-M3 CPU1 software reset status 0x0: No software reset occurred 0x1: Cortex M3 CPU1 has been reset upon software reset | RW W1toClr | 0 |

Table 3-505. Register Call Summary for Register RM_MPU_M3_RSTST

PRCM Register Manual

- CORE_PRM Register Summary: [0]

Table 3-506. RM MPU M3 MPU M3 CONTEXT

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0224 | | |
| Physical Address | 0x4A30 6924 | Instance | CORE_PRM |
| Description | This register contains dedicated MPU_A3 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------------------|----|-------------------------|----|----|----|---|---|----------|---|---|---|---|---|---|---|-----------------|--|-----------------|--|
| | | | | | | | | RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | LOSTCONTEXT_RFF | | LOSTCONTEXT_DFF | |
| | | | | | | | | | | | | | | | | LOSTMEM_MPU_M3_L2RAM | | LOSTMEM_MPU_M3_UNICACHE | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|--|---------------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | LOSTMEM_MPU_M3_L2RAM | Specify if memory-based context in MPU_A3_L2RAM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 8 | LOSTMEM_MPU_M3_UNICACHE | Specify if memory-based context in MPU_A3_UNICACHE memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of MPU_A3_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of MPU_A3_RST3 signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-507. Register Call Summary for Register RM_MPU_M3_MPU_M3_CONTEXT

Power Management Functional Description

- PD_CORE Description: [0] [1]

PRCM Register Manual

- CORE_PRM Register Summary: [2]

Table 3-508. RM_SDMA_SDMA_CONTEXT

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0324 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6A24 | | |
| Description | This register contains dedicated SDMA context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|-----------------|--|----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_CORE_OTHER_BANK | | | | | | | | RESERVED | | | | | | | | LOSTCONTEXT_RFF | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_CORE_OTHER_BANK | Specify if memory-based context in CORE_OTHER_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of SDMA_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-509. Register Call Summary for Register RM_SDMA_SDMA_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[1\]](#)

Table 3-510. RM_MEMIF_DMM_CONTEXT

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0424 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6B24 | | |
| Description | This register contains dedicated DMM context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|--|--|-----------------|--|-----------------|--|
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_CORE_NRET_BANK LOSTMEM_CORE_OTHER_BANK | | | | | | | | RESERVED | | | | | | | | | | LOSTCONTEXT_RFF | | LOSTCONTEXT_DFF | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|--|---------------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | LOSTMEM_CORE_NRET_BANK | Specify if memory-based context in CORE_NRET_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 8 | LOSTMEM_CORE_OTHER_BANK | Specify if memory-based context in CORE_OTHER_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-511. Register Call Summary for Register RM_MEMIF_DMM_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[2\]](#)

Table 3-512. RM_MEMIF_EMIF_FW_CONTEXT

| | | | |
|------------------|---|----------|----------|
| Address Offset | 0x0000 042C | Instance | CORE_PRM |
| Physical Address | 0x4A30 6B2C | | |
| Description | This register contains dedicated EMIF_FW context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|-----------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | | LOSTCONTEXT_DFF | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_PWRON_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-513. Register Call Summary for Register RM_MEMIF_EMIF_FW_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[2\]](#)

Table 3-514. RM_MEMIF_EMIF_1_CONTEXT

| | | | |
|------------------|--|----------|----------|
| Address Offset | 0x0000 0434 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6B34 | | |
| Description | This register contains dedicated EMIF_1 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|-----------------|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_PWRON_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_PWRON_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-515. Register Call Summary for Register RM_MEMIF_EMIF_1_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[2\]](#)

Table 3-516. RM_MEMIF_EMIF_2_CONTEXT

| | | | |
|------------------|--|----------|----------|
| Address Offset | 0x0000 043C | Instance | CORE_PRM |
| Physical Address | 0x4A30 6B3C | | |
| Description | This register contains dedicated EMIF_2 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|-----------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | | LOSTCONTEXT_DFF | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_PWRON_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_PWRON_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-517. Register Call Summary for Register RM_MEMIF_EMIF_2_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[2\]](#)

Table 3-518. RM_MEMIF_DLL_CONTEXT

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0444 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6B44 | | |
| Description | This register contains dedicated DLL context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of DLL_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-519. Register Call Summary for Register RM_MEMIF_DLL_CONTEXT

PRCM Register Manual

- [CORE_PRM Register Summary: \[0\]](#)

Table 3-520. RM_C2C_C2C_CONTEXT

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0524 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6C24 | | |
| Description | This register contains dedicated C2C context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|---|-----------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | | LOSTCONTEXT_DFF | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------|
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-521. Register Call Summary for Register RM_C2C_C2C_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[2\]](#)

Table 3-522. RM_C2C_C2C_FW_CONTEXT

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0534 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6C34 | | |
| Description | This register contains dedicated C2C_FW context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|-----------------|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | LOSTCONTEXT_DFF |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_PWRON_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-523. Register Call Summary for Register RM_C2C_C2C_FW_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[2\]](#)

Table 3-524. RM_L4CFG_L4_CFG_CONTEXT

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0624 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6D24 | | |
| Description | This register contains dedicated L4_CFG context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|---|-----------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | | LOSTCONTEXT_DFF | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_PWRON_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-525. Register Call Summary for Register RM_L4CFG_L4_CFG_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[2\]](#)

Table 3-526. RM_L4CFG_SPINLOCK_CONTEXT

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 062C | Instance | CORE_PRM |
| Physical Address | 0x4A30 6D2C | | |
| Description | This register contains dedicated HW_SEM context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|---|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-527. Register Call Summary for Register RM_L4CFG_SPINLOCK_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[1\]](#)

Table 3-528. RM_L4CFG_MAILBOX_CONTEXT

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0634 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6D34 | | |
| Description | This register contains dedicated MAILBOX context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|----------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | | | | | | | | | | | RESERVED | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-529. Register Call Summary for Register RM_L4CFG_MAILBOX_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[1\]](#)

Table 3-530. RM_L4CFG_SAR_ROM_CONTEXT

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 063C | | |
| Physical Address | 0x4A30 6D3C | Instance | CORE_PRM |
| Description | This register contains dedicated SAR_ROM context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-531. Register Call Summary for Register RM_L4CFG_SAR_ROM_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\]](#)

PRCM Register Manual

- [CORE_PRM Register Summary: \[1\]](#)

Table 3-532. RM_L3INSTR_L3_3_CONTEXT

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0724 | | |
| Physical Address | 0x4A30 6E24 | Instance | CORE_PRM |
| Description | This register contains dedicated L3_3 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|-----------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | LOSTCONTEXT_DFF | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_PWRON_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------|
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-533. Register Call Summary for Register RM_L3INSTR_L3_3_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_PRМ Register Summary: \[2\]](#)

Table 3-534. RM_L3INSTR_L3_INSTR_CONTEXT

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 072C | Instance | CORE_PRМ |
| Physical Address | 0x4A30 6E2C | | |
| Description | This register contains dedicated L3_INSTR context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-535. Register Call Summary for Register RM_L3INSTR_L3_INSTR_CONTEXT

Power Management Functional Description

- [PD_CORE Description: \[0\]](#)

PRCM Register Manual

- [CORE_PRМ Register Summary: \[1\]](#)

Table 3-536. RM_L3INSTR_OCP_WP1_CONTEXT

| | | | |
|------------------|--|----------|----------|
| Address Offset | 0x0000 0744 | Instance | CORE_PRM |
| Physical Address | 0x4A30 6E44 | | |
| Description | This register contains dedicated OCP_WP1 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----|----|---|---|---|---|-----------------|---|-----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_CORE_NRET_BANK | | RESERVED | | | | | | | | LOSTCONTEXT_RFF | | LOSTCONTEXT_DFF | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_CORE_NRET_BANK | Specify if memory-based context in CORE_NRET_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_PWRON_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CORE_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-537. Register Call Summary for Register RM_L3INSTR_OCP_WP1_CONTEXT

PRCM Register Manual

- [CORE_PRM Register Summary: \[0\]](#)

3.11.9 IVAHD_PRM Registers

3.11.9.1 IVAHD_PRM Register Summary

Table 3-538. IVAHD_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | IVAHD_PRM L4 Base Address |
|------------------------------------|------|-----------------------|----------------|---------------------------|
| PM_IVAHD_PWRSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 6F00 |
| PM_IVAHD_PWRSTST | R | 32 | 0x0000 0004 | 0x4A30 6F04 |

Table 3-538. IVAHD_PRM Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | IVAHD_PRM L4 Base Address |
|--|------|-----------------------|----------------|---------------------------|
| RM_IVAHD_RSTCTRL | RW | 32 | 0x0000 0010 | 0x4A30 6F10 |
| RM_IVAHD_RSTST | RW | 32 | 0x0000 0014 | 0x4A30 6F14 |
| RM_IVAHD_IVAHD_CONTEXT | RW | 32 | 0x0000 0024 | 0x4A30 6F24 |
| RM_IVAHD_SL2_CONTEXT | RW | 32 | 0x0000 002C | 0x4A30 6F2C |

3.11.9.2 IVAHD_PRM Register Description

Table 3-539. PM_IVAHD_PWRSTCTRL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0000 | Instance | IVAHD_PRM |
| Physical Address | 0x4A30 6F00 | | |
| Description | This register controls the IVAHD power state to reach upon a domain sleep transition | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|------------------|------------------|----|-----------------|----|-----------------|----|----------|----|----|----|-------------------|-------------------|------------------|------------------|----------|---|---|---|---------------------|---|----------|---------------|------------|--|
| RESERVED | | | | | | | | TCM2_MEM_ONSTATE | TCM1_MEM_ONSTATE | | SL2_MEM_ONSTATE | | HWA_MEM_ONSTATE | | RESERVED | | | | TCM2_MEM_RETSTATE | TCM1_MEM_RETSTATE | SL2_MEM_RETSTATE | HWA_MEM_RETSTATE | RESERVED | | | | LOWPOWERSTATECHANGE | | RESERVED | LOGICRETSTATE | POWERSTATE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|--------------------|-------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:22 | TCM2_MEM_ONSTATE | TCM2 memory state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 21:20 | TCM1_MEM_ONSTATE | TCM1 memory state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 19:18 | SL2_MEM_ONSTATE | SL2 memory state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 17:16 | HWA_MEM_ONSTATE | HWA memory state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 15:12 | RESERVED | | R | 0x0 |
| 11 | TCM2_MEM_RETSTATE | TCM2 memory state when domain is RETENTION. 0x0: Memory bank is off when the domain is in the RETENTION state. 0x1: Memory bank is retained when domain is in RETENTION state. | RW | 1 |
| 10 | TCM1_MEM_RETSTATE | TCM1 memory state when domain is RETENTION. 0x0: Memory bank is off when the domain is in the RETENTION state. 0x1: Memory bank is retained when domain is in RETENTION state. | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|----------------|-------|
| 9 | SL2_MEM_RETSTATE | SL2 memory state when domain is RETENTION. 0x0: Memory bank is off when the domain is in the RETENTION state. 0x1: Memory bank is retained when domain is in RETENTION state. | RW | 1 |
| 8 | HWA_MEM_RETSTATE | HWA memory state when domain is RETENTION. Read 0x0: Memory bank is off when the domain is in the RETENTION state. | R | 0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | LOWPOWERSTATECHANGE | Power state change request when domain has already performed a sleep transition. Allows going into deeper low power state without waking up the power domain. 0x0: Do not request a low power state change. 0x1: Request a low power state change. This bit is automatically cleared when the power state is effectively changed or when power state is ON. | RW WSpecial | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICRETSTATE | Logic state when power domain is RETENTION Read 0x0: Whole logic is off when the domain is in RETENTION state. | R | 0 |
| 1:0 | POWERSTATE | Power state control 0x0: OFF state 0x1: RETENTION state 0x2: INACTIVE state 0x3: ON State | RW | 0x3 |

Table 3-540. Register Call Summary for Register PM_IVAHD_PWRSTCTRL

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)

PRCM Register Manual

- [IVAHD_PRM Register Summary: \[11\]](#)

Table 3-541. PM_IVAHD_PWRSTST

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0004 | Instance | IVAHD_PRM |
| Physical Address | 0x4A30 6F04 | | |
| Description | This register provides a status on the current IVAHD power domain state. [warm reset insensitive] | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------|----|----------|----|--------------|----|----------|----|----|----|----|----|----------------|----|----------------|---|---------------|---|---------------|---|----------|---|------------|---|------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | LASTPOWERSTATEENTERED | | RESERVED | | INTRANSITION | | RESERVED | | | | | | TCM2_MEM_STATE | | TCM1_MEM_STATE | | SL2_MEM_STATE | | HWA_MEM_STATE | | RESERVED | | LOGICSTATE | | POWERSTATE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|---------------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | LASTPOWERSTATEENTERED | <p>Last low power state entered. Set to 0x3 upon write of the same only. This register is intended for debug purpose only.</p> <p>Read 0x3: Power domain was previously ON-ACTIVE</p> <p>Read 0x2: Power domain was previously ON-INACTIVE</p> <p>Read 0x1: Power domain was previously in RETENTION</p> <p>Read 0x0: Power domain was previously OFF</p> | RW W1toSet | 0x0 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | INTRANSITION | <p>Domain transition status</p> <p>Read 0x0: No ongoing transition on power domain</p> <p>Read 0x1: Power domain transition is in progress.</p> | R | 0 |
| 19:12 | RESERVED | | R | 0x00 |
| 11:10 | TCM2_MEM_STATEST | <p>TCM2 memory state status</p> <p>Read 0x0: Memory is OFF</p> <p>Read 0x1: Memory is RETENTION</p> <p>Read 0x2: Reserved</p> <p>Read 0x3: Memory is ON</p> | R | 0x3 |
| 9:8 | TCM1_MEM_STATEST | <p>TCM1 memory state status</p> <p>Read 0x0: Memory is OFF</p> <p>Read 0x1: Memory is RETENTION</p> <p>Read 0x2: Reserved</p> <p>Read 0x3: Memory is ON</p> | R | 0x3 |
| 7:6 | SL2_MEM_STATEST | <p>SL2 memory state status</p> <p>Read 0x0: Memory is OFF</p> <p>Read 0x1: Memory is RETENTION</p> <p>Read 0x2: Reserved</p> <p>Read 0x3: Memory is ON</p> | R | 0x3 |
| 5:4 | HWA_MEM_STATEST | <p>HWA memory state status</p> <p>Read 0x0: Memory is OFF</p> <p>Read 0x1: Memory is RETENTION</p> <p>Read 0x2: Reserved</p> <p>Read 0x3: Memory is ON</p> | R | 0x3 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICSTATEST | <p>Logic state status</p> <p>Read 0x0: Logic in domain is OFF</p> <p>Read 0x1: Logic in domain is ON</p> | R | 1 |
| 1:0 | POWERSTATEST | <p>Current power state status</p> <p>Read 0x0: Power domain is OFF</p> <p>Read 0x1: Power domain is in RETENTION</p> <p>Read 0x2: Power domain is ON-INACTIVE</p> <p>Read 0x3: Power domain is ON-ACTIVE</p> | R | 0x3 |

Table 3-542. Register Call Summary for Register PM_IVAHD_PWRSTST

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

PRCM Register Manual

- [IVAHD_PRM Register Summary: \[8\]](#)

Table 3-543. RM_IVAHD_RSTCTRL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0010 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 6F10 | | | | | | | | | | | | | | | | InstanceIVAHD_PRM | | | | | | | | | | | | | | | |
| Description | This register controls the release of the IVAHD sub-system resets. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|------|---|------|---|------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | RST3 | | RST2 | | RST1 | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | RST3 | IVAHD logic and SL2 reset control 0x0: Reset is cleared for the IVAHD logic and SL2 0x1: Reset is asserted for IVAHD logic and SL2 | RW | 1 |
| 1 | RST2 | IVAHD Sequencer2 reset control 0x0: Reset is cleared for IVAHD Sequencer CPU2 0x1: Reset is asserted for IVAHD Sequencer CPU2 | RW | 1 |
| 0 | RST1 | IVAHD sequencer1 reset control 0x0: Reset is cleared for the IVAHD Sequencer CPU1 0x1: Reset is asserted for the IVAHD sequencer CPU1 | RW | 1 |

Table 3-544. Register Call Summary for Register RM_IVAHD_RSTCTRL

Reset Management Functional Description

- [Reset Domains: \[0\]](#)
- [IVAHD Subsystem Power-On Reset Sequence: \[1\] \[2\] \[3\]](#)
- [IVAHD Subsystem Software Warm Reset Sequence: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)

PRCM Register Manual

- [IVAHD_PRM Register Summary: \[10\]](#)

Table 3-545. RM_IVAHD_RSTST

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0014 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 6F14 | | | | | | | | | | | | | | | | InstanceIVAHD_PRM | | | | | | | | | | | | | | | |
| Description | This register logs the different reset sources of the IVAHD domain. Each bit is set upon release of the domain reset signal. Must be cleared by software. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------------------------|---|------------------------|---|-----------------------|---|-----------------------|---|--------|--|--------|--|--------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | ICECRUSHER_SEQ2_RST2ST | | ICECRUSHER_SEQ1_RST1ST | | EMULATION_SEQ2_RST2ST | | EMULATION_SEQ1_RST1ST | | RST3ST | | RST2ST | | RST1ST | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|---------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | ICECRUSHER_SEQ2_RST2ST | Sequencer2 CPU has been reset due to IVAHD ICECRUSHER2 reset event 0x0: No icecrusher reset 0x1: Sequencer2 has been reset upon icecrusher reset | RW W1toClr | 0 |
| 5 | ICECRUSHER_SEQ1_RST1ST | Sequencer1 CPU has been reset due to IVAHD ICECRUSHER1 reset event 0x0: No icecrusher reset 0x1: Sequencer1 has been reset upon icecrusher reset | RW W1toClr | 0 |
| 4 | EMULATION_SEQ2_RST2ST | 0x0: No emulation reset 0x1: Sequencer2 has been reset upon emulation reset | RW W1toClr | 0 |
| 3 | EMULATION_SEQ1_RST1ST | Sequencer1 CPU has been reset due to emulation reset source e.g. assert reset command initiated by the icepick module 0x0: No emulation reset 0x1: Sequencer1 has been reset upon emulation reset | RW W1toClr | 0 |
| 2 | RST3ST | IVAHD logic and SL2 software reset 0x0: No software reset occurred 0x1: IVAHD logic and SL2 has been reset upon software reset | RW W1toClr | 0 |
| 1 | RST2ST | IVAHD Sequencer2 CPU software reset 0x0: No software reset occurred 0x1: Sequencer2 has been reset upon software reset | RW W1toClr | 0 |
| 0 | RST1ST | IVAHD Sequencer1 CPU software reset 0x0: No software reset occurred 0x1: Sequencer1 has been reset upon software reset | RW W1toClr | 0 |

Table 3-546. Register Call Summary for Register RM_IVAHD_RSTST

PRCM Register Manual

- [IVAHD_PRM Register Summary: \[0\]](#)

Table 3-547. RM_IVAHD_IVAHD_CONTEXT

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0024 | Instance | IVAHD_PRM |
| Physical Address | 0x4A30 6F24 | | |
| Description | This register contains dedicated IVAHD context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|------------------|----|----|------------------|---|---|----------|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_HWA_MEM | | | LOSTMEM_TCM2_MEM | | | LOSTMEM_TCM1_MEM | | | RESERVED | | | | | | | LOSTCONTEXT_DFF |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|---------------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10 | LOSTMEM_HWA_MEM | Specify if memory-based context in HWA_MEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 9 | LOSTMEM_TCM2_MEM | Specify if memory-based context in TCM2_MEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 8 | LOSTMEM_TCM1_MEM | Specify if memory-based context in TCM1_MEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of IVAHD_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-548. Register Call Summary for Register RM_IVAHD_IVAHD_CONTEXT

Power Management Functional Description

- [PD_IVAHD Description: \[0\]](#)

PRCM Register Manual

- [IVAHD_PRM Register Summary: \[1\]](#)

Table 3-549. RM_IVAHD_SL2_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 002C | Instance | IVAHD_PRM |
| Physical Address | 0x4A30 6F2C | | |
| Description | This register contains dedicated SL2 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-----------------|----------|---|---|---|---|---|---|--|--|--|--|--|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | LOSTMEM_SL2_MEM | RESERVED | | | | | | | | | | | | LOSTCONTEXT_DFF |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_SL2_MEM | Specify if memory-based context in SL2_MEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------|
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of IVAHD_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-550. Register Call Summary for Register RM_IVAHD_SL2_CONTEXT

Power Management Functional Description

- [PD_IVAHD Description: \[0\]](#)

PRCM Register Manual

- [IVAHD_PRM Register Summary: \[1\]](#)

3.11.10 CAM_PRM Registers

3.11.10.1 CAM_PRM Register Summary

Table 3-551. CAM_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CAM_PRM L4 Base Address |
|-------------------------------------|------|-----------------------|----------------|-------------------------|
| PM_CAM_PWRSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 7000 |
| PM_CAM_PWRSTST | RW | 32 | 0x0000 0004 | 0x4A30 7004 |
| RM_CAM_ISS_CONTEXT | RW | 32 | 0x0000 0024 | 0x4A30 7024 |
| RM_CAM_FDIF_CONTEXT | RW | 32 | 0x0000 002C | 0x4A30 702C |

3.11.10.2 CAM_PRM Register Description

Table 3-552. PM_CAM_PWRSTCTRL

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0000 | Instance | CAM_PRM |
| Physical Address | 0x4A30 7000 | | |
| Description | This register controls the CAM power state to reach upon a domain sleep transition | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------------------|---|---|---|----------|---|------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CAM_MEM_ONSTATE | | | | | | | | RESERVED | | | | | | | | LOWPOWERSTATECHANGE | | | | RESERVED | | POWERSTATE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|-----------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | CAM_MEM_ONSTATE | CAM_MEM memory state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|----------------|-------|
| 15:5 | RESERVED | | R | 0x000 |
| 4 | LOWPOWERSTATECHANGE | Power state change request when domain has already performed a sleep transition. Allows going into deeper low power state without waking up the power domain. 0x0: Do not request a low power state change. 0x1: Request a low power state change. This bit is automatically cleared when the power state is effectively changed or when power state is ON. | RW WSpecial | 0 |
| 3:2 | RESERVED | | R | 0x0 |
| 1:0 | POWERSTATE | Power state control 0x0: OFF state Read 0x1: Reserved 0x2: INACTIVE state 0x3: ON State | RW | 0x0 |

Table 3-553. Register Call Summary for Register PM_CAM_PWRSTCTRL

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [CAM_PRM Register Summary: \[3\]](#)

Table 3-554. PM_CAM_PWRSTST

| | | | |
|------------------|---|----------|---------|
| Address Offset | 0x0000 0004 | Instance | CAM_PRM |
| Physical Address | 0x4A30 7004 | | |
| Description | This register provides a status on the current CAM power domain state. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------|----------|----|--------------|----------|----|----|----|----|----|----|----|----|----|---------------|----------|------------|------------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | LASTPOWERSTATEENTERED | RESERVED | | INTRANSITION | RESERVED | | | | | | | | | | CAM_MEM_STATE | RESERVED | LOGICSTATE | POWERSTATE | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|---------------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | LASTPOWERSTATEENTERED | Last low power state entered. Set to 0x3 upon write of the same only. This register is intended for debug purpose only. Read 0x3: Power domain was previously ON-ACTIVE Read 0x2: Power domain was previously ON-INACTIVE Read 0x1: Power domain was previously in RETENTION Read 0x0: Power domain was previously OFF | RW W1toSet | 0x0 |
| 23:21 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|--------|
| 20 | INTRANSITION | Domain transition status Read 0x1: Power domain transition is in progress. Read 0x0: No on-going transition on power domain | R | 0 |
| 19:6 | RESERVED | | R | 0x0000 |
| 5:4 | CAM_MEM_STATEST | CAM_MEM memory state status Read 0x3: Memory is ON Read 0x2: Reserved Read 0x1: Reserved Read 0x0: Memory is OFF | R | 0x3 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICSTATEST | Logic state status Read 0x1: Logic in domain is ON Read 0x0: Logic in domain is OFF | R | 1 |
| 1:0 | POWERSTATEST | Current power state status Read 0x3: Power domain is ON-ACTIVE Read 0x2: Power domain is ON-INACTIVE Read 0x1: Power domain is in RETENTION Read 0x0: Power domain is OFF | R | 0x3 |

Table 3-555. Register Call Summary for Register PM_CAM_PWRSTST

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [CAM_PRM Register Summary: \[4\]](#)

Table 3-556. RM_CAM_ISS_CONTEXT

| | | | |
|------------------|---|----------|---------|
| Address Offset | 0x0000 0024 | Instance | CAM_PRM |
| Physical Address | 0x4A30 7024 | | |
| Description | This register contains dedicated ISS context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----------|----|----|----|----|---|---|---|-----------------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_CAM_MEM | RESERVED | | | | | | | | LOSTCONTEXT_DFF | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-----------|
| 31:9 | RESERVED | | R | 0x0000000 |
| 8 | LOSTMEM_CAM_MEM | Specify if memory-based context in CAM_MEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------|
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CAM_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-557. Register Call Summary for Register RM_CAM_ISS_CONTEXT

Power Management Functional Description

- [PD_CAM Description: \[0\]](#)

PRCM Register Manual

- [CAM_PRM Register Summary: \[1\]](#)

Table 3-558. RM_CAM_FDIF_CONTEXT

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 002C | Instance | CAM_PRM |
| Physical Address | 0x4A30 702C | | |
| Description | This register contains dedicated FDIF context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----------|----|----|----|----|---|---|---|---|---|-----------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_CAM_MEM | RESERVED | | | | | | | | | | LOSTCONTEXT_DFF | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-----------|
| 31:9 | RESERVED | | R | 0x0000000 |
| 8 | LOSTMEM_CAM_MEM | Specify if memory-based context in CAM_MEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of CAM_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-559. Register Call Summary for Register RM_CAM_FDIF_CONTEXT

Power Management Functional Description

- [PD_CAM Description: \[0\]](#)

PRCM Register Manual

- [CAM_PRM Register Summary: \[1\]](#)

3.11.11 DSS_PRM Registers

3.11.11.1 DSS_PRM Register Summary

Table 3-560. DSS_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DSS_PRM L4 Base Address |
|-------------------------------------|------|-----------------------|----------------|-------------------------|
| PM_DSS_PWRSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 7100 |
| PM_DSS_PWRSTST | R | 32 | 0x0000 0004 | 0x4A30 7104 |
| PM_DSS_DSS_WKDEP | RW | 32 | 0x0000 0020 | 0x4A30 7120 |
| RM_DSS_DSS_CONTEXT | RW | 32 | 0x0000 0024 | 0x4A30 7124 |
| RM_DSS_BB2D_CONTEXT | RW | 32 | 0x0000 002C | 0x4A30 712C |

3.11.11.2 DSS_PRM Register Description

Table 3-561. PM_DSS_PWRSTCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0000 | Instance | DSS_PRM |
| Physical Address | 0x4A30 7100 | | |
| Description | This register controls the DSS power state to reach upon a domain sleep transition | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----------|----|----|----|----|---|---|---|------------------|----------|---|---------------------|---|----------|---------------|--|------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | | | | | | | | | DSS_MEM_ONSTATE | RESERVED | | | | | | | | DSS_MEM_RETSTATE | RESERVED | | LOWPOWERSTATECHANGE | | RESERVED | LOGICRETSTATE | | POWERSTATE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|-----------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | DSS_MEM_ONSTATE | DSS_MEM state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | DSS_MEM_RETSTATE | DSS_MEM state when domain is RETENTION. Read 0x0: Memory bank is off when the domain is in the RETENTION state. | R | 0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | LOWPOWERSTATECHANGE | Power state change request when domain has already performed a sleep transition. Allows going into deeper low power state without waking up the power domain. 0x0: Do not request a low power state change. 0x1: Request a low power state change. This bit is automatically cleared when the power state is effectively changed or when power state is ON. | RW WSpecial | 0 |
| 3 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 2 | LOGICRETSTATE | Logic state when power domain is RETENTION Read 0x0: Whole logic is off when the domain is in RETENTION state. | R | 0 |
| 1:0 | POWERSTATE | Power state control 0x0: OFF state 0x1: RETENTION state 0x2: INACTIVE state 0x3: ON State | RW | 0x0 |

Table 3-562. Register Call Summary for Register PM_DSS_PWRSTCTRL

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [DSS_PRM Register Summary: \[5\]](#)

Table 3-563. PM_DSS_PWRSTST

| | |
|------------------|---|
| Address Offset | 0x0000 0004 |
| Physical Address | 0x4A30 7104 |
| Instance | DSS_PRM |
| Description | This register provides a status on the current DSS power domain state. [warm reset insensitive] |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------|----|----------|----|--------------|----|----------|----|----|----|----|----|----|----|---------------|---|----------|---|------------|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | LASTPOWERSTATEENTERED | | RESERVED | | INTRANSITION | | RESERVED | | | | | | | | DSS_MEM_STATE | | RESERVED | | LOGICSTATE | | POWERSTATE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|---------------|--------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | LASTPOWERSTATEENTERED | Last low power state entered. Set to 0x3 upon write of the same only. This register is intended for debug purpose only. Read 0x3: Power domain was previously OFF Read 0x2: Power domain was previously in RETENTION Read 0x1: Power domain was previously ON-INACTIVE Read 0x0: Power domain was previously ON-ACTIVE | RW W1toSet | 0x0 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | INTRANSITION | Domain transition status Read 0x0: No ongoing transition on power domain Read 0x1: Power domain transition is in progress. | R | 0 |
| 19:6 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------|
| 5:4 | DSS_MEM_STATEST | DSS_MEM state status Read 0x0: Memory is OFF Read 0x1: Reserved Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICSTATEST | Logic state status Read 0x0: Logic in domain is OFF Read 0x1: Logic in domain is ON | R | 1 |
| 1:0 | POWERSTATEST | Current power state status Read 0x0: Power domain is OFF Read 0x1: Power domain is in RETENTION Read 0x2: Power domain is ON-INACTIVE Read 0x3: Power domain is ON-ACTIVE | R | 0x3 |

Table 3-564. Register Call Summary for Register PM_DSS_PWRSTST

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [DSS_PRM Register Summary: \[4\]](#)

Table 3-565. PM_DSS_DSS_WKDEP

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0020 | Instance | DSS_PRM |
| Physical Address | 0x4A30 7120 | | |
| Description | This register controls wakeup dependency based on DSS service requests. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----------------------|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---------------------|---|------------------------|---|---------------------|--|-------------------|--|------------------|--|---------------------|--|------------------|--|-------------------|--|------------------|--|---------------------|--|------------------|--|--------------------|--|-------------------|--|----------------------|--|-------------------|--|
| RESERVED | | | | | | | | | | | | WKUPDEP_HDMIDMA_SDMA | | | | RESERVED | | | | | | | | | | | | WKUPDEP_HDMIIRQ_DSP | | WKUPDEP_HDMIIRQ_MPU_M3 | | WKUPDEP_HDMIIRQ_MPU | | WKUPDEP_DSI2_SDMA | | WKUPDEP_DSI2_DSP | | WKUPDEP_DSI2_MPU_M3 | | WKUPDEP_DSI2_MPU | | WKUPDEP_DSI1_SDMA | | WKUPDEP_DSI1_DSP | | WKUPDEP_DSI1_MPU_M3 | | WKUPDEP_DSI1_MPU | | WKUPDEP_DISPC_SDMA | | WKUPDEP_DISPC_DSP | | WKUPDEP_DISPC_MPU_M3 | | WKUPDEP_DISPC_MPU | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|-----------------|-------|
| 31:20 | RESERVED | | R | 0x000 |
| 19 | WKUPDEP_HDMIDMA_SDMA | Wakeup dependency from HDMI module (SWakeup_HDMI_dma signal) towards SDMA + L3_2 domains Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 18:15 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------|
| 14 | WKUPDEP_HDMIIRQ_DSP | Wakeup dependency from HDMI module (softwareakeup_HDMI_irq signal) towards DSP + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 13 | WKUPDEP_HDMIIRQ_MPU_M3 | Wakeup dependency from HDMI module (softwareakeup_HDMI_irq signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 12 | WKUPDEP_HDMIIRQ_MPU | Wakeup dependency from HDMI module (softwareakeup_HDMI_irq signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 11 | WKUPDEP_DSI2_SDMA | Wakeup dependency from DSI2 module (softwareakeup_DSI2 signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 10 | WKUPDEP_DSI2_DSP | Wakeup dependency from DSI2 module (softwareakeup_DSI2 signal) towards DSP + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 9 | WKUPDEP_DSI2_MPU_M3 | Wakeup dependency from DSI2 module (softwareakeup_DSI2 signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 8 | WKUPDEP_DSI2_MPU | Wakeup dependency from DSI2 module (softwareakeup_DSI2 signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 7 | WKUPDEP_DSI1_SDMA | Wakeup dependency from DSI1 module (softwareakeup_DSI1 signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 6 | WKUPDEP_DSI1_DSP | Wakeup dependency from DSI1 module (softwareakeup_DSI1 signal) towards DSP + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 5 | WKUPDEP_DSI1_MPU_M3 | Wakeup dependency from DSI1 module (softwareakeup_DSI1 signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 4 | WKUPDEP_DSI1_MPU | Wakeup dependency from DSI1 module (softwareakeup_DSI1 signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|-------|
| 3 | WKUPDEP_DISPC_SDMA | Wakeup dependency from DISPC module (softwareakeup_DISPC signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | WKUPDEP_DISPC_DSP | Wakeup dependency from DISPC module (softwareakeup_DISPC signal) towards DSP + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | WKUPDEP_DISPC_MPU_M3 | Wakeup dependency from DISPC module (softwareakeup_DISPC signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_DISPC_MPU | Wakeup dependency from DISPC module (softwareakeup_DISPC signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-566. Register Call Summary for Register PM_DSS_DSS_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)

PRCM Register Manual

- [DSS_PRM Register Summary: \[16\]](#)

Table 3-567. RM_DSS_DSS_CONTEXT

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0024 | Instance | DSS_PRM |
| Physical Address | 0x4A30 7124 | | |
| Description | This register contains dedicated DSS context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-----------------|----------|---|---|---|---|---|---|--|--|--|-----------------|--|-----------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | LOSTMEM_DSS_MEM | RESERVED | | | | | | | | | | LOSTCONTEXT_RFF | | LOSTCONTEXT_DFF | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_DSS_MEM | Specify if memory-based context in DSS_MEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------|
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of DSS_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of DSS_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-568. Register Call Summary for Register RM_DSS_DSS_CONTEXT

Power Management Functional Description

- [PD_DSS Description: \[0\] \[1\]](#)

PRCM Register Manual

- [DSS_PRM Register Summary: \[2\]](#)

Table 3-569. RM_DSS_BB2D_CONTEXT

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 002C | Instance | DSS_PRM |
| Physical Address | 0x4A30 712C | | |
| Description | This register contains dedicated BB2D context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----------|----|----|----|---|---|---|---|-----------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_BB2D_MEM | | RESERVED | | | | | | | | LOSTCONTEXT_DFF | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|-----------|
| 31:9 | RESERVED | | R | 0x0000000 |
| 8 | LOSTMEM_BB2D_MEM | Specify if memory-based context in BB2D_MEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of DSS_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-570. Register Call Summary for Register RM_DSS_BB2D_CONTEXT

Power Management Functional Description

- [PD_DSS Description: \[0\]](#)

PRCM Register Manual

- [DSS_PRM Register Summary: \[1\]](#)

3.11.12 SGX_PRM Registers

3.11.12.1 SGX_PRM Register Summary

Table 3-571. SGX_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | SGX_PRM L4 Base Address |
|--------------------|------|-----------------------|----------------|-------------------------|
| PM_SGX_PWRSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 7200 |
| PM_SGX_PWRSTST | R | 32 | 0x0000 0004 | 0x4A30 7204 |
| RM_SGX_SGX_CONTEXT | RW | 32 | 0x0000 0024 | 0x4A30 7224 |

3.11.12.2 SGX_PRM Register Description

Table 3-572. PM SGX PWRSTCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4A30 7200 | Instance | SGX_PRM |
| Description | This register controls the SGX power state to reach upon a domain sleep transition | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|---------------------|----------|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | SGX_MEM_ONSTATE | RESERVED | | | | | | | | | | | | | | LOWPOWERSTATECHANGE | RESERVED | POWERSTATE |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|---------------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | SGX_MEM_ONSTATE | SGX_MEM memory bank state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Rreturns 1s | 0x3 |
| 15:5 | RESERVED | | R | 0x000 |
| 4 | LOWPOWERSTATECHANGE | Power state change request when domain has already performed a sleep transition. Allows going into deeper low power state without waking up the power domain. 0x0: Do not request a low power state change. 0x1: Request a low power state change. This bit is automatically cleared when the power state is effectively changed or when power state is ON. | RW WSpecial | 0 |
| 3:2 | RESERVED | | R | 0x0 |
| 1:0 | POWERSTATE | Power state control 0x0: OFF state 0x1: Reserved 0x2: INACTIVE state 0x3: ON State | RW | 0x0 |

Table 3-573. Register Call Summary for Register PM_SGX_PWRSTCTRL

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [SGX_PRM Register Summary: \[3\]](#)

Table 3-574. PM_SGX_PWRSTST

| | | | |
|------------------|---|----------|---------|
| Address Offset | 0x0000 0004 | Instance | SGX_PRM |
| Physical Address | 0x4A30 7204 | | |
| Description | This register provides a status on the current SGX power domain state. [warm reset insensitive] | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|--------------|----------|----|----|----|----|----|----|----|-----------------|----|----------|---|--------------|--------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | INTRANSITION | RESERVED | | | | | | | | SGX_MEM_STATEST | | RESERVED | | LOGICSTATEST | POWERSTATEST | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|---------------|--------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | LASTPOWERSTATEENTERED | <p>Last low power state entered. Set to 0x3 upon write of the same only. This register is intended for debug purpose only.</p> <p>Read 0x0: Power domain was previously OFF</p> <p>Read 0x1: Power domain was previously in RETENTION</p> <p>Read 0x2: Power domain was previously ON-INACTIVE</p> <p>Read 0x3: Power domain was previously ON-ACTIVE</p> | RW W1toSet | 0x0 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | INTRANSITION | <p>Domain transition status</p> <p>Read 0x0: No ongoing transition on power domain</p> <p>Read 0x1: Power domain transition is in progress.</p> | R | 0 |
| 19:6 | RESERVED | | R | 0x0000 |
| 5:4 | SGX_MEM_STATEST | <p>SGX_MEM memory bank state status</p> <p>Read 0x0: Memory is OFF</p> <p>Read 0x1: Reserved</p> <p>Read 0x2: Reserved</p> <p>Read 0x3: Memory is ON</p> | R | 0x3 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICSTATEST | <p>Logic state status</p> <p>Read 0x0: Logic in domain is OFF</p> <p>Read 0x1: Logic in domain is ON</p> | R | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 1:0 | POWERSTATEST | Current power state status Read 0x0: Power domain is OFF Read 0x1: Power domain is in RETENTION Read 0x2: Power domain is ON-INACTIVE Read 0x3: Power domain is ON-ACTIVE | R | 0x3 |

Table 3-575. Register Call Summary for Register PM_SGX_PWRSTST

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [SGX_PRM Register Summary: \[4\]](#)

Table 3-576. RM_SGX_SGX_CONTEXT

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0024 | Instance | SGX_PRM |
| Physical Address | 0x4A30 7224 | | |
| Description | This register contains dedicated SGX context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----------|----|----|----|----|---|---|---|---|---|-----------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_SGX_MEM | RESERVED | | | | | | | | | | LOSTCONTEXT_DFF | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_SGX_MEM | Specify if memory-based context in SGX_MEM memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of SGX_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-577. Register Call Summary for Register RM_SGX_SGX_CONTEXT

Power Management Functional Description

- [PD_SGX Description: \[0\]](#)

PRCM Register Manual

- [SGX_PRM Register Summary: \[1\]](#)

3.11.13 L3INIT_PRM Registers

3.11.13.1 L3INIT_PRM Register Summary

Table 3-578. L3INIT_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | L3INIT_PRM L4 Base Address |
|-----------------------------|------|-----------------------|----------------|----------------------------|
| PM_L3INIT_PWRSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 7300 |
| PM_L3INIT_PWRSTST | R | 32 | 0x0000 0004 | 0x4A30 7304 |
| PM_L3INIT_MMC1_WKDEP | RW | 32 | 0x0000 0028 | 0x4A30 7328 |
| RM_L3INIT_MMC1_CONTEXT | RW | 32 | 0x0000 002C | 0x4A30 732C |
| PM_L3INIT_MMC2_WKDEP | RW | 32 | 0x0000 0030 | 0x4A30 7330 |
| RM_L3INIT_MMC2_CONTEXT | RW | 32 | 0x0000 0034 | 0x4A30 7334 |
| PM_L3INIT_HSI_WKDEP | RW | 32 | 0x0000 0038 | 0x4A30 7338 |
| RM_L3INIT_HSI_CONTEXT | RW | 32 | 0x0000 003C | 0x4A30 733C |
| RESERVED | RW | 32 | 0x0000 0040 | 0x4A30 7340 |
| RESERVED | RW | 32 | 0x0000 0044 | 0x4A30 7344 |
| PM_L3INIT_HSUSBHOST_WKDEP | RW | 32 | 0x0000 0058 | 0x4A30 7358 |
| RM_L3INIT_HSUSBHOST_CONTEXT | RW | 32 | 0x0000 005C | 0x4A30 735C |
| PM_L3INIT_HSUSBOTG_WKDEP | RW | 32 | 0x0000 0060 | 0x4A30 7360 |
| RM_L3INIT_HSUSBOTG_CONTEXT | RW | 32 | 0x0000 0064 | 0x4A30 7364 |
| PM_L3INIT_HSUSBTLL_WKDEP | RW | 32 | 0x0000 0068 | 0x4A30 7368 |
| RM_L3INIT_HSUSBTLL_CONTEXT | RW | 32 | 0x0000 006C | 0x4A30 736C |
| RESERVED | RW | 32 | 0x0000 007C | 0x4A30 737C |
| RESERVED | RW | 32 | 0x0000 0084 | 0x4A30 7384 |
| RESERVED | RW | 32 | 0x0000 0088 | 0x4A30 7388 |
| RESERVED | RW | 32 | 0x0000 008C | 0x4A30 738C |
| RESERVED | RW | 32 | 0x0000 0094 | 0x4A30 7394 |
| RESERVED | RW | 32 | 0x0000 0098 | 0x4A30 7398 |
| RESERVED | RW | 32 | 0x0000 009C | 0x4A30 739C |
| RESERVED | RW | 32 | 0x0000 00AC | 0x4A30 73AC |
| RESERVED | R | 32 | 0x0000 00C0 | 0x4A30 73C0 |
| RESERVED | RW | 32 | 0x0000 00C4 | 0x4A30 73C4 |
| RESERVED | RW | 32 | 0x0000 00C8 | 0x4A30 73C8 |
| RESERVED | RW | 32 | 0x0000 00CC | 0x4A30 73CC |
| RESERVED | R | 32 | 0x0000 00D0 | 0x4A30 73D0 |
| RESERVED | R | 32 | 0x0000 00D4 | 0x4A30 73D4 |
| RM_L3INIT_USBPHY_CONTEXT | RW | 32 | 0x0000 00E4 | 0x4A30 73E4 |

3.11.13.2 L3INIT_PRM Register Description

Table 3-579. PM_L3INIT_PWRSTCTRL

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0000 | Instance | L3INIT_PRM |
| Physical Address | 0x4A30 7300 | | |
| Description | This register controls the L3INIT power state to reach upon a domain sleep transition | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------------|----------|----|----|----|----|----|---|-----------------------|----------|---|---------------------|----------|---|---------------|------------|---|
| RESERVED | | | | | | | | | | | | | | | L3INIT_BANK1_ONSTATE | RESERVED | | | | | | | L3INIT_BANK1_RETSTATE | RESERVED | | LOWPOWERSTATECHANGE | RESERVED | | LOGICRETSTATE | POWERSTATE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|--------------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | L3INIT_BANK1_ONSTATE | L3INIT BANK state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | L3INIT_BANK1_RETSTATE | L3INIT BANK1 state when domain is RETENTION. Read 0x0: Memory bank is off when the domain is in the RETENTION state. | R | 0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | LOWPOWERSTATECHANGE | Power state change request when domain has already performed a sleep transition. Allows going into deeper low power state without waking up the power domain. 0x0: Do not request a low power state change. 0x1: Request a low power state change. This bit is automatically cleared when the power state is effectively changed or when power state is ON. | RW WSpecial | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICRETSTATE | Logic state when power domain is RETENTION 0x0: Only retention registers are retained and remain logic is off when the domain is in RETENTION state. 0x1: Whole logic is retained when domain is in RETENTION state. | RW | 1 |
| 1:0 | POWERSTATE | Power state control 0x0: OFF state 0x1: RETENTION state 0x2: INACTIVE state 0x3: ON State | RW | 0x0 |

Table 3-580. Register Call Summary for Register PM_L3INIT_PWRSTCTRL

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [L3INIT_PRM Register Summary: \[5\]](#)

Table 3-581. PM_L3INIT_PWRSTST

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0004 | Instance | L3INIT_PRM |
| Physical Address | 0x4A30 7304 | | |
| Description | This register provides a status on the current L3INIT power domain state. [warm reset insensitive] | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------------------|---|---|---|---|---|---|---|----------|--|------------|--|------------|--|
| RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | L3INIT_BANK1_STATE | | | | | | | | RESERVED | | LOGICSTATE | | POWERSTATE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|---------------|--------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | LASTPOWERSTATEENTERED | Last low power state entered. Set to 0x3 upon write of the same only. This register is intended for debug purpose only. Read 0x3: Power domain was previously ON-ACTIVE Read 0x2: Power domain was previously ON-INACTIVE Read 0x1: Power domain was previously in RETENTION Read 0x0: Power domain was previously OFF | RW W1toSet | 0x0 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | INTRANSITION | Domain transition status Read 0x0: No ongoing transition on power domain Read 0x1: Power domain transition is in progress. | R | 0 |
| 19:6 | RESERVED | | R | 0x0000 |
| 5:4 | L3INIT_BANK1_STATEST | L3INIT BANK1 state status Read 0x0: Memory is OFF Read 0x1: Reserved Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICSTATEST | Logic state status Read 0x0: Logic in domain is OFF Read 0x1: Logic in domain is ON | R | 1 |
| 1:0 | POWERSTATEST | Current power state status Read 0x0: Power domain is OFF Read 0x1: Power domain is in RETENTION Read 0x2: Power domain is ON-INACTIVE Read 0x3: Power domain is ON-ACTIVE | R | 0x3 |

Table 3-582. Register Call Summary for Register PM_L3INIT_PWRSTST

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [L3INIT_PRM Register Summary: \[5\]](#)

Table 3-583. PM_L3INIT_MMC1_WKDEP

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0028 | Instance | L3INIT_PRM |
| Physical Address | 0x4A30 7328 | | |
| Description | This register controls wakeup dependency based on MMC1 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|------------------|----|---|---|---------------------|---|---|---|------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_MMC1_SDMA | | | | WKUPDEP_MMC1_DSP | | | | WKUPDEP_MMC1_MPU_M3 | | | | WKUPDEP_MMC1_MPU | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MMC1_SDMA | Wakeup dependency from MMC1 module (softwareakeup signal) towards SDMA + L3_2 + L4PER domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | WKUPDEP_MMC1_DSP | Wakeup dependency from MMC1 module (softwareakeup signal) towards DSP + L3_1 + L3_2 + L4_PER domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | WKUPDEP_MMC1_MPU_M3 | Wakeup dependency from MMC1 module (softwareakeup signal) towards MPU_A3 + L3_2 + L4_PER domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_MMC1_MPU | Wakeup dependency from MMC1 module (softwareakeup signal) towards MPU + L3_1 + L3_2 + L4_PER domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-584. Register Call Summary for Register PM_L3INIT_MMC1_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [L3INIT_PRM Register Summary: \[4\]](#)

Table 3-585. RM_L3INIT_MMC1_CONTEXT

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 002C | Instance | L3INIT_PRM |
| Physical Address | 0x4A30 732C | | |
| Description | This register contains dedicated MMC1 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------------|----------|----|----|----|----|---|---|---|-----------------|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_L3INIT_BANK1 | RESERVED | | | | | | | | LOSTCONTEXT_RFF | RESERVED | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_L3INIT_BANK1 | Specify if memory-based context in L3INIT_BANK1 memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L3_INIT_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-586. Register Call Summary for Register RM_L3INIT_MMC1_CONTEXT

Power Management Functional Description

- [PD_L3_INIT Description: \[0\]](#)

PRCM Register Manual

- [L3INIT_PRM Register Summary: \[1\]](#)

Table 3-587. PM_L3INIT_MMC2_WKDEP

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0030 | Instance | L3INIT_PRM |
| Physical Address | 0x4A30 7330 | | |
| Description | This register controls wakeup dependency based on MMC2 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | WKUPDEP_MMC2_SDMA | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | WKUPDEP_MMC2_DSP | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | WKUPDEP_MMC2_MPU_M3 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | WKUPDEP_MMC2_MPU | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MMC2_SDMA | Wakeup dependency from MMC2 module (softwareakeup signal) towards SDMA + L3_2 + L4PER domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | WKUPDEP_MMC2_DSP | Wakeup dependency from MMC2 module (softwareakeup signal) towards DSP + L3_1 + L3_2 + L4_PER domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | WKUPDEP_MMC2_MPU_M3 | Wakeup dependency from MMC2 module (softwareakeup signal) towards MPU_A3 + L3_2 + L4_PER domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_MMC2_MPU | Wakeup dependency from MMC2 module (softwareakeup signal) towards MPU + L3_1 + L3_2 + L4_PER domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-588. Register Call Summary for Register PM_L3INIT_MMC2_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [L3INIT_PRM Register Summary: \[4\]](#)

Table 3-589. RM L3INIT MMC2 CONTEXT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0034 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7334 | | | | | | | | | | | | | | | | Instance | L3INIT_PRM | | | | | | | | | | | | | | | |
| Description | This register contains dedicated MMC2 context statuses. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------------|----------|----|----|----|----|---|---|---|---|---|-----------------|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_L3INIT_BANK1 | RESERVED | | | | | | | | | | LOSTCONTEXT_RFF | RESERVED | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_L3INIT_BANK1 | Specify if memory-based context in L3INIT_BANK1 memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L3_INIT_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-590. Register Call Summary for Register RM_L3INIT_MMC2_CONTEXT

Power Management Functional Description

- [PD_L3_INIT Description: \[0\]](#)

PRCM Register Manual

- [L3INIT_PRM Register Summary: \[1\]](#)

Table 3-591. PM_L3INIT_HSI_WKDEP

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0038 | Instance | L3INIT_PRM |
| Physical Address | 0x4A30 7338 | | |
| Description | This register controls wakeup dependency based on HSI service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----------|----|---------------------|----|----------|---|---|---|------------------------|---|---------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_WGM_HSI_WAKE_MPU | | RESERVED | | WKUPDEP_HSI_DSP_DSP | | RESERVED | | | | WKUPDEP_HSI_MCU_MPU_M3 | | WKUPDEP_HSI_MCU_MPU | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|-----------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | WKUPDEP_WGM_HSI_WAKE_MPU | Wakeup dependency from modem HSI_WAKE signal towards MPU + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 7 | RESERVED | | R | 0 |
| 6 | WKUPDEP_HSI_DSP_DSP | Wakeup dependency from HSI module (softwareakeup_DSP signal) towards DSP + L3_1 + L4_CFG domains Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 5:2 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------|
| 1 | WKUPDEP_HSI_MCU_MPU_M3 | Wakeup dependency from HSI module (softwareakeup_MPU signal) towards MPU_A3 + L3_2 + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_HSI_MCU_MPU | Wakeup dependency from HSI module (softwareakeup_MPU signal) towards MPU + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-592. Register Call Summary for Register PM_L3INIT_HSI_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [L3INIT_PRM Register Summary: \[4\]](#)

Table 3-593. RM_L3INIT_HSI_CONTEXT

| | | | |
|------------------|---|----------|------------|
| Address Offset | 0x0000 003C | Instance | L3INIT_PRM |
| Physical Address | 0x4A30 733C | | |
| Description | This register contains dedicated HSI context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------------|----------|----|----|----|----|---|---|-----------------|----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_L3INIT_BANK1 | RESERVED | | | | | | | LOSTCONTEXT_RFF | RESERVED | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_L3INIT_BANK1 | Specify if memory-based context in L3INIT_BANK1 memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L3_INIT_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Power Management Functional Description

- PD_L3_INIT Description: [0]

- L3INIT_PRM Register Summary: [1]

| | | | |
|------------------|---|----------|------------|
| Address Offset | 0x0000 0058 | | |
| Physical Address | 0x4A30 7358 | Instance | L3INIT_PRM |
| Description | This register controls wakeup dependency based on USB_HOST_HS service requests. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_HSUSBHOST_MPU_M3 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | WKUPDEP_HSUSBHOST_MPU | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | WKUPDEP_HSUSBHOST_MPU_M3 | <p>Wakeup dependency from USB_HOST_HS module (softwareakeup signal) towards MPU_A3 + L3_2 + L3_1 + L4_CFG domains</p> <p>0x0: Dependency is disabled</p> <p>0x1: Dependency is enabled</p> | RW | 0 |
| 0 | WKUPDEP_HSUSBHOST_MPU | <p>Wakeup dependency from USB_HOST_HS module (softwareakeup signal) towards MPU + L3_1 + L4_CFG domains</p> <p>0x0: Dependency is disabled</p> <p>0x1: Dependency is enabled</p> | RW | 0 |

Clock Management Functional Description

- Clock Domain Dependency: [0] [1]

- L3INIT_PRM Register Summary: [2]

Table 3-597. RM_L3INIT_HSUSBHOST_CONTEXT

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 005C | Instance | L3INIT_PRM |
| Physical Address | 0x4A30 735C | | |
| Description | This register contains dedicated USB_HOST context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L3_INIT_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-598. Register Call Summary for Register RM_L3INIT_HSUSBHOST_CONTEXT

PRCM Register Manual

- [L3INIT_PRM Register Summary: \[0\]](#)

Table 3-599. PM_L3INIT_HSUSBOTG_WKDEP

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0060 | Instance | L3INIT_PRM |
| Physical Address | 0x4A30 7360 | | |
| Description | This register controls wakeup dependency based on USB_OTG_HS service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------------------|--|----------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_HSUSBOTG_MPU_M3 | | WKUPDEP_HSUSBOTG_MPU | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | WKUPDEP_HSUSBOTG_MPU_M3 | Wakeup dependency from USB_OTG_HS module (softwareakeup signal) towards MPU_A3 + L3_2 + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_HSUSBOTG_MPU | Wakeup dependency from USB_OTG_HS module (softwareakeup signal) towards MPU + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-600. Register Call Summary for Register PM_L3INIT_HSUSBOTG_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L3INIT_PRM Register Summary: \[2\]](#)

Table 3-601. RM_L3INIT_HSUSBOTG_CONTEXT

| | | | |
|------------------|--|----------|------------|
| Address Offset | 0x0000 0064 | Instance | L3INIT_PRM |
| Physical Address | 0x4A30 7364 | | |
| Description | This register contains dedicated USB_OTG_HS context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------------|----------|----|----|----|----|---|---|-----------------|----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_L3INIT_BANK1 | RESERVED | | | | | | | LOSTCONTEXT_RFF | RESERVED | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|-----------|
| 31:9 | RESERVED | | R | 0x0000000 |
| 8 | LOSTMEM_L3INIT_BANK1 | Specify if memory-based context in L3INIT_BANK1 memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L3_INIT_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-602. Register Call Summary for Register RM_L3INIT_HSUSBOTG_CONTEXT

PRCM Register Manual

- L3INIT_PRM Register Summary: [0]

Table 3-603. PM_L3INIT_HSUSBTLL_WKDEP

| | | |
|-------------------------|---|----------------------------|
| Address Offset | 0x0000 0068 | |
| Physical Address | 0x4A30 7368 | Instance L3INIT_PRM |
| Description | This register controls wakeup dependency based on USB_TLL service requests. | |
| Type | RW | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------------------|----------------------|
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_HSUSBTLL_MPU_M3 | WKUPDEP_HSUSBTLL_MPU |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | WKUPDEP_HSUSBTLL_MPU_M3 | <p>Wakeup dependency from USB_TLL module (softwareakeup signal) towards MPU_A3 + L3_2 + L3_1 + L4_CFG domains</p> <p>0x0: Dependency is disabled</p> <p>0x1: Dependency is enabled</p> | RW | 0 |
| 0 | WKUPDEP_HSUSBTLL_MPU | <p>Wakeup dependency from USB_TLL module (softwareakeup signal) towards MPU + L3_1 + L4_CFG domains</p> <p>0x0: Dependency is disabled</p> <p>0x1: Dependency is enabled</p> | RW | 0 |

Table 3-604. Register Call Summary for Register PM_L3INIT_HSUSBTLL_WKDEP

Clock Management Functional Description

- Clock Domain Dependency: [0] [1]

PRCM Register Manual

- L3INIT_PRM Register Summary: [2]

Table 3-605. RM_L3INIT_HSUSBTLL_CONTEXT

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 006C | Instance | L3INIT_PRM |
| Physical Address | 0x4A30 736C | | |
| Description | This register contains dedicated USB_TLL context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|--|----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | | RESERVED | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L3_INIT_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-606. Register Call Summary for Register RM_L3INIT_HSUSBTLL_CONTEXT

Power Management Functional Description

- [PD_L3_INIT Description: \[0\]](#)

PRCM Register Manual

- [L3INIT_PRM Register Summary: \[1\]](#)

Table 3-607. RM_L3INIT_USBPHY_CONTEXT

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 00E4 | Instance | L3INIT_PRM |
| Physical Address | 0x4A30 73E4 | | |
| Description | This register contains dedicated USBPHY context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L3_INIT_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-608. Register Call Summary for Register RM_L3INIT_USBPHY_CONTEXT

Power Management Functional Description

- [PD_L3_INIT Description: \[0\]](#)

PRCM Register Manual

- [L3INIT_PRM Register Summary: \[1\]](#)

3.11.14 L4PER_PRM Registers

3.11.14.1 L4PER_PRM Register Summary

Table 3-609. L4PER_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | L4PER_PRM L4 Base Address |
|--|------|-----------------------|----------------|---------------------------|
| PM_L4PER_PWRSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 7400 |
| PM_L4PER_PWRSTST | R | 32 | 0x0000 0004 | 0x4A30 7404 |
| RESERVED | RW | 32 | 0x0000 0024 | 0x4A30 7424 |
| PM_L4PER_GPTIMER10_WKDEP | R | 32 | 0x0000 0028 | 0x4A30 7428 |
| RM_L4PER_GPTIMER10_CONTEXT | RW | 32 | 0x0000 002C | 0x4A30 742C |
| PM_L4PER_GPTIMER11_WKDEP | RW | 32 | 0x0000 0030 | 0x4A30 7430 |
| RM_L4PER_GPTIMER11_CONTEXT | RW | 32 | 0x0000 0034 | 0x4A30 7434 |
| PM_L4PER_GPTIMER2_WKDEP | R | 32 | 0x0000 0038 | 0x4A30 7438 |
| RM_L4PER_GPTIMER2_CONTEXT | RW | 32 | 0x0000 003C | 0x4A30 743C |
| PM_L4PER_GPTIMER3_WKDEP | RW | 32 | 0x0000 0040 | 0x4A30 7440 |
| RM_L4PER_GPTIMER3_CONTEXT | RW | 32 | 0x0000 0044 | 0x4A30 7444 |
| PM_L4PER_GPTIMER4_WKDEP | RW | 32 | 0x0000 0048 | 0x4A30 7448 |
| RM_L4PER_GPTIMER4_CONTEXT | RW | 32 | 0x0000 004C | 0x4A30 744C |
| PM_L4PER_GPTIMER9_WKDEP | RW | 32 | 0x0000 0050 | 0x4A30 7450 |
| RM_L4PER_GPTIMER9_CONTEXT | RW | 32 | 0x0000 0054 | 0x4A30 7454 |
| RM_L4PER_ELM_CONTEXT | RW | 32 | 0x0000 005C | 0x4A30 745C |
| PM_L4PER_GPIO2_WKDEP | RW | 32 | 0x0000 0060 | 0x4A30 7460 |
| RM_L4PER_GPIO2_CONTEXT | RW | 32 | 0x0000 0064 | 0x4A30 7464 |
| PM_L4PER_GPIO3_WKDEP | R | 32 | 0x0000 0068 | 0x4A30 7468 |
| RM_L4PER_GPIO3_CONTEXT | RW | 32 | 0x0000 006C | 0x4A30 746C |
| PM_L4PER_GPIO4_WKDEP | R | 32 | 0x0000 0070 | 0x4A30 7470 |
| RM_L4PER_GPIO4_CONTEXT | RW | 32 | 0x0000 0074 | 0x4A30 7474 |
| PM_L4PER_GPIO5_WKDEP | R | 32 | 0x0000 0078 | 0x4A30 7478 |
| RM_L4PER_GPIO5_CONTEXT | RW | 32 | 0x0000 007C | 0x4A30 747C |
| PM_L4PER_GPIO6_WKDEP | R | 32 | 0x0000 0080 | 0x4A30 7480 |
| RM_L4PER_GPIO6_CONTEXT | RW | 32 | 0x0000 0084 | 0x4A30 7484 |
| RM_L4PER_HDQ1W_CONTEXT | RW | 32 | 0x0000 008C | 0x4A30 748C |
| RESERVED | R | 32 | 0x0000 0090 | 0x4A30 7490 |

Table 3-609. L4PER_PRM Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | L4PER_PRM L4 Base Address |
|---------------------------|------|-----------------------|----------------|---------------------------|
| RESERVED | RW | 32 | 0x0000 0094 | 0x4A30 7494 |
| RESERVED | R | 32 | 0x0000 0098 | 0x4A30 7498 |
| RESERVED | RW | 32 | 0x0000 009C | 0x4A30 749C |
| PM_L4PER_I2C1_WKDEP | RW | 32 | 0x0000 00A0 | 0x4A30 74A0 |
| RM_L4PER_I2C1_CONTEXT | RW | 32 | 0x0000 00A4 | 0x4A30 74A4 |
| PM_L4PER_I2C2_WKDEP | RW | 32 | 0x0000 00A8 | 0x4A30 74A8 |
| RM_L4PER_I2C2_CONTEXT | RW | 32 | 0x0000 00AC | 0x4A30 74AC |
| PM_L4PER_I2C3_WKDEP | RW | 32 | 0x0000 00B0 | 0x4A30 74B0 |
| RM_L4PER_I2C3_CONTEXT | RW | 32 | 0x0000 00B4 | 0x4A30 74B4 |
| PM_L4PER_I2C4_WKDEP | RW | 32 | 0x0000 00B8 | 0x4A30 74B8 |
| RM_L4PER_I2C4_CONTEXT | RW | 32 | 0x0000 00BC | 0x4A30 74BC |
| RM_L4PER_L4_PER_CONTEXT | RW | 32 | 0x0000 00C0 | 0x4A30 74C0 |
| RESERVED | RW | 32 | 0x0000 00D0 | 0x4A30 74D0 |
| RESERVED | RW | 32 | 0x0000 00D4 | 0x4A30 74D4 |
| RESERVED | RW | 32 | 0x0000 00D8 | 0x4A30 74D8 |
| RESERVED | RW | 32 | 0x0000 00DC | 0x4A30 74DC |
| PM_L4PER_MCBSP4_WKDEP | RW | 32 | 0x0000 00E0 | 0x4A30 74E0 |
| RM_L4PER_MCBSP4_CONTEXT | RW | 32 | 0x0000 00E4 | 0x4A30 74E4 |
| RESERVED | RW | 32 | 0x0000 00EC | 0x4A30 74EC |
| PM_L4PER_MCSP1_WKDEP | RW | 32 | 0x0000 00F0 | 0x4A30 74F0 |
| RM_L4PER_MCSP1_CONTEXT | RW | 32 | 0x0000 00F4 | 0x4A30 74F4 |
| PM_L4PER_MCSP2_WKDEP | RW | 32 | 0x0000 00F8 | 0x4A30 74F8 |
| RM_L4PER_MCSP2_CONTEXT | RW | 32 | 0x0000 00FC | 0x4A30 74FC |
| PM_L4PER_MCSP3_WKDEP | RW | 32 | 0x0000 0100 | 0x4A30 7500 |
| RM_L4PER_MCSP3_CONTEXT | RW | 32 | 0x0000 0104 | 0x4A30 7504 |
| PM_L4PER_MCSP4_WKDEP | RW | 32 | 0x0000 0108 | 0x4A30 7508 |
| RM_L4PER_MCSP4_CONTEXT | RW | 32 | 0x0000 010C | 0x4A30 750C |
| PM_L4PER_MMCS3_WKDEP | RW | 32 | 0x0000 0120 | 0x4A30 7520 |
| RM_L4PER_MMCS3_CONTEXT | RW | 32 | 0x0000 0124 | 0x4A30 7524 |
| PM_L4PER_MMCS4_WKDEP | RW | 32 | 0x0000 0128 | 0x4A30 7528 |
| RM_L4PER_MMCS4_CONTEXT | RW | 32 | 0x0000 012C | 0x4A30 752C |
| RESERVED | RW | 32 | 0x0000 0134 | 0x4A30 7534 |
| PM_L4PER_SLIMBUS2_WKDEP | RW | 32 | 0x0000 0138 | 0x4A30 7538 |
| RM_L4PER_SLIMBUS2_CONTEXT | RW | 32 | 0x0000 013C | 0x4A30 753C |
| PM_L4PER_UART1_WKDEP | RW | 32 | 0x0000 0140 | 0x4A30 7540 |
| RM_L4PER_UART1_CONTEXT | RW | 32 | 0x0000 0144 | 0x4A30 7544 |
| PM_L4PER_UART2_WKDEP | RW | 32 | 0x0000 0148 | 0x4A30 7548 |
| RM_L4PER_UART2_CONTEXT | RW | 32 | 0x0000 014C | 0x4A30 754C |
| PM_L4PER_UART3_WKDEP | RW | 32 | 0x0000 0150 | 0x4A30 7550 |
| RM_L4PER_UART3_CONTEXT | RW | 32 | 0x0000 0154 | 0x4A30 7554 |
| PM_L4PER_UART4_WKDEP | RW | 32 | 0x0000 0158 | 0x4A30 7558 |
| RM_L4PER_UART4_CONTEXT | RW | 32 | 0x0000 015C | 0x4A30 755C |
| PM_L4PER_MMCS5_WKDEP | RW | 32 | 0x0000 0160 | 0x4A30 7560 |
| RM_L4PER_MMCS5_CONTEXT | RW | 32 | 0x0000 0164 | 0x4A30 7564 |
| RESERVED | R | 32 | 0x0000 0168 | 0x4A30 7568 |
| RESERVED | RW | 32 | 0x0000 016C | 0x4A30 756C |

Table 3-609. L4PER_PRM Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | L4PER_PRM L4 Base Address |
|---------------|------|-----------------------|----------------|---------------------------|
| RESERVED | RW | 32 | 0x0000 01A4 | 0x4A30 75A4 |
| RESERVED | RW | 32 | 0x0000 01AC | 0x4A30 75AC |
| RESERVED | RW | 32 | 0x0000 01B4 | 0x4A30 75B4 |
| RESERVED | RW | 32 | 0x0000 01BC | 0x4A30 75BC |
| RESERVED | RW | 32 | 0x0000 01C4 | 0x4A30 75C4 |
| RESERVED | RW | 32 | 0x0000 01CC | 0x4A30 75CC |
| RESERVED | RW | 32 | 0x0000 01DC | 0x4A30 75DC |

3.11.14.2 L4PER_PRM Register Description

Table 3-610. PM_L4PER_PWRSTCTRL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0000 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7400 | | |
| Description | This register controls the L4PER power state to reach upon a domain sleep transition | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|-----------------------|----|----------|----|----|----|----|----|---|---|---------------------------|---|------------------------|---|----------|---|---------------------|---|----------|--|---------------|--|------------|--|
| RESERVED | | | | | | | | | | | | NONRETAINED_BANK_ONSTATE | | RETAINED_BANK_ONSTATE | | RESERVED | | | | | | | | NONRETAINED_BANK_RETSTATE | | RETAINED_BANK_RETSTATE | | RESERVED | | LOWPOWERSTATECHANGE | | RESERVED | | LOGICRETSTATE | | POWERSTATE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|---|-----------------|-------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:18 | NONRETAINED_BANK_ONSTATE | NONRETAINED_BANK state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 17:16 | RETAINED_BANK_ONSTATE | RETAINED_BANK state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 15:10 | RESERVED | | R | 0x00 |
| 9 | NONRETAINED_BANK_RETSTATE | NONRETAINED_BANK state when domain is RETENTION. Read 0x0: Memory bank is off when the domain is in the RETENTION state. | R | 0 |
| 8 | RETAINED_BANK_RETSTATE | RETAINED_BANK state when domain is RETENTION. Read 0x1: Memory bank is retained when domain is in RETENTION state. | R Returns 1s | 1 |
| 7:5 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|----------------|-------|
| 4 | LOWPOWERSTATECHANGE | Power state change request when domain has already performed a sleep transition. Allows going into deeper low power state without waking up the power domain. 0x0: Do not request a low power state change. 0x1: Request a low power state change. This bit is automatically cleared when the power state is effectively changed or when power state is ON. | RW WSpecial | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICRETSTATE | Logic state when power domain is RETENTION 0x0: Only retention registers are retained and remaining logic is off when the domain is in RETENTION state. 0x1: Whole logic is retained when domain is in RETENTION state. | RW | 1 |
| 1:0 | POWERSTATE | Power state control 0x0: Reserved 0x1: RETENTION state 0x2: INACTIVE state 0x3: ON State | RW | 0x3 |

Table 3-611. Register Call Summary for Register PM_L4PER_PWRSTCTRL

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[7\]](#)

Table 3-612. PM_L4PER_PWRSTST

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0004 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7404 | | |
| Description | This register provides a status on the current L4PER power domain state. [warm reset insensitive] | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------|----|----------|----|--------------|----|----------|----|----|----|----|----|----|----|--------------------------|---|-----------------------|---|----------|---|--------------|---|--------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | LASTPOWERSTATEENTERED | | RESERVED | | INTRANSITION | | RESERVED | | | | | | | | NONRETAINED_BANK_STATEST | | RETAINED_BANK_STATEST | | RESERVED | | LOGICSTATEST | | POWERSTATEST | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|--|---------------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | LASTPOWERSTATEENTERED | Last low power state entered. Set to 0x3 upon write of the same only. This register is intended for debug purpose only. Read 0x3: Power domain was previously ON-ACTIVE Read 0x2: Power domain was previously ON-INACTIVE Read 0x1: Power domain was previously in RETENTION Read 0x0: Power domain was previously OFF | RW W1toSet | 0x0 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | INTRANSITION | Domain transition status Read 0x0: No ongoing transition on power domain Read 0x1: Power domain transition is in progress. | R | 0 |
| 19:8 | RESERVED | | R | 0x000 |
| 7:6 | NONRETAINED_BANK_STATE ST | NONRETAINED_BANK state status Read 0x0: Memory is OFF Read 0x1: Reserved Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 5:4 | RETAINED_BANK_STATE ST | RETAINED_BANK state status Read 0x0: Memory is OFF Read 0x1: Memory is RETENTION Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICSTATE ST | Logic state status Read 0x0: Logic in domain is OFF Read 0x1: Logic in domain is ON | R | 1 |
| 1:0 | POWERSTATE ST | Current power state status Read 0x0: Reserved Read 0x1: Power domain is in RETENTION Read 0x2: Power domain is ON-INACTIVE Read 0x3: Power domain is ON-ACTIVE | R | 0x3 |

Table 3-613. Register Call Summary for Register PM_L4PER_PWRSTST

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[6\]](#)

Table 3-614. PM_L4PER_GPTIMER10_WKDEP

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0028 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7428 | | |
| Description | This register controls wakeup dependency based on DMTIMER10 service requests. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_DMTIMER10_MPU | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|-----------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | WKUPDEP_DMTIMER10_MPU | Wakeup dependency from DMTIMER10 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains Read 0x1: Dependency is enabled | R Returns 1s | 1 |

Table 3-615. Register Call Summary for Register PM_L4PER_GPTIMER10_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-616. RM_L4PER_GPTIMER10_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 002C | Instance | L4PER_PRM |
| Physical Address | 0x4A30 742C | | |
| Description | This register contains dedicated DMTIMER10 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-617. Register Call Summary for Register RM_L4PER_GPTIMER10_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-618. PM_L4PER_GPTIMER11_WKDEP

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0030 | | |
| Physical Address | 0x4A30 7430 | Instance | L4PER_PRM |
| Description | This register controls wakeup dependency based on DMTIMER11 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------------------------|-----------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_DWTIMER11_MPU_M3 | WKUPDEP_DWTIMER11_MPU |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | WKUPDEP_DMTIMER11_MPU_M3 | Wakeup dependency from DMTIMER11 module (softwareakeup signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_DMTIMER11_MPU | Wakeup dependency from DMTIMER11 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-619. Register Call Summary for Register PM_L4PER_GPTIMER11_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER PRM Register Summary: \[2\]](#)

Table 3-620. RM_L4PER_GPTIMER11_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0034 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7434 | | |
| Description | This register contains dedicated DMTIMER11 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-621. Register Call Summary for Register RM_L4PER_GPTIMER11_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-622. PM_L4PER_GPTIMER2_WKDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0038 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7438 | | |
| Description | This register controls wakeup dependency based on DMTIMER2 service requests. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_DMTIMER2_MPU |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|-----------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | WKUPDEP_DMTIMER2_MPU | Wakeup dependency from DMTIMER2 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains Read 0x1: Dependency is enabled | R Returns 1s | 1 |

Table 3-623. Register Call Summary for Register PM_L4PER_GPTIMER2_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-624. RM_L4PER_GPTIMER2_CONTEXT

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 003C | Instance | L4PER_PRM |
| Physical Address | 0x4A30 743C | | |
| Description | This register contains dedicated DMTIMER2 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-625. Register Call Summary for Register RM_L4PER_GPTIMER2_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-626. PM_L4PER_GPTIMER3_WKDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0040 | | |
| Physical Address | 0x4A30 7440 | Instance | L4PER_PRM |
| Description | This register controls wakeup dependency based on DMTIMER3 service requests. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------------------|----------------------|
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_DMTIMER3_MPU_M3 | WKUPDEP_DMTIMER3_MPU |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | WKUPDEP_DMTIMER3_MPU_M3 | Wakeup dependency from DMTIMER3 module (softwareakeup signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_DMTIMER3_MPU | Wakeup dependency from DMTIMER3 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-627. Register Call Summary for Register PM_L4PER_GPTIMER3_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_PRCM Register Summary: \[2\]](#)

Table 3-628. RM_L4PER_GPTIMER3_CONTEXT

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0044 | | |
| Physical Address | 0x4A30 7444 | Instance | L4PER_PRM |
| Description | This register contains dedicated DMTIMER3 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-629. Register Call Summary for Register RM_L4PER_GPTIMER3_CONTEXT

Power Management Functional Description

- PD L4 PER Description: [0]

PRCM Register Manual

- L4PER_PRM Register Summary: [1]

Table 3-630. PM L4PER GPTIMER4 WKDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0048 | | |
| Physical Address | 0x4A30 7448 | Instance | L4PER_PRM |
| Description | This register controls wakeup dependency based on DMTIMER4 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------------------|----------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_DMTIMER4_MPU_M3 | WKUPDEP_DMTIMER4_MPU |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | WKUPDEP_DMTIMER4_MPU_M3 | <p>Wakeup dependency from DMTIMER4 module (softwareakeup signal) towards MPU_A3 + L3_2 domains</p> <p>0x0: Dependency is disabled</p> <p>0x1: Dependency is enabled</p> | RW | 0 |
| 0 | WKUPDEP_DMTIMER4_MPU | <p>Wakeup dependency from DMTIMER4 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains</p> <p>0x0: Dependency is disabled</p> <p>0x1: Dependency is enabled</p> | RW | 0 |

Table 3-631. Register Call Summary for Register PM_L4PER_GPTIMER4_WKDEP

Clock Management Functional Description

- Clock Domain Dependency: [0] [1]

PRCM Register Manual

- L4PER_PRM Register Summary: [2]

Table 3-632. RM_L4PER_GPTIMER4_CONTEXT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 004C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 744C | | | | | | | | | | | | | | | | InstanceL4PER_PRM | | | | | | | | | | | | | | |
| Description | This register contains dedicated DMTIMER4 context statuses. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-633. Register Call Summary for Register RM_L4PER_GPTIMER4_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-634. PM_L4PER_GPTIMER9_WKDEP

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0050 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7450 | | | | | | | | | | | | | | | | InstanceL4PER_PRM | | | | | | | | | | | | | | | |
| Description | This register controls wakeup dependency based on DMTIMER9 service requests. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------------------|--|----------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_DMTIMER9_MPU_M3 | | WKUPDEP_DMTIMER9_MPU | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | WKUPDEP_DMTIMER9_MPU_M3 | Wakeup dependency from DMTIMER9 module (softwareakeup signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_DMTIMER9_MPU | Wakeup dependency from DMTIMER9 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-635. Register Call Summary for Register PM_L4PER_GPTIMER9_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[2\]](#)

Table 3-636. RM_L4PER_GPTIMER9_CONTEXT

| | | | |
|------------------|--|----------|-----------|
| Address Offset | 0x0000 0054 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7454 | | |
| Description | This register contains dedicated DMTIMER9 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-637. Register Call Summary for Register RM_L4PER_GPTIMER9_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-638. RM_L4PER_ELM_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 005C | Instance | L4PER_PRM |
| Physical Address | 0x4A30 745C | | |
| Description | This register contains dedicated ELM context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-639. Register Call Summary for Register RM_L4PER_ELM_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-640. PM_L4PER_GPIO2_WKDEP

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0060 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7460 | | |
| Description | This register controls wakeup dependency based on GPIO2 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----------|----|----|----|----|---|---|---|---|---|---------------------------|------------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_GPIO2_IRQ2_DSP | RESERVED | | | | | | | | | | WKUPDEP_GPIO2_IRQ1_MPU_M3 | WKUPDEP_GPIO2_IRQ1_MPU | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|---------------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | WKUPDEP_GPIO2_IRQ2_DSP | Wakeup dependency from GPIO2 module (POINTRsoftwareAKEUP2 signal) towards DSP + L3_1 + L3_2 domains Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5:2 | RESERVED | | R | 0x0 |
| 1 | WKUPDEP_GPIO2_IRQ1_MPU_M3 | Wakeup dependency from GPIO2 module (POINTRsoftwareAKEUP1 signal) module towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_GPIO2_IRQ1_MPU | Wakeup dependency from GPIO2 module (POINTRsoftwareAKEUP1 signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-641. Register Call Summary for Register PM_L4PER_GPIO2_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[3\]](#)

Table 3-642. RM_L4PER_GPIO2_CONTEXT

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0064 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7464 | | |
| Description | This register contains dedicated GPIO2 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-643. Register Call Summary for Register RM_L4PER_GPIO2_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-644. PM_L4PER_GPIO3_WKDEP

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0068 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7468 | | |
| Description | This register controls wakeup dependency based on GPIO3 service requests. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----|----|---|---|------------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_GPIO3_IRQ2_DSP | | RESERVED | | | | | | WKUPDEP_GPIO3_IRQ1_MPU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--|-----------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | WKUPDEP_GPIO3_IRQ2_DSP | Wakeup dependency from GPIO3 module (POINTRsoftwareAKEUP2 signal) towards DSP + L3_1 + L3_2 domains Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 5:1 | RESERVED | | R | 0x00 |
| 0 | WKUPDEP_GPIO3_IRQ1_MPU | Wakeup dependency from GPIO3 module (POINTRsoftwareAKEUP1 signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-645. Register Call Summary for Register PM_L4PER_GPIO3_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[2\]](#)

Table 3-646. RM_L4PER_GPIO3_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 006C | Instance | L4PER_PRM |
| Physical Address | 0x4A30 746C | | |
| Description | This register contains dedicated GPIO3 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|-----------------|---|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-647. Register Call Summary for Register RM_L4PER_GPIO3_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-648. PM_L4PER_GPIO4_WKDEP

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0070 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7470 | | |
| Description | This register controls wakeup dependency based on GPIO4 service requests. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----|----|---|---|---|---|---|---|------------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_GPIO4_IRQ2_DSP | | RESERVED | | | | | | | | | | WKUPDEP_GPIO4_IRQ1_MPU | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--|-----------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | WKUPDEP_GPIO4_IRQ2_DSP | Wakeup dependency from GPIO4 module (POINTRsoftwareAKEUP2 signal) towards DSP + L3_1 + L3_2 domains Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 5:1 | RESERVED | | R | 0x00 |
| 0 | WKUPDEP_GPIO4_IRQ1_MPU | Wakeup dependency from GPIO4 module (POINTRsoftwareAKEUP1 signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-649. Register Call Summary for Register PM_L4PER_GPIO4_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[2\]](#)

Table 3-650. RM_L4PER_GPIO4_CONTEXT

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0074 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7474 | | |
| Description | This register contains dedicated GPIO4 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-651. Register Call Summary for Register RM_L4PER_GPIO4_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-652. PM_L4PER_GPIO5_WKDEP

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0078 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7478 | | |
| Description | This register controls wakeup dependency based on GPIO5 service requests. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----|----|---|---|------------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_GPIO5_IRQ2_DSP | | RESERVED | | | | | | WKUPDEP_GPIO5_IRQ1_MPU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--|-----------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | WKUPDEP_GPIO5_IRQ2_DSP | Wakeup dependency from GPIO5 module (POINTRsoftwareAKEUP2 signal) towards DSP + L3_1 + L3_2 domains Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 5:1 | RESERVED | | R | 0x00 |
| 0 | WKUPDEP_GPIO5_IRQ1_MPU | Wakeup dependency from GPIO5 module (POINTRsoftwareAKEUP1 signal) towards MPU + L3_1 + L3_2 domains Read 0x1: Dependency is enabled | R Returns 1s | 1 |

Table 3-653. Register Call Summary for Register PM_L4PER_GPIO5_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[2\]](#)

Table 3-654. RM_L4PER_GPIO5_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 007C | Instance | L4PER_PRM |
| Physical Address | 0x4A30 747C | | |
| Description | This register contains dedicated GPIO5 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-655. Register Call Summary for Register RM_L4PER_GPIO5_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-656. PM_L4PER_GPIO6_WKDEP

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0080 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7480 | | |
| Description | This register controls wakeup dependency based on GPIO6 service requests. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----|----|---|---|------------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_GPIO6_IRQ2_DSP | | RESERVED | | | | | | WKUPDEP_GPIO6_IRQ1_MPU | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--|-----------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | WKUPDEP_GPIO6_IRQ2_DSP | Wakeup dependency from GPIO6 module (POINTRsoftwareAKEUP2 signal) towards DSP + L3_1 + L3_2 domains Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 5:1 | RESERVED | | R | 0x00 |
| 0 | WKUPDEP_GPIO6_IRQ1_MPU | Wakeup dependency from GPIO6 module (POINTRsoftwareAKEUP1 signal) towards MPU + L3_1 + L3_2 domains Read 0x1: Dependency is enabled | R Returns 1s | 1 |

Table 3-657. Register Call Summary for Register PM_L4PER_GPIO6_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[2\]](#)

Table 3-658. RM_L4PER_GPIO6_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0084 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7484 | | |
| Description | This register contains dedicated GPIO6 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|-----------------|---|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | | RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-659. Register Call Summary for Register RM_L4PER_GPIO6_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-660. RM_L4PER_HDQ1W_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 008C | Instance | L4PER_PRM |
| Physical Address | 0x4A30 748C | | |
| Description | This register contains dedicated HDQ1W context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-661. Register Call Summary for Register RM_L4PER_HDQ1W_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-662. PM_L4PER_I2C1_WKDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00A0 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74A0 | | |
| Description | This register controls wakeup dependency based on I2C1 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----------|----|----|----|----|---|---|---|---|---|-------------------------|----------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_I2C1_DMA_SDMA | RESERVED | | | | | | | | | | WKUPDEP_I2C1_IRQ_MPU_M3 | WKUPDEP_I2C1_IRQ_MPU | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|---------------------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7 | WKUPDEP_I2C1_DMA_SDMA | Wakeup dependency from I2C1 module (softwareakeup_dma signal) towards SDMA + L3_2 domains Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 6:2 | RESERVED | | R | 0x00 |
| 1 | WKUPDEP_I2C1_IRQ_MPU_M3 | Wakeup dependency from I2C1 module (softwareakeup_irq signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_I2C1_IRQ_MPU | Wakeup dependency from I2C1 module (softwareakeup_irq signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-663. Register Call Summary for Register PM_L4PER_I2C1_WKDEP

| |
|--|
| Clock Management Functional Description |
| • Clock Domain Dependency: [0] [1] [2] |
| PRCM Register Manual |
| • L4PER_PRM Register Summary: [3] |

Table 3-664. RM_L4PER_I2C1_CONTEXT

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00A4 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74A4 | | |
| Description | This register contains dedicated I2C1 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|-----------------|---|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | | RESERVED | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-665. Register Call Summary for Register RM_L4PER_I2C1_CONTEXT

| |
|---|
| Power Management Functional Description |
| • PD_L4_PER Description: [0] |
| PRCM Register Manual |
| • L4PER_PRM Register Summary: [1] |

Table 3-666. PM_L4PER_I2C2_WKDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00A8 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74A8 | | |
| Description | This register controls wakeup dependency based on I2C2 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----------|----|----|----|----|---|-------------------------|---|---|----------------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_I2C2_DMA_SDMA | RESERVED | | | | | | WKUPDEP_I2C2_IRQ_MPU_M3 | | | WKUPDEP_I2C2_IRQ_MPU | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|---------------------|-----------|
| 31:8 | RESERVED | | R | 0x0000000 |
| 7 | WKUPDEP_I2C2_DMA_SDMA | Wakeup dependency from I2C2 module (softwareakeup_dma signal) towards SDMA + L3_2 domains Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 6:2 | RESERVED | | R | 0x00 |
| 1 | WKUPDEP_I2C2_IRQ_MPU_M3 | Wakeup dependency from I2C2 module (softwareakeup_irq signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_I2C2_IRQ_MPU | Wakeup dependency from I2C2 module (softwareakeup_irq signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-667. Register Call Summary for Register PM_L4PER_I2C2_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[3\]](#)

Table 3-668. RM_L4PER_I2C2_CONTEXT

| | | | |
|------------------|--|----------|-----------|
| Address Offset | 0x0000 00AC | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74AC | | |
| Description | This register contains dedicated I2C2 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-669. Register Call Summary for Register RM_L4PER_I2C2_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-670. PM_L4PER_I2C3_WKDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00B0 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74B0 | | |
| Description | This register controls wakeup dependency based on I2C3 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----------|----|----|----|----|---|-------------------------|----------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_I2C3_DMA_SDMA | RESERVED | | | | | | WKUPDEP_I2C3_IRQ_MPU_M3 | WKUPDEP_I2C3_IRQ_MPU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|---------------------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7 | WKUPDEP_I2C3_DMA_SDMA | Wakeup dependency from I2C3 module (softwareakeup_dma signal) towards SDMA + L3_2 domains Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 6:2 | RESERVED | | R | 0x00 |
| 1 | WKUPDEP_I2C3_IRQ_MPU_M3 | Wakeup dependency from I2C3 module (softwareakeup_irq signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_I2C3_IRQ_MPU | Wakeup dependency from I2C3 module (softwareakeup_irq signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-671. Register Call Summary for Register PM_L4PER_I2C3_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[3\]](#)

Table 3-672. RM_L4PER_I2C3_CONTEXT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00B4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 74B4 | | | | | | | | | | | | | | | | InstanceL4PER_PRM | | | | | | | | | | | | | | | |
| Description | This register contains dedicated I2C3 context statuses. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-673. Register Call Summary for Register RM_L4PER_I2C3_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-674. PM_L4PER_I2C4_WKDEP

| | | | |
|------------------|--|----------|-----------|
| Address Offset | 0x0000 00B8 | | |
| Physical Address | 0x4A30 74B8 | Instance | L4PER_PRM |
| Description | This register controls wakeup dependency based on I2C4 service requests. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----------|----|----|----|----|---|-------------------------|---|---|----------------------|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_I2C4_DMA_SDMA | RESERVED | | | | | | WKUPDEP_I2C4_IRQ_MPU_M3 | | | WKUPDEP_I2C4_IRQ_MPU | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|---------------------|-----------|
| 31:8 | RESERVED | | R | 0x0000000 |
| 7 | WKUPDEP_I2C4_DMA_SDMA | Wakeup dependency from I2C4 module (softwareakeup_dma signal) towards SDMA + L3_2 domains Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 6:2 | RESERVED | | R | 0x00 |
| 1 | WKUPDEP_I2C4_IRQ_MPU_M3 | Wakeup dependency from I2C4 module (softwareakeup_irq signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_I2C4_IRQ_MPU | Wakeup dependency from I2C4 module (softwareakeup_irq signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-675. Register Call Summary for Register PM_L4PER_I2C4_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[3\]](#)

Table 3-676. RM_L4PER_I2C4_CONTEXT

| | | | |
|------------------|--|----------|-----------|
| Address Offset | 0x0000 00BC | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74BC | | |
| Description | This register contains dedicated I2C4 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-677. Register Call Summary for Register RM_L4PER_I2C4_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-678. RM_L4PER_L4_PER_CONTEXT

| | | | |
|------------------|--|----------|-----------|
| Address Offset | 0x0000 00C0 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74C0 | | |
| Description | This register contains dedicated L4_PER context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|-----------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | LOSTCONTEXT_DFF | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_PWRON_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-679. Register Call Summary for Register RM_L4PER_L4_PER_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[2\]](#)

Table 3-680. PM_L4PER_MCBSP4_WKDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00E0 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74E0 | | |
| Description | This register controls wakeup dependency based on MCBSP4 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_MCBSP4_SDMA WKUPDEP_MCBSP4_DSP RESERVED WKUPDEP_MCBSP4_MPU | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MCBSP4_SDMA | Wakeup dependency from MCBSP4 module (softwareakeup signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | WKUPDEP_MCBSP4_DSP | Wakeup dependency from MCBSP4 module (softwareakeup signal) towards DSP + L3_1 + L3_2 domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | WKUPDEP_MCBSP4_MPU | Wakeup dependency from MCBSP4 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-681. Register Call Summary for Register PM_L4PER_MCBSP4_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[3\]](#)

Table 3-682. RM_L4PER_MCBSP4_CONTEXT

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00E4 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74E4 | | |
| Description | This register contains dedicated MCBSP4 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_NONRETAINED_BANK | | | | | | | | RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_NONRETAINED_BANK | Specify if memory-based context in NONRETAINED_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-683. Register Call Summary for Register RM_L4PER_MCBSP4_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-684. PM_L4PER_MCSP11_WKDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00F0 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74F0 | | |
| Description | This register controls wakeup dependency based on MCSP11 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|--------------------|----|---|---|-----------------------|---|---|---|--------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_MCSP11_SDMA | | | | WKUPDEP_MCSP11_DSP | | | | WKUPDEP_MCSP11_MPU_M3 | | | | WKUPDEP_MCSP11_MPU | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MCSP11_SDMA | Wakeup dependency from MCSP11 module (softwareakeup signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | WKUPDEP_MCSP11_DSP | Wakeup dependency from MCSP11 module (softwareakeup signal) towards DSP + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | WKUPDEP_MCSP11_MPU_M3 | Wakeup dependency from MCSP11 module (softwareakeup signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_MCSP11_MPU | Wakeup dependency from MCSP11 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-685. Register Call Summary for Register PM_L4PER_MCSP11_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [L4PER_PRCM Register Summary: \[4\]](#)

Table 3-686. RM_L4PER_MCSP11_CONTEXT

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00F4 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74F4 | | |
| Description | This register contains dedicated MCSPI1 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-687. Register Call Summary for Register RM_L4PER_MCSP1_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-688. PM_L4PER_MCSP12_WKDEP

| | | | |
|------------------|--|----------|-----------|
| Address Offset | 0x0000 00F8 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74F8 | | |
| Description | This register controls wakeup dependency based on MCSPI2 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----------|----|-----------------------|---|--------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_MCSP12_SDMA | | | | RESERVED | | WKUPDEP_MCSP12_MPU_M3 | | WKUPDEP_MCSP12_MPU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MCSP12_SDMA | Wakeup dependency from MCSPI2 module (softwareakeup signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | RESERVED | | R | 0 |
| 1 | WKUPDEP_MCSP12_MPU_M3 | Wakeup dependency from MCSPI2 module (softwareakeup signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_MCSP12_MPU | Wakeup dependency from MCSPI2 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-689. Register Call Summary for Register PM_L4PER_MCSP12_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[3\]](#)

Table 3-690. RM_L4PER_MCSPi2_CONTEXT

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00FC | Instance | L4PER_PRM |
| Physical Address | 0x4A30 74FC | | |
| Description | This register contains dedicated MCSPI2 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-691. Register Call Summary for Register RM_L4PER_MCSPi2_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-692. PM_L4PER_MCSPi3_WKDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0100 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7500 | | |
| Description | This register controls wakeup dependency based on MCSPI3 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---------------------|---|---|---|----------|--|--------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_MCSPi3_SDMA | | | | RESERVED | | WKUPDEP_MCSPi3_MPU | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MCSPi3_SDMA | Wakeup dependency from MCSPi3 module (softwareakeup signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2:1 | RESERVED | | R | 0x0 |
| 0 | WKUPDEP_MCSPi3_MPU | Wakeup dependency from MCSPi3 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-693. Register Call Summary for Register PM_L4PER_MCSPi3_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[2\]](#)

Table 3-694. RM_L4PER_MCSPi3_CONTEXT

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0104 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7504 | | |
| Description | This register contains dedicated MCSPi3 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW | 1 |

Table 3-695. Register Call Summary for Register RM_L4PER_MCSPi3_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-696. PM_L4PER_MCSPi4_WKDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0108 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7508 | | |
| Description | This register controls wakeup dependency based on MCSPI4 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|---|---|---|---|----------|--------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_MCSPi4_SDMA | | | | | | | | | | | RESERVED | WKUPDEP_MCSPi4_MPU | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MCSPi4_SDMA | Wakeup dependency from MCSPI4 module (softwareakeup signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2:1 | RESERVED | | R | 0x0 |
| 0 | WKUPDEP_MCSPi4_MPU | Wakeup dependency from MCSPI4 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-697. Register Call Summary for Register PM_L4PER_MCSPi4_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[2\]](#)

Table 3-698. RM_L4PER_MCSPi4_CONTEXT

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 010C | Instance | L4PER_PRM |
| Physical Address | 0x4A30 750C | | |
| Description | This register contains dedicated MCSPI4 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|-----------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-699. Register Call Summary for Register RM_L4PER_MCSPi4_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-700. PM_L4PER_MMCSd3_WKDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0120 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7520 | | |
| Description | This register controls wakeup dependency based on MMCSd3 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----------|----|-----------------------|---|--------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_MMCSd3_SDMA | | | | RESERVED | | WKUPDEP_MMCSd3_MPU_M3 | | WKUPDEP_MMCSd3_MPU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MMCSd3_SDMA | Wakeup dependency from MMCSd3 module (softwareakeup signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | RESERVED | | R | 0 |
| 1 | WKUPDEP_MMCSd3_MPU_M3 | Wakeup dependency from MMCSd3 module (softwareakeup signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_MMCSd3_MPU | Wakeup dependency from MMCSd3 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-701. Register Call Summary for Register PM_L4PER_MMCSO3_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_PRN Register Summary: \[3\]](#)

Table 3-702. RM_L4PER_MMCSO3_CONTEXT

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0124 | Instance | L4PER_PRN |
| Physical Address | 0x4A30 7524 | | |
| Description | This register contains dedicated MMCSO3 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_NONRETAINED_BANK | | | | | | | | RESERVED | | | | | | | | LOSTCONTEXT_DFF |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEN_NONRETAINED_BANK | Specify if memory-based context in NONRETAINED_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-703. Register Call Summary for Register RM_L4PER_MMCSO3_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRN Register Summary: \[1\]](#)

Table 3-704. PM_L4PER_MMCS4_WKDEP

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0128 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7528 | | |
| Description | This register controls wakeup dependency based on MMCS4 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----------|----|----------------------|---|-------------------|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_MMCS4_SDMA | | | RESERVED | | WKUPDEP_MMCS4_MPU_M3 | | WKUPDEP_MMCS4_MPU | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MMCS4_SDMA | Wakeup dependency from MMCS4 module (softwareakeup signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | RESERVED | | R | 0 |
| 1 | WKUPDEP_MMCS4_MPU_M3 | Wakeup dependency from MMCS4 module (softwareakeup signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_MMCS4_MPU | Wakeup dependency from MMCS4 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-705. Register Call Summary for Register PM_L4PER_MMCS4_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[3\]](#)

Table 3-706. RM_L4PER_MMCS4_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 012C | Instance | L4PER_PRM |
| Physical Address | 0x4A30 752C | | |
| Description | This register contains dedicated MMCS4 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|--|--|-----------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_NONRETAINED_BANK | | | | | | | | RESERVED | | | | | | | | | | LOSTCONTEXT_DFF | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_NONRETAINED_BANK | Specify if memory-based context in NONRETAINED_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-707. Register Call Summary for Register RM_L4PER_MMCS4_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-708. PM_L4PER_SLIMBUS2_WKDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0138 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7538 | | |
| Description | This register controls wakeup dependency based on SLIMBUS2 service requests. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------------|----|--------------------------|----|----------|----|--------------------------|---|----------|---|--------------------------|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_SLIMBUS2_DMA_SDMA | | WKUPDEP_SLIMBUS2_DMA_DSP | | RESERVED | | WKUPDEP_SLIMBUS2_IRQ_DSP | | RESERVED | | WKUPDEP_SLIMBUS2_IRQ_MPU | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|--|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7 | WKUPDEP_SLIMBUS2_DMA_SDMA | Wakeup dependency from SLIMBUS2 module (softwareakeup_dma signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 6 | WKUPDEP_SLIMBUS2_DMA_DSP | Wakeup dependency from SLIMBUS2 module (softwareakeup_dma signal) towards DSP + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 5:3 | RESERVED | | R | 0x0 |
| 2 | WKUPDEP_SLIMBUS2_IRQ_DSP | Wakeup dependency from SLIMBUS2 module (softwareakeup_irq signal) towards DSP + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | WKUPDEP_SLIMBUS2_IRQ_MPU | Wakeup dependency from SLIMBUS2 module (softwareakeup_irq signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-709. Register Call Summary for Register PM_L4PER_SLIMBUS2_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [L4PER_PRCM Register Summary: \[4\]](#)

Table 3-710. RM_L4PER_SLIMBUS2_CONTEXT

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 013C | Instance | L4PER_PRM |
| Physical Address | 0x4A30 753C | | |
| Description | This register contains dedicated SLIMBUS2 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_NONRETAINED_BANK | | | | | | | | RESERVED | | | | | | | | LOSTCONTEXT_DFF |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_NONRETAINED_BANK | Specify if memory-based context in NONRETAINED_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-711. Register Call Summary for Register RM_L4PER_SLIMBUS2_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-712. PM_L4PER_UART1_WKDEP

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0140 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7540 | | |
| Description | This register controls wakeup dependency based on UART1 service requests. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------|----|----------|----|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WKUPDEP_UART1_SDMA | | RESERVED | | WKUPDEP_UART1_MPU | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_UART1_SDMA | Wakeup dependency from UART1 module (softwareakeup signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2:1 | RESERVED | | R | 0x0 |
| 0 | WKUPDEP_UART1_MPU | Wakeup dependency from UART1 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-713. Register Call Summary for Register PM_L4PER_UART1_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[2\]](#)

Table 3-714. RM_L4PER_UART1_CONTEXT

| | |
|-------------------------|---|
| Address Offset | 0x0000 0144 |
| Physical Address | 0x4A30 7544 |
| Description | This register contains dedicated UART1 context statuses. [warm reset insensitive] |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|-----------------|--|----------|--|
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_RETAINED_BANK | | | | | | | | RESERVED | | | | | | | | LOSTCONTEXT_RFF | | RESERVED | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_RETAINED_BANK | Specify if memory-based context in RETAINED_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-715. Register Call Summary for Register RM_L4PER_UART1_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-716. PM_L4PER_UART2_WKDEP

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0148 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7548 | | |
| Description | This register controls wakeup dependency based on UART2 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|--------------------|----------|---|-------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_UART2_SDMA | RESERVED | | WKUPDEP_UART2_MPU |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_UART2_SDMA | Wakeup dependency from UART2 module (softwareakeup signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2:1 | RESERVED | | R | 0x0 |
| 0 | WKUPDEP_UART2_MPU | Wakeup dependency from UART2 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-717. Register Call Summary for Register PM_L4PER_UART2_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[2\]](#)

Table 3-718. RM_L4PER_UART2_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 014C | Instance | L4PER_PRM |
| Physical Address | 0x4A30 754C | | |
| Description | This register contains dedicated UART2 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----------|----|----|----|----|---|---|---|-----------------|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_RETAINED_BANK | RESERVED | | | | | | | | LOSTCONTEXT_RFF | RESERVED | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_RETAINED_BANK | Specify if memory-based context in RETAINED_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-719. Register Call Summary for Register RM_L4PER_UART2_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-720. PM_L4PER_UART3_WKDEP

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0150 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7550 | | |
| Description | This register controls wakeup dependency based on UART3 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|-------------------|----|---|---|----------------------|---|---|---|-------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_UART3_SDMA | | | | WKUPDEP_UART3_DSP | | | | WKUPDEP_UART3_MPU_M3 | | | | WKUPDEP_UART3_MPU | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_UART3_SDMA | Wakeup dependency from UART3 module (softwareakeup signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | WKUPDEP_UART3_DSP | Wakeup dependency from UART3 module (softwareakeup signal) towards DSP + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | WKUPDEP_UART3_MPU_M3 | Wakeup dependency from UART3 module (softwareakeup signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_UART3_MPU | Wakeup dependency from UART3 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-721. Register Call Summary for Register PM_L4PER_UART3_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[4\]](#)

Table 3-722. RM_L4PER_UART3_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0154 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7554 | | |
| Description | This register contains dedicated UART3 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|-----------------|--|----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_RETAINED_BANK | | | | | | | | RESERVED | | | | | | | | LOSTCONTEXT_RFF | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_RETAINED_BANK | Specify if memory-based context in RETAINED_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-723. Register Call Summary for Register RM_L4PER_UART3_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-724. PM_L4PER_UART4_WKDEP

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0158 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7558 | | |
| Description | This register controls wakeup dependency based on UART4 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----------|----|---|---|-------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | WKUPDEP_UART4_SDMA | | | | RESERVED | | | | WKUPDEP_UART4_MPU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_UART4_SDMA | Wakeup dependency from UART4 module (softwareakeup signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2:1 | RESERVED | | R | 0x0 |
| 0 | WKUPDEP_UART4_MPU | Wakeup dependency from UART4 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-725. Register Call Summary for Register PM_L4PER_UART4_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[2\]](#)

Table 3-726. RM_L4PER_UART4_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 015C | Instance | L4PER_PRM |
| Physical Address | 0x4A30 755C | | |
| Description | This register contains dedicated UART4 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|-----------------|--|----------|--|
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_RETAINED_BANK | | | | | | | | RESERVED | | | | | | | | LOSTCONTEXT_RFF | | RESERVED | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_RETAINED_BANK | Specify if memory-based context in RETAINED_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | LOSTCONTEXT_RFF | Specify if RFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RET_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-727. Register Call Summary for Register RM_L4PER_UART4_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-728. PM_L4PER_MMCS5_WKDEP

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0160 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7560 | | |
| Description | This register controls wakeup dependency based on MMCS5 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----------|----|----------------------|---|-------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_MMCS5_SDMA | | | | RESERVED | | WKUPDEP_MMCS5_MPU_M3 | | WKUPDEP_MMCS5_MPU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | WKUPDEP_MMCS5_SDMA | Wakeup dependency from MMCS5 module (softwareakeup signal) towards SDMA + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | RESERVED | | R | 0 |
| 1 | WKUPDEP_MMCS5_MPU_M3 | Wakeup dependency from MMCS5 module (softwareakeup signal) towards MPU_A3 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|-------|
| 0 | WKUPDEP_MMCS5 MPU | Wakeup dependency from MMCS5 module (softwareakeup signal) towards MPU + L3_1 + L3_2 domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-729. Register Call Summary for Register PM_L4PER_MMCS5_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[3\]](#)

Table 3-730. RM_L4PER_MMCS5_CONTEXT

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0164 | Instance | L4PER_PRM |
| Physical Address | 0x4A30 7564 | | |
| Description | This register contains dedicated MMCS5 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|-----------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_NONRETAINED_BANK | | | | | | | | RESERVED | | | | | | | | LOSTCONTEXT_DFF | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_NONRETAINED_BANK | Specify if memory-based context in NONRETAINED_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of L4_PER_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-731. Register Call Summary for Register RM_L4PER_MMCS5_CONTEXT

Power Management Functional Description

- [PD_L4_PER Description: \[0\]](#)

PRCM Register Manual

- [L4PER_PRM Register Summary: \[1\]](#)

Table 3-734. Register Call Summary for Register RM_WKUP_L4WKUP_CONTEXT

Power Management Functional Description

- PD_WKUP Description: [0]

PRCM Register Manual

- [WKUP_PRM Register Summary](#): [1]

Table 3-735. PM_WKUP_WDTIMER2_WKDEP

| | | |
|-------------------------|--|-----------------|
| Address Offset | 0x0000 0030 | |
| Physical Address | 0x4A30 7730 | Instance |
| Description | This register controls wakeup dependency based on WDT2 service requests. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | <div>WKUPDEP_WDT2_MPU_M3</div> <div>WKUPDEP_WDT2_MPU</div> | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | WKUPDEP_WDT2_MPU_M3 | Wakeup dependency from WDT2 module (softwareakeup signal) towards MPU_A3 + L3_2 + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_WDT2_MPU | Wakeup dependency from WDT2 module (softwareakeup signal) towards MPU + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-736. Register Call Summary for Register PM_WKUP_WDTIMER2_WKDEP

Clock Management Functional Description

- Clock Domain Dependency: [0] [1]

PRCM Register Manual

- [WKUP_PRM Register Summary: \[2\]](#)

Table 3-737. RM_WKUP_WDTIMER2_CONTEXT

| | | | |
|------------------|--|----------|----------|
| Address Offset | 0x0000 0034 | Instance | WKUP_PRM |
| Physical Address | 0x4A30 7734 | | |
| Description | This register contains dedicated WDT2 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|-----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | LOSTCONTEXT_DFF | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of WKUP_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-738. Register Call Summary for Register RM_WKUP_WDTIMER2_CONTEXT

Power Management Functional Description

- [PD_WKUP Description: \[0\]](#)

PRCM Register Manual

- [WKUP_PRM Register Summary: \[1\]](#)

Table 3-739. PM_WKUP_GPIO1_WKDEP

| | | | |
|------------------|---|----------|----------|
| Address Offset | 0x0000 0038 | Instance | WKUP_PRM |
| Physical Address | 0x4A30 7738 | | |
| Description | This register controls wakeup dependency based on GPIO1 service requests. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|----------|---|---|---|------------------------|----------|--|--|--|---------------------------|------------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | RESERVED | | | | WKUPDEP_GPIO1_IRQ2_DSP | RESERVED | | | | WKUPDEP_GPIO1_IRQ1_MPU_M3 | WKUPDEP_GPIO1_IRQ1_MPU |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|-----------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | WKUPDEP_GPIO1_IRQ2_DSP | Wakeup dependency from GPIO1 module (POINTRsoftwareAKEUP2 signal) towards DSP + L3_1 + L4_CFG domains Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 5:2 | RESERVED | | R | 0x0 |
| 1 | WKUPDEP_GPIO1_IRQ1_MPU_M3 | Wakeup dependency from GPIO1 module (POINTRsoftwareAKEUP1 signal) module towards MPU_A3 + L3_2 + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | WKUPDEP_GPIO1_IRQ1_MPU | Wakeup dependency from GPIO1 module (POINTRsoftwareAKEUP1 signal) towards MPU + L3_1 + L4_CFG domains 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-740. Register Call Summary for Register PM_WKUP_GPIO1_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [WKUP_PRM Register Summary: \[3\]](#)

Table 3-741. RM_WKUP_GPIO1_CONTEXT

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 003C | Instance | WKUP_PRM |
| Physical Address | 0x4A30 773C | | |
| Description | This register contains dedicated GPIO1 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of WKUP_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-742. Register Call Summary for Register RM_WKUP_GPIO1_CONTEXT

Power Management Functional Description

- [PD_WKUP Description: \[0\]](#)

PRCM Register Manual

- [WKUP_PRM Register Summary: \[1\]](#)

Table 3-743. PM_WKUP_GPTIMER1_WKDEP

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0040 | Instance | WKUP_PRM |
| Physical Address | 0x4A30 7740 | | |
| Description | This register controls wakeup dependency based on TIMER1 service requests. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKUPDEP_TIMER1_MPU | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|---------------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | WKUPDEP_TIMER1_MPU | Wakeup dependency from TIMER1 module (softwareakeup signal) towards MPU + L3_1 + L4_CFG domains Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |

Table 3-744. Register Call Summary for Register PM_WKUP_GPTIMER1_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\]](#)

PRCM Register Manual

- [WKUP_PRM Register Summary: \[1\]](#)

Table 3-745. RM_WKUP_GPTIMER1_CONTEXT

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0044 | Instance | WKUP_PRM |
| Physical Address | 0x4A30 7744 | | |
| Description | This register contains dedicated TIMER1 context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of WKUP_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-746. Register Call Summary for Register RM_WKUP_GPTIMER1_CONTEXT

| | |
|---|--|
| Power Management Functional Description | <ul style="list-style-type: none"> • PD_WKUP Description: [0] |
| PRCM Register Manual | <ul style="list-style-type: none"> • WKUP_PRM Register Summary: [1] |

Table 3-747. RM_WKUP_32KTIMER_CONTEXT

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0054 | | |
| Physical Address | 0x4A30 7754 | Instance | WKUP_PRM |
| Description | This register contains dedicated SYNCTIMER context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of WKUP_SYS_PWRON_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-748. Register Call Summary for Register RM_WKUP_32KTIMER_CONTEXT

Power Management Functional Description

- [PD_WKUP Description: \[0\]](#)

PRCM Register Manual

- [WKUP_PRM Register Summary: \[1\]](#)

Table 3-749. RM WKUP SARRAM CONTEXT

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0064 | | |
| Physical Address | 0x4A30 7764 | Instance | WKUP_PRM |
| Description | This register contains dedicated SARRAM context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|-------------------|----------|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | LOSTMEM_WKUP_BANK | RESERVED | | | | | | | | LOSTCONTEXT_DFF |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_WKUP_BANK | Specify if memory-based context in WKUP_BANK memory bank has been lost due to a previous global cold reset. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of WKUP_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-750. Register Call Summary for Register RM_WKUP_SARRAM_CONTEXT

Power Management Functional Description

- [PD_WKUP Description: \[0\]](#)

PRCM Register Manual

- [WKUP_PRM Register Summary: \[1\]](#)

Table 3-751. PM_WKUP_KEYBOARD_WKDEP

| | | | |
|------------------|--|----------|----------|
| Address Offset | 0x0000 0078 | Instance | WKUP_PRM |
| Physical Address | 0x4A30 7778 | | |
| Description | This register controls wakeup dependency based on KEYBOARD service requests. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | WKUPDEP_KEYBOARD_MPU | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|---------------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | WKUPDEP_KEYBOARD_MPU | Wakeup dependency from KEYBOARD module (softwareakeup signal) towards MPU + L3_1 + L4_CFG domains Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |

Table 3-752. Register Call Summary for Register PM_WKUP_KEYBOARD_WKDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\]](#)

PRCM Register Manual

- [WKUP_PRM Register Summary: \[1\]](#)

Table 3-753. RM_WKUP_KEYBOARD_CONTEXT

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 007C | Instance | WKUP_PRM |
| Physical Address | 0x4A30 777C | | |
| Description | This register contains dedicated KEYBOARD context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_DFF |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of WKUP_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-754. Register Call Summary for Register RM_WKUP_KEYBOARD_CONTEXT

Power Management Functional Description

- [PD_WKUP Description: \[0\]](#)

PRCM Register Manual

- [WKUP_PRM Register Summary: \[1\]](#)

3.11.16 WKUP_CM Registers

3.11.16.1 WKUP_CM Register Summary

Table 3-755. WKUP_CM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | WKUP_CM L4 Base Address |
|--|------|-----------------------|----------------|-------------------------|
| CM_WKUP_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 7800 |
| CM_WKUP_L4WKUP_CLKCTRL | R | 32 | 0x0000 0020 | 0x4A30 7820 |
| RESERVED | R | 32 | 0x0000 0028 | 0x4A30 7828 |
| CM_WKUP_WDTIMER2_CLKCTRL | RW | 32 | 0x0000 0030 | 0x4A30 7830 |
| CM_WKUP_GPIO1_CLKCTRL | RW | 32 | 0x0000 0038 | 0x4A30 7838 |
| CM_WKUP_GPTIMER1_CLKCTRL | RW | 32 | 0x0000 0040 | 0x4A30 7840 |
| RESERVED | R | 32 | 0x0000 0048 | 0x4A30 7848 |
| CM_WKUP_32KTIMER_CLKCTRL | R | 32 | 0x0000 0050 | 0x4A30 7850 |
| RESERVED | RW | 32 | 0x0000 0058 | 0x4A30 7858 |
| CM_WKUP_SARRAM_CLKCTRL | R | 32 | 0x0000 0060 | 0x4A30 7860 |
| CM_WKUP_KEYBOARD_CLKCTRL | RW | 32 | 0x0000 0078 | 0x4A30 7878 |
| RESERVED | RW | 32 | 0x0000 0080 | 0x4A30 7880 |
| CM_WKUP_BANDGAP_CLKCTRL | RW | 32 | 0x0000 0088 | 0x4A30 7888 |

3.11.16.2 WKUP_CM Register Description

Table 3-756. CM_WKUP_CLKSTCTRL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|----|--|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----------|--------------------------|----|---------------------------|----|----------|---|------------------------|---|---------------------|---|----------|---|---|---|--|----|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------------------------|--|--------------------------|--|---------------------------|--|----------|--|------------------------|--|---------------------|--|----------|--|--|--|--|--|-----------|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7800 | | | | | | | | | | | | | | | | Instance | WKUP_CM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="2">CLKACTIVITY_WKUP_TS_FCLK</td><td colspan="2">CLKACTIVITY_L4_WKUP_ICLK</td><td colspan="2">CLKACTIVITY_WKUP_32K_FCLK</td><td colspan="2">RESERVED</td><td colspan="2">CLKACTIVITY_ABE_LP_CLK</td><td colspan="2">CLKACTIVITY_SYS_CLK</td><td colspan="6">RESERVED</td><td colspan="1">CLKTRCTRL</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_WKUP_TS_FCLK | | CLKACTIVITY_L4_WKUP_ICLK | | CLKACTIVITY_WKUP_32K_FCLK | | RESERVED | | CLKACTIVITY_ABE_LP_CLK | | CLKACTIVITY_SYS_CLK | | RESERVED | | | | | | CLKTRCTRL |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_WKUP_TS_FCLK | | CLKACTIVITY_L4_WKUP_ICLK | | CLKACTIVITY_WKUP_32K_FCLK | | RESERVED | | CLKACTIVITY_ABE_LP_CLK | | CLKACTIVITY_SYS_CLK | | RESERVED | | | | | | CLKTRCTRL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:14 | RESERVED | | | | | | | | | | | | | | | | | | | | | R | | 0x00000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | CLKACTIVITY_WKUP_TS_FCLK | | This field indicates the state of the WKUP_TS_FCLK clock in the domain. [warm reset insensitive] Read 0x1: Corresponding clock is running or gating/ungating transition is on-going Read 0x0: Corresponding clock is definitely gated | | | | | | | | | | | | | | | | | | | R | | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | CLKACTIVITY_L4_WKUP_ICLK | | This field indicates the state of the clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | | | | | | | | | | | | | | | | | | | R | | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | CLKACTIVITY_WKUP_32K_FCLK | | This field indicates the state of the clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | | | | | | | | | | | | | | | | | | | R | | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | RESERVED | | | | | | | | | | | | | | | | | | | | | R | | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | CLKACTIVITY_ABE_LP_CLK | | This field indicates the state of the clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | | | | | | | | | | | | | | | | | | | R | | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | CLKACTIVITY_SYS_CLK | | This field indicates the state of the SYS_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | | | | | | | | | | | | | | | | | | | R | | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7:2 | RESERVED | | | | | | | | | | | | | | | | | | | | | R | | 0x00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | CLKTRCTRL | Controls the clock state transition of the WKUP clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved Read 0x2: Reserved 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-757. Register Call Summary for Register CM_WKUP_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [WKUP_CM Register Summary: \[5\]](#)

Table 3-758. CM_WKUP_L4WKUP_CLKCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0020 | Instance | WKUP_CM |
| Physical Address | 0x4A30 7820 | | |
| Description | This register manages the L4WKUP clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | | | MODULEMODE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Clock Management Functional Description

- PRCM Register Manual

- | | | |
|-------------------------|--|-----------------|
| Address Offset | 0x0000 0030 | |
| Physical Address | 0x4A30 7830 | Instance |
| Description | This register manages the WDT2 clocks. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup).</p> <p>Read 0x1: Reserved</p> <p>0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen.</p> <p>Read 0x3: Reserved</p> | RW | 0x0 |

Clock Management Functional Description

- PRCM Register Manual

- WKUP_CM Register Summary: [2]

Table 3-762. CM_WKUP_GPIO1_CLKCTRL

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0038 | Instance | WKUP_CM |
| Physical Address | 0x4A30 7838 | | |
| Description | This register manages the GPIO1 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|-----------------|----------|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | OPTFCLKEN_DBCLK | RESERVED | | | | | | | | MODULEMODE |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_DBCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-763. Register Call Summary for Register CM_WKUP_GPIO1_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [WKUP_CM Register Summary: \[2\]](#)

Table 3-764. CM_WKUP_GPTIMER1_CLKCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0040 | Instance | WKUP_CM |
| Physical Address | 0x4A30 7840 | | |
| Description | This register manages the TIMER1 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----------|----|----|----|----|----|----|----|----------|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | MODULEMODE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL | Select the source of the functional clock 0x0: Selects the SYS_CLK as the source 0x1: Selects the 32KHz as the source | RW | 0 |
| 23:18 | RESERVED | | R | 0x00 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-765. Register Call Summary for Register CM_WKUP_GPTIMER1_CLKCTRL

Clock Management Functional Description

- [PRM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\]](#)

PRCM Register Manual

- [WKUP_CM Register Summary: \[3\]](#)

Table 3-766. CM WKUP 32KTIMER CLKCTRL

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0050 | | |
| Physical Address | 0x4A30 7850 | Instance | WKUP_CM |
| Description | This register manages the SYNCTIMER clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|--------------------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state.</p> | <p>R</p> <p>Rreturns</p> | 0x1 |

Table 3-767. Register Call Summary for Register CM_WKUP_32KTIMER_CLKCTRL

| |
|--|
| <p>Clock Management Functional Description</p> <ul style="list-style-type: none"> • Clock Domain Module Attributes: [0] [1] |
| <p>PRCM Register Manual</p> <ul style="list-style-type: none"> • WKUP_CM Register Summary: [2] |

Table 3-768. CM WKUP SARRAM CLKCTRL

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0060 | | |
| Physical Address | 0x4A30 7860 | Instance | WKUP_CM |
| Description | This register manages the SARRAM clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|--------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Returns | 0x1 |

Table 3-769. Register Call Summary for Register CM_WKUP_SARRAM_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [WKUP_CM Register Summary: \[2\]](#)

Table 3-770. CM_WKUP_KEYBOARD_CLKCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0078 | Instance | WKUP_CM |
| Physical Address | 0x4A30 7878 | | |
| Description | This register manages the KEYBOARD clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | | | | | | | RESERVED | | | | | | | | MODULEMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-771. Register Call Summary for Register CM_WKUP_KEYBOARD_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [WKUP_CM Register Summary: \[2\]](#)

Table 3-772. CM_WKUP_BANDGAP_CLKCTRL

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0088 | Instance | WKUP_CM |
| Physical Address | 0x4A30 7888 | | |
| Description | This register manages the clock delivered to the Bandgap and SYSCTRL_GENERAL_CORE modules for the Thermal Sensor feature. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|----|----|----|-------------------|----------|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | CLKSEL | RESERVED | | | | | | | | | | OPTFCLKEN_TS_FCLK | RESERVED | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|--------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | CLKSEL | Selects the divider value for generating the Thermal Sensor clock from L4WKUP_ICLK source. The divider has to be selected so as to guarantee a frequency between 1MHz and 2MHz. 0x0: Divide by 8 0x1: Divide by 16 0x2: Divide by 32 0x3: Reserved | RW | 0x2 |
| 23:9 | RESERVED | | R | 0x0000 |
| 8 | OPTFCLKEN_TS_FCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:0 | RESERVED | | R | 0x00 |

Table 3-773. Register Call Summary for Register CM_WKUP_BANDGAP_CLKCTRL

Clock Management Functional Description

- [PRM Clock Source: \[0\]](#)

PRCM Register Manual

- [WKUP_CM Register Summary: \[1\]](#)

3.11.17 EMU_PRM Registers

3.11.17.1 EMU_PRM Register Summary

Table 3-774. EMU_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | EMU_PRM L4 Base Address |
|--|------|-----------------------|----------------|-------------------------|
| PM_EMU_PWRSTCTRL | R | 32 | 0x0000 0000 | 0x4A30 7900 |
| PM_EMU_PWRSTST | R | 32 | 0x0000 0004 | 0x4A30 7904 |
| RM_EMU_DEBUGSS_CONTEXT | RW | 32 | 0x0000 0024 | 0x4A30 7924 |

3.11.17.2 EMU_PRM Register Description

Table 3-775. PM_EMU_PWRSTCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0000 | Instance | EMU_PRM |
| Physical Address | 0x4A30 7900 | | |
| Description | This register controls the EMU power state to reach upon a domain sleep transition | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| RESERVED | | | | | | | | | | | | | | EMU_BANK_ONSTATE | RESERVED | | | | | | | | | | | | | | POWERSTATE | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|-----------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | EMU_BANK_ONSTATE | EMU memory state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R Returns 1s | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | POWERSTATE | Power state control Read 0x0: OFF state | R | 0x0 |

Table 3-776. Register Call Summary for Register PM_EMU_PWRSTCTRL

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\]](#)

PRCM Register Manual

- [EMU_PRM Register Summary: \[2\]](#)

Table 3-777. PM_EMU_PWRSTST

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0004 | Instance | EMU_PRM |
| Physical Address | 0x4A30 7904 | | |
| Description | This register provides a status on the EMU domain current power state. [warm reset insensitive] | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------------|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|------------|--|--|--|--|--|--|--|------------|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LASTPOWERSTATEENTERED | | | | | | | | INTRANSITION | | | | | | | | RESERVED | | | | | | | | EMU_BANK_STATE | | | | | | | | RESERVED | | | | | | | | LOGICSTATE | | | | | | | | POWERSTATE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|---------------|--------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | LASTPOWERSTATEENTERED | Last low power state entered. Set to 0x3 upon write of the same only. This register is intended for debug purpose only. Read 0x0: Power domain was previously OFF Read 0x1: Power domain was previously in RETENTION Read 0x2: Power domain was previously ON-INACTIVE Read 0x3: Power domain was previously ON-ACTIVE | RW W1toSet | 0x0 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | INTRANSITION | Domain transition status Read 0x0: No ongoing transition on power domain Read 0x1: Power domain transition is in progress. | R | 0 |
| 19:6 | RESERVED | | R | 0x0000 |
| 5:4 | EMU_BANK_STATE | EMU memory bank state status Read 0x0: Memory is OFF Read 0x1: Reserved Read 0x2: Reserved Read 0x3: Memory is ON It is supplied by WKUP LDO | R | 0x3 |
| 3 | RESERVED | | R | 0 |
| 2 | LOGICSTATE | Logic state status Read 0x0: Logic in domain is OFF Read 0x1: Logic in domain is ON | R | 1 |
| 1:0 | POWERSTATE | Current power state status Read 0x0: Power domain is OFF Read 0x3: Power domain is ON-ACTIVE | R | 0x3 |

Table 3-778. Register Call Summary for Register PM_EMU_PWRSTST

Power Management Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [EMU_PRM Register Summary: \[4\]](#)

Table 3-779. RM_EMU_DEBUGSS_CONTEXT

| | | | |
|------------------|---|----------|---------|
| Address Offset | 0x0000 0024 | Instance | EMU_PRM |
| Physical Address | 0x4A30 7924 | | |
| Description | This register contains dedicated DEBUGSS context statuses. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_EMU_BANK | RESERVED | | | | | | | | | | | | | | LOSTCONTEXT_DFF |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | LOSTMEM_EMU_BANK | Specify if memory-based context in EMU_BANK memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. (set upon assertion of EMU_RST signal) 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 3-780. Register Call Summary for Register RM_EMU_DEBUGSS_CONTEXT

PRCM Register Manual

- [EMU_PRM Register Summary: \[0\]](#)

3.11.18 EMU_CM Registers

3.11.18.1 EMU_CM Register Summary

Table 3-781. EMU_CM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | EMU_CM L4 Base Address |
|--|------|-----------------------|----------------|------------------------|
| CM_EMU_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 7A00 |
| CM_EMU_DYNAMICDEP | RW | 32 | 0x0000 0008 | 0x4A30 7A08 |
| CM_EMU_DEBUGSS_CLKCTRL | RW | 32 | 0x0000 0020 | 0x4A30 7A20 |

3.11.18.2 EMU_CM Register Description

Table 3-782. CM_EMU_CLKSTCTRL

| | | | |
|-------------------------|---|-----------------|--------|
| Address Offset | 0x0000 0000 | Instance | EMU_CM |
| Physical Address | 0x4A30 7A00 | | |
| Description | This register enables the EMU domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------------------|----|----|----|----|----|---|---|-------------------------|---|----------|---|---|---|---|---|--|--|-----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_CORE_DPLL_EMU_CLK | | | | | | | | CLKACTIVITY_EMU_SYS_CLK | | RESERVED | | | | | | | | CLKTRCTRL | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|---|------|------------|
| 31:10 | RESERVED | | R | 0x00000000 |
| 9 | CLKACTIVITY_CORE_DPLL_EMU_CLK | This field indicates the state of the CORE_DPLL_EMU_CLK clock in the domain. Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 8 | CLKACTIVITY_EMU_SYS_CLK | This field indicates the state of the EMU_SYS_CLK clock in the domain. Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the EMU clock domain. Read 0x0: Reserved Read 0x1: Reserved 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x2 |

Table 3-783. Register Call Summary for Register CM_EMU_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [EMU_CM Register Summary: \[3\]](#)

Table 3-784. CM_EMU_DYNAMICDEP

| | | | |
|-------------------------|---|-----------------|--------|
| Address Offset | 0x0000 0008 | Instance | EMU_CM |
| Physical Address | 0x4A30 7A08 | | |
| Description | This register controls the dynamic domain dependencies from EMU domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|----|----|-------------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | | | | | L3_2_DYNDEP | | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|---------------------|---------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor INTRCONN interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:7 | RESERVED | | R | 0x00000 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5:0 | RESERVED | | R | 0x00 |

Table 3-785. Register Call Summary for Register CM_EMU_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\]](#)

PRCM Register Manual

- [EMU_CM Register Summary: \[1\]](#)

Table 3-786. CM_EMU_DEBUGSS_CLKCTRL

| | | | |
|-------------------------|--|-----------------|--------|
| Address Offset | 0x0000 0020 | Instance | EMU_CM |
| Physical Address | 0x4A30 7A20 | | |
| Description | This register manages the DEBUGSS clocks. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | |
|----------|----|----|----|--------------------|----|----|----|----------------------|----|----|----|--------------------|----|----|----|------------------|----|----|----|----------|----|---|---|--------|---|--------|---|----------|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|------------|--|
| RESERVED | | | | CLKSEL_PMD_STM_CLK | | | | CLKSEL_PMD_TRACE_CLK | | | | PMD_TRACE_MUX_CTRL | | | | PMD_STM_MUX_CTRL | | | | RESERVED | | | | STBYST | | IDLEST | | RESERVED | | | | | | | | | | | | | | | | MODULEMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|--------|
| 31:30 | RESERVED | | R | 0x0 |
| 29:27 | CLKSEL_PMD_STM_CLK | Selection of STM clock division Read 0x0: Reserved 0x1: STM_CLK is the selected STM source clock divided by 1 0x2: STM_CLK is the selected STM source clock divided by 2 Read 0x3: Reserved 0x4: STM_CLK is the selected STM source clock divided by 4 Read 0x5: Reserved Read 0x6: Reserved Read 0x7: Reserved | RW | 0x1 |
| 26:24 | CLKSEL_PMD_TRACE_CLK | Selection of TRACE clock division Read 0x0: Reserved 0x1: TRACE_CLK is the selected TRACE source clock divided by 1 0x2: TRACE_CLK is the selected TRACE source clock divided by 2 Read 0x3: Reserved 0x4: TRACE_CLK is the selected TRACE source clock divided by 4 Read 0x5: Reserved Read 0x6: Reserved Read 0x7: Reserved | RW | 0x1 |
| 23:22 | PMD_TRACE_MUX_CTRL | Selection of TRACE source clock 0x0: TRACE source clock is SYS_CLK 0x1: TRACE source clock is CORE_DPLL_EMU_CLK Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |
| 21:20 | PMD_STM_MUX_CTRL | Selection of STM source clock 0x0: STM source clock is SYS_CLK 0x1: STM source clock is CORE_DPLL_EMU_CLK Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |
| 19 | RESERVED | | R | 0 |
| 18 | STBYST | Module standby status Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Rreturns | 0x1 |

Table 3-787. Register Call Summary for Register CM_EMU_DEBUGSS_CLKCTRL

Clock Management Functional Description

- [Overview: \[0\] \[1\]](#)

PRCM Register Manual

- [EMU_CM Register Summary: \[2\]](#)

3.11.19 DEVICE_PRM Registers

3.11.19.1 DEVICE_PRM Register Summary

Table 3-788. DEVICE_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DEVICE_PRM L4 Base Address |
|--|------|-----------------------|----------------|----------------------------|
| PRM_RSTCTRL | RW | 32 | 0x0000 0000 | 0x4A30 7B00 |
| PRM_RSTST | RW | 32 | 0x0000 0004 | 0x4A30 7B04 |
| PRM_RSTTIME | RW | 32 | 0x0000 0008 | 0x4A30 7B08 |
| PRM_CLKREQCTRL | RW | 32 | 0x0000 000C | 0x4A30 7B0C |
| PRM_VOLTCTRL | RW | 32 | 0x0000 0010 | 0x4A30 7B10 |
| PRM_PWRREQCTRL | RW | 32 | 0x0000 0014 | 0x4A30 7B14 |
| PRM_PSCON_COUNT | RW | 32 | 0x0000 0018 | 0x4A30 7B18 |
| PRM_IO_COUNT | RW | 32 | 0x0000 001C | 0x4A30 7B1C |
| PRM_IO_PMCTRL | RW | 32 | 0x0000 0020 | 0x4A30 7B20 |
| PRM_VOLTSETUP_WARMRESET | RW | 32 | 0x0000 0024 | 0x4A30 7B24 |
| PRM_VOLTSETUP_CORE_OFF | RW | 32 | 0x0000 0028 | 0x4A30 7B28 |
| PRM_VOLTSETUP_MPU_OFF | RW | 32 | 0x0000 002C | 0x4A30 7B2C |
| PRM_VOLTSETUP_IVA_OFF | RW | 32 | 0x0000 0030 | 0x4A30 7B30 |
| PRM_VOLTSETUP_CORE_RET_SLEEP | RW | 32 | 0x0000 0034 | 0x4A30 7B34 |
| PRM_VOLTSETUP_MPU_RET_SLEEP | RW | 32 | 0x0000 0038 | 0x4A30 7B38 |
| PRM_VOLTSETUP_IVA_RET_SLEEP | RW | 32 | 0x0000 003C | 0x4A30 7B3C |
| PRM_VP_CORE_CONFIG | RW | 32 | 0x0000 0040 | 0x4A30 7B40 |
| PRM_VP_CORE_STATUS | R | 32 | 0x0000 0044 | 0x4A30 7B44 |
| PRM_VP_CORE_VLIMITTO | RW | 32 | 0x0000 0048 | 0x4A30 7B48 |
| PRM_VP_CORE_VOLTAGE | R | 32 | 0x0000 004C | 0x4A30 7B4C |
| PRM_VP_CORE_VSTEPMAX | RW | 32 | 0x0000 0050 | 0x4A30 7B50 |
| PRM_VP_CORE_VSTEPMIN | RW | 32 | 0x0000 0054 | 0x4A30 7B54 |
| PRM_VP_MPU_CONFIG | RW | 32 | 0x0000 0058 | 0x4A30 7B58 |
| PRM_VP_MPU_STATUS | R | 32 | 0x0000 005C | 0x4A30 7B5C |
| PRM_VP_MPU_VLIMITTO | RW | 32 | 0x0000 0060 | 0x4A30 7B60 |
| PRM_VP_MPU_VOLTAGE | R | 32 | 0x0000 0064 | 0x4A30 7B64 |
| PRM_VP_MPU_VSTEPMAX | RW | 32 | 0x0000 0068 | 0x4A30 7B68 |
| PRM_VP_MPU_VSTEPMIN | RW | 32 | 0x0000 006C | 0x4A30 7B6C |
| PRM_VP_IVA_CONFIG | RW | 32 | 0x0000 0070 | 0x4A30 7B70 |

Table 3-788. DEVICE_PRM Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | DEVICE_PRM L4 Base Address |
|---------------------------|------|-----------------------|----------------|----------------------------|
| PRM_VP_IVA_STATUS | R | 32 | 0x0000 0074 | 0x4A30 7B74 |
| PRM_VP_IVA_VLIMITTO | RW | 32 | 0x0000 0078 | 0x4A30 7B78 |
| PRM_VP_IVA_VOLTAGE | R | 32 | 0x0000 007C | 0x4A30 7B7C |
| PRM_VP_IVA_VSTEPMAX | RW | 32 | 0x0000 0080 | 0x4A30 7B80 |
| PRM_VP_IVA_VSTEPMIN | RW | 32 | 0x0000 0084 | 0x4A30 7B84 |
| PRM_VC_SMPS_SA | RW | 32 | 0x0000 0088 | 0x4A30 7B88 |
| PRM_VC_VAL_SMPS_RA_VOL | RW | 32 | 0x0000 008C | 0x4A30 7B8C |
| PRM_VC_VAL_SMPS_RA_CMD | RW | 32 | 0x0000 0090 | 0x4A30 7B90 |
| PRM_VC_VAL_CMD_VDD_CORE_L | RW | 32 | 0x0000 0094 | 0x4A30 7B94 |
| PRM_VC_VAL_CMD_VDD_MPU_L | RW | 32 | 0x0000 0098 | 0x4A30 7B98 |
| PRM_VC_VAL_CMD_VDD_IVA_L | RW | 32 | 0x0000 009C | 0x4A30 7B9C |
| PRM_VC_VAL_BYPASS | RW | 32 | 0x0000 00A0 | 0x4A30 7BA0 |
| PRM_VC_CFG_CHANNEL | RW | 32 | 0x0000 00A4 | 0x4A30 7BA4 |
| PRM_VC_CFG_I2C_MODE | RW | 32 | 0x0000 00A8 | 0x4A30 7BA8 |
| PRM_VC_CFG_I2C_CLK | RW | 32 | 0x0000 00AC | 0x4A30 7BAC |
| PRM_SRAM_COUNT | RW | 32 | 0x0000 00B0 | 0x4A30 7BB0 |
| PRM_SRAM_WKUP_SETUP | RW | 32 | 0x0000 00B4 | 0x4A30 7BB4 |
| PRM_LDO_SRAM_CORE_SETUP | RW | 32 | 0x0000 00B8 | 0x4A30 7BB8 |
| PRM_LDO_SRAM_CORE_CTRL | RW | 32 | 0x0000 00BC | 0x4A30 7BBC |
| PRM_LDO_SRAM_MPU_SETUP | RW | 32 | 0x0000 00C0 | 0x4A30 7BC0 |
| PRM_LDO_SRAM_MPU_CTRL | RW | 32 | 0x0000 00C4 | 0x4A30 7BC4 |
| PRM_LDO_SRAM_IVA_SETUP | RW | 32 | 0x0000 00C8 | 0x4A30 7BC8 |
| PRM_LDO_SRAM_IVA_CTRL | RW | 32 | 0x0000 00CC | 0x4A30 7BCC |
| PRM_LDO_ABB_MPU_SETUP | RW | 32 | 0x0000 00D0 | 0x4A30 7BD0 |
| PRM_LDO_ABB_MPU_CTRL | RW | 32 | 0x0000 00D4 | 0x4A30 7BD4 |
| PRM_LDO_ABB_IVA_SETUP | RW | 32 | 0x0000 00D8 | 0x4A30 7BD8 |
| PRM_LDO_ABB_IVA_CTRL | RW | 32 | 0x0000 00DC | 0x4A30 7BDC |
| PRM_LDO_BANDGAP_SETUP | RW | 32 | 0x0000 00E0 | 0x4A30 7BE0 |
| PRM_DEVICE_OFF_CTRL | RW | 32 | 0x0000 00E4 | 0x4A30 7BE4 |
| PRM_PHASE1_CNDP | R | 32 | 0x0000 00E8 | 0x4A30 7BE8 |
| PRM_PHASE2A_CNDP | RW | 32 | 0x0000 00EC | 0x4A30 7BEC |
| PRM_PHASE2B_CNDP | RW | 32 | 0x0000 00F0 | 0x4A30 7BF0 |
| RESERVED | RW | 32 | 0x0000 00F4 | 0x4A30 7BF4 |
| PRM_VC_ERRST | RW | 32 | 0x0000 00F8 | 0x4A30 7BF8 |

3.11.19.2 DEVICE_PRM Register Description

Table 3-789. PRM_RSTCTRL

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4A30 7B00 | Instance | DEVICE_PRM |
| Description | Global software cold and warm reset control. This register is auto-cleared. Only write 1 is possible. A read returns 0 only. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--------------------------|--------------------------|
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RST_GLOBAL_COLD_software | RST_GLOBAL_WARM_software |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | RST_GLOBAL_COLD_software | Global COLD software reset control. This bit is reset only upon a global cold source of reset. 0x0: Global COLD software reset is cleared. 0x1: Triggers a global COLD software reset. The software must ensure the SDRAM is properly put in self-refresh mode before applying this reset. | RW | 0 |
| 0 | RST_GLOBAL_WARM_software | Global WARM software reset control. This bit is reset upon any global source of reset (warm and cold). 0x0: Global warm software reset is cleared. 0x1: Triggers a global warm software reset. | RW | 0 |

Table 3-790. Register Call Summary for Register PRM_RSTCTRL

Reset Management Functional Description

- [Global Reset Sources: \[0\] \[1\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[2\]](#)

Table 3-791. PRM RSTST

| | |
|-------------------------|---|
| Address Offset | 0x0000 0004 |
| Physical Address | 0x4A30 7B04 |
| Instance | DEVICE_PRM |
| Description | This register logs the global reset sources. Each bit is set upon release of the domain reset signal. Must be cleared by software. [warm reset insensitive] |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|-------------|----|-----------------------|----|----------------------|---|----------------------|---|-------------------|---|----------|---|-------------|---|----------|--|--------------------|--|-----------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | C2C_RST | | ICEPICK_RST | | VDD_CORE_VOLT_MGR_RST | | VDD_IVA_VOLT_MGR_RST | | VDD_MPU_VOLT_MGR_RST | | EXTERNAL_WARM_RST | | RESERVED | | MPU_WDT_RST | | RESERVED | | GLOBAL_WARM_SW_RST | | GLOBAL_COLD_RST | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|---------------|-----------|
| 31:11 | RESERVED | | R | 0x0000000 |
| 10 | C2C_RST | C2C warm reset event. This is a source of global warm reset. 0x0: No C2C warm reset. 0x1: C2C warm reset has occurred. | RW W1toClr | 0 |
| 9 | ICEPICK_RST | IcePick reset event. This is a source of global warm reset initiated by the emulation. 0x0: No ICEPICK reset. 0x1: IcePick reset has occurred. | RW W1toClr | 0 |
| 8 | VDD_CORE_VOLT_MGR_RST | VDD_CORE voltage manager reset event This is a source of global WARM reset. 0x0: No VDD_CORE voltage manager reset. 0x1: VDD_CORE voltage manager reset has occurred. | RW W1toClr | 0 |
| 7 | VDD_IVA_VOLT_MGR_RST | VDD_IVA voltage manager reset event This is a source of global WARM reset. 0x0: No VDD_IVA voltage manager reset. 0x1: VDD_IVA voltage manager reset has occurred. | RW W1toClr | 0 |
| 6 | VDD_MPU_VOLT_MGR_RST | VDD_MPU voltage manager reset event This is a source of global WARM reset. 0x0: No VDD_MPU voltage manager reset. 0x1: VDD_MPU voltage manager reset has occurred. | RW W1toClr | 0 |
| 5 | EXTERNAL_WARM_RST | External warm reset event 0x0: No global warm reset. 0x1: Global external warm reset has occurred. | RW W1toClr | 0 |
| 4 | RESERVED | | RW W1toClr | 0 |
| 3 | MPU_WDT_RST | MPU Watchdog timer reset event. This is a source of global WARM reset. 0x0: No MPU watchdog reset. 0x1: MPU watchdog reset has occurred. | RW W1toClr | 0 |
| 2 | RESERVED | | RW W1toClr | 0 |
| 1 | GLOBAL_WARM_SW_RST | Global warm software reset event 0x0: No global warm software reset 0x1: Global warm software reset has occurred. | RW W1toClr | 0 |
| 0 | GLOBAL_COLD_RST | Power-on (cold) reset event 0x0: No power-on reset. 0x1: Power-on reset has occurred. | RW W1toClr | 1 |

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

| | | |
|-------------------------|--|----------------------------|
| Address Offset | 0x0000 0008 | |
| Physical Address | 0x4A30 7B08 | Instance DEVICE_PRM |
| Description | Reset duration control. [warm reset insensitive] | |
| Type | RW | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:10 | RSTTIME2 | (Power domain) reset duration 2 (number of RM.SYSCLK clock cycles) 0x0: Reserved | RW | 0x10 |
| 9:0 | RSTTIME1 | (Global) reset duration 1 (number of Func_32k.clk clock cycles) 0x0: Reserved | RW | 0x06 |

Reset Management Functional Description

- [Reset Domains: \[0\]](#)
- [DSP Subsystem Power-On Reset Sequence: \[1\] \[2\]](#)
- [DSP Subsystem Software Warm Reset Sequence: \[3\]](#)
- [DSP Subsystem Reset Sequence On Wake-Up Transitions From OSWR RETENTION State: \[4\]](#)
- [Cortex-M3 MPU Subsystem Power-On Reset Sequence: \[5\] \[6\]](#)
- [Cortex-M3 MPU Subsystem Software Warm Reset Sequence: \[7\]](#)
- [Global Warm Reset Sequence: \[8\]](#)

Device Low-Power States

- [Device Off Mode Wake-Up Sequences: \[9\]](#)

PRCM Register Manual

- [DEVICE_PRCM Register Summary: \[10\]](#)

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 000C | | |
| Physical Address | 0x4A30 7B0C | Instance | DEVICE_PRM |
| Description | This register allows controlling the CLKREQ signal towards SCRM. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | CLKREQ_COND | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | CLKREQ_COND | Control upon which condition CLKREQ signal is de-asserted. 0x0: CLKREQ is never de-asserted 0x1: CLKREQ is de-asserted when system clock is not required by any function in the device and if all voltage domains are in OFF state. 0x2: CLKREQ is de-asserted when system clock is not required by any function in the device and if all voltage domains are in RET or OFF state. 0x3: CLKREQ is de-asserted when system clock is not required by any function in the device and if all voltage domains are in SLEEP or RET or OFF state. 0x4: CLKREQ is de-asserted when system clock is not required by any function in the device. This is designed for low-power use-cases using the DPLL cascading scheme (ex: MP3) Read 0x5: Reserved Read 0x6: Reserved Read 0x7: Reserved | RW | 0x0 |

Table 3-796. Register Call Summary for Register PRM_CLKREQCTRL

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-797. PRM_VOLTCTRL

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0010 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B10 | | |
| Description | This register provides voltage domain management controls. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|---------------------|----|----------------------|----|----------|---|------------------|---|------------------|---|----------|---|---------------------|---|---------------------|--|----------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | VDD_IVA_I2C_DISABLE | | VDD_MPU_I2C_DISABLE | | VDD_CORE_I2C_DISABLE | | RESERVED | | VDD_IVA_PRESENCE | | VDD_MPU_PRESENCE | | RESERVED | | AUTO_CTRL_VDD_IVA_L | | AUTO_CTRL_VDD_MPU_L | | AUTO_CTRL_VDD_CORE_L | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|----------|
| 31:15 | RESERVED | | R | 0x000000 |
| 14 | VDD_IVA_I2C_DISABLE | This bit allows disabling I2C interface with powerIC for IVA voltage (for debug purpose only). [warm reset insensitive] 0x0: Normal mode: I2C is enabled. 0x1: Debug mode: I2C is disabled. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|-------|
| 13 | VDD_MPU_I2C_DISABLE | This bit allows disabling I2C interface with powerIC for MPU voltage (for debug purpose only). [warm reset insensitive] 0x0: Normal mode: I2C is enabled. 0x1: Debug mode: I2C is disabled. | RW | 0 |
| 12 | VDD_CORE_I2C_DISABLE | This bit allows disabling I2C interface with powerIC for CORE voltage (for debug purpose only). [warm reset insensitive] 0x0: Normal mode: I2C is enabled. 0x1: Debug mode: I2C is disabled. | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | VDD_IVA_PRESENCE | This bit control the presence of IVA voltage in device. [warm reset insensitive] 0x0: IVA voltage is not present as an individual voltage: IVA voltage is merged with MPU voltage if VDD_MPU_presence=1. IVA voltage is merged with CORE voltage if VDD_MPU_presence=0. 0x1: IVA voltage is present on the device. | RW | 1 |
| 8 | VDD_MPU_PRESENCE | This bit control the presence of MPU voltage in device. [warm reset insensitive] 0x0: MPU voltage is not present as an individual voltage: MPU voltage is merged with IVA voltage if VDD_IVA_presence=1. MPU voltage is merged with CORE voltage if VDD_IVA_presence=0. 0x1: MPU voltage is present on the device. | RW | 1 |
| 7:6 | RESERVED | | R | 0x0 |
| 5:4 | AUTO_CTRL_VDD_IVA_L | This bit field specifies the state to which the hardware can automatically transition the VDD_IVA_L voltage domain. 0x0: Voltage domain transitions are disabled. 0x1: Voltage domain transitions to SLEEP are enabled. 0x2: Voltage domain transitions to RET are enabled. Read 0x3: reserved | RW | 0x0 |
| 3:2 | AUTO_CTRL_VDD_MPU_L | This bit field specifies the state to which the hardware can automatically transition the VDD_MPU_L voltage domain. 0x0: Voltage domain transitions are disabled. 0x1: Voltage domain transitions to SLEEP are enabled. 0x2: Voltage domain transitions to RET are enabled. Read 0x3: reserved | RW | 0x0 |
| 1:0 | AUTO_CTRL_VDD_CORE_L | This bit field specifies the state to which the hardware can automatically transition the VDD_CORE_L voltage domain. 0x0: Voltage domain transitions are disabled. 0x1: Voltage domain transitions to SLEEP are enabled. 0x2: Voltage domain transitions to RET are enabled. Read 0x3: reserved | RW | 0x0 |

Table 3-798. Register Call Summary for Register PRM_VOLTCTRL

Voltage Management Functional Description

- [VDD_x_L Transitions: \[0\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[1\]](#)

Table 3-799. PRM_PWRREQCTRL

| | | | | |
|-------------------------|---|--|-----------------|------------|
| Address Offset | 0x0000 0014 | | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B14 | | | |
| Description | This register allows controlling the PWRREQ signal towards power IC. | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PWRREQ_COND | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | PWRREQ_COND | Control upon which condition from MPU, IVA and CORE voltage domains PWRREQ is de-asserted. 0x0: PWRREQ is never de-asserted 0x1: PWRREQ is de-asserted if all voltage domain are in SLEEP, RET or OFF state. Conversely, PWRREQ is asserted upon any voltage domain entering or staying in ON state. 0x2: PWRREQ is de-asserted if all voltage domain are in RET or OFF state. Conversely, PWRREQ is asserted upon any voltage domain entering or staying in ON or SLEEP state. 0x3: PWRREQ is de-asserted if all voltage domain are in OFF state. Conversely, PWRREQ is asserted upon any voltage domain entering or staying in ON or SLEEP or RET state. | RW | 0x0 |

Table 3-800. Register Call Summary for Register PRM_PWRREQCTRL

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-801. PRM_PSCON_COUNT

| | | | | |
|-------------------------|--|--|-----------------|------------|
| Address Offset | 0x0000 0018 | | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B18 | | | |
| Description | This register allows controlling 2 parameters for power state controller. [warm reset insensitive] | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|--------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PONOUT_2_PGOODIN_TIME | | | | | | | | PCHARGE_TIME | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | PONOUT_2_PGOODIN_TIME | The value "NbCycles" set in this field determines the duration of the PONOUT to PGOODIN transition for power domain without DPS. The duration is computed as 8 x NbCycles of system clock cycles. | RW | 0x9A |
| 7:0 | PCHARGE_TIME | Number of system clock cycles for the SRAM precharge duration. | RW | 0x27 |

Table 3-802. Register Call Summary for Register PRM_PSCON_COUNT

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-803. PRM_IO_COUNT

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 001C | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B1C | | |
| Description | This register allows controlling LPDDR2 I/O isolation removal setup. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ISO_2_ON_TIME | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | ISO_2_ON_TIME | Determines the setup time of the LPDDR2 I/Os going out of isolation. Counting on the system clock. Target is 1.5us. | RW | 0x3A |

Table 3-804. Register Call Summary for Register PRM_IO_COUNT

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-805. PRM_IO_PMCTRL

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0020 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B20 | | |
| Description | This register allows overriding ISOCCLK signal towards I/O pad ring. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----------|----|----|----|----|---|---|---|--------------|------------|----------|-------------|---------------|----------|----------------|------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | GLOBAL_WUEN | RESERVED | | | | | | | | WUCLK_STATUS | WUCLK_CTRL | RESERVED | IOON_STATUS | ISOOVR_EXTEND | RESERVED | ISOCCLK_STATUS | ISOCCLK_OVERRIDE |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|--------|
| 31:17 | RESERVED | | R | 0x0000 |
| 16 | GLOBAL_WUEN | Global I/O wakeup enable. This is a gating condition to all individual I/O WUEN coming from control module. Gating is done in the Spinner logic. 0x0: All individual I/O WUEN are gated in the Spinner logic (overriden to 0). 0x1: All individual I/O WUEN from control module are going to IOs. | RW | 0 |
| 15:10 | RESERVED | | R | 0x00 |
| 9 | WUCLK_STATUS | Gives value of WUCLKOUT signal coming back from I/O pad ring. | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------|
| 8 | WUCLK_CTRL | Direct control on WUCLKIN signal to I/O pad ring. 0x0: WUCLKIN signal is driven to 0. I/O wakeup daisy chain is functional as well as I/O whose wakeup feature is enabled. 0x1: WUCLKIN signal is driven to 1. I/O wakeup daisy chain is reset and is latching current pad states and WUEN inputs. | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | IOON_STATUS | Gives the functional status of the I/O ring. Read 0x0: Part or all of the IOs are not in the ON state, that is in isolation state Read 0x1: All IOs are in the ON state | R | 1 |
| 4 | ISOOVR_EXTEND | Control non-EMIF I/O isolation extension upon a device wakeup from OFF mode. 0x0: Non-EMIF I/O isolation is not extended. "EMIF_ON" I/O transition happens as soon as automatic restore is completed 0x1: Non-EMIF I/O isolation is extended. "EMIF_ON" I/O transition is stalled | RW | 0 |
| 3:2 | RESERVED | | R | 0x0 |
| 1 | ISOCLK_STATUS | Gives value of ISOCLKOUT signal coming back from I/O pad ring. | R | 0 |
| 0 | ISOCLK_OVERRIDE | Override control on ISOCLKIN signal to I/O pad ring. Override should be used at boot time only when it is needed to change the mode of an I/O from 1.8-V default mode to 1.2-V mode. When not overridden, this signal is controlled by hardware only. 0x0: ISOCLKIN signal is not overridden. 0x1: ISOCLKIN signal is overridden to active value (1). | RW | 0 |

Table 3-806. Register Call Summary for Register PRM_IO_PMCTRL

Device Low-Power States

- [Device Off Mode Wake-Up Sequences: \[0\]](#)
- [I/O Management: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [Software-Controlled I/O Isolation: \[7\] \[8\] \[9\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[10\]](#)

Table 3-807. PRM_VOLTSETUP_WARMRESET

| | | | |
|------------------|--|----------|------------|
| Address Offset | 0x0000 0024 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B24 | | |
| Description | This register provides bit fields for specifying voltage ramp-up and ramp-down times for PRM managed external regulators. These values are used for VDD_CORE_L domain transitions with OFF state. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----------|----|--------------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STABLE_PRESCAL | | RESERVED | | STABLE_COUNT | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9:8 | STABLE_PRESCAL | Determines prescaler for stabilization duration counting. 0x0: Ramp-up counter is incremented every 32 system clock cycles 0x1: Ramp-up counter is incremented every 256 system clock cycles 0x2: Ramp-up counter is incremented every 2048 system clock cycles 0x3: Ramp-up counter is incremented every 16384 system clock cycles | RW | 0x0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5:0 | STABLE_COUNT | Determines the stabilization duration of all VDD_XXX_L regulators upon a global warm reset assertion. The duration is computed according to Stable_Prescal. | RW | 0x00 |

Table 3-808. Register Call Summary for Register PRM_VOLTSETUP_WARMRESET

Device Low-Power States

- [Device Off Mode Wake-Up Sequences: \[0\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[1\]](#)

Table 3-809. PRM_VOLTSETUP_CORE_OFF

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0028 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B28 | | |
| Description | This register provides bit fields for specifying voltage ramp-up and ramp-down times for PRM managed external regulators. These values are used for VDD_CORE_L domain transitions with OFF state. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RAMP_DOWN_PRESCAL | | | | | | | | RESERVED | | | | | | | | RAMP_UP_PRESCAL | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | RAMP_DOWN_PRESCAL | Determines prescaler for ramp-down duration counting. 0x0: Ramp-down counter is incremented every 64 system clock cycles 0x1: Ramp-down counter is incremented every 256 system clock cycles 0x2: Ramp-down counter is incremented every 512 system clock cycles 0x3: Ramp-down counter is incremented every 2048 system clock cycles | RW | 0x0 |
| 23:22 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|-------|
| 21:16 | RAMP_DOWN_COUNT | Determines the ramp-down duration of VDD_CORE_L regulators. The duration is computed according to Ramp_Down_Prescal. | RW | 0x00 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:8 | RAMP_UP_PRESCAL | Determines prescaler for ramp-up duration counting. 0x0: Ramp-up counter is incremented every 64 system clock cycles 0x1: Ramp-up counter is incremented every 256 system clock cycles 0x2: Ramp-up counter is incremented every 512 system clock cycles 0x3: Ramp-up counter is incremented every 2048 system clock cycles | RW | 0x0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5:0 | RAMP_UP_COUNT | Determines the ramp-up duration of VDD_CORE_L regulators. The duration is computed according to Ramp_Up_Prescal. At cold reset, PRCM assumes that VDD_CORE_L will be at a valid ON voltage before SYS_NRESPWRON is de-asserted. | RW | 0x00 |

Table 3-810. Register Call Summary for Register PRM_VOLTSETUP_CORE_OFF

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-811. PRM_VOLTSETUP_MPU_OFF

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 002C | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B2C | | |
| Description | This register provides bit fields for specifying voltage ramp-up and ramp-down times for PRM managed external regulators. These values are used for VDD_MPU_L domain transitions to or from OFF state. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|----|----------|----|-----------------|----|----|----|----------|----|----|----|----|----|---|---|-----------------|---|----------|---|---------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RAMP_DOWN_PRESCAL | | RESERVED | | RAMP_DOWN_COUNT | | | | RESERVED | | | | | | | | RAMP_UP_PRESCAL | | RESERVED | | RAMP_UP_COUNT | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | RAMP_DOWN_PRESCAL | Determines prescaler for ramp-down duration counting. 0x0: Ramp-down counter is incremented every 64 system clock cycles 0x1: Ramp-down counter is incremented every 256 system clock cycles 0x2: Ramp-down counter is incremented every 512 system clock cycles 0x3: Ramp-down counter is incremented every 2048 system clock cycles | RW | 0x0 |

Table 3-812. Register Call Summary for Register PRM VOLTSETUP MPU OFF

- [DEVICE_PRM Register Summary: \[0\]](#)

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0030 | | |
| Physical Address | 0x4A30 7B30 | Instance | DEVICE_PRM |
| Description | This register provides bit fields for specifying voltage ramp-up and ramp-down times for PRM managed external regulators. These values are used for VDD_IVA_L domain transitions to or from OFF state. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----------------|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|---------------|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | RAMP_DOWN_PRESCAL | | | | | | | | RESERVED | | | | | | | | RAMP_DOWN_COUNT | | | | | | | | RESERVED | | | | | | | | RAMP_UP_PRESCAL | | | | | | | | RESERVED | | | | | | | | RAMP_UP_COUNT | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | RAMP_DOWN_PRESCAL | Determines prescaler for ramp-down duration counting. 0x0: Ramp-down counter is incremented every 64 system clock cycles 0x1: Ramp-down counter is incremented every 256 system clock cycles 0x2: Ramp-down counter is incremented every 512 system clock cycles 0x3: Ramp-down counter is incremented every 2048 system clock cycles | RW | 0x0 |
| 23:22 | RESERVED | | R | 0x0 |
| 21:16 | RAMP_DOWN_COUNT | Determines the ramp-down duration of VDD_IVA_L regulators. The duration is computed according to Ramp_Down_Prescal. | RW | 0x00 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:8 | RAMP_UP_PRESCAL | Determines prescaler for ramp-up duration counting. 0x0: Ramp-up counter is incremented every 64 system clock cycles 0x1: Ramp-up counter is incremented every 256 system clock cycles 0x2: Ramp-up counter is incremented every 512 system clock cycles 0x3: Ramp-up counter is incremented every 2048 system clock cycles | RW | 0x0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5:0 | RAMP_UP_COUNT | Determines the ramp-up duration of VDD_IVA_L regulators. The duration is computed according to Ramp_Up_Prescal. At cold reset, PRCM assumes that VDD_IVA_L will be at a valid ON voltage before SYS_NRESPWRON is de-asserted. | RW | 0x00 |

Table 3-814. Register Call Summary for Register PRM_VOLTSETUP_IVA_OFF

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-815. PRM_VOLTSETUP_CORE_RET_SLEEP

| | | | |
|------------------|---|----------|------------|
| Address Offset | 0x0000 0034 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B34 | | |
| Description | This register provides bit fields for specifying voltage ramp-up and ramp-down times for PRM managed external regulators. These values are used for VDD_CORE_L domain transitions between ON and RET or SLEEP state. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----------------|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|---------------|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | RAMP_DOWN_PRESCAL | | | | | | | | RESERVED | | | | | | | | RAMP_UP_PRESCAL | | | | | | | | RESERVED | | | | | | | | RAMP_UP_COUNT | | | | | | | |

Table 3-816. Register Call Summary for Register PRM_VOLTSETUP_CORE_RET_SLEEP

- **DEVICE_PRM Register Summary:** [0]

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0038 | | |
| Physical Address | 0x4A30 7B38 | Instance | DEVICE_PRM |
| Description | This register provides bit fields for specifying voltage ramp-up and ramp-down times for PRM managed external regulators. These values are used for VDD_MPU_L domain transitions between ON and RET or SLEEP state. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----------------|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|---------------|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | RAMP_DOWN_PRESCAL | | | | | | | | RESERVED | | | | | | | | RAMP_DOWN_COUNT | | | | | | | | RESERVED | | | | | | | | RAMP_UP_PRESCAL | | | | | | | | RESERVED | | | | | | | | RAMP_UP_COUNT | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | RAMP_DOWN_PRESCAL | Determines prescaler for ramp-down duration counting. 0x0: Ramp-down counter is incremented every 64 system clock cycles 0x1: Ramp-down counter is incremented every 256 system clock cycles 0x2: Ramp-down counter is incremented every 512 system clock cycles 0x3: Ramp-down counter is incremented every 2048 system clock cycles | RW | 0x0 |
| 23:22 | RESERVED | | R | 0x0 |
| 21:16 | RAMP_DOWN_COUNT | Determines the ramp-down duration of VDD_MPU_L regulators. The duration is computed according to Ramp_Down_Prescal. | RW | 0x00 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:8 | RAMP_UP_PRESCAL | Determines prescaler for ramp-up duration counting. 0x0: Ramp-up counter is incremented every 64 system clock cycles 0x1: Ramp-up counter is incremented every 256 system clock cycles 0x2: Ramp-up counter is incremented every 512 system clock cycles 0x3: Ramp-up counter is incremented every 2048 system clock cycles | RW | 0x0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5:0 | RAMP_UP_COUNT | Determines the ramp-up duration of VDD_MPU_L regulators. The duration is computed according to Ramp_Up_Prescal. | RW | 0x00 |

Table 3-818. Register Call Summary for Register PRM_VOLTSETUP_MPU_RET_SLEEP

PRCM Register Manual

- **DEVICE_PRM Register Summary:** [0]

Table 3-819. PRM_VOLTSETUP IVA RET SLEEP

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 003C | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B3C | | |
| Description | This register provides bit fields for specifying voltage ramp-up and ramp-down times for PRM managed external regulators. These values are used for VDD_IVA_L domain transitions between ON and RET or SLEEP state. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RAMP_DOWN_COUNT | | | | | | | | RESERVED | | | | | | | | RAMP_UP_COUNT | | | | | | | |
| RAMP_DOWN_PRESCAL | | | | | | | | RESERVED | | | | | | | | RAMP_UP_PRESCAL | | | | | | | | RESERVED | | | | | | | |

Table 3-820. Register Call Summary for Register PRM_VOLTSETUP_IVA_RET_SLEEP

- **DEVICE_PRM Register Summary:** [0]

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0040 | | |
| Physical Address | 0x4A30 7B40 | Instance | DEVICE_PRM |
| Description | This register allows the configuration of the Voltage Processor dedicated to CORE Voltage Domain (VDD_CORE_L). | | |
| Type | RW | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|-------|
| 31:24 | ERROROFFSET | Offset value in the Error to Voltage converter (two's complement number). | RW | 0x00 |
| 23:16 | ERRORGAIN | Gain value in the Error to Voltage converter (two's complement number). | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------|
| 15:8 | INITVOLTAGE | Set the initial voltage level of the SMPS. It must be reconfigured before enable the SmartReflex around a new OPP. | RW | 0x00 |
| 7:4 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0x0 |
| 3 | TIMEOUTEN | Enable or disable the timeout capability of the Voltage Controller State Machine. 0x0: Timeout is disabled. Loop will wait indefinitely. 0x1: Timeout will occur when TIMEOUT cycles have elapsed. | RW | 0 |
| 2 | INITVDD | Initializes the voltage in the Voltage Processor. 0x0: Reset the initialization bit. 0x1: The positive edge of InitVdd triggers a write of the value in the InitVoltage into the Voltage Processor. | RW | 0 |
| 1 | FORCEUPDATE | Forces an update of the SMPS. 0x0: Reset the force bit. 0x1: The positive edge of ForceUpdate triggers an update of the voltage to the SMPS. | RW | 0 |
| 0 | VPENABLE | Enables or disables the Voltage Processor updates on SR_SInterruptz. 0x0: Disables the Voltage Processor. 0x1: Enables the Voltage Processor. | RW | 0 |

Table 3-822. Register Call Summary for Register PRM_VP_CORE_CONFIG

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-823. PRM_VP_CORE_STATUS

| | | | |
|------------------|--|----------|------------|
| Address Offset | 0x0000 0044 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B44 | | |
| Description | This register reflects the idle state of the Voltage Processor dedicated to the CORE Voltage Domain (VDD_CORE_L. This register is read only and automatically updated. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VPINIDLE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0x0000 0000 |
| 0 | VPINIDLE | CORE Voltage Processor idle status. Read 0x0: The Voltage Processor for CORE is processing. Warm reset sensitive Read 0x1: The Voltage Processor for CORE is in idle state. | R | 1 |

Table 3-824. Register Call Summary for Register PRM_VP_CORE_STATUS

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-825. PRM_VP_CORE_VLIMITTO

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0048 | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7B48 | | | | | | | | | | | | | | | |
| Instance | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | This register allows the configuration of the voltage limits and timeout values of the Voltage Processor dedicated to the CORE Voltage Domain (VDD_CORE_L). | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VDDMAX | | | | | | | | VDDMIN | | | | | | | | TIMEOUT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:24 | VDDMAX | Defines the maximum voltage supply level. | RW | 0x00 |
| 23:16 | VDDMIN | Defines the minimum voltage supply level. | RW | 0x00 |
| 15:0 | TIMEOUT | Defines Voltage Controller maximum wait time for responses, measured in sysclk cycles. | RW | 0x0000 |

Table 3-826. Register Call Summary for Register PRM_VP_CORE_VLIMITTO

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-827. PRM_VP_CORE_VOLTAGE

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 004C | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7B4C | | | | | | | | | | | | | | | |
| Instance | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | This register indicates the current value of the SMPS voltage for the Voltage Processor dedicated to the CORE Voltage Domain (VDD_CORE_L). | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FORCEUPDATEWAIT | | | | | | | | | | | | | | | | VPVOLTAGE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|----------|
| 31:8 | FORCEUPDATEWAIT | The time voltage processor needs to wait for SMPS to be settled after receiving SMPS acknowledge. This wait only be used during force_update operation. | RW | 0x000111 |
| 7:0 | VPVOLTAGE | Indicates the current SMPS programmed voltage. | R | 0x00 |

Table 3-828. Register Call Summary for Register PRM_VP_CORE_VOLTAGE

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-829. PRM_VP_CORE_VSTEPMAX

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0050 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7B50 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | This register allows the programming of the maximum voltage step and waiting time of the Voltage Processor dedicated to CORE Voltage Domain (VDD_CORE_L). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SMPsoftwareAITTIMEMAX | | | | | | | | | | | | | | | | VSTEPMAX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|--------|
| 31:24 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0x00 |
| 23:8 | SMPsoftwareAITTIMEMAX | Slew rate for positive voltage step (in number of cycles per step). | RW | 0x0000 |
| 7:0 | VSTEPMAX | Maximum voltage step | RW | 0x00 |

Table 3-830. Register Call Summary for Register PRM_VP_CORE_VSTEPMAX

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-831. PRM_VP_CORE_VSTEPMIN

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0054 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7B54 | | | | | | | | | | | | | | | | Instance DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | This register allows the programming of the minimum voltage step and waiting time of the Voltage Processor dedicated to the CORE Voltage Domain (VDD_CORE_L). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SMPsoftwareAITTIMEMIN | | | | | | | | | | | | | | | | VSTEPMIN | | | | | | | |

| | | | | |
|-------------|-----------------------|---|-------------|--------------|
| Bits | Field Name | Description | Type | Reset |
| 31:24 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0x00 |
| 23:8 | SMPsoftwareAITTIMEMIN | Slew rate for negative voltage step (in number of cycles per step). | RW | 0x0000 |
| 7:0 | VSTEPMIN | Minimum voltage step | RW | 0x00 |

Table 3-832. Register Call Summary for Register PRM_VP_CORE_VSTEPMIN

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-833. PRM_VP_MPU_CONFIG

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0058 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B58 | | |
| Description | This register allows the configuration of the Voltage Processor dedicated to MPU Voltage Domain (VDD_MPU_L). | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----|----|----|----|----|----|----|-----------|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|----------|---|---|---|-----------|---------|-------------|----------|
| ERROROFFSET | | | | | | | | ERRORGAIN | | | | | | | | INITVOLTAGE | | | | | | | | RESERVED | | | | TIMEOUTEN | INITVDD | FORCEUPDATE | VPENABLE |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|-------|
| 31:24 | ERROROFFSET | Offset value in the Error to Voltage converter (two's complement number). | RW | 0x00 |
| 23:16 | ERRORGAIN | Gain value in the Error to Voltage converter (two's complement number). | RW | 0x00 |
| 15:8 | INITVOLTAGE | Set the initial voltage level of the SMPS. It must be reconfigured before enable the SmartReflex around a new OPP. | RW | 0x00 |
| 7:4 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0x0 |
| 3 | TIMEOUTEN | Enable or disable the timeout capability of the Voltage Controller State Machine. 0x0: Timeout is disabled. Loop will wait indefinitely. 0x1: Timeout will occur when TIMEOUT cycles have elapsed. | RW | 0 |
| 2 | INITVDD | Initializes the voltage in the Voltage Processor. 0x0: Reset the initialization bit. 0x1: The positive edge of InitVdd triggers a write of the value in the InitVoltage into the Voltage Processor. | RW | 0 |
| 1 | FORCEUPDATE | Forces an update of the SMPS. 0x0: Reset the force bit. 0x1: The positive edge of ForceUpdate triggers an update of the voltage to the SMPS. | RW | 0 |
| 0 | VPENABLE | Enables or disables the Voltage Processor updates on SR_SInterruptz. 0x0: Disables the Voltage Processor. 0x1: Enables the Voltage Processor. | RW | 0 |

Table 3-834. Register Call Summary for Register PRM_VP_MPU_CONFIG

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-835. PRM_VP_MPU_STATUS

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 005C | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B5C | | |
| Description | This register reflects the idle state of the Voltage Processor dedicated to the MPU Voltage Domain (VDD_MPU_L). This register is read only and automatically updated. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VPINIDLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 3-839. PRM_VP_MPU_VOLTAGE

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0064 | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7B64 | | | | | | | | | | | | | | | |
| | Instance DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | This register indicates the current value of the SMPS voltage for the Voltage Processor dedicated to the MPU Voltage Domain (VDD_MPU_L). | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FORCEUPDATEWAIT | | | | | | | | | | | | | | | | VPVOLTAGE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|----------|
| 31:8 | FORCEUPDATEWAIT | The time voltage processor needs to wait for SMPS to be settled after receiving SMPS acknowledge. This wait only be used during force_update operation. | RW | 0x000111 |
| 7:0 | VPVOLTAGE | Indicates the current SMPS programmed voltage. | R | 0x00 |

Table 3-840. Register Call Summary for Register PRM_VP_MPU_VOLTAGE

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-841. PRM_VP_MPU_VSTEPMAX

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0068 | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7B68 | | | | | | | | | | | | | | | |
| | Instance DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | This register allows the programming of the maximum voltage step and waiting time of the Voltage Processor dedicated to MPU Voltage Domain (VDD_MPU_L). | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SMPsoftwareAITTIMEMAX | | | | | | | | | | | | | | | | VSTEPMAX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|--------|
| 31:24 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0x00 |
| 23:8 | SMPsoftwareAITTIMEMAX | Slew rate for positive voltage step (in number of cycles per step). | RW | 0x0000 |
| 7:0 | VSTEPMAX | Maximum voltage step | RW | 0x00 |

Table 3-842. Register Call Summary for Register PRM_VP_MPU_VSTEPMAX

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-843. PRM_VP_MPU_VSTEPMIN

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 006C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7B6C | | | | | | | | | | | | | | | | Instance | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | This register allows the programming of the minimum voltage step and waiting time of the Voltage Processor dedicated to the MPU Voltage Domain (VDD_MPU_L). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SMPsoftwareAITTIMEMIN | | | | | | | | | | | | | | | | VSTEPMIN | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|--------|
| 31:24 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0x00 |
| 23:8 | SMPsoftwareAITTIMEMIN | Slew rate for negative voltage step (in number of cycles per step). | RW | 0x0000 |
| 7:0 | VSTEPMIN | Minimum voltage step | RW | 0x00 |

Table 3-844. Register Call Summary for Register PRM_VP_MPU_VSTEPMIN

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-845. PRM_VP_IVA_CONFIG

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0070 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B70 | | |
| Description | This register allows the configuration of the Voltage Processor dedicated to IVA Voltage Domain (VDD_IVA_L). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|----|----|----|----|----|----|-----------|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|----------|---|---|---|-----------|---------|-------------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ERROROFFSET | | | | | | | | ERRORGAIN | | | | | | | | INITVOLTAGE | | | | | | | | RESERVED | | | | TIMEOUTEN | INITVDD | FORCEUPDATE | VPENABLE |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|-------|
| 31:24 | ERROROFFSET | Offset value in the Error to Voltage converter (two's complement number). | RW | 0x00 |
| 23:16 | ERRORGAIN | Gain value in the Error to Voltage converter (two's complement number). | RW | 0x00 |
| 15:8 | INITVOLTAGE | Set the initial voltage level of the SMPS. It must be reconfigured before enable the SmartReflex around a new OPP. | RW | 0x00 |
| 7:4 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0x0 |
| 3 | TIMEOUTEN | Enable or disable the timeout capability of the Voltage Controller State Machine. 0x0: Timeout is disabled. Loop will wait indefinitely. 0x1: Timeout will occur when TIMEOUT cycles have elapsed. | RW | 0 |
| 2 | INITVDD | Initializes the voltage in the Voltage Processor. 0x0: Reset the initialization bit. 0x1: The positive edge of InitVdd triggers a write of the value in the InitVoltage into the Voltage Processor. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 1 | FORCEUPDATE | Forces an update of the SMPS. 0x0: Reset the force bit. 0x1: The positive edge of ForceUpdate triggers an update of the voltage to the SMPS. | RW | 0 |
| 0 | VPENABLE | Enables or disables the Voltage Processor updates on SR_SInterrupztz. 0x0: Disables the Voltage Processor. 0x1: Enables the Voltage Processor. | RW | 0 |

Table 3-846. Register Call Summary for Register PRM_VP_IVA_CONFIG

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-847. PRM_VP_IVA_STATUS

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0074 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B74 | | |
| Description | This register reflects the idle state of the Voltage Processor dedicated to the MPU Voltage Domain (VDD_IVA_L. This register is read only and automatically updated. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | VPINIDLE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0x0000 0000 |
| 0 | VPINIDLE | Voltage Processor 1 idle status. Read 0x0: The Voltage Processor 1 is processing. Read 0x1: The Voltage Processor 1 is in idle state. | R | 1 |

Table 3-848. Register Call Summary for Register PRM_VP_IVA_STATUS

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-849. PRM_VP_IVA_VLIMITTO

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0078 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B78 | | |
| Description | This register allows the configuration of the voltage limits and timeout values of the Voltage Processor dedicated to the IVA Voltage Domain (VDD_IVA_L). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VDDMAX | | | | | | | | VDDMIN | | | | | | | | TIMEOUT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:24 | VDDMAX | Defines the maximum voltage supply level. | RW | 0x00 |
| 23:16 | VDDMIN | Defines the minimum voltage supply level. | RW | 0x00 |
| 15:0 | TIMEOUT | Defines Voltage Controller maximum wait time for responses, measured in sysclk cycles. | RW | 0x0000 |

Table 3-850. Register Call Summary for Register PRM_VP_IVA_VLIMITTO

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-851. PRM_VP_IVA_VOLTAGE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 007C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7B7C | | | | | | | | | | | | | | | | Instance | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | This register indicates the current value of the SMPS voltage for the Voltage Processor dedicated to the IVA Voltage Domain (VDD_IVA_L). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FORCEUPDATEWAIT | | | | | | | | | | | | | | | | | | | | | | | | VPVOLTAGE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|----------|
| 31:8 | FORCEUPDATEWAIT | The time voltage processor needs to wait for SMPS to be settled after receiving SMPS acknowledge. This wait only be used during force_update operation. | RW | 0x000111 |
| 7:0 | VPVOLTAGE | Indicates the current SMPS programmed voltage. | R | 0x00 |

Table 3-852. Register Call Summary for Register PRM_VP_IVA_VOLTAGE

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-853. PRM_VP_IVA_VSTEPMAX

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|-----------------------|----|----|----|----|----|-----------------------|---|----|----|----|----|----|----|----|-----------------|------------|----|----|----|---|---|-------------|--------------|--------|---|---|---|---|---|--|--|
| Address Offset | 0x0000 0080 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7B80 | | | | | | | | | | | | | | | | Instance | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | This register allows the programming of the maximum voltage step and waiting time of the Voltage Processor dedicated to IVA Voltage Domain (VDD_IVA_L). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | SMPsoftwareAITTIMEMAX | | | | | | | | | | | | | | | | VSTEPMAX | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | Description | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | |
| 31:24 | | RESERVED | | | | | | | Write 0's for future compatibility. Read is undefined. | | | | | | | | | | | | | | | | R | 0x00 | | | | | | | |
| 23:8 | | SMPsoftwareAITTIMEMAX | | | | | | | Slew rate for positive voltage step (in number of cycles per step). | | | | | | | | | | | | | | | | RW | 0x0000 | | | | | | | |
| 7:0 | | VSTEPMAX | | | | | | | Maximum voltage step | | | | | | | | | | | | | | | | RW | 0x00 | | | | | | | |

Table 3-854. Register Call Summary for Register PRM_VP_IVA_VSTEPMAX

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-855. PRM_VP_IVA_VSTEPMIN

| | | | |
|------------------|---|----------|------------|
| Address Offset | 0x0000 0084 | | |
| Physical Address | 0x4A30 7B84 | Instance | DEVICE_PRM |
| Description | This register allows the programming of the minimum voltage step and waiting time of the Voltage Processor dedicated to the IVA Voltage Domain (VDD_IVA_L). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|----|----|----|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SMPsoftwareAITTIMEMIN | | | | | | | | | | VSTEPMIN | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|--------|
| 31:24 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0x00 |
| 23:8 | SMPsoftwareAITTIMEMIN | Slew rate for negative voltage step (in number of cycles per step). | RW | 0x0000 |
| 7:0 | VSTEPMIN | Minimum voltage step | RW | 0x00 |

Table 3-856. Register Call Summary for Register PRM_VP_IVA_VSTEPMIN

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-857. PRM_VC_SMPS_SA

| | | | |
|------------------|--|----------|------------|
| Address Offset | 0x0000 0088 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B88 | | |
| Description | This register allows the setting of the I2C slave address of the Power IC device. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----------|--------------|----|----|----|----|---|---|---|----------|---------------|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | SA_VDD_MPU_L | | | | | | | | RESERVED | SA_VDD_IVA_L | | | | | | | | RESERVED | SA_VDD_CORE_L | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|-------|
| 31:23 | RESERVED | | R | 0x000 |
| 22:16 | SA_VDD_MPU_L | Set the I2C slave address value for the third (if any) Power IC device. | RW | 0x00 |
| 15 | RESERVED | | R | 0 |
| 14:8 | SA_VDD_IVA_L | Set the I2C slave address value for the second (if any) Power IC device. | RW | 0x00 |
| 7 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0 |
| 6:0 | SA_VDD_CORE_L | Set the I2C slave address value for the first Power IC device. | RW | 0x00 |

Table 3-858. Register Call Summary for Register PRM_VC_SMPS_SA

PRCM Module Programming Guide

- [Global Initialization: \[0\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[1\]](#)

Table 3-859. PRM_VC_VAL_SMPS_RA_VOL

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 008C | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7B8C | | | | | | | | | | | | | | | |
| Instance | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | This register allows the setting of the voltage configuration register address for the VDD channels. [warm reset insensitive] | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VOLRA_VDD_MPU_L | | | | | | | | VOLRA_VDD_IVA_L | | | | | | | | VOLRA_VDD_CORE_L | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|-------|
| 31:24 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0x00 |
| 23:16 | VOLRA_VDD_MPU_L | Voltage configuration register address value for VDD_MPU_L channel | RW | 0x00 |
| 15:8 | VOLRA_VDD_IVA_L | Voltage configuration register address value for VDD_IVA_L channel (if VDD_IVA_L source is placed in same chip as VDD_MPU_L source and have different voltage configuration register) | RW | 0x00 |
| 7:0 | VOLRA_VDD_CORE_L | Voltage configuration register address value for the VDD_CORE_L channel (if VDD_CORE_L source is placed in same chip as VDD_MPU_L source and has different voltage configuration register) | RW | 0x00 |

Table 3-860. Register Call Summary for Register PRM_VC_VAL_SMPS_RA_VOL

PRCM Module Programming Guide

- [Global Initialization: \[0\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[1\]](#)

Table 3-861. PRM_VC_VAL_SMPS_RA_CMD

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0090 | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7B90 | | | | | | | | | | | | | | | |
| Instance | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | Command (ON/ON-Low-Power/Retention/OFF) configuration register address values for the VDD channels (if used SMPS chips have different command configuration register than voltage configuration register) [warm reset insensitive] | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CMDRA_VDD_MPU_L | | | | | | | | CMDRA_VDD_IVA_L | | | | | | | | CMDRA_VDD_CORE_L | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 31:24 | RESERVED | Write 0's for future compatibility. Read is undefined. | R | 0x00 |
| 23:16 | CMDRA_VDD_MPU_L | Command (ON/ON-Low-Power /Retention/OFF) configuration register address value for VDD_MPU_L channel | RW | 0x00 |
| 15:8 | CMDRA_VDD_IVA_L | Command (ON/ON-Low-Power /Retention/OFF) configuration register address value for VDD_IVA_L channel (if VDD_IVA_L source has different command configuration register than voltage VDD_MPU_L) | RW | 0x00 |
| 7:0 | CMDRA_VDD_CORE_L | Command (ON/ON-Low-Power /Retention/OFF) configuration register address value for VDD_CORE_L channel (if VDD_CORE_L source has different command configuration register than voltage VDD_MPU_L) | RW | 0x00 |

Table 3-862. Register Call Summary for Register PRM_VC_VAL_SMPS_RA_CMD

PRCM Module Programming Guide

- [Global Initialization: \[0\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[1\]](#)

Table 3-863. PRM_VC_VAL_CMD_VDD_CORE_L

| | | | |
|-------------------------|---|-----------------------|-----------------|
| Address Offset | 0x0000 0094 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B94 | | |
| Description | This register allows the setting of the ON/ON-Low-Power/Retention/OFF command values for VDD_CORE_L channel. [warm reset insensitive] | | |
| Type | RW | | |
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| ON | ONLP | RET | OFF |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------------------|------|-------|
| 31:24 | ON | Set the ON command value. | RW | 0x00 |
| 23:16 | ONLP | Set the ON-Low-Power command value. | RW | 0x00 |
| 15:8 | RET | Set the RET command value. | RW | 0x00 |
| 7:0 | OFF | Set the OFF command value. | RW | 0x00 |

Table 3-864. Register Call Summary for Register PRM_VC_VAL_CMD_VDD_CORE_L

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-865. PRM_VC_VAL_CMD_VDD_MPU_L

| | | | |
|-------------------------|--|-----------------------|-----------------|
| Address Offset | 0x0000 0098 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B98 | | |
| Description | This register allows the setting of the ON/ON-Low-Power/Retention/OFF command values for VDD_MPU_L channel. [warm reset insensitive] | | |
| Type | RW | | |
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| ON | ONLP | RET | OFF |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------------------|------|-------|
| 31:24 | ON | Set the ON command value. | RW | 0x00 |
| 23:16 | ONLP | Set the ON-Low-Power command value. | RW | 0x00 |
| 15:8 | RET | Set the RET command value. | RW | 0x00 |
| 7:0 | OFF | Set the OFF command value. | RW | 0x00 |

Table 3-866. Register Call Summary for Register PRM_VC_VAL_CMD_VDD_MPU_L

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-867. PRM_VC_VAL_CMD_VDD_IVA_L

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 009C | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7B9C | | |
| Description | This register allows the setting of the ON/ON-Low-Power/Retention/OFF command values for VDD_IVA_L channel. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ON | | | | | | | | ONLP | | | | | | | | RET | | | | | | | | OFF | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------------------|------|-------|
| 31:24 | ON | Set the ON command value. | RW | 0x00 |
| 23:16 | ONLP | Set the ON-Low-Power command value. | RW | 0x00 |
| 15:8 | RET | Set the RET command value. | RW | 0x00 |
| 7:0 | OFF | Set the OFF command value. | RW | 0x00 |

Table 3-868. Register Call Summary for Register PRM_VC_VAL_CMD_VDD_IVA_L

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-869. PRM_VC_VAL_BYPASS

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 00A0 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7BA0 | | |
| Description | Bypass data values register used for bypass command channel to send other configuration information (other than voltage configuration parameters) for SMPS chips which have no other configuration interface then this I2C interface. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|-----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DATA | | | | | | | | REGADDR | | | | | | | | SLAVEADDR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|----------------|-------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | VALID | This bit validates the bypass command. It is automatically cleared by hardware either after getting the acknowledge back from the SMPS or if an error occurred. Read 0x0: The last command send has been acknowledged 0x1: Pending command is being process | RW WSpecial | 0 |
| 23:16 | DATA | Data to send to the Power IC device. | RW | 0x00 |
| 15:8 | REGADDR | Set the address of Power IC device register to configure. | RW | 0x00 |
| 7 | RESERVED | | R | 0 |
| 6:0 | SLAVEADDR | Set the I2C slave address value. | RW | 0x00 |

Table 3-870. Register Call Summary for Register PRM_VC_VAL_BYPASS

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-871. PRM_VC_CFG_CHANNEL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00A4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7BA4 | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | This register allows the configuration pointers for both VDD channels. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|-----------------|---------------|---------------|---------------|--------------|----------|----|----|----|----|---------------|-----------------|---------------|---------------|--------------|----------|---|---|---|---|----------------|------------------|----------------|----------------|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | RACEN_VDD_MPU_L | RAC_VDD_MPU_L | RAV_VDD_MPU_L | CMD_VDD_MPU_L | SA_VDD_MPU_L | RESERVED | | | | | CMD_VDD_IVA_L | RACEN_VDD_IVA_L | RAC_VDD_IVA_L | RAV_VDD_IVA_L | SA_VDD_IVA_L | RESERVED | | | | | CMD_VDD_CORE_L | RACEN_VDD_CORE_L | RAC_VDD_CORE_L | RAV_VDD_CORE_L | SA_VDD_CORE_L |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|-------|
| 31:21 | RESERVED | | R | 0x000 |
| 20 | RACEN_VDD_MPU_L | Enable bit for usage of RAC_VDD_MPU_L 0x0: VDD_MPU_L channel uses VOLRA values for register address of VFSM-s commands. VFSM-s commands goes also to voltage configuration register. 0x1: VDD_MPU_L channel uses CMDRA values for register address of VFSM-s commands. VFSM-s commands goes to different command configuration register. | RW | 0 |
| 19 | RAC_VDD_MPU_L | Command (ON/ON-Low-Power/Retention/OFF) configuration register address pointer for VDD_MPU_L channel. (This bit has no influence on VDD_MPU_L channel) 0x0: Select CMDRA_VDD_CORE_L for VDD_MPU_L channel 0x1: Select CMDRA_VDD_MPU_L for VDD_MPU_L channel | RW | 0 |
| 18 | RAV_VDD_MPU_L | Voltage configuration register address pointer for VDD_MPU_L channel. (This bit has no influence on VDD_MPU_L channel) 0x0: Select VOLRA_VDD_CORE_L for VDD_MPU_L channel 0x1: Select VOLRA_VDD_MPU_L for VDD_MPU_L channel | RW | 0 |
| 17 | CMD_VDD_MPU_L | Command values (ON/ON-Low-Power/Retention/OFF voltage values) set selection for VDD_MPU_L channel. (This bit has no influence on VDD_MPU_L channel) 0x0: VDD_MPU_L channel use VC_VAL_CMD_VDD_CORE_L set for command values 0x1: VDD_MPU_L channel use VC_VAL_CMD_VDD_MPU_L set for command values | RW | 0 |
| 16 | SA_VDD_MPU_L | Slave address pointer for VDD_MPU_L channel. (This bit has no influence on VDD_MPU_L channel) 0x0: Select SA_VDD_CORE_L for VDD_MPU_L channel 0x1: Select SA_VDD_MPU_L for VDD_MPU_L channel | RW | 0 |
| 15:13 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-------|
| 12 | CMD_VDD_IVA_L | Command values (ON/ON-Low-Power/Retention/OFF voltage values) set selection for VDD_IVA_L channel 0x0: VDD_IVA_L channel use VC_VAL_CMD_VDD_MPU_L set for command values 0x1: VDD_IVA_L channel use VC_VAL_CMD_VDD_IVA_L set for command values | RW | 0 |
| 11 | RACEN_VDD_IVA_L | Enable bit for usage of RAC_VDD_IVA_L 0x0: VDD_IVA_L channel uses VOLRA values for register address of VFSM-s commands. VFSM-s commands goes also to voltage configuration register. 0x1: VDD_IVA_L channel uses CMDRA values for register address of VFSM-s commands. VFSM-s commands goes to different command configuration register. | RW | 0 |
| 10 | RAC_VDD_IVA_L | Command (ON/ON-Low-Power/Retention/OFF) configuration register address pointer for VDD_IVA_L channel 0x0: Select CMDRA_VDD_MPU_L for VDD_IVA_L channel 0x1: Select CMDRA_VDD_IVA_L for VDD_IVA_L channel | RW | 0 |
| 9 | RAV_VDD_IVA_L | Voltage configuration register address pointer for VDD_IVA_L channel. 0x0: Select VOLRA_VDD_MPU_L for VDD_IVA_L channel 0x1: Select VOLRA_VDD_IVA_L for VDD_IVA_L channel | RW | 0 |
| 8 | SA_VDD_IVA_L | Slave address pointer for VDD_IVA_L channel. 0x0: Select SA_VDD_MPU_L for VDD_IVA_L channel 0x1: Select SA_VDD_IVA_L for VDD_IVA_L channel | RW | 0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CMD_VDD_CORE_L | Command values (ON/ON-Low-Power/Retention/OFF voltage values) set selection for VDD_CORE_L channel. | RW | 0 |
| 3 | RACEN_VDD_CORE_L | Enable bit for usage of RAC_VDD_CORE_L. 0x0: VDD_CORE_L channel use VOLRA values for register address of VFSM-s commands. VFSM-s commands goes also to voltage configuration register. 0x1: VDD_CORE_L channel use CMDRA values for register address of VFSM-s commands. VFSM-s commands goes to different command configuration register. | RW | 0 |
| 2 | RAC_VDD_CORE_L | Command (ON/ON-Low-Power/Retention/OFF) configuration register address pointer for VDD_CORE_L channel. 0x0: Select CMDRA_VDD_MPU_L for the VDD_CORE_L channel. 0x1: Select CMDRA_VDD_CORE_L for the VDD_CORE_L channel. | RW | 0 |
| 1 | RAV_VDD_CORE_L | Voltage configuration register address pointer for VDD_CORE_L channel. 0x0: Select VOLRA_VDD_MPU_L for the VDD_CORE_L channel. 0x1: Select VOLRA_VDD_CORE_L for the VDD_CORE_L channel. | RW | 0 |
| 0 | SA_VDD_CORE_L | Slave address pointer for VDD_CORE_L channel. 0x0: Select SA_VDD_MPU_L for the VDD_CORE_L channel. 0x1: Select SA_VDD_CORE_L for the VDD_CORE_L channel. | RW | 0 |

Table 3-872. Register Call Summary for Register PRM_VC_CFG_CHANNEL

PRCM Module Programming Guide

- [Global Initialization: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[5\]](#)

Table 3-873. PRM_VC_CFG_I2C_MODE

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 00A8 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7BA8 | | |
| Description | I ² C configuration register. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-----------|----------|----------|----------|---------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | DFILTEREN | RESERVED | SRMODEEN | HSMODEEN | HSMCODE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | DFILTEREN | This field enables double filter procedure for I ² C input lines 0x0: I ² C bus digital filter rejects all glitches smaller than 1 sytem clock cycle 0x1: I ² C bus digital filter rejects all glitches smaller than 2 sytem clock cycles | RW | 0 |
| 5 | RESERVED | | R | 0 |
| 4 | SRMODEEN | Enables the I ² C repeated start operation mode. (Effect of holding the SCL and SDA lines low, in effect blocking the I ² C bus from losing arbitration between repeated start points). Use of this feature results from a trade-off between speed and power consumption of I ² C interface. 0x0: Disables the repeated start operation mode 0x1: Enables the repeated start operation mode | RW | 1 |
| 3 | HSMODEEN | Enables I ² C bus high-speed mode. 0x0: Disables the I ² C high-speed mode 0x1: Enables the I ² C high-speed mode | RW | 1 |
| 2:0 | HSMCODE | Master code value for I ² C high-speed preamble transmission. | RW | 0x0 |

Table 3-874. Register Call Summary for Register PRM_VC_CFG_I2C_MODE

PRCM Module Programming Guide

- [Global Initialization: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[4\]](#)

Table 3-875. PRM_VC_CFG_I2C_CLK

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00AC | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7BAC | | | | | | | | | | | | | | | |
| Instance | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | I2C Interface clock configuration parameters. [warm reset insensitive] | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HSSCLL | | | | | | | | HSSCLH | | | | | | | | SCLL | | | | | | | | SCLH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | HSSCLL | Number of the system clock cycles, necessary to count the low period of the I2C clock signal, when the I2C interface runs in high-speed mode of operation. The value of the bit field is automatically increased by 7. | RW | 0x00 |
| 23:16 | HSSCLH | Number of the system clock cycles, necessary to count the high period of the I2C clock signal, when the I2C interface runs in high-speed mode of operation. The value of the bit field is automatically increased by 5. | RW | 0x00 |
| 15:8 | SCLL | Number of the system clock cycles, necessary to count the low period of the I2C clock signal, when the I2C interface runs in fast mode of operation. The value of the bit field is automatically increased by 7. | RW | 0x00 |
| 7:0 | SCLH | Number of the system clock cycles, necessary to count the high period of the I2C clock signal, when the I2C interface runs in fast mode of operation. The value of the bit field is automatically increased by 5. | RW | 0x00 |

Table 3-876. Register Call Summary for Register PRM_VC_CFG_I2C_CLK

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-877. PRM_SRAM_COUNT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00B0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7BB0 | | | | | | | | | | | | | | | | Instance | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | Common setup for SRAM LDO transition counters. Applies to all voltage domains. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|----------|------------------|---|---|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| STARTUP_COUNT | | | | | | | | SLPCNT_VALUE | | | | | | | | VSETUPCNT_VALUE | | | | | | | | RESERVED | PCHARGEcnt_VALUE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|-------|
| 31:24 | STARTUP_COUNT | Determines the start-up duration of SRAM and ABB LDO. The duration is computed as 16 x NbCycles of system clock cycles. Target is 50us. | RW | 0x78 |
| 23:16 | SLPCNT_VALUE | Delay between retention/off assertion of last SRAM bank and SRAMALLRET signal to LDO is driven high. Counting on system clock. Target is 2us. | RW | 0x00 |
| 15:8 | VSETUPCNT_VALUE | SRAM LDO rampup time from retention to active mode. The duration is computed as 8 x NbCycles of system clock cycles. Target is 30us. | RW | 0x00 |
| 7:6 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|-------|
| 5:0 | PCHARGE_CNT_VALUE | Delay between de-assertion of standby_rta_ret_on and standby_rta_ret_good. Counting on system clock. Target is 600ns. | RW | 0x17 |

Table 3-878. Register Call Summary for Register PRM_SRAM_COUNT

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-879. PRM_SRAM_WKUP_SETUP

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 00B4 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7BB4 | | |
| Description | Setup of memory in WKUP voltage domain. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|--------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DISABLE_RTA_EXPORT |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|----------------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | DISABLE_RTA_EXPORT | Control for HD memory RTA feature. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: HD memory RTA feature is enabled 0x1: HD memory RTA feature is disabled | RW WSpecial | 0 |

Table 3-880. Register Call Summary for Register PRM_SRAM_WKUP_SETUP

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-881. PRM_LDO_SRAM_CORE_SETUP

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 00B8 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7BB8 | | |
| Description | Setup of the SRAM LDO for CORE voltage domain. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | AIPOFF | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | ENFUNC5 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | ENFUNC4 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | ENFUNC3_EXPORT | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | ENFUNC2_EXPORT | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | ENFUNC1_EXPORT | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | ABBOFF_SLEEP_EXPORT | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | ABBOFF_ACT_EXPORT | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | DISABLE_RTA_EXPORT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|----------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | AIPOFF | Override on AIPOFF input of SRAM LDO. 0x0: AIPOFF signal is not overridden 0x1: AIPOFF signal is overridden to 1. Corresponding SRAM LDO is disabled and in HZ mode. | RW | 0 |
| 7 | ENFUNC5 | ENFUNC5 input of SRAM LDO. 0x0: Active to retention is a one step transfer 0x1: Active to retention is a two steps transfer | RW | 0 |
| 6 | ENFUNC4 | ENFUNC4 input of SRAM LDO. 0x0: One external clock is supplied 0x1: No external clock is supplied | RW | 0 |
| 5 | ENFUNC3_EXPORT | ENFUNC3 input of SRAM LDO. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: Sub regulation is disabled 0x1: Sub regulation is enabled | RW WSpecial | 0 |
| 4 | ENFUNC2_EXPORT | ENFUNC2 input of SRAM LDO. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: External cap is used 0x1: External cap is not used | RW WSpecial | 0 |
| 3 | ENFUNC1_EXPORT | ENFUNC1 input of SRAM LDO. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: Short circuit protection is disabled 0x1: Short circuit protection is enabled | RW WSpecial | 0 |
| 2 | ABBOFF_SLEEP_EXPORT | Determines whether SRAMNWA is supplied by VDD5 or VDDAR during deep-sleep. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: SRAMNWA supplied with VDD5 0x1: SRAMNWA supplied with VDDAR | RW WSpecial | 0 |
| 1 | ABBOFF_ACT_EXPORT | Determines whether SRAMNWA is supplied by VDD5 or VDDAR during active mode. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: SRAMNWA supplied with VDD5 0x1: SRAMNWA supplied with VDDAR | RW WSpecial | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|----------------|-------|
| 0 | DISABLE_RTA_EXPORT | Control for HD memory RTA feature. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: HD memory RTA feature is enabled 0x1: HD memory RTA feature is disabled | RW WSpecial | 0 |

Table 3-882. Register Call Summary for Register PRM_LDO_SRAM_CORE_SETUP

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-883. PRM_LDO_SRAM_CORE_CTRL

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 00BC | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7BBC | | |
| Description | Control and status of the SRAM LDO for CORE voltage domain. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|----------------|---|----------|---|---|---|---|---|---|--|--|--|--|--|--|--|----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | SRAM_IN_TRANSITION | | | | | | | SRAMLDO_STATUS | | RESERVED | | | | | | | | | | | | | | RETMODE_ENABLE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | SRAM_IN_TRANSITION | Status indicating SRAM LDO state machine state. Read 0x0: SRAM LDO state machine is stable Read 0x1: SRAM LDO state machine is in transition state | R | 0 |
| 8 | SRAMLDO_STATUS | SRAMLDO status Read 0x0: SRAMLDO is in ACTIVE mode. Read 0x1: SRAMLDO is on RETENTION mode. | R | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | RETMODE_ENABLE | Control if the SRAM LDO retention mode is used or not. 0x0: SRAM LDO is not allowed to go to RET mode 0x1: SRAM LDO go to RET mode when all memory of voltage domain are OFF or RET | RW | 0 |

Table 3-884. Register Call Summary for Register PRM_LDO_SRAM_CORE_CTRL

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-885. PRM_LDO_SRAM_MPU_SETUP

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 00C0 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7BC0 | | |
| Description | Setup of the SRAM LDO for MPU voltage domain. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|--------|---------|---------|----------------|----------------|----------------|---------------------|-------------------|--------------------|
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | AIPOFF | ENFUNC5 | ENFUNC4 | ENFUNC3_EXPORT | ENFUNC2_EXPORT | ENFUNC1_EXPORT | ABBOFF_SLEEP_EXPORT | ABBOFF_ACT_EXPORT | DISABLE_RTA_EXPORT |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|----------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | AIPOFF | Override on AIPOFF input of SRAM LDO. 0x0: AIPOFF signal is not overridden 0x1: AIPOFF signal is overridden to 1. Corresponding SRAM LDO is disabled and in HZ mode. | RW | 0 |
| 7 | ENFUNC5 | ENFUNC5 input of SRAM LDO. 0x0: Active to retention is a one step transfer 0x1: Active to retention is a two steps transfer | RW | 0 |
| 6 | ENFUNC4 | ENFUNC4 input of SRAM LDO. 0x0: One external clock is supplied 0x1: No external clock is supplied | RW | 0 |
| 5 | ENFUNC3_EXPORT | ENFUNC3 input of SRAM LDO. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: Sub regulation is disabled 0x1: Sub regulation is enabled | RW | 0 |
| 4 | ENFUNC2_EXPORT | ENFUNC2 input of SRAM LDO. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: External cap is used 0x1: External cap is not used | RW WSpecial | 0 |
| 3 | ENFUNC1_EXPORT | ENFUNC1 input of SRAM LDO. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: Short circuit protection is disabled 0x1: Short circuit protection is enabled | RW | 0 |
| 2 | ABBOFF_SLEEP_EXPORT | Determines whether SRAMNWA is supplied by VDD5 or VDDAR during deep-sleep. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: SRAMNWA supplied with VDD5 0x1: SRAMNWA supplied with VDDAR | RW WSpecial | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|----------------|-------|
| 1 | ABBOFF_ACT_EXPORT | Determines whether SRAMNWA is supplied by VDDS or VDDAR during active mode. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: SRAMNWA supplied with VDDS 0x1: SRAMNWA supplied with VDDAR | RW WSpecial | 0 |
| 0 | DISABLE_RTA_EXPORT | Control for HD memory RTA feature. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: HD memory RTA feature is enabled 0x1: HD memory RTA feature is disabled | RW WSpecial | 0 |

Table 3-886. Register Call Summary for Register PRM_LDO_SRAM_MPU_SETUP

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-887. PRM_LDO_SRAM_MPU_CTRL

| | | | |
|------------------|---|----------|------------|
| Address Offset | 0x0000 00C4 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7BC4 | | |
| Description | Control and status of the SRAM LDO for MPU voltage domain. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----------------|----|----------|----|---|---|---|---|---|---|---|---|---|---|--|--|----------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | SRAM_IN_TRANSITION | | SRAMLDO_STATUS | | RESERVED | | | | | | | | | | | | | | RETMODE_ENABLE | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | SRAM_IN_TRANSITION | Status indicating SRAM LDO state machine state. Read 0x0: SRAM LDO state machine is stable Read 0x1: SRAM LDO state machine is in transition state | R | 0 |
| 8 | SRAMLDO_STATUS | SRAMLDO status Read 0x0: SRAMLDO is in ACTIVE mode. Read 0x1: SRAMLDO is on RETENTION mode. | R | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | RETMODE_ENABLE | Control if the SRAM LDO retention mode is used or not. 0x0: SRAM LDO is not allowed to go to RET mode 0x1: SRAM LDO go to RET mode when all memory of voltage domain are OFF or RET | RW | 0 |

Table 3-888. Register Call Summary for Register PRM_LDO_SRAM_MPU_CTRL

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-889. PRM_LDO_SRAM_IVA_SETUP

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 00C8 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7BC8 | | |
| Description | Setup of the SRAM LDO for IVA voltage domain. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|--------|---------|---------|----------------|----------------|----------------|---------------------|-------------------|--------------------|
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | AIPOFF | ENFUNC5 | ENFUNC4 | ENFUNC3_EXPORT | ENFUNC2_EXPORT | ENFUNC1_EXPORT | ABBOFF_SLEEP_EXPORT | ABBOFF_ACT_EXPORT | DISABLE_RTA_EXPORT |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|----------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | AIPOFF | Override on AIPOFF input of SRAM LDO. 0x0: AIPOFF signal is not overridden 0x1: AIPOFF signal is overridden to 1. Corresponding SRAM LDO is disabled and in HZ mode. | RW | 0 |
| 7 | ENFUNC5 | ENFUNC5 input of SRAM LDO. 0x0: Active to retention is a one step transfer 0x1: Active to retention is a two steps transfer | RW | 0 |
| 6 | ENFUNC4 | ENFUNC4 input of SRAM LDO. 0x0: One external clock is supplied 0x1: No external clock is supplied | RW | 0 |
| 5 | ENFUNC3_EXPORT | ENFUNC3 input of SRAM LDO. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: Sub regulation is disabled 0x1: Sub regulation is enabled | RW | 0 |
| 4 | ENFUNC2_EXPORT | ENFUNC2 input of SRAM LDO. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: External cap is used 0x1: External cap is not used | RW WSpecial | 0 |
| 3 | ENFUNC1_EXPORT | ENFUNC1 input of SRAM LDO. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: Short circuit protection is disabled 0x1: Short circuit protection is enabled | RW | 0 |
| 2 | ABBOFF_SLEEP_EXPORT | Determines whether SRAMNWA is supplied by VDDS or VDDAR during deep-sleep. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: SRAMNWA supplied with VDDS 0x1: SRAMNWA supplied with VDDAR | RW WSpecial | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|----------------|-------|
| 1 | ABBOFF_ACT_EXPORT | Determines whether SRAMNWA is supplied by VDDS or VDDAR during active mode. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: SRAMNWA supplied with VDDS 0x1: SRAMNWA supplied with VDDAR | RW WSpecial | 0 |
| 0 | DISABLE_RTA_EXPORT | Control for HD memory RTA feature. After PowerOn reset and Efuse sensing, this bit field is automatically loaded with an Efuse value from control module. Bit field remains writable after this. 0x0: HD memory RTA feature is enabled 0x1: HD memory RTA feature is disabled | RW WSpecial | 0 |

Table 3-890. Register Call Summary for Register PRM_LDO_SRAM_IVA_SETUP

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-891. PRM_LDO_SRAM_IVA_CTRL

| | | | |
|------------------|---|----------|------------|
| Address Offset | 0x0000 00CC | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7BCC | | |
| Description | Control and status of the SRAM LDO for IVA voltage domain. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----------------|----|----------|----|---|---|---|---|---|---|----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SRAM_IN_TRANSITION | | SRAMLDO_STATUS | | RESERVED | | | | | | | | RETMODE_ENABLE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | SRAM_IN_TRANSITION | Status indicating SRAM LDO state machine state. Read 0x0: SRAM LDO state machine is stable Read 0x1: SRAM LDO state machine is in transition state | R | 0 |
| 8 | SRAMLDO_STATUS | SRAMLDO status Read 0x0: SRAMLDO is in ACTIVE mode. Read 0x1: SRAMLDO is on RETENTION mode. | R | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | RETMODE_ENABLE | Control if the SRAM LDO retention mode is used or not. 0x0: SRAM LDO is not allowed to go to RET mode 0x1: SRAM LDO go to RET mode when all memory of voltage domain are OFF or RET | RW | 0 |

Table 3-892. Register Call Summary for Register PRM_LDO_SRAM_IVA_CTRL

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-893. PRM_LDO_ABB_MPU_SETUP

| | | | |
|-------------------------|-------------------------------|-----------------|------------|
| Address Offset | 0x0000 00D0 | | |
| Physical Address | 0x4A30 7BD0 | Instance | DEVICE_PRM |
| Description | Selects the MPU_ABB LDO mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|----------|---|---|---|----------|----------------|----------------|-------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SR2_WTCNT_VALUE | | | | | | | | RESERVED | | | | RESERVED | ACTIVE_FBB_SEL | ACTIVE_RBB_SEL | SR2EN |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | SR2_WTCNT_VALUE | LDO settling time for active-mode OPP change. Counting at a 16 system clock cycles rate. Target is 50us. [warm reset insensitive] | RW | 0x00 |
| 7:4 | RESERVED | | R | 0x0 |
| 3 | RESERVED | Reserved | RW | 0 |
| 2 | ACTIVE_FBB_SEL | Defines ABB LDO mode when voltage is in slow fast OPP. [warm reset insensitive] 0x0: ABB LDO is in bypass mode 0x1: ABB LDO is in ABB Set1 mode | RW | 0 |
| 1 | ACTIVE_RBB_SEL | Defines ABB LDO mode when MPU voltage is in OPP_TURBO. [warm reset insensitive] 0x0: ABB LDO is in bypass mode 0x1: ABB LDO is in ABB Set2 mode | RW | 0 |
| 0 | SR2EN | Enable ABB power management 0x0: ABB LDO is put in bypass mode 0x1: ABB LDO will operate accordingly to settings | RW | 0 |

Table 3-894. Register Call Summary for Register PRM_LDO_ABB_MPU_SETUP

Voltage Management Functional Description

- [ABB LDOs Control: \[0\] \[1\]](#)

PRCM Module Programming Guide

- [Changing OPP: \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[5\]](#)

Table 3-895. PRM_LDO_ABB_MPU_CTRL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00D4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7BD4 | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | Control and Status of ABB on MPU voltage domain. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|-------------------|---|----------|---|------------|---|------------|---|---------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | SR2_IN_TRANSITION | | RESERVED | | SR2_STATUS | | OPP_CHANGE | | OPP_SEL | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|----------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | SR2_IN_TRANSITION | Indicates VBLDO_CON is or is not in transition state. This output should be used by programming interface to clear OPP_CHANGE bit as an indication of OPP change completion. Read 0x0: Read 0x1: Indicates that VBLDO_CON is in transition and SR2_STATUS bits are not stable to read. | R | 0 |
| 5 | RESERVED | | R | 0 |
| 4:3 | SR2_STATUS | Indicate ABB LDO current operation status Read 0x0: ABB LDO is placed in bypass mode. Read 0x1: ABB LDO is placed in ABB Set2 active mode Read 0x2: ABB LDO is placed in ABB Set1 active mode. Read 0x3: Reserved | R | 0x0 |
| 2 | OPP_CHANGE | When OPP_CHANGE is set to 1, VBLDO_CON samples OPP_SEL ACTIVE_FBB_SEL/ACTIVE_RBB_SEL upon detecting rising edge. VBLDO_CON asserts signal SR2_IN_TRANSITION in response to OPP_CHANGE. OPP_CHANGE should be cleared to 0 when SR2_IN_TRANSITION from VBLDO_CON is de-asserted. | RW WSpecial | 0 |
| 1:0 | OPP_SEL | Selects the OPP at which the MPU voltage domain is operating 0x0: default : Nominal 0x1: Fast OPP 0x2: Nominal 0x3: Slow OPP | RW | 0x0 |

Table 3-896. Register Call Summary for Register PRM_LDO_ABB_MPU_CTRL

Voltage Management Functional Description

- [ABB LDOs Control: \[0\]](#)

PRCM Module Programming Guide

- [Changing OPP: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[8\]](#)

Table 3-897. PRM_LDO_ABB_IVA_SETUP

| | | | |
|-------------------------|-------------------------------|-----------------|------------|
| Address Offset | 0x0000 00D8 | | |
| Physical Address | 0x4A30 7BD8 | Instance | DEVICE_PRM |
| Description | Selects the IVA_ABB LDO mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|----------|---|---|---|----------|----------------|----------------|-------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SR2_WTCNT_VALUE | | | | | | | | RESERVED | | | | RESERVED | ACTIVE_FBB_SEL | ACTIVE_RBB_SEL | SR2EN |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | SR2_WTCNT_VALUE | LDO settling time for active-mode OPP change. Counting at a 16 system clock cycles rate. Target is 50us. [warm reset insensitive] | RW | 0x00 |
| 7:4 | RESERVED | | R | 0x0 |
| 3 | RESERVED | Reserved | RW | 0 |
| 2 | ACTIVE_FBB_SEL | Defines ABB LDO mode when voltage is in slow fast OPP. [warm reset insensitive] 0x0: ABB LDO is in bypass mode 0x1: ABB LDO is in ABB Set1 mode | RW | 0 |
| 1 | ACTIVE_RBB_SEL | Defines ABB LDO mode when IVA voltage is in OPP_TURBO. [warm reset insensitive] 0x0: ABB LDO is in bypass mode 0x1: ABB LDO is in ABB Set2 mode | RW | 0 |
| 0 | SR2EN | Enable ABB power management 0x0: ABB LDO is put in bypass mode 0x1: ABB LDO will operate accordingly to settings< | RW | 0 |

Table 3-898. Register Call Summary for Register PRM_LDO_ABB_IVA_SETUP

Voltage Management Functional Description

- [ABB LDOs Control: \[0\] \[1\]](#)

PRCM Module Programming Guide

- [Changing OPP: \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[5\]](#)

Table 3-899. PRM_LDO_ABB_IVA_CTRL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00DC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7BDC | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | Control and Status of ABB on IVA voltage domain. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|-------------------|---|----------|---|------------|---|------------|---|---------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | SR2_IN_TRANSITION | | RESERVED | | SR2_STATUS | | OPP_CHANGE | | OPP_SEL | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|----------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | SR2_IN_TRANSITION | Indicates VBLDO_CON is or is not in transition state. This output should be used by programming interface to clear OPP_CHANGE bit as an indication of OPP change completion. Read 0x0: Read 0x1: Indicates that VBLDO_CON is in transition and SR2_STATUS bits are not stable to read. | R | 0 |
| 5 | RESERVED | | R | 0 |
| 4:3 | SR2_STATUS | Indicate ABB LDO current operation status Read 0x0: ABB LDO is placed in bypass mode. Read 0x1: ABB LDO is placed in ABB Set2 active mode Read 0x2: ABB LDO is placed in ABB Set1 active mode. Read 0x3: Reserved | R | 0x0 |
| 2 | OPP_CHANGE | When OPP_CHANGE is set to 1, VBLDO_CON samples OPP_SEL ACTIVE_FBB_SEL/ACTIVE_RBB_SEL upon detecting rising edge. VBLDO_CON asserts signal SR2_IN_TRANSITION in response to OPP_CHANGE. OPP_CHANGE should be cleared to 0 when SR2_IN_TRANSITION from VBLDO_CON is de-asserted. | RW WSpecial | 0 |
| 1:0 | OPP_SEL | Selects the OPP at which the IVA voltage domain is operating (Fast OPP, Nominal OPP or Slow OPP) 0x0: default : Nominal 0x1: Fast OPP 0x2: Nominal 0x3: Slow OPP | RW | 0x0 |

Table 3-900. Register Call Summary for Register PRM_LDO_ABB_IVA_CTRL

Voltage Management Functional Description

- [ABB LDOs Control: \[0\]](#)

PRCM Module Programming Guide

- [Changing OPP: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[8\]](#)

Table 3-901. PRM_LDO_BANDGAP_SETUP

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00E0 | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7BE0 | | | | | | | | | | | | | | | |
| Instance | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | Control of the bandgap. [warm reset insensitive] | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STARTUP_COUNT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | STARTUP_COUNT | Determines the start-up duration of BANDGAP. The duration is computed as 32 x NbCycles of system clock cycles. Target is 100us. | RW | 0x78 |

Table 3-902. Register Call Summary for Register PRM_LDO_BANDGAP_SETUP

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-903. PRM_DEVICE_OFF_CTRL

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00E4 | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7BE4 | | | | | | | | | | | | | | | |
| Instance | DEVICE_PRM | | | | | | | | | | | | | | | |
| Description | This register is used to control device OFF transition. | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|-----------------------|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | EMIF2_OFFWKUP_DISABLE | | EMIF1_OFFWKUP_DISABLE | | RESERVED | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|------|-----------|
| 31:10 | RESERVED | | R | 0x0000 00 |
| 9 | EMIF2_OFFWKUP_DISABLE | Controls the EMIF2_DEVICE_OFFWKUP_CORESRTACTST notifier sent to EMIF2 upon a device wakeup from off mode. (Warm reset insensitive) 0x0: Notifier is activated. 0x1: Notifier is not activated – stays low. | RW | 0 |
| 8 | EMIF1_OFFWKUP_DISABLE | Controls the EMIF1_DEVICE_OFFWKUP_CORESRTACTST notifier sent to EMIF1 upon a device wakeup from off mode. (Warm reset insensitive) 0x0: Notifier is activated. 0x1: Notifier is not activated – stays low. | RW | 0 |
| 7:1 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|-------|
| 0 | DEVICE_OFF_ENABLE | Controls transition to device OFF mode. 0x0: Device is not allowed to perform transition to off mode 0x1: Device is allowed to perform transition to off mode as soon as all power domains in MPU, IVA and CORE voltage are in OFF or OsoftwareRET state (open switch retention) | RW | 0 |

Table 3-904. Register Call Summary for Register PRM_DEVICE_OFF_CTRL

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-905. PRM_PHASE1_CNDP

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 00E8 | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7BE8 | | |
| Description | This register stores the start descriptor address of automatic restore phase1. [warm reset insensitive] | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PHASE1_CNDP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|---------------|-------------|
| 31:0 | PHASE1_CNDP | Start descriptor address of automatic restore phase1. Hard-coded to SAR_ROM base address. | R Rreturns | 0x4A05 E000 |

Table 3-906. Register Call Summary for Register PRM_PHASE1_CNDP

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-907. PRM_PHASE2A_CNDP

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 00EC | Instance | DEVICE_PRM |
| Physical Address | 0x4A30 7BEC | | |
| Description | This register stores the start descriptor address of automatic restore phase2A. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PHASE2A_CNDP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|---------------|-------------|
| 31:0 | PHASE2A_CNDP | Start descriptor address of automatic restore phase2A. Hard-coded to SAR_ROM base address + 0x30. | R Rreturns | 0x4A05 E030 |

Table 3-908. Register Call Summary for Register PRM_PHASE2A_CNDP

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

Table 3-909. PRM PHASE2B CNDP

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 00F0 | | |
| Physical Address | 0x4A30 7BF0 | Instance | DEVICE_PRM |
| Description | This register stores the start descriptor address of automatic restore phase2B. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PHASE2B CNDP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|---------------|-------------|
| 31:0 | PHASE2B_CNDP | Start descriptor address of automatic restore phase2B. Hard-coded to SAR_ROM base address + 0x60. | R Rreturns | 0x4A05 E060 |

Table 3-910. Register Call Summary for Register PRM_PHASE2B_CNDP

PRCM Register Manual

- **DEVICE_PRM Register Summary:** [0]

Table 3-911. PRM VC ERRST

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 00F8 | | |
| Physical Address | 0x4A30 7BF8 | Instance | DEVICE_PRM |
| Description | This debug register logs the error status coming from Voltage Controller. Must be cleared by software. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|--------------------|---------------|---------------|----------|----|----|----------------------|-----------------|-----------------|----------------------|-----------------|-----------------|----------|----|----|----------------------|-----------------|-----------------|----------------------|-----------------|-----------------|----------|---|---|-----------------------|------------------|------------------|-----------------------|------------------|------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | BYPASS_TIMEOUT_ERR | BYPASS_RA_ERR | BYPASS_SA_ERR | RESERVED | | | VFSM_TIMEOUT_ERR_MPU | VFSM_RA_ERR_MPU | VFSM_SA_ERR_MPU | SMPS_TIMEOUT_ERR_MPU | SMPS_RA_ERR_MPU | SMPS_SA_ERR_MPU | RESERVED | | | VFSM_TIMEOUT_ERR_IVA | VFSM_RA_ERR_IVA | VFSM_SA_ERR_IVA | SMPS_TIMEOUT_ERR_IVA | SMPS_RA_ERR_IVA | SMPS_SA_ERR_IVA | RESERVED | | | VFSM_TIMEOUT_ERR_CORE | VFSM_RA_ERR_CORE | VFSM_SA_ERR_CORE | SMPS_TIMEOUT_ERR_CORE | SMPS_RA_ERR_CORE | SMPS_SA_ERR_CORE |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|---------------|-------|
| 31:27 | RESERVED | | R | 0x00 |
| 26 | BYPS_TIMEOUT_ERR | Bypass command frame is finished but is not acknowledged by the slave, or (I2C multimaster) arbitration lost. 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 25 | BYPS_RA_ERR | Wrong register address error for bypass command 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 24 | BYPS_SA_ERR | Wrong slave address error for bypass command 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 23:22 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|---------------|-------|
| 21 | VFSM_TIMEOUT_ERR_MPU | MPU voltage FSM command frame is finished but is not acknowledged by the slave, or (I2C multimaster) arbitration lost. 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 20 | VFSM_RA_ERR_MPU | Wrong register address error for MPU voltage FSM 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 19 | VFSM_SA_ERR_MPU | Wrong slave address error for MPU voltage FSM 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 18 | SMPS_TIMEOUT_ERR_MPU | MPU voltage processor command frame is finished but is not acknowledged by the slave, or (I2C multimaster) arbitration lost. 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 17 | SMPS_RA_ERR_MPU | Wrong register address error for MPU voltage processor 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 16 | SMPS_SA_ERR_MPU | Wrong slave address error for MPU voltage processor 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 15:14 | RESERVED | | R | 0x0 |
| 13 | VFSM_TIMEOUT_ERR_IVA | IVA voltage FSM command frame is finished but is not acknowledged by the slave, or (I2C multimaster) arbitration lost. 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 12 | VFSM_RA_ERR_IVA | Wrong register address error for IVA voltage FSM 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 11 | VFSM_SA_ERR_IVA | Wrong slave address error for IVA voltage FSM 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 10 | SMPS_TIMEOUT_ERR_IVA | IVA voltage processor command frame is finished but is not acknowledged by the slave, or (I2C multimaster) arbitration lost. 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 9 | SMPS_RA_ERR_IVA | Wrong register address error for IVA voltage processor 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 8 | SMPS_SA_ERR_IVA | Wrong slave address error for IVA voltage processor 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | VFSM_TIMEOUT_ERR_CORE | CORE voltage FSM command frame is finished but is not acknowledged by the slave, or (I2C multimaster) arbitration lost. 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|---------------|-------|
| 4 | VFSM_RA_ERR_CORE | Wrong register address error for CORE voltage FSM 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 3 | VFSM_SA_ERR_CORE | Wrong slave address error for CORE voltage FSM 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 2 | SMPS_TIMEOUT_ERR_CORE | CORE voltage processor command frame is finished but is not acknowledged by the slave, or (I2C multimaster) arbitration lost. 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 1 | SMPS_RA_ERR_CORE | Wrong register address error for CORE voltage processor 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |
| 0 | SMPS_SA_ERR_CORE | Wrong slave address error for CORE voltage processor 0x0: No error 0x1: An error has been logged | RW W1toClr | 0 |

Table 3-912. Register Call Summary for Register PRM_VC_ERRST

PRCM Register Manual

- [DEVICE_PRM Register Summary: \[0\]](#)

3.11.20 INSTR_PRM Registers

3.11.20.1 INSTR_PRM Register Summary

Table 3-913. INSTR_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | INSTR_PRM Base Address |
|-------------------------------------|------|-----------------------|----------------|------------------------|
| PMI_IDENTIFICATION | R | 32 | 0x0000 0000 | 0x4A30 7F00 |
| PMI_SYS_CONFIG | RW | 32 | 0x0000 0010 | 0x4A30 7F10 |
| PMI_STATUS | R | 32 | 0x0000 0014 | 0x4A30 7F14 |
| PMI_CONFIGURATION | RW | 32 | 0x0000 0024 | 0x4A30 7F24 |
| PMI_CLASS_FILTERING | RW | 32 | 0x0000 0028 | 0x4A30 7F28 |
| PMI_TRIGGERING | RW | 32 | 0x0000 002C | 0x4A30 7F2C |
| PMI_SAMPLING | RW | 32 | 0x0000 0030 | 0x4A30 7F30 |

3.11.20.2 INSTR_PRM Register Description

Table 3-914. PMI_IDENTICATION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7F00 | | | | | | | | | | | | | | | | Instance INSTR_PRM | | | | | | | | | | | | | | | |
| Description | PM profiling identification register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|---------------------------|
| 31:0 | REVISION | IP revision | R | 0x-- TI Internal data. |

Table 3-915. Register Call Summary for Register PMI_IDENTICATION

PRCM Register Manual

- [INSTR_PRM Register Summary: \[0\]](#)

Table 3-916. PMI_SYS_CONFIG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0010 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 7F10 | | | | | | | | | | | | | | | | Instance INSTR_PRM | | | | | | | | | | | | | | | |
| Description | PM profiling system configuartion register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|----------|---|----------|---|-----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RESERVED | | IDLEMODE | | RESERVED | | SOFTRESET | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:6 | RESERVED | Reserved | R | 0x00000000 |
| 5:4 | RESERVED | Reserved | R | 0x0 |
| 3:2 | IDLEMODE | Configuration of the local tartget state management mode | RW | 0x2 |
| 1 | RESERVED | Reserved | R | 0 |
| 0 | SOFTRESET | Software reset | RW | 0 |

Table 3-917. Register Call Summary for Register PMI_SYS_CONFIG

PRCM Register Manual

- [INSTR_PRM Register Summary: \[0\]](#)

Table 3-918. PMI_STATUS

| | | | |
|-------------------------|------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0014 | Instance | INSTR_PRM |
| Physical Address | 0x4A30 7F14 | | |
| Description | PM profiling status register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FIFOEMPTY | | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------|------|----------|
| 31:9 | RESERVED | Reserved | R | 0x000000 |
| 8 | FIFOEMPTY | PM Profiling buffer empty | R | 1 |
| 7:0 | RESERVED | Reserved | R | 0x00 |

Table 3-919. Register Call Summary for Register PMI_STATUS

PRCM Register Manual

- [INSTR_PRM Register Summary: \[0\]](#)

Table 3-920. PMI_CONFIGURATION

| | | | |
|-------------------------|-------------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0024 | Instance | INSTR_PRM |
| Physical Address | 0x4A30 7F24 | | |
| Description | PM profiling configuration register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|---------|----|---------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|----|----------|---|-------------|---|----------|---|----------|---|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CLAIM_3 | | CLAIM_2 | | CLAIM_1 | | RESERVED | | RESERVED | | RESERVED | | RESERVED | | RESERVED | | RESERVED | | RESERVED | | RESERVED | | RESERVED | | EVT_CAPT_EN | | RESERVED | | RESERVED | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|-------|
| 31:30 | CLAIM_3 | Ownership | RW | 0x0 |
| 29 | CLAIM_2 | Debugger override qualifier | RW | 1 |
| 28 | CLAIM_1 | Current owner | R | 0 |
| 27:24 | RESERVED | Reserved | R | 0x0 |
| 23 | RESERVED | Reserved | R | 0 |
| 22:16 | RESERVED | Reserved | R | 0x00 |
| 15 | RESERVED | Reserved | R | 0 |
| 14:8 | RESERVED | Reserved | R | 0x00 |
| 7 | EVT_CAPT_EN | When HIGH the PM events capture is enabled | RW | 0 |
| 6:0 | RESERVED | Reserved | R | 0x00 |

Table 3-921. Register Call Summary for Register PMI_CONFIGURATION

PRCM Register Manual

- [INSTR_PRM Register Summary: \[0\]](#)

Table 3-922. PMI_CLASS_FILTERING

| | | | |
|-------------------------|---------------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0028 | Instance | INSTR_PRM |
| Physical Address | 0x4A30 7F28 | | |
| Description | PM profiling class filtering register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|---|---|---|-----------------|--|-----------------|--|-----------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | SNAP_CAPT_EN_03 | | | | SNAP_CAPT_EN_02 | | SNAP_CAPT_EN_01 | | SNAP_CAPT_EN_00 | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | SNAP_CAPT_EN_03 | Snapshot capture enable - Class-ID = 0x03 | RW | 0 |
| 2 | SNAP_CAPT_EN_02 | Snapshot capture enable - Class-ID = 0x02 | RW | 0 |
| 1 | SNAP_CAPT_EN_01 | Snapshot capture enable - Class-ID = 0x01 | RW | 0 |
| 0 | SNAP_CAPT_EN_00 | Snapshot capture enable - Class-ID = 0x00 | RW | 0 |

Table 3-923. Register Call Summary for Register PMI_CLASS_FILTERING

PRCM Register Manual

- [INSTR_PRM Register Summary: \[0\]](#)

Table 3-924. PMI_TRIGGERING

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 002C | Instance | INSTR_PRM |
| Physical Address | 0x4A30 7F2C | | |
| Description | PM profiling triggering control register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------------|--|---------------|--|
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | TRIG_STOP_EN | | TRIG_START_EN | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1 | TRIG_STOP_EN | Enable stop capturing PM events from external trigger detection | RW | 0 |
| 0 | TRIG_START_EN | Enable start capturing PM events from external trigger detection | RW | 0 |

Table 3-925. Register Call Summary for Register PMI_TRIGGERING

PRCM Register Manual

- [INSTR_PRM Register Summary: \[0\]](#)

Table 3-926. PMI_SAMPLING

| | | | |
|-------------------------|---------------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0030 | Instance | INSTR_PRM |
| Physical Address | 0x4A30 7F30 | | |
| Description | PM profiling sampling window register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------------|----|----|----|----------|----|----|----|----|----|----|----|----------------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FCLK_DIV_FACOR | | | | RESERVED | | | | | | | | SAMP_WIND_SIZE | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|-------|
| 31:20 | RESERVED | Reserved | R | 0x000 |
| 19:16 | FCLK_DIV_FACOR | FunClk divide factor ranging from 1 to 16 | RW | 0x0 |
| 15:8 | RESERVED | Reserved | R | 0x00 |
| 7:0 | SAMP_WIND_SIZE | PM events sampling window size | RW | 0x00 |

Table 3-927. Register Call Summary for Register PMI_SAMPLING

PRCM Register Manual

- [INSTR_PRM Register Summary: \[0\]](#)

3.11.21 CM1 Instance Summary

Table 3-928. CM1 Instance Summary

| Module Name | L4 Base Address | Size |
|---------------------|-----------------|----------|
| INTRCONN_SOCKET_CM1 | 0x4A00 4000 | 256Bytes |
| CKGEN_CM1 | 0x4A00 4100 | 512Bytes |
| MPU_CM1 | 0x4A00 4300 | 256Bytes |
| DSP_CM1 | 0x4A00 4400 | 256Bytes |
| ABE_CM1 | 0x4A00 4500 | 256Bytes |
| RESTORE_CM1 | 0x4A00 4E00 | 256Bytes |
| INSTR_CM1 | 0x4A00 4F00 | 256Bytes |

3.11.22 INTRCONN_SOCKET_CM1 Registers

3.11.22.1 INTRCONN_SOCKET_CM1 Register Summary

Table 3-929. INTRCONN_SOCKET_CM1 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | INTRCONN_SOCKET_CM1 L4 Base Address |
|---------------|------|-----------------------|----------------|-------------------------------------|
| REVISION_CM1 | R | 32 | 0x0000 0000 | 0x4A00 4000 |

Table 3-929. INTRCONN_SOCKET_CM1 Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | INTRCONN_SOCKET_C M1 L4 Base Address |
|--------------------------|------|-----------------------|----------------|--------------------------------------|
| CM_CM1_PROFILING_CLKCTRL | RW | 32 | 0x0000 0040 | 0x4A00 4040 |
| CM1_DEBUG_CFG | RW | 32 | 0x0000 00F0 | 0x4A00 40F0 |

3.11.22.2 INTRCONN_SOCKET_CM1 Register Description

Table 3-930. REVISION_CM1

| | | | |
|-------------------------|--|-----------------|---------------------|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4A00 4000 | Instance | INTRCONN_SOCKET_CM1 |
| Description | This register contains the IP revision code for the CM1 part of the PRCM | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|---------------------------|
| 31:0 | REVISION | Revision Number | R | 0x - TI Internal data. |

Table 3-931. Register Call Summary for Register REVISION_CM1

- [INTRCONN_SOCKET_CM1 Register Summary](#): [0]

Table 3-932. CM_CM1_PROFILING_CLKCTRL

| | | | |
|-------------------------|---|-----------------|---------------------|
| Address Offset | 0x0000 0040 | | |
| Physical Address | 0x4A00 4040 | Instance | INTRCONN_SOCKET_CM1 |
| Description | This register manages the CM1_PROFILING clock. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status | R | 0x3 |
| | | Read 0x0: Module is fully functional | | |
| | | Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion | | |
| | | Read 0x2: Module is in Idle | | |
| | | Read 0x3: Module is disabled | | |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disabled by software. INTRCONN configuration port is not accessible. 0x1: Module is managed automatically by hardware along with CM1 and EMU domain. INTRCONN configuration port is accessible only when EMU domain is on. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x1 |

Table 3-933. Register Call Summary for Register CM_CM1_PROFILING_CLKCTRL

PRCM Register Manual

- [INTRCONN_SOCKET_CM1 Register Summary: \[0\]](#)
- [RESTORE_CM1 Register Description: \[1\]](#)

Table 3-934. CM1_DEBUG_CFG

| | | | |
|-------------------------|---|-----------------|---------------------|
| Address Offset | 0x0000 00F0 | Instance | INTRCONN_SOCKET_CM1 |
| Physical Address | 0x4A00 40F0 | | |
| Description | This register is used to configure the CM1's 32-bit debug output. There is one 7-bit source select field for selecting from a shared set of 8-bit internal signal blocks per byte. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|------|----|----|----|----|----|----|----------|------|----|----|----|----|----|----|----------|------|----|----|----|----|---|---|----------|------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | SEL3 | | | | | | | RESERVED | SEL2 | | | | | | | RESERVED | SEL1 | | | | | | | RESERVED | SEL0 | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31 | RESERVED | | R | 0 |
| 30:24 | SEL3 | Internal signal block select for debug word byte-3 | RW | 0x03 |
| 23 | RESERVED | | R | 0 |
| 22:16 | SEL2 | Internal signal block select for debug word byte-2 | RW | 0x02 |
| 15 | RESERVED | | R | 0 |
| 14:8 | SEL1 | Internal signal block select for debug word byte-1 | RW | 0x01 |
| 7 | RESERVED | | R | 0 |
| 6:0 | SEL0 | Internal signal block select for debug word byte-0 | RW | 0x00 |

Table 3-935. Register Call Summary for Register CM1_DEBUG_CFG

PRCM Register Manual

- [INTRCONN_SOCKET_CM1 Register Summary: \[0\]](#)

3.11.23 CKGEN_CM1 Registers

3.11.23.1 CKGEN_CM1 Register Summary

Table 3-936. CKGEN_CM1 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CKGEN_CM1 L4 Base Address |
|--------------------------------|------|-----------------------|----------------|---------------------------|
| CM_CLKSEL_CORE | RW | 32 | 0x0000 0000 | 0x4A00 4100 |

Table 3-936. CKGEN_CM1 Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | CKGEN_CM1 L4 Base Address |
|-----------------------------|------|-----------------------|----------------|---------------------------|
| CM_CLKSEL_ABE | RW | 32 | 0x0000 0008 | 0x4A00 4108 |
| CM_DLL_CTRL | RW | 32 | 0x0000 0010 | 0x4A00 4110 |
| CM_CLKMODE_DPLL_CORE | RW | 32 | 0x0000 0020 | 0x4A00 4120 |
| CM_IDLEST_DPLL_CORE | R | 32 | 0x0000 0024 | 0x4A00 4124 |
| CM_AUTOIDLE_DPLL_CORE | RW | 32 | 0x0000 0028 | 0x4A00 4128 |
| CM_CLKSEL_DPLL_CORE | RW | 32 | 0x0000 002C | 0x4A00 412C |
| CM_DIV_M2_DPLL_CORE | RW | 32 | 0x0000 0030 | 0x4A00 4130 |
| CM_DIV_M3_DPLL_CORE | RW | 32 | 0x0000 0034 | 0x4A00 4134 |
| CM_DIV_M4_DPLL_CORE | RW | 32 | 0x0000 0038 | 0x4A00 4138 |
| CM_DIV_M5_DPLL_CORE | RW | 32 | 0x0000 003C | 0x4A00 413C |
| CM_DIV_M6_DPLL_CORE | RW | 32 | 0x0000 0040 | 0x4A00 4140 |
| CM_DIV_M7_DPLL_CORE | RW | 32 | 0x0000 0044 | 0x4A00 4144 |
| CM_SSC_DELTAMSTEP_DPLL_CORE | RW | 32 | 0x0000 0048 | 0x4A00 4148 |
| CM_SSC_MODFREQDIV_DPLL_CORE | RW | 32 | 0x0000 004C | 0x4A00 414C |
| CM_EMU_OVERRIDE_DPLL_CORE | RW | 32 | 0x0000 0050 | 0x4A00 4150 |
| CM_CLKMODE_DPLL_MPU | RW | 32 | 0x0000 0060 | 0x4A00 4160 |
| CM_IDLEST_DPLL_MPU | R | 32 | 0x0000 0064 | 0x4A00 4164 |
| CM_AUTOIDLE_DPLL_MPU | RW | 32 | 0x0000 0068 | 0x4A00 4168 |
| CM_CLKSEL_DPLL_MPU | RW | 32 | 0x0000 006C | 0x4A00 416C |
| CM_DIV_M2_DPLL_MPU | RW | 32 | 0x0000 0070 | 0x4A00 4170 |
| CM_SSC_DELTAMSTEP_DPLL_MPU | RW | 32 | 0x0000 0088 | 0x4A00 4188 |
| CM_SSC_MODFREQDIV_DPLL_MPU | RW | 32 | 0x0000 008C | 0x4A00 418C |
| CM_BYPCLK_DPLL_MPU | RW | 32 | 0x0000 009C | 0x4A00 419C |
| CM_CLKMODE_DPLL_IVA | RW | 32 | 0x0000 00A0 | 0x4A00 41A0 |
| CM_IDLEST_DPLL_IVA | R | 32 | 0x0000 00A4 | 0x4A00 41A4 |
| CM_AUTOIDLE_DPLL_IVA | RW | 32 | 0x0000 00A8 | 0x4A00 41A8 |
| CM_CLKSEL_DPLL_IVA | RW | 32 | 0x0000 00AC | 0x4A00 41AC |
| CM_DIV_M4_DPLL_IVA | RW | 32 | 0x0000 00B8 | 0x4A00 41B8 |
| CM_DIV_M5_DPLL_IVA | RW | 32 | 0x0000 00BC | 0x4A00 41BC |
| CM_SSC_DELTAMSTEP_DPLL_IVA | RW | 32 | 0x0000 00C8 | 0x4A00 41C8 |
| CM_SSC_MODFREQDIV_DPLL_IVA | RW | 32 | 0x0000 00CC | 0x4A00 41CC |
| CM_BYPCLK_DPLL_IVA | RW | 32 | 0x0000 00DC | 0x4A00 41DC |
| CM_CLKMODE_DPLL_ABE | RW | 32 | 0x0000 00E0 | 0x4A00 41E0 |
| CM_IDLEST_DPLL_ABE | R | 32 | 0x0000 00E4 | 0x4A00 41E4 |
| CM_AUTOIDLE_DPLL_ABE | RW | 32 | 0x0000 00E8 | 0x4A00 41E8 |
| CM_CLKSEL_DPLL_ABE | RW | 32 | 0x0000 00EC | 0x4A00 41EC |
| CM_DIV_M2_DPLL_ABE | RW | 32 | 0x0000 00F0 | 0x4A00 41F0 |
| CM_DIV_M3_DPLL_ABE | RW | 32 | 0x0000 00F4 | 0x4A00 41F4 |
| CM_SSC_DELTAMSTEP_DPLL_ABE | RW | 32 | 0x0000 0108 | 0x4A00 4208 |
| CM_SSC_MODFREQDIV_DPLL_ABE | RW | 32 | 0x0000 010C | 0x4A00 420C |
| RESERVED | RW | 32 | 0x0000 0120 | 0x4A00 4220 |
| RESERVED | R | 32 | 0x0000 0124 | 0x4A00 4224 |
| RESERVED | RW | 32 | 0x0000 0128 | 0x4A00 4228 |
| RESERVED | RW | 32 | 0x0000 012C | 0x4A00 422C |
| RESERVED | RW | 32 | 0x0000 0130 | 0x4A00 4230 |
| RESERVED | RW | 32 | 0x0000 0138 | 0x4A00 4238 |
| RESERVED | RW | 32 | 0x0000 013C | 0x4A00 423C |

Table 3-936. CKGEN_CM1 Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | CKGEN_CM1 L4 Base Address |
|--|------|-----------------------|----------------|---------------------------|
| RESERVED | RW | 32 | 0x0000 0140 | 0x4A00 4240 |
| RESERVED | RW | 32 | 0x0000 0148 | 0x4A00 4248 |
| RESERVED | RW | 32 | 0x0000 014C | 0x4A00 424C |
| CM_SHADOW_FREQ_CONFIG1 | RW | 32 | 0x0000 0160 | 0x4A00 4260 |
| CM_SHADOW_FREQ_CONFIG2 | RW | 32 | 0x0000 0164 | 0x4A00 4264 |
| CM_DYN_DEP_PRESCAL | RW | 32 | 0x0000 0170 | 0x4A00 4270 |
| CM_RESTORE_ST | RW | 32 | 0x0000 0180 | 0x4A00 4280 |

3.11.23.2 CKGEN_CM1 Register Description

Table 3-937. CM_CLKSEL_CORE

| | | | |
|-------------------------|------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0000 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4100 | | |
| Description | CORE module clock selection. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----------|----|-----------|----|----------|---|-------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | CLKSEL_L4 | | RESERVED | | CLKSEL_L3 | | RESERVED | | CLKSEL_CORE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKSEL_L4 | Selects L4 interconnect clock (L4_clk) 0x0: L4_CLK is L3_CLK divided by 1 0x1: L4_CLK is L3_CLK divided by 2, to be used for OPP119 and OPP50 | RW | 0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CLKSEL_L3 | Selects L3 interconnect clock (L3_clk) 0x0: L3_CLK is CORE_CLK divided by 1 0x1: L3_CLK is CORE_CLK divided by 2, to be used for OPP119 and OPP50 | RW | 0 |
| 3:1 | RESERVED | | R | 0x0 |
| 0 | CLKSEL_CORE | Selects CORE_CLK configuration 0x0: CORE_CLK is CORE_X2_CLK divided by 1, to be used for OPP119 and OPP50 0x1: CORE_CLK is CORE_X2_CLK divided by 2 | RW | 0 |

Table 3-938. Register Call Summary for Register CM_CLKSEL_CORE

Clock Management Functional Description

- [CM Clock Source: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[3\]](#)
- [CKGEN_CM1 Register Description: \[4\] \[5\]](#)
- [RESTORE_CM1 Register Description: \[6\] \[7\] \[8\]](#)

Table 3-939. CM_CLKSEL_ABE

| | | | |
|-------------------------|-----------------------------|-----------------|-----------|
| Address Offset | 0x0000 0008 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4108 | | |
| Description | ABE module clock selection. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----------|---------------|----------|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SLIMBUS_CLK_GATE | RESERVED | PAD_CLKS_GATE | RESERVED | | | | | | | | CLKSEL_OPP | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10 | SLIMBUS_CLK_GATE | Gating control for SLIMBUS_CLK clock tree in ABE. SLIMBUS module always gets the ungated version. 0x0: The clock is gated 0x1: The clock is enabled | RW | 0 |
| 9 | RESERVED | | R | 0 |
| 8 | PAD_CLKS_GATE | Gating control for PAD_CLKS clock tree in ABE 0x0: The clock is gated 0x1: The clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKSEL_OPP | Selects the OPP divider ABE domain 0x0: ABE_CLK is divide by 1 of DPLL_ABE_X2_CLK, to be used for OPP100 0x1: ABE_CLK is divide by 2 of DPLL_ABE_X2_CLK, to be used for OPP50 0x2: ABE_CLK is divide by 4 of DPLL_ABE_X2_CLK 0x3: Reserved | RW | 0x0 |

Table 3-940. Register Call Summary for Register CM_CLKSEL_ABE

Clock Management Functional Description

- [CM Clock Source: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[4\]](#)

Table 3-941. CM_DLL_CTRL

| | | | |
|-------------------------|----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0010 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4110 | | |
| Description | Special register for DLL control | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DLL_OVERRIDE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | DLL_OVERRIDE | Control if DLL lock and code outputs are overridden or not 0x0: Lock and code outputs are not overridden 0x1: Lock output is overridden to 1 and code output is overridden with a value coming from control module. | RW | 1 |

Table 3-942. Register Call Summary for Register CM_DLL_CTRL

PRCM Register Manual

- CKGEN_CM1 Register Summary: [0]
- CKGEN_CM1 Register Description: [1]
- RESTORE_CM1 Register Description: [2]

Table 3-943. CM_CLKMODE DPLL CORE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0020 | | |
| Physical Address | 0x4A00 4120 | Instance | CKGEN_CM1 |
| Description | This register allows controlling the DPLL modes. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|--------------|----|-------------|----|---------------|---|----------------|---|----------|---|--------------------|---|----------|---|--|--|---------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | DPLL_SSC_DOWNSPREAD | | DPLL_SSC_ACK | | DPLL_SSC_EN | | DPLL_REGM4XEN | | DPLL_LPMODE_EN | | RESERVED | | DPLL_DRIFTGUARD_EN | | RESERVED | | | | DPLL_EN | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14 | DPLL_SSC_DOWNSPREAD | Control if only low frequency spread is required 0x0: When SSC is enabled, clock frequency is spread on both sides of the programmed frequency 0x1: When SSC is enabled, clock frequency is spread only on the lower side of the programmed frequency | RW | 0 |
| 13 | DPLL_SSC_ACK | Acknowledgement from the DPLL regarding start and stop of Spread Spectrum Clocking feature Read 0x0: SSC has been turned off on PLL o/ps Read 0x1: SSC has been turned on on PLL o/ps | R | 0 |
| 12 | DPLL_SSC_EN | Enable or disable Spread Spectrum Clocking 0x0: SSC disabled 0x1: SSC enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|------|-------|
| 11 | DPLL_REGM4XEN | Enable the REGM4XEN mode of the DPLL. Please check the DPLL documentation to check when this mode can be enabled. Read 0x0: REGM4XEN mode of the DPLL is disabled | R | 0 |
| 10 | DPLL_LPMODE_EN | Set the DPLL in low-power mode. Check the DPLL documentation to see when this can be enabled. 0x0: Low-power mode of the DPLL is disabled 0x1: Low-power mode of the DPLL is enabled | RW | 0 |
| 9 | RESERVED | | RW | 0 |
| 8 | DPLL_DRIFTGUARD_EN | This bit allows to enable or disable the automatic recalibration feature of the DPLL. The DPLL will automatically start a recalibration process upon assertion of the DPLL's RECAL flag if this bit is set. 0x0: DRIFTGUARD feature is disabled 0x1: DRIFTGUARD feature is enabled | RW | 0 |
| 7:3 | RESERVED | | RW | 0x00 |
| 2:0 | DPLL_EN | DPLL control. Upon Warm Reset, the PRCM DPLL control state machine updates this register to reflect MN bypass mode. 0x0: Reserved 0x1: Reserved 0x2: Reserved 0x3: Reserved 0x4: Put the DPLL in MN bypass mode. The DPLL_MULT register bits are reset to 0 automatically by putting the DPLL in this mode. 0x5: Put the DPLL in Idle bypass low-power mode. 0x6: Put the DPLL in Idle bypass fast-relock mode. 0x7: Enables the DPLL in lock mode | RW | 0x4 |

Table 3-944. Register Call Summary for Register CM_CLKMODE_DPLL_CORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\] \[1\] \[2\] \[5\] \[6\] \[7\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[8\]](#)
- [CKGEN_CM1 Register Description: \[9\]](#)
- [RESTORE_CM1 Register Description: \[10\] \[11\]](#)

Table 3-945. CM_IDLEST_DPLL_CORE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0024 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4124 | | |
| Description | This register allows monitoring DPLL activity. This register is read only and automatically updated. [warm reset insensitive] | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|--------------|----------|---|---|---|---|---|---|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | ST_MN_BYPASS | RESERVED | | | | | | | ST_DPLL_CLK |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | ST_MN_BYPASS | DPLL MN_BYPASS status Read 0x1: DPLL is in MN_Bypass Read 0x0: DPLL is not in MN_Bypass | R | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | ST_DPLL_CLK | DPLL lock status Read 0x1: DPLL is LOCKED Read 0x0: DPLL is either in bypass mode or in stop mode. | R | 0 |

Table 3-946. Register Call Summary for Register CM_IDLEST_DPLL_CORE

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[0\]](#)

Table 3-947. CM_AUTOIDLE_DPLL_CORE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0028 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4128 | | |
| Description | This register provides automatic control over the DPLL activity. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | AUTO_DPLL_MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|------------|
| 31:3 | RESERVED | | R | 0x00000000 |
| 2:0 | AUTO_DPLL_MODE | DPLL automatic control. 0x0: DPLL auto control disabled 0x1: The DPLL is automatically put in low-power stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x2: The DPLL is automatically put in fast-relock stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x3: Reserved 0x4: Reserved 0x5: The DPLL is automatically put in idle bypass low-power mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x6: The DPLL is automatically put in idle bypass fast-relock mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x7: Reserved | RW | 0x0 |

Table 3-948. Register Call Summary for Register CM_AUTOIDLE_DPLL_CORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[1\]](#)
- [RESTORE_CM1 Register Description: \[2\]](#)

Table 3-949. CM_CLKSEL_DPLL_CORE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 002C | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 412C | | |
| Description | This register provides controls over the DPLL. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|-----------------|----------|----|-----------------------|----------|----|-----------|----|----|----|----|----|----|----|----------|---|----------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | DPLL_BYP_CLKSEL | RESERVED | | DPLL_CLKOUTHIF_CLKSEL | RESERVED | | DPLL_MULT | | | | | | | | RESERVED | | DPLL_DIV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|-------|
| 31:24 | RESERVED | | R | 0x00 |
| 23 | DPLL_BYP_CLKSEL | Allows control of the BYPASS clock of the PLL and the associated HSDIVIDER. Same as ULOWCLKEN on DPLL. In DPLL locked mode, 0 - No impact 1 - No impact In DPLL bypass mode, 0 - CLKINP is selected as the BYPASS clock for CLKOUT/CLKOUTX2 1 - CLKINPULOW is selected as the BYPASS clock for CLKOUT/CLKOUTX2 | RW | 0 |
| 22:21 | RESERVED | | R | 0x0 |
| 20 | DPLL_CLKOUTHIF_CLKSEL | Selects the source of the DPLL CLKOUTHIF clock. Same as CLKINPHIFSEL pin on the DPLL 0x0: CLKOUTHIF is generated from the DPLL oscillator (DCO) 0x1: CLKOUTHIF is generated from CLKINPHIF | RW | 0 |
| 19 | RESERVED | | R | 0 |
| 18:8 | DPLL_MULT | DPLL multiplier factor (2 to 2047). This register is automatically cleared to 0 when the DPLL_EN field in the *CLKMODE_DPLL* register is set to select MN bypass mode. (equal to input M of DPLL; M=2 to 2047 = DPLL multiplies by M). 0x0: Reserved 0x1: Reserved | RW | 0x000 |
| 7 | RESERVED | | R | 0 |
| 6:0 | DPLL_DIV | DPLL divider factor (0 to 127) (equal to input N of DPLL; actual division factor is N+1). | RW | 0x00 |

Table 3-950. Register Call Summary for Register CM_CLKSEL_DPLL_CORE

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)
- [DPLL_CORE Description: \[1\] \[2\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[3\]](#)
- [RESTORE_CM1 Register Description: \[4\]](#)

Table 3-951. CM_DIV_M2_DPLL_CORE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0030 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4130 | | |
| Description | This register provides controls over the M2 divider of the DPLL. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|-----------------------|----|----------|----|----------------------|---|-----------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | ST_DPLL_CLKOUT | | DPLL_CLKOUT_GATE_CTRL | | RESERVED | | DPLL_CLKOUT_DIVCHACK | | DPLL_CLKOUT_DIV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|-----------|
| 31:10 | RESERVED | | R | 0x0000000 |
| 9 | ST_DPLL_CLKOUT | DPLL CLKOUT status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | DPLL_CLKOUT_GATE_CTRL | Control gating of DPLL CLKOUT 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | DPLL_CLKOUT_DIVCHACK | Toggle on this status bit after changing DPLL_CLKOUT_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | DPLL_CLKOUT_DIV | DPLL post-divider factor, M2, for internal clock generation (1 to 31); Divide value from 1 to 31. 0x0: Reserved 0x1: 1, to be used for OPP119 0x2: 2, to be used for OPP50 | RW | 0x01 |

Table 3-952. Register Call Summary for Register CM_DIV_M2_DPLL_CORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[4\]](#)
- [CKGEN_CM1 Register Description: \[5\]](#)
- [RESTORE_CM1 Register Description: \[6\] \[7\]](#)

Table 3-953. CM_DIV_M3_DPLL_CORE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0034 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4134 | | |
| Description | This register provides controls over the M3 divider of the DPLL. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|--------------------------|----|----------|----|-------------------------|---|--------------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | ST_DPLL_CLKOUTHIF | | DPLL_CLKOUTHIF_GATE_CTRL | | RESERVED | | DPLL_CLKOUTHIF_DIVCHACK | | DPLL_CLKOUTHIF_DIV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | ST_DPLL_CLKOUTHIF | DPLL CLKOUTHIF status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | DPLL_CLKOUTHIF_GATE_CTRL | Control gating of DPLL CLKOUTHIF 0x0: Gate unconditionally this clock and stop requesting it 0x1: Request this clock and un-gate it when available | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | DPLL_CLKOUTHIF_DIVCHACK | Toggle on this status bit after changing DPLL_CLKOUTHIF_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | DPLL_CLKOUTHIF_DIV | DPLL post-divider factor, M3, for internal clock generation (1 to 31); Divide value from 1 to 31. 0x0: Reserved 0x6: 6, to be used for OPP119 0x9: 9, to be used for OPP50 | RW | 0x01 |

Table 3-954. Register Call Summary for Register CM_DIV_M3_DPLL_CORE

Clock Management Functional Description

- [Generic DPLL Overview: \[0\]](#)
- [DPLL_CORE Description: \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[5\]](#)
- [RESTORE_CM1 Register Description: \[6\]](#)

Table 3-955. CM_DIV_M4_DPLL_CORE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0038 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4138 | | |
| Description | This register provides controls over the CLKOUT1 o/p of the HSDIVIDER. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----------------------|----|-----------------------------|---|----------|---|----------------------------|---|-----------------------|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT1_PWDN | | RESERVED | | ST_HSDIVIDER_CLKOUT1 | | HSDIVIDER_CLKOUT1_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT1_DIVCHACK | | HSDIVIDER_CLKOUT1_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HSDIVIDER_CLKOUT1_PWDN | Direct power down control for HSDIVIDER M4 divider and CLKOUT1 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | ST_HSDIVIDER_CLKOUT1 | HSDIVIDER CLKOUT1 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | HSDIVIDER_CLKOUT1_GATE_CTRL | Control gating of HSDIVIDER CLKOUT1 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT1_DIVCHACK | Toggle on this status bit after changing HSDIVIDER_CLKOUT1_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT1_DIV | DPLL M4 post-divider factor (1 to 31). 0x0: Reserved 0x8: 8, to be used for OPP119 and OPP50 | RW | 0x04 |

Table 3-956. Register Call Summary for Register CM_DIV_M4_DPLL_CORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[5\]](#)
- [RESTORE_CM1 Register Description: \[6\]](#)

Table 3-957. CM_DIV_M5_DPLL_CORE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 003C | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 413C | | |
| Description | This register provides controls over the CLKOUT2 o/p of the HSDIVIDER. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----|----|----------|----|---|---|----------------------|---|---|---|-----------------------------|---|---|---|----------|--|--|--|----------------------------|--|--|--|-----------------------|--|--|--|
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT2_PWDN | | | | RESERVED | | | | ST_HSDIVIDER_CLKOUT2 | | | | HSDIVIDER_CLKOUT2_GATE_CTRL | | | | RESERVED | | | | HSDIVIDER_CLKOUT2_DIVCHACK | | | | HSDIVIDER_CLKOUT2_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HSDIVIDER_CLKOUT2_PWDN | Direct power down control for HSDIVIDER M5 divider and CLKOUT2 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | ST_HSDIVIDER_CLKOUT2 | HSDIVIDER CLKOUT2 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | HSDIVIDER_CLKOUT2_GATE_CTRL | Control gating of HSDIVIDER CLKOUT2 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT2_DIVCHACK | Toggle on this status bit after changing HSDIVIDER_CLKOUT2_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT2_DIV | DPLL M5 post-divider factor (1 to 31). 0x0: Reserved 0x4: 4, to be used for OPP119 0x8: 8, to be used for OPP50 | RW | 0x04 |

Table 3-958. Register Call Summary for Register CM_DIV_M5_DPLL_CORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[5\]](#)
- [CKGEN_CM1 Register Description: \[6\]](#)
- [RESTORE_CM1 Register Description: \[7\] \[8\]](#)

Table 3-959. CM_DIV_M6_DPLL_CORE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0040 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4140 | | |
| Description | This register provides controls over the CLKOUT3 o/p of the HSDIVIDER. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----------------------|----|-----------------------------|---|----------|---|----------------------------|---|-----------------------|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT3_PWDN | | RESERVED | | ST_HSDIVIDER_CLKOUT3 | | HSDIVIDER_CLKOUT3_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT3_DIVCHACK | | HSDIVIDER_CLKOUT3_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HSDIVIDER_CLKOUT3_PWDN | Direct power down control for HSDIVIDER M6 divider and CLKOUT3 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | ST_HSDIVIDER_CLKOUT3 | HSDIVIDER CLKOUT3 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | HSDIVIDER_CLKOUT3_GATE_CTRL | Control gating of HSDIVIDER CLKOUT3 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT3_DIVCHACK | Toggle on this status bit after changing HSDIVIDER_CLKOUT3_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT3_DIV | DPLL M6 post-divider factor (1 to 31). 0x0: Reserved 0x6: 6, to be used for OPP119 0x8: 8, to be used for OPP50 | RW | 0x08 |

Table 3-960. Register Call Summary for Register CM_DIV_M6_DPLL_CORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[5\]](#)
- [RESTORE_CM1 Register Description: \[6\]](#)

Table 3-961. CM_DIV_M7_DPLL_CORE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0044 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4144 | | |
| Description | This register provides controls over the CLKOUT4 o/p of the HSDIVIDER. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----------------------|----|-----------------------------|---|----------|---|----------------------------|---|-----------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT4_PWDN | | RESERVED | | ST_HSDIVIDER_CLKOUT4 | | HSDIVIDER_CLKOUT4_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT4_DIVCHACK | | HSDIVIDER_CLKOUT4_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HSDIVIDER_CLKOUT4_PWDN | Direct power down control for HSDIVIDER M7 divider and CLKOUT4 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | ST_HSDIVIDER_CLKOUT4 | HSDIVIDER CLKOUT4 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | HSDIVIDER_CLKOUT4_GATE_CTRL | Control gating of HSDIVIDER CLKOUT4 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT4_DIVCHACK | Toggle on this status bit after changing HSDIVIDER_CLKOUT4_DIV indicates that the change in divider value has taken effect ⁽¹⁾ | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT4_DIV | DPLL M7 post-divider factor (1 to 31). 0x0: Reserved 0x5: 5, to be used for OPP119 0xA: 10, to be used for OPP50 | RW | 0x04 |

⁽¹⁾ It is toggled only if the programmed divider value differs from the previous one.

Table 3-962. Register Call Summary for Register CM_DIV_M7_DPLL_CORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[5\]](#)
- [RESTORE_CM1 Register Description: \[6\]](#)

Table 3-963. CM_SSC_DELTAMSTEP_DPLL_CORE

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0048 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4148 | | |
| Description | Control the DeltaMStep parameter for Spread Spectrum Clocking. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | DELTAMSTEP | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:0 | DELTAMSTEP | DeltaMStep is split into fractional and integer part. For Triangular Spread Spectrum: [19:18] for integer part, [17:0] for fractional part For Square Wave Spread Spectrum [19:14] for integer part, [13:0] for fractional part | RW | 0x00000 |

Table 3-964. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_CORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[1\]](#)
- [RESTORE_CM1 Register Description: \[2\]](#)

Table 3-965. CM_SSC_MODFREQDIV_DPLL_CORE

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 004C | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 414C | | |
| Description | Control the Modulation Frequency (Fm) for Spread Spectrum. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|----------|---------------------|---|---|---|---|---|---|---|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | | | | | | | | | MODFREQDIV_EXPONENT | | | | | | | RESERVED | MODFREQDIV_MANTISSA | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|-----------|
| 31:11 | RESERVED | | R | 0x0000000 |
| 10:8 | MODFREQDIV_EXPONENT | Set the Exponent component of MODFREQDIV factor | RW | 0x0 |
| 7 | RESERVED | | R | 0 |
| 6:0 | MODFREQDIV_MANTISSA | Set the Mantissa component of MODFREQDIV factor | RW | 0x00 |

Table 3-966. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_CORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[2\]](#)
- [RESTORE_CM1 Register Description: \[3\]](#)

Table 3-967. CM_EMU_OVERRIDE_DPLL_CORE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0050 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4150 | | |
| Description | This register provides emulation override controls over the CORE DPLL. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|----------|---|-------------------|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | CORE_DPLL_EMU_MULT | | | | | | | | RESERVED | | CORE_DPLL_EMU_DIV | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31:20 | RESERVED | | R | 0x000 |
| 19 | OVERWRITE_ENABLE | This bit allows to enable or disable the emulation override controls 0x0: The emulation override controls are disabled 0x1: The emulation override controls are enabled | RW | 0 |
| 18:8 | CORE_DPLL_EMU_MULT | DPLL multiplier factor (2 to 2047). (equal to input M of DPLL; M=2 to 2047 = DPLL multiplies by M) 0x0: Reserved 0x1: Reserved | RW | 0x000 |
| 7 | RESERVED | | R | 0 |
| 6:0 | CORE_DPLL_EMU_DIV | CORE DPLL override divider factor (0 to 127) (equal to input N of DPLL; actual division factor is N+1). | RW | 0x00 |

Table 3-968. Register Call Summary for Register CM_EMU_OVERRIDE_DPLL_CORE

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[0\]](#)

Table 3-969. CM_CLKMODE_DPLL_MPU

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0060 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4160 | | |
| Description | This register allows controlling the DPLL modes. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|--------------|-------------|---------------|----------------|----------|--------------------|----------|---|---|---|---------|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | DPLL_SSC_DOWNSPREAD | DPLL_SSC_ACK | DPLL_SSC_EN | DPLL_REGM4XEN | DPLL_LPMODE_EN | RESERVED | DPLL_DRIFTGUARD_EN | RESERVED | | | | DPLL_EN | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14 | DPLL_SSC_DOWNSPREAD | Control if only low frequency spread is required 0x0: When SSC is enabled, clock frequency is spread on both sides of the programmed frequency 0x1: When SSC is enabled, clock frequency is spread only on the lower side of the programmed frequency | RW | 0 |
| 13 | DPLL_SSC_ACK | Acknowledgement from the DPLL regarding start and stop of Spread Spectrum Clocking feature Read 0x0: SSC has been turned off on PLL o/ps Read 0x1: SSC has been turned on on PLL o/ps | R | 0 |
| 12 | DPLL_SSC_EN | Enable or disable Spread Spectrum Clocking 0x0: SSC disabled 0x1: SSC enabled | RW | 0 |
| 11 | DPLL_REGM4XEN | Enable the REGM4XEN mode of the DPLL. Please check the DPLL documentation to check when this mode can be enabled. Read 0x0: REGM4XEN mode of the DPLL is disabled | R | 0 |
| 10 | DPLL_LPMODE_EN | Set the DPLL in low-power mode. Check the DPLL documentation to see when this can be enabled. 0x0: Low-power mode of the DPLL is disabled 0x1: Low-power mode of the DPLL is enabled | RW | 0 |
| 9 | RESERVED | | RW | 0 |
| 8 | DPLL_DRIFTGUARD_EN | This bit allows to enable or disable the automatic recalibration feature of the DPLL. The DPLL will automatically start a recalibration process upon assertion of the DPLL's RECAL flag if this bit is set. 0x0: DRIFTGUARD feature is disabled 0x1: DRIFTGUARD feature is enabled | RW | 0 |
| 7:3 | RESERVED | | RW | 0x00 |
| 2:0 | DPLL_EN | DPLL control. Upon Warm Reset, the PRCM DPLL control state machine updates this register to reflect MN bypass mode. 0x0: Reserved 0x1: Reserved 0x2: Reserved 0x3: Reserved 0x4: Put the DPLL in MN bypass mode. The DPLL_MULT register bits are reset to 0 automatically by putting the DPLL in this mode. 0x5: Put the DPLL in idle bypass low-power mode. 0x6: Put the DPLL in idle bypass fast-relock mode. 0x7: Enables the DPLL in lock mode | RW | 0x4 |

Table 3-970. Register Call Summary for Register CM_CLKMODE_DPLL_MPU

Clock Management Functional Description

- [DPLL_MPU Description: \[0\] \[1\] \[2\] \[5\] \[6\] \[7\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[8\]](#)

Table 3-971. CM_IDLEST_DPLL_MPU

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0064 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4164 | | |
| Description | This register allows monitoring DPLL activity. This register is read only and automatically updated. [warm reset insensitive] | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----------|----|----|----|---|---|---|---|-------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ST_MN_BYPASS | | RESERVED | | | | | | | | ST_DPLL_CLK | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-----------|
| 31:9 | RESERVED | | R | 0x0000000 |
| 8 | ST_MN_BYPASS | DPLL MN_BYPASS status Read 0x1: DPLL is in MN_Bypass Read 0x0: DPLL is not in MN_Bypass | R | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | ST_DPLL_CLK | DPLL lock status Read 0x1: DPLL is LOCKED Read 0x0: DPLL is either in bypass mode or in stop mode. | R | 0 |

Table 3-972. Register Call Summary for Register CM_IDLEST_DPLL_MPU

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[0\]](#)

Table 3-973. CM_AUTOIDLE_DPLL_MPU

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0068 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4168 | | |
| Description | This register provides automatic control over the DPLL activity. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | AUTO_DPLL_MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | AUTO_DPLL_MODE | DPLL automatic control; 0x0: DPLL auto control disabled 0x1: The DPLL is automatically put in low-power stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x2: The DPLL is automatically put in fast-relock stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x3: Reserved 0x4: Reserved 0x5: The DPLL is automatically put in idle bypass low-power mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x6: The DPLL is automatically put in idle bypass fast-relock mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x7: Reserved | RW | 0x0 |

Table 3-974. Register Call Summary for Register CM_AUTOIDLE_DPLL_MPU

Clock Management Functional Description

- [DPLL_MPU Description: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[1\]](#)

Table 3-975. CM_CLKSEL_DPLL_MPU

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 006C | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 416C | | |
| Description | This register provides controls over the DPLL. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|-----------------|--------|----------|----|----|----|-----------|----|----|----|----|----|----|----|----------|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DCC_COUNT_MAX | | | | | | | | DPLL_BYP_CLKSEL | DCC_EN | RESERVED | | | | DPLL_MULT | | | | | | | | RESERVED | | DPLL_DIV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|--------------------|-------|
| 31:24 | DCC_COUNT_MAX | The value "NbCycles" set in this field determines the duration of the clock ramp step during which the output frequency is $F_{dpll}/(2 \times M2)$. The duration is computed as $32 \times \text{NbCycles}$ of L4 clock cycles (100 MHz). Duration should be 2.5 μs to allow enough time for DCC to lock. This bit field is relevant only when DCC_EN = 1. | RW | 0x05 |
| 23 | DPLL_BYP_CLKSEL | Only CLKINPULOW bypass clock supported for this PLL | R Returns 1s | 1 |
| 22 | DCC_EN | Enable or disable duty cycle correction. Must be enabled only for frequency 1 GHz. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| | | When enabled, the CLKOUTHIF output of the DPLL is used after duty cycle correction instead of CLKOUT. The M3 divider is hard-wired to 1 so the lock frequency Fdpll is directly provided to MPU. 0x0: DCC disabled 0x1: DCC enabled | | |
| 21:19 | RESERVED | | R | 0x0 |
| 18:8 | DPLL_MULT | DPLL multiplier factor (2 to 2047). This register is automatically cleared to 0 when the DPLL_EN field in the *CLKMODE_DPLL* register is set to select MN bypass mode. (equal to input M of DPLL; M=2 to 2047 = DPLL multiplies by M). 0x0: Reserved 0x1: Reserved | RW | 0x000 |
| 7 | RESERVED | | R | 0 |
| 6:0 | DPLL_DIV | DPLL divider factor (0 to 127) (equal to input N of DPLL; actual division factor is N+1). | RW | 0x00 |

Table 3-976. Register Call Summary for Register CM_CLKSEL_DPLL_MPU

Clock Management Functional Description

- [DPLL_MPU Description: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[4\]](#)

Table 3-977. CM_DIV_M2_DPLL_MPU

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0070 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4170 | | |
| Description | This register provides controls over the M2 divider of the DPLL. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|-----------------------|----|----------|----|----------------------|---|-----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ST_DPLL_CLKOUT | | DPLL_CLKOUT_GATE_CTRL | | RESERVED | | DPLL_CLKOUT_DIVCHACK | | DPLL_CLKOUT_DIV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|-----------|
| 31:10 | RESERVED | | R | 0x0000000 |
| 9 | ST_DPLL_CLKOUT | DPLL CLKOUT status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | DPLL_CLKOUT_GATE_CTRL | Control gating of DPLL CLKOUT 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|-------|
| 5 | DPLL_CLKOUT_DIVCHACK | Toggle on this status bit after changing DPLL_CLKOUT_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | DPLL_CLKOUT_DIV | DPLL post-divider factor, M2, for internal clock generation (1 to 31); Divide value from 1 to 31. 0x0: Reserved 0x1: 1, to be used for OPP100, OPP_TURBO and OPP_NITRO 0x2: 2, to be used for OPP50 | RW | 0x01 |

Table 3-978. Register Call Summary for Register CM_DIV_M2_DPLL_MPU

Clock Management Functional Description

- [DPLL_MPU Description: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[4\]](#)

Table 3-979. CM_SSC_DELTAMSTEP_DPLL_MPU

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0088 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4188 | | |
| Description | Control the DeltaMStep parameter for Spread Spectrum Clocking. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DELTAMSTEP | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:0 | DELTAMSTEP | DeltaMStep is split into fractional and integer part. For Triangular Spread Spectrum: [19:18] for integer part, [17:0] for fractional part For Square Wave Spread Spectrum [19:14] for integer part, [13:0] for fractional part | RW | 0x00000 |

Table 3-980. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_MPU

Clock Management Functional Description

- [DPLL_MPU Description: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[1\]](#)

Table 3-981. CM_SSC_MODFREQDIV_DPLL_MPU

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 008C | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 418C | | |
| Description | Control the Modulation Frequency (Fm) for Spread Spectrum. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|----------|---|---------------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | MODFREQDIV_EXPONENT | | | | | | RESERVED | | MODFREQDIV_MANTISSA | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10:8 | MODFREQDIV_EXPONENT | Set the Exponent component of MODFREQDIV factor | RW | 0x0 |
| 7 | RESERVED | | R | 0 |
| 6:0 | MODFREQDIV_MANTISSA | Set the Mantissa component of MODFREQDIV factor | RW | 0x00 |

Table 3-982. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_MPU

Clock Management Functional Description

- [DPLL_MPU Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[2\]](#)

Table 3-983. CM_BYPCLK_DPLL_MPU

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 009C | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 419C | | |
| Description | Control MPU PLL BYPASS clock. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKSEL | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | CLKSEL | Select the DPLL MPU bypass clock 0x0: DPLL_MPU bypass clock is CORE_X2_CLK divided by 1, to be used for OPP119 and OPP50 0x1: DPLL_MPU bypass clock is CORE_X2_CLK divided by 2 0x2: DPLL_MPU bypass clock is CORE_X2_CLK divided by 4 0x3: DPLL_MPU bypass clock is CORE_X2_CLK divided by 8 | RW | 0x0 |

Table 3-984. Register Call Summary for Register CM_BYPCLK_DPLL_MPU

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[1\]](#)

Table 3-985. CM_CLKMODE_DPLL_IVA

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00A0 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 41A0 | | |
| Description | This register allows controlling the DPLL modes. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|--------------|-------------|---------------|----------------|----------|--------------------|----------|---|---|---|---------|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | DPLL_SSC_DOWNSPREAD | DPLL_SSC_ACK | DPLL_SSC_EN | DPLL_REGM4XEN | DPLL_LPMODE_EN | RESERVED | DPLL_DRIFTGUARD_EN | RESERVED | | | | DPLL_EN | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14 | DPLL_SSC_DOWNSPREAD | Control if only low frequency spread is required 0x0: When SSC is enabled, clock frequency is spread on both sides of the programmed frequency 0x1: When SSC is enabled, clock frequency is spread only on the lower side of the programmed frequency | RW | 0 |
| 13 | DPLL_SSC_ACK | Acknowledgement from the DPLL regarding start and stop of Spread Spectrum Clocking feature Read 0x0: SSC has been turned off on PLL o/ps Read 0x1: SSC has been turned on on PLL o/ps | R | 0 |
| 12 | DPLL_SSC_EN | Enable or disable Spread Spectrum Clocking 0x0: SSC disabled 0x1: SSC enabled | RW | 0 |
| 11 | DPLL_REGM4XEN | Enable the REGM4XEN mode of the DPLL. Please check the DPLL documentation to check when this mode can be enabled. Read 0x0: REGM4XEN mode of the DPLL is disabled | R | 0 |
| 10 | DPLL_LPMODE_EN | Set the DPLL in low-power mode. Check the DPLL documentation to see when this can be enabled. 0x0: Low-power mode of the DPLL is disabled 0x1: Low-power mode of the DPLL is enabled | RW | 0 |
| 9 | RESERVED | | RW | 0 |
| 8 | DPLL_DRIFTGUARD_EN | This bit allows to enable or disable the automatic recalibration feature of the DPLL. The DPLL will automatically start a recalibration process upon assertion of the DPLL's RECAL flag if this bit is set. 0x0: DRIFTGUARD feature is disabled 0x1: DRIFTGUARD feature is enabled | RW | 0 |
| 7:3 | RESERVED | | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 2:0 | DPLL_EN | <p>DPLL control. Upon Warm Reset, the PRCM DPLL control state machine updates this register to reflect MN bypass mode.</p> <p>0x0: Reserved</p> <p>0x1: Reserved</p> <p>0x2: Reserved</p> <p>0x3: Reserved</p> <p>0x4: Put the DPLL in MN bypass mode. The DPLL_MULT register bits are reset to 0 automatically by putting the DPLL in this mode.</p> <p>0x5: Put the DPLL in idle bypass low-power mode.</p> <p>0x6: Reserved</p> <p>0x7: Enables the DPLL in lock mode</p> | RW | 0x4 |

Table 3-986. Register Call Summary for Register CM_CLKMODE_DPLL_IVA

Clock Management Functional Description

- [DPLL_IVA Description: \[0\] \[1\] \[2\] \[5\] \[6\] \[7\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[8\]](#)

Table 3-987. CM_IDLEST_DPLL_IVA

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00A4 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 41A4 | | |
| Description | This register allows monitoring DPLL activity. This register is read only and automatically updated. [warm reset insensitive] | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----------|----|----|----|----|---|---|---|---|---|-------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ST_MN_BYPASS | RESERVED | | | | | | | | | | ST_DPLL_CLK | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-----------|
| 31:9 | RESERVED | | R | 0x0000000 |
| 8 | ST_MN_BYPASS | <p>DPLL MN_BYPASS status</p> <p>Read 0x1: DPLL is in MN_Bypass</p> <p>Read 0x0: DPLL is not in MN_Bypass</p> | R | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | ST_DPLL_CLK | <p>DPLL lock status</p> <p>Read 0x1: DPLL is LOCKED</p> <p>Read 0x0: DPLL is either in bypass mode or in stop mode.</p> | R | 0 |

Table 3-988. Register Call Summary for Register CM_IDLEST_DPLL_IVA

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[0\]](#)

Table 3-989. CM_AUTOIDLE_DPLL_IVA

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00A8 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 41A8 | | |
| Description | This register provides automatic control over the DPLL activity. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | AUTO_DPLL_MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|------------|
| 31:3 | RESERVED | | R | 0x00000000 |
| 2:0 | AUTO_DPLL_MODE | DPLL automatic control; 0x0: DPLL auto control disabled 0x1: The DPLL is automatically put in low-power stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x2: The DPLL is automatically put in fast-relock stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x3: Reserved 0x4: Reserved 0x5: The DPLL is automatically put in idle bypass low-power mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x6: Reserved 0x7: Reserved | RW | 0x0 |

Table 3-990. Register Call Summary for Register CM_AUTOIDLE_DPLL_IVA

Clock Management Functional Description

- [DPLL_IVA Description: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[1\]](#)

Table 3-991. CM_CLKSEL_DPLL_IVA

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00AC | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 41AC | | |
| Description | This register provides controls over the DPLL. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----------|----|----|----|-----------|----|----|----|----|----|----|----|----------|----------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DPLL_BYP_CLKSEL | RESERVED | | | | DPLL_MULT | | | | | | | | RESERVED | DPLL_DIV | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|-------|
| 31:24 | RESERVED | | R | 0x00 |
| 23 | DPLL_BYP_CLKSEL | Allows control of the BYPASS clock of the PLL and the associated HSDIVIDER. Same as ULOWCLKEN on DPLL. In DPLL locked mode, 0 - No impact 1 - No impact In DPLL bypass mode, 0 - CLKINP is selected as the BYPASS clock for CLKOUT/CLKOUTX2 1 - CLKINPULOW is selected as the BYPASS clock for CLKOUT/CLKOUTX2 | RW | 0 |
| 22:19 | RESERVED | | R | 0x0 |
| 18:8 | DPLL_MULT | DPLL multiplier factor (2 to 2047). This register is automatically cleared to 0 when the DPLL_EN field in the *CLKMODE_DPLL* register is set to select MN bypass mode. (equal to input M of DPLL; M=2 to 2047 = DPLL multiplies by M). 0x0: Reserved 0x1: Reserved | RW | 0x000 |
| 7 | RESERVED | | R | 0 |
| 6:0 | DPLL_DIV | DPLL divider factor (0 to 127) (equal to input N of DPLL; actual division factor is N+1). | RW | 0x00 |

Table 3-992. Register Call Summary for Register CM_CLKSEL_DPLL_IVA

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)
- [DPLL_IVA Description: \[1\] \[2\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[3\]](#)

Table 3-993. CM_DIV_M4_DPLL_IVA

| | | | |
|------------------|--|----------|-----------|
| Address Offset | 0x0000 00B8 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 41B8 | | |
| Description | This register provides controls over the CLKOUT1 o/p of the HSDIVIDER. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----|----|----------|----|---|---|----------------------|---|-----------------------------|---|----------|---|----------------------------|---|-----------------------|--|--|--|
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT1_PWDN | | | | RESERVED | | | | ST_HSDIVIDER_CLKOUT1 | | HSDIVIDER_CLKOUT1_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT1_DIVCHACK | | HSDIVIDER_CLKOUT1_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HSDIVIDER_CLKOUT1_PWDN | Direct power down control for HSDIVIDER M4 divider and CLKOUT1 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | ST_HSDIVIDER_CLKOUT1 | HSDIVIDER CLKOUT1 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | HSDIVIDER_CLKOUT1_GATE_CTRL | Control gating of HSDIVIDER CLKOUT1 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT1_DIVCHACK | Toggle on this status bit after changing HSDIVIDER_CLKOUT1_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT1_DIV | DPLL M4 post-divider factor (1 to 31). 0x00: Reserved 0x2: 2, to be used for OPP_TURBO and OPP_NITRO 0x4: 4, to be used for OPP100 0x8: 8, to be used for OPP50 | RW | 0x04 |

Table 3-994. Register Call Summary for Register CM_DIV_M4_DPLL_IVA

Clock Management Functional Description

- [DPLL_IVA Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[5\]](#)

Table 3-995. CM_DIV_M5_DPLL_IVA

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00BC | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 41BC | | |
| Description | This register provides controls over the CLKOUT2 o/p of the HSDIVIDER. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----------------------|----|-----------------------------|---|----------|---|----------------------------|---|-----------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT2_PWDN | | RESERVED | | ST_HSDIVIDER_CLKOUT2 | | HSDIVIDER_CLKOUT2_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT2_DIVCHACK | | HSDIVIDER_CLKOUT2_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HSDIVIDER_CLKOUT2_PWDN | Direct power down control for HSDIVIDER M5 divider and CLKOUT2 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | ST_HSDIVIDER_CLKOUT2 | HSDIVIDER CLKOUT2 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | HSDIVIDER_CLKOUT2_GATE_CTRL | Control gating of HSDIVIDER CLKOUT2 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT2_DIVCHACK | Toggle on this status bit after changing HSDIVIDER_CLKOUT2_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT2_DIV | DPLL M5 post-divider factor (1 to 31). 0x00: Reserved 0x2: 2, to be used for OPP_NITRO 0x3: 3, to be used for OPP_TURBO 0x7: 7, to be used for OPP100 0xE: 14, to be used for OPP50 | RW | 0x04 |

Table 3-996. Register Call Summary for Register CM_DIV_M5_DPLL_IVA

Clock Management Functional Description

- [DPLL_IVA Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[5\]](#)

Table 3-997. CM_SSC_DELTAMSTEP_DPLL_IVA

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00C8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 41C8 | | | | | | | | | | | | | | | | Instance CKGEN_CM1 | | | | | | | | | | | | | | | |
| Description | Control the DeltaMStep parameter for Spread Spectrum Clocking. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | DELTAMSTEP | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:0 | DELTAMSTEP | DeltaMStep is split into fractional and integer part. For Triangular Spread Spectrum: [19:18] for integer part, [17:0] for fractional part For Square Wave Spread Spectrum [19:14] for integer part, [13:0] for fractional part | RW | 0x00000 |

Table 3-998. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_IVA

Clock Management Functional Description

- [DPLL_IVA Description: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[1\]](#)

Table 3-999. CM_SSC_MODFREQDIV_DPLL_IVA

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00CC | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CKGEN_CM1 | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 41CC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Control the Modulation Frequency (Fm) for Spread Spectrum. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|----------|---------------------|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | MODFREQDIV_EXPONENT | | | | | | | RESERVED | MODFREQDIV_MANTISSA | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10:8 | MODFREQDIV_EXPONENT | Set the Exponent component of MODFREQDIV factor | RW | 0x0 |
| 7 | RESERVED | | R | 0 |
| 6:0 | MODFREQDIV_MANTISSA | Set the Mantissa component of MODFREQDIV factor | RW | 0x00 |

Table 3-1000. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_IVA

Clock Management Functional Description

- [DPLL_IVA Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[2\]](#)

Table 3-1001. CM_BYPCLK_DPLL_IVA

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00DC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 41DC | | | | | | | | | | | | | | | | InstanceCKGEN_CM1 | | | | | | | | | | | | | | | |
| Description | Control IVA PLL BYPASS clock. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKSEL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | CLKSEL | Select the DPLL IVA bypass clock 0x0: DPLL_IVA bypass clock is CORE_X2_CLK divided by 1, to be used for OPP119 and OPP50 0x1: DPLL_IVA bypass clock is CORE_X2_CLK divided by 2 0x2: DPLL_IVA bypass clock is CORE_X2_CLK divided by 4 0x3: DPLL_IVA bypass clock is CORE_X2_CLK divided by 8 | RW | 0x0 |

Table 3-1002. Register Call Summary for Register CM_BYPCLK_DPLL_IVA

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[1\]](#)

Table 3-1003. CM_CLKMODE_DPLL_ABE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00E0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 41E0 | | | | | | | | | | | | | | | | InstanceCKGEN_CM1 | | | | | | | | | | | | | | | |
| Description | This register allows controlling the DPLL modes. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|--------------|----|-------------|----|---------------|---|----------------|---|----------|---|--------------------|---|----------|---|--|--|---------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | DPLL_SSC_DOWNSPREAD | | DPLL_SSC_ACK | | DPLL_SSC_EN | | DPLL_REGM4XEN | | DPLL_LPmode_EN | | RESERVED | | DPLL_DRIFTGUARD_EN | | RESERVED | | | | DPLL_EN | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14 | DPLL_SSC_DOWNSPREAD | Control if only low frequency spread is required 0x0: When SSC is enabled, clock frequency is spread on both sides of the programmed frequency 0x1: When SSC is enabled, clock frequency is spread only on the lower side of the programmed frequency | RW | 0 |
| 13 | DPLL_SSC_ACK | Acknowledgement from the DPLL regarding start and stop of Spread Spectrum Clocking feature Read 0x0: SSC has been turned off on PLL o/ps Read 0x1: SSC has been turned on on PLL o/ps | R | 0 |
| 12 | DPLL_SSC_EN | Enable or disable Spread Spectrum Clocking 0x0: SSC disabled 0x1: SSC enabled | RW | 0 |
| 11 | DPLL_REGM4XEN | Enable the REGM4XEN mode of the DPLL. Please check the DPLL documentation to check when this mode can be enabled. Read 0x0: REGM4XEN mode of the DPLL is disabled | RW | 0 |
| 10 | DPLL_LPMODE_EN | Set the DPLL in low-power mode. Check the DPLL documentation to see when this can be enabled. 0x0: Low-power mode of the DPLL is disabled 0x1: Low-power mode of the DPLL is enabled | RW | 0 |
| 9 | RESERVED | | RW | 0 |
| 8 | DPLL_DRIFTGUARD_EN | This bit allows to enable or disable the automatic recalibration feature of the DPLL. The DPLL will automatically start a recalibration process upon assertion of the DPLL's RECAL flag if this bit is set. 0x0: DRIFTGUARD feature is disabled 0x1: DRIFTGUARD feature is enabled | RW | 0 |
| 7:3 | RESERVED | | RW | 0x00 |
| 2:0 | DPLL_EN | DPLL control. Upon Warm Reset, the PRCM DPLL control state machine updates this register to reflect MN bypass mode. 0x0: Reserved 0x1: Reserved 0x2: Reserved 0x3: Reserved 0x4: Put the DPLL in MN bypass mode. The DPLL_MULT register bits are reset to 0 automatically by putting the DPLL in this mode. 0x5: Put the DPLL in idle bypass low-power mode. 0x6: Put the DPLL in idle bypass fast-relock mode. 0x7: Enables the DPLL in lock mode | RW | 0x4 |

Table 3-1004. Register Call Summary for Register CM_CLKMODE_DPLL_ABE

Clock Management Functional Description

- [DPLL_ABE Description: \[0\] \[1\] \[2\] \[5\] \[6\] \[7\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[8\]](#)

Table 3-1005. CM_IDLEST_DPLL_ABE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00E4 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 41E4 | | |
| Description | This register allows monitoring DPLL activity. This register is read only and automatically updated. [warm reset insensitive] | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | ST_MN_BYPASS | | | | | | | | RESERVED | | | | | | | | ST_DPLL_CLK |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-----------|
| 31:9 | RESERVED | | R | 0x0000000 |
| 8 | ST_MN_BYPASS | DPLL MN_BYPASS status Read 0x1: DPLL is in MN_Bypass Read 0x0: DPLL is not in MN_Bypass | R | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | ST_DPLL_CLK | DPLL lock status Read 0x1: DPLL is LOCKED Read 0x0: DPLL is either in bypass mode or in stop mode. | R | 0 |

Table 3-1006. Register Call Summary for Register CM_IDLEST_DPLL_ABE

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[0\]](#)

Table 3-1007. CM_AUTOIDLE_DPLL_ABE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00E8 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 41E8 | | |
| Description | This register provides automatic control over the DPLL activity. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | AUTO_DPLL_MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | AUTO_DPLL_MODE | DPLL automatic control; 0x0: DPLL auto control disabled 0x1: The DPLL is automatically put in low-power stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x2: The DPLL is automatically put in fast-relock stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x3: Reserved 0x4: Reserved 0x5: The DPLL is automatically put in idle bypass low-power mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x6: The DPLL is automatically put in idle bypass fast-relock mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x7: Reserved | RW | 0x0 |

Table 3-1008. Register Call Summary for Register CM_AUTOIDLE_DPLL_ABE

Clock Management Functional Description

- [DPLL_ABE Description: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[1\]](#)

Table 3-1009. CM_CLKSEL_DPLL_ABE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00EC | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 41EC | | |
| Description | This register provides controls over the DPLL. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----------|----|----|----|----|----|----|----|-----------|----|----|----|----|---|---|---|----------|----------|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | DPLL_BYP_CLKSEL | RESERVED | | | | | | | | DPLL_MULT | | | | | | | | RESERVED | DPLL_DIV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|-----------------|-------|
| 31:24 | RESERVED | | R | 0x00 |
| 23 | DPLL_BYP_CLKSEL | Only CLKINPULOW bypass clock supported for this PLL | R Returns 1s | 1 |
| 22:19 | RESERVED | | R | 0x0 |
| 18:8 | DPLL_MULT | DPLL multiplier factor (2 to 2047). This register is automatically cleared to 0 when the DPLL_EN field in the *CLKMODE_DPLL* register is set to select MN bypass mode. (equal to input M of DPLL; M=2 to 2047 = DPLL multiplies by M). 0x0: Reserved 0x1: Reserved | RW | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7 | RESERVED | | R | 0 |
| 6:0 | DPLL_DIV | DPLL divider factor (0 to 127) (equal to input N of DPLL; actual division factor is N+1). | RW | 0x00 |

Table 3-1010. Register Call Summary for Register CM_CLKSEL_DPLL_ABE

Clock Management Functional Description

- [DPLL_ABE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[2\]](#)

Table 3-1011. CM_DIV_M2_DPLL_ABE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00F0 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 41F0 | | |
| Description | This register provides controls over the M2 divider of the DPLL. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|-------------------------|----|---|---|----------------|---|---|---|-----------------------|---|---|---|----------|--|--|--|----------------------|--|--|--|-----------------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | ST_DPLL_CLKOUTX2 | | | | DPLL_CLKOUTX2_GATE_CTRL | | | | ST_DPLL_CLKOUT | | | | DPLL_CLKOUT_GATE_CTRL | | | | RESERVED | | | | DPLL_CLKOUT_DIVCHACK | | | | DPLL_CLKOUT_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11 | ST_DPLL_CLKOUTX2 | DPLL CLKOUTX2 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 10 | DPLL_CLKOUTX2_GATE_CTRL | Control gating of DPLL CLKOUTX2 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 9 | ST_DPLL_CLKOUT | DPLL CLKOUT status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | DPLL_CLKOUT_GATE_CTRL | Control gating of DPLL CLKOUT 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | DPLL_CLKOUT_DIVCHACK | Toggle on this status bit after changing DPLL_CLKOUT_DIV indicates that the change in divider value has taken effect | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------|
| 4:0 | DPLL_CLKOUT_DIV | DPLL post-divisor factor, M2, for internal clock generation (1 to 31). Divide value from 1 to 31. 0x0: Reserved 0x1: 1, to be used for OPP100 and OPP50 | RW | 0x01 |

Table 3-1012. Register Call Summary for Register CM_DIV_M2_DPLL_ABE

Clock Management Functional Description

- [DPLL_ABE Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[6\]](#)

Table 3-1013. CM_DIV_M3_DPLL_ABE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00F4 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 41F4 | | |
| Description | This register provides controls over the M3 divider of the DPLL. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|--------------------------|----|----------|----|-------------------------|---|--------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ST_DPLL_CLKOUTHIF | | DPLL_CLKOUTHIF_GATE_CTRL | | RESERVED | | DPLL_CLKOUTHIF_DIVCHACK | | DPLL_CLKOUTHIF_DIV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|-----------|
| 31:10 | RESERVED | | R | 0x0000000 |
| 9 | ST_DPLL_CLKOUTHIF | DPLL CLKOUTHIF status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | DPLL_CLKOUTHIF_GATE_CTRL | Control gating of DPLL CLKOUTHIF 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | DPLL_CLKOUTHIF_DIVCHACK | Toggle on this status bit after changing DPLL_CLKOUTHIF_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | DPLL_CLKOUTHIF_DIV | DPLL post-divisor factor, M3, for internal clock generation (1 to 31). Divide value from 1 to 31. 0x0: Reserved 0x1: 1, to be used for OPP100 and OPP50 | RW | 0x01 |

Table 3-1014. Register Call Summary for Register CM_DIV_M3_DPLL_ABE

Clock Management Functional Description

- [DPLL_ABE Description: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[4\]](#)

Table 3-1015. CM_SSC_DELTAMSTEP_DPLL_ABE

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0108 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4208 | | |
| Description | Control the DeltaMStep parameter for Spread Spectrum Clocking. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | DELTAMSTEP | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:0 | DELTAMSTEP | DeltaMStep is split into fractional and integer part. For Triangular Spread Spectrum: [19:18] for integer part, [17:0] for fractional part For Square Wave Spread Spectrum [19:14] for integer part, [13:0] for fractional part | RW | 0x00000 |

Table 3-1016. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_ABE

Clock Management Functional Description

- [DPLL_ABE Description: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[1\]](#)

Table 3-1017. CM_SSC_MODFREQDIV_DPLL_ABE

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 010C | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 420C | | |
| Description | Control the Modulation Frequency (Fm) for Spread Spectrum. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|----------|---------------------|---|---|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | MODFREQDIV_EXPONENT | | | | | | | RESERVED | MODFREQDIV_MANTISSA | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10:8 | MODFREQDIV_EXPONENT | Set the Exponent component of MODFREQDIV factor | RW | 0x0 |
| 7 | RESERVED | | R | 0 |
| 6:0 | MODFREQDIV_MANTISSA | Set the Mantissa component of MODFREQDIV factor | RW | 0x00 |

Table 3-1018. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_ABE

Clock Management Functional Description

- [DPLL_ABE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[2\]](#)

Table 3-1019. CM_SHADOW_FREQ_CONFIG1

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0160 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4260 | | |
| Description | Shadow register to program new DPLL configuration affecting EMIF and GPMC (L3 clock) functional frequency during DVFS. The PRCM h/w automatically applies the new configuration after EMIF/GPMC have been put in idle state. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|------------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|----------|---|---|---|-----------|--------------|----------|-------------|
| RESERVED | | | | | | | | DPLL_CORE_M2_DIV | | | | | | | | DPLL_CORE_DPLL_EN | | | | | | | | RESERVED | | | | DLL_RESET | DLL_OVERRIDE | RESERVED | FREQ_UPDATE |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:16 | RESERVED | | R | 0x10D |
| 15:11 | DPLL_CORE_M2_DIV | Shadow register for CM_DIV_M2_DPLL_CORE .DPLL_CLKOUT_DIV. The main register is automatically loaded with the shadow register value after EMIF IDLE if the FREQ_UPDATE field is set to 1. Divide value from 1 to 31. 0x0: Reserved | RW | 0x01 |
| 10:8 | DPLL_CORE_DPLL_EN | Shadow register for CM_CLKMODE_DPLL_CORE .DPLL_EN. The main register is automatically loaded with the shadow register value after EMIF IDLE if the FREQ_UPDATE field is set to 1. 0x0: Reserved 0x1: Reserved 0x2: Reserved 0x3: Reserved 0x4: Put the DPLL in MN bypass mode. The DPLL_MULT register bits are reset to 0 automatically by putting the DPLL in this mode. 0x5: Put the DPLL in idle bypass low-power mode. 0x6: Put the DPLL in idle bypass fast-relock mode. 0x7: Enables the DPLL in lock mode | RW | 0x5 |
| 7:4 | RESERVED | | R | 0x0 |
| 3 | DLL_RESET | Specify if DLL should be reset or not during the frequency change hardware sequence. 0x0: DLL is not reset during the frequency change hardware sequence 0x1: DLL is reset automatically during the frequency change hardware sequence | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|----------------|-------|
| 2 | DLL_OVERRIDE | Shadow register for CM_DLL_CTRL.DLL_OVERRIDE . The main register is automatically loaded with the shadow register value after EMIF IDLE if the FREQ_UPDATE field is set to 1. 0x0: Lock and code outputs are not overridden 0x1: Lock output is overridden to 1 and code output is overridden with a value coming from control module. | RW | 1 |
| 1 | RESERVED | | RW | 0 |
| 0 | FREQ_UPDATE | Writing 1 indicates that a new configuration is available. It is automatically cleared by h/w after the configuration has been applied. | RW WSpecial | 0 |

Table 3-1020. Register Call Summary for Register CM_SHADOW_FREQ_CONFIG1

Clock Management Functional Description

- [DPLLs Cascading: \[0\] \[1\]](#)

Device Low-Power States

- [Device Off Mode Wake-Up Sequences: \[2\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[3\]](#)
- [CKGEN_CM1 Register Description: \[4\] \[5\] \[6\]](#)
- [RESTORE_CM1 Register Description: \[7\] \[8\] \[9\] \[10\]](#)

Table 3-1021. CM_SHADOW_FREQ_CONFIG2

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0164 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4264 | | |
| Description | Shadow register to program new DPLL configuration affecting GPMC (L3 clock) functional frequency during DVFS. The PRCM h/w automatically applies the new configuration after EMIF/GPMC have been put in idle state. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|-----------|----|-------------|---|------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DPLL_CORE_M5_DIV | | | | CLKSEL_L3 | | CLKSEL_CORE | | GPMC_FREQ_UPDATE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:3 | DPLL_CORE_M5_DIV | Shadow register for CM_DIV_M5_DPLL_CORE.HSDIVIDER_CLKOUT2_DIV . The main register is automatically loaded with the shadow register value after GPMC IDLE if the CM_SHADOW_FREQ_CONFIG1.FREQ_UPDATE field is set to 1 and GPMC_FREQ_UPDATE is set to 1. Divide value from 1 to 31. 0x0: Reserved | RW | 0x01 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-------|
| 2 | CLKSEL_L3 | Shadow register for CM_CLKSEL_CORE .CLKSEL_L3. The main register is automatically loaded with the shadow register value after GPMC IDLE if the CM_SHADOW_FREQ_CONFIG1 .FREQ_UPDATE field is set to 1 and GPMC_FREQ_UPDATE is set to 1. 0x0: L3_CLK is CORE_CLK divided by 1 0x1: L3_CLK is CORE_CLK divided by 2 | RW | 0 |
| 1 | CLKSEL_CORE | Shadow register for CM_CLKSEL_CORE .CLKSEL_CORE. The main register is automatically loaded with the shadow register value after GPMC IDLE if the CM_SHADOW_FREQ_CONFIG1 .FREQ_UPDATE field is set to 1 and GPMC_FREQ_UPDATE is set to 1. 0x0: CORE_CLK is CORE_X2_CLK divided by 1 0x1: CORE_CLK is CORE_X2_CLK divided by 2 | RW | 0 |
| 0 | GPMC_FREQ_UPDATE | Controls whether or not GPMC has to be put automatically into idle during the frequency change operation. 0x0: GPMC is not put automatically into idle during frequency change operation. 0x1: GPMC is put automatically into idle during frequency change operation. | RW | 0 |

Table 3-1022. Register Call Summary for Register CM_SHADOW_FREQ_CONFIG2

Voltage Management Functional Description

- [GPMC Clocks Frequency Scaling Constraints: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[1\]](#)
- [RESTORE_CM1 Register Description: \[2\]](#)

Table 3-1023. CM_DYN_DEP_PRESCAL

| Address Offset | 0x0000 0170 | | | | | | | | | | | | | | | | Instance | CKGEN_CM1 | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|-----------|--|--|--|--|--|--|--|--|--|--|--|------|------------|--|--|
| Physical Address | 0x4A00 4270 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Control the time unit of the sliding window for dynamic dependencies (auto-sleep feature). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div><div>313029282726252423222120191817161514131211109876543210</div><div>RESERVEDPRESCAL</div></div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | Type | Reset | | |
| 31:6 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x00000000 | | |
| 5:0 | PRESCAL | Time unit is equal to (PRESCAL + 1) L4 clock cycles. | | | | | | | | | | | | | | | | | | | | | | | | | | | | RW | 0x20 | | |

Table 3-1024. Register Call Summary for Register CM_DYN_DEP_PRESCAL

Device Power Management Introduction

- [Clock Management: \[0\]](#)

PRCM Register Manual

- [EMU_CM Register Description: \[1\]](#)
- [CKGEN_CM1 Register Summary: \[2\]](#)
- [MPU_CM1 Register Description: \[3\]](#)
- [DSP_CM1 Register Description: \[4\]](#)
- [RESTORE_CM1 Register Description: \[5\]](#)
- [CORE_CM2 Register Description: \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [L4PER_CM2 Register Description: \[11\]](#)
- [RESTORE_CM2 Register Description: \[12\] \[13\] \[14\] \[15\] \[16\]](#)

Table 3-1025. CM_RESTORE_ST

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0180 | Instance | CKGEN_CM1 |
| Physical Address | 0x4A00 4280 | | |
| Description | Automatic restore status. This register is used by the system DMA to write a predefined value at the end of end automatic restore phase. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|---|---|---|-------------------|---|---|---|---|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | PHASE2B_COMPLETED | | | | | | | | | | | PHASE2A_COMPLETED | | | | | | | | | | | PHASE1_COMPLETED | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | PHASE2B_COMPLETED | Indicates if restore phase 2b is completed. Must be cleared by software before going to device OFF mode. | RW | 0 |
| 1 | PHASE2A_COMPLETED | Indicates if restore phase 2a is completed. Must be cleared by software before going to device OFF mode. | RW | 0 |
| 0 | PHASE1_COMPLETED | Indicates if restore phase 1 is completed. Must be cleared by software before going to device OFF mode. | RW | 0 |

Table 3-1026. Register Call Summary for Register CM_RESTORE_ST

PRCM Register Manual

- [CKGEN_CM1 Register Summary: \[0\]](#)

3.11.24 MPU_CM1 Registers

3.11.24.1 MPU_CM1 Register Summary

Table 3-1027. MPU_CM1 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | MPU_CM1 L4 Base Address |
|----------------------------------|------|-----------------------|----------------|-------------------------|
| CM_MPU_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A00 4300 |

Table 3-1027. MPU_CM1 Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | MPU_CM1 L4 Base Address |
|--------------------|------|-----------------------|----------------|-------------------------|
| CM_MPU_STATICDEP | RW | 32 | 0x0000 0004 | 0x4A00 4304 |
| CM_MPU_DYNAMICDEP | RW | 32 | 0x0000 0008 | 0x4A00 4308 |
| CM_MPU_MPU_CLKCTRL | R | 32 | 0x0000 0020 | 0x4A00 4320 |

3.11.24.2 MPU_CM1 Register Description

Table 3-1028. CM_MPU_CLKSTCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0000 | Instance | MPU_CM1 |
| Physical Address | 0x4A00 4300 | | |
| Description | This register enables the MPU domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|--------------------------|----------|---|---|---|---|---|---|--|--|--|-----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | CLKACTIVITY_MPU_DPLL_CLK | RESERVED | | | | | | | | | | CLKTRCTRL | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKACTIVITY_MPU_DPLL_CLK | This field indicates the state of the MPU_DPLL_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the MPU clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1029. Register Call Summary for Register CM_MPU_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\]](#)

PRCM Register Manual

- [MPU_CM1 Register Summary: \[2\]](#)
- [RESTORE_CM1 Register Description: \[3\]](#)

Table 3-1030. CM_MPU_STATICDEP

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0004 | Instance | MPU_CM1 |
| Physical Address | 0x4A00 4304 | | |
| Description | This register controls the static domain dependencies from MPU domain towards 'target' domains. It is relevant only for domain having system initiator(s). | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----------------|----------|---------------|---------------|--------------|-------------|-------------|-------------|----------------|--------------|--------------|---------------|-------------|---------------|-------------|----------------|
| RESERVED | | | | | | | | C2C_STATDEP RESERVED ALWONCORE_STATDEP | | | | | | | | L4WKUP_STATDEP | RESERVED | L4PER_STATDEP | L4CFG_STATDEP | SDMA_STATDEP | SGX_STATDEP | ISS_STATDEP | DSS_STATDEP | L3INIT_STATDEP | L3_2_STATDEP | L3_1_STATDEP | MEMIF_STATDEP | ABE_STATDEP | IVAHD_STATDEP | DSP_STATDEP | MPU_M3_STATDEP |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|--------|
| 31:19 | RESERVED | | R | 0x0000 |
| 18 | C2C_STATDEP | Static dependency towards C2C clock domain Read 0x0: Dependency is disabled | R | 0 |
| 17 | RESERVED | | R | 0 |
| 16 | ALWONCORE_STATDEP | Static dependency towards ALWONCORE clock domain Read 0x0: Dependency is disabled | R | 0 |
| 15 | L4WKUP_STATDEP | Static dependency towards L4WKUP clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 14 | RESERVED | | R | 0 |
| 13 | L4PER_STATDEP | Static dependency towards L4PER clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 12 | L4CFG_STATDEP | Static dependency towards L4CFG clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 11 | SDMA_STATDEP | Static dependency towards SDMA clock domain Read 0x0: Dependency is disabled | R | 0 |
| 10 | SGX_STATDEP | Static dependency towards SGX clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 9 | ISS_STATDEP | Static dependency towards ISS clock domain Read 0x0: Dependency is disabled | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------|
| 8 | DSS_STATDEP | Static dependency towards DSS clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 7 | L3INIT_STATDEP | Static dependency towards L3INIT clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 6 | L3_2_STATDEP | Static dependency towards L3_2 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 5 | L3_1_STATDEP | Static dependency towards L3_1 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 4 | MEMIF_STATDEP | Static dependency towards MEMIF clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 3 | ABE_STATDEP | Static dependency towards ABE clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | IWAHD_STATDEP | Static dependency towards IWAHD clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | DSP_STATDEP | Static dependency towards DSP clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | MPU_M3_STATDEP | Static dependency towards MPU_A3 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-1031. Register Call Summary for Register CM_MPU_STATICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)

PRCM Register Manual

- [MPU_CM1 Register Summary: \[15\]](#)

Table 3-1032. CM_MPU_DYNAMICDEP

| | | | |
|------------------|---|----------|---------|
| Address Offset | 0x0000 0008 | Instance | MPU_CM1 |
| Physical Address | 0x4A00 4308 | | |
| Description | This register controls the dynamic domain dependencies from MPU domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|--------------|------------|----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | | | | | | | | | | | L3_1_DYNDEP | MEMIF_DYNDEP | ABE_DYNDEP | RESERVED | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|-----------------|---------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor INTRCONN interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:6 | RESERVED | | R | 0x00000 |
| 5 | L3_1_DYNDEP | Dynamic dependency towards L3_1 clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 4 | MEMIF_DYNDEP | Dynamic dependency towards MEMIF clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 3 | ABE_DYNDEP | Dynamic dependency towards ABE clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 2:0 | RESERVED | | R | 0x0 |

Table 3-1033. Register Call Summary for Register CM_MPU_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [MPU_CM1 Register Summary: \[3\]](#)

Table 3-1034. CM_MPU_MPU_CLKCTRL

| | | | |
|-------------------------|---------------------------------------|-----------------|---------|
| Address Offset | 0x0000 0020 | Instance | MPU_CM1 |
| Physical Address | 0x4A00 4320 | | |
| Description | This register manages the MPU clocks. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|---------------------|----------------------|----------|----|----|----|--------|--------|----------|----|----|----|----|----|----|----|---|---|---|---|------------|---|---|---|---|---|
| RESERVED | | | | | | CLKSEL_ABE_DIV_MODE | CLKSEL_EMIF_DIV_MODE | RESERVED | | | | STBYST | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|--|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25 | CLKSEL_ABE_DIV_MODE | Selects the ratio for MPU-ABE async bridge versus MPU DPLL clock. 0x0: MPU DPLL clock divided by 4 0x1: MPU DPLL clock divided by 8 | RW | 0 |
| 24 | CLKSEL_EMIF_DIV_MODE | Selects the ratio for memory adapter clock (MA_EOCP_ICLK) versus MPU DPLL clock. 0x0: MPU DPLL clock divided by 2 0x1: MPU DPLL clock divided by 4 | RW | 0 |
| 23:19 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|--------------|--------|
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. Module clocks may be gated according to the clock domain state. | R Returns | 0x1 |

Table 3-1035. Register Call Summary for Register CM_MPU_MPU_CLKCTRL

Clock Management Functional Description

- [DPLL_MPU Description: \[0\] \[1\] \[2\]](#)
- [Clock Domain Module Attributes: \[3\] \[4\] \[5\]](#)

PRCM Register Manual

- [MPU_CM1 Register Summary: \[6\]](#)

3.11.25 DSP_CM1 Registers

3.11.25.1 DSP_CM1 Register Summary

Table 3-1036. DSP_CM1 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DSP_CM1 L4 Base Address |
|------------------------------------|------|-----------------------|----------------|-------------------------|
| CM_DSP_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A00 4400 |
| CM_DSP_STATICDEP | RW | 32 | 0x0000 0004 | 0x4A00 4404 |
| CM_DSP_DYNAMICDEP | RW | 32 | 0x0000 0008 | 0x4A00 4408 |
| CM_DSP_DSP_CLKCTRL | RW | 32 | 0x0000 0020 | 0x4A00 4420 |

3.11.25.2 DSP_CM1 Register Description

Table 3-1037. CM_DSP_CLKSTCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0000 | Instance | DSP_CM1 |
| Physical Address | 0x4A00 4400 | | |
| Description | This register enables the DSP domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----------|----|----|----|----|---|---|---|-----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_DSP_ROOT_CLK | RESERVED | | | | | | | | CLKTRCTRL | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKACTIVITY_DSP_ROOT_CLK | <p>This field indicates the state of the DSP_ROOT_CLK clock in the domain. [warm reset insensitive]</p> <p>Read 0x0: Corresponding clock is definitely gated</p> <p>Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing</p> | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | <p>Controls the clock state transition of the DSP clock domain.</p> <p>0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur.</p> <p>0x1: SW_SLEEP: Start a software forced sleep transition on the domain.</p> <p>0x2: SW_WKUP: Start a software forced wake-up transition on the domain.</p> <p>0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions.</p> | RW | 0x3 |

Table 3-1038. Register Call Summary for Register CM_DSP_CLKSTCTRL

Reset Management Functional Description

- [DSP Subsystem Power-On Reset Sequence: \[0\]](#)

Clock Management Functional Description

- [Clock Domain Modes: \[1\] \[2\]](#)

PRCM Register Manual

- [DSP_CM1 Register Summary: \[3\]](#)

Table 3-1039. CM_DSP_STATICDEP

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0004 | Instance | DSP_CM1 |
| Physical Address | 0x4A00 4404 | | |
| Description | This register controls the static domain dependencies from DSP domain towards 'target' domains. It is relevant only for domain having system initiator(s). | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----------------|----------|---------------|---------------|----------|-------------|----------|----------------|--------------|--------------|---------------|-------------|---------------|----------|---|
| RESERVED | | | | | | | | | | | | | | | | ALWONCORE_STATDEP | L4WKUP_STATDEP | RESERVED | L4PER_STATDEP | L4CFG_STATDEP | RESERVED | ISS_STATDEP | RESERVED | L3INIT_STATDEP | L3_2_STATDEP | L3_1_STATDEP | MEMIF_STATDEP | ABE_STATDEP | IVAHD_STATDEP | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|--------|
| 31:17 | RESERVED | | R | 0x0000 |
| 16 | ALWONCORE_STATDEP | Static dependency towards ALWONCORE clock domain Read 0x0: Dependency is disabled | R | 0 |
| 15 | L4WKUP_STATDEP | Static dependency towards L4WKUP clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 14 | RESERVED | | R | 0 |
| 13 | L4PER_STATDEP | Static dependency towards L4PER clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 12 | L4CFG_STATDEP | Static dependency towards L4CFG clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | ISS_STATDEP | Static dependency towards ISS clock domain Read 0x0: Dependency is disabled | R | 0 |
| 8 | RESERVED | | R | 0 |
| 7 | L3INIT_STATDEP | Static dependency towards L3INIT clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 6 | L3_2_STATDEP | Static dependency towards L3_2 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 5 | L3_1_STATDEP | Static dependency towards L3_1 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 4 | MEMIF_STATDEP | Static dependency towards MEMIF clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 3 | ABE_STATDEP | Static dependency towards ABE clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 2 | IVAHD_STATDEP | Static dependency towards IVAHD clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1:0 | RESERVED | | R | 0x0 |

Table 3-1040. Register Call Summary for Register CM_DSP_STATICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)

PRCM Register Manual

- [DSP_CM1 Register Summary: \[9\]](#)

Table 3-1041. CM_DSP_DYNAMICDEP

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0008 | Instance | DSP_CM1 |
| Physical Address | 0x4A00 4408 | | |
| Description | This register controls the dynamic domain dependencies from DSP domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------------|----------|------------|--------------|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | | | | | | | | | | | | | L3_1_DYNDEP | RESERVED | ABE_DYNDEP | IVAHD_DYNDEP | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|---------------------|---------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor INTRCONN interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:6 | RESERVED | | R | 0x00000 |
| 5 | L3_1_DYNDEP | Dynamic dependency towards L3_1 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 4 | RESERVED | | R | 0 |
| 3 | ABE_DYNDEP | Dynamic dependency towards ABE clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 2 | IVAHD_DYNDEP | Dynamic dependency towards IVAHD clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 1:0 | RESERVED | | R | 0x0 |

Table 3-1042. Register Call Summary for Register CM_DSP_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [DSP_CM1 Register Summary: \[3\]](#)

Table 3-1043. CM_DSP_DSP_CLKCTRL

| | | | |
|-------------------------|---------------------------------------|-----------------|---------|
| Address Offset | 0x0000 0020 | Instance | DSP_CM1 |
| Physical Address | 0x4A00 4420 | | |
| Description | This register manages the DSP clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|--------|----|--------|----|----------|----|----|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | STBYST | | IDLEST | | RESERVED | | | | | | | | | | | | MODULEMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:19 | RESERVED | | R | 0x0000 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1044. Register Call Summary for Register CM_DSP_DSP_CLKCTRL

Reset Management Functional Description

- [DSP Subsystem Power-On Reset Sequence: \[0\]](#)

Clock Management Functional Description

- [Clock Domain Module Attributes: \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [DSP_CM1 Register Summary: \[4\]](#)

3.11.26 ABE_CM1 Registers

3.11.26.1 ABE_CM1 Register Summary

Table 3-1045. ABE_CM1 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ABE_CM1 L4 Base Address |
|--|------|-----------------------|----------------|-------------------------|
| CM1_ABE_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A00 4500 |
| CM1_ABE_L4ABE_CLKCTRL | R | 32 | 0x0000 0020 | 0x4A00 4520 |
| CM1_ABE_AESS_CLKCTRL | RW | 32 | 0x0000 0028 | 0x4A00 4528 |
| CM1_ABE_PDM_CLKCTRL | RW | 32 | 0x0000 0030 | 0x4A00 4530 |
| CM1_ABE_DMIC_CLKCTRL | RW | 32 | 0x0000 0038 | 0x4A00 4538 |
| CM1_ABE_MCASP_CLKCTRL | RW | 32 | 0x0000 0040 | 0x4A00 4540 |
| CM1_ABE_MCBSP1_CLKCTRL | RW | 32 | 0x0000 0048 | 0x4A00 4548 |
| CM1_ABE_MCBSP2_CLKCTRL | RW | 32 | 0x0000 0050 | 0x4A00 4550 |
| CM1_ABE_MCBSP3_CLKCTRL | RW | 32 | 0x0000 0058 | 0x4A00 4558 |
| CM1_ABE_SLIMBUS_CLKCTRL | RW | 32 | 0x0000 0060 | 0x4A00 4560 |
| CM1_ABE_GPTIMER5_CLKCTRL | RW | 32 | 0x0000 0068 | 0x4A00 4568 |
| CM1_ABE_GPTIMER6_CLKCTRL | RW | 32 | 0x0000 0070 | 0x4A00 4570 |
| CM1_ABE_GPTIMER7_CLKCTRL | RW | 32 | 0x0000 0078 | 0x4A00 4578 |
| CM1_ABE_GPTIMER8_CLKCTRL | RW | 32 | 0x0000 0080 | 0x4A00 4580 |
| CM1_ABE_WDTIMER3_CLKCTRL | RW | 32 | 0x0000 0088 | 0x4A00 4588 |

3.11.26.2 ABE_CM1 Register Description**Table 3-1046. CM1_ABE_CLKSTCTRL**

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0000 | Instance | ABE_CM1 |
| Physical Address | 0x4A00 4500 | | |
| Description | This register enables the ABE domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|-------------------------------|---|---|---|---|---|-------------------------|---|---|---|--|--|----------------------|--|--|--|--|--|-----------------------|--|--|--|--|--|-----------------------------|--|--|--|--|--|----------|--|--|--|--|--|-----------|--|
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_ABE_24M_FCLK | | | | | | CLKACTIVITY_ABE_ALWON_32K_CLK | | | | | | CLKACTIVITY_ABE_SYSCCLK | | | | | | CLKACTIVITY_24M_FCLK | | | | | | CLKACTIVITY_ABE_ICLK2 | | | | | | CLKACTIVITY_DPLL_ABE_X2_CLK | | | | | | RESERVED | | | | | | CLKTRCTRL | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13 | CLKACTIVITY_ABE_24M_FCLK | This field indicates the state of the ABE_24M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------|--|------|-------|
| 12 | CLKACTIVITY_ABE_ALWON_32K_CLK | This field indicates the state of the ABE_ALWON_32K_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 11 | CLKACTIVITY_ABE_SYSCLK | This field indicates the state of the ABE_SYSCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 10 | CLKACTIVITY_24M_FCLK | This field indicates the state of the 24M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 9 | CLKACTIVITY_ABE_ICLK2 | This field indicates the state of the ABE_ICLK2 interface clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 8 | CLKACTIVITY_DPLL_ABE_X2_CLK | This field indicates the state of the DPLL_ABE_X2_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the ABE clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. 0x1: SW_SLEEP: Start a software forced sleep transition on the domain. 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x3 |

Table 3-1047. Register Call Summary for Register CM1_ABE_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[7\]](#)

Table 3-1048. CM1_ABE_L4ABE_CLKCTRL

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0020 | Instance | ABE_CM1 |
| Physical Address | 0x4A00 4520 | | |
| Description | This register manages the L4ABE clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | MODULEMODE | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|--------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Returns | 0x1 |

Table 3-1049. Register Call Summary for Register CM1_ABE_L4ABE_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[2\]](#)

Table 3-1050. CM1_ABE_AESS_CLKCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0028 | Instance | ABE_CM1 |
| Physical Address | 0x4A00 4528 | | |
| Description | This register manages the AESS clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------------|----|----------|----|----|----|--------|----|--------|----|----------|----|----|----|----|----|----|----|------------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | CLKSEL_AESS_FCLK | | RESERVED | | | | STBYST | | IDLEST | | RESERVED | | | | | | | | MODULEMODE | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|--------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL_AESS_FCLK | Selects the ratio of AESS_FCLK to ABE_CLK 0x0: AESS_FCLK is divide by 1 of ABE_CLK 0x1: AESS_FCLK is divide by 2 of ABE_CLK | RW | 0 |
| 23:19 | RESERVED | | R | 0x00 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1051. Register Call Summary for Register CM1 ABE AESS CLKCTRL

Clock Management Functional Description

- CM Clock Source: [0] [1]
- Clock Domain Module Attributes: [2] [3] [4]

PRCM Register Manual

- ABE_CM1 Register Summary: [5]

Table 3-1052. CM1 ABE PDM CLKCTRL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0030 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 4530 | | | | | | | | | | | | | | | | Instance | ABE_CM1 | | | | | | | | | | | | | | | |
| Description | This register manages the PDM clocks. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | | | MODULEMODE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guaranteed to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1053. Register Call Summary for Register CM1_ABE_PDM_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[2\]](#)

Table 3-1054. CM1_ABE_DMIC_CLKCTRL

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0038 | Instance | ABE_CM1 |
| Physical Address | 0x4A00 4538 | | |
| Description | This register manages the DMIC clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------------------|----|---------------|----|----------|----|----|----|--------|----|----------|----|----|----|----|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | CLKSEL_INTERNAL_SOURCE | | CLKSEL_SOURCE | | RESERVED | | | | IDLEST | | RESERVED | | | | | | | | | | | | | | MODULEMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|--------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:26 | CLKSEL_INTERNAL_SOURCE | <p>Selects the internal clock to be used as the functional clock in case CLKSEL_SOURCE selects the internal clock source as the functional clock source.</p> <p>0x0: 24MHz clock derived from DPLL_ABE is selected</p> <p>0x1: ABE_SYSCCLK is selected</p> <p>0x2: 24MHz clock derived from DPLL_PER is selected</p> <p>0x3: Reserved</p> | RW | 0x0 |
| 25:24 | CLKSEL_SOURCE | <p>Selects the source of the functional clock between, internal source, CLKS pad and Audio SLIMBUS_CLK pad. The switching between the clocks is not guaranteed to be glitchless.</p> <p>0x0: Functional clock is sourced from an internal clock</p> <p>0x1: Functional clock is sourced from CLKS pad</p> <p>0x2: Functional clock is sourced from Audio SIMBUS pad</p> <p>0x3: Reserved</p> | RW | 0x0 |
| 23:18 | RESERVED | | R | 0x00 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup).</p> <p>Read 0x1: Reserved</p> <p>0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen.</p> <p>Read 0x3: Reserved</p> | RW | 0x0 |

Table 3-1055. Register Call Summary for Register CM1_ABE_DMIC_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\] \[1\]](#)
- [Clock Domain Module Attributes: \[2\] \[3\]](#)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[4\]](#)

Table 3-1056. CM1_ABE_MCASP_CLKCTRL

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0040 | Instance | ABE_CM1 |
| Physical Address | 0x4A00 4540 | | |
| Description | This register manages the MCASP clocks. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|------------------------|----|---------------|----|----------|----|----|----|--------|----|----------|----|----|----|----|----|----|----|---|---|---|---|------------|---|---|---|---|---|
| RESERVED | | | | CLKSEL_INTERNAL_SOURCE | | CLKSEL_SOURCE | | RESERVED | | | | IDLEST | | RESERVED | | | | | | | | | | | | MODULEMODE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|--|------|--------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:26 | CLKSEL_INTERNAL_SOURCE | <p>Selects the internal clock to be used as the functional clock in case CLKSEL_SOURCE selects the internal clock source as the functional clock source.</p> <p>0x0: 24MHz clock derived from DPLL_ABE is selected</p> <p>0x1: ABE_SYSCLK is selected</p> <p>0x2: 24MHz clock derived from DPLL_PER is selected</p> <p>0x3: Reserved</p> | RW | 0x0 |
| 25:24 | CLKSEL_SOURCE | <p>Selects the source of the functional clock between, internal source, CLKS pad and Audio SLIMBUS_CLK pad. The switching between the clocks is not guaranteed to be glitchless.</p> <p>0x0: Functional clock is sourced from an internal clock</p> <p>0x1: Functional clock is sourced from CLKS pad</p> <p>0x2: Functional clock is sourced from Audio SIMBUS pad</p> <p>0x3: Reserved</p> | RW | 0x0 |
| 23:18 | RESERVED | | R | 0x00 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1057. Register Call Summary for Register CM1_ABE_MCASP_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\] \[1\]](#)
- [Clock Domain Module Attributes: \[2\] \[3\]](#)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[4\]](#)

Table 3-1058. CM1_ABE_MCBSP1_CLKCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0048 | Instance | ABE_CM1 |
| Physical Address | 0x4A00 4548 | | |
| Description | This register manages the MCBSP1 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------------------|----|----|---------------|----|----------|----|----|----|--------|----|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | CLKSEL_INTERNAL_SOURCE | | | CLKSEL_SOURCE | | RESERVED | | | | IDLEST | | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:26 | CLKSEL_INTERNAL_SOURCE | Selects the internal clock to be used as the functional clock in case CLKSEL_SOURCE selects the internal clock source as the functional clock source. 0x0: 24MHz clock derived from DPLL_ABE is selected 0x1: ABE_SYSCLK is selected 0x2: 24MHz clock derived from DPLL_PER is selected 0x3: Reserved | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|--------|
| 25:24 | CLKSEL_SOURCE | Selects the source of the functional clock between, internal source, CLKS pad and Audio SLIMBUS_CLK pad. The switching between the clocks is not guaranteed to be glitchless. 0x0: Functional clock is sourced from an internal clock 0x1: Functional clock is sourced from CLKS pad 0x2: Functional clock is sourced from Audio SIMBUS pad 0x3: Reserved | RW | 0x0 |
| 23:18 | RESERVED | | R | 0x00 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1059. Register Call Summary for Register CM1_ABE_MCBSP1_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\] \[1\]](#)
- [Clock Domain Module Attributes: \[2\] \[3\]](#)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[4\]](#)

Table 3-1060. CM1_ABE_MCBSP2_CLKCTRL

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0050 | | |
| Physical Address | 0x4A00 4550 | Instance | ABE_CM1 |
| Description | This register manages the MCBSP2 clocks. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|------------------------|----|---------------|----|----------|----|----|----|--------|----|----------|----|----|----|----|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| RESERVED | | | | CLKSEL_INTERNAL_SOURCE | | CLKSEL_SOURCE | | RESERVED | | | | IDLEST | | RESERVED | | | | | | | | | | | | | | MODULEMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|--|------|--------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:26 | CLKSEL_INTERNAL_SOURCE | Selects the internal clock to be used as the functional clock in case CLKSEL_SOURCE selects the internal clock source as the functional clock source. 0x0: 24MHz clock derived from DPLL_ABE is selected 0x1: ABE_SYSCCLK is selected 0x2: 24MHz clock derived from DPLL_PER is selected 0x3: Reserved | RW | 0x0 |
| 25:24 | CLKSEL_SOURCE | Selects the source of the functional clock between, internal source, CLKS pad and Audio SLIMBUS_CLK pad. The switching between the clocks is not guaranteed to be glitchless. 0x0: Functional clock is sourced from an internal clock 0x1: Functional clock is sourced from CLKS pad 0x2: Functional clock is sourced from Audio SIMBUS pad 0x3: Reserved | RW | 0x0 |
| 23:18 | RESERVED | | R | 0x00 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1061. Register Call Summary for Register CM1_ABE_MCBSP2_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\] \[1\]](#)
- [Clock Domain Module Attributes: \[2\] \[3\]](#)

Table 3-1061. Register Call Summary for Register CM1_ABE_MCBSP2_CLKCTRL (continued)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[4\]](#)

Table 3-1062. CM1_ABE_MCBSP3_CLKCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0058 | Instance | ABE_CM1 |
| Physical Address | 0x4A00 4558 | | |
| Description | This register manages the MCBSP3 clocks. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|------------------------|----|---------------|----|----------|----|----|----|--------|----|----------|----|----|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| RESERVED | | | | CLKSEL_INTERNAL_SOURCE | | CLKSEL_SOURCE | | RESERVED | | | | IDLEST | | RESERVED | | | | | | | | | | MODULEMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|--------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:26 | CLKSEL_INTERNAL_SOURCE | Selects the internal clock to be used as the functional clock in case CLKSEL_SOURCE selects the internal clock source as the functional clock source. 0x0: 24MHz clock derived from DPLL_ABE is selected 0x1: ABE_SYSCCLK is selected 0x2: 24MHz clock derived from DPLL_PER is selected 0x3: Reserved | RW | 0x0 |
| 25:24 | CLKSEL_SOURCE | Selects the source of the functional clock between, internal source, CLKS pad and Audio SLIMBUS_CLK pad. The switching between the clocks is not guaranteed to be glitchless. 0x0: Functional clock is sourced from an internal clock 0x1: Functional clock is sourced from CLKS pad 0x2: Functional clock is sourced from Audio SIMBUS pad 0x3: Reserved | RW | 0x0 |
| 23:18 | RESERVED | | R | 0x00 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1063. Register Call Summary for Register CM1_ABE_MCBSP3_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\] \[1\]](#)
- [Clock Domain Module Attributes: \[2\] \[3\]](#)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[4\]](#)

Table 3-1064. CM1_ABE_SLIMBUS_CLKCTRL

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0060 | Instance | ABE_CM1 |
| Physical Address | 0x4A00 4560 | | |
| Description | This register manages the SLIMBUS clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|-----------------------|----|----|---|-----------------|---|---|---|-----------------|---|---|---|-----------------|--|--|--|----------|--|--|--|--|--|--|--|------------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | OPTFCLKEN_SLIMBUS_CLK | | | | OPTFCLKEN_FCLK2 | | | | OPTFCLKEN_FCLK1 | | | | OPTFCLKEN_FCLK0 | | | | RESERVED | | | | | | | | MODULEMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:12 | RESERVED | | R | 0x0 |
| 11 | OPTFCLKEN_SLIMBUS_CLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |

Table 3-1065. Register Call Summary for Register CM1_ABE_SLIMBUS_CLKCTRL

- Clock Domain Module Attributes: [0] [1]

- ABE_CM1 Register Summary: [2]

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0068 | Instance | ABE_CM1 |
| Physical Address | 0x4A00 4568 | | |
| Description | This register manages the TIMER5 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|--------|----------|----|----|----|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | CLKSEL | RESERVED | | | | | | | IDLEST | RESERVED | | | | | | | | | | | MODULEMODE | | | | |

[Submit Documentation Feedback](#)

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1067. Register Call Summary for Register CM1_ABE_GPTIMER5_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\]](#)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[3\]](#)

Table 3-1068. CM1_ABE_GPTIMER6_CLKCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0070 | Instance | ABE_CM1 |
| Physical Address | 0x4A00 4570 | | |
| Description | This register manages the TIMER6 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|--------|----------|----|----|----|--------|----------|----|----|----|----|----|----|----|----|---|---|---|------------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | CLKSEL | RESERVED | | | | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL | Selects between ABE_SYSCCLK and ABE_ALWON_32K_CLK as the timer functional clock 0x0: Selects ABE_SYSCCLK as the functional clock 0x1: Selects ABE_ALWON_32K_CLK as the functional clock | RW | 0 |
| 23:18 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1069. Register Call Summary for Register CM1_ABE_GPTIMER6_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\]](#)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[3\]](#)

Table 3-1070. CM1_ABE_GPTIMER7_CLKCTRL

| | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0078 | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 4578 | | | | | | | | | | | | | | | |
| Instance | ABE_CM1 | | | | | | | | | | | | | | | |
| Description | This register manages the TIMER7 clocks. | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|--------|----------|----|----|----|--------|----------|----|----|----|----|----|----|----|----|---|------------|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | CLKSEL | RESERVED | | | | IDLEST | RESERVED | | | | | | | | | | MODULEMODE | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL | Selects between ABE_SYSCCLK and ABE_ALWON_32K_CLK as the timer functional clock 0x0: Selects ABE_SYSCCLK as the functional clock 0x1: Selects ABE_ALWON_32K_CLK as the functional clock | RW | 0 |
| 23:18 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1071. Register Call Summary for Register CM1_ABE_GPTIMER7_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\]](#)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[3\]](#)

Table 3-1072. CM1_ABE_GPTIMER8_CLKCTRL

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0080 | Instance | ABE_CM1 |
| Physical Address | 0x4A00 4580 | | |
| Description | This register manages the TIMER8 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|--------|----------|----|----|----|--------|----------|----|----|----|----|----|----|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | CLKSEL | RESERVED | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL | Selects between ABE_SYSCCLK and ABE_ALWON_32K_CLK as the timer functional clock 0x0: Selects ABE_SYSCCLK as the functional clock 0x1: Selects ABE_ALWON_32K_CLK as the functional clock | RW | 0 |
| 23:18 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1073. Register Call Summary for Register CM1_ABE_GPTIMER8_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\]](#)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[3\]](#)

Table 3-1074. CM1_ABE_WDTIMER3_CLKCTRL

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0088 | Instance | ABE_CM1 |
| Physical Address | 0x4A00 4588 | | |
| Description | This register manages the WDT3 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1075. Register Call Summary for Register CM1_ABE_WDTIMER3_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [ABE_CM1 Register Summary: \[2\]](#)

3.11.27 RESTORE_CM1 Registers

3.11.27.1 RESTORE_CM1 Register Summary

Table 3-1076. RESTORE_CM1 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | RESTORE_CM1 L4 Base Address |
|---|------|-----------------------|----------------|-----------------------------|
| CM_CLKSEL_CORE_RESTORE | RW | 32 | 0x0000 0000 | 0x4A00 4E00 |
| CM_DIV_M2_DPLL_CORE_RESTORE | RW | 32 | 0x0000 0004 | 0x4A00 4E04 |
| CM_DIV_M3_DPLL_CORE_RESTORE | RW | 32 | 0x0000 0008 | 0x4A00 4E08 |
| CM_DIV_M4_DPLL_CORE_RESTORE | RW | 32 | 0x0000 000C | 0x4A00 4E0C |
| CM_DIV_M5_DPLL_CORE_RESTORE | RW | 32 | 0x0000 0010 | 0x4A00 4E10 |
| CM_DIV_M6_DPLL_CORE_RESTORE | RW | 32 | 0x0000 0014 | 0x4A00 4E14 |
| CM_DIV_M7_DPLL_CORE_RESTORE | RW | 32 | 0x0000 0018 | 0x4A00 4E18 |
| CM_CLKSEL_DPLL_CORE_RESTORE | RW | 32 | 0x0000 001C | 0x4A00 4E1C |
| CM_SSC_DELTAMSTEP_DPLL_CORE_RESTORE | RW | 32 | 0x0000 0020 | 0x4A00 4E20 |
| CM_SSC_MODFREQDIV_DPLL_CORE_RESTORE | RW | 32 | 0x0000 0024 | 0x4A00 4E24 |
| CM_CLKMODE_DPLL_CORE_RESTORE | RW | 32 | 0x0000 0028 | 0x4A00 4E28 |
| CM_SHADOW_FREQ_CONFIG2_RESTORE | RW | 32 | 0x0000 002C | 0x4A00 4E2C |
| CM_SHADOW_FREQ_CONFIG1_RESTORE | RW | 32 | 0x0000 0030 | 0x4A00 4E30 |
| CM_AUTOIDLE_DPLL_CORE_RESTORE | RW | 32 | 0x0000 0034 | 0x4A00 4E34 |
| CM_MPU_CLKSTCTRL_RESTORE | RW | 32 | 0x0000 0038 | 0x4A00 4E38 |
| CM_CM1_PROFILING_CLKCTRL_RESTORE | RW | 32 | 0x0000 003C | 0x4A00 4E3C |
| CM_DYN_DEP_PRESCAL_RESTORE | RW | 32 | 0x0000 0040 | 0x4A00 4E40 |
| RESERVED | RW | 32 | 0x0000 0044 | 0x4A00 4E44 |
| RESERVED | RW | 32 | 0x0000 0048 | 0x4A00 4E48 |
| RESERVED | RW | 32 | 0x0000 004C | 0x4A00 4E4C |
| RESERVED | RW | 32 | 0x0000 0050 | 0x4A00 4E50 |
| RESERVED | RW | 32 | 0x0000 0054 | 0x4A00 4E54 |
| RESERVED | RW | 32 | 0x0000 0058 | 0x4A00 4E58 |

3.11.27.2 RESTORE_CM1 Register Description

Table 3-1077. CM_CLKSEL_CORE_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0000 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E00 | | |
| Description | Second address map for register CM_CLKSEL_CORE . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-----------|---|----------|---|---|-----------|---|----------|--|--|-------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | CLKSEL_L4 | | RESERVED | | | CLKSEL_L3 | | RESERVED | | | CLKSEL_CORE | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKSEL_L4 | Selects L4 interconnect clock (L4_clk) 0x0: L4_CLK is L3_CLK divided by 1 0x1: L4_CLK is L3_CLK divided by 2 | RW | 0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CLKSEL_L3 | Selects L3 interconnect clock (L3_clk) 0x0: L3_CLK is CORE_CLK divided by 1 0x1: L3_CLK is CORE_CLK divided by 2 | RW | 0 |
| 3:1 | RESERVED | | R | 0x0 |
| 0 | CLKSEL_CORE | Selects CORE_CLK configuration 0x0: CORE_CLK is CORE_X2_CLK divided by 1 0x1: CORE_CLK is CORE_X2_CLK divided by 2 | RW | 0 |

Table 3-1078. Register Call Summary for Register CM_CLKSEL_CORE_RESTORE

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[0\]](#)

Table 3-1079. CM_DIV_M2_DPLL_CORE_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0004 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E04 | | |
| Description | Second address map for register CM_DIV_M2_DPLL_CORE . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|-----------------------|----|----------|----|----------------------|---|-----------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | ST_DPLL_CLKOUT | | DPLL_CLKOUT_GATE_CTRL | | RESERVED | | DPLL_CLKOUT_DIVCHACK | | DPLL_CLKOUT_DIV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | ST_DPLL_CLKOUT | DPLL CLKOUT status Read 0x0: The clock output is enabled Read 0x1: The clock output is gated | R | 0 |
| 8 | DPLL_CLKOUT_GATE_CTRL | Control gating of DPLL CLKOUT 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | DPLL_CLKOUT_DIVCHACK | Toggle on this status bit after changing DPLL_CLKOUT_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | DPLL_CLKOUT_DIV | DPLL post-divider factor, M2, for internal clock generation (1 to 31); Divide value from 1 to 31. 0x0: Reserved | RW | 0x01 |

Table 3-1080. Register Call Summary for Register CM_DIV_M2_DPLL_CORE_RESTORE

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[0\]](#)

Table 3-1081. CM_DIV_M3_DPLL_CORE_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0008 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E08 | | |
| Description | Second address map for register CM_DIV_M3_DPLL_CORE . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|--------------------------|----|----------|----|-------------------------|---|--------------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | ST_DPLL_CLKOUTHIF | | DPLL_CLKOUTHIF_GATE_CTRL | | RESERVED | | DPLL_CLKOUTHIF_DIVCHACK | | DPLL_CLKOUTHIF_DIV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | ST_DPLL_CLKOUTHIF | DPLL CLKOUTHIF status Read 0x0: The clock output is enabled Read 0x1: The clock output is gated | R | 0 |
| 8 | DPLL_CLKOUTHIF_GATE_CTRL | Control gating of DPLL CLKOUTHIF 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | DPLL_CLKOUTHIF_DIVCHACK | Toggle on this status bit after changing DPLL_CLKOUTHIF_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | DPLL_CLKOUTHIF_DIV | DPLL post-divisor factor, M3, for internal clock generation (1 to 31); Divide value from 1 to 31. 0x0: Reserved | RW | 0x01 |

Table 3-1082. Register Call Summary for Register CM_DIV_M3_DPLL_CORE_RESTORE

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[0\]](#)

Table 3-1083. CM_DIV_M4_DPLL_CORE_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 000C | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E0C | | |
| Description | Second address map for register CM_DIV_M4_DPLL_CORE . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----------------------|----|-----------------------------|---|----------|---|----------------------------|---|-----------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT1_PWDN | | RESERVED | | ST_HSDIVIDER_CLKOUT1 | | HSDIVIDER_CLKOUT1_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT1_DIVCHACK | | HSDIVIDER_CLKOUT1_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|----------|
| 31:13 | RESERVED | | R | 0x000000 |
| 12 | HSDIVIDER_CLKOUT1_PWDN | Direct power down control for HSDIVIDER M4 divider and CLKOUT1 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|------|-------|
| 9 | ST_HSDIVIDER_CLKOUT1 | HSDIVIDER CLKOUT1 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | HSDIVIDER_CLKOUT1_GATE_CTRL | Control gating of HSDIVIDER CLKOUT1 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT1_DIVCHA CK | Toggle on this status bit after changing HSDIVIDER_CLKOUT1_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT1_DIV | DPLL M4 post-divisor factor (1 to 31). 0x0: Reserved | RW | 0x01 |

Table 3-1084. Register Call Summary for Register CM_DIV_M4_DPLL_CORE_RESTORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\]](#)

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[1\]](#)

Table 3-1085. CM_DIV_M5_DPLL_CORE_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0010 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E10 | | |
| Description | Second address map for register CM_DIV_M5_DPLL_CORE . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----------------------|----|-----------------------------|---|----------|---|----------------------------|---|-----------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT2_PWDN | | RESERVED | | ST_HSDIVIDER_CLKOUT2 | | HSDIVIDER_CLKOUT2_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT2_DIVCHACK | | HSDIVIDER_CLKOUT2_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HSDIVIDER_CLKOUT2_PWDN | Direct power down control for HSDIVIDER M5 divider and CLKOUT2 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|------|-------|
| 9 | ST_HSDIVIDER_CLKOUT2 | HSDIVIDER CLKOUT2 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | HSDIVIDER_CLKOUT2_GATE_CTRL | Control gating of HSDIVIDER CLKOUT2 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT2_DIVCHA CK | Toggle on this status bit after changing HSDIVIDER_CLKOUT2_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT2_DIV | DPLL M5 post-divisor factor (1 to 31). 0x0: Reserved | RW | 0x01 |

Table 3-1086. Register Call Summary for Register CM_DIV_M5_DPLL_CORE_RESTORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\]](#)

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[1\]](#)

Table 3-1087. CM_DIV_M6_DPLL_CORE_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0014 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E14 | | |
| Description | Second address map for register CM_DIV_M6_DPLL_CORE . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----------------------|----|-----------------------------|---|----------|---|----------------------------|---|-----------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT3_PWDN | | RESERVED | | ST_HSDIVIDER_CLKOUT3 | | HSDIVIDER_CLKOUT3_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT3_DIVCHACK | | HSDIVIDER_CLKOUT3_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HSDIVIDER_CLKOUT3_PWDN | Direct power down control for HSDIVIDER M6 divider and CLKOUT3 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|------|-------|
| 9 | ST_HSDIVIDER_CLKOUT3 | HSDIVIDER CLKOUT3 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | HSDIVIDER_CLKOUT3_GATE_CTRL | Control gating of HSDIVIDER CLKOUT3 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT3_DIVCHA CK | Toggle on this status bit after changing HSDIVIDER_CLKOUT3_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT3_DIV | DPLL M6 post-divisor factor (1 to 31). 0x0: Reserved | RW | 0x01 |

Table 3-1088. Register Call Summary for Register CM_DIV_M6_DPLL_CORE_RESTORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\]](#)

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[1\]](#)

Table 3-1089. CM_DIV_M7_DPLL_CORE_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0018 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E18 | | |
| Description | Second address map for register CM_DIV_M7_DPLL_CORE . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----------------------|----|-----------------------------|---|----------|---|----------------------------|---|-----------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT4_PWDN | | RESERVED | | ST_HSDIVIDER_CLKOUT4 | | HSDIVIDER_CLKOUT4_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT4_DIVCHACK | | HSDIVIDER_CLKOUT4_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HSDIVIDER_CLKOUT4_PWDN | Direct power down control for HSDIVIDER M7 divider and CLKOUT4 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|------|-------|
| 9 | ST_HSDIVIDER_CLKOUT4 | HSDIVIDER CLKOUT4 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | HSDIVIDER_CLKOUT4_GATE_CTRL | Control gating of HSDIVIDER CLKOUT4 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT4_DIVCHA CK | Toggle on this status bit after changing HSDIVIDER_CLKOUT4_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT4_DIV | DPLL M7 post-divisor factor (1 to 31). 0x0: Reserved | RW | 0x01 |

Table 3-1090. Register Call Summary for Register CM_DIV_M7_DPLL_CORE_RESTORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\]](#)

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[1\]](#)

Table 3-1091. CM_CLKSEL_DPLL_CORE_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 001C | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E1C | | |
| Description | Second address map for register CM_CLKSEL_DPLL_CORE . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----------|----|-----------------------|----------|----|-----------|----|----|----|----|----|----|----|---|---|---|----------|---|----------|---|---|---|---|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | DPLL_BYP_CLKSEL | RESERVED | | DPLL_CLKOUTHIF_CLKSEL | RESERVED | | DPLL_MULT | | | | | | | | | | | RESERVED | | DPLL_DIV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|-------|
| 31:24 | RESERVED | | R | 0x00 |
| 23 | DPLL_BYP_CLKSEL | Allows control of the BYPASS clock of the PLL and the associated HSDIVIDER. Same as ULOWCLKEN on DPLL. In DPLL Locked mode, 0 - No impact 1 - No impact In DPLL Bypass mode, 0 - CLKINP is selected as the BYPASS clock for CLKOUT/CLKOUTX2 1 - CLKINPULOW is selected as the BYPASS clock for CLKOUT/CLKOUTX2 | RW | 0 |
| 22:21 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------|
| 20 | DPLL_CLKOUTHIF_CLKSEL | Selects the source of the DPLL CLKOUTHIF clock. Same as CLKINPHIFSEL pin on the DPLL 0x0: CLKOUTHIF is generated from the DPLL oscillator (DCO) 0x1: CLKOUTHIF is generated from CLKINPHIF | RW | 0 |
| 19 | RESERVED | | R | 0 |
| 18:8 | DPLL_MULT | DPLL multiplier factor (2 to 2047). This register is automatically cleared to 0 when the DPLL_EN field in the *CLKMODE_DPLL* register is set to select MN bypass mode. (equal to input M of DPLL; M=2 to 2047 = DPLL multiplies by M). 0x0: Reserved 0x1: Reserved | RW | 0x000 |
| 7 | RESERVED | | R | 0 |
| 6:0 | DPLL_DIV | DPLL divider factor (0 to 127) (equal to input N of DPLL; actual division factor is N+1). | RW | 0x00 |

Table 3-1092. Register Call Summary for Register CM_CLKSEL_DPLL_CORE_RESTORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[2\]](#)

Table 3-1093. CM_SSC_DELTAMSTEP_DPLL_CORE_RESTORE

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 0020 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E20 | | |
| Description | Second address map for register CM_SSC_DELTAMSTEP_DPLL_CORE . Used only by automatic restore upon wakeup from device OFF mode. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | DELTAMSTEP | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:0 | DELTAMSTEP | DeltaMStep is split into fractional and integer part. For Triangular Spread Spectrum: [19:18] for integer part, [17:0] for fractional part For Square Wave Spread Spectrum [19:14] for integer part, [13:0] for fractional part | RW | 0x00000 |

Table 3-1094. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_CORE_RESTORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\]](#)

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[1\]](#)

Table 3-1095. CM_SSC_MODFREQDIV_DPLL_CORE_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0024 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E24 | | |
| Description | Second address map for register CM_SSC_MODFREQDIV_DPLL_CORE . Used only by automatic restore upon wakeup from device OFF mode. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|---|----------|---------------------|---|---|---|---|---|---|--|
| RESERVED | | | | | | | | | | | | | | | | MODFREQDIV_EXPONENT | | | | | | | | RESERVED | MODFREQDIV_MANTISSA | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10:8 | MODFREQDIV_EXPONENT | Set the Exponent component of MODFREQDIV factor | RW | 0x0 |
| 7 | RESERVED | | R | 0 |
| 6:0 | MODFREQDIV_MANTISSA | Set the Mantissa component of MODFREQDIV factor | RW | 0x00 |

Table 3-1096. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_CORE_RESTORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\] \[1\]](#)

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[2\]](#)

Table 3-1097. CM_CLKMODE_DPLL_CORE_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0028 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E28 | | |
| Description | Second address map for register CM_CLKMODE_DPLL_CORE . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|--------------|-------------|---------------|-----------------|----------|--------------------|----------|---|---|---|---|---|---|---------|---|--|
| RESERVED | | | | | | | | | | | | | | | | DPLL_SSC_DOWNSPREAD | DPLL_SSC_ACK | DPLL_SSC_EN | DPLL_REGM4XEN | DPLL_LP_MODE_EN | RESERVED | DPLL_DRIFTGUARD_EN | RESERVED | | | | | | | DPLL_EN | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14 | DPLL_SSC_DOWNSPREAD | Control if only low frequency spread is required 0x0: When SSC is enabled, clock frequency is spread on both sides of the programmed frequency 0x1: When SSC is enabled, clock frequency is spread only on the lower side of the programmed frequency | RW | 0 |
| 13 | DPLL_SSC_ACK | Acknowledgement from the DPLL regarding start and stop of Spread Spectrum Clocking feature Read 0x0: SSC has been turned off on PLL o/ps Read 0x1: SSC has been turned on on PLL o/ps | R | 0 |
| 12 | DPLL_SSC_EN | Enable or disable Spread Spectrum Clocking 0x0: SSC disabled 0x1: SSC enabled | RW | 0 |
| 11 | DPLL_REGM4XEN | Enable the REGM4XEN mode of the DPLL. Please check the DPLL documentation to check when this mode can be enabled. Read 0x0: REGM4XEN mode of the DPLL is disabled | R | 0 |
| 10 | DPLL_LPMODE_EN | Set the DPLL in low-power mode. Check the DPLL documentation to see when this can be enabled. 0x0: Low-power mode of the DPLL is disabled 0x1: Low-power mode of the DPLL is enabled | RW | 0 |
| 9 | RESERVED | | RW | 0 |
| 8 | DPLL_DRIFTGUARD_EN | This bit allows to enable or disable the automatic recalibration feature of the DPLL. The DPLL will automatically start a recalibration process upon assertion of the DPLL's RECAL flag if this bit is set. 0x0: DRIFTGUARD feature is disabled 0x1: DRIFTGUARD feature is enabled | RW | 0 |
| 7:3 | RESERVED | | RW | 0x00 |
| 2:0 | DPLL_EN | DPLL control. Upon Warm Reset, the PRCM DPLL control state machine updates this register to reflect MN bypass mode. 0x0: Reserved 0x1: Reserved 0x2: Reserved 0x3: Reserved 0x4: Put the DPLL in MN bypass mode. The DPLL_MULT register bits are reset to 0 automatically by putting the DPLL in this mode. 0x5: Put the DPLL in idle bypass low-power mode. 0x6: Put the DPLL in idle bypass fast-relock mode. 0x7: Enables the DPLL in lock mode | RW | 0x4 |

Table 3-1098. Register Call Summary for Register CM_CLKMODE_DPLL_CORE_RESTORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[6\]](#)

Table 3-1099. CM_SHADOW_FREQ_CONFIG2_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 002C | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E2C | | |
| Description | Second address map for register CM_SHADOW_FREQ_CONFIG2 . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|-----------|----|-------------|---|------------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | DPLL_CORE_M5_DIV | | | | CLKSEL_L3 | | CLKSEL_CORE | | GPMC_FREQ_UPDATE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-----------|
| 31:8 | RESERVED | | R | 0x0000000 |
| 7:3 | DPLL_CORE_M5_DIV | Shadow register for CM_DIV_M5_DPLL_CORE .HSDIVIDER_CLKOUT2_DIV. The main register is automatically loaded with the shadow register value after GPMC IDLE if the CM_SHADOW_FREQ_CONFIG1 .FREQ_UPDATE field is set to 1 and GPMC_FREQ_UPDATE is set to 1. Divide value from 1 to 31. 0x0: Reserved | RW | 0x04 |
| 2 | CLKSEL_L3 | Shadow register for CM_CLKSEL_CORE .CLKSEL_L3. The main register is automatically loaded with the shadow register value after GPMC IDLE if the CM_SHADOW_FREQ_CONFIG1 .FREQ_UPDATE field is set to 1 and GPMC_FREQ_UPDATE is set to 1. 0x0: L3_CLK is CORE_CLK divided by 1 0x1: L3_CLK is CORE_CLK divided by 2 | RW | 0 |
| 1 | CLKSEL_CORE | Shadow register for CM_CLKSEL_CORE .CLKSEL_CORE. The main register is automatically loaded with the shadow register value after GPMC IDLE if the CM_SHADOW_FREQ_CONFIG1 .FREQ_UPDATE field is set to 1 and GPMC_FREQ_UPDATE is set to 1. 0x0: CORE_CLK is CORE_X2_CLK divided by 1 0x1: CORE_CLK is CORE_X2_CLK divided by 2 | RW | 0 |
| 0 | GPMC_FREQ_UPDATE | Controls whether or not GPMC has to be put automatically into idle during the frequency change operation. 0x0: GPMC is not put automatically into idle during frequency change operation. 0x1: GPMC is put automatically into idle during frequency change operation. | RW | 0 |

Table 3-1100. Register Call Summary for Register CM_SHADOW_FREQ_CONFIG2_RESTORE

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[0\]](#)

Table 3-1101. CM_SHADOW_FREQ_CONFIG1_RESTORE

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 0030 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E30 | | |
| Description | Second address map for register CM_SHADOW_FREQ_CONFIG1 . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|-------------------|----|---|---|----------|---|---|---|-----------|--------------|----------|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DPLL_CORE_M2_DIV | | | | DPLL_CORE_DPLL_EN | | | | RESERVED | | | | DLL_RESET | DLL_OVERRIDE | RESERVED | FREQ_UPDATE |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:16 | RESERVED | | R | 0x10D |
| 15:11 | DPLL_CORE_M2_DIV | Shadow register for CM_DIV_M2_DPLL_CORE .DPLL_CLKOUT_DIV. The main register is automatically loaded with the shadow register value after EMIF IDLE if the FREQ_UPDATE field is set to 1. Divide value from 1 to 31. 0x0: Reserved | RW | 0x01 |
| 10:8 | DPLL_CORE_DPLL_EN | Shadow register for CM_CLKMODE_DPLL_CORE .DPLL_EN. The main register is automatically loaded with the shadow register value after EMIF IDLE if the FREQ_UPDATE field is set to 1. 0x0: Reserved 0x1: Reserved 0x2: Reserved 0x3: Reserved 0x4: Put the DPLL in MN bypass mode. The DPLL_MULT register bits are reset to 0 automatically by putting the DPLL in this mode. 0x5: Put the DPLL in idle bypass low-power mode. 0x6: Put the DPLL in idle bypass fast-relock mode. 0x7: Enables the DPLL in lock mode | RW | 0x5 |
| 7:4 | RESERVED | | R | 0x0 |
| 3 | DLL_RESET | Specify if DLL should be reset or not during the frequency change hardware sequence. 0x0: DLL is not reset during the frequency change hardware sequence 0x1: DLL is reset automatically during the frequency change hardware sequence | RW | 1 |
| 2 | DLL_OVERRIDE | Shadow register for CM_DLL_CTRL .DLL_OVERRIDE.The main register is automatically loaded with the shadow register value after EMIF IDLE if the FREQ_UPDATE field is set to 1. 0x0: Lock and code outputs are not overridden 0x1: Lock output is overridden to 1 and code output is overridden with a value coming from control module. | RW | 1 |
| 1 | RESERVED | | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|----------------|-------|
| 0 | FREQ_UPDATE | Writing 1 indicates that a new configuration is available. It is automatically cleared by h/w after the configuration has been applied. | RW WSpecial | 0 |

Table 3-1102. Register Call Summary for Register CM_SHADOW_FREQ_CONFIG1_RESTORE

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[0\]](#)

Table 3-1103. CM_AUTOIDLE_DPLL_CORE_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0034 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E34 | | |
| Description | Second address map for register CM_AUTOIDLE_DPLL_CORE . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---------------------|----------|----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | DPLL_DCOCLKLDO_PWDN | RESERVED | AUTO_DPLL_MODE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|------------|
| 31:5 | RESERVED | | R | 0x00000000 |
| 4 | DPLL_DCOCLKLDO_PWDN | Allows powering down the DCOCLKLDO o/p of DPLL if all dividers in HSDIVIDER are powered down. PRCM takes care of reenabling this path for either restarting HSDIVIDER o/p or entering bypass mode. 0x0: Keep DCOCLKLDO powered even when all dividers in HSDIVIDER are powered down. 0x1: Automatically power down DCOCLKLDO when all o/ps of HSDIVIDER are powered down. | RW | 0 |
| 3 | RESERVED | | R | 0 |
| 2:0 | AUTO_DPLL_MODE | DPLL automatic control. 0x0: DPLL auto control disabled 0x1: The DPLL is automatically put in low-power stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x2: The DPLL is automatically put in fast-relock stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x3: Reserved 0x4: Reserved 0x5: The DPLL is automatically put in idle bypass low-power mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x6: The DPLL is automatically put in idle bypass fast-relock mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x7: Reserved | RW | 0x0 |

Table 3-1104. Register Call Summary for Register CM_AUTOIDLE_DPLL_CORE_RESTORE

Clock Management Functional Description

- [DPLL_CORE Description: \[0\]](#)

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[1\]](#)

Table 3-1105. CM_MPU_CLKSTCTRL_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0038 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E38 | | |
| Description | Second address map for register CM_MPU_CLKSTCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----------|----|----|----|----|---|---|---|---|---|-----------|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_MPU_DPLL_CLK | RESERVED | | | | | | | | | | CLKTRCTRL | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKACTIVITY_MPU_DPLL_CLK | This field indicates the state of the MPU_DPLL_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the MPU clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1106. Register Call Summary for Register CM_MPU_CLKSTCTRL_RESTORE

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[0\]](#)

Table 3-1107. CM_CM1_PROFILING_CLKCTRL_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 003C | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E3C | | |
| Description | Second address map for register CM_CM1_PROFILING_CLKCTRL . Used only by automatic restore upon wakeup from device OFF mode. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | MODULEMODE | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status Read 0x3: Module is disabled Read 0x2: Module is in Idle Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x0: Module is fully functional | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disabled by software. OCP configuration port is not accessible. 0x1: Module is managed automatically by hardware along with CM1 and EMU domain. OCP configuration port is accessible only when EMU domain is on. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x1 |

Table 3-1108. Register Call Summary for Register CM_CM1_PROFILING_CLKCTRL_RESTORE

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[0\]](#)

Table 3-1109. CM_DYN_DEP_PRESCAL_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0040 | Instance | RESTORE_CM1 |
| Physical Address | 0x4A00 4E40 | | |
| Description | Second address map for register CM_DYN_DEP_PRESCAL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PRESCAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5:0 | PRESCAL | Time unit is equal to (PRESCAL + 1) L4 clock cycles. | RW | 0x20 |

Table 3-1110. Register Call Summary for Register CM_DYN_DEP_PRESCAL_RESTORE

PRCM Register Manual

- [RESTORE_CM1 Register Summary: \[0\]](#)

3.11.28 INSTR_CM1 Registers

3.11.28.1 INSTR_CM1 Register Summary

Table 3-1111. INSTR_CM1 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | INSTR_CM1 Base Address |
|--------------------------------------|------|-----------------------|----------------|------------------------|
| CMI1_IDENTIFICATION | R | 32 | 0x0000 0000 | 0x4A00 4F00 |
| CMI1_SYS_CONFIG | RW | 32 | 0x0000 0010 | 0x4A00 4F10 |
| CMI1_STATUS | R | 32 | 0x0000 0014 | 0x4A00 4F14 |
| CMI1_CONFIGURATION | RW | 32 | 0x0000 0024 | 0x4A00 4F24 |
| CMI1_CLASS_FILTERING | RW | 32 | 0x0000 0028 | 0x4A00 4F28 |
| CMI1_TRIGGERING | RW | 32 | 0x0000 002C | 0x4A00 4F2C |
| CMI1_SAMPLING | RW | 32 | 0x0000 0030 | 0x4A00 4F30 |

3.11.28.2 INSTR_CM1 Register Description

Table 3-1112. CMI1_IDENTIFICATION

| | | | |
|-------------------------|--------------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0000 | Instance | INSTR_CM1 |
| Physical Address | 0x4A00 4F00 | | |
| Description | CM profiling identification register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|---------------------------|
| 31:0 | REVISION | IP revision | R | 0x-- TI Internal data. |

Table 3-1113. Register Call Summary for Register CMI1_IDENTIFICATION

PRCM Register Manual

- [INSTR_CM1 Register Summary: \[0\]](#)

Table 3-1114. CMI1_SYS_CONFIG

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0010 | Instance | INSTR_CM1 |
| Physical Address | 0x4A00 4F10 | | |
| Description | CM profiling system configuration register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----------|----|----------|----|-----------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | IDLEMODE | | RESERVED | | SOFTRESET | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:6 | RESERVED | Reserved | R | 0x00000000 |
| 5:4 | RESERVED | Reserved | R | 0x0 |
| 3:2 | IDLEMODE | Configuration of the local target state management mode | RW | 0x2 |
| 1 | RESERVED | Reserved | R | 0 |
| 0 | SOFTRESET | Software reset | RW | 0 |

Table 3-1115. Register Call Summary for Register CMI1_SYS_CONFIG

PRCM Register Manual

- [INSTR_CM1 Register Summary: \[0\]](#)

Table 3-1116. CMI1_STATUS

| | | | |
|-------------------------|------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0014 | Instance | INSTR_CM1 |
| Physical Address | 0x4A00 4F14 | | |
| Description | CM profiling status register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FIFOEMPTY | | RESERVED | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------|------|------------|
| 31:9 | RESERVED | Reserved | R | 0x00000000 |
| 8 | FIFOEMPTY | PM Profiling buffer empty | R | 1 |
| 7:0 | RESERVED | Reserved | R | 0x00 |

Table 3-1117. Register Call Summary for Register CMI1_STATUS

PRCM Register Manual

- [INSTR_CM1 Register Summary: \[0\]](#)

Table 3-1118. CMI1_CONFIGURATION

| | | | |
|-------------------------|-------------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0024 | Instance | INSTR_CM1 |
| Physical Address | 0x4A00 4F24 | | |
| Description | CM profiling configuration register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|---------|----|---------|----|----------|----|----------|----------|----|----|----|----|----|----|----|----------|----------|----|----|----|---|---|---|---|-------------|----------|---|---|---|---|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| CLAIM_3 | | CLAIM_2 | | CLAIM_1 | | RESERVED | | RESERVED | RESERVED | | | | | | | | RESERVED | RESERVED | | | | | | | | EVT_CAPT_EN | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|-------|
| 31:30 | CLAIM_3 | Ownership | RW | 0x0 |
| 29 | CLAIM_2 | Debugger override qualifier | RW | 1 |
| 28 | CLAIM_1 | Current owner | R | 0 |
| 27:24 | RESERVED | Reserved | R | 0x0 |
| 23 | RESERVED | Reserved | R | 0 |
| 22:16 | RESERVED | Reserved | R | 0x00 |
| 15 | RESERVED | Reserved | R | 0 |
| 14:8 | RESERVED | Reserved | R | 0x00 |
| 7 | EVT_CAPT_EN | When HIGH the PM events capture is enabled | RW | 0 |
| 6:0 | RESERVED | Reserved | R | 0x00 |

Table 3-1119. Register Call Summary for Register CMI1_CONFIGURATION

PRCM Register Manual

- [INSTR_CM1 Register Summary: \[0\]](#)

Table 3-1120. CMI1_CLASS_FILTERING

| | | | |
|-------------------------|---------------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0028 | Instance | INSTR_CM1 |
| Physical Address | 0x4A00 4F28 | | |
| Description | CM profiling class filtering register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-----------------|---|---|---|-----------------|---|-----------------|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | SNAP_CAPT_EN_03 | | | | SNAP_CAPT_EN_02 | | SNAP_CAPT_EN_01 | SNAP_CAPT_EN_00 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | SNAP_CAPT_EN_03 | Snapshot capture enable - Class-ID = 0x03 | RW | 0 |
| 2 | SNAP_CAPT_EN_02 | Snapshot capture enable - Class-ID = 0x02 | RW | 0 |
| 1 | SNAP_CAPT_EN_01 | Snapshot capture enable - Class-ID = 0x01 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------|
| 0 | SNAP_CAPT_EN_00 | Snapshot capture enable - Class-ID = 0x00 | RW | 0 |

Table 3-1121. Register Call Summary for Register CMI1_CLASS_FILTERING

PRCM Register Manual

- [INSTR_CM1 Register Summary: \[0\]](#)

Table 3-1122. CMI1_TRIGGERING

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 002C | Instance | INSTR_CM1 |
| Physical Address | 0x4A00 4F2C | | |
| Description | CM profiling triggering control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------------|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | TRIG_STOP_EN | TRIG_START_EN |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1 | TRIG_STOP_EN | Enable stop capturing PM events from external trigger detection | RW | 0 |
| 0 | TRIG_START_EN | Enable start capturing PM events from external trigger detection | RW | 0 |

Table 3-1123. Register Call Summary for Register CMI1_TRIGGERING

PRCM Register Manual

- [INSTR_CM1 Register Summary: \[0\]](#)

Table 3-1124. CMI1_SAMPLING

| | | | |
|-------------------------|---------------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0030 | Instance | INSTR_CM1 |
| Physical Address | 0x4A00 4F30 | | |
| Description | CM profiling sampling window register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----------|----|----|----|----|----|---|---|----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | FCLK_DIV_FACOR | | | | RESERVED | | | | | | | | SAMP_WIND_SIZE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|-------|
| 31:20 | RESERVED | Reserved | R | 0x000 |
| 19:16 | FCLK_DIV_FACOR | FunClk divide factor ranging from 1 to 16 | RW | 0x0 |
| 15:8 | RESERVED | Reserved | R | 0x00 |
| 7:0 | SAMP_WIND_SIZE | PM events sampling window size | RW | 0x00 |

Table 3-1125. Register Call Summary for Register CMI1_SAMPLING

PRCM Register Manual

- [INSTR_CM1 Register Summary: \[0\]](#)

3.11.29 CM2 Instance Summary

Table 3-1126. CM2 Instance Summary

| Module Name | L4 Base Address | Size |
|---------------------|-----------------|----------|
| INTRCONN_SOCKET_CM2 | 0x4A00 8000 | 256Bytes |
| CKGEN_CM2 | 0x4A00 8100 | 256Bytes |
| ALWAYS_ON_CM2 | 0x4A00 8600 | 256Bytes |
| CORE_CM2 | 0x4A00 8700 | 2KBytes |
| IWAHD_CM2 | 0x4A00 8F00 | 256Bytes |
| CAM_CM2 | 0x4A00 9000 | 256Bytes |
| DSS_CM2 | 0x4A00 9100 | 256Bytes |
| SGX_CM2 | 0x4A00 9200 | 256Bytes |
| L3INIT_CM2 | 0x4A00 9300 | 256Bytes |
| L4PER_CM2 | 0x4A00 9400 | 512Bytes |
| RESTORE_CM2 | 0x4A00 9E00 | 256Bytes |
| INSTR_CM2 | 0x4A00 9F00 | 256Bytes |

3.11.30 INTRCONN_SOCKET_CM2 Registers

3.11.30.1 INTRCONN_SOCKET_CM2 Register Summary

Table 3-1127. INTRCONN_SOCKET_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | INTRCONN_SOCKET_CM2 L4 Base Address |
|--|------|-----------------------|----------------|-------------------------------------|
| REVISION_CM2 | R | 32 | 0x0000 0000 | 0x4A00 8000 |
| CM_CM2_PROFILING_CLKCTRL | RW | 32 | 0x0000 0040 | 0x4A00 8040 |
| CM2_DEBUG_CFG | RW | 32 | 0x0000 00F0 | 0x4A00 80F0 |

3.11.30.2 INTRCONN_SOCKET_CM2 Register Description

Table 3-1128. REVISION_CM2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 8000 | | | | | | | | | | | | | | | | InstanceINTRCONN_SOCKET_CM2 | | | | | | | | | | | | | | | |
| Description | This register contains the IP revision code for the CM2 part of the PRCM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|----------------------------|
| 31:0 | REVISION | Revision Number | R | 0x- - TI Internal data. |

Table 3-1129. Register Call Summary for Register REVISION_CM2

PRCM Register Manual

- [INTRCONN_SOCKET_CM2 Register Summary: \[0\]](#)

Table 3-1130. CM_CM2_PROFILING_CLKCTRL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0040 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 8040 | | | | | | | | | | | | | | | InstanceINTRCONN_SOCKET_CM2 | | | | | | | | | | | | | | | |
| Description | This register manages the CM2_PROFILING clocks. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | | | MODULEMODE |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status Read 0x0: Module is fully functional Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in Idle Read 0x3: Module is disabled | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disabled by software. INTRCONN configuration port is not accessible. 0x1: Module is managed automatically by hardware along with L3INSTR domain. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x1 |

Table 3-1131. Register Call Summary for Register CM_CM2_PROFILING_CLKCTRL

PRCM Register Manual

- [INTRCONN_SOCKET_CM2 Register Summary: \[0\]](#)
- [RESTORE_CM2 Register Description: \[1\]](#)

Table 3-1132. CM2_DEBUG_CFG

| | | | |
|-------------------------|---|-----------------|---------------------|
| Address Offset | 0x0000 00F0 | Instance | INTRCONN_SOCKET_CM2 |
| Physical Address | 0x4A00 80F0 | | |
| Description | This register is used to configure the CM2's 32-bit debug output. There is one 7-bit source select field for selecting from a shared set of 8-bit internal signal blocks per byte. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SEL3 | | | | | | | | SEL2 | | | | | | | | SEL1 | | | | | | | | SEL0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:24 | SEL3 | Internal signal block select for debug word byte-3 | RW | 0x03 |
| 23:16 | SEL2 | Internal signal block select for debug word byte-2 | RW | 0x02 |
| 15:8 | SEL1 | Internal signal block select for debug word byte-1 | RW | 0x01 |
| 7:0 | SEL0 | Internal signal block select for debug word byte-0 | RW | 0x00 |

Table 3-1133. Register Call Summary for Register CM2_DEBUG_CFG

PRCM Register Manual

- [INTRCONN_SOCKET_CM2 Register Summary: \[0\]](#)

3.11.31 CKGEN_CM2 Registers

3.11.31.1 CKGEN_CM2 Register Summary

Table 3-1134. CKGEN_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CKGEN_CM2 L4 Base Address |
|---|------|-----------------------|----------------|---------------------------|
| CM_CLKSEL_MPU_M3_ISS_ROOT | R | 32 | 0x0000 0000 | 0x4A00 8100 |
| CM_CLKSEL_USB_60MHZ | RW | 32 | 0x0000 0004 | 0x4A00 8104 |
| CM_SCALE_FCLK | RW | 32 | 0x0000 0008 | 0x4A00 8108 |
| CM_CORE_DVFS_PERF1 | RW | 32 | 0x0000 0010 | 0x4A00 8110 |
| CM_CORE_DVFS_PERF2 | RW | 32 | 0x0000 0014 | 0x4A00 8114 |
| CM_CORE_DVFS_PERF3 | RW | 32 | 0x0000 0018 | 0x4A00 8118 |
| CM_CORE_DVFS_PERF4 | RW | 32 | 0x0000 001C | 0x4A00 811C |
| CM_CORE_DVFS_CURRENT | RW | 32 | 0x0000 0024 | 0x4A00 8124 |
| CM_IVA_DVFS_PERF_DSP | RW | 32 | 0x0000 0028 | 0x4A00 8128 |
| CM_IVA_DVFS_PERF_IVAHD | RW | 32 | 0x0000 002C | 0x4A00 812C |
| CM_IVA_DVFS_PERF_ABE | RW | 32 | 0x0000 0030 | 0x4A00 8130 |
| CM_IVA_DVFS_CURRENT | RW | 32 | 0x0000 0038 | 0x4A00 8138 |
| CM_CLKMODE_DPLL_PER | RW | 32 | 0x0000 0040 | 0x4A00 8140 |
| CM_IDLEST_DPLL_PER | R | 32 | 0x0000 0044 | 0x4A00 8144 |
| CM_AUTOIDLE_DPLL_PER | RW | 32 | 0x0000 0048 | 0x4A00 8148 |
| CM_CLKSEL_DPLL_PER | RW | 32 | 0x0000 004C | 0x4A00 814C |
| CM_DIV_M2_DPLL_PER | RW | 32 | 0x0000 0050 | 0x4A00 8150 |

Table 3-1134. CKGEN_CM2 Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | CKGEN_CM2 L4 Base Address |
|----------------------------|------|-----------------------|----------------|---------------------------|
| CM_DIV_M3_DPLL_PER | RW | 32 | 0x0000 0054 | 0x4A00 8154 |
| CM_DIV_M4_DPLL_PER | RW | 32 | 0x0000 0058 | 0x4A00 8158 |
| CM_DIV_M5_DPLL_PER | RW | 32 | 0x0000 005C | 0x4A00 815C |
| CM_DIV_M6_DPLL_PER | RW | 32 | 0x0000 0060 | 0x4A00 8160 |
| CM_DIV_M7_DPLL_PER | RW | 32 | 0x0000 0064 | 0x4A00 8164 |
| CM_SSC_DELTAMSTEP_DPLL_PER | RW | 32 | 0x0000 0068 | 0x4A00 8168 |
| CM_SSC_MODFREQDIV_DPLL_PER | RW | 32 | 0x0000 006C | 0x4A00 816C |
| RESERVED | RW | 32 | 0x0000 0070 | 0x4A00 8170 |
| CM_CLKMODE_DPLL_USB | RW | 32 | 0x0000 0080 | 0x4A00 8180 |
| CM_IDLEST_DPLL_USB | R | 32 | 0x0000 0084 | 0x4A00 8184 |
| CM_AUTOIDLE_DPLL_USB | RW | 32 | 0x0000 0088 | 0x4A00 8188 |
| CM_CLKSEL_DPLL_USB | RW | 32 | 0x0000 008C | 0x4A00 818C |
| CM_DIV_M2_DPLL_USB | RW | 32 | 0x0000 0090 | 0x4A00 8190 |
| CM_SSC_DELTAMSTEP_DPLL_USB | RW | 32 | 0x0000 00A8 | 0x4A00 81A8 |
| CM_SSC_MODFREQDIV_DPLL_USB | RW | 32 | 0x0000 00AC | 0x4A00 81AC |
| CM_CLKDCOLDO_DPLL_USB | RW | 32 | 0x0000 00B4 | 0x4A00 81B4 |
| RESERVED | RW | 32 | 0x0000 00C0 | 0x4A00 81C0 |
| RESERVED | R | 32 | 0x0000 00C4 | 0x4A00 81C4 |
| RESERVED | RW | 32 | 0x0000 00C8 | 0x4A00 81C8 |
| RESERVED | RW | 32 | 0x0000 00CC | 0x4A00 81CC |
| RESERVED | RW | 32 | 0x0000 00D0 | 0x4A00 81D0 |
| RESERVED | RW | 32 | 0x0000 00E8 | 0x4A00 81E8 |
| RESERVED | RW | 32 | 0x0000 00EC | 0x4A00 81EC |

3.11.31.2 CKGEN_CM2 Register Description**Table 3-1135. CM_CLKSEL_MPU_M3_ISS_ROOT**

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|-----------|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|--------|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 8100 | Instance | CKGEN_CM2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | MPU_M3/ISS root clock status (MPU_M3_ISS_CLK). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="28">RESERVED</td><td colspan="4">CLKSEL</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | CLKSEL | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | CLKSEL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:1 | RESERVED | | R | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | CLKSEL | This bit gives the status of the root clock of MPU_M3/ISS Read 0x0: Root clock is sourced from CORE_CLK | R | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 3-1136. Register Call Summary for Register CM_CLKSEL_MPU_M3_ISS_ROOT

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[0\]](#)

Table 3-1137. CM_CLKSEL_USB_60MHZ

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0004 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8104 | | |
| Description | Selects the configuration of the divider generating 60MHz clock for USB from the DPLL_USB o/p. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|--------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | CLKSEL | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | CLKSEL | Select the configuration of the divider 0x0: Set the divider in bypass mode to support bypass clock from DPLL_USB to pass through without division. 0x1: Set the divider to divide the DPLL o/p (480MHz typical) by 8 to generate 60MHz clock. To be used for OPP119 and OPP50 | RW | 1 |

Table 3-1138. Register Call Summary for Register CM_CLKSEL_USB_60MHZ

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[1\]](#)

Table 3-1139. CM_SCALE_FCLK

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0008 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8108 | | |
| Description | This register can be used to scale PER_ABE_NC_FCLK, 96M_FCLK, 48M_FCLK, and 64M_FCLK to half their respective typical frequencies. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | SCALE | FCLK |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | SCALE_FCLK | Enable or disable the functional clock scaling. 0x0: The functional clocks run at their default frequencies 0x1: The functional clocks run at half their typical frequencies | RW | 0 |

Table 3-1140. Register Call Summary for Register CM_SCALE_FCLK

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[1\]](#)

Table 3-1141. CM_CORE_DVFS_PERF1

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0010 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8110 | | |
| Description | This register allows to system master #1 to specify which level of performance is required from CORE domain (mainly external memory throughput?) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PERF_REQ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | PERF_REQ | Current performance request. Unit to be defined by user. | RW | 0x00 |

Table 3-1142. Register Call Summary for Register CM_CORE_DVFS_PERF1

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[0\]](#)

Table 3-1143. CM_CORE_DVFS_PERF2

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0014 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8114 | | |
| Description | This register allows to system master #2 to specify which level of performance is require from CORE domain (mainly external memory throughput?) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PERF_REQ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | PERF_REQ | Current performance request. Unit to be defined by user. | RW | 0x00 |

Table 3-1144. Register Call Summary for Register CM_CORE_DVFS_PERF2

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[0\]](#)

Table 3-1145. CM_CORE_DVFS_PERF3

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0018 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 8118 | | | | | | | | | | | | | | | | InstanceCKGEN_CM2 | | | | | | | | | | | | | | | |
| Description | This register allows to system master #3 to specify which level of performance is require from CORE domain (mainly external memory throughput?) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PERF_REQ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:8 | RESERVED | | R | 0x0000000 |
| 7:0 | PERF_REQ | Current performance request. Unit to be defined by user. | RW | 0x00 |

Table 3-1146. Register Call Summary for Register CM_CORE_DVFS_PERF3

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[0\]](#)

Table 3-1147. CM_CORE_DVFS_PERF4

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 001C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 811C | | | | | | | | | | | | | | | | InstanceCKGEN_CM2 | | | | | | | | | | | | | | | |
| Description | This register allows to system master #4 to specify which level of performance is require from CORE domain (mainly external memory throughput?) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PERF_REQ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:8 | RESERVED | | R | 0x0000000 |
| 7:0 | PERF_REQ | Current performance request. Unit to be defined by user. | RW | 0x00 |

Table 3-1148. Register Call Summary for Register CM_CORE_DVFS_PERF4

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[0\]](#)

Table 3-1149. CM_CORE_DVFS_CURRENT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0024 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 8124 | | | | | | | | | | | | | | | | InstanceCKGEN_CM2 | | | | | | | | | | | | | | | |
| Description | This register hold the current level of performance achievable by the CORE domain, according to the current OPP setting | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|--------------|---|---|---|---|---|---|---|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | PERF_CURRENT | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | PERF_CURRENT | Current achievable performance level. Unit to be defined by user. | RW | 0x00 |

Table 3-1150. Register Call Summary for Register CM_CORE_DVFS_CURRENT

Voltage Management Functional Description

- [DVFS Voting Mechanism \(VDD_CORE_L and VDD_IVA_L Voltage Domains\): \[0\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[1\]](#)

Table 3-1151. CM_IVA_DVFS_PERF_DSP

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0028 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 8128 | | | | | | | | | | | | | | | | Instance | CKGEN_CM2 | | | | | | | | | | | | | | | |
| Description | This register allows to specify which level of performance is required from IVA domain for DSP to operate. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | PERF_REQ | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | PERF_REQ | Current performance request. Unit to be defined by user. | RW | 0x00 |

Table 3-1152. Register Call Summary for Register CM_IVA_DVFS_PERF_DSP

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[0\]](#)

Table 3-1153. CM_IVA_DVFS_PERF_IVAHD

| | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|----------|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 002C | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 812C | | | | | | | | Instance | CKGEN_CM2 | | | | | | | | | | | | | | |
| Description | This register allows to specify which level of performance is required from IVA domain for IVAHD to operate. | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PERF_REQ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | PERF_REQ | Current performance request. Unit to be defined by user. | RW | 0x00 |

Table 3-1154. Register Call Summary for Register CM_IVA_DVFS_PERF_IVAHD

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[0\]](#)

Table 3-1155. CM_IVA_DVFS_PERF_ABE

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0030 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8130 | | |
| Description | This register allows to specify which level of performance is required from IVA domain for ABE to operate. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PERF_REQ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | PERF_REQ | Current performance request. Unit to be defined by user. | RW | 0x00 |

Table 3-1156. Register Call Summary for Register CM_IVA_DVFS_PERF_ABE

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[0\]](#)

Table 3-1157. CM_IVA_DVFS_CURRENT

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0038 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8138 | | |
| Description | This register hold the current level of performance achievable by the IVA domain, according to the current OPP setting | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PERF_CURRENT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | PERF_CURRENT | Current achievable performance level. Unit to be defined by user. | RW | 0x00 |

Table 3-1158. Register Call Summary for Register CM_IVA_DVFS_CURRENT

Voltage Management Functional Description

- [DVFS Voting Mechanism \(VDD_CORE_L and VDD_IVA_L Voltage Domains\): \[0\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[1\]](#)

Table 3-1159. CM_CLKMODE_DPLL_PER

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0040 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8140 | | |
| Description | This register allows controlling the DPLL modes. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|--------------|-------------|---------------|----------------|----------|--------------------|----------|---|---|---|---------|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | DPLL_SSC_DOWNSPREAD | DPLL_SSC_ACK | DPLL_SSC_EN | DPLL_REGM4XEN | DPLL_LPMODE_EN | RESERVED | DPLL_DRIFTGUARD_EN | RESERVED | | | | DPLL_EN | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14 | DPLL_SSC_DOWNSPREAD | Control if only low frequency spread is required 0x0: When SSC is enabled, clock frequency is spread on both sides of the programmed frequency 0x1: When SSC is enabled, clock frequency is spread only on the lower side of the programmed frequency | RW | 0 |
| 13 | DPLL_SSC_ACK | Acknowledgement from the DPLL regarding start and stop of Spread Spectrum Clocking feature Read 0x0: SSC has been turned off on PLL o/ps Read 0x1: SSC has been turned on on PLL o/ps | R | 0 |
| 12 | DPLL_SSC_EN | Enable or disable Spread Spectrum Clocking 0x0: SSC disabled 0x1: SSC enabled | RW | 0 |
| 11 | DPLL_REGM4XEN | Enable the REGM4XEN mode of the DPLL. Please check the DPLL documentation to check when this mode can be enabled. Read 0x0: REGM4XEN mode of the DPLL is disabled | R | 0 |
| 10 | DPLL_LPMODE_EN | Set the DPLL in low-power mode. Check the DPLL documentation to see when this can be enabled. 0x0: Low-power mode of the DPLL is disabled 0x1: Low-power mode of the DPLL is enabled | RW | 0 |
| 9 | RESERVED | | RW | 0 |
| 8 | DPLL_DRIFTGUARD_EN | This bit allows to enable or disable the automatic recalibration feature of the DPLL. The DPLL will automatically start a recalibration process upon assertion of the DPLL's RECAL flag if this bit is set. 0x0: DRIFTGUARD feature is disabled 0x1: DRIFTGUARD feature is enabled | RW | 0 |
| 7:3 | RESERVED | | RW | 0x00 |
| 2:0 | DPLL_EN | DPLL control. Upon Warm Reset, the PRCM DPLL control state machine updates this register to reflect MN bypass mode. 0x0: Reserved 0x1: Reserved 0x2: Reserved 0x3: Reserved 0x4: Put the DPLL in MN bypass mode. The DPLL_MULT register bits are reset to 0 automatically by putting the DPLL in this mode. 0x5: Put the DPLL in idle bypass low-power mode. 0x6: Put the DPLL in idle bypass fast-relock mode. 0x7: Enables the DPLL in lock mode | RW | 0x4 |

Table 3-1160. Register Call Summary for Register CM_CLKMODE_DPLL_PER

Clock Management Functional Description

- [DPLL_PER Description: \[0\] \[1\] \[2\] \[5\] \[6\] \[7\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[8\]](#)

Table 3-1161. CM_IDLEST_DPLL_PER

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0044 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8144 | | |
| Description | This register allows monitoring DPLL activity. This register is read only and automatically updated. [warm reset insensitive] | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----------|----|----|----|----|---|---|---|---|---|-------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ST_MN_BYPASS | RESERVED | | | | | | | | | | ST_DPLL_CLK | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-----------|
| 31:9 | RESERVED | | R | 0x0000000 |
| 8 | ST_MN_BYPASS | DPLL MN_BYPASS status Read 0x1: DPLL is in MN_Bypass Read 0x0: DPLL is not in MN_Bypass | R | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | ST_DPLL_CLK | DPLL lock status Read 0x1: DPLL is LOCKED Read 0x0: DPLL is either in bypass mode or in stop mode. | R | 0 |

Table 3-1162. Register Call Summary for Register CM_IDLEST_DPLL_PER

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[0\]](#)

Table 3-1163. CM_AUTOIDLE_DPLL_PER

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0048 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8148 | | |
| Description | This register provides automatic control over the DPLL activity. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | AUTO_DPLL_MODE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-----------|
| 31:3 | RESERVED | | R | 0x0000000 |
| 2:0 | AUTO_DPLL_MODE | DPLL automatic control; 0x0: DPLL auto control disabled 0x1: The DPLL is automatically put in low-power stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x2: The DPLL is automatically put in fast-relock stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x3: Reserved 0x4: Reserved 0x5: The DPLL is automatically put in idle bypass low-power mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x6: The DPLL is automatically put in idle bypass fast-relock mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x7: Reserved | RW | 0x0 |

Table 3-1164. Register Call Summary for Register CM_AUTOIDLE_DPLL_PER

Clock Management Functional Description

- [DPLL_PER Description: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[1\]](#)

Table 3-1165. CM_CLKSEL_DPLL_PER

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 004C | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 814C | | |
| Description | This register provides controls over the DPLL. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----------|----|----|----|----|----|----|----|-----------|----|----|----|----|---|---|---|----------|----------|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | DPLL_BYP_CLKSEL | RESERVED | | | | | | | | DPLL_MULT | | | | | | | | RESERVED | DPLL_DIV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|-------|
| 31:24 | RESERVED | | R | 0x00 |
| 23 | DPLL_BYP_CLKSEL | Allows control of the BYPASS clock of the PLL and the associated HSDIVIDER. Same as ULOWCLKEN on DPLL. In DPLL Locked mode, 0 - No impact 1 - No impact In DPLL Bypass mode, 0 - CLKINP is selected as the BYPASS clock for CLKOUT/CLKOUTX2 1 - CLKINPULOW is selected as the BYPASS clock for CLKOUT/CLKOUTX2 | RW | 0 |
| 22:19 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 18:8 | DPLL_MULT | DPLL multiplier factor (2 to 2047). This register is automatically cleared to 0 when the DPLL_EN field in the *CLKMODE_DPLL* register is set to select MN bypass mode. (equal to input M of DPLL; M=2 to 2047 = DPLL multiplies by M). 0x0: Reserved 0x1: Reserved | RW | 0x000 |
| 7 | RESERVED | | R | 0 |
| 6:0 | DPLL_DIV | DPLL divider factor (0 to 127) (equal to input N of DPLL; actual division factor is N+1). | RW | 0x00 |

Table 3-1166. Register Call Summary for Register CM_CLKSEL_DPLL_PER

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)
- [DPLL_PER Description: \[1\] \[2\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[3\]](#)

Table 3-1167. CM_DIV_M2_DPLL_PER

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0050 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8150 | | |
| Description | This register provides controls over the M2 divider of the DPLL. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|-------------------------|----|----------------|----|-----------------------|---|----------|---|----------------------|---|-----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ST_DPLL_CLKOUTX2 | | DPLL_CLKOUTX2_GATE_CTRL | | ST_DPLL_CLKOUT | | DPLL_CLKOUT_GATE_CTRL | | RESERVED | | DPLL_CLKOUT_DIVCHACK | | DPLL_CLKOUT_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11 | ST_DPLL_CLKOUTX2 | DPLL CLKOUTX2 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 10 | DPLL_CLKOUTX2_GATE_CTRL | Control gating of DPLL CLKOUTX2 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 9 | ST_DPLL_CLKOUT | DPLL CLKOUT status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|-------|
| 8 | DPLL_CLKOUT_GATE_CTRL | Control gating of DPLL CLKOUT 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | DPLL_CLKOUT_DIVCHACK | Toggle on this status bit after changing DPLL_CLKOUT_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | DPLL_CLKOUT_DIV | DPLL post-divider factor, M2, for internal clock generation (1 to 31) 0x0: Reserved 0x4: 4, to be used for OPP119 and OPP50 (when DPLL_PER is locked at 768 MHz) 0x8: 8, to be used for OPP119 and OPP50 (when DPLL_PER is locked at 1536 MHz) | RW | 0x01 |

Table 3-1168. Register Call Summary for Register CM_DIV_M2_DPLL_PER

Clock Management Functional Description

- [DPLL_PER Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[6\]](#)

Table 3-1169. CM_DIV_M3_DPLL_PER

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0054 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8154 | | |
| Description | This register provides controls over the M3 divider of the DPLL. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|-------------------|---|--------------------------|---|----------|---|-------------------------|--|--------------------|--|--|--|--|
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | ST_DPLL_CLKOUTHIF | | DPLL_CLKOUTHIF_GATE_CTRL | | RESERVED | | DPLL_CLKOUTHIF_DIVCHACK | | DPLL_CLKOUTHIF_DIV | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | ST_DPLL_CLKOUTHIF | DPLL CLKOUTHIF status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | DPLL_CLKOUTHIF_GATE_CTRL | Control gating of DPLL CLKOUTHIF 0x0: Gate unconditionally this clock and stop requesting it 0x1: Request this clock and un-gate it when available | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------|
| 5 | DPLL_CLKOUTHIF_DIVCHACK | Toggle on this status bit after changing DPLL_CLKOUTHIF_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | DPLL_CLKOUTHIF_DIV | DPLL post-divider factor, M3, for internal clock generation (1 to 31) 0x0: Reserved 0x3: 3, to be used for OPP119 (when DPLL_PER is locked at 768 MHz) 0x4: 4, to be used for OPP50 (when DPLL_PER is locked at 768 MHz) 0x6: 6, to be used for OPP119 (when DPLL_PER is locked at 1536 MHz) 0x8: 8, to be used for OPP50 (when DPLL_PER is locked at 1536 MHz) | RW | 0x01 |

Table 3-1170. Register Call Summary for Register CM_DIV_M3_DPLL_PER

Clock Management Functional Description

- [Generic DPLL Overview: \[0\]](#)
- [DPLL_PER Description: \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[5\]](#)

Table 3-1171. CM_DIV_M4_DPLL_PER

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0058 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8158 | | |
| Description | This register provides controls over the CLKOUT1 o/p of the HSDIVIDER. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----|----|----------|----|----------------------|---|-----------------------------|---|----------|---|----------------------------|---|-----------------------|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT1_PWDN | | | | RESERVED | | ST_HSDIVIDER_CLKOUT1 | | HSDIVIDER_CLKOUT1_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT1_DIVCHACK | | HSDIVIDER_CLKOUT1_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|----------|
| 31:13 | RESERVED | | R | 0x000000 |
| 12 | HSDIVIDER_CLKOUT1_PWDN | Direct power down control for HSDIVIDER M4 divider and CLKOUT1 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | ST_HSDIVIDER_CLKOUT1 | HSDIVIDER CLKOUT1 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|------|-------|
| 8 | HSDIVIDER_CLKOUT1_GATE_CTRL | Control gating of HSDIVIDER CLKOUT1 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT1_DIVCHACK | Toggle on this status bit after changing HSDIVIDER_CLKOUT1_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT1_DIV | DPLL M4 post-divider factor (1 to 31). 0x0: Reserved 0x6: 6, to be used for OPP119 and OPP50 (when DPLL_PER is locked at 768 MHz) 0xC: 12, to be used for OPP119 and OPP50 (when DPLL_PER is locked at 1536 MHz) | RW | 0x04 |

Table 3-1172. Register Call Summary for Register CM_DIV_M4_DPLL_PER

Clock Management Functional Description

- [DPLL_PER Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[5\]](#)

Table 3-1173. CM_DIV_M5_DPLL_PER

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 005C | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 815C | | |
| Description | This register provides controls over the CLKOUT2 o/p of the HSDIVIDER. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----------------------|----|-----------------------------|---|----------|---|----------------------------|---|-----------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT2_PWDN | | RESERVED | | ST_HSDIVIDER_CLKOUT2 | | HSDIVIDER_CLKOUT2_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT2_DIVCHACK | | HSDIVIDER_CLKOUT2_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HSDIVIDER_CLKOUT2_PWDN | Direct power down control for HSDIVIDER M5 divider and CLKOUT2 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | ST_HSDIVIDER_CLKOUT2 | HSDIVIDER CLKOUT2 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|--|------|-------|
| 8 | HSDIVIDER_CLKOUT2_GATE_CTRL | Control gating of HSDIVIDER CLKOUT2 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT2_DIVCHA CK | Toggle on this status bit after changing HSDIVIDER_CLKOUT2_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT2_DIV | DPLL M5 post-divider factor (1 to 31). 0x0: Reserved 0x5: 5, to be used for OPP119 and OPP50 (when DPLL_PER is locked at 768 MHz) 0x9: 9, to be used for OPP100 and OPP50 (when DPLL_PER is locked at 1536 MHz) | RW | 0x04 |

Table 3-1174. Register Call Summary for Register CM_DIV_M5_DPLL_PER

Clock Management Functional Description

- [DPLL_PER Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[5\]](#)

Table 3-1175. CM_DIV_M6_DPLL_PER

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0060 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8160 | | |
| Description | This register provides controls over the CLKOUT3 o/p of the HSDIVIDER. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----------------------|----|-----------------------------|---|----------|---|----------------------------|---|-----------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT3_PWDN | | RESERVED | | ST_HSDIVIDER_CLKOUT3 | | HSDIVIDER_CLKOUT3_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT3_DIVCHACK | | HSDIVIDER_CLKOUT3_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HSDIVIDER_CLKOUT3_PWDN | Direct power down control for HSDIVIDER M6 divider and CLKOUT3 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | ST_HSDIVIDER_CLKOUT3 | HSDIVIDER CLKOUT3 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|------|-------|
| 8 | HSDIVIDER_CLKOUT3_GATE_CTRL | Control gating of HSDIVIDER CLKOUT3 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT3_DIVCHA CK | Toggle on this status bit after changing HSDIVIDER_CLKOUT3_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT3_DIV | DPLL M6 post-divider factor (1 to 31). 0x0: Reserved 0x2: 2, to be used for OPP119 (when DPLL_PER is locked at 768 MHz) 0x4: 4, to be used for OPP119 (when DPLL_PER is locked at 1536 MHz) and for OPP50 (when DPLL_PER is locked at 768 MHz) 0x8: 8, to be used for OPP50 (when DPLL_PER is locked at 1536 MHz) | RW | 0x04 |

Table 3-1176. Register Call Summary for Register CM_DIV_M6_DPLL_PER

Clock Management Functional Description

- [DPLL_PER Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[5\]](#)

Table 3-1177. CM_DIV_M7_DPLL_PER

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0064 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8164 | | |
| Description | This register provides controls over the CLKOUT4 o/p of the HSDIVIDER. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----------|----|----------------------|----|-----------------------------|---|----------|---|----------------------------|---|-----------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSDIVIDER_CLKOUT4_PWDN | | RESERVED | | ST_HSDIVIDER_CLKOUT4 | | HSDIVIDER_CLKOUT4_GATE_CTRL | | RESERVED | | HSDIVIDER_CLKOUT4_DIVCHACK | | HSDIVIDER_CLKOUT4_DIV | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HSDIVIDER_CLKOUT4_PWDN | Direct power down control for HSDIVIDER M7 divider and CLKOUT4 output. Power down should be enabled only when clock is first gated. 0x0: Divider is powered up 0x1: Divider is powered down | RW | 0 |
| 11:10 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|------|-------|
| 9 | ST_HSDIVIDER_CLKOUT4 | HSDIVIDER CLKOUT4 status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | HSDIVIDER_CLKOUT4_GATE_CTRL | Control gating of HSDIVIDER CLKOUT4 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | HSDIVIDER_CLKOUT4_DIVCHA CK | Toggle on this status bit after changing HSDIVIDER_CLKOUT4_DIV indicates that the change in divider value has taken effect | R | 0 |
| 4:0 | HSDIVIDER_CLKOUT4_DIV | DPLL M7 post-divisor factor (1 to 31). 0x0: Reserved 0x2: 2, to be used for OPP119 (when DPLL_PER is locked at 768 MHz) 0x4: 4, to be used for OPP119 (when DPLL_PER is locked at 1536 MHz) and OPP50 (when DPLL_PER is locked at 768 MHz) 0x8: 8, to be used for OPP50 (when DPLL_PER is locked at 1536 MHz) | RW | 0x04 |

Table 3-1178. Register Call Summary for Register CM_DIV_M7_DPLL_PER

Clock Management Functional Description

- [DPLL_PER Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[5\]](#)

Table 3-1179. CM_SSC_DELTAMSTEP_DPLL_PER

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|---|----|----|----|----|----|----|----|----|----|----|----|----|------------|----------|-----------|------|---------|----|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0068 | | | | | | | | | | | | | | | | Instance | CKGEN_CM2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 8168 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Control the DeltaMStep parameter for Spread Spectrum Clocking. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="16">DELTAMSTEP</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | DELTAMSTEP | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | DELTAMSTEP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:20 | RESERVED | | | | | | | | | | | | | | | | | | R | 0x000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19:0 | DELTAMSTEP | | DeltaMStep is split into fractional and integer part. For Triangular Spread Spectrum: [19:18] for integer part, [17:0] for fractional part For Square Wave Spread Spectrum [19:14] for integer part, [13:0] for fractional part | | | | | | | | | | | | | | | | RW | 0x00000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:0 | DELTAMSTEP | DeltaMStep is split into fractional and integer part. For Triangular Spread Spectrum: [19:18] for integer part, [17:0] for fractional part For Square Wave Spread Spectrum [19:14] for integer part, [13:0] for fractional part | RW | 0x00000 |

Table 3-1180. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_PER

Clock Management Functional Description

- [DPLL_PER Description: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[1\]](#)

Table 3-1181. CM_SSC_MODFREQDIV_DPLL_PER

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 006C | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 816C | | |
| Description | Control the Modulation Frequency (Fm) for Spread Spectrum. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|----------|---------------------|---|---|---|---|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | MODFREQDIV_EXPONENT | | | | | | RESERVED | MODFREQDIV_MANTISSA | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|-----------|
| 31:11 | RESERVED | | R | 0x0000000 |
| 10:8 | MODFREQDIV_EXPONENT | Set the Exponent component of MODFREQDIV factor | RW | 0x0 |
| 7 | RESERVED | | R | 0 |
| 6:0 | MODFREQDIV_MANTISSA | Set the Mantissa component of MODFREQDIV factor | RW | 0x00 |

Table 3-1182. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_PER

Clock Management Functional Description

- [DPLL_PER Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[2\]](#)

Table 3-1183. CM_CLKMODE_DPLL_USB

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0080 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8180 | | |
| Description | This register allows controlling the DPLL modes. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|--------------|----|-------------|---|----------|---|---|---|---|---|---|---------|---|
| RESERVED | | | | | | | | | | | | | | | | DPLL_SSC_DOWNSPREAD | | | DPLL_SSC_ACK | | DPLL_SSC_EN | | RESERVED | | | | | | | DPLL_EN | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14 | DPLL_SSC_DOWNSPREAD | Control if only low frequency spread is required 0x0: When SSC is enabled, clock frequency is spread on both sides of the programmed frequency 0x1: When SSC is enabled, clock frequency is spread only on the lower side of the programmed frequency | RW | 0 |
| 13 | DPLL_SSC_ACK | Acknowledgement from the DPLL regarding start and stop of Spread Spectrum Clocking feature Read 0x0: SSC has been turned off on PLL o/ps Read 0x1: SSC has been turned on on PLL o/ps | R | 0 |
| 12 | DPLL_SSC_EN | Enable or disable Spread Spectrum Clocking 0x0: SSC disabled 0x1: SSC enabled | RW | 0 |
| 11:3 | RESERVED | | R | 0x000 |
| 2:0 | DPLL_EN | DPLL control. Upon Warm Reset, the PRCM DPLL control state machine updates this register to reflect DPLL low-power stop mode. 0x0: Reserved 0x1: Put the DPLL in low-power stop mode 0x2: Reserved2 0x3: Reserved 0x4: Put the DPLL in MN bypass mode. The DPLL_MULT register bits are reset to 0 automatically by putting the DPLL in this mode. 0x5: Put the DPLL in idle bypass low-power mode. 0x6: Reserved 0x7: Enables the DPLL in lock mode | RW | 0x4 |

Table 3-1184. Register Call Summary for Register CM_CLKMODE_DPLL_USB

Clock Management Functional Description

- [DPLL_USB Description: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[4\]](#)

Table 3-1185. CM_IDLEST_DPLL_USB

| | | | |
|------------------|--|----------|-----------|
| Address Offset | 0x0000 0084 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8184 | | |
| Description | This register allows monitoring DPLL activity. This register is read only and automatically updated. [warm reset insensitive] | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ST_MN_BYPASS | RESERVED | | | | | | | | | | | | | | ST_DPLL_CLK |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | ST_MN_BYPASS | DPLL MN_BYPASS status Read 0x1: DPLL is in MN_Bypass Read 0x0: DPLL is not in MN_Bypass | R | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | ST_DPLL_CLK | DPLL lock status Read 0x1: DPLL is LOCKED Read 0x0: DPLL is either in bypass mode or in stop mode. | R | 0 |

Table 3-1186. Register Call Summary for Register CM_IDLEST_DPLL_USB

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[0\]](#)

Table 3-1187. CM_AUTOIDLE_DPLL_USB

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0088 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8188 | | |
| Description | This register provides automatic control over the DPLL activity. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | AUTO_DPLL_MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | AUTO_DPLL_MODE | DPLL automatic control; 0x0: DPLL auto control disabled 0x1: The DPLL is automatically put in low-power stop mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x2: Reserved 0x3: Reserved 0x4: Reserved 0x5: The DPLL is automatically put in idle bypass low-power mode when its DPLL generated clocks are not required anymore. It is also restarted automatically. 0x6: Reserved 0x7: Reserved | RW | 0x0 |

Table 3-1188. Register Call Summary for Register CM_AUTOIDLE_DPLL_USB

Clock Management Functional Description

- [DPLL_USB Description: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[1\]](#)

Table 3-1189. CM_CLKSEL_DPLL_USB

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 008C | | |
| Physical Address | 0x4A00 818C | Instance | CKGEN_CM2 |
| Description | This register provides controls over the DPLL. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|----|----|----|----|----|----|-----------------|----------|----|----|-----------|----|----|----|----|----|----|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DPLL_SD_DIV | | | | | | | | DPLL_BYP_CLKSEL | RESERVED | | | DPLL_MULT | | | | | | | | DPLL_DIV | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|-------|
| 31:24 | DPLL_SD_DIV | Sigma-Delta divider select (2-255). This factor must be set by s/w to ensure optimum jitter performance. DPLL_SD_DIV = CEILING ([DPLL_MULT/(DPLL_DIV+1)] * CLKINP / 250), where CLKINP is the input clock of the DPLL in MHz). Must be set with M and N factors, and must not be changed once DPLL is locked. 0x0: Reserved 0x1: Reserved | RW | 0x04 |
| 23 | DPLL_BYP_CLKSEL | Allows control of the BYPASS clock of the PLL and the associated HSDIVIDER. Same as ULOWCLKEN on DPLL. In DPLL locked mode, 0 - No impact 1 - No impact In DPLL bypass mode, 0 - CLKINP is selected as the BYPASS clock for CLKOUT 1 - CLKINPULOW is selected as the BYPASS clock for CLKOUT | RW | 0 |
| 22:20 | RESERVED | | R | 0x0 |
| 19:8 | DPLL_MULT | DPLL multiplier factor (2 to 4095). This register is automatically cleared to 0 when the DPLL_EN field in the *CLKMODE_DPLL* register is set to select MN bypass mode. (equal to input M of DPLL; M=2 to 4095 = DPLL multiplies by M). 0x0: Reserved 0x1: Reserved | RW | 0x000 |
| 7:0 | DPLL_DIV | DPLL divider factor (0 to 255) (equal to input N of DPLL; actual division factor is N+1). | RW | 0x00 |

Table 3-1190. Register Call Summary for Register CM_CLKSEL_DPLL_USB

Clock Management Functional Description

- [DPLL_USB Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[2\]](#)

Table 3-1191. CM_DIV_M2_DPLL_USB

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0090 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 8190 | | |
| Description | This register provides controls over the M2 divider of the DPLL. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|-----------------------|----|----|----------------------|---|---|-----------------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ST_DPLL_CLKOUT | | | DPLL_CLKOUT_GATE_CTRL | | | DPLL_CLKOUT_DIVCHACK | | | DPLL_CLKOUT_DIV | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|---------|
| 31:10 | RESERVED | | R | 0x00000 |
| 9 | ST_DPLL_CLKOUT | DPLL CLKOUT status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | DPLL_CLKOUT_GATE_CTRL | Control gating of DPLL CLKOUT 0x0: Automatically gate this clock when there is no dependency for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7 | DPLL_CLKOUT_DIVCHACK | Toggle on this status bit after changing DPLL_CLKOUT_DIV indicates that the change in divider value has taken effect | R | 0 |
| 6:0 | DPLL_CLKOUT_DIV | DPLL post-divider factor, M2, for internal clock generation (1 to 127) 0x0: Reserved 0x2: 2, to be used for OPP119 and OPP50 | RW | 0x01 |

Table 3-1192. Register Call Summary for Register CM_DIV_M2_DPLL_USB

Clock Management Functional Description

- [DPLL_USB Description: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[4\]](#)

Table 3-1193. CM_SSC_DELTAMSTEP_DPLL_USB

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 00A8 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 81A8 | | |
| Description | Control the DeltaMStep parameter for Spread Spectrum Clocking. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DELTAMSTEP | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:21 | RESERVED | | R | 0x000 |
| 20:0 | DELTAMSTEP | DeltaMStep is split into fractional and integer part. For Triangular Spread Spectrum: [20:18] for integer part, [17:0] for fractional part For Square Wave Spread Spectrum [19:14] for integer part, [13:0] for fractional part | RW | 0x00000 |

Table 3-1194. Register Call Summary for Register CM_SSC_DELTAMSTEP_DPLL_USB

Clock Management Functional Description

- [DPLL_USB Description: \[0\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[1\]](#)

Table 3-1195. CM_SSC_MODFREQDIV_DPLL_USB

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 00AC | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 81AC | | |
| Description | Control the Modulation Frequency (Fm) for Spread Spectrum. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----------|----|---------------------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MODFREQDIV_EXPONENT | | RESERVED | | MODFREQDIV_MANTISSA | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10:8 | MODFREQDIV_EXPONENT | Set the Exponent component of MODFREQDIV factor | RW | 0x0 |
| 7 | RESERVED | | R | 0 |
| 6:0 | MODFREQDIV_MANTISSA | Set the Mantissa component of MODFREQDIV factor | RW | 0x00 |

Table 3-1196. Register Call Summary for Register CM_SSC_MODFREQDIV_DPLL_USB

Clock Management Functional Description

- [DPLL_USB Description: \[0\] \[1\]](#)

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[2\]](#)

Table 3-1197. CM_CLKDCOLDO_DPLL_USB

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00B4 | Instance | CKGEN_CM2 |
| Physical Address | 0x4A00 81B4 | | |
| Description | This register provides controls over the CLKDCOLDO output of the DPLL. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|--------------------------|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ST_DPLL_CLKDCOLDO | | DPLL_CLKDCOLDO_GATE_CTRL | | RESERVED | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | ST_DPLL_CLKDCOLDO | DPLL CLKDCOLDO status Read 0x0: The clock output is gated Read 0x1: The clock output is enabled | R | 0 |
| 8 | DPLL_CLKDCOLDO_GATE_CTRL | Control gating of DPLL CLKDCOLDO 0x0: Automatically gate this clock when there is no request for it 0x1: Force this clock to stay enabled even if there is no request | RW | 0 |
| 7:0 | RESERVED | | R | 0x00 |

Table 3-1198. Register Call Summary for Register CM_CLKDCOLDO_DPLL_USB

PRCM Register Manual

- [CKGEN_CM2 Register Summary: \[0\]](#)

3.11.32 ALWAYS_ON_CM2 Registers

3.11.32.1 ALWAYS_ON_CM2 Register Summary

Table 3-1199. ALWAYS_ON_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ALWAYS_ON_CM2 L4 Base Address |
|--|------|-----------------------|----------------|-------------------------------|
| CM_ALWON_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A00 8600 |
| RESERVED | R | 32 | 0x0000 0020 | 0x4A00 8620 |
| CM_ALWON_SR_MPU_CLKCTRL | RW | 32 | 0x0000 0028 | 0x4A00 8628 |
| CM_ALWON_SR_IVA_CLKCTRL | RW | 32 | 0x0000 0030 | 0x4A00 8630 |
| CM_ALWON_SR_CORE_CLKCTRL | RW | 32 | 0x0000 0038 | 0x4A00 8638 |
| CM_ALWON_USBPHY_CLKCTRL | RW | 32 | 0x0000 0040 | 0x4A00 8640 |

3.11.32.2 ALWAYS_ON_CM2 Register Description

Table 3-1200. CM_ALWON_CLKSTCTRL

| | | | |
|------------------|--|----------|---------------|
| Address Offset | 0x0000 0000 | Instance | ALWAYS_ON_CM2 |
| Physical Address | 0x4A00 8600 | | |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------------------------|----|----|----|----------------------------|----|---|---|---------------------------|---|---|---|---------------------------|---|---|---|------------------------|--|--|--|----------|--|--|--|-----------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_CORE_ALWON_32K_GFCLK | | | | CLKACTIVITY_SR_CORE_SYSCLK | | | | CLKACTIVITY_SR_IVA_SYSCLK | | | | CLKACTIVITY_SR_MPU_SYSCLK | | | | CLKACTIVITY_L4_AO_ICLK | | | | RESERVED | | | | CLKTRCTRL | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | CLKACTIVITY_CORE_ALWON_32K_GFCLK | <p>This field indicates the state of the CORE_ALWON_32K_GFCLK clock in the domain. [warm reset insensitive]</p> <p>Read 0x0: Corresponding clock is definitely gated.</p> <p>Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing.</p> | R | 0 |
| 11 | CLKACTIVITY_SR_CORE_SYSCLK | <p>This field indicates the state of the SR_CORE_SYSCLK clock input of the domain. [warm reset insensitive]</p> <p>Read 0x0: Corresponding clock is definitely gated</p> <p>Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing</p> | R | 0 |
| 10 | CLKACTIVITY_SR_IVA_SYSCLK | <p>This field indicates the state of the SR_IVA_SYSCLK clock input of the domain. [warm reset insensitive]</p> <p>Read 0x0: Corresponding clock is definitely gated</p> <p>Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing</p> | R | 0 |
| 9 | CLKACTIVITY_SR_MPU_SYSCLK | <p>This field indicates the state of the SR_MPU_SYSCLK clock input of the domain. [warm reset insensitive]</p> <p>Read 0x0: Corresponding clock is definitely gated</p> <p>Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing</p> | R | 0 |
| 8 | CLKACTIVITY_L4_AO_ICLK | <p>This field indicates the state of the L4_AO_ICLK clock of the domain. [warm reset insensitive]</p> <p>Read 0x0: Corresponding clock is definitely gated</p> <p>Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing</p> | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | CLKTRCTRL | Controls the clock state transition of the ALWONCORE clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x3 |

Table 3-1201. Register Call Summary for Register CM_ALWON_CLKSTCTRL

PRCM Register Manual

- [ALWAYS_ON_CM2 Register Summary: \[0\]](#)

Table 3-1202. CM_ALWON_SR_MPU_CLKCTRL

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0028 | Instance | ALWAYS_ON_CM2 |
| Physical Address | 0x4A00 8628 | | |
| Description | This register manages the SR_MPU clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1203. Register Call Summary for Register CM ALWON SR MPU CLKCTRL

Clock Management Functional Description

- Clock Domain Module Attributes: [0] [1]

PRCM Register Manual

- [ALWAYS_ON_CM2 Register Summary: \[2\]](#)

Table 3-1204. CM ALWON SR IVA CLKCTRL

| | | |
|-------------------------|--|-----------------|
| Address Offset | 0x0000 0030 | |
| Physical Address | 0x4A00 8630 | Instance |
| Description | This register manages the SR_IVA clocks. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup).</p> <p>Read 0x1: Reserved</p> <p>0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen.</p> <p>Read 0x3: Reserved</p> | RW | 0x0 |

Table 3-1205. Register Call Summary for Register CM_ALWON_SR_IVA_CLKCTRL

Clock Management Functional Description

- Clock Domain Module Attributes: [0] [1]

PRCM Register Manual

- ALWAYS_ON_CM2 Register Summary: [2]

Table 3-1206. CM_ALWON_SR_CORE_CLKCTRL

| | | | |
|-------------------------|---|-----------------|---------------|
| Address Offset | 0x0000 0038 | | |
| Physical Address | 0x4A00 8638 | Instance | ALWAYS_ON_CM2 |
| Description | This register manages the SR_CORE clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | | | | | | | | | MODULEMODE | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup).</p> <p>Read 0x1: Reserved</p> <p>0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen.</p> <p>Read 0x3: Reserved</p> | RW | 0x0 |

Table 3-1207. Register Call Summary for Register CM_ALWON_SR_CORE_CLKCTRL

| |
|--|
| <p>Clock Management Functional Description</p> <ul style="list-style-type: none"> • Clock Domain Module Attributes: [0] [1] |
| <p>PRCM Register Manual</p> <ul style="list-style-type: none"> • ALWAYS_ON_CM2 Register Summary: [2] |

Table 3-1208. CM_ALWON_USBPHY_CLKCTRL

| | | | |
|------------------|--|----------|---------------|
| Address Offset | 0x0000 0040 | | |
| Physical Address | 0x4A00 8640 | Instance | ALWAYS_ON_CM2 |
| Description | This register manages the USB PHY 32KHz clock. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OPTFCLKEN_CLK32K | | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-----------|
| 31:9 | RESERVED | | R | 0x0000000 |
| 8 | OPTFCLKEN_CLK32K | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:0 | RESERVED | | R | 0x00 |

Table 3-1209. Register Call Summary for Register CM_ALWON_USBPHY_CLKCTRL

PRCM Register Manual

- [ALWAYS_ON_CM2 Register Summary: \[0\]](#)

3.11.33 CORE_CM2 Registers

3.11.33.1 CORE_CM2 Register Summary

Table 3-1210. CORE_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CORE_CM2 L4 Base Address |
|--|------|-----------------------|----------------|--------------------------|
| CM_L3_1_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A00 8700 |
| CM_L3_1_DYNAMICDEP | RW | 32 | 0x0000 0008 | 0x4A00 8708 |
| CM_L3_1_L3_1_CLKCTRL | R | 32 | 0x0000 0020 | 0x4A00 8720 |
| CM_L3_2_CLKSTCTRL | RW | 32 | 0x0000 0100 | 0x4A00 8800 |
| CM_L3_2_DYNAMICDEP | RW | 32 | 0x0000 0108 | 0x4A00 8808 |
| CM_L3_2_L3_2_CLKCTRL | R | 32 | 0x0000 0120 | 0x4A00 8820 |
| CM_L3_2_GPMC_CLKCTRL | RW | 32 | 0x0000 0128 | 0x4A00 8828 |
| CM_L3_2_OCMC_RAM_CLKCTRL | R | 32 | 0x0000 0130 | 0x4A00 8830 |
| CM_MPU_M3_CLKSTCTRL | RW | 32 | 0x0000 0200 | 0x4A00 8900 |
| CM_MPU_M3_STATICDEP | RW | 32 | 0x0000 0204 | 0x4A00 8904 |
| CM_MPU_M3_DYNAMICDEP | RW | 32 | 0x0000 0208 | 0x4A00 8908 |
| CM_MPU_M3_MPU_M3_CLKCTRL | RW | 32 | 0x0000 0220 | 0x4A00 8920 |
| CM_SDMA_CLKSTCTRL | RW | 32 | 0x0000 0300 | 0x4A00 8A00 |
| CM_SDMA_STATICDEP | RW | 32 | 0x0000 0304 | 0x4A00 8A04 |
| CM_SDMA_DYNAMICDEP | R | 32 | 0x0000 0308 | 0x4A00 8A08 |
| CM_SDMA_SDMA_CLKCTRL | R | 32 | 0x0000 0320 | 0x4A00 8A20 |
| CM_MEMIF_CLKSTCTRL | RW | 32 | 0x0000 0400 | 0x4A00 8B00 |
| CM_MEMIF_DMM_CLKCTRL | R | 32 | 0x0000 0420 | 0x4A00 8B20 |
| CM_MEMIF_EMIF_FW_CLKCTRL | R | 32 | 0x0000 0428 | 0x4A00 8B28 |
| CM_MEMIF_EMIF_1_CLKCTRL | RW | 32 | 0x0000 0430 | 0x4A00 8B30 |
| CM_MEMIF_EMIF_2_CLKCTRL | RW | 32 | 0x0000 0438 | 0x4A00 8B38 |
| CM_MEMIF_DLL_CLKCTRL | RW | 32 | 0x0000 0440 | 0x4A00 8B40 |

Table 3-1210. CORE_CM2 Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | CORE_CM2 L4 Base Address |
|-----------------------------|------|-----------------------|----------------|--------------------------|
| RESERVED | RW | 32 | 0x0000 0450 | 0x4A00 8B50 |
| RESERVED | RW | 32 | 0x0000 0458 | 0x4A00 8B58 |
| RESERVED | RW | 32 | 0x0000 0460 | 0x4A00 8B60 |
| CM_C2C_CLKSTCTRL | RW | 32 | 0x0000 0500 | 0x4A00 8C00 |
| CM_C2C_STATICDEP | RW | 32 | 0x0000 0504 | 0x4A00 8C04 |
| CM_C2C_DYNAMICDEP | RW | 32 | 0x0000 0508 | 0x4A00 8C08 |
| CM_C2C_C2C_CLKCTRL | R | 32 | 0x0000 0520 | 0x4A00 8C20 |
| RESERVED | R | 32 | 0x0000 0528 | 0x4A00 8C28 |
| CM_C2C_C2C_FW_CLKCTRL | R | 32 | 0x0000 0530 | 0x4A00 8C30 |
| CM_L4CFG_CLKSTCTRL | RW | 32 | 0x0000 0600 | 0x4A00 8D00 |
| CM_L4CFG_DYNAMICDEP | RW | 32 | 0x0000 0608 | 0x4A00 8D08 |
| CM_L4CFG_L4_CFG_CLKCTRL | R | 32 | 0x0000 0620 | 0x4A00 8D20 |
| CM_L4CFG_SPINLOCK_CLKCTRL | R | 32 | 0x0000 0628 | 0x4A00 8D28 |
| CM_L4CFG_MAILBOX_CLKCTRL | R | 32 | 0x0000 0630 | 0x4A00 8D30 |
| CM_L4CFG_SAR_ROM_CLKCTRL | R | 32 | 0x0000 0638 | 0x4A00 8D38 |
| CM_L3INSTR_CLKSTCTRL | R | 32 | 0x0000 0700 | 0x4A00 8E00 |
| CM_L3INSTR_L3_3_CLKCTRL | RW | 32 | 0x0000 0720 | 0x4A00 8E20 |
| CM_L3INSTR_L3_INSTR_CLKCTRL | RW | 32 | 0x0000 0728 | 0x4A00 8E28 |
| CM_L3INSTR_OCP_WP1_CLKCTRL | RW | 32 | 0x0000 0740 | 0x4A00 8E40 |

3.11.33.2 CORE_CM2 Register Description**Table 3-1211. CM_L3_1_CLKSTCTRL**

| | | | |
|------------------|--|----------|----------|
| Address Offset | 0x0000 0000 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8700 | | |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----------|----|----|----|----|---|---|---|-----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_L3_1_ICLK | RESERVED | | | | | | | | CLKTRCTRL | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKACTIVITY_L3_1_ICLK | This field indicates the state of the L3_1_ICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the L3_1 clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved Read 0x2: Reserved 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1212. Register Call Summary for Register CM_L3_1_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)
- [RESTORE_CM2 Register Description: \[3\]](#)

Table 3-1213. CM_L3_1_DYNAMICDEP

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0008 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8708 | | |
| Description | This register controls the dynamic domain dependencies from L3_1 domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|----|----|--------------|----|----|----|----------|----|---|---|-------------|---|----------|--------------|------------|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | | | | | L4CFG_DYNDEP | | | | RESERVED | | | | L3_2_DYNDEP | | RESERVED | MEMIF_DYNDEP | ABE_DYNDEP | RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|---------------------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor INTRCONN interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:13 | RESERVED | | R | 0x000 |
| 12 | L4CFG_DYNDEP | Dynamic dependency towards L4CFG clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 11:7 | RESERVED | | R | 0x00 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5 | RESERVED | | R | 0 |
| 4 | MEMIF_DYNDEP | Dynamic dependency towards MEMIF clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 3 | ABE_DYNDEP | Dynamic dependency towards ABE clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 2:0 | RESERVED | | R | 0x0 |

Table 3-1216. Register Call Summary for Register CM_L3_1_L3_1_CLKCTRL

Clock Management Functional Description
 • [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual
 • [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1216. Register Call Summary for Register CM_L3_1_L3_1_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1217. CM_L3_2_CLKSTCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0100 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8800 | | |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----------|----|----|----|----|---|---|---|-----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_L3_2_ICLK | RESERVED | | | | | | | | CLKTRCTRL | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKACTIVITY_L3_2_ICLK | This field indicates the state of the L3_2_ICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the L3_2 clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved Read 0x2: Reserved 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1218. Register Call Summary for Register CM_L3_2_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)
- [RESTORE_CM2 Register Description: \[3\]](#)

Table 3-1219. CM_L3_2_DYNAMICDEP

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0108 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8808 | | |
| Description | This register controls the dynamic domain depedencies from L3_2 domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|----|----|--------------|----------|----|------------|------------|------------|----------------|----------|-------------|----------|---|--------------|----------|---------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | | | | | L4PER_DYNDEP | RESERVED | | SGX_DYNDEP | CAM_DYNDEP | DSS_DYNDEP | L3_INIT_DYNDEP | RESERVED | L3_1_DYNDEP | RESERVED | | IVAHD_DYNDEP | RESERVED | MPU_M3_DYNDEP | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|-----------------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor INTRCONN interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:14 | RESERVED | | R | 0x000 |
| 13 | L4PER_DYNDEP | Dynamic dependency towards L4PER clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 12:11 | RESERVED | | R | 0x0 |
| 10 | SGX_DYNDEP | Dynamic dependency towards SGX clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 9 | CAM_DYNDEP | Dynamic dependency towards ISS clock domain Read 0x0: Dependency is disabled | R | 0 |
| 8 | DSS_DYNDEP | Dynamic dependency towards DSS clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 7 | L3_INIT_DYNDEP | Dynamic dependency towards L3INIT clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 6 | RESERVED | | R | 0 |
| 5 | L3_1_DYNDEP | Dynamic dependency towards L3_1 clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 4:3 | RESERVED | | R | 0x0 |
| 2 | IVAHD_DYNDEP | Dynamic dependency towards IVAHD clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 1 | RESERVED | | R | 0 |
| 0 | MPU_M3_DYNDEP | Dynamic dependency towards CORTEXM3 clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |

Table 3-1220. Register Call Summary for Register CM_L3_2_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency](#): [0] [1] [2] [3] [4] [5] [6] [7] [8]

PRCM Register Manual

- [CORE_CM2 Register Summary](#): [9]
- [RESTORE_CM2 Register Description](#): [10]

Table 3-1221. CM L3 2 L3 2 CLKCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0120 | | |
| Physical Address | 0x4A00 8820 | Instance | CORE_CM2 |
| Description | This register manages the L3_2 clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|--------------------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state.</p> | <p>R</p> <p>Rreturns</p> | 0x1 |

Table 3-1222. Register Call Summary for Register CM L3 2 L3 2 CLKCTRL

Clock Management Functional Description
 • [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual
 • [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1223. CM L3 2 GPMC CLKCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0128 | | |
| Physical Address | 0x4A00 8828 | Instance | CORE_CM2 |
| Description | This register manages the GPMC clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

Table 3-1224. Register Call Summary for Register CM_L3_2_GPMC_CLKCTRL

- Clock Domain Module Attributes: [0] [1]

- CORE_CM2 Register Summary: [2]

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0130 | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 8830 | | | | | | | | | | | | | | | |
| Instance | CORE_CM2 | | | | | | | | | | | | | | | |
| Description | This register manages the OCMC_RAM clocks. | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Copyright © 2011, Texas Instruments Incorporated

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|--------|
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Rreturns | 0x1 |

Table 3-1226. Register Call Summary for Register CM_L3_2_OCMC_RAM_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1227. CM_MPU_M3_CLKSTCTRL

| | | | |
|------------------|--|----------|----------|
| Address Offset | 0x0000 0200 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8900 | | |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----------|----|----|----|----|---|---|-----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_MPU_M3_CLK | RESERVED | | | | | | | CLKTRCTRL | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKACTIVITY_MPU_M3_CLK | This field indicates the state of the MPU_M3_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the MPU_A3 clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. 0x1: SW_SLEEP: Start a software forced sleep transition on the domain. 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x3 |

Table 3-1228. Register Call Summary for Register CM_MPU_M3_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1229. CM_MPU_M3_STATICDEP

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0204 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8904 | | |
| Description | This register controls the static domain dependencies from MPU_A3 domain towards 'target' domains. It is relevant only for domain having system initiator(s). | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----------------|----------|---------------|---------------|--------------|-------------|-------------|-------------|----------------|--------------|--------------|---------------|-------------|---------------|-------------|----------|
| RESERVED | | | | | | | | | | | | | | | | ALWONCORE_STATDEP | L4WKUP_STATDEP | RESERVED | L4PER_STATDEP | L4CFG_STATDEP | SDMA_STATDEP | SGX_STATDEP | ISS_STATDEP | DSS_STATDEP | L3INIT_STATDEP | L3_2_STATDEP | L3_1_STATDEP | MEMIF_STATDEP | ABE_STATDEP | IVAHD_STATDEP | DSP_STATDEP | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|--------|
| 31:17 | RESERVED | | R | 0x0000 |
| 16 | ALWONCORE_STATDEP | Static dependency towards ALWONCORE clock domain Read 0x0: Dependency is disabled | R | 0 |
| 15 | L4WKUP_STATDEP | Static dependency towards L4WKUP clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 14 | RESERVED | | RW | 0 |
| 13 | L4PER_STATDEP | Static dependency towards L4PER clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 12 | L4CFG_STATDEP | Static dependency towards L4CFG clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 11 | SDMA_STATDEP | Static dependency towards SDMA clock domain Read 0x0: Dependency is disabled | R | 0 |
| 10 | SGX_STATDEP | Static dependency towards SGX clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 9 | ISS_STATDEP | Static dependency towards ISS clock domain Read 0x0: Dependency is disabled | R | 0 |
| 8 | DSS_STATDEP | Static dependency towards DSS clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 7 | L3INIT_STATDEP | Static dependency towards L3INIT clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 6 | L3_2_STATDEP | Static dependency towards L3_2 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 5 | L3_1_STATDEP | Static dependency towards L3_1 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 4 | MEMIF_STATDEP | Static dependency towards MEMIF clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 3 | ABE_STATDEP | Static dependency towards ABE clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | IVAHD_STATDEP | Static dependency towards IVAHD clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | DSP_STATDEP | Static dependency towards DSP clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 0 | RESERVED | | R | 0 |

Table 3-1230. Register Call Summary for Register CM_MPU_M3_STATICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[13\]](#)

Table 3-1231. CM_MPU_M3_DYNAMICDEP

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0208 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8908 | | |
| Description | This register controls the dynamic domain dependencies from MPU_A3 domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|----|----|------------|----|----------|----|-------------|----|----------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | | | | | CAM_DYNDEP | | RESERVED | | L3_2_DYNDEP | | RESERVED | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor INTRCONN interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:10 | RESERVED | | R | 0x0000 |
| 9 | CAM_DYNDEP | Dynamic dependency towards ISS clock domain Read 0x0: Dependency is disabled | R | 0 |
| 8:7 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|---------------------|-------|
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5:0 | RESERVED | | R | 0x00 |

Table 3-1232. Register Call Summary for Register CM_MPU_M3_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1233. CM_MPU_M3_MPU_M3_CLKCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0220 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8920 | | |
| Description | This register manages the MPU_A3 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|--------|--------|----------|----|----|----|----|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | STBYST | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:19 | RESERVED | | R | 0x0000 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1234. Register Call Summary for Register CM_MPU_M3_MPU_M3_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[3\]](#)

Table 3-1235. CM_SDMA_CLKSTCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0300 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8A00 | | |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------------|----------|----|----|----|----|---|---|---|---|---|-----------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_DMA_L3_ICLK | RESERVED | | | | | | | | | | CLKTRCTRL | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKACTIVITY_DMA_L3_ICLK | This field indicates the state of the DMA_L3_ICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the SDMA clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x3 |

Table 3-1236. Register Call Summary for Register CM_SDMA_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1237. CM_SDMA_STATICDEP

| | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0304 | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 8A04 | | | | | | | | | | | | | | | |
| Instance | CORE_CM2 | | | | | | | | | | | | | | | |
| Description | This register controls the static domain dependencies from SDMA domain towards 'target' domains. It is relevant only for domain having system initiator(s). | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----------|---------------|---------------|----------|-------------|-------------|----------------|--------------|--------------|---------------|-------------|---------------|----------|----------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | L4WKUP_STATDEP | RESERVED | L4PER_STATDEP | L4CFG_STATDEP | RESERVED | ISS_STATDEP | DSS_STATDEP | L3INIT_STATDEP | L3_2_STATDEP | L3_1_STATDEP | MEMIF_STATDEP | ABE_STATDEP | IVAHD_STATDEP | RESERVED | MPU_M3_STATDEP | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|---------------------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | L4WKUP_STATDEP | Static dependency towards L4WKUP clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 14 | RESERVED | | R | 0 |
| 13 | L4PER_STATDEP | Static dependency towards L4PER clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 12 | L4CFG_STATDEP | Static dependency towards L4CFG clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | ISS_STATDEP | Static dependency towards ISS clock domain Read 0x0: Dependency is disabled | R | 0 |
| 8 | DSS_STATDEP | Static dependency towards DSS clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 7 | L3INIT_STATDEP | Static dependency towards L3INIT clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 6 | L3_2_STATDEP | Static dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5 | L3_1_STATDEP | Static dependency towards L3_1 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 4 | MEMIF_STATDEP | Static dependency towards MEMIF clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 3 | ABE_STATDEP | Static dependency towards ABE clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------|
| 2 | IVAHD_STATDEP | Static dependency towards IVAHD clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | MPU_M3_STATDEP | Static dependency towards MPU_A3 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-1238. Register Call Summary for Register CM_SDMA_STATICDEP

Device Low-Power States

- [Device Off Mode Wake-Up Sequences: \[0\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[1\]](#)
- [RESTORE_CM2 Register Description: \[2\]](#)

Table 3-1239. CM_SDMA_DYNAMICDEP

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0308 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8A08 | | |
| Description | This register controls the dynamic domain dependencies from SDMA domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | L3_2_DYNDEP | | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x0: Dependency is disabled | R | 0 |
| 5:0 | RESERVED | | R | 0x00 |

Table 3-1240. Register Call Summary for Register CM_SDMA_DYNAMICDEP

PRCM Register Manual

- [CORE_CM2 Register Summary: \[0\]](#)

Table 3-1241. CM_SDMA_SDMA_CLKCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0320 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8A20 | | |
| Description | This register manages the SDMA clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|--------|--------|----------|----|----|----|----|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | STBYST | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|---------------|--------|
| 31:19 | RESERVED | | R | 0x0000 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Rreturns | 0x1 |

Table 3-1242. Register Call Summary for Register CM_SDMA_SDMA_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[3\]](#)

Table 3-1243. CM_MEMIF_CLKSTCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0400 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8B00 | | |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|---------------------|----|----|--------------------------|---|---|----------|---|---|---|---|---|---|-----------|--|
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_PHY_ROOT_CLK | | | CLKACTIVITY_DLL_CLK | | | CLKACTIVITY_L3_EMIF_ICLK | | | RESERVED | | | | | | | CLKTRCTRL | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|-----------|
| 31:11 | RESERVED | | R | 0x0000000 |
| 10 | CLKACTIVITY_PHY_ROOT_CLK | This field indicates the state of the PHY_ROOT_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 9 | CLKACTIVITY_DLL_CLK | This field indicates the state of the DLL_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 8 | CLKACTIVITY_L3_EMIF_ICLK | This field indicates the state of the L3_EMIF_ICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the MEMIF clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1244. Register Call Summary for Register CM_MEMIF_CLKSTCTRL

Clock Management Functional Description

- Clock Domain Modes: [0] [1] [2] [3]

PRCM Register Manual

- CORE_CM2 Register Summary: [4]
- RESTORE_CM2 Register Description: [5]

Table 3-1245. CM_MEMIF_DMM_CLKCTRL

| | | | |
|-------------------------|---------------------------------------|-----------------|----------|
| Address Offset | 0x0000 0420 | | |
| Physical Address | 0x4A00 8B20 | Instance | CORE_CM2 |
| Description | This register manages the DMM clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|---------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Rreturns | 0x1 |

Table 3-1246. Register Call Summary for Register CM_MEMIF_DMM_CLKCTRL

Clock Management Functional Description

- Clock Domain Module Attributes: [0] [1]

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1247. CM MEMIF EMIF FW CLKCTRL

| | | | |
|------------------|---|----------|----------|
| Address Offset | 0x0000 0428 | | |
| Physical Address | 0x4A00 8B28 | Instance | CORE_CM2 |
| Description | This register manages the EMIF_FW clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|--------------------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state.</p> | <p>R</p> <p>Rreturns</p> | 0x1 |

Table 3-1248. Register Call Summary for Register CM MEMIF EMIF FW CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1249. CM MEMIF EMIF 1 CLKCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0430 | | |
| Physical Address | 0x4A00 8B30 | Instance | CORE_CM2 |
| Description | This register manages the EMIF_1 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is temporarily disabled by software. Interconnect access to module are stalled. Can be used to change timing parameter of EMIF1 module. 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x1 |

Table 3-1250. Register Call Summary for Register CM_MEMIF_EMIF_1_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1251. CM_MEMIF_EMIF_2_CLKCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0438 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8B38 | | |
| Description | This register manages the EMIF_2 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|--------|
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is temporarily disabled by software. Interconnect access to module are stalled. Can be used to change timing parameter of EMIF2 module. 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x1 |

Table 3-1252. Register Call Summary for Register CM_MEMIF_EMIF_2_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1253. CM_MEMIF_DLL_CLKCTRL

| | | | |
|------------------|--------------------------------------|----------|----------|
| Address Offset | 0x0000 0440 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8B40 | | |
| Description | This register manages the DLL clock. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OPTFCLKEN_DLL_CLK | RESERVED | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|-----------|
| 31:9 | RESERVED | | R | 0x0000000 |
| 8 | OPTFCLKEN_DLL_CLK | Optional functional clock control. 0x0: Optional functional clock is disabled. DLL_CLK can be gated when MEMIF domain performs sleep transition 0x1: Optional functional clock is enabled. DLL_CLK is guaranteed to not be gated if already running. | RW | 0 |
| 7:0 | RESERVED | | R | 0x00 |

Table 3-1254. Register Call Summary for Register CM_MEMIF_DLL_CLKCTRL

PRCM Register Manual

- [CORE_CM2 Register Summary: \[0\]](#)

Table 3-1255. CM_C2C_CLKSTCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0500 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8C00 | | |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------------|----|----|----|----|----|-------------------------|---|---|---|---|---|-------------------------|---|---|---|--|--|----------|--|--|--|--|--|--|-----------|--|
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_L3X2_C2C_ICLK | | | | | | CLKACTIVITY_L4_C2C_ICLK | | | | | | CLKACTIVITY_L3_C2C_ICLK | | | | | | RESERVED | | | | | | | CLKTRCTRL | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|--|------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10 | CLKACTIVITY_L3X2_C2C_ICLK | This field indicates the state of the C2C_L3X2_ICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 9 | CLKACTIVITY_L4_C2C_ICLK | This field indicates the state of the L4_C2C_ICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 8 | CLKACTIVITY_L3_C2C_ICLK | This field indicates the state of the L3_C2C_ICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the C2C clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x3 |

Table 3-1256. Register Call Summary for Register CM_C2C_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[4\]](#)

Table 3-1257. CM_C2C_STATICDEP

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0504 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8C04 | | |
| Description | This register controls the static domain dependencies from C2C domain towards 'target' domains. It is relevant only for domain having system initiator(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|---------------|----------|----|----|----|---|---|----------------|--------------|--------------|---------------|-------------|---------------|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | L4PER_STATDEP | L4CFG_STATDEP | RESERVED | | | | | | L3INIT_STATDEP | L3_2_STATDEP | L3_1_STATDEP | MEMIF_STATDEP | ABE_STATDEP | IVAHD_STATDEP | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13 | L4PER_STATDEP | Static dependency towards L4PER clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 12 | L4CFG_STATDEP | Static dependency towards L4CFG clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 11:8 | RESERVED | | R | 0x0 |
| 7 | L3INIT_STATDEP | Static dependency towards L3INIT clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 6 | L3_2_STATDEP | Static dependency towards L3_2 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 5 | L3_1_STATDEP | Static dependency towards L3_1 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 4 | MEMIF_STATDEP | Static dependency towards MEMIF clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 3 | ABE_STATDEP | Static dependency towards ABE clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | IVAHD_STATDEP | Static dependency towards IVAHD clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1:0 | RESERVED | | R | 0x0 |

Table 3-1258. Register Call Summary for Register CM_C2C_STATICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[8\]](#)
- [RESTORE_CM2 Register Description: \[9\]](#)

Table 3-1259. CM_C2C_DYNAMICDEP

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0508 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8C08 | | |
| Description | This register controls the dynamic domain dependencies from C2C domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|----|----|-------------|----------|--------------|----------|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | | | | | L3_2_DYNDEP | RESERVED | MEMIF_DYNDEP | RESERVED | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|---------------------|---------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor INTRCONN interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:7 | RESERVED | | R | 0x00000 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5 | RESERVED | | R | 0 |
| 4 | MEMIF_DYNDEP | Dynamic dependency towards MEMIF clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 3:0 | RESERVED | | R | 0x0 |

Table 3-1260. Register Call Summary for Register CM_C2C_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)
- [RESTORE_CM2 Register Description: \[3\]](#)

Table 3-1261. CM_C2C_C2C_CLKCTRL

| | | | |
|-------------------------|---------------------------------------|-----------------|----------|
| Address Offset | 0x0000 0520 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8C20 | | |
| Description | This register manages the C2C clocks. | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|--------|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| RESERVED | | | | | | | | | | | | | STBYST | IDLEST | RESERVED | | | | | | | | | | | | | MODULEMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|--------------|--------|
| 31:19 | RESERVED | | R | 0x0000 |
| 18 | STBYST | C2C module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | C2C interface idle status. [warm reset insensitive] Read 0x0: C2C interface is in functional state Read 0x1: C2C interface is in a transitory state Read 0x2: C2C interface is in IDLE state | R | 0x2 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Returns | 0x1 |

Table 3-1262. Register Call Summary for Register CM_C2C_C2C_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[3\]](#)

Table 3-1263. CM_C2C_C2C_FW_CLKCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0530 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8C30 | | |
| Description | This register manages the C2C_FW clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | | | | | | | MODULEMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Rreturns | 0x1 |

Table 3-1264. Register Call Summary for Register CM_C2C_C2C_FW_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1265. CM_L4CFG_CLKSTCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0600 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8D00 | | |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|-------------------------|---|---|---|---|---|----------|---|---|---|--|--|-----------|--|
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_CORE_TS_FCLK | | | | | | CLKACTIVITY_CFG_L4_ICLK | | | | | | RESERVED | | | | | | CLKTRCTRL | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | CLKACTIVITY_CORE_TS_FCLK | This field indicates the state of the CORE_TS_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is on-going | R | 0 |
| 8 | CLKACTIVITY_CFG_L4_ICLK | This field indicates the state of the CFG_L4_ICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is gated. Read 0x1: Corresponding clock is running or gating/ungating; transition is ongoing. | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 1:0 | CLKTRCTRL | Controls the clock state transition of the L4CFG clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved Read 0x2: Reserved 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1266. Register Call Summary for Register CM_L4CFG_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)
- [RESTORE_CM2 Register Description: \[3\]](#)

Table 3-1267. CM_L4CFG_DYNAMICIDEP

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0608 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8D08 | | |
| Description | This register controls the dynamic domain dependencies from L4_CFG domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|------------|------------|----------|------------------|---------------|----------|----|----|----|-------------|----------|------------|------------|----------------|-------------|-------------|--------------|----------|------------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | MPU_DYNDEP | C2C_DYNDEP | RESERVED | ALWONCORE_DYNDEP | L4WKUP_DYNDEP | RESERVED | | | | SDMA_DYNDEP | RESERVED | CAM_DYNDEP | DSS_DYNDEP | L3_INIT_DYNDEP | L3_2_DYNDEP | L3_1_DYNDEP | MEMIF_DYNDEP | RESERVED | DSP_DYNDEP | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|---------------------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor INTRCONN interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:20 | RESERVED | | R | 0x00 |
| 19 | MPU_DYNDEP | Dynamic dependency towards MPU clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 18 | C2C_DYNDEP | Dynamic dependency towards C2C clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 17 | RESERVED | | R | 1 |
| 16 | ALWONCORE_DYNDEP | Dynamic dependency towards ALWONCORE clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 15 | L4WKUP_DYNDEP | Dynamic dependency towards L4WKUP clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|---------------------|-------|
| 14:12 | RESERVED | | R | 0x0 |
| 11 | SDMA_DYNDEP | Dynamic dependency towards SDMA clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 10 | RESERVED | | R | 0 |
| 9 | CAM_DYNDEP | Dynamic dependency towards ISS clock domain Read 0x0: Dependency is disabled | R | 0 |
| 8 | DSS_DYNDEP | Dynamic dependency towards DSS clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 7 | L3_INIT_DYNDEP | Dynamic dependency towards L3INIT clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5 | L3_1_DYNDEP | Dynamic dependency towards L3_1 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 4 | MEMIF_DYNDEP | Dynamic dependency towards MEMIF clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 3:2 | RESERVED | | R | 0x0 |
| 1 | DSP_DYNDEP | Dynamic dependency towards DSP clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-1268. Register Call Summary for Register CM_L4CFG_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[9\]](#)
- [RESTORE_CM2 Register Description: \[10\]](#)

Table 3-1269. CM_L4CFG_L4_CFG_CLKCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0620 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8D20 | | |
| Description | This register manages the L4_CFG clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | MODULEMODE | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|--------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Returns | 0x1 |

Table 3-1270. Register Call Summary for Register CM_L4CFG_L4_CFG_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1271. CM_L4CFG_SPINLOCK_CLKCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0628 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8D28 | | |
| Description | This register manages the HW_SEM clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | | | | | | | RESERVED | | | | | | | | MODULEMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Rreturns | 0x1 |

Table 3-1272. Register Call Summary for Register CM_L4CFG_SPINLOCK_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1273. CM_L4CFG_MAILBOX_CLKCTRL

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0630 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8D30 | | |
| Description | This register manages the MAILBOX clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | MODULEMODE | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|---------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Rreturns | 0x1 |

Table 3-1274. Register Call Summary for Register CM_L4CFG_MAILBOX_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1275. CM L4CFG SAR ROM CLKCTRL

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0638 | | |
| Physical Address | 0x4A00 8D38 | Instance | CORE_CM2 |
| Description | This register manages the SAR_ROM clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|---------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state.</p> | R Rreturns | 0x1 |

Table 3-1276. Register Call Summary for Register CM_L4CFG_SAR_ROM_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1277. CM L3INSTR CLKSTCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0700 | | |
| Physical Address | 0x4A00 8E00 | Instance | CORE_CM2 |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------------|----------|----|----|----|----|---|---|---|-----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_L3_INSTR_ICLK | RESERVED | | | | | | | | CLKTRCTRL | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|--|--------------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKACTIVITY_L3_INSTR_ICLK | This field indicates the state of the L3_INSTR_GICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the L3INSTR clock domain. Read 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | R Returns 1s | 0x3 |

Table 3-1278. Register Call Summary for Register CM_L3INSTR_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)

Table 3-1279. CM_L3INSTR_L3_3_CLKCTRL

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0720 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8E20 | | |
| Description | This register manages the L3_3 clocks. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x1 |

Table 3-1280. Register Call Summary for Register CM_L3INSTR_L3_3_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)
- [RESTORE_CM2 Register Description: \[3\]](#)

Table 3-1281. CM_L3INSTR_L3_INSTR_CLKCTRL

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0728 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8E28 | | |
| Description | This register manages the L3 INSTRUMENTATION clocks. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | MODULEMODE | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|--------|
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disabled by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x1 |

Table 3-1282. Register Call Summary for Register CM_L3INSTR_L3_INSTR_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [CORE_CM2 Register Summary: \[2\]](#)
- [RESTORE_CM2 Register Description: \[3\]](#)

Table 3-1283. CM_L3INSTR_OCP_WP1_CLKCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0740 | Instance | CORE_CM2 |
| Physical Address | 0x4A00 8E40 | | |
| Description | This register manages the OCP_WP1 clocks. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. Read 0x3: Module is disabled and cannot be accessed Read 0x2: Module is in idle mode (only Interconnect part). It is functional if using separate functional clock Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x0: Module is fully functional, including Interconnect | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any Interconnect access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any Interconnect access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x1 |

Table 3-1284. Register Call Summary for Register CM_L3INSTR_OCP_WP1_CLKCTRL

PRCM Register Manual

- [CORE_CM2 Register Summary: \[0\]](#)
- [RESTORE_CM2 Register Description: \[1\]](#)

3.11.34 IVAHD_CM2 Registers

3.11.34.1 IVAHD_CM2 Register Summary

Table 3-1285. IVAHD_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | IVAHD_CM2 L4 Base Address |
|--|------|-----------------------|----------------|---------------------------|
| CM_IVAHD_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A00 8F00 |
| CM_IVAHD_STATICDEP | RW | 32 | 0x0000 0004 | 0x4A00 8F04 |
| CM_IVAHD_DYNAMICDEP | R | 32 | 0x0000 0008 | 0x4A00 8F08 |
| CM_IVAHD_IVAHD_CLKCTRL | RW | 32 | 0x0000 0020 | 0x4A00 8F20 |
| CM_IVAHD_SL2_CLKCTRL | RW | 32 | 0x0000 0028 | 0x4A00 8F28 |

3.11.34.2 IVAHD_CM2 Register Description

Table 3-1286. CM_IVAHD_CLKSTCTRL

| | | | |
|------------------|--|----------|-----------|
| Address Offset | 0x0000 0000 | Instance | IVAHD_CM2 |
| Physical Address | 0x4A00 8F00 | | |
| Description | This register enables the IVAHD domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|-----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_IVAHD_CLK | | | | | | | | RESERVED | | | | | | | CLKTRCTRL | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKACTIVITY_IVAHD_CLK | This field indicates the state of the IVAHD_CLK clock input of the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the IVAHD clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. 0x1: SW_SLEEP: Start a software forced sleep transition on the domain. 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x3 |

Table 3-1287. Register Call Summary for Register CM_IVAHD_CLKSTCTRL

Reset Management Functional Description

- [IVAHD Subsystem Software Warm Reset Sequence: \[0\]](#)

Clock Management Functional Description

- [Clock Domain Modes: \[1\] \[2\]](#)

PRCM Register Manual

- [IVAHD_CM2 Register Summary: \[3\]](#)

Table 3-1288. CM_IVAHD_STATICDEP

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0004 | Instance | IVAHD_CM2 |
| Physical Address | 0x4A00 8F04 | | |
| Description | This register controls the static domain dependencies from IVAHD domain towards 'target' domains. It is relevant only for domain having system initiator(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|--------------|----|---|---|---------------|---|---|---|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | L3_2_STATDEP | | | | L3_1_STATDEP | | | | MEMIF_STATDEP | | | | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|-----------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | L3_2_STATDEP | Static dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 5 | L3_1_STATDEP | Static dependency towards L3_1 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 4 | MEMIF_STATDEP | Static dependency towards MEMIF clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 3:0 | RESERVED | | R | 0x0 |

Table 3-1289. Register Call Summary for Register CM_IVAHD_STATICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [IVAHD_CM2 Register Summary: \[3\]](#)

Table 3-1290. CM_IVAHD_DYNAMICDEP

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0008 | Instance | IVAHD_CM2 |
| Physical Address | 0x4A00 8F08 | | |
| Description | This register controls the dynamic domain dependencies from IVAHD domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | L3_2_DYNDEP | | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x0: Dependency is disabled | R | 0 |
| 5:0 | RESERVED | | R | 0x00 |

Table 3-1291. Register Call Summary for Register CM_IVAHD_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\]](#)

PRCM Register Manual

- [IVAHD_CM2 Register Summary: \[1\]](#)

Table 3-1292. CM_IVAHD_IVAHD_CLKCTRL

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0020 | Instance | IVAHD_CM2 |
| Physical Address | 0x4A00 8F20 | | |
| Description | This register manages the IVAHD clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|--------|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | STBYST | IDLEST | RESERVED | | | | | | | | | | | | | MODULEMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:19 | RESERVED | | R | 0x0000 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1293. Register Call Summary for Register CM_IVAHD_IVAHD_CLKCTRL

Reset Management Functional Description

- [IVAHD Subsystem Software Warm Reset Sequence: \[0\] \[1\]](#)

Clock Management Functional Description

- [Clock Domain Module Attributes: \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [IVAHD_CM2 Register Summary: \[5\]](#)

Table 3-1294. CM_IVAHD_SL2_CLKCTRL

| | | | |
|------------------|---------------------------------------|----------|-----------|
| Address Offset | 0x0000 0028 | Instance | IVAHD_CM2 |
| Physical Address | 0x4A00 8F28 | | |
| Description | This register manages the SL2 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | | | | | | | RESERVED | | | | | | | | MODULEMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1295. Register Call Summary for Register CM_IVAHD_SL2_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [IVAHD_CM2 Register Summary: \[2\]](#)

3.11.35 CAM_CM2 Registers

3.11.35.1 CAM_CM2 Register Summary

Table 3-1296. CAM_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CAM_CM2 L4 Base Address |
|-------------------------------------|------|-----------------------|----------------|-------------------------|
| CM_CAM_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A00 9000 |
| CM_CAM_STATICDEP | RW | 32 | 0x0000 0004 | 0x4A00 9004 |
| CM_CAM_DYNAMICDEP | R | 32 | 0x0000 0008 | 0x4A00 9008 |
| CM_CAM_ISS_CLKCTRL | RW | 32 | 0x0000 0020 | 0x4A00 9020 |
| CM_CAM_FDIF_CLKCTRL | RW | 32 | 0x0000 0028 | 0x4A00 9028 |

3.11.35.2 CAM_CM2 Register Description

Table 3-1297. CM_CAM_CLKSTCTRL

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0000 | Instance | CAM_CM2 |
| Physical Address | 0x4A00 9000 | | |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|------------------------------|---------------------|----------|----|----|---|---|---|---|---|-----------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_FDIF_FCLK | CLKACTIVITY_CAM_PHY_CTRL_CLK | CLKACTIVITY_ISS_CLK | RESERVED | | | | | | | | CLKTRCTRL | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|--|------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10 | CLKACTIVITY_FDIF_FCLK | This field indicates the state of the FDIF_FCLK clock input of the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 9 | CLKACTIVITY_CAM_PHY_CTRL_CLK | This field indicates the state of the CAM_PHY_CTRL_CLK clock input of the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 8 | CLKACTIVITY_ISS_CLK | This field indicates the state of the ISS_CLK clock input of the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the CAM clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. 0x1: SW_SLEEP: Start a software forced sleep transition on the domain. 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x3 |

Table 3-1298. Register Call Summary for Register CM_CAM_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [CAM_CM2 Register Summary: \[4\]](#)

Table 3-1299. CM_CAM_STATICDEP

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0004 | Instance | CAM_CM2 |
| Physical Address | 0x4A00 9004 | | |
| Description | This register controls the static domain dependencies from CAM domain towards 'target' domains. It is relevant only for domain having system initiator(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|--------------|----|---------------|----|----------|---|---------------|---|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | L3_2_STATDEP | | L3_1_STATDEP | | MEMIF_STATDEP | | RESERVED | | IVAHD_STATDEP | | RESERVED | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------------|-----------|
| 31:7 | RESERVED | | R | 0x0000000 |
| 6 | L3_2_STATDEP | Static dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5 | L3_1_STATDEP | Static dependency towards L3_1 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 4 | MEMIF_STATDEP | Static dependency towards MEMIF clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | IVAHD_STATDEP | Static dependency towards IVAHD clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1:0 | RESERVED | | R | 0x0 |

Table 3-1300. Register Call Summary for Register CM_CAM_STATICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [CAM_CM2 Register Summary: \[4\]](#)

Table 3-1301. CM_CAM_DYNAMICDEP

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0008 | Instance | CAM_CM2 |
| Physical Address | 0x4A00 9008 | | |
| Description | This register controls the dynamic domain dependencies from CAM domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | L3_2_DYNDEP | | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-----------|
| 31:7 | RESERVED | | R | 0x0000000 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x0: Dependency is disabled | R | 0 |
| 5:0 | RESERVED | | R | 0x00 |

Table 3-1302. Register Call Summary for Register CM_CAM_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\]](#)

PRCM Register Manual

- [CAM_CM2 Register Summary: \[1\]](#)

Table 3-1303. CM_CAM_ISS_CLKCTRL

| | | | |
|-------------------------|---------------------------------------|-----------------|---------|
| Address Offset | 0x0000 0020 | Instance | CAM_CM2 |
| Physical Address | 0x4A00 9020 | | |
| Description | This register manages the ISS clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|--------|----|----------|----|---|---|-------------------|---|----------|---|---|---|------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STBYST | | IDLEST | | RESERVED | | | | OPTFCLKEN_CTRLCLK | | RESERVED | | | | MODULEMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:19 | RESERVED | | R | 0x0000 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_CTRLCLK | Optional functional clock control for CAM_PHY_CTRL_GCLK 96Mhz clock. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1304. Register Call Summary for Register CM_CAM_ISS_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [CAM_CM2 Register Summary: \[3\]](#)

Table 3-1305. CM_CAM_FDIF_CLKCTRL

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0028 | Instance | CAM_CM2 |
| Physical Address | 0x4A00 9028 | | |
| Description | This register manages the FDIF clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------|----------|----|----|----|--------|--------|----------|----|----|----|----|----|----|---|---|---|---|------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CLKSEL_FCLK | RESERVED | | | | STBYST | IDLEST | RESERVED | | | | | | | | | | | MODULEMODE | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|--------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | CLKSEL_FCLK | Select the ration of FDIF_FCLK to FUNC_128M_CLK 0x0: FDIF_FCLK is divide by 1 of FUNC_128_CLK, to be used for OPP119 0x1: FDIF_FCLK is divide by 2 of FUNC_128_CLK, to be used for OPP50 0x2: FDIF_FCLK is divide by 4 of FUNC_128_CLK 0x3: Reserved | RW | 0x0 |
| 23:19 | RESERVED | | R | 0x00 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1306. Register Call Summary for Register CM_CAM_FDIF_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [CAM_CM2 Register Summary: \[4\]](#)

3.11.36 DSS_CM2 Registers

3.11.36.1 DSS_CM2 Register Summary

Table 3-1307. DSS_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DSS_CM2 L4 Base Address |
|-------------------------------------|------|-----------------------|----------------|-------------------------|
| CM_DSS_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A00 9100 |
| CM_DSS_STATICDEP | RW | 32 | 0x0000 0004 | 0x4A00 9104 |
| CM_DSS_DYNAMICDEP | R | 32 | 0x0000 0008 | 0x4A00 9108 |
| CM_DSS_DSS_CLKCTRL | RW | 32 | 0x0000 0020 | 0x4A00 9120 |
| CM_DSS_BB2D_CLKCTRL | RW | 32 | 0x0000 0028 | 0x4A00 9128 |

3.11.36.2 DSS_CM2 Register Description

Table 3-1308. CM_DSS_CLKSTCTRL

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0000 | Instance | DSS_CM2 |
| Physical Address | 0x4A00 9100 | | |
| Description | This register enables the DSS domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|-------------------------------|----|---|---|-------------------------------|---|---|---|----------------------|---|---|---|-------------------------|--|--|--|----------|--|--|--|--|--|--|--|-----------|--|
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_BB2D_FCLK | | | | CLKACTIVITY_HDMI_PHY_48M_FCLK | | | | CLKACTIVITY_DSS_ALWON_SYS_CLK | | | | CLKACTIVITY_DSS_FCLK | | | | CLKACTIVITY_DSS_L3_ICLK | | | | RESERVED | | | | | | | | CLKTRCTRL | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | CLKACTIVITY_BB2D_FCLK | This field indicates the state of the BB2D_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 11 | CLKACTIVITY_HDMI_PHY_48M_FCLK | This field indicates the state of the HDMI_PHY_48MHz_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 10 | CLKACTIVITY_DSS_ALWON_SYS_CLK | This field indicates the state of the DSS_ALWON_SYS_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 9 | CLKACTIVITY_DSS_FCLK | This field indicates the state of the DSS_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 8 | CLKACTIVITY_DSS_L3_ICLK | This field indicates the state of the DSS_L3_ICLK (and DSS_L4_ICLK) clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | CLKTRCTRL | Controls the clock state transition of the DSS clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. 0x1: SW_SLEEP: Start a software forced sleep transition on the domain. 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x3 |

Table 3-1309. Register Call Summary for Register CM_DSS_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)

PRCM Register Manual

- [DSS_CM2 Register Summary: \[6\]](#)

Table 3-1310. CM_DSS_STATICDEP

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0004 | Instance | DSS_CM2 |
| Physical Address | 0x4A00 9104 | | |
| Description | This register controls the static domain dependencies from DSS domain towards 'target' domains. It is relevant only for domain having system initiator(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|--------------|----|---------------|----|----------|---|---------------|---|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | L3_2_STATDEP | | L3_1_STATDEP | | MEMIF_STATDEP | | RESERVED | | IVAHD_STATDEP | | RESERVED | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|--------------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | L3_2_STATDEP | Static dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 5 | L3_1_STATDEP | Static dependency towards L3_1 clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 4 | MEMIF_STATDEP | Static dependency towards MEMIF clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | IVAHD_STATDEP | Static dependency towards IVAHD clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1:0 | RESERVED | | R | 0x0 |

Table 3-1311. Register Call Summary for Register CM_DSS_STATICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [DSS_CM2 Register Summary: \[4\]](#)

Table 3-1312. CM_DSS_DYNAMICDEP

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0008 | Instance | DSS_CM2 |
| Physical Address | 0x4A00 9108 | | |
| Description | This register controls the dynamic domain dependencies from DSS domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|-------------|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | L3_2_DYNDEP | | L3_1_DYNDEP | | RESERVED | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-----------|
| 31:7 | RESERVED | | R | 0x0000000 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 domain Read 0x0: Dependency is disabled | R | 0 |
| 5 | L3_1_DYNDEP | Dynamic dependency towards L3_1 domain Read 0x0: Dependency is disabled | R | 0 |
| 4:0 | RESERVED | | R | 0x00 |

Table 3-1313. Register Call Summary for Register CM_DSS_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [DSS_CM2 Register Summary: \[2\]](#)

Table 3-1314. CM_DSS_DSS_CLKCTRL

| | | | |
|-------------------------|---------------------------------------|-----------------|---------|
| Address Offset | 0x0000 0020 | Instance | DSS_CM2 |
| Physical Address | 0x4A00 9120 | | |
| Description | This register manages the DSS clocks. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|--------|--------|----------|----|----|----|----|----|-------------------|---------------------|------------------|----------|---|---|---|---|---|---|---|------------|
| RESERVED | | | | | | | | | | | | | STBYST | IDLEST | RESERVED | | | | | | OPTFCLKEN_SYS_CLK | OPTFCLKEN_48MHZ_CLK | OPTFCLKEN_DSSCLK | RESERVED | | | | | | | | MODULEMODE |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|--------|
| 31:19 | RESERVED | | R | 0x0000 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:11 | RESERVED | | R | 0x0 |
| 10 | OPTFCLKEN_SYS_CLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 9 | OPTFCLKEN_48MHZ_CLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 8 | OPTFCLKEN_DSSCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1315. Register Call Summary for Register CM_DSS_DSS_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [DSS_CM2 Register Summary: \[3\]](#)

Table 3-1316. CM_DSS_BB2D_CLKCTRL

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0028 | | |
| Physical Address | 0x4A00 9128 | Instance | DSS_CM2 |
| Description | This register manages the BB2D clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------------------|----------|----|----|----|--------|--------|----------|----|----|----|----|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CLKSEL_BB2D_FCLK | RESERVED | | | | STBYST | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 3-1318. SGX_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | SGX_CM2 L4 Base Address |
|------------------------------------|------|-----------------------|----------------|-------------------------|
| CM_SGX_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A00 9200 |
| CM_SGX_STATICDEP | RW | 32 | 0x0000 0004 | 0x4A00 9204 |
| CM_SGX_DYNAMICDEP | R | 32 | 0x0000 0008 | 0x4A00 9208 |
| CM_SGX_SGX_CLKCTRL | RW | 32 | 0x0000 0020 | 0x4A00 9220 |

3.11.37.2 SGX_CM2 Register Description**Table 3-1319. CM_SGX_CLKSTCTRL**

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0000 | Instance | SGX_CM2 |
| Physical Address | 0x4A00 9200 | | |
| Description | This register enables the SGX domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------------|----|----|----|----|----|---|----------|---|---|---|---|---|---|-----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_SGX_FCLK | | | | | | | RESERVED | | | | | | | CLKTRCTRL | |
| | | | | | | | | | | | | | | | | CLKACTIVITY_SGX_L3_ICLK | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|--|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | CLKACTIVITY_SGX_FCLK | This field indicates the state of the SGX_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 8 | CLKACTIVITY_SGX_L3_ICLK | This field indicates the state of the SGX_L3_ICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the SGX clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. 0x1: SW_SLEEP: Start a software forced sleep transition on the domain. 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x3 |

Table 3-1320. Register Call Summary for Register CM_SGX_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [SGX_CM2 Register Summary: \[3\]](#)

Table 3-1321. CM_SGX_STATICDEP

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0004 | Instance | SGX_CM2 |
| Physical Address | 0x4A00 9204 | | |
| Description | This register controls the static domain dependencies from SGX domain towards 'target' domains. It is relevant only for domain having system initiator(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|--------------|----|---------------|----|----------|---|---------------|---|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | L3_2_STATDEP | | L3_1_STATDEP | | MEMIF_STATDEP | | RESERVED | | IVAHD_STATDEP | | RESERVED | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------------|-----------|
| 31:7 | RESERVED | | R | 0x0000000 |
| 6 | L3_2_STATDEP | Static dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5 | L3_1_STATDEP | Static dependency towards L3_1 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 4 | MEMIF_STATDEP | Static dependency towards MEMIF clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | IVAHD_STATDEP | Static dependency towards IVAHD clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1:0 | RESERVED | | R | 0x0 |

Table 3-1322. Register Call Summary for Register CM_SGX_STATICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [SGX_CM2 Register Summary: \[4\]](#)

Table 3-1323. CM_SGX_DYNAMICDEP

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0008 | Instance | SGX_CM2 |
| Physical Address | 0x4A00 9208 | | |
| Description | This register controls the dynamic domain dependencies from SGX domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | L3_2_DYNDEP | | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x0: Dependency is disabled | R | 0 |
| 5:0 | RESERVED | | R | 0x00 |

Table 3-1324. Register Call Summary for Register CM_SGX_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\]](#)

PRCM Register Manual

- [SGX_CM2 Register Summary: \[1\]](#)

Table 3-1325. CM_SGX_SGX_CLKCTRL

| | | | |
|-------------------------|---------------------------------------|-----------------|---------|
| Address Offset | 0x0000 0020 | Instance | SGX_CM2 |
| Physical Address | 0x4A00 9220 | | |
| Description | This register manages the SGX clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----------|----|----|----|--------|--------|----------|----|----|----|----|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CLKSEL_SGX_FCLK | RESERVED | | | | STBYST | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|-------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL_SGX_FCLK | This bit gives status of the SGX_FCLK source. Read 0x1: Functional clock is sourced from DPLL_PER HSDIVIDER | R | 1 |
| 23:19 | RESERVED | | R | 0x00 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1326. Register Call Summary for Register CM_SGX_SGX_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\] \[2\]](#)

PRCM Register Manual

- [SGX_CM2 Register Summary: \[3\]](#)

3.11.38 L3INIT_CM2 Registers

3.11.38.1 L3INIT_CM2 Register Summary

Table 3-1327. L3INIT_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | L3INIT_CM2 L4 Base Address |
|---|------|-----------------------|----------------|----------------------------|
| CM_L3INIT_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A00 9300 |
| CM_L3INIT_STATICDEP | RW | 32 | 0x0000 0004 | 0x4A00 9304 |
| CM_L3INIT_DYNAMICDEP | R | 32 | 0x0000 0008 | 0x4A00 9308 |
| CM_L3INIT_HSMCM1_CLKCTRL | RW | 32 | 0x0000 0028 | 0x4A00 9328 |
| CM_L3INIT_HSMCM2_CLKCTRL | RW | 32 | 0x0000 0030 | 0x4A00 9330 |
| CM_L3INIT_HSI_CLKCTRL | RW | 32 | 0x0000 0038 | 0x4A00 9338 |
| RESERVED | RW | 32 | 0x0000 0040 | 0x4A00 9340 |
| CM_L3INIT_HSUSBHOST_CLKCTRL | RW | 32 | 0x0000 0058 | 0x4A00 9358 |
| CM_L3INIT_HSUSBOTG_CLKCTRL | RW | 32 | 0x0000 0060 | 0x4A00 9360 |
| CM_L3INIT_HSUSBTLL_CLKCTRL | RW | 32 | 0x0000 0068 | 0x4A00 9368 |
| RESERVED | R | 32 | 0x0000 0078 | 0x4A00 9378 |
| RESERVED | RW | 32 | 0x0000 0080 | 0x4A00 9380 |
| RESERVED | RW | 32 | 0x0000 0088 | 0x4A00 9388 |
| RESERVED | RW | 32 | 0x0000 0090 | 0x4A00 9390 |
| RESERVED | RW | 32 | 0x0000 0098 | 0x4A00 9398 |

Table 3-1327. L3INIT_CM2 Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | L3INIT_CM2 L4 Base Address |
|--|------|-----------------------|----------------|----------------------------|
| RESERVED | RW | 32 | 0x0000 00A8 | 0x4A00 93A8 |
| RESERVED | RW | 32 | 0x0000 00C0 | 0x4A00 93C0 |
| RESERVED | RW | 32 | 0x0000 00C8 | 0x4A00 93C8 |
| RESERVED | R | 32 | 0x0000 00D0 | 0x4A00 93D0 |
| CM_L3INIT_USBPHY_CLKCTRL | RW | 32 | 0x0000 00E0 | 0x4A00 93E0 |

3.11.38.2 L3INIT_CM2 Register Description**Table 3-1328. CM_L3INIT_CLKSTCTRL**

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0000 | Instance | L3INIT_CM2 |
| Physical Address | 0x4A00 9300 | | |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|------------------------------|------------------------------|-------------------------|-------------------------|----------------------------|----------|--------------------------|--------------------------|------------------------------|------------------------------|----------|-------------------------------|-------------------------------|---------------------------|-----------------------------|--------------------------|----------------------------|---------------------------|----------|----|--------------------------|--------------------------|----------|---|---|---|---|---|---|-----------|
| RESERVED | | CLKACTIVITY_INIT_60M_P2_FCLK | CLKACTIVITY_INIT_60M_P1_FCLK | CLKACTIVITY_HSI_P2_FCLK | CLKACTIVITY_HSI_P1_FCLK | CLKACTIVITY_UTMI_ROOT_FCLK | RESERVED | CLKACTIVITY_TLL_CH1_FCLK | CLKACTIVITY_TLL_CH0_FCLK | CLKACTIVITY_HSI_P2_480M_FCLK | CLKACTIVITY_HSI_P1_480M_FCLK | RESERVED | CLKACTIVITY_INIT_HSMCMC2_FCLK | CLKACTIVITY_INIT_HSMCMC1_FCLK | CLKACTIVITY_INIT_HSI_FCLK | CLKACTIVITY_USB_DPLL_HS_CLK | CLKACTIVITY_USB_DPLL_CLK | CLKACTIVITY_INIT_48MC_FCLK | CLKACTIVITY_INIT_48M_FCLK | RESERVED | | CLKACTIVITY_INIT_L4_ICLK | CLKACTIVITY_INIT_L3_ICLK | RESERVED | | | | | | | CLKTRCTRL |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|--|------|-------|
| 31:30 | RESERVED | | R | 0x0 |
| 29 | CLKACTIVITY_INIT_60M_P2_FCLK | This field indicates the state of the INIT_60M_P2_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 28 | CLKACTIVITY_INIT_60M_P1_FCLK | This field indicates the state of the INIT_60M_P1_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 27 | CLKACTIVITY_HSI_P2_FCLK | This field indicates the state of the HSI_P2_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------|---|------|-------|
| 26 | CLKACTIVITY_HSIC_P1_FCLK | This field indicates the state of the HSIC_P1_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 25 | CLKACTIVITY_UTMI_ROOT_FCLK | This field indicates the state of the UTMI_ROOT_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 24 | RESERVED | | R | 0 |
| 23 | CLKACTIVITY_TLL_CH1_FCLK | This field indicates the state of the TLL_CH1_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 22 | CLKACTIVITY_TLL_CH0_FCLK | This field indicates the state of the TLL_CH0_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 21 | CLKACTIVITY_HSIC_P2_480M_FCLK | This field indicates the state of the HSIC_P2_480M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 20 | CLKACTIVITY_HSIC_P1_480M_FCLK | This field indicates the state of the HSIC_P1_480M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 19 | RESERVED | Reserved | R | 0 |
| 18 | CLKACTIVITY_INIT_HSMC2_FCLK | This field indicates the state of the INIT_HSMC2_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 17 | CLKACTIVITY_INIT_HSMC1_FCLK | This field indicates the state of the INIT_HSMC1_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 16 | CLKACTIVITY_INIT_HSI_FCLK | This field indicates the state of the INIT_HSI_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 15 | CLKACTIVITY_USB_DPLL_HS_CLK | This field indicates the state of the USB_DPLL_HS_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|---|------|-------|
| 14 | CLKACTIVITY_USB_DPLL_CLK | This field indicates the state of the USB_DPLL_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 13 | CLKACTIVITY_INIT_48MC_FCLK | This field indicates the state of the INIT_48MC_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 12 | CLKACTIVITY_INIT_48M_FCLK | This field indicates the state of the INIT_48M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 11:10 | RESERVED | Reserved | R | 0x0 |
| 9 | CLKACTIVITY_INIT_L4_ICLK | This field indicates the state of the L4_INIT_ICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 8 | CLKACTIVITY_INIT_L3_ICLK | This field indicates the state of the L3_INIT_ICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | Reserved | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the L3INIT clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. 0x1: SW_SLEEP: Start a software forced sleep transition on the domain. 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1329. Register Call Summary for Register CM_L3INIT_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)

PRCM Register Manual

- [L3INIT_CM2 Register Summary: \[17\]](#)
- [RESTORE_CM2 Register Description: \[18\]](#)

Table 3-1330. CM_L3INIT_STATICDEP

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0004 | Instance | L3INIT_CM2 |
| Physical Address | 0x4A00 9304 | | |
| Description | This register controls the static domain dependencies from L3INIT domain towards 'target' domains. It is relevant only for domain having system initiator(s). | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----------|---------------|---------------|----------|----|---|---|--------------|--------------|---------------|-------------|---------------|----------|---|---|
| RESERVED | | | | | | | | | | | | | | | | L4WKUP_STATDEP | RESERVED | L4PER_STATDEP | L4CFG_STATDEP | RESERVED | | | | L3_2_STATDEP | L3_1_STATDEP | MEMIF_STATDEP | ABE_STATDEP | IWAHD_STATDEP | RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|---------------------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | L4WKUP_STATDEP | Static dependency towards L4WKUP clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 14 | RESERVED | | R | 0 |
| 13 | L4PER_STATDEP | Static dependency towards L4PER clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 12 | L4CFG_STATDEP | Static dependency towards L4CFG clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 11:7 | RESERVED | | R | 0x00 |
| 6 | L3_2_STATDEP | Static dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5 | L3_1_STATDEP | Static dependency towards L3_1 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 4 | MEMIF_STATDEP | Static dependency towards MEMIF clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 3 | ABE_STATDEP | Static dependency towards ABE clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | IWAHD_STATDEP | Static dependency towards IWAHD clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1:0 | RESERVED | | R | 0x0 |

Table 3-1331. Register Call Summary for Register CM_L3INIT_STATICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

PRCM Register Manual

- [L3INIT_CM2 Register Summary: \[7\]](#)

Table 3-1332. CM_L3INIT_DYNAMICDEP

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0008 | Instance | L3INIT_CM2 |
| Physical Address | 0x4A00 9308 | | |
| Description | This register controls the dynamic domain dependencies from L3INIT domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|-------------|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | L3_2_DYNDEP | | L3_1_DYNDEP | | RESERVED | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x0: Dependency is disabled | R | 0 |
| 5 | L3_1_DYNDEP | Dynamic dependency towards L3_1 clock domain Read 0x0: Dependency is disabled | R | 0 |
| 4:0 | RESERVED | | R | 0x00 |

Table 3-1333. Register Call Summary for Register CM_L3INIT_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L3INIT_CM2 Register Summary: \[2\]](#)

Table 3-1334. CM_L3INIT_HSMMC1_CLKCTRL

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0028 | Instance | L3INIT_CM2 |
| Physical Address | 0x4A00 9328 | | |
| Description | This register manages the MMC1 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|--------|----|--------|----|----------|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CLKSEL | | RESERVED | | | | STBYST | | IDLEST | | RESERVED | | | | | | | | | | MODULEMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL | Selects the source of the functional clock. 0x0: 64MHz clock derived from DPLL_PER is selected 0x1: 96MHz clock derived from DPLL_PER is selected | RW | 0 |
| 23:19 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | Reserved | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1335. Register Call Summary for Register CM_L3INIT_HSMMC1_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [L3INIT_CM2 Register Summary: \[4\]](#)

Table 3-1336. CM_L3INIT_HSMMC2_CLKCTRL

| | | | |
|------------------|--|----------|------------|
| Address Offset | 0x0000 0030 | Instance | L3INIT_CM2 |
| Physical Address | 0x4A00 9330 | | |
| Description | This register manages the MMC2 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|--------|----------|----|----|----|--------|--------|----------|----|----|----|----|----|----|----|---|---|---|------------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | CLKSEL | RESERVED | | | | STBYST | IDLEST | RESERVED | | | | | | | | | | | MODULEMODE | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL | Selects the source of the functional clock. 0x0: 64MHz clock derived from DPLL_PER is selected 0x1: 96MHz clock derived from DPLL_PER is selected | RW | 0 |
| 23:19 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | Reserved | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1337. Register Call Summary for Register CM_L3INIT_HSMC2_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [L3INIT_CM2 Register Summary: \[4\]](#)

Table 3-1338. CM_L3INIT_HSI_CLKCTRL

| | | | |
|------------------|---------------------------------------|----------|------------|
| Address Offset | 0x0000 0038 | Instance | L3INIT_CM2 |
| Physical Address | 0x4A00 9338 | | |
| Description | This register manages the HSI clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|--------|----------|----|----|----|--------|--------|----------|----|----|----|----|----|----|----|----|---|---|---|------------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | CLKSEL | RESERVED | | | | STBYST | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:24 | CLKSEL | Selects the functional clock source. 0x0: HSI_FCLK is divide by 1 of 192MHz clock, to be used for OPP119 0x1: HSI_FCLK is divide by 2 of 192MHz clock, to be used for OPP50 0x2: HSI_FCLK is divide by 4 of 192MHz clock 0x3: Reserved | RW | 0x0 |
| 23:19 | RESERVED | | R | 0x00 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | Reserved | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain Read 0x: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1339. Register Call Summary for Register CM_L3INIT_HSI_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [L3INIT_CM2 Register Summary: \[4\]](#)

Table 3-1340. CM_L3INIT_HSUSBHOST_CLKCTRL

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0058 | Instance | L3INIT_CM2 |
| Physical Address | 0x4A00 9358 | | |
| Description | This register manages the USB_HOST_HS clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------------------|--------------------------|--------------------------|-------------------------|-------------------------|-----------------------|-----------------------|-----------------------|----------|---|----------|---|----------|---|------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | OPTFCLKEN_FUNC48MCLK | OPTFCLKEN_HSI480M_P2_CLK | OPTFCLKEN_HSI480M_P1_CLK | OPTFCLKEN_HSI60M_P2_CLK | OPTFCLKEN_HSI60M_P1_CLK | OPTFCLKEN_UTMI_P3_CLK | OPTFCLKEN_UTMI_P2_CLK | OPTFCLKEN_UTMI_P1_CLK | RESERVED | | SAR_MODE | | RESERVED | | MODULEMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25 | CLKSEL_UTMI_P2 | Selects the source of the functional clock for UTMI Port2 on USB Host 0x0: The functional clock is provided by the internal clock source 0x1: The functional clock is provided by an external PHY through an I/O pad. | RW | 0 |
| 24 | CLKSEL_UTMI_P1 | Selects the source of the functional clock for UTMI Port1 on USB Host 0x0: The functional clock is provided by the internal clock source 0x1: The functional clock is provided by an external PHY through an I/O pad. | RW | 0 |
| 23:19 | RESERVED | | R | 0x00 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15 | OPTFCLKEN_FUNC48MCLK | USB-HOST optional clock control: FUNC48MCLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 14 | OPTFCLKEN_HSI480M_P2_CLK | USB-HOST optional clock control: HSI480M_P2_CLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 13 | OPTFCLKEN_HSI480M_P1_CLK | USB-HOST optional clock control: HSI480M_P1_CLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 12 | OPTFCLKEN_HSI60M_P2_CLK | USB-HOST optional clock control: HSI60M_P2_CLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 11 | OPTFCLKEN_HSI60M_P1_CLK | USB-HOST optional clock control: HSI60M_P1_CLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------|
| 10 | OPTFCLKEN_UTMI_P3_CLK | USB-HOST optional clock control: UTMI_P3_CLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 9 | OPTFCLKEN_UTMI_P2_CLK | USB-HOST optional clock control: UTMI_P2_CLK when CLKSEL_UTMI_P2 is 0 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 8 | OPTFCLKEN_UTMI_P1_CLK | USB-HOST optional clock control: UTMI_P1_CLK when CLKSEL_UTMI_P1 is 0 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SAR_MODE | SAR mode control for the module. Shall not be modify except if module is disabled. 0x0: SAR mode is disabled 0x1: SAR mode is enabled | RW | 0 |
| 3:2 | RESERVED | | R | 0x0 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1341. Register Call Summary for Register CM_L3INIT_HSUSBHOST_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\] \[1\]](#)
- [Clock Domain Module Attributes: \[2\] \[3\] \[4\]](#)

PRCM Register Manual

- [L3INIT_CM2 Register Summary: \[5\]](#)

Table 3-1342. CM_L3INIT_HSUSBOTG_CLKCTRL

| | | | |
|------------------|--|----------|------------|
| Address Offset | 0x0000 0060 | Instance | L3INIT_CM2 |
| Physical Address | 0x4A00 9360 | | |
| Description | This register manages the USB_OTG_HS clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------------|----------|----|----|----|--------|--------|----------|----|----|----|----------------|----------|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CLKSEL_60M | RESERVED | | | | STBYST | IDLEST | RESERVED | | | | OPTFCLKEN_XCLK | RESERVED | | | | MODULEMODE | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL_60M | Selects the source of the 60MHz functional clock. 0x0: The 60MHz clock is sourced from on die UTMI PHY 0x1: The 60MHz clock is sourced from the external ULPI PHY | RW | 0 |
| 23:19 | RESERVED | | R | 0x00 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_XCLK | USB_OTG optional clock control: XCLK (60MHz clock) 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1343. Register Call Summary for Register CM_L3INIT_HSUSBOTG_CLKCTRL

Clock Management Functional Description

- [CM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\] \[3\]](#)

PRCM Register Manual

- [L3INIT_CM2 Register Summary: \[4\]](#)

Table 3-1344. CM_L3INIT_HSUSBTLL_CLKCTRL

| | | | |
|------------------|---|----------|------------|
| Address Offset | 0x0000 0068 | | |
| Physical Address | 0x4A00 9368 | Instance | L3INIT_CM2 |
| Description | This register manages the USB_TLL clocks. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----------|----|----|----|---|---|-----------------------|---|-----------------------|---|----------|---|----------|---|----------|--|------------|--|
| RESERVED | | | | | | | | | | | | | | | | IDLEST | | RESERVED | | | | | | OPTFCLKEN_USB_CH1_CLK | | OPTFCLKEN_USB_CH0_CLK | | RESERVED | | SAR_MODE | | RESERVED | | MODULEMODE | |

Table 3-1346. CM_L3INIT_USBPHY_CLKCTRL

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 00E0 | Instance | L3INIT_CM2 |
| Physical Address | 0x4A00 93E0 | | |
| Description | This register manages the USBPHY clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|------------------|----|----------|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | OPTFCKEN_PHY_48M | | RESERVED | | | | | | | | MODULEMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCKEN_PHY_48M | USBPHY optional clock control: PHY_48M 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1347. Register Call Summary for Register CM_L3INIT_USBPHY_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L3INIT_CM2 Register Summary: \[2\]](#)

3.11.39 L4PER_CM2 Registers

3.11.39.1 L4PER_CM2 Register Summary

Table 3-1348. L4PER_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | L4PER_CM2 L4 Base Address |
|--|------|-----------------------|----------------|---------------------------|
| CM_L4PER_CLKSTCTRL | RW | 32 | 0x0000 0000 | 0x4A00 9400 |
| CM_L4PER_DYNAMICDEP | RW | 32 | 0x0000 0008 | 0x4A00 9408 |
| RESERVED | RW | 32 | 0x0000 0020 | 0x4A00 9420 |
| CM_L4PER_GPTIMER10_CLKCTRL | RW | 32 | 0x0000 0028 | 0x4A00 9428 |
| CM_L4PER_GPTIMER11_CLKCTRL | RW | 32 | 0x0000 0030 | 0x4A00 9430 |
| CM_L4PER_GPTIMER2_CLKCTRL | RW | 32 | 0x0000 0038 | 0x4A00 9438 |
| CM_L4PER_GPTIMER3_CLKCTRL | RW | 32 | 0x0000 0040 | 0x4A00 9440 |
| CM_L4PER_GPTIMER4_CLKCTRL | RW | 32 | 0x0000 0048 | 0x4A00 9448 |
| CM_L4PER_GPTIMER9_CLKCTRL | RW | 32 | 0x0000 0050 | 0x4A00 9450 |
| CM_L4PER_ELM_CLKCTRL | R | 32 | 0x0000 0058 | 0x4A00 9458 |
| CM_L4PER_GPIO2_CLKCTRL | RW | 32 | 0x0000 0060 | 0x4A00 9460 |
| CM_L4PER_GPIO3_CLKCTRL | RW | 32 | 0x0000 0068 | 0x4A00 9468 |
| CM_L4PER_GPIO4_CLKCTRL | RW | 32 | 0x0000 0070 | 0x4A00 9470 |
| CM_L4PER_GPIO5_CLKCTRL | RW | 32 | 0x0000 0078 | 0x4A00 9478 |
| CM_L4PER_GPIO6_CLKCTRL | RW | 32 | 0x0000 0080 | 0x4A00 9480 |
| CM_L4PER_HDQ1W_CLKCTRL | RW | 32 | 0x0000 0088 | 0x4A00 9488 |
| RESERVED | RW | 32 | 0x0000 0090 | 0x4A00 9490 |
| RESERVED | RW | 32 | 0x0000 0098 | 0x4A00 9498 |
| CM_L4PER_I2C1_CLKCTRL | RW | 32 | 0x0000 00A0 | 0x4A00 94A0 |
| CM_L4PER_I2C2_CLKCTRL | RW | 32 | 0x0000 00A8 | 0x4A00 94A8 |
| CM_L4PER_I2C3_CLKCTRL | RW | 32 | 0x0000 00B0 | 0x4A00 94B0 |
| CM_L4PER_I2C4_CLKCTRL | RW | 32 | 0x0000 00B8 | 0x4A00 94B8 |
| CM_L4PER_L4PER_CLKCTRL | R | 32 | 0x0000 00C0 | 0x4A00 94C0 |
| RESERVED | RW | 32 | 0x0000 00D0 | 0x4A00 94D0 |
| RESERVED | RW | 32 | 0x0000 00D8 | 0x4A00 94D8 |
| CM_L4PER_MCBSP4_CLKCTRL | RW | 32 | 0x0000 00E0 | 0x4A00 94E0 |
| RESERVED | RW | 32 | 0x0000 00E8 | 0x4A00 94E8 |
| CM_L4PER_MCSPI1_CLKCTRL | RW | 32 | 0x0000 00F0 | 0x4A00 94F0 |
| CM_L4PER_MCSPI2_CLKCTRL | RW | 32 | 0x0000 00F8 | 0x4A00 94F8 |
| CM_L4PER_MCSPI3_CLKCTRL | RW | 32 | 0x0000 0100 | 0x4A00 9500 |
| CM_L4PER_MCSPI4_CLKCTRL | RW | 32 | 0x0000 0108 | 0x4A00 9508 |
| CM_L4PER_MMCSDB3_CLKCTRL | RW | 32 | 0x0000 0120 | 0x4A00 9520 |
| CM_L4PER_MMCSDB4_CLKCTRL | RW | 32 | 0x0000 0128 | 0x4A00 9528 |
| RESERVED | RW | 32 | 0x0000 0130 | 0x4A00 9530 |
| CM_L4PER_SLIMBUS2_CLKCTRL | RW | 32 | 0x0000 0138 | 0x4A00 9538 |
| CM_L4PER_UART1_CLKCTRL | RW | 32 | 0x0000 0140 | 0x4A00 9540 |
| CM_L4PER_UART2_CLKCTRL | RW | 32 | 0x0000 0148 | 0x4A00 9548 |
| CM_L4PER_UART3_CLKCTRL | RW | 32 | 0x0000 0150 | 0x4A00 9550 |
| CM_L4PER_UART4_CLKCTRL | RW | 32 | 0x0000 0158 | 0x4A00 9558 |
| CM_L4PER_MMCSDB5_CLKCTRL | RW | 32 | 0x0000 0160 | 0x4A00 9560 |
| RESERVED | RW | 32 | 0x0000 0168 | 0x4A00 9568 |
| RESERVED | RW | 32 | 0x0000 0180 | 0x4A00 9580 |
| RESERVED | RW | 32 | 0x0000 0184 | 0x4A00 9584 |
| RESERVED | R | 32 | 0x0000 0188 | 0x4A00 9588 |
| RESERVED | RW | 32 | 0x0000 01A0 | 0x4A00 95A0 |
| RESERVED | RW | 32 | 0x0000 01A8 | 0x4A00 95A8 |
| RESERVED | RW | 32 | 0x0000 01B0 | 0x4A00 95B0 |

Table 3-1348. L4PER_CM2 Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | L4PER_CM2 L4 Base Address |
|---------------|------|-----------------------|----------------|---------------------------|
| RESERVED | RW | 32 | 0x0000 01B8 | 0x4A00 95B8 |
| RESERVED | RW | 32 | 0x0000 01C0 | 0x4A00 95C0 |
| RESERVED | RW | 32 | 0x0000 01C8 | 0x4A00 95C8 |
| RESERVED | R | 32 | 0x0000 01D8 | 0x4A00 95D8 |

3.11.39.2 L4PER_CM2 Register Description**Table 3-1349. CM_L4PER_CLKSTCTRL**

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0000 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9400 | | |
| Description | This register enables the domain power state transition. It controls the hardware supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|------------------------------|----------|----------|-----------------------------|----------|----|--------------------------|--------------------------|--------------------------|---------------------------|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|-------------------------|----------|---|---|---|---|---|-----------|---|
| RESERVED | | | | | | CLKACTIVITY_PER_ABE_24M_FCLK | RESERVED | RESERVED | CLKACTIVITY_PER_MCBSP4_FCLK | RESERVED | | CLKACTIVITY_PER_96M_FCLK | CLKACTIVITY_PER_48M_FCLK | CLKACTIVITY_PER_32K_FCLK | CLKACTIVITY_PER_24MC_FCLK | CLKACTIVITY_12M_FCLK_FCLK | CLKACTIVITY_GPT9_FCLK | CLKACTIVITY_GPT4_FCLK | CLKACTIVITY_GPT3_FCLK | CLKACTIVITY_GPT2_FCLK | CLKACTIVITY_GPT11_FCLK | CLKACTIVITY_GPT10_FCLK | CLKACTIVITY_L4_PER_ICLK | RESERVED | | | | | | CLKTRCTRL | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|--|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25 | CLKACTIVITY_PER_ABE_24M_FCLK | This field indicates the state of the PER_ABE_24M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 24 | RESERVED | | R | 0 |
| 23 | RESERVED | | R | 0 |
| 22 | CLKACTIVITY_PER_MCBSP4_FCLK | This field indicates the state of the PER_MCBSP4_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 21:20 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|-------|
| 19 | CLKACTIVITY_PER_96M_FCLK | This field indicates the state of the PER_96M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 18 | CLKACTIVITY_PER_48M_FCLK | This field indicates the state of the PER_48M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 17 | CLKACTIVITY_PER_32K_FCLK | This field indicates the state of the PER_32K_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 16 | CLKACTIVITY_PER_24MC_FCLK | This field indicates the state of the PER_24MC_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 15 | CLKACTIVITY_12M_FCLK | This field indicates the state of the FUNC_12M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 14 | CLKACTIVITY_GPT9_FCLK | This field indicates the state of the DMT9_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 13 | CLKACTIVITY_GPT4_FCLK | This field indicates the state of the DMT4_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 12 | CLKACTIVITY_GPT3_FCLK | This field indicates the state of the DMT3_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 11 | CLKACTIVITY_GPT2_FCLK | This field indicates the state of the DMT2_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 10 | CLKACTIVITY_GPT11_FCLK | This field indicates the state of the DMT11_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 9 | CLKACTIVITY_GPT10_FCLK | This field indicates the state of the DMT10_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------|
| 8 | CLKACTIVITY_L4_PER_ICLK | This field indicates the state of the L4_PER_GICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the L4PER clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. 0x1: SW_SLEEP: Start a software forced sleep transition on the domain. 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1350. Register Call Summary for Register CM_L4PER_CLKSTCTRL

Clock Management Functional Description

- [Clock Domain Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[15\]](#)
- [RESTORE_CM2 Register Description: \[16\]](#)

Table 3-1351. CM_L4PER_DYNAMICDEP

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0008 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9408 | | |
| Description | This register controls the dynamic domain dependencies from L4PER domain towards 'target' domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|----|----|------------|----|----------------|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | | | | | DSS_DYNDEP | | L3_INIT_DYNDEP | | RESERVED | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|--------------------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor INTRCONN interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:9 | RESERVED | | R | 0x020 |
| 8 | DSS_DYNDEP | Dynamic dependency towards DSS clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 7 | L3_INIT_DYNDEP | Dynamic dependency towards L3INIT clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 6:0 | RESERVED | | R | 0x00 |

Table 3-1352. Register Call Summary for Register CM_L4PER_DYNAMICDEP

Clock Management Functional Description

- [Clock Domain Dependency: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)
- [RESTORE_CM2 Register Description: \[3\]](#)

Table 3-1353. CM_L4PER_GPTIMER10_CLKCTRL

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0028 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9428 | | |
| Description | This register manages the DMTIMER10 clocks. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|----|--------|----------|----|----|----|---|---|---|---|---|---|---|---|------------|---|
| RESERVED | | | | | | | | CLKSEL | RESERVED | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL | Select the source of the functional clock 0x0: Selects the SYS_CLK as the source 0x1: Selects the 32KHz as the source | RW | 0 |
| 23:18 | RESERVED | | R | 0x00 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1354. Register Call Summary for Register CM_L4PER_GPTIMER10_CLKCTRL

Clock Management Functional Description

- [PRM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\]](#)

Table 3-1354. Register Call Summary for Register CM_L4PER_GPTIMER10_CLKCTRL (continued)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[3\]](#)

Table 3-1355. CM_L4PER_GPTIMER11_CLKCTRL

| | | | | |
|------------------|---|--|----------|-----------|
| Address Offset | 0x0000 0030 | | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9430 | | | |
| Description | This register manages the DMTIMER11 clocks. | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----------|----|----|----|--------|----------|----|----|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CLKSEL | RESERVED | | | | IDLEST | RESERVED | | | | | | | | | | MODULEMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL | Select the source of the functional clock 0x0: Selects the SYS_CLK as the source 0x1: Selects the 32KHz as the source | RW | 0 |
| 23:18 | RESERVED | | R | 0x00 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1356. Register Call Summary for Register CM_L4PER_GPTIMER11_CLKCTRL

Clock Management Functional Description

- [PRM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[3\]](#)

Table 3-1357. CM_L4PER_GPTIMER2_CLKCTRL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0038 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9438 | | |
| Description | This register manages the DMTIMER2 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | CLKSEL | | | | IDLEST | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | MODULEMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL | Select the source of the functional clock 0x0: Selects the SYS_CLK as the source 0x1: Selects the 32KHz as the source | RW | 0 |
| 23:18 | RESERVED | | R | 0x00 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1358. Register Call Summary for Register CM_L4PER_GPTIMER2_CLKCTRL

Clock Management Functional Description

- [PRM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[3\]](#)

Table 3-1359. CM_L4PER_GPTIMER3_CLKCTRL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0040 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9440 | | |
| Description | This register manages the DMTIMER3 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|--------|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | IDLEST | | | | RESERVED | | | | | | | | | | | | MODULEMODE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL | Select the source of the functional clock 0x0: Selects the SYS_CLK as the source 0x1: Selects the 32KHz as the source | RW | 0 |
| 23:18 | RESERVED | | R | 0x00 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1360. Register Call Summary for Register CM_L4PER_GPTIMER3_CLKCTRL

Clock Management Functional Description

- [PRM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[3\]](#)

Table 3-1361. CM_L4PER_GPTIMER4_CLKCTRL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0048 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9448 | | |
| Description | This register manages the DMTIMER4 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----------|----|----|----|----|----|----|----|----------|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | MODULEMODE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL | Select the source of the functional clock 0x0: Selects the SYS_CLK as the source 0x1: Selects the 32KHz as the source | RW | 0 |
| 23:18 | RESERVED | | R | 0x00 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1362. Register Call Summary for Register CM_L4PER_GPTIMER4_CLKCTRL

Clock Management Functional Description

- [PRM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[3\]](#)

Table 3-1363. CM_L4PER_GPTIMER9_CLKCTRL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0050 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9450 | | |
| Description | This register manages the DMTIMER9 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|--------|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | IDLEST | | | | RESERVED | | | | | | | | | | | | MODULEMODE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | CLKSEL | Select the source of the functional clock 0x0: Selects the SYS_CLK as the source 0x1: Selects the 32KHz as the source | RW | 0 |
| 23:18 | RESERVED | | R | 0x00 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1364. Register Call Summary for Register CM_L4PER_GPTIMER9_CLKCTRL

Clock Management Functional Description

- [PRM Clock Source: \[0\]](#)
- [Clock Domain Module Attributes: \[1\] \[2\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[3\]](#)

Table 3-1365. CM L4PER ELM CLKCTRL

| | | | |
|-------------------------|---------------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0058 | | |
| Physical Address | 0x4A00 9458 | Instance | L4PER_CM2 |
| Description | This register manages the ELM clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|--------------------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state.</p> | <p>R</p> <p>Rreturns</p> | 0x1 |

Table 3-1366. Register Call Summary for Register CM_L4PER_ELM_CLKCTRL

| |
|--|
| <p>Clock Management Functional Description</p> <ul style="list-style-type: none"> • Clock Domain Module Attributes: [0] [1] |
| <p>PRCM Register Manual</p> <ul style="list-style-type: none"> • L4PER_CM2 Register Summary: [2] |

Table 3-1367. CM L4PER GPIO2 CLKCTRL

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0060 | | |
| Physical Address | 0x4A00 9460 | Instance | L4PER_CM2 |
| Description | This register manages the GPIO2 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|-----------------|----------|---|---|---|---|---|---|------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | OPTFCLKEN_DBCLK | RESERVED | | | | | | | MODULEMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_DBCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1368. Register Call Summary for Register CM_L4PER_GPIO2_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)
- [RESTORE_CM2 Register Description: \[3\]](#)

Table 3-1369. CM_L4PER_GPIO3_CLKCTRL

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0068 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9468 | | |
| Description | This register manages the GPIO3 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|-----------------|----------|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | OPTFCLKEN_DBCLK | RESERVED | | | | | | | | MODULEMODE |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_DBCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1370. Register Call Summary for Register CM_L4PER_GPIO3_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)
- [RESTORE_CM2 Register Description: \[3\]](#)

Table 3-1371. CM_L4PER_GPIO4_CLKCTRL

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0070 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9470 | | |
| Description | This register manages the GPIO4 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|-----------------|----------|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | OPTFCLKEN_DBCLK | RESERVED | | | | | | | | MODULEMODE |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_DBCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1372. Register Call Summary for Register CM_L4PER_GPIO4_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)
- [RESTORE_CM2 Register Description: \[3\]](#)

Table 3-1373. CM_L4PER_GPIO5_CLKCTRL

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0078 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9478 | | |
| Description | This register manages the GPIO5 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|-----------------|----------|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | OPTFCLKEN_DBCLK | RESERVED | | | | | | | | MODULEMODE |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_DBCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1374. Register Call Summary for Register CM_L4PER_GPIO5_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)
- [RESTORE_CM2 Register Description: \[3\]](#)

Table 3-1375. CM_L4PER_GPIO6_CLKCTRL

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0080 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9480 | | |
| Description | This register manages the GPIO6 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|-----------------|----|----------|----|----|----|---|---|----------|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | OPTFCLKEN_DBCLK | | RESERVED | | | | | | RESERVED | | | | MODULEMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_DBCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1376. Register Call Summary for Register CM_L4PER_GPIO6_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)
- [RESTORE_CM2 Register Description: \[3\]](#)

Table 3-1377. CM_L4PER_HDQ1W_CLKCTRL

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0088 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9488 | | |
| Description | This register manages the HDQ1W clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1378. Register Call Summary for Register CM_L4PER_HDQ1W_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)

Table 3-1379. CM_L4PER_I2C1_CLKCTRL

| | | | |
|------------------|--|----------|-----------|
| Address Offset | 0x0000 00A0 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 94A0 | | |
| Description | This register manages the I2C1 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1380. Register Call Summary for Register CM_L4PER_I2C1_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)

Table 3-1381. CM_L4PER_I2C2_CLKCTRL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00A8 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 94A8 | | |
| Description | This register manages the I2C2 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | | | | | | | | | | | MODULEMODE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1382. Register Call Summary for Register CM_L4PER_I2C2_CLKCTRL

Clock Management Functional Description

- Clock Domain Module Attributes: [0] [1]

PRCM Register Manual

- L4PER_CM2 Register Summary: [2]

Table 3-1383. CM_L4PER_I2C3_CLKCTRL

| | | |
|------------------|--|----------|
| Address Offset | 0x0000 00B0 | |
| Physical Address | 0x4A00 94B0 | Instance |
| Description | This register manages the I2C3 clocks. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup).</p> <p>Read 0x1: Reserved</p> <p>0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen.</p> <p>Read 0x3: Reserved</p> | RW | 0x0 |

Table 3-1384. Register Call Summary for Register CM_L4PER_I2C3_CLKCTRL

Clock Management Functional Description

- Clock Domain Module Attributes: [0] [1]

PRCM Register Manual

- L4PER_CM2 Register Summary: [2]

Table 3-1385. CM_L4PER_I2C4_CLKCTRL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00B8 | | |
| Physical Address | 0x4A00 94B8 | Instance | L4PER_CM2 |
| Description | This register manages the I2C4 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | MODULEMODE | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup).</p> <p>Read 0x1: Reserved</p> <p>0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen.</p> <p>Read 0x3: Reserved</p> | RW | 0x0 |

Table 3-1386. Register Call Summary for Register CM_L4PER_I2C4_CLKCTRL

Clock Management Functional Description
 • [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual
 • [L4PER_CM2 Register Summary: \[2\]](#)

Table 3-1387. CM L4PER L4PER CLKCTRL

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 00C0 | | |
| Physical Address | 0x4A00 94C0 | Instance | L4PER_CM2 |
| Description | This register manages the L4PER clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | MODULEMODE | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|---------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Rreturns | 0x1 |

Table 3-1388. Register Call Summary for Register CM_L4PER_L4PER_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)

Table 3-1389. CM_L4PER_MCBSP4_CLKCTRL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00E0 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 94E0 | | |
| Description | This register manages the MCBSP4 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------------------|----|---------------|----|----------|----|----|----|--------|----|----------|----|----|----|----|----|----|----|------------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | CLKSEL_INTERNAL_SOURCE | | CLKSEL_SOURCE | | RESERVED | | | | IDLEST | | RESERVED | | | | | | | | MODULEMODE | | | | | | | | | |

Table 3-1390. Register Call Summary for Register CM_L4PER_MCBSP4_CLKCTRL

- CM Clock Source: [0] [1]
- Clock Domain Module Attributes: [2] [3]

- L4PER_CM2 Register Summary: [4]

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00F0 | | |
| Physical Address | 0x4A00 94F0 | Instance | L4PER_CM2 |
| Description | This register manages the MCSPI1 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1392. Register Call Summary for Register CM_L4PER_MCSP1_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)

Table 3-1393. CM_L4PER_MCSP12_CLKCTRL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 00F8 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 94F8 | | |
| Description | This register manages the MCSPI2 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | | | | | | | RESERVED | | | | | | | | MODULEMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1394. Register Call Summary for Register CM_L4PER_MCSPi2_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)

Table 3-1395. CM_L4PER_MCSPi3_CLKCTRL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0100 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9500 | | |
| Description | This register manages the MCSPI3 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | | | | | | | | | | | MODULEMODE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1396. Register Call Summary for Register CM_L4PER_MCSPi3_CLKCTRL

Clock Management Functional Description

- Clock Domain Module Attributes: [0] [1]

PRCM Register Manual

- L4PER_CM2 Register Summary: [2]

Table 3-1397. CM_L4PER_MCSPi4_CLKCTRL

| | | |
|-------------------------|--|-----------------|
| Address Offset | 0x0000 0108 | |
| Physical Address | 0x4A00 9508 | Instance |
| Description | This register manages the MCSPI4 clocks. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup).</p> <p>Read 0x1: Reserved</p> <p>0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen.</p> <p>Read 0x3: Reserved</p> | RW | 0x0 |

Table 3-1398. Register Call Summary for Register CM_L4PER_MCSPI4_CLKCTRL

Clock Management Functional Description

- Clock Domain Module Attributes: [0] [1]

PRCM Register Manual

- L4PER_CM2 Register Summary: [2]

Table 3-1399. CM_L4PER_MMCS3_CLKCTRL

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0120 | | |
| Physical Address | 0x4A00 9520 | Instance | L4PER_CM2 |
| Description | This register manages the MMCSDB clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | MODULEMODE | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup).</p> <p>Read 0x1: Reserved</p> <p>0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen.</p> <p>Read 0x3: Reserved</p> | RW | 0x0 |

Table 3-1400. Register Call Summary for Register CM_L4PER_MMCSDB3_CLKCTRL

Clock Management Functional Description
 • [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual
 • [L4PER_CM2 Register Summary: \[2\]](#)

Table 3-1401. CM L4PER MMCSD4 CLKCTRL

| | | | |
|------------------|--|----------|-----------|
| Address Offset | 0x0000 0128 | | |
| Physical Address | 0x4A00 9528 | Instance | L4PER_CM2 |
| Description | This register manages the MMCSd4 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1402. Register Call Summary for Register CM_L4PER_MMCS4_CLKCTRL

Clock Management Functional Description

- Clock Domain Module Attributes: [0] [1]

PRCM Register Manual

- L4PER_CM2 Register Summary: [2]

Table 3-1403. CM L4PER SLIMBUS2 CLKCTRL

| | | |
|-------------------------|--|-----------------|
| Address Offset | 0x0000 0138 | |
| Physical Address | 0x4A00 9538 | Instance |
| Description | This register manages the SLIMBUS2 clocks. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----------------------|---|---|--------------------------|---|---|------------------------|---|--|----------|--|--|--|--|--|--|--|------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | |
| RESERVED | | | | | | | | IDLEST | | | | | | | | RESERVED | | | | | | | | OPTFCLKEN_SLIMBUS_CLK | | | OPTFCLKEN_PERABE24M_FCLK | | | OPTFCLKEN_PER24MC_FCLK | | | RESERVED | | | | | | | | MODULEMODE | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:11 | RESERVED | | R | 0x00 |
| 10 | OPTFCLKEN_SLIMBUS_CLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 9 | OPTFCLKEN_PERABE24M_FCLK | Optional functional clock control for PER_ABE_24M_FCLK clock. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 8 | OPTFCLKEN_PER24MC_FCLK | Optional functional clock control for PER_24MC_FCLK clock. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1404. Register Call Summary for Register CM_L4PER_SLIMBUS2_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)

Table 3-1405. CM L4PER UART1 CLKCTRL

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0140 | | |
| Physical Address | 0x4A00 9540 | Instance | L4PER_CM2 |
| Description | This register manages the UART1 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup).</p> <p>Read 0x1: Reserved</p> <p>0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen.</p> <p>Read 0x3: Reserved</p> | RW | 0x0 |

Table 3-1406. Register Call Summary for Register CM_L4PER_UART1_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)

Table 3-1407. CM_L4PER_UART2_CLKCTRL

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0148 | | |
| Physical Address | 0x4A00 9548 | Instance | L4PER_CM2 |
| Description | This register manages the UART2 clocks. | | |
| Type | RW | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | <p>Module idle status. [warm reset insensitive]</p> <p>Read 0x0: Module is fully functional, including INTRCONN</p> <p>Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion</p> <p>Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock</p> <p>Read 0x3: Module is disabled and cannot be accessed</p> | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | <p>Control the way mandatory clocks are managed.</p> <p>0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup).</p> <p>Read 0x1: Reserved</p> <p>0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen.</p> <p>Read 0x3: Reserved</p> | RW | 0x0 |

Clock Management Functional Description

- Clock Domain Module Attributes: [0] [1]

PRCM Register Manual

- L4PER_CM2 Register Summary: [2]

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0150 | | |
| Physical Address | 0x4A00 9550 | Instance | L4PER_CM2 |
| Description | This register manages the UART3 clocks. | | |
| Type | RW | | |

1004 *Power, Reset, and Clock Management*

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1410. Register Call Summary for Register CM_L4PER_UART3_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)

Table 3-1411. CM_L4PER_UART4_CLKCTRL

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0158 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9558 | | |
| Description | This register manages the UART4 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | | | | | | | RESERVED | | | | | | | | MODULEMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1412. Register Call Summary for Register CM_L4PER_UART4_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)

Table 3-1413. CM_L4PER_MMCS5D5_CLKCTRL

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0160 | Instance | L4PER_CM2 |
| Physical Address | 0x4A00 9560 | | |
| Description | This register manages the MMCS5D5 clocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | | | | | | | | | | | MODULEMODE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1414. Register Call Summary for Register CM_L4PER_MMCS5D5_CLKCTRL

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [L4PER_CM2 Register Summary: \[2\]](#)

3.11.40 RESTORE_CM2 Registers

3.11.40.1 RESTORE_CM2 Register Summary

Table 3-1415. RESTORE_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | RESTORE_CM2 L4 Base Address |
|---|------|-----------------------|----------------|-----------------------------|
| CM_L3_1_CLKSTCTRL_RESTORE | RW | 32 | 0x0000 0000 | 0x4A00 9E00 |
| CM_L3_2_CLKSTCTRL_RESTORE | RW | 32 | 0x0000 0004 | 0x4A00 9E04 |
| CM_L4CFG_CLKSTCTRL_RESTORE | RW | 32 | 0x0000 0008 | 0x4A00 9E08 |
| CM_MEMIF_CLKSTCTRL_RESTORE | RW | 32 | 0x0000 000C | 0x4A00 9E0C |
| CM_L4PER_CLKSTCTRL_RESTORE | RW | 32 | 0x0000 0010 | 0x4A00 9E10 |
| CM_L3INIT_CLKSTCTRL_RESTORE | RW | 32 | 0x0000 0014 | 0x4A00 9E14 |
| CM_L3INSTR_L3_3_CLKCTRL_RESTORE | RW | 32 | 0x0000 0018 | 0x4A00 9E18 |
| CM_L3INSTR_L3_INSTR_CLKCTRL_RESTORE | RW | 32 | 0x0000 001C | 0x4A00 9E1C |
| CM_L3INSTR_OCP_WP1_CLKCTRL_RESTORE | RW | 32 | 0x0000 0020 | 0x4A00 9E20 |
| CM_CM2_PROFILING_CLKCTRL_RESTORE | RW | 32 | 0x0000 0024 | 0x4A00 9E24 |
| CM_C2C_STATICDEP_RESTORE | RW | 32 | 0x0000 0028 | 0x4A00 9E28 |
| CM_L3_1_DYNAMICDEP_RESTORE | RW | 32 | 0x0000 002C | 0x4A00 9E2C |
| CM_L3_2_DYNAMICDEP_RESTORE | RW | 32 | 0x0000 0030 | 0x4A00 9E30 |
| CM_C2C_DYNAMICDEP_RESTORE | RW | 32 | 0x0000 0034 | 0x4A00 9E34 |
| CM_L4CFG_DYNAMICDEP_RESTORE | RW | 32 | 0x0000 0038 | 0x4A00 9E38 |
| CM_L4PER_DYNAMICDEP_RESTORE | RW | 32 | 0x0000 003C | 0x4A00 9E3C |
| CM_L4PER_GPIO2_CLKCTRL_RESTORE | RW | 32 | 0x0000 0040 | 0x4A00 9E40 |
| CM_L4PER_GPIO3_CLKCTRL_RESTORE | RW | 32 | 0x0000 0044 | 0x4A00 9E44 |
| CM_L4PER_GPIO4_CLKCTRL_RESTORE | RW | 32 | 0x0000 0048 | 0x4A00 9E48 |
| CM_L4PER_GPIO5_CLKCTRL_RESTORE | RW | 32 | 0x0000 004C | 0x4A00 9E4C |
| CM_L4PER_GPIO6_CLKCTRL_RESTORE | RW | 32 | 0x0000 0050 | 0x4A00 9E50 |
| CM_L3INIT_HSUSBHOST_CLKCTRL_RESTORE | RW | 32 | 0x0000 0054 | 0x4A00 9E54 |
| CM_L3INIT_HSUSBTLL_CLKCTRL_RESTORE | RW | 32 | 0x0000 0058 | 0x4A00 9E58 |
| CM_SDMA_STATICDEP_RESTORE | RW | 32 | 0x0000 005C | 0x4A00 9E5C |

3.11.40.2 RESTORE_CM2 Register Description

Table 3-1416. CM_L3_1_CLKSTCTRL_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0000 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E00 | | |
| Description | Second address map for register CM_L3_1_CLKSTCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----------|----|----|----|----|---|---|---|-----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_L3_1_ICLK | RESERVED | | | | | | | | CLKTRCTRL | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKACTIVITY_L3_1_ICLK | This field indicates the state of the L3_1_GICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the L3_1 clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved Read 0x2: Reserved 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1417. Register Call Summary for Register CM_L3_1_CLKSTCTRL_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1418. CM_L3_2_CLKSTCTRL_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0004 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E04 | | |
| Description | Second address map for register CM_L3_2_CLKSTCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|-----------|
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_L3_2_ICLK | | | | | | | | RESERVED | | | | | | | | CLKTRCTRL |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKACTIVITY_L3_2_ICLK | This field indicates the state of the L3_2_GICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the L3_2 clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved Read 0x2: Reserved 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1419. Register Call Summary for Register CM_L3_2_CLKSTCTRL_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1420. CM_L4CFG_CLKSTCTRL_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0008 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E08 | | |
| Description | Second address map for register CM_L4CFG_CLKSTCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|-----------|--|
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_CFG_L4_ICLK | | | | | | | | RESERVED | | | | | | | | CLKTRCTRL | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | CLKACTIVITY_CFG_L4_ICLK | This field indicates the state of the L4_CFG_GICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the L4CFG clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved Read 0x2: Reserved 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1421. Register Call Summary for Register CM_L4CFG_CLKSTCTRL_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1422. CM_MEMIF_CLKSTCTRL_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 000C | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E0C | | |
| Description | Second address map for register CM_MEMIF_CLKSTCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|----|----|----|----|----|---|----------|---|---|---|---|---|---|-----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKACTIVITY_ASYNC_PHY2_CLK CLKACTIVITY_ASYNC_PHY1_CLK CLKACTIVITY_ASYNC_DLL_CLK CLKACTIVITY_PHY_ROOT_CLK CLKACTIVITY_DLL_CLK CLKACTIVITY_L3_EMIF_ICLK | | | | | | | RESERVED | | | | | | | CLKTRCTRL | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|--|------|----------|
| 31:14 | RESERVED | | R | 0x000000 |
| 13 | CLKACTIVITY_ASYNC_PHY2_CLK | This field indicates the state of the ASYNC_PHY2_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------|--|------|-------|
| 12 | CLKACTIVITY_ASYNC_PHY1_CLK | This field indicates the state of the ASYNC_PHY1_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 11 | CLKACTIVITY_ASYNC_DLL_CLK | This field indicates the state of the ASYNC_DLL_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 10 | CLKACTIVITY_PHY_ROOT_CLK | This field indicates the state of the PHY_ROOT_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 9 | CLKACTIVITY_DLL_CLK | This field indicates the state of the DLL_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 8 | CLKACTIVITY_L3_EMIF_ICLK | This field indicates the state of the L3_EMIF_GICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the MEMIF clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. Read 0x1: Reserved 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1423. Register Call Summary for Register CM_MEMIF_CLKSTCTRL_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1424. CM_L4PER_CLKSTCTRL_RESTORE

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 0010 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E10 | | |
| Description | Second address map for register CM_L4PER_CLKSTCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|------------------------------|----------|----------|-----------------------------|----------|--------------------------|--------------------------|--------------------------|---------------------------|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|-------------------------|----------|---|---|---|---|---|-----------|---|---|
| RESERVED | | | | | | CLKACTIVITY_PER_ABE_24M_FCLK | RESERVED | RESERVED | CLKACTIVITY_PER_MCBSP4_FCLK | RESERVED | CLKACTIVITY_PER_96M_FCLK | CLKACTIVITY_PER_48M_FCLK | CLKACTIVITY_PER_32K_FCLK | CLKACTIVITY_PER_24MC_FCLK | CLKACTIVITY_12M_FCLK_FCLK | CLKACTIVITY_GPT9_FCLK | CLKACTIVITY_GPT4_FCLK | CLKACTIVITY_GPT3_FCLK | CLKACTIVITY_GPT2_FCLK | CLKACTIVITY_GPT11_FCLK | CLKACTIVITY_GPT10_FCLK | CLKACTIVITY_L4_PER_ICLK | RESERVED | | | | | | CLKTRCTRL | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|--|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25 | CLKACTIVITY_PER_ABE_24M_FCLK | This field indicates the state of the PER_ABE_24M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 24 | RESERVED | | R | 0 |
| 23 | RESERVED | | R | 0 |
| 22 | CLKACTIVITY_PER_MCBSP4_FCLK | This field indicates the state of the PER_MCBSP4_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 21:20 | RESERVED | | R | 0 |
| 19 | CLKACTIVITY_PER_96M_FCLK | This field indicates the state of the PER_96M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 18 | CLKACTIVITY_PER_48M_FCLK | This field indicates the state of the PER_48M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 17 | CLKACTIVITY_PER_32K_FCLK | This field indicates the state of the PER_32K_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 16 | CLKACTIVITY_PER_24MC_FCLK | This field indicates the state of the PER_24MC_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 15 | CLKACTIVITY_12M_FCLK_FCLK | This field indicates the state of the FUNC_12M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------|
| 14 | CLKACTIVITY_GPT9_FCLK | This field indicates the state of the DMT9_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 13 | CLKACTIVITY_GPT4_FCLK | This field indicates the state of the DMT4_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 12 | CLKACTIVITY_GPT3_FCLK | This field indicates the state of the DMT3_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 11 | CLKACTIVITY_GPT2_FCLK | This field indicates the state of the DMT2_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 10 | CLKACTIVITY_GPT11_FCLK | This field indicates the state of the DMT11_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 9 | CLKACTIVITY_GPT10_FCLK | This field indicates the state of the DMT10_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 8 | CLKACTIVITY_L4_PER_ICLK | This field indicates the state of the L4_PER_GICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the L4PER clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. 0x1: SW_SLEEP: Start a software forced sleep transition on the domain. 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1425. Register Call Summary for Register CM_L4PER_CLKSTCTRL_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1426. CM_L3INIT_CLKSTCTRL_RESTORE

| | | | | | |
|------------------|--|--|----------|-------------|--|
| Address Offset | | 0x0000 0014 | | | |
| Physical Address | | 0x4A00 9E14 | Instance | RESTORE_CM2 | |
| Description | | Second address map for register CM_L3INIT_CLKSTCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | | |
| Type | | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|------------------------------|----|------------------------------|----|--------------------------|----|--------------------------|----|----------------------------|----|----------|----|--------------------------|----|--------------------------|----|-------------------------------|----|-------------------------------|----|-------------------------------|---|-------------------------------|---|-------------------------------|---|---------------------------|---|-----------------------------|---|--------------------------|--|----------------------------|--|---------------------------|--|----------|--|--------------------------|--|--------------------------|--|----------|--|--|--|-----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | |
| RESERVED | | CLKACTIVITY_INIT_60M_P2_FCLK | | CLKACTIVITY_INIT_60M_P1_FCLK | | CLKACTIVITY_HSIC_P2_FCLK | | CLKACTIVITY_HSIC_P1_FCLK | | CLKACTIVITY_UTMI_ROOT_FCLK | | RESERVED | | CLKACTIVITY_TLL_CH1_FCLK | | CLKACTIVITY_TLL_CH0_FCLK | | CLKACTIVITY_HSIC_P2_480M_FCLK | | CLKACTIVITY_HSIC_P1_480M_FCLK | | CLKACTIVITY_INIT_HSMCMC6_FCLK | | CLKACTIVITY_INIT_HSMCMC2_FCLK | | CLKACTIVITY_INIT_HSMCMC1_FCLK | | CLKACTIVITY_INIT_HSI_FCLK | | CLKACTIVITY_USB_DPLL_HS_CLK | | CLKACTIVITY_USB_DPLL_CLK | | CLKACTIVITY_INIT_48MC_FCLK | | CLKACTIVITY_INIT_48M_FCLK | | RESERVED | | CLKACTIVITY_INIT_L4_ICLK | | CLKACTIVITY_INIT_L3_ICLK | | RESERVED | | | | CLKTRCTRL | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|--|------|-------|
| 31:30 | RESERVED | | R | 0x0 |
| 29 | CLKACTIVITY_INIT_60M_P2_FCLK | This field indicates the state of the INIT_60M_P2_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 28 | CLKACTIVITY_INIT_60M_P1_FCLK | This field indicates the state of the INIT_60M_P1_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 27 | CLKACTIVITY_HSIC_P2_FCLK | This field indicates the state of the HSIC_P2_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 26 | CLKACTIVITY_HSIC_P1_FCLK | This field indicates the state of the HSIC_P1_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 25 | CLKACTIVITY_UTMI_ROOT_FCLK | This field indicates the state of the UTMI_ROOT_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 24 | RESERVED | | R | 0 |
| 23 | CLKACTIVITY_TLL_CH1_FCLK | This field indicates the state of the TLL_CH1_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------|---|------|-------|
| 22 | CLKACTIVITY_TLL_CH0_FCLK | This field indicates the state of the TLL_CH0_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 21 | CLKACTIVITY_HSIC_P2_480M_FCLK | This field indicates the state of the HSIC_P2_480M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 20 | CLKACTIVITY_HSIC_P1_480M_FCLK | This field indicates the state of the HSIC_P1_480M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 19 | CLKACTIVITY_INIT_HSMC6_FCLK | This field indicates the state of the INIT_HSMC6_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 18 | CLKACTIVITY_INIT_HSMC2_FCLK | This field indicates the state of the INIT_HSMC2_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 17 | CLKACTIVITY_INIT_HSMC1_FCLK | This field indicates the state of the INIT_HSMC1_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 16 | CLKACTIVITY_INIT_HSI_FCLK | This field indicates the state of the INIT_HSI_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 15 | CLKACTIVITY_USB_DPLL_HS_CLK | This field indicates the state of the USB_DPLL_HS_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 14 | CLKACTIVITY_USB_DPLL_CLK | This field indicates the state of the USB_DPLL_CLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 13 | CLKACTIVITY_INIT_48MC_FCLK | This field indicates the state of the INIT_48MC_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 12 | CLKACTIVITY_INIT_48M_FCLK | This field indicates the state of the INIT_48M_FCLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|-------|
| 11:10 | RESERVED | Reserved | R | 0x0 |
| 9 | CLKACTIVITY_INIT_L4_ICLK | This field indicates the state of the L4_INIT_GICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 8 | CLKACTIVITY_INIT_L3_ICLK | This field indicates the state of the L3_INIT_GICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing | R | 0 |
| 7:2 | RESERVED | Reserved | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the L3INIT clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may however occur. 0x1: SW_SLEEP: Start a software forced sleep transition on the domain. 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transition are based upon hardware conditions. | RW | 0x0 |

Table 3-1427. Register Call Summary for Register CM_L3INIT_CLKSTCTRL_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1428. CM_L3INSTR_L3_3_CLKCTRL_RESTORE

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 0018 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E18 | | |
| Description | Second address map for register CM_L3INSTR_L3_3_CLKCTRL. Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | | | | | | | MODULEMODE |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x1 |

Table 3-1429. Register Call Summary for Register CM_L3INSTR_L3_3_CLKCTRL_RESTORE

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[2\]](#)

Table 3-1430. CM_L3INSTR_L3_INSTR_CLKCTRL_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 001C | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E1C | | |
| Description | Second address map for register CM_L3INSTR_L3_INSTR_CLKCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | | | | | | | RESERVED | | | | | | | | | | | | | | | MODULEMODE |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x1 |

Table 3-1431. Register Call Summary for Register CM_L3INSTR_L3_INSTR_CLKCTRL_RESTORE

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[2\]](#)

Table 3-1432. CM_L3INSTR_OCP_WP1_CLKCTRL_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0020 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E20 | | |
| Description | Second address map for register CM_L3INSTR_OCP_WP1_CLKCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | IDLEST | | | | | | | | RESERVED | | | | | | | | | | | | | | | | | | MODULEMODE |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x3: Module is disabled and cannot be accessed Read 0x2: Module is in idle mode (only Interconnect part). It is functional if using separate functional clock Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x0: Module is fully functional, including Interconnect | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any Interconnect access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any Interconnect access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x1 |

Table 3-1433. Register Call Summary for Register CM_L3INSTR_OCP_WP1_CLKCTRL_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1434. CM_CM2_PROFILING_CLKCTRL_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0024 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E24 | | |
| Description | Second address map for register CM_CM2_PROFILING_CLKCTRL . Used only by automatic restore upon wakeup from device OFF mode. [warm reset insensitive] | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | IDLEST | | | | | | | | RESERVED | | | | | | | | | | | | | | | | MODULEMODE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status Read 0x3: Module is disabled Read 0x2: Module is in Idle Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x0: Module is fully functional | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disabled by software. OCP configuration port is not accessible. 0x1: Module is managed automatically by hardware along with L3INSTR domain. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x1 |

Table 3-1435. Register Call Summary for Register CM_CM2_PROFILING_CLKCTRL_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1436. CM_C2C_STATICDEP_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0028 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E28 | | |
| Description | Second address map for register CM_C2C_STATICDEP . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|---------------|----|----------|----|---|---|----------------|---|--------------|---|--------------|---|---------------|---|-------------|--|---------------|--|----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | L4PER_STATDEP | | L4CFG_STATDEP | | RESERVED | | | | L3INIT_STATDEP | | L3_2_STATDEP | | L3_1_STATDEP | | MEMIF_STATDEP | | ABE_STATDEP | | IVAHD_STATDEP | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13 | L4PER_STATDEP | Static dependency towards L4PER clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 12 | L4CFG_STATDEP | Static dependency towards L4CFG clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 11:8 | RESERVED | | R | 0x0 |
| 7 | L3INIT_STATDEP | Static dependency towards L3INIT clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 6 | L3_2_STATDEP | Static dependency towards L3_2 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 5 | L3_1_STATDEP | Static dependency towards L3_1 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 4 | MEMIF_STATDEP | Static dependency towards MEMIF clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 3 | ABE_STATDEP | Static dependency towards ABE clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | IVAHD_STATDEP | Static dependency towards IVAHD clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1:0 | RESERVED | | R | 0x0 |

Table 3-1437. Register Call Summary for Register CM_C2C_STATICDEP_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1438. CM_L3_1_DYNAMICDEP_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 002C | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E2C | | |
| Description | Second address map for register CM_L3_1_DYNAMICDEP . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|----|----|--------------|----|----------|----|----|----|-------------|---|----------|--------------|------------|----------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | | | | | L4CFG_DYNDEP | | RESERVED | | | | L3_2_DYNDEP | | RESERVED | MEMIF_DYNDEP | ABE_DYNDEP | RESERVED | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|-----------------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor OCP interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:13 | RESERVED | | R | 0x000 |
| 12 | L4CFG_DYNDEP | Dynamic dependency towards L4CFG clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 11:7 | RESERVED | | R | 0x00 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 5 | RESERVED | | R | 0 |
| 4 | MEMIF_DYNDEP | Dynamic dependency towards MEMIF clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 3 | ABE_DYNDEP | Dynamic dependency towards ABE clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 2:0 | RESERVED | | R | 0x0 |

Table 3-1439. Register Call Summary for Register CM_L3_1_DYNAMICDEP_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1440. CM_L3_2_DYNAMICDEP_RESTORE

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0030 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E30 | | |
| Description | Second address map for register CM_L3_2_DYNAMICDEP . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|------------|----|----|----|----------|----|----|----|--------------|----|---|---|--------------|---|---|---|----------|---|---|---|------------|--|--|--|------------|--|--|--|------------|--|--|--|---------------|--|--|--|----------|--|--|--|-------------|--|--|--|----------|--|--|--|--------------|--|--|--|----------|--|--|--|---------------|--|--|--|
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | C2C_DYNDEP | | | | RESERVED | | | | L4SEC_DYNDEP | | | | L4PER_DYNDEP | | | | RESERVED | | | | GFX_DYNDEP | | | | ISS_DYNDEP | | | | DSS_DYNDEP | | | | L3INIT_DYNDEP | | | | RESERVED | | | | L3_1_DYNDEP | | | | RESERVED | | | | IVAHD_DYNDEP | | | | RESERVED | | | | MPU_M3_DYNDEP | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|---------------------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor OCP interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:19 | RESERVED | | R | 0x00 |
| 18 | C2C_DYNDEP | Dynamic dependency towards D2D clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 17:15 | RESERVED | | R | 0x0 |
| 14 | L4SEC_DYNDEP | Dynamic dependency towards L4SEC clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 13 | L4PER_DYNDEP | Dynamic dependency towards L4PER clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 12:11 | RESERVED | | R | 0x0 |
| 10 | GFX_DYNDEP | Dynamic dependency towards GFX clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 9 | ISS_DYNDEP | Dynamic dependency towards ISS clock domain Read 0x0: Dependency is disabled | R | 0 |
| 8 | DSS_DYNDEP | Dynamic dependency towards DSS clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 7 | L3INIT_DYNDEP | Dynamic dependency towards L3INIT clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 6 | RESERVED | | R | 0 |
| 5 | L3_1_DYNDEP | Dynamic dependency towards L3_1 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 4:3 | RESERVED | | R | 0x0 |
| 2 | IVAHD_DYNDEP | Dynamic dependency towards IVAHD clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 1 | RESERVED | | R | 0 |
| 0 | MPU_M3_DYNDEP | Dynamic dependency towards CORTEXM3 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |

Table 3-1441. Register Call Summary for Register CM_L3_2_DYNAMICDEP_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1442. CM_C2C_DYNAMICDEP_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0034 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E34 | | |
| Description | Second address map for register CM_C2C_DYNAMICDEP . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------------|----------|--------------|----------|---|---|---|---|
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | | | | | | | | | | | | | L3_2_DYNDEP | RESERVED | MEMIF_DYNDEP | RESERVED | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|---------------------|---------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor OCP interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:7 | RESERVED | | R | 0x00000 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5 | RESERVED | | R | 0 |
| 4 | MEMIF_DYNDEP | Dynamic dependency towards MEMIF clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 3:0 | RESERVED | | R | 0x0 |

Table 3-1443. Register Call Summary for Register CM_C2C_DYNAMICDEP_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1444. CM_L4CFG_DYNAMICDEP_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0038 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E38 | | |
| Description | Second address map for register CM_L4CFG_DYNAMICDEP . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|------------|----|----|----|------------|----|----|----|----------|----|---|---|------------------|---|---|---|---------------|---|---|---|----------|--|--|--|-------------|--|--|--|----------|--|--|--|------------|--|--|--|------------|--|--|--|---------------|--|--|--|-------------|--|--|--|-------------|--|--|--|--------------|--|--|--|----------|--|--|--|------------|--|--|--|----------|--|--|--|
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | MPU_DYNDEP | | | | C2C_DYNDEP | | | | RESERVED | | | | ALWONCORE_DYNDEP | | | | L4WKUP_DYNDEP | | | | RESERVED | | | | SDMA_DYNDEP | | | | RESERVED | | | | ISS_DYNDEP | | | | DSS_DYNDEP | | | | L3INIT_DYNDEP | | | | L3_2_DYNDEP | | | | L3_1_DYNDEP | | | | MEMIF_DYNDEP | | | | RESERVED | | | | DSP_DYNDEP | | | | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|---------------------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor OCP interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:20 | RESERVED | | R | 0x0 |
| 19 | MPU_DYNDEP | Dynamic dependency towards MPU clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 18 | C2C_DYNDEP | Dynamic dependency towards D2D clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 17 | RESERVED | | R | 1 |
| 16 | ALWONCORE_DYNDEP | Dynamic dependency towards ALWONCORE clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 15 | L4WKUP_DYNDEP | Dynamic dependency towards L4WKUP clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 14:12 | RESERVED | | R | 0x0 |
| 11 | SDMA_DYNDEP | Dynamic dependency towards SDMA clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 10 | RESERVED | | R | 0 |
| 9 | ISS_DYNDEP | Dynamic dependency towards ISS clock domain Read 0x0: Dependency is disabled | R | 0 |
| 8 | DSS_DYNDEP | Dynamic dependency towards DSS clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 7 | L3INIT_DYNDEP | Dynamic dependency towards L3INIT clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 6 | L3_2_DYNDEP | Dynamic dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5 | L3_1_DYNDEP | Dynamic dependency towards L3_1 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 4 | MEMIF_DYNDEP | Dynamic dependency towards MEMIF clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 3:2 | RESERVED | | R | 0x0 |
| 1 | DSP_DYNDEP | Dynamic dependency towards DSP clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 0 | RESERVED | | R | 0 |

Table 3-1445. Register Call Summary for Register CM_L4CFG_DYNAMICDEP_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1446. CM_L4PER_DYNAMICDEP_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 003C | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E3C | | |
| Description | Second address map for register CM_L4PER_DYNAMICDEP . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|----|----|--------------|----|----------|----|----|----|------------|---|---------------|---|----------|---|---|---|---|---|--|--|
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | | | | | L4SEC_DYNDEP | | RESERVED | | | | DSS_DYNDEP | | L3INIT_DYNDEP | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|--------------------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor OCP interface activity for determination of auto-sleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:15 | RESERVED | | R | 0x000 |
| 14 | L4SEC_DYNDEP | Dynamic dependency towards L4SEC clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | DSS_DYNDEP | Dynamic dependency towards DSS clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 7 | L3INIT_DYNDEP | Dynamic dependency towards L3INIT clock domain Read 0x1: Dependency is enabled | R Returns 1s | 1 |
| 6:0 | RESERVED | | R | 0x00 |

Table 3-1447. Register Call Summary for Register CM_L4PER_DYNAMICDEP_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

Table 3-1448. CM_L4PER_GPIO2_CLKCTRL_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0040 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E40 | | |
| Description | Second address map for register CM_L4PER_GPIO2_CLKCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|-----------------|----|----------|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | OPTFCLKEN_DBCLK | | RESERVED | | | | | | | | MODULEMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_DBCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1449. Register Call Summary for Register CM_L4PER_GPIO2_CLKCTRL_RESTORE

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\]](#)

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[1\]](#)

Table 3-1450. CM_L4PER_GPIO3_CLKCTRL_RESTORE

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 0044 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E44 | | |
| Description | Second address map for register CM_L4PER_GPIO3_CLKCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|---|---|---|-----------------|----------|---|---|---|---|---|--|--|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | OPTFCLKEN_DBCLK | RESERVED | | | | | | | | MODULEMODE |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_DBCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1451. Register Call Summary for Register CM_L4PER_GPIO3_CLKCTRL_RESTORE

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\]](#)

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[1\]](#)

Table 3-1452. CM_L4PER_GPIO4_CLKCTRL_RESTORE

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 0048 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E48 | | |
| Description | Second address map for register CM_L4PER_GPIO4_CLKCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|---|---|---|-----------------|----------|---|---|---|---|---|--|--|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | OPTFCLKEN_DBCLK | RESERVED | | | | | | | | MODULEMODE |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_DBCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1453. Register Call Summary for Register CM_L4PER_GPIO4_CLKCTRL_RESTORE

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\]](#)

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[1\]](#)

Table 3-1454. CM_L4PER_GPIO5_CLKCTRL_RESTORE

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 004C | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E4C | | |
| Description | Second address map for register CM_L4PER_GPIO5_CLKCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----|----|----|---|---|---|-----------------|----------|---|---|---|---|---|--|--|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | | | | | | | | | IDLEST | RESERVED | | | | | | | | OPTFCLKEN_DBCLK | RESERVED | | | | | | | | MODULEMODE |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_DBCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1455. Register Call Summary for Register CM_L4PER_GPIO5_CLKCTRL_RESTORE

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\]](#)

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[1\]](#)

Table 3-1456. CM_L4PER_GPIO6_CLKCTRL_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0050 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E50 | | |
| Description | Second address map for register CM_L4PER_GPIO6_CLKCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|-----------------|----|----------|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | OPTFCLKEN_DBCLK | | RESERVED | | | | | | | | MODULEMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:9 | RESERVED | | R | 0x00 |
| 8 | OPTFCLKEN_DBCLK | Optional functional clock control. 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1457. Register Call Summary for Register CM_L4PER_GPIO6_CLKCTRL_RESTORE

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\]](#)

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[1\]](#)

Table 3-1458. CM_L3INIT_HSUSBHOST_CLKCTRL_RESTORE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0054 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 9E54 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | RESTORE_CM2 | | | | | | | | | | | | | | | |
| Description | Second address map for register CM_L3INIT_USB_HOST_CLKCTRL. Used only by automatic restore upon wakeup from device OFF mode. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----------------|----------------|----------|----|----|----|----|----|--------|----|--------|----|----------------------|----|---------------------------|----|---------------------------|---|--------------------------|---|--------------------------|---|-----------------------|---|-----------------------|---|-----------------------|--|----------|--|--|----------|--|----------|--|--|------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | |
| RESERVED | | | | | | CLKSEL_UTMI_P2 | CLKSEL_UTMI_P1 | RESERVED | | | | | | STBYST | | IDLEST | | OPTFCLKEN_FUNC48MCLK | | OPTFCLKEN_HSIC480M_P2_CLK | | OPTFCLKEN_HSIC480M_P1_CLK | | OPTFCLKEN_HSIC60M_P2_CLK | | OPTFCLKEN_HSIC60M_P1_CLK | | OPTFCLKEN_UTMI_P3_CLK | | OPTFCLKEN_UTMI_P2_CLK | | OPTFCLKEN_UTMI_P1_CLK | | RESERVED | | | SAR_MODE | | RESERVED | | | MODULEMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|---|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25 | CLKSEL_UTMI_P2 | Selects the source of the functional clock for UTMI Port2 on USB Host 0x0: The functional clock is provided by the internal clock source 0x1: The functional clock is provided by an external PHY through an I/O pad. | RW | 0 |
| 24 | CLKSEL_UTMI_P1 | Selects the source of the functional clock for UTMI Port1 on USB Host 0x0: The functional clock is provided by the internal clock source 0x1: The functional clock is provided by an external PHY through an I/O pad. | RW | 0 |
| 23:19 | RESERVED | | R | 0x00 |
| 18 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15 | OPTFCLKEN_FUNC48MCLK | USB-HOST optional clock control: FUNC48MCLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 14 | OPTFCLKEN_HSIC480M_P2_CLK | USB-HOST optional clock control: HSIC480M_P2_CLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 13 | OPTFCLKEN_HSIC480M_P1_CLK | USB-HOST optional clock control: HSIC480M_P1_CLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 12 | OPTFCLKEN_HSIC60M_P2_CLK | USB-HOST optional clock control: HSIC60M_P2_CLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 11 | OPTFCLKEN_HSIC60M_P1_CLK | USB-HOST optional clock control: HSIC60M_P1_CLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 10 | OPTFCLKEN_UTMI_P3_CLK | USB-HOST optional clock control: UTMI_P3_CLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 9 | OPTFCLKEN_UTMI_P2_CLK | USB-HOST optional clock control: UTMI_P2_CLK when CLKSEL_UTMI_P2 is 0 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 8 | OPTFCLKEN_UTMI_P1_CLK | USB-HOST optional clock control: UTMI_P1_CLK when CLKSEL_UTMI_P1 is 0 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:5 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 4 | SAR_MODE | SAR mode control for the module. Shall not be modify except if module is disabled. 0x0: SAR mode is disabled 0x1: SAR mode is enabled | RW | 0 |
| 3:2 | RESERVED | | R | 0x0 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). Read 0x1: Reserved 0x2: Module is explicitly enabled. Interface clock (if not used for functions) may be gated according to the clock domain state. Functional clocks are guarantied to stay present. As long as in this configuration, power domain sleep transition cannot happen. Read 0x3: Reserved | RW | 0x0 |

Table 3-1459. Register Call Summary for Register CM_L3INIT_HSUSBHOST_CLKCTRL_RESTORE

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\] \[1\]](#)

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[2\]](#)

Table 3-1460. CM_L3INIT_HSUSBTLL_CLKCTRL_RESTORE

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0058 | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E58 | | |
| Description | Second address map for register CM_L3INIT_HSUSBTLL_CLKCTRL . Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----------------------|---|-----------------------|---|----------|---|----------|---|----------|--|------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | IDLEST | | | | | | | | RESERVED | | | | | | | | OPTFCLKEN_USB_CH1_CLK | | OPTFCLKEN_USB_CH0_CLK | | RESERVED | | SAR_MODE | | RESERVED | | MODULEMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status. [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion Read 0x2: Module is in idle mode (only INTRCONN part). It is functional if using separate functional clock Read 0x3: Module is disabled and cannot be accessed | R | 0x3 |
| 15:10 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------|
| 9 | OPTFCLKEN_USB_CH1_CLK | USB-HOST optional clock control: USB_CH1_CLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 8 | OPTFCLKEN_USB_CH0_CLK | USB-HOST optional clock control: USB_CH0_CLK 0x0: Optional functional clock is disabled 0x1: Optional functional clock is enabled | RW | 0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SAR_MODE | SAR mode control for the module. Shall not be modify except if module is disabled. 0x0: SAR mode is disabled 0x1: SAR mode is enabled | RW | 0 |
| 3:2 | RESERVED | | R | 0x0 |
| 1:0 | MODULEMODE | Control the way mandatory clocks are managed. 0x0: Module is disable by software. Any INTRCONN access to module results in an error, except if resulting from a module wakeup (asynchronous wakeup). 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL=3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. Read 0x2: Reserved Read 0x3: Reserved | RW | 0x0 |

Table 3-1461. Register Call Summary for Register CM_L3INIT_HSUSBTLL_CLKCTRL_RESTORE

Clock Management Functional Description

- [Clock Domain Module Attributes: \[0\]](#)

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[1\]](#)

Table 3-1462. CM_SDMA_STATICDEP_RESTORE

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 005C | Instance | RESTORE_CM2 |
| Physical Address | 0x4A00 9E5C | | |
| Description | Second address map for register CM_SDMA_STATICDEP. Used only by automatic restore upon wakeup from device OFF mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----------|---------------|---------------|----------|-------------|-------------|----------------|--------------|--------------|---------------|-------------|---------------|----------|----------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | L4WKUP_STATDEP | RESERVED | L4PER_STATDEP | L4CFG_STATDEP | RESERVED | ISS_STATDEP | DSS_STATDEP | L3INIT_STATDEP | L3_2_STATDEP | L3_1_STATDEP | MEMIF_STATDEP | ABE_STATDEP | IVAHD_STATDEP | RESERVED | MPU_M3_STATDEP | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | L4WKUP_STATDEP | Static dependency towards L4WKUP clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|---------------------|-------|
| 14 | RESERVED | | RW | 0 |
| 13 | L4PER_STATDEP | Static dependency towards L4PER clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 12 | L4CFG_STATDEP | Static dependency towards L4CFG clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 11:10 | RESERVED | | R | 0x0 |
| 9 | ISS_STATDEP | Static dependency towards ISS clock domain Read 0x0: Dependency is disabled | R | 0 |
| 8 | DSS_STATDEP | Static dependency towards DSS clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 7 | L3INIT_STATDEP | Static dependency towards L3INIT clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 6 | L3_2_STATDEP | Static dependency towards L3_2 clock domain Read 0x1: Dependency is enabled | R Rreturns 1s | 1 |
| 5 | L3_1_STATDEP | Static dependency towards L3_1 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 4 | MEMIF_STATDEP | Static dependency towards MEMIF clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 1 |
| 3 | ABE_STATDEP | Static dependency towards ABE clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 2 | IVAHD_STATDEP | Static dependency towards IVAHD clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | MPU_M3_STATDEP | Static dependency towards MPU_A3 clock domain 0x0: Dependency is disabled 0x1: Dependency is enabled | RW | 0 |

Table 3-1463. Register Call Summary for Register CM_SDMA_STATICDEP_RESTORE

PRCM Register Manual

- [RESTORE_CM2 Register Summary: \[0\]](#)

3.11.41 INSTR_CM2 Registers

3.11.41.1 INSTR_CM2 Register Summary

Table 3-1464. INSTR_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | INSTR_CM2 Base Address |
|----------------------------------|------|-----------------------|----------------|------------------------|
| CM2_IDENTICATION | R | 32 | 0x0000 0000 | 0x4A00 9F00 |

Table 3-1464. INSTR_CM2 Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | INSTR_CM2 Base Address |
|--------------------------------------|------|-----------------------|----------------|------------------------|
| CMI2_SYS_CONFIG | RW | 32 | 0x0000 0010 | 0x4A00 9F10 |
| CMI2_STATUS | R | 32 | 0x0000 0014 | 0x4A00 9F14 |
| CMI2_CONFIGURATION | RW | 32 | 0x0000 0024 | 0x4A00 9F24 |
| CMI2_CLASS_FILTERING | RW | 32 | 0x0000 0028 | 0x4A00 9F28 |
| CMI2_TRIGGERING | RW | 32 | 0x0000 002C | 0x4A00 9F2C |
| CMI2_SAMPLING | RW | 32 | 0x0000 0030 | 0x4A00 9F30 |

3.11.41.2 INSTR_CM2 Register Description

Table 3-1465. CMI2_IDENTICATION

| | | | |
|-------------------------|--------------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0000 | Instance | INSTR_CM2 |
| Physical Address | 0x4A00 9F00 | | |
| Description | CM profiling identification register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|---------------------------|
| 31:0 | REVISION | IP revision | R | 0x-- TI Internal data. |

Table 3-1466. Register Call Summary for Register CMI2_IDENTICATION

PRCM Register Manual

- [INSTR_CM2 Register Summary: \[0\]](#)

Table 3-1467. CMI2_SYS_CONFIG

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0010 | Instance | INSTR_CM2 |
| Physical Address | 0x4A00 9F10 | | |
| Description | CM profiling system configuartion register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|----------|---|----------|-----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RESERVED | | IDLEMODE | | RESERVED | SOFTRESET | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:6 | RESERVED | Reserved | R | 0x00000000 |
| 5:4 | RESERVED | Reserved | R | 0x0 |
| 3:2 | IDLEMODE | Configuration of the local tartget state management mode | RW | 0x2 |
| 1 | RESERVED | Reserved | R | 0 |
| 0 | SOFTRESET | Software reset | RW | 0 |

Table 3-1468. Register Call Summary for Register CMI2_SYS_CONFIG

PRCM Register Manual

- [INSTR_CM2 Register Summary: \[0\]](#)

Table 3-1469. CMI2_STATUS

| | | | |
|-------------------------|------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0014 | Instance | INSTR_CM2 |
| Physical Address | 0x4A00 9F14 | | |
| Description | CM profiling status register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FIFOEMPTY | | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------|------|----------|
| 31:9 | RESERVED | Reserved | R | 0x000000 |
| 8 | FIFOEMPTY | PM Profiling buffer empty | R | 1 |
| 7:0 | RESERVED | Reserved | R | 0x00 |

Table 3-1470. Register Call Summary for Register CMI2_STATUS

PRCM Register Manual

- [INSTR_CM2 Register Summary: \[0\]](#)

Table 3-1471. CMI2_CONFIGURATION

| | | | |
|-------------------------|-------------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0024 | Instance | INSTR_CM2 |
| Physical Address | 0x4A00 9F24 | | |
| Description | CM profiling configuration register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|---------|---------|----------|----|----|----|----|----------|----------|----|----|----|----|----|----|----|----------|----------|----|----|----|---|---|---|---|-------------|----------|---|---|---|---|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| CLAIM_3 | CLAIM_2 | CLAIM_1 | RESERVED | | | | | RESERVED | RESERVED | | | | | | | | RESERVED | RESERVED | | | | | | | | EVT_CAPT_EN | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|-------|
| 31:30 | CLAIM_3 | Ownership | RW | 0x0 |
| 29 | CLAIM_2 | Debugger override qualifier | RW | 1 |
| 28 | CLAIM_1 | Current owner | R | 0 |
| 27:24 | RESERVED | Reserved | R | 0x0 |
| 23 | RESERVED | Reserved | R | 0 |
| 22:16 | RESERVED | Reserved | R | 0x00 |
| 15 | RESERVED | Reserved | R | 0 |
| 14:8 | RESERVED | Reserved | R | 0x00 |
| 7 | EVT_CAPT_EN | When HIGH the PM events capture is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------|
| 6:0 | RESERVED | Reserved | R | 0x00 |

Table 3-1472. Register Call Summary for Register CMI2_CONFIGURATION

PRCM Register Manual

- [INSTR_CM2 Register Summary: \[0\]](#)

Table 3-1473. CMI2_CLASS_FILTERING

| | | | |
|-------------------------|---------------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0028 | Instance | INSTR_CM2 |
| Physical Address | 0x4A00 9F28 | | |
| Description | CM profiling class filtering register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|-----------------|----|-----------------|---|-----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SNAP_CAPT_EN_03 | | | | SNAP_CAPT_EN_02 | | SNAP_CAPT_EN_01 | | SNAP_CAPT_EN_00 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | SNAP_CAPT_EN_03 | Snapshot capture enable - Class-ID = 0x03 | RW | 0 |
| 2 | SNAP_CAPT_EN_02 | Snapshot capture enable - Class-ID = 0x02 | RW | 0 |
| 1 | SNAP_CAPT_EN_01 | Snapshot capture enable - Class-ID = 0x01 | RW | 0 |
| 0 | SNAP_CAPT_EN_00 | Snapshot capture enable - Class-ID = 0x00 | RW | 0 |

Table 3-1474. Register Call Summary for Register CMI2_CLASS_FILTERING

PRCM Register Manual

- [INSTR_CM2 Register Summary: \[0\]](#)

Table 3-1475. CMI2_TRIGGERING

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 002C | Instance | INSTR_CM2 |
| Physical Address | 0x4A00 9F2C | | |
| Description | CM profiling triggering control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|--------------|---------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | TRIG_STOP_EN | TRIG_START_EN | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1 | TRIG_STOP_EN | Enable stop capturing PM events from external trigger detection | RW | 0 |
| 0 | TRIG_START_EN | Enable start capturing PM events from external trigger detection | RW | 0 |

Table 3-1476. Register Call Summary for Register CMI2_TRIGGERING

PRCM Register Manual

- [INSTR_CM2 Register Summary: \[0\]](#)

Table 3-1477. CMI2_SAMPLING

| | | | |
|-------------------------|---------------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0030 | Instance | INSTR_CM2 |
| Physical Address | 0x4A00 9F30 | | |
| Description | CM profiling sampling window register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------------|----|----|----|----------|----|----|----|----|----|----|----|----------------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FCLK_DIV_FACOR | | | | RESERVED | | | | | | | | SAMP_WIND_SIZE | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|-------|
| 31:20 | RESERVED | Reserved | R | 0x000 |
| 19:16 | FCLK_DIV_FACOR | FunClk divide factor ranging from 1 to 16 | RW | 0x0 |
| 15:8 | RESERVED | Reserved | R | 0x00 |
| 7:0 | SAMP_WIND_SIZE | PM events sampling window size | RW | 0x00 |

Table 3-1478. Register Call Summary for Register CMI2_SAMPLING

PRCM Register Manual

- [INSTR_CM2 Register Summary: \[0\]](#)

3.12 SCRM Register Manual

3.12.1 SCRM Instance Summary

Table 3-1479. SCRM Instance Summary

| Module Name | L4 Base Address | Size |
|-------------|-----------------|----------|
| SCRM | 0x4A30 A000 | 256Bytes |

3.12.2 SCRM Registers

3.12.2.1 SCRM Register Summary

Table 3-1480. SCRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | SCRM L4 Base Address |
|------------------|------|-----------------------|----------------|----------------------|
| REVISION_SCRM | R | 32 | 0x0000 0000 | 0x4A30 A000 |
| CLKSETUPTIME | RW | 32 | 0x0000 0100 | 0x4A30 A100 |
| PMICSETUPTIME | RW | 32 | 0x0000 0104 | 0x4A30 A104 |
| ALTCLKSRC | RW | 32 | 0x0000 0110 | 0x4A30 A110 |
| RESERVED | RW | 32 | 0x0000 0118 | 0x4A30 A118 |
| C2CCLKM | RW | 32 | 0x0000 011C | 0x4A30 A11C |
| EXTCLKREQ | RW | 32 | 0x0000 0200 | 0x4A30 A200 |
| ACCCCLKREQ | RW | 32 | 0x0000 0204 | 0x4A30 A204 |
| PWRREQ | RW | 32 | 0x0000 0208 | 0x4A30 A208 |
| AUXCLKREQ0 | RW | 32 | 0x0000 0210 | 0x4A30 A210 |
| AUXCLKREQ1 | RW | 32 | 0x0000 0214 | 0x4A30 A214 |
| AUXCLKREQ2 | RW | 32 | 0x0000 0218 | 0x4A30 A218 |
| AUXCLKREQ3 | RW | 32 | 0x0000 021C | 0x4A30 A21C |
| AUXCLKREQ4 | RW | 32 | 0x0000 0220 | 0x4A30 A220 |
| AUXCLKREQ5 | RW | 32 | 0x0000 0224 | 0x4A30 A224 |
| C2CCLKREQ | RW | 32 | 0x0000 0234 | 0x4A30 A234 |
| AUXCLK0 | RW | 32 | 0x0000 0310 | 0x4A30 A310 |
| AUXCLK1 | RW | 32 | 0x0000 0314 | 0x4A30 A314 |
| AUXCLK2 | RW | 32 | 0x0000 0318 | 0x4A30 A318 |
| AUXCLK3 | RW | 32 | 0x0000 031C | 0x4A30 A31C |
| AUXCLK4 | RW | 32 | 0x0000 0320 | 0x4A30 A320 |
| AUXCLK5 | RW | 32 | 0x0000 0324 | 0x4A30 A324 |
| RSTTIME_REG | RW | 32 | 0x0000 0400 | 0x4A30 A400 |
| RESERVED | RW | 32 | 0x0000 0418 | 0x4A30 A418 |
| C2CRSTCTRL | RW | 32 | 0x0000 041C | 0x4A30 A41C |
| EXTPWRONRSTCTRL | RW | 32 | 0x0000 0420 | 0x4A30 A420 |
| RESERVED | RW | 32 | 0x0000 0500 | 0x4A30 A500 |
| RESERVED | RW | 32 | 0x0000 0504 | 0x4A30 A504 |
| RESERVED | RW | 32 | 0x0000 0508 | 0x4A30 A508 |
| RESERVED | RW | 32 | 0x0000 050C | 0x4A30 A50C |
| EXTWARMRSTST_REG | RW | 32 | 0x0000 0510 | 0x4A30 A510 |
| APEWARMRSTST_REG | RW | 32 | 0x0000 0514 | 0x4A30 A514 |
| RESERVED | RW | 32 | 0x0000 0518 | 0x4A30 A518 |
| C2CWARMRSTST_REG | RW | 32 | 0x0000 051C | 0x4A30 A51C |

3.12.2.2 SCRM Register Description

Table 3-1481. REVISION_SCRM

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0000 | Instance | SCRM |
| Physical Address | 0x4A30 A000 | | |
| Description | This register contains the IP revision code for the SCRM. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | REV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------|------|----------------------------|
| 31:8 | RESERVED | Reads returns 0. | R | 0x000000 |
| 7:0 | REV | Revision Number | R | 0x- - TI Internal data. |

Table 3-1482. Register Call Summary for Register REVISION_SCRM

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1483. CLKSETUPTIME

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0100 | Instance | SCRM |
| Physical Address | 0x4A30 A100 | | |
| Description | This register holds the clock setup time counters of the system clock source supplier. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|-----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DOWNTIME | | | | | | | | RESERVED | | | | SETUPTIME | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:22 | RESERVED | Reads returns 0. | R | 0x000 |
| 21:16 | DOWNTIME | Holds the number of 32 kHz clock cycles it takes to gate the clock source supplier. | RW | 0x00 |
| 15:12 | RESERVED | Reads returns 0. | R | 0x0 |
| 11:0 | SETUPTIME | Holds the number of 32 kHz clock cycles it takes to stabilize the clock source supplier. | RW | 0x000 |

Table 3-1484. Register Call Summary for Register CLKSETUPTIME

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1485. PMICSETUPTIME

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0104 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 A104 | | | | | | | | Instance | | | | | | | | SCRM | | | | | | | | | | | | | | | |
| Description | This register holds the setup time counters for the sleep mode of the PMIC. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | WAKEUPTIME | | | | | | | | RESERVED | | | | | | | | SLEEPTIME | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:22 | RESERVED | Reads returns 0. | R | 0x000 |
| 21:16 | WAKEUPTIME | Holds the number of 32 kHz clock cycles it takes to exit the PMIC from sleep mode. | RW | 0x00 |
| 15:6 | RESERVED | Reads returns 0. | R | 0x000 |
| 5:0 | SLEEPTIME | Holds the number of 32 kHz clock cycles it takes to enter the PMIC in sleep mode. | RW | 0x00 |

Table 3-1486. Register Call Summary for Register PMICSETUPTIME

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1487. ALTCLKSRC

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0110 | | | | | | | | | | | | | | | | Instance | SCRM | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 A110 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | This register controls the alternate system clock source supplier. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------------|---|------------|---|------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | ENABLE_EXT | | ENABLE_INT | | MODE | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | Reads returns 0. | R | 0x00000000 |
| 3 | ENABLE_EXT | <p>This bit allows to enable and disable the output alternate system clock version. This bit is intended to be used in order to gate this clock path while the source is stabilizing.</p> <p>0x0: The alternate system clock version is disabled.</p> <p>0x1: The alternate system clock version is enabled.</p> | RW | 0 |
| 2 | ENABLE_INT | <p>This bit allows to enable and disable the alternate system clock version used to generate the auxiliary clocks. This bit is intended to be used in order to gate this clock path while the source is stabilizing and also to gate this clock path while switching the auxiliary clock paths on / from this possible source.</p> <p>0x0: The alternate system clock version is disabled.</p> <p>0x1: The alternate system clock version is enabled.</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | MODE | <p>This bit field defines the functional mode of the alternate system clock supplier.</p> <p>0x0: The alternate system clock source supplier is powered-down.</p> <p>0x1: The alternate system clock source supplier is active.</p> <p>0x2: The alternate system clock source supplier is bypassed.</p> <p>0x3: Reserved</p> | RW | 0x0 |

Table 3-1488. Register Call Summary for Register ALTCLKSRC

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1489. C2CCLKM

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 011C | | |
| Physical Address | 0x4A30 A11C | Instance | SCRM |
| Description | This register controls the clocks of the external C2C interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | SYSCLK | CLK_32KHZ |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | Reads returns 0. | R | 0x0000 0000 |
| 1 | SYSCLK | <p>This bit allows to enable and disable the system clock version of the external C2C interface.</p> <p>0x0: The system clock version for the external C2C interface is disabled.</p> <p>0x1: The system clock version for the external C2C interface is enabled.</p> | RW | 0 |
| 0 | CLK_32KHZ | <p>This bit allows to enable and disable the 32 kHz clock version of the external C2C interface.</p> <p>0x0: The 32 kHz clock version for the external C2C interface is disabled.</p> <p>0x1: The 32 kHz clock version for the external C2C interface is enabled.</p> | RW | 0 |

Table 3-1490. Register Call Summary for Register C2CCLKM

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1491. EXTCLKREQ

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0200 | Instance | SCRM |
| Physical Address | 0x4A30 A200 | | |
| Description | This register holds qualifiers for the external clock request. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | POLARITY | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reads returns 0. | R | 0x0000 0000 |
| 0 | POLARITY | This bit defines the active level of the external clock request. 0x0: The external clock request is active low. 0x1: The external clock request is active high. | RW | 1 |

Table 3-1492. Register Call Summary for Register EXTCLKREQ

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1493. ACCCLKREQ

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0204 | Instance | SCRM |
| Physical Address | 0x4A30 A204 | | |
| Description | This register holds qualifiers for the accurate clock request. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | POLARITY | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reads returns 0. | R | 0x0000 0000 |
| 0 | POLARITY | This bit defines the active level of the accurate clock request. 0x0: The accurate clock request is active low. 0x1: The accurate clock request is active high. | RW | 1 |

Table 3-1494. Register Call Summary for Register ACCCLKREQ

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1495. PWRREQ

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0208 | Instance | SCRM |
| Physical Address | 0x4A30 A208 | | |
| Description | This register holds qualifiers for the external power request. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | POLARITY | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reads returns 0. | R | 0x0000 0000 |
| 0 | POLARITY | This bit defines the active level of the external power request. 0x0: The external power request is active low. 0x1: The external power request is active high. | RW | 1 |

Table 3-1496. Register Call Summary for Register PWRREQ

PRCM Register Manual

- [DEVICE_PRM Register Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)

SCRM Register Manual

- [SCRM Register Summary: \[9\]](#)

Table 3-1497. AUXCLKREQ0

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0210 | Instance | SCRM |
| Physical Address | 0x4A30 A210 | | |
| Description | This register holds qualifiers for the auxiliary clock request #0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---------|---|----------|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | MAPPING | | ACCURACY | POLARITY | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:5 | RESERVED | | R | 0x00000000 |
| 4:2 | MAPPING | <p>This field allows re-mapping the auxiliary clock request #0 on another auxiliary clock output than auxiliary clock #0.</p> <p>0x0: The auxiliary clock request #0 is mapped on the auxiliary clock #0.</p> <p>0x1: The auxiliary clock request #0 is mapped on the auxiliary clock #1.</p> <p>0x2: The auxiliary clock request #0 is mapped on the auxiliary clock #2.</p> <p>0x3: The auxiliary clock request #0 is mapped on the auxiliary clock #3.</p> <p>0x4: The auxiliary clock request #0 is mapped on the auxiliary clock #4.</p> <p>0x5: The auxiliary clock request #0 is mapped on the auxiliary clock #5.</p> <p>0x6: Reserved</p> <p>0x7: Reserved</p> | RW | 0x0 |
| 1 | ACCURACY | <p>This bit qualifies the auxiliary clock request #0 as an accurate clock request.</p> <p>0x0: An active auxiliary clock request #0 doesn't generate an accurate clock request.</p> <p>0x1: An active auxiliary clock request #0 generates an accurate clock request.</p> | RW | 0 |
| 0 | POLARITY | <p>This bit defines the active level of the auxiliary clock request #0.</p> <p>0x0: The auxiliary clock request #0 is active low.</p> <p>0x1: The auxiliary clock request #0 is active high.</p> | RW | 1 |

Table 3-1498. Register Call Summary for Register AUXCLKREQ0

PRCM Subsystem Environment

- [External Clock Signals: \[0\]](#)

SCRM Register Manual

- [SCRM Register Summary: \[1\]](#)

Table 3-1499. AUXCLKREQ1

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0214 | | |
| Physical Address | 0x4A30 A214 | Instance | SCRM |
| Description | This register holds qualifiers for the auxiliary clock request #1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----------|----|----------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MAPPING | | | | ACCURACY | | POLARITY | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:5 | RESERVED | Reads returns 0. | R | 0x0000000 |
| 4:2 | MAPPING | <p>This field allows re-mapping the auxiliary clock request #1 on another auxiliary clock output than auxiliary clock #1.</p> <p>0x0: The auxiliary clock request #1 is mapped on the auxiliary clock #0.</p> <p>0x1: The auxiliary clock request #1 is mapped on the auxiliary clock #1.</p> <p>0x2: The auxiliary clock request #1 is mapped on the auxiliary clock #2.</p> <p>0x3: The auxiliary clock request #1 is mapped on the auxiliary clock #3.</p> <p>0x4: The auxiliary clock request #1 is mapped on the auxiliary clock #4.</p> <p>0x5: The auxiliary clock request #1 is mapped on the auxiliary clock #5.</p> <p>0x6: Reserved</p> <p>0x7: Reserved</p> | RW | 0x1 |
| 1 | ACCURACY | <p>This bit qualifies the auxiliary clock request #1 as an accurate clock request.</p> <p>0x0: An active auxiliary clock request #1 doesn't generate an accurate clock request.</p> <p>0x1: An active auxiliary clock request #1 generates an accurate clock request.</p> | RW | 0 |
| 0 | POLARITY | <p>This bit defines the active level of the auxiliary clock request #1.</p> <p>0x0: The auxiliary clock request #1 is active low.</p> <p>0x1: The auxiliary clock request #1 is active high.</p> | RW | 1 |

Table 3-1500. Register Call Summary for Register AUXCLKREQ1

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1501. AUXCLKREQ2

| | | | |
|------------------|--|----------|------|
| Address Offset | 0x0000 0218 | | |
| Physical Address | 0x4A30 A218 | Instance | SCRM |
| Description | This register holds qualifiers for the auxiliary clock request #2. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---------|---|---|---|----------|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MAPPING | | | | ACCURACY | POLARITY | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:5 | RESERVED | Reads returns 0. | R | 0x00000000 |
| 4:2 | MAPPING | <p>This field allows re-mapping the auxiliary clock request #2 on another auxiliary clock output than auxiliary clock #2.</p> <p>0x0: The auxiliary clock request #2 is mapped on the auxiliary clock #0.</p> <p>0x1: The auxiliary clock request #2 is mapped on the auxiliary clock #1.</p> <p>0x2: The auxiliary clock request #2 is mapped on the auxiliary clock #2.</p> <p>0x3: The auxiliary clock request #2 is mapped on the auxiliary clock #3.</p> <p>0x4: The auxiliary clock request #2 is mapped on the auxiliary clock #4.</p> <p>0x5: The auxiliary clock request #2 is mapped on the auxiliary clock #5.</p> <p>0x6: Reserved</p> <p>0x7: Reserved</p> | RW | 0x2 |
| 1 | ACCURACY | <p>This bit qualifies the auxiliary clock request #2 as an accurate clock request.</p> <p>0x0: An active auxiliary clock request #2 doesn't generate an accurate clock request.</p> <p>0x1: An active auxiliary clock request #2 generates an accurate clock request.</p> | RW | 0 |
| 0 | POLARITY | <p>This bit defines the active level of the auxiliary clock request #2.</p> <p>0x0: The auxiliary clock request #2 is active low.</p> <p>0x1: The auxiliary clock request #2 is active high.</p> | RW | 1 |

Table 3-1502. Register Call Summary for Register AUXCLKREQ2

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1503. AUXCLKREQ3

| | | | |
|------------------|--|----------|------|
| Address Offset | 0x0000 021C | | |
| Physical Address | 0x4A30 A21C | Instance | SCRM |
| Description | This register holds qualifiers for the auxiliary clock request #3. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----------|----------|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MAPPING | | | | ACCURACY | POLARITY | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:5 | RESERVED | Reads returns 0. | R | 0x0000000 |
| 4:2 | MAPPING | <p>This field allows re-mapping the auxiliary clock request #3 on another auxiliary clock output than auxiliary clock #3.</p> <p>0x0: The auxiliary clock request #3 is mapped on the auxiliary clock #0.</p> <p>0x1: The auxiliary clock request #3 is mapped on the auxiliary clock #1.</p> <p>0x2: The auxiliary clock request #3 is mapped on the auxiliary clock #2.</p> <p>0x3: The auxiliary clock request #3 is mapped on the auxiliary clock #3.</p> <p>0x4: The auxiliary clock request #3 is mapped on the auxiliary clock #4.</p> <p>0x5: The auxiliary clock request #3 is mapped on the auxiliary clock #5.</p> <p>0x6: Reserved</p> <p>0x7: Reserved</p> | RW | 0x3 |
| 1 | ACCURACY | <p>This bit qualifies the auxiliary clock request #3 as an accurate clock request.</p> <p>0x0: An active auxiliary clock request #3 doesn't generate an accurate clock request.</p> <p>0x1: An active auxiliary clock request #3 generates an accurate clock request.</p> | RW | 0 |
| 0 | POLARITY | <p>This bit defines the active level of the auxiliary clock request #3.</p> <p>0x0: The auxiliary clock request #3 is active low.</p> <p>0x1: The auxiliary clock request #3 is active high.</p> | RW | 1 |

Table 3-1504. Register Call Summary for Register AUXCLKREQ3

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1505. AUXCLKREQ4

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0220 | | |
| Physical Address | 0x4A30 A220 | Instance | SCRM |
| Description | This register holds qualifiers for the auxiliary clock request #4. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----------|----|----------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MAPPING | | | | ACCURACY | | POLARITY | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:5 | RESERVED | Reads returns 0. | R | 0x00000000 |
| 4:2 | MAPPING | <p>This field allows re-mapping the auxiliary clock request #4 on another auxiliary clock output than auxiliary clock #4.</p> <p>0x0: The auxiliary clock request #4 is mapped on the auxiliary clock #0.</p> <p>0x1: The auxiliary clock request #4 is mapped on the auxiliary clock #1.</p> <p>0x2: The auxiliary clock request #4 is mapped on the auxiliary clock #2.</p> <p>0x3: The auxiliary clock request #4 is mapped on the auxiliary clock #3.</p> <p>0x4: The auxiliary clock request #4 is mapped on the auxiliary clock #4.</p> <p>0x5: The auxiliary clock request #4 is mapped on the auxiliary clock #5.</p> <p>0x6: Reserved</p> <p>0x7: Reserved</p> | RW | 0x4 |
| 1 | ACCURACY | <p>This bit qualifies the auxiliary clock request #4 as an accurate clock request.</p> <p>0x0: An active auxiliary clock request #4 doesn't generate an accurate clock request.</p> <p>0x1: An active auxiliary clock request #4 generates an accurate clock request.</p> | RW | 0 |
| 0 | POLARITY | <p>This bit defines the active level of the auxiliary clock request #4.</p> <p>0x0: The auxiliary clock request #4 is active low.</p> <p>0x1: The auxiliary clock request #4 is active high.</p> | RW | 1 |

Table 3-1506. Register Call Summary for Register AUXCLKREQ4

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1507. AUXCLKREQ5

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0224 | | |
| Physical Address | 0x4A30 A224 | Instance | SCRM |
| Description | This register holds qualifiers for the auxiliary clock request #5. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----------|----|----------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MAPPING | | | | ACCURACY | | POLARITY | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:5 | RESERVED | Reads returns 0. | R | 0x0000000 |
| 4:2 | MAPPING | <p>This field allows re-mapping the auxiliary clock request #5 on another auxiliary clock output than auxiliary clock #5.</p> <p>0x0: The auxiliary clock request #5 is mapped on the auxiliary clock #0.</p> <p>0x1: The auxiliary clock request #5 is mapped on the auxiliary clock #1.</p> <p>0x2: The auxiliary clock request #5 is mapped on the auxiliary clock #2.</p> <p>0x3: The auxiliary clock request #5 is mapped on the auxiliary clock #3.</p> <p>0x4: The auxiliary clock request #5 is mapped on the auxiliary clock #4.</p> <p>0x5: The auxiliary clock request #5 is mapped on the auxiliary clock #5.</p> <p>0x6: Reserved</p> <p>0x7: Reserved</p> | RW | 0x5 |
| 1 | ACCURACY | <p>This bit qualifies the auxiliary clock request #5 as an accurate clock request.</p> <p>0x0: An active auxiliary clock request #5 doesn't generate an accurate clock request.</p> <p>0x1: An active auxiliary clock request #5 generates an accurate clock request.</p> | RW | 0 |
| 0 | POLARITY | <p>This bit defines the active level of the auxiliary clock request #5.</p> <p>0x0: The auxiliary clock request #5 is active low.</p> <p>0x1: The auxiliary clock request #5 is active high.</p> | RW | 1 |

Table 3-1508. Register Call Summary for Register AUXCLKREQ5

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1509. C2CLKREQ

| | | | | |
|------------------|--|--|----------|------|
| Address Offset | 0x0000 0234 | | Instance | SCRM |
| Physical Address | 0x4A30 A234 | | | |
| Description | This register holds qualifiers for the external C2C interface clock request. | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ACCURACY | | POLARITY | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | Reads returns 0. | R | 0x0000 0000 |
| 1 | ACCURACY | <p>This bit qualifies the external C2C interface clock request as an accurate clock request.</p> <p>0x0: An active external C2C interface clock request doesn't generate an accurate clock request.</p> <p>0x1: An active external C2C interface clock request generates an accurate clock request.</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | POLARITY | This bit defines the active level of the external C2C interface clock request. 0x0: The external C2C interface clock request is active low. 0x1: The external C2C interface clock request is active high. | RW | 1 |

Table 3-1510. Register Call Summary for Register C2CCLKREQ

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1511. AUXCLK0

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0310 | Instance | SCRM |
| Physical Address | 0x4A30 A310 | | |
| Description | This register holds qualifiers for the auxiliary clock #0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----------|----|----|----|----|----|------------|--------|----------|---|---|---|---|---|-----------|---|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | CLKDIV | | | | RESERVED | | | | | | DISABLECLK | ENABLE | RESERVED | | | | | | SRCSELECT | | POLARITY |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:20 | RESERVED | Reads returns 0. | R | 0x000 |
| 19:16 | CLKDIV | This field holds the divider value for the auxiliary clock #0. 0x0: The auxiliary clock #0 is divided by 1. 0x1: The auxiliary clock #0 is divided by 2. 0x2: The auxiliary clock #0 is divided by 3. 0x3: The auxiliary clock #0 is divided by 4. 0x4: The auxiliary clock #0 is divided by 5. 0x5: The auxiliary clock #0 is divided by 6. 0x6: The auxiliary clock #0 is divided by 7. 0x7: The auxiliary clock #0 is divided by 8. 0x8: The auxiliary clock #0 is divided by 9. 0x9: The auxiliary clock #0 is divided by 10. 0xA: The auxiliary clock #0 is divided by 11. 0xB: The auxiliary clock #0 is divided by 12. 0xC: The auxiliary clock #0 is divided by 13. 0xD: The auxiliary clock #0 is divided by 14. 0xE: The auxiliary clock #0 is divided by 15. 0xF: The auxiliary clock #0 is divided by 16. | RW | 0x0 |
| 15:10 | RESERVED | Reads returns 0. | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 9 | DISABLECLK | This bit allows to gate the auxiliary clock #0 without condition. This bit is intended to be used only when the SOC is not clock provider. 0x0: The auxiliary clock #0 is gated upon normal condition: auxiliary clock requests mapped on this path or ENABLE bit set. 0x1: The auxiliary clock #0 is gated without condition. | RW | 0 |
| 8 | ENABLE | This bit allows to request the auxiliary clock #0 by software. 0x0: The auxiliary clock #0 is not requested by software. 0x1: The auxiliary clock #0 is requested by software. | RW | 0 |
| 7:3 | RESERVED | Reads returns 0. | R | 0x00 |
| 2:1 | SRCSELECT | This field allows selecting the clock source of the auxiliary clock #0. 0x0: The clock source is the system clock. 0x1: The clock source is the version from the CORE DPLL. 0x2: The clock source is the version from the PER DPLL. 0x3: The clock source is the alternate clock. | RW | 0x0 |
| 0 | POLARITY | This bit defines the output level when the auxiliary clock #0 is gated. 0x0: The auxiliary clock #0 is gated low. 0x1: The auxiliary clock #0 is gated high. | RW | 0 |

Table 3-1512. Register Call Summary for Register AUXCLK0

| |
|---|
| PRCM Subsystem Environment |
| • External Clock Signals: [0] [1] |
| SCRM Register Manual |
| • SCRM Register Summary: [2] |

Table 3-1513. AUXCLK1

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0314 | Instance | SCRM |
| Physical Address | 0x4A30 A314 | | |
| Description | This register holds qualifiers for the auxiliary clock #1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----------|----|----|----|--------|----|----------|----|----|----|-----------|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CLKDIV | | | | RESERVED | | | | ENABLE | | RESERVED | | | | SRCSELECT | | POLARITY | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:20 | RESERVED | Reads returns 0. | R | 0x000 |
| 19:16 | CLKDIV | This field holds the divider value for the auxiliary clock #1. 0x0: The auxiliary clock #1 is divided by 1. 0x1: The auxiliary clock #1 is divided by 2. 0x2: The auxiliary clock #1 is divided by 3. 0x3: The auxiliary clock #1 is divided by 4. 0x4: The auxiliary clock #1 is divided by 5. 0x5: The auxiliary clock #1 is divided by 6. 0x6: The auxiliary clock #1 is divided by 7. 0x7: The auxiliary clock #1 is divided by 8. 0x8: The auxiliary clock #1 is divided by 9. 0x9: The auxiliary clock #1 is divided by 10. 0xA: The auxiliary clock #1 is divided by 11. 0xB: The auxiliary clock #1 is divided by 12. 0xC: The auxiliary clock #1 is divided by 13. 0xD: The auxiliary clock #1 is divided by 14. 0xE: The auxiliary clock #1 is divided by 15. 0xF: The auxiliary clock #1 is divided by 16. | RW | 0x0 |
| 15:9 | RESERVED | Reads returns 0. | R | 0x00 |
| 8 | ENABLE | This bit allows to request the auxiliary clock #1 by software. 0x0: The auxiliary clock #1 is not requested by software. 0x1: The auxiliary clock #1 is requested by software. | RW | 0 |
| 7:3 | RESERVED | Reads returns 0. | R | 0x00 |
| 2:1 | SRCSELECT | This field allows selecting the clock source of the auxiliary clock #1. 0x0: The clock source is the system clock. 0x1: The clock source is the version from the CORE DPLL. 0x2: The clock source is the version from the PER DPLL. 0x3: The clock source is the alternate clock. | RW | 0x0 |
| 0 | POLARITY | This bit defines the output level when the auxiliary clock #1 is gated. 0x0: The auxiliary clock #1 is gated low. 0x1: The auxiliary clock #1 is gated high. | RW | 0 |

Table 3-1514. Register Call Summary for Register AUXCLK1

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1515. AUXCLK2

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0318 | Instance | SCRM |
| Physical Address | 0x4A30 A318 | | |
| Description | This register holds qualifiers for the auxiliary clock #2. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------|---|---|---|-----------|---|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CLKDIV | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | SRCSELECT | | POLARITY | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:20 | RESERVED | Reads returns 0. | R | 0x000 |
| 19:16 | CLKDIV | This field holds the divider value for the auxiliary clock #2. 0x0: The auxiliary clock #2 is divided by 1. 0x1: The auxiliary clock #2 is divided by 2. 0x2: The auxiliary clock #2 is divided by 3. 0x3: The auxiliary clock #2 is divided by 4. 0x4: The auxiliary clock #2 is divided by 5. 0x5: The auxiliary clock #2 is divided by 6. 0x6: The auxiliary clock #2 is divided by 7. 0x7: The auxiliary clock #2 is divided by 8. 0x8: The auxiliary clock #2 is divided by 9. 0x9: The auxiliary clock #2 is divided by 10. 0xA: The auxiliary clock #2 is divided by 11. 0xB: The auxiliary clock #2 is divided by 12. 0xC: The auxiliary clock #2 is divided by 13. 0xD: The auxiliary clock #2 is divided by 14. 0xE: The auxiliary clock #2 is divided by 15. 0xF: The auxiliary clock #2 is divided by 16. | RW | 0x0 |
| 15:9 | RESERVED | Reads returns 0. | R | 0x00 |
| 8 | ENABLE | This bit allows to request the auxiliary clock #2 by software. 0x0: The auxiliary clock #2 is not requested by software. 0x1: The auxiliary clock #2 is requested by software. | RW | 0 |
| 7:3 | RESERVED | Reads returns 0. | R | 0x00 |
| 2:1 | SRCSELECT | This field allows selecting the clock source of the auxiliary clock #2. 0x0: The clock source is the system clock. 0x1: The clock source is the version from the CORE DPLL. 0x2: The clock source is the version from the PER DPLL. 0x3: The clock source is the alternate clock. | RW | 0x0 |
| 0 | POLARITY | This bit defines the output level when the auxiliary clock #2 is gated. 0x0: The auxiliary clock #2 is gated low. 0x1: The auxiliary clock #2 is gated high. | RW | 0 |

Table 3-1516. Register Call Summary for Register AUXCLK2

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1517. AUXCLK3

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 031C | Instance | SCRM |
| Physical Address | 0x4A30 A31C | | |
| Description | This register holds qualifiers for the auxiliary clock #3. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----------|----|----|----|--------|----|----------|----|----|----|-----------|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CLKDIV | | | | RESERVED | | | | ENABLE | | RESERVED | | | | SRCSELECT | | POLARITY | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:20 | RESERVED | Reads returns 0. | R | 0x000 |
| 19:16 | CLKDIV | This field holds the divider value for the auxiliary clock #3. 0x0: The auxiliary clock #3 is divided by 1. 0x1: The auxiliary clock #3 is divided by 2. 0x2: The auxiliary clock #3 is divided by 3. 0x3: The auxiliary clock #3 is divided by 4. 0x4: The auxiliary clock #3 is divided by 5. 0x5: The auxiliary clock #3 is divided by 6. 0x6: The auxiliary clock #3 is divided by 7. 0x7: The auxiliary clock #3 is divided by 8. 0x8: The auxiliary clock #3 is divided by 9. 0x9: The auxiliary clock #3 is divided by 10. 0xA: The auxiliary clock #3 is divided by 11. 0xB: The auxiliary clock #3 is divided by 12. 0xC: The auxiliary clock #3 is divided by 13. 0xD: The auxiliary clock #3 is divided by 14. 0xE: The auxiliary clock #3 is divided by 15. 0xF: The auxiliary clock #3 is divided by 16. | RW | 0x0 |
| 15:9 | RESERVED | Reads returns 0. | R | 0x00 |
| 8 | ENABLE | This bit allows to request the auxiliary clock #3 by software. 0x0: The auxiliary clock #3 is disabled by software. 0x1: The auxiliary clock #3 is requested by software. | RW | 0 |
| 7:3 | RESERVED | Reads returns 0. | R | 0x00 |
| 2:1 | SRCSELECT | This field allows selecting the clock source of the auxiliary clock #3. 0x0: The clock source is the system clock. 0x1: The clock source is the version from the CORE DPLL. 0x2: The clock source is the version from the PER DPLL. 0x3: The clock source is the alternate clock. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | POLARITY | This bit defines the output level when the auxiliary clock #3 is gated. 0x0: The auxiliary clock #3 is gated low. 0x1: The auxiliary clock #3 is gated high. | RW | 0 |

Table 3-1518. Register Call Summary for Register AUXCLK3

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1519. AUXCLK4

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0320 | Instance | SCRM |
| Physical Address | 0x4A30 A320 | | |
| Description | This register holds qualifiers for the auxiliary clock #4. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----------|----|----|----|--------|----|----------|----|----|----|-----------|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CLKDIV | | | | RESERVED | | | | ENABLE | | RESERVED | | | | SRCSELECT | | POLARITY | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:20 | RESERVED | Reads returns 0. | R | 0x000 |
| 19:16 | CLKDIV | This field holds the divider value for the auxiliary clock #4. 0x0: The auxiliary clock #4 is divided by 1. 0x1: The auxiliary clock #4 is divided by 2. 0x2: The auxiliary clock #4 is divided by 3. 0x3: The auxiliary clock #4 is divided by 4. 0x4: The auxiliary clock #4 is divided by 5. 0x5: The auxiliary clock #4 is divided by 6. 0x6: The auxiliary clock #4 is divided by 7. 0x7: The auxiliary clock #4 is divided by 8. 0x8: The auxiliary clock #4 is divided by 9. 0x9: The auxiliary clock #4 is divided by 10. 0xA: The auxiliary clock #4 is divided by 11. 0xB: The auxiliary clock #4 is divided by 12. 0xC: The auxiliary clock #4 is divided by 13. 0xD: The auxiliary clock #4 is divided by 14. 0xE: The auxiliary clock #4 is divided by 15. 0xF: The auxiliary clock #4 is divided by 16. | RW | 0x1 |
| 15:9 | RESERVED | Reads returns 0. | R | 0x00 |
| 8 | ENABLE | This bit allows to request the auxiliary clock #4 by software. 0x0: The auxiliary clock #4 is not requested by software. 0x1: The auxiliary clock #4 is requested by software. | RW | 1 |
| 7:3 | RESERVED | Reads returns 0. | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 2:1 | SRCSELECT | This field allows selecting the clock source of the auxiliary clock #4. 0x0: The clock source is the system clock. 0x1: The clock source is the version from the CORE DPLL. 0x2: The clock source is the version from the PER DPLL. 0x3: The clock source is the alternate clock. | RW | 0x0 |
| 0 | POLARITY | This bit defines the output level when the auxiliary clock #4 is gated. 0x0: The auxiliary clock #4 is gated low. 0x1: The auxiliary clock #4 is gated high. | RW | 0 |

Table 3-1520. Register Call Summary for Register AUXCLK4

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1521. AUXCLK5

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0324 | Instance | SCRM |
| Physical Address | 0x4A30 A324 | | |
| Description | This register holds qualifiers for the auxiliary clock #5. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----------|----|----|----|----|----|---|---|--------|----------|---|---|---|---|---|-----------|--|----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | | | | | CLKDIV | | | | RESERVED | | | | | | | | ENABLE | RESERVED | | | | | | SRCSELECT | | POLARITY | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:20 | RESERVED | Reads returns 0. | R | 0x000 |
| 19:16 | CLKDIV | This field holds the divider value for the auxiliary clock #5. 0x0: The auxiliary clock #5 is divided by 1. 0x1: The auxiliary clock #5 is divided by 2. 0x2: The auxiliary clock #5 is divided by 3. 0x3: The auxiliary clock #5 is divided by 4. 0x4: The auxiliary clock #5 is divided by 5. 0x5: The auxiliary clock #5 is divided by 6. 0x6: The auxiliary clock #5 is divided by 7. 0x7: The auxiliary clock #5 is divided by 8. 0x8: The auxiliary clock #5 is divided by 9. 0x9: The auxiliary clock #5 is divided by 10. 0xA: The auxiliary clock #5 is divided by 11. 0xB: The auxiliary clock #5 is divided by 12. 0xC: The auxiliary clock #5 is divided by 13. 0xD: The auxiliary clock #5 is divided by 14. 0xE: The auxiliary clock #5 is divided by 15. 0xF: The auxiliary clock #5 is divided by 16. | RW | 0x0 |
| 15:9 | RESERVED | Reads returns 0. | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 8 | ENABLE | This bit allows to request the auxiliary clock #5 by software. 0x0: The auxiliary clock #5 is not requested by software. 0x1: The auxiliary clock #5 is requested by software. | RW | 0 |
| 7:3 | RESERVED | Reads returns 0. | R | 0x00 |
| 2:1 | SRCSELECT | This field allows selecting the clock source of the auxiliary clock #5. 0x0: The clock source is the system clock. 0x1: The clock source is the version from the CORE DPLL. 0x2: The clock source is the version from the PER DPLL. 0x3: The clock source is the alternate clock. | RW | 0x0 |
| 0 | POLARITY | This bit defines the output level when the auxiliary clock #5 is gated. 0x0: The auxiliary clock #5 is gated low. 0x1: The auxiliary clock #5 is gated high. | RW | 0 |

Table 3-1522. Register Call Summary for Register AUXCLK5

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1523. RSTTIME_REG

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0400 | Instance | SCRM |
| Physical Address | 0x4A30 A400 | | |
| Description | This register holds the reset time counter which is used to extend the reset lines beyond the release of the pad reset. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RSTTIME | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | Reads returns 0. | R | 0x00000000 |
| 3:0 | RSTTIME | Holds the number of 32 kHz clock cycles for which the reset duration is extended. Values 0,1 and 2 are not allowed. 0x0: Reserved. 0x1: Reserved. 0x2: Reserved. | RW | 0x4 |

Table 3-1524. Register Call Summary for Register RSTTIME_REG

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1525. C2CRSTCTRL

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 041C | | |
| Physical Address | 0x4A30 A41C | Instance | SCRM |
| Description | This register controls the release of the external C2C interface reset lines. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---------|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WARMRST | COLDRST |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | Reads returns 0. | R | 0x0000 0000 |
| 1 | WARMRST | <p>This bit allows to release the warm reset line of the external C2C interface. [warm reset sensitive]</p> <p>0x0: Clearing this bit has for effect to release the warm reset line of the external C2C interface.</p> <p>0x1: Writing this bit has for effect to assert the warm reset line of the external C2C interface.</p> | RW | 1 |
| 0 | COLDRST | <p>This bit allows to release the cold reset line of the external C2C interface.</p> <p>0x0: Clearing this bit has for effect to release the cold reset line of the external C2C interface.</p> <p>0x1: Writing this bit has for effect to assert the cold reset line of the external C2C interface.</p> | RW | 1 |

Table 3-1526. Register Call Summary for Register C2CRSTCTRL

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1527. EXTPWRONRSTCTRL

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0420 | | |
| Physical Address | 0x4A30 A420 | Instance | SCRM |
| Description | This register allows the software to perform an external power-on reset. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | PWRONRST | ENABLE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|----------------|-------------|
| 31:2 | RESERVED | Reads returns 0. | R | 0x0000 0000 |
| 1 | PWRONRST | <p>This bit controls the assertion and the de-assertion of the external power-on reset.</p> <p>0x0: De-asserts the external power-on reset.</p> <p>0x1: Asserts the external power-on reset.</p> | RW WSpecial | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|----------------|-------|
| 0 | ENABLE | This bit must be set to 1 to allow the software to assert the external power-on reset. 0x0: Prevents the software to assert the external power-on reset. 0x1: Allows the software to assert the external power-on reset. | RW WSpecial | 0 |

Table 3-1528. Register Call Summary for Register EXTPWRONRSTCTRL

Reset Management Functional Description

- [SCRM Reset Management Functional Description: \[0\] \[1\]](#)

SCRM Register Manual

- [SCRM Register Summary: \[2\]](#)

Table 3-1529. EXTWARMRSTST_REG

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0510 | | |
| Physical Address | 0x4A30 A510 | Instance | SCRM |
| Description | This register logs the source of warm reset output. Each bit is set upon release of the warm reset output and must be cleared by software. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|--------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EXTWARMRSTST |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|---------------|-------------|
| 31:1 | RESERVED | Reads returns 0. | R | 0x0000 0000 |
| 0 | EXTWARMRSTST | This bit logs the external warm reset source. 0x0: No external warm reset occurred. 0x1: An external warm reset occurred. | RW W1toClr | 0 |

Table 3-1530. Register Call Summary for Register EXTWARMRSTST_REG

Reset Management Functional Description

- [SCRM Reset Management Functional Description: \[0\]](#)

SCRM Register Manual

- [SCRM Register Summary: \[1\]](#)

Table 3-1531. APEWARMRSTST_REG

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0514 | Instance | SCRM |
| Physical Address | 0x4A30 A514 | | |
| Description | This register logs the source of warm reset on the APE. Each bit is set upon release of the APE warm reset and must be cleared by software. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|--------------|---|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | APEWARMRSTST | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|---------------|-------------|
| 31:2 | RESERVED | Reads returns 0. | R | 0x0000 0000 |
| 1 | APEWARMRSTST | This bit logs the APE warm reset source. 0x0: No APE warm reset occurred. 0x1: An APE warm reset occurred. | RW W1toClr | 0 |
| 0 | RESERVED | Reads returns 0. | R | 0 |

Table 3-1532. Register Call Summary for Register APEWARMRSTST_REG

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

Table 3-1533. C2CWARMRSTST_REG

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 051C | Instance | SCRM |
| Physical Address | 0x4A30 A51C | | |
| Description | This register logs the source of warm reset on the external C2C interface. Each bit is set upon release of the external C2C interface warm reset and must be cleared by software. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|--------------|---|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | C2CWARMRSTST | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|---------------|------------|
| 31:4 | RESERVED | Reads returns 0. | R | 0x00000000 |
| 3 | C2CWARMRSTST | This bit logs the C2C warm reset source. 0x0: No C2C warm reset occurred. 0x1: A C2C warm reset occurred. | RW W1toClr | 0 |
| 2:0 | RESERVED | Reads returns 0. | R | 0x0 |

Table 3-1534. Register Call Summary for Register C2CWARMRSTST_REG

SCRM Register Manual

- [SCRM Register Summary: \[0\]](#)

3.13 SR Register Manual

3.13.1 SR Instance Summary

Table 3-1535. SR Instance Summary

| Module Name | L4 Base Address | Size |
|-------------|-----------------|----------|
| SR_MPU | 0x4A0D 9000 | 256Bytes |
| SR_IVA | 0x4A0D B000 | 256Bytes |
| SR_CORE | 0x4A0D D000 | 256Bytes |

3.13.2 SR Registers

3.13.2.1 SR Register Summary

Table 3-1536. SR Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | SR_MPU L4 Base Address | SR_IVA L4 Base Address | SR_CORE L4 Base Address |
|----------------------------------|------|-----------------------|----------------|------------------------|------------------------|-------------------------|
| SRCONFIG | RW | 32 | 0x0000 0000 | 0x4A0D 9000 | 0x4A0D B000 | 0x4A0D D000 |
| SRSTATUS | R | 32 | 0x0000 0004 | 0x4A0D 9004 | 0x4A0D B004 | 0x4A0D D004 |
| SENVAL | R | 32 | 0x0000 0008 | 0x4A0D 9008 | 0x4A0D B008 | 0x4A0D D008 |
| SENMIN | R | 32 | 0x0000 000C | 0x4A0D 900C | 0x4A0D B00C | 0x4A0D D00C |
| SENMAX | R | 32 | 0x0000 0010 | 0x4A0D 9010 | 0x4A0D B010 | 0x4A0D D010 |
| SENAVG | R | 32 | 0x0000 0014 | 0x4A0D 9014 | 0x4A0D B014 | 0x4A0D D014 |
| AVGWEIGHT | RW | 32 | 0x0000 0018 | 0x4A0D 9018 | 0x4A0D B018 | 0x4A0D D018 |
| NVALUERECIPROCAL | RW | 32 | 0x0000 001C | 0x4A0D 901C | 0x4A0D B01C | 0x4A0D D01C |
| RESERVED | W | 32 | 0x0000 0020 | 0x4A0D 9020 | 0x4A0D B020 | 0x4A0D D020 |
| IRQSTATUS_RAW | RW | 32 | 0x0000 0024 | 0x4A0D 9024 | 0x4A0D B024 | 0x4A0D D024 |
| IRQSTATUS | RW | 32 | 0x0000 0028 | 0x4A0D 9028 | 0x4A0D B028 | 0x4A0D D028 |
| IRQENABLE_SET | RW | 32 | 0x0000 002C | 0x4A0D 902C | 0x4A0D B02C | 0x4A0D D02C |
| IRQENABLE_CLR | RW | 32 | 0x0000 0030 | 0x4A0D 9030 | 0x4A0D B030 | 0x4A0D D030 |
| SENERROR | R | 32 | 0x0000 0034 | 0x4A0D 9034 | 0x4A0D B034 | 0x4A0D D034 |
| ERRCONFIG | RW | 32 | 0x0000 0038 | 0x4A0D 9038 | 0x4A0D B038 | 0x4A0D D038 |

3.13.2.2 SR Register Description

Table 3-1537. SRCONFIG

| | |
|-------------------------|--|
| Address Offset | 0x0000 0000 |
| Physical Address | 0x4A0D 9000 0x4A0D B000 0x4A0D D000 |
| Description | Configuration bits for the Sensor Core and the Digital Processing. |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|-------------|----|----|----|----|----|----|----|----------|----|----|----|-----------|----|---|---|----------------------|---|---|---|-----------------|---|---|---|----------|--|--|--|--|--|--|--|------------|--|--|--|------------|--|--|--|
| ACCUMDATA | | | | | | | | SRCLKLENGTH | | | | | | | | SRENABLE | | | | SENENABLE | | | | ERRORGENERATORENABLE | | | | MINMAXAVGENABLE | | | | RESERVED | | | | | | | | SENNENABLE | | | | SENPENABLE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|-------|
| 31:22 | ACCUMDATA | Number of Values to Accumulate | RW | 0x080 |
| 21:12 | SRCLKLENGTH | Determines frequency of SRClk | RW | 0x200 |
| 11 | SRENABLE | 0: Asynchronously resets MinMaxAvgAccumValid, MinMaxAvgValid, ErrorGeneratorValid, AccumData sensor, SRClk counter, and MinMaxAvg registers. Also gates the clock for power savings and disables all the digital logic. , 1: Enables the module | RW | 0 |
| 10 | SENENABLE | 0: All sensors disabled, 1: Sensors enabled per SenNEnable SenPEnable | RW | 1 |
| 9 | ERRORGENERATORENABLE | 0: Error Generator Module disabled, 1: Error Generator Module enabled | RW | 0 |
| 8 | MINMAXAVGENABLE | 0: MinMaxAvg Detector Module disabled, 1: MinMaxAvg Detector Module enabled | RW | 0 |
| 7:2 | RESERVED | Reserved | RW | 0x00 |
| 1 | SENNENABLE | 0: Disable SenN sensor, 1: Enable SenN sensor | RW | 1 |
| 0 | SENPENABLE | 0: Disable SenP sensor, 1: Enable SenP sensor | RW | 0 |

Table 3-1538. Register Call Summary for Register SRCONFIG

Voltage Management Functional Description

- [Adaptive Voltage Scaling](#): [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]

PRCM Module Programming Guide

- [Global Initialization](#): [11] [12] [13] [14] [15] [16] [17] [18]
- [Disable Sequence for AVS \(SmartReflex\) and VP](#): [19] [20] [21]
- [Changing OPP](#): [22] [23] [24] [25]

SR Register Manual

- [SR Register Summary](#): [26]

Table 3-1539. SRSTATUS

| | |
|-------------------------|--|
| Address Offset | 0x0000 0004 |
| Physical Address | 0x4A0D 9004 0x4A0D B004 0x4A0D D004 |
| Description | Status bits that indicate that the values in the register are valid or events have occurred. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----------------|----|---|---|---------------------|---|---|---|---------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | AVGERRVALID | | | | MINMAXAVGVALID | | | | ERRORGENERATORVALID | | | | MINMAXAVGACCUMVALID | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | AVGERRVALID | 0: AvgError registers are not valid, 1: AvgError registers are valid. | R | 0 |
| 2 | MINMAXAVGVALID | 0: SenVal, SenMin, SenMax, SenAvg registers are not valid, 1: SenVal, SenMin, SenMax, SenAvg registers are valid, but not necessarily fully accumulated | R | 0 |
| 1 | ERRORGENERATORVALID | 0: SenError register do not have valid data, 1: SenError registers have valid data. | R | 0 |
| 0 | MINMAXAVGACCUMVALID | 0: SenVal, SenMin, SenMax, SenAvg registers are not valid, 1: SenVal, SenMin, SenMax, SenAvg registers have valid, final data | R | 0 |

Table 3-1540. Register Call Summary for Register SRSTATUS

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

SR Register Manual

- [SR Register Summary: \[7\]](#)

Table 3-1541. SENVAL

| | |
|-------------------------|---|
| Address Offset | 0x0000 0008 |
| Physical Address | 0x4A0D 9008 0x4A0D B008 0x4A0D D008 |
| Description | The current sensor values from the Sensor Core. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SENPVAL | | | | | | | | | | | | | | | | SENNVAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | SENPVAL | The latest value of the SenPVal from the sensor core. | R | 0x0000 |
| 15:0 | SENNVAL | The latest value of the SenNVal from the sensor core. | R | 0x0000 |

Table 3-1542. Register Call Summary for Register SENVAL

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[0\] \[1\] \[2\] \[3\]](#)

SR Register Manual

- [SR Register Summary: \[4\]](#)

Table 3-1543. SENMIN

| | |
|-------------------------|---|
| Address Offset | 0x0000 000C |
| Physical Address | 0x4A0D 900C 0x4A0D B00C 0x4A0D D00C |
| Description | The minimum sensor values. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SENPMIN | | | | | | | | | | | | | | | | SENNMIN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | SENPMIN | The minimum value of the SenPVal from the sensor core since the last restat operation. | R | 0xFFFF |
| 15:0 | SENNMIN | The minimum value of the SenNVal from the sensor core since the last restat operation. | R | 0xFFFF |

Table 3-1544. Register Call Summary for Register SENMIN

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[0\] \[1\] \[2\] \[3\]](#)

SR Register Manual

- [SR Register Summary: \[4\]](#)

Table 3-1545. SENMAX

| | |
|-------------------------|---|
| Address Offset | 0x0000 0010 |
| Physical Address | 0x4A0D 9010 0x4A0D B010 0x4A0D D010 |
| Description | The maximum sensor values. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SENPMAX | | | | | | | | | | | | | | | | SENNMAX | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | SENPMAX | The maximum value of the SenPVal from the sensor core since the last restat operation. | R | 0x0000 |
| 15:0 | SENNMAX | The maximum value of the SenNVal from the sensor core since the last restat operation. | R | 0x0000 |

Table 3-1546. Register Call Summary for Register SENMAX

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[0\] \[1\] \[2\] \[3\]](#)

SR Register Manual

- [SR Register Summary: \[4\]](#)

Table 3-1547. SENAVG

| | |
|------------------|---|
| Address Offset | 0x0000 0014 |
| Physical Address | 0x4A0D 9014 0x4A0D B014 0x4A0D D014 |
| Description | The average sensor values. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SENPAVG | | | | | | | | | | | | | | | SENNAVG | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | SENPAVG | The running average of the SenPVal from the sensor core since the last restat operation. | R | 0x0000 |
| 15:0 | SENNAVG | The running average of the SenNVal from the sensor core since the last restat operation. | R | 0x0000 |

Table 3-1548. Register Call Summary for Register SENAVG

| |
|---|
| Voltage Management Functional Description |
| • Adaptive Voltage Scaling: [0] [1] [2] [3] |
| SR Register Manual |
| • SR Register Summary: [4] |

Table 3-1549. AVGWEIGHT

| | |
|------------------|--|
| Address Offset | 0x0000 0018 |
| Physical Address | 0x4A0D 9018 0x4A0D B018 0x4A0D D018 |
| Description | The weighting factor in the average computation. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---------------|---|----------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | SENPAVGWEIGHT | | SENNAVVGWEIGHT | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|------------|
| 31:4 | RESERVED | Reserved bits. | R | 0x00000000 |
| 3:2 | SENPAVGWEIGHT | The weighting factor for the SenP averager. | RW | 0x0 |
| 1:0 | SENNAVGWEIGHT | The weighting factor for the SenN averager. | RW | 0x0 |

Table 3-1550. Register Call Summary for Register AVGWEIGHT

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Module Programming Guide

- [Global Initialization: \[4\] \[5\] \[6\] \[7\]](#)

SR Register Manual

- [SR Register Summary: \[8\]](#)

Table 3-1551. NVALUERECIPOCAL

| | |
|-------------------------|--|
| Address Offset | 0x0000 001C |
| Physical Address | 0x4A0D 901C 0x4A0D B01C 0x4A0D D01C |
| Description | The reciprocal of the SenN and SenP values used in error generation. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SENP GAIN | | | | SEN N GAIN | | | | SEN P RN | | | | | | | | SEN N RN | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:24 | RESERVED | Reserved bits. | R | 0x00 |
| 23:20 | SENP GAIN | The gain value for the SenP reciprocal. | RW | 0x0 |
| 19:16 | SEN N GAIN | The gain value for the SenN reciprocal. | RW | 0x0 |
| 15:8 | SEN P RN | The scale value for the SenP reciprocal. | RW | 0x00 |
| 7:0 | SEN N RN | The scale value for the SenN reciprocal. | RW | 0x00 |

Table 3-1552. Register Call Summary for Register NVALUERECIPOCAL

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

PRCM Module Programming Guide

- [Global Initialization: \[8\] \[9\] \[10\] \[11\]](#)

SR Register Manual

- [SR Register Summary: \[12\]](#)

Table 3-1553. IRQSTATUS_RAW

| | |
|-------------------------|---|
| Address Offset | 0x0000 0024 |
| Physical Address | 0x4A0D 9024 0x4A0D B024 0x4A0D D024 |
| Description | MCU raw interrupt status and set. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|---------------------|----|---|---|----------------------|---|---|---|--------------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | MCU ACCUMINTSTATRAW | | | | MCU VALIDINTSTATRAW | | | | MCU BOUNDSINTSTATRAW | | | | MCU DISABLEACKINTSTATRAW | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|------------|
| 31:4 | RESERVED | Reserved bits. | R | 0x00000000 |
| 3 | MCU ACCUMINTSTATRAW | 0: Accum interrupt status is unchanged 1: Accum interrupt status is set | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------|
| 2 | MCUVALIDINTSTATRAW | 0: Valid interrupt status is unchanged 1: Valid interrupt status is set | RW | 0 |
| 1 | MCUBOUNDSINTSTATRAW | 0: Bounds interrupt status is unchanged 1: Bounds interrupt status is set | RW | 0 |
| 0 | MCUDISABLEACKINTSTATRAW | 0: MCUDisable acknowledge status is unchanged 1: MCUDisable acknowledge status is set | RW | 0 |

Table 3-1554. Register Call Summary for Register IRQSTATUS_RAW

SR Register Manual

- [SR Register Summary: \[0\]](#)

Table 3-1555. IRQSTATUS

| | |
|-------------------------|---|
| Address Offset | 0x0000 0028 |
| Physical Address | 0x4A0D 9028 0x4A0D B028 0x4A0D D028 |
| Description | MCU masked interrupt status and clear. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|--------------------|----|---|---|---------------------|---|---|---|-------------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MCUACCUMINTSTATENA | | | | MCUVALIDINTSTATENA | | | | MCUBOUNDSINTSTATENA | | | | MCUDISABLEACKINTSTATENA | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|------------|
| 31:4 | RESERVED | Reserved bits | R | 0x00000000 |
| 3 | MCUACCUMINTSTATENA | Read 0: Accum interrupt status is unchanged. Read 1: Accum interrupt status is set. Write 0: Accum interrupt status is unchanged. Write 1: Accum interrupt status is cleared. | RW | 0 |
| 2 | MCUVALIDINTSTATENA | Read 0: Valid interrupt status is unchanged. Read 1: Valid interrupt status is set. Write 0: Valid interrupt status is unchanged. Write 1: Valid interrupt status is cleared. | RW | 0 |
| 1 | MCUBOUNDSINTSTATENA | Read 0: Bounds interrupt status is unchanged. Read 1: Bounds interrupt status is set. Write 0: Bounds interrupt status is unchanged. Write 1: Bounds interrupt status is cleared. | RW | 0 |
| 0 | MCUDISABLEACKINTSTATENA | Read 0: MCUDisable acknowledge status is unchanged. Read 1: MCUDisable acknowledge status is set. Write 0: MCUDisable interrupt status is unchanged. Write 1: MCUDisable interrupt status is cleared. | RW | 0 |

Table 3-1556. Register Call Summary for Register IRQSTATUS

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

PRCM Module Programming Guide

- [Disable Sequence for AVS \(SmartReflex\) and VP: \[5\] \[6\] \[7\] \[8\] \[9\]](#)

PRCM Register Manual

- [INTRCONN_SOCKET_PRM Register Description: \[10\] \[11\] \[12\] \[13\]](#)

SR Register Manual

- [SR Register Summary: \[14\]](#)

Table 3-1557. IRQENABLE_SET

| | |
|-------------------------|---|
| Address Offset | 0x0000 002C |
| Physical Address | 0x4A0D 902C 0x4A0D B02C 0x4A0D D02C |
| Description | MCU interrupt enable flag and set. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-------------------|-------------------|--------------------|------------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | MCUACCUMINTENASET | MCUVALIDINTENASET | MCUBOUNDSINTENASET | MCUDISABLEACTINTENASET |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--|------|------------|
| 31:4 | RESERVED | Reserved bits. | R | 0x00000000 |
| 3 | MCUACCUMINTENASET | Read mode: 0: Accum interrupt generation is disabled/masked, 1: Accum interrupt generation is enabled; Write mode: 0: No change to Accum interrupt enable, 1: Enable Accum interrupt generation. | RW | 0 |
| 2 | MCUVALIDINTENASET | Read mode: 0: Valid interrupt generation is disabled/masked, 1: Valid interrupt generation is enabled; Write mode: 0: No change to Valid interrupt enable, 1: Enable Valid interrupt generation. | RW | 0 |
| 1 | MCUBOUNDSINTENASET | Read mode: 0: Bounds interrupt generation is disabled/masked, 1: Bounds interrupt generation is enabled; Write mode: 0: No change to Bounds interrupt enable, 1: Enable Bounds interrupt generation. | RW | 0 |
| 0 | MCUDISABLEACTINTENASET | Read mode: 0: MCUDisableAck interrupt generation is disabled/masked, 1: MCUDisableAck interrupt generation is enabled; Write mode: 0: No change to MCUDisAck interrupt enable, 1: Enable MCUDisableAck interrupt generation. | RW | 0 |

Table 3-1558. Register Call Summary for Register IRQENABLE_SET

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Module Programming Guide

- [Global Initialization: \[4\] \[5\] \[6\]](#)
- [Disable Sequence for AVS \(SmartReflex\) and VP: \[7\]](#)

SR Register Manual

- [SR Register Summary: \[8\]](#)

Table 3-1559. IRQENABLE_CLR

| | |
|-------------------------|---|
| Address Offset | 0x0000 0030 |
| Physical Address | 0x4A0D 9030 0x4A0D B030 0x4A0D D030 |
| Description | MCU interrupt enable flag and clear. |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|-------------------|----|---|---|--------------------|---|---|---|------------------------|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | MCUACCUMINTENACLR | | | | MCUVALIDINTENACLR | | | | MCUBOUNDSINTENACLR | | | | MCUDISABLEACKINTENACLR | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--|------|------------|
| 31:4 | RESERVED | Reserved bits. | R | 0x00000000 |
| 3 | MCUACCUMINTENACLR | Read mode: 0: Accum interrupt generation is disabled/masked, 1: Accum interrupt generation is enabled; Write mode: 0: No change to Accum interrupt enable, 1: Enable Accum interrupt generation. | RW | 0 |
| 2 | MCUVALIDINTENACLR | Read mode: 0: Valid interrupt generation is disabled/masked, 1: Valid interrupt generation is enabled; Write mode: 0: No change to Valid interrupt enable, 1: Enable Valid interrupt generation. | RW | 0 |
| 1 | MCUBOUNDSINTENACLR | Read mode: 0: Bounds interrupt generation is disabled/masked, 1: Bounds interrupt generation is enabled; Write mode: 0: No change to Bounds interrupt enable, 1: Enable Bounds interrupt generation. | RW | 0 |
| 0 | MCUDISABLEACKINTENACLR | Read mode: 0: MCUDisableAck interrupt generation is disabled/masked, 1: MCUDisableAck interrupt generation is enabled; Write mode: 0: No change to MCUDisAck interrupt enable, 1: Enable MCUDisableAck interrupt generation. | RW | 0 |

Table 3-1560. Register Call Summary for Register IRQENABLE_CLR

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[0\] \[1\] \[2\] \[3\]](#)

PRCM Module Programming Guide

- [Disable Sequence for AVS \(SmartReflex\) and VP: \[4\] \[5\] \[6\] \[7\]](#)

Table 3-1560. Register Call Summary for Register IRQENABLE_CLR (continued)

SR Register Manual

- [SR Register Summary: \[8\]](#)

Table 3-1561. SENERROR

| | |
|-------------------------|--|
| Address Offset | 0x0000 0034 |
| Physical Address | 0x4A0D 9034 0x4A0D B034 0x4A0D D034 |
| Description | The sensor error from the error generator. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | AVGERROR | | | | | | | | SENERERROR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------------------------|------|--------|
| 31:16 | RESERVED | Reserved bits. | R | 0x0000 |
| 15:8 | AVGERROR | The average sensor error. | R | 0x00 |
| 7:0 | SENERERROR | The percentage of sensor error. | R | 0x00 |

Table 3-1562. Register Call Summary for Register SENERROR

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

SR Register Manual

- [SR Register Summary: \[7\]](#)
- [SR Register Description: \[8\]](#)

Table 3-1563. ERRCONFIG

| | |
|-------------------------|---|
| Address Offset | 0x0000 0038 |
| Physical Address | 0x4A0D 9038 0x4A0D B038 0x4A0D D038 |
| Description | The sensor error configuration. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----------|--------------------|-------------------|----------|----|----|-----------|----|----|-------------|----|----|----|---|---|---|---|-------------|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | WAKEUPENABLE | IDLEMODE | VPBOUNDSINTSTATENA | VPBOUNDSINTENABLE | RESERVED | | | ERRWEIGHT | | | ERRMAXLIMIT | | | | | | | | ERRMINLIMIT | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|-------|
| 31:27 | RESERVED | Reserved bits. | R | 0x00 |
| 26 | WAKEUPENABLE | Wakeup from MCU Interrupts enable. | RW | 0 |
| 25:24 | IDLEMODE | 0b00: Force-Idle Mode, 0b01: No Idle Mode, 0b10: Smart-Idle Mode #2, 0b11: Smart-Idle-Wkup mode | RW | 0x2 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 23 | VPBOUNDSINTSTATENA | 0: Bounds interrupt status is unchanged, 1: Bounds interrupt status is cleared. | RW | 0 |
| 22 | VPBOUNDSINTENABLE | 0: Bounds interrupt disabled, 1: Bounds interrupt enabled. | RW | 0 |
| 21:19 | RESERVED | Reserved bits. | R | 0x0 |
| 18:16 | ERRWEIGHT | The AvgSenError weight. | RW | 0x0 |
| 15:8 | ERRMAXLIMIT | The upper limit of SenError for interrupt generation. | RW | 0x7F |
| 7:0 | ERRMINLIMIT | The lower limit of SenError for interrupt generation. | RW | 0x80 |

Table 3-1564. Register Call Summary for Register ERRCONFIG

Voltage Management Functional Description

- [Adaptive Voltage Scaling: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

PRCM Module Programming Guide

- [Global Initialization: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [Disable Sequence for AVS \(SmartReflex\) and VP: \[14\] \[15\]](#)

SR Register Manual

- [SR Register Summary: \[16\]](#)

PRELIMINARY

Dual Cortex-A9 MPU Subsystem

This chapter describes the dual Cortex™-A9 MPU subsystem.

| Topic | Page |
|---|------|
| 4.1 Dual Cortex-A9 MPU Subsystem Overview | 1076 |
| 4.2 Dual Cortex-A9 MPU Subsystem Integration | 1079 |
| 4.3 Dual Cortex-A9 MPU Subsystem Functional Description | 1084 |
| 4.4 Dual Cortex-A9 MPU Subsystem Register Manual | 1112 |

4.1 Dual Cortex-A9 MPU Subsystem Overview

4.1.1 Introduction

The dual Cortex™-A9 microprocessor unit (MPU) subsystem of the device is based on the symmetric multiprocessor (SMP) architecture. Thus, the dual Cortex-A9 MPU subsystem delivers higher performance, optimal power management, and debug and emulation capabilities.

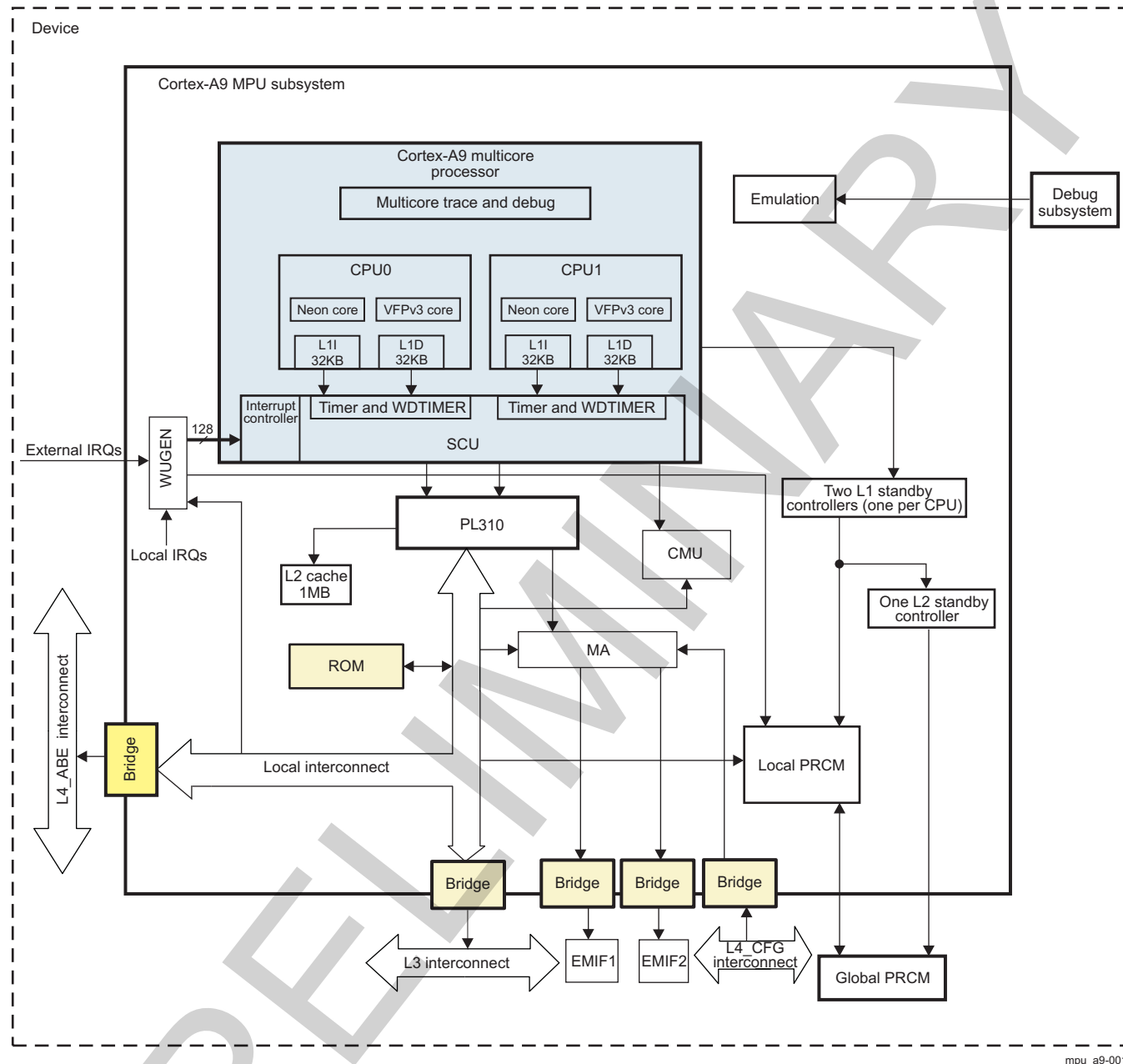
The dual Cortex-A9 MPU subsystem incorporates two Cortex-A9 central processing units (CPUs), level 2 (L2) cache shared between the two CPUs, and uses PL310 as an L2 cache controller. Each CPU has 32KB of level 1 (L1) instruction cache, 32KB of L1 data cache, separate dedicated power domain, and includes one Neon™ and Vector Floating Point Unit (VFPv3) coprocessors. The dual Cortex-A9 MPU subsystem also includes standard CoreSight™ components to support SMP debug and emulation, snoop control unit (SCU), interrupt controller (GIC), clock and reset manager, Memory Adapter (MA) and Cache Management Unit (CMU).

The MPU subsystem handles transactions among the ARM® core, L3 interconnect, EMIF controller (through the MA), L4-ABE, and interrupt controller (INTC).

Hereafter in this chapter, references to the dual Cortex-A9 MPU subsystem, Cortex-A9 MPU subsystem, and MPU subsystem are equivalent.

[Figure 4-1](#) shows a high-level block diagram of the MPU subsystem.

Figure 4-1. Cortex-A9 MPU Subsystem Overview



4.1.2 Features

The Cortex-A9 MPU subsystem integrates the following:

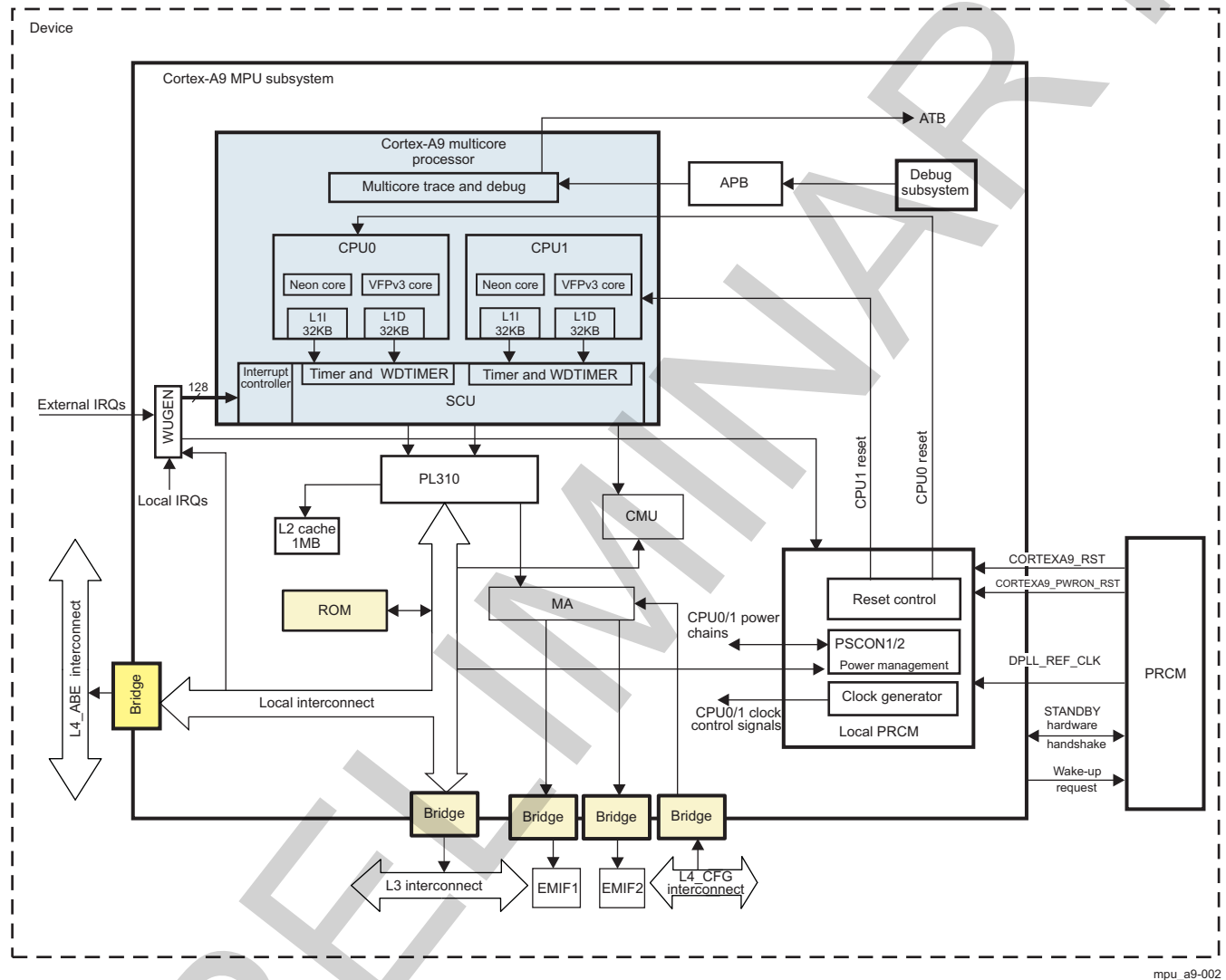
- ARM subchip
 - Cortex-A9 core revision r2p10
 - SMP architecture
 - Superscalar, dynamic multiple issue technology with an efficient 8-stage pipeline
 - Out-of-order (OoO) instruction dispatch and completion
 - ARM Neon™ Advanced SIMD (single instruction, multiple data) support for accelerated media and signal processing computation.
 - Include VFPv3 hardware to support single and double-precision add, subtract, divide, multiply and accumulate, and square root operations
 - 32KB L1 instruction and 32-KB L1 data cache – 32-byte line size, 4-way set associative
 - Memory management unit (MMU)
 - Two-level translation lookaside buffer (TLB) organization
 - First level is an 32-entry, fully associative micro-TLB implemented on the Instruction and Data side.
 - Second level is a unified, 2-way associative, 128-entry main TLB
 - Supports hardware TLB table-walk
 - SCU ensures memory coherency between the two CPUs
 - Integrated timer and watchdog timer per CPU
 - Interrupt controller with 128 hardware interrupt inputs
- PL310 L2 cache controller (revision r3p1-50rel0) with 1-MB cache size
 - 16-way set associative
 - 32-byte line size
 - PL310 address filtering function used to split accesses between MA and Local interconnect
 - Two slave ports and two master ports
 - Includes four 256-bit line-fill-buffers (LFBs) shared by the master ports
 - Each slave port includes two 256-bit line-read-buffers (LRBs)
 - Includes four 256-bit store buffers with merge capability
 - Support for 64-byte line fills issued to L3
- Program trace macrocell (PTM)
- Emulation logic (cross-triggers)
- AMBA advanced trace bus (ATB) trace port
- Advanced peripheral bus (APB) port
- ROM memory
- Wake-up generator (WUGEN) module: Responsible for waking up the CPUs
- Standby controllers: The Cortex-A9 MPU implements a two-level standby controller consisting of two L1 standby controllers (one per CPU) and one L2 standby controller. The standby controllers handle the power transitions inside the Cortex-A9 MPU subsystem.
- Interface to audio back-end (ABE) subsystem: Enables direct connection between the Cortex-A9 multicore processor and the ABE module to reduce power consumption during long audio playback
- Power, clock, and reset manager: The Cortex-A9 MPU subsystem implements a local PRCM module to handle CPU power domains.
- MA
- CMU

4.2 Dual Cortex-A9 MPU Subsystem Integration

This section describes the integration of the module in the device, including information about clocks, resets, and hardware requests.

Figure 4-2 shows the Cortex-A9 MPU integration.

Figure 4-2. Cortex-A9 MPU Subsystem Integration



NOTE: For more information about the STANDBY hardware handshake and the wake-up request, see [Section 3.1.1.1, Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

[Table 4-1](#) and [Table 4-2](#) summarize the integration of the module in the device.

Table 4-1. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| CORTEXA9 | PD_MPU | L3 |

Table 4-2. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|---------------------|--------|---|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| CORTEXA9 | MPU_DPLL_CLK | MPU_DPLL_CLK | PRCM | Interface and functional clock |
| Resets | | | | |
| CORTEXA9 | CORTEXA9_PWRON_RSTN | CORTEXA9_PWRON_RSTN | PRCM | Power-on reset (POR) for all the modules inside the MPU system power domain; nonretention |
| | CORTEXA9_RSTN | CORTEXA9_RSTN | PRCM | Warm reset for all the modules inside the MPU system power domain; nonretention |

4.2.1 Clock Distribution

The Cortex-A9 MPU clock generator is fed by the MPU digital phase-locked loop (DPLL), which can be gated off by the global power, reset, and clock management (PRCM) module when system power domain is in a low-power state. There is a global clock gating for each CPU. Because of the MPU DPLL, the Cortex-A9 MPU subsystem is asynchronous from the rest of the device.

The clock generator generates the following clocks from the MPU DPLL output clock:

- ARM_FCLK: ARM Cortex-A9 MPCore functional clock
- LOCAL_INTCNT_FCLK: Local interconnect functional clock
- CACHE_CTRL_FCLK: PL310 cache controller functional clock
- CMU_CLK1 and CMU_CLK2: CMU functional clocks
- MA_CLK1, MA_CLK2 and MA_CLK3: MA functional clocks

The following clocks have the same frequency:

- ARM_FCLK
- CACHE_CTRL_FCLK
- CMU_CLK1
- MA_CLK1

The frequency of the following clocks is half of ARM_FCLK:

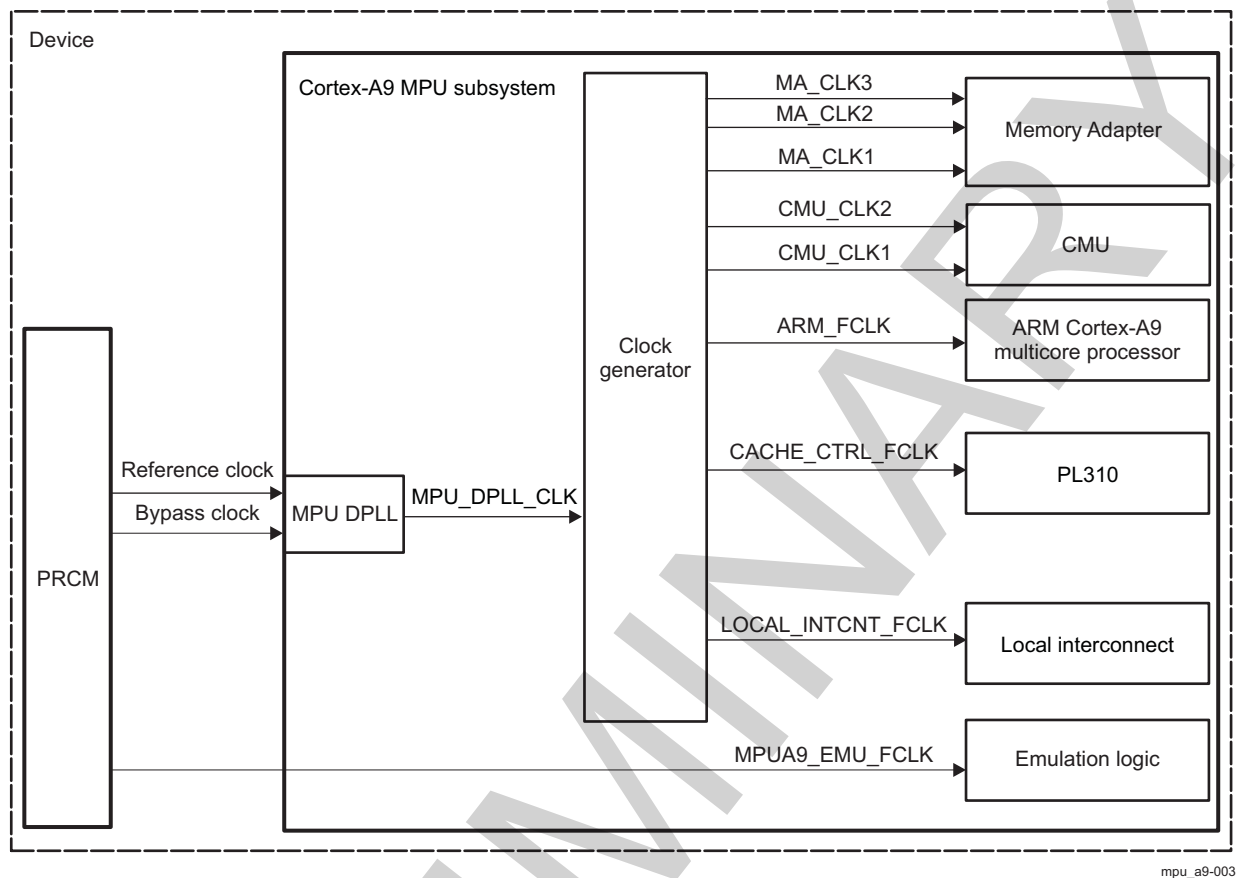
- LOCAL_INTCNT_FCLK
- CMU_CLK2
- MA_CLK2

The frequency of MA_CLK3 is software-configurable (through the CM_MPU_MPU_CLKCTRL[24] CLKSEL_EMIF_DIV_MODE bit) and can be half of the ARM_FCLK and one fourth of the ARM_FCLK frequency.

NOTE: For more information about setting the CM_MPU_MPU_CLKCTRL[24] CLKSEL_EMIF_DIV_MODE and CM_MPU_MPU_CLKCTRL[25] CLKSEL_ABE_DIV_MODE bits, see the *Data Manual Operating Condition Addendum*.

Figure 4-3 shows the MPU subsystem clocking scheme.

Figure 4-3. Cortex-A9 MPU Subsystem Clocking Scheme



mpu_a9-003

NOTE: For more information about the MPU DPLL, see [Section 3.6.3.3, Generic DPLL Overview](#), in [Chapter 3, Power, Reset, and Clock Management](#).

The reference clock in [Figure 4-3](#) is relevant to the DPLL_REF_CLK clock signal. The ARM Cortex-A9 multicore processor has no wake-up capabilities.

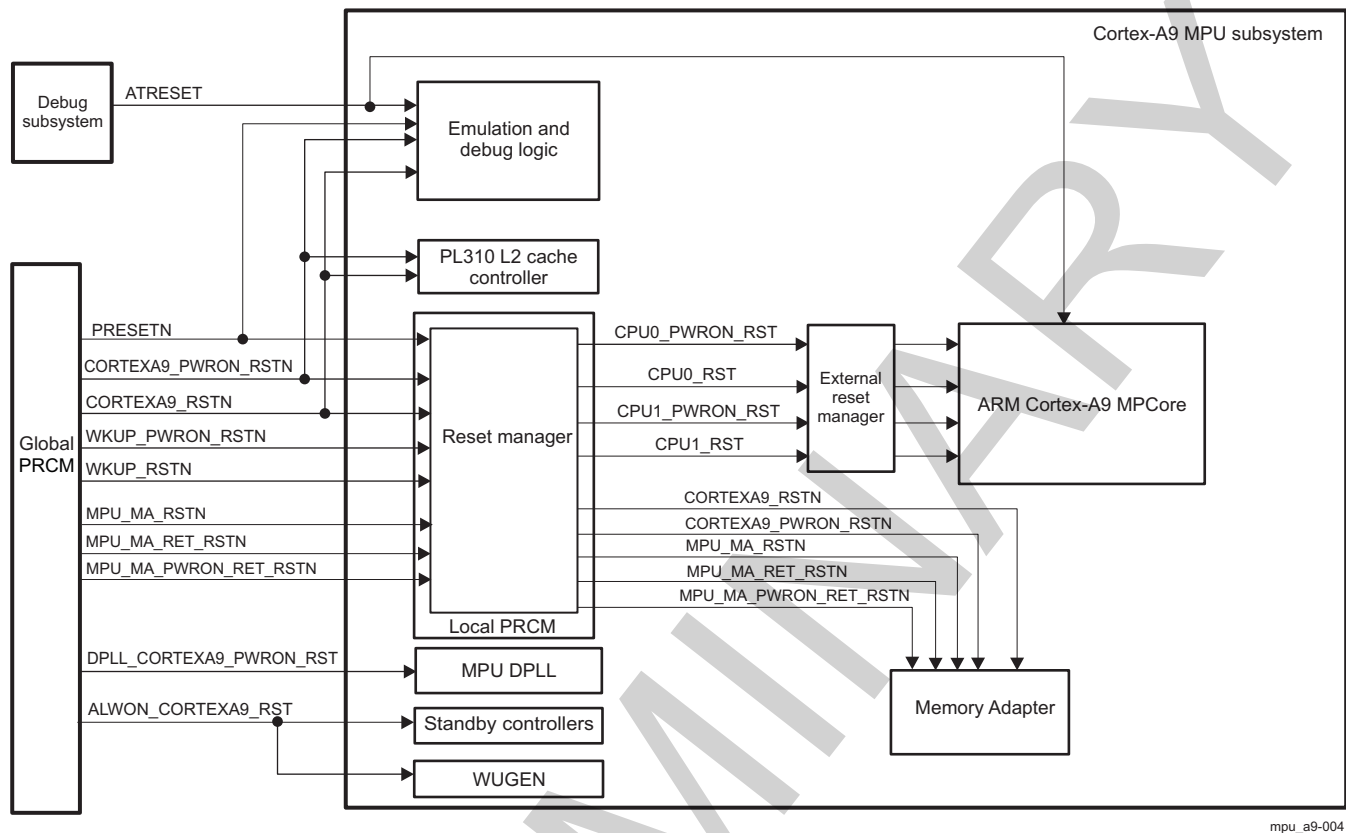
If only one Cortex-A9 CPU is needed, the ARM_FCLK can be gated independently for each CPU. For more information about how to gate this clock, see [Section 4.3.6.2, Power States of CPU0 and CPU1](#).

The two Cortex-A9 CPUs cannot be clocked at different frequencies.

4.2.2 Reset Distribution

Resets to the MPU subsystem are provided by the global PRCM module and controlled by the local PRCM module.

For more information about the power domains in the Cortex-A9 MPU subsystem, see [Section 4.3.6.1, Power Domains](#). [Figure 4-4](#) shows the reset scheme of the MPU subsystem.

Figure 4-4. Cortex-A9 MPU Subsystem Reset Scheme

All eight external resets that are input to the local PRCM signals are active low. All eleven external reset input signals are driven by the global PRCM, except the ATRESETN reset signal, which is driven by the device debug subsystem. There are four internal reset signals that are generated by the local PRCM module.

ATRESETN is asserted at initial device power up and resets the debug and trace modules. ATRESETN affects the debug logic of the Cortex-A9 MPU and ARM CPUs.

The PRESETN reset signal resets the debug logic in the Cortex-A9 MPU (CTI0/1, trace funnel, DAP_PC) and ARM CPUs.

The WKUP_PWRON_RSTN reset signal is a global cold reset for the wake-up logic and resets the wake-up domain logic (the PSCON modules) in the local PRCM module. A cold reset is typically asserted when power is initially applied to the system. The user can check whether this reset event has occurred by reading the [PRM_RSTST\[0\]](#) GLOBAL_COLD_RESET bit.

The WKUP_RSTN reset signal is a global warm reset that resets the wake-up domain logic (the PSCON modules) in the local PRCM module. Warm reset is typically used for resetting a system that has been operating for some time. The user can check whether this reset event has occurred by reading the [PRM_RSTST\[1\]](#) GLOBAL_WARM_RST bit.

The DPLL_CORTEXA9_PWRON_RST reset signal resets the MPU_DPLL.

The ALWON_CORTEXA9_RST reset signal resets the MPU always-on domain: The standby controllers and the WUGEN. The user can check whether the reset has occurred by reading the [WKG_CONTROL_0\[15\]](#) DOMAIN_RST bit for CPU0 and the [WKG_CONTROL_1\[15\]](#) DOMAIN_RST bit for CPU1.

The MA has five incoming reset signals:

- CORTEXA9_RSTN
- CORTEXA9_PWRON_RSTN

- MPU_MA_RSTN
- MPU_MA_RET_RSTN
- MPU_MA_PWRON_RET_RSTN

These five reset signals are driven by the Cortex-A9 MPU local reset manager and are active low.

The local PRCM module provides two reset signals for each CPU:

- The CPU0_RST and CPU1_RST reset signals are warm reset events. These reset signals initialize most of the ARM CPUs, except the debug logic (breakpoints and watchpoints are retained during this reset). The user can check whether these reset events have occurred by reading the [RM_PDA_CPUi_RSTCTRL\[0\]](#) RST bit.
- The CPU0_PWRON_RST and CPU1_PWRON_RST reset signals are cold and debug reset events.

For more information about clocks, resets, and power domains, and the CORTEXA9_PWRON_RSTN and CORTEXA9_RSTN reset signals, see [Chapter 3, Power, Reset, and Clock Management](#).

4.3 Dual Cortex-A9 MPU Subsystem Functional Description

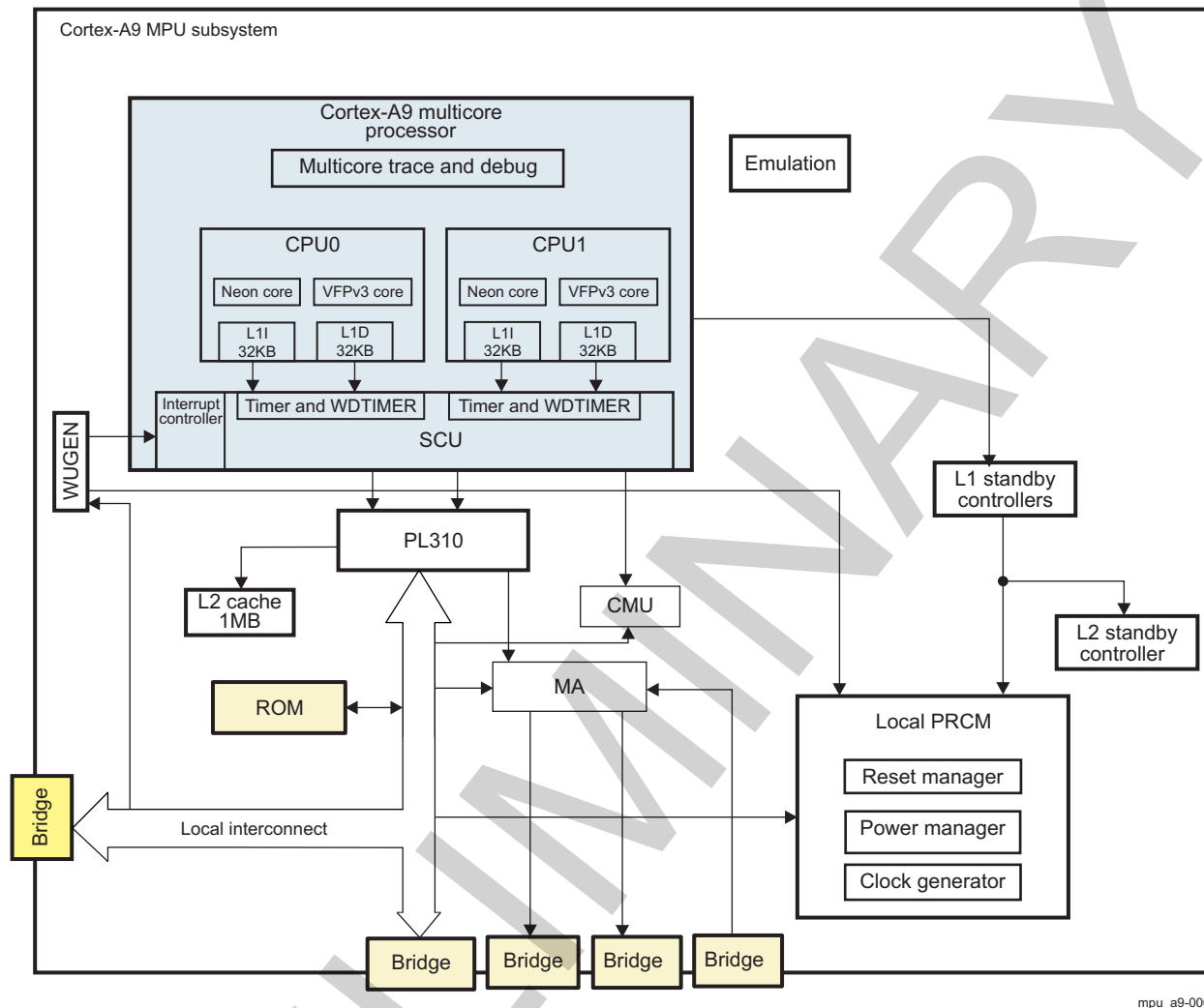
4.3.1 Cortex-A9 MPU Subsystem Block Diagram

The Cortex-A9 MPU subsystem integrates the following group of submodules:

- Two ARM Cortex-A9 CPUs. Each CPU contains:
 - ARM version 7 ISA™: Standard ARM instruction set plus Thumb®-2, Jazelle® RCT, and Jazelle DBX Java™ accelerator
 - Neon SIMD coprocessor and VFPv3
- INTC: Handles module interrupts (for more information, see [Chapter 18, Interrupt Controller](#))
- PL310 L2 cache controller (revision r3p1-50rel0) with 1-MB cache and two 64-bit slave and two 64-bit master ports (for more information about the L2 cache controller, see the *ARM PL310 Cache Controller TRM*)
- Local interconnect: Connects the ARM Cortex-A9 multicore processor to:
 - Level 3 (L3) interconnect
 - ABE interconnect
 - Local PRCM module
 - PL310 L2 cache controller
 - On-chip ROM
 - WUGEN
 - CMU
 - MA
- Power, clock, and reset manager
- On-chip ROM: CPU0 (the master CPU) can boot from this memory. The ROM size is 48KB, and the address range is from 0x4003 0000 to 0x4003 BFFF. For more information, see [Chapter 28, Initialization](#).
- WUGEN: Responsible for waking up the CPUs, used by the ROM code and OS during SMP boot. Two internal memory-mapped registers ([AUX_CORE_BOOT_0](#) and [AUX_CORE_BOOT_1](#)) are available to the OS for communicating start-up information. For more information, see [Chapter 28, Initialization](#).
- Standby controllers: Handle the power transitions inside the Cortex-A9 MPU subsystem
- SCU for L1 cache coherency
- One timer and one watchdog unit per core
- Caches memories:
 - 32-KB L1 instruction and 32-KB data caches: 4-way associative on each core
 - 1-MB L2 unified cache: 16-way associative
- MA
- CMU

[Figure 4-5](#) is the Cortex-A9 MPU block diagram.

Figure 4-5. Cortex-A9 MPU Block Diagram



4.3.2 ARM Core

The Cortex-A9 MPU subsystem implements ARM version 7 ISA. [Table 4-3](#) lists the main functions of the Cortex-A9 core.

Table 4-3. ARM Core Key Features

| Feature | Comment |
|----------------------|---|
| ARM version 7 ISA | Standard ARM instruction set + Thumb-2, Jazelle RCT/DBX Java accelerator, and media extensions. Backward-compatible with previous ARM ISA versions. |
| L1 Icache and Dcache | 32KB each |

Table 4-3. ARM Core Key Features (continued)

| Feature | Comment |
|-------------------|---|
| L2 cache (PL310) | Main characteristics are: <ul style="list-style-type: none"> • Physically addressed and physically tagged • 16-way associative • 32-byte line length • Critical word first transactions • Prefetching capability • Pseudo-random victim selection policy • Two 256-bit LFBs in each master port • Two 256-bit LRBs in each slave port • Three 256-bit write buffers (merging capable) • Three 256-bit eviction buffers • Two 64-bit slave ports from SCU • Two master ports, one 64-bit port to L3 (through the Local interconnect) and one 128-bit port to EMIF (through the MA) • PL310 address filtering function used to split accesses between MA and Local interconnect • Support for 64-byte line fills issued to L3 |
| SCU | The SCU controls by hardware the coherency of the two Cortex-A9 MPCores L1 data caches. The SCU supports up to four outstanding reads for each CPU. The SCU can be given an address range that redirects all memory transactions within this range to the second master ports (to L2 cache controller). |
| TLB | Two levels: Micro TLB (32 entries on each of instruction and data sides) + main TLB (instruction/data unified) implemented as a combination of a fully associative array of 4 elements (lockable) + a low-associative, 128 entries, 2-way |
| Trace interface | One program trace macrocell (PTM) per core |
| Branch prediction | 512 entries per core + global history buffer (GHB) of 4096 2-bit predictors + 8-entry return stack |
| Enhanced MMU | Mapping sizes are 4KB, 64KB, 1MB, and 16MB. |
| Neon | Includes advanced SIMD instructions and the ARM VFPv3 instructions |

4.3.3 Local Interconnect

The local interconnect is used in the device design to connect one of the 64-bit buses of the PL310 L2 cache controller to the L3 interconnect (64-bit width), MA, ABE interconnect port (32-bit width), and local power manager. The local interconnect must do some minimal address decoding to decide where to forward the requests.

Main features:

- Connects to the L3 interconnect through a 64-bit port. The interface frequency is configurable between one half (default value) and one fourth of the MPU_DPLL_CLK clock signal frequency. This is programmable in the CM_MPU_MPU_CLKCTRL[24] CLKSEL_EMIF_DIV_MODE bit.
- Connects to the ABE through a 32-bit port. The interface frequency is configurable between one fourth (default value) and one eighth of the MPU_DPLL_CLK clock signal frequency. This is programmable in the CM_MPU_MPU_CLKCTRL[25] CLKSEL_ABE_DIV_MODE bit.

NOTE: For more information about setting the CM_MPU_MPU_CLKCTRL[24] CLKSEL_EMIF_DIV_MODE and CM_MPU_MPU_CLKCTRL[25] CLKSEL_ABE_DIV_MODE bits, see the *Data Manual Operating Condition Addendum*.

- Connection to the CMU for register configuration
- Connection to the MA for register configuration
- Contains internal configuration register related to the MA function
- Supports single-request-multiple-data (data handshaking) burst mode to pipeline requests
- Supports multiple outstanding requests

- Supports posted and nonposted write transactions, based on the attributes of the transactions coming from the ARM Cortex-A9 processor. Software can override all writes from the local interconnect to the L3 interconnect to be nonposted, regardless of the attributes of the transactions coming from the ARM Cortex-A9 processor, by setting the FORCEWRNP[0] MPUFORCEWRNP bit to 0x1. For the register description, see [Chapter 19, Control Module](#).

NOTE: For the register description of the CM_MPU_MPU_CLKCTRL, see [Chapter 3, Power, Reset, and Clock Management](#).

4.3.4 Memory Adapter

The purpose of the MA is to improve the missed latency of the L2 cache between the ARM Cortex-A9 processor and external memory. One of the PL310 master ports is connected to the MA and is used for all accesses to SCRAM. The PL310 address filtering mechanism is used to split incoming addresses between the MA connected to one of the PL310 master ports and the local interconnect connected to the other PL310 master port.

Requests from the MA to the EMIF typically run at half the CPU frequency. In high-speed (turbo) mode, when the CPU runs at higher frequency, these requests can be run at one fourth of the CPU frequency. The MA matches the bandwidth of the PL310 port on burst accesses by packing the write data to 128-bit-wide words and unpacking the 128-bit read data at full processor speed. Because the MA duplicates some of the logic in the local interconnect and DMM module, the MA has similar functionality.

The main features of the MA are:

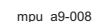
- Connected to the PL310 slave port
- Direct 128-bit interface each to EMIF1 and EMIF2
 - Single request multiple data
 - No write response on posted writes
- Full-speed interface to the PL310 L2 cache controller
- Programmable half-speed (default is one half) or one-fourth speed interface to the EMIF (EMIF1 and EMIF2). This is selected by the CM_MPU_MPU_CLKCTRL[24] CLKSEL_EMIF_DIV_MODE bit.

NOTE: For more information about setting the CM_MPU_MPU_CLKCTRL[24] CLKSEL_EMIF_DIV_MODE and CM_MPU_MPU_CLKCTRL[25] CLKSEL_ABE_DIV_MODE bits, see the *Data Manual Operating Condition Addendum*.

- Performs interleaving functions to optimize the bandwidth of the EMIF
- Uses firewall logic to check access rights of incoming addresses. The firewall on both EMIF supports:
 - Configurable number of regions with fixed priority
 - Access support for up to eight execution domains
 - Busy indicator during reconfiguration
- Blocked read and write access to the EMIF for all accesses failing authorization checks
- Parallel processing of reads and writes
- Packing of burst write data into 128-bit words at full processor clock speeds
- Unpacking of burst read data into 64-bit words at full processor clock speeds
- Support for narrow bursts
- Burst wrap for single and double cache line fills.
- Supports the CMU by squelching dummy accesses (single thread operation only)
- Supports boot from EMIF space
- MA section manager (SM) supports:
 - Programmable multi-zone DRAM mapping and interleaving configuration
 - Supports 4 prioritized sections for defining configuration regions within the external memory

- Figure 4-6 shows the integration of the MA in the device.

Figure 4-6. MA Block Diagram



4.3.4.1 MA Functional Description

4.3.4.1.1 Input Interface

The input is driven from one of the PL310 master ports. Only accesses that target EMIF external space appear on this interface. All accesses to the configuration registers of the EMIF, firewall, and MA SM appear on the other master port of the PL310 and are routed through the local interconnect.

4.3.4.1.2 Interleaving

To optimize the bandwidth of the two EMIFs and their associated DDR memories, an interleaving scheme can be enabled. This interleaving is programmable and supports interleaving on 128-, 256-, and 512-byte boundaries. The programming can be performed in the MA_LISA_MAP_i[19:18] SDRC_INTL (where i = 0 to 3) bit fields. Some address translation is also part of this interleaving function. Because the EMIF memories are accessible by the Cortex-A9 MPU through the MA and the L3 interconnect through the DMM, the same interleaving scheme must be used. To ensure compatibility, the interleaving function is implemented by a scaled-down version of the MA SM, which implements the interleaving function in the DMM. For more information about the interleaving scheme of the MA SM, see [Section 16.2.3.5.1.1, Dynamic Mapping](#), and [Section 16.2.3.5.1.2, Address Mapping](#), in [Section 16.2, Dynamic Memory Manager](#). When reading, replace DMM with MA SM.

4.3.4.1.2.1 Section Manager

The SM module in the MA contains one set of registers and three ports. Each port can handle one address translation, provide the interface size, and determine the EMIF mapping. Two of the ports process read and write addresses simultaneously. The third port processes the address of a split read burst. The MA SM supports four sections.

4.3.4.1.2.2 Memory Adapter Registers

[Table 4-4](#) lists the DMM registers that are duplicated locally in the MA. These registers have the same names except that DMM is replaced by MA. Software must keep the content of these registers equal to the content of their counterparts in the DMM module.

Table 4-4. MA Registers Duplicated From the DMM Register Map

| Register | Type | Width (Bits) | Base Address |
|------------------------------------|------|--------------|---------------------------------|
| MA_LISA_LOCK | RW | 32 | 0x482A F01C |
| MA_LISA_MAP_P_i (where i = 0 to 3) | RW | 32 | From 0x482A F040 to 0x482A F04C |

For descriptions of the registers, see [Section 16.2.6.2.2, DMM Register Description](#), in [Section 16.2, Dynamic Memory Manager](#). The only differences are the following reset values of the MA_LISA_MAP_0 register:

- MA_LISA_MAP_0[22:20] SYS_SIZE = 0x1 (32-MB section)
- MA_LISA_MAP_0[17:16] SDRC_ADDRSPC = 0x1
- MA_LISA_MAP_0[9:8] SDRC_MAP = 0x1

The configuration of the MA must be programmed by the Cortex-A9 MPU to match the configuration of the DMM during boot. The registers must be locked after initial programming to avoid corruption by application software. When the SM configuration registers are being programmed there are no interlocks or safeguards to prevent accesses from being processed at the same time. The MA_LISA_LOCK and MA_LISA_MAP_i registers are retained during power down of retention mode.

If an access is made to a region marked as having unused address space or an unmapped SDRC map, no access is made to the EMIF and an error is returned. If an access is made to a region marked as accesses-SDRC-internal-registers, no access occurs to the EMIF and an error is returned. This is because the internal registers are not accessible from this port.

4.3.4.1.2.3 Posted and Nonposted Writes

On posted writes, a response is returned after all write data is accepted by the MA and one of the follow occurs:

- The request is canceled, because of an interleaving error or is stopped by the CMU logic.
- The request is pushed into the firewall FIFO.

On nonposted writes, a response is not returned until after all write data is accepted by the MA and one of the follow occurs:

- The request is canceled, because of an interleaving error or is stopped by the CMU logic.
- The request has a firewall violation.
- The associated response is received from the EMIF (access is completed in the EMIF).

When the FORCEWRNP[0] MPUFORCEWRNP bit is set to 0x1, all writes are forced to be converted to nonposted writes (prevents posted writes).

4.3.4.1.2.4 Errors

If the region is marked as unmapped, targets EMIF internal registers or reserved space, access is blocked and an error response is returned. Such an error occurs on the first half of a potential split access and aborts the entire access at that time.

To avoid undefined results, the following program rules must be followed:

- A section cannot be mapped as interleaving (MA_LISA_MAP_i[9:8] SDRC_MAP = 0x3), and the MA_LISA_MAP_i[19:18] SDRC_INTL bit field must be equal to 0x0.
- If the section maps to a single EMIF (MA_LISA_MAP_i[9:8] SDRC_MAP = 0x1 or 0x2), the MA_LISA_MAP_i[7:0] SDRC_ADDR bit field must be aligned to the MA_LISA_MAP_i[22:20] SYS_SIZE bit field (that is, the lower SDRC_ADDR bits must be 0).
- If the section maps to both EMIFs (MA_LISA_MAP_i[9:8] SDRC_MAP = 0x3), the MA_LISA_MAP_i[7:0] SDRC_ADDR bit field must be aligned to MA_LISA_MAP_i[22:20] SYS_SIZE – 1, because the addressable space for each EMIF is half.
- If the section maps to both EMIFs (MA_LISA_MAP_i[9:8] SDRC_MAP = 0x3), the MA_LISA_MAP_i[22:20] SYS_SIZE bit field cannot be 0.

4.3.4.1.3 CMU Access Squelching

The CMU allows blocks of memory space to be flushed from the cache in the background while the Cortex-A9 MPU runs other user code. The CMU accomplishes this by generating dummy read and write accesses through the PL310 accelerator coherency port (ACP), which evicts or invalidates the required lines. If these dummy accesses reach the MA, they must be killed and the appropriate response returned. For more information about the CMU, see [Section 4.3.5, Cache Management Unit](#).

4.3.4.1.3.1 Statistics Collector Probe Ports

To enable performance monitoring by the debug subsystem, a subset of interconnect signals must be monitored and sent to a statistics collector in the CORE domain. For more information about the statistics collector, see [Chapter 29, On-Chip Debug Support](#).

4.3.4.1.4 MA Firewall

A firewall exists between the interleaving logic and each of the EMIF ports. The firewall checks the address and access qualifiers against the permission attributes for the highest priority region to which the address belongs. If the access fails to get permission, a violation occurs and the fw_func_error or fw_debug_error outputs are asserted. The failing access is blocked and a slave error response is returned on the MA port for read and nonposted accesses. For more information about the MA firewall, see [Chapter 14, Interconnect](#).

4.3.4.1.5 MA Power and Reset Management

The MA supports a power-down state where the MA SM and FW configurations are retained. It also supports a save-and-restore operation where external logic saves the configuration state of the firewall (does not include the MA SM) and reloads it before the Cortex-A9 MPU is brought out of reset state. For more information about the save-and-restore operation, see , *sDMA*.

The MA SM supports only smart-idle mode.

4.3.5 Cache Management Unit

4.3.5.1 Overview

The CMU provides the ability to perform maintenance operations on Cortex-A9 MPU caches by physical address range. This reduces the execution time required by the Cortex-A9 CPUs to perform cache maintenance operations, while improving the overall throughput of maintenance operations. This frees the CPUs for other useful work. The registers inside the CMU are configured using the 32-bit interconnect configuration port from the local interconnect. The CMU operates at half the clock speed of the CPU core.

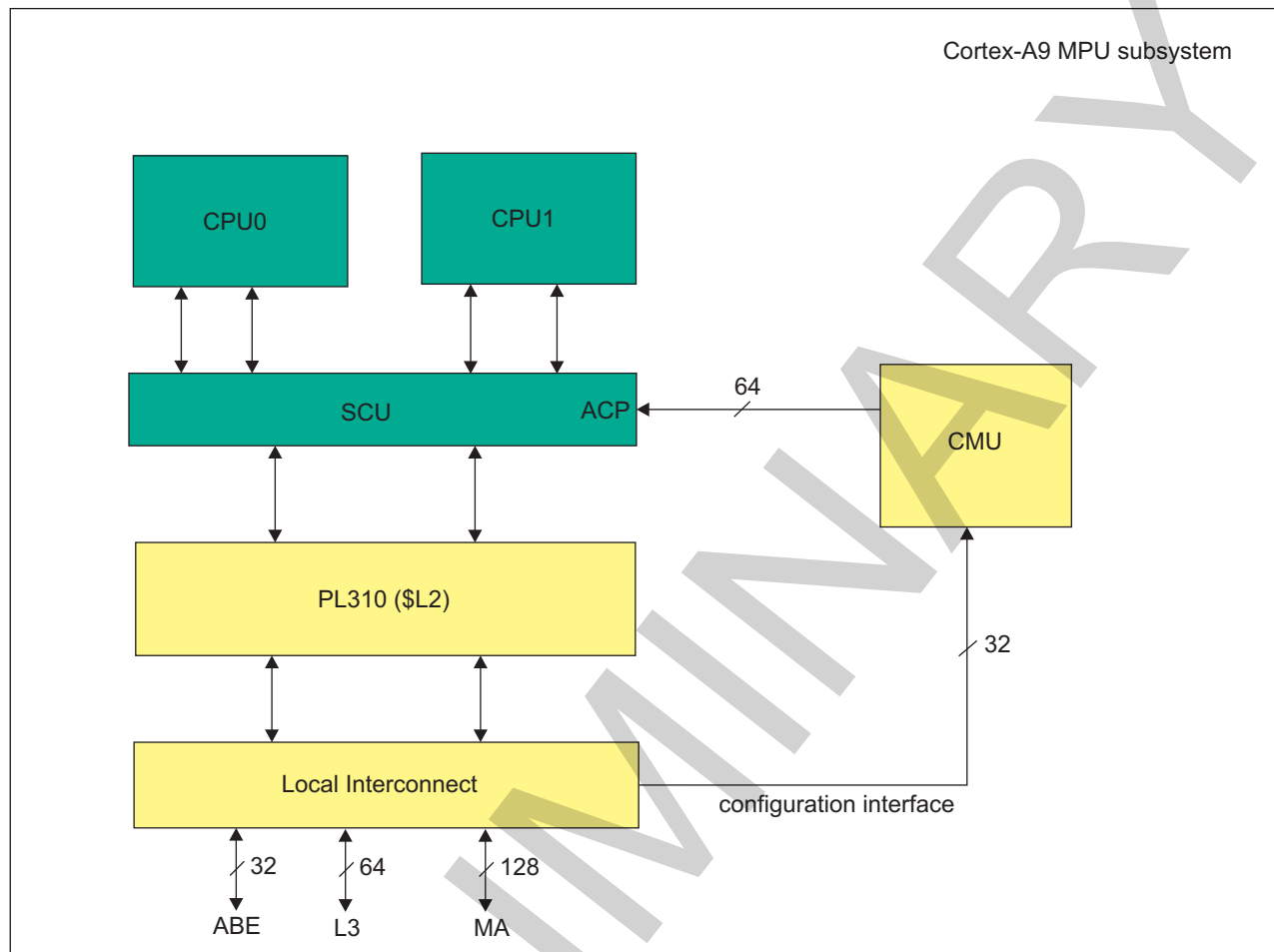
The main features of the CMU are:

- Autonomous cache invalidate and clean-and-invalidate operations on physical address ranges
- Multiprocessor and multiprogramming supported through built-in atomic range set allocation
- Independent programming of parameters in 64 range programming sets (RangeSets)
- Poll for status or interrupt on completion or error
- Handshake with power-management logic to ensure the CMU is idle before power management

The CMU indicates the idle status to the Cortex-A9 MPU subsystem, which implies all pending operations in the CMU are complete and is used by the local power-management logic to signal to the global PRCM module to shut down the domain clock and power of the Cortex-A9 MPU subsystem. The local power-management logic uses a handshake approach to ensure that the CMU completes all outstanding cache maintenance operations and enters IDLE state.

4.3.5.1.1 Integration in the Cortex-A9 MPU Subsystem

Figure 4-6 shows the integration of the CMU into the Cortex-A9 MPU subsystem. The CMU is connected to the ACP of the SCU. The ACP is a 64-bit slave port over which the CMU can perform ACP reads and writes, coherent and noncoherent. The registers inside the CMU are configured using the 32-bit interconnect configuration port from the local interconnect.

Figure 4-7. Integration of CMU in Cortex-A9 MPU Subsystem

mpu_a9-009

4.3.5.1.2 Functionality

The CMU is programmed with:

- Starting physical address: [CMUSTARTPA_i\[31:0\]](#) STARTPA. It is a byte granular address and has no alignment restrictions.
- Length of region to be operated on: [CMULENGTH_i\[11:0\]](#) LEN. The maximum length can be as large as 4KB or as small as 1 byte. CMU operates on "line step" granularity, and the default value for line step is 32 bytes, which is the line size of the Cortex-A9 MPU. The line step can be programmed in the [CMUCONFIGREG\[2:0\]](#) LINESTEP bit field.
- Type of operation to be performed (clean/clean-invalidate/invalidate): [CMUOPERATION_i\[3:0\]](#) OPNSEL

This information is programmed in a structure called a range set.

The CMU performs the appropriate operation (clean/clean-invalidate/invalidate) on the address range in all cache levels on a line step basis and can be programmed to interrupt the processor when the operation completes, or to poll for the status. The CMU can generate an interrupt request (CMU_IRQ_P) to the Cortex-A9 MPU interrupt controller (mapped as MA_IRQ_6) when it finishes operating.

The CMU has 64 range sets. Allocation and deallocation of the 64 range sets is done as an explicit step in software. Allocation is performed by reading the [CMUALLOCATE](#) register. Deallocation is performed by writing in the [CMUDEALLOCATE](#) register. Two groups of registers can check the status of operations: [CMUOPERATION_i](#) and [CMURANGESTATE_i](#).

4.3.5.1.3 Clean/Clean-Invalidate/Invalidate Flow

For all flows, the following bits must be set in PL310 so that the L2 line is invalidated on a write if it hits in the L2 cache:

- Shared Attribute Override Enable = 0; bit 22 of the Auxiliary Control Register. This is the default behavior and transforms normal memory noncacheable transactions into:
 - Cacheable no allocate for reads: L2 is looked up.
 - Write Through (WT) and No Write Allocate (NWA) for writes: L2 is updated on a hit and write is sent to L3. These writes are done as part of the clean/clean-invalidate flow.
- Shared Attribute Invalidate Enable = 1; bit 13 of the Auxiliary Control Register. When this bit is set, the L2 line is invalidated in the L2 cache and a write is sent to L3.

4.3.5.1.3.1 Clean/Clean-Invalidate Flow

For a clean/clean-invalidate operation:

1. The CMU performs an ACP read of the first line in the address range:
 - (a) If the address hit in L1 or L2, get data from L1 or L2. The CMU does not know where it came from.
 - (b) Else if the address missed in L1 and L2:
 - (i) PL310 sends a read request to L3.
 - (ii) The local interconnect returns a slave error to the CMU if the local interconnect sees a read request from the CMU/ACP and the CMU ends the operation on that line.
2. If the ACP read did not abort, the CMU performs an ACP write of data returned from the ACP read (all bytes valid). This is called as an optimized transfer.
 - (a) ACP write of all bytes invalidates the line in L1: Cortex-A9 behavior
 - (b) ACP write goes to PL310 where if the address hits, the PL310 line is invalidated. To optimize CMU flows, some auxiliary control bits must be set to make use of the "invalidate L2 line if it hits" feature.
 - (c) ACP writes the data to L3 through the local interconnect: The line has been cleaned/clean-invalidated. Clean invalidates the line.
3. Return to Step 1 for the next line in the range if the address of the next line is less than the starting physical address + length.

NOTE: There is no difference between the clean and clean-invalidate flows.

NOTE: The PL310 auxiliary control register cannot be changed dynamically. L2 must be disabled, which requires flushing the buffers, etc. and then changing the register.

4.3.5.1.3.2 Invalidate Flow

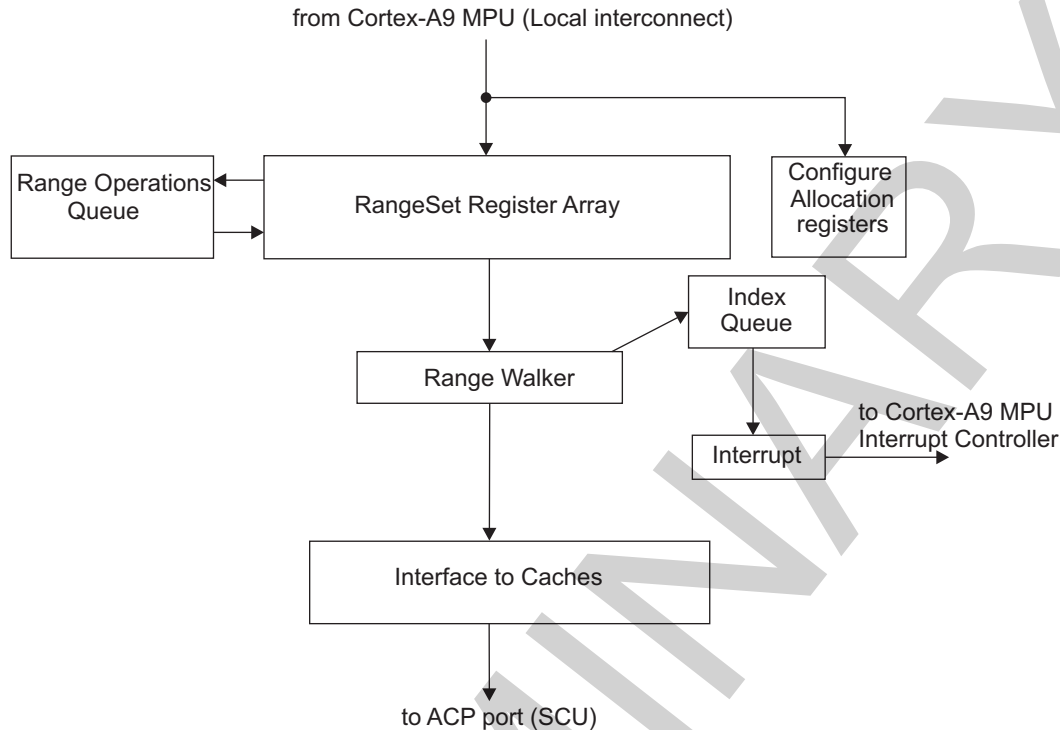
For an invalidate operation:

1. The CMU does an ACP write of all bytes. Data is set to 0.
2. This invalidates lines in L1 and L2; if it hit in L1 or L2, the write is sent to L3 by PL310. The local interconnect drops the write request and sends an OKAY response to the CMU.
3. If the address misses in L1 and L2, the PL310 sends the address to the local interconnect, which drops the write request and sends an OKAY response to the CMU.

4.3.5.2 Architecture

Figure 4-8 shows the major blocks of the CMU.

- Range Operations Queue: Queue of activated range sets
- RangeSet Register Array: Sets of registers holding the range sets
- Range Walker: Block that performs the operation
- Index Queue: Holds a queue of indices of the range set that needs to interrupt the CPUs

Figure 4-8. Cache Maintenance Unit Blocks

The Interface to Caches (see [Figure 4-8](#)) issues a request to no more than one cache line at a time.

4.3.5.2.1 Range Sets

Each range operation is programmed into a set of range operation registers called a range set. The CMU has 64 range sets.

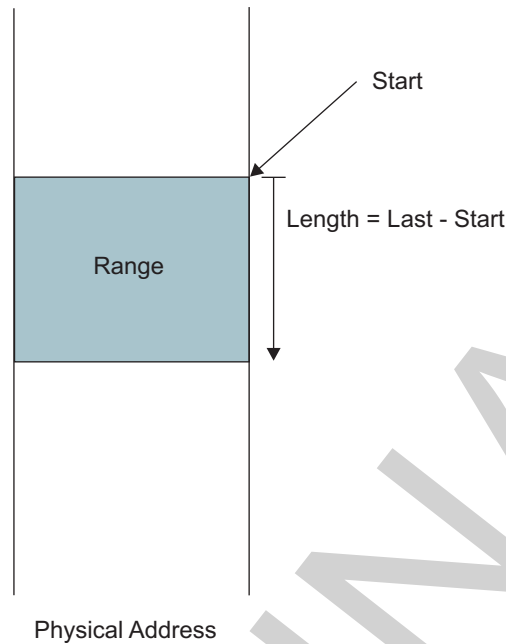
The CMU supports queuing of cache maintenance range operations. By enqueueing range sets, the programming interface is freed to allow programming of the next range set.

A range set has three registers that must be programmed to define the range set operation:

- The CMU Starting Address Register contains a 32-bit physical address ([CMUSTARTPA_i\[31:0\]](#) STARTPA).
- The CMU Length Register programs the length of a range in bytes ([CMULENGTH_i\[11:0\]](#) LEN). The value in this register must be the length of the data buffer minus 1 so that $\text{CMUSTARTPA} + \text{CMULENGTH}$ is the address of the last byte within the range. Cache lines containing the starting address and every physical address up to and including $\text{CMUSTARTPA} + \text{CMULENGTH}$ have the particular cache management operation (CMO) performed on them.
- The CMU Operation Register controls the operation performed and several other properties of the range set ([CMUOPERATION_i\[3:0\]](#) OPNSSEL). The operations supported are clean, clean/invalidate, and invalidate. The write to set the operation register activates the range set. Once the range set is activated, software must not attempt to change any range set register.

[Figure 4-9](#) shows the relationship between the starting address and the length.

Figure 4-9. Start and Length of Range Set



Multiple range set may be programmed and will queue to execute. The programmer should not wait for previous range sets to complete before activating new range sets.

4.3.5.2.2 Parallelism and Pipelining

The CMU can pipeline requests, thus achieving faster throughput on the execution of a range set operation.

The `CMUCONFIGREG[10] DISABLEPIPELINING` bit forces the interface to the caches to issue a request to no more than one cache line at a time. Depending on the particular interface to the caches, operations can normally be pipelined several cache lines deep by issuing operations against additional cache lines before earlier cache line requests are complete. The disable pipelining feature causes the CMU to perform the operations serially. When disable pipelining is enabled, the accesses are sent as strongly ordered accesses; this ensures that accesses are not pipelined. This feature detects bad addresses that have been programmed in the CMU, because this address goes to the local interconnect block, which then detects the bad addresses. Setting disable pipelining makes the CMU ineffective. Therefore, disable pipelining must be used only for debug purposes when bad address programming is suspected.

In addition, the CMU can process more than one range-set operation in parallel. Multithreading can occur through time-multiplexing or pipelining the operation of more than one range operation so that they occur at least partially in parallel. The `CMUOPERATION_i[8] WAIT` bit indicates that this range operation must not be started until all previously activated operations complete (wait does not affect allocated operations, only activated operations). Thus, the WAIT bit prevents a range operation from being threaded in parallel with any range operation activated earlier.

4.3.5.2.3 Completion Handling

Completion of the handling of a range-set operation leaves it in completed state or error state. The completion handling option for a range set is programmed in the `CMUOPERATION_i[10:9] COMPLETION` bit field. No interrupt is sent if the `CMUCONFIGREG[8] INTEN` is set to 0.

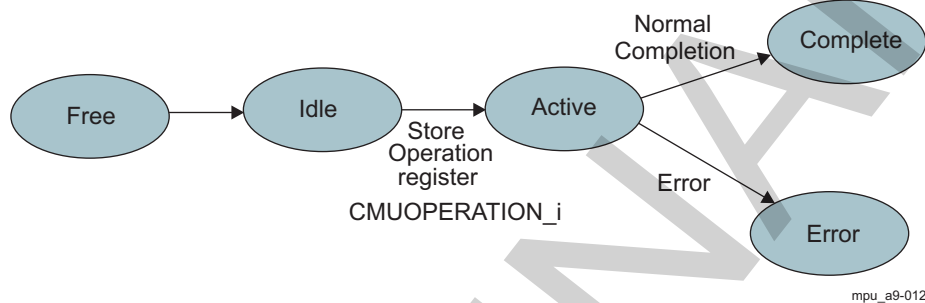
Anytime a normal or error completion generates an interrupt (or would, but `INTEN = 0`), the INDEX, ERROR, and VALID bits of the `CMUINTRACK` register of the range set is put into the interrupt index queue of the CMU FIFO. If the FIFO is already full and `INTEN = 1`, the CMU suspends the processing of range sets until the completion can be recorded in the range set. If the FIFO is already full and `INTEN = 0`, the newest completion is lost and not recorded in the FIFO.

Normal completion is not signaled until any writes generated by clean operations have reached the point where they can be seen by all masters in the device, usually the main memory.

Figure 4-10 shows the states a range set can take:

- Free: Range set is available.
- Idle: Range set has been allocated or reserved by software, but not yet activated.
- Active: Range set has been activated.
- Complete: Range set completed normally.
- Error: Range set completed with an error.

Figure 4-10. Range Set States



4.3.5.2.4 Allocation

To allocate a range set, software reads the allocation register ([CMUALLOCATE](#)). This register returns the index of a free range set (in free state). If there are no free range sets, the register returns with the NONE bit set ([CMUALLOCATE](#)[31] NONE = 0x1). The range set that is allocated is moved to idle state and is not available for allocation.

To return a range set to free state, software that has processed the completion must write the range set index to the deallocation register ([CMUDEALLOCATE](#)[7:0] INDEX). If software does not deallocate range sets, the pool of free range sets is exhausted and allocation fails.

This allocation and deallocation scheme places all mutual exclusion into the allocation hardware where it can be made atomic.

The number of allocations is the total number of range sets minus 8.

4.3.5.3 Address Sequence Generation

The CMU generates a sequence of addresses according to the programmed quantities in a range set. The addresses generated are always aligned to the LINESTEP size.

Because the length register ([CMULENGTH_i](#)) encodes the range length (1 byte), the minimum length that can be encoded is 1 byte (encoded as 0 in the length field: [CMULENGTH_i](#)[11:0] LEN = 0x0).

The first address issued is always the StartingPA ([CMUSTARTPA_i](#)[31:0] STARTPA) aligned to the beginning of the cache line.

After each cache line step, the working address is incremented by the LINESTEP size (32 bytes). If the new working address is greater than [CMUSTARTPA_i](#) + [CMULENGTH_i](#), the operation is complete. Otherwise, the operation is performed using the new working address and execution loops to perform the next cache line step.

4.3.5.4 Using the CMU

To use the CMU:

1. Allocate a range set.
2. Store StartPA and length.
3. Activate by storing the operation register.

4. Monitor for completion through an interrupt (preferred) or polling.
5. Free range set.

[Section 4.3.5.4.6](#) explains how to use the CMU with paged memory so that a single buffer can span the divide between pages and large buffers that are more than 4KB in length.

NOTE: It is important to follow the previous sequence. Otherwise, interconnect response errors can occur. For example, trying to free a range set before it completes (with or without error) can lead to an interconnect response error. Writing to a range that is not free (which is really IDLE, because free goes to IDLE after successful allocation) also leads to interconnect response errors.

It is not necessary to enable interrupts on all range sets. For example, if five ranges are enabled, then interrupt can be enabled for only the last range set (assuming range sets 0, 1, 2, 3, and 4 were activated in that order [0 first, 1 next, etc.]). Then, when interrupt is enabled for range set 4, range sets 0, 1, 2, and 3 are assured to be complete. However, it is still recommended to read the status of range sets 0, 1, 2, and 3 to ensure they are complete and without errors, before concluding that range sets 0 to 4 are complete.

4.3.5.4.1 Allocating a Range Set

Software may attempt to allocate a range set by reading from the CMU allocation register ([CMUALLOCATE](#)). If the returned value is positive, it is the index of a range set that has been allocated by this read. The allocated range set is not eligible for allocation again until it is freed. The allocation register makes mutual exclusion unnecessary for choosing and programming a range set.

If the value returned by the allocation register is 1 (the [CMUALLOCATE](#)[31] NONE bit), no range set can be allocated. Software must wait to allow processing that can free a range set to complete before retrying the allocation.

The number of allocations is 56.

4.3.5.4.2 Storing Starting Physical Address and Length

The first store into a range set must be to the [CMUSTARTPA_i](#)[31:0] STARTPA bit field.

The STARTPA is the lowest physical address in the range (the smallest value in unsigned arithmetic). It is a 32-bit byte address. There are no address alignment constraints because the range walker masks the generated addresses so that each cache operation is performed to the lowest address in a cache line.

The [CMULENGTH_i](#)[11:0] LEN bit field is defined to be the difference between the STARTPA and the byte of the range with the highest value (using unsigned arithmetic). This is the size of the range minus 1. The byte addressed by STARTPA + LEN is within the range. The largest range size is 4KB.

4.3.5.4.3 Activate the Range Set by Storing the Operation Register

A range set is activated when its operation register is stored. This register is programmed with the cache operation ([CMUOPERATION_i](#)), whether to interrupt on completion, and other controls.

The registers of a range set are not writable unless they are in IDLE state. This must be enforced in software; otherwise, an interconnect response error occurs.

A range set cannot be deallocated unless it is in COMPLETE or ERROR state. This also must be enforced in software; otherwise, an interconnect response error occurs.

4.3.5.4.4 Monitoring Completion

Two ways to monitor for completion are:

- Polling: To monitor for completion with polling, the status register **CMUSTATUSREG[0]** BUSY can be read to determine whether any range sets are still in operation, if wanting to wait for all range sets to complete, or poll the **CMURANGESTATE_i[31:29]** STATE bit field to watch for a particular range set to move to COMPLETE or ERROR state. These states indicate that the range operation completed normally or stopped because of an error, respectively.
- Interrupt: To monitor for completion with interrupt, the **CMUOPERATION_i[10:9]** COMPLETION bit field must be set to interrupt on completion. The interrupt handler must read the **CMUINTRACK_NS[11:0]** INDEX bit field to get the range set index of the interrupt-generating cache operation. The status of the completed operation can be read from the range set, particularly the **CMURANGESTATE_i[31:29]** STATE bit field.

4.3.5.4.5 Freeing a Range Set

When a range set operation completes and software is done examining the completion information, the range set must be freed to allow it to be reallocated. To free a range set, write its index to the **CMUDEALLOCATE[7:0]** INDEX bit field.

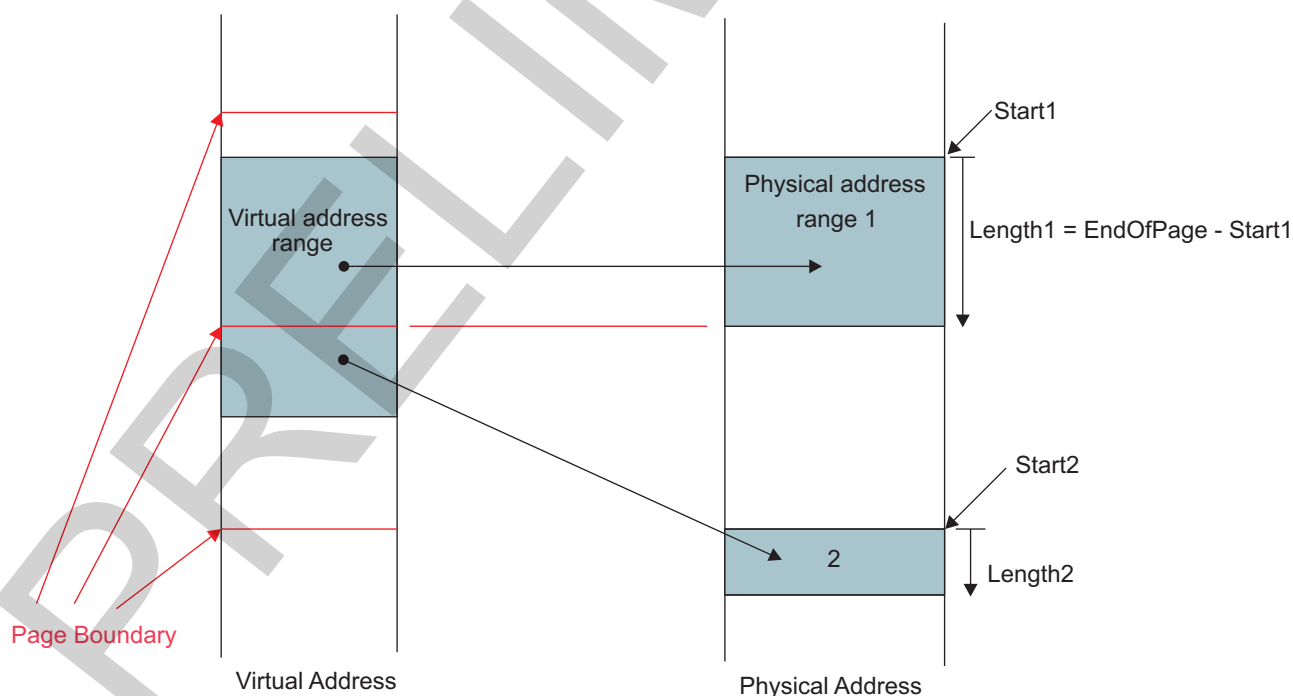
4.3.5.4.6 Paged Memory

Any range more than 1-byte long may span a page boundary. The page mappings for contiguous virtual memory pages may not be contiguous in physical memory. Ranges must end when a page boundary is encountered so each page of the range can be translated separately to physical memory. The software must perform the page mapping (possibly using ARM CP15 operations for that purpose) to produce the physical address needed to program the CMU.

In a paged environment, even a small buffer may cross a page boundary and require two range operations to cover the two parts of the buffer. Two range sets must be used to program the two ranges, each wholly contained within a page.

Figure 4-11 shows this scenario.

Figure 4-11. Range in Paged Virtual Memory



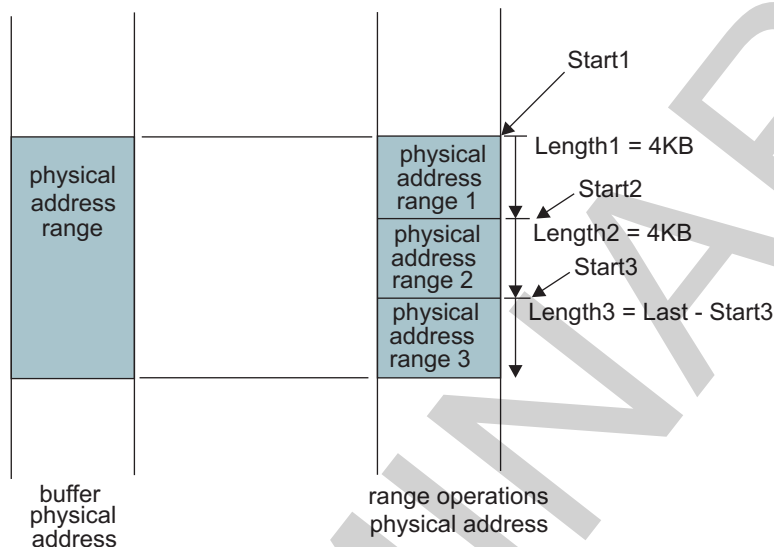
mpu_a9-016

4.3.5.4.7 Large Buffers

Even when a buffer is contiguous in physical memory it may be large enough that it cannot be contained within a range set, because the length is restricted to 4KB.

Figure 4-12 shows the large buffer in physical memory.

Figure 4-12. Large Buffer in Physical Memory

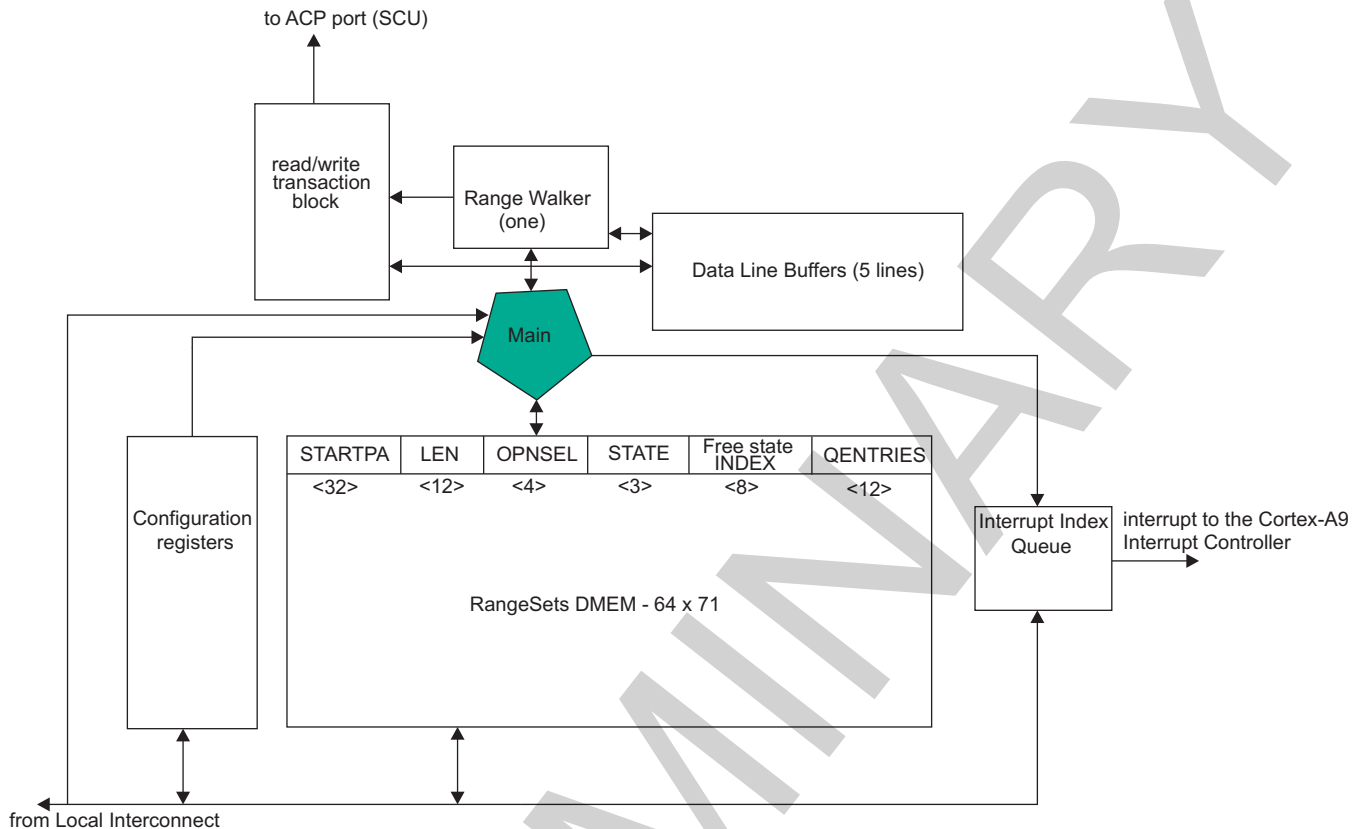


mpu_a9-013

4.3.5.5 Micro-Architecture of CMU

Different range sets can be activated by different masters; therefore, no assumptions must be made regarding the atomicity of range set register programming. The Start PA, length, and operation registers from multiple masters can be interleaved. Multiple range sets can be allocated to different masters and activation of them can be out of order.

Figure 4-13 shows the CMU micro-architecture.

Figure 4-13. CMU Micro-Architecture

mpu_a9-014

4.3.5.5.1 Range Set DMEM

This memory has 64 rows and each row is 71 bits wide.

4.3.5.5.2 Data Line Buffers

The data line buffers hold the read data for the ACP reads that hit in L1 or L2 for clean/clean-invalidate operations. Each line is 32 bytes with a 64-bit interface from ACP. To maintain an optimal throughput, the Cortex-A9 MPU, which has a single range walker, needs at least four line buffers (five line buffers are available).

4.3.5.5.3 Range Walker

The range walker is the block that steps through line steps using STARTPA until reaching STARTPA + LEN. The range walker gets two indices from main control that it uses to access range sets DMEM to get STARTPA, LEN, etc., and then interacts with the read/write transaction block. This block issues ACP reads, ACP writes, etc. for the range.

4.3.5.5.4 Main Control

This is the main controller that coordinates between the various blocks and resolves arbitration conflicts for access to the DMEMs and maintains the free state indices and operation queue pointers.

4.3.5.5.5 Interrupt Index Queue

The Interrupt index queue holds the index of the range set whose operation register [CMUOPERATION_i](#) indicates "interrupt on completion." The size is constant and is four entries.

4.3.5.5.6 Configuration Registers

This block holds all the common configuration registers, such as [CMUALLOCATE](#), [CMUDEALLOCATE](#), and others.

4.3.5.5.7 Read/Write Transaction Block

This is the block that creates the read/write transactions from the range walker into SCU-compatible protocol.

4.3.5.6 Free Set Management, Operation Queue Functionality, and Main Control

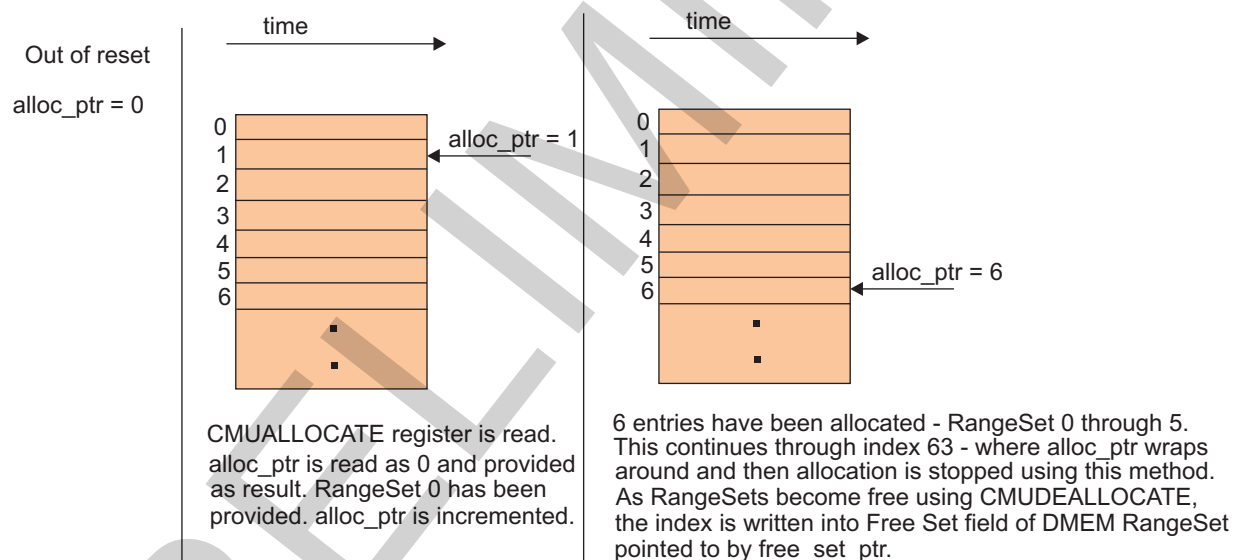
4.3.5.6.1 Allocation and Free Set Management

Using the CMU, the first step to enabling a range set is to read the [CMUALLOCATE](#) register. This returns the index of a range set that is in free state. Detecting a free range set is done in the following two ways.

4.3.5.6.1.1 Out of Reset

Two pointers are maintained in main control, `alloc_ptr` and `active_ptr`. Both are 0 out of reset. When the [CMUALLOCATE](#) register is read, the value of `alloc_ptr` is returned and then incremented. This continues until `alloc_ptr` wraps around, which happens when all 64 range sets have been allocated (see [Figure 4-14](#)).

Figure 4-14. Free Set Allocation out of Reset



mpu_a9-015

4.3.5.6.1.2 Steady State – Once `alloc_ptr` Has Wrapped Around

Once `alloc_ptr` has wrapped around, allocation cannot be based on the out-of-reset way. Allocations must be based on range sets that are free. Range sets can be activated in an order that differs from what was allocated. Software can program activations out of order with respect to allocations. This can happen naturally when there are multiple masters. When the [CMUDEALLOCATE](#) register is written, the index pointed to by the register contents is freed. This index is written into the free state INDEX field of the range set DMEM, as pointed to by `free_set_ptr`, which is then incremented (see [Figure 4-15](#)).

RangeSets
DMEM - 64 x 71

| STARTPA | LEN | OPNSEL | STATE | Free State INDEX | QENTRIES |
|---------|------|--------|-------|------------------|----------|
| <32> | <12> | <4> | <3> | <8> | <12> |
| | | | | 10 | |
| | | | | 20 | |
| | | | | 22 | |
| | | | | 0 | |
| | | | | 3 | |
| | | | | | |
| | | ▪ | | | |
| | | ▪ | | | |
| | | | | | |

alloc_ptr = 0

free_set_ptr = 5

If CMUALLOCATE is executed, index 10 is given using alloc_ptr, alloc_ptr is incremented - next index 20 pointed by alloc_ptr will be given etc.

mpu_a9-017

The check mark in each index indicates that the index has been allocated. Figure 4-15 shows a state where all 64 range sets have been allocated. Assume various range sets have been activated. Now, assume that range set 10 becomes free first when software writes to the **CMUDEALLOCATE** register with index 10. Index 10 is written into the Free State field as pointed to by `free_set_ptr`, which is 0 out of reset. Next, range sets 20, 22, 0, and 3 are freed. `free_set_ptr` points to entry 5 as the next entry to be updated when the **CMUDEALLOCATE** register is written. When a **CMUALLOCATE** register is read, the DMEM entry pointed to by `alloc_ptr` is read. The contents of the Free Set field are read (10 is returned to **CMUALLOCATE** register read). `alloc_ptr` is then incremented.

The operation queue stores the indices of the range sets that have been activated. When CMUOPERATION is stored that particular index is activated. The activated index is written into the operation queue (QENTRIES) field of DMEM RangeSets to the address pointed to by active_ptr, which is 0 out of reset (see [Figure 4-16](#)).

- The CMUCONFIGREG_i[10] DISABLEPIPELINING and CMUCONFIGREG_i[9] DISABLEPARALLEL bits must be set to 0. These come out of reset as 1, and if not set to 0, they serialize the operation of the CMU and reduce throughput significantly. Disable pipelining must be set to 0 for proper operation and should be used only when bad address programming is suspected; if this bit is set to 1, the CMU will not work.
- The CMUCONFIGREG_i register must be programmed at the beginning or when the CMU is idle. The CMUCONFIGREG_i[3] ENNSWR bit (enable NS write) must be set appropriately so that non-safe programs can write or not write to this register.
- All CMU writes must be done as device writes; otherwise, they are combined in the Cortex-A9 MPU and can become a burst write access, which the local interconnect does not have the logic to split.

NOTE: All interconnect write response errors are imprecise errors when writes are device writes, because they are a bufferable type in PL310. If precise errors are required, writes must be done as strongly ordered writes; however, these are slow and thus should be avoided. Because writes that encounter errors do not occur in the CMU, the effect of imprecise errors is that later instructions to the CMU that depend on earlier writes (that may have encountered an error) would have occurred. Because no such sequences are in the CMU, it should be okay to use device stores. Sequences do exist, however, where **CMUALLOCATE** read is done and if the read is successful, then a write to RangeSet occurs. However, **CMUALLOCATE** is a read followed by writes and read errors are always precise. **CMUDEALLOCATE** is a write that may not happen (because of a software error, such as trying to deallocate something that is not complete or if the NS = 1 program is trying to deallocate an NS = 0 RangeSet). Subsequent writes to range sets, however, are protected by a read in between by **CMUALLOCATE**.

- All CMU reads must be done as device reads.
- Writes to range sets must be done only when **CMUALLOCATE** read returns a valid range set (**CMUALLOCATE**); otherwise, an interconnect response error results.
- Writes to free a range set by a **DEALLOCATE** write must be done only after the status is examined to ensure that the range set is complete (with or without error); otherwise, an interconnect response error (**CMUDEALLOCATE**) results.
- It is preferable to use interrupt processing rather than polling to determine whether a range set is complete.

4.3.5.10 Notes on Corner Cases – Hardware and Software Notes

- When the ACP performs a read of a line, for example in L1, it uses that data to perform an ACP write for clean/clean-invalidate. If the CPU modifies the data between the ACP read and ACP write, the CPU write is lost. The ACP/CMU has no way to detect this. Semaphores must be used to ensure that the CMU clean/clean-invalidate is started only after the CPU updates the buffer.
- The Cortex-A9 CPUs support prefetching and speculative caching of data into L1 and L2 caches. While CMU operations are in progress, Cortex-A9 may prefetch the data back into L1 and L2 after it has been invalidated; this may be because addresses close to the invalidated range were touched by the CPU. An external master may have updated the address that has been invalidated and for the CPU to see the updated state, the speculatively filled address must be invalidated out of L1/L2. This can be done as an invalidation of the L1/L2 address range just before fetching the updated buffer. Care should be taken to ensure that the CPU is not working on addresses being operated on the CMU.
- CMU data is always dirty; therefore, when data is clean in L1/L2, it still is written to external memory because the CMU data looks like the most recent write to dirty the clean data in L1/L2. Therefore, software must not attempt to start the consumer to consume the data until after the CMU operation has completed a clean or clean-invalidate range.
- Because all of the bytes of the cache lines at the beginning and end of a range are affected by cache maintenance, software must insure that this does not cause unintended effects. The most general solution is to allocate buffers that may be subject to cache maintenance so that they are aligned to a cache line boundary (32 bytes on this device, but for compatibility with old and future devices, 64-byte alignment is suggested). This will prevent unrelated data from sharing a cache line with the beginning of the buffer. In addition, the end of the buffer allocation should also be padded to a cache line

boundary so that no unrelated data shares the final cache line of the buffer.

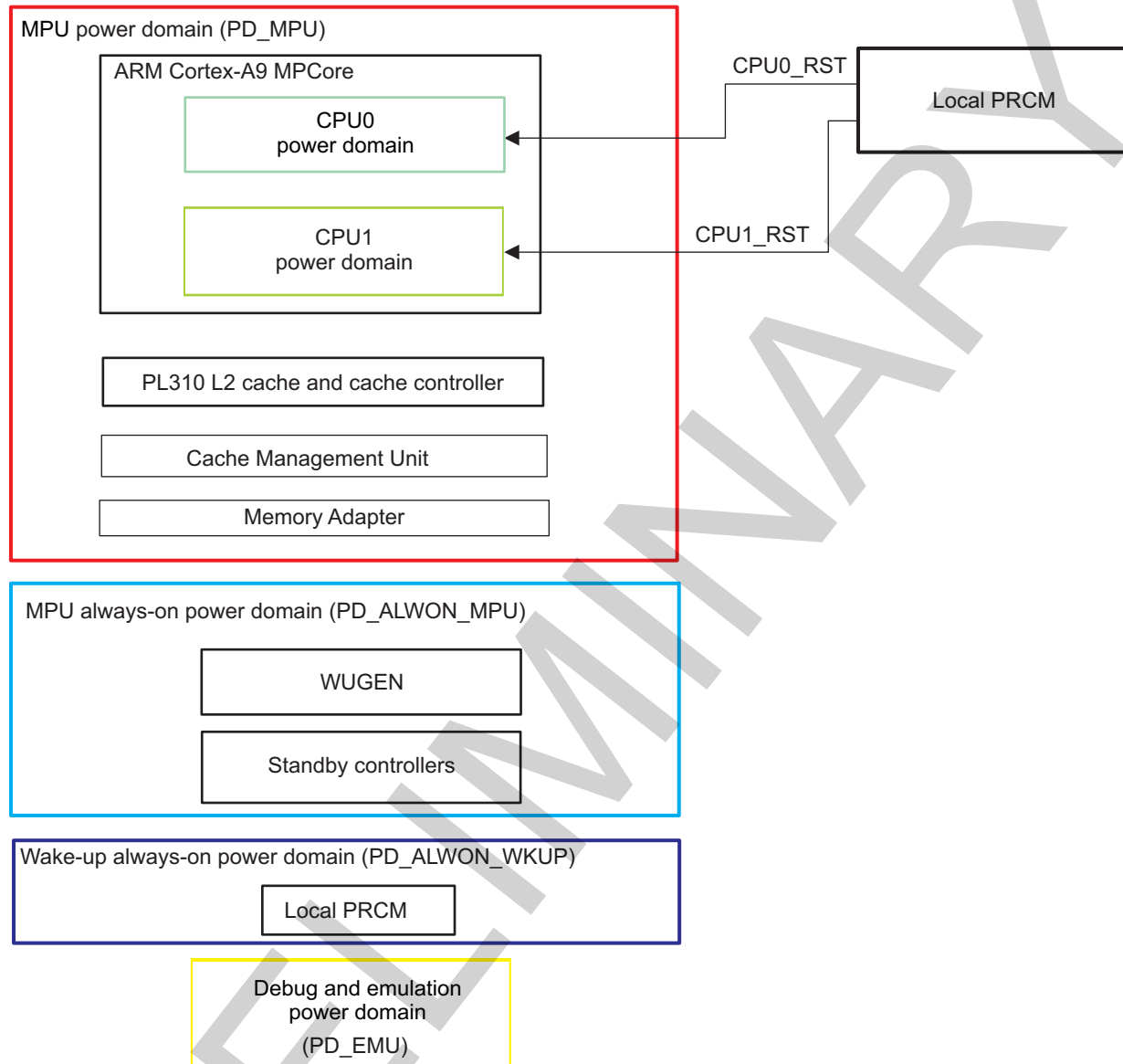
- The CMU does not handle wrap-around from a high physical address to a low physical address. Software must not program a CMU range set with a starting address and length that exceeds $2^{32} - 1$. Such a range must be broken into parts so that no single range set is programmed to cross this boundary.

4.3.6 Power Management

- The Cortex-A9 MPU subsystem implemented a local PRCM module to handle the local CPU power domain.
- Support cache retention
- The Cortex-A9 MPU subsystem has six power domains.
- The local PRCM module handles the power management in conjunction with the global PRCM. The local PRCM module has its own registers and is clocked by the system clock, which is the same as the global PRCM.

4.3.6.1 Power Domains

The Cortex-A9 MPU subsystem is divided into six power domains controlled by the local or global PRCM module, as shown in [Figure 4-17](#).

Figure 4-17. Cortex-A9 MPU Subsystem Power Domain Overview

mpu_a9-005

The CPU power domains (CPU0 and CPU1) and L1 cache are controlled by the local PRCM module. The system and emulation power domains (PD_MPU and PD_EMU) are controlled by the global PRCM. The power-management support for debug and emulation is distributed between the local and global PRCM modules.

The Cortex-A9 local PRCM module includes two PSCON modules to control the power chains for CPU0 and CPU1. The [PRM_PSCON_COUNT](#) register is used for that control purpose.

To maximize performance and SMP scalability, both CPUs must run at the same frequency. Do not lower the frequency of one CPU as a power-saving option.

The device-level power domains are directly aligned with voltage domains and thus can be represented as a cross-reference to the different voltage domains.

For information about the physical power domains (PD_MPU, PD_EMU, and PD_ALWON_MPU) and the related voltage domains, see [Chapter 3, Power, Reset, and Clock Management](#).

4.3.6.2 Power States of CPU0 and CPU1

CPU_x (where x = 0 or 1) changes power states only when the StandbyWFI signal is asserted. The user can check this in the [WKG_CONTROL_0/WKG_CONTROL_1](#)[8] STANDBYWFI bit. In conjunction with StandbyWFI, the CPU power state transition is also based on the SCU CPU Power Status register, which software must program before executing the wait for interrupt (WFI) instruction.

Each CPU clock can be gated independently. This clock gating is controlled by several hardware and software conditions.

Clock transition depends on the StandbyWFI assertion + the value of 3 bit fields:

- PWRCTLO from the SCU power status register (internal to ARM)
- CLKTRCTRL from the [CM_PDA_CPUi_CLKSTCTRL](#) register (local PRCM module)
- POWERSTATE from the [PM_PDA_CPUi_PWRSTCTRL](#) register (local PRCM module)

The power states of both CPUs do not have to be the same. The power state of CPU_x can be:

- Normal (run) mode
- Dormant mode
- Power-off mode

[Table 4-5](#) gives details of the power state of the supported CPU_x and the corresponding values of the local PRCM register.

Table 4-5. CPU_x Supported Power States

| Hardware Conditions | | CPU _x Programming Model | | | | Resulting CPU _x State | | | |
|--|--|--|--|---|--|----------------------------------|-------------|---|------------------------------------|
| StandbyWFI StandbyWFE | SCU CPU _x Power Status | Local PRCM Power State PM_PDA_CPUi_PWRSTCTRL [1:0] POWERSTATE | Local PRCM Logic Retention State PM_PDA_CPUi_PWRSTCTRL [2] LOGICRETSTA TE | Local PRCM L1 Cache Memory Retention State PM_PDA_CPUi_PWRSTCTRL [8] L1_BANK_RET STATE | Local PRCM Clock Transition Control CM_PDA_CPUi_CLKSTCTRL [1:0] CLKTRCTRL | Logic | L1 Cache | ARM Cortex- A9 Internal Clock Gating | Power State at Local PRCM |
| CPU _x running ⁽¹⁾ | Any | Any | Any | Any | Any | ON | ON | ON | ON |
| CPU _x in WFE ⁽²⁾ | Any | Any | Any | Any | Any | ON | ON | OFF | ON |
| CPU _x in WFI | Normal | Any | Any | Any | NO_SLEEP/SW _WKUP | ON | ON | OFF | ON |
| | | ON | Any | Any | HW_AUTO | ON | ON | OFF | ON |
| | | INACTIVE | Any | Any | HW_AUTO | ON | ON | OFF | INACTIV E |
| CPU _x in WFI | Dorman t | RETENTION | Open switch retention (OSW) | RETENTION | HW_AUTO | OFF | RET | OFF | Open switch retention |
| CPU _x in WFI | Power off | OFF | Any | Any | HW_AUTO | OFF | OFF | OFF | OFF |

⁽¹⁾ When CPU_x is running, no power transition is possible.

⁽²⁾ When CPU_x is in WFE mode, no power transition is possible.

The [PM_PDA_CPUi_PWRSTCTRL](#) register is static over any power transition. That is, software programs it before executing the WFI instruction and does not change it until CPU_x is again in running mode. In other words, when CPU_x reaches a low-power state (DORMANT, POWER OFF), it cannot move to another low-power state. It must be woken up to reach another low-power state. To wake up CPU_x, the user must:

1. Execute a forced wake-up transition to the CPU_x: [CM_PDA_CPUx_CLKSTCTRL](#)[1:0] CLKTRCTRL = 0x2.
2. The CPU_x interrupt handler must set back the automatic hardware transition [CM_PDA_CPUx_CLKSTCTRL](#)[1:0] CLKTRCTRL = 0x3.

The MPU subsystem power domain (PD_MPU) must be at a higher or equal power state (state that consumes more power) than the higher of the two CPUs. For example, it is illegal for the MPU subsystem power state to be OFF, while the power state of one or both of the CPUs is DORMANT. Software must ensure that only legal power states are programmed. When an illegal state is entered, the behavior of the hardware is unpredictable. Do not program the Cortex-A9 MPU in CSWRET, L2\$ in OFF, or either or both CPUs in CSWRET.

For coherency, software must ensure that both CPUs are in the Running/ON or WFI/ON state.

Table 4-6 lists the available CPU power states in single and coherency mode.

Table 4-6. Available CPU Power States in Single and Coherency Mode

| CPU0 Power State | CPU1 Power State | Mode |
|----------------------|----------------------|---|
| Running/ON or WFI/ON | Running/ON or WFI/ON | SMP mode (coherent mode) |
| Running/ON or WFI/ON | OFF | Single mode (CPU1 is out of coherency) |
| WFI/INACT | OFF | |
| WFI/OSWRET | OFF | |
| WFI/OFF | OFF | |

Table 4-7 lists the MPU power states handled by the local and global PRCM.

Table 4-7. MPU Power States Handled by the Local and Global (Device) PRCM Modules

| CPU State at Local PRCM | PRCM Power State | Logic Retention State | L2 Cache Memory Retention State | PRCM Clock Control | Logic Resulting State | L2 Cache Memory Resulting State | DPLL Clock | MPU Power State at PRCM |
|--|------------------|-----------------------|---------------------------------|--------------------------|-----------------------|---------------------------------|------------|-------------------------|
| At least one is ON | Any | Any | Any | Any | ON | ON | ON | ON |
| Power state of both CPUs is less than or equal to OSWRET | Any | Any | Any | No sleep/software wakeup | ON | ON | ON | ON |
| | ON | Any | Any | Hardware auto | ON | ON | ON | ON |
| | INACTIVE | Any | Any | Hardware auto | ON | ON | OFF | INACTIVE |
| | RETENTION | CSW | RETENTION | Hardware auto | ON | RETENTION | OFF | CSWRET |
| Power state of both CPUs is less than or equal to OSWRET | RETENTION | OSW | RETENTION | Hardware auto | OFF | RETENTION | OFF | OSWRET |
| | RETENTION | OSW | OFF | Hardware auto | OFF | OFF | OFF | OSWRET |
| Power state of both CPUs is OFF | OFF | Any | Any | Hardware auto | OFF | OFF | OFF | OFF |

WFI: State where logic is closed switch, memory is ON, and clock is gated off

DORMANT (for CPU0 or CPU1): State where logic is in opened or closed switch (depending on programming value), memory is in RETENTION, and clock is gated off

ON/OFF (for system logic): State where logic is in opened or closed switch, depending on whether the higher of the two CPU power states is opened or closed switch. For example, if CPU0 is in opened switch dormant mode and CPU1 is in closed switch dormant mode, system logic must be closed switch.

When the Cortex-A9 MPU reaches a low-power state (INACT, CSWRET, OSWRET, OFF), it cannot move to another low-power state. It must be woken up to reach another low-power state.

For the CPU0 and CPU1 power states and power state transitions, see the ARM Cortex-A9 MPCore TRM.

4.3.6.3 WUGEN

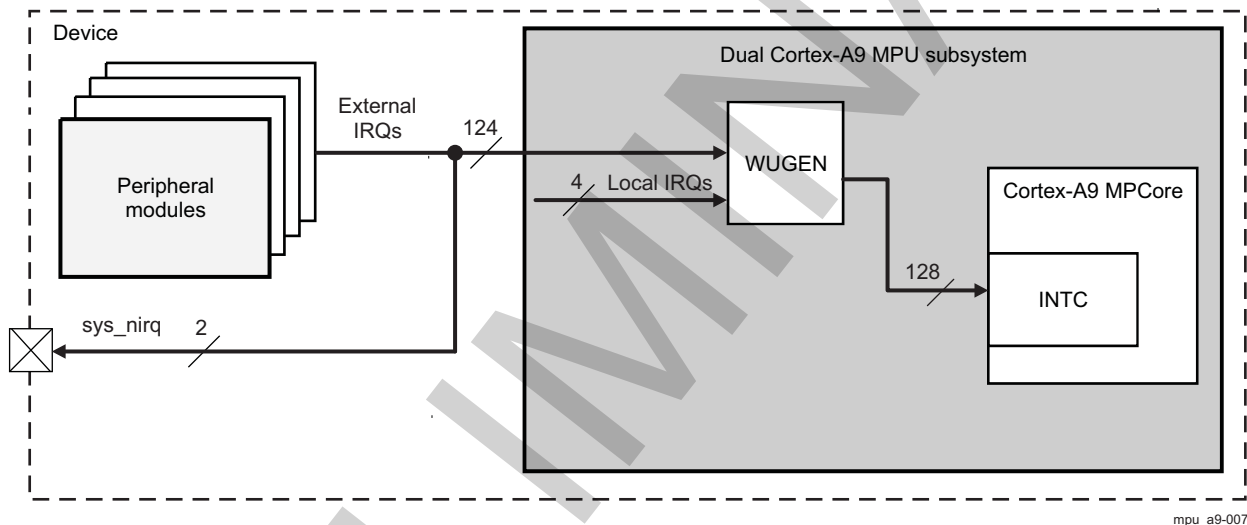
The WUGEN belongs to the MPU always-on power domain (PD_ALWON_MPU) and is responsible for generating wake-up events from the incoming interrupts (external and local) according to the enabled bits in the WUGEN registers.

The WUGEN unit has a 128-bit enable field (from [WKG_ENB_A_0](#) to [WKG_ENB_D_0](#) for CPU0 and from [WKG_ENB_A_1](#) to [WKG_ENB_D_1](#) for CPU1) which defines the interrupt that wakes up the corresponding CPU. The enable bits are reset to 0 and can be set to 1 to enable the interrupt to wake up the CPU. All interrupts are enabled after reset, except MA_IRQ_8 (which is not supported by the GP device). The Cortex-A9 MPU can access the WUGEN internal configuration registers through the local interconnect.

Software must program interrupt enabling and disabling coherently in the INTC and in the WUGEN enable registers. That is, a given interrupt for a given CPU is either enabled at both INTC and WUGEN, or disabled at both; no combination is allowed.

Figure 4-18 is a functional overview of the WUGEN in the Cortex-A9 MPU subsystem.

Figure 4-18. Cortex-A9 MPU Subsystem WUGEN



mpu_a9-007

4.3.6.4 Power Transition Sequence

The three types of power transition sequences are:

- Power transitions that do not involve the local or global PRCM module

When the CPU enters WFI state, provided the CPU power is not shut down or the DPLL is not gated off, the Cortex-A9 internally gates off the CPU clock and no action is required by local or global PRCM module. When an (enabled) interrupt is received, the Cortex-A9 exits WFI state.

- Power transitions handled by the local PRCM module

When the CPU enters DORMANT or OFF states, the local PRCM module must participate to perform the power sequencing. If the system power domain remains ON and the DPLL is not gated off, the global PRCM module is not needed. To enable and control the CPU domain power mode transitions, write in the [CM_PDA_CPUi_CLKCTRL\[1:0\]](#) CLKTRCTRL bit field.

- Power transitions handled by the local and global PRCM modules

When the CPU enters a power state that causes the system power domain to go into WFI, DORMANT, or OFF state, the local and global PRCM modules must be involved in the power transition.

4.3.6.5 CPU0 and CPU1 Power Domains Description

The PD_CPUx (where x = 1 or 2) contains the following reset domains:

- CPU0_RST

- CPU0_PWRON_RST
- CPU1_RST
- CPU1_PWRON_RST

The PD_CPUx contains the following clock domains:

- CD_CPU0
- CD_CPU1

Table 4-8 lists the logic retention capability for each module of the PD_CPUx.

Table 4-8. PD_CPUx Modules Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|--------|-----------------|---|--------------------|
| CPUx | No | RM_PDA_CPUi_CONTEXT[0] LOSTCONTEXT_DFF | None |

The DFF-based logic is nonretention flip flop. For more information, see [Chapter 3, Power, Reset, and Clock Management](#).

4.3.6.5.1 Power Domain Modes

This section describes the various power modes supported by the logic and memory areas of the power domain. It also identifies the software control and associated status bit fields. For a functional description of the power-management architecture of a generic power domain, see [Power Domain](#), in [Chapter 3, Power, Reset, and Clock Management](#).

4.3.6.5.1.1 Logic and Memory Area Power Modes

Table 4-9 lists the power modes supported by the logic area of the power domain.

Table 4-9. PD_CPUx Logic Area Power Modes

| OFF | RETENTION-OSWR | RETENTION-CSWR | ON-INACTIVE | ON-ACTIVE |
|-----------|----------------|----------------|-------------|-----------|
| Available | Available | Available | Available | Available |

Table 4-10 lists the power modes supported by the memory area of the power domain. A memory area power mode is identified with respect to a power state of the power domain. The Logic ON, Logic RETENTION, and Logic OFF columns identify the power states of the power domain. The values in these columns identify the supported power state of the memory area (see the Memory Bank column) or the module memory inside the memory area (see the Module – Memory column).

Table 4-10. PD_CPUx Memory Area Power Modes

| Memory Bank | Module – Memory | Logic ON | Logic RETENTION | Logic OFF |
|-------------|-----------------|-----------|------------------|-----------|
| CPU0_L1 | | ON | OFF, RETENTION | OFF |
| | CPU0–CPU0_L1 | always_on | software_control | |
| CPU1_L1 | | ON | OFF, RETENTION | OFF |
| | CPU1–CPU1_L1 | always_on | software_control | |

4.3.6.5.1.2 Logic and Memory Area Power Modes Control and Status

Table 4-11 lists the power mode controls for the power domain.

Table 4-11. PD_CPUx Power Mode Control Parameters

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|---|-------------|---|-------------|
| Memory Area – State Control (Logic in RETENTION state) | CPUx_L1 | PM_PDA_CPUi_PWRSTCTRL[8] L1_BANK_RETSTATE | Read only |

Table 4-11. PD_CPUx Power Mode Control Parameters (continued)

| Parameter Name | Memory Bank | Control Bit Field | Access Type |
|--|-------------|---|-------------|
| Memory Area – State Control (Logic in ON state) | CPUx_L1 | PM_PDA_CPUi_PWRSTCTRL [17:16] L1_BANK_ONSTATE | Read only |
| Logic Area – Retention State Control | | PM_PDA_CPUi_PWRSTCTRL [2] LOGICRETSTATE | Read/write |
| Power Domain – State Transition Control | | PM_PDA_CPUi_PWRSTCTRL [1:0] POWERSTATE | Read/write |

[Table 4-12](#) lists the status of the power modes for the power domain.

Table 4-12. PD_CPUx Power Mode Status Parameters

| Parameter Name | Memory Bank | Status Bit Field |
|--|-------------|---|
| Memory Area – State Status | CPUx_L1 | PM_PDA_CPUi_PWRSTST [5:4] L1_BANK_STATEST |
| Power Domain – State Transition Status | | PM_PDA_CPUi_PWRSTST [20] INTRANSITION |
| Logic Area – State Status | | PM_PDA_CPUi_PWRSTST [2] LOGICSTATEST |
| Power Domain – State Status | | PM_PDA_CPUi_PWRSTST [1:0] POWERSTATEST |

[Table 4-13](#) lists the supported clock-management modes and the associated software control bit fields for each module of the power domain.

Table 4-13. Module Clock Management Modes and Control

| Module | Clock Management Protocol | Status Bit Field | Role |
|--------|---------------------------|--|----------------|
| CPUx | Master/Slave | CM_PDA_CPUi_CLKCTRL [0] STBYST | Standby status |

[Table 4-14](#) lists the supported clock-management modes and associated software control bit fields for each module of the power domain.

Table 4-14. Module Slave Clock Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|--------|----------|-----------|---------|--|-------------|
| CPUx | n/a | Available | n/a | CM_PDA_CPUi_CLKSTCTRL [1:0] MODULEMODE | Read/write |

4.4 Dual Cortex-A9 MPU Subsystem Register Manual

4.4.1 Cortex-A9 MPU Subsystem Instance Summary

Table 4-15. Cortex-A9 MPU Instance Summary

| Module Name | Base Address | Size |
|-------------------------------------|--------------|-----------|
| SCU | 0x4824 0000 | 128 bytes |
| GIC_Proc_Interface ⁽¹⁾ | 0x4824 0100 | 256 bytes |
| Timer | 0x4824 0600 | 256 bytes |
| GIC_Intr_Distributor ⁽²⁾ | 0x4824 1000 | 4KB |
| PL310 | 0x4824 2000 | 4KB |
| CORTEXA9_SOCKET_PRCM | 0x4824 3000 | 512 bytes |
| CORTEXA9_PRCM | 0x4824 3200 | 512 bytes |
| CORTEXA9_CPU0 | 0x4824 3400 | 1KB |
| CORTEXA9_CPU1 | 0x4824 3800 | 1KB |
| CORTEXA9_WUGEN | 0x4828 1000 | 4KB |
| CMU | 0x4829 0000 | 64KB |
| Local interconnect | 0x482A 0000 | 4KB |
| MA | 0x482A F000 | 4KB |

⁽¹⁾ Processor interfaces: Handles interrupt acknowledgment, interrupt masking, and interrupt completion acknowledgment

⁽²⁾ Interrupt distributor: Handles interrupt detection, interrupt prioritization, and distribution of interrupts to the CPUs

4.4.2 SCU Registers

For information about the SCU registers and their description, see the ARM® Cortex™-A9 MPCore Technical Reference Manual .

4.4.3 Interrupt Controller Registers

For information about the GIC registers and their description, see the ARM® Cortex™-A9 MPCore Technical Reference Manual .

4.4.4 Timer Registers

For information about the timer registers and their description, see the ARM® Cortex™-A9 MPCore Technical Reference Manual .

4.4.5 PL310 Registers

For information about the PL310 registers and their description, see the ARM® PL310 Cache Controller Technical Reference Manual .

4.4.6 Local PRCM Revision Register

4.4.6.1 Local PRCM Revision Register Summary

Table 4-16. Local PRCM Revision Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CORTEXA9_SOCKET_P RCM Base Address |
|--|------|-----------------------|----------------|---------------------------------------|
| CORTEXA9_PRCM_REVISION | R | 32 | 0x0 | 0x4824 3000 |

4.4.6.2 Local PRCM Revision Register Description

Table 4-17. CORTEXA9_PRCM_REVISION

| | | | |
|------------------|----------------------|----------|----------------------|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4824 3000 | Instance | CORTEXA9_SOCKET_PRCM |
| Description | IP Revision register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP revision | R | TI internal data |

Table 4-18. Register Call Summary for Register CORTEXA9_PRCM_REVISION

Dual Cortex-A9 MPU Subsystem Register Manual

- Local PRCM Revision Register Summary: [0]

4.4.7 Local PRCM Registers

4.4.7.1 Local PRCM Register Summary

Table 4-19. Local PRCM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CORTEXA9_PRM Base Address |
|-----------------|------|-----------------------|----------------|---------------------------|
| PRM_RSTST | RW | 32 | 0x0000 0000 | 0x4824 3200 |
| PRM_PSCON_COUNT | RW | 32 | 0x0000 0004 | 0x4824 3204 |

4.4.7.2 Local PRCM Log Register Description

Table 4-20. PRM RSTST

| | |
|-------------------------|---|
| Address Offset | 0x0000 0000 |
| Physical Address | 0x4824 3200 |
| Instance | CORTXA9_PRM |
| Description | This register logs the global reset sources, thus contains information regarding the cold/warm reset events generated by global PRCM. Each bit is set upon release of the domain reset signal. Must be cleared by software. |
| Type | RW (W1toClr - write 0x1 to clear the bit) |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------|-----------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | GLOBAL_WARM_RST | GLOBAL_COLD_RST | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1 | GLOBAL_WARM_RST | Global warm reset event generated by Global PRCM 0x0: No global warm reset. 0x1: Global external warm reset has occurred. | RW W1toClr | 0 |
| 0 | GLOBAL_COLD_RST | Power-on (cold) reset event generated by global PRCM 0x0: No power-on reset. 0x1: Power-on reset has occurred. | RW W1toClr | 1 |

Table 4-21. Register Call Summary for Register PRM_RSTST

Dual Cortex-A9 MPU Subsystem Integration

- [Reset Distribution: \[0\] \[1\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [Local PRCM Register Summary: \[2\]](#)

Table 4-22. PRM_PSCON_COUNT

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 0004 | Instance | CORTEXA9_PRM |
| Physical Address | 0x4824 3204 | | |
| Description | Programmable Precharge count for L1Cache. This register is useful to ensure the correct delay between toggles of pscn lines and therefore to avoid Any problem of power switch transitions. The register corresponds to the number of device system clock cycles for the SRAM precharge duration. It means that the local PRCM module waits for PCHARGE_TIME cycles of system clock. The pscn modules belongs to the local PRCM modules and are used to control the power of the CPUx. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SPAREUSED | | | | | | | | SPARE | | | | | | | | PCHARGE_TIME | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|---------|
| 31:28 | SPAREUSED | 4 bits consumed for Last Power State Entered | R | 0x0 |
| 27:8 | SPARE | Spare programmable bits | RW | 0x00000 |
| 7:0 | PCHARGE_TIME | Programmable Precharge count during retention | RW | 0x17 |

Table 4-23. Register Call Summary for Register PRM_PSCON_COUNT

Dual Cortex-A9 MPU Subsystem Functional Description

- [Power Domains: \[0\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [Local PRCM Register Summary: \[1\]](#)

4.4.8 Local PRCM CPU0 and CPU1 Registers

4.4.8.1 Local PRCM CPU0 and CPU1 Register Summary

Table 4-24. Local PRCM CPU0 and CPU1 Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CORTEXA9_CPU0 Base Address | CORTEXA9_CPU1 Base Address |
|--|------|-----------------------|----------------|----------------------------|----------------------------|
| PM_PDA_CPUi_PWRSTCTRL ⁽¹⁾ | RW | 32 | 0x0000 0000 | 0x4824 3400 | 0x4824 3800 |
| PM_PDA_CPUi_PWRSTST ⁽¹⁾ | RW | 32 | 0x0000 0004 | 0x4824 3404 | 0x4824 3804 |

Table 4-24. Local PRCM CPU0 and CPU1 Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | CORTEXA9_CPU0 Base Address | CORTEXA9_CPU1 Base Address |
|--------------------------------------|------|-----------------------|----------------|----------------------------|----------------------------|
| RM_PDA_CPUi_CONTEXT ⁽¹⁾ | RW | 32 | 0x0000 0008 | 0x4824 3408 | 0x4824 3808 |
| RM_PDA_CPUi_RSTCTRL ⁽¹⁾ | RW | 32 | 0x0000 000C | 0x4824 340C | 0x4824 380C |
| RESERVED | R | 32 | 0x0000 0010 | 0x4824 3410 | 0x4824 3810 |
| CM_PDA_CPUi_CLKCTRL ⁽¹⁾ | R | 32 | 0x0000 0014 | 0x4824 3414 | 0x4824 3814 |
| CM_PDA_CPUi_CLKSTCTRL ⁽¹⁾ | RW | 32 | 0x0000 0018 | 0x4824 3418 | 0x4824 3818 |

(1) I = 0 or 1

4.4.8.2 Local PRCM CPU0 Register Description

Table 4-25. PM_PDA_CPUi_PWRSTCTRL

| | | | |
|-------------------------|---|-----------------|--------------------------------|
| Address Offset | 0x0000 0000 | Index | I = 0 to 1 |
| Physical Address | 0x4824 3400 0x4824 3800 | Instance | CORTEXA9_CPU0 CORTEXA9_CPU1 |
| Description | This register controls the CPU domain power state to reach upon a domain sleep transition | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----------|----|----|----|----|----|----|---|------------------|----------|---|---|---|---|---|---|---------------|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | L1_BANK_ONSTATE | RESERVED | | | | | | | | L1_BANK_RETSTATE | RESERVED | | | | | | | LOGICRETSTATE | POWERSTATE |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|--------|
| 31:18 | RESERVED | Reserved | R | 0x0000 |
| 17:16 | L1_BANK_ONSTATE | CPU_L1 memory state when domain is ON. Read 0x3: Memory bank is on when the domain is ON. | R | 0x3 |
| 15:9 | RESERVED | Reserved | R | 0x00 |
| 8 | L1_BANK_RETSTATE | CPU L1 memory state when domain is RETENTION state. Read 0x1: Memory bank is retained when domain is in RETENTION state. | R | 1 |
| 7:3 | RESERVED | Reserved | R | 0x0 |
| 2 | LOGICRETSTATE | Logic state control when power domain is RETENTION 0x0: All CPU logic is off when the domain is in RETENTION state. 0x1: Whole logic is retained when domain is in RETENTION state. | RW | 1 |
| 1:0 | POWERSTATE | Power state control 0x0: OFF state 0x1: RETENTION state 0x2: INACTIVE state 0x3: ON State | RW | 0x2 |

Table 4-26. Register Call Summary for Register PM_PDA_CPUi_PWRSTCTRL

Dual Cortex-A9 MPU Subsystem Functional Description

- [Power States of CPU0 and CPU1: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [Power Domain Modes: \[5\] \[6\] \[7\] \[8\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [Local PRCM CPU0 and CPU1 Register Summary: \[9\]](#)
- [Local PRCM CPU0 Register Description: \[10\]](#)

Table 4-27. PM_PDA_CPUi_PWRSTST

| | | | |
|-------------------------|---|-----------------|--------------------------------|
| Address Offset | 0x0000 0004 | Index | I = 0 to 1 |
| Physical Address | 0x4824 3404 0x4824 3804 | Instance | CORTEXA9_CPU0 CORTEXA9_CPU1 |
| Description | This register provides a status on the CPU domain current power state. [warm reset insensitive] | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|-----------------------|----|----------|----|--------------|----|----------|----|----|----|----|----|----|----|----|----|---|---|-----------------|---|----------|---|--------------|---|--------------|---|
| RESERVED | | | | | | LASTPOWERSTATEENTERED | | RESERVED | | INTRANSITION | | RESERVED | | | | | | | | | | | | L1_BANK_STATEST | | RESERVED | | LOGICSTATEST | | POWERSTATEST | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|---------------|--------|
| 31:26 | RESERVED | Reserved | R | 0x000 |
| 25:24 | LASTPOWERSTATEENTERED | Last low power state entered. The software has to write 0x3 in this field to update this register. 0x0: Power domain was previously in OFF 0x1: Power domain was previously in RETENTION 0x2: Power domain was previously INACTIVE 0x3: Power domain was previously ON | RW W1toSet | 0x0 |
| 23:21 | RESERVED | Reserved | R | 0x0 |
| 20 | INTRANSITION | Domain transition status Read 0x0: No ongoing transition on power domain Read 0x1: Power domain transition is in progress. | R | 0 |
| 19:6 | RESERVED | Reserved | R | 0x0000 |
| 5:4 | L1_BANK_STATEST | CPU_L1 memory state status Read 0x0: Memory is OFF Read 0x1: Memory is RET Read 0x2: Reserved Read 0x3: Memory is ON | R | 0x3 |
| 3 | RESERVED | Reserved | R | 0 |
| 2 | LOGICSTATEST | Logic state status Read 0x0: Logic in domain is OFF Read 0x1: Logic in domain is ON | R | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 1:0 | POWERSTATEST | Current power state status Read 0x0: Power domain is OFF Read 0x1: Power domain is in RETENTION Read 0x2: Power domain is ON-INACTIVE Read 0x3: Power domain is ON-ACTIVE | R | 0x3 |

Table 4-28. Register Call Summary for Register PM_PDA_CPUi_PWRSTST

Dual Cortex-A9 MPU Subsystem Functional Description

- [Power Domain Modes: \[0\] \[1\] \[2\] \[3\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [Local PRCM CPU0 and CPU1 Register Summary: \[4\]](#)

Table 4-29. RM_PDA_CPUi_CONTEXT

| | | | |
|-------------------------|---|-----------------|--------------------------------|
| Address Offset | 0x0000 0008 | Index | I = 0 to 1 |
| Physical Address | 0x4824 3408 0x4824 3808 | Instance | CORTEXA9_CPU0 CORTEXA9_CPU1 |
| Description | This register contains dedicated CPU context statuses. [warm reset insensitive] | | |
| Type | RW (W1toClr - write 0x1 to clear the bit) | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----------|----|----|----|---|---|---|---|-----------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOSTMEM_CPU_L1 | | RESERVED | | | | | | | | LOSTCONTEXT_DFF | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|----------|
| 31:9 | RESERVED | Reserved | R | 0x000000 |
| 8 | LOSTMEM_CPU_L1 | Specify if memory-based context in CPU_L1 memory bank has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |
| 7:1 | RESERVED | Reserved | R | 0x00 |
| 0 | LOSTCONTEXT_DFF | Specify if DFF-based context has been lost due to a previous power transition or other reset source. 0x0: Context has been maintained 0x1: Context has been lost | RW W1toClr | 1 |

Table 4-30. Register Call Summary for Register RM_PDA_CPUi_CONTEXT

Dual Cortex-A9 MPU Subsystem Functional Description

- [CPU0 and CPU1 Power Domains Description: \[0\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [Local PRCM CPU0 and CPU1 Register Summary: \[1\]](#)

Table 4-31. RM_PDA_CPUi_RSTCTRL

| | | | |
|-------------------------|--|-----------------|--------------------------------|
| Address Offset | 0x0000 000C | Index | I = 0 to 1 |
| Physical Address | 0x4824 340C 0x4824 380C | Instance | CORTEXA9_CPU0 CORTEXA9_CPU1 |
| Description | This register controls the assertion/release of the CPU CORE reset. This is basically a software warm reset (that asserts CPUx_RST) per CPU. One CPU can set this bit to reset the other CPU. Actually the CPU can set this bit to reset itself as well (and it will be kept in reset until the other active CPU clears this bit). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RST | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | RST | CPU warm local reset control 0x0: Reset is cleared 0x1: Reset is asserted | RW | 0 |

Table 4-32. Register Call Summary for Register RM_PDA_CPUi_RSTCTRL

Dual Cortex-A9 MPU Subsystem Integration

- [Reset Distribution: \[0\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [Local PRCM CPU0 and CPU1 Register Summary: \[1\]](#)

Table 4-33. CM_PDA_CPUi_CLKCTRL

| | | | |
|-------------------------|---------------------------------------|-----------------|--------------------------------|
| Address Offset | 0x0000 0014 | Index | I = 0 to 1 |
| Physical Address | 0x4824 3414 0x4824 3814 | Instance | CORTEXA9_CPU0 CORTEXA9_CPU1 |
| Description | This register manages the CPU clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STBYST | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | STBYST | Module standby status. [warm reset insensitive] Read 0x0: Module is functional (not in standby) Read 0x1: Module is in standby | R | 1 |

Table 4-34. Register Call Summary for Register CM_PDA_CPUi_CLKCTRL

Dual Cortex-A9 MPU Subsystem Functional Description

- [Power Transition Sequence: \[0\]](#)
- [Power Domain Modes: \[1\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [Local PRCM CPU0 and CPU1 Register Summary: \[2\]](#)

Table 4-35. CM_PDA_CPUi_CLKSTCTRL

| | | | |
|-------------------------|--|-----------------|--------------------------------|
| Address Offset | 0x0000 0018 | Index | I = 0 to 1 |
| Physical Address | 0x4824 3418 0x4824 3818 | Instance | CORTEXA9_CPU0 CORTEXA9_CPU1 |
| Description | This register enables the CPU domain power state transition. It controls the hardware-supervised domain power state transition between ON-ACTIVE and ON-INACTIVE states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | <div>CLKTRCTRL</div> | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1:0 | CLKTRCTRL | <p>Controls the full domain transition of the CPU domain.</p> <p>0x0: NO_SLEEP: Sleep transition cannot be initiated. Wake-up transition may however occur.</p> <p>Read 0x1: Reserved</p> <p>0x2: Start a software forced wake-up transition on the domain. The software forced wake-up transition allows the software to wakeup a powered-down CPU by a method other than an externally triggered interrupt.</p> <p>0x3: HW_AUTO: Automatic transition is enabled. Sleep and wake-up transition are based upon hardware conditions. WFI triggers the sleep transition based on settings in CM_PDA_CPUi_CLKSTCTRL and PM_PDA_CPUi_PWRSTCTRL registers.</p> | RW | 0x0 |

Table 4-36. Register Call Summary for Register CM_PDA_CPUi_CLKSTCTRL

Dual Cortex-A9 MPU Subsystem Functional Description

- Power States of CPU0 and CPU1: [0] [1]
- Power Domain Modes: [2]

Dual Cortex-A9 MPU Subsystem Register Manual

- Local PRCM CPU0 and CPU1 Register Summary: [3]
- Local PRCM CPU0 Register Description: [4]

4.4.9 Wake-Up Generator Registers

4.4.9.1 CORTEXA9_WUGEN Register Summary

Table 4-37. CORTEXA9 WUGEN Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Base Address |
|---------------|------|-----------------------|----------------|--------------|
| WKG_CONTROL_0 | R | 32 | 0x0000 0000 | 0x4828 1000 |
| WKG_ENB_A_0 | RW | 32 | 0x0000 0010 | 0x4828 1010 |
| WKG_ENB_B_0 | RW | 32 | 0x0000 0014 | 0x4828 1014 |
| WKG_ENB_C_0 | RW | 32 | 0x0000 0018 | 0x4828 1018 |
| WKG_ENB_D_0 | RW | 32 | 0x0000 001C | 0x4828 101C |
| RESERVED | R | 32 | 0x0000 0020 | 0x4828 1020 |
| RESERVED | R | 32 | 0x0000 0024 | 0x4828 1024 |

Table 4-37. CORTEXA9_WUGEN Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | Base Address |
|-----------------|------|-----------------------|----------------|--------------|
| RESERVED | R | 32 | 0x0000 0028 | 0x4828 1028 |
| RESERVED | R | 32 | 0x0000 002C | 0x4828 102C |
| WKG_CONTROL_1 | R | 32 | 0x0000 0400 | 0x4828 1400 |
| WKG_ENB_A_1 | RW | 32 | 0x0000 0410 | 0x4828 1410 |
| WKG_ENB_B_1 | RW | 32 | 0x0000 0414 | 0x4828 1414 |
| WKG_ENB_C_1 | RW | 32 | 0x0000 0418 | 0x4828 1418 |
| WKG_ENB_D_1 | RW | 32 | 0x0000 041C | 0x4828 141C |
| RESERVED | R | 32 | 0x0000 0420 | 0x4828 1420 |
| RESERVED | R | 32 | 0x0000 0424 | 0x4828 1424 |
| RESERVED | R | 32 | 0x0000 0428 | 0x4828 1428 |
| RESERVED | R | 32 | 0x0000 042C | 0x4828 142C |
| AUX_CORE_BOOT_0 | RW | 32 | 0x0000 0800 | 0x4828 1800 |
| AUX_CORE_BOOT_1 | RW | 32 | 0x0000 0804 | 0x4828 1804 |
| RESERVED | R | 32 | 0x0000 0C00 | 0x4828 1C00 |
| RESERVED | R | 32 | 0x0000 0C04 | 0x4828 1C04 |
| RESERVED | R | 32 | 0x0000 0C08 | 0x4828 1C08 |
| RESERVED | R | 32 | 0x0000 0C0C | 0x4828 1C0C |

4.4.9.2 CORTEXA9_WUGEN Register Description**Table 4-38. WKG_CONTROL_0**

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0000 | Instance | CORTEXA9_WUGEN |
| Physical Address | 0x4828 1000 | | |
| Description | Wake-up generator status register for CPU0 | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|-------------------|-------------------|---------|----------|--------|------------|------------|----------|---|---|---|---|---|---|---|--|--|--|--|--|--|
| RESERVED | | | | | | | | | | | | | | | | DOMAIN_RST | CORTEXA9_WARM_RST | CORTEXA9_COLD_RST | WDT_RST | RESERVED | EVENTO | STANDBYWFE | STANDBYWFI | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|----------|
| 31:16 | RESERVED | Reserved | R | 0x000000 |
| 15 | DOMAIN_RST | MPU always-on power domain (PD_ALWON_MPU) reset status bit. It shows if the reset occurred previously. 0x0: no reset occur 0x1: reset occur | R | 0 |
| 14 | CORTEXA9_WARM_RST | This bit is set when the CORTEXA9_RSTN signal is asserted. 0x0: CORTEXA9_RSTN reset signal has not been asserted 0x1: CORTEXA9_RSTN reset request has been asserted | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|-------|
| 13 | CORTEXA9_COLD_RST | This bit is set when the CORTEXA9_PWRON_RSTN signal is asserted. 0x0: CORTEXA9_PWRON_RSTN reset signal has not been asserted 0x1: CORTEXA9_PWRON_RSTN reset request has been asserted | R | 0 |
| 12 | WDT_RST | This bit is set when the WD timer Reset Request signal from the SCU is asserted. 0x0: WDT reset request has not been asserted 0x1: WDT reset request has been asserted | R | 0 |
| 11 | RESERVED | Reserved | R | 0 |
| 10 | EVENTO | EVENTO status bit. The event output signal is active, when one SEV instruction is executed. This bit is set when a rising edge of EVENTO from CPU is detected. 0x0: Rising edge of EVENTO is not detected 0x1: Rising edge of EVENTO is detected | R | 0 |
| 9 | STANDBYWFE | This bit gives software the visibility to track whether WFE mode have been entered. 0x0: WFE mode has not been entered 0x1: WFE mode has been entered | R | 0 |
| 8 | STANDBYWFI | This bit gives software the visibility to track whether WFI mode have been entered. 0x0: WFI mode has not been entered 0x1: WFI mode has been entered | R | 0 |
| 7:0 | RESERVED | Reserved | R | 0 |

Table 4-39. Register Call Summary for Register WKG_CONTROL_0

Dual Cortex-A9 MPU Subsystem Integration

- [Reset Distribution: \[0\]](#)

Dual Cortex-A9 MPU Subsystem Functional Description

- [Power States of CPU0 and CPU1: \[1\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CORTEXA9_WUGEN Register Summary: \[2\]](#)

Table 4-40. WKG_ENB_A_0

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 0010 | Instance | CORTEXA9_WUGEN |
| Physical Address | 0x4828 1010 | | |
| Description | This register enables the interrupts (for CPU0) from MA_IRQ_0 to MA_IRQ_31 write 0x0: disable interrupt write 0x1: enable interrupt | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|----------|-------------------|-------------------|----------|-------------------|----------|-------------------|-------------------|-------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WKG_ENB_FOR_INTR31 | WKG_ENB_FOR_INTR30 | WKG_ENB_FOR_INTR29 | WKG_ENB_FOR_INTR28 | WKG_ENB_FOR_INTR27 | WKG_ENB_FOR_INTR26 | WKG_ENB_FOR_INTR25 | WKG_ENB_FOR_INTR24 | WKG_ENB_FOR_INTR23 | WKG_ENB_FOR_INTR22 | WKG_ENB_FOR_INTR21 | WKG_ENB_FOR_INTR20 | WKG_ENB_FOR_INTR19 | WKG_ENB_FOR_INTR18 | WKG_ENB_FOR_INTR17 | WKG_ENB_FOR_INTR16 | WKG_ENB_FOR_INTR15 | WKG_ENB_FOR_INTR14 | WKG_ENB_FOR_INTR13 | WKG_ENB_FOR_INTR12 | WKG_ENB_FOR_INTR11 | WKG_ENB_FOR_INTR10 | WKG_ENB_FOR_INTR9 | RESERVED | WKG_ENB_FOR_INTR7 | WKG_ENB_FOR_INTR6 | RESERVED | WKG_ENB_FOR_INTR4 | RESERVED | WKG_ENB_FOR_INTR2 | WKG_ENB_FOR_INTR1 | WKG_ENB_FOR_INTR0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|-------------|------|------------------|
| 31 | WKG_ENB_FOR_INTR31 | | RW | 1 |
| 30 | WKG_ENB_FOR_INTR30 | | RW | 1 |
| 29 | WKG_ENB_FOR_INTR29 | | RW | 1 |
| 28 | WKG_ENB_FOR_INTR28 | | RW | 1 |
| 27 | WKG_ENB_FOR_INTR27 | | RW | 1 |
| 26 | WKG_ENB_FOR_INTR26 | | RW | 1 |
| 25 | WKG_ENB_FOR_INTR25 | | RW | 1 |
| 24 | WKG_ENB_FOR_INTR24 | | RW | 1 |
| 23 | WKG_ENB_FOR_INTR23 | | RW | 1 |
| 22 | WKG_ENB_FOR_INTR22 | | RW | 1 |
| 21 | WKG_ENB_FOR_INTR21 | | RW | 1 |
| 20 | WKG_ENB_FOR_INTR20 | | RW | 1 |
| 19 | WKG_ENB_FOR_INTR19 | | RW | 1 |
| 18 | WKG_ENB_FOR_INTR18 | | RW | 1 |
| 17 | WKG_ENB_FOR_INTR17 | | RW | 1 |
| 16 | WKG_ENB_FOR_INTR16 | | RW | 1 |
| 15 | WKG_ENB_FOR_INTR15 | | RW | 1 |
| 14 | WKG_ENB_FOR_INTR14 | | RW | 1 |
| 13 | WKG_ENB_FOR_INTR13 | | RW | 1 |
| 12 | WKG_ENB_FOR_INTR12 | | RW | 1 |
| 11 | WKG_ENB_FOR_INTR11 | | RW | 1 |
| 10 | WKG_ENB_FOR_INTR10 | | RW | 1 |
| 9 | WKG_ENB_FOR_INTR9 | | RW | 1 |
| 8 | RESERVED | | R | 0 ⁽¹⁾ |
| 7 | WKG_ENB_FOR_INTR7 | | RW | 1 |
| 6 | WKG_ENB_FOR_INTR6 | | RW | 1 |
| 5 | RESERVED | | R | 1 |
| 4 | WKG_ENB_FOR_INTR4 | | RW | 1 |
| 3 | RESERVED | | R | 1 |
| 2 | WKG_ENB_FOR_INTR2 | | RW | 1 |
| 1 | WKG_ENB_FOR_INTR1 | | RW | 1 |
| 0 | WKG_ENB_FOR_INTR0 | | RW | 1 |

⁽¹⁾ The reset value is 0x0 by safety reasons.

Table 4-41. Register Call Summary for Register WKG_ENB_A_0

Dual Cortex-A9 MPU Subsystem Functional Description

- [WUGEN: \[0\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CORTEXA9_WUGEN Register Summary: \[1\]](#)

Table 4-42. WKG_ENB_B_0

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0014 | Instance | CORTEXA9_WUGEN |
| Physical Address | 0x4828 1014 | | |
| Description | This register enables the interrupts (for CPU0) from MA_IRQ_32 to MA_IRQ_63 write 0x0: disable interrupt write 0x1: enable interrupt | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|--------------------|--------------------|----------|--------------------|--------------------|--------------------|--------------------|----------|----------|--------------------|----------|----------|----------|----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------|--------------------|--------------------|--------------------|
| RESERVED | WKG_ENB_FOR_INTR62 | WKG_ENB_FOR_INTR61 | RESERVED | WKG_ENB_FOR_INTR59 | WKG_ENB_FOR_INTR58 | WKG_ENB_FOR_INTR57 | WKG_ENB_FOR_INTR56 | RESERVED | RESERVED | WKG_ENB_FOR_INTR53 | RESERVED | RESERVED | RESERVED | RESERVED | WKG_ENB_FOR_INTR48 | WKG_ENB_FOR_INTR47 | WKG_ENB_FOR_INTR46 | WKG_ENB_FOR_INTR45 | WKG_ENB_FOR_INTR44 | WKG_ENB_FOR_INTR43 | WKG_ENB_FOR_INTR42 | WKG_ENB_FOR_INTR41 | WKG_ENB_FOR_INTR40 | WKG_ENB_FOR_INTR39 | WKG_ENB_FOR_INTR38 | WKG_ENB_FOR_INTR37 | WKG_ENB_FOR_INTR36 | RESERVED | WKG_ENB_FOR_INTR34 | WKG_ENB_FOR_INTR33 | WKG_ENB_FOR_INTR32 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|-------------|------|-------|
| 31 | RESERVED | | R | 1 |
| 30 | WKG_ENB_FOR_INTR62 | | RW | 1 |
| 29 | WKG_ENB_FOR_INTR61 | | RW | 1 |
| 28 | RESERVED | | R | 1 |
| 27 | WKG_ENB_FOR_INTR59 | | RW | 1 |
| 26 | WKG_ENB_FOR_INTR58 | | RW | 1 |
| 25 | WKG_ENB_FOR_INTR57 | | RW | 1 |
| 24 | WKG_ENB_FOR_INTR56 | | RW | 1 |
| 23 | RESERVED | | R | 1 |
| 22 | RESERVED | | R | 1 |
| 21 | WKG_ENB_FOR_INTR53 | | RW | 1 |
| 20 | RESERVED | | R | 1 |
| 19 | RESERVED | | R | 1 |
| 18 | RESERVED | | R | 1 |
| 17 | RESERVED | | R | 1 |
| 16 | WKG_ENB_FOR_INTR48 | | RW | 1 |
| 15 | WKG_ENB_FOR_INTR47 | | RW | 1 |
| 14 | WKG_ENB_FOR_INTR46 | | RW | 1 |
| 13 | WKG_ENB_FOR_INTR45 | | RW | 1 |
| 12 | WKG_ENB_FOR_INTR44 | | RW | 1 |
| 11 | WKG_ENB_FOR_INTR43 | | RW | 1 |
| 10 | WKG_ENB_FOR_INTR42 | | RW | 1 |
| 9 | WKG_ENB_FOR_INTR41 | | RW | 1 |
| 8 | WKG_ENB_FOR_INTR40 | | RW | 1 |
| 7 | WKG_ENB_FOR_INTR39 | | RW | 1 |
| 6 | WKG_ENB_FOR_INTR38 | | RW | 1 |
| 5 | WKG_ENB_FOR_INTR37 | | RW | 1 |
| 4 | WKG_ENB_FOR_INTR36 | | RW | 1 |
| 3 | RESERVED | | R | 1 |
| 2 | WKG_ENB_FOR_INTR34 | | RW | 1 |
| 1 | WKG_ENB_FOR_INTR33 | | RW | 1 |
| 0 | WKG_ENB_FOR_INTR32 | | RW | 1 |

Table 4-43. Register Call Summary for Register WKG_ENB_B_0

Dual Cortex-A9 MPU Subsystem Register Manual

- [CORTEXA9_WUGEN Register Summary: \[0\]](#)

Table 4-44. WKG_ENB_C_0

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0018 | Instance | CORTEXA9_WUGEN |
| Physical Address | 0x4828 1018 | | |
| Description | This register enables the interrupts (for CPU0) from MA_IRQ_64 to MA_IRQ_95 write 0x0: disable interrupt write 0x1: enable interrupt | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------|--------------------|--------------------|----------|----------|--------------------|----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------|
| RESERVED | WKG_ENB_FOR_INTR94 | WKG_ENB_FOR_INTR93 | WKG_ENB_FOR_INTR92 | WKG_ENB_FOR_INTR91 | WKG_ENB_FOR_INTR90 | WKG_ENB_FOR_INTR89 | WKG_ENB_FOR_INTR88 | WKG_ENB_FOR_INTR87 | WKG_ENB_FOR_INTR86 | RESERVED | WKG_ENB_FOR_INTR84 | WKG_ENB_FOR_INTR83 | RESERVED | RESERVED | WKG_ENB_FOR_INTR80 | RESERVED | WKG_ENB_FOR_INTR78 | WKG_ENB_FOR_INTR77 | WKG_ENB_FOR_INTR76 | WKG_ENB_FOR_INTR75 | WKG_ENB_FOR_INTR74 | WKG_ENB_FOR_INTR73 | WKG_ENB_FOR_INTR72 | WKG_ENB_FOR_INTR71 | WKG_ENB_FOR_INTR70 | WKG_ENB_FOR_INTR69 | WKG_ENB_FOR_INTR68 | WKG_ENB_FOR_INTR67 | WKG_ENB_FOR_INTR66 | WKG_ENB_FOR_INTR65 | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|-------------|------|-------|
| 31 | RESERVED | | R | 1 |
| 30 | WKG_ENB_FOR_INTR94 | | RW | 1 |
| 29 | WKG_ENB_FOR_INTR93 | | RW | 1 |
| 28 | WKG_ENB_FOR_INTR92 | | RW | 1 |
| 27 | WKG_ENB_FOR_INTR91 | | RW | 1 |
| 26 | WKG_ENB_FOR_INTR90 | | RW | 1 |
| 25 | WKG_ENB_FOR_INTR89 | | RW | 1 |
| 24 | WKG_ENB_FOR_INTR88 | | RW | 1 |
| 23 | WKG_ENB_FOR_INTR87 | | RW | 1 |
| 22 | WKG_ENB_FOR_INTR86 | | RW | 1 |
| 21 | RESERVED | | R | 1 |
| 20 | WKG_ENB_FOR_INTR84 | | RW | 1 |
| 19 | WKG_ENB_FOR_INTR83 | | RW | 1 |
| 18 | RESERVED | | R | 1 |
| 17 | RESERVED | | R | 1 |
| 16 | WKG_ENB_FOR_INTR80 | | RW | 1 |
| 15 | RESERVED | | R | 1 |
| 14 | WKG_ENB_FOR_INTR78 | | RW | 1 |
| 13 | WKG_ENB_FOR_INTR77 | | RW | 1 |
| 12 | WKG_ENB_FOR_INTR76 | | RW | 1 |
| 11 | WKG_ENB_FOR_INTR75 | | RW | 1 |
| 10 | WKG_ENB_FOR_INTR74 | | RW | 1 |
| 9 | WKG_ENB_FOR_INTR73 | | RW | 1 |
| 8 | WKG_ENB_FOR_INTR72 | | RW | 1 |
| 7 | WKG_ENB_FOR_INTR71 | | RW | 1 |
| 6 | WKG_ENB_FOR_INTR70 | | RW | 1 |
| 5 | WKG_ENB_FOR_INTR69 | | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|-------------|------|-------|
| 4 | WKG_ENB_FOR_INTR68 | | RW | 1 |
| 3 | WKG_ENB_FOR_INTR67 | | RW | 1 |
| 2 | WKG_ENB_FOR_INTR66 | | RW | 1 |
| 1 | WKG_ENB_FOR_INTR65 | | RW | 1 |
| 0 | RESERVED | | R | 1 |

Table 4-45. Register Call Summary for Register WKG_ENB_C_0

Dual Cortex-A9 MPU Subsystem Register Manual

- [CORTEXA9_WUGEN Register Summary: \[0\]](#)

Table 4-46. WKG_ENB_D_0

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 001C | Instance | CORTEXA9_WUGEN |
| Physical Address | 0x4828 101C | | |
| Description | This register enables the interrupts (for CPU0) from MA_IRQ_96 to MA_IRQ_127 write 0x0: disable interrupt write 0x1: enable interrupt | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----------|----------|----------|----------|----------|----------|---------------------|---------------------|----------|----------|----------|----------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------|---------------------|----------|----------|---------------------|---------------------|---------------------|---------------------|---------------------|--------------------|--------------------|--------------------|--------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | RESERVED | RESERVED | RESERVED | RESERVED | RESERVED | RESERVED | WKG_ENB_FOR_INTR120 | WKG_ENB_FOR_INTR119 | RESERVED | RESERVED | RESERVED | RESERVED | WKG_ENB_FOR_INTR114 | WKG_ENB_FOR_INTR113 | WKG_ENB_FOR_INTR112 | WKG_ENB_FOR_INTR111 | WKG_ENB_FOR_INTR110 | WKG_ENB_FOR_INTR109 | RESERVED | WKG_ENB_FOR_INTR107 | RESERVED | RESERVED | WKG_ENB_FOR_INTR104 | WKG_ENB_FOR_INTR103 | WKG_ENB_FOR_INTR102 | WKG_ENB_FOR_INTR101 | WKG_ENB_FOR_INTR100 | WKG_ENB_FOR_INTR99 | WKG_ENB_FOR_INTR98 | WKG_ENB_FOR_INTR97 | WKG_ENB_FOR_INTR96 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|-------------|------|-------|
| 31 | RESERVED | | R | 1 |
| 30 | RESERVED | | R | 1 |
| 29 | RESERVED | | R | 1 |
| 28 | RESERVED | | R | 1 |
| 27 | RESERVED | | R | 1 |
| 26 | RESERVED | | R | 1 |
| 25 | RESERVED | | R | 1 |
| 24 | WKG_ENB_FOR_INTR120 | | RW | 1 |
| 23 | WKG_ENB_FOR_INTR119 | | RW | 1 |
| 22 | RESERVED | | R | 1 |
| 21 | RESERVED | | R | 1 |
| 20 | RESERVED | | R | 1 |
| 19 | RESERVED | | R | 1 |
| 18 | WKG_ENB_FOR_INTR114 | | RW | 1 |
| 17 | WKG_ENB_FOR_INTR113 | | RW | 1 |
| 16 | WKG_ENB_FOR_INTR112 | | RW | 1 |
| 15 | WKG_ENB_FOR_INTR111 | | RW | 1 |
| 14 | WKG_ENB_FOR_INTR110 | | RW | 1 |
| 13 | WKG_ENB_FOR_INTR109 | | RW | 1 |
| 12 | RESERVED | | R | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|-------------|------|-------|
| 11 | WKG_ENB_FOR_INTR107 | | RW | 1 |
| 10 | RESERVED | | R | 1 |
| 9 | RESERVED | | R | 1 |
| 8 | WKG_ENB_FOR_INTR104 | | RW | 1 |
| 7 | WKG_ENB_FOR_INTR103 | | RW | 1 |
| 6 | WKG_ENB_FOR_INTR102 | | RW | 1 |
| 5 | WKG_ENB_FOR_INTR101 | | RW | 1 |
| 4 | WKG_ENB_FOR_INTR100 | | RW | 1 |
| 3 | WKG_ENB_FOR_INTR99 | | RW | 1 |
| 2 | WKG_ENB_FOR_INTR98 | | RW | 1 |
| 1 | WKG_ENB_FOR_INTR97 | | RW | 1 |
| 0 | WKG_ENB_FOR_INTR96 | | RW | 1 |

Table 4-47. Register Call Summary for Register WKG_ENB_D_0

Dual Cortex-A9 MPU Subsystem Functional Description

- [WUGEN: \[0\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CORTEXA9_WUGEN Register Summary: \[1\]](#)

Table 4-48. WKG_CONTROL_1

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0400 | Instance | CORTEXA9_WUGEN |
| Physical Address | 0x4828 1400 | | |
| Description | Wake-up generator status register for CPU1 | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|-------------------|-------------------|---------|----------|--------|------------|------------|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DOMAIN_RST | CORTEXA9_WARM_RST | CORTEXA9_COLD_RST | WDT_RST | RESERVED | EVENTO | STANDBYWFE | STANDBYWF1 | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|---------|
| 31:16 | RESERVED | | R | 0x00000 |
| 15 | DOMAIN_RST | MPU always-on power domain (PD_ALWON_MPU) reset status bit. It shows if the reset occurred previously. 0x0: no reset occur 0x1: reset occur | R | 0 |
| 14 | CORTEXA9_WARM_RST | This bit is set when the CORTEXA9_RSTN signal is asserted. 0x0: CORTEXA9_RSTN reset signal has not been asserted 0x1: CORTEXA9_RSTN reset request has been asserted | R | 0 |
| 13 | CORTEXA9_COLD_RST | This bit is set when the CORTEXA9_PWRON_RSTN signal is asserted. 0x0: CORTEXA9_PWRON_RSTN reset signal has not been asserted 0x1: CORTEXA9_PWRON_RSTN reset request has been asserted | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 12 | WDT_RST | This bit is set when the WD timer Reset Request signal from the SCU is asserted. 0x0: WDT reset request has not been asserted 0x1: WDT reset request has been asserted | R | 0 |
| 11 | RESERVED | Reserved | R | 0 |
| 10 | EVENTO | EVENTO status bit. The event output signal is active, when one SEV instruction is executed. This bit is set when a rising edge of EVENTO from CPU is detected. 0x0: Rising edge of EVENTO is not detected 0x1: Rising edge of EVENTO is detected | R | 0 |
| 9 | STANDBYWFE | This bit gives software the visibility to track whether WFE mode have been entered. 0x0: WFE mode has not been entered 0x1: WFE mode has been entered | R | 0 |
| 8 | STANDBYWFI | This bit gives software the visibility to track whether WFI mode have been entered. 0x0: WFI mode has not been entered 0x1: WFI mode has been entered | R | 0 |
| 7:0 | RESERVED | Reserved | R | 0 |

Table 4-49. Register Call Summary for Register WKG_CONTROL_1

Dual Cortex-A9 MPU Subsystem Integration

- [Reset Distribution: \[0\]](#)

Dual Cortex-A9 MPU Subsystem Functional Description

- [Power States of CPU0 and CPU1: \[1\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CORTEXA9_WUGEN Register Summary: \[2\]](#)

Table 4-50. WKG_ENB_A_1

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 0410 | Instance | CORTEXA9_WUGEN |
| Physical Address | 0x4828 1410 | | |
| Description | This register enables the interrupts (for CPU1) from MA_IRQ_0 to MA_IRQ_31 write 0x0: disable interrupt write 0x1: enable interrupt | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|----------|-------------------|-------------------|----------|-------------------|----------|-------------------|-------------------|-------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WKG_ENB_FOR_INTR31 | WKG_ENB_FOR_INTR30 | WKG_ENB_FOR_INTR29 | WKG_ENB_FOR_INTR28 | WKG_ENB_FOR_INTR27 | WKG_ENB_FOR_INTR26 | WKG_ENB_FOR_INTR25 | WKG_ENB_FOR_INTR24 | WKG_ENB_FOR_INTR23 | WKG_ENB_FOR_INTR22 | WKG_ENB_FOR_INTR21 | WKG_ENB_FOR_INTR20 | WKG_ENB_FOR_INTR19 | WKG_ENB_FOR_INTR18 | WKG_ENB_FOR_INTR17 | WKG_ENB_FOR_INTR16 | WKG_ENB_FOR_INTR15 | WKG_ENB_FOR_INTR14 | WKG_ENB_FOR_INTR13 | WKG_ENB_FOR_INTR12 | WKG_ENB_FOR_INTR11 | WKG_ENB_FOR_INTR10 | WKG_ENB_FOR_INTR9 | RESERVED | WKG_ENB_FOR_INTR7 | WKG_ENB_FOR_INTR6 | RESERVED | WKG_ENB_FOR_INTR4 | RESERVED | WKG_ENB_FOR_INTR2 | WKG_ENB_FOR_INTR1 | WKG_ENB_FOR_INTR0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|-------------|------|-------|
| 31 | WKG_ENB_FOR_INTR31 | | RW | 1 |
| 30 | WKG_ENB_FOR_INTR30 | | RW | 1 |
| 29 | WKG_ENB_FOR_INTR29 | | RW | 1 |
| 28 | WKG_ENB_FOR_INTR28 | | RW | 1 |
| 27 | WKG_ENB_FOR_INTR27 | | RW | 1 |
| 26 | WKG_ENB_FOR_INTR26 | | RW | 1 |
| 25 | WKG_ENB_FOR_INTR25 | | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|-------------|------|------------------|
| 24 | WKG_ENB_FOR_INTR24 | | RW | 1 |
| 23 | WKG_ENB_FOR_INTR23 | | RW | 1 |
| 22 | WKG_ENB_FOR_INTR22 | | RW | 1 |
| 21 | WKG_ENB_FOR_INTR21 | | RW | 1 |
| 20 | WKG_ENB_FOR_INTR20 | | RW | 1 |
| 19 | WKG_ENB_FOR_INTR19 | | RW | 1 |
| 18 | WKG_ENB_FOR_INTR18 | | RW | 1 |
| 17 | WKG_ENB_FOR_INTR17 | | RW | 1 |
| 16 | WKG_ENB_FOR_INTR16 | | RW | 1 |
| 15 | WKG_ENB_FOR_INTR15 | | RW | 1 |
| 14 | WKG_ENB_FOR_INTR14 | | RW | 1 |
| 13 | WKG_ENB_FOR_INTR13 | | RW | 1 |
| 12 | WKG_ENB_FOR_INTR12 | | RW | 1 |
| 11 | WKG_ENB_FOR_INTR11 | | RW | 1 |
| 10 | WKG_ENB_FOR_INTR10 | | RW | 1 |
| 9 | WKG_ENB_FOR_INTR9 | | RW | 1 |
| 8 | RESERVED | | R | 0 ⁽¹⁾ |
| 7 | WKG_ENB_FOR_INTR7 | | RW | 1 |
| 6 | WKG_ENB_FOR_INTR6 | | RW | 1 |
| 5 | RESERVED | | R | 1 |
| 4 | WKG_ENB_FOR_INTR4 | | RW | 1 |
| 3 | RESERVED | | R | 1 |
| 2 | WKG_ENB_FOR_INTR2 | | RW | 1 |
| 1 | WKG_ENB_FOR_INTR1 | | RW | 1 |
| 0 | WKG_ENB_FOR_INTR0 | | RW | 1 |

⁽¹⁾ The reset value is 0x0 by safety reasons.

Table 4-51. Register Call Summary for Register WKG_ENB_A_1

Dual Cortex-A9 MPU Subsystem Functional Description

- [WUGEN: \[0\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CORTEXA9_WUGEN Register Summary: \[1\]](#)

Table 4-52. WKG_ENB_B_1

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0414 | Instance | CORTEXA9_WUGEN |
| Physical Address | 0x4828 1414 | | |
| Description | This register enables the interrupts (for CPU1) from MA_IRQ_32 to MA_IRQ_63 write 0x0: disable interrupt write 0x1: enable interrupt | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|--------------------|--------------------|----------|--------------------|--------------------|--------------------|--------------------|----------|----------|--------------------|----------|----------|----------|----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------|--------------------|--------------------|--------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | WKG_ENB_FOR_INTR62 | WKG_ENB_FOR_INTR61 | RESERVED | WKG_ENB_FOR_INTR59 | WKG_ENB_FOR_INTR58 | WKG_ENB_FOR_INTR57 | WKG_ENB_FOR_INTR56 | RESERVED | RESERVED | WKG_ENB_FOR_INTR53 | RESERVED | RESERVED | RESERVED | RESERVED | WKG_ENB_FOR_INTR48 | WKG_ENB_FOR_INTR47 | WKG_ENB_FOR_INTR46 | WKG_ENB_FOR_INTR45 | WKG_ENB_FOR_INTR44 | WKG_ENB_FOR_INTR43 | WKG_ENB_FOR_INTR42 | WKG_ENB_FOR_INTR41 | WKG_ENB_FOR_INTR40 | WKG_ENB_FOR_INTR39 | WKG_ENB_FOR_INTR38 | WKG_ENB_FOR_INTR37 | WKG_ENB_FOR_INTR36 | RESERVED | WKG_ENB_FOR_INTR34 | WKG_ENB_FOR_INTR33 | WKG_ENB_FOR_INTR32 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|-------------|------|-------|
| 31 | RESERVED | | R | 1 |
| 30 | WKG_ENB_FOR_INTR62 | | RW | 1 |
| 29 | WKG_ENB_FOR_INTR61 | | RW | 1 |
| 28 | RESERVED | | R | 1 |
| 27 | WKG_ENB_FOR_INTR59 | | RW | 1 |
| 26 | WKG_ENB_FOR_INTR58 | | RW | 1 |
| 25 | WKG_ENB_FOR_INTR57 | | RW | 1 |
| 24 | WKG_ENB_FOR_INTR56 | | RW | 1 |
| 23 | RESERVED | | R | 1 |
| 22 | RESERVED | | R | 1 |
| 21 | WKG_ENB_FOR_INTR53 | | RW | 1 |
| 20 | RESERVED | | R | 1 |
| 19 | RESERVED | | R | 1 |
| 18 | RESERVED | | R | 1 |
| 17 | RESERVED | | R | 1 |
| 16 | WKG_ENB_FOR_INTR48 | | RW | 1 |
| 15 | WKG_ENB_FOR_INTR47 | | RW | 1 |
| 14 | WKG_ENB_FOR_INTR46 | | RW | 1 |
| 13 | WKG_ENB_FOR_INTR45 | | RW | 1 |
| 12 | WKG_ENB_FOR_INTR44 | | RW | 1 |
| 11 | WKG_ENB_FOR_INTR43 | | RW | 1 |
| 10 | WKG_ENB_FOR_INTR42 | | RW | 1 |
| 9 | WKG_ENB_FOR_INTR41 | | RW | 1 |
| 8 | WKG_ENB_FOR_INTR40 | | RW | 1 |
| 7 | WKG_ENB_FOR_INTR39 | | RW | 1 |
| 6 | WKG_ENB_FOR_INTR38 | | RW | 1 |
| 5 | WKG_ENB_FOR_INTR37 | | RW | 1 |
| 4 | WKG_ENB_FOR_INTR36 | | RW | 1 |
| 3 | RESERVED | | R | 1 |
| 2 | WKG_ENB_FOR_INTR34 | | RW | 1 |
| 1 | WKG_ENB_FOR_INTR33 | | RW | 1 |
| 0 | WKG_ENB_FOR_INTR32 | | RW | 1 |

Table 4-53. Register Call Summary for Register WKG_ENB_B_1

Dual Cortex-A9 MPU Subsystem Register Manual

- [CORTEXA9_WUGEN Register Summary: \[0\]](#)

Table 4-54. WKG_ENB_C_1

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0418 | Instance | CORTEXA9_WUGEN |
| Physical Address | 0x4828 1418 | | |
| Description | This register enables the interrupts (for CPU1) from MA_IRQ_64 to MA_IRQ_95 write 0x0: disable interrupt write 0x1: enable interrupt | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------|--------------------|--------------------|----------|----------|--------------------|----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | WKG_ENB_FOR_INTR94 | WKG_ENB_FOR_INTR93 | WKG_ENB_FOR_INTR92 | WKG_ENB_FOR_INTR91 | WKG_ENB_FOR_INTR90 | WKG_ENB_FOR_INTR89 | WKG_ENB_FOR_INTR88 | WKG_ENB_FOR_INTR87 | WKG_ENB_FOR_INTR86 | RESERVED | WKG_ENB_FOR_INTR84 | WKG_ENB_FOR_INTR83 | RESERVED | RESERVED | WKG_ENB_FOR_INTR80 | RESERVED | WKG_ENB_FOR_INTR78 | WKG_ENB_FOR_INTR77 | WKG_ENB_FOR_INTR76 | WKG_ENB_FOR_INTR75 | WKG_ENB_FOR_INTR74 | WKG_ENB_FOR_INTR73 | WKG_ENB_FOR_INTR72 | WKG_ENB_FOR_INTR71 | WKG_ENB_FOR_INTR70 | WKG_ENB_FOR_INTR69 | WKG_ENB_FOR_INTR68 | WKG_ENB_FOR_INTR67 | WKG_ENB_FOR_INTR66 | WKG_ENB_FOR_INTR65 | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|-------------|------|-------|
| 31 | RESERVED | | R | 1 |
| 30 | WKG_ENB_FOR_INTR94 | | RW | 1 |
| 29 | WKG_ENB_FOR_INTR93 | | RW | 1 |
| 28 | WKG_ENB_FOR_INTR92 | | RW | 1 |
| 27 | WKG_ENB_FOR_INTR91 | | RW | 1 |
| 26 | WKG_ENB_FOR_INTR90 | | RW | 1 |
| 25 | WKG_ENB_FOR_INTR89 | | RW | 1 |
| 24 | WKG_ENB_FOR_INTR88 | | RW | 1 |
| 23 | WKG_ENB_FOR_INTR87 | | RW | 1 |
| 22 | WKG_ENB_FOR_INTR86 | | RW | 1 |
| 21 | RESERVED | | R | 1 |
| 20 | WKG_ENB_FOR_INTR84 | | RW | 1 |
| 19 | WKG_ENB_FOR_INTR83 | | RW | 1 |
| 18 | RESERVED | | R | 1 |
| 17 | RESERVED | | R | 1 |
| 16 | WKG_ENB_FOR_INTR80 | | RW | 1 |
| 15 | RESERVED | | R | 1 |
| 14 | WKG_ENB_FOR_INTR78 | | RW | 1 |
| 13 | WKG_ENB_FOR_INTR77 | | RW | 1 |
| 12 | WKG_ENB_FOR_INTR76 | | RW | 1 |
| 11 | WKG_ENB_FOR_INTR75 | | RW | 1 |
| 10 | WKG_ENB_FOR_INTR74 | | RW | 1 |
| 9 | WKG_ENB_FOR_INTR73 | | RW | 1 |
| 8 | WKG_ENB_FOR_INTR72 | | RW | 1 |
| 7 | WKG_ENB_FOR_INTR71 | | RW | 1 |
| 6 | WKG_ENB_FOR_INTR70 | | RW | 1 |
| 5 | WKG_ENB_FOR_INTR69 | | RW | 1 |
| 4 | WKG_ENB_FOR_INTR68 | | RW | 1 |
| 3 | WKG_ENB_FOR_INTR67 | | RW | 1 |
| 2 | WKG_ENB_FOR_INTR66 | | RW | 1 |
| 1 | WKG_ENB_FOR_INTR65 | | RW | 1 |
| 0 | RESERVED | | R | 1 |

Table 4-55. Register Call Summary for Register WKG_ENB_C_1

Dual Cortex-A9 MPU Subsystem Register Manual

- [CORTEXA9_WUGEN Register Summary: \[0\]](#)

Table 4-56. WKG_ENB_D_1

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 041C | Instance | CORTEXA9_WUGEN |
| Physical Address | 0x4828 141C | | |
| Description | This register enables the interrupts (for CPU1) from MA_IRQ_96 to MA_IRQ_127 write 0x0: disable interrupt write 0x1: enable interrupt | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----------|----------|----------|----------|----------|----------|---------------------|---------------------|----------|----------|----------|----------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------|---------------------|----------|----------|---------------------|---------------------|---------------------|---------------------|---------------------|--------------------|--------------------|--------------------|--------------------|
| RESERVED | RESERVED | RESERVED | RESERVED | RESERVED | RESERVED | RESERVED | WKG_ENB_FOR_INTR120 | WKG_ENB_FOR_INTR119 | RESERVED | RESERVED | RESERVED | RESERVED | WKG_ENB_FOR_INTR114 | WKG_ENB_FOR_INTR113 | WKG_ENB_FOR_INTR112 | WKG_ENB_FOR_INTR111 | WKG_ENB_FOR_INTR110 | WKG_ENB_FOR_INTR109 | RESERVED | WKG_ENB_FOR_INTR107 | RESERVED | RESERVED | WKG_ENB_FOR_INTR104 | WKG_ENB_FOR_INTR103 | WKG_ENB_FOR_INTR102 | WKG_ENB_FOR_INTR101 | WKG_ENB_FOR_INTR100 | WKG_ENB_FOR_INTR99 | WKG_ENB_FOR_INTR98 | WKG_ENB_FOR_INTR97 | WKG_ENB_FOR_INTR96 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|-------------|------|-------|
| 31 | RESERVED | | R | 1 |
| 30 | RESERVED | | R | 1 |
| 29 | RESERVED | | R | 1 |
| 28 | RESERVED | | R | 1 |
| 27 | RESERVED | | R | 1 |
| 26 | RESERVED | | R | 1 |
| 25 | RESERVED | | R | 1 |
| 24 | WKG_ENB_FOR_INTR120 | | RW | 1 |
| 23 | WKG_ENB_FOR_INTR119 | | RW | 1 |
| 22 | RESERVED | | R | 1 |
| 21 | RESERVED | | R | 1 |
| 20 | RESERVED | | R | 1 |
| 19 | RESERVED | | R | 1 |
| 18 | WKG_ENB_FOR_INTR114 | | RW | 1 |
| 17 | WKG_ENB_FOR_INTR113 | | RW | 1 |
| 16 | WKG_ENB_FOR_INTR112 | | RW | 1 |
| 15 | WKG_ENB_FOR_INTR111 | | RW | 1 |
| 14 | WKG_ENB_FOR_INTR110 | | RW | 1 |
| 13 | WKG_ENB_FOR_INTR109 | | RW | 1 |
| 12 | RESERVED | | R | 1 |
| 11 | WKG_ENB_FOR_INTR107 | | RW | 1 |
| 10 | RESERVED | | R | 1 |
| 9 | RESERVED | | R | 1 |
| 8 | WKG_ENB_FOR_INTR104 | | RW | 1 |
| 7 | WKG_ENB_FOR_INTR103 | | RW | 1 |
| 6 | WKG_ENB_FOR_INTR102 | | RW | 1 |
| 5 | WKG_ENB_FOR_INTR101 | | RW | 1 |
| 4 | WKG_ENB_FOR_INTR100 | | RW | 1 |
| 3 | WKG_ENB_FOR_INTR99 | | RW | 1 |
| 2 | WKG_ENB_FOR_INTR98 | | RW | 1 |
| 1 | WKG_ENB_FOR_INTR97 | | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|-------------|------|-------|
| 0 | WKG_ENB_FOR_INTR96 | | RW | 1 |

Table 4-57. Register Call Summary for Register WKG_ENB_D_1

Dual Cortex-A9 MPU Subsystem Functional Description

- [WUGEN: \[0\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CORTEXA9_WUGEN Register Summary: \[1\]](#)

Table 4-58. AUX_CORE_BOOT_0

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x800 | Instance | CORTEXA9_WUGEN |
| Physical Address | 0x4828 1800 | | |
| Description | This register is used by the ROM code and OS during SMP boot, it is intended to store execution start address of CPU1. When needed, the SMP OS (executing on the CPU0) wakes up CPU1 by executing a SEV command. CPU0 needs to communicate some start-up information (e.g. starting address) to CPU1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| AUX_CORE_BOOT_0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|-------------------|------|------------|
| 31:0 | AUX_CORE_BOOT_0 | SMP boot register | RW | 0x00000000 |

Table 4-59. Register Call Summary for Register AUX_CORE_BOOT_0

Dual Cortex-A9 MPU Subsystem Functional Description

- [Cortex-A9 MPU Subsystem Block Diagram: \[0\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CORTEXA9_WUGEN Register Summary: \[1\]](#)
- [CORTEXA9_WUGEN Register Description: \[2\]](#)

Table 4-60. AUX_CORE_BOOT_1

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x804 | Instance | CORTEXA9_WUGEN |
| Physical Address | 0x4828 1804 | | |
| Description | This register is used by the ROM code and OS during SMP boot, used to indicate boot status to either CPUs. When CPU1 received an event (caused by the SEV command), it continues execution in the ROM which set up the code to branch to the address signaled by CPU0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| AUX_CORE_BOOT_1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|-------------------|------|------------|
| 31:0 | AUX_CORE_BOOT_1 | SMP boot register | RW | 0x00000000 |

Table 4-61. Register Call Summary for Register AUX_CORE_BOOT_1

Dual Cortex-A9 MPU Subsystem Functional Description

- [Cortex-A9 MPU Subsystem Block Diagram: \[0\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CORTEXA9_WUGEN Register Summary: \[1\]](#)
- [CORTEXA9_WUGEN Register Description: \[2\]](#)

4.4.10 CMU Registers

4.4.10.1 CMU Register Summary

Table 4-62. CMU Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CMU Base Address |
|--------------------------------|------|-----------------------|--------------------------|--------------------------|
| CMUCONFIGREG | RW | 32 | 0x0000 0000 | 0x4829 0000 |
| CMUSTATUSREG | R | 32 | 0x0000 0004 | 0x4829 0004 |
| RESERVED | R | 32 | 0x0000 0008 | 0x4829 0008 |
| CMUINTRACK | R | 32 | 0x0000 000C | 0x4829 000C |
| CMUALLOCATE | R | 32 | 0x0000 0010 | 0x4829 0010 |
| CMUDEALLOCATE | RW | 32 | 0x0000 0014 | 0x4829 0014 |
| RESERVED | R | 32 | 0x0000 0018 | 0x4829 0018 |
| CMUDEBUG | RW | 32 | 0x0000 001C | 0x4829 001C |
| CMUOPERATION_i ⁽¹⁾ | RW | 32 | 0x0000 1000 + (0x10 * I) | 0x4829 1000 + (0x10 * I) |
| CMUSTARTPA_i ⁽¹⁾ | RW | 32 | 0x0000 1004 + (0x10 * I) | 0x4829 1004 + (0x10 * I) |
| CMULENGTH_i ⁽¹⁾ | RW | 32 | 0x0000 1008 + (0x10 * I) | 0x4829 1008 + (0x10 * I) |
| CMURANGESTATE_i ⁽¹⁾ | R | 32 | 0x0000 100C + (0x10 * I) | 0x4829 100C + (0x10 * I) |

⁽¹⁾ I = 0 to 63

4.4.10.2 CMU Register Description

Table 4-63. CMUCONFIGREG

| | | | |
|-------------------------|----------------------------|-----------------|-----|
| Address Offset | 0x0000 0000 | Instance | CMU |
| Physical Address | 0x4829 0000 | | |
| Description | CMU Configuration Register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------|----|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-------------------|-----------------|-------|----------|---|---|---|--------|----------|---|---|---|
| THREADS | | | | QENTRIES | | | | | | | | | | | | RESERVED | | | | DISABLEPIPELINING | DISABLEPARALLEL | INTEN | RESERVED | | | | ENNSWR | LINESTEP | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31:28 | THREADS | Number of parallel CMO threads that can be simultaneously processed. | R | 0x1 |
| 27:16 | QENTRIES | Number of Queue Entries Configured | R | 0x040 |
| 15:11 | RESERVED | Reserved. | R | 0x00 |
| 10 | DISABLEPIPELINING | Disable pipelining of requests. | RW | 1 |
| 9 | DISABLEPARALLEL | Force sequential operation by disabling any parallelism between RangeSets. | RW | 1 |
| 8 | INTEN | Enable Interrupt on Set Completion. 0b0 = Don't interrupt. 0b1 = Interrupt on Completion. | RW | 0 |
| 7:4 | RESERVED | Reserved | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 3 | ENNSWR | This enables Non-Safe programs to write this register. Out of reset - this bit is 0 which will prevent Non-Safe programs from writing it. Reading is always allowed. This bit can be set to 0x1 only through a Special Safe Monitor API. For more information about the API, see the Initialization chapter. The ROM Code will set this bit to 1 at boot time. The API can be used at runtime by the NS SW to enable/disable when necessary. | RW | 0 |
| 2:0 | LINESTEP | Size of smallest cache line size, log2 - 2. 0x0: Line Step = 4 bytes. 0x1: Line Step = 8 bytes. 0x2: Line Step = 16 bytes. 0x3: Line Step = 32 bytes. 0x4: Line Step = 64 bytes. 0x5: Line Step = 128 bytes. 0x6: Line Step = 256 bytes. 0x7: Line Step = 512 bytes. | R | 0x3 |

Table 4-64. Register Call Summary for Register CMUCONFIGREG

Dual Cortex-A9 MPU Subsystem Functional Description

- [Functionality: \[0\]](#)
- [Parallelism and Pipelining: \[1\]](#)
- [Completion Handling: \[2\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CMU Register Summary: \[3\]](#)

Table 4-65. CMUSTATUSREG

| | | | |
|------------------|-------------|----------|-----|
| Address Offset | 0x0000 0004 | Instance | CMU |
| Physical Address | 0x4829 0004 | | |
| Description | CMU Status. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BUSY | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved. | R | 0x0000 0000 |
| 0 | BUSY | Indicates that at least one set is active. 0b0 = CMU is idle. 0b1 = At least one set is active. | R | 0 |

Table 4-66. Register Call Summary for Register CMUSTATUSREG

Dual Cortex-A9 MPU Subsystem Functional Description

- [Monitoring Completion: \[0\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CMU Register Summary: \[1\]](#)

Table 4-67. CMUINTRACK

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 000C | Instance | CMU |
| Physical Address | 0x4829 000C | | |
| Description | Interrupt Acknowledgment Register. Returns the index of the RangeSet that caused the interrupt. An error bit indicates an error completion. Since there is a queue of interrupt acknowledgments, there is also a valid bit that indicates that there were no more interrupts on the queue. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----------|----|----|----|-------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VALID | RESERVED | | | | | | | | | | | | | | | | ERROR | RESERVED | | | | INDEX | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31 | VALID | Indicates that the label field is valid. Can read the entire queue of entries by reading until get Valid = 0. | R | 0 |
| 30:16 | RESERVED | Reserved | R | 0x0000 |
| 15 | ERROR | Indicates that the RangeSet operation completed with an error. | R | - |
| 14:12 | RESERVED | Reserved | R | 0x0 |
| 11:0 | INDEX | The index of the RangeSet that caused the interrupt. | R | 0x— |

Table 4-68. Register Call Summary for Register CMUINTRACK

Dual Cortex-A9 MPU Subsystem Functional Description

- [Completion Handling: \[0\]](#)
- [Interrupt Index Queue: \[1\] \[2\] \[3\] \[4\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CMU Register Summary: \[5\]](#)

Table 4-69. CMUALLOCATE

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 0010 | Instance | CMU |
| Physical Address | 0x4829 0010 | | |
| Description | Returns the index of a RangeSet in the Free state. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| NONE | RESERVED | | | | | | | | | | | | | | | | INDEX | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31 | NONE | Returns 0b0 if Index is valid or 0b1 if no RangeSets available for allocation | R | 0 |
| 30:8 | RESERVED | Reserved. | R | 0x000000 |
| 7:0 | INDEX | Returns the Index of a RangeSet if one is available or zero. | R | 0x00 |

Table 4-70. Register Call Summary for Register CMUALLOCATE

| | |
|--|--|
| Dual Cortex-A9 MPU Subsystem Functional Description | |
| • Functionality: [0] | |
| • Allocation: [1] [2] | |
| • Allocating a Range Set: [3] [4] | |
| • Configuration Registers: [5] | |
| • Allocation and Free Set Management: [6] [7] [8] [9] | |
| • Priority of Range Set DMEM Accesses: [10] | |
| • Important Programming Notes for Users of CMU: [11] [12] [13] [14] [15] | |
| Dual Cortex-A9 MPU Subsystem Register Manual | |
| • CMU Register Summary: [16] | |

Table 4-71. CMUDEALLOCATE

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 0014 | | |
| Physical Address | 0x4829 0014 | Instance | CMU |
| Description | An index stored to this register frees the RangeSet with that index. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | INDEX | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7:0 | INDEX | RangeSet Index written here is deallocated (set to the Free state). | RW | 0x00 |

Table 4-72. Register Call Summary for Register CMUDEALLOCATE

- [Dual Cortex-A9 MPU Subsystem Functional Description](#)
- [Functionality](#): [0]
- [Allocation](#): [1]
- [Freeing a Range Set](#): [2]
- [Configuration Registers](#): [3]
- [Allocation and Free Set Management](#): [4] [5] [6]
- [Priority of Range Set DMEM Accesses](#): [7]
- [Important Programming Notes for Users of CMU](#): [8]

- [Dual Cortex-A9 MPU Subsystem Register Manual](#)
- [CMU Register Summary](#): [9]

Table 4-73. CMUDEBUG

| | |
|-------------------------|--|
| Address Offset | 0x0000 001C |
| Physical Address | 0x4829 001C |
| Description | Instance CMU Debug register to configure how MSuspend from the various CPUs need to be looked at by CMU to either send or not send traffic during debug session. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|--------------|-------------|---------------|---|--------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | AND_MSUSPEND | OR_MSUSPEND | SPEC_MSUSPEND | | CPU_MSUSPEND | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|------------|
| 31:5 | RESERVED | | R | 0x00000000 |
| 4 | AND_MSUSPEND | This bit can be set so that only if all the MSuspends of all the CPUs present are enabled, CMU will suspend activity to ACP. Bits 3 and 2 need to be set to 0. | RW | 0 |
| 3 | OR_MSUSPEND | This bit can be set so that if any of the MSuspends of CPUs present are enabled, then CMU will suspend activity to ACP. Bits 4 and 2 need to be 0. | RW | 0 |
| 2 | SPEC_MSUSPEND | This bit enables CMU to look at the MSuspend of a specific CPU to suspend CMU activity to ACP. Bits 4, 3 need to be 0 when bit 2 is 1. | RW | 0 |
| 1:0 | CPU_MSUSPEND | This field allows CMU to look at the MSuspend of a specific CPU to suspend traffic to ACP. When bit 4:2 = 3'b001, bits 1:0 indicates which CPU's MSuspend needs to be looked at. If the appropriate CPU's MSuspend is 1, then CMU will not generate any more activity to ACP and rest of system to have a non-intrusive debug session. When Bit 2 = 0, specific CPU's MSuspend cannot be used to control CMU's activity. | RW | 0x0 |

Table 4-74. Register Call Summary for Register CMUDEBUG

Dual Cortex-A9 MPU Subsystem Register Manual

- [CMU Register Summary: \[0\]](#)

Table 4-75. CMUOPERATION_i

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 1000 + (0x10 * I) | Index | I = 0 to 63 |
| Physical Address | 0x4829 1000 + (0x10 * I) | Instance | CMU |
| Description | Controls the operation of one RangeSet of the CMU. Storing this register enqueues or activates the RangeSet. Note: must not write to any of the rangeset registers if State != 0b00. That indicates that previous values have not yet been transferred to the queue! | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|------|----|----------|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | COMPLETION | | WAIT | | RESERVED | | | | OPNSEL | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|---------------|---------|
| 31 | NS | Not Safe. Set to NS used to access StartPA register. Writing one to this bit will perform the operation as non-safe. The software can not clear this bit to 0x0 after. | RW W1toSet | 0 |
| 30:11 | RESERVED | Reserved. | R | 0x00000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 10:9 | COMPLETION | Completion Signaling Options: 0x0: No notification of normal or error completion. 0x1: Interrupt on normal or error completion. 0x2: Interrupt on error but not normal completion. 0x3: Reserved. | RW | 0x0 |
| 8 | WAIT | Wait to start. 0b1 = Wait until all previous requests are complete. 0b0 = may proceed in parallel with previous requests. | RW | 0 |
| 7:4 | RESERVED | Reserved. | R | 0x0 |
| 3:0 | OPNSEL | Selects the Cache Management Operation. If an operation is started with a reserved OpnSel, the RangeSet is immediately moved to the Error state. 0x0: No operation is performed. A RangeSet activated with this OpnSel is immediately moved to the completed state. 0x1: Invalidate. 0x2: Clean. 0x3: Clean and Invalidate. 0x4: Reserved. 0x5: Reserved. 0x6: Reserved. 0x7: Reserved. 0x8: Reserved. 0x9: Reserved. 0xA: Reserved. 0xB: Reserved. 0xC: Reserved. 0xD: Reserved. 0xE: Reserved. 0xF: Always moves the RangeSet to the Error State. | RW | 0x0 |

Table 4-76. Register Call Summary for Register CMUOPERATION_i

Dual Cortex-A9 MPU Subsystem Functional Description

- [Functionality: \[0\] \[1\]](#)
- [Range Sets: \[2\]](#)
- [Parallelism and Pipelining: \[3\]](#)
- [Completion Handling: \[4\]](#)
- [Activate the Range Set by Storing the Operation Register: \[5\]](#)
- [Monitoring Completion: \[6\]](#)
- [Interrupt Index Queue: \[7\]](#)
- [Interrupt Index Queue: \[8\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CMU Register Summary: \[9\]](#)

Table 4-77. CMUSTARTPA_i

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 1004 + (0x10 * I) | Index | I = 0 to 63 |
| Physical Address | 0x4829 1004 + (0x10 * I) | Instance | CMU |
| Description | Starting (lower, inclusive) 32-bit physical address. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STARTPA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------------------|------|-------------|
| 31:0 | STARTPA | Start of range for cache operations. | RW | 0x0000 0000 |

Table 4-78. Register Call Summary for Register CMUSTARTPA_i

Dual Cortex-A9 MPU Subsystem Functional Description

- [Functionality: \[0\]](#)
- [Range Sets: \[1\]](#)
- [Address Sequence Generation: \[2\] \[3\]](#)
- [Storing Starting Physical Address and Length: \[4\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CMU Register Summary: \[5\]](#)

Table 4-79. CMULENGTH_i

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 1008 + (0x10 * I) | Index | I = 0 to 63 |
| Physical Address | 0x4829 1008 + (0x10 * I) | Instance | CMU |
| Description | Length in bytes of the range - 1, giving a representable range of 1 byte to 4k bytes. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LEN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------|------|-------|
| 31:12 | RESERVED | Reserved | R | 0x000 |
| 11:0 | LEN | Length of range minus 1. | RW | 0x000 |

Table 4-80. Register Call Summary for Register CMULENGTH_i

Dual Cortex-A9 MPU Subsystem Functional Description

- [Functionality: \[0\]](#)
- [Range Sets: \[1\]](#)
- [Address Sequence Generation: \[2\] \[3\] \[4\]](#)
- [Storing Starting Physical Address and Length: \[5\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CMU Register Summary: \[6\]](#)

Table 4-81. CMURANGESTATE_i

| | | | |
|------------------|--|----------|-------------|
| Address Offset | 0x0000 100C + (0x10 * I) | Index | I = 0 to 63 |
| Physical Address | 0x4829 100C + (0x10 * I) | Instance | CMU |
| Description | State of the Range Operation. Used to poll RangeSet for error or completion. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STATE | | | | | | | | RESERVED | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------------|
| 31:29 | STATE | State of the RangeSet Request. Read 0x0: RangeSet is unallocated. Read 0x1: RangeSet allocated but not yet activated. Read 0x2: Reserved Read 0x3: RangeSet is active, either sequencing through cache lines, awaiting completion of earlier RangeSets or awaiting processing resources. Read 0x4: Reserved Read 0x5: Reserved Read 0x6: RangeSet operation completed without errors. Read 0x7: RangeSet encountered an error. Processing of the RangeSet stops with the first error. It is reported as complete with error. | R | 0x0 |
| 28:0 | RESERVED | Reserved | R | 0x0000 0000 |

Table 4-82. Register Call Summary for Register CMURANGESTATE_i

Dual Cortex-A9 MPU Subsystem Functional Description

- [Functionality: \[0\]](#)
- [Monitoring Completion: \[1\] \[2\]](#)

Dual Cortex-A9 MPU Subsystem Register Manual

- [CMU Register Summary: \[3\]](#)

4.4.11 Local Interconnect Registers

4.4.11.1 Local Interconnect Register Summary

Table 4-83. Local interconnect Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Local interconnect Base Address |
|-----------------------------|------|-----------------------|----------------|---------------------------------|
| MA_PRIORITY | RW | 32 | 0x0 | 0x482A 2000 |

4.4.11.2 Local Interconnect Register Description

Table 4-84. MA_PRIORITY

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x482A 2000 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | Local interconnect | | | | | | | | | | | | | | | |
| Description | Memory Adapter Priority Register. This register indicates the priority of memory access from MA to EMIF. This priority is used by EMIF in scheduling MA access to EMIF. 0x0 is lowest priority and 0x7 highest priority. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------|---|---|---|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | PRIORITY | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------|------|-------------|
| 31:3 | RESERVED | Reserved | RW | 0x0000 0000 |
| 2:0 | PRIORITY | MA priority value | RW | 0x0 |

Table 4-85. Register Call Summary for Register MA_PRIORITY

Dual Cortex-A9 MPU Subsystem Register Manual

- [Local Interconnect Register Summary: \[0\]](#)

4.4.12 MA Registers

4.4.12.1 MA Register Summary

Table 4-86. MA Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | MA Base Address |
|------------------------------|------|-----------------------|-------------------------|-------------------------|
| RESERVED | R | 32 | 0x0000 0010 | 0x482A F010 |
| MA_LISA_LOCK | RW | 32 | 0x0000 001C | 0x482A F01C |
| MA_LISA_MAP_i ⁽¹⁾ | RW | 32 | 0x0000 0040 + (0x4 * I) | 0x482A F040 + (0x4 * I) |

⁽¹⁾ I = 0 to 63

4.4.12.2 MA Register Description

For the description of the MA registers, see [Section 16.2.6, DMM Register Manual](#), in [Section 16.2, Dynamic Memory Manager](#), where MA_LISA_LOCK corresponds to the DMM_LISA_LOCK register description, and MA_LISA_MAP_i corresponds to the DMM_LISA_MAP_i register description.

PRELIMINARY

DSP Subsystem

This information is not available in the public domain.

Topic

Page

| |
|--|
| |
|--|

PRELIMINARY

IVA-HD Subsystem

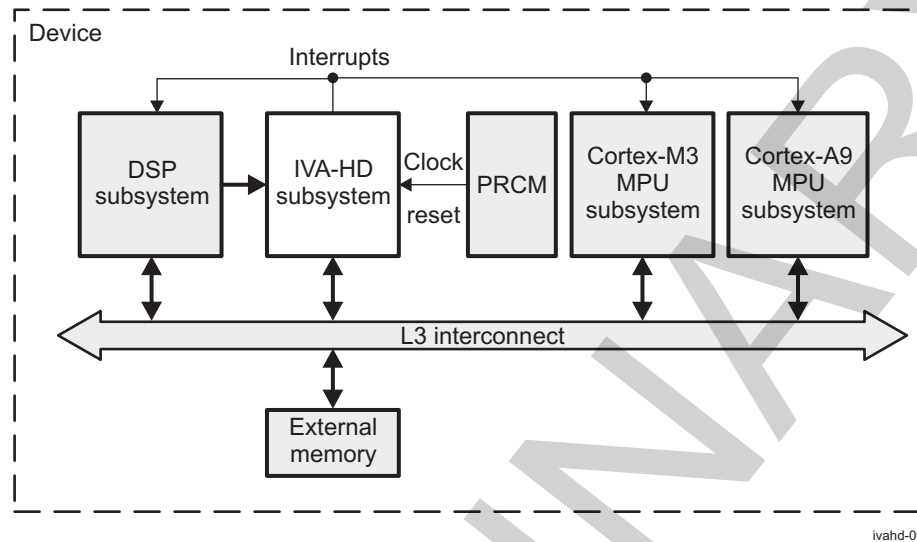
This chapter describes the IVA-HD subsystem in the multimedia device.

| Topic | Page |
|---------------------------|------|
| 6.1 IVA-HD Overview | 1146 |

6.1 IVA-HD Overview

The IVA-HD is the image and video imaging hardware accelerator subsystem. Figure 6-1 shows the IVA-HD subsystem in the device.

Figure 6-1. IVA-HD in the Device



The IVA-HD supports resolutions up to 1080 p/i with full performance of 30 fps (or 60 fields). The IVA-HD subsystem supports the following codec standards natively; that is, all functions of standards are accelerated (without any intervention of the digital signal processor [DSP]):

- H.264: BP/MP/HP Encode and Decode
- H.264: Fast Profile/RCDO Encode and Decode
- MPEG-4: SP/ASP Encode/Decode (No support for GMC)
- DivX 5.x and higher Encode/Decode (No lower version; for example, 3.11 and 4.x)
- H.263: Profile 0 and 3 for Decode, Profile 0 for Encode
- Sorenson Spark: V0 and V1 Decode (No encode support)
- MPEG-2 SP/MP Encode/Decode
- MPEG-1 Encode/Decode
- VC-1/WMV9/RTV : SP/MP/AP Encode and Decode
- On2® VP6/VP7 Decode
- RealVideo® 8/9/10 Decode
- AVS 1.0 Encode and Decode
- JPEG (also MJPEG) Baseline Encode/Decode
- H.264 Annex G (SVC) Scalable Baseline Profile to 480p – 720p30
- H.264 Annex H (MVC) up to 720p30

The IVA-HD subsystem is composed of:

- A primary sequencer, including its memories and an interrupt controller: iCONT1
- A video direct memory access (DMA) processor, which can be used as a secondary sequencer: iCONT2
- A video DMA engine: vDMA
- An entropy coder/decoder: ECD3
- A motion compensation engine: MC3
- A transform and quantization calculation engine: CALC3
- A loop filter acceleration engine: iLF3

- A motion estimation acceleration engine: iME3
- An intraprediction estimation engine: iPE3
- Shared level 2 (L2) interface and memory
- Local interconnect
- A message interface for communication between SyncBoxes
- Mailbox
- A debug module for trace event and software instrumentation: SMSET

IVA-HD 1.0 will use eXpressDSP Digital Media (xDM) standard as the principle software interface. The xDM standard defines application programming interfaces (APIs) through which an application invokes a particular class of codec, such as video decode or audio encode.

xDM developers kit, technical documentation and full compliant codecs can be downloaded from <http://focus.ti.com/docs/toolsw/folders/print/tmdxdaisxdm.html>.

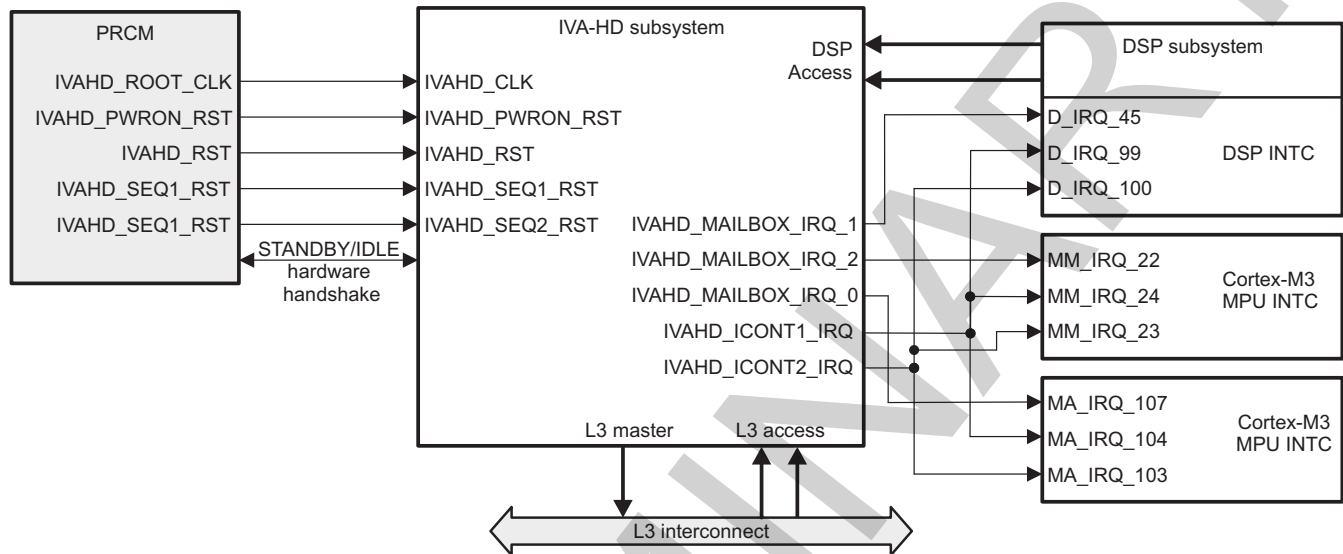
Software released on IVA-HD 1.0 will be xDM-compliant and will be available during 2010.

6.1.1 IVA-HD Integration

This section describes IVA-HD in the device, including information about clocks, resets, and hardware requests.

Figure 6-2 shows IVA-HD integration.

Figure 6-2. IVA-HD Integration



ivahd-002

NOTE: For more information about the STANDBY/IDLE hardware handshake and the wake-up request, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3 Power, Reset and Clock Management](#).

Table 6-1 through Table 6-3 summarize the integration of the module in the device.

Table 6-1. IVA-HD Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| IVA-HD | PD_IVAHD | L3 |

Table 6-2. IVA-HD Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| IVA-HD | IVAHD_CLK | IVAHD_ROOT_CLK | CM | IVA-HD clock (functional and interface) |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| IVA-HD | IVAHD_PWRON_RST | IVAHD_PWRON_RST | PRM | IVA-HD power-on reset |
| IVA-HD | IVAHD_RST | IVAHD_RST | PRM | IVA-HD global reset (all logic is reset) |
| IVA-HD | IVAHD_SEQ1_RST | IVAHD_SEQ1_RST | PRM | iCONT1 reset |
| IVA-HD | IVAHD_SEQ2_RST | IVAHD_SEQ2_RST | PRM | iCONT2 reset |

Table 6-3. Hardware Requests

| Module Instance | Source Signal Name | Destination Signal Name | Interrupt Requests | |
|-----------------|---------------------|-------------------------|---------------------|---------------------------------|
| | | | Destination | Description |
| IVA-HD | IVAHD_MAILBOX_IRQ_0 | MA_IRQ_107 | Cortex™-A9 MPU INTC | IVA-HD mailbox user 0 interrupt |
| IVA-HD | IVAHD_ICONT1_IRQ | MA_IRQ_104 | Cortex-A9 MPU INTC | Sync interrupt from iCONT1 |
| IVA-HD | IVAHD_ICONT2_IRQ | MA_IRQ_103 | Cortex-A9 MPU INTC | Sync interrupt from iCONT2 |
| IVA-HD | IVAHD_MAILBOX_IRQ_1 | D_IRQ_45 | DSP INTC | IVA-HD mailbox user 1 interrupt |
| IVA-HD | IVAHD_ICONT1_IRQ | D_IRQ_99 | DSP INTC | Sync interrupt from iCONT1 |
| IVA-HD | IVAHD_ICONT2_IRQ | D_IRQ_100 | DSP INTC | Sync interrupt from iCONT2 |
| IVA-HD | IVAHD_MAILBOX_IRQ_2 | MM_IRQ_22 | Cortex™-M3 MPU INTC | IVA-HD mailbox user 2 interrupt |
| IVA-HD | IVAHD_ICONT1_IRQ | MM_IRQ_24 | Cortex-M3 MPU INTC | Sync interrupt from iCONT1 |
| IVA-HD | IVAHD_ICONT2_IRQ | MM_IRQ_23 | Cortex-M3 MPU INTC | Sync interrupt from iCONT2 |

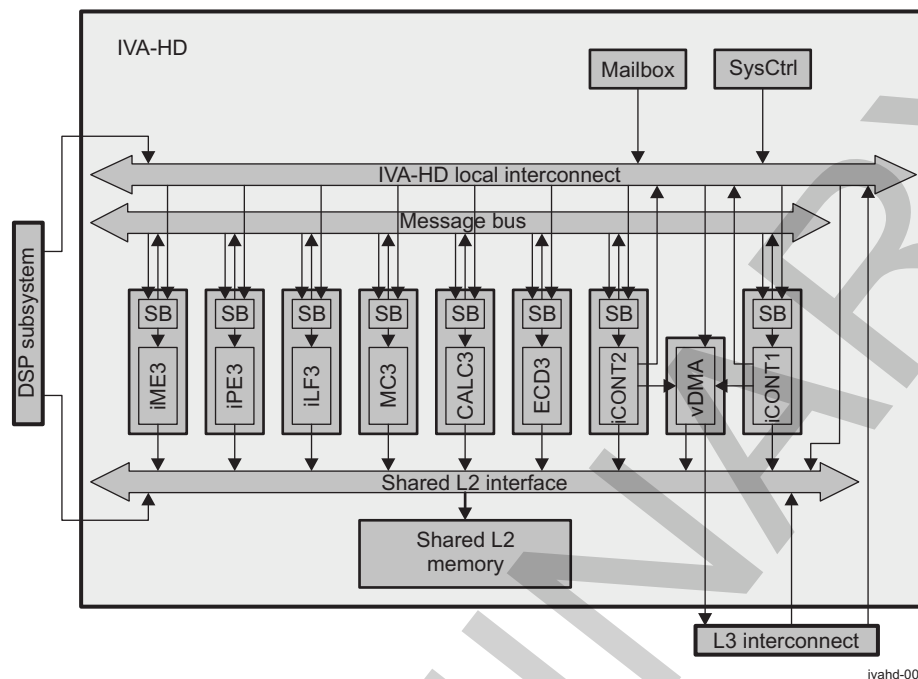
NOTE:

- For more information about the mailbox interrupt, see [Section 20.3.4](#).

6.1.2 IVA-HD Functional Description

6.1.2.1 IVA-HD Block Diagram

[Figure 6-3](#) shows a block diagram of the IVA-HD subsystem.

Figure 6-3. IVA-HD Block Diagram

NOTE: SB stands for SyncBox.

NOTE: iPE3, MC3, CALC3, and ECD3 include a load and store engine (LSE), which is the same in each of these modules.

6.1.2.1.1 SyncBox

The SyncBox is a configurable module that is responsible for scheduling all embedded hardware module within IVA-HD subsystem. It handles all aspects of synchronization, data sharing, and parameters passing between accelerators. It also offers the possibilities to use asynchronous messages.

6.1.2.1.2 iCONTs

The iCONT module is an ARM968E-S™ based microcontroller with 32KB of instruction tightly coupled memory and 16KB of data tightly coupled memory. It includes an interrupt controller (INTC), a local data mover, its own SyncBox module for synchronizing tasks with other modules and its associated SyncBox handler.

Two identical instances of iCONT, iCONT1, and iCONT2, are present in the IVA-HD subsystem. They can typically be used to perform high-level processing (at frame and slice level), control at macroblock-level bounding box computation and other vDMA processing tasks.

Software can map process equally on either iCONT.

6.1.2.1.3 vDMA

The vDMA is a DMA engine to perform data transfer between external memories and shared L2 memory and also memory copies inside SL2 and inside external memory.

6.1.2.1.4 iME3

The iME3 accelerator is used to perform motion estimation in encode processing. iME3 embeds its own SyncBox module for synchronizing tasks with other modules.

It compares a current macroblock to reference area and provides area in reference region (in terms of offsets) which is least different to the current macroblock. It can also interpolate a block with half or quarter pixel precision, thus producing 4 (half pixel) or 16 (quarter pixel) interpolated blocks from the original block. Additionally, it supports searching of the best matching block within the interpolated planes.

6.1.2.1.5 iPE3

The iPE3 accelerator is used to perform the intraprediction estimation in encode. The iPE3 embeds its own SyncBox module for synchronizing tasks with other modules and an LSE to transfer data from internal memories to shared L2 memory.

It supports two modes, depending on video standard:

- Spatial intraprediction estimation for H.264 and AVS. It creates intraprediction macroblocks with given intramodes from original macroblock and provides cost estimation between the original macroblock and each pseudo intraprediction macroblock, and then chooses a mode with the smallest cost to recommend it as an optimal intraprediction mode.
- Spatial activity for MPEG-1/2/4 and VC-1. It calculates the spatial activity of the original luminance samples with the specified block size. This mode intends to provide information of the original Luma pixels. The values can be used to decide the coding parameters of the macroblock such as the coding mode and the quantization parameter.

6.1.2.1.6 MC3

The MC3 accelerator is used to perform the motion compensation. MC3 embeds its own SyncBox module for synchronizing tasks with other HWAs and an LSE to transfer data from internal memories to shared L2 memory.

It creates an interprediction macroblock with given motion vectors and modes from the reference data.

6.1.2.1.7 CALC3

The CALC3 accelerator is used to perform forward and inverse transform and quantization calculation. CALC3 embeds its own SyncBox module for synchronizing tasks with other HWAs and an LSE to transfer data from internal memories to shared L2 memory.

It can perform transform/inverse transform, Q/iQ and DC/AC prediction.

6.1.2.1.8 iLF3

The iLF3 accelerator is used to perform deblocking filtering and boundary strength computation. The iLF3 embeds its own SyncBox module for synchronizing tasks with other HWAs.

6.1.2.1.9 ECD3

The ECD3 accelerator is designed to encode and decode the stream. ECD3 embeds its own SyncBox module for synchronizing tasks with other HWAs and an LSE to transfer data from internal memories to shared L2 memory.

It supports Huffman codes and arithmetic codes.

For encode, the ECD3 encodes the macroblock information and residual data into bitstream. For decode, the ECD3 decodes the bitstream and recovers the macroblock information and residual data.

6.1.2.1.10 SL2 Interface

The shared L2 interface, SL2IF, is an arbitrator that allows 18 initiators to access to an interleaved set of eight memory banks.

The SL2IF has two sets of interfaces:

- Eighteen 128-bit interfaces for accesses from module's to shared L2 memories.
- Eight 128-bit memory interfaces for direct accesses to memory bank

6.1.2.1.11 Message Bus

The message bus, is an arbitrator that allows eight initiators to access eight targets. It is used to dispatch messages generated by the SyncBox of the different IPs.

6.1.2.1.12 IVA-HD Local Interconnect

The IVA-HD local interconnect provides connectivity between two external host interconnects (DSP and L3), two local sequencers (iCONT1 and iCONT2) and video hardware accelerators (iME3, iLF3, ECD3, CALC3, MC3, iPE3), video DMA engine (vDMA), and local modules (mailbox and sysctrl).

6.1.2.1.13 MailBox

The function of the mailbox is to support a 2-way communication between two hosts through interrupt. It allows the software to establish a communication channel between processors through a set of registers and associated interrupt signals by sending and receiving messages.

The mailbox embedded inside the IVA-HD subsystem implements a 2-way communication between three external users and one internal user. This communication is ensured through three pairs of mailboxes and four-message FIFO depth for each message queue.

NOTE: The internal user is one of the two iCONTs. iCONT1 and iCONT2 are connected on a shared interrupt line. The choice between iCONT1 and iCONT2 is done by masking mailbox interrupt on iCONT1 or iCONT2. iCONT1 and iCONT2 can access the mailbox through the IVA-HD local interconnect.

For a detailed description of the mailbox, including IVA-HD mailbox interrupt mapping, see , *IVA-HD Imaging Controller*.

6.1.2.1.14 IVA-HD System Control

The SYSCTRL module of IVA-HD is in charge of:

- Controlling clocks to module's, upon software control and power handshaking state
- Controlling power, reset, and clock management (PRCM) module power handshaking
- Providing status of the above operation
- Supporting synchronization through external event

6.1.2.2 IVA-HD Power Management

Table 6-4 describes power-management features available for the IVA-HD module.

NOTE: For descriptions of IdleMode and StandbyMode features, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 6-4. Local Power-Management Features

| Feature | Registers | Description |
|----------------------|--|---|
| Slave idle modes | IVAHD_SYSCONFIG [3:2] IDLEMODE | No-idle and smart-idle modes are available. |
| Master standby modes | IVAHD_SYSCONFIG [5:4] STANDBYMODE | No-standby and smart-standby modes are available. |

6.1.2.3 IVA-HD Memory Mapping

ARM968E-S (of each iCONT) can address a 4-GB memory space. The lower address range (8MB) is allocated to its level 1 (L1) memories (ITCM and DTCM). The higher address range is allocated to L2 memories. Access to L2 memories can be buffered or nonbuffered, depending on the selected address range. For more information, see the ARM968E-STM Technical Reference Manual.

In [Table 6-5](#), the address spaces of buffered regions are shown as EXT_BUF, and the address spaces of nonbuffered regions are shown as EXT_NBUF.

Table 6-5. iCONT Memory Mapping Regions

| Region Name | Address | | Size (KB) | Description |
|---------------------|--------------|-------------|-----------|-------------------------------|
| | Start | Stop | | |
| ITCM | 0x0000 0000 | 0x0000 7FFF | 32 | ITCM memory aliased 128 times |
| | ... | ... | ... | |
| ITCM (alias 127) | 0x003F 8000 | 0x003F FFFF | 32 | |
| DTCM | 0x0040 0000 | 0x0040 3FFF | 16 | DTCM memory aliased 256 times |
| | ... | ... | ... | |
| DTCM (alias 255) | 0x007F C000 | 0x007F FFFF | 16 | |
| EXT_BUF | 0x0080 0000 | 0x008F FFFF | 1024 | External buffered region |
| | ... | ... | ... | |
| EXT_BUF (alias 247) | 0x0FF0 0000 | 0x0FFF FFFF | 1024 | External buffered region |
| EXT_NBUF (alias) | 0x1000 0000 | 0x100F 0000 | 1024 | External nonbuffered region |
| | ... | ... | ... | |
| EXT_NBUF (alias) | 0x1FF0 00000 | 0x1FFF FFFF | 1024 | External nonbuffered region |
| | ... | ... | ... | |
| EXT_BUF (alias) | 0xM000 0000 | 0xM0FF FFFF | 1024 | External buffered region |
| | ... | ... | ... | |
| EXT_NBUF (alias) | 0xFFFF 0000 | 0xFFFF FFFF | 1024 | External nonbuffered region |

Each of these regions (EXT_BUF and EXT_NBUF) has the same memory map, aliased throughout the address range of the region. [Table 6-6](#) lists iCONT1 memory mapping, and [Table 6-7](#) lists iCONT2 memory mapping. Offsets shown are from the start of the region.

Table 6-6. iCONT1 Memory Mapping

| Module | Offset in Region | | Size (KB) |
|---------------|------------------|-------------|-----------|
| | Begin | End | |
| SL2 - Mem | 0x0000 0000 | 0x0003 FFFF | 256 |
| Reserved | 0x0004 0000 | 0x0007 FFFF | 256 |
| iCONT1 - DMem | 0x0008 0000 | 0x0008 3FFF | 16 |
| Reserved | 0x0008 4000 | 0x0008 7FFF | 16 |
| iCONT1 - IMem | 0x0008 8000 | 0x0008 FFFF | 32 |
| iCONT2 - DMem | 0x0009 0000 | 0x0009 3FFF | 16 |
| Reserved | 0x0009 4000 | 0x0009 7FFF | 16 |
| iCONT2 - IMem | 0x0009 8000 | 0x0009 FFFF | 32 |
| ECD3 - Mem | 0x000A 0000 | 0x000A 7FFF | 32 |
| CALC3 - Mem | 0x000A 8000 | 0x000A BFFF | 16 |
| Reserved | 0x000A C000 | 0x000A FFFF | 16 |
| MC3 - Mem | 0x000B 0000 | 0x000B 7FFF | 32 |
| iPE3 - Mem | 0x000B 8000 | 0x000B 8FFF | 4 |
| Reserved | 0x000B 9000 | 0x000C 0FFF | 32 |
| SMSET - Reg | 0x000C 1000 | 0x000C 1FFF | 4 |
| SMSET - SWI | 0x000C 2000 | 0x000C 27FF | 2 |
| Reserved | 0x000C 2800 | 0x000C FFFF | 54 |
| vDMA - Reg | 0x000D 0000 | 0x000D 1FFF | 8 |
| iLF3 - Reg | 0x000D 2000 | 0x000D 2FFF | 4 |
| Reserved | 0x000D 3000 | 0x000D 3FFF | 4 |

Table 6-6. iCONT1 Memory Mapping (continued)

| Module | Offset in Region | | Size KB |
|-----------------------------|------------------|-------------|------------|
| | Begin | End | |
| iME3 - Reg | 0x000D 4000 | 0x000D 7FFF | 16 |
| CALC3 - Reg | 0x000D 8000 | 0x000D 87FF | 2 |
| iPE3 - Reg | 0x000D 8800 | 0x000D 8FFF | 2 |
| MC3 - Reg | 0x000D 9000 | 0x000D 97FF | 2 |
| ECD3 - Reg | 0x000D 9800 | 0x000D 9FFF | 2 |
| Reserved | 0x000D A000 | 0x000D A3FF | 1 |
| SysControl | 0x000D A400 | 0x000D A7FF | 1 |
| Mailbox | 0x000D A800 | 0x000D ABFF | 1 |
| Reserved | 0x000D AC00 | 0x000D FFFF | 21 |
| iCONT1 - SyncBox | 0x000E 0000 | 0x000E 07FF | 2 |
| iCONT2 - SyncBox | 0x000E 0800 | 0x000E 0FFF | 2 |
| iLF3 - SyncBox | 0x000E 1000 | 0x000E 17FF | 2 |
| iME3 - SyncBox | 0x000E 1800 | 0x000E 1FFF | 2 |
| CALC3 - SyncBox | 0x000E 2000 | 0x000E 27FF | 2 |
| iPE3 - SyncBox | 0x000E 2800 | 0x000E 2FFF | 2 |
| MC3 - SyncBox | 0x000E 3000 | 0x000E 37FF | 2 |
| ECD3 - SyncBox | 0x000E 3800 | 0x000E 3FFF | 2 |
| Reserved | 0x000E 4000 | 0x000E FFFF | 48 |
| iCONT1 - Reg ⁽¹⁾ | 0x000F 0000 | 0x000F 0FFF | 4 |
| iCONT2 - Reg | 0x000F 1000 | 0x000F 1FFF | 4 |
| iCONT1 - Reg ⁽²⁾ | 0x000F 2000 | 0x000F 2FFF | 4 |
| Reserved | 0x000F 3000 | 0x000F FFFF | 52 |

(1) iCONT1 private access to its own registers

(2) iCONT1 self-access to its own registers

Table 6-7. iCONT2 Memory Mapping

| Module | Offset in Region | | Size KB |
|---------------|------------------|-------------|------------|
| | Begin | End | |
| SL2 - Mem | 0x0000 0000 | 0x0003 FFFF | 256 |
| Reserved | 0x0004 0000 | 0x0007 FFFF | 256 |
| iCONT1 - DMem | 0x0008 0000 | 0x0008 3FFF | 16 |
| Reserved | 0x0008 4000 | 0x0008 7FFF | 16 |
| iCONT1 - IMem | 0x0008 8000 | 0x0008 FFFF | 32 |
| iCONT2 - DMem | 0x0009 0000 | 0x0009 3FFF | 16 |
| Reserved | 0x0009 4000 | 0x0009 7FFF | 16 |
| iCONT2 - IMem | 0x0009 8000 | 0x0009 FFFF | 32 |
| ECD3 - Mem | 0x000A 0000 | 0x000A 7FFF | 32 |
| CALC3 - Mem | 0x000A 8000 | 0x000A BFFF | 16 |
| Reserved | 0x000A C000 | 0x000A FFFF | 16 |
| MC3 - Mem | 0x000B 0000 | 0x000B 7FFF | 32 |
| iPE3 - Mem | 0x000B 8000 | 0x000B 8FFF | 4 |
| Reserved | 0x000B 9000 | 0x000C 0FFF | 32 |
| SMSET - Reg | 0x000C 1000 | 0x000C 1FFF | 4 |
| SMSET - SWI | 0x000C 2000 | 0x000C 27FF | 2 |
| Reserved | 0x000C 2800 | 0x000C FFFF | 54 |

Table 6-7. iCONT2 Memory Mapping (continued)

| Module | Offset in Region | | Size |
|------------------|------------------|-------------|------|
| | | | |
| vDMA - Reg | 0x000D 0000 | 0x000D 1FFF | 8 |
| iLF3 - Reg | 0x000D 2000 | 0x000D 2FFF | 4 |
| Reserved | 0x000D 3000 | 0x000D 3FFF | 4 |
| iME3 - Reg | 0x000D 4000 | 0x000D 7FFF | 16 |
| CALC3 - Reg | 0x000D 8000 | 0x000D 87FF | 2 |
| iPE3 - Reg | 0x000D 8800 | 0x000D 8FFF | 2 |
| MC3 - Reg | 0x000D 9000 | 0x000D 97FF | 2 |
| ECD3 - Reg | 0x000D 9800 | 0x000D 9FFF | 2 |
| Reserved | 0x000D A000 | 0x000D A3FF | 1 |
| SysControl | 0x000D A400 | 0x000D A7FF | 1 |
| Mailbox | 0x000D A800 | 0x000D ABFF | 1 |
| Reserved | 0x000D AC00 | 0x000D FFFF | 21 |
| iCONT1 - SyncBox | 0x000E 0000 | 0x000E 07FF | 2 |
| iCONT2 - SyncBox | 0x000E 0800 | 0x000E 0FFF | 2 |
| iLF3 - SyncBox | 0x000E 1000 | 0x000E 17FF | 2 |
| iME3 - SyncBox | 0x000E 1800 | 0x000E 1FFF | 2 |
| CALC3 - SyncBox | 0x000E 2000 | 0x000E 27FF | 2 |
| iPE3 - SyncBox | 0x000E 2800 | 0x000E 2FFF | 2 |
| MC3 - SyncBox | 0x000E 3000 | 0x000E 37FF | 2 |
| ECD3 - SyncBox | 0x000E 3800 | 0x000E 3FFF | 2 |
| Reserved | 0x000E 4000 | 0x000E FFFF | 48 |
| iCONT1 - Reg | 0x000F 0000 | 0x000F 0FFF | 4 |
| iCONT2 - Reg | 0x000F 1000 | 0x000F 1FFF | 4 |
| Reserved | 0x000F 2000 | 0x000F 2FFF | 4 |
| iCONT2 - Reg | 0x000F 3000 | 0x000F 3FFF | 4 |
| Reserved | 0x000F 4000 | 0x000F FFFF | 48 |

1. iCONT2 private access to its own registers
2. iCONT2 self-access to its own registers

NOTE: Definition of iCONT self-access and private access:

- Self-access: Direct access of iCONT to its own memory-mapped registers (MMRs) (reduced latency); that is, without using the IVA-HD local interconnect. Internal iCONT configuration (CFG) registers are not visible. Only IRQ, DM, and SBH registers can be accessed.
- Private access: Access through IVA-HD local interconnect. By default, all iCONT accesses described in [Table 6-6](#) and [Table 6-7](#) are private, except for corresponding self-access. In case of iCONT private access to its own registers, internal iCONT CFG registers are visible (on top of IRQ, DM, and SBH).

NOTE: Examples of start address:

- Buffered region: 0x0080 0000, 0x0090 0000, 0x00A0 0000, 0x0FF0 0000, 0x2000 0000, etc.
- Nonbuffered region: 0x1000 0000, 0x1010 0000, 0x1020 0000, 0x1FF0 0000, 0x3000 0000, etc.

[Table 6-8](#) shows IVA-HD modules and memory addresses for the DSP processor and L3 access.

Table 6-8. DSP and L3 Interconnect Memory Mapping

| Module | Begin Offset | DSP Private Address | | L3 Interconnect Address | | Size (KB) |
|-----------------|--------------|---------------------|-------------|-------------------------|-------------|-----------|
| | | Begin | End | Begin | End | |
| iCONT1 - DMem | 0x0000 0000 | 0x01E0 0000 | 0x01E0 3FFF | 0x5A00 0000 | 0x5A00 3FFF | 16 |
| Reserved | 0x0000 4000 | 0x01E0 4000 | 0x01E0 7FFF | 0x5A00 4000 | 0x5A00 7FFF | 16 |
| iCONT1 - IMem | 0x0000 8000 | 0x01E0 8000 | 0x01E0 FFFF | 0x5A00 8000 | 0x5A00 FFFF | 32 |
| iCONT2 - DMem | 0x0001 0000 | 0x01E1 0000 | 0x01E1 3FFF | 0x5A01 0000 | 0x5A01 3FFF | 16 |
| Reserved | 0x0001 4000 | 0x01E1 4000 | 0x01E1 7FFF | 0x5A01 4000 | 0x5A01 7FFF | 16 |
| iCONT2 - IMem | 0x0001 8000 | 0x01E1 8000 | 0x01E1 FFFF | 0x5A01 8000 | 0x5A01 FFFF | 32 |
| ECD3 - Mem | 0x0002 0000 | 0x01E2 0000 | 0x01E2 7FFF | 0x5A02 0000 | 0x5A02 7FFF | 32 |
| CALC3 - Mem | 0x0002 8000 | 0x01E2 8000 | 0x01E2 BFFF | 0x5A02 8000 | 0x5A02 BFFF | 16 |
| Reserved | 0x0002 C000 | 0x01E2 C000 | 0x01E2 FFFF | 0x5A02 C000 | 0x5A02 FFFF | 16 |
| MC3 - Mem | 0x0003 0000 | 0x01E3 0000 | 0x01E3 7FFF | 0x5A03 0000 | 0x5A03 7FFF | 32 |
| iPE3 - Mem | 0x0003 8000 | 0x01E3 8000 | 0x01E3 8FFF | 0x5A03 8000 | 0x5A03 8FFF | 4 |
| Reserved | 0x0003 9000 | 0x01E3 9000 | 0x01E4 FFFF | 0x5A03 9000 | 0x5A04 FFFF | 92 |
| vDMA - Reg | 0x0005 0000 | 0x01E5 0000 | 0x01E5 1FFF | 0x5A05 0000 | 0x5A05 1FFF | 8 |
| iLF3 - Reg | 0x0005 2000 | 0x01E5 2000 | 0x01E5 2FFF | 0x5A05 2000 | 0x5A05 2FFF | 4 |
| Reserved | 0x0005 3000 | 0x01E5 3000 | 0x01E5 3FFF | 0x5A05 3000 | 0x5A05 3FFF | 4 |
| iME3 - Reg | 0x0005 4000 | 0x01E5 4000 | 0x01E5 7FFF | 0x5A05 4000 | 0x5A05 7FFF | 16 |
| CALC3 - Reg | 0x0005 8000 | 0x01E5 8000 | 0x01E5 87FF | 0x5A05 8000 | 0x5A05 87FF | 2 |
| iPE3 - Reg | 0x0005 8800 | 0x01E5 8800 | 0x01E5 8FFF | 0x5A05 8800 | 0x5A05 8FFF | 2 |
| MC3 - Reg | 0x0005 9000 | 0x01E5 9000 | 0x01E5 97FF | 0x5A05 9000 | 0x5A05 97FF | 2 |
| ECD3 - Reg | 0x0005 9800 | 0x01E5 9800 | 0x01E5 9FFF | 0x5A05 9800 | 0x5A05 9FFF | 2 |
| Reserved | 0x0005 A000 | 0x01E5 A000 | 0x01E5 A3FF | 0x5A05 A000 | 0x5A05 A3FF | 1 |
| SysControl | 0x0005 A400 | 0x01E5 A400 | 0x01E5 A7FF | 0x5A05 A400 | 0x5A05 A7FF | 1 |
| Mailbox | 0x0005 A800 | 0x01E5 A800 | 0x01E5 ABFF | 0x5A05 A800 | 0x5A05 ABFF | 1 |
| Reserved | 0x0005 AC00 | 0x01E5 AC00 | 0x01E5 FFFF | 0x5A05 AC00 | 0x5A05 FFFF | 21 |
| iCONT1 - SBox | 0x0006 0000 | 0x01E6 0000 | 0x01E6 07FF | 0x5A06 0000 | 0x5A06 07FF | 2 |
| iCONT2 - SBox | 0x0006 0800 | 0x01E6 0800 | 0x01E6 0FFF | 0x5A06 0800 | 0x5A06 0FFF | 2 |
| iLF3 - SyncBox | 0x0006 1000 | 0x01E6 1000 | 0x01E6 17FF | 0x5A06 1000 | 0x5A06 17FF | 2 |
| iME3 - SyncBox | 0x0006 1800 | 0x01E6 1800 | 0x01E6 1FFF | 0x5A06 1800 | 0x5A06 1FFF | 2 |
| CALC3 - SyncBox | 0x0006 2000 | 0x01E6 2000 | 0x01E6 27FF | 0x5A06 2000 | 0x5A06 27FF | 2 |
| iPE3 - SyncBox | 0x0006 2800 | 0x01E6 2800 | 0x01E6 2FFF | 0x5A06 2800 | 0x5A06 2FFF | 2 |
| MC3 - SyncBox | 0x0006 3000 | 0x01E6 3000 | 0x01E6 37FF | 0x5A06 3000 | 0x5A06 37FF | 2 |
| ECD3 - SyncBox | 0x0006 3800 | 0x01E6 3800 | 0x01E6 3FFF | 0x5A06 3800 | 0x5A06 3FFF | 2 |
| Reserved | 0x0006 4000 | 0x01E6 4000 | 0x01E6 FFFF | 0x5A06 4000 | 0x5A06 FFFF | 48 |
| iCONT1 - Reg | 0x0007 0000 | 0x01E7 0000 | 0x01E7 0FFF | 0x5A07 0000 | 0x5A07 0FFF | 4 |
| iCONT2 - Reg | 0x0007 1000 | 0x01E7 1000 | 0x01E7 1FFF | 0x5A07 1000 | 0x5A07 1FFF | 4 |
| Reserved | 0x0007 2000 | 0x01E7 2000 | 0x01E7 FFFF | 0x5A07 2000 | 0x5A07 FFFF | 56 |

6.1.3 IVA-HD Register Manual

CAUTION

This section provides information about iCONT memory mapping (private access). This information represents only the address offsets from the start of relevant buffered (EXT_BUF) or nonbuffered (EXT_NBUF) regions. For more information, see [Section 6.1.2.3, IVA-HD Memory Mapping](#).

6.1.3.1 IVA-HD Instance Summary

Table 6-9 shows the IVA-HD instance summary.

Table 6-9. IVA-HD Instance Summary

| Module Name | Base Address (L3 Interconnect) | Base Address (DSP Private Access) | Base Address (iCONT Private Access) | Size |
|-------------|-----------------------------------|--------------------------------------|--|------|
| SYSCTRL | 0x5A05 A400 | 0x01E5 A400 | 0x000D A400 | 1KB |

NOTE: Private access is an access through the IVA-HD local interconnect without using the L3 interconnect.

6.1.3.2 SYSCTRL Registers

6.1.3.2.1 SYSCTRL Register Summary

Table 6-10 lists the mapping summary for the SYSCTRL registers.

CAUTION

SYSCTRL registers are limited to 32-bit access; 16-bit and 8-bit accesses are not allowed and can corrupt register content.

Table 6-10. SYSCTRL Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address (L3 Interconnect) | Physical Address (DSP Private Access) | Physical Address (iCONT Private Access) |
|--|------|-----------------------------|----------------|---|--|---|
| IVAHD_REVISION | R | 32 | 0x0000 0000 | 0x5A05 A400 | 0x01E5 A400 | 0x000D A400 |
| IVAHD_HWINFO | R | 32 | 0x0000 0004 | 0x5A05 A404 | 0x01E5 A404 | 0x000D A404 |
| IVAHD_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5A05 A410 | 0x01E5 A410 | 0x000D A410 |
| RESERVED | RW | 32 | 0x0000 0020 | 0x5A05 A420 | 0x01E5 A420 | 0x000D A420 |
| IVAHD_IRQSTATUS_RAW | RW | 32 | 0x0000 0024 | 0x5A05 A424 | 0x01E5 A424 | 0x000D A424 |
| IVAHD_IRQSTATUS | RW | 32 | 0x0000 0028 | 0x5A05 A428 | 0x01E5 A428 | 0x000D A428 |
| IVAHD_IRQENABLE_SET | RW | 32 | 0x0000 002C | 0x5A05 A42C | 0x01E5 A42C | 0x000D A42C |
| IVAHD_IRQENABLE_CLR | RW | 32 | 0x0000 0030 | 0x5A05 A430 | 0x01E5 A430 | 0x000D A430 |
| IVAHD_SYNC_IRQSTATUS_RAW | RW | 32 | 0x0000 0034 | 0x5A05 A434 | 0x01E5 A434 | 0x000D A434 |
| IVAHD_SYNC_IRQSTATUS | RW | 32 | 0x0000 0038 | 0x5A05 A438 | 0x01E5 A438 | 0x000D A438 |
| IVAHD_SYNC_IRQENABLE_SET | RW | 32 | 0x0000 003C | 0x5A05 A43C | 0x01E5 A43C | 0x000D A43C |
| IVAHD_SYNC_IRQENABLE_CLR | RW | 32 | 0x0000 0040 | 0x5A05 A440 | 0x01E5 A440 | 0x000D A440 |
| IVAHD_CLKCTRL | RW | 32 | 0x0000 0050 | 0x5A05 A450 | 0x01E5 A450 | 0x000D A450 |
| IVAHD_CLKST | R | 32 | 0x0000 0054 | 0x5A05 A454 | 0x01E5 A454 | 0x000D A454 |
| IVAHD_STDBYST | R | 32 | 0x0000 0058 | 0x5A05 A458 | 0x01E5 A458 | 0x000D A458 |

6.1.3.2.2 SYSCTRL Register Description

Table 6-11. IVAHD_REVISION

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0000 | Instance | SYSCTRL_L3 SYSCTRL_DSP SYSCTRL_ICONT |
| Physical Address | 0x5A05 A400 0x01E5 A400 0x000D A400 | | |
| Description | IP revision identifier (X.Y.R). Used by software to track features, bugs, and compatibility | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP revision | R | TI Internal Data |

Table 6-12. Register Call Summary for Register IVAHD_REVISION

IVA-HD Overview

- [SYSCTRL Register Summary: \[0\]](#)

Table 6-13. IVAHD_HWINFO

| | | | |
|-------------------------|---|-----------------|---------------|
| Address Offset | 0x0000 0004 | Instance | SYSCTRL_L3 |
| Physical Address | 0x5A05 A404 0x01E5 A404 0x000D A404 | | SYSCTRL_DSP |
| | | | SYSCTRL_ICONT |
| Description | Information about the IP module's hardware configuration. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|-----|------|-------|------|------|------|--------|--------|---------|---------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECD3 | MC3 | IPE3 | CALC3 | IME3 | ILF3 | VDMA | ICONT2 | ICONT1 | SL2BANK | SL2SIZE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | Reserved | R | 0x00000 |
| 14 | ECD3 | ECD3 available 0: ECD3 not present 1: ECD3 present | R | 1 |
| 13 | MC3 | MC3 available 0: MC3 not present 1: MC3 present | R | 1 |
| 12 | IPE3 | iPE3 available 0: iPE3 not present 1: iPE3 present | R | 1 |
| 11 | CALC3 | CALC3 available 0: CALC3 not present 1: CALC3 present | R | 1 |
| 10 | IME3 | iME3 available 0: iME3 not present 1: iME3 present | R | 1 |
| 9 | ILF3 | iLF3 available 0: iLF3 not present 1: iLF3 present | R | 1 |
| 8 | VDMA | vDMA available 0: vDMA not present 1: vDMA present | R | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7 | ICONT2 | iCONT2 available 0: iCONT2 not present 1: iCONT2 present | R | 1 |
| 6 | ICONT1 | iCONT1 available 0: iCONT1 not present 1: iCONT1 present | R | 1 |
| 5:4 | SL2BANK | Read 0x0: 1 memory bank Read 0x1: 2 memory bank Read 0x2: 4 memory bank Read 0x3: 8 memory bank | R | 0x3 |
| 3:0 | SL2SIZE | Size of SL2 memory Read 0x1: 16KB Read 0x2: 32KB Read 0x3: 48KB Read 0x4: 64KB Read 0x5: 96KB Read 0x6: 128KB Read 0x7: 160KB Read 0x8: 192KB Read 0x9: 224KB Read 0xA: 256KB Read 0xB: 320KB Read 0xC: 384KB Read 0xD: 448KB Read 0xE: 512KB | R | 0xA |

Table 6-14. Register Call Summary for Register IVAHD_HWINFO

IVA-HD Overview

- [SYSCTRL Register Summary: \[0\]](#)

Table 6-15. IVAHD_SYSCONFIG

| | | | |
|------------------|---|----------|--|
| Address Offset | 0x0000 0010 | | |
| Physical Address | 0x5A05 A410 0x01E5 A410 0x000D A410 | Instance | SYSCTRL_L3 SYSCTRL_DSP SYSCTRL_ICONT |
| Description | Clock management configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------------|---|---|----------|---|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | STANDBYMODE | | | IDLEMODE | | RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|------------|
| 31:6 | RESERVED | Reserved | R | 0x00000000 |
| 5:4 | STANDBYMODE | Configuration of the local initiator state management mode. By definition, initiator may generate read/write transaction as long as it is out of STANDBY state. 0x0 and 0x3: Reserved 0x1: No-standby mode: local initiator is unconditionally placed out of standby state. Backup mode, for debug only. 0x2: Smart-standby mode: local initiator standby status depends on local conditions, that is, the module's functional requirement from the initiator. IP module shall not generate (initiator-related) wakeup events. | RW | 0x2 |
| 3:2 | IDLEMODE | Configuration of the local target state management mode. By definition, target can handle read/write transaction as long as it is out of IDLE state. 0x0 and 0x3: Reserved 0x1: No-idle mode: local target never enters idle state. Backup mode, for debug only. 0x2: Smart-idle mode: local target's idle state eventually follows (acknowledges) the system's idle requests, depending on the IP module's internal requirements. IP module shall not generate (IRQ- or DMA-request-related) wakeup events. | RW | 0x2 |
| 1:0 | RESERVED | Reserved | R | 0x0 |

Table 6-16. Register Call Summary for Register IVAHD_SYSCONFIG

IVA-HD Overview

- [IVA-HD Power Management: \[0\] \[1\]](#)
- [SYSCTRL Register Summary: \[2\]](#)

Table 6-17. IVAHD_IRQSTATUS_RAW

| | | | |
|------------------|---|----------|------------------------------|
| Address Offset | 0x0000 0024 | Instance | SYSCTRL_L3 |
| Physical Address | 0x5A05 A424 0x01E5 A424 0x000D A424 | | SYSCTRL_DSP SYSCTRL_ICONT |
| Description | Per-event raw interrupt status vector. Raw status is set even if event is not enabled. Write 1 to set the (raw) status, mostly for debug. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | SYSCTRL_CLKERR |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | SYSCTRL_CLKERR | Settable raw status for Clock Programming Error event Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW | 0 |

Table 6-18. Register Call Summary for Register IVAHD_IRQSTATUS_RAW

IVA-HD Overview

- [SYSCTRL Register Summary: \[1\]](#)

Table 6-19. IVAHD_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0028 | Instance | SYSCTRL_L3 SYSCTRL_DSP SYSCTRL_ICONT |
| Physical Address | 0x5A05 A428 0x01E5 A428 0x000D A428 | | |
| Description | Per-event "enabled" interrupt status vector, line 0. Enabled status is not set unless event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | SYSCTRL_CLKERR |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | SYSCTRL_CLKERR | Clearable, enabled status for Clock Programming Error event Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW | 0 |

Table 6-20. Register Call Summary for Register IVAHD_IRQSTATUS

IVA-HD Overview

- [SYSCTRL Register Summary: \[3\]](#)

Table 6-21. IVAHD_IRQENABLE_SET

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 002C | | |
| Physical Address | 0x5A05 A42C 0x01E5 A42C 0x000D A42C | Instance | SYSCTRL_L3 SYSCTRL_DSP SYSCTRL_ICONT |
| Description | Per-event interrupt enable bit vector. Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SYSCTRL_CLKERR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|---------------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | SYSCTRL_CLKERR | Clock Programing Error Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |

Table 6-22. Register Call Summary for Register IVAHD_IRQENABLE_SET

IVA-HD Overview

- [SYSCTRL Register Summary: \[3\]](#)

Table 6-23. IVAHD_IRQENABLE_CLR

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0030 | | |
| Physical Address | 0x5A05 A430 0x01E5 A430 0x000D A430 | Instance | SYSCTRL_L3 SYSCTRL_DSP SYSCTRL_ICONT |
| Description | Per-event interrupt enable bit vector. Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SYSCTRL_CLKERR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | SYSCTRL_CLKERR | Clock Programing Error Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |

Table 6-24. Register Call Summary for Register IVAHD_IRQENABLE_CLR

IVA-HD Overview

- [SYSCTRL Register Summary: \[1\]](#)

Table 6-25. IVAHD_SYNC_IRQSTATUS_RAW

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0034 | Instance | SYSCTRL_L3 SYSCTRL_DSP SYSCTRL_ICONT |
| Physical Address | 0x5A05 A434 0x01E5 A434 0x000D A434 | | |
| Description | Per-event raw interrupt status vector. Raw status is set even if event is not enabled. Write 1 to set the (raw) status, mostly for debug. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SYNC_INPUT7_0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7:0 | SYNC_INPUT7_0 | Settable raw status for SYNC INPUT event. For each bit of the bit field: Read 0: No event pending Read 1: Event pending Write 0: No action Write 1: Set event (debug) | RW | 0x00 |

Table 6-26. Register Call Summary for Register IVAHD_SYNC_IRQSTATUS_RAW

IVA-HD Overview

- [SYSCTRL Register Summary: \[1\]](#)

Table 6-27. IVAHD_SYNC_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0038 | Instance | SYSCTRL_L3 SYSCTRL_DSP SYSCTRL_ICONT |
| Physical Address | 0x5A05 A438 0x01E5 A438 0x000D A438 | | |
| Description | Per-event "enabled" interrupt status vector, line 0. Enabled status is not set unless event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SYNC_INPUT7_0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7:0 | SYNC_INPUT7_0 | Clearable, enabled status for SYNC INPUT event. For each bit of the bit field: Read 0: No (enabled) event pending Read 1: Event pending Write 0: No action Write 1: Clear (raw) event | RW | 0x00 |

Table 6-28. Register Call Summary for Register IVAHD_SYNC_IRQSTATUS

IVA-HD Overview

- [SYSCTRL Register Summary: \[1\]](#)

Table 6-29. IVAHD_SYNC_IRQENABLE_SET

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 003C | Instance | SYSCTRL_L3 SYSCTRL_DSP SYSCTRL_ICONT |
| Physical Address | 0x5A05 A43C 0x01E5 A43C 0x000D A43C | | |
| Description | Per-event interrupt enable bit vector. Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SYNC_INPUT7_0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7:0 | SYNC_INPUT7_0 | Enable for interrupt event. For each bit of the bit field: Read 0: Interrupt disabled (masked) Read 1: Interrupt enabled Write 0: No action Write 1: Enable interrupt | RW | 0x00 |

Table 6-30. Register Call Summary for Register IVAHD_SYNC_IRQENABLE_SET

IVA-HD Overview

- [SYSCTRL Register Summary: \[1\]](#)

Table 6-31. IVAHD_SYNC_IRQENABLE_CLR

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0040 | | |
| Physical Address | 0x5A05 A440 0x01E5 A440 0x000D A440 | Instance | SYSCTRL_L3 SYSCTRL_DSP SYSCTRL_ICONT |
| Description | Per-event interrupt enable bit vector. Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SYNC_INPUT7_0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7:0 | SYNC_INPUT7_0 | Enable for interrupt event. For each bit of the bitfield: Read 0: Interrupt disabled (masked) Read 1: Interrupt enabled Write 0: No action Write 1: Disable interrupt | RW | 0x00 |

Table 6-32. Register Call Summary for Register IVAHD_SYNC_IRQENABLE_CLR

IVA-HD Overview

- [SYSCTRL Register Summary: \[1\]](#)

Table 6-33. IVAHD_CLKCTRL

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0050 | | |
| Physical Address | 0x5A05 A450 0x01E5 A450 0x000D A450 | Instance | SYSCTRL_L3 SYSCTRL_DSP SYSCTRL_ICONT |
| Description | IVA-HD clock control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|-------|------|-----|------|-------|------|------|------|--------|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | SMSET | MSGIF | ECD3 | MC3 | IPE3 | CALC3 | ILF3 | IME3 | VDMA | ICONT2 | ICONT1 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------|
| 31:11 | RESERVED | Reserved | R | 0x000000 |
| 10 | SMSET | Clock control of SMSET 0: Exit idle state and start SMSET clock 1: Request SMSET to go to idle state and stop SMSET clock Note: Shutting down SMSET clock may hang system if software performs software instrumentation and/or access to its configuration port. | RW | 0 |
| 9 | MSGIF | Clock control of MSGIF 0: Exit idle state and start MSGIF clock 1: Request MSGIF to go to idle state and stop MSGIF clock | RW | 0 |
| 8 | ECD3 | Clock control of ECD3 0: Exit idle state and start ECD3 clock 1: Request ECD3 to go to idle state and stop ECD3 clock | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7 | MC3 | Clock control of MC3 0: Exit idle state and start MC3 clock 1: Request MC3 to go to idle state and stop MC3 clock | RW | 0 |
| 6 | IPE3 | Clock control of iPE3 0: Exit idle state and start iPE3 clock 1: Request iME3 to go to idle state and stop iPE3 clock | RW | 0 |
| 5 | CALC3 | Clock control of CALC3 0: Exit idle state and start CALC3 clock 1: Request CALC3 to go to idle state and stop CALC3 clock | RW | 0 |
| 4 | ILF3 | Clock control of iLF3 0: Exit idle state and start iLF3 clock 1: Request iLF3 to go to idle state and stop iLF3 clock | RW | 0 |
| 3 | IME3 | Clock control of iME3 0: Exit idle state and start iME3 clock 1: Request iME3 to go to idle state and stop iME3 clock | RW | 0 |
| 2 | VDMA | Clock control of vDMA 0: Exit idle state and start vDMA clock 1: Request vDMA to go to idle state and stop vDMA clock | RW | 0 |
| 1 | ICONT2 | Clock control of iCONT2 0: Exit idle state and start iCONT2 clock 1: Request iCONT2 to go to idle state and stop iCONT2 clock | RW | 0 |
| 0 | ICONT1 | Clock control of iCONT1 0: Exit idle state and start iCONT1 clock 1: Request iCONT1 to go to idle state and stop iCONT1 clock | RW | 0 |

Table 6-34. Register Call Summary for Register IVAHD_CLKCTRL

IVA-HD Overview

- [SYSCTRL Register Summary: \[4\]](#)

Table 6-35. IVAHD_CLKST

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0054 | Instance | SYSCTRL_L3 SYSCTRL_DSP SYSCTRL_ICONT |
| Physical Address | 0x5A05 A454 0x01E5 A454 0x000D A454 | | |
| Description | IVA-HD clock status register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|-------|------|-----|------|-------|------|------|------|--------|--------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SMSET | MSGIF | ECD3 | MC3 | IPE3 | CALC3 | ILF3 | IME3 | VDMA | ICONT2 | ICONT1 | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-----------|
| 31:11 | RESERVED | Reserved | R | 0x0000000 |
| 10 | SMSET | Clock status of SMSET 1: SMSET clock is active 0: SMSET clock is idled | R | 0 |
| 9 | MSGIF | Clock status of MSGIF 1: MSGIF clock is active 0: MSGIF clock is idled | R | 0 |
| 8 | ECD3 | Clock status of ECD3 1: ECD3 clock is active 0: ECD3 clock is idled | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7 | MC3 | Clock status of MC3 1: MC3 clock is active 0: MC3 clock is idled | R | 0 |
| 6 | IPE3 | Clock status of iPE3 1: iPE3 clock is active 0: iPE3 clock is idled | R | 0 |
| 5 | CALC3 | Clock status of CALC3 1: CALC3 clock is active 0: CALC3 clock is idled | R | 0 |
| 4 | ILF3 | Clock status of iLF3 1: iLF3 clock is active 0: iLF3 clock is idled | R | 0 |
| 3 | IME3 | Clock status of iME3 1: iME3 clock is active 0: iME3 clock is idled | R | 0 |
| 2 | VDMA | Clock status of vDMA 1: vDMA clock is active 0: vDMA clock is idled | R | 0 |
| 1 | ICONT2 | Clock status of iCONT2 1: iCONT2 clock is active 0: iCONT2 clock is idled | R | 0 |
| 0 | ICONT1 | Clock status of iCONT1 1: iCONT1 clock is active 0: iCONT1 clock is idled | R | 0 |

Table 6-36. Register Call Summary for Register IVAHD_CLKST

IVA-HD Overview

- [SYSCTRL Register Summary: \[1\]](#)

Table 6-37. IVAHD STDBYST

| | | | |
|-------------------------|---|-----------------|------------------------------|
| Address Offset | 0x0000 0058 | Instance | SYSCTRL_L3 |
| Physical Address | 0x5A05 A458 0x01E5 A458 0x000D A458 | | SYSCTRL_DSP SYSCTRL_ICONT |
| Description | IVA-HD STANDBY status | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|--------|----|--------|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | vDMA | | | iCONT2 | | iCONT1 | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2 | vDMA | vDMA Standby status 0: module is not in Standby 1: module is in Standby | R | 1 |
| 1 | iCONT2 | iCONT2 Standby status 0: module is not in Standby 1: module is in Standby | R | 1 |
| 0 | iCONT1 | iCONT1 Standby status 0: module is not in Standby 1: module is in Standby | R | 1 |

Table 6-38. Register Call Summary for Register IVAHD_STDBYST

IVA-HD Overview

- [SYSCTRL Register Summary: \[2\]](#)

Dual Cortex-M3 MPU Subsystem

This chapter describes the dual Cortex-M3 microprocessor unit (MPU) subsystem.

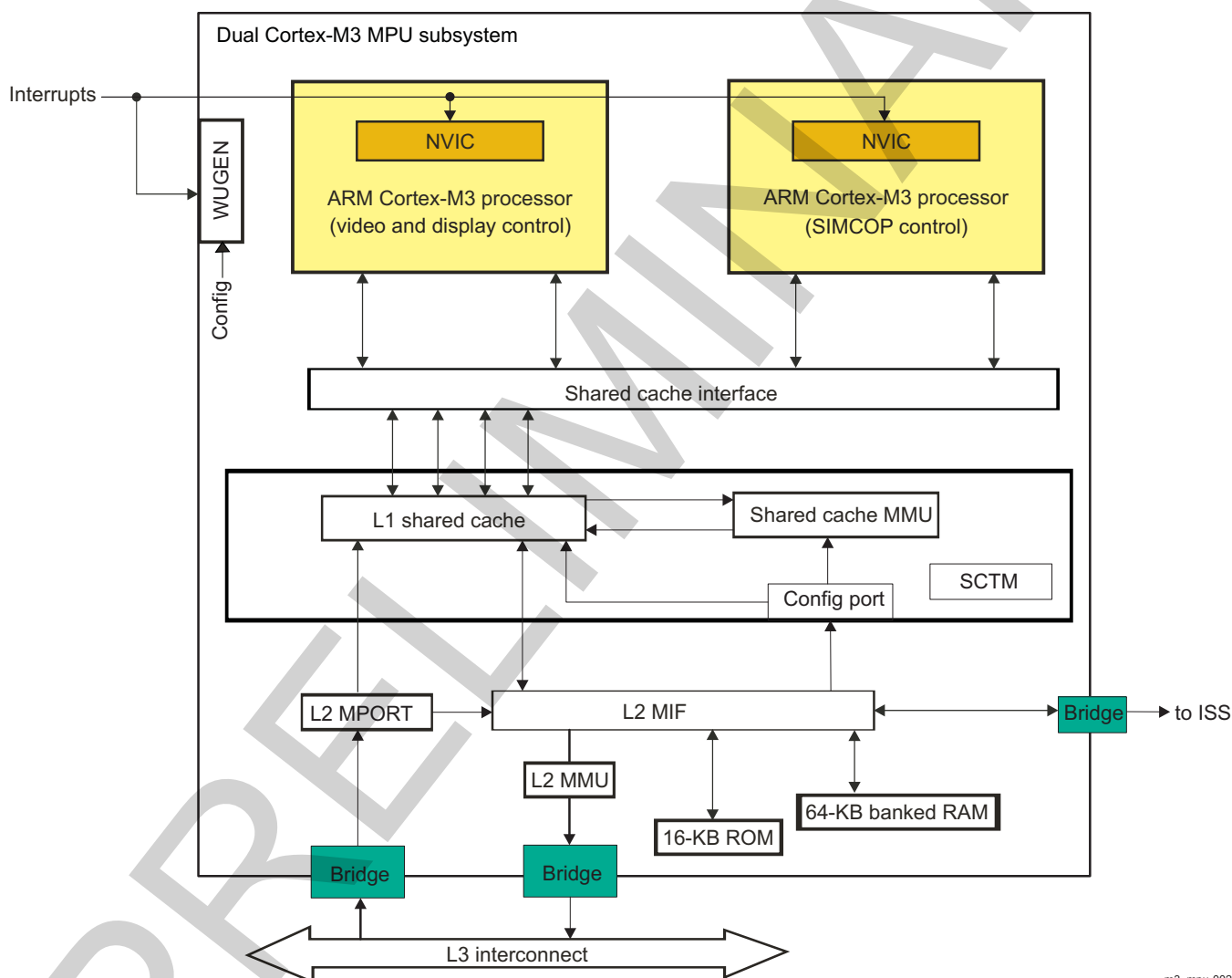
| Topic | Page |
|---|------|
| 7.1 Dual Cortex-M3 MPU Subsystem Overview | 1170 |
| 7.2 Dual Cortex-M3 MPU Subsystem Integration | 1172 |
| 7.3 Dual Cortex-M3 MPU Subsystem Functional Description | 1176 |
| 7.4 Dual Cortex-M3 MPU Subsystem Register Manual | 1186 |

7.1 Dual Cortex-M3 MPU Subsystem Overview

7.1.1 Introduction

The dual Cortex™-M3 microprocessor (MPU) subsystem controls the imaging subsystem (ISS) and manages some controls of the video and display subsystem. It contains two ARM® Cortex-M3 processors (CPUs) that share a common level 1 (L1) cache (shared cache). One of the CPUs is dedicated to sequencing still image coprocessor (SIMCOP) accelerators, and the other CPU is dedicated to the ISS and display subsystem control. A single image real-time operating system (RTOS) runs on both cores, thereby minimizing the code size. The integrated interrupt handling of the dual Cortex-M3 MPU allows efficient control of the ISS. Figure 7-1 is a high-level block diagram of the dual Cortex-M3 MPU subsystem.

Figure 7-1. Dual Cortex-M3 MPU Subsystem Overview



7.1.2 Features

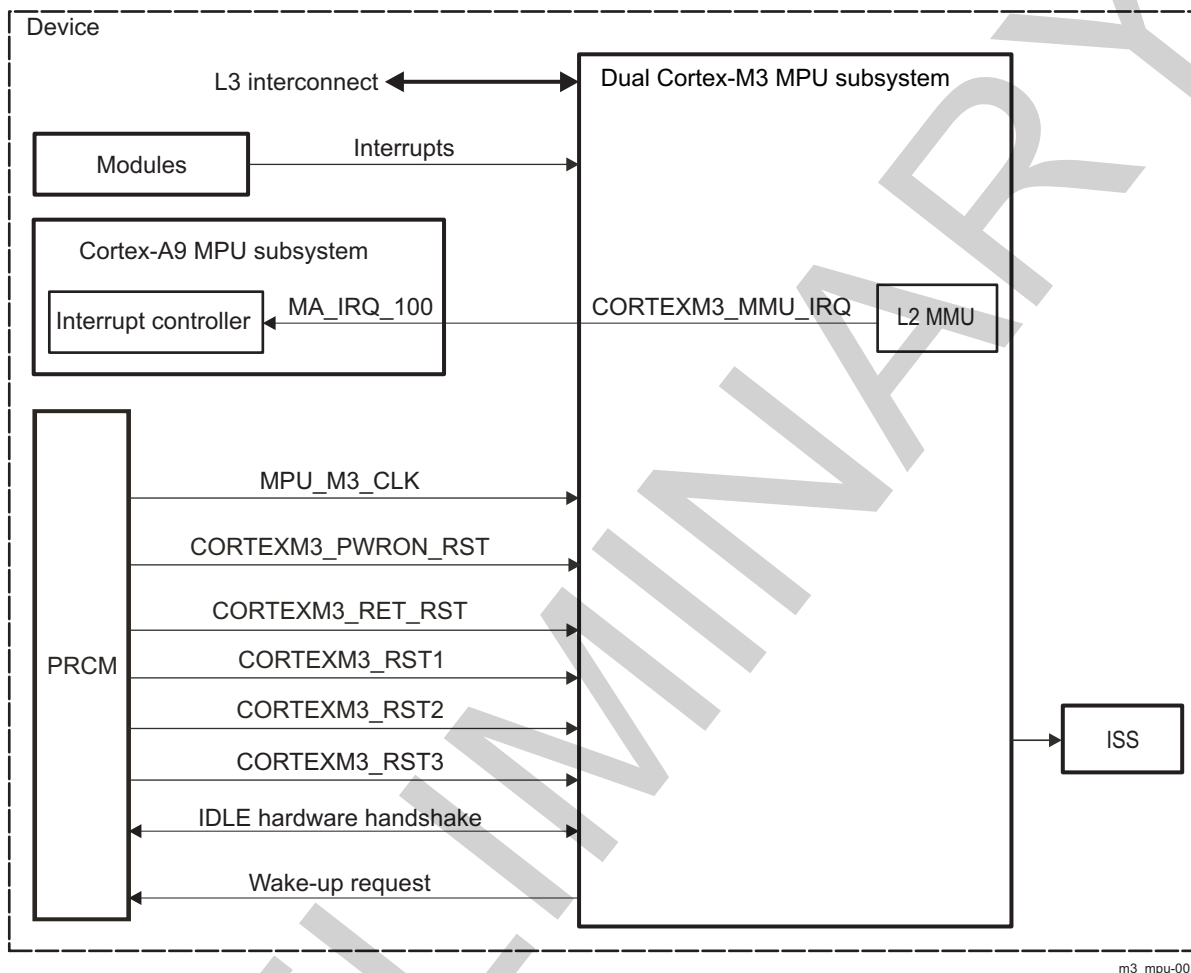
The dual Cortex-M3 MPU subsystem integrates the following:

- Two ARM Cortex-M3 microprocessors:
 - ARMv7-M and Thumb®-2 instruction set architecture
 - Hardware division and single-cycle multiplication computational acceleration
 - Integrated nested vector interrupt controller (NVIC)
 - Integrated bus matrix
 - Registers:
 - Thirteen general-purpose 32-bit registers
 - Link register (LR)
 - Program counter (PC)
 - Program status register, xPSR
 - Two banked SP registers
 - Integrated power management
 - Extensive debug capabilities
- Shared cache interface:
 - Instruction and data interface
 - Supports paralleled accesses
- Level 2 (L2) MIF (master interface) splitter for access to memory or configuration port
- Configuration port: Used for shared cache maintenance and shared cache memory management unit (MMU) configuration
- Shared cache:
 - 32KB divided into 16 banks
 - 4-way
 - Cache configuration lock/freeze/preload
 - Internal MMU:
 - 16-entry region-based address translation
 - Read/write control and access type control
 - Execute Never (XN) MMU protection policy
 - Little-endian format
- Subsystem counter timer module (SCTM)
- On-chip ROM and banked RAM memory
- Emulation/debug: Emulation feature embedded in Cortex-M3
- L2 MMU: 32 entries with walking table logic
- Wake-up generator (WUGEN): Generates wake-up request from external interrupts
- Power management:
 - Local power-management control: Configurable through the WUGEN registers.
 - Three sleep modes supported, controlled by the local power-management module.
 - Dual Cortex-M3 MPU is clock-gated in all sleep modes.
 - NVIC interrupt interface stays awake.

7.2 Dual Cortex-M3 MPU Subsystem Integration

Figure 7-2 shows the signals that interface with other modules.

Figure 7-2. Dual Cortex-M3 MPU Subsystem Integration Overview



NOTE: Some debug, trace, and emulation features are implemented in the MPU subsystem. This chapter includes only the clock/reset inputs and power-management aspects for these features.

Table 7-1 through Table 7-3 summarize the integration of the module in the device.

Table 7-1. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| CORTEXM3 | PD_CORE | L3 |

Table 7-2. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|--------------------|------------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| L2_MMU | CORTEXM3_MMU_IRQ | MA_IRQ_100 | Cortex-A9 MPU INTC | L2 MMU fault interrupt |

Table 7-3. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|-------------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| CORTEXM3 | MPU_M3_CLK | MPU_M3_CLK | PRCM module | Interface and functional clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| CORTEXM3 | CORTEXM3_PWRON_RST | CORTEXM3_PWRON_RST | PRCM module | Power-on reset, used to reset the whole dual Cortex-M3 subsystem |
| | CORTEXM3_RET_RST | CORTEXM3_RET_RST | PRCM module | Retention reset to few retention logic inside the shared cache |
| | CORTEXM3_RST1 | CORTEXM3_RST1 | PRCM module | Reset signal to the video and display control CPU |
| | CORTEXM3_RST2 | CORTEXM3_RST2 | PRCM module | Reset signal to the SIMCOP CPU |
| | CORTEXM3_RST3 | CORTEXM3_RST3 | PRCM module | Reset signal to the shared cache and the L2 MMU |

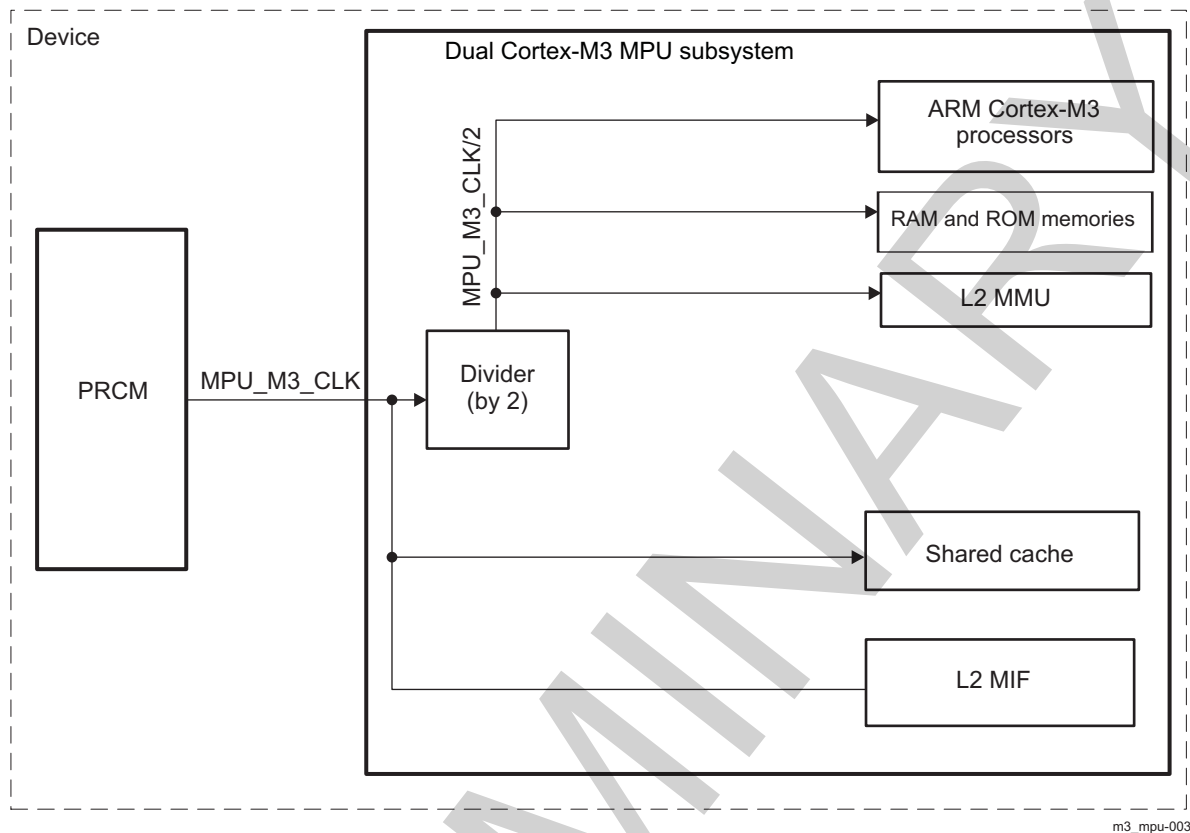
For more information about clocks, resets, and power domains, see [Chapter 3, Power, Reset, and Clock Management](#).

7.2.1 Dual Cortex-M3 MPU Subsystem Clock and Reset Distribution

7.2.1.1 Clock Distribution

The dual Cortex-M3 subsystem receives only one clock, MPU_M3_CLK, which is divided in two for each ARM Cortex-M3 processor, ROM and RAM memory and the L2 MMU. The shared cache and the L2 MIF are directly clocked by the MPU_M3_CLK, without any division. For more information, see [Chapter 3, Power, Reset, and Clock Management](#).

[Figure 7-3](#) shows the clocking scheme of the MPU subsystem.

Figure 7-3. Dual Cortex-M3 MPU Subsystem Clocking Scheme

m3_mpu-003

7.2.1.2 Reset Distribution

Three reset signals controlled by the power, reset, and clock management (PRCM) module let the two ARM Cortex-M3 processors and the rest of the dual Cortex-M3 MPU subsystem be reset independently. These three reset signals are: CORTEXM3_RST1, CORTEXM3_RST2, and CORTEXM3_RST3. The ARM Cortex-M3 processors must come out of reset one at a time:

- At CORTEXM3_RST1, the video and display control ARM Cortex-M3 processor comes out of reset, but the SIMCOP ARM Cortex-M3 processor is held in reset.
- The video and display control ARM Cortex-M3 controls the reset for the SIMCOP Cortex-M3 (through the PRCM register - RM_MPU_M3_RSTCTRL[1] RST2).

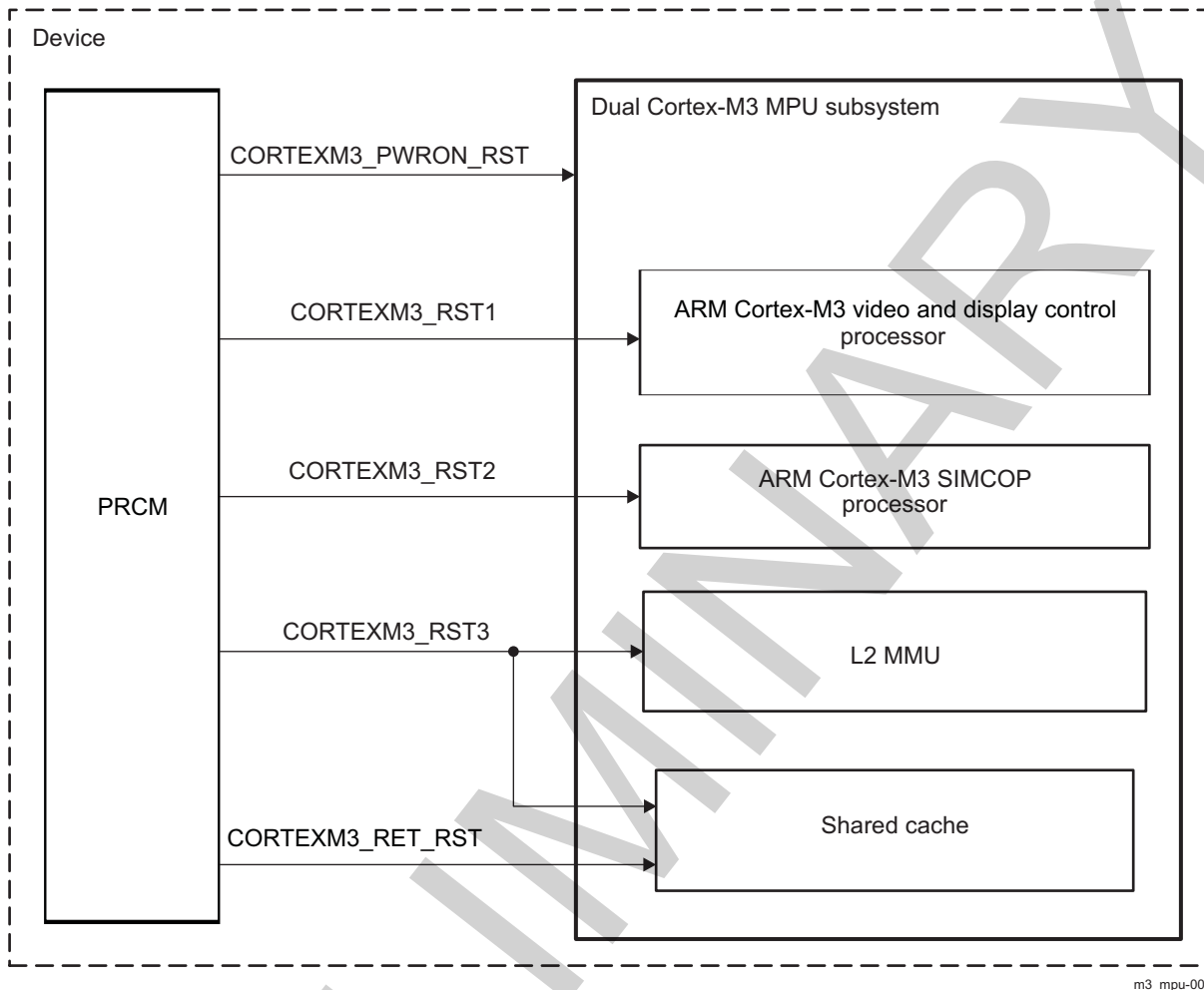
As the video and display control ARM Cortex-M3 controls the reset for the SIMCOP Cortex-M3 (through the PRCM registers), the code running on the video and display control ARM Cortex-M3 decides the mode of operation, whether it is:

- Mode 1: One ARM Cortex-M3 processor is running, and the other processor is held on reset.
- Mode 2: The two ARM Cortex-M3 processors are running.

This decision of which mode to use is driven by the use case. If the software partitioning and performance requirement for a use case requires two Cortex-M3 processor to run simultaneously, the user must go to mode 2. If SIMCOP Cortex-M3 is not required for a particular use case, the user can remain in mode 1.

Figure 7-4 shows the reset scheme of the MPU subsystem.

Figure 7-4. Dual Cortex-M3 MPU Subsystem Reset Scheme



7.3 Dual Cortex-M3 MPU Subsystem Functional Description

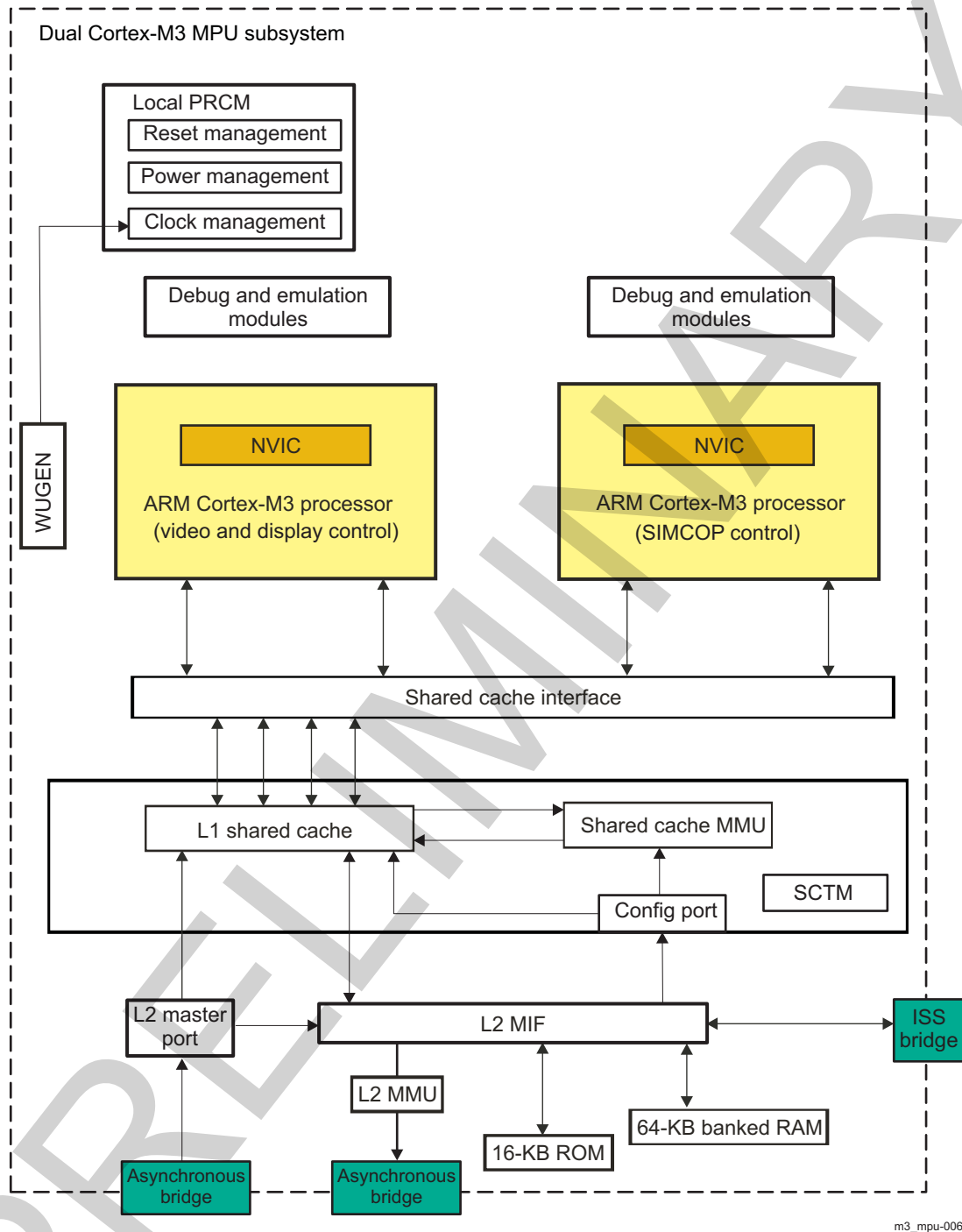
7.3.1 Dual Cortex-M3 MPU Subsystem Block Diagram

The dual Cortex-M3 MPU subsystem integrates the following group of submodules:

- Two ARM Cortex-M3 processors: Two cores (r2p0 revision), one dedicated to sequencing SIMCOP accelerators and the other dedicated for video and display subsystem control. For a description of the ARM Cortex-M3 processor, see the *ARM Cortex-M3 Technical Reference Manual*.
- Interrupt controller (NVIC): To facilitate parallel processing, the interrupt mapping is the same for the two cores. Each Cortex-M3 processor receives the same interrupts, except for a few internal interrupts. Every IRQ line is shared between the two ARM processors. By properly configuring the NVIC registers inside each ARM processor, it can be ensured that the shared IRQ is taken by only one of the ARM processors (for more information, see [Chapter 18, Interrupt Controller](#)).
- Shared cache interface: The cache interface converts the data between the different protocols in the subsystem. Four ports are required to support the four buses from the ARM Cortex-M3 processors (two for each processor). The instruction and data connections from each ARM Cortex-M3 are multiplexed, but the ARM Cortex-M3 prevents conflicts on this connection. Default cache policies are provided through the sideband signals and are not used to access the cache. Cacheability is provided through the MMU inside the cache.
- Shared cache: Allows basic maintenance operations, which are performed through a dedicated interface: preload, lock, clean (write out dirty lines, but do not invalidate directly), and invalidate.
- Shared cache MMU: Provides the multiple access cache with region-based address translation, read/write control, access type control, and multilevel cache maintenance. Access to the shared cache MMU is done only under privilege mode. The shared cache MMU can be programmed by the Cortex-A9 MPU subsystem through the Cortex-M3 slave port.
- SCTM: Embedded in the shared cache
- Interconnect configuration port: Cache maintenance and MMU configuration are done through an interconnect slave port. Accesses must be performed to a noncacheable area that must be defined within the shared cache MMU. Interconnect accesses are generated from the L2 MIF.
- L2 MMU: Provides address translation for all the accesses done from the Cortex-M3 to the level 3 (L3) interconnect. The L2 MMU can be programmed by the Cortex-A9 MPU subsystem through the Cortex-M3 slave port.
- L3 interconnect port: Allows access to the system memories and peripherals. For the address mapping of the modules in the dual Cortex-M3 MPU subsystem, see [Chapter 2, Memory Mapping](#).
- On-chip ROM and banked RAM memory. The ROM memory is used for boot/initialization purposes. For more information about the initialization of the device, see [Chapter 28, Initialization](#). The address range of the ROM memory is from 0x5500_0000 to 0x5500_3FFF. The address range of the on-chip banked RAM memory is from 0x5502_0000 to 0x5502_FFFF.

[Figure 7-5](#) is the block diagram of the dual Cortex-M3 MPU subsystem.

Figure 7-5. Dual Cortex-M3 MPU Block Diagram



7.3.2 Power Management

NOTE: For information about source clock gating and for a description of the sleep/wake-up transitions, see [Section 3.1.1.1, Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

7.3.2.1 Local Power Management

The user can configure the local power management through the [STANDBY_CORE_SYSCONFIG](#), [IDLE_CORE_SYSCONFIG](#), and [WUGEN_IRQ_EN](#) registers. The user can:

- Configure the different standby modes (the default is smart wake-up standby mode) through the [STANDBY_CORE_SYSCONFIG\[1:0\]](#) STANDBYMODE bit field
- Configure the different idle modes (the default is smart wake-up idle mode) through the [IDLE_CORE_SYSCONFIG\[1:0\]](#) IDLEMODE bit field
- Control which interrupts will cause a wakeup by appropriately configuring the [WUGEN_MEVT0](#) and [WUGEN_MEVT1](#) registers (the default is ALL_MASKED)

The Cortex-M3 provides three sleep modes:

- On mode: Sleep on exit (wait for the interrupt service routine [ISR] to complete)
- Sleep mode: Wait for interrupt to wake up the processor
- Deep-sleep mode: Long duration sleep; phase-locked loop (PLL) can be stopped

During sleep mode, the system clock can be stopped, but the free-running clock input must still be running to allow the processor to be awakened by an interrupt or an event. The sleep modes are invoked by wait for interrupt (WFI) or wait for event (WFE) instructions. The processor clock is automatically stopped, waiting for an interrupt or an event. Deep-sleep mode also stops the processor clock, but this can also be supported by the PRCM module. A combined signal is generated from the two Cortex-M3 processors in deep-sleep mode to initiate another power state and let the PRCM module handle the next power states. At this time, software must ensure that all shared cache background operations (for example, maintenance) are complete.

[Table 7-4](#) describes local clock gating.

Table 7-4. Local Clock Gating

| Cortex-M3 CPU Mode | CPU2 On | CPU2 Sleep | CPU2 Deep Sleep |
|------------------------|------------------------------------|--|--|
| CPU1 On | On | Functional clock 2 stopped locally | Functional clock 2 stopped locally |
| CPU1 Sleep | Functional clock 1 stopped locally | Functional clock 1 and clock 2 stopped locally | Functional clock 1 and clock 2 stopped locally |
| CPU1 Deep Sleep | Functional clock 1 stopped locally | Functional clock 1 and clock 2 stopped locally | Standby request to power-management module |

7.3.2.2 Power Domains

The dual Cortex-M3 MPU subsystem is divided into two power domains (CORE and WKUP), which are controlled by the PRCM module (see [Section 7.3.2.3](#)).

The CORE power domain is the main power domain and includes all the Cortex-M3 components (two ARM Cortex-M3 processors, shared cache, ROM and RAM memories, and emulation\debug modules) except the WUGEN.

The AWLON_CORE power domain is an always-on power domain. The AWLON_CORE power domain contains the WUGEN, which generates a wake-up request from external interrupts. By this separate AWLON_CORE power domain, the wake-up request can be generated even when the CORE power domain is in OFF or RET state.

For information about the CORE and ALWON_CORE power domains, see [Chapter 3, Power, Reset, and Clock Management](#).

7.3.2.3 Voltage Domain

The dual Cortex-M3 MPU subsystem is composed of two voltage domains. Each voltage domain can control individual voltage levels:

- VDD1: Cortex-M3, shared cache/MMU, WUGEN
- VDD_array: All memories array

The AWLON_CORE and CORE power domains are in the same voltage domain – the CORE voltage domain (CORE_VD).

For information about the physical power domains, see [Chapter 3, Power, Reset, and Clock Management](#).

7.3.2.4 Power States and Modes

[Table 7-5](#) lists the different power modes and the expected states for each power domain.

Table 7-5. Dual Cortex-M3 MPU Power Modes

| | Functional Domain | Activity | | | Power Status | |
|-------------|-------------------|-----------------------|-----------------------|------------------------------|-------------------|-------------------------|
| | | Core | | Dual Cortex-M3 MPU Subsystem | CORE Power Domain | AWLON_CORE Power Domain |
| | Modules included | Cortex-M3 processor 1 | Cortex-M3 processor 2 | WUGEN | | |
| Power modes | Active | Active | Active | Active | ON | ON |
| | Processor 1 idle | Idle | Active | Active | ON | ON |
| | Processor 2 idle | Active | Idle | Active | ON | ON |
| | Core standby | Idle | Idle | Active | ON | ON |
| | Full idle | Idle | Idle | Idle | ON | ON |
| | Retention | Idle | Idle | Idle | RET | ON |
| | Power off | Idle | Idle | Idle | OFF | OFF |

[Table 7-6](#) lists the power mode transitions in the dual Cortex-M3 MPU subsystem.

Table 7-6. Power Mode Transitions

| | Active | Processor 1 Idle | Processor 2 Idle | Standby | Full-Idle | Retention | Power Off |
|------------------|-------------------|---------------------|---------------------|--------------------------------|-------------------------------------|-------------|-------------|
| Active | | WFE/WFI instruction | WFE/WFI instruction | | | | |
| Processor 1 idle | Events/interrupts | | | Deep sleep | | | |
| Processor 2 idle | Events/interrupts | | | Deep sleep | | | |
| Standby | Wake-up IRQ | | | | L1/L2/ WUGEN functional domain idle | | |
| Full idle | Wake-up IRQ | | | Wake-up (through interconnect) | | PRCM module | PRCM module |
| Retention | | | | | PRCM module or wakeup | | PRCM module |
| Power off | | | | | PRCM module or wakeup | PRCM module | |

The different power modes and their features are:

- Active mode: All function domains are operable.
- Core 1 and Core 2 idle mode:
 - Only the CPU core is idled (when running WFE/WFI instructions).
 - Only one Cortex-M3 core can be in this mode. Interrupts or events can waken the core.
 - Can go into sleep or deep-sleep mode. Potentially, both cores can be in sleep mode.
 - When both cores are in deep-sleep mode, a standby request is sent to the PRCM module.
 - Software must ensure that all shared cache background operations (for example, maintenance) are complete before the PRCM module asserts an IdleReq. For more information, see [Chapter 5, DSP, , Direct Maintenance of Caches](#).

- Core standby mode
 - Both cores in the CORE functional domain are in idle mode (an interrupt cannot wake up either of the cores).
 - The PRCM module must have acknowledged its acceptance by an MWait signal.
 - After this handshake, all power management is under the control of the PRCM module.
- Full-idle mode:
 - The dual Cortex-M3 MPU subsystem functional domain is also idled.
 - After coming to this mode, power states can be moved deeper.
- Retention mode:
 - The voltage of the logic supply is lowered to reduce static power consumption by leakage current. The logic power switch in the CORE power domain is still closed (ON); thus, all logic states are retained.
 - L1 and/or L2 memories can go independently into retention depending on the settings done at the PRCM level.
- Power off mode:
 - The voltage source is shut down. The logic states, including the retention logic, are lost.
 - The WUGEN is not operating and only the PRCM module can trigger the Cortex-M3 wakeup.
 - Reset must be applied to the dual Cortex-M3 MPU subsystem to restart the two ARM Cortex-M3 processors and the memory subsystem.

7.3.2.5 Wake-Up Generator

The WUGEN in the dual Cortex-M3 MPU subsystem enables efficient power management. The WUGEN generates a wake-up signal to the PRCM module to enable the dual Cortex-M3 MPU subsystem to recover its functional clocks, which are gated by the PRCM module when at least one request is active. The WUGEN can be configured in standby mode or idle mode through the [STANDBY_CORE_SYSCONFIG\[1:0\] STANDBYMODE](#) and [IDLE_CORE_SYSCONFIG\[1:0\] IDLEMODE](#) bit fields.

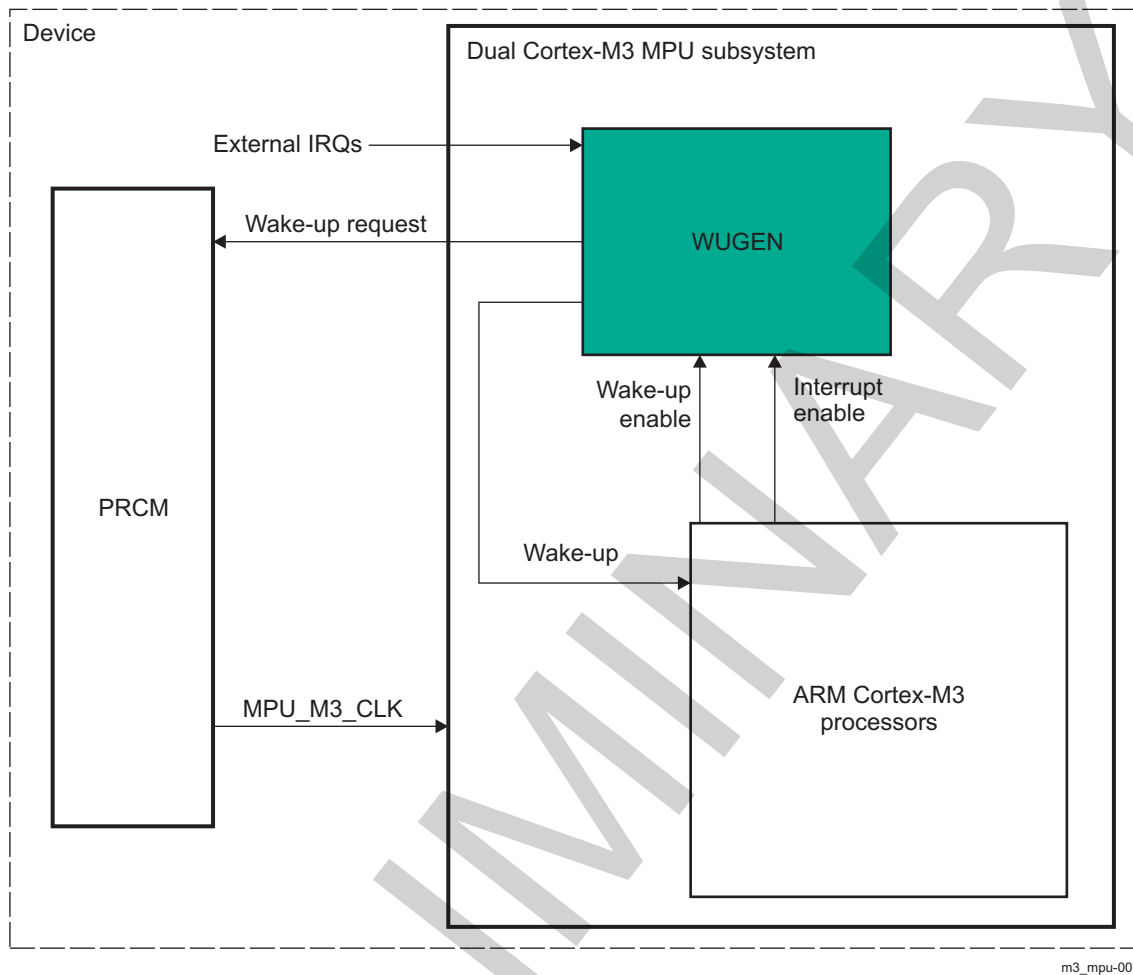
7.3.2.5.1 WUGEN Main Features

The WUGEN allows:

- Gating of the Cortex-M3 MPU clock dynamically, thus reducing power consumption
- Simplifying of dependencies in the PRCM module

[Figure 7-6](#) is an overview of the WUGEN.

Figure 7-6. WUGEN Overview



The wake-up signal to the PRCM module requests the Cortex-M3 functional clock (MPU_M3_CLK). The wake-up signal to the ARM Cortex-M3 processors indicates to them that at least one enabled request is active.

Two retention registers [WUGEN_MEVT0](#) (for CPU1) and [WUGEN_MEVT1](#) (for CPU2), enable the WUGEN requests to the NVICs.

7.3.3 Shared Cache

[Table 7-7](#) describes the shared cache configuration in the dual Cortex-M3 MPU subsystem platform.

Table 7-7. Shared Cache Configuration

| Parameter | Value |
|----------------------------|----------|
| Way | 4 |
| Size | 32KB |
| Bank elements | 32 bits |
| Bank number | 16 |
| Slave interface data size | 32 bits |
| Master interface data size | 64 bits |
| Line size | 256 bits |
| MMU lookup | Included |
| Number of slaves | 4 |

Table 7-7. Shared Cache Configuration (continued)

| Parameter | Value |
|---------------------------------|------------------------|
| Number of masters | 1 |
| Number of fill/prefetch buffers | Four prefetch buffers |
| Slave types | Shared cache interface |

Shared cache allows basic maintenance operations, which are performed through a dedicated interface:

1. Preload
2. Lock
3. Clean
4. Invalidate

Maintenance of the cache is performed between the start and end addresses. This allows for direct control of memory regions. All maintenance operations occur in the background and can generate an interrupt when they complete. Such operations are protected by software semaphore, because only one operation at a time can be performed. The maintenance operations can also be performed using MMU small entries.

The shared cache is the same as the one in the DSP subsystem. For more information about the shared cache, see [Chapter 5, DSP Subsystem](#).

7.3.4 Shared Cache MMU

The MMU for the shared cache provides the multi-access cache with region-based address translation, read/write control, access type control, and multilevel cache maintenance. [Table 7-8](#) describes the MMU configuration in the dual Cortex-M3 MPU subsystem.

Table 7-8. Shared Cache MMU Configuration

| Parameter | Values |
|---|-------------------------------|
| Number of large pages | Four entries |
| Size of large pages | 512MB or 32MB (configurable) |
| Number of medium pages | Two entries |
| Size of medium pages | 256KB or 128MB (configurable) |
| Number of small pages | 10 entries |
| Size of small pages | 16KB or 4KB (configurable) |
| Number of patch pages | Not included |
| Size of line pages | 256-bit |
| Number of comparison interfaces | 4 |
| Number of comparator sets | 1 |
| Write pipeline data comparison | Disabled |
| Number of shared cache maintenance interfaces | 3 |
| Size of entry address | 32-bit |

The size of the pages is configurable in the shared cache MMU registers. The different MMU page sizes can be used to create smaller policies within a larger region. The shared cache MMU is the same as the one in the DSP subsystem. For more information, see [Chapter 5, DSP Subsystem](#).

7.3.5 L2 MMU

An additional MMU provides address translation for the accesses done from the dual Cortex-M3 MPU subsystem to the L3 interconnect. The main characteristics of this MMU are:

- 32 entries
- Compatible with ARMv6 architecture MMU translation tables (protection bits not used)
- Page-based or access-based endianness conversion

- Two-level descriptor hierarchy
- One intermediate page table
- Four page sizes (16MB, 1MB, 64KB, 4KB)
- Page table alignment on 128-byte boundary for ARM11® compatibility

The configuration of the MMU can be done from one of the Cortex-M3 cores or from the L3 interconnect slave port. The accesses done to configure the MMU cannot be part of a burst access.

For more information about the L2 MMU, see [Chapter 21](#), *Memory Management Unit*.

7.3.5.1 L2 MMU Behavior on Page-Fault in Dual Cortex-M3 MPU

Table 7-9. L2 MMU Behavior on Page-Fault

| Application | | Debug | |
|--|---|--|--|
| Table-Walker Enabled | Table-Walker Disabled | Table-Walker Enabled | Table-Walker Disabled |
| Use Table-Walker to find translation. Update TLB cache if successful, set TRANSLATIONFAULT bit and interrupt if not. The following bits are used for the purpose: MMU_IRQENABLE[1] TRANSLATIONFAULT and MMU_IRQSTATUS[1] TRANSLATIONFAULT. | Set TLBMISS bit and interrupt and stall. The following registers are used for the purpose: MMU_IRQENABLE[0] TLBMISS and MMU_IRQSTATUS[0] TLBMISS. | Use Table-Walker to find translation. Update TLB cache if successful (only if MMU_CNTL[3] EMUTLBUPDATE is set), generate in-band bus error if not. | Set EMUMISS bit and interrupt and stall. The following bits are used for the purpose: MMU_IRQENABLE[2] EMUMISS and MMU_IRQSTATUS[2] EMUMISS. |

The MMU fault interrupt line is connected to both Cortex-M3 cores and also propagated outside of Cortex-M3 and connected to the Cortex-A9 MPU (MA_IRQ_100). The Cortex-A9 MPU receives the MMU fault and must clean up the fault to resume the execution of the code (or reset Cortex-M3). It is not possible for one of the Cortex-M3 CPUs to clean up the fault caused by the other Cortex-M3 CPU. This is because both the slave port of L2 MMU (which is stalled) and the configuration port of L2 MMU is connected (through a splitter) to the same shared cache master port.

The above default behavior of the L2 MMU can be overridden by setting the MMU_GP_REG[0] BUS_ERR_BACK_EN bit to 1. Once this bit is set, all MMU faults (including TLB miss) return a bus error to the Cortex-M3 (interrupt event XLATE_MMU_FAULT). This allows the end user to quickly establish the cause of the MMU fault by having appropriate code in the ISR.

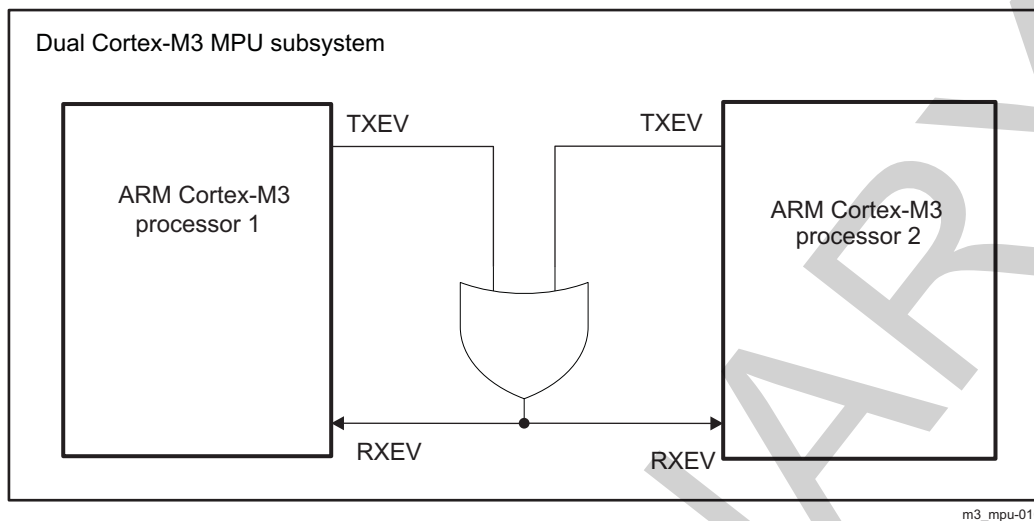
7.3.6 Interprocessor Communication (IPC)

7.3.6.1 Use of WFE and SEV

The dual Cortex-M3 MPU subsystem provides multiprocessor communication interface for synchronizing tasks. The ARM processors have one output signal, TXEV (transmit event), for sending events and one input signal, RXEV (receive event), for receiving events. [Figure 7-7](#) shows how TXEV and RXEV are connected in the dual Cortex-M3 MPU subsystem.

When a WFE instruction is executed, the processor enters into sleep mode waiting for an event and continues instruction execution when an external event is received. With an SEV (send event) instruction, one processor can wake up the other processor, which is in sleep mode.

The WFE and SEV instructions can help reduce the number of iterations around a lock acquire loop (a spinlock), and thereby reduce power consumption. The basic mechanism involves an observer that is in a spinlock executing a WFE instruction, which suspends execution on that observer until an asynchronous exception or an explicit event (sent by an observer using the SEV instruction) is seen by that observer. The observer that holds the lock uses the SEV instruction to send an event after a lock is released.

Figure 7-7. Event Communication Connection in Dual Cortex-M3 MPU Subsystem

7.3.6.2 Use of Interrupt for IPC

Each Cortex-M3 can interrupt the other Cortex-M3 by setting up an interrupt register ([CORTEXM3_CTRL_REG](#)). Because the priority level for that interrupt can be defined, it is possible to choose the task level at which the interrupt will run. For example, if CPU1 was active and CPU2 was idle (WFI state), when CPU1 completes its task it sets the bit for CPU2 in the control register ([CORTEXM3_CTRL_REG\[16\] INT_CORTEX_2](#)) and goes into sleep mode. CPU2 wakes up seeing this interrupt, and starts running its task. After the completion of its task, CPU2 sets the interrupt for CPU1 ([CORTEXM3_CTRL_REG\[0\] INT_CORTEX_1](#)), and then goes into WFI state. This kind of handshake ensures that if CPU1 and CPU2 are accessing the same resources (memory, registers etc.), only one of the CPUs at a time is active.

7.3.6.3 Use of the Bit-Band Feature for Semaphore Operations

The two Cortex-M3 cores share the same memory system, and it is possible to use the bit-band feature to carry semaphore operations. Because the bit-band alias writes are locked read-modify-write transfers, provided that all tasks changed only the lock bit representing themselves, the lock bits of other tasks are not lost, even if two tasks try to write to the same memory location at the same time.

Each Cortex-M3 core supports two bit-band regions.

Bit-band 1 applies to the virtual address space 0x2000 0000 – 0x200F FFFF (1MB). This virtual address space can be mapped to any physical address and bit-banding will apply to that region. It is recommended that the user map the L2 RAM (64KB) to this virtual space and use it only for bit-banding operations. If required, the user can define other available small and medium pages over and above the L2 RAM virtual space and further extend the use of the bit-band feature.

Bit-band 2 applies to the virtual address space 0x4000 0000 – 0x400F FFFF (1MB). The first 16KB of this space (0x4000 0000 – 0x4000 3FFF) are already reserved for small (one page) pages and cannot be remapped by software. The bit-band alias that corresponds to this 16-KB region (0x4200 0000 – 0x4207 FFFF) must also be treated as reserved and no access should be made. The rest of bit-band 2 can be used by appropriately defining the available small and medium pages. In this device, because it is likely that during normal AMMU programming all of L3 is mapped to this region, it is highly recommended that the user use only bit-band 1 for all purposes and bit-band 2 only if it is necessary.

7.3.6.4 Private Memory Space

Each ARM Cortex-M3 processor has its own memory space, inaccessible by the other processor. In the private memory space are the NVICs and RW table registers: [CORTEXM3_RW_PID1](#) and

[CORTEXM3_RW_PID2](#). [CORTEXM3_RW_PID1](#) and [CORTEXM3_RW_PID2](#) are only accessible by the respective Cortex-M3 cores ([CORTEXM3_RW_PID1](#) is accessible only to the video and display control ARM processor, while [CORTEXM3_RW_PID2](#) is only accessible by the SIMCOP processor) . These registers are not accessible from the Cortex-A9 MPU. Because they are not shared, they do not require bit-band feature (semaphore) to read and write to them.

7.4 Dual Cortex-M3 MPU Subsystem Register Manual

7.4.1 Dual Cortex-M3 Subsystem Instance Summary

Table 7-10 summarizes the dual Cortex-M3 MPU instance.

Table 7-10. Dual Cortex-M3 MPU Subsystem Instance Summary

| Module Name | Base Address | Size |
|------------------------------|--------------|------|
| SCACHE_CFG | 0x5508 0000 | 4KB |
| SCACHE_SCTM | 0x5508 0400 | 4KB |
| SCACHE_MMU | 0x5508 0800 | 4KB |
| CORTEXM3_WKUP | 0x5508 1000 | 4KB |
| CORTEXM3_MMU | 0x5508 2000 | 4KB |
| CM3_NVIC_CPU1 ⁽¹⁾ | 0xE000 E000 | 4KB |
| CM3_NVIC_CPU2 ⁽²⁾ | 0xE000 E000 | 4KB |
| CM3_RW_Table ⁽³⁾ | 0xE00F E000 | 4KB |

⁽¹⁾ Private memory space for CPU1

⁽²⁾ Private memory space for CPU2

⁽³⁾ Private memory space for each CPU

7.4.2 Shared Cache Configuration Registers

For information about the shared cache configuration registers and their description, see [Chapter 5, DSP Subsystem](#).

7.4.3 Shared Cache SCTM Registers

For information about the shared cache SCTM registers and their description, see [Chapter 5, DSP Subsystem](#).

The SCTM registers in the Cortex-M3 MPU differ from the registers listed in [Chapter 5, DSP Subsystem](#), in the following ways:

- Counters with indexes from $i = 2$ to 5 can be chained and shadowing is enabled.
- The reset value of the SCACHE_SCTM_CTCR_WOT_j[7] CHNSDW bit is 1.
- The option to write 1 in the SCACHE_SCTM_CTCR_WOT_j[4] CHAIN bit is not reserved and when the bit is write 1, the counter is chained.

7.4.4 Shared Cache MMU Registers

For information about the shared cache MMU registers and their description, see [Chapter 5, DSP Subsystem](#).

The shared cache MMU in Cortex-M3 has four large pages, two medium pages, and ten small pages. Because of the different page sizes, there are differences with the registers described in Chapter 5, DSP Subsystem, in the enumerated indexes below the register mapping, which are the following: ($i = 0$ to 3), ($j = 0$ to 1), ($k = 0$ to 9). There are also differences in the reset value of the following registers:

- SCACHE_MMU_SMALL_ADDR_0 with reset value 0x00000000
- SCACHE_MMU_SMALL_ADDR_1 with reset value 0x40000000
- SCACHE_MMU_SMALL_POLICY_k with reset value 0x00000000 ($k = 0$ to 9)
- SCACHE_MMU_SMALL_XLTE_0 with reset value 0x55020000
- SCACHE_MMU_SMALL_XLTE_1 with reset value 0x55080000
- SCACHE_MMU_SMALL_XLTE_k with reset value 0x00000000 ($k = 2$ to 9)

The page sizes for the 16 entries are:

- Large pages (four): The page size supported are 32MB and 512MB.

- Medium pages (two): The page sizes supported are 128KB and 256KB.
- Small pages (ten): The page sizes supported are 4KB and 16KB.

7.4.5 Cortex-M3 L2 MMU Registers

For information about the L2 MMU registers and their description, see [Chapter 21](#), *Memory Management Unit*.

7.4.6 Cortex-M3 NVIC Registers

For information about the Cortex-M3 MPU NVIC registers and their description, see the ARM Cortex-M3 Technical Reference Manual .

7.4.7 Cortex-M3 Wake-Up Generator Registers

7.4.7.1 CORTEXM3_WKUP Register Summary

[Table 7-11](#) summarizes the dual Cortex-M3 MPU register mapping.

Table 7-11. CORTEXM3_WKUP Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Cortex-M3 Base Address |
|--|------|-----------------------|----------------|------------------------|
| CORTEXM3_CTRL_REG | RW | 32 | 0x0000 0000 | 0x5508 1000 |
| STANDBY_CORE_SYSCONFIG | RW | 32 | 0x0000 0004 | 0x5508 1004 |
| IDLE_CORE_SYSCONFIG | RW | 32 | 0x0000 0008 | 0x5508 1008 |
| WUGEN_MEVT0 | RW | 32 | 0x0000 000C | 0x5508 100C |
| WUGEN_MEVT1 | RW | 32 | 0x0000 0010 | 0x5508 1010 |
| RESERVED | R | 32 | 0x0000 0014 | 0x5508 1014 |

7.4.7.2 Dual Cortex-M3 MPU Wake-Up Generator Register Description

Table 7-12. CORTEXM3_CTRL_REG

| | |
|-------------------------|---|
| Address Offset | 0x0000 0000 |
| Physical Address | 0x5508 1000 |
| Instance | CORTEXM3_WKUP |
| Description | The register is used by one CPU to interrupt the other, thus used as a handshake between the two CPUs 0x0: Interrupt is cleared; 0x1: Interrupt is set. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|--------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | INT_CORTEX_2 | RESERVED | | | | | | | | | | | | | | INT_CORTEX_1 | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---------------------------------|------|-------------|
| 31:17 | RESERVED | | RW | 0x0000 0000 |
| 16 | INT_CORTEX_2 | Interrupt to ARM Cortex-M3 CPU2 | RW | 0 |
| 15:1 | RESERVED | | RW | 0x0000 0000 |
| 0 | INT_CORTEX_1 | Interrupt to ARM Cortex-M3 CPU1 | RW | 0 |

Table 7-13. Register Call Summary for Register CORTEXM3_CTRL_REG

Dual Cortex-M3 MPU Subsystem Functional Description

- [Use of Interrupt for IPC: \[0\] \[1\] \[2\]](#)

Dual Cortex-M3 MPU Subsystem Register Manual

- [CORTEXM3_WKUP Register Summary: \[3\]](#)

Table 7-14. STANDBY_CORE_SYSCONFIG

| | | | |
|------------------|------------------|----------|---------------|
| Address Offset | 0x0000 0004 | Instance | CORTEXM3_WKUP |
| Physical Address | 0x5508 1004 | | |
| Description | Standby protocol | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | STANDBYMODE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------------|
| 31:2 | RESERVED | | RW | 0x0000 0000 |
| 1:0 | STANDBYMODE | 0x0: Force-standby mode 0x1: No-standby mode 0x2: Smart-standby mode 0x3: Smart-standby wakeup mode - normal mode to be used | RW | 0x3 |

Table 7-15. Register Call Summary for Register STANDBY_CORE_SYSCONFIG

Dual Cortex-M3 MPU Subsystem Functional Description

- [Local Power Management: \[0\] \[1\]](#)
- [Wake-Up Generator: \[2\]](#)

Dual Cortex-M3 MPU Subsystem Register Manual

- [CORTEXM3_WKUP Register Summary: \[3\]](#)

Table 7-16. IDLE_CORE_SYSCONFIG

| | | | |
|------------------|---------------|----------|---------------|
| Address Offset | 0x0000 0008 | Instance | CORTEXM3_WKUP |
| Physical Address | 0x5508 1008 | | |
| Description | Idle protocol | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | IDLEMODE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | | RW | 0x0000 0000 |
| 1:0 | IDLEMODE | 0x0: Force-idle mode 0x1: No-idle mode 0x2: Smart-idle mode 0x3: Smart-idle wakeup mode - normal mode to be used | RW | 0x3 |

Table 7-17. Register Call Summary for Register IDLE_CORE_SYSCONFIG

Dual Cortex-M3 MPU Subsystem Functional Description

- [Local Power Management: \[0\] \[1\]](#)
- [Wake-Up Generator: \[2\]](#)

Dual Cortex-M3 MPU Subsystem Register Manual

- [CORTEXM3_WKUP Register Summary: \[3\]](#)

Table 7-18. WUGEN_MEVT0

| | | | |
|-------------------------|---|-----------------|---------------|
| Address Offset | 0x0000 000C | Instance | CORTEXM3_WKUP |
| Physical Address | 0x5508 100C | | |
| Description | This register contains the interrupt mask (LSB) wake-up enable bit per interrupt request 0x0: Interrupt is disabled; 0x1: Interrupt is enabled. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|-------|-------|----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| MIRQ31 | RESERVED | MIRQ29 | MIRQ28 | MIRQ27 | MIRQ26 | MIRQ25 | MIRQ24 | MIRQ23 | MIRQ22 | MIRQ21 | MIRQ20 | MIRQ19 | MIRQ18 | MIRQ17 | MIRQ16 | MIRQ15 | MIRQ14 | MIRQ13 | MIRQ12 | MIRQ11 | MIRQ10 | MIRQ9 | MIRQ8 | MIRQ7 | RESERVED | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------|------|-------|
| 31 | MIRQ31 | Interrupt Mask bit 31 | RW | 0 |
| 30 | RESERVED | Reserved | R | 0 |
| 29 | MIRQ29 | Interrupt Mask bit 29 | RW | 0 |
| 28 | MIRQ28 | Interrupt Mask bit 28 | RW | 0 |
| 27 | MIRQ27 | Interrupt Mask bit 27 | RW | 0 |
| 26 | MIRQ26 | Interrupt Mask bit 26 | RW | 0 |
| 25 | MIRQ25 | Interrupt Mask bit 25 | RW | 0 |
| 24 | MIRQ24 | Interrupt Mask bit 24 | RW | 0 |
| 23 | MIRQ23 | Interrupt Mask bit 23 | RW | 0 |
| 22 | MIRQ22 | Interrupt Mask bit 22 | RW | 0 |
| 21 | MIRQ21 | Interrupt Mask bit 21 | RW | 0 |
| 20 | MIRQ20 | Interrupt Mask bit 20 | RW | 0 |
| 19 | MIRQ19 | Interrupt Mask bit 19 | RW | 0 |
| 18 | MIRQ18 | Interrupt Mask bit 18 | RW | 0 |
| 17 | MIRQ17 | Interrupt Mask bit 17 | RW | 0 |
| 16 | MIRQ16 | Interrupt Mask bit 16 | RW | 0 |
| 15 | MIRQ15 | Interrupt Mask bit 15 | RW | 0 |
| 14 | MIRQ14 | Interrupt Mask bit 14 | RW | 0 |
| 13 | MIRQ13 | Interrupt Mask bit 13 | RW | 0 |
| 12 | MIRQ12 | Interrupt Mask bit 12 | RW | 0 |
| 11 | MIRQ11 | Interrupt Mask bit 11 | RW | 0 |
| 10 | MIRQ10 | Interrupt Mask bit 10 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------------|------|-------|
| 9 | MIRQ9 | Interrupt Mask bit 9 | RW | 0 |
| 8 | MIRQ8 | Interrupt Mask bit 8 | RW | 0 |
| 7 | MIRQ7 | Interrupt Mask bit 7 | RW | 0 |
| 6:0 | RESERVED | Reserved | R | 0 |

Table 7-19. Register Call Summary for Register WUGEN_MEVT0

Dual Cortex-M3 MPU Subsystem Functional Description

- [Local Power Management: \[0\]](#)
- [WUGEN Main Features: \[1\]](#)

Dual Cortex-M3 MPU Subsystem Register Manual

- [CORTEXM3_WKUP Register Summary: \[2\]](#)

Table 7-20. WUGEN_MEVT1

| | | | |
|-------------------------|---|-----------------|---------------|
| Address Offset | 0x0000 0010 | Instance | CORTEXM3_WKUP |
| Physical Address | 0x5508 1010 | | |
| Description | This register contains the interrupt mask (MSB) wake-up enable bit per interrupt request 0x0: Interrupt is disabled; 0x1: Interrupt is enabled. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|--------|----------|--------|--------|--------|--------|--------|----------|--------|--------|--------|----------|----------|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| MIRQ63 | MIRQ62 | MIRQ61 | MIRQ60 | MIRQ59 | MIRQ58 | MIRQ57 | MIRQ56 | RESERVED | MIRQ54 | MIRQ53 | MIRQ52 | MIRQ51 | MIRQ50 | RESERVED | MIRQ48 | MIRQ47 | MIRQ46 | RESERVED | RESERVED | RESERVED | MIRQ42 | MIRQ41 | MIRQ40 | MIRQ39 | MIRQ38 | MIRQ37 | MIRQ36 | MIRQ35 | MIRQ34 | MIRQ33 | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-----------------------|------|-------|
| 31 | MIRQ63 | Interrupt Mask bit 63 | RW | 0 |
| 30 | MIRQ62 | Interrupt Mask bit 62 | RW | 0 |
| 29 | MIRQ61 | Interrupt Mask bit 61 | RW | 0 |
| 28 | MIRQ60 | Interrupt Mask bit 60 | RW | 0 |
| 27 | MIRQ59 | Interrupt Mask bit 59 | RW | 0 |
| 26 | MIRQ58 | Interrupt Mask bit 58 | RW | 0 |
| 25 | MIRQ57 | Interrupt Mask bit 57 | RW | 0 |
| 24 | MIRQ56 | Interrupt Mask bit 56 | RW | 0 |
| 23 | RESERVED | Reserved | R | 0 |
| 22 | MIRQ54 | Interrupt Mask bit 54 | RW | 0 |
| 21 | MIRQ53 | Interrupt Mask bit 53 | RW | 0 |
| 20 | MIRQ52 | Interrupt Mask bit 52 | RW | 0 |
| 19 | MIRQ51 | Interrupt Mask bit 51 | RW | 0 |
| 18 | MIRQ50 | Interrupt Mask bit 50 | RW | 0 |
| 17 | RESERVED | Reserved | R | 0 |
| 16 | MIRQ48 | Interrupt Mask bit 48 | RW | 0 |
| 15 | MIRQ47 | Interrupt Mask bit 47 | RW | 0 |
| 14 | MIRQ46 | Interrupt Mask bit 46 | RW | 0 |
| 13:11 | RESERVED | Reserved | R | 0 |
| 10 | MIRQ42 | Interrupt Mask bit 42 | RW | 0 |
| 9 | MIRQ41 | Interrupt Mask bit 41 | RW | 0 |
| 8 | MIRQ40 | Interrupt Mask bit 40 | RW | 0 |
| 7 | MIRQ39 | Interrupt Mask bit 39 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------|------|-------|
| 6 | MIRQ38 | Interrupt Mask bit 38 | RW | 0 |
| 5 | MIRQ37 | Interrupt Mask bit 37 | RW | 0 |
| 4 | MIRQ36 | Interrupt Mask bit 36 | RW | 0 |
| 3 | MIRQ35 | Interrupt Mask bit 35 | RW | 0 |
| 2 | MIRQ34 | Interrupt Mask bit 34 | RW | 0 |
| 1 | MIRQ33 | Interrupt Mask bit 33 | RW | 0 |
| 0 | RESERVED | Reserved | R | 0 |

Table 7-21. Register Call Summary for Register WUGEN_MEVT1

Dual Cortex-M3 MPU Subsystem Functional Description

- [Local Power Management: \[0\]](#)
- [WUGEN Main Features: \[1\]](#)

Dual Cortex-M3 MPU Subsystem Register Manual

- [CORTEXM3_WKUP Register Summary: \[2\]](#)

7.4.8 Cortex-M3 RW Table Registers

7.4.8.1 CM3_RW_Table Register Summary

Table 7-22. CM3_RW_Table Register Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Cortex-M3 Base Address |
|----------------------------------|------|-----------------------|----------------|------------------------|
| CORTEXM3_RW_PID1 | RW | 32 | 0x0000 0000 | 0xE00F E000 |
| CORTEXM3_RW_PID2 | RW | 32 | 0x0000 0004 | 0xE00F E004 |
| RESERVED | R | 32 | 0x0000 0008 | 0xE00F E008 |

7.4.8.2 Cortex-M3 RW Table Register Description

Table 7-23. CORTEXM3_RW_PID1

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0000 | Instance | CM3_RW_Table |
| Physical Address | 0xE00F E000 | | |
| Description | Peripheral Identification register - allows the user software to differentiate between the two ARM Cortex-M3 processors (two CPUs). The same piece of code running on the two CPUs can result in different execution (in example branch to different location) depending on what address is stored in the register. The address is stored by the BIOS code. The register cannot be accessed when the BIOS code is running (used). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BASEADD1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------|------|-------------|
| 31:0 | BASEADD1 | ROM memory address | RW | 0x0000 0000 |

Table 7-24. Register Call Summary for Register CORTEXM3_RW_PID1

Dual Cortex-M3 MPU Subsystem Functional Description

- [Private Memory Space: \[0\] \[1\] \[2\]](#)

Dual Cortex-M3 MPU Subsystem Register Manual

- [CM3_RW_Table Register Summary: \[3\]](#)

Table 7-25. CORTEXM3_RW_PID2

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0004 | Instance | CM3_RW_Table |
| Physical Address | 0xE00F E004 | | |
| Description | Peripheral Identification register - allows the user software to differentiate between the two ARM Cortex-M3 processors (two CPUs). The same piece of code running on the two CPUs can result in different execution (in example branch to different location) depending on what address is stored in the register. The address is stored by the BIOS code. The register cannot be accessed when the BIOS code is running (used). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BASEADD2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------|------|-------------|
| 31:0 | BASEADD2 | ROM memory address | RW | 0x0000 0000 |

Table 7-26. Register Call Summary for Register CORTEXM3_RW_PID2

Dual Cortex-M3 MPU Subsystem Functional Description

- [Private Memory Space: \[0\] \[1\] \[2\]](#)

Dual Cortex-M3 MPU Subsystem Register Manual

- [CM3_RW_Table Register Summary: \[3\]](#)

Imaging Subsystem

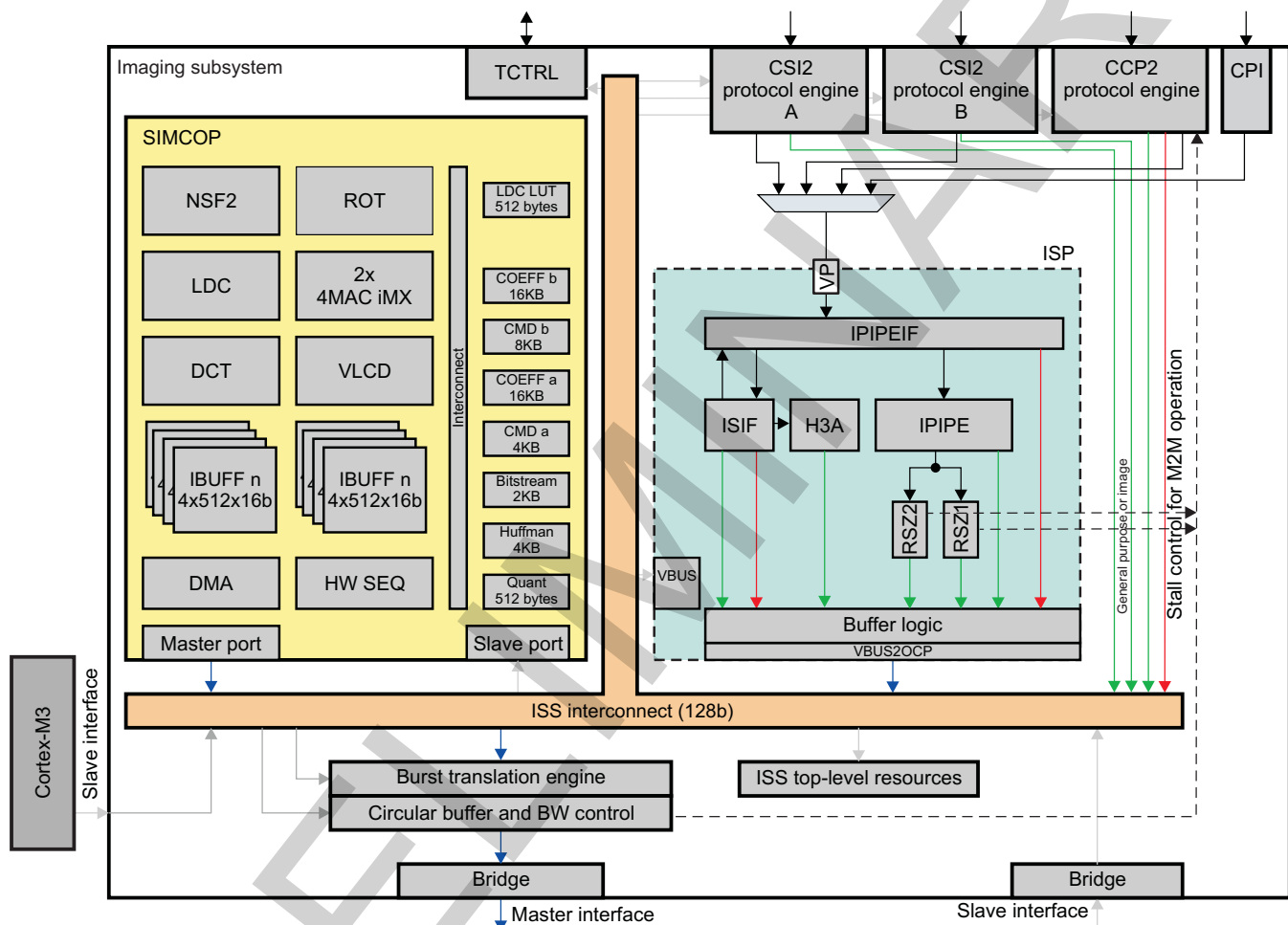
This chapter gives a top-level overview of the imaging subsystem (ISS) in the device.

| Topic | Page |
|--|-------------|
| 8.1 ISS Overview | 1194 |
| 8.2 ISS Interfaces | 1232 |
| 8.3 ISS ISP | 1500 |
| 8.4 ISS Still Image Coprocessor | 1955 |

8.1 ISS Overview

The imaging subsystem (ISS) deals with the processing of the pixel data coming from an external image sensor, data from memory (image format encoding and decoding can be done to and from memory), or data from SL2 in IVA-HD for hardware encoding. With its subparts, such as interfaces and interconnects, image signal processor (ISP), and still image coprocessor (SIMCOP), the ISS is a key component for the following multimedia applications: camera viewfinder, video record, and still image capture. [Figure 8-1](#) shows an overview of the ISS.

Figure 8-1. ISS Overview



The direction of the arrows shows the command flow direction from the master (initiator) to the slave (target). The following color conventions are used for the connections:

- Blue: Bidirectional, 128-bit-wide interface data connection
- Green: Write (ISS → system memory) data connection. Either 64-bit interface, 128-bit interface, or 32-bit MTC (inside ISP5).
- Red: Read (system memory to ISS) data connection. 128-bit interface port or 32-bit MTC (inside ISP5).
- Gray: 32-bit interface configuration connection
- Solid black: Video port and camera interface related signals
- Dotted black: Data flow stall control signal. Used to slow down ISP for memory-to-memory operation.

The ISS is mainly composed of CCP2 and CSI2-A, CSI2-B camera interfaces, a parallel interface (CPI), an ISP, and a block-based imaging accelerator (SIMCOP).

The ISS is designed to reach high throughput and low latency with large image sensors. In high-performance mode, the ISS supports a pixel throughput of 233 MPix/s.

Two programmable image processors (iMX4) are included in the SIMCOP subsystem to add further flexibility to implement new algorithms or where new issues are encountered with the image sensors. The iMX4 processors are also open to third-party algorithms.

The ISS is tightly coupled with a low-interrupt latency microprocessor unit (MPU) subsystem (Cortex™-M3 MPU) that runs a real-time operating system (OS) to reach optimal performance. Mainly, the Cortex-M3 MPU can quickly change the ISS configuration during frame blanking periods and run some sequencing tasks.

The ISS targets the following major use cases:

- Viewfinder with digital zoom, video stabilization, and rotations
- Up to 1080p video record at 30 fps with digital zoom, video stabilization, and rotation
- Up to 16 MPix still image capture with digital zoom and rotation
 - High performance mode: Up to 233 MPix/s throughput
 - High quality and low light modes: Up to 50 MPix/s throughput
- Still image capture during video record

NOTE: The ISS is not limited to 16 Mpix. Higher resolution can be achieved through multiple passes.

NOTE: For a detailed list of features of a certain submodule, see the related subsection.

The ISS offers the following features:

- SIMCOP:
 - Memory-to-memory operation
 - JPEG encode and decode hardware acceleration
 - High-ISO noise filtering (NSF 2.0) with up to 120 MPix/s throughput
 - Rotation accelerator
 - Warping accelerator
 - Lens distortion correction (YUV space) with up to 200 MPix/s throughput
 - General-purpose (GP) imaging accelerator (2x iMX4) with up to 400-MHz clock speed
 - Direct memory access (DMA) controller
 - Hardware sequencer
- ISP:
 - On-the-fly or memory-to-memory processing
 - Up to 233-MHz pixel throughput
 - Statistic data collection
 - Image pipe interface front-end raw data processing
 - RGB and YUV data processing through ISIF and IPIPE
 - Hardware 3A (H3A) statistics block for real-time auto focus (AF), auto exposure (AE), and auto white balance (AWB)
 - Two image continuous real-time resizers
 - Video port (VP) for interfacing with the receivers and directing data to the ISP
- ISS interfaces:
 - 128-bit-wide data interface to the level 3 (L3) interconnect
 - Burst translation engine (BTE) tightly coupled with the TILER to support efficient rotation
 - Circular buffer for linear space, physically located in memory

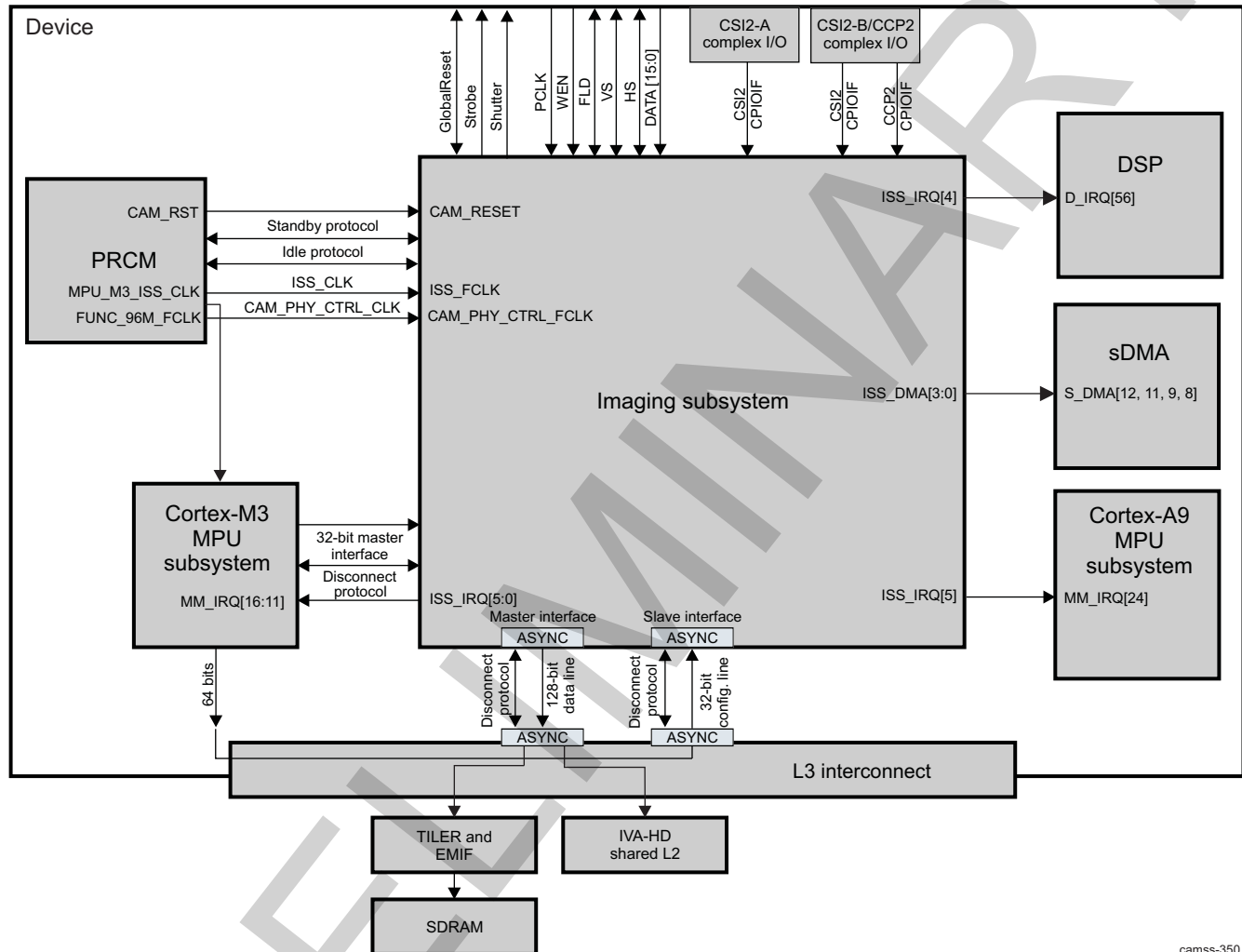
- The ISS relies on the centralized memory management unit (MMU) feature of the DMM. See [Chapter 21](#), *Memory Management Unit*, and [Chapter 16](#), *Memory Subsystem*.
- Two CSI2 camera interfaces: CSI2-A (primary) and CSI2-B (secondary)
- CCP2 camera interface (secondary). Compatible with the *SMIA CCP2 Specification v1.0* and the *MIPI CSI1 Specification*.
- Parallel interface (CPI) (16 bit wide, with up to 148.5 MPix/s throughput, and supporting BT656, SYNC modes)
- System memory data read-back port (supported by the CCP2 protocol engine module)

8.1.1 ISS Integration

This section describes the integration of the module in the device, including information about clocks, resets, and hardware requests.

Figure 8-2 shows the ISS integration.

Figure 8-2. ISS Integration



camss-350

NOTE: For more information about the IDLE hardware handshake and wake-up request, see [Section 3.1.1.1, Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

This section gives an overview of typical uses of the module. For more information about the relationship of the power, reset, and clock management (PRCM) module to the ISS clocks and the reset settings, see the detailed functional description in [Chapter 3, Power, Reset, and Clock Management](#).

The ISS is part of ISS hardware and power management, which comprises the Cortex-M3 MPU, ISS, and a clock generator. These are all independent power domains. The ISS is part of the CAM power domain.

The PRCM module provides a single clock (MPU_M3_ISS_CLK) to ISS power management. This clock generates the clocks for the Cortex-M3 MPU, ISS, and the bridges to L3.

The ISS also supports software reset. A software reset has the same function as a hardware reset except that it does not reset the power-management protocols.

When enabled, MPU_M3_ISS_CLK is gated to provide ISS_CLK, which, after entering the ISS boundary, is named ISS_FCLK. MPU_M3_ISS_CLK is provided as long as the Cortex-M3 MPU or ISS modules within the ISS require it.

CAM_PHY_CTRL_CLK is gated from FUNC_96M_FCLK, which comes from the PRCM module. When enabled and inside the ISS boundary, it is called CAM_PHY_CTRL_FCLK.

NOTE: For more information about the device clocks and how they are handled by the PRCM module before going into the ISS, see, *CM2 Clock Generator*, in [Chapter 3, Power, Reset, and Clock Management](#).

Table 8-1 through Table 8-3 summarize the integration of the module in the device.

Table 8-1. ISS Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| ISS | PD_CAM | No | |

Table 8-2. ISS Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| ISS | ISS_FCLK | ISS_CLK | PRCM | ISS global functional clock from the PRCM module |
| | CAM_PHY_CTRL_FCLK | CAM_PHY_CTRL_CLK | PRCM | Physical layer functional clock from the PRCM module |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| ISS | CAM_RESET | CAM_RST | PRCM | ISS global reset |

Table 8-3. ISS Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|----------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| ISS | ISS_IRQ4 | D_IRQ_56 | DSP INTC | Interrupt generated by ISS to DSP |
| | ISS_IRQ5 | MM_IRQ_24 | Cortex-A9 INTC | Interrupt generated by ISS to Cortex-A9 |
| | ISS_IRQ0 | MM_IRQ_11 | Cortex-M3 INTC | Interrupt generated by ISS to Cortex-M3 |
| | ISS_IRQ1 | MM_IRQ_12 | Cortex-M3 INTC | Interrupt generated by ISS to Cortex-M3 |
| | ISS_IRQ2 | MM_IRQ_13 | Cortex-M3 INTC | Interrupt generated by ISS to Cortex-M3 |
| | ISS_IRQ3 | MM_IRQ_14 | Cortex-M3 INTC | Interrupt generated by ISS to Cortex-M3 |
| | ISS_IRQ4 | MM_IRQ_15 | Cortex-M3 INTC | Interrupt generated by ISS to Cortex-M3 |
| | ISS_IRQ5 | MM_IRQ_16 | Cortex-M3 INTC | Interrupt generated by ISS to Cortex-M3 |
| DMA Requests | | | | |
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| ISS | ISS_DMA0 | S_DMA_8 | sDMA | Signal connected to the sDMA directly provided by ISP. |
| | ISS_DMA1 | S_DMA_9 | sDMA | Signal connected to the sDMA directly provided by ISP |
| | ISS_DMA2 | S_DMA_11 | sDMA | Signal connected to the sDMA directly provided by ISP |
| | ISS_DMA3 | S_DMA_12 | sDMA | Signal connected to the sDMA directly provided by ISP |

8.1.1.1 ISS PRCM Interface Integration

8.1.1.1.1 ISS Clock Domains

The ISS has five asynchronous clock domains. Most of the logic uses ISS_FCLK; the other clock domains are used for interfaces.

Table 8-4 provides a high-level view of clocks. The frequencies provided are maximum values.

Table 8-4. ISS Local Clock Domains

| Name | Description |
|-------------------|---|
| PCLK | Parallel interface (CPI) pixel clock provided by the camera external sensor. The CSI2-A, CSI2-B, and CCP2 modules also have video port outputs, each having its own pixel clock. These pixel clocks are generated from the functional clock (ISS_FCLK). Then all four pixel clock sources are multiplexed into one clock provided to the ISP. |
| CSI2_A_BC | Byte clock provided by the CSI2-A complex I/O. Used by the CSI2-A receiver. |
| CSI2_B_BC | Byte clock provided by the CSI2-B/CCP2 complex I/O. Used by the CSI2-B receiver. |
| CCP2_BC | Clock provided by the CCP2 complex I/O. Used by the CCP2 protocol engine. |
| ISS_FCLK | Functional clock provided by ISS_CLK from the PRCM module. It is used by all ISS submodules and ISS top-level resources. |
| CAM_PHY_CTRL_FCLK | Functional clock provided by the PRCM module. It is used by the CSI2-A and CSI2-B/CCP2 complex I/Os. |

To save power, the ISS can divide the received functional clock (ISS_CLK) by 2 or 4 from ISS_CTRL[4:5] ISS_CLK_DIV. The configuration clock is always half the functional clock.

The functional clock of some submodules can be cut by software to reduce power consumption by cutting off or turning on the modules from the ISS_CLKCTRL register. Also, the pixel clocks sent by submodules to ISP can be cut off from ISS_CLKCTRL VPORTx_CLK.

WARNING

There is a dependency on the maximum frequencies of the ISS_FCLK for OPP119, OPP100 and OPP50. When the VDD_CORE_L voltage domain is defined for the first set of OPPs, then only OPP119 and OPP50 are supported. When the VDD_CORE_L voltage domain is defined for the second set of OPPs, then OPP119, OPP100 and OPP50 are supported.

The ISS_FCLK has a specific dependency on the selection of the VDD_CORE_L set of OPPs. Therefore, ISS_FCLK frequency is up to 233 MHz for OPP119 (up to 116.5 MHz for OPP50), only when the VDD_CORE_L voltage domain is defined for the first supported set of OPPs. When the VDD_CORE_L voltage domain is defined for the second set of OPPs, then ISS_FCLK is available for OPP119 and OPP100 at up to 200 MHz, and for OPP50 at up to 100 MHz.

For more details on the device voltage management see Section 3.8.1, Overview, in Chapter 3, PRCM.

8.1.2 ISS Functional Description

This section provides only a top-level overview of the ISS. The ISS submodules are described in: [Section 8.4, ISS:SIMCOP](#), [Section 8.2, ISS:interfaces](#), and [Section 8.3, ISS:ISP](#).

[Section 8.1.2.1, ISS Interrupts](#), describes the ISS power-management mechanisms and gives an introduction to and a functional description of the ISP submodules.

8.1.2.1 ISS Interrupts

[Table 8-5](#) lists the events generated by the submodules and the top level of the ISS.

Each event that generates an interrupt can be individually enabled by setting the appropriate bit in the [ISS_HL_IRQENABLE_SET_i](#) register. The interrupt is disabled by setting the appropriate bit in the [ISS_HL_IRQENABLE_CLR_i](#) register.

When an event occurs, the corresponding bit in the [ISS_HL_IRQSTATUS_RAW_i](#) register is set regardless of whether or not the event is enabled. Bits in the [ISS_HL_IRQSTATUS_i](#) registers are set only when an enabled event occurs.

Software can clear a pending HS_VS_IRQ event by setting the [ISS_HL_IRQSTATUS_i\[17\]](#) HS_VS_IRQ bit. Events generated by submodules are automatically cleared at the ISS level when they are cleared at the submodule level.

8.1.2.1.1 ISS Interrupt Merger

The ISS merges the following eight interrupt sources into six physical interrupt lines. All six lines support level and pulse modes.

Table 8-5. ISS Interrupts

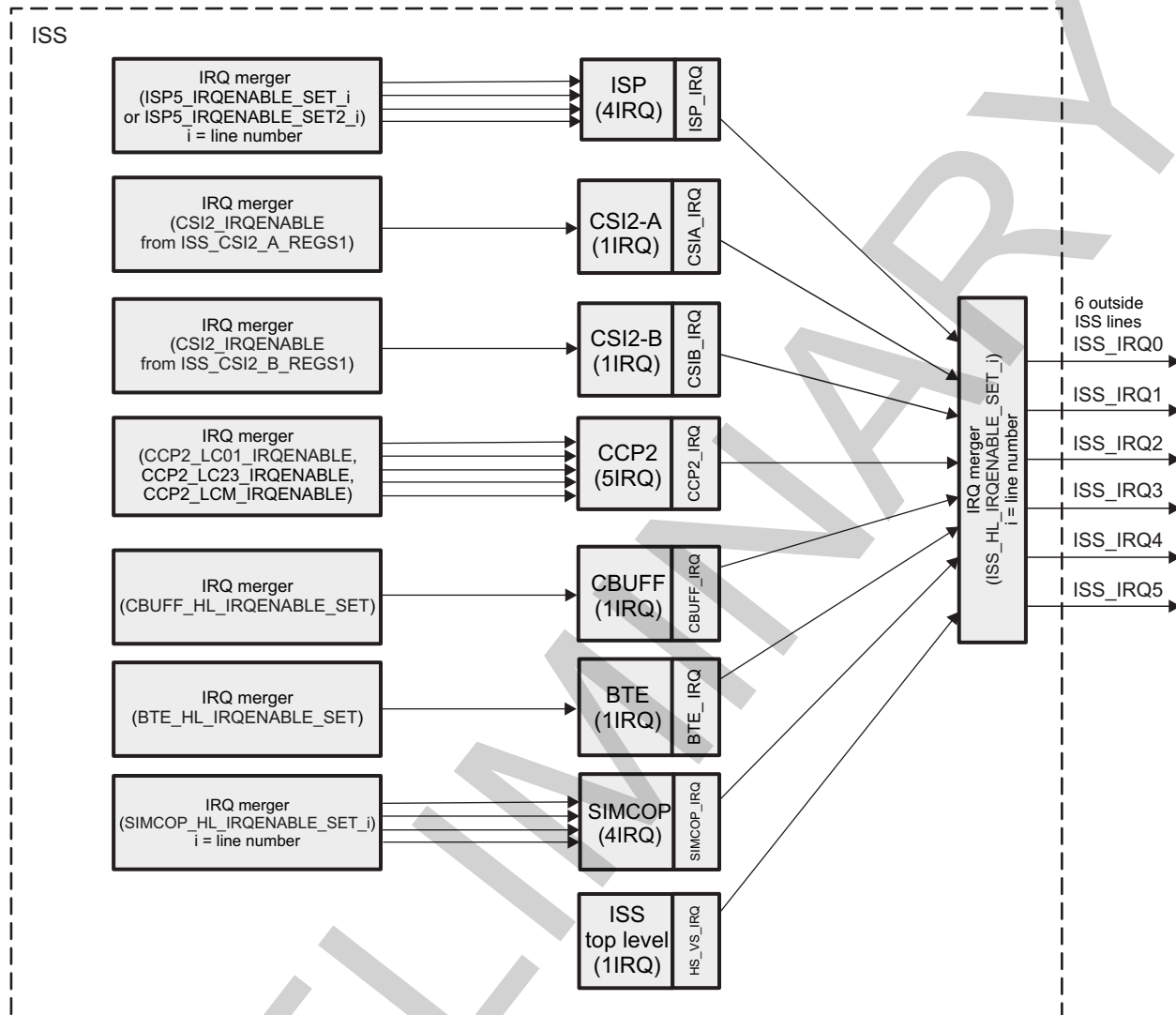
| Interrupt | Source | Description |
|-----------------|--------|---|
| ISP_IRQ[3:0] | ISP | Interrupt generated by the ISP ⁽¹⁾ |
| CSIA_IRQ | CSI2-A | Interrupt generated by the CSI2-A receiver ⁽¹⁾ |
| CSIB_IRQ | CSI2-B | Interrupt generated by the CSI2-B receiver ⁽¹⁾ |
| CCP2_IRQ[3:0] | CCP2 | Interrupt generated by the CCP2 receiver ⁽¹⁾ |
| CCP2_IRQ[8] | CCP2 | Interrupt generated by the CCP2 receiver ⁽¹⁾ |
| CBUFF_IRQ | CBUFF | Interrupt generated by the circular buffer ⁽¹⁾ |
| BTE_IRQ | BTE | Interrupt generated by the BTE ⁽¹⁾ |
| SIMCOP_IRQ[3:0] | SIMCOP | Interrupt generated by SIMCOP |
| HS_VS_IRQ | ISS | HS or VS synchronization event. This event is triggered if a rising or falling edge is detected on the HS or VS signal. The rising or falling edge and the HS or VS signal selection are chosen using the ISP_CTRL[0:1] SYNC_DETECT bit field. |

⁽¹⁾ For more information, see [Section 8.1.2.1.2, ISS Submodule Interrupts](#).

Software can select which interrupt sources are routed to each output line (ISS_IRQ[0:5]). All six physical interrupt outputs have equivalent functions. Software can use different interrupt lines to group events together by type and therefore reduce interrupt latencies. Typically, one interrupt line is used for low-priority events (errors), and the other interrupt lines are used for high-priority events (for example, SIMCOP sequencing and end-of-frame events to trigger configuration load). The ISS internal interrupt request (IRQ) merger (see [Figure 8-3](#)) relies only on level interrupts provided by submodules. Pulse interrupts provided by submodules are ignored. Typically, all of the interrupts are routed to the Cortex-M3 running the camera driver. In addition, one interrupt is routed to Cortex-A9, which may run the imaging software. Software does not need to clear events from submodules at the ISS level: it clears only the events at the submodule level; the IRQ merger automatically clears the IRQ at this level.

NOTE: Only the HS_VS_IRQ top-level event is cleared at the ISS level.

Figure 8-3. ISS Interrupt Merger



camss-702u

NOTE: For more information about mapping the six lines to the outside ISS device modules, see [Table 8-3](#).

Only the ISP, SIMCOP, and HL ISS merger IRQ lines are configurable. Each interrupt can be mapped to the required line. This is not the case with CCP2 where, for example, LC01 is hardwired to line0 and line1.

8.1.2.1.2 ISS Submodule Interrupts

The ISS shown in [Figure 8-3](#) and listed in [Table 8-3](#) can generate six interrupts.

8.1.2.1.2.1 ISS ISP Interrupts

[Table 8-6](#) summarizes events that cause ISP interrupts.

Table 8-6. ISS ISP Interrupts

| Event and Register ⁽¹⁾ | Description |
|--|--|
| ISP5_IRQENABLE_SET_i[[31] OCP_ERR_IRQ | An interface port error has been received on the ISP master port. |
| ISP5_IRQENABLE_SET_i[29] IPIPE_INT_DPC_RNEW1 | HD interrupt signal to indicate the need to renew the defect pixel correction (DPC) table with new entries. The second 128 entries in the DPC table must be updated when this event triggers. This event is triggered when the 255th entry in the look-up table (LUT) is used. This interrupt is not synchronous to the HD signal. |
| ISP5_IRQENABLE_SET_i[28] IPIPE_INT_DPC_RNEW0 | VD interrupt signal to indicate the need to renew the DPC table with new entries. The first 128 entries in the DPC table must be updated when the event triggers. This event is triggered when the 127th entry in the LUT is used. This interrupt is not synchronous to the HD signal. |
| ISP5_IRQENABLE_SET_i[27] IPIPE_INT_DPC_INI | Interrupt to signal the need to initialize the DPC table. The DPC table contains two tables of 128 entries. When this signal is used, software must ensure that the 256 table entries are updated with the DPC information. |
| ISP5_IRQENABLE_SET_i[25] IPIPE_INT_EOF | End of frame interrupt signal |
| ISP5_IRQENABLE_SET_i[24] H3A_INT_EOF | End of frame interrupt signal |
| ISP5_IRQENABLE_SET_i[22] RSZ_INT_EOF1 | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET_i[23] RSZ_INT_EOF0 | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET_i[19] RSZ_FIFO_IN_BLK_ERR | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET_i[18] RSZ_FIFO_IN_OVF | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET_i[17] RSZ_INT_CYC_RZB | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET_i[16] RSZ_INT_CYC_RZA | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET_i[15] RSZ_INT_DMA | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET_i[14] RSZ_INT_LAST_PIX | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET_i[13] RSZ_INT_REG | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET_i[12] H3A_INT | Interrupt generated by the AF and AE/AWB blocks inside the H3A module. It indicates the end of processing a frame and is active high for one configuration bus clock cycle. |
| ISP5_IRQENABLE_SET_i[11] AF_INT | AF inside generates an interrupt at the end of processing frame; a third interrupt is generated at the same time as the last process to finish. |
| ISP5_IRQENABLE_SET_i[10] AEW_INT | AEW inside generates an interrupt at the end of processing frame; a third interrupt is generated at the same time as the last process to finish. |
| ISP5_IRQENABLE_SET_i[9] IPIPEIF_IRQ | IPIPEIF module interrupt is generated at the start position of a frame and is active high for one configuration bus clock cycle. |
| ISP5_IRQENABLE_SET_i[8] IPIPE_INT_HST | IPIPE module interrupt is generated when histogram is done. |
| ISP5_IRQENABLE_SET_i[7] IPIPE_INT_BSC | IPIPE module interrupt is generated when boundary signal calculation is done. |
| ISP5_IRQENABLE_SET_i[6] IPIPE_INT_DMA | IPIPE module interrupt is issued when the SDRAM transfer of boxcar is done. At this time, IPIPE EOF is sent to buffer logic. |
| ISP5_IRQENABLE_SET_i[5] IPIPE_INT_LAST_PIX | IPIPE module interrupt is issued when the last pixel of a frame comes into IPIPE. |
| ISP5_IRQENABLE_SET_i[4] IPIPE_INT_REG | IPIPE module interrupt is issued when the register update of the module is allowed. |
| ISP5_IRQENABLE_SET_i[3] ISIF_INT_3 | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET_i[2] ISIF_INT_2 | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |

⁽¹⁾ i = 0 to 3

Table 8-6. ISS ISP Interrupts (continued)

| Event and Register ⁽¹⁾ | Description |
|---|---|
| ISP5_IRQENABLE_SET_i[1] ISIF_INT_1 | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET_i[0] ISIF_INT_0 | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET2_i[0] H3A_OVF | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET2_i[1] IPIPEIF_UDF | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET2_i[2] IPIPE_BOXCAR_OVF | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET2_i[3] ISIF_OVF | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |
| ISP5_IRQENABLE_SET2_i[4] IPIPE_HST_ERR | See Section 8.1.3, ISS Register Manual , and Section 8.3.5, ISS ISP Register Manual . |

8.1.2.1.2.2 ISS CSI2-A and CSI2-B Complex I/O Interrupts

[Table 8-7](#) lists the event generation of the CSI2-A and CSI2-B receivers through the CSI2 interrupt status and interrupt enable registers. The events are checked for status using the CSI2_IRQSTATUS and CSI2_IRQENABLE registers.

Table 8-7. ISS CSI2-A and CSI2-B Interrupts

| Event and Register | Description |
|--|--|
| CSI2_IRQENABLE[14] OCP_ERR_IRQ | Interface port error |
| CSI2_IRQENABLE[13] SHORT_PACKET_IRQ | Short packet reception (other than sync events: line start, line end, frame start, and frame end; only data types from 0x8 to 0xF are considered) |
| CSI2_IRQENABLE[12] ECC_CORRECTION_IRQ | ECC was used to correct a 1-bit error (short packet only). |
| CSI2_IRQENABLE[11] ECC_NO_CORRECTION_IRQ | ECC was not used to correct the header because the error is larger than 1 bit (short and long packets). |
| CSI2_IRQENABLE[9] COMPLEXIO_ERR_IRQ | Error signaling from complex I/O: This interrupt is triggered when any error is received from the complex I/O (events are defined in CSI2_COMPLEXIO_IRQSTATUS [see Table 8-8]). |
| CSI2_IRQENABLE[8] FIFO_OVF_IRQ | FIFO overflow error: This interrupt is triggered when a FIFO overflow is detected. An overflow can occur if there is a mismatch between the data input and output rates. A reset of the module is required to restart correctly. |
| CSI2_IRQENABLE[7] CONTEXT7 | At least one interrupt event enabled from Context 7 occurred (see Table 8-9). |
| CSI2_IRQENABLE[6] CONTEXT6 | At least one interrupt event enabled from Context 6 occurred (see Table 8-9). |
| CSI2_IRQENABLE[5] CONTEXT5 | At least one interrupt event enabled from Context 5 occurred (see Table 8-9). |
| CSI2_IRQENABLE[4] CONTEXT4 | At least one interrupt event enabled from Context 4 occurred (see Table 8-9). |
| CSI2_IRQENABLE[3] CONTEXT3 | At least one interrupt event enabled from Context 3 occurred (see Table 8-9). |
| CSI2_IRQENABLE[2] CONTEXT2 | At least one interrupt event enabled from Context 2 occurred (see Table 8-9). |
| CSI2_IRQENABLE[1] CONTEXT1 | At least one interrupt event enabled from Context 1 occurred (see Table 8-9). |
| CSI2_IRQENABLE[0] CONTEXT0 | At least one interrupt event enabled from Context 0 occurred (see Table 8-9). |

Table 8-8 lists CSI2 receiver event generation through the CSI2-A/CSI2-B complex I/O interrupt status and interrupt enable registers. The events are checked and controlled from the CSI2_COMPLEXIO_IRQSTATUS and CSI2_COMPLEXIO_IRQENABLE registers.

Table 8-8. ISS CSI2-A and CSI2-B Receivers Complex I/O Interrupts

| Event and Register | Description |
|---|---|
| CSI2_COMPLEXIO_IRQENABLE[0] ERRSOTHS1 | Start of transmission error for lane 1 |
| CSI2_COMPLEXIO_IRQENABLE[1] ERRSOTHS2 | Start of transmission error for lane 2 |
| CSI2_COMPLEXIO_IRQENABLE[2] ERRSOTHS3 | Start of transmission error for lane 3 |
| CSI2_COMPLEXIO_IRQENABLE[5] ERRSOTSYNCHS1 | Start of transmission sync error for lane 1 |
| CSI2_COMPLEXIO_IRQENABLE[6] ERRSOTSYNCHS2 | Start of transmission sync error for lane 2 |
| CSI2_COMPLEXIO_IRQENABLE[7] ERRSOTSYNCHS3 | Start of transmission sync error for lane 3 |
| CSI2_COMPLEXIO_IRQENABLE[10] ERRESC1 | Escape entry error for lane 1 |
| CSI2_COMPLEXIO_IRQENABLE[11] ERRESC2 | Escape entry error for lane 2 |
| CSI2_COMPLEXIO_IRQENABLE[12] ERRESC3 | Escape entry error for lane 3 |
| CSI2_COMPLEXIO_IRQENABLE[15] ERRCONTROL1 | Control error for lane 1 |
| CSI2_COMPLEXIO_IRQENABLE[16] ERRCONTROL2 | Control error for lane 2 |
| CSI2_COMPLEXIO_IRQENABLE[17] ERRCONTROL3 | Control error for lane 3 |
| CSI2_COMPLEXIO_IRQENABLE[20] STATEULPM1 | Lane 1 in ULPM |
| CSI2_COMPLEXIO_IRQENABLE[21] STATEULPM2 | Lane 2 in ULPM |
| CSI2_COMPLEXIO_IRQENABLE[22] STATEULPM3 | Lane 3 in ULPM |
| CSI2_COMPLEXIO_IRQENABLE[25] STATEALLULPMENTER | All active lanes are entering the ULPM. |
| CSI2_COMPLEXIO_IRQENABLE[26] STATEALLULPMEXIT | At least one active lane exited the ULPM. |

Because the CSI2-A/CSI2-B receivers support eight contexts, the CSI2_CTX_IRQSTATUS_i and CSI2_CTX_IRQENABLE_i registers are present eight times (one time per context).

The events are generated only for the enabled context(s). Table 8-9 describes the generation of the CSI2 receiver event through the CSI2_CTX_IRQSTATUS_i and CSI2_CTX_IRQENABLE_i registers.

Table 8-9. ISS CSI2-A/CSI2-B Receivers CONTEXT Interrupts

| Event ⁽¹⁾ | Description |
|--|---|
| CSI2_CTX_IRQENABLE _i [0] FS_IRQ | Frame start: This interrupt is triggered when a frame-start synchronization code is detected in the CSI2 data stream. |
| CSI2_CTX_IRQENABLE _i [1] FE_IRQ | Frame end: This interrupt is triggered when a frame-end synchronization code is detected in the CSI2 data stream. |
| CSI2_CTX_IRQENABLE _i [2] LS_IRQ | Line start: This interrupt is triggered when a line-start synchronization code is detected in the CSI2 data stream. |
| CSI2_CTX_IRQENABLE _i [3] LE_IRQ | Line end: This interrupt is triggered when a line-end synchronization code is detected in the CSI2 data stream. |
| CSI2_CTX_IRQENABLE _i [5] CS_IRQ | CS error: This interrupt is triggered when a mismatch between the transmitter and receiver checksums (payload) is detected. |
| CSI2_CTX_IRQENABLE _i [6] FRAME_NUMBER_IRQ | Frame counter reached: This interrupt is triggered when the frame counter reaches its programmable target value. |
| CSI2_CTX_IRQENABLE _i [7] LINE_NUMBER_IRQ | Line number reached: The programmable line number is received. The modulo feature can be selected (CSI2_CTX_CTRL1 _i .LINE_MODULO). When selected, the interrupt is generated for each line number multiple of the programmed line number (CSI2_CTX_CTRL3 _i .LINE_NUMBER); otherwise, the interrupt is generated only for the line number. |
| CSI2_CTX_IRQENABLE _i [8] ECC_CORRECTION_IRQ | ECC was used to correct a 1-bit error (long packets only). |

⁽¹⁾ i = 0 to 7

8.1.2.1.2.3 ISS CCP2 Interrupts

Table 8-10 summarizes the CCP2 receiver interrupts.

Table 8-10. ISS CCP2 Receiver Interrupts

| Event and Register | Description |
|--|---|
| CCP2_LC01_IRQENABLE[31] LC1_OCPERROR_IRQ | CCP2 write master interface port error on logical channel 1 |
| CCP2_LC01_IRQENABLE[27] LC1_FS_IRQ | CCP2 frame-start synchronization code detection on logical channel 1. This interrupt is triggered when a frame-start synchronization code is detected in the CCP2 data stream. |
| CCP2_LC01_IRQENABLE[26] LC1_LE_IRQ | CCP2 line-end synchronization code detection on logical channel 1. This interrupt is triggered when a line-end synchronization code is detected in the CCP2 data stream. |
| CCP2_LC01_IRQENABLE[25] LC1_LS_IRQ | CCP2 line-start synchronization code detection on logical channel 1. This interrupt is triggered when a line-start synchronization code is detected in the CCP2 data stream. |
| CCP2_LC01_IRQENABLE[24] LC1_FE_IRQ | CCP2 frame-end synchronization code detection on logical channel 1. This interrupt is triggered when a frame-end synchronization code is detected in the CCP2 data stream. |
| CCP2_LC01_IRQENABLE[23] LC1_COUNT_IRQ | CCP2 frame counter reached on logical channel 1. This interrupt is triggered when the frame counter reaches its programmable target value. |
| CCP2_LC01_IRQENABLE[21] LC1_FIFO_OVF_IRQ | CCP2 FIFO overflow error for logical channel 1. An overflow can occur if there is a mismatch between the data input and output rates. |
| CCP2_LC01_IRQENABLE[20] LC1_CRC_IRQ | CCP2 CRC error for logical channel 1. This interrupt is triggered when a mismatch between the transmitter and receiver checksums is detected. |
| CCP2_LC01_IRQENABLE[19] LC1_FSP_IRQ | CCP2 false-synchronization protection code error for logical channel 1. This interrupt is triggered by the FSP decoder if an illegal combination is detected, but 0xA5 is not present in the bitstream. |
| CCP2_LC01_IRQENABLE[18] LC1_FW_IRQ | CCP2 frame-width error for logical channel 1. This interrupt is generated if the frame width constraints associated with the current data type are not respected. |
| CCP2_LC01_IRQENABLE[17] LC1_FSC_IRQ | CCP2 false-synchronization code error for logical channel 1. This interrupt is triggered if the synchronization code order is not respected. This state is shown in the CCP2 receiver finite state-machine (FSM). |
| CCP2_LC01_IRQENABLE[15] LC0_OCPERROR_IRQ | CCP2 write master interface port error on logical channel 1 |
| CCP2_LC01_IRQENABLE[11] LC0_FS_IRQ | CCP2 frame-start synchronization code detection on logical channel 0. This interrupt is triggered when a frame-start synchronization code is detected in the CCP2 data stream. |
| CCP2_LC01_IRQENABLE[10] LC0_LE_IRQ | CCP2 line-end synchronization code detection on logical channel 0. This interrupt is triggered when a line-end synchronization code is detected in the CCP2 data stream. |
| CCP2_LC01_IRQENABLE[9] LC0_LS_IRQ | CCP2 line-start synchronization code detection on logical channel 0. This interrupt is triggered when a line-start synchronization code is detected in the CCP2 data stream. |
| CCP2_LC01_IRQENABLE[8] LC0_FE_IRQ | CCP2 frame-end synchronization code detection on logical channel 0. This interrupt is triggered when a frame-end synchronization code is detected in the CCP2 data stream. |
| CCP2_LC01_IRQENABLE[7] LC0_COUNT_IRQ | CCP2 frame counter reached on logical channel 0. This interrupt is triggered when the frame counter reaches its programmable target value. |
| CCP2_LC01_IRQENABLE[5] LC0_FIFO_OVF_IRQ | CCP2 FIFO overflow error for logical channel 0. An overflow can occur if there is a mismatch between the data input and output rates. |
| CCP2_LC01_IRQENABLE[4] LC0_CRC_IRQ | CCP2 CRC error for logical channel 0. This interrupt is triggered when a mismatch between the transmitter and receiver checksums is detected. |
| CCP2_LC01_IRQENABLE[3] LC0_FSP_IRQ | CCP2 false-synchronization code error for logical channel 0. This interrupt is triggered if the synchronization code order is not respected. This state is shown in the CCP2 receiver FSM. |
| CCP2_LC01_IRQENABLE[2] LC0_FW_IRQ | CCP2 frame-width error for logical channel 0. This interrupt is generated if the frame-width constraints associated with the current data type are not respected. |

Table 8-10. ISS CCP2 Receiver Interrupts (continued)

| Event and Register | Description |
|--|--|
| CCP2_LC01_IRQENABLE[1] LC0_FSC_IRQ | CCP2 false-synchronization code error for logical channel 0. This interrupt is triggered if the synchronization code order is not respected. This state is shown in the CCP2 receiver FSM. |
| CCP2_LC23_IRQENABLE[31] LC3_OCPERROR_IRQ | CCP2 write master interface port error on logical channel 3 |
| CCP2_LC23_IRQENABLE[27] LC3_FS_IRQ | CCP2 frame-start synchronization code detection on logical channel 3. This interrupt is triggered when a frame-start synchronization code is detected in the CCP2 data stream. |
| CCP2_LC23_IRQENABLE[26] LC3_LE_IRQ | CCP2 line-end synchronization code detection on logical channel 3. This interrupt is triggered when a line-end synchronization code is detected in the CCP2 data stream. |
| CCP2_LC23_IRQENABLE[25] LC3_LS_IRQ | CCP2 line-start synchronization code detection on logical channel 3. This interrupt is triggered when a line-start synchronization code is detected in the CCP2 data stream. |
| CCP2_LC23_IRQENABLE[24] LC3_FE_IRQ | CCP2 frame-end synchronization code detection on logical channel 3. This interrupt is triggered when a frame-end synchronization code is detected in the CCP2 data stream. |
| CCP2_LC23_IRQENABLE[23] LC3_COUNT_IRQ | CCP2 frame counter reached on logical channel 3. This interrupt is triggered when the frame counter reaches its programmable target value. |
| CCP2_LC23_IRQENABLE[21] LC3_FIFO_OVF_IRQ | CCP2 FIFO overflow error for logical channel 3. An overflow can occur if there is a mismatch between the data input and output rates. |
| CCP2_LC23_IRQENABLE[20] LC3_CRC_IRQ | CCP2 CRC error for logical channel 3. This interrupt is triggered when a mismatch between the transmitter and receiver checksums is detected. |
| CCP2_LC23_IRQENABLE[19] LC3_FSP_IRQ | CCP2 false-synchronization code error for logical channel 3. This interrupt is triggered if the synchronization code order is not respected. This state is shown in the CCP2 receiver FSM. |
| CCP2_LC23_IRQENABLE[18] LC3_FW_IRQ | CCP2 frame-width error for logical channel 3. This interrupt is generated if the frame-width constraints associated with the current data type are not respected. |
| CCP2_LC23_IRQENABLE[17] LC3_FSC_IRQ | CCP2 false-synchronization code error for logical channel 3. This interrupt is triggered if the synchronization code order is not respected. This state is shown in the CCP2 receiver FSM. |
| CCP2_LC23_IRQENABLE[11] LC2_FS_IRQ | CCP2 frame-start synchronization code detection on logical channel 2. This interrupt is triggered on the detection of a frame-start synchronization code into the CCP2 data stream. |
| CCP2_LC23_IRQENABLE[10] LC2_LE_IRQ | CCP2 line-end synchronization code detection on logical channel 2. This interrupt is triggered on the detection of a line-end synchronization code into the CCP2 data stream. |
| CCP2_LC23_IRQENABLE[9] LC2_LS_IRQ | CCP2 line-start synchronization code detection on logical channel 2. This interrupt is triggered when a line-start synchronization code is detected in the CCP2 data stream. |
| CCP2_LC23_IRQENABLE[8] LC2_FE_IRQ | CCP2 frame-end synchronization code detection on logical channel 2. This interrupt is triggered when a frame-end synchronization code is detected in the CCP2 data stream. |
| CCP2_LC23_IRQENABLE[7] LC2_COUNT_IRQ | CCP2 frame counter reached on logical channel 2. This interrupt is triggered when the frame counter reaches its programmable target value. |
| CCP2_LC23_IRQENABLE[5] LC2_FIFO_OVF_IRQ | CCP2 FIFO overflow error for logical channel 2. An overflow can occur if there is a mismatch between the data input and output rates. |
| CCP2_LC23_IRQENABLE[4] LC2_CRC_IRQ | CCP2 CRC error for logical channel 2. This interrupt is triggered when a mismatch is detected between the transmitter and receiver checksums. |
| CCP2_LC23_IRQENABLE[3] LC2_FSP_IRQ | CCP2 false-synchronization code error for logical channel 2. This interrupt is triggered if the synchronization code order is not respected. This state is shown in the CCP2 receiver FSM. |
| CCP2_LC23_IRQENABLE[2] LC2_FW_IRQ | CCP2 frame-width error for logical channel 2. This interrupt is generated if the frame-width constraints associated with the current data type are not respected. |
| CCP2_LC23_IRQENABLE[1] LC2_FSC_IRQ | CCP2 false-synchronization code error for logical channel 2. This interrupt is triggered if the synchronization code order is not respected. This state is shown in the CCP2 receiver FSM. |

Table 8-10. ISS CCP2 Receiver Interrupts (continued)

| Event and Register | Description |
|------------------------------------|--|
| CCP2_LCM_IRQENABLE[1] LCM_OCPERROR | CCP2 an interface error occurred on the master read port. This interrupt is triggered when an OCP error is detected on the master read port. |
| CCP2_LCM_IRQENABLE[0] LCM_EOF | Memory read channel – end of frame: This interrupt is triggered when a frame is read completely from memory. |

8.1.2.1.2.4 ISS CBUFF Interrupts

Table 8-11 summarizes the CBUFF interrupts.

Table 8-11. ISS CBUFF Interrupts

| Event and Register | Description |
|---|--|
| CBUFF_HL_IRQENABLE_SET[31] IRQ_CTX7_OVR | CBUFF overflow |
| CBUFF_HL_IRQENABLE_SET[30] IRQ_CTX6_OVR | CBUFF overflow |
| CBUFF_HL_IRQENABLE_SET[29] IRQ_CTX5_OVR | CBUFF overflow |
| CBUFF_HL_IRQENABLE_SET[28] IRQ_CTX4_OVR | CBUFF overflow |
| CBUFF_HL_IRQENABLE_SET[27] IRQ_CTX3_OVR | CBUFF overflow |
| CBUFF_HL_IRQENABLE_SET[26] IRQ_CTX2_OVR | CBUFF overflow |
| CBUFF_HL_IRQENABLE_SET[25] IRQ_CTX1_OVR | CBUFF overflow |
| CBUFF_HL_IRQENABLE_SET[24] IRQ_CTX0_OVR | CBUFF overflow |
| CBUFF_HL_IRQENABLE_SET[23] IRQ_CTX7_INVALID | CBUFF invalid access |
| CBUFF_HL_IRQENABLE_SET[22] IRQ_CTX6_INVALID | CBUFF invalid access |
| CBUFF_HL_IRQENABLE_SET[21] IRQ_CTX5_INVALID | CBUFF invalid access |
| CBUFF_HL_IRQENABLE_SET[20] IRQ_CTX4_INVALID | CBUFF invalid access |
| CBUFF_HL_IRQENABLE_SET[19] IRQ_CTX3_INVALID | CBUFF invalid access |
| CBUFF_HL_IRQENABLE_SET[18] IRQ_CTX2_INVALID | CBUFF invalid access |
| CBUFF_HL_IRQENABLE_SET[17] IRQ_CTX1_INVALID | CBUFF invalid access |
| CBUFF_HL_IRQENABLE_SET[16] IRQ_CTX0_INVALID | CBUFF invalid access |
| CBUFF_HL_IRQENABLE_SET[15] IRQ_CTX7_READY | CBUFF WB physical window ready for access by the CPU |
| CBUFF_HL_IRQENABLE_SET[14] IRQ_CTX6_READY | CBUFF WB physical window ready for access by the CPU |
| CBUFF_HL_IRQENABLE_SET[13] IRQ_CTX5_READY | CBUFF WB physical window ready for access by the CPU |
| CBUFF_HL_IRQENABLE_SET[12] IRQ_CTX4_READY | CBUFF WB physical window ready for access by the CPU |
| CBUFF_HL_IRQENABLE_SET[11] IRQ_CTX3_READY | CBUFF WB physical window ready for access by the CPU |
| CBUFF_HL_IRQENABLE_SET[10] IRQ_CTX2_READY | CBUFF WB physical window ready for access by the CPU |
| CBUFF_HL_IRQENABLE_SET[9] IRQ_CTX1_READY | CBUFF WB physical window ready for access by the CPU |
| CBUFF_HL_IRQENABLE_SET[8] IRQ_CTX0_READY | CBUFF WB physical window ready for access by the CPU |
| CBUFF_HL_IRQENABLE_SET[0] IRQ_OCP_ERR | CBUFF master interface port error |

8.1.2.1.2.5 ISS BTE Interrupts

Table 8-12 summarizes the BTE interrupts.

Table 8-12. ISS BTE Interrupts

| Event and Register | Description |
|---------------------------------------|--|
| BTE_HL_IRQENABLE_SET[31] IRQ_CTX7_ERR | Writes enable notification for read request before enough data is prefetched. Reads notify when a read request that requires translation on Context 7 is received, but not enough frame lines have been prefetched in the buffer. See Section 8.2.7.3.2.4.3, iSS BTE Buffer Prefetch . |

Table 8-12. ISS BTE Interrupts (continued)

| Event and Register | Description |
|---|--|
| BTE_HL_IRQENABLE_SET[30] IRQ_CTX6_ERR | Writes enable notification for read request before enough data is prefetched. Reads notify when a read request that requires translation on Context 6 is received, but not enough frame lines have been prefetched in the buffer. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[29] IRQ_CTX5_ERR | Writes enable notification for read request before enough data is prefetched. Reads notify when a read request that requires translation on Context 5 is received, but not enough frame lines have been prefetched in the buffer. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[28] IRQ_CTX4_ERR | Writes enable notification for read request before enough data is prefetched. Reads notify when a read request that requires translation on Context 4 is received, but not enough frame lines have been prefetched in the buffer. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[27] IRQ_CTX3_ERR | Writes enable notification for read request before enough data is prefetched. Reads notify when a read request that requires translation on Context 3 is received, but not enough frame lines have been prefetched in the buffer. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[26] IRQ_CTX2_ERR | Writes enable notification for read request before enough data is prefetched. Reads notify when a read request that requires translation on Context 2 is received, but not enough frame lines have been prefetched in the buffer. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[25] IRQ_CTX1_ERR | Writes enable notification for read request before enough data is prefetched. Reads notify when a read request that requires translation on Context 1 is received, but not enough frame lines have been prefetched in the buffer. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[24] IRQ_CTX0_ERR | Writes enable notification for read request before enough data is prefetched. Reads notify when a read request that requires translation on Context 0 is received, but not enough frame lines have been prefetched in the buffer. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[23] IRQ_CTX7_INVALID | Writes enable invalid access to Context 7. Reads notify when access to an unexpected location in Context 7 is requested, or the start context location access is valid, but the burst length exceeds the Context 7 end. See Section 8.2.7.3.2.2, ISS BTE Virtual Address Space and Context Mapping . |
| BTE_HL_IRQENABLE_SET[22] IRQ_CTX6_INVALID | Writes enable invalid access to Context 6. Reads notify when access to an unexpected location in Context 6 is requested, or the start context location access is valid, but the burst length exceeds the Context 6 end. See Section 8.2.7.3.2.2, ISS BTE Virtual Address Space and Context Mapping . |
| BTE_HL_IRQENABLE_SET[21] IRQ_CTX5_INVALID | Writes enable invalid access to Context 5. Reads notify when access to an unexpected location in Context 5 is requested, or the start context location access is valid, but the burst length exceeds the Context 5 end. See Section 8.2.7.3.2.2, ISS BTE Virtual Address Space and Context Mapping . |
| BTE_HL_IRQENABLE_SET[20] IRQ_CTX4_INVALID | Writes enable invalid access to Context 4. Reads notify when access to an unexpected location in Context 4 is requested, or the start context location access is valid, but the burst length exceeds the Context 4 end. See Section 8.2.7.3.2.2, ISS BTE Virtual Address Space and Context Mapping . |
| BTE_HL_IRQENABLE_SET[19] IRQ_CTX3_INVALID | Writes enable invalid access to Context 3. Reads notify when access to an unexpected location in Context 3 is requested, or the start context location access is valid, but the burst length exceeds the Context 3 end. See Section 8.2.7.3.2.2, ISS BTE Virtual Address Space and Context Mapping . |

Table 8-12. ISS BTE Interrupts (continued)

| Event and Register | Description |
|---|--|
| BTE_HL_IRQENABLE_SET[18] IRQ_CTX2_INVALID | Writes enable invalid access to Context 2. Reads notify when access to an unexpected location in Context 2 is requested, or the start context location access is valid, but the burst length exceeds the Context 2 end. See Section 8.2.7.3.2.2, ISS BTE Virtual Address Space and Context Mapping . |
| BTE_HL_IRQENABLE_SET[17] IRQ_CTX1_INVALID | Writes enable invalid access to Context 1. Reads notify when access to an unexpected location in Context 1 is requested, or the start context location access is valid, but the burst length exceeds the Context 1 end. See Section 8.2.7.3.2.2, ISS BTE Virtual Address Space and Context Mapping . |
| BTE_HL_IRQENABLE_SET[16] IRQ_CTX0_INVALID | Writes enable invalid access to Context 0. Reads notify when access to an unexpected location in Context 0 is requested, or the start context location access is valid, but the burst length exceeds the Context 0 end. See Section 8.2.7.3.2.2, ISS BTE Virtual Address Space and Context Mapping . |
| BTE_HL_IRQENABLE_SET[15] IRQ_CTX7_DONE | Writes enable notification for context that has been fully and successfully transferred to TILER. Reads notify when enough frame lines have been prefetched into the buffer and Context 7 is translated to TILER. This interrupt is triggered when flushing completes (if enabled) in one-shot mode. It is triggered once per frame in continuous mode. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[14] IRQ_CTX6_DONE | Writes enable notification for context that has been fully and successfully transferred to TILER. Reads notify when enough frame lines have been prefetched into the buffer and Context 6 is translated to TILER. This interrupt is triggered when flushing completes (if enabled) in one-shot mode. It is triggered once per frame in continuous mode. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[13] IRQ_CTX5_DONE | Writes enable notification for context that has been fully and successfully transferred to TILER. Reads notify when enough frame lines have been prefetched into the buffer and Context 5 is translated to TILER. This interrupt is triggered when flushing completes (if enabled) in one-shot mode. It is triggered once per frame in continuous mode. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[12] IRQ_CTX4_DONE | Writes enable notification for context that has been fully and successfully transferred to TILER. Reads notify when enough frame lines have been prefetched into the buffer and Context 4 is translated to TILER. This interrupt is triggered when flushing completes (if enabled) in one-shot mode. It is triggered once per frame in continuous mode. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[11] IRQ_CTX3_DONE | Writes enable notification for context that has been fully and successfully transferred to TILER. Reads notify when enough frame lines have been prefetched into the buffer and Context 3 is translated to TILER. This interrupt is triggered when flushing completes (if enabled) in one-shot mode. It is triggered once per frame in continuous mode. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[10] IRQ_CTX2_DONE | Writes enable notification for context that has been fully and successfully transferred to TILER. Reads notify when enough frame lines have been prefetched into the buffer and Context 2 is translated to TILER. This interrupt is triggered when flushing completes (if enabled) in one-shot mode. It is triggered once per frame in continuous mode. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[9] IRQ_CTX1_DONE | Writes enable notification for context that has been fully and successfully transferred to TILER. Reads notify when enough frame lines have been prefetched into the buffer and Context 1 is translated to TILER. This interrupt is triggered when flushing completes (if enabled) in one-shot mode. It is triggered once per frame in continuous mode. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |

Table 8-12. ISS BTE Interrupts (continued)

| Event and Register | Description |
|---------------------------------------|--|
| BTE_HL_IRQENABLE_SET[8] IRQ_CTX0_DONE | Writes enable notification for context that has been fully and successfully transferred to TILER. Reads notify when enough frame lines have been prefetched into the buffer and Context 0 is translated to TILER. This interrupt is triggered when flushing completes (if enabled) in one-shot mode. It is triggered once per frame in continuous mode. See Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |
| BTE_HL_IRQENABLE_SET[1] IRQ_INVALID | Writes enable Invalid virtual space access notification. Reads notify when access falls into a translated from the BTE region, but it is 2D access or it does not map to an active context. See Section 8.2.7.3.2.4.3, ISS BTE Virtual Address Space and Context Mapping . |
| BTE_HL_IRQENABLE_SET[1] IRQ_OCP_ERR | Writes enable notification for error on the master output interface. Reads notify when an error has occurred on the master output interface. |

8.1.2.1.2.6 ISS SIMCOP Interrupts

[Table 8-13](#) summarizes the SIMCOP high-level interrupts mapped to the outer boundaries of the SIMCOP. For more information about interrupts generated from inside the SIMCOP modules, see the SIMCOP section.

Table 8-13. ISS SIMCOP High-Level Interrupts

| Event and Register | Description |
|--|--|
| SIMCOP_HL_IRQENABLE_SET_i[19] CPU_PROC_START_IRQ | Interrupt used when CPU data processing is used in a macroblock processing pipeline. When the CPU receives this IRQ, data is ready to be processed. When the CPU finishes processing the data, it acknowledges by setting the SIMCOP_HWSEQ_CTRL.CPU_PROC_DONE bit. |
| SIMCOP_HL_IRQENABLE_SET_i[18] SIMCOP_DMA_IRQ1 | Interrupt triggered by SIMCOP DMA |
| SIMCOP_HL_IRQENABLE_SET_i[16] OCP_ERR_IRQ | SIMCOP master port interface error |
| SIMCOP_HL_IRQENABLE_SET_i[15] VLCDJ_DECODE_ERR_IRQ | A decode error has been signaled by the VLCDJ module. |
| SIMCOP_HL_IRQENABLE_SET_i[14] DONE_IRQ | Event triggered when hardware sequencer finishes the sequence: <ul style="list-style-type: none"> The sequence step counter has reached the limit. All accelerator and DMA events for the last sequence step have been received. |
| SIMCOP_HL_IRQENABLE_SET_i[13] STEP3_IRQ | Event triggered when a SIMCOP Context 3 is activated by the hardware sequencer. |
| SIMCOP_HL_IRQENABLE_SET_i[12] STEP2_IRQ | Event triggered when a SIMCOP Context 2 is activated by the hardware sequencer. |
| SIMCOP_HL_IRQENABLE_SET_i[11] STEP1_IRQ | Event triggered when a SIMCOP Context 1 is activated by the hardware sequencer. |
| SIMCOP_HL_IRQENABLE_SET_i[10] STEP0_IRQ | Event triggered when a SIMCOP Context 0 is activated by the hardware sequencer. |
| SIMCOP_HL_IRQENABLE_SET_i[9] LDC_BLOCK_IRQ | A macroblock has been processed. |
| SIMCOP_HL_IRQENABLE_SET_i[7] ROT_A | Rotational engine interrupt |
| SIMCOP_HL_IRQENABLE_SET_i[6] IMX_B_IRQ | Event triggered when iMX has executed a SLEEP instruction |
| SIMCOP_HL_IRQENABLE_SET_i[5] IMX_A_IRQ | Event triggered when iMX has executed a SLEEP instruction |
| SIMCOP_HL_IRQENABLE_SET_i[4] NSF_IRQ | Event triggered by the NSD2 imaging accelerator when processing of a block is done |
| SIMCOP_HL_IRQENABLE_SET_i[3] VLCDJ_BLOC_IRQ | A macroblock has been processed (that is, encode and decode). |
| SIMCOP_HL_IRQENABLE_SET_i[2] DCT_IRQ | DCT operating is complete (configured number of MCUs for YUV4:2:0/4:2:2 mode, or number of blocks for sequential block mode). |
| SIMCOP_HL_IRQENABLE_SET_i[1] LDC_FRAME_IRQ | A full frame has been processed. |

Table 8-13. ISS SIMCOP High-Level Interrupts (continued)

| Event and Register | Description |
|--|-----------------------------------|
| SIMCOP_HL_IRQENABLE_SET_i[0] SIMCOP_DMA_IRQ0 | Interrupt triggered by SIMCOP DMA |

8.1.2.2 ISS Clocks

The clocks of ISS submodules can be cut individually using the [ISS_CLKCTRL](#) register. Software can poll the module status reading the appropriate bit in the [ISS_CLKSTAT](#) register.

When software wants to enable a submodule:

- Software sets the appropriate bit in the [ISS_CLKCTRL](#) register.
- Hardware enables the submodule functional and interface clocks (expected to take a few cycles).
- Hardware sets the appropriate bit in the [ISS_CLKSTAT](#) register.

Software must enable the modules in the correct order. The hardware imposes no particular constraint. For example, when data must be provided by the CSI2-A/CSI2-B receiver and processed by the ISP, both modules must be enabled and correctly configured before data arrives. An example of configuration order is: enabling the CSI2-A receiver powers up the complex I/O connected to the external sensor. Additionally, the ISP must be configured and the source interface must be selected. For details and the order of configuration, see the programming module of the particular submodule.

When software wants to shut down a submodule:

- Software ensures that the submodule is idle. Mainly:
 - The submodule must not generate new events.
 - The submodule must not have any pending events.
 - For initiators: The submodule must stop the generation of an interface bridge transaction.
- Software clears the appropriate bit in the [ISS_CLKCTRL](#) register.
- For modules having only a master port: Hardware waits until the submodule to be disconnected asserts the MStandBy signal on its master port. It asserts MWait of the submodule.

NOTE: The ISS does not assert the MWait signal when a shutdown of the module is not requested by software.

- Hardware cuts the submodule clocks.
- Hardware clears the appropriate bit in the [ISS_CLKSTAT](#) register.

[Table 8-14](#) describes the clock gating of the ISS submodule.

Table 8-14. ISS Submodule Clock Gating

| ISS Resource | Feature On/Off Control |
|---|--|
| ISS top-level resources | Not applicable. ISS top-level resources cannot be cut. However, top-level resources support the autogating feature. |
| SIMCOP | ISS_CLKCTRL [0] SIMCOP |
| ISP | ISS_CLKCTRL [1] ISP |
| CSI2-A | ISS_CLKCTRL [2] CSI2_A |
| CSI2-B | ISS_CLKCTRL [3] CSI2_B |
| CCP2 | ISS_CLKCTRL [4] CCP2 |
| ISS interconnect BTE CBUFF TCTRL | These modules cannot be switched off individually. They are required for any processing performed by SIMCOP because they are on the main data path. However, they support autogating to reduce power consumption when activity is low. |

When the clock of a submodule is cut and an interface bridge request for this module is received from the ISS configuration interconnect, the ISS clock manager temporarily enables the module clock to handle the access properly.

All ISS submodules are off after reset; software must enable them before they can be used.

8.1.2.3 ISS Reset

The ISS can accept a general software reset, propagated through all the hierarchy. This reset can be done to initialize the module and has the same effect as the hardware reset.

1. Set the [ISS_HL_SYSCONFIG\[0\] SOFTRESET](#) bit to 1.
2. Read the [ISS_HL_SYSCONFIG\[0\] SOFTRESET](#) bit to check whether it equals 0, which means the reset occurred.

If after five reads, [ISS_HL_SYSCONFIG\[0\] SOFTRESET](#) still returns 1, it can be assumed that an error occurred during the reset stage.

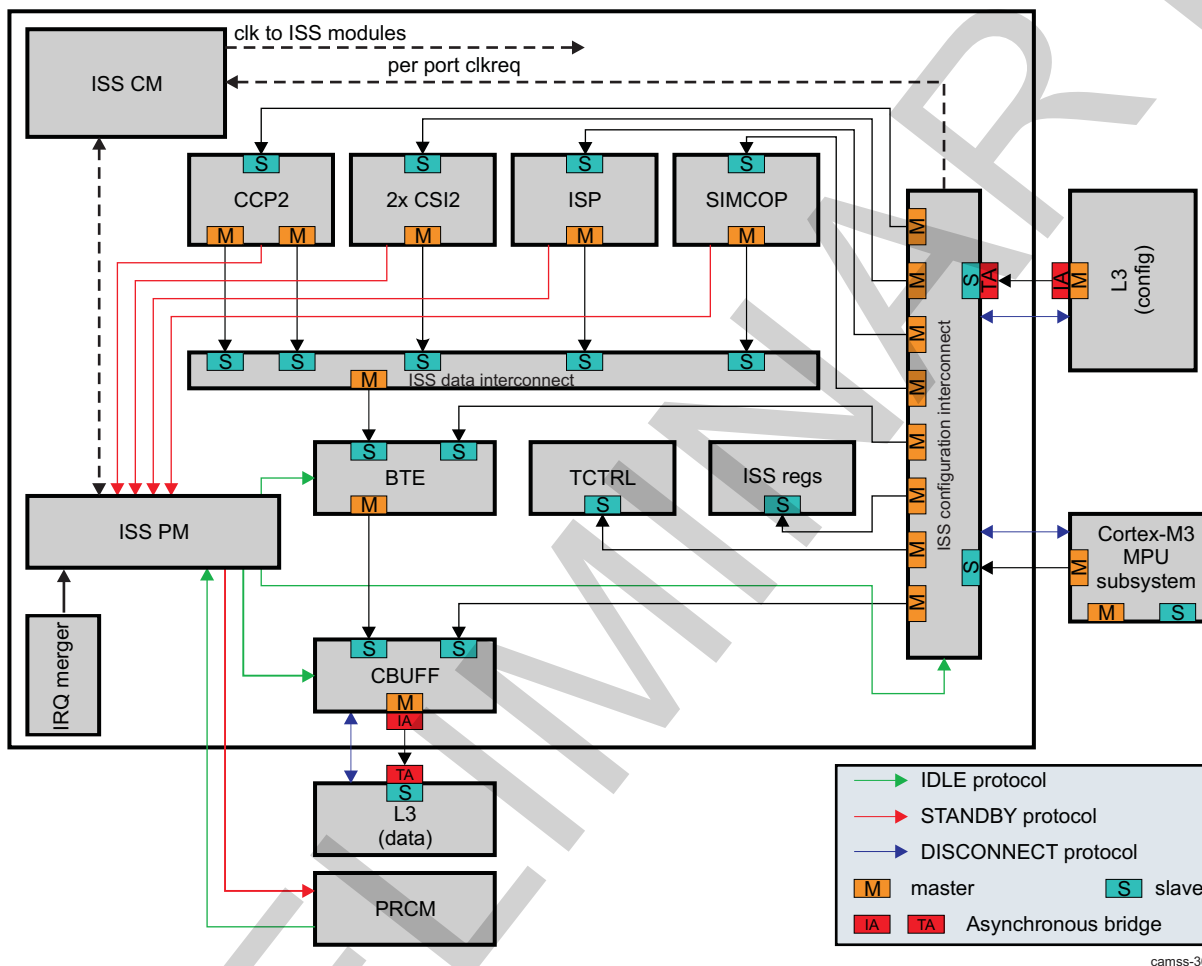
A software reset must not reset the power manager protocols (must not reset the IDLE and STANDBY generic IPs).

8.1.2.4 ISS Power Management

8.1.2.4.1 ISS Power-Management Infrastructure Overview

Figure 8-4 is an overview of the ISS power management.

Figure 8-4. ISS Power Management



NOTE: For power savings, the PRCM module can request idle mode from the ISS. When the ISS is not functional, software must decide when the PRCM module can send the request. For more information, see [Section 3.1.1.1.2, Module Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

8.1.2.4.2 ISS STANDBY Mechanism

The power manager receives STANDBY information from the CCP2, CSI2-A, CSI2-B, ISP, and SIMCOP modules. These modules assert a standby signal when they have no more transactions to perform. The ISS power manager acknowledges by asserting a wait signal.

When those five modules are in standby mode, the ISS power manager initiates a STANDBY sequence for the ISS:

1. The ISS waits while the CCP2, CSI2-A, CSI2-B, ISP, and SIMCOP MStandby is asserted.
2. The ISS power manager acknowledges by asserting the CCP2, CSI2-A, CSI2-B, ISP, and SIMCOP MWAIT signal.
3. The ISS initiators assert only the MStandby signal when they receive responses to all sent requests.

Therefore, when all initiators have asserted MStandBy, the ISS interconnect has no more pending traffic (although configurable, only nonposted writes must be used for error reporting).

4. The ISS power manager sends an IDLE request to the BTE. This IDLE request is used to drain BTE data. It does not affect the configuration port.
5. The BTE drains all transactions.
6. The BTE acknowledges the IDLE request.
7. The ISS power manager sends an IDLE request to the CBUFF. This IDLE request is used to drain CBUFF data. It does not affect the configuration port.
8. CBUFF drains all transactions.
9. CBUFF disconnects the interface master port connected to the L3 interconnect.
10. CBUFF acknowledges the IDLE request.
11. The ISS power manager asserts the MStandBy signals connected to the system PRCM module.
12. The PRCM module acknowledges by asserting the MWait signal.

A functional standby transition can be aborted when one of the CCP2, CSI2-A, CSI2-B, ISP, or SIMCOP modules deasserts the MStandBy signal. The corresponding MWait signal is deasserted only when the ISS interconnect, BTE, CBUFF, and ISS interface master port are ready to receive requests.

When one of the CCP2, CSI2-A, CSI2-B, ISP, or SIMCOP modules must perform accesses to the ISS interface master port, it deasserts the MStandBy signal. The ISS power manager executes the following sequence to leave the STANDBY state:

1. The ISS power manager deasserts the MStandby signal.
2. The ISS waits until the PRCM module deasserts the MWait signal.
3. The ISS power manager requests CBUFF to go into functional mode.
4. CBUFF connects the interface port.
5. The ISS power manager requests the BTE to go into functional mode.
6. The ISS power manager waits until CBUFF and BTE acknowledge functional mode.
7. The ISS deasserts the MWait signal of the module requesting access.

Abort of the standby-to-functional mode transition is not supported. The ISS power manager completes the standby-to-functional transition and then allows a new functional-to-standby transition.

Typically, the MStandby signal is used for two purposes. Software chooses one of the following behaviors through PRCM configuration:

- During blanking periods: The ISS asserts the MStandBy signal between frames when it has no more data to send. The PRCM module can use this information to switch off the L3 interconnect and save some dynamic power. However, the PRCM module is not allowed to cut the ISS functional clock in that case, because it is needed to receive the next frame.
- For ISS shutdown: The ISS asserts MStandBy when it has no more transactions to perform. The PRCM module then initiates an IDLE sequence. Once the ISS acknowledges the transition into idle mode, the PRCM module can cut the ISS clock and power.

The internal standby mode can be reached only when CCP2, CSI2-A, CSI2-B, SIMCOP, ISP, ISS data interconnect, BTE, and CBUFF are in IDLE or STANDBY state. Choosing no-idle or no-standby mode for any of these modules prevents the ISS from going into STANDBY state.

Four modes for standby control are supported, configured through the [ISS_HL_SYSCONFIG\[5:4\]](#) STANDBYMODE bit field:

- Smart-standby-wakeup mode: This is the mode normally used. When in this mode, the ISS asserts the MStandBy signal when the MStandBy of all ISS internal initiators is asserted and the ISS data interconnect, BTE, and CBUFF are in IDLE state.
- Smart-standby mode: The ISS has no wake-up event. This mode is equivalent to smart-standby-wakeup mode.
- Force-standby mode: This is a backup mode intended to be used only if smart-standby mode is bugged. When in this mode, the ISS asserts MStandBy unconditionally. Software must ensure that the ISS is in a correct quiet state before programming this mode.

- No-standby mode: This is a backup mode intended to be used only if smart-standby mode is bugged. When in this mode, the ISS never asserts the MStandBy signal.

8.1.2.4.3 ISS IDLE Mechanism

The PRCM module can request the ISS to go into IDLE state when the ISS has asserted its MStandBy output.

In a normal case, software must ensure that the ISS is in a quiet state before allowing the PRCM module to send an IDLE request to the ISS:

- The ISS has no more traffic to generate.
- The ISS cannot generate any new interrupts.
- The ISS has no pending interrupts.

When an IDLE request is received from the PRCM module, the ISS power manager verifies that the ISS MWait input has been asserted and that all ISS interrupt outputs are deasserted. It then starts the STANDBY-to-IDLE transition:

1. Send IDLE request to the ISS configuration interconnect.
2. The ISS configuration interconnect requests disconnection of both ISS interface slave ports. Disconnection is done by the master:
 - It stops accepting new requests and drains currently ongoing ones.
 - It waits for completion of all ongoing transactions.
3. The ISS configuration interconnect acknowledges the IDLE transition.
4. The ISS power manager acknowledges the IDLE request from the PRCM module.
5. The PRCM module can cut the ISS clock and power.

The PRCM module first enables the ISS power and clock before requesting the ISS to go into functional state by deasserting the SIdleReq signal. The ISS power manager then executes the wake-up sequence:

1. Request the ISS interconnect to go into functional state.
2. The ISS interconnect connects the ISS slave ports.
3. The ISS interconnect acknowledges transition into functional mode.
4. The ISS power manager acknowledges transition into functional mode (ISS output SIdleAck = 00).

Four modes for IDLE control are supported, controlled through the [ISS_HL_SYSCONFIG\[3:2\]](#) IDLEMODE bit field:

- Smart-idle-wakeup mode [b11]: This is the mode normally used. When in this mode, the ISS acknowledges a request to go idle from the power manager after having performed all hardware operations necessary for the IAF to be in a correct quiet state.
- Smart-idle mode [b10]: This is equivalent to smart-idle-wakeup mode.
- Force-idle mode [b00]: This is a backup mode intended to be used only if smart-idle mode is bugged. When in this mode, the ISS acknowledges a request to go idle from the power manager with no hardware condition. Software must ensure that the ISS is in a correct quiet state before requesting a force-idle transition.
- No-idle mode [b01]: When in this mode, the ISS disregards any request to go idle from the power manager.

8.1.3 ISS Register Manual

8.1.3.1 ISS Instance Summary

Table 8-15 is the ISS instance.

Table 8-15. ISS Instance Summary

| Module Name | Module Base Address | Size |
|-------------|---------------------|-----------|
| ISS_TOP | 0x5200 0000 | 256 bytes |

NOTE: This section contains the ISS TOP registers only. For submodule register details, see the register manual of the particular submodule.

8.1.3.2 ISS Registers

8.1.3.2.1 ISS TOP Register Summary

Table 8-16 summarizes the ISS TOP register mapping.

Table 8-16. ISS TOP Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_TOP Base Address |
|--|------|-----------------------|--------------------------|--------------------------|
| ISS_HL_REVISION | R | 32 | 0x0000 0000 | 0x5200 0000 |
| RESERVED | R | 32 | 0x0000 0004 | 0x5200 0004 |
| ISS_HL_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5200 0010 |
| RESERVED | RW | 32 | 0x0000 001C | 0x5200 001C |
| ISS_HL_IRQSTATUS_R AW _i ⁽¹⁾ | RW | 32 | 0x0000 0020 + (0x10 * i) | 0x5200 0020 + (0x10 * i) |
| ISS_HL_IRQSTATUS_i ⁽¹⁾ | RW | 32 | 0x0000 0024 + (0x10 * i) | 0x5200 0024 + (0x10 * i) |
| ISS_HL_IRQENABLE_S ET _i ⁽¹⁾ | RW | 32 | 0x0000 0028 + (0x10 * i) | 0x5200 0028 + (0x10 * i) |
| ISS_HL_IRQENABLE_C LR _i ⁽¹⁾ | RW | 32 | 0x0000 002C + (0x10 * i) | 0x5200 002C + (0x10 * i) |
| ISS_CTRL | RW | 32 | 0x0000 0080 | 0x5200 0080 |
| ISS_CLKCTRL | W | 32 | 0x0000 0084 | 0x5200 0084 |
| ISS_CLKSTAT | R | 32 | 0x0000 0088 | 0x5200 0088 |
| ISS_PM_STATUS | R | 32 | 0x0000 008C | 0x5200 008C |

⁽¹⁾ i = 0 to 5

8.1.3.2.2 ISS TOP Register Description

through describe the ISS TOP registers.

Table 8-17. ISS_HL_REVISION

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0000 | Instance | ISS_TOP |
| Physical Address | 0x5200 0000 | | |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP Revision | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 8-18. Register Call Summary for Register ISS_HL_REVISION

ISS Overview

- [ISS TOP Register Summary: \[0\]](#)

Table 8-19. ISS_HL_SYSCONFIG

| | | | |
|------------------|--------------------------------|----------|---------|
| Address Offset | 0x0000 0010 | Instance | ISS_TOP |
| Physical Address | 0x5200 0010 | | |
| Description | Clock management configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------------|---|----------|---|----------|---|-----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | STANDBYMODE | | IDLEMODE | | RESERVED | | SOFTRESET | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5:4 | STANDBYMODE | Master interface power management, standby/Wait control 0x0: Force-standby. MStandby is asserted unconditionally. 0x1: No-standby. MStandby is never asserted. 0x3: Smart-standby 0x2: Smart-standby | RW | 0x2 |
| 3:2 | IDLEMODE | IDLE protocol configuration 0x0: Force-idle 0x1: No-idle 0x3: Smart-idle 0x2: Smart-idle | RW | 0x2 |
| 1 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | SOFTRESET | Software reset. Write 0x0: No action Write 0x1: Initiate software reset Read 0x1: Reset (software or other) ongoing Read 0x0: Reset done, no pending action | RW | 0 |

Table 8-20. Register Call Summary for Register ISS_HL_SYSCONFIG

ISS Overview

- [ISS Reset: \[0\] \[1\] \[2\]](#)
- [ISS STANDBY Mechanism: \[3\]](#)
- [ISS IDLE Mechanism: \[4\]](#)
- [ISS TOP Register Summary: \[5\]](#)

Table 8-21. ISS_HL_IRQSTATUS_RAW_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0020 + (0x10 * i) | Index | i = 0 to 5 |
| Physical Address | 0x5200 0020 + (0x10 * i) | Instance | ISS_TOP |
| Description | Per-event raw interrupt status vector, line 0. Raw status is set even if event is not enabled by setting the ISS_HL_IRQENABLE_SET_i register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|-----------|-------------|-------------|-------------|-------------|---------|----------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | HS_VS_IRQ | CCP2_IRQ8 | SIMCOP_IRQ3 | SIMCOP_IRQ2 | SIMCOP_IRQ1 | SIMCOP_IRQ0 | BTE_IRQ | CBUF_IRQ | CCP2_IRQ3 | CCP2_IRQ2 | CCP2_IRQ1 | CCP2_IRQ0 | CSIB_IRQ | CSIA_IRQ | ISP_IRQ3 | ISP_IRQ2 | ISP_IRQ1 | ISP_IRQ0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17 | HS_VS_IRQ | HS or VS synchronization event. This event is triggered if a rising or falling edge is detected on the HS or VS signal (after the video port mux). The rising or falling edge and the HS or VS signal selection is chosen with the ISS_CTRL.SYNC_DETECT bit field. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW | 0 |
| 16 | CCP2_IRQ8 | Event generated by the CCP2 receiver Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 15 | SIMCOP_IRQ3 | Event generated by SIMCOP Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 14 | SIMCOP_IRQ2 | Event generated by SIMCOP Read 0x1: Event pending Read 0x0: No event pending | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 13 | SIMCOP_IRQ1 | Event generated by SIMCOP Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 12 | SIMCOP_IRQ0 | Event generated by SIMCOP Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 11 | BTE_IRQ | Event generated by the burst translation engine Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 10 | CBUFF_IRQ | Event generated by the circular buffer Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 9 | CCP2_IRQ3 | Event generated by the CCP2 receiver Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 8 | CCP2_IRQ2 | Event generated by the CCP2 receiver Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 7 | CCP2_IRQ1 | Event generated by the CCP2 receiver Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 6 | CCP2_IRQ0 | Event generated by the CCP2 receiver Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 5 | CSIB_IRQ | Event generated by the CSI2 receiver #b Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 4 | CSIA_IRQ | Event generated by the CSI2 receiver #a Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 3 | ISP_IRQ3 | Combined interrupt event provided by the ISP. Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 2 | ISP_IRQ2 | Combined interrupt event provided by the ISP. Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 1 | ISP_IRQ1 | Combined interrupt event provided by the ISP. Read 0x1: Event pending Read 0x0: No event pending | R | 0 |
| 0 | ISP_IRQ0 | Combined interrupt event provided by the ISP. Read 0x1: Event pending Read 0x0: No event pending | R | 0 |

Table 8-22. Register Call Summary for Register ISS_HL_IRQSTATUS_RAW_i

ISS Overview

- [ISS Interrupts: \[0\]](#)
- [ISS TOP Register Summary: \[1\]](#)

Table 8-23. ISS_HL_IRQSTATUS_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0024 + (0x10 * i) | Index | i = 0 to 5 |
| Physical Address | 0x5200 0024 + (0x10 * i) | Instance | ISS_TOP |
| Description | Per-event "enabled" interrupt status vector, line 0. Enabled status is not set unless event is enabled by setting the ISS_HL_IRQENABLE_SET_i register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|-----------|----|-------------|----|-------------|---|-------------|---|-------------|---|---------|---|-----------|---|-----------|--|-----------|--|-----------|--|-----------|--|----------|--|----------|--|----------|--|----------|--|----------|--|----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | HS_VS_IRQ | | CCP2_IRQ8 | | SIMCOP_IRQ3 | | SIMCOP_IRQ2 | | SIMCOP_IRQ1 | | SIMCOP_IRQ0 | | BTE_IRQ | | CBUFF_IRQ | | CCP2_IRQ3 | | CCP2_IRQ2 | | CCP2_IRQ1 | | CCP2_IRQ0 | | CSIB_IRQ | | CSIA_IRQ | | ISP_IRQ3 | | ISP_IRQ2 | | ISP_IRQ1 | | ISP_IRQ0 | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|---------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17 | HS_VS_IRQ | HS or VS synchronization event. This event is triggered if a rising or falling edge is detected on the HS or VS signal (after the video port mux). The rising or falling edge and the HS or VS signal selection is chosen with the ISS_CTRL.SYNC_DETECT bit field. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toSet | 0 |
| 16 | CCP2_IRQ8 | Event generated by the CCP2 receiver Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 15 | SIMCOP_IRQ3 | Event generated by SIMCOP Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 14 | SIMCOP_IRQ2 | Event generated by SIMCOP Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 13 | SIMCOP_IRQ1 | Event generated by SIMCOP Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 12 | SIMCOP_IRQ0 | Event generated by SIMCOP Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 11 | BTE_IRQ | Event generated by the burst translation engine Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 10 | CBUFF_IRQ | Event generated by the circular buffer Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 9 | CCP2_IRQ3 | Event generated by the CCP2 receiver Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 8 | CCP2_IRQ2 | Event generated by the CCP2 receiver Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 7 | CCP2_IRQ1 | Event generated by the CCP2 receiver Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 6 | CCP2_IRQ0 | Event generated by the CCP2 receiver Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 5 | CSIB_IRQ | Event generated by the CSI2 receiver #b Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 4 | CSIA_IRQ | Event generated by the CSI2 receiver #a Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 3 | ISP_IRQ3 | Combined interrupt event provided by the ISP. Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 2 | ISP_IRQ2 | Combined interrupt event provided by the ISP. Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 1 | ISP_IRQ1 | Combined interrupt event provided by the ISP. Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |
| 0 | ISP_IRQ0 | Combined interrupt event provided by the ISP. Read 0x1: Event pending Read 0x0: No (enabled) event pending | R | 0 |

Table 8-24. Register Call Summary for Register ISS_HL_IRQSTATUS_i

ISS Overview

- [ISS Interrupts: \[0\] \[1\]](#)
- [ISS TOP Register Summary: \[2\]](#)

Table 8-25. ISS_HL_IRQENABLE_SET_i

| | | | |
|------------------|--|----------|------------|
| Address Offset | 0x0000 0028 + (0x10 * i) | Index | i = 0 to 5 |
| Physical Address | 0x5200 0028 + (0x10 * i) | Instance | ISS_TOP |
| Description | Per-event interrupt enable bit vector Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|-----------|-------------|-------------|-------------|-------------|---------|-----------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | HS_VS_IRQ | CCP2_IRQ8 | SIMCOP_IRQ3 | SIMCOP_IRQ2 | SIMCOP_IRQ1 | SIMCOP_IRQ0 | BTE_IRQ | CBUFF_IRQ | CCP2_IRQ3 | CCP2_IRQ2 | CCP2_IRQ1 | CCP2_IRQ0 | CSIB_IRQ | CSIA_IRQ | ISP_IRQ3 | ISP_IRQ2 | ISP_IRQ1 | ISP_IRQ0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|---------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17 | HS_VS_IRQ | <p>HS or VS synchronization event. This event is triggered if a rising or falling edge is detected on the HS or VS signal (after the video port mux). The rising or falling edge and the HS or VS signal selection is chosen with the ISS_CTRL.SYNC_DETECT bit field.</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 16 | CCP2_IRQ8 | <p>Event generated by the CCP2 receiver</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 15 | SIMCOP_IRQ3 | <p>Event generated by SIMCOP</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 14 | SIMCOP_IRQ2 | <p>Event generated by SIMCOP</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 13 | SIMCOP_IRQ1 | <p>Event generated by SIMCOP</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 12 | SIMCOP_IRQ0 | <p>Event generated by SIMCOP</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 11 | BTE_IRQ | <p>Event generated by the burst translation engine</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 10 | CBUFF_IRQ | <p>Event generated by the circular buffer</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 9 | CCP2_IRQ3 | <p>Event generated by the CCP2 receiver</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------|
| 8 | CCP2_IRQ2 | Event generated by the CCP2 receiver Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 7 | CCP2_IRQ1 | Event generated by the CCP2 receiver Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 6 | CCP2_IRQ0 | Event generated by the CCP2 receiver Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 5 | CSIB_IRQ | Event generated by the CSI2 receiver #b Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 4 | CSIA_IRQ | Event generated by the CSI2 receiver #a Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 3 | ISP_IRQ3 | Combined interrupt event provided by the ISP. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 2 | ISP_IRQ2 | Combined interrupt event provided by the ISP. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 1 | ISP_IRQ1 | Combined interrupt event provided by the ISP. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 0 | ISP_IRQ0 | Combined interrupt event provided by the ISP. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |

Table 8-26. Register Call Summary for Register ISS_HL_IRQENABLE_SET_i

ISS Overview

- [ISS Interrupts: \[0\]](#)
- [ISS TOP Register Summary: \[1\]](#)
- [ISS TOP Register Description: \[2\] \[3\]](#)

Table 8-27. ISS_HL_IRQENABLE_CLR_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 002C + (0x10 * i) | Index | i = 0 to 5 |
| Physical Address | 0x5200 002C + (0x10 * i) | Instance | ISS_TOP |
| Description | Per-event interrupt enable bit vector Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|-----------|-------------|-------------|-------------|-------------|---------|-----------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | HS_VS_IRQ | CCP2_IRQ8 | SIMCOP_IRQ3 | SIMCOP_IRQ2 | SIMCOP_IRQ1 | SIMCOP_IRQ0 | BTE_IRQ | CBUFF_IRQ | CCP2_IRQ3 | CCP2_IRQ2 | CCP2_IRQ1 | CCP2_IRQ0 | CSIB_IRQ | CSIA_IRQ | ISP_IRQ3 | ISP_IRQ2 | ISP_IRQ1 | ISP_IRQ0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|---------------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17 | HS_VS_IRQ | HS or VS synchronization event. This event is triggered if a rising or falling edge is detected on the HS or VS signal (after the video port mux). The rising or falling edge and the HS or VS signal selection is chosen with the ISS_CTRL.SYNC_DETECT bit field. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 16 | CCP2_IRQ8 | Event generated by the CCP2 receiver Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 15 | SIMCOP_IRQ3 | Event generated by SIMCOP Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 14 | SIMCOP_IRQ2 | Event generated by SIMCOP Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|---------------|-------|
| 13 | SIMCOP_IRQ1 | Event generated by SIMCOP Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 12 | SIMCOP_IRQ0 | Event generated by SIMCOP Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 11 | BTE_IRQ | Event generated by the BTE Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 10 | CBUFF_IRQ | Event generated by the CBUFF Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 9 | CCP2_IRQ3 | Event generated by the CCP2 receiver Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 8 | CCP2_IRQ2 | Event generated by the CCP2 receiver Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 7 | CCP2_IRQ1 | Event generated by the CCP2 receiver Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 6 | CCP2_IRQ0 | Event generated by the CCP2 receiver Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 5 | CSIB_IRQ | Event generated by the CSI2 receiver b Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |

Table 8-28. Register Call Summary for Register ISS_HL_IRQENABLE_CLR_i

- ISS Interrupts: [0]
- ISS TOP Register Summary: [1]

Table 8-29. ISS_CTRL

[illegible]

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:28 | CSI2_B_TAG_CNT | Defines the maximum number of tags that could be used by the CSI2 b write bridge. Note: Tag count must be set to 16 for best performance. | RW | 0x0 |
| 27:24 | CSI2_A_TAG_CNT | Defines the maximum number of tags that could be used by the CSI2 a write bridge. Note: Tag count must be set to 16 for best performance. | RW | 0x0 |
| 23:20 | CCP2W_TAG_CNT | Defines the maximum number of tags that could be used by the CCP2 write bridge Note: Tag count must be set to 16 for best performance. | RW | 0x0 |
| 19:16 | CCP2R_TAG_CNT | Defines the maximum number of tags that could be used by the CCP2 read bridge Note: Tag count must be set to 16 for best performance. | RW | 0x0 |
| 15:6 | RESERVED | | R | 0x000 |
| 5:4 | ISS_CLK_DIV | ISS functional clock division CLK refers to the input clock provided to the ISS. FCLK is the functional clock provided to ISS top level and submodules. CFGCLK is the clock used for the configuration network. 0x0: FCLK=CLK CFGCLK=CLK/2 0x1: FCLK=CLK/2 CFGCLK=CLK/4 0x3: Reserved 0x2: FCLK=CLK/4 CFGCLK=CLK/8 | RW | 0x0 |
| 3:2 | INPUT_SEL | Selects ISP input 0x0: CSI2-A 0x1: CSI2-B 0x2: CCP2 0x3: Parallel interface | RW | 0x0 |
| 1:0 | SYNC_DETECT | Chooses among rising and falling edge for the HS_VS_IRQ synchronization event 0x0: HS falling edge 0x1: HS raising edge 0x3: VS raising edge 0x2: VS falling edge | RW | 0x0 |

Table 8-30. Register Call Summary for Register ISS_CTRL

ISS Overview

- [ISS Clock Domains: \[0\]](#)
- [ISS TOP Register Summary: \[2\]](#)
- [ISS TOP Register Description: \[3\] \[4\] \[5\] \[6\]](#)

Table 8-31. ISS_CLKCTRL

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0084 | Instance | ISS_TOP |
| Physical Address | 0x5200 0084 | | |
| Description | ISS clock control register. Use to enable/disable the interface and functional clock of ISS submodules. | | |
| Type | W | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------|------------|------------|------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|--------|--------|-----|--------|---|---|---|---|---|---|---|
| VPORT3_CLK | VPORT2_CLK | VPORT1_CLK | VPORT0_CLK | RESERVED | | | | | | | | | | | | | | | | CCP2 | CSI2_B | CSI2_A | ISP | SIMCOP | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31 | VPORT3_CLK | Enables the pixel clock from the parallel interface 0x0: Disabled 0x1: Enabled | RW | 1 |
| 30 | VPORT2_CLK | Enables the pixel clock from the CCP2 protocol engine 0x0: Disabled 0x1: Enabled | RW | 1 |
| 29 | VPORT1_CLK | Enables the pixel clock from the CSI2_B protocol engine 0x0: Disabled 0x1: Enabled | RW | 1 |
| 28 | VPORT0_CLK | Enables the pixel clock from the CSI2_A protocol engine 0x0: Disabled 0x1: Enabled | RW | 1 |
| 27:5 | RESERVED | | R | 0x000000 |
| 4 | CCP2 | CCP2 Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off. Write 0x1: Request enable of the submodule. No effect if the submodule clock is already on. | W | 0 |
| 3 | CSI2_B | CSI2_B Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off. Write 0x1: Request enable of the submodule. No effect if the submodule clock is already on. | W | 0 |
| 2 | CSI2_A | CSI2_A Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off. Write 0x1: Request enable of the submodule. No effect if the submodule clock is already on. | W | 0 |
| 1 | ISP | ISP Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off. Write 0x1: Request enable of the submodule. No effect if the submodule clock is already on. | W | 0 |
| 0 | SIMCOP | SIMCOP Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off. Write 0x1: Request enable of the submodule. No effect if the submodule clock is already on. | W | 0 |

Table 8-32. Register Call Summary for Register ISS_CLKCTRL

ISS Overview

- [ISS Clock Domains: \[0\] \[1\]](#)
- [ISS Clocks: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [ISS TOP Register Summary: \[10\]](#)

Table 8-33. ISS_CLKSTAT

| | | | |
|-------------------------|----------------------------|-----------------|---------|
| Address Offset | 0x0000 0088 | Instance | ISS_TOP |
| Physical Address | 0x5200 0088 | | |
| Description | ISS clock status register. | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------|------------|------------|------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|--------|--------|-----|--------|---|---|---|---|---|---|---|
| VPORT3_CLK | VPORT2_CLK | VPORT1_CLK | VPORT0_CLK | RESERVED | | | | | | | | | | | | | | | | CCP2 | CSI2_B | CSI2_A | ISP | SIMCOP | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31 | VPORT3_CLK | Status of the pixel clock from the parallel interface Read 0x1: Enabled Read 0x0: Disabled | R | 1 |
| 30 | VPORT2_CLK | Status of the pixel clock from the CCP2 protocol engine Read 0x1: Enabled Read 0x0: Disabled | R | 1 |
| 29 | VPORT1_CLK | Status of the pixel clock from the CSI2_B protocol engine Read 0x1: Enabled Read 0x0: Disabled | R | 1 |
| 28 | VPORT0_CLK | Status of the pixel clock from the CSI2_A protocol engine Read 0x1: Enabled Read 0x0: Disabled | R | 1 |
| 27:5 | RESERVED | | R | 0x000000 |
| 4 | CCP2 | CCP2 Read 0x1: The submodule is on. Read 0x0: The submodule is off. | R | 0 |
| 3 | CSI2_B | CSI2_B Read 0x1: The submodule is on. Read 0x0: The submodule is off. | R | 0 |
| 2 | CSI2_A | CSI2_A Read 0x1: The submodule is on. Read 0x0: The submodule is off. | R | 0 |
| 1 | ISP | ISP Read 0x1: The submodule is on. Read 0x0: The submodule is off. | R | 0 |
| 0 | SIMCOP | SIMCOP Read 0x1: The submodule is on. Read 0x0: The submodule is off. | R | 0 |

Table 8-34. Register Call Summary for Register ISS_CLKSTAT

ISS Overview

- [ISS Clocks: \[0\] \[1\] \[2\]](#)
- [ISS TOP Register Summary: \[3\]](#)

Table 8-35. ISS_PM_STATUS

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 008C | Instance | ISS_TOP |
| Physical Address | 0x5200 008C | | |
| Description | ISS power manager status register. Software could know what modules are in functional or STANDBY/IDLE state. This feature could be particularly useful to debug when ISS does not go into STANDBY mode | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|--------|----|-----------|----|--------|---|---------|---|-----------|---|-----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CBUFF_PM | | BTE_PM | | SIMCOP_PM | | ISP_PM | | CCP2_PM | | CSI2_B_PM | | CSI2_A_PM | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|----------|
| 31:14 | RESERVED | | R | 0x000000 |
| 13:12 | CBUFF_PM | Power status of the CBUFF. Read 0x2: Functional Read 0x1: Transition Read 0x0: Idle | R | 0x0 |
| 11:10 | BTE_PM | Power status of the BTE. Read 0x2: Functional Read 0x1: Transition Read 0x0: Idle | R | 0x0 |
| 9:8 | SIMCOP_PM | Power status of the SIMCOP. Read 0x2: Functional Read 0x1: Transition Read 0x0: Standby | R | 0x0 |
| 7:6 | ISP_PM | Power status of the ISP. Read 0x2: Functional Read 0x1: Transition Read 0x0: Standby | R | 0x0 |
| 5:4 | CCP2_PM | Power status of the CCP2. Read 0x2: Functional Read 0x1: Transition Read 0x0: Standby | R | 0x0 |
| 3:2 | CSI2_B_PM | Power status of the CSI2 module b Read 0x2: Functional Read 0x1: Transition Read 0x0: Standby | R | 0x0 |
| 1:0 | CSI2_A_PM | Power status of the CSI2 module a Read 0x2: Functional Read 0x1: Transition Read 0x0: Standby | R | 0x0 |

Table 8-36. Register Call Summary for Register ISS_PM_STATUS

ISS Overview

- [ISS TOP Register Summary: \[0\]](#)

PRELIMINARY

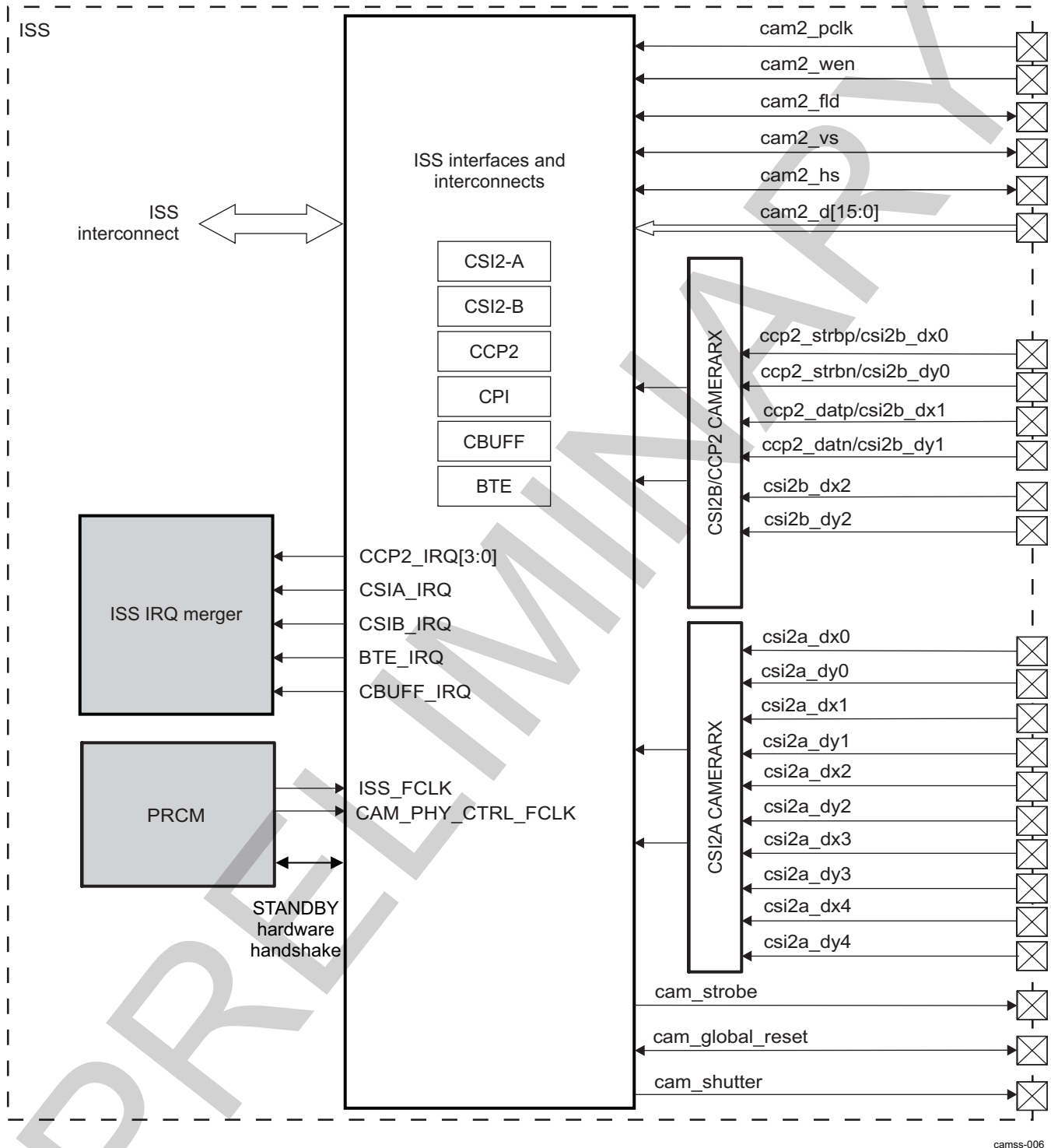
8.2 ISS Interfaces

8.2.1 ISS Interfaces Overview

Along with the submodules, the ISS has two serial camera interfaces (primary and secondary) and a parallel interface. The primary serial interface (CSI2-A) supports MIPI® CSI2 protocol with four data lanes, and the secondary serial interface (CSI2-B/CCP2) supports CSI2 protocol with two data lanes or CCP2 protocol. The parallel interface (CPI) supports up to 16 data lanes. All interfaces can use the image signal processor (ISP), but not concurrently. When one interface uses the ISP, the other must send data to memory. However, the ISP can still be used to process this data in memory-to-memory. Time multiplex processing is also possible.

[Figure 8-5](#) shows the ISS interfaces and interconnects.

Figure 8-5. ISS Interfaces and Interconnects Highlight



NOTE: In the device, the number 2 in the cam2 interface name does not mean there are two camera parallel interfaces available in the device. The cam2 interface name defines the camera parallel interface available in the device versus the legacy device.

8.2.1.1 ISS Interface Features

The camera subsystem supports the following features:

- System interfaces and interconnects:
 - Two 32-bit-wide configuration interfaces:
 - Interface to Cortex™-M3 microprocessor unit (MPU): Synchronous to the functional clock
 - Interface to Cortex™-A9 MPU and system direct memory access (sDMA): Asynchronous from the functional clock
 - 128-bit-wide data interface to level 3 (L3) interconnect: Asynchronous from the functional clock
 - Shared interface level 2 (L2) in IVA-HD module for hardware encoding
 - Outside connection using the L3 interconnect through the TILER to the synchronous dynamic random access memory (SDRAM) controller (SDRC), which acts as the primary interface between the SDRAM and the ISS functional block
 - The ISS has a local interconnect that connects all modules inside the ISS.
 - BTE:
 - Tightly coupled with the TILER to support efficient rotation
 - CBUFF:
 - Maps a linear space into a circular buffer
 - The buffer is physically located in system memory.
 - TCTRL:
 - Control signal generation for flash prestrobe and strobe
 - Camera global reset control
- Camera interfaces:
 - Two CSI2 camera interfaces: CSI2-A (primary) and CSI2-B (secondary)
 - Transfer pixels and data received by the CSI2 digital physical layer receiver to the system memory or to the ISP
 - Use unidirectional data link
 - CSI2-A supports four configurable data links in addition to the clock signaling.
 - CSI2-B supports two configurable data links in addition to the clock signaling.
 - Maximum data rate of 1 Gbps per data lane
 - Data merger for 2-, 3-, or 4-data lane configuration
 - Maximum data rate of 1 Gbps per data lane, possible configurations are:
 - One data lane: 1000 Mbps (824 Mbps if lane 4 is used)
 - Two data lanes: 2 × 1000 Mbps (2 × 824 Mbps if lane 4 is used)
 - Three data lanes: 3 × 1000 Mbps (3 × 824 Mbps if lane 4 is used)
 - Four data lanes: 4 × 824 Mbps
 - Error detection and correction by the protocol engine
 - Direct memory access (DMA) engine integrated with dedicated first in first out (FIFO)
 - One-dimensional (1D) and two-dimensional (2D) addressing mode
 - Burst support
 - Streaming burst support (64- or 32-bit)
 - Eight contexts to support eight dedicated configurations of virtual channel ID and data types
 - Ping-pong mechanism for double-buffering
 - All primary and secondary MIPI-defined formats are supported.
 - Conversion of the RGB formats
 - On-the-fly differential pulse code modulation (DPCM) decompression
 - On-the-fly image cropping and A-law/DPCM compression

- Configuration of the complex input/output (I/O) physical layer (PHY) (MIPI D-PHY-compliant receiver PHY solution [D-PHY mode]/CCP2-compatible receiver PHY solution (CCP2 mode)
- CCP2 camera interface (secondary)
 - Four logical channels
 - Transfer pixels and data received by the complex I/O PHY (CCP2 D-PHY RX to the system memory or the ISP)
 - Use unidirectional data link
 - Maximum data rate of 650 Mbps
 - DMA engine integrated with dedicated FIFO
 - 1D and 2D addressing mode
 - False synchronization code protection
 - Ping-pong mechanism for double-buffering
 - RGB, RAW, YUV, and JPEG formats supported
 - On-the-fly DPCM decompression
 - On-the-fly image cropping and A-Law/DPCM compression
- Parallel interface (CPI)
 - 16 bits wide
 - up to 148.5 MPix/s
 - BT656 and SYNC mode (HS, VS, FIELD, WEN)
- System memory data read back port (supported by the CCP2 protocol engine)
 - RAW 6, 7, 8, 10, 12, 14, 16 formats supported
 - DPCM and A-law decompression
 - Supports image cropping for compressed or uncompressed data

NOTE: Rotated DPCM data is not supported.

8.2.2 ISS Interfaces Environment

8.2.2.1 ISS Interfaces Signal Descriptions

Table 8-37 summarizes the I/O signals.

Table 8-37. ISS I/O Description

| Signal Name | I/O ⁽¹⁾ | Description | Serial Mode CCP2 | Serial Mode CSI2 | Parallel Mode CPI |
|------------------|--------------------|--|------------------|------------------|-------------------|
| cam_strobe | O | Flash strobe control signal | x | x | |
| cam_shutter | O | Mechanical shutter control signal | x | x | |
| cam_global_reset | I/O | Global reset release shutter signal | x | x | |
| csi2a_dx0 | I | Serial CSI2-A mode: Differential clock positive input | | x | |
| csi2a_dy0 | I | Serial CSI2-A mode: Differential clock negative input | | x | |
| csi2a_dx1 | I | Serial CSI2-A mode: Differential data lane positive input | | x | |
| csi2a_dy1 | I | Serial CSI2-A mode: Differential data lane negative input | | x | |
| csi2a_dx2 | I | Serial CSI2-A mode: Differential data lane positive input | | x | |
| csi2a_dy2 | I | Serial CSI2-A mode: Differential data lane negative input | | x | |
| csi2a_dx3 | I | Serial CSI2-A mode: Differential data lane positive input | | x | |
| csi2a_dy3 | I | Serial CSI2-A mode: Differential data lane negative input | | x | |
| csi2a_dx4 | I | Serial CSI2-A mode: Differential data lane positive input | | x | |
| csi2a_dy4 | I | Serial CSI2-A mode: Differential data lane negative input | | x | |
| csi2b_dx0 | I | Serial CSI2-B mode: Differential clock lane positive input | | x | |
| csi2b_dy0 | I | Serial CSI2-B mode: Differential clock lane negative input | | x | |
| csi2b_dx1 | I | Serial CSI2-B mode: Differential data lane positive input | | x | |
| csi2b_dy1 | I | Serial CSI2-B mode: Differential data lane negative input | | x | |
| csi2b_dx2 | I | Serial CSI2-B mode: Differential data lane positive input | | x | |

⁽¹⁾ I = Input; O = Output

Table 8-37. ISS I/O Description (continued)

| Signal Name | I/O ⁽¹⁾ | Description | Serial Mode CCP2 | Serial Mode CSI2 | Parallel Mode CPI |
|--------------|--------------------|---|---------------------|------------------|-------------------|
| csi2b_dy2 | I | Serial CSI2-B mode: Differential data lane negative input | | x | |
| ccp2_strbp | I | Serial CCP2 mode: Differential clock positive input | x | | |
| ccp2_strbn | I | Serial CCP2 mode: Differential clock negative input | x | | |
| ccp2_datp | I | Serial CCP2 mode: Differential data positive input | x | | |
| ccp2_datn | I | Serial CCP2 mode: Differential data negative input | x | | |
| cam2_pclk | I | Parallel mode pixel clock input | | | x |
| cam2_wen | I | Parallel mode write enable signal input | | | x |
| cam2_fld | I/O | Parallel mode pixel clock field signal | | | x |
| cam2_vs | I/O | Parallel mode vertical frame synchronization | | | x |
| cam2_hs | I/O | Parallel mode horizontal frame synchronization | | | x |
| cam2_d[15:0] | I | Parallel mode data lanes (16 signals) | | | x |

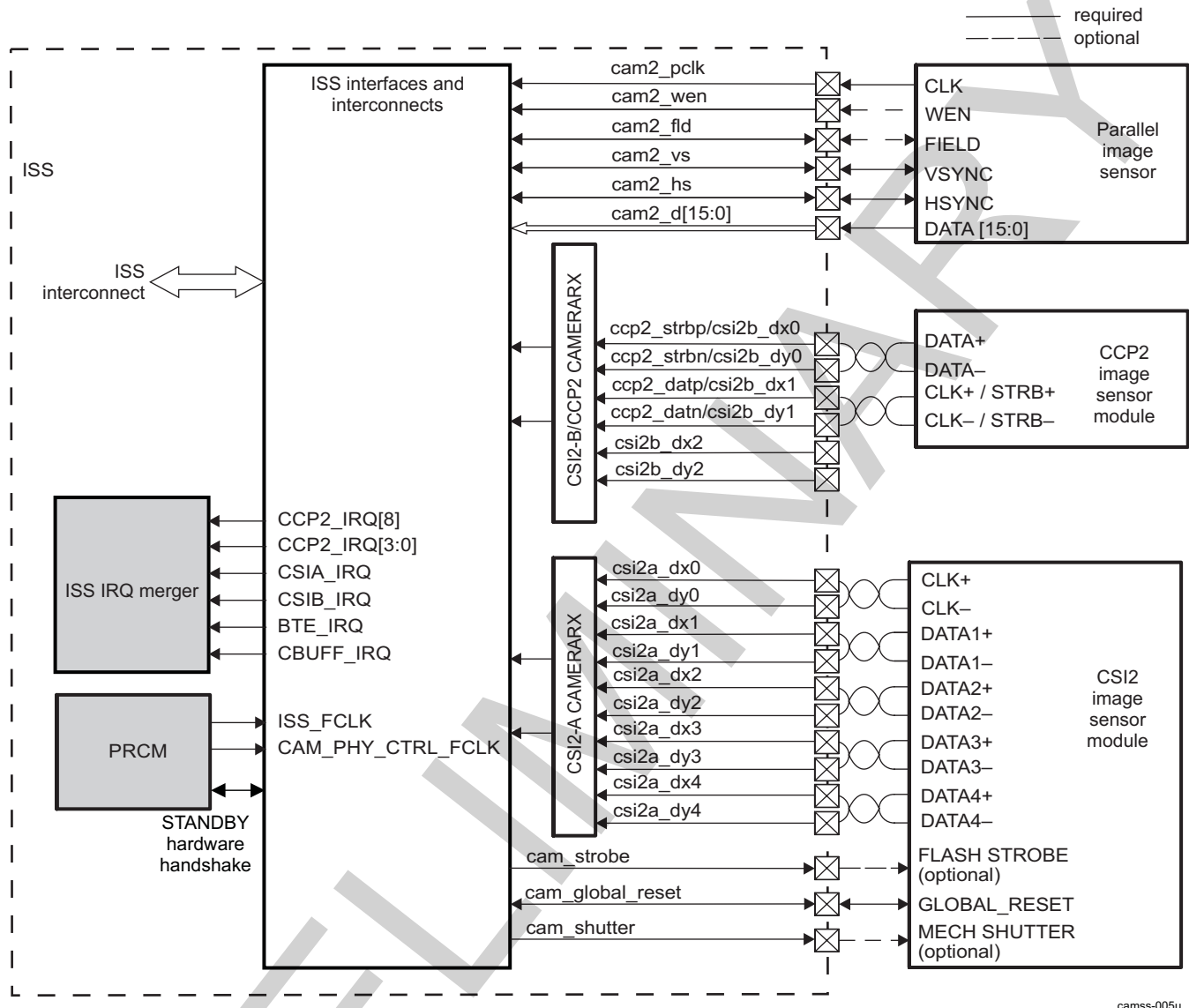
NOTE: Lane polarity can be changed in complex I/O. For more information, see [Section 8.2.2.2, ISS Interface Modes](#).

NOTE: At least one data lane must be configured for using the CSI2-A and CSI2-B interfaces. The signals are also configurable from the control module. Thus, they are not required to be at a certain location to act as clock or data; this can be configured.

NOTE: The Parallel interface (CPI), CCP2, and CSI2-B share pins. Their modes are not supported as a pin configuration mux option. The modes are configured from the CSI2-B/CCP2 CAMERARX configured from the system control module (see [Chapter 19, Control Module](#)).

8.2.2.2 ISS Interfaces Modes

The camera subsystem can manage a parallel interface and two serial image sensors. Depending on the configuration of the shared pins, two of the interfaces can be active at the same time. However, only one data flow can use the ISP. Moreover, if the parallel interface is used data from it goes to ISP and the other used interface must send it to memory. [Figure 8-6](#) shows an example block diagram of the interface configuration. Each serial port clock lane is configurable. The MIPI CSI2 protocol requires only a clock lane setup. The data lane configuration is optional. For more information, see [Section 8.2.5.1.1, ISS CSI2 Protocol and Data Format](#).

Figure 8-6. ISS CSI2-A, CSI2-B/CCP2 Serial Interface Configuration

camss-005u

NOTE: Depending on the needs, `cam_strobe`, `cam_global_reset`, and `cam_shutter` can be connected to the image sensor module rather than the CSI2 image sensor module.

NOTE: Dedicated power, reset, and clock management (PRCM) module pins for power and ground are provided for external sensors: `vdda_csi2a`, `vdda_csi2b`, `vssa_csi2a`, and `vssa_csi2b`.

A graphical representation of the pins for connecting external sensors to the ISS shows a variety of connectivity configurations that are possible by setting the PHY immediately before the receivers, and a variety of output paths, including some sensor data through the receivers to memory or the ISP. [Table 8-38](#) lists some of the connectivity possibilities; the ISP can take only one input lane at a time. For more information about the operating properties and configuration of the CAMERARX PHY, see [Section 8.2.3, ISS CSI2 PHY](#).

Table 8-38. ISS Interfaces Connectivity Scheme Example Scenarios

| | | | | | | | |
|---|---|---|---|---|---|---------------------------------------|---|
| CSI2-A | On, 4DL CSI2-A ⁽¹⁾ to ISP | On, 2DL CSI2-A ⁽²⁾ to Memory | Off | On, 2DL CSI2-A ⁽²⁾ to memory | On, 3DL CSI2-A ⁽²⁾ to ISP/memory | Off | Off |
| CCP2 | Off | Off | On, 1DL CCP2 ⁽¹⁾ to Memory | On, 1DL CCP2 ⁽¹⁾ to ISP | Off | On, 1DL CCP2 ⁽¹⁾ to memory | Off |
| CSI2-B | On, 2DL CSI2-B ⁽¹⁾ to memory | Off | Off | Off | On, 2DL CSI2-B ⁽¹⁾ to memory/ISP | Off | On, 2DL CSI2-B ⁽¹⁾ to memory |
| Parallel interface (CPI) up to 16 lanes | Off | On, 16 data lanes ⁽¹⁾ to ISP | On, 12 data lanes ⁽²⁾ to ISP | Off | Off | Off | Off |
| Signal | Simultaneous | Simultaneous | Simultaneous | Simultaneous | Simultaneous | Simultaneous | Simultaneous |
| cam_strobe | x | x | x | x | x | x | x |
| cam_global_reset | x | x | x | x | x | x | x |
| cam_shutter | x | x | x | x | x | x | x |
| csi2a_dx0 | x | x | | x | x | | |
| csi2a_dy0 | x | x | | x | x | | |
| csi2a_dx1 | x | x | | x | x | | |
| csi2a_dy1 | x | x | | x | x | | |
| csi2a_dx2 | x | x | | x | x | | |
| csi2a_dy2 | x | x | | x | x | | |
| csi2a_dx3 | x | | | | x | | |
| csi2a_dy3 | x | | | | x | | |
| csi2a_dx4 | x | | | | | | |
| csi2a_dy4 | x | | | | | | |
| csi2b_dx0/ccp2_strbp | x | | x | x | x | x | x |
| csi2b_dy0/ccp2_strbn | x | | x | x | x | x | x |
| csi2b_dx1/ccp2_datp | x | | x | x | x | x | x |
| csi2b_dy1/ccp2_datn | x | | x | x | x | x | x |
| csi2b_dx2 | x | | | | x | | x |
| csi2b_dy2 | x | | | | x | | x |
| cam2_pclk | | x | x | | | | |
| cam2_wen | | x | x | | | | |
| cam2_fld | | x | x | | | | |
| cam2_vs | | x | x | | | | |
| cam2_hs | | x | x | | | | |
| cam2_d[15:0] | | x | x | | | | |

⁽¹⁾ Full: All data/clock lanes are connected.

⁽²⁾ Limited: Some data/clock lanes are connected.

NOTE: The ISP can take only one input at a time. The other inputs must go to memory and then be processed after the ISP processes the input that was received first.

In looking at the sample connections between the ISS through the receivers and external sensors, it is

apparent that the lanes of the input can be adjusted for certain needs. For example, it is not necessary that the CSI2-A has four data lanes connected at the same time. The restriction is that CSI2-B is limited to two data lanes. Because CSI2-B and CCP2 share pins, they cannot be used simultaneously. CSI2-A and CSI2-B/CCP2 can function at the same time by sending data to memory. In this manner, external sensors can be connected any way possible for best performance and results.

8.2.2.3 ISS Interfaces CPI Data Formats

8.2.2.3.1 ISS Interfaces CPI Generic Configuration Protocol and Data Format (8, 10, 12, 16 Bits)

The SYNC mode implements a generic parallel interface with the image sensor. The SYNC mode supports 8- to 16-bit-wide data signals.

In this configuration, no assumptions are made about the data format of pixels, but the dynamic range is limited to 8, 10, 12, and 16 bits (data can be pure Luminance for black and white sensor, RGB444, Bayer RGB, etc.). The pixel data is presented on cam2_d, where 1 pixel is sampled for every cam2_pclk rising edge (or falling edge, depending on the configuration of cam2_pclk polarity).

Additional pixel times between rows represent blanking periods. Active pixels are identified by a combination of two additional timing signals: horizontal synchronization (cam2_hs) and vertical synchronization (cam2_vs). During the image-sensor readout, these signals define when a row of valid data begins and ends, and when a frame starts and ends.

NOTE: For correct operation, the clock cam2_pclk must run during blanking periods (cam2_hs and cam2_vs inactive). cam2_pclk must start before sending cam2_d and start cam2_vs and cam2_hs.

Figure 8-7 and Figure 8-8 show the frame and data timing, based on synchronization signals in the parallel No BT configuration.

Figure 8-7. ISS Interfaces CPI Synchronization Signals and Frame Timing in SYNC Mode

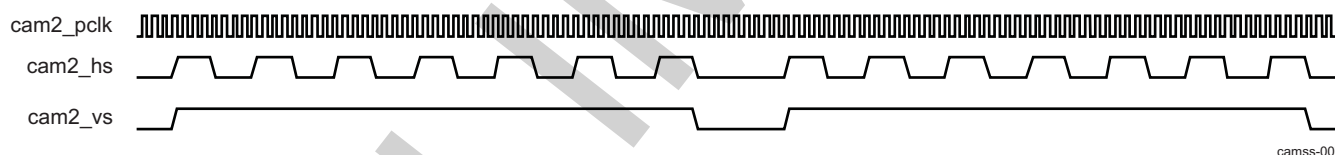
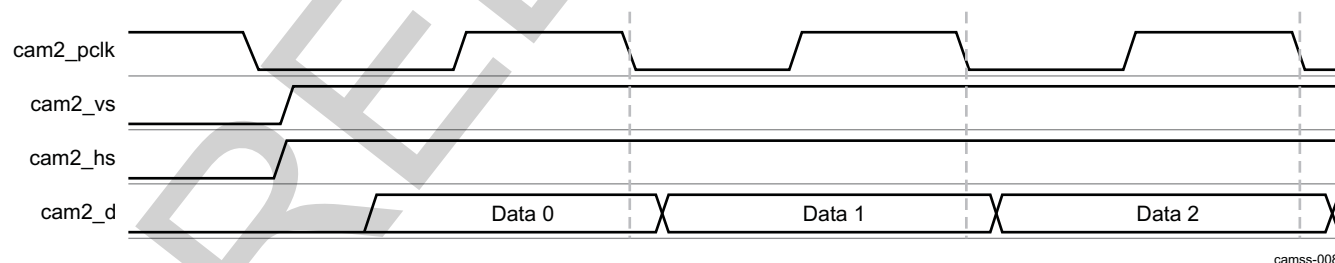


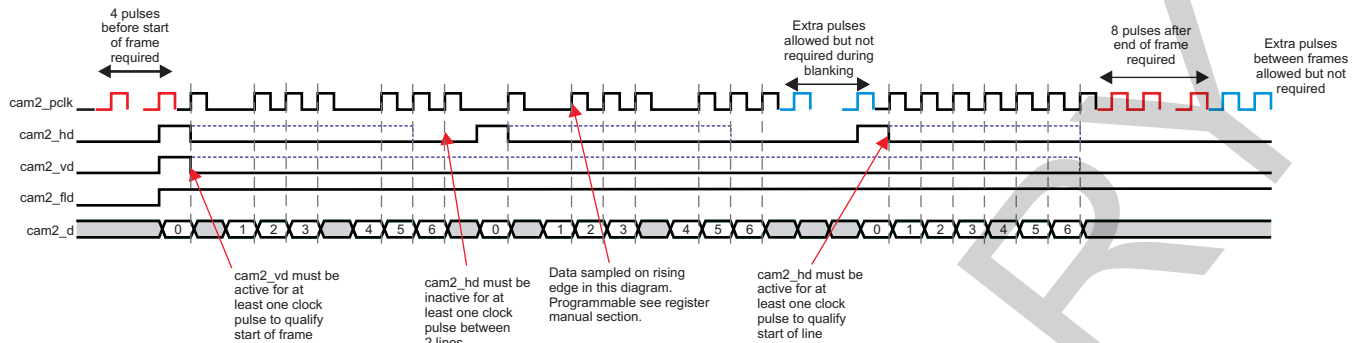
Figure 8-8. ISS Interfaces CPI Synchronization Signals and Data Timing in SYNC Mode



NOTE: The pixel clock can be gated to qualify valid pixels. It can also be gated during blanking periods to reduce power consumption. However, at least four clock pulses are required before sending active image data and synchronization information; eight clock pulses are required after the end of active video. Extra-clock pulses are allowed but not required during the line blanking periods.

Figure 8-9 shows the timing diagram of the SYNC move clock gating.

Figure 8-9. ISS Interfaces CPI SYNC Mode Clock Gating



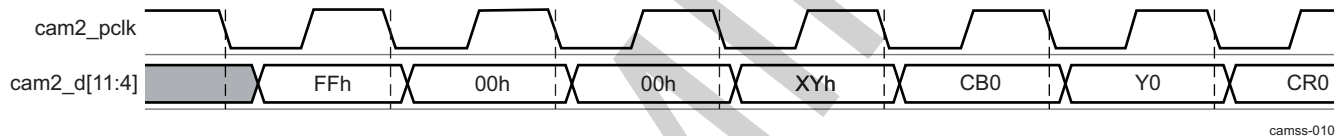
camss-009

8.2.2.3.2 ISS Interfaces CPI ITU-R BT.656/1120 422 Protocol and Data Formats (8, 10 Bits)

The ISS CPI supports data in ITU-R BT.656 format. The ITU-R BT.656 standard specifies a method of transferring YUV4:2:2 data over an 8- or 10-bit video interface.

Figure 8-10 shows the data timing diagram with embedded synchronization signals.

Figure 8-10. ISS Interfaces CPI Data Timing With Embedded Synchronization Signals (8-Bit Case)



camss-010

In BT.656, the data words (8- or 10-bit) in which the 8 most-significant bits (MSBs) are all set to 1, or all set to 0, are reserved.

NOTE: The ITU-R BT.656 specification is for 525-line and 625-line, digital component video signals in compliance with ITU-R BT.601. See the CCIR document Rec. 656-1 for detailed information about the interface.

The data is multiplexed in the following order: Cb0 Y0 Cr0 Y1 Cb2 Y2 Cr2 Y3, etc., where the byte sequence Cb2n Y2n Cr2n refers to interleaved Luminance and Chroma samples and the following byte Y2n + 1 corresponds to the next Luminance sample.

The BT.656 protocol uses unique timing reference signals embedded in the video stream. The synchronization signals cam2_hs and cam2_vs are not needed. This reduces the number of wires required for a BT.656 video interface.

There are two timing reference codes: The start of active video (SAV) reference code precedes each video data block, and the end of active video (EAV) follows each video data block. Each timing reference signal consists of a 4-byte sequence in the following hexadecimal format: FF 00 00 XY. The first 3 bytes are a fixed preamble (see the ITU-R BT.656 specification). The fourth byte (XY) contains information defining field identification (F), blanking (V), and SAV/EAV information (H), and 4 parity bits calculated as a function of F, V, and H (see the ITU-R BT.656 specification).

Table 8-39 lists the video timing reference codes for SAV and EAV.

Table 8-39. ISS Interfaces CPI Video Timing Reference Codes for SAV and EAV

| Data Bit Number | First Word (FF) | Second Word (00) | Third Word (00) | Fourth Word (XY) |
|-----------------|-----------------|------------------|-----------------|------------------|
| 9 (MSB) | 1 | 0 | 0 | 1 |
| 8 | 1 | 0 | 0 | F |
| 7 | 1 | 0 | 0 | V |
| 6 | 1 | 0 | 0 | H |

Table 8-39. ISS Interfaces CPI Video Timing Reference Codes for SAV and EAV (continued)

| Data Bit Number | First Word (FF) | Second Word (00) | Third Word (00) | Fourth Word (XY) |
|-----------------|-----------------|------------------|-----------------|------------------|
| 5 | 1 | 0 | 0 | P3 |
| 4 | 1 | 0 | 0 | P2 |
| 3 | 1 | 0 | 0 | P1 |
| 2 | 1 | 0 | 0 | P0 |
| 1 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 |

Table 8-40 describes the F, V, and H signals.

Table 8-40. ISS Interfaces CPI F, V, H Signal Descriptions

| Signal | Value | Command |
|--------|-------|----------------|
| F | 0 | Field 1 |
| | 1 | Field 2 |
| V | 0 | 0 |
| | 1 | Vertical blank |
| H | 0 | SAV |
| | 1 | EAV |

The resulting Hamming distance between any two code words is four, allowing two error detections and one error correction. To enable or disable the error-correcting capability, configure the ISIF_REC656IF[0] ECCFVH bit.

NOTE: The 2-bit errors are detected, but not flagged or corrected. Errors of more than 2 bits are not corrected or flagged.

Table 8-41 lists the F, V, and H protection (error-correction) bits.

Table 8-41. ISS Interfaces CPI F, V, H Protection (Error-Correction) Bits

| F | V | H | P3 | P2 | P1 | P0 |
|---|---|---|----|----|----|----|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 | 1 |

When operating in ITU-R BT.656 mode, data is stored in SDRAM according to the format listed in Table 8-42 when the ISIF_REC656IF[1] R656ON bit is enabled.

Table 8-42. ISS Interfaces CPI ITU-R BT.656 Mode Data Format in SDRAM

| b31 | | | | | b0 |
|-----|-------------|--------------|-------------|--------------|----|
| | Pixel3 (Y1) | Pixel2 (Cr0) | Pixel1 (Y0) | Pixel0 (Cb0) | |

8.2.3 ISS CSI2 PHY

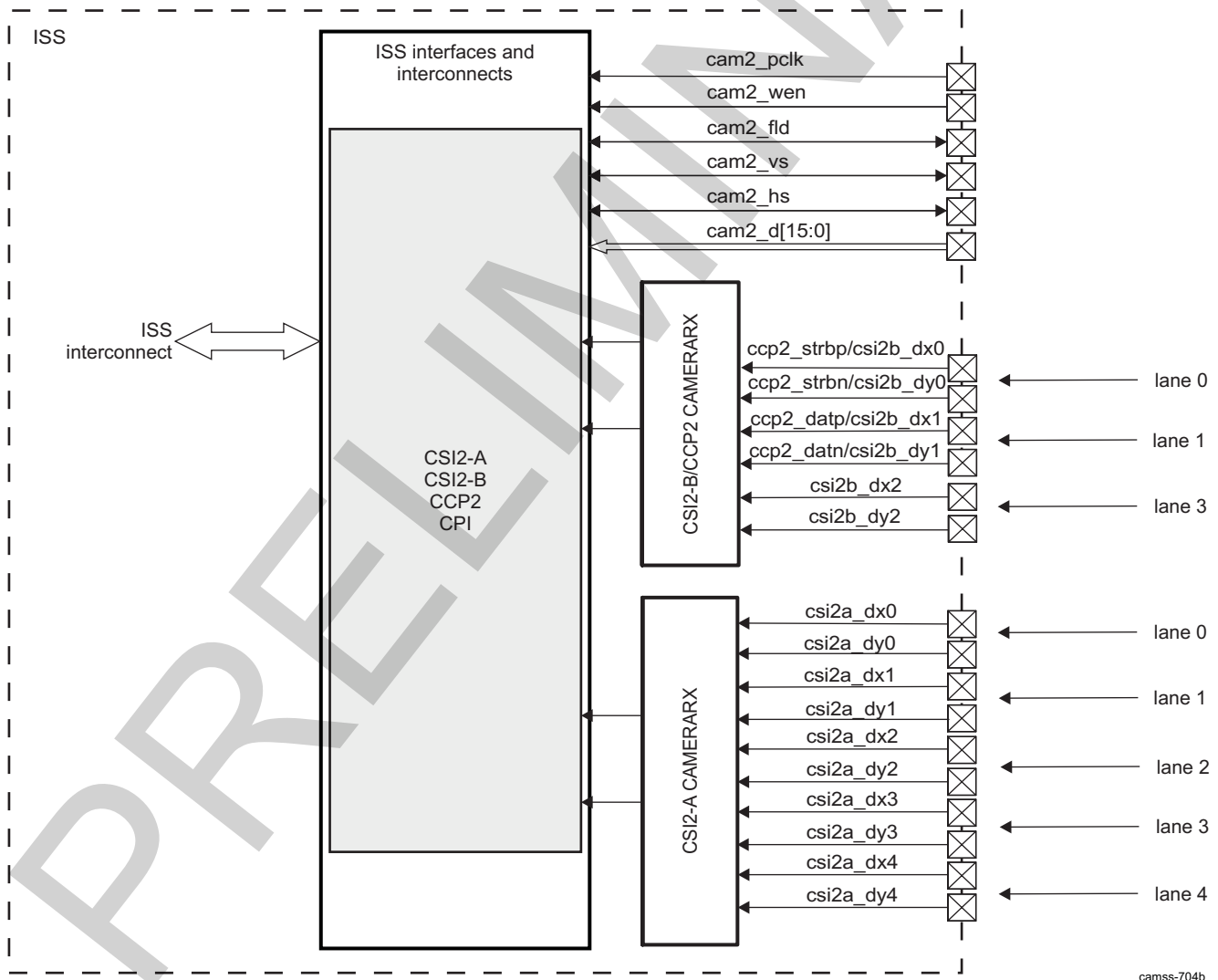
8.2.3.1 ISS CSI2 PHY Overview

Two MIPI D-PHY-compliant CAMERARX PHY receivers immediately before the ISS interfaces act as a physical connection and configuration of clock/data lanes with external sensors. CAMERARX PHY supports up to four configurations, depending on the required number of D-PHY data lane external sensors. The receivers are compatible with the *MIPI D-PHY Specification v0.92*. The selection of CAMERARX in D-PHY mode, parallel mode, or CCP2 mode must be done before reset and not on the fly.

The PHY is controlled and must be configured first from the control module for pad configuration. The differential data/clock lanes coming into the CSI2-A and CSI2-B CAMERARX are configured from registers explained in [Section 19.4.8.4](#) (see register CONTROL_CAMERA_RX).

As mentioned previously, two PHYs are integrated in the device. The CSI2-A CAMERARX contains four data lanes, as shown in [Figure 8-11](#); CSI2-B is the same except that it has two data lanes plus a clock/strobe lane. The figure also shows case CSI2-A, with four data lanes and one clock, listed in [Table 8-38](#).

Figure 8-11. ISS Interfaces CSI2-A PHY Diagram Four D-PHY Data Lane Configuration



NOTE: If CCP2 mode is chosen for use in the CSI2-B/CCP2 CAMERARX, then LANE 0 and LANE 1 are used only as datp/datn and strbp/strbn.

NOTE: LANE 4 can be used only as a data lane, never as a clock lane. All other configurations are possible. Also, a speed restriction is present when lane 4 is used; then all data lanes perform at up to 824 Mbps instead of 1000 Mbps.

NOTE: Depending on the selected mux mode from the Control Module, the Parallel interface (CPI) signals can also be going through one of the CAMERARXs

CSI2-A and CSI2-B/CCP2 CAMERARX represent the overall PHY solution for connecting external sensors to feed the ISS. The MIPI D-PHY function can support up to four data lane modules and one clock lane module. Reverse direction escape mode is not supported. The lane module polarity and positions are configurable; that is, any lane module can be chosen as the clock lane module, and the DX/DY data pad for each lane module can be configured as DP or DN pins defined. The configuration and the selection of D-PHY mode, data/clock, or data/strobes are done through the control module (see [Chapter 19, Control Module](#)). The only exception is the four-data-lane use case, in which one corner lane is allowed to be only a data lane. For the CCP2 function, the CAMERARX PHY solution supports one data/strobe or data/clock lane module. The data lane module and strobe lane module must be physically adjacent. CAMERARX supports serial configuration protocol for the configuration interface.

8.2.3.2 ISS CSI2 PHY Functional Description

8.2.3.2.1 ISS CSI2 PHY Functional Configuration

The CSI2 PHY converts the bitstream, divided into 1 to 4 serial data lanes, into a bitstream compatible with the CSI2 receiver and one clock lane.

The [CSI2_COMPLEXIO_IRQSTATUS](#) register logs complex I/O events of the following types:

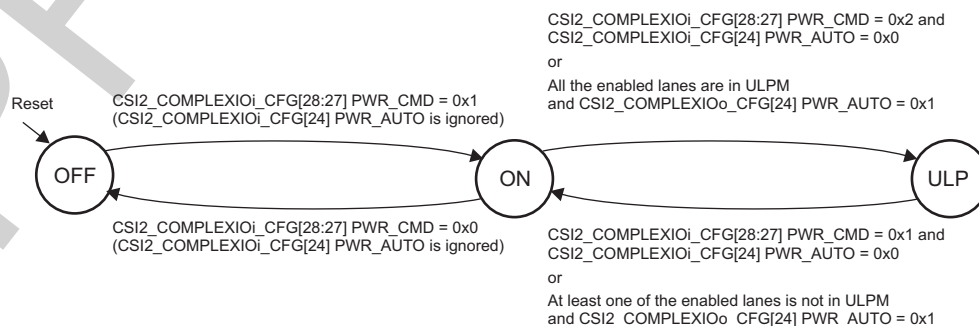
- Line power-state change (all lanes in ultralow-power mode [ULPM], at least one lane exits ULPM, etc.)
- Error on one lane

The CSI2 receiver embeds two registers to configure/read some complex I/O parameters:

- The [REGISTER0](#) register detects clock miss with respect to the *MIPI D-PHY Specification v0.92* and control timing.
- The [REGISTER1](#) register reports completion of reset on the different parts of the module and configures the timing parameters.
- The [CSI2_COMPLEXIO_CFG](#) registers contain the PWR_AUTO and PWR_CMD bit fields, which affect the power management of the two complex I/Os.

The complex I/O has three power modes: on, off, and ultralow power (ULP). These modes can reflect the ON or ULP states of the five differential lines if the [CSI2_COMPLEXIO_CFG\[24\]](#) PWR_AUTO bit is set to 1. If the PWR_AUTO bit is at reset value (0), the complex I/O power state is controlled by the [CSI2_COMPLEXIO_CFG\[28:27\]](#) PWR_CMD bit field, which directly defines the power state. [Figure 8-12](#) shows the complex I/O power finite state-machine (FSM).

Figure 8-12. ISS CSI2 Complex I/O Power FSM



camss-253

Another register, [CSI2_TIMING](#), is used to control the power state of the complex I/O modules with regard to the differential line state. This register controls the mode of the two complex I/Os (RxMode and NoRxMode) and the delay between the differential lanes in STOP state and the complex I/O on NoRxMode. The [CSI2_TIMING\[15\] FORCE_RX_MODE_IO1](#) bit sets the complex I/O in RxMode or NoRxMode (stopped mode). The [FORCE_RX_MODE_IO](#) bit is automatically reset to 0 by hardware when the counter ends and the FSM returns to NoRxMode. Three bits ([CSI2_TIMING\[14\] STOP_STATE_X16_IO1](#), [CSI2_TIMING\[13\] STOP_STATE_X4_IO1](#), and the [CSI2_TIMING\[12:0\] STOP_STATE_COUNTER_IO1](#) bit field) configure the delay between line stop mode and complex I/O stop mode. The delay represents the number of functional clock (ISS_FCLK) cycles and can be calculated as follows:

Total delay in ISS_FCLK cycle = [CSI2_TIMING.STOP_STATE_COUNTER_IO](#) x (1+[CSI2_TIMING.STOP_STATE_X16_IO](#) x 15) x (1+[CSI2_TIMING.STOP_STATE_X4_IO](#) x 3).

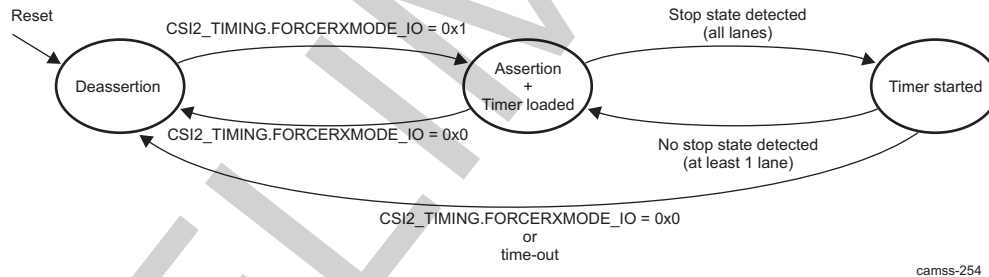
[Table 8-43](#) lists the possible values of the delay, in terms of the ISS_FCLK cycles, depending on the values of the [STOP_STATE_X16_IO](#) and [STOP_STATE_X4_IO](#) bits.

Table 8-43. ISS CSI2 Possible Time-Out Value for RxMode Counter

| STOP_STATE_X16_IO | STOP_STATE_X4_IO | Possible Delay Value (in Functional Clock Cycles) |
|-------------------|------------------|---|
| 0x0 | 0x0 | 8191 (with step of 1) |
| 0x0 | 0x1 | 32764 (with step of 4) |
| 0x1 | 0x0 | 131056 (with step of 16) |
| 0x1 | 0x1 | 524224 (with step of 64) |

The FORCERXMODE signal is used at initialization time (complex I/O). [Figure 8-13](#) describes the ForceRxMode and StopState FSM to assert and deassert the FORCERXMODE signal and to monitor STOPSTATE from the complex I/O.

Figure 8-13. ISS CSI2 RxMode and StopState FSM



8.2.3.2.2 ISS CSI2 PHY and Link Initialization Sequence

The MIPI D-PHY initialization sequence is not implemented within CAMERARX. The CSI2-A receiver is expected to coordinate the PHY initialization. The controller must ensure that the PHY is held in RESET/WAIT for RX mode until the D-PHY transmitter is powered up and the link comes to the defined state. The controller can use the STOPSTATE and FORCERXMODE signals of CAMERARX for this purpose. STOPSTATE indicates the line states, while FORCERXMODE forces the receiver state-machine into "wait for stop state." One possible initialization sequence is:

To fully initialize the CSIPHY, perform the following steps:

1. Configure all CSI2 receiver registers to be ready to receive signals/data from the CSIPHY:
 - (a) Configure all needed CSI2 registers:
 - (i) Set [CSI2_COMPLEXIO_CFG\[18:16\] DATA4_POSITION](#).
 - (ii) Set [CSI2_COMPLEXIO_CFG\[14:12\] DATA3_POSITION](#).
 - (iii) Set [CSI2_COMPLEXIO_CFG\[10:8\] DATA2_POSITION](#).
 - (iv) Set [CSI2_COMPLEXIO_CFG\[6:4\] DATA1_POSITION](#).
 - (v) Set [CSI2_COMPLEXIO_CFG\[2:0\] CLOCK_POSITION](#).

- (vi) Set the CONTROL_CAMERA_RX[20:19] CAMERARX_CSI22_CAMMODE or CONTROL_CAMERA_RX[17:16] CAMERARX_CSI21_CAMMODE.

CAUTION

This must be done before the CSIPHY is active.

2. CSIPHY and link initialization sequence:

- (a) Deassert the CSIPHY reset.

- (i) Set [CSI2_COMPLEXIO_CFG](#)[30] RESET_CTRL to 0x1.

CAUTION

For the [CSI2_COMPLEXIO_CFG](#)[29] RESET_DONE bit to be set to 0x1 (reset completed), the external sensor must to be active and sending the MIPI HS BYTECLK.

The following registers can be set only after deasserting the CSIPHY reset and before asserting the FORCERXMODE signal:

- [REGISTER0](#)
- [REGISTER1](#)
- [REGISTER2](#)

- (b) Assert the FORCERXMODE signal:

- (i) Set [CSI2_TIMING](#)[15] FORCE_RX_MODE_IO1 to 0x1.

- (c) Connect pulldown on link (DP/DN) by asserting the respective PIPD* signals (PIPD* = 0):

For CSI2-A CAMERARX pulldown on signals through padconf registers:

- csi21_dx4:
 - CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4[8] CSI21_DX4_INPUTENABLE = 0x1
 - CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4[4] CSI21_DX4_PULLTYPESELECT = 0x0
 - CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4[3] CSI21_DX4_PULLUDENABLE = 0x1
- csi21_dy4:
 - CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4[24] CSI21_DY4_INPUTENABLE = 0x1
 - CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4[20] CSI21_DY4_PULLTYPESELECT = 0x0
 - CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4[19] CSI21_DY4_PULLUDENABLE = 0x1
- csi21_dx3:
 - CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3[8] CSI21_DX3_INPUTENABLE = 0x1
 - CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3[4] CSI21_DX3_PULLTYPESELECT = 0x0
 - CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3[3] CSI21_DX3_PULLUDENABLE = 0x1
- csi21_dy3:
 - CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3[24] CSI21_DY3_INPUTENABLE = 0x1

- CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3[20]
CSI21_DY3_PULLTYPESELECT= 0x0
- CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3[19]
CSI21_DY3_PULLUDENABLE = 0x1
- csi21_dx2:
 - CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2[8] CSI21_DX2_INPUTENABLE
= 0x1
 - CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2[4]
CSI21_DX2_PULLTYPESELECT= 0x0
 - CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2[3]
CSI21_DX2_PULLUDENABLE = 0x1
- csi21_dy2:
 - CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2[24] CSI21_DY2_INPUTENABLE
= 0x1
 - CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2[20]
CSI21_DY2_PULLTYPESELECT= 0x0
 - CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY3[19]
CSI21_DY2_PULLUDENABLE = 0x1
- csi21_dx1:
 - CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1[8] CSI21_DX1_INPUTENABLE
= 0x1
 - CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1[4]
CSI21_DX1_PULLTYPESELECT= 0x0
 - CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1[3]
CSI21_DX1_PULLUDENABLE = 0x1
- csi21_dy1:
 - CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1[24] CSI21_DY1_INPUTENABLE
= 0x1
 - CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1[20]
CSI21_DY1_PULLTYPESELECT= 0x0
 - CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1[19]
CSI21_DY1_PULLUDENABLE = 0x1
- csi21_dx0:
 - CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0[8] CSI21_DX0_INPUTENABLE
= 0x1
 - CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0[4]
CSI21_DX0_PULLTYPESELECT= 0x0
 - CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0[3]
CSI21_DX0_PULLUDENABLE = 0x1
- csi21_dy0:
 - CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0[24] CSI21_DY0_INPUTENABLE
= 0x1
 - CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0[20]
CSI21_DY0_PULLTYPESELECT= 0x0
 - CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0[19]
CSI21_DY0_PULLUDENABLE = 0x1

For CSI2-B/CCP2 CAMERARX pulldown on signals through padconf registers:

- csi22_dx2:
 - CONTROL_CORE_PAD0_DPM_EMU19_PAD1_CSI22_DX2[24]
CSI22_DX1_INPUTENABLE = 0x1
 - CONTROL_CORE_PAD0_DPM_EMU19_PAD1_CSI22_DX2[20]

- CSI22_DX1_PULLTYPESELECT = 0x0
- CONTROL_CORE_PAD0_DPM_EMU19_PAD1_CSI22_DX2[19]
CSI22_DX1_PULLUDENABLE = 0x1
- csi22_dy2:
 - CONTROL_CORE_PAD0_CSI22_DY2[8] CSI22_DY1_INPUTENABLE = 0x1
 - CONTROL_CORE_PAD0_CSI22_DY2[4] CSI22_DY1_PULLTYPESELECT = 0x0
 - CONTROL_CORE_PAD0_CSI22_DY2[3] CSI22_DY1_PULLUDENABLE = 0x1
- csi22_dx1:
 - CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1[8] CSI22_DX1_INPUTENABLE = 0x1
 - CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1[4]
CSI22_DX1_PULLTYPESELECT = 0x0
 - CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1[3]
CSI22_DX1_PULLUDENABLE = 0x1
- csi22_dy1:
 - CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1[24] CSI22_DY1_INPUTENABLE = 0x1
 - CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1[20]
CSI22_DY1_PULLTYPESELECT = 0x0
 - CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1[19]
CSI22_DY1_PULLUDENABLE = 0x1
- csi22_dx0:
 - CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0[8] CSI22_DX0_INPUTENABLE = 0x1
 - CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0[4]
CSI22_DX0_PULLTYPESELECT = 0x0
 - CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0[3]
CSI22_DX0_PULLUDENABLE = 0x1
- csi22_dy0:
 - CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0[24] CSI22_DY0_INPUTENABLE = 0x1
 - CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0[20]
CSI22_DY0_PULLTYPESELECT = 0x0
 - CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0[19]
CSI22_DY0_PULLUDENABLE = 0x1
- (d) Power up the CSIPHY:
 - (i) Set [CSI2_COMPLEXIO_CFG](#)[28:27] PWR_CMD to 0x1.
- (e) Check whether the state status reaches the ON state:
 - [CSI2_COMPLEXIO_CFG](#)[26:25] PWR_STATUS = 0x1
- (f) Wait for STOPSTATE = 1 (for all enabled lane modules):
 - (i) The timer is set through the [CSI2_TIMING](#)[14:0] bit field. The reset value can be kept.
 - (ii) Wait until [CSI2_TIMING](#)[15] FORCE_RX_MODE_IO1 = 0x0. It is automatically put at 0 when all enabled lanes are in STOPSTATE and the timer is finished.
- (g) Release PIPD* (= 1).
For CSI2-A CAMERARX pullup on signals through padconf registers:
 - csi21_dx4:
 - CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4[4]
CSI21_DX4_PULLTYPESELECT = 0x1
 - csi21_dy4:

- CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4[20]
CSI21_DY4_PULLTYPESELECT = 0x1
- csi21_dx3:
 - CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3[4]
CSI21_DX3_PULLTYPESELECT = 0x1
- csi21_dy3:
 - CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3[20]
CSI21_DY3_PULLTYPESELECT = 0x1
- csi21_dx2:
 - CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2[4]
CSI21_DX2_PULLTYPESELECT = 0x1
- csi21_dy2:
 - CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2[20]
CSI21_DY2_PULLTYPESELECT = 0x1
- csi21_dx1:
 - CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1[4]
CSI21_DX1_PULLTYPESELECT = 0x1
- csi21_dy1:
 - CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1[20]
CSI21_DY1_PULLTYPESELECT = 0x1
- csi21_dx0:
 - CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0[4]
CSI21_DX0_PULLTYPESELECT = 0x1
- csi21_dy0:
 - CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0[20]
CSI21_DY0_PULLTYPESELECT = 0x1

3. The CSIPHY is initialized and ready/active in CSI2 mode.

8.2.3.2.3 ISS CCP2 and Link Initialization Sequence

The CSI2-B interface is expected to coordinate the PHY initialization. The controller must ensure that the PHY is held in RESET state until the CCP transmitter is powered up and the link comes to the defined state. The controller can use the FORCERXMODE signals of CAMERARX for this purpose. FORCERXMODE forces the receiver state-machine into RESET state, while the rest of common logic is powered up and functional. One possible initialization sequence is:

To fully initialize the CSIPHY, perform the following steps:

1. Configure all CSI2-B receiver registers to be ready to receive signals/data from the CSIPHY:
 - (a) Configure all CCP2 registers:
 - (i) Set [CSI2_COMPLEXIO_CFG\[2:0\]](#) CLOCK_POSITION.
 - (ii) Set [CSI2_COMPLEXIO_CFG\[6:4\]](#) DATA1_POSITION.
 - (b) Set CONTROL_CAMERA_RX[20:19] CAMERARX_CSI22_CAMMODE

CAUTION

This must be done before the CSIPHY is active.

2. CSIPHY and link initialization sequence:
 - (a) Deassert the CSIPHY reset:
 - (i) Set [CSI2_COMPLEXIO_CFG\[30\]](#) RESET_CTRL to 0x1.
 - (b) Assert the FORCERXMODE signal:

- (i) Set [CSI2_TIMING](#)[15] FORCE_RX_MODE_IO1 to 0x1.
 - (c) Power up the CSIPHY:
 - (i) Set [CSI2_COMPLEXIO_CFG](#)[28:27] PWR_CMD to 0x1.
 - (d) Check that the state status reaches the ON state:
 - [CSI2_COMPLEXIO_CFG](#)[26:25] PWR_STATUS = 0x1
 - (e) Release the FORCERXMODE signal:
 - (i) Set [CSI2_TIMING](#)[15] FORCE_RX_MODE_IO1 to 0x0.
3. The CSIPHY is initialized and ready/active in CSI1/CCP2B mode.

8.2.3.2.4 ISS CSI PHY Error Signals

In D-PHY mode, the CSIPHY supports the following error detection and signaling to the associated receiver:

- ERRSOTHS: Flags 1-bit errors in the HS start of transmission synchronization pattern. In this error scenario, the CSIPHY continues to receive the data and pass it to the receiver, but confidence in the data may be low, because of the 1-bit error seen in sync. This signal, if asserted, is high for one cycle of RXBYTECLKHS.
- ERRSOTSYNCHS: Flags multiple bit errors in the HS start of transmission synchronization pattern. In this case, the CSIPHY cannot achieve proper synchronization and does not pass the received data to the receiver. This signal, if asserted, is high for one cycle of RXBYTECLKHS.
- ERRCONTROL: Flags the control sequence error; that is, when the LP sequence observed on line is not recognized as a valid control sequence. This signal, if asserted, is high until the next change in the state of the LP line.
- ERRESC: Flags the escape entry error; that is, when the escape entry sequence is unrecognized. This signal, if asserted, is high until the next change in the state of the LP line.
- ERRSYNCESC: Flags the low-power data transmission synchronization error. This error is flagged if the number of bits received during a low-power data transmission is not a multiple of 8 bits. This signal, if asserted, is high until the next change in the state of the LP line. In case the number of received bits is 1 less than a multiple of 8, RXVALIDESC is also asserted together with ERRSYNCESC, and an erroneous data byte is output on RXDATAESC. In other cases of this error, RXVALIDESC is not asserted and an erroneous data byte is not sent out.

In CCP2 mode, the CSIPHY supports the following error detection and signaling to the associated receiver:

- CCPERRRESYNC output is an error indicator to the receiver to flag the shifted synchronization error, if the new synchronization sequence is not aligned with a 32-bit word boundary compared to the previously received synchronization sequence. This error flag is asserted for 32 cycles (4 bytes/32 bits).

8.2.3.3 ISS CSI2 PHY Register Manual

8.2.3.3.1 ISS CSI2 PHY Instance Summary

[Table 8-44](#) lists the ISS CSI2 PHY instance.

Table 8-44. ISS CSI2 PHY Instance Summary

| Module Name | L3 Base Address | Size |
|------------------------------------|-----------------|----------|
| ISS_CAMERARX_CORE1 | 0x5200 1170 | 32 bytes |
| ISS_CAMERARX_CORE2 | 0x5200 1570 | 32 bytes |

NOTE: ISS_CAMERARX_CORE1 is for CSI2-A CAMERARX.

ISS_CAMERARX_CORE2 is for CSI2-B/CCP2 CAMERARX.

8.2.3.3.2 ISS CSI2 PHY Registers

8.2.3.3.2.1 ISS CSI2 PHY Register Summary

Table 8-45 summarizes the ISS CSI2 register mapping.

Table 8-45. ISS CSI2 PHY Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_CAMERARX_CORE1 Base Address | ISS_CAMERARX_CORE2 Base Address |
|---------------|------|-----------------------|----------------|---------------------------------|---------------------------------|
| REGISTER0 | RW | 32 | 0x0000 0000 | 0x5200 1170 | 0x5200 1570 |
| REGISTER1 | RW | 32 | 0x0000 0004 | 0x5200 1174 | 0x5200 1574 |
| REGISTER2 | RW | 32 | 0x0000 0008 | 0x5200 1178 | 0x5200 1578 |

8.2.3.3.2.2 ISS CSI2 PHY Register Description

through describe the ISS CSI2 PHY register bits.

Table 8-46. REGISTER0

| | |
|------------------|----------------------------|
| Address Offset | 0x0000 0000 |
| Physical Address | 0x5200 1170 0x5200 1570 |
| Description | First register |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|---------------|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | HSCLOCKCONFIG | RESERVED | | | | | | | | THS_TERM | | | | | | | | THS_SETTLE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|-------|
| 31:25 | RESERVED | Reserved fields | NA | 0x00 |
| 24 | HSCLOCKCONFIG | Disable clock missing detector | RW | 0 |
| 23:16 | RESERVED | Read returns zero | R | 0x00 |
| 15:8 | THS_TERM | THS_TERM timing parameter in multiples of DDR clock Effective time for enabling of termination = synchronizer delay + timer delay + LPRX delay + combinational routing delay ~ (1–2)* DDRCLK + THS-TERM + ~ (1 –15) ns Programmed value = ceil(12.5 / DDR clock period) –1 | RW | 0x04 |
| 7:0 | THS_SETTLE | THS_SETTLE timing parameter in multiples of DDR clock frequency Effective THS_SETTLE seen on line (starting to look for sync pattern) = synchronizer delay + timer delay + LPRX delay + combinational routing delay – pipeline delay in HS data path. ~ (1–2)* DDRCLK + THS-SETTLE + ~ (1–15) ns –1*DDRCLK Programmed value = ceil(90 ns / DDR clock period) + 3 | RW | 0x27 |

Table 8-47. Register Call Summary for Register REGISTER0

ISS Interfaces

- [ISS CSI2 PHY Functional Configuration: \[0\]](#)
- [ISS CSI2 PHY and Link Initialization Sequence: \[1\]](#)
- [ISS CSI2 PHY Register Summary: \[2\]](#)

Table 8-48. REGISTER1

| | |
|-------------------------|--|
| Address Offset | 0x0000 0004 |
| Physical Address | 0x5200 1174 0x5200 1574 |
| Description | Second register |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------|----|-------------------|----|----------|----|----------------------------|-----------|----|----|----|----|----|----|----|----------------------|----|----|----|----|----|----|---|--------------------|-------------|---|---|---|---|---|---|---|
| RESVD_READ_BIT | | RESET_DONE_STATUS | | RESERVED | | CLOCK_MISS_DETECTOR_STATUS | TCLK_TERM | | | | | | | | DPHY_HS_SYNC_PATTERN | | | | | | | | CTRLCLK_DIV_FACTOR | TCLK_SETTLE | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|--|------|-------|
| 31:30 | RESVD_READ_BIT | Reserved bit | NA | 0x0 |
| 29:28 | RESET_DONE_STATUS | Reset done read bits. 28: RESETDONERXBYTECLK Note: BYTECLK is provided to the ISS CSI2-A, CSI2-B, and CCP2 interfaces 29: RESETDONECTRLCLK Note: This is the CAM_PHY_CTRL_FCLK provided to the PHY from the PRCM module. | R | 0x0 |
| 27:26 | RESERVED | Write 0 for future compatibility. | RW | 0x0 |
| 25 | CLOCK_MISS_DETECTOR_STATUS | 1: Error in clock missing detector. 0: Clock missing detector successful | R | 0 |
| 24:18 | TCLK_TERM | TCLK_TERM timing parameter in multiples of CTRLCLK Effective time for enabling of termination = synchronizer delay + timer delay + LPRX delay + combinational routing delay ~ (1–2)* CTRLCLK + TCLK_TERM + ~ (1–15) ns Programmed value = ceil(9.5 / CTRLCLK period) – 1 | RW | 0x00 |
| 17:10 | DPHY_HS_SYNC_PATTERN | DPHY mode HS sync pattern in byte order (reverse of received order) See Section 8.2.3.2.4, ISS CSI PHY Error Signals . | RW | 0xB8 |
| 9:8 | CTRLCLK_DIV_FACTOR | Divide factor for CTRLCLK for CLKMISS detector | RW | 0x1 |
| 7:0 | TCLK_SETTLE | TCLK_SETTLE timing parameter in multiples of CTRLCLK Clock Effective TCLK_SETTLE = synchronizer delay + timer delay + LPRX delay + combinational routing delay ~ (1–2)* CTRLCLK + Tclk-settle + ~ (1 –15) ns Programmed value = max[3, ceil(155 ns/CTRLCLK period) – 1] | RW | 0x0E |

Table 8-49. Register Call Summary for Register REGISTER1

ISS Interfaces

- [ISS CSI2 PHY Functional Configuration: \[0\]](#)
- [ISS CSI2 PHY and Link Initialization Sequence: \[1\]](#)
- [ISS CSI2 PHY Register Summary: \[2\]](#)

Table 8-50. REGISTER2

| | |
|------------------|----------------------------|
| Address Offset | 0x0000 0008 |
| Physical Address | 0x5200 1178 0x5200 1578 |
| Description | Third register |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|------------------------|----|----|----|------------------------|----|----|----|------------------------|----|----|----|-------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TRIGGER_CMD_RXTRIGESC0 | | | | TRIGGER_CMD_RXTRIGESC1 | | | | TRIGGER_CMD_RXTRIGESC2 | | | | TRIGGER_CMD_RXTRIGESC3 | | | | CCP2_SYNC_PATTERN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|--|------|----------|
| 31:30 | TRIGGER_CMD_RXTRIGESC0 | Mapping of Trigger escape entry command to PPI output RXTRIGGERESC0 | RW | 0x0 |
| 29:28 | TRIGGER_CMD_RXTRIGESC1 | Mapping of Trigger escape entry command to PPI output RXTRIGGERESC1 | RW | 0x0 |
| 27:26 | TRIGGER_CMD_RXTRIGESC2 | Mapping of Trigger escape entry command to PPI output RXTRIGGERESC2 | RW | 0x0 |
| 25:24 | TRIGGER_CMD_RXTRIGESC3 | Mapping of Trigger escape entry command to PPI output RXTRIGGERESC3 | RW | 0x0 |
| 23:0 | CCP2_SYNC_PATTERN | CCP2 mode sync pattern in byte order See Section 8.2.3.2.4, ISS CSI PHY Error Signals . | R | 0x0000FF |

Table 8-51. Register Call Summary for Register REGISTER2

ISS Interfaces

- [ISS CSI2 PHY and Link Initialization Sequence: \[0\]](#)
- [ISS CSI2 PHY Register Summary: \[1\]](#)

8.2.4 ISS CCP2

8.2.4.1 ISS CCP2 Environment

8.2.4.1.1 ISS CCP2 Protocol and Data Formats

This section describes the CCP2 protocol and data formats. The CCP2 receiver is compatible with the *SMIA CCP2 Specification v1.0* and the *MIPI CSI1 Specification*. [Table 8-52](#) describes the I/O for serial interface CCP2.

Table 8-52. I/O Description for Serial Interface CCP2

| Signal Name | | I/O ⁽¹⁾ | Description |
|-------------|------------|--------------------|---|
| ccp2_datp | CAM_S_DATA | I | Serial data input. Configurable. |
| ccp2_datn | | | |
| ccp2_strbp | CAM_S_CLK | I | Serial clock or strobe input. Configurable. |
| ccp2_strbn | | | |

⁽¹⁾ I = Input; O = Output

From the device point of view, the CCP2 interface comprises four differential inputs representing two effective signals: the serial data and the clock.

The CCP2 receiver is a serial interface to an image sensor. Signals from the camera are serial input data (CAM_S_DATA) and a clock/strobe signal (CAM_S_CLK).

8.2.4.1.1.1 ISS CCP2 Synchronization Codes

Each frame is clearly identified by four unique 32-bit synchronization codes: frame start, frame end, line start, and line end, which are embedded in the serial bitstream. The logical channel identification number is also encoded in the synchronization codes.

- Frame-start code (FSC): Identifies the start of a new frame
- Line-start code (LSC): Identifies the start of a new line and is received for every line, except the first line, that starts with an FSC
- Line-end code (LEC): Identifies the end of a line and is received for every line, except the last line, that ends with an FEC
- Frame-end code (FEC): Identifies the end of the last line and the end of the current frame

8.2.4.1.1.2 ISS CCP2 False Synchronization Code Protection

CCP2 supports false synchronization protection (FSP). Additional bytes after the JPEG stream can be written to the SDRAM. They do not prevent JPEG encode and there is no need to preserve them.

8.2.4.1.1.3 ISS CCP2 Image Data Operating Modes and Alignment Constraints

The CCP2 receiver interface has several image data operating modes (see [Table 8-53](#)). The EXPx formats (where x = 8, 16, or 32) are used to expand data up to 8, 16, or 32 bits by padding data with zeros. The Data Size Increase in Memory column indicates memory overhead versus format without data expansion and/or DPCM compression.

Table 8-53. ISS CCP2 Image Data Operating Modes and Alignment Constraints

| CCP2_LCx_CT RL[7:2] Format | CCP2 Data Format | Bits per Pixel (bpp) (When sending data to memory, N/A when sending to VP) | Data Size Increase in Memory. (When negative, data compression present) | 2D Mode Availability ⁽¹⁾ | Comments |
|----------------------------------|---------------------------|--|---|--|----------|
| 0x0 | YUV4:2:2 big endian | 16 | 0% | Yes | |
| 0x1 | YUV4:2:2 little endian | 16 | 0% | Yes | |
| 0x2 | YUV4:2:0 | 12 | 0% | Yes | |
| 0x3 | YUV4:2:2 + VP | N/A, data are sent to VP, YUV4:2:2 + VP = RAW8 + VP | N/A | Yes | |
| 0x3 | RAW8 + VP | N/A, data are sent to VP, YUV4:2:2 + VP must be used to output RAW8 + VP to memory | N/A | Yes | |

⁽¹⁾ If 2D mode is available, there are no supplementary constraints on data width. 2D mode does not apply when sending to the video port (VP).

Table 8-53. ISS CCP2 Image Data Operating Modes and Alignment Constraints (continued)

| CCP2_LCx_CT RL[7:2] Format | CCP2 Data Format | Bits per Pixel (bpp) (When sending data to memory, N/A when sending to VP) | Data Size Increase in Memory. (When negative, data compression present) | 2D Mode Availability ⁽¹⁾ | Comments |
|---|--|---|--|--|-----------------------|
| 0x4 | RGB444 + EXP16 | 16 | 50% | Yes | |
| 0x5 | RGB565 | 16 | 0% | Yes | |
| 0x6 | RGB888 | 24 | 0% | Yes | |
| 0x7 | RGB888 + EXP32 | 32 | 33% | Yes | |
| 0x8 | RAW6 + EXP8 | 8 | 33% | Yes | |
| 0x9 | RAW6 + DPCM10 + EXP16 | 16 | 167% | Yes | DPCM decompression |
| 0xA | RAW6 + DPCM10 + VP | N/A, data are sent to VP | N/A | Yes | DPCM decompression |
| 0xB | RAW10 - RAW6 DPCM | 6 | 40% | Yes | DPCM compression |
| 0xC | RAW7 + EXP8 | 8 | 14% | Yes | |
| 0xD | RAW7 + DPCM10 + EXP16 | 16 | 128% | Yes | DPCM decompression |
| 0xE | RAW7 + DPCM10 + VP | N/A, data are sent to VP | N/A | Yes | DPCM decompression |
| 0xF | RAW10 - RAW6 DPCM + EXP8 | 8 | 25% | Yes | DPCM compression |
| 0x10 | RAW8, this mode can be used to output RAW6 and RAW7 | 8 | 0% | Yes | |
| 0x11 | RAW8 + DPCM10 + EXP16 | 16 | 100% | Yes | DPCM decompression |
| 0x12 | RAW8 + DPCM10 + VP | N/A, data are sent to VP | N/A | Yes | DPCM decompression |
| 0x13 | RAW10 - RAW7 DPCM | 7 | 30% | Yes | DPCM compression |
| 0x14 | RAW10 | 10 | 0% | Yes | |
| 0x15 | RAW10 + EXP16 | 16 | 60% | Yes | |
| 0x16 | RAW10 + VP | N/A, data are sent to VP | N/A | Yes | |
| 0x17 | RAW10 - RAW7 DPCM + EXP8 | 8 | 20% | Yes | |
| 0x18 | RAW12 | 12 | 0% | Yes | |
| 0x19 | RAW12 + EXP16 | 16 | 33% | Yes | |
| 0x1A | RAW12 + VP | N/A, data are sent to VP | N/A | Yes | |
| 0x1B | RAW10 - RAW8 DPCM | 8 | 20% | Yes | DPCM decompression |
| 0x1C | JPEG, 8-bit data | N/A | 0% | Yes | |
| 0x1D | JPEG, 8-bit data + FSP | N/A | 0% | Yes | |
| 0x1E | RAW10 - RAW8 DPCM | 8 | 20% | Yes | Data right shift |
| 0x1F | RAW8 DPCM12- RAW12 + VP | N/A, data are sent to VP | N/A | Yes | |
| 0x20 | RAW10 - RAW8 ALAW | 8 | 20% | Yes | |
| 0x21 | RAW8 DPCM10 - ALAW | 8 | 20% | Yes | |

NOTE:

- Padding data of a 32-bit pixel data stream is handled the same way regardless of the programmed format. Therefore, there is no increase or decrease in storage because it is not compressed or decompressed.
- EXP8 = Data expansion to 8 bits, padding with zeros
- EXP16 = Data expansion to 16 bits, padding with alpha or zeros
[CCP2_LCx_CTRL](#)[15:8] ALPHA can be used to set an alpha value.
 For RGB444 + EXP16:
 - data_out[31:28] = ALPHA [3:0]
 - data_out[15:12] = ALPHA [3:0]
- EXP32 = Data expansion to 32 bits, padding with alpha
[CCP2_LCx_CTRL](#)[15:8] ALPHA can be used to set an alpha value.
 For RGB888 + EXP32: data_out[31:24] = ALPHA [7:0]
- FSP = False synchronization code protection decoding. Applies only to JPEG8 data format.
- VP = Output to the video-preprocessing hardware is enabled. Programmers must ensure that only one logical channel is enabled to the video preprocessing hardware. The behavior of the hardware is unpredictable if several logical channels to the video preprocessing hardware are enabled simultaneously.
- DPCM10 = Data decompression to 10 bits. Applies only to RAW6, RAW7, and RAW8 data formats; disabled if [CCP2_CTRL](#)[4] MODE = 0.
- Padding is handled the same way regardless of the programmed format.

NOTE: Data written by CSI2 can be read back by the CCP2 read channel. Some constraints apply (see [Table 8-56](#)).

8.2.4.1.1.4 ISS CCP2 Pixel Data Format

This section summarizes how the CCP2 pixel data formats are transmitted over the serial interface and how the pixels are reconstructed, stored in memory, or passed to the video port.

The CCP2 receiver can cope with all data formats if the data line length sent through the CS1/CCP2 physical protocol is a multiple of 32 bits. This condition is required for the CCP2 receiver to work correctly.

However, some data formats impose stronger line-length constraints to finish pixel reconstruction correctly at the end of the lines. This is imposed by CCP2 protocol-specific requirements, and not the CCP2 receiver. If CCP2 protocol constraints are not respected:

- Only the pixels reconstructed last in every line are erroneous. The missing bits are replaced with zeros to perform pixel reconstruction.
- The FW_IRQ interrupt is triggered.

8.2.4.1.1.4.1 ISS CCP2 YUV Operating Modes

NOTE: Although there are different possibilities of endianness in the bitstream, the device as a whole typically works in little-endian format. Therefore, the use of little-endian format is recommended.

8.2.4.1.1.4.1.1 ISS CCP2 YUV4:2:2

The YUV4:2:2 data format can be stored to memory in little- or big-endian format. The line length sent through the CCP2 receiver protocol must be a multiple of 32 bits.

YUV4:2:2 data format can also be sent to the video port.

YUV4:2:2 + VP is used to output RAW8 data to the video port: YUV4:2:2 + VP is equivalent to RAW8 + VP. [Figure 8-14](#) and [Figure 8-15](#) show big-endian and little-endian YUV4:2:2 format, respectively. Set [CCP2_LCx_CTRL\[7:2\] FORMAT](#) to 0x0 to select YUV4:2:2 big-endian mode and to 0x1 for YUV4:2:2 little-endian mode.

Figure 8-14. ISS CCP2 YUV4:2:2 Big Endian

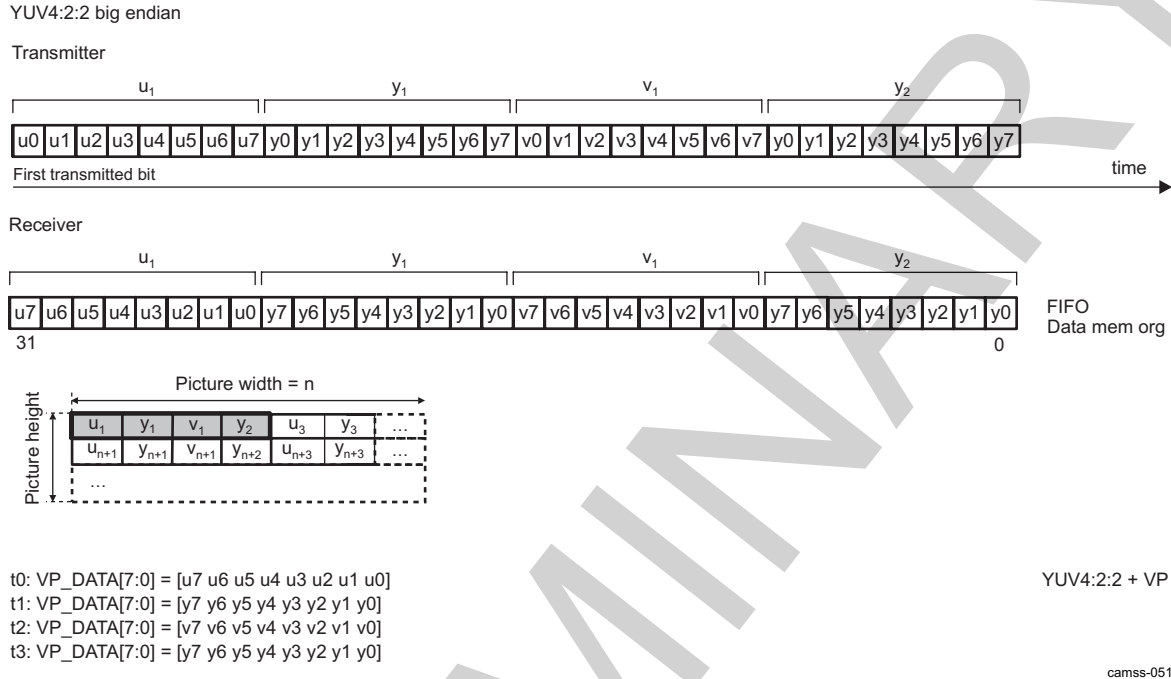
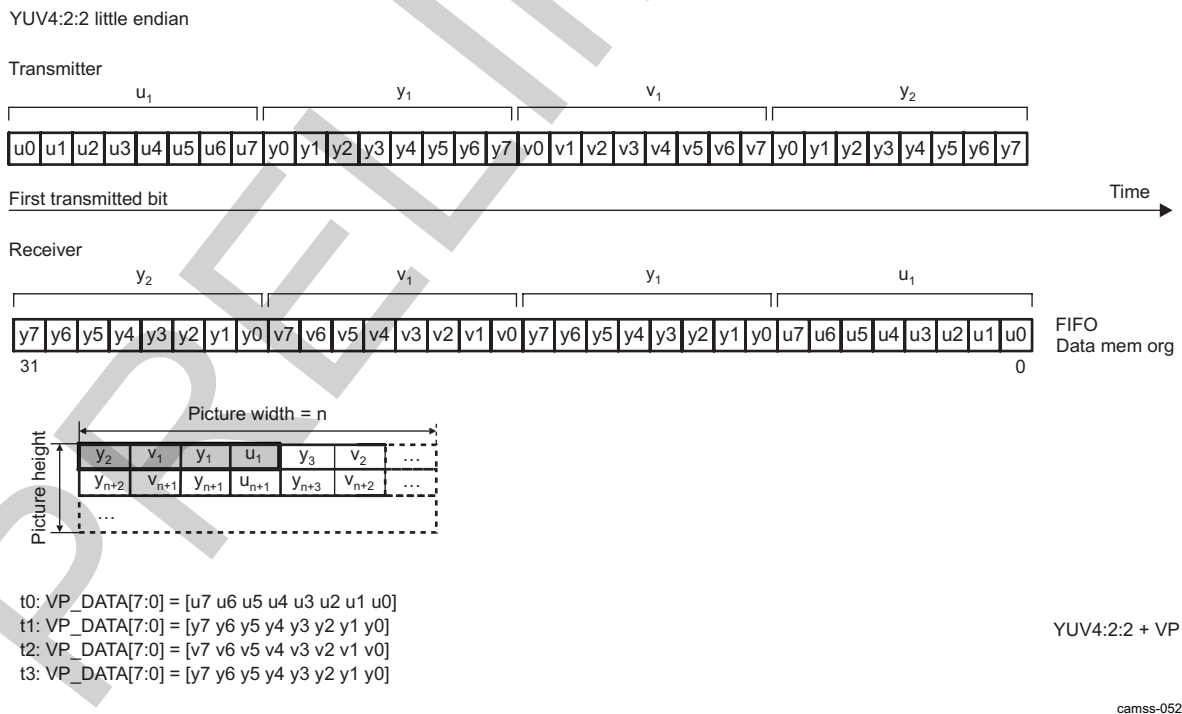


Figure 8-15. ISS CCP2 YUV4:2:2 Little Endian

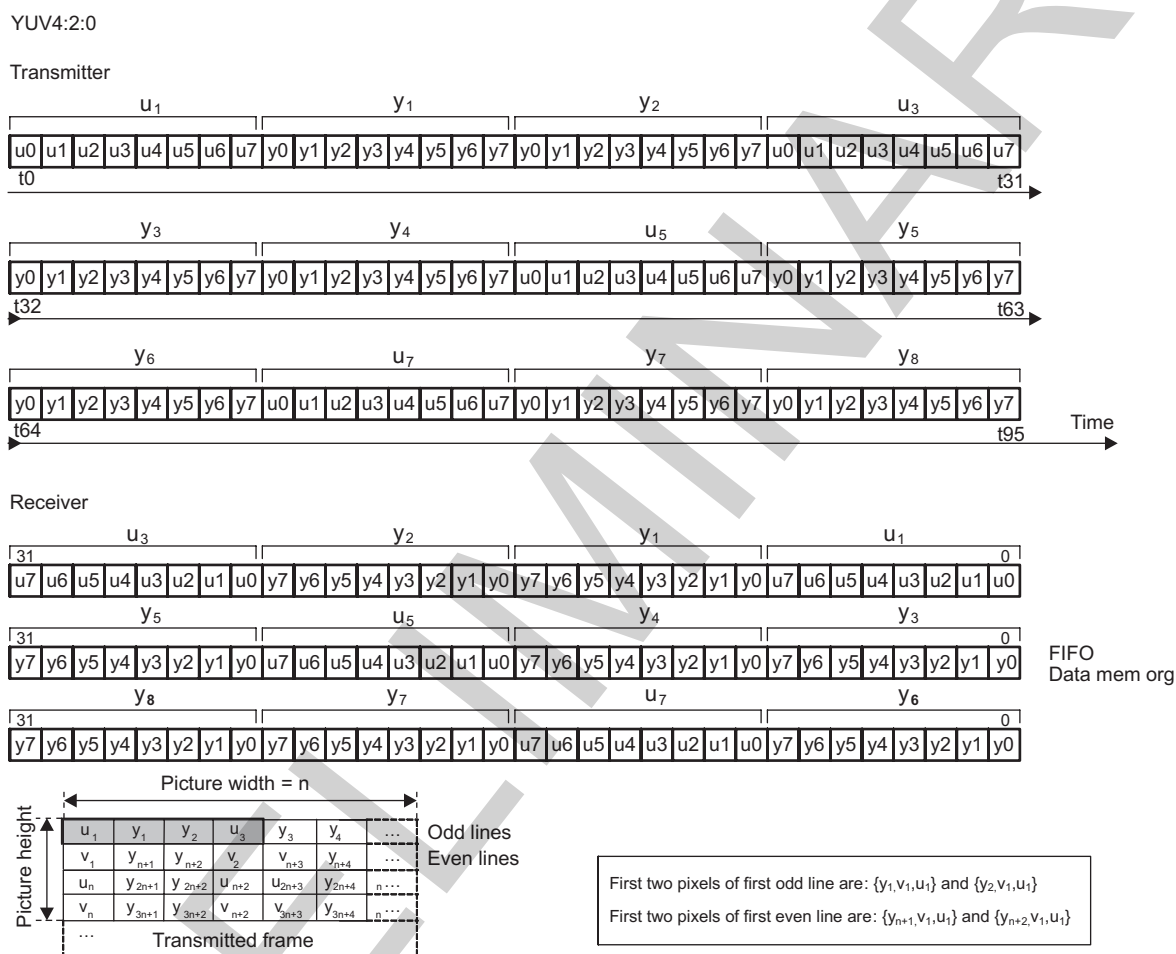


8.2.4.1.1.4.1.2 ISS CCP2 YUV4:2:0

The line length sent through the CCP2 receiver protocol is a multiple of 32 bits. Furthermore, the line length all together sent by the CCP2 receiver is a multiple of 3 x 32 bits and the number of lines is even to correctly finish the pixel reconstruction.

The line structure is different for odd and even lines. Odd lines transport the U component, while even lines contain the V component. This is shown in [Figure 8-16](#). Set `CCP2_LCx_CTRL[7:2] FORMAT` to 0x3 to select YUV4:2:0 mode.

Figure 8-16. ISS CCP2 YUV4:2:0



camss-053

8.2.4.1.1.4.2 ISS CCP2 RGB Operating Modes

8.2.4.1.1.4.2.1 ISS CCP2 RGB888

RGB888 data format can be output to memory in two formats: without data expansion and with data expansion.

If data expansion is used, the value of the 8 upper bits is programmable and can be set with an alpha value for computer graphics applications. The line length sent through the CCP2 receiver protocol is a multiple of 32 bits. The line length all together sent by the CCP2 receiver is a multiple of 3 x 32 bits to finish pixel reconstruction correctly.

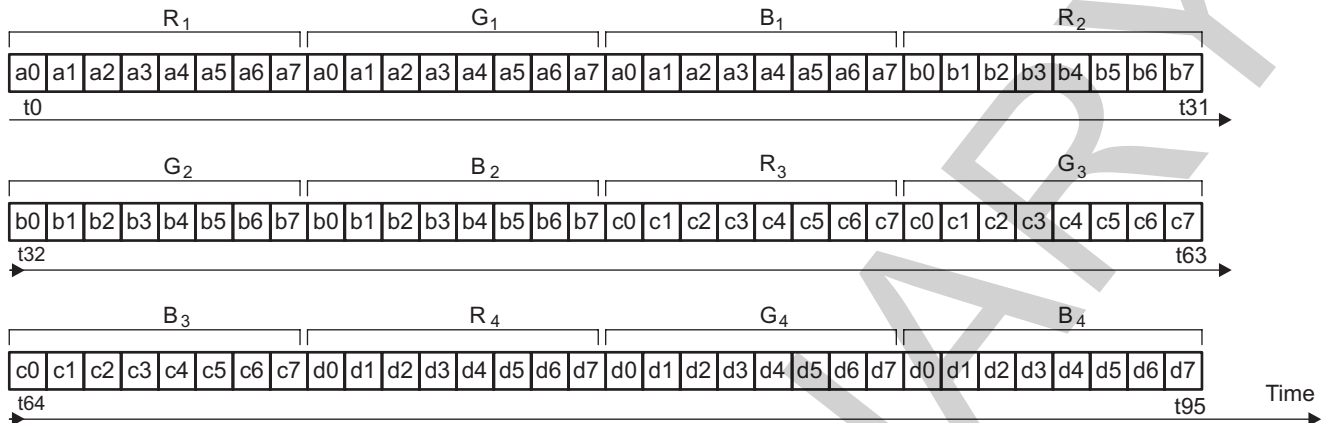
[Figure 8-17](#) is an example of RGB888 format. Set `CCP2_LCx_CTRL[7:2] FORMAT` to 0x6 to select RGB888 mode (24 bits) or to 0x7 to expand RGB888 over 32 bits.

Figure 8-17. ISS CCP2 RGB888

RGB888

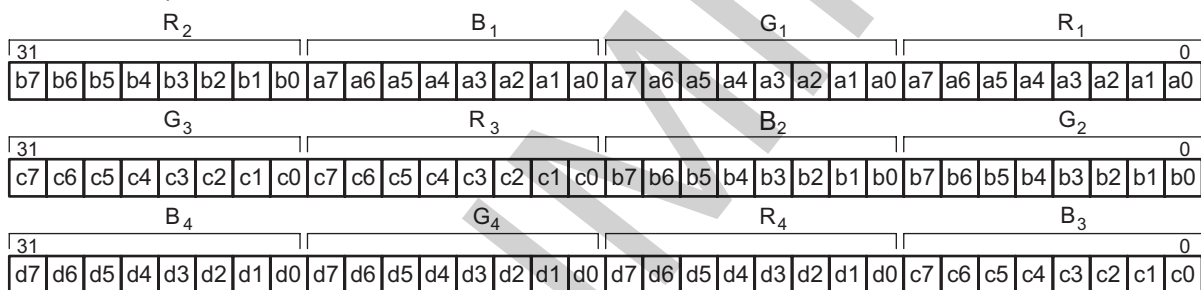
Line width must be a multiple of three 32-bit words.

Transmitter

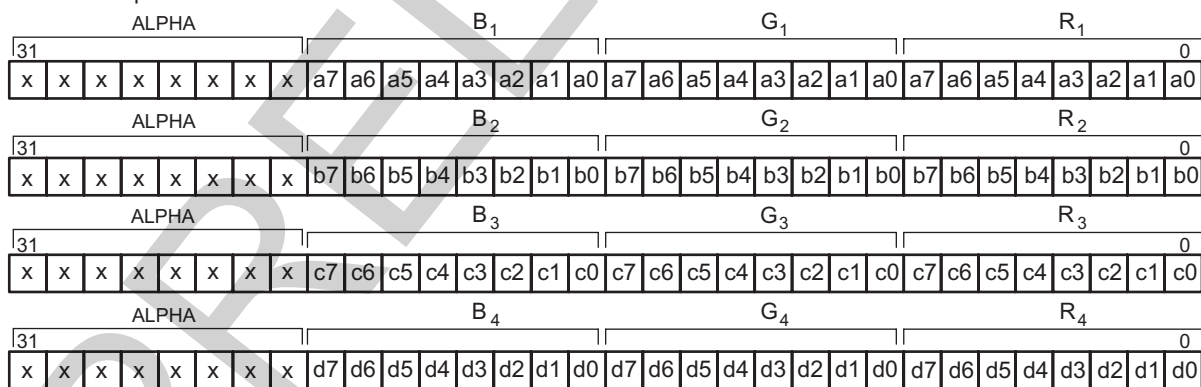


Receiver

Without data expansion



With data expansion



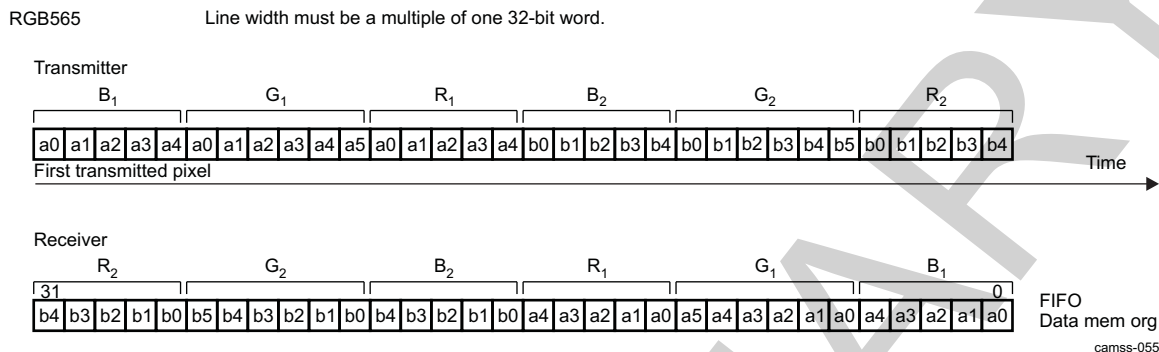
CCP2_LCx_CTRL[15:8] ALPHA (x = 0 to 3)

camss-054

8.2.4.1.1.4.2.2 ISS CCP2 RGB565

For RGB565, the line length sent through the CCP2 receiver protocol is a multiple of 32 bits (see [Figure 8-18](#)). Set `CCP2_LCx_CTRL[7:2] FORMAT` to 0x6 to select RGB565 mode.

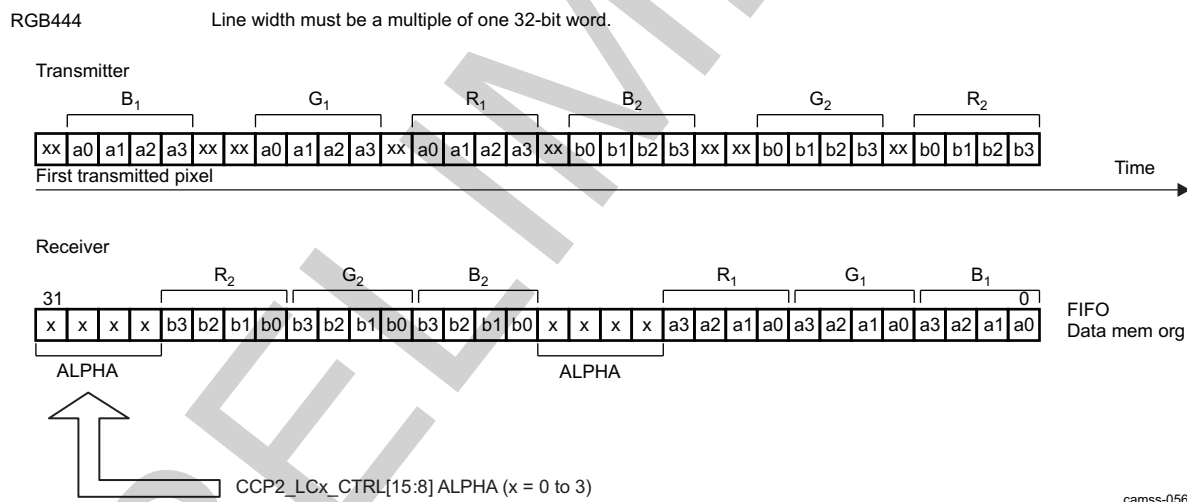
Figure 8-18. ISS CCP2 RGB565



8.2.4.1.1.4.2.3 ISS CCP2 RGB444

RGB444 data format is output to memory with data expansion. If data expansion is used, the value of the 4 upper bits is programmable and can be set with an alpha value for computer graphics applications. The line length sent through the CCP2 receiver protocol is a multiple of 32 bits (see [Figure 8-19](#)). Set `CCP2_LCx_CTRL[7:2] FORMAT` to 0x4 to select RGB444 mode (12 bits expanded to 16).

Figure 8-19. ISS CCP2 RGB444



8.2.4.1.1.4.3 ISS CCP2 RAW Bayer Operating Modes

NOTE: For more information about packed RAW data, see [Section 8.2.4.3.5.1, ISS CCP2 Read Data From Memory](#).

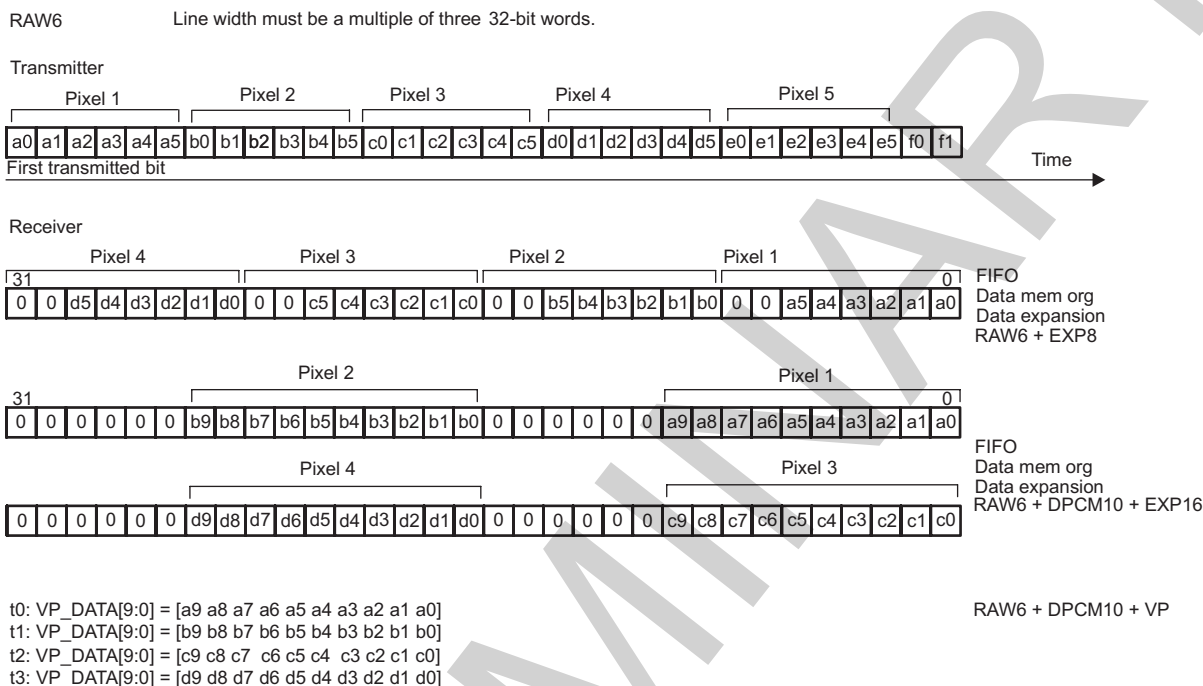
8.2.4.1.1.4.3.1 ISS CCP2 RAW6

RAW6 data format can be output to memory in two formats: without data expansion and with data expansion. The line length sent through the CSI receiver protocol is a multiple of 32 bits. The line all together sent by the CCP2 receiver is a multiple of 3 x 32 bits to finish pixel reconstruction correctly (the lowest common multiple of 32 and 6 is 96; that is, 3 x 32 bits).

[Figure 8-20](#) shows the RAW6 format. Set `CCP2_LCx_CTRL[7:2] FORMAT` to:

- 0x8 to select RAW6 mode expanded to 8-bit
- 0x9 to select RAW6 mode with DPCM decompression
- 10-bit and expansion to 16-bit
- 0xA to select RAW6 mode with DPCM decompression to 10-bit to video port

Figure 8-20. ISS CCP2 RAW6



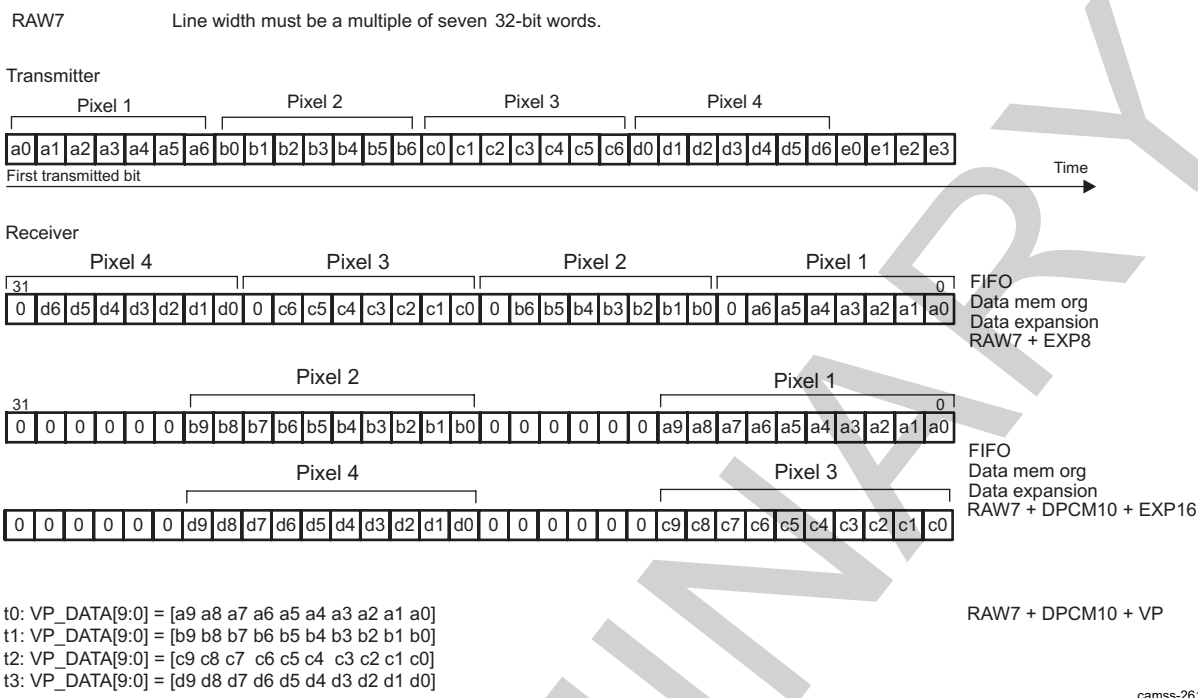
NOTE: Use RAW8 data format to output RAW6 data format to memory.

8.2.4.1.1.4.3.2 ISS CCP2 RAW7

RAW7 data format can be output to memory in two formats: without data expansion and with data expansion. The line length sent through the CCP2 receiver protocol is a multiple of 32 bits. The line length all together sent by the CCP2 receiver is a multiple of 7 x 32 bits to finish the pixel reconstruction correctly (the lowest common multiple of 32 and 7 is 224; that is, 7 x 32 bits).

Figure 8-21 shows the RAW7 format. Set CCP2_LCx_CTRL[7:2] FORMAT to:

- 0xC to select RAW7 mode expanded to 8-bit
- 0xD to select RAW7 mode with DPCM decompression to 10-bit and expansion to 16-bit
- 0xE to select RAW7 mode with DPCM decompression to 10-bit to video port

Figure 8-21. ISS CCP2 RAW7

NOTE: Use RAW8 data format to output RAW7 data format to memory.

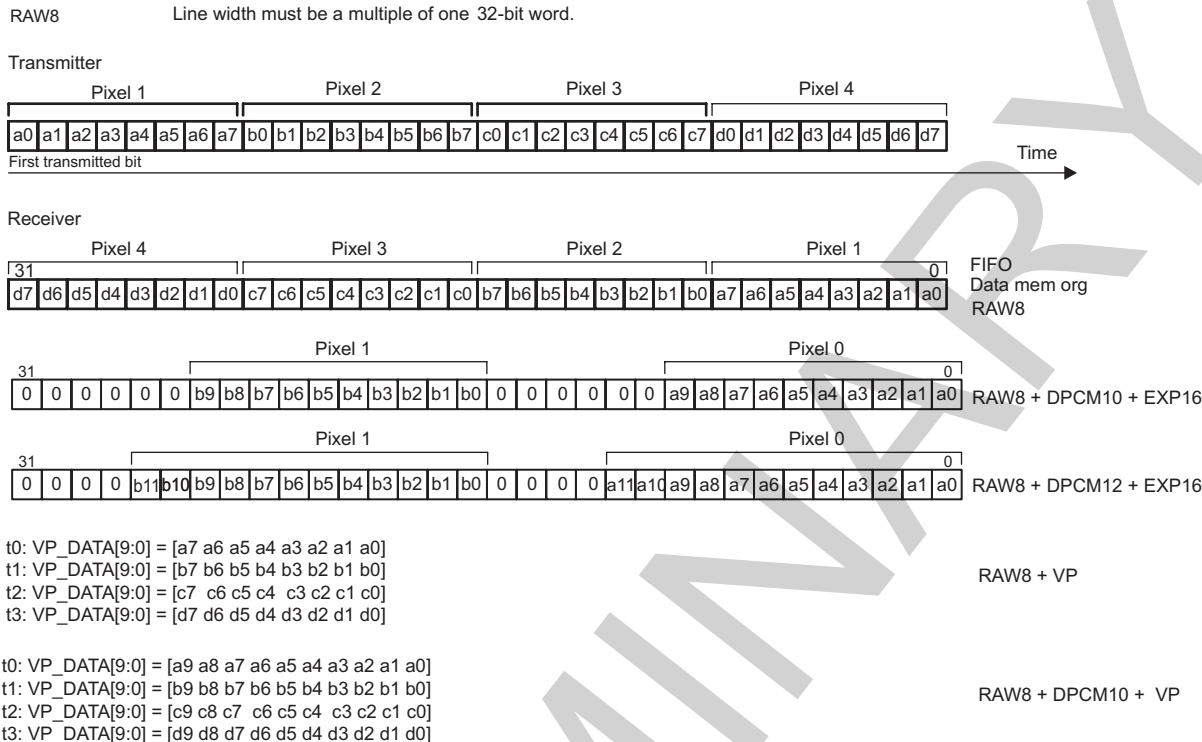
8.2.4.1.1.4.3.3 ISS CCP2 RAW8

RAW8 data format can be output to memory. The line length sent through the CCP2 receiver protocol is a multiple of 32 bits.

Figure 8-22 shows RAW8 format. Set [CCP2_LCx_CTRL\[7:2\] FORMAT](#) to:

- 0x10 to select RAW8
- 0x11 to select RAW8 mode with DPCM decompression to 10-bit and expansion to 16-bit
- 0x12 to select RAW8 mode with DPCM decompression to 10-bit to video port
- 0x20 to select RAW8 with A-Law decompression to RAW10

Figure 8-22. ISS CCP2 RAW8



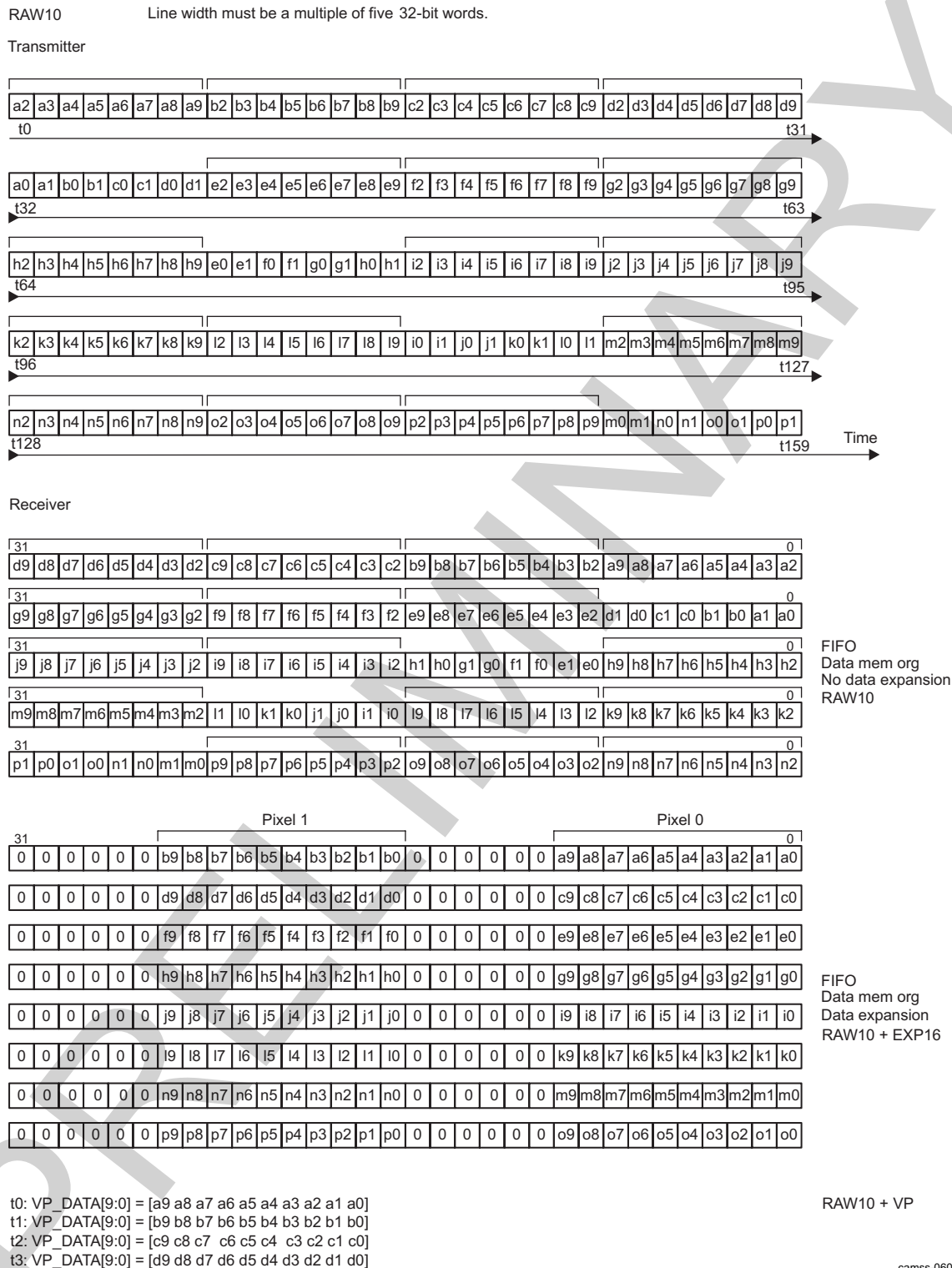
NOTE: Use YUV4:2:2 + VP to output RAW8 data to the video port: YUV4:2:2 + VP is equivalent to RAW8 + VP.

8.2.4.1.1.4.3.4 ISS CCP2 RAW10

RAW10 data format can be output to memory in two formats: without data expansion and with data expansion. If data expansion is used, the 10-bit data are padded with 0s on a 16-bit word. The line length sent through the CCP2 receiver protocol is a multiple of 32 bits. Furthermore, the line length all together sent by the CCP2 receiver is a multiple of 5 x 32 bits to finish pixel reconstruction correctly (the lowest common multiple of 32 and 10 is 320; that is, 10 x 32 bits).

RAW10 data format can be sent to the video port. Figure 8-23 shows the RAW10 format. Set [CCP2_LCx_CTRL\[7:2\] FORMAT](#) to:

- 0x14 to select RAW10
- 0x13 to select RAW10 mode with DPCM compression to 7-bit
- 0x16 to select RAW10 mode to video port
- 0x17 with DPCM compression to 7-bit with expansion to 8-bit
- 0x1B to select RAW10 compressed to 8-bit
- 0xB with DPCM compression to 6-bit
- 0xF to select RAW10 compressed to 6-bit with expansion to 8-bit
- 0x1E to select RAW10 compressed to 8-bit
- 0x20 to select RAW10 with A-Law compression to RAW8

Figure 8-23. ISS CCP2 RAW10

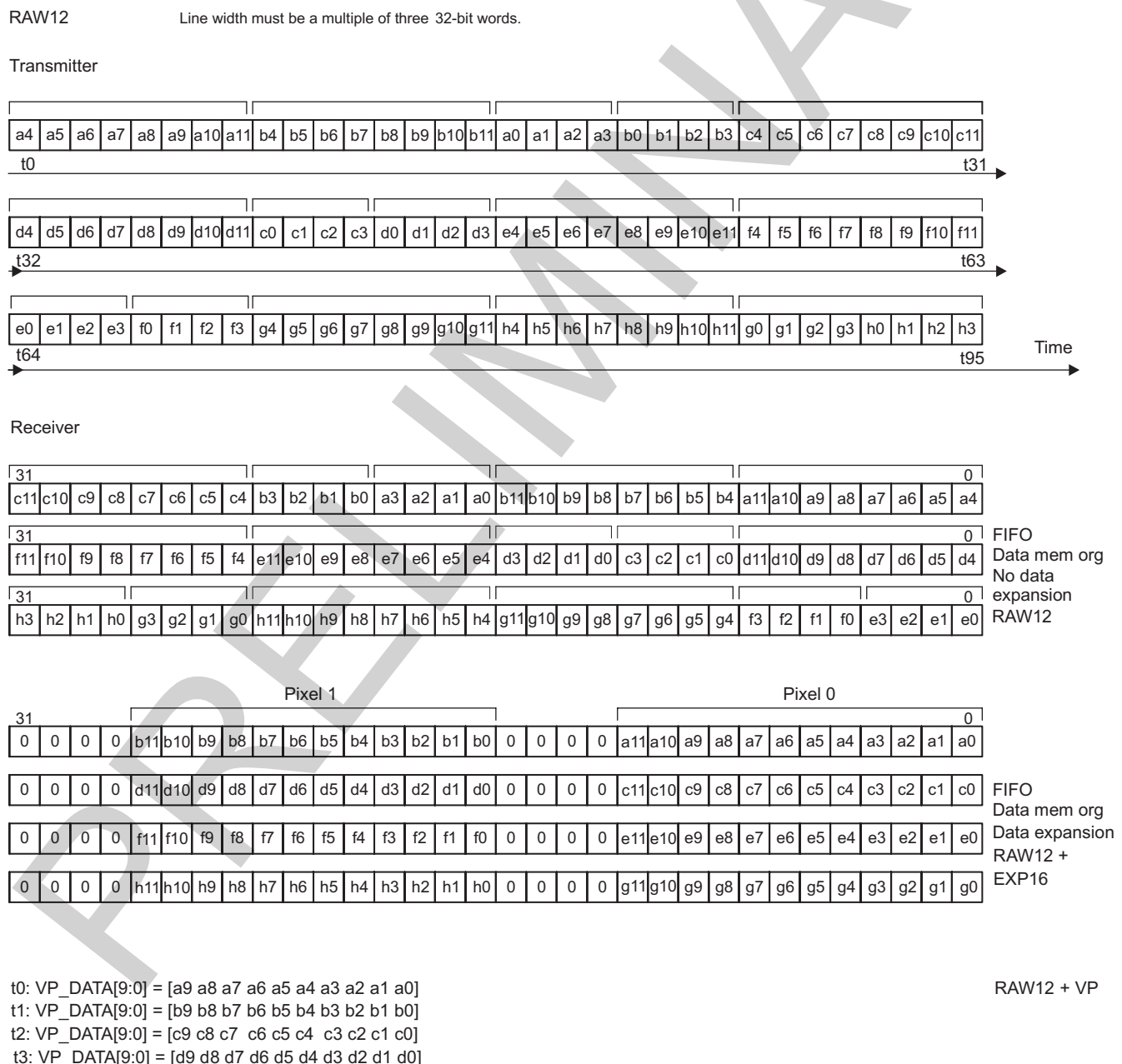
8.2.4.1.1.4.3.5 ISS CCP2 RAW12

RAW12 data format can be output to memory in two formats: without data expansion and with data expansion. If data expansion is used, the 12-bit data are padded with 0s on a 16-bit word. The line length sent through the CCP2 PHY is a multiple of 32 bits. The line length is a multiple of 3 x 32 bits to finish pixel reconstruction correctly (the lowest common multiple of 32 and 12 is 96; that is, 3 x 32 bits).

RAW12 data format can be sent to the video port. Figure 8-24 shows RAW12 format. Set **CCP2_LCx_CTRL[7:2] FORMAT** to:

- 0x18 to select RAW12
- 0x19 to select RAW12 mode with expansion to 16-bit
- 0x1A to select RAW12 mode to video port
- 0x17 with DPCM compression to 7-bit with expansion to 8-bit

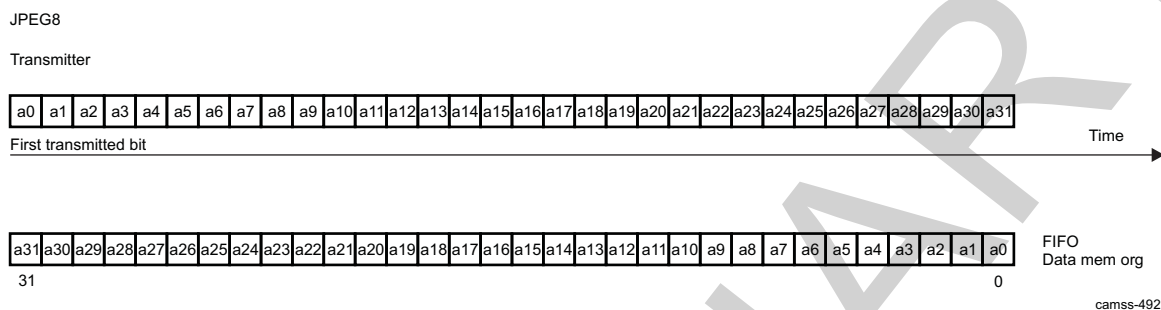
Figure 8-24. ISS CCP2 RAW12



8.2.4.1.1.4.4 ISS CCP2 JPEG8 Operating Modes

The line length sent through the CCP2 receiver protocol is a multiple of 32 bits. The FSP code insertion on the transmitter side automatically ensures this line length. It is impossible to know in advance the size of a compressed stream. [Figure 8-25](#) shows the JPEG8 and JPEG8 FSP format. Set `CCP2_LCx_CTRL[7:2]` FORMAT to 0x1C to select JPEG8 format, or to 0x1D to select JPEG8 format with FSP.

Figure 8-25. ISS CCP2 JPEG8 and JPEG8 FSP



In JPEG8 mode, the JPEG encoder on the sensor side must avoid generating data equal to the synchronization code and must deliver a synchronization-code-free bitstream for line-start and line-end before and after the transmitted data. For more information, see [Section 8.2.4.1.1.2, ISS CCP2 False Synchronization Protection Code](#).

8.2.4.1.1.5 ISS CCP2 Data Transfer Through Write Master Port

The CCP2 receiver module uses its 64-bit master interface to transfer the data stored in the FIFO. The system can set the burst size to be used in the `CCP2_CTRL` BURST register. The recommended burst size is 128 bytes (0x4: 16 x 64-bit bursts are the most efficient for memory output); other sizes should be used only when issues are faced. The module tries to burst data whenever possible to increase system performance and save power. The module uses the appropriate register-selected burst size when the conditions (address is properly aligned, there is enough data in the FIFO to finish the line) are met; otherwise, it uses single requests.

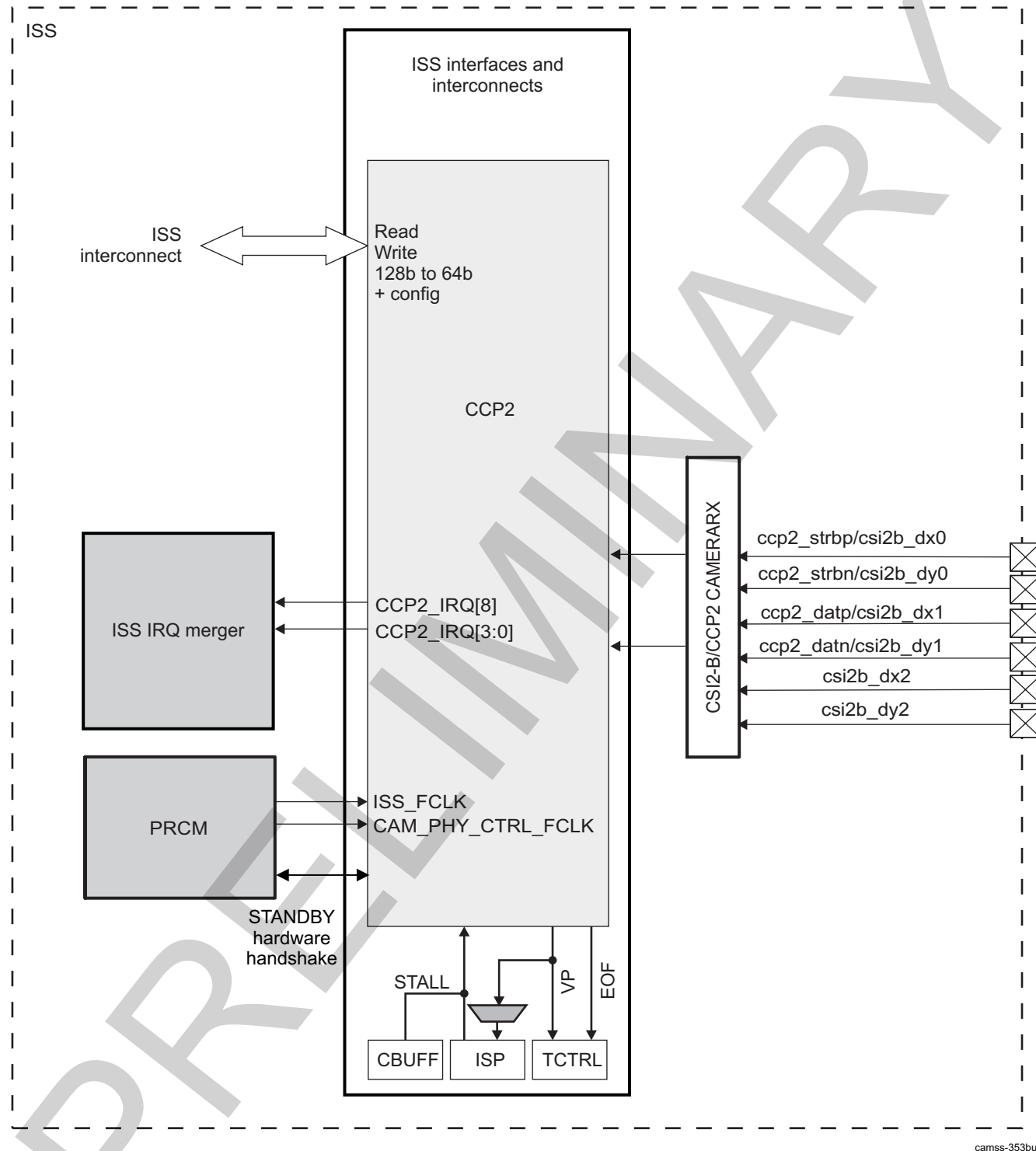
For example, if the line consists of 50 pixels of 64-bit data and BURST = 0x4 (16 x 64-bit bursts), the module generates four times 16 x 64-bit bursts to transmit the whole line. The FIFO can have information about only two different lines.

The CCP2 engine supports tag count. The count is configurable through a register at the top level of the ISS (see [Section 8.1.3, ISS Register Manual](#)).

8.2.4.2 ISS CCP2 Integration

[Figure 8-26](#) is an overview of the integration of the CCP2 interface in the device. The figure shows the CCP2 receiver top-level block diagram. The CCP2 receiver receives serial data from a CCP2-compatible image sensor, converts it to parallel data, extracts the logical channels, detects and extracts the synchronization codes, reformats the data, and outputs it through the VP interface (which is connected to the video preprocessing hardware [ISP]) or the ISS interconnect. The CCP2 can also get its data from memory using a dedicated interface read master port when this feature is enabled at compile time.

Figure 8-26. ISS CCP2 Integration



NOTE: Because CCP2 and CSI2-B share pins, they cannot be used simultaneously. For ISP source select, see [Section 8.1.1, ISS Integration](#), for ISP registers input selection and for top-level input select settings.

For power domain, clocks, reset, and hardware requests, see [Section 8.1.2.4, ISS Power Management](#).

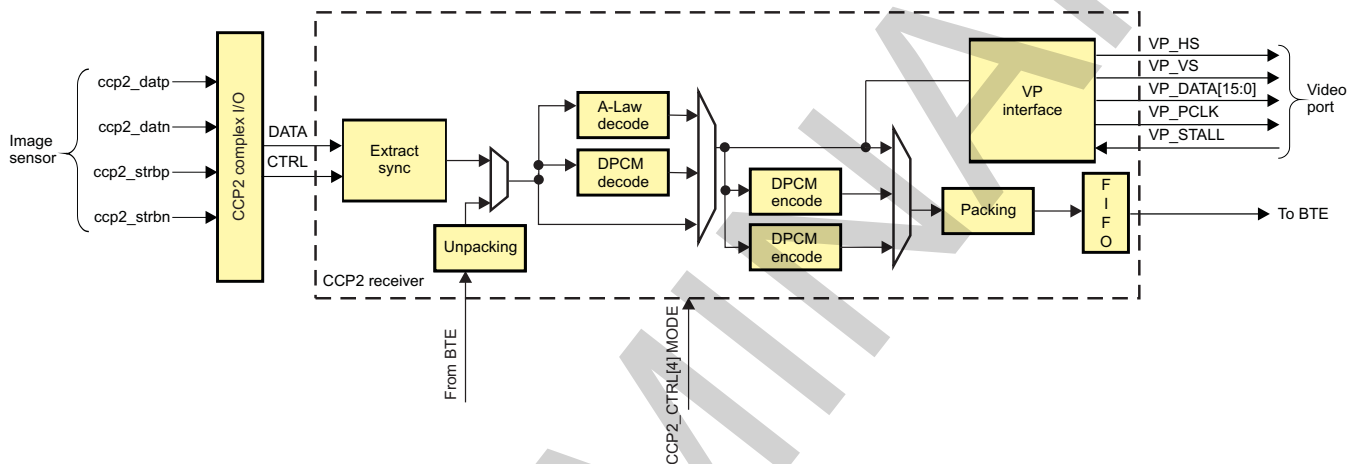
8.2.4.3 ISS CCP2 Functional Description

8.2.4.3.1 ISS CCP2 Overview

Figure 8-27 is the top-level block diagram of the CCP2 receiver. The CCP2 receiver receives serial data from a CCP2-compatible image sensor, converts it to parallel data, extracts the logical channels, detects and extracts the synchronization codes, reformats the data, and outputs it through the VP interface (which is connected to the video preprocessing hardware [ISP]) or the ISS interconnect. The CCP2 can also read data from memory getting burst packets from the BTE when this feature has been enabled at compile time. For read data from memory, see [Section 8.2.4.3.5, ISS CCP2 Memory Read Channel](#).

The CCP2 receiver video port interface is connected to the video preprocessing hardware.

Figure 8-27. ISS CCP2 Receiver Block Diagram



camss-493

8.2.4.3.2 ISS CCP2 PHY

The CCP2 receiver does not connect directly to a sensor (see [Section 8.2.3, ISS CSI2 PHY](#)). It uses a complex I/O physical layer. The CCP2 complex I/O is shared with the CSI2-B receiver. The CSI2-B/CCP2 PHY is powered up by configuring the CSI2 receiver configuration register. For more information about the configuration of the PHY, see [Section 8.2.3.2.1, ISS CSI2 PHY Functional Configuration](#). The CCP2 serial interface is a unidirectional differential serial interface with two options for the PHY: data/clock or data/strobe signals. After the PHY is configured and initialization is done, the CCP2 mode can be selected and controlled by the [CCP2_CTRL\[1\] MODE](#) bit.

8.2.4.3.2.1 ISS CCP2 Data/Clock Signaling

Data/clock signaling consists of two parallel signals: data and data clock.

- The data signal carries bit serial data. The CCP2 transmitter writes the data on each falling edge of the clock. The data are usually transmitted byte-wise, least-significant bit (LSB) first.
- The data clock signal carries the clock signal. The CCP2 transmitter writes the data on each falling edge of the clock. The CCP2 receiver reads the data on the rising edge of the clock.

8.2.4.3.2.2 ISS CCP2 Data/Strobe Signaling (CCP2 Only)

Data/strobe signaling consists of two parallel signals: data and data strobe.

- The data signal carries bit serial data.
- The data strobe signal carries the strobe signal. It toggles when the data signal does not change state.

The data signal or the strobe signal changes between 2 data bits. The data and strobe signals must not change simultaneously. The data and strobe signals are used in the receiver to reconstruct the transmission clock. Both fronts of the reconstructed clock are used to sample the data. Set the [CCP2_CTRL\[4\] MODE](#) bit and see [Section 8.2.3, ISS CSI2 PHY](#), to set the data/clock or data/strobe function.

8.2.4.3.3 ISS CCP2 VP Interface

[Table 8-54](#) summarizes the video interface signals. The video interface connects the CCP2 receiver module to the video preprocessing hardware (ISP). The interface is connected to a 16-bit video port. On the other side of the video port is the ISIF inside the ISP. The ISIF also uses the signals listed in [Table 8-54](#) to synchronize pixel data sent to it by the CCP2 receiver.

Table 8-54. ISS CCP2 Video interface Signals

| Pin | Type ⁽¹⁾ | Description |
|---------------|---------------------|--|
| VP_HS | O | Line trigger output signal |
| VP_VS | O | Frame trigger output signal |
| VP_DATA[15:0] | O | Parallel output data: bits 0 to 15 |
| VP_PCLK | O | Video port pixel clock. The frequency can be configured. |
| VP_STALL | I | Stalls data flow when data is read from memory |

⁽¹⁾ I = Input; O = Output

When data is read from memory and sent to the video port, the data flow can be stalled by asserting the VP_STALL signal. Doing so does not overflow internal FIFOs: the CCP2 module adapts its read rate automatically.

The response time to the VP_STALL signal must not exceed two cycles: when VP_STALL is asserted, the CCP2 module can send 0, 1, or 2 pixels to the video port.

VP_STALL is asserted and deasserted synchronous to the functional clock.

NOTE: Stalling the video port for data received from the sensor may lead to internal overflows; VP_STALL must not be used for this purpose.

The pixel clock is generated from the functional clock. Clock pulses are gated based on the selected clock division factor and pixel availability. In other words, software must set the CCP2 receiver to ensure that the pixel clock:

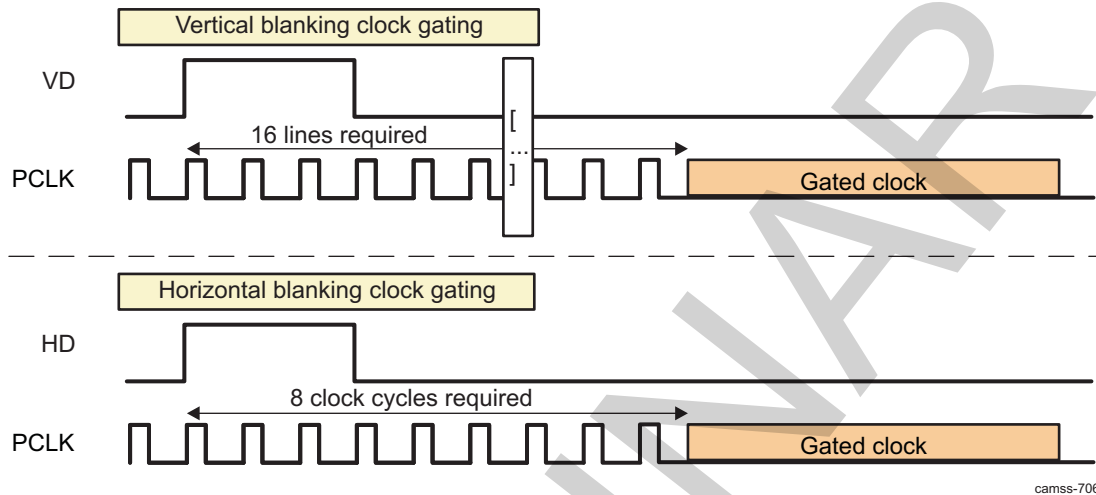
- Never exceeds what the ISP can support: the top value set in the [CCP2_CTRL\[31:15\] FRACDIV](#) bit field
- Is sent only when valid pixels or blanking data must be sent

Also, software must set the number of clock pulses during horizontal blanking periods using the [CCP2_CTRL1\[1:0\] BLANKING](#) bit field.

- The CCP2 receiver stops generating horizontal blanking clock pulses when the number of pulses defined in the [CCP2_CTRL1\[1:0\] BLANKING](#) bit field are generated or when data for the next line arrives from the sensor.
- Free-running horizontal blanking can be selected only when data comes from the sensor.
- When data comes from memory, the CCP2 receiver ensures that the number of horizontal blanking pulses defined in the [CCP2_CTRL1\[1:0\] BLANKING](#) bit field is received. The CCP2 receiver stops generating horizontal blanking clock pulses when then number of pulses defined in the [CCP2_CTRL1\[1:0\] BLANKING](#) bit field is generated or when data for the next line arrives from the sensor.

NOTE: To work properly, the ISP requires a minimum of eight clock cycles in the horizontal blanking period and a minimum of 16 lines in the vertical blanking period. The pixel clock can be gated only when these intervals are respected. This is required to flush the pipeline of the different ISP modules. [Figure 8-28](#) shows VP_PCLK gating during blanking periods.

Figure 8-28. ISS CCP2 VP_PCLK Gating During Blanking Periods



Vertical blanking generation is controlled through the [CCP2_CTRL\[9\]](#) VP_CLK_FORCE_ON bit. The VP_PCLK clock is enabled during vertical blanking periods when this bit is set. This pushes pixels through the ISP processing pipe. It is needed, for example, when the ISP resizer uses the averager. Otherwise, hardware ensures only that at least four clock pulses are generated before the first pixel of each frame. It may be necessary for the clock to keep running after the frame end to flush internal pipelines. In that case, an interrupt request (IRQ) or status bit is typically present in the attached hardware that indicates when the VP_PCLK clock is no longer needed (for example, an end of processing interrupt). The module leaves the vertical blanking state when new data is received from the sensor or the memory read channel.

The configured pixel clock is used for active and blanking periods.

[Table 8-55](#) shows how RAW and YUV data is sent over the video port. The data is sent to the ISIF if ISP is used. For the ISIF details about video port data, see [Section 8.3 ISS: ISP](#).

Table 8-55. ISS CCP2 Video Port Data Mapping

| Format | Video Port DATA[15:0] | | | | | | | | | | | | | | | |
|----------|-----------------------|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RAW6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R5 | R4 | R3 | R2 | R1 | R0 |
| RAW7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |
| RAW8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |
| RAW10 | 0 | 0 | 0 | 0 | 0 | 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |
| RAW12 | 0 | 0 | 0 | 0 | R11 | R10 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |
| RAW14 | 0 | 0 | R13 | R12 | R11 | R10 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |
| RAW16 | R15 | R14 | R13 | R12 | R11 | R10 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |
| YUV4:2:2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | U7 | U6 | U5 | U4 | U3 | U2 | U1 | U0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Y7 | Y6 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | V7 | V6 | V5 | V4 | V3 | V2 | V1 | V0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Y7 | Y6 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 |

8.2.4.3.4 ISS CCP2 Data Compression

The data compression technique used is DPCM and pulse code modulation (PCM).

The CCP2 receiver performs on-the-fly compression and decompression. The compressed/decompressed data is passed to the video preprocessing hardware or stored in memory.

The data compression method is lossy and does not require any information outside the current encoded/decoded line. This means that all the image lines can be encoded and decoded separately.

Two different predictors are used:

- The simple predictor

This predictor uses only the previous same color component value as a prediction value. Therefore, only 2-pixel memory is required.

- The advanced predictor

This predictor uses four previous pixel values, when the prediction value is evaluated. This means that also the other color component values are used, when the prediction value is defined.

The preferable use is that the simple predictor is used with 10 bits to 8 bits or 12 bits to 8 bits conversion (10810 or 12812) and the advanced predictor is used with 10 bits to 7 bits and 10 bits to 6 bits conversions (10710 and 10610). The advanced predictor gives slightly better prediction for pixel value; thus, the image quality can be improved with it. Because the simple predictor is very simple, the processing power and memory requirements are reduced with it, when the image quality is already high enough.

Select the predictor with the [CCP2_LCx_CTRL\[10\]](#) DPCM_PRED bit.

8.2.4.3.5 ISS CCP2 Memory Read Channel

The memory channel can perform the following operations:

- Reads data from memory. It is unpacked and DPCM or A-Law decompressed if necessary.
- Sends data to the video preprocessing hardware
- Sends data back to memory. It can be DPCM or A-Law compressed and packed before it is sent to memory.

It cannot receive its input data directly from the sensor, and the logical channels are disabled when the memory channel is enabled.

[Table 8-56](#) summarizes supported modes for memory-to-memory operations.

NOTE: Video port and memory destinations are mutually exclusive.

Table 8-56. ISS CCP2 Memory-to-Memory Supported Operations

| Memory Input | Memory Output | | | | | | | | | | | | | | | | | | | | | |
|------------------------|---------------|-------------|-------------|-------------------|------------------|-----------------------|-------|-------------|-------------|-------------------|------------------|-----------------------|-------|-------------|---------------|---------------|--------|--------------|--------|--------------|--------|--------|
| | RAW 6 | RAW 6+PA CK | RAW 6+DP CM | RAW 6+PA CK+D PCM | RAW 6+DP CM_A DV | RAW 6+PA CK+D PCM_ADV | RAW 7 | RAW 7+PA CK | RAW 7+DP CM | RAW 7+PA CK+D PCM | RAW 7+DP CM_A DV | RAW 7+PA CK+D PCM_ADV | RAW 8 | RAW 8+DP CM | RAW 8+DP CM12 | RAW 8+AL AW10 | RAW 10 | RAW 10+P ACK | RAW 12 | RAW 12+P ACK | RAW 14 | RAW 16 |
| RAW6 | | | | | | | | | | | | | | | | | | | | | | |
| RAW6 + PACK | | | | | | | | | | | | | | | | | | | | | | |
| RAW6 + DPCM | | | | | | | | | | | | | | | | | X | X | | | | |
| RAW6 + PACK + DPCM | | | | | | | | | | | | | | | | | X | X | | | | |
| RAW6 + DPCM_ADV | | | | | | | | | | | | | | | | | X | X | | | | |
| RAW6 + PACK + DPMC_ADV | | | | | | | | | | | | | | | | | X | X | | | | |
| RAW7 | | | | | | | | | | | | | | | | | | | | | | |
| RAW7 + PACK | | | | | | | | | | | | | | | | | | | | | | |
| RAW7 + DPCM | | | | | | | | | | | | | | | | | X | X | | | | |
| RAW7 + PACK + DPCM | | | | | | | | | | | | | | | | | X | X | | | | |
| RAW7 + DPCM_ADV | | | | | | | | | | | | | | | | | X | X | | | | |
| RAW7 + PACK + DPMC_ADV | | | | | | | | | | | | | | | | | X | X | | | | |
| RAW8 | | | | | | | | | | | | | | | | | | | | | | |
| RAW8 + DPCM | | | | | | | | | | | | | | | | | X | X | | | | |
| RAW8 + DPCM12 | | | | | | | | | | | | | | | | | | | X | X | | |

Table 8-56. ISS CCP2 Memory-to-Memory Supported Operations (continued)

| Memory Input | Memory Output | | | | | | | | | | | | | | | | | | | | | |
|---------------|---------------|-------------|-------------|-------------------|------------------|-----------------------|-------|-------------|-------------|-------------------|------------------|-----------------------|-------|-------------|---------------|---------------|--------|--------------|--------|--------------|--------|--------|
| | RAW 6 | RAW 6+PA CK | RAW 6+DP CM | RAW 6+PA CK+D PCM | RAW 6+DP CM_A DV | RAW 6+PA CK+D PCM_ADV | RAW 7 | RAW 7+PA CK | RAW 7+DP CM | RAW 7+PA CK+D PCM | RAW 7+DP CM_A DV | RAW 7+PA CK+D PCM_ADV | RAW 8 | RAW 8+DP CM | RAW 8+DP CM12 | RAW 8+AL AW10 | RAW 10 | RAW 10+P ACK | RAW 12 | RAW 12+P ACK | RAW 14 | RAW 16 |
| RAW8 + ALAW10 | | | | | | | | | | | | | | | | | X | X | | | | |
| RAW10 | | | X | X | X | X | | | X | X | X | X | | X | | | | | | | | |
| RAW10 + PACK | | | X | X | X | X | | | X | X | X | X | | X | | | | | | | | |
| RAW12 | | | | | | | | | | | | | | | | | | | | | | |
| RAW12 + PACK | | | | | | | | | | | | | | | | | | | | | | |
| RAW14 | | | | | | | | | | | | | | | | | | | | | | |
| RAW16 | | | | | | | | | | | | | | | | | | | | | | |

Table 8-57 summarizes supported modes for memory-to-video port operations.

Table 8-57. ISS CCP2 Memory-to-Video Port Supported Formats

| Memory Input | Video Port Output | | | | | | |
|------------------------|-------------------|------|------|-------|-------|-------|-------|
| | RAW6 | RAW7 | RAW8 | RAW10 | RAW12 | RAW14 | RAW16 |
| RAW6 | X | | | | | | |
| RAW6 + PACK | X | | | | | | |
| RAW6 +DPCM | | | | X | | | |
| RAW6 + PACK + DPCM | | | | X | | | |
| RAW6 + DPCM_ADV | | | | X | | | |
| RAW6 + DPCM_ADV + PACK | | | | X | | | |
| RAW7 | | X | | | | | |
| RAW7 + PACK | | X | | | | | |
| RAW7 + DPCM | | | | X | | | |
| RAW7 + PACK + DPCM | | | | X | | | |
| RAW7 + DPCM_ADV | | | | X | | | |
| RAW7 + DPCM_ADV + PACK | | | | X | | | |

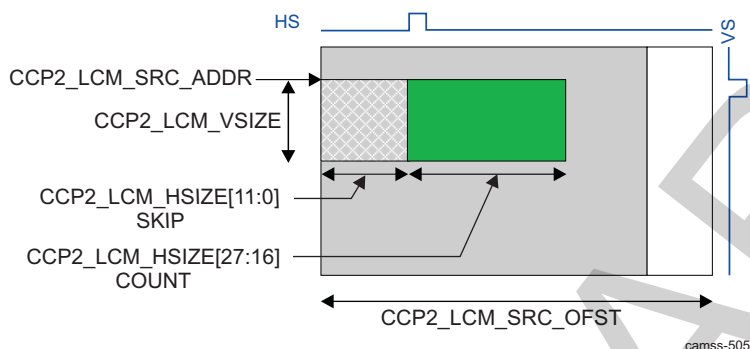
Table 8-57. ISS CCP2 Memory-to-Video Port Supported Formats (continued)

| Memory Input | Video Port Output | | | | | | |
|---------------|-------------------|------|------|-------|-------|-------|-------|
| | RAW6 | RAW7 | RAW8 | RAW10 | RAW12 | RAW14 | RAW16 |
| RAW8 | | | X | | | | |
| RAW8 + DPCM | | | | X | | | |
| RAW8 + DPCM12 | | | | | X | | |
| RAW8 + ALOW10 | | | | X | | | |
| RAW10 | | | | X | | | |
| RAW10 + PACK | | | | X | | | |
| RAW12 | | | | | X | | |
| RAW12 + PACK | | | | | X | | |
| RAW14 | | | | | | X | |
| RAW16 | | | | | | | X |

8.2.4.3.5.1 ISS CCP2 Read Data From Memory

Figure 8-29 shows the data organization in memory.

Figure 8-29. ISS CCP2 Data Organization in Memory



The user chooses the start address and the line length using the [CCP2_LCM_SRC_ADDR](#) and [CCP2_LCM_SRC_OFST](#) registers. The image start address normally must point to the beginning of a line because of packing constraints. However, it does not necessarily point to the first line of the frame in memory. The [CCP2_LCM_VSIZE\[27:16\]](#) COUNT bit field specifies the total line count to be read from memory.

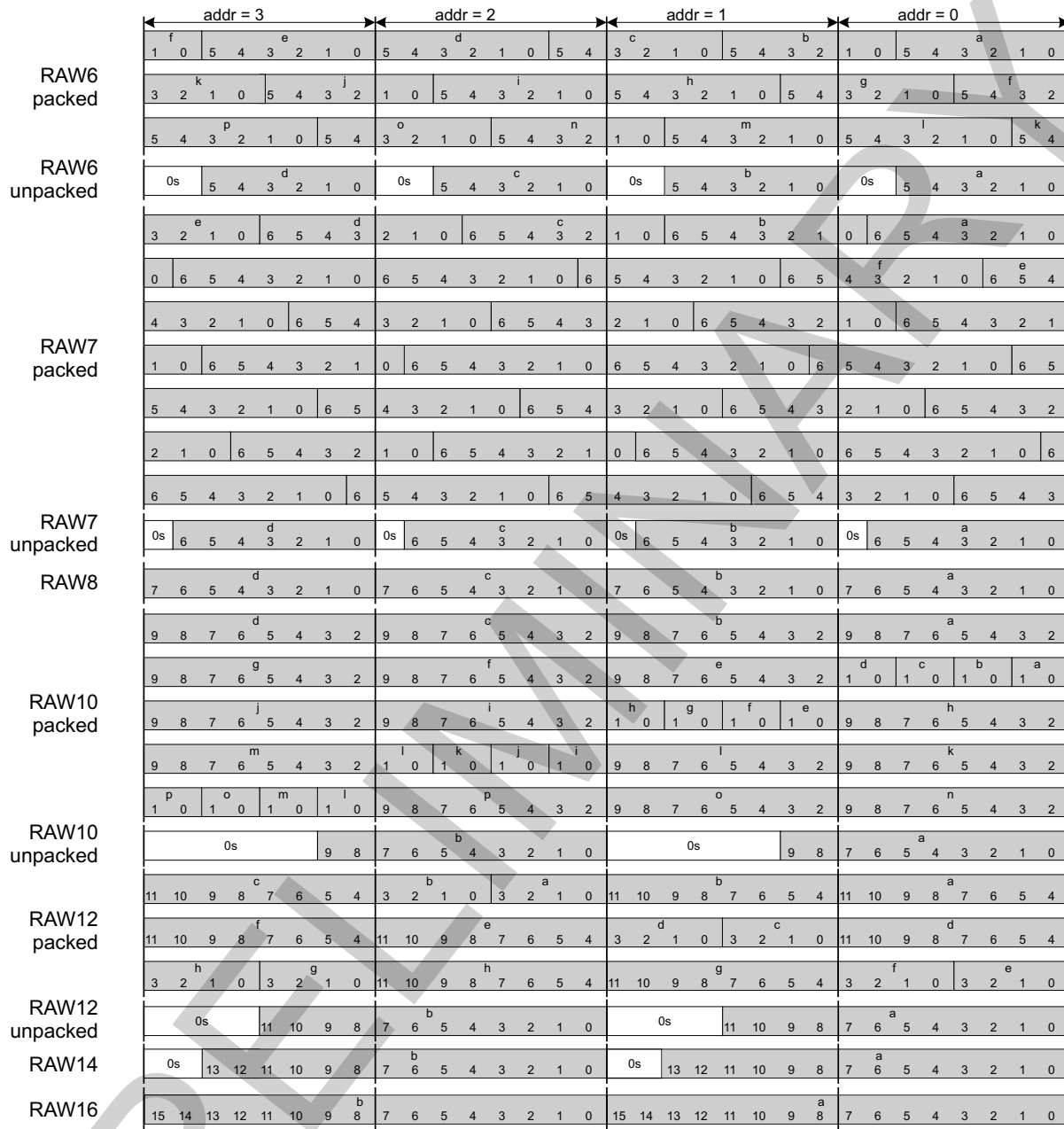
It is also possible to skip a certain pixel count ([CCP2_LCM_HSIZE\[11:0\]](#) SKIP) from the start of the line. Thus, they are not sent to the video port or back to memory. The [CCP2_LCM_HSIZE\[27:16\]](#) COUNT bit field specifies the horizontal size of the image. The pixels after the right boundary of the image are not read from memory.

When data are sent to the video port, throughput is imposed by the selected VP_PCLK. Otherwise, it is imposed by the selected interconnect read port clock. The interconnect read rate can be throttled (limiting the maximum data read speed for memory-to-memory operation) using the [CCP2_LCM_CTRL\[4:3\]](#) READ_THROTTLE bit field. Therefore, it is possible to read the unused data at a higher rate than the used video port data rate. This provides better performance than framing the image in the video preprocessing hardware.

The data storage format in memory is defined by the [CCP2_LCM_CTRL\[18:16\]](#) SRC_FORMAT and [CCP2_LCM_CTRL\[23\]](#) SRC_PACK bit fields.

Not all I/O format combinations are valid. For more information, see [Table 8-56](#) and [Table 8-57](#).

[Figure 8-30](#) shows how data are packed in memory. Pixel order (left to right in the image) is alphabetical (a, b, c). Therefore, data storage is little endian.

Figure 8-30. ISS CCP2 Data Organization Packing in Memory

camss-506u

Table 8-58 summarizes the storage reduction versus unpacked format and image width restrictions when data packing is used. The image width applies to the data width multiple in pixels that must be stored to have storage reduction. Moreover, because each address is 8 bits long, the percentage shows how many bits out of 8 are to be packed in the empty space from another pixel address. A pixel is selected and split. One of the parts is put into another pixel address empty space. When unpacked, each pixel bit is stored continuously again.

Table 8-58. ISS CCP2 Data Packing Benefit and Constraints

| | Bits Per Pixel | | Storage Reduction | Width Multiple (Pixels) |
|------|----------------|----------|-------------------|-------------------------|
| | Packed | Unpacked | | |
| RAW6 | 6 | 8 | 25% | 16 |
| RAW7 | 7 | 8 | 13% | 3 |

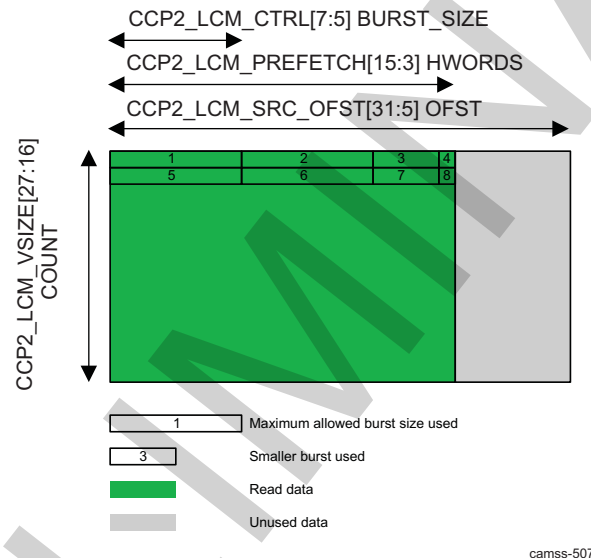
Table 8-58. ISS CCP2 Data Packing Benefit and Constraints (continued)

| | Bits Per Pixel | | Storage Reduction | Width Multiple (Pixels) |
|-------|----------------|----------|-------------------|-------------------------|
| | Packed | Unpacked | | |
| RAW8 | 8 | 8 | 0% | 4 |
| RAW10 | 10 | 16 | 38% | 16 |
| RAW12 | 12 | 16 | 25% | 8 |

8.2.4.3.5.2 ISS CCP2 Memory Read Port Burst Generation

Hardware always uses the largest possible burst size according to the setup. The amount of data read from memory can be higher than what is actually used by the CCP2 receiver. Only full 64-bit burst words are read back from memory. [Figure 8-31](#) shows the data organization and the relationship between the different parameters controlling the burst generation.

Figure 8-31. ISS CCP2 Data Organization in Memory



NOTE:

- A minimum burst size of 2 must be selected for correct operation.
- The HWORDS bit field must be even for correct operation.

The [CCP2_LCM_SRC_ADDR](#) register address of the first data to read is aligned to a 32-byte boundary. The read port fetches [CCP2_LCM_PREFETCH\[15:3\]](#) HWORDS of 64-bit words per line using the longest possible burst computed from the [CCP2_LCM_CTRL\[7:5\]](#) BURST_SIZE bit field and the remaining data to be fetched. Burst size of 128 bytes is preferred. When the CCP2 receiver is configured to fetch more data than required, extra data are dropped internally.

8.2.4.3.5.3 ISS CCP2 Video Port

The video port always receives unpacked data. It can be enabled using the [CCP2_LCM_CTRL\[2\]](#) DST_PORT bit. Its clock can be selected with the [CCP2_CTRL\[31:15\]](#) FRACDIV bit field and gated or not during frame blanking periods using the [CCP2_CTRL\[9\]](#) VP_CLK_FORCE_ON bit.

The data format used by the video port is defined by the [CCP2_LCM_CTRL\[26:24\]](#) DST_FORMAT bit field. For a list of supported modes, see [Table 8-57](#).

8.2.4.3.5.4 ISS CCP2 Encode, Pack, and Store Data

This stage is used only when data are sent to memory. Memory destination is selected using the [CCP2_LCM_CTRL\[2\] DST_PORT](#) bit. The output data format is defined by the [CCP2_LCM_CTRL\[26:24\] DST_FORMAT](#) bit field and the [CCP2_LCM_CTRL\[31\] DST_PACK](#) bit. Not all possible combinations are supported; see [Table 8-56](#) for details.

The destination address and offset for the output data of the memory channel are set by the [CCP2_LCM_DST_ADDR](#) and [CCP2_LCM_DST_OFST](#) registers.

Because of alignment constraints on the interconnect port, the output image width restrictions in [Table 8-59](#) apply.

Table 8-59. ISS CCP2 Output Width Restrictions in Memory-to-Memory Operation

| Format | Bits per Pixel | Width Multiple of ⁽¹⁾ | Note |
|--------------|----------------|----------------------------------|---|
| RAW6 | 8 | 1 | Full 32-bit words are written at the end of the line. This last word can eventually include 0s. |
| RAW6 packed | 6 | 1 | |
| RAW7 | 8 | 1 | |
| RAW7 packed | 7 | 1 | |
| RAW8 | 8 | 1 | |
| RAW10 | 16 | 1 | |
| RAW10 packed | 10 | 16 | |
| RAW12 | 16 | 1 | Same constraints as RAW8 |
| RAW12 packed | 12 | 8 | |

⁽¹⁾ In continuous mode, lines must be multiples of 128 bits. In 2D mode, lines must start on 128-bit boundaries.

For example, when RAW6 packed data are written to memory, any output width is allowed. However, only full 32-bit words are written to memory. This eventually overwrites some data in memory at the end of a line.

The supported output width is restricted for packed RAW10 and RAW12 data because of the particular bit ordering in those formats (see [Figure 8-30](#)).

When the DST_OFST bit is set to 0, start of lines are aligned on 4-byte boundaries. When DST_OFST is not set to 0, data are aligned on 32-byte boundaries.

NOTE: The RAW6, RAW7, and DPCM data formats do not apply to the MIPI CSI1-compatible mode.

8.2.4.3.5.5 ISS CCP2 DPCM Decompression History

The DPCM compression algorithm can encode the difference between consecutive samples in a line instead of the actual samples value to reduce the amount of data to store. The drawback is that lines must always be decoded from the beginning (the first samples of a line are always encoded as PCM).

The CCP2 receiver has a mechanism to preserve the DPCM decode history for each line to avoid decoding the same samples multiple times when vertical frame division mode is used.

The typical use case (also known as vertical frame division mode) is when an image is wider than the ISP can process on the fly, but the image must be processed. Therefore, the image is cut into multiple vertical slices that are processed sequentially by the ISP. The slices are stitched together in the SDRAM after ISP processing through proper address generation in the ISP. Because of various alignment constraints in the ISP, the slices sent to ISP must overlap. Without preserving the DPCM history, all lines from the beginning of the second (and other consecutive) vertical slice would have to be recoded, which would lead to performance degradation.

Writing DPCM history information into the system memory is enabled by setting the [CCP2_LCM_HISTORY\[16\] EN_HIST_WR](#) bit. The [CCP2_LCM_HISTORY\[15:0\] HIST_EXPORT](#) bit field defines the position at which history data is written to memory. The position is counted from the beginning line. The first decoded pixel has position 0. The last decoded pixel has position [CCP2_LCM_HSIZE\[14:0\] SKIP + CCP2_LCM_HSIZE\[30:16\] COUNT - 1](#). The [CCP2_LCM_HISTORY\[15:0\] HIST_EXPORT](#) bit field is used to choose the resume position and allows support of overlapping vertical slices. History data is written to the SDRAM at $ADDR = \text{CCP2_LCM_DST_ADDR}[31:5] + Y \times 8 \text{ bytes}$ (where Y is the line number). The CCP2 receiver always writes 8 bytes of history data per line to the SDRAM regardless of the chosen DPCM format. The CCP2 receiver uses the interface bursts to send history data to memory.

DPCM history data holds the decoded value of four samples. The CCP2 receiver exports samples of positions:

- [CCP2_LCM_HISTORY\[15:0\] HIST_EXPORT - 3](#)
- [CCP2_LCM_HISTORY\[15:0\] HIST_EXPORT - 2](#)
- [CCP2_LCM_HISTORY\[15:0\] HIST_EXPORT - 1](#)
- [CCP2_LCM_HISTORY\[15:0\] HIST_EXPORT](#)

Every sample is coded on 16 bits, and several MSBs are unused. The valid range for [CCP2_LCM_HISTORY\[15:0\] HIST_EXPORT](#) is $[3.. \text{CCP2_LCM_HSIZE}[14:0] \text{ SKIP} + \text{CCP2_LCM_HSIZE}[30:16] \text{ COUNT} - 1]$. History data can be exported even when data is not sent to the video port or ISS interconnect port (that is, [CCP2_LCM_HISTORY\[15:0\] HIST_EXPORT < CCP2_LCM_HSIZE\[14:0\] SKIP](#) is valid).

8.2.4.4 ISS CCP2 Programming Model

This section describes the programming model of the CCP2 receiver.

8.2.4.4.1 ISS CCP2 Programming Hardware Setup/Initialization

This section discusses the configuration of the CCP2 receiver required before image capture can begin. Before using the receiver, a CSIPHY initialization in CCP2 mode must be made for CSI2-B/CCP2 CAMERARX, which is associated with the CCP2 receiver. See [Section 8.2.3.2.3, ISS CCP2 and Link Initialization Sequence](#).

NOTE: The setup/initialization previously explained is valid only when the external sensor is used. If the user plans to use the logical memory channel (LCM) or debug mode ([CCP2_CTRL\[13\] DBG_EN = 0x1](#)) instead of the external sensor, this setup/initialization is not necessary.

8.2.4.4.1.1 ISS CCP2 Reset Behavior

On hardware or software reset of the ISS, all registers in the CCP2 receiver are reset to their reset values.

The two sources for CCP2 software reset are:

- Global reset for the whole ISS – [ISS_HL_SYSCONFIG\[0\] SOFTRESET](#) bit
- Local reset, affecting only the CCP2 module. The reset is initiated by writing 0x1 in the [CCP2_SYSCONFIG\[1\] SOFT_RESET](#) bit. The reset done status can be check by reading the [CCP2_SYSSTATUS\[0\] RESET_DONE](#) bit.

8.2.4.4.2 ISS CCP2 Programming Event and Status Checking

When an event occurs, the corresponding bit in the [CCP2_LC01_IRQSTATUS](#), [CCP2_LC23_IRQSTATUS](#), or [CCP2_LCM_IRQSTATUS](#) register is set. Each event can be individually masked using the [CCP2_LC01_IRQENABLE](#), [CCP2_LC23_IRQENABLE](#), or [CCP2_LCM_IRQENABLE](#) register. Masked events are not transmitted to the interrupt line, but the [CCP2_LC01_IRQSTATUS](#), [CCP2_LC23_IRQSTATUS](#), or [CCP2_LCM_IRQSTATUS](#) register is updated.

Events transmitted to the ISS interrupt merger can be mapped to the Cortex-A9 or Cortex-M3 MPU

subsystem or DSP by unmasking ISS_HL_IRQENABLE_SET_i[] CCP2_IRQj (where i = 0 to 5, j = 0, 1, 2, 3, and 8). Only the ISS_HL_IRQENABLE_SET_5 output line is connected to the Cortex-A9 MPU interrupt controller, and only the ISS_HL_IRQENABLE_SET_4 output line is connected to the DSP interrupt controller. The Cortex-M3 interrupt controller, however, is connected to all six output lines of ISS_HL_IRQENABLE_SET_i (where i = 0 to 5). To clear an event, the following actions are required:

- Clear the event at the CCP2 receiver level by writing 1 to the corresponding bit in the [CCP2_LC01_IRQSTATUS](#), [CCP2_LC23_IRQSTATUS](#) or [CCP2_LCM_IRQSTATUS](#) register.
- Events generated by the submodules and ISS top level clear it. Each event that generates an interrupt can be individually enabled by setting the appropriate bit in the ISS_HL_IRQENABLE_SET_i register. It is disabled by setting the appropriate bit in the ISS_HL_IRQENABLE_CLR_i register. When an event occurs, the corresponding bit in the ISS_HL_IRQSTATUS_i register is set, regardless of whether or not the event is enabled. Bits in the ISS_HL_IRQSTATUS_i registers are set only when an enabled event occurs. Software can clear a pending HS_VS_IRQ event by setting the appropriate bit ISS_HL_IRQSTATUS[17] HS_VS_IRQ. Events generated by submodules are automatically cleared at ISS top level when they are cleared at submodule level.

8.2.4.4.3 ISS CCP2 Programming Register Accessibility During Frame Processing

There are two types of register accesses in the CCP2 receiver:

- Shadowed registers:
 - These registers/fields can be read and written (if the field is writable) at any time. However, written values take effect only at the start of a frame. Reads return the most-recent write, even though the settings are not used until the next start of frame.
 - The shadowed registers are:
 - [CCP2_LCx_CTRL](#)
 - [CCP2_LCx_CODE](#)
 - [CCP2_LCx_STAT_START](#)
 - [CCP2_LCx_STAT_SIZE](#)
 - [CCP2_LCx_SOF_ADDR](#)
 - [CCP2_LCx_EOF_ADDR](#)
 - [CCP2_LCx_DAT_SIZE](#)
 - [CCP2_LCx_DAT_PING_ADDR](#)
 - [CCP2_LCx_DAT_PONG_ADDR](#)
 - [CCP2_LCx_DAT_OFST](#)
- Busy-locked registers:
 - These registers/fields must not be written if the module is busy.
 - All register fields not listed as shadowed are busy-writable registers.

8.2.4.4.4 ISS CCP2 Programming Enable/Disable the Hardware

The CCP2 receiver is globally controlled by the [CCP2_CTRL](#) register. The bit fields in this register must not be modified when the CCP2 interface is active (except [CCP2_CTRL\[0\] IF_EN](#)).

[Table 8-60](#) and [Table 8-61](#) list the procedures to enable and disable, respectively, the interface.

Table 8-60. ISS CCP2 Interface Enable

| Step | Bit Field | Value |
|---|------------------------------------|-------|
| Clear the interface. Data acquisition starts on the following FSC synchronization code. | CCP2_CTRL[0] IF_EN | 0x1 |
| Reset the output FIFO of the module; the reset is caused by the 0-to-1 edge transition. | CCP2_CTRL[0] IF_EN | 0x1 |

Table 8-61. ISS CCP2 Interface Disable

| Step | Bit Field | Value |
|--|---------------------------------|-------|
| Disable interface. <ul style="list-style-type: none"> The interface is disabled immediately if <code>CCP2_CTRL[3] FRAME = 0x0</code>. If <code>CCP2_CTRL[3] FRAME = 0x1</code> and <code>CCP2_LCx_CTRL[2] CRC_EN = 0x0</code>, the interface is disabled after the FEC synchronization code is received. If <code>CCP2_CTRL[3] FRAME = 0x1</code> and <code>CCP2_LCx_CTRL[2] CRC_EN = 0x1</code>, the interface is disabled only after the 16-bit CRC checksum and 16-bit pad data is received. Before disabling the interface (<code>IF_EN = 0</code>), it is advised to disable all active channels by writing <code>CCP2_LCx_CTRL[0] CHAN_EN = 0x0</code>. Otherwise, if <code>IF_EN = 0</code> is set during a vertical blanking period, the reception continues until the FEC synchronization code is received for all active channels. | <code>CCP2_CTRL[0] IF_EN</code> | 0x0 |

8.2.4.4.5 ISS CCP2 Programming Select the Signaling Scheme

Table 8-62 lists the procedure to select the signaling scheme.

Table 8-62. ISS CCP2 Select the Signaling Scheme

| Step | Bit Field | Value |
|---|--|-------------------------------------|
| Selects whether the data/strobe or data/clock signaling scheme is used. For the correct settings as a function of the image sensor class, see Section 8.2.3, ISS CSI2 PHY . This setting must also be configured in the control module. | See Section 8.2.3, ISS CSI2 PHY . For the register and bit field, see Chapter 19, Control Module (<code>CONTROL_CAMERA_RX</code> register). | 0x0: Data/clock 0x1: Data/strobe |

8.2.4.4.6 ISS CCP2 Programming Select the Mode: MIPI CSI1 or CCP2

Table 8-63 lists the procedure to select MIPI CSI1 or CCP2 mode.

Table 8-63. ISS CCP2 Select MIPI CSI1 or CCP2 Mode

| Step | Bit Field | Value |
|--|--------------------------------|--|
| Selects whether the CCP2 module works in MIPI CSI1 or CCP2-compatible mode | <code>CCP2_CTRL[4] MODE</code> | 0x0: Disables the CCP2-specific features (data/strobe, CRC, logical channels, RAW6, RAW7, and DPCM data formats) 0x1: CCP2 mode |

8.2.4.4.7 ISS CCP2 Programming Burst Settings

Table 8-64 lists the procedure to configure the burst settings.

Table 8-64. ISS CCP2 Configure Burst Settings

| Step | Bit Field | Value |
|--|---|---|
| The module can be forced to perform single 64-bit requests or bursts of 2x, 4x, 8x, and 16 x 64 bits. The module must always use 16 x 64. The FIFO size is 64 x 64 bits. | <code>CCP2_CTRL[6:5] BURST</code> <code>CSI2_CTRL[16] BURST_SIZE_EXPAND</code> | 0x0: Single request. 0x1: 2 x 64-bit bursts 0x2: 4 x 64-bit bursts 0x3: 8 x 64-bit bursts 0x4: 16 x 64-bit bursts (with burst expand) |

Table 8-64. ISS CCP2 Configure Burst Settings (continued)

| Step | Bit Field | Value |
|--|--|--|
| Enable 128 bytes (recommended setting) of the DMA CSI2/CCP DMA engine to burst 128 bytes over the L3 interconnect. | CSI2_CTRL [16] BURST_SIZE_EXPAND | 0x0: Use the burst size defined in the BURST_SIZE bit field. 0x1: Allow generation of 16 x 64-bit bursts. |

8.2.4.4.8 ISS CCP2 Programming Debug Mode

[Table 8-65](#) lists the procedure to enable debug mode.

Table 8-65. ISS CCP2 Enable Debug Mode

| Step | Bit Field | Value |
|--------------------|---------------------------------------|-------|
| Enable debug mode. | CCP2_CTRL [13] DBG_EN | 0x1 |

- During debug mode, the input comes from the [CCP2_DBG](#) register, not from the CCP2 physical interface. The full CCP2 receiver function can be debugged in debug mode. Full 32-bit values must always be written to the [CCP2_DBG](#) register.
- The following bit has no effect during debug mode:
 - [CCP2_CTRL](#)[0] IF_EN
- The following examples apply to the [CCP2_DBG](#) register:
 - Synchronization codes: [CCP2_DBG](#) = 0xFF000000 (LSC) or 0xFF000001 (LEC) or 0xFF000002 (FSC) or 0xFF000003 (FEC)
 - To send the RAW12 pixels 0x673, 0x452, 0x01d, 0xefc, 0xab0, 0x891, 0x326, and 0x547, write [CCP2_DBG](#) = 0x01234567 followed by [CCP2_DBG](#) = 0x89abcdef and [CCP2_DBG](#) = 0x76543210.

NOTE: Each write to the [CCP2_DBG](#) register sends a full 32-bit word through the CCP2 receiver hardware. When 8- or 16-bit writes are performed to the register, the previous 32-bit value is merged with the newly written one. When the driver writes, for example, 0x01234567 followed by 0x0000 00FF the MPU subsystem informs that only 8 bits are written), the CCP2 receiver pipeline gets 0x01234567 followed by 0x012345FF.

8.2.4.4.9 ISS CCP2 Programming Video Port

[Table 8-66](#) lists the procedure to configure the video port.

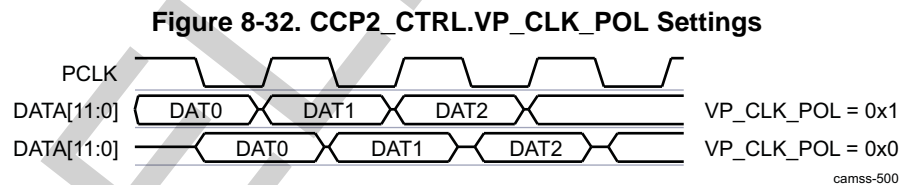
Table 8-66. ISS CCP2 Configure Video Port

| Step | Bit Field | Value |
|---|---|---|
| Set the video port output frequency. It varies from ISS_FLCK down to ISS_FLCK/65,536 MHz. | CCP2_CTRL [31:15] FRACDIV | From 1 to 65,536 |
| Enable video port clock during vertical blanking periods or not. | CCP2_CTRL [9] VP_CLK_FORCE_ON | 0x0: The video port clock is gated during vertical blanking periods. 0x1: The video port clock is free-running during vertical blanking periods. |

Table 8-66. ISS CCP2 Configure Video Port (continued)

| Step | Bit Field | Value |
|---|--|---|
| Controls whether the video-port output is the only output interface enabled and applies for all channels. When CCP2_CTRL[11] VP_ONLY_EN = 0x1, the data are output only to the video port; the interface master port is not used. The two parts of the frame (embedded data and pixel data) are output to the video port (instead of pixel data to the video port and embedded data to the interconnect). <ul style="list-style-type: none"> The video port outputs the embedded data defined by the CCP2_LCx_STAT_START and CCP2_LCx_STAT_SIZE registers without decompression. The video port outputs the pixel data defined by the CCP2_LCx_DAT_START and CCP2_LCx_DAT_SIZE registers. | CCP2_CTRL[11] VP_ONLY_EN | |
| Control the video port pixel clock polarity: (Recommended setting: rising edge) | CCP2_CTRL[12] VP_CLK_POL | 0x0: The CCP2 receiver writes the data on the video port on the pixel-clock falling edge. The module connected to the video port samples the data on the pixel clock rising edge. 0x1: The CCP2 receiver writes the data on the video port on the pixel-clock rising edge. The module connected to the video port samples the data on the pixel clock falling edge. Figure 8-32 shows the settings for CCP2_CTRL.VP_CLK_POL . |

[Figure 8-32](#) shows the settings for [CCP2_CTRL.VP_CLK_POL](#).



8.2.4.4.10 ISS CCP2 Programming Logical Channels

The CCP2 receiver supports simultaneous logical channels. Each logical channel is controlled independently with its own set of registers. The four sets of registers are identical, but some reset values are different.

The same description applies to all four logical channels (LCx, where x = 0 to 3).

All the registers in this section can be modified at any time. However, the modifications apply only from the start of the following frame.

8.2.4.4.11 ISS CCP2 Programming Controls

[Table 8-67](#) lists the procedure to enable the logical channels.

Table 8-67. ISS CCP2 Enable Logical Channels

| Step | Bit Field | Value |
|--|--|-------|
| Enable logical channels. It has no effect if CCP2_CTRL[4] MODE = 0x0. By default, all logical channels except logical channel 0 are disabled. Only the pixel data of one logical channel can go to the video preprocessing hardware; the SOF and EOF lines are always sent to memory through the interconnect interface. | CCP2_LCx_CTRL[0] CHAN_EN | 0x1 |

8.2.4.4.12 ISS CCP2 Programming Region-of-Interest

[Table 8-68](#) lists the procedure to enable the region-of-interest.

Table 8-68. ISS CCP2 Enable Region-of-Interest

| Step | Bit Field | Value |
|---|--|-------|
| Enables the region-of-interest feature (SOF lines, pixel data, and EOF lines): <ul style="list-style-type: none"> If enabled, register settings set the position and size of each region; all data not in a region of interest are ignored. If disabled, all data in the frame are output. CCP2_LCx_CTRL[1] REGION_EN is set to 0x0 for a JPEG bitstream. | CCP2_LCx_CTRL[1] REGION_EN | 0x1 |

8.2.4.4.13 ISS CCP2 Programming CRC

[Table 8-69](#) lists the procedure to enable the CRC.

Table 8-69. ISS CCP2 Enable the CRC

| Step | Bit Field | Value |
|--|---|-------|
| Enable the CRC. If the received checksum and the computed checksum do not match, an interrupt is triggered: the corresponding event is LCx_CRC_IRQ . Setting CCP2_LCx_CTRL[2] CRC_EN = 0x1 has no effect if CCP2_CTRL[4] MODE = 0x0. | CCP2_LCx_CTRL[2] CRC_EN | 0x1 |

8.2.4.4.14 ISS CCP2 Programming Destination Format

Control the destination format:

- The CCP2 receiver reformats received data to store it in memory or to send it to the video preprocessing.
- The [CCP2_LCx_CTRL\[7:3\] FORMAT](#) bit field controls the destination-data format:
 - EXP8 = Data expansion to 8 bits, padding with zeros
 - EXP16 = Data expansion to 16 bits, padding with alpha or zeros. The [CCP2_CTRL\[15:8\] ALPHA](#) bit field can be used to set an alpha value. For RGB444 + EXP16:
 - [data_out \[31:28\] = ALPHA \[3:0\]](#)
 - [data_out \[15:12\] = ALPHA \[3:0\]](#)
 - EXP32 = Data expansion to 32 bits, padding with alpha. The [CCP2_CTRL\[15:8\] ALPHA](#) bit field can be used to set an alpha value. For RGB888 + EXP32: [data_out \[31:24\] = ALPHA \[7:0\]](#)
 - FSP = False synchronization protection code decoding. Applies only to JPEG8 data format.
 - VP = Output to video preprocessing is enabled.

8.2.4.4.15 ISS CCP2 Programming Frame Acquisition

Table 8-70 lists the procedure to acquire frames.

Table 8-70. ISS CCP2 Frame Acquisition

| Step | Bit Field | Value |
|---|---|--|
| Program the number of frames that the CCP2 receiver acquires. The value of COUNT is decremented after each frame received. | CCP2_LCx_CTRL [31:24] COUNT | 0: The counter is free-running (default value). 1255: Remaining frames to be acquired |
| Writes to the COUNT bit field are controlled by the COUNT_UNLOCK bit. | CCP2_LCx_CTRL [16] COUNT_UNLOCK | |
| Configures PING and PONG addresses | CCP2_LCx_DAT_PING_ADDR and CCP2_LCx_DAT_PONG_ADDR | |
| Indicates whether the PING address or PONG address was used to store the pixel data of the last frame. After reset or after a 0-to-1 edge transition in CCP2_CTRL [0] IF_EN, the pixel data are written in the PING buffer and CCP2_LCx_CTRL [17] PING_PONG = 0x1 (PONG). After the first FEC synchronization code is received, the pixel data are written in the PONG buffer and CCP2_LCx_CTRL [17] PING_PONG = 0x0 (PING). CCP2_LCx_CTRL [17] PING_PONG toggles after every FEC synchronization code. | CCP2_LCx_CTRL [17] PING_PONG | |

After the correct number of frames is received, acquisition is automatically disabled ([CCP2_LCx_CTRL](#)[0] CHAN_EN = 0x0) and the COUNT_IRQ interrupt is triggered. The programmer can re-enable the acquisition by resetting the [CCP2_LCx_CTRL](#)[0] CHAN_EN bit to 0x1.

8.2.4.4.16 ISS CCP2 Programming Synchronization Codes

The FSC, FEC, LSC, and LEC synchronization codes have default values given by the *SMIA CCP2 Specification v1.0*. Also, each logical channel is identified by a default identifier.

The [CCP2_LCx_CODE](#) register enables overwriting of the default values: [CCP2_LCx_CODE](#)[11:8] FSC, [CCP2_LCx_CODE](#)[15:12] FEC, [CCP2_LCx_CODE](#)[3:0] LSC, and [CCP2_LCx_CODE](#)[7:4] LEC overwrite the 4 LSBs of the 32-bit synchronization codes. The default values must not be modified.

8.2.4.4.17 ISS CCP2 Programming Status Data

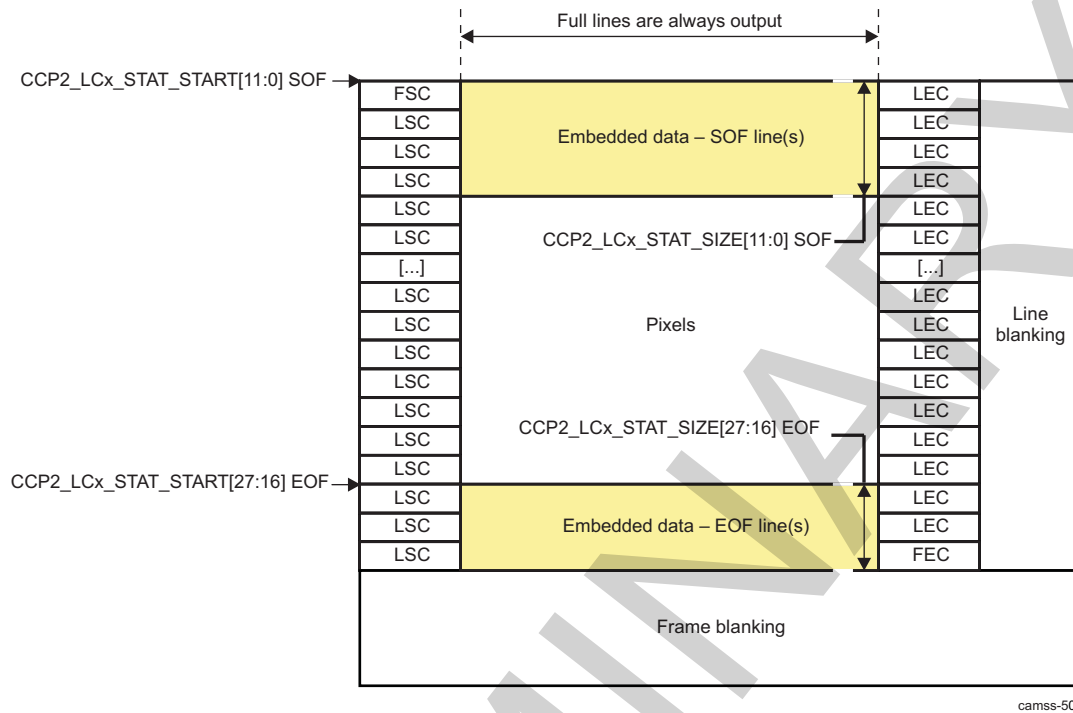
The SOF and EOF status lines can be output to memory.

The SOF and EOF status lines always cover full lines. No register settings enable the setting of width.

The [CCP2_LCx_STAT_START](#) register enables the setting of the vertical start position of the SOF and EOF status lines. Because the SOF status line comes first in the CCP2 frame, [CCP2_LCx_STAT_START](#)[11:0] SOF = 0x0.

The [CCP2_LCx_STAT_SIZE](#) register enables the setting of the numbers of SOF and EOF status lines. If [CCP2_LCx_STAT_SIZE](#)[11:0] SOF = 0x0 and [CCP2_LCx_STAT_SIZE](#)[27:16] EOF = 0x0, no status data are output.

Figure 8-33 shows the SOF and EOF region settings. The SOF and EOF status lines and the pixel data must not overlap, but can be consecutive.

Figure 8-33. ISS CCP2 SOF and EOF Region Settings

camss-501

The 32-bit destination addresses of the SOF status lines are set by the [CCP2_LCx_SOF_ADDR](#) register.

NOTE: The destination addresses of the SOF status lines must be aligned on a 32-byte boundary; the 5 LSBs of the address are ignored. The SOF lines are packed together at the destination address.

The 32-bit destination addresses of the EOF status lines are set by the [CCP2_LCx_EOF_ADDR](#) register.

NOTE: The destination addresses of the EOF status lines must be aligned on a 32-byte boundary; the 5 LSBs of the address are ignored. The EOF lines are packed together at the destination address.

NOTE: The CCP2 receiver does not modify the data in the SOF and EOF status lines. The data are received and written with no modifications.

8.2.4.4.18 ISS CCP2 Programming Pixel Data Region

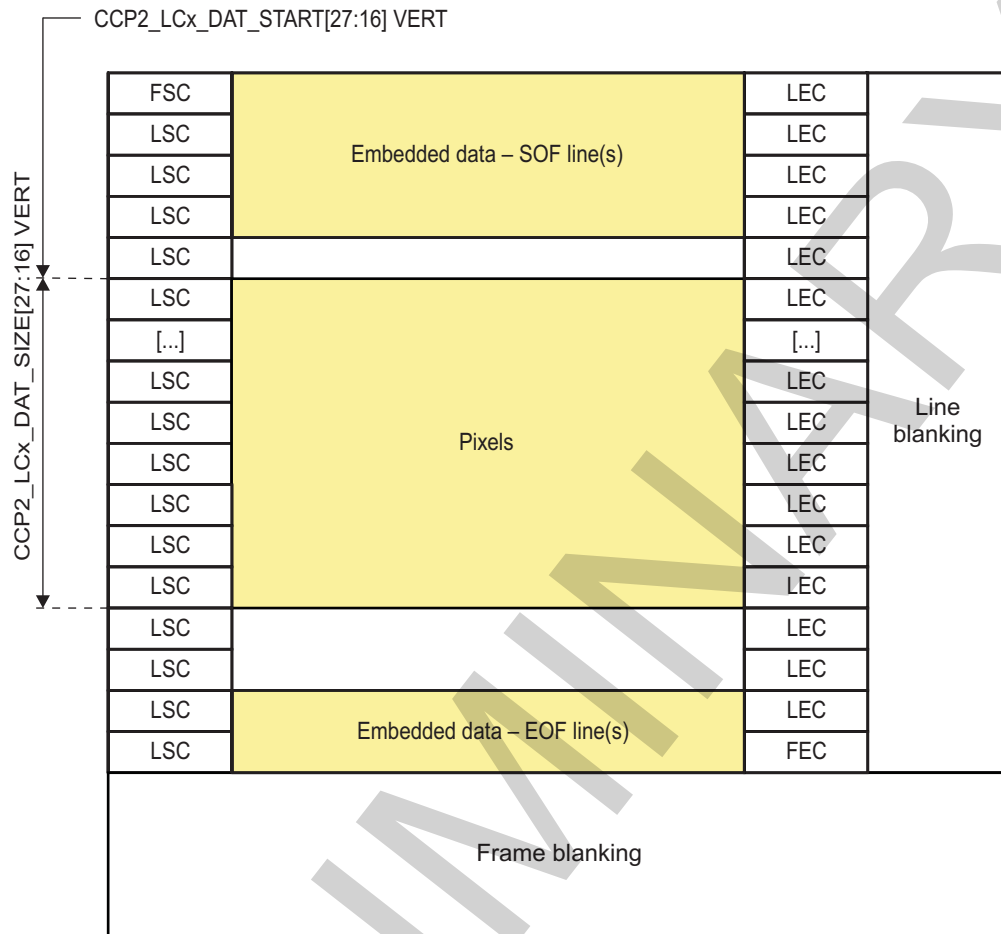
Pixel data can be output to memory or to the video-preprocessing hardware.

The pixel data region covers full lines. The [CCP2_LCx_DAT_SIZE](#) register sets the horizontal size of the pixel region. The vertical size is expressed in lines.

The [CCP2_LCx_DAT_START](#) register enables the setting of the vertical start position of the pixel data. The vertical start position is expressed in lines.

[Figure 8-34](#) shows the pixel region settings.

Figure 8-34. ISS CCP2 Pixel Data Region Settings



camss-502

The 32-bit destination addresses of the pixel data are set by the [CCP2_LCx_DAT_PING_ADDR](#) and [CCP2_LCx_DAT_PONG_ADDR](#) registers.

NOTE: The destination address must be aligned on a 32-byte boundary; the 5 LSBs of the address are ignored. The pixel data lines are packed together at the destination address.

It is possible to perform double-buffering (ping-ponging) at the destination by setting different addresses in the [CCP2_LCx_DAT_PING_ADDR](#) and [CCP2_LCx_DAT_PONG_ADDR](#) registers. It is possible to disable double-buffering by setting up the same address in both registers. The [CCP2_LCx_CTRL\[17\]](#) PING_PONG bit must be used by software to determine which address contains the latest frame.

A destination pitch controls the address jump between the address of the first pixel of the previous line and the address of the first pixel of the current line. The destination pitch is set in bytes with the [CCP2_LCx_DAT_OFST](#) register. It applies for [CCP2_LCx_DAT_PING_ADDR](#) and [CCP2_LCx_DAT_PONG_ADDR](#).

NOTE: The destination pitch must be a multiple of 32 bytes; the 5 LSBs of the address are ignored.

The destination data format is set with the [CCP2_LCx_CTRL\[7:2\]](#) FORMAT bit field.

For the PING frame:

- @Line0 = [CCP2_LCx_DAT_PING_ADDR](#)
- @Line1 = @Line0 + [CCP2_LCx_DAT_OFST](#)

- @Line2 = @Line1 + CCP2_LCx_DAT_OFST

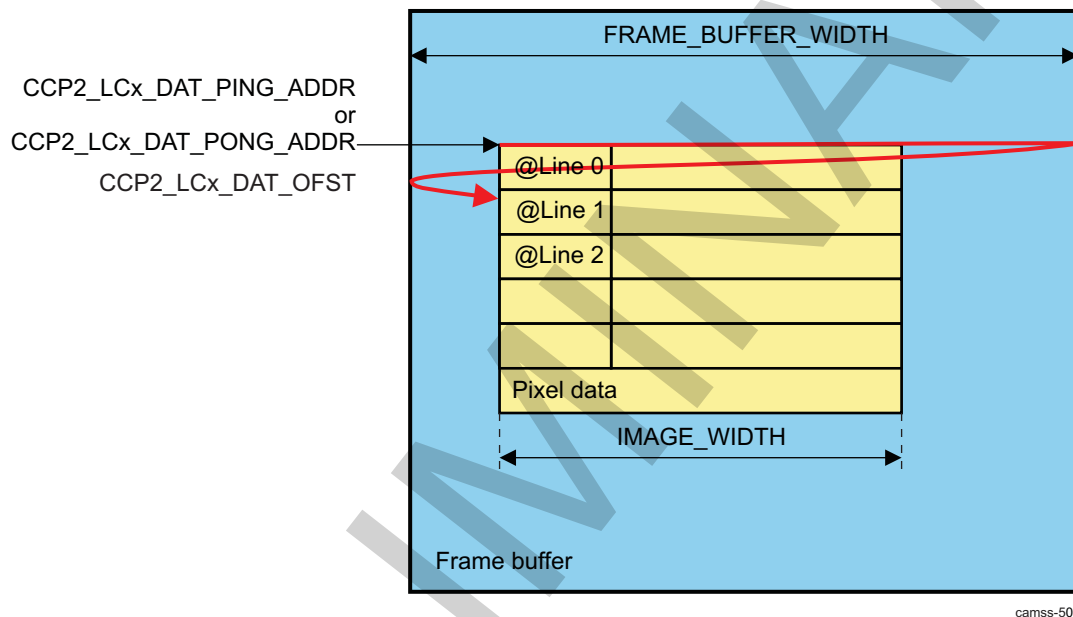
For the PONG frame:

- @Line0 = CCP2_LCx_DAT_PONG_ADDR
- @Line1 = @Line0 + CCP2_LCx_DAT_OFST
- @Line2 = @Line1 + CCP2_LCx_DAT_OFST

When CCP2_LCx_DAT_OFST = 0x0, the lines are written contiguously in memory. The destination pitch enables 2D transfers; it is required to write the pixel data directly in the frame buffer, for instance.

In such cases, CCP2_LCx_DAT_OFST = FRAME_BUFFER_WIDTH. Figure 8-35 shows the pixel data destination settings.

Figure 8-35. ISS CCP2 Pixel Data Destination Settings



8.2.4.4.19 ISS CCP2 Programming Memory Read Channel

8.2.4.4.19.1 ISS CCP2 Write Data From Sensor to Memory

Data can be captured from the sensor using any logical channel. To keep the native data format, the channel format must be set to YUV4:2:2 little-endian format.

8.2.4.4.19.2 ISS CCP2 Read Data From Memory

Table 8-71 lists the procedure to configure read data from memory.

Table 8-71. ISS CCP2 Configure Read Data From Memory

| Step | Bit Field | Value |
|--|-------------------------------|-------|
| Disable all logical channels. | CCP2_CTRL[0] IF_EN | 0x0 |
| Wait until disabling of the physical interface is effective before enabling the memory read channel. | CCP2_CTRL[3] FRAME | 0x1 |
| Configure the burst size. The recommended value for best performance is 0x4 (16 × 64-bit burst). | CCP2_LCM_CTRL[7:5] BURST_SIZE | – |

Table 8-71. ISS CCP2 Configure Read Data From Memory (continued)

| Step | Bit Field | Value |
|---|--|--------------------------------|
| <p>Configure the source data format, location, and framing.</p> <p>In addition to the CCP2_LCM_HSIZE[11:0] SKIP and CCP2_LCM_HSIZE[27:16] COUNT bit fields, firmware must specify the amount of data to be fetched from memory. This value is set in 64-bit word steps and must be a multiple of 32 bytes (four words of 64 bits). The value is computed with the following formula:</p> $\text{HWORDS} = 4 \times \text{ceil}((\text{SKIP} + \text{COUNT}) \times \text{bits_per_pixel}) / (8 \times 32) \quad (3)$ <p>The CCP2_LCM_SRC_ADDR and CCP2_LCM_SRC_OFST registers must be aligned on 32-byte boundaries for correct operation. For best performance, both registers must be aligned on 256-byte boundaries. See the example following this table.</p> | CCP2_LCM_CTRL , CCP2_LCM_HSIZE , CCP2_LCM_VSIZE , CCP2_LCM_PREFETCH , CCP2_LCM_SRC_ADDR , CCP2_LCM_SRC_OFST | |
| Select destination. | CCP2_LCM_CTRL[2] DST_PORT | 0x0: Video port 0x1: Memory |
| If destination = video port, configure clock frequency and its gating during frame blanking periods. | CCP2_CTRL[31:15] FRACDIV, CCP2_CTRL[9] VP_CLK_FORCE_ON | |
| If needed, configure READ_THROTTLE to reduce the bandwidth in memory-to-memory operation to prevent system overload. It has no effect when data are sent to the video port (controlled by video port clock in this case). | CCP2_LCM_CTRL[4:3] READ_THROTTLE | |
| If the memory write port is used, the destination format and address must be configured. | CCP2_LCM_DST_ADDR , CCP2_LCM_DST_OFST | |
| Enable memory read channel. After processing a full frame, this bit is automatically cleared by hardware and an EOF event is triggered. | CCP2_LCM_CTRL[0] CHAN_EN | 0x1 |

Example:

- [CCP2_LCM_CTRL\[7:5\]](#) BURST_SIZE is set to 16 × 64 bits
 - [CCP2_LCM_HSIZE\[11:0\]](#) SKIP = 0
 - [CCP2_LCM_HSIZE\[27:16\]](#) COUNT = 1000
 - [CCP2_LCM_CTRL\[23\]](#) SRC_PACK = YES
 - [CCP2_LCM_CTRL\[18:16\]](#) SRC_FORMAT = RAW6
 - [CCP2_LCM_PREFETCH\[15:3\]](#) HWORDS = 96 (=94)
- Setting the size to 94 produces the following burst sequence: 16, 16, 16, 16, 16, 8, and 4 (7 interconnect requests). However, when it is set to 96, the burst sequence is 6 × 16 (6 interconnect requests).

8.2.4.5 ISS CCP2 Register Manual

8.2.4.5.1 ISS CCP2 Instance Summary

[Table 8-72](#) summarizes the CCP2 instance.

Table 8-72. ISS CCP2 Instance Summary

| Module Name | L3 Base Address | Size |
|--------------------------|-----------------|-----------|
| ISS_CCP2 | 0x5200 1C00 | 512 bytes |

8.2.4.5.2 ISS CCP2 Registers

8.2.4.5.2.1 ISS CCP2 Register Summary

Table 8-73 lists the CCP2 registers.

Table 8-73. ISS CCP2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_CCP2 Base Address |
|---------------------------------------|------|-----------------------|--------------------------|--------------------------|
| CCP2_REVISION | R | 32 | 0x0000 0000 | 0x5200 1C00 |
| CCP2_SYSCONFIG | RW | 32 | 0x0000 0004 | 0x5200 1C04 |
| CCP2_SYSSTATUS | R | 32 | 0x0000 0008 | 0x5200 1C08 |
| CCP2_LC01_IRQENABLER | RW | 32 | 0x0000 000C | 0x5200 1C0C |
| CCP2_LC01_IRQSTATUS | RW | 32 | 0x0000 0010 | 0x5200 1C10 |
| CCP2_LC23_IRQENABLER | RW | 32 | 0x0000 0014 | 0x5200 1C14 |
| CCP2_LC23_IRQSTATUS | RW | 32 | 0x0000 0018 | 0x5200 1C18 |
| CCP2_LCM_IRQENABLE | RW | 32 | 0x0000 002C | 0x5200 1C2C |
| CCP2_LCM_IRQSTATUS | RW | 32 | 0x0000 0030 | 0x5200 1C30 |
| CCP2_CTRL | RW | 32 | 0x0000 0040 | 0x5200 1C40 |
| CCP2_DBG | W | 32 | 0x0000 0044 | 0x5200 1C44 |
| CCP2_GNQ | R | 32 | 0x0000 0048 | 0x5200 1C48 |
| CCP2_CTRL1 | RW | 32 | 0x0000 004C | 0x5200 1C4C |
| CCP2_LCx_CTRL ⁽¹⁾ | RW | 32 | 0x0000 0050 + (x * 0x30) | 0x5200 1C50 + (x * 0x30) |
| CCP2_LCx_CODE ⁽¹⁾ | RW | 32 | 0x0000 0054 + (x * 0x30) | 0x5200 1C54 + (x * 0x30) |
| CCP2_LCx_STAT_START ⁽¹⁾ | RW | 32 | 0x0000 0058 + (x * 0x30) | 0x5200 1C58 + (x * 0x30) |
| CCP2_LCx_STAT_SIZE ⁽¹⁾ | RW | 32 | 0x0000 005C + (x * 0x30) | 0x5200 1C5C + (x * 0x30) |
| CCP2_LCx_SOF_ADDR ⁽¹⁾ | RW | 32 | 0x0000 0060 + (x * 0x30) | 0x5200 1C60 + (x * 0x30) |
| CCP2_LCx_EOF_ADDR ⁽¹⁾ | RW | 32 | 0x0000 0064 + (x * 0x30) | 0x5200 1C64 + (x * 0x30) |
| CCP2_LCx_DAT_START ⁽¹⁾ | RW | 32 | 0x0000 0068 + (x * 0x30) | 0x5200 1C68 + (x * 0x30) |
| CCP2_LCx_DAT_SIZE ⁽¹⁾ | RW | 32 | 0x0000 006C + (x * 0x30) | 0x5200 1C6C + (x * 0x30) |
| CCP2_LCx_DAT_PING_ADDR ⁽¹⁾ | RW | 32 | 0x0000 0070 + (x * 0x30) | 0x5200 1C70 + (x * 0x30) |
| CCP2_LCx_DAT_PONG_ADDR ⁽¹⁾ | RW | 32 | 0x0000 0074 + (x * 0x30) | 0x5200 1C74 + (x * 0x30) |
| CCP2_LCx_DAT_OFST ⁽¹⁾ | RW | 32 | 0x0000 0078 + (x * 0x30) | 0x5200 1C78 + (x * 0x30) |
| CCP2_LCM_CTRL | RW | 32 | 0x0000 01D0 | 0x5200 1DD0 |
| CCP2_LCM_VSIZE | RW | 32 | 0x0000 01D4 | 0x5200 1DD4 |
| CCP2_LCM_HSIZE | RW | 32 | 0x0000 01D8 | 0x5200 1DD8 |
| CCP2_LCM_PREFETCH | RW | 32 | 0x0000 01DC | 0x5200 1DDC |
| CCP2_LCM_SRC_ADDR | RW | 32 | 0x0000 01E0 | 0x5200 1DE0 |
| CCP2_LCM_SRC_OFST | RW | 32 | 0x0000 01E4 | 0x5200 1DE4 |
| CCP2_LCM_DST_ADDR | RW | 32 | 0x0000 01E8 | 0x5200 1DE8 |
| CCP2_LCM_DST_OFST | RW | 32 | 0x0000 01EC | 0x5200 1DEC |
| CCP2_LCM_HISTORY | RW | 32 | 0x0000 01F0 | 0x5200 1DF0 |

⁽¹⁾ x = 0 to 3

8.2.4.5.2.2 ISS CCP2 Register Description

Table 8-74 through Table 8-139 describe the CCP2 registers.

Table 8-74. CCP2_REVISION

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0000 | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1C00 | | |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP revision | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 8-75. Register Call Summary for Register CCP2_REVISION

ISS Interfaces

- [ISS CCP2 Register Summary: \[0\]](#)

Table 8-76. CCP2_SYSCONFIG

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0004 | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1C04 | | |
| Description | SYSTEM CONFIGURATION REGISTER This register is the OCP-socket system configuration register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----------|----|----|----|---|---|---|---|---|---|------------|---|-----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MSTANDBY_MODE | | RESERVED | | | | | | | | | | SOFT_RESET | | AUTO_IDLE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:12 | MSTANDBY_MODE | Sets the behavior of the master port power management signals. 0x0: Force-standby. MStandby is only asserted when the module is disabled. 0x1: No-standby. MStandby is never asserted. 0x2: Smart-standby: MStandby is asserted based on the activity of the module. The module will try to go to standby during the vertical blanking period. | RW | 0x0 |
| 11:2 | RESERVED | | R | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 1 | SOFT_RESET | Software reset. Set the bit to 1 to trigger a module reset. The bit is automatically reset by the hardware. During reads return 0. 0x0: Normal mode. 0x1: The module is reset | RW | 0 |
| 0 | AUTO_IDLE | Internal OCP clock gating strategy. 0x0: OCP clock is free-running. 0x1: Automatic OCP clock gating strategy is applied based on the OCP interface activity. | RW | 1 |

Table 8-77. Register Call Summary for Register CCP2_SYSCONFIG

ISS Interfaces

- [ISS CCP2 Reset Behavior: \[0\]](#)
- [ISS CCP2 Register Summary: \[1\]](#)

Table 8-78. CCP2_SYSSTATUS

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0008 | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1C08 | | |
| Description | SYSTEM STATUS REGISTER This register provides status information about the module, excluding the interrupt status register. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESET_DONE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Write 0's for future compatibility. Reads returns 0. | R | 0x0000 0000 |
| 0 | RESET_DONE | Internal reset monitoring Read 0x1: Reset completed. Read 0x0: Internal module reset is on going. | R | 1 |

Table 8-79. Register Call Summary for Register CCP2_SYSSTATUS

ISS Interfaces

- [ISS CCP2 Reset Behavior: \[0\]](#)
- [ISS CCP2 Register Summary: \[1\]](#)

Table 8-80. CCP2_LC01_IRQENABLE

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 000C | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1C0C | | |
| Description | INTERRUPT ENABLE REGISTER - LOG CHAN 0 1 This register regroups all the events related to logical channel 0 and logical channel 1. The events related to logical channel 0 trigger SINTERRUPTN[0]. The events related to logical channel 1 trigger SINTERRUPTN[1]. The channel shall be enabled for events to be generated on that channel. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|------------------|----------|----|----|----|------------|------------|------------|------------|---------------|----------|------------------|-------------|-------------|------------|-------------|----------|------------------|----------|----|----|----|------------|------------|------------|------------|---------------|----------|------------------|-------------|-------------|------------|-------------|----------|
| LC1_OCPERROR_IRQ | RESERVED | | | | LC1_FS_IRQ | LC1_LE_IRQ | LC1_LS_IRQ | LC1_FE_IRQ | LC1_COUNT_IRQ | RESERVED | LC1_FIFO_OVF_IRQ | LC1_CRC_IRQ | LC1_FSP_IRQ | LC1_FW_IRQ | LC1_FSC_IRQ | RESERVED | LC0_OCPERROR_IRQ | RESERVED | | | | LC0_FS_IRQ | LC0_LE_IRQ | LC0_LS_IRQ | LC0_FE_IRQ | LC0_COUNT_IRQ | RESERVED | LC0_FIFO_OVF_IRQ | LC0_CRC_IRQ | LC0_FSP_IRQ | LC0_FW_IRQ | LC0_FSC_IRQ | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|-------|
| 31 | LC1_OCPERROR_IRQ | An OCP error occurred on the master write port. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 30:28 | RESERVED | | R | 0x0 |
| 27 | LC1_FS_IRQ | Logical channel 1 - Frame start sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 26 | LC1_LE_IRQ | Logical channel 1 - Line end sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 25 | LC1_LS_IRQ | Logical channel 1 - Line start sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 24 | LC1_FE_IRQ | Logical channel 1 - Frame end sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 23 | LC1_COUNT_IRQ | Logical channel 1 - Frame counter reached. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 22 | RESERVED | | R | 0 |
| 21 | LC1_FIFO_OVF_IRQ | Logical channel 1 - FIFO overflow error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 20 | LC1_CRC_IRQ | Logical channel 1 - CRC error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 19 | LC1_FSP_IRQ | Logical channel 1 - FSP error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 18 | LC1_FW_IRQ | Logical channel 1 - Frame width error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|-------|
| 17 | LC1_FSC_IRQ | Logical channel 1 - False sync code error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 16 | RESERVED | Reserved | RW | 0 |
| 15 | LC0_OCPERROR_IRQ | An OCP error occurred on the master write port. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 14:12 | RESERVED | | R | 0x0 |
| 11 | LC0_FS_IRQ | Logical channel 0 - Frame start sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 10 | LC0_LE_IRQ | Logical channel 0 - Line end sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 9 | LC0_LS_IRQ | Logical channel 0 - Line start sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 8 | LC0_FE_IRQ | Logical channel 0 - Frame end sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 7 | LC0_COUNT_IRQ | Logical channel 0 - Frame counter reached. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 6 | RESERVED | | R | 0 |
| 5 | LC0_FIFO_OVF_IRQ | Logical channel 0 - FIFO overflow error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 4 | LC0_CRC_IRQ | Logical channel 0 - CRC error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 3 | LC0_FSP_IRQ | Logical channel 0 - FSP error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 2 | LC0_FW_IRQ | Logical channel 0 - Frame width error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 1 | LC0_FSC_IRQ | Logical channel 0 - False sync code error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 0 | RESERVED | Reserved | RW | 0 |

Table 8-81. Register Call Summary for Register CCP2_LC01_IRQENABLE

ISS Interfaces

- [ISS CCP2 Programming Event and Status Checking: \[0\]](#)
- [ISS CCP2 Register Summary: \[1\]](#)

Table 8-82. CCP2_LC01_IRQSTATUS

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0010 | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1C10 | | |
| Description | <p>INTERRUPT STATUS REGISTER - LOG CHAN 0 1</p> <p>This register regroups all the events related to logical channel 0 and logical channel 1. The events related to logical channel 0 trigger SINTERRUPTN[0]. The events related to logical channel 1 trigger SINTERRUPTN[1]. The channel shall be enabled for events to be generated on that channel.</p> | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|------------------|----------|----|----|----|------------|------------|------------|------------|---------------|----------|------------------|-------------|-------------|------------|-------------|----------|------------------|----------|----|----|----|------------|------------|------------|------------|---------------|----------|------------------|-------------|-------------|------------|-------------|----------|
| LC1_OCPERROR_IRQ | RESERVED | | | | LC1_FS_IRQ | LC1_LE_IRQ | LC1_LS_IRQ | LC1_FE_IRQ | LC1_COUNT_IRQ | RESERVED | LC1_FIFO_OVF_IRQ | LC1_CRC_IRQ | LC1_FSP_IRQ | LC1_FW_IRQ | LC1_FSC_IRQ | RESERVED | LC0_OCPERROR_IRQ | RESERVED | | | | LC0_FS_IRQ | LC0_LE_IRQ | LC0_LS_IRQ | LC0_FE_IRQ | LC0_COUNT_IRQ | RESERVED | LC0_FIFO_OVF_IRQ | LC0_CRC_IRQ | LC0_FSP_IRQ | LC0_FW_IRQ | LC0_FSC_IRQ | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|---------------|-------|
| 31 | LC1_OCPERROR_IRQ | An OCP error occurred on the master write port. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 30:28 | RESERVED | | R | 0x0 |
| 27 | LC1_FS_IRQ | Logical channel 1 - Frame start sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 26 | LC1_LE_IRQ | Logical channel 1 - Line end sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 25 | LC1_LS_IRQ | Logical channel 1 - Line start sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 24 | LC1_FE_IRQ | Logical channel 1 - Frame end sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 23 | LC1_COUNT_IRQ | Logical channel 1 - Frame counter reached status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 22 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|---------------|-------|
| 21 | LC1_FIFO_OVF_IRQ | Logical channel 1 - FIFO overflow error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 20 | LC1_CRC_IRQ | Logical channel 1 - CRC error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 19 | LC1_FSP_IRQ | Logical channel 1 - FSP error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 18 | LC1_FW_IRQ | Logical channel 1 - Frame width error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 17 | LC1_FSC_IRQ | Logical channel 1 - False sync code error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 16 | RESERVED | Reserved | RW | 0 |
| 15 | LC0_OCPERROR_IRQ | An OCP error occurred on the master write port. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 14:12 | RESERVED | | R | 0x0 |
| 11 | LC0_FS_IRQ | Logical channel 0 - Frame start sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 10 | LC0_LE_IRQ | Logical channel 0 - Line end sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 9 | LC0_LS_IRQ | Logical channel 0 - Line start sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 8 | LC0_FE_IRQ | Logical channel 0 - Frame end sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|-------|
| 7 | LC0_COUNT_IRQ | Logical channel 0 - Frame counter reached status 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 6 | RESERVED | | R | 0 |
| 5 | LC0_FIFO_OVF_IRQ | Logical channel 0 - FIFO overflow error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 4 | LC0_CRC_IRQ | Logical channel 0 - CRC error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 3 | LC0_FSP_IRQ | Logical channel 0 - FSP error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 2 | LC0_FW_IRQ | Logical channel 0 - Frame width error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 1 | LC0_FSC_IRQ | Logical channel 0 - False sync code error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 0 | RESERVED | Reserved | RW | 0 |

Table 8-83. Register Call Summary for Register CCP2_LC01_IRQSTATUS

ISS Interfaces

- [ISS CCP2 Programming Event and Status Checking: \[0\] \[1\] \[2\]](#)
- [ISS CCP2 Register Summary: \[3\]](#)

Table 8-84. CCP2_LC23_IRQENABLE

| | | | |
|------------------|---|----------|----------|
| Address Offset | 0x0000 0014 | | |
| Physical Address | 0x5200 1C14 | Instance | ISS_CCP2 |
| Description | INTERRUPT ENABLE REGISTER - LOG CHAN 2 3 This register regroups all the events related to logical channel 2 and logical channel 3. The events related to logical channel 2 trigger SINTERRUPTN[2]. The events related to logical channel 3 trigger SINTERRUPTN[3]. The channel shall be enabled for events to be generated on that channel. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|------------------|----------|----|----|----|------------|------------|------------|------------|---------------|----------|------------------|-------------|-------------|------------|-------------|----------|------------------|----------|----|----|----|------------|------------|------------|------------|---------------|----------|------------------|-------------|-------------|------------|-------------|----------|
| LC3_OCPERROR_IRQ | RESERVED | | | | LC3_FS_IRQ | LC3_LE_IRQ | LC3_LS_IRQ | LC3_FE_IRQ | LC3_COUNT_IRQ | RESERVED | LC3_FIFO_OVF_IRQ | LC3_CRC_IRQ | LC3_FSP_IRQ | LC3_FW_IRQ | LC3_FSC_IRQ | RESERVED | LC2_OCPERROR_IRQ | RESERVED | | | | LC2_FS_IRQ | LC2_LE_IRQ | LC2_LS_IRQ | LC2_FE_IRQ | LC2_COUNT_IRQ | RESERVED | LC2_FIFO_OVF_IRQ | LC2_CRC_IRQ | LC2_FSP_IRQ | LC2_FW_IRQ | LC2_FSC_IRQ | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|-------|
| 31 | LC3_OCPERROR_IRQ | An OCP error occurred on the master write port. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 30:28 | RESERVED | | R | 0x0 |
| 27 | LC3_FS_IRQ | Logical channel 3 - Frame start sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 26 | LC3_LE_IRQ | Logical channel 3 - Line end sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 25 | LC3_LS_IRQ | Logical channel 3 - Line start sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 24 | LC3_FE_IRQ | Logical channel 3 - Frame end sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 23 | LC3_COUNT_IRQ | Logical channel 3 - Frame counter reached. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 22 | RESERVED | | R | 0 |
| 21 | LC3_FIFO_OVF_IRQ | Logical channel 3 - FIFO overflow error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 20 | LC3_CRC_IRQ | Logical channel 3 - CRC error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 19 | LC3_FSP_IRQ | Logical channel 3 - FSP error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 18 | LC3_FW_IRQ | Logical channel 3 - Frame width error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 17 | LC3_FSC_IRQ | Logical channel 3 - False sync code error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 16 | RESERVED | Reserved | RW | 0 |
| 15 | LC2_OCPERROR_IRQ | An OCP error occurred on the master write port. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|-------|
| 14:12 | RESERVED | | R | 0x0 |
| 11 | LC2_FS_IRQ | Logical channel 2 - Frame start sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 10 | LC2_LE_IRQ | Logical channel 2 - Line end sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 9 | LC2_LS_IRQ | Logical channel 2 - Line start sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 8 | LC2_FE_IRQ | Logical channel 2 - Frame end sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 7 | LC2_COUNT_IRQ | Logical channel 2 - Frame counter reached. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 6 | RESERVED | | R | 0 |
| 5 | LC2_FIFO_OVF_IRQ | Logical channel 2 - FIFO overflow error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 4 | LC2_CRC_IRQ | Logical channel 2 - CRC error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 3 | LC2_FSP_IRQ | Logical channel 2 - FSP error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 2 | LC2_FW_IRQ | Logical channel 2 - Frame width error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 1 | LC2_FSC_IRQ | Logical channel 2 - False sync code error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 0 | RESERVED | Reserved | RW | 0 |

Table 8-85. Register Call Summary for Register CCP2_LC23_IRQENABLE

ISS Interfaces

- [ISS CCP2 Programming Event and Status Checking: \[0\]](#)
- [ISS CCP2 Register Summary: \[1\]](#)

Table 8-86. CCP2_LC23_IRQSTATUS

| | |
|-------------------------|---|
| Address Offset | 0x0000 0018 |
| Physical Address | 0x5200 1C18 |
| Instance | ISS_CCP2 |
| Description | <p>INTERRUPT STATUS REGISTER - LOG CHAN 2 3</p> <p>This register regroups all the events related to logical channel 2 and logical channel 3. The events related to logical channel 2 trigger SINTERRUPTN[2]. The events related to logical channel 3 trigger SINTERRUPTN[3]. The channel shall be enabled for events to be generated on that channel.</p> |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|------------------|----------|----|----|----|------------|------------|------------|------------|---------------|----------|------------------|-------------|-------------|------------|-------------|----------|------------------|----------|----|----|----|------------|------------|------------|------------|---------------|----------|------------------|-------------|-------------|------------|-------------|----------|
| LC3_OCPERROR_IRQ | RESERVED | | | | LC3_FS_IRQ | LC3_LE_IRQ | LC3_LS_IRQ | LC3_FE_IRQ | LC3_COUNT_IRQ | RESERVED | LC3_FIFO_OVF_IRQ | LC3_CRC_IRQ | LC3_FSP_IRQ | LC3_FW_IRQ | LC3_FSC_IRQ | RESERVED | LC2_OCPERROR_IRQ | RESERVED | | | | LC2_FS_IRQ | LC2_LE_IRQ | LC2_LS_IRQ | LC2_FE_IRQ | LC2_COUNT_IRQ | RESERVED | LC2_FIFO_OVF_IRQ | LC2_CRC_IRQ | LC2_FSP_IRQ | LC2_FW_IRQ | LC2_FSC_IRQ | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|---------------|-------|
| 31 | LC3_OCPERROR_IRQ | An OCP error occurred on the master write port. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 30:28 | RESERVED | | R | 0x0 |
| 27 | LC3_FS_IRQ | Logical channel 3 - Frame start sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 26 | LC3_LE_IRQ | Logical channel 3 - Line end sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 25 | LC3_LS_IRQ | Logical channel 3 - Line start sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 24 | LC3_FE_IRQ | Logical channel 3 - Frame end sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 23 | LC3_COUNT_IRQ | Logical channel 3 - Frame counter reached status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 22 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|---------------|-------|
| 21 | LC3_FIFO_OVF_IRQ | Logical channel 3 - FIFO overflow error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 20 | LC3_CRC_IRQ | Logical channel 3 - CRC error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 19 | LC3_FSP_IRQ | Logical channel 3 - FSP error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 18 | LC3_FW_IRQ | Logical channel 3 - Frame width error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 17 | LC3_FSC_IRQ | Logical channel 3 - False sync code error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 16 | RESERVED | Reserved | RW | 0 |
| 15 | LC2_OCPERROR_IRQ | An OCP error occurred on the master write port. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 14:12 | RESERVED | | R | 0x0 |
| 11 | LC2_FS_IRQ | Logical channel 2 - Frame start sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 10 | LC2_LE_IRQ | Logical channel 2 - Line end sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 9 | LC2_LS_IRQ | Logical channel 2 - Line start sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 8 | LC2_FE_IRQ | Logical channel 2 - Frame end sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|-------|
| 7 | LC2_COUNT_IRQ | Logical channel 2 - Frame counter reached status 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 6 | RESERVED | | R | 0 |
| 5 | LC2_FIFO_OVF_IRQ | Logical channel 2 - FIFO overflow error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 4 | LC2_CRC_IRQ | Logical channel 2 - CRC error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 3 | LC2_FSP_IRQ | Logical channel 2 - FSP error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 2 | LC2_FW_IRQ | Logical channel 2 - Frame width error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 1 | LC2_FSC_IRQ | Logical channel 2 - False sync code error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 0 | RESERVED | Reserved | RW | 0 |

Table 8-87. Register Call Summary for Register CCP2_LC23_IRQSTATUS

ISS Interfaces

- [ISS CCP2 Programming Event and Status Checking: \[0\] \[1\] \[2\]](#)
- [ISS CCP2 Register Summary: \[3\]](#)

Table 8-88. CCP2_LCM_IRQENABLE

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 002C | | |
| Physical Address | 0x5200 1C2C | Instance | ISS_CCP2 |
| Description | INTERRUPT ENABLE REGISTER - Memory channel This register regroups all the events related to the memory channel 2. The events related to memory channel trigger SINTERRUPTN[8]. The channel shall be enabled for events to be generated on that channel. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|---------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LCM_OCPERROR | | LCM_EOF | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LCM_OCPERROR | An interconnect error has been returned for a read (interconnect read master) or write (interconnect write master) transaction related to LCM operation 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 0 | LCM_EOF | Memory read channel - End of frame 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

Table 8-89. Register Call Summary for Register CCP2_LCM_IRQENABLE

ISS Interfaces

- [ISS CCP2 Programming Event and Status Checking: \[0\]](#)
- [ISS CCP2 Register Summary: \[1\]](#)

Table 8-90. CCP2_LCM_IRQSTATUS

| | | | |
|------------------|--|----------|----------|
| Address Offset | 0x0000 0030 | | |
| Physical Address | 0x5200 1C30 | Instance | ISS_CCP2 |
| Description | INTERRUPT STATUS REGISTER - Memory channel This register regroups all the events related to memory channel. The events related to memory channel trigger SINTERRUPTN[8]. The channel shall be enabled for events to be generated on that channel. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|---------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LCM_OCPERROR | | LCM_EOF | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LCM_OCPERROR | An interconnect error has been returned for a read (interconnect read master) or write (interconnect write master) transaction related to LCM operation 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------|
| 0 | LCM_EOF | Memory read channel - End of frame 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |

Table 8-91. Register Call Summary for Register CCP2_LCM_IRQSTATUS

ISS Interfaces

- [ISS CCP2 Programming Event and Status Checking: \[0\] \[1\] \[2\]](#)
- [ISS CCP2 Register Summary: \[3\]](#)

Table 8-92. CCP2_CTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0040 | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1C40 | | |
| Description | GLOBAL CONTROL REGISTER This register controls the CCP2 receiver. This register shall not be modified dynamically (except IF_EN bit field). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|--------|----|------------|----|------------|---|----------|---|-----------------|---|----------|---|-------|---|--|--|------|--|-------|--|----------|--|----------|--|-------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | |
| FRACDIV | | | | | | | | | | | | | | | | POSTED | | DBG_EN | | VP_CLK_POL | | VP_ONLY_EN | | RESERVED | | VP_CLK_FORCE_ON | | RESERVED | | BURST | | | | MODE | | FRAME | | RESERVED | | RESERVED | | IF_EN | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | FRACDIV | Fractional clock divider control for the video port. The mean video port clock is VPBSECLOCK * FRACDIV/65536. Valid range: 1-65536 | RW | 0x10000 |
| 14 | POSTED | Selects between posted and non posted writes. 0x0: Non posted 0x1: Posted | RW | 0 |
| 13 | DBG_EN | Enables the debug mode. 0x0: Disable 0x1: Enable | RW | 0 |
| 12 | VP_CLK_POL | VP clock polarity 0x0: The CCP2 receiver writes the data on the VP on the L3 falling edge before the next falling PCLK edge. 0x1: The CCP2 receiver writes the data on the VP on the L3 rising edge before the next rising PCLK edge. | RW | 0 |
| 11 | VP_ONLY_EN | VP only enable. 0x0: The VP is enabled and the OCP master port are enabled. 0x1: The VP is enabled and the OCP master port is disabled. The embedded data and pixel data are output on the VP. | RW | 0 |
| 10 | RESERVED | Read returns reset value | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------|
| 9 | VP_CLK_FORCE_ON | Controls VP_PCLK gating during frame blanking periods. 0x0: The VP_PCLK is gated during vertical blanking periods. 0x1: The VP_PCLK is free-running during vertical blanking periods. | RW | 0 |
| 8 | RESERVED | | R | 0 |
| 7:5 | BURST | Forces the write burst size used by the module. The write burst size shall never exceed the output FIFO size. The output FIFO size can be read with the CCP2_GNQ.FIFODEPTH bit field. 0x0: 1x 64-bit burst = single request. 0x1: 2x 64-bit bursts. 0x3: 8x 64-bit bursts. 0x4: 16x 64-bit bursts. 0x2: 4x 64-bit bursts. | RW | 0x0 |
| 4 | MODE | Selects the receiver operating mode. This bit is only writable when the CCP2MODE input is 1. 0x0: MIPI CSI1 compatible mode. When this bit is set all CCP2 settings are ignored. If the settings are not set correctly to MIPI CSI1 values, the behavior of the receiver is unpredictable. 0x1: CCP2 compatible mode | RW | 0 |
| 3 | FRAME | Set the modality in which IF_EN works. 0x0: When software writes IF_EN = 0 the interface is disabled immediately. 0x1: When software writes IF_EN = 0 the interface is disabled after the next FEC sync code. | RW | 0 |
| 2 | RESERVED | Read returns reset value | RW | 0 |
| 1 | RESERVED | Read returns reset value | RW | 0 |
| 0 | IF_EN | Enables the physical interface to the module. 0x0: The interface is disabled. If FRAME = 0, it is disabled immediately. If FRAME = 1, it is disabled on the next FEC sync code. If FRAME=1, it is advised to disable the logical channels first (CCP2_LCX_CTRL.CHAN_EN=0) before writing IF_EN=0. 0x1: The interface is enabled immediately, the data acquisition starts on the next FSC sync code. Writing 1 to this register when the current value is 0 has the effect to clear the output FIFO. The pixel data of the following frame will be written in the PING buffer, that is, the CCP2_LCX_CTRL.PING_PONG bits are reset to 1 as well. | RW | 0 |

Table 8-93. Register Call Summary for Register CCP2_CTRL

ISS Interfaces

- [ISS CCP2 Image Data Operating Modes and Alignment Constraints: \[0\]](#)
- [ISS CCP2 Data Transfer Through Write Master Port: \[1\]](#)
- [ISS CCP2 PHY: \[2\]](#)
- [ISS CCP2 Data/Strobe Signaling \(CCP2 Only\): \[3\]](#)
- [ISS CCP2 VP Interface: \[4\] \[5\]](#)
- [ISS CCP2 Video Port: \[6\] \[7\]](#)
- [ISS CCP2 Programming Hardware Setup/Initialization: \[8\]](#)
- [ISS CCP2 Programming Enable/Disable the Hardware: \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [ISS CCP2 Programming Select the Mode: MIPI CSI1 or CCP2: \[17\]](#)
- [ISS CCP2 Programming Burst Settings: \[18\]](#)
- [ISS CCP2 Programming Debug Mode: \[19\] \[20\]](#)
- [ISS CCP2 Programming Video Port: \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\]](#)
- [ISS CCP2 Programming Controls: \[28\]](#)
- [ISS CCP2 Programming CRC: \[29\]](#)
- [ISS CCP2 Programming Destination Format: \[30\] \[31\]](#)
- [ISS CCP2 Programming Frame Acquisition: \[32\]](#)
- [ISS CCP2 Read Data From Memory: \[33\] \[34\] \[35\] \[36\]](#)
- [ISS CCP2 Register Summary: \[37\]](#)
- [ISS CCP2 Register Description: \[38\]](#)
- [ISS CSI2 REGS1 Register Description: \[39\]](#)

Table 8-94. CCP2_DBG

| | | | |
|------------------|---|----------|----------|
| Address Offset | 0x0000 0044 | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1C44 | | |
| Description | <div>DEBUG REGISTER</div> <div>This register provides a way to debug the CCP2 receiver with no image sensor connected to the module. The debug mode is enabled by CCP2_CTRL.DBG_EN. Each write to this register provides a full 32bit word to the CCP2 receiver, even when only 8 or 16 bits are written. The newly written value is merged with the previous value (check the example in the programming model section).</div> | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DBG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | DBG | 32-bit input value. Write only register. Reads return 0. | W | 0x0000 0000 |

Table 8-95. Register Call Summary for Register CCP2_DBG

ISS Interfaces

- [ISS CCP2 Programming Debug Mode: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [ISS CCP2 Register Summary: \[8\]](#)

Table 8-96. CCP2_GNQ

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0048 | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1C48 | | |
| Description | GENERIC PARAMETER REGISTER This register provide a way to read the generic parameters used in the design. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|-----------|----|----|------------|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OCPREADPORT | | FIFODEPTH | | | NBCHANNELS | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5 | OCPREADPORT | The OCP master read port, the DPCM encoder and ALAW decompression are only present when this bit is set. | R | 1 |
| 4:2 | FIFODEPTH | Output FIFO size in multiple of 64 bits. Read 0x3: 16 x 64 bits Read 0x4: 32 x 64 bits Read 0x2: 8 x 64 bits Read 0x0: 2 x 64 bits Read 0x1: 4 x 64 bits Read 0x5: 64 x 64 bits | R | 0x5 |
| 1:0 | NBCHANNELS | Number of logical channels supported by the module. Read 0x3: 8 logical channels Read 0x2: 4 logical channels Read 0x1: 2 logical channels Read 0x0: 1 logical channel | R | 0x2 |

Table 8-97. Register Call Summary for Register CCP2_GNQ

ISS Interfaces

- [ISS CCP2 Register Summary: \[0\]](#)
- [ISS CCP2 Register Description: \[1\]](#)

Table 8-98. CCP2_CTRL1

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 004C | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1C4C | | |
| Description | GLOBAL CONTROL REGISTER (2) This register controls the CCP2 receiver. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | BLANKING |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|----------------------|-------|
| 31:2 | RESERVED | Reserved | RO Rreturns 0s | 0 |
| 1:0 | BLANKING | Controls the number of clock pulses provided during vertical and horizontal clock periods. When the blanking period provided by the camera is lower than the value set here, the blanking period is shortened by the CCP2 to prevent internal FIFO overflow. Software must increase the sensor blanking period in that case. 0x0: 4 video port clock cycles 0x1: 16 video port clock cycles 0x2: 64 video port clock cycles 0x3: Free running | RW | 0x0 |

Table 8-99. Register Call Summary for Register CCP2_CTRL1

ISS Interfaces

- [ISS CCP2 VP Interface: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS CCP2 Register Summary: \[4\]](#)

Table 8-100. CCP2_LCx_CTRL

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0050 + (x * 0x30) | Index | x = 0 to 3 |
| Physical Address | 0x5200 1C50 + (x * 0x30) | Instance | ISS_CCP2 |
| Description | CONTROL REGISTER - LOG CHAN 0 This register controls the logical channel 0. This register is shadowed: modifications are taken into account after the next FSC sync code. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----------|----|----|----|--------|-----------|-----------|--------------|-------|----|----|----|----|----|---|---|--------|---|---|---|-----------|---------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COUNT | | | | | | | | RESERVED | | | | CRC_EN | DPCM_PRED | PING_PONG | COUNT_UNLOCK | ALPHA | | | | | | | | FORMAT | | | | REGION_EN | CHAN_EN | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:24 | COUNT | Sets the number of frame to acquire. Once the frame acquisition starts, the COUNT value is decremented after every frame. When COUNT reaches 0, the COUNT_IRQ interrupt is triggered and CHAN_EN is set to 0. Writes to this bit field are controlled by the COUNT_UNLOCK bit. COUNT can be overwritten dynamically with a new count value. 0: Infinite number of frames (no count). 1: 1 frame to acquire ... 255: 255 frames to acquire. | RW | 0x00 |
| 23:20 | RESERVED | | R | 0x0 |
| 19 | CRC_EN | Enables the cyclic redundancy check. 0x0: Disabled 0x1: Enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------|
| 18 | DPCM_PRED | <p>Selects the DPCM predictor to be used for the RAW6+DPCM10, RAW7+DPCM10 and RAW8+DPCM12 data formats.</p> <p>The RAW8+DPCM10 data format always use the simple predictor.</p> <p>0x0: The advanced predictor is used</p> <p>0x1: The simple predictor is used.</p> | RW | 0 |
| 17 | PING_PONG | <p>Indicates whether the PING or PONG destination address (CCP2_LC0_DAT_PING_ADDR or CCP2_LC0_DAT_PONG_ADDR) was used to write the last frame. This bit field toggles after every FEC sync code.</p> <p>Read 0x1: PONG buffer</p> <p>Read 0x0: PING buffer</p> | R | 1 |
| 16 | COUNT_UNLOCK | <p>Unlock writes to the COUNT bit field.</p> <p>Write 0x0: COUNT bit field is locked. Writes have no effect</p> <p>Write 0x1: COUNT bit field is unlocked. Writes are possible.</p> | W | 0 |
| 15:8 | ALPHA | Alpha value for RGB888 and RBG444. | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7:2 | FORMAT | <p>Data format selection.</p> <p>0xD: RAW7 + DPCM10 + EXP16</p> <p>0x15: RAW10 + EXP16</p> <p>0x1E: RAW10 - RAW8 RAW10 data from sensor is right shifted to produce RAW8 before it is send to memory</p> <p>0x8: RAW6 + EXP8</p> <p>0x5: RGB565</p> <p>0x1B: RAW10 - RAW8 DPCM RAW10 data from sensor is DPCM compressed into RAW8 before it is send to memory.</p> <p>0x2: YUV4:2:0</p> <p>0x4: RGB444 + EXP16</p> <p>0x6: RGB888</p> <p>0x1: YUV4:2:2 LITTLE ENDIAN</p> <p>0x1D: JPEG8</p> <p>0x0: YUV4:2:2 BIG ENDIAN</p> <p>0xB: RAW10 - RAW6 DPCM RAW10 data from sensor is DPCM compressed into RAW6 before it is send to memory. Used predictor is selected by the DPCM_PRED bit.</p> <p>0x20: RAW10 - RAW8 ALAW</p> <p>0x3: YUV4:2:2 + VP or RAW8 + VP</p> <p>0x17: RAW10 - RAW7 DPCM + EXP8 RAW10 data from sensor is DPCM compressed into RAW7 and expanded to 8 bits before it is send to memory. Used predictor is selected by the DPCM_PRED bit.</p> <p>0x11: RAW8 + DPCM10 + EXP16</p> <p>0xA: RAW6 + DPCM10 + VP</p> <p>0x9: RAW6 + DPCM10 + EXP16</p> <p>0x10: RAW8 This mode can be used to output RAW6 and RAW7 as well.</p> <p>0x21: RAW8 DPCM10 - ALAW</p> <p>0x12: RAW8 + DPCM10 + VP</p> <p>0x13: RAW10 - RAW7 DPCM RAW10 data from sensor is DPCM compressed into RAW7 before it is send to memory. Used predictor is selected by the DPCM_PRED bit.</p> <p>0x18: RAW12</p> <p>0x14: RAW10</p> <p>0xE: RAW7 + DPCM10 + VP</p> <p>0x16: RAW10 + VP</p> <p>0x1C: JPEG8 + FSP</p> <p>0x7: RGB888 + EXP32</p> <p>0x19: RAW12 + EXP16</p> <p>0x1F: RAW8 DPCM12 - RAW12 + VP Used predictor is selected by the DPCM_PRED bit.</p> <p>0x1A: RAW12 + VP</p> <p>0xF: RAW10 - RAW6 DPCM + EXP8 RAW10 data from sensor is DPCM compressed into RAW6 and expanded to 8 bits before it is send to memory. Used predictor is selected by the DPCM_PRED bit.</p> <p>0xC: RAW7 + EXP8</p> | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|--|
| 1 | REGION_EN | Enables the setting of regions of interest in the frame: SOF region, EOF region and DAT region. 0x0: Disabled 0x1: Enabled | RW | 0 |
| 0 | CHAN_EN | Enables the logical channel 0x0: Disabled 0x1: Enabled | RW | 0x1 for LC0 0x0 for LC1 0x0 for LC2 0x0 for LC3 |

Table 8-101. Register Call Summary for Register CCP2_LCx_CTRL

ISS Interfaces

- [ISS CCP2 Image Data Operating Modes and Alignment Constraints: \[0\] \[1\] \[2\]](#)
- [ISS CCP2 Pixel Data Format: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [ISS CCP2 Data Compression: \[16\]](#)
- [ISS CCP2 Programming Register Accessibility During Frame Processing: \[17\]](#)
- [ISS CCP2 Programming Enable/Disable the Hardware: \[18\] \[19\] \[20\]](#)
- [ISS CCP2 Programming Controls: \[21\]](#)
- [ISS CCP2 Programming Region-of-Interest: \[22\] \[23\]](#)
- [ISS CCP2 Programming CRC: \[24\] \[25\]](#)
- [ISS CCP2 Programming Destination Format: \[26\]](#)
- [ISS CCP2 Programming Frame Acquisition: \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\]](#)
- [ISS CCP2 Programming Pixel Data Region: \[35\] \[36\]](#)
- [ISS CCP2 Register Summary: \[37\]](#)

Table 8-102. CCP2_LCx_CODE

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0054 + (x * 0x30) | Index | x = 0 to 3 |
| Physical Address | 0x5200 1C54 + (x * 0x30) | Instance | ISS_CCP2 |
| Description | CODE REGISTER - LOG CHAN 0 This register sets the codes that are used in the 32-bit synchronization codes to recognize the logical channel, frame start, frame end, line start and line end codes. This register applies for logical channel 0 only. The default values are usually not supposed to be modified. Updating this register with new codes under a flowing serial transmission on that channel will cause unexpected result. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|-----|----|----|----|-----|----|----|----|-----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CHAN_ID | | | | FEC | | | | FSC | | | | LEC | | | | LSC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:16 | CHAN_ID | Log chan 0 identifier. The channel identifier is located between bits 4 to 7 in the 32-bit synchronization codes. | RW | 0x0 |
| 15:12 | FEC | Log chan 0 frame end sync code identifier. The sync code identifier is located between bits 0 to 3 in the 32-bit synchronization codes. | RW | 0x3 |
| 11:8 | FSC | Log chan 0 frame start sync code identifier. The sync code identifier is located between bits 0 to 3 in the 32-bit synchronization codes. | RW | 0x2 |
| 7:4 | LEC | Log chan 0 line end sync code identifier. The sync code identifier is located between bits 0 to 3 in the 32-bit synchronization codes. | RW | 0x1 |
| 3:0 | LSC | Log chan 0 line start sync code identifier. The sync code identifier is located between bits 0 to 3 in the 32-bit synchronization codes. | RW | 0x0 |

Table 8-103. Register Call Summary for Register CCP2_LCx_CODE

ISS Interfaces

- [ISS CCP2 Programming Register Accessibility During Frame Processing: \[0\]](#)
- [ISS CCP2 Programming Synchronization Codes: \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [ISS CCP2 Register Summary: \[6\]](#)

Table 8-104. CCP2_LCx_STAT_START

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0058 + (x * 0x30) | Index | x = 0 to 3 |
| Physical Address | 0x5200 1C58 + (x * 0x30) | Instance | ISS_CCP2 |
| Description | STATUS LINE START REGISTER - LOG CHAN 0 This register is shadowed: modifications are taken into account after the next FSC sync code. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | EOF | | | | | | | | RESERVED | | | | | | | | SOF | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | EOF | Sets the vertical position of the EOF status lines in regards of the FSC sync code. From 0 to 4095. | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | SOF | Sets the vertical position of the EOF status lines in regards of the FSC sync code. Should always be 0. | RW | 0x000 |

Table 8-105. Register Call Summary for Register CCP2_LCx_STAT_START

ISS Interfaces

- [ISS CCP2 Programming Register Accessibility During Frame Processing: \[0\]](#)
- [ISS CCP2 Programming Video Port: \[1\]](#)
- [ISS CCP2 Programming Status Data: \[2\] \[3\]](#)
- [ISS CCP2 Register Summary: \[4\]](#)

Table 8-106. CCP2_LCx_STAT_SIZE

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 005C + (x * 0x30) | Index | x = 0 to 3 |
| Physical Address | 0x5200 1C5C + (x * 0x30) | Instance | ISS_CCP2 |
| Description | STATUS LINE SIZE REGISTER - LOG CHAN 0 This register is shadowed: modifications are taken into account after the next FSC sync code. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | EOF | | | | | | | | RESERVED | | | | | | | | SOF | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | EOF | Sets the number of EOF status lines From 0 to 4095 | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | SOF | Sets the number of SOF status line(s) From 0 to 4095 | RW | 0x000 |

Table 8-107. Register Call Summary for Register CCP2_LCx_STAT_SIZE

ISS Interfaces

- [ISS CCP2 Programming Register Accessibility During Frame Processing: \[0\]](#)
- [ISS CCP2 Programming Video Port: \[1\]](#)
- [ISS CCP2 Programming Status Data: \[2\] \[3\] \[4\]](#)
- [ISS CCP2 Register Summary: \[5\]](#)

Table 8-108. CCP2_LCx_SOF_ADDR

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0060 + (x * 0x30) | Index | x = 0 to 3 |
| Physical Address | 0x5200 1C60 + (x * 0x30) | Instance | ISS_CCP2 |
| Description | SOF STATUS LINE MEM ADDRESS REGISTER - LOG CHAN 0 This register sets the 32-bit memory address where the SOF data are stored. The 5 LSBs are ignored: the address shall be aligned on a 32-byte boundary. This register is shadowed: modifications are taken into account after the next FSC sync code. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:5 | ADDR | 27 most significant bits of the 32-bit address. | RW | 0x0000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-109. Register Call Summary for Register CCP2_LCx_SOF_ADDR

ISS Interfaces

- [ISS CCP2 Programming Register Accessibility During Frame Processing: \[0\]](#)
- [ISS CCP2 Programming Status Data: \[1\]](#)
- [ISS CCP2 Register Summary: \[2\]](#)

Table 8-110. CCP2_LCx_EOF_ADDR

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0064 + (x * 0x30) | Index | x = 0 to 3 |
| Physical Address | 0x5200 1C64 + (x * 0x30) | Instance | ISS_CCP2 |
| Description | EOF STATUS LINE MEM ADDRESS REGISTER - LOG CHAN 0 This register sets the 32-bit memory address where the EOF data are stored. The 5 LSBs are ignored: the address shall be aligned on a 32-byte boundary. This register is shadowed: modifications are taken into account after the next FSC sync code. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:5 | ADDR | 27 most significant bits of the 32-bit address. | RW | 0x0000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-111. Register Call Summary for Register CCP2_LCx_EOF_ADDR

ISS Interfaces

- [ISS CCP2 Programming Register Accessibility During Frame Processing: \[0\]](#)
- [ISS CCP2 Programming Status Data: \[1\]](#)
- [ISS CCP2 Register Summary: \[2\]](#)

Table 8-112. CCP2_LCx_DAT_START

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0068 + (x * 0x30) | Index | x = 0 to 3 |
| Physical Address | 0x5200 1C68 + (x * 0x30) | Instance | ISS_CCP2 |
| Description | DATA START REGISTER - LOG CHAN 0 This register is shadowed: modifications are taken into account after the next FSC sync code. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VERT | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | VERT | Sets the vertical position of the data in regards of the FSC sync code. From 0 to 4095 lines. | RW | 0x000 |
| 15:0 | RESERVED | | R | 0x0000 |

Table 8-113. Register Call Summary for Register CCP2_LCx_DAT_START

ISS Interfaces

- [ISS CCP2 Programming Video Port: \[0\]](#)
- [ISS CCP2 Programming Pixel Data Region: \[1\]](#)
- [ISS CCP2 Register Summary: \[2\]](#)

Table 8-114. CCP2_LCx_DAT_SIZE

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 006C + (x * 0x30) | Index | x = 0 to 3 |
| Physical Address | 0x5200 1C6C + (x * 0x30) | Instance | ISS_CCP2 |
| Description | DATA SIZE REGISTER - LOG CHAN 0 This register is shadowed: modifications are taken into account after the next FSC sync code. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VERT | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | VERT | Sets the vertical size of the data window. From 0 to 4095 lines. If VERT = "0", no data is output. | RW | 0x000 |
| 15:0 | RESERVED | | R | 0x0000 |

Table 8-115. Register Call Summary for Register CCP2_LCx_DAT_SIZE

ISS Interfaces

- [ISS CCP2 Programming Register Accessibility During Frame Processing: \[0\]](#)
- [ISS CCP2 Programming Video Port: \[1\]](#)
- [ISS CCP2 Programming Pixel Data Region: \[2\]](#)
- [ISS CCP2 Register Summary: \[3\]](#)

Table 8-116. CCP2_LCx_DAT_PING_ADDR

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0070 + (x * 0x30) | Index | x = 0 to 3 |
| Physical Address | 0x5200 1C70 + (x * 0x30) | Instance | ISS_CCP2 |
| Description | DATA MEM PING ADDRESS REGISTER - LOG CHAN 0 This register sets the 32-bit memory address where the pixel data are stored. The destination is double buffered: this register sets the PING address. Double buffering is enabled when the addresses CCP2_LC0_DAT_PING_ADDR and CCP2_LC0_DAT_PONG_ADDR are different. The 5 LSBs are ignored: the address shall be aligned on a 32-byte boundary. This register is shadowed: modifications are taken into account after the next FSC sync code. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:5 | ADDR | 27 most significant bits of the 32-bit address. | RW | 0x0000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-117. Register Call Summary for Register CCP2_LCx_DAT_PING_ADDR

ISS Interfaces

- [ISS CCP2 Programming Register Accessibility During Frame Processing: \[0\]](#)
- [ISS CCP2 Programming Frame Acquisition: \[1\]](#)
- [ISS CCP2 Programming Pixel Data Region: \[2\] \[3\] \[4\] \[5\]](#)
- [ISS CCP2 Register Summary: \[6\]](#)

Table 8-118. CCP2_LCx_DAT_PONG_ADDR

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0074 + (x * 0x30) | Index | x = 0 to 3 |
| Physical Address | 0x5200 1C74 + (x * 0x30) | Instance | ISS_CCP2 |
| Description | DATA MEM PONG ADDRESS REGISTER - LOG CHAN 0 This register sets the 32-bit memory address where the pixel data are stored. The destination is double buffered: this register sets the PONG address. Double buffering is enabled when the addresses CCP2_LC0_DAT_PING_ADDR and CCP2_LC0_DAT_PONG_ADDR are different. The 5 LSBs are ignored: the address shall be aligned on a 32-byte boundary. This register is shadowed: modifications are taken into account after the next FSC sync code. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:5 | ADDR | 27 most significant bits of the 32-bit address. | RW | 0x0000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-119. Register Call Summary for Register CCP2_LCx_DAT_PONG_ADDR

ISS Interfaces

- [ISS CCP2 Programming Register Accessibility During Frame Processing: \[0\]](#)
- [ISS CCP2 Programming Frame Acquisition: \[1\]](#)
- [ISS CCP2 Programming Pixel Data Region: \[2\] \[3\] \[4\] \[5\]](#)
- [ISS CCP2 Register Summary: \[6\]](#)

Table 8-120. CCP2_LCx_DAT_OFST

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0078 + (x * 0x30) | Index | x = 0 to 3 |
| Physical Address | 0x5200 1C78 + (x * 0x30) | Instance | ISS_CCP2 |
| Description | DATA MEM ADDRESS OFFSET REGISTER - LOG CHAN 0 This register sets the offset, which is applied on the destination address after each line is written to memory. This register applies for both CCP2_LC0_DAT_PING_ADDR and CCP2_LC0_DAT_PONG_ADDR. For example, it enables to perform 2D data transfers of the pixel data into a frame buffer. In such case, the pixel data and frame buffer data shall have the same data format. The 5 LSBs are ignored: the offset shall be a multiple of 32 bytes. Only full 64-bits words are written to memory at the end of lines. This register is shadowed: modifications are taken into account after the next FSC sync code. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| OFST | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:5 | OFST | Line offset programmed in bytes. If OFST = 0, the data is written contiguously in memory. Otherwise, OFST sets the destination offset between the first pixel of the previous line and the first pixel of the current line. NOTE: An OCP access (read/write) is required to properly update the CCP2_LCx_DAT_OFST register | RW | 0x00000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-121. Register Call Summary for Register CCP2_LCx_DAT_OFST

ISS Interfaces

- [ISS CCP2 Programming Register Accessibility During Frame Processing: \[0\]](#)
- [ISS CCP2 Programming Pixel Data Region: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [ISS CCP2 Register Summary: \[8\]](#)
- [ISS CCP2 Register Description: \[9\]](#)

Table 8-122. CCP2_LCM_CTRL

Address Offset

Physical Address

Description

Type

0x0000 01D0

0x5200 1DD0

Control register for the memory channel. It defines the data format of the source frame stored in memory and how this frame is processed.

RW

Instance

ISS_CCP2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|---------------|----|-----------|----|----------|----|------------|----|----------|----|---------------|----|-------------|----|------------|----|----------|----|----|----|---|---|---|---|------------|---|---------------|---|----------|---|----------|--|---------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| DST_PACK | | DST_DPCM_PRED | | DST_COMPR | | RESERVED | | DST_FORMAT | | SRC_PACK | | SRC_DPCM_PRED | | SRC_DECOMPR | | SRC_FORMAT | | RESERVED | | | | | | | | BURST_SIZE | | READ_THROTTLE | | DST_PORT | | RESERVED | | CHAN_EN | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 31 | DST_PACK | Data is packed before it is send to memory. Applies to RAW6, RAW7, RAW10, and RAW12 only. 0x0: Disabled 0x1: Enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|-------|
| 30 | DST_DPCM_PRED | Selects the DPCM predictor to be used for the RAW6+DPCM10 and RAW7+DPCM10 data formats. The RAW8+DPCM10 data format always use the simple predictor. 0x0: The advanced predictor is used 0x1: The simple predictor is used. | RW | 0 |
| 29:28 | DST_COMPR | Enables data compression of data sent to memory 0x0: No compression 0x1: A-Law compression RAW10 - RAW8 A-Law when DST_FORMAT=RAW8 other destination formats are invalid. 0x2: DPCM compression RAW10 - RAW6 DPCM when DST_FORMAT=RAW6 RAW10 - RAW7 DPCM when DST_FORMAT=RAW7 RAW10 - RAW8 DPCM when DST_FORMAT=RAW8 other destination formats are invalid. | RW | 0x0 |
| 27 | RESERVED | | R | 0 |
| 26:24 | DST_FORMAT | Output format selection. Not every combination between input and output formats are possible. 0x6: RAW16 0x1: RAW7 0x0: RAW6 0x2: RAW8 0x4: RAW12 0x5: RAW14 0x3: RAW10 | RW | 0x0 |
| 23 | SRC_PACK | Data stored in memory is packed and must be unpacked. 0x0: Disabled 0x1: Enabled | RW | 0 |
| 22 | SRC_DPCM_PRED | Selects the DPCM predictor to be used for the RAW6+DPCM10, RAW7+DPCM10 and RAW8+DPCM12 data formats. The RAW8+DPCM10 and RAW6 + DPCM12 data format always use the simple predictor. 0x0: The advanced predictor is used 0x1: The simple predictor is used. | RW | 0 |
| 21:20 | SRC_DECOMPR | Enable decompression of incoming data 0x0: No decompression 0x1: A-Law decompression RAW8 A-Law - RAW10 when SRC_FORMAT=RAW8 other source formats are invalid. 0x3: DPCM decompression RAW6 DPCM - RAW12 when SRC_FORMAT=RAW6 RAW8 DPCM - RAW12 when SRC_FORMAT=RAW8 other source formats are invalid. 0x2: DPCM decompression RAW6 DPCM - RAW10 when SRC_FORMAT=RAW6 RAW7 DPCM - RAW10 when SRC_FORMAT=RAW7 RAW8 DPCM - RAW10 when SRC_FORMAT=RAW8 other source formats are invalid. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|-------|
| 19:16 | SRC_FORMAT | <p>Data format of the data stored in memory. As there is no header embedded in the data sent to memory the user is responsible of choosing the adequate format.</p> <p>0x6: RAW16 0x1: RAW7 0xA: Reserved 0x7: Reserved 0xD: Reserved 0x0: RAW6 0x2: RAW8 0x8: Reserved 0x9: Reserved 0xB: Reserved 0x4: RAW12 0x5: RAW14 0xF: Reserved 0xC: Reserved 0x3: RAW10 0xE: Reserved</p> | RW | 0x0 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:5 | BURST_SIZE | <p>Defines the burst size of the master read port</p> <p>0x0: 1x 64-bit burst = single request. 0x1: 2x 64-bit bursts. 0x3: 8x 64-bit bursts. 0x4: 16x 64-bit bursts. 0x2: 4x 64-bit bursts.</p> | RW | 0x0 |
| 4:3 | READ_THROTTLE | <p>Limit maximum data read speed for memory to memory operation</p> <p>0x0: Full speed. Throughput is limited by internal processing capabilities. 0x1: 1/2 speed 0x3: 1/8 speed 0x2: 1/4 speed</p> | RW | 0x0 |
| 2 | DST_PORT | <p>Select the destination port</p> <p>0x0: Data is send to video port, it is always send without compression or packing. The DST_COMPR, DST_DPCM_PRED, DST_PACK, CCP2_LCM_DST_WRITE, and CCP2_LCM_DST_OFST registers have no effect. 0x1: Data is send to memory.</p> | RW | 0 |
| 1 | RESERVED | | R | 0 |
| 0 | CHAN_EN | <p>Enables the read from memory channel. Before enabling the memory read channel software shall:</p> <ul style="list-style-type: none"> - disable the physical interface using the IF_EN bit - wait until disabling of the physical interface is effective (depends on the FRAME bit) <p>Read from memory starts as soon as this bit is set, therefore all CCP2_LCM_x registers must be configured correctly before. This bit is cleared by hardware at the end of the frame.</p> <p>0x0: Disabled 0x1: Enabled</p> | RW | 0 |

Table 8-123. Register Call Summary for Register CCP2_LCM_CTRL

ISS Interfaces

- [ISS CCP2 Read Data From Memory: \[0\] \[1\] \[2\]](#)
- [ISS CCP2 Memory Read Port Burst Generation: \[3\]](#)
- [ISS CCP2 Video Port: \[4\] \[5\]](#)
- [ISS CCP2 Encode, Pack, and Store Data: \[6\] \[7\] \[8\]](#)
- [ISS CCP2 Read Data From Memory: \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [ISS CCP2 Register Summary: \[17\]](#)

Table 8-124. CCP2_LCM_VSIZE

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 01D4 | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1DD4 | | |
| Description | Memory channel vertical framing register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COUNT | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:29 | RESERVED | | R | 0x0 |
| 28:16 | COUNT | Defines the line count to be read from memory. From 1 to 8191 lines. | RW | 0x0001 |
| 15:0 | RESERVED | | R | 0x0000 |

Table 8-125. Register Call Summary for Register CCP2_LCM_VSIZE

ISS Interfaces

- [ISS CCP2 Read Data From Memory: \[0\]](#)
- [ISS CCP2 Read Data From Memory: \[1\]](#)
- [ISS CCP2 Register Summary: \[2\]](#)

Table 8-126. CCP2_LCM_HSIZE

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 01D8 | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1DD8 | | |
| Description | Memory read channel horizontal framing register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COUNT | | | | | | | | RESERVED | | SKIP | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31 | RESERVED | | R | 0x0 |
| 30:16 | COUNT | Horizontal count of samples to output after the skipped pixels. Valid values: 1 to 32767. | RW | 0x0001 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|--------|
| 15 | RESERVED | | R | 0x0 |
| 14:0 | SKIP | Horizontal count of samples to skip after the start of the line. When DPCM compressed data is read from memory using this feature is the only valid way to set a horizontal starting position. Valid values: 0 to 32767. 0 disables pixel skipping | RW | 0x0000 |

Table 8-127. Register Call Summary for Register CCP2_LCM_HSIZE

ISS Interfaces

- [ISS CCP2 Read Data From Memory: \[0\] \[1\]](#)
- [ISS CCP2 DPCM Decompression History: \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [ISS CCP2 Read Data From Memory: \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [ISS CCP2 Register Summary: \[12\]](#)
- [ISS CCP2 Register Description: \[13\]](#)

Table 8-128. CCP2_LCM_PREFETCH

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 01DC | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1DDC | | |
| Description | This register defines the amount of data to be fetched from memory. It must be consistent with the CCP2_LCM_HSIZE register (check programming model). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | HWORDS | | | | | | | | | | | | | | | | | | | | | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:3 | HWORDS | 64 bit words to read from memory for each line of the image. Possible values 1..8191 | RW | 0x0001 |
| 2:0 | RESERVED | | R | 0x0 |

Table 8-129. Register Call Summary for Register CCP2_LCM_PREFETCH

ISS Interfaces

- [ISS CCP2 Memory Read Port Burst Generation: \[0\]](#)
- [ISS CCP2 Read Data From Memory: \[1\] \[2\]](#)
- [ISS CCP2 Register Summary: \[3\]](#)

Table 8-130. CCP2_LCM_SRC_ADDR

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 01E0 | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1DE0 | | |
| Description | Memory channel source address register. This register sets the 32-bit memory address where the pixel data are stored. The 5 LSBs are ignored: the address shall be aligned on a 32-byte boundary. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:5 | ADDR | 27 most-significant bits of the 32-bit address | RW | 0x00000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-131. Register Call Summary for Register CCP2_LCM_SRC_ADDR

ISS Interfaces

- [ISS CCP2 Read Data From Memory: \[0\]](#)
- [ISS CCP2 Memory Read Port Burst Generation: \[1\]](#)
- [ISS CCP2 Read Data From Memory: \[2\] \[3\]](#)
- [ISS CCP2 Register Summary: \[4\]](#)

Table 8-132. CCP2_LCM_SRC_OFST

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 01E4 | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1DE4 | | |
| Description | Memory channel source offset register. This register sets the offset, which is applied on the source address after each line is read from memory. For example, it enables to perform 2D data transfers of the pixel data from a frame buffer. In such case, the pixel data and frame buffer data shall have the same data format. The 5 LSBs are ignored: the offset shall be a multiple of 32 bytes. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| OFST | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:5 | OFST | Line offset programmed in bytes. If OFST = 0, the data is read contiguously from memory. Otherwise, OFST sets the source offset between the first pixel of the previous line and the first pixel of the current line. | RW | 0x00000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-133. Register Call Summary for Register CCP2_LCM_SRC_OFST

ISS Interfaces

- [ISS CCP2 Read Data From Memory: \[0\]](#)
- [ISS CCP2 Read Data From Memory: \[1\] \[2\]](#)
- [ISS CCP2 Register Summary: \[3\]](#)

Table 8-134. CCP2_LCM_DST_ADDR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 01E8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5200 1DE8 | | | | | | | | | | | | | | | | InstanceISS_CCP2 | | | | | | | | | | | | | | | |
| Description | Memory channel destination address. This register sets the 32-bit memory address where the pixel data are stored. The 5 LSBs are ignored: the address shall be aligned on a 32-byte boundary. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | | | | | | | | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:5 | ADDR | 27 most significant bits of the 32-bit address. | RW | 0x00000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-135. Register Call Summary for Register CCP2_LCM_DST_ADDR

ISS Interfaces

- [ISS CCP2 Encode, Pack, and Store Data: \[0\]](#)
- [ISS CCP2 DPCM Decompression History: \[1\]](#)
- [ISS CCP2 Read Data From Memory: \[2\]](#)
- [ISS CCP2 Register Summary: \[3\]](#)

Table 8-136. CCP2_LCM_DST_OFST

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 01EC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5200 1DEC | | | | | | | | | | | | | | | InstanceISS_CCP2 | | | | | | | | | | | | | | | |
| Description | <p>Memory channel destination offset register.</p> <p>This register sets the offset, which is applied on the destination address after each line is written to memory.</p> <p>For example, it enables to perform 2D data transfers of the pixel data into a frame buffer. In such case, the pixel data and frame buffer data shall have the same data format.</p> <p>The 5 LSBs are ignored: the offset shall be a multiple of 32 bytes.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| OFST | | | | | | | | | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:5 | OFST | Line offset programmed in bytes. If OFST = 0, the data is written contiguously to memory if possible. At the end of a line only full 32 bit words will be written, creating eventually gaps at the end of lines. Otherwise, OFST sets the destination offset between the first pixel of the previous line and the first pixel of the current line. | RW | 0x00000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-137. Register Call Summary for Register CCP2_LCM_DST_OFST

ISS Interfaces

- [ISS CCP2 Encode, Pack, and Store Data: \[0\]](#)
- [ISS CCP2 Read Data From Memory: \[1\]](#)
- [ISS CCP2 Register Summary: \[2\]](#)
- [ISS CCP2 Register Description: \[3\]](#)

Table 8-138. CCP2_LCM_HISTORY

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 01F0 | Instance | ISS_CCP2 |
| Physical Address | 0x5200 1DF0 | | |
| Description | Controls operation of the DPCM history read/write feature | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|------------|-------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | EN_HIST_RD | EN_HIST_WR | HIST_EXPORT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17 | EN_HIST_RD | Enable DPCM history read 0x0: Disable 0x1: Enable | RW | 0 |
| 16 | EN_HIST_WR | Enable DPCM history write 0x0: Disable 0x1: Enable | RW | 0 |
| 15:0 | HIST_EXPORT | Defines the horizontal position at which DPCM history information is written. The first decoded sample of a line has position 0 The last decoded sample has position SKIP+COUNT-1 Valid range [3..SKIP+COUNT-1] | RW | 0x0000 |

Table 8-139. Register Call Summary for Register CCP2_LCM_HISTORY

ISS Interfaces

- [ISS CCP2 DPCM Decompression History: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [ISS CCP2 Register Summary: \[9\]](#)

8.2.5 ISS CSI2

8.2.5.1 ISS CSI2 Environment

8.2.5.1.1 ISS CSI2 Protocol and Data Format

The CSI2 supports MIPI CSI2 multiple data type formats. This section describes MIPI CSI2 protocol and data formats. The CSI2 is compatible with the *MIPI CSI2 Specification v1.0-01-00 r0.03*. [Table 8-140](#) lists the MIPI CSI2 supported by CSI2 formats in addition to JPEG8. Shading in the primary and secondary MIPI CSI2-defined formats indicates special format extensions of the CSI2 receiver.

[Table 8-140](#) summarizes the pixel formats supported by the CSI2 receiver interface.

Table 8-140. ISS CSI2 Pixel Format Modes

| CSI2_CTX_CT RL2_i[9:0] Format | CSI2 Data Format | Bits per Pixel (BPP) | Data Size Increases in Memory | 2D Mode Availability ⁽¹⁾ | Comments |
|-------------------------------------|--------------------------|----------------------|----------------------------------|--|-----------------------|
| 0x18 | YUV4:2:0 8 bit | 12 | 0% | Yes | |
| 0x19 | YUV4:2:0 10 bit | 12 | 0% | Yes | |
| 0x1E | YUV4:2:2 8 bit | 16 | 0% | Yes | |
| 0x1F | YUV4:2:2 10 bit | 16 | 0% | Yes | |
| 0x22 | RGB565 | 16 | 0% | Yes | |
| 0x24 | RGB888 | 24 | 0% | Yes | |
| 0x29 | RAW7 | 7 | 0% | Yes | |
| 0x2A | RAW8 | 8 | 8% | Yes | |
| 0x2B | RAW10 | 10 | 0% | Yes | |
| 0x2C | RAW12 | 12 | 0% | Yes | |
| 0x2D | RAW14 | 14 | 0% | Yes | |
| 0xA3 | RGB666 + EXP32 | 32 | 77% | Yes | |
| 0x68 | RAW6 + EXP8 | 8 | 33% | Yes | |
| 0x69 | RAW7 + EXP8 | 8 | 14% | Yes | |
| 0xA0 | RGB444 + EXP16 | 16 | 33% | Yes | |
| 0xA1 | RGB555 + EXP16 | 16 | 6% | Yes | |
| 0xAB | RAW10 + EXP16 | 16 | 60% | Yes | |
| 0xAC | RAW12 + EXP16 | 16 | 33% | Yes | |
| 0xAD | RAW14 + EXP16 | 16 | 14% | Yes | |
| 0xE3 | RGB666 + EXP32 | 32 | 77% | Yes | |
| 0xE4 | RGB888 + EXP32 | 32 | 33% | Yes | |
| 0x2A8 | RAW6 + DPCM10 + EXP16 | 16 | 166% | Yes | DPCM decompression |
| 0x229 | RAW7 + DPCM10 + EXP16 | 16 | 128% | Yes | DPCM decompression |
| 0x2AA | RAW8 + DPCM10 + EXP16 | 16 | 100% | Yes | DPCM decompression |
| 0x369 | RAW7 + DPCM12 + EXP16 | 16 | 128% | Yes | DPCM decompression |
| 0x36A | RAW8 + DPCM12 + EXP16 | 16 | 100% | Yes | DPCM decompression |
| 0x3A8 | RAW6 + DPCM12 + EXP16 | 16 | 166% | Yes | DPCM decompression |
| 0x12 | JPEG8 | 8 | 0% | | |

⁽¹⁾ If 2D mode is available, there are no supplementary constraints on data width. 2D mode does not apply when sending to the video port (VP).

For more information about how the data formats are transmitted and how the data are stored in memory, see [Section 8.2.5.1.1.4, CSI2 Operating Modes](#).

NOTE: The VP formats are not included in [Table 8-140](#), because they are not sent to memory; instead they are sent to the ISP for further processing.

NOTE: Data written by CSI2 can be read back by the CCP2 read channel. CCP2 can get data from a sensor or memory. For more information about supported memory operations, see [Table 8-56](#).

8.2.5.1.1.1 ISS CSI2 Physical Layer

The CSI2-A/CSI2-B receivers are tightly connected to a PHY layer (for more information about the PHY, see [Section 8.2.3, ISS CSI2 PHY](#)). [Table 8-141](#) lists the CSI2-A receiver I/O, and [Table 8-142](#) lists the CSI2-B I/O. The CSI2_RECEIVER provides access to the complex I/O register through a serial configuration port interface. Accesses performed to the CSI2_PHY_CFG_i register are forwarded to the complex I/O register at address i. The CSI2_RECEIVER can access up to eight 32-bit registers in each complex I/O (up to two complex I/Os supported).

Table 8-141. ISS CSI2-A I/O Description

| Signal Name | | I/O ⁽¹⁾ | Description |
|-------------|------------------------|--------------------|-------------------------|
| csi2a_dx0 | lane 0 (position 1) | I | Serial data/clock input |
| csi2a_dy0 | | | |
| csi2a_dx1 | lane 1 (position 2) | I | Serial data/clock input |
| csi2a_dy1 | | | |
| csi2a_dx2 | lane 2 (position 3) | I | Serial data/clock input |
| csi2a_dy2 | | | |
| csi2a_dx3 | lane 3 (position 4) | I | Serial data/clock input |
| csi2a_dy3 | | | |
| csi2a_dx4 | lane 4 (position 5) | I | Serial data input only |
| csi2a_dy4 | | | |

⁽¹⁾ I = Input

Table 8-142. ISS CSI2-B I/O Description

| Signal Name | | I/O ⁽¹⁾ | Description |
|-------------|------------------------|--------------------|-------------------------|
| csi2b_dx0 | line 0 (position 1) | I | Serial data/clock input |
| csi2b_dy0 | | | |
| csi2b_dx1 | line 1 (position 2) | I | Serial data/clock input |
| csi2b_dy1 | | | |
| csi2b_dx2 | line 2 (position 3) | I | Serial data/clock input |
| csi2b_dy2 | | | |

⁽¹⁾ I = Input

NOTE: The serial lane can be used as clock lane or data lane (excluding lane 4 on the CSI2-A I/O). The MIPI CSI2 protocol requires one clock lane (others are data lane or unused lane).

Lanes support the two operating modes:

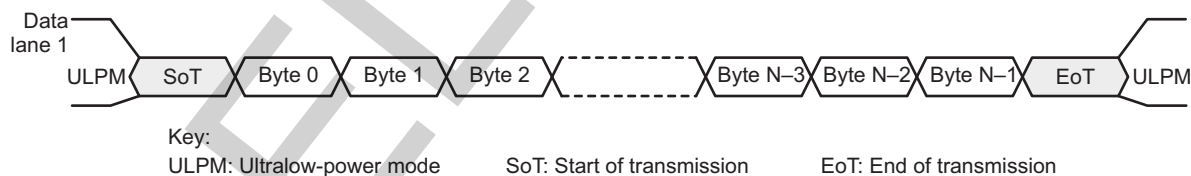
- HS mode: High-speed transmit mode
- Off mode: Lane is off.

8.2.5.1.1.2 ISS CSI2 Lane Merger

The layer consists of lane merger logic to merge the incoming serial stream into a byte stream. The lane merger can merge up to four lanes (CSI2-A) into a single byte stream. The bits are sent with the LSB first. The order of the lanes at the CSI2-A, CSI2-B receiver core depends on the lane configuration. The merger is not used for a single lane.

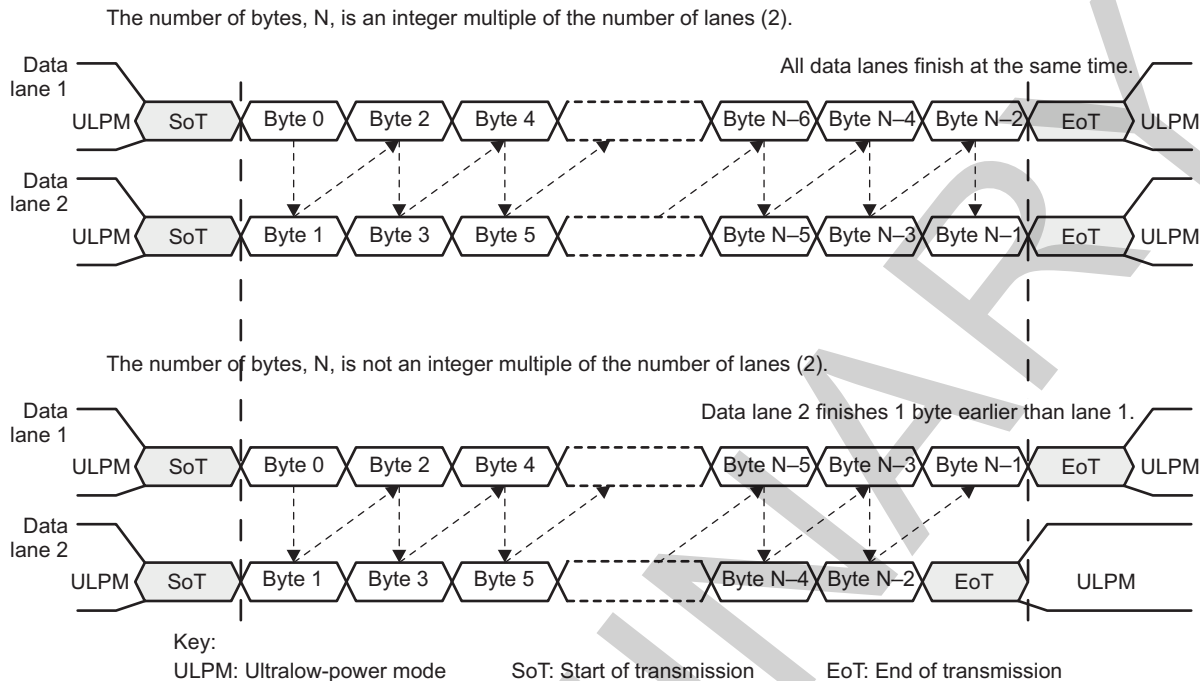
The number of lanes and their configuration can be changed only in ULPM or when all data lanes are in off mode.

Figure 8-36 to Figure 8-39 show the byte position into each serial link for one to four data lane configurations. The byte stream always starts from lane 1. It finishes on one of the lanes, depending on the number of bytes to receive and the number of lanes.

Figure 8-36. ISS CSI2 One Data-Lane Configuration

camss-240

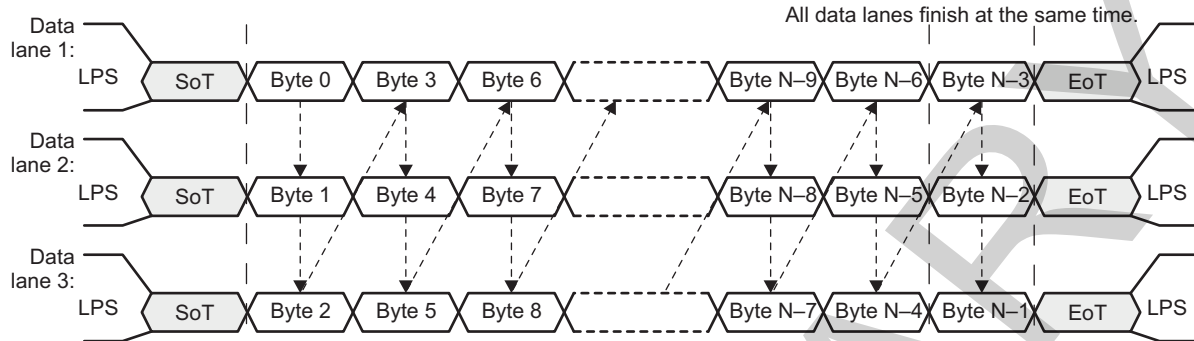
Figure 8-37. ISS CSI2 Two Data-Lane Merger Configuration



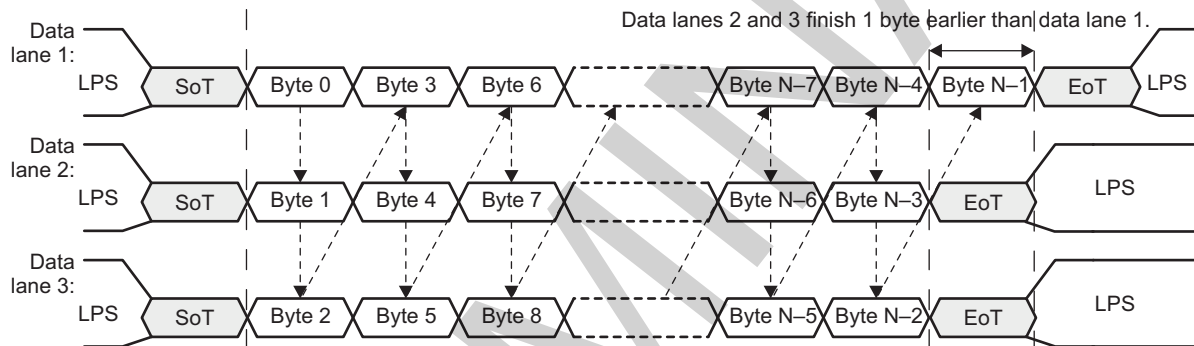
camss-239

Figure 8-38. ISS CSI2 Three Data-Lane Merger Configuration

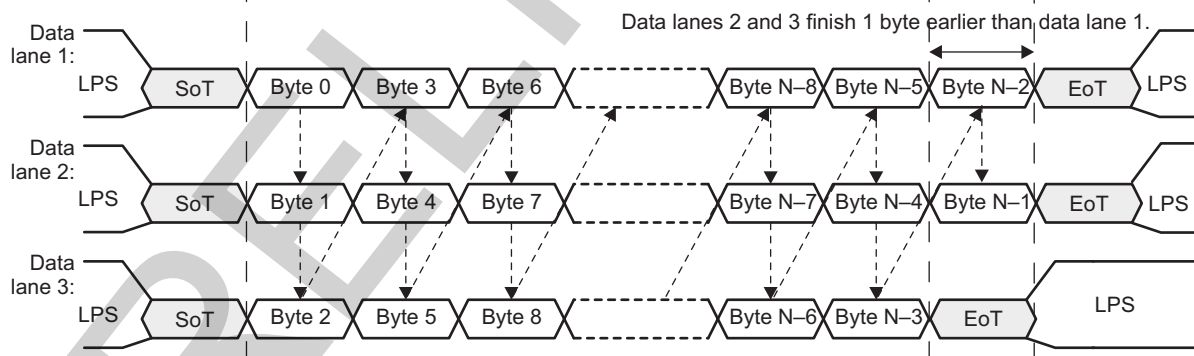
Number of bytes, N, transmitted is an integer multiple of the number of data lanes:



Number of bytes, N, transmitted is not an integer multiple of the number of data lanes (Example 1):



Number of bytes, N, transmitted is not an integer multiple of the number of data lanes (Example 2):



Key:

LPM: Low-power mode

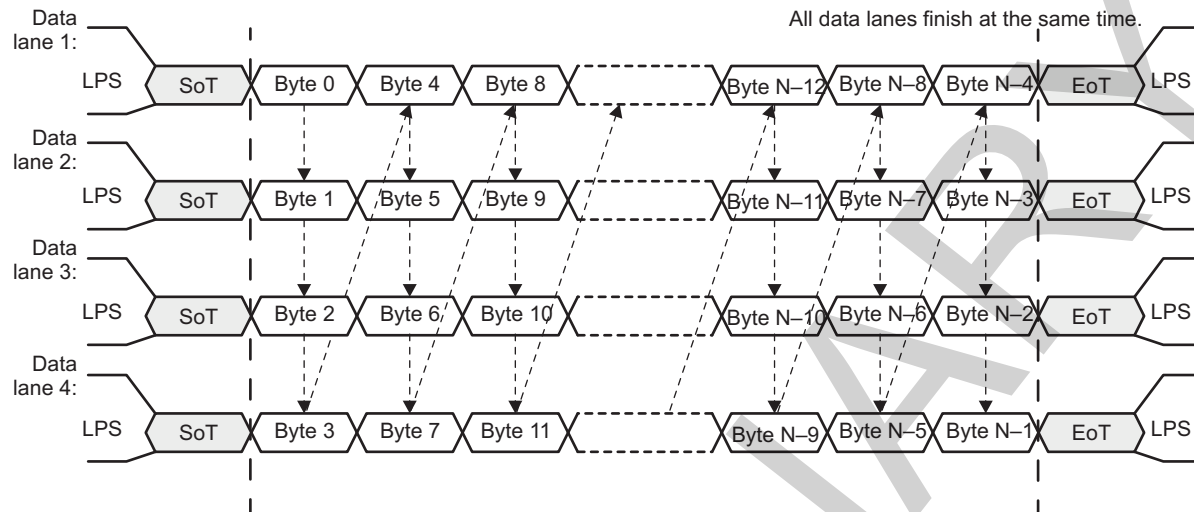
SoT: Start of transmission

EoT: End of transmission

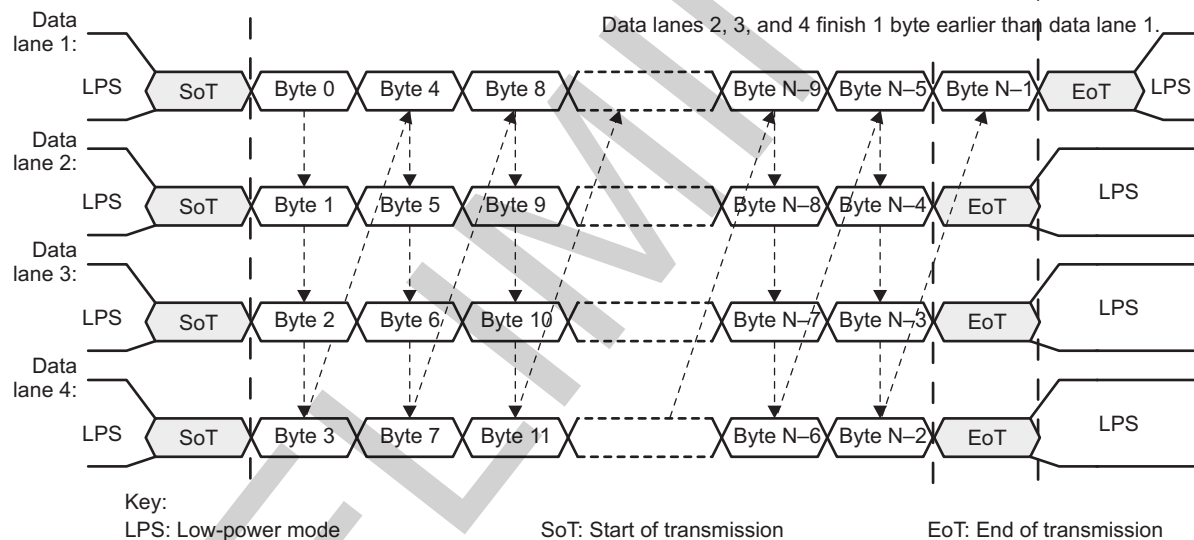
camss-257

Figure 8-39. ISS CSI2 Four Data-Lane Merger Configuration

Number of bytes, N, transmitted is not an integer multiple of the number of data lanes:



Number of bytes, N, transmitted is not an integer multiple of the number of data lanes:



camss-258

8.2.5.1.1.3 ISS CSI2 Protocol Layer

The low-level protocol (LLP) is a byte-oriented protocol from the lane merger layer. It supports short and long packet formats.

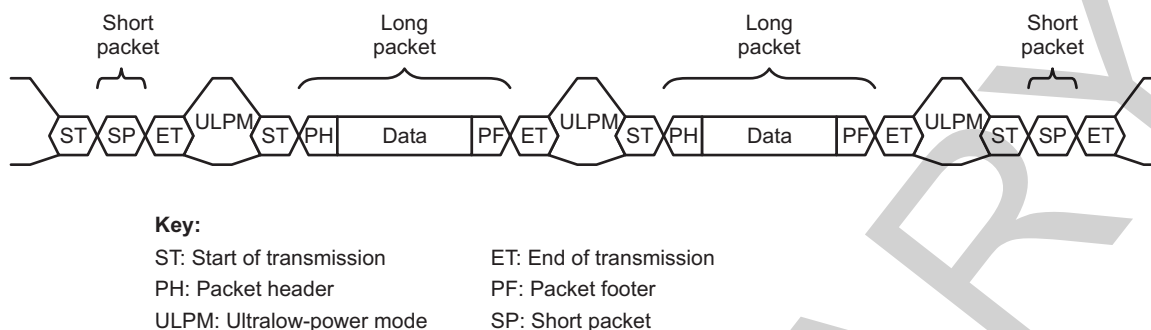
The CSI2 protocol layer defines how image-sensor data is transported onto the physical layer.

The feature set of the protocol layer implemented by the CSI2 receiver is:

- Transport of arbitrary data (payload-independent)
- 8-bit word size
- Support for up to four interleaved virtual channels on the same link
- Special packets for frame-start, frame-end, line-start, and line-end information
- Descriptor for the type, pixel depth, and format of application-specific payload data
- Error-correction code (ECC) for 1-bit error correction or 2-bit error detection in the header
- 16-bit checksum code for payload error detection

Figure 8-40 shows the CSI2 protocol layer with short and long packets.

Figure 8-40. ISS CSI2 Protocol Layer With Short and Long Packets



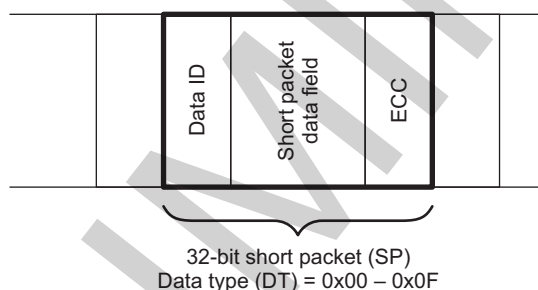
camss-241

Two packets are always separated from each other with a sequence of ET, ULPM, and ST.

8.2.5.1.1.3.1 ISS CSI2 Short Packet

A short packet is identified by data types 0x00 to 0x0F. A short packet can be used for frame or line synchronization or for generic data. Figure 8-41 shows the structure of a short packet.

Figure 8-41. ISS CSI2 Short Packet Structure



camss-242

For frame-synchronization data types, the short packet data field is the frame number. For line-synchronization data types, the short packet data field is the line number. For generic short packet data types, the content of the short packet data field is user-defined.

The 16-bit frame number, when used, is always nonzero to distinguish it from the use case where the frame number is inoperative and remains set to 0. The behavior of the 16-bit frame number is one of the following:

- The frame number is always 0 and is inoperative.
- The frame number increments by 1 for every FS packet within the same virtual channel and is periodically reset to 1 (1, 2, 1, 2, 1, 2, 1, 2 or 1, 2, 3, 4, 1, 2, 3, 4).

For LSC and LEC synchronization packets, the short packet data field contains a 16-bit line number. This line number is the same for the LS and LE packets corresponding to a given line. Line numbers are logical line numbers and do not necessarily equal physical line numbers. The 16-bit line number, when used, is always nonzero to distinguish it from the use case where the line number is inoperative and remains set to 0.

The behavior of the 16-bit line number is one of the following:

- The line number is always 0 and is inoperative.
- The line number increments by 1 for every LS packet within the same virtual channel and the same data type. The line number is periodically reset to 1 for the first LS packet after an FS packet. The intended use is for progressive scan (noninterlaced) video data streams. The line number must be a nonzero value.
- The line number increments by the same arbitrary step value greater than 1 for every LS packet within the same virtual channel and the same data type. The line number is periodically reset to a nonzero

arbitrary start value for the first LS packet after an FS packet. The arbitrary start value can be different between successive frames. The intended use is for interlaced video data streams.

The ECC byte allows single-bit errors to be corrected and 2-bit errors to be detected in the short packet.

Short packets apply to all contexts using the same virtual channel ID (up to eight contexts support eight dedicated configurations of virtual channel ID and data types). The data type associated with the context is not used to distinguish which context is used when receiving short packets.

8.2.5.1.1.3.2 ISS CSI2 Long Packet

A long packet is identified by data types 0x10 to 0x37. A long packet consists of three elements:

- A 32-bit packet header (PH)
- An application-specific data payload with a variable number of 8-bit data words
- A 16-bit packet footer (PF)

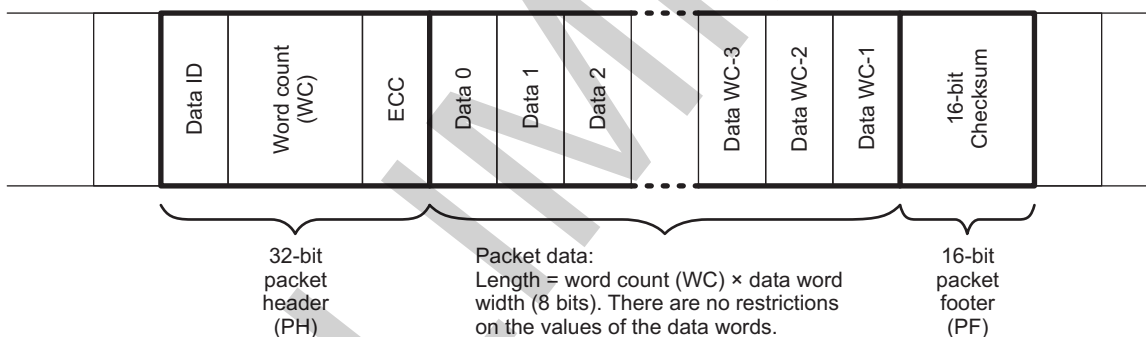
The packet header is composed of three elements:

- An 8-bit data identifier
- A 16-bit word count field
- An 8-bit ECC

The packet footer has one element, a 16-bit checksum.

Figure 8-42 and Table 8-143 show the structure of a long packet.

Figure 8-42. ISS CSI2 Long Packet Structure



camss-243

Table 8-143. ISS CSI2 Long Packet Structure Description

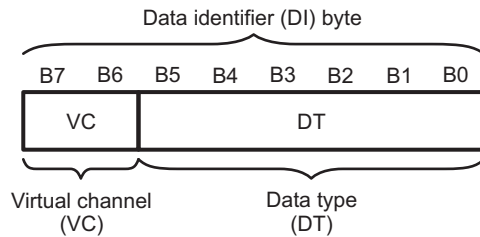
| Packet Part | Field Name | Size (Bits) | Description |
|-------------|------------|-------------|--|
| Header | Data ID | 8 | Contains the virtual channel identifier and the data-type information |
| | Word count | 16 | Number of data words in the packet data. A word is 8 bits. |
| | ECC | 8 | ECC for data ID and WC field. Allows 1-bit error recovery and 2-bit error detection. |
| Data | Data | WC-8 | Application-specific payload (WC words of 8 bits) |
| Footer | Checksum | 16 | 16-bit CRC for packet data |

There are no restrictions on the size of the packet data, but each data format can impose additional restrictions on the length of the payload data (for example, a multiple of 4 bytes).

8.2.5.1.1.3.3 ISS CSI2 Data Identifier

The data identifier byte contains the virtual channel (VC) value and the data-type (DT) value, as shown in Figure 8-43. The VC value is in the 2 MSBs of the data identifier byte. The DT value is in the 6 LSBs of the data identifier byte.

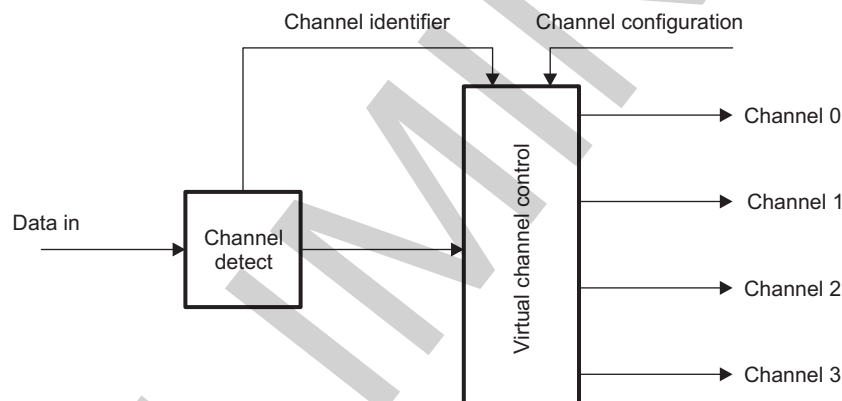
Figure 8-43 shows the data identifier structure.

Figure 8-43. ISS CSI2 Data Identifier Structure

camss-244

Virtual Channel

The CSI2 protocol layer transports virtual channels. Virtual channels are built of frames. A frame can comprise embedded data and image-sensor data. Two contexts are used to send the two types of data separately. Each frame is identified by unique mandatory synchronization codes: frame start and frame end. Line start and line end synchronization codes are optional for the transmitter. A set of registers is associated with each context defined by the virtual channel ID and the data type. [Figure 8-44](#) shows a virtual channel.

Figure 8-44. ISS CSI2 Virtual Channel

camss-245

Pixel Formats

8.2.5.1.1.3.4 ISS CSI2 Synchronization Codes

Data reception from the image-sensor module uses four synchronization codes embedded in the serial bitstream:

- FSC: Identifies the start of a new frame
- LSC: Identifies the start of a new line; received for every line
- LEC: Identifies the end of a line; received for every line
- FEC: Identifies the end of the last line and the end of the current frame

[Table 8-144](#) summarizes the synchronization code values.

Table 8-144. ISS CSI2 Synchronization Codes

| Synchronization Code | Value | Comments |
|----------------------|------------|-----------|
| FSC | 0x0 | Mandatory |
| FEC | 0x1 | Mandatory |
| LSC | 0x2 | Optional |
| LEC | 0x3 | Optional |
| Reserved | 0x4 to 0x7 | Not used |

8.2.5.1.1.3.5 ISS CSI2 Generic Short Packet Codes

When the synchronization code value is from 0x8 to 0xF, the short packet is called a generic short packet. Short packets are not processed by the camera interface hardware. A generic short packet is stored in a register without the ECC and an interrupt can be generated. Therefore, generic short packets must be handled by software.

8.2.5.1.1.3.6 ISS CSI2 Generic Long Packet Codes

The code value 0x10 indicates null packets, which can be received at any time. They are discarded by the protocol engine.

The code value 0x11 indicates blanking packets, which can be received at any time. They are discarded by the protocol engine.

The code value 0x12 indicates embedded 8-bit nonimage data typically used for JPEG.

Code values from 0x13 to 0x17 are reserved.

8.2.5.1.1.3.7 ISS CSI2 Frame Structure

Each frame consists of short packets to indicate SOF and EOF. Optional short packets for start of line and end of line can be sent by the image sensor.

Some information before and after the picture data can be sent as SOF and EOF information by the image sensor to the memory through the L3 port.

For each frame, the pixel data (arbitrary data or user-defined byte data) are valid only after an SOF short packet. If the data are invalid, they are discarded by the protocol engine.

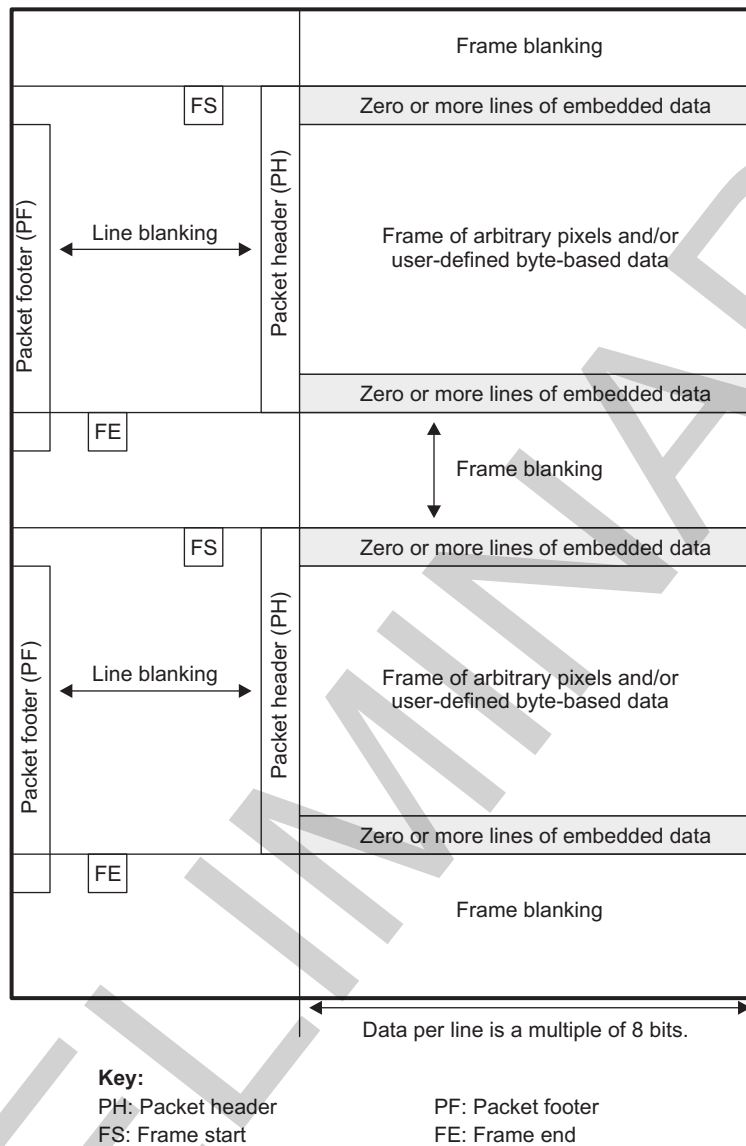
A frame contains embedded data and image-sensor data. [Figure 8-45](#) shows where the embedded data and image-sensor data are in the frame. The frame is scanned in raster order starting from the top-left corner, as shown in [Figure 8-45](#) and [Figure 8-46](#). The following definitions for a frame apply:

- Zero or more SOF status lines (SOF lines) can be embedded at the beginning of a CSI2 frame.
- The image embedded data is carried using separate data types and virtual channels (see [Section 8.2.4.1.1, ISS CCP2 Protocol and Data Formats](#), and [Section 8.2.5.3.3.4, ISS CSI2 Virtual Channel and Context](#)).
- Zero or more EOF status lines (EOF lines) can be embedded at the end of a CSI2 frame.
- The SOF lines, pixel data, and EOF lines do not overlap.

The CSI2 receiver does not use the information in the status lines. However, it extracts it and stores it in memory for use by software.

Because the data types are different, the data is carried using separate data types called virtual channels. Those must be mapped to the adequate context. The CSI2 receiver uses a different context for embedded data and image-sensor data. See [Section 8.2.5.3.3.4, ISS CSI2 Virtual Channel and Context](#).

Embedded data is supported as a context by the CSI2 receiver; therefore, there is no specific hardware support for embedded data.

Figure 8-45. ISS CSI2 General Frame Structure (Informative)

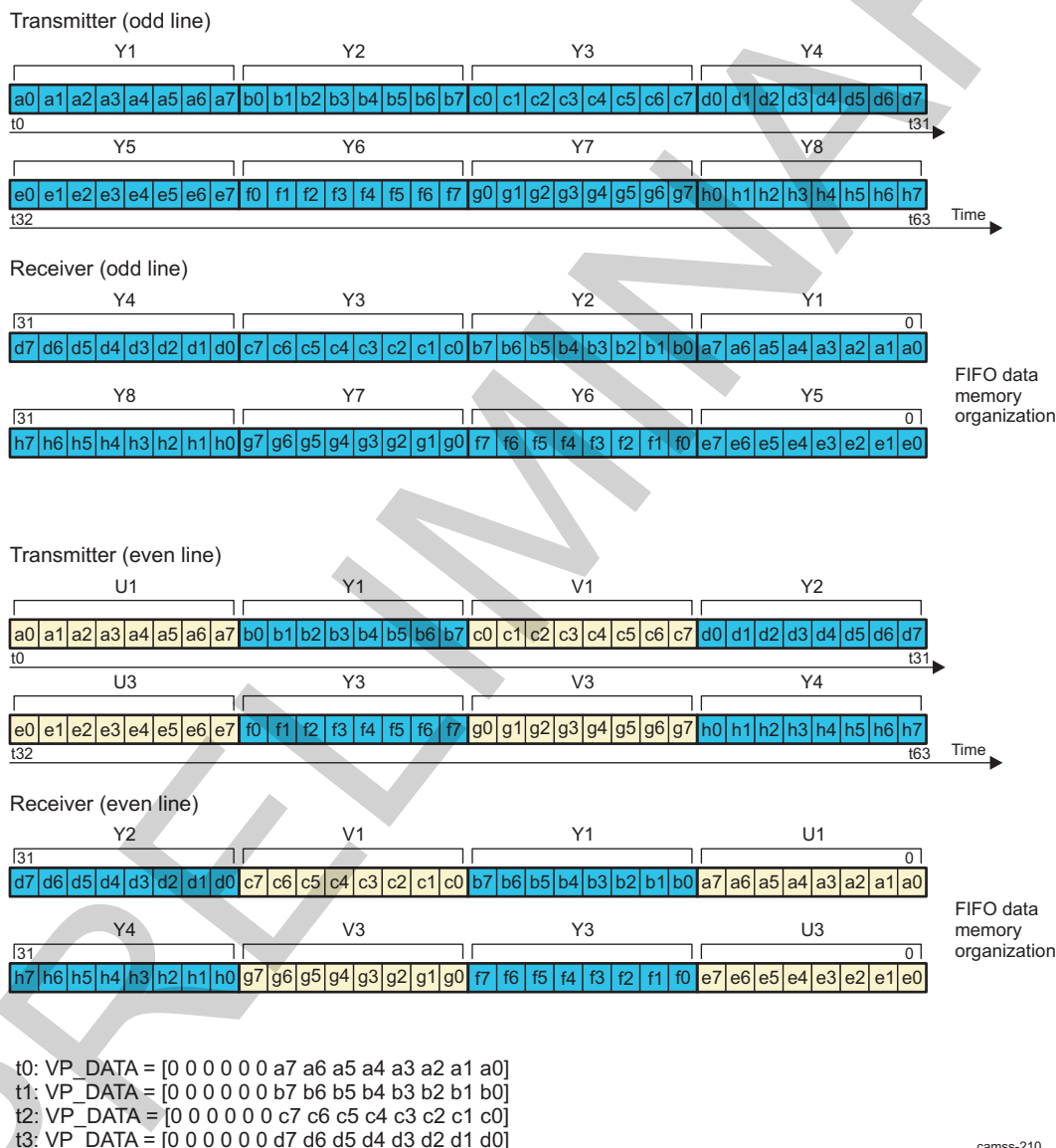
camss-246

Figure 8-46 shows the frame structure of a YUV4:2:2 interlaced video frame without embedded data.

be even. Figure 8-47 shows the storage format for YUV4:2:0 8-bit data. It is shown as little endian. If the data format is big endian, the figure changes accordingly. Set the `CSI2_CTX_CTRL2_i[9:0]` FORMAT bit field to 0x18 to select YUV4:2:0 8-bit mode. Even and odd lines do not have the same length. Offset must be set accordingly with the `CSI2_CTX_DAT_OFST_i[16:5]` OFST bit field; for example, if the offset is 0, the data is written in a contiguous way (bit-to-bit of odd and even lines). If the data has an offset, set the destination offset between the first pixel of the previous line and the first pixel of the current line being written to memory.

Figure 8-47. ISS CSI2 YUV4:2:0 8-Bit

YUV4:2:0 8-bit



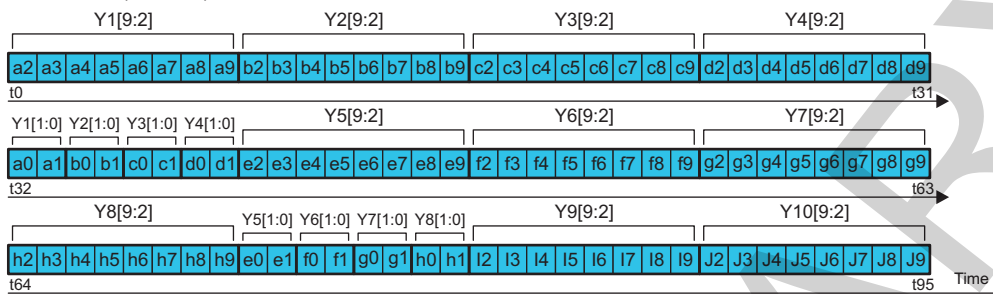
8.2.5.1.1.4.1.2 ISS CSI2 YUV4:2:0 10-Bit

YUV4:2:0 10-bit data can be stored to memory in little-endian and big-endian format. The line length sent through the CSI2 physical protocol is a multiple of 40 bits for odd lines and 80 bits for even lines. Figure 8-48 shows the storage format for YUV4:2:0 10-bit data. Set the `CSI2_CTX_CTRL2_i[9:0]` FORMAT bit field to 0x19 to select YUV4:2:0 10-bit mode. Even and odd lines do not have the same length. Offset must be set accordingly with the `CSI2_CTX_DAT_OFST_i[16:5]` OFST bit field.

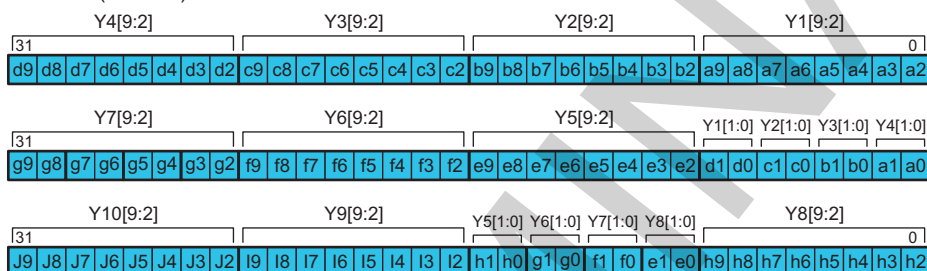
Figure 8-48. ISS CSI2 YUV4:2:0 10-Bit

YUV4:2:0 10-bit

Transmitter (odd line)

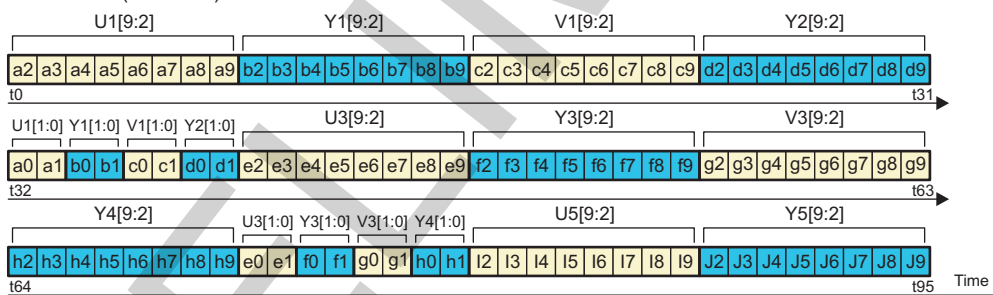


Receiver (odd line)

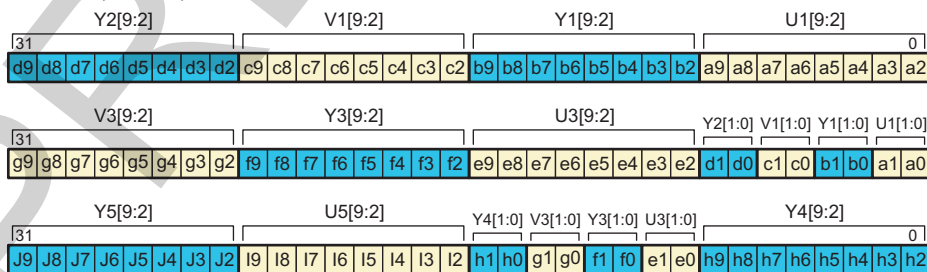


FIFO data
memory
organization

Transmitter (even line)



Receiver (odd line)



FIFO data
memory
organization

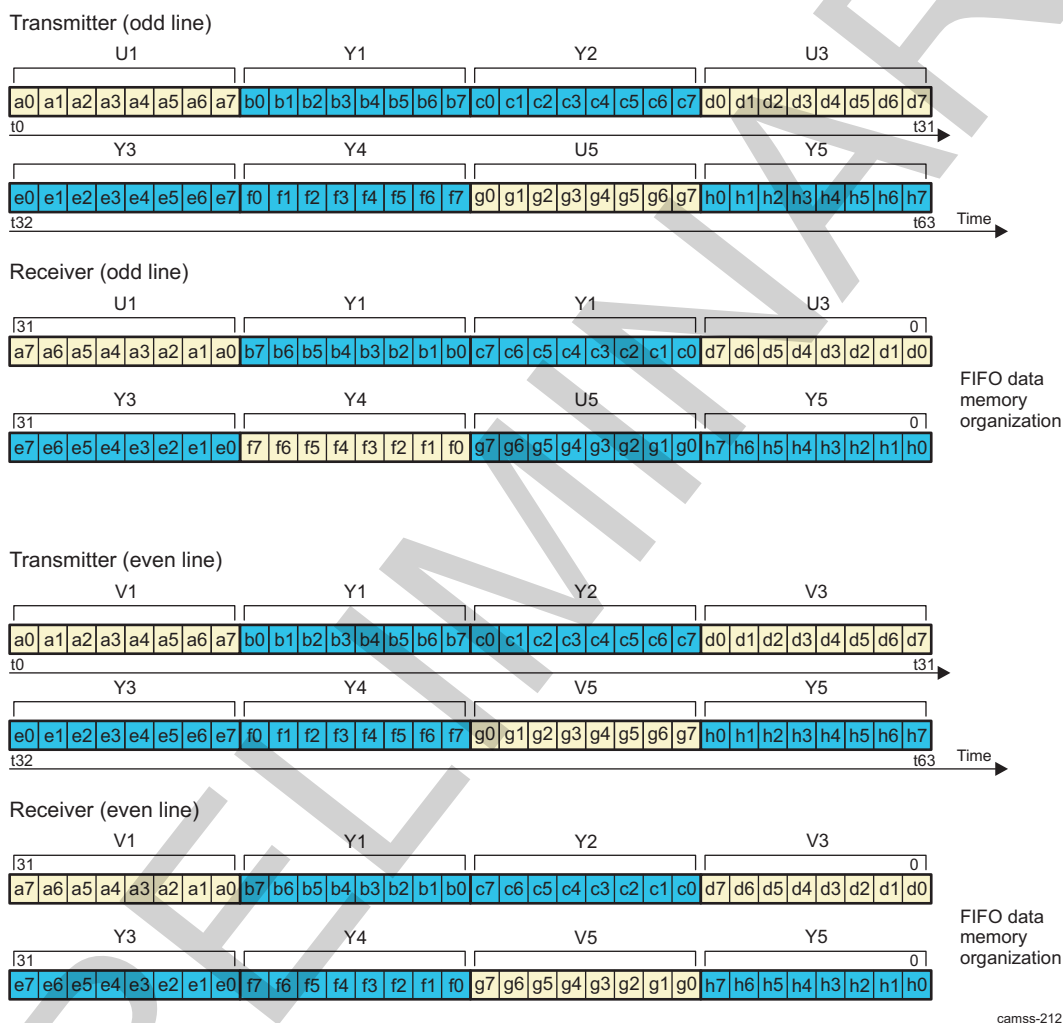
camss-211

8.2.5.1.1.4.1.3 CSI2 YUV4:2:0 8-Bit Legacy

YUV4:2:0 8-bit legacy data can be stored to memory in little-endian and big-endian format. The line length sent through the CSI2 physical protocol is a multiple of 4 bytes. Figure 8-49 shows the storage format for YUV4:2:0 8-bit legacy data. Set the `CSI2_CTX_CTRL2_i[9:0]` FORMAT bit field to 0x1A to select YUV4:2:0 8-bit legacy mode.

Figure 8-49. ISS CSI2 YUV4:2:0 8-Bit Legacy

YUV4:2:0 8-bit legacy



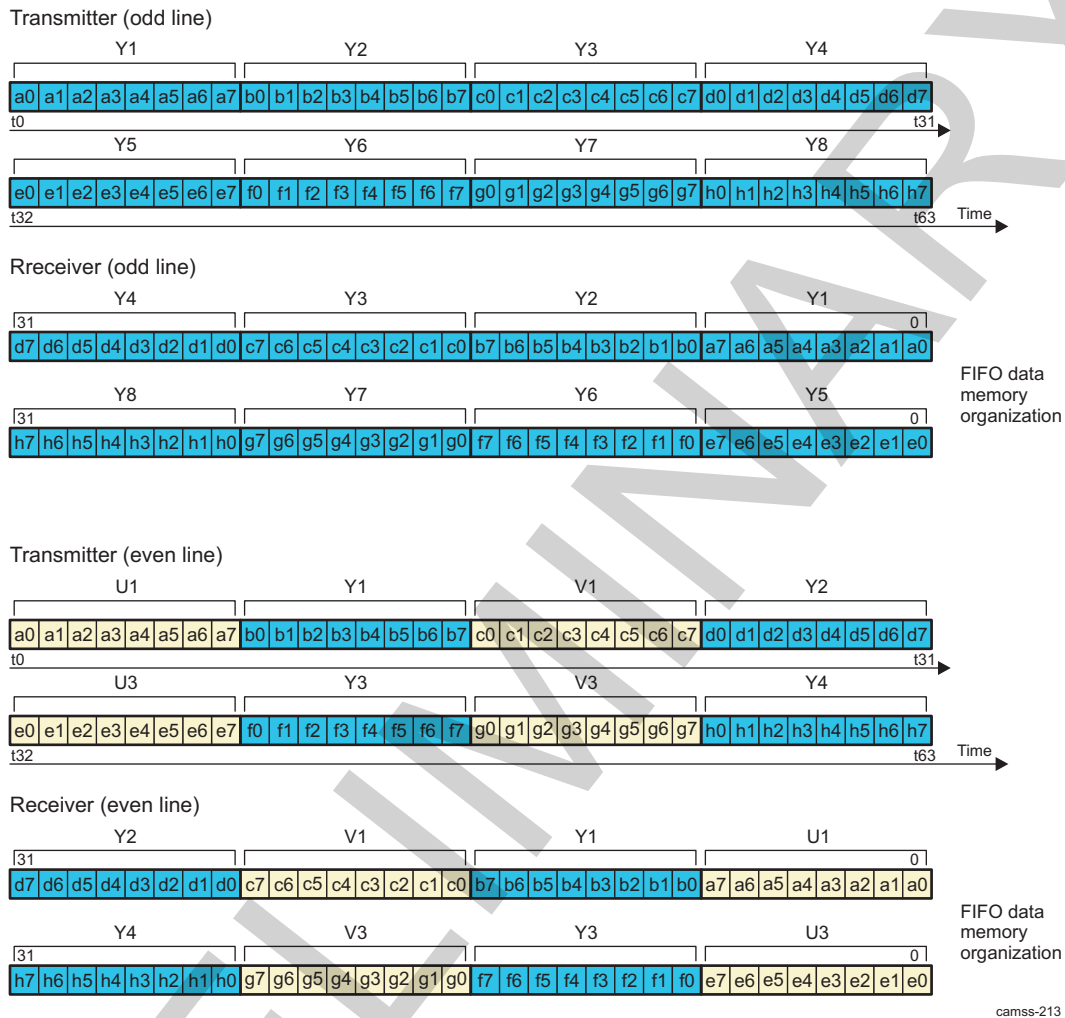
8.2.5.1.1.4.1.4 ISS CSI2 YUV4:2:0 8-Bit + CSPS

YUV4:2:0 8-bit CSPS data can be stored to memory in little-endian and big-endian format. The line length sent through the CSI2 physical protocol is a multiple of 16 bits for odd lines and 32 bits for even lines.

For correct pixel reconstruction, the line length must be a multiple of 3 32 bits and the number of lines must be even. Figure 8-50 shows the storage format for YUV4:2:0 8-bit + CSPS data. Set the `CSI2_CTX_CTRL2_i[9:0]` FORMAT bit field to 0x1C to select YUV4:2:0 8-bit + CSPS mode.

Figure 8-50. ISS CSI2 YUV4:2:0 8-Bit + CSPS

YUV4:2:0 8-bit + CSPS



8.2.5.1.1.4.1.5 Camera ISP CSI2 Byte Swap

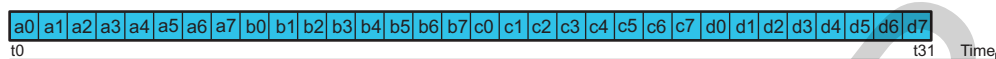
The CSI2 receiver incorporates a byte-swapping function. Software can optionally enable byte-swapping of the payload data by setting the CSI2_CTLx_CTRL1[31] BYTESWAP bit. This feature must be used only when the amount of payload data per packet is a multiple of 16 bits. The byte-swapping is performed before pixel reconstruction.

Figure 8-51. Camera ISP CSI2 Byte Swap

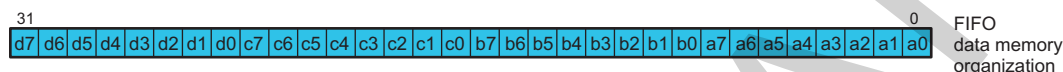
ISS CSI2 byte-swap

For example, CSI2_CTX_CTRL2[9:0] FORMAT = RAW8

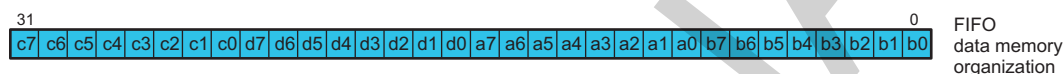
Transmitter



Receiver when CSI2_CTX_CTRL1[31] BYTESWAP = 0x0



Receiver when CSI2_CTX_CTRL1[31] BYTESWAP = 0x1



isp-001

8.2.5.1.1.4.1.6 ISS CSI2 YUV4:2:0 10-Bit + CSPS

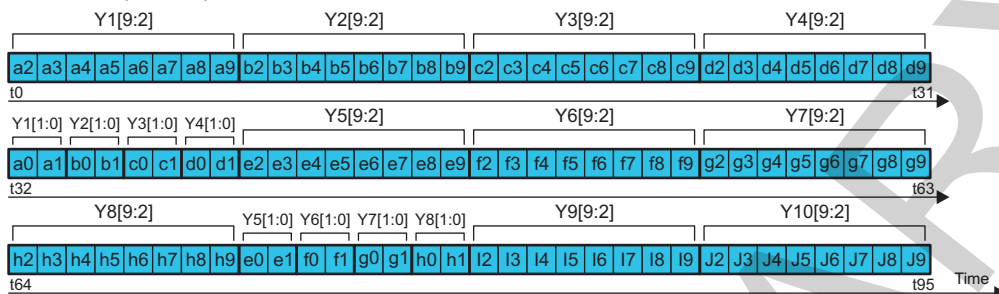
YUV4:2:0 10-bit CSPS data can be stored to memory in little-endian and big-endian format. The line length sent through the CSI2 physical protocol is a multiple of 40 bits for odd lines and 80 bits for even lines.

For correct pixel reconstruction, the line length must be a multiple of 3 32 bits and the number of lines must be even. [Figure 8-52](#) shows the storage format for YUV4:2:0 10-bit + CSPS data. Set the CSI2_CTX_CTRL2_i[9:0] FORMAT bit field to 0x1D to select YUV4:2:0 10-bit + CSPS mode.

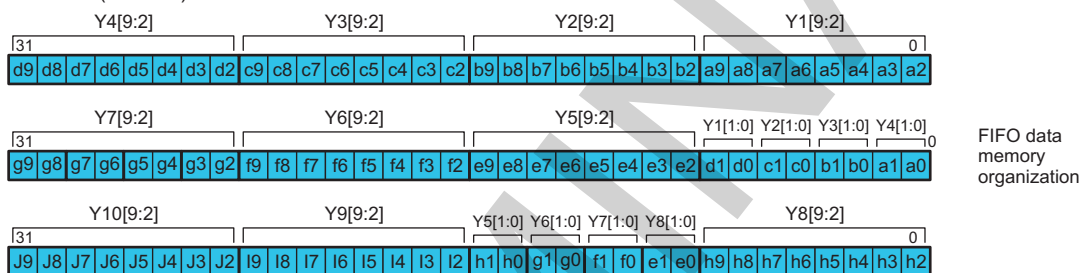
Figure 8-52. ISS CSI2 YUV4:2:0 10-Bit + CSPS

YUV4:2:0 10-bit + CSPS

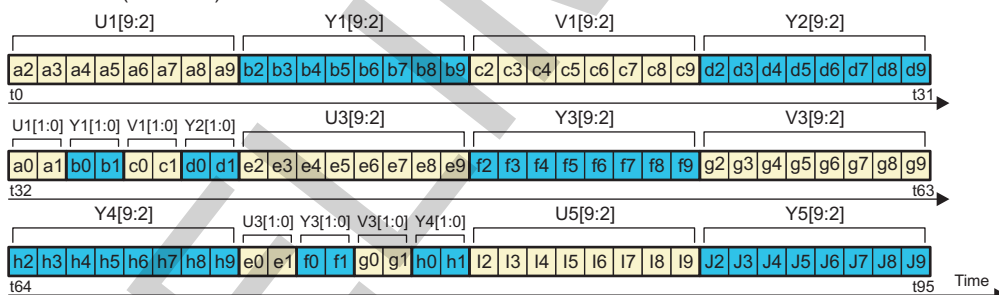
Transmitter (odd line)



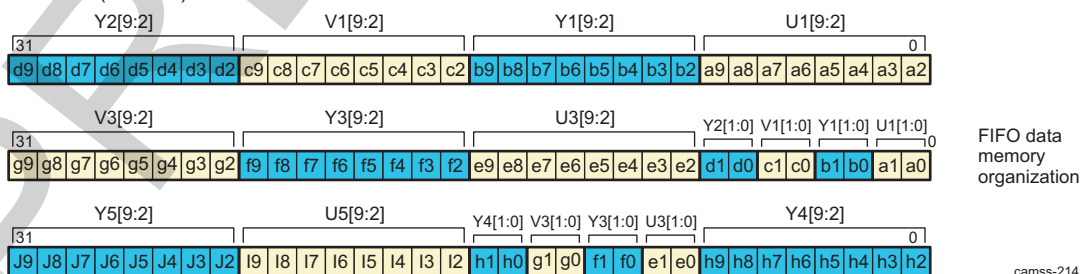
Receiver (odd line)



Transmitter (even line)



Receiver (odd line)



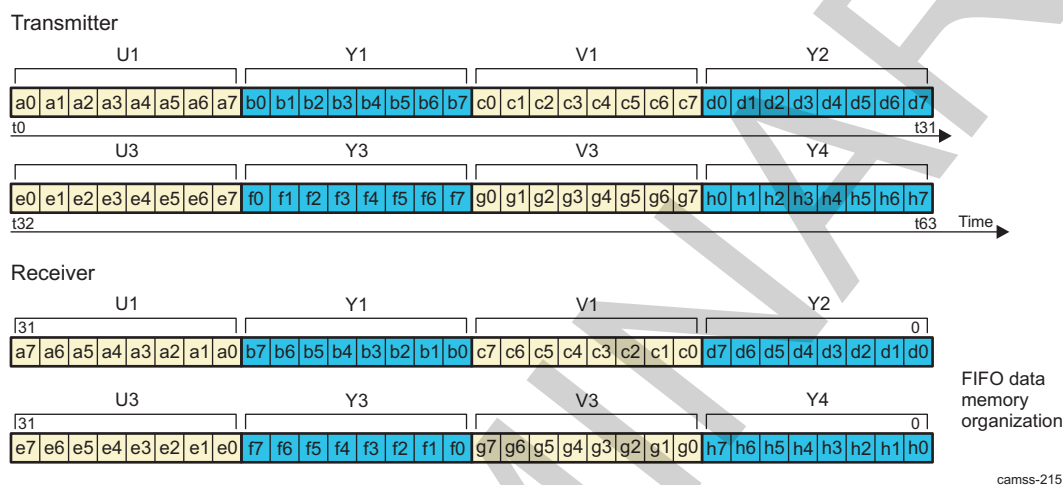
camss-214

8.2.5.1.1.4.1.7 ISS CSI2 YUV4:2:2 8-Bit

YUV4:2:2 data can be stored to memory in little-endian and big-endian format. To set the endianness for YUV4:2:2 use the [CSI2_CTRL\[4\] ENDIANNESS](#) bit. The line length sent through the CSI2 physical protocol is a multiple of 32 bits. [Figure 8-53](#) shows the storage format for YUV4:2:2 8-bit data. Set the [CSI2_CTX_CTRL2_i\[9:0\] FORMAT](#) bit field to 0x1E to select YUV4:2:2 8-bit mode.

Figure 8-53. ISS CSI2 YUV4:2:2 8-Bit

YUV4:2:2 8-bit

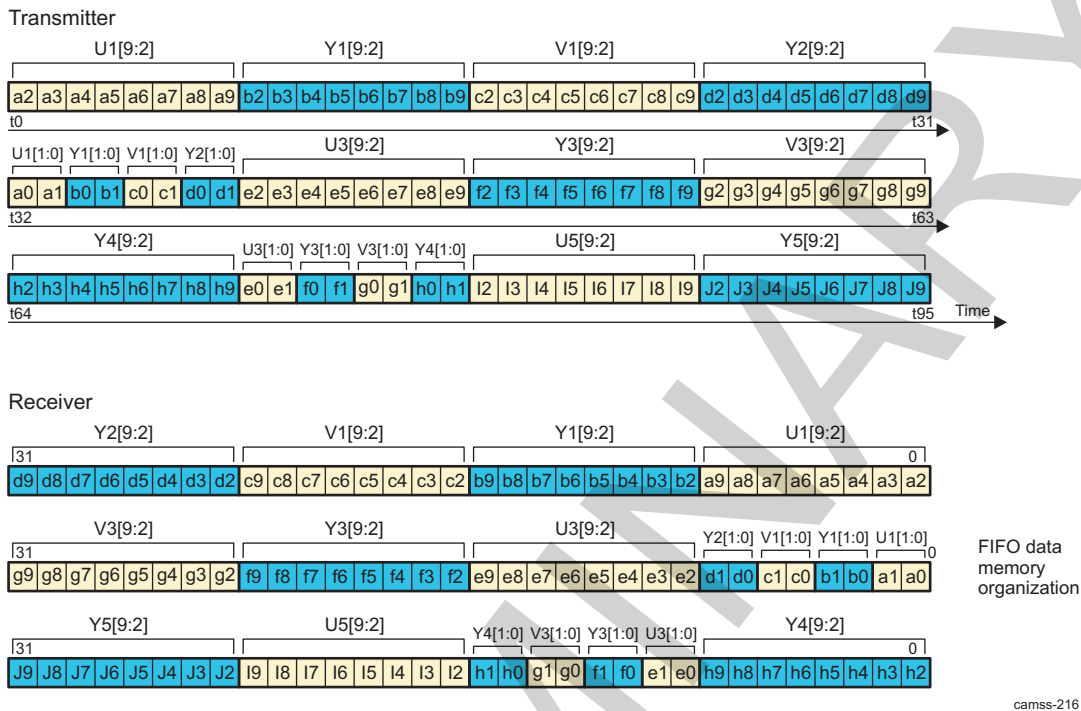


8.2.5.1.1.4.1.8 CSI2 YUV4:2:2 10-Bit

YUV4:2:2 data can be stored to memory in little-endian and big-endian format. The line length sent through the CSI2 physical protocol is a multiple of 40 bits. [Figure 8-54](#) shows the storage format for YUV4:2:2 10-bit data. Set the [CSI2_CTX_CTRL2_i\[9:0\] FORMAT](#) bit field to 0x1F to select YUV4:2:2 10-bit mode.

Figure 8-54. ISS CSI2 YUV4:2:2 10-Bit

YUV4:2:2 10-bit



8.2.5.1.1.4.2 ISS CSI2 RGB Operating Modes

8.2.5.1.1.4.2.1 ISS CSI2 RGB565

RGB565 data is output to memory without data expansion. The line length sent through the CSI2 physical layer is always a multiple of 16 bits. [Figure 8-55](#) shows the storage format for RGB565 data. Set the `CSI2_CTX_CTRL2_i[9:0]` FORMAT bit field to 0x22 to select RGB565 mode.

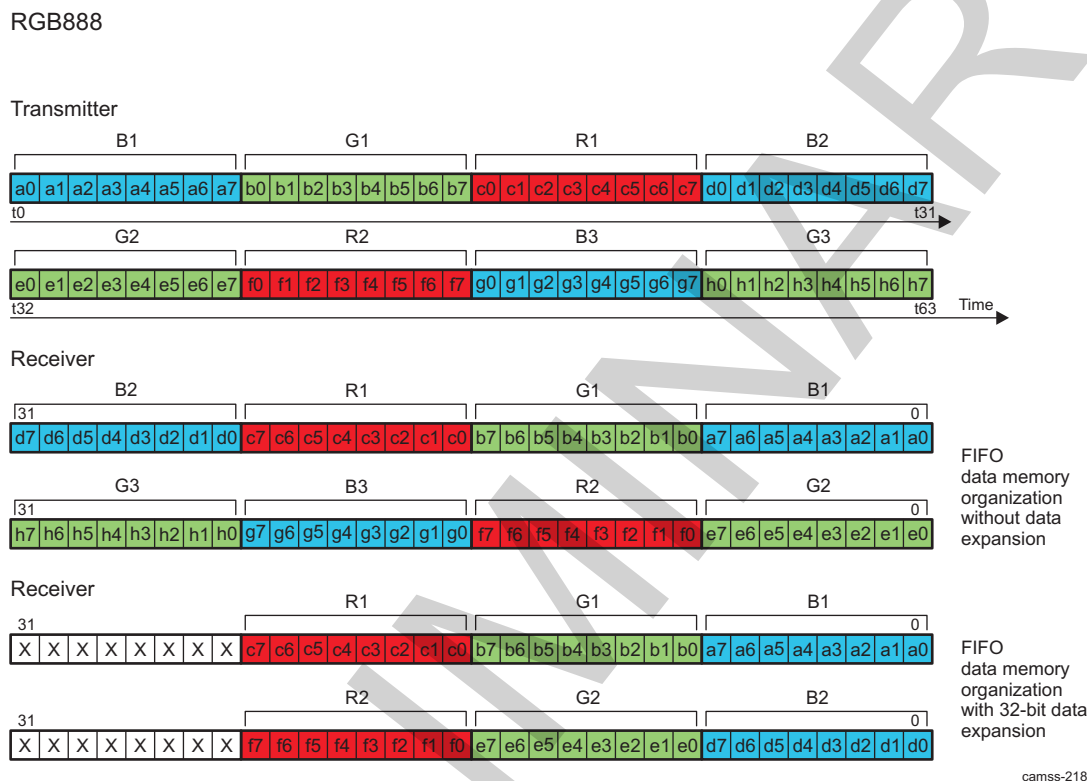
Figure 8-55. ISS CSI2 RGB565



8.2.5.1.1.4.2.2 ISS CSI2 RGB888

RGB888 data can be output to memory in two formats: with or without data expansion. If data expansion is used, the value of the 8 upper bits is programmable and can be set with an alpha value for computer graphics applications (the [CSI2_CTX_CTRL3_i\[29:16\]](#) ALPHA bit field). [Figure 8-56](#) shows the storage format for RGB888 data. Set the [CSI2_CTX_CTRL2_i\[9:0\]](#) FORMAT bit field to 0x24 to select RGB888 mode.

Figure 8-56. ISS CSI2 RGB888

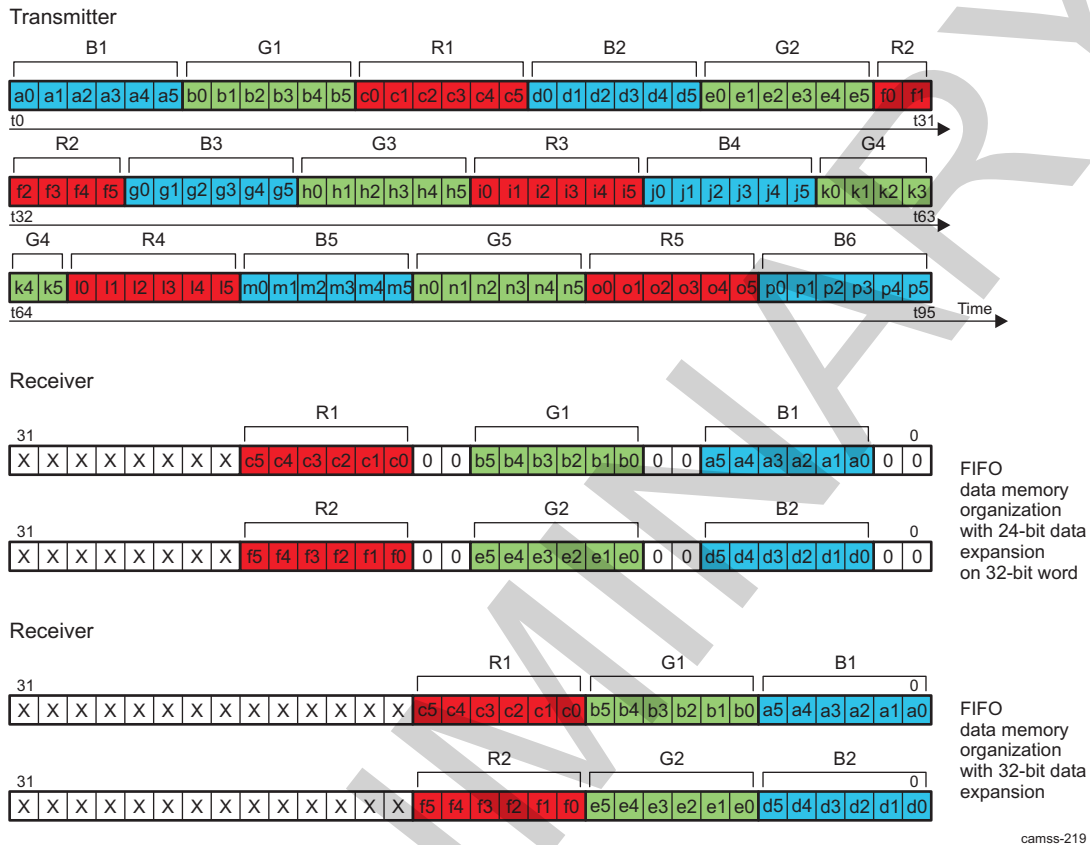


8.2.5.1.1.4.2.3 ISS CSI2 RGB666

RGB666 data is always output to memory with data expansion. The value of the 14 upper bits is programmable and can be set with an alpha value for computer graphics applications (the [CSI2_CTX_CTRL3_i\[29:16\]](#) ALPHA bit field). The line length sent through the CSI2 physical protocol is a multiple of 8 bits. Furthermore, the line length is a multiple of 9×8 bits to finish the pixel reconstruction correctly. [Figure 8-57](#) shows the storage format for RGB666 data. Set the [CSI2_CTX_CTRL2_i\[9:0\]](#) FORMAT bit field to 0x33 to select RGB666 mode.

Figure 8-57. ISS CSI2 RGB666

RGB666



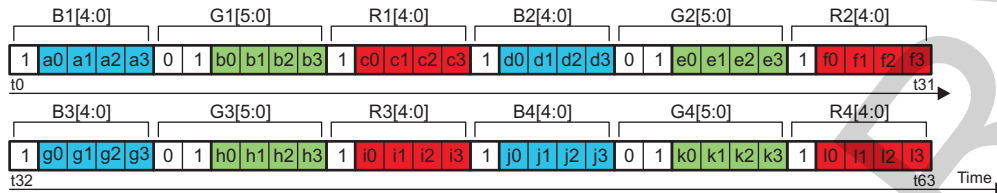
8.2.5.1.1.4.2.4 ISS CSI2 RGB444

RGB444 data is output to memory with data expansion. When data expansion is used, the value of the 4 upper bits is programmable and can be set with an alpha value for computer graphics applications (the [CSI2_CTX_CTRL3_i\[29:16\]](#) ALPHA bit field). [Figure 8-58](#) shows the storage format for RGB444 data. Set the [CSI2_CTX_CTRL2_i\[9:0\]](#) FORMAT bit field to 0xA0 to select RGB444 mode.

Figure 8-58. ISS CSI2 RGB444

RGB444

Transmitter



Receiver



camss-220

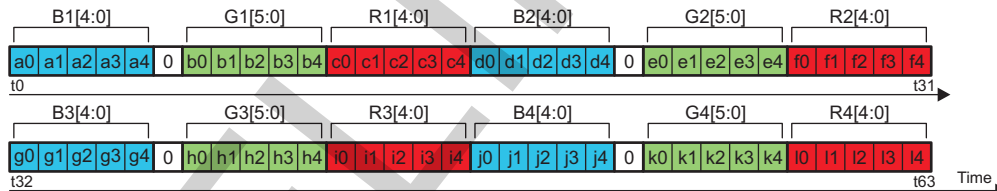
8.2.5.1.1.4.2.5 ISS CSI2 RGB555

RGB555 data is output to memory with data expansion. [Figure 8-59](#) shows the storage format for RGB555 data. Set the `CSI2_CTX_CTRL2_i[9:0]` FORMAT bit field to 0xA1 to select RGB555 mode.

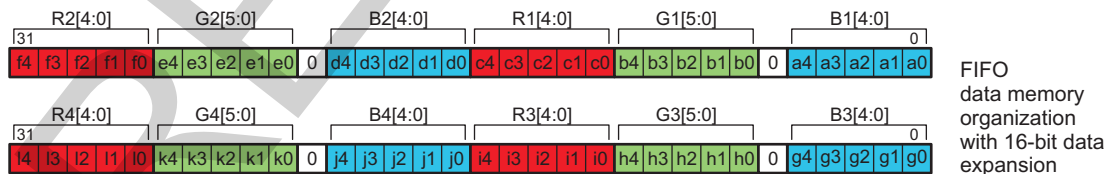
Figure 8-59. ISS CSI2 RGB555

RGB555

Transmitter



Receiver



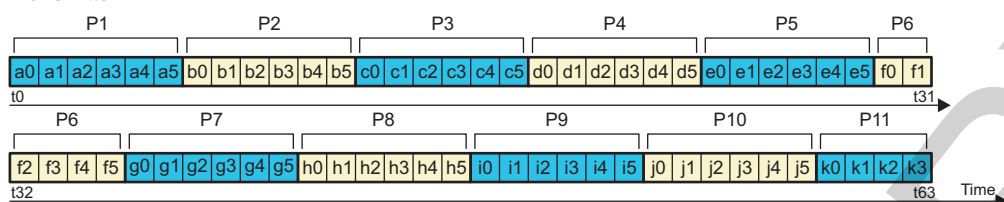
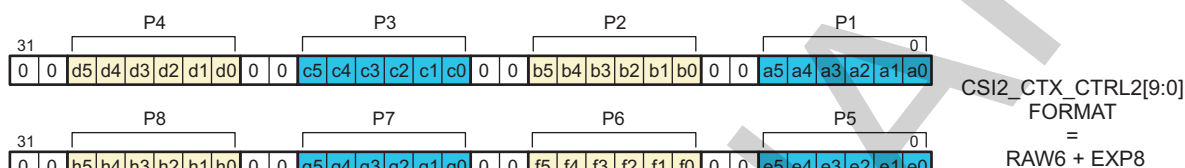
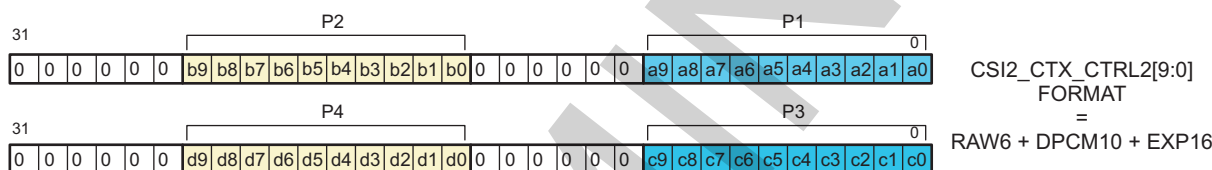
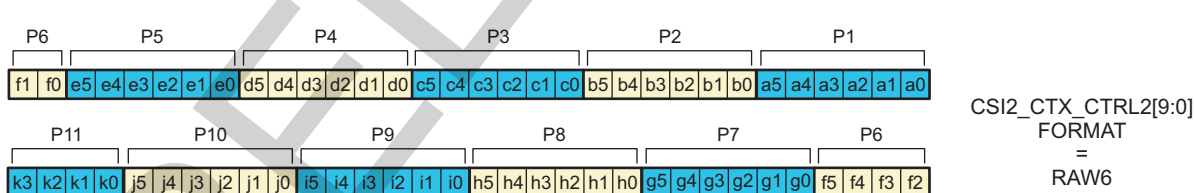
camss-221

8.2.5.1.1.4.3 ISS CSI2 RAW Bayer RGB Operating Modes**8.2.5.1.1.4.3.1 ISS CSI2 RAW6**

RAW6 data can be output to memory with or without data expansion. The line length sent through the CSI2 physical layer is a multiple of 8 bits (6-bit image data + 2-bit expansion). Furthermore, the line length is a multiple of 3×8 bits to complete the pixel reconstruction correctly (the lowest common multiple of 8 and 6 is 24, so 3×8 bits). [Figure 8-60](#) shows the storage format for RAW6 data. Set the `CSI2_CTX_CTRL2_i[9:0]` FORMAT bit field as follows:

- To 0x28 to select RAW6 mode

- To 0x68 for RAW6 + 8-bit expansion
- To 0xE8 for RAW6 + DPCM decompression to 10-bit to video port
- To 0x2A8 for RAW6 + DPCM decompression to 10-bit expanded to 16-bit
- To 0x3A8 for RAW6 + DPCM decompression to 12-bit expanded to 16-bit
- To 0x368 for RAW6 + DPCM decompression to 12-bit to video port

Figure 8-60. ISS CSI2 RAW6**RAW6****Transmitter****Receiver****Receiver****Receiver****Receiver**

t0: VP_DATA = [0 0 0 0 a9 a8 a7 a6 a5 a4 a3 a2 a1 a0]
 t1: VP_DATA = [0 0 0 0 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0]
 t2: VP_DATA = [0 0 0 0 c9 c8 c7 c6 c5 c4 c3 c2 c1 c0]
 t3: VP_DATA = [0 0 0 0 d9 d8 d7 d6 d5 d4 d3 d2 d1 d0]

CSI2_CTX_CTRL2[9:0]
 FORMAT
 =
 RAW6 + DPCM10 + VP

t0: VP_DATA = [0 0 a11 a10 a9 a8 a7 a6 a5 a4 a3 a2 a1 a0]
 t1: VP_DATA = [0 0 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0]
 t2: VP_DATA = [0 0 c11 c10 c9 c8 c7 c6 c5 c4 c3 c2 c1 c0]
 t3: VP_DATA = [0 0 d11 d10 d9 d8 d7 d6 d5 d4 d3 d2 d1 d0]

CSI2_CTX_CTRL2[9:0]
 FORMAT
 =
 RAW6 + DPCM12 + VP

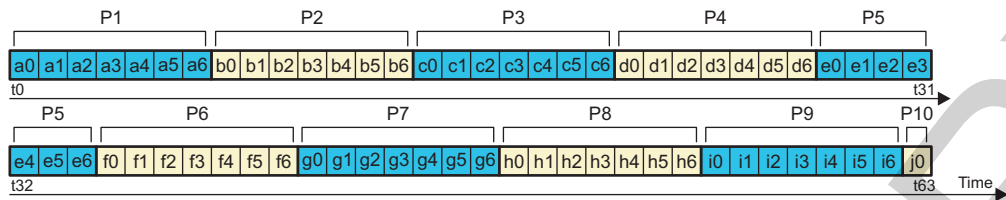
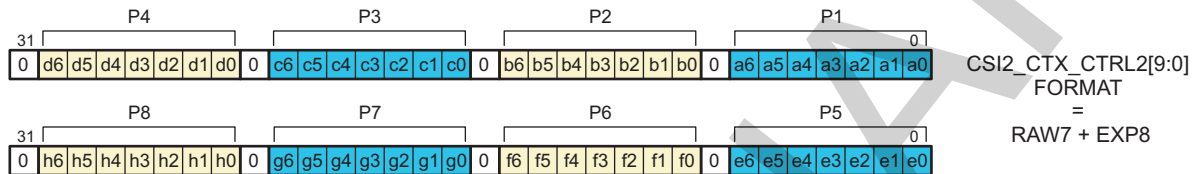
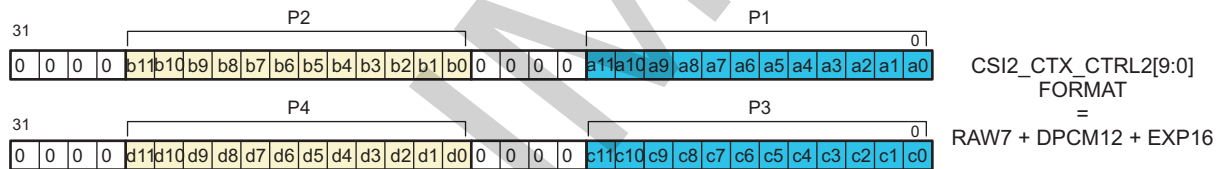
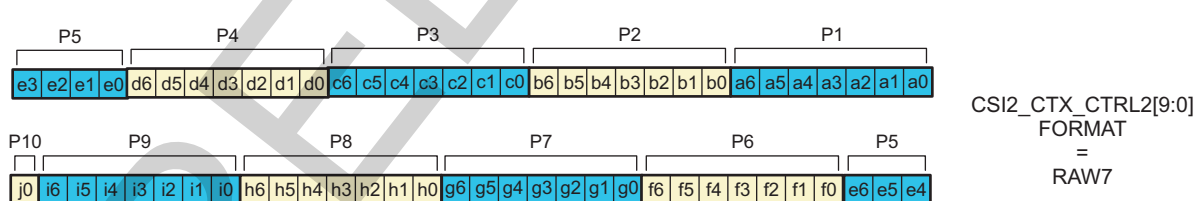
camss-079

8.2.5.1.1.4.3.2 ISS CSI2 RAW7

RAW7 data can be output to memory with or without data expansion. The line length sent through the CSI2 physical layer is a multiple of 8 bits. Furthermore, the line length is a multiple of 7×8 bits to complete the pixel reconstruction correctly (the lowest common multiple of 8 and 7 is 56, so 7×8 bits).

[Figure 8-61](#) shows the storage format for RAW7 data. Set the [CSI2_CTX_CTRL2_i\[9:0\]](#) FORMAT bit field as follows:

- To 0x29 to select RAW7 mode
- To 0x69 for RAW7 + 8-bit expansion
- To 0x329 for RAW7 + DPCM decompression to 10-bit to video port
- To 0x229 for RAW7 + DPCM decompression to 10-bit expanded to 16-bit
- To 0x369 for RAW7 + DPCM decompression to 12-bit expanded to 16-bit
- To 0x3A9 for RAW7 + DPCM decompression to 12-bit to video port

Figure 8-61. ISS CSI2 RAW7**RAW7****Transmitter****Receiver****Receiver****Receiver****Receiver**

t0: VP_DATA = [0 0 0 0 a9 a8 a7 a6 a5 a4 a3 a2 a1 a0]
t1: VP_DATA = [0 0 0 0 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0]
t2: VP_DATA = [0 0 0 0 c9 c8 c7 c6 c5 c4 c3 c2 c1 c0]
t3: VP_DATA = [0 0 0 0 d9 d8 d7 d6 d5 d4 d3 d2 d1 d0]

CSI2_CTX_CTRL2[9:0]
FORMAT
= RAW7 + DPCM10 + VP

t0: VP_DATA = [0 0 a11 a10 a9 a8 a7 a6 a5 a4 a3 a2 a1 a0]
t1: VP_DATA = [0 0 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0]
t2: VP_DATA = [0 0 c11 c10 c9 c8 c7 c6 c5 c4 c3 c2 c1 c0]
t3: VP_DATA = [0 0 d11 d10 d9 d8 d7 d6 d5 d4 d3 d2 d1 d0]

CSI2_CTX_CTRL2[9:0]
FORMAT
= RAW7 + DPCM12 + VP

camss-078

8.2.5.1.1.4.3.3 ISS CSI2 RAW8

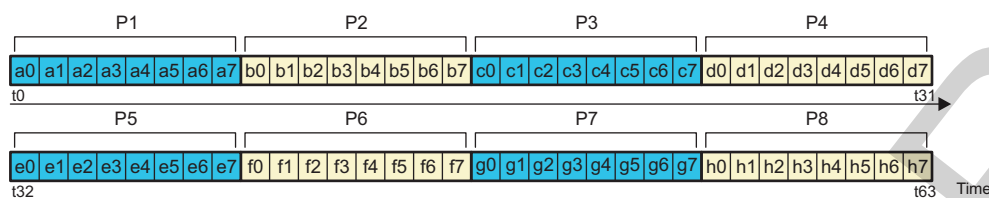
RAW8 data can be output to memory with or without data expansion. The line length sent through the CSI2 physical layer is always a multiple of 8 bits. [Figure 8-62](#) shows the storage format for RAW8 data. Set the [CSI2_CTX_CTRL2_i](#)[9:0] FORMAT bit field as follows:

- To 0x2A to select RAW8 mode
- To 0x12A for RAW8 to video port
- To 0x32A for RAW8 + DPCM decompression to 10-bit to video port
- To 0x2AA for RAW8 + DPCM decompression to 10-bit expanded to 16-bit
- To 0x36A for RAW8 + DPCM decompression to 12-bit expanded to 16-bit
- To 0x3AA for RAW8 + DPCM decompression to 12-bit to video port

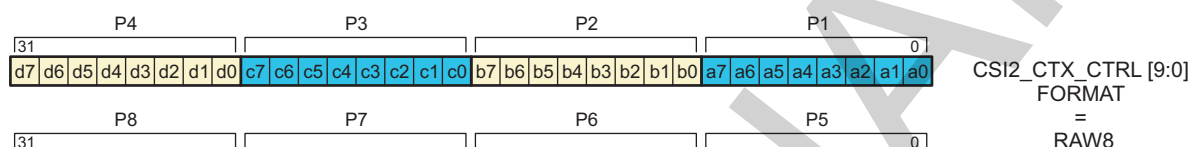
Figure 8-62. ISS CSI2 RAW8

RAW8

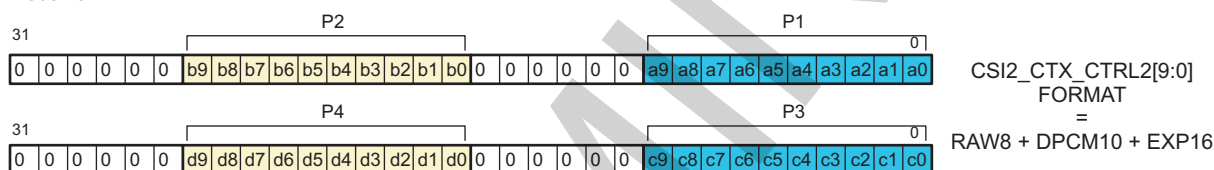
Transmitter



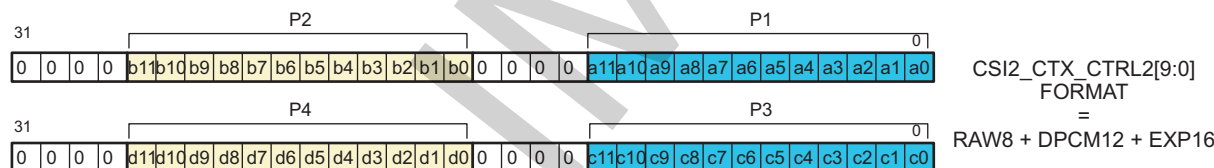
Receiver



Receiver



Receiver



t0: VP_DATA = [0 0 0 0 a9 a8 a7 a6 a5 a4 a3 a2 a1 a0]
 t1: VP_DATA = [0 0 0 0 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0]
 t2: VP_DATA = [0 0 0 0 c9 c8 c7 c6 c5 c4 c3 c2 c1 c0]
 t3: VP_DATA = [0 0 0 0 d9 d8 d7 d6 d5 d4 d3 d2 d1 d0]

CSI2_CTX_CTRL2[9:0]
FORMAT
= RAW8 + DPCM10 + VP

t0: VP_DATA = [0 0 a11 a10 a9 a8 a7 a6 a5 a4 a3 a2 a1 a0]
 t1: VP_DATA = [0 0 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0]
 t2: VP_DATA = [0 0 c11 c10 c9 c8 c7 c6 c5 c4 c3 c2 c1 c0]
 t3: VP_DATA = [0 0 d11 d10 d9 d8 d7 d6 d5 d4 d3 d2 d1 d0]

CSI2_CTX_CTRL2[9:0]
FORMAT
= RAW8 + DPCM12 + VP

t0: VP_DATA = [0 0 0 0 0 a7 a6 a5 a4 a3 a2 a1 a0]
 t1: VP_DATA = [0 0 0 0 0 b7 b6 b5 b4 b3 b2 b1 b0]
 t2: VP_DATA = [0 0 0 0 0 c7 c6 c5 c4 c3 c2 c1 c0]
 t3: VP_DATA = [0 0 0 0 0 d7 d6 d5 d4 d3 d2 d1 d0]

CSI2_CTX_CTRL2[9:0]
FORMAT
= RAW8 + VP

camss-081

8.2.5.1.1.4.3.4 ISS CSI2 RAW10

RAW10 data can be output memory in two formats: with or without data expansion. It can also be sent to

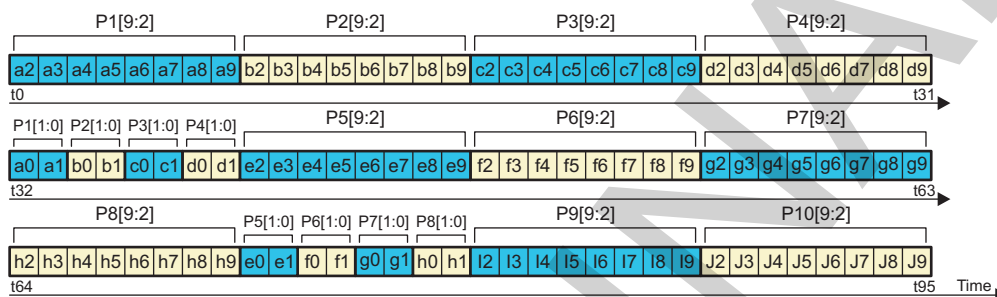
the video port. If data expansion is used, the 10-bit data are padded with 0s on a 16-bit word. The line length sent through the CSI2 physical layer is a multiple of 8 bits. Furthermore, the line length is a multiple of 5×8 bits to complete the pixel reconstruction correctly (the lowest common multiple of 8 and 10 is 40, so 5×8 bits). Figure 8-63 shows the storage format for RAW10 data. Set the `CSI2_CTX_CTRL2`[9:0] FORMAT bit field as follows:

- To 0x2B to select RAW10 mode
- To 0xAB for RAW10 + 16-bit expansion
- To 0x12F for RAW10 to video port

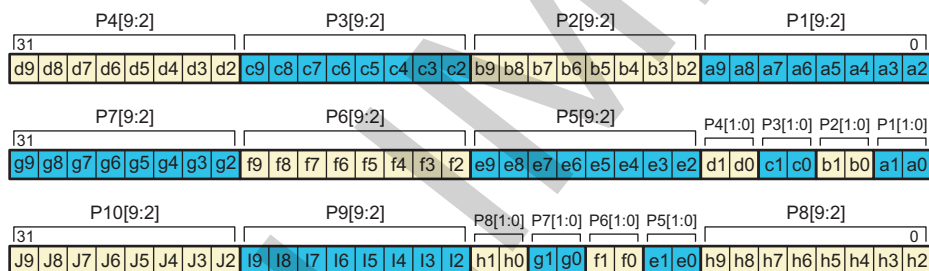
Figure 8-63. ISS CSI2 RAW10

RAW10

Transmitter

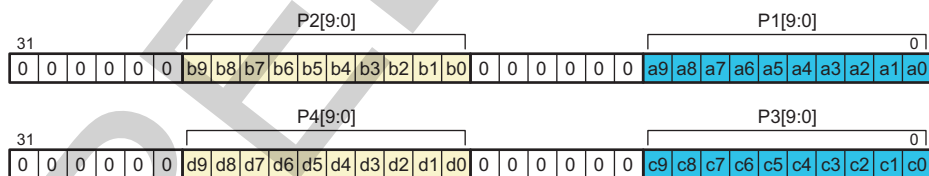


Receiver



FIFO
data memory
organization
without data
expansion

Receiver



FIFO
data memory
organization
with 16-bit data
expansion

t0: VP_DATA = [0 0 0 0 a9 a8 a7 a6 a5 a4 a3 a2 a1 a0]
t1: VP_DATA = [0 0 0 0 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0]
t2: VP_DATA = [0 0 0 0 c9 c8 c7 c6 c5 c4 c3 c2 c1 c0]
t3: VP_DATA = [0 0 0 0 d9 d8 d7 d6 d5 d4 d3 d2 d1 d0]

camss-225

8.2.5.1.1.4.3.5 ISS CSI2 RAW12

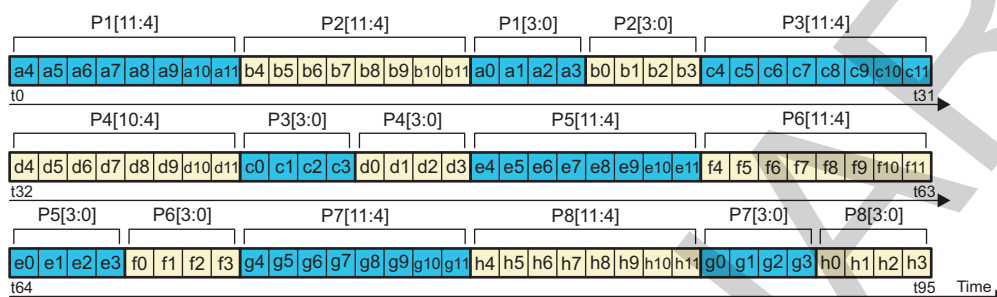
RAW12 data can be output to memory in two formats: with or without data expansion. It can also be sent to the video port. If data expansion is used, the 12-bit data are padded with 0s on a 16-bit word. The line length sent through the CSI2 physical layer is a multiple of 8 bits. Furthermore, the line length is a multiple of 3×8 bits to complete the pixel reconstruction correctly (the lowest common multiple of 8 and 12 is 24, so 3×8 bits). Figure 8-64 shows the storage format for RAW12 data. Set the `CSI2_CTX_CTRL2`[9:0] FORMAT bit field as follows:

- To 0x2C to select RAW12 mode
- To 0xAC for RAW12 + 16-bit expansion
- To 0x12C for RAW12 to video port

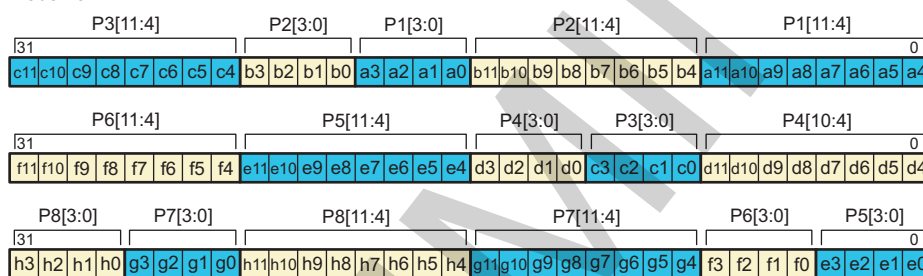
Figure 8-64. ISS CSI2 RAW12

RAW12

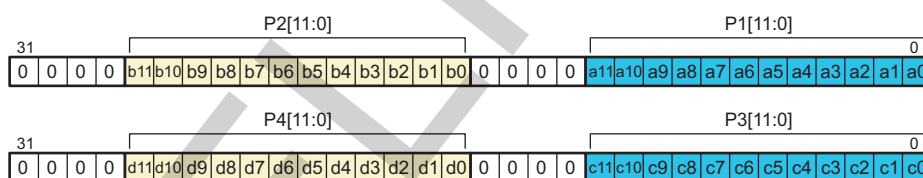
Transmitter



Receiver

FIFO
data memory
organization
without data
expansion

Receiver

FIFO
data memory
organization
with 16-bit data
expansion

t0: VP_DATA = [0 0 a11 a10 a9 a8 a7 a6 a5 a4 a3 a2 a1 a0]
 t1: VP_DATA = [0 0 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0]
 t2: VP_DATA = [0 0 c11 c10 c9 c8 c7 c6 c5 c4 c3 c2 c1 c0]
 t3: VP_DATA = [0 0 d11 d10 d9 d8 d7 d6 d5 d4 d3 d2 d1 d0]

camss-226

8.2.5.1.4.3.6 ISS CSI2 RAW14

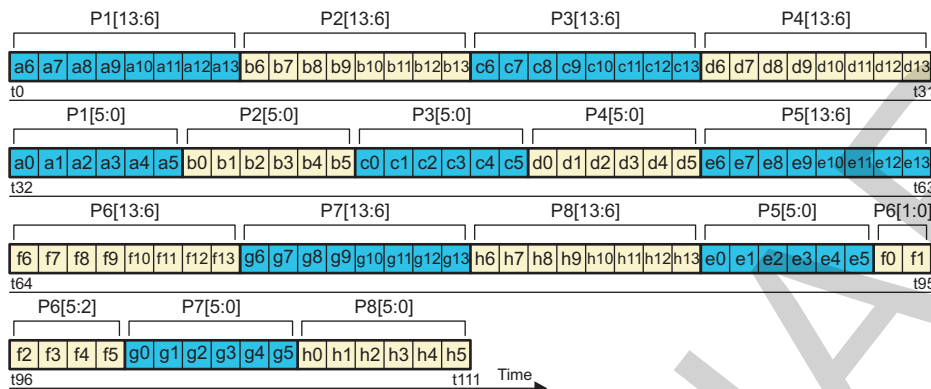
RAW14 data can be output to memory in two formats: with or without data expansion. It can also be sent to the video port. If data expansion is used, the 14-bit data are padded with 0s on a 16-bit word. The line length sent through the CSI2 physical layer is a multiple of 8 bits. Furthermore, the line length is a multiple of 7×8 bits to complete the pixel reconstruction correctly (the lowest common multiple of 8 and 14 is 56, so 7×8 bits). [Figure 8-65](#) shows the storage format for RAW14 data. Set the `CSI2_CTX_CTRL2_i[9:0]` FORMAT bit field as follows:

- To 0x2D to select RAW14 mode
- To 0xAD for RAW14 + 16-bit expansion
- To 0x12D for RAW12 to video port

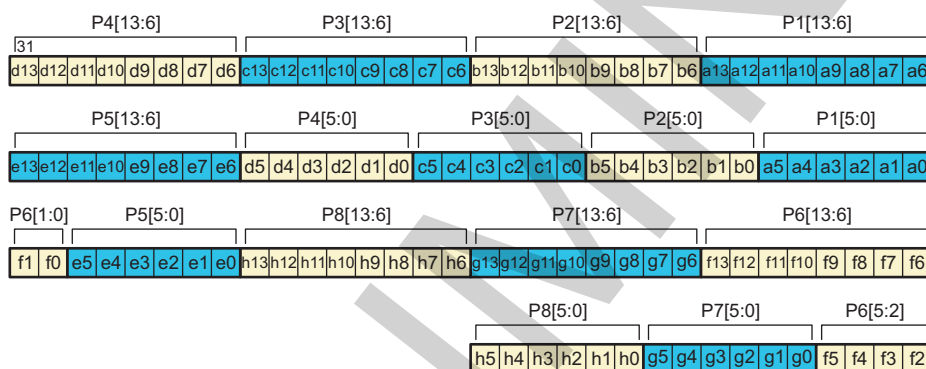
Figure 8-65. ISS CSI2 RAW14

RAW14

Transmitter

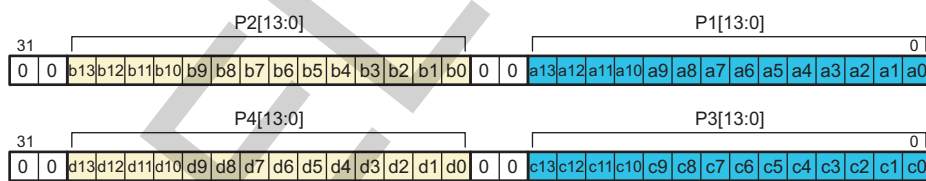


Receiver



FIFO
data memory
organization
without data
expansion

Receiver



FIFO
data memory
organization
with 16-bit data
expansion

t0: VP_DATA = [a13 a12 a11 a10 a9 a8 a7 a6 a5 a4 a3 a2 a1 a0]
t1: VP_DATA = [b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0]
t2: VP_DATA = [c13 c12 c11 c10 c9 c8 c7 c6 c5 c4 c3 c2 c1 c0]
t3: VP_DATA = [d13 d12 d11 d10 d9 d8 d7 d6 d5 d4 d3 d2 d1 d0]

camss-227

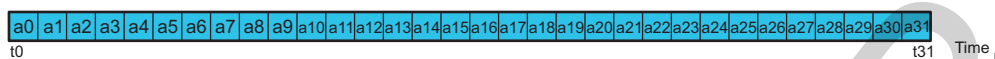
8.2.5.1.1.4.4 ISS CSI2 JPEG8 Operating Modes

The size of a compressed stream can be known in advance. Figure 8-66 shows the format for storing JPEG8 data.

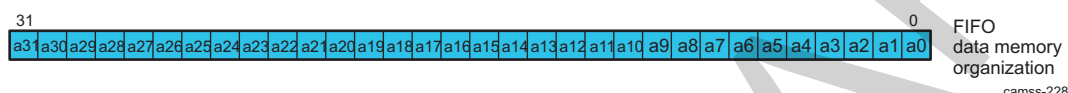
Figure 8-66. ISS CSI2 JPEG8

JPEG8 (Embedded 8-bit non image data)

Transmitter



Receiver

**8.2.5.1.1.4.5 ISS CSI2 Generic Format**

The CSI2 receiver supports a generic format to send data to memory and/or the video port. The generic mode is entered by setting the `CSI2_CTX_CTRL1_i[30]` GENERIC bit. The `CSI2_CTX_CTRL2_i[9:0]` FORMAT bit field defines how the data stream is decoded. When generic mode is enabled (GENERIC = 1), the MIPI data type code is ignored and data is decoded using the FORMAT bit. Whatever the MIPI data type code, it is ignored (the data stream is processed even if the FORMAT bit does not match the MIPI data type code.) When generic mode is not used (GENERIC = 0), the data stream is processed only when the MIPI data type code matches the FORMAT setting of the enabled context. If not matched, the data stream is not processed by the CSI2 engine. Only the virtual channel information is used to map a received data stream to a context. Software must ensure that a MIPI virtual channel used in generic mode is mapped only to a single context.

Figure 8-67 shows the ISS CSI2 generic format.

Figure 8-67. ISS CSI2 Generic FormatISS CSI2 Generic: `CSI2_CTX_CTRL1_i[30]` GENERIC = 0x1

Transmitter

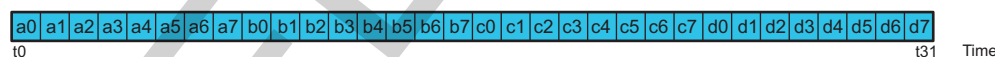
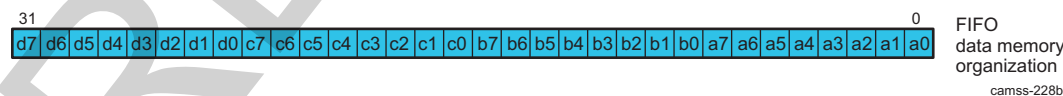
Receiver when, for example, `CSI2_CTX_CTRL2[9:0]` FORMAT = RAW8**8.2.5.1.1.4.6 ISS CSI2 MIPI Format Supported Summary**

Table 8-145 summarizes the CSI2 MIPI-supported formats and their output category. By setting the `CSI2_CTX_CTRL2_i` register format, the CSI2 outputs certain types of pixel packet data.

Table 8-145. ISS CSI2 MIPI Format Supported by the Protocol Engine

| Category | MIPI | | CSI2 Protocol Engine Support |
|--|--|---|---|
| | Abbreviation | Register Setting Format Description | Configuration Value for CSI2_CTX_CTRL2_i[9:0] FORMAT |
| Sync short packet data types ⁽¹⁾ | Short packet sync code | Mandatory FSC | 0x000 |
| | Short packet sync code | Mandatory FEC | 0x001 |
| | Short packet sync code | Optional LSC | 0x002 |
| | Short packet sync code | Optional LEC | 0x003 |
| | | | 0x004 |
| | | | 0x005 |
| | | | 0x006 |
| | | | 0x007 |
| Generic short packet data types ⁽¹⁾ | Short packet | 32-bit without ECC is stored in a register with code value 0x008. | 0x008 |
| | Short packet | 32-bit without ECC is stored in a register with code value 0x009. | 0x009 |
| | Short packet | 32-bit without ECC is stored in a register with code value 0x00A. | 0x00A |
| | Short packet | 32-bit without ECC is stored in a register with code value 0x00B. | 0x00B |
| | Short packet | 32-bit without ECC is stored in a register with code value 0x00C. | 0x00C |
| | Short packet | 32-bit without ECC is stored in a register with code value 0x00D. | 0x00D |
| | Short packet | 32-bit without ECC is stored in a register with code value 0x00E. | 0x00E |
| | Short packet | 32-bit without ECC is stored in a register with code value 0x00F. | 0x00F |
| Generic Long packet data types ⁽²⁾ | Null | Discarded | 0x010 |
| | Blanking data | Discarded | 0x011 |
| | Embedded 8-bit nonimage data (for example, JPEG) | 0x12: Embedded 8-bit nonimage data (for example, JPEG) | 0x012 |
| | | Send to memory when FORMAT = 0 | 0x013 |
| | | Send to memory when FORMAT = 0 | 0x014 |
| | | Send to memory when FORMAT = 0 | 0x015 |
| | | Send to memory when FORMAT = 0 | 0x016 |
| | | Send to memory when FORMAT = 0 | 0x017 |
| YUV data | YUV4:2:0 8-bit | YUV4:2:0 8-bit | 0x018 |
| | YUV4:2:0 10-bit | YUV4:2:0 10-bit | 0x019 |
| | YUV4:2:0 8-bit legacy | YUV4:2:0 8-bit legacy | 0x01A |
| | Reserved | Send to memory when FORMAT = 0 | 0x01B |
| | YUV4:2:0 8-bit + CSPS | YUV4:2:0 8 bit + CSPS | 0x01C |
| | YUV4:2:0 10-bit + CSPS | YUV4:2:0 10 bit + CSPS | 0x01D |
| | YUV4:2:2 8-bit | YUV4:2:2 8-bit | 0x01E |
| | | YUV4:2:2 8-bit + VP | 0x09E |

⁽¹⁾ To understand ISS synchronization codes and short packets, see [Section 8.2.5.3.3.3, ISS CSI2 Short Packet](#).

⁽²⁾ To understand ISS synchronization codes and long packets, see [Section 8.2.5.1.1.3.2, ISS CSI2 Long Packet](#).

Table 8-145. ISS CSI2 MIPI Format Supported by the Protocol Engine (continued)

| MIPI | | | CSI2 Protocol Engine Support |
|---------------------------------|----------------|--|---|
| Category | Abbreviation | Register Setting Format Description | Configuration Value for CSI2_CTX_CTRL2_i[9:0] FORMAT |
| RGB data | YUV4:2:2 8-bit | YUV4:2:2 8-bit + VP16 | 0x0DE |
| | | YUV4:2:2 10-bit | 0x01F |
| | RGB444 | RGB444 + EXP16 | 0x0A0 |
| | | RGB555 + EXP16 | 0x0A1 |
| | RGB565 | RGB565 | 0x022 |
| | | RGB666 + EXP32 | 0x0E3 |
| | RGB666 | RGB666 + EXP32_24 | 0x033 |
| | | RGB888 | 0x024 |
| | RGB888 | RGB888 + EXP32 | 0x0E4 |
| | Reserved | Send to memory when FORMAT = 0 | 0x025 |
| | Reserved | Send to memory when FORMAT = 0 | 0x026 |
| | Reserved | Send to memory when FORMAT = 0 | 0x027 |
| RAW data | RAW6 | RAW6 | 0x028 |
| | | RAW6 + EXP8 | 0x068 |
| | | RAW6 + DPCM10 + VP | 0x0E8 |
| | | RAW6 + DPCM10 + EXP16 | 0x2A8 |
| | | RAW6 + DPCM12 + VP | 0x368 |
| | | RAW6 + DPCM12 + EXP16 | 0x3A8 |
| | RAW7 | RAW7 | 0x029 |
| | | RAW7 + EXP8 | 0x069 |
| | | RAW7 + DPCM10 + EXP16 | 0x229 |
| | | RAW7 + DPCM10 + VP | 0x329 |
| | | RAW7 + DPCM12 + EXP16 | 0x369 |
| | | RAW7 + DPCM12 + VP | 0x3A9 |
| | RAW8 | RAW8 | 0x02A |
| | | RAW8 + VP | 0x12A |
| | | RAW8 + DPCM10 + EXP16 | 0x2AA |
| | | RAW8 + DPCM10 + VP | 0x32A |
| | | RAW8 + DPCM12 + EXP16 | 0x36A |
| | | RAW8 + DPCM12 + VP | 0x3AA |
| | RAW10 | RAW10 | 0x02B |
| | | RAW10 + EXP16 | 0x0AB |
| | | RAW10 + VP | 0x12F |
| | RAW12 | RAW12 | 0x02C |
| | | RAW12 + EXP16 | 0x0AC |
| | | RAW12 + VP | 0x12C |
| | RAW14 | RAW14 | 0x02D |
| | | RAW14 + EXP16 | 0x0AD |
| | | RAW14 + VP | 0x12D |
| | Reserved | Send to memory when FORMAT = 0 | 0x02E |
| | Reserved | Send to memory when FORMAT = 0 | 0x02F |
| User-defined byte-based data | | USER_DEFINED_BYTE_DATA | 0x040 |
| | | USER_DEFINED_BYTE_DATA + EXP8 | 0x080 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + EXP16 | 0x2C0 |

Table 8-145. ISS CSI2 MIPI Format Supported by the Protocol Engine (continued)

| MIPI | | | CSI2 Protocol Engine Support |
|----------|--------------|--|---|
| Category | Abbreviation | Register Setting Format Description | Configuration Value for CSI2_CTX_CTRL2_i[9:0] FORMAT |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + VP | 0x340 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + EXP16 | 0x1C0 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + VP | 0x140 |
| | | USER_DEFINED_BYTE_DATA | 0x041 |
| | | USER_DEFINED_BYTE_DATA + EXP8 | 0x081 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + EXP16 | 0x2C1 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + VP | 0x341 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + EXP16 | 0x1C1 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + VP | 0x141 |
| | | USER_DEFINED_BYTE_DATA | 0x042 |
| | | USER_DEFINED_BYTE_DATA + EXP8 | 0x082 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + EXP16 | 0x2C2 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + VP | 0x342 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + EXP16 | 0x1C2 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + VP | 0x142 |
| | | USER_DEFINED_BYTE_DATA | 0x043 |
| | | USER_DEFINED_BYTE_DATA + EXP8 | 0x083 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + EXP16 | 0x2C3 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + VP | 0x343 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + EXP16 | 0x1C3 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + VP | 0x143 |
| | | USER_DEFINED_BYTE_DATA | 0x044 |
| | | USER_DEFINED_BYTE_DATA + EXP8 | 0x084 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + EXP16 | 0x2C4 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + VP | 0x344 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + EXP16 | 0x1C4 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + VP | 0x144 |
| | | USER_DEFINED_BYTE_DATA | 0x045 |
| | | USER_DEFINED_BYTE_DATA + EXP8 | 0x085 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + EXP16 | 0x2C5 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + VP | 0x345 |

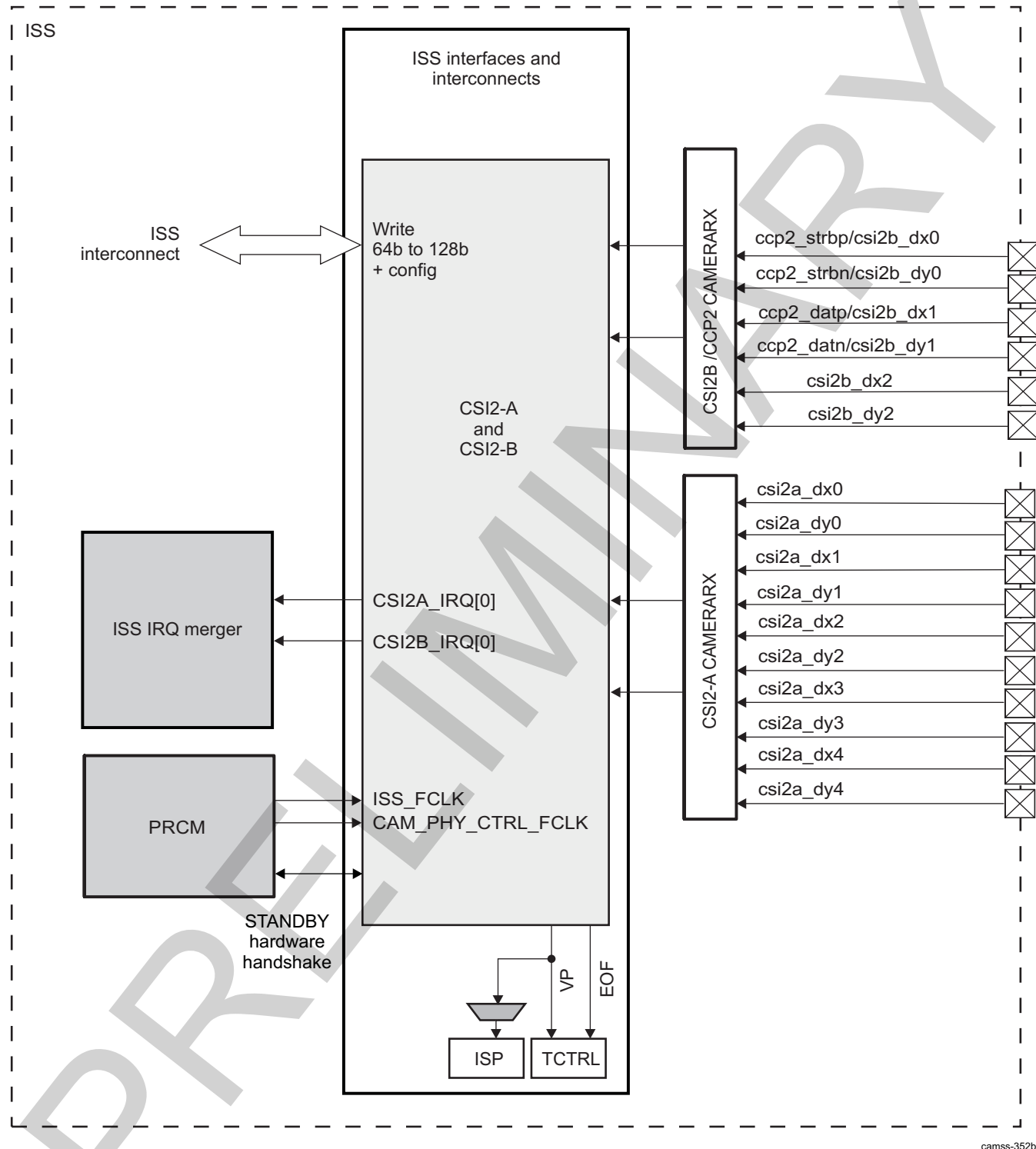
Table 8-145. ISS CSI2 MIPI Format Supported by the Protocol Engine (continued)

| MIPI | | | CSI2 Protocol Engine Support |
|----------|--------------|---|---|
| Category | Abbreviation | Register Setting Format Description | Configuration Value for CSI2_CTX_CTRL2_i[9:0] FORMAT |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + EXP16 | 0x1C5 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + VP | 0x145 |
| | | USER_DEFINED_BYTE_DATA | 0x046 |
| | | USER_DEFINED_BYTE_DATA + EXP8 | 0x086 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + EXP16 | 0x2C6 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + VP | 0x346 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + EXP16 | 0x1C6 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + VP | 0x146 |
| | | USER_DEFINED_BYTE_DATA | 0x047 |
| | | USER_DEFINED_BYTE_DATA + EXP8 | 0x087 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + EXP16 | 0x2C7 |
| | | USER_DEFINED_BYTE_DATA + DPCM10 + VP | 0x347 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + EXP16 | 0x1C7 |
| | | USER_DEFINED_BYTE_DATA + DPCM12 + VP | 0x147 |
| Reserved | | Send to memory when FORMAT = 0 | 0x038 |
| | | Send to memory when FORMAT = 0 | 0x039 |
| | | Send to memory when FORMAT = 0 | 0x03A |
| | | Send to memory when FORMAT = 0 | 0x03B |
| | | Send to memory when FORMAT = 0 | 0x03C |
| | | Send to memory when FORMAT = 0 | 0x03D |
| | | Send to memory when FORMAT = 0 | 0x03E |
| | | Send to memory when FORMAT = 0 | 0x03F |

8.2.5.2 ISS CSI2 Integration

Figure 8-68 is an overview of the integration of the CSI2-A/CSI2-B interface in the device. The figure is the top-level block diagram of the CSI2-A/CSI2-B receiver. The CSI2-A/CSI2-B receiver receives the serial data coming from a CSI2 compatible image sensor, converts it to parallel data, extracts the logical channels, detects and extracts the synchronization codes, reformats the data, and outputs it through the video port or the ISS interconnect interface.

Figure 8-68. ISS CSI2-A/CSI2-B Integration



camss-352b

The CSI2-A/CSI2-B receiver can send data directly to system memory using the master port or send it to the camera ISP using the video port.

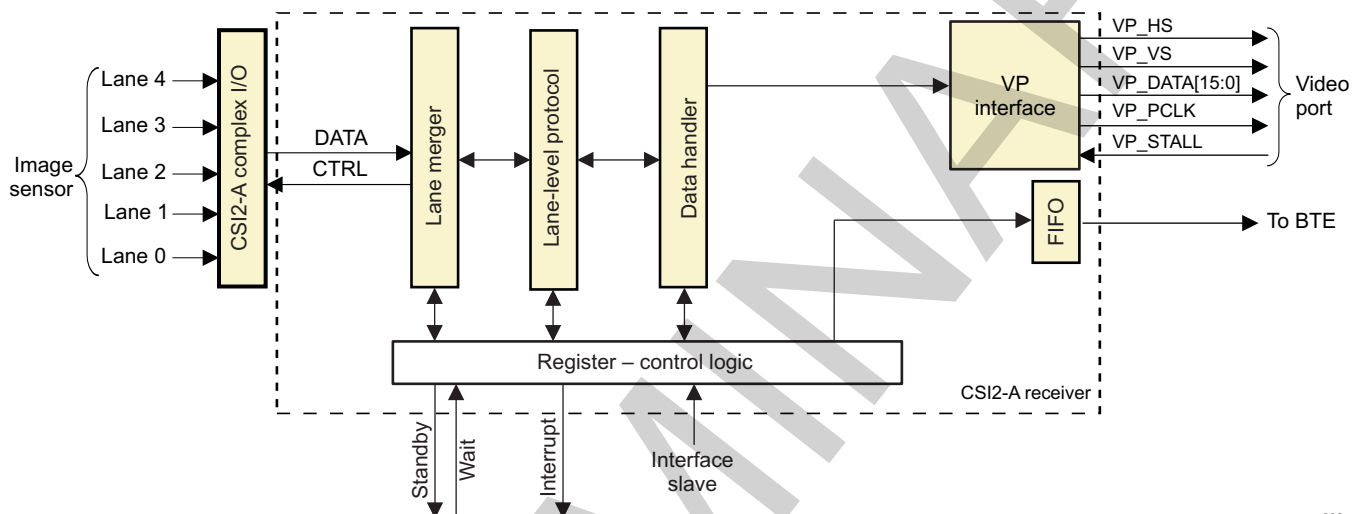
For power domain, clocks, reset, and hardware requests, see [Section 8.1.2.4, ISS Power Management](#).

8.2.5.3 ISS CSI2 Functional Description

8.2.5.3.1 ISS CSI2 Overview

Figure 8-69 is the CSI2-A receiver block diagram (it assumes there are four CSI2 image sensor data lines). The only difference for CSI2-B is the number of lanes coming into the complex I/O. The CSI2 receiver receives the byte data coming from a CSI2 D-PHY receiver (up to four data pairs), converts it to byte stream, detects and corrects errors, extracts the virtual channel ID, detects and extracts the synchronization codes, reformats the data, and outputs it through the video port or the ISS interconnect interface. Data communication between CSI2 and ISP is done through the video port.

Figure 8-69. ISS CSI2-A Receiver Block Diagram



camss-693

8.2.5.3.2 ISS CSI2 Features

The CSI2 receiver is a master on the L3 interconnect for storing data in memory and a slave on the level 4 (L4) interconnect for register access.

The main features of the CSI2 receiver are:

- Transfer pixels and data received by the CSI2 PHY to the system memory or video processor
- Unidirectional data link
- Supports up to four data-configurable links in addition to the clock signaling (minimum of one data link and maximum of four depending on the speed)
- Data merger for two, three, or four data lane configurations
- Error detection and correction by the protocol engine
- DMA engine integrated with dedicated FIFO
- 1D and 2D addressing modes
- Up to eight contexts to support eight dedicated configurations of virtual channel ID and data types
- Ping-pong mechanism for double-buffering
- JPEG support for unknown length transfer (no extraction of the thumbnail)
- Supports all primary and secondary MIPI-defined formats (RGB, RAW, and YUV)
- Storage in progressive mode for interlaced stream (using line numbering)
- Conversion to the RGB formats
- Decompressions of the RAW formats
- RAW frame transcoding, including DPCM and A-Law compression
- Fully configurable interface of the complex PHY I/O: position of the clock and data and order of \pm differential signals for each pair

8.2.5.3.3 ISS CSI2 Functional Description

8.2.5.3.3.1 ISS CSI2 Physical Layer Lane Configuration

The CSI2 serial interface is a unidirectional differential serial interface with data/clock for the physical layer.

The maximum CSI2 receiver data transfer capacity is 1000 Mbps per data lane.

Data-clock signaling consists of two to five differential signal pairs: from one to four data lanes and one clock lane:

- The data signal carries the bit-serial data. The CSI2 transmitter in the image sensor sends the data in-quadrature with the dual-data rate (DDR) clock in HS mode; otherwise, the clock is extracted from the received data in LS mode. Data is transmitted byte-wise, LSB first. The CSI2 complex I/O receives the data and sends the byte stream to the CSI2 receiver.
- The clock signal carries the DDR clock signal.

Each physical lane can be a data or clock lane with a restriction to the fourth line, which can only be data (see [Section 8.2.3.1, ISS CSI2 PHY Overview](#)). The clock/data lane must be configured before transmission to indicate the byte order, while merging the received bytes into a byte stream shows the reachable speed per data lane function of data lane numbers.

Lanes are configured through the [CSI2_COMPLEXIO_CFG](#) registers for CSI2-A and CSI2-B PHY, respectively. The [CSI2_COMPLEXIO_CFG\[2:0\] CLOCK_POSITION](#) bit field and the [CSI2_COMPLEXIO_CFG\[3\] CLOCK_POL](#) bit configure which lane transmits the clock and define its polarity. [DATAI_POSITION](#) and [DATAI_POL](#) configure the data lanes and their polarity, where *I* is the number of the data lane (*I* = 1 to 4). When the [DATAI_POSITION](#) field is set to 0, data lane *I* is not used.

CAUTION

Lane 4 (position 5) supports only data. The [CLOCK_POSITION](#) must not be set at position 5.

8.2.5.3.3.2 ISS CSI2 ECC and Checksum Generation

The CSI2 receiver includes an ECC in the packet header and a checksum in the packet footer for long-packet transmission. These two fields can be used to detect and/or correct errors in the received packet.

8.2.5.3.3.2.1 ISS CSI2 ECC

To detect and correct transmission errors of the header of short and long packets, an 8-bit ECC is included in the header of packets (short and long packet).

The ECC concerns all the fields for a short packet (data ID and short-packet data field) and the packet header for a long packet (data ID and word count). The ECC can only correct one error. Additional errors cannot be repaired, but they are flagged.

The CSI2 receiver ECC is compared against the CSI2 transmitter ECC embedded in the bitstream. If the ECC does not match, an interrupt is triggered to the host central processing unit (CPU).

For long and short packets, the correction is always done if there is only one error per packet header.

An ECC error with or without correction can be reported at two levels, depending on the type of packet. [Table 8-146](#) describes the field in which events are logged. Logging cannot be disabled, but users can set the corresponding bit in the [CSI2_IRQENABLE](#) and [CSI2_CTX_IRQENABLE_i](#) registers to prevent event generation at a higher level.

Table 8-146. ISS CSI2 ECC Event Logging

| | Short Packet | Long Packet |
|--------------------|--|---|
| With correction | Global CSI2_IRQSTATUS [12] ECC_CORRECTION_IRQ | Context CSI2_CTX_IRQSTATUS_i [8] ECC_CORRECTION_IRQ |
| Without correction | Global CSI2_IRQSTATUS [11] ECC_NO_CORRECTION_IRQ | Global CSI2_IRQSTATUS [11] ECC_NO_CORRECTION_IRQ |

The ECC check can be disabled (short and long packet) by setting the [CSI2_CTRL](#)[2] ECC_EN bit to 0. Setting the bit to 1 enables the ECC check.

8.2.5.3.3.2 ISS CSI2 Checksum

To detect errors in transmission of the payload of long packets, a 16-bit CRC checksum is computed on the payload of the long packets in the transmitter. This CRC is stored in the packet footer. A CRC is also computed in the CSI2 receiver. If the checksums do not match, an interrupt is triggered to the host CPU.

CRC errors are logged in the CS_IRQ field of the corresponding context register, [CSI2_CTX_IRQSTATUS_i](#). Logging cannot be disabled, but users can set the corresponding bit in the [CSI2_CTX_IRQENABLE_i](#) register to prevent event generation at a higher level.

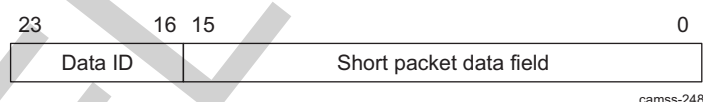
The CRC can be disabled for a specific context by setting the [CSI2_CTRL](#)[5] CS_EN bit to 0. Setting the bit to 1 enables the CRC.

8.2.5.3.3.3 ISS CSI2 Short Packet

There are two types of short packets in the CSI2 receiver:

- Synchronization short packet: Used by the protocol engine to synchronize frame and line (data ID from 0x0 to 0x7)
- Generic short packet: User-dependent; not treated by the protocol engine (data ID from 0x8 to 0xF)

When a generic short packet is received by the CSI2 receiver, the ECC check is performed if it is enabled. Then, the short packet is written in the [CSI2_SHORT_PACKET](#)[23:0] SHORT_PACKET bit field. The ECC field is deleted from the short packet. [Figure 8-70](#) shows the SHORT_PACKET bit field format.

Figure 8-70. ISS CSI2 SHORT_PACKET Bit Field Format

When a short packet is stored, an event is logged in the [CSI2_IRQSTATUS](#)[13] SHORT_PACKET_IRQ bit. Logging cannot be disabled, but users can set the corresponding bit in the [CSI2_IRQENABLE](#) register to prevent event generation at a higher level.

The application reads the [CSI2_SHORT_PACKET](#) register before the next short packet with a code from 0x8 to 0xF. There is a single register for capturing the generic short packet, because no data type in it is associated with context.

8.2.5.3.3.4 ISS CSI2 Virtual Channel and Context

The CSI2 protocol layer transports virtual channels. The virtual channels separate different data flows interleaved in the same data stream. Each virtual channel is identified by a unique channel identification number in the packet header. This channel identification number is encoded in the 2-bit code.

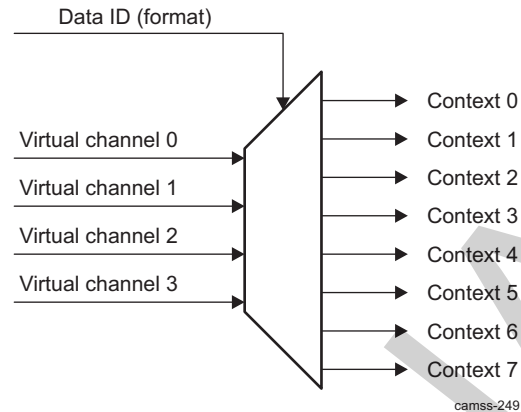
The CSI2 receiver monitors the channel identifier number and demultiplexes the interleaved data streams. The CSI2 receiver supports up to four concurrent virtual channels.

The CSI2 receiver supports eight contexts with their events to control the four possible virtual channels and the different data transmitted through them. A context is linked to a specific data type transported by a given virtual channel. The following bit fields permit configuration of a context:

- [CSI2_CTX_CTRL2_i\[12:11\] VIRTUAL_ID](#): Configures the virtual ID linked to the current context
- [CSI2_CTX_CTRL2_i\[9:0\] FORMAT](#): Configures the data format linked to the current context

Figure 8-71 shows the relationships between virtual channels and contexts.

Figure 8-71. ISS CSI2 Virtual Channel to Context



Each context consists of eight registers: six registers to control the corresponding context and two to log and enable events from the context. All registers in a context can be modified at any time; however, modifications apply only from the start of the following frame.

A context can be enabled independently by setting the [CSI2_CTX_CTRL1_i\[0\] CTX_EN](#) bit to 1; setting this bit to 0 disables the corresponding context.

When acquiring frames on a context, users can write the number of frames to capture in the [CSI2_CTX_CTRL1_i\[15:8\] COUNT](#) bit field. Acceptable values are 0 to 255; 0 stands for infinite capture (no count). After each frame is acquired, the count value is decremented by 1. When the count value reaches 0, the [CSI2_CTX_IRQSTATUS_i\[6\] FRAME_NUMBER_IRQ](#) event is set and the [CTX_EN](#) bit is set to 0. To write a value in the [COUNT](#) bit field, the [CSI2_CTX_CTRL1_i\[4\] COUNT_UNLOCK](#) bit must be set to 1. If the value of the [COUNT_UNLOCK](#) bit is 0, a write in the [COUNT](#) bit field has no effect.

The [CSI2_CTX_CTRL3_i\[15:0\] LINE_NUMBER](#) bit field configures the generation of the [CSI2_CTX_IRQSTATUS_i\[7\] LINE_NUMBER_IRQ](#) event. The [CSI2_CTX_CTRL1_i\[1\] LINE_MODULO](#) bit configures how the [LINE_NUMBER](#) event is generated:

- 0: The event is generated one time by frame.
- 1: The event is generated modulo [LINE_NUMBER](#) (the event can be generated more than once in a frame).

During a frame capture, the [CSI2_CTX_CTRL2_i\[31:16\] FRAME_NUMBER](#) bit field shows the number that identifies the frame received.

8.2.5.3.3.5 ISS CSI2 DMA Engine

The CSI2 receiver integrates its own DMA engine with dedicated FIFO.

Global DMA configuration is common to the eight channels and is defined in the [CSI2_CTRL](#) register. Configuration of the ping-pong address and the offset between lines is specific for a given context; therefore, each context has its own DMA configuration registers.

The DMA engine supports:

- 1D addressing mode (no address line offset, [CSI2_CTX_DAT_OFST_i](#) = 0)
- 2D addressing mode (address line offset different than 0, [CSI2_CTX_DAT_OFST_i](#) = 0)

The burst size is defined in the [CSI2_CTRL\[6:5\] BURST_SIZE](#) bit field and the [CSI2_CTRL\[16\]](#)

BURST_SIZE_EXPAND bit. The DMA uses the burst size or smaller sizes down to single open-core protocol (OCP) writes depending on the alignment at the end of lines. The DMA engine can handle burst requests. When the burst requests can be used, as soon as one burst of data is present in the FIFO, the DMA engine initiates a burst write. The burst size is defined in the [CSI2_CTRL\[6:5\] BURST_SIZE](#) bit field and the [CSI2_CTRL\[16\] BURST_SIZE_EXPAND](#) bit.

NOTE: Unless there are specific requirements, CSI2 (also applies to all other ISS initiators) must be configured to use only a burst size of 128 bytes and nonposted writes.

When single requests must be used, as soon as one element (the size depends on the data type and the post-processing: DPCM, EXT, etc.) is present in the FIFO, the DMA engine initiates a single write.

Interleave mode is dedicated by the CSI2 receiver only when the line numbers are received (short packets). The line number is used to calculate the start address of the line.

The DMA starts to write in memory using the [CSI2_CTX_DAT_PING_ADDR_i\[31:5\] ADDR](#) bit field for the first frame to be transferred, and then uses the [CSI2_CTX_DAT_PONG_ADDR_i\[31:5\] ADDR](#) bit field and the ping address alternately. Thus, the first frame uses the ping address, the second frame uses the pong address, the third frame uses the ping address, and so on.

The [CSI2_CTX_CTRL1_i\[3\] PING_PONG](#) status bit indicates whether the ping address ([CSI2_CTX_DAT_PING_ADDR_i](#)) or the pong address ([CSI2_CTX_DAT_PONG_ADDR_i](#)) was used to store the pixel data of the last frame. After reset or after a 0-to-1 edge transition in the [CSI2_CTRL\[0\] IF_EN](#) bit, the pixel data is written in the ping buffer and the [CSI2_CTX_CTRL1_i\[3\] PING_PONG](#) bit = PONG. When the number of FECs received equals the value programmed in the [CSI2_CTX_CTRL1_i\[23:16\] FEC_NUMBER](#) bit field, the pixel data are written in the pong buffer and [CSI2_CTX_CTRL1_i\[3\] PING_PONG](#) = PING. [CSI2_CTX_CTRL1_i\[3\] PING_PONG](#) toggles after the [CSI2_CTX_CTRL1_i\[23:16\] FEC_NUMBER](#) FEC sync code with the virtual channel ID defined is received in the [CSI2_CTX_CTRL2_i\[12:11\] VIRTUAL_ID](#) bit field.

The [CSI2_CTX_CTRL1_i\[23:16\] FEC_NUMBER](#) bit field must be set as follows:

- In progressive mode, set to 1.
- In interlaced mode, set to the number of interlaced frames to recreate a progressive image in the PING_PONG buffer.

8.2.5.3.3.5.1 ISS CSI2 Progressive Frame to Progressive Storage

After each line, a new start line address is computed, depending on the value of the [CSI2_CTX_DAT_OFST_i\[31:5\] OFST](#) bit field:

- If OFST = 0, the new line starts immediately after the last pixel (data are written contiguously in memory).
- Otherwise, the value of OFST sets the offset between the first pixel of the previous line and the first pixel of the current line in memory.

For the ping frame:

$$\text{@Line0} = \text{CSI2_CTX_DAT_PING_ADDR_i@Line1} = \text{@Line0} + \text{CSI2_CTX_DAT_OFST_i@Line2} = \text{@Line1} + \text{CSI2_CTX_DAT_OFST_i}$$

For the pong frame:

$$\text{@Line0} = \text{CSI2_CTX_DAT_PONG_ADDR_i@Line1} = \text{@Line0} + \text{CSI2_CTX_DAT_OFST_i@Line2} = \text{@Line1} + \text{CSI2_CTX_DAT_OFST_i}$$

8.2.5.3.3.5.2 ISS CSI2 Interlaced Frame to Progressive Storage

The mode is functional only when the line numbers are transmitted. It is automatically enabled without setting.

For the ping frame:

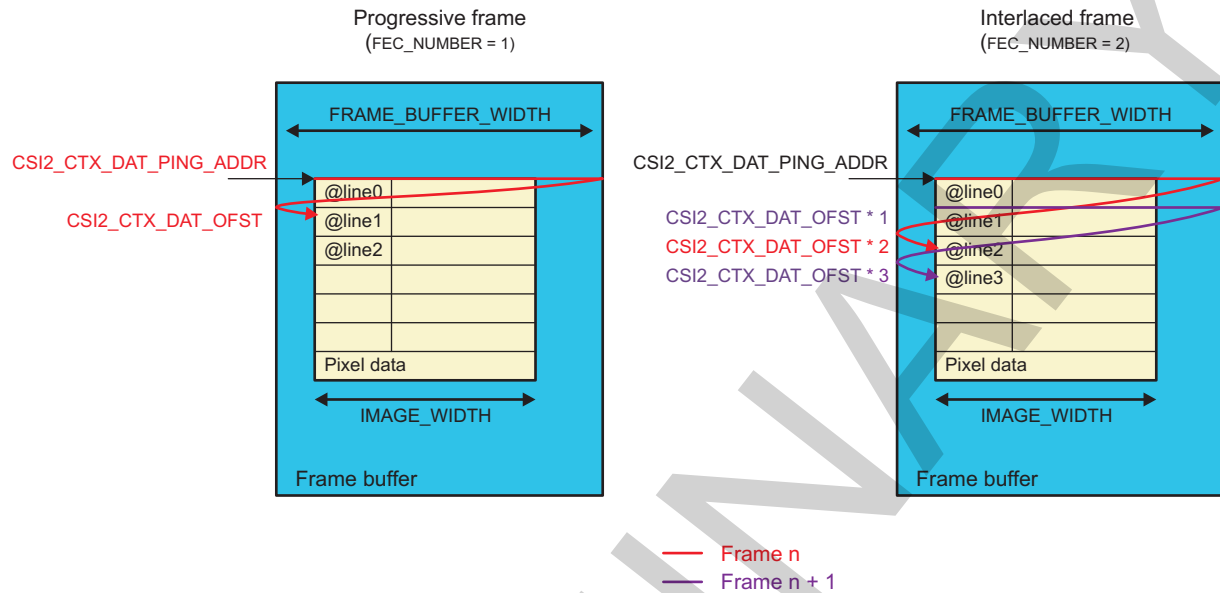
$$\text{@LineX} = \text{CSI2_CTX_DAT_PING_ADDR_i} + \text{CSI2_CTX_DAT_OFST_i} * \text{Line_Number}$$

For the pong frame:

$$@LineX = CSI2_CTX_DAT_PONG_ADDR_i + CSI2_CTX_DAT_OFST_i * Line_Number$$

Figure 8-72 shows how data are stored in memory regarding the DMA configuration.

Figure 8-72. ISS CSI2 Pixel Data Destination Setting in Progressive and Interlaced Mode



camss-250

The burst size is defined in the [CSI2_CTRL\[6:5\] BURST_SIZE](#) bit field for bursts up to 16 × 64 bits or the [CSI2_CTRL\[16\] BURST_SIZE_EXPAND](#) bit for 16 × 128-bit bursts. It can be changed only while the [CSI2_CTRL\[0\] IF_EN](#) bit is reset to 0. The recommended value is the [CSI2_CTRL\[16\] BURST_SIZE_EXPAND](#) bit set to 1, which defines a burst of 16 × 64 bits (the maximum value); otherwise, by default it is set to 8 × 64 bits. When the BURST_SIZE_EXPAND bit is set, the BURST_SIZE setting has no effect. The DMA uses nonposted writes by default. The [CSI2_CTRL\[13\] NON_POSTED_WRITE](#) bit must be set to 1 to match DMA default configuration. It can be changed only while the [CSI2_CTRL\[0\] IF_EN](#) bit is reset to 0.

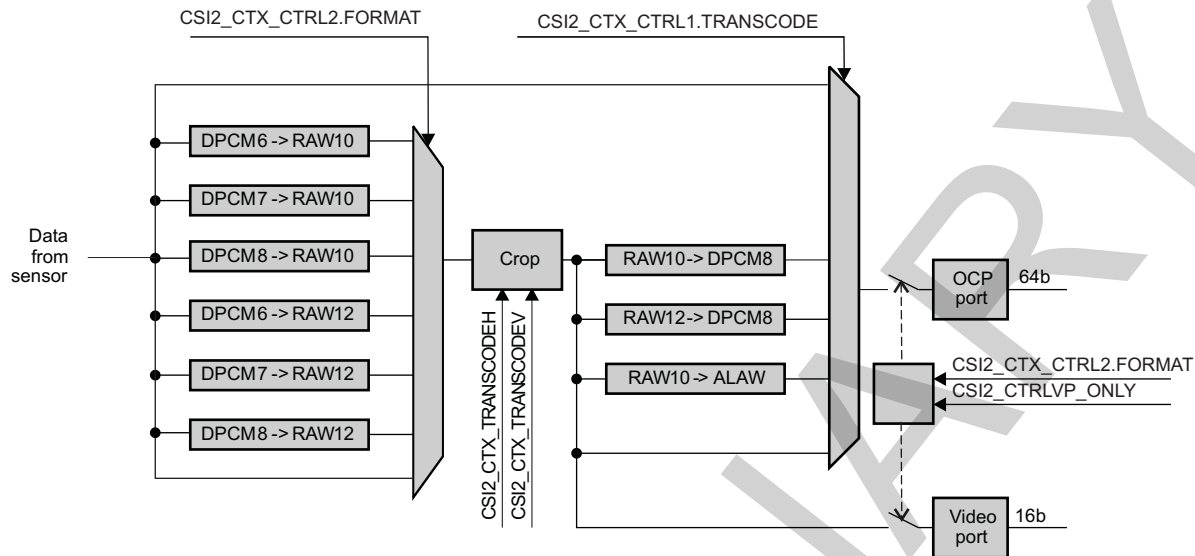
8.2.5.3.3.6 ISS CSI2 Transcoding

Image transcoding is used mainly to reduce memory footprint and bandwidth when:

- The sensor does not support DPCM compression. In fact, A-Law and DPCM compressed pixels occupy only 6, 7, or 8 BPP of storage.
- Digital zoom is used
 - Data that is not going to be used by further processing does not need to be stored in system memory.
 - Pixels cannot be accessed from random locations in a DPCM-compressed frame. Transcoding avoids memory-to-memory processing of unused pixels.

Figure 8-73 shows the logical representation of the image transcoding operation.

- Data is extracted from the CSI2 stream by the protocol engine.
- It is DPCM decompressed if necessary. That is the case when the received stream is DPCM-compressed and transcoding has been enabled using the [CSI2_CTX_CTRL1_i\[27:24\] TRANSCODE](#) bit field.
- Data sent to the video port cannot be compressed: it is intended to be processed by the ISS ISP. Data sent to system memory can be optionally compressed.
- Internal data are aligned on MSB when they enter the cropping stage. For example:
 - 4 LSBs are 0s when RAW10 data are handled.
 - 2 LSBs are 0s when RAW12 data are handled.

Figure 8-73. ISS CSI2 Frame Processing

camss-255

Table 8-147 shows the input format provided to the cropping engine for a given pixel format provided by the sensor. Formats not listed in the table are not supported for transcoding. The FORMAT and Corresponding Setting Value column corresponds to the value set in the `CSI2_CTX_CTRL2_i[9:0]` FORMAT register.

Table 8-147. ISS CSI2 Supported Transcoding Input Formats

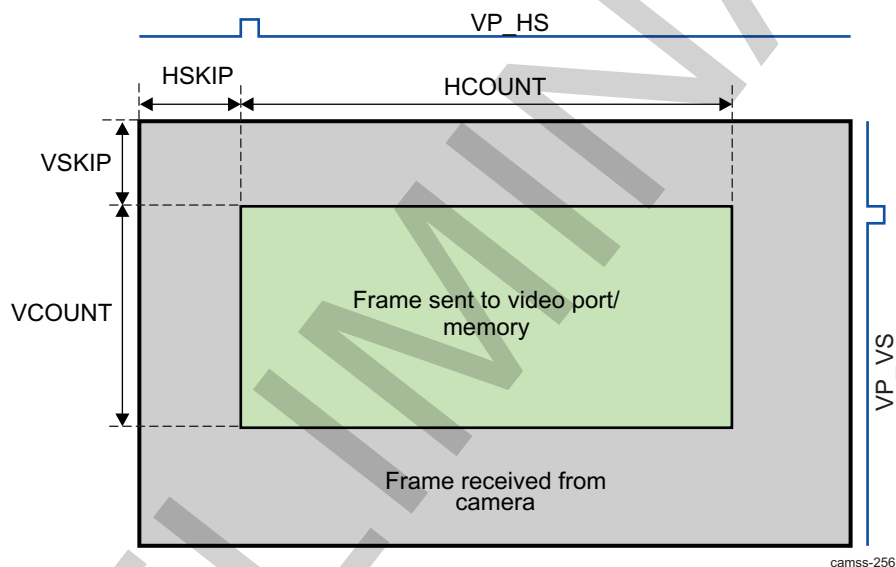
| <code>CSI2_CTX_CTRL2_i[9:0]</code> FORMAT and Corresponding Setting Value | | Cropping Engine Input Format | DPCM Decomposition Enabled | Video Port Enabled |
|---|---|------------------------------|----------------------------|--------------------|
| 0x028 | RAW6 | RAW6 | | |
| 0x068 | RAW6 + EXP8 | | | |
| 0x029 | RAW7 | | | |
| 0x069 | RAW7 + EXP8 | | | |
| 0x02A | RAW8 | RAW8 | | |
| 0x12A | RAW8 + VP | | | Yes |
| 0x02B | RAW10 | RAW10 | | |
| 0x0AB | RAW10 + EXP16 | | | |
| 0x0E8 | RAW6 + DPCM10 + VP | | Yes | Yes |
| 0x12F | RAW10 + VP | | | Yes |
| 0x229 | RAW7 + DPCM10 + EXP16 | | Yes | |
| 0x2A8 | RAW6 + DPCM10 + EXP16 | | Yes | |
| 0x2AA | RAW8 + DPCM10 + EXP16 | | Yes | |
| 0x329 | RAW7 + DPCM10 + VP | | Yes | Yes |
| 0x32A | RAW8 + DPCM10 + VP | | Yes | Yes |
| 0x2Cn | USER_DEFINED_BYTE_DATA + DPCM10 + EXP16 | | Yes | |
| 0x34n | USER_DEFINED_BYTE_DATA + DPCM10 + VP | | Yes | Yes |
| 0x02C | RAW12 | RAW12 | | |
| 0x0AC | RAW12 + EXP16 | | | |
| 0x12C | RAW12 + VP | | | Yes |
| 0x35A | RAW8 DPCM12 + EXP16 | | Yes | |
| 0x3AA | RAW8 DPCM12 + VP | | Yes | Yes |
| 0x1Cn | USER_DEFINED_BYTE_DATA + DPCM12 + EXP16 | | Yes | |

Table 8-147. ISS CSI2 Supported Transcoding Input Formats (continued)

| CSI2_CTX_CTRL2_i[9:0] FORMAT and Corresponding Setting Value | | Cropping Engine Input Format | DPCM Decomposition Enabled | Video Port Enabled |
|--|--------------------------------------|------------------------------|----------------------------|--------------------|
| 0x14n | USER_DEFINED_BYTE_DATA + DPCM12 + VP | | Yes | Yes |
| 0x3A8 | RAW6 + DPCM12 + EXP16 | | Yes | |
| 0x368 | RAW6 + DPCM12 + VP | | Yes | Yes |
| 0x369 | RAW7 + DPCM12 + EXP16 | | Yes | |
| 0x3A9 | RAW7 + DPCM12 + VP | | Yes | Yes |
| 0x02D | RAW14 | RAW14 | | |
| 0x0AD | RAW14 + EXP16 | | | |
| 0x12D | RAW14 + VP | | | Yes |

Image cropping parameters are controlled by software. [Figure 8-74](#) shows the cropping operation.

Figure 8-74. ISS CSI2 Frame Cropping



CAUTION

Hardware does not check for validity of the settings. The following rules must be respected:

- [CSI2_CTX_TRANSCODEH_i\[12:0\]](#) HSKIP + [CSI2_CTX_TRANSCODEH_i\[28:16\]](#) HCOUNT = image width
- [CSI2_CTX_TRANSCODEV_i\[12:0\]](#) VSKIP + [CSI2_CTX_TRANSCODEV_i\[28:16\]](#) VCOUNT = image height

Furthermore, the [CSI2_CTX_TRANSCODEH_i\[28:16\]](#) HCOUNT bit field must comply with the following alignment constraints; otherwise, undefined behavior occurs. [Table 8-148](#) shows the transcode alignment constraints

Table 8-148. ISS CSI2 Transcode Alignment Constraints

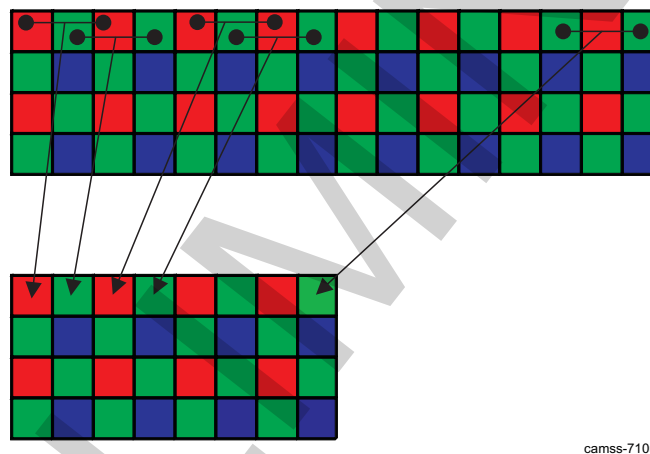
| CSI2_CTX_CTRLi[27:24] TRANSCODE Value | Transcode | HCOUNT Must Be Multiple of |
|---------------------------------------|-------------|----------------------------|
| 0x0 | Disabled | 1 |
| 0x1 | DPCM10 RAW8 | 1 |

Table 8-148. ISS CSI2 Transcode Alignment Constraints (continued)

| CSI2_CTX_CTRL1[27:24] TRANSCODE Value | Transcode | HCOUNT Must Be Multiple of |
|---------------------------------------|---------------|----------------------------|
| 0x2 | DPCM12 RAW8 | 1 |
| 0x3 | ALAW10 RAW8 | 1 |
| 0x4 | RAW8 | 1 |
| 0x5 | RAW10 + EXP16 | 1 |
| 0x6 | RAW10 | 4 |
| 0x7 | RAW12 + EXP16 | 1 |
| 0x8 | RAW12 | 2 |
| 0x9 | RAW10 + EXP16 | 4 |

The [CSI2_CTX_CTRL1_i\[28\]](#) HSCALE configuration register enables horizontal downscaling of RAW data. It reduces the horizontal size and pixel clock by a factor of 2. The scaler uses a 2-tap horizontal filter operating on samples of the same color plane. The coefficients are: $[1/2 ; 0 ; 1/2]$

[Figure 8-75](#) shows the scaler operation.

Figure 8-75. ISS CSI2 Horizontal Scaler

The scaler can send data to the video port or the interface port. When data goes to the video port, no additional alignment constraints apply. But when data goes to the interface port, HCOUNT/2 must comply with the constraints from [Table 8-148](#) (for example, for RAW10, HCOUNT must be a multiple of 8).

[Table 8-149](#) lists possible combinations of input and output formats supported by the transcoding engine. The Transcode column corresponds to the [CSI2_CTX_CTRL1_i\[27:24\]](#) TRANSCODE bit field of a context.

Table 8-149. ISS CSI2-Supported Transcoding Output Formats

| Cropping Engine Output | Transcode | | Supported | Cropping Engine Output | Transcode | | Supported |
|------------------------|-----------|---------------|-----------|------------------------|-----------|---------------|-----------|
| RAW6 | 0 | Disabled | Yes | RAW10 | 0 | Disabled | Yes |
| | 1 | DPCM10 RAW8 | | | 1 | DPCM10 RAW8 | Yes |
| | 2 | DPCM12 RAW8 | | | 2 | DPCM12 RAW8 | |
| | 3 | ALAW10 RAW8 | | | 3 | ALAW10 RAW8 | Yes |
| | 4 | RAW8 | | | 4 | RAW8 | |
| | 5 | RAW10 + EXP16 | | | 5 | RAW10 + EXP16 | Yes |
| | 6 | RAW10 | | | 6 | RAW10 | Yes |
| | 7 | RAW12 + EXP16 | | | 7 | RAW12 + EXP16 | |
| | 8 | RAW12 | | | 8 | RAW12 | |

Table 8-149. ISS CSI2-Supported Transcoding Output Formats (continued)

| Cropping Engine Output | Transcode | | Supported | Cropping Engine Output | Transcode | | Supported |
|------------------------|-----------|---------------|-----------|------------------------|-----------|---------------|-----------|
| RAW7 | 9 | RAW14 | | RAW12 | 9 | RAW14 | |
| | 0 | Disabled | Yes | | 0 | Disabled | Yes |
| | 1 | DPCM10 RAW8 | | | 1 | DPCM10 RAW8 | |
| | 2 | DPCM12 RAW8 | | | 2 | DPCM12 RAW8 | Yes |
| | 3 | ALAW10 RAW8 | | | 3 | ALAW10 RAW8 | |
| | 4 | RAW8 | | | 4 | RAW8 | |
| | 5 | RAW10 + EXP16 | | | 5 | RAW10 + EXP16 | |
| | 6 | RAW10 | | | 6 | RAW10 | |
| | 7 | RAW12 + EXP16 | | | 7 | RAW12 + EXP16 | Yes |
| RAW8 | 8 | RAW12 | | RAW14 | 8 | RAW12 | Yes |
| | 9 | RAW14 | | | 9 | RAW14 | |
| | 0 | Disabled | Yes | | 0 | Disabled | Yes |
| | 1 | DPCM10 RAW8 | | | 1 | DPCM10 RAW8 | |
| | 2 | DPCM12 RAW8 | | | 2 | DPCM12 RAW8 | |
| | 3 | ALAW10 RAW8 | | | 3 | ALAW10 RAW8 | |
| | 4 | RAW8 | Yes | | 4 | RAW8 | |
| | 5 | RAW10 + EXP16 | | | 5 | RAW10 + EXP16 | |
| | 6 | RAW10 | | | 6 | RAW10 | |
| | 7 | RAW12 + EXP16 | | | 7 | RAW12 + EXP16 | |
| | 8 | RAW12 | | | 8 | RAW12 | |
| | 9 | RAW14 | | | 9 | RAW14 | Yes |

RAW pixels are packed into 64-bit words sent to the OCP master port, as defined in:

- [Section 8.2.5.1.1.4.3.3](#), ISS CSI2 RAW8
- [Section 8.2.5.1.1.4.3.4](#), ISS CSI2 RAW10
- [Section 8.2.5.1.1.4.3.5](#), ISS CSI2 RAW12
- [Section 8.2.5.1.1.4.3.6](#), ISS CSI2 RAW14

For RAW10 and RAW12, software can choose among packed and nonpacked storage. A-Law and DPCM-compressed pixels are stored as RAW8 data: each RAW8 container holds a compressed data point.

Similarly, RAW data is sent over the video port, as described in:

- [Section 8.2.5.1.1.4.3.3](#), ISS CSI2 RAW8
- [Section 8.2.5.1.1.4.3.4](#), ISS CSI2 RAW10
- [Section 8.2.5.1.1.4.3.5](#), ISS CSI2 RAW12
- [Section 8.2.5.1.1.4.3.6](#), ISS CSI2 RAW14

Enabling of the OCP/video port is controlled by the [CSI2_CTX_CTRL2_i\[9:0\]](#) FORMAT bit field and the [CSI2_CTRL\[11\]](#) VP_ONLY_EN and [CSI2_CTX_CTRL1_i\[2\]](#) VPFORCE bits.

To enable transcoding, software configures the context normally and also configures the framing using the [CSI2_CTX_TRANSCODEV_i](#) and [CSI2_CTX_TRANSCODEH_i](#) registers. Software defines the after transcoding with the [CSI2_CTX_CTRL1_i\[27:24\]](#) TRANSCODE bit field.

8.2.5.3.3.7 ISS CSI2 EndOfFrame and EndOfLine (EOF and EOL) Pulses

The CSI2 receiver generates two signals to qualify the last pixel of a frame and the last pixel of a line to the TCTRL. It is active during or after the adequate interface bridge transaction and becomes inactive before the first transaction of the next line. Software can enable/disable generation of those signals for each context using the [CSI2_CTX_CTRL1_i\[7\]](#) EOF_EN and [CSI2_CTX_CTRL1_i\[6\]](#) EOL_EN bits. When data is sent to both OCP and video ports, the EOL/EOF timing defined for the OCP port is used.

8.2.5.3.3.8 ISS CSI2 Data Decompression

The data compression technique used is DPCM and PCM.

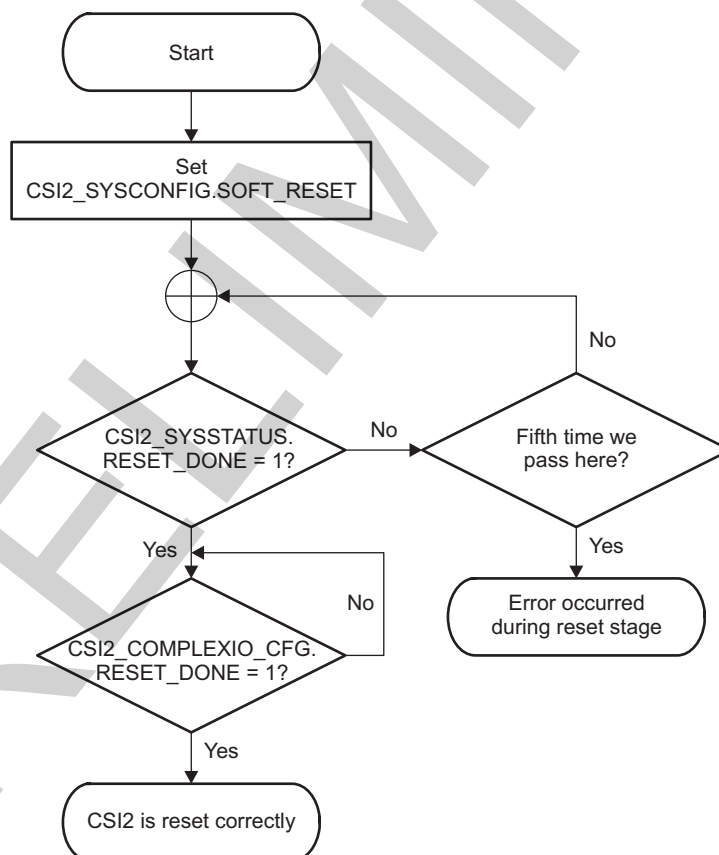
To select the DPCM decompression predictor for the CSI2 Interface, set the [CSI2_CTX_CTRL2_i\[10\]](#) DPCM_PRED bit to 1 for simple predictor or to 0 for advanced predictor.

8.2.5.4 ISS CSI2 Programming Model

8.2.5.4.1 ISS CSI2 Programming Reset Management

The CSI2 receiver accepts a general software reset, propagated throughout the hierarchy. This reset can be done to initialize the CSI2 receiver and the complex I/O (A or B) and has the same effect as a hardware reset. [Figure 8-76](#) shows how to reset CSI2 globally.

Figure 8-76. ISS CSI2 Receiver Global Reset Flow Chart



camss-252

NOTE: Before setting the software reset bit to 1 in the [CSI2_SYSCONFIG](#) register, the user must have access to a CSI2 receiver register.

NOTE: The [CSI2_COMPLEXIO_CFG](#)[29] RESET_DONE bit is set to 1 only after the initialization of the CSI2 receiver, CSI2 complex I/O, and external camera completes.

8.2.5.4.2 ISS CSI2 Programming Enable Video/Picture Acquisition

Before using the receiver, a CSIPHY initialization in CSI2 mode must be made for CSI2-A CAMERARX, which is associated with the CSI2 receiver. See [Section 8.2.3.2.2, ISS CSI2 PHY and Link Initialization Sequence](#). To start a video/picture acquisition, perform the steps listed in [Table 8-150](#).

Table 8-150. ISS CSI2 Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|---|---|------------|
| Reset the CSI2 receiver. | See Section 8.2.5.4.1, Reset Management . | |
| Configure the module power management. The module tries to enter smart-standby mode during the vertical blanking period. The CSI2_SYSCONFIG [0] AUTO_IDLE bit keeps its reset value; by default, an automatic port clock gating strategy is applied based on port interface activity. | CSI2_SYSCONFIG [13:12] MSTANDBY_MODE | 0x2 |
| Configure the interrupt generation as required. To enable context and/or complex I/O event reporting, enable the corresponding bit field in the CSI2_IRQENABLE register. If the enable bit is at 0, logging is still effective if an event occurs, but is not reported to a higher level. | CSI2_IRQSTATUS and CSI2_IRQENABLE | |
| Configure the complex I/O interrupt generation as required. If the enable bit is at 0, logging is still effective if an event occurs, but is not reported to a higher level. | CSI2_COMPLEXIO_IRQSTATUS and CSI2_COMPLEXIO_IRQENABLE | |
| Start complex I/O: Set the CSI2_COMPLEXIO_CFG [28:27] PWR_CMD bit field to 0x1 to pass the complex I/O to the ON state, and then check that the state status reaches the ON state (CSI2_COMPLEXIO_CFG [26:25] PWR_STATUS = 0x1) (for complex I/O A). | CSI2_COMPLEXIO_CFG [28:27] PWR_CMD | 0x1 |
| Configure the complex I/O: <ul style="list-style-type: none"> The complex I/O is fully functional with CSI2_COMPLEX_CFG set at its reset value. CSI2_COMPLEX_CFG must be changed according to the data rate being used. | CSI2_COMPLEXIO_CFG | |
| Set RXMODE and STOPSTATE FSM to RXMODE state. Users can also configure the delay for the FSM to return from RXMODE to NORXMODE when all lines reach STOPSTATE. | CSI2_TIMING [15] FORCE_RX_MODE_IO1 | 0x1 |
| Activate ECC correction and error detection on short packets and packet headers. The ECC check corrects the packet if there is one error and generates an error if there is more than one error (unrecoverable error). | CSI2_CTRL [2] ECC_EN | 0x1 |
| Start the CSI2 receiver. | CSI2_CTRL [0] IF_EN | 0x1 |
| Configure the different contexts to be used. | | |
| Link the context to a virtual channel and a data type. | See Section 8.2.5.4.6, Linking a Context to a Virtual Channel and a Data Type . | |
| Set the FEC_NUMBER bit field to 0x1 for a progressive video and to 0x2 for an interlaced video. For more information, see Section 8.2.5.3.3.5, DMA Engine . | CSI2_CTX_CTRL1_i [26:23] FEC_NUMBER | 0x1 or 0x2 |
| Capture an infinite number of frames (until the interface or the context is disabled). | CSI2_CTX_CTRL1_i [15:8] COUNT and CSI2_CTX_CTRL1_i [4] COUNT_UNLOCK | 0x0 |

Table 8-150. ISS CSI2 Global Initialization (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Enable the CRC checksum on long packet payload. This allows detection of errors, but cannot correct errors like the ECC for header and short packet. On error detection, an event is triggered (the CSI2_CTX_IRQSTATUS_i[5] CS_IRQ bit). | CSI2_CTX_CTRL1_i[5] CS_EN | |
| Configure the DMA engine for the current channel: Configure the ping and pong addresses. | CSI2_CTX_DAT_PING_ADDR_i[31:5] ADDR and CSI2_CTX_DAT_PING_ADDR_i[31:5] ADDR | |
| Set the CSI2_CTX_DAT_OFST_i[15:5] OFST bit field to 0x0 so consecutive lines are stored consecutively in memory (image width and frame-buffer width are equal). | CSI2_CTX_DAT_OFST_i[15:5] OFST | |
| Keep the ALPHA setting at its reset value (0x0) for RGB padding. | CSI2_CTX_CTRL3_i[29:16] ALPHA | |
| Enable the contexts. | CSI2_CTX_CTRL1_i[0] CTX_EN | 0x1 |

8.2.5.4.3 ISS CSI2 Programming Disable Video/Picture Acquisition

There are two ways to end picture acquisition:

- Disable the corresponding context by setting the [CSI2_CTX_CTRL1_i\[0\]](#) CTX_EN bit to 0. This stops the acquisition for the current context. Other enabled contexts are still capturing frames and writing them in memory.
- Disable the CSI2 receiver interface by setting the [CSI2_CTRL\[0\]](#) IF_EN bit to 0. This can have an immediate effect if the [CSI2_CTRL\[3\]](#) FRAME bit is set to 0, or it can be effective after all the enabled contexts receive the FEC if the [CSI2_CTRL\[3\]](#) FRAME bit is set to 1.

8.2.5.4.4 ISS CSI2 Programming Capture a Finite Number of Frames

The CSI2 receiver can be configured to capture a finite number of frames. To configure the CSI2 receiver in this mode, perform the steps listed in [Table 8-151](#).

Table 8-151. ISS CSI2 Capture a Finite Number of Frames

| Step | Bit Field | Value |
|---|--|--|
| Enable a write to the COUNT bit field. | CSI2_CTX_CTRL1_i[4] COUNT_UNLOCK | 0x1 |
| Set the bit field to the number of frames the CSI2 receiver must capture. | CSI2_CTX_CTRL1_i[15:8] COUNT | Valid values are 0 to 255; 0 is infinite capture and 1 to 255 defines the number of frames to capture. |
| Disable a write to the COUNT bit field. | CSI2_CTX_CTRL1_i[4] COUNT_UNLOCK | 0x0 |

During frame capture, the COUNT bit field is decremented by 1 at each frame capture. Software reads the COUNT bit field to know how many frames must still be captured.

The COUNT bit can be updated during capture if the COUNT_UNLOCK bit is set to 1.

8.2.5.4.5 ISS CSI2 Programming a Periodic Event During Frame Acquisition

The CSI2 receiver can generate a periodic event. This line number is defined in the [CSI2_CTX_CTRL3_i\[15:0\]](#) LINE_NUMBER bit field. The event can be generated once or multiple times per frame, depending on the value of the [CSI2_CTX_CTRL1_i\[1\]](#) LINE_MODULO bit:

- If the LINE_MODULO bit = 0, the event is generated when the line number corresponding to the LINE_NUMBER bit field is received.
- If the LINE_MODULO bit = 1, the event is generated when the line number received corresponds to a multiple of the LINE_NUMBER value (LINE_NUMBER is used as a modulo).

8.2.5.4.6 ISS CSI2 Programming a Context to a Virtual Channel and a Data Type

The CSI2 receiver supports eight contexts and the CSI2 protocol defines four virtual channels. Therefore, a CSI2 receiver context can be associated with a virtual channel and a data type. Virtual channels are defined by a 2-bit field. Valid data types for the CSI2 receiver with their associated values are described in the [CSI2_CTX_CTRL2_i\[9:0\] FORMAT](#) bit field.

For each context, a [CSI2_CTX_CTRL2_i](#) register defines with which channel and data type the context is associated:

- The VIRTUAL_ID bit field defines the associated virtual ID transported by the CSI2 protocol from the camera sensor.
- The FORMAT bit field defines the associated data type. The data type is a combination of the data type transported by the CSI2 protocol and the type of storage in memory. A given data type (RGB888) can be stored in memory in different ways (RGB888 or RGB888 + EXP32). Therefore, the FORMAT bit field also defines how DMA stores data in memory.

For example, for the current context to capture a frame from virtual channel 2 and data type RAW12 with data expansion (RAW12 + EXP16), write the value 0x10AC (0x2 11 + 0xAC) in the 16 LSBs of the [CSI2_CTX_CTRL2_i](#) register.

8.2.5.4.7 ISS CSI2 Programming Progressive and Interleaved Frame Configuration

The CSI2 receiver can treat progressive and interlaced frames. There is no progressive or interleaved mode, but the [CSI2_CTX_CTRL1_i\[23:16\] FEC_NUMBER](#) bit field controls the number of FECs before swapping to the other (ping or pong) buffer. Therefore, two modes are possible:

- **FEC_NUMBER = 1:** This is equivalent to progressive mode. After a FEC on the context, the current buffer is switched (ping to pong or pong to ping). The image in the memory buffer consists of one transmitted frame.
- **FEC_NUMBER 1:** The current buffer is switched (ping to pong or pong to ping) after the **FEC_NUMBER** FEC is received for the context. The image in the memory buffer consists of the **FEC_NUMBER** transmitted frame.

For more information about how data is stored in memory through the DMA, see [Section 8.2.5.3.3.5, DMA Engine](#).

NOTE: If **FEC_NUMBER** 1, the camera sensor must send the line number information with the current line. Otherwise, the CSI2 receiver cannot calculate each line address.

8.2.5.4.8 ISS CSI2 Programming Progressive and Interleaved Frame Configuration

[Table 8-152](#) lists the procedure to enable debug mode.

Table 8-152. ISS CSI2 Enable Debug Mode

| Step | Bit | Value |
|--------------------|-------------------------------------|-------|
| Enable debug mode. | CSI2_CTRL[7] DBG_EN | 0x1 |

- During debug mode the input does not come from the CSI2 receiver interface but from the [CSI2_DBG_H](#) and [CSI2_DBG_P](#) registers. The full CSI2 receiver function can be debugged in debug mode. Full 32-bit values must always be written to the [CSI2_DBG_H](#) register. The [CSI2_CTRL\[0\] IF_EN](#) bit has no affect during debug mode. To reset the FIFO in case of overflow, the [CSI2_CTRL\[7\] DBG_EN](#) bit must be reset to 0, and the interface must be enabled by setting the [CSI2_CTRL\[0\] IF_EN](#) bit to 0x1.
- The [CSI2_DBG_H](#) register is used to provide short packet and long packet headers.
- The [CSI2_DBG_P](#) register is used to provide long packet payload.

The following examples apply to the [CSI2_DBG_H](#) register:

- The sync codes for virtual channel 0 are written as **CSI2_DBG_H** = 0xFF00 0000 or 0xFF00 0001, or 0xFF00 0002 or 0xFF00 0003. To send the RAW12 pixels 0x673, 0x452, 0x01d, 0xefc, 0xab0, 0x891, 0x326, 0x547, write **CSI2_DBG_H** = 0x0123 4567, followed by **CSI2_DBG_H** = 0x89abcdef, and **CSI2_DBG_H** = 0x7654 3210.

8.2.5.5 ISS CSI2 Register Manual

8.2.5.5.1 ISS CSI2 Instance Summary

Table 8-153 summarizes the CSI2 instance.

Table 8-153. ISS CSI2 Instance Summary

| Module Name | L3 Base Address | Size |
|------------------|-----------------|-----------|
| ISS_CSI2_A_REGS1 | 0x5200 1000 | 368 bytes |
| ISS_CSI2_A_REGS2 | 0x5200 11C0 | 64 bytes |
| ISS_CSI2_B_REGS1 | 0x5200 1400 | 368 bytes |
| ISS_CSI2_B_REGS2 | 0x5200 15C0 | 64 bytes |

8.2.5.5.2 ISS CSI2 REGS1 Registers

8.2.5.5.2.1 ISS CSI2 REGS1 Register Summary

Table 8-154 summarizes the CSI2 REGS1 registers.

Table 8-154. ISS CSI2 REGS1 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_CSI2_A_REGS1 Base Address | ISS_CSI2_B_REGS1 Base Address |
|--|------|-----------------------|--------------------------|-------------------------------|-------------------------------|
| CSI2_REVISION | R | 32 | 0x0000 0000 | 0x5200 1000 | 0x5200 1400 |
| CSI2_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5200 1010 | 0x5200 1410 |
| CSI2_SYSSTATUS | R | 32 | 0x0000 0014 | 0x5200 1014 | 0x5200 1414 |
| CSI2_IRQSTATUS | RW | 32 | 0x0000 0018 | 0x5200 1018 | 0x5200 1418 |
| CSI2_IRQENABLE | RW | 32 | 0x0000 001C | 0x5200 101C | 0x5200 141C |
| CSI2_CTRL | RW | 32 | 0x0000 0040 | 0x5200 1040 | 0x5200 1440 |
| CSI2_DBG_H | W | 32 | 0x0000 0044 | 0x5200 1044 | 0x5200 1444 |
| RESERVED | R | 32 | 0x0000 0048 | 0x5200 1048 | 0x5200 1448 |
| RESERVED | RW | 32 | 0x0000 004C | 0x5200 104C | 0x5200 144C |
| CSI2_COMPLEXIO_CFG | RW | 32 | 0x0000 0050 | 0x5200 1050 | 0x5200 1450 |
| CSI2_COMPLEXIO_IRQSTATUS | RW | 32 | 0x0000 0054 | 0x5200 1054 | 0x5200 1454 |
| RESERVED | RW | 32 | 0x0000 0058 | 0x5200 1058 | 0x5200 1458 |
| CSI2_SHORT_PACKET | R | 32 | 0x0000 005C | 0x5200 105C | 0x5200 145C |
| CSI2_COMPLEXIO_IRQENABLE | RW | 32 | 0x0000 0060 | 0x5200 1060 | 0x5200 1460 |
| RESERVED | RW | 32 | 0x0000 0064 | 0x5200 1064 | 0x5200 1464 |
| CSI2_DBG_P | W | 32 | 0x0000 0068 | 0x5200 1068 | 0x5200 1468 |
| CSI2_TIMING | RW | 32 | 0x0000 006C | 0x5200 106C | 0x5200 146C |
| CSI2_CTX_CTRL1 _i ⁽¹⁾ | RW | 32 | 0x0000 0070 + (0x20 * i) | 0x5200 1070 + (0x20 * i) | 0x5200 1470 + (0x20 * i) |
| CSI2_CTX_CTRL2 _i ⁽¹⁾ | RW | 32 | 0x0000 0074 + (0x20 * i) | 0x5200 1074 + (0x20 * i) | 0x5200 1474 + (0x20 * i) |

⁽¹⁾ i = 0 to 7

Table 8-154. ISS CSI2 REGS1 Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_CSI2_A_REGS 1 Base Address | ISS_CSI2_B_REGS 1 Base Address |
|---|------|-----------------------|-----------------------------|--------------------------------|--------------------------------|
| CSI2_CTX_DAT_O FST_i ⁽¹⁾ | RW | 32 | 0x0000 0078 + (0x20 * i) | 0x5200 1078 + (0x20 * i) | 0x5200 1478 + (0x20 * i) |
| CSI2_CTX_DAT_PI NG_ADDR_i ⁽¹⁾ | RW | 32 | 0x0000 007C + (0x20 * i) | 0x5200 107C + (0x20 * i) | 0x5200 147C + (0x20 * i) |
| CSI2_CTX_DAT_P ONG_ADDR_i ⁽¹⁾ | RW | 32 | 0x0000 0080 + (0x20 * i) | 0x5200 1080 + (0x20 * i) | 0x5200 1480 + (0x20 * i) |
| CSI2_CTX_IRQEN ABLE_i ⁽¹⁾ | RW | 32 | 0x0000 0084 + (0x20 * i) | 0x5200 1084 + (0x20 * i) | 0x5200 1484 + (0x20 * i) |
| CSI2_CTX_IRQSTA TUS_i ⁽¹⁾ | RW | 32 | 0x0000 0088 + (0x20 * i) | 0x5200 1088 + (0x20 * i) | 0x5200 1488 + (0x20 * i) |
| CSI2_CTX_CTRL3_ i ⁽¹⁾ | RW | 32 | 0x0000 008C + (0x20 * i) | 0x5200 108C + (0x20 * i) | 0x5200 148C + (0x20 * i) |

8.2.5.5.2.2 ISS CSI2 REGS1 Register Description

Table 8-155 through Table 8-157 describe the CSI2 REGS1 registers.

Table 8-155. CSI2_REVISION

| | |
|-------------------------|---|
| Address Offset | 0x0000 0000 |
| Physical Address | 0x5200 1000 0x5200 1400 |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP Revision | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 8-156. Register Call Summary for Register CSI2_REVISION

| |
|--|
| ISS Interfaces |
| • ISS CSI2 REGS1 Register Summary: [0] |

Table 8-157. CSI2_SYSCONFIG

| | |
|-------------------------|---|
| Address Offset | 0x0000 0010 |
| Physical Address | 0x5200 1010 0x5200 1410 |
| Description | SYSTEM CONFIGURATION REGISTER This register is the OCP-socket system configuration register. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----------|----|----|----|---|---|---|---|---|---|------------|---|-----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MSTANDBY_MODE | | RESERVED | | | | | | | | | | SOFT_RESET | | AUTO_IDLE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:12 | MSTANDBY_MODE | <p>Sets the behavior of the master port power management signals.</p> <p>0x0: Force-standby. MStandby is only asserted when the module is disabled.</p> <p>0x1: No-standby. MStandby is never asserted.</p> <p>0x2: Smart-standby: MStandby is asserted based on the activity of the module. The module will try to go to standby during the vertical blanking period.</p> | RW | 0x0 |
| 11:2 | RESERVED | | R | 0x000 |
| 1 | SOFT_RESET | <p>Software reset. Set the bit to 1 to trigger a module reset. The bit is automatically reset by the hardware. During reads return 0.</p> <p>0x0: Normal mode.</p> <p>0x1: The module is reset</p> <p>Note: Before setting the software reset bit to 1 in CSI2_SYSCONFIG register, the user must have access to a CSI2 receiver register.</p> | RW | 0 |
| 0 | AUTO_IDLE | <p>Internal OCP gating strategy</p> <p>0x0: OCP clock is free-running.</p> <p>0x1: Automatic OCP clock gating strategy is applied based on the OCP interface activity.</p> | RW | 1 |

Table 8-158. Register Call Summary for Register CSI2_SYSCONFIG

ISS Interfaces

- [ISS CSI2 Programming Reset Management: \[0\]](#)
- [ISS CSI2 Programming Enable Video/Picture Acquisition: \[1\] \[2\]](#)
- [ISS CSI2 REGS1 Register Summary: \[3\]](#)
- [ISS CSI2 REGS1 Register Description: \[4\]](#)

Table 8-159. CSI2_SYSSTATUS

| | |
|------------------|---|
| Address Offset | 0x0000 0014 |
| Physical Address | 0x5200 1014 0x5200 1414 |
| Description | <p>SYSTEM STATUS REGISTER</p> <p>This register provides status information about the module, excluding the interrupt status register.</p> |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESET_DONE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reads returns 0. | R | 0x0000 0000 |
| 0 | RESET_DONE | Internal reset monitoring Read 0x1: Reset completed. Read 0x0: Internal module reset is on going. | R | 1 |

Table 8-160. Register Call Summary for Register CSI2_SYSSTATUS

ISS Interfaces

- [ISS CSI2 REGS1 Register Summary: \[0\]](#)

Table 8-161. CSI2_IRQSTATUS

| | |
|-------------------------|--|
| Address Offset | 0x0000 0018 |
| Physical Address | 0x5200 1018 0x5200 1418 |
| Description | INTERRUPT STATUS REGISTER - All contexts This register associates one bit for each context in order to determine which context has generated the interrupt. The context shall be enabled for events to be generated on that context. If the context is disabled, the interrupt is not generated. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|------------------|--------------------|-----------------------|----------|-------------------|--------------|----------|----------|----------|----------|----------|----------|----------|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OCP_ERR_IRQ | SHORT_PACKET_IRQ | ECC_CORRECTION_IRQ | ECC_NO_CORRECTION_IRQ | RESERVED | COMPLEXIO_ERR_IRQ | FIFO_OVF_IRQ | CONTEXT7 | CONTEXT6 | CONTEXT5 | CONTEXT4 | CONTEXT3 | CONTEXT2 | CONTEXT1 | CONTEXT0 | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|---------------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14 | OCP_ERR_IRQ | OCP Error Interrupt 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 13 | SHORT_PACKET_IRQ | Short packet reception status (other than synch events: Line Start, Line End, Frame Start, and Frame End: data type between 0x8 and x0F only shall be considered). 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 12 | ECC_CORRECTION_IRQ | ECC has been used to do the correction of the only 1-bit error status (short packet only). 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|---------------|-------|
| 11 | ECC_NO_CORRECTION_IRQ | ECC error status (short and long packets). No correction of the header because of more than 1-bit error. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 10 | RESERVED | Reserved | R | 0 |
| 9 | COMPLEXIO_ERR_IRQ | Error signaling from complex I/O: status of the PHY errors received from the complex I/O (events are defined in CSI2_COMPLEXIO_IRQSTATUS for the complex I/O). Read 0x1: READS: Event is true (pending). Read 0x0: READS: Event is false. | R | 0 |
| 8 | FIFO_OVF_IRQ | FIFO overflow error status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 7 | CONTEXT7 | Context 7 Read 0x1: READS: Event is true (pending). Read 0x0: READS: Event is false. | R | 0 |
| 6 | CONTEXT6 | Context 6 Read 0x1: READS: Event is true (pending). Read 0x0: READS: Event is false. | R | 0 |
| 5 | CONTEXT5 | Context 5 Read 0x1: READS: Event is true (pending). Read 0x0: READS: Event is false. | R | 0 |
| 4 | CONTEXT4 | Context 4 Read 0x1: READS: Event is true (pending). Read 0x0: READS: Event is false. | R | 0 |
| 3 | CONTEXT3 | Context 3 Read 0x1: READS: Event is true (pending). Read 0x0: READS: Event is false. | R | 0 |
| 2 | CONTEXT2 | Context 2 Read 0x1: READS: Event is true (pending). Read 0x0: READS: Event is false. | R | 0 |
| 1 | CONTEXT1 | Context 1 Read 0x1: READS: Event is true (pending). Read 0x0: READS: Event is false. | R | 0 |
| 0 | CONTEXT0 | Context 0 Read 0x1: READS: Event is true (pending). Read 0x0: READS: Event is false. | R | 0 |

Table 8-162. Register Call Summary for Register CSI2_IRQSTATUS

ISS Interfaces

- [ISS CSI2 ECC and Checksum Generation: \[0\] \[1\] \[2\]](#)
- [ISS CSI2 Short Packet: \[3\]](#)
- [ISS CSI2 Programming Enable Video/Picture Acquisition: \[4\]](#)
- [ISS CSI2 REGS1 Register Summary: \[5\]](#)

Table 8-163. CSI2_IRQENABLE

| | |
|-------------------------|---|
| Address Offset | 0x0000 001C |
| Physical Address | 0x5200 101C 0x5200 141C |
| Description | INTERRUPT ENABLE REGISTER - All contexts This register associates one bit for each context in order to enable/disable each context individually. |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|------------------|----|--------------------|----|-----------------------|---|----------|---|-------------------|---|--------------|---|----------|---|----------|--|----------|--|----------|--|----------|--|----------|--|----------|--|----------|--|
| RESERVED | | | | | | | | | | | | | | | | OCP_ERR_IRQ | | SHORT_PACKET_IRQ | | ECC_CORRECTION_IRQ | | ECC_NO_CORRECTION_IRQ | | RESERVED | | COMPLEXIO_ERR_IRQ | | FIFO_OVF_IRQ | | CONTEXT7 | | CONTEXT6 | | CONTEXT5 | | CONTEXT4 | | CONTEXT3 | | CONTEXT2 | | CONTEXT1 | | CONTEXT0 | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14 | OCP_ERR_IRQ | OCP Error Interrupt 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 13 | SHORT_PACKET_IRQ | Short packet reception (other than synch events: Line Start, Line End, Frame Start, and Frame End: data type between 0x8 and x0F only shall be considered). 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 12 | ECC_CORRECTION_IRQ | ECC has been used to correct the only 1-bit error (short packet only). 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 11 | ECC_NO_CORRECTION_IRQ | ECC error (short and long packets). No correction of the header because of more than 1-bit error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 10 | RESERVED | Reserved | RW | 0 |
| 9 | COMPLEXIO_ERR_IRQ | Error signaling from complex I/O: the interrupt is triggered when any error is received from the complex I/O (events are defined in CSI2_COMPLEXIO_IRQSTATUS for the complex I/O). 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 8 | FIFO_OVF_IRQ | FIFO overflow enable 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 7 | CONTEXT7 | Context 7 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 6 | CONTEXT6 | Context 6 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 5 | CONTEXT5 | Context 5 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 4 | CONTEXT4 | Context 4 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 3 | CONTEXT3 | Context 3 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 2 | CONTEXT2 | Context 2 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 1 | CONTEXT1 | Context 1 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 0 | CONTEXT0 | Context 0 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

Table 8-164. Register Call Summary for Register CSI2_IRQENABLE

ISS Interfaces

- ISS CSI2 ECC and Checksum Generation: [0]
- ISS CSI2 Short Packet: [1]
- ISS CSI2 Programming Enable Video/Picture Acquisition: [2] [3]
- ISS CSI2 REGS1 Register Summary: [4]

Table 8-165. CSI2_CTRL

| | |
|-------------------------|---|
| Address Offset | 0x0000 0040 |
| Physical Address | 0x5200 1040 0x5200 1440 |
| Description | GLOBAL CONTROL REGISTER This register controls the CSI2 RECEIVER module. This register shall not be modified dynamically (except IF_EN bit field). |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|-----------|----------|------------------|----------|------------|------------------|-------------|--------|------------|------------|-------|--------|----------|-------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BURST_SIZE_EXPAND | VP_CLK_EN | RESERVED | NON_POSTED_WRITE | RESERVED | VP_ONLY_EN | STREAMING_32_BIT | VP_OUT_CTRL | DBG_EN | BURST_SIZE | ENDIANNESS | FRAME | ECC_EN | RESERVED | IF_EN | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|--------|
| 31:17 | RESERVED | Reserved | R | 0x0000 |
| 16 | BURST_SIZE_EXPAND | Sets the DMA burst size on the L3 interconnect. 0x0: Use the burst size defined in the BURST_SIZE register 0x1: Allow generation of 16x64-bit bursts | RW | 0 |
| 15 | VP_CLK_EN | VP clock enable. 0x0: The VP clock is disabled. 0x1: The VP clock is enabled. | RW | 0 |
| 14 | RESERVED | Read returns reset value | RW | 0 |
| 13 | NON_POSTED_WRITE | Not posted writes 0x0: Disable 0x1: Enable | RW | 0 |
| 12 | RESERVED | | R | 0 |
| 11 | VP_ONLY_EN | VP only enable. 0x0: The VP is enabled and the OCP master port is enabled. 0x1: The VP is enabled and the OCP master port is disabled. | RW | 0 |
| 10 | STREAMING_32_BIT | Indicates if 64-bit or 32-bit streaming burst is used. Valid only if CSI2_CTRL .STREAMING=1 0x0: 64-bit streaming burst is used; byte enable pattern is 0xFF 0x1: 32-bit streaming burst is used; byte enable pattern is 0x0F | RW | 0 |
| 9:8 | VP_OUT_CTRL | VP_PCLK control. Sets the VP_PCLK as a function of the ISS interconnect interface clock (OCPCLK). 0x0: No division: VP_PCLK = OCPCLK. 0x1: Division by 2: VP_PCLK = OCPCLK / 2. 0x3: Division by 4: VP_PCLK = OCPCLK / 4. 0x2: Division by 3: VP_PCLK = OCPCLK / 3. Example scenarios: - Low VP_PCLK, Memory - VP: Same as typical memory - VP, but VP_PCLK = OCPCLK/2 - Typical sensor - VP: Autoidle enabled, FCLK at optimal rate, sensor provides DPCM compressed RAW12 data at 650 Mbps. Image timings VP_PCLK = (OCPCLK/2) and CCP2_CTRL [31:15] FRACDIV = 0xD000 2600 active pixels/line, 128 blanking pixels, no vertical blanking. (This scenario corresponds to the OTF operation at maximum CCP2 speed.) | RW | 0x0 |
| 7 | DBG_EN | Enables the debug mode. 0x0: Disable 0x1: Enable | RW | 0 |
| 6:5 | BURST_SIZE | Sets the DMA burst size on the L3 interconnect. 0x0: 1x64 OCP writes 0x1: 2x64 OCP writes 0x3: 8x64 OCP writes 0x2: 4x64 OCP writes | RW | 0x0 |
| 4 | ENDIANNESS | Select endianness for YUV4:2:2 8 bit and YUV4:2:0 legacy formats. 0x0: Use native MIPI CSI2 endianness: Little endian for all formats except for YUV4:2:2 8b and YUV4:2:0 Legacy which a big endian. 0x1: Store all pixel formats little endian. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 3 | FRAME | Set the modality in which IF_EN works. 0x0: If IF_EN = 0 the interface is disabled immediately. 0x1: If IF_EN = 1 the interface is disabled after all FEC sync code have been received for the active contexts. | RW | 0 |
| 2 | ECC_EN | Enables the Error Correction Code check for the received header (short and long packets for all virtual channel ids). 0x0: Disabled 0x1: Enabled | RW | 0 |
| 1 | RESERVED | Read returns reset value | RW | 0 |
| 0 | IF_EN | Enables the physical interface to the module. 0x0: The interface is disabled. If FRAME = 0, it is disabled immediately. If FRAME = 1, it is disabled when each context has received the FEC sync code. 0x1: The interface is enabled immediately, the data acquisition starts on the next FSC sync code. Writing 1 to this register when the current value is 0 has the effect to clear the output FIFO. The pixel data of the following frame will be written in the PING buffer, that is, the CSI2_CTX_CTRL.PING_PONG bits are reset to 0 as well. | RW | 0 |

Table 8-166. Register Call Summary for Register CSI2_CTRL

ISS Interfaces

- [ISS CCP2 Programming Burst Settings: \[0\] \[1\]](#)
- [ISS CSI2 Operating Modes: \[2\] \[3\]](#)
- [ISS CSI2 ECC and Checksum Generation: \[4\] \[5\]](#)
- [ISS CSI2 DMA Engine: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\]](#)
- [ISS CSI2 Transcoding: \[18\]](#)
- [ISS CSI2 Programming Enable Video/Picture Acquisition: \[19\] \[20\]](#)
- [ISS CSI2 Programming Disable Video/Picture Acquisition: \[21\] \[22\] \[23\]](#)
- [ISS CSI2 Programming Progressive and Interleaved Frame Configuration: \[24\] \[25\] \[26\] \[27\]](#)
- [ISS CSI2 REGS1 Register Summary: \[28\]](#)
- [ISS CSI2 REGS1 Register Description: \[29\] \[30\] \[31\] \[32\]](#)

Table 8-167. CSI2_DBG_H

Address Offset

Physical Address

Description

Type

0x0000 0044

0x5200 1044
0x5200 1444

DEBUG REGISTER (Header)
This register provides a way to debug the CSI2 RECEIVER module with no image sensor connected to the module. The debug mode is enabled by [CSI2_CTRL.DBG_EN](#). Only full 32-bit values shall be written. The register is used to write short packets and header of long packets.

W

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DBG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------|------|-------------|
| 31:0 | DBG | 32-bit input value. | W | 0x0000 0000 |

Table 8-168. Register Call Summary for Register CSI2_DBG_H

ISS Interfaces

- [ISS CSI2 Programming Progressive and Interleaved Frame Configuration: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [ISS CSI2 REGS1 Register Summary: \[8\]](#)

Table 8-169. CSI2_COMPLEXIO_CFG

| | |
|-------------------------|---|
| Address Offset | 0x0000 0050 |
| Physical Address | 0x5200 1050 0x5200 1450 |
| Description | COMPLEXIO CONFIGURATION REGISTER for the complex I/O This register contains the lane configuration for the order and position of the lanes (clock and data) and the polarity order for the control of the PHY differential signals in addition to the control bit for the power FSM. |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|------------|------------|---------|------------|----------|----------|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| RESERVED | RESET_CTRL | RESET_DONE | PWR_CMD | PWR_STATUS | PWR_AUTO | RESERVED | DATA4_POL | DATA4_POSITION | DATA3_POL | DATA3_POSITION | DATA2_POL | DATA2_POSITION | DATA1_POL | DATA1_POSITION | CLOCK_POL | CLOCK_POSITION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31 | RESERVED | | R | 0 |
| 30 | RESET_CTRL | Controls the reset of the complex I/O 0x0: Complex I/O reset active. 0x1: Complex I/O reset deasserted. | RW | 0 |
| 29 | RESET_DONE | Internal reset monitoring of the power domain using the byte clock provided by the associated CSIPHY (see Section 8.1.1, ISS Clock Domains . Caution: For the CSI2_COMPLEXIO_CFG[29] RESET_DONE bit to be set to 0x1 (reset completed), the external sensor must to be active and sending the MIPI HS BYTECLK. Read 0x1: Reset completed. Read 0x0: Internal module reset is ongoing. | R | 0 |
| 28:27 | PWR_CMD | Command for power control of the complex I/O 0x0: Command to change to OFF state 0x1: Command to change to ON state 0x2: Command to change to Ultralow-Power state | RW | 0x0 |
| 26:25 | PWR_STATUS | Status of the power control of the complex I/O Read 0x2: Complex I/O in Ultralow-Power state Read 0x1: Complex I/O in ON state Read 0x0: Complex I/O in OFF state | R | 0x0 |
| 24 | PWR_AUTO | Automatic switch between ULP and ON states based on ULPM signals from complex I/O 0x0: Disable 0x1: Enable | RW | 0 |
| 23:20 | RESERVED | | R | 0x0 |
| 19 | DATA4_POL | +/- differential pin order of data lane 4. 0x0: +/- pin order 0x1: -/+ pin order | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|-------|
| 18:16 | DATA4_POSITION | <p>Position and order of the data lane 4. The values 6 and 7 are reserved. This lane is not available for CSI2-B receiver.</p> <p>0x0: This data lane is not used.</p> <p>0x1: Data lane 4 is at position 1. This position is not available to the CSI2-B receiver.</p> <p>0x2: Data lane 4 is at position 2. This position is not available to the CSI2-B receiver.</p> <p>0x3: Data lane 4 is at position 3. This position is not available to the CSI2-B receiver.</p> <p>0x4: Data lane 4 is at position 4. This position is not available to the CSI2-B receiver.</p> <p>0x5: Data lane 4 is at position 5. This position is not available to the CSI2-B receiver.</p> <p>0x6: Reserved</p> <p>0x7: Reserved</p> | RW | 0x0 |
| 15 | DATA3_POL | <p>+/- differential pin order of data lane 3.</p> <p>0x0: +/- pin order</p> <p>0x1: -/+ pin order</p> | RW | 0 |
| 14:12 | DATA3_POSITION | <p>Position and order of the data lane 3. The values 6 and 7 are reserved. This lane is not available for CSI2-B receiver.</p> <p>0x0: This data lane is not used.</p> <p>0x1: Data lane 3 is at position 1. This position is not available to the CSI2-B receiver.</p> <p>0x2: Data lane 3 is at position 2. This position is not available to the CSI2-B receiver.</p> <p>0x3: Data lane 3 is at position 3. This position is not available to the CSI2-B receiver.</p> <p>0x4: Data lane 3 is at position 4. This position is not available to the CSI2-B receiver.</p> <p>0x5: Data lane 3 is at position 5. This position is not available to the CSI2-B receiver.</p> <p>0x6: Reserved</p> <p>0x7: Reserved</p> | RW | 0x0 |
| 11 | DATA2_POL | <p>+/- differential pin order of DATA lane 2.</p> <p>0x0: +/- pin order (csi2_dx=+ and csi2_dy=-)</p> <p>0x1: -/+ pin order (csi2_dx=- and csi2_dy=+)</p> | RW | 0 |
| 10:8 | DATA2_POSITION | <p>Position and order of the data lane 2. The values 6 and 7 are reserved.</p> <p>0x0: This data lane is not used.</p> <p>0x1: Data lane 2 is at position 1.</p> <p>0x2: Data lane 2 is at position 2.</p> <p>0x3: Data lane 2 is at position 3.</p> <p>0x4: Data lane 2 is at position 4. This position is not available to the CSI2-B receiver.</p> <p>0x5: Data lane 2 is at position 5. This position is not available to the CSI2-B receiver.</p> <p>0x6: Reserved</p> <p>0x7: Reserved</p> | RW | 0x0 |
| 7 | DATA1_POL | <p>+/- differential pin order of data lane 1.</p> <p>0x0: +/- pin order (csi2_dx=+ and csi2_dy=-)</p> <p>0x1: -/+ pin order (csi2_dx=- and csi2_dy=+)</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------|
| 6:4 | DATA1_POSITION | Position and order of the DATA lane 1. The values 6 and 7 are reserved. When CSI2 is used, the data lane 1 position must be different from 0, 6, or 7. 0x0: This data lane is not used. 0x1: Data lane 1 is at position 1. x2: Data lane 1 is at position 2. 0x3: Data lane 1 is at position 3. 0x4: Data lane 1 is at position 4. This position is not available to the CSI2-B receiver. 0x5: Data lane 1 is at position 5. This position is not available to the CSI2-B receiver. 0x6: Reserved 0x7: Reserved | RW | 0x0 |
| 3 | CLOCK_POL | +/- differential pin order of clock lane. 0x0: +/- pin order (csi2_dx=+ and csi2_dy=-) 0x1: -/+ pin order (csi2_dx=- and csi2_dy=+) | RW | 0 |
| 2:0 | CLOCK_POSITION | Position and order of the clock lane. The values 5, 6, and 7 are reserved. When CSI2 is used, the clock lane position must be different from 0, 5, 6, or 7. 0x0: This data lane is not used. 0x1: Clock lane is at position 1. 0x2: Clock lane is at position 2. 0x3: Clock lane is at position 3. 0x4: Clock lane is at position 4. This position is not available to the CSI2-B receiver. 0x5: Reserved 0x6: Reserved 0x7: Reserved | RW | 0x0 |

Table 8-170. Register Call Summary for Register CSI2_COMPLEXIO_CFG

ISS Interfaces

- [ISS CSI2 PHY Functional Configuration: \[0\] \[1\] \[2\]](#)
- [ISS CSI2 PHY and Link Initialization Sequence: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [ISS CCP2 and Link Initialization Sequence: \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [ISS CSI2 Physical Layer Lane Configuration: \[17\] \[18\] \[19\]](#)
- [ISS CSI2 Programming Reset Management: \[20\]](#)
- [ISS CSI2 Programming Enable Video/Picture Acquisition: \[21\] \[22\] \[23\] \[24\]](#)
- [ISS CSI2 REGS1 Register Summary: \[25\]](#)
- [ISS CSI2 REGS1 Register Description: \[26\]](#)

Table 8-171. CSI2_COMPLEXIO_IRQSTATUS

| | |
|------------------|--|
| Address Offset | 0x0000 0054 |
| Physical Address | 0x5200 1054 0x5200 1454 |
| Description | INTERRUPT STATUS REGISTER - All errors from complex I/O #1 |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|------------------|-------------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|---------|---------|---------|---------|---------|---------------|---------------|---------------|---------------|---------------|-----------|-----------|-----------|-----------|-----------|
| RESERVED | | | | | STATEALLULPMEXIT | STATEALLULPMENTER | STATEULPM5 | STATEULPM4 | STATEULPM3 | STATEULPM2 | STATEULPM1 | ERRCONTROL5 | ERRCONTROL4 | ERRCONTROL3 | ERRCONTROL2 | ERRCONTROL1 | ERRESC5 | ERRESC4 | ERRESC3 | ERRESC2 | ERRESC1 | ERRSOTSYNCHS5 | ERRSOTSYNCHS4 | ERRSOTSYNCHS3 | ERRSOTSYNCHS2 | ERRSOTSYNCHS1 | ERRSOTHS5 | ERRSOTHS4 | ERRSOTHS3 | ERRSOTHS2 | ERRSOTHS1 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|---------------|-------|
| 31:27 | RESERVED | | R | 0x00 |
| 26 | STATEALLULPMEXIT | At least one of the active lanes has exit the ULPM 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 25 | STATEALLULPMENTER | All active lanes are entering in ULPM. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 24 | STATEULPM5 | Lane 5 in ULPM 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 23 | STATEULPM4 | Lane 4 in ULPM 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 22 | STATEULPM3 | Lane 3 in ULPM 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 21 | STATEULPM2 | Lane 2 in ULPM 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 20 | STATEULPM1 | Lane 1 in ULPM 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 19 | ERRCONTROL5 | Control error for lane 5 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------|-------|
| 18 | ERRCONTROL4 | Control error for lane 4 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 17 | ERRCONTROL3 | Control error for lane 3 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 16 | ERRCONTROL2 | Control error for lane 2 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 15 | ERRCONTROL1 | Control error for lane 1 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 14 | ERRESC5 | Escape entry error for lane 5 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 13 | ERRESC4 | Escape entry error for lane 4 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 12 | ERRESC3 | Escape entry error for lane 3 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 11 | ERRESC2 | Escape entry error for lane 2 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 10 | ERRESC1 | Escape entry error for lane 1 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 9 | ERRSOTSYNCHS5 | Start of transmission sync error for lane 5 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 8 | ERRSOTSYNCHS4 | Start of transmission sync error for lane 4 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------|-------|
| 7 | ERRSOTSYNCHS3 | Start of transmission sync error for lane 3 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 6 | ERRSOTSYNCHS2 | Start of transmission sync error for lane 2 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 5 | ERRSOTSYNCHS1 | Start of transmission sync error for lane 1 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 4 | ERRSOTHS5 | Start of transmission error for lane 5 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 3 | ERRSOTHS4 | Start of transmission error for lane 4 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 2 | ERRSOTHS3 | Start of transmission error for lane 3 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 1 | ERRSOTHS2 | Start of transmission error for lane 2 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 0 | ERRSOTHS1 | Start of transmission error for lane 1 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |

Table 8-172. Register Call Summary for Register CSI2_COMPLEXIO_IRQSTATUS

ISS Interfaces

- [ISS CSI2 PHY Functional Configuration: \[0\]](#)
- [ISS CSI2 Programming Enable Video/Picture Acquisition: \[1\]](#)
- [ISS CSI2 REGS1 Register Summary: \[2\]](#)
- [ISS CSI2 REGS1 Register Description: \[3\] \[4\]](#)

Table 8-173. CSI2_SHORT_PACKET

| | |
|-------------------------|---|
| Address Offset | 0x0000 005C |
| Physical Address | 0x5200 105C 0x5200 145C |
| Description | SHORT PACKET INFORMATION - This register sets the 24-bit DATA_ID + Short Packet Data Field when the data type is between 0x8 and x0F |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SHORT_PACKET | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|-----------|
| 31:24 | RESERVED | Reads returns 0. | R | 0x00 |
| 23:0 | SHORT_PACKET | Short Packet information: DATA ID + DATA FIELD | R | 0x0000000 |

Table 8-174. Register Call Summary for Register CSI2_SHORT_PACKET

ISS Interfaces

- [ISS CSI2 Short Packet: \[0\] \[1\]](#)
- [ISS CSI2 REGS1 Register Summary: \[2\]](#)

Table 8-175. CSI2_COMPLEXIO_IRQENABLE

| | |
|-------------------------|---|
| Address Offset | 0x0000 0060 |
| Physical Address | 0x5200 1060 0x5200 1460 |
| Description | INTERRUPT ENABLE REGISTER - All errors from complex I/O |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
|----------|----|----|----|----|----|----|----|------------------|-------------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|-------------|---------|---------|---------|---------|---------|---------------|---------------|---------------|---------------|---------------|-----------|-----------|-----------|-----------|-----------|
| RESERVED | | | | | | | | STATEALLULPMEXIT | STATEALLULPMENTER | STATEULPM5 | STATEULPM4 | STATEULPM3 | STATEULPM2 | STATEULPM1 | ERRCONTROL5 | ERRCONTROL4 | ERRCONTROL3 | ERRCONTROL2 | ERRCONTROL1 | ERRESC5 | ERRESC4 | ERRESC3 | ERRESC2 | ERRESC1 | ERRSOTSYNCHS5 | ERRSOTSYNCHS4 | ERRSOTSYNCHS3 | ERRSOTSYNCHS2 | ERRSOTSYNCHS1 | ERRSOTHS5 | ERRSOTHS4 | ERRSOTHS3 | ERRSOTHS2 | ERRSOTHS1 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:27 | RESERVED | | R | 0x00 |
| 26 | STATEALLULPMEXIT | At least one of the active lanes has exit the ULPM 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 25 | STATEALLULPMENTER | All active lanes are entering in ULPM. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 24 | STATEULPM5 | Lane 5 in ULPM 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 23 | STATEULPM4 | Lane 4 in ULPM 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 22 | STATEULPM3 | Lane 3 in ULPM 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 21 | STATEULPM2 | Lane 2 in ULPM 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 20 | STATEULPM1 | Lane 1 in ULPM 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 19 | ERRCONTROL5 | Control error for lane 5 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 18 | ERRCONTROL4 | Control error for lane 4 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 17 | ERRCONTROL3 | Control error for lane 3 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 16 | ERRCONTROL2 | Control error for lane 2 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 15 | ERRCONTROL1 | Control error for lane 1 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 14 | ERRESC5 | Escape entry error for lane 5 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 13 | ERRESC4 | Escape entry error for lane 4 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 12 | ERRESC3 | Escape entry error for lane 3 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 11 | ERRESC2 | Escape entry error for lane 2 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 10 | ERRESC1 | Escape entry error for lane 1 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 9 | ERRSOTSYNCHS5 | Start of transmission sync error for lane 5 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 8 | ERRSOTSYNCHS4 | Start of transmission sync error for lane 4 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 7 | ERRSOTSYNCHS3 | Start of transmission sync error for lane 3 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 6 | ERRSOTSYNCHS2 | Start of transmission sync error for lane 2 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 5 | ERRSOTSYNCHS1 | Start of transmission sync error for lane 1 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 4 | ERRSOTHS5 | Start of transmission error for lane 5 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 3 | ERRSOTHS4 | Start of transmission error for lane 4 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 2 | ERRSOTHS3 | Start of transmission error for lane 3 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 1 | ERRSOTHS2 | Start of transmission error for lane 2 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 0 | ERRSOTHS1 | Start of transmission error for lane 1 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

Table 8-176. Register Call Summary for Register CSI2_COMPLEXIO_IRQENABLE

ISS Interfaces

- [ISS CSI2 Programming Enable Video/Picture Acquisition: \[0\]](#)
- [ISS CSI2 REGS1 Register Summary: \[1\]](#)

Table 8-177. CSI2_DBG_P

| | |
|------------------|---|
| Address Offset | 0x0000 0068 |
| Physical Address | 0x5200 1068 0x5200 1468 |
| Description | DEBUG REGISTER (Payload) This register provides a way to debug the CSI2 RECEIVER module with no image sensor connected to the module. The debug mode is enabled by CSI2_CTRL.DBG_EN . Only full 32-bit values shall be written. The register is used to write payload of long packets. |
| Type | W |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DBG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------|------|-------------|
| 31:0 | DBG | 32-bit input value. | W | 0x0000 0000 |

Table 8-178. Register Call Summary for Register CSI2_DBG_P

ISS Interfaces

- [ISS CSI2 Programming Progressive and Interleaved Frame Configuration: \[0\] \[1\]](#)
- [ISS CSI2 REGS1 Register Summary: \[2\]](#)

Table 8-179. CSI2_TIMING

| | |
|-------------------------|---|
| Address Offset | 0x0000 006C |
| Physical Address | 0x5200 106C 0x5200 146C |
| Description | TIMING REGISTER This register controls the CSI2 RECEIVER module. This register shall not be modified while CSI2_CTRL.IF_EN is set to 1. It is used to indicate the number of L3 cycles for the Stop State monitoring. |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----------|----------|----------|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|--------------------|-------------------|------------------------|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | RESERVED | RESERVED | RESERVED | | | | | | | | | | | | | FORCE_RX_MODE_IO1 | STOP_STATE_X16_IO1 | STOP_STATE_X4_IO1 | STOP_STATE_COUNTER_IO1 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|--------|
| 31 | RESERVED | Read returns reset value | RW | 0 |
| 30 | RESERVED | Read returns reset value | RW | 1 |
| 29 | RESERVED | Read returns reset value | RW | 1 |
| 28:16 | RESERVED | Read returns reset value | RW | 0x1FFF |
| 15 | FORCE_RX_MODE_IO1 | Control of ForceRxMode signal 0x0: Deassertion of ForceRxMode. The hardware reset the bit at the end of the Force RX Mode assertion. The software can reset the bit in order to stop the assertion of the ForceRXMode signal prior to the completion of the period. 0x1: Assertion of ForceRxMode | RW | 0 |
| 14 | STOP_STATE_X16_IO1 | Multiplication factor for the number of L3 cycles defined in STOP_STATE_COUNTER bit field 0x0: The number of L3 cycles defined in STOP_STATE_COUNTER is multiplied by 1x 0x1: The number of L3 cycles defined in STOP_STATE_COUNTER is multiplied by 16x | RW | 1 |
| 13 | STOP_STATE_X4_IO1 | Multiplication factor for the number of L3 cycles defined in STOP_STATE_COUNTER bit field 0x0: The number of L3 cycles defined in STOP_STATE_COUNTER is multiplied by 1x 0x1: The number of L3 cycles defined in STOP_STATE_COUNTER is multiplied by 4x | RW | 1 |
| 12:0 | STOP_STATE_COUNTER_IO1 | Stop State counter for monitoring. It indicates the number of L3 to monitor for Stop State before deasserting ForceRxMode (complex I/O 1). The value is from 0 to 8191. | RW | 0x1FFF |

Table 8-180. Register Call Summary for Register CSI2_TIMING

ISS Interfaces

- [ISS CSI2 PHY Functional Configuration: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [ISS CSI2 PHY and Link Initialization Sequence: \[8\] \[9\] \[10\]](#)
- [ISS CCP2 and Link Initialization Sequence: \[11\] \[12\]](#)
- [ISS CSI2 Programming Enable Video/Picture Acquisition: \[13\]](#)
- [ISS CSI2 REGS1 Register Summary: \[14\]](#)

Table 8-181. CSI2_CTX_CTRL1_i

| | | | |
|-------------------------|---|--------------|------------|
| Address Offset | 0x0000 0070 + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 1070 + (0x20 * i) 0x5200 1470 + (0x20 * i) | | |
| Description | CONTROL REGISTER - Context This register controls the Context. This register is shadowed: modifications are taken into account after the next FSC sync code. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|---------|----------|--------|-----------|----|----|----|------------|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|--------|--------|-------|--------------|-----------|----------|-------------|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BYTESWAP | GENERIC | RESERVED | HSCALE | TRANSCODE | | | | FEC_NUMBER | | | | | | | | COUNT | | | | | | | | EOF_EN | EOL_EN | CS_EN | COUNT_UNLOCK | PING_PONG | VP_FORCE | LINE_MODULO | CTX_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 31 | BYTESWAP | Allows swapping bytes two by two in the payload data. It does not affect: - short packets - long packet header or footers - CRC calculation The purpose is to by swap data send to the OCP port and/or video port 0x0: Disabled 0x1: Enabled | RW | 0 |
| 30 | GENERIC | Enables the generic mode. 0x0: Disabled. Data is received according to CSI2_CTX_CTRL1.FORMAT and the long packet code transmitted in the MIPI stream is used. 0x1: Enabled. Data is received according to CSI2_CTX_CTRL1.FORMAT and the long packet code transmitted in the MIPI stream is ignored. | RW | 0 |
| 29 | RESERVED | | R | 0x0 |
| 28 | HSCALE | Enable horizontal downscaling by a factor of two. Applies to RAW data when transcoding is enabled. 0x0: Disable 0x1: Enable | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 27:24 | TRANSCODE | <p>Enables image transcoding.</p> <p>When this features is enabled:</p> <ul style="list-style-type: none"> - the data format from the camera is defined by the FORMAT register - the format after transcode is defined by the TRANSCODE register. The memory storage / video port formats is defined by the TRANSCODE register <p>0x6: Outputs uncompressed RAW10 data. Data in memory is organized as regular packed RAW10 data</p> <p>0x1: Outputs DPCM compressed RAW10 data. After compression, pixels are coded on 8 bits. Data in memory is organized as regular RAW8 data</p> <p>0x7: Outputs uncompressed RAW12 data. Data in memory is organized as regular RAW12+EXP16 data</p> <p>0x0: Feature disabled.</p> <p>0x2: Outputs DPCM compressed RAW12 data. After compression, pixels are coded on 8 bits. Data in memory is organized as regular RAW8 data</p> <p>0x8: Outputs uncompressed RAW12 data. Data in memory is organized as regular packed RAW12 data</p> <p>0x9: Outputs uncompressed RAW14 data.</p> <p>0x4: Outputs uncompressed RAW8 data. Data in memory is organized as regular RAW8 data</p> <p>0x5: Outputs uncompressed RAW10 data. Data in memory is organized as regular RAW10+EXP16 data</p> <p>0x3: Outputs A-Law compressed RAW10 data. After compression, pixels are coded on 8 bits. Data in memory is organized as regular RAW8 data.</p> | RW | 0x0 |
| 23:16 | FEC_NUMBER | <p>Number of FEC to receive between using swap of CSI2_CTX_DAT_PING_ADDR and CSI2_CTX_DAT_PONG_ADDR for the calculation of the address in memory (must be used only in interlace mode, otherwise set to 1).</p> | RW | 0x01 |
| 15:8 | COUNT | <p>Sets the number of frame to acquire. Once the frame acquisition starts, the COUNT value is decremented after every frame. When COUNT reaches 0, the FRAME_NUMBER_IRQ interrupt is triggered and CTX_EN is set to 0.</p> <p>Writes to this bit field are controlled by the COUNT_UNLOCK bit. During the same OCP write access, the bit field COUNT_UNLOCK shall be written in addition to COUNT bit field in order to change the COUNT value. COUNT can be overwritten dynamically with a new count value.</p> <p>0: Infinite number of frames (no count). 1: 1 frame to acquire ... 255: 255 frames to acquire</p> | RW | 0x00 |
| 7 | EOF_EN | <p>Indicates if the end of frame signal shall be asserted at the end of the line.</p> <p>Read 0x1: The end of frame signal is asserted at the end of each frame.</p> <p>Read 0x0: The end of frame signal is not asserted at the end of each frame.</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 6 | EOL_EN | Indicates if the end of line signal shall be asserted at the end of the line. Read 0x1: The end of line signal is asserted at the end of each frame. Read 0x0: The end of line signal is not asserted at the end of each frame. | RW | 0 |
| 5 | CS_EN | Enables the checksum check for the received payload (long packet only). 0x0: Disabled 0x1: Enabled | RW | 0 |
| 4 | COUNT_UNLOCK | Unlock writes to the COUNT bit field. Write 0x0: COUNT bit field is locked. Writes have no effect Write 0x1: COUNT bit field is unlocked. Writes are possible. | W | 0 |
| 3 | PING_PONG | Indicates whether the PING or PONG destination address (CSI2_CTX_DAT_PING_ADDR or CSI2_CTX_DAT_PONG_ADDR) was used to write the last frame. This bit field toggles after every FEC_NUMBER FEC sync code received for the current context. Read 0x1: PONG buffer Read 0x0: PING buffer | R | 1 |
| 2 | VP_FORCE | Forces sending of the data to both VPORT and OCP. Only applies to formats that existing in two versions: - One sending data to OCP port only - One sending data to VPORT only (tagged with the +VP extension) The format version sending data only to OCP should be chosen. 0x0: Disabled 0x1: Enabled | RW | 0 |
| 1 | LINE_MODULO | Line modulo configuration 0x0: CSI2_CTX_CTRL3.LINE_NUMBER is used once per frame for the generation of the LINE_NUMBER_IRQ. 0x1: CSI2_CTX_CTRL3.LINE_NUMBER is used as a modulo number for the generation of the LINE_NUMBER_IRQ (multiple times the interrupt can be generated for each frame) | RW | 0 |
| 0 | CTX_EN | Enables the context 0x0: Disabled 0x1: Enabled | RW | 0 |

Table 8-182. Register Call Summary for Register CSI2_CTX_CTRL1_i

ISS Interfaces

- [ISS CSI2 Operating Modes: \[0\]](#)
- [ISS CSI2 Virtual Channel and Context: \[1\] \[2\] \[3\] \[4\]](#)
- [ISS CSI2 DMA Engine: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [ISS CSI2 Transcoding: \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [ISS CSI2 EndOfFrame and EndOfLine \(EOF and EOL\) Pulses: \[17\] \[18\]](#)
- [ISS CSI2 Programming Enable Video/Picture Acquisition: \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [ISS CSI2 Programming Disable Video/Picture Acquisition: \[24\]](#)
- [ISS CSI2 Programming Capture a Finite Number of Frames: \[25\] \[26\] \[27\]](#)
- [ISS CSI2 Programming a Periodic Event During Frame Acquisition: \[28\]](#)
- [ISS CSI2 Programming Progressive and Interleaved Frame Configuration: \[29\]](#)
- [ISS CSI2 REGS1 Register Summary: \[30\]](#)

Table 8-183. CSI2_CTX_CTRL2_i

| | | | |
|-------------------------|---|--------------|------------|
| Address Offset | 0x0000 0074 + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 1074 + (0x20 * i) 0x5200 1474 + (0x20 * i) | | |
| Description | CONTROL REGISTER - Context This register controls the Context. This register is shadowed: modifications are taken into account after the next FSC sync code (except for VIRTUAL_ID and FORMAT fields). The change of VIRTUAL_ID and FORMAT has to occur only when the context is disabled (CSI2_CTX_CTRL1.CTX_EN). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|------------------|----|------------|----|-----------|---|--------|---|---|---|---|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| FRAME | | | | | | | | | | | | | | | | RESERVED | USER_DEF_MAPPING | | VIRTUAL_ID | | DPCM_PRED | | FORMAT | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|--------|
| 31:16 | FRAME | Frame number received | R | 0x0000 |
| 15 | RESERVED | | R | 0 |
| 14:13 | USER_DEF_MAPPING | Selects the pixel format of USER_DEFINED in FORMAT 0x0: RAW6 0x1: RAW7 0x2: RAW8 (not valid if FORMAT is USER_DEFINED_8_BIT_DATA_TYPE_x_EXP8 with x from 1 to 8) | RW | 0x0 |
| 12:11 | VIRTUAL_ID | Virtual channel ID 0x0: Virtual Channel ID 0 0x1: Virtual Channel ID 1 0x3: Virtual Channel ID 3 0x2: Virtual Channel ID 2 | RW | 0x0 |
| 10 | DPCM_PRED | Selects the DPCM predictor. 0x0: The advanced predictor is used. Not supported for 10- 8- 10 algorithm. Performance limited to 1 pixel/cycle. 0x1: The simple predictor is used. | RW | 0 |
| 9:0 | FORMAT | Data format selection. 0x3A9: RAW7 DPCM12 + VP 0x80: USER_DEFINED_8_BIT_DATA_TYPE_1 + EXP8 0x84: USER_DEFINED_8_BIT_DATA_TYPE_5 + EXP8 0x346: USER_DEFINED_8_BIT_DATA_TYPE_7 + DPCM10 + VP 0x1D: YUV4:2:0 10bit + CSPS 0x2C6: USER_DEFINED_8_BIT_DATA_TYPE_7 + DPCM10 + EXP16 0x41: USER_DEFINED_8_BIT_DATA_TYPE_2 0x1C5: USER_DEFINED_8_BIT_DATA_TYPE_6_DPCM12_EXP16 0xAC: RAW12 + EXP16 0x145: USER_DEFINED_8_BIT_DATA_TYPE_6_DPCM12_VP | RW | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| | | 0x12: Embedded 8-bit nonimage data (that is, JPEG) | | |
| | | 0x46: USER_DEFINED_8_BIT_DATA_TYPE_7 | | |
| | | 0x83: USER_DEFINED_8_BIT_DATA_TYPE_4 + EXP8 | | |
| | | 0x2B: RAW10 | | |
| | | 0x9E: YUV4:2:2 8bit + VP | | |
| | | 0x1C0: USER_DEFINED_8_BIT_DATA_TYPE_1_DPCM12_EXP 16 | | |
| | | 0x140: USER_DEFINED_8_BIT_DATA_TYPE_1_DPCM12_VP | | |
| | | 0x329: RAW7 + DPCM10 + VP | | |
| | | 0x22: RGB565 | | |
| | | 0x68: RAW6 + EXP8 | | |
| | | 0x43: USER_DEFINED_8_BIT_DATA_TYPE_4 | | |
| | | 0xE3: RGB666 + EXP32 | | |
| | | 0x1C7: USER_DEFINED_8_BIT_DATA_TYPE_8_DPCM12_EXP 16 | | |
| | | 0x143: USER_DEFINED_8_BIT_DATA_TYPE_4_DPCM12_VP | | |
| | | 0xA0: RGB444 + EXP16 | | |
| | | 0x87: USER_DEFINED_8_BIT_DATA_TYPE_8 + EXP8 | | |
| | | 0x85: USER_DEFINED_8_BIT_DATA_TYPE_6 + EXP8 | | |
| | | 0x0: OTHERS (except NULL and BLANKING packets) | | |
| | | 0x341: USER_DEFINED_8_BIT_DATA_TYPE_2 + DPCM10 + VP | | |
| | | 0xAD: RAW14 + EXP16 | | |
| | | 0x2C3: USER_DEFINED_8_BIT_DATA_TYPE_4 + DPCM10 + EXP16 | | |
| | | 0xE4: RGB888 + EXP32 | | |
| | | 0x343: USER_DEFINED_8_BIT_DATA_TYPE_4 + DPCM10 + VP | | |
| | | 0x368: RAW6 DPCM12 + VP | | |
| | | 0x12C: RAW12 + VP | | |
| | | 0x42: USER_DEFINED_8_BIT_DATA_TYPE_3 | | |
| | | 0xA1: RGB555 + EXP16 | | |
| | | 0x12D: RAW14 + VP | | |
| | | 0x144: USER_DEFINED_8_BIT_DATA_TYPE_5_DPCM12_VP | | |
| | | 0x1C4: USER_DEFINED_8_BIT_DATA_TYPE_5_DPCM12_EXP 16 | | |
| | | 0x2A: RAW8 | | |
| | | 0x3AA: RAW8 DPCM12 + VP | | |
| | | 0x2C1: USER_DEFINED_8_BIT_DATA_TYPE_2 + DPCM10 + EXP16 | | |
| | | 0x1C3: USER_DEFINED_8_BIT_DATA_TYPE_4_DPCM12_EXP 16 | | |
| | | 0x342: USER_DEFINED_8_BIT_DATA_TYPE_3 + DPCM10 + VP | | |
| | | 0x142: USER_DEFINED_8_BIT_DATA_TYPE_3_DPCM12_VP | | |
| | | 0x1A: YUV4:2:0 8bit legacy | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| | | 0x36A: RAW8 DPCM12 + EXP16 | | |
| | | 0x32A: RAW8 + DPCM10 + VP | | |
| | | 0x229: RAW7 + DPCM10 + EXP16 | | |
| | | 0x12A: RAW8 + VP | | |
| | | 0x28: RAW6 | | |
| | | 0x1C1: USER_DEFINED_8_BIT_DATA_TYPE_2_DPCM12_EXP 16 | | |
| | | 0x2A8: RAW6 + DPCM10 + EXP16 | | |
| | | 0x45: USER_DEFINED_8_BIT_DATA_TYPE_6 | | |
| | | 0xDE: Same as YUV4:2:2 8bit + VP but data is send as 16-bit wide words to video port. Could be used together with the GENERIC and BYTESWAP features. | | |
| | | 0x340: USER_DEFINED_8_BIT_DATA_TYPE_1 + DPCM10 + VP | | |
| | | 0x40: USER_DEFINED_8_BIT_DATA_TYPE_1 | | |
| | | 0x19: YUV4:2:0 10 bit | | |
| | | 0x344: USER_DEFINED_8_BIT_DATA_TYPE_5 + DPCM10 + VP | | |
| | | 0x2C2: USER_DEFINED_8_BIT_DATA_TYPE_3 + DPCM10 + EXP16 | | |
| | | 0x141: USER_DEFINED_8_BIT_DATA_TYPE_2_DPCM12_VP | | |
| | | 0x369: RAW7 DPCM12 + EXP16 | | |
| | | 0x69: RAW7 + EXP8 | | |
| | | 0x2C4: USER_DEFINED_8_BIT_DATA_TYPE_5 + DPCM10 + EXP16 | | |
| | | 0x1C: YUV4:2:0 8 bit + CSPS | | |
| | | 0x347: USER_DEFINED_8_BIT_DATA_TYPE_8 + DPCM10 + VP | | |
| | | 0x146: USER_DEFINED_8_BIT_DATA_TYPE_7_DPCM12_VP | | |
| | | 0x82: USER_DEFINED_8_BIT_DATA_TYPE_3 + EXP8 | | |
| | | 0x47: USER_DEFINED_8_BIT_DATA_TYPE_8 | | |
| | | 0x2AA: RAW8 + DPCM10 + EXP16 | | |
| | | 0x1E: YUV4:2:2 8 bit | | |
| | | 0x33: RGB666 + EXP32_24 | | |
| | | 0x2C: RAW12 | | |
| | | 0x2C7: USER_DEFINED_8_BIT_DATA_TYPE_8 + DPCM10 + EXP16 | | |
| | | 0x147: USER_DEFINED_8_BIT_DATA_TYPE_8_DPCM12_VP | | |
| | | 0x81: USER_DEFINED_8_BIT_DATA_TYPE_2 + EXP8 | | |
| | | 0x24: RGB888 | | |
| | | 0x2D: RAW14 | | |
| | | 0x345: USER_DEFINED_8_BIT_DATA_TYPE_6 + DPCM10 + VP | | |
| | | 0xAB: RAW10 + EXP16 | | |
| | | 0x3A8: RAW6 DPCM12 + EXP16 | | |
| | | 0x44: USER_DEFINED_8_BIT_DATA_TYPE_5 | | |
| | | 0x2C0: USER_DEFINED_8_BIT_DATA_TYPE_1 + DPCM10 + EXP16 | | |
| | | 0x18: YUV4:2:0 8 bit | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| | | 0x12F: RAW10 + VP | | |
| | | 0xE8: RAW6 + DPCM10 + VP | | |
| | | 0x1F: YUV4:2:2 10 bit | | |
| | | 0x2C5: USER_DEFINED_8_BIT_DATA_TYPE_6 + DPCM10 + EXP16 | | |
| | | 0x1C2: USER_DEFINED_8_BIT_DATA_TYPE_3_DPCM12_EXP16 | | |
| | | 0x1C6: USER_DEFINED_8_BIT_DATA_TYPE_7_DPCM12_EXP16 | | |
| | | 0x29: RAW7 | | |
| | | 0x86: USER_DEFINED_8_BIT_DATA_TYPE_7 + EXP8 | | |

Table 8-184. Register Call Summary for Register CSI2_CTX_CTRL2_i

ISS Interfaces

- ISS CSI2 Protocol and Data Format: [0]
- ISS CSI2 Operating Modes: [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21]
- ISS CSI2 Virtual Channel and Context: [22] [23] [24]
- ISS CSI2 DMA Engine: [25]
- ISS CSI2 Transcoding: [26] [27] [28]
- ISS CSI2 Data Decompression: [29]
- ISS CSI2 Programming a Context to a Virtual Channel and a Data Type: [30] [31] [32]
- ISS CSI2 REGS1 Register Summary: [33]

Table 8-185. CSI2_CTX_DAT_OFST_i

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|--|------------|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|------|--------|---|---|----------|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|
| Address Offset | 0x0000 0078 + (0x20 * i) | Index | i = 0 to 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5200 1078 + (0x20 * i) 0x5200 1478 + (0x20 * i) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | DATA MEM ADDRESS OFFSET REGISTER - Context This register sets the offset, which is applied on the destination address after each line is written to memory. This register applies for both CSI2_CTX_DAT_PING_ADDR and CSI2_CTX_DAT_PONG_ADDR. For example, it enables to perform 2D data transfers of the pixel data into a frame buffer. In such case, the pixel data and frame buffer data shall have the same data format. The 5 LSBs are ignored: the offset shall be a multiple of 32 bytes. This register is shadowed: modifications are taken into account after the next FSC sync code. Only full 32-bit values shall be written. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="10">OFST</td><td colspan="6">RESERVED</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | OFST | | | | | | | | | | RESERVED | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | OFST | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:17 | RESERVED | | | | | | | | | | | | | | | | | | | | | R | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16:5 | OFST | Line offset programmed in bytes (signed value 2s complement). If OFST = 0, the data is written contiguously in memory. Otherwise, OFST sets the destination offset between the first pixel of the previous line and the first pixel of the current line. | | | | | | | | | | | | | | | | | | | | RW | 0x000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4:0 | RESERVED | | | | | | | | | | | | | | | | | | | | | R | 0x00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-186. Register Call Summary for Register CSI2_CTX_DAT_OFST_i

ISS Interfaces

- [ISS CSI2 Operating Modes: \[0\] \[1\]](#)
- [ISS CSI2 DMA Engine: \[2\] \[3\] \[4\]](#)
- [ISS CSI2 Programming Enable Video/Picture Acquisition: \[5\]](#)
- [ISS CSI2 REGS1 Register Summary: \[6\]](#)

Table 8-187. CSI2_CTX_DAT_PING_ADDR_i

| | | | |
|-------------------------|--|--------------|------------|
| Address Offset | 0x0000 007C + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 107C + (0x20 * i) 0x5200 147C + (0x20 * i) | | |
| Description | DATA MEM PING ADDRESS REGISTER - Context This register sets the 32-bit memory address where the pixel data are stored. The destination is double buffered: this register sets the PING address. Double buffering is enabled when the addresses CSI2_CTX_DAT_PING_ADDR and CSI2_CTX_DAT_PONG_ADDR are different. The 5 LSBs are ignored: the address shall be aligned on a 32-byte boundary. This register is shadowed: modifications are taken into account after the next FSC sync code. Only full 32-bit values shall be written. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:5 | ADDR | 27 most-significant bits of the 32-bit address. | RW | 0x00000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-188. Register Call Summary for Register CSI2_CTX_DAT_PING_ADDR_i

ISS Interfaces

- [ISS CSI2 DMA Engine: \[0\] \[1\]](#)
- [ISS CSI2 Programming Enable Video/Picture Acquisition: \[2\] \[3\]](#)
- [ISS CSI2 REGS1 Register Summary: \[4\]](#)

Table 8-189. CSI2_CTX_DAT_PONG_ADDR_i

| | | | |
|-------------------------|--|--------------|------------|
| Address Offset | 0x0000 0080 + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 1080 + (0x20 * i) 0x5200 1480 + (0x20 * i) | | |
| Description | DATA MEM PONG ADDRESS REGISTER - Context This register sets the 32-bit memory address where the pixel data are stored. The destination is double-buffered: this register sets the PONG address. Double-buffering is enabled when the addresses CSI2_CTX_DAT_PING_ADDR and CSI2_CTX_DAT_PONG_ADDR are different. The 5 LSBs are ignored: the address shall be aligned on a 32-byte boundary. This register is shadowed: modifications are taken into account after the next FSC sync code. Only full 32-bit values shall be written. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:5 | ADDR | 27 most-significant bits of the 32-bit address. | RW | 0x00000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-190. Register Call Summary for Register CSI2_CTX_DAT_PONG_ADDR_i

ISS Interfaces

- [ISS CSI2 DMA Engine: \[0\] \[1\]](#)
- [ISS CSI2 REGS1 Register Summary: \[2\]](#)

Table 8-191. CSI2_CTX_IRQENABLE_i

| | | | |
|-------------------------|--|--------------|------------|
| Address Offset | 0x0000 0084 + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 1084 + (0x20 * i) 0x5200 1484 + (0x20 * i) | | |
| Description | INTERRUPT ENABLE REGISTER - Context This register regroups all the events related to context. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|-----------------|------------------|--------|----------|--------|--------|--------|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_CORRECTION_IRQ | LINE_NUMBER_IRQ | FRAME_NUMBER_IRQ | CS_IRQ | RESERVED | LE_IRQ | LS_IRQ | FE_IRQ | FS_IRQ | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | ECC_CORRECTION_IRQ | Context - ECC has been used to correct the only 1-bit error (long packet only). 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 7 | LINE_NUMBER_IRQ | Context - Line number is reached. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 6 | FRAME_NUMBER_IRQ | Context - Frame counter reached. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 5 | CS_IRQ | Context - Check-Sum of the payload mismatch detection 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 4 | RESERVED | | R | 0 |
| 3 | LE_IRQ | Context - Line end sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 2 | LS_IRQ | Context - Line start sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 1 | FE_IRQ | Context - Frame end sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | FS_IRQ | Context - Frame start sync code detection. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

Table 8-192. Register Call Summary for Register CSI2_CTX_IRQENABLE_i

ISS Interfaces

- [ISS CSI2 ECC and Checksum Generation: \[0\] \[1\]](#)
- [ISS CSI2 REGS1 Register Summary: \[2\]](#)

Table 8-193. CSI2_CTX_IRQSTATUS_i

| | | | |
|-------------------------|--|--------------|------------|
| Address Offset | 0x0000 0088 + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 1088 + (0x20 * i) 0x5200 1488 + (0x20 * i) | | |
| Description | INTERRUPT STATUS REGISTER - Context This register regroups all the events related to Context. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|-----------------|------------------|--------|----------|--------|--------|--------|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_CORRECTION_IRQ | LINE_NUMBER_IRQ | FRAME_NUMBER_IRQ | CS_IRQ | RESERVED | LE_IRQ | LS_IRQ | FE_IRQ | FS_IRQ | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|---------------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | ECC_CORRECTION_IRQ | Context - ECC has been used to do the correction of the only 1-bit error status (long packet only). 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 7 | LINE_NUMBER_IRQ | Context - Line number reached status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 6 | FRAME_NUMBER_IRQ | Context - Frame counter reached status 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 5 | CS_IRQ | Context - Check-Sum mismatch status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 4 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 3 | LE_IRQ | Context - Line end sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 2 | LS_IRQ | Context - Line start sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 1 | FE_IRQ | Context - Frame end sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 0 | FS_IRQ | Context - Frame start sync code detection status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |

Table 8-194. Register Call Summary for Register CSI2_CTX_IRQSTATUS_i

ISS Interfaces

- [ISS CSI2 ECC and Checksum Generation: \[0\] \[1\]](#)
- [ISS CSI2 Virtual Channel and Context: \[2\] \[3\]](#)
- [ISS CSI2 Programming Enable Video/Picture Acquisition: \[4\]](#)
- [ISS CSI2 REGS1 Register Summary: \[5\]](#)

Table 8-195. CSI2_CTX_CTRL3_i

| | | | |
|-------------------------|---|--------------|------------|
| Address Offset | 0x0000 008C + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 108C + (0x20 * i) 0x5200 148C + (0x20 * i) | | |
| Description | CONTROL REGISTER - Context This register controls the Context. This register is shadowed: modifications are taken into account after the next FSC sync code. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | ALPHA | | | | | | | | LINE_NUMBER | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|--------|
| 31:30 | RESERVED | | R | 0x0 |
| 29:16 | ALPHA | Alpha value for RGB888, RGB666 and RGB444. | RW | 0x0000 |
| 15:0 | LINE_NUMBER | Line number for the interrupt generation | RW | 0x0000 |

Table 8-196. Register Call Summary for Register CSI2_CTX_CTRL3_i

ISS Interfaces

- [ISS CSI2 Operating Modes: \[0\] \[1\] \[2\]](#)
- [ISS CSI2 Virtual Channel and Context: \[3\]](#)
- [ISS CSI2 Programming Enable Video/Picture Acquisition: \[4\]](#)
- [ISS CSI2 Programming a Periodic Event During Frame Acquisition: \[5\]](#)
- [ISS CSI2 REGS1 Register Summary: \[6\]](#)

8.2.5.5.3 ISS CSI2 REGS2 Registers**8.2.5.5.3.1 ISS CSI2 REGS2 Register Summary**

[Table 8-197](#) summarizes the CSI2 REGS2 registers.

Table 8-197. ISS CSI2 REGS2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_CSI2_A_REGS 2 Base Address | ISS_CSI2_B_REGS 2 Base Address |
|--|------|-----------------------|-------------------------|--------------------------------|--------------------------------|
| CSI2_CTX_TRANS CODEH_i⁽¹⁾ | RW | 32 | 0x0000 0000 + (0x8 * i) | 0x5200 11C0 + (0x8 * i) | 0x5200 15C0 + (0x8 * i) |
| CSI2_CTX_TRANS CODEV_i⁽¹⁾ | RW | 32 | 0x0000 0004 + (0x8 * i) | 0x5200 11C4 + (0x8 * i) | 0x5200 15C4 + (0x8 * i) |

⁽¹⁾ i = 0 to 7

8.2.5.5.3.2 ISS CSI2 REGS2 Register Description

and describe the CSI2 REGS2 registers.

Table 8-198. CSI2_CTX_TRANSCODEH_i

| | | | |
|-------------------------|--|--------------|------------|
| Address Offset | 0x0000 0000 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 11C0 + (0x8 * i) 0x5200 15C0 + (0x8 * i) | | |
| Description | Transcode configuration register: defines horizontal frame cropping | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | HCOUNT | | | | | | | | RESERVED | | | | | | | | HSKIP | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:29 | RESERVED | | R | 0x0 |
| 28:16 | HCOUNT | Pixels to output per line when the values is between 1 and 8191. Pixels HSKIP-WIDTH pixels are output when HCOUNT=0. WIDTH corresponds to the image width provided by the sensor. | RW | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | HSKIP | Pixel to skip horizontally. Valid values: 0-8191 | RW | 0x0000 |

Table 8-199. Register Call Summary for Register CSI2_CTX_TRANSCODEH_i

ISS Interfaces

- [ISS CSI2 Transcoding: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS CSI2 REGS2 Register Summary: \[4\]](#)

Table 8-200. CSI2_CTX_TRANSCODEV_i

| | | | |
|-------------------------|---|--------------|------------|
| Address Offset | 0x0000 0004 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 11C4 + (0x8 * i) 0x5200 15C4 + (0x8 * i) | | |
| Description | Transcode configuration register: defines vertical frame cropping | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VCOUNT | | | | | | | | RESERVED | | | | | | | | VSKIP | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:29 | RESERVED | | R | 0x0 |
| 28:16 | VCOUNT | Lines to output per frame when the values is between 1 and 8191. Pixels VSKIP-HEIGHT pixels are output when VCOUNT=0. HEIGHT corresponds to the image height provided by the sensor. | RW | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VSKIP | Pixel to skip vertically Valid values: 0-8191 | RW | 0x0000 |

Table 8-201. Register Call Summary for Register CSI2_CTX_TRANSCODEV_i

ISS Interfaces

- [ISS CSI2 Transcoding: \[0\] \[1\] \[2\]](#)
- [ISS CSI2 REGS2 Register Summary: \[3\]](#)

8.2.6 ISS TCTRL

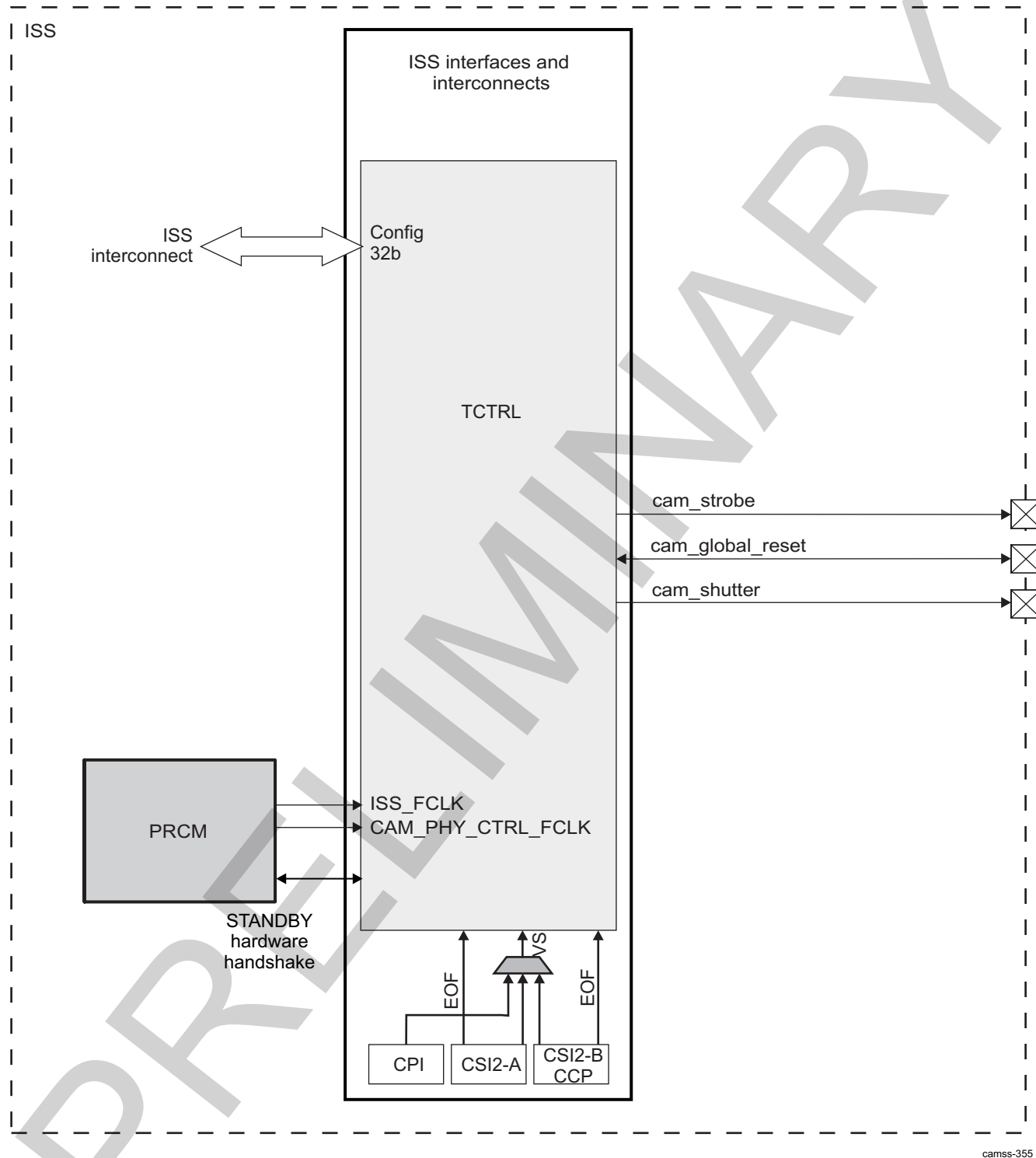
8.2.6.1 ISS TCTRL Environment

There are no particular environment attributes. See [Section 8.2.2](#), *ISS Interfaces Environment*.

8.2.6.2 ISS TCTRL Integration

[Figure 8-77](#) shows the integration of the TCTRL.

Figure 8-77. ISS TCTRL Integration



For information about the power domain, clocks, reset, and hardware requests, see [Section 8.1.2.4, ISS Power Management](#).

8.2.6.3 ISS TCTRL Functional Description

8.2.6.3.1 ISS TCTRL Features

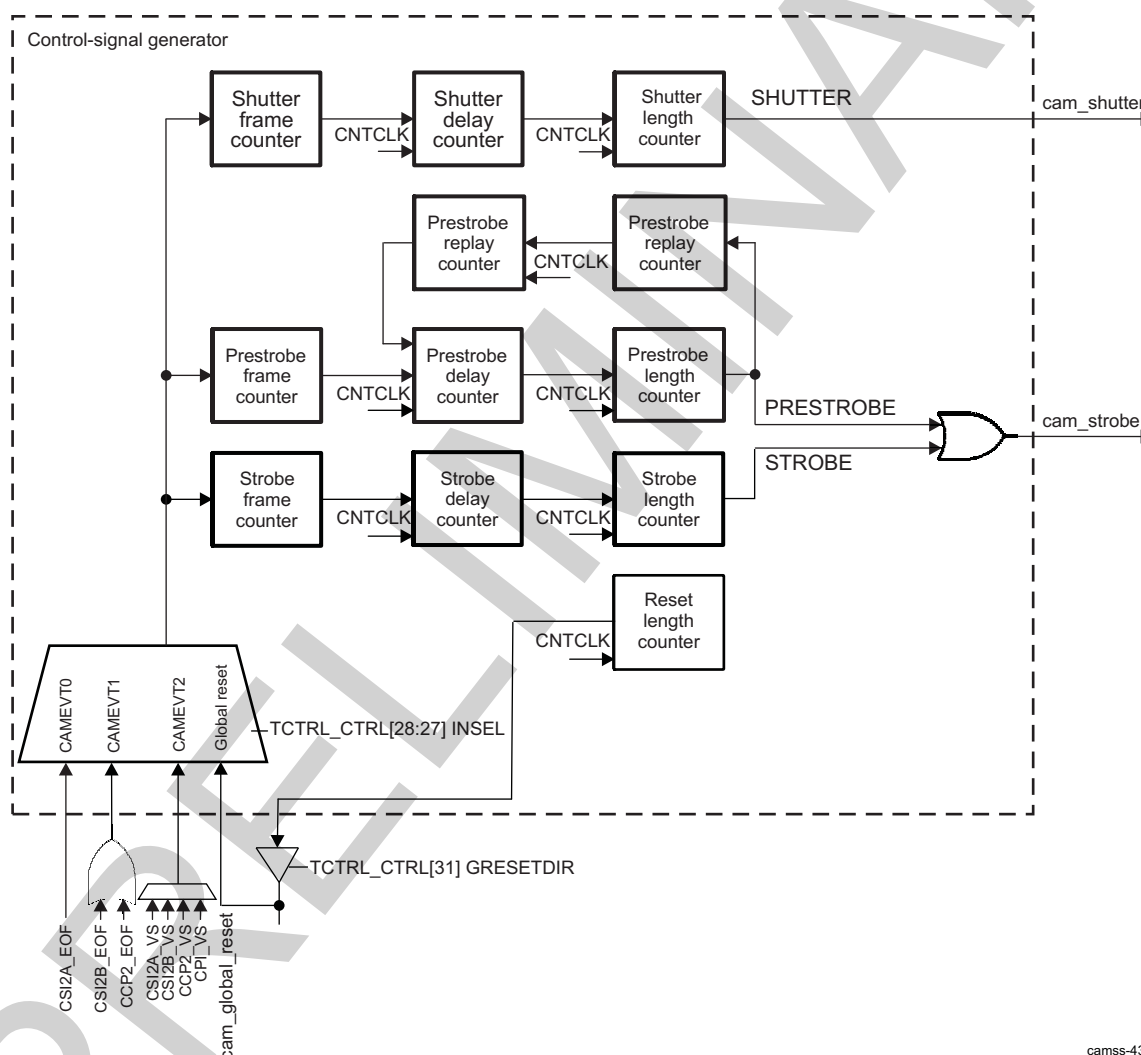
The TCTRL generates the control signals (cam_strobe and cam_shutter) for the flash prestrobe, flash strobe, and mechanical shutters.

The TCTRL includes a timing generator and a control-signal generator.

8.2.6.3.2 ISS TCTRL Control-Signal Generator

The control-signal generator generates the prestrobe, strobe, and shutter signals: cam_strobe and cam_shutter. Figure 8-78 shows the principle of control-signal generation.

Figure 8-78. TCTRL Control-Signal Generation



camss-433

The control-signal generator gathers precise timings for the cam_strobe and cam_shutter signals, to assert and deassert the signals at known times. The timing control-signal generator can be synchronized on the vertical synchronization signal coming from the CSI2-A, CSI2-B, CCP2, Parallel interface (CPI), or on an externally generated cam_global_reset signal.

A multiplexer controls which of the CSI2-A, CSI2-B, CCP2, or Parallel interfaces drives control-signal generation. This multiplexer can also select the externally generated cam_global_reset signal as the trigger event. The TCTRL_CTRL[31] GRESETDIR bit defines the direction of cam_global_reset.

- The externally generated cam_global_reset is used as a trigger when TCTRL_CTRL[31] GRESETDIR = 0 and TCTRL_CTRL[28:27] INSEL = 3.
- The internally generated cam_global_reset is used as a trigger when TCTRL_CTRL[31] GRESETDIR = 1 and TCTRL_CTRL[28:27] INSEL = 3.

The cam_global_reset signal can also be generated internally by the control-signal generator under software control. In this case, the prestrobe and shutter signals are synchronized on internally generated cam_global_reset. The multiplexer controls whether control-signal generation must be triggered by the internal or external cam_global_reset.

The prestrobe-, strobe-, and shutter-control signals can be individually enabled at any time. These signals must not be disabled by software.

The clock divider generates the CNTCLK clock based on the functional clock. The clock divider is programmable. Table 8-202 lists the possible frequencies as a function of the divisor values.

Table 8-202. ISS TCTRL Control-Signal Generator: CNTCLK Frequencies

| Divisor Value TCTRL_CTRL[18:10] DIVC | CNTCLK Clock | CNTCLK Precision (ns) |
|--------------------------------------|------------------------|-----------------------|
| 0 (default) | Clock gated. No clock. | N/A |
| 1 | 233 MHz | 5 |
| 2 | 116.5 MHz | 10 |
| 3 | 77.6 MHz | 15 |
| 4 | 58.25 MHz | 20 |
| ... | ... | ... |
| 510 | 0.456 MHz | 2550 |
| 511 | 0.455 MHz | 2555 |

There are three counters per control signal, for a total of nine counters. Each counter is programmable.

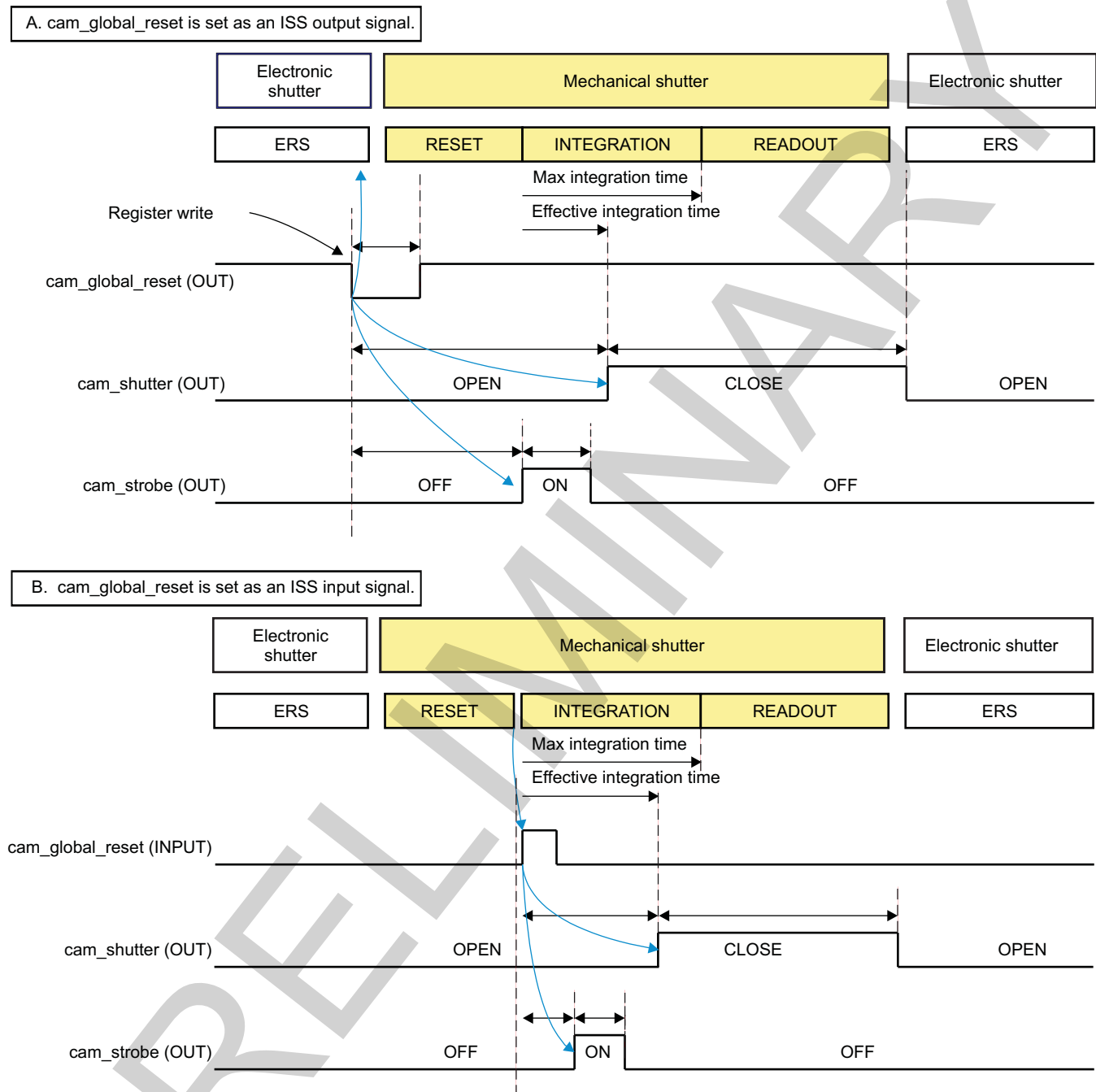
- The frame counter is decreased each time a full new frame is received.
 - A new frame is detected by the TCTRL module when CAMEVTx is received.
 - The frame counter determines how many whole frames must be ignored before the delay counter is triggered. The frame counters can be set to 0 to bypass the frame counters.
- The delay counter determines the control-signal activation delay. The counter is decreased at every CNTCLK clock cycle. When the counter reaches 0, the control signal is asserted. If the delay counter is set to 0, the control signal is asserted immediately.
- The activation-length counter determines the length of control-signal assertion. The counter is decreased at every CNTCLK clock cycle. When the counter reaches 0, the signal is deasserted and the control-signal enable bit is disabled. If the activation length is set to 0, the control signal is not asserted and the control-signal enable bit is disabled.

The polarity of the following signals can be individually selected:

- TCTRL_CTRL[26] STRBPSTRBPOL for the prestrobe and strobe signals
- TCTRL_CTRL[24] SHUTPOL for the shutter signal
- TCTRL_CTRL[30] GRESETPOL for cam_global_reset

Software can trigger the generation of cam_global_reset to the camera module. The length of signal-activation is programmable. The counter is decreased at every CNTCLK clock cycle. When the counter reaches 0, the signal is deasserted and the global reset enable bit is disabled (the TCTRL_CTRL[29] GRESETEN bit). If the activation length is set to 0, the control signal is not asserted and the control-signal enable bit is disabled. The polarity of cam_global_reset can be selected (the TCTRL_CTRL[30] GRESETPOL bit).

Figure 8-79 shows the use of cam_global_reset set as an input or output signal. cam_global_reset is asynchronous, edge-sensitive, and asserted for at least one interconnect clock cycle.

Figure 8-79. ISS TCTRL Use of cam_global_reset With Global Reset Release Camera Modules

camss-434

There are two types of shutter mechanisms: mechanical and electronic. A mechanical shutter is used only for high-resolution sensors. The three control signals (cam_global_reset, cam_shutter, and cam_strobe) are useful with a mechanical shutter. High frame rates can be achieved only with an electronic shutter. When an electronic shutter is used, none of the three control signals is used.

- Mechanical shutter mechanism:
 - Reset: All pixels of the sensor are reset to their black value. When the sensor has a global reset feature, the mechanical shutter can be open during reset.
 - Integration: The light received by the sensor is transformed into electrical charges that are stored inside pixels. At the end of the integration time, the shutter must be closed. Exposure time is

defined by the time between reset release and shutter close.

- Readout: The charges accumulated in pixels are converted to digital values that are sent to the camera receiver.
- Electronic rolling shutter (ERS) mechanism:
 - Each line of the sensor is reset separately and read after a fixed amount of time. Exposure time is defined by the time between reset and read.

8.2.6.4 ISS TCTRL Programming Model

The following settings must be done before enabling the TCTRL.

8.2.6.4.1 ISS TCTRL Camera-Control Signal Generator

Two configurations apply:

- First configuration: The control signals are based on the vertical synchronization information coming from the camera module or from externally generated cam_global_reset.
- Second configuration: The control signals are based on internally generated cam_global_reset.

8.2.6.4.1.1 ISS TCTRL Vertical Sync-Based Control-Signal Generation or Externally Generated cam_global_reset

To enable control-signal generation in the first configuration, follow the procedure listed in [Table 8-203](#).

Table 8-203. ISS TCTRL Enabling the Control-Signal Generation in First Configuration

| Step | Bit Field | Value |
|--|---|---|
| Select the input that triggers the control signals. The trigger signal can come from the CSI2-A, CSI2-B/CCP2 interface, Parallel interface (CPI) or the externally generated cam_global_reset signal. | TCTRL_CTRL[28:27] INSEL | 0x0: CSI2A 0x1: CSI2B or CCP2 0x2: VS signal 0x3: Global reset |
| Set the global reset as input signal. Writes to the TCTRL_CTRL[29] GRESETEN bit do not trigger the CAM_STROBE and CAM_SHUTTER signals and do not generate the CAM_GLOBAL_RESET signal. | TCTRL_CTRL[31] GRESETDIR | 0x0 |
| The following bits are cleared automatically to 0 after the signal assertion: | <ul style="list-style-type: none"> • TCTRL_CTRL[21] SHUTEN • TCTRL_CTRL[22] PSTRBEN • TCTRL_CTRL[23] STRBEN | |
| Set the polarity of the SHUTTER, STROBE/PRESTROBE, and cam_global_reset signals. | <ul style="list-style-type: none"> • TCTRL_CTRL[24] SHUTPOL • TCTRL_CTRL[26] STRBPSTRBPOL • TCTRL_CTRL[30] GRESETPOL | |
| Set the clock divisor value, which generates the CNTCLK clock. The clock is set by CNTCLK = ISS_FCLK/ TCTRL_CTRL[18:10] DIVC. | TCTRL_CTRL[18:10] DIVC | 0x0: Disable CNTCLK 0 to 511: Divider |
| Set the frame counters. | <ul style="list-style-type: none"> • TCTRL_FRAME[5:0] SHUT • TCTRL_FRAME[11:6] PSTRB • TCTRL_FRAME[17:12] STRB | 0: TCTRL does not delay any frame in input. 1 to 63 |
| Set the delay counters. | <ul style="list-style-type: none"> • TCTRL_SHUT_DELAY • TCTRL_PSTRB_DELAY • TCTRL_STRB_DELAY | The possible values are 0 to $2^{25} - 1$ cycles. The cycles are at the CNTCLK clock frequency. The maximum signal duration is $(2^{25} - 1) \times 511/233 \text{ MHz} = 73.58933369 \text{ s}$ (TCTRL_CTRL[18:10] DIVC = 511). |

Table 8-203. ISS TCTRL Enabling the Control-Signal Generation in First Configuration (continued)

| Step | Bit Field | Value |
|------------------------------|--|--|
| Set the signal durations. | <ul style="list-style-type: none"> TCTRL_SHUT_LENGTH TCTRL_PSTRB_LENGTH TCTRL_STRB_LENGTH | The possible values are 0 to $2^{24} - 1$ cycles. The cycles are at the CNTCLK clock frequency. The maximum signal duration for a 233 MHz input clock is $(2^{24} - 1) \times 511/233 \text{ MHz} = 36.79466685 \text{ s}$ (TCTRL_CTRL.DIVC = 511). |
| Enable the SHUTTER signal. | TCTRL_CTRL[21] SHUTEN | 0x1 |
| Enable the PRESTROBE signal. | TCTRL_CTRL[22] PSTRBEN | 0x1 |
| Enable the STROBE signal. | TCTRL_CTRL[23] STRBEN | 0x1 |

8.2.6.4.1.2 ISS TCTRL Internally Generated cam_global_reset-Based Control-Signal Generation

To enable control-signal generation in the second configuration, follow the procedure listed in [Table 8-204](#).

Table 8-204. ISS TCTRL Enabling the Control-Signal Generation in Second Configuration

| Step | Bit Field | Value |
|--|---|---|
| Select the input to global reset, to loop back the internally generated GLOBAL_RESET. Vertical synchronization events do not trigger the CAM_STROBE and CAM_SHUTTER signals. | TCTRL_CTRL[28:27] INSEL | 0x3: Global reset |
| Set the global reset as output signal. | TCTRL_CTRL[31] GRESETDIR | 0x1 |
| The following bits are cleared automatically to 0 after the signal assertion: | <ul style="list-style-type: none"> TCTRL_CTRL[21] SHUTEN TCTRL_CTRL[22] PSTRBEN TCTRL_CTRL[23] STRBEN TCTRL_CTRL[29] GRESETEN | 0x0 |
| Set the polarity of the SHUTTER, STROBE/PRESTROBE, and cam_global_reset signals. | <ul style="list-style-type: none"> TCTRL_CTRL[24] SHUTPOL TCTRL_CTRL[26] STRBPSTRBPOL TCTRL_CTRL[30] GRESETPOL | |
| Set the clock divisor value, which generates the CNTCLK clock. The clock is set by $\text{CNTCLK} = \text{ISS_FCLK}/\text{TCTRL_CTRL[18:10]} \text{ DIVC}$. | TCTRL_CTRL[18:10] DIVC | 0x0: Disable CNTCLK 0 to 511: Divider |
| Set the frame counters. | <ul style="list-style-type: none"> TCTRL_FRAME[5:0] SHUT TCTRL_FRAME[11:6] PSTRB TCTRL_FRAME[17:12] STRB | 0: TCTRL does not delay any frame in input. 1 to 63 |
| Set the delay counters. | <ul style="list-style-type: none"> TCTRL_SHUT_DELAY TCTRL_PSTRB_DELAY TCTRL_STRB_DELAY | The possible values are 0 to $2^{25} - 1$ cycles. The cycles are at the CNTCLK clock frequency. The maximum signal duration is $(2^{25} - 1) \times 511/233 \text{ MHz} = 73.58933369 \text{ s}$ (TCTRL_CTRL[18:10] DIVC = 511). |

Table 8-204. ISS TCTRL Enabling the Control-Signal Generation in Second Configuration (continued)

| Step | Bit Field | Value |
|--|--|--|
| Set the signal durations. | <ul style="list-style-type: none"> TCTRL_SHUT_LENGTH TCTRL_PSTRB_LENGTH TCTRL_STRB_LENGTH | The possible values are 0 to $2^{24} - 1$ cycles. The cycles are at the CNTCLK clock frequency. The maximum signal duration for a 233 MHz input clock is $(2^{24} - 1) \times 511 / 233 \text{ MHz} = 36.79466685 \text{ s}$ (TCTRL_CTRL.DIVC = 511). |
| Set the cam_global_reset assertion time. | TCTRL_GRESET_LENGTH | The possible values are 0 to $2^{24} - 1$ cycles. The cycles are at the CNTCLK clock frequency. The maximum signal duration for a 233 MHz input clock is $(2^{24} - 1) \times 511 / 233 \text{ MHz} = 36.79466685 \text{ s}$ (TCTRL_CTRL.DIVC = 511). |
| Enable the SHUTTER signal. | TCTRL_CTRL[21] SHUTEN | 0x1 |
| Enable the PRESTROBE signal. | TCTRL_CTRL[22] PSTRBEN | 0x1 |
| Enable the STROBE signal. | TCTRL_CTRL[23] STRBEN | 0x1 |
| Enable the cam_global_reset control-signal generation. | TCTRL_CTRL[29] GRESETEN | 0x1 |

NOTE: Setting the following bits to 1 simultaneously leads to unpredictable behavior:

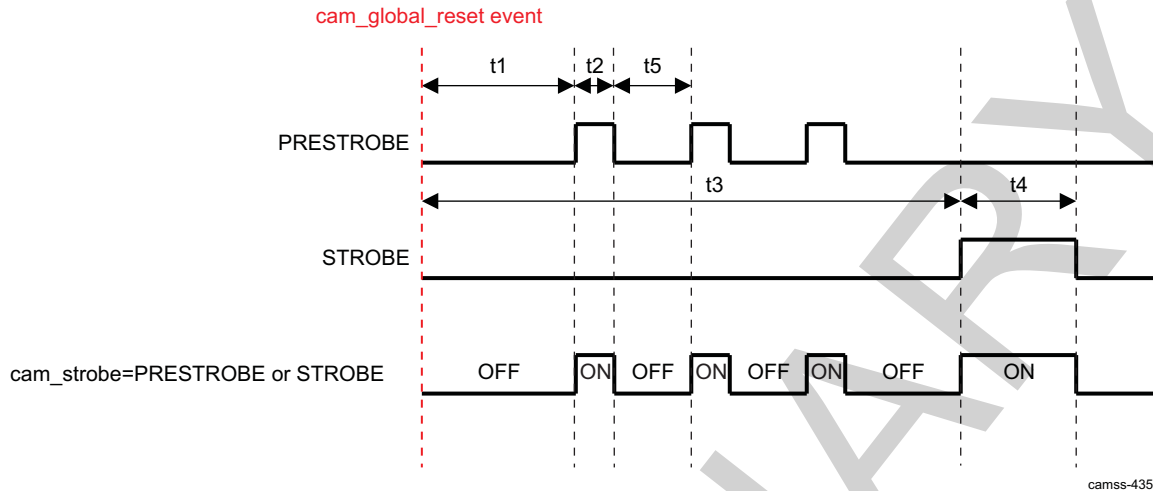
- [TCTRL_CTRL\[21\] SHUTEN](#)
- [TCTRL_CTRL\[22\] PSTRBEN](#)
- [TCTRL_CTRL\[23\] STRBEN](#)
- [TCTRL_CTRL\[29\] GRESETEN](#)

The following bits must be set before [TCTRL_CTRL\[29\] GRESETEN](#) is enabled:

- [TCTRL_CTRL\[21\] SHUTEN](#)
- [TCTRL_CTRL\[22\] PSTRBEN](#)
- [TCTRL_CTRL\[23\] STRBEN](#)

8.2.6.4.1.3 ISS TCTRL STROBE and PRESTROBE Signal Generation for Red-Eye Removal

The STROBE and PRESTROBE signal generation enables a strobe flash for red-eye removal. The process is shown in [Figure 8-80](#). The dotted line corresponds to known timings from which the delay counters start decreasing: cam_global_reset event.

Figure 8-80. cam_strobe Signal-Generation for Red-Eye Removal

- t1: Set by the [TCTRL_PSTRB_DELAY](#) register
- t2: Set by the [TCTRL_PSTRB_LENGTH](#) register
- t5: Set by the [TCTRL_PSTRB_REPLAY\[24:0\]](#) DELAY bit field. The number of times the pulse is repeated is controlled by the [TCTRL_PSTRB_REPLAY\[31:25\]](#) COUNTER bit field.
In the previous example, [TCTRL_PSTRB_REPLAY\[31:25\]](#) COUNTER = 2.
 - The possible delay values are 0 to $2^{25} - 1$ cycle. The cycles are at the CNTCLK clock frequency. The maximum signal duration is $(2^{25} - 1) \times 511/233 \text{ MHz} = 73.58933369 \text{ s}$ ([TCTRL_CTRL\[18:11\]](#) DIVC = 511).
 - The possible count values are 0 to 127 additional pulses.
- t3: Set by the [TCTRL_STRB_DELAY](#) register
- t4: Set by the [TCTRL_STRB_LENGTH](#) register

8.2.6.5 ISS TCTRL Register Manual

8.2.6.5.1 ISS TCTRL Instance Summary

[Table 8-205](#) summarizes the TCTRL instance.

Table 8-205. ISS TCTRL Instance Summary

| Module Name | L3 Base Address | Size |
|---------------------------|-----------------|-----------|
| ISS_TCTRL | 0x5200 0400 | 256 bytes |

8.2.6.5.2 ISS TCTRL Registers

8.2.6.5.2.1 ISS TCTRL Register Summary

[Table 8-206](#) summarizes the TCTRL registers.

Table 8-206. ISS TCTRL Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_TCTRL Base Address |
|-----------------------------------|------|-----------------------|----------------|------------------------|
| TCTRL_REVISION | R | 32 | 0x0000 0000 | 0x5200 0400 |
| TCTRL_SYSCONFIG | RW | 32 | 0x0000 0004 | 0x5200 0404 |
| TCTRL_SYSSTATUS | R | 32 | 0x0000 0008 | 0x5200 0408 |
| TCTRL_STRB_LENGTH | RW | 32 | 0x0000 0010 | 0x5200 0410 |

Table 8-206. ISS TCTRL Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_TCTRL Base Address |
|---------------------|------|-----------------------|----------------|------------------------|
| TCTRL_PSTRB_LENTH | RW | 32 | 0x0000 0014 | 0x5200 0414 |
| TCTRL_SHUT_LENTH | RW | 32 | 0x0000 0018 | 0x5200 0418 |
| TCTRL_GRESET_LENTH | RW | 32 | 0x0000 001C | 0x5200 041C |
| TCTRL_STRB_DELAY | RW | 32 | 0x0000 0020 | 0x5200 0420 |
| TCTRL_PSTRB_DELAY | RW | 32 | 0x0000 0024 | 0x5200 0424 |
| TCTRL_SHUT_DELAY | RW | 32 | 0x0000 0028 | 0x5200 0428 |
| TCTRL_CTRL | RW | 32 | 0x0000 0030 | 0x5200 0430 |
| TCTRL_PSTRB_REPLACE | RW | 32 | 0x0000 0034 | 0x5200 0434 |
| TCTRL_FRAME | RW | 32 | 0x0000 0038 | 0x5200 0438 |

8.2.6.5.2.2 ISS TCTRL Register Description

Table 8-207 through Table 8-232 describe the TCTRL registers.

Table 8-207. TCTRL_REVISION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|-----------|----|----|----|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5200 0400 | | | | | | | | | | | | | | | | Instance | ISS_TCTRL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="32">REVISION</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP revision | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 8-208. Register Call Summary for Register TCTRL_REVISION

ISS Interfaces

- [ISS TCTRL Register Summary: \[0\]](#)

Table 8-209. TCTRL_SYSCONFIG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0004 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_TCTRL | | | | | | | | | | | | | | | |
| Physical Address | 0x5200 0404 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | OCP-SOCKET SYSTEM CONFIGURATION REGISTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | SOFT_RESET | AUTO_IDLE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | SOFT_RESET | Software reset. Set the bit to 1 to trigger the module reset. The bit is automatically reset by the hardware. During reads return 0. 0x0: Normal mode. 0x1: The module is reset. | RW | 0 |
| 0 | AUTO_IDLE | Internal OCP and functional clock gating strategy 0x0: OCP and functional clocks are free-running 0x1: Automatic clock gating strategy is applied, based on the OCP interface activity for interface clock and on the functional activity for functional clocks. | RW | 1 |

Table 8-210. Register Call Summary for Register TCTRL_SYSCONFIG

ISS Interfaces

- [ISS TCTRL Register Summary: \[0\]](#)

Table 8-211. TCTRL_SYSSTATUS

| | | | |
|-------------------------|-----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0008 | Instance | ISS_TCTRL |
| Physical Address | 0x5200 0408 | | |
| Description | OCP-SOCKET SYSTEM STATUS REGISTER | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESET DONE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | RESET_DONE | Internal reset monitoring Read 0x1: Reset completed. Read 0x0: Internal module reset is ongoing. | R | 0 |

Table 8-212. Register Call Summary for Register TCTRL_SYSSTATUS

ISS Interfaces

- [ISS TCTRL Register Summary: \[0\]](#)

Table 8-213. TCTRL_STRB_LENGTH

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|----|---|----|----|----|----|--------|----|----|----|----|----|----|----|----|-------------------|----|------|----|----------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0010 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5200 0410 | | | | | | | | | | | | | | | | InstanceISS_TCTRL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | TIMING CONTROL - STROBE LENGTH REGISTER This register is used by the TIMING CTRL module to generate the STROBE signal. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="8">RESERVED</td><td colspan="24">LENGTH</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | LENGTH | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | LENGTH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:24 | RESERVED | | | | | | | | | | | | | | | | | | R | | 0x00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23:0 | LENGTH | | Sets the length of the CAM_STROBE signal assertion in cycles of the CNTCLK clock. The CNTCLK frequency is generated with the TCTRL_CTRL.DIVC bit field. After signal assertion, the TCTRL_CTRL.STRBEN bit is automatically cleared. The possible values are 0 to 2 ²⁴ -1 cycles. | | | | | | | | | | | | | | | | RW | | 0x000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-214. Register Call Summary for Register TCTRL_STRB_LENGTH

ISS Interfaces

- [ISS TCTRL Vertical Sync-Based Control-Signal Generation or Externally Generated cam_global_reset: \[0\]](#)
- [ISS TCTRL Internally Generated cam_global_reset-Based Control-Signal Generation: \[1\]](#)
- [ISS TCTRL STROBE and PRESTROBE Signal Generation for Red-Eye Removal: \[2\]](#)
- [ISS TCTRL Register Summary: \[3\]](#)
- [ISS TCTRL Register Description: \[4\]](#)

Table 8-215. TCTRL_PSTRB_LENGTH

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|----|---|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|------|----|----------|----|---|---|---|---|---|---|---|---|----|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0014 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5200 0414 | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | ISS_TCTRL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | TIMING CONTROL - PRESTROBE LENGTH REGISTER This register is used by the TIMING CTRL module to generate the PRESTROBE signal. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="8">RESERVED</td><td colspan="22">LENGTH</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | LENGTH | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | LENGTH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:24 | RESERVED | | | | | | | | | | | | | | | | | R | | 0x00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23:0 | LENGTH | | Sets the length of the CAM_PRESTROBE signal assertion in cycles of the CNTCLK clock. The CNTCLK frequency is generated with the TCTRL_CTRL.DIVC bit field. After signal assertion, the TCTRL_CTRL.PSTRBEN bit is automatically cleared. The possible values are 0 to 2 ²⁴ -1 cycles. | | | | | | | | | | | | | | | RW | | 0x000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-216. Register Call Summary for Register TCTRL_PSTRB_LENGTH

ISS Interfaces

- [ISS TCTRL Vertical Sync-Based Control-Signal Generation or Externally Generated cam_global_reset: \[0\]](#)
- [ISS TCTRL Internally Generated cam_global_reset-Based Control-Signal Generation: \[1\]](#)
- [ISS TCTRL STROBE and PRESTROBE Signal Generation for Red-Eye Removal: \[2\]](#)
- [ISS TCTRL Register Summary: \[3\]](#)
- [ISS TCTRL Register Description: \[4\] \[5\] \[6\] \[7\]](#)

Table 8-217. TCTRL_SHUT_LENGTH

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0018 | | |
| Physical Address | 0x5200 0418 | Instance | ISS_TCTRL |
| Description | TIMING CONTROL - SHUTTER LENGTH REGISTER This register is used by the TIMING CTRL module to generate the SHUTTER signal. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | LENGTH | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|----------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:0 | LENGTH | Sets the length of the CAM_SHUTTER signal assertion in cycles of the CNTCLK clock. The CNTCLK frequency is generated with the TCTRL_CTRL.DIVC bit field. After signal assertion, the TCTRL_CTRL.SHUTEN bit is automatically cleared. The possible values are 0 to 2 ²⁴ -1 cycles. | RW | 0x000000 |

Table 8-218. Register Call Summary for Register TCTRL_SHUT_LENGTH

ISS Interfaces

- [ISS TCTRL Vertical Sync-Based Control-Signal Generation or Externally Generated cam_global_reset: \[0\]](#)
- [ISS TCTRL Internally Generated cam_global_reset-Based Control-Signal Generation: \[1\]](#)
- [ISS TCTRL Register Summary: \[2\]](#)
- [ISS TCTRL Register Description: \[3\]](#)

Table 8-219. TCTRL_GRESET_LENGTH

Address Offset

0x0000 001C

Physical Address

0x5200 041C

Description

TIMING CONTROL - GLOBAL SHUTTER LENGTH REGISTER

This register is used by the TIMING CTRL module to generate the CAM.GRESET signal.

Type

RW

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | LENGTH | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|----------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:0 | LENGTH | Sets the length of the CAM_GLOBAL_RESET signal assertion in cycles of the CNTCLK clock. The CNTCLK frequency is generated with the TCTRL_CTRL.DIVC bit field. After signal assertion, the TCTRL_CTRL.GRESETEN bit is automatically cleared. The possible values are 0 to 2 ²⁴ -1 cycles. The polarity of the CAM_GLOBAL_RESET signal is set by the TCTRL_CTRL.GRESETPOL bit. | RW | 0x000000 |

Table 8-220. Register Call Summary for Register TCTRL_GRESET_LENGTH

ISS Interfaces

- [ISS TCTRL Internally Generated cam_global_reset-Based Control-Signal Generation: \[0\]](#)
- [ISS TCTRL Register Summary: \[1\]](#)
- [ISS TCTRL Register Description: \[2\]](#)

Table 8-221. TCTRL_STRB_DELAY

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0020 | | | | | | | | | | | | | | | | Instance | ISS_TCTRL | | | | | | | | | | | | | | | |
| Physical Address | 0x5200 0420 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | TIMING CONTROL - STROBE DELAY REGISTER This register is used by the TIMING CTRL module to generate the STROBE signal. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DELAY | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-----------|
| 31:25 | RESERVED | | R | 0x00 |
| 24:0 | DELAY | Sets the delay for the CAM_STROBE signal assertion in cycles of the CNTCLK clock. The CNTCLK frequency is generated with the TCTRL_CTRL.DIVC bit field. The possible values are 0 to 2 ²⁵ -1 cycles. | RW | 0x0000000 |

Table 8-222. Register Call Summary for Register TCTRL_STRB_DELAY

ISS Interfaces

- [ISS TCTRL Vertical Sync-Based Control-Signal Generation or Externally Generated cam_global_reset](#): [0]
- [ISS TCTRL Internally Generated cam_global_reset-Based Control-Signal Generation](#): [1]
- [ISS TCTRL STROBE and PRESTROBE Signal Generation for Red-Eye Removal](#): [2]
- [ISS TCTRL Register Summary](#): [3]
- [ISS TCTRL Register Description](#): [4]

Table 8-223. TCTRL_PSTRB_DELAY

| | | | | |
|------------------|---|--|----------|-----------|
| Address Offset | 0x0000 0024 | | Instance | ISS_TCTRL |
| Physical Address | 0x5200 0424 | | | |
| Description | TIMING CONTROL - PRE STROBE DELAY REGISTER This register is used by the TIMING CTRL module to generate the PRESTROBE signal. | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DELAY | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-----------|
| 31:25 | RESERVED | | R | 0x00 |
| 24:0 | DELAY | Sets the delay for the CAM_PSTROBE signal assertion in cycles of the CNTCLK clock. The CNTCLK frequency is generated with the TCTRL_CTRL.DIVC bit field. The possible values are 0 to 2 ²⁵ -1 cycles. | RW | 0x0000000 |

Table 8-224. Register Call Summary for Register TCTRL_PSTRB_DELAY

ISS Interfaces

- [ISS TCTRL Vertical Sync-Based Control-Signal Generation or Externally Generated cam_global_reset](#): [0]
- [ISS TCTRL Internally Generated cam_global_reset-Based Control-Signal Generation](#): [1]
- [ISS TCTRL STROBE and PRESTROBE Signal Generation for Red-Eye Removal](#): [2]
- [ISS TCTRL Register Summary](#): [3]
- [ISS TCTRL Register Description](#): [4] [5]

Table 8-225. TCTRL_SHUT_DELAY

| | | | |
|------------------|--|----------|-----------|
| Address Offset | 0x0000 0028 | Instance | ISS_TCTRL |
| Physical Address | 0x5200 0428 | | |
| Description | TIMING CONTROL - SHUTTER DELAY REGISTER This register is used by the TIMING CTRL module to generate the SHUTTER signal. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DELAY | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-----------|
| 31:25 | RESERVED | | R | 0x00 |
| 24:0 | DELAY | Sets the delay for the CAM_SHUTTER signal assertion in cycles of the CNTCLK clock. The CNTCLK frequency is generated with the TCTRL_CTRL.DIVC bit field. The possible values are 0 to 2 ²⁵ -1 cycles. | RW | 0x0000000 |

Table 8-226. Register Call Summary for Register TCTRL_SHUT_DELAY

ISS Interfaces

- [ISS TCTRL Vertical Sync-Based Control-Signal Generation or Externally Generated cam_global_reset](#): [0]
- [ISS TCTRL Internally Generated cam_global_reset-Based Control-Signal Generation](#): [1]
- [ISS TCTRL Register Summary](#): [2]
- [ISS TCTRL Register Description](#): [3]

Table 8-227. TCTRL_CTRL

| | | | |
|------------------|-----------------------------------|----------|-----------|
| Address Offset | 0x0000 0030 | Instance | ISS_TCTRL |
| Physical Address | 0x5200 0430 | | |
| Description | TIMING CONTROL - CONTROL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|-----------|----------|-------|----|--------------|----------|---------|--------|---------|--------|----------|------|----|----|----|----|----|----|----|----|----|----------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GRESETDIR | GRESETPOL | GRESETEN | INSEL | | STRBPSTRBPOL | RESERVED | SHUTPOL | STRBEN | PSTRBEN | SHUTEN | RESERVED | DIVC | | | | | | | | | | RESERVED | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 31 | GRESETDIR | Sets the direction of the GLOBAL_RESET signal. 0x0: INPUT – GLOBAL_RESET is an input to the TIMING CONTROL module. GLOBAL_RESET is externally generated. 0x1: OUTPUT – GLOBAL_RESET is an output of the TIMING CONTROL module. GLOBAL_RESET is internally generated. If GRESETEN is set to 1, the internally generated GLOBAL_RESET will trigger the generation of the PRESTROBE, STROBE and SHUTTER signals. The frame counters are ignored. | RW | 0 |
| 30 | GRESETPOL | Sets the polarity of the global reset signal: CAM_GLOBAL_RESET. It applies whatever the direction of the GLOBAL_RESET signal: input or output. 0x0: active high 0x1: active low | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|-------|
| 29 | GRESETEN | Triggers the generation of the CAM_GLOBAL_RESET signal. The signal is asserted immediately. If enabled, the CAM_GLOBAL_RESET signal will be asserted for TCTRL_GRESET_LENGTH cycles. After the signal assertion, the enable bit is automatically cleared to 0. The polarity of the GLOBAL_RESET signal is set with TCTRL_CTRL.GRESETPOL . Enabling this bit triggers the generation of the CAM_SHUTTER and CAM_STROBE signals (if previously enabled). The frame counters shall be set to 0 when this bit is set to 1 and GRESETDIR is set a OUTPUT. | RW | 0 |
| 28:27 | INSEL | Sets the mode that will trigger the SHUTTER, PRESTROBE and STROBE signals. 0x0: Synchronization event from camera 0 0x1: Synchronization event from camera 1 0x3: GRESET – The CAM_GLOBAL_RESET input signal will trigger the SHUTTER, PRESTROBE and STROBE signals. In this mode, there are no frame counters. The delay counters start decrementing as soon as the GLOBAL_RESET signal is asserted. The polarity of the GLOBAL_RESET signal is set with TCTRL_CTRL.GRESETPOL . 0x2: Synchronization event from camera 2 (serial interfaces muxed with the camera Parallel interface (CPI)) | RW | 0x0 |
| 26 | STRBPSTRBPOL | Sets the polarity of the strobe and prestrobe signals. 0x0: Active high 0x1: Active low | RW | 0 |
| 25 | RESERVED | | R | 0 |
| 24 | SHUTPOL | Sets the polarity of the mechanical shutter signal: CAM_SHUTTER 0x0: Active high 0x1: Active low | RW | 0 |
| 23 | STRBEN | Flash strobe signal enable. If enabled, the STROBE signal will be asserted after TCTRL_FRAME.STRB frames have been received and a delay of TCTRL_STRB_DELAY cycles have passed. The STROBE signal is asserted for TCTRL_STRB_LENGTH cycles. After the signal assertion, the enable bit is automatically cleared to 0. This signal shall not be disabled by software. | RW | 0 |
| 22 | PSTRBEN | Flash prestrobe signal enable. If enabled, the PRESTROBE signal will be asserted after TCTRL_FRAME.PSTRB frames have been received and a delay of TCTRL_PSTRB_DELAY cycles have passed. The PRESTROBE signal is asserted for TCTRL_PSTRB_LENGTH cycles. After the signal assertion, the enable bit is automatically cleared to 0. This signal shall not be disabled by software. | RW | 0 |
| 21 | SHUTEN | Mechanical shutter signal enable. If enabled, the SHUTTER signal will be asserted after TCTRL_FRAME.SHUT frames have been received and a delay of TCTRL_SHUT_DELAY cycles have passed. The SHUTTER signal is asserted for TCTRL_SHUT_LENGTH cycles. After the signal assertion, the enable bit is automatically cleared to 0. This signal shall not be disabled by software. | RW | 0 |
| 20:19 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 18:10 | DIVC | Sets the clock divisor value for the CNTCLK clock generation based on the CLK input clock. CNTCLK is an internal clock used by the TIMING CTRL module counters. Usually, CNTCLK = CLK / DIVC, except for some particular values shown hereafter. 0x0: No clock. CNTCLK is gated. | RW | 0x000 |
| 9:0 | RESERVED | | R | 0x000 |

Table 8-228. Register Call Summary for Register TCTRL_CTRL

ISS Interfaces

- [ISS TCTRL Control-Signal Generator: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\]](#)
- [ISS TCTRL Vertical Sync-Based Control-Signal Generation or Externally Generated cam_global_reset: \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\]](#)
- [ISS TCTRL Internally Generated cam_global_reset-Based Control-Signal Generation: \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\] \[44\] \[45\] \[46\] \[47\] \[48\] \[49\] \[50\] \[51\] \[52\]](#)
- [ISS TCTRL STROBE and PRESTROBE Signal Generation for Red-Eye Removal: \[53\]](#)
- [ISS TCTRL Register Summary: \[54\]](#)
- [ISS TCTRL Register Description: \[55\] \[56\] \[57\] \[58\] \[59\] \[60\] \[61\] \[62\] \[63\] \[64\] \[65\] \[66\] \[67\] \[68\] \[69\]](#)

Table 8-229. TCTRL_PSTRB_REPLAY

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0034 | Instance | ISS_TCTRL |
| Physical Address | 0x5200 0434 | | |
| Description | TIMING CONTROL - PRESTROBE REPLAY REGISTER This register is used by the TIMING CTRL module to generate the prestrobe signal. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COUNTER | | | | | | | | DELAY | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|------------|
| 31:25 | COUNTER | Sets the number of PRESTROBE pulses after the original pulse. If this bit is set to 0, the PRESTROBE signal behavior is only controlled by TCTRL_FRAME.STRB , TCTRL_PSTRB_DELAY , and TCTRL_PSTRB_LENGTH . If TCTRL_PSTRB_LENGTH =0, there is no replay. This bit is useful when one wants to enable red-eye removal. | RW | 0x00 |
| 24:0 | DELAY | Sets the delay for the PRESTROBE signal reassertion in cycles of the CNTCLK clock. The CNTCLK frequency is generated with the TCTRL_CTRL.DIVC bit field. The possible values are 0 to $2^{25}-1$ cycles. If TCTRL_PSTRB_LENGTH =0, there is no replay. This bit field shall not be set to 0 if the COUNTER is set to a value different of 0. This bit is useful when one wants to enable red-eye removal. | RW | 0x00000000 |

Table 8-230. Register Call Summary for Register TCTRL_PSTRB_REPLAY

ISS Interfaces

- [ISS TCTRL STROBE and PRESTROBE Signal Generation for Red-Eye Removal: \[0\] \[1\] \[2\]](#)
- [ISS TCTRL Register Summary: \[3\]](#)

Table 8-231. TCTRL_FRAME

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0038 | Instance | ISS_TCTRL |
| Physical Address | 0x5200 0438 | | |
| Description | TIMING CONTROL - FRAME REGISTER This register is used by the TIMING CTRL module to generate the SHUTTER, PRESTROBE, and STROBE signals. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|-------|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STRB | | | | PSTRB | | | | SHUT | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:12 | STRB | Frame counter for the STROBE signal generation. From 0 to 63 frames. This bit field is ignored if TCTRL.INSEL=GRESET. | RW | 0x00 |
| 11:6 | PSTRB | Frame counter for the PRESTROBE signal generation. From 0 to 63 frames. This bit field is ignored if TCTRL.INSEL=GRESET. | RW | 0x00 |
| 5:0 | SHUT | Frame counter for the SHUTTER signal generation. From 0 to 63 frames. This bit field is ignored if TCTRL.INSEL=GRESET. | RW | 0x00 |

Table 8-232. Register Call Summary for Register TCTRL_FRAME

ISS Interfaces

- [ISS TCTRL Vertical Sync-Based Control-Signal Generation or Externally Generated cam_global_reset](#): [0] [1] [2]
- [ISS TCTRL Internally Generated cam_global_reset-Based Control-Signal Generation](#): [3] [4] [5]
- [ISS TCTRL Register Summary](#): [6]
- [ISS TCTRL Register Description](#): [7] [8] [9] [10]

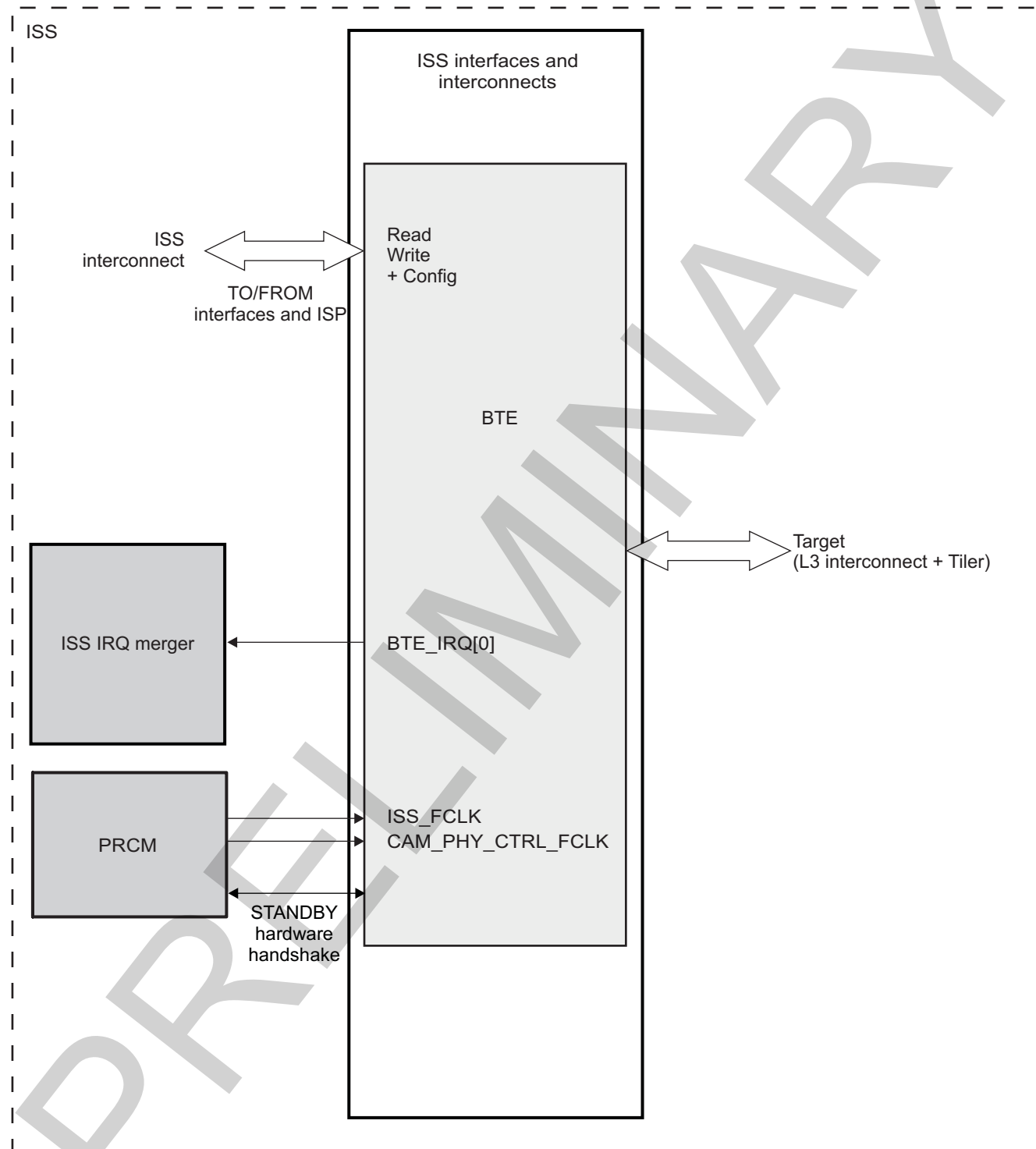
8.2.7 ISS BTE

8.2.7.1 ISS BTE Environment

There are no particular environment attributes (see [Section 8.2.2](#), *ISS Interfaces Environment*).

8.2.7.2 ISS BTE Integration

Figure 8-81. ISS BTE Integration



camss-318

For power domain, clocks, reset, and hardware requests, see [Section 8.1.2.4, ISS Power Management](#).

8.2.7.2.1 ISS BTE PRCM Interface

8.2.7.2.1.1 ISS BTE Power Management

8.2.7.2.1.1.1 ISS BTE PRCM Handshake

The BTE supports the IDLE protocol to flush outstanding transactions. When an IDLE request is received, the BTE:

- Completes ongoing requests on OCPI (request, data and response phases) and stalls the port (SCmdAccept = 0)
- Flushes all contexts (same behavior than when the [BTE_CONTEXT_CTRL_i\[2\]](#) FLUSH bit is set by software) when the [BTE_CONTEXT_CTRL_i\[11\]](#) AUTOFLUSH bit is set. Otherwise, no context flushing is triggered by an IDLE request.
- Completes ongoing requests on OCPO (request, data and response phases)
- Acknowledges the IDLE request.

8.2.7.3 ISS BTE Functional Description

8.2.7.3.1 ISS BTE Features

The BTE increases access efficiency of raster initiators to tiled SDRAM. In fact, the TILER expects 2D-bursts corresponding to a row or column of subtiles for maximal efficiency. For more information about SDRAM and TILER, see [Section 16.2, Dynamic Memory Manager](#).

The BTE is connected between one or multiple raster initiators. It can translate reads and writes. For reads, BTE prefetches sufficient data from tiled memory to translate raster requests. For writes, BTE buffers raster requests until it has sufficient data to generate requests to tiled memory. The features of the BTE are:

- Interfaces:
 - 32-bit-wide configuration interface (OCPC)
 - 128-bit-wide slave data port (OCPI)
 - 128-bit-wide master data port (OCPO)
- Incrementing to 2D burst translation for read and writes:
 - Four contexts. A context is a virtual frame buffer attached to a data flow requiring translation.
 - One-shot and continuous mode
- Local memories for temporal storage:
 - Cannot use external memories for temporal data storage
- Transparent for accesses that do not require translation. Requests are forwarded from OCPI to OCPO without modification.
- Local buffer

8.2.7.3.2 ISS BTE Functional Description Details

The main tasks and capabilities of the BTE are:

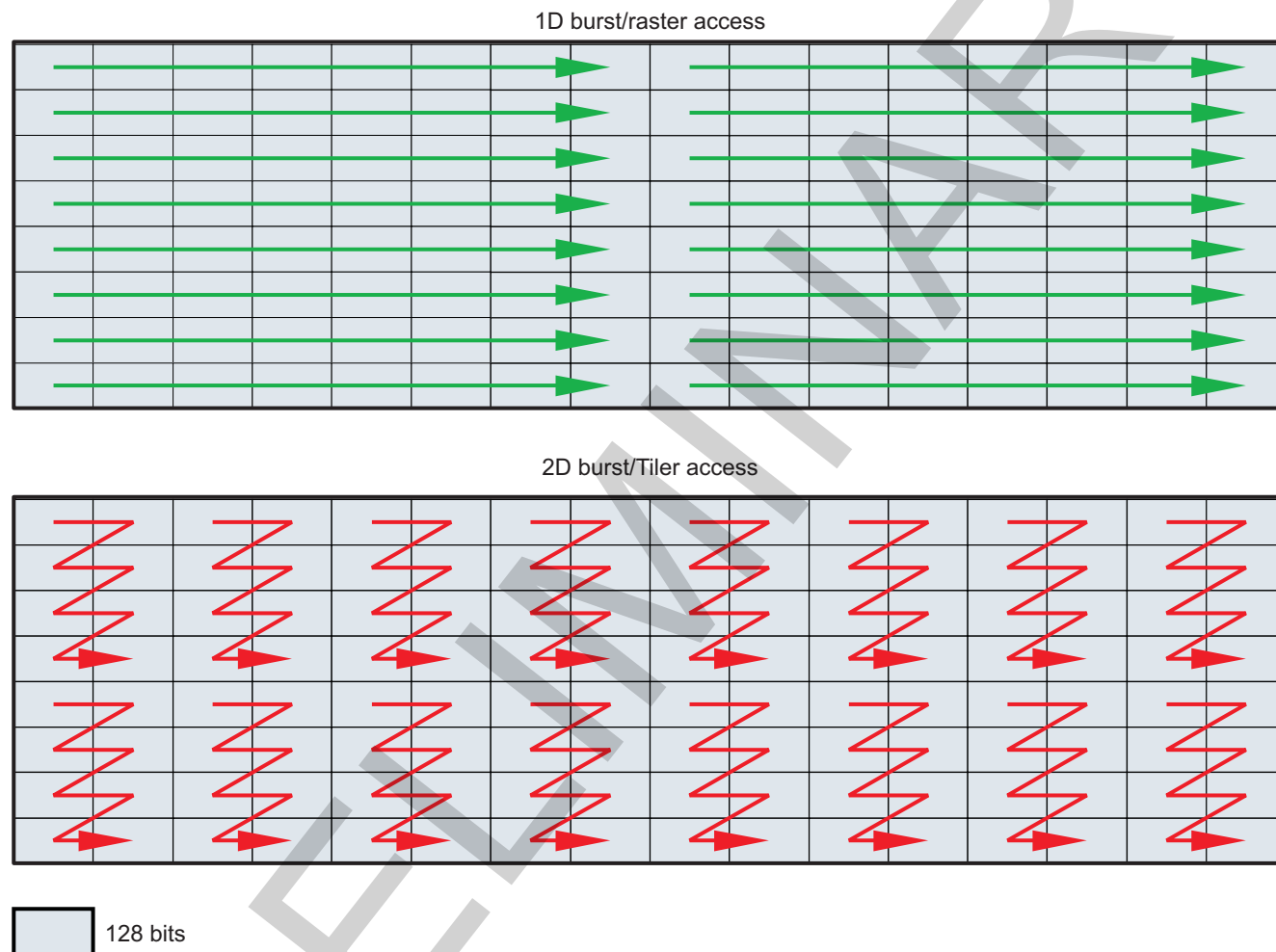
- Forward OCP transactions that do not need translation.
- For OCP writes requiring translation:
 - Store data received from OCPI to local buffers.
 - Read data from local buffers and send it to OCPO.
- For OCP read requiring translation:
 - Store data received from OCPO to local buffers.
 - Read data from local buffers and send it to OCPI.
- BTE DMA capability

8.2.7.3.2.1 ISS BTE Burst Translation Principle

The BTE receives raster accesses from the OCPI port and generates TILER accesses on OCPO.

The BTE keeps track of the amount of data written into the local memories. For translated writes, 2D bursts are sent to OCPO when there is sufficient data in the local memory to generate TILER accesses. For translated reads, 2D burst are generated to fill the local memory with data that is returned when raster accesses are received on OCPI. [Figure 8-82](#) shows the BTE burst translation principle.

Figure 8-82. ISS BTE Burst Translation Principle



camss-320

In the following sections, three address spaces are described:

- **Virtual:** Corresponds to the translated address region on OCPI. Accesses performed to this address space are translated by the BTE. It can be seen as a 64KB x 8 k lines frame buffer. Locations in this space are expressed as byte addresses for OCP compliance. However, the access granularity is 128-bit (4 LSBs expected to be zeros). For more information about this space, see [Section 8.2.7.3.2.2, ISS BTE Virtual Address Space and Context Mapping](#).
- **Physical:** Corresponds to the addresses used to access the physical buffer of the BTE. The physical space is addressed in 128-bit-wide words. However, this document refers to byte addresses to preserve homogeneity.
- **Tiler:** Corresponds to addresses used by translated accesses. Locations in this space are expressed as byte addresses for OCP compliance. However, the access granularity is 128-bit (4 LSBs expected to be zeros). For more information about this space, see [Section 8.2.7.3.2.5, ISS BTE TILER Space Accesses: 2D Burst Generation](#).

8.2.7.3.2.2 ISS BTE Virtual Address Space and Context Mapping

The location of the virtual space in the address map of OCPI is set by the [BTE_CTRL\[11:8\]](#) BASE bit field. It always occupies 64KB × 8k lines = 512MB. Software must map a virtual space into an unused region (a region, for example, that the ISS top level cannot access).

The virtual space is decomposed into contexts. A context corresponds to a 2D region in the virtual space that requires burst translation. It can also be seen as a virtual frame buffer.

Accesses to different contexts can be interleaved at OCP transaction level. OCP transactions spanning multiple contexts are not allowed.

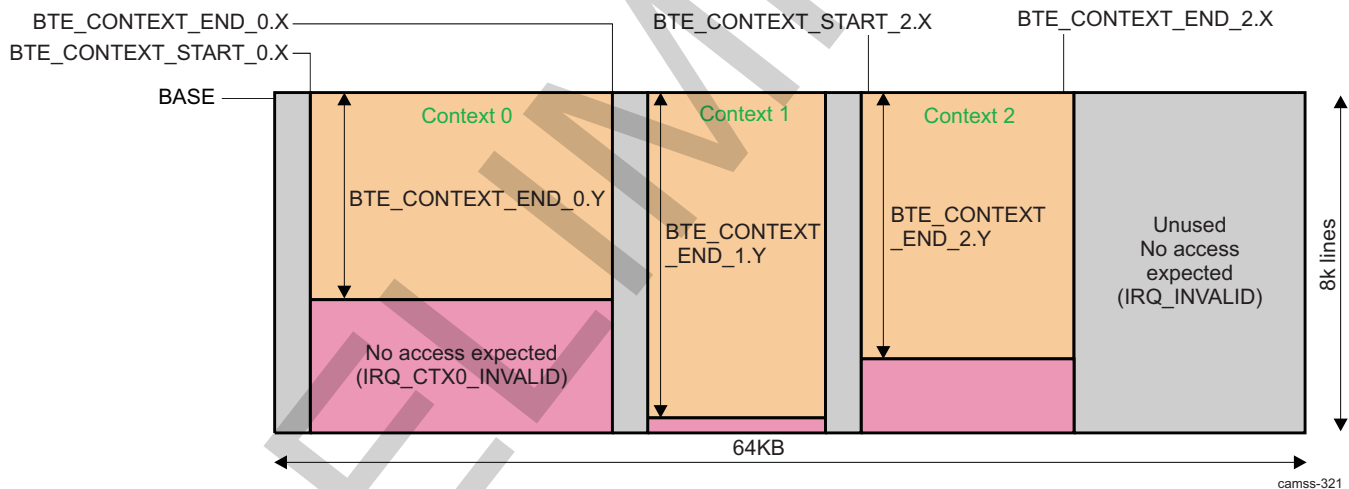
When the BTE receives an access from the OCPI port, it performs the following checks:

- If the access address is not between BASE 512MB and (BASE + 1) 512MB 1, it is handled as a transparent: request and data phases are simply forwarded to the OCPO without modification.
- If the access falls into the translated region:
 - If the access is a 2D burst, an `IRQ_INVALID` event is generated.
 - If the access does not map to an active context, an `IRQ_INVALID` event is generated. The BTE ignores bits [28:16] for this test.
 - Otherwise, context mapping is performed (see [Figure 8-83](#)).

Invalid requests are not forwarded to the OCPO.

Software must ensure that contexts do not overlap. The BTE hardware does not check for this condition. Wrong setup is likely to lead to corrupted data.

Figure 8-83. ISS BTE Context Mapping



The BTE internally keeps track of every context where the next access is expected. It internally maintains a 2D pointer, referred to as (SX_i, SY_i) in the remainder of this document. The expected byte address for an access into context x is:

$$\text{ADDR} = \text{BTE_CTRL}[11:8] \text{ BASE } 512\text{MB} + \text{SX}_i \text{ 16 bytes} + \text{SY}_i \text{ 64KB}$$

If an access to an unexpected location in a given context is received from OCPI, the BTE generates an `IRQ_CTXx_INVALID` event. The BTE provides a valid response on OCPI but does not store any data into the internal buffer. Subsequent accesses are handled normally: in other words, the BTE does not enter any specific error mode. When this happens, typically an initiator configuration is not aligned with the BTE context configuration.

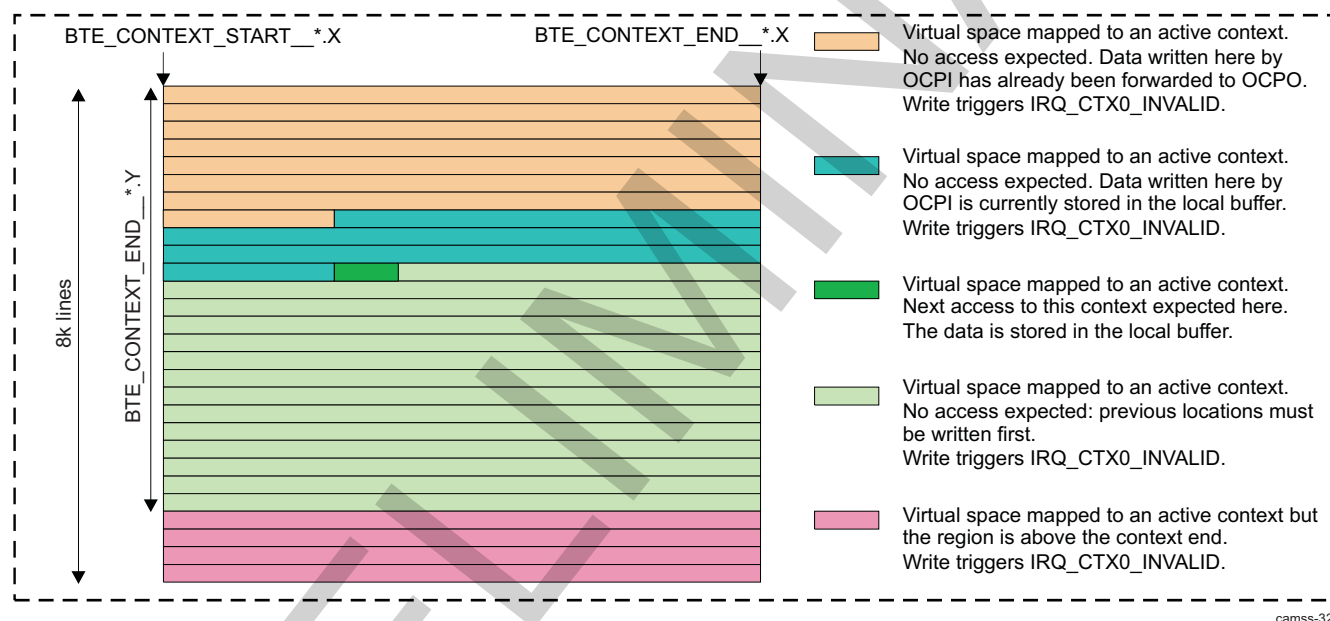
The (SX_i, SY_i) pointer of a context is updated on every access to this context. It is reset to SX_i = BTE_CONTEXT_START_i[15:7] X and SY_x = 0 when a context is enabled. SX_i is incremented by 1 for every received 16-byte word, except when it equals BTE_CONTEXT_END_i[15:4] X. In that case it is reset to BTE_CONTEXT_START_i[15:7] X and SY_i is incremented. SY_i is reset when it reaches the bottom-right corner of the context.

Therefore, the BTE can only translate raster accesses:

- Image data must be provided line by line, starting from the top-left corner of the context.
- A line stride of 64KB is expected.
- The maximum supported image height is 8k lines.

Figure 8-84 is an example of an active context. There is only one location in an active context where an access from OCPI is expected (green). Accesses to any other location trigger an IRQ_CTXx_INVALID event. Reads to contexts in write mode (BTE_CONTEXT_CTRL_i[7:6] MODE = 0) or writes to contexts in read mode (BTE_CONTEXT_CTRL_i[7:6] MODE = 1) trigger an IRQ_CTXx_INVALID event. When an access to an expected location is received but the burst length exceeds the context end, an IRQ_CTXx_INVALID event is triggered.

Figure 8-84. ISS BTE Expected Access Locations in the Virtual Space



camss-322

Some alignment constraints are summarized as follows and are shown in Figure 8-85. They apply only to translated accesses.

- The context start addresses are aligned on 16-byte boundaries.
- The context width is aligned on 16-byte boundaries.
- The OCPI initiator must not use BYTEEN to qualify subwords in the middle of lines. The BTE interprets each BYTEEN as 0xFFFF. Access of partial words triggers an IRQ_CTXx_INVALID error.
- The line length sent by the initiator can be 1-byte aligned. The initiator can use BYTEEN to qualify valid data for the last access of the line. The BTE treats those accesses as full 16-byte writes and writes 0 data into its local buffers to complete the access. Those 0s are forwarded to OCPO when burst translation is performed. Software must ensure this data is discarded when the buffer is read back.
- The BTE does not impose any specific constraint on vertical alignment on the TILER tile and subtile grids. However, it is strongly recommended to configure the burst generation in such a way the requests performed to the TILER do not cross tile or subtile boundaries. For more information, see Section 8.2.7.3.2.5, *ISS BTE TILER Space Accesses: 2D Burst Generation*.
- The BTE accepts only one outstanding transaction per OCP tag on the OCPI port. When an initiator

tries to generate an OCP request on a tag ID that is already used (no response has been returned on OCPI), the OCPI port is stalled.

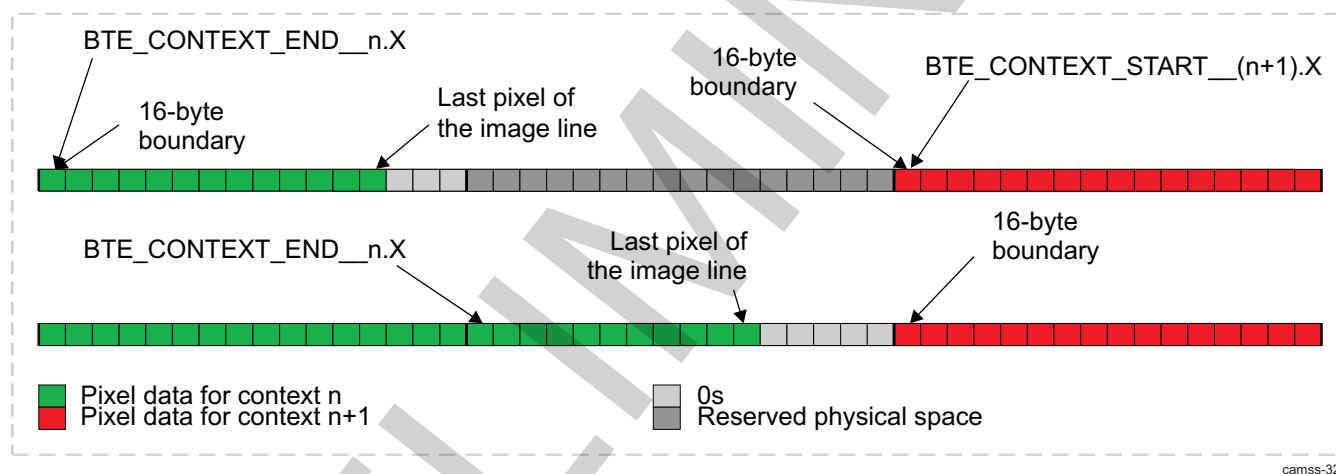
- The amount of memory allocated for each context must be a multiple of 512 bytes. Software must leave $\text{mod}(\text{BTE_CONTEXT_END_i} - \text{BTE_CONTEXT_START_i} + 1, 8)$ unused locations between the end of the context and the start of the next one. No accesses to this space from OCPI are allowed, but the BTE can use it to store data.
- While programming a BTE context, the BTE context End X value of all contexts must be less than $\text{MEMORY}/64$ in 128-bit address (equals $\text{MEMORY}/4$ in byte address)

NOTE: The generic BTE MEMORY size can be found by reading the [BTE_HL_HWINFO\[18:0\]](#) MEMORY bit field.

- While reading from a BTE-translated location, the CCP2 read burst size must be greater than or equal to (=) 16 bytes (128 bits) for correct operation. Bus width translation is performed in the ISS. Therefore, 64-bit accesses lead to 128-bit accesses with $\text{BYTEEN} = 0x00FF$. On the BTE side, BYTEEN is always processed as $0xFFFF$; thus, access to a BTE-translated 128-bit location is not correct if software uses 64-bit access.

Figure 8-85 shows the BTE context alignment constraints.

Figure 8-85. ISS BTE Context Alignment Constraints



8.2.7.3.2.3 ISS BTE TILER Context Configuration Example

Global configuration and context configuration must be done before traffic from the master can be enabled.

This section provides a configuration example used to write YUV4:2:0 data into a 90-degree rotated buffer ($S = 1, Y = 1, X = 0$). The YUV frame is made up of two objects: Y data (8 bits) and UV data (16 bits).

The BTE provides data orientation and format information to the TILER using a 33-bit address. It can be controlled by software using the [BTE_CONTEXT_BASE_i](#) and [BTE_CONTEXT_CTRL_i\[12\]](#) ADDR32 bits. ADDR32 must be set to 1. Bits [31:27] of the address control the accessed view format. [Table 8-233](#) is an example of a BTE TILER context configuration.

Figure 8-86 shows BTE TILER mode addressing in 90- or 270-degree orientation.

Table 8-233. ISS BTE TILER Context Configuration Example

| 32 | 31 | 30 | 29 | 28 | 27 | 26 ... 4 | 3 ... 0 |
|----|-------------|----|----|------|----|-----------------|---------|
| T | Orientation | | | Mode | | Virtual Address | |
| 1 | S | /Y | /X | M1 | M0 | A26 ... A4 | 0 |

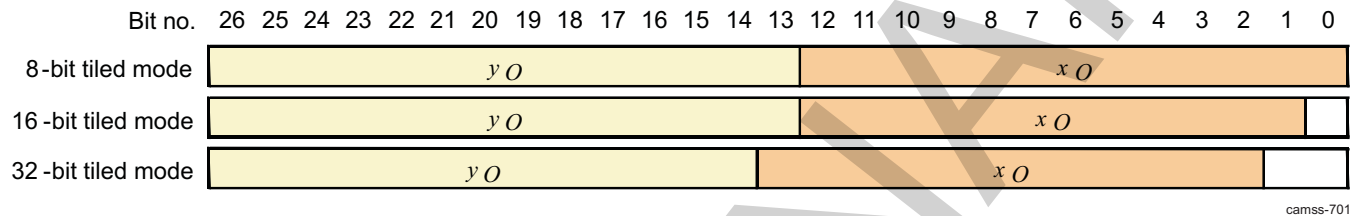
For the example described here, the following settings are used:

90-degree view, 8-bit data ADDR[32:27] = 0b1 110 00
90-degree view, 16-bit data ADDR[32:27] = 0b1 110 01

Software must also configure the [BTE_CONTEXT_CTRL_i\[9:8\]](#) GRID bit field to match the view and format set by the base address:

90-degree view, 8-bit data GRID = 1 Stride = 8k
90-degree view, 16-bit data GRID = 1 Stride = 8k

Figure 8-86. ISS BTE TILER Mode Addressing in 90- or 270-Degree Orientation



Bits [26:0] of the [BTE_CONTEXT_BASE_i](#) register are used to address a pixel in the virtual space of TILER. It must point to the top-left corner of the 2D object.

Software must also configure the other context register before it can start it by setting the [BTE_CONTEXT_CTRL_i\[0\]](#) START bit.

8.2.7.3.2.4 ISS BTE Local Memory Management

8.2.7.3.2.4.1 ISS BTE Introduction

The amount of data buffered is defined by the [BTE_CONTEXT_CTRL_i\[29:16\]](#) TRIGGER bit field. In write mode, translated 2D writes to OCPO are issued when the buffer fill level is greater than or equal to the value of the [BTE_CONTEXT_CTRL_i\[29:16\]](#) TRIGGER bit field. In read mode, translated 2D reads are sent to OCPO when the buffer level is less than the value of the [BTE_CONTEXT_CTRL_i\[29:16\]](#) TRIGGER bit field.

8.2.7.3.2.4.2 ISS BTE Buffer Flushing

8.2.7.3.2.4.2.1 ISS BTE One-Shot Mode

One-shot mode is enabled by setting the [BTE_CONTEXT_CTRL_i\[10\]](#) ONESHOT bit.

During normal operation, a data transfer from local memory to the TILER is automatically triggered when sufficient data is available in the buffer.

Three lines of data remain in the buffer once the OCPI initiator stops sending data into the context.

The BTE supports two ways to flush data remaining in the buffer:

- The last data (bottom-right corner) in a context is written. The last data is defined by the [BTE_CONTEXT_END_i\[15:4\]](#) X and [BTE_CONTEXT_END_i\[28:16\]](#) Y bit fields.
- Software writes the [BTE_CONTEXT_CTRL_i\[2\]](#) FLUSH bit. This is typically done when the context has been stopped before the full frame has been written.

An autoflush mode controls automatic context flushing when an IDLE request is received. It can be activated by setting the [BTE_CONTEXT_CTRL_i\[11\]](#) AUTOFLUSH bit to 1.

During a context flush, all remaining data in the buffer are written to the TILER.

Buffer flushing has lower priority than burst translation active contexts or forwarding transparent accesses. This prevents performance degradation.

If software wants to abort context operation at a random location, it must disable the context.

8.2.7.3.2.4.2 ISS BTE Continuous Mode

When continuous mode is selected (the `BTE_CONTEXT_CTRL_i[10]` ONESHOT bit set to 0), reception of frame *n* pushes the data remaining from frame 1 out of the memory to OCPO. This mode is particularly useful when vertical blanking periods are too short to perform a buffer flush at the end of the frame. Also, it avoids creating traffic peaks due to buffer flushing.

The frame height must be a multiple of eight lines and the `BTE_CONTEXT_CTRL_i[14:13]` INITSY bit field must be 0x0 in continuous mode.

8.2.7.3.2.4.3 ISS BTE Buffer Prefetch

The buffer must be prefilled before read requests requiring translation can be accepted. Buffer prefetch starts with the top-left corner of the frame when a context is enabled by setting the `BTE_CONTEXT_CTRL_i[0]` START bit. When enough lines have been prefetched, an `IRQ_CTXx_DONE` event is triggered to inform software that the context is ready to perform request translation. Typically, software enables the data flow requiring translation in response to this event. Context ready for transaction and last transaction can be controlled by `BTE_CONTEXT_START` and `BTE_CONTEXT_END`, respectively.

When a read request requiring translation is received while prefetch is ongoing, an `IRQ_CTXx_ERR` event is triggered. It informs software that the read traffic was enabled too early. The BTE returns 0s to OCPI for the failing request (it does not hold the response until real data is available).

After prefetch completion, when a request requiring translation is received but the required data is missing (the BTE is waiting for a response from OCPO), the BTE delays the response on OCPI until the missing data is received on OCPI.

This behavior avoids stalling the OCPI port for too long (that is, a prefetch of up to 3.25 lines of data). However, it avoids getting errors because of slow OCPI responses.

8.2.7.3.2.4.4 ISS BTE Bandwidth Limiter

Translated and transparent traffic has higher priority than prefetch and flushing traffic. However, overall system bandwidth is limited. Requesting too much bandwidth for prefetch and flushing traffic may increase latencies for higher priority traffic. That could affect higher priority traffic.

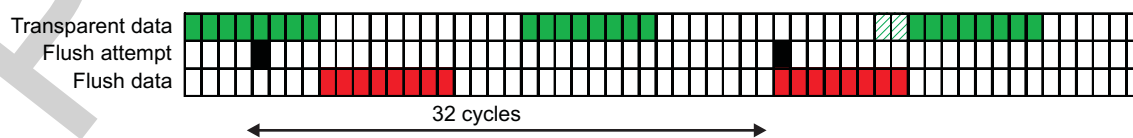
Software can limit the speed of prefetching and buffer flushing by using the `BTE_CTRL[31:22]` `BW_LIMITER` bit field. Typically, this register is used to avoid the buffer prefetch and flush traffic using all the available system bandwidth. This register does not slow down the translated or transparent traffic.

The example in [Figure 8-87](#) assumes:

- 200-MHz functional clock
- 800 Mbps of transparent traffic = one 8 × 128-bit burst every 32 cycles

Without the bandwidth limiter, prefetch and flush traffic may use up to $3.2 - 0.8 = 2.4$ Gbps. Using `BTE_CTRL[31:22]` `BW_LIMITER` = 24 ensures that at a maximum one flush/prefetch request is issued every 32 cycles. A prefetch/flush request may be delayed by higher priority traffic of OCP port stalls. To avoid excessive traffic slowdown, the BTE tries to catch up by requesting the next flush/prefetch transaction earlier.

Figure 8-87. BTE Bandwidth Limiter Example



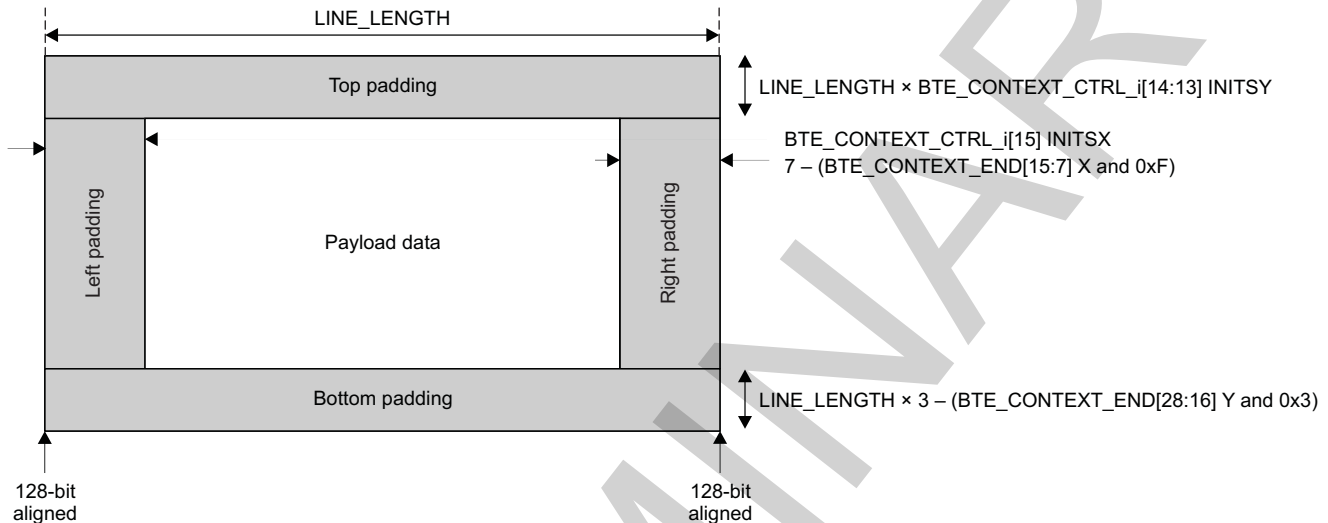
camss-332

8.2.7.3.2.5 ISS BTE TILER Space Accesses: 2D Burst Generation

8.2.7.3.2.5.1 ISS BTE Buffer Fill Level

The BTE maintains an internal counter to keep track of the buffer fill level. This internal counter is used to detect when a translated OCP request is sent to the OCPO port. The counter also accounts for padding data. Figure 8-88 shows the BTE buffer fill-level padding.

Figure 8-88. ISS BTE Buffer Fill-Level Padding



camss-333

In BTE context, the preferred parameter to be used is 128-bit word as unit. The [BTE_CONTEXT_START_i](#) and [BTE_CONTEXT_END_i](#) registers are usually written as byte-aligned; however, the [BTE_CONTEXT_START_i.X](#) and [BTE_CONTEXT_END_i.X](#) bit fields are more readily understood (nominally) as (128 bytes = 8 x 128 bits = 8 words).

The (lower half) [BTE_CONTEXT_END_i](#) register must be written as byte-aligned, but the [BTE_CONTEXT_END_i.X](#) bit field is understood (nominally) as (128 bits = 1 word).

The BTE TRIGGER is based on word size (128 bits), but the related register (upper half) [BTE_BTE_CONTEXT_CTRL_i](#) register is not byte-aligned; it is word-aligned (128-bits).

$$\text{LINE_LENGTH} = ((\text{BTE_CONTEXT_END_i}[15:4] \text{ X}) - \text{BTE_CONTEXT_START_i}[15:7] \text{ X}) \times 4 + 0xFF8 + 8$$

NOTE: LINE_LENGTH is measured as a 128-bit word and can be used directly for TRIGGER calculation ($3 * \text{LINE_LENGTH} + x$)

Example 1: 64 x 15 pixels line = 64 x 15 Nb bytes in a line
 (Nb bytes in a line – 16(128-bit word)) 4 = 0x3B
 LINE_LENGTH = (0x3B 0xFF8) + 8 = 0x40
 TRIGGER = 0x40 * 3 + 2 = 0xC2

Example 2: 64 x 11 pixel line = 64 x 11 Nb bytes in a line
 (Nb bytes in a line – 16(128-bit word)) 4 = 0x2B
 LINE_LENGTH = (0x2B 0xFF8) + 8 = 0x30
 TRIGGER = 0x30 * 3 + 2 = 0x92

Figure 8-88 is a visual representation of the following explanation about how read or write events are triggered determined by the internal buffer size.

When context is started, the buffer fill level is initialized to $\text{LINE_LENGTH} \times \text{BTE_CONTEXT_CTRL_i}[14:13] \text{ INITSY} + \text{BTE_CONTEXT_CTRL_i}[15] \text{ INITSX}$ (see the previous equation for the LINE_LENGTH calculation). If the BTE reads or writes, the level of the internal buffer is incremented or decremented, respectively, by the burst size. Here, only full 16-byte accesses are performed. Other OCP BYTEEN patterns are forced to 0xFF.

The [BTE_CONTEXT_CTRL_i](#) [29:16] TRIGGER bit field triggers a buffer level read or write even. In write mode, if flushing, the data level is greater than 0; if not flushing, the BTE translates to OCPO when the level is greater than or equal to the value set by the register. If the level is smaller than the [BTE_CONTEXT_CTRL_i](#) [29:16] TRIGGER software setup, then the BTE reads data.

8.2.7.3.2.5.2 ISS BTE OCP Request Generation

Except on borders:

- TILER bursts are 32 bytes \times 4 lines of data blocks.
- Bursts are aligned on subtile boundaries.

The BTE maintains an internal 2D pointer (DX_i , DY_i) that corresponds to the top-left corner of the next access to be issued to the TILER. It is initialized to (0, 0) when a context is enabled or wraps around. It is updated each time an access to the TILER is performed.

[Table 8-234](#) lists all supported TILER formats and views.

Table 8-234. ISS BTE Supported TILER Formats and Views

| Mode s | View | | | Description | OFST | Subtile Grid | | 1KB Tile Grid | | X | | Y | | GRID | Subtile Aligned | | Tile Aligned | |
|-----------|------|----|----|---------------------------------------|-------|-----------------|---|------------------|----|-----|-----|-----|-----|------|--------------------|---------|-----------------|---------|
| | S | /Y | /X | | | X | Y | X | Y | LSB | MSB | LSB | MSB | | X | Y | X | Y |
| 8-bit | 0 | 0 | 0 | 0-degree view | 16384 | 4 | 4 | 32 | 32 | 0 | 13 | 14 | 26 | 0 | [1:0] | [15:14] | [4:0] | [18:14] |
| | 0 | 0 | 1 | 0-degree view with vertical mirror | | | | | | | | | | | | | | |
| | 0 | 1 | 0 | 0-degree view with horizontal mirror | | | | | | | | | | | | | | |
| | 0 | 1 | 1 | 180-degree view | | | | | | | | | | | | | | |
| | 1 | 0 | 0 | 90-degree view with vertical mirror | 8192 | 4 | 4 | 32 | 32 | 0 | 12 | 13 | 26 | 1 | [1:0] | [14:13] | [4:0] | [17:13] |
| | 1 | 0 | 1 | 270-degree view | | | | | | | | | | | | | | |
| | 1 | 1 | 0 | 90-degree view | | | | | | | | | | | | | | |
| | 1 | 1 | 1 | 90-degree view with horizontal mirror | | | | | | | | | | | | | | |
| 16-bit | 0 | 0 | 0 | 0-degree view | 32768 | 8 | 2 | 64 | 16 | 0 | 14 | 15 | 26 | 2 | [2:0] | [15] | [5:0] | [18:15] |
| | 0 | 0 | 1 | 0-degree view with vertical mirror | | | | | | | | | | | | | | |
| | 0 | 1 | 0 | 0-degree view with horizontal mirror | | | | | | | | | | | | | | |
| | 0 | 1 | 1 | 180-degree view | | | | | | | | | | | | | | |
| | 1 | 0 | 0 | 90-degree view with vertical mirror | 8192 | 4 | 4 | 32 | 32 | 0 | 12 | 13 | 26 | 1 | [1:0] | [14:13] | [4:0] | [17:13] |
| | 1 | 0 | 1 | 270-degree view | | | | | | | | | | | | | | |
| | 1 | 1 | 0 | 90-degree view | | | | | | | | | | | | | | |
| | 1 | 1 | 1 | 90-degree view with horizontal mirror | | | | | | | | | | | | | | |
| 32-bit | 0 | 0 | 0 | 0-degree view | 32768 | 8 | 2 | 64 | 16 | 0 | 14 | 15 | 26 | 2 | [2:0] | [15] | [5:0] | [18:15] |
| | 0 | 0 | 1 | 0-degree view with vertical mirror | | | | | | | | | | | | | | |
| | 0 | 1 | 0 | 0-degree view with horizontal mirror | | | | | | | | | | | | | | |
| | 0 | 1 | 1 | 180-degree view | | | | | | | | | | | | | | |
| | 1 | 0 | 0 | 90-degree view with vertical mirror | 16384 | 8 | 2 | 64 | 16 | 0 | 13 | 14 | 26 | 3 | [2:0] | [14] | [5:0] | [17:14] |
| | 1 | 0 | 1 | 270-degree view | | | | | | | | | | | | | | |
| | 1 | 1 | 0 | 90-degree view | | | | | | | | | | | | | | |
| | 1 | 1 | 1 | 90-degree view with horizontal mirror | | | | | | | | | | | | | | |

The **BTE_CONTEXT_BASE_i** and **BTE_CONTEXT_CTRL_i[9:8]** GRID registers must be configured by software to choose the format and view. The format must match the data stored into the virtual space. The choice of the view depends on the desired behavior.

The GRID bit field controls the used OCP stride and OCP address generation. The OCP address is generated using the following formula:

$$\text{OCP_ADDR} = \text{BTE_CONTEXT_BASE_n} + \text{DX_x} + \text{DY_x} \text{ Y_LSB}$$

Y_LSB corresponds to the Y LSB column of [Table 8-234](#).

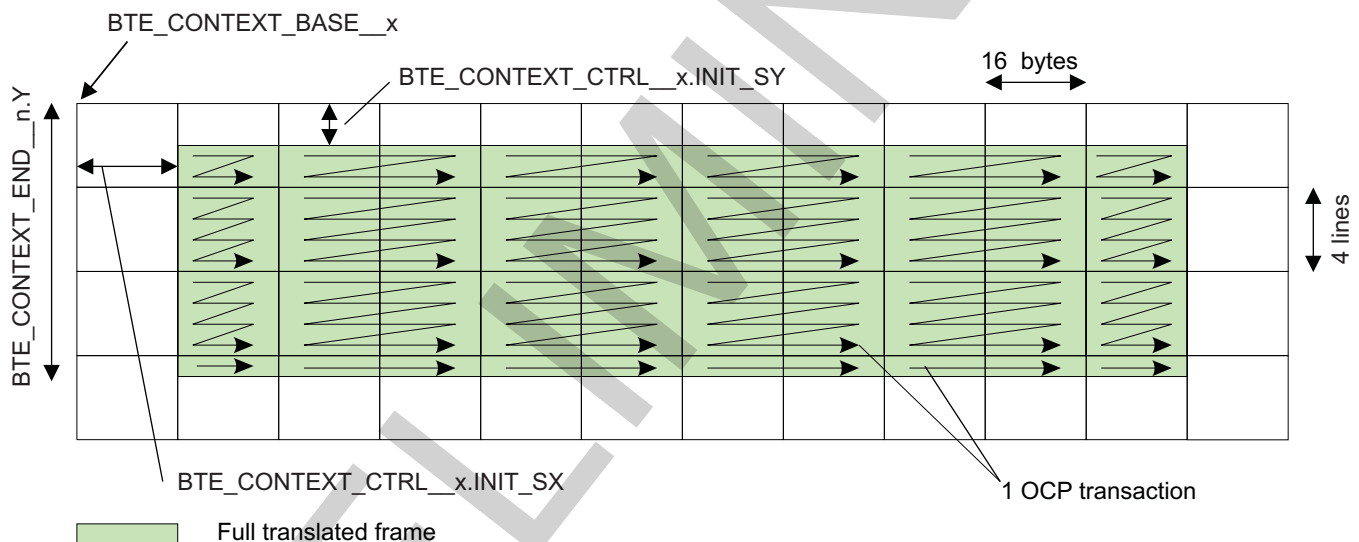
The OCP stride corresponds to the OFST column of [Table 8-234](#). The tile and subtile grid information is currently not used by hardware.

The BTE does not automatically realign 2D bursts on tile or subtile boundaries. However, software can force the (SX_i, SY_i) (see [Section 8.2.7.3.2.4, ISS BTE Local Memory Management](#), for the definition of SY_i) reset value to be used. It is set through the **BTE_CONTEXT_CTRL_i[15]** INITSX bit and the **BTE_CONTEXT_CTRL_i[14:13]** INITSY bit field.

The length and height of the 2D burst is adapted by the BTE to avoid sending dummy data to the TILER.

[Figure 8-89](#) is an example of BTE 2D burst generation. The vertical start and end of the full 2D frame are not vertically aligned on the grid.

Figure 8-89. ISS BTE 2D Burst Generation



camss-336

8.2.7.3.2.6 ISS BTE Posted and Nonposted Write Support

The BTE can handle posted and nonposted writes received on OCPI. Normally, only nonposted writes should be used.

For transparent accesses, posted and nonposted writes are forwarded to OCPO. The response provided by OCPO is returned to OCPI.

For translated accesses, the response to posted and nonposted writes is provided by the BTE. It does not wait for the response of the translated request that is sent to the TILER. In other words, the BTE has no true nonposted write support for translated accesses. The BTE does not ensure that the data has effectively been written to the destination memory when it returns the response to a nonposted translated write.

True nonposted write support is ensured for transparent accesses. Only nonposted writes must be used. Select nonposted write mode through the **BTE_CTRL[5]** POSTED bit.

8.2.7.3.2.7 ISS BTE Error Reporting

Unexpected accesses are flagged using interrupts. Also, when an SResp = ERR is received on OCPO, an interrupt is triggered. If the response corresponds to a transparent access, it is forwarded to OCPI.

The BTE is not an OCP checker: It expects only valid and supported transactions from the external world.

Also, it is not intended to detect all types of software errors; few cases are detected. Those cases are described in the functional description sections.

8.2.7.3.2.8 ISS BTE Interrupts

All events generated by the module are merged into a single event at ISS level. This event can be enabled from ISS level by the ISS_HL_IRQENABLE_SET_i[11] BTE_IRQ bit. [Table 8-235](#) lists the BTE interrupt events.

Table 8-235. ISS BTE Interrupt Events

| Event | Description |
|------------------|---|
| IRQ_OCP_ERR | OCP error received from OCPO master port |
| IRQ_INVALID | An access to a location that is not mapped to any context has been performed. For more information, see Section 8.2.7.3.2.2, ISS BTE Virtual Address Space and Context Mapping . |
| IRQ_CTXx_DONE | Context has been fully transferred to the TILER. This interrupt is triggered when flushing completes in one-shot mode. It is triggered once per frame in continuous mode. |
| IRQ_CTXx_INVALID | Unexpected address sequence or access direction (read of a context in write mode or write of a context in read mode). For more information, see Section 8.2.7.3.2.2, ISS BTE Virtual Address Space and Context Mapping . |
| IRQ_CTXx_ERR | Can occur only when a context is configured in read mode. This request triggers when a read request is received but insufficient data is buffered to perform the translation. For more information, see Section 8.2.7.3.2.4.3, ISS BTE Buffer Prefetch . |

8.2.7.3.2.9 ISS BTE Debug Support

The BTE has no specific debug support.

8.2.7.4 ISS BTE Programming Model

8.2.7.4.1 ISS BTE Reset

The BTE can accept a general software reset, propagated through all the hierarchy. This reset can be done to initialize the module and has the same effect as the hardware reset.

1. Set the [BTE_HL_SYSCONFIG\[0\] SOFTRESET](#) bit to 1.
2. Read the [BTE_HL_SYSCONFIG\[0\] SOFTRESET](#) bit to check whether it is set to 1, which means the reset occurred.

If after five reads, the [BTE_HL_SYSCONFIG\[0\] SOFTRESET](#) bit still returns 0, assume that an error occurred during the reset stage.

Programmers must not set the [BTE_HL_SYSCONFIG\[0\] SOFTRESET](#) bit to 1 if the BTE is integrated in a subsystem; it is safer to use the software reset at subsystem level.

NOTE: A software reset does not reset the IDLE protocol signals.

8.2.7.4.2 ISS BTE Interrupts

All events are mapped to a single interrupt output, BTE_IRQ. [Table 8-236](#) lists the procedure to configure or manage the BTE interrupts.

Table 8-236. ISS BTE Configure/Manage Interrupts

| Step | Bit Field | Value |
|---|---|-------|
| Each event that generates an interrupt can be individually enabled by setting the appropriate bit. | BTE_HL_IRQENABLE_SET | |
| Each event that generates an interrupt can be individually disabled by setting the adequate bit. | BTE_HL_IRQENABLE_CLR | |
| When an event occurs, the corresponding bit in the BTE_HL_IRQSTATUS_RAW register is set, regardless of whether or not the event is enabled. Bits in the BTE_HL_IRQSTATUS registers are set only when an enabled event occurs. | BTE_HL_IRQSTATUS_RAW and BTE_HL_IRQSTATUS | |
| Software can clear a pending event by setting the adequate bit in the BTE_HL_IRQSTATUS register. | BTE_HL_IRQSTATUS | |

8.2.7.4.3 ISS BTE Context Configuration

Global configuration and context configuration must be done before traffic from the master can be enabled.

This section provides a configuration example used to write YUV4:2:0 data into a 90-degree rotated buffer ($S = 1, Y = 1, X = 0$). The YUV frame consists of two objects: Y data (8 bits) and UV data (16 bits).

The BTE provides data orientation and format information to the TILER using a 33-bit address. It can be controlled by software using the [BTE_CONTEXT_BASE_i](#) and [BTE_CONTEXT_CTRL_i\[12\]](#) ADDR32 registers.

ADDR32 must be set to 1. Bits [31:27] of the address control the accessed view and data format.

[Table 8-237](#) gives the format of the TILER address. [Figure 8-90](#) shows BTE tiled mode addressing in 90- or 270-degree orientation.

Table 8-. TILER Address Format

| 32 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----|-------------|----|----|------|----|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| T | Orientation | | | Mode | | Virtual Address | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | S | > | × | M | M | A26 ... A4 | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |

For the example described here, the following settings are used.

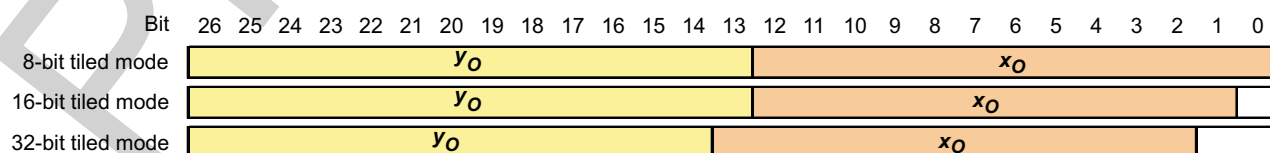
90-degree view, 8-bit data ADDR[32:27] = 0b1 110 00

90-degree view, 16-bit data ADDR[32:27] = 0b1 110 01

Software must also configure the [BTE_CONTEXT_CTRL_i\[9:8\]](#) GRID bit field to match the view and format set by the base address:

90-degree view, 8-bit data GRID = 1 Stride = 8k

90-degree view, 16-bit data GRID = 1 Stride = 8k

Figure 8-90. ISS BTE Tiled Mode Addressing in 90- or 270-Degree Orientation (S = 1)

camss-340

Bits [26:0] of the [BTE_CONTEXT_BASE_i](#) register are used to address a pixel in the virtual space of the TILER. It must point to the top-left corner of the 2D object.

Software must also configure the other context registers before it can start it by setting the [BTE_CONTEXT_CTRL_i\[0\]](#) START bit.

8.2.7.4.4 ISS BTE Change Context Configuration

All contexts operate independently. Software can change the configuration of an inactive context while other contexts are active and perform request translation.

When software must change the configuration of an active context, it must follow the sequence in [Table 8-238](#).

Table 8-238. ISS BTE Change Context Configuration

| Step | Bit Field | Value |
|--|--|----------|
| Ensure that the initiator does not send any more data to this context until it is re-enabled. | | |
| Disable the context. <ul style="list-style-type: none"> The STOP condition is considered on a valid OCP boundary. It preserves the internal states so that buffer flushing can be done. The BTE no longer translates requests received for this context. Any transactions received for an inactive context trigger error interrupts. The BTE completes all outstanding transactions on OCPO. | BTE_CONTEXT_CTRL_i[1] STOP | 0x1 |
| Flush all remaining data for the context, if needed. If software simply wants to abort the transfer to recover from some error condition, flushing is not needed. The context is automatically reset when it is enabled again. | BTE_CONTEXT_CTRL_i[2] FLUSH | 0x1 |
| Wait until the context completes pending OCP transaction and buffer flush (if enabled). It sets the IRQ_CTXx_DONE when it becomes idle. | BTE_HL_IRQSTATUS . IRQ_CTXx_DONE | Read 0x0 |
| Change the context configuration. | | |
| Enable the context by setting the BTE_CONTEXT_CTRL_i[0] START bit. Setting the START bit resets the internal state-machine of the context. | BTE_CONTEXT_CTRL_i[0] START | 0x1 |

Alternatively, software can change the context mode to one-shot and wait until the [CTXx_DONE_IRQ](#) is triggered.

NOTE: Once a context is disabled it cannot be resumed simply by writing the START bit. In fact, doing so resets the internal FSM. If data is lost in the buffer, it will be lost.

8.2.7.5 ISS BTE Register Manual

8.2.7.5.1 ISS BTE Instance Summary

[Table 8-239](#) lists the BTE instance.

Table 8-239. ISS BTE Instance Summary

| Module Name | L3 Base Address | Size |
|-------------------------|-----------------|-----------|
| ISS_BTE | 0x5200 2000 | 512 bytes |

8.2.7.5.2 ISS BTE Registers

8.2.7.5.2.1 ISS BTE Register Summary

Table 8-240 summarizes the BTE registers.

Table 8-240. ISS BTE Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_BTE Base Address |
|--|------|-----------------------|--------------------------|--------------------------|
| BTE_HL_REVISION | R | 32 | 0x0000 0000 | 0x5200 2000 |
| BTE_HL_HWINFO | R | 32 | 0x0000 0004 | 0x5200 2004 |
| BTE_HL_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5200 2010 |
| RESERVED | RW | 32 | 0x0000 001C | 0x5200 201C |
| BTE_HL_IRQSTATUS_RAW | RW | 32 | 0x0000 0020 | 0x5200 2020 |
| BTE_HL_IRQSTATUS | RW | 32 | 0x0000 0024 | 0x5200 2024 |
| BTE_HL_IRQENABLE_SET | RW | 32 | 0x0000 0028 | 0x5200 2028 |
| BTE_HL_IRQENABLE_CLR | RW | 32 | 0x0000 002C | 0x5200 202C |
| BTE_CTRL | RW | 32 | 0x0000 0030 | 0x5200 2030 |
| BTE_CTRL1 | RW | 32 | 0x0000 0034 | 0x5200 2034 |
| BTE_CONTEXT_CTRL _i ⁽¹⁾ | RW | 32 | 0x0000 0040 + (0x20 * i) | 0x5200 2040 + (0x20 * i) |
| BTE_CONTEXT_BASE _i ⁽¹⁾ | RW | 32 | 0x0000 0044 + (0x20 * i) | 0x5200 2044 + (0x20 * i) |
| BTE_CONTEXT_STAR _{T_i} ⁽¹⁾ | RW | 32 | 0x0000 0048 + (0x20 * i) | 0x5200 2048 + (0x20 * i) |
| BTE_CONTEXT_END _i ⁽¹⁾ | RW | 32 | 0x0000 004C + (0x20 * i) | 0x5200 204C + (0x20 * i) |

⁽¹⁾ i = 0 to 3

8.2.7.5.2.2 ISS BTE Register Description

Table 8-241 through Table 8-266 describe the BTE registers.

Table 8-241. BTE_HL_REVISION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|---------|----|----|----|---|---|---|---|---|---|---|---|---|---|------|--------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5200 2000 | | | | | | | | | | | | | | | | Instance | ISS_BTE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | IP revision identifier (X.Y.R) Used by software to track features, bugs, and compatibility | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="17">REVISION</td><td colspan="15"></td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | | | | | | | | | | Description | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:0 | REVISION | | | | | | | | | | | | | | | | IP revision | | | | | | | | | | | | | | | R | See ⁽¹⁾ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

⁽¹⁾ TI internal data

Table 8-242. Register Call Summary for Register BTE_HL_REVISION

ISS Interfaces

- [ISS BTE Register Summary: \[0\]](#)

Table 8-243. BTE_HL_HWINFO

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0004 | Instance | ISS_BTE |
| Physical Address | 0x5200 2004 | | |
| Description | Information about the hardware configuration of the IP module; that is, typically, the HDL generics (if any) of the module. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----------|----|----------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESPFIFO | | CONTEXTS | | RESERVED | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:24 | RESERVED | Reserved | R | 0x00 |
| 23:21 | RESPFIFO | Response FIFO size Read 0x3: 64 x 128 bits Read 0x4: 128 x 128 bits Read 0x2: 32 x 128 bits Read 0x0: Reserved Read 0x6: Reserved Read 0x1: 16 x 128 bits Read 0x7: Reserved Read 0x5: Reserved | R | 0x2 |
| 20:19 | CONTEXTS | Number of contexts Read 0x3: Reserved Read 0x2: 8 contexts Read 0x1: 4 contexts Read 0x0: 2 contexts | R | 0x1 |
| 18:0 | RESERVED | Reserved | R | 0x056A0 |

Table 8-244. Register Call Summary for Register BTE_HL_HWINFO

ISS Interfaces

- [ISS BTE Virtual Address Space and Context Mapping: \[0\]](#)
- [ISS BTE Register Summary: \[1\]](#)

Table 8-245. BTE_HL_SYSCONFIG

| | | | |
|-------------------------|--------------------------------|-----------------|---------|
| Address Offset | 0x0000 0010 | Instance | ISS_BTE |
| Physical Address | 0x5200 2010 | | |
| Description | Clock management configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|----------|----------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | IDLEMODE | RESERVED | SOFTRESET |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:2 | IDLEMODE | Configuration of the local target state management mode. By definition, target can handle read/write transaction as long as it is out of IDLE state. 0x0: An IDLE request is acknowledged unconditionally 0x1: An IDLE request is never acknowledged 0x3: Reserved. Do not use 0x2: Smart-idle mode. Acknowledgment to an IDLE request is given based on the internal activity of the module. | RW | 0x2 |
| 1 | RESERVED | | R | 0 |
| 0 | SOFTRESET | Software reset. Write 0x0: No action Write 0x1: Initiate software reset Read 0x1: Reset (software or other) ongoing Read 0x0: Reset done, no pending action | RW | 0 |

Table 8-246. Register Call Summary for Register BTE_HL_SYSCONFIG

ISS Interfaces

- [ISS BTE Reset: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS BTE Register Summary: \[4\]](#)

Table 8-247. BTE_HL_IRQSTATUS_RAW

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0020 | Instance | ISS_BTE |
| Physical Address | 0x5200 2020 | | |
| Description | Per-event raw interrupt status vector Raw status is set even if event is not enabled. Write 1 to set the (raw) status, mostly for debug. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|--------------|--------------|--------------|--------------|----------|----|----|----|------------------|------------------|------------------|------------------|----------|----|----|----|---------------|---------------|---------------|---------------|----------|---|---|---|-------------|-------------|---|---|
| RESERVED | | | | IRQ_CTX3_ERR | IRQ_CTX2_ERR | IRQ_CTX1_ERR | IRQ_CTX0_ERR | RESERVED | | | | IRQ_CTX3_INVALID | IRQ_CTX2_INVALID | IRQ_CTX1_INVALID | IRQ_CTX0_INVALID | RESERVED | | | | IRQ_CTX3_DONE | IRQ_CTX2_DONE | IRQ_CTX1_DONE | IRQ_CTX0_DONE | RESERVED | | | | IRQ_INVALID | IRQ_OCP_ERR | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|-------------------|-------|
| 31:28 | RESERVED | Reserved | RO R returns 0 | 0 |
| 27 | IRQ_CTX3_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|-------------------|-------|
| 26 | IRQ_CTX2_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 25 | IRQ_CTX1_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 24 | IRQ_CTX0_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 23:20 | RESERVED | Reserved | RO R returns 0 | 0 |
| 19 | IRQ_CTX3_INVALID | Invalid access. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 18 | IRQ_CTX2_INVALID | Invalid access. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 17 | IRQ_CTX1_INVALID | Invalid access. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 16 | IRQ_CTX0_INVALID | Invalid access. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 15:12 | RESERVED | Reserved | RO R returns 0 | 0 |
| 11 | IRQ_CTX3_DONE | Context has been fully transferred to the TILER Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|---------------|-------|
| 10 | IRQ_CTX2_DONE | Context has been fully transferred to the TILER Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 9 | IRQ_CTX1_DONE | Context has been fully transferred to the TILER Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 8 | IRQ_CTX0_DONE | Write mode: Context has been fully transferred to the TILER Read mode: Context prefetch has completed. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | IRQ_INVALID | Invalid access to the virtual space Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 0 | IRQ_OCP_ERR | OCP error received from OCP master port. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |

Table 8-248. Register Call Summary for Register BTE_HL_IRQSTATUS_RAW

ISS Interfaces

- [ISS BTE Interrupts: \[0\] \[1\]](#)
- [ISS BTE Register Summary: \[2\]](#)

Table 8-249. BTE_HL_IRQSTATUS

| | | | |
|------------------|--|----------|---------|
| Address Offset | 0x0000 0024 | Instance | ISS_BTE |
| Physical Address | 0x5200 2024 | | |
| Description | Per-event "enabled" interrupt status vector. Enabled status is not set unless event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|--------------|--------------|--------------|--------------|----------|----|----|----|------------------|------------------|------------------|------------------|----------|----|----|----|---------------|---------------|---------------|---------------|----------|---|---|---|-------------|-------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | IRQ_CTX3_ERR | IRQ_CTX2_ERR | IRQ_CTX1_ERR | IRQ_CTX0_ERR | RESERVED | | | | IRQ_CTX3_INVALID | IRQ_CTX2_INVALID | IRQ_CTX1_INVALID | IRQ_CTX0_INVALID | RESERVED | | | | IRQ_CTX3_DONE | IRQ_CTX2_DONE | IRQ_CTX1_DONE | IRQ_CTX0_DONE | RESERVED | | | | IRQ_INVALID | IRQ_OCP_ERR | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|-------------------|-------|
| 31:28 | RESERVED | Reserved | RO R returns 0 | 0 |
| 27 | IRQ_CTX3_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 26 | IRQ_CTX2_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 25 | IRQ_CTX1_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 24 | IRQ_CTX0_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 23:20 | RESERVED | Reserved | RO R returns 0 | 0 |
| 19 | IRQ_CTX3_INVALID | Invalid access. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 18 | IRQ_CTX2_INVALID | Invalid access. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 17 | IRQ_CTX1_INVALID | Invalid access. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 16 | IRQ_CTX0_INVALID | Invalid access. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|-------------------|-------|
| 15:12 | RESERVED | Reserved | RO R returns 0 | 0 |
| 11 | IRQ_CTX3_DONE | Context has been fully transferred to the TILER Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 10 | IRQ_CTX2_DONE | Context has been fully transferred to the TILER Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 9 | IRQ_CTX1_DONE | Context has been fully transferred to the TILER Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 8 | IRQ_CTX0_DONE | Write mode: Context has been fully transferred to the TILER Read mode: Context prefetch has completed. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | IRQ_INVALID | Invalid access to the virtual space Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 0 | IRQ_OCP_ERR | OCP error received from OCP master port. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |

Table 8-250. Register Call Summary for Register BTE_HL_IRQSTATUS

ISS Interfaces

- [ISS BTE Interrupts: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS BTE Change Context Configuration: \[4\]](#)
- [ISS BTE Register Summary: \[5\]](#)

Table 8-251. BTE_HL_IRQENABLE_SET

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0028 | Instance | ISS_BTE |
| Physical Address | 0x5200 2028 | | |
| Description | Per-event interrupt enable bit vector Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|------------------|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|---------------|---|---|---|---|---|---|---|---------------|-------------|--|--|--|--|--|--|---------------|--|--|--|--|--|--|--|---------------|--|--|--|--|--|--|--|-------------|--|--|--|--|--|--|--|-------------|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | IRQ_INVALID | IRQ_OCP_ERR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IRQ_CTX3_ERR | | | | | | | | IRQ_CTX3_INVALID | | | | | | | | IRQ_CTX4_DONE | | | | | | | | IRQ_CTX3_DONE | | | | | | | | IRQ_CTX2_DONE | | | | | | | | IRQ_CTX1_DONE | | | | | | | | IRQ_CTX0_DONE | | | | | | | | IRQ_INVALID | | | | | | | | IRQ_OCP_ERR | | | | | | | |
| IRQ_CTX2_ERR | | | | | | | | IRQ_CTX2_INVALID | | | | | | | | IRQ_CTX3_DONE | | | | | | | | IRQ_CTX4_DONE | | | | | | | | IRQ_CTX1_DONE | | | | | | | | IRQ_CTX0_DONE | | | | | | | | IRQ_INVALID | | | | | | | | IRQ_OCP_ERR | | | | | | | | | | | | | | | |
| IRQ_CTX1_ERR | | | | | | | | IRQ_CTX1_INVALID | | | | | | | | IRQ_CTX2_DONE | | | | | | | | IRQ_CTX3_DONE | | | | | | | | IRQ_CTX4_DONE | | | | | | | | IRQ_INVALID | | | | | | | | IRQ_OCP_ERR | | | | | | | | | | | | | | | | | | | | | | | |
| IRQ_CTX0_ERR | | | | | | | | IRQ_CTX0_INVALID | | | | | | | | IRQ_CTX1_DONE | | | | | | | | IRQ_CTX2_DONE | | | | | | | | IRQ_CTX3_DONE | | | | | | | | IRQ_CTX4_DONE | | | | | | | | IRQ_INVALID | | | | | | | | IRQ_OCP_ERR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|-------------------|-------|
| 31:28 | RESERVED | Reserved | RO R returns 0 | 0 |
| 27 | IRQ_CTX3_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 26 | IRQ_CTX2_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 25 | IRQ_CTX1_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 24 | IRQ_CTX0_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 23:20 | RESERVED | Reserved | RO R returns 0 | 0 |
| 19 | IRQ_CTX3_INVALID | Invalid access. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |

ISS Interfaces

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|-------------------|-------|
| 18 | IRQ_CTX2_INVALID | Invalid access. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 17 | IRQ_CTX1_INVALID | Invalid access. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 16 | IRQ_CTX0_INVALID | Invalid access. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 15:12 | RESERVED | Reserved | RO R returns 0 | 0 |
| 11 | IRQ_CTX3_DONE | Context has been fully transferred to the TILER Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 10 | IRQ_CTX2_DONE | Context has been fully transferred to the TILER Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 9 | IRQ_CTX1_DONE | Context has been fully transferred to the TILER Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 8 | IRQ_CTX0_DONE | Write mode: Context has been fully transferred to the TILER Read mode: Context prefetch has completed. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | IRQ_INVALID | Invalid access to the virtual space Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|---------------|-------|
| 0 | IRQ_OCP_ERR | <p>OCP error received from OCP master port.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Enable interrupt</p> <p>Read 0x1: Interrupt enabled</p> <p>Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |

Table 8-252. Register Call Summary for Register BTE_HL_IRQENABLE_SET

ISS Interfaces

- [ISS BTE Interrupts: \[0\]](#)
- [ISS BTE Register Summary: \[1\]](#)

Table 8-253. BTE_HL_IRQENABLE_CLR

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 002C | Instance | ISS_BTE |
| Physical Address | 0x5200 202C | | |
| Description | <p>Per-event interrupt enable bit vector</p> <p>Write 1 to clear (disable interrupt).</p> <p>Readout equal to corresponding _SET register.</p> | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|--------------|--------------|--------------|--------------|----------|----|----|----|------------------|------------------|------------------|------------------|----------|----|----|----|---------------|---------------|---------------|---------------|----------|---|---|---|-------------|-------------|---|---|
| RESERVED | | | | IRQ_CTX3_ERR | IRQ_CTX2_ERR | IRQ_CTX1_ERR | IRQ_CTX0_ERR | RESERVED | | | | IRQ_CTX3_INVALID | IRQ_CTX2_INVALID | IRQ_CTX1_INVALID | IRQ_CTX0_INVALID | RESERVED | | | | IRQ_CTX3_DONE | IRQ_CTX2_DONE | IRQ_CTX1_DONE | IRQ_CTX0_DONE | RESERVED | | | | IRQ_INVALID | IRQ_OCP_ERR | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|-------------------|-------|
| 31:28 | RESERVED | Reserved | RO R returns 0 | 0 |
| 27 | IRQ_CTX3_ERR | <p>Read request received before sufficient data has been prefetched.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Disable interrupt</p> <p>Read 0x1: Interrupt enabled</p> <p>Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |
| 26 | IRQ_CTX2_ERR | <p>Read request received before sufficient data has been prefetched.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Disable interrupt</p> <p>Read 0x1: Interrupt enabled</p> <p>Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |
| 25 | IRQ_CTX1_ERR | <p>Read request received before sufficient data has been prefetched.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Disable interrupt</p> <p>Read 0x1: Interrupt enabled</p> <p>Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |

ISS Interfaces

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|-------------------|-------|
| 24 | IRQ_CTX0_ERR | Read request received before sufficient data has been prefetched. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 23:20 | RESERVED | Reserved | RO R returns 0 | 0 |
| 19 | IRQ_CTX3_INVALID | Invalid access. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 18 | IRQ_CTX2_INVALID | Invalid access. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 17 | IRQ_CTX1_INVALID | Invalid access. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 16 | IRQ_CTX0_INVALID | Invalid access. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 15:12 | RESERVED | Reserved | RO R returns 0 | 0 |
| 11 | IRQ_CTX3_DONE | Context has been fully transferred to the TILER Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 10 | IRQ_CTX2_DONE | Context has been fully transferred to the TILER Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 9 | IRQ_CTX1_DONE | Context has been fully transferred to the TILER Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------|-------|
| 8 | IRQ_CTX0_DONE | Write mode: Context has been fully transferred to the TILER Read mode: Context prefetch has completed. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1 | IRQ_INVALID | Invalid access to the virtual space Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 0 | IRQ_OCP_ERR | OCP error received from OCP master port. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |

Table 8-254. Register Call Summary for Register BTE_HL_IRQENABLE_CLR

ISS Interfaces

- [ISS BTE Interrupts: \[0\]](#)
- [ISS BTE Register Summary: \[1\]](#)

Table 8-255. BTE_CTRL

| | | | |
|------------------|----------------------|----------|---------|
| Address Offset | 0x0000 0030 | Instance | ISS_BTE |
| Physical Address | 0x5200 2030 | | |
| Description | BTE control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|------|----|----|----|----------|--------|----------|---------|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BW_LIMITER | | | | | | | | RESERVED | | | | | | | | BASE | | | | RESERVED | POSTED | RESERVED | TAG_CNT | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:22 | BW_LIMITER | Minimum number of OCP cycles between two consecutive buffer flushing or prefetch requests. Used to limit the bandwidth used to fill/empty buffers. 0: Maximum speed. Up to 1 request every 8 cycles (3.2GB @ 200 MHz) 1: Up to 1 request every 9 cycles. 1023: Minimum speed. Up to 1 request every 1031 cycles (24MB @ 200 MHz) | RW | 0x000 |
| 21:12 | RESERVED | | R | 0x000 |
| 11:8 | BASE | Base address of the virtual space translated by the BTE. Start address = BASE*512MB End address = (BASE+1)*512MB 1 For example: BASE=3 = 0x 0 6000 0000 - 0x 0 7FFF FFFF | RW | 0x0 |
| 7:6 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 5 | POSTED | Select among posted and nonposted writes for translated requests. 0x0: Use non posted writes 0x1: Use posted writes | RW | 0 |
| 4 | RESERVED | | R | 0 |
| 3:0 | TAG_CNT | BTE could use up to TAG_CNT+1 tags on OCPO. There could only be one outstanding request per tag. TAG_CNT does not control the number of requests it could handle on OCPI. This register is internally shadowed. Modifications are taken into account when there are no outstanding transactions on OCPO. TAG ID 0 to TAG_CNT are used on OCPO. | RW | 0xF |

Table 8-256. Register Call Summary for Register BTE_CTRL

ISS Interfaces

- [ISS BTE Virtual Address Space and Context Mapping: \[0\] \[1\]](#)
- [ISS BTE Local Memory Management: \[2\] \[3\]](#)
- [ISS BTE Posted and Nonposted Write Support: \[4\]](#)
- [ISS BTE Register Summary: \[5\]](#)

Table 8-257. BTE_CTRL1

| | | | |
|------------------|----------------------|----------|---------|
| Address Offset | 0x0000 0034 | Instance | ISS_BTE |
| Physical Address | 0x5200 2034 | | |
| Description | BTE control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RESP_FIFO_THR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6:0 | RESP_FIFO_THR | The BTE stops accepting new requests from OCPI (on a clean burst boundary) when the response FIFO contains more than RESP_FIFO_THR words. The reset value is FIFO_SIZE - 16 - 1. FIFO_SIZE = 8 * 2 ^{RESP_FIFO} | RW | 0x0F |

Table 8-258. Register Call Summary for Register BTE_CTRL1

ISS Interfaces

- [ISS BTE Register Summary: \[0\]](#)

Table 8-259. BTE_CONTEXT_CTRL_i

| | | | |
|-------------------------|--------------------------|-----------------|------------|
| Address Offset | 0x0000 0040 + (0x20 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5200 2040 + (0x20 * i) | Instance | ISS_BTE |
| Description | Context control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|--------|--------|-----------|---------|------|------|----------|-------|------|-------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | TRIGGER | | | | | | | | | | | | | | | INITSX | INITSY | ADDR32 | AUTOFLUSH | ONESHOT | GRID | MODE | RESERVED | FLUSH | STOP | START | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:30 | RESERVED | | R | 0x0 |
| 29:16 | TRIGGER | Threshold used to trigger translated requests to OCPO. Unit: words or 16 bytes Valid range: 3 lines + 2 ... 4 lines WRITE: a 2D write is issued to OCPO when the internal buffer level (including masked accesses) is superior or equal to TRIGGER READ: a 2D read is issued to OCPO when the internal buffer level (including masked accesses) is inferior to TRIGGER. | RW | 0x0000 |
| 15 | INITSX | Reset value to be used for SX_x. Check the section describing the local buffer management for details. | RW | 0 |
| 14:13 | INITSY | Reset value to be used for SY_x. Check the section describing the local buffer management for details. Must be 0 when ONESHOT = 0. | RW | 0x0 |
| 12 | ADDR32 | Controls the value of the OCP address bit 32 to be used for translated accesses | RW | 1 |
| 11 | AUTOFLUSH | Controls automatic context flushing when an IDLE request is received 0x0: Disabled 0x1: Enabled | RW | 0 |
| 10 | ONESHOT | Selects one-shot or continuous mode 0x0: The context is automatically re-enabled when its end is reached. 0x1: The context is disabled when the end of a frame has been reached. | RW | 0 |
| 9:8 | GRID | Grid used to access the TILER 0x0: Stride = 16k Subtile = 4x4 bytes Tile = 32x32 bytes 0x1: Stride = 8k Subtile = 4x4 bytes Tile = 32x32 bytes 0x3: Stride = 16k Subtile = 8x2 bytes Tile = 64x16 bytes 0x2: Stride = 32k Subtile = 8x2 bytes Tile = 64x16 bytes | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7:6 | MODE | Select the translation mode for the context 0x0: Write translation 0x1: Read translation 0x3: reserved 0x2: Direct access to local buffer | RW | 0x0 |
| 5:3 | RESERVED | | R | 0x0 |
| 2 | FLUSH | Flushes all remaining data of the context to the TILER. Write 0x0: No effect Write 0x1: Flush | W | 0 |
| 1 | STOP | Stops the context on a clean OCP transaction boundary. Write 0x0: No effect Write 0x1: Stop the context | W | 0 |
| 0 | START | Resets the contexts internal state and enables the context on a clean OCP transaction boundary. Write 0x0: No effect Write 0x1: Reset + Enable | W | 0 |

Table 8-260. Register Call Summary for Register BTE_CONTEXT_CTRL_i

ISS Interfaces

- [ISS BTE Power Management: \[0\] \[1\]](#)
- [ISS BTE Virtual Address Space and Context Mapping: \[2\] \[3\]](#)
- [ISS BTE TILER Context Configuration Example: \[4\] \[5\] \[6\]](#)
- [ISS BTE Local Memory Management: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)
- [ISS BTE TILER Space Accesses: 2D Burst Generation: \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [ISS BTE Context Configuration: \[24\] \[25\] \[26\]](#)
- [ISS BTE Change Context Configuration: \[27\] \[28\] \[29\] \[30\]](#)
- [ISS BTE Register Summary: \[31\]](#)

Table 8-261. BTE_CONTEXT_BASE_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0044 + (0x20 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5200 2044 + (0x20 * i) | Instance | ISS_BTE |
| Description | Address of the frame buffer in the TILER address space. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------|
| 31:5 | ADDR | Address | RW | 0x00000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-262. Register Call Summary for Register BTE_CONTEXT_BASE_i

ISS Interfaces

- [ISS BTE TILER Context Configuration Example: \[0\] \[1\]](#)
- [ISS BTE TILER Space Accesses: 2D Burst Generation: \[2\]](#)
- [ISS BTE Context Configuration: \[3\] \[4\]](#)
- [ISS BTE Register Summary: \[5\]](#)

Table 8-263. BTE_CONTEXT_START_i

| | | | |
|-------------------------|---------------------------------|-----------------|------------|
| Address Offset | 0x0000 0048 + (0x20 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5200 2048 + (0x20 * i) | Instance | ISS_BTE |
| Description | Top-left corner of the context. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | X | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|----------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:7 | X | Address, in 128-byte words | RW | 0x000 |
| 6:0 | RESERVED | | R | 0x00 |

Table 8-264. Register Call Summary for Register BTE_CONTEXT_START_i

ISS Interfaces

- [ISS BTE Virtual Address Space and Context Mapping: \[0\] \[1\] \[2\]](#)
- [ISS BTE TILER Space Accesses: 2D Burst Generation: \[3\] \[4\] \[5\]](#)
- [ISS BTE Register Summary: \[6\]](#)

Table 8-265. BTE_CONTEXT_END_i

| | | | |
|-------------------------|-------------------------------------|-----------------|------------|
| Address Offset | 0x0000 004C + (0x20 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5200 204C + (0x20 * i) | Instance | ISS_BTE |
| Description | Bottom-right corner of the context. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | Y | | | | | | | | X | | | | | | | | | | | | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:29 | RESERVED | | R | 0x0 |
| 28:16 | Y | Last line number for the context (0 corresponds to a context of 1 line) Must be 7 when ONESHOT = 0. | RW | 0x0000 |
| 15:4 | X | Address, in 128-bit words, of the last column of the context | RW | 0x000 |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-266. Register Call Summary for Register BTE_CONTEXT_END_i

ISS Interfaces

- [ISS BTE Virtual Address Space and Context Mapping: \[0\] \[1\]](#)
- [ISS BTE Local Memory Management: \[2\] \[3\]](#)
- [ISS BTE TILER Space Accesses: 2D Burst Generation: \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [ISS BTE Register Summary: \[9\]](#)

PRELIMINARY

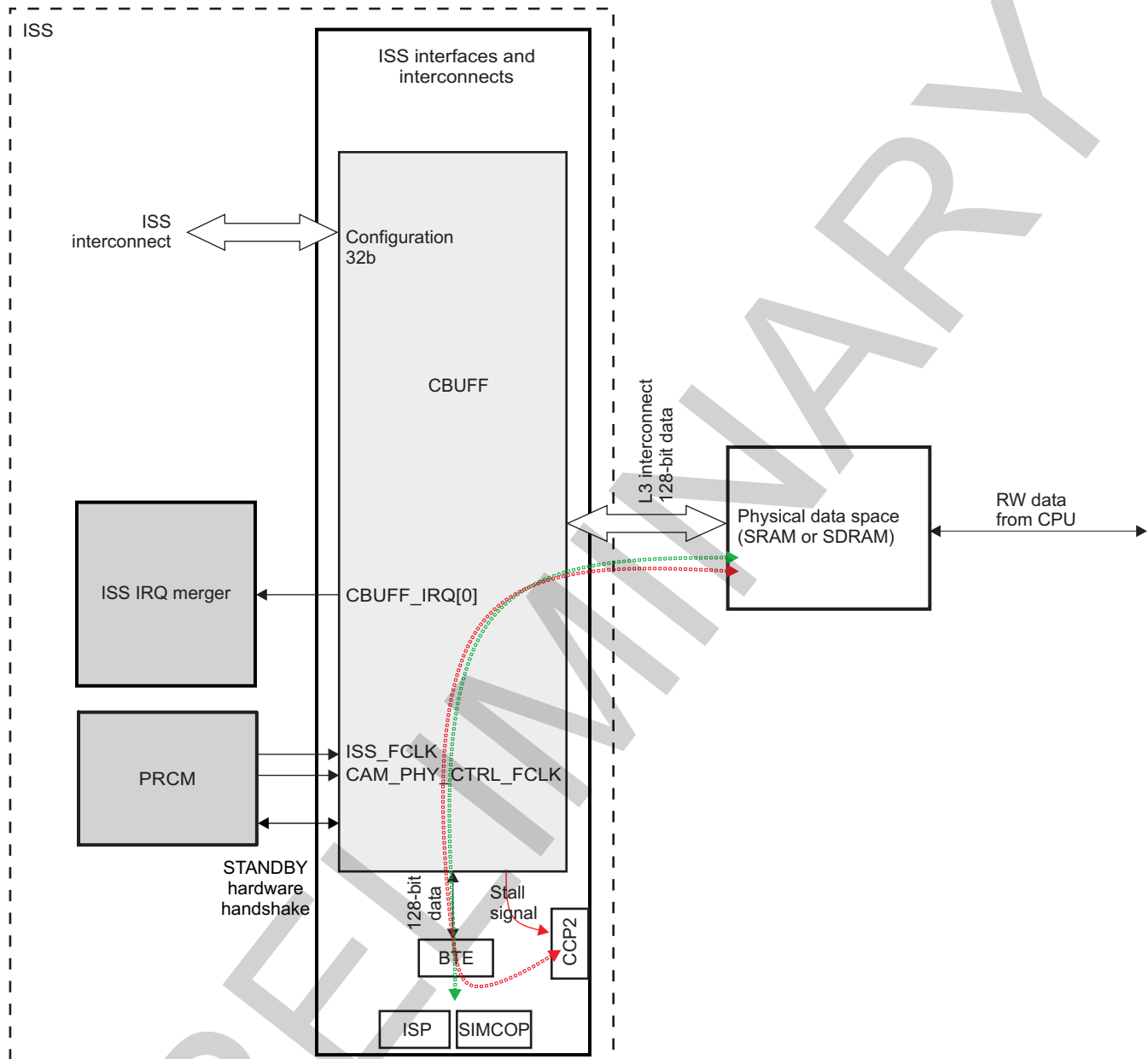
8.2.8 ISS CBUFF

8.2.8.1 ISS CBUFF Environment

There are no particular environment attributes. See [Section 8.2.2, ISS Interfaces Environment](#).

8.2.8.2 ISS CBUFF Integration

[Figure 8-91](#) shows the integration of the CBUFF in the ISS. Because the CBUFF maps a virtual memory space from the physical memory, it therefore communicates with the ISS ISP and ISS interface modules for data to and from memory. This figure shows the normal data flow for further processing by the ISP and/or still-image coprocessor (SIMCOP) (in green) and the stall functionality of CBUFF (in red), which stall the data for a certain amount of time. An example of stalling is when the ISP processes the data faster than the input from CCP2 to memory. The CBUFF then must stall the data flow until a sufficient amount of data can be read from memory by the ISP.

Figure 8-91. ISS CBUFF Integration

RED - Stalled data flow
 GREEN - Normal data flow

camss-679

For power domain, clocks, reset, and hardware requests, see [Section 8.1.2.4, ISS Power Management](#).

8.2.8.2.1 ISS CBUFF PRCM Interface

8.2.8.2.1.1 ISS CBUFF Reset and Idle Mechanism

A reset signal is provided by the PRCM module to the top-level ISS power and clock-management module.

For standby, when none of the ISS modules require CBUFF execution actions, ISS PM executes the standby sequence, which reaches the CBUFF. When an IDLE request arrives, the CBUFF data is drained. After all transactions are drained, the CBUFF acknowledges the IDLE request to the ISS PM/CM. The IDLE request/acknowledge steps are:

When an IDLE request is received in smart-idle mode:

1. CBUFF stops accepting any new OCP requests on a clean OCP transaction boundary.
2. Waits until the interrupt output becomes inactive (no more enabled event pending)
3. Waits until all outstanding OCP transactions are complete on OCPO and OCPI. CBUFF keeps track of issued requests, data phases, and responses for that purpose.
4. CBUFF disconnects the OCPO port.
5. CBUFF acknowledges the IDLE request.

When a wake-up request is received in smart-idle mode:

1. CBUFF connects the OCPO port.
2. Starts accepting new requests from OCPI
3. Acknowledges the functional state

Idle mode is controlled through the [CBUFF_HL_SYSCONFIG\[3:2\]](#) IDLEMODE bit field. For software reset, it is recommended to use the global ISS reset; if a reset is required, it can be set from the [CBUFF_HL_SYSCONFIG\[0\]](#) SOFTRESET bit.

8.2.8.2.2 ISS CBUFF Interrupts

All events generated by the module are merged into a single event at ISS level. This event can be mapped to the MPU subsystem by enabling the [ISS_HL_IRQENABLE_SET_i\[10\]](#) CBUFF_IRQ bit. [Table 8-267](#) lists the procedure to manage CBUFF interrupts.

Table 8-267. ISS CBUFF Interrupt Management

| Description | Bit Field | Value |
|--|--|-------|
| Each event that generates an interrupt can be individually enabled by setting the appropriate bit. | CBUFF_HL_IRQENABLE_SET | |
| Each event that generates an interrupt can be individually disabled by setting the appropriate bit. | CBUFF_HL_IRQENABLE_CLR | |
| When an event occurs, the corresponding bit in the CBUFF_HL_IRQSTATUS_RAW register is set regardless of whether or not the event is enabled. Bits in the CBUFF_HL_IRQSTATUS registers are only set only when an enabled event occurs | CBUFF_HL_IRQSTATUS_RAW and CBUFF_HL_IRQSTATUS | |
| Software can clear a pending event by setting the appropriate bit in the CBUFF_HL_IRQSTATUS register. | CBUFF_HL_IRQSTATUS | |

The CBUFF can generate three events per context and one global event. All events are merged into one physical interrupt line. [Table 8-268](#) describes the CBUFF-generated events.

Table 8-268. ISS CBUFF-Generated Events

| Event | Description |
|------------------|--|
| IRQ_CTXx_READY | Read mode: CPU can write data to the physical window pointed by CBUFF_CTX_STATUS_i[3:0] WB. |
| | Write mode: CPU can read data from the physical window pointed by CBUFF_CTX_STATUS_i[3:0] WB. |
| | Read/write mode: The OCPI initiator has completed writing a physical window. |
| IRQ_CTXx_INVALID | Invalid access |
| | OCPI writes the virtual space of context i in read mode. |
| | OCPI reads the virtual space of context i in write mode. |
| | OCPI writes the virtual space of context i outside the CBUFF_CTX_STATUS_i[11:8] WA window in write or read/write mode. |

Table 8-268. ISS CBUFF-Generated Events (continued)

| Event | Description |
|--------------|---|
| | OCPI reads the virtual space of context i outside the <code>CBUFF_CTX_STATUS_i[11:8]</code> WA window in read mode. |
| | OCPI reads the virtual space of context i outside the <code>CBUFF_CTX_STATUS_i[3:0]</code> WB window in read/write mode. |
| | CPU writes the DONE bit when physical windows are not ready for the CPU. |
| | This event indicates a wrong configuration of the CBUFF, the OCPI initiator or bogus software. When it happens, context i goes into an error state. In this state all accesses to the virtual space of context i are cancelled: they are not forwarded to the physical space. The purpose is to prevent corruption of the physical memory. Of course, the CBUFF still returns OCP responses to OCPI to ensure the integrity of the OCP. |
| | The error state can be left by disabling the context i and re-enabling it. Before doing so, software must ensure that there are no more outstanding requests to the virtual space of context i. |
| IRQ_CTXx_OVR | Physical space overflow or underflow event This event indicates a bandwidth mismatch between data producer and data consumer. When it happens, context i does not go into error state. However, the data in the physical space is likely to be corrupted. |
| IRQ_OCP_ERR | OCP error received in the OCPO master port. The OCP response is forwarded to OCPI normally. |

8.2.8.3 ISS CBUFF Functional Description

The CBUFF maps a virtual space to a physical space by address translation. It does not change the data or store it locally.

8.2.8.3.1 ISS CBUFF Features

The ISS CBUFF features are:

- Fully transparent for accesses out of the configured virtual space
- Three functional modes:
 - Read mode: Read requests received from OCPI and forwarded after translation to OCPO. Writes are handled by an external process and acknowledged by the CPU.
 - Write mode: Write request received from OCPI and forwarded after translation to OCPO. Reads are handled by an external process and acknowledged by the CPU.
 - Read/write mode: Read and write requests received from OCPI and forwarded after translation to OCPO
- Four independent contexts
- Virtual address space (linear) mapped into a physical space (circular)
- Maximum physical buffer size of 16 × 16MB:
 - Physical space consists of 2, 4, 8, or 16 windows.
 - Maximum allowed window size is 16MB.
- Support of 2D addressing modes
- Strong error detection mechanisms to prevent data corruption caused by bogus configuration
- Addresses are 128-bit aligned, but window fill level managing is byte accurate
- Bandwidth control feedback loop to stall in initiator connected to OCPI

8.2.8.3.2 ISS CBUFF Functional Description

The CBUFF maps a virtual address space to a physical space also called circular buffer.

The CBUFF can handle up to eight contexts. For most data formats, primarily four contexts are used. In cases where YUV4:2:0 data is exchanged, two contexts are consumed by the SIMCOP (JPEG encode) coming from the resizer module, which is the ISP output module. Moreover, a context is a virtual full-frame buffer that maps to a configurable number of physical windows.

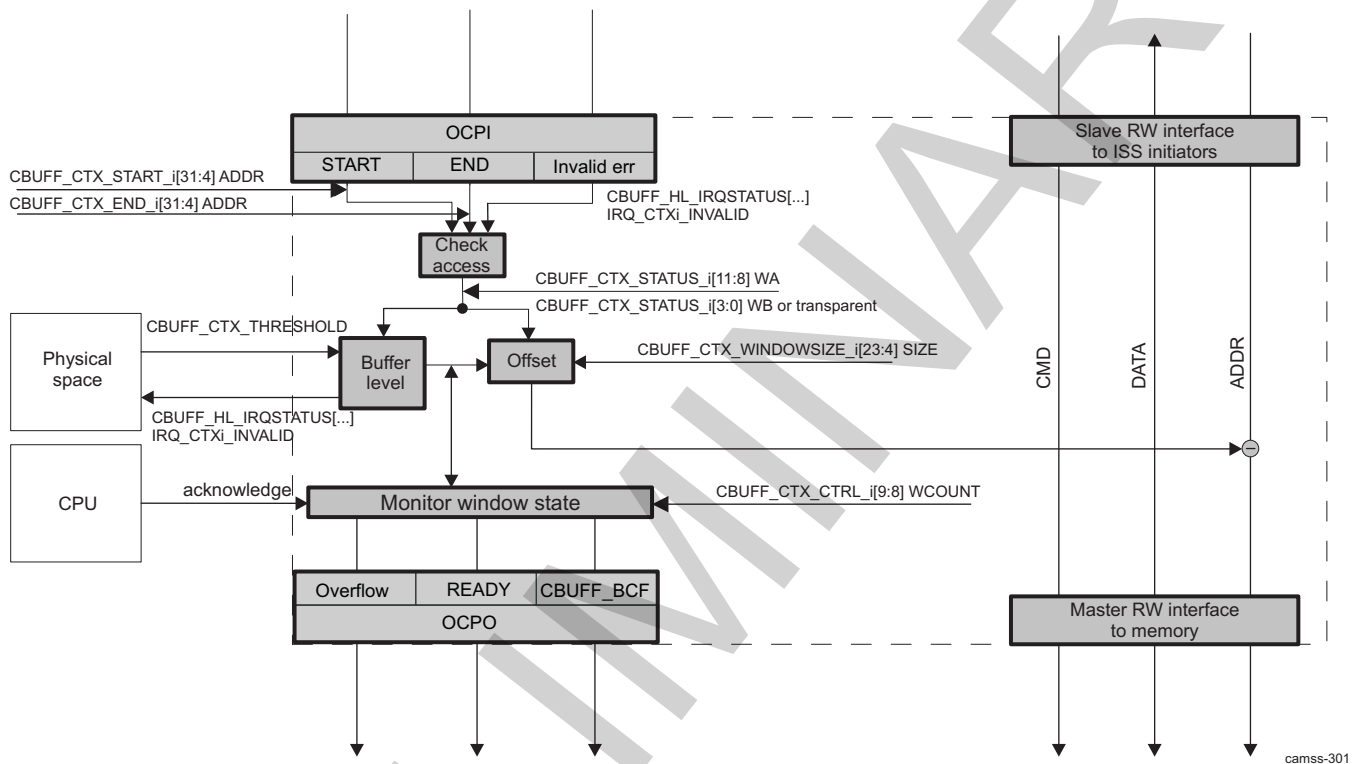
This section gives an overview of typical uses of the CBUFF.

8.2.8.3.2.1 ISS CBUFF Top-Level Diagram

Figure 8-92 shows the functional principle diagram. It does not include an exhaustive list of the interface signals or internal status registers.

A more detailed functional description is provided in the following sections.

Figure 8-92. ISS CBUFF Top-Level Diagram



camss-301

8.2.8.3.2.2 ISS CBUFF Functional Modes

The CBUFF supports three functional modes (see Table 8-269).

Table 8-269. ISS CBUFF Functional Modes

| Mode | Data Written by | Data Read by |
|-----------------|------------------------|------------------------|
| Write mode | ISS initiator | CPU-controlled process |
| Read mode | CPU-controlled process | ISS initiator |
| Read/write mode | ISS initiator | ISS initiator |

8.2.8.3.2.2.1 ISS CBUFF Write Mode

In write mode, the physical space is written by the CBUFF and it is read by the CPU. An IRQ_CTXx_READY event is set each time a physical window is available to be read by the CPU. This happens when the CBUFF_CTX_STATUS_i[11:8] WA pointer is moved by the CBUFF.

The CBUFF sets an IRQ_CTXx_READY event to inform the CPU that it can access the CBUFF_CTX_STATUS_i[3:0] WB physical window. The CBUFF cannot monitor CPU accesses to the physical window. The CPU must indicate when it has completed the processing of the CBUFF_CTX_STATUS_i[3:0] WB window by setting the CBUFF_CTX_CTRL_i[2:1] DONE bit field. This increments the window index CBUFF_CTX_STATUS_i[3:0] WB by one modulo the window count (defined by the CBUFF_CTX_CTRL_i[9:8] WCOUNT bit field).

The CBUFF ensures that one IRQ_CTXx_READY event is sent to the CPU per physical window to be read. In other words, when a new IRQ_CTXx_READY event occurs before the previous one(s) is acknowledged by the CPU, it is not lost. The CBUFF memorizes the event and triggers the interrupt line again when the CPU clears it.

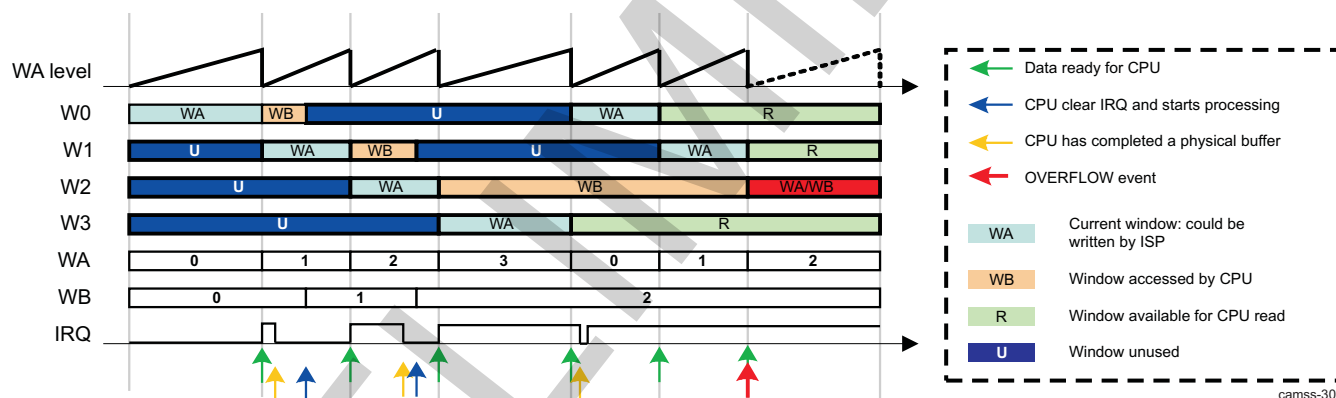
When the CPU reads the physical space too slowly, the CBUFF_CTX_STATUS_i[11:8] WA window pointer falls into the CBUFF_CTX_STATUS_i[3:0] WB window. This generates an IRQ_CTXx_OVR event when the OCPI initiator performs an access to that window. The CPU receives the IRQ_CTXx_READY event only if it is allowed to access a physical window. Therefore, it cannot generate an IRQ_CTXx_OVR event in a normal case. The OCPI initiator accesses are tracked based on activity on the OCP port.

When an IRQ_CTXx_OVR event occurs, the buffer content is likely to be corrupted. However, the CBUFF context continues processing data normally; it does not go into error state. Software must reset data generation and the CBUFF in a clean manner.

Figure 8-93 shows an example scenario with CBUFF_CTX_CTRL_i[9:8] WCOUNT = 1 (four windows). In normal operation, the CPU processes data at least at the same speed as it is written to the physical space. When this is not true, the number of windows to be read by the CPU increases. When no more physical windows are available for OCPI writes, an overflow occurs.

In the previous example, the CPU takes more time than expected to read the third buffer. Therefore, physical windows are not freed up. The OCPI initiator continues to write data into the physical window. That leads to an overflow when the OCPI initiator writes into the physical window that is read by the CPU (CBUFF_CTX_STATUS_i[11:8] WA = CBUFF_CTX_STATUS_i[3:0] WB and writes into CBUFF_CTX_STATUS_i[11:8] WA detected).

Figure 8-93. ISS CBUFF Write Mode CPU Interaction Example



- (1) When there is no physical window available to be read by the CPU and the CPU writes the DONE bit, an IRQ_CTXx_INVALID event occurs.
- (2) The bandwidth control feedback (BCF) feature can be used to prevent overflow. It must be supported by the module writing data into the virtual space (typically, an ISS).

8.2.8.3.2.2.2 ISS CBUFF Read Mode

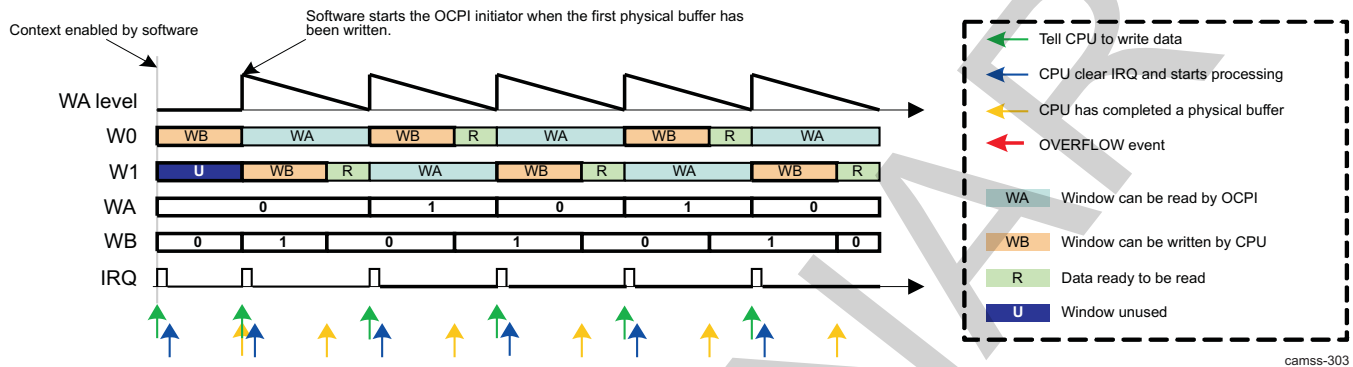
In read mode, the physical space is read by the CBUFF and it is written by the CPU. An IRQ_CTXx_READY event is set each time a physical window is available to be written by the CPU. This is true until all free buffers are used.

The CBUFF sets an IRQ_CTXx_READY event to inform the CPU that it can write the CBUFF_CTX_STATUS_i[3:0] WB window. The CBUFF cannot monitor CPU accesses to the physical space. It must indicate when it completes writing the CBUFF_CTX_STATUS_i[3:0] WB window by setting the CBUFF_CTX_CTRL_i[2:1] DONE bit field. This increments the CPU window index CBUFF_CTX_STATUS_i[3:0] WB by one modulo the window count (defined by the CBUFF_CTX_CTRL_i[9:8] WCOUNT bit field).

The CBUFF ensures that one IRQ_CTXx_READY event is sent to the CPU per physical window to be written. In other words, when a new IRQ_CTXx_READY event occurs before the previous one(s) is acknowledged by the CPU, it is not lost. The CBUFF memorizes the event and triggers the interrupt line again when the CPU clears it.

The following is an example of a normal operation in which the CPU writes data faster than it is read by the OCPI initiator. [Figure 8-94](#) uses two physical windows (CBUFF_CTX_CTRL_i[9:8] WCOUNT = 0).

Figure 8-94. ISS CBUFF CPU Writes Data Faster Than it Is Read by the OCPI Initiator



Software must enable the ISS initiator only when at least one window is written by the CPU. Otherwise, an OVERFLOW event occurs when BCF is not used.

The CPU receives an interrupt each time a physical window is available to receive data. It clears the interrupt and then starts filling the physical window. When the buffer is completely written, it sets the CBUFF_CTX_CTRL_i[2:1] DONE bit field. This happens before the OCPI initiator has read all data from the previous physical window: the CPU must wait until the next IRQ_CTXx_READY event is received before it can write again to the physical space.

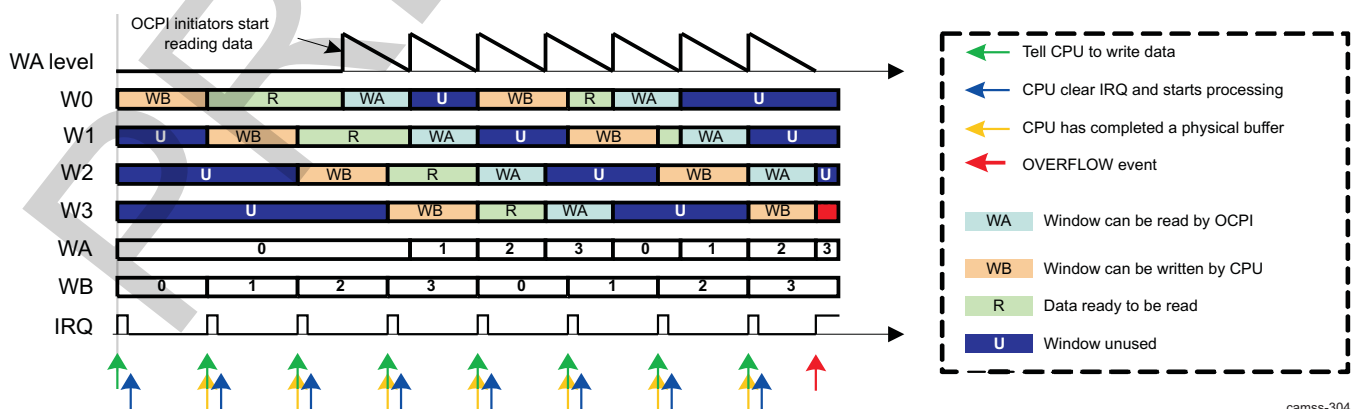
When the CPU writes buffers too slowly, the CBUFF_CTX_STATUS_i[11:8] WA window falls into the CBUFF_CTX_STATUS_i[3:0] WB window. This generates an IRQ_CTXx_OVR event only when the OCPI initiator performs reads to that window. The CPU receives the IRQ_CTXx_READY event only if it is allowed to access a physical window. Therefore, it does not generate an IRQ_CTXx_OVR event in a normal case. ISS accesses are tracked based on activity on the OCPI port.

When no buffer is available to be written by the CPU and the CPU writes the DONE bit, an IRQ_CTXx_INVALID event occurs.

When an IRQ_CTXx_OVR event occurs, the OCPI initiator reading the virtual space is likely to receive dummy data. However, the CBUFF context continues to process data normally; it does not go into error state. Software must reset the data consumer (OCPI initiator) and CBUFF context in a clean manner.

[Figure 8-95](#) is an example of CBUFF read mode CPU interaction.

Figure 8-95. CBUFF Read Mode CPU Interaction Example



The BCF feature can be used to prevent overflow. It must be supported by the module reading data from the virtual space (typically, an ISS).

8.2.8.3.2.2.3 ISS CBUFF Read/Write Mode

Reads and writes are performed by OCPI initiators such as a camera interface, ISP, or SIMCOP. Address translation is performed for read and write data flows. The WA pointer is used for the write data flow, and the WB pointer is used for the read data flow. Therefore, address translation for the write data flow is the same as for write mode.

In this mode, the OCPI read data flow is stalled when there is not enough data to read in the physical space. A typical application is to store data from the camera in a CBUFF and to read it back by the ISP. When the camera is slower than the ISP, the ISP stalls.

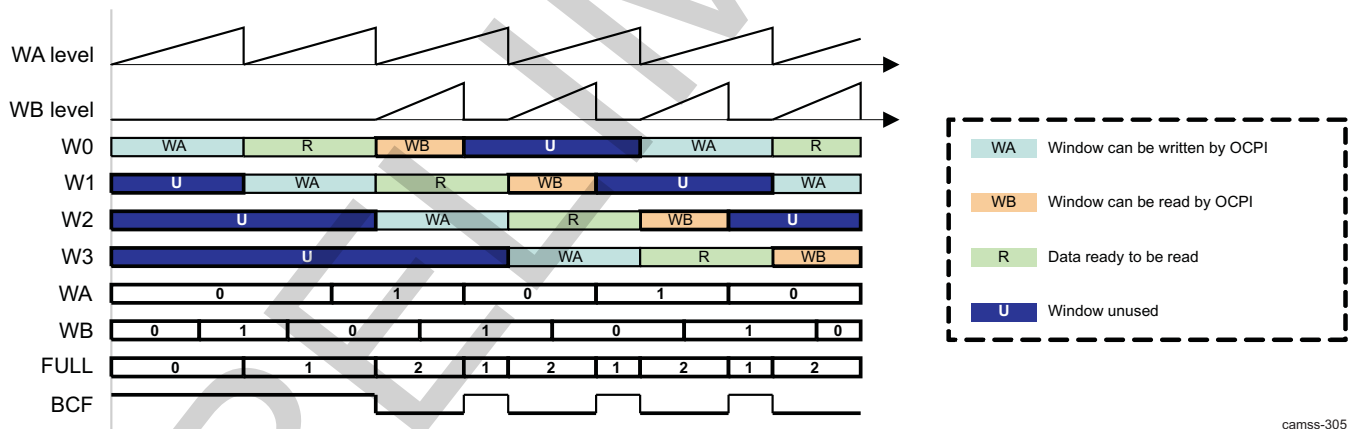
This mode does not rely on CPU synchronization. Synchronization is always performed using the BCF hardware mechanism. IRQ_CTXx_READY events are triggered in this mode when the OCPI write initiator has filled a physical window. Software can use this event for debug or performance bench marking purposes. Writes to the [CBUFF_CTX_CTRL_i\[2:1\]](#) DONE bit field are ignored in this mode.

The IRQ_CTXx_OVR event is triggered when an underflow occurs. In a normal case this should not occur, because the BCF signal is used to stall the read data flow when insufficient data is available in the physical space.

Figure 8-96 assumes:

- Read/write mode
- Four physical windows
- [CBUFF_CTX_THRESHOLD_S_i](#) = [CBUFF_CTX_THRESHOLD_F_i](#)
- The OCPI read initiator is faster than the OCPI write initiator. The BCF feature is used to stall the read initiator. [CBUFF_CTX_CTRL_i\[7:4\]](#) BCF = 2

Figure 8-96. ISS CBUFF Read/Write Mode Example



camss-305

8.2.8.3.2.3 ISS CBUFF Events and Status Checking

8.2.8.3.2.3.1 ISS CBUFF Operations

A CBUFFx_READY_IRQ event is generated each time the CPU can read data from the CBUFF. The CPU can clear the event when it starts processing the data to avoid masking other events. The CPU can keep track of the location on the data internally or use the CBUFF registers to compute it.

The formula used is: ADDR = [CBUFF_CTX_STATUS_i\[3:0\]](#) WB [CBUFF_CTX_WINDOWSIZE_i](#) + [CBUFF_CTX_PHY_i](#)

When the CPU is done with processing, it must free the buffer by setting the [CBUFF_CTX_CTRL_i\[10\]](#) DONE bit. Otherwise, an overflow event may occur.

The CBUFF does not keep track of EOF events. They must be managed by the CPU using the EOF event of the module that writes into the CBUFF. At the EOF, data may remain in the current write windows. For example, when the window size is set to 8 lines and the image size is 20 lines, only two window-ready events are generated for a linear addressing scheme. The remaining four lines can be read after the EOF event.

No automatic reset of the CBUFF FSM occurs at the end of the image frame. Software must reset the context by clearing the [CBUFF_CTX_CTRL_i\[0\] ENABLEABLE](#) bit when the frame is completely processed. A new frame can start only when the [CBUFF_CTX_CTRL_i\[0\] ENABLEABLE](#) bit is set.

8.2.8.3.2.3.2 ISS CBUFF Status Checking

The CBUFF provides read-only access to the [CBUFF_CTX_STATUS_i\[11:8\]](#) WA and [CBUFF_CTX_STATUS_i\[3:0\]](#) WB pointers through the [CBUFF_CTX_STATUS_i](#) register. For example, the [CBUFF_CTX_STATUS_i\[3:0\]](#) WB index can be used by the CPU to compute the address of a physical window. Those indexes can also be used to evaluate latency margins.

8.2.8.3.2.3.3 ISS CBUFF Register Accessibility During Frame Processing

All registers are busy-writeable registers. These registers/fields can be read or written even if the module is busy. Changes to the underlying settings occur instantly. However, module behavior is unpredictable when registers are changed during processing.

For correct operation, software must:

1. Disable all accesses to the virtual space managed by the context.
2. Disable the context by clearing the [CBUFF_CTX_CTRL_i\[0\] ENABLEABLE](#) bit.
3. Change the configuration.
4. Re-enable CBUFFx by setting the [CBUFF_CTX_CTRL_i\[0\] ENABLEABLE](#) bit.

8.2.8.3.2.4 ISS CBUFF Memory-to-Memory Operation BCF

The BCF mechanism matches the bandwidth between two processes.

The BCF feature can be used in all three CBUFF modes:

- Read mode: A CPU-controlled process writes data into physical space. The BCF signal is deasserted when the physical space contains enough data to start the read initiator connected to OCPI.
- Write mode: The BCF signal controls the write initiator connected to OCPI. When the CPU-controlled process does not read the data fast enough from the physical space, the BCF signal is asserted to stall filling of the buffer. It is deasserted when enough space is available in the physical space.
- Read/write mode: The BCF signal controls the read initiator connected to OCPI. Another initiator connected to OCPI fills the physical space. The BCF signal is deasserted when the physical space contains data that can be read by the read initiator. It is deasserted when insufficient data is available in the physical space.

The CBUFF_BCF output is controlled based on two factors:

- The window count available for the OCPI initiator to read/write
- The amount of data in the last available window (pretrigger)

The CBUFF_BCF signal is enabled by the [CBUFF_CTX_CTRL_i\[7:4\]](#) BCF bit field. It defines:

- Write mode: The amount of required free windows to allow writing from the ISS. In other words, when less than the required amount of BCF windows is available for ISS writes, the stall mechanism is triggered. The number of free windows is initialized to the total window count of the context. It is decreased by 1 each time the OCPI initiator finishes writing a window. It is increased by 1 each time the CPU finishes reading a window.
- Read and read/write modes: The minimum amount of required full windows to allow reading from the OCPI. When fewer than [CBUFF_CTX_CTRL_i\[7:4\]](#) BCF windows are available for ISS read, the stall mechanism is triggered. The number of full windows is initialized to 0. It is decreased by 1 each time the OCPI initiator completes reading a window. It is increased by 1 each time the CPU/OCPI initiator finishes writing a window.

Figure 8-97 is an example of BCF use. It assumes:

- Write mode: OCPI writes data into physical space and the CPU reads it.
- Two physical windows
- $\text{CBUFF_CTX_THRESHOLD_S}_i = \text{CBUFF_CTX_THRESHOLD_F}_i$
- The OCPI write initiator is faster than the CPU.
- $\text{CBUFF_CTX_CTRL}_i[7:4] \text{ BCF} = 1$

Figure 8-97. ISS CBUF Write Mode CPU Interaction Example BCF Used

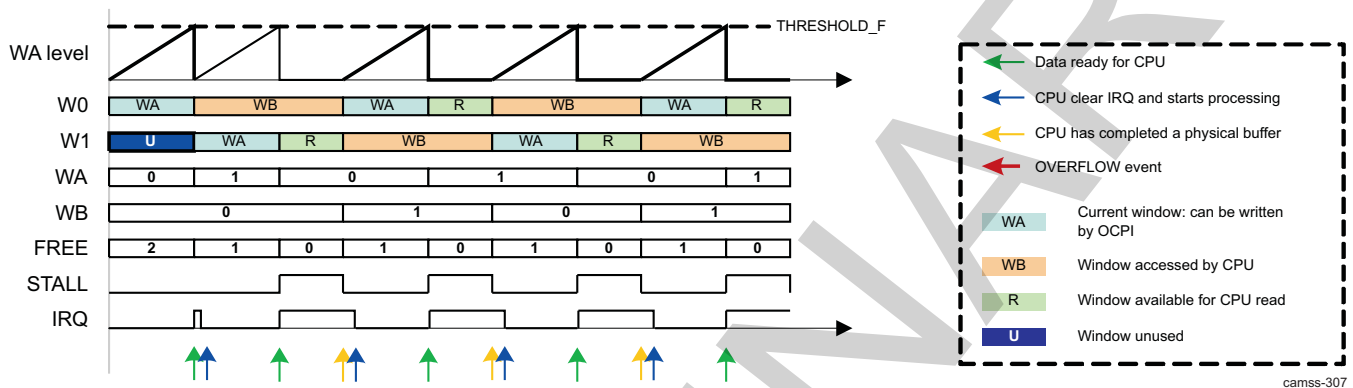


Figure 8-98 is another example. It assumes:

- Read mode: The CPU writes data into physical space and the OCPI reads it.
- Four physical windows
- $\text{CBUFF_CTX_THRESHOLD_S}_i = \text{CBUFF_CTX_THRESHOLD_F}_i$
- The OCPI read initiator is faster than the CPU. It starts after the CPU.
- $\text{CBUFF_CTX_CTRL}_i[7:4] \text{ BCF} = 2$

Figure 8-98. ISS CBUF Read Mode CPU Interaction Example (1)

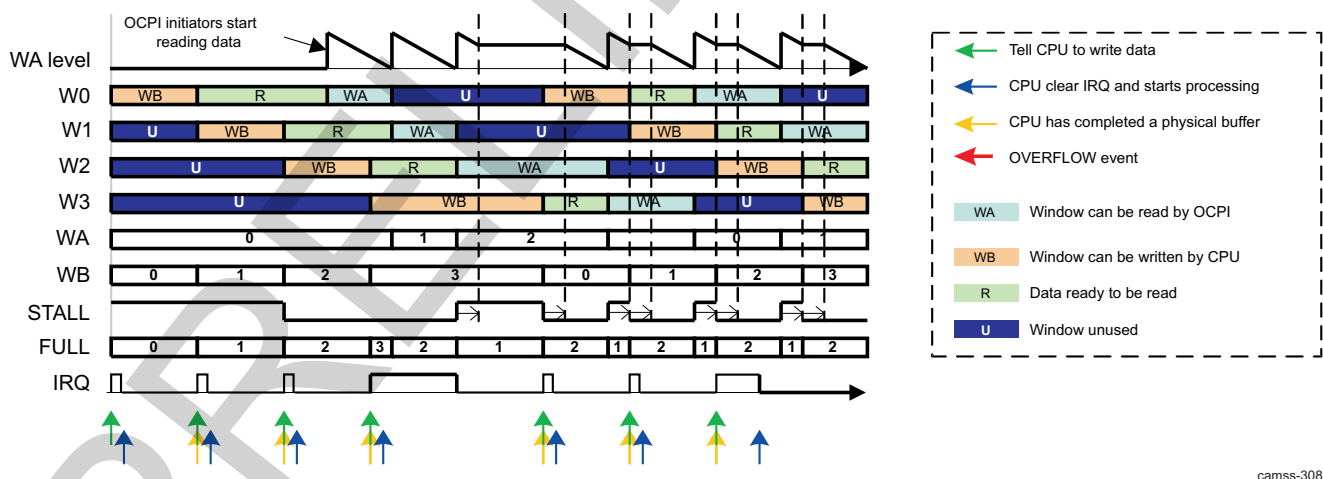


Figure 8-99 is another example. It assumes:

- Read mode: The CPU writes data into physical space and the OCPI reads it.
- Two physical windows
- $\text{CBUFF_CTX_THRESHOLD_S}_i = \text{CBUFF_CTX_THRESHOLD_F}_i$
- The OCPI read initiator is faster than the CPU. It starts after the CPU.
- $\text{CBUFF_CTX_CTRL}_i[7:4] \text{ BCF} = 1$

Figure 8-99. ISS CBUFF Read Mode CPU Interaction Example (2)

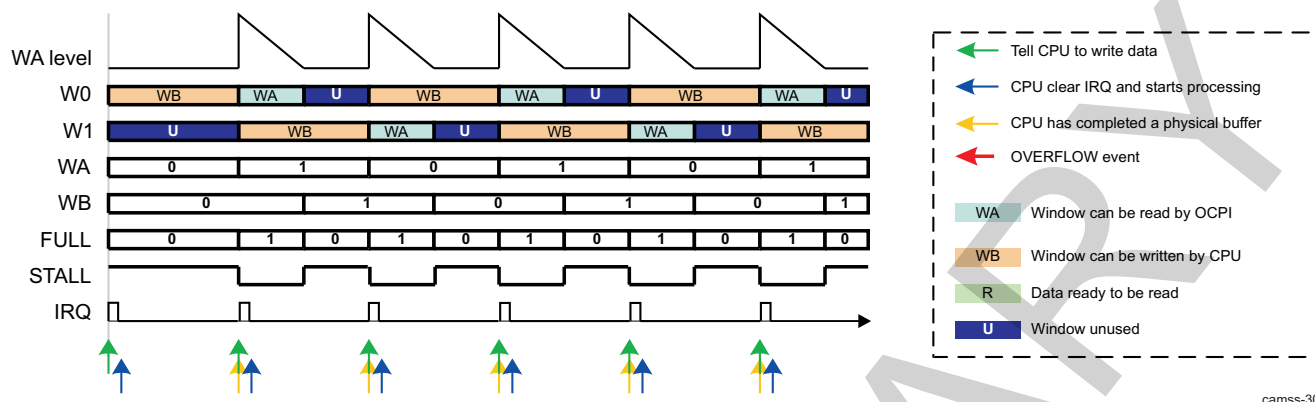


Figure 8-100 is another example. It assumes:

- Read mode: The CPU writes data into physical space and the OCPI reads it.
- Four physical windows
- $\text{CBUFF_CTX_THRESHOLD_S}_i = \text{CBUFF_CTX_THRESHOLD_F}_i$
- The OCPI read initiator is faster than the CPU. It starts after the CPU.
- $\text{CBUFF_CTX_CTRL}_i[7:4] \text{ BCF} = 1$

CBUFF supports pretriggering the BCF signal for finer latency compensation control. This mechanism is active only for the last window available for OCPI access. It typically improves the physical space use, which is particularly useful when on-chip SRAM is used as a ping-pong buffer.

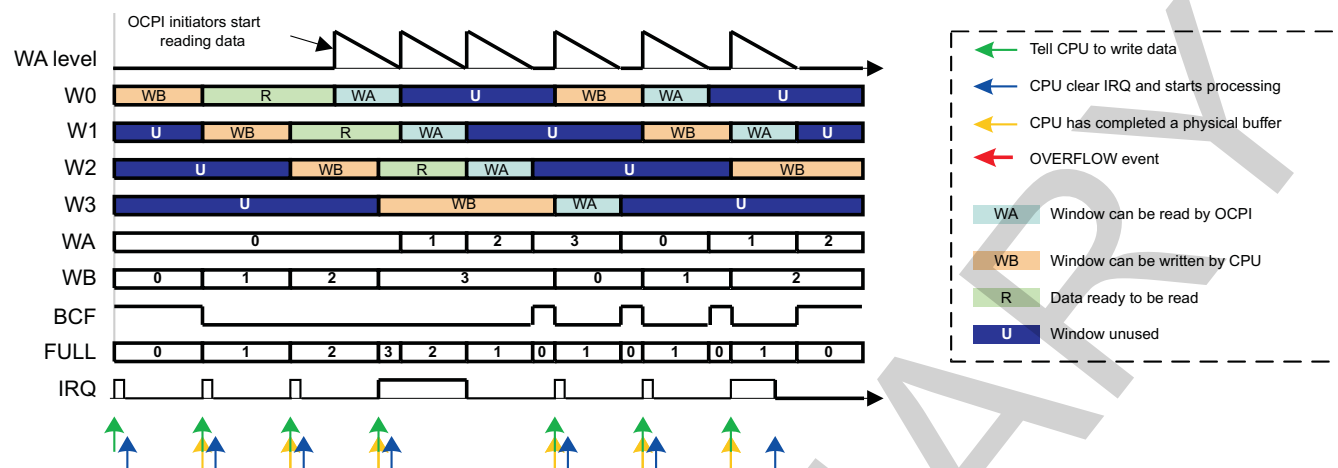
Pretriggering is controlled through the $\text{CBUFF_CTX_THRESHOLD_S}_i$ register. It defines:

- Write mode: When the fill level of the last window available for ISS writes is greater than or equal to $\text{CBUFF_CTX_THRESHOLD_S}_i$, the CBUFF_BCF signal is asserted.
- Read mode: When the amount of data in the last window available for ISS reads is less than $\text{CBUFF_CTX_THRESHOLD_F}_i / \text{CBUFF_CTX_THRESHOLD_S}_i$, the CBUFF_BCF signal is asserted.

BCF pretriggering is disabled by setting $\text{CBUFF_CTX_THRESHOLD_S}_i = \text{CBUFF_CTX_THRESHOLD_F}_i$.

Figure 8-100 is an example of BCF pretriggering, assuming the following:

- Write mode: The CPU reads data from the physical space and the OCPI writes it.
- Two physical windows
- $\text{CBUFF_CTX_THRESHOLD_S}_i = 1/3 \text{ CBUFF_CTX_THRESHOLD_F}_i$
- $\text{CBUFF_CTX_CTRL}_i[7:4] \text{ BCF} = 1$

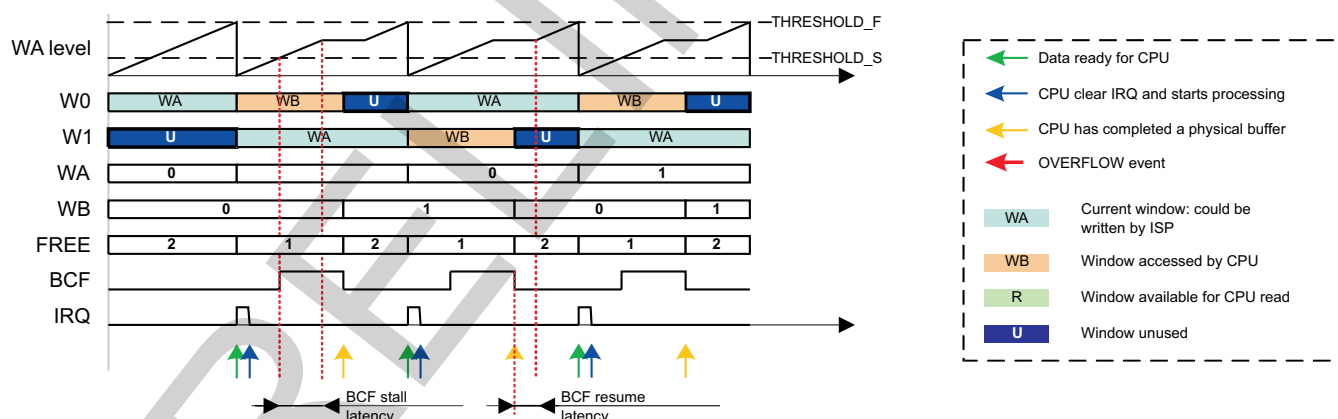
Figure 8-100. ISS CBUFF BCF Pretrigger Example: Write Mode

camss-310

The CBUFF_BCF output signal is a logical OR of all internal BCF signals of CBUFF contexts. For example, when contexts 0 and 1 have enabled the BCF feature, both contexts can request a data flow stall.

Figure 8-101 is an example of pretriggering in read mode:

- Read mode: CPU writes data into the physical space and the OCPI reads it.
- Four physical windows
- $\text{CBUFF_CTX_THRESHOLD_S}_i = 2/3 \text{ CBUFF_CTX_THRESHOLD_F}_i$
- The OCPI read initiator is faster than the CPU. It starts after the CPU.
- $\text{CBUFF_CTX_CTRL}_i[7:4] \text{ BCF} = 2$

Figure 8-101. ISS CBUFF BCF Pretrigger Example: Read Mode

camss-311

8.2.8.3.2.5 ISS CBUFF TILER Support

The CBUFF can translate 2D (BLOCK) bursts intended for the TILER. However, software must ensure that a given burst fits in a window.

The expected value for ADDR[32] is defined by the $\text{CBUFF_CTX_CTRL}_i[11]$ TILERMODE bit.

- When $\text{ADDR}[32] = \text{CBUFF_CTX_CTRL}_i[11]$ TILERMODE, the access is processed normally. ADDR[32] is not used for further processing.
- Otherwise, the access is treated as transparent.

8.2.8.3.2.6 ISS CBUFF Window Management and Address Remapping Details

This section explains the internal address remapping and windows management algorithm. Internally, the module maintains some variables in addition to the configuration registers. The module manages multiple contexts in parallel. [Table 8-270](#) lists the CBUFF internal variables.

Table 8-270. ISS CBUFF Internal Variables

| Variable | Description |
|----------|--|
| WAX | Current window index for context x. Possible values are 0 to allowed window count. The current value can be read using the CBUFF_CTX_STATUS_i[11:8] WA bit field. |
| WBx | Window in the physical space that can be accessed by the CPU in read/write modes. Window that is read from OCPI in read/write mode. Possible values are 0 to allowed window count. The current value can be read using the CBUFF_CTX_STATUS_i[3:0] WB bit field. |
| VPAX | Start address, in the virtual space, of the CBUFF_CTX_STATUS_i[11:8] WA window |
| | Used as a base pointer for the read (read mode) or write data flow (write, read/write modes) |
| | This is an internal quantity that cannot be accessed by software. |
| VPBx | Start address, in the virtual space, of the CBUFF_CTX_STATUS_i[3:0] WB window |
| | Used as a base pointer for the read data flow. |
| | This is an internal quantity that cannot be accessed by software. |
| OFFSETAx | This is an internal quantity that cannot be accessed by software. |
| OFFSETBx | Address offset used when WAX or WBx is accessed |
| LEVELAx | This is an internal quantity that cannot be accessed by software. |
| LEVELBx | Address offset used when WAX or WBx is accessed |

8.2.8.3.2.6.1 ISS CBUFF Startup

The status of a CBUFF context is reset when it is disabled. This does not affect the configuration registers or the CBUFF_IRQSTATUS register. [Table 8-271](#) lists the internal state after reset.

Table 8-271. ISS CBUFF Internal State After Reset

| Variable | Description |
|----------------------|---|
| WAX | 0 |
| WBx | 0 |
| VPAX VPBx | CBUFF_CTX_START_i |
| OFFSETAx OFFSETBx | CBUFF_CTX_START_i – CBUFF_CTX_PHY_i |
| LEVELAx LEVELBx | 0 |

8.2.8.3.2.6.2 ISS CBUFF Access Identification

For each access to the virtual space (OCPI slave port), the CBUFF first checks the address to classify the transaction into one of the categories listed in [Table 8-272](#).

Table 8-272. ISS CBUFF Address identification

| Address ID | Variable | Condition |
|------------|-----------|---|
| 0+2*x | WA_CBUFFx | CBUFF_CTX_CTRL_i[0] ENABLE = 1 and ADDR = VPAX and ADDR VPAX + CBUFF_CTX_WINDOWSIZE_i and ADDR = CBUFF_CTX_END_i and Access type = write when read/write mode is selected |
| 1+2*x | WB_CBUFFx | CBUFF_CTX_CTRL_i[0] ENABLE = 1 and CBUFF_CTX_CTRL_i[2:1] MODE = 2 and |

Table 8-272. ISS CBUFF Address identification (continued)

| Address ID | Variable | Condition |
|------------|-------------|--|
| | | Access type = read and ADDR=VPBx and ADDRVPBx + CBUFF_CTX_WINDOWSIZE_i and ADDR= CBUFF_CTX_END_i |
| 16+x | ERR_CBUFFx | CBUFF_CTX_CTRL_i[0] ENABLE = 1 and ADDR= CBUFF_CTX_START_i and ADDR= CBUFF_CTX_END_i |
| 24 | TRANSPARENT | Always true |

Lower IDs correspond to higher priorities if multiple conditions are true. For example, when the current virtual window of CBUFF 0 is accessed, at least the tests for categories WA_CBUFFx and ERR_CBUFFx are true. The final category is WA_CBUFFx, because it has a higher priority.

NOTE: Tests must be performed in parallel to match the desired performance.

Further processing depends on the category:

- TRANSPARENT: Accesses flow through the module without changing its internal state or any translation.
- ERR_CBUFFx: The module goes into error state for the concerned context and sets the [CBUFF_HL_IRQSTATUS.IRQ_CTXx_INVALID](#) bit. When the module is in error state for CBUFFx, all accesses to that buffer are cancelled. In other words, any access that has an address between [CBUFF_CTX_START_i](#) and [CBUFF_CTX_END_i](#) is not transmitted to the OCPO master port. There are two ways to leave the error state:
 - Hardware reset
 - Disable and re-enable the context in error state.

Accesses outside of the virtual space from the context in error state are not affected.
- WA_CBUFFx and WB_CBUFFx: The internal state is updated and address translation is performed when the performed access type (read or write) is compatible with the current mode (read, write, or read/write mode). Otherwise, a [CBUFF_HL_IRQSTATUS.IRQ_CTXx_INVALID](#) event is set and CBUFFx goes into the error state.

8.2.8.3.2.6.3 ISS CBUFF Address Translation

An offset is selected depending on the access category (see [Section 8.2.8.3.2.6.1, ISS CBUFF Startup](#)) and the internal state of the accessed buffer. [Table 8-273](#) lists possible cases.

Table 8-273. ISS CBUFF Address Translation

| Condition | Address Translation |
|---|--|
| CBUFF_CTX_CTRL_i[0] ENABLE = 1 and ADDR = CBUFF_CTX_START_i and ADDR = CBUFF_CTX_END_i and CBUFFx in error state | Access cancelled |
| Category = WA_CBUFFx | ADDRROUT = ADDRIN-OFFSETAx |
| Category = WB_CBUFFx | Read/write mode only ADDRROUT = ADDRIN-OFFSETBx |
| Category = ERR_CBUFFx | Access cancelled |
| Category = TRANSPARENT | ADDRROUT = ADDRIN |

8.2.8.3.2.6.4 ISS CBUFF Window Fill Level

Each time an access is performed into an active window (WA_CBUFFx when context x is enabled) the window level is updated. The corresponding LEVELy is incremented according to the BYTEEN input of the OCPI slave port. All possible BYTEEN patterns, including nonaligned ones, are supported. [Table 8-274](#) shows some examples. The basic idea is to count the number of 1s in the BYTEEN input for each 128-bit word and to sum the values.

Table 8-274. ISS CBUFF Window-Level Increment

| BYTEEN | LEVELy Increment | Comment |
|--------|------------------|----------------|
| 0x0000 | 0 | No access |
| 0x0001 | 1 | 8-bit access |
| 0x0002 | 1 | 8-bit access |
| 0x0003 | 2 | 16-bit access |
| ... | ... | ... |
| 0x0007 | 3 | 24-bit access |
| ... | ... | ... |
| 0x000F | 4 | 32-bit access |
| ... | ... | ... |
| 0x00F0 | 4 | 32-bit access |
| ... | ... | ... |
| 0xFFFF | 16 | 128-bit access |

The window level is compared to CBUFFx_THRESHOLD. [Table 8-275](#) lists the situations that may occur:

Table 8-275. ISS CBUFF Window-Level Comparison⁽¹⁾

| Condition | Description |
|-----------------------------------|--|
| LEVELAx = CBUFF_CTX_THRESHOLD_F_i | The CBUFF_CTX_STATUS_i[11:8] WA bit field of context x is full (write mode) or empty (read mode). Internal window indexes, levels, and offsets are updated. |
| LEVELBx = CBUFF_CTX_THRESHOLD_F_i | Read/write mode only Window used to handle the read flow of context x is empty. Internal window indexes, levels, and offsets are updated. |

⁽¹⁾ All situations described in [Table 8-275](#) are mutually exclusive because only one level is updated each cycle.

8.2.8.3.2.6.5 ISS CBUFF Window Pointer and Offset Update

The following description refers to the update of WA in write mode:

When the current window of a context is full:

- A new window is opened. The update is done in a circular manner: the first physical window in is reused after the last one.
 - WA (WA + 1) modulo the number defined by CBUFF_CTX_CTRL_i[9:8] WCOUNT
 - LEVELA - 0
 - VPA - VPA + CBUFF_CTX_WINDOWSIZE_i
- When the window is moved from the last buffer to the first:
 - OFFSETA - OFFSETA + CBUFF_CTX_WINDOWSIZE_i (CBUFF_CTX_CTRL_i[9:8] WCOUNT + 1)
- Otherwise, OFFSETA does not change.

The algorithm used to update WA in read mode is the same, except that *full* refers to *all data of the window has been read or window empty*.

For read/write mode, the same algorithm is used to translate reads to the WBx window. Make the following changes:

- Replace WA with WB.
- Replace LEVELA with LEVELB.
- Replace VPA with VPB.
- Replace OFFSETA with OFFSETB.

8.2.8.3.2.7 ISS CBUFF Error State

Contexts may go into error state when they receive unexpected accesses. In that case, the CBUFF does not send dummy transactions to the OCPO port. It does not forward the failing transactions to OCPO and returns valid responses (SResp = DVA) on OCPI to preserve the integrity of the OCP.

Responses may be received on OCPO while the CBUFF responds to failing transactions on OCPI. The OCPO response phase is stalled (MRespAccept = 0) during that time to prevent corruption. OCPO cannot be stalled longer than one full OCP transaction. Responses received on OCPO are handled before another internally generated response can be sent back to the OCPI. In that case, command and data phases are eventually stalled. Not stalling OCPO for too long is required to avoid affecting system performance.

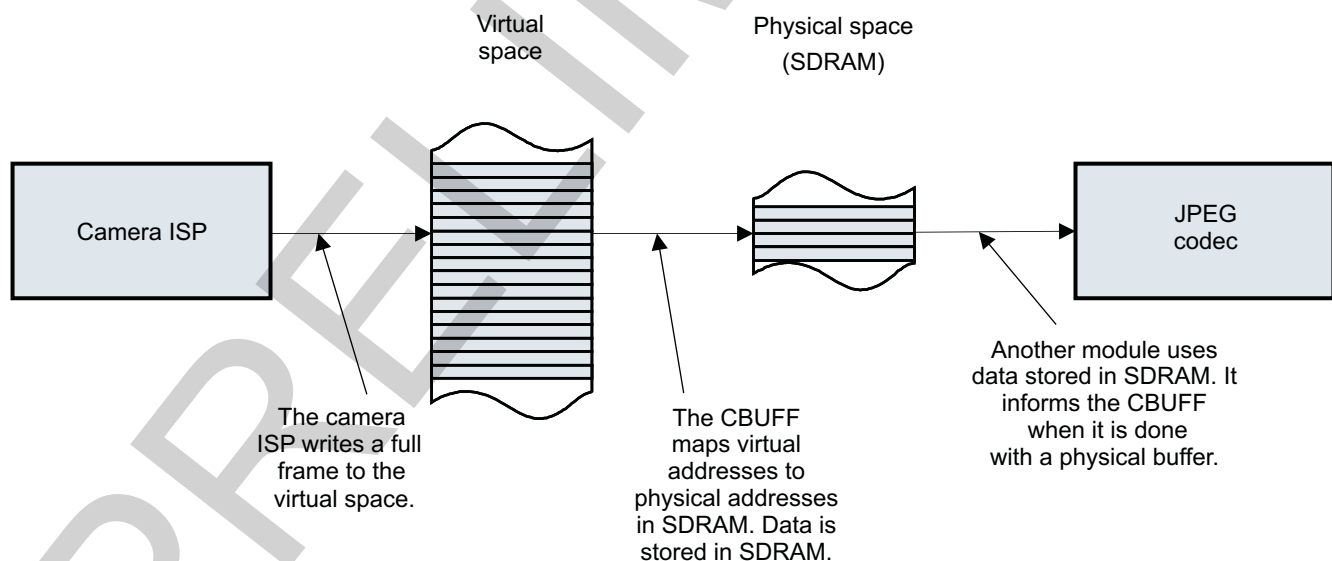
During normal operation (that is, no context is in error state), the OCPO response phase is never stalled.

8.2.8.3.2.8 ISS CBUFF Typical Configurations

8.2.8.3.2.8.1 ISS CBUFF Single-Slice Buffer

An OCP master (typically, the ISS) writes data with an incremental addressing scheme to the virtual space. The physical space is smaller than the virtual space. Therefore, physical space locations are read and written multiple times. [Figure 8-102](#) shows the CBUFF single-slice buffer in write mode.

Figure 8-102. ISS CBUFF Single-Slice Buffer (Write Mode)

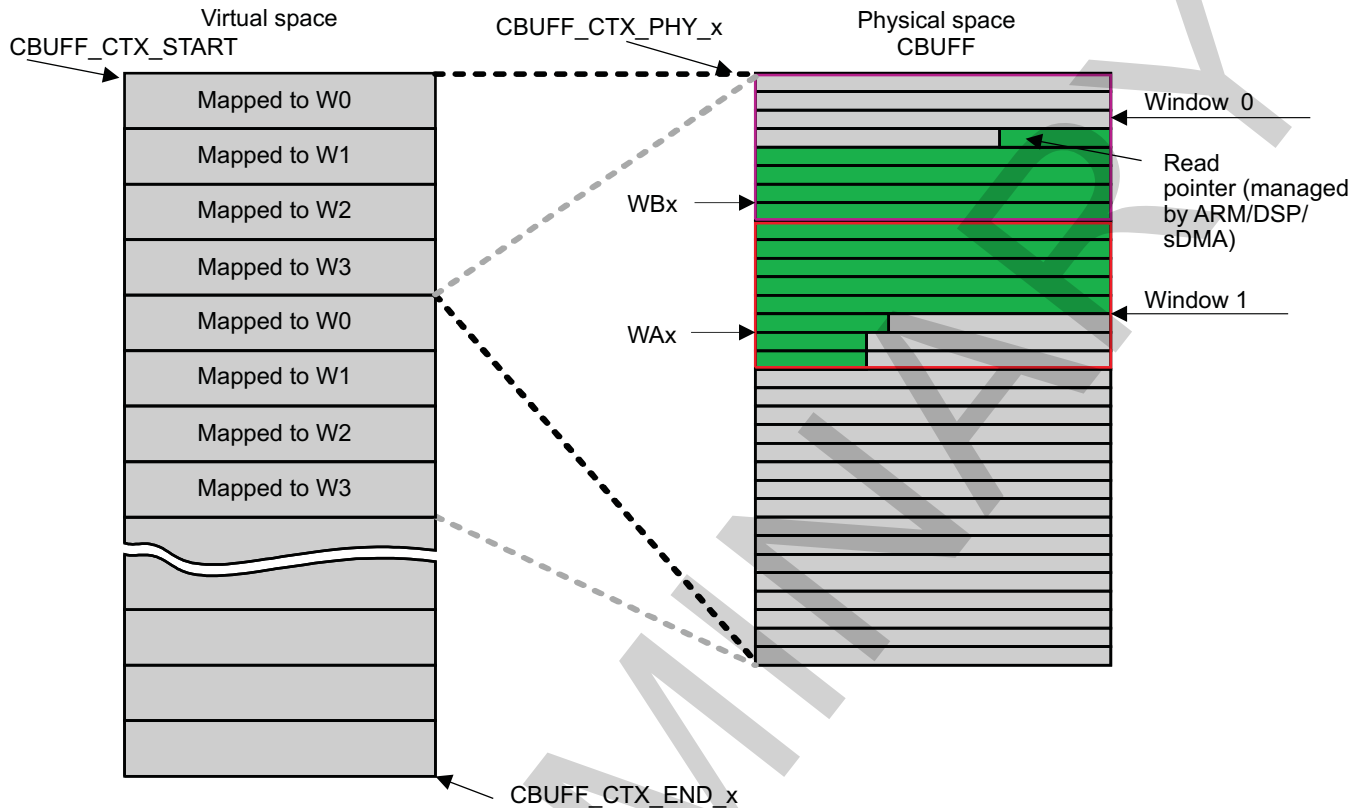


camss-313

Physically, this CBUFF is in on-chip SRAM or SDRAM. The virtual space is defined by a start and end addresses. The physical space is defined by a start address, a window size, and a window count. It is contiguous in memory. When the CPU accesses physical memory for processing, it must know if the SDRAM is available for it to access and if the CBUFF is not using it. The CPU and CBUFF cannot track each other. For example, an interrupt must be triggered from the SIMCOP to the CBUFF to notify it when the processor is done working with SDRAM. For more information about the software configuration for these interrupts, see [Section 8.2.8.3.2.2.1, ISS CBUFF Write Mode](#).

Figure 8-103 shows the buffer organization for a 4-window buffer.

Figure 8-103. ISS CBUFF Single-Slice Buffer Example (Write Mode)



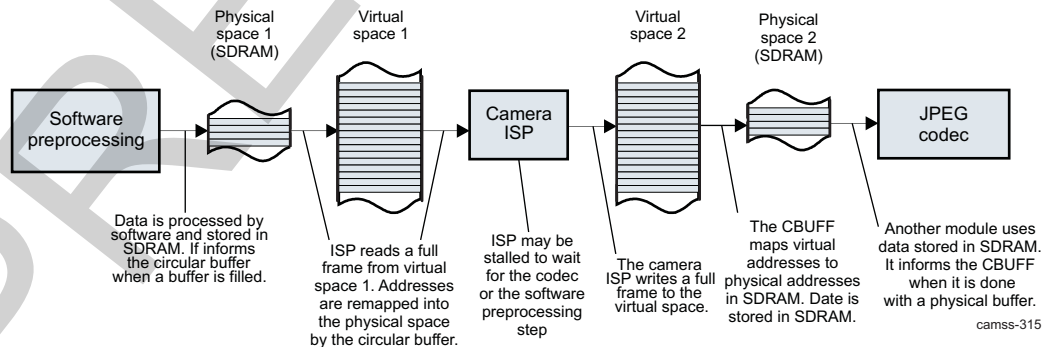
camss-314

The CBUFF can manage multiple contexts in single-slice mode.

8.2.8.3.2.8.2 ISS CBUFF Extended-Slice Buffer

In extended-slice mode, at least two contexts managed by the CBUFF are used together. The two contexts provide address translation, one for the read data flow and the other for a write data flow. Figure 8-104 is an example of the CBUFF extended-slice buffer.

Figure 8-104. ISS CBUFF Extended-Slice Buffer Example

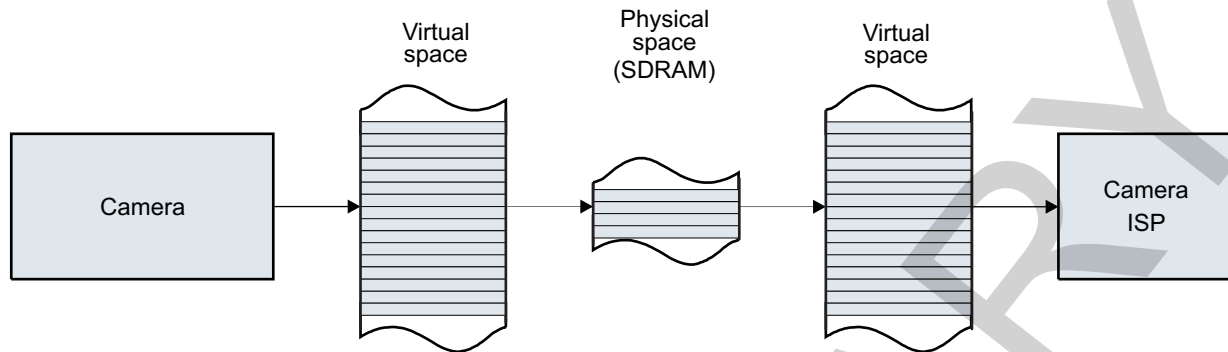


camss-315

8.2.8.3.2.9 ISS CBUFF FIFO Mode

The CBUFF can behave like a FIFO to buffer data between two initiators connected to the OCPI. A typical use case is a camera interface writing data to the FIFO and an ISP reading data from the FIFO.

Figure 8-105 shows the CBUFF FIFO mode.

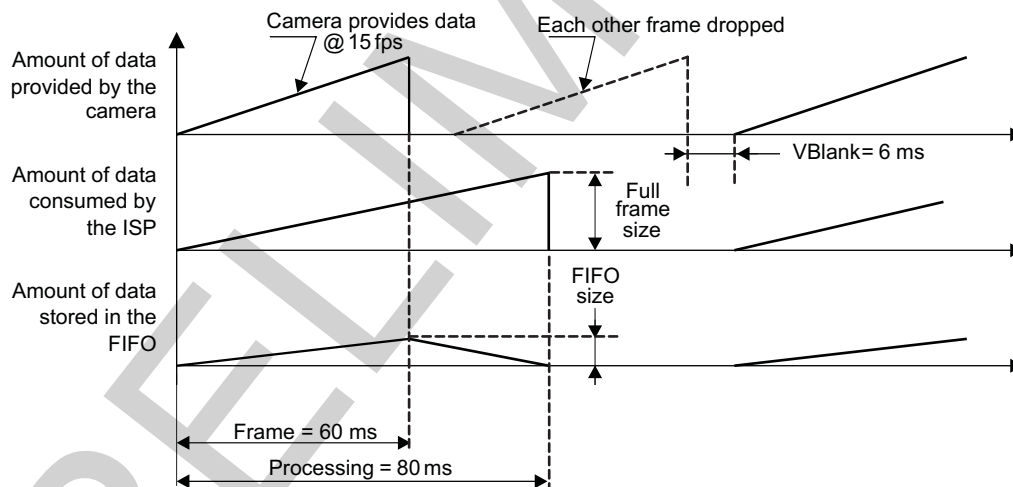
Figure 8-105. ISS CBUFF FIFO Mode

camss-316

The CBUFF is used as a FIFO when the camera provides data at a higher rate than the ISP can process. To avoid storing one or multiple full-frame buffers, a FIFO buffer is used to store the data that cannot be processed immediately.

For this example, assume that the camera provides 16 MPix at 15 frames per second at 200 Mhz. A new frame is provided every 66 ms. The ISP needs 80 ms to process this frame. Therefore, the processing cannot be done on the fly, and each other frame must be dropped.

Figure 8-106 shows the accumulated amount of data provided by the camera since the start of the frame; the amount of data consumed by the ISP since it has started processing the frame; and the difference between the two, which must be stored in the FIFO.

Figure 8-106. ISS CBUFF FIFO Use Example

camss-317

The FIFO is emulated as 16 windows (`CBUFF_CTX_CTRL_i[9:8] WCOUNT = 0x3`). The ISP is started by software when a few kilobytes of data are written to the physical space. Alternatively, the BCF mechanism can be used, but the minimum FIFO size is more complex to calculate.

The FIFO level reaches its maximum when the camera performs the last write of the frame. The camera provides the data at $1 \text{ byte/pixel} \times 16 \text{ MPix}/60 \text{ ms} = 266 \text{ MBytes/s}$. The ISP reads data at $1 \text{ byte/pixel} \times 16 \text{ MPix}/80 \text{ ms} = 200 \text{ MBytes/s}$. Therefore, the minimum FIFO size is $60 \text{ ms} \times (266 \text{ MBytes/s} - 200 \text{ MBytes/s}) = 3.96 \text{ MBytes/s}$, which is four times less than a full-frame buffer.

Each window holds 256KB of data. The camera starts writing to a new physical window every $256\text{KB}/266 \text{ MBytes/s} = 962 \mu\text{s}$. The ISP starts reading from a new physical window every $1280 \mu\text{s}$.

The FIFO mode can also be used when the ISP is slower than the camera. In that case, the ISP is stalled when insufficient data is available in the physical space.

8.2.8.4 ISS CBUFF Programming Model

8.2.8.4.1 ISS CBUFF Reset Behavior

Upon hardware or software reset of the CBUFF, all registers in the CBUFF are reset to their reset values

This software reset has the same effect as a hardware reset. ISS high-level software reset ensures that traffic is stopped on clear boundary because the CBUFF is sending data to and from other modules. ISS top-level reset is preferred. For more information about ISS software reset, see [Section 8.1.2.3, ISS Reset](#). Submodule reset is not preferred but is available through the following registers:

1. Set the [CBUFF_HL_SYSCONFIG\[0\] SOFTRESET](#) bit to 1.
2. Read the [CBUFF_HL_SYSCONFIG\[0\] SOFTRESET](#) bit to check whether it is set to 1, which means the reset occurred.

The reset is performed without waiting until all OCP traffic stops. To avoid OCP corruption, software must ensure there is no more ongoing traffic before performing a reset.

8.2.8.4.2 ISS CBUFF Register Setup

All registers of the context to be used must be initialized for correct operation. [Table 8-276](#) lists the procedure for the CBUFF register setup.

Table 8-276. ISS CBUFF Setup Register

| Step | Bit Field | Value |
|--|---|--|
| Set operation mode. | CBUFF_CTX_CTRL_i[2:1] MODE | 0x0: Write mode 0x1: Read mode 0x2: Read/write mode 0x3: Reserved |
| Define the virtual address range managed by the CBUFF. It usually corresponds to the address region where one image frame is written by the OCPI initiator. | CBUFF_CTX_START_i and CBUFF_CTX_END_i | |
| Define the start address of the physical buffer. | CBUFF_CTX_PHY_i | |
| Set the window count and size. The window size usually depends on the use of the buffer. Eight or 16 video lines correspond to a current size for JPEG video compression. A higher window count provides better latency-related overflow protection. | CBUFF_CTX_CTRL_i[9:8] WCOUNT and CBUFF_CTX_WINDOWSIZE_i | |
| When the 2D addressing capability is not used, set to the window size in CBUFF_CTX_THRESHOLD_F_i . Otherwise, it is set to a smaller value depending on the buffer organization. For example, when each window corresponds to lines by 4096 pixels, but the ISP sends lines of only 2560 pixels, CBUFF_CTX_WINDOWSIZE_i = 8 4096 and CBUFF_CTX_THRESHOLD_F_i = 8 2560. | CBUFF_CTX_THRESHOLD_F_i | |
| BCF signal-generation configuration is optional. | CBUFF_CTX_THRESHOLD_S_i and CBUFF_CTX_CTRL_i[7:4] BCF | |
| Enable the module. It can be disabled by clearing the ENABLE bit. This must be done only when there are no more outstanding requests to the virtual space managed by CBUFFx. All internal FSMs and counters of the CBUFF are reset when it is disabled. Pending interrupts are not affected. | CBUFF_CTX_CTRL_i[0] ENABLE | |

8.2.8.5 ISS CBUFF Register Manual

8.2.8.5.1 ISS CBUFF Instance Summary

[Table 8-277](#) lists the CBUFF instance.

Table 8-277. ISS CBUFF Instance Summary

| Module Name | L3 Base Address | Size |
|-------------|-----------------|-----------|
| ISS_CBUFF | 0x5200 1800 | 512 bytes |

8.2.8.5.2 ISS CBUFF Registers

8.2.8.5.2.1 ISS CBUFF Register Summary

Table 8-278 summarizes the CBUFF registers.

Table 8-278. ISS CBUFF Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_CBUFF Base Address |
|---|------|-----------------------|--------------------------|--------------------------|
| CBUFF_HL_REVISION | R | 32 | 0x0000 0000 | 0x5200 1800 |
| CBUFF_HL_HWINFO | R | 32 | 0x0000 0004 | 0x5200 1804 |
| CBUFF_HL_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5200 1810 |
| RESERVED | RW | 32 | 0x0000 001C | 0x5200 181C |
| CBUFF_HL_IRQSTATUS_RAW | RW | 32 | 0x0000 0020 | 0x5200 1820 |
| CBUFF_HL_IRQSTATUS | RW | 32 | 0x0000 0024 | 0x5200 1824 |
| CBUFF_HL_IRQENABLE_SET | RW | 32 | 0x0000 0028 | 0x5200 1828 |
| CBUFF_HL_IRQENABLE_CLR | RW | 32 | 0x0000 002C | 0x5200 182C |
| CBUFF_FRAG_ADDR_j ⁽¹⁾ | RW | 32 | 0x0000 0080 + (0x4 * j) | 0x5200 1880 + (0x4 * j) |
| CBUFF_CTX_CTRL_i ⁽²⁾ | RW | 32 | 0x0000 0100 + (0x20 * i) | 0x5200 1900 + (0x20 * i) |
| CBUFF_CTX_START_i ⁽²⁾ | RW | 32 | 0x0000 0104 + (0x20 * i) | 0x5200 1904 + (0x20 * i) |
| CBUFF_CTX_END_i ⁽²⁾ | RW | 32 | 0x0000 0108 + (0x20 * i) | 0x5200 1908 + (0x20 * i) |
| CBUFF_CTX_WINDOW_SIZE_i ⁽²⁾ | RW | 32 | 0x0000 010C + (0x20 * i) | 0x5200 190C + (0x20 * i) |
| CBUFF_CTX_THRESH_OLD_F_i ⁽²⁾ | RW | 32 | 0x0000 0110 + (0x20 * i) | 0x5200 1910 + (0x20 * i) |
| CBUFF_CTX_THRESH_OLD_S_i ⁽²⁾ | RW | 32 | 0x0000 0114 + (0x20 * i) | 0x5200 1914 + (0x20 * i) |
| CBUFF_CTX_STATUS_i ⁽²⁾ | R | 32 | 0x0000 0118 + (0x20 * i) | 0x5200 1918 + (0x20 * i) |
| CBUFF_CTX_PHY_i ⁽²⁾ | RW | 32 | 0x0000 011C + (0x20 * i) | 0x5200 191C + (0x20 * i) |

⁽¹⁾ j = 0 to 15

⁽²⁾ i = 0 to 7

8.2.8.5.2.2 ISS CBUFF Register Description

Table 8-279 through Table 8-310 describe the CBUFF registers.

Table 8-279. CBUF_HL_REVISION

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0000 | Instance | ISS_CBUF |
| Physical Address | 0x5200 1800 | | |
| Description | IP revision identifier (X.Y.R) Used by software to track features, bugs, and compatibility | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP Revision | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 8-280. Register Call Summary for Register CBUF_HL_REVISION

ISS Interfaces

- [ISS CBUF Register Summary: \[0\]](#)

Table 8-281. CBUF_HL_HWINFO

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0004 | Instance | ISS_CBUF |
| Physical Address | 0x5200 1804 | | |
| Description | Information about the IP module's hardware configuration. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----------|----------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CONTEXTS | ENABLE FRAGMENTATION |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:1 | CONTEXTS | Number of contexts Read 0x3: Reserved Read 0x2: 8 contexts Read 0x1: 4 contexts Read 0x0: 2 contexts | R | 0x1 |
| 0 | ENABLE_FRAGMENTATION | Provides information to software if fragmentation support is available Read 0x1: Yes Read 0x0: No | R | 0 |

Table 8-282. Register Call Summary for Register CBUF_HL_HWINFO

ISS Interfaces

- [ISS CBUF Register Summary: \[0\]](#)

Table 8-283. CBUF_HL_SYSCONFIG

| | | | |
|------------------|--------------------------------|----------|-----------|
| Address Offset | 0x0000 0010 | Instance | ISS_CBUFF |
| Physical Address | 0x5200 1810 | | |
| Description | Clock management configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------|----------|-----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | IDLEMODE | RESERVED | SOFTRESET | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:2 | IDLEMODE | Configuration of the local target state management mode. By definition, target can handle read/write transaction as long as it is out of IDLE state. 0x0: Force-idle mode: local target's idle state follows (acknowledges) the system's idle requests unconditionally, that is, regardless of the IP module's internal requirements. Backup mode, for debug only. 0x1: No-idle mode: local target never enters IDLE state. Backup mode, for debug only. 0x3: Reserved 0x2: Smart-idle mode: local target's IDLE state eventually follows (acknowledges) the system's IDLE requests, depending on the IP module's internal requirements. IP module shall not generate (IRQ- or DMA-request-related) wake-up events. | RW | 0x2 |
| 1 | RESERVED | | R | 0 |
| 0 | SOFTRESET | Software reset Write 0x0: No action Write 0x1: Initiate software reset Read 0x1: Reset (software or other) ongoing Read 0x0: Reset done, no pending action | RW | 0 |

Table 8-284. Register Call Summary for Register CBUF_HL_SYSCONFIG

ISS Interfaces

- [ISS CBUF Reset and Idle Mechanism: \[0\] \[1\]](#)
- [ISS CBUF Reset Behavior: \[2\] \[3\]](#)
- [ISS CBUF Register Summary: \[4\]](#)

Table 8-285. CBUF_HL_IRQSTATUS_RAW

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0020 | Instance | ISS_CBUF |
| Physical Address | 0x5200 1820 | | |
| Description | Per-event raw interrupt status vector. Raw status is set even if event is not enabled. Write 1 to set the (raw) status, mostly for debug. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------|---|---|---|---|---|---|---|-------------|
| IRQ_CTX7_OVR | IRQ_CTX6_OVR | IRQ_CTX5_OVR | IRQ_CTX4_OVR | IRQ_CTX3_OVR | IRQ_CTX2_OVR | IRQ_CTX1_OVR | IRQ_CTX0_OVR | IRQ_CTX7_INVALID | IRQ_CTX6_INVALID | IRQ_CTX5_INVALID | IRQ_CTX4_INVALID | IRQ_CTX3_INVALID | IRQ_CTX2_INVALID | IRQ_CTX1_INVALID | IRQ_CTX0_INVALID | IRQ_CTX7_READY | IRQ_CTX6_READY | IRQ_CTX5_READY | IRQ_CTX4_READY | IRQ_CTX3_READY | IRQ_CTX2_READY | IRQ_CTX1_READY | IRQ_CTX0_READY | RESERVED | | | | | | | | IRQ_OCP_ERR |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|---------------|-------|
| 31 | IRQ_CTX7_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 30 | IRQ_CTX6_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 29 | IRQ_CTX5_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 28 | IRQ_CTX4_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 27 | IRQ_CTX3_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 26 | IRQ_CTX2_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |

ISS Interfaces

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|-------|
| 25 | IRQ_CTX1_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 24 | IRQ_CTX0_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 23 | IRQ_CTX7_INVALID | Invalid access. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 22 | IRQ_CTX6_INVALID | Invalid access. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 21 | IRQ_CTX5_INVALID | Invalid access. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 20 | IRQ_CTX4_INVALID | Invalid access. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 19 | IRQ_CTX3_INVALID | Invalid access. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 18 | IRQ_CTX2_INVALID | Invalid access. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 17 | IRQ_CTX1_INVALID | Invalid access. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|-------|
| 16 | IRQ_CTX0_INVALID | Invalid access. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 15 | IRQ_CTX7_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 14 | IRQ_CTX6_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 13 | IRQ_CTX5_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 12 | IRQ_CTX4_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 11 | IRQ_CTX3_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 10 | IRQ_CTX2_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 9 | IRQ_CTX1_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|---------------|-------|
| 8 | IRQ_CTX0_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | IRQ_OCP_ERR | OCP error received in the master port. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |

Table 8-286. Register Call Summary for Register CBUFF_HL_IRQSTATUS_RAW

ISS Interfaces

- [ISS CBUFF Interrupts: \[0\] \[1\]](#)
- [ISS CBUFF Register Summary: \[2\]](#)

Table 8-287. CBUFF_HL_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 0024 | Instance | ISS_CBUFF |
| Physical Address | 0x5200 1824 | | |
| Description | Per-event "enabled" interrupt status vector. Enabled status is not set unless event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------|---|---|---|---|---|---|---|-------------|
| IRQ_CTX7_OVR | IRQ_CTX6_OVR | IRQ_CTX5_OVR | IRQ_CTX4_OVR | IRQ_CTX3_OVR | IRQ_CTX2_OVR | IRQ_CTX1_OVR | IRQ_CTX0_OVR | IRQ_CTX7_INVALID | IRQ_CTX6_INVALID | IRQ_CTX5_INVALID | IRQ_CTX4_INVALID | IRQ_CTX3_INVALID | IRQ_CTX2_INVALID | IRQ_CTX1_INVALID | IRQ_CTX0_INVALID | IRQ_CTX7_READY | IRQ_CTX6_READY | IRQ_CTX5_READY | IRQ_CTX4_READY | IRQ_CTX3_READY | IRQ_CTX2_READY | IRQ_CTX1_READY | IRQ_CTX0_READY | RESERVED | | | | | | | | IRQ_OCP_ERR |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|---------------|-------|
| 31 | IRQ_CTX7_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 30 | IRQ_CTX6_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|-------|
| 29 | IRQ_CTX5_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 28 | IRQ_CTX4_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 27 | IRQ_CTX3_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 26 | IRQ_CTX2_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 25 | IRQ_CTX1_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 24 | IRQ_CTX0_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 23 | IRQ_CTX7_INVALID | Invalid access. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 22 | IRQ_CTX6_INVALID | Invalid access. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 21 | IRQ_CTX5_INVALID | Invalid access. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|-------|
| 20 | IRQ_CTX4_INVALID | Invalid access. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 19 | IRQ_CTX3_INVALID | Invalid access. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 18 | IRQ_CTX2_INVALID | Invalid access. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 17 | IRQ_CTX1_INVALID | Invalid access. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 16 | IRQ_CTX0_INVALID | Invalid access. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 15 | IRQ_CTX7_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 14 | IRQ_CTX6_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 13 | IRQ_CTX5_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 12 | IRQ_CTX4_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|---------------|-------|
| 11 | IRQ_CTX3_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 10 | IRQ_CTX2_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 9 | IRQ_CTX1_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 8 | IRQ_CTX0_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | IRQ_OCP_ERR | OCP error received in the master port. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |

Table 8-288. Register Call Summary for Register CBUF_HL_IRQSTATUS

ISS Interfaces

- [ISS CBUF Interrupts: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS CBUF Window Management and Address Remapping Details: \[4\] \[5\]](#)
- [ISS CBUF Register Summary: \[6\]](#)

Table 8-289. CBUF_HL_IRQENABLE_SET

| | | | |
|------------------|---|----------|----------|
| Address Offset | 0x0000 0028 | Instance | ISS_CBUF |
| Physical Address | 0x5200 1828 | | |
| Description | Per-event interrupt enable bit vector. Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. | | |
| Type | RW | | |

ISS Interfaces

www.ti.com

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------|---|---|---|---|---|---|---|-------------|
| IRQ_CTX7_OVR | IRQ_CTX6_OVR | IRQ_CTX5_OVR | IRQ_CTX4_OVR | IRQ_CTX3_OVR | IRQ_CTX2_OVR | IRQ_CTX1_OVR | IRQ_CTX0_OVR | IRQ_CTX7_INVALID | IRQ_CTX6_INVALID | IRQ_CTX5_INVALID | IRQ_CTX4_INVALID | IRQ_CTX3_INVALID | IRQ_CTX2_INVALID | IRQ_CTX1_INVALID | IRQ_CTX0_INVALID | IRQ_CTX7_READY | IRQ_CTX6_READY | IRQ_CTX5_READY | IRQ_CTX4_READY | IRQ_CTX3_READY | IRQ_CTX2_READY | IRQ_CTX1_READY | IRQ_CTX0_READY | RESERVED | | | | | | | | IRQ_OCP_ERR |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|---------------|-------|
| 31 | IRQ_CTX7_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 30 | IRQ_CTX6_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 29 | IRQ_CTX5_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 28 | IRQ_CTX4_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 27 | IRQ_CTX3_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 26 | IRQ_CTX2_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 25 | IRQ_CTX1_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 24 | IRQ_CTX0_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|-------|
| 23 | IRQ_CTX7_INVALID | Invalid access. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 22 | IRQ_CTX6_INVALID | Invalid access. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 21 | IRQ_CTX5_INVALID | Invalid access. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 20 | IRQ_CTX4_INVALID | Invalid access. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 19 | IRQ_CTX3_INVALID | Invalid access. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 18 | IRQ_CTX2_INVALID | Invalid access. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 17 | IRQ_CTX1_INVALID | Invalid access. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 16 | IRQ_CTX0_INVALID | Invalid access. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 15 | IRQ_CTX7_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|---------------|-------|
| 14 | IRQ_CTX6_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 13 | IRQ_CTX5_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 12 | IRQ_CTX4_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 11 | IRQ_CTX3_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 10 | IRQ_CTX2_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 9 | IRQ_CTX1_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 8 | IRQ_CTX0_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | IRQ_OCP_ERR | OCP error received in the master port. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |

Table 8-290. Register Call Summary for Register CBUFF_HL_IRQENABLE_SET

ISS Interfaces

- [ISS CBUFF Interrupts: \[0\]](#)
- [ISS CBUFF Register Summary: \[1\]](#)

Table 8-291. CBUFF_HL_IRQENABLE_CLR

| | | | |
|-------------------------|--|-----------------|-----------|
| Address Offset | 0x0000 002C | Instance | ISS_CBUFF |
| Physical Address | 0x5200 182C | | |
| Description | Per-event interrupt enable bit vector, line 0. Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------|---|---|---|---|---|---|---|-------------|
| IRQ_CTX7_OVR | IRQ_CTX6_OVR | IRQ_CTX5_OVR | IRQ_CTX4_OVR | IRQ_CTX3_OVR | IRQ_CTX2_OVR | IRQ_CTX1_OVR | IRQ_CTX0_OVR | IRQ_CTX7_INVALID | IRQ_CTX6_INVALID | IRQ_CTX5_INVALID | IRQ_CTX4_INVALID | IRQ_CTX3_INVALID | IRQ_CTX2_INVALID | IRQ_CTX1_INVALID | IRQ_CTX0_INVALID | IRQ_CTX7_READY | IRQ_CTX6_READY | IRQ_CTX5_READY | IRQ_CTX4_READY | IRQ_CTX3_READY | IRQ_CTX2_READY | IRQ_CTX1_READY | IRQ_CTX0_READY | RESERVED | | | | | | | | IRQ_OCP_ERR |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|---------------|-------|
| 31 | IRQ_CTX7_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 30 | IRQ_CTX6_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 29 | IRQ_CTX5_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 28 | IRQ_CTX4_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 27 | IRQ_CTX3_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |

ISS Interfaces

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|---------------|-------|
| 26 | IRQ_CTX2_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 25 | IRQ_CTX1_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 24 | IRQ_CTX0_OVR | Buffer overflow event. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 23 | IRQ_CTX7_INVALID | Invalid access. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 22 | IRQ_CTX6_INVALID | Invalid access. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 21 | IRQ_CTX5_INVALID | Invalid access. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 20 | IRQ_CTX4_INVALID | Invalid access. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 19 | IRQ_CTX3_INVALID | Invalid access. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 18 | IRQ_CTX2_INVALID | Invalid access. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|---------------|-------|
| 17 | IRQ_CTX1_INVALID | Invalid access. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 16 | IRQ_CTX0_INVALID | Invalid access. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 15 | IRQ_CTX7_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 14 | IRQ_CTX6_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 13 | IRQ_CTX5_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 12 | IRQ_CTX4_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 11 | IRQ_CTX3_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 10 | IRQ_CTX2_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|---------------|-------|
| 9 | IRQ_CTX1_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 8 | IRQ_CTX0_READY | The WB physical window is ready to be accessed by the CPU. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | IRQ_OCP_ERR | OCP error received in the master port. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |

Table 8-292. Register Call Summary for Register CBUFF_HL_IRQENABLE_CLR

ISS Interfaces

- [ISS CBUFF Interrupts: \[0\]](#)
- [ISS CBUFF Register Summary: \[1\]](#)

Table 8-293. CBUFF_FRAG_ADDR_j

| | | | |
|-----------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0080 + (0x4 * j) | Index | j = 0 to 15 |
| | See Table 8-278 . | Instance | ISS_CBUFF |
| Description | Start address of the physical buffer of the CBUFF context 0. This register only exists when fragmentation support is enabled. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------|------|------------|
| 31:4 | ADDR | Address, in 128-bit words | RW | 0x00000000 |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-294. Register Call Summary for Register CBUFF_FRAG_ADDR_j

ISS Interfaces

- [ISS CBUFF Register Summary: \[0\]](#)

Table 8-295. CBUFF_CTX_CTRL_i

| | | | |
|-------------------------|--------------------------|-----------------|------------|
| Address Offset | 0x0000 0100 + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 1900 + (0x20 * i) | Instance | ISS_CBUFF |
| Description | Context control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|------|--------|-----|---|---|---|----------|------|--------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | TILERMODE | DONE | WCOUNT | BCF | | | | RESERVED | MODE | ENABLE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11 | TILERMODE | Sets the expected value for ADDR[32]. If ADDR[32]=TILERMODE, ADDR[31:4] is processed and eventually translated. Otherwise, the access is handled as transparent, regardless of the other address bits. | RW | 0 |
| 10 | DONE | Write this bit to 1 to indicate the CPU has finished processing its physical buffer. This bit is automatically cleared by hardware, reads always return 0. This bit has no effect when MODE=2 (read/write) Write 0x0: No effect. Write 0x1: The CPU has completely processed the WB physical buffer. | W | 0 |
| 9:8 | WCOUNT | Window count 0x0: 2 windows 0x1: 4 windows 0x3: 16 windows 0x2: 8 windows | RW | 0x0 |
| 7:4 | BCF | This register controls the bandwidth control feedback loop output. 0: Control loop disabled. 1-15: The control feedback loop enabled. Behavior depends on functional mode, see Section 8.2.8.3.2.4, ISS CBUFF Memory-to-Memory Operation BCF . | RW | 0x0 |
| 3 | RESERVED | | R | 0 |
| 2:1 | MODE | Selects the functional mode of this context 0x0: Write mode. ISS writes and CPU reads the physical space. CPU accesses are out of the scope of the CBUFF module; therefore, only writes are permitted between CBUFF_CTX_START__x and CBUFF_CTX_END__x. 0x1: Read mode. Hardware reads and CPU writes the physical space. CPU accesses are out of the scope of the CBUFF module; therefore, only reads are permitted between CBUFF_CTX_START__x and CBUFF_CTX_END__x. 0x2: Read/Write mode. Read and writes are monitored by the CBUFF. WB is used to track current read positions WA is used to track current write position. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | ENABLE | Enable/disable 0x0: Disables the context. This resets the internal state of the context. All accesses received on OCPI are transmitted to OCPO without modification. Disabling the context takes effect immediately. Software must ensure that no more accesses to the context are outstanding before disabling it. Otherwise memory corruption may occur. 0x1: Enable the context. All accesses between CBUFF_CTX_START__x and CBUFF_CTX_END__x are processed by the CBUFF. | RW | 0 |

Table 8-296. Register Call Summary for Register CBUFF_CTX_CTRL_i

ISS Interfaces

- [ISS CBUFF Functional Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [ISS CBUFF Events and Status Checking: \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [ISS CBUFF Memory-to-Memory Operation BCF: \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\]](#)
- [ISS CBUFF TILER Support: \[22\] \[23\]](#)
- [ISS CBUFF Window Management and Address Remapping Details: \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\]](#)
- [ISS CBUFF FIFO Mode: \[31\]](#)
- [ISS CBUFF Register Setup: \[32\] \[33\] \[34\] \[35\]](#)
- [ISS CBUFF Register Summary: \[36\]](#)

Table 8-297. CBUFF_CTX_START_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0104 + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 1904 + (0x20 * i) | Instance | ISS_CBUFF |
| Description | Start address of the virtual space managed by the context | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------|------|------------|
| 31:4 | ADDR | Address, in 128-bit words | RW | 0x00000000 |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-298. Register Call Summary for Register CBUFF_CTX_START_i

ISS Interfaces

- [ISS CBUFF Window Management and Address Remapping Details: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS CBUFF Register Setup: \[5\]](#)
- [ISS CBUFF Register Summary: \[6\]](#)

Table 8-299. CBUFF_CTX_END_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0108 + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 1908 + (0x20 * i) | Instance | ISS_CBUFF |
| Description | End address of the virtual space managed by the context | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------|------|------------|
| 31:4 | ADDR | Address, in 128-bit words | RW | 0x00000000 |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-300. Register Call Summary for Register CBUFF_CTX_END_i

ISS Interfaces

- [ISS CBUFF Window Management and Address Remapping Details: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS CBUFF Register Setup: \[5\]](#)
- [ISS CBUFF Register Summary: \[6\]](#)

Table 8-301. CBUFF_CTX_WINDOWSIZE_i

| | | | |
|-------------------------|------------------------------|-----------------|------------|
| Address Offset | 0x0000 010C + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 190C + (0x20 * i) | Instance | ISS_CBUFF |
| Description | Defines the size of a window | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SIZE | | | | | | | | | | | | | | | | | | | | | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|------------------------|------|----------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:4 | SIZE | Size, in 128-bit words | RW | 0x000000 |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-302. Register Call Summary for Register CBUFF_CTX_WINDOWSIZE_i

ISS Interfaces

- [ISS CBUFF Events and Status Checking: \[0\]](#)
- [ISS CBUFF Window Management and Address Remapping Details: \[1\] \[2\] \[3\] \[4\]](#)
- [ISS CBUFF Register Setup: \[5\] \[6\]](#)
- [ISS CBUFF Register Summary: \[7\]](#)

Table 8-303. CBUF_F_CTX_THRESHOLD_F_i

| | | | |
|------------------|---|----------|------------|
| Address Offset | 0x0000 0110 + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 1910 + (0x20 * i) | Instance | ISS_CBUFF |
| Description | Threshold value used to check if a write window is full | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | THRESHOLD | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------------------|------|----------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:0 | THRESHOLD | Threshold value, in bytes | RW | 0x000000 |

Table 8-304. Register Call Summary for Register CBUF_F_CTX_THRESHOLD_F_i

ISS Interfaces

- [ISS CBUF_F Functional Modes: \[0\]](#)
- [ISS CBUF_F Memory-to-Memory Operation BCF: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [ISS CBUF_F Window Management and Address Remapping Details: \[9\] \[10\]](#)
- [ISS CBUF_F Register Setup: \[11\] \[12\] \[13\]](#)
- [ISS CBUF_F Register Summary: \[14\]](#)

Table 8-305. CBUF_S_CTX_THRESHOLD_S_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0114 + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 1914 + (0x20 * i) | Instance | ISS_CBUFF |
| Description | Threshold value used to control the BCF synchronization mechanism | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | THRESHOLD | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------------------|------|----------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:0 | THRESHOLD | Threshold value, in bytes | RW | 0x000000 |

Table 8-306. Register Call Summary for Register CBUF_S_CTX_THRESHOLD_S_i

ISS Interfaces

- [ISS CBUF_S Functional Modes: \[0\]](#)
- [ISS CBUF_S Memory-to-Memory Operation BCF: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [ISS CBUF_S Register Setup: \[11\]](#)
- [ISS CBUF_S Register Summary: \[12\]](#)

Table 8-307. CBUFCTX_STATUS_i

| | | | |
|-------------------------|--------------------------|-----------------|------------|
| Address Offset | 0x0000 0118 + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 1918 + (0x20 * i) | Instance | ISS_CBUFF |
| Description | Status register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WA | | | | RESERVED | | | | WB | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:8 | WA | Valid values depend on the CBUFF_CTX_CTRL__x.WCOUNT register. | R | 0x0 |
| 7:4 | RESERVED | | R | 0x0 |
| 3:0 | WB | Valid values depend on the CBUFF_CTX_CTRL__x.WCOUNT register. | R | 0x0 |

Table 8-308. Register Call Summary for Register CBUFCTX_STATUS_i

ISS Interfaces

- [ISS CBUFCTX Interrupts: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS CBUFCTX Functional Modes: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [ISS CBUFCTX Events and Status Checking: \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [ISS CBUFCTX Window Management and Address Remapping Details: \[24\] \[25\] \[26\] \[27\] \[28\]](#)
- [ISS CBUFCTX Register Summary: \[29\]](#)

Table 8-309. CBUFCTX_PHY_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 011C + (0x20 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5200 191C + (0x20 * i) | Instance | ISS_CBUFF |
| Description | Start address of the first physical buffer managed by the context when fragmentation support is disabled. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------------------|------|-----------|
| 31:4 | ADDR | Address, in 128 bit words. | RW | 0x0000000 |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-310. Register Call Summary for Register CBUFCTX_PHY_i

ISS Interfaces

- [ISS CBUFCTX Events and Status Checking: \[0\]](#)
- [ISS CBUFCTX Window Management and Address Remapping Details: \[1\]](#)
- [ISS CBUFCTX Register Setup: \[2\]](#)
- [ISS CBUFCTX Register Summary: \[3\]](#)

8.3 ISS ISP

This section describes the image signal processor.

8.3.1 ISS ISP Overview

The image signal processor (ISP) is part of the image subsystem (ISS) of the device and is a key component for imaging and video applications. It describes all ISP modules in the multimedia device; that is, the video port (VP), pattern generator (PG), image pipe interface (IPIPEIF), image pipe module (IPIPE), resizer (RSZ), hardware 3A (H3A), image sensor interface (ISIF), and buffer logic (BL). For better understanding, see the first top-level ISS diagram and feature list in [Section 8.1, ISS Overview](#).

8.3.1.1 ISS ISP Features

The video-processing hardware removes the need for expensive camera modules to perform processing functions. The ISS can support the following features:

- On-the-fly or memory-to-memory processing
- Up to 233-MHz pixel throughput.
- Statistic data collection:
 - On-the-fly or memory-to-memory operation
 - Data collection for auto exposure
 - Data collection for auto white balance
 - Data collection for auto focus
 - Boundary signal calculation for video stabilization
- IPIPE front end: RAW data processing:
 - On-the-fly or memory-to-memory processing
 - 16-bit-wide RAW BAYER data path between image and sensor linearization module
 - 12-bit-wide RAW BAYER data path between sensor linearization module and gamma correction module. Gamma correction module outputs 10-bit data.
 - Programmable Bayer RGB positions
 - Sensor data linearization for dynamic range extension
 - Programmable 2D lens shading compensation (LSC) correction
 - Per-pixel gain and offset control
 - Black level compensation
 - Boxcar filter
 - Data collection for histogram generation
 - Defect pixel correction (LUT_DPC) with look-up table (LUT)
 - Defect pixel correction (OTF_DPC) with on-the-fly detection and correction
 - 2D noise filtering
 - Green imbalance correction (GIC)
 - Digital gains and offset
 - 8- to 10-bit A-law decompression and 10- to 8-bit A-law compression
- IPIPE back end: RGB and YUV data processing:
 - RGB-to-RGB color correction
 - Gamma correction (GC).
 - RGB - YUV4:2:2: Color conversion, cosited chroma filtering and downsampling
 - 2D edge enhancement (EE)
 - 3D LUT for color correction
 - False chroma suppression (FCS)
- Two resizers:

- Performance: input and output rates up to 233 MPix/s
- YUV4:2:2 to RGB56, ARGB888, YUV4:2:2, and YUV4:2:0 data output
- YUV4:2:0 to YUV4:2:0 data output
- RAW to RAW data output
- Range from x1/4096 to x20. Supports memory-to-memory rescaling.

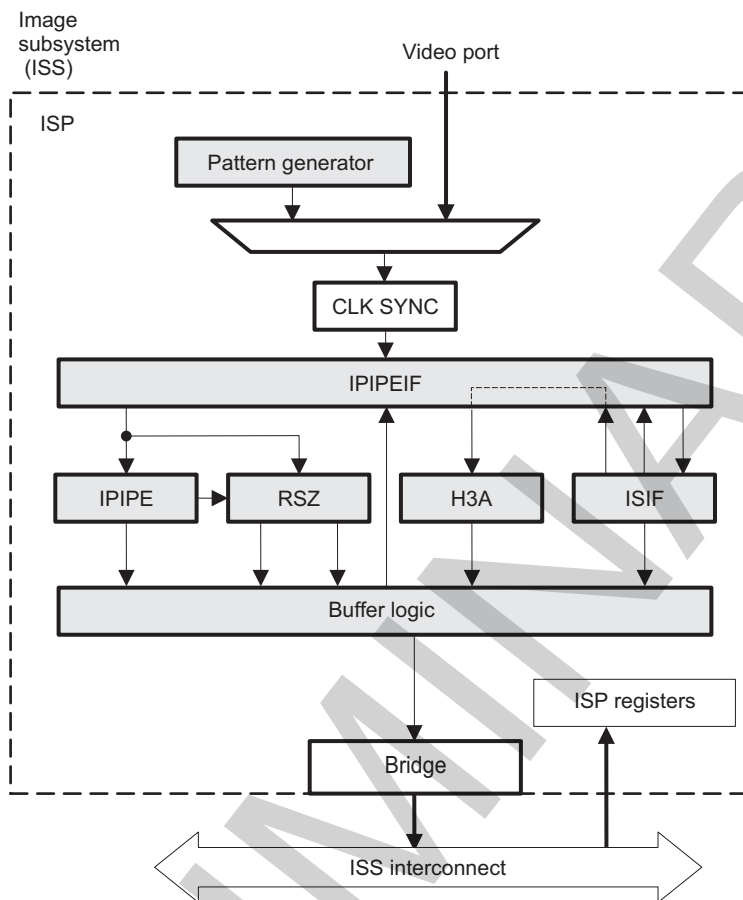
The ISP comprises the following modules:

- Pattern generator (PG)
- IPIPE interface (IPIPEIF)
- Image sensor interface (ISIF) accelerator
- Auto exposure, auto white balance, and auto focus engine (H3A)
- Image pipe accelerator (IPIPE)
- Two resizer (RSZ) accelerators
- Buffer logic (BL): Receives module requests, performs arbitration, and creates read/write bursts to the memory subsystem

8.3.1.2 ISS ISP Block Diagram

[Figure 8-107](#) is the ISP top-level block diagram. The ISS supports four simultaneous pixel flows (CCP2, CSI2 A, CSI2 B, and parallel interface [CPI]), but only one of them at a time can use the video-processing hardware; the others can go directly to memory (CPI must always use ISP).

The ISP master port is connected to the level 3 (L3) interconnect, and the slave port is connected to the level 4 (L4) interconnect.

Figure 8-107. ISS ISP Block Diagram

camss-003

8.3.2 ISS ISP Integration

This section describes the integration of the ISP modules in the ISP and includes information about clocks, resets, and hardware requests.

The ISP is part of the ISS of the device and is a key component for imaging and video applications such as camera viewfinder, video record, and still image capture.

ISS is coupled with a low interrupt latency ISS microprocessor unit (MPU) subsystem running a real-time operating system to reach optimal performance. Primarily, the ISS MPU subsystem can quickly change the ISS configuration during frame blanking periods and run some sequencing tasks.

8.3.2.1 ISS ISP PRCM Interface

The ISP and its internal modules, as integrated in the ISS, use the same power and clock management details. See [Section 8.1.2, ISS Functional Description](#), for the ISP top-level power, reset, and clock management (PRCM) Interface.

8.3.2.1.1 ISS ISP Clocks

The PRCM module, through the local power and clock management inside the ISS, provides a unique PCLK that can be enabled from the [ISP5_CTRL](#) register.

The modules inside the ISP require three clocks:

- PCLK: This clock is asynchronous to the other clocks. It is provided by the module sending the data to the IPIPEIF module on the VP.
- ISS_FCLK: This clock is synchronous with the configuration clock domain. This is the clock used for the MTC interface.
- GCK_MMR: This is the clock for the configuration bus. It is created from the ISS_FCLK and runs at half the speed of the ISS_FCLK.

8.3.2.1.2 ISS ISP Reset

The ISP supports global software reset along with internal hardware reset, if needed.

Software reset is done through the [ISP5_SYSCONFIG](#)[1] SOFTRESET bit. Before issuing a software reset, the ISP must be in standby mode. The following must be done:

1. Ensure that the interfaces are stopped from sending data and/or the ISP modules are disabled. Before reset, the last interrupt triggered by the ISP when the frame processing completes is RSZ_INT_DMA. RSZ_INT_DMA must be used to enable clean termination of the processing. Software must wait a few hundred cycles to trigger a soft reset after RSZ_INT_DMA is asserted; this is to ensure that the BL is completely drained.
2. Ensure that [ISP5_SYSCONFIG](#)[5:4] STANDBYMODE = 2 (smart standby). Write the [ISP5_CTRL](#)[24] MSTANDBY bit to 1 and poll for [ISP5_CTRL](#)[20] MSTANDBY_WAIT = 1. Then, the soft reset can be applied ([ISP5_SYSCONFIG](#)[1] SOFTRESET = 1).

In case an ISP overflow event happens (for example, RSZ_FIFO_OVF, ISIF_OVF, etc.), it is not sufficient to reset the ISP. In that case a reset must take place at the ISS level.

8.3.2.2 ISS ISP Interrupt Tree

[Table 8-311](#) summarizes the submodule interrupts that can be mapped to the four ISP interrupt output lines. After this, these output lines are mapped to the ISS top interrupt request (IRQ) merger (for more information, see [Section 8.1.2](#)). Software enables the explained before merger from the top-level ISS resources registers in [Section 8.1.2](#).

Table 8-311. ISS ISP Interrupt Tree Table

| Register | Module | Destination | Comments |
|--|----------|----------------------------------|---|
| ISP5_IRQENABLE_SET [9] IPIPEIF_IRQ | IPPIPEIF | ISP to ISS merger four IRQ lines | See Section 8.3.2.4.1 . |

Table 8-311. ISS ISP Interrupt Tree Table (continued)

| Register | Module | Destination | Comments |
|--|--------|-------------|---|
| ISP5_IRQENABLE_SET2_i[1] IPIPEIF_UDF | IPIPE | | See Section 8.3.2.5.1 . |
| ISP5_IRQENABLE_SET_i[29] IPIPE_INT_DPC_RNEW1 | | | |
| ISP5_IRQENABLE_SET_i[28] IPIPE_INT_DPC_RNEW0 | | | |
| ISP5_IRQENABLE_SET_i[27] IPIPE_INT_DPC_INI | | | |
| ISP5_IRQENABLE_SET_i[8] IPIPE_INT_HST | | | |
| ISP5_IRQENABLE_SET_i[7] IPIPE_INT_BSC | | | |
| ISP5_IRQENABLE_SET_i[6] IPIPE_INT_DMA | | | |
| ISP5_IRQENABLE_SET_i[5] IPIPE_INT_LAST_PIX | | | |
| ISP5_IRQENABLE_SET_i[4] IPIPE_INT_REG | | | |
| ISP5_IRQENABLE_SET_i[25] IPIPE_INT_EOF | | | |
| ISP5_IRQENABLE_SET2_i[4] IPIPE_HST_ERR | | | |
| ISP5_IRQENABLE_SET2_i[2] IPIPE_BOXCAR_OVF | | | |
| ISP5_IRQENABLE_SET_i[12] H3A_INT | H3A | | See Section 8.3.2.7 . |
| ISP5_IRQENABLE_SET_i[24] H3A_INT_EOF | | | |
| ISP5_IRQENABLE_SET2_i[0] H3A_OVF | | | |
| ISP5_IRQENABLE_SET_i[23] RSZ_INT_EOF1 | RSZ | | See Section 8.3.2.6.2 . |
| ISP5_IRQENABLE_SET_i[22] RSZ_INT_EOF0 | | | |
| ISP5_IRQENABLE_SET_i[19] RSZ_FIFO_IN_BLK_ERR | | | |
| ISP5_IRQENABLE_SET_i[18] RSZ_FIFO_OVF | | | |
| ISP5_IRQENABLE_SET_i[17] RSZ_INT_CYC_RZB | | | |
| ISP5_IRQENABLE_SET_i[16] RSZ_INT_CYC_RZA | | | |
| ISP5_IRQENABLE_SET_i[15] RSZ_INT_DMA | | | |
| ISP5_IRQENABLE_SET_i[14] RSZ_INT_LAST_PIX | | | |
| ISP5_IRQENABLE_SET_i[13] RSZ_INT_REG | | | |
| ISP5_IRQENABLE_SET_i[3] ISIF_INT_3 | ISIF | | See Section 8.3.2.8.1 . |
| ISP5_IRQENABLE_SET_i[2] ISIF_INT_2 | | | |
| ISP5_IRQENABLE_SET_i[1] ISIF_INT_1 | | | |
| ISP5_IRQENABLE_SET_i[0] ISIF_INT_0 | | | |
| ISP5_IRQENABLE_SET2_i[3] ISIF_OVF | | | |

8.3.2.3 ISS ISP PG Integration

See [Section 8.3.2](#), *ISS ISP Integration*.

8.3.2.4 ISS ISP IPIPEIF Integration**8.3.2.4.1 ISS ISP IPIPEIF Interrupts**

The IPIPEIF module generates two interrupts, one generic and one:

- IPIPEIF_IRQ: This event is triggered to the BL module when a new frame starts (VS signal). The interrupt is active low and is asserted for one GCK_MMR clock cycle.
- IPIPEIF_UDF: Interrupt generated when an underflow happens in the IPIPEIF module. Underflow events are nonrecoverable at the ISP level and a soft reset is required at the ISS level.

The interrupts are enabled from the [ISP5_IRQENABLE_SET_i](#)[9] IPIPEIF_IRQ and [ISP5_IRQENABLE_SET2_i](#)[1] IPIPEIF_UDF bits (where i = 0 to 3 for the line that will be mapped to the four lines of the ISP). Then, each line from the ISP is sent to the ISS top level, where it is muxed with other ISS modules for a total output of six interrupt lines. See [Section 8.1.2, ISP Top-Level Integration](#).

8.3.2.5 ISS ISP IPIPE Integration

8.3.2.5.1 ISS ISP IPIPE Interrupts

IPIPE can generate several interrupts:

- IPIPE_INT_DPC_RNEW: This event is triggered when there is permission to initialize LUT-DPC table lines 0 and 1.
- IPIPE_INT_DPC_INI: This event is triggered when the defect pixel correction (DPC) table is initialized.
- IPIPE_INT_HST: This event is triggered when the histogram is done.
- IPIPE_INT_BSC: This event is triggered when boundary signal calculation is done.
- IPIPE_INT_DMA: This event is triggered when the boxcar SDRAM transfer is done. On this timing, IPIPE_INT_EOF is sent to the BL. This event is active high for one GCK_MMR clock cycle.
- IPIPE_INT_LAST_PIX: This event is triggered when the last pixel of a frame comes into IPIPE. This event is active high for one GCK_MMR clock cycle.
- IPIPE_INT_EOF: This event is triggered for end of frame.
- IPIPE_BOXCAR_OVF: This event is generated when an overflow happens in the IPIPE-BOXCAR output buffer. The interrupt avoids polling the [IPIPE_SRC_STA](#)[0] VAL0 bit for errors. Overflow events are nonrecoverable at the ISP level and a soft reset is required at the ISS level.
- IPIPE_HST_ERR: This event is triggered when the MPU or system direct memory access (sDMA) is still reading the memory that is being used by the module. This is an indication that the read operation was not fast enough.

The interrupts are enabled from the [ISP5_IRQENABLE_SET_i](#) and [ISP5_IRQENABLE_SET2_i](#) registers (where i = 0 to 3 for the line that will be mapped to the four lines of the ISP). Then, each line from the ISP is sent to the ISS top level, where it is muxed with other ISS modules for a total output of six interrupt lines. See [Section 8.1.2, ISP Top-Level Integration](#).

8.3.2.5.2 ISS ISP DMA Requests

The ISP generally outputs four direct memory access (DMA) requests, which can be used to read or write memories inside the IPIPE module. These memories are:

- BSC memory: This memory must be read during a vertical blanking period. It is used by the video stabilization application.
- HIST memory: This memory must be read during a vertical blanking period. It is used by the 3A application. The HIST data is double-buffered from frame-to-frame. Software must select the memory that is to be used by setting the [IPIPE_HST_TBL](#)[0] SEL bit.
- GAMMA memory: This memory must be set during a vertical blanking period. The imaging application typically uses multiple gamma tables.
- DPC memory: This memory must be set during a frame acquisition. The memory is not big enough to store all faulty pixels for a given frame.

To generate the DMA requests, the following events must be used:

- The IPIPE_INT_BSC event is used to generate the DMA request for the BSC memory. It maps on DMA line 0, ISS_DMA0.
- The IPIPE_INT_HST event is used to generate the DMA request for the HIST memory. It maps on DMA line 1, ISS_DMA1. The HIST data is double-buffered from frame-to-frame. Software must select the memory that is to be used by setting the [IPIPE_HST_TBL](#)[0] SEL bit. When the DMA request is set, it is required to read 4KB from the ping buffer address (0x2000) or the pong buffer address (0x3000). Software must ensure that when one buffer is selected no other accesses (for example, MPU) take place in the other buffer.
- The IPIPE_INT_LAST_PIX event is used to generate the DMA request for the GAMMA memory. This

same event can also be used to initialize the DPC LUT (not the preferred method; it is better to use IPIPE_INT_DPC_INI). Basically, when the last pixel is output from the IPIPE module, it is safe to modify the IPIPE memories. It maps on DMA line 3, ISS_DMA3.

- The IPIPE_INT_DPC_INI event signals that DPC table memory initialization can take place. IPIPE_INT_DPC_INI is used to generate two back-to-back DMA requests, the first one mapping on IPIPE_INT_DPC_RNEW0 and the second one mapping on IPIPE_INT_DPC_RNEW1. After initialization (steady state), the IPIPE_INT_DPC_RNEW0 and IPIPE_INT_DPC_RNEW1 events are used to generate the DMA request for the DPC LUT renewal. It maps on DMA line 2, ISS_DMA2. To select which event is used to initialize the DPC (IPIPE_INT_LAST_PIX or IPIPE_INT_DPC_INI), set the [ISP5_CTRL\[25\] DPC_EVT_INI](#) bit.

NOTE: The size of the DPC table in SDRAM must be a multiple of the number of DMA requests. It ensures that during burst capture mode the DMA always loads the correct data from frame-to-frame. The DMA automatically warps back to the start of the table after all expected DMA requests are received. There is a total of $\text{ceil}(\text{nb_faulty_pixel}/128) + 2$ DMA requests per frame when the IPIPE_INT_DPC_INI EVENT is used. Hence, the size of the DPC table in the SDRAM is $(\text{ceil}(\text{nb_faulty_pixel}/128) + 2) \times 128 \times 32$ bits.

NOTE: If DMA channels are not used but the MPU is used, an error check must be performed for IPIPE HST. See [ISP5_CTRL\[26\] HST_RD_CHK](#) for details.

The DMA request assertion and deassertion to the sDMA is automatic and no software intervention is needed. The ISP contains two registers ([ISP5_DMAENABLE_SET](#) and [ISP5_DMAENABLE_CLR](#)) that must be used to enable or disable generation of the DMA requests.

The DMA request deassertion is based on late deassertion; that is, the DMA request is disabled only when all the data corresponding to the transfer size have been read or written. To deassert the DMA request and generate the hw_eoi signal, hardware counts the number of 32-bit accesses that are done in the memory range of the corresponding DMA request through the ISP slave port. When the number of accesses corresponding to the DMA request is done, the DMA request is cleared. Multiple DMA requests can be active simultaneously.

Software must not attempt to read or write in the memory range of the DMA requests that are enabled because CPU accesses, instead of sDMA accesses, will be counted. Software can freely access ISP memories for which the DMA request is disabled, and can access registers while the sDMA performs the transfers.

8.3.2.6 ISS ISP RSZ Integration

8.3.2.6.1 ISS ISP RSZ PRCM Interface

8.3.2.6.1.1 ISS ISP RSZ Reset

The resizer module has no standalone software reset. RSZ must be reset at the ISP level. See [Section 8.3.2.1.2, ISS ISP Reset](#).

8.3.2.6.2 ISS ISP RSZ Interrupts

RSZ can generate several interrupts:

- RSZ_INT_EOF0: This event is triggered for end of frame.
- RSZ_INT_EOF1: This event is triggered for end of frame.
- RSZ_FIFO_IN_BLK_ERR: This event is triggered when the minimum vertical blanking period has not been respected, thus causing errors in the input data buffering submodule. This event is triggered when the RSZ_INT_REG event of frame N is triggered before RSZ_INT_DMA of frame N + 1. This event typically happens at the transition between two frames because there is not enough vertical blanking between frames. Hardware cannot recover from this error. It requires a reset. It is a requirement that despite the error the RSZ module must finish correctly: ongoing requests are

completed and further requests are blocked.

- **RSZ_FIFO_OVF**: This event typically occurs while processing a frame, because the VP pixel clock is too high. Because hardware cannot recover from this error, a reset is required. It is a requirement that despite the error the RSZ module must finish correctly: ongoing requests are completed and further requests are blocked.

This event signifies overflow in the following scenarios:

- In Bypass or Operating (normal/downscale) modes, the **RSZ_FIFO_OVF** event is triggered when overflow occurs in the input circular data buffer. The **rsz_stall_input** signal can be asserted by programming appropriate thresholds to prevent input FIFO overflow.
- In Pass-through mode, the **RSZ_FIFO_OVF** event is triggered when overflow occurs in the output MTC buffer. There is no hardware mechanism to prevent overflow in Pass-through mode.
- **RSZ_INT_CYC_RZA/RSZ_INT_CYC_RZB**: This event is triggered as circular interrupt every time that **RSZ_IRQ_RZA/RSZ_IRQ_RZB** output lines are written out to the **RZA_SDR_Y/RZB_SDR_Y** buffer. The range can go from 1 to 8192 lines. Usually, this value must be such that the circular buffer vertical size (set by the **RZBA_SDR_Y_PTR_E/RZBB_SDR_Y_PTR_E** register) is a multiple of **RSZ_IRQ_RZA/RSZ_IRQ_RZB**.
- **RSZ_INT_DMA**: This event is triggered when the last EOF (of the two MTC interfaces) is sent out to the BL and the RSZ core returns to idle. This event is active high for one GCK_MMR clock cycle.
- **RSZ_INT_LAST_PIX**: This event is triggered when the last pixel of the valid area is received. This event is active high for one GCK_MMR clock cycle.
- **RSZ_INT_REG**: This event is triggered when the new value of the shadowed registers, if updated, takes effect on the next **RSZ_INT_REG** event. Then again, shadowed registers can be updated for the next frame after the **RSZ_INT_REG** event is triggered. This event is active high for one GCK_MMR clock cycle.

The interrupts are enabled from the **ISP5_IRQENABLE_SET_i** register (where $i = 0$ to 3 for the line that will be mapped to the four lines of the ISP). Then, each line from the ISP is sent to the ISS top level, where it is muxed with other ISS modules for a total output of six interrupt lines. See [Section 8.1.2, ISP Top-Level Integration](#).

8.3.2.7 ISS ISP H3A Integration

8.3.2.7.1 ISS ISP H3A Interrupts

H3A can generate the following interrupts:

- **H3A_INT**: This event is triggered at the end of the last window or last paxel, whichever completes last. This always triggers at the same time as **H3A_INT_EOF**.
- **H3A_INT_EOF**: This event is triggered and generated at the end of the last window. This event is active high for one GCK_MMR clock cycle.
- **H3A_OVF**: This interrupt is generated when an overflow happens in the H3A output buffer. The interrupt avoids polling the **H3A_PCR[21]** OVF bit for errors. Overflow events are nonrecoverable at the ISP level and a soft reset is required at the ISS level. The event is active high for one GCK_MMR clock cycle.

The interrupts are enabled from **ISP5_IRQENABLE_SET_i** and **ISP5_IRQENABLE_SET2_i** (where $i = 0$ to 3 for the line that will be mapped to the four lines of the ISP). Then, each line from the ISP is sent to the ISS top level, where it is muxed with other ISS modules for a total output of six interrupt lines. See [Section 8.1.2, ISP Top-Level Integration](#).

8.3.2.8 ISS ISP ISIF Integration

8.3.2.8.1 ISS ISP ISIF Interrupts

The ISIF can generate several interrupts:

- **ISIF_INT_0**: This event is triggered when the VD0 interrupt on line 0 is configured. The VD0 interrupt can be configured based on the VD position. It is asserted after receiving the number of horizontal lines (horizontal pulse signals) set in **VDINT0**. See [Section 8.3.3.7.19.1](#) for more information.

- ISIF_INT_1: This event is triggered when the VD1 interrupt on line 1 is configured. The VD1 interrupt can be configured based on the VD position. It is asserted after receiving the number of horizontal lines (horizontal pulse signals) set in VDINT1. See [Section 8.3.3.7.19.1](#) for more information.
- ISIF_INT_2: This event is triggered when the VD2 interrupt on line 2 is configured. The VD2 interrupt can be configured based on the VD position. It is asserted after receiving the number of horizontal lines (horizontal pulse signals) set in VDINT2. See [Section 8.3.3.7.19.1](#) for more information.
- ISIF_INT_3: This event is triggered LSC interrupt is an interrupt issued by the 2D-LSC block. See [Section 8.3.3.7.10.1.5](#) for more information.
- ISIF_OVF: This Interrupt is generated when an overflow happens in the ISIF module. The interrupt avoids polling the [ISIF_MODESET\[11\]](#) OVF bit for errors.

The interrupts are enabled from the [ISP5_IRQENABLE_SET_i](#) and [ISP5_IRQENABLE_SET2_i](#) registers (where i = 0 to 3 for the line that will be mapped to the four lines of the ISP). Then, each line from ISP is sent to the ISS top level where it is muxed with other ISS modules for a total output of six interrupt lines. See [Section 8.1.2](#), *ISP Top-Level integration*.

8.3.2.9 ISS ISP BL Integration

See [Section 8.3.2](#), *ISS ISP Integration*.

The functionality of the ISP is part of the overall performance of the ISS. For the top-level ISS diagram with ISP inside and for a features list, see [Section 8.1, ISS Overview](#). [Figure 8-108](#) is an overview of the ISP module. It outputs DMA and interrupt requests, has clocks coming in, and a stall signal to the CCP2 interface receiver from the resizer. It also shows the top-level configuration for input to IPIPEIF. For the scaled-in functional details of each submodule inside the ISP, see its functional description section.

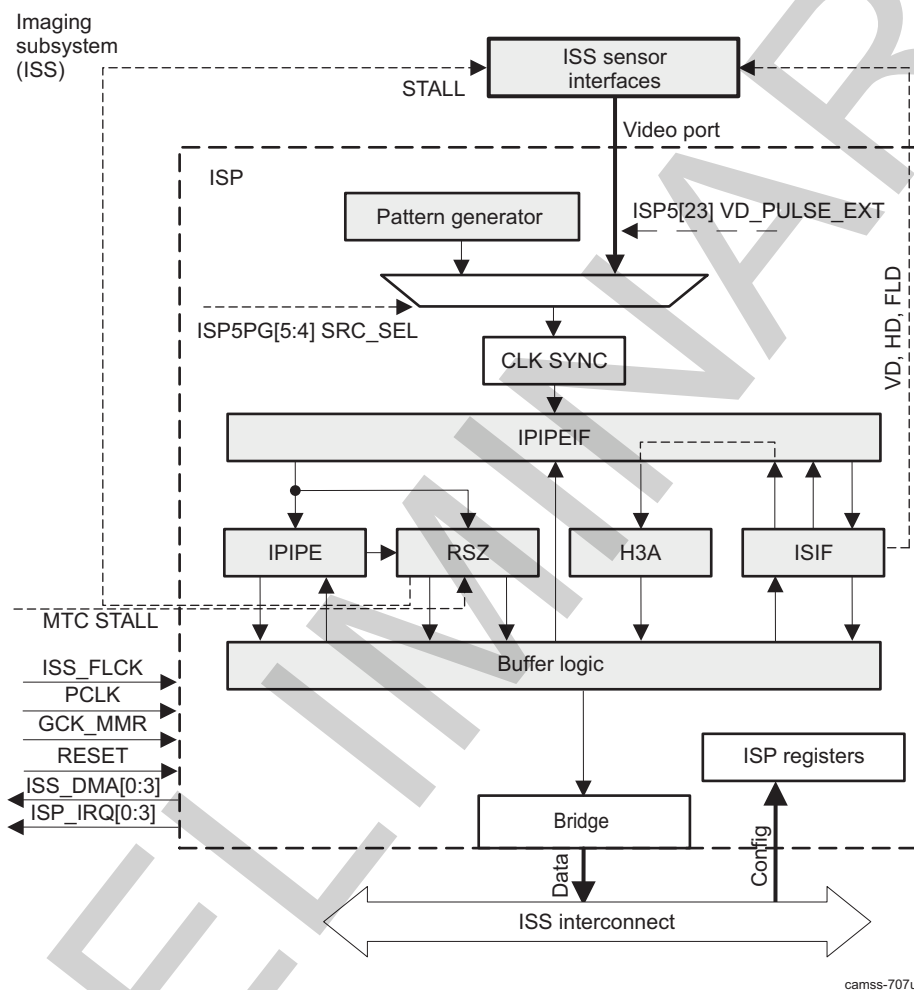
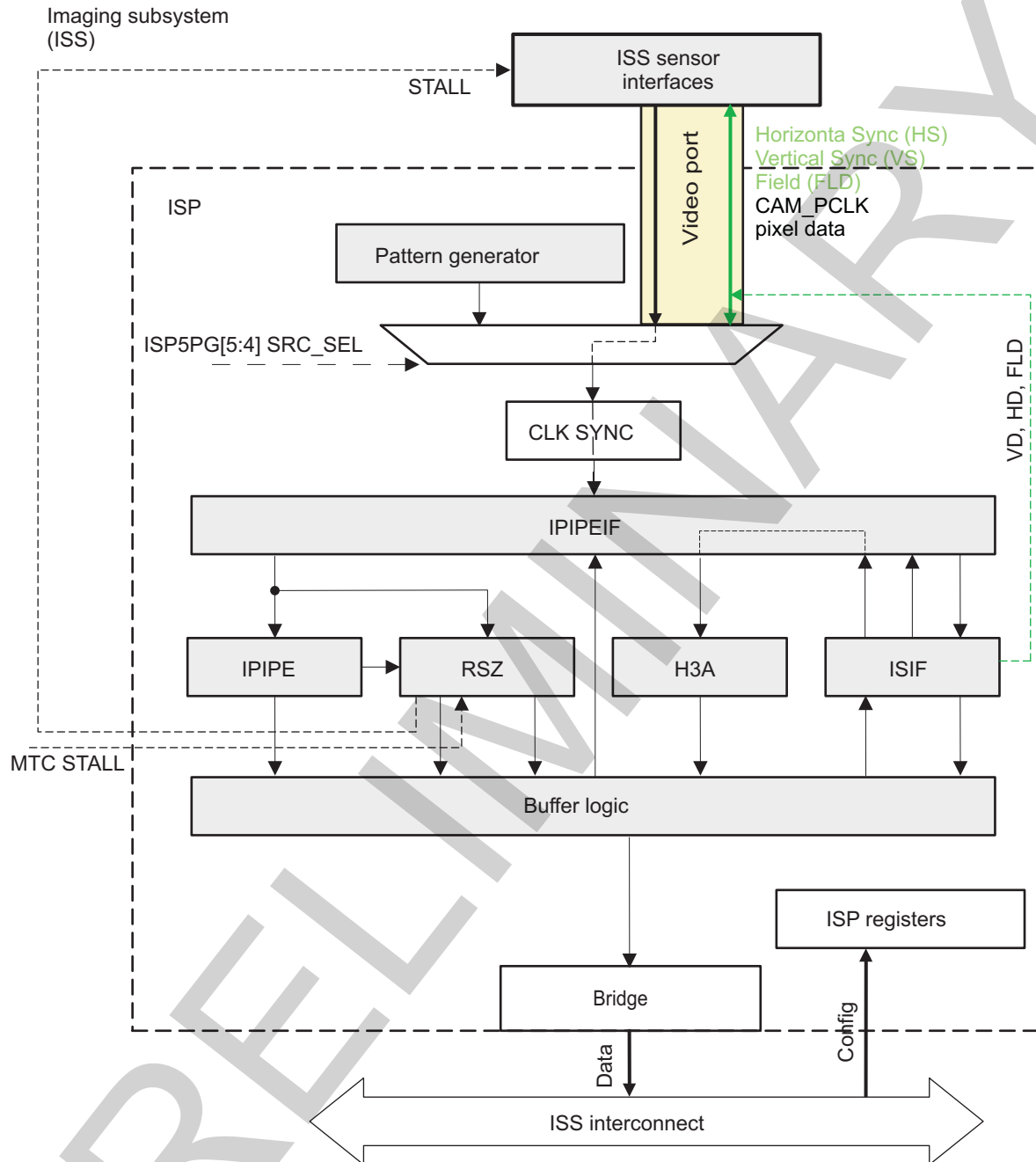


Figure 8-109 shows the VP module connections to other submodules of the ISP.

Figure 8-109. ISS ISP VP High-Level Diagram

camss-699

8.3.3.1.2 ISS ISP VP Data Formats

The VP can be used to connect external camera receivers to the ISS. Data paths inside the ISP hardware depend on the image format sourced by the sensor (RAW RGB, YUV4:2:2, JPEG, etc.). [Table 8-312](#) shows how the CCP2/CSI2 modules are connected to the VP in function of the image format.

Table 8-312. ISS ISP VP Format Mapping

| Source | | For mat | Connected to | | | | | | | | | | | | | | | ISIF | Data Provided to ISIF Linearization Engine | | | | | | | | | | | | | | | | |
|----------|------|---------------|--------------|---------|---------|---------|---------|---------|----|----|---------|---------|---------|---------|---------|---------|---------|---------|--|---------|---------|---------|---------|---------|---------|----|----|----|----|----|----|----|----|----|----|
| CCP 2 | CSI2 | | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | GW DI | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| X | X | RA W16 | R1 5 | R1 4 | R1 3 | R1 2 | R1 1 | R1 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | R1 5 | R1 4 | R1 3 | R1 2 | R1 1 | R1 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |
| X | X | RA W14 | R1 3 | R1 2 | R1 1 | R1 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | R1 3 | R1 2 | R1 1 | R1 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 |
| | | | 0 | 0 | R1 3 | R1 2 | R1 1 | R1 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 1 | R1 3 | R1 2 | R1 1 | R1 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 |
| X | X | RA W12 | 0 | 0 | 0 | 0 | R1 1 | R1 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | R1 1 | R1 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 |
| | | | 0 | 0 | R1 1 | R1 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 1 | R1 1 | R1 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 |
| | | | R1 1 | R1 0 | R9 | R8 | R7 | R5 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 | 2 | R1 1 | R1 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 |
| X | X | RA W10 | 0 | 0 | 0 | 0 | 0 | 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | 0 | 0 | 0 | 0 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 1 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | 0 | 0 | R9 | R8 | R7 | R5 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 | 2 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 | 0 | 0 |
| X | X | RA W8 | | | | | | | | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | | | | | | | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | | 1 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | | | | | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | | 2 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | | | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | | | | 3 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | | R7 | R5 | R5 | R4 | R3 | R2 | R1 | R0 | | | | | | | | 4 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | YUV 16-bit | Y7 | Y6 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 | C7 | C6 | C5 | C4 | C3 | C2 | C1 | C0 | 0 | | | | | | | | | | | | | | | | |
| | | YUV 8-bit | | | | | | | | | YC 7 | YC 6 | YC 5 | YC 4 | YC 3 | YC 2 | YC 1 | YC 0 | 0 | | | | | | | | | | | | | | | | |

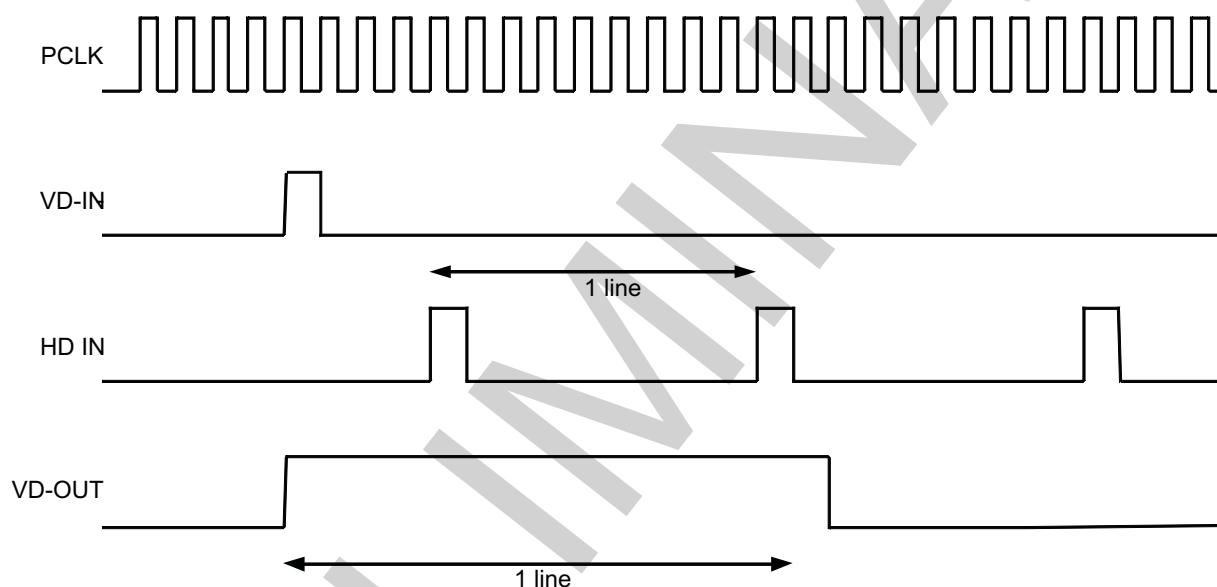
8.3.3.1.3 ISS ISP VP Top-Level Communication With CCP2 RX and CSI2 RX

At the ISS level, the VP is connected to the VP of the CCP2 RX and CSI2 RX modules. The interface that the VP uses to connect to the ISP is selected at the top-level of the ISS through the ISS_CTRL[3:2] INPUT_SEL bit. VP implementation differences force the introduction of a bridge between the CCP2 RX/CIS2 RX modules and the VP. The role of the bridge is to perform VD pulse extension. The CCP2 RX module assumes that the VD signal is active for at least one pixel clock cycle, and the CSI2 RX module assumes that the VD signal is asserted for four pixel clock cycles. However, the ISP assumes that the VD pulse is active on at least one line.

Figure 8-110 shows how the VD pulse extension works. Assume that VD-IN is the VD signal at the input of the pulse extension bridge, and VD-OUT is the VD signal at the output of the pulse extension bridge.

The VD-OUT signal is asserted at the same time as VD-IN. The VD-OUT signal is kept high until one full line is received. A line is delimited by two rising edges of the HD signal. The VD-OUT pulse is deasserted on the next cycle after the falling edge of the HD signal.

Figure 8-110. ISS ISP VP VD Pulse



camss-691

The ISP5_CTRL[23] VD_PULSE_EXT bit controls whether the VD extension bridge is enabled or disabled. By default, the bridge is enabled. When the bridge is disabled, the VD pulse must be unmodified: VD-OUT = VD-IN. At the ISS level, it is expected that ISP5_CTRL [23] VD_PULSE_EXT = 1 when the VP gets data from the CSI2 RX modules and ISP5_CTRL[23] VD_PULSE_EXT = 0 when the VP gets data from the parallel interface or CCP2 RX module.

CAUTION

A minimum of four lines per frame is required on the VP when the VD pulse extension bridge is enabled; therefore, the VD extension bridge is not functional if a 1-/2-/3-line frame is sent to the VP.

8.3.3.1.4 ISS ISP VP Pixel Clock Inversion

The ISP always uses the rising edge of the pixel clock to sample the pixel data. The ISP provides the capability to invert the pixel clock so it can shift the resampling of a pixel clock period by half. This is controlled by the ISP5_CTRL[22] PCLK_INV bit. By default, the inversion is disabled. The 5 bits in Table 8-313 are resynchronized from the GCK_MMR clock domain to the PCLK clock domain. There must be at least three clock cycles between the time these bits are modified and the HD/VD pulse for start of frame comes.

Table 8-313. ISS ISP VP GCK_MMR to PCLK Clock Resynchronization

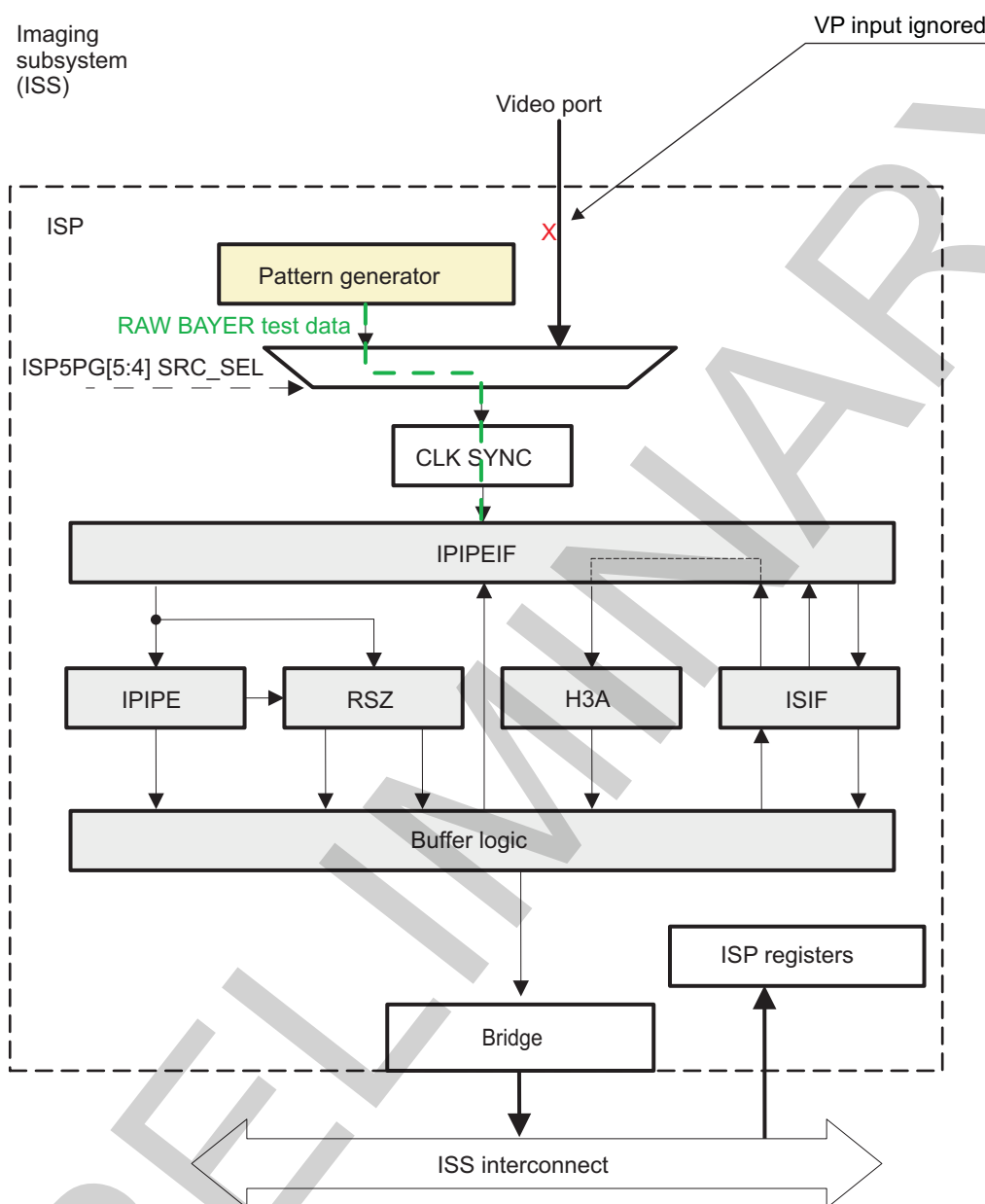
| Module | Register | Bit Field |
|--------|------------------------------|-----------------|
| ISP | ISP5_CTRL | VD_PULSE_EXT |
| ISIF | ISIF_MODESET | HDVDD |
| ISIF | ISIF_MODESET | FIDD |
| ISP | ISP5_CTRL | ISIF_CLK_ENABLE |

8.3.3.2 ISS ISP PG Functional Description

8.3.3.2.1 ISS ISP PG Overview

The PG implements an internal data generation mechanism to test the external pins and can generate RAW data (to the IPIPEIF, ISIF, and other ISP modules) without the need for an external image sensor.

[Figure 8-111](#) show the PG module connections to other submodules of the ISP.

Figure 8-111. ISS ISP PG High-Level Diagram

camss-686

8.3.3.2.2 ISS ISP PG Functional Description

The data pattern is as follows:

- Data remain unchanged from frame to frame.
- Data are always generated as a BAYER pattern with RED (only on even/even pixel/line; other locations are RED = 0), GREEN (only on odd/even pixel/line and even/odd pixel/line; other locations are GREEN = 0) and BLUE (only on odd/odd pixel/line; other locations are BLUE = 0) colors.
- The frame is divided into four equal horizontal sections:
 - 1st horizontal section is further divided into eight equal vertical sections
 - 1st vertical section is RED only with maximum value (depending on number of bits programmed).
 - 2nd vertical section is RED and GREEN with maximum value.

- 3rd vertical section is RED, GREEN, and BLUE with maximum value.
- 4th vertical section RED and BLUE with maximum value.
- 5th vertical section is all zeros.
- 6th vertical section is GREEN and BLUE with maximum value.
- 7th vertical section is GREEN with maximum value.
- 8th vertical section is BLUE with maximum value.
- 2nd horizontal section is all RED with the pixel value linearly incrementing (reset to zero for each line) from zero onward.
- 3rd horizontal section is all GREEN with the pixel value linearly incrementing (reset to zero for each line) from zero onward.
- 4th horizontal section is all BLUE with the pixel value linearly incrementing (reset to zero for each line) from zero onward.

By default, the ISP source is the VP. To select PG as the source for the ISP, set the [ISP5_PG\[5:4\] SRC_SEL](#) bit field to 0x3.

The [ISP5_PG\[2\] WEN](#) bit controls write-enable signal generation for the PG module. There are two modes: the write enable signal is enabled all the time or it is enabled and disabled every eight clock cycles. The [ISP5_PG\[1\] HDPOL](#) and [ISP5_PG\[0\] VDPOL](#) bits control the polarity of the horizontal and vertical synchronization signals generated by the PG module. These signals can be active high or active low.

The [ISP5_PG_PULSE_CTRL](#) register controls the HS and VS signal widths for the PG module.

- The [ISP5_PG_PULSE_CTRL\[12:0\] HDW](#) bit field sets the duration of the HD signal in terms of pixel clock cycles. The actual duration of the signal is [ISP5_PG_PULSE_CTRL\[12:0\] HDW](#) + 1 cycle. The minimum signal duration is one cycle, and the maximum signal duration is 4096 cycles.
- The [ISP5_PG_PULSE_CTRL\[27:16\] VDW](#) bit field sets the duration of the VD signal in terms of lines. The actual duration of the signal is [ISP5_PG_PULSE_CTRL\[27:16\] VDW](#) + 1 line. The minimum signal duration is one line, and the maximum signal duration is 4096 lines.

The [ISP5_PG_FRAME_SIZE](#) register controls the PG module horizontal and vertical frame sizes.

- The [ISP5_PG_FRAME_SIZE\[31:16\] PPLN](#) bit field sets the number of pixels per line a frame generated by the PG module. The actual number of pixels in a line is set by [ISP5_PG_FRAME_SIZE\[31:16\] FRAME_PPLN](#) + 1. The minimum number of pixels is 1.
- [ISP5_PG_FRAME_SIZE\[15:0\] HLPFR](#) sets the number of lines per frame generated by the PG module. The actual number lines is set by [ISP5_PG_FRAME_SIZE\[15:0\] HLPFR](#) + 1. The minimum number of lines is one.

The [ISP5_PG\[3\] EN](#) bit enables or disables the PG module.

8.3.3.3 ISS ISP IPIPEIF Functional Description

8.3.3.3.1 ISS ISP IPIPEIF Overview

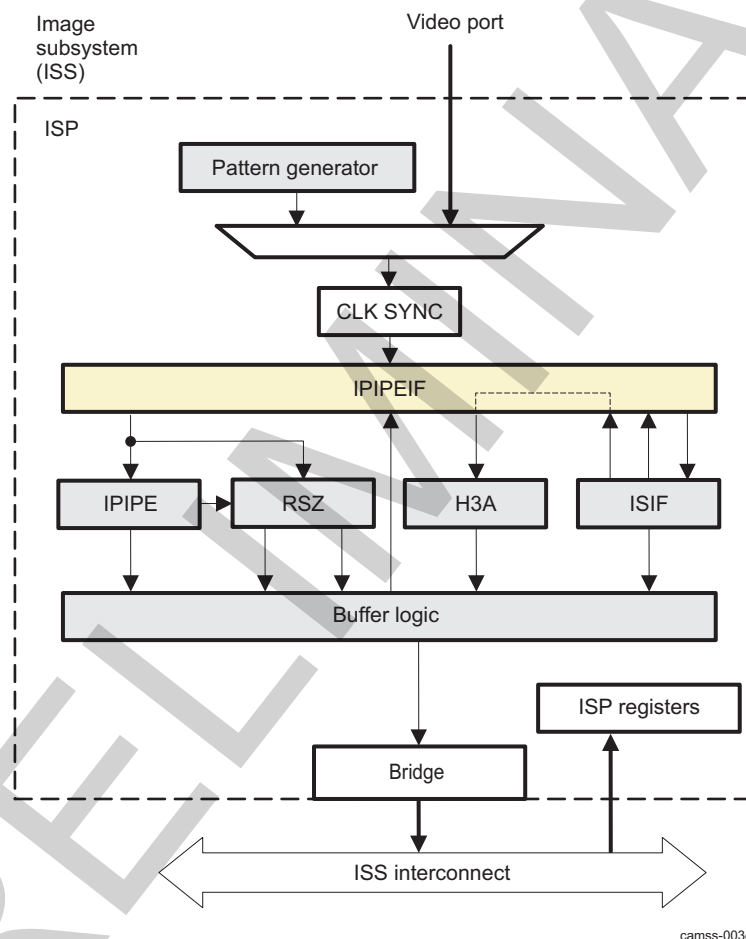
The IPIPEIF module provides data and synchronization signals (HD, VD) for the ISIF, IPIPE, RSZ, and H3A modules. The data source of this module is the VP, ISIF, or SDRAM using BL, and the selected data is output to ISIF, IPIPE, H3A, and RSZ. This module supports:

- Up to 16-bpp data on the VP
- Up to 233-MHz pixel clock on the VP, up to 8K × 8K imaging resolution
- RAW and YUV data formats on the VP and BL ports
- Dark-frame subtract of 8-bit RAW image stored in SDRAM from image from VP
- Dark-frame subtract of 8-bit RAW image stored in SDRAM from image from ISIF
- Dark-frame subtract of 8-bit RAW image from VP from image read from SDRAM through the BL
- Simple defect correction to prevent the subtraction of defect pixels
- 8-10, 8-12 DPCM of 10-8, 12-8 DPCM compressed data in SDRAM

- Simple and advanced DPCM predictor
- Inverse A-Law decompression of RAW data 10-8 A-Law compressed from SDRAM
- 8-bit, 12-bit unpacking of 8-bit, 12-bit packed SDRAM data
- Gain multiply for output data to IPIPE module
- Horizontal Bayer rescaler in the data paths to the IPIPE and H3A modules: Supports (1, 2, 1) averager filter and supports horizontal pixel decimation
- Data rate control when reading data from SDRAM: Fraction clock divider
- (1, 2, 1) averager filter and supports horizontal pixel decimation in the data path to the IPIPE for YUV data.

Figure 8-112 show the IPIPEIF module connections to other submodules of the ISP.

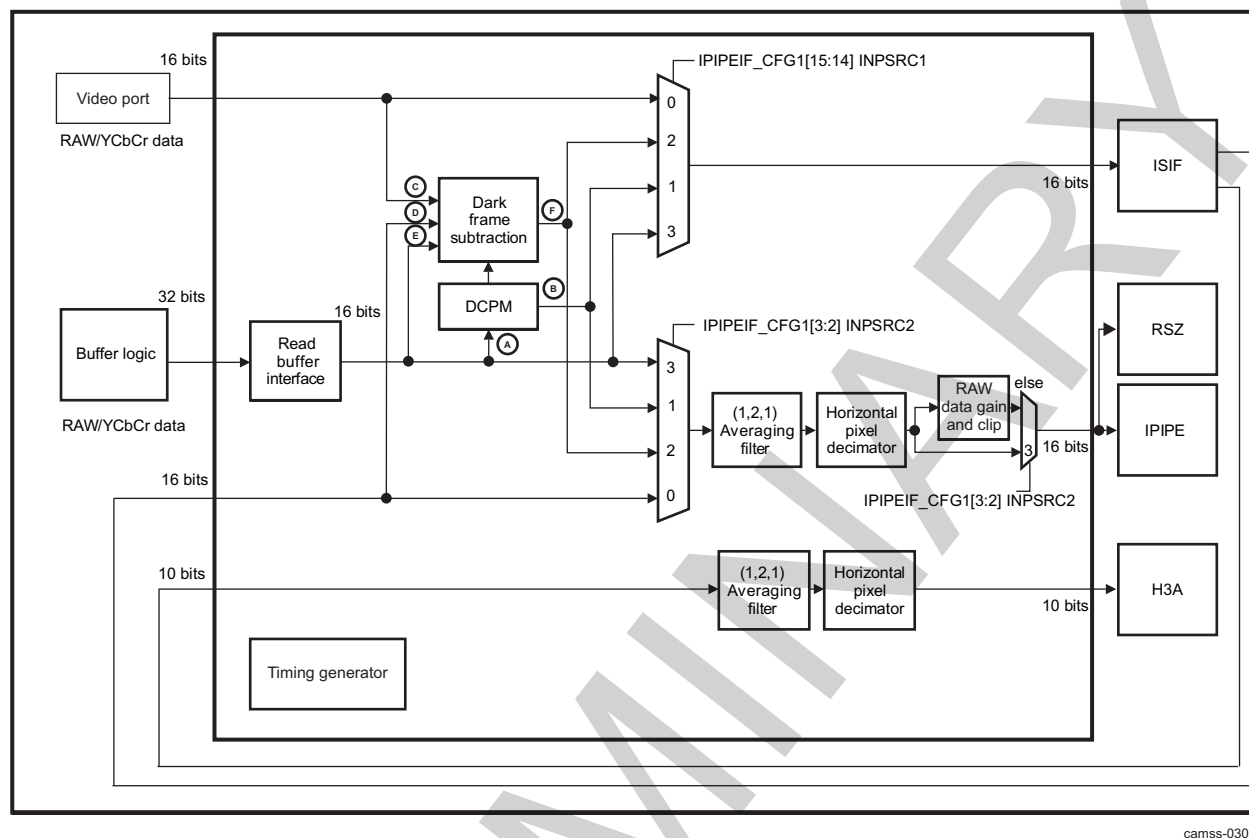
Figure 8-112. ISS ISP IPIPEIF High-Level Diagram



8.3.3.3.2 ISS ISP IPIPEIF Top-Level Block Diagram

The following sections describe the function of each subblock in the IPIPEIF, as shown in Figure 8-113.

Figure 8-113. ISS ISP IPIPEIF Top-Level Block Diagram



NOTE: When the IPIPEIF receives data from the VP, the timing generator must be configured for HD, VD, and WEN. For more information, see [Section 8.3.3.3.5, ISS ISP IPIPEIF Timing Generation](#).

8.3.3.3.3 ISS ISP IPIPEIF Input Interface

The IPIPEIF module comprises two major interface blocks: VP and BL. The data types can be RAW or YUV.

8.3.3.3.3.1 ISS ISP IPIPEIF Input From VP

The VP typically receives data from the image sensor. At the ISS level, it is connected to the serial interface receivers.

8.3.3.3.3.2 ISS ISP IPIPEIF Input From BL

The BL is the interface with the memory (SDRAM). In that case, the SDRAM address and line offset registers must be programmed in units of 32 bytes.

- SDRAM start address (byte) = (IPIPEIF_ADDRU[10:0] ADDRU)16 + (IPIPEIF_ADDRDL[15:0] ADDRDL)
- SDRAM address offset (byte) = IPIPEIF_ADOFS[11:0] ADOFS

Two types of data can be stored in memory: pixel data and dark frame data.

For pixel data, the HD and VD signals are reconstructed with:

- IPIPEIF_HNUM
- IPIPEIF_VNUM

- [IPIPEIF_LPFR](#)
- [IPIPEIF_PPLN](#)

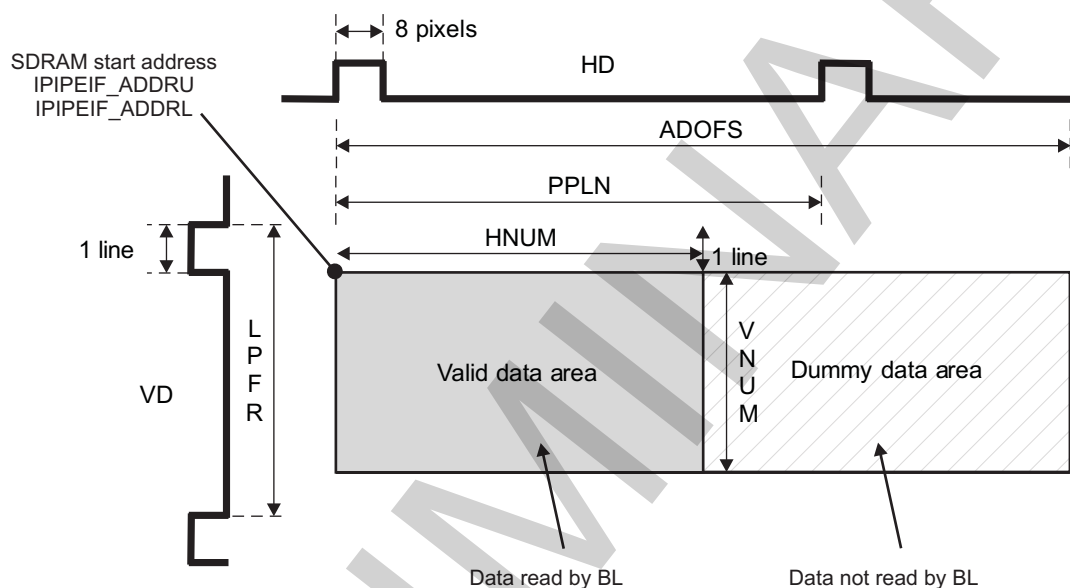
The [IPIPEIF_HNUM](#) and [IPIPEIF_VNUM](#) registers define the number of pixels per line and lines per frame to read from the SDRAM, and the [IPIPEIF_LPFR](#) and [IPIPEIF_PPLN](#) registers define the interval of VD and HD, respectively.

Vertical blanking for the frame is defined with the following equation: [IPIPEIF_LPFR](#) [IPIPEIF_VNUM](#) 1.

Horizontal blanking for the frame is defined with the following equation: [IPIPEIF_PPLN](#) [IPIPEIF_HNUM](#).

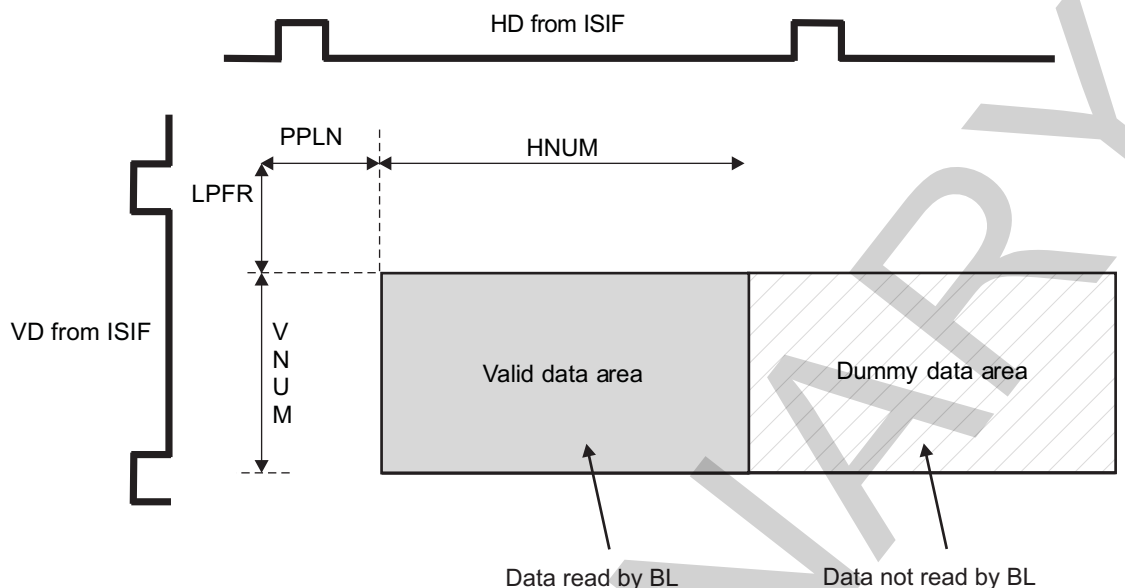
[Figure 8-114](#) shows the global frame definition for all SDRAM input modes, except for dark frame subtract.

Figure 8-114. ISS ISP IPIPEIF Global Frame Definition in SDRAM Input Modes (Except Dark Frame)



For dark frame data, the HD and VD signals come from the VP through the ISIF. The [IPIPEIF_PPLN](#) and [IPIPEIF_LPFR](#) registers must be used to indicate the horizontal and vertical start position of the subtraction from the ISIF data, as shown in [Figure 8-115](#). The value of the [IPIPEIF_LPFR](#) [12:0] LPFR bit field must be greater than 0 because the first line from the VP or ISIF cannot be subtracted from. The [IPIPEIF_HNUM](#) and [IPIPEIF_VNUM](#) registers must be used to set the number of valid pixels horizontally and the number of valid lines vertically.

Figure 8-115. ISS ISP IPIPEIF Global Frame Definition in Dark Frame Subtract Mode



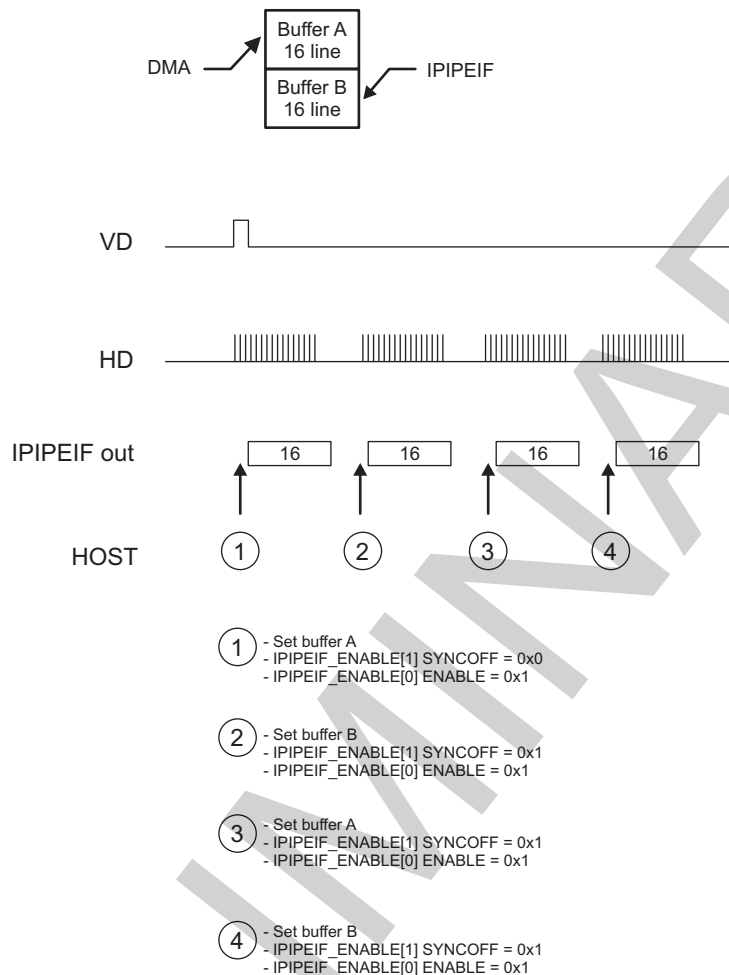
8.3.3.3.2.1 ISS ISP IPIPEIF Double-Buffer Input Function When Reading From BL

The IPIPEIF module supports a double-buffer input function. This feature is most useful when SDRAM space is limited, because it enables to read continuously from two buffers and to push data to the rest of the ISP (ISIF, H3A, etc.) for further processing.

Consider the following configuration where data are read from two buffers, A and B. The intent is not only to read continuously from these buffers but also to ensure that the ISP modules consider the data as being from the same frame; that is, VD is generated the first time buffer A is read, but it must not toggle until all the frames are read.

The IPIPEIF module can mask the VD sync signal by writing the `IPIPEIF_ENABLE[1] SYNCOFF` bit but such that the IPIPEIF module drives the data to the ISP modules as if it is a continuous frame data.

In the following example, there are 16 lines per trigger and input circular addressing. $VNUM = 16$ (see Figure 8-114), and the VD signal is generated only for the first frame (see Figure 8-116).

Figure 8-116. ISS ISP IPIPEIF Double-Buffer Functionality

camss-615

8.3.3.3.4 ISS ISP IPIPEIF Data Path Selection

The data path configuration through the IPIPEIF module is set with the [IPIPEIF_CFG1\[15:14\] INPSRC1](#) and [IPIPEIF_CFG1\[3:2\] INPSRC2](#) bit fields. [Table 8-314](#) lists the possible combinations for these two bit fields.

Table 8-314. ISS ISP IPIPEIF IPIPEIF_CFG1[15:14] INPSRC1 and IPIPEIF_CFG1[3:2] INPSRC2 Possible Combinations

| IPIPEIF_CFG1[15:14] INPSRC1 | IPIPEIF_CFG1[3:2] INPSRC2 | Description | Common Use |
|---|---|---|--|
| 0 | 0 | This data path is described in Section 8.3.3.3.4.1, ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 0 . | Video record, view finder, on-the-fly still image capture applications |
| 0 | 1 | This data path is described in Section 8.3.3.3.4.2, ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 1 . | Memory-to IPIPE-to memory |
| 0 | 2 | This data path is described in Section 8.3.3.3.4.3, ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 2 . | Image capture with on-the-fly dark frame subtraction |

Table 8-314. ISS ISP IPIPEIF IPIPEIF_CFG1[15:14] INPSRC1 and IPIPEIF_CFG1[3:2] INPSRC2 Possible Combinations (continued)

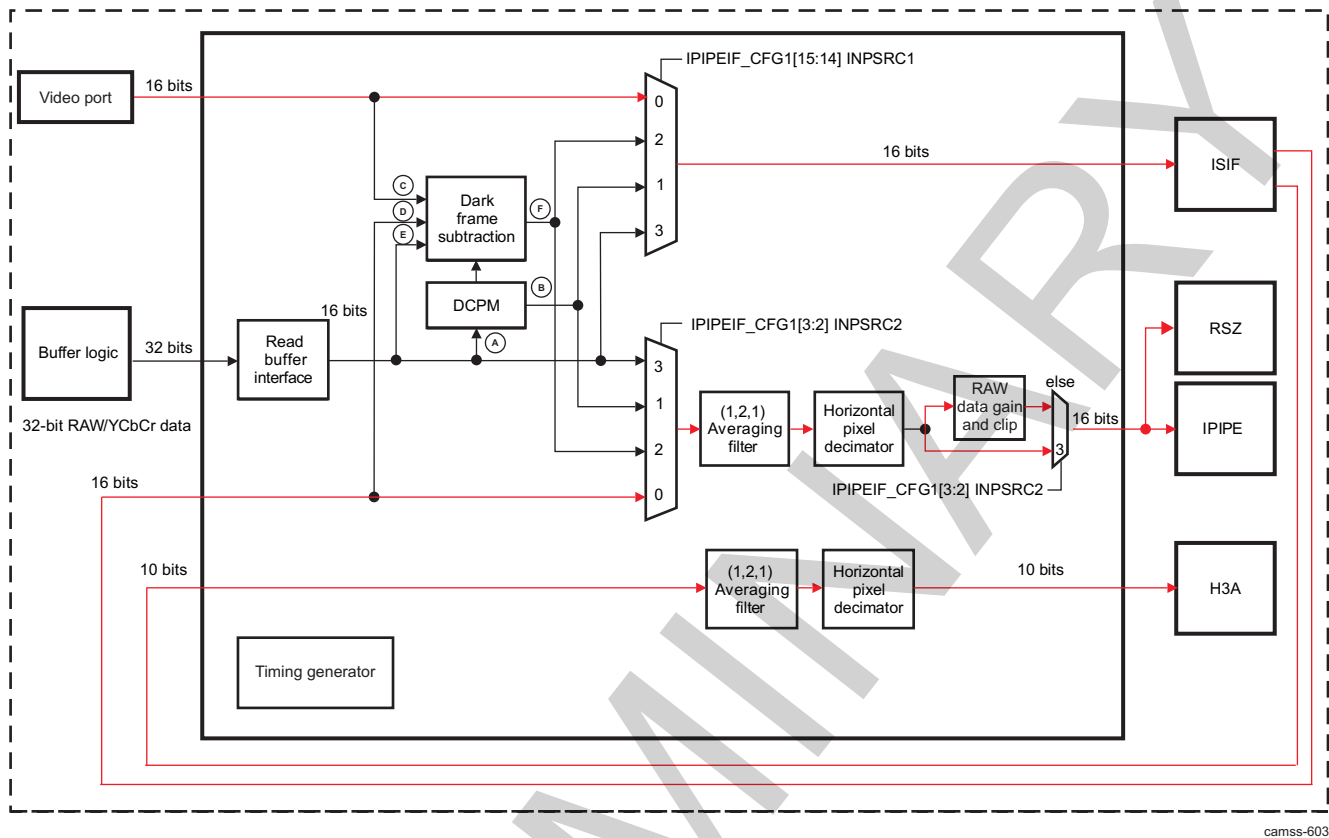
| IPIPEIF_CFG1[15:14] INPSRC1 | IPIPEIF_CFG1[3:2] INPSRC2 | Description | Common Use |
|------------------------------------|----------------------------------|---|---|
| 0 | 3 | This data path is described in Section 8.3.3.3.4.4 , <i>ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 3</i> . | On-the-fly data acquisition done in VP, forwarded to the ISIF, and then to the H3A through IPIPEIF while data from memory is processed and forwarded to the IPIPE module and then stored in memory YUV4:2:2 or RAW data processing with the IPIPE and RESIZER modules from memory to memory fetched by IPIPEIF |
| 1 | 0 | This data path is described in Section 8.3.3.3.4.5 , <i>ISS ISP IPIPEIF INPSRC1 = 1 and INPSRC2 = 0</i> . | Memory-to-ISIF- to memory operation |
| 1 | 1 | This data path is possible but there is no use case associated. | N/A |
| 1 | 2 | This data path is not supported. | N/A |
| 1 | 3 | This data path is not supported. | N/A |
| 2 | 0 | This data path is described in Section 8.3.3.3.4.6 , <i>ISS ISP IPIPEIF INPSRC1 = 2 and INPSRC2 = 0</i> . | Dark frame subtraction is performed and data sent to the ISIF module for further processing, back to IPIPEIF, and then to IPIPE and RSZ. |
| 2 | 1 | This data path is not supported. | N/A |
| 2 | 2 | This data path is not supported. | N/A |
| 2 | 3 | This data path is not supported. | N/A |
| 3 | 0 | This data path is described in Section 8.3.3.3.4.7 , <i>ISS ISP IPIPEIF INPSRC1 = 3 and INPSRC2 = 0</i> . | Memory-to-ISIF-to memory operation |
| 3 | 1 | This data path is not supported. | N/A |
| 3 | 2 | This data path is not supported. | N/A |
| 3 | 3 | This data path is possible but there is no use case associated. | N/A |

8.3.3.3.4.1 ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 0

Set the [IPIPEIF_CFG1\[15:14\] INPSRC1](#) bit field to 0 and the [IPIPEIF_CFG1\[3:2\] INPSRC2](#) bit field to 0.

This configuration can be used for the video record, viewfinder, and on-the-fly still image capture applications. The full ISP processing capability is used in a single pass.

[Figure 8-117](#) shows the data path.

Figure 8-117. ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 0 Data Path

camss-603

8.3.3.3.4.2 ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 1

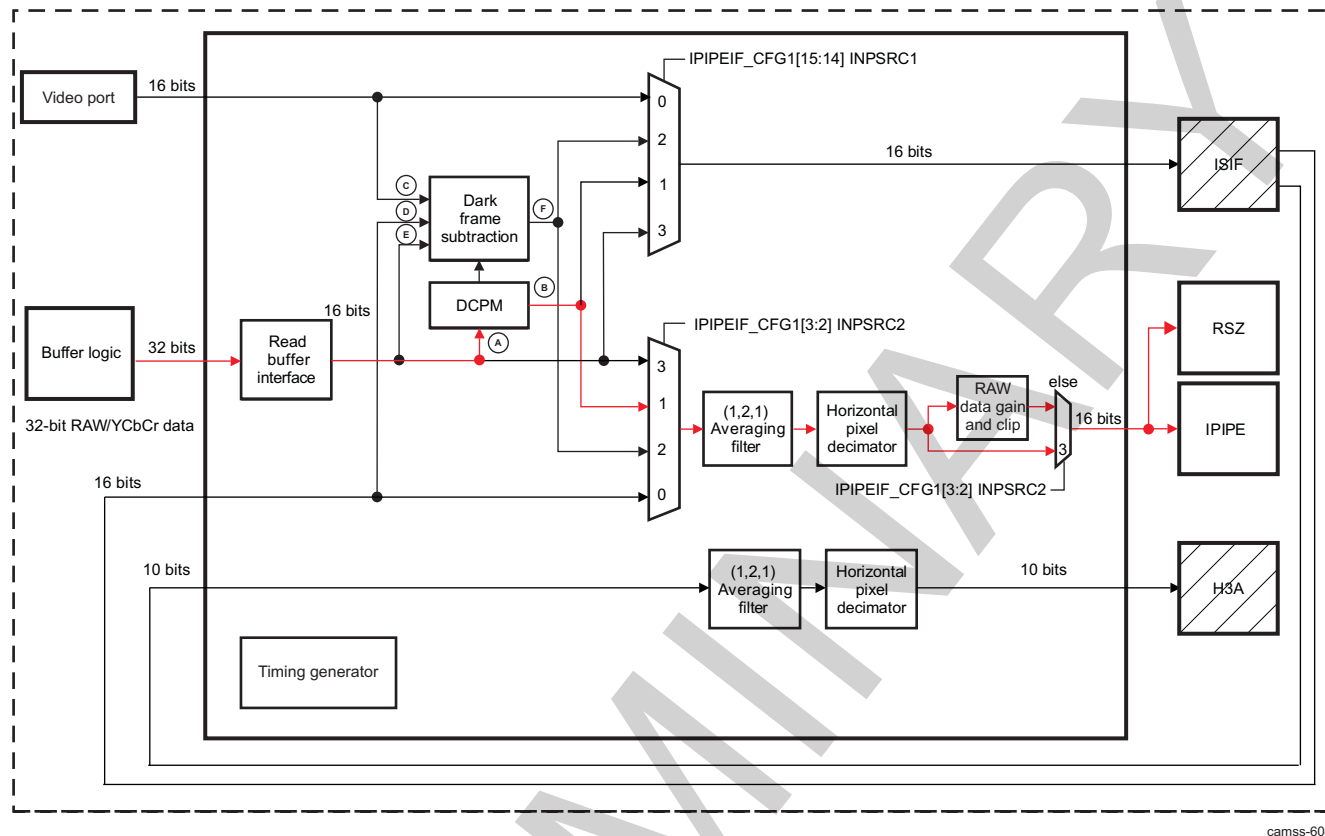
Set the **IPIPEIF_CFG1[15:14] INPSRC1** bit field to 0 and the **IPIPEIF_CFG1[3:2] INPSRC2** bit field to 1.

This configuration can be used to process data with the IPIPE module from memory to memory. The data stored in SDRAM can be decompressed (A-law or DPCM) before being forwarded to the IPIPE module.

NOTE: In this configuration, the ISIF and H3A modules are assumed to be disabled.

Figure 8-118 shows the data path.

Figure 8-118. ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 1 Data Path



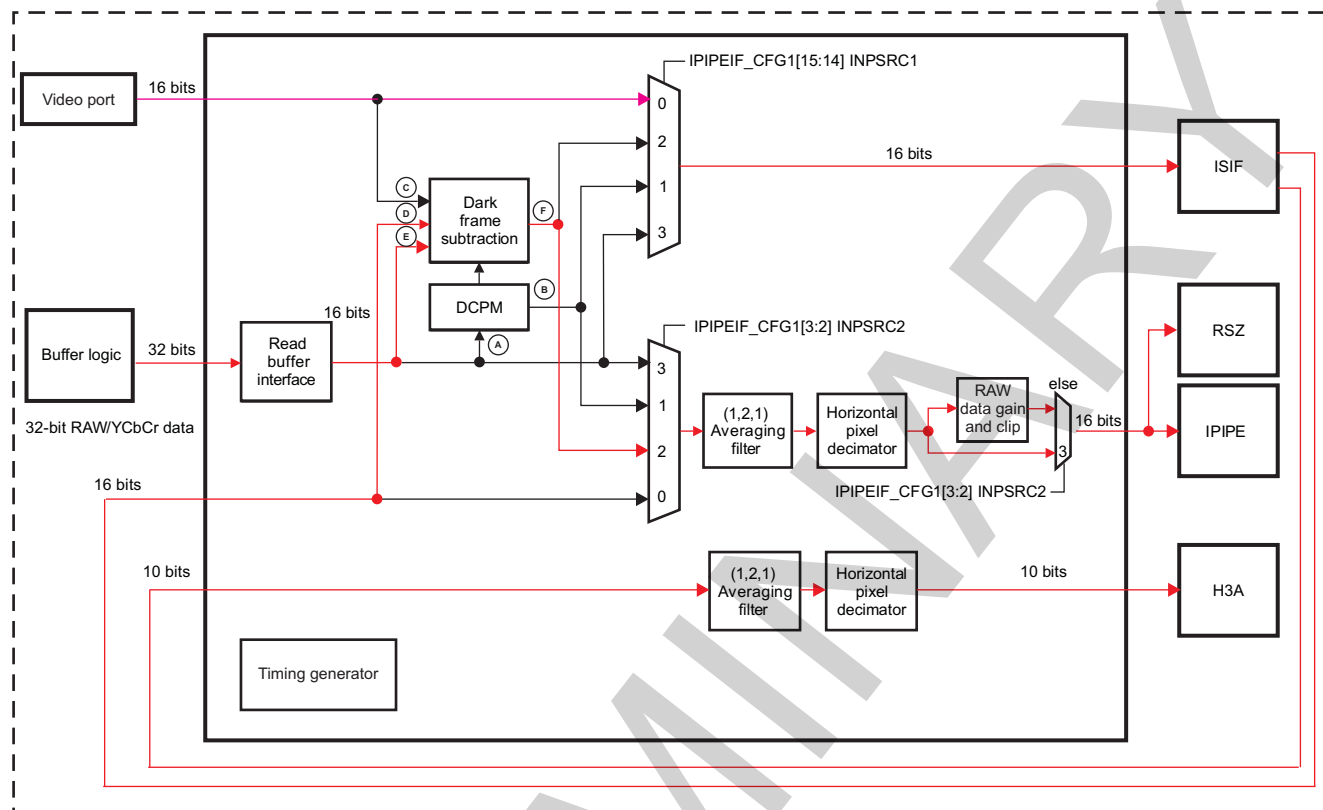
camss-604

8.3.3.3.4.3 ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 2

Set `IPIPEIF_CFG1[15:14] INPSRC1` to 0 and `IPIPEIF_CFG1[3:2] INPSRC2` to 2.

This configuration can be used for image capture with on-the-fly dark-frame subtraction. In the first case, the dark frame can come from BL and data from the ISIF. In the second case, the dark frame can come from the VP and data from BL.

Figure 8-119 shows the data path.

Figure 8-119. ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 2 Data Paths

camss-610

8.3.3.3.4.4 ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 3

Set the [IPIPEIF_CFG1\[15:14\] INPSRC1](#) bit field to 0 and the [IPIPEIF_CFG1\[3:2\] INPSRC2](#) bit field to 3.

In the first case, on-the-fly data acquisition is done with the VP, forwarded to the ISIF, and then sent to the H3A through the IPIPEIF while data from memory is processed and forwarded to the IPIPE module and then stored in memory.

In the second case, the configuration can be used to process YUV4:2:2 or RAW data with the IPIPE and RESIZER modules from memory-to-memory. The YUV4:2:2 or RAW data stored in the SDRAM is fetched and forwarded to the IPIPE and RSZ modules. ISIF and H3A are assumed to be disabled in this configuration.

[Figure 8-120](#) and [Figure 8-121](#) show the two possible data paths.

Figure 8-120. ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 3 Data Paths: First Case

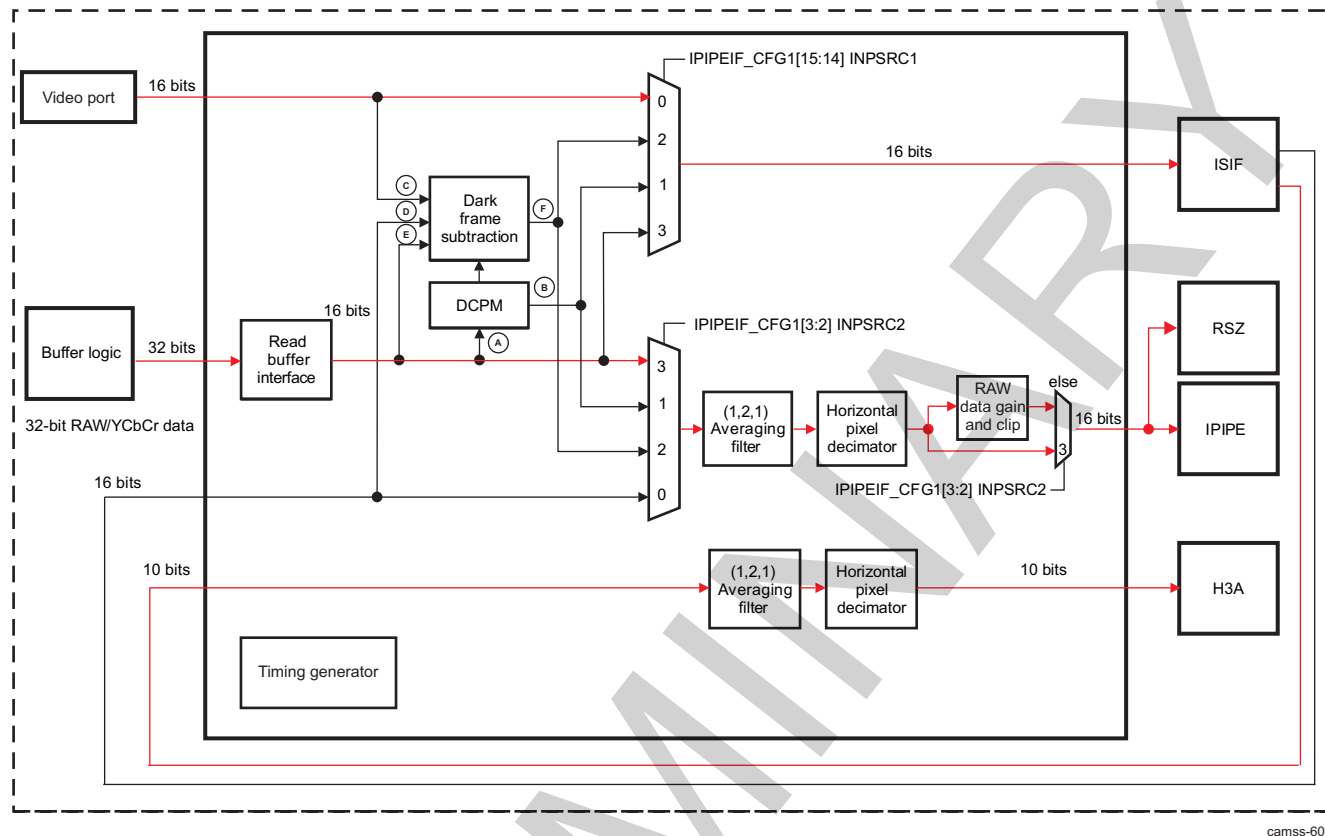
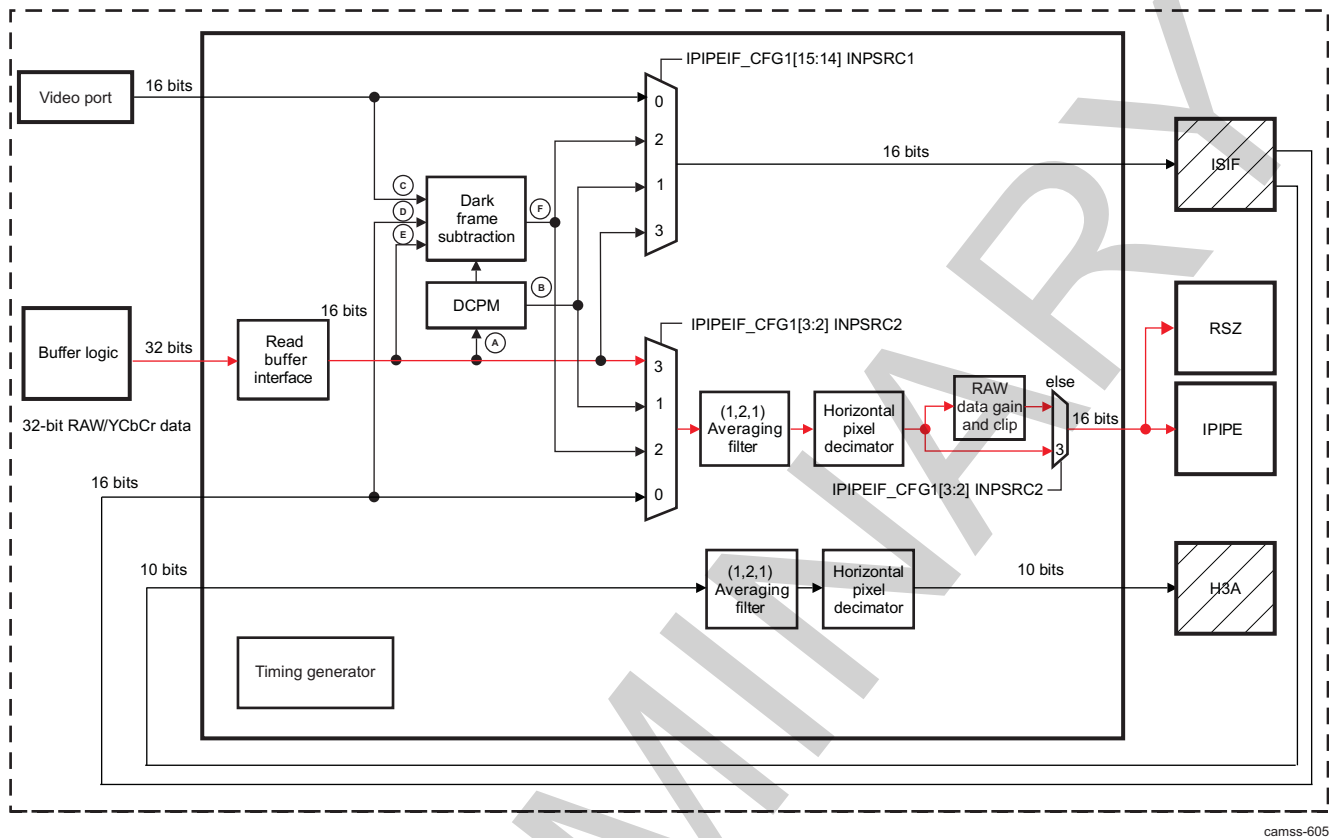


Figure 8-121. ISS ISP IPIPEIF INPSRC1 = 0 and INPSRC2 = 3 Data Paths: Second Case

camss-605

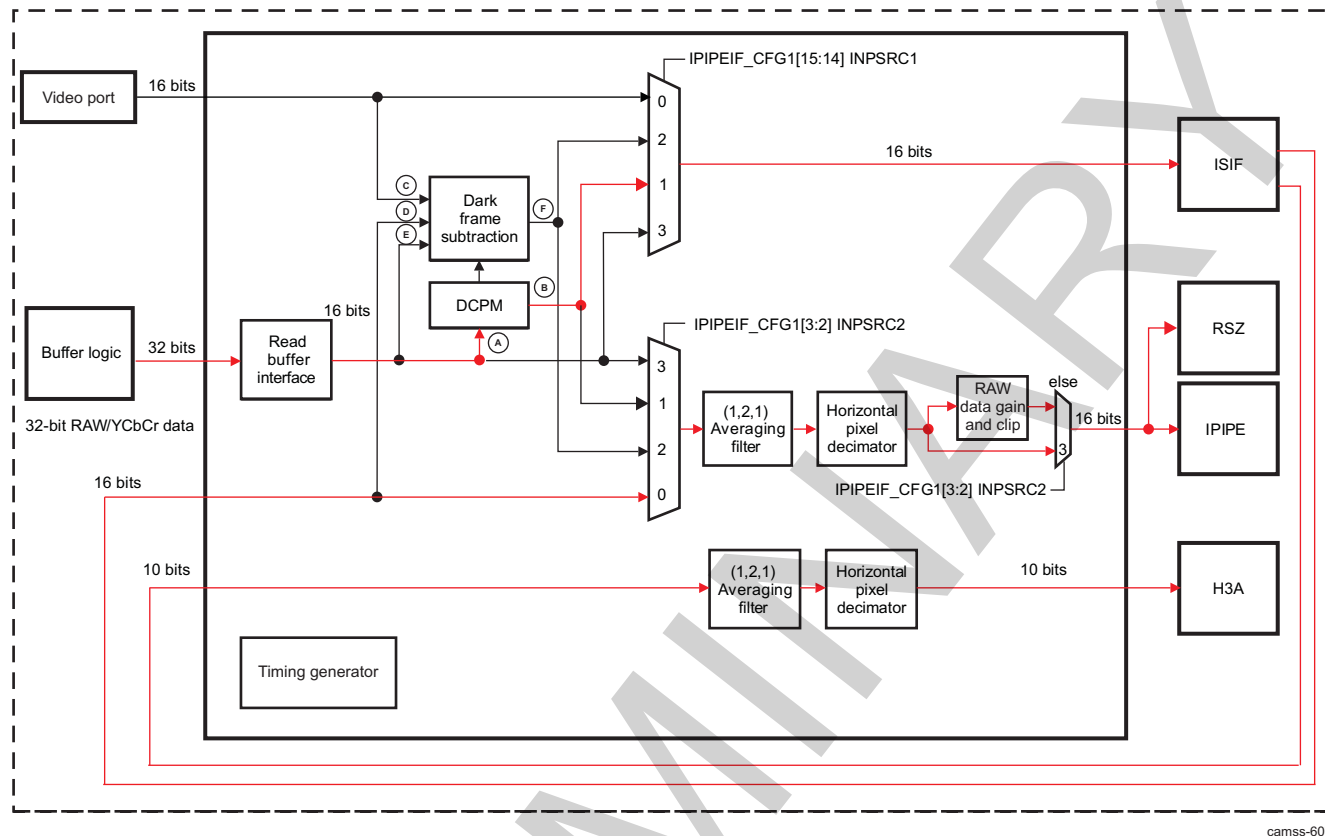
8.3.3.3.4.5 ISS ISP IPIPEIF INPSRC1 = 1 and INPSRC2 = 0

Set the **IPIPEIF_CFG1[15:14] INPSRC1** bit field to 1 and the **IPIPEIF_CFG1[3:2] INPSRC2** bit field to 0.

This configuration is a memory-to-memory operation. RAW data is read by the BL interface, decompressed, and pushed to the ISIF. The ISIF processes the data and sends it back to the IPIPEIF module before the data is pushed to the IPIPE and H3A modules.

Figure 8-122 shows the data path.

Figure 8-122. ISS ISP IPIPEIF INPSRC1 = 1 and INPSRC2 = 0 Data Path

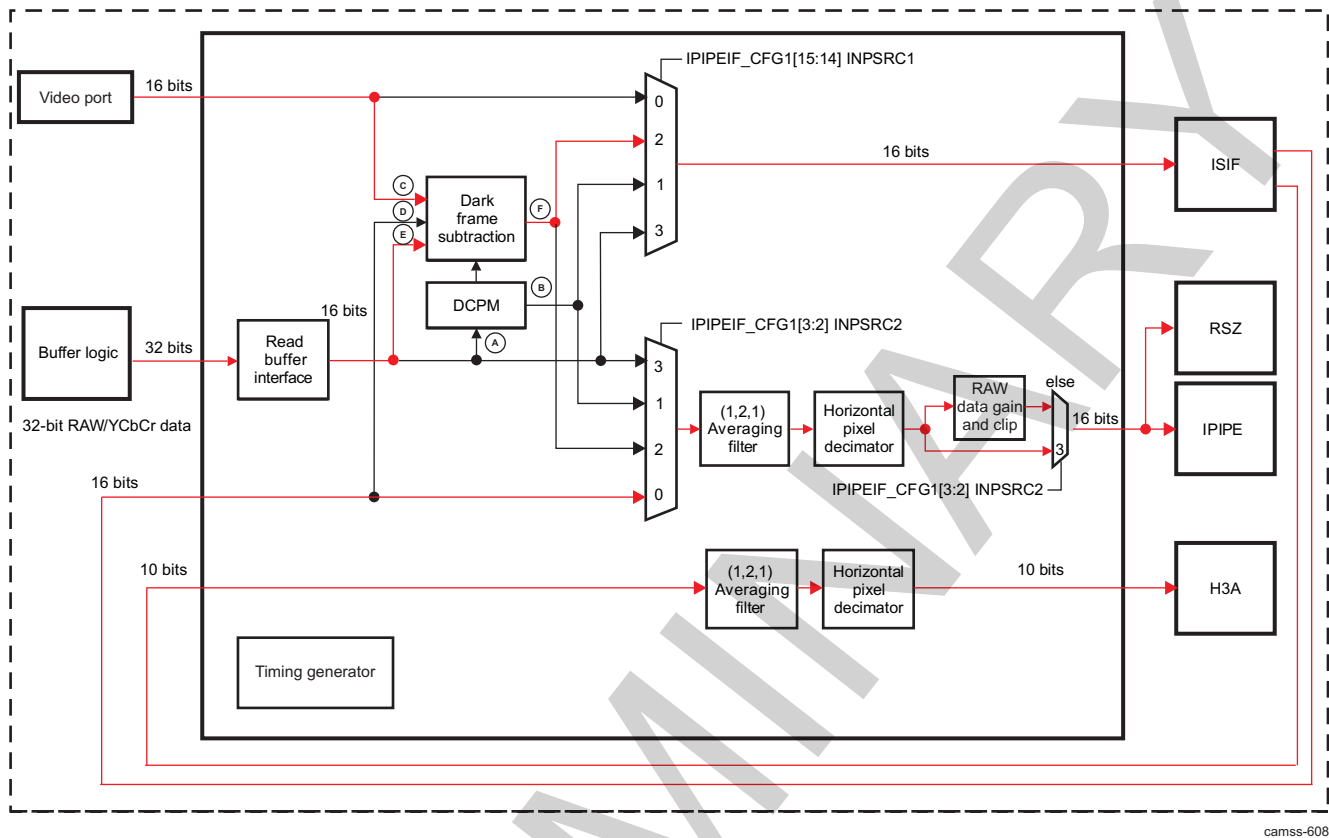


8.3.3.3.4.6 ISS ISP IPIPEIF INPSRC1 = 2 and INPSRC2 = 0

Set the `IPIPEIF_CFG1[15:14]` INPSRC1 bit field to 2 and the `IPIPEIF_CFG1[3:2]` INPSRC2 bit field to 0.

In this configuration, dark frame subtraction is performed and data is sent to the ISIF module. The ISIF processes the data and sends it back to the IPIPEIF module before the data is pushed to the IPIPE or RSZ modules. There are two possible dark frame subtractions: the first is with data coming from the VP and the dark frame coming from BL; the second is with data coming from BL and the dark frame coming from the VP.

Figure 8-123 shows the data path.

Figure 8-123. ISS ISP IPIPEIF INPSRC1 = 2 and INPSRC2 = 0 Data Path

camss-608

8.3.3.3.4.7 ISS ISP IPIPEIF INPSRC1 = 3 and INPSRC2 = 0

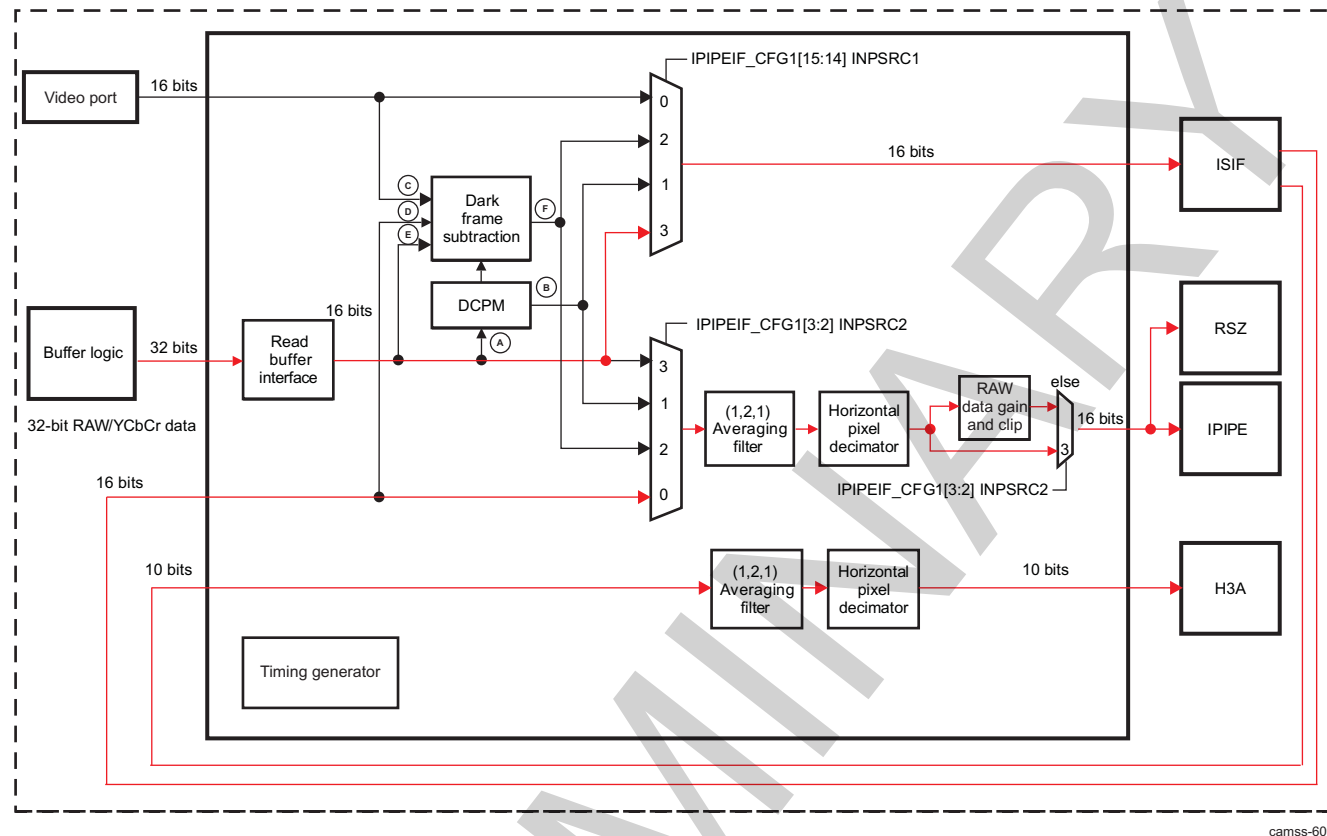
Set the **IPIPEIF_CFG1[15:14] INPSRC1** bit field to 3 and the **IPIPEIF_CFG1[3:2] INPSRC2** bit field to 0.

This configuration is a memory-to-memory operation. Data is loaded from the SDRAM. Input data is expected as 16 bpp. The ISIF processes the data and sends it back to the IPIPEIF module before the data is pushed to the IPIPE or RSZ module.

In this configuration data is assumed to be YUV only, and H3A and RAW data gain are assumed to be disabled.

Figure 8-124 shows the data path.

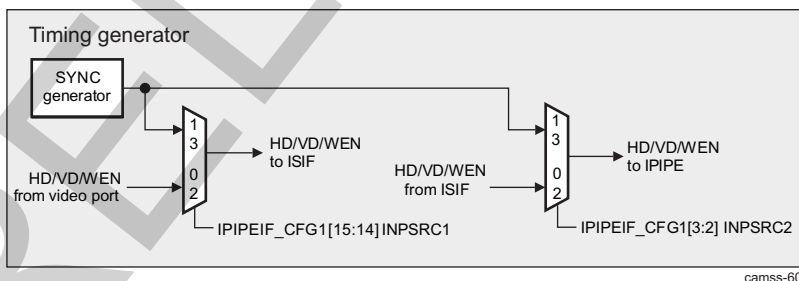
Figure 8-124. ISS ISP IPIPEIF INPSRC1 = 3 and INPSRC2 = 0 Data Path



8.3.3.3.5 ISS ISP IPIPEIF Timing Generation

Figure 8-125 shows the ISS ISP IPIPEIF timing generator submodule.

Figure 8-125. ISS ISP IPIPEIF Timing Generator Submodule



When the IPIPEIF module input source is from the VP (**IPIPEIF_CFG1**[15:14] INPSRC1 = 0 or 2) or the ISIF (**IPIPEIF_CFG1**[3:2] INPSRC2 = 0 or 2) , the **IPIPEIF_CFG1**[10] CLKSEL bit must be set to 0 so that data is latched using the PCLK, HD, and VD signals from the VP.

When the IPIPEIF module input source is not from the VP (**IPIPEIF_CFG1**[15:14] INPSRC1 = 1 or 3), the **IPIPEIF_CFG1**[10] CLKSEL bit must be set to 1 so that the IPIPEIF module generates its proper PCLK, HD, and VD signals (through the use of the SYNC generator). The **IPIPEIF_CLKDIV** register is then used to select a divide ratio of the SDRAM (DMA) clock for the pixel clock frequency, which is used to clock the data into the PCLK. See [Section 8.3.3.3.5.1, ISS ISP IPIPEIF Fractional Clock Divider](#).

When the `IPIPEIF_CFG1[15:14]` INPSRC1 or `IPIPEIF_CFG1[3:2]` INPSRC2 bit field is not set to 0, the IPIPEIF SDRAM data reading and timing generation can be enabled (`IPIPEIF_ENABLE[0]` ENABLE) in one-shot mode or continuous mode (`IPIPEIF_CFG1[0]` ONESHOT).

8.3.3.3.5.1 ISS ISP IPIPEIF Fractional Clock Divider

When the input data of the IPIPEIF module does not come from the VP but from memory, it is useful to have control of the rate at which the data is fetched from memory to avoid overflow conditions or to avoid peak bandwidth requirements. The `IPIPEIF_CFG1[10]` CLKSEL bit is equal to 1 for fractional divider use.

The ISP clock `ISS_FCLK` is divided to generate the pixel clock, which goes to the ISIF and IPIPE modules when data is read from memory (`IPIPEIF_CFG1[15:14]` INPSRC1 = `IPIPEIF_CFG1[3:2]` INPSRC2 = 1 or 3). The `IPIPEIF_CLKDIV` register selects the divider ratio: M and N values in the `IPIPEIF_CLKDIV[15:0]` CLKDIV bit field.

Given an input clock of clock rate `ISS_FCLK`, the fractional clock divider generates an output clock with average clock rate `f_out`.

Where $f_{out} = ISS_FCLK \times M/N$, and M = 1 through 256, and N = 1 through 256.

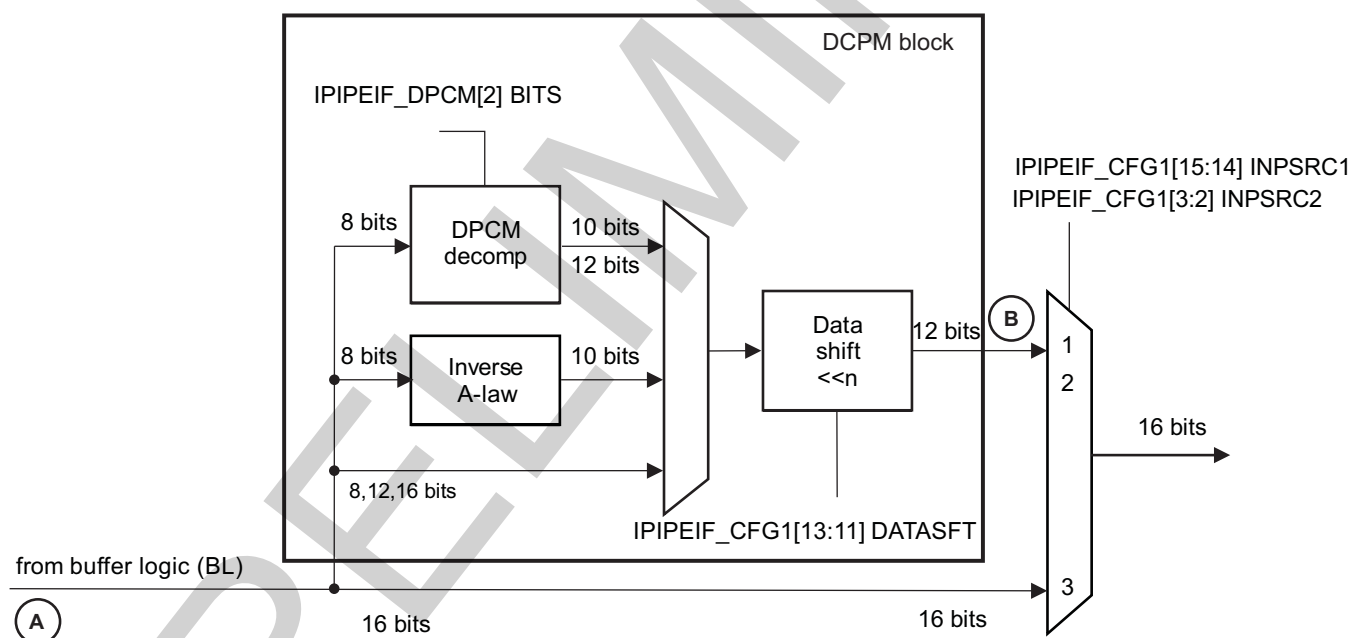
The fractional clock divider logic is synchronous and uses only the positive clock edge of the input clock.

8.3.3.3.6 ISS ISP IPIPEIF Decompression (DCPM) Subblock: Unpack and Decompression Function

The IPIPEIF module can read RAW data from memory. The RAW data can be previously packed/compressed into memory. Unpack, A-Law decompression, and DPCM decompression are available in the IPIPEIF module.

Figure 8-126 shows the DCPM subblock.

Figure 8-126. ISS ISP IPIPEIF DCPM Subblock



camss-032

Table 8-315 provides the possible configuration of the DCPM block.

Table 8-315. ISS ISP IPIPEIF DCPM Block Possible Configuration

| Number of Bits per Pixel at DCPM Block Input | Number of Bits per Pixel at DCPM Block Output | Description | Registers |
|--|---|--|---|
| 16 | 16 | It can correspond to YUV4:2:2 or RAW16 data. | <code>IPIPEIF_CFG1[9:8]</code> UNPACK = 0x0 In this configuration, <code>IPIPEIF_CFG1[3:2]</code> INPSRC2 = 0x3. In this configuration data bypasses the DCPM block. |

Table 8-315. ISS ISP IPIPEIF DCPM Block Possible Configuration (continued)

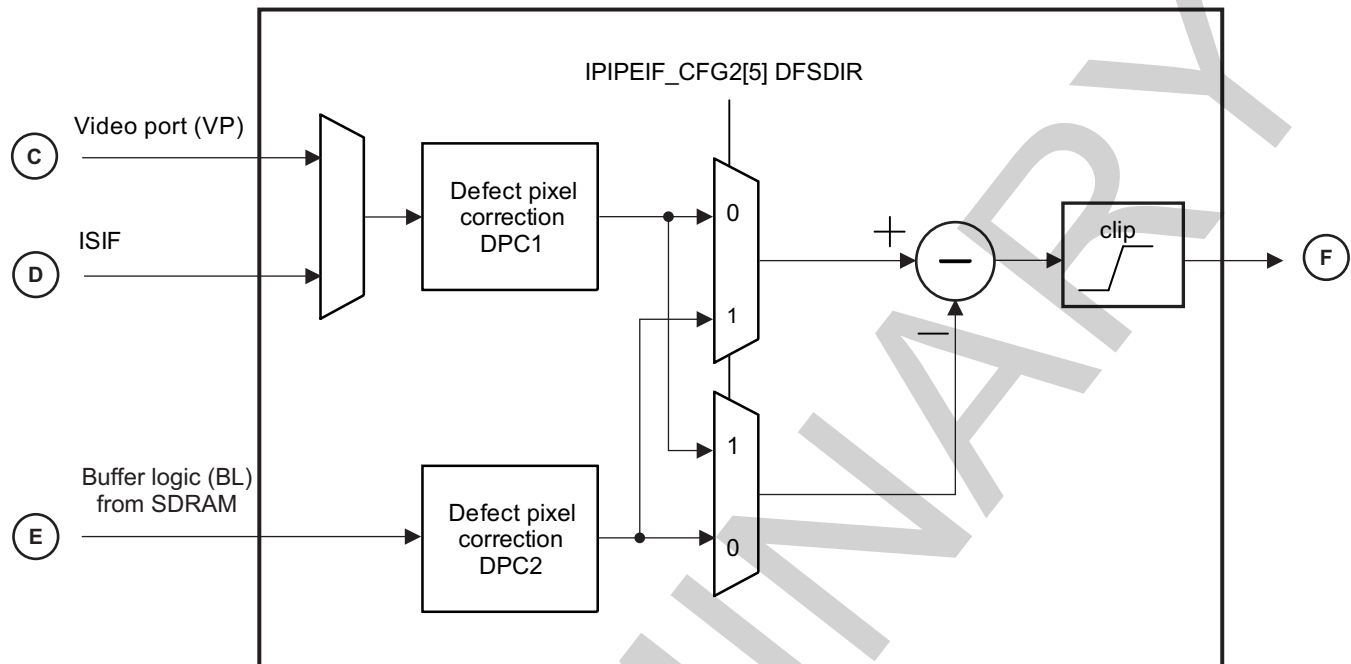
| Number of Bits per Pixel at DCPM Block Input | Number of Bits per Pixel at DCPM Block Output | Description | Registers |
|--|---|--|---|
| 8 | 8 | PACK8: YUV | IPIPEIF_CFG1 [9:8] UNPACK = 0x1 IPIPEIF_DPCM [0] ENA = 0x0 IPIPEIF_CFG1 [13:11] DATASFT = 0x01. In this configuration an 8-bit packed RAW data is used in DFS mode or YUV4:2:0 pass through. (See Section 8.3.3.3.13 , <i>ISS ISP IPIPEIF YUV4:2:2 8-bits Packed Data Input Coming From ISIF Module</i> .) |
| 8 | 10 | DPCM10: The 8-bit input data are DPCM-decompressed in 10 bits. | IPIPEIF_CFG1 [9:8] UNPACK = 0x1 IPIPEIF_DPCM [0] ENA = 0x1 IPIPEIF_DPCM [2] BITS= 0x0 Set the IPIPEIF_DPCM [1] PRED ^{(1) (2)} IPIPEIF_CFG1 [13:11] DATASFT = 0x2 |
| 8 | 12 | DPCM12: The 8-bit input data are DPCM-decompressed in 12 bits. | IPIPEIF_CFG1 [9:8] UNPACK = 0x1 IPIPEIF_DPCM [0] ENA = 0x1 IPIPEIF_DPCM [2] = 0x1 Set the IPIPEIF_DPCM [1] PRED ^{(1) (2)} IPIPEIF_CFG1 [13:11] DATASFT = 0x0 |
| 8 | 10 | ALAW10: The 8-bit input data were previously A-law compressed. The 8 bits are A-law decompressed and padded with 0. | IPIPEIF_CFG1 [9:8] UNPACK = 0x2 IPIPEIF_CFG1 [13:11] DATASFT = 0x2 |
| 12 | 12 | PACK12: The input is coded on 12 bits and is packed in the SDRAM. This mode is compatible with the ISIF module packing capability. If inverse A-law and DPCM decompression are not enabled, the data read from the SDRAM can be shifted by the IPIPEIF_CFG1 [13:11] DATASFT bit field to select which 12 bits to use. MSB input data bit must be shifted such that it corresponds to bit 11 after the shift. | IPIPEIF_CFG1 [9:8] UNPACK = 0x3 Set the IPIPEIF_CFG1 [13:11] DATASFT |

⁽¹⁾ The simple predictor uses only the value of the previous same color component as a prediction value. Therefore, only 2-pixel memory is required. It is typically used for 10–8–10 or 12–8–12 bit conversions.

⁽²⁾ The advanced predictor uses four previous pixel values, when the prediction value is evaluated. This means that the values of the other color components are also used, when the prediction value is defined. Therefore, the advanced predictor is slightly better than the simple predictor but consumes more power and memory. It can, however, improve image quality. It is typically used for 10–7–10 and 10–6–10 bit conversions.

8.3.3.3.7 ISS ISP IPIPEIF Dark-Frame Subtraction Functionality

Figure 8-127. ISS ISP IPIPEIF Dark-Frame Subtraction Subblock



camss-033

The dark-frame subtract function is used to remove noise from the sensor. Typically, the ISIF module previously writes a dark frame (frame captured when the shutter is closed) to SDRAM using 8 bits of linear data packed into 2 pixels per 16 bits.

In this mode, RAW data from the ISIF and SDRAM is used. Data can also be read from SDRAM with the [IPIPEIF_CFG1\[9:8\] UNPACK](#) bit field set to 1. Each pixel read from SDRAM is subtracted from each pixel sent from the VP or ISIF.

The mux at the input of the dark-frame subtraction subblock is implicitly controlled by the selection of the [IPIPEIF_CFG1\[15:14\] INPSRC1](#) and [IPIPEIF_CFG1\[3:2\] INPSRC2](#) bit fields:

- When [IPIPEIF_CFG1\[15:14\] INPSRC1](#) = 0x2, the selected input ports are VP and BL. Therefore, the dark frame operation can be:
 - Dark frame = VP – BL
 - Dark frame = BL – VP
- When [IPIPEIF_CFG1\[3:2\] INPSRC2](#) = 0x2, the selected input ports are ISIF and BL. Therefore, the dark frame operation can be:
 - Dark frame = ISIF – BL
 - Dark frame = BL – ISIF

The output of the dark frame subtract operation is 12-bits wide (U12Q0). There must be adequate SDRAM bandwidth if this feature is enabled. If the data fetched from memory arrives late, an underflow bit ([IPIPEIF_DTUF](#)) must be triggered to know it.

8.3.3.3.7.1 ISS ISP IPIPEIF Defect Pixel Correction

NOTE: For DPC memory access locations, see [Section 8.3.3.9](#).

A simple DPC can be applied to the ISIF or VP input data path and SDRAM input data path, respectively. This DPC algorithm is intended to correct hot pixels during RAW dark frame acquisition or dark frame readout from SDRAM before dark frame subtraction.

The following code describes DPC algorithm:

```
If (image(n) TH) || ((image(2) TH) (image(n+2) TH)
    image(n) = image(n)
Else if image(2) TH
    image(n) = image(n+2)
Else if image(n+2) TH
    image(n) = image(2)
Else
    image(n) = (image(2)+ image(n+2))/2
// Where TH is equal to IPIPEIF_DPC1[11:0] TH for DPC1
// Where TH is equal to IPIPEIF_DPC2[11:0] TH for DPC2
```

The [IPIPEIF_DPC1\[12\]](#) ENA bit enables DPC for the VP/ISIF input path, and the [IPIPEIF_DPC2\[12\]](#) ENA bit enables DPC for the SDRAM input path. The algorithm requires a threshold value that is set by the [IPIPEIF_DPC1\[11:0\]](#) TH or [IPIPEIF_DPC2\[11:0\]](#) TH bit field that is a 12-bit unsigned value.

8.3.3.3.7.2 ISS ISP IPIPEIF DFS Subtraction Direction

The [IPIPEIF_CFG2\[5\]](#) DFSDIR bit selects how the DFS subtraction is performed.

- Set the [IPIPEIF_CFG2\[5\]](#) DFSDIR bit to 0 when the RAW data is coming from the VP/ISIF and the dark frame is stored in SDRAM.
- Set the [IPIPEIF_CFG2\[5\]](#) DFSDIR bit to 1 when the RAW data is coming from SDRAM and the dark frame is coming from the VP/ISIF.

After subtraction, a clip ensures that the value is not negative.

[Table 8-316](#) lists the different modes supported in DFS.

Table 8-316. ISS ISP IPIPEIF DFS Modes Supported

| Description | DFDIR Value |
|--|--|
| Dark frame subtract of 8-bit RAW image stored in SDRAM from image from VP | IPIPEIF_CFG2[5] DFSDIR = 0x0 |
| Dark frame subtract of 8-bit RAW image stored in SDRAM from image from ISIF | IPIPEIF_CFG2[5] DFSDIR = 0x0 |
| Dark frame subtract of 8-bit RAW image from VP from image read from SDRAM through the BL | IPIPEIF_CFG2[5] DFSDIR = 0x1 |

NOTE: DFS input depends on the INPSRC1 and INPSRC2 settings.

8.3.3.3.8 ISS ISP IPIPEIF (1, 2, 1) Averaging Filter for IPIPE Data Path

The averaging filter acts as an anti-aliasing low-pass filter for the horizontal pixel decimator. Usually, when horizontal pixel decimation is enabled ([IPIPEIF_CFG1\[1\]](#) DECIM), the averaging filter must also be enabled to avoid aliasing artifacts. The averaging filter can be enabled by setting the [IPIPEIF_CFG1\[7\]](#) AVGFILT bit. It operates on every other pixel (same color) in RAW Bayer input or every Y component in YCbCr data in the following equation:

$$\text{output} = (\text{input}[i - 1] + 2 * \text{input}[i] + \text{input}[i + 1]) / 2$$

The averaging filter operates on every other pixel (same color) in RAW Bayer input or YUV data.

If the data is YUV4:2:2, the option to average and decimate is given under the conditions listed in [Table 8-317](#).

Table 8-317. ISS ISP IPIPEIF Averaging Filter Conditions for YUV4:2:2 Data

| IPIPEIF_CFG1[3:2] INPSRC2 | IPIPEIF_CFG2[3] YUV16 | Comments |
|---|---------------------------------------|--|
| 0 | 1 | YUV4:2:2 data is coming from the ISIF module. Averager and decimation is possible on the data path to the IPIPE module. |

Table 8-317. ISS ISP IPIPEIF Averaging Filter Conditions for YUV4:2:2 Data (continued)

| IPIPEIF_CFG1[3:2] INPSRC2 | IPIPEIF_CFG2[3] YUV16 | Comments |
|----------------------------------|------------------------------|---|
| 1 | 1 | YUV4:2:2 data is read from SDRAM. Averager and decimation is possible on the data path to the IPIPE module. |
| 3 | | YUV4:2:2 data is read from SDRAM. Averager and decimation is possible on the data path to the IPIPE module. |
| Other value | Other value | For YUV4:2:2 data, averager and decimation is not possible on the data path to the IPIPE module. |

The averager implements a (1, 2, 1) FIR filter on Luma and Chroma. The following registers have a part in the behavior of the YUV data averaging and decimation:

- [IPIPEIF_INIRSZ\[12:0\] INIRSZ](#)
- [IPIPEIF_CFG1\[7\] AVGFILT](#)
- [IPIPEIF_CFG1\[1\] DECIM](#)

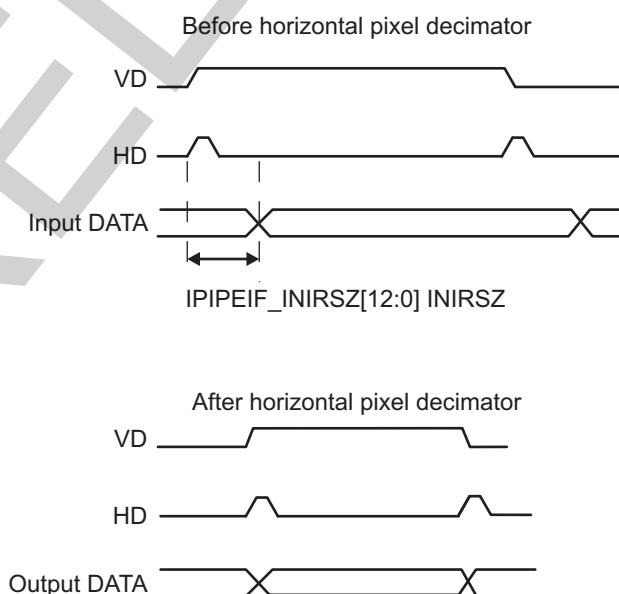
8.3.3.3.9 ISS ISP IPIPEIF Horizontal Pixel Decimator (Downsizer) for IPIPE Data Path

The IPIPE input is limited to 5376 pixels per horizontal line due to restrictions in the line memory width in the IPIPE.

To process image sensor resolutions with more than 5376 pixels per line with no resolution loss, vertical frame division mode (FDM) must be used; that is, the image must be divided into vertical chunks of less than 5376 pixels, and each chunk must be processed sequentially by the ISP. FDM is memory-to-memory processing and is not supported on the fly.

Alternatively, if a loss in resolution is acceptable, the line width decimator (the [IPIPEIF_CFG1\[1\] DECIM](#) bit) can be enabled to downsample the input lines to a width equal to or less than the 5376 pixel maximum. The resize ratio (16/RSZ) can be configured by programming the [IPIPEIF_RSZ\[6:0\] RSZ](#) bit field to be within the range from 16 to 112 to give a resampling range from 1x to 1/7x.

When ALNSYNC is enabled ([IPIPEIF_INIRSZ\[13\] ALNSYNC](#) = 0x1), the [IPIPEIF_INIRSZ\[12:0\] INIRSZ](#) pixels are skipped (from the HD position) before the horizontal pixel decimator, as shown in [Figure 8-128](#).

Figure 8-128. ISS ISP IPIPEIF Resizer Offset Definition

camss-614

8.3.3.3.10 ISS ISP IPIPEIF RAW Data Gain for IPIPE Data Path

A gain factor ranging from 0.00195(1/512) to 1.99805(1023/512) is multiplied to the RAW output of the IPIPEIF. The gain is not applied if the input data is YCbCr. The gain constant is set in the [IPIPEIF_GAIN\[9:0\]](#) GAIN bit field using U10Q9 format.

The output value is clipped after gain control through the value of the [IPIPEIF_OCLIP\[11:0\]](#) OCLIP bit field.

8.3.3.3.11 ISS ISP IPIPEIF (1, 2, 1) Averaging Filter for H3A Data Path

The averaging filter acts as an anti-aliasing low-pass filter for the horizontal pixel decimator. Usually, when horizontal pixel decimation is enabled (the [IPIPEIF_RSZ3A\[9\]](#) DECIM bit), the averaging filter must also be enabled to avoid aliasing artifacts. The averaging filter can also be used to reduce noise before H3A statistics generation. It operates on every other pixel (the same color) in a RAW Bayer input or every Y component in YCbCr data. The averaging filter can be enabled by setting the [IPIPEIF_RSZ3A\[8\]](#) AVGFILT bit, and it operates with the following equation:

$$\text{output} = (\text{input}[i - 1] + 2 * \text{input}[i] + \text{input}[i + 1]) / 2$$

8.3.3.3.12 ISS ISP IPIPEIF Horizontal Pixel Decimator (Downsizer) for H3A Data Path

The H3A input is limited to 3008 pixels per horizontal line due to restrictions in the line memory width in the H3A.

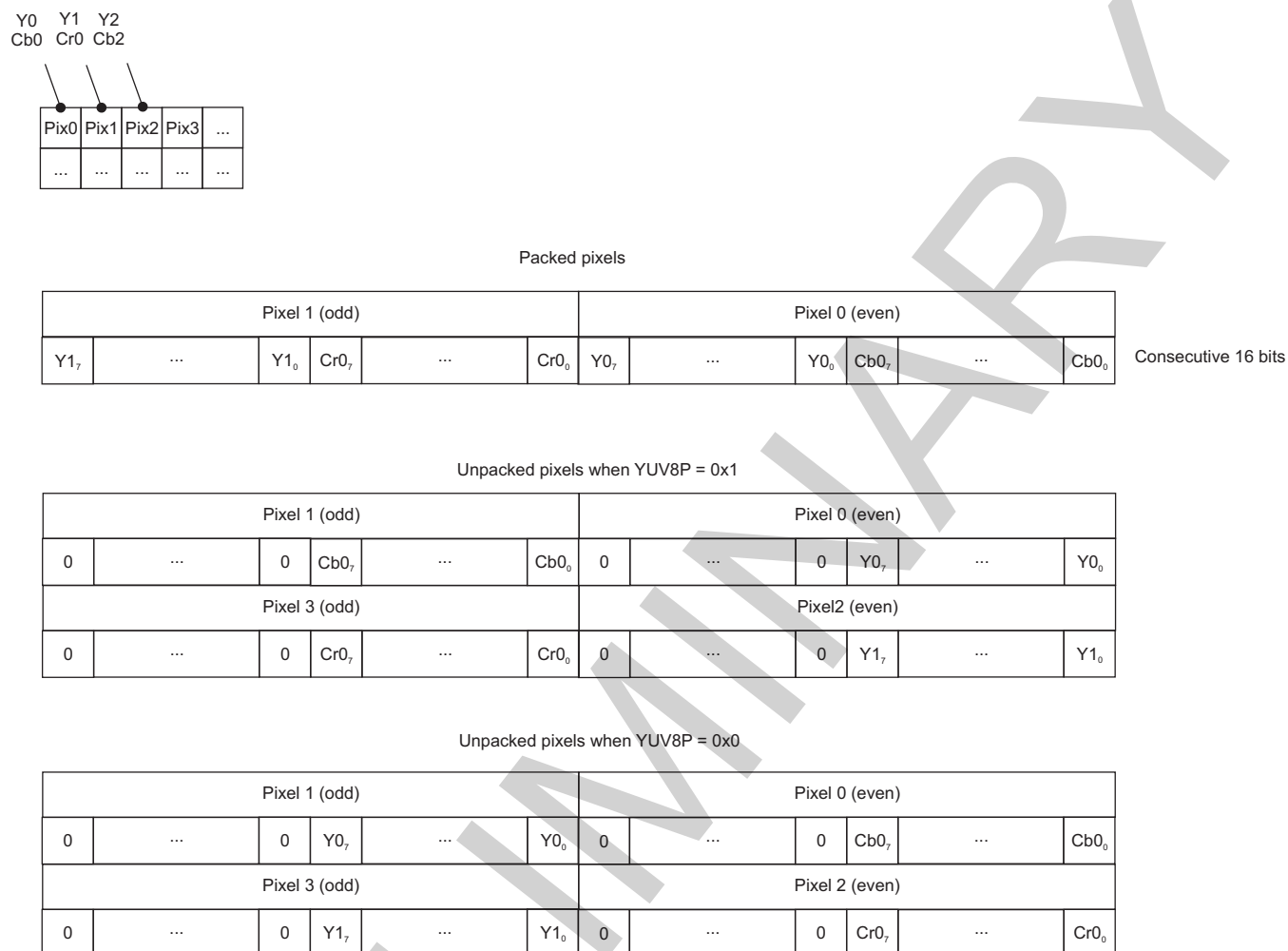
To process image-sensor resolutions with more than 3008 pixels per line with no resolution loss, vertical frame division mode (FDM must be used); that is, the image must be divided into vertical chunks of less than 3008 pixels, and each chunk must be processed sequentially by the ISP. FDM is memory-to-memory processing and is not supported on the fly.

Alternatively, if loss of resolution is acceptable, the line width decimator (the [IPIPEIF_RSZ3A\[9\]](#) DECIM bit) can be enabled to downsample the input lines to a width equal to or less than the 3008 pixel maximum. The resize ratio (16/RSZ) can be configured by programming the [IPIPEIF_RSZ3A\[6:0\]](#) RSZ bit field to be within the range from 16 to 112 to give a resampling range from 1x to 1/7x.

When ALNSYNC is enabled ([IPIPEIF_INIRSZ3A\[13\]](#) ALNSYNC = 0x1), the [IPIPEIF_INIRSZ3A\[12:0\]](#) INIRSZ pixels are skipped (from the HD position) before the horizontal pixel decimator (see [Figure 8-128](#)).

8.3.3.3.13 ISS ISP IPIPEIF YUV4:2:2 8-bits Packed Data Input Coming From ISIF Module

This section applies when data coming from the ISIF is 8 bits ([IPIPEIF_CFG2\[6\]](#) YUV8 = 0x1). When [IPIPEIF_CFG1\[3:2\]](#) INPSRC2 = 0 and [IPIPEIF_CFG2\[3\]](#) YUV16 = 1, the 8-bit YUV data are transformed into 16-bit YUV data. The way the data are unpacked from 8 bits to 16 bits is controlled by the [IPIPEIF_CFG2\[7\]](#) YUV8P bit. See [Figure 8-129](#).

Figure 8-129. ISS ISP IPIPEIF YUV8P Settings

camss-616

8.3.3.3.14 ISS ISP IPIPEIF YUV4:2:0 Data Input for Memory-to-Memory Resize Operations

The ISP RSZ module can resize YUV4:2:0 data. The YUV4:2:0 data can come from the memory (through BL) or from the VP through the CCP2 RX module, which reads data from SDRAM and pushes it to the IPIPEIF module VP. The possible data paths are:

- SDRAM - IPIPEIF (BL) - RESIZER - SDRAM
- SDRAM - CCP2 RX - IPIPEIF (VP) - RESIZER - SDRAM
- SDRAM - IPIPEIF (BL) - IPIPE - RESIZER - SDRAM
- SDRAM - CCP2 RX - IPIPEIF (BL) - IPIPE - RESIZER - SDRAM

When the data comes from BL, the IPIPEIF module must be set up to process the luminance data first, and then the chrominance data.

- For 420Y (first pass):
 - IPIPEIF_CFG1[15:14] INPSRC1 = 0x1 (SDRAM data input)
 - IPIPEIF_CFG1[3:2] INPSRC2 = 0x1 (SDRAM data input)
 - IPIPEIF_CFG1[13:11] DATASFT = 0x0 (no data shift)
 - IPIPEIF_CFG1[9:8] UNPACK = 0x1 (data packed on 8 bits)
 - IPIPEIF_CFG2[3] YUV16 = 0x1 (data_input [7:0] = 0 and data_input [15:8] = valid)
- For 420C (second pass):

- [IPIPEIF_CFG1\[15:14\]](#) INPSRC1 = 0x1 (SDRAM data input)
- [IPIPEIF_CFG1\[3:2\]](#) INPSRC2 = 0x1 (SDRAM data input)
- [IPIPEIF_CFG1\[13:11\]](#) DATASFT = 0x0 (no data shift)
- [IPIPEIF_CFG1\[9:8\]](#) UNPACK = 0x1 (data packed on 8 bits)
- [IPIPEIF_CFG2\[3\]](#) YUV16 = 0x0 (data_input[7:0] = valid and data_input [15:8] = 0)

8.3.3.3.15 ISS ISP IPIPEIF Module Events and Status Checking

The IPIPEIF module generates an IPIPEIF event through the IPIPEIF_IRQ interrupt at the end of each frame. This interrupt is set through the [ISP5_IRQENABLE_SET_i\[9\]](#) IPIPEIF_IRQ bit. The input interrupt source generation is selected through the [IPIPEIF_CFG2\[0\]](#) INTSW bit in a certain configuration. The following pseudo code describes INTSW.

```
if (IPIPEIF_CFG2[0] INTSW==0) // Interrupt source from VP
    if (IPIPEIF_CFG1[15:14] INPSRC1==1,2 or 3)
        if (CFG1.ONESHOT==1) // In one shot mode
            Interrupt happens at the end of frame
        else // In continuous mode
            Interrupt is the start position of VD which is generated by IPIPEIF timing generator
    else // IPIPEIF_CFG1[15:14] INPSRC1==0, data is from VP
        Interrupt is the start position of VD from VP
else // Interrupt source from ISIF: IPIPEIF_CFG2[0] INTSW==1
    if (IPIPEIF_CFG1[3:2] INPSRC2==1,2 or 3)
        if (CFG1.ONESHOT==1) // In one shot mode
            Interrupt happens at the end of frame
        else
            Interrupt is the start position of VD which is generated by IPIPEIF timing generator
    else // IPIPEIF_CFG1[3:2] INPSRC2==0, data is from ISIF
        Interrupt is the start position of VD from ISIF
```

In addition to this interrupt, the host must check the IPIPEIF_DTUF status flag of the [ISP5_IRQSTATUS_RAW2_i\[1\]](#) IPIPEIF_UDF bit (if this is enabled and mapped to the ISP IRQ lines) to see if an underflow occurred. For more information, see [Section 8.3.4.3.4](#).

8.3.3.4 ISS ISP IPIPE Functional Description

8.3.3.4.1 ISS ISP IPIPE Overview

- The input interface extracts the valid region from the Bayer RAW data:
 - Up to 12-bit input pixel resolution
 - Requires at least 8 pixels for horizontal blanking and four lines for vertical blanking. In one-shot mode; 16 blanking lines after processing area are required.
 - The maximum horizontal and vertical offset of IPIPE processing area from synchronous signal is 65534.
 - Supports RGB Bayer pattern for input
- The DPC module fixes defect pixels using two methods: LUT-based and on-the-fly adaptive.
- The 2D noise-filter module reduces noise in RAW data.
- The green-imbalance-correction (GIC) module reduces Gb/Gr difference to remove line crawl noise.
- The white balance module applies offset and gain adjustments to each color.
- The Color filter array (CFA) interpolation module implements CFA interpolation. The output from the CFA interpolation module is RGB-4:4:4 formatted data. CFA also reduces aliasing caused by undersampling by digital anti-aliasing (DAA).
- The RGB2RGB blending module applies a 3 × 3 matrix transform to the RGB data generated by the CFA interpolation module.
- The gamma correction module independently applies gamma correction to each RGB component. Gamma is implemented using a piece-wise linear interpolation approach with a 512-entry LUT for each color.

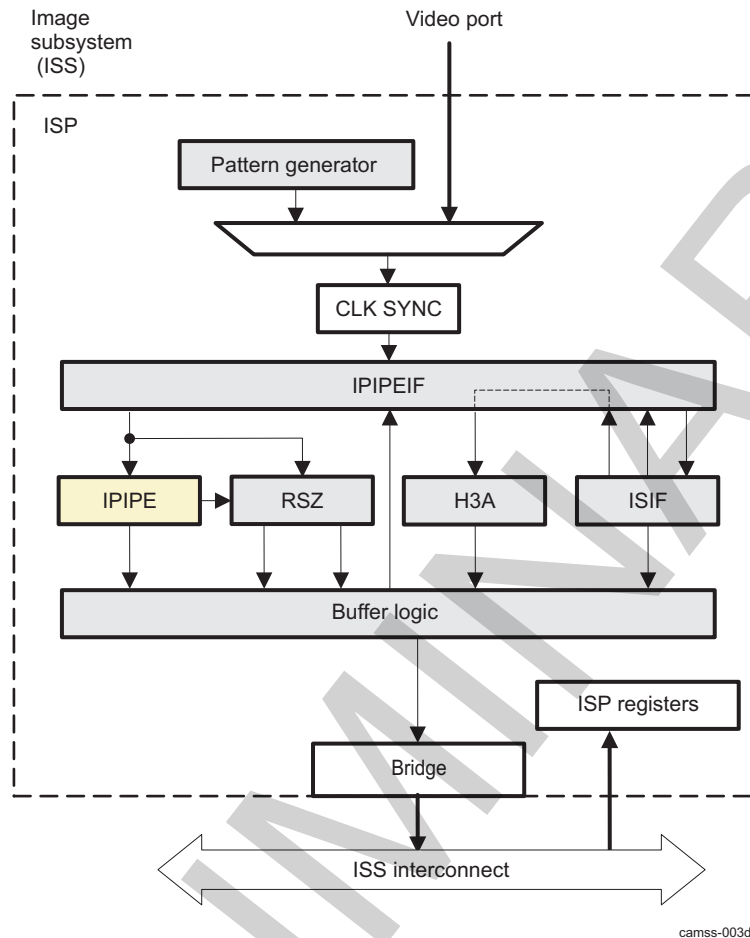
- The 2nd RGB2RGB blending module applies a 3×3 matrix transform to the RGB data after gamma correction.
- 3D-LUT converts RGB data to RGB data using $9 \times 9 \times 9$ table and tetrahedral interpolation.
- The RGB2YCbCr conversion module applies 3×3 matrix transformation to the RGB data to convert it to YCbCr data. This module also implements offset. The global brightness and contrast enhancement module fixes brightness and contrast tone.
- The 4:2:2 conversion module applies the chroma low pass filter and downsampling to Cb and Cr to convert 4:4:4 data to 4:2:2 data.
- The 2D edge-enhancer module improves image clarity with a luminance nonlinear filter.
- The chroma artifact reduction module reduces color artifacts using gain control and a 2D median filter.
- The output interface module transfers data from IPIPE to SDRAM in the form of one YCbCr (4:2:2 or 4:2:0), RGB (32/16 bits), or Bayer data.
- The histogram function can record histograms of up to four distinct areas into up to 256 bins.
- The boxcar function makes 1/8 or 1/16 size (1/64 or 1/256 in area) images.
- The boundary signal calculator (BSC) makes vectors of row and column summations.

IPIPE has four different processing paths:

- Case 1: IPIPE reads CCD RAW data and applies all IPIPE functions and stores the YCbCr (or RGB) data to SDRAM.
- Case 2: IPIPE reads CCD RAW data and stores the Bayer data after white balance to SDRAM.
- Case 3: IPIPE reads YCbCr-4:2:2 data and applies edge enhance, chroma suppression, and resize to output YCbCr data to SDRAM.
- Case 4: IPIPE reads YCbCr-4:2:0 data and applies resize to output YCbCr data to SDRAM.

[Figure 8-130](#) shows the connections from the IPIPE module to other submodules of the ISP.

Figure 8-130. ISS ISP IPIPE High-Level Diagram

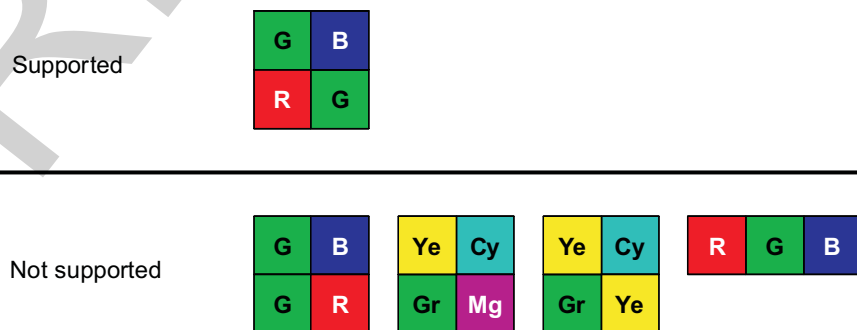


8.3.3.4.2 ISS ISP IPIPE Top-Level Block Diagram

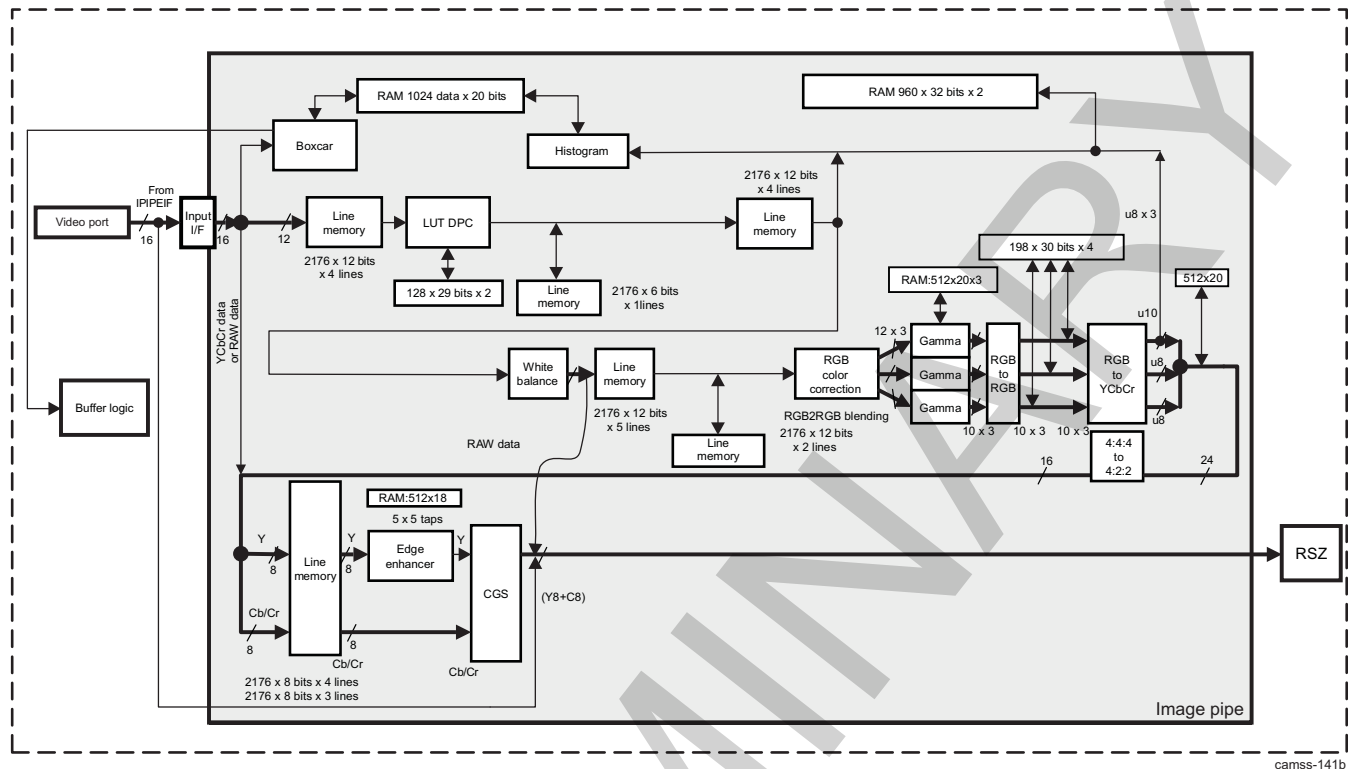
The IPIPE is a programmable hardware image-processing module that generates image data in YCbCr-4:2:2 or YCbCr-4:2:0 format from RAW CCD/CMOS data. The IPIPE module supports output of Bayer data.

The IPIPE module supports RAW data in Bayer format, as shown in [Figure 8-131](#). Other RGB formats or complimentary color formats are not supported.

Figure 8-131. ISS ISP IPIPE Supported CFA Format



As shown in [Figure 8-132](#), many internal modules are used to process Bayer data into YCbCr data

Figure 8-132. ISS ISP IPIPE Module Block Diagram

8.3.3.4.3 ISS ISP IPIPE Input Interface

The IPIPE module receives 12-bit RAW image data or 16-bit YCbCr data through the IPIPEIF module. The IPIPE module can work with up to 5376 pixels in each horizontal line, except in RAW pass-through mode. If the image width is larger than 5376, the image must be scaled down at the IPIPEIF module level. Otherwise, the input image must be split into several blocks.

If the input data is YCbCr, all RGB processing modules are skipped, and only edge enhancer and chroma suppression are applied to the input data.

If the input data is YCbCr-4:2:0, only Y or C can be processed at a time, and only the resizer process can be applied. Because the resizer is outside the ISIF module, the data is passed to it directly by skipping the RGB and YCbCr processing modules.

In RAW pass-through mode, images up to 8190 pixels per line can be processed. In RAW pass-through mode, the input data is written out directly to SDRAM.

The IPIPE module is enabled through the [IPIPE_SRC_EN\[0\]](#) EN bit.

The IPIPEIF module must be selected as the IPIPE module source with the [IPIPE_SRC_MODE\[1\]](#) WRT bit set to 1 from the input port of the IPIPEIF. This is required to enable and transfer data properly from the interface to the IPIPE.

The IPIPE module has two processing modes, which can be selected through the [IPIPE_SRC_MODE\[0\]](#) OST bit:

- One-shot mode: [IPIPE_SRC_MODE\[0\]](#) OST = 0x1
- Free-run mode: [IPIPE_SRC_MODE\[0\]](#) OST = 0x0

The input and output formats are selected in the [IPIPE_SRC_FMT\[1:0\]](#) FMT bit field (see [Table 8-318](#)).

Table 8-318. ISS ISP IPIPE Input and Output Selections

| IPIPE_SRC_FMT[1:0] FMT | IPIPE Module Input | IPIPE Module Output |
|------------------------|--------------------|---------------------|
| 0x0 | RAW Bayer | YCbCr or RGB |
| 0x1 | RAW Bayer | RAW Bayer |
| 0x2 | RAW Bayer | Disabled |
| 0x3 | YCbCr 16 bits | YCbCr |

The input to the IPIPE module is in the formats (YCbCr-8bit is not allowed) shown in [Figure 8-133](#).

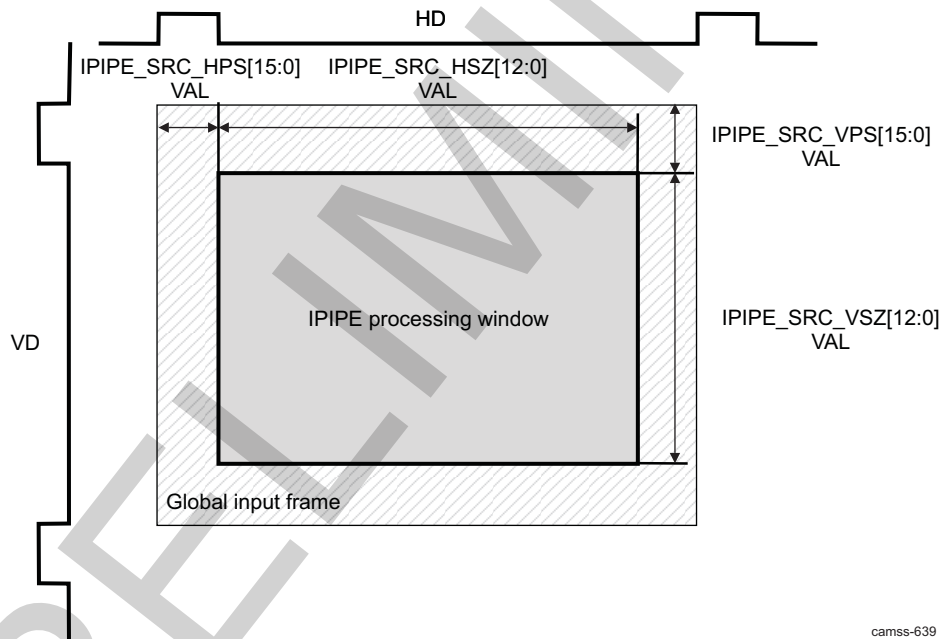
Figure 8-133. ISS ISP IPIPE Module Input Format

| IPIPE input | RAW | LOW | LOW | LOW | LOW | RAW11 | RAW10 | RAW9 | RAW8 | RAW7 | RAW6 | RAW5 | RAW4 | RAW3 | RAW2 | RAW1 | RAW0 |
|----------------|-----------|-----|-----|-----|-----|-------|-------|------|------|--------|--------|--------|--------|--------|--------|--------|--------|
| | YCbCr 16b | Y7 | Y6 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 | Cb/Cr7 | Cb/Cr6 | Cb/Cr5 | Cb/Cr4 | Cb/Cr3 | Cb/Cr2 | Cb/Cr1 | Cb/Cr0 |
| | Y 8bit | Y7 | Y6 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 | LOW | LOW | LOW | LOW | LOW | LOW | LOW | LOW |
| | CbCr 8bit | LOW | LOW | LOW | LOW | LOW | LOW | LOW | LOW | Cb/Cr7 | Cb/Cr6 | Cb/Cr5 | Cb/Cr4 | Cb/Cr3 | Cb/Cr2 | Cb/Cr1 | Cb/Cr0 |

camss-143

The window to process can be defined by its vertical and horizontal start position (IPIPE_SRC_VPS and IPIPE_SRC_HPS) and vertical and horizontal size (IPIPE_SRC_VSZ and IPIPE_SRC_HSZ). [Figure 8-134](#) shows the window settings for processing.

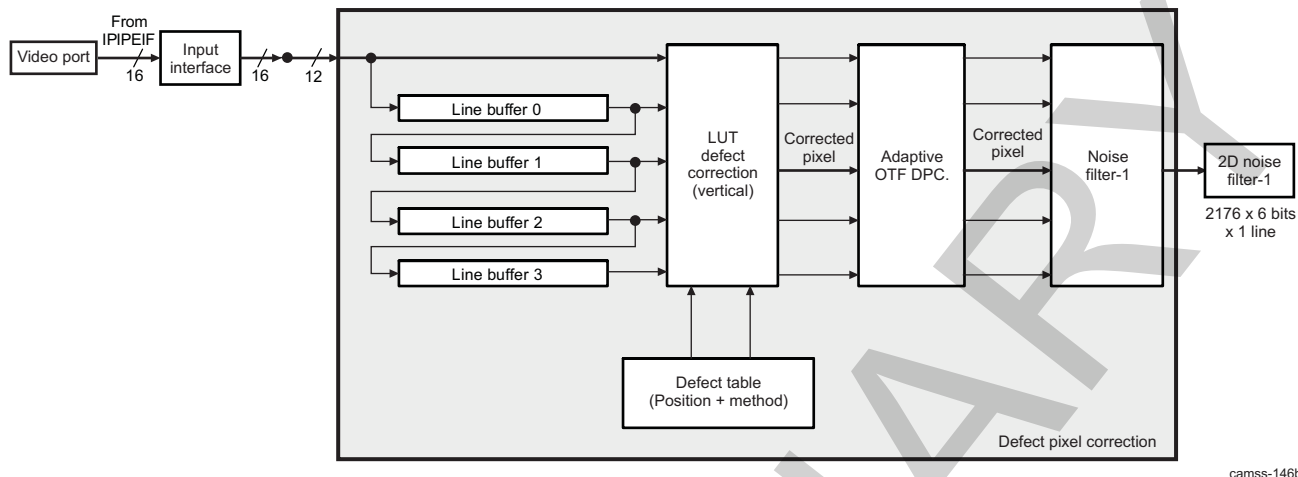
Figure 8-134. ISS ISP IPIPE Module Processing Window Settings



camss-639

8.3.3.4.4 ISS ISP IPIPE Defect Pixel Correction

The DPC module corrects defect pixels using two methods: look-up-table-based method (LUT DPC) and on-the-fly adaptive method (OTF DPC). [Figure 8-135](#) shows defect pixel correction.

Figure 8-135. ISS ISP IPIPE Defect Pixel Correction

camss-146b

8.3.3.4.4.1 ISS ISP IPIPE LUT Defect Pixel Correction (LUT DPC)

LUT DPC is the first stage of the IPIPE image-processing pipeline. The LUT DPC module corrects defects in input data. It supports up to a 256-defect point table. However, the table can be renewed as required during image processing. Therefore, the maximum amount of defect information is limited only by system-level performance.

The module uses two sets of 128×29 memories to hold defect information. The table contains the information of horizontal position (13 bits), vertical position (13 bits), and correction method (3 bits), as shown in Table 8-319. The LUT DPC is enabled through the `IPIPE_DPC_LUT_EN[0]` EN bit.

Table 8-319. ISS ISP IPIPE Defect Information Packing

| Correction Method | Vertical Position | Horizontal Position |
|-------------------|-------------------|---------------------|
| 28...26 | 25...13 | 12...0 |

The information must be listed in the order of "from left to right" and "from the top to bottom." The first position in the defect information table and the number of defects that are used can be specified. The address of the table must be programmed in the `IPIPE_DPC_LUT_ADR[9:0]` ADR bit field. Thus, the address of the first valid data is stated.

The LUT type can be:

- With a finite number of entries:
 - `IPIPE_DPC_LUT_SEL[1]` TBL = 0x0
 - The size of the LUT is set in the `IPIPE_DPC_LUT_SIZ[9:0]` SIZ bit field.
- With an infinite number of entries:
 - `IPIPE_DPC_LUT_SEL[1]` TBL = 0x1

The correction methods, set in Table 8-319, are described in Table 8-320.

Table 8-320. ISS ISP IPIPE Correction Method Description

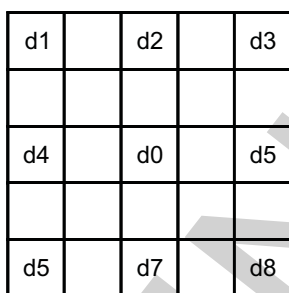
| Correction Method | d0 = | Comment |
|-------------------|--------------------|--|
| 0 | Black or white dot | Replace with a black (or white) dot to force OTF-DPC to work on the pixel. White or black dot replacement can be selected through the <code>IPIPE_DPC_LUT_SEL[0]</code> DOT field. |
| 1 | d4 | Copy from left |
| 2 | d5 | Copy from right |

Table 8-320. ISS ISP IPIPE Correction Method Description (continued)

| Correction Method | d0 = | Comment |
|-------------------|-------------------------|--------------------------|
| 3 | $(d4 + d5)/2$ | Horizontal interpolation |
| 4 | $(d2 + d7)/2$ | Vertical interpolation |
| 5 | d2 | Copy from top |
| 6 | d7 | Copy from bottom |
| 7 | $(d2 + d4 + d5 + d7)/2$ | 2D interpolation |

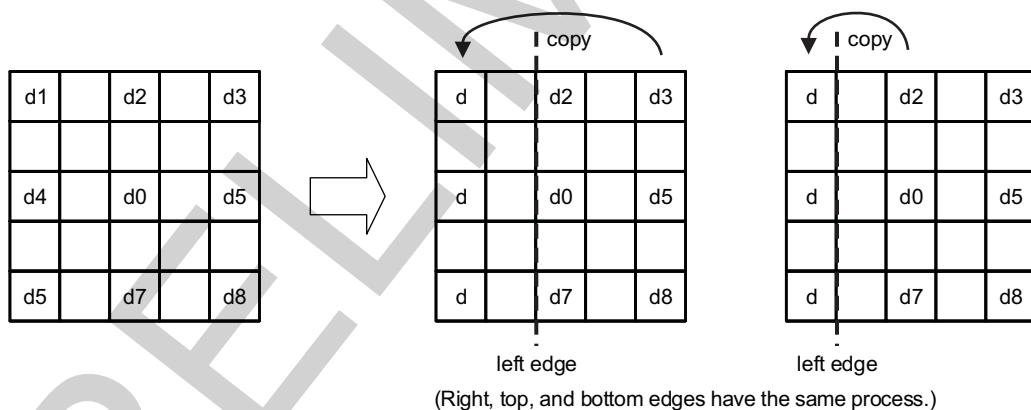
The pixels in the defect correction algorithm are numbered as shown in [Figure 8-136](#).

Figure 8-136. ISS ISP IPIPE Pixel Numbering in Defect Correction Algorithm



The pixels at the edges are mirrored in the way described in [Figure 8-137](#). The figure shows the typical correction by overwriting far-edge pixels and mirroring them with other edge pixels. The example shows how by using a noise filter the correct-by-definition pixels are copied over bad pixels.

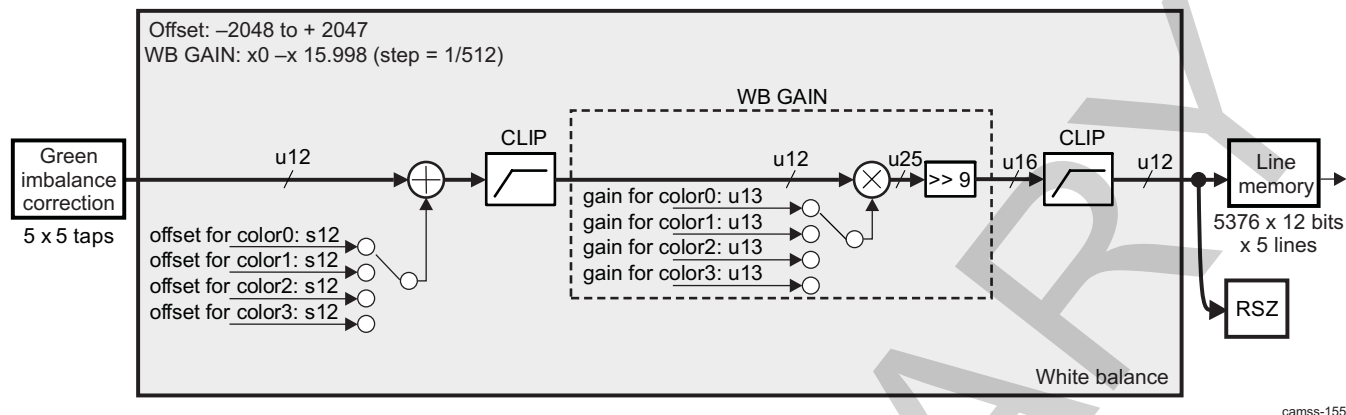
Figure 8-137. ISS ISP IPIPE Mirroring in Defect Correction and Noise Filter



8.3.3.4.5 ISS ISP IPIPE White Balance

The white balance module executes white balance to each color component. White balance gain adjusts the ratio of each color existing in a CFA pattern. An offset can be applied before white balance correction (IPIPE_WB2_OFT_R, GR, Gb, or B registers).

[Figure 8-138](#) is a block diagram of the white balance module. In the white balance gain adjuster, the RAW data is multiplied by a selected gain (IPIPE_WB2_WGN_R, Gr, Gb, or B registers) corresponding to the color. The white balance gain can be selected from four 13-bit values. Firmware can assign any combination of 4 pixels in horizontal and vertical directions. The precision of each gain is shown in the figure.

Figure 8-138. ISS ISP IPIPE White Balance**8.3.3.4.6 ISS ISP IPIPE RGB2RGB Blending Module**

The RGB2RGB blending module transforms the RGB data generated by the CFA interpolation module using a 3×3 square matrix transformation in combination with an added offset. The RGB-to-RGB blending is calculated using the formula shown in Figure 8-139. Each gain range is from -8 to +7.996 with step $1/256 = 0.004$, and is set in the `IPIPE_RGB1_MUL_RR` to `IPIPE_RGB1_MUL_BB` registers. The offset range for each component is from -4096 to 4095, and is set in the `IPIPE_RGB1_OFT_OR` to `IPIPE_RGB1_OFT_OB` registers.

Figure 8-139. ISS ISP IPIPE RGB2RGB Conversion Formula

$$\begin{pmatrix} R_out \\ G_out \\ B_out \end{pmatrix} = \begin{pmatrix} gain_RR & gain_GR & gain_BR \\ gain_RG & gain_GG & gain_BG \\ gain_RB & gain_GB & gain_BB \end{pmatrix} \begin{pmatrix} R_in \\ G_in \\ B_in \end{pmatrix} + \begin{pmatrix} offset_r \\ offset_G \\ offset_B \end{pmatrix}$$

camss-650

8.3.3.4.7 ISS ISP IPIPE Gamma Correction Module

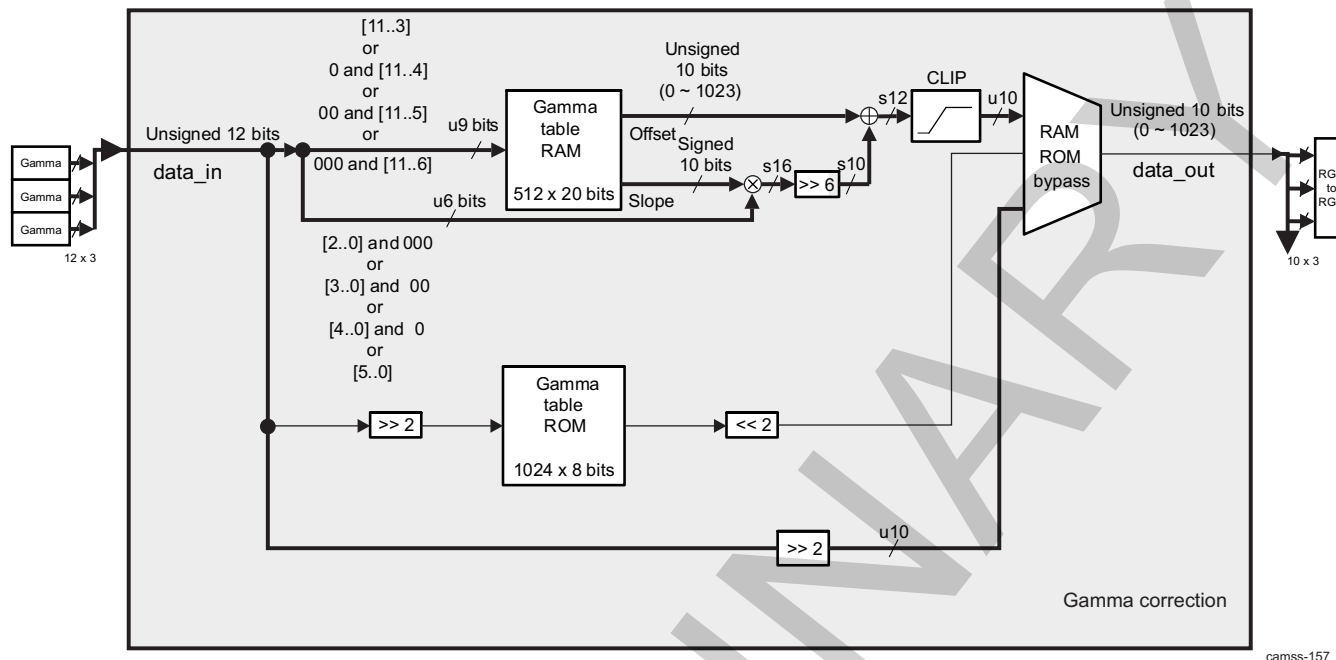
NOTE: For the memory access locations of the gamma correction module, see [Section 8.3.3.9](#).

The gamma correction module performs gamma correction independently for each color in the RGB color space by using a piece-wise linear interpolation. ROM tables and RAM tables are selectable through the `IPIPE_GMM_CFG[4]` TBL bit. Each ROM table and RAM table has 512-entries, and each entry accommodates a 10-bit offset and 10-bit slope. The range of slope value is from -512 to +511. The ROM table has 1024 entries and an output 8-bit value.

Figure 8-140 is a block diagram of the gamma correction module. It is composed of two tables and one selector. When the BYPASS bit is asserted, the input data is divided by 16 (the `IPIPE_GMM_CFG[0]` BYPR, `IPIPE_GMM_CFG[1]` BYPG, and `IPIPE_GMM_CFG[2]` BYPB bits).

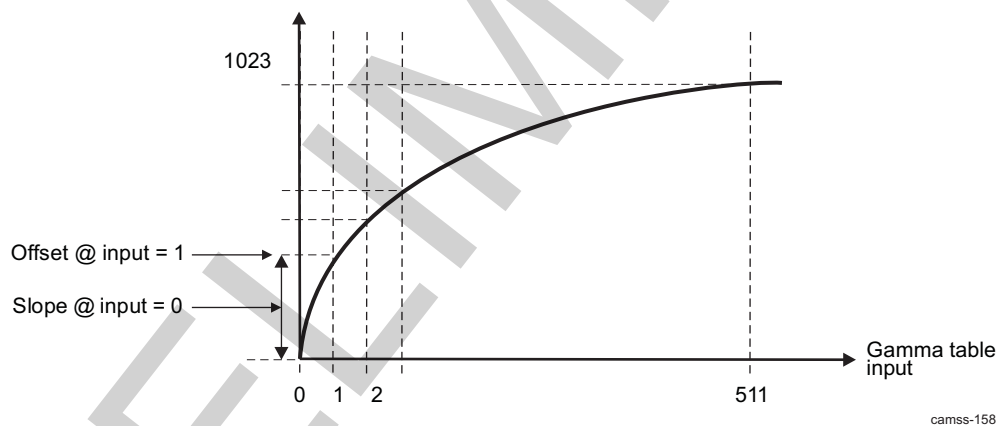
Figure 8-141 shows an example of the gamma curve. Figure 8-142 shows offset and slope packing.

Figure 8-140. ISS ISP IPIPE Gamma Correction Module Block Diagram



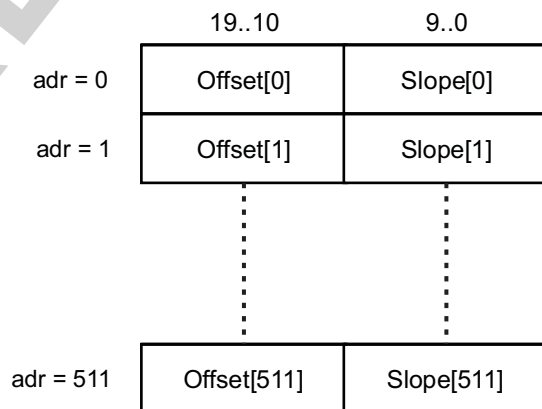
camss-157

Figure 8-141. ISS ISP IPIPE Gamma Curve Example



camss-158

Figure 8-142. ISS ISP IPIPE Gamma Table Offset/Slope Packing



camss-159

8.3.3.4.8 ISS ISP IPIPE 2nd RGB2RGB Conversion Matrix

The second RGB2RGB blending module transforms the RGB data after gamma correction using the 3×3 square matrix transformation in combination with an added offset. The RGB-to-RGB blending is calculated using the formula shown in Figure 8-143. Each gain range is from -4 to $+3.996$ with step $1/256 = 0.004$ (s3.8), and is set in the `IPIPE_RGB2_MUL_RR` to `IPIPE_RGB2_MUL_BB` registers. The offset is -1024 to 1023 (s11), and is set in the `IPIPE_RGB2_OFT_OR` to `IPIPE_RGB2_OFT_OB` registers.

Figure 8-143. ISS ISP IPIPE RGB2RGB 2nd Conversion Formula

$$\begin{pmatrix} R_out \\ G_out \\ B_out \end{pmatrix} = \begin{pmatrix} gain_RR & gain_GR & gain_BR \\ gain_RG & gain_GG & gain_BG \\ gain_RB & gain_GB & gain_BB \end{pmatrix} \begin{pmatrix} R_in \\ G_in \\ B_in \end{pmatrix} + \begin{pmatrix} offset_r \\ offset_G \\ offset_B \end{pmatrix}$$

camss-650

8.3.3.4.9 ISS ISP IPIPE RGB2YCbCr Conversion Matrix

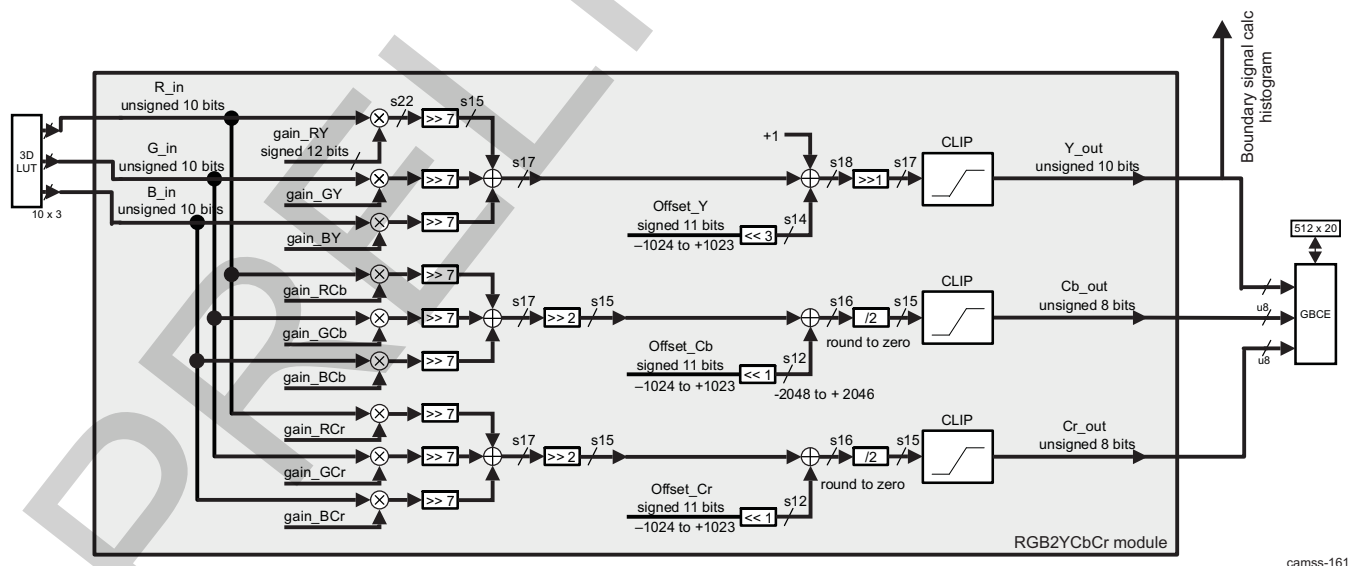
This module transforms the RGB data to YCbCr data format using a 3×3 matrix transformation in combination with an added offset. While transferring, the brightness control and contrast control can be adjusted using the `IPIPE_YUV_ADJ[8:15]` BRT and `IPIPE_YUV_ADJ[8:15]` CRT bit fields, respectively. Then, the transform is calculated using the formula shown in Figure 8-144. Each gain range is from -8 to $+7.996$ with step $1/256 = 0.004$, configured in the `IPIPE_YUV_MUL_RY` to `IPIPE_YUV_MUL_BCr` registers. The offset is -1024 to 1023 for Y, Cb, and Cr, configured in the `IPIPE_YUV_OFT_Y` to `IPIPE_YUV_OFT_Cr` registers. Figure 8-145 is the block diagram of the RGB to RGB blending module. The output is calculated by the equation.

Figure 8-144. ISS ISP IPIPE RGB2RGB 2nd Conversion Formula

$$\begin{pmatrix} Y_out \\ Cb_out \\ Cr_out \end{pmatrix} = \begin{pmatrix} gain_RY & gain_GY & gain_BY \\ gain_RCb & gain_GCb & gain_BCb \\ gain_RCr & gain_GCr & gain_BCr \end{pmatrix} \begin{pmatrix} R_in \\ G_in \\ B_in \end{pmatrix} + \begin{pmatrix} offset_Y \\ offset_Cb \\ offset_Cr \end{pmatrix}$$

camss-654

Figure 8-145. ISS ISP IPIPE RGB2YCbCr Module Block Diagram

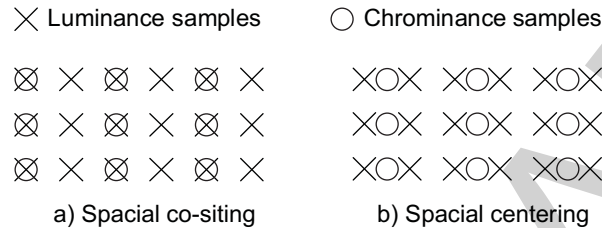


camss-161

8.3.3.4.10 ISS ISP IPIPE 4:2:2 Conversion Module

The 4:2:2 conversion module converts the image data to YCbCr-4:2:2 format by taking the average of every two Cb and Cr components. Y and Cb/Cr sampling point of spatial cosited or spatial centering are selectable using the [IPIPE_YUV_PHS\[0\]](#) POS register. Horizontal 3 taps and 4- or 2-tap filters are used for spatial cosited and spatial centering, respectively. The module is enabled from the [IPIPE_YUV_PHS\[1\]](#) PLF bit.

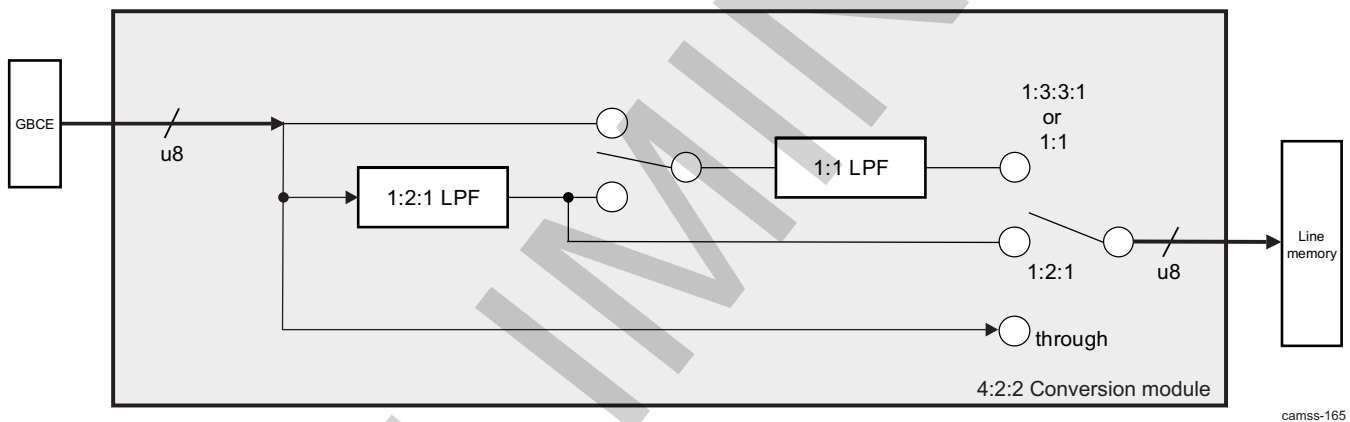
Figure 8-146. ISS ISP IPIPE Chroma Subsampling Position



camss-164

[Figure 8-147](#) is a block diagram of the 4:2:2 conversion module.

Figure 8-147. ISS ISP IPIPE 4:2:2 Conversion Module Block Diagram



camss-165

8.3.3.4.11 ISS ISP IPIPE 2D Edge Enhancer

NOTE: For the location of 2D edge-enhancer memory accesses, see [Section 8.3.3.9](#).

The edge-enhancer module operates on the luminance (Y data) component of images to improve the image quality and can be enabled from the [IPIPE_YEE_EN\[0\]](#) EN bit. Edges in input images are detected by a 2D high-pass filter, and its sharpness is increased by the value from a non-linear table. [Figure 8-148](#) shows a block diagram of the luminance non-linear edge-enhancer. Entry for the non-linear table is 10-bit and the output is in signed 9-bit.

In edge-enhancer mode when [IPIPE_YEE_TYP\[0\]](#) SEL is set to 0, linear filter with programmable coefficient is applied to the Y input. Here, M is a 5×5 matrix with programmable coefficients ([IPIPE_YEE_MUL_xx](#), where $x = 00, 01, 02, 10, 11, 12, 20, 21, 22$). A down shift of high pass filter is applied to the edge enhancer from the [IPIPE_YEE_SHF\[3:0\]](#) SHF bit field (shgHPF in the formula).

Then, the HPF value is shrunk by a threshold value (u6) specified by the [IPIPE_YEE_THR](#) register (thresholdHPF in the formula), and clipped to signed 10 bits to get the index for the LUT.

Figure 8-148. ISS ISP IPIPE 2D Edge-Enhancer Indexing

$$index = clip(\text{shrink}(HPF, threshold_{HPF}), -512, 511)$$

$$\text{shrink}(x, threshold) = \begin{cases} x + threshold & x < -threshold \\ 0 & -threshold \leq x \leq threshold \\ x - threshold & threshold < x \end{cases}$$

$$\text{clip}(x, limit_{LOW}, limit_{HIGH}) = \begin{cases} -limit_{LOW} & x < -limit_{LOW} \\ x & -limit_{LOW} \leq x \leq limit_{HIGH} \\ limit_{HIGH} & limit_{HIGH} < x \end{cases}$$

camss-661

Moreover, the edge-enhancement intensity is looked up from the LUT through the formula shown in [Figure 8-149](#) and in [Table 8-321](#).

Figure 8-149. ISS ISP IPIPE 2D Edge Intensity LUT Formula

$$E_{int} = LUT[index]$$

camss-662

Table 8-321. ISS ISP IPIPE Edge-Enhancer LUT Mapping

| Address (32-bit Word Address) | Bit Position | LUT Index |
|-------------------------------|--------------|-----------|
| 0x00000h | 8 .. 0 | 1 |
| | 17 .. 9 | 2 |
| 0x00001h | 8 .. 0 | 2 |
| | 17 .. 9 | 3 |
| 0x00002h | 8 .. 0 | 4 |
| | 17 .. 9 | 5 |
| 0x00003h | 8 .. 0 | 6 |
| | 17 .. 9 | 7 |
| . | . | . |
| | . | . |
| 0x000FFh | 8 .. 0 | 510 |
| | 17 .. 9 | 511 |
| 0x00100h | 8 .. 0 | -512 |
| | 17 .. 0 | -511 |
| 0x00101h | 8 .. 0 | -510 |
| | 17 .. 9 | -509 |
| . | . | . |
| | . | . |
| 0x001FD | 8 .. 0 | -6 |
| | 17 .. 9 | -5 |
| 0x001FE | 8 .. 0 | -4 |
| | 17 .. 9 | -3 |
| 0x001FFh | 8 .. 0 | -2 |
| | 17 .. 9 | -1 |

Figure 8-150 shows the LUT packing, and Figure 8-151 shows the 2D edge-enhancer block diagram.

Figure 8-150. ISS ISP IPIPE 2D Edge-Enhancer LUT Packing

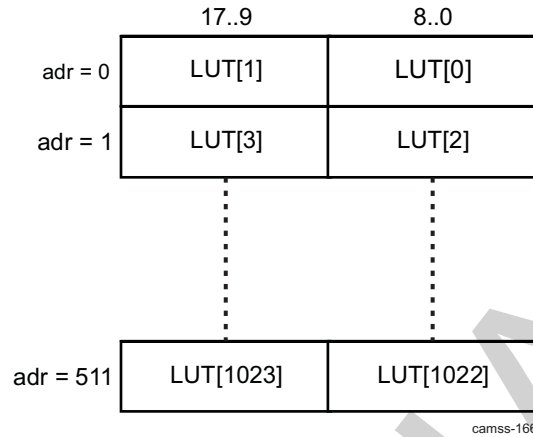
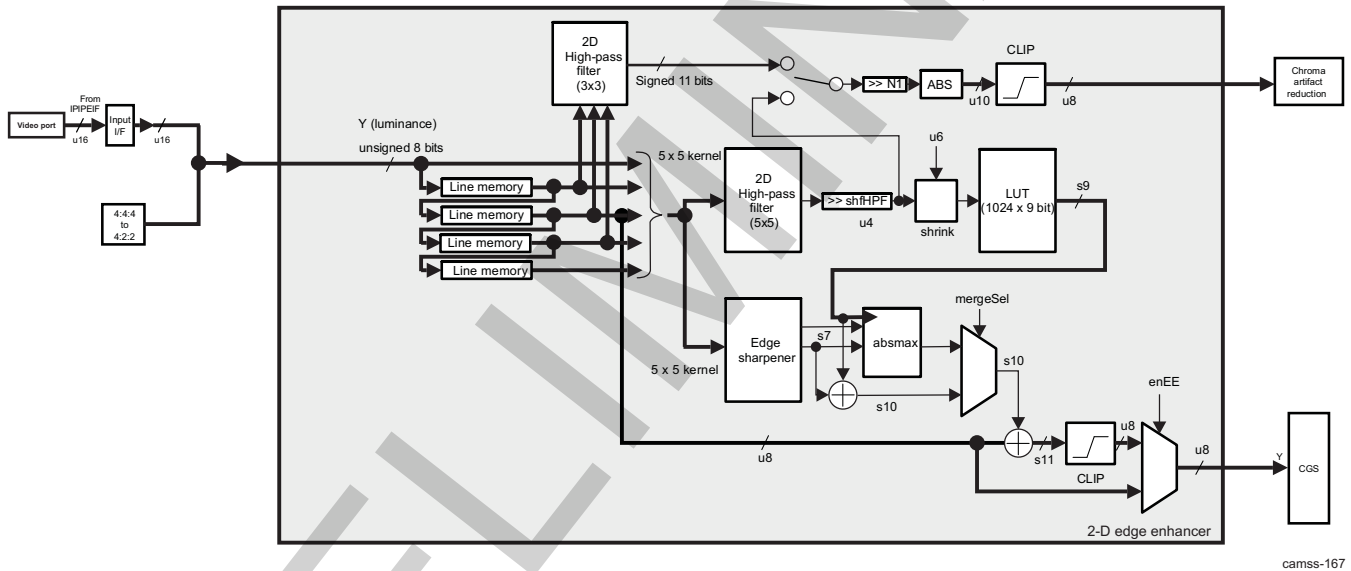


Figure 8-151. ISS ISP IPIPE 2D Edge-Enhancer Block Diagram



In edge sharpener mode, enabled when `IPIPE_YEE_TYP[0] SEL = 1`, edge clarity is enhanced without producing a Halo artifact. In this module, edge intensity is derived by the 2D linear filter with fixed coefficients shown in Figure 8-152.

Figure 8-152. ISS ISP IPIPE Edge Sharpener Details

$$S_{i,j} = \begin{pmatrix} 0 & -1 & -2 & -1 & 0 \\ -1 & 0 & 2 & 0 & -1 \\ -2 & 2 & 8 & 2 & -2 \\ -1 & 0 & 2 & 0 & -1 \\ 0 & -1 & -2 & -1 & 0 \end{pmatrix}$$

$$\text{sharpness}(h,v) = \text{clip} \left(\text{shrink} \left(g \sum_{j=-2}^2 \sum_{i=-2}^2 S_{i,j} Y(h+i,v+j), -\text{threshold}_{\text{LOW}}, \text{threshold}_{\text{LOW}} \right) \gg 6, \text{threshold}_{\text{HIGH}} \right)$$

camss-663

The gain (g) and threshold values for the shrink/clip function (threshold_{LOW}, threshold_{HIGH}) are determined by the [IPIPE_YEE_E_GAN](#), [IPIPE_YEE_THR_1](#) and [IPIPE_YEE_THR_2](#) registers. The bit width of g and threshold_{HIGH} is in U6, and threshold_{LOW} is in U12Q6.

This edge intensity is then clipped by a threshold value in the formula shown in [Figure 8-153](#).

Figure 8-153. ISS ISP IPIPE 2D Edge-Intensity Clipping Formula

$$S_{int} = \begin{cases} clip(sharpness, grad) & \text{Halo reduction on} \\ sharpness & \text{Halo reduction off} \end{cases}$$

camss-664

The threshold value (grad) is a function of the activity around the target pixel, which is derived from gradient values. Gain and offset are specified by [IPIPE_YEE_G_GAN](#) and [IPIPE_YEE_G_OFT](#)

Capping with gradient value prevents overly enhancing edges, and suppresses halo artifacts around edges.

The output from edge enhancer and edge sharpener are merged with the function shown in [Figure 8-154](#).

Figure 8-154. ISS ISP IPIPE 2D Edge Enhancer and Sharpener Merger Formula

$$E_{merge} = \begin{cases} E_{int} + S_{int} & mergedsel = 1 \\ abs\ max(E_{int}, S_{int}) & mergedsel = 0 \end{cases}$$

$$abs\ max(x, y) = \begin{cases} x & abs(y) \leq abs(x) \\ y & otherwise \end{cases}$$

camss-665

The E_{merge} value is added to the Y input value to make the final output.

For chroma suppression, another 2D high pass filter (HPF) is implemented. One of the four coefficient sets shown in [Figure 8-155](#) is selectable.

Figure 8-155. ISS ISP IPIPE 2D Edge Chroma-Suppression Coefficient Sets

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 0 & 0 \\ 1 & -2 & 1 \\ 0 & 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 1 & 0 \\ 0 & -2 & 0 \\ 0 & 1 & 0 \end{pmatrix}, \text{ or } \begin{pmatrix} 0 & 1 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

camss-667

At the end of the edge enhancer process, brightness and contrast adjustment are applied to the Y signal. The formula shown in [Figure 8-156](#) describes the process.

Figure 8-156. ISS ISP IPIPE 2D Edge-Brightness and Contrast Adjustments Formula

$$Y_{ctr_bri} = clip8(clip8((Y_{EE} \times CTR) \gg 4) + BRT)$$

camss-668

8.3.3.4.12 ISS ISP IPIPE Histogram

NOTE: The boxcar function can be used simultaneously with the histogram function if needed.

NOTE: For the locations of histogram memory access, see [Section 8.3.3.9](#).

The histogram module counts the number of pixels that have a value in a region and can be enabled from the [IPIPE_HST_EN\[0\]](#) EN bit. Moreover, if enabled, the [IPIPE_HST_MODE](#) register can be set to work constantly or one time. If the [IPIPE_HST_MODE\[0\]](#) OST bit is set to 1, the histogram is disabled by clearing the [IPIPE_HST_EN\[0\]](#) EN bit to 0 after one run (one-shot mode).

After enabling the module, the following features are available:

- The data to be summed is taken from the DPC memory or RGB2YCbCr module. The choice is made in the `IPIPE_HST_SEL[2]` SEL bit.
- When data are collected from the DPC memory, the sampled colors are R/G/B/Y. Y is derived in the following method:

$$Y = (HST_MUL_R \cdot R + HST_MUL_GR \cdot Gr + HST_MUL_GB \cdot Gb + HST_MUL_B \cdot B) \quad (4)$$

For the G histogram, Gb, Gr, or the average is used, through the `IPIPE_HST_SEL[1:0]` TYP bit field.

- Two sets of 512×20 -bit memory are used.
- The number of bins can be set from 32 to 256 in the `IPIPE_HST_PARA[13:12]` BIN bit field.
- The number of regions (areas) from 1 to 4; each region can be enabled through `IPIPE_HST_PARA[x]` RGNx (where $x = 0$ to 3). The positions of the regions are defined in `IPIPE_HST_x_VPS` and `IPIPE_HST_x_HPS`, and the vertical and horizontal size are defined by `IPIPE_HST_x_VSZ` and `IPIPE_HST_x_HSZ`, respectively (where $x = 0$ to 3).
- The number of regions \times the number of bins = 256.
- Each region can be turned on/off counting.
- The regions have priority orders.
- Each region has its own start coordinate X/Y (12 bits) and horizontal/vertical sizes (12 bits)
- When regions are overlapped, the value in the overlapped region is accumulated only in the region with the highest priority.
- The number of colors to be counted is from 1 to 4. Each color in all regions can be turned off counting (the `IPIPE_HST_PARA[7:4]` bit field).
- The value of each pixel is down-shifted ($0 \sim 11$) before counting using the `IPIPE_HST_PARA[11:8]` SHF bit field.
- When the value of a bin reaches $(2^{20} - 1)$, the value is saturated until the memory is cleared.
- Number of bins: 32, 64, 128, or 256

The histogram memory can be cleared at the VD signal. When the memory is cleared, the first line of each frame cannot be sampled by the histogram if the width of the frame is larger than 512. If the width of the frame is smaller than 512, the first ceil ($512/\text{width}$) lines cannot be collected, where $\text{ceil}(x)$ is the smallest integer value above x . If the clearing function is not enabled, the histogram bins are accumulated over the previous values.

The histogram has two banks of memories, which can be switched alternatively. The two memory banks are slipped into four histogram memory tables. Only two tables can be used at a time: output memory tables 0 and 1, or tables 2 and 3. To initialize tables, the `IPIPE_HST_TBL[1]` CLR bit is set to 1, and to select which set of tables is to be used the `IPIPE_HST_TBL[0]` SEL bit can be switched between 0 and 1.

A gain for each color can be applied using the `IPIPE_HST_MUL_x` registers, where $x = R, GR, GB, \text{ or } B$.

8.3.3.4.13 ISS ISP IPIPE Boxcar

The boxcar module generates a boxcar by taking mosaic image data and averaging the red, green, and blue pixels in an (8×8) or (16×16) block to produce one red, green, and blue output, as shown in [Figure 8-157](#) and in [Figure 8-158](#). Here, similar to the histogram module, the boxcar is enabled from the `IPIPE_BOX_EN[0]` EN bit, and if the mode is set to run once (one shot) (`IPIPE_BOX_MODE[0]` OST = 1), the enable bit is cleared after the run. The size of the blocks is determined from the `IPIPE_BOX_SHF[0]` SEL bit, where if set to 0 = 8×8 , and 1 = 16×16 .

The result of this operation is a full-color image with $(1/64)$ or $(1/256)$ area of the original image. The maximum input horizontal width is 8190 pixels when a 16×16 block is used; the width is 4096 when an 8×8 block is used. Also, the image size (width and height) must be multiple of 16 for a 16×16 block, and multiple of 8 for an 8×8 block. Boxcar operation works on 12-bit Bayer data and outputs 16-bit data. The output data is 48-bit RGB data for each 8×8 or 16×16 block. The 48-bit data is aligned in 64-bit format

in SDRAM as shown in [Section 8.3.3.4.13](#). The first address of SDRAM access is specified by the [IPIPE_BOX_SDR_SAD_H](#) and [IPIPE_BOX_SDR_SAD_L](#) registers. The output data are written to SDRAM continuously line by line; there is no address offset between lines. After the image transfer of each frame completes, the `ipipe_eof` signal is sent to buffer logic. This signal is issued at the same timing as `ipipe_int_dma`.

Figure 8-157. ISS ISP IPIPE Boxcar Operation (8 × 8 Block)

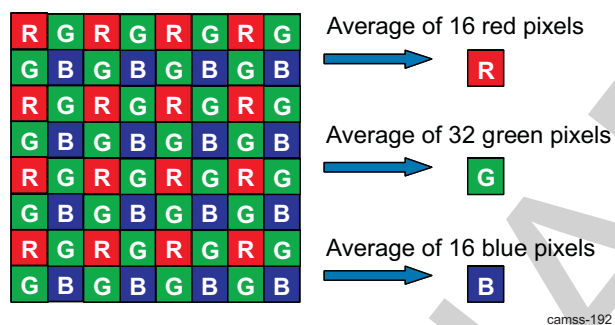


Figure 8-158. ISS ISP IPIPE Boxcar Operation (16 × 16 Block)

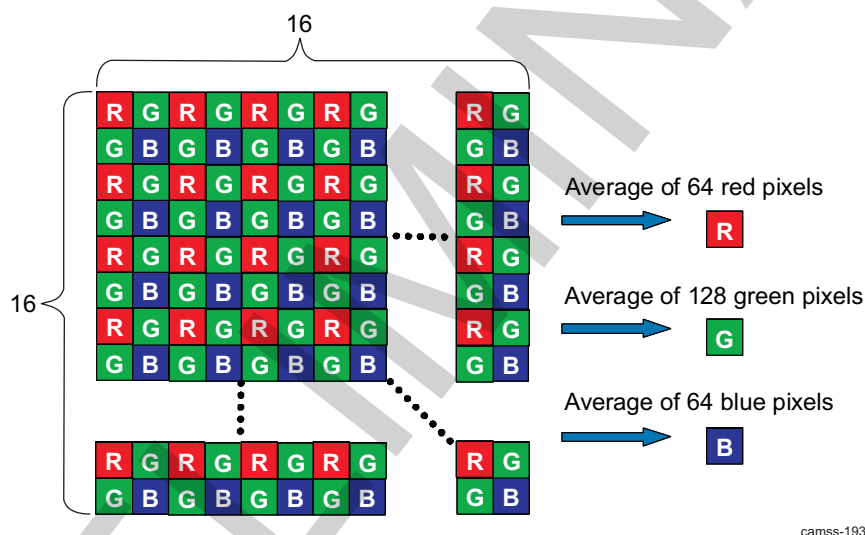
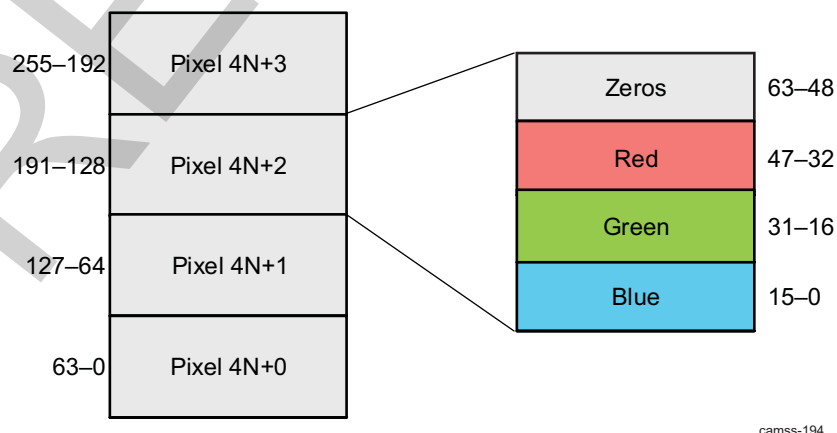


Figure 8-159. ISS ISP IPIPE Boxcar Data Packing in SDRAM



The right shift value is specified by the [IPIPE_BOX_SHF](#) register, which has a range of 0 to 4. (The shift down is performed to fit the 20-bit accumulated value into 16-bit output.) For green signal processing, a divide-by-two operation rounds off the least-significant bit (LSB).

8.3.3.5 ISS ISP RSZ Functional Description

8.3.3.5.1 ISS ISP RSZ Overview

The RSZ module rescales images into various sizes ranging from x1/4096 scale-down to x16 scale-up. It also works in conjunction with the rotational engine (ROT) in SIMCOP for rotating images. The RSZ data slave interfaces support a parallel video port (VP). The RSZ module can produce two output images simultaneously, because there are two independent resizer engines. The input data used by the two resizer engines is the same.

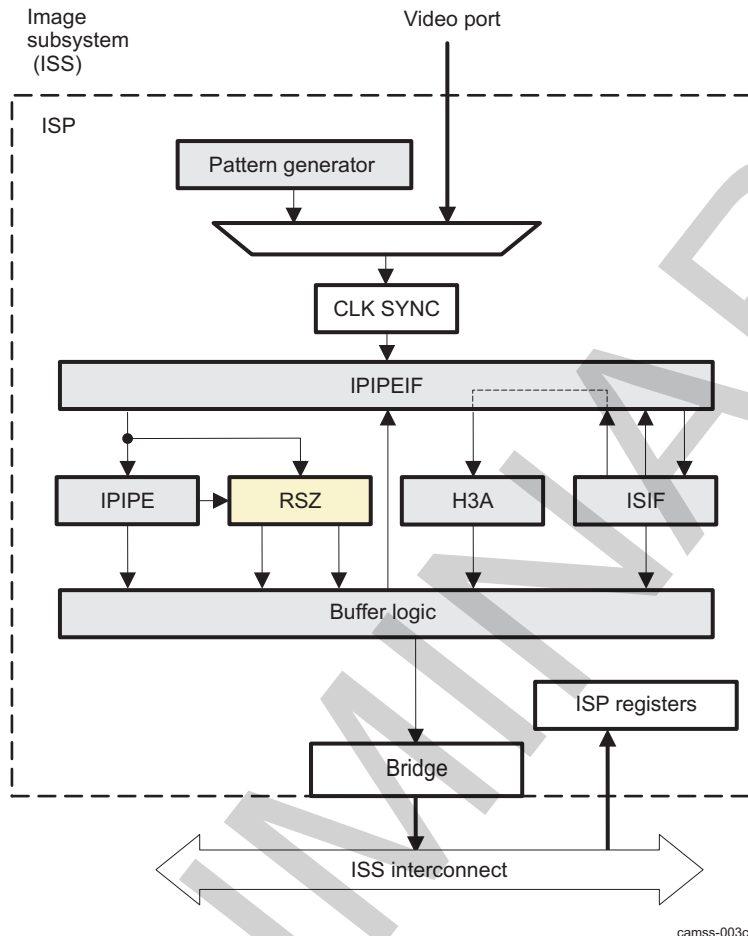
The RSZ module has the following capabilities:

- Input/output data formats:
 - Common input data for the two resizers
 - Independent output data formats for the two resizers
 - Supports YUV4:2:2 input and then supports YUV4:2:2/YUV4:2:0 or RGB5:6:5/ARGB32 output.
 - Output rates up to 233 MPix/s for YUV4:2:2/YUV4:2:0 or RGB5:6:5 output
 - Output rates up to 160 MPix/s for ARGB32 output
 - Supports YUV4:2:0 input data and then supports only YUV4:2:0
 - YUV4:2:0 input format not supported natively
 - Two passes required: luma followed by chroma or vice versa
 - Input and output rates up to 100 MPix/s in this configuration (YUV4:2:0)
 - Only supported from memory to memory
 - Supports RAW Bayer input and RAW Bayer output
 - RAW format invariant. Takes whichever RAW format at the input and writes it out unmodified: 16 bits are read, 16 bits are written out.
 - No resizing can take place on RAW data.
- Resizer capabilities:
 - Input image cropping
 - Common for the two resizer engines: Same input data before and after cropping
 - Supported on YUV4:2:2 and RAW data formats
 - Supported on pass-through mode data path
 - Supported on bypass mode data path
 - Dual resizer engines: RSZ-A and RSZ-B
 - Up to x20 upsampling and x1/4096 downsampling on both engines
 - Up to 233-MHz pixel throughput on both resizer engines
 - Programmable data rate control to smooth the peak memory bandwidth
 - RSZ-A
 - Horizontal resolution of up to 8K pixels on RSZ-A.
 - RSZ-B
 - Horizontal resolution of up to 8K pixels on resizer RSZ-B
 - Independent Y and Cb/Cr phases on horizontal and vertical axis
 - Enables to take care of different YUV4:2:0 phases used in different video formats
 - Enables frame division mode: Images can be stitched together with the right phase.
 - Rescaling: two modes supported
 - Normal mode for upscale and downscale: Higher flexibility but lower downscale quality
 - Downscale mode for downscale only: Lower flexibility but higher downscale quality
 - Filtering: two modes supported
 - Independent settings for the horizontal and vertical directions
 - 3-tap low pass filter with 2-tap linear interpolation

- 4-tap cubic interpolation
- Flip support of the output image
 - Horizontal flip
 - Vertical flip
- Pixel duplication on the top/bottom, left/right sides
 - Avoids losing pixels at the image boundaries because of the filtering
- Support pass-through and bypass modes: Resizer engines bypassed
 - Pass-through mode
 - RAW and YUV4:2:2 data support
 - Lower power consumption mode to transfer data to memory
 - Can transfer images larger than 8K pixels to memory
 - Bypass mode
 - RAW and YUV4:2:2 data support
 - Input buffer used. Can benefit from additional buffering in case the BL module memory is not big enough and back pressure occurs.
- Slave data interface: VP interface
 - Two VP interfaces: The programming model selects which VP is used to input data to the RSZ module. Both VPs cannot be active simultaneously.
 - VP 1: Typically connected to the IPIPE module.
 - VP 2: Typically connected to the IPIPEIF module.
 - Up to 233-MHz pixel clock
- Master data interface:
 - Two interfaces to the BL module
 - Up to 233 MHz
 - 32-bit wide, 32-byte long requests
 - Accesses are aligned on 32-byte boundaries
 - Used to transfer data to memory
 - Each interface is dedicated to a single output image.
 - Addressing modes
 - Linear
 - Circular
- Configuration interface:
 - Up to 116.6 MHz
 - 32-bit wide
 - Used to configure the resizer registers
- Power management:
 - Independent clock domains for the two resizers
 - Each resizer engine can be gated off separately
- Error management:
 - FIFO overflow detection on the input buffers

Figure 8-160 show the RSZ module connections to other submodules of the ISP.

Figure 8-160. ISS ISP RSZ High-Level Diagram

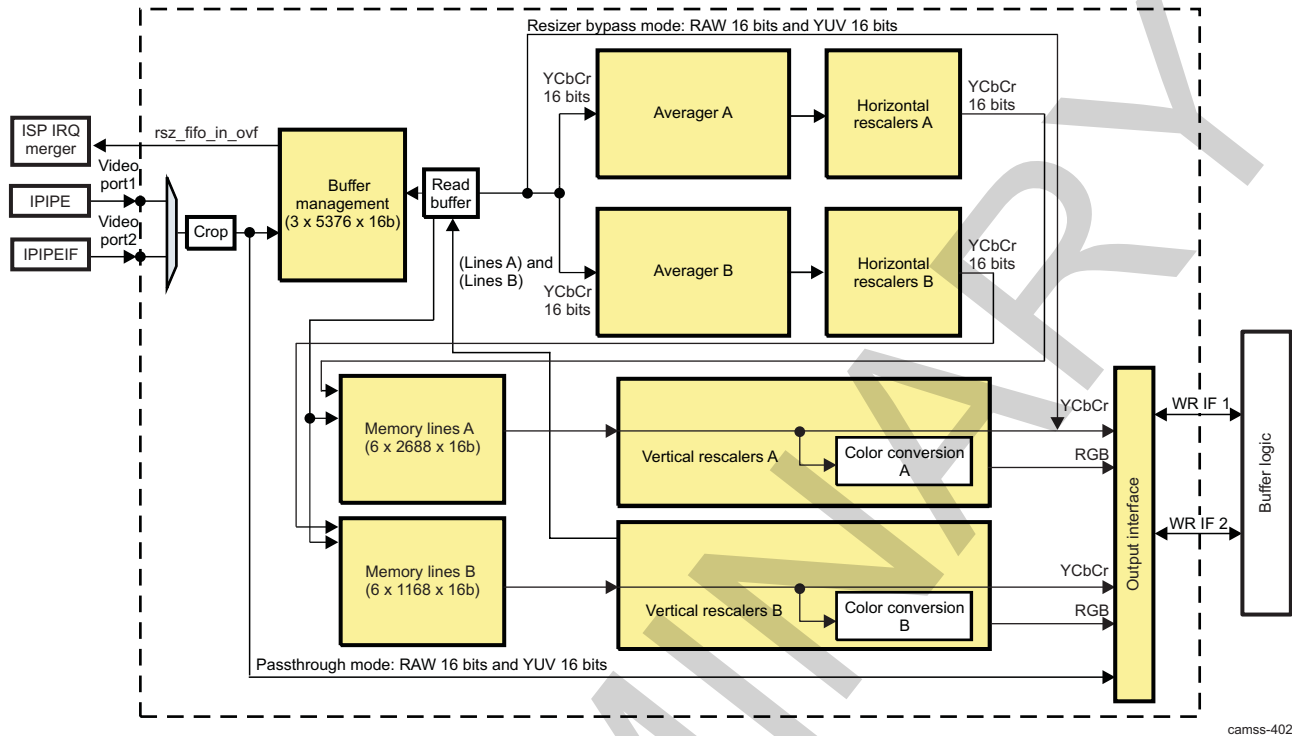


8.3.3.5.2 ISS ISP RSZ Top-Level Block Diagram

Figure 8-161 is the top-level block diagram of the RSZ module. The RSZ module comprises the following submodules: cropping, input data buffering, data requestor, averager, data saturation, and resizer Interpolation (comprised of horizontal rescaler, vertical rescaler, color conversion, and output interface) (see the following sections for more information).

The RSZ module comprises two independent resizer engines with the same capabilities (except for the memory line size). The input data can come from VP 1 or VP 2. Software must determine and control which interface is selected.

The RSZ module includes one VBUSP slave port, which is used to control the RSZ registers. It also includes two MTC master ports, which are used to pass the pixels to the BL. The BL in turn creates the burst requests to the memory subsystem (see Section 8.3.3.5.3, *ISS ISP RSZ Interfaces*).

Figure 8-161. ISS ISP RSZ Top-Level Block Diagram

camss-402

8.3.3.5.3 ISS ISP RSZ Interfaces

The RSZ module has the following data interfaces:

- One 32-bit read/write point-to-point pending VBUSP interface
- Two slave VP interfaces for transport YUV and RAW data
- TWO MTC interfaces to BL for RZA A and RZA B, with only write capabilities

8.3.3.5.3.1 ISS ISP RSZ VBUSP interface

The VBUSP interface is a 32-bit read/write capable interface. The VBUSP interface must be programmed in a way that back-to-back requests are possible for read and write. The [RSZ_GCK_MMR\[0\]](#) MMR bit enables the memory register access from the VBUSP interface to enable transfer and signal such as MMR request, direction, enable write/read data can be enabled.

8.3.3.5.3.2 ISS ISP RSZ Video Port Interfaces

The VP interfaces are slave interfaces; one is connected to IPIPE, and the other to IPIPEIF. These interfaces are for data transfer. [Table 8-322](#) lists the format supported across IPIPE/IPIPEIF and RSZ. Signals coming from IPIPE and IPIPEIF can be write-enable signals. The [RSZ_SRC_MODE\[1\]](#) WRT bit is set whether or not the write enable signals are considered. This is a line-valid qualifier. This signal is sampled on the rising edge of HD, and the value is used for the full line.

Table 8-322. ISS ISP RSZ VP Supported Formats

| VP Signals: From IPIPE and IPIPEIF Modules (dat[15:0] Register) | | | | | | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|----|----|------------|------------|------------|------------|------------|------------|------------|------------|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RAW16 | R15 | R14 | R13 | R12 | R11 | R10 | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |
| YUV4:2:2 16 bits | Y7 | Y6 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 | Cb7 Cr7 | Cb6 Cr6 | Cb5 Cr5 | Cb4 Cr4 | Cb3 Cr3 | Cb2 Cr2 | Cb1 Cr1 | Cb0 Cr0 |

Table 8-322. ISS ISP RSZ VP Supported Formats (continued)

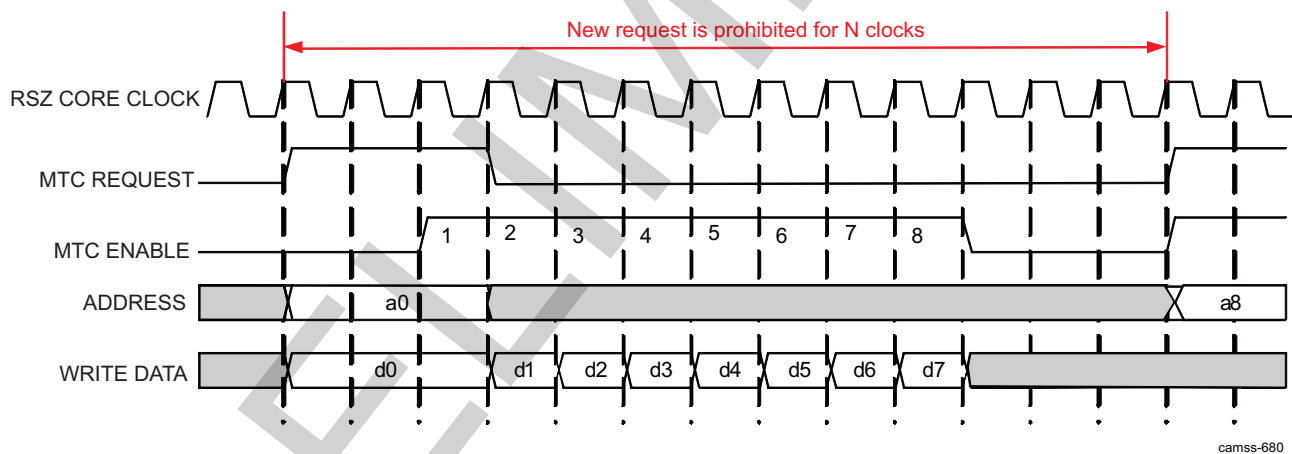
| | | | | | | | | | | | | | | | | |
|-------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------------|------------|------------|------------|------------|------------|------------|------------|
| YUV4:2: 0 Y data | Y7 | Y6 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 | Low | Low | Low | Low | Low | Low | Low | Low |
| YUV4:2: 0 Cb/Cr data | Low | Low | Low | Low | Low | Low | Low | Low | Cb7 Cr7 | Cb6 Cr6 | Cb5 Cr5 | Cb4 Cr4 | Cb3 Cr3 | Cb2 Cr2 | Cb1 Cr1 | Cb0 Cr0 |

NOTE: The formats are set from the IPIPE and IPIPEIF registers. For more information, see [Section 8.3.3.4](#) and [Section 8.3.3.3](#).

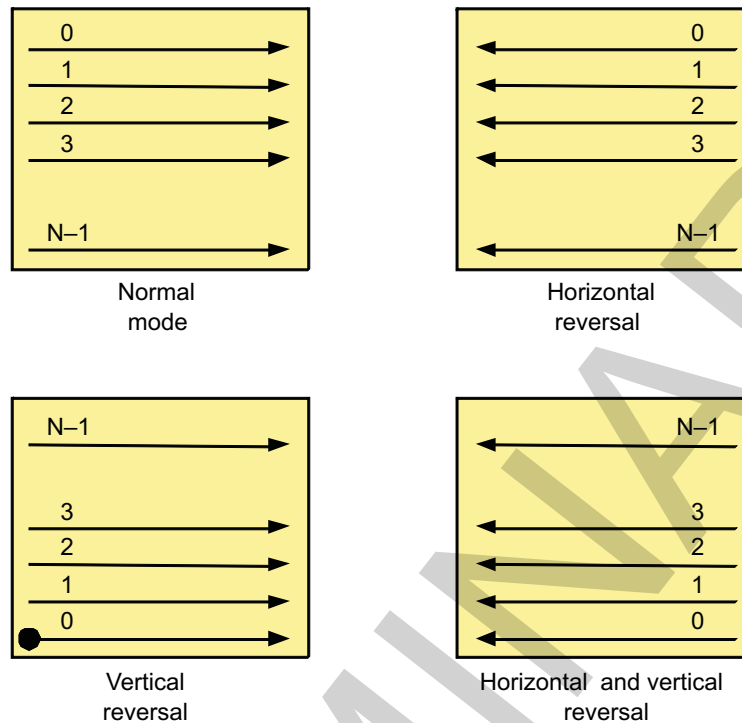
8.3.3.5.3.3 ISS ISP RSZ MTC interfaces

The RSZ module includes two write-only MTC interfaces. Their implementation enables passing a maximum of eight 32-byte requests in ten clock cycles. The RSZ must be programmed to obtain smooth and average bandwidth to buffer logic module by setting a minimum interval between two successive requests (set the [RSZ_DMA_RZA\[15:0\]](#) RZA and [RSZ_DMA_RZB\[15:0\]](#) RZB bit fields for the A and B resizers as appropriate). This setting is not expected to be dynamic. It can be fixed setting from request to request and frame to frame. When the bandwidth is set appropriately, between the first valid translated pixel and the EOF signal sent to buffer logic, the [RSZ_DMA_STA\[0\]](#) STATUS bit can be seen, and it is high if the transfer over the MTC interfaces is active. [Figure 8-162](#) shows how RSZ_DMA_RZx for resizers A and B affects the MTC data request generator.

Figure 8-162. ISS ISP RSZ MTC DMA Bandwidth Control



[Figure 8-163](#) shows the pixel order in memory written by the MTC. The arrows do not represent the order in which data is written. Data are always written from left to right, whether horizontal reversal is enabled or not.

Figure 8-163. ISS ISP RSZ MTC Image Data Storage Pixel Order

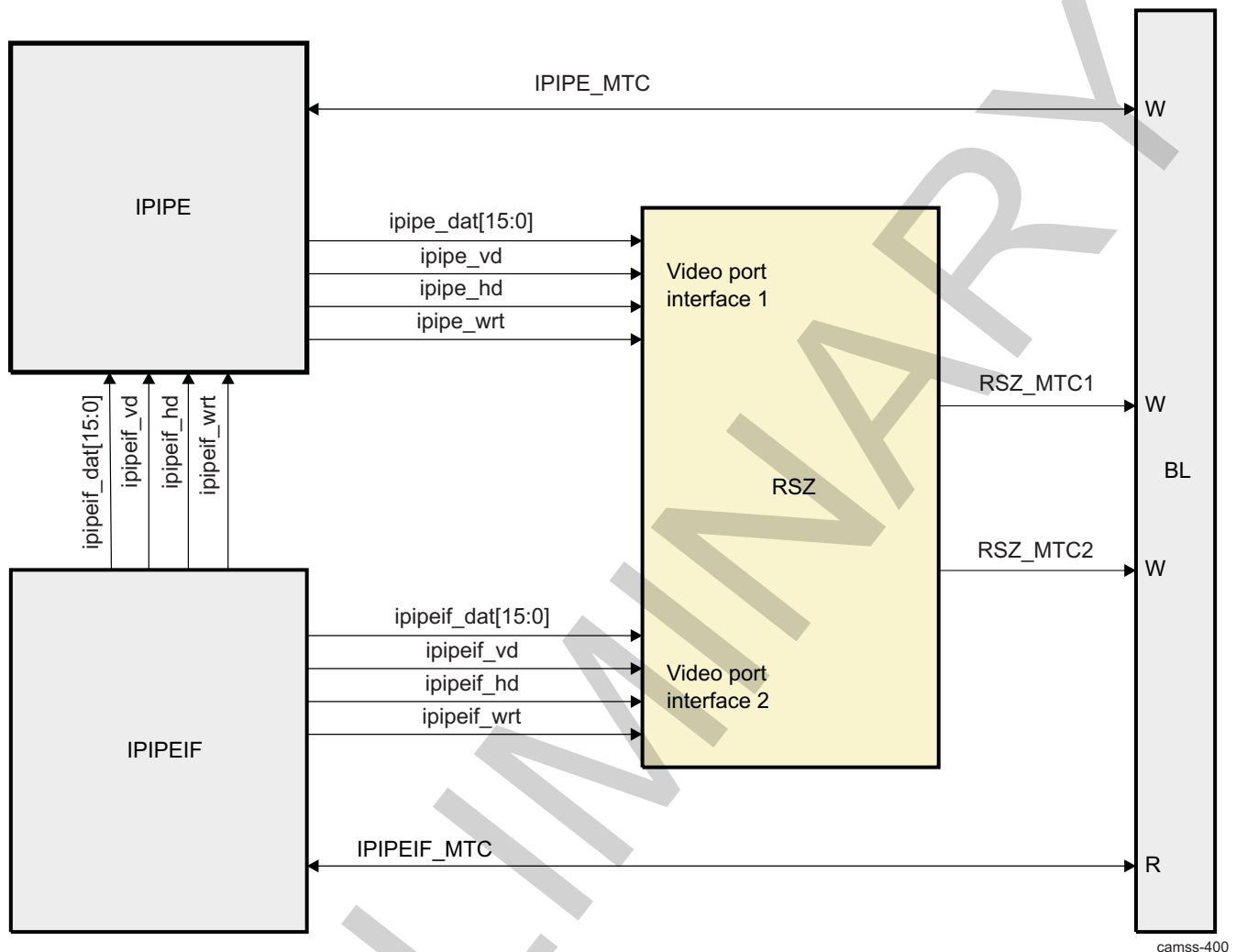
camss-684

The RSZ MTC interfaces can be stalled by the input MTC STALL signal. The assertion of the MTC STALL signal is a result of a hardware mechanism that is monitoring the CBUFF module to prevent its overflow. When this signal is asserted, the current 32-byte MTC request is finished and then the RSZ MTC output ports are stalled. For details on the output ports, see [Section 8.3.3.5.7, ISS ISP RSZ Output Interface](#).

8.3.3.5.4 ISS ISP RSZ Integration

[Figure 8-164](#) shows how the VP and interfaces of the RSZ module are connected to surrounding modules at the ISP level. The RSZ module gets data from the IPIPEIF module or IPIPE module.

Figure 8-164. ISS ISP RSZ Typical Module Integration: High-Level Summary



The following constraints apply to the RSZ module:

- The data coming from the IPIPEIF module can be RAW or YUV4:2:2 data. Because the RSZ module can rescale only YUV4:2:2 data, the RSZ module must be configured in pass-through mode when RAW data is received on VP 2. It is possible to bypass the RSZ engine if YUV4:2:2 data is sent but rescaling is not needed (bypass mode).
- The data coming from the IPIPE module can be RAW or YUV4:2:2 data. Eventually, YUV4:2:0 data can be sent through this path, but the data must be sent in two passes. Because the RSZ module can rescale only YUV4:2:2 data, the RSZ module must be configured in pass-through mode when RAW data is received on VP 1. It is possible to bypass the RSZ engine if YUV4:2:2 data is sent but rescaling is not needed (bypass mode).

VP 2 provides a way to bypass the IPIPE module when YUV4:2:2 data is received from the images sensor or when YUV4:2:2 is read back from memory with the CCP2 RX or ISIF module.

Table 8-323 summarizes the different RSZ configuration possibilities as a function of the input data format.

Table 8-323. ISS ISP RSZ Data Flow vs. Input Data Format Constraints

| VP 1 Data Format | VP 2 Data Format | RSZ-A Configuration | RSZ-B Configuration | Comments |
|---------------------|---------------------|------------------------|------------------------|---------------------------------|
| RAW | N/A | Disabled | Disabled | RSZ module in pass-through mode |

Table 8-323. ISS ISP RSZ Data Flow vs. Input Data Format Constraints (continued)

| VP 1 Data Format | VP 2 Data Format | RSZ-A Configuration | RSZ-B Configuration | Comments |
|---------------------|---------------------|------------------------|------------------------|--|
| N/A | RAW | Disabled | Disabled | RSZ module in pass-through mode |
| YUV4:2:2 | N/A | Disabled | Disabled | RSZ module in pass-through mode or bypass mode |
| YUV4:2:2 | N/A | Enabled | Disabled | One output image |
| YUV4:2:2 | N/A | Disabled | Enabled | One output image |
| YUV4:2:2 | N/A | Enabled | Enabled | Two output images |
| N/A | YUV4:2:2 | Disabled | Disabled | RSZ module in pass-through mode or bypass mode |
| N/A | YUV4:2:2 | Enabled | Disabled | One output image |
| N/A | YUV4:2:2 | Disabled | Enabled | One output image |
| N/A | YUV4:2:2 | Enabled | Enabled | Two output images |

8.3.3.5.5 ISS ISP RSZ Functional Description

To start up, the RSZ configuration can be set from the [RSZ_SYSCONFIG](#) register, which provides enabling the RSZ-A and RSZ-B clocks. The RSZ module does not have standalone reset and status check. Software reset must be done at the ISP level. Moreover, when enabled, the RSZ module can control the input data buffer, and when the `rsz_stall_input` signals are set from the [RSZ_IN_FIFO_CTRL](#) register, the RSZ module generates a stall signal that can be used by the master module sending data to the RSZ module when the data threshold is too high.

The [RSZ_SRC_EN\[0\]](#) EN bit starts the resizer processing. If the processing mode is set to one shot (one run and then turn off) from the [RSZ_SRC_MODE\[0\]](#) OST bit, the EN bit is cleared to 0.

The resizer can be configured to be bypassed in certain cases (see [Figure 8-164](#) for the module constraints) from the [RSZ_SRC_FMT0\[1\]](#) BYPASS bit. The data can be sent directly from here to the output interface (bypass mode) or imported to the module buffer, but not manipulated and sent to the output interface (pass-through mode). The master device sending data to the resizer can be switched between IPIPEIF and IPIPE using the [RSZ_SRC_FMT0\[0\]](#) SEL bit. The resizer understanding of the data input is set from the [RSZ_SRC_FMT1](#) register (for more information, see [Table 8-325](#)). The [RSZ_SEQ.VRVX](#) and [RSZ_SEQ.HRVX](#) registers can be set to flip the image horizontally or vertically, respectively (see [Figure 8-163](#)).

Depending on the mode to which the resizer is set, the core clock can be enabled from the [RSZ_GCK_SDR](#) register. [Table 8-324](#) summarizes the behavior of the module for the different settings.

Table 8-324. ISS ISP RSZ Module Modes: Register Settings

| Configuration Number | RSZ_SRC_EN | RZA_EN | RZA_CLK_EN | RZB_EN | RZB_CLK_EN | RSZ_GCK_SDR_CORE | RSZ_SRC_FMT0.BYPASS | Comments |
|----------------------|------------|--------|------------|--------|------------|------------------|---------------------|--|
| 0 | 0 | X | X | X | X | X | X | Data cannot go through the RSZ module. Interrupts are not issued. |
| 1 | 1 | 0 | X | 0 | X | 1 | 0 | Resizer A is disabled. Resizer B is disabled. It is best to have RZA_EN = RZB_EN = 0 to save power, but RZA_EN = RZB_EN = 1 is also supported. |
| 2 | 1 | 1 | 1 | 0 | X | 1 | 0 | This configuration is supported but does not make sense because data cannot go through the module. Resizer A is enabled. Resizer B is disabled. |

Table 8-324. ISS ISP RSZ Module Modes: Register Settings (continued)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|--|
| | | | | | | | | It is best to have RZB_EN = 0 to save power, but RZB_EN =1 is supported as well. |
| 3 | 1 | 0 | X | 1 | 1 | 1 | 0 | Resizer A is disabled. Resizer B is enabled. |
| | | | | | | | | It is best to have RZA_EN = 0 to save power, but RZA_EN = 1 is also supported. |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | Resizer A is enabled. Resizer B is enabled. |
| 5 | 1 | X | X | X | X | 0 | 0 | Bypass mode is enabled. Resizer core functional clock is disabled. |
| 6 | 1 | X | X | X | X | 0 | 1 | Pass-through mode enabled. Resizer core functional clock is disabled. |
| 7 | 1 | X | X | X | X | 1 | 1 | Pass-through mode is enabled. Resizer core functional clock is enabled. |
| | | | | | | | | Not a preferred configuration. Configuration (6) saves power. |

Table 8-325. ISS ISP RSZ Module Input Control: Register Settings

| RSZ_SRC_FMT1.IN420 | RSZ_SRC_FMT1.COL | Comments |
|------------------------------------|----------------------------------|--|
| 0 | X | YUV4:2:2 input. Chrominance is cosited. |
| 1 | 0 | YUV4:2:0 input. Valid data is Y, C is dummy. On the VP, YUV4:2:2 data is always assumed. |
| 1 | 1 | YUV4:2:0 input. Valid data is C, Y is dummy. On the VP, YUV4:2:2 data is always assumed. |

The [RSZ_YUV_PHS\[0\]](#) POS bit sets the chrominance output. The RSZ module does not change the relative position of the chroma samples versus the luma samples between the input and output, and the chroma position at the output of the IPIPE module and at the output of the RSZ module must be identical. In other words, [RSZ_YUV_PHS.POS](#) = [IPIPE_YUV_PHS.POS](#).

Settings are common for both resizer engines inside the RSZ module. Each engine (RZA or RZB) can be enabled from the [RZx_EN](#) register: select the mode from [RZx_MODE](#), and select the input and output in the YUV color scheme from the [RZx_420](#) register (valid only if YUV 4:2:2 is the input set from [RSZ_SRC_FMT1.IN420](#)). [Table 8-326](#) summarizes the combination of settings available in the [RZx_420](#) register.

Table 8-326. ISS ISP RSZ-A/RSZ-B Output Format Selection

| RZx_420.YEN | RZx_420.CEN | Comments |
|-----------------------------|-----------------------------|---|
| 0 | 0 | Input is YUV4:2:2. Output is YUV4:2:2 if RZX_RGB_EN = 0 and RGB if RZB_RGB_EN = 1. |
| 0 | 1 | Input is YUV4:2:2. Output is the chroma of YUV4:2:0. RZX_RGB_EN is ignored. Must be used to rescale YUV4:2:0 data: 1st/2nd pass |
| 1 | 0 | Input is YUV4:2:2. Output is the luma of YUV4:2:0. RZX_RGB_EN is ignored. Must be used to rescale YUV4:2:0 data: 2nd/1st pass |
| 1 | 1 | Input is YUV4:2:2. Output is YUV4:2:0. RZX_RGB_EN is ignored. |

8.3.3.5.5.1 ISS ISP RSZ Operating Modes

The RSZ module offers two basic rescaling modes. These modes are not built-in but are particular configurations, which means that other hybrid modes can be programmed. The normal mode provides more flexibility (the rescale ratio granularity is smaller) than downscale mode, but downscale mode produces better image quality (averager performs anti-aliasing):

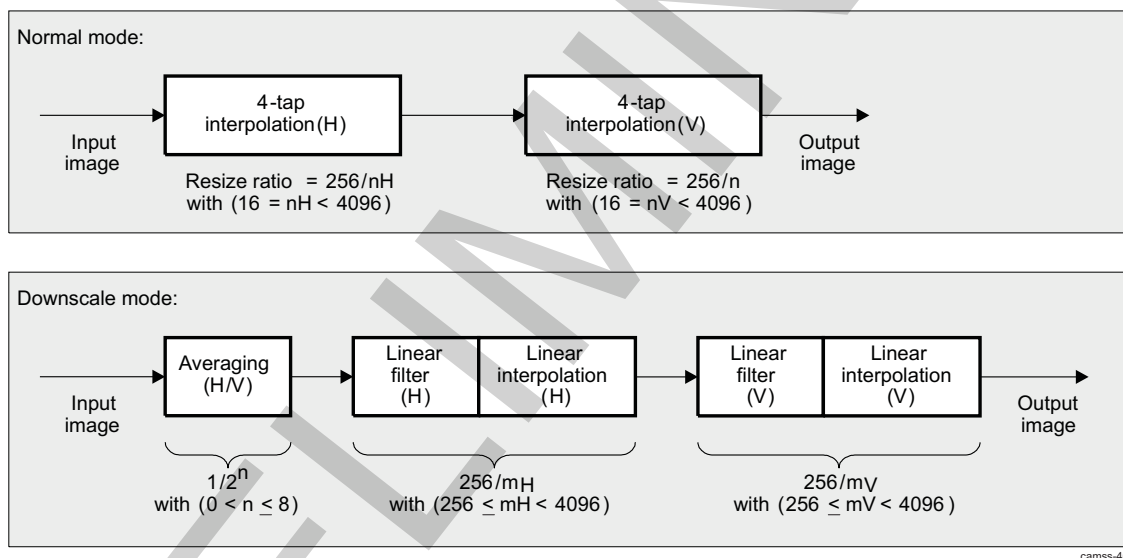
- Normal mode: The scaling process is carried out using interpolation with a 4-tap filter. The interpolation method is a 4-tap cubic convolution or a 3-tap linear filter + 2-tap linear interpolation. The user controls the type of interpolation that is used. The possible rescale ratios range from 1/16x to 20x.
- Downscale mode: The scaling process is the same as for normal mode, but an averaging function is placed before. It enables reaching much higher reduction factors while avoiding anti-aliasing artifacts. The interpolation method is a 4-tap cubic convolution or a 3-tap linear filter + 2-tap linear interpolation. The possible rescale ratios range from 1/4096x to 1x.

NOTE: The selection of the mode is independent for each resizer engine. One resizer engine can be configured in normal mode, while another is configured in downscale mode.

The RSZ module can produce two output images simultaneously, because there are two independent resizer engines. The input data used by the two resizer engines is the same. The RSZ output image sizes are limited to [RSZ_GNC\[0:12\]](#) RSZA_MEM_LINE_SIZE pixels/line for RSZ-A (5376 pixels/line) and RSZB_MEM_LINE_SIZE[16:28] for RSZ-B (2336 pixels/line).

Figure 8-165 shows the RSZ operating modes. Nothing prevents the use of linear interpolation in normal mode or bicubic interpolation in downscale mode; similarly, it is possible to mix the interpolation modes for horizontal and vertical filtering. This is fully programmable.

Figure 8-165. ISS ISP RSZ Operating Modes



8.3.3.5.5.1 ISS ISP RSZ Operating Modes and Maximum Input Clock

The maximum output pixel clock on both resizers is 233 MHz (100 percent optimal power performance [OPP]); that is, a pixel throughput of 233 MPix/s. Moreover, hardware takes care of the following constraints:

- When both resizer engines are configured to perform downscaling, there is no particular constraint on the VP pixel clock. The VP pixel clock can be as high as 233 MHz.
 - When one resizer engine is configured to perform upscaling and the second resizer engine is configured to perform downscaling, the VP pixel clock must be limited. The VP must be lower than:
- $$\text{clk_pix} = (233 \text{ MHz} / (\text{Vertical Upscale Ratio} * \text{Horizontal Upscale Ratio})) \quad (5)$$

For example, if a 4x upscale ratio happens horizontally and vertically, then the input pixel clock must be lower than $233 / (4 * 4) = 14.5625 \text{ MHz}$.

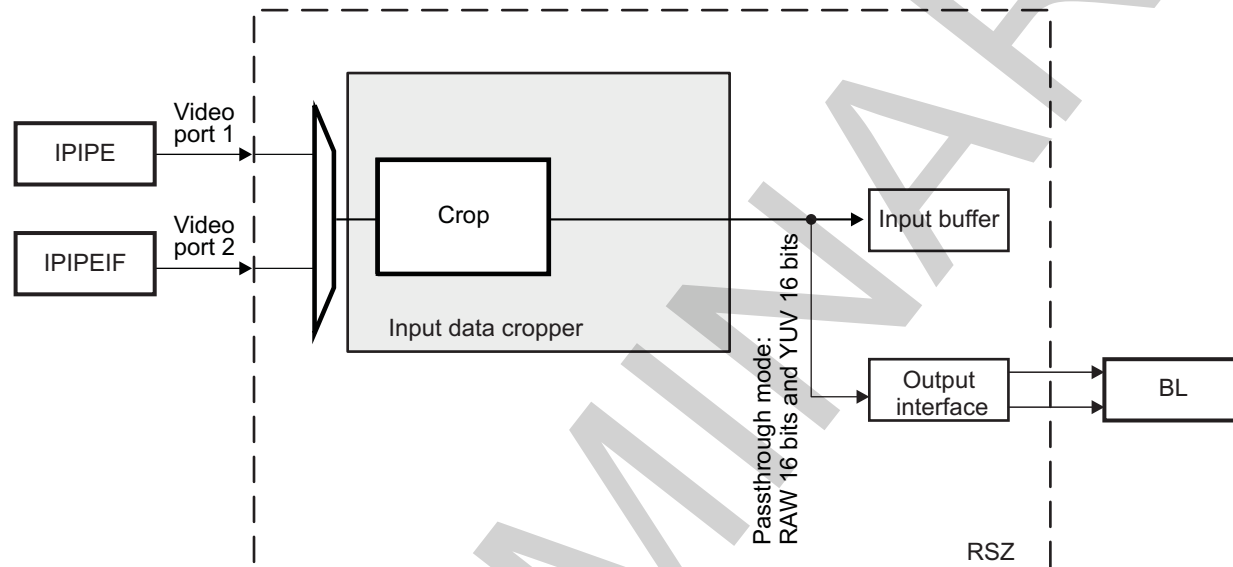
It is the reason why it is not possible to perform digital zoom upscaling on the fly. It is necessary to acquire the pixels to memory first and to read them back at a pace that does not exceed the previously discussed constraints. At the ISS level, data can be read back from memory from the CCP2 RX or ISIF module.

- When the two resizer engines are configured to perform upscaling, the VP pixel clock must be limited. In that case, the VP frequency is limited by the resizer engine having the larger rescale ratios.

8.3.3.5.5.2 ISS ISP RSZ Input Data Cropper

The data coming from the VPs into the RSZ module can be cropped: this applies to RAW and YUV4:2:2 data. It is mandatory to crop the data as early as possible in the RSZ processing pipeline to reduce power consumption. It is mandatory to crop the data before storing it in the input data buffer. Figure 8-166 is the block diagram of the RSZ input data cropper.

Figure 8-166. ISS ISP RSZ Input Data Cropper Block Diagram



camss-708

The input data are in YUV4:2:2 interleaved format or RAW format.

For YUV4:2:2 format, the data come as Cb0, Y0, Cr0, Y1, Cb2, Y2, Cr2, Y3, etc. Y denotes the luma component value and Cb/Cr denotes the chroma component values. There are as many Y components as Cb/Cr components per line.

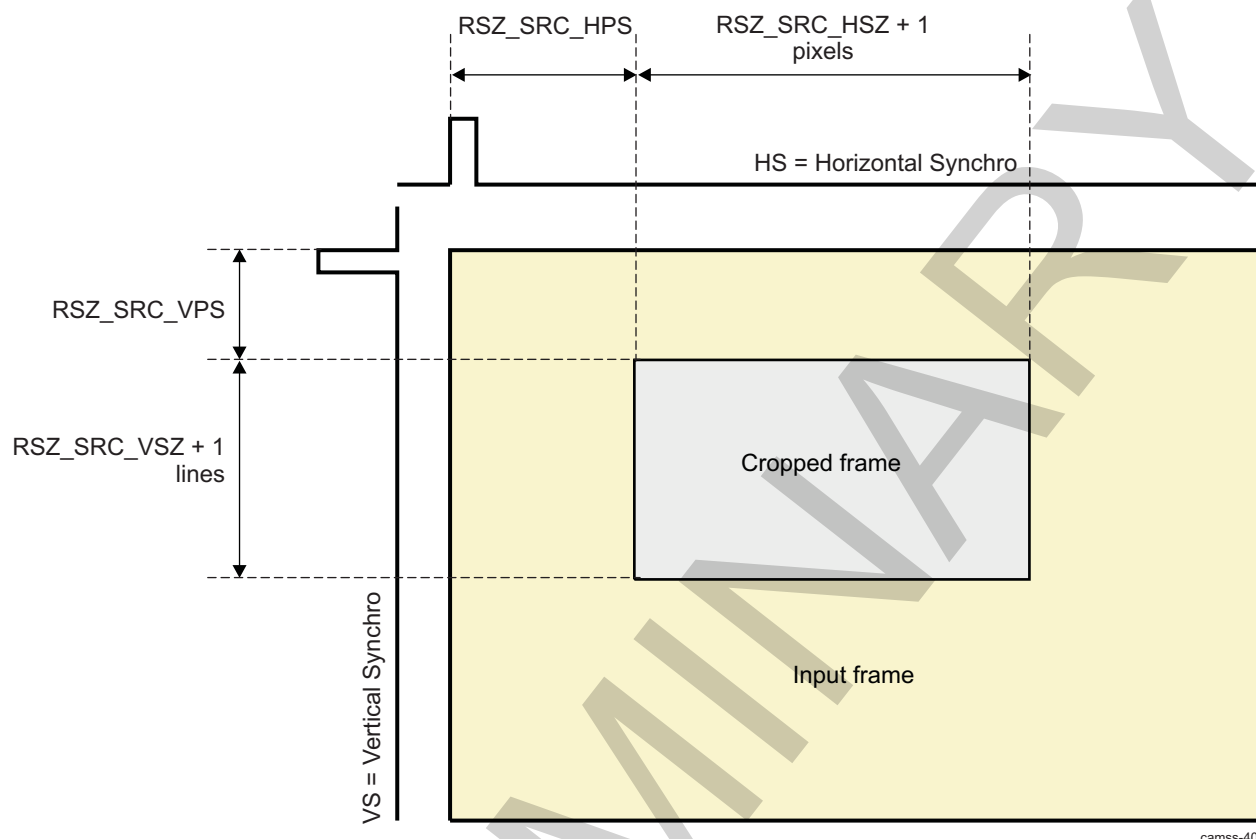
Figure 8-167 shows input data cropping. Only the cropped data is stored in the input data buffer. The names used in the figure correspond to the register names. If no cropping is desired, the [RSZ_SRC_HPS](#) and [RSZ_SRC_VPS](#) registers, which set the horizontal and vertical positions, must be set to 0; the start size from the [RSZ_SRC_HSZ](#) register must be set to the input image width minus 1, and the [RSZ_SRC_VSZ](#) register must be set to the input image height minus 1. These are typical settings for both resizer engines inside the RESIZER. After setting, more flexibility is present through [RZx_i_VPS](#) and [RZx_i_HPS](#) for vertical and horizontal positioning, respectively, of the input/output (where x = A or B, i = I or O).

Depending on the input data format, different constraints apply to the registers that set the cropping parameters:

- For YUV4:2:2 format, the vertical start positions of the cropped frame can be even or odd. However, the horizontal start position must be even: the reason is to always start with the same pattern: Cb_{2n}, Y_{2n}, Cr_{2n}, Y_{2n+1}... For the same reason, the horizontal size of the cropped frame ([RSZ_SRC_HSZ](#) + 1) must be an even number. Finally, the vertical size of the cropped frame can be odd or even.
- For RAW format, the vertical start position of the cropped frame can be even or odd. The vertical size can be even or odd. The horizontal resolution must be even.

These features and constraints are common for both resizer engines inside the resizer module.

Figure 8-167 shows the input data cropping.

Figure 8-167. ISS ISP RSZ Input Data Cropping

8.3.3.5.5.3 ISS ISP RSZ Averager

8.3.3.5.5.3.1 ISS ISP RSZ Use Cases

The two RSZ engines can have independent averager settings:

- Both resizers can use it.
- One resizer can bypass it and the other can use it.
- Both resizers can bypass it.

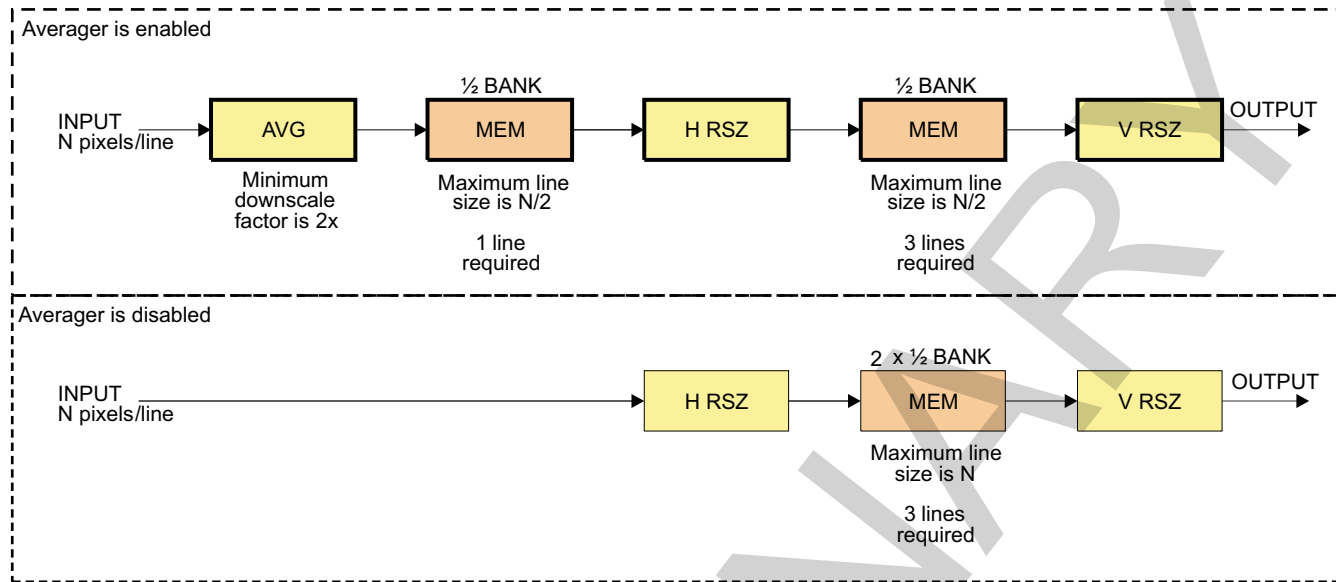
8.3.3.5.5.3.2 ISS ISP RSZ Memory Utilization

Vertical averaging requires memory to perform pixel data accumulation. It shares the vertical memory lines that are used for vertical filtering: this is the reason why the vertical memory lines are organized as two banks of half lines.

- The averagers output lines that are at most half the size of the input image in one memory bank.
- The horizontal resizers write their output data in the second memory banks.

Figure 8-168 shows the use of memory when the averager is enabled or disabled.

Figure 8-168. ISS ISP RSZ Averager Memory Utilization

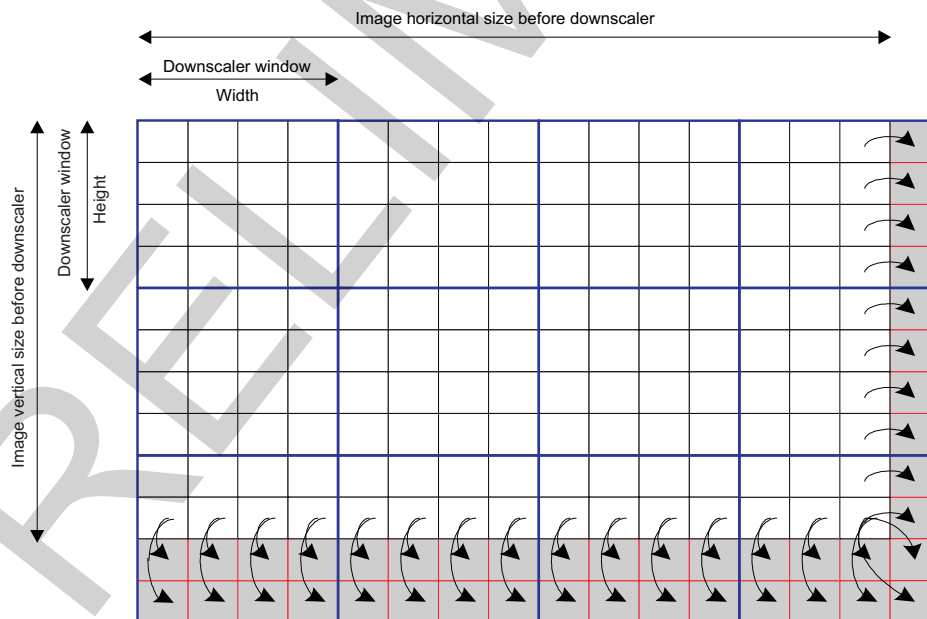


camss-407

8.3.3.5.5.3.3 ISS ISP RSZ Border Conditions

Figure 8-169 shows the averager behavior for border conditions. If the input image is not big enough, border duplication must occur.

Figure 8-169. ISS ISP RSZ Averager Border Conditions



camss-408

Downscaling is enabled from the RZi_DWN_EN register. Moreover, the vertical averaging size is set by the [RZA_DWN_AV\[3:5\]](#) V bit field. The actual downscale ratio is given by $1/2^{(RZA_DWN_AV[3:5] \cdot V + 1)}$. The range is from 1/2 to 1/256 in power of two. The horizontal averaging size is set by the [RZA_DWN_AV\[0:2\]](#) H bit field. The actual downscale ratio is given by $1/2^{(RZA_DWN_AV[0:2] \cdot H + 1)}$. The equations are the same for RSZ-B. The range goes from 1/2 to 1/256 in power of 2.

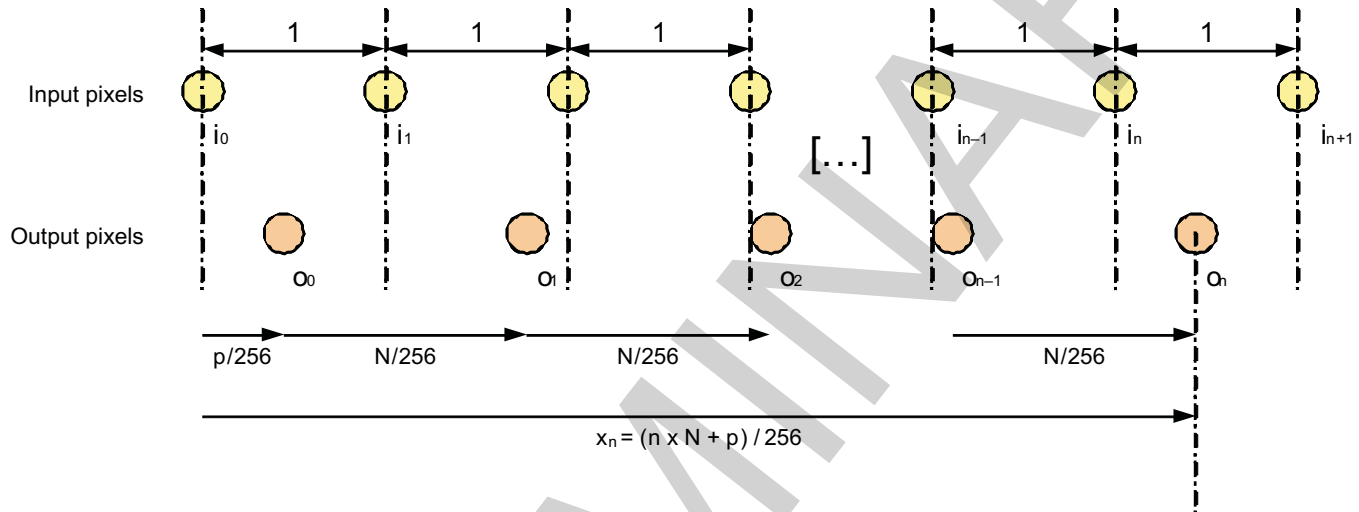
8.3.3.5.5.4 ISS ISP RSZ Interpolation

Figure 8-170 shows the basic interpolation method used in the RESIZER module. The following assumptions are made:

- The distance between each input pixel is 1.
- The magnification ration is given by $256/N$ and $p/256$ is the initial phase of the output data.

The output pixels are also evenly spaced. The distance between each output pixel is given by $N/256$. In the example in Figure 8-170, N is greater than 256. The position of the n^{th} output pixel is given by $(n \times N + p) / 256$.

Figure 8-170. ISS ISP RSZ Basic Interpolation Method



camss-682

Assuming the intensity of input pixels is i_0, i_1, i_2 , etc. and the resized (output) pixels are o_0, o_1, o_2 , etc., the n^{th} output pixel (o_n) is determined using the nearest 4 input pixels as follows:

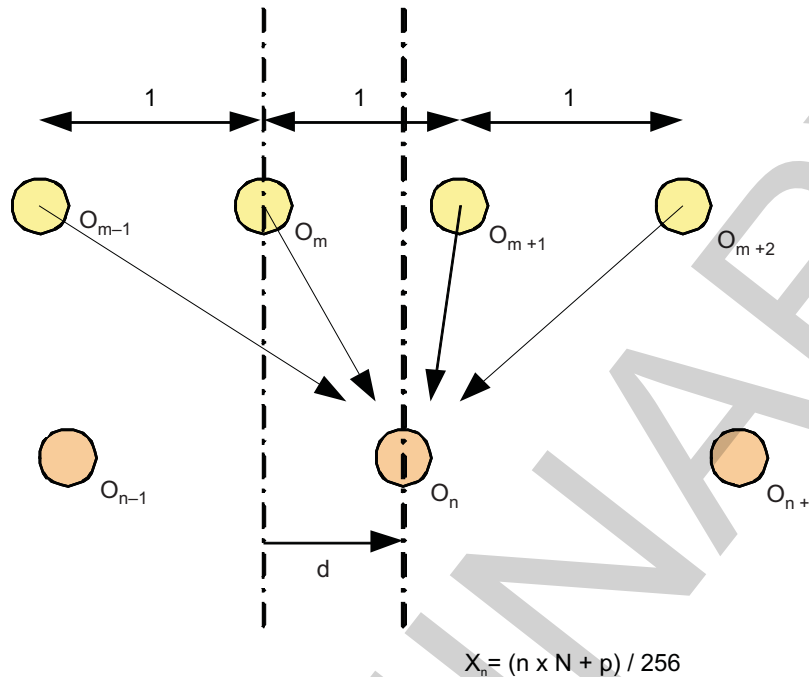
$$o_n = h(1+d) \times i_1 + h(d) \times i_m + h(d-1) \times i_{m+1} + h(d-2) \times i_{m+2}$$

In the previous equation $h(x)$ is the interpolation main function. The RESIZER module supports linear and bicubic convolution interpolation functions.

Figure 8-171 shows the interpolation principle at the n^{th} output pixel (o_n) at position x_n . Furthermore, the m and d parameters are as follows:

$$m = \text{floor}((n \times N + p) / 256) \text{ and } d = ((n \times N + p) / 256) - m$$

Figure 8-171. ISS ISP RSZ Interpolation Filtering



camss-683

For each resizer (RSZ-A or RSZ-B), and for chrominance and luminance, the interpolation method for vertical interpolation can be a 2-tap linear interpolation or a 4-tap cubic convolution (default) method. The choice is made in RZi_V_TYP[0] Y for luminance and RZi_V_TYP[1] C for chrominance, where $i = A$ or B and is the resizer number. It is similar for horizontal interpolation from RZi_H_TYP[0] Y for luminance and RZi_H_TYP[1] C for chrominance, where $i = A$ or B and is the resizer number.

8.3.3.5.5.4.1 ISS ISP RSZ Liner Interpolation Input Data

Before data interpolation, a low pass filtering (LPF) operation is required on the input data. The following equation gives the LPF function. The equation is evaluated at pixel position d_i but neighbor pixels d_{i-1} and d_{i+1} are required. The gain value g is set up by the register RZi_V_LPF and RZi_H_LPF. Different gains are possible horizontally and vertically as well as for Luma and Chroma.

$$LPF_g(d_{i-1}, d_i, d_{i+1}) = d_i + g \times (d_{i-1} - 2d_{i+1} + d_{i+2})/128$$

8.3.3.5.5.4.1.1 ISS ISP RSZ Cubic Convolution Mode

The input data is not modified in bicubic mode. Basically, the input is equal to the output.

8.3.3.5.5.4.1.2 ISS ISP RSZ Phase Settings

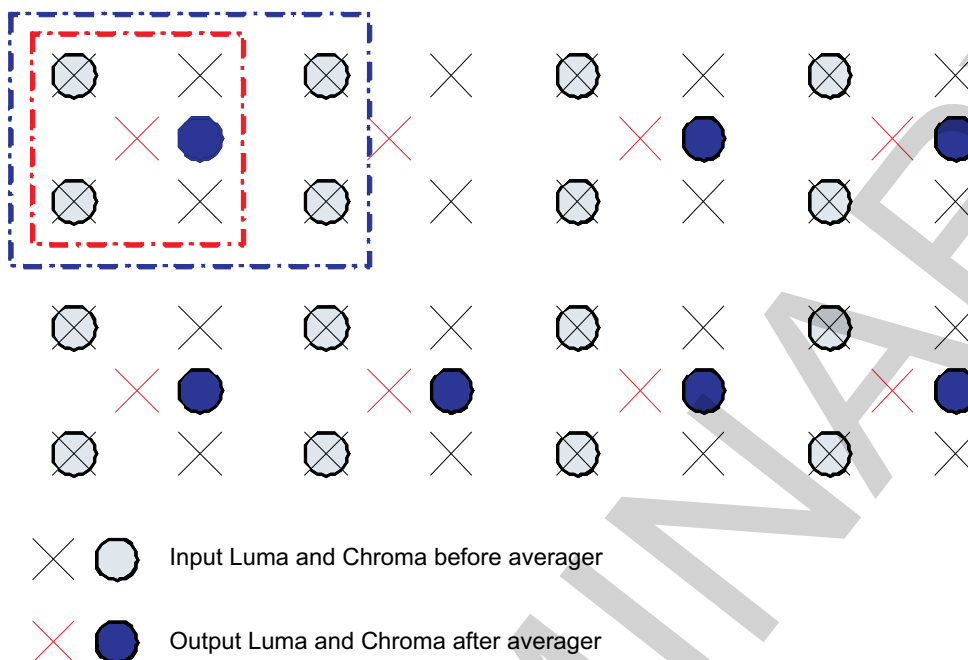
The initial value for the phase value for vertical resizing is set by the RZi_V_PHS_Y for luminance and RZi_V_PHS_C for chrominance. These values are in the U14Q8 fractional format (values in the range $[0 - 63.996]$). When YUV4:2:2 data are output, the phase value for Luma and Chroma must be aligned; that is, $RZi_V_PHS_Y = RZi_V_PHS_C$.

The following constraint equation applies: $|RZi_V_PHS_Y - RZx_V_PHS_C| = RZi_V_DIF$. This constraint means that at most the distance between the initial phases for luminance and chrominance is not expected to exceed the distance between two Luma pixels. The absolute value is used; therefore, the initial Luma phase can be greater than the initial Chroma phase or vice versa. As a reminder, the distance between two output pixels for Luma is given by RZi_V_DIF.

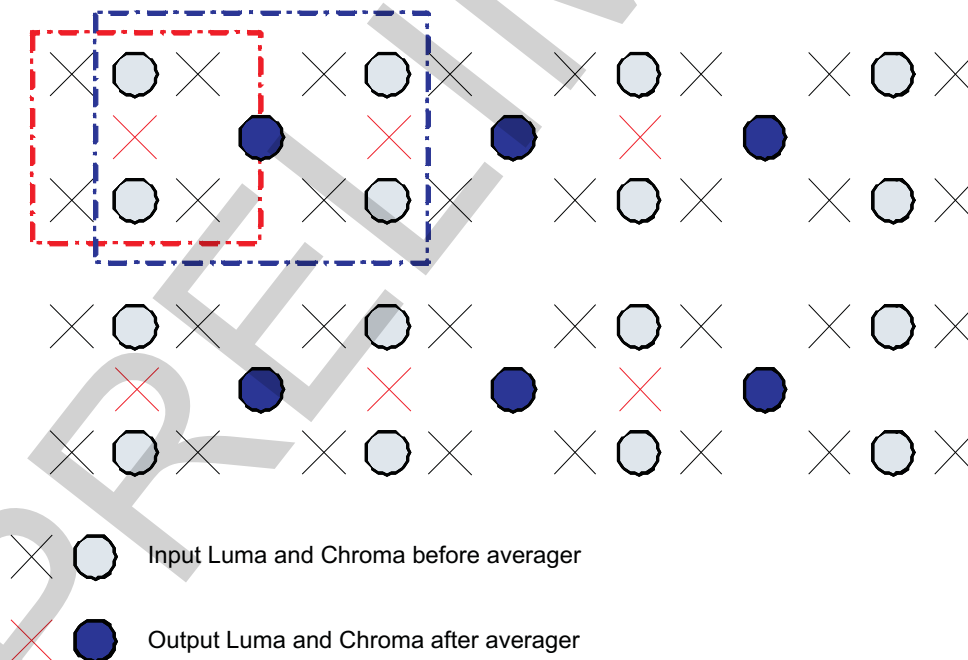
The initial value for the phase value for horizontal resizing is set by the RZi_H_PHS bit field. The RZi_H_PHS_ADJ register enables adjusting the horizontal phase for the Luma component when averaging is enabled (the averager disrupts the relative sampling point between luminance and chrominance when YUV4:2:2 cosited data is input). The relative phase between Luma and Chroma is different before and after the horizontal averager. The vertical phase is not affected by the averager. [Figure 8-172](#) shows the effect of the averager on the phases. RZi_H_PHS_ADJ is expected to be equal to zero if the averager is disabled.

Figure 8-172. ISS ISP RSZ-A/RSZ-B Phase Averager Effect

Input Chroma is co-sited: relative input I/O phases btw Y and UV are different, correction is needed.



Input Chroma is centered: relative input I/O phases btw Y and UV are identical, no correction is needed.



camss-685

8.3.3.5.5 ISS ISP RSZ Data Saturator

After vertical rescaling and before color conversion, the output data is saturated (clipped) to programmable values that are given by the following registers:

- [RSZ_YUV_Y_MIN](#)
- [RSZ_YUV_Y_MAX](#)
- [RSZ_YUV_C_MIN](#)
- [RSZ_YUV_C_MAX](#)

The maximum Y value is set up with the [RSZ_YUV_Y_MAX](#) register. If the Input Y value is greater than the MAX value, it is clipped to MAX.

The minimum Y value is set up with the [RSZ_YUV_Y_MIN](#) register. If the Input Y value is smaller than the MIN value, it is clipped to MIN.

The maximum Cb/Cr value is set up with the [RSZ_YUV_C_MAX](#) register. If the Input Cb/Cr value is greater than the MAX value, it is clipped to MAX.

The minimum Cb/Cr value is set up with the [RSZ_YUV_C_MIN](#) register. If the Input Cb/Cr value is smaller than the MIN value, it is clipped to MIN.

8.3.3.5.5.6 ISS ISP RSZ Color Convertor

As mentioned previously, the resizer can support RAW, YUV4:2:0, and YUV4:2:2 formats. The resizer engines can also support RGB output: RGB5:6:5 and ARGB32.

The RGB5:6:5 data is 16 bits wide and consists of 5 bits for red, 6 bits for green, and 5 bits for blue.

The following table shows the way RGB5:6:5 is stored to memory. This data format is compatible with the display controller. Only the little-endian memory representation is supported.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|----|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| R1 | | | | | G1 | | | | | | B1 | | | | | R0 | | | | | G0 | | | | | B0 | | | | | |

The ARGB32 data is 32 bits wide and consists of 8 bits for alpha, 8 bits for red, 8 bits for green, and 8 bits for blue. The alpha value is global and is set for the entire frame; registers control the alpha value: the RZx_RGB_BLD register controls the alpha values of resizer A and resizer B.

The following table shows the way ARGB32 is stored to memory. This data format is compatible with the display controller. This representation is endianness invariant: it is the same for little endian and big endian.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| A | | | | | | | | R | | | | | | | | G | | | | | | | | B | | | | | | | |

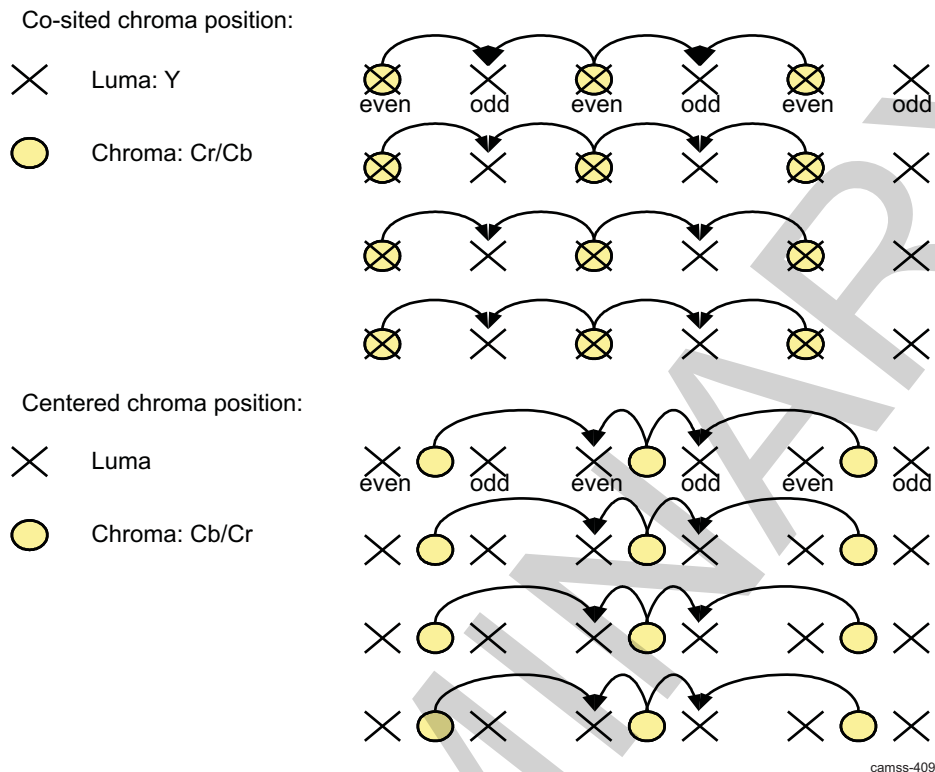
The RGB output is enabled by setting the RZx_RGB_EN[0] RGB_EN bit to 1.

The RGB format is set by the RZx_RGB_TYP[0] TYP bit (0 for ARGB32 format and 1 for RGB5:6:5).

To handle the horizontal border conditions, the leftmost Chroma sample or the right-most Chroma sample is duplicated on the left or the right.

Software must make it possible to remove 2 pixels on the left and/or right to take care of the issues that Chroma duplication introduces on the borders. The RZx_RGB_TYP[1] MSK0 and RZx_RGB_TYP[2] MSK1 bits control this feature.

Figure 8-173. ISS ISP RSZ Chroma Position and Upsampling



8.3.3.5.5.7 ISS ISP RSZ Output Interface

The output interface receives the data generated by the two resizer engines and generates the addresses and the port requests to the BL module.

- The port 1 interface is dedicated to the RSZ-A module. If the RSZ module is set up in pass-through mode, then the data is output on the port 1 interface. This interface can transfer RAW, YUV4:2:2, YUV4:2:0 and RGB data
- The port 2 interface is dedicated to the RSZ-B module. This interface can transfer RAW, YUV4:2:2, YUV4:2:0 and RGB data.

The YUV4:2:0 data format is handled differently from the other formats because the output data are written at two different memory locations: luminance in one buffer and chrominance in a second buffer. For all other formats the data are written in the same buffer.

Each data format must be stored in memory in a dedicated manner, which is summarized in [Table 8-327](#).

Table 8-327. ISS ISP RSZ Output Interface: Data Formats

| Output Format | Bytes per Pixel | Output Buffers per Image | Interface Supporting the Data Format |
|---------------|-----------------|--------------------------|--------------------------------------|
| RAW | 2 | 1 | MTC port 1 |
| YUV4:2:2 | 2 average | 1 | MTC port 1 port 2 |
| YUV4:2:0 | 1.5 average | 2 | MTC port 1 port 2 |
| RGB16 | 2 | 1 | MTC port 1 port 2 |
| ARGB32 | 4 | 1 | MTC port 1 port 2 |

8.3.3.5.5.7.1 ISS ISP RSZ Circular Buffer

Figure 8-174 shows the parameters that are required to set up the circular buffers. As mentioned previously, there can be up to four circular buffers in case the two resizer engines are outputting YUV4:2:0 data.

The circular buffer management requires the following parameters (REZ-A or RSZ-B A or B, chrominance or luminance Y or C, low or high part of the address, L or H. Sets the base address of the circular buffer):

- Baseline address (BAD, in registers, where x is the resizer A or B, and i is Y or C)
- Start address (SAD, in RZx_SDR_i_SAD_j registers)
- Start pointer (PTR_S, in RZx_SDR_i_PTR_S registers)
- End pointer (PTR_E, in RZx_SDR_i_PTR_E registers)
- Line offset (OFT, in RZx_SDR_i_OFT registers)

| Circular Buffer Parameter | Register (for RSZ-A and RSZ-B) | Description |
|---------------------------|--|--|
| Baseline address | RZA_SDR_Y_BAD_H RZA_SDR_Y_BAD_L RZA_SDR_C_BAD_H RZA_SDR_C_BAD_L RZB_SDR_Y_BAD_H RZB_SDR_Y_BAD_L RZB_SDR_C_BAD_H RZB_SDR_C_BAD_L | Sets the base address of the circular buffer |
| Start address | RZA_SDR_Y_SAD_H RZA_SDR_Y_SAD_L RZA_SDR_C_SAD_H RZA_SDR_C_SAD_L RZB_SDR_Y_SAD_H RZB_SDR_Y_SAD_L RZB_SDR_C_SAD_H RZB_SDR_C_SAD_L | Sets the start address of the circular buffer. The first data output is written to this address. If the first line of a frame must be written at the beginning of the circular buffer memory, then SAD = BAD and PTR_S = 0. |
| Start pointer | RZA_SDR_Y_PTR_S RZA_SDR_C_PTR_S RZB_SDR_Y_PTR_S RZB_SDR_C_PTR_S | Sets the initial value of the circular buffer internal counter. It must be set up as PTR_S = (SAD - BAD)/OFT. PTR_S is expressed in the number of lines. |
| End pointer | RZA_SDR_Y_PTR_E RZA_SDR_C_PTR_E RZB_SDR_Y_PTR_E RZB_SDR_C_PTR_E | Sets the size of the circular buffer. PTR_E is expressed in the number of lines. The circular buffer can contain up to PTR_E lines. |
| Line offset | RZA_SDR_Y_OFT RZA_SDR_C_OFT RZB_SDR_Y_OFT RZB_SDR_C_OFT | This is the offset expressed in bytes between two lines in the circular buffer. Here: Line 0 = SAD, Line 1 = SAD + 1 x OFT, Line 2 = SAD + 2 x OFT, etc. OFT does not necessarily correspond to the size of a line in a frame; it can be bigger. |

More generally, the following equations hold:

- $SAD = BAD + (PTR_S \times OFT)$ and $PTR_S \leq PTR_E$

Interrupts can be triggered every time a certain number of lines are written to the circular buffer. There are independent settings for each resizer and for each possible output of each resizer.

Figure 8-174. ISS ISP RSZ and Circular Buffer Settings

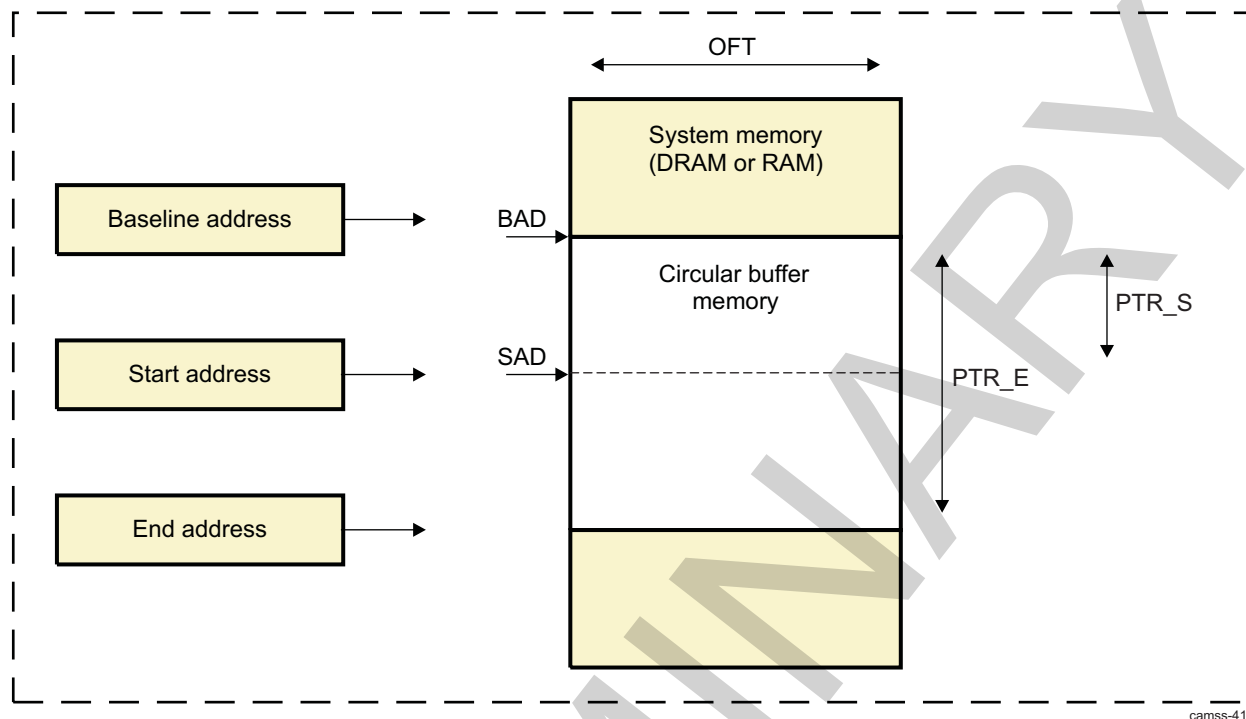
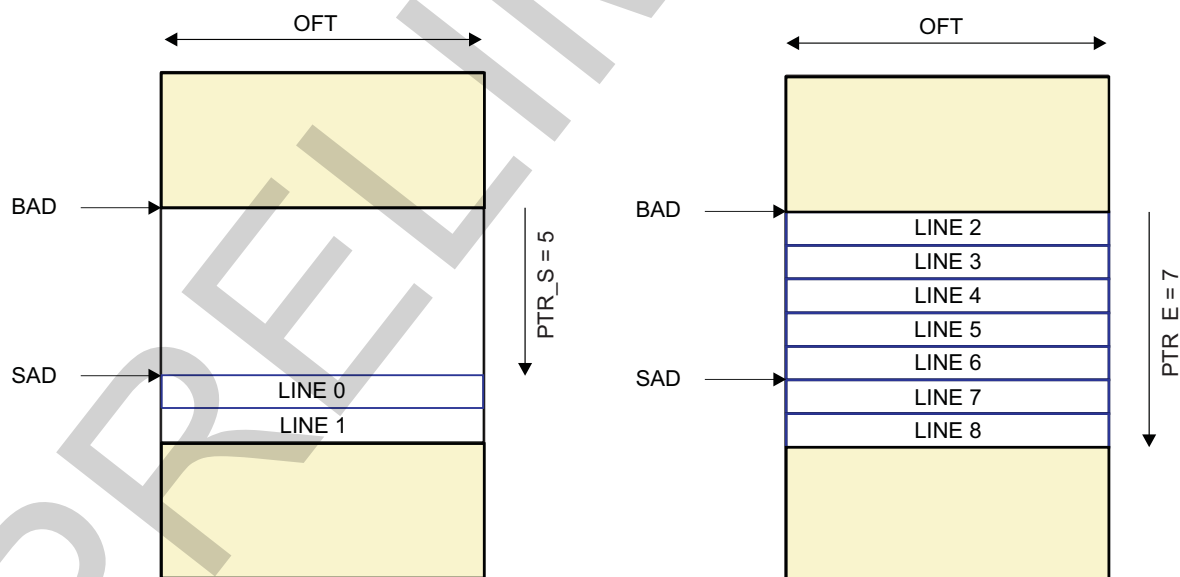


Figure 8-175 shows how the data are stored in the circular buffer over time when vertical flip is disabled. In this example, $PTR_S = 5$ and $PTR_E = 7$. There can be up to $PTR_E = 7$ lines in the circular buffer.

Figure 8-175. ISS ISP RSZ and Circular Buffer Settings – Example 1



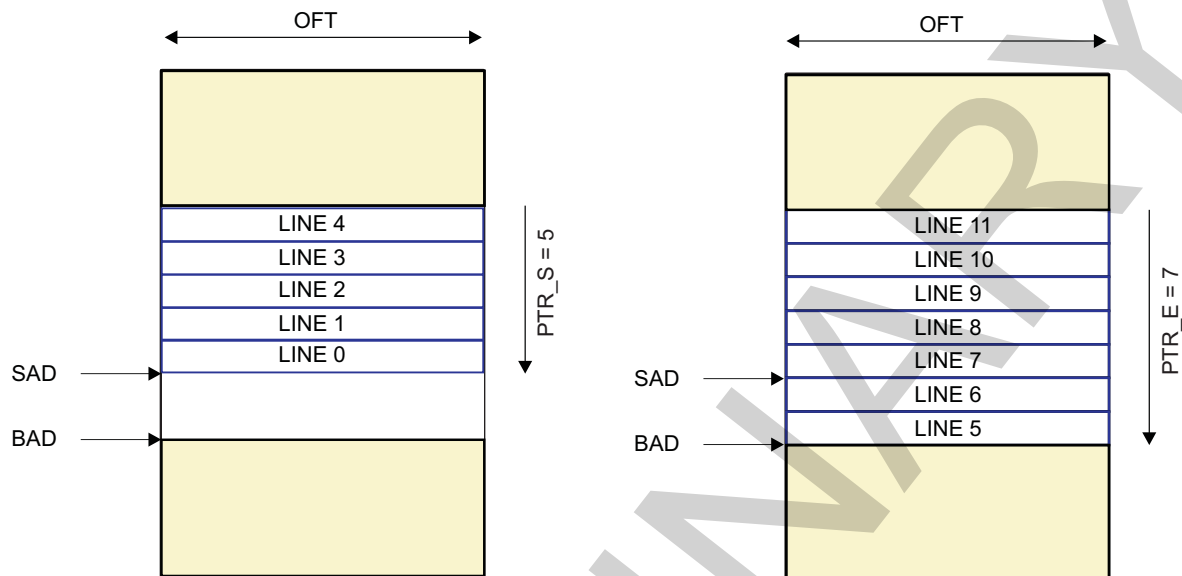
Vertical flip enabled:

1. Start from SAD.
2. Output $PTR_E - PTR_S$ lines.
3. Wrap to BAD.
4. Output PTR_E lines and continue wrapping to BAD.

camss-412

Figure 8-176 shows how the data are stored in the circular buffer over time when vertical flip is enabled. In this example, PTR_S = 5 and PTR_E = 7. There can be up to PTR_E = 7 lines in the circular buffer.

Figure 8-176. ISS ISP RSZ and Circular Buffer Settings – Example 2



Vertical flip enabled:

1. Start from SAD.
2. Output PTR_E – PTR_S lines.
3. Wrap to BAD.
4. Output PTR_E lines and continue wrapping to BAD.

camss-413

8.3.3.6 ISS ISP H3A Functional Description

8.3.3.6.1 ISS ISP H3A Overview

The H3A module supports the control loops for autofocus, auto white balance, and auto exposure by collecting metrics about the imaging/video data. The metrics are used to adjust parameters for processing the imaging/video data. There are two main blocks in the H3A module:

- Autofocus (AF) engine:

The AF submodule extracts and filters the red, green, and blue data from input image data and provides the accumulation or peaks of the data in a specified region. The specified region is a 2D block of data referred to as a paxel. The AF engine supports the following features:

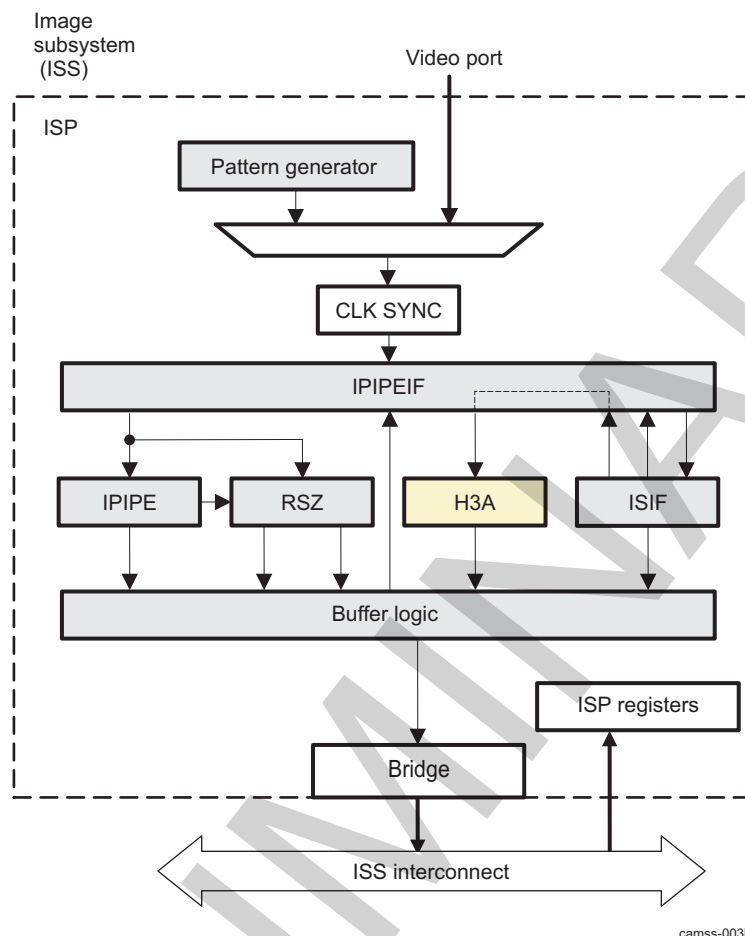
- Peak mode in a paxel
 - Accumulation of the maximum focus value (FV) of each line in a paxel
- Accumulation mode in a paxel
- Accumulation of horizontal and vertical focus value in a paxel
- Up to 12 paxels in the horizontal direction and up to 12 paxels in the vertical direction with vertical focus
- Up to 36 paxels in the horizontal direction and up to 128 paxels in the vertical direction with horizontal focus only
- Programmable width and height for the paxel/window
- Programmable red, green, and blue position within a 2 × 2 matrix
- Separate horizontal start for paxel and filtering

- Programmable vertical and horizontal line increments within a paxel
- Horizontal FV uses parallel infinite impulse response (IIR) filters configured in a dual-biquad configuration with individual coefficients (two filters with 11 coefficients each). The filters are intended to compute the sharpness/peaks in the frame to focus on.
- Vertical FV uses a 5-tap FIR filter with 8-bit coefficients. With horizontal steps each paxel has up to 32 columns to be maintained for vertical FV calculation.
- Auto exposure and auto white balance (AE/AWB) engine:

The AE/AWB engine accumulates values and checks for saturated values in a subsampling of the video data. In the case of the AE/AWB, the 2D block of data is referred to as a window. Thus, other than having different names, paxels and windows are essentially the same. However, the numbers, dimensions, and starting positions of AF paxels and AE/AWB windows are programmable separately. AE/AWB supports the following features:

 - Accumulate clipped pixels along with all nonsaturated pixels in each window per color
 - Accumulate the sum of squared pixels in each window per color
 - Minimum and maximum pixel values in each window per color
 - Supports for up to 36 horizontal windows with sum + { sum_sq or min+max} output
 - Support for up to 56 horizontal windows with sum output
 - Support for up to 128 vertical windows
 - Programmable width and height for the windows. All windows in the frame are the same size.
 - Separate vertical start coordinate and height for a black row of paxels that is different than the remaining color paxels
 - Programmable horizontal sampling points in a window
 - Programmable vertical sampling points in a window
- Maximum pixel throughput of 233 MPix/s
- Double-buffer for paxel/window accumulation
- H3A data path is 10 bits.
- Maximum input size is 3008 pixels.

Figure 8-177 shows the H3A module connections to other submodules of the ISP.

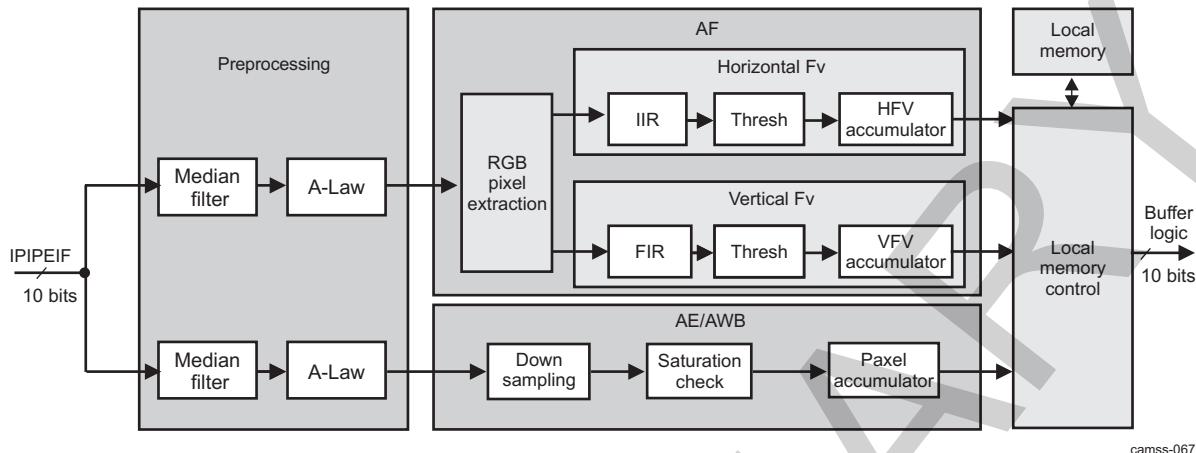
Figure 8-177. ISS ISP H3A High-Level Diagram**8.3.3.6.2 ISS ISP H3A Top-Level Block Diagram**

The block diagram in [Figure 8-178](#) shows the process of the AF and AE/AWB data paths through the H3A module.

The data flow before H3A is:

1. Data comes from the VP (VP) or BL.
2. The data is processed by the ISIF.
3. The data is processed by the IPIPEIF.
4. The data is 10 bits from the IPIPEIF at H3A input.

Figure 8-178. ISS ISP H3A Top-Level Block Diagram

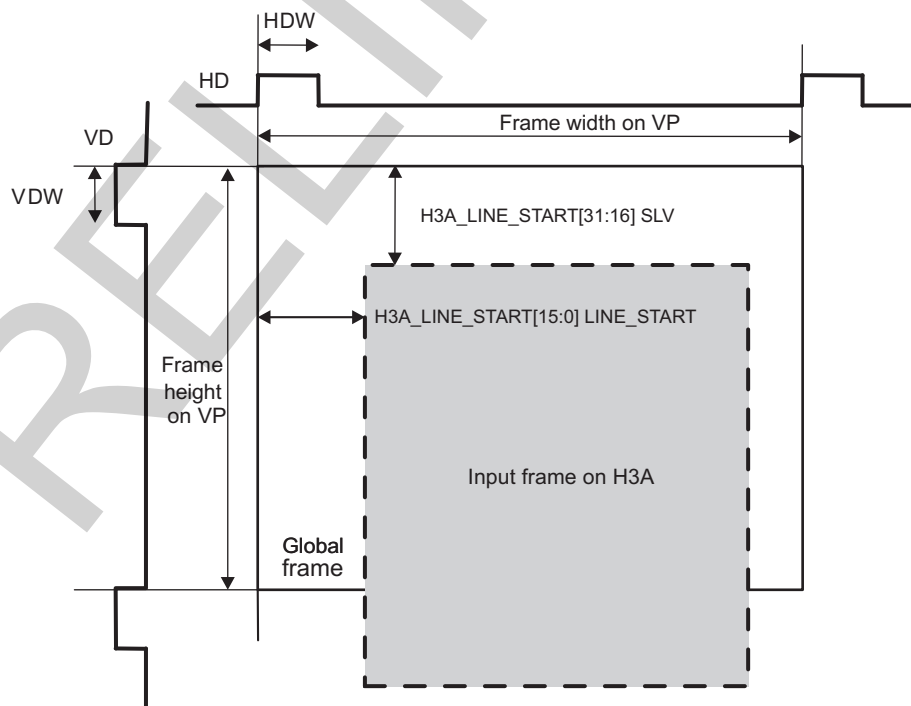


camss-067

8.3.3.6.3 ISS ISP H3A Line Framing Logic

In certain cases the number of clock cycles between HD pulses is greater than the line buffer included in the H3A. To solve this problem a framing module was added before the line buffer. The framing module uses the [H3A_LINE_START](#) register to find the position of the first pixel to place into the line buffer. All other registers reference this point as the 0 pixel for their start positions. The line size is 3008 pixels. After 3008 clock cycles the framing logic disables the line buffer and waits until the next HD. If the next HD comes before 3008 clock cycles, then the active region ends immediately and the counter waits for the [H3A_LINE_START](#) register count to be reached again. For the vertical position the [H3A_LINE_START\[31:16\]](#) SLV bit field can be used to determine where the start point of the frame is relative to the rising edge of VD. This logic allows for an active frame to cross VD boundaries and remain in the same frame.

Figure 8-179. ISS ISP H3A Frame Format Settings



camss-073

NOTE: (Frame width on VP) - ([H3A_LINE_START](#)[15:0] `LINE_START`) must be less than or equal to 3008, because the H3A memory lines are limited to 3008 pixels.

8.3.3.6.4 ISS ISP H3A Optional Preprocessing

The input to the H3A module is 10-bit RAW data from the IPIPEIF. A 10-bit to 8-bit A-Law compression step can be enabled and disabled separately for the AF engine (the [H3A_PCR](#)[1] `AF_ALAW_EN` bit) and the AE/AWB engine (the [H3A_PCR](#)[17] `AEW_ALAW_EN` bit). A-Law compression offers added protection against overflowing the accumulators.

If the A-Law table is enabled, the output is 10 bits, with the upper two bits filled with 0.

For the AF process, a horizontal median filter can be enabled and disabled (the [H3A_PCR](#)[2] `AF_MED_EN` bit) before A-Law compression. This filter is useful for reducing temperature-induced noise. The horizontal median filter calculates the absolute difference between the current pixel (*i*) and pixel (*i* - 2), and between the current pixel (*i*) and pixel (*i* + 2). If the absolute difference exceeds a threshold, and the sign of the differences is the same, the average of pixel (*i* - 2) and pixel (*i* + 2) replaces pixel (*i*). The threshold of the horizontal median filter can be set in the [H3A_PCR](#)[10:3] `MED_TH` bit field.

8.3.3.6.5 ISS ISP H3A Autofocus Engine

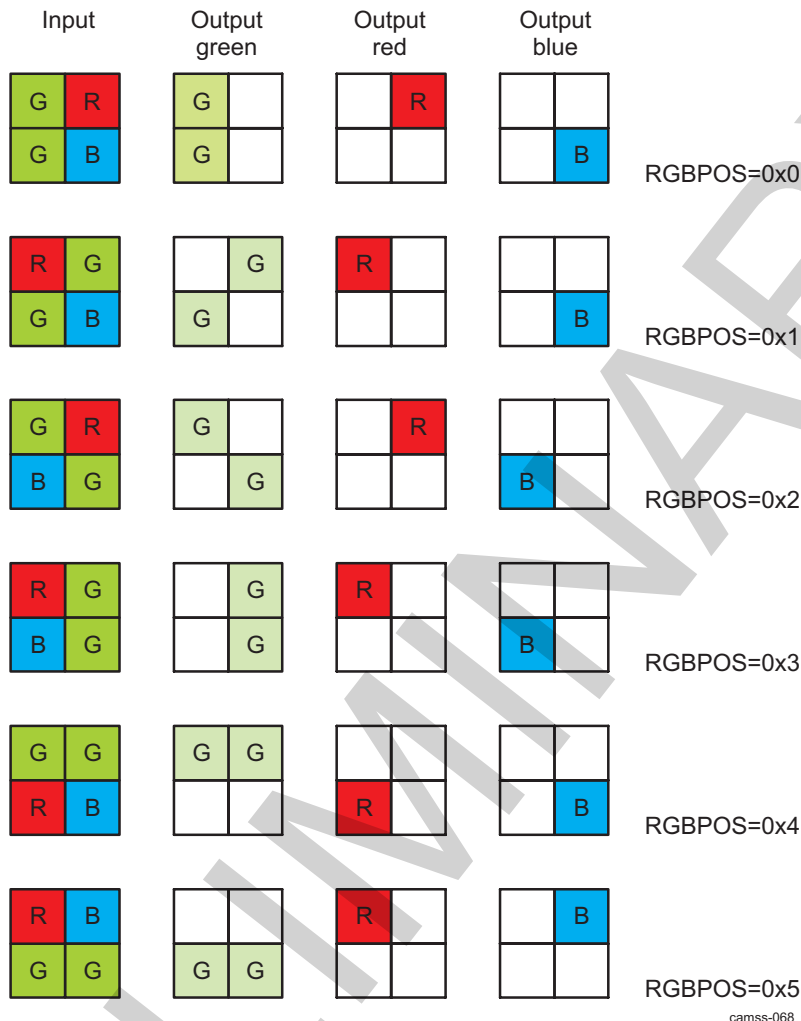
The AF engine works by extracting each green (Gr or Gb) pixel from the video stream and subtracts a fixed offset of 128 or 512 (depending on whether A-Law is enabled or disabled) from the pixel value. The offset value is then passed through an IIR filter and the absolute value of the filter output is the focus value (FV). Both FV and FV² are produced. The FV and FV² values can be accumulated or the maximum for each line/column can be accumulated. The following sections describe this process in more detail.

8.3.3.6.5.1 ISS ISP H3A Poxel Extraction

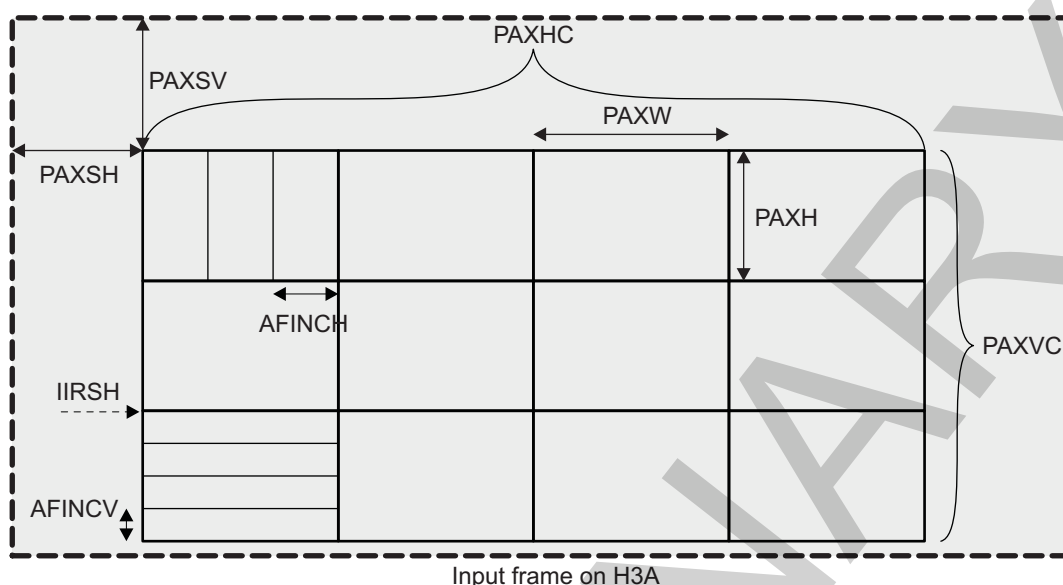
From the poxel starting coordinate (the [H3A_AFPAXSTART](#)[27:16] `PAXSH` and [H3A_AFPAXSTART](#)[11:0] `PAXSV` bit fields) specifies the starting point of the poxel grid, with respect to first pixel of the input image frame.

The poxel starting coordinate also indicates which color pixels are extracted if VF is enabled (that is, if [H3A_PCR](#)[20] `AF_VF_EN` = 1). Normally, either Gr or Gb is used for AF, but it is not important to the hardware whether it is red, green, or blue. If VF is not enabled, then the red, green, and blue pixel extraction is controlled by the [H3A_PCR](#) [13:11] `RGBPOS` bit field to extract the correct colors from the input stream. [Figure 8-181](#) shows the available options for this bit field. The red and blue pixel positions are interchangeable. For each 2 × 2 grid, the green pixels are summed to create a single value. Because of this, the amplitude of the green output contains 2 pixels, while the red and blue outputs each contain 1 pixel.

Figure 8-180. ISS ISP H3A Red, Green, and Blue Pixel Extraction Examples



Each paxel is [H3A_AFPAX1\[23:16\]](#) PAXW × [H3A_AFPAX1\[7:0\]](#) PAXH (width × height) pixels. Inside each paxel, horizontal FV can skip lines, operating on one every [H3A_AFPAX2\[16:13\]](#) AFINCV lines. Vertical FV can skip columns, operating on one every [H3A_AFPAX2\[20:17\]](#) AFINCH columns. Up to 32 columns are supported for each paxel. If floor (PAXW/AFINCH) = 32, only the first 32 designated columns are operated on. Because PAXW, PAXH, AFINCV, and AFINCH are all even numbers, AF always operates on the same green color, Gr or Gb. IIR filters for the horizontal FVs start operation at column [H3A_AFIIRSH\[11:0\]](#) IIRSH.

Figure 8-181. ISS ISP H3A Horizontal/Vertical FV Poxel Configuration

camss-071

NOTE: $(\text{H3A_AFPAXSTART}[27:16] \text{ PAXSH}) + (\text{H3A_AFPAX2}[5:0] \text{ PAXHC}) \times (\text{H3A_AFPAX1}[23:16] \text{ PAXW}) = [(\text{Frame width on VP}) - (\text{H3A_LINE_START}[15:0] \text{ LINE_START})] = 3008$

Table 8-328 lists the register fields that configure the size and number of paxels.

Table 8-328. ISS ISP H3A Poxel Register Field Descriptions

| Register Field | Bit Width | Description |
|--|-----------|--------------------------------------|
| H3A_AFPAX1 [23:16] PAXW | 8 | Poxel width (in pixels) |
| H3A_AFPAX1 [7:0] PAXH | 8 | Poxel height (in lines) |
| H3A_AFPAX2 [5:0] PAXHC | 6 | Poxel count for horizontal direction |
| H3A_AFPAX2 [12:6] PAXVC | 7 | Poxel count for vertical direction |
| H3A_AFPAX2 [16:13] AFINCV | 4 | Line increments in a poxel |
| H3A_AFPAX2 [20:17] AFINCH | 4 | Column increments in a poxel |
| H3A_AFPAXSTART [27:16] PAXSH | 12 | Poxel start position H |
| H3A_AFPAXSTART [11:0] PAXSV | 12 | Poxel start position V |
| H3A_AFIIRSH [11:0] IIRSH | 12 | IIR filter start position |

The H3A AF engine also has an option for an advanced or normal stats collection mode. When 0xCA00 is written to the [H3A_ADVANCED](#)[31:15] ID bit field, then [H3A_ADVANCED](#)[0] AF_MODE can be used to toggle between normal and advanced AF stats collection mode. When the advanced AF stats collection mode is enabled, the ZEROS section of the AF poxel packet is filled with the sum of the maximum FVs, regardless of the color, from HFV_1 and HFV_2.

8.3.3.6.5.2 ISS ISP H3A Horizontal FV Calculator

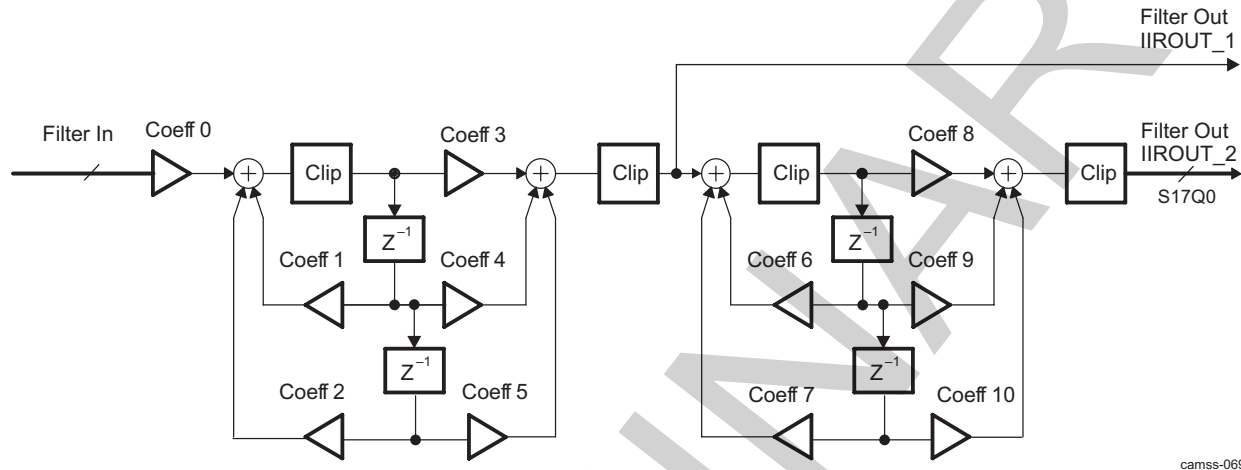
The FV calculator takes the unsigned red/green/blue extracted data and subtracts 128 or 512 (depending on whether A-Law is enabled) to place the data in the range [–128:127] or [–512:511].

After removing the offset, the data is sent through two parallel IIR filters configured in a dual-biquad configuration. Each filter uses a unique set of 11 programmable coefficients. Each coefficient is 12-bits-wide with 6 bits of decimal, S12Q6 ([H3A_AFCOE010](#) to [H3A_AFCOE0010](#) for SET0, and [H3A_AFCOE110](#) to [H3A_AFCOE1010](#) for SET1). The filter-shift registers are cleared on each

horizontal line at the position set by the register IIR horizontal start register (the [H3A_AFIIRSH](#) [11:0] IIRSH bit field). The absolute values of the output (16-bits-wide with 4 bits of decimal, U16Q4) of both filters are then sent to the AF accumulator module. Signed clipping is performed during the FV calculation. If the input value is m bits (signed) and the required output value is n bits, clipping transforms the input to between -2^1 and 2^1 . Values lower than -2^1 are set to -2^1 , and values higher than 2^1 are set to 2^1 .

Figure 8-182 shows the IIR filter model.

Figure 8-182. ISS ISP H3A IIR Filter Model



8.3.3.6.5.3 ISS ISP H3A HFV Accumulator

The horizontal focus value (HFV) accumulator takes the output of the horizontal IIR filter and accumulates values for each pixel. The size and number of pixels is configurable by registers.

Table 8-328 lists the register fields that configure the size and number of paxels:

- In peak mode (H3A_PCR[14] FVMODE = 0x1), the maximum value is accumulated.
- In sum mode (H3A_PCR[14] FVMODE = 0x0), all HFV_n are accumulated in a paxel.

The following equations detail the calculation for:

- Sum of pixel values used in HFV: The pixel values that are used for filtering and accumulation of HFV are also accumulated in this sum of pixel values.
- HFV_n (HFV_n_peak for peak mode or HFV_n_sum for sum mode)
- HFV_count_n
- HFV_sq_n (HFV_sq_n_peak for peak mode or HFV_sq_n_sum for sum mode)

$n = 1$ or 2 for IIR1 and IIR2, respectively.

For each pixel, these six values are available for each R, G, and B component.

```

for (k=0; k PAXH) // Loop on paxel rows
{
    rowpeak_n = 0;
    for (l=0; lPAXW; l++) // Loop on values within a row
    {
        aIIRout_n = ABS(IIRout_n);
        if (aIIRout_n = threshold_n)
        {
            hfval = aIIRout_n - threshold_n;
            HFV_count_n++;
        }
        else hfval = 0;
        if (hfval > rowpeak_n)
        {
            rowpeak_n = HFV_n;
        }
    }
}

```

```

HFV_n_sum += hfval;
HFV_sq_n_sum += (hfval* hfval + RNDADD)  RNDSHIFT;
} // Finished looping on values in a row
HFV_n_peak += rowpeak_n;
HFV_sq_n_peak += (rowpeak_n * rowpeak_n + RNDADD)  RNDSHIFT;
}

```

- threshold_n is [H3A_HVF_THR\[15:0\]](#) HTHR1 and [H3A_HVF_THR\[31:16\]](#) HTHR2, respectively.
- IIRout_n is the IIRout_1 and IIRout_2 outputs, respectively.
- HFV_count_n and HFV_sq_n are not sent to the DMA interface if VF is disabled.
- RNDADD and RNDSHIFT depend on whether input pixels are 8-bit or 10-bit, and achieves rounding. This is automatically performed by the module.
- If VF is enabled, only the green color channel values are output to the DMA interface.
- In sum mode:
 - HFV_n = HFV_n_sum
 - HFV_sq_n = HFV_sq_n_sum
- In peak mode:
 - HFV_n = HFV_n_peak
 - HFV_sq_n = HFV_sq_n_peak

8.3.3.6.5.4 ISS ISP H3A VFV Calculator

The VFV calculator takes the unsigned extracted data through two FIR filters, each with a set of five coefficients (VCOEF1_x, where x = 0..4, in the [H3A_VFV_CFG1](#) and [H3A_VFV_CFG2](#) registers for FIR 1, and VCOEF2_x, where x = 0..4, in [H3A_VFV_CFG3](#) and [H3A_VFV_CFG4](#) registers). Each coefficient is 8 bits wide with 4 bits of decimal (S8Q4). The filter outcome is downshifted by 4 bits and taken absolute value to produce a 16-bit unsigned value. This is then sent to threshold [H3A_VFV_CFG2\[31:16\]](#) VTHR1 for FIR 1, and [H3A_VFV_CFG4\[31:16\]](#) VTHR2 for FIR 2, and square logic to produce VFV_n and VFV_sq_n.

8.3.3.6.5.5 ISS ISP H3A VFV Accumulator

The VFV accumulator takes the output of the vertical FIR filters and accumulates values for each paxel. The size and number of paxels is configurable by registers.

[Table 8-328](#) lists the register fields that configure the size and number of paxels.

The following equations detail the calculation for:

- VFV_n
- VFV_count_n
- VFV_sq_n

n = 1 or 2 for FIR1 and FIR2, respectively.

For each paxel, these six values are available for each R, G, and B component.

```

FIR_coef_n = [VCOEFn_0, VCOEFn_1, VCOEFn_2, VCOEFn_3, VCOEFn_4]; /* coefficient values in S8.4
format */
aFIRout_n = (ABS(inner_product(extracted_G, FIR_coef_n)) + 8)  4;
if (aFIRout_n > threshold_n)
{
    VFV_n = aFIRout_n - threshold_n;
    VFV_count_n++;
}
else VFV_n = 0;
VFV_sq_n = (VFV_n * VFV_n + RNDADD)  RNDSHIFT;

```

- threshold_n is [H3A_VFV_CFG2\[31:16\]](#) VTHR1 and [H3A_VFV_CFG4\[31:16\]](#) VTHR2, respectively.
- FIRout_n is the FIRout_1 and FIRout_2 outputs, respectively.
- RNDADD and RNDSHIFT depend on whether the input pixels are 8-bit or 10-bit, and achieves rounding. This is automatically performed by the module.

8.3.3.6.6 ISS ISP H3A AE/AWB Engine

The AE/AWB engine starts by dividing the frames into windows, and then subsamples each window into 2×2 blocks. For each subsampled 2×2 block, each pixel is accumulated. Also, each pixel is compared to a limit set in a register. If any pixels in a 2×2 block are greater than or equal to the limit, the block is not counted in the unsaturated block counter. Pixels greater than the limit are replaced by the limit, and the value of the pixel is accumulated.

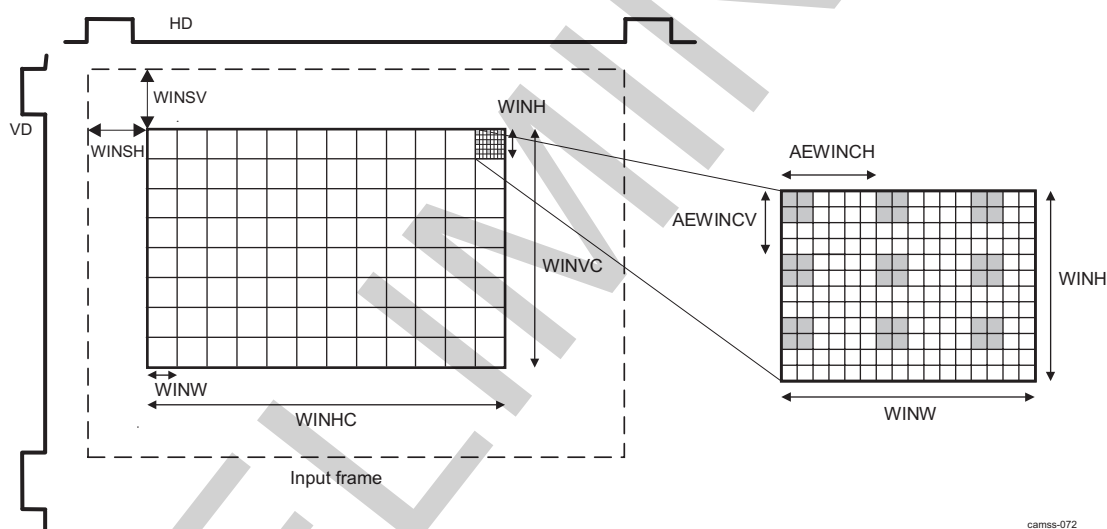
The AE/AWB module has three output format modes, which are set through the [H3A_AEWCFG\[9:8\]](#) AEFMT bit field:

- Sum of square mode: [H3A_AEWCFG\[9:8\]](#) AEFMT = 0x0
- Min/max mode: [H3A_AEWCFG\[9:8\]](#) AEFMT = 0x1
- Sum-only mode: [H3A_AEWCFG\[9:8\]](#) AEFMT = 0x2

8.3.3.6.6.1 ISS ISP H3A Subsampler

The subsampler partitions the frame into windows using the size, count, and starting location parameters shown on the left in [Figure 8-179](#). Each window is further sampled down to a set of 2×2 blocks. The horizontal and vertical distances between the start of blocks within a window is programmable using the parameters shown on the right in [Figure 8-179](#).

Figure 8-183. ISS ISP H3A AE/AWB Window Configurations



[Table 8-329](#) lists the register fields that configure the window and block sizes, counts, and starting positions.

Table 8-329. ISS ISP H3A AE/AWB Window Register Field Descriptions

| Register Field | Bit Width | Description |
|---|-----------|--|
| H3A_AEWWIN1[20:13] WINW | 7 | Window width (in pixels) |
| H3A_AEWWIN1[31:24] WINH | 7 | Window height (in lines) |
| H3A_AEWWIN1[5:0] WINHC | 6 | Window count for horizontal direction |
| H3A_AEWWIN1[12:6] WINVC | 7 | Window count for vertical direction |
| H3A_AEWINSTART[11:0] WINSH | 12 | Window start position H |
| H3A_AEWINSTART[27:16] WINSV | 12 | Window start position V |
| H3A_AEWSUBWIN[3:0] AEWINCH | 4 | Horizontal distance between subsamples |
| H3A_AEWSUBWIN[11:8] AEWINCV | 4 | Vertical distance between subsamples |

8.3.3.6.6.2 ISS ISP H3A Additional Black Row of AE/AWB Windows

In addition to the 128 rows of windows, the AE/AWB module provides support for an additional row of windows for black data. This data may be useful in determining the DC offset noise of the rest of the data. The black row of windows can be before or after the regular rows of windows. The vertical start line for the black row of windows is specified in the [H3A_AEWINBLK\[27:16\] WINSV](#) bit field, and the height is specified in the [H3A_AEWINBLK\[6:0\] WINH](#) bit field. The horizontal starting pixel and horizontal width of the black row of windows are the same as for the regular rows of windows.

[Figure 8-184](#) shows a black row of windows before rows of windows.

Figure 8-184. ISS ISP H3A Black Row of Windows Before Regular Rows of Windows

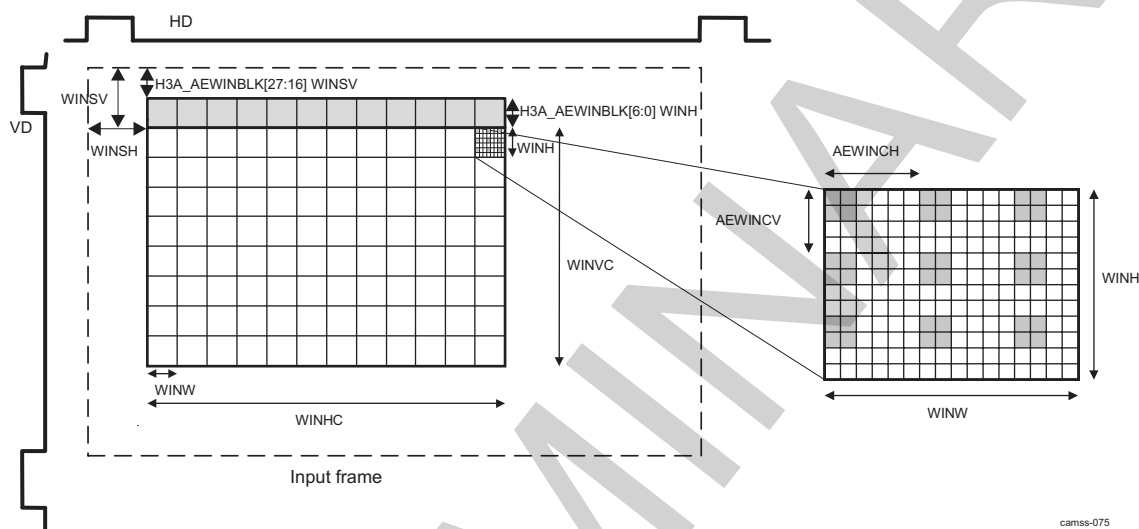


Table 8-330. ISS ISP H3A AE/AWB Window with Additional Black Row Register Field Descriptions

| Register Field | Bit Width | Description |
|---|-----------|--|
| H3A_AEWWIN1[20:13] WINW | 7 | Window width (in pixels) |
| H3A_AEWWIN1[31:24] WINH | 7 | Window height (in lines) |
| H3A_AEWWIN1[5:0] WINHC | 6 | Window count for horizontal direction |
| H3A_AEWWIN1[12:6] WINVC | 7 | Window count for vertical direction |
| H3A_AEWINSTART[11:0] WINSH | 12 | Window start position H |
| H3A_AEWINSTART[27:16] WINSV | 12 | Window start position V |
| H3A_AEWSUBWIN[3:0] AEWINCH | 4 | Horizontal distance between subsamples |
| H3A_AEWSUBWIN[11:8] AEWINCV | 4 | Vertical distance between subsamples |
| H3A_AEWINBLK[27:16] WINSV | 12 | Window start position H for single black line |
| H3A_AEWINBLK[6:0] WINH | 7 | Window height (in lines) for single black line |

8.3.3.6.6.3 ISS ISP H3A Saturation Check

The saturation check module compares the data from the subsampler to the value programmed in the [H3A_PCR \[31:22\] AVE2LMT](#) bit field. This value is the maximum clipping value. If all 4 pixels in the 2 × 2 block are less than the AVE2LMT value, the value of the unsaturated block counter is incremented. There is one unsaturated block counter per window. The unsaturated block counters are later written to memory.

8.3.3.6.4 ISS ISP H3A AE/AWB Accumulators

The output from the saturation check module and the subsampler module are separately accumulated for each pixel in every 2×2 pixel block for each window. Therefore, there are eight accumulators per window (one accumulator for each pixel in a 2×2 pixel block, times two sets of accumulators: clipped/saturated data and presaturated data). Each of the 4 pixels in the 2×2 pixel grid is associated with a color (R, Gr, B, Gb); however, the output of these accumulators is referenced by position in the grid, not color.

The accumulators are 16 bits wide, and the accumulated data is 10 bits wide. Therefore, when a window contains more than 64 pixels of the same color, an overflow risk exists. This risk can be reduced by enabling the A-Law conversion in the preprocessing stage. See [Section 8.3.3.6.4](#) for details.

The AE/AWB module has a shift value for the accumulation of pixel values that is set in the [H3A_AEWCFG](#)[3:0] SUMSHFT bit field.

8.3.3.6.7 ISS ISP H3A DMA Interface

The DMA interface module takes the data from the AF engine and AE/AWB engine and builds packets to be sent out to the memory through the BL module.

The data interface has separate start pointers for the AF and AE/AWB engines.

- The starting address for the AF engine is the [H3A_AFBUFST](#)[31:5] AFBUFST bit field.
- The starting address for the AE/AWB engine is the [H3A_AEWBUFST](#)[31:5] AEWBUFST bit field.

The DMA interface module continuously loops through this data as it builds the packets. To optimize the transfer sizes, the DMA interface sends out an AF or AE transfer for each row of paxels or windows. This requires that each horizontal row of paxels or windows starts and ends on a 32-byte boundary. If a horizontal row of paxels or windows ends on a non-32 byte boundary, the hardware packs zeroes. The counts for the AEW that occur every eight windows is sent in the row with the 8th consecutive window.

[Table 8-331](#) lists the packet formats for AF with vertical AF disabled.

Table 8-331. ISS ISP H3A AF Packet Format With Vertical AF Disabled

| Buffer Start Address (Byte Address) H3A_AFBUFST | 31 | 16 | 15 | 0 |
|--|----|----|----|-----------|
| Sum of pixel values used in HFV | | | | (Paxel 0) |
| HFV_1 (peak or sum) | | | | (Paxel 0) |
| HFV_2 (peak or sum) | | | | (Paxel 0) |
| ZEROES | | | | (Paxel 0) |
| Sum of pixel values used in HFV | | | | (Paxel 0) |
| HFV_1 (peak or sum) | | | | (Paxel 0) |
| HFV_2 (peak or sum) | | | | (Paxel 0) |
| ZEROES | | | | (Paxel 0) |
| Sum of pixel values used in HFV | | | | (Paxel 0) |
| HFV_1 (peak or sum) | | | | (Paxel 0) |
| HFV_2 (peak or sum) | | | | (Paxel 0) |
| ZEROES | | | | (Paxel 0) |
| Sum of pixel values used in HFV | | | | (Paxel 1) |
| HFV_1 (peak or sum) | | | | (Paxel 1) |
| HFV_2 (peak or sum) | | | | (Paxel 1) |
| ZEROES | | | | (Paxel 1) |
| ... | | | | |

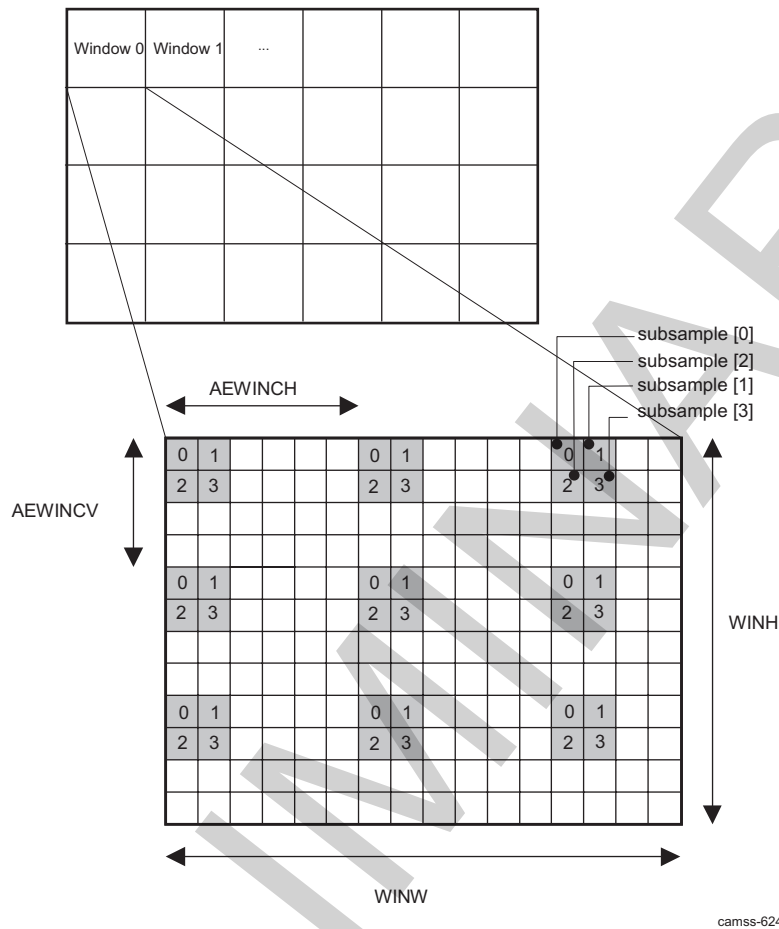
[Table 8-332](#) shows the packet formats for AF with vertical AF enabled.

Table 8-332. ISS ISP H3A AF Packet Format With Vertical AF Enabled

| Buffer Start Address (Byte Address) H3A_AFBUFST | 31 | 16 | 15 | 0 |
|---|----|----|----|-----------|
| Sum of pixel values used in HFV | | | | (Paxel 0) |
| HFV_1 (peak or sum) | | | | (Paxel 0) |
| HFV_sq_1 (peak or sum) | | | | (Paxel 0) |
| HFV_count_1 | | | | (Paxel 0) |
| HFV_2 (peak or sum) | | | | (Paxel 0) |
| HFV_sq_2 (peak or sum) | | | | (Paxel 0) |
| HFV_count_2 | | | | (Paxel 0) |
| ZEROES | | | | (Paxel 0) |
| VFV_1 | | | | (Paxel 0) |
| VFV_sq_1 | | | | (Paxel 0) |
| VFV_count_1 | | | | (Paxel 0) |
| ZEROES | | | | (Paxel 0) |
| VFV_2 | | | | (Paxel 0) |
| VFV_sq_2 | | | | (Paxel 0) |
| VFV_count_2 | | | | (Paxel 0) |
| ZEROES | | | | (Paxel 0) |
| Sum of pixel values used in HFV | | | | (Paxel 1) |
| HFV_1 (peak or sum) | | | | (Paxel 1) |
| HFV_sq_1 (peak or sum) | | | | (Paxel 1) |
| HFV_count_1 | | | | (Paxel 1) |
| ... | | | | |

Figure 8-185 shows the windows and subsample definition used in tables.

Figure 8-185. ISS ISP H3A AE/AWB Window and Subsample Definition



camss-624

Table 8-333 lists the packet formats for AE/AWB for sum of square mode (`H3A_AEWCFG[9:8] AEFMT = 0x0`).

Table 8-333. ISS ISP H3A AE/AWB Packet Format for Sum of Square Mode

| 31 | | 16 15 | | 0 | |
|--|---------------------|-------|--------------------|---|---------------|
| Buffer address (byte address) H3A_AEWBUF ST | Subsample Accum[1] | | Subsample Accum[0] | | Window 0 data |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| | Sum of squares[0] | | | | |
| | Sum of squares[1] | | | | |
| | Sum of squares[2] | | | | |
| | Sum of squares[3] | | | | |
| H3A_AEWBUF ST + 32 bytes | Subsample Accum[1] | | Subsample Accum[0] | | Window 1 data |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |

**Table 8-333. ISS ISP H3A AE/AWB Packet Format for Sum of Square Mode
(continued)**

| 31 | | 16 15 | | 0 | |
|---------------------------------|---------------------|-------|--------------------|---|---------------|
| H3A_AEWBUF ST + 64 bytes | Sum of squares[0] | | | | Window 2 data |
| | Sum of squares[1] | | | | |
| | Sum of squares[2] | | | | |
| | Sum of squares[3] | | | | |
| | Subsample Accum[1] | | Subsample Accum[0] | | |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| | Sum of squares[0] | | | | |
| | Sum of squares[1] | | | | |
| H3A_AEWBUF ST + 96 bytes | Sum of squares[2] | | | | Window 3 data |
| | Sum of squares[3] | | | | |
| | Subsample Accum[1] | | Subsample Accum[0] | | |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| | Sum of squares[0] | | | | |
| | Sum of squares[1] | | | | |
| | Sum of squares[2] | | | | |
| | Sum of squares[3] | | | | |
| H3A_AEWBUF ST + 128 bytes | Subsample Accum[1] | | Subsample Accum[0] | | Window 4 data |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| | Sum of squares[0] | | | | |
| | Sum of squares[1] | | | | |
| | Sum of squares[2] | | | | |
| | Sum of squares[3] | | | | |
| | Subsample Accum[1] | | Subsample Accum[0] | | |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| H3A_AEWBUF ST + 160 bytes | Saturator Accum[1] | | Saturator Accum[0] | | Window 5 data |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| | Sum of squares[0] | | | | |
| | Sum of squares[1] | | | | |
| | Sum of squares[2] | | | | |
| | Sum of squares[3] | | | | |
| | Subsample Accum[1] | | Subsample Accum[0] | | |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| H3A_AEWBUF ST + 192 bytes | Sum of squares[0] | | | | Window 6 data |
| | Sum of squares[1] | | | | |
| | Sum of squares[2] | | | | |
| | Sum of squares[3] | | | | |
| | Subsample Accum[1] | | Subsample Accum[0] | | |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| | Sum of squares[0] | | | | |
| | Sum of squares[1] | | | | |
| Sum of squares[2] | | | | | |
| Sum of squares[3] | | | | | |

Table 8-333. ISS ISP H3A AE/AWB Packet Format for Sum of Square Mode (continued)

| | 31 | 16 | 15 | 0 | |
|---------------------------------|--|----|--------------------------|---|--|
| H3A_AEWBUF ST + 224 bytes | Subsample Accum[1] | | Subsample Accum[0] | | Window 7 data |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| | Sum of squares[0] | | | | |
| | Sum of squares[1] | | | | |
| | Sum of squares[2] | | | | |
| | Sum of squares[3] | | | | |
| H3A_AEWBUF ST + 256 bytes | Unsaturated count, win 1 | | Unsaturated count, win 0 | | Unsaturated block count for the above 8 windows |
| | Unsaturated count, win 3 | | Unsaturated count, win 2 | | |
| | Unsaturated count, win 5 | | Unsaturated count, win 4 | | |
| | Unsaturated count, win 7 | | Unsaturated count, win 6 | | |
| | Data for next eight windows, and so on. If the total number of windows is not a multiple of 8, the unsaturated counters are written immediately following the last window data. For example, if the total number of windows (including the black row) are 43, the first 40 windows are written out as per the 272-byte boundary above. Then the remaining three windows are written at +0, +32, and +64 bytes. The counts are written out at +96 instead of +256-byte boundary. | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Table 8-334 lists the packet formats for AE/AWB in minimum-maximum mode (H3A_AEWCFG[9:8] AEFMT = 0x1).

Table 8-334. ISS ISP H3A AE/AWB Packet Format for Minimum-Maximum Mode

| 31 | | 16 | 15 | 0 | |
|--|---------------------|----|--------------------|---|---------------|
| Buffer address (byte address) H3A_AEWBUF ST | Subsample Accum[1] | | Subsample Accum[0] | | Window 0 data |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| | Minimum[1] | | Minimum[0] | | |
| | Minimum[3] | | Minimum[2] | | |
| | Maximum[1] | | Maximum[0] | | |
| | Maximum[3] | | Maximum[2] | | |
| H3A_AEWBUF ST + 32 bytes | Subsample Accum[1] | | Subsample Accum[0] | | Window 1 data |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| | Minimum[1] | | Minimum[0] | | |
| | Minimum[3] | | Minimum[2] | | |
| | Maximum[1] | | Maximum[0] | | |
| | Maximum[3] | | Maximum[2] | | |
| H3A_AEWBUF ST + 64 bytes | Subsample Accum[1] | | Subsample Accum[0] | | Window 2 data |
| | | | | | |

**Table 8-334. ISS ISP H3A AE/AWB Packet Format for Minimum-Maximum Mode
(continued)**

| | 31 | 16 15 | 0 |
|---------------------------------|---------------------|--------------------|---------------|
| H3A_AEWBUF ST + 96 bytes | Subsample Accum[3] | Subsample Accum[2] | Window 3 data |
| | Saturator Accum[1] | Saturator Accum[0] | |
| | Saturator Accum [3] | Saturator Accum[2] | |
| | Minimum[1] | Minimum[0] | |
| | Minimum[3] | Minimum[2] | |
| | Maximum[1] | Maximum[0] | |
| | Maximum[3] | Maximum[2] | |
| H3A_AEWBUF ST + 128 bytes | Subsample Accum[1] | Subsample Accum[0] | Window 4 data |
| | Subsample Accum[3] | Subsample Accum[2] | |
| | Saturator Accum[1] | Saturator Accum[0] | |
| | Saturator Accum [3] | Saturator Accum[2] | |
| | Minimum[1] | Minimum[0] | |
| | Minimum[3] | Minimum[2] | |
| | Maximum[1] | Maximum[0] | |
| H3A_AEWBUF ST + 160 bytes | Maximum[3] | Maximum[2] | Window 5 data |
| | Subsample Accum[1] | Subsample Accum[0] | |
| | Subsample Accum[3] | Subsample Accum[2] | |
| | Saturator Accum[1] | Saturator Accum[0] | |
| | Saturator Accum [3] | Saturator Accum[2] | |
| | Minimum[1] | Minimum[0] | |
| | Minimum[3] | Minimum[2] | |
| H3A_AEWBUF ST + 192 bytes | Maximum[1] | Maximum[0] | Window 6 data |
| | Maximum[3] | Maximum[2] | |
| | Subsample Accum[1] | Subsample Accum[0] | |
| | Subsample Accum[3] | Subsample Accum[2] | |
| | Saturator Accum[1] | Saturator Accum[0] | |
| | Saturator Accum [3] | Saturator Accum[2] | |
| | Minimum[1] | Minimum[0] | |
| H3A_AEWBUF ST + 224 bytes | Minimum[3] | Minimum[2] | Window 7 data |
| | Maximum[1] | Maximum[0] | |
| | Maximum[3] | Maximum[2] | |
| | Subsample Accum[1] | Subsample Accum[0] | |
| | Subsample Accum[3] | Subsample Accum[2] | |
| | Saturator Accum[1] | Saturator Accum[0] | |
| | Saturator Accum [3] | Saturator Accum[2] | |
| | Minimum[1] | Minimum[0] | |

Table 8-334. ISS ISP H3A AE/AWB Packet Format for Minimum-Maximum Mode (continued)

| 31 | | 16 15 | | 0 | |
|---|--|-------|--|---|--------------------------|
| H3A_AEWBUF ST + 256 bytes | Minimum[3] | | | | Minimum[2] |
| | Maximum[1] | | | | Maximum[0] |
| | Maximum[3] | | | | Maximum[2] |
| | Unsaturated count, win 1 | | | | Unsaturated count, win 0 |
| | Unsaturated count, win 3 | | | | Unsaturated count, win 2 |
| | Unsaturated count, win 5 | | | | Unsaturated count, win 4 |
| | Unsaturated count, win 7 | | | | Unsaturated count, win 6 |
| | Data for next eight windows, and so on. If the total number of windows is not a multiple of 8, the unsaturated counters are written immediately following the last window data. For example, if the total number of windows (including the black row) are 43, the first 40 windows are written out as per the 272-byte boundary above. Then the remaining three windows are written at +0, +32, and +64 bytes. The counts are written out at +96 instead of +256-byte boundary. | | | | |
| Unsaturated block count for the above 8 windows | | | | | |

Table 8-335 lists the packet formats for AE/AWB in sum-only mode (H3A_AEWCFG[9:8] AEFMT = 0x2).

Table 8-335. ISS ISP H3A AE/AWB Packet Format for Sum-Only Mode

| | 31 | 16 | 15 | 0 |
|--|---------------------|----|--------------------|---|
| Buffer address (byte address) H3A_AEWBUF ST | Subsample Accum[1] | | Subsample Accum[0] | |
| | Subsample Accum[3] | | Subsample Accum[2] | |
| | Saturator Accum[1] | | Saturator Accum[0] | |
| | Saturator Accum [3] | | Saturator Accum[2] | |
| H3A_AEWBUF ST + 32 bytes | Subsample Accum[1] | | Subsample Accum[0] | |
| | Subsample Accum[3] | | Subsample Accum[2] | |
| | Saturator Accum[1] | | Saturator Accum[0] | |
| | Saturator Accum [3] | | Saturator Accum[2] | |
| H3A_AEWBUF ST + 64 bytes | Subsample Accum[1] | | Subsample Accum[0] | |
| | Subsample Accum[3] | | Subsample Accum[2] | |
| | Saturator Accum[1] | | Saturator Accum[0] | |
| | Saturator Accum [3] | | Saturator Accum[2] | |
| H3A_AEWBUF ST + 96 bytes | Subsample Accum[1] | | Subsample Accum[0] | |
| | Subsample Accum[3] | | Subsample Accum[2] | |
| | Saturator Accum[1] | | Saturator Accum[0] | |
| | Saturator Accum [3] | | Saturator Accum[2] | |
| H3A_AEWBUF ST + 128 bytes | Subsample Accum[1] | | Subsample Accum[0] | |
| | Subsample Accum[3] | | Subsample Accum[2] | |
| | Saturator Accum[1] | | Saturator Accum[0] | |
| | Saturator Accum [3] | | Saturator Accum[2] | |

**Table 8-335. ISS ISP H3A AE/AWB Packet Format for Sum-Only Mode
(continued)**

| | 31 | 16 | 15 | 0 | |
|---------------------------------|--|----|--------------------------|---|--|
| H3A_AEWBUF ST + 160 bytes | Subsample Accum[1] | | Subsample Accum[0] | | Window 5 data |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| H3A_AEWBUF ST + 192 bytes | Subsample Accum[1] | | Subsample Accum[0] | | Window 6 data |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| H3A_AEWBUF ST + 224 bytes | Subsample Accum[1] | | Subsample Accum[0] | | Window 7 data |
| | Subsample Accum[3] | | Subsample Accum[2] | | |
| | Saturator Accum[1] | | Saturator Accum[0] | | |
| | Saturator Accum [3] | | Saturator Accum[2] | | |
| H3A_AEWBUF ST + 256 bytes | Unsaturated count, win 1 | | Unsaturated count, win 0 | | Unsaturated block count for the above 8 windows |
| | Unsaturated count, win 3 | | Unsaturated count, win 2 | | |
| | Unsaturated count, win 5 | | Unsaturated count, win 4 | | |
| | Unsaturated count, win 7 | | Unsaturated count, win 6 | | |
| | Data for next eight windows, and so on. If the total number of windows is not a multiple of 8, the unsaturated counters are written immediately following the last window data. For example, if the total number of windows (including black row) are 43, the first 40 windows are written out as per the 272-byte boundary above. Then the remaining three windows are written at +0, +32, and +64 bytes. The counts are written out at +96 instead of +256-byte boundary. | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

8.3.3.6.8 ISS ISP H3A Events and Status Checking

The AF and AEW engines generate an interrupt event at the end of processing each frame. However, these two interrupts are internally tied together so that only one H3A interrupt signal is generated. If the AF engine and AEW engine do not process the same frame concurrently, this should not be an issue. However, if they do run concurrently, one of two outcomes may occur:

- The H3A interrupt may seem to trigger only once for each frame. This can happen when the processing for the AF and AEW engines finishes at or near the same time. The interrupt service routine does not have enough time to clear the interrupt flag for the first interrupt before the second interrupt occurs.
- The H3A interrupt may trigger twice for each frame. This can happen when the AF engine or the AEW engine finishes processing the frame much earlier than the other engine. In this case, the interrupt service routine does have enough time to clear the interrupt flag for the first interrupt by the time the second interrupt occurs.

The outcome depends on the difference in location of the last paxel/window in the frame (determines when processing is finished), the frequency of the relative clocks in the system, the occurrence and triggering of other interrupts in the system, and the latencies of the context switching and interrupt service routine execution.

The [H3A_PCR\[15\]](#) BUSYAF and/or [H3A_PCR\[18\]](#) BUSYAEAWB status bits are set when the start of frame occurs (if the [H3A_PCR\[0\]](#) AF_EN and/or [H3A_PCR\[16\]](#) AEW_EN bits are 1 at that time). They are automatically reset to 0 at the end of processing a frame. The [H3A_PCR\[15\]](#) BUSYAF and/or [H3A_PCR\[18\]](#) BUSYAEAWB status bits may be polled to determine the end of frame status.

8.3.3.7 ISS ISP ISIF Functional Description

8.3.3.7.1 ISS ISP ISIF Overview

The image sensor interface (ISIF) module receives RAW or YUV4:2:2 data from the IPIPEIF module. The module outputs data back to the IPIPEIF module and can also output data to memory through the BL module. The ISIF module can process the incoming data and supports the following functions:

- Maximum supported image size is 32,768 × 32,768
- Supports up to 16-bit analog front end
- Sensor data linearization
- Supports Bayer and Foveon® input data format (RGB and CMYG color support)
- Supports VGA read out mode
- Supports various image data format
- Color space conversion
- Digital clamp with horizontal/vertical offset drift compensation
- Vertical line defect correction
- Programmable 2D-matrix LSC
- Gain and offset control
- Programmable horizontal/vertical culling pattern
- Maximum pixel rate clock of 233 MPix/s on the VP interface.
- 10-to-8-bit A-Law compression table inside
- 12-bit pack supported when written to memory

[Figure 8-186](#) show the ISIF module connections to other submodules of the ISP.

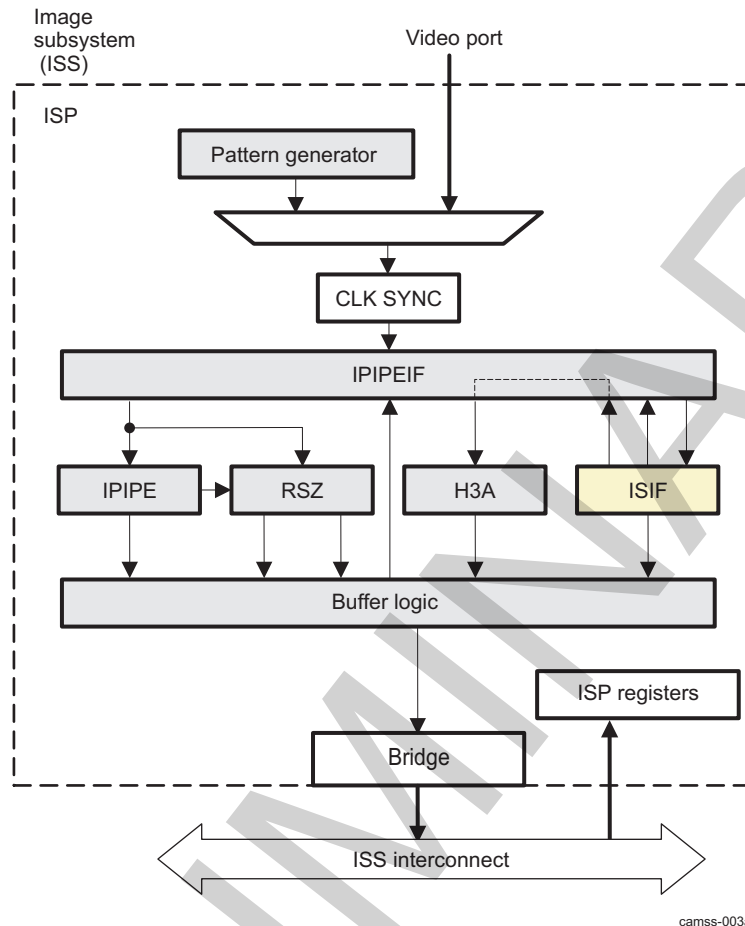
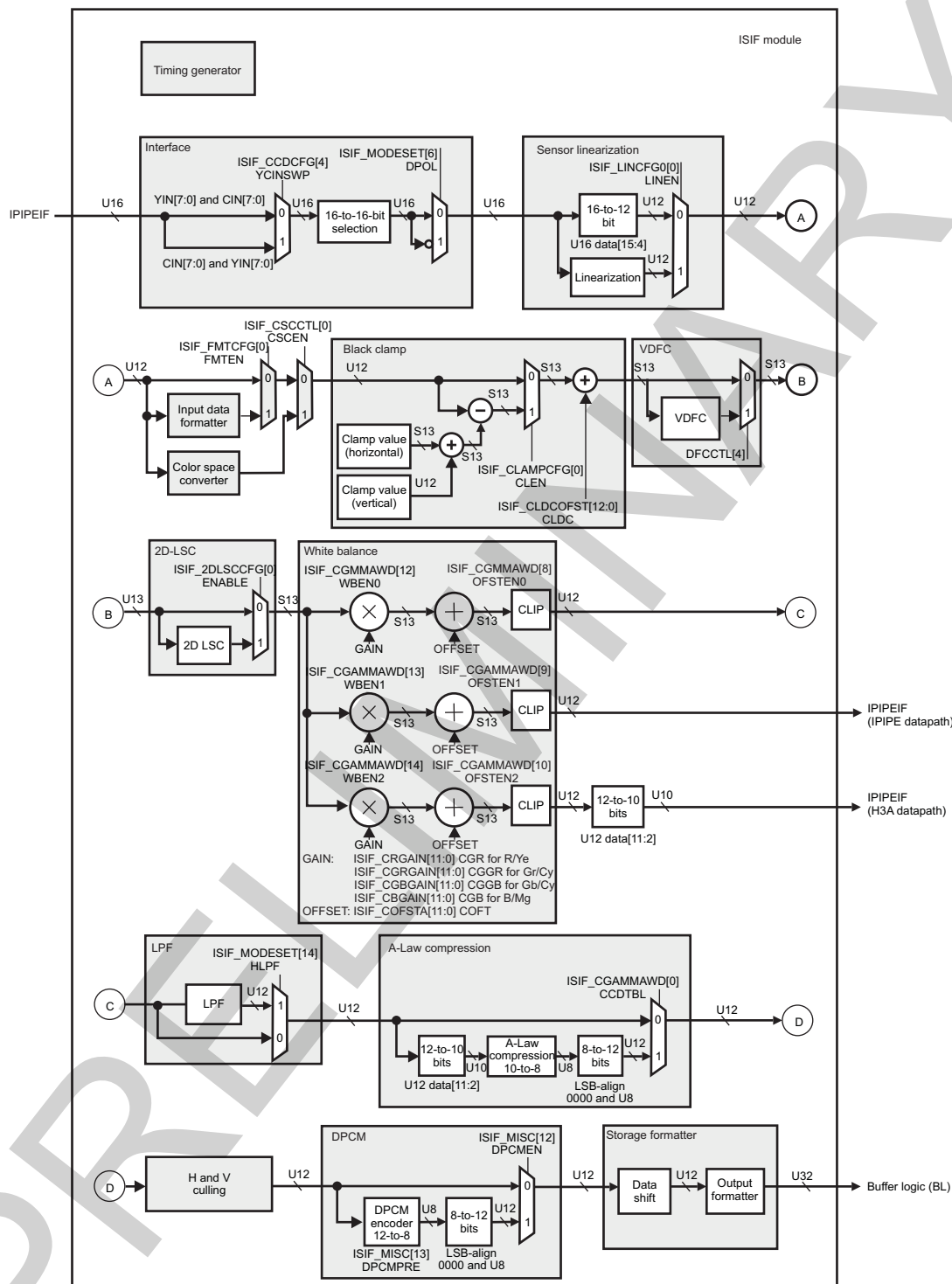
Figure 8-186. ISS ISP ISIF High-Level Diagram**8.3.3.7.2 ISS ISP ISIF Top-Level Block Diagram**

Figure 8-187 shows the different blocks of the ISIF module.

Figure 8-187. ISS ISP ISIF Top-Level Block Diagram



camss-074

The following sections describe the blocks in the ISIF module.

8.3.3.7.3 ISS ISP ISIF Input Interface

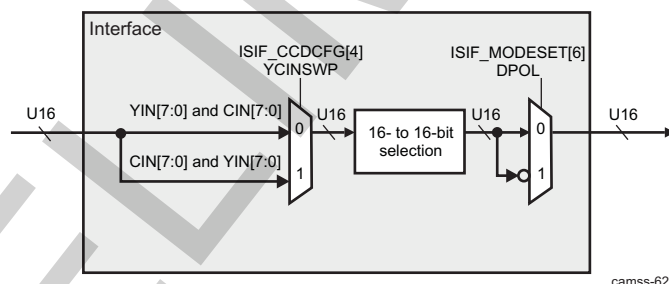
The input interface is a video interface. It comprises the horizontal(HD)I and vertical(VD) synchronization signal, pixel clock (PCLK), and data(DATA). [Table 8-336](#) gives more information about these different signals. The ISIF uses the HD and VD signals provided by the sensor through the VP and IPIPEIF. The pixel clock clocks data into the ISIF at a maximum rate of MHz.

Table 8-336. ISS ISP ISIF Input Interface Signals

| Name | I/O | Function |
|------|-----|--|
| VD | I | Vertical sync signal |
| HD | I | Horizontal sync signal |
| PCLK | I | Pixel clock. This signal is the pixel clock used to load image data into the ISIF. The clock controller can configure to trigger on the rising or falling edge of the PCLK signal. |
| DATA | I | Data. The data interface is a 16-bit interface. When the ISIF is configured to write data to SDRAM, the write enable signal allows an external device to control which data is to be written to SDRAM. The data input can be configured from the ISIF_MODESET.INPMOD register where it can be set to RAW, YCbCr (16 bits and 8 bits). The polarity of the data can be changed from the ISIF_MODESET.DPOL as shown in Figure 8-188 . |

8.3.3.7.4 ISS ISP ISIF Interface

Figure 8-188. ISS ISP ISIF Interface Block Diagram



The ISIF supports 8- to 16-bit-wide RAW data signals and 8-/16-bit YCbCr signals, as described in [Table 8-337](#). The interface can be set in the three different modes from the [ISIF_MODESET\[13:12\]](#) INPMOD bit field. The [ISIF_CCDCFG\[11\]](#) Y8POS bit selects the y signal positioning whenever YUV4:2:2 is input. Moreover, if CCIR656 input is used the width of selected bit can be set through the [ISIF_CCDCFG\[5\]](#) BT656 bit.

Table 8-337. ISS ISP ISIF Data Input Formats

| ISIF Input Port Name | RAW Data | 16-bit YCbCr | 8-bit YCbCr |
|----------------------|----------|--------------|-------------|
| YI7 | C_DATA15 | Y7 | |
| YI6 | C_DATA14 | Y6 | |
| YI5 | C_DATA13 | Y5 | |
| YI4 | C_DATA12 | Y4 | |
| YI3 | C_DATA11 | Y3 | |
| YI2 | C_DATA10 | Y2 | |
| YI1 | C_DATA9 | Y1 | |

Table 8-337. ISS ISP ISIF Data Input Formats (continued)

| ISIF Input Port Name | RAW Data | 16-bit YCbCr | 8-bit YCbCr |
|----------------------|----------|--------------|-------------|
| Y10 | C_DATA8 | Y0 | |
| Cl7 | C_DATA7 | Cb7,Cr7 | Y7,Cb7,Cr7 |
| Cl6 | C_DATA6 | Cb6,Cr6 | Y6,Cb6,Cr6 |
| Cl5 | C_DATA5 | Cb5,Cr5 | Y5,Cb5,Cr5 |
| Cl4 | C_DATA4 | Cb4,Cr4 | Y4,Cb4,Cr4 |
| Cl3 | C_DATA3 | Cb3,Cr3 | Y3,Cb3,Cr3 |
| Cl2 | C_DATA2 | Cb2,Cr2 | Y2,Cb2,Cr2 |
| Cl1 | C_DATA1 | Cb1,Cr1 | Y1,Cb1,Cr1 |
| Cl0 | C_DATA0 | Cb0,Cr0 | Y0,Cb0,Cr0 |

Y and C input signals can be swapped through the [ISIF_CCDCFG\[4\]](#) YCINSWP bit.

In case of RAW data at ISIF input, a 16- to-16-bit selection can be done: when the number of RAW data lines is less than 16, data can be connected to the upper or lower lines of C_DATA[15:0]. Lines not connected must be tied low. As shown in [Table 8-338](#), the [ISIF_CGAMMAWD\[4:1\]](#) GWDI bit field must be configured correctly so that the MSB of the input is connected to the MSB of the 16-bit data bus in ISIF.

Table 8-338. ISS ISP ISIF Raw Data Connection: Selects MSB Position of Input Data

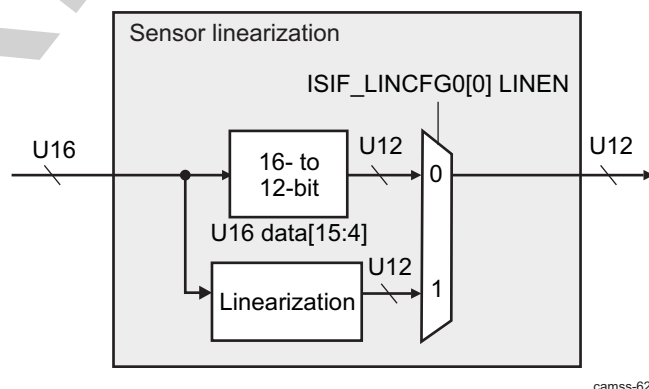
| ISIF_CGAMMAWD[4:1] GWDI | 16-to-16-bit Selection |
|-------------------------|--------------------------------------|
| 0 | C_DATA [15:0] = C_DATA[15:0] |
| 1 | C_DATA [15:0] = C_DATA[14:0] 0 |
| 2 | C_DATA [15:0] = C_DATA[13:0] 00 |
| 3 | C_DATA [15:0] = C_DATA[12:0] 000 |
| 4 | C_DATA [15:0] = C_DATA[11:0] 0000 |
| 5 | C_DATA [15:0] = C_DATA[10:0] 00000 |
| 6 | C_DATA [15:0] = C_DATA[9:0] 000000 |
| 7 | C_DATA [15:0] = C_DATA[8:0] 0000000 |
| 8 | C_DATA [15:0] = C_DATA[7:0] 00000000 |

The polarity of the input image data can be switched through the [ISIF_MODESET\[6\]](#) DPOL bit.

8.3.3.7.5 ISS ISP ISIF Sensor Linearization

NOTE: For the memory access locations of the sensor linearization table, see [Section 8.3.3.9](#).

Figure 8-189. ISS ISP ISIF Sensor Linearization Block Diagram



camss-627

The sensor linearization module can correct for the non-linear response of image sensors. A LUT is programmed with an offset value to add to the original pixel value based on the original pixel value.

The LUT is a sampling of the linearization correction curve based on calibration of the image sensor. Intermediate values between sampling points are computed using linear interpolation. The entire correction curve is divided into seven regions, as shown in [Table 8-339](#). The regions for the darkest part and the brightest part of the response curve have dense sampling. The linearization mode can be a uniform or a non-uniform sampling and can be set through the [ISIF_LINCFG0\[1\]](#) LINMD bit.

Table 8-339. ISS ISP ISIF Linearization LUT

| Region | Number of Sample Points | LUT Address |
|--------------------------|-------------------------|----------------------|
| table_in[15:11] == 00000 | 32 | table_in[10:6] |
| table_in[15:11] == 00001 | 4 | table_in[10:9] + 32 |
| table_in[15:12] == 0001 | 4 | table_in[11:10] + 36 |
| table_in[15:13] == 001 | 4 | table_in[12:11] + 40 |
| table_in[15:14] == 01 | 4 | table_in[13:12] + 44 |
| table_in[15:14] == 10 | 16 | table_in[13:10] + 48 |
| table_in[15:14] == 01 | 128 | table_in[13:7] + 64 |

The LUT has 192 entries and is split into two 96 × 10-bit memories, as shown in [Figure 8-190](#). The table is mapped in the memory map. The LUT entries are interleaved between memory 0 and memory 1.

Figure 8-190. ISS ISP ISIF Linearization LUT Memories

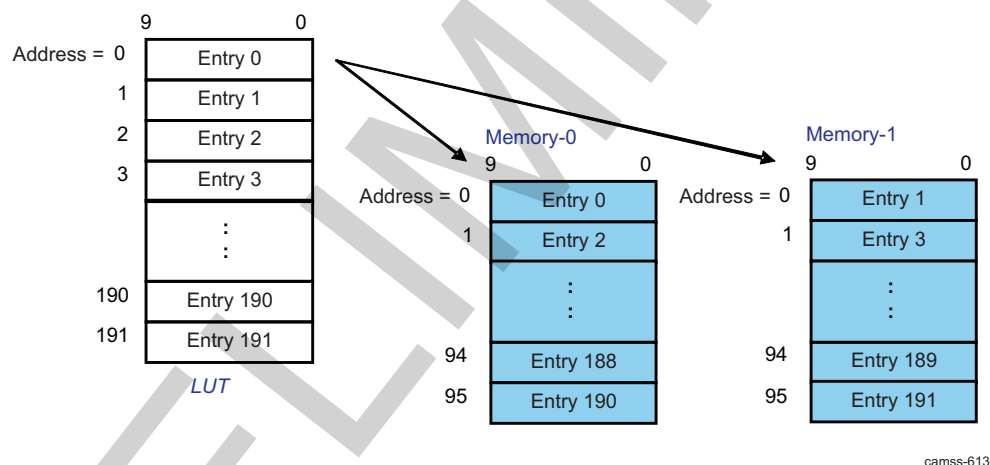
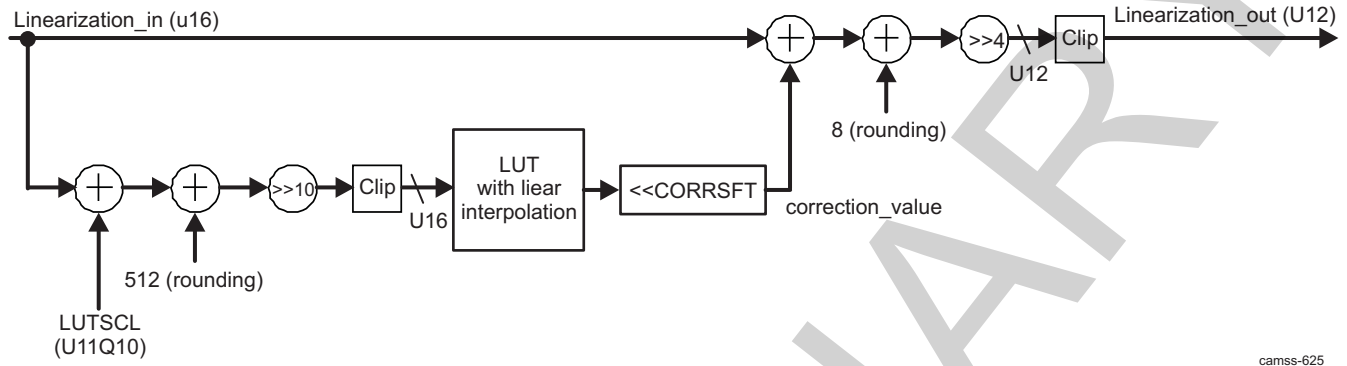


Table 8-340. ISS ISP ISIF LUT Memory Region

| Memory Region | Address Range | Description |
|---------------|-----------------|-----------------------------------|
| Memory 0 | 0xC000 – 0xC17F | ISIF linearity compensation LUT 0 |
| Memory 1 | 0xC400 – C57F | ISIF linearity compensation LUT 1 |

A scale factor is applied to the input before lookup through the [ISIF_LINCFG1\[10:0\]](#) LUTSCL bit field. The LUT entries are signed 10-bit data (u16). After linear interpolation, the correction value is left-shifted by a programmable amount (the [ISIF_LINCFG0\[6:4\]](#) CORRSFT bit field), and then added to the input. This is then converted to unsigned 12-bit by right shift, followed by clipping.

Figure 8-191. ISS ISP ISIF Linearization Block Diagram

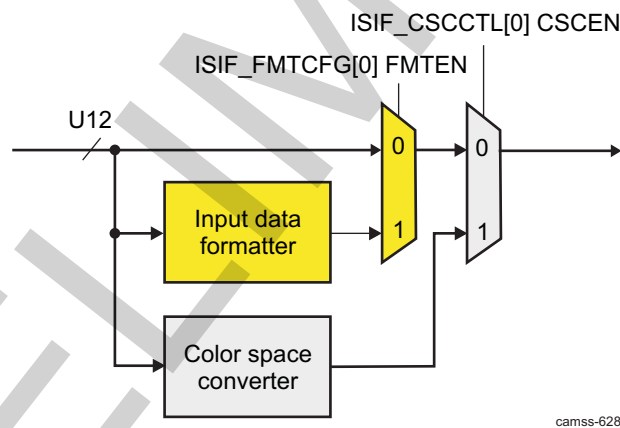


To enable the linearization module, set the [ISIF_LINCFG0\[0\]](#) LINEN bit to 1.

If the linearization module is disabled ([ISIF_LINCFG0\[0\]](#) LINEN = 0x0), a 16- to-12-bit transformation is done, and the upper 12-bits of U16 input are sent to the next block.

8.3.3.7.6 ISS ISP ISIF Input Data Formatter

Figure 8-192. ISS ISP ISIF Input Data Formatter Block Diagram



There are two functional blocks: input data formatter and color space converter, which use two 5376 × 12-bit memories (corresponds to one line of maximum 5376 pixels with each pixel equal to 12 bits). Only one of the function blocks can be enabled.

The input data formatter block allows the ISIF to handle a wide variety of current and future readout schemes other than Bayer format. Two line memories and a programmable address generator are used to translate those patterns into a standard Bayer pattern (or any other pattern). This allows the back-end processing (noise filters, interpolation, histogram, 3A statistics) to remain unchanged.

The input data formatter block also supports divided input lines. In case an input line is divided into multiple lines and fed to the ISIF, the formatter gathers the divided lines and organizes a single line. Up to four divided lines can be supported.

The input data formatter is enabled through the [ISIF_FMTCFG\[0\]](#) FMTEN bit.

The input data formatter can split an input line into 1, 2, 3, or 4 output lines, or can combine the divided 1, 2, 3, or 4 input lines into a single line.

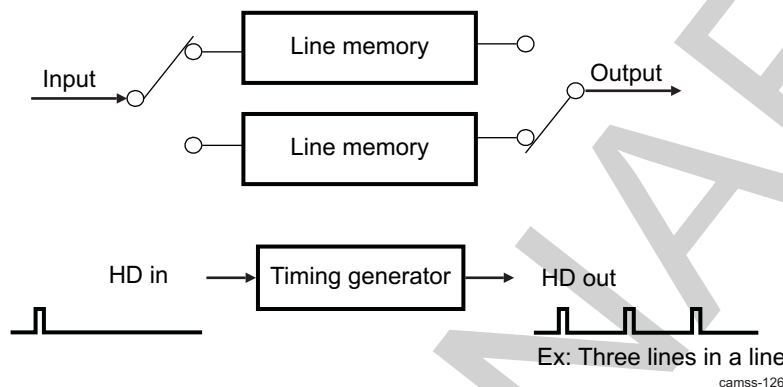
- Set the [ISIF_FMTCFG\[1\]](#) FMTCBL bit to 0 for split mode.

- Set the [ISIF_FMTCFG\[1\]](#) FMTCBL bit to 1 for combine mode.
- Select the number of lines in the [ISIF_FMTCFG\[5:4\]](#) LNUM bit field.

The Input data formatter can work in normal or line alternative mode. The choice is done through the [ISIF_FMTCFG\[2\]](#) LNALT bit.

[Figure 8-193](#) shows an example of generating three output lines from an input line with a new, internally generated HD signal.

Figure 8-193. ISS ISP ISIF Splits an Input Line Into Three Output Lines



This HD signal then gates the downstream processing rather than the original sensor HD signal. Descriptions of how to configure the formatter are provided in the following sections.

Because the size of the line memories is 5376×12 bits, the following restrictions apply for the data formatter:

- Split mode:
 - The maximum number of pixels that can be supported in an output line if the input line is transformed into 1 output line is 5376.
 - The maximum number of pixels that can be supported in an output line if the input line is transformed into 2 output lines is 2688.
 - The maximum number of pixels that can be supported in an output line if the input line is transformed into 3 output lines is 1792.
 - The maximum number of pixels that can be supported in an output line if the input line is transformed into 4 output lines is 1344.
- Combine mode:
 - The maximum number of pixels that can be supported in an input line if 1 input line is transformed into an output line is 5376.
 - The maximum number of pixels that can be supported in an input line if 2 input lines are transformed into an output line is 2688.
 - The maximum number of pixels that can be supported in an input line if 3 input lines are transformed into an output line is 1792.
 - The maximum number of pixels that can be supported in an input line if 4 input lines are transformed into an output line is 1344.

8.3.3.7.6.1 ISS ISP ISIF Formatter Area Settings

As shown in [Figure 8-194](#), the following registers are used to set the formatter area:

- [ISIF_FMTSPH](#)
- [ISIF_FMTLNH](#)
- [ISIF_FMTLSV](#)
- [ISIF_FMTLNV](#)

Table 8-341 describes these registers. The input line is input to the formatter, and the output line is output from the formatter.

Figure 8-194. ISS ISP ISIF Input Data Formatter Area Settings

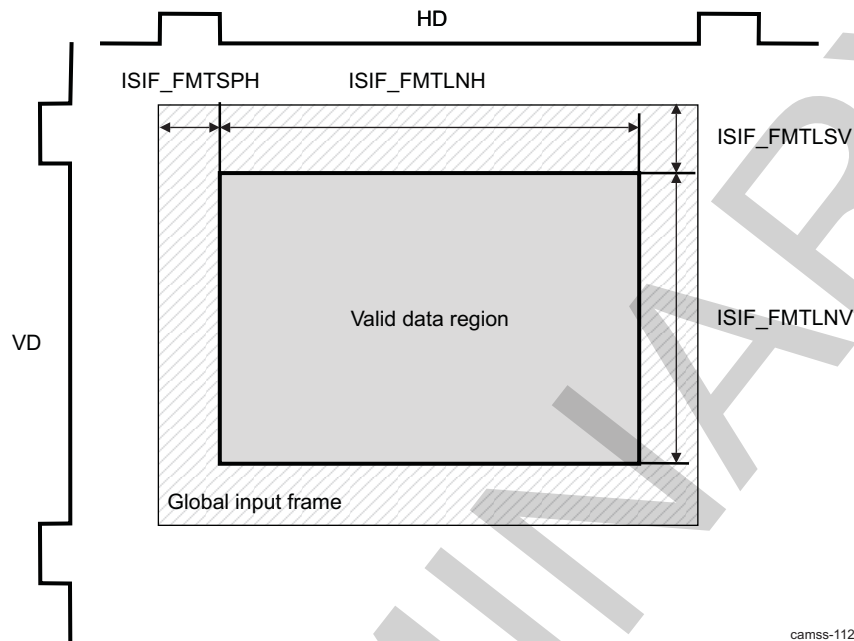


Table 8-341. ISS ISP ISIF Input Data Formatter Area Setting Registers

| Register | Description |
|-------------|--|
| ISIF_FMTSPH | The first valid pixel of an input line |
| ISIF_FMTLNH | Valid length of a input line = FMTLNH + 1 |
| ISIF_FMTLSV | The first valid input line |
| ISIF_FMTLNV | The number of the valid input lines = FMTLNV + 1 |

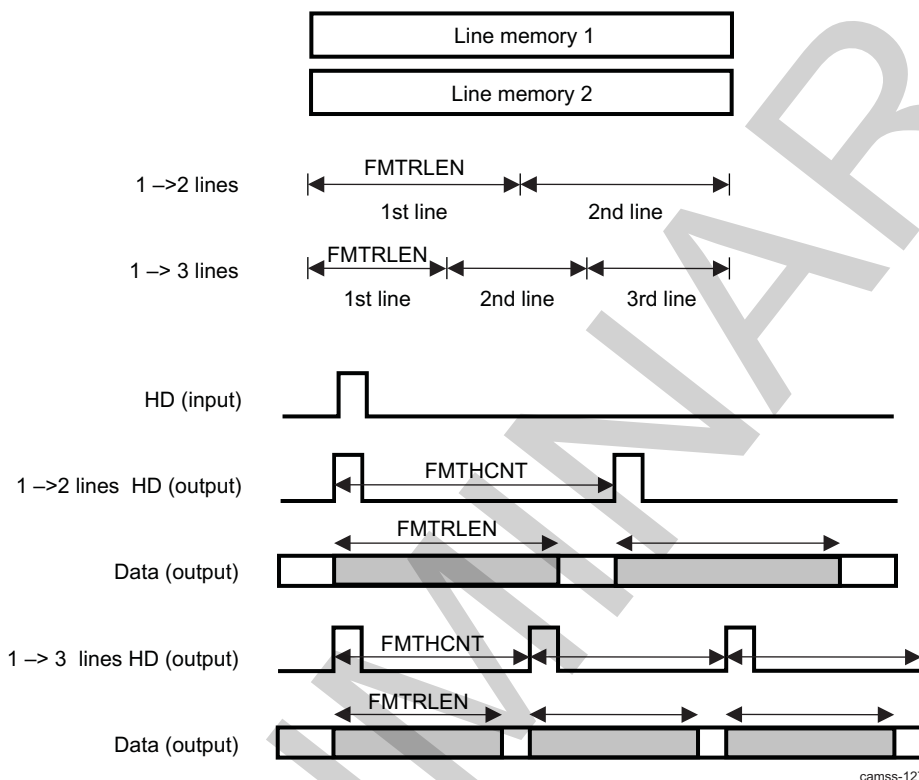
Table 8-342. ISS ISP ISIF Output Data Formatter Area Setting Registers

| Register | Description |
|--------------|--|
| ISIF_FMTRLN | The length of an output line |
| ISIF_FMTHCNT | HD interval for output lines |
| ISIF_SPH | The first pixel in an output line to be stored to SDRAM |
| ISIF_LNH | Number of pixels in an output line to be stored to SDRAM = LNH + 1 |
| ISIF_LNV | The number of the output lines to be stored to SDRAM = LNV + 1 |

The number of pixels in an output line must be set to the [ISIF_FMRLEN](#) register, and the HD output interval must be set to the [ISIF_FMTHCNT](#) register. It is not necessary to set the [ISIF_FMTHCNT](#) register if multiple input lines are combined into a single line.

[Figure 8-195](#) shows an example of splitting an input line into two or three output lines.

Figure 8-195. ISS ISP ISIF Data Formatter Output Control Example



8.3.3.7.6.2 ISS ISP ISIF Formatter Programming

The data formatter derives its flexibility by supporting up to 16 different addresses and a program that can contain up to 32 entries.

Address pointer

There are 16 address pointer registers ([ISIF_FMTAPTR0](#) to [ISIF_FMTAPTR15](#)), which contain:

- The [ISIF_FMTAPTRx\[14:13\]](#) LINE bit field: 2-bit line number to specify the output line to which it belongs: 0, 1, 2, or 3. It is valid only for the line splitting.
- The [ISIF_FMTAPTRx\[12:0\]](#) INIT bit field: 13-bit initial address for pointer x (where x = 0 to 15)

Each of the address values is auto-incremented or auto-decremented by a programmable value (the [ISIF_FMTCFG\[11:8\]](#) FMTAINC bit field).

Program

There are 32 program entry registers, which contain:

- In the [ISIF_FMTPGMVFO](#) and [ISIF_FMTPGMVF1](#) registers: The PGMxxEN fields (where xx = 00 to 31) set the program entry valid flag.
- In the [ISIF_FMTPGMAPS0](#) to [ISIF_FMTPGMAPS7](#) registers: The PGMxxAPTR fields specify the program xx address pointer (where xx = 00 to 31).
- In the [ISIF_FMTPGMAPU0](#) and [ISIF_FMTPGMAPU1](#) registers: The PGMxxUPDT fields (where xx = 00 to 31) set the program xx address update (increment or decrement).

Because each of the program entries has a valid flag, the formatter can also support images larger than the memory limit (length: 4480) by not choosing some of the entries.

The total program memory of 32 entries is divided into two or four SETs:

- Program memory of 16 entries each for odd and even lines to split the line:
 - SET0 for even input line: Program entry 015
 - SET1 for odd input line: Program entry 1631
- Program memory of eight entries for up to four input lines to combine the lines:
 - SET0 for first input line: Program entry 07
 - SET1 for second input line: Program entry 815
 - SET2 for third input line: Program entry 1623
 - SET3 for fourth input line: Program entry 2431

The number of program entries per SET must be specified by the [ISIF_FMTPLEN](#) register as follows:

- Number of program entries for SET0: [ISIF_FMTPLEN](#)[3:0] FMTPLEN0
- Number of program entries for SET1: [ISIF_FMTPLEN](#)[7:4] FMTPLEN1
- Number of program entries for SET2: [ISIF_FMTPLEN](#)[10:8] FMTPLEN2
- Number of program entries for SET3: [ISIF_FMTPLEN](#)[14:12] FMTPLEN3

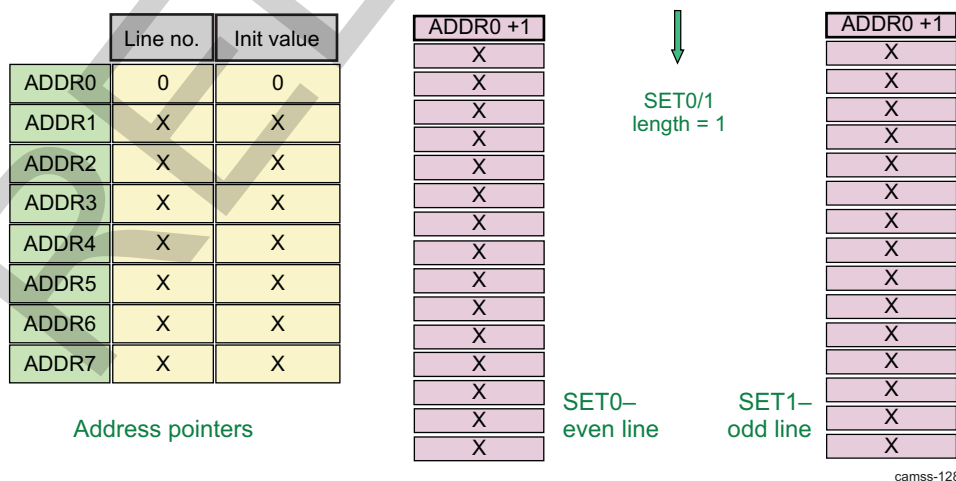
The program entry must be set from the lower registers within a SET. For instance, start from program entry 16 for odd input lines.

The following examples show the programmability of the data formatter:

- Register settings:
 - [ISIF_FMTCFG](#)[0] FMTEN = 0x1
 - [ISIF_FMTCFG](#)[1] FMTCBL = 0x0
 - [ISIF_FMTCFG](#)[11:8] FMTAINC = 0x0 (add or subtract 1)
- 1 input line - 1 output line

NOTE: ADDR0 is set to an example value. Addresses with no value in the following example are marked with X.

Figure 8-196. ISS ISP ISIF Conventional Read-Out Pattern

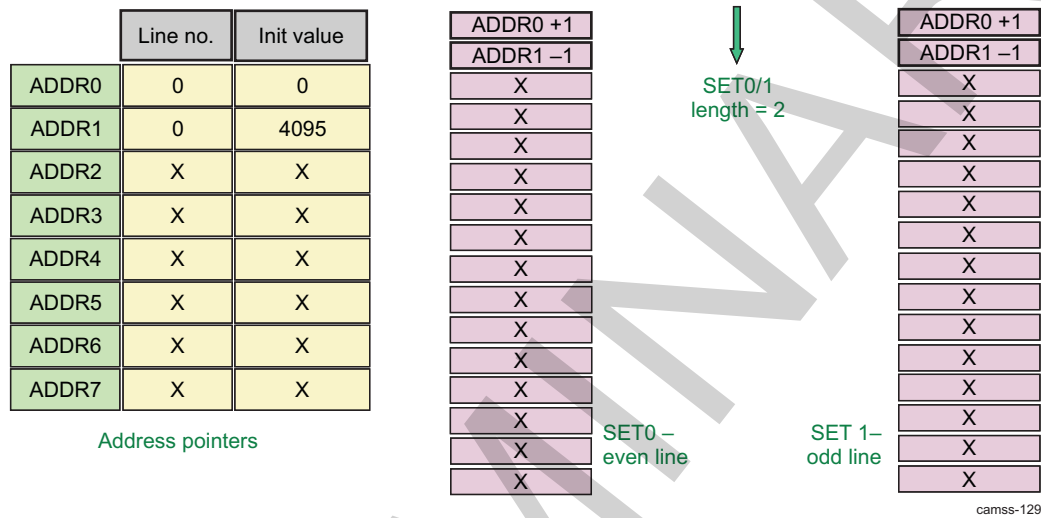


The following examples show the programmability of the data formatter with a 2-tap analog front end (AFE):

- Register settings:
 - [ISIF_FMTCFG](#)[0] FMTEN = 0x1

- **ISIF_FMTCFG[1]** FMTCBL = 0x0
- **ISIF_FMTCFG[11:8]** FMTAINC = 0x0 (add or subtract 1)
- **ISIF_FMTCFG[5:4]** LNUM = 0x0
- One input line (4096) - one output line with left and right read-out
- Input - First pixel, last pixel, first pixel + 1, last pixel – 1, and so on
- Input - 0, 4095, 1, 4094, 2, 4093, 3, 4092, ..., 2047 and 2048
- Output - 0, 1, 2, 3, ..., 4094 and 4095

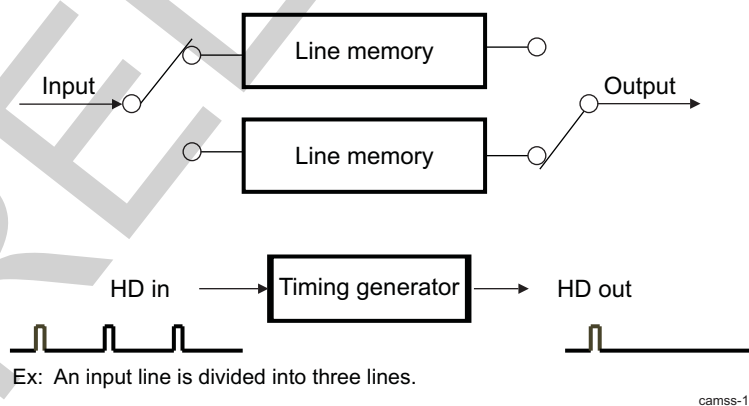
Figure 8-197. ISS ISP ISIF Conventional Read-Out Pattern With 2-tap AFE



8.3.3.7.6.3 ISS ISP ISIF Combine the Divided Input Lines

The formatter can gather the divided input lines and organize a single line. [Figure 8-198](#) shows an example generating a single output line from three input lines and masking two out of three HD input pulses.

Figure 8-198. ISS ISP ISIF Combine Three Input Lines Into Single Line



[Figure 8-199](#) is an example that shows the register setting.

- Multiple input lines combined into one output line (use three input lines to one output line in this example)
- Input - 4, 5, 10, 11, ..., 2, 3, 8, 9, ..., 0, 1, 6, 7, ... (three lines read from sensor)
- Output - 0, 1, 2, 3, ... (1 line output)
- Register settings:

- ISIF_FMTCFG[0] FMTEN = 0x1
- ISIF_FMTCFG[1] FMTCLB = 0x1
- ISIF_FMTCFG[11:8] FMTAINC = 0x5 (add or subtract 6)
- ISIF_FMTCFG[5:4] LNUM = 0x2
- SETs recycled based on LNUM

Figure 8-199. ISS ISP ISIF Example of Combining Three Input Lines Into a Single Line

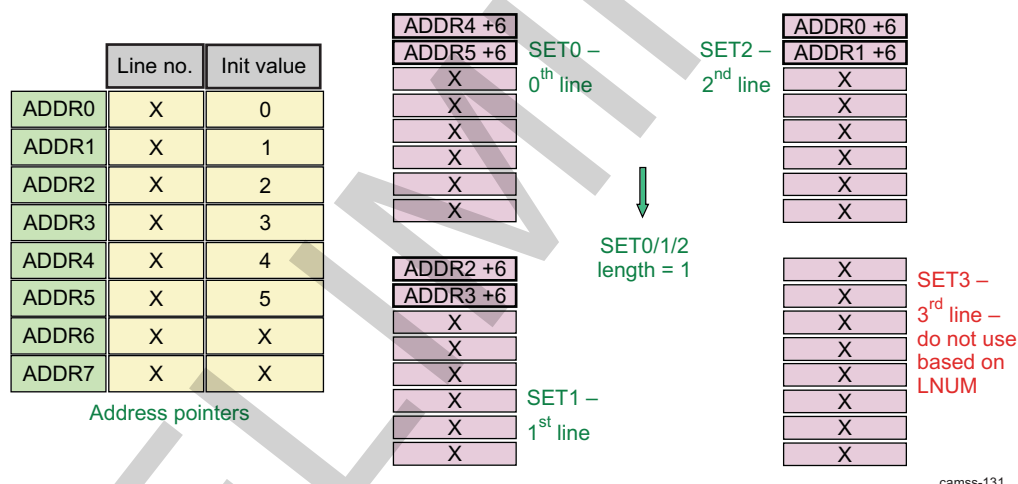
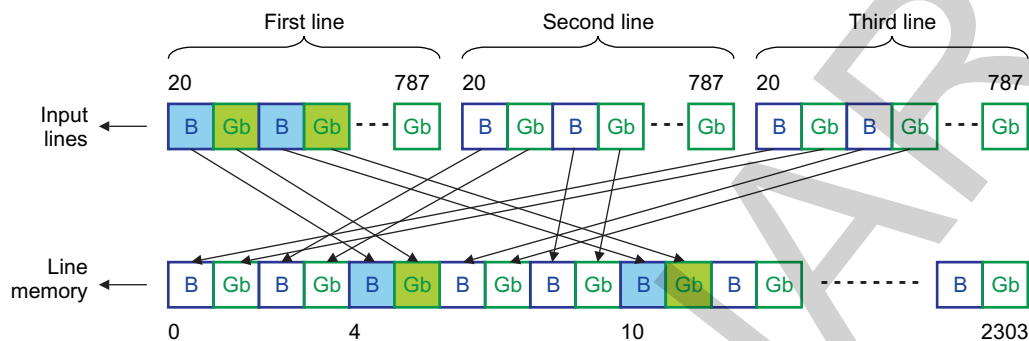


Table 8-343. ISS ISP ISIF Example of Combining Three Input Lines Into a Single Line: Register Setting Example

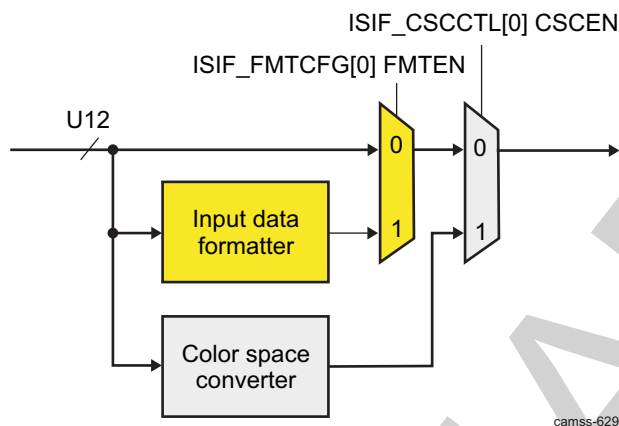
| Step | Configuration Required | Size |
|--|----------------------------|------|
| Formatter enable | ISIF_FMTCFG[0] FMTEN | 1 |
| Combine input lines. | ISIF_FMTCFG[1] FMTCLB | 1 |
| Address increment = FMTAINC + 1 = 6 | ISIF_FMTCFG[11:8] FMTAINC | 5 |
| The first valid pixel of a divided line | ISIF_FMTSPH[12:0] FMTSPH | 20 |
| Valid length of a divided line = FMTLNH + 1 = 768 | ISIF_FMTLNH[12:0] FMTLNH | 767 |
| The first valid divided line | ISIF_FMTLSV[12:0] FMTSLV | 16 |
| The number of the valid divided lines = FMTLNV + 1 = 4590 | ISIF_FMTLNV[14:0] FMTLNV | 4589 |
| The length of an organized line = (FMTLNH + 1) x (LNUM + 1) = 2304 | ISIF_FMTLEN[12:0] FMTLEN | 2304 |
| Split/combine line number = LNUM + 1 = 3. | ISIF_FMTCFG[5:4] LNUM | 2 |
| Number of PGM entries for SET0 = FMTPLEN0 + 1 = 2 | ISIF_FMTPLEN[3:0] FMTPLEN0 | 1 |
| Number of PGM entries for SET1 = FMTPLEN1 + 1 = 2 | ISIF_FMTPLEN[7:4] FMTPLEN1 | 1 |

Table 8-343. ISS ISP ISIF Example of Combining Three Input Lines Into a Single Line: Register Setting Example (continued)

| Step | Configuration Required | Size |
|---|--|------|
| Number of PGM entries for SET2 = $FMTPLEN2 + 1 = 2$ | ISIF_FMTPLEN [10:8] FMTPLEN2 | 1 |
| Address Pointer 0, INIT = 0 | ISIF_FMTAPTR0 [12:0] INIT | 0 |
| Address Pointer 1, INIT = 1 | ISIF_FMTAPTR1 [12:0] INIT | 1 |
| Address Pointer 2, INIT = 2 | ISIF_FMTAPTR2 [12:0] INIT | 2 |
| Address Pointer 3, INIT = 3 | ISIF_FMTAPTR3 [12:0] INIT | 3 |
| Address Pointer 4, INIT = 4 | ISIF_FMTAPTR4 [12:0] INIT | 4 |
| Address Pointer 5, INIT = 5 | ISIF_FMTAPTR5 [12:0] INIT | 5 |
| Program 0 Valid flag | ISIF_FMTPGMVFO [0] PGM00EN | 1 |
| Program 1 Valid flag | ISIF_FMTPGMVFO [1] PGM01EN | 1 |
| Program 8 Valid flag | ISIF_FMTPGMVFO [8] PGM08EN | 1 |
| Program 9 Valid flag | ISIF_FMTPGMVFO [9] PGM09EN | 1 |
| Program 16 Valid flag | ISIF_FMTPGMVFO [16] PGM16EN | 1 |
| Program 17 Valid flag | ISIF_FMTPGMVFO [17] PGM17EN | 1 |
| Increment Address pointer = 0x0 Program 0 Address pointer = ADDR4 + 6 | ISIF_FMTPGMAPU0 [0] PGM0UPDT ISIF_FMTPGMAPS0 [3:0] PGM0APTR | 4 |
| Increment Address pointer = 0x0 Program 1 Address pointer = ADDR5 + 6 | ISIF_FMTPGMAPU0 [1] PGM1UPDT ISIF_FMTPGMAPS0 [7:4] PGM1APTR | 5 |
| Increment Address pointer = 0x0 Program 8 Address pointer = ADDR2 + 6 | ISIF_FMTPGMAPU0 [8] PGM8UPDT ISIF_FMTPGMAPS2 [3:0] PGM8APTR | 2 |
| Increment Address pointer = 0x0 Program 9 Address pointer = ADDR3 + 6 | ISIF_FMTPGMAPU0 [9] PGM9UPDT ISIF_FMTPGMAPS2 [7:4] PGM9APTR | 3 |
| Increment Address pointer = 0x0 Program 16 Address pointer = ADDR0 + 6 | ISIF_FMTPGMAPU1 [1] PGM17UPDT ISIF_FMTPGMAPS4 [3:0] PGM16APTR | 0 |
| Increment Address pointer = 0x0 Program 17 Address pointer = ADDR1 + 6 | ISIF_FMTPGMAPU1 [0] PGM16UPDT ISIF_FMTPGMAPS4 [7:4] PGM17APTR | 1 |

8.3.3.7.7 ISS ISP ISIF Color Space Converter

Figure 8-200. ISS ISP ISIF Color Space Converter Block Diagram

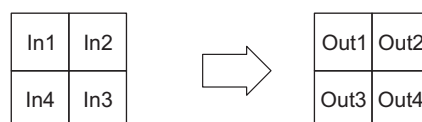


The color space converter (CSC) includes four 8-bit × 12-bit multipliers and one adder for the color space conversion. These multiplier/adder units are used for the operation described in Figure 8-201. Data are taken from two input lines during the operation.

Coefficients are signed 8-bit (decimal is 5 bits). Coefficients are set through the following registers:

- Coefficient M00: [ISIF_CSCM0\[7:0\]](#) CSCM00
- Coefficient M01: [ISIF_CSCM0\[15:8\]](#) CSCM01
- Coefficient M02: [ISIF_CSCM1\[7:0\]](#) CSCM02
- Coefficient M03: [ISIF_CSCM1\[15:8\]](#) CSCM03
- Coefficient M10: [ISIF_CSCM2\[7:0\]](#) CSCM10
- Coefficient M11: [ISIF_CSCM2\[15:8\]](#) CSCM11
- Coefficient M12: [ISIF_CSCM3\[7:0\]](#) CSCM12
- Coefficient M13: [ISIF_CSCM3\[15:8\]](#) CSCM13
- Coefficient M20: [ISIF_CSCM4\[7:0\]](#) CSCM20
- Coefficient M21: [ISIF_CSCM4\[15:8\]](#) CSCM21
- Coefficient M22: [ISIF_CSCM5\[7:0\]](#) CSCM22
- Coefficient M23: [ISIF_CSCM5\[15:8\]](#) CSCM23
- Coefficient M30: [ISIF_CSCM6\[7:0\]](#) CSCM30
- Coefficient M31: [ISIF_CSCM6\[15:8\]](#) CSCM31
- Coefficient M32: [ISIF_CSCM7\[7:0\]](#) CSCM32
- Coefficient M33: [ISIF_CSCM7\[15:8\]](#) CSCM33

Figure 8-201. ISS ISP ISIF Color Space Converter Operation



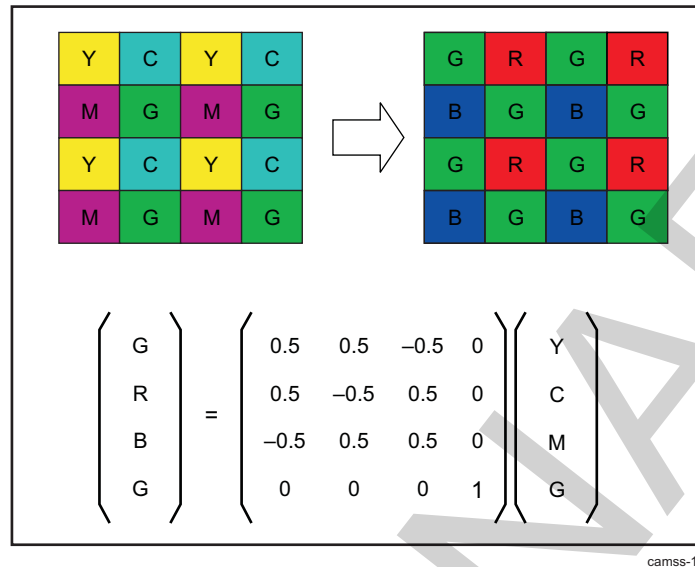
$$\begin{pmatrix} Out1 \\ Out2 \\ Out3 \\ Out4 \end{pmatrix} = \begin{pmatrix} M00 & M01 & M02 & M03 \\ M10 & M11 & M12 & M13 \\ M20 & M21 & M22 & M23 \\ M30 & M31 & M32 & M33 \end{pmatrix} \begin{pmatrix} In1 \\ In2 \\ In3 \\ In4 \end{pmatrix}$$

M00–M33: Signed 8-bit data with 5-bit decimal the value range $-4 \leq M_{xx} < 4$

camss-618

The CSC can convert CMYG filtered CCD data to Bayer matrix (RGBG) data, as shown in [Figure 8-202](#).

Figure 8-202. ISS ISP ISIF Color Space Converter Operation: CMYG to RGBG



[Figure 8-203](#) through [Figure 8-205](#) show which input pixels are used for the operation. There is one-line latency between the input and the output.

Figure 8-203. ISS ISP ISIF Color Space Conversion Example

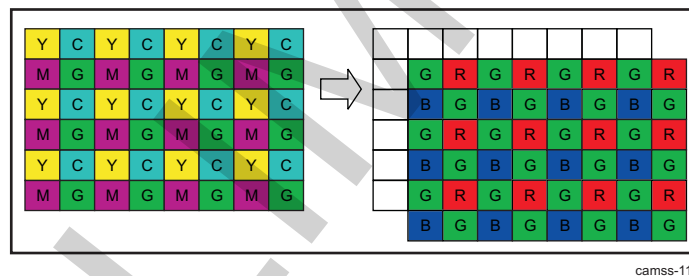


Figure 8-204. ISS ISP ISIF 1st Pixel/1st Line Generation

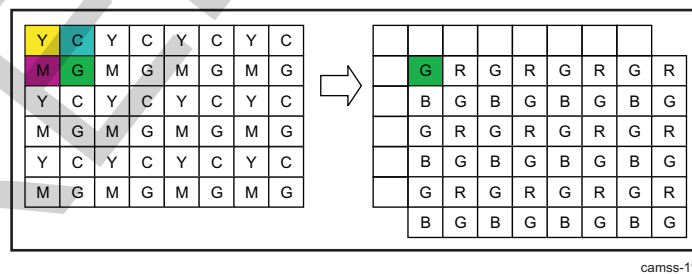
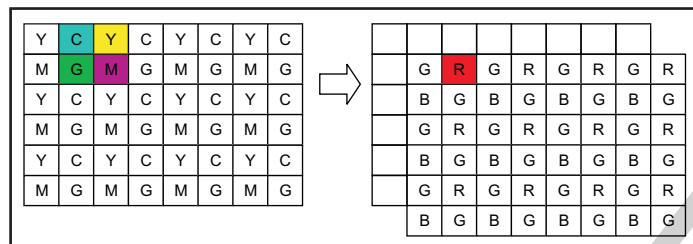


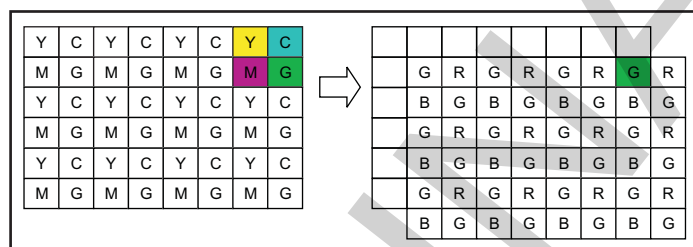
Figure 8-205. ISS ISP ISIF 2nd Pixel/1st Line Generation



camss-116

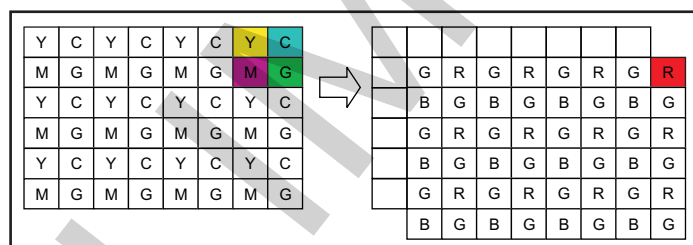
As shown in Figure 8-206 through Figure 8-209, the operation for the last pixel and the second last pixel uses the same input data.

Figure 8-206. ISS ISP ISIF 2nd Last Pixel/1st Line Generation



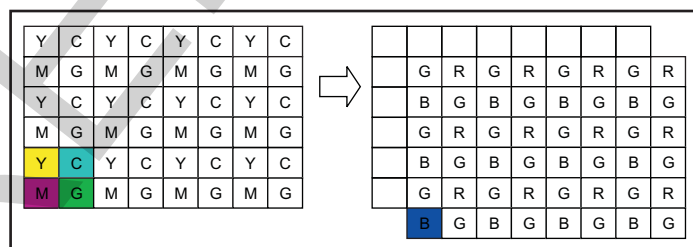
camss-117

Figure 8-207. ISS ISP ISIF Last Pixel/1st Line Generation

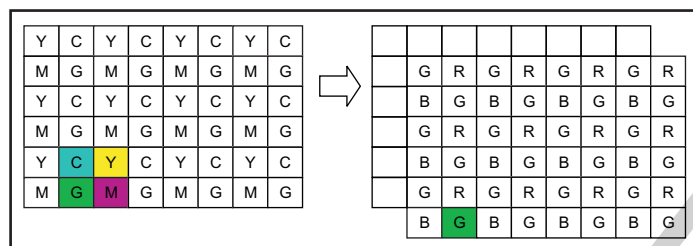


camss-118

Figure 8-208. ISS ISP ISIF 1st Pixel/Last Line Generation

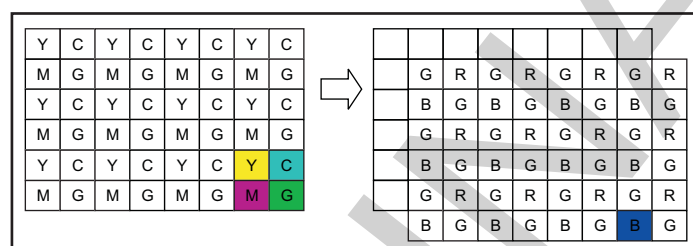


camss-119

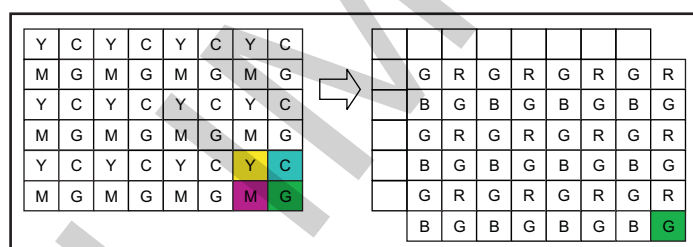
Figure 8-209. ISS ISP ISIF 2nd Pixel/Last Line Generation

camss-120

Also, the operation for the last line and the second last line uses the same input data (see [Figure 8-210](#) and [Figure 8-211](#)).

Figure 8-210. ISS ISP ISIF 2nd Last Pixel/Last Line Generation

camss-121

Figure 8-211. ISS ISP ISIF Last Pixel/Last Line Generation

camss-122

In addition to the registers specific to the color space converter, some of the registers are shared with the input data formatter to configure the valid area:

- [ISIF_FMTSPH](#)
- [ISIF_FMTLNH](#)
- [ISIF_FMTLSV](#)
- [ISIF_FMTLVN](#)

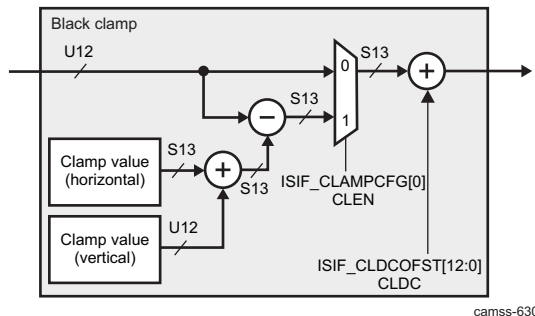
There must be at least 1 invalid pixel at the end of the line and one invalid line at the end of the frame.

To enable the color space conversion, set the [ISIF_CSCCTL\[0\]](#) CSCEN bit to 1.

8.3.3.7.8 ISS ISP ISIF Black Clamp

NOTE: For the memory access locations of the ISIF clamp, see [Section 8.3.3.9](#).

Figure 8-212. ISS ISP ISIF Black Clamp Block Diagram



The clamp value is calculated based on the pixel value of the OB region of the sensor. The clamp value is calculated separately for horizontal and vertical directions to compensate the offset drift in both horizontal and vertical directions. The sum of the horizontal and vertical clamp values is subtracted from the image data, and then the additional DC offset is added (the [ISIF_CLDCOFST\[12:0\]](#) CLDC bit field, an S13Q0 value). This value is added whether the black clamp module is enabled or not.

The horizontal clamp is disabled through the [ISIF_CLAMPCFG\[2:1\]](#) CLHMD bit field.

To enable the black clamp module, set the [ISIF_CLAMPCFG\[0\]](#) CLEN bit to 1. The [ISIF_PPLN\[15:0\]](#) PPLN bit field sets the pixel per line, and the number of pixel clock periods in one line HD period equals PPLN + 1 pixel clock. The [ISIF_PPLN\[15:0\]](#) bit field is not used when the input is already HD/VD.

8.3.3.7.8.1 ISS ISP ISIF Clamp Value for Horizontal Direction

The clamp value for horizontal direction is calculated using the pixel values at the upper OB region.

The maximum pixel value to be used for the clamp value calculation can be limited to 1023 if the pixel value limitation is enabled ([ISIF_CLHWIN0\[6\]](#) CLHLMT = 1).

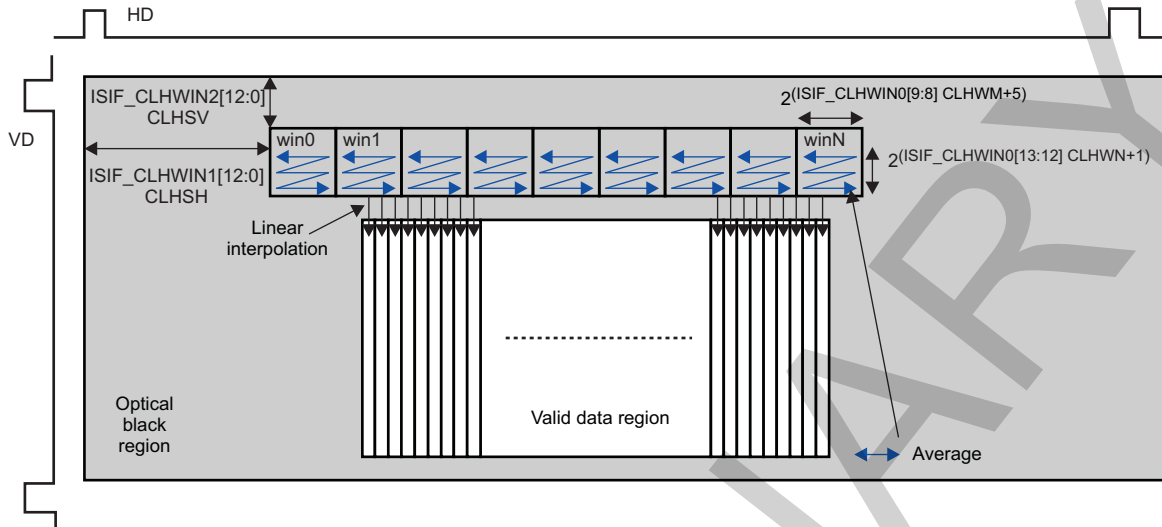
Clamp value calculation for horizontal direction can be disabled in case there is no upper OB region. The operating modes are:

- Horizontal clamp value calculation is enabled. The calculated horizontal clamp value is subtracted from the image data along with the vertical clamp value ([ISIF_CLAMPCFG\[2:1\]](#) CLHMD = 0x1).
- Horizontal clamp value is not updated. The horizontal clamp value used for the previous image is subtracted from the image data along with the vertical clamp value ([ISIF_CLAMPCFG\[2:1\]](#) CLHMD = 0x2).
- Horizontal clamp value is not updated. Only the vertical clamp value is subtracted from the image data ([ISIF_CLAMPCFG\[2:1\]](#) CLHMD = 0x0).

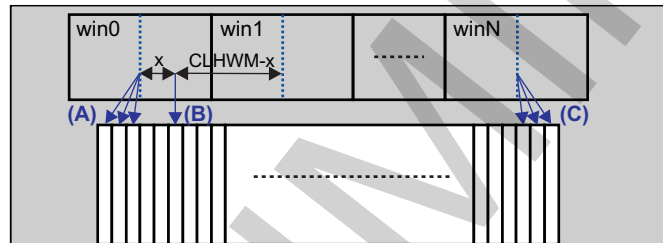
The number of windows in a row is set with the [ISIF_CLHWIN0\[4:0\]](#) CLHWC bit field.

Up to 32 windows in a row can be set for clamp value calculation. All the windows have the same size in a format $[2^{(\text{ISIF_CLHWIN0}[9:8] \text{ CLHWM}+5)}]$ pixels by $[2^{(\text{ISIF_CLHWIN0}[13:12] \text{ CLHWN}+1)}]$ lines.

The [ISIF_CLHWIN2\[12:0\]](#) CLHSV and [ISIF_CLHWIN1\[12:0\]](#) CLHSH bit fields enable setting the position of the first optical black clamp window in the frame. The pixel and line offset are in a range [0:8191]. The [ISIF_HDW](#) register sets the width of the HD.

Figure 8-213. ISS ISP ISIF Clamp Value for Horizontal Direction

Windows settings details



camss-132

The clamp value for horizontal direction calculation steps is:

1. Calculate the average of the pixel value in each window (ave_win₀ to ave_win_N).

| Calculation Steps | win0 | win1 | win2 | ... | wini | wini + 1 | ... | winN |
|----------------------------|----------------------|----------------------|----------------------|-----|----------------------|------------------------|-----|----------------------|
| Average of the pixel value | ave_win ₀ | ave_win ₁ | ave_win ₂ | | ave_win _i | ave_win _{i+1} | | ave_win _N |

2. Set the average of the left-most window or the right-most window as the base value B_V:

- B_V = ave_win₀ (if ISIF_CLHWIN0[5] CLHWBS = 0x0, case 1)
- B_V = ave_win_N (if ISIF_CLHWIN0[5] CLHWBS = 0x1, case 2)

3. Subtract the base value from the average of each window. Use this value as a clamp value for each window.

| Calculation Steps | win0 | ... | wini | wini+1 | ... | winN |
|-----------------------------|---|-----|---|---|-----|---|
| Clamp value for each window | clamp_win ₀ = ave_win ₀ - B_V | | clamp_win _i = ave_win _i - B_V | clamp_win _{i+1} = ave_win _{i+1} - B_V | | clamp_win _N = ave_win _N - B_V |

4. Acquire the horizontal distance (X and CLHWM - X) from the valid pixel to be processed to the center of the closest two windows.
5. Calculate the clamp value of the valid pixel by linear interpolation, using the clamp value of the closest two windows (i and i + 1).
 - Case 1: interpolated_clamp_win_x = (clamp_win_{i+1} - clamp_win_i) * X / CLHWM
 - Case 2: interpolated_clamp_win_x = (clamp_win_i - clamp_win_N) * (CLHWM - X) / CLHWM +

$$(\text{clamp_win}_{i+1} - \text{clamp_win}_N) * X / \text{CLHWM}$$

6. If the valid pixel is on the left of the center of the left-most window, the clamp value of the left-most window is applied. If the valid pixel is on the right of the center of the right-most window, the clamp value of the right-most window is applied.

The clamp values calculated (A), (B) and (C) are:

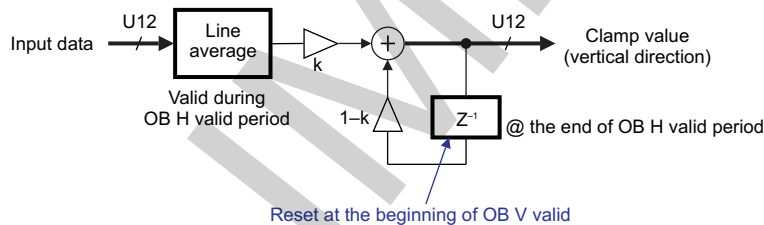
- Case1: Base is win0 (Left-most window: [ISIF_CLHWIN0\[5\]](#) CLHWBS = 0x0)
 - (A): zero
 - (B): $(\text{clamp_win}_{i+1} - \text{clamp_win}_i) * X / \text{CLHWM}$
 - (C): $(\text{clamp_win}_N - \text{clamp_win}_0)$
- Case2: Base is winN (Right-most window: [ISIF_CLHWIN0\[5\]](#) CLHWBS = 0x1)
 - (A): $(\text{clamp_win}_0 - \text{clamp_win}_N)$
 - (B): $(\text{clamp_win}_i - \text{clamp_win}_N) * (\text{CLHWM} - X) / \text{CLHWM} + (\text{clamp_win}_{i+1} - \text{clamp_win}_N) * X / \text{CLHWM}$
 - (C): zero

Each interpolated value $\text{interpolated_clamp_win}_X$ is then subtracted to the associated column.

8.3.3.7.8.2 ISS ISP ISIF Clamp Value for Vertical Direction

The clamp value for vertical direction is calculated using the pixel values at the left or right OB region. Line average is calculated for the OB H valid period ($2^{(\text{ISIF_CLVWIN0}[2:0] \text{ CLVOBH} + 1)}$). The averages for the previous lines are also added back to reduce the difference between the lines, as shown in [Figure 8-214](#).

Figure 8-214. ISS ISP ISIF Clamp Value for Vertical Direction Calculation



- Clamp Value (V_n) = Line Average (V_n) * k + Clamp Value (V_1) * $(1-k)$
- $k = \text{ISIF_CLVWIN0}[15:8] \text{ CLVCOEF}$

The position of the first vertical black clamp window is set with the [ISIF_CLVWIN2\[12:0\]](#) CLVSV and [ISIF_CLVWIN1\[12:0\]](#) CLVSH bit fields. The number of vertical windows is set with the [ISIF_CLVWIN3\[12:0\]](#) CLVOBV bit field. [ISIF_VDW](#) sets the width of the VD.

The accumulator, which holds the vertical clamp value for the previous line, is reset at the beginning of the OB V valid. The reset value can be selected through the [ISIF_CLVWIN0\[5:4\]](#) CLVRVSL bit field:

- [ISIF_CLVWIN0\[5:4\]](#) CLVRVSL = 0x0: The base value is calculated for horizontal direction (left-most window win0 or right-most winn set with [ISIF_CLHWIN0\[5\]](#) CLHWBS).
- [ISIF_CLVWIN0\[5:4\]](#) CLVRVSL = 0x1: The base value is set through the configuration register ([ISIF_CLVRV\[11:0\]](#) CLVRV).
- [ISIF_CLVWIN0\[5:4\]](#) CLVRVSL = 0x2: No update (same as the previous image)

The following figures show the OB valid settings and associated vertical clamp value calculation when OB region is at the left (see [Figure 8-215](#)) and when OB region is at the right (see [Figure 8-216](#)). Each line average value is subtracted from the associated line valid region data.

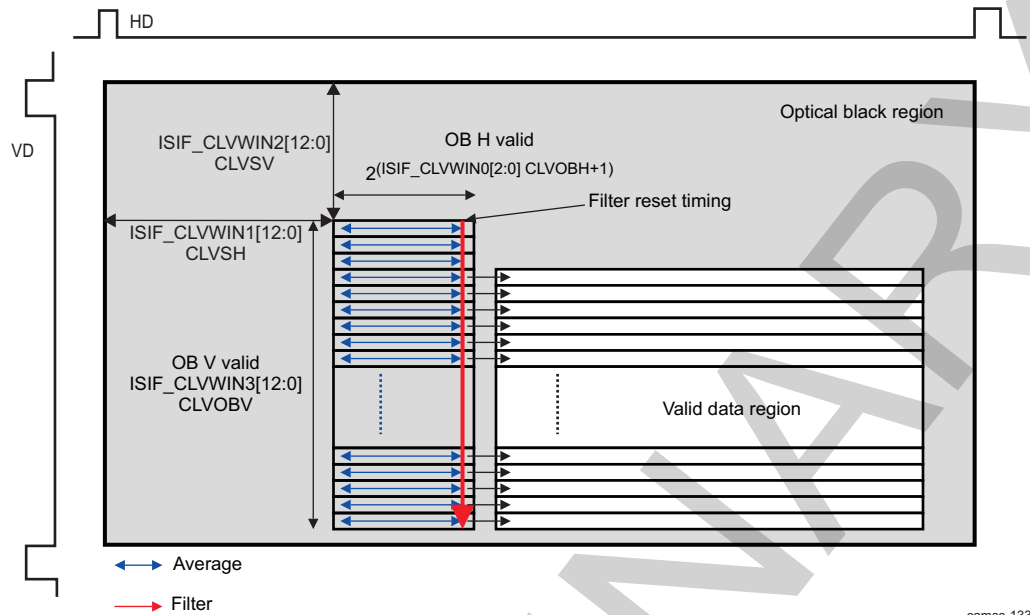
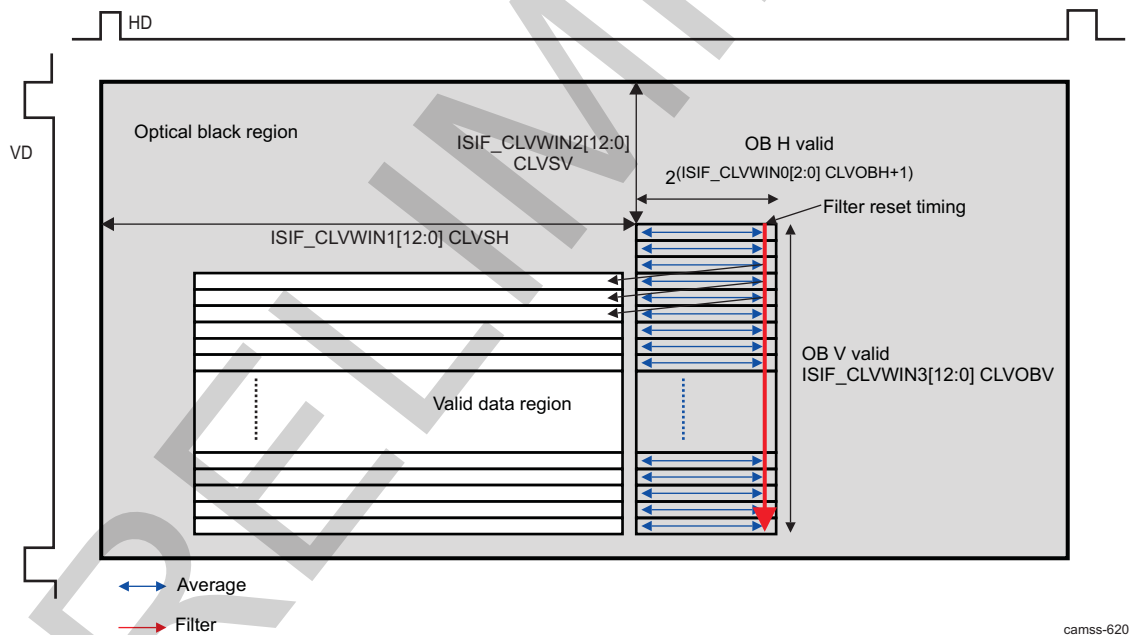
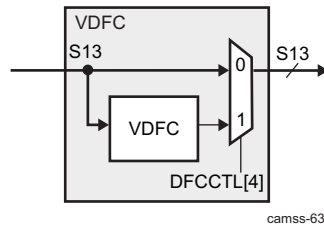
Figure 8-215. ISS ISP ISIF Clamp Value for Vertical Direction With OB Region at the Left**Figure 8-216. ISS ISP ISIF Clamp Value for Vertical Direction With OB Region at the Right****8.3.3.7.9 ISS ISP ISIF Vertical Line Defect Correction (VDFC)**

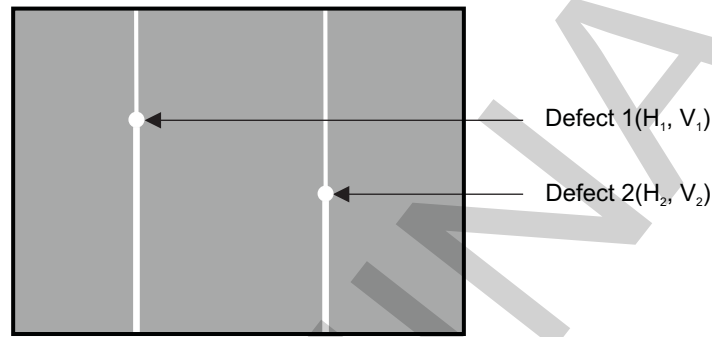
Figure 8-217 shows the block diagram of the vertical line defect (VDFC) correction.

Figure 8-217. ISS ISP ISIF Vertical Line Defect Correction Block Diagram



The VDFC block can correct up to eight vertical line defects (see [Figure 8-218](#)).

Figure 8-218. ISS ISP ISIF Vertical Line Defects



The correction method is common to all the defects and can be selected through the [ISIF_DFCCTL\[6:5\]](#) VDFCSL bit field.

There are two different methods to correct vertical line defects ([ISIF_DFCCTL\[6:5\]](#) VDFCSL):

- Method 1: Data is replaced by an average ([ISIF_DFCCTL\[6:5\]](#) VDFCSL = 0x2):
 - The defect is replaced by the average of pixel (i – 2) and pixel (i + 2)
- Method 2: Data is subtracted by a defect level ([ISIF_DFCCTL\[6:5\]](#) VDFCSL = 0x0 or 0x1):
 - A saturation level is defined in the [ISIF_VDFSATLV\[11:0\]](#) VDFS LV bit field.
 - The coordinates of the defect:
 - Are defined in the [ISIF_DFCMEM0\[12:0\]](#) DFCMEM0 and [ISIF_DFCMEM1\[12:0\]](#) DFCMEM1 bit fields
 - Are 13 bits wide for horizontal and vertical direction, so an image size up to 8192 × 8192 is supported
 - If the data is not saturated (data VDFS LV):
 - The defect is corrected by subtracting the defect level. A different defect level is defined for:
 - The point of the defect (V = Vdefect): SUB1 defect level is defined in the [ISIF_DFCMEM2\[7:0\]](#) DFCMEM2 bit field.
 - The pixels lower than the defect (V < Vdefect): SUB2 defect level is defined in the [ISIF_DFCMEM3\[7:0\]](#) DFCMEM3 bit field.
 - The pixels upper than the defect (V > Vdefect): Defect level is defined in the [ISIF_DFCMEM4\[7:0\]](#) DFCMEM4 bit field.
 - Each defect level (value to be subtracted from the data) described previously can be up-shifted through the [ISIF_DFCCTL\[10:8\]](#) VDFLSFT bit field.
 - Vertical line defect correction for upper pixels can be disabled through the [ISIF_DFCCTL\[7\]](#) VDFCUDA bit.
 - If the data is saturated (VDFS LV), there are two possibilities:
 - [ISIF_DFCCTL\[6:5\]](#) VDFCSL = 0x0: Data is simply fed through (not subtracted).
 - [ISIF_DFCCTL\[6:5\]](#) VDFCSL = 0x1: Horizontal interpolation ((i – 2) + (i + 2))/2 (data is replaced by

interpolation or data is subtracted with interpolation)

The [ISIF_LPFR](#) register sets the number of half lines per frame or field: VD period = (L PFR+ 1)/2 lines. LPFR is not used when HD and VD are inputs.

The following paragraphs concern only method 2 correction.

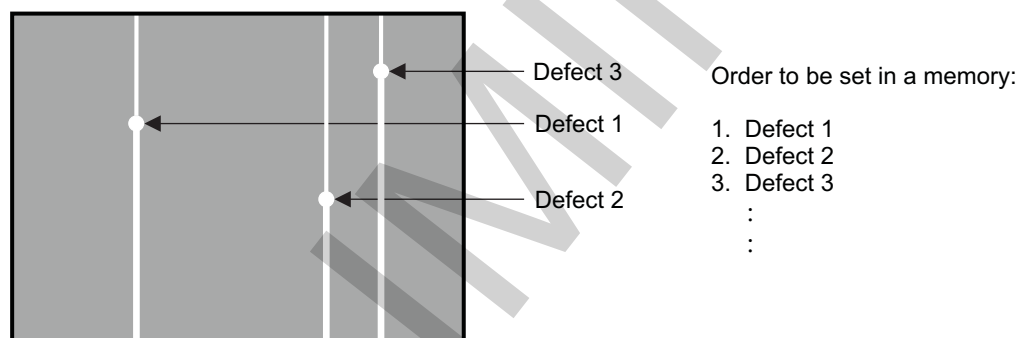
The coordinates of the defects and the defect levels to be subtracted from the data must be set to the processing shown in [Table 8-344](#).

Table 8-344. ISS ISP ISIF Vertical Line Defect Table in Memory

| Bit | Defect Information |
|-------|--|
| 12:0 | Vertical position of the defects |
| 25:13 | Horizontal position of the defects |
| 33:26 | Defect level of the vertical line defect position (V = Vdefect) |
| 41:34 | Defect level of the pixels upper than the vertical line defect (V Vdefect) |
| 49:42 | Defect level of the pixels lower than the vertical line defect (V Vdefect) |

The defect must be set from left to right, as shown in [Figure 8-219](#).

Figure 8-219. ISS ISP ISIF Vertical Line Defects



camss-135

Vertical line defect correction is enable by setting the [ISIF_DFCCTL](#)[4] VDFCEN bit to 1, but the procedure explained in [Section 8.3.3.7.9.1](#), *ISS ISP ISIF Vertical Line Defect Table Update Procedure*, must be respected.

8.3.3.7.9.1 ISS ISP ISIF Vertical Line Defect Table Update Procedure

The following procedure must be respected to write the vertical line defect table in memory.

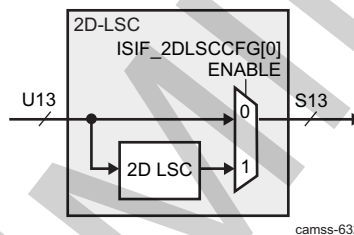
1. [ISIF_DFCMEMCTL](#)[4] DFCMCLR = 0x1
2. Ensure that [ISIF_DFCCTL](#)[4] VDFCEN is disabled (0x0).
3. Write the V coordinate of the first defect to the [ISIF_DFCMEM0](#)[12:0] DFCMEM0 bit field.
4. Write the H coordinate of the first defect to the [ISIF_DFCMEM1](#)[12:0] DFCMEM1 bit field.
5. Set the defect level to:
 - [ISIF_DFCMEM2](#)[7:0] DFCMEM2
 - [ISIF_DFCMEM3](#)[7:0] DFCMEM3
 - [ISIF_DFCMEM4](#)[7:0] DFCMEM4
6. Set the [ISIF_DFCMEMCTL](#)[0] DFCMWR bit to 1 with the [ISIF_DFCMEMCTL](#)[2] DFCMARST bit set to 1.
7. Wait until the [ISIF_DFCMEMCTL](#)[0] DFCMWR bit is cleared.
8. Write the next data to:
 - [ISIF_DFCMEM0](#)[12:0] DFCMEM0

- [ISIF_DFCMEM1\[12:0\]](#) DFCMEM1
 - [ISIF_DFCMEM2\[7:0\]](#) DFCMEM2
 - [ISIF_DFCMEM3\[7:0\]](#) DFCMEM3
 - [ISIF_DFCMEM4\[7:0\]](#) DFCMEM4
9. Set the [ISIF_DFCMEMCTL\[0\]](#) DFCMWR bit to 1 with the [ISIF_DFCMEMCTL\[2\]](#) DFCMARST bit cleared.
 10. Repeat 4~5 times until all entries (up to 8) are written to the vertical line defect table.
 11. In case the defect entry is less than 8, an extra write cycle is required to fill the next table location with a certain value.
 12. Clear the [ISIF_DFCMEM0\[12:0\]](#) DFCMEM0 bit field to all 0, set the [ISIF_DFCMEM1\[12:0\]](#) DFCMEM1 to all 1, and set the [ISIF_DFCMEMCTL\[0\]](#) DFCMWR bit to 1 with the [ISIF_DFCMEMCTL\[2\]](#) DFCMARST bit cleared.
 13. Enable VDFC by setting the [ISIF_DFCCTL\[1\]](#) VDFCEN bit.

8.3.3.7.10 ISS ISP ISIF Lens Shading Correction (2D-LSC)

NOTE: For the memory access locations of the 2D-LSC table, see [Section 8.3.3.9](#).

Figure 8-220. ISS ISP ISIF 2D-LSC Block Diagram



LSC is useful for correcting optical artifacts that cause image brightness to decrease starting from the center of the image and going out to the edges.

The LSC module implements a per pixel offset and gain adjustment in the RAW Bayer domain (2×2 color pattern). The offset is applied before gain multiplication.

The offset and gains are stored in a LUT, which is stored in SDRAM and is loaded in real time. The submodule prefetches the data from SDRAM such that no underflow occurs. Underflow occurs when the offset and gain data required for the current pixel are not available.

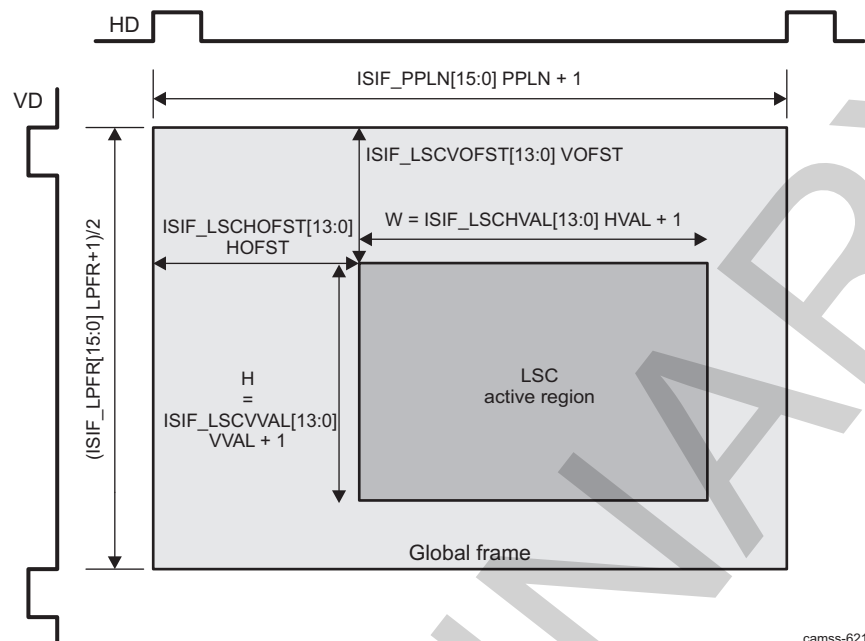
The data stored in the LUT is downsampled; that is, there is no gain or offset per pixel. The downsampling factor is programmable. High downsampling ratios lead to a smaller LUT, lower accuracy, and lower memory bandwidth. A low downsampling ratio leads to a bigger LUT, higher accuracy, and higher memory bandwidth.

When the offset and gain values are loaded, they are upsampled to the incoming image resolution. The missing table values are computed through bilinear interpolation.

To enable the 2D-LSC module, set the [ISIF_2DLSCCFG\[0\]](#) ENABLE bit to 1.

8.3.3.7.10.1 ISS ISP ISIF 2D-LSC Active Region Settings

The gain and offset maps are internally up-sampled to full resolution before being applied to the image. In order to account for all the possible cropping schemes and zoom ratios, the 2D-LSC can be configured such that a single gain map can be stored in memory that maps to sensor lens. The 2D-LSC active region is defined by [Figure 8-221](#).

Figure 8-221. ISS ISP ISIF 2D-LSC Active Region for ISIF Input Frame**8.3.3.7.10.1.1 ISS ISP ISIF 2D-LSC Gain and Offset Tables**

The gain and offset map are MxN downsampled:

- M is the horizontal sampling factor.
- N is the vertical sampling factor.
- M and N are {8, 16, 32, 64, 128} independently.
- N = M. M is set in the [ISIF_2DLSCCFG\[14:12\] GAIN_MODE_M](#) bit field.
- N is set in the [ISIF_2DLSCCFG\[10:8\] GAIN_MODE_N](#) bit field.

The starting point of the preconfigured lens shading map can be modified in software to align with the ISIF input image frame. The location of the gain and offset mask data in memory is specified by :

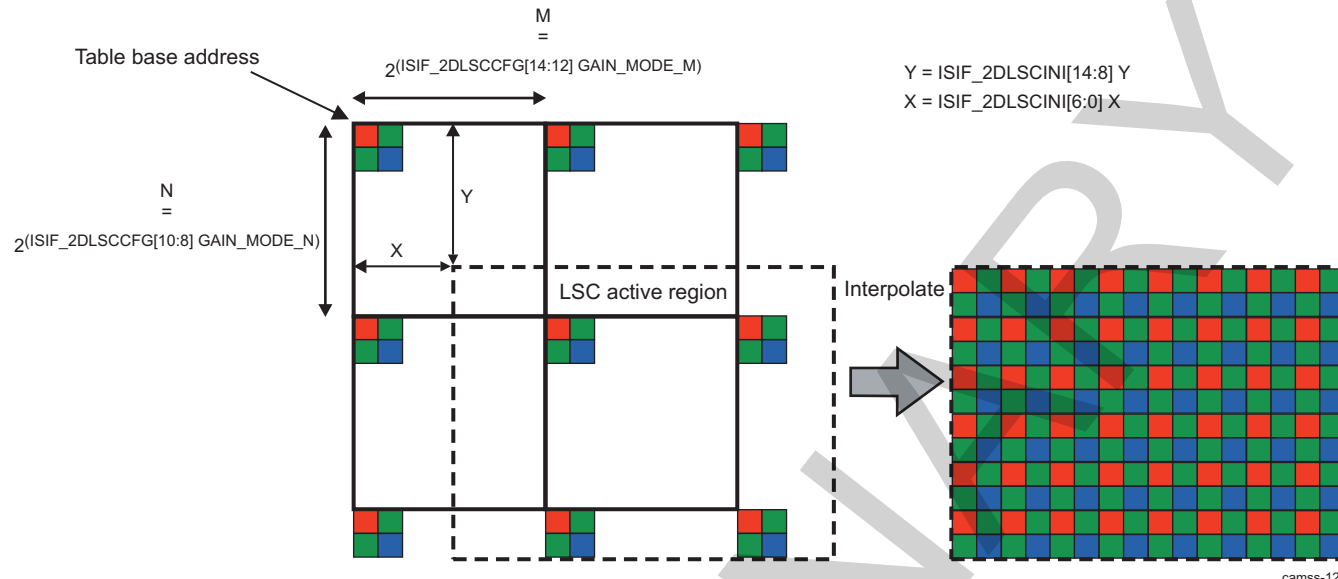
- For gain map:
 - Table base address: [ISIF_2DLSCGRBU\[15:0\] BASE31_16](#) and [ISIF_2DLSCGRBL\[15:0\] BASE15_0](#)
- For offset map:
 - Table base address: [ISIF_2DLSCORBU\[15:0\] BASE](#) and [ISIF_2DLSCORBL\[15:0\] BASE](#)

The input address must be aligned to a 4-byte boundary.

In the full resolution case, the address is set to the beginning of the map. When the LSC active region is defined over a cropped region of the full image, the SDRAM input address can be set to the upper-left corner of the grid closest to the beginning of the active region, and the [ISIF_2DLSCINI\[6:0\] X](#) and [ISIF_2DLSCINI\[14:8\] Y](#) bit fields mark the offset into the upsampled gain and offset map where the active region begins. [Figure 8-222](#) shows the LSC active region with respect to the gain and offset map grid. Because (X, Y) deals with the pixel phase inside a gain and offset map grid, X and Y must each be less than M and N, respectively.

Before applying the gain or offset table, the table is internally upsampled and interpolated back to full resolution via bilinear interpolation.

Figure 8-222. ISS ISP ISIF Gain and Offset Mask Upsampling via Bilinear Interpolation



The gain table format is set in the [ISIF_2DLSCCFG\[3:1\] GAIN_FORMAT](#) bit field. 8-bit entries are supported in the gain map (in U8Q8, U8Q7, U8Q6, and U8Q5 format with optional base of 1.0 to shift the range up).

8-bit entries are supported in the offset map (in S8Q0 format). An optional shifting up for offsets is possible. The shift up value is selected through the [ISIF_2DLSCOFST\[6:4\] OFSTSFT](#) bit field. A scaling factor for offsets is defined in the [ISIF_2DLSCOFST\[15:8\] OFSTSF](#) bit field.

The offset control in the 2D-LSC module can be enabled or disabled through the [ISIF_2DLSCOFST\[0\] OFSTEN](#) bit.

For an LSC active region size of $W \times H$ (the output and input are the same size), and the gain and offset maps are $M \times N$ downsampled, a table with the following values is needed:

- $(\text{ceil}[(X + W) / M] + 1) \times (\text{ceil}[(Y + H) / N] + 1) \times 4$ bytes data in external memory organized as:
 - $(\text{ceil}[(\text{InitX} + W) / M] + 1)$ lines of data
 - Each line having at least $(\text{ceil}[(\text{InitY} + H) / N] + 1) \times 4$ data points
- Extra data at end of each line can be skipped by the line offset register parameter:
- For gain map:
 - Line offset: [ISIF_2DLSCGROF\[15:0\] OFFSET](#)
 - For offset map:
 - Line offset: [ISIF_2DLSCOROF\[15:0\] OFFSET](#)
 - Each line offset must start at a 32-bit aligned boundary.

8.3.3.7.10.1.2 ISS ISP ISIF 2D-LSC Gain and Offset Table Upsampling

Upsampling of the pixel-by-pixel gains is performed by locating the four same-color anchors for each destination gain value and applying bilinear interpolation.

The gain and offset mask function is neutral to color pattern. The starting color of the gain and offset mask must be consistent with the starting color of the image, and can be any color. To align starting colors, the X and Y values must be even. The 2D-LSC engine upsamples each phase of the mask data as a separate plane and applies the upsampled mask to the image with the same color phasing. In other words, the red

gains are interpolated with red gains, and applied to the red input pixels. The same is done for each of the other three colors in the color pattern. The 2D-LSC module is designed to work with Bayer CFA data, having the R/Gr/Gb/B color pattern. For the purpose of functional description, assume red is the starting color, but any other starting color or other 2×2 pattern can be used by placing color gains in the appropriate order.

8.3.3.7.10.1.3 ISS ISP ISIF Application of Gain and Offset to Image Pixels

The gain value interpolated for each pixel is multiplied with a corresponding input pixel. An offset is applied before the gain. The product is rounded to the nearest integer and then clipped or saturated to the valid range of 13 bits.

The following equation describes the operation of the LSC in terms of offset and gain:

$$\text{out}[x,y] = (\text{in}[x,y] + a * (\text{ofst}[x,y] \gg T)) * \text{gain}[x,y] \quad (6)$$

- $\text{in}[x, y]$ are the input pixels, 13 bits signed.
- $\text{ofst}[x, y]$ are the upsampled offset points.
- T is the upshift value applied to the result of the offset interpolation points (0 – 5) set through the [ISIF_2DLSCOFST\[6:4\]](#) OFSTSFT bit field.
- a is the offset gain value in U8Q7 format set through the [ISIF_2DLSCOFST\[15:8\]](#) OFSTSF bit field.
- $\text{gain}[x, y]$ are the upsampled gain points.
- $\text{out}[x, y]$ are the resulting output pixels, 13 bits signed.

8.3.3.7.10.1.4 ISS ISP ISIF Enabling/ Disabling the 2D-LSC Module

LSC operates on a single frame or continuously, depending on the firmware programming.

Upon power-on reset (POR), the 2D-LSC module is disabled and input pixels are copied to the output, bypassing any shading operation.

When enabling or disabling the 2D-LSC, caution must be taken on the timing of register modifications. To avoid causing a prefetch error or other unexpected behavior, the following safeguards must be implemented:

1. While configuring the 2D-LSC registers, the input clock into the ISIF should be toggling.
2. All of the 2D-LSC registers must be configured appropriately before enabling the [ISIF_2DLSCCFG\[0\]](#) ENABLE bit.
3. After setting the ENABLE bit to 1, the hardware immediately begins fetching the first two rows of gain and offset data entries from external memory. When this is complete, the [ISIF_2DLSCIRQST\[2\]](#) PREFETCH_COMPLETED status flag is set.

NOTE: If the ENABLE bit is disabled before the [ISIF_2DLSCIRQST\[3\]](#) SOF status flag is set, the [ISIF_2DLSCIRQST\[1\]](#) PREFETCH_ERROR flag is set and the state of the 2D-LSC submodule may lead to unexpected errors. Therefore, the ENABLE bit must not be disabled until after the [ISIF_2DLSCIRQST\[3\]](#) SOF status flag is set.

4. Appropriate gains and offsets are applied to the image pixels. Pixels outside the LSC active region are passed through unaltered. When the 2D-LSC operation on the active region completes, the [ISIF_2DLSCIRQST\[0\]](#) DONE status flag is set.
5. At this point:
 - If the ENABLE bit is still set to 1, the hardware immediately begins to prefetch the gain and offset data entries for the next frame and waits for the active region of the next frame to arrive.
 - If the ENABLE bit is set to 0, it stops LSC operation once the active region is passed, and goes into idle until the ENABLE bit is written to 1 again.

NOTE: To provide a mechanism for firmware to recover from the LSC module waiting indefinitely for the input image, if LSC_ENABLE is written to 0 after it has started gain/offset map prefetching, but before the LSC gets to the next active region, the LSC operation is aborted and turned idle, and any prefetched gain/offset entries are discarded. This can happen before or after the next start-of-frame.

NOTE: Therefore, because of the constraints set in point 3, the ENABLE register bit must be disabled only after the [ISIF_2DLSCIRQST\[3\]](#) SOF status flag is set and before the [ISIF_2DLSCIRQST\[0\]](#) DONE status flag is set for that same frame.

It is suggested that when the 2D-LSC or the whole ISIF needs to be disabled for switching modes, the [ISIF_2DLSCIRQST\[3\]](#) SOF interrupt be enabled so that software knows when it is safe to disable the 2D-LSC. Then the ISIF can be disabled after the [ISIF_2DLSCIRQST\[0\]](#) DONE status signal is set for that frame.

NOTE: The LSC_ENABLE bit, once written to 1, must not be cleared until at least one vpi_clk clock cycle after start-of-frame, to ensure correct processing.

8.3.3.7.10.1.5 ISS ISP ISIF 2D-LSC Events and Status Checking

The 2D-LSC submodule can generate events on a single interrupt line. These events are further remapped at the ISP level in [ISP5_IRQENABLE_SET__0.ISIF_INT_3](#) - [ISP5_IRQENABLE_SET__3.ISIF_INT3](#).

Four 2D-LSC events can be generated:

- **DONE:** LSC done. This event triggers when the LSC submodules transition from ACTIVE state to IDLE state.
- **PREFETCH_ERROR:** Gain table prefetch error. This event triggers when the tables stored in SDRAM are read too slowly. After this event is asserted, the LSC disables the LSC computation until the beginning of the next frame.
- **PREFETCH_COMPLETE:** Gain table prefetch complete. This event triggers when data prefetching from SDRAM completes. Data prefetching must complete by the time the first pixel of a frame comes. The event triggers when the buffer contains three full rows of data.
- **SOF:** This event signals the start of the LSC valid region. The LSC configuration registers for the next frame can be updated after the LSC SOF triggers.

The [ISIF_2DLSCIRQEN](#) register can be configured to select which events are masked and which are propagated to the LSC interrupt signal. The [ISIF_2DLSCIRQST](#) register can be read and cleared to identify which events have occurred.

In addition, the 2D-LSC module provides the following status bit:

- **BUSY:** This indicates that LSC has entered the active region vertically. This bit remains on during horizontal blanking, and turns off only after the entire active region of the current frame is processed.

8.3.3.7.10.1.6 ISS ISP ISIF Supported On-the-Fly 2D-LSC Configurations

The 2D-LSC prefetch memory is equal to $2 \times 1536 \times 32$ bits. This memory is sized to fetch three lines of 8-bit gain and 8-bit offset \times four color components per paxel. Given an image sensor of horizontal resolution H, there are $\text{floor}[(H / \text{ISIF_2DLSCCFG}[14:12] \text{ GAIN_MODE_M}) + 1]$ paxels per line, where M is the horizontal LSC paxel size.

[Table 8-345](#) shows the LSC horizontal paxel size, which can be supported for different image sensor resolutions. When $M = 8$, some resolutions cannot be supported on the fly (orange-shaded cells in the table); the way to process such large images is to use vertical frame division.

Table 8-345. ISS ISP ISIF Supported On-the-Fly LSC Configurations

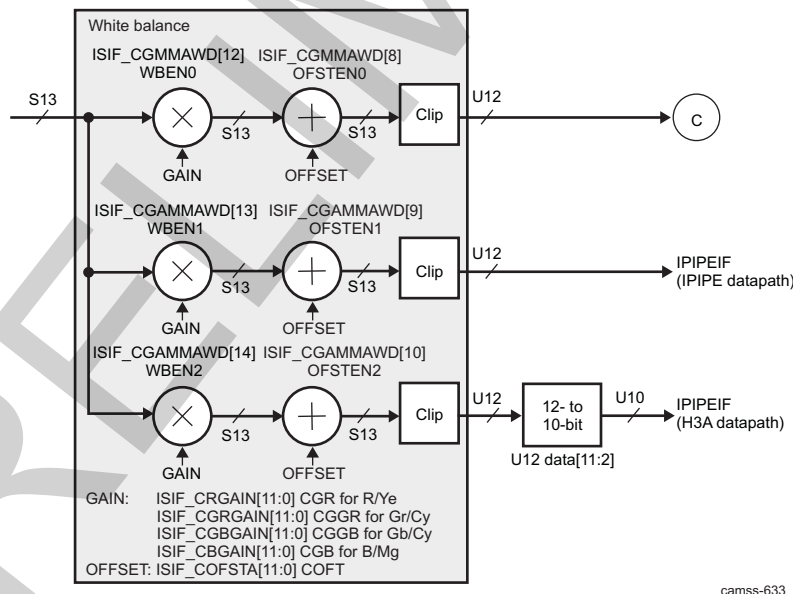
| MPix | Aspect Ratio | | Line Size | Horizontal LSC Pixel Size: $M = 2^{[ISIF_2DLSCCFG[14:12] \text{ GAIN_MODE_M}]}$ | | | | |
|---------|--------------|---|-----------|--|------|-----|-----|-----|
| | | | | 8 | 16 | 32 | 64 | 128 |
| Maximum | — | — | 5376 | 2019 | 1011 | 507 | 255 | 129 |
| 16 | 16 | 9 | 5333 | 2003 | 1003 | 503 | 253 | 128 |
| 16 | 4 | 3 | 4619 | 1735 | 869 | 436 | 220 | 111 |
| 16 | 3 | 2 | 4899 | 1840 | 922 | 462 | 233 | 118 |
| 12 | 16 | 9 | 4619 | 1735 | 869 | 436 | 220 | 111 |
| 12 | 4 | 3 | 4000 | 1503 | 753 | 378 | 191 | 97 |
| 12 | 3 | 2 | 4243 | 1594 | 798 | 401 | 202 | 102 |
| 10 | 16 | 9 | 4216 | 1584 | 794 | 398 | 201 | 102 |
| 10 | 4 | 3 | 3651 | 1372 | 688 | 345 | 174 | 89 |
| 10 | 3 | 2 | 3873 | 1455 | 729 | 366 | 185 | 94 |
| 8 | 16 | 9 | 3771 | 1417 | 710 | 357 | 180 | 91 |
| 8 | 4 | 3 | 3266 | 1228 | 615 | 309 | 156 | 80 |
| 8 | 3 | 2 | 3464 | 1302 | 653 | 328 | 165 | 84 |

8.3.3.7.10.1.7 ISS ISP ISIF Bandwidth Requirements on BL Read Port

See [Section 8.3.3.7.18.2](#) for details.

8.3.3.7.11 ISS ISP ISIF White Balance

[Figure 8-223](#) shows the white balance block diagram.

Figure 8-223. ISS ISP ISIF White Balance Block Diagram

Color pattern settings are set through the [ISIF_CCOLP](#) register. Moreover, through this register the pixel position from 0 to 3 can be set to the needed Bayer universal camera filter color pattern (RGB/CYGM).

The CFA pattern can be in two modes, stripe or mosaic, and is set through the [ISIF_CGAMMAWD\[5\]](#) CFAP bit.

There are color-dependent gain controls for the three outputs: BL output, IPIPEIF (IPIPE path) output, and IPIPEIF (H3A path) output. Gain applied to each data is selected according to the pixel position and the color pattern settings. Gain factors are common for the three data paths. Gain is in U11Q9 format, which ranges from 0 to 3 + 511/512. The gain factor is set through the following registers:

- R/Ye gain: [ISIF_CRGAIN\[11:0\]](#) CGR
- Gr/Cy gain: [ISIF_CGRGAIN\[11:0\]](#) CGGR
- Gb/Cy gain: [ISIF_CGBGAIN\[11:0\]](#) CGGB
- B/Mg gain: [ISIF_CBGAIN\[11:0\]](#) CGB

Gain control can be enabled or disabled individually for each path.

- Enable or disable gain for the BL path: [ISIF_CGAMMAWD\[12\]](#) WBEN0.
- Enable or disable gain for the IPIPEIF (IPIPE) path: [ISIF_CGAMMAWD\[13\]](#) WBEN1.
- Enable or disable gain for the IPIPEIF (H3A) path: [ISIF_CGAMMAWD\[14\]](#) WBEN2.

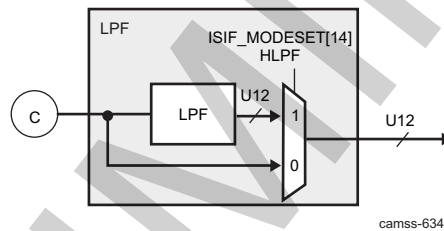
After the gain control, a single offset value can be added to each path individually. This offset is common for the three paths and is set through the [ISIF_COFFSTA\[11:0\]](#) COFT bit field. The offset value is U12, which ranges from 0 to 4095. Data (S13) are then truncated to U12.

- Enable or disable offset for the BL path: [ISIF_CGAMMAWD\[8\]](#) OFSTEN0.
- Enable or disable offset for the IPIPEIF (IPIPE) path: [ISIF_CGAMMAWD\[9\]](#) OFSTEN1.
- Enable or disable offset for the IPIPEIF (H3A) path: [ISIF_CGAMMAWD\[10\]](#) OFSTEN2.

8.3.3.7.12 ISS ISP ISIF Low-Pass Filter (LPF)

Figure 8-224 shows the low-pass filter block diagram.

Figure 8-224. ISS ISP ISIF Low-Pass Filter Block Diagram



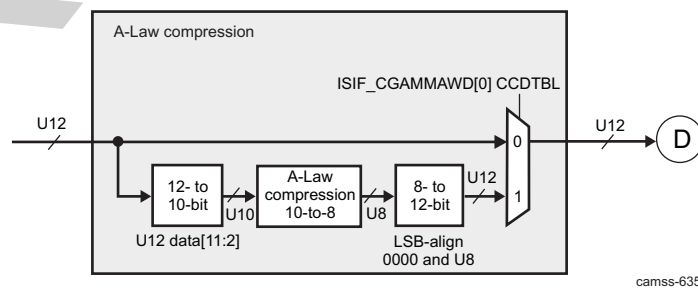
An optional horizontal low-pass anti-aliasing filter (LPF) can be applied (the [ISIF_MODESET\[14\]](#) HLPF bit) after reframing. The low-pass filter consists of a simple 3-tap (1/4, 1/2, and 1/4) filter. Two pixels on the left and two pixels on the right of each line are cropped if the filter is enabled. Use of the LPF is intended for bandwidth reduction if culling is enabled.

NOTE: For YUV data, the LPF must be disabled ([ISIF_MODESET\[14\]](#) HLPF = 0x0).

8.3.3.7.13 ISS ISP ISIF A-Law Compression

Figure 8-225 shows the A-Law compression block diagram.

Figure 8-225. ISS ISP ISIF A-Law Compression Block Diagram



An optional 10-to-8-bit A-Law compression using a fixed A-Law table can be applied ([ISIF_CGAMMAWD\[0\] CCDTBL](#)) as the final processing stage. Using this compression causes the data width to be reduced to 8 bits and allows packing to 8 bits/pixel when saving to memory. Because data resolution can be greater than 10 bits at this stage, the 10 bits for input to the A-Law operation must be selected ([ISIF_CGAMMAWD\[4:1\] GWDI](#)).

The IPIPEIF module has an inverse A-Law table (A-Law decompression) option so that this nonlinear operation can be reversed if this saved data is to be read back in for further processing.

NOTE: Do not use A-Law compression ([ISIF_CGAMMAWD\[0\] CCDTBL = 0](#)) with YUV data.

[Figure 8-226](#) shows the A-Law table diagram, and [Figure 8-227](#) shows the A-Law table values.

Figure 8-226. ISS ISP ISIF A-Law Table Diagram

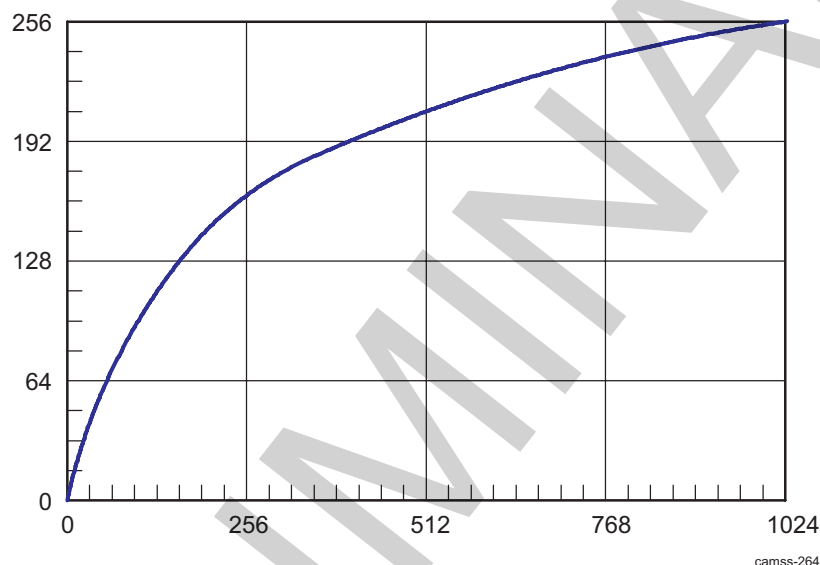


Figure 8-227. ISS ISP ISIF A-Law Table Values

| Input | A-Law | Input | A-Law | Input | A-Law | Input | A-Law | Input | A-Law | Input | A-Law | Input | A-Law | Input | A-Law |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0 | 64 | 64 | 128 | 112 | 192 | 140 | 256 | 161 | 320 | 176 | 384 | 189 | 448 | 200 |
| 1 | 1 | 65 | 65 | 129 | 113 | 193 | 141 | 257 | 161 | 321 | 176 | 385 | 189 | 449 | 200 |
| 2 | 2 | 66 | 66 | 130 | 113 | 194 | 141 | 258 | 161 | 322 | 177 | 386 | 189 | 450 | 200 |
| 3 | 3 | 67 | 67 | 131 | 114 | 195 | 142 | 259 | 161 | 323 | 177 | 387 | 189 | 451 | 200 |
| 4 | 4 | 68 | 68 | 132 | 114 | 196 | 142 | 260 | 162 | 324 | 177 | 388 | 190 | 452 | 200 |
| 5 | 5 | 69 | 69 | 133 | 115 | 197 | 142 | 261 | 162 | 325 | 177 | 389 | 190 | 453 | 200 |
| 6 | 6 | 70 | 70 | 134 | 115 | 198 | 143 | 262 | 162 | 326 | 177 | 390 | 190 | 454 | 201 |
| 7 | 7 | 71 | 71 | 135 | 116 | 199 | 143 | 263 | 162 | 327 | 178 | 391 | 190 | 455 | 201 |
| 8 | 8 | 72 | 72 | 136 | 116 | 200 | 143 | 264 | 163 | 328 | 178 | 392 | 190 | 456 | 201 |
| 9 | 9 | 73 | 73 | 137 | 117 | 201 | 144 | 265 | 163 | 329 | 178 | 393 | 190 | 457 | 201 |
| 10 | 10 | 74 | 74 | 138 | 117 | 202 | 144 | 266 | 163 | 330 | 178 | 394 | 191 | 458 | 201 |
| 11 | 11 | 75 | 75 | 139 | 118 | 203 | 144 | 267 | 163 | 331 | 178 | 395 | 191 | 459 | 201 |
| 12 | 12 | 76 | 76 | 140 | 118 | 204 | 145 | 268 | 164 | 332 | 179 | 396 | 191 | 460 | 201 |
| 13 | 13 | 77 | 77 | 141 | 119 | 205 | 145 | 269 | 164 | 333 | 179 | 397 | 191 | 461 | 202 |
| 14 | 14 | 78 | 78 | 142 | 119 | 206 | 145 | 270 | 164 | 334 | 179 | 398 | 191 | 462 | 202 |
| 15 | 15 | 79 | 78 | 143 | 120 | 207 | 146 | 271 | 164 | 335 | 179 | 399 | 191 | 463 | 202 |
| 16 | 16 | 80 | 79 | 144 | 120 | 208 | 146 | 272 | 165 | 336 | 179 | 400 | 192 | 464 | 202 |
| 17 | 17 | 81 | 80 | 145 | 121 | 209 | 146 | 273 | 165 | 337 | 180 | 401 | 192 | 465 | 202 |
| 18 | 18 | 82 | 81 | 146 | 121 | 210 | 147 | 274 | 165 | 338 | 180 | 402 | 192 | 466 | 202 |
| 19 | 19 | 83 | 82 | 147 | 122 | 211 | 147 | 275 | 166 | 339 | 180 | 403 | 192 | 467 | 202 |
| 20 | 20 | 84 | 83 | 148 | 122 | 212 | 147 | 276 | 166 | 340 | 180 | 404 | 192 | 468 | 203 |
| 21 | 21 | 85 | 84 | 149 | 123 | 213 | 148 | 277 | 166 | 341 | 181 | 405 | 193 | 469 | 203 |
| 22 | 22 | 86 | 84 | 150 | 123 | 214 | 148 | 278 | 166 | 342 | 181 | 406 | 193 | 470 | 203 |
| 23 | 23 | 87 | 85 | 151 | 124 | 215 | 148 | 279 | 167 | 343 | 181 | 407 | 193 | 471 | 203 |
| 24 | 24 | 88 | 86 | 152 | 124 | 216 | 149 | 280 | 167 | 344 | 181 | 408 | 193 | 472 | 203 |
| 25 | 25 | 89 | 87 | 153 | 125 | 217 | 149 | 281 | 167 | 345 | 181 | 409 | 193 | 473 | 203 |
| 26 | 26 | 90 | 88 | 154 | 125 | 218 | 149 | 282 | 167 | 346 | 182 | 410 | 193 | 474 | 204 |
| 27 | 27 | 91 | 88 | 155 | 125 | 219 | 150 | 283 | 168 | 347 | 182 | 411 | 194 | 475 | 204 |
| 28 | 28 | 92 | 89 | 156 | 126 | 220 | 150 | 284 | 168 | 348 | 182 | 412 | 194 | 476 | 204 |
| 29 | 29 | 93 | 90 | 157 | 126 | 221 | 150 | 285 | 168 | 349 | 182 | 413 | 194 | 477 | 204 |
| 30 | 30 | 94 | 91 | 158 | 127 | 222 | 151 | 286 | 168 | 350 | 182 | 414 | 194 | 478 | 204 |
| 31 | 31 | 95 | 91 | 159 | 127 | 223 | 151 | 287 | 168 | 351 | 183 | 415 | 194 | 479 | 204 |
| 32 | 32 | 96 | 92 | 160 | 128 | 224 | 151 | 288 | 169 | 352 | 183 | 416 | 194 | 480 | 204 |
| 33 | 33 | 97 | 93 | 161 | 128 | 225 | 152 | 289 | 169 | 353 | 183 | 417 | 195 | 481 | 205 |
| 34 | 34 | 98 | 93 | 162 | 129 | 226 | 152 | 290 | 169 | 354 | 183 | 418 | 195 | 482 | 205 |
| 35 | 35 | 99 | 94 | 163 | 129 | 227 | 152 | 291 | 169 | 355 | 183 | 419 | 195 | 483 | 205 |
| 36 | 36 | 100 | 95 | 164 | 129 | 228 | 152 | 292 | 170 | 356 | 184 | 420 | 195 | 484 | 205 |
| 37 | 37 | 101 | 96 | 165 | 130 | 229 | 153 | 293 | 170 | 357 | 184 | 421 | 195 | 485 | 205 |
| 38 | 38 | 102 | 96 | 166 | 130 | 230 | 153 | 294 | 170 | 358 | 184 | 422 | 195 | 486 | 205 |
| 39 | 39 | 103 | 97 | 167 | 131 | 231 | 153 | 295 | 170 | 359 | 184 | 423 | 196 | 487 | 205 |
| 40 | 40 | 104 | 98 | 168 | 131 | 232 | 154 | 296 | 171 | 360 | 184 | 424 | 196 | 488 | 206 |
| 41 | 41 | 105 | 98 | 169 | 132 | 233 | 154 | 297 | 171 | 361 | 185 | 425 | 196 | 489 | 206 |
| 42 | 42 | 106 | 99 | 170 | 132 | 234 | 154 | 298 | 171 | 362 | 185 | 426 | 196 | 490 | 206 |
| 43 | 43 | 107 | 100 | 171 | 132 | 235 | 155 | 299 | 171 | 363 | 185 | 427 | 196 | 491 | 206 |
| 44 | 44 | 108 | 100 | 172 | 133 | 236 | 155 | 300 | 172 | 364 | 185 | 428 | 196 | 492 | 206 |
| 45 | 45 | 109 | 101 | 173 | 133 | 237 | 155 | 301 | 172 | 365 | 185 | 429 | 197 | 493 | 206 |
| 46 | 46 | 110 | 102 | 174 | 134 | 238 | 155 | 302 | 172 | 366 | 185 | 430 | 197 | 494 | 206 |
| 47 | 47 | 111 | 102 | 175 | 134 | 239 | 156 | 303 | 172 | 367 | 186 | 431 | 197 | 495 | 207 |
| 48 | 48 | 112 | 103 | 176 | 134 | 240 | 156 | 304 | 173 | 368 | 186 | 432 | 197 | 496 | 207 |
| 49 | 49 | 113 | 103 | 177 | 135 | 241 | 156 | 305 | 173 | 369 | 186 | 433 | 197 | 497 | 207 |
| 50 | 50 | 114 | 104 | 178 | 135 | 242 | 157 | 306 | 173 | 370 | 186 | 434 | 197 | 498 | 207 |
| 51 | 51 | 115 | 105 | 179 | 136 | 243 | 157 | 307 | 173 | 371 | 186 | 435 | 198 | 499 | 207 |
| 52 | 52 | 116 | 105 | 180 | 136 | 244 | 157 | 308 | 173 | 372 | 187 | 436 | 198 | 500 | 207 |
| 53 | 53 | 117 | 106 | 181 | 136 | 245 | 157 | 309 | 174 | 373 | 187 | 437 | 198 | 501 | 207 |
| 54 | 54 | 118 | 106 | 182 | 137 | 246 | 158 | 310 | 174 | 374 | 187 | 438 | 198 | 502 | 208 |
| 55 | 55 | 119 | 107 | 183 | 137 | 247 | 158 | 311 | 174 | 375 | 187 | 439 | 198 | 503 | 208 |
| 56 | 56 | 120 | 108 | 184 | 137 | 248 | 158 | 312 | 174 | 376 | 187 | 440 | 198 | 504 | 208 |
| 57 | 57 | 121 | 108 | 185 | 138 | 249 | 159 | 313 | 175 | 377 | 188 | 441 | 198 | 505 | 208 |
| 58 | 58 | 122 | 109 | 186 | 138 | 250 | 159 | 314 | 175 | 378 | 188 | 442 | 199 | 506 | 208 |
| 59 | 59 | 123 | 109 | 187 | 139 | 251 | 159 | 315 | 175 | 379 | 188 | 443 | 199 | 507 | 208 |
| 60 | 60 | 124 | 110 | 188 | 139 | 252 | 159 | 316 | 175 | 380 | 188 | 444 | 199 | 508 | 208 |
| 61 | 61 | 125 | 110 | 189 | 139 | 253 | 160 | 317 | 175 | 381 | 188 | 445 | 199 | 509 | 208 |
| 62 | 62 | 126 | 111 | 190 | 140 | 254 | 160 | 318 | 176 | 382 | 188 | 446 | 199 | 510 | 209 |
| 63 | 63 | 127 | 112 | 191 | 140 | 255 | 160 | 319 | 176 | 383 | 189 | 447 | 199 | 511 | 209 |

camss-262

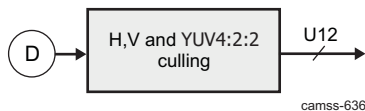
| Input | A-Law | Input | A-Law | Input | A-Law | Input | A-Law | Input | A-Law | Input | A-Law | Input | A-Law | Input | A-Law |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 512 | 209 | 576 | 217 | 640 | 224 | 704 | 231 | 768 | 237 | 832 | 243 | 896 | 248 | 960 | 253 |
| 513 | 209 | 577 | 217 | 641 | 225 | 705 | 231 | 769 | 237 | 833 | 243 | 897 | 248 | 961 | 253 |
| 514 | 209 | 578 | 217 | 642 | 225 | 706 | 231 | 770 | 237 | 834 | 243 | 898 | 248 | 962 | 253 |
| 515 | 209 | 579 | 217 | 643 | 225 | 707 | 231 | 771 | 237 | 835 | 243 | 899 | 248 | 963 | 253 |
| 516 | 209 | 580 | 218 | 644 | 225 | 708 | 232 | 772 | 238 | 836 | 243 | 900 | 248 | 964 | 253 |
| 517 | 210 | 581 | 218 | 645 | 225 | 709 | 232 | 773 | 238 | 837 | 243 | 901 | 248 | 965 | 253 |
| 518 | 210 | 582 | 218 | 646 | 225 | 710 | 232 | 774 | 238 | 838 | 243 | 902 | 248 | 966 | 253 |
| 519 | 210 | 583 | 218 | 647 | 225 | 711 | 232 | 775 | 238 | 839 | 243 | 903 | 249 | 967 | 253 |
| 520 | 210 | 584 | 218 | 648 | 225 | 712 | 232 | 776 | 238 | 840 | 243 | 904 | 249 | 968 | 253 |
| 521 | 210 | 585 | 218 | 649 | 225 | 713 | 232 | 777 | 238 | 841 | 244 | 905 | 249 | 969 | 253 |
| 522 | 210 | 586 | 218 | 650 | 226 | 714 | 232 | 778 | 238 | 842 | 244 | 906 | 249 | 970 | 254 |
| 523 | 210 | 587 | 218 | 651 | 226 | 715 | 232 | 779 | 238 | 843 | 244 | 907 | 249 | 971 | 254 |
| 524 | 211 | 588 | 219 | 652 | 226 | 716 | 232 | 780 | 238 | 844 | 244 | 908 | 249 | 972 | 254 |
| 525 | 211 | 589 | 219 | 653 | 226 | 717 | 232 | 781 | 238 | 845 | 244 | 909 | 249 | 973 | 254 |
| 526 | 211 | 590 | 219 | 654 | 226 | 718 | 233 | 782 | 238 | 846 | 244 | 910 | 249 | 974 | 254 |
| 527 | 211 | 591 | 219 | 655 | 226 | 719 | 233 | 783 | 239 | 847 | 244 | 911 | 249 | 975 | 254 |
| 528 | 211 | 592 | 219 | 656 | 226 | 720 | 233 | 784 | 239 | 848 | 244 | 912 | 249 | 976 | 254 |
| 529 | 211 | 593 | 219 | 657 | 226 | 721 | 233 | 785 | 239 | 849 | 244 | 913 | 249 | 977 | 254 |
| 530 | 211 | 594 | 219 | 658 | 226 | 722 | 233 | 786 | 239 | 850 | 244 | 914 | 249 | 978 | 254 |
| 531 | 211 | 595 | 219 | 659 | 227 | 723 | 233 | 787 | 239 | 851 | 244 | 915 | 249 | 979 | 254 |
| 532 | 212 | 596 | 220 | 660 | 227 | 724 | 233 | 788 | 239 | 852 | 244 | 916 | 250 | 980 | 254 |
| 533 | 212 | 597 | 220 | 661 | 227 | 725 | 233 | 789 | 239 | 853 | 245 | 917 | 250 | 981 | 254 |
| 534 | 212 | 598 | 220 | 662 | 227 | 726 | 233 | 790 | 239 | 854 | 245 | 918 | 250 | 982 | 254 |
| 535 | 212 | 599 | 220 | 663 | 227 | 727 | 233 | 791 | 239 | 855 | 245 | 919 | 250 | 983 | 254 |
| 536 | 212 | 600 | 220 | 664 | 227 | 728 | 233 | 792 | 239 | 856 | 245 | 920 | 250 | 984 | 255 |
| 537 | 212 | 601 | 220 | 665 | 227 | 729 | 234 | 793 | 239 | 857 | 245 | 921 | 250 | 985 | 255 |
| 538 | 212 | 602 | 220 | 666 | 227 | 730 | 234 | 794 | 240 | 858 | 245 | 922 | 250 | 986 | 255 |
| 539 | 212 | 603 | 220 | 667 | 227 | 731 | 234 | 795 | 240 | 859 | 245 | 923 | 250 | 987 | 255 |
| 540 | 213 | 604 | 220 | 668 | 227 | 732 | 234 | 796 | 240 | 860 | 245 | 924 | 250 | 988 | 255 |
| 541 | 213 | 605 | 221 | 669 | 228 | 733 | 234 | 797 | 240 | 861 | 245 | 925 | 250 | 989 | 255 |
| 542 | 213 | 606 | 221 | 670 | 228 | 734 | 234 | 798 | 240 | 862 | 245 | 926 | 250 | 990 | 255 |
| 543 | 213 | 607 | 221 | 671 | 228 | 735 | 234 | 799 | 240 | 863 | 245 | 927 | 250 | 991 | 255 |
| 544 | 213 | 608 | 221 | 672 | 228 | 736 | 234 | 800 | 240 | 864 | 245 | 928 | 250 | 992 | 255 |
| 545 | 213 | 609 | 221 | 673 | 228 | 737 | 234 | 801 | 240 | 865 | 246 | 929 | 250 | 993 | 255 |
| 546 | 213 | 610 | 221 | 674 | 228 | 738 | 234 | 802 | 240 | 866 | 246 | 930 | 251 | 994 | 255 |
| 547 | 214 | 611 | 221 | 675 | 228 | 739 | 235 | 803 | 240 | 867 | 246 | 931 | 251 | 995 | 255 |
| 548 | 214 | 612 | 221 | 676 | 228 | 740 | 235 | 804 | 240 | 868 | 246 | 932 | 251 | 996 | 255 |
| 549 | 214 | 613 | 221 | 677 | 228 | 741 | 235 | 805 | 240 | 869 | 246 | 933 | 251 | 997 | 255 |
| 550 | 214 | 614 | 222 | 678 | 229 | 742 | 235 | 806 | 241 | 870 | 246 | 934 | 251 | 998 | 255 |
| 551 | 214 | 615 | 222 | 679 | 229 | 743 | 235 | 807 | 241 | 871 | 246 | 935 | 251 | 999 | 255 |
| 552 | 214 | 616 | 222 | 680 | 229 | 744 | 235 | 808 | 241 | 872 | 246 | 936 | 251 | 1000 | 255 |
| 553 | 214 | 617 | 222 | 681 | 229 | 745 | 235 | 809 | 241 | 873 | 246 | 937 | 251 | 1001 | 255 |
| 554 | 214 | 618 | 222 | 682 | 229 | 746 | 235 | 810 | 241 | 874 | 246 | 938 | 251 | 1002 | 255 |
| 555 | 215 | 619 | 222 | 683 | 229 | 747 | 235 | 811 | 241 | 875 | 246 | 939 | 251 | 1003 | 255 |
| 556 | 215 | 620 | 222 | 684 | 229 | 748 | 235 | 812 | 241 | 876 | 246 | 940 | 251 | 1004 | 255 |
| 557 | 215 | 621 | 222 | 685 | 229 | 749 | 235 | 813 | 241 | 877 | 246 | 941 | 251 | 1005 | 255 |
| 558 | 215 | 622 | 222 | 686 | 229 | 750 | 236 | 814 | 241 | 878 | 247 | 942 | 251 | 1006 | 255 |
| 559 | 215 | 623 | 223 | 687 | 229 | 751 | 236 | 815 | 241 | 879 | 247 | 943 | 252 | 1007 | 255 |
| 560 | 215 | 624 | 223 | 688 | 230 | 752 | 236 | 816 | 241 | 880 | 247 | 944 | 252 | 1008 | 255 |
| 561 | 215 | 625 | 223 | 689 | 230 | 753 | 236 | 817 | 242 | 881 | 247 | 945 | 252 | 1009 | 255 |
| 562 | 215 | 626 | 223 | 690 | 230 | 754 | 236 | 818 | 242 | 882 | 247 | 946 | 252 | 1010 | 255 |
| 563 | 216 | 627 | 223 | 691 | 230 | 755 | 236 | 819 | 242 | 883 | 247 | 947 | 252 | 1011 | 255 |
| 564 | 216 | 628 | 223 | 692 | 230 | 756 | 236 | 820 | 242 | 884 | 247 | 948 | 252 | 1012 | 255 |
| 565 | 216 | 629 | 223 | 693 | 230 | 757 | 236 | 821 | 242 | 885 | 247 | 949 | 252 | 1013 | 255 |
| 566 | 216 | 630 | 223 | 694 | 230 | 758 | 236 | 822 | 242 | 886 | 247 | 950 | 252 | 1014 | 255 |
| 567 | 216 | 631 | 223 | 695 | 230 | 759 | 236 | 823 | 242 | 887 | 247 | 951 | 252 | 1015 | 255 |
| 568 | 216 | 632 | 224 | 696 | 230 | 760 | 236 | 824 | 242 | 888 | 247 | 952 | 252 | 1016 | 255 |
| 569 | 216 | 633 | 224 | 697 | 230 | 761 | 237 | 825 | 242 | 889 | 247 | 953 | 252 | 1017 | 255 |
| 570 | 216 | 634 | 224 | 698 | 231 | 762 | 237 | 826 | 242 | 890 | 247 | 954 | 252 | 1018 | 255 |
| 571 | 217 | 635 | 224 | 699 | 231 | 763 | 237 | 827 | 242 | 891 | 248 | 955 | 252 | 1019 | 255 |
| 572 | 217 | 636 | 224 | 700 | 231 | 764 | 237 | 828 | 242 | 892 | 248 | 956 | 252 | 1020 | 255 |
| 573 | 217 | 637 | 224 | 701 | 231 | 765 | 237 | 829 | 243 | 893 | 248 | 957 | 253 | 1021 | 255 |
| 574 | 217 | 638 | 224 | 702 | 231 | 766 | 237 | 830 | 243 | 894 | 248 | 958 | 253 | 1022 | 255 |
| 575 | 217 | 639 | 224 | 703 | 231 | 767 | 237 | 831 | 243 | 895 | 248 | 959 | 253 | 1023 | 255 |

camss-263

8.3.3.7.14 ISS ISP ISIF Culling

Figure 8-228 shows the culling block diagram.

Figure 8-228. ISS ISP ISIF Culling Block Diagram



The culling block performs a programmable decimation function for horizontal, vertical, and YUV4:2:2 data directions. The horizontal and vertical decimation of image data can be controlled by two registers.

The horizontal culling operation allows selected pixel data to be culled (deleted) from a line. The **ISIF_CULH** register specifies the horizontal culling pattern for even and odd lines:

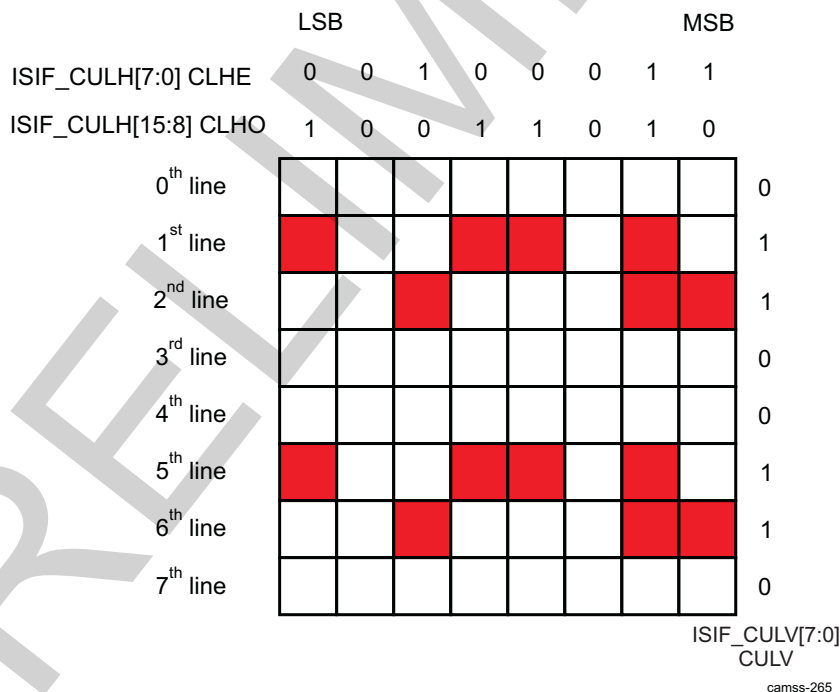
- Even lines: **ISIF_CULH**[15:8] CLHE
- Odd lines: **ISIF_CULH**[16:0] CLHO

The vertical culling operation allows selected lines to be culled from a frame. The **ISIF_CULV** register specifies the pattern for the vertical direction. The LSBs of CULV represent the top line of the CCD; the MSB is the seventh line.

Figure 8-229 is an example of how register values apply the decimation pattern to the data. The red pixels are saved to memory and the white pixels are discarded. In this example, **CULH** = 0x59C4 and **CULV** = 0x0066.

NOTE: Culling can be used with YUV data, but care must be taken to preserve the YUV4:2:2 output format.

Figure 8-229. ISS ISP ISIF Example for Decimation Pattern



8.3.3.7.15 ISS ISP ISIF 12-to-8 bit DCPM Compression Block

In ISIF, there is a DPCM compression block, which is between the culling module and the storage formatter module. This block can compress 12-bit image data to 8 bits for bandwidth reduction in transmission between the ISIF and SDRAM. An 8- to-12-bit DPCM decoder at the IPIPEIF decompresses data for IPIPE processing.

Two different predictors are used for the compression system. The first predictor is simple (simple predictor), and the second predictor is slightly more complex (advanced predictor). Because the advanced predictor gives a slightly better prediction for the pixel value, the image quality can be improved using it. Because the simple predictor is very simple, the processing power and memory requirements are reduced using it, when the image quality is already sufficiently high.

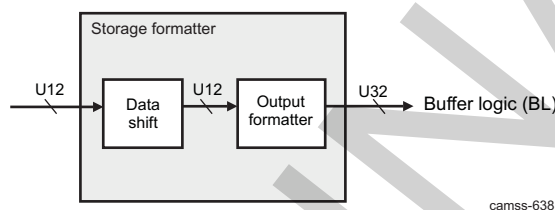
- Advanced predictor: This predictor uses only the previous same color component value as a prediction value. Therefore, only 2-pixel memory is required.
- This predictor uses four previous pixel values when the prediction value is evaluated. This means that the other color component values are also used when the prediction value has been defined.

The function is controlled from the [ISIF_MISC\[12\] DPCMEN](#) and [ISIF_MISC\[13\] DPCMPRE](#) bits.

8.3.3.7.16 ISP ISIF Storage Formatter

[Figure 8-230](#) shows the storage formatter block diagram.

Figure 8-230. ISS ISP ISIF Storage Formatter Block Diagram



Data are stored to the lower bits of a 16-bit SDRAM word, or can be 8- or 12-bit packed. The [ISIF_HSIZE\[11:0\]](#) HSIZE bit field can specify the memory address offsets between lines of memory (offset in 32-byte units). If set, the [ISIF_HSIZE\[12\]](#) ADCR bit can decrement the memory address line and the line can be horizontally flipped in memory.

In case of RAW data, a data shift module is used: data to be stored can be right-shifted according to the value set at the [ISIF_MODESET\[10:8\]](#) CCDW bit field, as described in [Table 8-346](#).

Table 8-346. ISS ISP ISIF RAW Data Shifting

| ISIF_MODESET[10:8] CCDW | Output Format | |
|-------------------------|-------------------------|-----|
| | MSB | LSB |
| 000 | 0000 U12 data[11:0] | |
| 001 | 00000 U12 data[11:1] | |
| 010 | 000000 U12 data[11:2] | |
| 011 | 0000000 U12 data[11:3] | |
| 100 | 00000000 U12 data[11:4] | |

Table 8-347 shows the format where data are stored to the lower bits of a 16-bit word and the format where data are packed to 8 bits. The unused bits are filled with zeros.

Table 8-347. ISS ISP ISIF SDRAM Data Format

| | Upper Word | | Lower Word | |
|--------------|-----------------|---------|-----------------|--------|
| | MSB(31) | LSB(16) | MSB(15) | LSB(0) |
| 12 bit | 0 Pixel 1 | | 0 Pixel 0 | |
| 11 bit | 0 Pixel 1 | | 0 Pixel 0 | |
| 10 bit | 0 Pixel 1 | | 0 Pixel 0 | |
| 9 bit | 0 Pixel 1 | | 0 Pixel 0 | |
| 8 bit | 0 Pixel 1 | | 0 Pixel 0 | |
| 8-bit packed | Pixel 3 Pixel 2 | | Pixel 1 Pixel 0 | |

Table 8-348 shows the format where data are packed to 12 bits.

Table 8-348. ISS ISP ISIF SDRAM Data Format for 12-bit Packed

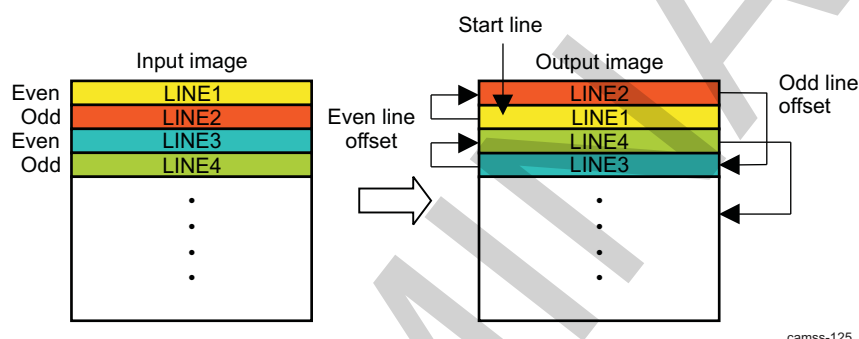
| | Upper Word | | Lower Word | |
|--------|--------------------|---------|---------------------|--------|
| | MSB(31) | LSB(16) | MSB(15) | LSB(0) |
| 12 bit | Pixel2[7:0] Pixel1 | | Pixel 0 | |
| | Pixel5[3:0] Pixel4 | | Pixel3 Pixel2[11:8] | |
| | Pixel7 Pixel6 | | Pixel5[11:4] | |

In case of YUV, YUV data is stored in memory in packed YUV4:2:2 mode, using 2 pixels per 32 bits, as shown in [Table 8-349](#).

The output formatter can configure to any image format by using the SDRAM line offset register and offset control registers. [Figure 8-231](#) shows how to construct a frame format in SDRAM. The `ISIF_CADU[10:0]` CADU bit field specifies the memory destination (upper 11 bits) to SDRAM (the address is the value of the set bit multiplied by 32 bytes). On the other hand, the `ISIF_CADL[15:0]` CADL bit field sets the memory destination to SDRAM (lower 16 bits) (the address is the value of the set bit multiplied by 32 bytes).

- [ISIF_SPH](#)
- [ISIF_LNH](#)
- [ISIF_SLV0](#)
- [ISIF_SLV1](#)
- [ISIF_LNV](#)

Figure 8-231. ISS ISP ISIF Frame Image Format Conversion



8.3.3.7.17 ISS ISP ISIF YCbCr signal Processing

The ISIF accepts 4:2:2 sampled YCbCr input data. The luminance and color difference signals are 8 bits each, scaled 0 to 255. The color difference signals are multiplexed into one 8-bit bus beginning with a Cb sample. The Y and CbCr buses can be input parallel (16-bit mode) or be time-multiplexed and input as a single bus (8-bit mode).

The 16- or 8-bit YCbCr data is stored in SDRAM as 4:2:2 format. [Table 8-349](#) lists the data format in SDRAM. Y data typically has a range of 16 to 235; however, it is possible to subtract a DC value from the Y signal.

Table 8-349. ISS ISP ISIF Memory Output Format for YUV Data

| Memory Address | Upper Word | | Lower Word | |
|----------------|------------|---------|------------|--------|
| | MSB(31) | LSB(16) | MSB(15) | LSB(0) |
| N | Y1 | Cr0 | Y0 | Cb0 |
| N + 1 | Y3 | Cr1 | Y2 | Cb1 |
| N + 2 | Y5 | Cr2 | Y4 | Cb2 |

8.3.3.7.18 ISS ISP ISIF Expected Bandwidth on BL Ports

The ISIF module has a write port and a read port connected to the BL. This section summarizes the expected bandwidth on these ports.

8.3.3.7.18.1 ISS ISP ISIF Write Port

The write port is used to write pixels to memory after the data have passed through the storage formatter. Data storage to SDRAM is controlled by the `ISIF_SYNCEN[1]` DWEN bit. The module allows writing the data as 16, 12, and 8 bits per pixel. The bit width is controlled by the `ISIF_CCDCFG[1:0]` SDRPACK bit field.

The write port generates a burst of 32 bytes on the MTC interface. The delay between consecutive bursts is proportional to the input pixel clock. Hence, the write port does not request peak bandwidth traffic.

Table 8-350 lists the estimated delay between 32-byte MTC requests for different pixel clock frequencies and assumes the L3 clock is 200 MHz.

Table 8-350. ISP ISIF ISIF Module: Write Port Bandwidth

| Pixel Clock | Maximum Bandwidth 2 bytes/s pixel MB/s | Expected Delay Between MTC Requests |
|-------------|--|--|
| 200 | 400 | 16 cycles = 80 ns |
| 100 | 200 | 32 cycles = 160 ns |
| 10 | 20 | 320 cycles = 1600 ns |

8.3.3.7.18.2 ISS ISP ISIF Read Port

The read port is used to read gain and offset data from SDRAM required for the LSC computation. When LSC is enabled, 8-bit gain values are read and 8-bit offset values can optionally also be read. The LSC gain computation can be enabled or disabled by setting the [ISIF_2DLSCCFG\[0\] ENABLE](#) bit. The LSC offset computation can be enabled by setting the [ISIF_2DLSCOFST\[0\] OFSTEN](#) bit.

The LSC submodule fetches four 8-bit gain values per paxel and optionally four 8-bit offset values per paxel. This is a maximum 8 bytes per paxel.

The bandwidth that is generated by the LSC module is also proportional to the paxel size. The paxel size is set up by the [ISIF_2DLSCCFG\[14:12\] GAIN_MODE_M](#) and [ISIF_2DLSCCFG\[10:8\] GAIN_MODE_N](#) bit fields. The possible values are 8, 16, 32, 64 and 128. Smaller values lead to higher memory bandwidth requirements. Hence, the worst case is achieved by setting an 8 × 8 paxel size.

When the LSC submodule is enabled it automatically prefetches two lines of gain values and two lines of offset values (if this is enabled). When the first VD comes, it again requests one line of gain values and one line of offset values (if this is enabled). Then, it again fetches one line of gain values and one line of offset values (if this is enabled) after [ISIF_2DLSCCFG\[10:8\] GAIN_MODE_N](#) lines. It continues to do so until the last row of paxels. For the last row of paxels, it fetch two lines of gain values and two lines of offset values (if this is enabled), which are used for the following frame.

By default, the LSC submodule creates peak bandwidth requirements. To avoid this, the MTC bandwidth limiter must be used to space the request over time.

The MTC bandwidth limiter must be used to smooth the bandwidth requirements of the LSC module. The MTC bandwidth limiter can be set with the [ISP5_BL_MTC_1.ISIF_R](#) register.

The principle is that instead of reading the gain and offset data as fast as possible, use the time that it takes for [ISIF_2DLSCCFG\[10:8\] GAIN_MODE_N](#) lines to pass through the ISP to read the data.

Table 8-351 gives the estimated delay between 32-byte MTC requests for different pixel clock frequencies and assumes the L3 clock at 200 MHz.

Table 8-351. ISS ISP ISIF Read Port Bandwidth

| Pixel Clock | Max Bandwidth MB/s | Expected Delay Between MTC Requests |
|-------------|-----------------------|-------------------------------------|
| 200 | 25.07 | 255 cycles = 1275 ns |
| 100 | 12.5 | 510 cycles = 2550 ns |
| 10 | 1.25 | 5103 cycles = 2515 ns |

When the bandwidth limiter is used, ensure that there is enough time for the data prefetching.

- The LSC submodule must be enabled at least $2 \times \text{ISIF_2DLSCCFG}[10:8]$ GAIN_MODE_N lines before the first VD.
- There must be at least $\text{ISIF_2DLSCCFG}[10:8]$ GAIN_MODE_N lines of blanking. If there is not enough blanking, multiply the bandwidth requirement by 2 (that is, ensure two lines of gain and offset data can be fetched within the time of $\text{ISIF_2DLSCCFG}[10:8]$ GAIN_MODE_N lines).

8.3.3.7.19 ISS ISP ISIF Events and Status Checking

The ISIF module can generate four different interrupts: VDINT0, VDINT1, VDINT2, and 2DLSCINT. The $\text{ISIF_SYNCEN}[0]$ SYEN bit must be enabled to receive any of the ISIF interrupts.

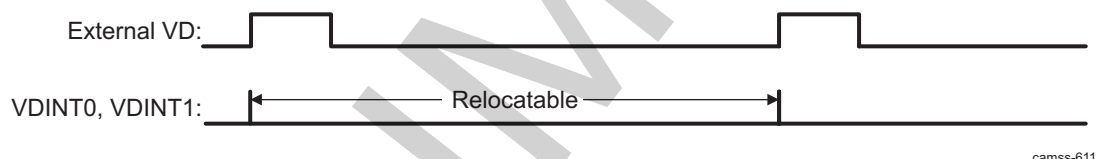
8.3.3.7.19.1 ISS ISP ISIF VDINT0, VDINT1, and VDINT2 Interrupts

As shown in Figure 8-232, the VDINT0, VDINT1, and VDINT2 interrupts occur relative to the VD pulse. The trigger timing is selected by using the $\text{ISIF_MODESET}[2]$ VDPOL bit setting. VDINT0, VDINT1, and VDINT2 occur after receiving the number of horizontal lines (HD pulse signals) set in the $\text{ISIF_VDINT0}[14:0]$ CDV0, $\text{ISIF_VDINT1}[14:0]$ CDV1, and $\text{ISIF_VDINT2}[14:0]$ CDV2 register fields, respectively.

NOTE: In the case of BT.656 input mode, there is a VD at the beginning of each field. Therefore, there are two interrupts for each frame (that is, one for each field).

If the $\text{ISIF_MODESET}[2]$ VDPOL bit is set to 0, the VDINT0, VDINT1, and VDINT2 HD counters begin counting HD pulses from the rising edge of the external VD.

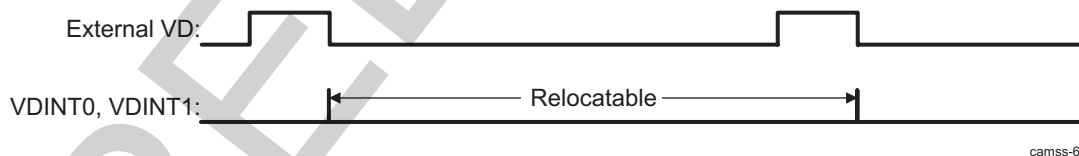
Figure 8-232. ISS ISP ISIF VDINT0/VDINT1/VDINT2 Interrupt Behavior When VDPOL = 0



camss-611

If the $\text{ISIF_MODESET}[2]$ VDPOL bit is set to 1, the VDINT0, VDINT1, and VDINT2 HD counters begin counting HD pulses from the falling edge of the external VD.

Figure 8-233. ISS ISP ISIF VDINT0/VDINT1/VDINT2 Interrupt Behavior When VDPOL = 1



camss-612

8.3.3.7.19.2 ISS ISP ISIF 2DLSCINT Interrupt

See Section 8.3.3.7.10.1.5 for more information.

8.3.3.7.19.3 ISS ISP ISIF Status Checking

The $\text{ISIF_MODESET}[15]$ MDFS bit is set when the field status is on an even field, and it is cleared when the field status is on an odd field.

The 2D-LSC has a register that monitors the status of the LSC. See Section 8.3.3.7.10.1.5 for more information.

8.3.3.8 ISS ISP BL Functional Description

8.3.3.8.1 ISS ISP BL Overview

The BL module arbitrates and merges the memory requests of the ISP master module. The BL module also generates interrupts upon frame completion for the following modules. The interrupt generation is delayed until the transfer completes (ack is returned). The following interrupts are delayed by the BL module:

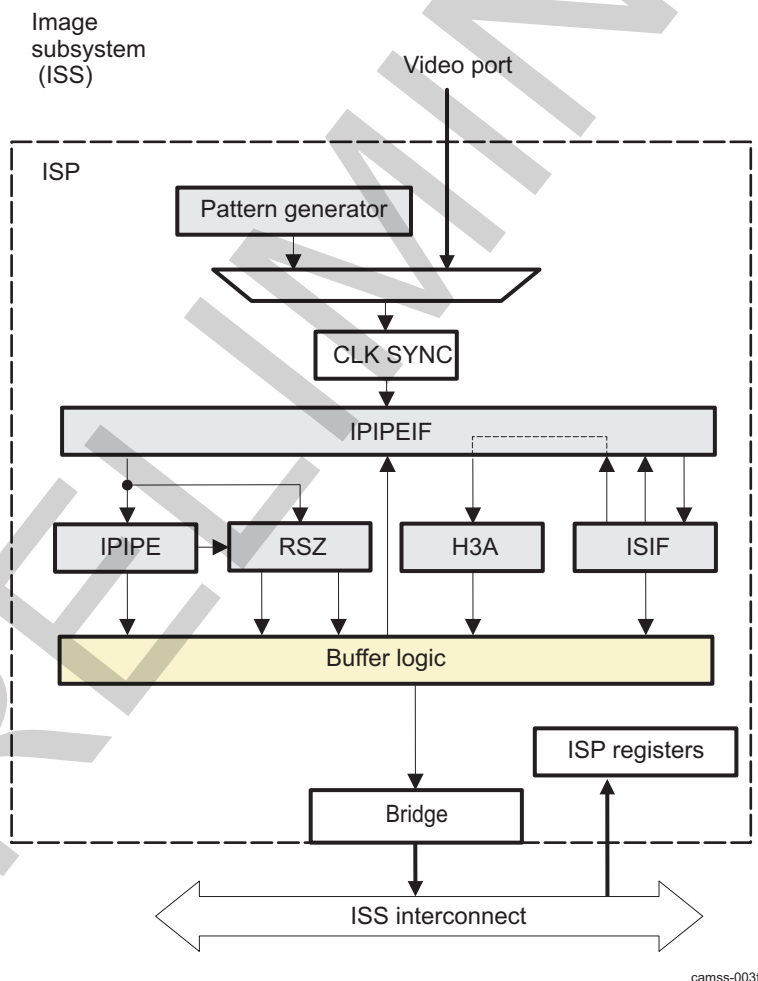
- RSZ module RSZ-A EOF
- RSZ module resizer RSZ-B EOF
- H3A module EOF
- IPIPE module EOF

The BL uses two different types of interfaces:

- MTC protocol is used between the ISP modules and the BL.
- VBUSM is use on the BL master port interface.

Figure 8-234 show the BL module connections to other submodules of the ISP.

Figure 8-234. ISS ISP BL High-Level Diagram



8.3.3.8.2 ISS ISP BL Functional Description

The BL merges the memory requests of the ISP master module to memory (read/write). The BL interfaces with all the ISP modules through a 32-bit-wide bus following.

The ISP modules make memory requests of 32 bytes. Additional signals, SOF for read and EOF for write, are included to deal with boundary conditions in frame transitions.

The BL arbitration is divided into two parts: a bus hog and a fixed priority arbitration. Bus hog refers to the property of the buffer logic that gives higher priority to the module that last sent or received data. RESIZER module MTC write port 0 and RESIZER module MTC write port 1 are excluded from the bus hog.

The buffer logic is to be programmed to maximize the memory bandwidth: it makes maximum burst requests of 128 bytes (8×128 bits) for reads and writes. The BL can generate burst sizes of 2×128 , 4×128 , 6×128 , and 8×128 bits.

NOTE: The ISP interface supports burst sizes of only 1, 2, 4, and 8×128 bits. If the BL generates a 6×128 -bit request, it is broken into a 4×128 -bit request, followed by another 2×128 -bit request.

To use the memory bandwidth efficiently, the BL interfaces with the memory through a high-bandwidth bus (128 bits wide).

The BL handles memory requests for the following modules:

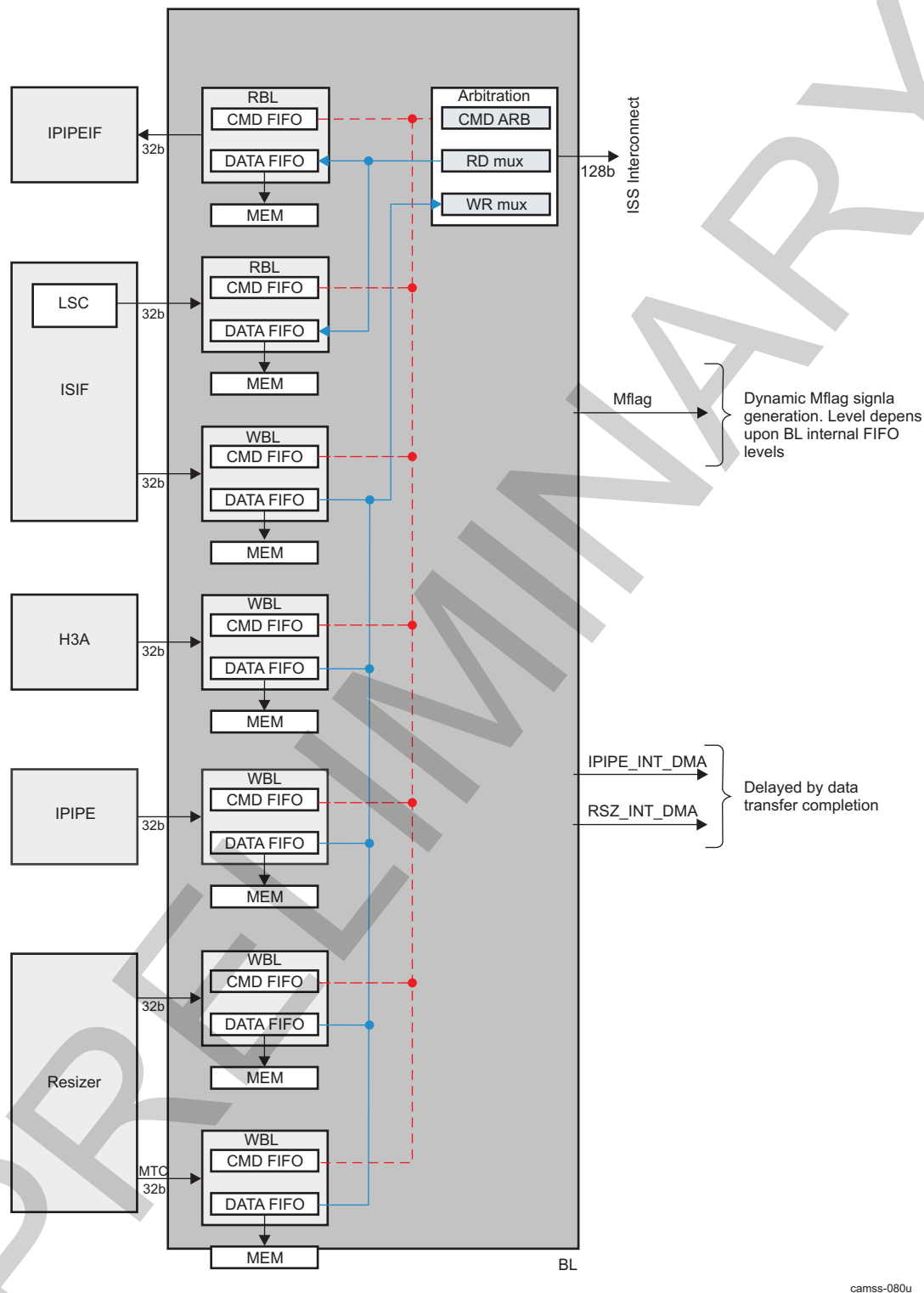
- IPIPEIF module read port
- ISIF-LSC module read port
- ISIF module write port
- IPIPE-BOXCAR module write port
- H3A module write port
- RESIZER module write port 0
- RESIZER module write port 1

From a use case point of view, the following sharing and priority arrangement is used. All reads have higher priority than writes; for reads: IPIPEIF ISIF-LSC, and for writes: ISIF IPIPE-BOXCAR RESIZER 0 RESIZER 1 H3A.

NOTE: BL can generate a static or a dynamic MFlag signal. The MFlag signal is used by the ISS arbitration to consider the urgency of the requests coming from the ISP. The dynamic MFlag feature is enabled from the [ISP5_CTRL\[21\] MFLAG](#) bit.

[Figure 8-235](#) shows the BL top-level block diagram. The figure highlights the two clock domains that are used.

Figure 8-235. ISS ISP BL Block Diagram



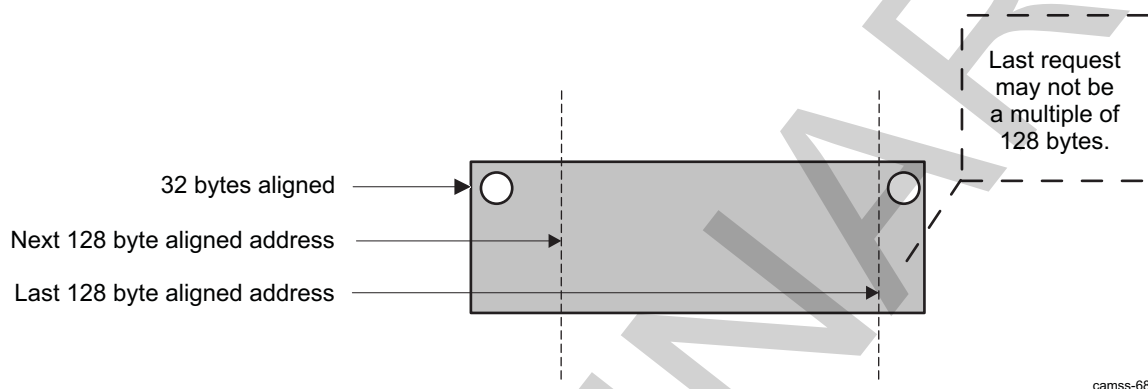
NOTE: The BL module has no registers. The configurations come from the top level of the ISP. See [Table 8-393](#) for register details.

8.3.3.8.3 ISS ISP BL Address Alignment

The BL module ensures maximum memory efficiency by realigning data to a 128-byte address boundary. In all cases, the BL accesses are 32-byte-aligned: address [4:0] is always 0.

This is required when the input address is a multiple of 32 bytes, not 128 bytes. The BL issues a non-aligned burst until it reaches a 128-byte boundary, and then keeps making a 128-byte request until the end of the line. Eventually, although the last burst in a line may not be a multiple of 128 bytes, it will always be a multiple of 32 bytes, as shown in [Figure 8-236](#).

Figure 8-236. ISS ISP BL Address Alignment



camss-687

8.3.3.8.4 ISS ISP BL Out-of-Order Responses

BL supports out-of-order responses. The out-of-order response is handled by having up to 16 outstanding CIDs (reads + writes). The maximum number of outstanding CIDs is set up by the `ISP5_CTRL[7:4]` `VBUSM_CIDS` bit field. There is one outstanding request per CID.

If any of the CIDs are not outstanding, a command is accepted from the highest prioritized buffer with a request. The CID availability is cleared when status complete is received. The outstanding commands can be all reads or all writes or any combination. The CID that is allocated is the lowest number of the 16 that are available when the command is accepted. As soon as a CID is released it is used if a command is available.

The `VBUSM2OCP` module transforms the `VBUSM` CIDs into `OCP MFlag` signals. Note that there can be only one outstanding per tag. It is not authorized to make a new request on a tag which is already waiting for a response.

8.3.3.8.5 ISS ISP BL Stalling

The BL can stall the requests from the initiator modules for reads and writes

8.3.3.8.5.1 ISS ISP BL Stalling Write Requests

One reason for the BL to stall write requests is that there is usually back pressure on the system memory and requests cannot be issued as fast as required. In that case the BL must stall requests from the initiator modules. The BL module cannot know whether stalling the request will lead to an initiator overflow or not. The `RESIZER` module can support back pressure from the BL module when it is configured in bypass mode. The input buffer memory can be used to store data from the `IPIPE` and `IPIPEIF` modules. If the `RESIZER` input buffer overflows, an interrupt is issued.

8.3.3.8.5.2 ISS ISP BL Stalling Read Requests

The BL may also stall read requests from the `ISIF-LSC` and `IPIPEIF` modules. When data comes from an image sensor there is no way to stop the sensor. If the read request is stalled too long, the `LSC` module may eventually underflow. When the `IPIPEIF` module reads all its data from memory, the `IPIPEIF` stalls transfers to successive modules by masking the clock.

8.3.3.8.6 ISS ISP BL Dynamic and Static MFlag Generation

NOTE: The following applies when [ISP5_CTRL\[21\]](#) MFLAG = 1. The MFlag value is static.

The BL outputs `cpriority[2:0]` and `cepriority[2:0]` signals on its VBUS master port interface. On the VBUSM side, these signals are aligned with the request (`creq`). Both values are actually repeating register input signals. The lower value (0) corresponds to the higher priority.

The MFlag signal does not need to be aligned with the request. The signal can change value anytime.

In the ISP VBUSM2 interface bridge, the `cepriority` signal is ignored and only the `cpriority` signal is used. Because the priority value is set up by a register setting, the value is not going to be dynamically modified obviously. [Table 8-352](#) shows how the `cpriority` values are mapped to the interface MFlag signal, which is present on the ISP master interface and set in the [ISP5_CTRL\[3:1\]](#) VBUSM_CPRIORITY bit field.

Table 8-352. ISS ISP BL `cpriority` to MFlag With [ISP5_CTRL\[21\]](#) MFLAG = 1

| MFlag[1:0] | Description |
|------------|--|
| 00 | Normal priority <code>cpriority[2:0]</code> = 4, 5, 6, 7 |
| 01 | Medium priority <code>cpriority[2:0]</code> = 2, 3 |
| 10 | Reserved |
| 11 | High priority <code>cpriority[2:0]</code> = 0, 1 |

NOTE: The following applies when the [ISP5_CTRL\[21\]](#) MFLAG = 0. The MFlag value is dynamic.

This feature is enabled at reset. The general idea for dynamic MFlag generation is to monitor the FIFO levels. Thresholds are used to increase or decrease the MFlag values. There are different implementations for read and write requestors.

An individual MFlag value is generated for each FIFO and then ORed altogether and exported at the BL boundary. The MFlag signal generation does not affect the BL arbitration scheme.

- Writes: To prevent overflows in the BL, dynamic MFlag signal generation gives higher priority to FIFOs that are almost full:
 - Low FIFO level = 50 percent
 - High FIFO level = 75 percent
 - FIFOs with more than 75 percent fill level have high priority: MFlag = 11
 - FIFOs between 50 and 75 percent fill level have medium priority: MFlag = 01
 - FIFOs below 50 percent fill level have normal priority: MFlag = 00

[Table 8-353](#) gives the low- and high-level priority thresholds for write initiators.

Table 8-353. ISS ISP BL MFlag Write Low- and High-Level Priority Thresholds

| | ISIF | H3A | IPIPE | RSZ |
|----------------|----------|----------|----------|----------|
| Access type | Write | Write | Write | Write |
| Buffer size | 64 × 128 | 64 × 128 | 48 × 128 | 64 × 136 |
| 50% low level | 32 × 128 | 32 × 128 | 24 × 128 | 32 × 136 |
| 75% high level | 48 × 128 | 48 × 128 | 36 × 128 | 48 × 128 |

- Reads: The dynamic MFlag signal generation depends on the reserved data units in the initiator data FIFO. The reserved data units correspond to read commands waiting to be sent on the interface bus, plus the read commands that have been sent on the interface bus and for which data responses have not yet arrived.
- The total FIFO size in bytes can be expressed as reserved data units (bytes) + data bytes stored (bytes) + empty space (bytes). By definition, empty space is lower than a burst size (128 bytes).
 - Low FIFO level = 25 percent

- High FIFO level = 50 percent
- Data bytes stored + empty space (bytes) = 50 percent of FIFO size: MFlag = 00
- Data bytes stored + empty space (bytes) 50 percent of FIFO size: MFlag = 01
- Data bytes stored + empty space (bytes) 25 percent of FIFO size: MFlag = 11

Table 8-354 gives the low- and high-level priority thresholds for read initiators

Table 8-354. ISS ISP BL MFlag Read Low- and High-Level Priority Thresholds

| | IPIPEIF | ISIF-LSC |
|-----------------|----------|----------|
| Access type | Read | Read |
| Buffer size | 64 × 128 | 32 × 128 |
| 25% buffer size | 16 × 128 | 8 × 128 |
| 50% buffer size | 32 × 128 | 16 × 128 |

8.3.3.8.7 ISS ISP BL VBUSM2OCP Last Beat Command Delay

The VBUSM2OCP module bridge implements the following function to work around a limitation of the BL module, which does not send back-to-back requests to the ISS, thereby leading to possible situations where the ISP loses arbitration at the ISS level.

To fully benefit from dynamic MFlag generation (see [Section 8.3.3.8.6](#)), the following function is present in the VBUSM2OCP module bridge:

- The delay occurs only if BL MFlag = [ISP5_BL_VBUSM\[5\] MFLAG_THRES](#).
- The MFlag value used is whatever is available when the last beat comes on the interface bus.
- The last beat of the interface request (read or write) is held until one cycle before a new command (read or write). This is achieved by masking the last beat of the interface command at the ISP interface.

The last beat is unmasked on the first event of one cycle before a new interface command, or the delay counter that uses the [ISP5_BL_VBUSM\[4:0\] LASTCMD_DLY](#) value counter expires (has decremented to zero). The [ISP5_BL_VBUSM\[4:0\] LASTCMD_DLY](#) bit field must be set before the request on the BL starts. If the value of the [ISP5_BL_VBUSM\[4:0\] LASTCMD_DLY](#) bit field is changed during the pending requests, the delay counter is not updated.

8.3.3.8.8 ISS ISP BL Peak Memory Bandwidth Reduction

To limit the peak memory bandwidth generated by the IPIPEIF (read port), ISIF (read port), and H3A (write port) modules, a bandwidth limiter is placed between the modules and the BL. The resizer module has this function built in and therefore does not need a bandwidth limiter.

The bandwidth limiter enables control of the minimum interval between two consecutive memory requests.

This function is controlled by the [ISP5_BL_MTC_1](#) and [ISP5_BL_MTC_2](#) registers. When the registers are set to 0, the function is not modified (that is, the bandwidth limiter is disabled). For the resizer module, it is controlled by the following registers: [RSZ_DMA_RZA](#) and [RSZ_DMA_RZB](#).

8.3.3.9 ISS ISP Memory Mapping

A total of 64KB is reserved for the ISP registers and memories. [Table 8-355](#) describes the memory map.

Table 8-355. ISS ISP Memory Mapping

| Memory Mapping | Start | End | Size | Comments |
|-----------------------|-------------|-------------|------|--------------------------------------|
| ISS ISP5 SYS1 | 0x5201 0000 | 0x5201 009F | 160 | ISP5 configuration registers (set 1) |
| ISS ISP5 SYS2 | 0x5201 00A0 | 0x5201 03FF | 864 | ISP5 configuration registers (set 2) |
| ISS RESIZER registers | 0x5201 0400 | 0x5201 07FF | 1024 | RESIZER configuration registers |

Table 8-355. ISS ISP Memory Mapping (continued)

| Memory Mapping | Start | End | Size | Comments |
|-----------------------|-------------|-------------|-------|--|
| ISS IPIPE registers | 0x5201 0800 | 0x5201 0FFF | 2048 | IPIPE configuration registers |
| ISS ISIF registers | 0x5201 1000 | 0x5201 11FF | 512 | ISIF configuration registers |
| ISS IPIPEIF registers | 0x5201 1200 | 0x5201 13FF | 512 | IPIPEIF configuration registers |
| ISS H3A registers | 0x5201 1400 | 0x5201 15FF | 512 | H3A configuration registers |
| Reserved | 0x5201 1600 | 0x5201 17FF | 512 | Reserved |
| Reserved | 0x5201 1800 | 0x5201 1BFF | 1024 | Reserved |
| Reserved | 0x5201 1C00 | 0x5201 1DFF | 512 | Reserved |
| Reserved | 0x5201 1E00 | 0x5201 1FFF | 512 | Reserved |
| HST memory 0 | 0x5201 2000 | 0x5201 27FF | 2048 | IPIPE histogram |
| HST memory 1 | 0x5201 2800 | 0x5201 2FFF | 2048 | IPIPE histogram |
| HST memory 2 | 0x5201 3000 | 0x5201 37FF | 2048 | IPIPE histogram |
| HST memory 3 | 0x5201 3800 | 0x5201 3FFF | 2048 | IPIPE histogram |
| Reserved | 0x5201 4000 | 0x5201 6EFF | 16384 | Reserved |
| DPC table 0 | 0x5201 8000 | 0x5201 81FF | 1024 | IPIPE Defect(Fault) Pixel Correction address table |
| DPC table 1 | 0x5201 8400 | 0x5201 85FF | 1024 | IPIPE Defect(Fault) Pixel Correction address table |
| YEE table | 0x5201 8800 | 0x5201 8FFF | 2048 | IPIPE Y-data Edge Enhance table |
| Reserved | 0x5201 9000 | 0x5201 A6FF | 6144 | Reserved |
| GAMR table | 0x5201 A800 | 0x5201 AFFF | 2048 | IPIPE Gamma correction table (R) |
| GAMG table | 0x5201 B000 | 0x5201 B7FF | 2048 | IPIPE Gamma correction table (G) |
| GAMB table | 0x5201 B800 | 0x5201 BFFF | 2048 | IPIPE Gamma correction table (B) |
| LIN table0 | 0x5201 C000 | 0x5201 C17F | 1024 | ISIF Linearization table |
| LIN table1 | 0x5201 C400 | 0x5201 C57F | 1024 | ISIF Linearization table |
| DCCLAMP | 0x5201 C800 | 0x5201 C9FF | 2048 | ISIF Digital Clamp |
| LSC table0 | 0x5201 D000 | 0x5201 E7FF | 6144 | ISIF Lens Shading gain table |
| LSC table1 | 0x5201 E800 | 0x5201 FFFF | 6144 | ISIF Lens Shading gain table |

8.3.4 ISS ISP Programming Model

NOTE: The preferred way to perform memory-to-memory processing with ISP is to use the CCP2 receiver module at the ISS level (see [Section 8.2, ISS Interfaces.](#)). It is possible to use the IPIPEIF read port for memory-to-memory processing, but it is not the preferred way because it does not provide enough granularity on the fractional clock divider for up to 20x digital zoom.

8.3.4.1 ISS ISP PG Programming Model

The procedure in [Table 8-356](#) initializes the pattern generator.

Table 8-356. ISS ISP PG Settings

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Select the PG as the ISP source. | ISP5_PG[5:4] SRC_SEL | 0x3 |
| Select the mode for write-enable signal generation. | ISP5_PG[2] WEN | |
| Select the polarity of the horizontal sync signal. | ISP5_PG[1] HDPOL | |
| Select the polarity of the vertical sync signal. | ISP5_PG[0] VDPOL | |
| Sets the duration of the HD signal | ISP5_PG_PULSE_CTRL[12:0] HDW | |
| Sets the duration of the VD signal | ISP5_PG_PULSE_CTRL[27:16] VDW | |
| Sets the number of pixels per line | ISP5_PG_FRAME_SIZE[31:16] PPLN | |
| Sets the number of lines per frame | ISP5_PG_FRAME_SIZE[15:0] HLPFR | |
| Enables the pattern generator | ISP5_PG[3] EN | 0x1 |

8.3.4.2 ISS ISP ISIF Programming Model

This section discusses issues related to the software control of the ISIF. It lists the registers that are required to be programmed in different modes, describes how to enable and disable the ISIF and how to check the status of the ISIF, discusses the different register access types, and enumerates several programming constraints.

8.3.4.2.1 ISS ISP ISIF Hardware Setup/Initialization

This section discusses the configuration of the ISIF required before image processing can begin.

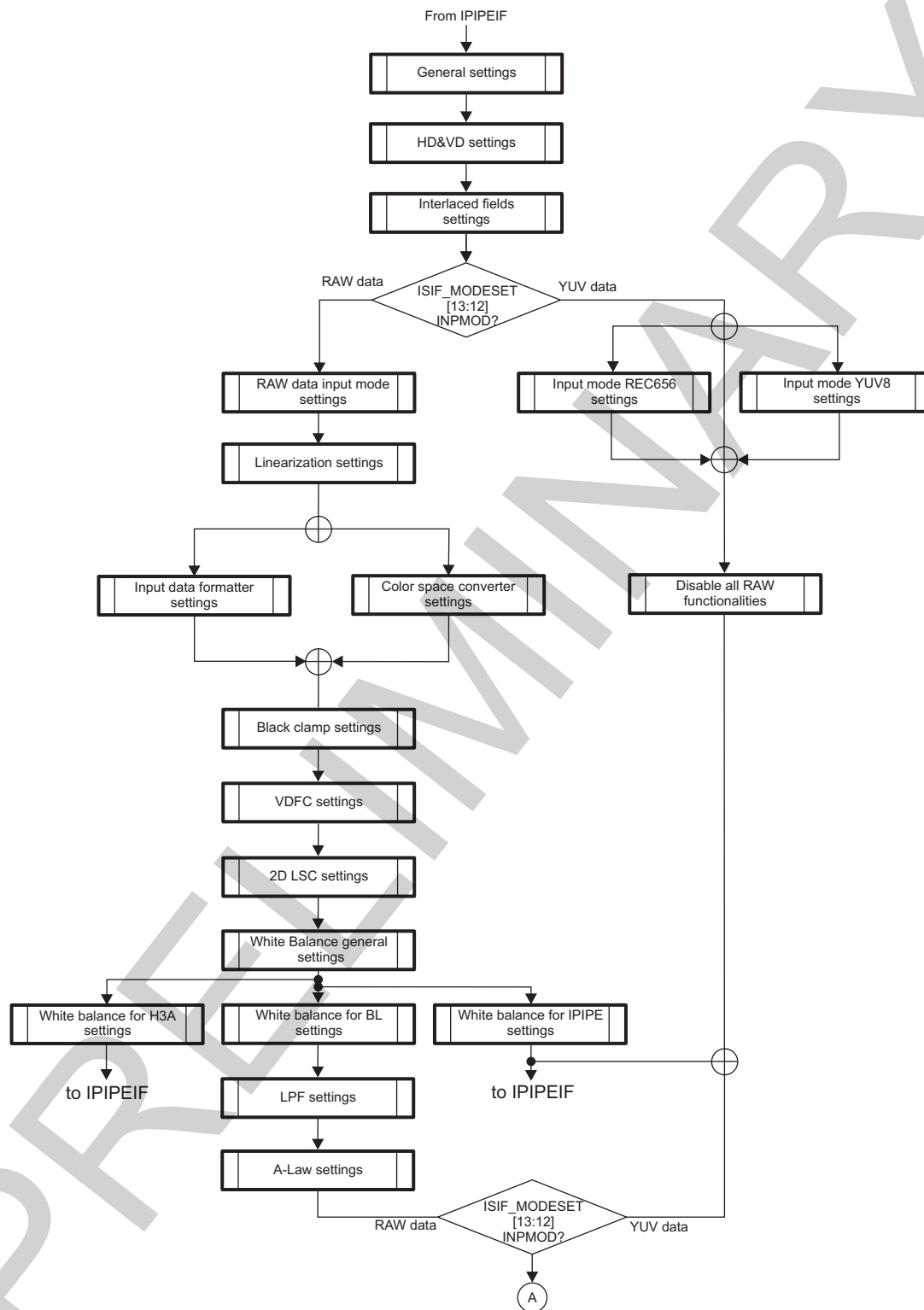
8.3.4.2.1.1 ISS ISP ISIF Reset Behavior

Upon hardware reset of the ISP, all of the registers in the ISIF, except the defect table registers, are reset to their reset values. Because the defect table registers are stored in internal RAM, they do not have reset values. If the reset is a chip-level POR (reset after power is applied), the values of the defect table register are unknown. If the reset is an ISP module reset (when power remains active), the contents of this memory remain the same as before the reset.

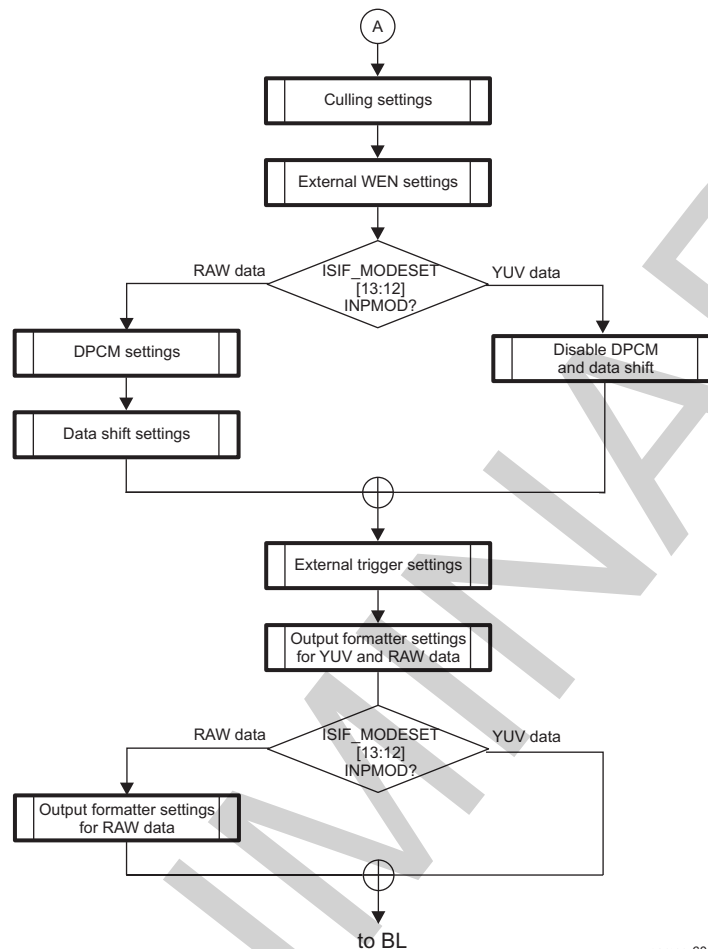
8.3.4.2.1.2 ISS ISP ISIF Register Setup

Before enabling the ISIF, the hardware must be properly configured through register writes. [Figure 8-237](#) and [Figure 8-238](#) show the sequence to be used for RAW and YUV data before enabling the ISIF. The register settings for each process in the following sequence are described in [Table 8-357](#).

Figure 8-237. ISS ISP ISIF Initialization Flow Chart – Part One



camss-600

Figure 8-238. ISS ISP ISIF Initialization Flow Chart – Part Two

camss-601

Table 8-357. ISS ISP ISIF Required Configuration Parameters

| Step | Configuration Required | Value |
|---|----------------------------|-------|
| General settings | | |
| Set the Field Indicator signal direction. | ISIF_MODESET[1] FIDD | |
| Set the VD signal polarity. | ISIF_MODESET[2] VDPOL | |
| Set the HD signal polarity. | ISIF_MODESET[3] HDPOL | |
| Set the Field Indicator signal polarity. | ISIF_MODESET[4] FIPOL | |
| HD and VD settings | | |
| Set the HD and VD signal directions. | ISIF_MODESET[0] HDVDD | |
| If: HD and VD are set as output (HDVDD = 0x1): | | |
| Set the HD width. | ISIF_HDW[11:0] HDW | |
| Set the VD width. | ISIF_VDW[11:0] VDW | |
| Set the HD period. | ISIF_PPLN[15:0] PPLN | |
| Set the VD period. | ISIF_LPFR[15:0] LPFR | |
| End | | |
| Interlaced fields settings | | |
| Select the type of image sensor (progressive or interlaced) | ISIF_MODESET[7] CCDMD | |
| Input mode settings | | |
| Set the data input mode. | ISIF_MODESET[13:12] INPMOD | |

Table 8-357. ISS ISP ISIF Required Configuration Parameters (continued)

| Step | Configuration Required | Value |
|--|---|-------|
| Input mode settings for REC656 data | | |
| Select CCIR Rec.656 interface or not. | ISIF_REC656IF[1] R656ON | |
| If: input is REC656 (R656ON = 0x1) | | |
| Set error correction of FVH code. | ISIF_REC656IF[0] ECCFVH | |
| Selects bit width of CCIR656. | ISIF_CCDCFG[5] BT656 | |
| e End | | |
| Input mode settings for YCC 8 bit data (if INPMOD = 0x2) | | |
| Selects Y position signal | ISIF_CCDCFG[11] Y8POS | |
| RAW data processing: input settings | | |
| Enable or disable MSB inverse of CIN port (YUV format). | ISIF_CCDCFG[13] MSBINVI | |
| Select Y and C swapping. | ISIF_CCDCFG[4] YCINSWP | |
| Selects MSB position of input data (16 bits-to-16 bits) | ISIF_CGAMMAWD[4:1] GWDI | |
| Set the image sensor data polarity. | ISIF_MODESET[6] DPOL | |
| Select the CFA pattern mode. | ISIF_CGAMMAWD[5] CFAP | |
| Specifies the color pattern | ISIF_CCOLP[7:6] CP0_F0 | |
| | ISIF_CCOLP[5:4] CP1_F0 | |
| | ISIF_CCOLP[3:2] CP2_F0 | |
| | ISIF_CCOLP[1:0] CP3_F0 | |
| Linearization settings | | |
| Enable linearization or not. | ISIF_LINCFG0[0] LINEN | |
| If: Linearization enabled (LINEN = 0x1) | | |
| Select linearization mode. | ISIF_LINCFG0[1] LINMD | |
| Select the shift value. | ISIF_LINCFG0[6:4] CORRSFT | |
| Set the scale factor for LUT. | ISIF_LINCFG1[10:0] LUTSCL | |
| Set up linearization LUT. | | |
| End | | |
| Input data formatter settings | | |
| Enable data formatter or not. | ISIF_FMTCFG[0] FMTEN | |
| If: Data formatter is enabled (FMTEN = 0x1) | | |
| Select the combine input lines. | ISIF_FMTCFG[1] FMTCBL | |
| Select the mode normal or alternative. | ISIF_FMTCFG[2] LNALT | |
| Select the split/combine number of lines. | ISIF_FMTCFG[5:4] LNUM | |
| Set the address increment. | ISIF_FMTCFG[11:8] FMTAINC | |
| Set the number of program entries per SET. | ISIF_FMTPLEN[3:0] FMTPLEN0 | |
| | ISIF_FMTPLEN[7:4] FMTPLEN1 | |
| | ISIF_FMTPLEN[10:8] FMTPLEN2 | |
| | ISIF_FMTPLEN[14:12] FMTPLEN3 | |
| Set the first pixel in a line. | ISIF_FMTSPH[12:0] FMTSPH | |
| Set the number of pixels in a line. | ISIF_FMTLNH[12:0] FMTLNH | |
| Set the start line vertical. | ISIF_FMTLSV[12:0] FMTSLV | |
| Set the number of lines in a vertical. | ISIF_FMTLVN[14:0] FMTLVN | |
| Set the number of pixels in an output line. | ISIF_FMTREN[12:0] FMTREN | |
| Set the HD interval for output lines. | ISIF_FMTHCNT[12:0] FMTHCNT | |
| Set up to 16 address pointers. | ISIF_FMTAPTRx[14:13] LINE (x = 0 to 15) | |
| | ISIF_FMTAPTRx[12:0] INIT (x = 0 to 15) | |

Table 8-357. ISS ISP ISIF Required Configuration Parameters (continued)

| Step | Configuration Required | Value |
|--|--|-------|
| Set the 32 possible program entry valid flag. | ISIF_FMTPGMVFO ISIF_FMTPGMVF1 | |
| Set the 32 possible address pointers. | ISIF_FMTPGMAPS0 ISIF_FMTPGMAPS1 ISIF_FMTPGMAPS2 ISIF_FMTPGMAPS3 ISIF_FMTPGMAPS4 ISIF_FMTPGMAPS5 ISIF_FMTPGMAPS6 ISIF_FMTPGMAPS7 | |
| Set the 32 possible address update (increment or decrement). | ISIF_FMTPGMAPU0 ISIF_FMTPGMAPU1 | E |
| End | | |
| Color space converter settings | | |
| Enable or disable color space converter. | ISIF_CSCCTL[0] CSCEN | |
| If: Color space converter is enabled (CSCEN = 0x1) | | |
| Set the color space converter coefficients. | ISIF_CSCM0 ISIF_CSCM1 ISIF_CSCM2 ISIF_CSCM3 ISIF_CSCM4 ISIF_CSCM5 ISIF_CSCM6 ISIF_CSCM7 | |
| End | | |
| Black Clamp settings | | |
| Enable or disable black clamp. | ISIF_CLAMPCFG[0] CLEN | |
| If: Black clamp is enabled (CLEN = 0x1) | | |
| Set the DC offset for black clamp. | ISIF_CLDCOFST[12:0] CLDC | |
| <i>[Horizontal Black Clamp]</i> | | |
| Set the horizontal clamp mode. | ISIF_CLAMPCFG[2:1] CLHMD | |
| Set the vertical dimension of a window. | ISIF_CLHWIN0[13:12] CLHWN | |
| Set the horizontal dimension of a window. | ISIF_CLHWIN0[9:8] CLHWM | |
| Enable or disable limitation for horizontal. | ISIF_CLHWIN0[6] CLHLMT | |
| Select base window. | ISIF_CLHWIN0[5] CLHWBS | |
| Set the window count per color. | ISIF_CLHWIN0[4:0] CLHWC | |
| Set window start position (H). | ISIF_CLHWIN1[12:0] CLHSH | |
| Set the window start position (V). | ISIF_CLHWIN2[12:0] CLHSV | |
| <i>[Vertical Black Clamp]</i> | | |
| Set the black clamp start position. | ISIF_CLSV[12:0] CLSV | |
| Set the vertical black clamp reset value. | ISIF_CLVRV[11:0] CLVRV | |
| Set the line average coefficient. | ISIF_CLVWIN0[15:8] CLVCOEF | |
| Select the reset value for the clamp value of the previous line. | ISIF_CLVWIN0[5:4] CLVRVSL | |
| Select the optical black H valid. | ISIF_CLVWIN0[2:0] CLVOBH | |
| Set the window start position (H). | ISIF_CLVWIN1[12:0] CLVSH | |
| Set the window start position (V). | ISIF_CLVWIN2[12:0] CLVSV | |
| Select the optical black V valid. | ISIF_CLVWIN3[12:0] CLVOBV | |

Table 8-357. ISS ISP ISIF Required Configuration Parameters (continued)

| Step | Configuration Required | Value |
|--|--------------------------------------|-----------------------------|
| End | | |
| Set the DC offset for black clamp (RAW data only). | ISIF_CLDCOFST[12:0] CLDC | DC offset available for YUV |
| Vertical line defect correction (VDFC) settings | | |
| Disable vertical line defect correction. | ISIF_DFCCTL[4] VDFCEN | 0x0 |
| If: Vertical line defect correction will be enabled (VDFCEN = 0x1) | | |
| Select the mode. | ISIF_DFCCTL[6:5] VDFCSL | |
| Select upper pixels correction enable or disable. | ISIF_DFCCTL[7] VDFCUDA | |
| Set the shift value. | ISIF_DFCCTL[10:8] VDFLSFT | |
| Set the saturation level. | ISIF_VDFSATLV[11:0] VDFS LV | |
| Clear memories. | ISIF_DFCMEMCTL[4] DFCMCLR | 0x1 |
| Vertical line defect table update procedure. | See Section 8.3.3.7.9.1 for details. | |
| | Use the following registers: | |
| | ISIF_DFCMEMCTL[2] DFCMARST | |
| | ISIF_DFCMEMCTL[0] DFCMWR | |
| | ISIF_DFCMEM0 | |
| | ISIF_DFCMEM1 | |
| | ISIF_DFCMEM2 | |
| | ISIF_DFCMEM3 | |
| | ISIF_DFCMEM4 | |
| Rnd | | |
| Enable vertical line defect correction. | ISIF_DFCCTL[4] VDFCEN | 0x1 |
| 2D Lens Shading Compensation (LSC) settings | | |
| Disable lens shading compensation. | ISIF_2DLSCCFG[0] ENABLE | 0x0 |
| If: 2D-LSC will be enabled (ENABLE = 0x1) | | |
| Set the H direction data offset. | ISIF_LSCHOFST[13:0] HOFST | |
| Set the V direction data offset. | ISIF_LSCVOFST[13:0] VOFST | |
| Set the number of valid pixels in H direction. | ISIF_LSCHVAL[13:0] HVAL | |
| Set the number of valid lines in V direction. | ISIF_LSCVVAL[13:0] VVAL | |
| Define the horizontal dimension of a paxel. | ISIF_2DLSCCFG[14:12] GAIN_MODE_M | |
| Define the vertical dimension of a paxel. | ISIF_2DLSCCFG[10:8] GAIN_MODE_N | |
| Set gain format table. | ISIF_2DLSCCFG[3:1] GAIN_FORMAT | |
| Enable or disable offset control. | ISIF_2DLSCOFST[0] OFSTEN | |
| Select shift up value for offsets. | ISIF_2DLSCOFST[6:4] OFSTSFT | |
| Set scaling factor for offset. | ISIF_2DLSCOFST[15:8] OFSTS F | |
| Set the initial Y position. | ISIF_2DLSCINI[14:8] Y | |
| Set the initial X position. | ISIF_2DLSCINI[6:0] X | |
| Set the gain table base address. | ISIF_2DLSCGRBU[15:0] BASE31_16 | |
| | ISIF_2DLSCGRBL[15:0] BASE15_0 | |
| Set the gain table offset (length of one row). | ISIF_2DLSCGROF[15:0] OFFSET | |
| Set the offset table base address. | ISIF_2DLSCORBU[15:0] BASE | |
| | ISIF_2DLSCORBL[15:0] BASE | |
| Set the offset table offset (length of one row). | ISIF_2DLSCOROF | |

Table 8-357. ISS ISP ISIF Required Configuration Parameters (continued)

| Step | Configuration Required | Value |
|--|---------------------------------------|-------|
| Enable useful interrupts | ISIF_2DLSCIRQEN[3] SOF | |
| | ISIF_2DLSCIRQEN[2] PREFETCH_COMPLETED | |
| | ISIF_2DLSCIRQEN[1] PREFETCH_ERROR | |
| | ISIF_2DLSCIRQEN[0] DONE | |
| Set up LSC gain table and offset table in SDRAM. See Figure 8-224 for details. | | |
| Wait seven clock periods before enabling LSC. | | |
| Enable lens shading compensation. | ISIF_2DLSCCFG[0] ENABLE | 0x1 |
| End | | |
| White balance color settings | | |
| Set R/Ye gain. | ISIF_CRGAIN[11:0] CGR | |
| Set Gr/Cy gain. | ISIF_CGRGAIN[11:0] CGGR | |
| Set Gr/Cy gain. | ISIF_CGBGAIN[11:0] CGGB | |
| Set B/Mg gain. | ISIF_CBGAIN[11:0] CGB | |
| Set offset. | ISIF_COFSTA[11:0] COFT | |
| [For BL output] | | |
| Enable or disable white balance for BL path. | ISIF_CGAMMAWD[12] WBNEN0 | |
| Enable or disable offset control for BL path. | ISIF_CGAMMAWD[8] OFSTEN0 | |
| [For IPIPE (through IPIPEIF) output] | | |
| Enable or disable white balance for IPIPE path. | ISIF_CGAMMAWD[13] WBEN1 | |
| Enable or disable offset control for IPIPE path. | ISIF_CGAMMAWD[9] OFSTEN1 | |
| [For H3A (through IPIPEIF) output] | | |
| Enable or disable white balance for H3A path. | ISIF_CGAMMAWD[14] WBEN2 | |
| Enable or disable offset control for H3A path. | ISIF_CGAMMAWD[10] OFSTEN2 | |
| LPF settings (for BL output only) (RAW data only) | | |
| Enable or disable low pass filter. | ISIF_MODESET[14] HLPF | |
| A-Law compression settings (for BL output only) (RAW data only) | | |
| Enable or disable A-Law compression. | ISIF_CGAMMAWD[0] CCDTBL | |
| Culling settings (for BL output only) (RAW or YUV data) | | |
| Set the culling pattern in odd lines. | ISIF_CULH[15:8] CLHO | |
| Set the culling pattern in even lines. | ISIF_CULH[7:0] CLHE | |
| Set the culling pattern in vertical lines. | ISIF_CULV[7:0] CULV | |
| External WEN settings (for BL output only) | | |
| Select external WEN use or not. | ISIF_MODESET[5] SWEN | |
| If: External WEN is used (SWEN = 0x1): | | |
| Specifies the CCD valid area | ISIF_CCDCFG[8] WENLOG | |
| End | | |
| DPCM settings (for BL output only) RAW data only | | |
| Select the predictor for DPCM encoder. | ISIF_MISC[13] DPCMPRE | |
| Enable or disable DPCM encoding. | ISIF_MISC[12] DPCMEN | |
| Data shift settings (for BL output only) (RAW data only) | | |
| Select the data shift value when image is written to memory | ISIF_MODESET[10:8] CCDW | |

Table 8-357. ISS ISP ISIF Required Configuration Parameters (continued)

| Step | Configuration Required | Value |
|--|--|-------|
| External trigger settings (for BL output only) | | |
| If: External trigger is selected (EXTRG = 0x1): | | |
| Select the trigger source signal. | ISIF_CCDCFG[9] TRGSEL | |
| End | | |
| Output formatter (for BL output only) RAW and YUV | | |
| Set the memory address decrement. | ISIF_HSIZE[12] ADCR | |
| Set the memory address offset between lines. | ISIF_HSIZE[11:0] HSIZE | |
| Set the first pixel in a line to be stored in memory. | ISIF_SPH[14:0] SPH | |
| Set the number of pixels in a line to be stored in memory. | ISIF_LNH[14:0] LNH | |
| Set the start line vertical for field 0. | ISIF_SLV0[14:0] SLV0 | |
| Set the start line vertical for field 1. | ISIF_SLV1[14:0] SLV1 | |
| Set the number of lines to be stored in memory. | ISIF_LNV[14:0] LNV | |
| Enable or disable the storage of image in memory. | ISIF_SYNCEN[1] DWEN | |
| Set the memory destination address. | ISIF_CADU[10:0] CADU ISIF_CADL[10:0] CADL | |
| Enable or disable MSB inverse of COUT port. | ISIF_CCDCFG[14] MSBINVO | |
| Enable or disable byte swap when SDRAM capturing. | ISIF_CCDCFG[12] BSWD | |
| Select Y and C swapping. | ISIF_CCDCFG[2] YCOUNTSWP | |
| Select SDRAM pack mode. | ISIF_CCDCFG[1:0] SDRPACK | |
| Enable or disable VD/HD output. | ISIF_SYNCEN[0] SYEN | |

8.3.4.2.2 ISS ISP ISIF Enable/Disable Hardware

The ISIF is enabled by setting the [ISIF_SYNCEN\[0\] SYEN](#) bit. This is done after all the required registers discussed in the previous section are programmed.

With respect to the write enable bit and output address, the following procedure must be followed:

1. Set the data output address ([ISIF_CADU](#) and [ISIF_CADL](#)).
2. Enable HD/VD and WEN at the same time ([ISIF_MODESET\[1\] DWEN](#) and [ISIF_SYNCEN\[0\] SYEN](#)).

If the [ISIF_SYNCEN\[0\] SYEN](#) bit is written before the output address and the SDRAM write enable bit (not recommended but may be required for a particular mode), data begins to be written to the old address value and not the one recently programmed. The desired response can be achieved if the following procedure is followed:

1. Enable HD/VD ([ISIF_SYNCEN\[0\] SYEN](#)).
2. Set the output address ([ISIF_CADU](#) and [ISIF_CADL](#)).
3. Wait for the next VD.
4. Enable WEN ([ISIF_MODESET\[1\] DWEN](#)).

The ISIF always operates in continuous mode. In other words, after enabling the ISIF, it continues to process sequential frames until the [ISIF_SYNCEN\[0\] SYEN](#) bit is cleared by software. When this happens, the frame being processed is disabled immediately and does not continue to process the current frame.

When the HD/VD signals are set to outputs ([ISIF_MODESET\[0\]](#) HDVDD = 0x1), fetching and processing of the frame begin immediately upon setting the [ISIF_SYNCEN\[0\]](#) SYEN bit.

When the HD/VD signals are set to inputs ([ISIF_MODESET\[0\]](#) HDVDD = 0x0), processing of the frame is dependent on the input timing of the external sensor/decoder. To ensure that data from the external device is not missed, the ISIF must be enabled before data transmission from the external device. In this way, the ISIF waits for data from the external device.

8.3.4.2.3 ISS ISP ISIF Register Accessibility During Frame Processing

There are two types of register access in the ISIF:

- Shadowed registers (event latched registers)
Shadowed registers are those that can be read and written at any time, but the written values take effect (are latched) only at certain times based on some event. Reads still return the most recent write even though the settings are not used until the specific event occurs.
- Busy-writable registers
These registers/fields can be read or written even if the module is busy. Changes to the underlying settings takes place instantly.

The following registers/fields can be set as shadow registers, or optionally set as busy-writable registers. When the [ISIF_CCDCFG\[15\]](#) VDLC bit is set to 0, these registers are shadowed; when the [ISIF_CCDCFG\[15\]](#) VDLC bit is set to 1, these registers are busy-writable. All other ISIF registers not included in this list are always busy-writable.

| | | | |
|---------------------------------------|-----------------------------|--|-------------------------------|
| ISIF_SYNCEN[1] DWEN | ISIF_SLV1 | ISIF_CGRGAIN | ISIF_FMTLSV |
| ISIF_MODESET[14] HLPF | ISIF_CULH | ISIF_CGBGAIN | ISIF_FMTLNV |
| ISIF_HDW | ISIF_CULV | ISIF_CBGAIN | ISIF_LSCOFST |
| ISIF_VDW | ISIF_HSIZE | ISIF_COFSTA | ISIF_LSCVOFST |
| ISIF_PPLN | ISIF_SDOFST | ISIF_CLAMPCFG[0] CLEN | ISIF_DFCCTL |
| ISIF_LPFR | ISIF_CADU | ISIF_MISC | ISIF_VDFSATLV |
| ISIF_SPH | ISIF_CADL | ISIF_CGAMMAWD | |
| ISIF_LNH | ISIF_CCOLP | ISIF_FMTSPH | |
| ISIF_SLV0 | ISIF_CRGAIN | ISIF_FMTLNH | |

8.3.4.2.4 ISS ISP ISIF Interframe Operations

Between frames, it may be necessary to enable or disable functions or to modify the memory pointers. Because the [ISIF_SYNCEN\[1\]](#) DWEN bit and the memory pointer registers are shadowed, these modifications can occur any time before the end of the frame and the data will be latched in for the next frame. Likewise, the 2D-LSC registers can be changed after receiving the LSC SOF interrupt but before it starts to prefetch the gain values for the next frame (the end of the LSC active region is reached). The host controller can perform these changes upon receiving an interrupt.

8.3.4.2.5 ISS ISP ISIF Summary of Constraints

The following is a list of register configuration constraints to adhere to when programming the ISIF. It can be used as a quick checklist. More detailed register setting constraints can be found in the individual register descriptions.

- PCLK cannot be higher than 233 MHz.
- If SDRAM output port is enabled:
 - The memory output line offset and address must be on 32-byte boundaries.
 - [ISIF_LNH\[14:0\]](#) LNH –1 must be a multiple of 32 bytes.
 - [ISIF_SPH](#), [ISIF_LNH](#), [ISIF_SLV0](#), [ISIF_SLV1](#), and [ISIF_LNV](#) must be cleared to 0 within the same VD period that the [ISIF_SYNCEN\[1\]](#) DWEN bit is cleared to 0.

- [ISIF_SPH](#), [ISIF_LNH](#), [ISIF_SLV0](#), [ISIF_SLV1](#), and [ISIF_LNV](#) must be set from 0 to the appropriate values within the same VD period that the [ISIF_SYNCEN](#)[1] DWEN bit is set to 1.
- In RAW input mode:
 - [ISIF_CCDCFG](#)[4] YCINSWP must be set to 0.
- If DPCM compression is enabled:
 - Horizontal culling must not be used. Use the input formatter instead.
- For 2D-LSC:
 - $N=M$ (where M = horizontal downsampling factor, N = vertical downsampling factor)
 - The [ISIF_2DLSINI](#) register values must be even numbers.
 - Maximum widths with respect to selected M value (see [Table 8-358](#))

Table 8-358. ISS ISP ISIF Maximum Line Width Versus M Value

| M | Maximum Line Width |
|-----|--------------------|
| 8 | 2040 |
| 16 | 4080 |
| 32 | 8160 |
| 64 | 16,320 |
| 128 | 16,384 |

8.3.4.3 ISS ISP IPIPEIF Programming Model

This section discusses issues related to the software control of the IPIPEIF module. It lists the registers that are required to be programmed in different modes, describes how to enable and disable the IPIPEIF module and how to check the status of the IPIPEIF module, discusses the different register access types, and enumerates several programming constraints.

8.3.4.3.1 ISS ISP IPIPEIF Hardware Setup/Initialization

This section discusses the configuration of the IPIPEIF module required before image processing can begin.

8.3.4.3.1.1 ISS ISP IPIPEIF Reset Behavior

Upon hardware reset of the ISP ([ISP5_SYSCONFIG](#)[1] SOFTRESET = 0x1), all the registers in the IPIPEIF are reset to their reset values.

8.3.4.3.1.2 ISS ISP IPIPEIF Register Setup

Before enabling the IPIPEIF, the hardware must be properly configured through register writes. [Table 8-359](#) identifies the register parameters that must be programmed before enabling the IPIPEIF module (depending on the functions needed).

Table 8-359. ISS ISP IPIPEIF Required Configuration Parameters

| Step | Configuration Required | Value |
|---------------------------------------|--|-------|
| General settings | | |
| Select the input sources for IPIPEIF. | IPIPEIF_CFG1 [15:14] INPSRC1 | |
| | IPIPEIF_CFG1 [3:2] INPSRC2 | |
| Select VD sync polarity. | IPIPEIF_CFG2 [2] VDPOL | |
| Select HD sync polarity. | IPIPEIF_CFG2 [1] HDPOL | |
| Select the interrupt source. | IPIPEIF_CFG2 [0] INTSW | |
| Select the input clock source. | IPIPEIF_CFG1 [10] CLKSEL | |
| Set the clock divider value. | IPIPEIF_CLKDIV [15:0] CLKDIV | |
| Set the data type: YUV or RAW. | IPIPEIF_CFG2 [3] YUV16 | |

Table 8-359. ISS ISP IPIPEIF Required Configuration Parameters (continued)

| Step | Configuration Required | Value |
|---|--|-------|
| Settings to perform if data is from BL | | |
| Set HD setting. | IPIPEIF_PPLN[12:0] PPLN | |
| Set VD setting. | IPIPEIF_LPFR[12:0] LPFR | |
| Set the number of valid pixels in a line. | IPIPEIF_HNUM[12:0] HNUM | |
| Set the number of valid lines. | IPIPEIF_VNUM[12:0] VNUM | |
| Set memory address information. | IPIPEIF_ADDRU[10:0] ADDRU | |
| | IPIPEIF_ADDRL[15:0] ADDRL | |
| | IPIPEIF_ADOFS[11:0] ADOFS | |
| Set one-shot mode, if needed. | IPIPEIF_CFG1[0] ONESHOT | |
| Use SYNCOFF function only for double-buffering. See Section 8.3.3.3.2.1 for details. | IPIPEIF_ENABLE[1] SYNCOFF | |
| Settings to perform for RAW data from ISIF or BL | | |
| Select the unpack function. | IPIPEIF_CFG1[9:8] UNPACK | |
| Settings to perform for YUV for data from ISIF | | |
| Set the data type to YUV. | IPIPEIF_CFG2[3] YUV16 | |
| If YUV16 = 0x1, enables or not the conversion from 8 bits to 16 bits | IPIPEIF_CFG2[6] YUV8 | |
| If YUV16 = 0x1, set the way the data is unpacked. | IPIPEIF_CFG2[7] YUV8P | |
| DCPM function | RAW data from Buffer Logic (BL) | |
| Enable or disable DPCM decompression. | IPIPEIF_DPCM[0] ENA | |
| Select DPCM prediction mode. | IPIPEIF_DPCM[1] PRED | |
| Select DPCM bit mode. | IPIPEIF_DPCM[2] BITS | |
| Select inverse A-Law function. | IPIPEIF_CFG1[9:8] UNPACK | |
| Select SDRAM read data shift. - For RAW data - DPCM enabled and A- Law disabled - or DPCM disabled | IPIPEIF_CFG1[13:11] DATASFT | |
| Dark frame subtraction (DFS) function | RAW data from VP (video port), BL(buffer logic, SDRAM) or ISIF | |
| Set defect pixel correction (DPC1) for VP or ISIF inputs. | IPIPEIF_DPC1[12] ENA | |
| Set the associated threshold for DPC1. | IPIPEIF_DPC1[11:0] TH | |
| Set defect pixel correction (DPC2) for BL inputs. | IPIPEIF_DPC2[12] ENA | |
| Set the associated threshold for DPC1. | IPIPEIF_DPC2[11:0] TH | |
| Set the direction of subtraction. | IPIPEIF_CFG2[5] DFSDIR | |
| Set the averaging filter, horizontal pixel decimator, and gain function for IPIPE data path. | | |
| Enable averaging filter function. | IPIPEIF_CFG1[7] AVGFILT | |
| Enable horizontal pixel decimation function. | IPIPEIF_CFG1[1] DECIM | |
| Set horizontal resizing value. | IPIPEIF_RSZ[6:0] RSZ | |
| Set the resizer initial position. | IPIPEIF_INIRSZ[13] ALNSYNC | |
| | IPIPEIF_INIRSZ[12:0] INIRSZ | |
| Set the data gain (only for RAW data). | IPIPEIF_GAIN[9:0] GAIN | |
| Set the output clipping value. | IPIPEIF_OCLIP[11:0] OCLIP | |

Table 8-359. ISS ISP IPIPEIF Required Configuration Parameters (continued)

| Step | Configuration Required | Value |
|---|----------------------------|-------|
| Set the averaging filter and horizontal pixel decimator function for H3A data path. | | |
| Enable averaging filter function. | IPIPEIF_RSZ3A[8] AVGFILT | |
| Enable horizontal pixel decimation function. | IPIPEIF_RSZ3A[9] DECIM | |
| Set horizontal resizing value. | IPIPEIF_RSZ3A[6:0] RSZ | |
| Set the resizer initial position. | IPIPEIF_RSZ3A[13] ALNSYNC | |
| | IPIPEIF_RSZ3A[12:0] INIRSZ | |

For information about YUV data coming and unpacking from the ISIF module, see [Section 8.3.3.3.13](#).

8.3.4.3.2 ISS ISP IPIPEIF Enable/Disable Hardware

When IPIPEIF_CFG1[15:14] INPSRC1 or IPIPEIF_CFG1[3:2] INPSRC2 = 0, the IPIPEIF does not need to be enabled: it receives data from the VP and pushes it to the ISIF, H3A, IPIPE, and RESIZER modules.

If IPIPEIF_CFG1[15:14] INPSRC1 or IPIPEIF_CFG1[3:2] INPSRC2 ≠ 0, the IPIPEIF module begins to fetch data from the BL by setting the IPIPEIF_ENABLE[0] ENABLE bit. Writing the enable bit must be the last step of the configuration.

When the input source is the BL, the IPIPEIF can optionally operate in one-shot mode or continuous mode by setting the IPIPEIF_CFG1[0] ONESHOT parameter. If one-shot mode is enabled, then after enabling the IPIPEIF, the IPIPEIF_ENABLE[0] ENABLE bit is automatically turned off (set to 0) and only a single frame is processed from memory. In this mode, fetching and processing of the frame begins immediately upon setting the IPIPEIF_ENABLE[0] ENABLE bit.

When the input source is the ISIF, processing of the frame is dependent on the timing of the ISIF. To ensure that data from the ISIF is not missed, the IPIPEIF must be enabled before the ISIF. In this way, the IPIPEIF waits for data from the ISIF.

When the IPIPEIF is in continuous mode, it can be disabled by clearing the IPIPEIF_ENABLE[0] ENABLE bit after processing of the last frame. The disable takes place immediately because it is a busy-writable register.

An EOF interrupt can indicate to other modules that the frame treatment is finished. See [Section 8.3.3.3.15](#) for more information.

8.3.4.3.3 ISS ISP IPIPEIF Register Accessibility During Frame Processing

There are two types of register access in the IPIPEIF:

- Shadow registers

These registers/fields can be read and written (if the field is writable) at any time. However, the written values take effect only at the start of a frame (VD rising edge). Reads still return the most recent write even though the settings are not used until the next start of frame. The following are the shadowed registers in the IPIPEIF:

| | | |
|------------------------|---------------------------|--------------------------|
| IPIPEIF_PPLN | IPIPEIF_ADDRU | IPIPEIF_CFG1[1] DECIM |
| IPIPEIF_HNUM | IPIPEIF_ADOFS | IPIPEIF_CFG1[7] AVGFILT |
| IPIPEIF_VNUM | IPIPEIF_ENABLE[1] SYNCOFF | IPIPEIF_RSZ |
| IPIPEIF_GAIN | IPIPEIF_RSZ3A[9] DECIM | IPIPEIF_RSZ3A[8] AVGFILT |
| IPIPEIF_RSZ3A[6:0] RSZ | | |

- Busy-writable registers

These registers/fields can be read or written even if the module is busy. Changes to the underlying settings takes place instantaneously. Registers that are not shadowed are busy-writable.

Only for busy-writable registers, the ideal procedure for changing the IPIPEIF registers is IF (PCR.BUSY == 0) OR IF (EOF interrupt occurs):

- Disable IPIPEIF ([IPIPEIF_ENABLE\[0\]](#) ENABLE = 0x0).
- Change registers.
- Enable IPIPEIF ([IPIPEIF_ENABLE\[0\]](#) ENABLE = 0x1).

8.3.4.3.4 ISS ISP IPIPEIF Interframe Operations

Between frames, it may be necessary to enable or disable functions or to modify the memory pointers. Because several of the registers are shadowed, these modifications can take place any time before the end of the frame, and the data is latched in for the next frame. The host controller can perform these changes upon receiving an interrupt.

When reading input data from the BL, the host must check [IPIPEIF_DTUF](#) or the [ISP5_IRQSTATUS_RAW2_i\[1\]](#) IPIPEIF_UDF register (if this event is enabled and mapped to the ISP IRQ lines) during vertical blanking to see if an underflow occurred.

If an underflow occurs it means the system is congested because too much bandwidth is being generated. It is most likely that the scenario being passed is too memory bandwidth-intensive. If the bit is set, software must clear the bit. If the process is taking place from memory-to-memory, the software may try to re-initiate the data flow. Software must decide the sequence to execute after an underflow.

8.3.4.3.5 ISS ISP IPIPEIF Summary of Constraints

The following is a list of register configuration constraints to adhere to when programming the IPIPEIF module. It can be used as a quick checklist. More detailed register setting constraints can be found in the individual register descriptions.

- If BL is the source for the IPIPEIF:
 - The memory output line offset and address must be on 32-byte boundaries.
 - In DFS block, [IPIPEIF_LPFR](#) must be 0, because the first line cannot be fetched.
 - [IPIPEIF_PPLN](#) [IPIPEIF_HNUM](#)
 - [IPIPEIF_LPFR](#) [IPIPEIF_VNUM](#) + 1
- There are restrictions on [IPIPEIF_CFG1\[15:14\]](#) INPSRC1 and [IPIPEIF_CFG1\[3:2\]](#) INPSRC2 combinations. See [Table 8-314](#) for details.

8.3.4.4 ISS ISP IPIPE Programming Model

This section describes the low-level hardware programming sequences for the configuration and use of the ISS PIPE module.

8.3.4.4.1 Global Initialization

8.3.4.4.1.1 Surrounding Modules Global Initialization

This initialization of surrounding modules is based on the integration of the ISS ISP.

8.3.4.4.1.2 ISS IPIPE Global Initialization

8.3.4.4.1.2.1 Main Sequence – ISS ISP IPIPE Global Initialization

This procedure initializes the ISS ISP PIPE modules after a POR or software reset.

Table 8-360. ISS Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|---|--------------------------------------|-------|
| Set the IPIPE processing modes. | IPIPE_SRC_MODE[0] OST | 0x- |
| Select the IPIPEIF module as a source. | IPIPE_SRC_MODE[1] WRT | 0x1 |
| Set the vertical start position of the window to process. | IPIPE_SRC_VPS[15:0] VAL | 0x- |
| Set the horizontal start position of the window to process. | IPIPE_SRC_HPS[15:0] VAL | 0x- |
| Set the vertical size of the processing area. | IPIPE_SRC_VSZ[12:0] VAL | 0X- |
| Set the horizontal size of the processing area. | IPIPE_SRC_HSZ[12:1] VAL | 0x- |
| Enable clk_arm_g0. | IPIPE_GCK_MMR[0] REG | 0x- |
| Enable the clk_pix_g3. | IPIPE_GCK_PIX[3] G3 | 0x- |
| Enable the clk_pix_g2. | IPIPE_GCK_PIX[2] G2 | 0x- |
| Enable the clk_pix_g1. | IPIPE_GCK_PIX[1] G1 | 0x- |
| Enable the clk_pix_g0. | IPIPE_GCK_PIX[0] G0 | 0x- |
| Enable IPIPE module. | IPIPE_SRC_EN[0] EN | 0x1 |

8.3.4.4.1.2.2 Subsequence – ISS ISP IPIPE Defect Pixel Correction Initialization

8.3.4.4.1.2.2.1 Subsequence – ISS ISP IPIPE LUT Defect Pixel Correction (LUT DPC)

Table 8-361. ISS ISP IPIPE LUT Defect Pixel Correction (LUT DPC)

| Step | Register/Bit Field/Programming Model | Value |
|---|--------------------------------------|-------|
| Set the address of the first valid data in the LUT. | IPIPE_DPC_LUT_ADR[9:0] ADR | 0x- |
| Set the LUT type. | IPIPE_DPC_LUT_SEL[1] TBL | 0x- |
| Set the size of the LUT. | IPIPE_DPC_LUT_SIZ[9:0] SIZ | 0x- |
| Set the dot replacement correction method . | IPIPE_DPC_LUT_SEL[0] DOT | 0x- |
| Enable LUT DPC. | IPIPE_DPC_LUT_EN[0] EN | 0x1 |

8.3.4.4.1.2.3 Subsequence – ISS ISP IPIPE White Balance Initialization

Table 8-362. ISS ISP IPIPE White Balance Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--------------------------------------|--|-------|
| Set the offset before white balance. | IPIPE_WB2_OFT_R[11:0] VAL IPIPE_WB2_OFT_GR[11:0] VAL IPIPE_WB2_OFT_GB[11:0] VAL IPIPE_WB2_OFT_B[11:0] VAL | 0x- |
| Set the white balance gain. | IPIPE_WB2_WGN_R[12:0] VAL IPIPE_WB2_WGN_GR[12:0] VAL IPIPE_WB2_WGN_GB[12:0] VAL IPIPE_WB2_WGN_B[12:0] VAL | 0x- |

8.3.4.4.1.2.4 Subsequence – ISS ISP IPIPE RGB2RGB Blending Module Initialization

Table 8-363. ISS ISP IPIPE RGB2RGB Blending Module Initialization

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Set gain range. | IPIPE_RGB1_MUL_RR[11:0] VAL IPIPE_RGB1_MUL_GR[11:0] VAL IPIPE_RGB1_MUL_BR[11:0] VAL IPIPE_RGB1_MUL_RG[11:0] VAL IPIPE_RGB1_MUL_GG[11:0] VAL IPIPE_RGB1_MUL_BG[11:0] VAL IPIPE_RGB1_MUL_RB[11:0] VAL IPIPE_RGB1_MUL_GB[11:0] VAL IPIPE_RGB1_MUL_BB[11:0] VAL | 0x- |
| Se the offset range for each component. | IPIPE_RGB1_OFT_OR[12:0] VAL IPIPE_RGB1_OFT_OG[12:0] VAL IPIPE_RGB1_OFT_OB[12:0] VAL | 0x- |

8.3.4.4.1.2.5 Subsequence – ISS ISP IPIPE Gamma Correction Module Initialization

Table 8-364. ISS ISP IPIPE Gamma Correction Module Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Select the gamma table. | IPIPE_GMM_CFG[4] TBL | 0x- |
| Set the size of the gamma table. | IPIPE_GMM_CFG[6:5]SIZ | 0x- |
| (optional) Insert bypass bit for each color. | IPIPE_GMM_CFG[0] BYPR IPIPE_GMM_CFG[1] BYPG IPIPE_GMM_CFG[2] BYPB | 0x1 |

8.3.4.4.1.2.6 Subsequence – ISS ISP IPIPE 2nd RGB2RGB Conversion Matrix Initialization

Table 8-365. ISS ISP IPIPE 2nd RGB2RGB Conversion Matrix Initialization

| Step | Register/Bit Field/Programming Model | Value |
|---------------------|---|-------|
| Set the gain range. | IPIPE_RGB2_MUL_RR[10:0] VAL IPIPE_RGB2_MUL_GR[10:0] VAL IPIPE_RGB2_MUL_BR[10:0] VAL IPIPE_RGB2_MUL_RG[10:0] VAL IPIPE_RGB2_MUL_GG[10:0] VAL IPIPE_RGB2_MUL_BG[10:0] VAL IPIPE_RGB2_MUL_RB[10:0] VAL IPIPE_RGB2_MUL_GB[10:0] VAL IPIPE_RGB2_MUL_BB[10:0] VAL | 0x- |
| Set the offset. | IPIPE_RGB2_OFT_OR[10:0] VAL IPIPE_RGB2_OFT_OG[10:0] VAL IPIPE_RGB2_OFT_OB[10:0] VAL | 0x- |

8.3.4.4.1.2.7 Subsequence – ISS ISP IPIPE RGB2YCbCr Conversion Matrix Initialization

Table 8-366. ISS ISP IPIPE RGB2YCbCr Conversion Matrix Initialization

| Step | Register/Bit Field/Programming Model | Value |
|-----------------------------|---|-------|
| Set the brightness control. | IPIPE_YUV_ADJ[15:8] BRT | 0x- |
| Set the contrast control. | IPIPE_YUV_ADJ[7:0] CRT | 0x- |
| Configure the gain range. | IPIPE_YUV_MUL_RY[11:0]VAL IPIPE_YUV_MUL_GY[11:0]VAL IPIPE_YUV_MUL_BY[11:0]VAL IPIPE_YUV_MUL_RCB[11:0]VAL IPIPE_YUV_MUL_GCB[11:0]VAL IPIPE_YUV_MUL_BCB[11:0]VAL IPIPE_YUV_MUL_RCR[11:0]VAL IPIPE_YUV_MUL_GCR[11:0]VAL IPIPE_YUV_MUL_BCR[11:0]VAL | 0x- |

Table 8-366. ISS ISP IPIPE RGB2YCbCr Conversion Matrix Initialization (continued)

| Step | Register/Bit Field/Programming Model | Value |
|-------------------------------------|--------------------------------------|-------|
| Set the output offset value for Y. | IPIPE_YUV_OFT_Y[10:0] VAL | 0x- |
| Set the output offset value for Cr. | IPIPE_YUV_OFT_CR[10:0] VAL | 0x- |
| Set the output offset value for Cb. | IPIPE_YUV_OFT_CB[10:0] VAL | 0x- |

8.3.4.4.1.2.8 Subsequence – ISS ISP IPIPE 4:2:2 Conversion Module Initialization

Table 8-367. ISS ISP IPIPE 4:2:2 Conversion Module Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| If: RAW BAYER data set as an input? | IPIPE_SRC_FMT.[1:0] FMT | = 0x0 |
| Select the Y and Cb/Cr sampling point. | IPIPE_YUV_PHS[0] POS | 0x- |
| Enable 4:2:2 conversion module. | IPIPE_YUV_PHS[1] PLF | 0x- |
| ELSE | | |

8.3.4.4.1.2.9 Subsequence – ISS ISP IPIPE 2D Edge Enhancer Initialization

Table 8-368. ISS ISP IPIPE 2D Edge Enhancer Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Set the merging method. | IPIPE_YEE_TYP[0] SEL | 0x- |
| Set the downshift length of HPF in the edge enhancer. | IPIPE_YEE_SHF[3:0] SHF | 0x- |
| Set the edge enhancer lower threshold before referring to the LUT. | IPIPE_YEE_THR[5:0] VAL | 0x- |
| Set the multiplier coefficient in the HPF. | IPIPE_YEE_MUL_00[9:0] VAL IPIPE_YEE_MUL_01[9:0] VAL IPIPE_YEE_MUL_02[9:0] VAL IPIPE_YEE_MUL_10[9:0] VAL IPIPE_YEE_MUL_11[9:0] VAL IPIPE_YEE_MUL_12[9:0] VAL IPIPE_YEE_MUL_20[9:0] VAL IPIPE_YEE_MUL_21[9:0] VAL IPIPE_YEE_MUL_22[9:0] VAL | 0x- |
| Set the edge sharpener HPF value lower limit. | IPIPE_YEE_E_THR_1[11:0] VAL | 0x- |
| Set the edge sharpener HPF value upper limit. | IPIPE_YEE_E_THR_2[5:0] VAL | 0x- |
| Set the edge sharpener gain value on gradient. | IPIPE_YEE_G_GAN[7:0] VAL | 0x- |
| Set the edge sharpener gain value. | IPIPE_YEE_E_GAN[7:0] VAL | 0x- |
| Set the edge sharpener offset value on gradient. | IPIPE_YEE_G_OFT[5:0] VAL | 0x- |
| Enable the 2D edge enhancer. | IPIPE_YEE_EN[0] EN | 0x1 |

8.3.4.4.1.2.10 Subsequence – ISS ISP IPIPE Histogram Initialization

Table 8-369. ISS ISP IPIPE Histogram Initialization

| Step | Register/Bit Field/Programming Model | Value |
|-------------------------|--------------------------------------|-------|
| Select input source. | IPIPE_HST_SEL[2] SEL | 0x- |
| Select the Bayer mode. | IPIPE_HST_SEL[1:0] TYP | 0x- |
| Set the number of bins. | IPIPE_HST_PARA[13:12] BIN | 0x- |
| Enable region(area) 0. | IPIPE_HST_PARA[0] RGN0 | 0x- |
| Enable region(area) 1. | IPIPE_HST_PARA[1] RGN1 | 0x- |
| Enable region(area) 2. | IPIPE_HST_PARA[2] RGN2 | 0x- |

Table 8-369. ISS ISP IPIPE Histogram Initialization (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Enable region(area) 3. | IPIPE_HST_PARA[3] RGN3 | 0x- |
| Set the vertical position of region 0. | IPIPE_HST_0_VPS[12:1] VAL | 0x- |
| Set the vertical position of region 1. | IPIPE_HST_1_VPS[12:1] VAL | 0x- |
| Set the vertical position of region 2. | IPIPE_HST_2_VPS[12:1] VAL | 0x- |
| Set the vertical position of region 3. | IPIPE_HST_3_VPS[12:1] VAL | 0x- |
| Set the horizontal position of region 0. | IPIPE_HST_0_HPS[12:1] VAL | 0x- |
| Set the horizontal position of region 1. | IPIPE_HST_0_HPS[12:1] VAL | 0x- |
| Set the horizontal position of region 2. | IPIPE_HST_0_HPS[12:1] VAL | 0x- |
| Set the horizontal position of region 3. | IPIPE_HST_0_HPS[12:1] VAL | 0x- |
| Set the vertical size of region 0. | IPIPE_HST_0_VSZ[12:1] VAL | 0x- |
| Set the vertical size of region 1. | IPIPE_HST_1_VSZ[12:1] VAL | 0x- |
| Set the vertical size of region 2. | IPIPE_HST_2_VSZ[12:1] VAL | 0x- |
| Set the vertical size of region 3. | IPIPE_HST_3_VSZ[12:1] VAL | 0x- |
| Set the horizontal size of region 0. | IPIPE_HST_0_HSZ[12:1] VAL | 0x- |
| Set the horizontal size of region 1. | IPIPE_HST_1_HSZ[12:1] VAL | 0x- |
| Set the horizontal size of region 2. | IPIPE_HST_2_HSZ[12:1] VAL | 0x- |
| Set the horizontal size of region 3. | IPIPE_HST_3_HSZ[12:1] VAL | 0x- |
| Enable selection of the color pattern 0 (R). | IPIPE_HST_PARA[4] COL0 | 0x- |
| Enable selection of the color pattern 1 (G). | IPIPE_HST_PARA[5] COL1 | 0x- |
| Enable selection of the color pattern 2 (B). | IPIPE_HST_PARA[6] COL2 | 0x- |
| Enable selection of the color pattern 3 (Y). | IPIPE_HST_PARA[7] COL3 | 0x- |
| Set the shift length of the input data. | IPIPE_HST_PARA[11:8] SHF | 0x- |
| Enable/disable histogram memory clear. | IPIPE_HST_TBL[1] CLR | 0x- |
| Select table for store the histogram data. | IPIPE_HST_TBL[1] CLR | 0x- |
| IF: Is input from noise filter? | IPIPE_HST_SEL[2] SEI | 0x0 |
| Gain for color for R. | IPIPE_HST_MUL_R[7:0] GAIN | 0x- |
| Gain for color for GR. | IPIPE_HST_MUL_GR[7:0] GAIN | 0x- |
| Gain for color for GB. | IPIPE_HST_MUL_GB[7:0] GAIN | 0x- |
| Gain for color for B. | IPIPE_HST_MUL_B[7:0] GAIN | 0x- |
| ENDIF | | |
| Select processing mode. | IPIPE_HST_MODE[0] OST | 0x- |
| Enable histogram. | IPIPE_HST_EN[0] EN | 0x1 |

8.3.4.4.1.2.11 Subsequence – ISS ISP IPIPE Boxcar Initialization

Table 8-370. ISS ISP IPIPE Boxcar Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Select the processing mode. | IPIPE_BOX_MODE[0] OST | 0x- |
| Set the size of blocks. | IPIPE_BOX_TYP[0] SEL | 0x- |
| Set the higher 16 bits of the first address of output in memory. | IPIPE_BOX_SDR_SAD_H[15:0] VAL | 0x- |
| Set the lower 16 bits of the first address of output in memory. | IPIPE_BOX_SDR_SAD_L[15:5] VAL | 0x- |
| Set the downshift value. | IPIPE_BOX_SHF[2:0] VAL | 0x- |
| Enable boxcar. | IPIPE_BOX_EN[0] EN | 0x1 |

8.3.4.4.2 ISS ISP IPIPE Operational Modes Configuration

8.3.4.4.2.1 ISS ISP IPIPE Processing Path: Case 1 Configuration

Table 8-371. ISS ISP IPIPE Processing Path: Case 1 Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Select processing path: Case 1 | IPIPE_SRC_FMT [1:0] FMT | 0x0 |
| Configure IPIPE DPC. | See Section 8.3.4.4.1.2.2, Subsequence – ISS ISP IPIPE Defect Pixel Correction Initialization. | |
| Configure IPIPE white balance. | See Section 8.3.4.4.1.2.3, Subsequence – ISS ISP IPIPE White Balance Initialization. | |
| Configure IPIPE RGB2RGB blending module. | See Section 8.3.4.4.1.2.4, Subsequence – ISS ISP IPIPE RGB2RGB Blending Module Initialization. | |
| Configure IPIPE gamma correction module. | See Section 8.3.4.4.1.2.5, Subsequence – ISS ISP IPIPE Gamma Correction Module Initialization. | |
| Configure IPIPE 2nd RGB2RGB conversion matrix. | See Section 8.3.4.4.1.2.6, Subsequence – ISS ISP IPIPE 2nd RGB2RGB Conversion Matrix Initialization. | |
| Configure IPIPE RGB2YCbCr conversion matrix. | See Section 8.3.4.4.1.2.7, Subsequence – ISS ISP IPIPE RGB2YCbCr Conversion Matrix Initialization. | |
| Configure IPIPE 2D edge enhancer. | See Section 8.3.4.4.1.2.9, Subsequence – ISS ISP IPIPE 2D Edge Enhancer Initialization. | |
| Enable IPIPE module. | IPIPE_SRC_EN [0] EN | 0x1 |

8.3.4.4.2.2 ISS ISP IPIPE Processing Path: Case 2 Configuration

Table 8-372. ISS ISP IPIPE Processing Path: Case 2 Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------------|--|-------|
| Select processing path: Case 2. | IPIPE_SRC_FMT [1:0] FMT | 0x1 |
| Configure IPIPE DPC. | See Section 8.3.4.4.1.2.2, Subsequence – ISS ISP IPIPE Defect Pixel Correction Initialization. | |
| Configure IPIPE white balance. | See Section 8.3.4.4.1.2.3, Subsequence – ISS ISP IPIPE White Balance Initialization. | |
| Enable IPIPE module. | IPIPE_SRC_EN [0] EN | 0x1 |

8.3.4.4.2.3 ISS ISP IPIPE Processing Path: Case 3 Configuration

Table 8-373. ISS ISP IPIPE Processing Path: Case 3 Configuration

| Step | Register/Bit Field/Programming Model | Value |
|-----------------------------------|---|-------|
| Select processing path: Case 3. | IPIPE_SRC_FMT [1:0] FMT | 0x3 |
| Configure IPIPE 2D edge enhancer. | See Section 8.3.4.4.1.2.9, Subsequence – ISS ISP IPIPE 2D Edge Enhancer Initialization. | |
| Enable IPIPE module. | IPIPE_SRC_EN [0] EN | 0x1 |

8.3.4.4.2.4 ISS ISP IPIPE Processing Path: Case 4 Configuration

Table 8-374. ISS ISP IPIPE Processing Path: Case 4 Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------------|--|-------|
| Select processing path: Case 4. | IPIPE_SRC_FMT [1:0] FMT | 0x2 |
| Configure IPIPE boxcar. | See Section 8.3.4.4.1.2.11, Subsequence – ISS ISP IPIPE Boxcar Initialization. | |

Table 8-374. ISS ISP IPIPE Processing Path: Case 4 Configuration (continued)

| Step | Register/Bit Field/Programming Model | Value |
|----------------------------|--|-------|
| Configure IPIEE histogram. | See Section 8.3.4.4.1.2.10 , <i>Subsequence – ISS ISP IPIPE Histogram Initialization</i> . | |
| Enable IPIPE module. | IPIPE_SRC_EN[0] EN | 0x1 |

8.3.4.5 ISS ISP RSZ Programming Model

This section discusses programming configuration steps related to software control of the RSZ. It lists the registers that must be programmed in different modes, describes how to enable and disable the RSZ and how to check the status of the image resizing procedure, and discusses the different register access types and several programming constraints.

8.3.4.5.1 ISS ISP RSZ Hardware Setup/Initialization

This section discusses the configuration of the RSZ required before image processing can begin.

8.3.4.5.1.1 ISS ISP RSZ Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the RSZ module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the RSZ. For more information, see [Section 8.3.3.5.4](#), *ISS ISP RSZ Integration..*

Table 8-375. ISS ISP RSZ Surrounding Modules Global Initialization

| Surrounding Modules | Comments |
|---------------------|---|
| PRCM | Module interface and functional clocks must be enabled. RSZ is part of ISP, which is part of ISS. To enable the clocks for ISS, see Chapter 3 , <i>Power, Reset, and Clock Management</i> . Also see Section 8.3.2.1.1 , <i>ISS ISP Clocks</i> . |
| (optional) MPU INTC | The MPU INTC must be configured to enable interrupts from the RSZ. For information about how to configure the local ISS interrupt channels, see Section 8.3.2.2 , <i>ISS ISP Interrupt Tree</i> , and Section 8.1.2.1.1 , <i>ISS Interrupt Merger</i> . Then, to configure the outside ISS boundary channels, see Chapter 18 , <i>Interrupt Controllers</i> . |
| (optional) IPIPE | Configure the IPIPE module to process and pass data to the RSZ module. See Section 8.3.4.4 , <i>ISS ISP IPIPE Programming Model</i> . |
| (optional) IPIPEIF | Configure the IPIPEIF module to process and pass data to the RSZ module. See Section 8.3.4.3 , <i>ISS ISP IPIPEIF Programming Model</i> . |
| (optional) BL | Configure the BL for reading back data from memory. See Section 8.3.4.7 , <i>ISS ISP BL Programming Model</i> . |
| (optional) CSI2 | If the data comes from the sensor, configure the CSI2-A interface. See Section 8.2.5.4 , <i>ISS CSI2 Programming Model</i> . |
| (optional) CCP2 | If the data comes from the sensor, configure the CCP2 interface. See Section 8.2.4.4 , <i>ISS CCP2 Programming Model</i> . |

NOTE: The MPU INTC configurations are necessary if the interrupt-based communication modes are used. The IPIPE or IPIPEIF configuration is also necessary for putting data into the RSZ. Moreover, if data comes from memory, the BL must be configured. If data comes from the image sensor CSI2 or CCP2, the interface must be configured.

8.3.4.5.1.2 ISS ISP RSZ Initial Register Setup

Before enabling the RSZ, the hardware must be properly configured through register writes. [Table 8-376](#) identifies the sequence to be used before enabling the hardware.

Table 8-376. ISS ISP RSZ Initial Register Setup

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Set the MMR clock to enable RSZ register read/write access. | RSZ_GCK_MMR [0] MMR | 0x1 |
| Determine whether or not a bypass mode will be used and set the RSZ core functional clock accordingly. | RSZ_GCK_SDR [0] CORE | 0x- |
| IF: Is the core clock enabled? | RSZ_GCK_SDR [0] CORE | = 0x1 |
| Enable RSZ engine clocks. | RSZ_SYSCONFIG [8] RSZA_CLK_EN RSZ_SYSCONFIG [9] RSZB_CLK_EN | 0x1 |
| ELSE: The input data buffer is not used? | RSZ_GCK_SDR [0] CORE | = 0x0 |
| Set the bypass mode accordingly. | RSZ_SRC_FMT0 [1] BYPASS | 0x- |
| ENDIF | | |
| Enable the RSZ core clock. | RSZ_GCK_SDR [0] CORE | 0x1 |
| Determine the upscale ratio and functional clock, and adjust the fractional clock divider as appropriate. | RSZ_FRACDIV [15:0] RSZ_FRACDIV | 0x- |
| Set the low threshold of the RSZ input data buffer as appropriate. | RSZ_IN_FIFO_CTRL [28:16] THRLD_LOW | 0x- |
| Set the high threshold of the RSZ input data buffer as appropriate. | RSZ_IN_FIFO_CTRL [12:0] THRLD_HIGH | 0x- |
| Determine whether IPIPE or IPEPIF will be the source of input and set this bit accordingly. | RSZ_SRC_FMT0 [0] SEL | 0x- |
| Determine whether the RSZ will process as long as data is present in the input buffer, or whether it will wait for a WEN signal from the input source (IPIPE or IPEPIF) to process lines arrived only during WEN high state. | RSZ_SRC_MODE [1] WRT | 0x- |
| Select the processing mode (one shot or free running). This bit controls the RSZ module. There are also additional mode settings for the two RSZ engines within. After RSZ reset, the mode is automatically set to free running. | RSZ_SRC_MODE [0] OST | 0x- |
| Configure the number of interrupt intervals for writing lines into CBUFF for the two RSZ engines. | RSZ_IRQ_RZA [12:0] RZA RSZ_IRQ_RZB [12:0] RZB | 0x- |
| Enable the RSZ module. | RSZ_SRC_EN [0] EN | 0x1 |
| Enable the RSZ engine A. | RZA_EN [0] EN | 0x1 |
| Enable the RSZ engine B. | RZB_EN [0] EN | 0x1 |

NOTE: RSZ engine A or RSZ engine B must be enabled after setting all needed configuration parameters.

8.3.4.5.1.3 ISS ISP RSZ Reset Behavior

Because the RSZ module has no software reset, software can issue one at the ISP level. Moreover, upon hardware reset, all the registers in the RSZ are reset to their reset values. [Table 8-377](#) identifies the proper software sequence before and after RSZ reset issues at the ISP level.

Table 8-377. ISS ISP RSZ Reset Behavior

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| ELSE IF: Is FIFO overflow or blanking error present? | ISP5_IRQSTATUS_i[18] RSZ_FIFO_IN_OVF or ISP5_IRQSTATUS_i[19] RSZ_FIFO_IN_BLK_ERR | = 0x1 |
| Clear the FIFO blanking event. | ISP5_IRQENABLE_CLR_i[19] RSZ_FIFO_IN_BLK_ERR | 0x1 |
| Clear the overflow event. | SP5_IRQENABLE_CLR_i[18] RSZ_FIFO_IN_OVF | 0x1 |
| ELSE: No FIFO overflow or blanking error is present? | | |
| Wait until there is no DMA process and the module ready for reset. | ISP5_SYSCONFIG[1] SOFTRESET and ISP5_IRQSTATUS_i[15] RSZ_INT_DMA | = 0x0 |
| ENDIF | | |
| Disable the source data. | RSZ_SRC_EN[0] EN | 0x0 |
| Reset the RSZ at the ISP level. | ISP5_SYSCONFIG[1] SOFTRESET | 0x1 |
| Check whether the RSZ has been reset properly. | ISP5_SYSCONFIG[1] SOFTRESET | 0x- |

8.3.4.5.2 ISS ISP RSZ Global Image Processing Settings

This section discusses the configuration of the RSZ global settings before/during image frame processing. [Table 8-378](#) identifies the global RSZ functional sequence, which includes global control, frame settings, bandwidth control, and reversal output image frames.

Table 8-378. ISS ISP RSZ Global Image Processing Settings

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Initialize the RSZ module. | See Section 8.3.4.5.1 . | |
| Determine input data type and configure the source parameters. | See Section 8.3.4.5.2.1 . | |
| Determine if vertical flip of the output image will be performed by the two RSZ engines and set accordingly. | RSZ_SEQ[1] VRVA RSZ_SEQ[3] VRVB | 0x- |
| Determine if horizontal flip of the output image will be performed by the two RSZ engines and set accordingly. | RSZ_SEQ[0] HRVA RSZ_SEQ[2] HRVB | 0x- |
| Set the baseline address of the RSZ output to CBUFF. Best performance can be achieved by assigning address on a 128-byte boundary. | RZA_SDR_Y_BAD_H[15:0] Y_BAD_H RZA_SDR_Y_BAD_L[15:0] Y_BAD_L RZB_SDR_Y_BAD_H[15:0] Y_BAD_H RZB_SDR_Y_BAD_L[15:0] Y_BAD_L RZA_SDR_C_BAD_H[15:0] C_BAD_H RZA_SDR_C_BAD_L[15:0] C_BAD_L RZB_SDR_C_BAD_H[15:0] C_BAD_H RZB_SDR_C_BAD_L[15:0] C_BAD_L | 0x- |

Table 8-378. ISS ISP RSZ Global Image Processing Settings (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Set the start address of the RSZ output to CBUFF. The first data output will be written to this address. If the first line of a frame is written at the beginning of the CBUFF memory, then SAD = BAD and PTR_S = 0. It is strongly advised to set up this address on a 128-byte boundary, which will lead to the best performance. | RZA_SDR_Y_SAD_H[15:0] Y_SAD_H | 0x- |
| | RZA_SDR_Y_SAD_L[15:0] Y_SAD_L | |
| | RZB_SDR_Y_SAD_H[15:0] Y_SAD_H | |
| | RZB_SDR_Y_SAD_L[15:0] Y_SAD_L | |
| | RZA_SDR_C_SAD_H[15:0] C_SAD_H | |
| | RZA_SDR_C_SAD_L[15:0] C_SAD_L | |
| | RZB_SDR_C_SAD_H[15:0] C_SAD_H | |
| Set the start pointer of the CBUFF internal counter. It must be set up as $PTR_S = (SAD - BAD) / OFT$. PTR_S is expressed in number of lines. | RZA_SDR_Y_PTR_S[12:0] Y_PTR_S | 0x- |
| | RZB_SDR_Y_PTR_S[12:0] Y_PTR_S | |
| | RZA_SDR_C_PTR_S[12:0] C_PTR_S | |
| | RZB_SDR_C_PTR_S[12:0] C_PTR_S | |
| Set the end pointer of the CBUFF internal counter. PTR_E is expressed in number of lines. The CBUFF can contain up to PTR_E lines. | RZA_SDR_Y_PTR_E[12:0] Y_PTR_E | 0x- |
| | RZB_SDR_Y_PTR_E[12:0] Y_PTR_E | |
| | RZA_SDR_C_PTR_E[12:0] C_PTR_E | |
| | RZB_SDR_C_PTR_E[12:0] C_PTR_E | |
| Set the line of offset expressed in bytes between two lines in the CBUFF (Line 0 = SAD, Line 1 = SAD + 1 x OFT, Line 2 = SAD + 2 x OFT). PTR_E is expressed in number of lines. The CBUFF can contain up to PTR_E lines. Note: OFT does not necessarily correspond to the size of a line in a frame; it can be much bigger. The line offset must be a multiple of 128 bytes. | RZA_SDR_Y_OFT[16:0] Y_OFT | 0x- |
| | RZB_SDR_Y_OFT[16:0] Y_OFT | |
| | RZA_SDR_C_OFT[16:0] C_OFT | |
| | RZB_SDR_C_OFT[16:0] C_OFT | |
| Determine output data type, whether it will be flipped, and configure the output memory addresses. | See Section 8.3.4.5.2.2 . | |

NOTE: When data output is 4:2:2 or 4:2:0-Y only, the following values are not needed:

- RZx_SDR_C_BAD_x
- RZx_SDR_C_SAD_x
- RZx_SDR_C_PTR_S
- RZx_SDR_C_PTR_E
- RZx_SDR_C_OFT

When output is 4:2:0-C only, the following values are not needed:

- RZx_SDR_Y_BAD_x
 - RZx_SDR_Y_SAD_x
 - RZx_SDR_Y_PTR_S
 - RZx_SDR_Y_PTR_E
 - RZx_SDR_Y_OFT
-

8.3.4.5.2.1 ISS ISP RSZ Global Image Processing Settings – Subsequence 1

The procedure shown in [Figure 8-239](#) determines which of the RSZ engines is enabled and the type of input data, and configures the source data parameters.

Figure 8-239. ISS ISP RSZ Global Image Processing Settings – Subsequence 1

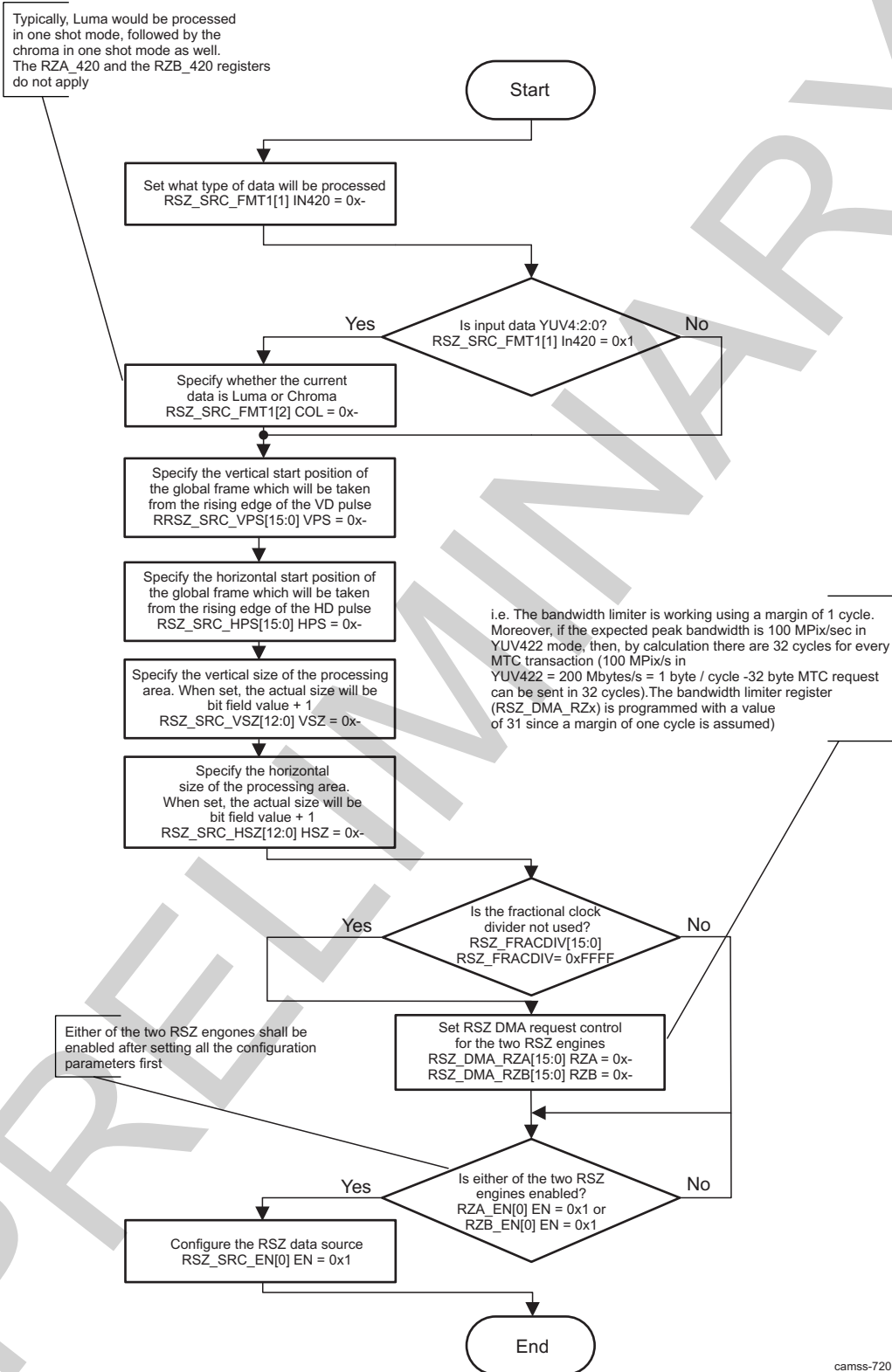
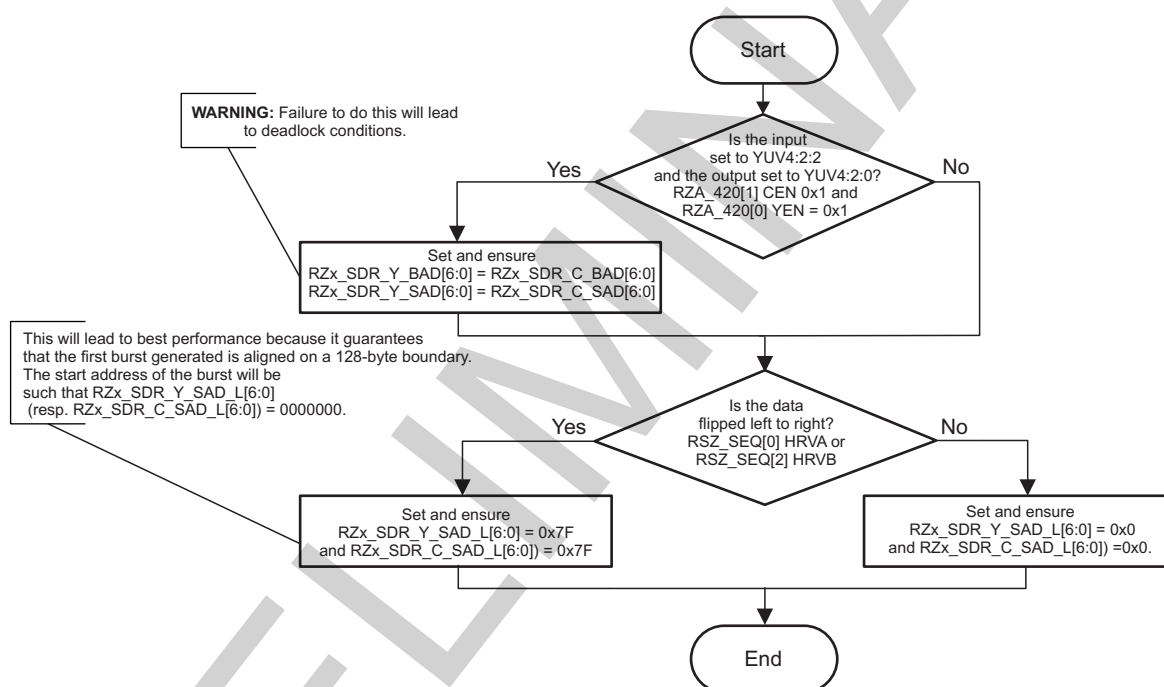


Table 8-379. Register Call Summary for ISS ISP RSZ Global Image Processing Settings – Subsequence 1

| Register Name | Register Name | Register Name |
|---------------------------------------|---------------------------------------|---|
| RZA_420[1] CEN | RZA_420[0] YEN | RSZ_SRC_FMT1[1] IN420 |
| RZB_420[0] CEN | RZB_420[1] YEN | RSZ_SRC_FMT1[2] COL |
| RSZ_SRC_EN[0] EN | RSZ_SRC_VPS[15:0] VPS | RSZ_SRC_HPS[15:0] HPS |
| RSZ_SRC_VSZ[12:0] VSZ | RSZ_SRC_HSZ[12:0] HSZ | RSZ_FRACDIV[15:0] RSZ_FRACDIV |
| RSZ_DMA_RZA[15:0] RZA | RSZ_DMA_RZB[15:0] RZB | |

8.3.4.5.2.2 ISS ISP RSZ Global Image Processing Settings – Subsequence 2

The procedure shown in [Figure 8-240](#) determines the type of output data and whether it will be flipped. Then it configures the RSZ engines accordingly.

Figure 8-240. ISS ISP RSZ Global Image Processing Settings – Subsequence 2

camss-721

Table 8-380. Register Call Summary for ISS ISP RSZ Global Image Processing Settings – Subsequence 2

| Register Name | Register Name | Register Name |
|---------------------------------|---------------------------------|---------------------------------|
| RZA_420[1] CEN | RZA_420[0] YEN | RZB_420[1] CEN |
| RZB_420[0] YEN | RZA_SDR_Y_SAD_L | RZA_SDR_C_SAD_L |
| RZB_SDR_Y_SAD_L | RZB_SDR_C_SAD_L | RSZ_SEQ[0] HRVA |
| RSZ_SEQ[2] HRVB | | |

8.3.4.5.3 ISS ISP RSZ Engines Interframe Image Processing Settings

This section discusses the configuration of the RSZ interframe image processing. [Table 8-381](#) identifies the setup sequence for the two different engines within the RSZ module.

Table 8-381. ISS ISP RSZ Engines Interframe Image Processing Settings

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| IF: Is the resizer module set to free-running mode? | RSZ_SRC_MODE [0] OST | = 0x0 |
| Set either of the engines to free-running mode to keep popping data out of the internal buffer. Otherwise, it will lead to an overflow event after the first frame. | RZA_MODE [0] MODE RZB_MODE [0] MODE | 0x0 |
| ELSE: Is the resizer module set to one-shot mode? | | |
| Set both RSZ engines to one-shot mode. | RZA_MODE [0] MODE RZB_MODE [0] MODE | 0x1 |
| ENDIF | | |
| Set the output format. See Table 8-326 . | RZA_420 [0] YEN RZA_420 [1] CEN RZB_420 [0] YEN RZB_420 [1] CEN | 0x- |
| On the side of the RSZ_SRC_VPS , RSZ_SRC_HPS , RSZ_SRC_VSZ , and RSZ_SRC_HSZ registers, set the engine complementary function to crop within the global frame and assign proper vertical start position of the input frame. | RZA_I_VPS [12:0] VPS RZB_I_VPS [12:0] VPS | 0x- |
| Assign proper horizontal start position of the input frame. | RZA_I_HPS [12:0] HPS RZB_I_HPS [12:0] HPS | 0x- |
| Assign proper vertical size of the output frame. | RZA_O_VSZ [12:0] VPS RZB_O_VSZ [12:0] VPS | 0x- |
| Assign proper horizontal size of the output frame. | RZA_O_HSZ [12:1] HPS RZB_O_HSZ [12:1] HPS | 0x- |
| Set the phase position for the Chroma and Luma element and configure the averager. | See Section 8.3.4.5.3.1 | |
| Set the vertical resize value for the two engines. (vertical resize ration = 256 / RZx_V_DIF). | RZA_V_DIF [13:0] V RZB_V_DIF [13:0] V | 0x- |
| Set the horizontal resize value for the two engines. (horizontal resize ration = 256 / RZx_H_DIF). | RZA_H_DIF [13:0] H RZB_H_DIF [13:0] H | 0x- |
| Select vertical method of resizing filtering (linear or cubic interpolation) for the Luma and Chroma elements. | RZA_V_TYP [0] Y RZB_V_TYP [0] Y RZA_V_TYP [1] C RZB_V_TYP [1] C | 0x- |
| Select horizontal method of resizing filtering (linear or cubic interpolation) for the Luma and Chroma elements. | RZA_H_TYP [0] Y RZB_H_TYP [0] Y RZA_H_TYP [1] C RZB_H_TYP [1] C | 0x- |
| IF: Is the interpolation method linear? | RZx_V_TYP [0] Y AND RZx_V_TYP [1] C RZx_H_TYP [0] Y AND RZx_H_TYP [1] C | = 0x1 |
| Set the needed vertical LPF intensity for the Luma and Chroma elements. | RZA_V_LPF [5:0] Y RZA_V_LPF [11:6] C RZB_V_LPF [5:0] Y RZB_V_LPF [11:6] C | 0x- |
| Set the needed horizontal LPF intensity for the Luma and Chroma elements. | RZA_H_LPF [5:0] Y RZA_H_LPF [11:6] C RZB_H_LPF [5:0] Y RZB_H_LPF [11:6] C | 0x- |
| ENDIF | | |
| Set the Chroma saturation MAX and MIN values. | RSZ_YUV_C_MAX [7:0] MAX RSZ_YUV_C_MIN [7:0] MIN | 0x- |
| Set the Luma saturation MAX and MIN values. | RSZ_YUV_Y_MAX [7:0] MAX RSZ_YUV_Y_MIN [7:0] MIN | 0x- |

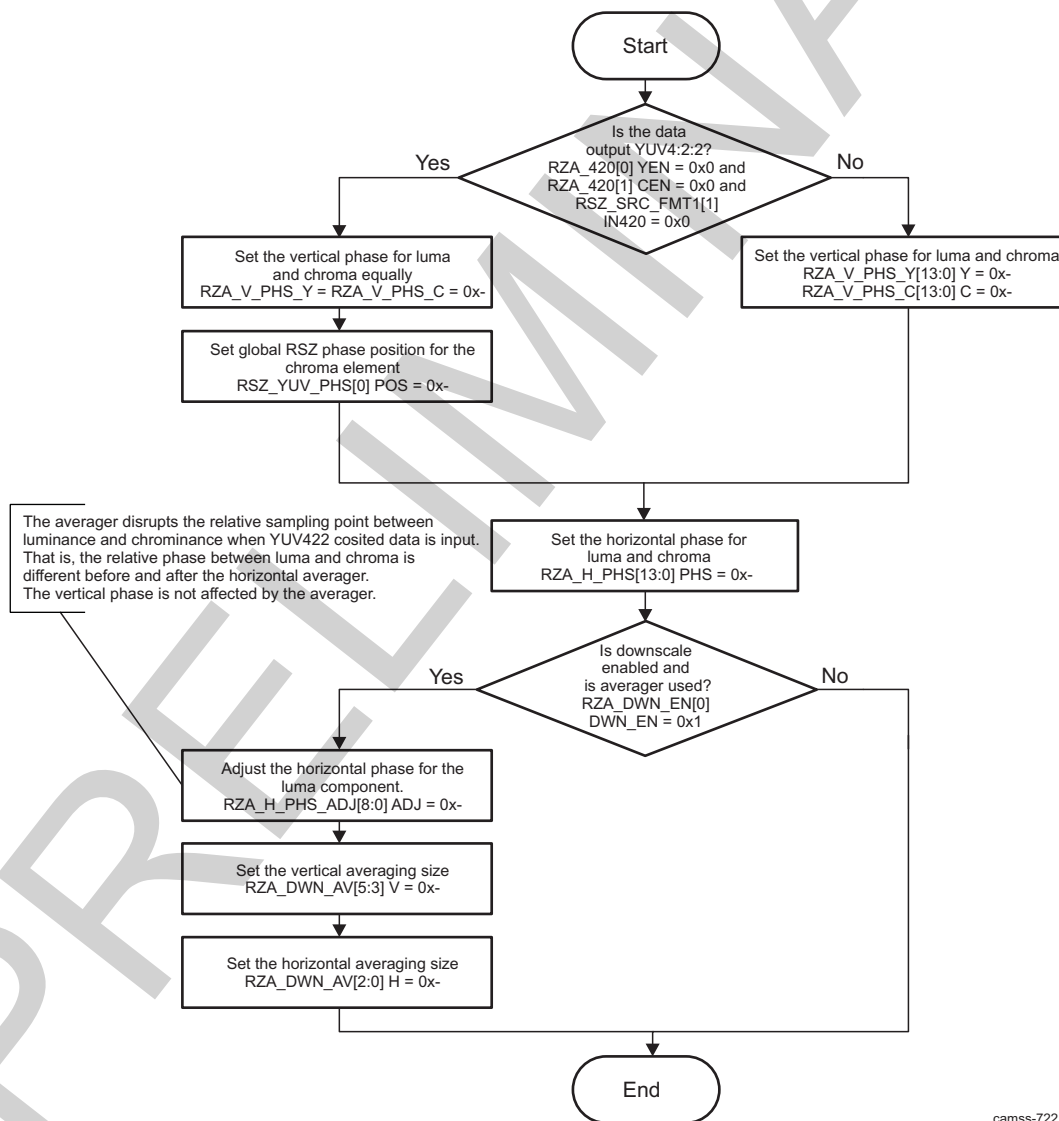
Table 8-381. ISS ISP RSZ Engines Interframe Image Processing Settings (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| (optional) Set the mode to RGB conversion, configure the alpha value and set additional pixel masking. | See Section 8.3.4.5.3.2 . | |

8.3.4.5.3.1 ISS ISP RSZ Engines Interframe Image Processing Settings – Subsequence 1

The procedure shown in [Figure 8-241](#) sets the phase position for the Chroma and Luma elements and configures the averager.

NOTE: This procedure configures RSZ engine A. The procedure for RSZ engine B is identical.

Figure 8-241. ISS ISP RSZ Engines Interframe Image Processing Settings – Subsequence 1

NOTE: When masking is used, boundaries affect the leftmost/rightmost 2 pixels in up-conversion.

Table 8-382. Register Call Summary for ISS ISP RSZ Engines Interframe Image Processing Settings – Subsequence 1

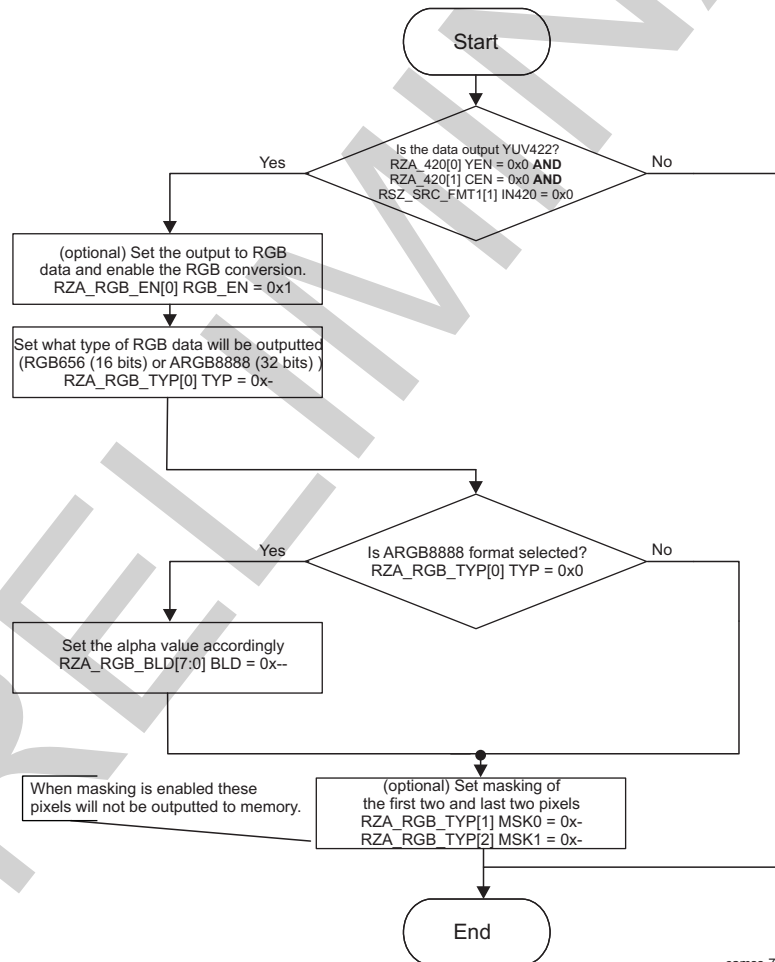
| Register Name | Register Name | Register Name |
|--------------------------------------|--|---------------------------------------|
| RZA_420[0] YEN | RZA_420[1] CEN | RSZ_SRC_FMT1[1] IN420 |
| RZA_V_PHS_Y | RZA_V_PHS_C | RSZ_YUV_PHS[0] POS |
| RZA_V_PHS_Y[13:0] Y | RZA_V_PHS_C[13:0] C | RZA_H_PHS [13:0] PHS |
| RZA_DWN_EN[0] DWN_EN | RZA_H_PHS_ADJ[8:0] ADJ | RZA_DWN_AV[5:3] V |
| RZA_DWN_AV[2:0] H | | |

8.3.4.5.3.2 ISS ISP RSZ Engines Interframe Image Processing Settings – Subsequence 2

The procedure shown in [Figure 8-242](#) sets the mode to RGB conversion, configures the alpha value, and sets additional pixel masking.

NOTE: This procedure configures RSZ engine A. The procedure for RSZ engine B is identical.

Figure 8-242. ISS ISP RSZ Engines Interframe Image Processing Settings – Subsequence 2



camss-723

Table 8-383. Register Call Summary for ISS ISP RSZ Engines Interframe Image Processing Settings – Subsequence 2

| Register Name | Register Name | Register Name |
|--------------------------------|--------------------------------|---------------------------------------|
| RZA_420[0] YEN | RZA_420[1] CEN | RSZ_SRC_FMT1[1] IN420 |

Table 8-383. Register Call Summary for ISS ISP RSZ Engines Interframe Image Processing Settings – Subsequence 2 (continued)

| Register Name | Register Name | Register Name |
|--------------------------------------|-------------------------------------|--------------------------------------|
| RZA_RGB_EN[0] RGB_EN | RZA_RGB_TYP[0] TYP | RZA_RGB_BLD[7:0] BLD |
| RZA_RGB_TYP[1] MSK0 | RZA_RGB_TYP[2] MSK1 | |

8.3.4.5.4 ISS ISP RSZ Programming Constraints

The RSZ module contains shadowed and nonshadowed registers. Shadowed registers can be updated anytime during the resizing operation, but the new setting does not take effect until the next `rsz_int_reg` event. Shadowed registers can be updated for the next frame after the `rsz_int_reg` event triggers.

Nonshadowed registers must be programmed before enabling the RSZ module or between frames (that is, after the `rsz_int_dma` and the entire frame have come on the VPORT IF, and before the VD of the next frame). [Table 8-384](#) list the nonshadowed registers.

Table 8-384. ISS ISP RSZ Nonshadowed Registers

| Nonshadowed Registers |
|----------------------------------|
| RSZ_SYSCONFIG |
| RSZ_IN_FIFO_CTRL |
| RSZ_GCK_MMR |
| RSZ_GCK_SDR |
| RSZ_SRC_MODE |
| RSZ_SRC_FMT0 |
| RSZ_SRC_VPS |
| RSZ_SRC_HPS |
| RSZ_SRC_EN |

8.3.4.6 ISS ISP H3A Programming Model

This section discusses issues related to the software control of the H3A module. It lists which registers are required to be programmed in different modes, how to enable and disable the H3A, how to check the status of the H3A, discusses the different register access types, and enumerates several programming constraints.

8.3.4.6.1 ISS ISP H3A Hardware Setup/Initialization

This section discusses the configuration of the H3A required before image processing can begin.

8.3.4.6.1.1 ISS ISP H3A Reset Behavior

Upon hardware reset of the ISP, all the registers in the H3A are reset to their reset values.

8.3.4.6.1.2 ISS ISP H3A Register Setup

For register configuration purposes, the AF and AEW engines of the H3A can be configured independently. Because there are separate enable bits for each engine, this section is divided into the AF engine and the AEW engine.

8.3.4.6.1.2.1 ISS ISP H3A AF Engine

Before enabling the AF engine, the hardware must be properly configured through register writes.

[Table 8-385](#) lists the register parameters that must be programmed before enabling the AF engine of the H3A.

Table 8-385. ISS ISP H3A AF Engine Required Configuration Parameters

| Step | Configuration Required | Value |
|--|---|-------|
| AF optional preprocessing settings | | |
| Note: A suggestion is to use the averaging filter in the IPIPEIF to reduce noise before generating AF statistics. | | |
| Enable or disable the median filter. | H3A_PCR[2] AF_MED_EN | |
| Set the median filter threshold, if the filter is enabled. | H3A_PCR[10:3] MED_TH | |
| Enable or disable A-Law compression. | H3A_PCR[1] AF_ALAW_EN | |
| Set AF general settings. | | |
| Set the focus value accumulation mode. | H3A_PCR[14] FVMODE | |
| Set the input start information. | H3A_LINE_START[31:16] SLV H3A_LINE_START[15:0] LINE_START | |
| Set the output SDRAM destination start address. | H3A_AFBUFST[31:5] AFBUFST | |
| RGB pixel extraction and paxel settings | | |
| Set the RGB positions in the pixel. | H3A_PCR[13:11] RGBPOS | |
| Set the paxel width. | H3A_AFPAX1[23:16] PAXW | |
| Set the paxel height. | H3A_AFPAX1[7:0] PAXH | |
| Set the paxel horizontal start position. | H3A_AFPAXSTART[27:16] PAXSH | |
| Set the paxel vertical start position. | H3A_AFPAXSTART[11:0] PAXSV | |
| Set the column increment. | H3A_AFPAX2[20:17] AFINCH | |
| Set the line increment. | H3A_AFPAX2[16:13] AFINCV | |
| Set the vertical paxel count. | H3A_AFPAX2[12:6] PAXVC | |
| Set the horizontal paxel count. | H3A_AFPAX2[5:0] PAXHC | |
| Horizontal focus value calculator settings | | |
| Set the horizontal threshold for the two IIR. | H3A_HVF_THR[31:16] HTHR2 H3A_HVF_THR[15:0] HTHR1 | |
| Set the IIR horizontal start position. | H3A_AFIIRSH[11:0] IIRSH | |
| Set the coefficients for the SET 0 IIR. | H3A_AFCOEF010 H3A_AFCOEF032 H3A_AFCOEF054 H3A_AFCOEF076 H3A_AFCOEF098 H3A_AFCOEF0010 | |
| Set the coefficients for the SET 1 IIR. | H3A_AFCOEF110 H3A_AFCOEF132 H3A_AFCOEF154 H3A_AFCOEF176 H3A_AFCOEF198 H3A_AFCOEF1010 | |
| Vertical focus value calculator settings | | |
| Enable or disable vertical AF focus value calculation. | H3A_PCR[20] AF_VF_EN | |
| Set the vertical FIR 1 coefficients and threshold. | H3A_VFV_CFG1 H3A_VFV_CFG2 | |
| Set the vertical FIR 2 coefficients and threshold. | H3A_VFV_CFG3 H3A_VFV_CFG4 | |

The following references offer guidelines on how to program the filter coefficients and make use of the H3A output.

- V. Peddigari, M. Gamadia, and N. Kehtarnavaz, *Real-time implementation issues in passive automatic focusing for digital still cameras*, Journal of Imaging Science and Technology, vol. 49, no. 2, pp. 114-123, Mar/Apr 2005.
- M. Gamadia and N. Kehtarnavaz, *A real-time continuous automatic focus algorithm for digital cameras*, in Proceedings of IEEE Southwest Symposium on Image Analysis and Interpretation 2006, pp. 163 - 167, Mar. 2006.
- M. Gamadia, N. Kehtarnavaz, and K. Roberts-Hoffman, *Low-light auto-focus enhancement for digital and cell-phone camera image pipelines*, IEEE Transactions on Consumer Electronics, vol. 53, no. 2, pp. 249-257, May 2007.

8.3.4.6.1.2.2 ISS ISP H3A AEW Engine

Before enabling the AEW engine, the hardware must be properly configured through register writes. [Table 8-386](#) lists the register parameters that must be programmed before enabling the AEW engine of the H3A.

Table 8-386. ISS ISP H3A AEW Engine Required Configuration Parameters

| Step | Configuration Required | Value |
|---|--|-------|
| AEW optional preprocessing settings | | |
| Enable or disable the median filter. | H3A_PCR[19] AEW_MED_EN | |
| Set the median filter threshold. | H3A_PCR[10:3] MED_TH | |
| Enable or disable A-Law compression. | H3A_PCR[17] AEW_ALAW_EN | |
| Set AEW general settings. | | |
| Set the saturation limit. | H3A_PCR[31:22] AVE2LMT | |
| Set the AE/AWB output format. | H3A_AEWCFG[9:8] AEFMT | |
| Set the AE/AWB shift value for sum of pixels. | H3A_AEWCFG[3:0] SUMFST | |
| Set the input start information. | H3A_LINE_START[31:16] SLV H3A_LINE_START[15:0] LINE_START | |
| Set the output SDRAM destination start address. | H3A_AEWBUFST[31:5] AEWBUFST | |
| Set the AE/AWB window configuration settings. | | |
| Set the window width (in pixels). | H3A_AEWWIN1[20:13] WINW | |
| Set the window height (in lines). | H3A_AEWWIN1[31:24] WINH | |
| Set the window count for horizontal direction. | H3A_AEWWIN1[5:0] WINHC | |
| Set the window count for vertical direction. | H3A_AEWWIN1[12:6] WINVC | |
| Set the window start position H. | H3A_AEWINSTART[11:0] WINSH | |
| Set the window start position V. | H3A_AEWINSTART[27:16] WINSV | |
| Set the horizontal distance between subsamples. | H3A_AEWSUBWIN[3:0] AEWINCH | |
| Set the vertical distance between subsamples. | H3A_AEWSUBWIN[11:8] AEWINCV | |
| Set the vertical start position for single black line of windows. | H3A_AEWINBLK[27:16] WINSV | |
| Set the height for the single black line of windows. | H3A_AEWINBLK[6:0] WINH | |

8.3.4.6.2 ISS ISP H3A Enable/Disable Hardware

Setting the [H3A_PCR\[0\] AF_EN](#) bit enables the AF engine, and setting the [H3A_PCR\[16\] AEW_EN](#) bit enables the AEW engine. This is done after all of the required registers discussed in the previous section are programmed.

The H3A operates in continuous mode. Processing of the frame is dependent on the timing of the IPIPEIF. To ensure that data from the IPIPEIF is not missed, the H3A must be enabled before the IPIPEIF. In this way, the H3A waits for data from the IPIPEIF. The AF engine or the AEW engine can be disabled by clearing the [H3A_PCR\[0\] AF_EN](#) or [H3A_PCR\[16\] AEW_EN](#) bit, respectively, during the processing of the last frame. The disable is latched in at the end of the frame in which it was written.

8.3.4.6.3 ISS ISP H3A Register Accessibility During Frame Processing

There are two types of register access in the H3A module:

- Shadow registers

These registers/fields can be read and written (if the field is writable) at any time. However, the written values take effect only at the start of a frame. Reads still return the most recent write even though the settings are not used until the next start of frame.

The only shadowed registers in the H3A module are:

- [H3A_AFPAX1](#)
- [H3A_AFPAX2](#)
- [H3A_AFPAXSTART](#)
- [H3A_AFIIRSH](#)
- [H3A_AEWWIN1](#)
- [H3A_AEWINSTART](#)
- [H3A_AEWINBLK](#)
- [H3A_AEWSUBWIN](#)
- [H3A_AEWCFCG](#)
- [H3A_AEWBUFST](#)

- Busy-lock registers

All other registers, except those described previously, belong to this category.

Busy-lock registers cannot be written when the module is busy ([H3A_PCR\[15\] BUSYAF == 1](#) OR [H3A_PCR\[18\] BUSYAEAWB == 1](#)). Writes are allowed to occur, but no change occurs in the registers (blocked writes from the hardware perspective, but allowed write from the software perspective). Once the busy bit in the [H3A_PCR](#) register ([H3A_PCR\[15\] BUSYAF](#) or [H3A_PCR\[18\] BUSYAEAWB](#) bit) is reset to 0, the busy-lock registers can be written.

The ideal procedure for changing the H3A registers if ([H3A_PCR\[15\] BUSYAF == 0](#) or [H3A_PCR\[18\] BUSYAEAWB == 0](#)) or if (EOF interrupt occurs) is:

1. Disable AF or AE/AWB.
2. Change registers.
3. Enable AF or AE/AWB.

8.3.4.6.4 ISS ISP H3A Interframe Operations

Between frames, it may be necessary to modify the memory pointers before processing the next frame. Because the [H3A_PCR](#) register and memory pointer registers are shadowed, these modifications can take place any time before the end of the frame, and the data will be latched in for the next frame. The host controller can perform these changes upon receiving an interrupt.

8.3.4.6.5 ISS ISP H3A Summary of Constraints

The following is a list of register configuration constraints to adhere to when programming the H3A. It can be used as a quick checklist. More detailed register setting constraints can be found in the individual register descriptions.

- The output addresses ([H3A_AFBUFST](#)[31:5] AFBUFST and) must be on 64-byte boundaries.
- Each horizontal row of paxels () or windows () starts on a 32-byte boundary.
- If the pixel clock frequency $ISP_FCLK/2$ and vertical focus is enabled, the constraints listed in [Table 8-387](#) apply.

Table 8-387. ISS ISP H3A Constraints When $PCLK < ISP_FCLK/2$ and Vertical Focus Enabled

| Field | Constraint |
|--|--|
| H3A_AEWWIN1 [20:13] WINW | 7 |
| H3A_AFPAX1 [23:16] PAXW | 7 |
| H3A_AFIIRSH [11:0] IIRSH | None |
| H3A_AFPAXSTART [27:16] PAXSH | = H3A_AFIIRSH [11:0] IIRSH + 2 |
| H3A_AFPAX2 [20:17] AFINCH | None |
| H3A_AFPAX2 [5:0] PAXHC | =11 |

- If the pixel clock frequency $ISP_FCLK/2$ and vertical focus is disabled, the constraints listed in [Table 8-388](#) apply.

Table 8-388. ISS ISP H3A Constraints When $PCLK < ISP_FCLK/2$ and Vertical Focus Disabled

| Field | Constraint |
|--|---|
| H3A_AEWWIN1 [20:13] WINW | 7 |
| H3A_AFPAX1 [23:16] PAXW | 7 |
| H3A_AFIIRSH [11:0] IIRSH | Must be even |
| H3A_AFPAXSTART [27:16] PAXSH | = H3A_AFIIRSH [11:0] IIRSH + 2 and must be even |
| H3A_AFPAX2 [20:17] AFINCH | (1+ H3A_AFPAX1 [23:16] PAXW / H3A_AFPAX2 [20:17] AFINCH) * H3A_AFPAX2 [5:0] PAXHC must be between 4 and 384 |
| H3A_AFPAX2 [5:0] PAXHC | =35 |

- If the pixel clock frequency = $ISP_FCLK/2$ and vertical focus is enabled, the constraints listed in [Table 8-389](#) apply.

Table 8-389. ISS ISP H3A Constraints When $PCLK \geq ISP_FCLK/2$ and Vertical Focus Enabled

| Field | Constraint |
|--|--|
| H3A_AEWWIN1 [20:13] WINW | 15 |
| H3A_AFPAX1 [23:16] PAXW | 15 |
| H3A_AFIIRSH [11:0] IIRSH | None |
| H3A_AFPAXSTART [27:16] PAXSH | = H3A_AFIIRSH [11:0] IIRSH + 2 |
| H3A_AFPAX2 [20:17] AFINCH | None |
| H3A_AFPAX2 [5:0] PAXHC | =11 |

- If the pixel clock frequency = $ISP_FCLK/2$ and vertical focus is disabled, the constraints in [Table 8-390](#) apply.

Table 8-390. ISS ISP H3A Constraints When $PCLK \geq ISP_FCLK/2$ and Vertical Focus Disabled

| Field | Constraint |
|--|---|
| H3A_AEWWIN1 [20:13] WINW | 15 |
| H3A_AFPAX1 [23:16] PAXW | 15 |
| H3A_AFIIRSH [11:0] IIRSH | Must be even |
| H3A_AFPAXSTART [27:16] PAXSH | = H3A_AFIIRSH [11:0] IIRSH + 2 and must be even |

Table 8-390. ISS ISP H3A Constraints When PCLK >= ISP_FCLK/2 and Vertical Focus Disabled (continued)

| Field | Constraint |
|---|--|
| H3A_AFPAX2 [20:17] AFINCH | (1+ H3A_AFPAX1 [23:16] PAXW / H3A_AFPAX2 [20:17] AFINCH) * H3A_AFPAX2 [5:0] PAXHC must be between 4 and 384 and H3A_AFPAX2 [20:17] AFINCH modulo H3A_AFPAX1 [23:16] PAXW !=1 |
| H3A_AFPAX2 [5:0] PAXHC | =35 |

AF engine

- The paxel horizontal start value must be greater than or equal to the IIR horizontal start position.
- The paxel start/end and IIR filter start positions must not be set within the first 2 and the last 2 pixels (to check).
- The width ([H3A_AFPAX1](#)[23:16] PAXW) and height ([H3A_AFPAX1](#)[7:0] PAXH) of the paxels must be an even number.
- The minimum width of the paxel ([H3A_AFPAX1](#)[23:16] PAXW) must be 16 pixels, if the pixel clock is half or less of the ISP_FCLK clock. If the pixel clock is equal to ISP_FCLK, then the minimum width is 32 pixels.
- The number of columns to increment in a paxel ([H3A_AFPAX2](#)[20:17] AFINCH) must be even and is restricted to 2 to 32.
- The number of lines to increment in a paxel ([H3A_AFPAX2](#)[16:13] AFINCV) must be even and is restricted to 0 to 30.
- The maximum number of vertical paxels in a frame ([H3A_AFPAX2](#)[12:6] PAXVC) must not exceed 128.
- The number of paxels in the horizontal direction ([H3A_AFPAX2](#)[5:0] PAXHC) has a valid range from 1 to 35.
- If vertical mode is enabled:
 - The paxel horizontal start position ([H3A_AFPAXSTART](#)[27:16] PAXSH) must be even.
 - The lower bit of the [H3A_AFPAXSTART](#)[27:16] PAXSH bit field and the lower bit of the [H3A_AFIIRSH](#)[11:0] IIRSH bit field must be equal.
 - The [H3A_AFPAXSTART](#)[11:0] PAXSV bit field must be = 8.
- If vertical mode is not enabled, the [H3A_AFIIRSH](#)[11:0] IIRSH bit field must be even.
- Paxels cannot overlap the last pixel in a line.
- Paxels must be adjacent to one another.

AEW engine

- The width ([H3A_AEWWIN1](#)[20:13] WINW) and height ([H3A_AEWWIN1](#)[31:24] WINH) of the windows must be an even number.
- The minimum width of the window ([H3A_AEWWIN1](#)[20:13] WINW) must be 16 pixels, if the pixel clock is half or less of the ISP_FCLK clock. If the pixel clock is equal to ISP_FCLK, then the minimum width is 32 pixels.
- The window height ([H3A_AEWWIN1](#)[31:24] WINH) has a valid range from 2 to 512.
- The maximum number of vertical windows in a frame ([H3A_AEWWIN1](#)[12:6] WINVC) must not exceed 128.
- The number of horizontal windows ([H3A_AEWWIN1](#)[5:0] WINHC) has a valid range from 1 to 35.
- The vertical and horizontal window start position ([H3A_AEWWINSTART](#)) has a valid range from 0 to 4095.
- The vertical window start position for single black lines ([H3A_AEWINBLK](#)[27:16] WINSV) has a valid range from 0 to 4095.
- The horizontal window start position for single black lines ([H3A_AEWINBLK](#)[6:0] WINH) must be even and has a valid range from 2 to 256

- The subsampling windows can start only on even numbers.
- The vertical and horizontal sampling point increment ([H3A_AEWSUBWIN](#)) has a valid range from 2 to 32.

8.3.4.7 ISS ISP BL Programming Model

The procedure listed in [Table 8-391](#) initializes the buffer logic.

Table 8-391. ISS ISP BL Settings

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Sets the memory access priority registers | ISP5_MPSR | |
| Sets the minimum interval between two memory requests for ISIF read port | ISP5_BL_MTC_1 [31:16] ISIF_R | |
| Sets the minimum interval between two memory requests for IPIPEIF read port | ISP5_BL_MTC_1 [15:0] IPIPEIF_R | |
| Sets the minimum interval between two memory requests for H3A write port | ISP5_BL_MTC_1 [31:16] H3A_W | |
| Set the maximum number of CIDs/tags that the BL can use. | ISP5_CTRL [7:4] VBUSM_CIDS | |
| Set the BL VBUSM priority setting. | ISP5_CTRL [3:1] VBUSM_CPRIORITY | |
| Set write posted/nonposted. | ISP5_CTRL [0] OCP_WRNP | |
| Enable the BL clock. | ISP5_CTRL [15] BL_CLK_ENABLE | 0x1 |

8.3.5 ISS ISP Register Manual

8.3.5.1 ISS ISP Instance Summary

Table 8-392. ISS ISP Instance Summary

| Module Name | Module Base Address | Size |
|---------------|---------------------|-----------|
| ISS_ISP5_SYS1 | 0x5201 0000 | 160 bytes |
| ISS_ISP5_SYS2 | 0x5201 00A0 | 864 bytes |
| ISS_RESIZER | 0x5201 0400 | 1KB |
| ISS_IPIPE | 0x5201 0800 | 2KB |
| ISS_ISIF | 0x5201 1000 | 512 bytes |
| ISS_IPIPEIF | 0x5201 1200 | 128 bytes |
| ISS_H3A | 0x5201 1400 | 512 bytes |

8.3.5.2 ISS ISP5 SYS1 Registers

8.3.5.2.1 ISS ISP5 SYS1 Register Summary

Table 8-393. ISS ISP5 SYS1 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_ISP5_SYS1 Base Address |
|--|------|-----------------------|--------------------------|----------------------------|
| ISP5_REVISION | R | 32 | 0x0000 0000 | 0x5201 0000 |
| ISP5_HWINFO1 | R | 32 | 0x0000 0004 | 0x5201 0004 |
| ISP5_HWINFO2 | R | 32 | 0x0000 0008 | 0x5201 0008 |
| ISP5_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5201 0010 |
| RESERVED | RW | 32 | 0x0000 0020 | 0x5201 0020 |
| ISP5_IRQSTATUS_RA W _i ⁽¹⁾ | RW | 32 | 0x0000 0024 + (0x10 * i) | 0x5201 0024 + (0x10 * i) |
| ISP5_IRQSTATUS_i ⁽¹⁾ | RW | 32 | 0x0000 0028 + (0x10 * i) | 0x5201 0028 + (0x10 * i) |
| ISP5_IRQENABLE_SET _i ⁽¹⁾ | RW | 32 | 0x0000 002C + (0x10 * i) | 0x5201 002C + (0x10 * i) |
| ISP5_IRQENABLE_CLR _i ⁽¹⁾ | RW | 32 | 0x0000 0030 + (0x10 * i) | 0x5201 0030 + (0x10 * i) |
| ISP5_DMAENABLE_SE T | RW | 32 | 0x0000 0064 | 0x5201 0064 |
| ISP5_DMAENABLE_CL R | RW | 32 | 0x0000 0068 | 0x5201 0068 |
| ISP5_CTRL | RW | 32 | 0x0000 006C | 0x5201 006C |
| ISP5_PG | RW | 32 | 0x0000 0070 | 0x5201 0070 |
| ISP5_PG_PULSE_CTR L | RW | 32 | 0x0000 0074 | 0x5201 0074 |
| ISP5_PG_FRAME_SIZE | RW | 32 | 0x0000 0078 | 0x5201 0078 |
| ISP5_MPSR | RW | 32 | 0x0000 007C | 0x5201 007C |
| ISP5_BL_MTC_1 | RW | 32 | 0x0000 0080 | 0x5201 0080 |
| ISP5_BL_MTC_2 | RW | 32 | 0x0000 0084 | 0x5201 0084 |
| ISP5_BL_VBUSM | RW | 32 | 0x0000 0088 | 0x5201 0088 |

⁽¹⁾ i = 0 to 3

8.3.5.2.2 ISS ISP5 SYS1 Register Description

Table 8-394. ISP5_REVISION

| | | |
|-------------------------|---|-------------------------------|
| Address Offset | 0x0000 0000 | |
| Physical Address | 0x5201 0000 | Instance ISS_ISP5_SYS1 |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility | |
| Type | R | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP Revision | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data**Table 8-395. Register Call Summary for Register ISP5_REVISION**

ISS ISP

- [ISS ISP5 SYS1 Register Summary: \[0\]](#)

Table 8-396. ISP5_HWINFO1

| | | |
|-------------------------|--|-------------------------------|
| Address Offset | 0x0000 0004 | |
| Physical Address | 0x5201 0004 | Instance ISS_ISP5_SYS1 |
| Description | GENERIC PARAMETER REGISTER Information about the hardware configuration of the IP module. | |
| Type | R | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | ISIF_RFM_LINE_SIZE | | | | | | | | RESERVED | | | | | | | | IPIPE_LINE_SIZE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|--------|
| 31:29 | RESERVED | | R | 0x0 |
| 28:16 | ISIF_RFM_LINE_SIZE | Memory line size for the data reformatter in the ISIF module. | R | 0x1500 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | IPIPE_LINE_SIZE | Memory line size for the IPIPE module | R | 0x1500 |

Table 8-397. Register Call Summary for Register ISP5_HWINFO1

ISS ISP

- [ISS ISP5 SYS1 Register Summary: \[0\]](#)

Table 8-398. ISP5_HWINFO2

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0008 | | |
| Physical Address | 0x5201 0008 | Instance | ISS_ISP5_SYS1 |
| Description | GENERIC PARAMETER REGISTER Information about the hardware configuration of the IP module. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | H3A_LINE_SIZE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|-------------------------------------|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | H3A_LINE_SIZE | Memory line size for the H3A module | R | 0x0BC0 |

Table 8-399. Register Call Summary for Register ISP5_HWINFO2

ISS ISP

- [ISS ISP5 SYS1 Register Summary: \[0\]](#)

Table 8-400. ISP5_SYSCONFIG

| | | | |
|-------------------------|--------------------------------|-----------------|---------------|
| Address Offset | 0x0000 0010 | Instance | ISS_ISP5_SYS1 |
| Physical Address | 0x5201 0010 | | |
| Description | Clock management configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------------|---|----------|---|-----------|---|-----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | STANDBYMODE | | RESERVED | | SOFTRESET | | AUTO_IDLE | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-----------|
| 31:6 | RESERVED | | R | 0x0000000 |
| 5:4 | STANDBYMODE | Configuration of the local initiator state management mode. By definition, initiator may generate read/write transaction as long as it is out of STANDBY state. 0x0: Force-standby mode: local initiator is unconditionally placed in standby state. Backup mode, for debug only. 0x1: No-standby mode: local initiator is unconditionally placed out of standby state. Backup mode, for debug only. 0x3: Reserved 0x2: Smart-standby mode: local initiator standby status depends on local conditions, that is, the module's functional requirement from the initiator. IP module must not generate (initiator-related) wake-up events. Generation of the MStandby signal must be initiated by the firmware by writing ISP5_CTRL.MSTANDBY = 1. | RW | 0x2 |
| 3:2 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 1 | SOFTRESET | <p>Software reset.</p> <p>The soft reset will cause the MStandby to be asserted as the reset value of the ISP5_CTRL.MSTANDBY bit is 1. After a soft reset, the software must ensure not to perform any access for 16 clock cycles (OCP-slave port frequency) after writing this bit. The OCP slave port is running at half the frequency of the functional clock. Before issuing a soft reset, the software must ensure that no more traffic is being generated by the ISP. Basically, it means that the camera module must be stopped from sending data and/or that the ISP modules are disabled. The last interrupt triggered by the ISP design upon completion of the frame processing is rsz_int_dma. This rsz_int_dma event must be used to enable clean termination of the processing. The software must wait a few hundred cycles to trigger the soft reset after upon assertion of the rsz_int_dma, this is to ensure that the BL is completely drained.</p> <p>Software must set the ISP in standby mode before issuing the soft reset:</p> <p>Set ISP5_SYSCONFIG.STANDBYMODE = 2 (smart standby).</p> <p>Set ISP5_CTRL.MSTANDBY to 1.</p> <p>Poll for ISP5_CTRL.MSTANDBY_WAIT = 1.</p> <p>Then, the soft reset can be applied (ISP5_SYSCONFIG.SOFTRESET = 1).</p> <p>Write 0x0: No action</p> <p>Write 0x1: Initiate software reset</p> <p>Read 0x1: Reset (software or other) ongoing</p> <p>Read 0x0: Reset done, no pending action</p> | RW | 0 |
| 0 | AUTO_IDLE | Auto clock gating. Always enabled. | R | 1 |

Table 8-401. Register Call Summary for Register ISP5_SYSCONFIG

ISS ISP

- [ISS ISP Reset: \[0\] \[1\] \[2\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[3\]](#)
- [ISS ISP RSZ Hardware Setup/Initialization: \[4\] \[5\] \[6\]](#)
- [ISS ISP5 SYS1 Register Summary: \[7\]](#)
- [ISS ISP5 SYS1 Register Description: \[8\] \[9\]](#)

Table 8-402. ISP5_IRQSTATUS_RAW_i

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0024 + (0x10 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5201 0024 + (0x10 * i) | Instance | ISS_ISP5_SYS1 |
| Description | <p>Per-event raw interrupt status vector.</p> <p>Raw status is set even if event is not enabled.</p> <p>Write 1 to set the (raw) status, mostly for debug.</p> <p>The ISP outputs four interrupt lines, ISP_IRQ0 to ISP_IRQ3. Any internal ISP event can be merged on the four lines. A same event must be enabled on only one interrupt line.</p> | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----------|---------------------|---------------------|-------------------|----------|---------------|-------------|--------------|--------------|----------|---------------------|--------------|-----------------|-----------------|-------------|------------------|-------------|---------|--------|---------|-------------|---------------|---------------|---------------|--------------------|---------------|------------|------------|------------|------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| OCP_ERR_IRQ | RESERVED | IPIPE_INT_DPC_RNEW1 | IPIPE_INT_DPC_RNEW0 | IPIPE_INT_DPC_INI | RESERVED | IPIPE_INT_EOF | H3A_INT_EOF | RSZ_INT_EOF1 | RSZ_INT_EOF0 | RESERVED | RSZ_FIFO_IN_BLK_ERR | RSZ_FIFO_OVF | RSZ_INT_CYC_RZB | RSZ_INT_CYC_RZA | RSZ_INT_DMA | RSZ_INT_LAST_PIX | RSZ_INT_REG | H3A_INT | AF_INT | AEW_INT | IPIPEIF_IRQ | IPIPE_INT_HST | IPIPE_INT_BSC | IPIPE_INT_DMA | IPIPE_INT_LAST_PIX | IPIPE_INT_REG | ISIF_INT_3 | ISIF_INT_2 | ISIF_INT_1 | ISIF_INT_0 | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|---------------|-------|
| 31 | OCP_ERR_IRQ | An OCP error has been received on the ISP master port. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 30 | RESERVED | | R | 0 |
| 29 | IPIPE_INT_DPC_RNEW1 | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 28 | IPIPE_INT_DPC_RNEW0 | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 27 | IPIPE_INT_DPC_INI | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 26 | RESERVED | | R | 0 |
| 25 | IPIPE_INT_EOF | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 24 | H3A_INT_EOF | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 23 | RSZ_INT_EOF1 | RESIZER module event: This event signals that the BL has received the EOF signal from the resizer B engine which happens one the last transfer in the frame has happened. Note that because the BL has FIFOs it may take some additional time before true data transfer completion to memory. Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|---------------|-------|
| 22 | RSZ_INT_EOF0 | <p>RESIZER module event:</p> <p>This event signals that the BL has received the EOF signal from the resizer A engine which happens one the last transfer in the frame has happened. Note that because the BL has FIFOs it may take some additional time before true data transfer completion to memory.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Set event (debug)</p> <p>Read 0x1: Event pending</p> <p>Read 0x0: No event pending</p> | RW W1toSet | 0 |
| 21:20 | RESERVED | | R | 0x0 |
| 19 | RSZ_FIFO_IN_BLK_ERR | <p>This event signals that the minimum vertical blanking period has not been respected causing errors in the input data buffering submodule.</p> <p>This event will be triggered when the rsz_int_reg event of frame N is triggered before the rsz_int_dma of frame N + 1.</p> <p>This event would typically happen at the transition between two frames because there is not enough vertical blanking between frames: the firmware must take care to ensure enough vertical blanking.</p> <p>The hardware cannot recover from this error. It will be required to perform a reset of the IP.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Set event (debug)</p> <p>Read 0x1: Event pending</p> <p>Read 0x0: No event pending</p> | RW W1toSet | 0 |
| 18 | RSZ_FIFO_OVF | <p>This event signals that overflow happened in the input data buffering submodule.</p> <p>This event would typically happen while processing a frame because the video port pixel clock is too high: the firmware must take care to use a lower pixel clock at the input of the resizer module. Depending on the mode being used, the overflow can happen at different places:</p> <ol style="list-style-type: none"> 1. Bypass mode: overflow happened in the input circular buffer. 2. Pass through mode: overflow happened on the module output interface (MTC) 3. Normal resize mode: overflow happened in the input circular buffer. <p>The hardware cannot recover from this error. It will be required to perform a reset of the IP.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Set event (debug)</p> <p>Read 0x1: Event pending</p> <p>Read 0x0: No event pending</p> | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|---------------|-------|
| 17 | RSZ_INT_CYC_RZB | <p>RESIZER module event: This event is the circular interrupt for RESIZER #B. An event can be triggered every time that RSZ_IRQ_RZB output lines have been written out to the RZB_SDR_Y buffer. The range can go from 1 to 8192 lines. Usually, this value should be such that the circular buffer vertical size (set by the RZB_SDR_Y_PTR_E register) is a multiple of RSZ_IRQ_RZB. Note that at the time the interrupt is triggered, the actual data write has not taken place. It may take a few hundred of cycles to complete the data write into system memory. This is not an issue since the start of the buffer is read first.</p> <p>Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending</p> | RW W1toSet | 0 |
| 16 | RSZ_INT_CYC_RZA | <p>RESIZER module event: This event is the circular interrupt for RESIZER #A. An event can be triggered every time that RSZ_IRQ_RZA output lines have been written out to the RZA_SDR_Y buffer. The range can go from 1 to 8192 lines. Usually, the circular buffer vertical size (set by the RZA_SDR_Y_PTR_E register) should be a multiple of RSZ_IRQ_RZA. Note that at the time the interrupt is triggered, the actual data write has not taken place. It may take a few hundred of cycles to complete the data write into system memory. This is not an issue since the start of the buffer is read first.</p> <p>Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending</p> | RW W1toSet | 0 |
| 15 | RSZ_INT_DMA | <p>This event is triggered when the last EOF (of the two MTC interfaces) is sent out to the BL and that the resizer core has returned to idle. rsz_int_dma is a true indication that all processing is finished for the particular frame on both resizer engines.</p> <p>Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending</p> | RW W1toSet | 0 |
| 14 | RSZ_INT_LAST_PIX | <p>This event is triggered when the last pixel of the valid area is received.</p> <p>Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending</p> | RW W1toSet | 0 |
| 13 | RSZ_INT_REG | <p>This event is triggered when the first pixel of the valid area is received. Shadowed registers can be updated at any time but the new value will take effect on the next rsz_int_reg event.</p> <p>Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending</p> | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|---------------|-------|
| 12 | H3A_INT | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 11 | AF_INT | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 10 | AEW_INT | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 9 | IPIPEIF_IRQ | IPIPEIF module interrupt Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 8 | IPIPE_INT_HST | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 7 | IPIPE_INT_BSC | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 6 | IPIPE_INT_DMA | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 5 | IPIPE_INT_LAST_PIX | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 4 | IPIPE_INT_REG | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 3 | ISIF_INT_3 | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 2 | ISIF_INT_2 | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 1 | ISIF_INT_1 | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 0 | ISIF_INT_0 | Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending Read 0x0: No event pending | RW W1toSet | 0 |

Table 8-403. Register Call Summary for Register ISP5_IRQSTATUS_RAW_i

ISS ISP

- [ISS ISP5 SYS1 Register Summary: \[0\]](#)

Table 8-404. ISP5_IRQSTATUS_i

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0028 + (0x10 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5201 0028 + (0x10 * i) | Instance | ISS_ISP5_SYS1 |
| Description | Per-event "enabled" interrupt status vector. Enabled status is not set unless event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). The ISP outputs four interrupt lines, ISP_IRQ0 to ISP_IRQ3. Any internal ISP event can be merged on the four lines. A same event must be enabled on only one interrupt line. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|----------|----|---------------------|----|---------------------|----|-------------------|----|----------|----|---------------|----|-------------|----|--------------|----|--------------|----|----------|----|---------------------|---|--------------|---|-----------------|---|-----------------|---|-------------|---|------------------|--|-------------|--|---------|--|--------|--|---------|--|-------------|--|---------------|--|---------------|--|---------------|--|--------------------|--|---------------|--|------------|--|------------|--|------------|--|------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OCP_ERR_IRQ | | RESERVED | | IPIPE_INT_DPC_RNEW1 | | IPIPE_INT_DPC_RNEW0 | | IPIPE_INT_DPC_INI | | RESERVED | | IPIPE_INT_EOF | | H3A_INT_EOF | | RSZ_INT_EOF1 | | RSZ_INT_EOF0 | | RESERVED | | RSZ_FIFO_IN_BLK_ERR | | RSZ_FIFO_OVF | | RSZ_INT_CYC_RZB | | RSZ_INT_CYC_RZA | | RSZ_INT_DMA | | RSZ_INT_LAST_PIX | | RSZ_INT_REG | | H3A_INT | | AF_INT | | AEW_INT | | IPIPEIF_IRQ | | IPIPE_INT_HST | | IPIPE_INT_BSC | | IPIPE_INT_DMA | | IPIPE_INT_LAST_PIX | | IPIPE_INT_REG | | ISIF_INT_3 | | ISIF_INT_2 | | ISIF_INT_1 | | ISIF_INT_0 | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|---------------|-------|
| 31 | OCF_ERR_IRQ | An OCP error has been received on the ISP master port. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 30 | RESERVED | | R | 0 |
| 29 | IPIPE_INT_DPC_RNEW1 | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 28 | IPIPE_INT_DPC_RNEW0 | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|---------------|-------|
| 27 | IPIPE_INT_DPC_INI | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 26 | RESERVED | | R | 0 |
| 25 | IPIPE_INT_EOF | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 24 | H3A_INT_EOF | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 23 | RSZ_INT_EOF1 | RESIZER module event: This event signals that the BL has received the EOF signal from the resizer B engine which happens one the last transfer in the frame has happened. Note that because the BL has FIFOs it may take some additional time before true data transfer completion to memory. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 22 | RSZ_INT_EOF0 | RESIZER module event: This event signals that the BL has received the EOF signal from the resizer A engine which happens one the last transfer in the frame has happened. Note that because the BL has FIFOs it may take some additional time before true data transfer completion to memory. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 21:20 | RESERVED | | R | 0x0 |
| 19 | RSZ_FIFO_IN_BLK_ERR | This event signals that the minimum vertical blanking period has not been respected causing errors in the input data buffering submodule. This event will be triggered when the rsz_int_reg event of frame N is triggered before the rsz_int_dma of frame N + 1. This event would typically happen at the transition between two frames because there is not enough vertical blanking between frames: the firmware must take care to ensure enough vertical blanking. The hardware cannot recover from this error. It will be required to perform a reset of the IP. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------|
| 18 | RSZ_FIFO_OVF | <p>This event signals that overflow happened in the input data buffering submodule or in the RSZ output interface. This event would typically happen while processing a frame because the video port pixel clock is too high: the firmware must take care to use a lower pixel clock at the input of the resizer module.</p> <p>The hardware cannot recover from this error. It will be required to perform a reset of the IP.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Clear (raw) event</p> <p>Read 0x1: Event pending</p> <p>Read 0x0: No (enabled) event pending</p> | RW W1toClr | 0 |
| 17 | RSZ_INT_CYC_RZB | <p>RESIZER module event:</p> <p>This event is the circular interrupt for RESIZER #B. An event can be triggered every time that RSZ_IRQ_RZB output lines have been written out to the RZB_SDR_Y buffer. The range can go from 1 to 8192 lines. Usually, this value should be such that the circular buffer vertical size (set by the RZB_SDR_Y_PTR_E register) is a multiple of RSZ_IRQ_RZB.</p> <p>Note that at the time the interrupt is triggered, the actual data write has not taken place. It may take a few hundred of cycles to complete the data write into system memory. This is not an issue since the start of the buffer is read first.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Clear (raw) event</p> <p>Read 0x1: Event pending</p> <p>Read 0x0: No (enabled) event pending</p> | RW W1toClr | 0 |
| 16 | RSZ_INT_CYC_RZA | <p>RESIZER module event:</p> <p>This event is the circular interrupt for RESIZER #A. An event can be triggered every time that RSZ_IRQ_RZA output lines have been written out to the RZA_SDR_Y buffer. The range can go from 1 to 8192 lines. Usually, the circular buffer vertical size (set by the RZA_SDR_Y_PTR_E register) should be a multiple of RSZ_IRQ_RZA.</p> <p>Note that at the time the interrupt is triggered, the actual data write has not taken place. It may take a few hundred of cycles to complete the data write into system memory. This is not an issue since the start of the buffer is read first.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Clear (raw) event</p> <p>Read 0x1: Event pending</p> <p>Read 0x0: No (enabled) event pending</p> | RW W1toClr | 0 |
| 15 | RSZ_INT_DMA | <p>This event is triggered when the last EOF (of the two MTC interfaces) is sent out to the BL and that the resizer core has returned to idle. rsz_int_dma is a true indication that all processing is finished for the particular frame on both resizer engines.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Clear (raw) event</p> <p>Read 0x1: Event pending</p> <p>Read 0x0: No (enabled) event pending</p> | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|---------------|-------|
| 14 | RSZ_INT_LAST_PIX | This event is triggered when the last pixel of the valid area is received. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 13 | RSZ_INT_REG | This event is triggered when the first pixel of the valid area is received. Shadowed registers can be updated at any time but the new value will take effect on the next rsz_int_reg event. Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 12 | H3A_INT | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 11 | AF_INT | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 10 | AEW_INT | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 9 | IPIPEIF_IRQ | IPIPEIF module interrupt Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 8 | IPIPE_INT_HST | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 7 | IPIPE_INT_BSC | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 6 | IPIPE_INT_DMA | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 5 | IPIPE_INT_LAST_PIX | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|---------------|-------|
| 4 | IPIPE_INT_REG | Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 3 | ISIF_INT_3 | LSC interrupt issued by 2D-LSC block. Four types of 2D-LSC can be generated and mapped to the INT_3 line. For more information, see Section 8.3.3.7.10.1.5 , <i>ISS ISP ISIF 2D-LSC Events and Status Checking</i> . Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 2 | ISIF_INT_2 | VD interrupt 2 event. Read this bit to check the interrupt mapped to the INT_2 line. This interrupt is also set based on the VD pulse position after receiving a configured number of horizontal pulse signals. For more information, see Section 8.3.3.7.19.1 , <i>ISS ISP ISIF VDINT0, VDINT1 and VDINT2 Interrupts</i> . Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 1 | ISIF_INT_1 | VD interrupt 1 event. Read this bit to check the interrupt mapped to the INT_1 line. This interrupt is also set based on the VD pulse position after receiving a configured number of horizontal pulse signals. For more information, see Section 8.3.3.7.19.1 , <i>ISS ISP ISIF VDINT0, VDINT1 and VDINT2 Interrupts</i> . Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |
| 0 | ISIF_INT_0 | VD interrupt 0 event. Read this bit to check the interrupt mapped to the INT_0 line. This interrupt is also set based on the VD pulse position after receiving a configured number of horizontal pulse signals. For more information, see Section 8.3.3.7.19.1 , <i>ISS ISP ISIF VDINT0, VDINT1 and VDINT2 Interrupts</i> . Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending | RW W1toClr | 0 |

Table 8-405. Register Call Summary for Register ISP5_IRQSTATUS_i

ISS ISP

- [ISS ISP RSZ Hardware Setup/Initialization: \[0\] \[1\]](#)
- [ISS ISP5 SYS1 Register Summary: \[2\]](#)

NOTE: ISP submodule interrupts are mapped to ISP top-level lines. Moreover, ISP top-level lines are mapped to the ISS top interrupt merger level. For information about how IRQ lines are handled at the ISP level, see [Table 8-311](#). For information about how IRQs are handled at the ISS top-level before the signals leave ISS boundaries, see [Section 8.1.2.1.1](#), *ISS Interrupt Merger*.

Table 8-406. ISP5_IRQENABLE_SET_i

| | | | |
|-------------------------|---|-----------------|---------------|
| Address Offset | 0x0000 002C + (0x10 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5201 002C + (0x10 * i) | Instance | ISS_ISP5_SYS1 |
| Description | Per-event interrupt enable bit vector. Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. The ISP outputs four interrupt lines, ISP_IRQ0 to ISP_IRQ3. Any internal ISP event can be merged on the four lines. A same event must be enabled on only one interrupt line. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----------|---------------------|---------------------|-------------------|----------|---------------|-------------|--------------|--------------|----------|---------------------|--------------|-----------------|-----------------|-------------|------------------|-------------|---------|--------|---------|-------------|---------------|---------------|---------------|--------------------|---------------|------------|------------|------------|------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| OC_P_ERR_IRQ | RESERVED | IPIPE_INT_DPC_RNEW1 | IPIPE_INT_DPC_RNEW0 | IPIPE_INT_DPC_INI | RESERVED | IPIPE_INT_EOF | H3A_INT_EOF | RSZ_INT_EOF1 | RSZ_INT_EOF0 | RESERVED | RSZ_FIFO_IN_BLK_ERR | RSZ_FIFO_OVF | RSZ_INT_CYC_RZB | RSZ_INT_CYC_RZA | RSZ_INT_DMA | RSZ_INT_LAST_PIX | RSZ_INT_REG | H3A_INT | AF_INT | AEW_INT | IPIPEIF_IRQ | IPIPE_INT_HST | IPIPE_INT_BSC | IPIPE_INT_DMA | IPIPE_INT_LAST_PIX | IPIPE_INT_REG | ISIF_INT_3 | ISIF_INT_2 | ISIF_INT_1 | ISIF_INT_0 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|---------------|-------|
| 31 | OCP_ERR_IRQ | An OCP error has been received on the ISP master port. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 30 | RESERVED | | R | 0 |
| 29 | IPIPE_INT_DPC_RNEW1 | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 28 | IPIPE_INT_DPC_RNEW0 | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 27 | IPIPE_INT_DPC_INI | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 26 | RESERVED | | R | 0 |
| 25 | IPIPE_INT_EOF | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 24 | H3A_INT_EOF | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|---------------|-------|
| 23 | RSZ_INT_EOF1 | RESIZER module event: This event signals that the BL has received the EOF signal from the resizer B engine which happens one the last transfer in the frame has happened. Note that because the BL has FIFOs it may take some additional time before true data transfer completion to memory. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 22 | RSZ_INT_EOF0 | RESIZER module event: This event signals that the BL has received the EOF signal from the resizer A engine which happens one the last transfer in the frame has happened. Note that because the BL has FIFOs it may take some additional time before true data transfer completion to memory. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 21:20 | RESERVED | | R | 0x0 |
| 19 | RSZ_FIFO_IN_BLK_ERR | This event signals that the minimum vertical blanking period has not been respected causing errors in the input data buffering submodule. This event will be triggered when the rsz_int_reg event of frame N is triggered before the rsz_int_dma of frame N + 1. This event would typically happen at the transition between two frames because there is not enough vertical blanking between frames: the firmware must take care to ensure enough vertical blanking. The hardware cannot recover from this error. It will be required to perform a reset of the IP. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 18 | RSZ_FIFO_OVF | This event signals that overflow happened in the input data buffering submodule or in the RSZ output interface. This event would typically happen while processing a frame because the video port pixel clock is too high: the firmware must take care to use a lower pixel clock at the input of the resizer module. The hardware cannot recover from this error. It will be required to perform a reset of the IP. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|---------------|-------|
| 17 | RSZ_INT_CYC_RZB | <p>RESIZER module event: This event is the circular interrupt for RESIZER #B. An event can be triggered every time that RSZ_IRQ_RZB output lines have been written out to the RZB_SDR_Y buffer. The range can go from 1 to 8192 lines. Usually, this value should be such that the circular buffer vertical size (set by the RZB_SDR_Y_PTR_E register) is a multiple of RSZ_IRQ_RZB. Note that at the time the interrupt is triggered, the actual data write has not taken place. It may take a few hundred of cycles to complete the data write into system memory. This is not an issue since the start of the buffer is read first.</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 16 | RSZ_INT_CYC_RZA | <p>RESIZER module event: This event is the circular interrupt for RESIZER #A. An event can be triggered every time that RSZ_IRQ_RZA output lines have been written out to the RZA_SDR_Y buffer. The range can go from 1 to 8192 lines. Usually, the circular buffer vertical size (set by the RZA_SDR_Y_PTR_E register) should be a multiple of RSZ_IRQ_RZA. Note that at the time the interrupt is triggered, the actual data write has not taken place. It may take a few hundred of cycles to complete the data write into system memory. This is not an issue since the start of the buffer is read first.</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 15 | RSZ_INT_DMA | <p>This event is triggered when the last EOF (of the two MTC interfaces) is sent out to the BL and that the resizer core has returned to idle. <code>rsz_int_dma</code> is a true indication that all processing is finished for the particular frame on both resizer engines.</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 14 | RSZ_INT_LAST_PIX | <p>This event is triggered when the last pixel of the valid area is received.</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 13 | RSZ_INT_REG | <p>This event is triggered when the first pixel of the valid area is received. Shadowed registers can be updated at any time but the new value will take effect on the next <code>rsz_int_reg</code> event.</p> <p>Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|---------------|-------|
| 12 | H3A_INT | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 11 | AF_INT | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 10 | AEW_INT | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 9 | IPIPEIF_IRQ | IPIPEIF module interrupt Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 8 | IPIPE_INT_HST | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 7 | IPIPE_INT_BSC | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 6 | IPIPE_INT_DMA | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 5 | IPIPE_INT_LAST_PIX | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 4 | IPIPE_INT_REG | Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |
| 3 | ISIF_INT_3 | LSC interrupt issued by the 2D-LSC block. Four types of 2D-LSC can be generated and mapped to the INT_3 line. For more information, see Section 8.3.3.7.10.1.5, ISS ISP ISIF 2D-LSC Events and Status Checking . Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------|
| 2 | ISIF_INT_2 | <p>VD interrupt 2 event. Set this bit to enable the interrupt and map it to the INT_2 line. This interrupt is set based on the VD pulse position after receiving a configured number of horizontal pulse signals. For more information, see Section 8.3.3.7.19.1, <i>ISS ISP ISIF VDINT0, VDINT1 and VDINT2 Interrupts</i>.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Enable interrupt</p> <p>Read 0x1: Interrupt enabled</p> <p>Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 1 | ISIF_INT_1 | <p>VD interrupt 1 event. Set this bit to enable the interrupt and map it to the INT_1 line. This interrupt is set based on the VD pulse position after receiving a configured number of horizontal pulse signals. For more information, see Section 8.3.3.7.19.1, <i>ISS ISP ISIF VDINT0, VDINT1 and VDINT2 Interrupts</i>.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Enable interrupt</p> <p>Read 0x1: Interrupt enabled</p> <p>Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |
| 0 | ISIF_INT_0 | <p>VD interrupt 0 event. Set this bit to enable the interrupt mapped to INT_0 line. This interrupt is set based on the VD pulse position after receiving a configured number of horizontal pulse signals. For more information, see Section 8.3.3.7.19.1, <i>ISS ISP ISIF VDINT0, VDINT1 and VDINT2 Interrupts</i>.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Enable interrupt</p> <p>Read 0x1: Interrupt enabled</p> <p>Read 0x0: Interrupt disabled (masked)</p> | RW W1toSet | 0 |

Table 8-407. Register Call Summary for Register ISP5_IRQENABLE_SET_i

ISS ISP

- [ISS ISP Interrupt Tree: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\]](#)
- [ISS ISP IPIPEIF Interrupts: \[25\]](#)
- [ISS ISP IPIPE Interrupts: \[26\]](#)
- [ISS ISP RSZ Interrupts: \[27\]](#)
- [ISS ISP H3A Interrupts: \[28\]](#)
- [ISS ISP ISIF Interrupts: \[29\]](#)
- [ISS ISP IPIPEIF Module Events and Status Checking: \[30\]](#)
- [ISS ISP5 SYS1 Register Summary: \[31\]](#)

NOTE: Setting the ISP submodule interrupts and mapping them to the ISP lines requires a configuration to receive the IRQ events at a higher ISS interrupt merger level. For information about how IRQ lines are handled at the ISP level, see [Table 8-311](#). For information about how IRQs are handled at the ISS top-level before the signals leave ISS boundaries, see [Section 8.1.2.1.1](#), *ISS Interrupt Merger*.

Table 8-408. ISP5_IRQENABLE_CLR_i

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0030 + (0x10 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5201 0030 + (0x10 * i) | Instance | ISS_ISP5_SYS1 |
| Description | Per-event interrupt enable bit vector. Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. The ISP outputs four interrupt lines, ISP_IRQ0 to ISP_IRQ3. Any internal ISP event can be merged on the four lines. A same event must be enabled on only one interrupt line. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----------|---------------------|---------------------|-------------------|----------|---------------|-------------|--------------|--------------|----------|---------------------|--------------|-----------------|-----------------|-------------|------------------|-------------|---------|--------|---------|-------------|---------------|---------------|---------------|--------------------|---------------|------------|------------|------------|------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| OCP_ERR_IRQ | RESERVED | IPIPE_INT_DPC_RNEW1 | IPIPE_INT_DPC_RNEW0 | IPIPE_INT_DPC_INI | RESERVED | IPIPE_INT_EOF | H3A_INT_EOF | RSZ_INT_EOF1 | RSZ_INT_EOF0 | RESERVED | RSZ_FIFO_IN_BLK_ERR | RSZ_FIFO_OVF | RSZ_INT_CYC_RZB | RSZ_INT_CYC_RZA | RSZ_INT_DMA | RSZ_INT_LAST_PIX | RSZ_INT_REG | H3A_INT | AF_INT | AEW_INT | IPIPEIF_IRQ | IPIPE_INT_HST | IPIPE_INT_BSC | IPIPE_INT_DMA | IPIPE_INT_LAST_PIX | IPIPE_INT_REG | ISIF_INT_3 | ISIF_INT_2 | ISIF_INT_1 | ISIF_INT_0 | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|---------------|-------|
| 31 | OCP_ERR_IRQ | An OCP error has been received on the ISP master port. Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 30 | RESERVED | | R | 0 |
| 29 | IPIPE_INT_DPC_RNEW1 | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 28 | IPIPE_INT_DPC_RNEW0 | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 27 | IPIPE_INT_DPC_INI | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 26 | RESERVED | | R | 0 |
| 25 | IPIPE_INT_EOF | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW | 0 |
| 24 | H3A_INT_EOF | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|---------------|-------|
| 23 | RSZ_INT_EOF1 | <p>RESIZER module event: This event signals that the BL has received the EOF signal from the resizer B engine which happens one the last transfer in the frame has happened. Note that because the BL has FIFOs it may take some additional time before true data transfer completion to memory.</p> <p>Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW | 0 |
| 22 | RSZ_INT_EOF0 | <p>RESIZER module event: This event signals that the BL has received the EOF signal from the resizer A engine which happens one the last transfer in the frame has happened. Note that because the BL has FIFOs it may take some additional time before true data transfer completion to memory.</p> <p>Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW | 0 |
| 21:20 | RESERVED | | R | 0x0 |
| 19 | RSZ_FIFO_IN_BLK_ERR | <p>This event signals that the minimum vertical blanking period has not been respected causing errors in the input data buffering submodule. This event will be triggered when the rsz_int_reg event of frame N is triggered before the rsz_int_dma of frame N + 1. This event would typically happen at the transition between two frames because there is not enough vertical blanking between frames: the firmware must take care to ensure enough vertical blanking. The hardware cannot recover from this error. It will be required to perform a reset of the IP.</p> <p>Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |
| 18 | RSZ_FIFO_OVF | <p>RESIZER module event: This event signals that overflow happened in the input data buffering submodule or in the RSZ output interface.. This event would typically happen because the video port pixel clock is too high.</p> <p>Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|-------|
| 17 | RSZ_INT_CYC_RZB | <p>RESIZER module event: This event is the circular interrupt for RESIZER #B. An event can be triggered every time that RSZ_IRQ_RZB output lines have been written out to the RZB_SDR_Y buffer. The range can go from 1 to 8192 lines. Usually, this value should be such that the circular buffer vertical size (set by the RZB_SDR_Y_PTR_E register) is a multiple of RSZ_IRQ_RZB. Note that at the time the interrupt is triggered, the actual data write has not taken place. It may take a few hundred of cycles to complete the data write into system memory. This is not an issue since the start of the buffer is read first.</p> <p>Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |
| 16 | RSZ_INT_CYC_RZA | <p>RESIZER module event: This event is the circular interrupt for RESIZER #A. An event can be triggered every time that RSZ_IRQ_RZA output lines have been written out to the RZA_SDR_Y buffer. The range can go from 1 to 8192 lines. Usually, the circular buffer vertical size (set by the RZA_SDR_Y_PTR_E register) should be a multiple of RSZ_IRQ_RZA. Note that at the time the interrupt is triggered, the actual data write has not taken place. It may take a few hundred of cycles to complete the data write into system memory. This is not an issue since the start of the buffer is read first.</p> <p>Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |
| 15 | RSZ_INT_DMA | <p>RESIZER module event: This event is triggered when the last EOF (of the two MTC interfaces) is sent out to the BL and that the resizer core has returned to idle. rsz_int_dma is a true indication that all processing is finished for the particular frame on both resizer engines.</p> <p>Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |
| 14 | RSZ_INT_LAST_PIX | <p>RESIZER module event: This event is triggered when the last pixel of the valid area is received.</p> <p>Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |
| 13 | RSZ_INT_REG | <p>RESIZER module event: This event is triggered when the first pixel of the valid area is received. Shadowed registers can be updated at any time but the new value will take effect on the next rsz_int_reg event.</p> <p>Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|---------------|-------|
| 12 | H3A_INT | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 11 | AF_INT | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 10 | AEW_INT | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 9 | IPIPEIF_IRQ | IPIPEIF module interrupt Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 8 | IPIPE_INT_HST | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 7 | IPIPE_INT_BSC | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 6 | IPIPE_INT_DMA | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 5 | IPIPE_INT_LAST_PIX | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 4 | IPIPE_INT_REG | Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |
| 3 | ISIF_INT_3 | Set this bit to disable the LSC interrupt issued by the 2D-LSC block. Four types of 2D-LSC can be generated and mapped to the INT_3 line. For more information, see Section 8.3.3.7.10.1.5, ISS ISP ISIF 2D-LSC Events and Status Checking . Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled (masked) | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------|
| 2 | ISIF_INT_2 | <p>VD interrupt 2 event. Set this bit to disable the interrupt mapped to the INT_2 line. This interrupt is set based on the VD pulse position after receiving a configured number of horizontal pulse signals. For more information, see Section 8.3.3.7.19.1, <i>ISS ISP ISIF VDINT0, VDINT1 and VDINT2 Interrupts</i>.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Disable interrupt</p> <p>Read 0x1: Interrupt enabled</p> <p>Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |
| 1 | ISIF_INT_1 | <p>VD interrupt 1 event. Set this bit to disable the interrupt mapped to the INT_1 line. This interrupt is set based on the VD pulse position after receiving a configured number of horizontal pulse signals. For more information, see Section 8.3.3.7.19.1, <i>ISS ISP ISIF VDINT0, VDINT1 and VDINT2 Interrupts</i>.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Disable interrupt</p> <p>Read 0x1: Interrupt enabled</p> <p>Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |
| 0 | ISIF_INT_0 | <p>VD interrupt 0 event. Set this bit to disable the interrupt mapped to the INT_0 line. This interrupt is set based on the VD pulse position after receiving a configured number of horizontal pulse signals. For more information, see Section 8.3.3.7.19.1, <i>ISS ISP ISIF VDINT0, VDINT1 and VDINT2 Interrupts</i>.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Disable interrupt</p> <p>Read 0x1: Interrupt enabled</p> <p>Read 0x0: Interrupt disabled (masked)</p> | RW W1toClr | 0 |

Table 8-409. Register Call Summary for Register ISP5_IRQENABLE_CLR_i

ISS ISP

- [ISS ISP RSZ Hardware Setup/Initialization: \[0\]](#)
- [ISS ISP5 SYS1 Register Summary: \[1\]](#)

NOTE: Setting or disabling the ISP submodule interrupts mapped to the ISP lines requires a configuration to receive or disable the IRQ events at a higher ISS interrupt merger level. For information about how IRQ lines are handled at the ISP level, see [Table 8-311](#). For information about how IRQs are handled at the ISS top-level before the signals leave ISS boundaries, see [Section 8.1.2.1.1](#), *ISS Interrupt Merger*.

Table 8-410. ISP5_DMAENABLE_SET

| | | | |
|------------------|--|----------|---------------|
| Address Offset | 0x0000 0064 | | |
| Physical Address | 0x5201 0064 | Instance | ISS_ISP5_SYS1 |
| Description | Per-line DMA enable bit vector Write 1 to set (enable DMA request generation). Readout equal to corresponding _CLR register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---------------------|---|--------------------|---|---------------------|---|---------------|---|---------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | IPIPE_INT_DPC_RNEW1 | | IPIPE_INT_LAST_PIX | | IPIPE_INT_DPC_RNEW0 | | IPIPE_INT_HST | | IPIPE_INT_BSC | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|---------------|------------|
| 31:5 | RESERVED | | R | 0x00000000 |
| 4 | IPIPE_INT_DPC_RNEW1 | Enable for ISP DMA request generation on line #2 This DMA request must be set to transfer the DPC data from memory to the IPIPE internal RAM. Write 0x0: No action Write 0x1: Enable DMA Read 0x1: DMA enabled Read 0x0: DMA disabled | RW W1toSet | 0 |
| 3 | IPIPE_INT_LAST_PIX | Enable for ISP DMA request generation on line #3 This DMA request must be set to transfer the GAMMA data from memory to the IPIPE internal RAM or to initialize the DPC table. One must set the ISP5_CTRL.DMA3_CFG register before enabling this DMA request. Write 0x0: No action Write 0x1: Enable DMA Read 0x1: DMA enabled Read 0x0: DMA disabled | RW W1toSet | 0 |
| 2 | IPIPE_INT_DPC_RNEW0 | Enable for ISP DMA request generation on line #2 This DMA request must be set to transfer the DPC data from memory to the IPIPE internal RAM. Write 0x0: No action Write 0x1: Enable DMA Read 0x1: DMA enabled Read 0x0: DMA disabled | RW W1toSet | 0 |
| 1 | IPIPE_INT_HST | Enable for ISP DMA request generation on line #1 This DMA request must be set to transfer the HIST data from the IPIPE internal RAM to memory. Write 0x0: No action Write 0x1: Enable DMA Read 0x1: DMA enabled Read 0x0: DMA disabled | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|---------------|-------|
| 0 | IPIPE_INT_BSC | Enable for ISP DMA request generation on line #0 This DMA request must be set to transfer the BSC data from the IPIPE internal RAM to memory. Write 0x0: No action Write 0x1: Enable DMA Read 0x1: DMA enabled Read 0x0: DMA disabled | RW W1toSet | 0 |

Table 8-411. Register Call Summary for Register ISP5_DMAENABLE_SET

ISS ISP

- [ISS ISP DMA Requests: \[0\]](#)
- [ISS ISP5 SYS1 Register Summary: \[1\]](#)

Table 8-412. ISP5_DMAENABLE_CLR

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0068 | Instance | ISS_ISP5_SYS1 |
| Physical Address | 0x5201 0068 | | |
| Description | Per-line DMA clear bit vector Write 1 to clear (disable DMA request generation). Readout equal to corresponding _SET register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|---|---|---|---|---|--------------------|---|---------------------|---|---------------|--|---------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | IPIPE_INT_DPC_RNEW1 | | | | | | | | | | | | IPIPE_INT_LAST_PIX | | IPIPE_INT_DPC_RNEW0 | | IPIPE_INT_HST | | IPIPE_INT_BSC | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|---------------|------------|
| 31:5 | RESERVED | | R | 0x00000000 |
| 4 | IPIPE_INT_DPC_RNEW1 | Clear for ISP DMA request generation on line ISS_DMA2. This DMA request must be set to transfer the DPC data from memory to the IPIPE internal RAM. Write 0x0: No action Write 0x1: Disable DMA Read 0x1: DMA enabled Read 0x0: DMA disabled | RW W1toClr | 0 |
| 3 | IPIPE_INT_LAST_PIX | Clear for ISP DMA request generation on ISS_DMA3. This DMA request must be set to transfer the GAMMA data from memory to the IPIPE internal RAM. Write 0x0: No action Write 0x1: Disable DMA Read 0x1: DMA enabled Read 0x0: DMA disabled | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|---------------|-------|
| 2 | IPIPE_INT_DPC_RNEW0 | Clear for ISP DMA request generation on ISS_DMA2. This DMA request must be set to transfer the DPC data from memory to the IPIPE internal RAM. Write 0x0: No action Write 0x1: Disable DMA Read 0x1: DMA enabled Read 0x0: DMA disabled | RW W1toClr | 0 |
| 1 | IPIPE_INT_HST | Clear for ISP DMA request generation on ISS_DMA1. This DMA request must be set to transfer the HIST data from the IPIPE internal RAM to memory. Write 0x0: No action Write 0x1: Disable DMA Read 0x1: DMA enabled Read 0x0: DMA disabled | RW W1toClr | 0 |
| 0 | IPIPE_INT_BSC | Clear for ISP DMA request generation on ISS_DMA0. This DMA request must be set to transfer the BSC data from the IPIPE internal RAM to memory. Write 0x0: No action Write 0x1: Disable DMA Read 0x1: DMA enabled Read 0x0: DMA disabled | RW W1toClr | 0 |

Table 8-413. Register Call Summary for Register ISP5_DMAENABLE_CLR

ISS ISP

- ISS ISP DMA Requests: [0]
- ISS ISP5 SYS1 Register Summary: [1]

Table 8-414. ISP5 CTRL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|-----------------------|----|----------|----|------------|----|-------------|----|----------|----|--------------|----|----------|----|-------|----|---------------|----|---------------|----|---|---|---|---|---------------|---|-----------------|---|----------------|---|----------------|--|-----------------|--|-------------------|--|-------------|--|---------------|--|------------|--|--|--|-----------------|--|--|--|----------|--|
| Address Offset | | 0x0000 006C | | | | | | | | | | | | | | | | Instance | | ISS_ISP5_SYS1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | | 0x5201 006C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | ISP5 CONTROL REGISTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | |
| DMA3_CFG | | RESERVED | | RESERVED | | HST_RD_CHK | | DPC_EVT_INI | | MSTANDBY | | VD_PULSE_EXT | | PCLK_INV | | MFLAG | | MSTANDBY_WAIT | | RESERVED | | | | | | BL_CLK_ENABLE | | ISIF_CLK_ENABLE | | H3A_CLK_ENABLE | | RSZ_CLK_ENABLE | | PIPE_CLK_ENABLE | | PIPEIF_CLK_ENABLE | | SYNC_ENABLE | | PSYNC_CLK_SEL | | VBUSM_CIDS | | | | VBUSM_CPRIORITY | | | | OCP_WRNP | |

| Bits | Field Name | Description | Type | Reset |
|---|-------------|--|------|-------|
| 31:30 | DMA3_CFG | <p>This bit field selects the DMA transfer configuration which is used with the ISS_DMA3 DMA request signal. This DMA request is generated from IPIPE_INT_LAST_PIXEL event. One can choose to use this DMA request to transfer the DPC initialization data, the gamma table, or both.</p> <p>0x0: No DMA request associated with ISS_DMA3.</p> <p>0x1: DPC DMA request associated with ISS_DMA3. Expected DMA transfer size is 2KB in the range 0x8000-0x87FF. DPC_EVT_INI must be set to 0.</p> <p>0x3: DPC + GAMMA DMA request associated with ISS_DMA3. Expected DMA transfer size is 8KB in the range 0x8000-0x87FF and 0xA800-0xBFFF. DPC_EVT_INI must be set to 0.</p> <p>0x2: GAMMA DMA request associated with ISS_DMA3. Expected DMA transfer size is 6KB in the range 0xA800-0xBFFF.</p> | RW | 0x0 |
| 29:28 | RESERVED | | R | 0x0 |
| 27 | RESERVED | | R | 0x0 |
| 26 | HST_RD_CHK | <p>When the HISTOGRAM computation is enabled and the HST DMA request is not used to read out the data, this register ensures that the data is read fast enough, else an interrupt ISP5_IRQSTATUS2_i[5] IPIPE_HST_ERR is triggered.</p> <p>The hardware sets automatically this bit to 1 when software can start reading the memory.</p> | RW | 0 |
| <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;">CAUTION</p> <p>It is the software responsibility to set this bit to 0 after reading the data. Once the MPU has read the histogram data, it must clear this register, else the ISP5_IRQSTATUS2_i[5] IPIPE_HST_ERR will occur.</p> </div> | | | | |
| <p>Write 0x0: Clears the signal to avoid error generation. The software must write this bit to 0 after the last data read.</p> <p>Write 0x1: Reserved</p> <p>Read 0x1: The MPU can read the data from the memory. Needs to complete fast enough to avoid the interrupt generation.</p> <p>Read 0x0: No interrupt generation can happen</p> | | | | |
| 25 | DPC_EVT_INI | <p>Select the IPIPE module event to be used to generate the DMA requests for the DPC submodule.</p> <p>0x0: IPIPE_INT_LAST_PIX event is selected.</p> <p>0x1: IPIPE_INT_DPC_INI event is selected.</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|-------|
| 24 | MSTANDBY | <p>MStandby signal assertion and de-assertion control for power management transitions.</p> <p>After software reset, this bit is asserted.</p> <p>Write "1" to transition from normal mode to idle mode.</p> <p>The firmware needs to ensure that no more ISP processing is ongoing before setting up this bit.</p> <p>Write "0" to transition from idle mode to normal mode.</p> <p>The software should poll ISP5_CTRL.MSTANDBY_WAIT = 0 after writing ISP5_CTRL.MSTANDBY = 0 in a transition from idle to normal mode.</p> <p>0x0: De-assert MStandby signal. May not be immediate due to power management handshaking btw the MStandby and Wait signals.</p> <p>0x1: Assert MStandby signal</p> | RW | 1 |
| 23 | VD_PULSE_EXT | <p>VD pulse extension enable</p> <p>This bit enables or disables the VD extension bridge. By default, the bridge is enabled. At ISS level, it is expected that ISP5_CTRL.VD_PULSE_EXT = 1 when the VPORT gets data from the CSI2 RX module and ISP5_CTRL.VD_PULSE_EXT = 0 when the VPORT gets data from the parallel interface or the CCP2 RX module.</p> <p>There must be at least three clock cycles between the time this bit is modified and the HD/VD pulse for start of frame comes.</p> <p>0x0: Disabled</p> <p>0x1: Enabled</p> | RW | 1 |
| 22 | PCLK_INV | <p>Pixel clock inversion.</p> <p>This bit enables or disables pixel clock inversion. The ISP always samples the data on the rising edge of the pixel clock. Enabling the inversion shifts the resampling period by 1/2 a pixel clock period.</p> <p>0x0: Normal</p> <p>0x1: Inversed</p> | RW | 0 |
| 21 | MFLAG | <p>MFlag signal generation control</p> <p>This bit controls how the OCP MFlag signal is generated on the ISS NOC.</p> <p>0x0: The MFlag value is dynamic.</p> <p>0x1: The MFlag value is static. The value is set with the ISP5_CTRL[3:1] VBUSM_CPRIORITY.</p> | RW | 0 |
| 20 | MSTANDBY_WAIT | <p>MStandby / Wait power management status bit.</p> <p>The power management framework of the ISP is based on the handshaking of the MStandby and Wait signals. The software is not supposed to write inside the ISP slave port and initiate traffic when ISP5_CTRL.MSTANDBY bit is written. The software can poll this bit to know when Wait signal is deasserted.</p> <p>Read 0x1: MStandby signal is asserted.</p> <p>Read 0x0: MStandby signal is deasserted.</p> | R | - |
| 19:16 | RESERVED | | R | 0x0 |
| 15 | BL_CLK_ENABLE | <p>BL clock enable</p> <p>0x0: Disable</p> <p>0x1: Enable</p> | RW | 0 |
| 14 | ISIF_CLK_ENABLE | <p>ISIF clock enable</p> <p>The ISP will return OCP_ERROR if one tries to program the module MMR or memory when the clock is disabled. There must be at least three clock cycles between the time this bit is modified and the HD/VD pulse for start of frame comes.</p> <p>0x0: Disable</p> <p>0x1: Enable</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------|
| 13 | H3A_CLK_ENABLE | H3A clock enable The ISP will return OCP_ERROR if one tries to program the module MMR or memory when the clock is disabled. 0x0: Disable 0x1: Enable | RW | 0 |
| 12 | RSZ_CLK_ENABLE | RESIZER clock enable The ISP will return OCP_ERROR if one tries to program the module MMR or memory when the clock is disabled. 0x0: Disable 0x1: Enable | RW | 0 |
| 11 | IPIPE_CLK_ENABLE | IPIPE clock enable The ISP will return OCP_ERROR if one tries to program the module MMR or memory when the clock is disabled. 0x0: Disable 0x1: Enable | RW | 0 |
| 10 | IPIPEIF_CLK_ENABLE | IPIPEIF clock enable The ISP will return OCP_ERROR if one tries to program the module MMR or memory when the clock is disabled. 0x0: Disable 0x1: Enable | RW | 0 |
| 9 | SYNC_ENABLE | PCLK Sync module enable 0x0: Disable. must be used only when the video port is not receiving data; for example, data is read from the IPIPEIF module memory read port. 0x1: Enable. must only be used when the video port is not receiving data. | RW | 0 |
| 8 | PSYNC_CLK_SEL | PCLK Sync clock select. This bit selects the clock which is used to resynchronize the input pixel clock. 0x0: GCK_MMR. Can be used if the input pixel clock is always lower than 100 MHz. 0x1: ISS_FCLK. must be used if the pixel clock is higher than 100 MHz. | RW | 0 |
| 7:4 | VBUSM_CIDS | BL MAX VBUSM CIDS The BL module supports up to 16 CIDs/tags. This bit field sets up the maximum number of CIDs/tags that the BL can use. The actual number of CIDs/tags is setup by VBUSM_CIDS + 1. Tag number 0 to VBUSM_CIDS are used. | RW | 0xF |
| 3:1 | VBUSM_CPRIORITY | BL VBUSM priority setting 0x6: Normal Priority VBUSM cpriority[2:0] = 6 0x1: High Priority VBUSM cpriority[2:0] = 1 0x7: Normal Priority VBUSM cpriority[2:0] = 7 0x0: High Priority VBUSM cpriority[2:0] = 0 0x2: Medium Priority VBUSM cpriority[2:0] = 2 0x4: Normal Priority VBUSM cpriority[2:0] = 4 0x5: Normal Priority VBUSM cpriority[2:0] = 5 0x3: Medium Priority VBUSM cpriority[2:0] = 3 | RW | 0x4 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | OCP_WRNP | ISP OCP master port non-posted write control. 0x0: All writes are non posted. 0x1: All writes are posted. | RW | 0 |

Table 8-415. Register Call Summary for Register ISP5_CTRL

ISS ISP

- [ISS ISP Clocks: \[0\]](#)
- [ISS ISP Reset: \[1\] \[2\]](#)
- [ISS ISP DMA Requests: \[3\] \[4\]](#)
- [ISS ISP VP Top-Level Communication With CCP2 RX and CSI2 RX: \[6\] \[7\] \[8\]](#)
- [ISS ISP VP Pixel Clock Inversion: \[9\] \[10\] \[11\]](#)
- [ISS ISP BL Functional Description: \[12\]](#)
- [ISS ISP BL Out-of-Order Responses: \[13\]](#)
- [ISS ISP BL Dynamic and Static MFlag Generation: \[14\] \[15\] \[16\]](#)
- [ISS ISP BL Programming Model: \[17\] \[18\] \[19\] \[20\]](#)
- [ISS ISP5 SYS1 Register Summary: \[21\]](#)
- [ISS ISP5 SYS1 Register Description: \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\]](#)
- [ISS ISP5 SYS2 Register Description: \[34\]](#)

Table 8-416. ISP5_PG

| | | | |
|------------------|----------------------------|----------|---------------|
| Address Offset | 0x0000 0070 | Instance | ISS_ISP5_SYS1 |
| Physical Address | 0x5201 0070 | | |
| Description | PATTERN GENERATOR REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---------|---|----|-----|-------|-------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | SRC_SEL | | EN | WEN | HDPOL | VDPOL | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5:4 | SRC_SEL | Input mux selection 0x0: ISP video port is selected. 0x1: Reserved 0x3: Pattern generator is selected. 0x2: Reserved | RW | 0x0 |
| 3 | EN | 0x0: Pattern generator off 0x1: Enable pattern generator | RW | 0 |
| 2 | WEN | 0x0: WEN is always activated 0x1: WEN is on 8 cycles and off 8 cycles | RW | 0 |
| 1 | HDPOL | 0x0: Active high 0x1: Active low | RW | 0 |
| 0 | VDPOL | 0x0: Active high 0x1: Active low | RW | 0 |

Table 8-417. Register Call Summary for Register ISP5_PG

ISS ISP

- [ISS ISP PG Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP PG Programming Model: \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [ISS ISP5 SYS1 Register Summary: \[10\]](#)

Table 8-418. ISP5_PG_PULSE_CTRL

| | | | |
|-------------------------|-----------------------------|-----------------|---------------|
| Address Offset | 0x0000 0074 | Instance | ISS_ISP5_SYS1 |
| Physical Address | 0x5201 0074 | | |
| Description | PATTERN GENERATOR REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | VDW | | | | | | | | | | | | RESERVED | | HDW | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | VDW | Pattern generator VD width Width = VDW+1 | RW | 0x000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | HDW | Pattern generator HD width Width = HDW+1 | RW | 0x0000 |

Table 8-419. Register Call Summary for Register ISP5_PG_PULSE_CTRL

ISS ISP

- [ISS ISP PG Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP PG Programming Model: \[5\] \[6\]](#)
- [ISS ISP5 SYS1 Register Summary: \[7\]](#)

Table 8-420. ISP5_PG_FRAME_SIZE

| | | | |
|-------------------------|-----------------------------|-----------------|---------------|
| Address Offset | 0x0000 0078 | Instance | ISS_ISP5_SYS1 |
| Physical Address | 0x5201 0078 | | |
| Description | PATTERN GENERATOR REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| | | | | | | | | PPLN | | | | | | | | HLPFR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | PPLN | Pattern Generator: pixels per line, PPLN+1 | RW | 0x0000 |
| 15:0 | HLPFR | Pattern Generator: half lines per frame, HLPFR+1 | RW | 0x0000 |

Table 8-421. Register Call Summary for Register ISP5_PG_FRAME_SIZE

ISS ISP

- [ISS ISP PG Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP PG Programming Model: \[5\] \[6\]](#)
- [ISS ISP5 SYS1 Register Summary: \[7\]](#)

Table 8-422. ISP5_MPSR

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 007C | Instance | ISS_ISP5_SYS1 |
| Physical Address | 0x5201 007C | | |
| Description | ISP memory access register. One need to pay attention when setting the bit fields in this register such that there is no conflict between the CPU and module accesses. Usually, the ISP modules must have access to the memories and it is only when the ISP is idle (vertical blanking period or module disabled that the CPU can access the memories. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|---------------|----|----|----|----|----|----|----|----------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | RESERVED | | | | | | | | IPIPE_GAMMA_RGB_COPY | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | IPIPE_BSC_TB1 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | IPIPE_BSC_TB0 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | IPIPE_HST_TB3 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | IPIPE_HST_TB2 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | IPIPE_HST_TB1 | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | IPIPE_HST_TB0 | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | IPIPE_D3L_TB3 | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | IPIPE_D3L_TB2 | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | IPIPE_D3L_TB1 | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | IPIPE_D3L_TB0 | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | IPIPE_GBC_TB | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | IPIPE_YEE_TB | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | IPIPE_GMM_TBR | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | IPIPE_GMM_TBG | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | IPIPE_GMM_TBB | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | IPIPE_DPC_TB | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | ISIF_DCLAMP | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | ISIF_LSC_TB1 | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | ISIF_LSC_TB0 | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | ISIF_LIN_TB | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | RESERVED | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|-------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | IPIPE_GAMMA_RGB_COPY | GAMMA table RGB Copy This bit must be enable when one wants to use the same Gamma table for the R, G and B color components. When the CPU writes the R table, it is automatically copied to the G and B tables if this bit is set. 0x0: Copy disable Independent RGB gamma table 0x1: Copy enable Common RGB Gamma table | RW | 0 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | IPIPE_BSC_TB1 | IPIPE BSC TB1 memory access priority This memory is expected to be read by the CPU or the DMA to get BSC information during vertical blanking period. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |
| 19 | IPIPE_BSC_TB0 | IPIPE BSC TB0 memory access priority This memory is expected to be read by the CPU or the DMA to get BSC information during vertical blanking period. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |
| 18 | IPIPE_HST_TB3 | IPIPE histogram memory #3 access priority This memory is expected to be read by the CPU or the DMA to get HST information during vertical blanking period. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |
| 17 | IPIPE_HST_TB2 | IPIPE histogram memory #2 access priority This memory is expected to be read by the CPU or the DMA to get HST information during vertical blanking period. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 16 | IPIPE_HST_TB1 | IPIPE histogram memory #1 access priority This memory is expected to be read by the CPU or the DMA to get HST information during vertical blanking period. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |
| 15 | IPIPE_HST_TB0 | IPIPE histogram memory #0 access priority This memory is expected to be read by the CPU or the DMA to get HST information during vertical blanking period. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |
| 14 | IPIPE_D3L_TB3 | D3L TB3 memory access priority This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |
| 13 | IPIPE_D3L_TB2 | D3L TB2 memory access priority This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |
| 12 | IPIPE_D3L_TB1 | D3L TB1 memory access priority This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |
| 11 | IPIPE_D3L_TB0 | D3L TB0 memory access priority This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |
| 10 | IPIPE_GBC_TB | IPIPE GBC TB memory access priority This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |
| 9 | IPIPE_YEE_TB | YEE TB memory access priority This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |
| 8 | IPIPE_GMM_TBR | IPIPE Gamma LUT R memory arbitration This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods. 0x0: MODULE access has higher priority 0x1: CPU access has higher priority. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------|
| 7 | IPIPE_GMM_TBG | <p>IPIPE Gamma LUT G memory arbitration This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods.</p> <p>0x0: MODULE access has higher priority 0x1: CPU access has higher priority.</p> | RW | 0 |
| 6 | IPIPE_GMM_TBB | <p>IPIPE Gamma LUT B memory arbitration This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods.</p> <p>0x0: MODULE access has higher priority 0x1: CPU access has higher priority.</p> | RW | 0 |
| 5 | IPIPE_DPC_TB | <p>IPIPE defect pixel memory arbitration This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods.</p> <p>0x0: MODULE access has higher priority 0x1: CPU access has higher priority.</p> | RW | 0 |
| 4 | ISIF_DCLAMP | <p>ISIF DC accumulation memory arbitration This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods.</p> <p>0x0: MODULE access has higher priority 0x1: CPU access has higher priority.</p> | RW | 0 |
| 3 | ISIF_LSC_TB1 | <p>ISIF LSC memory 1 access This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods.</p> <p>0x0: MODULE has memory access When the module has memory access, the potential concurrent CPU accesses (on the ISP memory map) to read the memory are stalled. The CPU will eventually get back the data during the horizontal or vertical blanking periods when the module is not making access anymore.</p> <p>0x1: CPU has memory access When the CPU has memory access (read or write), it will cause data corruption if the module tries to perform concurrent memory accesses. The module cannot know that the read or write access has not taken place because of CPU accesses.</p> | RW | 0 |
| 2 | ISIF_LSC_TB0 | <p>ISIF LSC memory 0 access This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods.</p> <p>0x0: MODULE has memory access. When the module has memory access, the potential concurrent CPU accesses (on the ISP memory map) to read the memory are stalled. The CPU will eventually get back the data during the horizontal or vertical blanking periods when the module is not making access anymore.</p> <p>0x1: CPU has memory access When the CPU has memory access (read or write), it will cause data corruption if the module tries to perform concurrent memory accesses. The module cannot know that the read or write access has not taken place because of CPU accesses.</p> | RW | 0 |
| 1 | ISIF_LIN_TB | <p>ISIF linearity compensation memory arbitration This memory is expected to be written during ISP initialization and potentially updated during vertical blanking periods.</p> <p>0x0: MODULE access has higher priority 0x1: CPU access has higher priority.</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------|
| 0 | RESERVED | | R | 0 |

Table 8-423. Register Call Summary for Register ISP5_MPSR

ISS ISP

- [ISS ISP BL Programming Model: \[0\]](#)
- [ISS ISP5 SYS1 Register Summary: \[1\]](#)

Table 8-424. ISP5_BL_MTC_1

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0080 | Instance | ISS_ISP5_SYS1 |
| Physical Address | 0x5201 0080 | | |
| Description | MEMORY REQUEST MINIMUM INTERVAL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ISIF_R | | | | | | | | | | | | | | | | IPIPEIF_R | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | ISIF_R | Sets the minimum interval btw two consecutive memory requests for the ISIF-Read port. Specified in number of interface clock cycles. | RW | 0x0000 |
| 15:0 | IPIPEIF_R | Sets the minimum interval btw two consecutive memory requests for the IPIPEIF-Read port. Specified in number of interface clock cycles. | RW | 0x0000 |

Table 8-425. Register Call Summary for Register ISP5_BL_MTC_1

ISS ISP

- [ISS ISP ISIF Expected Bandwidth on BL Ports: \[0\]](#)
- [ISS ISP BL Peak Memory Bandwidth Reduction: \[1\]](#)
- [ISS ISP BL Programming Model: \[2\] \[3\] \[4\]](#)
- [ISS ISP5 SYS1 Register Summary: \[5\]](#)

Table 8-426. ISP5_BL_MTC_2

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0084 | Instance | ISS_ISP5_SYS1 |
| Physical Address | 0x5201 0084 | | |
| Description | MEMORY REQUEST MINIMUM INTERVAL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| H3A_W | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | H3A_W | Sets the minimum interval btw two consecutive memory requests for the H3A-Write port. Specified in number of interface clock cycles. | RW | 0x0000 |
| 15:0 | RESERVED | | R | 0x0000 |

Table 8-427. Register Call Summary for Register ISP5_BL_MTC_2

ISS ISP

- [ISS ISP BL Peak Memory Bandwidth Reduction: \[0\]](#)
- [ISS ISP5 SYS1 Register Summary: \[1\]](#)

Table 8-428. ISP5_BL_VBUSM

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0088 | Instance | ISS_ISP5_SYS1 |
| Physical Address | 0x5201 0088 | | |
| Description | BL VBUSM TUNING REGISTER The settings in the register are static and not expected to be modified dynamically. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|-------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MFLAG_THRES | | LASTCMD_DLY | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5 | MFLAG_THRES | <p>MFLAG Threshold value</p> <p>The value of this bit field is a threshold which is compared to the MFlag output of the ISP5. If the BL MFlag signal is greater or equal to this threshold the last beat of the VBUSM command is delayed by ISP5_BL_VBUSM[4:0] LASTCMD_DLY cycles. Only values 0, 1 are valid, the least significant bit is tied off to 1 to make a 2-bit field.</p> <p>0x0: Thres = 1</p> <p>0x1: Thres = 3</p> | RW | 1 |
| 4:0 | LASTCMD_DLY | <p>The value of this bit field represents a delay expressed in cycles (L3 clock). This value is used to delay the last beat of the VBUSM command such that the ISP does not loose arbitration at the ISS level because the BL does not generate back to back requests by default. The last beat is delayed until the counter expires or the new request is accepted.</p> <p>This delay is used when the MFlag output of the ISP is greater or equal to ISP5_BL_VBUSM[5] MFLAG_THRES. One can set this value to 0 to disable the last command beat delay.</p> | RW | 0x04 |

Table 8-429. Register Call Summary for Register ISP5_BL_VBUSM

ISS ISP

- [ISS ISP BL VBUSM2OCP Last Beat Command Delay: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP5 SYS1 Register Summary: \[4\]](#)
- [ISS ISP5 SYS1 Register Description: \[5\] \[6\]](#)

8.3.5.3 ISS ISP5 SYS2 Registers

CAUTION

The ISS ISP5 SYS2 registers are limited to 32 bit and 16 bit data accesses; 8bit data access is not allowed and can corrupt register content.

8.3.5.3.1 ISS ISP5 SYS2 Register Summary

Table 8-430. ISS ISP5 SYS2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_ISP5_SYS2 Base Address |
|--|------|-----------------------|--------------------------|----------------------------|
| ISP5_KEY_EN1 | R | 32 | 0x0000 0000 | 0x5201 00A0 |
| ISP5_KEY_EN2 | R | 32 | 0x0000 0004 | 0x5201 00A4 |
| ISP5_KEY_EN3 | R | 32 | 0x0000 0008 | 0x5201 00A8 |
| ISP5_KEY_EN4 | R | 32 | 0x0000 000C | 0x5201 00AC |
| ISP5_KEY_EN5 | R | 32 | 0x0000 0010 | 0x5201 00B0 |
| ISP5_KEY_EN6 | R | 32 | 0x0000 0014 | 0x5201 00B4 |
| ISP5_IRQSTATUS_RA W2_j ⁽¹⁾ | RW | 32 | 0x0000 0018 + (0x10 * i) | 0x5201 00B8 + (0x10 * i) |
| ISP5_IRQSTATUS2_j ⁽¹⁾ | RW | 32 | 0x0000 001C + (0x10 * i) | 0x5201 00BC + (0x10 * i) |
| ISP5_IRQENABLE_SET 2_j ⁽¹⁾ | RW | 32 | 0x0000 0020 + (0x10 * i) | 0x5201 00C0 + (0x10 * i) |
| ISP5_IRQENABLE_CLR 2_j ⁽¹⁾ | RW | 32 | 0x0000 0024 + (0x10 * i) | 0x5201 00C4 + (0x10 * i) |

⁽¹⁾ i = 0 to 3

8.3.5.3.2 ISS ISP5 SYS2 Register Description

Table 8-431. ISP5_KEY_EN1

| | | | |
|-------------------------|---------------------|-----------------|---------------|
| Address Offset | 0x0000 0000 | Instance | ISS_ISP5_SYS2 |
| Physical Address | 0x5201 00A0 | | |
| Description | IPIPE eFuse enable. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | KEY1_EN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | KEY1_EN | eFuse enable Equals 1 when ISP5_EFUSE3_EN = 1 or 0 otherwise. Read 0x1: Enable Read 0x0: Disable | R | 0 |

Table 8-432. Register Call Summary for Register ISP5_KEY_EN1

ISS ISP

- ISS ISP5 SYS2 Register Summary: [0]

Table 8-433. ISP5_KEY_EN2

| | | | |
|-------------------------|-----------------------------|-----------------|---------------|
| Address Offset | 0x0000 0004 | Instance | ISS_ISP5_SYS2 |
| Physical Address | 0x5201 00A4 | | |
| Description | ISIF eFuse enable. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | KEY1_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | KEY1_EN | eFuse enable Equals 1 when ISP5_EFUSE1_EN = 1 or 0 otherwise. Read 0x1: Enable Read 0x0: Disable | R | 1 |

Table 8-434. Register Call Summary for Register ISP5_KEY_EN2

ISS ISP

- [ISS ISP5 SYS2 Register Summary: \[0\]](#)

Table 8-435. ISP5_KEY_EN3

| | | | |
|-------------------------|-----------------------------|-----------------|---------------|
| Address Offset | 0x0000 0008 | Instance | ISS_ISP5_SYS2 |
| Physical Address | 0x5201 00A8 | | |
| Description | ISIF eFuse enable. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | KEY_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | KEY_EN | eFuse enable Equals 1 when ISP5_EFUSE3_EN = 1 or 0 otherwise. Read 0x1: Enable Read 0x0: Disable | R | 0 |

Table 8-436. Register Call Summary for Register ISP5_KEY_EN3

ISS ISP

- [ISS ISP5 SYS2 Register Summary: \[0\]](#)

Table 8-437. ISP5_KEY_EN4

| | | | |
|-------------------------|-----------------------|-----------------|---------------|
| Address Offset | 0x0000 000C | Instance | ISS_ISP5_SYS2 |
| Physical Address | 0x5201 00AC | | |
| Description | IPIPEIF eFuse enable. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|---------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | KEY2_EN | | KEY1_EN | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | KEY2_EN | eFuse enable Equals 1 when ISP5_EFUSE4_EN = 1 or 0 otherwise. Read 0x1: Enable Read 0x0: Disable | R | 0 |
| 0 | KEY1_EN | eFuse enable Equals 1 when ISP5_EFUSE1_EN = 1 or 0 otherwise. Read 0x1: Enable Read 0x0: Disable | R | 1 |

Table 8-438. Register Call Summary for Register ISP5_KEY_EN4

ISS ISP

- [ISS ISP5 SYS2 Register Summary: \[0\]](#)

Table 8-439. ISP5_KEY_EN5

| | | | |
|-------------------------|-------------------|-----------------|---------------|
| Address Offset | 0x0000 0010 | Instance | ISS_ISP5_SYS2 |
| Physical Address | 0x5201 00B0 | | |
| Description | H3A eFuse enable. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | KEY_EN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | KEY_EN | eFuse enable Equals 1 when ISP5_EFUSE2_EN = 1 or 0 otherwise. Read 0x1: Enable Read 0x0: Disable | R | 0 |

Table 8-440. Register Call Summary for Register ISP5_KEY_EN5

ISS ISP

- [ISS ISP5 SYS2 Register Summary: \[0\]](#)

Table 8-441. ISP5_KEY_EN6

| | | | |
|-------------------------|-------------------|-----------------|---------------|
| Address Offset | 0x0000 0014 | Instance | ISS_ISP5_SYS2 |
| Physical Address | 0x5201 00B4 | | |
| Description | H3A eFuse enable. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | KEY EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | KEY_EN | eFuse enable Equals 1 when ISP5_EFUSE3_EN = 1 or 0 otherwise. Read 0x1: Enable Read 0x0: Disable | R | 0 |

Table 8-442. Register Call Summary for Register ISP5_KEY_EN6

ISS ISP

- [ISS ISP5 SYS2 Register Summary: \[0\]](#)

Table 8-443. ISP5_IRQSTATUS_RAW2_i

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0018 + (0x10 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5201 00B8 + (0x10 * i) | Instance | ISS_ISP5_SYS2 |
| Description | Per-event raw interrupt status vector. Raw status is set even if event is not enabled. Write 1 to set the (raw) status, mostly for debug. Overflow / underflow errors are not recoverable at ISP level, a software reset is required at ISS level. The ISP outputs 4 interrupt lines ISP5_IRQ0 to ISP5_IRQ3. Any internal ISP event can be merged on the 4 lines. A same event must be enabled on only one interrupt line. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---------------|---|----------|---|------------------|--|-------------|--|---------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RESERVED | | | | IPIPE_HST_ERR | | ISIF_OVF | | IPIPE_BOXCAR_OVF | | IPIPEIF_UDF | | H3A_OVF | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5 | RESERVED | | R | 0x0 |
| 4 | IPIPE_HST_ERR | <p>IPIPE HISTOGRAM memory read error</p> <p>This error will happen when the histogram data is not read fast enough by the MPU or the DMA.</p> <p>When the data is read with the MPU, one need to pay attention to clear the ISP5_CTRL[26] HST_RD_CHK bit immediately after reading the last data, else this event will be set.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Set event (debug)</p> <p>Read 0x1: Event pending</p> <p>Read 0x0: No event pending</p> | RW W1toSet | 0 |
| 3 | ISIF_OVF | <p>ISIF module overflow</p> <p>Write 0x0: No action</p> <p>Write 0x1: Set event (debug)</p> <p>Read 0x1: Event pending</p> <p>Read 0x0: No event pending</p> | RW W1toSet | 0 |
| 2 | IPIPE_BOXCAR_OVF | <p>IPIPE BOXCAR module overflow</p> <p>Write 0x0: No action</p> <p>Write 0x1: Set event (debug)</p> <p>Read 0x1: Event pending</p> <p>Read 0x0: No event pending</p> | RW W1toSet | 0 |
| 1 | IPIPEIF_UDF | <p>IPIPEIF module underflow interrupt</p> <p>Write 0x0: No action</p> <p>Write 0x1: Set event (debug)</p> <p>Read 0x1: Event pending</p> <p>Read 0x0: No event pending</p> | RW W1toSet | 0 |
| 0 | H3A_OVF | <p>H3A module overflow interrupt.</p> <p>Write 0x0: No action</p> <p>Write 0x1: Set event (debug)</p> <p>Read 0x1: Event pending</p> <p>Read 0x0: No event pending</p> | RW W1toSet | 0 |

Table 8-444. Register Call Summary for Register ISP5_IRQSTATUS_RAW2_i

ISS ISP

- [ISS ISP IPIPEIF Module Events and Status Checking: \[0\]](#)
- [ISS ISP IPIPEIF Interframe Operations: \[1\]](#)
- [ISS ISP5 SYS2 Register Summary: \[2\]](#)

Table 8-445. ISP5_IRQSTATUS2_i

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 001C + (0x10 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5201 00BC + (0x10 * i) | Instance | ISS_ISP5_SYS2 |
| Description | <p>Per-event "enabled" interrupt status vector.</p> <p>Enabled status is not set unless event is enabled.</p> <p>Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled).</p> <p>Overflow / underflow errors are not recoverable at ISP level, a software reset is required at ISS level.</p> <p>The ISP outputs 4 interrupt lines ISP5_IRQ0 to ISP5_IRQ3. Any internal ISP event can be merged on the 4 lines. A same event must be enabled on only one interrupt line.</p> | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|---------------|----|----------|----|------------------|---|-------------|---|---------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | IPIPE_HST_ERR | | ISIF_OVF | | IPIPE_BOXCAR_OVF | | IPIPEIF_UDF | | H3A_OVF | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5 | RESERVED | | R | 0x0 |
| 4 | IPIPE_HST_ERR | <p>IPIPE HISTOGRAM memory read error This error will happen when the histogram data is not read fast enough by either the MPU or the DMA.</p> <p>Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending</p> | RW W1toClr | 0 |
| 3 | ISIF_OVF | <p>ISIF module overflow</p> <p>Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending</p> | RW W1toClr | 0 |
| 2 | IPIPE_BOXCAR_OVF | <p>IPIPE BOXCAR module overflow Overflow errors are not recoverable at ISP level, a software reset is required at ISS level.</p> <p>Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending</p> | RW W1toClr | 0 |
| 1 | IPIPEIF_UDF | <p>IPIPEIF module underflow interrupt</p> <p>Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending</p> | RW W1toClr | 0 |
| 0 | H3A_OVF | <p>H3A module overflow interrupt. Overflow errors are not recoverable at ISP level, a software reset is required at ISS level.</p> <p>Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending Read 0x0: No (enabled) event pending</p> | RW W1toClr | 0 |

Table 8-446. Register Call Summary for Register ISP5_IRQSTATUS2_i

ISS ISP

- [ISS ISP DMA Requests:](#)
- [ISS ISP5 SYS1 Register Description: \[4\] \[5\]](#)
- [ISS ISP5 SYS2 Register Summary: \[6\]](#)

Table 8-447. ISP5_IRQENABLE_SET2_i

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0020 + (0x10 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5201 00C0 + (0x10 * i) | Instance | ISS_ISP5_SYS2 |
| Description | Per-event interrupt enable bit vector. Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. Overflow / underflow errors are not recoverable at ISP level, a software reset is required at ISS level. The ISP outputs 4 interrupt lines ISP5_IRQ0 to ISP5_IRQ3. Any internal ISP event can be merged on the 4 lines. A same event must be enabled on only one interrupt line. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|---------------|----|----------|----|------------------|---|-------------|---|---------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | IPIPE_HST_ERR | | ISIF_OVF | | IPIPE_BOXCAR_OVF | | IPIPEIF_UDF | | H3A_OVF | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|---------------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5 | RESERVED | | R | 0x0 |
| 4 | IPIPE_HST_ERR | IPIPE HISTOGRAM memory read error This error will happen when the histogram data is not read fast enough by either the MPU or the DMA. | RW W1toSet | 0 |
| 3 | ISIF_OVF | ISIF module overflow | RW W1toSet | 0 |
| 2 | IPIPE_BOXCAR_OVF | IPIPE BOXCAR module overflow | RW W1toSet | 0 |
| 1 | IPIPEIF_UDF | IPIPEIF module underflow interrupt | RW W1toSet | 0 |
| 0 | H3A_OVF | H3A module overflow interrupt. Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled | RW W1toSet | 0 |

Table 8-448. Register Call Summary for Register ISP5_IRQENABLE_SET2_i

ISS ISP

- [ISS ISP Interrupt Tree: \[0\] \[2\] \[3\] \[4\] \[5\]](#)
- [ISS ISP IPIPEIF Interrupts: \[6\]](#)
- [ISS ISP IPIPE Interrupts: \[7\]](#)
- [ISS ISP H3A Interrupts: \[8\]](#)
- [ISS ISP ISIF Interrupts: \[9\]](#)
- [ISS ISP5 SYS2 Register Summary: \[10\]](#)

Table 8-449. ISP5_IRQENABLE_CLR2_i

| | | | |
|-------------------------|---|-----------------|---------------|
| Address Offset | 0x0000 0024 + (0x10 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5201 00C4 + (0x10 * i) | Instance | ISS_ISP5_SYS2 |
| Description | Per-event interrupt enable bit vector. Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. Overflow / underflow errors are not recoverable at ISP level, a software reset is required at ISS level. The ISP outputs 4 interrupt lines ISP5_IRQ0 to ISP5_IRQ3. Any internal ISP event can be merged on the 4 lines. A same event must be enabled on only one interrupt line. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|---------------|----|----------|----|------------------|---|-------------|---|---------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | IPIPE_HST_ERR | | ISIF_OVF | | IPIPE_BOXCAR_OVF | | IPIPEIF_UDF | | H3A_OVF | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|---------------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5 | RESERVED | | R | 0x0 |
| 4 | IPIPE_HST_ERR | IPIPE HISTOGRAM memory read error This error will happen when the histogram data is not read fast enough by either the MPU or the DMA. Write 0x0: No action Write 0x1: Disable Interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled | RW W1toClr | 0 |
| 3 | ISIF_OVF | ISIF module overflow Write 0x0: No action Write 0x1: Disable Interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled | RW W1toClr | 0 |
| 2 | IPIPE_BOXCAR_OVF | IPIPE BOXCAR module overflow Write 0x0: No action Write 0x1: Disable Interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled | RW W1toClr | 0 |
| 1 | IPIPEIF_UDF | IPIPEIF module underflow interrupt Write 0x0: No action Write 0x1: Disable Interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled | RW W1toClr | 0 |
| 0 | H3A_OVF | H3A module overflow interrupt. Write 0x0: No action Write 0x1: Disable Interrupt Read 0x1: Interrupt enabled Read 0x0: Interrupt disabled | RW W1toClr | 0 |

Table 8-450. Register Call Summary for Register ISP5_IRQENABLE_CLR2_i

ISS ISP

- [ISS ISP5 SYS2 Register Summary: \[0\]](#)

8.3.5.4 ISS RESIZER Registers

8.3.5.4.1 ISS RESIZER Register Summary

Table 8-451. ISS RESIZER Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_RESIZER Base Address |
|----------------------------------|------|-----------------------|----------------|--------------------------|
| RSZ_REVISION | R | 32 | 0x0000 0000 | 0x5201 0400 |
| RSZ_SYSCONFIG | RW | 32 | 0x0000 0004 | 0x5201 0404 |
| RESERVED | R | 32 | 0x0000 0008 | 0x5201 0408 |
| RSZ_IN_FIFO_CTRL | RW | 32 | 0x0000 000C | 0x5201 040C |
| RSZ_GNC | R | 32 | 0x0000 0010 | 0x5201 0410 |
| RSZ_FRACDIV | RW | 32 | 0x0000 0014 | 0x5201 0414 |
| RSZ_SRC_EN | RW | 32 | 0x0000 0020 | 0x5201 0420 |
| RSZ_SRC_MODE | RW | 32 | 0x0000 0024 | 0x5201 0424 |
| RSZ_SRC_FMT0 | RW | 32 | 0x0000 0028 | 0x5201 0428 |
| RSZ_SRC_FMT1 | RW | 32 | 0x0000 002C | 0x5201 042C |
| RSZ_SRC_VPS | RW | 32 | 0x0000 0030 | 0x5201 0430 |
| RSZ_SRC_VSZ | RW | 32 | 0x0000 0034 | 0x5201 0434 |
| RSZ_SRC_HPS | RW | 32 | 0x0000 0038 | 0x5201 0438 |
| RSZ_SRC_HSZ | RW | 32 | 0x0000 003C | 0x5201 043C |
| RSZ_DMA_RZA | RW | 32 | 0x0000 0040 | 0x5201 0440 |
| RSZ_DMA_RZB | RW | 32 | 0x0000 0044 | 0x5201 0444 |
| RSZ_DMA_STA | R | 32 | 0x0000 0048 | 0x5201 0448 |
| RSZ_GCK_MMR | RW | 32 | 0x0000 004C | 0x5201 044C |
| RESERVED | R | 32 | 0x0000 0050 | 0x5201 0450 |
| RSZ_GCK_SDR | RW | 32 | 0x0000 0054 | 0x5201 0454 |
| RSZ_IRQ_RZA | RW | 32 | 0x0000 0058 | 0x5201 0458 |
| RSZ_IRQ_RZB | RW | 32 | 0x0000 005C | 0x5201 045C |
| RSZ_YUV_Y_MIN | RW | 32 | 0x0000 0060 | 0x5201 0460 |
| RSZ_YUV_Y_MAX | RW | 32 | 0x0000 0064 | 0x5201 0464 |
| RSZ_YUV_C_MIN | RW | 32 | 0x0000 0068 | 0x5201 0468 |
| RSZ_YUV_C_MAX | RW | 32 | 0x0000 006C | 0x5201 046C |
| RSZ_YUV_PHS | RW | 32 | 0x0000 0070 | 0x5201 0470 |
| RSZ_SEQ | RW | 32 | 0x0000 0074 | 0x5201 0474 |
| RZA_EN | RW | 32 | 0x0000 0078 | 0x5201 0478 |
| RZA_MODE | RW | 32 | 0x0000 007C | 0x5201 047C |
| RZA_420 | RW | 32 | 0x0000 0080 | 0x5201 0480 |
| RZA_I_VPS | RW | 32 | 0x0000 0084 | 0x5201 0484 |
| RZA_I_HPS | RW | 32 | 0x0000 0088 | 0x5201 0488 |
| RZA_O_VSZ | RW | 32 | 0x0000 008C | 0x5201 048C |
| RZA_O_HSZ | RW | 32 | 0x0000 0090 | 0x5201 0490 |
| RZA_V_PHS_Y | RW | 32 | 0x0000 0094 | 0x5201 0494 |
| RZA_V_PHS_C | RW | 32 | 0x0000 0098 | 0x5201 0498 |
| RZA_V_DIF | RW | 32 | 0x0000 009C | 0x5201 049C |

Table 8-451. ISS RESIZER Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_RESIZER Base Address |
|-----------------|------|-----------------------|----------------|--------------------------|
| RZA_V_TYP | RW | 32 | 0x0000 00A0 | 0x5201 04A0 |
| RZA_V_LPF | RW | 32 | 0x0000 00A4 | 0x5201 04A4 |
| RZA_H_PHS | RW | 32 | 0x0000 00A8 | 0x5201 04A8 |
| RZA_H_PHS_ADJ | RW | 32 | 0x0000 00AC | 0x5201 04AC |
| RZA_H_DIF | RW | 32 | 0x0000 00B0 | 0x5201 04B0 |
| RZA_H_TYP | RW | 32 | 0x0000 00B4 | 0x5201 04B4 |
| RZA_H_LPF | RW | 32 | 0x0000 00B8 | 0x5201 04B8 |
| RZA_DWN_EN | RW | 32 | 0x0000 00BC | 0x5201 04BC |
| RZA_DWN_AV | RW | 32 | 0x0000 00C0 | 0x5201 04C0 |
| RZA_RGB_EN | RW | 32 | 0x0000 00C4 | 0x5201 04C4 |
| RZA_RGB_TYP | RW | 32 | 0x0000 00C8 | 0x5201 04C8 |
| RZA_RGB_BLD | RW | 32 | 0x0000 00CC | 0x5201 04CC |
| RZA_SDR_Y_BAD_H | RW | 32 | 0x0000 00D0 | 0x5201 04D0 |
| RZA_SDR_Y_BAD_L | RW | 32 | 0x0000 00D4 | 0x5201 04D4 |
| RZA_SDR_Y_SAD_H | RW | 32 | 0x0000 00D8 | 0x5201 04D8 |
| RZA_SDR_Y_SAD_L | RW | 32 | 0x0000 00DC | 0x5201 04DC |
| RZA_SDR_Y_OFT | RW | 32 | 0x0000 00E0 | 0x5201 04E0 |
| RZA_SDR_Y_PTR_S | RW | 32 | 0x0000 00E4 | 0x5201 04E4 |
| RZA_SDR_Y_PTR_E | RW | 32 | 0x0000 00E8 | 0x5201 04E8 |
| RZA_SDR_C_BAD_H | RW | 32 | 0x0000 00EC | 0x5201 04EC |
| RZA_SDR_C_BAD_L | RW | 32 | 0x0000 00F0 | 0x5201 04F0 |
| RZA_SDR_C_SAD_H | RW | 32 | 0x0000 00F4 | 0x5201 04F4 |
| RZA_SDR_C_SAD_L | RW | 32 | 0x0000 00F8 | 0x5201 04F8 |
| RZA_SDR_C_OFT | RW | 32 | 0x0000 00FC | 0x5201 04FC |
| RZA_SDR_C_PTR_S | RW | 32 | 0x0000 0100 | 0x5201 0500 |
| RZA_SDR_C_PTR_E | RW | 32 | 0x0000 0104 | 0x5201 0504 |
| RZB_EN | RW | 32 | 0x0000 0108 | 0x5201 0508 |
| RZB_MODE | RW | 32 | 0x0000 010C | 0x5201 050C |
| RZB_420 | RW | 32 | 0x0000 0110 | 0x5201 0510 |
| RZB_I_VPS | RW | 32 | 0x0000 0114 | 0x5201 0514 |
| RZB_I_HPS | RW | 32 | 0x0000 0118 | 0x5201 0518 |
| RZB_O_VSZ | RW | 32 | 0x0000 011C | 0x5201 051C |
| RZB_O_HSZ | RW | 32 | 0x0000 0120 | 0x5201 0520 |
| RZB_V_PHS_Y | RW | 32 | 0x0000 0124 | 0x5201 0524 |
| RZB_V_PHS_C | RW | 32 | 0x0000 0128 | 0x5201 0528 |
| RZB_V_DIF | RW | 32 | 0x0000 012C | 0x5201 052C |
| RZB_V_TYP | RW | 32 | 0x0000 0130 | 0x5201 0530 |
| RZB_V_LPF | RW | 32 | 0x0000 0134 | 0x5201 0534 |
| RZB_H_PHS | RW | 32 | 0x0000 0138 | 0x5201 0538 |
| RZB_H_PHS_ADJ | RW | 32 | 0x0000 013C | 0x5201 053C |
| RZB_H_DIF | RW | 32 | 0x0000 0140 | 0x5201 0540 |
| RZB_H_TYP | RW | 32 | 0x0000 0144 | 0x5201 0544 |
| RZB_H_LPF | RW | 32 | 0x0000 0148 | 0x5201 0548 |
| RZB_DWN_EN | RW | 32 | 0x0000 014C | 0x5201 054C |
| RZB_DWN_AV | RW | 32 | 0x0000 0150 | 0x5201 0550 |
| RZB_RGB_EN | RW | 32 | 0x0000 0154 | 0x5201 0554 |
| RZB_RGB_TYP | RW | 32 | 0x0000 0158 | 0x5201 0558 |

Table 8-451. ISS RESIZER Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_RESIZER Base Address |
|---------------------------------|------|-----------------------|----------------|--------------------------|
| RZB_RGB_BLD | RW | 32 | 0x0000 015C | 0x5201 055C |
| RZB_SDR_Y_BAD_H | RW | 32 | 0x0000 0160 | 0x5201 0560 |
| RZB_SDR_Y_BAD_L | RW | 32 | 0x0000 0164 | 0x5201 0564 |
| RZB_SDR_Y_SAD_H | RW | 32 | 0x0000 0168 | 0x5201 0568 |
| RZB_SDR_Y_SAD_L | RW | 32 | 0x0000 016C | 0x5201 056C |
| RZB_SDR_Y_OFT | RW | 32 | 0x0000 0170 | 0x5201 0570 |
| RZB_SDR_Y_PTR_S | RW | 32 | 0x0000 0174 | 0x5201 0574 |
| RZB_SDR_Y_PTR_E | RW | 32 | 0x0000 0178 | 0x5201 0578 |
| RZB_SDR_C_BAD_H | RW | 32 | 0x0000 017C | 0x5201 057C |
| RZB_SDR_C_BAD_L | RW | 32 | 0x0000 0180 | 0x5201 0580 |
| RZB_SDR_C_SAD_H | RW | 32 | 0x0000 0184 | 0x5201 0584 |
| RZB_SDR_C_SAD_L | RW | 32 | 0x0000 0188 | 0x5201 0588 |
| RZB_SDR_C_OFT | RW | 32 | 0x0000 018C | 0x5201 058C |
| RZB_SDR_C_PTR_S | RW | 32 | 0x0000 0190 | 0x5201 0590 |
| RZB_SDR_C_PTR_E | RW | 32 | 0x0000 0194 | 0x5201 0594 |

8.3.5.4.2 ISS RESIZER Register Description

Table 8-452. RSZ_REVISION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|-------------|-------------|--------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | Instance | ISS_RESIZER | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div><div>313029282726252423222120191817161514131211109876543210</div></div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:0 | REVISION | IP Revision | R | See ⁽¹⁾ | | | | | | | | | | | | | | | | | | | | | | | | | | | |

⁽¹⁾ TI internal data

Table 8-453. Register Call Summary for Register RSZ_REVISION

| |
|---|
| ISS ISP |
| • ISS RESIZER Register Summary: [0] |

Table 8-454. RSZ_SYSCONFIG

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0004 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0404 | | |
| Description | SYSTEM CONFIGURATION REGISTER This register is not shadowed. There is no standalone software reset for the resizer module. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|-------------|----|----------|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RSZB_CLK_EN | | RSZA_CLK_EN | | RESERVED | | | | | | | | AUTOGATING | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | RSZB_CLK_EN | Resizer B clock enable This bit enable to enable / disable the RESIZER B clock. Note that it is a second level clock enable. This bit has effect only if RSZ_GCK_SDR is set to 1. 0x0: off 0x1: on | RW | 0 |
| 8 | RSZA_CLK_EN | Resizer A clock enable This bit enable to enable / disable the RESIZER A clock. Note that it is a second level clock enable. This bit has effect only if RSZ_GCK_SDR is set to 1. 0x0: off 0x1: on | RW | 0 |
| 7:1 | RESERVED | | R | 0x00 |
| 0 | AUTOGATING | Internal Clock Gating Strategy Enables or disables auto clock gating. | RW | 1 |

NOTE: This is only for debug purposes. When this bit is set to "0" autogating is not performed on any of the clocks, thus the clocks stay free running. Though, they are still controlled by the clock enable bit fields RSZA_CLK_EN and RSZB_CLK_EN.

0x0: Clocks are free running

0x1: Automatic clock gating strategy.

Table 8-455. Register Call Summary for Register RSZ_SYSCONFIG

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Hardware Setup/Initialization: \[1\] \[2\]](#)
- [ISS ISP RSZ Programming Constraints: \[3\]](#)
- [ISS RESIZER Register Summary: \[4\]](#)

Table 8-456. RSZ_IN_FIFO_CTRL

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 000C | Instance | ISS_RESIZER |
| Physical Address | 0x5201 040C | | |
| Description | INPUT DATA BUFFER CONTROL REGISTER This register is not shadowed | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | THRLD_LOW | | | | | | | | RESERVED | | | | | | | | THRLD_HIGH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:29 | RESERVED | | R | 0x0 |
| 28:16 | THRLD_LOW | When RSZ_IN_FIFO_CTRL.THRLD_HIGH = RSZ_IN_FIFO_CTRL.THRLD_LOW , the rsz_stall_input is not asserted. The only purpose of the RSZ_IN_FIFO_CTRL.THRLD_LOW register is to prevent rsz_stall_input signal assertion. | RW | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | THRLD_HIGH | High threshold value. The rsz_stall_input signal is asserted if 2 lines of circular buffer are full and the third line has more pixels than RSZ_IN_FIFO_CTRL.THRLD_HIGH . The rsz_stall_input signal stays high as long as one full line is not free for receiving further data. THRLD_HIGH is in terms of line size and can at max be programmed equal to the input line size (RSZ_SRC_HSZ). | RW | 0x0000 |

Table 8-457. Register Call Summary for Register RSZ_IN_FIFO_CTRL

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Hardware Setup/Initialization: \[3\] \[4\]](#)
- [ISS ISP RSZ Programming Constraints: \[5\]](#)
- [ISS RESIZER Register Summary: \[6\]](#)
- [ISS RESIZER Register Description: \[7\] \[8\] \[9\] \[10\]](#)

Table 8-458. RSZ_GNC

| | | | |
|-------------------------|----------------------------|-----------------|-------------|
| Address Offset | 0x0000 0010 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0410 | | |
| Description | GENERIC PARAMETER REGISTER | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RSZB_MEM_LINE_SIZE | | | | | | | | RESERVED | | | | | | | | RSZA_MEM_LINE_SIZE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|--------|
| 31:29 | RESERVED | | R | 0x0 |
| 28:16 | RSZB_MEM_LINE_SIZE | Resizer #B memory line size (pixels). The output image cannot exceed this size. | R | 0x0920 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|--------|
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | RSZA_MEM_LINE_SIZE | Resizer #A memory line size (pixels). The output image cannot exceed this size. | R | 0x1500 |

Table 8-459. Register Call Summary for Register RSZ_GNC

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-460. RSZ_FRACDIV

| | | | |
|-------------------------|-----------------------------------|-----------------|-------------|
| Address Offset | 0x0000 0014 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0414 | | |
| Description | Fractional clock divider settings | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | RSZ_FRACDIV | Fractional clock divider value. The fractional clock divider gates the read requests made to the input data buffer such that the input data buffer is read at an average frequency equal to FFCLK instead of FCLK. The value of FFCLK depends upon the upscaling ratios as well as the input pixel clock: see the functional spec. We have $FFCLK = FCLK / FRACDIV$ MHz and $RSZ_FRACDIV = 65536 / FRACDIV$. When $RSZ_FRACDIV = 65536$, we have: $FFCLK = FCLK$. | RW | 0xFFFF |

Table 8-461. Register Call Summary for Register RSZ_FRACDIV

ISS ISP

- [ISS ISP RSZ Hardware Setup/Initialization: \[0\] \[1\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[2\] \[3\]](#)
- [ISS RESIZER Register Summary: \[4\]](#)
- [ISS RESIZER Register Description: \[5\] \[6\]](#)

Table 8-462. RSZ_SRC_EN

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0020 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0420 | | |
| Description | RESIZER ENABLE REGISTER This register is not shadowed | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | EN | Resizer module enable The start flag of the RESIZER module. When EN is set to 1, the RESIZER module starts the processing from the next rising edge of the VD pulse. If the processing mode of the RESIZER module is set to "one shot", the EN bit is cleared to 0 after the end of the processing. One has to pay attention that when this bit is enabled and 0x0: Disable 0x1: Enable | RW | 0 |

Table 8-463. Register Call Summary for Register RSZ_SRC_EN

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Hardware Setup/Initialization: \[1\] \[2\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[3\]](#)
- [ISS ISP RSZ Programming Constraints: \[4\]](#)
- [ISS RESIZER Register Summary: \[5\]](#)

Table 8-464. RSZ_SRC_MODE

| | | | |
|-------------------------|-------------------------------|-----------------|-------------|
| Address Offset | 0x0000 0024 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0424 | | |
| Description | This register is not shadowed | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WRT | | OST | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | WRT | Video port WEN signal selection This bit selects whether the WEN signal which is present on the IPIPE and IPIPEIF video port is used or not to select the input data. If WRT is 0, the RESIZER module ignores the WEN signal and processes all image frame while RESIZER is enabled. If WRT is 1, the RESIZER module only processes the lines that arrived while the WEN is high. HD is used to sample the WEN signal. 0x0: Disable 0x1: Enable | RW | 0 |
| 0 | OST | The processing mode selection of the RESIZER module. Value 0 indicates the mode of free run, value 1 indicates the mode of one shot. 0x0: Free running 0x1: One shot | RW | 0 |

Table 8-465. Register Call Summary for Register RSZ_SRC_MODE

ISS ISP

- [ISS ISP RSZ Interfaces: \[0\]](#)
- [ISS ISP RSZ Functional Description: \[1\]](#)
- [ISS ISP RSZ Hardware Setup/Initialization: \[2\] \[3\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[4\]](#)
- [ISS ISP RSZ Programming Constraints: \[5\]](#)
- [ISS RESIZER Register Summary: \[6\]](#)

Table 8-466. RSZ_SRC_FMT0

| | | | |
|-------------------------|-------------------------------|-----------------|-------------|
| Address Offset | 0x0000 0028 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0428 | | |
| Description | This register is not shadowed | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BYPASS | | SEL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | BYPASS | Pass Through This bit enables or disables the RESIZER module pass through mode. The pass through mode can transfer images which are 8K pixel wide. When it is enabled, the input data buffer and the resizer engines are bypassed. 0x0: Pass through off = normal output mode, the input data buffer is used. 0x1: Pass through on = normal output mode, the input data buffer is bypassed. | RW | 0 |
| 0 | SEL | Input selection This bit selects which of the two video port is selected to push data through the RESIZER module. 0x0: IPIPE 0x1: IPIPEIF | RW | 0 |

Table 8-467. Register Call Summary for Register RSZ_SRC_FMT0

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\] \[2\]](#)
- [ISS ISP RSZ Hardware Setup/Initialization: \[3\] \[4\]](#)
- [ISS ISP RSZ Programming Constraints: \[5\]](#)
- [ISS RESIZER Register Summary: \[6\]](#)
- [ISS RESIZER Register Description: \[7\] \[8\] \[9\] \[10\] \[11\]](#)

Table 8-468. RSZ_SRC_FMT1

| | | | |
|------------------|-------------|----------|-------------|
| Address Offset | 0x0000 002C | Instance | ISS_RESIZER |
| Physical Address | 0x5201 042C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----|-------|-----|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | COL | IN420 | RAW | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | COL | Y/C selection This bit is valid only if the input data is YUV4:2:0 (IN420 = 1). It enables to specify where the data which is input to the RESIZER module is luma or chroma data. 0x0: Y data is input 0x1: Chroma data is input | RW | 0 |
| 1 | IN420 | Chroma Format Selection This bit sets the chroma undersampling when YUV data is input to the RESIZER module. 0x0: YUV4:2:2 is input 0x1: YUV4:2:0 is input | RW | 0 |
| 0 | RAW | Pass-through mode input data format selection This bit affects the horizontal reversal (flipping) process. 0x0: Flipping preserves YCbCr format 0x1: Flipping preserves RAW format | RW | 0 |

Table 8-469. Register Call Summary for Register RSZ_SRC_FMT1

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[4\] \[5\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[6\] \[7\]](#)
- [ISS RESIZER Register Summary: \[8\]](#)

Table 8-470. RSZ_SRC_VPS

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0030 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0430 | | |
| Description | VERTICAL POSITION REGISTER This register is not shadowed | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VPS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | VPS | Vertical Start Position Sets the vertical position of the global frame from the rising edge of the VD. The RSZ module will start the image processing from the VPS'th line. This value can be odd or even whatever the input data format. | RW | 0x0000 |

Table 8-471. Register Call Summary for Register RSZ_SRC_VPS

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[2\]](#)
- [ISS ISP RSZ Programming Constraints: \[3\]](#)
- [ISS RESIZER Register Summary: \[4\]](#)

Table 8-472. RSZ_SRC_VSZ

| | | | |
|-------------------------|-------------------------|-----------------|-------------|
| Address Offset | 0x0000 0034 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0434 | | |
| Description | VERTICAL SIZER REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VSZ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | VSZ | Vertical Processing Size Sets the vertical size of the processing area. The RSZ module will process (VSZ+1) lines. This value can be odd or even whatever the input data format. | RW | 0x0000 |

Table 8-473. Register Call Summary for Register RSZ_SRC_VSZ

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-474. RSZ_SRC_HPS

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0038 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0438 | | |
| Description | HORIZONTAL POSITION REGISTER This register is not shadowed | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HPS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | HPS | Horizontal Start Position The RSZ_SRC_HPS register has two functions: The first function is to compensate for possible delay between the HD pulse and the first valid data. It is possible for this delay to be different than 0 when the RESIZER module gets its input data from the VP connected to the IPIPEIF module (the offset value can be odd or even). When data are coming from the IPIPE module, it is not required to resynchronize HD and the first valid data. The second function is to crop the data in the horizontal direction. When used for cropping, only RSZ_SRC_HPS must be even or null. | RW | 0x0000 |

Table 8-475. Register Call Summary for Register RSZ_SRC_HPS

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[2\]](#)
- [ISS ISP RSZ Programming Constraints: \[3\]](#)
- [ISS RESIZER Register Summary: \[4\]](#)
- [ISS RESIZER Register Description: \[5\] \[6\]](#)

Table 8-476. RSZ_SRC_HSZ

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|----|---|----|----|----|----|----|----|----|----|----|----|----|----|-----|----------|-------------|----|----|----|---|------|---|---------|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 003C | | | | | | | | | | | | | | | | Instance | ISS_RESIZER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 043C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | HORIZONTAL SIZE REGISTER The HSZ value is given by HSZ concatenated with HSZ_LSB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="16">HSZ</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | HSZ | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | HSZ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:13 | RESERVED | | | | | | | | | | | | | | | | | | | | | | R | | 0x00000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12:0 | HSZ | | Horizontal size Sets the horizontal size of the processing area. The RSZ module processes (HSZ+1) pixels. (HSZ+1) must be even for YUV4:2:2 and RAW data. The valid available values for HSZ are 1~xxxx. | | | | | | | | | | | | | | | | | | | | RW | | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-477. Register Call Summary for Register RSZ_SRC_HSZ

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[2\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[3\]](#)
- [ISS RESIZER Register Summary: \[4\]](#)
- [ISS RESIZER Register Description: \[5\]](#)

Table 8-478. RSZ_DMA_RZA

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0040 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0440 | | |
| Description | RESIZER A - MEMORY REQUEST MINIMUM INTERVAL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RZA | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | RZA | Sets the minimum interval btw two consecutive memory request for resizer #A. Specified in number of interface clock cycles. Values of 0, 1, and 2 are used as a condition to keep the bandwidth limiter off. When this function is enabled, this value must be greater than 10 cycles. | RW | 0x0000 |

Table 8-479. Register Call Summary for Register RSZ_DMA_RZA

ISS ISP

- [ISS ISP RSZ Interfaces: \[0\]](#)
- [ISS ISP BL Peak Memory Bandwidth Reduction: \[1\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-480. RSZ_DMA_RZB

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0044 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0444 | | |
| Description | RESIZER B - MEMORY REQUEST MINIMUM INTERVAL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RZB | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | RZB | Sets the minimum interval btw two consecutive memory request for resizer #B. Specified in number of interface clock cycles. Values of 0, 1, and 2 are used as a condition to keep the bandwidth limiter off. When this function is enabled, this value must be greater than 10 cycles. | RW | 0x0000 |

Table 8-481. Register Call Summary for Register RSZ_DMA_RZB

ISS ISP

- [ISS ISP RSZ Interfaces: \[0\]](#)
- [ISS ISP BL Peak Memory Bandwidth Reduction: \[1\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-482. RSZ_DMA_STA

| | | | |
|-------------------------|-------------------------|-----------------|-------------|
| Address Offset | 0x0000 0048 | | |
| Physical Address | 0x5201 0448 | Instance | ISS_RESIZER |
| Description | RESIZER STATUS REGISTER | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | STATUS |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | STATUS | Resizer process status This bit is set in the time window from rsz_int_reg to rsz_int_dma. Read 0x1: Active Read 0x0: Not active | R | 0 |

Table 8-483. Register Call Summary for Register RSZ_DMA_STA

ISS ISP

- [ISS ISP RSZ Interfaces: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-484. RSZ_GCK_MMR

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 004C | | |
| Physical Address | 0x5201 044C | Instance | ISS_RESIZER |
| Description | MMR CLOCK CONTROL REGISTER This register is not shadowed | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | MMR |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | MMR | The on/off selection of the MMR interface clock which is used for MMR register access. 0x0: Off 0x1: On | RW | 0 |

Table 8-485. Register Call Summary for Register RSZ_GCK_MMR

ISS ISP

- [ISS ISP RSZ Interfaces: \[0\]](#)
- [ISS ISP RSZ Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP RSZ Programming Constraints: \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-486. RSZ_GCK_SDR

| | | |
|-------------------------|--|-----------------------------|
| Address Offset | 0x0000 0054 | |
| Physical Address | 0x5201 0454 | Instance ISS_RESIZER |
| Description | CORE CLOCK CONTROL REGISTER This register is not shadowed | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | CORE | RSZ Core Clock Enable. This bit enables or disables the resizer core functional clock. When this bit is off, the resizer core (interpolator) is automatically bypassed (resizer-bypass mode of pass-through mode is selected depending on RSZ_SRC_FMT0 value). In resizer-bypass mode or pass-through mode, no up-scaling or downscaling process is operated. 0x0: Resizer core clock disabled. Resizer in bypass mode if RSZ_SRC_FMT0.BYPASS = 0 Resizer in pass-through if RSZ_SRC_FMT0.BYPASS = 1 0x1: Resizer core clock enabled. Resizer in rescaling mode if RSZ_SRC_FMT0.BYPASS = 0 Resizer in pass-through if RSZ_SRC_FMT0.BYPASS = 1 | RW | 0 |

Table 8-487. Register Call Summary for Register RSZ_GCK_SDR

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\]](#)
- [ISS ISP RSZ Hardware Setup/Initialization: \[2\] \[3\] \[4\] \[5\]](#)
- [ISS ISP RSZ Programming Constraints: \[6\]](#)
- [ISS RESIZER Register Summary: \[7\]](#)
- [ISS RESIZER Register Description: \[8\] \[9\]](#)

Table 8-488. RSZ_IRQ_RZA

| | | |
|-------------------------|---|-----------------------------|
| Address Offset | 0x0000 0058 | |
| Physical Address | 0x5201 0458 | Instance ISS_RESIZER |
| Description | RESIZER A - CIRCULAR BUFFER INTERRUPT INTERVAL REGISTER | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RZA | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | RZA | Resizer A circular buffer interval Sets the circular buffer interval for Resizer A. The interrupt is triggered every time (RZA+1) lines are written to the circular buffer (Y buffer). The range goes from 1 to 8192 lines. Usually, the circular buffer vertical size should be a multiple of RZA. | RW | 0x0000 |

Table 8-489. Register Call Summary for Register RSZ_IRQ_RZA

ISS ISP

- [ISS ISP RSZ Interrupts: \[0\] \[1\] \[2\]](#)
- [ISS ISP RSZ Hardware Setup/Initialization: \[3\]](#)
- [ISS ISP5 SYS1 Register Description: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [ISS RESIZER Register Summary: \[12\]](#)

Table 8-490. RSZ_IRQ_RZB

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 005C | Instance | ISS_RESIZER |
| Physical Address | 0x5201 045C | | |
| Description | RESIZER B - CIRCULAR BUFFER INTERRUPT INTERVAL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RZB | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | RZB | Resizer B circular buffer interval Sets the circular buffer interval for Resizer B. The interrupt is triggered every time (RZB+1) lines are written to the circular buffer (Y buffer). The range goes from 1 to 8192 lines. Usually, the circular buffer vertical size should be a multiple of RZB. | RW | 0x0000 |

Table 8-491. Register Call Summary for Register RSZ_IRQ_RZB

ISS ISP

- [ISS ISP RSZ Interrupts: \[0\]](#)
- [ISS ISP RSZ Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP5 SYS1 Register Description: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [ISS RESIZER Register Summary: \[10\]](#)

Table 8-492. RSZ_YUV_Y_MIN

| | | | |
|-------------------------|-------------------------------|-----------------|-------------|
| Address Offset | 0x0000 0060 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0460 | | |
| Description | LUMINANCE SATURATION REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MIN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | MIN | The minimum value of Luminance (8bits unsigned). If the value of the Luminance is smaller than VAL, it will be clipped to VAL. This bit field must be set to its default values when the resizer is set in pass-through mode. | RW | 0x00 |

Table 8-493. Register Call Summary for Register RSZ_YUV_Y_MIN

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-494. RSZ_YUV_Y_MAX

| | | | |
|------------------|-------------------------------|----------|-------------|
| Address Offset | 0x0000 0064 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0464 | | |
| Description | LUMINANCE SATURATION REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MAX | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | MAX | The maximum value of Luminance (8bits unsigned). If the value of the Luminance is larger than VAL, it will be clipped to VAL. This bit field must be set to its default values when the resizer is set in pass-through mode. | RW | 0xFF |

Table 8-495. Register Call Summary for Register RSZ_YUV_Y_MAX

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-496. RSZ_YUV_C_MIN

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0068 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_RESIZER | | | | | | | |
| Physical Address | 0x5201 0468 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | CHROMINANCE SATURATION REGISTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MIN | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | MIN | The minimum value of Chrominance (8bits unsigned). If the value of the Chrominance is smaller than VAL, it will be clipped to VAL. This bit field must be set to its default values when the resizer is set in pass-through mode. | RW | 0x00 |

Table 8-497. Register Call Summary for Register RSZ_YUV_C_MIN

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-498. RSZ_YUV_C_MAX

| | | | |
|-------------------------|---------------------------------|-----------------|-------------|
| Address Offset | 0x0000 006C | Instance | ISS_RESIZER |
| Physical Address | 0x5201 046C | | |
| Description | CHROMINANCE SATURATION REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MAX | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | MAX | The maximum value of Chrominance (8bits unsigned). If the value of the Chrominance is larger than VAL, it will be clipped to VAL. This bit field must be set to its default values when the resizer is set in pass-through mode. | RW | 0xFF |

Table 8-499. Register Call Summary for Register RSZ_YUV_C_MAX

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-500. RSZ_YUV_PHS

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0070 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0470 | | |
| Description | The phase position of the output of the Chrominance | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | POS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | POS | The phase position of the output of the chrominance. The RESIZER module does not change the relative position of the chroma samples vs. the luma samples between the input and output and the chroma position at the output of the IPIPE module and at the output of the RESIZER module must be identical. In other words, we must have RSZ_YUV_PHS.POS = IPIPE_YUV_PHS.POS . 0x0: Same position with Luminance: cosited 0x1: The middle of the luminance: centered | RW | 0 |

Table 8-501. Register Call Summary for Register RSZ_YUV_PHS

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)
- [ISS RESIZER Register Description: \[4\]](#)
- [ISS IPIPE Register Description: \[5\]](#)

Table 8-502. RSZ_SEQ

| | | | |
|-------------------------|-------------|-----------------|-------------|
| Address Offset | 0x0000 0074 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0474 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|-----|------|------|------|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | CRV | VRVB | HRVB | VRVA | HRVA |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:5 | RESERVED | | R | 0x00000000 |
| 4 | CRV | Chroma sampling point change 0x0: Chroma sampling point is not changed 0x1: Chroma sampling point is changed from odd-numbered pixels to even-number pixels. The pixel at the left end is removed and the pixel at the right end is duplicated. | RW | 0 |
| 3 | VRVB | Resizer B - Vertical reversal of output image 0x0: Processed pixels are output in the order of input (normal operation) in vertical direction. 0x1: The order of output data is flipped top to bottom. | RW | 0 |
| 2 | HRVB | Resizer B -Horizontal reversal of output image 0x0: Processed pixels are output in the order of input (normal operation) in horizontal direction. 0x1: The order of output data is flipped left to right. | RW | 0 |
| 1 | VRVA | Resizer A - Vertical reversal of output image 0x0: Processed pixels are output in the order of input (normal operation) in vertical direction. 0x1: The order of output data is flipped top to bottom. | RW | 0 |
| 0 | HRVA | Resizer A - Horizontal reversal of output image 0x0: Processed pixels are output in the order of input (normal operation) in horizontal direction. 0x1: The order of output data is flipped left to right. | RW | 0 |

Table 8-503. Register Call Summary for Register RSZ_SEQ

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [ISS RESIZER Register Summary: \[8\]](#)

Table 8-504. RZA_EN

| | | | |
|-------------------------|-----------------------------|-----------------|-------------|
| Address Offset | 0x0000 0078 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0478 | | |
| Description | RESIZER A - ENABLE REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ZE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | EN | Enable resizer #A This bit is latched on video port VD input. The reason is that the resizer must only starts the processing on a clean frame boundary. In one-shot mode, this bit is negated on VD. 0x0: Disable 0x1: Enable | RW | 0 |

Table 8-505. Register Call Summary for Register RZA_EN

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP RSZ Hardware Setup/Initialization: \[5\]](#)
- [ISS RESIZER Register Summary: \[6\]](#)

Table 8-506. RZA_MODE

| | | | |
|-------------------------|--------------------------|-----------------|-------------|
| Address Offset | 0x0000 007C | Instance | ISS_RESIZER |
| Physical Address | 0x5201 047C | | |
| Description | RESIZER #A MODE REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | MODE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | MODE | Select "Free Run mode" or "One Shot Mode" 0x0: Free run 0x1: One shot | RW | 0 |

Table 8-507. Register Call Summary for Register RZA_MODE

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\] \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-508. RZA_420

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0080 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0480 | | |
| Description | YEN/CEN: 0/0: in = YUV4:2:2 input, out = YUV4:2:2 output 0/1: in = YUV4:2:2 input, out = Chrominance of YUV4:2:0 output 1/0: in = YUV4:2:2 input, out = Luminance of YUV4:2:0 output 1/1: in = YUV4:2:2 input, out = YUV4:2:0 output | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----|-----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CEN | YEN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | CEN | Output Enable for Chrominance This bit is valid in 422 input mode. When CEN=0 and YEN=0, output is 422 0x0: C output disable 0x1: C output enable and 422to420 conversion enabled | RW | 0 |
| 0 | YEN | Output Enable for Luminance. This bit is valid in 422 input mode. When CEN=0 and YEN=0, output is 422 0x0: Y output disable 0x1: Y output enable and 422to420 conversion enabled | RW | 0 |

Table 8-509. Register Call Summary for Register RZA_420

ISS ISP

- [ISS ISP RSZ Global Image Processing Settings: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [ISS RESIZER Register Summary: \[10\]](#)
- [ISS RESIZER Register Description: \[11\] \[12\]](#)

Table 8-510. RZA_I_VPS

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0084 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0484 | | |
| Description | RESIZER A - INPUT VERTICAL START REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VPS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | VPS | Input Vertical Position Sets the vertical start position of the input image within the global frame. It enables to crop data into the global frame. After SRC_VPS, the Vps'th line is processed as the first line in each image. | RW | 0x0000 |

Table 8-511. Register Call Summary for Register RZA_I_VPS

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-512. RZA I HPS

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0088 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0488 | | | | | | | | | | | | | | | | Instance | ISS_RESIZER | | | | | | | | | | | | | | | |
| Description | RESIZER A - INPUT HORIZONTAL START REGISTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HPS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | HPS | Input Horizontal Position Sets the horizontal position of the first pixel for each line within the global frame. After SRC_HPS, the pixel at the VAL'th position is processed as the first pixel. This value must be even. | RW | 0x0000 |

Table 8-513. Register Call Summary for Register RZA I HPS

ISS ISP

- ISS ISP RSZ Engines Interframe Image Processing Settings: [0]
- ISS RESIZER Register Summary: [1]

Table 8-514. RZA_O_VSZ

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 008C | | | | | | | | | | | | | | | | Instance | ISS_RESIZER | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 048C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | RESIZER A - OUTPUT VERTICAL SIZER REGISTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VSZ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | VSZ | The target output size of the resized image. The number of output lines is (VSZ+1). Set 479, when 480 lines of output is required. | RW | 0x0000 |

Table 8-515. Register Call Summary for Register RZA_O_VSZ

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-516. RZA_O_HSZ

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 0090 | | |
| Physical Address | 0x5201 0490 | Instance | ISS_RESIZER |
| Description | RESIZER A - OUTPUT HORIZONTAL SIZE REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSZ | | | | | | | | | | | HSZ_LSB | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:1 | HSZ | The horizontal size of output image. The number of pixel in each line is (HSZ+1). Set 479, when 480 pixels are required. This value must be lower than the max memory line size supported by the resizer engine, except in RAW pass through mode. Note that the LSB of the 13-bit HSZ value is fixed to 1 such that the horizontal size is always even. | RW | 0x000 |
| 0 | HSZ_LSB | The least significant bit of HSZ is forced to 1. | R | 1 |

Table 8-517. Register Call Summary for Register RZA_O_HSZ

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-518. RZA_V_PHS_Y

| | | |
|------------------|---|----------------------|
| Address Offset | 0x0000 0094 | |
| Physical Address | 0x5201 0494 | Instance ISS_RESIZER |
| Description | <p>RESIZER A - INITIAL LUMINANCE PHASE OF VERTICAL RESIZING PROCESS</p> <p>When YUV4:2:2 data are output, the phase values for luma and chroma should typically be equal, that is, RZX_V_PHS_Y= RZX_V_PHS_C.</p> <p>The following constraints apply when setting the initial vertical phases ABS(RZX_V_PHS_Y - RZX_V_PHS_C) RZX_V_DIF. This constraint means that at most the distance between the initial phases for luminance and chrominance is not expected to exceed the distance between two luma pixels. Note that the absolute value is used, hence, the initial luma phase can be greater than the initial chroma phase or the other way around. As a reminder, the distance between two output pixels for luma is given by RZX_V_DIF.</p> | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | Y | The initial value for the luma phase in vertical resizing process. This value is in U14Q8 fractional format. | RW | 0x0000 |

Table 8-519. Register Call Summary for Register RZA_V_PHS_Y

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\] \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-520. RZA_V_PHS_C

| | | | |
|------------------|--|----------|-------------|
| Address Offset | 0x0000 0098 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0498 | | |
| Description | RESIZER A - INITIAL CHROMINANCE PHASE OF VERTICAL RESIZING PROCESS When YUV4:2:2 data are output, the phase values for luma and chroma should typically be equal, that is, RZX_V_PHS_Y= RZX_V_PHS_C. The following constraints apply when setting the initial vertical phases ABS(RZX_V_PHS_Y - RZX_V_PHS_C) RZX_V_DIF. This constraint means that at most the distance between the initial phases for luminance and chrominance is not expected to exceed the distance between two luma pixels. Note that the absolute value is used, hence, the initial luma phase can be greater than the initial chroma phase or the other way around. As a reminder, the distance between two output pixels for luma is given by RZX_V_DIF. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | C | The initial value for the chroma phase in vertical resizing process. This value is in U14Q8 fractional format. | RW | 0x0000 |

Table 8-521. Register Call Summary for Register RZA_V_PHS_C

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\] \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-522. RZA_V_DIF

| | | | |
|------------------|---------------------------------------|----------|-------------|
| Address Offset | 0x0000 009C | Instance | ISS_RESIZER |
| Physical Address | 0x5201 049C | | |
| Description | RESIZER A - VERTICAL RESIZER REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | V | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | V | The parameter for vertical resize. The actual resizing ratio is 256/ RZA_V_DIF . In normal mode: 16 = RZA_V_DIF = 4096. In down-scale mode: 256 = RZA_V_DIF = 4096. | RW | 0x0000 |

Table 8-523. Register Call Summary for Register RZA_V_DIF

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)
- [ISS RESIZER Register Description: \[2\] \[3\] \[4\]](#)

Table 8-524. RZA_V_TYP

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 00A0 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04A0 | | |
| Description | RESIZER A - INTERPOLATION METHOD FOR VERTICAL RESIZING | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | C | Y |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | C | Selection of resizing method for chrominance: vertical 0x0: 4-tap cubic convolution (default) 0x1: 2-tap linear interpolation | RW | 0 |
| 0 | Y | Selection of resizing method for luminance: vertical 0x0: 4-tap cubic convolution (default) 0x1: 2-tap linear interpolation | RW | 0 |

Table 8-525. Register Call Summary for Register RZA_V_TYP

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\] \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-526. RZA_V_LPF

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 00A4 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04A4 | | |
| Description | RESIZER A - VERTICAL LPF INTENSITY REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C | | | | Y | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:6 | C | The intensity parameter for chroma vertical low pass filtering. | RW | 0x00 |
| 5:0 | Y | The intensity parameter for luma vertical low pass filtering. | RW | 0x00 |

Table 8-527. Register Call Summary for Register RZA_V_LPF

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\] \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-528. RZA_H_PHS

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00A8 | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 04A8 | | | | | | | | | | | | | | | |
| Instance | ISS_RESIZER | | | | | | | | | | | | | | | |
| Description | RESIZER A - INITIAL PHASE OF HORIZONTAL RESIZING PROCESS | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PHS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | PHS | Initial value for the phase in horizontal resizing process, that is, the sampling position is shifted. This value is in U14Q8 fractional format. Example: If RZX_H_PHS = 128, the first output pixel is sampled at the center of the first two valid input pixels. If RZX_I_HPS=100 and RZX_H_PHS=128, the first output pixel is resampled at the center of the 100-th and the 101-st input pixels. | RW | 0x0000 |

Table 8-529. Register Call Summary for Register RZA_H_PHS

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-530. RZA_H_PHS_ADJ

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00AC | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 04AC | | | | | | | | | | | | | | | |
| Instance | ISS_RESIZER | | | | | | | | | | | | | | | |
| Description | RESIZER A - LUMINANCE HORIZONTAL PHASE ADJUSTMENT The RZA_H_PHS_ADJ register enables to adjust the horizontal phase for the luma component when averaging is enabled (the horizontal averaging disrupts the relative sampling point between luminance and chrominance when YUV4:2:2 cosited data is input), that is, the relative phase between luma and chroma is different before and after the horizontal averager. | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ADJ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8:0 | ADJ | Horizontal phase adjustment value. This value is in U9Q8 fractional format. This value is expected to be equal to zero if the averager is disabled or if input chroma is centered. | RW | 0x000 |

Table 8-531. Register Call Summary for Register RZA_H_PHS_ADJ

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)
- [ISS RESIZER Register Description: \[2\] \[3\]](#)
- [ISS IPIPE Register Description: \[4\]](#)

Table 8-532. RZA_H_DIF

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00B0 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_RESIZER | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 04B0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | RESIZER A - HORIZONTAL RESIZER REGISTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | H | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | H | The parameter for horizontal resizing process. The actual resizing ratio is 256/VAL. In normal mode 16= RSZ_RZA_H_DIF=4096 In down-scale mode 256=RSZ_RZA_H_DIF=4096 | RW | 0x0000 |

Table 8-533. Register Call Summary for Register RZA_H_DIF

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)
- [ISS RESIZER Register Description: \[2\] \[3\] \[4\] \[5\]](#)

Table 8-534. RZA_H_TYP

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00B4 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_RESIZER | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 04B4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Resize-A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | C | Y |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | C | Selection of resizing method for chrominance: horizontal 0x0: 4-tap cubic convolution (default) 0x1: 2-tap linear interpolation | RW | 0 |
| 0 | Y | Selection of resizing method for luminance: horizontal 0x0: 4-tap cubic convolution (default) 0x1: 2-tap linear interpolation | RW | 0 |

Table 8-535. Register Call Summary for Register RZA_H_TYP

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\] \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-536. RZA_H_LPF

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00B8 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_RESIZER | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 04B8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | RESIZER A - HORIZONTAL LPF INTENSITY REGISTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C | | | | | | | | Y | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:6 | C | Horizontal LPF Intensity for Chrominance | RW | 0x00 |
| 5:0 | Y | Selection of resizing method for Luminance in horizontal direction | RW | 0x00 |

Table 8-540. RZA_DWN_AV

| | | | |
|------------------|-------------|----------|-------------|
| Address Offset | 0x0000 00C0 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04C0 | | |
| Description | Resize-A | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | V | | H | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5:3 | V | Vertical averaging size : $1/2^{(VWT+1)}$ The range goes from 1/2 to 1/256 in power of two. 0:_DIV2 1/2 down scale 1:_DIV4 1/4 down scale 2:_DIV8 1/8 down scale 3:_DIV16 1/16 down scale 4:_DIV32 1/32 down scale 5:_DIV64 1/64 down scale 6:_DIV128 1/128 down scale 7:_DIV256 1/256 down scale | RW | 0x0 |
| 2:0 | H | Horizontal averaging size : $1/2^{(HWT+1)}$ The range goes from 1/2 to 1/256 in power of two. 0:_DIV2 1/2 down scale 1:_DIV4 1/4 down scale 2:_DIV8 1/8 down scale 3:_DIV16 1/16 down scale 4:_DIV32 1/32 down scale 5:_DIV64 1/64 down scale 6:_DIV128 1/128 down scale 7:_DIV256 1/256 down scale | RW | 0x0 |

Table 8-541. Register Call Summary for Register RZA_DWN_AV

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[2\] \[3\]](#)
- [ISS RESIZER Register Summary: \[4\]](#)

Table 8-542. RZA_RGB_EN

| | | | |
|------------------|--------------------------------|----------|-------------|
| Address Offset | 0x0000 00C4 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04C4 | | |
| Description | RESIZER #A - RGB OUTPUT ENABLE | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RGB_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | RGB_EN | <p>Enable of RGB output</p> <p>In pass through mode, this register must be 0.</p> <p>This bit can only be set to 1 when YUV4:2:2 data are output. YUV4:2:2 data output is selected when SRC_FMT1.IN420 = 0 and RZA_420.YEN = RZA_420.CEN = 0</p> <p>0x0: Off (YCbCr output)</p> <p>0x1: On (RGB output)</p> | RW | 0 |

Table 8-543. Register Call Summary for Register RZA_RGB_EN

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-544. RZA_RGB_TYP

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 00C8 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04C8 | | |
| Description | RESIZER A - RGB OUTPUT CONTROL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------|------|-----|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | MSK1 | MSK0 | TYP | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | MSK1 | <p>Enables masking of the last 2 pixels</p> <p>This bit is used to mask the 2 last pixels at the image boundary which are affected by the YUV4:2:2 to YUV4:4:4 conversion.</p> <p>0x0: output the last 2 pixels</p> <p>0x1: mask the last 2 pixels (Resizer do not output them.)</p> | RW | 0 |
| 1 | MSK0 | <p>Enables masking of the first 2 pixels</p> <p>This bit is used to mask the 2 first pixels at the image boundary which are affected by the YUV4:2:2 to YUV4:4:4 conversion.</p> <p>0x0: output the first 2 pixels</p> <p>0x1: mask the first 2 pixels (Resizer do not output them.)</p> | RW | 0 |
| 0 | TYP | <p>16bit/32bit output selection</p> <p>0x0: 32-bit output: alpha + R + G + B (8 bit each)</p> <p>This mode comes with performance degradation. The maximum input frequency in this mode is 160 MHz. This due to the fact that the output is 4 bytes / pixel.</p> <p>0x1: 16-bit output: R(5 bit) + G (6 bit) + B (5 bit)</p> | RW | 0 |

Table 8-545. Register Call Summary for Register RZA_RGB_TYP

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\] \[1\] \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-546. RZA_RGB_BLD

| | | | |
|-------------------------|--------------------------------|-----------------|-------------|
| Address Offset | 0x0000 00CC | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04CC | | |
| Description | RESIZER A - RGB BLEND REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BLD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | BLD | The alpha value used in 32-bit RGBA output mode | RW | 0x00 |

Table 8-547. Register Call Summary for Register RZA_RGB_BLD

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-548. RZA_SDR_Y_BAD_H

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 00D0 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04D0 | | |
| Description | RESIZER A - OUTPUT MEMORY BASE ADDRESS REGISTER (HIGH) This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0, RGB5:6:5, RGBA. RAW: RAW data is written to this address YUV4:2:2: YUV data is written to this address YUV4:2:0: Y data is written to this address RGB5:6:5: 16-bit RGB data is written to this address RGBA: 32-bit RGBA data is written to this address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y_BAD_H | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | Y_BAD_H | Memory Base Address Sets the 16 upper bits of the 32-bit base address of the circular buffer in memory. | RW | 0x0000 |

Table 8-549. Register Call Summary for Register RZA_SDR_Y_BAD_H

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-550. RZA_SDR_Y_BAD_L

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 00D4 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04D4 | | |
| Description | RESIZER A - OUTPUT MEMORY BASE ADDRESS REGISTER (LOW) This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0, RGB5:6:5, RGBA. RAW: RAW data is written to this address YUV4:2:2: YUV data is written to this address YUV4:2:0: Y data is written to this address RGB5:6:5: 16-bit RGB data is written to this address RGBA: 32-bit RGBA data is written to this address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y_BAD_L | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | Y_BAD_L | Memory Base Address Sets the 16 lower bits of the 32-bit base address of the circular buffer in memory. It is a byte address. YUV4:2:0 format (output data on 8 bits): The two least significant bits must be set to 00 when horizontal reversal mode is off. The two least significant bits must be set to 11 when horizontal reversal mode is on. RAW, RGB5:6:5 and YUV4:2:2 formats (output data on 16 bits): The two least significant bits must be set to 00 when horizontal reversal mode is off. The two least significant bits must be set to 11 when horizontal reversal mode is on. RGBA format (output data on 32 bits): The three least significant bits must be set to "000" when horizontal reversal mode is off. The three least significant bits must be set to "111" when horizontal reversal mode is on. | RW | 0x0000 |

Table 8-551. Register Call Summary for Register RZA_SDR_Y_BAD_L

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-552. RZA_SDR_Y_SAD_H

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 00D8 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04D8 | | |
| Description | RESIZER A - OUTPUT MEMORY START ADDRESS REGISTER (HIGH) This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0, RGB5:6:5, RGBA. RAW: RAW data is written to this address YUV4:2:2: YUV data is written to this address YUV4:2:0: Y data is written to this address RGB5:6:5: 16-bit RGB data is written to this address RGBA: 32-bit RGBA data is written to this address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y_SAD_H | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | Y_SAD_H | Memory Start Address Sets the 16 upper bits of the 32-bit start address in memory. | RW | 0x0000 |

Table 8-553. Register Call Summary for Register RZA_SDR_Y_SAD_H

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-554. RZA_SDR_Y_SAD_L

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 00DC | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04DC | | |
| Description | RESIZER A - OUTPUT MEMORY START ADDRESS REGISTER (LOW) This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0, RGB5:6:5, RGBA. RAW: RAW data is written to this address YUV4:2:2: YUV data is written to this address YUV4:2:0: Y data is written to this address RGB5:6:5: 16-bit RGB data is written to this address RGBA: 32-bit RGBA data is written to this address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y_SAD_L | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | Y_SAD_L | <p>Memory Start Address</p> <p>Sets 16 lower bits of the 32-bit start address in memory. It is a byte address. For every frame, the first line of data will be written to this address.</p> <p>We have: $SAD = BAD + (PTR_S \times OFT)$ and PTR_S</p> <p>PTR_E</p> <p>If the first line must be written at the beginning of the circular buffer memory then $SAD = BAD$ and $PTR_S = 0$.</p> <p>YUV4:2:0 format (output data on 8 bits):</p> <p>The two least significant bits must be set to 00 when horizontal reversal mode is off.</p> <p>The two least significant bits must be set to 11 when horizontal reversal mode is on.</p> <p>RAW, RGB5:6:5 and YUV4:2:2 formats (output data on 16 bits):</p> <p>The two least significant bits must be set to 00 when horizontal reversal mode is off.</p> <p>The two least significant bits must be set to 11 when horizontal reversal mode is on.</p> <p>RGBA format (output data on 32 bits):</p> <p>The three least significant bits must be set to "000" when horizontal reversal mode is off.</p> <p>The three least significant bits must be set to "111" when horizontal reversal mode is on.</p> | RW | 0x0000 |

Table 8-555. Register Call Summary for Register RZA_SDR_Y_SAD_L

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\] \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-556. RZA_SDR_Y_OFT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|---|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00E0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 04E0 | Instance | ISS_RESIZER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | RESIZER A - OUTPUT MEMORY OFFSET REGISTER This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0 or RGBA. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="16">Y_OFT</td></tr></table> | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | Y_OFT | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | Y_OFT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | Type Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:17 | RESERVED | | R 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16:0 | Y_OFT | Memory Line Offset Sets the size of each line in the circular buffer. It is expressed in bytes and unsigned. Note that OFT does not necessary corresponds to the size of a line in a frame, it can be much bigger. The line offset must be a multiple of 128 bytes (bits [6:0] of RZX_SDR_Y_OFT and RZX_SDR_C_OFT must be set to 0). Example: line 0 address = SAD line 1 address = SAD + 1 x OFT line 2 address = SAD + 2 x OFT | RW 0x00000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-557. Register Call Summary for Register RZA_SDR_Y_OFT

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-558. RZA_SDR_Y_PTR_S

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 00E4 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04E4 | | |
| Description | RESIZER A - OUTPUT MEMORY START ADDRESS REGISTER This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0 or RGBA. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y_PTR_S | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | Y_PTR_S | Start Line of Memory Pointer Sets the vertical position of the first output line in the output memory space. This value is expressed in number of lines. The hardware uses it to set up the initial value of the circular buffer. It must be set up such as PTR_S = (SAD - BAD) / OFT. This value must be set to 0 when RSZ_RZA_SDR_Y_BAD = RSZ_RZA_SDR_Y_SAD. | RW | 0x0000 |

Table 8-559. Register Call Summary for Register RZA_SDR_Y_PTR_S

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-560. RZA_SDR_Y_PTR_E

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 00E8 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04E8 | | |
| Description | RESIZER A - OUTPUT MEMORY END ADDRESS REGISTER This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0 or RGBA. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y_PTR_E | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | Y_PTR_E | End Line of Memory Pointer Sets the maximum number of lines to be stored in the output memory space. This value is expressed in number of lines. When the number of output lines exceeds this value, the address restarts from the first address in the output memory space (BAD). | RW | 0x0000 |

Table 8-561. Register Call Summary for Register RZA_SDR_Y_PTR_E

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS ISP5 SYS1 Register Description: \[2\] \[3\] \[4\] \[5\]](#)
- [ISS RESIZER Register Summary: \[6\]](#)

Table 8-562. RZA_SDR_C_BAD_H

| | | | | |
|-------------------------|---|--|-----------------|-------------|
| Address Offset | 0x0000 00EC | | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04EC | | | |
| Description | RESIZER A - OUTPUT MEMORY BASE ADDRESS REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0. U and V data are written into this buffer. | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C_BAD_H | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | C_BAD_H | Memory Base Address Sets the 16 higher bits of the 32-bit base address of the circular buffer in memory. | RW | 0x0000 |

Table 8-563. Register Call Summary for Register RZA_SDR_C_BAD_H

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-564. RZA_SDR_C_BAD_L

| | | | | |
|-------------------------|---|--|-----------------|-------------|
| Address Offset | 0x0000 00F0 | | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04F0 | | | |
| Description | RESIZER A - OUTPUT MEMORY BASE ADDRESS REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0. U and V data are written into this buffer. | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C_BAD_L | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | C_BAD_L | Memory Base Address Sets the 16 lower bits of the 32-bit base address of the circular buffer in memory. It is a byte address. YUV4:2:0 format (output data on 8 bits): The two least significant bits must be set to 00 when horizontal reversal mode is off. The two least significant bits must be set to 11 when horizontal reversal mode is on. | RW | 0x0000 |

Table 8-565. Register Call Summary for Register RZA_SDR_C_BAD_L

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-566. RZA_SDR_C_SAD_H

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 00F4 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04F4 | | |
| Description | RESIZER A - OUTPUT MEMORY START ADDRESS REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0. U and V data are written into this buffer. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C_SAD_H | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | C_SAD_H | Memory Base Address Sets the 16 higher bits of the 32-bit start address in memory. | RW | 0x0000 |

Table 8-567. Register Call Summary for Register RZA_SDR_C_SAD_H

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-568. RZA_SDR_C_SAD_L

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 00F8 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04F8 | | |
| Description | RESIZER A - OUTPUT MEMORY START ADDRESS REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0. U and V data are written into this buffer. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C_SAD_L | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | C_SAD_L | <p>Memory Base Address</p> <p>Sets the 16 lower bits of the 32-bit start address in memory. It is a byte address. For every frame, the first line of data will be written to this address.</p> <p>We have: $SAD = BAD + (PTR_S \times OFT)$ and PTR_S PTR_E</p> <p>If the first line must be written at the beginning of the circular buffer memory then $SAD = BAD$ and $PTR_S = 0$.</p> <p>YUV4:2:0 format (output data on 8 bits):</p> <p>The two least significant bits must be set to 00 when horizontal reversal mode is off.</p> <p>The two least significant bits must be set to 11 when horizontal reversal mode is on.</p> | RW | 0x0000 |

Table 8-569. Register Call Summary for Register RZA_SDR_C_SAD_L

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\] \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-570. RZA_SDR_C_OFT

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 00FC | Instance | ISS_RESIZER |
| Physical Address | 0x5201 04FC | | |
| Description | RESIZER A - OUTPUT MEMORY OFFSET REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C_OFT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:17 | RESERVED | | R | 0x0000 |
| 16:0 | C_OFT | Memory Line Offset Sets the size of each line in the circular buffer. It is expressed in bytes and unsigned. Note that OFT does not necessary corresponds to the size of a line in a frame, it can be much bigger. The line offset must be a multiple of 128 bytes (bits [6:0] of RZX_SDR_Y_OFT and RZX_SDR_C_OFT must be set to 0). Example: line 0 address = SAD line 1 address = SAD + 1 x OFT line 2 address = SAD + 2 x OFT | RW | 0x00000 |

Table 8-571. Register Call Summary for Register RZA_SDR_C_OFT

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-572. RZA_SDR_C_PTR_S

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0500 | | | | | | | | | | | | | | | | Instance | ISS_RESIZER | | | | | | | | | | | | | | | |
| Description | RESIZER A - OUTPUT MEMORY START ADDRESS REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | C_PTR_S | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | C_PTR_S | Start Line of Memory Pointer Sets the vertical position of the first output line in the output memory space. This value is expressed in number of lines. The hardware uses it to set up the initial value of the circular buffer. It must be set up such as PTR_S = (SAD - BAD) / OFT. This value must be set to 0 when RSZ_RZA_SDR_C_BAD = RSZ_RZA_SDR_C_SAD. | RW | 0x0000 |

Table 8-573. Register Call Summary for Register RZA_SDR_C_PTR_S

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-574. RZA_SDR_C_PTR_E

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|----|--|----|----|----|----|----|----|----|----|----|----|----|----|---------|----------|-------------|----|---------|----|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0104 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0504 | | | | | | | | | | | | | | | | Instance | ISS_RESIZER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | RESIZER A - OUTPUT MEMORY END ADDRESS REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="16">C_PTR_E</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | C_PTR_E | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | C_PTR_E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:13 | RESERVED | | | | | | | | | | | | | | | | | R | | 0x00000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12:0 | C_PTR_E | | End Line of Memory Pointer Sets the maximum number of lines to be stored in the output memory space. This value is expressed in number of lines. When the number of output lines exceeds this value, the address restarts from the first address in the output memory space (BAD). | | | | | | | | | | | | | | | RW | | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-575. Register Call Summary for Register RZA_SDR_C_PTR_E

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-576. RZB_EN

| | | | |
|-------------------------|-----------------------------|-----------------|-------------|
| Address Offset | 0x0000 0108 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0508 | | |
| Description | RESIZER B - ENABLE REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | EN | Enable resizer #A This bit is latched on the video port VD input signal. The reason is that the resizer must only starts the processing on a clean frame boundary. In one-shot mode, this bit is negated on VD. 0x0: Disable 0x1: Enable | RW | 0 |

Table 8-577. Register Call Summary for Register RZB_EN

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP RSZ Hardware Setup/Initialization: \[5\]](#)
- [ISS RESIZER Register Summary: \[6\]](#)

Table 8-578. RZB_MODE

| | | | |
|-------------------------|-------------------------|-----------------|-------------|
| Address Offset | 0x0000 010C | Instance | ISS_RESIZER |
| Physical Address | 0x5201 050C | | |
| Description | RESIZER B MODE REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | MODE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | MODE | Select "Free Run mode" or "One Shot Mode" 0x0: Free run 0x1: One shot | RW | 0 |

Table 8-579. Register Call Summary for Register RZB_MODE

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\] \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-580. RZB_420

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0110 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0510 | | |
| Description | YEN/CEN: 0/0: in = YUV4:2:2 input, out = YUV4:2:2 output 0/1: in = YUV4:2:2 input, out = Chrominance of YUV4:2:0 output 1/0: in = YUV4:2:2 input, out = Luminance of YUV4:2:0 output 1/1: in = YUV4:2:2 input, out = YUV4:2:0 output | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CEN | | YEN | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | CEN | Output Enable for Chrominance This bit is valid in 422 input mode. When CEN=0 and YEN=0, output is 422 0x0: C output disable 0x1: C output enable and 422to420 conversion enabled | RW | 0 |
| 0 | YEN | Output Enable for Luminance. This bit is valid in 422 input mode. When CEN=0 and YEN=0, output is 422 0x0: Y output disable 0x1: Y output enable and 422to420 conversion enabled | RW | 0 |

Table 8-581. Register Call Summary for Register RZB_420

ISS ISP

- [ISS ISP RSZ Global Image Processing Settings: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[4\] \[5\]](#)
- [ISS RESIZER Register Summary: \[6\]](#)
- [ISS RESIZER Register Description: \[7\] \[8\]](#)

Table 8-582. RZB_I_VPS

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0114 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0514 | | |
| Description | RESIZER B - INPUT VERTICAL START REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VPS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | VPS | Input Vertical Position Sets the vertical start position of the input image within the global frame. It enables to crop data into the global frame. After SRC_VPS, the Vps'th line is processed as the first line in each image. | RW | 0x0000 |

Table 8-583. Register Call Summary for Register RZB_I_VPS

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-584. RZB_I_HPS

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0118 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0518 | | |
| Description | RESIZER B - INPUT HORIZONTAL START REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HPS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | HPS | Input Horizontal Position Sets the horizontal position of the first pixel for each line within the global frame. After SRC_HPS, the pixel at the VAL'th position is processed as the first pixel. This value must be even. | RW | 0x0000 |

Table 8-585. Register Call Summary for Register RZB_I_HPS

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-586. RZB_O_VSZ

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 011C | Instance | ISS_RESIZER |
| Physical Address | 0x5201 051C | | |
| Description | RESIZER B - OUTPUT VERTICAL SIZER REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VSZ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | VSZ | The target output size of the resized image. The number of output lines is (VSZ+1). Set 479, when 480 lines of output is required. | RW | 0x0000 |

Table 8-587. Register Call Summary for Register RZB_O_VSZ

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-588. RZB_O_HSZ

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 0120 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0520 | | |
| Description | RESIZER B - OUTPUT HORIZONTAL SIZE REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSZ | | | | | | | | | | | | HSZ_LSB | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:1 | HSZ | The horizontal size of output image. The number of pixel in each line is (HSZ+1). Set 479, when 480 pixels are required. This value must be lower than the max memory line size supported by the resizer engine, except in RAW pass through mode. Note that the LSB of the 13-bit HSZ value is fixed to 1 such that the horizontal size is always even. | RW | 0x000 |
| 0 | HSZ_LSB | The least significant bit of HSZ is forced to 1. | R | 1 |

Table 8-589. Register Call Summary for Register RZB_O_HSZ

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-590. RZB_V_PHS_Y

| | | | |
|------------------|--|----------|-------------|
| Address Offset | 0x0000 0124 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0524 | | |
| Description | RESIZER B - INITIAL LUMINANCE PHASE OF VERTICAL RESIZING PROCESS When YUV4:2:2 data are output, the phase values for luma and chroma should typically be equal, that is, RZX_V_PHS_Y= RZX_V_PHS_C. The following constraints apply when setting the initial vertical phases ABS(RZX_V_PHS_Y - RZX_V_PHS_C) RZX_V_DIF. This constraint means that at most the distance between the initial phases for luminance and chrominance is not expected to exceed the distance between two luma pixels. Note that the absolute value is used, hence, the initial luma phase can be greater than the initial chroma phase or the other way around. As a reminder, the distance between two output pixels for luma is given by RZX_V_DIF. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | Y | The initial value for the luma phase in vertical resizing process. This value is in U14Q8 fractional format. | RW | 0x0000 |

Table 8-591. Register Call Summary for Register RZB_V_PHS_Y

ISS ISP

- [ISS RESIZER Register Summary: \[0\]](#)

Table 8-592. RZB_V_PHS_C

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 0128 | | |
| Physical Address | 0x5201 0528 | Instance | ISS_RESIZER |
| Description | <p>RESIZER B - INITIAL CHROMINANCE PHASE OF VERTICAL RESIZING PROCESS</p> <p>When YUV4:2:2 data are output, the phase values for luma and chroma should typically be equal, that is, RZX_V_PHS_Y= RZX_V_PHS_C.</p> <p>The following constraints apply when setting the initial vertical phases ABS(RZX_V_PHS_Y - RZX_V_PHS_C) RZX_V_DIF. This constraint means that at most the distance between the initial phases for luminance and chrominance is not expected to exceed the distance between two luma pixels. Note that the absolute value is used, hence, the initial luma phase can be greater than the initial chroma phase or the other way around. As a reminder, the distance between two output pixels for luma is given by RZX_V_DIF.</p> | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | C | The initial value for the chroma phase in vertical resizing process. This value is in U14Q8 fractional format. | RW | 0x0000 |

Table 8-593. Register Call Summary for Register RZB_V_PHS_C

ISS ISP

- [ISS RESIZER Register Summary: \[0\]](#)

Table 8-594. RZB_V_DIF

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 012C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 052C | | | | | | | | | | | | | | | | InstanceISS_RESIZER | | | | | | | | | | | | | | | |
| Description | RESIZER B - VERTICAL RESIZER REGISTERR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | V | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | V | The parameter for vertical resize. The actual resizing ratio is 256/ RZB_V_DIF . In normal mode: 16 = RZB_V_DIF = 4096. In down-scale mode: 256 = RZB_V_DIF = 4096. | RW | 0x0000 |

Table 8-595. Register Call Summary for Register RZB_V_DIF

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)
- [ISS RESIZER Register Description: \[2\] \[3\] \[4\]](#)

Table 8-596. RZB_V_TYP

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0130 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0530 | | |
| Description | RESIZER B - INTERPOLATION METHOD FOR VERTICAL RESIZING | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | C | Y |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | C | Selection of resizing method for chrominance: vertical 0x0: 4-tap cubic convolution (default) 0x1: 2-tap linear interpolation | RW | 0 |
| 0 | Y | Selection of resizing method for luminance: vertical 0x0: 4-tap cubic convolution (default) 0x1: 2-tap linear interpolation | RW | 0 |

Table 8-597. Register Call Summary for Register RZB_V_TYP

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\] \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-598. RZB_V_LPF

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 0134 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0534 | | |
| Description | RESIZER B - VERTICAL LPF INTENSITY REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C | | | | Y | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:6 | C | The intensity parameter for chroma vertical low pass filtering. | RW | 0x00 |
| 5:0 | Y | The intensity parameter for luma vertical low pass filtering. | RW | 0x00 |

Table 8-599. Register Call Summary for Register RZB_V_LPF

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\] \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-600. RZB_H_PHS

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|---|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|-------------|----|----|----|----|---|---|---|---|---|---|---|---|---|-------------|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0138 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0538 | | | | | | | | | | | | | | | Instance | ISS_RESIZER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | RESIZER B - INITIAL PHASE OF HORIZONTAL RESIZING PROCESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="15">PHS</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | PHS | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | PHS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:14 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x00000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13:0 | PHS | Initial value for the phase in horizontal resizing process, that is, the sampling position is shifted. This value is in U14Q8 fractional format. Example: If RZX_H_PHS = 128, the first output pixel is sampled at the center of the first two valid input pixels. If RZX_I_HPS=100 and RZX_H_PHS=128, the first output pixel is resampled at the center of the 100-th and the 101-st input pixels. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RW | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-601. Register Call Summary for Register RZB_H_PHS

ISS ISP

- [ISS RESIZER Register Summary: \[0\]](#)

Table 8-602. RZB_H_PHS_ADJ

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|----------|-------------|--|--|--|--|--|--|--|--|--|--|------|----------|--|--|
| Address Offset | 0x0000 013C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 053C | | | | | | | | | | | | | | | Instance | ISS_RESIZER | | | | | | | | | | | | | | |
| Description | <div>RESIZER B - LUMINANCE HORIZONTAL PHASE ADJUSTMENT</div> <div>The RZA_H_PHS_ADJ register enables to adjust the horizontal phase for the luma component when averaging is enabled (the horizontal averaging disrupts the relative sampling point between luminance and chrominance when YUV4:2:2 cosited data is input), that is, the relative phase between luma and chroma is different before and after the horizontal averager.</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div><div><div>313029282726252423222120191817161514131211109876543210</div><div>RESERVEDADJ</div></div></div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | | | | | | Type | Reset | | |
| 31:9 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x000000 | | |
| 8:0 | ADJ | | <div>Horizontal phase adjustment value.</div> <div>This value is in U9Q8 fractional format.</div> <div>This value is expected to be equal to zero if the averager is disabled or if input chroma is centered.</div> | | | | | | | | | | | | | | | | | | | | | | | | | RW | 0x000 | | |

Table 8-603. Register Call Summary for Register RZB_H_PHS_ADJ

ISS ISP

- [ISS RESIZER Register Summary: \[0\]](#)
- [ISS IPIPE Register Description: \[1\]](#)

Table 8-604. RZB_H_DIF

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0140 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0540 | | | | | | | | | | | | | | | | InstanceISS_RESIZER | | | | | | | | | | | | | | | |
| Description | RESIZER B - HORIZONTAL RESIZER REGISTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | H | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | H | The parameter for horizontal resizing process. The actual resizing ratio is 256/VAL. In normal mode 16= RSZ_RZA_H_DIF=4096 In down-scale mode 256=RSZ_RZA_H_DIF=4096 | RW | 0x0000 |

Table 8-605. Register Call Summary for Register RZB_H_DIF

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-606. RZB_H_TYP

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0144 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_RESIZER | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0544 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | RESIZER B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | C | Y |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | C | Selection of resizing method for chrominance: horizontal 0x0: 4-tap cubic convolution (default) 0x1: 2-tap linear interpolation | RW | 0 |
| 0 | Y | Selection of resizing method for luminance: horizontal 0x0: 4-tap cubic convolution (default) 0x1: 2-tap linear interpolation | RW | 0 |

Table 8-607. Register Call Summary for Register RZB_H_TYP

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\] \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-608. RZB_H_LPF

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0148 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0548 | | |
| Description | RESIZER B - HORIZONTAL LPF INTENSITY REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C | | Y | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:6 | C | Horizontal LPF Intensity for Chrominance | RW | 0x00 |
| 5:0 | Y | Selection of resizing method for Luminance in horizontal direction | RW | 0x00 |

Table 8-609. Register Call Summary for Register RZB_H_LPF

ISS ISP

- [ISS ISP RSZ Engines Interframe Image Processing Settings: \[0\] \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-610. RZB_DWN_EN

| | | | |
|------------------|---------------------------------------|----------|-------------|
| Address Offset | 0x0000 014C | Instance | ISS_RESIZER |
| Physical Address | 0x5201 054C | | |
| Description | RESIZER B - DOWNSCALE ENABLE REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DWN_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | DWN_EN | Resizer downscale enable 0x0: Off. Normal operation: upscale and downscale are allowed. 0x1: On. Downscale mode. | RW | 0 |

Table 8-611. Register Call Summary for Register RZB_DWN_EN

ISS ISP

- [ISS RESIZER Register Summary: \[0\]](#)

Table 8-612. RZB_DWN_AV

| | | | |
|------------------|-------------|----------|-------------|
| Address Offset | 0x0000 0150 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0550 | | |
| Description | RESIZER B | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | V | | | H | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5:3 | V | Vertical averaging size : $1/2^{(VWT+1)}$ The range goes from 1/2 to 1/256 in power of two. 0:_DIV2 1/2 down scale 1:_DIV4 1/4 down scale 2:_DIV8 1/8 down scale 3:_DIV16 1/16 down scale 4:_DIV32 1/32 down scale 5:_DIV64 1/64 down scale 6:_DIV128 1/128 down scale 7:_DIV256 1/256 down scale | RW | 0x0 |
| 2:0 | H | Horizontal averaging size : $1/2^{(HWT+1)}$ The range goes from 1/2 to 1/256 in power of two. 0:_DIV2 1/2 down scale 1:_DIV4 1/4 down scale 2:_DIV8 1/8 down scale 3:_DIV16 1/16 down scale 4:_DIV32 1/32 down scale 5:_DIV64 1/64 down scale 6:_DIV128 1/128 down scale 7:_DIV256 1/256 down scale | RW | 0x0 |

Table 8-613. Register Call Summary for Register RZB_DWN_AV

ISS ISP

- [ISS RESIZER Register Summary: \[0\]](#)

Table 8-614. RZB_RGB_EN

| | | | |
|-------------------------|-------------------------------|-----------------|-------------|
| Address Offset | 0x0000 0154 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0554 | | |
| Description | RESIZER B - RGB OUTPUT ENABLE | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RGB_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | RGB_EN | Enable of RGB output In pass through mode, this register must be 0. This bit can only be set to 1 when YUV4:2:2 data are output. YUV4:2:2 data output is selected when SRC_FMT1.IN420 = 0 and RZB_420.YEN = RZB_420.CEN = 0 0x0: Off (YCbCr output) 0x1: On (RGB output) | RW | 0 |

Table 8-615. Register Call Summary for Register RZB_RGB_EN

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS RESIZER Register Summary: \[1\]](#)

Table 8-616. RZB_RGB_TYP

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0158 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0558 | | |
| Description | RESIZER B - RGB OUTPUT CONTROL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------|------|-----|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | MSK1 | MSK0 | TYP | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | MSK1 | Enables masking of the last 2 pixels This bit is used to mask the 2 last pixels at the image boundary which are affected by the YUV4:2:2 to YUV4:4:4 conversion. 0x0: output the last 2 pixels 0x1: mask the last 2 pixels (Resizer do not output them.) | RW | 0 |
| 1 | MSK0 | Enables masking of the first 2 pixels This bit is used to mask the 2 first pixels at the image boundary which are affected by the YUV4:2:2 to YUV4:4:4 conversion. 0x0: output the first 2 pixels 0x1: mask the first 2 pixels (Resizer do not output them.) | RW | 0 |
| 0 | TYP | 16bit/32bit output selection 0x0: 32-bit output: alpha + R + G + B (8 bit each) This mode comes with performance degradation. The maximum input frequency in this mode is 160 MHz. This due to the fact that the output is 4 bytes / pixel. 0x1: 16-bit output: R(5 bit) + G (6 bit) + B (5 bit) | RW | 0 |

Table 8-617. Register Call Summary for Register RZB_RGB_TYP

ISS ISP

- [ISS RESIZER Register Summary: \[0\]](#)

Table 8-618. RZB_RGB_BLD

| | | | |
|-------------------------|--------------------------------|-----------------|-------------|
| Address Offset | 0x0000 015C | Instance | ISS_RESIZER |
| Physical Address | 0x5201 055C | | |
| Description | RESIZER B - RGB BLEND REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BLD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | BLD | The alpha value used in 32-bit RGBA output mode | RW | 0x00 |

Table 8-619. Register Call Summary for Register RZB_RGB_BLD

ISS ISP

- [ISS RESIZER Register Summary: \[0\]](#)

Table 8-620. RZB_SDR_Y_BAD_H

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0160 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0560 | | |
| Description | RESIZER B - OUTPUT MEMORY BASE ADDRESS REGISTER This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0, RGB5:6:5, RGBA. RAW: RAW data is written to this address YUV4:2:2: YUV data is written to this address YUV4:2:0: Y data is written to this address RGB5:6:5: 16-bit RGB data is written to this address RGBA: 32-bit RGBA data is written to this address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y_BAD_H | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | Y_BAD_H | Memory Base Address Sets 16 upper bits of the 32-bit base address of the circular buffer in memory. | RW | 0x0000 |

Table 8-621. Register Call Summary for Register RZB_SDR_Y_BAD_H

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-622. RZB_SDR_Y_BAD_L

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0164 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0564 | | |
| Description | RESIZER B - OUTPUT MEMORY BASE ADDRESS REGISTER This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0, RGB5:6:5, RGBA. RAW: RAW data is written to this address YUV4:2:2: YUV data is written to this address YUV4:2:0: Y data is written to this address RGB5:6:5: 16-bit RGB data is written to this address RGBA: 32-bit RGBA data is written to this address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y_BAD_L | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | Y_BAD_L | Memory Base Address Sets the 16 lower bits of the 32-bit base address of the circular buffer in memory. It is a byte address. YUV4:2:0 format (output data on 8 bits): The two least significant bits must be set to 00 when horizontal reversal mode is off. The two least significant bits must be set to 11 when horizontal reversal mode is on. RAW, RGB5:6:5 and YUV4:2:2 formats (output data on 16 bits): The two least significant bits must be set to 00 when horizontal reversal mode is off. The two least significant bits must be set to 11 when horizontal reversal mode is on. RGBA format (output data on 32 bits): The three least significant bits must be set to "000" when horizontal reversal mode is off. The three least significant bits must be set to "111" when horizontal reversal mode is on. | RW | 0x0000 |

Table 8-623. Register Call Summary for Register RZB_SDR_Y_BAD_L

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-624. RZB_SDR_Y_SAD_H

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0168 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0568 | | |
| Description | RESIZER B - OUTPUT MEMORY START ADDRESS REGISTER This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0, RGB5:6:5, RGBA. RAW: RAW data is written to this address YUV4:2:2: YUV data is written to this address YUV4:2:0: Y data is written to this address RGB5:6:5: 16-bit RGB data is written to this address RGBA: 32-bit RGBA data is written to this address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y_SAD_H | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | Y_SAD_H | Memory Start Address Sets 16 upper bits of the 32-bit start address in memory. | RW | 0x0000 |

Table 8-625. Register Call Summary for Register RZB_SDR_Y_SAD_H

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-626. RZB_SDR_Y_SAD_L

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 016C | Instance | ISS_RESIZER |
| Physical Address | 0x5201 056C | | |
| Description | RESIZER B - OUTPUT MEMORY START ADDRESS REGISTER This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0, RGB5:6:5, RGBA. RAW: RAW data is written to this address YUV4:2:2: YUV data is written to this address YUV4:2:0: Y data is written to this address RGB5:6:5: 16-bit RGB data is written to this address RGBA: 32-bit RGBA data is written to this address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y_SAD_L | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | Y_SAD_L | <p>Memory Start Address</p> <p>Sets the 16 lower bits of the 32-bit start address in memory. It is a byte address. For every frame, the first line of data will be written to this address.</p> <p>We have: $SAD = BAD + (PTR_S \times OFT)$ and $PTR_S \times PTR_E$</p> <p>If the first line must be written at the beginning of the circular buffer memory then $SAD = BAD$ and $PTR_S = 0$.</p> <p>YUV4:2:0 format (output data on 8 bits):</p> <p>The two least significant bits must be set to 00 when horizontal reversal mode is off.</p> <p>The two least significant bits must be set to 11 when horizontal reversal mode is on.</p> <p>RAW, RGB5:6:5 and YUV4:2:2 formats (output data on 16 bits):</p> <p>The two least significant bits must be set to 00 when horizontal reversal mode is off.</p> <p>The two least significant bits must be set to 11 when horizontal reversal mode is on.</p> <p>RGBA format (output data on 32 bits):</p> <p>The three least significant bits must be set to "000" when horizontal reversal mode is off.</p> <p>The three least significant bits must be set to "111" when horizontal reversal mode is on.</p> | RW | 0x0000 |

Table 8-627. Register Call Summary for Register RZB_SDR_Y_SAD_L

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\] \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-628. RZB_SDR_Y_OFT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|---|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0170 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0570 | Instance | ISS_RESIZER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | RESIZER B - OUTPUT MEMORY OFFSET REGISTER This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0 or RGBA. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="16">Y_OFT</td></tr></table> | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | Y_OFT | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | Y_OFT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | Type Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:17 | RESERVED | | R 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16:0 | Y_OFT | Memory Line Offset Sets the size of each line in the circular buffer. It is expressed in bytes and unsigned. Note that OFT does not necessary corresponds to the size of a line in a frame, it can be much bigger. The line offset must be a multiple of 128 bytes (bits [6:0] of RZX_SDR_Y_OFT and RZX_SDR_C_OFT must be set to 0). Example: line 0 address = SAD line 1 address = SAD + 1 x OFT line 2 address = SAD + 2 x OFT | RW 0x00000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-629. Register Call Summary for Register RZB_SDR_Y_OFT

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-630. RZB_SDR_Y_PTR_S

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0174 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0574 | | |
| Description | RESIZER B - OUTPUT MEMORY START ADDRESS REGISTER This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0 or RGBA. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y_PTR_S | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | Y_PTR_S | Start Line of Memory Pointer Sets the vertical position of the first output line in the output memory space. This value is expressed in number of lines. The hardware uses it to set up the initial value of the circular buffer. It must be set up such as PTR_S = (SAD - BAD) / OFT. This value must be set to 0 when RSZ_RZA_SDR_Y_BAD = RSZ_RZA_SDR_Y_SAD. | RW | 0x0000 |

Table 8-631. Register Call Summary for Register RZB_SDR_Y_PTR_S

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-632. RZB_SDR_Y_PTR_E

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0178 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0578 | | |
| Description | RESIZER B - OUTPUT MEMORY END ADDRESS REGISTER This register is used if the output data format is one of the following: RAW, YUV4:2:2, YUV4:2:0 or RGBA. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | Y_PTR_E | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | Y_PTR_E | End Line of Memory Pointer Sets the maximum number of lines to be stored in the output memory space. This value is expressed in number of lines. When the number of output lines exceeds this value, the address restarts from the first address in the output memory space (BAD). | RW | 0x0000 |

Table 8-633. Register Call Summary for Register RZB_SDR_Y_PTR_E

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS ISP5 SYS1 Register Description: \[2\] \[3\] \[4\] \[5\]](#)
- [ISS RESIZER Register Summary: \[6\]](#)

Table 8-634. RZB_SDR_C_BAD_H

| | | | | |
|-------------------------|---|--|-----------------|-------------|
| Address Offset | 0x0000 017C | | Instance | ISS_RESIZER |
| Physical Address | 0x5201 057C | | | |
| Description | RESIZER B - OUTPUT MEMORY BASE ADDRESS REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0. U and V data are written into this buffer. | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C_BAD_H | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | C_BAD_H | Memory Base Address Sets the 16 upper bits of the 32-bit base address of the circular buffer in memory. | RW | 0x0000 |

Table 8-635. Register Call Summary for Register RZB_SDR_C_BAD_H

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-636. RZB_SDR_C_BAD_L

| | | | | |
|-------------------------|---|--|-----------------|-------------|
| Address Offset | 0x0000 0180 | | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0580 | | | |
| Description | RESIZER B - OUTPUT MEMORY BASE ADDRESS REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0. U and V data are written into this buffer. | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C_BAD_L | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | C_BAD_L | Memory Base Address Sets the 16 lower bits of the 32-bit base address of the circular buffer in memory. It is a byte address. YUV4:2:0 format (output data on 8 bits): The two least significant bits must be set to 00 when horizontal reversal mode is off. The two least significant bits must be set to 11 when horizontal reversal mode is on. | RW | 0x0000 |

Table 8-637. Register Call Summary for Register RZB_SDR_C_BAD_L

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-638. RZB_SDR_C_SAD_H

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0184 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0584 | | |
| Description | RESIZER B - OUTPUT MEMORY START ADDRESS REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0. U and V data are written into this buffer. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C_SAD_H | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | C_SAD_H | Memory Base Address Sets the 16 upper bits of the 32-bit start address in memory. | RW | 0x0000 |

Table 8-639. Register Call Summary for Register RZB_SDR_C_SAD_H

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-640. RZB_SDR_C_SAD_L

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0188 | Instance | ISS_RESIZER |
| Physical Address | 0x5201 0588 | | |
| Description | RESIZER B - OUTPUT MEMORY START ADDRESS REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0. U and V data are written into this buffer. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C_SAD_L | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | C_SAD_L | <p>Memory Base Address</p> <p>Sets the 16 lower bits of the 32-bit start address in memory. It is a byte address.</p> <p>For every frame, the first line of data will be written to this address (C_SAD_H/C_SAD_L).</p> <p>We have: SAD = BAD + (PTR_S x OFT) and PTR_S</p> <p>PTR_E</p> <p>If the first line must be written at the beginning of the circular buffer memory then SAD = BAD and PTR_S = 0.</p> <p>YUV4:2:0 format (output data on 8 bits):</p> <p>The two least significant bits must be set to 00 when horizontal reversal mode is off.</p> <p>The two least significant bits must be set to 11 when horizontal reversal mode is on.</p> | RW | 0x0000 |

Table 8-641. Register Call Summary for Register RZB_SDR_C_SAD_L

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\] \[2\]](#)
- [ISS RESIZER Register Summary: \[3\]](#)

Table 8-642. RZB_SDR_C_OFT

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 018C | Instance | ISS_RESIZER |
| Physical Address | 0x5201 058C | | |
| Description | RESIZER B - OUTPUT MEMORY OFFSET REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C_OFT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:17 | RESERVED | | R | 0x0000 |
| 16:0 | C_OFT | Memory Line Offset Sets the size of each line in the circular buffer. It is expressed in bytes and unsigned. Note that OFT does not necessary corresponds to the size of a line in a frame, it can be much bigger. The line offset must be a multiple of 128 bytes (bits [6:0] of RZX_SDR_Y_OFT and RZX_SDR_C_OFT must be set to 0). Example: line 0 address = SAD line 1 address = SAD + 1 x OFT line 2 address = SAD + 2 x OFT | RW | 0x00000 |

Table 8-643. Register Call Summary for Register RZB_SDR_C_OFT

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-644. RZB_SDR_C_PTR_S

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----------|-------------|---------|----|---------|----|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0190 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0590 | | | | | | | | | | | | | | | Instance | ISS_RESIZER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | RESIZER B - OUTPUT MEMORY START ADDRESS REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="18">RESERVED</td><td colspan="14">C_PTR_S</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | C_PTR_S | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | C_PTR_S | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:13 | RESERVED | | | | | | | | | | | | | | | | | R | | 0x00000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12:0 | C_PTR_S | | Start Line of Memory Pointer Sets the vertical position of the first output line in the output memory space. This value is expressed in number of lines. The hardware uses it to set up the initial value of the circular buffer. It must be set up such as PTR_S = (SAD - BAD) / OFT. This value must be set to 0 when RSZ_RZA_SDR_C_BAD = RSZ_RZA_SDR_C_SAD. | | | | | | | | | | | | | | | RW | | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-645. Register Call Summary for Register RZB_SDR_C_PTR_S

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

Table 8-646. RZB_SDR_C_PTR_E

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|----|--|----|----|----|----|----|----|----|----|----|----|----|----|---------|----------|-------------|----|---------|----|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0194 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0594 | | | | | | | | | | | | | | | | Instance | ISS_RESIZER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | RESIZER B - OUTPUT MEMORY END ADDRESS REGISTER FOR CHROMA DATA (YUV4:2:0) This register is used if the output data format is YUV4:2:0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="16">C_PTR_E</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | C_PTR_E | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | C_PTR_E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:13 | RESERVED | | | | | | | | | | | | | | | | | R | | 0x00000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12:0 | C_PTR_E | | End Line of Memory Pointer Sets the maximum number of lines to be stored in the output memory space. This value is expressed in number of lines. When the number of output lines exceeds this value, the address restarts from the first address in the output memory space (BAD). | | | | | | | | | | | | | | | RW | | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-647. Register Call Summary for Register RZB_SDR_C_PTR_E

ISS ISP

- [ISS ISP RSZ Functional Description: \[0\]](#)
- [ISS ISP RSZ Global Image Processing Settings: \[1\]](#)
- [ISS RESIZER Register Summary: \[2\]](#)

8.3.5.5 ISS IPIPE registers

8.3.5.5.1 ISS IPIPE Register Summary

Table 8-648. ISS IPIPE Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_IPIPE Base Address |
|--------------------------|------|-----------------------|-------------------------|-------------------------|
| IPIPE_SRC_EN | RW | 32 | 0x0000 0000 | 0x5201 0800 |
| IPIPE_SRC_MODE | RW | 32 | 0x0000 0004 | 0x5201 0804 |
| IPIPE_SRC_FMT | RW | 32 | 0x0000 0008 | 0x5201 0808 |
| IPIPE_SRC_COL | RW | 32 | 0x0000 000C | 0x5201 080C |
| IPIPE_SRC_VPS | RW | 32 | 0x0000 0010 | 0x5201 0810 |
| IPIPE_SRC_VSZ | RW | 32 | 0x0000 0014 | 0x5201 0814 |
| IPIPE_SRC_HPS | RW | 32 | 0x0000 0018 | 0x5201 0818 |
| IPIPE_SRC_HSZ | RW | 32 | 0x0000 001C | 0x5201 081C |
| IPIPE_SEL_SBU | RW | 32 | 0x0000 0020 | 0x5201 0820 |
| IPIPE_SRC_STA | R | 32 | 0x0000 0024 | 0x5201 0824 |
| IPIPE_GCK_MMR | RW | 32 | 0x0000 0028 | 0x5201 0828 |
| IPIPE_GCK_PIX | RW | 32 | 0x0000 002C | 0x5201 082C |
| RESERVED | R | 32 | 0x0000 0030 | 0x5201 0830 |
| IPIPE_DPC_LUT_EN | RW | 32 | 0x0000 0034 | 0x5201 0834 |
| IPIPE_DPC_LUT_SEL | RW | 32 | 0x0000 0038 | 0x5201 0838 |
| IPIPE_DPC_LUT_ADR | RW | 32 | 0x0000 003C | 0x5201 083C |
| IPIPE_DPC_LUT_SIZ | RW | 32 | 0x0000 0040 | 0x5201 0840 |
| RESERVEDa ⁽¹⁾ | RW | 32 | 0x0000 0044 + (b * 4) | 0x5201 0844 + (b * 4) |
| IPIPE_LSC_VOFT | RW | 32 | 0x0000 0090 | 0x5201 0890 |
| IPIPE_LSC_VA2 | RW | 32 | 0x0000 0094 | 0x5201 0894 |
| IPIPE_LSC_VA1 | RW | 32 | 0x0000 0098 | 0x5201 0898 |
| IPIPE_LSC_VS | RW | 32 | 0x0000 009C | 0x5201 089C |
| IPIPE_LSC_HOFT | RW | 32 | 0x0000 00A0 | 0x5201 08A0 |
| IPIPE_LSC_HA2 | RW | 32 | 0x0000 00A4 | 0x5201 08A4 |
| IPIPE_LSC_HA1 | RW | 32 | 0x0000 00A8 | 0x5201 08A8 |
| IPIPE_LSC_HS | RW | 32 | 0x0000 00AC | 0x5201 08AC |
| IPIPE_LSC_GAN_R | RW | 32 | 0x0000 00B0 | 0x5201 08B0 |
| IPIPE_LSC_GAN_GR | RW | 32 | 0x0000 00B4 | 0x5201 08B4 |
| IPIPE_LSC_GAN_GB | RW | 32 | 0x0000 00B8 | 0x5201 08B8 |
| IPIPE_LSC_GAN_B | RW | 32 | 0x0000 00BC | 0x5201 08BC |
| IPIPE_LSC_OFT_R | RW | 32 | 0x0000 00C0 | 0x5201 08C0 |
| IPIPE_LSC_OFT_GR | RW | 32 | 0x0000 00C4 | 0x5201 08C4 |
| IPIPE_LSC_OFT_GB | RW | 32 | 0x0000 00C8 | 0x5201 08C8 |
| IPIPE_LSC_OFT_B | RW | 32 | 0x0000 00CC | 0x5201 08CC |
| IPIPE_LSC_SHF | RW | 32 | 0x0000 00D0 | 0x5201 08D0 |
| IPIPE_LSC_MAX | RW | 32 | 0x0000 00D4 | 0x5201 08D4 |
| RESERVEDb ⁽¹⁾ | RW | 32 | 0x0000 00D8 + (b * 0x4) | 0x5201 08D8 + (b * 0x4) |
| RESERVEDc ⁽¹⁾ | RW | 32 | 0x0000 01B8 + (c * 0x4) | 0x5201 09B8 + (c * 0x4) |

⁽¹⁾ a = 0 to 18
b = 0 to 55
c = 0 to 5
d = 0 to 14
e = 0 to 1
f = 0 to 24
g = 0 to 18

Table 8-648. ISS IPIPE Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_IPIPE Base Address |
|-------------------------|------|-----------------------|-------------------------|-------------------------|
| IPIPE_WB2_OFT_R | RW | 32 | 0x0000 01D0 | 0x5201 09D0 |
| IPIPE_WB2_OFT_GR | RW | 32 | 0x0000 01D4 | 0x5201 09D4 |
| IPIPE_WB2_OFT_GB | RW | 32 | 0x0000 01D8 | 0x5201 09D8 |
| IPIPE_WB2_OFT_B | RW | 32 | 0x0000 01DC | 0x5201 09DC |
| IPIPE_WB2_WGN_R | RW | 32 | 0x0000 01E0 | 0x5201 09E0 |
| IPIPE_WB2_WGN_GR | RW | 32 | 0x0000 01E4 | 0x5201 09E4 |
| IPIPE_WB2_WGN_GB | RW | 32 | 0x0000 01E8 | 0x5201 09E8 |
| IPIPE_WB2_WGN_B | RW | 32 | 0x0000 01EC | 0x5201 09EC |
| RESERVED ⁽¹⁾ | RW | 32 | 0x0000 01F0 + (d * 0x4) | 0x5201 09F0 + (d * 0x4) |
| IPIPE_RGB1_MUL_RR | RW | 32 | 0x0000 022C | 0x5201 0A2C |
| IPIPE_RGB1_MUL_GR | RW | 32 | 0x0000 0230 | 0x5201 0A30 |
| IPIPE_RGB1_MUL_BR | RW | 32 | 0x0000 0234 | 0x5201 0A34 |
| IPIPE_RGB1_MUL_RG | RW | 32 | 0x0000 0238 | 0x5201 0A38 |
| IPIPE_RGB1_MUL_GG | RW | 32 | 0x0000 023C | 0x5201 0A3C |
| IPIPE_RGB1_MUL_BG | RW | 32 | 0x0000 0240 | 0x5201 0A40 |
| IPIPE_RGB1_MUL_RB | RW | 32 | 0x0000 0244 | 0x5201 0A44 |
| IPIPE_RGB1_MUL_GB | RW | 32 | 0x0000 0248 | 0x5201 0A48 |
| IPIPE_RGB1_MUL_BB | RW | 32 | 0x0000 024C | 0x5201 0A4C |
| IPIPE_RGB1_OFT_OR | RW | 32 | 0x0000 0250 | 0x5201 0A50 |
| IPIPE_RGB1_OFT_OG | RW | 32 | 0x0000 0254 | 0x5201 0A54 |
| IPIPE_RGB1_OFT_OB | RW | 32 | 0x0000 0258 | 0x5201 0A58 |
| IPIPE_GMM_CFG | RW | 32 | 0x0000 025C | 0x5201 0A5C |
| IPIPE_RGB2_MUL_RR | RW | 32 | 0x0000 0260 | 0x5201 0A60 |
| IPIPE_RGB2_MUL_GR | RW | 32 | 0x0000 0264 | 0x5201 0A64 |
| IPIPE_RGB2_MUL_BR | RW | 32 | 0x0000 0268 | 0x5201 0A68 |
| IPIPE_RGB2_MUL_RG | RW | 32 | 0x0000 026C | 0x5201 0A6C |
| IPIPE_RGB2_MUL_GG | RW | 32 | 0x0000 0270 | 0x5201 0A70 |
| IPIPE_RGB2_MUL_BG | RW | 32 | 0x0000 0274 | 0x5201 0A74 |
| IPIPE_RGB2_MUL_RB | RW | 32 | 0x0000 0278 | 0x5201 0A78 |
| IPIPE_RGB2_MUL_GB | RW | 32 | 0x0000 027C | 0x5201 0A7C |
| IPIPE_RGB2_MUL_BB | RW | 32 | 0x0000 0280 | 0x5201 0A80 |
| IPIPE_RGB2_OFT_OR | RW | 32 | 0x0000 0284 | 0x5201 0A84 |
| IPIPE_RGB2_OFT_OG | RW | 32 | 0x0000 0288 | 0x5201 0A88 |
| IPIPE_RGB2_OFT_OB | RW | 32 | 0x0000 028C | 0x5201 0A8C |
| RESERVED | RW | 32 | 0x0000 0290 | 0x5201 0A90 |
| IPIPE_YUV_ADJ | RW | 32 | 0x0000 0294 | 0x5201 0A94 |
| IPIPE_YUV_MUL_RY | RW | 32 | 0x0000 0298 | 0x5201 0A98 |
| IPIPE_YUV_MUL_GY | RW | 32 | 0x0000 029C | 0x5201 0A9C |
| IPIPE_YUV_MUL_BY | RW | 32 | 0x0000 02A0 | 0x5201 0AA0 |
| IPIPE_YUV_MUL_RCB | RW | 32 | 0x0000 02A4 | 0x5201 0AA4 |
| IPIPE_YUV_MUL_GCB | RW | 32 | 0x0000 02A8 | 0x5201 0AA8 |
| IPIPE_YUV_MUL_BCB | RW | 32 | 0x0000 02AC | 0x5201 0AAC |
| IPIPE_YUV_MUL_RCR | RW | 32 | 0x0000 02B0 | 0x5201 0AB0 |
| IPIPE_YUV_MUL_GCR | RW | 32 | 0x0000 02B4 | 0x5201 0AB4 |
| IPIPE_YUV_MUL_BCR | RW | 32 | 0x0000 02B8 | 0x5201 0AB8 |
| IPIPE_YUV_OFT_Y | RW | 32 | 0x0000 02BC | 0x5201 0ABC |
| IPIPE_YUV_OFT_CB | RW | 32 | 0x0000 02C0 | 0x5201 0AC0 |

Table 8-648. ISS IPIPE Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_IPIPE Base Address |
|-------------------------|------|-----------------------|-------------------------|-------------------------|
| IPIPE_YUV_OFT_CR | RW | 32 | 0x0000 02C4 | 0x5201 0AC4 |
| IPIPE_YUV_PHS | RW | 32 | 0x0000 02C8 | 0x5201 0AC8 |
| RESERVED ⁽²⁾ | RW | 32 | 0x0000 02CC + (e * 0x4) | 0x5201 0ACC + (e * 0x4) |
| IPIPE_YEE_EN | RW | 32 | 0x0000 02D4 | 0x5201 0AD4 |
| IPIPE_YEE_TYP | RW | 32 | 0x0000 02D8 | 0x5201 0AD8 |
| IPIPE_YEE_SHF | RW | 32 | 0x0000 02DC | 0x5201 0ADC |
| IPIPE_YEE_MUL_00 | RW | 32 | 0x0000 02E0 | 0x5201 0AE0 |
| IPIPE_YEE_MUL_01 | RW | 32 | 0x0000 02E4 | 0x5201 0AE4 |
| IPIPE_YEE_MUL_02 | RW | 32 | 0x0000 02E8 | 0x5201 0AE8 |
| IPIPE_YEE_MUL_10 | RW | 32 | 0x0000 02EC | 0x5201 0AEC |
| IPIPE_YEE_MUL_11 | RW | 32 | 0x0000 02F0 | 0x5201 0AF0 |
| IPIPE_YEE_MUL_12 | RW | 32 | 0x0000 02F4 | 0x5201 0AF4 |
| IPIPE_YEE_MUL_20 | RW | 32 | 0x0000 02F8 | 0x5201 0AF8 |
| IPIPE_YEE_MUL_21 | RW | 32 | 0x0000 02FC | 0x5201 0AFC |
| IPIPE_YEE_MUL_22 | RW | 32 | 0x0000 0300 | 0x5201 0B00 |
| IPIPE_YEE_THR | RW | 32 | 0x0000 0304 | 0x5201 0B04 |
| IPIPE_YEE_E_GAN | RW | 32 | 0x0000 0308 | 0x5201 0B08 |
| IPIPE_YEE_E_THR_1 | RW | 32 | 0x0000 030C | 0x5201 0B0C |
| IPIPE_YEE_E_THR_2 | RW | 32 | 0x0000 0310 | 0x5201 0B10 |
| IPIPE_YEE_G_GAN | RW | 32 | 0x0000 0314 | 0x5201 0B14 |
| IPIPE_YEE_G_OFT | RW | 32 | 0x0000 0318 | 0x5201 0B18 |
| RESERVED ⁽³⁾ | RW | 32 | 0x0000 031C + (f * 0x4) | 0x5201 0B1C + (f * 0x4) |
| IPIPE_BOX_EN | RW | 32 | 0x0000 0380 | 0x5201 0B80 |
| IPIPE_BOX_MODE | RW | 32 | 0x0000 0384 | 0x5201 0B84 |
| IPIPE_BOX_TYP | RW | 32 | 0x0000 0388 | 0x5201 0B88 |
| IPIPE_BOX_SHF | RW | 32 | 0x0000 038C | 0x5201 0B8C |
| IPIPE_BOX_SDR_SAD_H | RW | 32 | 0x0000 0390 | 0x5201 0B90 |
| IPIPE_BOX_SDR_SAD_L | RW | 32 | 0x0000 0394 | 0x5201 0B94 |
| RESERVED | R | 32 | 0x0000 0398 | 0x5201 0B98 |
| IPIPE_HST_EN | RW | 32 | 0x0000 039C | 0x5201 0B9C |
| IPIPE_HST_MODE | RW | 32 | 0x0000 03A0 | 0x5201 0BA0 |
| IPIPE_HST_SEL | RW | 32 | 0x0000 03A4 | 0x5201 0BA4 |
| IPIPE_HST_PARA | RW | 32 | 0x0000 03A8 | 0x5201 0BA8 |
| IPIPE_HST_0_VPS | RW | 32 | 0x0000 03AC | 0x5201 0BAC |
| IPIPE_HST_0_VSZ | RW | 32 | 0x0000 03B0 | 0x5201 0BB0 |

⁽²⁾ a = 0 to 18
b = 0 to 55
c = 0 to 5
d = 0 to 14
e = 0 to 1
f = 0 to 24
g = 0 to 18

⁽³⁾ a = 0 to 18
b = 0 to 55
c = 0 to 5
d = 0 to 14
e = 0 to 1
f = 0 to 24
g = 0 to 18

Table 8-648. ISS IPIPE Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_IPIPE Base Address |
|--------------------------|------|-----------------------|-------------------------|-------------------------|
| IPIPE_HST_0_HPS | RW | 32 | 0x0000 03B4 | 0x5201 0BB4 |
| IPIPE_HST_0_HSZ | RW | 32 | 0x0000 03B8 | 0x5201 0BB8 |
| IPIPE_HST_1_VPS | RW | 32 | 0x0000 03BC | 0x5201 0BBC |
| IPIPE_HST_1_VSZ | RW | 32 | 0x0000 03C0 | 0x5201 0BC0 |
| IPIPE_HST_1_HPS | RW | 32 | 0x0000 03C4 | 0x5201 0BC4 |
| IPIPE_HST_1_HSZ | RW | 32 | 0x0000 03C8 | 0x5201 0BC8 |
| IPIPE_HST_2_VPS | RW | 32 | 0x0000 03CC | 0x5201 0BCC |
| IPIPE_HST_2_VSZ | RW | 32 | 0x0000 03D0 | 0x5201 0BD0 |
| IPIPE_HST_2_HPS | RW | 32 | 0x0000 03D4 | 0x5201 0BD4 |
| IPIPE_HST_2_HSZ | RW | 32 | 0x0000 03D8 | 0x5201 0BD8 |
| IPIPE_HST_3_VPS | RW | 32 | 0x0000 03DC | 0x5201 0BDC |
| IPIPE_HST_3_VSZ | RW | 32 | 0x0000 03E0 | 0x5201 0BE0 |
| IPIPE_HST_3_HPS | RW | 32 | 0x0000 03E4 | 0x5201 0BE4 |
| IPIPE_HST_3_HSZ | RW | 32 | 0x0000 03E8 | 0x5201 0BE8 |
| IPIPE_HST_TBL | RW | 32 | 0x0000 03EC | 0x5201 0BEC |
| IPIPE_HST_MUL_R | RW | 32 | 0x0000 03F0 | 0x5201 0BF0 |
| IPIPE_HST_MUL_GR | RW | 32 | 0x0000 03F4 | 0x5201 0BF4 |
| IPIPE_HST_MUL_GB | RW | 32 | 0x0000 03F8 | 0x5201 0BF8 |
| IPIPE_HST_MUL_B | RW | 32 | 0x0000 03FC | 0x5201 0BFC |
| RESERVEDg ⁽³⁾ | RW | 32 | 0x0000 0400 + (g * 0x4) | 0x5201 0C00 + (g * 0x4) |

8.3.5.5.2 ISS IPIPE Register Description**Table 8-649. IPIPE_SRC_EN**

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------------------------------|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----------|----------|-----------|----|----|----|---|---|---|---|---|---|---|---|---|------|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|---|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | Instance | ISS_IPIPE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | This register is not shadowed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="16">RESERVED</td><td>Z</td><td>W</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | Z | W |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | Z | W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:16 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15:1 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | EN | | <p>The start flag of the IPIPE module.</p> <p>When EN is 1, the IPIPE module starts a processing from the next rising edge of the VD.</p> <p>If the processing mode of the IPIPE module is one shot, the EN is cleared to 0 immediately after the processing has started.</p> <p>0x0: waiting</p> <p>0x1: start/busy</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | RW | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-650. Register Call Summary for Register IPIPE_SRC_EN

ISS ISP

- [ISS ISP IPIPE Input Interface: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS ISP IPIPE Operational Modes Configuration: \[2\] \[3\] \[4\] \[5\]](#)
- [ISS IPIPE Register Summary: \[6\]](#)

Table 8-651. IPIPE_SRC_MODE

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 0004 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0804 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-----|-----|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | WRT | OST | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1 | WRT | The mode selection of the ipipeif_wrt which is an input port of the IPIPE module. If WRT is 0, the IPIPE module does not use the ipipeif_wrt. Else the IPIPE module uses it. 0x0: Disable 0x1: Enable | RW | 0 |
| 0 | OST | The processing mode selection of the IPIPE module. Value 0 indicates the mode of free run, value 1 indicates the mode of one shot. 0x0: Free run 0x1: One shot | RW | 0 |

Table 8-652. Register Call Summary for Register IPIPE_SRC_MODE

ISS ISP

- [ISS ISP IPIPE Input Interface: \[0\] \[1\] \[2\] \[3\]](#)
- [Global Initialization: \[4\] \[5\]](#)
- [ISS IPIPE Register Summary: \[6\]](#)

Table 8-653. IPIPE_SRC_FMT

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 0008 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0808 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-----|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | FMT | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | FMT | IPIPE module data path selection 0x0: IN: RAW BAYER OUT: YUV4:2:2 Note that the IPIPE YUV4:2:2 output goes to the RESIZER module where it can be further be converted in YUV4:2:0 or RGB format. 0x1: IN: RAW BAYER OUT: RAW BAYER The data are output after the White Balance module. It enables to bypass a large part of the IPIPE module. 0x3: IN: YUV4:2:2 OUT: YUV4:2:2 Note that the IPIPE YUV4:2:2 output goes to the RESIZER module where it can be further be converted in YUV4:2:0 or RGB format. 0x2: IN: RAW BAYER OUT: DISABLED The data are only going to BOXCAR and HISTOGRAM modules. | RW | 0x0 |

Table 8-654. Register Call Summary for Register IPIPE_SRC_FMT

ISS ISP

- [ISS ISP IPIPE Input Interface: \[0\] \[1\]](#)
- [Global Initialization: \[2\]](#)
- [ISS ISP IPIPE Operational Modes Configuration: \[3\] \[4\] \[5\] \[6\]](#)
- [ISS IPIPE Register Summary: \[7\]](#)
- [ISS IPIPE Register Description: \[8\] \[9\] \[10\]](#)

Table 8-655. IPIPE_SRC_COL

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 000C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 080C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----|----|----|----|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | OO | OE | EO | EE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:6 | OO | The color pattern of the odd line and odd pixel. This parameter is valid when IPIPE_SRC[FMT] is 0,1,2. 0x0: R 0x1: Gr 0x3: B 0x2: Gb | RW | 0x3 |
| 5:4 | OE | The color pattern of the odd line and even pixel. This parameter is valid when IPIPE_SRC[FMT] is 0,1,2. 0x0: R 0x1: Gr 0x3: B 0x2: Gb | RW | 0x2 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 3:2 | EO | The color pattern of the even line and odd pixel. This parameter is valid when IPIPE_SRC[FMT] is 0,1,2. 0x0: R 0x1: Gr 0x3: B 0x2: Gb | RW | 0x1 |
| 1:0 | EE | The color pattern of the even line and even pixel. This parameter is valid when IPIPE_SRC[FMT] is 0,1,2. 0x0: R 0x1: Gr 0x3: B 0x2: Gb | RW | 0x0 |

Table 8-656. Register Call Summary for Register IPIPE_SRC_COL

ISS ISP

- [ISS IPIPE Register Summary: \[0\]](#)

Table 8-657. IPIPE_SRC_VPS

| | | | | | | | | | | | | | | | | | |
|-------------------------|-------------|-----------------|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0010 | Instance | ISS_IPIPE | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0810 | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | VAL | The vertical position of the global frame from the rising edge of the VD. The IPIPE module will start an image processing from VAL line. | RW | 0x0000 |

Table 8-658. Register Call Summary for Register IPIPE_SRC_VPS

ISS ISP

- [ISS ISP IPIPE Input Interface: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)
- [ISS IPIPE Register Description: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)

Table 8-659. IPIPE_SRC_VSZ

| | | | |
|-------------------------|-----------------------------|-----------------|-----------|
| Address Offset | 0x0000 0014 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0814 | | |
| Description | | | |
| Type | RW | | |

ISS ISP

www.ti.com

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|-----|----|----|---|---|---|---|---|---|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | The vertical size of the processing area. The VAL0 can not be written. The IPIPE module will process (VAL+1) lines. | RW | 0x0000 |

Table 8-660. Register Call Summary for Register IPIPE_SRC_VSZ

ISS ISP

- [ISS ISP IPIPE Input Interface: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-661. IPIPE_SRC_HPS

| | | | |
|-------------------------|-------------|-----------------|------------|
| Address Offset | 0x0000 0018 | Instance | ISS_IPPIPE |
| Physical Address | 0x5201 0818 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | VAL | The horizontal position of the global frame from the rising edge of the HD. The IPIPE module will start an image processing from VAL clock. | RW | 0x0000 |

Table 8-662. Register Call Summary for Register IPIPE_SRC_HPS

ISS ISP

- [ISS ISP IPIPE Input Interface: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)
- [ISS IPIPE Register Description: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)

Table 8-663. IPIPE_SRC_HSZ

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 001C | | |
| Physical Address | 0x5201 081C | Instance | ISS_IPIPE |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|-------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VAL | | | | | | | | | | | VAL 0 | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:1 | VAL | The horizontal size of the processing area. The VAL0 is fixed. The IPIPE module processes (VAL+1) clocks. | RW | 0x000 |
| 0 | VAL_0 | This is the LSB of the VAL[12:0]. This bit is read only. | R | 1 |

Table 8-664. Register Call Summary for Register IPIPE_SRC_HSZ

ISS ISP

- [ISS ISP IPIPE Input Interface: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-665. IPIPE_SEL_SBU

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 0020 | | |
| Physical Address | 0x5201 0820 | Instance | ISS_IPIPE |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | EDOF |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | EDOF | EDOF port selection This bit must not be enabled since the EDOF module is not implemented. This is a provision for a future revision of the IP. 0x0: Not used 0x1: Used | RW | 0 |

Table 8-666. Register Call Summary for Register IPIPE_SEL_SBU

ISS ISP

- [ISS IPIPE Register Summary: \[0\]](#)

Table 8-667. IPIPE_SRC_STA

| | | | |
|-------------------------|-----------------------|-----------------|-----------|
| Address Offset | 0x0000 0024 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0824 | | |
| Description | IPIPE STATUS REGISTER | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|------|------|------|------|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | VAL4 | VAL3 | VAL2 | VAL1 | VAL0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:5 | RESERVED | | R | 0x0000 |
| 4 | VAL4 | Status of Histogram Process (busy status). | R | 0 |
| 3 | VAL3 | Status of Histogram bank select. | R | 0 |
| 2 | VAL2 | Status of BSC process (busy status). | R | 0 |
| 1 | VAL1 | Status of Boxcar process (busy status). | R | 0 |
| 0 | VAL0 | Status of Boxcar process (error status). This bit will be triggered when an overflow happens while transferring the boxcar data to memory. Instead of polling for this register, it is preferable to use the IPIPE_BOXCAR_OVF interrupt. Overflow errors are non recoverable at ISP level and require a software reset at ISS level. | R | 0 |

Table 8-668. Register Call Summary for Register IPIPE_SRC_STA

ISS ISP

- [ISS ISP IPIPE Interrupts: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-669. IPIPE_GCK_MMR

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 0028 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0828 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-----|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | REG | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | REG | The on/off selection of the clk_arm_g0 which is used for some ARM register access. 0x0: Off 0x1: On | RW | 0 |

Table 8-670. Register Call Summary for Register IPIPE_GCK_MMR

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-671. IPIPE_GCK_PIX

| | | | |
|-------------------------|-------------------------------|-----------------|-----------|
| Address Offset | 0x0000 002C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 082C | | |
| Description | This register is not shadowed | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|----|----|----|----|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | G3 | G2 | G1 | G0 | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:4 | RESERVED | | R | 0x0000 |
| 3 | G3 | The on/off selection of the clk_pix_g3 which is use for the IPIPE processes of EE and "CAR". 0x0: Disable 0x1: Enable | RW | 0 |
| 2 | G2 | The on/off selection of the clk_pix_g2 which is use for the IPIPE processes of CFA to "422", "Histogram(YCbCr input)", and "Boundary Signal Calculator". 0x0: Disable 0x1: Enable | RW | 0 |
| 1 | G1 | The on/off selection of the clk_pix_g1 which is used for the IPIPE processes of "DefectCorrection" to "WhiteBalance", and "Histogram(RAW input)". 0x0: Disable 0x1: Enable | RW | 0 |
| 0 | G0 | The on/off selection of the clk_pix_g0 which is used for the IPIPE processing of "Boxcar". 0x0: Disable 0x1: Enable | RW | 0 |

Table 8-672. Register Call Summary for Register IPIPE_GCK_PIX

ISS ISP

- [Global Initialization: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS IPIPE Register Summary: \[4\]](#)

Table 8-673. IPIPE_DPC_LUT_EN

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 0034 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0834 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | EN |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | EN | Enable of LUT defect pixel correction. 0x0: Off 0x1: On | RW | 0 |

Table 8-674. Register Call Summary for Register IPIPE_DPC_LUT_EN

ISS ISP

- [ISS ISP IPIPE Defect Pixel Correction: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-675. IPIPE_DPC_LUT_SEL

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 0038 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0838 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----|-----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | TBL | DOT |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1 | TBL | LUT table type selection. 0x0: Up to 1024 entries. (use IPIPE_DPC_LUT_SIZ) 0x1: infinity number of entries. (not use IPIPE_DPC_LUT_SIZ) | RW | 0 |
| 0 | DOT | Replace dot selection on processing method 0. 0x0: Replace with black dot 0x1: Replace with white dot | RW | 0 |

Table 8-676. Register Call Summary for Register IPIPE_DPC_LUT_SEL

ISS ISP

- [ISS ISP IPIPE Defect Pixel Correction: \[0\] \[1\] \[2\]](#)
- [Global Initialization: \[3\] \[4\]](#)
- [ISS IPIPE Register Summary: \[5\]](#)

Table 8-677. IPIPE_DPC_LUT_ADR

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 003C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 083C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | ADR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | ADR | The address of the first valid data in look-up-table | RW | 0x000 |

Table 8-678. Register Call Summary for Register IPIPE_DPC_LUT_ADR

ISS ISP

- [ISS ISP IPIPE Defect Pixel Correction: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-679. IPIPE_DPC_LUT_SIZ

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 0040 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0840 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | SIZ | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | SIZ | The number of valid data in look-up-table. (SIZ+1) | RW | 0x000 |

Table 8-680. Register Call Summary for Register IPIPE_DPC_LUT_SIZ

ISS ISP

- [ISS ISP IPIPE Defect Pixel Correction: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)
- [ISS IPIPE Register Description: \[3\] \[4\]](#)

Table 8-681. IPIPE_LSC_VOFT

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 0090 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0890 | | |
| Description | LSC VOFT | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | LSC_VOFT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | LSC_VOFT | | RW | 0x0000 |

Table 8-682. Register Call Summary for Register IPIPE_LSC_VOFT

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-683. IPIPE_LSC_VA2

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 0094 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0894 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | LSC VA2 | RW | 0x0000 |

Table 8-684. Register Call Summary for Register IPIPE_LSC_VA2

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-685. IPIPE_LSC_VA1

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 0098 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0898 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | LSC VA1 | RW | 0x0000 |

Table 8-686. Register Call Summary for Register IPIPE_LSC_VA1

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-687. IPIPE_LSC_VS

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 009C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 089C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|-----|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | VS2 | | | | VS1 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:4 | VS2 | LSC VS1 | RW | 0x0 |
| 3:0 | VS1 | LSC VS1 | RW | 0x0 |

Table 8-688. Register Call Summary for Register IPIPE_LSC_VS

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[3\]](#)

Table 8-689. IPIPE_LSC_HOFT

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 00A0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 08A0 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | LSC HOFT | RW | 0x0000 |

Table 8-690. Register Call Summary for Register IPIPE_LSC_HOFT

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-691. IPIPE_LSC_HA2

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 00A4 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 08A4 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | LSC HA2 | RW | 0x0000 |

Table 8-692. Register Call Summary for Register IPIPE_LSC_HA2

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-693. IPIPE_LSC_HA1

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 00A8 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 08A8 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | LSC HA1 | RW | 0x0000 |

Table 8-694. Register Call Summary for Register IPIPE_LSC_HA1

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-695. IPIPE_LSC_HS

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 00AC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 08AC | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|-----|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | HS2 | | | | HS1 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:4 | HS2 | LSC HS1 | RW | 0x0 |
| 3:0 | HS1 | LSC HS1 | RW | 0x0 |

Table 8-696. Register Call Summary for Register IPIPE_LSC_HS

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[3\]](#)

Table 8-697. IPIPE_LSC_GAN_R

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|-----------|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 00B0 | | | | | | | | | | | | | | | | Instance | | ISS_IPIPE | | | | | | | | | |
| Physical Address | | 0x5201 08B0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | VAL | GAN R | RW | 0x00 |

Table 8-698. Register Call Summary for Register IPIPE_LSC_GAN_R

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary:](#) [1]

Table 8-699. IPIPE_LSC_GAN_GR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 00B4 | | | | | | | | | | | | | | | | Instance | | ISS_IPIPE | | | | | | | | | | | | | | | |
| Physical Address | | 0x5201 08B4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | VAL | GAN GR | RW | 0x00 |

Table 8-700. Register Call Summary for Register IPIPE_LSC_GAN_GR

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary:](#) [1]

Table 8-701. IPIPE_LSC_GAN_GB

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 00B8 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 08B8 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | VAL | GAN GB | RW | 0x00 |

Table 8-702. Register Call Summary for Register IPIPE_LSC_GAN_GB

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-703. IPIPE_LSC_GAN_B

| | | | | | | | | | | | | | | | | | |
|-------------------------|-------------|-----------------|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00BC | Instance | ISS_IPIPE | | | | | | | | | | | | | | |
| Physical Address | 0x5201 08BC | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | VAL | GAN B | RW | 0x00 |

Table 8-704. Register Call Summary for Register IPIPE_LSC_GAN_B

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-705. IPIPE_LSC_OFT_R

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 00C0 | | | | | | | | | | | | | | | | Instance | | ISS_IPIPE | | | | | | | | | | | | | | | |
| Physical Address | | 0x5201 08C0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | VAL | LSC OFT R | RW | 0x00 |

Table 8-706. Register Call Summary for Register IPIPE_LSC_OFT_R

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-707. IPIPE_LSC_OFT_GR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|-----------|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 00C4 | | | | | | | | | | | | | | | | Instance | | ISS_IPIPE | | | | | | | | | |
| Physical Address | | 0x5201 08C4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-708. Register Call Summary for Register IPIPE_LSC_OFT_GR

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary:](#) [1]

Table 8-709. IPIPE_LSC_OFT_GB

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 00C8 | | | | | | | | | | | | | | | | Instance | | ISS_IPIPE | | | | | | | | | | | | | | | |
| Physical Address | | 0x5201 08C8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | VAL | LSC OFT GB | RW | 0x00 |

Table 8-710. Register Call Summary for Register IPIPE_LSC_OFT_GB

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary:](#) [1]

Table 8-711. IPIPE_LSC_OFT_B

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 00CC | | |
| Physical Address | 0x5201 08CC | Instance | ISS_IPIPE |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | VAL | LSC OFT B | RW | 0x00 |

Table 8-712. Register Call Summary for Register IPIPE_LSC_OFT_B

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-713. IPIPE_LSC_SHF

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 00D0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 08D0 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|-----|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | VAL | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:4 | RESERVED | | R | 0x000 |
| 3:0 | VAL | LSC SHV | RW | 0x0 |

Table 8-714. Register Call Summary for Register IPIPE_LSC_SHF

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-715. IPIPE_LSC_MAX

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|------------|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----------|----|----|----|------|---|-----|---|--------|---|---|---|---|---|--|--|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 00D4 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_IPIPE | | | | | | | | | | | | | | | |
| Physical Address | | 0x5201 08D4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | | | | | | | | | | | | | | | | | | | | Type | | | | Reset | | | | | | | | | | | | | | | | | | | | | | | |
| 31:16 | RESERVED | | | | | | | | | | | | | | | | | | | | | R | | | | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | |
| 15:9 | RESERVED | | | | | | | | | | | | | | | | | | | | | R | | | | 0x00 | | | | | | | | | | | | | | | | | | | | | | | |
| 8:0 | VAL | LSC MAX | | | | | | | | | | | | | | | | | | | | RW | | | | 0x000 | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-716. Register Call Summary for Register IPIPE_LSC_MAX

ISS ISP

- [Global Initialization:](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-717. IPIPE_WB2_OFT_R

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 01D0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 09D0 | | |
| Description | White Balance Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | Offset before white balance (S12) -2048 to +2047 | RW | 0x000 |

Table 8-718. Register Call Summary for Register IPIPE_WB2_OFT_R

ISS ISP

- [ISS ISP IPIPE White Balance: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-719. IPIPE_WB2_OFT_GR

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 01D4 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 09D4 | | |
| Description | White Balance Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | Offset before white balance (S12) -2048 to +2047 | RW | 0x000 |

Table 8-720. Register Call Summary for Register IPIPE_WB2_OFT_GR

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-721. IPIPE_WB2_OFT_GB

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 01D8 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_IPIPE | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 09D8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | White Balance Register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | Offset before white balance (S12) -2048 to +2047 | RW | 0x000 |

Table 8-722. Register Call Summary for Register IPIPE_WB2_OFT_GB

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-723. IPIPE_WB2_OFT_B

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 01DC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 09DC | | |
| Description | White Balance Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | Offset before white balance (S12) -2048 to +2047 | RW | 0x000 |

Table 8-724. Register Call Summary for Register IPIPE_WB2_OFT_B

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-725. IPIPE_WB2_WGN_R

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 01E0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 09E0 | | |
| Description | White Balance Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | White balance gain for R in U4.9 format 0 to +15.998 | RW | 0x0200 |

Table 8-726. Register Call Summary for Register IPIPE_WB2_WGN_R

ISS ISP

- [ISS ISP IPIPE White Balance: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-727. IPIPE_WB2_WGN_GR

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 01E4 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 09E4 | | |
| Description | White Balance Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | White balance gain for Gr in U4.9 format 0 to +15.998 | RW | 0x0200 |

Table 8-728. Register Call Summary for Register IPIPE_WB2_WGN_GR

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-729. IPIPE_WB2_WGN_GB

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 01E8 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 09E8 | | |
| Description | White Balance Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | White balance gain for Gb in U4.9 format 0 to +15.998 | RW | 0x0200 |

Table 8-730. Register Call Summary for Register IPIPE_WB2_WGN_GB

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-731. IPIPE_WB2_WGN_B

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 01EC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 09EC | | |
| Description | White Balance Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | White balance gain for B in U4.9 format 0 to +15.998 | RW | 0x0200 |

Table 8-732. Register Call Summary for Register IPIPE_WB2_WGN_B

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-733. IPIPE_RGB1_MUL_RR

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 022C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A2C | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. 011111111111 = 2047/256 = 7.99609375 011111111110 = 2046/256 [...] 000011111111 = 255/256 000100000000 = 256/256 = 1 000100000001 = 257/256 [...] 000000000001 = 1/256 000000000000 = 0/256 = 0 111111111111 = -1/256 = -0.00390625 111111111110 = -2/256 [...] 100000000001 = -2047/256 100000000000 = -2048/256 = -8. | RW | 0x100 |

Table 8-734. Register Call Summary for Register IPIPE_RGB1_MUL_RR

ISS ISP

- [ISS ISP IPIPE RGB2RGB Blending Module: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-735. IPIPE_RGB1_MUL_GR

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0230 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A30 | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0x000 |

Table 8-736. Register Call Summary for Register IPIPE_RGB1_MUL_GR

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-737. IPIPE_RGB1_MUL_BR

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0234 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A34 | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0x000 |

Table 8-738. Register Call Summary for Register IPIPE_RGB1_MUL_BR

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-739. IPIPE_RGB1_MUL_RG

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0238 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A38 | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0x000 |

Table 8-740. Register Call Summary for Register IPIPE_RGB1_MUL_RG

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-741. IPIPE_RGB1_MUL_GG

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 023C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A3C | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0x100 |

Table 8-742. Register Call Summary for Register IPIPE_RGB1_MUL_GG

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-743. IPIPE_RGB1_MUL_BG

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0240 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A40 | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0x000 |

Table 8-744. Register Call Summary for Register IPIPE_RGB1_MUL_BG

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-745. IPIPE_RGB1_MUL_RB

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0244 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A44 | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0x000 |

Table 8-746. Register Call Summary for Register IPIPE_RGB1_MUL_RB

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-747. IPIPE_RGB1_MUL_GB

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0248 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A48 | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0x000 |

Table 8-748. Register Call Summary for Register IPIPE_RGB1_MUL_GB

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-749. IPIPE_RGB1_MUL_BB

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 024C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A4C | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0x100 |

Table 8-750. Register Call Summary for Register IPIPE_RGB1_MUL_BB

ISS ISP

- [ISS ISP IPIPE RGB2RGB Blending Module: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-751. IPIPE_RGB1_OFT_OR

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0250 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A50 | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | The output offset value for R. (s13) -4096 to +4095 | RW | 0x0000 |

Table 8-752. Register Call Summary for Register IPIPE_RGB1_OFT_OR

ISS ISP

- [ISS ISP IPIPE RGB2RGB Blending Module: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-753. IPIPE_RGB1_OFT_OG

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0254 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A54 | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | The output offset value for G. (s13) -4096 to +4095 | RW | 0x0000 |

Table 8-754. Register Call Summary for Register IPIPE_RGB1_OFT_OG

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-755. IPIPE_RGB1_OFT_OB

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0258 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A58 | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | VAL | The output offset value for B. (s13) -4096 to +4095 | RW | 0x0000 |

Table 8-756. Register Call Summary for Register IPIPE_RGB1_OFT_OB

ISS ISP

- [ISS ISP IPIPE RGB2RGB Blending Module: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-757. IPIPE_GMM_CFG

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 025C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A5C | | |
| Description | RGB to RGB Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|-----|----------|------|------|------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | SIZ | | TBL | RESERVED | BYPB | BYPG | BYPR | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:7 | RESERVED | | R | 0x0000 |
| 6:5 | SIZ | The size of the gamma table. 0x0: 64 words 0x1: 128 words 0x3: 512 words 0x2: 256 words | RW | 0x3 |
| 4 | TBL | Selection of Gamma table. 0x0: RAM 0x1: ROM | RW | 0 |
| 3 | RESERVED | | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 2 | BYPB | Gamma correction mode for B 0x0: Not bypassed 0x1: Bypassed | RW | 1 |
| 1 | BYPG | Gamma correction mode for G 0x0: Not bypassed 0x1: Bypassed | RW | 1 |
| 0 | BYPR | Gamma correction mode for R 0x0: Not bypassed 0x1: Bypassed | RW | 1 |

Table 8-758. Register Call Summary for Register IPIPE_GMM_CFG

ISS ISP

- [ISS ISP IPIPE Gamma Correction Module: \[0\] \[1\] \[2\] \[3\]](#)
- [Global Initialization: \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [ISS IPIPE Register Summary: \[9\]](#)

Table 8-759. IPIPE_RGB2_MUL_RR

| | | | |
|------------------|-----------------------------------|----------|-----------|
| Address Offset | 0x0000 0260 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A60 | | |
| Description | RGB to RGB conversion after gamma | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|-----|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | VAL | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The matrix coefficient. 011111111111 = 2047/256 = 7.99609375 011111111110 = 2046/256 000011111111 = 255/256 000100000000 = 256/256 = 1 000100000001 = 257/256 000000000001 = 1/256 000000000000 = 0/256 = 0 111111111111 = -1/256 = -0.00390625 111111111110 = -2/256 100000000001 = -2047/256 100000000000 = -2048/256 = -8. | RW | 0x100 |

Table 8-760. Register Call Summary for Register IPIPE_RGB2_MUL_RR

ISS ISP

- [ISS ISP IPIPE 2nd RGB2RGB Conversion Matrix: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-761. IPIPE_RGB2_MUL_GR

| | | | |
|-------------------------|-----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0264 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A64 | | |
| Description | RGB to RGB conversion after gamma | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The matrix coefficient. | RW | 0x000 |

Table 8-762. Register Call Summary for Register IPIPE_RGB2_MUL_GR

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-763. IPIPE_RGB2_MUL_BR

| | | | |
|-------------------------|-----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0268 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A68 | | |
| Description | RGB to RGB conversion after gamma | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The matrix coefficient. | RW | 0x000 |

Table 8-764. Register Call Summary for Register IPIPE_RGB2_MUL_BR

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-765. IPIPE_RGB2_MUL_RG

| | | | |
|-------------------------|-----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 026C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A6C | | |
| Description | RGB to RGB conversion after gamma | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

ISS ISP

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The matrix coefficient. | RW | 0x000 |

Table 8-766. Register Call Summary for Register IPIPE_RGB2_MUL_RG

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-767. IPIPE_RGB2_MUL_GG

| | | | |
|-------------------------|-----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0270 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A70 | | |
| Description | RGB to RGB conversion after gamma | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The matrix coefficient. | RW | 0x100 |

Table 8-768. Register Call Summary for Register IPIPE_RGB2_MUL_GG

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-769. IPIPE_RGB2_MUL_BG

| | | | |
|-------------------------|-----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0274 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A74 | | |
| Description | RGB to RGB conversion after gamma | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The matrix coefficient. | RW | 0x000 |

Table 8-770. Register Call Summary for Register IPIPE_RGB2_MUL_BG

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-771. IPIPE_RGB2_MUL_RB

| | | | |
|-------------------------|-----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0278 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A78 | | |
| Description | RGB to RGB conversion after gamma | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The matrix coefficient. | RW | 0x000 |

Table 8-772. Register Call Summary for Register IPIPE_RGB2_MUL_RB

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-773. IPIPE_RGB2_MUL_GB

| | | | |
|-------------------------|-----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 027C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A7C | | |
| Description | RGB to RGB conversion after gamma | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The matrix coefficient. | RW | 0x000 |

Table 8-774. Register Call Summary for Register IPIPE_RGB2_MUL_GB

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-775. IPIPE_RGB2_MUL_BB

| | | | |
|-------------------------|-----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0280 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A80 | | |
| Description | RGB to RGB conversion after gamma | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The matrix coefficient. | RW | 0x100 |

Table 8-776. Register Call Summary for Register IPIPE_RGB2_MUL_BB

ISS ISP

- [ISS ISP IPIPE 2nd RGB2RGB Conversion Matrix: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-777. IPIPE_RGB2_OFT_OR

| | | | |
|-------------------------|-----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0284 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A84 | | |
| Description | RGB to RGB conversion after gamma | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The output offset value for R S10 number: -1024 to + 1023 | RW | 0x000 |

Table 8-778. Register Call Summary for Register IPIPE_RGB2_OFT_OR

ISS ISP

- [ISS ISP IPIPE 2nd RGB2RGB Conversion Matrix: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-779. IPIPE_RGB2_OFT_OG

| | | | |
|-------------------------|-----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0288 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A88 | | |
| Description | RGB to RGB conversion after gamma | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The output offset value for G S10 number: -1024 to + 1023 | RW | 0x000 |

Table 8-780. Register Call Summary for Register IPIPE_RGB2_OFT_OG

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-781. IPIPE_RGB2_OFT_OB

| | | | |
|-------------------------|-----------------------------------|-----------------|-----------|
| Address Offset | 0x0000 028C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A8C | | |
| Description | RGB to RGB conversion after gamma | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The output offset value for B. S10 number: -1024 to + 1023 | RW | 0x000 |

Table 8-782. Register Call Summary for Register IPIPE_RGB2_OFT_OB

ISS ISP

- [ISS ISP IPIPE 2nd RGB2RGB Conversion Matrix: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-783. IPIPE_YUV_ADJ

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 0294 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0A94 | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | BRT | | | | | | | | CRT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | BRT | The offset value for brightness control. | RW | 0x00 |
| 7:0 | CRT | The multiplier coefficient value for contrast control. 00000000 = 0/16 = 0 00000001 = 1/16 00001111 = 15/16 00010000 = 16/16 = 1 00010001 = 17/16 11111110 = 254/16 11111111 = 255/16 = 15.9375 | RW | 0x10 |

Table 8-784. Register Call Summary for Register IPIPE_YUV_ADJ

ISS ISP

- [ISS ISP IPIPE RGB2YCbCr Conversion Matrix: \[0\] \[1\]](#)
- [Global Initialization: \[2\] \[3\]](#)
- [ISS IPIPE Register Summary: \[4\]](#)

Table 8-785. IPIPE_YUV_MUL_RY

| | | | |
|-------------------------|--------------------------------|-----------------|------------|
| Address Offset | 0x0000 0298 | Instance | ISS_IPPIPE |
| Physical Address | 0x5201 0A98 | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | Matrix Coefficient for RY (S4.8 = -8 - +7.996) | RW | 0x04D |

Table 8-786. Register Call Summary for Register IPIPE_YUV_MUL_RY

ISS ISP

- [ISS ISP IPIPE RGB2YCbCr Conversion Matrix: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-787. IPIPE_YUV_MUL_GY

| | | | |
|-------------------------|--------------------------------|-----------------|------------|
| Address Offset | 0x0000 029C | Instance | ISS_IPPIPE |
| Physical Address | 0x5201 0A9C | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | Matrix Coefficient for GY (S4.8 = -8 - +7.996) | RW | 0x096 |

Table 8-788. Register Call Summary for Register IPIPE_YUV_MUL_GY

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-789. IPIPE_YUV_MUL_BY

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 02A0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AA0 | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | Matrix Coefficient for BY (S4.8 = -8 - +7.996) | RW | 0x01D |

Table 8-790. Register Call Summary for Register IPIPE_YUV_MUL_BY

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-791. IPIPE_YUV_MUL_RCB

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 02A4 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AA4 | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0xFD5 |

Table 8-792. Register Call Summary for Register IPIPE_YUV_MUL_RCB

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-793. IPIPE_YUV_MUL_GCB

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 02A8 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AA8 | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0xFAB |

Table 8-794. Register Call Summary for Register IPIPE_YUV_MUL_GCB

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-795. IPIPE_YUV_MUL_BCB

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 02AC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AAC | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0x080 |

Table 8-796. Register Call Summary for Register IPIPE_YUV_MUL_BCB

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-797. IPIPE_YUV_MUL_RCR

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 02B0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AB0 | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0x080 |

Table 8-798. Register Call Summary for Register IPIPE_YUV_MUL_RCR

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-799. IPIPE_YUV_MUL_GCR

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 02B4 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AB4 | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0xF95 |

Table 8-800. Register Call Summary for Register IPIPE_YUV_MUL_GCR

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-801. IPIPE_YUV_MUL_BCR

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 02B8 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AB8 | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | The matrix coefficient. | RW | 0xFEB |

Table 8-802. Register Call Summary for Register IPIPE_YUV_MUL_BCR

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-803. IPIPE_YUV_OFT_Y

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 02BC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0ABC | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The output offset value for Y | RW | 0x000 |

Table 8-804. Register Call Summary for Register IPIPE_YUV_OFT_Y

ISS ISP

- [ISS ISP IPIPE RGB2YCbCr Conversion Matrix: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-805. IPIPE_YUV_OFT_CB

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 02C0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AC0 | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The output offset value for Cb For Cb/Cr, set (0x80 + offset value) here. (0x80 for zero offset.) | RW | 0x080 |

Table 8-806. Register Call Summary for Register IPIPE_YUV_OFT_CB

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-807. IPIPE_YUV_OFT_CR

| | | | |
|-------------------------|--------------------------------|-----------------|-----------|
| Address Offset | 0x0000 02C4 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AC4 | | |
| Description | RGB to YUV Conversion Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | VAL | The output offset value for Cr For Cb/Cr, set (0x80 + offset value) here. (0x80 for zero offset.) | RW | 0x080 |

Table 8-808. Register Call Summary for Register IPIPE_YUV_OFT_CR

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-809. IPIPE_YUV_PHS

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 02C8 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AC8 | | |
| Description | <p>YUV4:2:2 down sampling register.</p> <p>This register controls the YUV4:4:4 to YUV4:2:2 chroma downsampling. This register is valid if IPIPE_SRC_FMT.FMT = 0 (RAW input and YUV output).</p> <p>IPIPE_YUV_PHS = 0 leads to pure subsampling, no filtering, cosited chroma output.</p> <p>IPIPE_YUV_PHS = 1 leads to (1, 1) 1 filtering, centered chroma output.</p> <p>IPIPE_YUV_PHS = 2 leads to (1, 2, 1) 1 filtering, cosited chroma output.</p> <p>IPIPE_YUV_PHS = 3 leads to (1, 3, 3, 1) 3 filtering, centered chroma output.</p> <p>When the chroma output is cosited, and that downsampling is enabled in the RESIZER module, one need to take care that the averager disrupts the relative phase for luma and chroma color components. The RZA_H_PHS_ADJ and RZB_H_PHS_ADJ registers need to be used to fix the disruption.</p> | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----|-----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | LPF | ROS |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1 | LPF | <p>121-LPF enable for chrominance samples.</p> <p>This register is valid if IPIPE_SRC_FMT.FMT = 0 (RAW input and YUV output).</p> <p>0x0: off</p> <p>0x1: on</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | POS | <p>This bit sets the output position of the chrominance sample with regards to the luma sample positions. One can choose between centered and cosited.</p> <p>This register is valid if IPIPE_SRC_FMT.FMT = 0 (RAW input and YUV output).</p> <p>The RESIZER module does not change the relative position of the chroma samples vs. the luma samples between the input and output and the chroma position at the output of the IPIPE module and at the output of the RESIZER module must be identical. In other words, we must have RSZ_YUV_PHS.POS = IPIPE_YUV_PHS.POS.</p> <p>0x0: Cosited = same position with luminance</p> <p>0x1: Centered = middle of the luminance</p> | RW | 0 |

Table 8-810. Register Call Summary for Register IPIPE_YUV_PHS

ISS ISP

- [ISS ISP IPIPE 4:2:2 Conversion Module: \[0\] \[1\]](#)
- [ISS ISP RSZ Functional Description: \[2\]](#)
- [Global Initialization: \[3\] \[4\]](#)
- [ISS RESIZER Register Description: \[5\]](#)
- [ISS IPIPE Register Summary: \[6\]](#)
- [ISS IPIPE Register Description: \[7\] \[8\] \[9\] \[10\] \[11\]](#)

Table 8-811. IPIPE_YEE_EN

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 02D4 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AD4 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | Z |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | EN | The on/off selection of the Edge enhancer. 0x0: Disable 0x1: Enable | RW | 0 |

Table 8-812. Register Call Summary for Register IPIPE_YEE_EN

ISS ISP

- [ISS ISP IPIPE 2D Edge Enhancer: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-813. IPIPE_YEE_TYP

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 02D8 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AD8 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-----|-----|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | HAL | SEL | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1 | HAL | Halo reduction in Edge Sharpener module | RW | 0 |
| 0 | SEL | Merging method between Edge Enhancer and Edge Sharpener 0x0: EE + ES 0x1: Maximum (EE, ES) | RW | 0 |

Table 8-814. Register Call Summary for Register IPIPE_YEE_TYP

ISS ISP

- ISS ISP IPIPE 2D Edge Enhancer: [0] [1]
- Global Initialization: [2]
- ISS IPIPE Register Summary: [3]

Table 8-815. IPIPE_YEE_SHF

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 02DC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0ADC | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-----|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | SHF | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:4 | RESERVED | | R | 0x000 |
| 3:0 | SHF | Down shift length of high pass filter (HPF) in edge enhancer. | RW | 0x0 |

Table 8-816. Register Call Summary for Register IPIPE_YEE_SHF

ISS ISP

- ISS ISP IPIPE 2D Edge Enhancer: [0]
- Global Initialization: [1]
- ISS IPIPE Register Summary: [2]

Table 8-817. IPIPE_YEE_MUL_00

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 02E0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AE0 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | VAL | Multiplier coefficient in HPF. 0111111111 = 511 0111111110 = 510 0000000001 = 1 0000000000 = 0 1111111111 = -1 1000000001 = -511 1000000000 = -512 | RW | 0x000 |

Table 8-818. Register Call Summary for Register IPIPE_YEE_MUL_00

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-819. IPIPE_YEE_MUL_01

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 02E4 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AE4 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | VAL | Multiplier coefficient in HPF. | RW | 0x000 |

Table 8-820. Register Call Summary for Register IPIPE_YEE_MUL_01

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-821. IPIPE_YEE_MUL_02

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 02E8 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AE8 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | VAL | Multiplier coefficient in HPF. | RW | 0x000 |

Table 8-822. Register Call Summary for Register IPIPE_YEE_MUL_02

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-823. IPIPE_YEE_MUL_10

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 02EC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AEC | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | VAL | Multiplier coefficient in HPF. | RW | 0x000 |

Table 8-824. Register Call Summary for Register IPIPE_YEE_MUL_10

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-825. IPIPE_YEE_MUL_11

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 02F0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AF0 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

ISS ISP

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | VAL | Multiplier coefficient in HPF. | RW | 0x000 |

Table 8-826. Register Call Summary for Register IPIPE_YEE_MUL_11

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-827. IPIPE_YEE_MUL_12

| | | | |
|-------------------------|-----------------------------|-----------------|------------|
| Address Offset | 0x0000 02F4 | Instance | ISS_IPPIPE |
| Physical Address | 0x5201 0AF4 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | VAL | Multiplier coefficient in HPF. | RW | 0x000 |

Table 8-828. Register Call Summary for Register IPIPE_YEE_MUL_12

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-829. IPIPE_YEE_MUL_20

| | | | |
|-------------------------|-----------------------------|-----------------|------------|
| Address Offset | 0x0000 02F8 | Instance | ISS_IPPIPE |
| Physical Address | 0x5201 0AF8 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | VAL | Multiplier coefficient in HPF. | RW | 0x000 |

Table 8-830. Register Call Summary for Register IPIPE_YEE_MUL_20

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-831. IPIPE_YEE_MUL_21

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 02FC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0AFC | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | VAL | Multiplier coefficient in HPF. | RW | 0x000 |

Table 8-832. Register Call Summary for Register IPIPE_YEE_MUL_21

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-833. IPIPE_YEE_MUL_22

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 0300 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0B00 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | VAL | Multiplier coefficient in HPF. | RW | 0x000 |

Table 8-834. Register Call Summary for Register IPIPE_YEE_MUL_22

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-835. IPIPE_YEE_THR

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 0304 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0B04 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:6 | RESERVED | | R | 0x000 |
| 5:0 | VAL | Edge Enhancer lower threshold before referring to LUT. If HPF -IPIPE_YEE_THR - output is HPF + IPIPE_YEE_THR If HPF IPIPE_YEE_THR - output is HPF - IPIPE_YEE_THR Otherwise, output is zero. | RW | 0x00 |

Table 8-836. Register Call Summary for Register IPIPE_YEE_THR

ISS ISP

- ISS ISP IPIPE 2D Edge Enhancer: [0]
- Global Initialization: [1]
- ISS IPIPE Register Summary: [2]
- ISS IPIPE Register Description: [3] [4] [5] [6]

Table 8-837. IPIPE_YEE_E_GAN

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 0308 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0B08 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | Edge sharpener gain | RW | 0x000 |

Table 8-838. Register Call Summary for Register IPIPE_YEE_E_GAN

ISS ISP

- ISS ISP IPIPE 2D Edge Enhancer: [0]
- Global Initialization: [1]
- ISS IPIPE Register Summary: [2]

Table 8-839. IPIPE_YEE_E_THR_1

| | | | |
|-------------------------|------------------------|-----------------|-----------|
| Address Offset | 0x0000 030C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0B0C | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | VAL | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VAL | Edge sharpener HPF value lower limit | RW | 0x000 |

Table 8-840. Register Call Summary for Register IPIPE_YEE_E_THR_1

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-841. IPIPE_YEE_E_THR_2

| | | | |
|-------------------------|-----------------------------|-----------------|------------|
| Address Offset | 0x0000 0310 | Instance | ISS_IPPIPE |
| Physical Address | 0x5201 0B10 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:6 | RESERVED | | R | 0x000 |
| 5:0 | VAL | Edge sharpener HPF value upper limit (after 6 bit right shift) | RW | 0x00 |

Table 8-842. Register Call Summary for Register IPIPE_YEE_E_THR_2

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-843. IPIPE_YEE_G_GAN

| | | | |
|-------------------------|-----------------------------|-----------------|------------|
| Address Offset | 0x0000 0314 | Instance | ISS_IPPIPE |
| Physical Address | 0x5201 0B14 | | |
| Description | Edge Enhancer Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | VAL | Edge sharpener, gain value on gradient | RW | 0x00 |

Table 8-844. Register Call Summary for Register IPIPE_YEE_G_GAN

ISS ISP

- [ISS ISP IPIPE 2D Edge Enhancer: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-845. IPIPE_YEE_G_OFT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|-----------|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0318 | | | | | | | | | | | | | | | | Instance | | ISS_IPIPE | | | | | | | | | |
| Physical Address | | 0x5201 0B18 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Edge Enhancer Register | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|-----|---|---|---|---|---|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | VAL | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:6 | RESERVED | | R | 0x000 |
| 5:0 | VAL | Edge sharpener, offset value on gradient | RW | 0x00 |

Table 8-846. Register Call Summary for Register IPIPE_YEE_G_OFT

ISS ISP

- [ISS ISP IPIPE 2D Edge Enhancer: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | VAL | The threshold of the gain function for HPF value | RW | 0x00 |

Table 8-847. IPIPE_BOX_EN

| | | | |
|-------------------------|-----------------|-----------------|-----------|
| Address Offset | 0x0000 0380 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0B80 | | |
| Description | Boxcar Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | Z |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | EN | <p>This bit enables or disables the BOXCAR functionality. The BOXCAR output is written to SDRAM. One need to set the IPIPE_BOX_SDR_SAD_H and IPIPE_BOX_SDR_SAD_L registers with the appropriate address.</p> <p>0x0: Disable</p> <p>0x1: Enable</p> | RW | 0 |

Table 8-848. Register Call Summary for Register IPIPE_BOX_EN

ISS ISP

- [ISS ISP IPIPE Boxcar: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-849. IPIPE_BOX_MODE

| | | | |
|-------------------------|-----------------------------|-----------------|-----------|
| Address Offset | 0x0000 0384 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0B84 | | |
| Description | Boxcar Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | ISO |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | OST | The processing mode selection of the Boxcar function. A 0 indicates the mode of the free run, a 1 indicates the mode of the one shot. 0x0: Free run 0x1: One shot | RW | 0 |

Table 8-850. Register Call Summary for Register IPIPE_BOX_MODE

ISS ISP

- [ISS ISP IPIPE Boxcar: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)

Table 8-851. IPIPE_BOX_TYP

| | | | |
|-------------------------|-----------------------------|-----------------|-----------|
| Address Offset | 0x0000 0388 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0B88 | | |
| Description | Boxcar Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | 10 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | SEL | Block size in boxcar sampling 0x0: 8x8 0x1: 16x16 | RW | 0 |

Table 8-852. Register Call Summary for Register IPIPE_BOX_TYP

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-853. IPIPE_BOX_SHF

| | | | |
|------------------|-----------------|----------|-----------|
| Address Offset | 0x0000 038C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0B8C | | |
| Description | Boxcar Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-----|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | VAL | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:3 | RESERVED | | R | 0x0000 |
| 2:0 | VAL | The down shift value applied to the boxcar computation result. R out = SUM (Rij) SHF G out = (SUM (Gr ij)/2 + SUM (Gr ij)/2) SHF B out = SUM (Gij) SHF | RW | 0x0 |

Table 8-854. Register Call Summary for Register IPIPE_BOX_SHF

ISS ISP

- [ISS ISP IPIPE Boxcar: \[0\] \[1\]](#)
- [Global Initialization: \[2\]](#)
- [ISS IPIPE Register Summary: \[3\]](#)

Table 8-855. IPIPE_BOX_SDR_SAD_H

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0390 | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_IPIPE | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 0B90 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Boxcar Register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | VAL | The higher 11 bits of the first address of output in memory. | RW | 0x0000 |

Table 8-856. Register Call Summary for Register IPIPE_BOX_SDR_SAD_H

ISS ISP

- [ISS ISP IPIPE Boxcar: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)
- [ISS IPIPE Register Description: \[3\]](#)

Table 8-857. IPIPE_BOX_SDR_SAD_L

| | | | |
|-------------------------|-----------------|-----------------|-----------|
| Address Offset | 0x0000 0394 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0B94 | | |
| Description | Boxcar Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|--------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VAL | | | | | | | | VAL_RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:5 | VAL | The lower 16 bits of the first address of output in memory. | RW | 0x000 |
| 4:0 | VAL_RESERVED | Ensures 32-byte alignment. | R | 0x00 |

Table 8-858. Register Call Summary for Register IPIPE_BOX_SDR_SAD_L

ISS ISP

- [ISS ISP IPIPE Boxcar: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [ISS IPIPE Register Summary: \[2\]](#)
- [ISS IPIPE Register Description: \[3\]](#)

Table 8-859. IPIPE_HST_EN

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 039C | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0B9C | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | EN | This bit enables or disables the HISTOGRAM functionality. When enabled, the HISTOGRAM computation will start the processing from the next rising edge of the VD pulse. If the processing mode of the HISTOGRAM is one shot, the enable bit will be cleared to 0 immediately after the processing has started. 0x0: disable 0x1: start/busy | RW | 0 |

Table 8-860. Register Call Summary for Register IPIPE_HST_EN

ISS ISP

- [ISS ISP IPIPE Histogram: \[0\] \[1\]](#)
- [Global Initialization: \[2\]](#)
- [ISS IPIPE Register Summary: \[3\]](#)

Table 8-861. IPIPE_HST_MODE

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 03A0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BA0 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-----|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | OST | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | OST | The processing mode selection of the Histogram module. A 0 indicates the mode of the free run, a 1 indicates the mode of the one shot. 0x0: Free run 0x1: One shot | RW | 0 |

Table 8-862. Register Call Summary for Register IPIPE_HST_MODE

ISS ISP

- [ISS ISP IPIPE Histogram: \[0\] \[1\]](#)
- [Global Initialization: \[2\]](#)
- [ISS IPIPE Register Summary: \[3\]](#)

Table 8-863. IPIPE_HST_SEL

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 03A4 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BA4 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-----|-----|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | RES | TYP | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:3 | RESERVED | | R | 0x0000 |
| 2 | SEL | Input selection. When SEL0=0, RGBY are sampled from the output of the line buffer in noise filter-2. When SEL0=1, YCbCr are sampled at the output of RGB2YCbCr module. Y is sampled twice. 0x0: From noise filter input 0x1: From RGBtoYUV | RW | 0 |
| 1:0 | TYP | G selection in Bayer mode (SEL0=0) 0x0: Gb 0x1: Gr 0x3: Reserved 0x2: (Gb+Gr)/2 | RW | 0x0 |

Table 8-864. Register Call Summary for Register IPIPE_HST_SEL

ISS ISP

- [ISS ISP IPIPE Histogram: \[0\] \[1\]](#)
- [Global Initialization: \[2\] \[3\] \[4\]](#)
- [ISS IPIPE Register Summary: \[5\]](#)

Table 8-865. IPIPE_HST_PARA

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 03A8 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BA8 | | |
| Description | Histogram COL0, COL1, COL2, and COL3 should be set to 1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------|------|------|------|------|------|------|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | COL3 | COL2 | COL1 | COL0 | RGN3 | RGN2 | RGN1 | RGN0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:14 | RESERVED | | R | 0x0 |
| 13:12 | BIN | The number of the bins. 0x0: 32 0x1: 64 0x3: 256 0x2: 128 | RW | 0x0 |
| 11:8 | SHF | The shift length of the input data. data = (INPUT SHF) | RW | 0x0 |
| 7 | COL3 | The on/off selection of the color pattern 3 (Y). 0x0: Disable 0x1: Enable | RW | 0 |
| 6 | COL2 | The on/off selection of the color pattern 2 (B). 0x0: Disable 0x1: Enable | RW | 0 |
| 5 | COL1 | The on/off selection of the color pattern 1 (G). 0x0: Disable 0x1: Enable | RW | 0 |
| 4 | COL0 | The on/off selection of the color pattern 0 (R). 0x0: Disable 0x1: Enable | RW | 0 |
| 3 | RGN3 | The on/off selection of the region 3. 0x0: Disable 0x1: Enable | RW | 0 |
| 2 | RGN2 | The on/off selection of the region 2. 0x0: Disable 0x1: Enable | RW | 0 |
| 1 | RGN1 | The on/off selection of the region 1. 0x0: Disable 0x1: Enable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | RGN0 | The on/off selection of the region 0. 0x0: Disable 0x1: Enable | RW | 0 |

Table 8-866. Register Call Summary for Register IPIPE_HST_PARA

ISS ISP

- [ISS ISP IPIPE Histogram: \[0\] \[1\] \[2\] \[3\]](#)
- [Global Initialization: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [ISS IPIPE Register Summary: \[14\]](#)

Table 8-867. IPIPE_HST_0_VPS

| | | | |
|-------------------------|-------------|-----------------|------------|
| Address Offset | 0x0000 03AC | Instance | ISS_IPPIPE |
| Physical Address | 0x5201 0BAC | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|-----|----|----|---|---|---|---|---|---|---|--------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | VAL | | | | | | | | | | VAL RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The vertical position of the region 0 from the IPIPE_SRC_VPS . The region 0 will start the Histogram processing from VAL line. VAL[0] can not be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The vertical position of the region 0 from the IPIPE_SRC_VPS . The region 0 will start the Histogram processing from VAL line. VAL[0] can not be written. | R | 0 |

Table 8-868. Register Call Summary for Register IPIPE_HST_0_VPS

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-869. IPIPE_HST_0_VSZ

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 03B0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BB0 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|--------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | VAL RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|---------------------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The vertical size of the region 0. The Histogram processing of the region 0 will process (VAL+1) lines. | RW | 0x000 |
| 0 | VAL_RESERVED | The vertical size of the region 0. The Histogram processing of the region 0 will process (VAL+1) lines. VAL[0] cannot be written. | R Rreturns 1s | 1 |

Table 8-870. Register Call Summary for Register IPIPE_HST_0_VSZ

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-871. IPIPE_HST_0_HPS

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 03B4 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BB4 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|--------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | VAL RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The horizontal position of the region 0 from the IPIPE_SRC_HPS. The region 0 will start the Histogram processing from VAL clocks. VAL[0] can not be written. | RW | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 0 | VAL_RESERVED | The horizontal position of the region 0 from the IPIPE_SRC_HPS . The region 0 will start the Histogram processing from VAL clocks. VAL[0] can not be written. | R | 0 |

Table 8-872. Register Call Summary for Register IPIPE_HST_0_HPS

ISS ISP

- [Global Initialization: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS IPIPE Register Summary: \[4\]](#)

Table 8-873. IPIPE_HST_0_HSZ

| | | | |
|-------------------------|-----------------------------|-----------------|-----------|
| Address Offset | 0x0000 03B8 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BB8 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|-----|----|----|---|---|---|---|---|---|---|--------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | VAL | | | | | | | | | | VAL_RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|---------------------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The horizontal size of the region 0. The Histogram processing of the region 0 will process (VAL+1) clocks. VAL[0] cannot be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The horizontal size of the region 0. The Histogram processing of the region 0 will process (VAL+1) clocks. VAL[0] cannot be written. | R Rreturns 1s | 1 |

Table 8-874. Register Call Summary for Register IPIPE_HST_0_HSZ

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-875. IPIPE_HST_1_VPS

| | | | |
|-------------------------|-----------------------------|-----------------|-----------|
| Address Offset | 0x0000 03BC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BBC | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|-----|----|----|---|---|---|---|---|---|---|---|---|--------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | VAL | | | | | | | | | | | | VAL_RESERVED |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The vertical position of the region 0 from the IPIPE_SRC_VPS . The region 1 will start the Histogram processing from VAL line. VAL[0] can not be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The vertical position of the region 0 from the IPIPE_SRC_VPS . The region 1 will start the Histogram processing from VAL line. VAL[0] can not be written. | R | 0 |

Table 8-876. Register Call Summary for Register IPIPE_HST_1_VPS

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-877. IPIPE_HST_1_VSZ

| | | | |
|-------------------------|-----------------------------|-----------------|-----------|
| Address Offset | 0x0000 03C0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BC0 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|--------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | VAL_RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|-----------------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The vertical size of the region 1. The Histogram processing of the region 1 will process (VAL+1) lines. VAL[0] cannot be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The vertical size of the region 1. The Histogram processing of the region 1 will process (VAL+1) lines. VAL[0] cannot be written. | R Returns 1s | 1 |

Table 8-878. Register Call Summary for Register IPIPE_HST_1_VSZ

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-879. IPIPE_HST_1_HPS

| | | | |
|-------------------------|-----------------------------|-----------------|------------|
| Address Offset | 0x0000 03C4 | Instance | ISS_IPPIPE |
| Physical Address | 0x5201 0BC4 | | |
| Description | Histogram | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|--------------|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | VAL_RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The horizontal position of the region 0 from the IPIPE_SRC_HPS . The region 1 will start the Histogram processing from VAL clocks. VAL[0] can not be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The horizontal position of the region 0 from the IPIPE_SRC_HPS . The region 1 will start the Histogram processing from VAL clocks. VAL[0] can not be written. | R | 0 |

Table 8-880. Register Call Summary for Register IPIPE_HST_1_HPS

ISS ISP

- [ISS IPIPE Register Summary: \[0\]](#)

Table 8-881. IPIPE_HST_1_HSZ

| | | | |
|-------------------------|-----------------------------|-----------------|------------|
| Address Offset | 0x0000 03C8 | Instance | ISS_IPPIPE |
| Physical Address | 0x5201 0BC8 | | |
| Description | Histogram | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|-----|----|----|---|---|---|---|---|---|---|---|---|--------------|
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | VAL | | | | | | | | | | | | VAL_RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|-----------------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The horizontal size of the region 1. The Histogram processing of the region 1 will process (VAL+1) clocks. VAL[0] cannot be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The horizontal size of the region 1. The Histogram processing of the region 1 will process (VAL+1) clocks. VAL[0] cannot be written. | R Returns 1s | 1 |

Table 8-882. Register Call Summary for Register IPIPE_HST_1_HSZ

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-883. IPIPE_HST_2_VPS

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 03CC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BCC | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|--------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | VAL_RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The vertical position of the region 0 from the IPIPE_SRC_VPS . The region 2 will start the Histogram processing from VAL line. VAL[0] can not be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The vertical position of the region 0 from the IPIPE_SRC_VPS . The region 2 will start the Histogram processing from VAL line. VAL[0] can not be written. | R | 0 |

Table 8-884. Register Call Summary for Register IPIPE_HST_2_VPS

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-885. IPIPE_HST_2_VSZ

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 03D0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BD0 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|--------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | VAL_RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|-----------------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The vertical size of the region 2. The Histogram processing of the region 2 will process (VAL+1) lines. VAL[0] cannot be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The vertical size of the region 2. The Histogram processing of the region 2 will process (VAL+1) lines. VAL[0] cannot be written. | R Returns 1s | 1 |

Table 8-886. Register Call Summary for Register IPIPE_HST_2_VSZ

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-887. IPIPE_HST_2_HPS

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 03D4 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BD4 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|-----|----|----|---|---|---|---|---|---|---|--------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | VAL | | | | | | | | | | VAL_RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The horizontal position of the region 0 from the IPIPE_SRC_HPS . The region 2 will start the Histogram processing from VAL clocks. VAL[0] can not be written. | RW | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 0 | VAL_RESERVED | The horizontal position of the region 0 from the IPIPE_SRC_HPS . The region 2 will start the Histogram processing from VAL clocks. VAL[0] can not be written. | R | 0 |

Table 8-888. Register Call Summary for Register IPIPE_HST_2_HPS

ISS ISP

- [ISS IPIPE Register Summary: \[0\]](#)

Table 8-889. IPIPE_HST_2_HSZ

| | | | |
|-------------------------|-----------------------------|-----------------|-----------|
| Address Offset | 0x0000 03D8 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BD8 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|--------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | VAL RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|---------------------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The horizontal size of the region 2. The Histogram processing of the region 2 will process (VAL+1) clocks. VAL[0] cannot be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The horizontal size of the region 2. The Histogram processing of the region 2 will process (VAL+1) clocks. VAL[0] cannot be written. | R Rreturns 1s | 1 |

Table 8-890. Register Call Summary for Register IPIPE_HST_2_HSZ

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-891. IPIPE_HST_3_VPS

| | | | |
|-------------------------|-----------------------------|-----------------|-----------|
| Address Offset | 0x0000 03DC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BDC | | |
| Description | Histogram | | |
| Type | RW | | |

ISS ISP

www.ti.com

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|-----|----|----|---|---|---|---|---|---|---|--------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | VAL | | | | | | | | | | VAL_RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The vertical position of the region 0 from the IPIPE_SRC_VPS . The region 3 will start the Histogram processing from VAL line. VAL[0] can not be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The vertical position of the region 0 from the IPIPE_SRC_VPS . The region 3 will start the Histogram processing from VAL line. VAL[0] can not be written. | R | 0 |

Table 8-892. Register Call Summary for Register IPIPE_HST_3_VPS

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-893. IPIPE_HST_3_VSZ

| | | | |
|-------------------------|-----------------------------|-----------------|-----------|
| Address Offset | 0x0000 03E0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BE0 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|-----|----|----|---|---|---|---|---|---|---|--------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | VAL | | | | | | | | | | VAL_RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|-----------------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The vertical size of the region 3. The Histogram processing of the region 3 will process (VAL+1) lines. VAL[0] cannot be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The vertical size of the region 3. The Histogram processing of the region 3 will process (VAL+1) lines. VAL[0] cannot be written. | R Returns 1s | 1 |

Table 8-894. Register Call Summary for Register IPIPE_HST_3_VSZ

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-895. IPIPE_HST_3_HPS

| | | | |
|-------------------------|-----------------------------|-----------------|------------|
| Address Offset | 0x0000 03E4 | Instance | ISS_IPPIPE |
| Physical Address | 0x5201 0BE4 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|--------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VAL | | | | | | | | | | | | VAL RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The horizontal position of the region 0 from the IPIPE_SRC_HPS . The region 3 will start the Histogram processing from VAL clocks. VAL[0] can not be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The horizontal position of the region 0 from the IPIPE_SRC_HPS . The region 3 will start the Histogram processing from VAL clocks. VAL[0] can not be written. | R | 0 |

Table 8-896. Register Call Summary for Register IPIPE_HST_3_HPS

ISS ISP

- [ISS IPIPE Register Summary: \[0\]](#)

Table 8-897. IPIPE_HST_3_HSZ

| | | | |
|-------------------------|-----------------------------|-----------------|------------|
| Address Offset | 0x0000 03E8 | Instance | ISS_IPPIPE |
| Physical Address | 0x5201 0BE8 | | |
| Description | Histogram | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|-----|----|----|---|---|---|---|---|---|---|---|---|--------------|
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | VAL | | | | | | | | | | | | VAL RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|-----------------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:1 | VAL | The horizontal size of the region 3. The Histogram processing of the region 3 will process (VAL+1) clocks. VAL[0] cannot be written. | RW | 0x000 |
| 0 | VAL_RESERVED | The horizontal size of the region 3. The Histogram processing of the region 3 will process (VAL+1) clocks. VAL[0] cannot be written. | R Returns 1s | 1 |

Table 8-898. Register Call Summary for Register IPIPE_HST_3_HSZ

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-899. IPIPE_HST_TBL

| | | | |
|------------------|-------------|----------|-----------|
| Address Offset | 0x0000 03EC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BEC | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-----|-----|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | CLR | SEL | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1 | CLR | Histogram memory clear. The histogram can be cleared before the start of operations. However, the clear takes 512 cycles and therefore: + if line size 512, the first line must not be used for histogram computation. + if line size 512, ceil (512/line size) lines must not be used for histogram computation. It's the programmer's responsibility to set the histogram computation area outside the "clear" area. 0x0: Disable 0x1: Enable | RW | 0 |
| 0 | SEL | This bit must be used to select which memory is used to store the histogram data. By selecting alternatively one or the other bit, one can double buffer the histogram output buffer. The 4 KB memory can either be read by the CPU or a DMA request. 0x0: Use Table 0 and 1 = 4KB in the memory ISP map. 0x1: Use Table 2 and 3 = 4KB in the memory ISP map. | RW | 0 |

Table 8-900. Register Call Summary for Register IPIPE_HST_TBL

ISS ISP

- [ISS ISP DMA Requests: \[0\] \[1\]](#)
- [ISS ISP IPIPE Histogram: \[2\] \[3\]](#)
- [Global Initialization: \[4\] \[5\]](#)
- [ISS IPIPE Register Summary: \[6\]](#)

Table 8-901. IPIPE_HST_MUL_R

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 03F0 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BF0 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | GAIN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | GAIN | Gain | RW | 0x00 |

Table 8-902. Register Call Summary for Register IPIPE_HST_MUL_R

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-903. IPIPE_HST_MUL_GR

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 03F4 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BF4 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | GAIN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | GAIN | Gain | RW | 0x00 |

Table 8-904. Register Call Summary for Register IPIPE_HST_MUL_GR

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-905. IPIPE_HST_MUL_GB

| | | | |
|-------------------------|-------------|-----------------|-----------|
| Address Offset | 0x0000 03F8 | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BF8 | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | GAIN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | GAIN | Gain | RW | 0x00 |

Table 8-906. Register Call Summary for Register IPIPE_HST_MUL_GB

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

Table 8-907. IPIPE_HST_MUL_B

| | | | |
|-------------------------|-----------------------------|-----------------|-----------|
| Address Offset | 0x0000 03FC | Instance | ISS_IPIPE |
| Physical Address | 0x5201 0BFC | | |
| Description | Histogram | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | GAIN | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | GAIN | Gain | RW | 0x00 |

Table 8-908. Register Call Summary for Register IPIPE_HST_MUL_B

ISS ISP

- [Global Initialization: \[0\]](#)
- [ISS IPIPE Register Summary: \[1\]](#)

8.3.5.6 ISS ISIF Registers

CAUTION

The ISS ISIF registers are limited to 32 bit and 16 bit data accesses; 8bit data access is not allowed and can corrupt register content.

8.3.5.6.1 ISS ISIF Register Summary

Table 8-909. ISS ISIF Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_ISIF Base Address |
|------------------------------|------|-----------------------|----------------|-----------------------|
| ISIF_SYNCEN | RW | 32 | 0x0000 0000 | 0x5201 1000 |
| ISIF_MODESET | RW | 32 | 0x0000 0004 | 0x5201 1004 |
| ISIF_HDW | RW | 32 | 0x0000 0008 | 0x5201 1008 |
| ISIF_VDW | RW | 32 | 0x0000 000C | 0x5201 100C |
| ISIF_PPLN | RW | 32 | 0x0000 0010 | 0x5201 1010 |
| ISIF_LPFR | RW | 32 | 0x0000 0014 | 0x5201 1014 |
| ISIF_SPH | RW | 32 | 0x0000 0018 | 0x5201 1018 |
| ISIF_LNH | RW | 32 | 0x0000 001C | 0x5201 101C |

Table 8-909. ISS ISIF Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_ISIF Base Address |
|----------------|------|-----------------------|----------------|-----------------------|
| RESERVED | RW | 32 | 0x0000 0020 | 0x5201 1020 |
| RESERVED | RW | 32 | 0x0000 0024 | 0x5201 1024 |
| ISIF_LNV | RW | 32 | 0x0000 0028 | 0x5201 1028 |
| ISIF_CULH | RW | 32 | 0x0000 002C | 0x5201 102C |
| ISIF_CULV | RW | 32 | 0x0000 0030 | 0x5201 1030 |
| ISIF_HSIZE | RW | 32 | 0x0000 0034 | 0x5201 1034 |
| RESERVED | RW | 32 | 0x0000 0038 | 0x5201 1038 |
| ISIF_CADU | RW | 32 | 0x0000 003C | 0x5201 103C |
| ISIF_CADL | RW | 32 | 0x0000 0040 | 0x5201 1040 |
| ISIF_LINCFG0 | RW | 32 | 0x0000 0044 | 0x5201 1044 |
| ISIF_LINCFG1 | RW | 32 | 0x0000 0048 | 0x5201 1048 |
| ISIF_CCOLP | RW | 32 | 0x0000 004C | 0x5201 104C |
| ISIF_CRGAIN | RW | 32 | 0x0000 0050 | 0x5201 1050 |
| ISIF_CGRGAIN | RW | 32 | 0x0000 0054 | 0x5201 1054 |
| ISIF_CGBGAIN | RW | 32 | 0x0000 0058 | 0x5201 1058 |
| ISIF_CBGAIN | RW | 32 | 0x0000 005C | 0x5201 105C |
| ISIF_COFSTA | RW | 32 | 0x0000 0060 | 0x5201 1060 |
| ISIF_VDINT0 | RW | 32 | 0x0000 0070 | 0x5201 1070 |
| ISIF_VDINT1 | RW | 32 | 0x0000 0074 | 0x5201 1074 |
| ISIF_VDINT2 | RW | 32 | 0x0000 0078 | 0x5201 1078 |
| ISIF_MISC | RW | 32 | 0x0000 007C | 0x5201 107C |
| ISIF_CGAMMAWD | RW | 32 | 0x0000 0080 | 0x5201 1080 |
| ISIF_REC656IF | RW | 32 | 0x0000 0084 | 0x5201 1084 |
| ISIF_CCDCFG | RW | 32 | 0x0000 0088 | 0x5201 1088 |
| ISIF_DFCCTL | RW | 32 | 0x0000 008C | 0x5201 108C |
| ISIF_VDFSATLV | RW | 32 | 0x0000 0090 | 0x5201 1090 |
| ISIF_DFCMEMCTL | RW | 32 | 0x0000 0094 | 0x5201 1094 |
| ISIF_DFCMEM0 | RW | 32 | 0x0000 0098 | 0x5201 1098 |
| ISIF_DFCMEM1 | RW | 32 | 0x0000 009C | 0x5201 109C |
| ISIF_DFCMEM2 | RW | 32 | 0x0000 00A0 | 0x5201 10A0 |
| ISIF_DFCMEM3 | RW | 32 | 0x0000 00A4 | 0x5201 10A4 |
| ISIF_DFCMEM4 | RW | 32 | 0x0000 00A8 | 0x5201 10A8 |
| ISIF_CLAMPCFG | RW | 32 | 0x0000 00AC | 0x5201 10AC |
| ISIF_CLDCOFST | RW | 32 | 0x0000 00B0 | 0x5201 10B0 |
| ISIF_CLSV | RW | 32 | 0x0000 00B4 | 0x5201 10B4 |
| ISIF_CLHWIN0 | RW | 32 | 0x0000 00B8 | 0x5201 10B8 |
| ISIF_CLHWIN1 | RW | 32 | 0x0000 00BC | 0x5201 10BC |
| ISIF_CLHWIN2 | RW | 32 | 0x0000 00C0 | 0x5201 10C0 |
| ISIF_CLVRV | RW | 32 | 0x0000 00C4 | 0x5201 10C4 |
| ISIF_CLVWIN0 | RW | 32 | 0x0000 00C8 | 0x5201 10C8 |
| ISIF_CLVWIN1 | RW | 32 | 0x0000 00CC | 0x5201 10CC |
| ISIF_CLVWIN2 | RW | 32 | 0x0000 00D0 | 0x5201 10D0 |
| ISIF_CLVWIN3 | RW | 32 | 0x0000 00D4 | 0x5201 10D4 |
| ISIF_LSCHOFST | RW | 32 | 0x0000 00D8 | 0x5201 10D8 |
| ISIF_LSCVOFST | RW | 32 | 0x0000 00DC | 0x5201 10DC |
| ISIF_LSCHVAL | RW | 32 | 0x0000 00E0 | 0x5201 10E0 |
| ISIF_LSCVVAL | RW | 32 | 0x0000 00E4 | 0x5201 10E4 |

Table 8-909. ISS ISIF Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_ISIF Base Address |
|-----------------|------|-----------------------|----------------|-----------------------|
| ISIF_2DLSCCFG | RW | 32 | 0x0000 00E8 | 0x5201 10E8 |
| ISIF_2DLSCOFST | RW | 32 | 0x0000 00EC | 0x5201 10EC |
| ISIF_2DLSCINI | RW | 32 | 0x0000 00F0 | 0x5201 10F0 |
| ISIF_2DLSCGRBU | RW | 32 | 0x0000 00F4 | 0x5201 10F4 |
| ISIF_2DLSCGRBL | RW | 32 | 0x0000 00F8 | 0x5201 10F8 |
| ISIF_2DLSCGROF | RW | 32 | 0x0000 00FC | 0x5201 10FC |
| ISIF_2DLSCORBU | RW | 32 | 0x0000 0100 | 0x5201 1100 |
| ISIF_2DLSCORBL | RW | 32 | 0x0000 0104 | 0x5201 1104 |
| ISIF_2DLSCOROF | RW | 32 | 0x0000 0108 | 0x5201 1108 |
| ISIF_2DLSCIRQEN | RW | 32 | 0x0000 010C | 0x5201 110C |
| ISIF_2DLSCIRQST | RW | 32 | 0x0000 0110 | 0x5201 1110 |
| ISIF_FMTCFG | RW | 32 | 0x0000 0114 | 0x5201 1114 |
| ISIF_FMTPLEN | RW | 32 | 0x0000 0118 | 0x5201 1118 |
| ISIF_FMTSPH | RW | 32 | 0x0000 011C | 0x5201 111C |
| ISIF_FMTLNH | RW | 32 | 0x0000 0120 | 0x5201 1120 |
| ISIF_FMTLSV | RW | 32 | 0x0000 0124 | 0x5201 1124 |
| ISIF_FMTLNV | RW | 32 | 0x0000 0128 | 0x5201 1128 |
| ISIF_FMTRLN | RW | 32 | 0x0000 012C | 0x5201 112C |
| ISIF_FMTHCNT | RW | 32 | 0x0000 0130 | 0x5201 1130 |
| ISIF_FMTAPTR0 | RW | 32 | 0x0000 0134 | 0x5201 1134 |
| ISIF_FMTAPTR1 | RW | 32 | 0x0000 0138 | 0x5201 1138 |
| ISIF_FMTAPTR2 | RW | 32 | 0x0000 013C | 0x5201 113C |
| ISIF_FMTAPTR3 | RW | 32 | 0x0000 0140 | 0x5201 1140 |
| ISIF_FMTAPTR4 | RW | 32 | 0x0000 0144 | 0x5201 1144 |
| ISIF_FMTAPTR5 | RW | 32 | 0x0000 0148 | 0x5201 1148 |
| ISIF_FMTAPTR6 | RW | 32 | 0x0000 014C | 0x5201 114C |
| ISIF_FMTAPTR7 | RW | 32 | 0x0000 0150 | 0x5201 1150 |
| ISIF_FMTAPTR8 | RW | 32 | 0x0000 0154 | 0x5201 1154 |
| ISIF_FMTAPTR9 | RW | 32 | 0x0000 0158 | 0x5201 1158 |
| ISIF_FMTAPTR10 | RW | 32 | 0x0000 015C | 0x5201 115C |
| ISIF_FMTAPTR11 | RW | 32 | 0x0000 0160 | 0x5201 1160 |
| ISIF_FMTAPTR12 | RW | 32 | 0x0000 0164 | 0x5201 1164 |
| ISIF_FMTAPTR13 | RW | 32 | 0x0000 0168 | 0x5201 1168 |
| ISIF_FMTAPTR14 | RW | 32 | 0x0000 016C | 0x5201 116C |
| ISIF_FMTAPTR15 | RW | 32 | 0x0000 0170 | 0x5201 1170 |
| ISIF_FMTPGMVFO | RW | 32 | 0x0000 0174 | 0x5201 1174 |
| ISIF_FMTPGMVF1 | RW | 32 | 0x0000 0178 | 0x5201 1178 |
| ISIF_FMTPGMAPU0 | RW | 32 | 0x0000 017C | 0x5201 117C |
| ISIF_FMTPGMAPU1 | RW | 32 | 0x0000 0180 | 0x5201 1180 |
| ISIF_FMTPGMAPS0 | RW | 32 | 0x0000 0184 | 0x5201 1184 |
| ISIF_FMTPGMAPS1 | RW | 32 | 0x0000 0188 | 0x5201 1188 |
| ISIF_FMTPGMAPS2 | RW | 32 | 0x0000 018C | 0x5201 118C |
| ISIF_FMTPGMAPS3 | RW | 32 | 0x0000 0190 | 0x5201 1190 |
| ISIF_FMTPGMAPS4 | RW | 32 | 0x0000 0194 | 0x5201 1194 |
| ISIF_FMTPGMAPS5 | RW | 32 | 0x0000 0198 | 0x5201 1198 |
| ISIF_FMTPGMAPS6 | RW | 32 | 0x0000 019C | 0x5201 119C |
| ISIF_FMTPGMAPS7 | RW | 32 | 0x0000 01A0 | 0x5201 11A0 |

Table 8-909. ISS ISIF Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_ISIF Base Address |
|---------------|------|-----------------------|----------------|-----------------------|
| ISIF_CSCCTL | RW | 32 | 0x0000 01A4 | 0x5201 11A4 |
| ISIF_CSCM0 | RW | 32 | 0x0000 01A8 | 0x5201 11A8 |
| ISIF_CSCM1 | RW | 32 | 0x0000 01AC | 0x5201 11AC |
| ISIF_CSCM2 | RW | 32 | 0x0000 01B0 | 0x5201 11B0 |
| ISIF_CSCM3 | RW | 32 | 0x0000 01B4 | 0x5201 11B4 |
| ISIF_CSCM4 | RW | 32 | 0x0000 01B8 | 0x5201 11B8 |
| ISIF_CSCM5 | RW | 32 | 0x0000 01BC | 0x5201 11BC |
| ISIF_CSCM6 | RW | 32 | 0x0000 01C0 | 0x5201 11C0 |
| ISIF_CSCM7 | RW | 32 | 0x0000 01C4 | 0x5201 11C4 |
| ISIF_CLKCTL | RW | 32 | 0x0000 01F8 | 0x5201 11F8 |

8.3.5.6.2 ISS ISIF Register Description

Table 8-910. ISIF_SYNCEN

| | | | |
|------------------|-------------|----------|----------|
| Address Offset | 0x0000 0000 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1000 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | DWEN | SYEN |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1 | DWEN | Controls the storage of image sensor RAW data in memory. This bit is loaded with the timing of the internal VD signal: it becomes active starting at the lead of the VD signal that comes after 1 is written in this bit. 0x0: Disable 0x1: Enable | RW | 0 |
| 0 | SYEN | Controls ON/OFF of VD/HD output. Internal timing generator becomes active and VD/HD output starts when 1 is written in this bit. In case of input, VD/HD loading begins. 0: Disable 1: Enable | RW | 0 |

Table 8-911. Register Call Summary for Register ISIF_SYNCEN

ISS ISP

- [ISS ISP ISIF Expected Bandwidth on BL Ports: \[0\]](#)
- [ISS ISP ISIF Events and Status Checking: \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\] \[3\]](#)
- [ISS ISP ISIF Enable/Disable Hardware: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[10\]](#)
- [ISS ISP ISIF Interframe Operations: \[11\]](#)
- [ISS ISP ISIF Summary of Constraints: \[12\] \[13\]](#)
- [ISS ISIF Register Summary: \[14\]](#)

Table 8-912. ISIF_MODESET

| | | | |
|------------------|-------------|----------|----------|
| Address Offset | 0x0000 0004 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1004 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|------|--------|-----|------|----|---|-------|------|------|----------|-------|-------|------|-------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | HLPF | INPMOD | OVF | CCDW | | | CCDMD | DPOL | SWEN | RESERVED | HDPOL | VDPOL | FIDD | HDVDD | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | RESERVED | Read returns reset value | R | 0 |
| 14 | HLPF | Low pass filter enable. When this bit is enabled, a 3-tap ($1/4 + 1/2 Z^{-2} + 1/4 Z^4$) filtering process is performed on the sensor data. 0x0: Disable 0x1: Enable | RW | 0 |
| 13:12 | INPMOD | Data input mode: 0x0: RAW data 0x1: YCbCr 16bit 0x3: Reserved 0x2: YCbCr 8bit | RW | 0x2 |
| 11 | OVF | ISIF module write port overflow status bit If the write port of the ISIF module overflows when writing data to SDRAM, this bit will toggle. 0x0: No overflow pending (r) No action (w) 0x1: Overflow pending (r) Clear overflow (w) | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 10:8 | CCDW | <p>This bit enables to shift right (divide) the up-to-12-bit RAW data value when writing out to SDRAM. The effect is that the dynamic of the output signal is decreased. The ISIF_MODESET.CCDW, ISIF_HSIZE.ADCR, ISIF_HSIZE.HSIZE, ISIF_CCDCFG.BSWD, ISIF_CCDCFG.MSBINV, ISIF_CCDCFG.SDRPACK bit fields control how pixel data are stored to SDRAM.</p> <p>0x6: Reserved</p> <p>0x1: 1-bit right shift out[15:0] = 00000 data[11:1]</p> <p>0x7: Reserved</p> <p>0x0: No shift out[15:0] = 0000 data[11:0]</p> <p>0x2: 2-bit right shift out[15:0] = 000000 data[11:2]</p> <p>0x4: 4-bit right shift out[15:0] = 00000000 data[11:4]</p> <p>0x5: Reserved</p> <p>0x3: 3-bit right shift out[15:0] = 0000000 data[11:3]</p> | RW | 0x0 |
| 7 | CCDMD | <p>Field mode: This bit selects the type of image sensor: interlaced or progressive</p> <p>0x0: Progressive image sensor</p> <p>0x1: Interlaced image sensor</p> | RW | 0 |
| 6 | DPOL | <p>Image sensor input data polarity</p> <p>0x0: No change</p> <p>0x1: One's complement</p> | RW | 0 |
| 5 | SWEN | <p>External WEN selection In case this bit and SYNCEN.DWEN are set to 1, the external WEN signal is used to store image sensor data to memory.</p> <p>0x0: WEN not used</p> <p>0x1: Use external WEN</p> | RW | 0 |
| 4 | RESERVED | Read returns reset value | RW | 0 |
| 3 | HDPOL | <p>HD Sync Signal Polarity</p> <p>0x0: Positive</p> <p>0x1: Negative</p> | RW | 0 |
| 2 | VDPOL | <p>VD Sync Signal Polarity</p> <p>0x0: Positive</p> <p>0x1: Negative</p> | RW | 0 |
| 1 | FIDD | <p>FLD Signal Direction. There must be at least three clock cycles between the time this bit is modified and the HD/VD pulse for the start of frame comes.</p> <p>0x0: Input</p> <p>0x1: Output</p> | RW | 0 |
| 0 | HDVDD | <p>VD,HD Sync Signal Direction. There must be at least three clock cycles between the time this bit is modified and the HD/VD pulse for the start of frame comes.</p> <p>0x0: Input</p> <p>0x1: Output</p> | RW | 0 |

Table 8-913. Register Call Summary for Register ISIF_MODESET

ISS ISP

- [ISS ISP ISIF Interrupts: \[0\]](#)
- [ISS ISP VP Pixel Clock Inversion: \[1\] \[2\]](#)
- [ISS ISP ISIF Input Interface: \[3\] \[4\]](#)
- [ISS ISP ISIF Interface: \[5\] \[6\]](#)
- [ISS ISP ISIF Low-Pass Filter \(LPF\): \[7\] \[8\]](#)
- [ISP ISIF Storage Formatter: \[9\] \[10\]](#)
- [ISS ISP ISIF Events and Status Checking: \[11\] \[12\] \[13\] \[14\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\]](#)
- [ISS ISP ISIF Enable/Disable Hardware: \[26\] \[27\] \[28\] \[29\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[30\]](#)
- [ISS ISIF Register Summary: \[31\]](#)
- [ISS ISIF Register Description: \[32\] \[33\] \[34\] \[35\] \[36\]](#)

Table 8-914. ISIF_HDW

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 0008 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1008 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | HDW | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | HDW | HD width: Sets width of HD. HD width = HDW + 1 clock | RW | 0x000 |

Table 8-915. Register Call Summary for Register ISIF_HDW

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-916. ISIF_VDW

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 000C | Instance | ISS_ISIF |
| Physical Address | 0x5201 100C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | VDW | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VDW | VD width : Sets width of VD. VD width = VDW + 1 line | RW | 0x000 |

Table 8-917. Register Call Summary for Register ISIF_VDW

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-918. ISIF_PPLN

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 0010 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1010 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PPLN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | PPLN | Pixels per line Number of pixel clock periods in one line HD period = PPLN+1 pixel clocks. PPLN is not used when HD and VD are inputs, that is, when VDHDOUT in MODESET is cleared to 0. *This bit field is latched by VD. | RW | 0x0000 |

Table 8-919. Register Call Summary for Register ISIF_PPLN

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[3\]](#)
- [ISS ISIF Register Summary: \[4\]](#)

Table 8-920. ISIF_LPFR

| | | | |
|-------------------------|----------------------|-----------------|----------|
| Address Offset | 0x0000 0014 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1014 | | |
| Description | Line per Frame/Field | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LPFR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | LPFR | Half lines per filed or frame Sets number of half lines per frame or field. VD period = (LPFR+1)/2 lines. LPFR is not used when HD and are inputs, that is, when VDHDOUT in MODESET is cleared to 0. *This bit field is latched by VD. | RW | 0x0000 |

Table 8-921. Register Call Summary for Register ISIF_LPFR

ISS ISP

- [ISS ISP ISIF Vertical Line Defect Correction \(VDFC\): \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-922. ISIF_SPH

| | | | |
|------------------|------------------------|----------|----------|
| Address Offset | 0x0000 0018 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1018 | | |
| Description | Start Pixel Horizontal | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|-----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | SPH | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | RESERVED | | R | 0 |
| 14:0 | SPH | The first pixel in a line to be stored to memory. | RW | 0x0000 |

Table 8-923. Register Call Summary for Register ISIF_SPH

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\]](#)
- [ISP ISIF Storage Formatter: \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[3\]](#)
- [ISS ISP ISIF Summary of Constraints: \[4\] \[5\]](#)
- [ISS ISIF Register Summary: \[6\]](#)

Table 8-924. ISIF_LNH

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 001C | | | | | | | | | | | | | | | | Instance | | ISS_ISIF | | | | | | | | | | | | | | | |
| Physical Address | | 0x5201 101C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|-----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | LNH | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | RESERVED | | R | 0 |
| 14:0 | LNH | Number of pixels in an line to be stored to memory. Number of pixels = LNH + 1. | RW | 0x0000 |

Table 8-925. Register Call Summary for Register ISIF_LNH

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\]](#)
- [ISP ISIF Storage Formatter: \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[3\]](#)
- [ISS ISP ISIF Summary of Constraints: \[4\] \[5\] \[6\]](#)
- [ISS ISIF Register Summary: \[7\]](#)

Table 8-926. ISIF_LNV

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0028 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Instance | ISS_ISIF | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 1028 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|-----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | LNV | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | RESERVED | The number of lines to be stored to SDRAM. | R | 0 |
| 14:0 | LNV | The number of lines to be stored to memory. Number of lines = LNV + 1 | RW | 0x0000 |

Table 8-927. Register Call Summary for Register ISIF_LNV

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\]](#)
- [ISP ISIF Storage Formatter: \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISP ISIF Summary of Constraints: \[3\] \[4\]](#)
- [ISS ISIF Register Summary: \[5\]](#)

Table 8-928. ISIF_CULH

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 002C | Instance | ISS_ISIF |
| Physical Address | 0x5201 102C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLHO | | | | | | | | CLHE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | CLHO | Culling Pattern in ODD Line: Sets culling pattern when data is loaded into memory (odd lines). Example: 0xAA: 1 / 2 horizontal direction culling. LSB becomes left side on screen. 0x0: Pixel invalid 0x1: Pixel valid | RW | 0xFF |
| 7:0 | CLHE | Culling Pattern in Even Line: Sets culling pattern when data is loaded into memory (even lines). 0x0: Pixel invalid 0x1: Pixel valid | RW | 0xFF |

Table 8-929. Register Call Summary for Register ISIF_CULH

ISS ISP

- [ISS ISP ISIF Culling: \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[3\] \[4\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[5\]](#)
- [ISS ISIF Register Summary: \[6\]](#)

Table 8-930. ISIF_CULV

| | | | |
|------------------|-------------|----------|----------|
| Address Offset | 0x0000 0030 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1030 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | CULV | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | CULV | Culling Pattern in Vertical Line Example: 0x88: 1/4 vertical direction culling. LSB becomes top side on screen. 0x0: Pixel invalid 0x1: Pixel valid | RW | 0xFF |

Table 8-931. Register Call Summary for Register ISIF_CULV

ISS ISP

- [ISS ISP ISIF Culling: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-932. ISIF_HSIZE

| | | | |
|------------------|----------------------------|----------|----------|
| Address Offset | 0x0000 0034 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1034 | | |
| Description | SDRAM OUTPUT CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|------|-------|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | ADCR | HSIZE | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12 | ADCR | SDRAM address decrement. By setting this bit, memory address in a line is automatically decreased so that a line can be Horizontally flipped in memory. The ISIF_MODESET.CCDW , ISIF_HSIZE.ADCR , ISIF_HSIZE.HSIZE , ISIF_CCDCFG.BSWD , ISIF_CCDCFG.MSBINV , ISIF_CCDCFG.SDRPACK bit fields control how pixel data are stored to SDRAM. 0x0: Address increment. 0x1: Address decrement. | RW | 0 |
| 11:0 | HSIZE | Memory address offset between the lines. Specify the offset in 32-byte units. | RW | 0x000 |

Table 8-933. Register Call Summary for Register ISIF_HSIZE

ISS ISP

- [ISP ISIF Storage Formatter: \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\] \[3\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[4\]](#)
- [ISS ISIF Register Summary: \[5\]](#)
- [ISS ISIF Register Description: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)

Table 8-934. ISIF_CADU

| | | | |
|-------------------------|----------------------------|-----------------|----------|
| Address Offset | 0x0000 003C | Instance | ISS_ISIF |
| Physical Address | 0x5201 103C | | |
| Description | SDRAM OUTPUT CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | CADU | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | CADU | Memory Address (Upper 11-bits): Specifies the memory destination address. The actual address is the value set here multiplied by 32bytes. | RW | 0x000 |

Table 8-935. Register Call Summary for Register ISIF_CADU

ISS ISP

- [ISP ISIF Storage Formatter: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP ISIF Enable/Disable Hardware: \[2\] \[3\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[4\]](#)
- [ISS ISIF Register Summary: \[5\]](#)

Table 8-936. ISIF_CADL

| | | | |
|-------------------------|----------------------------|-----------------|----------|
| Address Offset | 0x0000 0040 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1040 | | |
| Description | SDRAM OUTPUT CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CADL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | CADL | Memory Address (Lower 16-bits): Specifies the memory destination address. The actual address is the value set here multiplied by 32bytes. | RW | 0x0000 |

Table 8-937. Register Call Summary for Register ISIF_CADL

ISS ISP

- [ISP ISIF Storage Formatter: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP ISIF Enable/Disable Hardware: \[2\] \[3\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[4\]](#)
- [ISS ISIF Register Summary: \[5\]](#)

Table 8-938. ISIF_LINCFG0

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0044 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_ISIF | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 1044 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | INPUT LINEARIZATION CTRL REGISTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------|---|---|---|----------|-------|-------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | CORRSFT | | | | RESERVED | LINMD | LINEN | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:7 | RESERVED | | R | 0x000 |
| 6:4 | CORRSFT | Shift up value for the correction value (S10). 0x6: 6-bit left shift 0x1: 1-bit left shift 0x7: Reserved 0x0: No shift 0x2: 2-bit left shift 0x4: 4-bit left shift 0x5: 5-bit left shift 0x3: 3-bit left shift | RW | 0x0 |
| 3:2 | RESERVED | | R | 0x0 |
| 1 | LINMD | Linearization Mode: 0x0: Uniform sampling 0x1: Non-uniform sampling | RW | 0 |
| 0 | LINEN | Linearization Enable: 0x0: Disable 0x1: Enable | RW | 0 |

Table 8-939. Register Call Summary for Register ISIF_LINCFG0

ISS ISP

- [ISS ISP ISIF Sensor Linearization: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[4\] \[5\] \[6\]](#)
- [ISS ISIF Register Summary: \[7\]](#)

Table 8-940. ISIF_LINCFG1

| | | | |
|-------------------------|-----------------------------------|-----------------|----------|
| Address Offset | 0x0000 0048 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1048 | | |
| Description | INPUT LINEARIZATION CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|--------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | LUTSCL | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:0 | LUTSCL | Scale factor (U11Q10) for LUT input. Range: 0 - 1+1023/1024 It is applied to the Input Data before looking up the correction factor. The scale factor is only applied to the table input. It is not applied when using the input value to compute the output. | RW | 0x400 |

Table 8-941. Register Call Summary for Register ISIF_LINCFG1

ISS ISP

- [ISS ISP ISIF Sensor Linearization: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-942. ISIF_CCOLP

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----------|----|----------|----|--------|---|--------|---|--------|---|--------|---|--------|---|
| Address Offset | | 0x0000 004C | | | | | | | | | | | | | | | | Instance | | ISS_ISIF | | | | | | | | | | | |
| Physical Address | | 0x5201 104C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CP0_F1 | | CP1_F1 | | CP2_F1 | | CP3_F1 | | CP0_F0 | | CP1_F0 | | CP2_F0 | | CP3_F0 | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:14 | CP0_F1 | Specifies color pattern for pixel position 0 (Field 1) Pixel position 0 corresponds to pixel count=0 at even line in case of CFAP= 0, and to pixel count=0 in case of CFAP= 1. 0x0: R / Ye 0x1: Gr / Cy 0x3: B / Mg 0x2: Gb / G | RW | 0x0 |
| 13:12 | CP1_F1 | Specifies color pattern for pixel position 1 (Field 1) Pixel position 1 corresponds to pixel count=1 at even line in case of CFAP= 0, and to pixel count=1 in case of CFAP= 1. 0x0: R / Ye 0x1: Gr / Cy 0x3: B / Mg 0x2: Gb / G | RW | 0x0 |
| 11:10 | CP2_F1 | Specifies color pattern for pixel position 2 (Field 1) Pixel position 2 corresponds to pixel count=0 at odd line in case of CFAP= 0, and to pixel count=2 in case of CFAP= 1. 0x0: R / Ye 0x1: Gr / Cy 0x3: B / Mg 0x2: Gb / G | RW | 0x0 |
| 9:8 | CP3_F1 | Specifies color pattern for pixel position 3 (Field 1) Pixel position 3 corresponds to pixel count=1 at odd line in case of CFAP= 0. Not applicable for CFAP= 1. 0x0: R / Ye 0x1: Gr / Cy 0x3: B / Mg 0x2: Gb / G | RW | 0x0 |
| 7:6 | CP0_F0 | Specifies color pattern for pixel position 0 (Field 0) Pixel position 0 corresponds to pixel count=0 at even line in case of CFAP= 0, and to pixel count=0 in case of CFAP= 1. 0x0: R / Ye 0x1: Gr / Cy 0x3: B / Mg 0x2: Gb / G | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 5:4 | CP1_F0 | Specifies color pattern for pixel position 1 (Field 0) Pixel position 1 corresponds to pixel count=1 at even line in case of CFAP= 0, and to pixel count=1 in case of CFAP= 1. 0x0: R / Ye 0x1: Gr / Cy 0x3: B / Mg 0x2: Gb / G | RW | 0x0 |
| 3:2 | CP2_F0 | Specifies color pattern for pixel position 2 (Field 0) Pixel position 2 corresponds to pixel count=0 at odd line in case of CFAP= 0, and to pixel count=2 in case of CFAP= 1. 0x0: R / Ye 0x1: Gr / Cy 0x3: B / Mg 0x2: Gb / G | RW | 0x0 |
| 1:0 | CP3_F0 | Specifies color pattern for pixel position 3 (Field 0) Pixel position 3 corresponds to pixel count=1 at odd line in case of CFAP= 0. Not applicable for CFAP= 1. 0x0: R / Ye 0x1: Gr / Cy 0x3: B / Mg 0x2: Gb / G | RW | 0x0 |

Table 8-943. Register Call Summary for Register ISIF CCOLP

ISS ISP

- ISS ISP ISIF White Balance: [0]
- ISS ISP ISIF Hardware Setup/Initialization: [1] [2] [3] [4]
- ISS ISP ISIF Register Accessibility During Frame Processing: [5]
- ISS ISIF Register Summary: [6]

Table 8-944. ISIF_CRGAIN

| Address Offset | | 0x0000 0050 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_ISIF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|------------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----------|----|----|-----|---|---|---|---|---|---|---|---|---|---|------|--------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|-----|--|--|--|--|--|--|--|--|--|--|
| Physical Address | | 0x5201 1050 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="5">RESERVED</td><td colspan="11">CGR</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | CGR | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | CGR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:16 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15:12 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11:0 | CGR | R/Ye gain: Performs gain adjustment on image sensor data. U12Q9. Range: 0 - 7+511/512 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RW | 0x200 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-945. Register Call Summary for Register ISIF_CRGAIN

ISS ISP

- [ISS ISP ISIF White Balance: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-946. ISIF_CGRGAIN

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 0054 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1054 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | CGGR | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | CGGR | Gr/Cy gain: Performs gain adjustment on image sensor data. U12Q9. Range: 0 - 7+511/512 | RW | 0x200 |

Table 8-947. Register Call Summary for Register ISIF_CGRGAIN

ISS ISP

- [ISS ISP ISIF White Balance: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-948. ISIF_CGBGAIN

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 0058 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1058 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | CGGB | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | CGGB | Gb/Cy gain: Performs gain adjustment on image sensor data. U12Q9. Range: 0 - 7+511/512 | RW | 0x200 |

Table 8-949. Register Call Summary for Register ISIF_CBGAIN

ISS ISP

- [ISS ISP ISIF White Balance: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-950. ISIF_CBGAIN

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 005C | Instance | ISS_ISIF |
| Physical Address | 0x5201 105C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | CGB | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | CGB | B/Mg gain: Performs gain adjustment on image sensor data. U12Q9. Range: 0 - 7+511/512 | RW | 0x200 |

Table 8-951. Register Call Summary for Register ISIF_CBGAIN

ISS ISP

- [ISS ISP ISIF White Balance: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-952. ISIF_COFSTA

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 0060 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1060 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | COFT | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | COFT | Image sensor offset: Performs offset value adjustment on image sensor data (0~4095). | RW | 0x000 |

Table 8-953. Register Call Summary for Register ISIF_COFSTA

ISS ISP

- [ISS ISP ISIF White Balance: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-954. ISIF_VDINT0

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 0070 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1070 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | CVD0 | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | RESERVED | | R | 0 |
| 14:0 | CVD0 | VD0 Interrupt timing in a field (line number). | RW | 0x0000 |

Table 8-955. Register Call Summary for Register ISIF_VDINT0

ISS ISP

- [ISS ISP ISIF Events and Status Checking: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-956. ISIF_VDINT1

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 0074 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1074 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | CVD1 | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | RESERVED | | R | 0 |
| 14:0 | CVD1 | VD1 Interrupt timing in a field (line number). | RW | 0x0000 |

Table 8-957. Register Call Summary for Register ISIF_VDINT1

ISS ISP

- [ISS ISP ISIF Events and Status Checking: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-958. ISIF_VDINT2

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 0078 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1078 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | CVD2 | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | RESERVED | | R | 0 |
| 14:0 | CVD2 | VD2 Interrupt timing in a field (line number). | RW | 0x0000 |

Table 8-959. Register Call Summary for Register ISIF_VDINT2

ISS ISP

- [ISS ISP ISIF Events and Status Checking: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-960. ISIF_MISC

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 007C | Instance | ISS_ISIF |
| Physical Address | 0x5201 107C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|---------|--------|----------|----|----|---|---|---|---|---|---|---|---|---|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | DPCMPRE | DPCMEN | RESERVED | | | | | | | | | | | | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:14 | RESERVED | | R | 0x0 |
| 13 | DPCMPRE | Selects Predictor for DPCM Encoder (12-8) 0x0: Predictor 1 0x1: Predictor 2 | RW | 0 |
| 12 | DPCMEN | Enables DPCM Encoding (12-8) 0x0: Disable 0x1: Enable | RW | 0 |
| 11:1 | RESERVED | | R | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------|
| 0 | RESERVED | | RW | 0 |

Table 8-961. Register Call Summary for Register ISIF_MISC

ISS ISP

- ISS ISP ISIF 12-to-8 bit DCPM Compression Block: [0] [1]
- ISS ISP ISIF Hardware Setup/Initialization: [2] [3]
- ISS ISP ISIF Register Accessibility During Frame Processing: [4]
- ISS ISIF Register Summary: [5]

Table 8-962. ISIF_CGAMMAWD

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 0080 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1080 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|-------|-------|-------|----------|---------|---------|---------|----------|------|------|---|---|--------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | WBEN2 | WBEN1 | WBEN0 | RESERVED | OFSTEN2 | OFSTEN1 | OFSTEN0 | RESERVED | CFAP | GWDI | | | CCDTBL | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | RESERVED | | R | 0 |
| 14 | WBEN2 | White Balance Enable for H3A 0x0: Disable 0x1: Enable | RW | 0 |
| 13 | WBEN1 | White Balance Enable for IPIPE 0x0: Disable 0x1: Enable | RW | 0 |
| 12 | WBEN0 | White Balance Enable for memory capture 0x0: Disable 0x1: Enable | RW | 0 |
| 11 | RESERVED | | R | 0 |
| 10 | OFSTEN2 | Offset control Enable for H3A 0x0: Disable 0x1: Enable | RW | 0 |
| 9 | OFSTEN1 | Offset control Enable for IPIPE 0x0: Disable 0x1: Enable | RW | 0 |
| 8 | OFSTEN0 | Offset control Enable for SDRAM capture 0x0: Disable 0x1: Enable | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 5 | CFAP | <p>Selects CFA pattern</p> <p>0x0: Mosaic color pattern. It should look like this.</p> <pre> G R G R G R G R ... B G B G B G B G ... G R G R G R G R </pre> <p>0x1: Stripe color pattern. It should look like this.</p> <pre> R G B R G B R G B ... R G B R G B R G B ... R G B R G B R G B </pre> | RW | 0 |
| 4:1 | GWDI | <p>Selects MSB position of Input Data</p> <p>0x6: bit 9</p> <p>0x1: bit 14</p> <p>0xA: Reserved</p> <p>0x7: bit 8</p> <p>0xD: Reserved</p> <p>0x0: bit 15</p> <p>0x2: bit 13</p> <p>0x8: bit 7</p> <p>0x9: Reserved</p> <p>0xB: Reserved</p> <p>0x4: bit 11</p> <p>0x5: bit 10</p> <p>0xF: Reserved</p> <p>0xC: Reserved</p> <p>0x3: bit 12</p> <p>0xE: Reserved</p> | RW | 0x0 |
| 0 | CCDTBL | <p>On/Off control of A-law table for SDRAM capture</p> <p>0x0: Disable</p> <p>0x1: Enable</p> | RW | 0 |

Table 8-963. Register Call Summary for Register ISIF_CGAMMAWD

ISS ISP

- [ISS ISP ISIF Interface: \[0\] \[1\]](#)
- [ISS ISP ISIF White Balance: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [ISS ISP ISIF A-Law Compression: \[9\] \[10\] \[11\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[21\]](#)
- [ISS ISIF Register Summary: \[22\]](#)

Table 8-964. ISIF_REC656IF

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0084 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_ISIF | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 1084 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | INPUT CONFIG REGISTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | R656ON | ECCFVH |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1 | R656ON | CCIR Rec.656 interface mode 0x0: Disable 0x1: Enable | RW | 0 |
| 0 | ECCFVH | Error correction of FVH code 0x0: Disable 0x1: Enable | RW | 0 |

Table 8-965. Register Call Summary for Register ISIF_REC656IF

ISS ISP

- [ISS ISP ISIF Hardware Setup/Initialization: \[0\] \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)
- [ISS ISIF Register Description: \[3\]](#)

Table 8-966. ISIF_CCDCFG

| | | | |
|------------------|-------------|----------|----------|
| Address Offset | 0x0000 0088 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1088 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----------|---------|------|-------|-------|--------|--------|-------|-------|---------|----------|----------|---------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VLDC | RESERVED | MSBINVI | BSWD | Y8POS | EXTRG | TRGSEL | WENLOG | FIDMD | BT656 | YCINSWP | RESERVED | RESERVED | SDRPACK | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | VLDC | On/off control of CPU registers resynchronize function by VSYNC. All the others are shadowed registers, where register values are updated at V-sync timing by default. If VDLC=1, ISIF register values are updated immediately after register write just like non-shadowed registers. 0x0: Enable 0x1: Disable | RW | 0 |
| 14 | RESERVED | Reserved. must always be set to 0. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 13 | MSBINVI | MSB inverse of CIN port when the data are captured to SDRAM. The ISIF_MODESET.CCDW , ISIF_HSIZE.ADCR , ISIF_HSIZE.HSIZE , ISIF_CCDCFG.BSWD , ISIF_CCDCFG.MSBINV , ISIF_CCDCFG.SDRPACK bit fields control how pixel data are stored to SDRAM. 0x0: Disable 0x1: Enable | RW | 0 |
| 12 | BSWD | On/off control of Byte SWAP function when SDRAM capturing. The ISIF_MODESET.CCDW , ISIF_HSIZE.ADCR , ISIF_HSIZE.HSIZE , ISIF_CCDCFG.BSWD , ISIF_CCDCFG.MSBINV , ISIF_CCDCFG.SDRPACK bit fields control how pixel data are stored to SDRAM. 0x0: Disable 0x1: Enable (swap) | RW | 0 |
| 11 | Y8POS | Selects Y signal position when in 8bit input mode 0x0: even pixel 0x1: odd pixel | RW | 0 |
| 10 | EXTRG | Setting 1 to this register, the SDRAM address is initialized at the rising edge of FID input signal or DWEN register. | RW | 0 |
| 9 | TRGSEL | Select trigger source signal of SDRAM address initializing in case EXTRG=1. 0x0: DWEN register 0x1: FID input port | RW | 0 |
| 8 | WENLOG | Specifies the CCD valid area. 0x0: internal valid signal and WEN signal is ANDed logically. 0x1: internal valid signal and WEN signal is ORed logically. | RW | 0 |
| 7:6 | FIDMD | Specifies FID detection mode 0x0: latch the FID at the VSYNC timing 0x1: no latch the FID 0x3: Reserved 0x2: Reserved | RW | 0x0 |
| 5 | BT656 | Selects bit width of CCIR656. This bit applies only if ISIF_REC656IF.R656ON = 1. 0x0: 8 bits 0x1: 10 bits | RW | 0 |
| 4 | YCINSWP | The ISIF module has a 16-bit interface. When 16-bit YUV data are input, the luma data (YIN7-0) are expected to be on the 8 MS bits and the chroma (CIN7-0) data are expected to be on the LS bits. This bit enables to swap the 8 MS bits with the 8 LS bits of the interface in case the luma and chroma do not come in the correct order. See the top-level ISIF block diagram. 0x0: YIN7-0 = Y signal / CIN7-0 = C signal 0x1: YIN7-0 = C signal / CIN7-0 = Y signal | RW | 0 |
| 3 | RESERVED | Reserved. must always be set to 0. | RW | 0 |
| 2 | RESERVED | Reserved. must always be set to 0. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | SDRPACK | <p>This bit field selects how the data are stored to SDRAM. There can be 8, 12 or 16 bits per pixel. The ISIF_MODESET.CCDW, ISIF_HSIZE.ADCR, ISIF_HSIZE.HSIZE, ISIF_CCDCFG.BSWD, ISIF_CCDCFG.MSBINV, ISIF_CCDCFG.SDRPACK bit fields control how pixel data are stored to SDRAM.</p> <p>0x0: 16 bits / pixel 0x1: 12 bits / pixel 0x3: Reserved 0x2: 8 bits / pixel</p> | RW | 0x0 |

Table 8-967. Register Call Summary for Register ISIF_CCDCFG

ISS ISP

- [ISS ISP ISIF Interface: \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Expected Bandwidth on BL Ports: \[3\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[14\] \[15\]](#)
- [ISS ISP ISIF Summary of Constraints: \[16\]](#)
- [ISS ISIF Register Summary: \[17\]](#)
- [ISS ISIF Register Description: \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\]](#)

Table 8-968. ISIF_DFCCTL

| | | | |
|-------------------------|-----------------------------------|-----------------|----------|
| Address Offset | 0x0000 008C | Instance | ISS_ISIF |
| Physical Address | 0x5201 108C | | |
| Description | VERTICAL LINE DEFCT CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|---------|----|----|----|---------|--------|--------|----------|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | VDFLSFT | | | | VDFCUDA | VDFCSL | VDFCEN | RESERVED | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:11 | RESERVED | | R | 0x00 |
| 10:8 | VDFLSFT | <p>Vertical line Defect level shift value Defect Level (value to be subtracted from the data) is 8bit width, but can be up-shifted up to 6bits by VDFLSFT. Left shift value = VDFLSFT (Range: 0-6) Setting 7 to VDFLSFT is not allowed.</p> | RW | 0x0 |
| 7 | VDFCUDA | <p>Vertical line Defect Correction upper pixels disable.</p> <p>0x0: The whole line is corrected. 0x1: Pixels upper than the defect are not corrected.</p> | RW | 0 |
| 6:5 | VDFCSL | <p>Vertical line Defect Correction mode select.</p> <p>0x0: Defect level subtraction. Just fed through if data are saturating. 0x1: Defect level subtraction. Horizontal interpolation ((i-2)+(i+2))/2 if data are saturating. 0x3: Reserved 0x2: Horizontal interpolation ((i-2)+(i+2))/2.</p> | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 4 | VDFCEN | Vertical line Defect Correction enable. This bit field is latched by VD. 0x0: Disable 0x1: Enable | RW | 0 |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-969. Register Call Summary for Register ISIF_DFCCTL

ISS ISP

- ISS ISP ISIF Vertical Line Defect Correction (VDFC): [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]
- ISS ISP ISIF Hardware Setup/Initialization: [11] [12] [13] [14] [15]
- ISS ISP ISIF Register Accessibility During Frame Processing: [16]
- ISS ISIF Register Summary: [17]

Table 8-970. ISIF_VDFSATLV

| | | | |
|-------------------------|-----------------------------------|-----------------|----------|
| Address Offset | 0x0000 0090 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1090 | | |
| Description | VERTICAL LINE DEFCT CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|---------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | VDFS LV | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | VDFS LV | Vertical line Defect Correction saturation level. VDFS LV is U12 (Range: 0 - 4,095). | RW | 0x000 |

Table 8-971. Register Call Summary for Register ISIF_VDFSATLV

ISS ISP

- ISS ISP ISIF Vertical Line Defect Correction (VDFC): [0]
- ISS ISP ISIF Hardware Setup/Initialization: [1]
- ISS ISP ISIF Register Accessibility During Frame Processing: [2]
- ISS ISIF Register Summary: [3]

Table 8-972. ISIF_DFCMEMCTL

| | | | |
|-------------------------|-----------------------------------|-----------------|----------|
| Address Offset | 0x0000 0094 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1094 | | |
| Description | VERTICAL LINE DEFCT CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|----------|----------|--------|--------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | DFCMCLR | | | | | | | | RESERVED | DFCMARST | DFCMRD | DFCMWR | | | | |

ISS ISP

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:5 | RESERVED | | R | 0x000 |
| 4 | DFCMCLR | Defect correction. Memory clear. Writing 1 to this bit clears the memory contents to all zero. It will be automatically cleared to `0` when the memory clear is completed. | RW | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | DFCMARST | Defect correction. Memory address reset. Setting DFCMWR or DFCMRD with LSCMARST set starts memory access to address offset 0. DFCMARST is automatically cleared if data transfer completes. Setting DFCMWR or DFCMRD with LSCMARST cleared starts memory access to the next address. 0x0: Increment the memory address 0x1: Clear the memory address to offset 0 | RW | 0 |
| 1 | DFCMRD | Defect correction. Memory read [for debug purpose] Writing 1 to this bit starts reading from the memory. It will be automatically cleared when the data transfer is completed, and the data can be read from DFCMEM4-0. | RW | 0 |
| 0 | DFCMWR | Defect correction. Memory write Writing 1 to this bit starts writing to the memory. It will be automatically cleared when the data transfer is completed. DFCMEM4-0 should be set prior to the memory access. | RW | 0 |

Table 8-973. Register Call Summary for Register ISIF_DFCMEMCTL

ISS ISP

- [ISS ISP ISIF Vertical Line Defect Correction \(VDFC\): \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[8\] \[9\] \[10\]](#)
- [ISS ISIF Register Summary: \[11\]](#)

Table 8-974. ISIF_DFCMEM0

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0098 | | | | | | | | | | | | | | | | Instance ISS_ISIF | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 1098 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Defect correction memory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|---------|----|----|---|---|---|---|---|---|---|---|---|---|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | DFCMEM0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | DFCMEM0 | Defect correction memory 0 Sets V position of the defects. | RW | 0x0000 |

Table 8-975. Register Call Summary for Register ISIF_DFCMEM0

ISS ISP

- [ISS ISP ISIF Vertical Line Defect Correction \(VDFC\): \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[4\]](#)
- [ISS ISIF Register Summary: \[5\]](#)

Table 8-976. ISIF_DFCMEM1

| | | | |
|-------------------------|--------------------------|-----------------|----------|
| Address Offset | 0x0000 009C | Instance | ISS_ISIF |
| Physical Address | 0x5201 109C | | |
| Description | Defect correction memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|---------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | DFCMEM1 | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | DFCMEM1 | Defect correction memory 1 Sets H position of the defects. | RW | 0x0000 |

Table 8-977. Register Call Summary for Register ISIF_DFCMEM1

ISS ISP

- [ISS ISP ISIF Vertical Line Defect Correction \(VDFC\): \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[4\]](#)
- [ISS ISIF Register Summary: \[5\]](#)

Table 8-978. ISIF_DFCMEM2

| | | | |
|-------------------------|--------------------------|-----------------|----------|
| Address Offset | 0x0000 00A0 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10A0 | | |
| Description | Defect correction memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|---------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | DFCMEM2 | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | DFCMEM2 | Defect correction Memory 2 Set SUB1: Defect level of the Vertical line defect position (V = Vdefect). DFCMEM2 can be up shifted according to VDFLSFT, and subtracted from the data for Vertical line defect correction. | RW | 0x00 |

Table 8-979. Register Call Summary for Register ISIF_DFCMEM2

ISS ISP

- [ISS ISP ISIF Vertical Line Defect Correction \(VDFC\): \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[3\]](#)
- [ISS ISIF Register Summary: \[4\]](#)

Table 8-980. ISIF_DFCMEM3

| | | | |
|-------------------------|--------------------------|-----------------|----------|
| Address Offset | 0x0000 00A4 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10A4 | | |
| Description | Defect correction memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | DFCMEM3 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | DFCMEM3 | Defect correction Memory 3 Set SUB2: Defect level of the pixels upper than the Vertical line defect (V Vdefect). DFCMEM3 can be up shifted according to VDFLSFT, and subtracted from the data for Vertical line defect correction. | RW | 0x00 |

Table 8-981. Register Call Summary for Register ISIF_DFCMEM3

ISS ISP

- [ISS ISP ISIF Vertical Line Defect Correction \(VDFC\): \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[3\]](#)
- [ISS ISIF Register Summary: \[4\]](#)

Table 8-982. ISIF_DFCMEM4

| | | | |
|-------------------------|--------------------------|-----------------|----------|
| Address Offset | 0x0000 00A8 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10A8 | | |
| Description | Defect correction memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | DFCMEM4 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | DFCMEM4 | Memory 4 Set SUB3: Defect level of the pixels lower than the Vertical line defect (V Vdefect). DFCMEM4 can be up shifted according to VDFLSFT, and subtracted from the data for Vertical line defect correction. | RW | 0x00 |

Table 8-983. Register Call Summary for Register ISIF_DFCMEM4

ISS ISP

- [ISS ISP ISIF Vertical Line Defect Correction \(VDFC\): \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[3\]](#)
- [ISS ISIF Register Summary: \[4\]](#)

Table 8-984. ISIF_CLAMPCFG

| | | | |
|-------------------------|---------------------------|-----------------|----------|
| Address Offset | 0x0000 00AC | Instance | ISS_ISIF |
| Physical Address | 0x5201 10AC | | |
| Description | BLACK CLAMP CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|------|----------|-------|---|------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | CLMD | RESERVED | CLHMD | | CLEN | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:5 | RESERVED | | R | 0x0000 |
| 4 | CLMD | Black clamp mode Clamp value can be calculated regardless of the color or can be calculated separately for each 4 colors. 0x0: Clamp value calculated regardless of the pixel color. 0x1: Clamp value calculated separately for each 4 colors. | RW | 0 |
| 3 | RESERVED | | R | 0 |
| 2:1 | CLHMD | Horizontal Clamp mode 0x0: Horizontal clamp disabled. Only the Vertical clamp value is subtracted from the Image data. 0x1: Horizontal clamp value calculation enabled. The calculated Horizontal clamp value is subtracted from the Image data along with the Vertical clamp value. 0x3: Reserved 0x2: Horizontal clamp value not updated. The Horizontal clamp value used for the previous image is subtracted from the Image data along with the Vertical clamp value. | RW | 0x0 |
| 0 | CLEN | Black Clamp Enable Enables clamp value to be subtracted from Image data. 0x0: Disable 0x1: Enable | RW | 0 |

Table 8-985. Register Call Summary for Register ISIF_CLAMPCFG

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[5\] \[6\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[7\]](#)
- [ISS ISIF Register Summary: \[8\]](#)
- [ISS ISIF Register Description: \[9\] \[10\]](#)

Table 8-986. ISIF_CLDCOFST

| | | | |
|-------------------------|---------------------------|-----------------|----------|
| Address Offset | 0x0000 00B0 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10B0 | | |
| Description | BLACK CLAMP CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | CLDC | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | CLDC | DC offset for black clamp This value is added to the incoming pixels regardless whether optical black clamp is enabled (ISIF_CLAMPCFG.CLEN). This value is in S13Q0 format. | RW | 0x0000 |

Table 8-987. Register Call Summary for Register ISIF_CLDCOFST

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\] \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-988. ISIF_CLSV

| | | | |
|-------------------------|---------------------------|-----------------|----------|
| Address Offset | 0x0000 00B4 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10B4 | | |
| Description | BLACK CLAMP CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | CLSV | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | CLSV | Black Clamp Start position (V). Sets the line number where clamp value subtraction starts. Range: 0 - 8191 | RW | 0x0000 |

Table 8-989. Register Call Summary for Register ISIF_CLSV

ISS ISP

- [ISS ISP ISIF Hardware Setup/Initialization: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-990. ISIF_CLHWINO

| | | | |
|-------------------------|---------------------------|-----------------|----------|
| Address Offset | 0x0000 00B8 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10B8 | | |
| Description | BLACK CLAMP CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|-------|----|----|----------|----|---|-------|---|----------|--------|--------|-------|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | CLHWN | | | RESERVED | | | CLHWM | | RESERVED | CLHLMT | CLHWBS | CLHWC | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:14 | RESERVED | | R | 0x0 |
| 13:12 | CLHWN | Horizontal Black clamp - Vertical dimension of a Window (2^N). 0x0: Window is 2 pixels tall (N=1) 0x1: Window is 4 pixels tall (N=2) 0x3: Window is 16 pixels tall (N=4) 0x2: Window is 8 pixels tall (N=3) | RW | 0x0 |
| 11:10 | RESERVED | | R | 0x0 |
| 9:8 | CLHWM | Horizontal Black clamp - Horizontal dimension of a Window (2^M). 0x0: Window is 32 pixels wide (M=5) 0x1: Window is 64 pixels wide (M=6) 0x3: Window is 256 pixels wide (M=8) 0x2: Window is 128 pixels wide (M=7) | RW | 0x0 |
| 7 | RESERVED | | R | 0 |
| 6 | CLHLMT | Horizontal Black clamp - Pixel value limitation for the Horizontal clamp value calculation. If this bit is set, the maximum pixel value to be used for the clamp value calculation would be limited to 1023. By setting this bit, the pixel value greater than 1023 will be replaced by the last pixel value which was equal to or less than 1023. In case ISIF_CLAMPCFG.CLMD=1 (4-color mode), the pixel value greater than 1023 will be replaced by the last pixel value of the same color which was equal to or less than 1023. 0x0: Limitation disabled 0x1: Limitation enabled | RW | 0 |
| 5 | CLHWBS | Horizontal Black clamp - Base Window select 0x0: The most left window 0x1: The most right window | RW | 0 |
| 4:0 | CLHWC | Horizontal Black clamp - Window count per color Window count = CLHWC+1 Range: 1 - 32 | RW | 0x00 |

Table 8-991. Register Call Summary for Register ISIF_CLHWINO

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [ISS ISIF Register Summary: \[12\]](#)

Table 8-992. ISIF_CLHWIN1

| | | | |
|-------------------------|---------------------------|-----------------|----------|
| Address Offset | 0x0000 00BC | Instance | ISS_ISIF |
| Physical Address | 0x5201 10BC | | |
| Description | BLACK CLAMP CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | CLHSH | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | CLHSH | Horizontal black clamp. Window Start position (H). Range: 0 - 8191 | RW | 0x0000 |

Table 8-993. Register Call Summary for Register ISIF_CLHWIN1

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-994. ISIF_CLHWIN2

| | | | |
|-------------------------|---------------------------|-----------------|----------|
| Address Offset | 0x0000 00C0 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10C0 | | |
| Description | BLACK CLAMP CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | CLHSV | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | CLHSV | Horizontal black clamp. Window Start position (V). Range: 0 - 8191 | RW | 0x0000 |

Table 8-995. Register Call Summary for Register ISIF_CLHWIN2

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-996. ISIF_CLVRV

| | | | |
|-------------------------|---------------------------|-----------------|----------|
| Address Offset | 0x0000 00C4 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10C4 | | |
| Description | BLACK CLAMP CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|-------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | CLVRV | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | CLVRV | Vertical black clamp reset value. (U12) Range: 0 to 4095 | RW | 0x000 |

Table 8-997. Register Call Summary for Register ISIF_CLVRV

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-998. ISIF_CLVWIN0

| | | | |
|------------------|---------------------------|----------|----------|
| Address Offset | 0x0000 00C8 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10C8 | | |
| Description | BLACK CLAMP CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|----------|---------|----------|--------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLVCOEF | | | | | | | | RESERVED | CLVRVSL | RESERVED | CLVOBH | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | CLVCOEF | Vertical Black clamp - Line average coefficient (k). Set a coefficient which is applied to the line average for clamp value calculation. (1-k) is applied to the clamp value of the previous line. Value in the U8Q8 format, the range is 0 to 255/256. | RW | 0x00 |
| 7:6 | RESERVED | | R | 0x0 |
| 5:4 | CLVRVSL | Vertical Black clamp - reset value selection Select the reset value for the clamp value of the previous line 0x0: The base value calculated for Horizontal direction 0x1: Value set via the configuration register 0x3: Reserved 0x2: No update (same as the previous image) | RW | 0x0 |
| 3 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 2:0 | CLVOBH | Vertical Black clamp - Optical Black H valid (2 ^L). 0x6: Reserved 0x1: 4 pixels wide (L=2) 0x7: Reserved 0x0: 2 pixels wide (L=1) 0x2: 8 pixels wide (L=3) 0x4: 32 pixels wide (L=5) 0x5: 64 pixels wide (L=6) 0x3: 16 pixels wide (L=4) | RW | 0x0 |

Table 8-999. Register Call Summary for Register ISIF_CLVWIN0

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[5\] \[6\] \[7\]](#)
- [ISS ISIF Register Summary: \[8\]](#)

Table 8-1000. ISIF_CLVWIN1

| | | | |
|-------------------------|-----------------------------|-----------------|----------|
| Address Offset | 0x0000 00CC | Instance | ISS_ISIF |
| Physical Address | 0x5201 10CC | | |
| Description | BLACK CLAMP CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|-------|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | CLVSH | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | CLVSH | Vertical black clamp. Window Start position (H). Range: 0 - 8191 | RW | 0x0000 |

Table 8-1001. Register Call Summary for Register ISIF_CLVWIN1

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-1002. ISIF_CLVWIN2

| | | | |
|-------------------------|---------------------------|-----------------|----------|
| Address Offset | 0x0000 00D0 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10D0 | | |
| Description | BLACK CLAMP CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | CLVSV | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | CLVSV | Vertical black clamp. Window Start position (V). Range: 0 - 8191 | RW | 0x0000 |

Table 8-1003. Register Call Summary for Register ISIF_CLVWIN2

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-1004. ISIF_CLVWIN3

| | | | |
|-------------------------|---------------------------|-----------------|----------|
| Address Offset | 0x0000 00D4 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10D4 | | |
| Description | BLACK CLAMP CTRL REGISTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|--------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | CLVOBV | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | CLVOBV | Vertical black clamp. Optical black V valid (V). Range: 0 - 8191 | RW | 0x0000 |

Table 8-1005. Register Call Summary for Register ISIF_CLVWIN3

ISS ISP

- [ISS ISP ISIF Black Clamp: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-1006. ISIF_LSCHOFST

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00D8 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_ISIF | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 10D8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | 2D Lens Shading Correction Register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-------|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | HOFST | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:14 | RESERVED | | R | 0x0 |
| 13:0 | HOFST | H direction Data offset for Lens Shading Correction. Range: 0-16,383 Not valid if the Formatter is enabled. | RW | 0x0000 |

Table 8-1007. Register Call Summary for Register ISIF_LSCHOFST

ISS ISP

- [ISS ISP ISIF Hardware Setup/Initialization: \[0\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-1008. ISIF_LSCVOFST

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-------------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----------|-------|----|----|----|---|---|---|---|---|---|---|---|---|---|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00DC | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_ISIF | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 10DC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | 2D Lens Shading Correction Register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | VOFST | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:14 | RESERVED | | R | 0x0 |
| 13:0 | VOFST | V direction Data offset for Lens Shading Correction. Range: 0-16,383 | RW | 0x0000 |

Table 8-1009. Register Call Summary for Register ISIF_LSCVOFST

ISS ISP

- [ISS ISP ISIF Hardware Setup/Initialization: \[0\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-1010. ISIF_LSCHVAL

| | | | |
|-------------------------|-------------------------------------|-----------------|----------|
| Address Offset | 0x0000 00E0 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10E0 | | |
| Description | 2D Lens Shading Correction Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | HVAL | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:14 | RESERVED | | R | 0x0 |
| 13:0 | HVAL | Number of valid pixels in H direction. HVAL is for LSC. Number of valid pixels = HVAL+ 1 | RW | 0x0000 |

Table 8-1011. Register Call Summary for Register ISIF_LSCHVAL

ISS ISP

- [ISS ISP ISIF Hardware Setup/Initialization: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-1012. ISIF_LSCVVAL

| | | | |
|-------------------------|-------------------------------------|-----------------|----------|
| Address Offset | 0x0000 00E4 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10E4 | | |
| Description | 2D Lens Shading Correction Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | VVAL | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:14 | RESERVED | | R | 0x0 |
| 13:0 | VVAL | Number of valid lines in V direction. VVAL is for LSC. Number of valid lines = VVAL+ 1 | RW | 0x0000 |

Table 8-1013. Register Call Summary for Register ISIF_LSCVVAL

ISS ISP

- [ISS ISP ISIF Hardware Setup/Initialization: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-1014. ISIF_2DLSCCFG

| | | | |
|-------------------------|-------------------------------------|-----------------|----------|
| Address Offset | 0x0000 00E8 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10E8 | | |
| Description | 2D Lens Shading Correction Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|-------------|----|----|----|----------|-------------|---|---|---|------|----------|---|---|---|-------------|--|--|--|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | GAIN_MODE_M | | | | RESERVED | GAIN_MODE_N | | | | BUSY | RESERVED | | | | GAIN_FORMAT | | | | ENABLE |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | RESERVED | | R | 0 |
| 14:12 | GAIN_MODE_M | Define the horizontal dimension of a paxel. Possible values are listed below. 0x6: Paxel is 64 pixels tall (M=64) 0x1: Reserved 0x7: Paxel is 128 pixels tall (M=128) 0x0: Reserved 0x2: Reserved 0x4: Paxel is 16 pixels tall (M=16) 0x5: Paxel is 32 pixels tall (M=32) 0x3: Paxel is 8 pixels tall (M=8) | RW | 0x6 |
| 11 | RESERVED | | R | 0 |
| 10:8 | GAIN_MODE_N | Define the vertical dimension of a paxel. Possible values are listed below. 0x6: Paxel is 64 pixels tall (N=64) 0x1: Reserved 0x7: Paxel is 128 pixels tall (N=128) 0x0: Reserved 0x2: Reserved 0x4: Paxel is 16 pixels tall (N=16) 0x5: Paxel is 32 pixels tall (N=32) 0x3: Paxel is 8 pixels tall (N=8) | RW | 0x6 |
| 7 | BUSY | Busy bit Read 0x1: Busy Read 0x0: Idle | R | 0 |
| 6:4 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 3:1 | GAIN_FORMAT | Sets gain table format 0x6: Coded as 3-bit integer, 5-bit fraction Range from 0 to 7+31/32 0x1: Coded as 8-bit fraction + 1.0 of base Range from 1 to 1+255/256 0x7: Coded as 3-bit integer, 5-bit fraction + 1.0 Range from 1 to 8+31/32 0x0: Coded as 8-bit fraction Range from 0 to 255/256 0x2: Coded as 1-bit integer, 7-bit fraction Range from 0 to 1+127/128 0x4: Coded as 2-bit integer, 6-bit fraction Range from 0 to 3+63/64 0x5: Coded as 2-bit integer, 6-bit fraction + 1.0 Range from 1 to 4+63/64 0x3: Coded as 1-bit integer, 7-bit fraction + 1.0 Range from 1 to 2+127/128 | RW | 0x0 |
| 0 | ENABLE | Enables/disables LSC 0x0: Disables the module at the end of the current frame. 0x1: Enables the module. | RW | 0 |

Table 8-1015. Register Call Summary for Register ISIF_2DLSCCFG

ISS ISP

- ISS ISP ISIF Lens Shading Correction (2D-LSC): [\[0\]](#) [\[1\]](#) [\[2\]](#) [\[3\]](#) [\[4\]](#) [\[5\]](#)
- ISS ISP ISIF Expected Bandwidth on BL Ports: [\[6\]](#) [\[7\]](#) [\[8\]](#) [\[9\]](#) [\[10\]](#) [\[11\]](#) [\[12\]](#) [\[13\]](#)
- ISS ISP ISIF Hardware Setup/Initialization: [\[14\]](#) [\[15\]](#) [\[16\]](#) [\[17\]](#) [\[18\]](#)
- ISS ISIF Register Summary: [\[19\]](#)

Table 8-1016. ISIF_2DLSCOFST

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|-------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00EC | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_ISIF | | | | | | | |
| Physical Address | 0x5201 10EC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | 2D Lens Shading Correction Register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|----------|---------|---|---|---|----------|--------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OFSTSF | | | | | | | | RESERVED | OFSTSFT | | | | RESERVED | OFSTEN | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | OFSTSF | Scaling factor for Offsets (U8Q7) Range: 0 to 1+127/128 | RW | 0x80 |
| 7 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 6:4 | OFSTSFT | Shift up value for Offsets (S8Q0) 0x6: Reserved 0x1: 1bit left shift 0x7: Reserved 0x0: No shift 0x2: 2bits left shift 0x4: 4bits left shift 0x5: 5bits left shift 0x3: 3bits left shift | RW | 0x0 |
| 3:1 | RESERVED | | R | 0x0 |
| 0 | OFSTEN | Enables/disables Offset control in LSC 0x0: Disable 0x1: Enable | RW | 0 |

Table 8-1017. Register Call Summary for Register ISIF_2DLSCOFST

ISS ISP

- [ISS ISP ISIF Lens Shading Correction \(2D-LSC\): \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP ISIF Expected Bandwidth on BL Ports: \[5\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[6\] \[7\] \[8\]](#)
- [ISS ISIF Register Summary: \[9\]](#)

Table 8-1018. ISIF_2DLSCINI

| | | | |
|-------------------------|-------------------------------------|-----------------|----------|
| Address Offset | 0x0000 00F0 | Instance | ISS_ISIF |
| Physical Address | 0x5201 10F0 | | |
| Description | 2D Lens Shading Correction Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|----------|---|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | Y | | | | | | | | RESERVED | X | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | RESERVED | | R | 0 |
| 14:8 | Y | Initial Y Y position, in pixels, of the first active pixel in reference to the first active paxel. Must be an even number. | RW | 0x00 |
| 7 | RESERVED | | R | 0 |
| 6:0 | X | Initial X X position, in pixels, of the first active pixel in reference to the first active paxel. Must be an even number. | RW | 0x00 |

Table 8-1019. Register Call Summary for Register ISIF_2DLSCINI

ISS ISP

- [ISS ISP ISIF Lens Shading Correction \(2D-LSC\): \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\] \[3\]](#)
- [ISS ISP ISIF Summary of Constraints: \[4\]](#)
- [ISS ISIF Register Summary: \[5\]](#)

Table 8-1020. ISIF_2DLSCGRBU

| | | | |
|-------------------------|-------------------------------------|-----------------|----------|
| Address Offset | 0x0000 00F4 | | |
| Physical Address | 0x5201 10F4 | Instance | ISS_ISIF |
| Description | 2D Lens Shading Correction Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BASE31_16 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | BASE31_16 | Gain Table address base (Upper 16-bits) Table address in bytes. Table is 32-bit aligned so this register must be a multiple of 4. This bit field sets the address of the gain table in memory. | RW | 0x0000 |

Table 8-1021. Register Call Summary for Register ISIF_2DLSCGRBU

ISS ISP

- [ISS ISP ISIF Lens Shading Correction \(2D-LSC\): \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-1022. ISIF_2DLSCGRBL

| | | | |
|-------------------------|-------------------------------------|-----------------|----------|
| Address Offset | 0x0000 00F8 | | |
| Physical Address | 0x5201 10F8 | Instance | ISS_ISIF |
| Description | 2D Lens Shading Correction Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BASE15_0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | BASE15_0 | Gain Table address base (Lower 16-bits) Table address in bytes. Table is 32-bit aligned so this register must be a multiple of 4. This bit field sets the address of the gain table in memory. | RW | 0x0000 |

Table 8-1023. Register Call Summary for Register ISIF_2DLSCGRBL

ISS ISP

- [ISS ISP ISIF Lens Shading Correction \(2D-LSC\): \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-1024. ISIF_2DLSCGROF

| | | | | | | | | | | | | | | | | |
|-------------------------|-------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00FC | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 10FC | | | | | | | | | | | | | | | |
| Description | 2D Lens Shading Correction Register | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OFFSET | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | OFFSET | Gain Table offset Defines the length, in bytes, of one row of the table. Table is 32-bit aligned, so this value must be a multiple of 4. Note that the row in memory could be longer than what LSC uses. | RW | 0x0000 |

Table 8-1025. Register Call Summary for Register ISIF_2DLSCGROF

ISS ISP

- [ISS ISP ISIF Lens Shading Correction \(2D-LSC\): \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-1026. ISIF_2DLSCORBU

| | | | | | | | | | | | | | | | | |
|-------------------------|-------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0100 | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 1100 | | | | | | | | | | | | | | | |
| Description | 2D Lens Shading Correction Register | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BASE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | BASE | Offset Table address base (Upper 16-bits) Table address in bytes. Table is 32-bit aligned so this register must be a multiple of 4. This bit field sets the address of the gain table in memory. | RW | 0x0000 |

Table 8-1027. Register Call Summary for Register ISIF_2DLSCORBU

ISS ISP

- [ISS ISP ISIF Lens Shading Correction \(2D-LSC\): \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-1028. ISIF 2DLSCORBL

| | | | |
|------------------|-------------------------------------|----------|----------|
| Address Offset | 0x0000 0104 | | |
| Physical Address | 0x5201 1104 | Instance | ISS_ISIF |
| Description | 2D Lens Shading Correction Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BASE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | BASE | Offset Table address base (Lower 16-bits) Table address in bytes. Table is 32-bit aligned so this register must be a multiple of 4. This bit field sets the address of the gain table in memory. | RW | 0x0000 |

Table 8-1029. Register Call Summary for Register ISIF_2DLSCORBL

ISS ISP

- ISS ISP ISIF Lens Shading Correction (2D-LSC): [0]
- ISS ISP ISIF Hardware Setup/Initialization: [1]
- ISS ISIF Register Summary: [2]

Table 8-1030. ISIF 2DLSCOROF

| | | | |
|------------------|-------------------------------------|----------|----------|
| Address Offset | 0x0000 0108 | | |
| Physical Address | 0x5201 1108 | Instance | ISS_ISIF |
| Description | 2D Lens Shading Correction Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OFFSET | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | OFFSET | Offset Table offset Defines the length, in bytes, of one row of the table. Table is 32-bit aligned, so this value must be a multiple of 4. Note that the row in memory could be longer than what LSC uses. | RW | 0x0000 |

Table 8-1031. Register Call Summary for Register ISIF_2DLSCOROF

ISS ISP

- ISS ISP ISIF Lens Shading Correction (2D-LSC): [0]
- ISS ISP ISIF Hardware Setup/Initialization: [1]
- ISS ISIF Register Summary: [2]

Table 8-1032. ISIF_2DLSCIRQEN

| | | | |
|------------------|-------------|----------|----------|
| Address Offset | 0x0000 010C | Instance | ISS_ISIF |
| Physical Address | 0x5201 110C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|-----|--------------------|----------------|------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | SOF | PREFETCH_COMPLETED | PREFETCH_ERROR | DONE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:4 | RESERVED | | R | 0x000 |
| 3 | SOF | <p>Interrupt status for LSC SOF Indicates the start of the LSC valid region. LSC configuration registers can be updated after LSC SOF for the next frame.</p> <p>0x0: Interrupt is masked 0x1: Interrupt is enabled</p> | RW | 0 |
| 2 | PREFETCH_COMPLETED | <p>Interrupt enable for Prefetch Complete Indicates current state of the prefetch buffer. Could be used to start sending the data once the buffer is full to minimize the risk of an underflow. This event is triggered when the buffer contains 3 full paxel rows.</p> <p>0x0: Interrupt is masked 0x1: Interrupt is enabled</p> | RW | 0 |
| 1 | PREFETCH_ERROR | <p>Interrupt enable for Prefetch Error The prefetch error indicates when the gain table was read to slowly from SDRAM. When this event is pending the module goes into transparent mode (output=input). Normal operation can be resumed at the start of the next frame after</p> <ol style="list-style-type: none"> 1) clearing this event 2) disabling the LSC module 3) enabling it <p>0x0: Interrupt is masked 0x1: Interrupt is enabled</p> | RW | 0 |
| 0 | DONE | <p>Interrupt enable for LSC Done The event is triggered when the internal state of LSC toggles from BUSY to IDLE.</p> <p>0x0: Interrupt is masked 0x1: Interrupt is enabled</p> | RW | 0 |

Table 8-1033. Register Call Summary for Register ISIF_2DLSCIRQEN

ISS ISP

- [ISS ISP ISIF Lens Shading Correction \(2D-LSC\): \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISIF Register Summary: \[5\]](#)

Table 8-1034. ISIF_2DLSCIRQST

| | | | |
|-------------------------|-------------------------------------|-----------------|----------|
| Address Offset | 0x0000 0110 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1110 | | |
| Description | 2D Lens Shading Correction Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|--------------------|---|----------------|---|------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | SOF | | PREFETCH_COMPLETED | | PREFETCH_ERROR | | DONE | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:4 | RESERVED | | R | 0x000 |
| 3 | SOF | <p>Interrupt status for LSC SOF</p> <p>Indicates the start of the LSC valid region. LSC configuration registers can be updated after LSC SOF for the next frame.</p> <p>0x0: Event is not pending (r) Bit remains unchanged (w)</p> <p>0x1: Event is pending (r) Event is cleared (w)</p> | RW | 0 |
| 2 | PREFETCH_COMPLETED | <p>Interrupt status for Prefetch Complete</p> <p>Indicates current state of the prefetch buffer. Could be used to start sending the data once the buffer is full to minimize the risk of an underflow.</p> <p>This event is triggered when the buffer contains 3 full paxel rows. It could be used to minimize buffer underflow risks.</p> <p>0x0: Event is not pending (r) Bit remains unchanged (w)</p> <p>0x1: Event is pending (r) Event is cleared (w)</p> | RW | 0 |
| 1 | PREFETCH_ERROR | <p>Interrupt status for Prefetch Error</p> <p>The prefetch error indicates when the gain table was read to slowly from SDRAM. When this event is pending the module goes into transparent mode (output=input). Normal operation can be resumed at the start of the next frame after</p> <ol style="list-style-type: none"> 1) clearing this event 2) disabling the LSC module 3) enabling it <p>0x0: Event is not pending (r) Bit remains unchanged (w)</p> <p>0x1: Event is pending (r) Event is cleared (w)</p> | RW | 0 |
| 0 | DONE | <p>Interrupt status for LSC Done</p> <p>The event is triggered when the internal state of LSC toggles from BUSY to IDLE.</p> <p>0x0: Event is not pending (r) Bit remains unchanged (w)</p> <p>0x1: Event is pending (r) Event is cleared (w)</p> | RW | 0 |

Table 8-1035. Register Call Summary for Register ISIF_2DLSCIRQST

ISS ISP

- [ISS ISP ISIF Lens Shading Correction \(2D-LSC\): \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [ISS ISIF Register Summary: \[10\]](#)

Table 8-1036. ISIF_FMTCFG

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0114 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1114 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|---|---|----------|---|------|---|----------|---|-------|--------|-------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | FMTAINC | | | | RESERVED | | LNUM | | RESERVED | | LNALT | FMTCBL | FMTEN |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:8 | FMTAINC | Address increment Address increment = (FMTAINC + 1) Range (1-16) *This bit is latched by VD. | RW | 0x0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5:4 | LNUM | Split/Combine number of lines *This bit is latched by VD. 0x0: 1 output line 0x1: 1 input line - 2 output lines (FMTCBL=0) 2 input lines - 1 output line (FMTCBL=1) 0x3: 1 input line - 4 output lines (FMTCBL=0) 4 input lines - 1 output line (FMTCBL=1) 0x2: 1 input line - 3 output lines (FMTCBL=0) 3 input lines - 1 output line (FMTCBL=1) | RW | 0x0 |
| 3 | RESERVED | | R | 0 |
| 2 | LNALT | Line alternating *This bit is latched by VD. 0x0: Normal mode 0x1: Line alternative mode | RW | 0 |
| 1 | FMTCBL | Combine Input lines *This bit is latched by VD. 0x0: Split 1 input line into multiple output lines 0x1: Combine multiple input lines into 1 output line | RW | 0 |
| 0 | FMTEN | CCD Formatter enable *This bit is latched by VD. 0x0: Disable 0x1: Enable | RW | 0 |

Table 8-1037. Register Call Summary for Register ISIF_FMTCFG

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[21\] \[22\] \[23\] \[24\] \[25\]](#)
- [ISS ISIF Register Summary: \[26\]](#)

Table 8-1038. ISIF_FMTPLEN

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0118 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1118 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----------|----|----------|----|----------|---|---|---|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FMTPLEN3 | | RESERVED | | FMTPLEN2 | | FMTPLEN1 | | | | FMTPLEN0 | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:12 | FMTPLEN3 | Number of program entries for SET3 Number of entries = (FMTPLEN3 + 1) Range: 1-8 Valid only if FMTCBL is set *This bit is latched by VD. | RW | 0x0 |
| 11 | RESERVED | | R | 0 |
| 10:8 | FMTPLEN2 | Number of program entries for SET2 Number of entries = (FMTPLEN2 + 1) Range: 1-8 Valid only if FMTCBL is set *This bit is latched by VD. | RW | 0x0 |
| 7:4 | FMTPLEN1 | Number of program entries for SET1 Number of entries = (FMTPLEN1 + 1) Range: 1-16 (FMTCBL = 0) 1-8 (FMTCBL = 1) Setting a value greater than 7 to FMTPLEN1 is not allowed if FMTCBL is set *This bit is latched by VD. | RW | 0x0 |
| 3:0 | FMTPLEN0 | Number of program entries for SET0 Number of entries = (PLEN0 + 1) Range: 1-16 (FMTCBL = 0) 1-8 (FMTCBL = 1) Setting a value greater than 7 to FMTPLEN1 is not allowed if FMTCBL is set *This bit is latched by VD. | RW | 0x0 |

Table 8-1039. Register Call Summary for Register ISIF_FMTPLEN

ISS ISP

- ISS ISP ISIF Input Data Formatter: [0] [1] [2] [3] [4] [5] [6] [7]
- ISS ISP ISIF Hardware Setup/Initialization: [8] [9] [10] [11]
- ISS ISIF Register Summary: [12]

Table 8-1040. ISIF_FMTSPH

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 011C | Instance | ISS_ISIF |
| Physical Address | 0x5201 111C | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FMTSPH | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | FMTSPH | The first pixel in a line fed into the formatter | RW | 0x0000 |

Table 8-1041. Register Call Summary for Register ISIF_FMTSPH

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Color Space Converter: \[3\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[4\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[5\]](#)
- [ISS ISIF Register Summary: \[6\]](#)

Table 8-1042. ISIF_FMTLNH

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0120 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1120 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FMTLNH | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | FMTLNH | Number of pixels in a line fed to the formatter. Number of pixels = FMTLNH + 1 | RW | 0x0000 |

Table 8-1043. Register Call Summary for Register ISIF_FMTLNH

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Color Space Converter: \[3\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[4\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[5\]](#)
- [ISS ISIF Register Summary: \[6\]](#)

Table 8-1044. ISIF_FMTSLV

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0124 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1124 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FMTSLV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------------|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | FMTSLV | Start line vertical | RW | 0x0000 |

Table 8-1045. Register Call Summary for Register ISIF_FMTLSV

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Color Space Converter: \[3\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[4\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[5\]](#)
- [ISS ISIF Register Summary: \[6\]](#)

Table 8-1046. ISIF_FMTLNV

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0128 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1128 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FMTLNV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:0 | FMTLNV | Number of lines in vertical Number of lines = FMTLNV + 1 | RW | 0x0000 |

Table 8-1047. Register Call Summary for Register ISIF_FMTLNV

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Color Space Converter: \[3\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[4\]](#)
- [ISS ISP ISIF Register Accessibility During Frame Processing: \[5\]](#)
- [ISS ISIF Register Summary: \[6\]](#)

Table 8-1048. ISIF_FMTRLEN

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 012C | Instance | ISS_ISIF |
| Physical Address | 0x5201 112C | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FMTRLEN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | FMTRLEN | Number of pixels in an output line Maximum value = 4480 | RW | 0x0000 |

Table 8-1049. Register Call Summary for Register ISIF_FMTRLEN

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[3\]](#)
- [ISS ISIF Register Summary: \[4\]](#)

Table 8-1050. ISIF_FMTHCNT

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0130 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1130 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FMTHCNT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | FMTHCNT | HD interval for output lines Set all 0 to this register if combining multiple lines into a single line | RW | 0x0000 |

Table 8-1051. Register Call Summary for Register ISIF_FMTHCNT

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[3\]](#)
- [ISS ISIF Register Summary: \[4\]](#)

Table 8-1052. ISIF_FMTAPTR0

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0134 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1134 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 0 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1053. Register Call Summary for Register ISIF_FMTAPTR0

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-1054. ISIF_FMTAPTR1

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0138 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1138 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 1 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1055. Register Call Summary for Register ISIF_FMTAPTR1

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-1056. ISIF_FMTAPTR2

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 013C | Instance | ISS_ISIF |
| Physical Address | 0x5201 113C | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 2 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1057. Register Call Summary for Register ISIF_FMTAPTR2

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-1058. ISIF_FMTAPTR3

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0140 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1140 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 3 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1059. Register Call Summary for Register ISIF_FMTAPTR3

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-1060. ISIF_FMTAPTR4

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0144 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1144 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 4 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1061. Register Call Summary for Register ISIF_FMTAPTR4

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-1062. ISIF_FMTAPTR5

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0148 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1148 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 5 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1063. Register Call Summary for Register ISIF_FMTAPTR5

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-1064. ISIF_FMTAPTR6

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 014C | Instance | ISS_ISIF |
| Physical Address | 0x5201 114C | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 6 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1065. Register Call Summary for Register ISIF_FMTAPTR6

ISS ISP

- [ISS ISIF Register Summary: \[0\]](#)

Table 8-1066. ISIF_FMTAPTR7

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0150 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1150 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 7 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1067. Register Call Summary for Register ISIF_FMTAPTR7

ISS ISP

- [ISS ISIF Register Summary: \[0\]](#)

Table 8-1068. ISIF_FMTAPTR8

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0154 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1154 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 8 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1069. Register Call Summary for Register ISIF_FMTAPTR8

ISS ISP

- [ISS ISIF Register Summary: \[0\]](#)

Table 8-1070. ISIF_FMTAPTR9

| | | | |
|------------------|-------------------------------|----------|----------|
| Address Offset | 0x0000 0158 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1158 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 9 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1071. Register Call Summary for Register ISIF_FMTAPTR9

ISS ISP

- [ISS ISIF Register Summary: \[0\]](#)

Table 8-1072. ISIF_FMTAPTR10

| | | | |
|------------------|-------------------------------|----------|----------|
| Address Offset | 0x0000 015C | Instance | ISS_ISIF |
| Physical Address | 0x5201 115C | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 10 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1073. Register Call Summary for Register ISIF_FMTAPTR10

ISS ISP

- [ISS ISIF Register Summary: \[0\]](#)

Table 8-1074. ISIF_FMTAPTR11

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0160 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1160 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 11 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1075. Register Call Summary for Register ISIF_FMTAPTR11

ISS ISP

- [ISS ISIF Register Summary: \[0\]](#)

Table 8-1076. ISIF_FMTAPTR12

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0164 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1164 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 12 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1077. Register Call Summary for Register ISIF_FMTAPTR12

ISS ISP

- [ISS ISIF Register Summary: \[0\]](#)

Table 8-1078. ISIF_FMTAPTR13

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0168 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1168 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 13 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1079. Register Call Summary for Register ISIF_FMTAPTR13

ISS ISP

- [ISS ISIF Register Summary: \[0\]](#)

Table 8-1080. ISIF_FMTAPTR14

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 016C | Instance | ISS_ISIF |
| Physical Address | 0x5201 116C | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 14 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1081. Register Call Summary for Register ISIF_FMTAPTR14

ISS ISP

- [ISS ISIF Register Summary: \[0\]](#)

Table 8-1082. ISIF_FMTAPTR15

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0170 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1170 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE | | INIT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | | R | 0x00000 |
| 14:13 | LINE | The output line the address belongs to Valid only if FMTCBL is cleared 0x0: 1st line 0x1: 2nd line 0x3: 4th line 0x2: 3rd line | RW | 0x0 |
| 12:0 | INIT | Initial address value for address pointer 15 This address can not exceed FMTRLEN - 1 | RW | 0x0000 |

Table 8-1083. Register Call Summary for Register ISIF_FMTAPTR15

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-1084. ISIF_FMTPGMVFO

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0174 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1174 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PGM15EN | PGM14EN | PGM13EN | PGM12EN | PGM11EN | PGM10EN | PGM09EN | PGM08EN | PGM07EN | PGM06EN | PGM05EN | PGM04EN | PGM03EN | PGM02EN | PGM01EN | PGM00EN |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | PGM15EN | Program 15 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 14 | PGM14EN | Program 14 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 13 | PGM13EN | Program 13 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 12 | PGM12EN | Program 12 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 11 | PGM11EN | Program 11 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 10 | PGM10EN | Program 10 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 9 | PGM09EN | Program 9 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 8 | PGM08EN | Program 8 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 7 | PGM07EN | Program 7 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 6 | PGM06EN | Program 6 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 5 | PGM05EN | Program 5 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 4 | PGM04EN | Program 4 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 3 | PGM03EN | Program 3 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 2 | PGM02EN | Program 2 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 1 | PGM01EN | Program 1 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 0 | PGM00EN | Program 0 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |

Table 8-1085. Register Call Summary for Register ISIF_FMTPGMVFO

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[5\]](#)
- [ISS ISIF Register Summary: \[6\]](#)

Table 8-1086. ISIF_FMTPGMV1

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0178 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1178 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PGM31EN | PGM30EN | PGM29EN | PGM28EN | PGM27EN | PGM26EN | PGM25EN | PGM24EN | PGM23EN | PGM22EN | PGM21EN | PGM20EN | PGM19EN | PGM18EN | PGM17EN | PGM16EN |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | PGM31EN | Program 31 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 14 | PGM30EN | Program 30 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 13 | PGM29EN | Program 29 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 12 | PGM28EN | Program 28 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 11 | PGM27EN | Program 27 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 10 | PGM26EN | Program 26 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 9 | PGM25EN | Program 25 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 8 | PGM24EN | Program 24 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 7 | PGM23EN | Program 23 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 6 | PGM22EN | Program 22 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 5 | PGM21EN | Program 21 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 4 | PGM20EN | Program 20 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 3 | PGM19EN | Program 19 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 2 | PGM18EN | Program 18 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 1 | PGM17EN | Program 17 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |
| 0 | PGM16EN | Program 16 Valid Flag 0x0: Skip this pixel 0x1: This pixel is valid | RW | 0 |

Table 8-1087. Register Call Summary for Register ISIF_FMTPGMVF1

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[3\]](#)
- [ISS ISIF Register Summary: \[4\]](#)

Table 8-1088. ISIF_FMTPGMAPU0

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 017C | Instance | ISS_ISIF |
| Physical Address | 0x5201 117C | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|-----------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PGM15UPDT | PGM14UPDT | PGM13UPDT | PGM12UPDT | PGM11UPDT | PGM10UPDT | PGM9UPDT | PGM8UPDT | PGM7UPDT | PGM6UPDT | PGM5UPDT | PGM4UPDT | PGM3UPDT | PGM2UPDT | PGM1UPDT | PGM0UPDT |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | PGM15UPDT | Program 15 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 14 | PGM14UPDT | Program 14 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 13 | PGM13UPDT | Program 13 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 12 | PGM12UPDT | Program 12 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 11 | PGM11UPDT | Program 11 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 10 | PGM10UPDT | Program 10 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 9 | PGM9UPDT | Program 9 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 8 | PGM8UPDT | Program 8 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 7 | PGM7UPDT | Program 7 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 6 | PGM6UPDT | Program 6 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 5 | PGM5UPDT | Program 5 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 4 | PGM4UPDT | Program 4 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 3 | PGM3UPDT | Program 3 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 2 | PGM2UPDT | Program 2 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 1 | PGM1UPDT | Program 1 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 0 | PGM0UPDT | Program 0 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |

Table 8-1089. Register Call Summary for Register ISIF_FMTPGMAPU0

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[5\]](#)
- [ISS ISIF Register Summary: \[6\]](#)

Table 8-1090. ISIF_FMTPGMAPU1

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0180 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1180 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PGM31UPDT | PGM30UPDT | PGM29UPDT | PGM28UPDT | PGM27UPDT | PGM26UPDT | PGM25UPDT | PGM24UPDT | PGM23UPDT | PGM22UPDT | PGM21UPDT | PGM20UPDT | PGM19UPDT | PGM18UPDT | PGM17UPDT | PGM16UPDT |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | PGM31UPDT | Program 31 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 14 | PGM30UPDT | Program 30 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 13 | PGM29UPDT | Program 29 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 12 | PGM28UPDT | Program 28 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 11 | PGM27UPDT | Program 27 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 10 | PGM26UPDT | Program 26 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 9 | PGM25UPDT | Program 25 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 8 | PGM24UPDT | Program 24 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 7 | PGM23UPDT | Program 23 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 6 | PGM22UPDT | Program 22 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 5 | PGM21UPDT | Program 21 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 4 | PGM20UPDT | Program 20 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 3 | PGM19UPDT | Program 19 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 2 | PGM18UPDT | Program 18 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 1 | PGM17UPDT | Program 17 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |
| 0 | PGM16UPDT | Program 16 Address Pointer Update 0x0: APTR* + N (Auto increment) 0x1: APTR* - N (Auto decrement) | RW | 0 |

Table 8-1091. Register Call Summary for Register ISIF_FMTPGMAPU1

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[3\]](#)
- [ISS ISIF Register Summary: \[4\]](#)

Table 8-1092. ISIF_FMTPGMAPS0

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0184 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1184 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----------|----|---|---|----------|---|---|---|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PGM3APTR | | | | PGM2APTR | | | | PGM1APTR | | | | PGM0APTR | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | PGM3APTR | Program 3 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 11:8 | PGM2APTR | Program 2 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 7:4 | PGM1APTR | Program 1 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 3:0 | PGM0APTR | Program 0 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |

Table 8-1093. Register Call Summary for Register ISIF_FMTPGMAPS0

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\] \[2\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[3\]](#)
- [ISS ISIF Register Summary: \[4\]](#)

Table 8-1094. ISIF_FMTPGMAPS1

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0188 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1188 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----------|----|---|---|----------|---|---|---|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PGM7APTR | | | | PGM6APTR | | | | PGM5APTR | | | | PGM4APTR | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | PGM7APTR | Program 7 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 11:8 | PGM6APTR | Program 6 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 7:4 | PGM5APTR | Program 5 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 3:0 | PGM4APTR | Program 0 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |

Table 8-1095. Register Call Summary for Register ISIF_FMTPGMAPS1

ISS ISP

- [ISS ISP ISIF Hardware Setup/Initialization: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-1096. ISIF_FMTPGMAPS2

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 018C | Instance | ISS_ISIF |
| Physical Address | 0x5201 118C | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|-----------|----|---|---|----------|---|---|---|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PGM11APTR | | | | PGM10APTR | | | | PGM9APTR | | | | PGM8APTR | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | PGM11APTR | Program 11 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 11:8 | PGM10APTR | Program 10 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 7:4 | PGM9APTR | Program 9 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 3:0 | PGM8APTR | Program 8 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |

Table 8-1097. Register Call Summary for Register ISIF_FMTPGMAPS2

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-1098. ISIF_FMTPGMAPS3

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0190 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1190 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------|----|----|----|-----------|----|----|----|-----------|----|----|----|-----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | PGM15APTR | | | | PGM14APTR | | | | PGM13APTR | | | | PGM12APTR | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | PGM15APTR | Program 15 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 11:8 | PGM14APTR | Program 14 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 7:4 | PGM13APTR | Program 13 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 3:0 | PGM12APTR | Program 12 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |

Table 8-1099. Register Call Summary for Register ISIF_FMTPGMAPS3

ISS ISP

- [ISS ISP ISIF Hardware Setup/Initialization: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-1100. ISIF_FMTPGMAPS4

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0194 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1194 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------|----|----|----|-----------|----|----|----|-----------|----|----|----|-----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | PGM19APTR | | | | PGM18APTR | | | | PGM17APTR | | | | PGM16APTR | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | PGM19APTR | Program 19 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 11:8 | PGM18APTR | Program 18 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 7:4 | PGM17APTR | Program 17 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 3:0 | PGM16APTR | Program 16 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |

Table 8-1101. Register Call Summary for Register ISIF_FMTPGMAPS4

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-1102. ISIF_FMTPGMAPS5

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 0198 | Instance | ISS_ISIF |
| Physical Address | 0x5201 1198 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------|----|----|----|-----------|----|----|----|-----------|----|----|----|-----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | PGM23APTR | | | | PGM22APTR | | | | PGM21APTR | | | | PGM20APTR | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | PGM23APTR | Program 23 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 11:8 | PGM22APTR | Program 22 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 7:4 | PGM21APTR | Program 21 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 3:0 | PGM20APTR | Program 20 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |

Table 8-1103. Register Call Summary for Register ISIF_FMTPGMAPS5

ISS ISP

- [ISS ISP ISIF Hardware Setup/Initialization: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-1104. ISIF_FMTPGMAPS6

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 019C | Instance | ISS_ISIF |
| Physical Address | 0x5201 119C | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------|----|----|----|-----------|----|----|----|-----------|----|----|----|-----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | PGM27APTR | | | | PGM26APTR | | | | PGM25APTR | | | | PGM24APTR | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | PGM27APTR | Program 27 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 11:8 | PGM26APTR | Program 26 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 7:4 | PGM25APTR | Program 25 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 3:0 | PGM24APTR | Program 24 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |

Table 8-1105. Register Call Summary for Register ISIF_FMTPGMAPS6

ISS ISP

- [ISS ISP ISIF Hardware Setup/Initialization: \[0\]](#)
- [ISS ISIF Register Summary: \[1\]](#)

Table 8-1106. ISIF_FMTPGMAPS7

| | | | |
|-------------------------|-------------------------------|-----------------|----------|
| Address Offset | 0x0000 01A0 | Instance | ISS_ISIF |
| Physical Address | 0x5201 11A0 | | |
| Description | Input Data Formatter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------|----|----|----|-----------|----|----|----|-----------|----|----|----|-----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | PGM31APTR | | | | PGM30APTR | | | | PGM29APTR | | | | PGM28APTR | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | PGM31APTR | Program 31 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 11:8 | PGM30APTR | Program 30 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 7:4 | PGM29APTR | Program 29 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |
| 3:0 | PGM28APTR | Program 28 Address Pointer Select n: APTRn n:0-15 (APTR0 - APR15) | RW | 0x0 |

Table 8-1107. Register Call Summary for Register ISIF_FMTPGMAPS7

ISS ISP

- [ISS ISP ISIF Input Data Formatter: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-1108. ISIF_CSCCTL

| | | | |
|-------------------------|--------------------------------|-----------------|----------|
| Address Offset | 0x0000 01A4 | Instance | ISS_ISIF |
| Physical Address | 0x5201 11A4 | | |
| Description | Color Space Converter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|-------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | | | | | | | | | | | | | | | CSCEN | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | CSCEN | Controls ON/OFF of Color Space converter. 0x0: Disable 0x1: Enable | RW | 0 |

Table 8-1109. Register Call Summary for Register ISIF_CSCCTL

ISS ISP

- [ISS ISP ISIF Color Space Converter: \[0\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISIF Register Summary: \[2\]](#)

Table 8-1110. ISIF_CSCM0

| | | | |
|------------------|--------------------------------|----------|----------|
| Address Offset | 0x0000 01A8 | Instance | ISS_ISIF |
| Physical Address | 0x5201 11A8 | | |
| Description | Color Space Converter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CSCM01 | | | | | | | | CSCM00 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | CSCM01 | Color Space convert coefficient value M01: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |
| 7:0 | CSCM00 | Color Space convert coefficient value M00: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |

Table 8-1111. Register Call Summary for Register ISIF_CSCM0

ISS ISP

- [ISS ISP ISIF Color Space Converter: \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-1112. ISIF_CSCM1

| | | | |
|-------------------------|--------------------------------|-----------------|----------|
| Address Offset | 0x0000 01AC | Instance | ISS_ISIF |
| Physical Address | 0x5201 11AC | | |
| Description | Color Space Converter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CSCM03 | | | | | | | | CSCM02 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | CSCM03 | Color Space convert coefficient value M03: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |
| 7:0 | CSCM02 | Color Space convert coefficient value M02: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |

Table 8-1113. Register Call Summary for Register ISIF_CSCM1

ISS ISP

- [ISS ISP ISIF Color Space Converter: \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-1114. ISIF_CSCM2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 01B0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_ISIF | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 11B0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Color Space Converter Register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CSCM11 | | | | | | | | CSCM10 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | CSCM11 | Color Space convert coefficient value M11: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |
| 7:0 | CSCM10 | Color Space convert coefficient value M10: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |

Table 8-1115. Register Call Summary for Register ISIF_CSCM2

ISS ISP

- [ISS ISP ISIF Color Space Converter: \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-1116. ISIF_CSCM3

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 01B4 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_ISIF | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 11B4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Color Space Converter Register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CSCM13 | | | | | | | | CSCM12 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | CSCM13 | Color Space convert coefficient value M13: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |
| 7:0 | CSCM12 | Color Space convert coefficient value M12: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |

Table 8-1117. Register Call Summary for Register ISIF_CSCM3

ISS ISP

- [ISS ISP ISIF Color Space Converter: \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-1118. ISIF_CSCM4

| | | | |
|------------------|--------------------------------|----------|----------|
| Address Offset | 0x0000 01B8 | Instance | ISS_ISIF |
| Physical Address | 0x5201 11B8 | | |
| Description | Color Space Converter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CSCM21 | | | | | | | | CSCM20 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | CSCM21 | Color Space convert coefficient value M21: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |
| 7:0 | CSCM20 | Color Space convert coefficient value M20: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |

Table 8-1119. Register Call Summary for Register ISIF_CSCM4

ISS ISP

- [ISS ISP ISIF Color Space Converter: \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-1120. ISIF_CSCM5

| | | | |
|-------------------------|--------------------------------|-----------------|----------|
| Address Offset | 0x0000 01BC | Instance | ISS_ISIF |
| Physical Address | 0x5201 11BC | | |
| Description | Color Space Converter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CSCM23 | | | | | | | | CSCM22 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | CSCM23 | Color Space convert coefficient value M23: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |
| 7:0 | CSCM22 | Color Space convert coefficient value M22: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |

Table 8-1121. Register Call Summary for Register ISIF_CSCM5

ISS ISP

- [ISS ISP ISIF Color Space Converter: \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-1122. ISIF_CSCM6

| | | | |
|------------------|--------------------------------|----------|----------|
| Address Offset | 0x0000 01C0 | Instance | ISS_ISIF |
| Physical Address | 0x5201 11C0 | | |
| Description | Color Space Converter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CSCM31 | | | | | | | | CSCM30 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | CSCM31 | Color Space convert coefficient value M31: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |
| 7:0 | CSCM30 | Color Space convert coefficient value M30: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |

Table 8-1123. Register Call Summary for Register ISIF_CSCM6

ISS ISP

- [ISS ISP ISIF Color Space Converter: \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-1124. ISIF_CSCM7

| | | | |
|-------------------------|--------------------------------|-----------------|----------|
| Address Offset | 0x0000 01C4 | Instance | ISS_ISIF |
| Physical Address | 0x5201 11C4 | | |
| Description | Color Space Converter Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CSCM33 | | | | | | | | CSCM32 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | CSCM33 | Color Space convert coefficient value M33: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |
| 7:0 | CSCM32 | Color Space convert coefficient value M32: This value is signed 8-bit with the 5-bits decimal. | RW | 0x00 |

Table 8-1125. Register Call Summary for Register ISIF_CSCM7

ISS ISP

- [ISS ISP ISIF Color Space Converter: \[0\] \[1\]](#)
- [ISS ISP ISIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISIF Register Summary: \[3\]](#)

Table 8-1126. ISIF_CLKCTL

| | | | |
|-------------------------|-------------|-----------------|----------|
| Address Offset | 0x0000 01F8 | Instance | ISS_ISIF |
| Physical Address | 0x5201 11F8 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|--------|--------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | CLKEN1 | CLKEN2 | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1 | CLKEN1 | Forces isif_clken1 to be active. (Test mode) 0x0: normal mode 0x1: force isif_clken1 to be active | RW | 0 |
| 0 | CLKEN2 | Forces isif_clken2 to be active. (Test mode) 0x0: normal mode 0x1: force isif_clken2 to be active | RW | 0 |

Table 8-1127. Register Call Summary for Register ISIF_CLKCTL

ISS ISP

- [ISS ISIF Register Summary: \[0\]](#)

8.3.5.7 ISS IPIPEIF Registers

8.3.5.7.1 ISS IPIPEIF Register Summary

Table 8-1128. ISS IPIPEIF Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_IPIPEIF Base Address |
|----------------|------|-----------------------|----------------|--------------------------|
| IPIPEIF_ENABLE | RW | 32 | 0x0000 0000 | 0x5201 1200 |
| IPIPEIF_CFG1 | RW | 32 | 0x0000 0004 | 0x5201 1204 |
| IPIPEIF_PPLN | RW | 32 | 0x0000 0008 | 0x5201 1208 |
| IPIPEIF_LPFR | RW | 32 | 0x0000 000C | 0x5201 120C |
| IPIPEIF_HNUM | RW | 32 | 0x0000 0010 | 0x5201 1210 |
| IPIPEIF_VNUM | RW | 32 | 0x0000 0014 | 0x5201 1214 |
| IPIPEIF_ADDRU | RW | 32 | 0x0000 0018 | 0x5201 1218 |
| IPIPEIF_ADDRL | RW | 32 | 0x0000 001C | 0x5201 121C |
| IPIPEIF_ADOFS | RW | 32 | 0x0000 0020 | 0x5201 1220 |
| IPIPEIF_RSZ | RW | 32 | 0x0000 0024 | 0x5201 1224 |
| IPIPEIF_GAIN | RW | 32 | 0x0000 0028 | 0x5201 1228 |
| IPIPEIF_DPCM | RW | 32 | 0x0000 002C | 0x5201 122C |
| IPIPEIF_CFG2 | RW | 32 | 0x0000 0030 | 0x5201 1230 |
| IPIPEIF_INIRSZ | RW | 32 | 0x0000 0034 | 0x5201 1234 |
| IPIPEIF_OCLIP | RW | 32 | 0x0000 0038 | 0x5201 1238 |
| IPIPEIF_DTUDF | RW | 32 | 0x0000 003C | 0x5201 123C |
| IPIPEIF_CLKDIV | RW | 32 | 0x0000 0040 | 0x5201 1240 |

Table 8-1128. ISS IPIPEIF Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_IPIPEIF Base Address |
|----------------------------------|------|-----------------------|----------------|--------------------------|
| IPIPEIF_DPC1 | RW | 32 | 0x0000 0044 | 0x5201 1244 |
| IPIPEIF_DPC2 | RW | 32 | 0x0000 0048 | 0x5201 1248 |
| IPIPEIF_RSZ3A | RW | 32 | 0x0000 0054 | 0x5201 1254 |
| IPIPEIF_INIRSZ3A | RW | 32 | 0x0000 0058 | 0x5201 1258 |

8.3.5.7.2 ISS IPIPEIF Register Description**Table 8-1129. IPIPEIF_ENABLE**

| | | | |
|-------------------------|-----------------------------|-----------------|-------------|
| Address Offset | 0x0000 0000 | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 1200 | | |
| Description | IPIPEIF Enable. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|--------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SYNCOFF | | ENABLE | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | SYNCOFF | VD output mask This register masks the VD output to the IPIPE module. This can be useful when one wants to read data from SDRAM which are stored in a double buffer. If the VD is not masked each time we start the module an new VD will be generated to the IPIPEIF module. Let's consider two buffers A and B of N lines each. *This bit field is latched by VD. 0x0: VD output mask is disabled. 0x1: VD output mask is enabled. | RW | 0 |
| 0 | ENABLE | IPIPE I/F Enable This register is used to start the operation of SDRAM buffer memory read and generates SYNC signals. This register is available when INPSRC1 or INPSCR2 = 1, 2 or 3. 0x0: disable 0x1: enable | RW | 0 |

Table 8-1130. Register Call Summary for Register IPIPEIF_ENABLE**ISS ISP**

- [ISS ISP IPIPEIF Input Interface: \[0\]](#)
- [ISS ISP IPIPEIF Timing Generation: \[1\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[2\]](#)
- [ISS ISP IPIPEIF Enable/Disable Hardware: \[3\] \[4\] \[5\] \[6\]](#)
- [ISS ISP IPIPEIF Register Accessibility During Frame Processing: \[7\] \[8\] \[9\]](#)
- [ISS IPIPEIF Register Summary: \[10\]](#)

Table 8-1131. IPIPEIF_CFG1

| | | | |
|------------------|--------------------------|----------|-------------|
| Address Offset | 0x0000 0004 | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 1204 | | |
| Description | IPIPEIF Configuration #1 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|---------|----|----|----|--------|--------|---------|----------|---|---|---|---------|-------|---------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | INPSRC1 | DATASFT | | | | CLKSEL | UNPACK | AVGFILT | RESERVED | | | | INPSRC2 | DECIM | ONESHOT | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:14 | INPSRC1 | Selects the source for the mux (VPORT / ISIF / SDRAM) as well as the data format type. 0x0: VPORT_RAW 0x1: SDRAM_RAW 0x3: SDRAM_YUV 0x2: ISIF_DARKFM Input ports to DFS submodule are ISIF and SDRAM. | RW | 0x0 |
| 13:11 | DATASFT | SDRAM read data shift This register is available when INPSRC1 or INPSRC2 = 1 or 2, that is, when data are read from SDRAM. 0x6: Output data[11:0] = (read data[15:4] 4) 0x0FFF 0x1: Output data[11:0] = (read data[11:0] 1) 0x0FFF 0x7: Output data[11:0] = (read data[15:4] 4) 0x0FFF 0x0: Output data[11:0] = (read data[11:0]) 0x0FFF 0x2: Output data[11:0] = (read data[11:0] 2) 0x0FFF 0x4: Output data[11:0] = (read data[11:0] 4) 0x0FFF 0x5: Output data[11:0] = (read data[15:4] 4) 0x0FFF 0x3: Output data[11:0] = (read data[11:0] 3) 0x0FFF | RW | 0x0 |
| 10 | CLKSEL | IPIPEIF IPIPE module pixel clock selection. This register must be set to 1 when INPSRC1 or INPSRC2 = 1 or 3, that is, data are solely read from SDRAM (VPORT inactive). 0x0: Selects the pixel clock from the VPORT. 0x1: Selects the pixel clock from the fractional clock divider. The fractional clock divider value is setup with the IPIPEIF_CLKDIV register. | RW | 0 |
| 9:8 | UNPACK | 8-Bit, 12-bit Packed Mode When sensor raw data are stored in 8-bit packed mode or 12-bit packed mode, this register should code 1 or 3. This register is effective when INPSRC = 1 or 2. 0x0: 16 bits / pixel 0x1: 8 bits / pixel 0x3: 12 bits / pixel 0x2: 8 bits / pixel + inverse A law (8 bits to 10 bits) | RW | 0x0 |
| 7 | AVGFILT | Averaging Filter It applies (1,2,1) filter for the RGB/YCbCr data. *This bit field is latched by VD. 0x0: disable 0x1: enable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 6:4 | RESERVED | | R | 0x0 |
| 3:2 | INPSRC2 | Selects the source for the mux (ISIF / SDRAM) as well as the data format type. 0x0: ISIF 0x1: SDRAM_RAW 0x3: SDRAM_YUV 0x2: ISIF_DARKFM Input ports to DFS submodule are VPORT and SDRAM. | RW | 0x0 |
| 1 | DECIM | Pixel Decimation The decimation rate defined by RSZ register. *This bit field is latched by VD. 0x0: No decimation 0x1: Decimation | RW | 0 |
| 0 | ONESHOT | One Shot Mode This register is available when INPSRC = 1 or 3. 0x0: Continuous mode 0x1: One shot mode | RW | 0 |

Table 8-1132. Register Call Summary for Register IPIPEIF_CFG1

ISS ISP

- ISS ISP IPIPEIF Data Path Selection: [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17]
- ISS ISP IPIPEIF Timing Generation: [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28]
- ISS ISP IPIPEIF Decompression (DCPM) Subblock: Unpack and Decompression Function: [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41]
- ISS ISP IPIPEIF Dark-Frame Subtraction Functionality: [42] [43] [44] [45] [46]
- ISS ISP IPIPEIF (1, 2, 1) Averaging Filter for IPIPE Data Path: [47] [48] [49] [50] [51]
- ISS ISP IPIPEIF Horizontal Pixel Decimator (Downsizer) for IPIPE Data Path: [52]
- ISS ISP IPIPEIF YUV4:2:2 8-bits Packed Data Input Coming From ISIF Module: [53]
- ISS ISP IPIPEIF YUV4:2:0 Data Input for Memory-to-Memory Resize Operations: [54] [55] [56] [57] [58] [59] [60] [61]
- ISS ISP IPIPEIF Hardware Setup/Initialization: [62] [63] [64] [65] [66] [67] [68] [69] [70]
- ISS ISP IPIPEIF Enable/Disable Hardware: [71] [72] [73] [74] [75]
- ISS ISP IPIPEIF Register Accessibility During Frame Processing: [76] [77]
- ISS ISP IPIPEIF Summary of Constraints: [78] [79]
- ISS IPIPEIF Register Summary: [80]
- ISS IPIPEIF Register Description: [81] [82] [83] [84]

Table 8-1133. IPIPEIF_PPLN

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 0008 | Instance | ISS_IPPIPEIF |
| Physical Address | 0x5201 1208 | | |
| Description | IPIPEIF Interval of HD / Start pixel in HD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | PPLN | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | PPLN | Case-1: Interval of Horizontal Sync (HD) Specifies the interval of horizontal sync. This register is available when INPSRC = 1 or 3. Case-2: Start Pixel in Horizontal Sync (HD) Specifies the start pixel in horizontal sync. This register is available when INPSRC = 2 *This bit field is latched by VD. | RW | 0x0000 |

Table 8-1134. Register Call Summary for Register IPIPEIF_PPLN

ISS ISP

- [ISS ISP IPIPEIF Input Interface: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[4\]](#)
- [ISS ISP IPIPEIF Register Accessibility During Frame Processing: \[5\]](#)
- [ISS ISP IPIPEIF Summary of Constraints: \[6\]](#)
- [ISS IPIPEIF Register Summary: \[7\]](#)

Table 8-1135. IPIPEIF_LPFR

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 000C | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 120C | | |
| Description | IPIPEIF Interval of VD / Start line in VD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | LPFR | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | LPFR | Case-1: Interval of Vertical Sync (VD) Specifies the interval of vertical sync. This register is available when INPSRC = 1 or 3. Case-2: Start Pixel in Vertical Sync (VD) Specifies the start line in vertical sync. This register is available when INPSRC = 2 *This bit field is latched by VD. | RW | 0x0000 |

Table 8-1136. Register Call Summary for Register IPIPEIF_LPFR

ISS ISP

- [ISS ISP IPIPEIF Input Interface: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[5\]](#)
- [ISS ISP IPIPEIF Summary of Constraints: \[6\] \[7\]](#)
- [ISS IPIPEIF Register Summary: \[8\]](#)

Table 8-1137. IPIPEIF_HNUM

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 0010 | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 1210 | | |
| Description | IPIPEIF Number of valid pixels per line | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | HNUM | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12:0 | HNUM | The Number of Valid Pixels in a Line Specifies the number of valid pixels in a horizontal line. This register is available when INPSRC = 1, 2 or 3 *This bit field is latched by VD. | RW | 0x0000 |

Table 8-1138. Register Call Summary for Register IPIPEIF_HNUM

ISS ISP

- [ISS ISP IPIPEIF Input Interface: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[4\]](#)
- [ISS ISP IPIPEIF Register Accessibility During Frame Processing: \[5\]](#)
- [ISS ISP IPIPEIF Summary of Constraints: \[6\]](#)
- [ISS IPIPEIF Register Summary: \[7\]](#)

Table 8-1139. IPIPEIF_VNUM

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0014 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 1214 | | | | | | | | | | | | | | | | Instance | ISS_IPIPEIF | | | | | | | | | | | | | | | |
| Description | IPIPEIF Number of valid lines per frame | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VNUM | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:0 | VNUM | The Number of Valid Line in a Vertical Specifies the number of valid line in a vertical. This register is available when INPSRC = 1, 2 or 3 *This bit field is latched by VD. | RW | 0x0000 |

Table 8-1140. Register Call Summary for Register IPIPEIF_VNUM

ISS ISP

- [ISS ISP IPIPEIF Input Interface: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[4\]](#)
- [ISS ISP IPIPEIF Register Accessibility During Frame Processing: \[5\]](#)
- [ISS ISP IPIPEIF Summary of Constraints: \[6\]](#)
- [ISS IPIPEIF Register Summary: \[7\]](#)

Table 8-1141. IPIPEIF_ADDRU

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0018 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 1218 | | | | | | | | | | | | | | | | Instance | ISS_IPIPEIF | | | | | | | | | | | | | | | |
| Description | IPIPEIF Memory Address (Upper) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | ADDRU | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-----------|
| 31:11 | RESERVED | | R | 0x0000000 |
| 10:0 | ADDRU | Memory Address - Upper Memory address upper 11-bits are specified in units of 32-bytes This register is available when INPSRC = 1, 2 or 3. *This bit field is latched by VD. | RW | 0x000 |

Table 8-1142. Register Call Summary for Register IPIPEIF_ADDRU

ISS ISP

- [ISS ISP IPIPEIF Input Interface: \[0\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP IPIPEIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS IPIPEIF Register Summary: \[3\]](#)

Table 8-1143. IPIPEIF_ADDRL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--------------------------------|----|--|----|----|----|----|----|----|----|----|----|----|----|----|-------|----------|-------------|------|----|--------|---|---|---|---|---|---|---|---|---|---|--|--|
| Address Offset | 0x0000 001C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 121C | | | | | | | | | | | | | | | | Instance | ISS_IPIPEIF | | | | | | | | | | | | | | | |
| Description | IPIPEIF Memory Address (Lower) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | ADDRL | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | |
| 31:16 | RESERVED | | | | | | | | | | | | | | | | | | R | | 0x0000 | | | | | | | | | | | | |
| 15:0 | ADDRL | | Memory Address - Lower Memory address lower 16-bits are specified in units of 32-bytes. This register is available when INPSRC = 1, 2 or 3. *This bit field is latched by VD. | | | | | | | | | | | | | | | | RW | | 0x0000 | | | | | | | | | | | | |

Table 8-1144. Register Call Summary for Register IPIPEIF_ADDRL

ISS ISP

- [ISS ISP IPIPEIF Input Interface: \[0\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[1\]](#)
- [ISS IPIPEIF Register Summary: \[2\]](#)

Table 8-1145. IPIPEIF_ADOFS

| | | | |
|-------------------------|------------------------|-----------------|-------------|
| Address Offset | 0x0000 0020 | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 1220 | | |
| Description | IPIPEIF Address offset | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ADOFS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:0 | ADOFS | Specifies the SDRAM stride for each line in units of 32-bytes. This register is available when reading data from SDRAM: INPSRC1 or INPSRC2 = 1, 2 or 3. Assuming that the first line is at position ADDR, the second line is at address ADDR+ ADOFS, etc. *This bit field is latched by VD. | RW | 0x000 |

Table 8-1146. Register Call Summary for Register IPIPEIF_ADOFS

ISS ISP

- [ISS ISP IPIPEIF Input Interface: \[0\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP IPIPEIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS IPIPEIF Register Summary: \[3\]](#)

Table 8-1147. IPIPEIF_RSZ

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0024 | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 1224 | | |
| Description | IPIPEIF Horizontal Resizing Parameter on IPIPE data path | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RSZ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:7 | RESERVED | | R | 0x0000000 |
| 6:0 | RSZ | Horizontal Resizing Parameter for IPIPE data path Specifies the horizontal resizing parameter. The RSZ register can be configured within 16 to 112 range. This resizing ratio is determined by 16/RSZ (= 1/1 to 1/7) *This bit field is latched by VD. | RW | 0x10 |

Table 8-1148. Register Call Summary for Register IPIPEIF_RSZ

ISS ISP

- [ISS ISP IPIPEIF Horizontal Pixel Decimator \(Downsizer\) for IPIPE Data Path: \[0\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP IPIPEIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS IPIPEIF Register Summary: \[3\]](#)

Table 8-1149. IPIPEIF_GAIN

| | | | |
|-------------------------|------------------------|-----------------|-------------|
| Address Offset | 0x0000 0028 | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 1228 | | |
| Description | IPIPEIF Gain Parameter | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | GAIN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9:0 | GAIN | Gain Parameter Specifies the gain applied to RAW data before it is forwarded to the IPIPE module. The gain value is expressed using the U10Q9 fractional format. The range is from 0.00195 (1/512) to 1.99805(1023/512). By default the unity gain is applied, that is, IPIPEIF_GAIN.GAIN = 0x200. The gain is applied to RAW data only (IPIPEIF_CFG1.INPSRC2 != 3): the gain is not applied if the input data is YCbCr. *This bit field is latched by VD. | RW | 0x200 |

Table 8-1150. Register Call Summary for Register IPIPEIF_GAIN

ISS ISP

- [ISS ISP IPIPEIF RAW Data Gain for IPIPE Data Path: \[0\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[1\]](#)
- [ISS ISP IPIPEIF Register Accessibility During Frame Processing: \[2\]](#)
- [ISS IPIPEIF Register Summary: \[3\]](#)
- [ISS IPIPEIF Register Description: \[4\]](#)

Table 8-1151. IPIPEIF_DPCM

| | | | | | |
|-------------------------|---|--|-----------------|-------------|--|
| Address Offset | 0x0000 002C | | Instance | ISS_IPIPEIF | |
| Physical Address | 0x5201 122C | | | | |
| Description | IPIPEIF DPCM configuration This register applies only if IPIPEIF_CFG1.UNPACK = 1, that is, RAW8 data is read from SDRAM. | | | | |
| Type | RW | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BITS | | PRED | | ENA | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | BITS | DPCM bit mode for SDRAM data 0x0: 8bit to 10bit DPCM decompression 0x1: 8bit to 12bit DPCM decompression | RW | 0 |
| 1 | PRED | DPCM prediction mode for SDRAM data 0x0: Simple predictor 0x1: Advanced predictor | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | ENA | DPCM decompression enable for SDRAM data. 0x0: DPCM off (no decompression) 0x1: DPCM on | RW | 0 |

Table 8-1152. Register Call Summary for Register IPIPEIF_DPCM

ISS ISP

- [ISS ISP IPIPEIF Decompression \(DCPM\) Subblock: Unpack and Decompression Function: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[7\] \[8\] \[9\]](#)
- [ISS IPIPEIF Register Summary: \[10\]](#)

Table 8-1153. IPIPEIF_CFG2

| | | | |
|-------------------------|--------------------------|-----------------|--------------|
| Address Offset | 0x0000 0030 | Instance | ISS_IPPIPEIF |
| Physical Address | 0x5201 1230 | | |
| Description | IPIPEIF Configuration #2 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|------|----|--------|----|----------|---|-------|---|-------|---|-------|---|-------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | YUV8P | | YUV8 | | DFSDIR | | RESERVED | | YUV16 | | VDPOL | | HDPOL | | INTSW | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:8 | RESERVED | | R | 0x0000000 |
| 7 | YUV8P | 8-bit YUV data unpacking to 16 bits When IPIPEIF_CFG1.INPSRC2 = 0 and IPIPEIF_CFG2.YUV16 = 1, the 8-bit YUV data are transformed into 16-bit YUV data. The way the data are unpacked from 8 bits to 16 bits is controlled by the IPIPEIF_CFG2.YUV8P register. The upper 8 bits of the 16-bit output are set to 0. 0x0: Y output on even pixels C output on odd pixels 0x1: C output on even pixels Y output on odd pixels | RW | 0 |
| 6 | YUV8 | YUV 8bit mode When ISIF_CFG1.INPSRC2 = 0 and YUV16 = 1, setting this bit to 1 enables the conversion from 8-bit YUV input to 16-bit YUV. This register is used when the input data from the ISIF module is 8-bit YUV data. 0x0: YUV16 0x1: YUV8 to 16 | RW | 0 |
| 5 | DFSDIR | DFS direction Selects the direction of dark frame subtraction. 0x0: VPORT IF(capture frame) - SDRAM (dark frame) 0x1: SDRAM (capture frame) - VPORT IF(dark frame) | RW | 0 |
| 4 | RESERVED | Read returns reset value | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 3 | YUV16 | <p>Data type selection. The behavior of this bit field depends upon other register settings. The functionality is best explained with the following pseudo code:</p> <pre> if ((CFG1.INPSRC2==0 CFG2.YUV16) CFG1.INPSRC2==3) { data_out[15:0] = yuv[15:0] } else if (CFG1.INPSRC2==1 CFG2.YUV16 CFG1.UNPACK==1) { data_out[15:8] = gain_clip[7:0]; data_out[7:0] = 0; } else { data_out[15:12] = 0; data_out[11: 0] = gain_clip[11:0]; } </pre> <p>where:</p> <ul style="list-style-type: none"> o data_out[15:0] = 16-bit YUV or 12-bit RAW data to ipipe o yuv[15:0] = 16-bit YUV data from "horizontal pixel decimator" block. o gain_clip[11:0] = 12-bit RAW data from "gain" block. <p>0x0: 12-bit RAW data 0x1: 16-bit YUV data</p> | RW | 0 |
| 2 | VDPOL | <p>VD Sync Polarity When input VD is active low SYNC pulse, this bit needs to be set to 1.</p> <p>0x0: Positive 0x1: Negative</p> | RW | 0 |
| 1 | HDPOL | <p>HD Sync Polarity When input HD is active low SYNC pulse, this bit needs to be set to 1.</p> <p>0x0: Positive 0x1: Negative</p> | RW | 0 |
| 0 | INTSW | <p>IPIPEIF interrupt source selection. This register select the interrupt source.</p> <p>0x0: Start position of VD from VPORT interface 0x1: Start position of VD from ISIF module</p> | RW | 0 |

Table 8-1154. Register Call Summary for Register IPIPEIF_CFG2

ISS ISP

- [ISS ISP IPIPEIF Dark-Frame Subtraction Functionality: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [ISS ISP IPIPEIF \(1, 2, 1\) Averaging Filter for IPIPE Data Path: \[6\]](#)
- [ISS ISP IPIPEIF YUV4:2:2 8-bits Packed Data Input Coming From ISIF Module: \[7\] \[8\] \[9\]](#)
- [ISS ISP IPIPEIF YUV4:2:0 Data Input for Memory-to-Memory Resize Operations: \[10\] \[11\]](#)
- [ISS ISP IPIPEIF Module Events and Status Checking: \[12\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\]](#)
- [ISS IPIPEIF Register Summary: \[21\]](#)
- [ISS IPIPEIF Register Description: \[22\] \[23\]](#)

Table 8-1155. IPIPEIF_INIRSZ

| | | | |
|------------------|--|----------|-------------|
| Address Offset | 0x0000 0034 | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 1234 | | |
| Description | IPIPEIF resize initial position - IPIPE data path. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|--------|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | ALNSYNC | INIRSZ | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13 | ALNSYNC | Align the HSYNC, VSYNC to initial position defined by INIRSZ. 0x0: Disable 0x1: Enable | RW | 0 |
| 12:0 | INIRSZ | Offset used to re-initialize the HD/VD position after resizer. From 0 to 8191 PCLK cycles. Skips INIRSZ pixels for every line. | RW | 0x0000 |

Table 8-1156. Register Call Summary for Register IPIPEIF_INIRSZ

ISS ISP

- [ISS ISP IPIPEIF \(1, 2, 1\) Averaging Filter for IPIPE Data Path: \[0\]](#)
- [ISS ISP IPIPEIF Horizontal Pixel Decimator \(Downsizer\) for IPIPE Data Path: \[1\] \[2\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[3\] \[4\]](#)
- [ISS IPIPEIF Register Summary: \[5\]](#)

Table 8-1157. IPIPEIF_OCLIP

| | | | |
|-------------------------|-------------------------------|-----------------|-------------|
| Address Offset | 0x0000 0038 | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 1238 | | |
| Description | IPIPEIF output clipping value | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OCLIP | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:0 | OCLIP | Output clipping value after gain control on IPIPE data path. This value is in U12Q0 data format. | RW | 0xFFF |

Table 8-1158. Register Call Summary for Register IPIPEIF_OCLIP

ISS ISP

- [ISS ISP IPIPEIF RAW Data Gain for IPIPE Data Path: \[0\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[1\]](#)
- [ISS IPIPEIF Register Summary: \[2\]](#)

Table 8-1159. IPIPEIF_DTUDF

| | | | |
|------------------|----------------------------------|----------|-------------|
| Address Offset | 0x0000 003C | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 123C | | |
| Description | IPIPEIF data underflow detection | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | DTUDF |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | DTUDF | Data under flow error status register. Reading 1 shows there is data under flow and at least one data is corrupted while reading from SDRAM. Writing 1 to this register clears (=0) the error (=1) status. Underflow errors are non recoverable at ISP level, need to do a soft reset at ISS level. The IPIPEIF_UDF interrupt is generated when an underflow happens. The interrupt avoids polling this register for errors. | RW | 0 |

Table 8-1160. Register Call Summary for Register IPIPEIF_DTUDF

ISS ISP

- [ISS IPIPEIF Register Summary: \[0\]](#)

Table 8-1161. IPIPEIF_CLKDIV

| | | | |
|------------------|-----------------------|----------|-------------|
| Address Offset | 0x0000 0040 | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 1240 | | |
| Description | IPIPEIF CLOCK DIVIDER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLKDIV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | CLKDIV | IPIPEIF clock rate configuration IPIPE/IPIPEIF clock frequency = M/N x ISS_FCLK clock frequency. We have M = CLKDIV[15:8] + 1 and N = CLKDIV[7:0] + 1 This register is available when IPIPEIF_CFG1.CLKSEL = 1. | RW | 0x0001 |

Table 8-1162. Register Call Summary for Register IPIPEIF_CLKDIV

ISS ISP

- [ISS ISP IPIPEIF Timing Generation: \[0\] \[1\] \[2\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[3\]](#)
- [ISS IPIPEIF Register Summary: \[4\]](#)
- [ISS IPIPEIF Register Description: \[5\]](#)

Table 8-1163. IPIPEIF_DPC1

| | | | |
|------------------|------------------------------------|----------|-------------|
| Address Offset | 0x0000 0044 | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 1244 | | |
| Description | IPIPEIF defect pixel correction #1 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | ENA | TH | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:13 | RESERVED | | R | 0x0 |
| 12 | ENA | DPC enable. Applies DPC for video port data, ISIF input path. 0x0: Disable 0x1: Enable | RW | 0 |
| 11:0 | TH | DPC threshold value | RW | 0x000 |

Table 8-1164. Register Call Summary for Register IPIPEIF_DPC1

ISS ISP

- [ISS ISP IPIPEIF Dark-Frame Subtraction Functionality: \[0\] \[1\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[2\] \[3\]](#)
- [ISS IPIPEIF Register Summary: \[4\]](#)

Table 8-1165. IPIPEIF_DPC2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0048 | | | | | | | | | | | | | | | | Instance | ISS_IPIPEIF | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 1248 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | IPIPEIF defect pixel correction #2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | ENA | TH | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | ENA | DPC enable. Applies DPC for SDRAM input path. 0x0: Disable 0x1: Enable | RW | 0 |
| 11:0 | TH | DPC threshold value | RW | 0x000 |

Table 8-1166. Register Call Summary for Register IPIPEIF_DPC2

ISS ISP

- [ISS ISP IPIPEIF Dark-Frame Subtraction Functionality: \[0\] \[1\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[2\] \[3\]](#)
- [ISS IPIPEIF Register Summary: \[4\]](#)

Table 8-1167. IPIPEIF_RSZ3A

| | | | |
|------------------|---|----------|-------------|
| Address Offset | 0x0000 0054 | Instance | ISS_IPIPEIF |
| Physical Address | 0x5201 1254 | | |
| Description | IPIPEIF HORIZONTAL RESIZING PARAMETER FOR H3A | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|-------|---------|----------|-----|---|---|---|---|---|---|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | DECIM | AVGFILT | RESERVED | RSZ | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9 | DECIM | Pixel Decimation Enable The decimation rate defined by the RSZ bit field. *This bit field is latched by VD. 0x0: No Decimation 0x1: Decimate | RW | 0 |
| 8 | AVGFILT | Averaging Filter It applies a (1, 2, 1) filter for the RGB/YCbCr data. *This bit field is latched by VD. 0x0: Disable 0x1: Enable | RW | 0 |
| 7 | RESERVED | | R | 0 |
| 6:0 | RSZ | Horizontal Resizing Parameter for H3A data path Specifies the horizontal resizing parameter. The RSZ register can be configured within 16 to 112 range. This resizing ratio is determined by 16/RSZ (= 1/1 to 1/7) *This bit field is latched by VD. | RW | 0x10 |

Table 8-1168. Register Call Summary for Register IPIPEIF_RSZ3A

ISS ISP

- [ISS ISP IPIPEIF \(1, 2, 1\) Averaging Filter for H3A Data Path: \[0\] \[1\]](#)
- [ISS ISP IPIPEIF Horizontal Pixel Decimator \(Downsizer\) for H3A Data Path: \[2\] \[3\]](#)
- [ISS ISP IPIPEIF Hardware Setup/Initialization: \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [ISS ISP IPIPEIF Register Accessibility During Frame Processing: \[9\] \[10\] \[11\]](#)
- [ISS IPIPEIF Register Summary: \[12\]](#)

Table 8-1169. IPIPEIF_INIRSZ3A

| | | | |
|------------------|--|----------|-------------|
| Address Offset | 0x0000 0058 | | |
| Physical Address | 0x5201 1258 | Instance | ISS_IPIPEIF |
| Description | IPIPEIF resize initial position - H3A data path. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|--------|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | ALNSYNC | INIRSZ | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13 | ALNSYNC | Align the HD, VD to initial position defined by the INIRSZ bit field. It means that HD and VD are effectively shifted by INIRSZ pixel clock cycles. 0x0: Disable 0x1: Enable | RW | 0 |
| 12:0 | INIRSZ | Offset used to re-initialize the HD/VD position after resizer. From 0 to 8191 PCLK cycles. Skips INIRSZ pixels for every line. | RW | 0x0000 |

Table 8-1170. Register Call Summary for Register IPIPEIF_INIRSZ3A

ISS ISP

- [ISS ISP IPIPEIF Horizontal Pixel Decimator \(Downsizer\) for H3A Data Path: \[0\] \[1\]](#)
- [ISS IPIPEIF Register Summary: \[2\]](#)

8.3.5.8 ISS H3A Registers

8.3.5.8.1 ISS H3A Register Summary

Table 8-1171. ISS H3A Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_H3A Base Address |
|--------------------------------|------|-----------------------|----------------|----------------------|
| H3A_PID | R | 32 | 0x0000 0000 | 0x5201 1400 |
| H3A_PCR | RW | 32 | 0x0000 0004 | 0x5201 1404 |
| H3A_AFPAX1 | RW | 32 | 0x0000 0008 | 0x5201 1408 |
| H3A_AFPAX2 | RW | 32 | 0x0000 000C | 0x5201 140C |
| H3A_AFPAXSTART | RW | 32 | 0x0000 0010 | 0x5201 1410 |
| H3A_AFIIRSH | RW | 32 | 0x0000 0014 | 0x5201 1414 |
| H3A_AFBUFST | RW | 32 | 0x0000 0018 | 0x5201 1418 |
| H3A_AFCOEF010 | RW | 32 | 0x0000 001C | 0x5201 141C |
| H3A_AFCOEF032 | RW | 32 | 0x0000 0020 | 0x5201 1420 |
| H3A_AFCOEF054 | RW | 32 | 0x0000 0024 | 0x5201 1424 |
| H3A_AFCOEF076 | RW | 32 | 0x0000 0028 | 0x5201 1428 |
| H3A_AFCOEF098 | RW | 32 | 0x0000 002C | 0x5201 142C |
| H3A_AFCOEF0010 | RW | 32 | 0x0000 0030 | 0x5201 1430 |
| H3A_AFCOEF110 | RW | 32 | 0x0000 0034 | 0x5201 1434 |
| H3A_AFCOEF132 | RW | 32 | 0x0000 0038 | 0x5201 1438 |
| H3A_AFCOEF154 | RW | 32 | 0x0000 003C | 0x5201 143C |
| H3A_AFCOEF176 | RW | 32 | 0x0000 0040 | 0x5201 1440 |
| H3A_AFCOEF198 | RW | 32 | 0x0000 0044 | 0x5201 1444 |
| H3A_AFCOEF1010 | RW | 32 | 0x0000 0048 | 0x5201 1448 |
| H3A_AEWWIN1 | RW | 32 | 0x0000 004C | 0x5201 144C |
| H3A_AEWINSTART | RW | 32 | 0x0000 0050 | 0x5201 1450 |
| H3A_AEWINBLK | RW | 32 | 0x0000 0054 | 0x5201 1454 |
| H3A_AEWSUBWIN | RW | 32 | 0x0000 0058 | 0x5201 1458 |
| H3A_AEWBUFST | RW | 32 | 0x0000 005C | 0x5201 145C |
| H3A_AEWCFG | RW | 32 | 0x0000 0060 | 0x5201 1460 |
| H3A_LINE_START | RW | 32 | 0x0000 0064 | 0x5201 1464 |
| H3A_VFV_CFG1 | RW | 32 | 0x0000 0068 | 0x5201 1468 |
| H3A_VFV_CFG2 | RW | 32 | 0x0000 006C | 0x5201 146C |

Table 8-1171. ISS H3A Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | ISS_H3A Base Address |
|------------------------------|------|-----------------------|----------------|----------------------|
| H3A_VFV_CFG3 | RW | 32 | 0x0000 0070 | 0x5201 1470 |
| H3A_VFV_CFG4 | RW | 32 | 0x0000 0074 | 0x5201 1474 |
| H3A_HVF_THR | RW | 32 | 0x0000 0078 | 0x5201 1478 |
| H3A_ADVANCED | RW | 32 | 0x0000 007C | 0x5201 147C |

8.3.5.8.2 ISS H3A Register Description

Table 8-1172. H3A_PID

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0000 | Instance | ISS_H3A |
| Physical Address | 0x5201 1400 | | |
| Description | Peripheral Revision and Class Information | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------|----|----------|----|------|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|-------|----|----------|---|-------|---|---|---|---|---|---|---|
| SCHEME | | RESERVED | | FUNC | | | | | | | | | | | | RTL | | | | MAJOR | | RESERVED | | MINOR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|-------|
| 31:30 | SCHEME | | R | 0x1 |
| 29:28 | RESERVED | | R | 0x0 |
| 27:16 | FUNC | | R | 0xD01 |
| 15:11 | RTL | | R | 0x00 |
| 10:8 | MAJOR | | R | 0x0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5:0 | MINOR | | R | 0x00 |

Table 8-1173. Register Call Summary for Register H3A_PID

ISS ISP

- [ISS H3A Register Summary: \[0\]](#)

Table 8-1174. H3A_PCR

| | | | |
|-------------------------|-----------------------------|-----------------|---------|
| Address Offset | 0x0000 0004 | Instance | ISS_H3A |
| Physical Address | 0x5201 1404 | | |
| Description | Peripheral Control Register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------|----|----|----|----|----|----|----|-----|----|----------|------------|-----------|-------------|--------|--------|--------|--------|----|----|----|--------|---|---|---|---|---|---|---|-----------|------------|-------|
| AVE2LMT | | | | | | | | OVF | | AF_VF_EN | AEW_MED_EN | BUSYAEAWB | AEW_ALAW_EN | AEW_EN | BUSYAF | FVMODE | RGBPOS | | | | MED_TH | | | | | | | | AF_MED_EN | AF_ALAW_EN | AF_EN |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|-------|
| 31:22 | AVE2LMT | AE/AWB Saturation Limit This is the value that all sub sampled pixels in the AE/AWB engine are compared to. If the data is greater or equal to this data then the block is considered saturated. | RW | 0x3FF |
| 21 | OVF | H3A module overflow status bit. If the H3A module overflows it will keep sending data. The software can read this status bit during vertical blanking period to ensure that no overflow happened while writing out the data to SDRAM. There is also an interrupt at ISP level (H3A_OVF) which can be used to monitor this. 0x0: Read 0: No overflow pending Write 0: Status bit unchanged 0x1: Read 1: Overflow happened while writing out the data. Output data likely to be corrupted. Write 1: Clear the status bit. | RW | 0 |
| 20 | AF_VF_EN | AF Vertical Focus Enable 0x0: 4 Color Horizontal FV only 0x1: 1 Color Horizontal FV and 1 Color Vertical FV | RW | 0 |
| 19 | AEW_MED_EN | AE/AWB Median filter Enable If the median filter is enabled, then the 1st 2 and last 2 pixels in the frame are not filtered. 0x0: Disable Auto Focus median filter 0x1: Enable Auto Focus median filter | RW | 0 |
| 18 | BUSYAEAWB | Busy bit for AE/AWB | R | 0 |
| 17 | AEW_ALAW_EN | AE/AWB A-law Enable 0x0: Disable Auto exposure/white balance A-law table 0x1: Enable Auto exposure/white balance A-law table. | RW | 0 |
| 16 | AEW_EN | AE/AWB enable 0x0: Disable Auto exposure/white balance 0x1: Enable Auto exposure/white balance | RW | 0 |
| 15 | BUSYAF | Busy bit for AF. | R | 0 |
| 14 | FVMODE | Focus Value Accumulation Mode 0x0: Sum mode. 0x1: Peak mode. | RW | 0 |
| 13:11 | RGBPOS | Red, Green, and blue pixel location in the AF windows RGBPOS(0): GR and GB as Bayer pattern RGBPOS(1): RG and GB as Bayer pattern RGBPOS(2): GR and BG as Bayer pattern RGBPOS(3): RG and BG as Bayer pattern RGBPOS(4): GG and RB as custom pattern RGBPOS(5): RB and GG as custom pattern 6 and 7 are reserved This Value is only used if VF is disabled | RW | 0x0 |
| 10:3 | MED_TH | Median filter threshold. | RW | 0xFF |
| 2 | AF_MED_EN | Auto Focus Median filter Enable If the median filter is enabled, then the 1st 2 and last 2 pixels in the frame are not in the valid region. Therefore the paxel start/end and IIR filter start positions should not be set within the 1st and last 2 pixels. 0x0: Disable AF median filter. 0x1: Enable AF median filter. | RW | 0 |
| 1 | AF_ALAW_EN | AF A-law table enable 0x0: Disable Auto Focus A-law table 0x1: Enable Auto Focus A-law table | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | AF_EN | AF enable 0x0: Disable Auto Focus Engine 0x1: Enable Auto Focus Engine | RW | 0 |

Table 8-1175. Register Call Summary for Register H3A_PCR

ISS ISP

- [ISS ISP H3A Interrupts: \[0\]](#)
- [ISS ISP H3A Optional Preprocessing: \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP H3A Autofocus Engine: \[5\] \[6\] \[7\] \[8\]](#)
- [ISS ISP H3A AE/AWB Engine: \[9\]](#)
- [ISS ISP H3A Events and Status Checking: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\]](#)
- [ISS ISP H3A Enable/Disable Hardware: \[26\] \[27\] \[28\] \[29\]](#)
- [ISS ISP H3A Register Accessibility During Frame Processing: \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\]](#)
- [ISS ISP H3A Interframe Operations: \[37\]](#)
- [ISS H3A Register Summary: \[38\]](#)

Table 8-1176. H3A_AFPAX1

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0008 | Instance | ISS_H3A |
| Physical Address | 0x5201 1408 | | |
| Description | Setup for the AF Engine Paxel Configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | PAXW | | | | | | | | RESERVED | | | | | | | | PAXH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:16 | PAXW | AF Engine Paxel Width The width of the paxel is the value of this register plus 1 multiplied by 2. The minimum width is 16 pixels if the pixel clock is half or less of the ISS_FLCK clock. If the pixel clock is equal to the ISS_FLCK clock, the minimum width is 32 pixels. * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x00 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | PAXH | AF Engine Paxel Height The height of the paxel is the value of this register plus 1 multiplied by 2 with a final value of 2-256 (even) * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x00 |

Table 8-1177. Register Call Summary for Register H3A_AFPAX1

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[5\] \[6\]](#)
- [ISS ISP H3A Register Accessibility During Frame Processing: \[7\]](#)
- [ISS ISP H3A Summary of Constraints: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\]](#)
- [ISS H3A Register Summary: \[18\]](#)

Table 8-1178. H3A_AFPAX2

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 000C | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 140C | | | | | | | | | | | | | | | |
| Instance | ISS_H3A | | | | | | | | | | | | | | | |
| Description | Setup for the AF Engine Poxel Configuration | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|--------|----|----|----|-------|----|----|----|-------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | AFINCH | | | | AFINCV | | | | PAXVC | | | | PAXHC | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:21 | RESERVED | | R | 0x000 |
| 20:17 | AFINCH | AF Engine Column Increments Number of columns to increment in a paxel plus 1 multiplied by 2. Thus, the number of columns that can be skipped between two processed line pairs is 2-32 (even). The starting two columns in a paxel are first processed before this field is applied. This must be set so that there are at least 4 samples on a line when combined with the number of horizontal paxels. * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x0 |
| 16:13 | AFINCV | AF Engine Line Increments Number of lines to increment in a Poxel plus 1 multiplied by 2. Incrementing the line in a paxel is always done on a line pair due to the fact that the RGB pattern falls in two lines. If all the lines are to be processed, this field should be set to zero, and thus line count is incremented by 2 following a line pair. Thus, the number of lines that can be skipped between two processed line pairs is 0-30 (even). The starting two lines in a paxel are first processed before this field is applied. * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x0 |
| 12:6 | PAXVC | AF Engine Vertical Poxel Count The number of paxels in the vertical direction plus 1. The maximum number of vertical paxels in a frame should not exceed 128. The value should be set to ensure that the bandwidth requirements and buffer size are not exceeded. * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x00 |
| 5:0 | PAXHC | AF Engine Horizontal Poxel Count The number of paxels in the horizontal direction plus 1. It is illegal to set a number that is greater than 35 (total of 36 paxels in the horizontal direction). The minimum number of paxels should be 2 (valid range for the field is 1-35). * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x00 |

Table 8-1179. Register Call Summary for Register H3A_AFPAX2

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[7\] \[8\] \[9\] \[10\]](#)
- [ISS ISP H3A Register Accessibility During Frame Processing: \[11\]](#)
- [ISS ISP H3A Summary of Constraints: \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\]](#)
- [ISS H3A Register Summary: \[29\]](#)

Table 8-1180. H3A_AFPAXSTART

| | | | | |
|-------------------------|-------------------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0010 | | Instance | ISS_H3A |
| Physical Address | 0x5201 1410 | | | |
| Description | Start Position for AF Engine Paxels | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | PAXSH | | | | | | | | RESERVED | | | | | | | | PAXSV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | PAXSH | AF Engine Poxel Horizontal start position Range: 2-4094 PAXSH must be equal to or greater than (IIRSH + 2) This value must be even if Vertical mode is not enabled. If Vertical mode is enabled then the lower bit of PAXSH and IIRSH must be equal. * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | PAXSV | AF Engine Poxel Vertical start position Range: 0-4095 Sets the vertical line for the first poxel. This value must be greater then or equal to 8 if the vertical mode is enabled. * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x000 |

Table 8-1181. Register Call Summary for Register H3A_AFPAXSTART

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[5\] \[6\]](#)
- [ISS ISP H3A Register Accessibility During Frame Processing: \[7\]](#)
- [ISS ISP H3A Summary of Constraints: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [ISS H3A Register Summary: \[15\]](#)

Table 8-1182. H3A_AFIIRSH

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0014 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_H3A | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 1414 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Start Position for IIRSH | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | IIRSH | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:0 | IIRSH | AF Engine IIR Horizontal Start Position Range from 0-4094. When the horizontal position of a line equals this value the shift registers are cleared on the next pixel. This value must be even if Vertical mode is not enabled. If vertical mode is enabled then the lower bit must match the paxel horizontal start position. * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x000 |

Table 8-1183. Register Call Summary for Register H3A_AFIIRSH

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\] \[1\] \[2\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[3\]](#)
- [ISS ISP H3A Register Accessibility During Frame Processing: \[4\]](#)
- [ISS ISP H3A Summary of Constraints: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [ISS H3A Register Summary: \[15\]](#)

Table 8-1184. H3A_AFBUFST

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0018 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 1418 | | | | | | | | | | | | | | | | Instance | ISS_H3A | | | | | | | | | | | | | | | |
| Description | SDRAM destination address for AF engine statistics | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| AFBUFST | | | | | | | | | | | | | | | | | | | | | | | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:5 | AFBUFST | SDRAM destination address for AF engine statistics The SDRAM destination address for the AF statistics. The 6 LSBs are ignored, address must be on a 64-byte boundary. This field can be altered even when the AF is busy. Change will take place only for the next frame. However, note that reading this register will always give the latest value. | RW | 0x0000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-1185. Register Call Summary for Register H3A_AFBUFST

ISS ISP

- [ISS ISP H3A DMA Interface: \[0\] \[1\] \[2\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[3\]](#)
- [ISS ISP H3A Summary of Constraints: \[4\]](#)
- [ISS H3A Register Summary: \[5\]](#)

Table 8-1186. H3A_AFCOEF010

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 001C | Instance | ISS_H3A |
| Physical Address | 0x5201 141C | | |
| Description | IIR filter coefficient data for SET 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COEFF1 | | | | | | | | RESERVED | | | | | | | | COEFF0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | COEFF1 | AF Engine IIR filter Coefficient #1 (Set 0) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | COEFF0 | AF Engine IIR filter Coefficient #0 (Set 0) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |

Table 8-1187. Register Call Summary for Register H3A_AFCOEF010

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[1\]](#)
- [ISS H3A Register Summary: \[2\]](#)

Table 8-1188. H3A_AFCOEF032

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0020 | Instance | ISS_H3A |
| Physical Address | 0x5201 1420 | | |
| Description | IIR filter coefficient data for SET 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COEFF3 | | | | | | | | RESERVED | | | | | | | | COEFF2 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | COEFF3 | AF Engine IIR filter Coefficient #3 (Set 0) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | COEFF2 | AF Engine IIR filter Coefficient #2 (Set 0) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |

Table 8-1189. Register Call Summary for Register H3A_AFCOEF032

ISS ISP

- [ISS ISP H3A Hardware Setup/Initialization: \[0\]](#)
- [ISS H3A Register Summary: \[1\]](#)

Table 8-1190. H3A_AFCOEF054

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0024 | Instance | ISS_H3A |
| Physical Address | 0x5201 1424 | | |
| Description | IIR filter coefficient data for SET 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COEFF5 | | | | | | | | RESERVED | | | | | | | | COEFF4 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | COEFF5 | AF Engine IIR filter Coefficient #5 (Set 0) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | COEFF4 | AF Engine IIR filter Coefficient #4 (Set 0) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |

Table 8-1191. Register Call Summary for Register H3A_AFCOEF054

ISS ISP

- [ISS ISP H3A Hardware Setup/Initialization: \[0\]](#)
- [ISS H3A Register Summary: \[1\]](#)

Table 8-1192. H3A_AFCOEF076

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0028 | Instance | ISS_H3A |
| Physical Address | 0x5201 1428 | | |
| Description | IIR filter coefficient data for SET 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COEFF7 | | | | | | | | RESERVED | | | | | | | | COEFF6 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | COEFF7 | AF Engine IIR filter Coefficient #7 (Set 0) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | COEFF6 | AF Engine IIR filter Coefficient #6 (Set 0) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |

Table 8-1193. Register Call Summary for Register H3A_AFCOEF076

ISS ISP

- [ISS ISP H3A Hardware Setup/Initialization: \[0\]](#)
- [ISS H3A Register Summary: \[1\]](#)

Table 8-1194. H3A_AFCOEF098

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 002C | Instance | ISS_H3A |
| Physical Address | 0x5201 142C | | |
| Description | IIR filter coefficient data for SET 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COEFF9 | | | | | | | | RESERVED | | | | | | | | COEFF8 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | COEFF9 | AF Engine IIR filter Coefficient #9 (Set 0) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | COEFF8 | AF Engine IIR filter Coefficient #8 (Set 0) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |

Table 8-1195. Register Call Summary for Register H3A_AFCOEF098

ISS ISP

- [ISS ISP H3A Hardware Setup/Initialization: \[0\]](#)
- [ISS H3A Register Summary: \[1\]](#)

Table 8-1196. H3A_AFCOEF0010

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0030 | Instance | ISS_H3A |
| Physical Address | 0x5201 1430 | | |
| Description | IIR filter coefficient data for SET 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | COEFF10 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:0 | COEFF10 | AF Engine IIR filter Coefficient #10 (Set 0) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |

Table 8-1197. Register Call Summary for Register H3A_AFCOEF0010

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[1\]](#)
- [ISS H3A Register Summary: \[2\]](#)

Table 8-1198. H3A_AFCOEF110

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0034 | Instance | ISS_H3A |
| Physical Address | 0x5201 1434 | | |
| Description | IIR filter coefficient data for SET 1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COEFF1 | | | | | | | | RESERVED | | | | | | | | COEFF0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | COEFF1 | AF Engine IIR filter Coefficient #1 (Set 1) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | COEFF0 | AF Engine IIR filter Coefficient #0 (Set 1) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |

Table 8-1199. Register Call Summary for Register H3A_AFCOEF110

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[1\]](#)
- [ISS H3A Register Summary: \[2\]](#)

Table 8-1200. H3A_AFCOEF132

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0038 | Instance | ISS_H3A |
| Physical Address | 0x5201 1438 | | |
| Description | IIR filter coefficient data for SET 1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COEFF3 | | | | | | | | RESERVED | | | | | | | | COEFF2 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | COEFF3 | AF Engine IIR filter Coefficient #3 (Set 1) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | COEFF2 | AF Engine IIR filter Coefficient #2 (Set 1) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |

Table 8-1201. Register Call Summary for Register H3A_AFCOEF132

ISS ISP

- [ISS ISP H3A Hardware Setup/Initialization: \[0\]](#)
- [ISS H3A Register Summary: \[1\]](#)

Table 8-1202. H3A_AFCOEF154

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 003C | Instance | ISS_H3A |
| Physical Address | 0x5201 143C | | |
| Description | IIR filter coefficient data for SET 1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COEFF5 | | | | | | | | RESERVED | | | | | | | | COEFF4 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | COEFF5 | AF Engine IIR filter Coefficient #5 (Set 1) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | COEFF4 | AF Engine IIR filter Coefficient #4 (Set 1) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |

Table 8-1203. Register Call Summary for Register H3A_AFCOEF154

ISS ISP

- [ISS ISP H3A Hardware Setup/Initialization: \[0\]](#)
- [ISS H3A Register Summary: \[1\]](#)

Table 8-1204. H3A_AFCOEF176

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0040 | Instance | ISS_H3A |
| Physical Address | 0x5201 1440 | | |
| Description | IIR filter coefficient data for SET 1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COEFF7 | | | | | | | | RESERVED | | | | | | | | COEFF6 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | COEFF7 | AF Engine IIR filter Coefficient #7 (Set 1) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | COEFF6 | AF Engine IIR filter Coefficient #6 (Set 1) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |

Table 8-1205. Register Call Summary for Register H3A_AFCOEF176

ISS ISP

- [ISS ISP H3A Hardware Setup/Initialization: \[0\]](#)
- [ISS H3A Register Summary: \[1\]](#)

Table 8-1206. H3A_AFCOE198

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0044 | Instance | ISS_H3A |
| Physical Address | 0x5201 1444 | | |
| Description | IIR filter coefficient data for SET 1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COEFF9 | | | | | | | | RESERVED | | | | | | | | COEFF8 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | COEFF9 | AF Engine IIR filter Coefficient #9 (Set 1) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | COEFF8 | AF Engine IIR filter Coefficient #8 (Set 1) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |

Table 8-1207. Register Call Summary for Register H3A_AFCOE198

ISS ISP

- [ISS ISP H3A Hardware Setup/Initialization: \[0\]](#)
- [ISS H3A Register Summary: \[1\]](#)

Table 8-1208. H3A_AFCOE1010

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0048 | Instance | ISS_H3A |
| Physical Address | 0x5201 1448 | | |
| Description | IIR filter coefficient data for SET 1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | COEFF10 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:0 | COEFF10 | AF Engine IIR filter Coefficient #10 (Set 1) The range is signed -32 = value = 31 +63/64 | RW | 0x000 |

Table 8-1209. Register Call Summary for Register H3A_AFCOE1010

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[1\]](#)
- [ISS H3A Register Summary: \[2\]](#)

Table 8-1210. H3A_AEWWIN1

| | | | |
|-------------------------|-----------------------------------|-----------------|---------|
| Address Offset | 0x0000 004C | Instance | ISS_H3A |
| Physical Address | 0x5201 144C | | |
| Description | Configuration for AE/AWB Windows. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----------|------|----|----|----|----|----|----|----|-------|----|----|----|----|---|---|---|-------|---|---|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| WINH | | | | | | | | RESERVED | WINW | | | | | | | | WINVC | | | | | | | | WINHC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:24 | WINH | AE/AWB Engine Window Height This specifies the window height in an even number of pixels, the window height is the value plus 1 multiplied by 2. The final value can be from 2-512 (even) * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x00 |
| 23:21 | RESERVED | | R | 0x0 |
| 20:13 | WINW | AE/AWB Engine Window Width This specifies the window width in an even number of pixels, the window width is the value plus 1 multiplied by 2. The minimum width is 16 pixels if the pixel clock is half or less of the ISS_FLCK clock. If the pixel clock is equal to the ISS_FLCK clock, the minimum width is 32 pixels. * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x00 |
| 12:6 | WINVC | AE/AWB Engine Vertical Window Count The number of windows in the vertical direction plus 1. The maximum number of vertical windows in a frame should not exceed 128. The value should be set to ensure that the bandwidth requirements and buffer size are not exceeded * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x00 |
| 5:0 | WINHC | AE/AWB Engine Horizontal Window Count The number of horizontal windows plus 1. The maximum number of horizontal windows is 35 plus 1 (36). The minimum number of windows should be 2 (valid range for the field is 1-35). * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x00 |

Table 8-1211. Register Call Summary for Register H3A_AEWWIN1

ISS ISP

- [ISS ISP H3A AE/AWB Engine: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[8\] \[9\] \[10\] \[11\]](#)
- [ISS ISP H3A Register Accessibility During Frame Processing: \[12\]](#)
- [ISS ISP H3A Summary of Constraints: \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\]](#)
- [ISS H3A Register Summary: \[23\]](#)

Table 8-1212. H3A_AEWINSTART

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0050 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5201 1450 | | | | | | | | | | | | | | | | InstanceISS_H3A | | | | | | | | | | | | | | | |
| Description | Start position for AE/AWB Windows. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|-------|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | WINSV | | | | | | | | | | | | RESERVED | | | | WINSH | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | WINSV | AE/AWB Engine Vertical Window Start Position Sets the first line for the first window. Range 0-4095 * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | WINSH | AE/AWB Engine Horizontal Window Start Position Sets the horizontal position for the first window on each line. Range 0-4095 * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x000 |

Table 8-1213. Register Call Summary for Register H3A_AEWINSTART

ISS ISP

- [ISS ISP H3A AE/AWB Engine: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[4\] \[5\]](#)
- [ISS ISP H3A Register Accessibility During Frame Processing: \[6\]](#)
- [ISS H3A Register Summary: \[7\]](#)

Table 8-1214. H3A_AEWINBLK

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0054 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | | 0x5201 1454 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | ISS_H3A | | | | | | | | | | | | | | | |
| Description | | Start position and height for black line of AE/AWB Windows | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
| RESERVED | | | | | | | | WINSV | | | | | | | | RESERVED | | | | | | | | | | | | | | | | WINH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | WINSV | AE/AWB Engine Vertical Window Start Position for single black line of windows Sets the first line for the single black line of windows. * This value is shadowed and latched on the rising edge of VSYNC. Range 0-4095 Note that the horizontal start and the horizontal number of windows will be similar to the regular windows | RW | 0x000 |
| 15:7 | RESERVED | | R | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 6:0 | WINH | AE/AWB Engine Window Height for the single black line of windows This specifies the window height in an even number of pixels, the window height is the value plus 1 multiplied by 2. The final value can be from 2-256 (even) * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x00 |

Table 8-1215. Register Call Summary for Register H3A_AEWINBLK

ISS ISP

- [ISS ISP H3A AE/AWB Engine: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[4\] \[5\]](#)
- [ISS ISP H3A Register Accessibility During Frame Processing: \[6\]](#)
- [ISS ISP H3A Summary of Constraints: \[7\] \[8\]](#)
- [ISS H3A Register Summary: \[9\]](#)

Table 8-1216. H3A_AEWSUBWIN

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0058 | Instance | ISS_H3A |
| Physical Address | 0x5201 1458 | | |
| Description | Configuration for subsample data in AE/AWB window. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----------|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | AEWINCV | | | | RESERVED | | | | AEWINCH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------|
| 31:12 | RESERVED | | R | 0x000000 |
| 11:8 | AEWINCV | AE/AWB Engine Vertical Sampling Point Increment Sets vertical distance between sub-samples within a window plus 1 multiplied by 2. The final range is 2-32. * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x0 |
| 7:4 | RESERVED | | R | 0x0 |
| 3:0 | AEWINCH | AE/AWB Engine Horizontal Sampling Point Increment Sets horizontal distance between sub-samples within a window plus 1 multiplied by 2. The final range is 2-32. * This value is shadowed and latched on the rising edge of VSYNC. | RW | 0x0 |

Table 8-1217. Register Call Summary for Register H3A_AEWSUBWIN

ISS ISP

- [ISS ISP H3A AE/AWB Engine: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[4\] \[5\]](#)
- [ISS ISP H3A Register Accessibility During Frame Processing: \[6\]](#)
- [ISS ISP H3A Summary of Constraints: \[7\]](#)
- [ISS H3A Register Summary: \[8\]](#)

Table 8-1218. H3A_AEWBUFST

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 005C | Instance | ISS_H3A |
| Physical Address | 0x5201 145C | | |
| Description | SDRAM destination address for AE/AWB engine statistics | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| AEWBUFST | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:5 | AEWBUFST | SDRAM destination address for AE/AWB engine statistics The start location in SDRAM for the AE/AWB statistics. The 6 LSB are ignored, address should be on a 64-byte boundary This field can be altered even when the AE/AWB is busy. Change will take place only for the next frame. However, note that reading this register will always give the latest value. | RW | 0x0000000 |
| 4:0 | RESERVED | | R | 0x00 |

Table 8-1219. Register Call Summary for Register H3A_AEWBUFST

ISS ISP

- [ISS ISP H3A DMA Interface: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[28\]](#)
- [ISS ISP H3A Register Accessibility During Frame Processing: \[29\]](#)
- [ISS H3A Register Summary: \[30\]](#)

Table 8-1220. H3A_AEWCFG

| | | | |
|-------------------------|--------------------------|-----------------|---------|
| Address Offset | 0x0000 0060 | Instance | ISS_H3A |
| Physical Address | 0x5201 1460 | | |
| Description | Configuration for AE/AWB | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----------|----|----|----|---------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | AEFMT | | RESERVED | | | | SUMSHFT | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-----------|
| 31:10 | RESERVED | | R | 0x0000000 |
| 9:8 | AEFMT | AE/AWB output format 0 = sum of squares 1 = min/max 2 = sum only; no sum of squares or min/max * This value is shadowed and latched on the rising edge of VSYNC | RW | 0x0 |
| 7:4 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 3:0 | SUMSHFT | <p>AE/AWB engine shift value for the accumulation of pixel values</p> <p>This bit field sets the right shift value which is applied on the result of the pixel accumulation before it is stored in the packet. The accumulation takes place on 26 bits which is enough for 10-bit data and a maximum widow size of 512 x 512 which results into the accumulation of 256 x 256 pixels of the same color. The shift value must be set such that the result fits on 16 bits.</p> <p>SUMSHFT = right shift value.</p> <p>Range: 0 -15</p> <p>* This value is shadowed and latched on the rising edge of VSYNC</p> | RW | 0x0 |

Table 8-1221. Register Call Summary for Register H3A_AEWCFG

ISS ISP

- [ISS ISP H3A AE/AWB Engine: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS ISP H3A DMA Interface: \[5\] \[6\] \[7\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[8\] \[9\]](#)
- [ISS ISP H3A Register Accessibility During Frame Processing: \[10\]](#)
- [ISS H3A Register Summary: \[11\]](#)

Table 8-1222. H3A_LINE_START

| Address Offset | 0x0000 0064 | | | | | | | | | | | | | | | Instance | ISS_H3A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|----|---|----|------|--------|----|----|----|----|----|----|----|----|----|------------|---------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Physical Address | 0x5201 1464 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Line Framing Logic Register In certain cases the number of clock cycles between HD pulses will be greater than the line buffer included in the H3A module. The framing module prior to the line buffer enables to control the data which is input to the line buffer. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">SLV</td><td colspan="16">LINE_START</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | SLV | | | | | | | | | | | | | | | | LINE_START | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLV | | | | | | | | | | | | | | | | LINE_START | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:16 | SLV | | Start Line Vertical Specifies how many lines after the VD rising edge the real frame starts. | | W | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15:0 | LINE_START | | Line Start The framing module uses the LINE_START bit field to find the position of the first pixel to place into the line buffer. Range: 0-65535 | | RW | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-1223. Register Call Summary for Register H3A_LINE_START

ISS ISP

- [ISS ISP H3A Line Framing Logic: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS ISP H3A Autofocus Engine: \[4\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[5\] \[6\] \[7\] \[8\]](#)
- [ISS H3A Register Summary: \[9\]](#)

Table 8-1224. H3A_VFV_CFG1

| | | | |
|-------------------------|---------------------------------------|-----------------|---------|
| Address Offset | 0x0000 0068 | Instance | ISS_H3A |
| Physical Address | 0x5201 1468 | | |
| Description | Vertical focus value configuration 1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VCOEF1_3 | | | | | | | | VCOEF1_2 | | | | | | | | VCOEF1_1 | | | | | | | | VCOEF1_0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------------------------|------|-------|
| 31:24 | VCOEF1_3 | Vertical FV FIR 1 coefficient 3 | RW | 0x00 |
| 23:16 | VCOEF1_2 | Vertical FV FIR 1 coefficient 2 | RW | 0x00 |
| 15:8 | VCOEF1_1 | Vertical FV FIR 1 coefficient 1 | RW | 0x00 |
| 7:0 | VCOEF1_0 | Vertical FV FIR 1 coefficient 0 | RW | 0x00 |

Table 8-1225. Register Call Summary for Register H3A_VFV_CFG1

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[1\]](#)
- [ISS H3A Register Summary: \[2\]](#)

Table 8-1226. H3A_VFV_CFG2

| | | | |
|-------------------------|---------------------------------------|-----------------|---------|
| Address Offset | 0x0000 006C | Instance | ISS_H3A |
| Physical Address | 0x5201 146C | | |
| Description | Vertical focus value configuration 2. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VTHR1 | | | | | | | | RESERVED | | | | | | | | VCOEF1_4 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------------------------|------|--------|
| 31:16 | VTHR1 | Threshold for vertical FV FIR 1 | RW | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | VCOEF1_4 | Vertical FV FIR 1 coefficient 4 | RW | 0x00 |

Table 8-1227. Register Call Summary for Register H3A_VFV_CFG2

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\] \[1\] \[2\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[3\]](#)
- [ISS H3A Register Summary: \[4\]](#)

Table 8-1228. H3A_VFV_CFG3

| | | | |
|-------------------------|---------------------------------------|-----------------|---------|
| Address Offset | 0x0000 0070 | | |
| Physical Address | 0x5201 1470 | Instance | ISS_H3A |
| Description | Vertical focus value configuration 4. | | |
| Type | RW | | |

| | | | |
|-------------------------|-------------------------|-----------------------|-----------------|
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| VCOEF2_3 | VCOEF2_2 | VCOEF2_1 | VCOEF2_0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------------------------|------|-------|
| 31:24 | VCOEF2_3 | Vertical FV FIR 2 coefficient 3 | RW | 0x00 |
| 23:16 | VCOEF2_2 | Vertical FV FIR 2 coefficient 2 | RW | 0x00 |
| 15:8 | VCOEF2_1 | Vertical FV FIR 2 coefficient 1 | RW | 0x00 |
| 7:0 | VCOEF2_0 | Vertical FV FIR 2 coefficient 0 | RW | 0x00 |

Table 8-1229. Register Call Summary for Register H3A_VFV_CFG3

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[1\]](#)
- [ISS H3A Register Summary: \[2\]](#)

Table 8-1230. H3A_VFV_CFG4

| | | | |
|-------------------------|---------------------------------------|-----------------|---------|
| Address Offset | 0x0000 0074 | | |
| Physical Address | 0x5201 1474 | Instance | ISS_H3A |
| Description | Vertical focus value configuration 4. | | |
| Type | RW | | |

| | | | |
|-------------------------|-------------------------|-----------------------|-----------------|
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| VTHR2 | | | |
| RESERVED | | | |
| VCOEF2_4 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------------------------|------|--------|
| 31:16 | VTHR2 | Threshold for vertical FV FIR 2 | RW | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:0 | VCOEF2_4 | Vertical FV FIR 2 coefficient 4 | RW | 0x00 |

Table 8-1231. Register Call Summary for Register H3A_VFV_CFG4

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\] \[1\] \[2\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[3\]](#)
- [ISS H3A Register Summary: \[4\]](#)

Table 8-1232. H3A_HVF_THR

| | | | |
|-------------------------|----------------------------------|-----------------|---------|
| Address Offset | 0x0000 0078 | Instance | ISS_H3A |
| Physical Address | 0x5201 1478 | | |
| Description | Horizontal Focus Value Threshold | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HTHR2 | | | | | | | | | | | | | | | | HTHR1 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-----------------------------------|------|--------|
| 31:16 | HTHR2 | Threshold for horizontal FV IIR 2 | RW | 0x0000 |
| 15:0 | HTHR1 | Threshold for horizontal FV IIR 1 | RW | 0x0000 |

Table 8-1233. Register Call Summary for Register H3A_HVF_THR

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\] \[1\]](#)
- [ISS ISP H3A Hardware Setup/Initialization: \[2\] \[3\]](#)
- [ISS H3A Register Summary: \[4\]](#)

Table 8-1234. H3A_ADVANCED

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 007C | Instance | ISS_H3A |
| Physical Address | 0x5201 147C | | |
| Description | Normal and Advanced AF stats collection mode | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| ID | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | AF_MODE |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | ID | 0x0: This bit field must be set to 0xCA00 to enable AF advanced mode. | RW | 0x00000 |
| 14:1 | RESERVED | | R | 0x0000 |
| 0 | AF_MODE | AF engine mode. 0x0: Normal Mode 0x1: Advanced mode. H3A_ADVANCED.ID must be set to 0xCA00 to enable this functionality. | RW | 0 |

Table 8-1235. Register Call Summary for Register H3A_ADVANCED

ISS ISP

- [ISS ISP H3A Autofocus Engine: \[0\] \[1\]](#)
- [ISS H3A Register Summary: \[2\]](#)
- [ISS H3A Register Description: \[3\]](#)

8.4 ISS Still Image Coprocessor

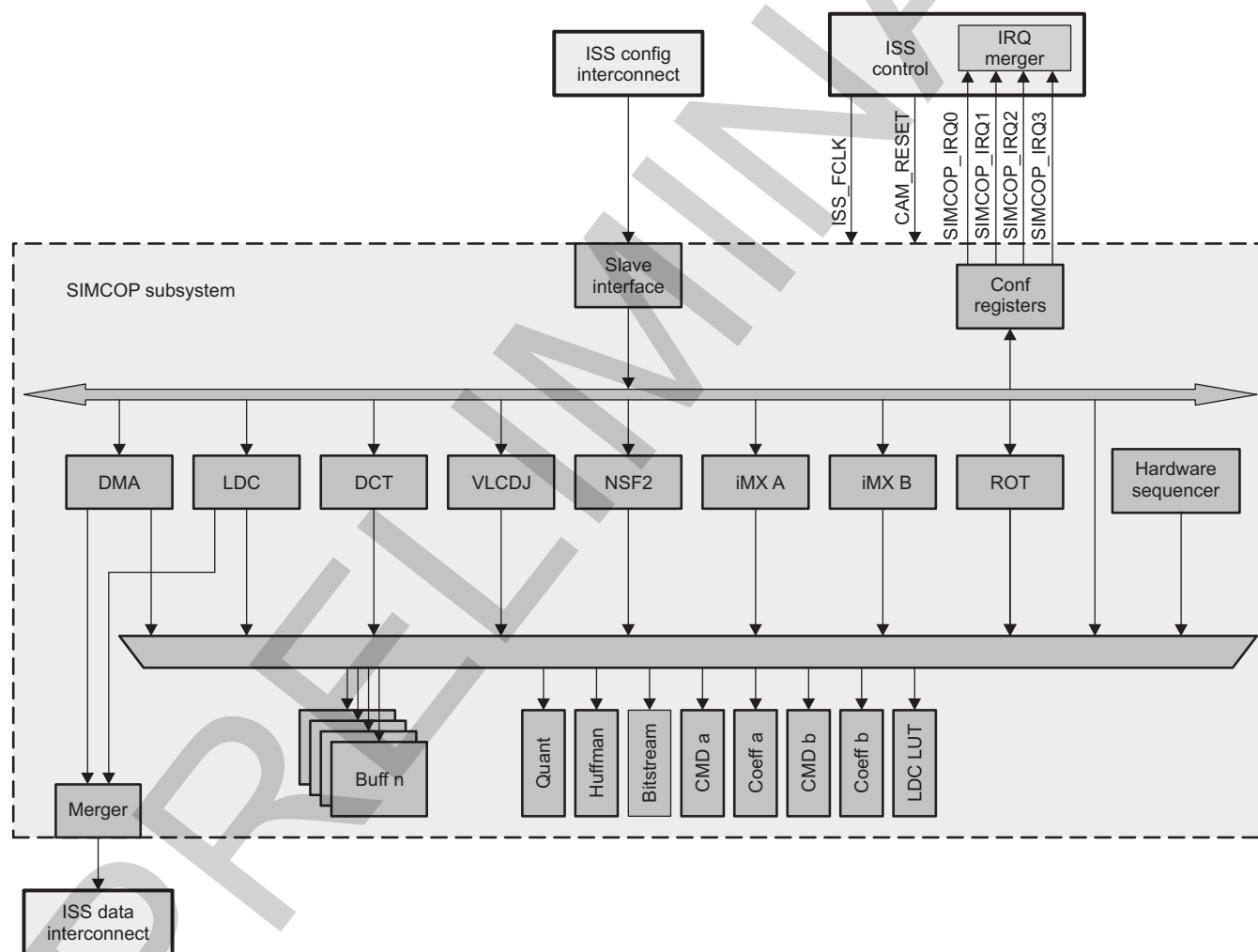
This section gives a high-level description of the ISS still iMage coprocessor (SIMCOP) in the device. For a high-level description of ISS level, see [Section 8.1, ISS: Overview](#).

8.4.1 ISS SIMCOP Overview

The SIMCOP subsystem is designed to encode, decode, and process image data. The SIMCOP is a macroblock-based memory-to-memory processing engine. It fetches macroblocks from system memory and stores them into local memories. Different accelerators take the fetched data, perform processing, and send the processing outcome back to local memories. From there the data could be further processed by other accelerators or be sent back to system memory. The SIMCOP needs an external central processing unit (CPU) to perform high-level control tasks and configurations. The SIMCOP is closely coupled to a CPU for that purpose.

Figure 8-243 shows a block diagram of the SIMCOP subsystem.

Figure 8-243. SIMCOP Subsystem Overview



simcop-002

The ISS SIMCOP subsystem consists of:

- Noise filter (NSF2) for advanced noise filtering and an edge-enhancement
- Two image and video processing engines (iMXs) supplement various fixed-function processing blocks
- Variable-length coder/decoder for JPEG (VLCDJ) module handles quantization and variable length coding, decoding and inverse quantization
- Discrete cosine transform (DCT) module implements method in the compression flow to transform

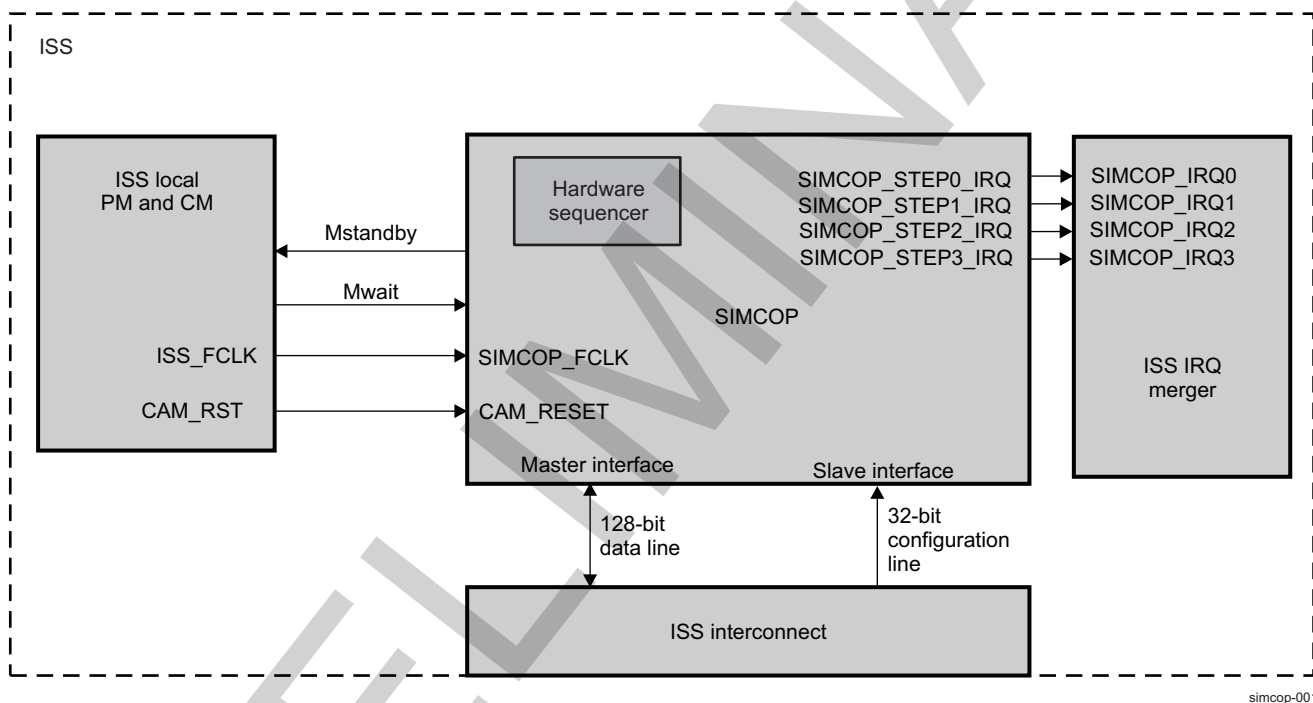
blocks of image

- Lens distortion correction (LDC) module deals with lens geometric distortion issues in the camera subsystem
- Rotation accelerator (ROT) engine blocks data rotation and shifting from a SIMCOP local memory to another SIMCOP local memory
- Hardware sequencer and buffers control SIMCOP modules/buffers to offload an external processor to perform low-level sequencing tasks
- Direct memory access (DMA) controller data transfers from SIMCOP memories to system memory or from system memory to SIMCOP memories

8.4.1.1 ISS SIMCOP Integration

The SIMCOP subsystem is connected to the rest of the system through the ISS local interconnect. [Figure 8-244](#) shows the integration of the SIMCOP subsystem in the ISS.

Figure 8-244. SIMCOP Integration



simcop-001

NOTE: For more information about the IDLE hardware handshake and the wake-up request, see [Section 3.1.1.1, Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

This section gives an overview of typical uses of the module. See [Chapter 3, Power, Reset, and Clock Management](#), for more information and settings of the PRCM relationship to ISS clocks and resets.

[Table 8-1236](#) lists the integration attributes.

Table 8-1236. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| SIMCOP | PD_CAM | |

Table 8-1237 lists the clocks and resets values.

Table 8-1237. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| SIMCOP | SIMCOP_FCLK | ISS_FCLK | PRCM | Functional clock provided by ISS_CLK from the PRCM module. It is used by all ISS submodules and ISS top-level resources. |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| SIMCOP | CAM_RESET | CAM_RST | PRCM | ISS and SIMCOP global reset |

Table 8-1238 lists the hardware resets.

Table 8-1238. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| SIMCOP | SIMCOP_STEP_0_IRQ | SIMCOP_IRQ0 | SIMCOP IRQ merger | Event triggered when a SIMCOP context is activated by the hardware sequencer |
| SIMCOP | SIMCOP_STEP_1_IRQ | SIMCOP_IRQ1 | SIMCOP IRQ merger | Event triggered when a SIMCOP context is activated by the hardware sequencer |
| SIMCOP | SIMCOP_STEP_2_IRQ | SIMCOP_IRQ2 | SIMCOP IRQ merger | Event triggered when a SIMCOP context is activated by the hardware sequencer |
| SIMCOP | SIMCOP_STEP_3_IRQ | SIMCOP_IRQ3 | SIMCOP IRQ merger | Event triggered when a SIMCOP context is activated by the hardware sequencer |

For more information about interrupt requests, see [Section 8.4.1.2.3, Interrupt Merger](#).

8.4.1.2 ISS SIMCOP Functional Description

8.4.1.2.1 ISS SIMCOP Local Power and Clock Management

8.4.1.2.1.1 ISS SIMCOP Local Clock Management

ISS has five asynchronous clock domains. The SIMCOP belongs to the ISS_FCLK clock domain.

An externally provided clock-enable signal is used. Multiple subdomains exist internally to reduce dynamic power consumption. This feature does not require intervention by the PRCM module. For high-level description of the SIMCOP clock domain and configuration inside ISS, see [Section 8.1.2.2, ISS Clocks](#).

Moreover, at high level the functional clock of ISS SIMCOP submodules can be cut by software to reduce power consumption by cutting off or turning on the modules from the [SIMCOP_CLKCTRL](#) register (see [Table 8-1239](#)).

When software wants to enable a submodule:

- Software sets the adequate bit in the [SIMCOP_CLKCTRL](#) register.
- Hardware enables the submodule functional and interface clocks.
- Hardware connects the configuration port of the submodule to the coprocessor bus.
- Hardware sets the appropriate bit in the [SIMCOP_CLKCTRL](#) register. Software must check if this bit is set before accessing the submodule.

[Table 8-1239](#) lists the ISS SIMCOP clock control register settings.

Table 8-1239. ISS SIMCOP Clock Control Register Settings

| Module Name | Bit Field Name | Description |
|-------------|--|--------------------------------|
| ROT | SIMCOP_CLKCTRL [7] ROT_A | Writing 0x1 enables the module |
| iMX B | SIMCOP_CLKCTRL [6] IMX_B | Writing 0x1 enables the module |
| iMX A | SIMCOP_CLKCTRL [5] IMX_A | Writing 0x1 enables the module |
| NSF2 | SIMCOP_CLKCTRL [4] NSF2 | Writing 0x1 enables the module |
| VLCDJ | SIMCOP_CLKCTRL [3] VLCDJ | Writing 0x1 enables the module |
| DCT | SIMCOP_CLKCTRL [2] DCT | Writing 0x1 enables the module |
| LDC | SIMCOP_CLKCTRL [1] LDC | Writing 0x1 enables the module |
| DMA | SIMCOP_CLKCTRL [0] DMA | Writing 0x1 enables the module |

When software wants to shutdown a submodule:

- Software ensures that the submodule is idle. Mainly:
 - The submodule must not generate new events.
 - The submodule must not have any pending events.
 - For initiators: the submodule must stop interconnect transaction generation.
- Software clears the appropriate bit in the [SIMCOP_CLKCTRL](#) register.
- Hardware disconnects the configuration port of the module from the coprocessor bus: no more accesses are routed to the submodule. Ongoing transactions are finished (hardware stays in this state as long as required).
- For initiators: hardware waits until there are no more outstanding transactions:
 - SIMCOP DMA provides an MStandBy signal for that purpose.
 - The LDC does not provide this information. Software must ensure that the LDC is idle. SIMCOP hardware ensures that the internal MTC2OCP bridges have no outstanding transactions.
- Hardware cuts the submodules clock.
- Hardware clears the appropriate [SIMCOP_CLKCTRL](#) registers.

SIMCOP submodules support autogating. They can gate their functional and interface clock internally based on functional requirements. This feature could be disabled for debug or power consumption measurement purposes.

8.4.1.2.1.2 Local Clock Autogating

The SIMCOP subsystem modules support autogating. They can gate their functional and interface clock internally based on functional requirements. This feature can be disabled. [Table 8-1240](#) summarizes which modules support autogating control and which control bit is used.

Table 8-1240. Autoclock Gating Bit Control

| SIMCOP Resource | Autogating Override |
|----------------------------|-------------------------------|
| SIMCOP top-level resources | N/A |
| SIMCOP DMA | N/A |
| LDC | N/A |
| DCT | DCT_CFG[5] AUTOGATING |
| VLCDJ | VLCDJ_CTRL[3] AUTOGATING |
| NSF2 | N/A |
| iMX A | iMXa.IMX_CLKCNTRL[0] CLKCNTRL |
| iMX B | iMXb.IMX_CLKCNTRL[0] CLKCNTRL |
| ROT | ROT_CFG[9] AUTOGATING |

8.4.1.2.1.3 ISS SIMCOP Power Management

The SIMCOP supports the STANDBY power-management protocol. It is used by the SIMCOP to indicate when it has no more interconnect transactions to perform. This information is used at ISS level to control the SIMCOP and ISS shut-down sequence. The SIMCOP does not have any internal wake-up events. DISCONNECT and IDLE protocols are not supported.

The typical SIMCOP shut-down sequence is:

1. Software disables all SIMCOP submodules. This ensures the SIMCOP does not:
 - (a) Generate any traffic on its master port: SIMCOP asserts the MStandby signal.
 - (b) Generate new events (IRQs).
2. Software clears all pending events at SIMCOP level: All interrupt lines become inactive.
3. Software initiates the SIMCOP shut-down sequence by writing the appropriate bit at ISS level.
4. ISS hardware:
 - (a) Disconnects the SIMCOP configuration port. Any access attempts to SIMCOP are blocked at ISS level. The DISCONNECT protocol is handled at ISS level: SIMCOP does not provide any handshake signals to support it.
 - (b) Waits until MStandby from SIMCOP is asserted (always true in a normal case because SIMCOP submodules are inactive)
 - (c) Asserts the SWait input of SIMCOP
 - (d) Cuts the SIMCOP clock

The typical SIMCOP enable sequence is:

1. Software initiates the SIMCOP enable sequence by writing the appropriate bit at ISS level.
2. ISS hardware:
 - (a) Enables the SIMCOP clock
 - (b) Deasserts the SWait input of the SIMCOP
 - (c) Connects the SIMCOP configuration port

Three modes for MStandBy control are supported. The mode is selected using the [SIMCOP_HL_SYSCONFIG\[5:4\]](#) STANDBYMODE bit field.

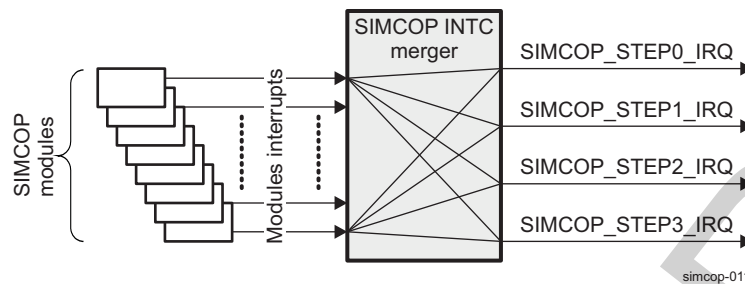
- Smart-standby: This is the normal mode to be used. When in this mode, the SIMCOP asserts the MStandBy signal when the MStandBy output of SIMCOP DMA is asserted, the LDC is effectively disabled ([SIMCOP_CLKCTRL\[1\]](#) LDC =0), and the MTCR2OCP bridge and the merger have no more outstanding transactions.
- Force-standby: This is a backup mode intended to be used only if smart-idle mode is bugged. When in this mode, the SIMCOP asserts MStandBy unconditionally. Software must ensure that the SIMCOP is in a correct quiet state before programming this mode.
- No-standby: This is a backup mode intended to be used only if smart-idle mode is bugged. When in this mode, the SIMCOP never asserts the MStandBy signal.

8.4.1.2.2 Software Reset

Software reset is intended to return the SIMCOP into a known state without requiring a complete device reset. A software reset at SIMCOP level is seen as a hardware reset for SIMCOP submodules. To perform a software reset, sets the [SIMCOP_HL_SYSCONFIG\[0\]](#) SOFTRESET bit to 1. The [SIMCOP_HL_SYSCONFIG\[0\]](#) SOFTRESET bit indicates that the software reset is ongoing when its value is 1. When the software reset completes, the [SIMCOP_HL_SYSCONFIG\[1\]](#) SOFTRESET bit is automatically reset. Software must ensure that the software reset completes before configuring the hardware sequencer or buffers.

8.4.1.2.3 Interrupt Merger

SIMCOP interrupts are merged at the SIMCOP subsystem level into four interrupts, as shown in [Figure 8-245](#).

Figure 8-245. SIMCOP Interrupt Merger Overview

These four outputs interrupts can be configured through [SIMCOP_HL_IRQENABLE_SET_i](#) and [SIMCOP_HL_IRQENABLE_CLR_i](#) (where $i = 0$ to 3, corresponding to output interrupt) to enable or disable interrupt mask for each interrupt output. Software can poll the value of interrupt before masking ([SIMCOP_HL_IRQSTATUS_RAW_i](#)) and after masking ([SIMCOP_HL_IRQSTATUS_i](#)).

Software can configure how outputs interrupts are generated through [SIMCOP_CTRL\[i\] IRQi_MODE](#) (where $i = 0$ to 3):

- 0x0: OR, the interrupt is asserted when one of the selected events has occurred
- 0x1: AND, the interrupt is asserted when all selected events have occurred

[Table 8-1241](#) shows how interrupts are mapped on the [SIMCOP_HL_IRQSTATUS_RAW_i](#), [SIMCOP_HL_IRQSTATUS_i](#), [SIMCOP_HL_IRQENABLE_SET_i](#), and [SIMCOP_HL_IRQENABLE_CLR_i](#) registers.

Table 8-1241. SIMCOP Interrupts

| Bit | Name | Description |
|-----|----------------------|---|
| 0 | SIMCOP_DMA_IRQ0 | Interrupt triggered by SIMCOP DMA |
| 1 | LDC_FRAME_IRQ | A full frame has been processed by LDC2 |
| 2 | DCT_IRQ | DCT operation has been completed (configured number of MCUs for YUV4:2:0/4:2:2 mode, or number of blocks for sequential block mode). |
| 3 | VLCDJ_BLOCK_IRQ | A macroblock has been processed (encode/decode). |
| 4 | NSF_IRQ | Event triggered by the NSF2 imaging accelerator when processing of a block is done |
| 5 | IMX_A_IRQ | Event triggered when iMX has executed a SLEEP instruction |
| 6 | IMX_B_IRQ | |
| 7 | ROT_A_IRQ | Event triggered by the ROT engine |
| 8 | RESERVED | Reserved |
| 9 | LDC_BLOCK_IRQ | A macroblock has been processed by LDC2. |
| 10 | SIMCOP_STEP0_IRQ | Event triggered when a SIMCOP context is activated by the hardware sequencer |
| 11 | SIMCOP_STEP1_IRQ | |
| 12 | SIMCOP_STEP2_IRQ | |
| 13 | SIMCOP_STEP3_IRQ | |
| 14 | DONE_IRQ | Event triggered when the hardware sequencer finishes the sequence: - the sequence step counter has reached the limit - All accelerator and DMA events for the last sequence step have been received. |
| 15 | VLCDJ_DECODE_ERR_IRQ | A decode error has been signaled by the VLCDJ |
| 16 | ICNT_ERR_IRQ | An error has been received on the SIMCOP master port on the L3 interconnect. |
| 17 | LDC2BRIDGE_ERR_IRQ | The LDC2 bridge has generated an error. This event must not trigger in a normal use case. |
| 18 | SIMCOP_DMA_IRQ1 | Interrupt triggered by SIMCOP DMA |
| 19 | CPU_PROC_START_IRQ | This interrupt is used when CPU data processing is used in a macroblock processing pipeline. When the CPU receives this IRQ, data is ready to be processed. When CPU is done with processing it acknowledges by setting the SIMCOP_HWSEQ_CTRL.CPU_PROC_DONE bit. The interrupt is cleared as usual. |

8.4.1.2.4 ISS SIMCOP Modules Description

This section gives links to each subsection for each submodule in the ISS SIMCOP module.

The ISS module provides unique ISS_FCLK for all the submodules inside the SIMCOP (see [Section 8.4.1.2.1.1, ISS SIMCOP Local Clock Management](#)).

For information about hardware and software resets for each module see [Table 8-1241](#).

For interrupt request information for each module, see [Section 8.4.1.2.3, Interrupt Merger](#).

ISS SIMCOP consists of the following submodules:

- Hardware sequencer and buffers, for more information see [Section 8.4.2, ISS SIMCOP Hardware Sequencer and Buffers](#).
- DMA, for more information, see [Section 8.4.3, ISS SIMCOP DMA Module](#).
- ROT, for more information, see [Section 8.4.7, ISS SIMCOP Rotation Accelerator \(ROT\) Module](#).
- iMX
- NSF2
- VLCDJ, for more information, see [Section 8.4.6, ISS SIMCOP Variable Length Coder/Decoder for JPEG \(VLCDJ\) Module](#).
- DCT, for more information, see [Section 8.4.5, ISS SIMCOP Discrete Cosine Transform \(DCT\) Module](#).
- LDC, for more information, see [Section 8.4.4, ISS SIMCOP LDC Module](#).

8.4.1.3 ISS SIMCOP Programming Models

8.4.1.3.1 Global Initialization

8.4.1.3.1.1 Surrounding Modules Global Initialization

This section identifies the requirements of initializing the surrounding modules when the ISS SIMCOP module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration of the ISS SIMCOP.

Table 8-1242. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|--|
| ISS local PM and CM | Module interface and functional clocks must be enabled. For more information, see Section 8.4.1.2.1, ISS SIMCOP Local Power and Clock Management . |

8.4.1.3.1.2 ISS SIMCOP Module Global Initialization

This procedure initializes the ISS SIMCOP module after a power on or software reset.

Table 8-1243. ISS SIMCOP Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Execute software reset. | SIMCOP_HL_SYSCONFIG[0] SOFTRESET | 0x1 |
| Wait until reset completed? | SIMCOP_HL_SYSCONFIG[0] SOFTRESET | 0x0 |
| Configure STANDBYMODE. | SIMCOP_HL_SYSCONFIG[5:4] STANDBYMODE | 0x2 |
| Configure submodules interface and functional clock. | SIMCOP_CLKCTRL[7:0] | xxx |
| Interrupt configuration | | |
| Set interrupt enable bit for the submodules. | SIMCOP_HL_IRQENABLE_SET_i[7:0] | xxx |

8.4.1.3.2 ISS SIMCOP Operational Modes Configuration

8.4.1.3.2.1 Interrupts

To unmask an interrupt for generation of SIMCOP_IRQi output interrupts, software must set the corresponding bit of [SIMCOP_HL_IRQENABLE_SET_i](#) (where i = 0 to 3) to 1.

Example 1, SIMCOP_IRQ1 is generated when DCT_IRQ or VLCDJ_BLOCK_IRQ are generated:

- [SIMCOP_HL_IRQENABLE_SET_i](#)[2] DCT_IRQ = 0x1 (where i = 1)
- [SIMCOP_HL_IRQENABLE_SET_i](#)[3] VLCDJ_BLOCK_IRQ = 0x1 (where i = 1)
- [SIMCOP_CTRL](#)[1] IRQ1_MODE = 0x0

Example 2, SIMCOP_IRQ3 is generated when IMX_A_IRQ and LDC_BLOCK_IRQ are generated:

- [SIMCOP_HL_IRQENABLE_SET_i](#)[5] IMX_A_IRQ = 0x1 (where i = 3)
- [SIMCOP_HL_IRQENABLE_SET_i](#)[9] LDC_BLOCK_IRQ = 0x1 (where i = 3)
- [SIMCOP_CTRL](#)[3] IRQ3_MODE = 0x1

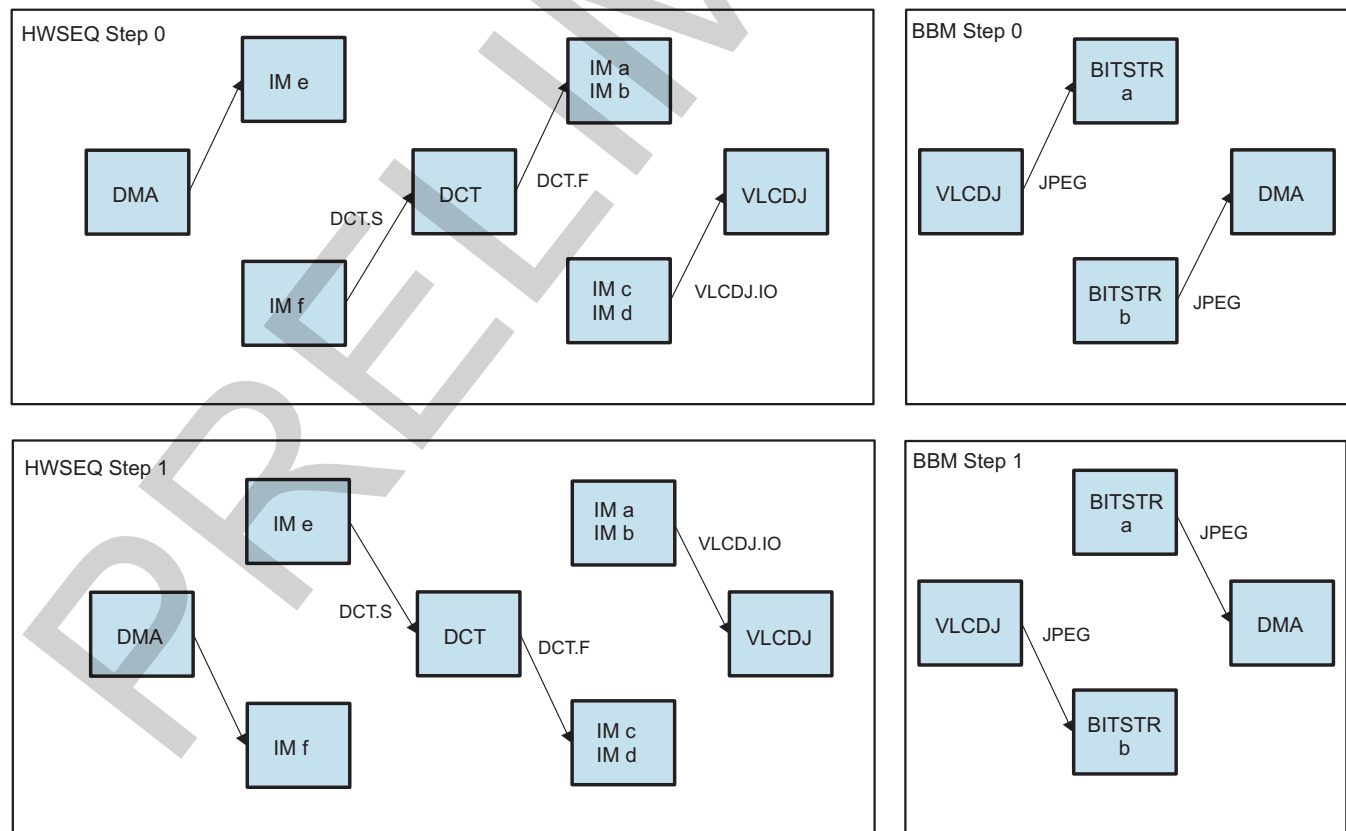
To mask an interrupt for generation of SIMCOP_IRQi output interrupts, software must clear the corresponding bit of [SIMCOP_HL_IRQENABLE_CLEAR_i](#) (where i = 0 to 3) to 0.

When an event occurs, the corresponding bit in the [SIMCOP_HL_IRQSTATUS_RAW_i](#) (where i = 0 to 3) register is set regardless if the event has been enabled or not. Bits in the [SIMCOP_HL_IRQSTATUS_i](#) (where i = 0 to 3) registers are only set when an enabled event occurs. Software can clear a pending event by setting the adequate bit in the [SIMCOP_HL_IRQSTATUS_i](#) (where i = 0 to 3) register.

8.4.1.3.2.2 JPEG Encode Operational Mode Configuration

Figure 8-246 shows a typical JPEG encode macroblock pipeline.

Figure 8-246. JPEG Encode Pipeline



simcop-012

Table 8-1244. JPEG Encode Pipeline

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Set SIMCOP DMA to fetch data from SDRAM and stored into an image buffer (IM e or IM f). | See DMA programming model Section 8.4.3.4 | xxx |
| Set DCT to reads data from an image buffer (IM e or IM f). | DCT_SPTR[12:5] ADDR | xxx |
| Set DCT to store data into sets of two image buffers (IM a + IM b or IM c + IM d). | DCT_FPTR[12:4] ADDR | xxx |
| Set VLCDJ to read data from image buffers. | See VLCDJ programming model Section 8.4.6.4 | xxx |
| Set VLCDJ to write the data to the bitstream buffer. | See VLCDJ programming model Section 8.4.6.4 | xxx |
| Set the SIMCOP DMA to send the data to SDRAM. | See DMA programming model Section 8.4.3.4 | xxx |

8.4.1.4 ISS SIMCOP Register Manual

8.4.1.4.1 SIMCOP Instance Summary

Table 8-1245 is the SIMCOP top level instance summary.

Table 8-1245. SIMCOP Instance Summary

| Module Name | Base Address L3 Interconnect | Base Address Cortex-M3 Private Access | Size |
|----------------|---------------------------------|--|-----------|
| SIMCOP_CONTROL | 0x5202 0000 | 0x5506 0000 | 256 bytes |

NOTE: Private Access is an access that does not use the L3/L4 interconnects.

8.4.1.4.2 SIMCOP Registers

8.4.1.4.2.1 SIMCOP Register Summary

Table 8-1246 is the SIMCOP_CONTROL register mapping summary.

Table 8-1246. SIMCOP_CONTROL Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-M3 Private Access |
|--|------|-----------------------------|-----------------------------|-------------------------------------|---|
| SIMCOP_HL_REVISION | R | 32 | 0x0000 0000 | 0x5202 0000 | 0x5506 0000 |
| SIMCOP_HL_HWINFO | R | 32 | 0x0000 0004 | 0x5202 0004 | 0x5506 0004 |
| SIMCOP_HL_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5202 0010 | 0x5506 0010 |
| RESERVED | RW | 32 | 0x0000 001C | 0x5202 001C | 0x5506 001C |
| SIMCOP_HL_IRQSTATUS_RAW_i ⁽¹⁾ | RW | 32 | 0x0000 0020 + (0x10 * i) | 0x5202 0020 + (0x10 * i) | 0x5506 0020 + (0x10 * i) |
| SIMCOP_HL_IRQSTATUS_i ⁽¹⁾ | RW | 32 | 0x0000 0024 + (0x10 * i) | 0x5202 0024 + (0x10 * i) | 0x5506 0024 + (0x10 * i) |
| SIMCOP_HL_IRQENABLE_SET_i ⁽¹⁾ | RW | 32 | 0x0000 0028 + (0x10 * i) | 0x5202 0028 + (0x10 * i) | 0x5506 0028 + (0x10 * i) |
| SIMCOP_HL_IRQENABLE_CLR_i ⁽¹⁾ | RW | 32 | 0x0000 002C + (0x10 * i) | 0x5202 002C + (0x10 * i) | 0x5506 002C + (0x10 * i) |
| SIMCOP_CTRL | RW | 32 | 0x0000 0060 | 0x5202 0060 | 0x5506 0060 |
| SIMCOP_CLKCTRL | RW | 32 | 0x0000 0064 | 0x5202 0064 | 0x5506 0064 |

⁽¹⁾ i = 0 to 3

8.4.1.4.2.2 SIMCOP_CONTROL Register Descriptions

Table 8-1247. SIMCOP HL REVISION

| | | |
|-------------------------|--|--|
| Address Offset | 0x0000 0000 | |
| Physical Address | 0x5202 0000 0x5506 0000 | Instance SIMCOP_CONTROL_L3 SIMCOP_CONTROL_CORTEX-M3 |
| Description | MODULE REVISION This register contains the IP revision code in binary coded digital. For example, we have: 0x01 = revision 0.1 and 0x21 = revision 2.1 | |
| Type | R | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| | | | | | | | | | | | | | | | | REV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REV | Revision ID | R | - ⁽¹⁾ |

(1) TI internal data

Table 8-1248. Register Call Summary for Register SIMCOP_HL_REVISION

ISS Still Image Coprocessor

- ISS SIMCOP Register Manual: [0]

Table 8-1249. SIMCOP HL HWINFO

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5202 0004 0x5506 0004 | Instance | | | | | | | | | | | | | | | | SIMCOP_CONTROL_L3 SIMCOP_CONTROL_CORTEX-M3 | | | | | | | | | | | | | | |
| Description | Information about the IP module's hardware configuration. It provides information about the generic parameters. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|---------------|----|----------|--------------|--------------|--------------|------------|--------------|------------|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LDCR_RESP_FIFO | | IMAGE_BUFFERS | | RESERVED | ROT_A_ENABLE | IMX_B_ENABLE | IMX_A_ENABLE | NSF_ENABLE | VLCDJ_ENABLE | DCT_ENABLE | LDC_ENABLE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|---------|
| 31:13 | RESERVED | Read returns 0. | R | 0x00000 |
| 12:10 | LDCR_RESP_FIFO | <p>Defines the size of the LDC read master response FIFO in words of 128-bits.</p> <p>Read 0x2: 8x128 bits</p> <p>Read 0x3: 16x128 bits</p> <p>Read 0x4: 32x128 bits</p> <p>Read 0x5: 64x128 bits</p> <p>Read 0x6: 128x128 bits</p> <p>Read 0x7: 256x256 bits</p> | R | 0x4 |
| 9:8 | IMAGE_BUFFERS | <p>This parameter defines the image buffer count.</p> <p>Read 0x0: 4 Image buffers (e, f, g, h)</p> <p>Read 0x1: 8 Image buffers</p> | R | 0x1 |
| 7 | RESERVED | Read returns 0. | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 6 | ROT_A_ENABLE | The ROT a is present when this parameter is set. Read 0x0: Disabled at design time Read 0x1: Enabled at design time | R | 1 |
| 5 | IMX_B_ENABLE | The iMX B module and the CMD b, COEFF b memories are present when this parameter is set. Read 0x0: Disabled at design time Read 0x1: Enabled at design time | R | 1 |
| 4 | IMX_A_ENABLE | The iMX A module and the CMD a, COEFF a memories are present when this parameter is set. Read 0x0: Disabled at design time Read 0x1: Enabled at design time | R | 1 |
| 3 | NSF_ENABLE | The NSF2 is present when this parameter is set. Read 0x0: Disabled at design time Read 0x1: Enabled at design time | R | 1 |
| 2 | VLCDJ_ENABLE | The VLCD module and the QUANT, HUFFMAN, BITSTREAM memories are present when this parameter is set. Read 0x0: Disabled at design time Read 0x1: Enabled at design time | R | 1 |
| 1 | DCT_ENABLE | The DCT module is present when this parameter is set. Read 0x0: Disabled at design time Read 0x1: Enabled at design time | R | 1 |
| 0 | LDC_ENABLE | The LDC module and the LDC LUT are present when this parameter is set. Read 0x0: Disabled at design time Read 0x1: Enabled at design time | R | 1 |

Table 8-1250. Register Call Summary for Register SIMCOP_HL_HWINFO

ISS Still Image Coprocessor

- [ISS SIMCOP Register Manual: \[0\]](#)

Table 8-1251. SIMCOP_HL_SYSCONFIG

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0010 | Instance | SIMCOP_CONTROL_L3 |
| Physical Address | 0x5202 0010 0x5506 0010 | | SIMCOP_CONTROL_CORTEX-M3 |
| Description | This register controls the various parameters of the OCP interface | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------------|---|----------|---|-----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | STANDBYMODE | | RESERVED | | SOFTRESET | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|------------|
| 31:6 | RESERVED | Read returns 0. | R | 0x00000000 |
| 5:4 | STANDBYMODE | Configuration of the local initiator state management mode. By definition, initiator may generate read/write transaction as long as it is out of STANDBY state. 0x0: Force-standby mode: local initiator is unconditionally placed in standby state. Backup mode, for debug only. 0x1: No-standby mode: local initiator is unconditionally placed out of standby state. Backup mode, for debug only. 0x2: Smart-standby mode: local initiator standby status depends on local conditions, that is, the module's functional requirement from the initiator. | RW | 0x0 |
| 3:1 | RESERVED | Read returns 0. | R | 0x0 |
| 0 | SOFTRESET | Software reset Read 0x0: Reset done, no pending action Write 0x0: No action Write 0x1: Initiate software reset Read 0x1: Reset (software or other) ongoing | RW | 0 |

Table 8-1252. Register Call Summary for Register SIMCOP_HL_SYSCONFIG

ISS Still Image Coprocessor

- [ISS SIMCOP Functional Description: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS SIMCOP Programming Models: \[4\] \[5\] \[6\]](#)
- [ISS SIMCOP Register Manual: \[7\]](#)

Table 8-1253. SIMCOP_HL_IRQSTATUS_RAW_i

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|----|----|----|----|----|----|--------------------|----|----|----|----|----|----|----|-----------------|---|----|----|--------------------|----|---|---|--------------|---|---|---|----------------------|---|---|---|----------|----|----|----|-----------|----|----|----|-----------|----|----|----|-----------|----|----|----|-----------|----|----|----|---------------|----|---|---|----------|---|---|---|-------|---|---|---|-----------|--|--|--|-----------|--|--|--|--------------------|--|--|--|----------------|--|--|--|-----------------|--|--|--|--------------------|--|--|--|-----------------|--|--|--|----------------------|--|--|--|----------|--|--|--|-----------|--|--|--|-----------|--|--|--|-----------|--|--|--|-----------|--|--|--|---------------|--|--|--|----------|--|--|--|-------|--|--|--|-----------|--|--|--|-----------|--|--|--|-------------|--|--|--|----------------|--|--|--|---------|--|--|--|---------------|--|--|--|-----------------|--|--|--|
| Address Offset | 0x0000 0020 + (0x10 * i) | | | | | | | | | | | | | | | | Instance SIMCOP_CONTROL_L3 SIMCOP_CONTROL_CORTEX-M3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5202 0020 + (0x10 * i) 0x5506 0020 + (0x10 * i) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Per-event raw interrupt status vector Raw status is set even if event is not enabled. Write 1 to set the (raw) status, mostly for debug. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="8">RESERVED</td><td colspan="8">CPU_PROC_START_IRQ</td><td colspan="4">SIMCOP_DMA_IRQ1</td><td colspan="4">LDC2BRIDGE_ERR_IRQ</td><td colspan="4">ICNT_ERR_IRQ</td><td colspan="4">VLCDJ_DECODE_ERR_IRQ</td><td colspan="4">DONE_IRQ</td><td colspan="4">STEP3_IRQ</td><td colspan="4">STEP2_IRQ</td><td colspan="4">STEP1_IRQ</td><td colspan="4">STEP0_IRQ</td><td colspan="4">LDC_BLOCK_IRQ</td><td colspan="4">RESERVED</td><td colspan="4">ROT_A</td><td colspan="4">IMX_B_IRQ</td><td colspan="4">IMX_A_IRQ</td><td colspan="4">NSF_IRQ_IRQ</td><td colspan="4">VLCDJ_BLOC_IRQ</td><td colspan="4">DCT_IRQ</td><td colspan="4">LDC_FRAME_IRQ</td><td colspan="4">SIMCOP_DMA_IRQ0</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | CPU_PROC_START_IRQ | | | | | | | | SIMCOP_DMA_IRQ1 | | | | LDC2BRIDGE_ERR_IRQ | | | | ICNT_ERR_IRQ | | | | VLCDJ_DECODE_ERR_IRQ | | | | DONE_IRQ | | | | STEP3_IRQ | | | | STEP2_IRQ | | | | STEP1_IRQ | | | | STEP0_IRQ | | | | LDC_BLOCK_IRQ | | | | RESERVED | | | | ROT_A | | | | IMX_B_IRQ | | | | IMX_A_IRQ | | | | NSF_IRQ_IRQ | | | | VLCDJ_BLOC_IRQ | | | | DCT_IRQ | | | | LDC_FRAME_IRQ | | | | SIMCOP_DMA_IRQ0 | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | CPU_PROC_START_IRQ | | | | | | | | SIMCOP_DMA_IRQ1 | | | | LDC2BRIDGE_ERR_IRQ | | | | ICNT_ERR_IRQ | | | | VLCDJ_DECODE_ERR_IRQ | | | | DONE_IRQ | | | | STEP3_IRQ | | | | STEP2_IRQ | | | | STEP1_IRQ | | | | STEP0_IRQ | | | | LDC_BLOCK_IRQ | | | | RESERVED | | | | ROT_A | | | | IMX_B_IRQ | | | | IMX_A_IRQ | | | | NSF_IRQ_IRQ | | | | VLCDJ_BLOC_IRQ | | | | DCT_IRQ | | | | LDC_FRAME_IRQ | | | | SIMCOP_DMA_IRQ0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|---------------|-------|
| 31:20 | RESERVED | Read returns 0. | R | 0x000 |
| 19 | CPU_PROC_START_IRQ | Event triggered by the hardware sequencer to instruct the CPU to process a macroblock Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 18 | SIMCOP_DMA_IRQ1 | Event triggered by the SIMCOP DMA. This event is automatically cleared at SIMCOP level when it is cleared at SIMCOP DMA level. Check SIMCOP DMA IRQ registers. Read 0x0: No event pending Read 0x1: Event pending | R | 0 |
| 17 | LDC2BRIDGE_ERR_IRQ | The LDC2 bridge has generated an error. Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 16 | ICNT_ERR_IRQ | An error has been received on the SIMCOP master port. Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 15 | VLCDJ_DECODE_ERR_IRQ | A decode error has been signaled by the VLCDJ module Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 14 | DONE_IRQ | Event triggered when the hardware sequencer finishes the sequence: - the sequence step counter has reached the limit - all accelerator and DMA events for the last sequence step have been received. Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 13 | STEP3_IRQ | Event triggered when Step 3 is activated by the hardware sequencer Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 12 | STEP2_IRQ | Event triggered when Step 2 is activated by the hardware sequencer Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|---------------|-------|
| 11 | STEP1_IRQ | Event triggered when Step 1 is activated by the hardware sequencer Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 10 | STEP0_IRQ | Event triggered when Step 0 is activated by the hardware sequencer Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 9 | LDC_BLOCK_IRQ | This event is triggered by LDC when a macroblock has been processed Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 8 | RESERVED | Read returns 0. | R | 0 |
| 7 | ROT_A | Event triggered by the ROT a engine Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 6 | IMX_B_IRQ | Event triggered when iMX has executed a SLEEP instruction. Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 5 | IMX_A_IRQ | Event triggered when iMX has executed a SLEEP instruction. Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 4 | NSF_IRQ_IRQ | Event triggered by the NSF2 imaging accelerator when processing of a block is done. Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 3 | VLCDJ_BLOC_IRQ | This event is triggered by VLCDJ when a macroblock has been processed (encode/decode) Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------|
| 2 | DCT_IRQ | Event triggered when a block has been processed by the DCT module and the filter outcome has been stored to an image buffer. Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 1 | LDC_FRAME_IRQ | This event is triggered by LDC when a full frame has been processed Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 0 | SIMCOP_DMA_IRQ0 | Event triggered by the SIMCOP DMA. This event is automatically cleared at SIMCOP level when it is cleared at SIMCOP DMA level. Check SIMCOP DMA IRQ registers. Read 0x0: No event pending Read 0x1: Event pending | R | 0 |

Table 8-1254. Register Call Summary for Register SIMCOP_HL_IRQSTATUS_RAW_i

ISS Still Image Coprocessor

- [ISS SIMCOP Functional Description: \[0\] \[1\]](#)
- [ISS SIMCOP Programming Models: \[2\]](#)
- [ISS SIMCOP Register Manual: \[3\]](#)

Table 8-1255. SIMCOP_HL_IRQSTATUS_i

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0024 + (0x10 * i) | | | | | | | | | | | | | | | | Instance SIMCOP_CONTROL_L3 SIMCOP_CONTROL_CORTX-M3 | | | | | | | | | | | | | | | |
| Physical Address | 0x5202 0024 + (0x10 * i) 0x5506 0024 + (0x10 * i) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Per-event "enabled" interrupt status vector. Enabled status is not set unless event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------------|----|----|----|-----------------|----|----|----|--------------------|----|----|----|--------------|----|---|---|----------------------|---|---|---|----------|---|---|---|-----------|--|--|--|-----------|--|--|--|-----------|--|--|--|-----------|--|--|--|---------------|--|--|--|----------|--|--|--|-------|--|--|--|-----------|--|--|--|-----------|--|--|--|-------------|--|--|--|----------------|--|--|--|---------|--|--|--|---------------|--|--|--|-----------------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | CPU_PROC_START_IRQ | | | | SIMCOP_DMA_IRQ1 | | | | LDC2BRIDGE_ERR_IRQ | | | | ICNT_ERR_IRQ | | | | VLCDJ_DECODE_ERR_IRQ | | | | DONE_IRQ | | | | STEP3_IRQ | | | | STEP2_IRQ | | | | STEP1_IRQ | | | | STEP0_IRQ | | | | LDC_BLOCK_IRQ | | | | RESERVED | | | | ROT_A | | | | IMX_B_IRQ | | | | IMX_A_IRQ | | | | NSF_IRQ_IRQ | | | | VLCDJ_BLOC_IRQ | | | | DCT_IRQ | | | | LDC_FRAME_IRQ | | | | SIMCOP_DMA_IRQ0 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|---------------|-------|
| 31:20 | RESERVED | Read returns 0. | R | 0x000 |
| 19 | CPU_PROC_START_IRQ | Event triggered by the hardware sequencer to instruct the CPU to process a macroblock Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 18 | SIMCOP_DMA_IRQ1 | Event triggered by the SIMCOP DMA. This event is automatically cleared at SIMCOP level when it is cleared at SIMCOP DMA level. Check SIMCOP DMA IRQ registers. Read 0x0: No (enabled) event pending Read 0x1: Event pending | R | 0 |
| 17 | LDC2BRIDGE_ERR_IRQ | The LDC2 bridge has generated an error. Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 16 | ICNT_ERR_IRQ | An error has been received on the SIMCOP master port. Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 15 | VLCDJ_DECODE_ERR_IRQ | A decode error has been signaled by the VLCDJ module Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 14 | DONE_IRQ | Event triggered when the hardware sequencer finishes the sequence: -The sequence step counter has reached the limit. All accelerator and DMA events for the last sequence step have been received. Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 13 | STEP3_IRQ | Event triggered when Step 3 is activated by the hardware sequencer Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 12 | STEP2_IRQ | Event triggered when Step 2 is activated by the hardware sequencer Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|---------------|-------|
| 11 | STEP1_IRQ | Event triggered when Step 1 is activated by the hardware sequencer Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 10 | STEP0_IRQ | Event triggered when Step 0 is activated by the hardware sequencer Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 9 | LDC_BLOCK_IRQ | This event is triggered by LDC when a macroblock has been processed Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 8 | RESERVED | Read returns 0. | R | 0 |
| 7 | ROT_A | Event triggered by the ROT a engine Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 6 | IMX_B_IRQ | Event triggered when iMX has executed a SLEEP instruction. Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 5 | IMX_A_IRQ | Event triggered when iMX has executed a SLEEP instruction. Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 4 | NSF_IRQ_IRQ | Event triggered by the NSF2 imaging accelerator when processing of a block is done. Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 3 | VLCDJ_BLOC_IRQ | This event is triggered by VLCDJ when a macroblock has been processed (encode/decode) Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------|
| 2 | DCT_IRQ | Event triggered when a block has been processed by the DCT module and the filter outcome has been stored to an image buffer. Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 1 | LDC_FRAME_IRQ | This event is triggered by LDC when a full frame has been processed Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 0 | SIMCOP_DMA_IRQ0 | Event triggered by the SIMCOP DMA. This event is automatically cleared at SIMCOP level when it is cleared at SIMCOP DMA level. Check SIMCOP DMA IRQ registers. Read 0x0: No (enabled) event pending Read 0x1: Event pending | R | 0 |

Table 8-1256. Register Call Summary for Register SIMCOP_HL_IRQSTATUS_i

ISS Still Image Coprocessor

- [ISS SIMCOP Functional Description: \[0\] \[1\]](#)
- [ISS SIMCOP Programming Models: \[2\] \[3\]](#)
- [ISS SIMCOP Register Manual: \[4\]](#)

Table 8-1257. SIMCOP_HL_IRQENABLE_SET_i

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0028 + (0x10 * i) | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SIMCOP_CONTROL_L3 SIMCOP_CONTROL_CORTEX-M3 | | | | | | | | | | | | | | | |
| Physical Address | 0x5202 0028 + (0x10 * i) 0x5506 0028 + (0x10 * i) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Per-event interrupt enable bit vector. Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------------|----|----|----|-----------------|----|----|----|--------------------|----|----|----|--------------|----|---|---|----------------------|---|---|---|----------|---|---|---|-----------|--|--|--|-----------|--|--|--|-----------|--|--|--|-----------|--|--|--|---------------|--|--|--|----------|--|--|--|-------|--|--|--|-----------|--|--|--|-----------|--|--|--|-------------|--|--|--|----------------|--|--|--|---------|--|--|--|---------------|--|--|--|-----------------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | CPU_PROC_START_IRQ | | | | SIMCOP_DMA_IRQ1 | | | | LDC2BRIDGE_ERR_IRQ | | | | ICNT_ERR_IRQ | | | | VLCDJ_DECODE_ERR_IRQ | | | | DONE_IRQ | | | | STEP3_IRQ | | | | STEP2_IRQ | | | | STEP1_IRQ | | | | STEP0_IRQ | | | | LDC_BLOCK_IRQ | | | | RESERVED | | | | ROT_A | | | | IMX_B_IRQ | | | | IMX_A_IRQ | | | | NSF_IRQ_IRQ | | | | VLCDJ_BLOC_IRQ | | | | DCT_IRQ | | | | LDC_FRAME_IRQ | | | | SIMCOP_DMA_IRQ0 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|--|---------------|-------|
| 31:20 | RESERVED | Read returns 0. | R | 0x000 |
| 19 | CPU_PROC_START_IRQ | Event triggered by the hardware sequencer to instruct the CPU to process a macroblock Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 18 | SIMCOP_DMA_IRQ1 | Event triggered by the SIMCOP DMA. Check SIMCOP DMA IRQ registers. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 17 | LDC2BRIDGE_ERR_IRQ | The LDC2 bridge has generated an error. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 16 | ICNT_ERR_IRQ | An error has been received on the SIMCOP master port. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 15 | VLCDJ_DECODE_ERR_IRQ | A decode error has been signaled by the VLCDJ module Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 14 | DONE_IRQ | Event triggered when the hardware sequencer finishes the sequence: The sequence step counter has reached the limit. All accelerator and DMA events for the last sequence step have been received. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 13 | STEP3_IRQ | Event triggered when Step 3 is activated by the hardware sequencer Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 12 | STEP2_IRQ | Event triggered when Step 2 is activated by the hardware sequencer Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|---------------|-------|
| 11 | STEP1_IRQ | Event triggered when Step 1 is activated by the hardware sequencer Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 10 | STEP0_IRQ | Event triggered when Step 0 is activated by the hardware sequencer Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 9 | LDC_BLOCK_IRQ | This event is triggered by LDC when a macroblock has been processed Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 8 | RESERVED | Read returns 0. | R | 0 |
| 7 | ROT_A | Event triggered by the ROT a engine Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 6 | IMX_B_IRQ | Event triggered when iMX has executed a SLEEP instruction. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 5 | IMX_A_IRQ | Event triggered when iMX has executed a SLEEP instruction. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 4 | NSF_IRQ_IRQ | Event triggered by the NSF2 imaging accelerator when processing of a block is done. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 3 | VLCDJ_BLOC_IRQ | This event is triggered by VLCDJ when a macroblock has been processed (encode/decode) Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|---------------|-------|
| 2 | DCT_IRQ | Event triggered when a block has been processed by the DCT module and the filter outcome has been stored to an image buffer. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 1 | LDC_FRAME_IRQ | This event is triggered by LDC when a full frame has been processed Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 0 | SIMCOP_DMA_IRQ0 | Event triggered by the SIMCOP DMA. Check SIMCOP DMA IRQ registers. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |

Table 8-1258. Register Call Summary for Register SIMCOP_HL_IRQENABLE_SET_i

ISS Still Image Coprocessor

- [ISS SIMCOP Functional Description: \[0\] \[1\]](#)
- [ISS SIMCOP Programming Models: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [ISS SIMCOP Register Manual: \[8\]](#)

Table 8-1259. SIMCOP_HL_IRQENABLE_CLR_i

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 002C + (0x10 * i) | | |
| Physical Address | 0x5202 002C + (0x10 * i) | Instance | SIMCOP_CONTROL_L3 |
| | 0x5506 002C + (0x10 * i) | | SIMCOP_CONTROL_CORTEX-M3 |
| Description | Per-event interrupt enable bit vector. Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------------|----|----|----|-----------------|----|----|----|--------------------|----|----|----|--------------|----|---|---|----------------------|---|---|---|----------|---|---|---|-----------|--|--|--|-----------|--|--|--|-----------|--|--|--|-----------|--|--|--|---------------|--|--|--|----------|--|--|--|-------|--|--|--|-----------|--|--|--|-----------|--|--|--|-------------|--|--|--|----------------|--|--|--|---------|--|--|--|---------------|--|--|--|-----------------|--|--|--|
| RESERVED | | | | | | | | CPU_PROC_START_IRQ | | | | SIMCOP_DMA_IRQ1 | | | | LDC2BRIDGE_ERR_IRQ | | | | ICNT_ERR_IRQ | | | | VLCDJ_DECODE_ERR_IRQ | | | | DONE_IRQ | | | | STEP3_IRQ | | | | STEP2_IRQ | | | | STEP1_IRQ | | | | STEP0_IRQ | | | | LDC_BLOCK_IRQ | | | | RESERVED | | | | ROT_A | | | | IMX_B_IRQ | | | | IMX_A_IRQ | | | | NSF_IRQ_IRQ | | | | VLCDJ_BLOC_IRQ | | | | DCT_IRQ | | | | LDC_FRAME_IRQ | | | | SIMCOP_DMA_IRQ0 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|---------------|-------|
| 31:20 | RESERVED | Read returns 0. | R | 0x000 |
| 19 | CPU_PROC_START_IRQ | Event triggered by the hardware sequencer to instruct the CPU to process a macroblock Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 18 | SIMCOP_DMA_IRQ1 | Event triggered by the SIMCOP DMA. Check SIMCOP DMA IRQ registers. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 17 | LDC2BRIDGE_ERR_IRQ | The LDC2 bridge has generated an error. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 16 | ICNT_ERR_IRQ | An error has been received on the SIMCOP master port. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 15 | VLCDJ_DECODE_ERR_IRQ | A decode error has been signaled by the VLCDJ module Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 14 | DONE_IRQ | Event triggered when the hardware sequencer finishes the sequence: The sequence step counter has reached the limit. All accelerator and DMA events for the last sequence step have been received. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 13 | STEP3_IRQ | Event triggered when Step 3 is activated by the hardware sequencer Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 12 | STEP2_IRQ | Event triggered when Step 2 is activated by the hardware sequencer Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|---------------|-------|
| 11 | STEP1_IRQ | Event triggered when Step 1 is activated by the hardware sequencer Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 10 | STEP0_IRQ | Event triggered when Step 0 is activated by the hardware sequencer Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 9 | LDC_BLOCK_IRQ | This event is triggered by LDC when a macroblock has been processed Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 8 | RESERVED | Read returns 0. | R | 0 |
| 7 | ROT_A | Event triggered by the ROT a engine Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 6 | IMX_B_IRQ | Event triggered when iMX has executed a SLEEP instruction. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 5 | IMX_A_IRQ | Event triggered when iMX has executed a SLEEP instruction. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 4 | NSF_IRQ_IRQ | Event triggered by the NSF2 imaging accelerator when processing of a block is done. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 3 | VLCDJ_BLOC_IRQ | This event is triggered by VLCDJ when a macroblock has been processed (encode/decode) Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------|
| 2 | DCT_IRQ | Event triggered when a block has been processed by the DCT module and the filter outcome has been stored to an image buffer. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 1 | LDC_FRAME_IRQ | This event is triggered by LDC when a full frame has been processed Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 0 | SIMCOP_DMA_IRQ0 | Event triggered by the SIMCOP DMA. Check SIMCOP DMA IRQ registers. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |

Table 8-1260. Register Call Summary for Register SIMCOP_HL_IRQENABLE_CLR_i

ISS Still Image Coprocessor

- [ISS SIMCOP Functional Description: \[0\] \[1\]](#)
- [ISS SIMCOP Register Manual: \[2\]](#)

Table 8-1261. SIMCOP_CTRL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0060 | | | | | | | | | | | | | | | | Instance SIMCOP_CONTROL_L3 SIMCOP_CONTROL_CORTEX-M3 | | | | | | | | | | | | | | | |
| Physical Address | | 0x5202 0060 0x5506 0060 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | SIMCOP control register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|-------------------|----|-----------------------|----|----------|----|---------------|----|----|----|----------|----|----|----|----------------|----|----|----|----------|---|-----------|---|-----------|---|------|---|-------|---|----------|--|---------|--|-----------|--|----------|--|-----------|--|-----------|--|-----------|--|-----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| RESERVED | | | | LDC_R_BURST_BREAK | | LDC_R_MAX_BURST_LENHT | | RESERVED | | LDC_R_TAG_CNT | | | | RESERVED | | | | LDC_R_TAG_OFST | | | | RESERVED | | IMX_B_CMD | | IMX_A_CMD | | HUFF | | QUANT | | RESERVED | | LDC_LUT | | LDC_INPUT | | NSF_WMEM | | IRQ3_MODE | | IRQ2_MODE | | IRQ1_MODE | | IRQ0_MODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|-------|
| 31:29 | RESERVED | Read returns 0. | R | 0x0 |
| 28 | LDC_R_BURST_BREAK | Controls if bursts issued by the LDC2 bridge could cross burst length boundaries. When this register is set, the LDC2 bridge only issues aligned bursts. Register can only be used when LDC_R_MAX_BURST_LENGTH is 32, 64, or 128 bytes. 0x0: Yes. 0x1: No. OCP transactions must be split | RW | 0 |
| 27:26 | LDC_R_MAX_BURST_LENGTH | Limits the maximum burst length that could be used by the LDC2 bridge 0x0: 8 x 128 0x1: 6 x 128 0x2: 4 x 128 0x3: 2 x 128 | RW | 0x0 |
| 25 | RESERVED | Read returns 0. | R | 0 |
| 24:21 | LDC_R_TAG_CNT | Limits the maximum number of outstanding requests to LDC_R_TAG_CNT+1 | RW | 0x3 |
| 20 | RESERVED | Read returns 0. | R | 0 |
| 19:16 | LDC_R_TAG_OFST | First OCP tag ID that can be used by LDC reads. Software must prevent overlap with tags generated by the SIMCOP DMA. Typically this value should be equal to SIMCP_DMA_CTRL.TAG_CNT+1. | RW | 0xC |
| 15 | RESERVED | Read returns 0. | R | 0 |
| 14 | IMX_B_CMD | Switch for iMX # command memory 0x0: Coprocessor bus 0x1: iMX B instruction read / write | RW | 0 |
| 13:12 | IMX_A_CMD | Switch for iMX A command memory 0x0: Coprocessor bus 0x1: iMX A instruction read/write 0x2: iMX B instruction read/write | RW | 0x0 |
| 11 | HUFF | Switch for Huffman table 0x0: Coprocessor 0x1: VLCDJ Huffman table read | RW | 0 |
| 10 | QUANT | Switch for quantization table 0x0: Coprocessor bus 0x1: VLCDJ quantization table read | RW | 0 |
| 9 | RESERVED | Read returns 0. | R | 0 |
| 8 | LDC_LUT | Switch for LDC LUT 0x0: Coprocessor bus 0x1: The LDC module could access the LDC LUT. | RW | 0 |
| 7:6 | LDC_INPUT | Selects input data buffer for LDC. Memories attached to LDC as working memories cannot be used by any other accelerators. HWSEQ or HWSEQ software override settings are ignored for those memories. 0x0: No input memory attached 0x1: Use image buffers a and b 0x2: Use image buffers a, b, c, and d 0x3: Use LDC private input memory. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 5:4 | NSF_WMEM | Selects working memory for NSF. Memories attached to NSF as working memories cannot be used by any other accelerators. HWSEQ or HWSEQ software override settings are ignored for those memories. 0x0: No working memory attached to NSF2. NSF2 cannot be used. 0x1: iMX A coefficient memory used. 0x2: Image buffers a and b used. Those image buffers cannot be used for other purposes. This setting has higher priority than the context configuration. 0x3: Image buffers a, b, c, and d used. Those image buffers cannot be used for other purposes. This setting has higher priority than the context configuration. | RW | 0x0 |
| 3 | IRQ3_MODE | Interrupt generation method 0x0: The interrupt line is asserted when one of the events enabled in SIMCOP_IRQENABLE_3 is pending. 0x1: The interrupt line is asserted when all events enabled in SIMCOP_IRQENABLE_3 are pending. | RW | 0 |
| 2 | IRQ2_MODE | Interrupt generation method 0x0: The interrupt line is asserted when one of the events enabled in SIMCOP_IRQENABLE_2 is pending. 0x1: The interrupt line is asserted when all events enabled in SIMCOP_IRQENABLE_2 are pending. | RW | 0 |
| 1 | IRQ1_MODE | Interrupt generation method 0x0: The interrupt line is asserted when one of the events enabled in SIMCOP_IRQENABLE_1 is pending. 0x1: The interrupt line is asserted when all events enabled in SIMCOP_IRQENABLE_1 are pending. | RW | 0 |
| 0 | IRQ0_MODE | Interrupt generation method 0x0: The interrupt line is asserted when one of the events enabled in SIMCOP_IRQENABLE_0 is pending. 0x1: The interrupt line is asserted when all events enabled in SIMCOP_IRQENABLE_0 are pending. | RW | 0 |

Table 8-1262. Register Call Summary for Register SIMCOP_CTRL

ISS Still Image Coprocessor

- [ISS SIMCOP Functional Description: \[0\]](#)
- [ISS SIMCOP Programming Models: \[1\] \[2\]](#)
- [ISS SIMCOP Register Manual: \[3\]](#)

Table 8-1263. SIMCOP_CLKCTRL

| | | | |
|------------------|---|----------|--|
| Address Offset | 0x0000 0064 | | |
| Physical Address | 0x5202 0064 0x5506 0064 | Instance | SIMCOP_CONTROL_L3 SIMCOP_CONTROL_CORTX-M3 |
| Description | SIMCOP clock control register. Use to enable/disable the interface and functional clock of SIMCOP submodules. Disabled modules cannot be accessed | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|-------|-------|------|-------|-----|-----|-----|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ROT_A | IMX_B | IMX_A | NSF2 | VLCDJ | DCT | LDC | DMA | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x000000 |
| 7 | ROT_A | ROT A Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off. Read 0x0: The submodule is off Read 0x1: The submodule is on Write 0x1: Request enable of the submodule. No effect if the submodule clock is already off. | RW | 0 |
| 6 | IMX_B | iMX B Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off. Read 0x0: The submodule is off. Read 0x1: The submodule is on. Write 0x1: Request enable of the submodule. No effect if the submodule clock is already off. | RW | 0 |
| 5 | IMX_A | iMX A Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off. Read 0x0: The submodule is off. Read 0x1: The submodule is on. Write 0x1: Request enable of the submodule. No effect if the submodule clock is already off. | RW | 0 |
| 4 | NSF2 | NSF2 Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off. Read 0x0: The submodule is off. Read 0x1: The submodule is on. Write 0x1: Request enable of the submodule. No effect if the submodule clock is already off. | RW | 0 |
| 3 | VLCDJ | VLCDJ Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off. Read 0x0: The submodule is off. Read 0x1: The submodule is on. Write 0x1: Request enable of the submodule. No effect if the submodule clock is already off. | RW | 0 |
| 2 | DCT | DCT Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off. Read 0x0: The submodule is off. Read 0x1: The submodule is on. Write 0x1: Request enable of the submodule. No effect if the submodule clock is already off. | RW | 0 |
| 1 | LDC | LDC Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off. Read 0x0: The submodule is off. Read 0x1: The submodule is on. Write 0x1: Request enable of the submodule. No effect if the submodule clock is already off. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | DMA | <p>DMA</p> <p>Write 0x0: Request shutdown of the submodule. No effect if the submodule clock is already off.</p> <p>Read 0x0: The submodule is off.</p> <p>Read 0x1: The submodule is on.</p> <p>Write 0x1: Request enable of the submodule. No effect if the submodule clock is already off.</p> | RW | 0 |

Table 8-1264. Register Call Summary for Register SIMCOP_CLKCTRL

ISS Still Image Coprocessor

- [ISS SIMCOP Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [ISS SIMCOP Programming Models: \[14\]](#)
- [ISS SIMCOP Register Manual: \[15\]](#)

8.4.1.5 ISS SIMCOP Memory Mapping

Table 8-1265 shows the SIMCOP memory mapping seen by the L3 interconnect and the Cortex-M3 MPU subsystem. SIMCOP memory mapping has a 128-KB address space.

Table 8-1265. SIMCOP Memory Mapping

| Module | L3 Address | | Cortex-M3 Address | | Size (Bits) |
|-------------------------------------|-------------|-------------|-------------------|-------------|-------------|
| | Begin | End | Begin | End | |
| Hardware sequencer/buffer registers | 0x5202 0000 | 0x5202 00FF | 0x5506 0000 | 0x5506 00FF | 256 |
| LDC registers | 0x5202 0100 | 0x5202 017F | 0x5506 0100 | 0x5506 017F | 128 |
| iMX A registers | 0x5202 0180 | 0x5202 01BF | 0x5506 0180 | 0x5506 01BF | 64 |
| iMX B registers | 0x5202 01C0 | 0x5202 01FF | 0x5506 01C0 | 0x5506 01FF | 64 |
| SIMCOP DMA registers | 0x5202 0200 | 0x5202 03FF | 0x5506 0200 | 0x5506 03FF | 512 |
| Reserved | 0x5202 0400 | 0x5202 05FF | 0x5506 0400 | 0x5506 05FF | 512 |
| VLCDJ registers | 0x5202 0600 | 0x5202 067F | 0x5506 0600 | 0x5506 067F | 128 |
| Reserved | 0x5202 0680 | 0x5202 06FF | 0x5506 0680 | 0x5506 06FF | 128 |
| ROT registers | 0x5202 0700 | 0x5202 073F | 0x5506 0700 | 0x5506 073F | 64 |
| Reserved | 0x5202 0740 | 0x5202 077F | 0x5506 0740 | 0x5506 077F | 64 |
| NSF2 registers | 0x5202 0780 | 0x5202 07FF | 0x5506 0780 | 0x5506 07FF | 128 |
| DCT registers | 0x5202 0800 | 0x5202 081F | 0x5506 0800 | 0x5506 081F | 32 |
| Reserved | 0x5202 0820 | 0x5202 0FFF | 0x5506 0820 | 0x5506 0FFF | 2016 |
| Bitstream buffer | 0x5202 1000 | 0x5202 1FFF | 0x5506 1000 | 0x5506 1FFF | 4096 |
| Huffman tables | 0x5202 2000 | 0x5202 2FFF | 0x5506 2000 | 0x5506 2FFF | 4096 |
| Reserved | 0x5202 3000 | 0x5202 3FFF | 0x5506 3000 | 0x5506 3FFF | 4096 |
| iMX B command memory | 0x5202 4000 | 0x5202 5FFF | 0x5506 4000 | 0x5506 5FFF | 8192 |
| iMX A command memory | 0x5202 6000 | 0x5202 6FFF | 0x5506 6000 | 0x5506 6FFF | 4096 |
| Quantization tables | 0x5202 7000 | 0x5202 73FF | 0x5506 7000 | 0x5506 73FF | 1024 |
| LDC LUT | 0x5202 7400 | 0x5202 75FF | 0x5506 7400 | 0x5506 75FF | 512 |
| Reserved | 0x5202 7600 | 0x5202 7FFF | 0x5506 7600 | 0x5506 7FFF | 2560 |
| Image buffer A | 0x5202 8000 | 0x5202 8FFF | 0x5506 8000 | 0x5506 8FFF | 4096 |
| Image buffer B | 0x5202 9000 | 0x5202 9FFF | 0x5506 9000 | 0x5506 9FFF | 4096 |
| Image buffer C | 0x5202 A000 | 0x5202 AFFF | 0x5506 A000 | 0x5506 AFFF | 4096 |
| Image buffer D | 0x5202 B000 | 0x5202 BFFF | 0x5506 B000 | 0x5506 BFFF | 4096 |
| Image buffer E | 0x5202 C000 | 0x5202 CFFF | 0x5506 C000 | 0x5506 CFFF | 4096 |
| Image buffer F | 0x5202 D000 | 0x5202 DFFF | 0x5506 D000 | 0x5506 DFFF | 4096 |
| Image buffer G | 0x5202 E000 | 0x5202 EFFF | 0x5506 E000 | 0x5506 EFFF | 4096 |
| Image buffer H | 0x5202 F000 | 0x5202 FFFF | 0x5506 F000 | 0x5506 FFFF | 4096 |
| iMX A coefficients memory | 0x5203 0000 | 0x5203 3FFF | 0x5507 0000 | 0x5507 3FFF | 16,384 |
| iMX B coefficients memory | 0x5203 4000 | 0x5203 7FFF | 0x5507 4000 | 0x5507 7FFF | 16,384 |

8.4.2 ISS SIMCOP Hardware Sequencer and Buffers

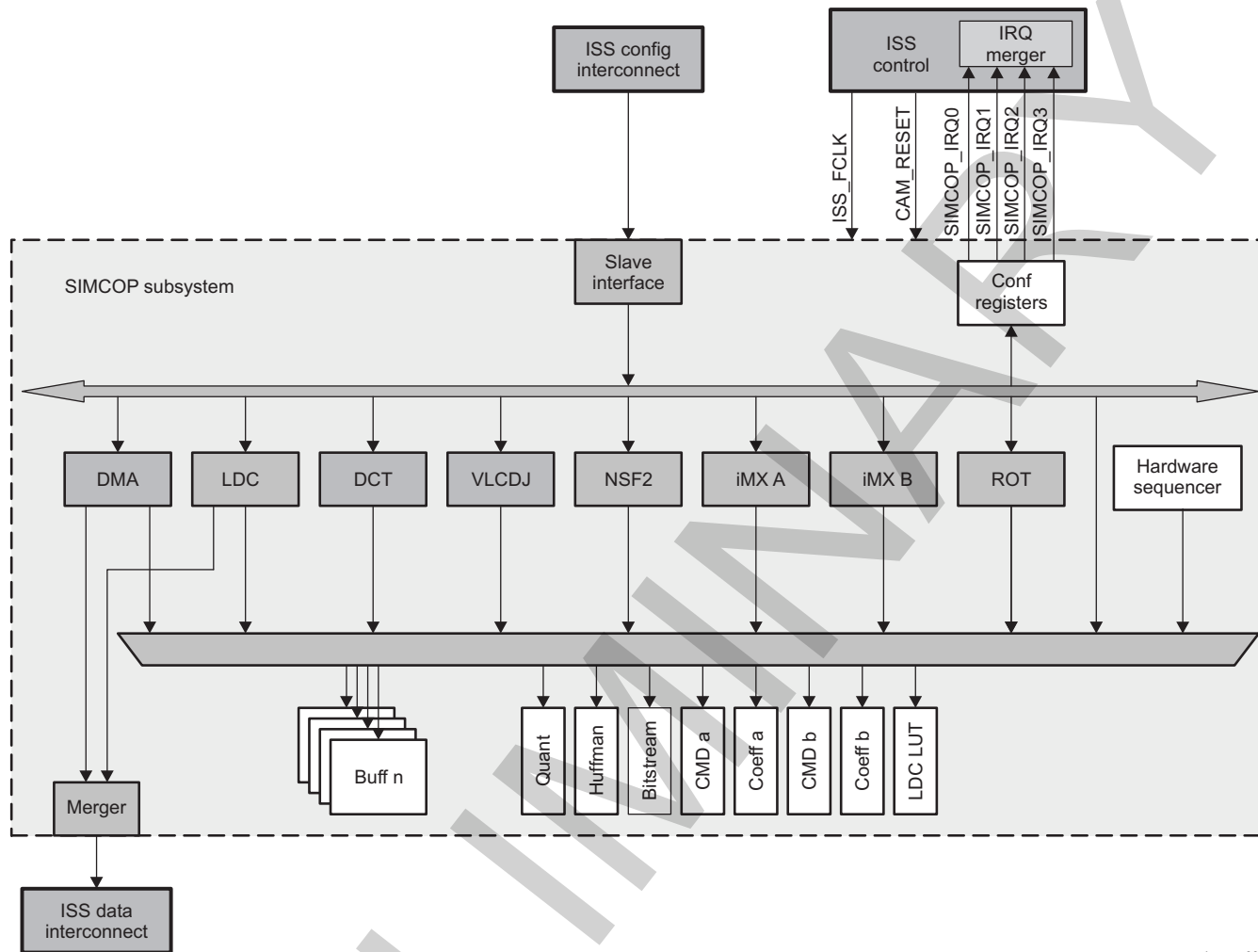
This section describes the hardware sequencer and buffers in the still image coprocessor (SIMCOP) subsystem.

8.4.2.1 ISS SIMCOP Hardware Sequencer and Buffers Overview

The SIMCOP hardware sequencer control all the modules included in the SIMCOP subsystem with their memories.

Figure 8-247 shows an overview of the hardware sequencer and buffers in the SIMCOP subsystem.

Figure 8-247. Hardware Sequencer and Buffers in the SIMCOP Subsystem



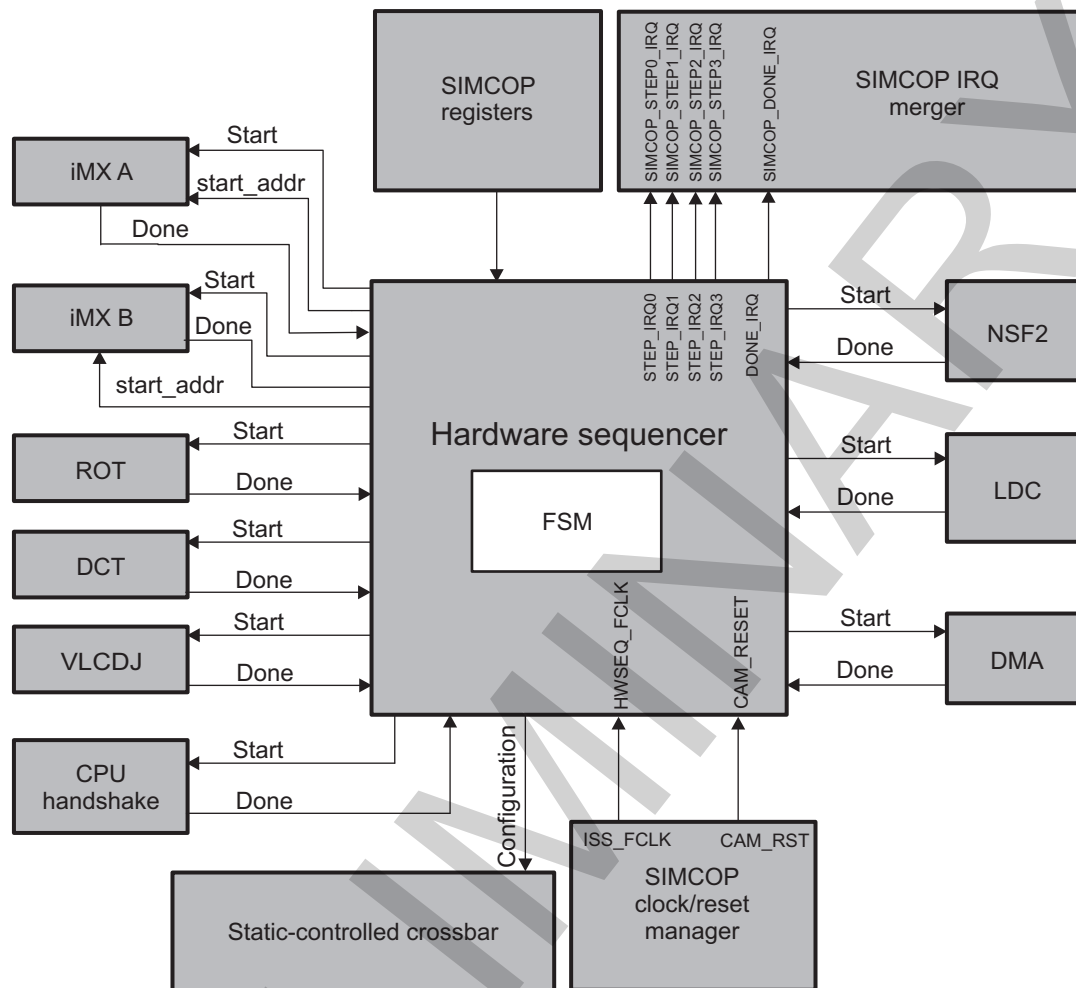
hwseq-001

- Hardware acceleration for low-level sequencing tasks:
 - Synchronizes with DMA, DCT, VLCDJ, ROT, NSF2, LDC, and iMX
 - Supports 4 memory crossbar contexts
- On-chip memories (RAM):
 - Eight image buffers, 4KB each
 - Quantization table storage: 512 bytes
 - Huffman table storage: 4KB
 - Bitstream buffer: 4KB
 - Two iMX coefficient memories: 16KB each
 - Two iMX program memories: 4KB for iMX A and 8KB for iMX B
 - LDC look-up table (LUT) storage: 256 entries
- Power-management support

8.4.2.2 ISS SIMCOP Hardware Sequencer and Buffer Integration

The hardware sequencer and buffers module is part of the SIMCOP subsystem in the imaging subsystem (ISS).

Figure 8-248 shows the integration of the hardware sequencer and buffers in the SIMCOP subsystem.

Figure 8-248. Hardware Sequencer and Buffer Integration

hwseq-011

Table 8-1266 lists the integration attributes, Table 8-1267 lists the clocks and resets, and Table 8-1268 lists the hardware requests.

Table 8-1266. Integration Attributes

| Module Instance | Attributes | |
|--------------------------------|--------------|--------------|
| | Power Domain | Interconnect |
| Hardware sequencer and buffers | PD_CAM | |

Table 8-1267. Clocks and Resets

| Clocks | | | | | |
|----------------------|-----------|-------------------------|--------------------|--------|--|
| Module Instance | | Destination Signal Name | Source Signal Name | Source | Description |
| Hardware and buffers | sequencer | HWSEQ_FCLK | ISS_FCLK | PRCM | Functional clock provided by ISS_CLK from PRCM . It is used by all ISS submodules and ISS top-level resources. |
| Resets | | | | | |
| Hardware and buffers | sequencer | CAM_RESET | CAM_RST | PRCM | ISS and SIMCOP global reset |

For information about clock and reset management, see [Section 8.4.1.2.1](#), *ISS SIMCOP Local Power and Clock Management*.

Table 8-1268. Hardware Requests

| Interrupt Requests | | | | | |
|--------------------------------|--------------------|-------------------------|-------------------|--|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description | |
| Hardware and buffers sequencer | STEP_IRQ0 | SIMCOP_STEP0_IRQ | SIMCOP IRQ merger | Event triggered when a SIMCOP context is activated by the hardware sequencer | |
| Hardware and buffers sequencer | STEP_IRQ1 | SIMCOP_STEP1_IRQ | SIMCOP IRQ merger | Event triggered when a SIMCOP context is activated by the hardware sequencer | |
| Hardware and buffers sequencer | STEP_IRQ2 | SIMCOP_STEP2_IRQ | SIMCOP IRQ merger | Event triggered when a SIMCOP context is activated by the hardware sequencer | |
| Hardware and buffers sequencer | STEP_IRQ3 | SIMCOP_STEP3_IRQ | SIMCOP IRQ merger | Event triggered when a SIMCOP context is activated by the hardware sequencer | |
| Hardware and buffers sequencer | DONE_IRQ | SIMCOP_DONE_IRQ | SIMCOP IRQ merger | Event triggered when the hardware sequencer finishes the sequence | |

For more information about interrupt requests, see [Section 8.4.1.2.3](#), *Interrupt Merger*.

8.4.2.3 ISS SIMCOP Hardware Sequencer and Buffers Functional Description

8.4.2.3.1 ISS SIMCOP Hardware Sequencer and Buffers Software Reset

For information about how to perform a software reset, see [Section 8.4.1.2.2, Software Reset](#).

8.4.2.3.2 ISS SIMCOP Hardware Sequencer and Buffers Power Management

For more information about power management, see [Section 8.4.1.2.1.3, ISS SIMCOP Power Management](#).

8.4.2.3.3 ISS SIMCOP Hardware Sequencer and Buffer Interrupt Requests

This module sends four interrupts to the ISS top level. For more information about interrupt management, see [Section 8.4.1.2.3, Interrupt Merger](#).

8.4.2.3.4 ISS SIMCOP Hardware Sequencer Buffer Description

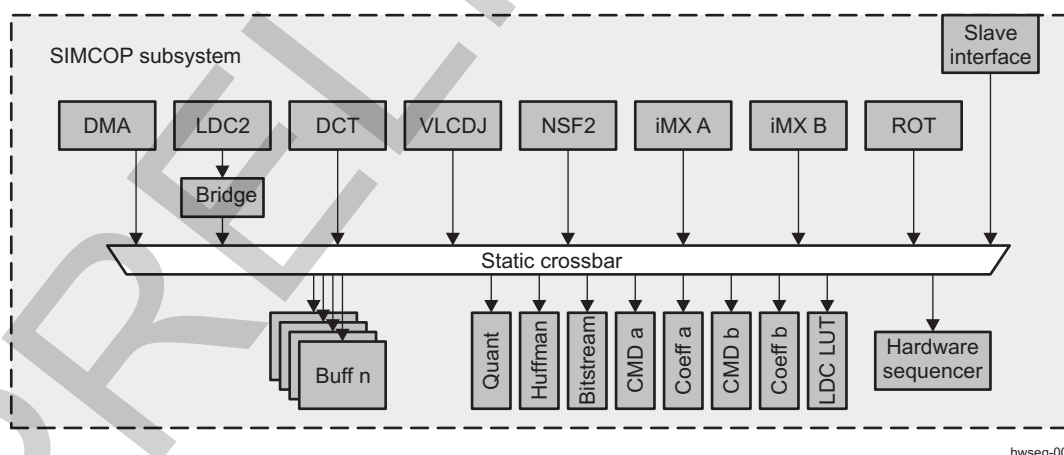
The SIMCOP subsystem includes the following memories:

- Eight image buffers, 4KB each
- Quantization table storage: 512 bytes
- Huffman table storage: 4KB
- Bitstream buffer: 4KB
- Two iMX coefficient memories: 16KB each
- Two iMX program memories: 4KB for iMX A and 8KB for iMX B
- LDC LUT storage: 256 entries
- LDC private working memory

8.4.2.3.4.1 Static Crossbar

The static crossbar connects SIMCOP modules to the SIMCOP memories as shown in [Figure 8-249](#).

Figure 8-249. SIMCOP Static Crossbar Overview



The buses for QUANT, HUFF, LDC LUT, CMD a, and CMD b are controlled by an external initiator. Typically, those memories are initialized before SIMCOP starts processing, and the content remains unchanged until the full frame is processed. The amount of data transferred to those memories is low and transfer is not timing critical. [Table 8-1269](#) shows how to connect these memories to SIMCOP modules.

NOTE: The transfer can only be done through the slave interface (for example, CPU or system DMA [sDMA]). The SIMCOP DMA cannot access those memories.

Table 8-1269. Static Crossbar Control Summary

| Memory | Register SIMCOP_CTRL | Value | | | | | | |
|--------------|-------------------------|-------|---------------|---------------|---------------|----------------|------------|--------------|
| | | Bus | iMX A inst | iMX B inst | VLCDJ HUFF | VLCDJ QUANT | LDC LUT | LDC INPUT |
| Quantization | [10] QUANT | 0 | | | | 1 | | |
| Huffman | [11] HUFF | 0 | | | 1 | | | |
| CMD a | [13:12] IMX_A_CMD | 0 | 1 | 2 | | | | |
| CMD b | [14] IMX_B_CMD | 0 | | 1 | | | | |
| LDC LUT | [8] LDC_LUT | 0 | | | | | 1 | |
| LDC Priv | [7:6] LDC_INPUT | | | | | | | 3 |

Image buffers and coefficient memories are used to store the data to be processed and processing results. Those memories can be accessed by the SIMCOP DMA, SIMCOP bus, and SIMCOP modules. [Table 8-1270](#) shows possible connections in the SIMCOP static crossbar: for example DCT Freq port can access image buffer A when SIMCOP_HWSEQ_SWITCH_i[2:0] IMBUFF_A = 5 (where i = 0, 1, 2, or 3 corresponds to the active context).

SIMCOP supports multiple contexts for the configuration of those memories. Software or the hardware sequencer can activate different contexts.

The BITSTREAM data flow is asynchronous from the macroblock pipeline. Therefore it supports dynamic buffer switching logic.

Table 8-1270. Static Crossbar Control Summary (2/2)

| Memory | Register (SIMCOP_HWSEQ_SWITCH_i and SIMCOP_HWSEQ_SWITCH_CTRL2_i) | Value | | | | | | | | | | | | | |
|-------------|---|-------|-----|------------------|------------------|-----------------|-----------------|--------------------|-------------|------------|----------------------------|----------|------------------------------|-----------|------------|
| | | Bus | DMA | iMX data A | iMX data B | VLC DJ IO | VLC DJ BS | DCT Spati al | DCT Freq | NSF2 IO | NSF2 WME M | LDC 0 | LDC WME M | ROT In | ROT Out |
| IMBUF A | [2:0] IMBUFF A | 0 | 1 | 2 | 3 | 4 | | | 5 | | NSF2 _WM EM = 2,3 | | LDC_ INPU T= 1 or 2 | 6 | |
| IMBUF B | [6:4] IMBUFF B | 0 | 1 | 2 | 3 | 4 | | | 5 | | | | | 6 | |
| IMBUF C | [10:8] IMBUFF C | 0 | 1 | 2 | 3 | 4 | | | 5 | | NSF2 _WM EM = 3 | | LDC_ INPU T= 2 | 6 | |
| IMBUF D | [14:12] IMBUFF D | 0 | 1 | 2 | 3 | 4 | | | 5 | | | | | 6 | |
| IMBUF E | [18:16] IMBUFF E | 0 | 1 | 2 | 3 | | | 4 | | 5 | | 6 | | | 7 |
| IMBUF F | [22:20] IMBUFF F | 0 | 1 | 2 | 3 | | | 4 | | 5 | | 6 | | | 7 |
| IMBUF G | [27:24] IMBUFF G | 0 | 1 | 2 | 3 | 4 | | 5 | 6 | 8 | | 9 | | | 7 |
| IMBUF H | [31:28] IMBUFF H | 0 | 1 | 2 | 3 | 4 | | 5 | 6 | 8 | | 9 | | | 7 |
| iMX A coeff | [2:0] COEFF_A | 0 | 1 | 2 | 3 | 4 | | | 5 | | NSF2 _WM EM = 1 | | | 6 | |
| iMX B coeff | [6:4] COEFF_B | 0 | 1 | 2 | 3 | 4 | | | 5 | | | | | | 6 |
| Bitstream | Handled by hardware | X | X | | | | X | | | | | | | | |

8.4.2.3.4.2 Image Buffers

Image buffers are four banks × 256 × 32 bits (4KB) working memories used by the SIMCOP modules to perform image processing operations. Image buffers are shared between the iMX, NSF2, DCT, LDC, VLCDJ, ROT, DMA, and SIMCOP bus accesses. Not all initiators can access the image buffers simultaneously.

Switches are controlled by the hardware sequencer or an external initiator through register configuration. Data is always organized in little-endian format.

One or multiple image buffers can be attached to a given accelerator port by configuring the adequate bits in the [SIMCOP_HWSEQ_STEP_SWITCH_i](#) registers.

The image buffer address mapping to different buses listed in [Table 8-1271](#) is controlled using the adequate [SIMCOP_HWSEQ_STEP_CTRL_i](#) register bit fields.

Table 8-1271. Image Buffer Address Map

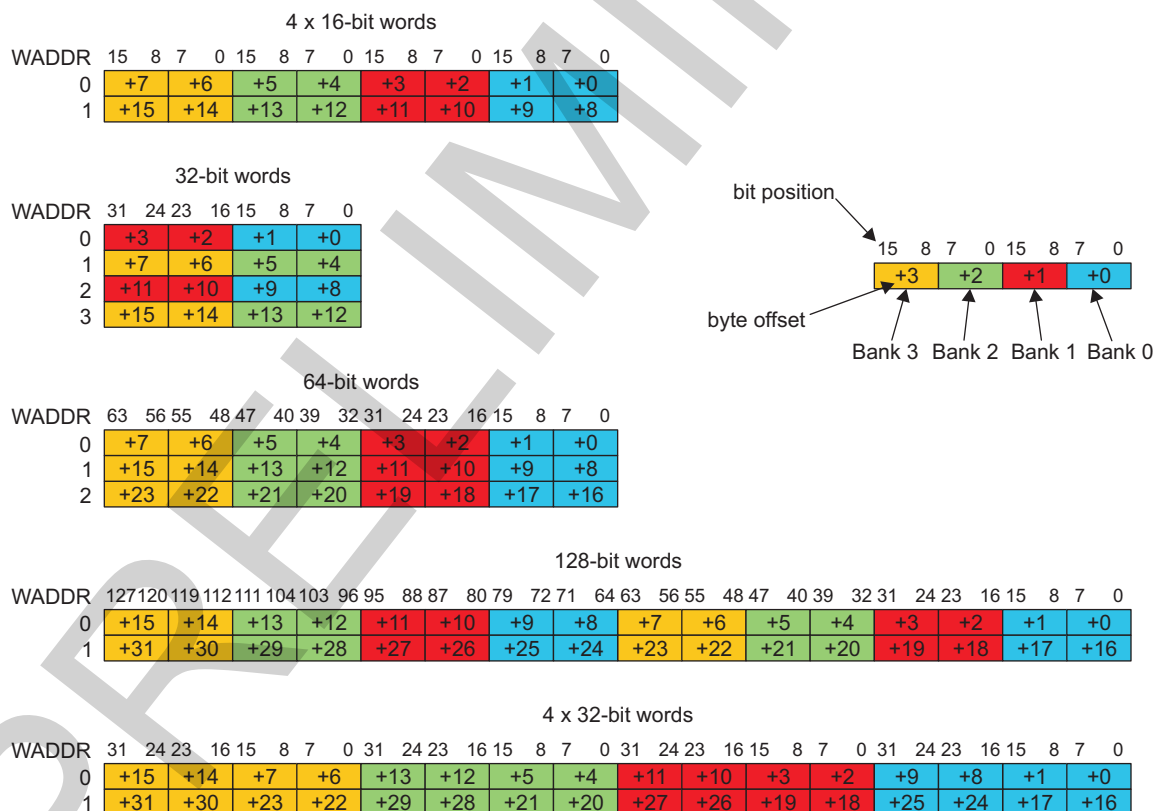
| Port | OFST | 0x0000 | 0x1000 | 0x2000 | 0x3000 | 0x4000 | 0x5000 | 0x6000 | 0x7000 |
|-------------|------|--------|--------|--------|--------|--------|--------|--------|--------|
| DMA | 0 | A | B | C | D | E | F | G | H |
| | 1 | B | C | D | E | F | G | H | A |
| | 2 | C | D | E | F | G | H | A | B |
| | 3 | D | E | F | G | H | A | B | C |
| | 4 | E | F | G | H | A | B | C | D |
| | 5 | F | G | H | A | B | C | D | E |
| | 6 | G | H | A | B | C | D | E | F |
| | 7 | H | A | B | C | D | E | F | G |
| iMX A data | 0 | A | B | C | D | | | | |
| | 1 | C | D | E | F | | | | |
| | 2 | E | F | G | H | | | | |
| | 3 | G | H | A | B | | | | |
| iMX B data | 0 | A | B | C | D | | | | |
| | 1 | C | D | E | F | | | | |
| | 2 | E | F | G | H | | | | |
| | 3 | G | H | A | B | | | | |
| VLCDJ I/O | 0 | A | B | C | D | | | | |
| | 1 | B | C | D | G | | | | |
| | 2 | C | D | G | H | | | | |
| | 3 | D | G | H | A | | | | |
| | 4 | G | H | A | B | | | | |
| | 5 | H | A | B | C | | | | |
| | 6 | | | | | | | | |
| | 7 | | | | | | | | |
| DCT spatial | 0 | E | F | | | | | | |
| | 1 | F | G | | | | | | |
| | 2 | G | H | | | | | | |
| | 3 | H | E | | | | | | |
| DCT Freq | 0 | A | B | C | D | | | | |
| | 1 | B | C | D | G | | | | |
| | 2 | C | D | G | H | | | | |
| | 3 | D | G | H | A | | | | |
| | 4 | G | H | A | B | | | | |
| | 5 | H | A | B | C | | | | |
| | 6 | | | | | | | | |
| | 7 | | | | | | | | |
| NSF I/O | 0 | E | F | | | | | | |
| | 1 | F | G | | | | | | |
| | 2 | G | H | | | | | | |
| | 3 | H | E | | | | | | |
| NSF2 WMEM | N/A | A | B | C | D | | | | |

Table 8-1271. Image Buffer Address Map (continued)

| Port | OFST | 0x0000 | 0x1000 | 0x2000 | 0x3000 | 0x4000 | 0x5000 | 0x6000 | 0x7000 |
|---------|------|--------|--------|--------|--------|--------|--------|--------|--------|
| LDC O | 0 | E | F | G | H | | | | |
| | 1 | F | G | H | E | | | | |
| | 2 | G | H | E | F | | | | |
| | 3 | H | E | F | G | | | | |
| LDC W | N/A | A | B | C | D | | | | |
| ROT in | 0 | A | B | C | D | | | | |
| | 1 | B | C | D | A | | | | |
| | 2 | C | D | A | B | | | | |
| | 3 | D | A | B | C | | | | |
| ROT out | 0 | E | F | G | H | | | | |
| | 1 | F | G | H | E | | | | |
| | 2 | G | H | E | F | | | | |
| | 3 | H | E | F | G | | | | |

Figure 8-250 shows how width conversion and bank interleaving is performed. Each color corresponds to a different physical bank.

Figure 8-250. Image Buffer Width Translation



hwseq-003

8.4.2.3.4.3 Coefficient Memories

The IMX_COEF_A memory is used by the NSF2 to store temporary data. The IMX_x also uses COEFF_A and COEFF_B to store coefficients used during certain operations. IMX_COEF_A and IMX_COEFF_B are shared between the iMX, DMA, DCT, VLCDJ, and SIMCOP bus accesses. Only one initiator can access a coefficient memory at given time.

Switches are controlled by the hardware sequencer or an external initiator through register configuration. Data is always organized in little-endian format.

The initiators access types to the IMX_COEF_x memory are summarized in [Table 8-1272](#). Coefficient memory configuration depends on the initiators. Data is always organized little endian.

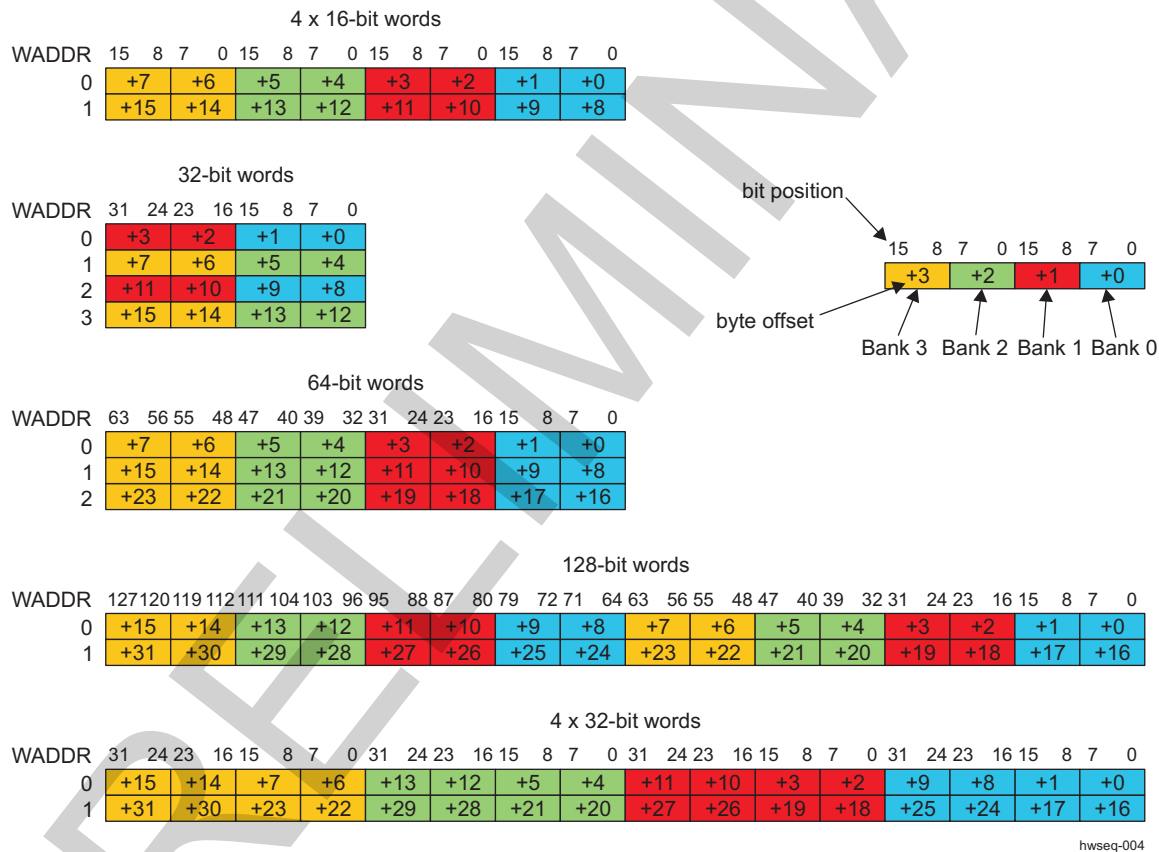
Table 8-1272. Coefficient Buffer Organization

| iMX | Coprocessor Bus | ROT In | DMA |
|--------------------------------|----------------------|----------------------|--------------------------|
| VLCDJ IO | | ROT Out | DCT Freq |
| | | | NSF2 WMEM ⁽¹⁾ |
| 4 banks × 2048 words × 16 bits | 4096 words × 32 bits | 2048 words × 64 bits | 1024 words × 128 bits |

⁽¹⁾ IMX_COEFF_A only

[Figure 8-251](#) shows how width conversion and bank interleaving is performed. Each color corresponds to a different physical bank.

Figure 8-251. Coefficient Memory Width Translation



8.4.2.3.4.4 Quantization Memories

The QUANT memory is used to store the quantization and dequantization tables for the VLCDJ module.

Coefficients are coded as 16-bit values. Every color component requires 8 × 8 quantization entries, therefore the QUANT memory of SIMCOP can hold up to four tables as shown in [Table 8-1273](#).

Table 8-1273. Quantization Table Storage in QUANT Memory

| Table | 0 | 1 | 2 | 3 |
|-------------|----------------|-----------------|--------|--------|
| ADDR | 0x000 | 0x0080 | 0x0100 | 0x0180 |
| Encode only | Y quantization | UV quantization | Unused | Unused |

Table 8-1273. Quantization Table Storage in QUANT Memory (continued)

| Table | 0 | 1 | 2 | 3 |
|-------------------|----------------|-----------------|------------------|-------------------|
| Decode only | Unused | Unused | Y dequantization | UV dequantization |
| Encode and decode | Y quantization | UV quantization | Y dequantization | UV dequantization |

QUANT is shared between the VLCDJ and SIMCOP bus accesses. All initiators cannot access QUANT simultaneously.

The initiators access types to the QUANT memory are summarized in [Table 8-1274](#). QUANT memory configuration depends on the initiators.

Table 8-1274. QUANT Memory Organization

| VLCDJ | Coprocessor Bus |
|---------------------|---------------------|
| 128 words × 32 bits | 128 words × 32 bits |

8.4.2.3.4.5 Huffman Tables

The HUFF memory is used to store the Huffman table for the VLCDJ module. Details about the Huffman table organization can be found in the VLCDJ module description (see [Section 8.4.6](#), *VLCDJ*).

HUFF memory is shared between the VLCDJ and SIMCOP bus accesses. All initiators cannot access HUFF simultaneously.

The initiators access types to the HUFF memory are summarized in [Table 8-1275](#). HUFF memory configuration depends on the initiators.

Table 8-1275. HUFF Memory Organization

| VLCDJ | Coprocessor Bus |
|----------------------|----------------------|
| 1024 words × 32 bits | 1024 words × 32 bits |

8.4.2.3.4.6 Bitstream Buffer

8.4.2.3.4.6.1 Overview

The bitstream buffer is used to store the VLCDJ bitstream. The bitstream buffer is shared between the VLCDJ, DMA, and SIMCOP bus accesses.

The bitstream buffer can be used in manual or automatic mode.

In manual mode, software selects if SIMCOP DMA, VLCDJ bitstream port, or SIMCOP bus can access the bitstream buffer. Manual mode is typically used to interleave JPEG encode and decode, for example, to support JPEG transcoding.

In automatic mode ([SIMCOP_HWSEQ_CTRL](#)[6:4] BITSTREAM = ENCODE or DECODE) the bitstream buffer is handled as two banks to prevent access collision between VLCDJ and SIMCOP DMA. A dedicated hardware engine (BBM) is used to ensure that VLCDJ and SIMCOP DMA access separate banks.

Automatic mode is disabled by writing [SIMCOP_HWSEQ_CTRL](#)[6:4] BITSTREAM = COPR.

The bitstream buffer mapping into the SIMCOP DMA address map depends on the [SIMCOP_HWSEQ_CTRL](#)[6:4] BITSTREAM and [SIMCOP_HWSEQ_CTRL](#)[3:2] BITSTR_XFER_SIZE bit fields and the internal state of the BBM. [Table 8-1276](#) lists the mapping of the bitstream buffer for SIMCOP DMA.

Table 8-1276. Bitstream Buffer Mapping to SIMCOP DMA

| SIMCOP_HWSEQ_CTRL | | Address Map | | BBM count | Bitstream buffer | |
|--------------------------------------|------------------|--------------------|--------|------------------|-------------------------|--------|
| BITSTREAM | XFER_SIZE | | | | | |
| 0: COPRO | N/A | 0x1000 | 0x1FFF | N/A | 0x000 | 0xFFFF |
| 5: ENCODE or 6: DECODE | 2048 bytes | 0x1000 | 0x17FF | N/A | 0x000 | 0x7FF |
| | | | | N/A | 0x800 | 0xFFF |
| | | 0x1800 | 0x1FFF | N/A | N/A | N/A |
| | | | | N/A | N/A | N/A |
| | 1024 bytes | 0x1000 | 0x13FF | 0 | 0x000 | 0x3FF |
| | | | | 1 | 0x400 | 0x7FF |
| | | 0x1400 | 0x1FFF | N/A | N/A | N/A |
| | | | | N/A | N/A | N/A |
| | 512 bytes | 0x1000 | 0x11FF | 0 | 0x000 | 0x1FF |
| | | | | 1 | 0x200 | 0x3FF |
| | | | | 2 | 0x400 | 0x5FF |
| | | | | 3 | 0x600 | 0x7FF |
| | | 0x1200 | 0x1FFF | N/A | N/A | N/A |
| | | | | N/A | N/A | N/A |
| | 256 bytes | 0x1000 | 0x10FF | 0 | 0x000 | 0x0FF |
| | | | | 1 | 0x100 | 0x1FF |
| | | | | 2 | 0x200 | 0x2FF |
| | | | | 3 | 0x300 | 0x3FF |
| | | | | 4 | 0x400 | 0x4FF |
| | | | | 5 | 0x500 | 0x5FF |
| | | | | 6 | 0x600 | 0x6FF |
| | | | | 7 | 0x700 | 0x7FF |
| | | 0x1100 | 0x1FFF | N/A | N/A | N/A |

8.4.2.3.4.6.2 Automatic Bitstream Buffer Management

To enter automatic mode software must write the following values into the BITSTREAM configuration register:

- [SIMCOP_HWSEQ_CTRL](#)[6:4] BITSTREAM=COPR (required to reset BBM)
- [SIMCOP_HWSEQ_CTRL](#)[6:4] BITSTREAM=JPEG_ENCODE or JPEG_DECODE

8.4.2.3.4.7 LDC Lookup Table

The LDC_LUT memory is used to store LUTs for the LDC module. LDC_LUT is shared between the LDC and SIMCOP bus accesses. All initiators cannot access LDC_LUT simultaneously.

The initiators access types to the QUANT memory are summarized in [Table 8-1277](#). QUANT memory configuration depends on the initiators.

Table 8-1277. LDC_LUT Memory Organization

| LDC | Coprocessor Bus |
|---------------------|---|
| 256 words × 14 bits | 128 words × 32 bits (see Table 8-1278) |

Table 8-1278. LUT Memory Format on 32-Bit Words

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----------------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESE RVED | | | | | | | | LDC_LUT [2a+1] | | | | | | | | RESE RVED | | | | | | | | LDC_LUT [2a+0] | | | | | | | |

8.4.2.3.4.8 LDC Private Input Memory

The LDC has a private input memory that can be used when LDC operates in YUV 4:2:0 mode. For YUV 4:2:2 and RAW operation, LDC must use image buffers as input memories.

The LDC input memory is dedicated for LDC operation. It cannot be accessed from the SIMCOP bus or by any other SIMCOP module.

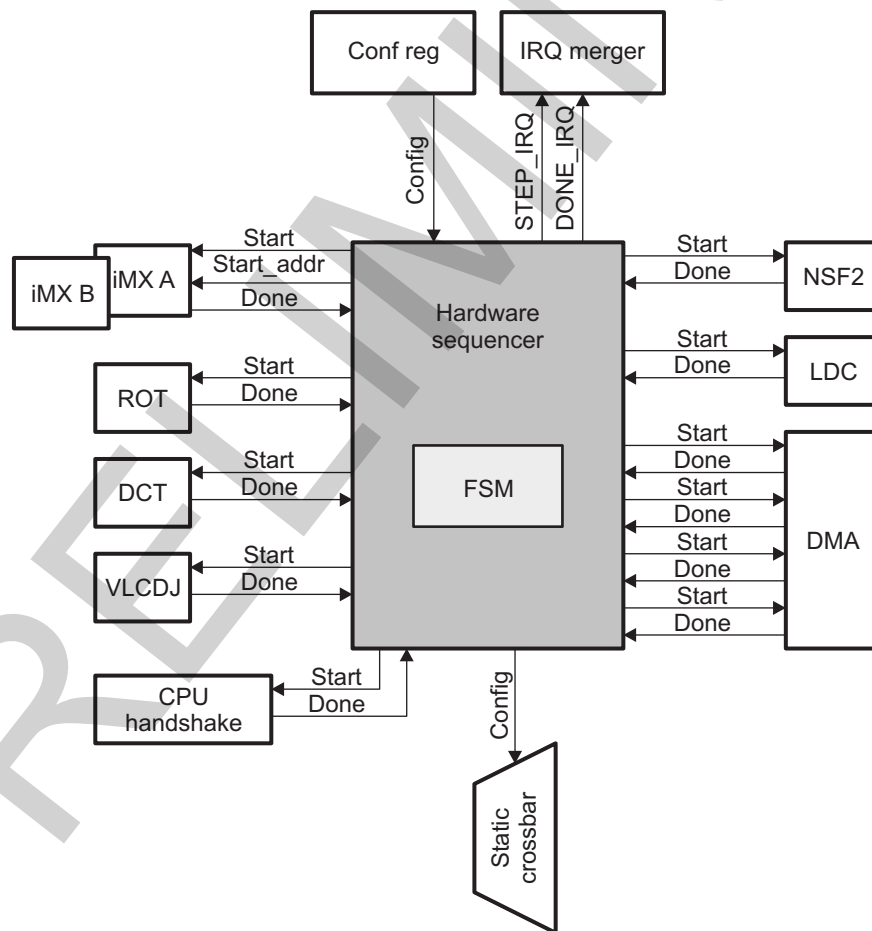
8.4.2.3.5 ISS SIMCOP Hardware Sequencer

SIMCOP typically processes a full frame on a macroblock by macroblock basis. SIMCOP modules and the DMA controller trigger an interrupt when they have completed a macroblock. This event can trigger an interrupt to an external initiator (manual mode) or trigger a context switch and resume DMA/SIMCOP module processing. Typically, initiator intervention is needed to fill the macroblock pipeline (called pipe-up. For example, first n macroblocks of an image) and to flush the macroblock pipeline (called pipe-down. For example, last n macroblocks of an image). Automatic sequencing mode is typically used for the rest of the image.

The hardware sequencer is particularly useful to offload the initiator during JPEG encode/decode, ROT, LDC, NSF2, or iMX processing.

Figure 8-252 shows the SIMCOP hardware sequencer overview.

Figure 8-252. SIMCOP Hardware Sequencer Overview



hwseq-008

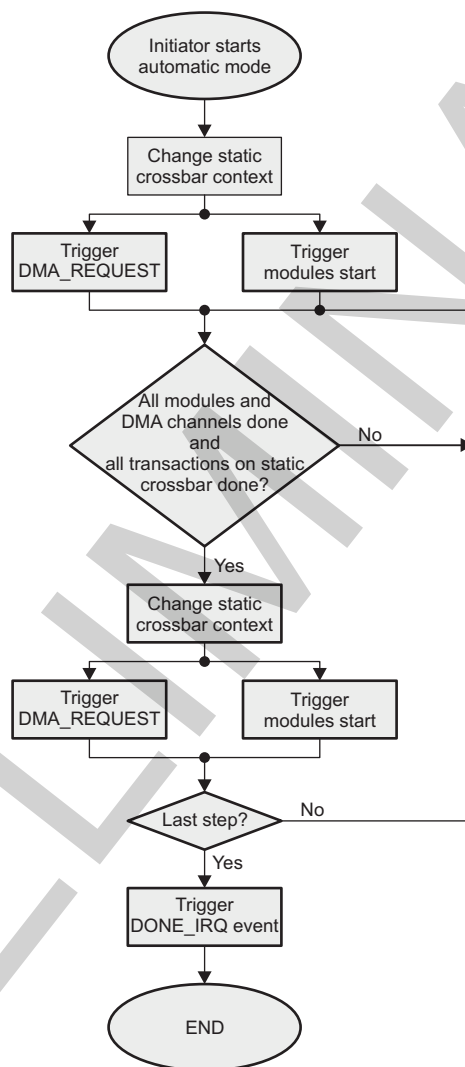
The hardware sequencer can automatically execute a predefined number of sequencing steps without

software intervention. That is called automatic operation. Automatic operation can also be used to pipeline filling and flushing with some limited software intervention. During automatic operation, the hardware sequencer controls generation of START/DONE pulses and the connections in the static-controlled crossbar. Software can take control over some resources while the hardware sequencer is running. That is called hardware sequencer override.

8.4.2.3.5.1 Automatic Operation

Figure 8-253 shows the flow diagram executed by the hardware sequencer.

Figure 8-253. Hardware Sequencing Example



hwseq-009

The external initiator configures the different SIMCOP modules and DMA channels. When this is done, the initiator enables the hardware sequencer. This resets the internal state of the hardware sequencer (pending events, context switch counter).

It starts by running sequence step [SIMCOP_HWSEQ_CTRL\[12:11\] STEP](#):

- Clear all pending completion events that have been selected for step 0 in the hardware sequencer. This does not affect the SIMCOP_IRQSTATUS register.
- Apply step [SIMCOP_HWSEQ_CTRL\[12:11\] STEP](#) configuration to the static crossbar.
- Start DMA transfers. Multiple channels can be enabled sequentially (for example, YUV 4:2:0 data transfers or SIMCOP→SDRAM followed by SDRAM→SIMCOP) by using the SIMCOP DMA linking feature.

- Start hardware accelerators. The list of accelerators to start can be selected by software using the [SIMCOP_HWSEQ_STEP_CTRL_i\[7:0\] *_SYNC](#) register.

The hardware sequencer then waits for completion of events from selected SIMCOP modules and SIMCOP DMA channels.

The hardware sequencer also ensures that all SIMCOP memory accesses requested by accelerators and DMA channels enabled for the synchronization step are complete. This condition prevents data corruption due to early switching.

Steps can be chained to define the sequence to execute. Steps are started until the step counter reaches the limit defined by software. When the last step has completed, a DONE_IRQ event is triggered.

SIMCOP can execute one hardware sequence at a time. However, software can be used to execute multiple independent sequences in parallel (for example, two unrelated macroblock pipelines) using the override feature.

The hardware sequencer has no specific support for macroblock pipeline filling (pipe-up) or flushing (pipe-down). It needs some software intervention.

The hardware sequencer supports sequences composed of up to four steps. Longer sequences require software intervention.

Figure 8-253 shows hardware sequencer operation.

Figure 8-254. Hardware Sequencer Operation Example



The example involves use of two SIMCOP modules (or DMA channels) that are synchronized using the hardware sequencer. A total of five sequencing steps are executed ([SIMCOP_HWSEQ_CTRL\[31:6\] HW_SEQ_STEP_COUNTER](#) = 5). The sequence is two steps long and starts with step 1. These two steps are configured using the [SIMCOP_HWSEQ_STEP_*_i](#) registers (where $i = 0$ and 1).

SIMCOP modules processing is started using START pulses (green). When SIMCOP modules are done they return a DONE pulse (red). Software can choose which accelerators to run for a given step using the [SIMCOP_HWSEQ_STEP_CTRL_i\[7:0\] *_SYNC](#) registers. They do not need to finish at the same time because the hardware sequencer waits for reception of all DONE pulses of used accelerators before moving to the next step.

The hardware sequencer also triggers a series of interrupts that can be used by software. For example, it is possible for software to change the configuration of inactive sequencing steps. This can be particularly useful to run longer sequences than what is supported by hardware.

For example, software can set up a 4-step looping sequence: Step $0 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 0 \rightarrow 1 \rightarrow \dots$. When the STEP1_IRQ event is triggered, software can load the configuration into the [SIMCOP_HWSEQ_STEP_*_i](#) registers, to be used the next time step 0 becomes active.

8.4.2.3.5.2 Hardware Sequencer Override

By default, the hardware sequencer controls START/DONE pulses of all SIMCOP modules as well as the static-controlled crossbar. Software can take control over some resources by setting the adequate bits in the [SIMCOP_HWSEQ_OVERRIDE](#) register. Sequencing resources under software control are managed using the [SIMCOP_HWSEQ_STEP_CTRL_OVERRIDE](#) and [SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE](#) registers.

Changes to the [SIMCOP_HWSEQ_STEP_CTRL_OVERRIDE](#)[27:11] *_OFST and [SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE](#) registers have immediate effect. Software must ensure there is no active traffic on the affected connection in the static-controlled crossbar.

For example, when software wants to alternatively attach image buffers a and b to SIMCOP_DMA while preserving the buffer start address in the SIMCOP DMA address map constant, it sets the following for the full application duration:

- [SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE](#)[2:0] IMBUFF_A = 1
- [SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE](#)[6:4] IMBUFF_B = 1

It then changes the [SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE](#)[2:0] IMBUFF_A and [SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE](#)[6:4] IMBUFF_B registers to attach the image buffers to the correct SIMCOP submodule.

The settings in the [SIMCOP_HWSEQ_STEP_CTRL_OVERRIDE](#) and [SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE](#) registers for resources controlled by the hardware sequencer have no effect.

Synchronization with SIMCOP modules is controlled using the [SIMCOP_HWSEQ_STEP_CTRL_OVERRIDE](#)[7:0] *_TRIGGER bit fields. For ROT, NSF, VLCDJ, DCT, and LDC, a START pulse is sent to the module when 1 is written into the adequate bit field. Software can trigger one or multiple start pulses at the time. The *_TRIGGER bit field is cleared by writing 1. It is automatically set by hardware when a DONE pulse is received from the relevant SIMCOP module.

Software can poll the status of the [SIMCOP_HWSEQ_STEP_CTRL_OVERRIDE](#)[7:0] *_TRIGGER bit field to detect when a SIMCOP module has completed its processing task. Alternatively, software can also use an interrupt. SIMCOP can merge one or multiple internal events into SIMCOP outgoing interrupts. Software can choose between two modes for each interrupt output (SIMCOP_CTRL[3:0] IRQx_MODE):

- 0x0: OR, the interrupt is asserted when one of the selected events has occurred.
- 0x1: AND, the interrupt is asserted when all selected events have occurred.

The AND mode leads to lower initiator load. In fact, the initiator is only interrupted once per sequencing step, even when events from multiple SIMCOP submodules are expected. Also, it does not need to poll the SIMCOP_HL_IRQSTATUS_i register to detect which events have occurred: it simply must write 0xFFFF into the SIMCOP_HL_IRQSTATUS_i register to clear all pending events.

The SIMCOP DMA START/DONE control is slightly different. Software can trigger one or multiple DMA channels by writing into the [SIMCOP_HWSEQ_STEP_CTRL_OVERRIDE](#)[7:5] DMA_TRIGGER bit field. The DMA_TRIGGER bit field returns the written value when all expected DONE pulses are received from SIMCOP DMA.

Alternatively, SIMCOP modules (except LDC) may be triggered by direct writes into their configuration registers. However, this approach leads to higher initiator load because multiple writes must be done.

8.4.2.4 ISS SIMCOP Hardware Sequencer and Buffers Basic Programming Model

8.4.2.4.1 ISS SIMCOP Application Programming Principle

Software must first configure SIMCOP access tag handling (SIMCOP_CTRL[24:21] LDC_R_TAG_CNT, SIMCOP_CTRL[19:16] LDC_R_TAG_OFST, and SIMCOP_DMA_CTRL[7:4] TAG_CNT). Software must ensure there is no active traffic on the SIMCOP master port before changing those registers.

Then it initializes Huffman, Quantization, and LDC LUT if they are used. Those memories must first be attached to the SIMCOP bus so they can be accessed from the slave port (SIMCOP_CTRL[11] HUFF, SIMCOP_CTRL[10] QUANT, and SIMCOP_CTRL[7:6] LDC_LUT). Then they can be preloaded using an external CPU or an external DMA engine. SIMCOP DMA cannot preload these tables.

Similarly, software can also preload data (such as filter coefficients) into iMX coefficient memories or image buffers. This can be handled by SIMCOP DMA:

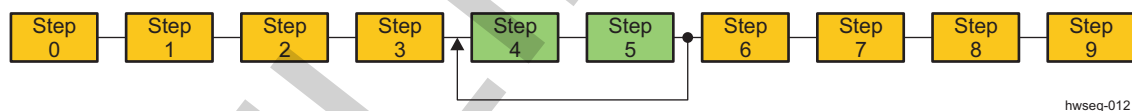
- The buffers must first be attached to the SIMCOP DMA using the [SIMCOP_HWSEQ_OVERRIDE](#) and [SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE](#) registers.
- Alternatively, software can use the SIMCOP_HWSEQ_STEP_*_i registers (where i = 0) instead of the override feature. The hardware sequencer ensures that the configuration of step 0 is applied when the hardware sequencer is disabled.
- Software then configures and starts one or multiple data transfers using the SIMCOP DMA.
- Software monitors SIMCOP DMA events to know when DMA transfers are complete. Other configuration tasks may happen concurrently, but software must ensure that transfers complete before attaching the memories to another module.

Software must then enable the modules to be used.

Typically, the first steps and last steps of the macroblock pipeline are different from the ones in the middle of the pipeline. The hardware sequencer has no specific support for pipe-up and pipe-down. However, software can cut the sequence into smaller sequences to benefit from the hardware sequencing and to avoid software sequencing.

[Figure 8-255](#) shows an example of a 10-step sequence involving two DMA transfers and three modules.

Figure 8-255. Typical Hardware Sequencer-Controlled Sequencer With Pipe-Up and Pipe-Down



The macroblock pipeline is composed of a chain of three modules. Data between the modules is exchanged using ping-pong buffering.

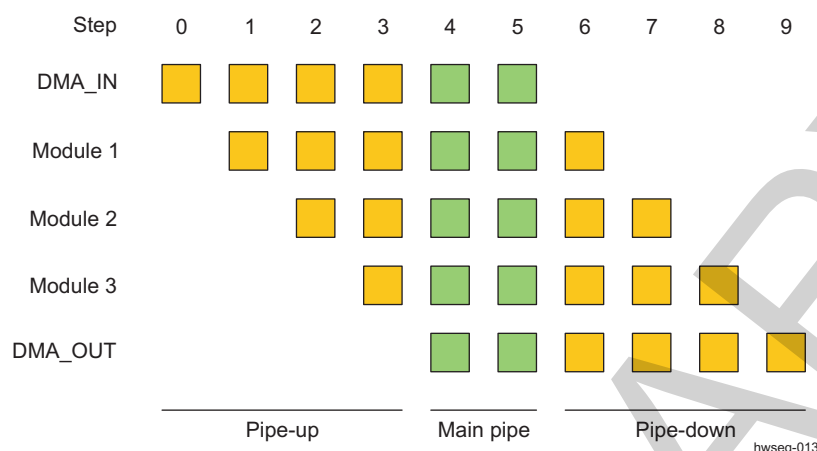
Pipe-up and pipe-down require four sequencing steps each. The main processing can be done with two steps.

Software configures the hardware sequencer with the 4-step pipe-up sequence. Each step is executed once. When pipe-up is done, SIMCOP triggers the DONE_IRQ event.

Software then reconfigures the hardware sequencer for the 2-step main sequence. The number of steps is defined by the amount of data to process. When the main pipe is done, SIMCOP triggers the DONE_IRQ event.

Software finally reconfigures the hardware sequencer with the 4-step pipe-down sequence. Each step is executed once. When pipe-down is done, SIMCOP triggers the DONE_IRQ event.

[Figure 8-256](#) shows an example of pipe-up and pipe-down.

Figure 8-256. Pipe-Up and Pipe-Down

The hardware sequencer configuration determines which module can access a given SIMCOP memory for a sequence step.

8.4.2.4.2 External CPU Use for Data Processing

An external CPU can be used to perform some data processing, as SIMCOP hardware accelerators do. A similar mechanism to the START/DONE pulse interaction with SIMCOP hardware accelerators is implemented.

The external CPU receives the request to start processing by the CPU_PROC_START_IRQ interrupt merged at SIMCOP subsystem level. This interrupt is enabled and acknowledged as usual.

When processing completes, the CPU generates the DONE pulse to the hardware sequencer by setting the [SIMCOP_HWSEQ_CTRL\[10\] CPU_PROC_DONE](#) bit to 1.

8.4.2.4.3 Rotation Operational Mode Configuration

The macroblock pipeline is controlled by a 2-step hardware sequence:

Figure 8-257. Rotation Macroblock Pipeline

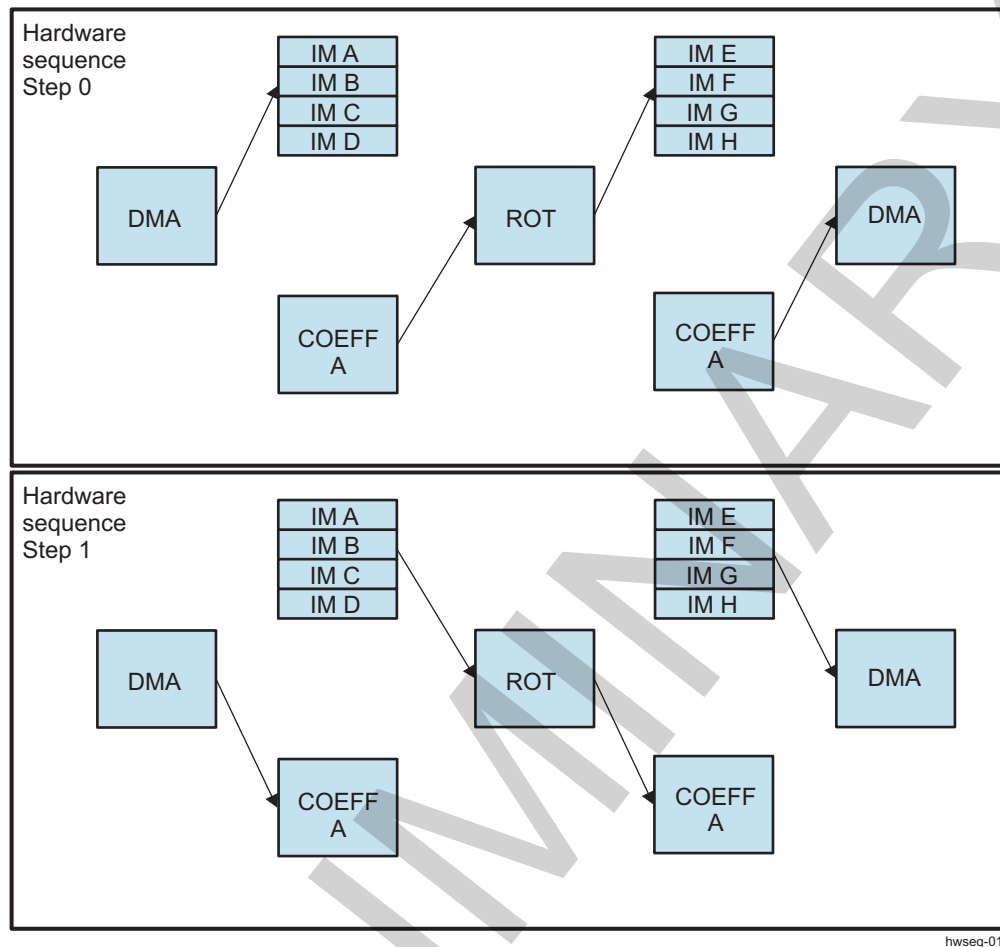


Table 8-1279. Rotation Macroblock Pipeline

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------------|---|-------|
| Set DMA to access IMBUFF_A. | SIMCOP_HWSEQ_STEP_SWITCH_i[2:0] IMBUFF_A (i = 0) | 0x1 |
| Set ROT_A_O to access IMBUFF_E. | SIMCOP_HWSEQ_STEP_SWITCH_i[18:16] IMBUFF_E (i = 0) | 0x7 |
| Set ROT_A_I to access COEFF_A. | SIMCOP_HWSEQ_STEP_CTRL2_i[2:0] = COEFF_A (i = 0) | 0x6 |
| Set DMA to access COEFF_B. | SIMCOP_HWSEQ_STEP_CTRL2_i[6:4] COEFF_B (i = 0) | 0x1 |
| Set ROT_A_I to access IMBUFF_A. | SIMCOP_HWSEQ_STEP_SWITCH_i[2:0] IMBUFF_A (i = 1) | 0x6 |
| Set DMA to access IMBUFF_E. | SIMCOP_HWSEQ_STEP_SWITCH_i[18:16] IMBUFF_E (i = 1) | 0x1 |
| Set DMA to access COEFF_A. | SIMCOP_HWSEQ_STEP_CTRL2_i[2:0] COEFF_A (i = 1) | 0x1 |
| Set ROT_A_O to access COEFF_B. | SIMCOP_HWSEQ_STEP_CTRL2_i[6:4] COEFF_B (i = 1) | 0x6 |

8.4.2.4.4 LDC Operational Mode Configuration

The LDC module fetches data from system memory, performs the transformation, and stores results into image buffers. DCT and VLCDJ modules are used to JPEG compress this data and store the results to the bitstream buffer. The SIMCOP DMA is used to transfer compressed data from bitstream buffer to system memory.

Figure 8-258. LDC Transformation Pipeline

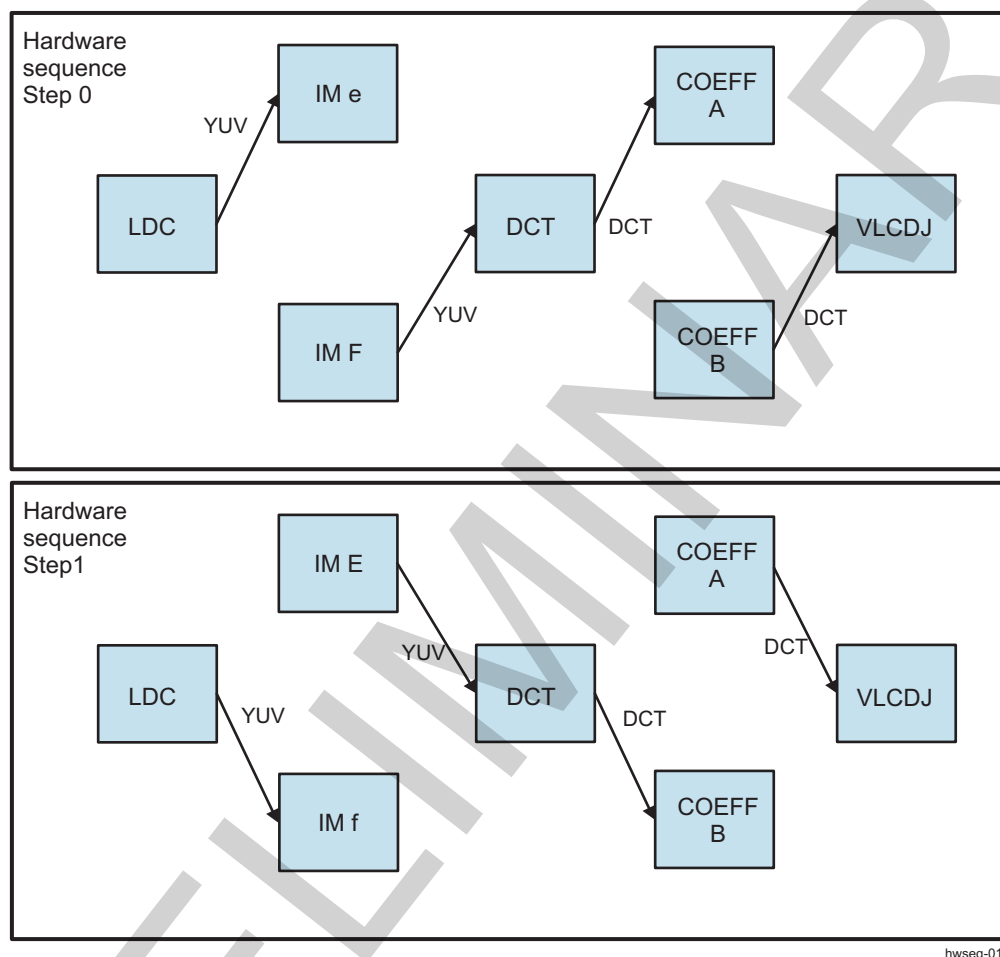


Table 8-1280. LDC Transformation

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Set IMBUFF_A and IMCUFF_B as input buffer. | SIMCOP_CTRL[7:6] LDC_INPUT | 0x1 |
| Set LDC to access IMBUFF_E. | SIMCOP_HWSEQ_STEP_SWITCH_i[18:16] IMBUFF_E | 0x6 |
| Set DCT to access COEFF_A. | SIMCOP_HWSEQ_STEP_CTRL2_i[2:0] COEFF_A | 0x5 |
| Set VLCDJ_IO to access COEFF_B. | SIMCOP_HWSEQ_STEP_CTRL2_i[6:4] COEFF_B | 0x4 |
| Set DCT to access IMBUFF_E. | SIMCOP_HWSEQ_STEP_SWITCH_i[18:16] IMBUFF_E | 0x4 |
| Set LDC to access IMBUFF_F. | SIMCOP_HWSEQ_STEP_SWITCH_i[18:16] IMBUFF_F | 0x6 |
| Set VLCDJ_IO to access COEFF_A. | SIMCOP_HWSEQ_STEP_CTRL2_i[2:0] COEFF_A | 0x4 |
| Set DCT to access COEFF_B. | SIMCOP_HWSEQ_STEP_CTRL2_i[6:4] COEFF_B | 0x5 |

8.4.2.4.5 Concurrent Software and Hardware Sequencing

Software can perform sequencing tasks concurrently with hardware sequencing. This is supported through the hardware sequencer override registers:

- [SIMCOP_HWSEQ_OVERRIDE](#)
- [SIMCOP_HWSEQ_STEP_CTRL_OVERRIDE](#)
- [SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE](#)
- [SIMCOP_HWSEQ_STEP_CTRL2_OVERRIDE](#)

Software can select which hardware resources are controlled by the hardware sequencer and which resources are controlled by software. Configuration parameters for software-controlled resources are provided using those registers as well.

Table 8-1281. Concurrent Software and Hardware Sequencing

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Set software to control IMBUFF_E. | SIMCOP_HWSEQ_OVERRIDE [13] IMBUFF_E | 0x1 |
| Set DMA to access IMBUFF_E. | SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE [1 8:16] IMBUFF_E | 0x1 |
| Set software to control IMBUFF_F. | SIMCOP_HWSEQ_OVERRIDE [14] IMBUFF_F | 0x1 |
| Set DCT_S to access IMBUFF_F. | SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE [2 2:20] IMBUFF_F | 0x4 |
| Set software to control COEFF_A. | SIMCOP_HWSEQ_OVERRIDE [17] COEFF_A | 0x1 |
| Set iMX A to access the COEFF_A. | SIMCOP_HWSEQ_STEP_CTRL2_OVERRIDE [2:0] COEFF_A | 0x2 |
| Set hardware sequencer to control COEFF_B. | SIMCOP_HWSEQ_OVERRIDE [18] COEFF_B | 0x0 |
| Set iMX B to access the COEFF_B. | SIMCOP_HWSEQ_STEP_CTRL2_i [6:4] COEFF_B | 0x3 |

8.4.2.5 ISS SIMCOP Hardware Sequencer and Buffers Register Manual

8.4.2.5.1 Hardware Sequencer Instance Summary

Table 8-1282 summarizes the hardware sequencer instance.

Table 8-1282. Hardware Sequencer Instance Summary

| Module Name | Base Address L3 Interconnect | Base Address Cortex-M3 Private Access | Size |
|-------------|---------------------------------|--|-----------|
| HWSEQ | 0x5202 0000 | 0x5506 0000 | 256 bytes |

NOTE: Private Access is an access that does not use the L3/L4 interconnects.

8.4.2.5.2 Hardware Sequencer Registers

8.4.2.5.2.1 Hardware Sequencer Register Summary

Table 8-1283 lists the HWSEQ register mapping.

Table 8-1283. HWSEQ Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-M3 Private Access |
|---|------|--------------------------|-----------------------------|-------------------------------------|---|
| SIMCOP_HWSEQ_CTRL | RW | 32 | 0x0000 0068 | 0x5202 0068 | 0x5506 0068 |
| SIMCOP_HWSEQ_STATUS | R | 32 | 0x0000 006C | 0x5202 006C | 0x5506 006C |
| SIMCOP_HWSEQ_OVERRIDE | RW | 32 | 0x0000 0070 | 0x5202 0070 | 0x5506 0070 |
| SIMCOP_HWSEQ_STEP_CTR L_OVERRIDE | RW | 32 | 0x0000 0074 | 0x5202 0074 | 0x5506 0074 |
| SIMCOP_HWSEQ_STEP_SWIT CH_OVERRIDE | RW | 32 | 0x0000 0078 | 0x5202 0078 | 0x5506 0078 |
| SIMCOP_HWSEQ_STEP_CTR L2_OVERRIDE | RW | 32 | 0x0000 007C | 0x5202 007C | 0x5506 007C |
| SIMCOP_HWSEQ_STEP_CTR L_i⁽¹⁾ | RW | 32 | 0x0000 0080 + (0x10 * i) | 0x5202 0080 + (0x10 * i) | 0x5506 0080 + (0x10 * i) |
| SIMCOP_HWSEQ_STEP_SWIT CH_i⁽¹⁾ | RW | 32 | 0x0000 0084 + (0x10 * i) | 0x5202 0084 + (0x10 * i) | 0x5506 0084 + (0x10 * i) |
| SIMCOP_HWSEQ_STEP_IMX_ CTRL_i⁽¹⁾ | RW | 32 | 0x0000 0088 + (0x10 * i) | 0x5202 0088 + (0x10 * i) | 0x5506 0088 + (0x10 * i) |
| SIMCOP_HWSEQ_STEP_CTR L2_i⁽¹⁾ | RW | 32 | 0x0000 008C + (0x10 * i) | 0x5202 008C + (0x10 * i) | 0x5506 008C + (0x10 * i) |

⁽¹⁾ i = 0 to 3

8.4.2.5.2.2 Hardware Sequencer Register Descriptions

through describe the registers in detail.

Table 8-1284. SIMCOP_HWSEQ_CTRL

| | | | |
|-------------------------|--|-----------------|-----------------------------|
| Address Offset | 0x0000 0068 | Instance | HWSEQ_L3 HWSEQ_CORTEX-M3 |
| Physical Address | 0x5202 0068 0x5506 0068 | | |
| Description | SIMCOP hardware sequencer control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|------|----|---------------|---|---------------|---|------------|---|-----------|---|------------------|---|-------------|--|--------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| HW_SEQ_STEP_COUNTER | | | | | | | | | | | | | | | | RESERVED | | | STEP | | CPU_PROC_DONE | | BBM_SYNC_CHAN | | BBM_STATUS | | BITSTREAM | | BITSTR_XFER_SIZE | | HW_SEQ_STOP | | HW_SEQ_START | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|--------|
| 31:16 | HW_SEQ_STEP_COUNTER | Number of steps executed by the hardware sequencer. HW_SEQ_STEP_COUNTER=0 corresponds to manual sequencing. | RW | 0x0000 |
| 15:13 | RESERVED | Read returns 0. | R | 0x0 |
| 12:11 | STEP | This register is automatically updated by the hardware sequencer when it is active. Otherwise, software can use it to activate the content of a given set of step registers (SIMCOP_HWSEQ_STEP_i) or to choose the first step number of a sequence. | RW | 0x0 |
| 10 | CPU_PROC_DONE | Used by the CPU to tell that it has completed data processing. This feature should be used together with the CPU_PROC_START_IRQ event Read's always return 0. Write 0x0: No effect. Write 0x1: CPU processing completed. | W | 0 |
| 9:8 | BBM_SYNC_CHAN | Defines the SIMCOP DMA hardware synchronization channel to be used for BBM. This register is only used when BITSTREAM=ENCODE or DECODE. Software must ensure that the same DMA hardware synchronization channel is not used by the hardware sequencer. | RW | 0x0 |
| 7 | BBM_STATUS | Status of the Bitstream buffer management hardware.Used only during automatic mode [BITSTREAM=5 or 6]. Equals 0 (IDLE) in manual mode [BITSTREAM=0..4].Set when automatic mode is entered. Automatic encode mode: used to detect when all banks have been flushed after the processing has completed (i.e. but request bank signals have been de-asserted by BBM). Automatic decode mode (BITSTREAM=DECODE): returns to 0 (IDLE) when automatic mode is left (BITSTREAM=COPR). Read 0x1: BBM is busy. Read 0x0: BBM is idle | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-------|
| 6:4 | BITSTREAM | <p>Bitstream buffer access control</p> <p>0x0: Bank 0: coprocessor bus (0x1000-0x17FF) Bank 1: coprocessor bus (0x1800-0x1FFF)</p> <p>0x1: Bank 0: DMA (0x1000-0x17FF) Bank 1: DMA (0x1800-0x1FFF)</p> <p>0x2: Bank 0: VLCDJ.B (0x000-0x7FF) Bank 1: VLCDJ.B (0x800-0xFFFF)</p> <p>0x3: Bank 0: DMA (0x1000-0x17FF) Bank 1: VLCDJ.B (0x800-0xFFFF)</p> <p>0x4: Bank 0: VLCDJ.B (0x000-0x7FF) Bank 1: DMA (0x1800-0x1FFF)</p> <p>0x5: The bitstream buffer is managed by hardware as a PING/PONG buffer to support JPEG encode use case. It can be accessed by the SIMCOP DMA or the VLCDJ module. The BITSTREAM hardware sequence is reset when the mode is changed to COPR, VLCDJ or DMA.</p> <p>0x6: The bitstream buffer is managed by hardware as a PING/PONG buffer to support JPEG decode use case. It can be accessed by the SIMCOP DMA or the VLCDJ module. The BITSTREAM hardware sequence is reset when the mode is changed to COPR, VLCDJ or DMA.</p> | RW | 0x0 |
| 3:2 | BITSTR_XFER_SIZE | <p>Defines the amount of data to be transferred per hardware request to the SIMCOP DMA. Bigger sizes lead to better SDRAM efficiency but prevents fine grained DMA transfer arbitration. This register is only used by hardware when BITSTREAM=ENCODE or BITSTREAM=DECODE.</p> <p>0x0: 2048 bytes</p> <p>0x1: 1024 bytes</p> <p>0x2: 512 bytes</p> <p>0x3: 256 bytes</p> | RW | 0x0 |
| 1 | HW_SEQ_STOP | <p>Stop the hardware sequencer. This feature is typically used to recover from an error condition. Read's always return 0.</p> <p>Write 0x0: No effect.</p> <p>Write 0x1: Stop the hardware sequence immediately (don't wait for expected DONE events). Setting this bit while the sequencer is idle has no effect.</p> | W | 0 |
| 0 | HW_SEQ_START | <p>Start the hardware sequencer. Read's always return 0.</p> <p>Write 0x0: No effect.</p> <p>Write 0x1: Starts step number SIMCOP_HWSEQ_CTRL[12:11] STEP of the hardware sequence. Setting this bit while the sequencer is running has no effect.</p> | W | 0 |

Table 8-1285. Register Call Summary for Register SIMCOP_HWSEQ_CTRL

ISS Still Image Coprocessor

- [ISS SIMCOP Hardware Sequencer and Buffers Functional Description: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[11\] \[12\] \[13\]](#)
- [ISS SIMCOP Hardware Sequencer and Buffers Basic Programming Model: \[14\]](#)
- [ISS SIMCOP Hardware Sequencer and Buffers Register Manual: \[15\] \[16\]](#)

Table 8-1286. SIMCOP_HWSEQ_STATUS

| | | | |
|-------------------------|------------------------------------|-----------------|-----------------------------|
| Address Offset | 0x0000 006C | Instance | HWSEQ_L3 HWSEQ_CORTEX-M3 |
| Physical Address | 0x5202 006C 0x5506 006C | | |
| Description | Hardware sequencer status register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| HW_SEQ_STEP_COUNTER | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | STATE |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|--------|
| 31:16 | HW_SEQ_STEP_COUNTER | Current step number | R | 0x0000 |
| 15:1 | RESERVED | Read returns 0. | R | 0x0000 |
| 0 | STATE | Current state Read 0x0: Idle Read 0x1: Running | R | 0 |

Table 8-1287. Register Call Summary for Register SIMCOP_HWSEQ_STATUS

ISS Still Image Coprocessor

- [ISS SIMCOP Hardware Sequencer and Buffers Register Manual: \[0\]](#)

Table 8-1288. SIMCOP_HWSEQ_OVERRIDE

| | | | |
|-------------------------|---|-----------------|-----------------------------|
| Address Offset | 0x0000 0070 | Instance | HWSEQ_L3 HWSEQ_CORTEX-M3 |
| Physical Address | 0x5202 0070 0x5506 0070 | | |
| Description | Hardware sequencer override control register. Bits in this register select what configuration register control a resource. 0: Resource controlled by hardware sequencer. Hardware uses the value from SIMCOP_HWSEQ_STEP_xx registers for the chosen resource 1: Resource controlled by software. Hardware uses the value from SIMCOP_HWSEQ_STEP_x_OVERRIDE registers for the chosen resource The bit field name matches the one of the resource. For example, IMX_A_D_OFST_OVR selects if SIMCOP_HWSEQ_STEP_CTRL_i[12:11] IMX_A_D_OFST or SIMCOP_HWSEQ_STEP_CTRL_OVERRIDE[12:11] IMX_A_D_OFST controls how image buffers are arranged in the iMX A address map. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|---------|----|----------|----|----------|---|----------|---|----------|---|----------|---|----------|---|----------|--|----------|--|----------------|--|----------------|--|----------------|--|-----------------|--|----------------|--|----------------|--|-------------------|--|------------------|--|------------------|--|
| RESERVED | | | | | | | | | | | | | | | | COEFF_B | | COEFF_A | | IMBUFF_H | | IMBUFF_G | | IMBUFF_F | | IMBUFF_E | | IMBUFF_D | | IMBUFF_C | | IMBUFF_B | | IMBUFF_A | | LDC_O_OFST_OVR | | ROT_Q_OFST_OVR | | ROT_I_OFST_OVR | | NSF_IO_OFST_OVR | | DCT_F_OFST_OVR | | DCT_S_OFST_OVR | | VLCDJ_IO_OFST_OVR | | IMX_B_D_OFST_OVR | | IMX_A_D_OFST_OVR | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------|------|--------|
| 31:19 | RESERVED | Read returns 0. | R | 0x0000 |
| 18 | COEFF_B | See register description | RW | 0 |
| 17 | COEFF_A | See register description | RW | 0 |
| 16 | IMBUFF_H | See register description | RW | 0 |
| 15 | IMBUFF_G | See register description | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--------------------------|------|-------|
| 14 | IMBUFF_F | See register description | RW | 0 |
| 13 | IMBUFF_E | See register description | RW | 0 |
| 12 | IMBUFF_D | See register description | RW | 0 |
| 11 | IMBUFF_C | See register description | RW | 0 |
| 10 | IMBUFF_B | See register description | RW | 0 |
| 9 | IMBUFF_A | See register description | RW | 0 |
| 8 | LDC_O_OFST_OVR | See register description | RW | 0 |
| 7 | ROT_O_OFST_OVR | See register description | RW | 0 |
| 6 | ROT_I_OFST_OVR | See register description | RW | 0 |
| 5 | NSF_IO_OFST_OVR | See register description | RW | 0 |
| 4 | DCT_F_OFST_OVR | See register description | RW | 0 |
| 3 | DCT_S_OFST_OVR | See register description | RW | 0 |
| 2 | VLCDJ_IO_OFST_OVR | See register description | RW | 0 |
| 1 | IMX_B_D_OFST_OVR | See register description | RW | 0 |
| 0 | IMX_A_D_OFST_OVR | See register description | RW | 0 |

Table 8-1289. Register Call Summary for Register SIMCOP_HWSEQ_OVERRIDE

ISS Still Image Coprocessor

- [ISS SIMCOP Hardware Sequencer and Buffers Functional Description: \[0\]](#)
- [ISS SIMCOP Hardware Sequencer and Buffers Basic Programming Model: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [ISS SIMCOP Hardware Sequencer and Buffers Register Manual: \[7\]](#)

Table 8-1290. SIMCOP_HWSEQ_STEP_CTRL_OVERRIDE

| | | | |
|-------------------------|---|-----------------|-----------------------------|
| Address Offset | 0x0000 0074 | Instance | HWSEQ_L3 HWSEQ_CORTEX-M3 |
| Physical Address | 0x5202 0074 0x5506 0074 | | |
| Description | Hardware sequencer override register. Used to execute software sequences in parallel to hardware sequencing steps | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|------------|------------|----------|------------|------------|---------------|----|--------------|--------------|----------|----|----|----|----|---|---|-------------|---------------|-------------|---------------|-------------|-------------|---|---|
| RESERVED | | | | | | | | ROT_O_OFST | ROT_I_OFST | RESERVED | DCT_F_OFST | DCT_S_OFST | VLCDJ_IO_OFST | | IMX_B_D_OFST | IMX_A_D_OFST | RESERVED | | | | | | | DMA_TRIGGER | ROT_A_TRIGGER | NSF_TRIGGER | VLCDJ_TRIGGER | DCT_TRIGGER | LDC_TRIGGER | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | Read returns 0. | R | 0x0 |
| 27:26 | ROT_O_OFST | Controls ROT.O bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: EFGH 0x1: FGHE 0x2: GHEF 0x3: HEFG | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|-------|
| 25:24 | ROT_I_OFST | Controls ROT_I bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: ABCD 0x1: BCDA 0x2: CDAB 0x3: DABC | RW | 0x0 |
| 23 | RESERVED | Read returns 0. | R | 0 |
| 22:20 | DCT_F_OFST | Controls DCT.F bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: ABCD 0x1: BCDG 0x2: CDGH 0x3: DGHA 0x4: GHAB 0x5: HABC | RW | 0x0 |
| 19:18 | DCT_S_OFST | Controls DCT.S bus mapping to image buffers: 0x0000 0x1000 0x0: EF 0x1: FG 0x2: GH 0x3: HE | RW | 0x0 |
| 17:15 | VLCDJ_IO_OFST | Controls VLCDJ IO data bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: ABCD 0x1: BCDG 0x2: CDGH 0x3: DGHA 0x4: GHAB 0x5: HABC | RW | 0x0 |
| 14:13 | IMX_B_D_OFST | Controls iMX B data bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: ABCD 0x1: CDEF 0x2: EFGH 0x3: GHAB | RW | 0x0 |
| 12:11 | IMX_A_D_OFST | Controls iMX A data bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: ABCD 0x1: CDEF 0x2: EFGH 0x3: GHAB | RW | 0x0 |
| 10:8 | RESERVED | Read returns 0. | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------|
| 7:5 | DMA_TRIGGER | <p>Software controlled START/DONE synchronization</p> <p>Write 0x0: No effect</p> <p>Read 0x0: No done pulse have been received since last non zero write into the DMA_TRIGGER register</p> <p>Read 0x1: DONE pulses for channel 0 and 1 have been received</p> <p>Write 0x1: Trigger channel 0 and 1. Clears all memorized done pulses for DMA.</p> <p>Write 0x2: Trigger channel 0, 1, 2. Clears all memorized done pulses for DMA.</p> <p>Read 0x2: DONE pulses for channel 0, 1 and 2 have been received</p> <p>Read 0x3: DONE pulses for channel 0, 1, 2 and 3 have been received.</p> <p>Write 0x3: Trigger channel 0, 1, 2 and 3. Clears all memorized done pulses for DMA.</p> <p>Read 0x4: DONE pulse for channel 0 has been received</p> <p>Write 0x4: Trigger channel 0. Clears all memorized done pulses for DMA.</p> <p>Write 0x5: Trigger channel 1. Clears all memorized done pulses for DMA.</p> <p>Read 0x5: DONE pulse for channel 1 has been received</p> <p>Read 0x6: DONE pulse for channel 2 has been received</p> <p>Write 0x6: Trigger channel 2. Clears all memorized done pulses for DMA.</p> <p>Write 0x7: Trigger channel 3. Clears all memorized done pulses for DMA.</p> <p>Read 0x7: DONE pulse for channel 3 has been received</p> | RW | 0x0 |
| 4 | ROT_A_TRIGGER | <p>Software controlled START/DONE synchronization</p> <p>Write 0x0: No Effect</p> <p>Read 0x0: No DONE pulse received since the last START pulse has been sent</p> <p>Read 0x1: DONE pulse received</p> <p>Write 0x1: Send a start pulse and clears the memorized done pulse</p> | RW | 0 |
| 3 | NSF_TRIGGER | <p>Software controlled START/DONE synchronization</p> <p>Write 0x0: No Effect</p> <p>Read 0x0: No DONE pulse received since the last START pulse has been sent</p> <p>Read 0x1: DONE pulse received</p> <p>Write 0x1: Send a start pulse and clears the memorized done pulse</p> | RW | 0 |
| 2 | VLCDJ_TRIGGER | <p>Software controlled START/DONE synchronization</p> <p>Write 0x0: No Effect</p> <p>Read 0x0: No DONE pulse received since the last START pulse has been sent</p> <p>Read 0x1: DONE pulse received</p> <p>Write 0x1: Send a start pulse and clears the memorized done pulse</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------|
| 1 | DCT_TRIGGER | Software controlled START/DONE synchronization Write 0x0: No Effect Read 0x0: No DONE pulse received since the last START pulse has been sent Read 0x1: DONE pulse received Write 0x1: Send a start pulse and clears the memorized done pulse | RW | 0 |
| 0 | LDC_TRIGGER | Software controlled START/DONE synchronization Write 0x0: No Effect Read 0x0: No DONE pulse received since the last START pulse has been sent Read 0x1: DONE pulse received Write 0x1: Send a start pulse and clears the memorized done pulse | RW | 0 |

Table 8-1291. Register Call Summary for Register SIMCOP_HWSEQ_STEP_CTRL_OVERRIDE

ISS Still Image Coprocessor

- [ISS SIMCOP Hardware Sequencer and Buffers Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [ISS SIMCOP Hardware Sequencer and Buffers Basic Programming Model: \[6\]](#)
- [ISS SIMCOP Hardware Sequencer and Buffers Register Manual: \[7\] \[8\]](#)

Table 8-1292. SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE

| | | | |
|-------------------------|---|-----------------|-----------------|
| Address Offset | 0x0000 0078 | Instance | HWSEQ_L3 |
| Physical Address | 0x5202 0078 0x5506 0078 | | HWSEQ_CORTEX-M3 |
| Description | Hardware sequencer override register. Used to execute software sequences in parallel to hardware sequencing steps | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----------|----|----|----|----------|----------|----|----|----|----------|----------|----|----|----|----------|----------|----|----|---|----------|----------|---|---|---|----------|----------|---|---|--|----------|----------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| IMBUFF_H | | | | IMBUFF_G | | | | RESERVED | IMBUFF_F | | | | RESERVED | IMBUFF_E | | | | RESERVED | IMBUFF_D | | | | RESERVED | IMBUFF_C | | | | RESERVED | IMBUFF_B | | | | RESERVED | IMBUFF_A | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | IMBUFF_H | Switch for image buffer h 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: VLCDJ_IO 0x5: DCT_S 0x6: DCT_F 0x7: ROT_A_O 0x8: NSF_IO 0x9: LDC_O | RW | 0x0 |
| 27:24 | IMBUFF_G | Switch for image buffer g 0x0: Coprocessor bus 0x1: SIMCOP DMA | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| | | 0x2: iMX A 0x3: iMX B 0x4: VLCDJ_IO 0x5: DCT_S 0x6: DCT_F 0x7: ROT_A_O 0x8: NSF_IO 0x9: LDC_O | | |
| 23 | RESERVED | Read returns 0. | R | 0 |
| 22:20 | IMBUFF_F | Switch for image buffer f 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: DCT_S 0x5: NSF_IO 0x6: LDC_O 0x7: ROT_A_O | RW | 0x0 |
| 19 | RESERVED | Read returns 0. | R | 0 |
| 18:16 | IMBUFF_E | Switch for image buffer e 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: DCT_S 0x5: NSF_IO 0x6: LDC_O 0x7: ROT_A_O | RW | 0x0 |
| 15 | RESERVED | Read returns 0. | R | 0 |
| 14:12 | IMBUFF_D | Switch for image buffer d 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: VLCDJ_IO 0x5: DCT_F 0x6: ROT_A_I 0x7: Reserved | RW | 0x0 |
| 11 | RESERVED | Read returns 0. | R | 0 |
| 10:8 | IMBUFF_C | Switch for image buffer c. 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: VLCDJ_IO 0x5: DCT_F 0x6: ROT_A_I 0x7: Reserved | RW | 0x0 |
| 7 | RESERVED | Read returns 0. | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 6:4 | IMBUFF_B | Switch for image buffer b. 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A IMBUFF 0x3: iMX B IMBUFF 0x4: VLCDJ_IO 0x5: DCT_F 0x6: ROT_A_I 0x7: Reserved | RW | 0x0 |
| 3 | RESERVED | Read returns 0. | R | 0 |
| 2:0 | IMBUFF_A | Switch for image buffer a 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A IMBUFF 0x3: iMX B IMBUFF 0x4: VLCDJ_IO 0x5: DCT_F 0x6: ROT_A_I 0x7: Reserved | RW | 0x0 |

Table 8-1293. Register Call Summary for Register SIMCOP_HWSEQ_STEP_SWITCH_OVERRIDE

ISS Still Image Coprocessor

- [ISS SIMCOP Hardware Sequencer and Buffers Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [ISS SIMCOP Hardware Sequencer and Buffers Basic Programming Model: \[7\] \[8\] \[9\] \[10\]](#)
- [ISS SIMCOP Hardware Sequencer and Buffers Register Manual: \[11\]](#)

Table 8-1294. SIMCOP_HWSEQ_STEP_CTRL2_OVERRIDE

| | | | |
|------------------|---|----------|-----------------|
| Address Offset | 0x0000 007C | Instance | HWSEQ_L3 |
| Physical Address | 0x5202 007C 0x5506 007C | | HWSEQ_CORTEX-M3 |
| Description | Hardware sequencer override register. Used to execute software sequences in parallel to hardware sequencing steps | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|------------|----|----------|---------|---|----------|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | NSF2_IO_OFST | | LDC_O_OFST | | RESERVED | COEFF_B | | RESERVED | COEFF_A | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|---------|
| 31:12 | RESERVED | Read returns 0. | R | 0x00000 |
| 11:10 | NSF2_IO_OFST | Controls NSF_IO bus mapping to image buffers: 0x0000 0x1000 0x0: EF 0x1: FG 0x2: GH 0x3: HE | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 9:8 | LDC_O_OFST | Controls LDC.O bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: EFGH 0x1: FGHE 0x2: GHEF 0x3: HEFG | RW | 0x0 |
| 7 | RESERVED | Read returns 0. | R | 0 |
| 6:4 | COEFF_B | Coefficient buffer b switch 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: VLCDJ_IO 0x5: DCT_F 0x6: ROT A O 0x7: Reserved | RW | 0x0 |
| 3 | RESERVED | Read returns 0. | R | 0 |
| 2:0 | COEFF_A | Coefficient buffer a switch 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: VLCDJ_IO 0x5: DCT_F 0x6: ROT A I 0x7: Reserved | RW | 0x0 |

Table 8-1295. Register Call Summary for Register SIMCOP_HWSEQ_STEP_CTRL2_OVERRIDE

ISS Still Image Coprocessor

- [ISS SIMCOP Hardware Sequencer and Buffers Basic Programming Model: \[0\] \[1\]](#)
- [ISS SIMCOP Hardware Sequencer and Buffers Register Manual: \[2\]](#)

Table 8-1296. SIMCOP_HWSEQ_STEP_CTRL_i

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0080 + (0x10 * i) | | | | | | | | | | | | | | | | Instance HWSEQ_L3 HWSEQ_CORTEX-M3 | | | | | | | | | | | | | | | |
| Physical Address | | 0x5202 0080 + (0x10 * i) 0x5506 0080 + (0x10 * i) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Hardware sequencer step control register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----------|----|----|----|------------|----|------------|----|----------|----|------------|----|----|----|------------|----|---------------|----|----|----|--------------|---|--------------|---|------|---|----------|---|----------|---|------------|--|----------|------------|----------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| CPU_SYNC | | DMA_OFST | | | | ROT_O_OFST | | ROT_I_OFST | | RESERVED | | DCT_F_OFST | | | | DCT_S_OFST | | VLCDJ_IO_OFST | | | | IMX_B_D_OFST | | IMX_A_D_OFST | | NEXT | | RESERVED | | DMA_SYNC | | ROT_A_SYNC | | NSF_SYNC | VLCDJ_SYNC | DCT_SYNC | LDC_SYNC |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|-------|
| 31 | CPU_SYNC | Enable hardware synchronization with the CPU so that it can be used for some processing on in the macroblock pipeline. 0x0: Disabled 0x1: Enabled. | RW | 0 |
| 30:28 | DMA_OFST | Controls DMA bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x4000 0x5000 0x6000 0x7000 0x0: ABCDEFGH 0x1: BCDEFGHA 0x2: CDEFGHAB 0x3: DEFGHABC 0x4: EFGHABCD 0x5: FGHABCDE 0x6: GHABCDEF 0x7: HABCDEFG | RW | 0x0 |
| 27:26 | ROT_O_OFST | Controls ROT.O bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: EFGH 0x1: FGHE 0x2: GHEF 0x3: HEFG | RW | 0x0 |
| 25:24 | ROT_I_OFST | Controls ROT.I bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: ABCD 0x1: BCDA 0x2: CDAB 0x3: DABC | RW | 0x0 |
| 23 | RESERVED | Read returns 0. | R | 0 |
| 22:20 | DCT_F_OFST | Controls DCT.F bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: ABCD 0x1: BCDG 0x2: CDGH 0x3: DGHA 0x4: GHAB 0x5: HABC | RW | 0x0 |
| 19:18 | DCT_S_OFST | Controls DCT.S bus mapping to image buffers: 0x0000 0x1000 0x0: EF 0x1: FG 0x2: GH 0x3: HE | RW | 0x0 |
| 17:15 | VLCDJ_IO_OFST | Controls VLCDJ IO data bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: ABCD 0x1: BCDG 0x2: CDGH 0x3: DGHA 0x4: GHAB 0x5: HABC | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|-------|
| 14:13 | IMX_B_D_OFST | Controls iMX B data bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: ABCD 0x1: CDEF 0x2: EFGH 0x3: GHAB | RW | 0x0 |
| 12:11 | IMX_A_D_OFST | Controls iMX A data bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: ABCD 0x1: CDEF 0x2: EFGH 0x3: GHAB | RW | 0x0 |
| 10:9 | NEXT | Next channel in the sync chain 0x0: Step 0 0x1: Step 1 0x2: Step 2 0x3: Step 3 | RW | 0x0 |
| 8 | RESERVED | Read returns 0. | R | 0 |
| 7:5 | DMA_SYNC | Enable hardware synchronization with the SIMCOP DMA 0x0: Disabled 0x1: Channel 0 and 1 0x2: Channel 0, 1, 2 0x3: Channel 0, 1, 2 and 3 0x4: Channel 0 0x5: Channel 1 0x6: Channel 2 0x7: Channel 3 | RW | 0x0 |
| 4 | ROT_A_SYNC | Enable hardware synchronization with the ROT #a module 0x0: Disabled 0x1: Enabled. | RW | 0 |
| 3 | NSF_SYNC | Enable hardware synchronization with the NSF module 0x0: Disabled 0x1: Enabled | RW | 0 |
| 2 | VLCDJ_SYNC | Enable hardware synchronization with the VLCDJ module 0x0: Disabled 0x1: Enabled | RW | 0 |
| 1 | DCT_SYNC | Enable hardware synchronization with the DCT module 0x0: Disabled 0x1: Enabled | RW | 0 |
| 0 | LDC_SYNC | Enable hardware synchronization with the LDC module 0x0: Disabled 0x1: Enabled | RW | 0 |

Table 8-1297. Register Call Summary for Register SIMCOP_HWSEQ_STEP_CTRL_i

ISS Still Image Coprocessor

- [ISS SIMCOP Hardware Sequencer and Buffers Functional Description: \[0\] \[1\] \[2\]](#)
- [ISS SIMCOP Hardware Sequencer and Buffers Register Manual: \[3\] \[4\]](#)

Table 8-1298. SIMCOP_HWSEQ_STEP_SWITCH_i

| | | | |
|-------------------------|--|-----------------|-----------------|
| Address Offset | 0x0000 0084 + (0x10 * i) | | |
| Physical Address | 0x5202 0084 + (0x10 * i) | Instance | HWSEQ_L3 |
| | 0x5506 0084 + (0x10 * i) | | HWSEQ_CORTEX-M3 |
| Description | Image buffer switch control. The configuration of step #0 is used when hardware sequencer is idle. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----------|----|----|----|----------|----------|----|----|----|----------|----------|----|----|----|----------|----------|----|----|---|----------|----------|---|---|---|----------|----------|---|---|--|----------|----------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| IMBUFF_H | | | | IMBUFF_G | | | | RESERVED | IMBUFF_F | | | | RESERVED | IMBUFF_E | | | | RESERVED | IMBUFF_D | | | | RESERVED | IMBUFF_C | | | | RESERVED | IMBUFF_B | | | | RESERVED | IMBUFF_A | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | IMBUFF_H | Switch for image buffer h 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: VLCDJ_IO 0x5: DCT_S 0x6: DCT_F 0x7: ROT_A_O 0x8: NSF_IO 0x9: LDC_O | RW | 0x0 |
| 27:24 | IMBUFF_G | Switch for image buffer g 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: VLCDJ_IO 0x5: DCT_S 0x6: DCT_F 0x7: ROT_A_O 0x8: NSF_IO 0x9: LDC_O | RW | 0x0 |
| 23 | RESERVED | Read returns 0. | R | 0 |
| 22:20 | IMBUFF_F | Switch for image buffer f 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: DCT_S 0x5: NSF_IO 0x6: LDC_O 0x7: ROT_A_O | RW | 0x0 |
| 19 | RESERVED | Read returns 0. | R | 0 |
| 18:16 | IMBUFF_E | Switch for image buffer e 0x0: Coprocessor bus 0x1: SIMCOP DMA | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| | | 0x2: iMX A 0x3: iMX B 0x4: DCT_S 0x5: NSF_IO 0x6: LDC_O 0x7: ROT_A_O | | |
| 15 | RESERVED | Read returns 0. | R | 0 |
| 14:12 | IMBUFF_D | Switch for image buffer d 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: VLCDJ_IO 0x5: DCT_F 0x6: ROT_A_I 0x7: Reserved | RW | 0x0 |
| 11 | RESERVED | Read returns 0. | R | 0 |
| 10:8 | IMBUFF_C | Switch for image buffer c. 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: VLCDJ_IO 0x5: DCT_F 0x6: ROT_A_I 0x7: Reserved | RW | 0x0 |
| 7 | RESERVED | Read returns 0. | R | 0 |
| 6:4 | IMBUFF_B | Switch for image buffer b. 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A IMBUFF 0x3: iMX B IMBUFF 0x4: VLCDJ_IO 0x5: DCT_F 0x6: ROT_A_I 0x7: Reserved | RW | 0x0 |
| 3 | RESERVED | Read returns 0. | R | 0 |
| 2:0 | IMBUFF_A | Switch for image buffer a 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A IMBUFF 0x3: iMX B IMBUFF 0x4: VLCDJ_IO 0x5: DCT_F 0x6: ROT_A_I 0x7: Reserved | RW | 0x0 |

Table 8-1299. Register Call Summary for Register SIMCOP_HWSEQ_STEP_SWITCH_i

ISS Still Image Coprocessor

- [ISS SIMCOP Hardware Sequencer and Buffers Functional Description: \[0\] \[1\]](#)
- [ISS SIMCOP Hardware Sequencer and Buffers Basic Programming Model: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [ISS SIMCOP Hardware Sequencer and Buffers Register Manual: \[9\]](#)

Table 8-1300. SIMCOP_HWSEQ_STEP_IMX_CTRL_i

| | | | |
|-------------------------|--|-----------------|-----------------------------|
| Address Offset | 0x0000 0088 + (0x10 * i) | | |
| Physical Address | 0x5202 0088 + (0x10 * i) 0x5506 0088 + (0x10 * i) | Instance | HWSEQ_L3 HWSEQ_CORTEX-M3 |
| Description | Hardware sequencer step control register The configuration of step #0 is used when hardware sequencer is idle. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----------|----|-------------|----|----|----|----|----|----|----|----|----|----|----|----|------------|----------|----|-------------|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| IMX_B_SYNC | RESERVED | | IMX_B_START | | | | | | | | | | | | | IMX_A_SYNC | RESERVED | | IMX_A_START | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|--------|
| 31 | IMX_B_SYNC | Enable hardware synchronization with the iMX B module 0x0: Disabled 0x1: Enabled. | RW | 0 |
| 30:29 | RESERVED | Read returns 0. | R | 0x0 |
| 28:16 | IMX_B_START | This register is only used when SIMCOP_HWSEQ_STEP_IMX_CTRL_i[31] IMX_B_SYNC=1. It contains the address, in 16-bit words, of the first instruction iMX will execute when it gets started. | RW | 0x0000 |
| 15 | IMX_A_SYNC | Enable hardware synchronization with the iMX A module 0x0: Disabled 0x1: Enabled. | RW | 0 |
| 14:13 | RESERVED | Read returns 0. | R | 0x0 |
| 12:0 | IMX_A_START | This register is only used when SIMCOP_HWSEQ_STEP_IMX_CTRL_i[15] IMX_A_SYNC=1. It contains the address, in 16-bit words, of the first instruction iMX will execute when it gets started. | RW | 0x0000 |

Table 8-1301. Register Call Summary for Register SIMCOP_HWSEQ_STEP_IMX_CTRL_i

ISS Still Image Coprocessor

- [ISS SIMCOP Hardware Sequencer and Buffers Register Manual: \[0\] \[1\] \[2\]](#)

Table 8-1302. SIMCOP_HWSEQ_STEP_CTRL2_i

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|
| Address Offset | 0x0000 008C + (0x10 * i) | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | HWSEQ_L3 HWSEQ_CORTEX-M3 | | | | | | | |
| Physical Address | 0x5202 008C + (0x10 * i) 0x5506 008C + (0x10 * i) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Hardware sequencer step control register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|------------|---|----------|---|---------|---|----------|---|---------|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | NSF2_IO_OFST | | LDC_O_OFST | | RESERVED | | COEFF_B | | RESERVED | | COEFF_A | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|---------|
| 31:12 | RESERVED | Read returns 0. | R | 0x00000 |
| 11:10 | NSF2_IO_OFST | Controls NSF_IO bus mapping to image buffers: 0x0000 0x1000 0x0: EF 0x1: FG 0x2: GH 0x3: HE | RW | 0x0 |
| 9:8 | LDC_O_OFST | Controls LDC.O bus mapping to image buffers: 0x0000 0x1000 0x2000 0x3000 0x0: EFGH 0x1: FGHE 0x2: GHEF 0x3: HEFG | RW | 0x0 |
| 7 | RESERVED | Read returns 0. | R | 0 |
| 6:4 | COEFF_B | Coefficient buffer b switch 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: VLCDJ_IO 0x5: DCT_F 0x6: ROT A O 0x7: Reserved | RW | 0x0 |
| 3 | RESERVED | Read returns 0. | R | 0 |
| 2:0 | COEFF_A | Coefficient buffer a switch 0x0: Coprocessor bus 0x1: SIMCOP DMA 0x2: iMX A 0x3: iMX B 0x4: VLCDJ_IO 0x5: DCT_F 0x6: ROT A I 0x7: Reserved | RW | 0x0 |

Table 8-1303. Register Call Summary for Register SIMCOP_HWSEQ_STEP_CTRL2_i

ISS Still Image Coprocessor

- [ISS SIMCOP Hardware Sequencer and Buffers Functional Description: \[0\]](#)
 - [ISS SIMCOP Hardware Sequencer and Buffers Basic Programming Model: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
 - [ISS SIMCOP Hardware Sequencer and Buffers Register Manual: \[10\]](#)
-

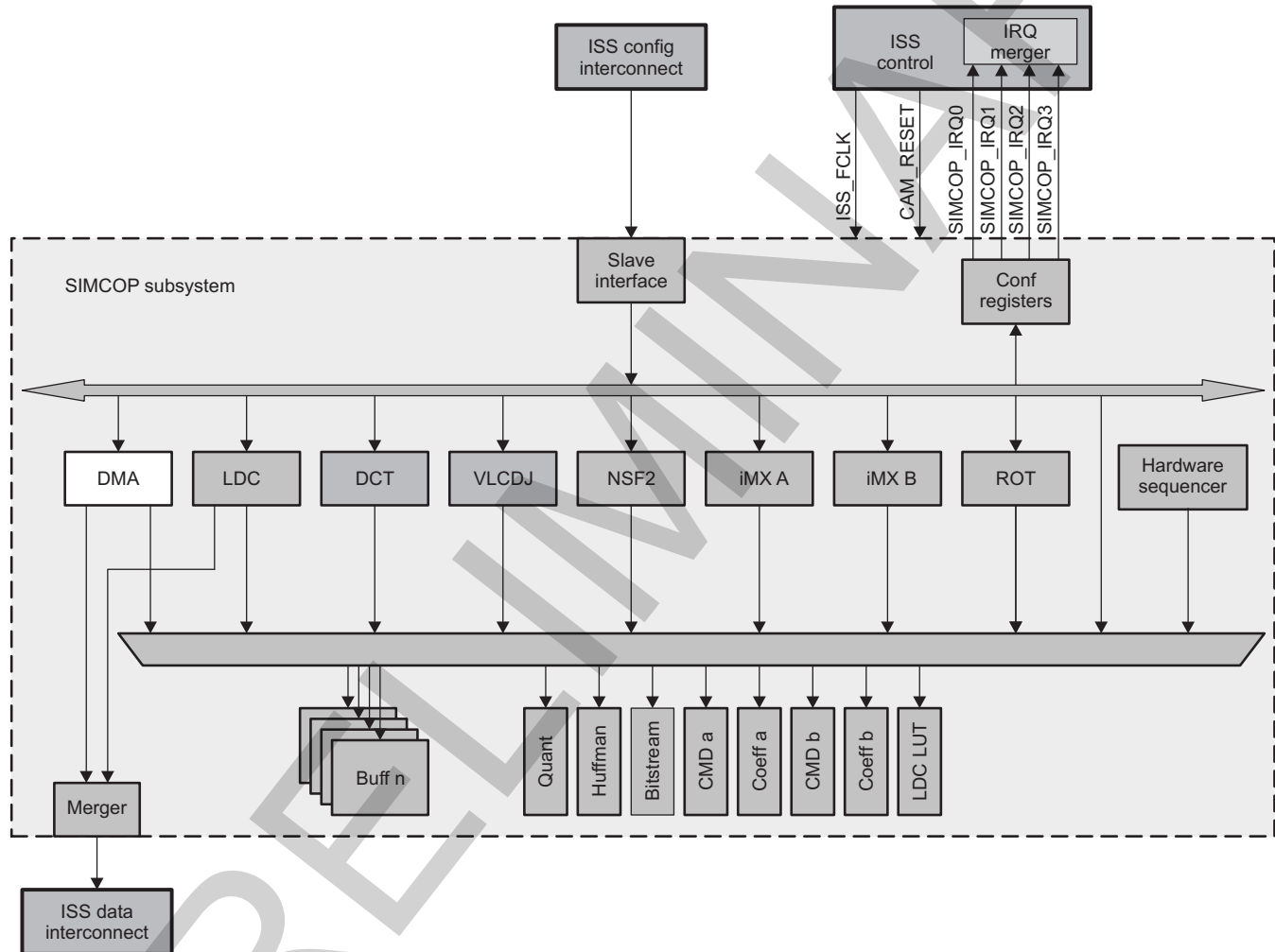
8.4.3 ISS SIMCOP DMA Module

This section describes the direct memory access (DMA) module in the still image coprocessor (SIMCOP) subsystem.

8.4.3.1 ISS SIMCOP DMA Overview

The direct memory access (DMA) module transfers data from system memory to the still image coprocessor (SIMCOP) memories and from SIMCOP memories. [Figure 8-259](#) is an overview of the DMA module in the SIMCOP subsystem.

Figure 8-259. DMA in the SIMCOP Subsystem



scpdma-001

The SIMCOP DMA supports the following features:

- Configuration interface, for register access
- Imaging subsystem (ISS) data interconnect master interface, for system memory access
 - Supports 1-dimensional (1D) and 2-dimensional (2D) burst
- SIMCOP crossbar master interface, for SIMCOP memories access
- Eight logical channels supported
- Hardware synchronization support
- 4-dimensional (4D) addressing modes
- 2D data block transfer (base address, stride, height, width)
- Array of 2D block transfer support

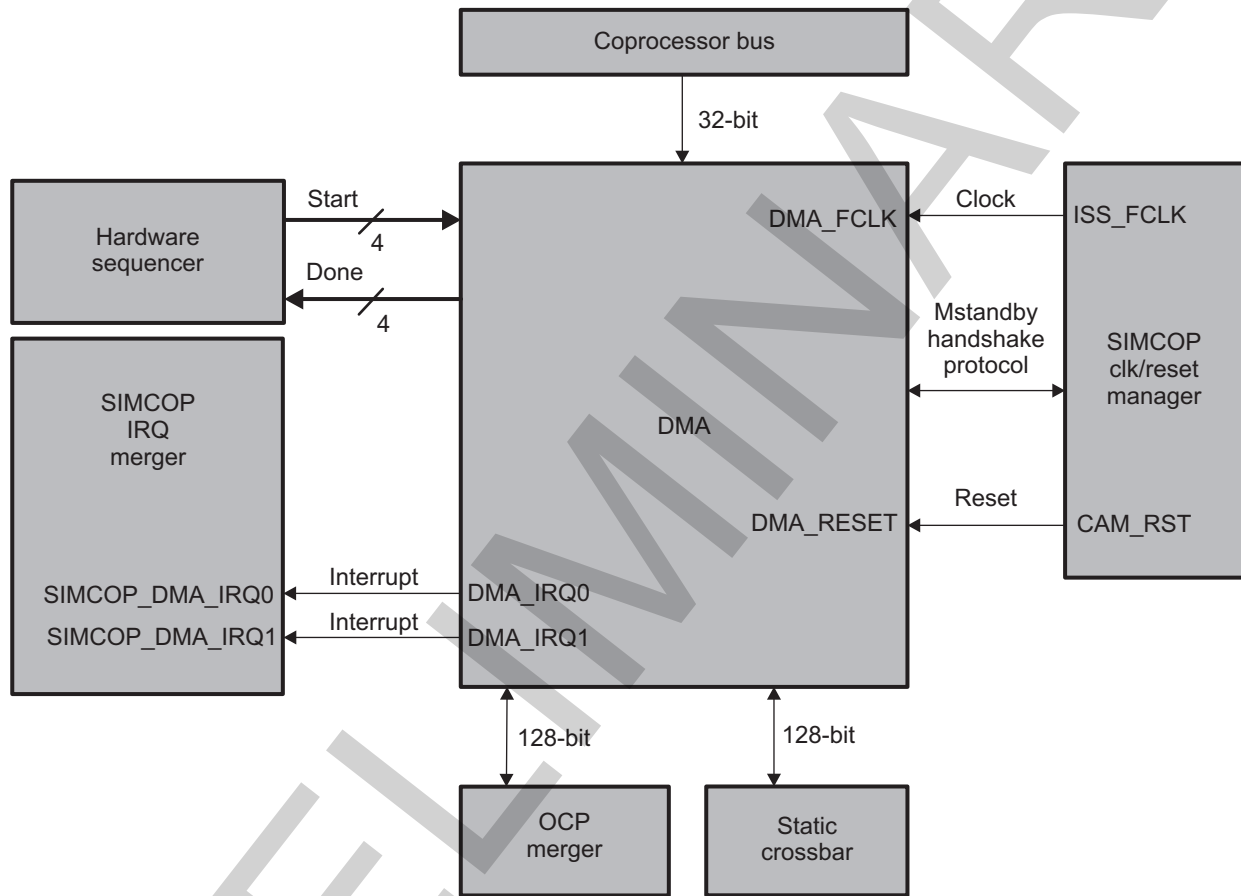
- Performance: Software-controllable bandwidth limiter

8.4.3.2 ISS SIMCOP DMA Integration

The DMA module is part of the SIMCOP subsystem in the ISS. [Figure 8-260](#) shows the integration of the DMA in the SIMCOP subsystem.

[Table 8-1304](#), [Table 8-1305](#), and [Table 8-1306](#) list the SIMCOP DMA integration attributes, clocks and resets, and hardware requests, respectively.

Figure 8-260. DMA Engine Integration



scpdma-004

Table 8-1304. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| DMA | PD_CAM | |

Table 8-1305. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| DMA | DMA_FCLK | ISS_FCLK | PRCM | Functional clock provided by ISS_CLK from the PRCM module. It is used by all ISS submodules and ISS top-level resources. |
| Resets | | | | |

Table 8-1305. Clocks and Resets (continued)

| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
|-----------------|-------------------------|--------------------|--------|-----------------------------|
| DMA | DMA_RESET | CAM_RST | PRCM | ISS and SIMCOP global reset |

For information about clock and reset management, see [Section 8.4.1.2.1](#), *ISS SIMCOP Local Power and Clock Management*.

Table 8-1306. Hardware Requests

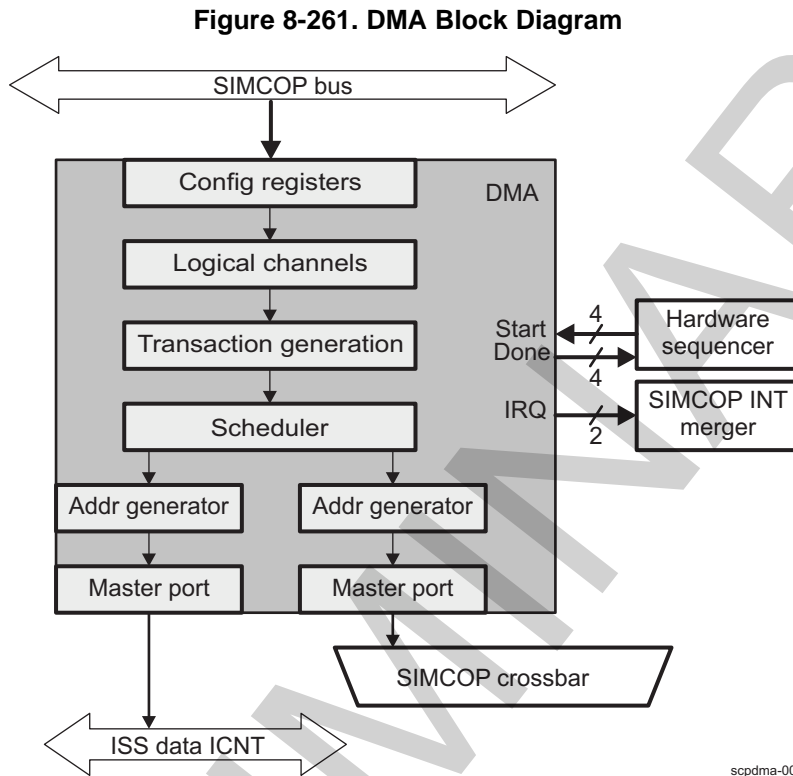
| Module Instance | Source Signal Name | Destination Signal Name | Interrupt Requests | |
|-----------------|--------------------|-------------------------|--------------------|-----------------------------------|
| | | | Destination | Description |
| DMA | DMA_IRQ0 | SIMCOP_DMA_IRQ0 | SIMCOP IRQ merger | Interrupt triggered by SIMCOP DMA |
| DMA | DMA_IRQ1 | SIMCOP_DMA_IRQ1 | SIMCOP IRQ merger | Interrupt triggered by SIMCOP DMA |

For more information about interrupt requests, see [Section 8.4.1.2.3](#), *Interrupt Merger*.

8.4.3.3 ISS SIMCOP DMA Functional Description

8.4.3.3.1 ISS SIMCOP DMA Block Diagram

Figure 8-261 is a block diagram of the SIMCOP DMA.



An external initiator sets up logical channels using the configuration interface.

When a logical channel becomes active, a transfer must be executed. A transfer corresponds to a 2D block of data copied from system memory to SIMCOP memory and vice versa.

A transfer is decomposed into one or multiple transactions by the transaction generation unit.

The scheduler issues transactions when tags are available. There can be one outstanding command per tag on the ISS data interconnect.

8.4.3.3.2 ISS SIMCOP DMA Power Management

Table 8-1307 lists the power-management features available in the DMA module.

Table 8-1307. Local Power-Management Features

| Feature | Registers | Description |
|----------------------|--|---|
| Master standby modes | SIMCOP_DMA_SYSCONFIG [5:4] STANDBYMODE | Force-standby, no-standby, and smart-standby modes are available. |

8.4.3.3.3 ISS SIMCOP DMA Interrupt Requests

The SIMCOP DMA module can generate two interrupts, SIMCOP_DMA_IRQ0 and SIMCOP_DMA_IRQ1. These two interrupts are controlled by four registers:

- [SIMCOP_DMA_IRQSTATUS_RAW_j](#): The status of the interrupt before masking
- [SIMCOP_DMA_IRQSTATUS_j](#): The status of the interrupt after masking
- [SIMCOP_DMA_IRQENABLE_SET_j](#): Enable an interrupt to propagate to SIMCOP_DMA_IRQi signal

(unmask)

- [SIMCOP_DMA_IRQENABLE_CLR_j](#): Disable an interrupt to propagate to SIMCOP_DMA_IRQi signal (mask)

To clear an interrupt, software must write 1 in the corresponding bit of the [SIMCOP_DMA_IRQSTATUS_j](#) register even if the event is not enabled ([SIMCOP_DMA_IRQSTATUS_RAW_j](#) is also cleared).

[Table 8-1308](#) lists all the SIMCOP DMA events that can lead to an interrupt generation.

Table 8-1308. SIMCOP DMA Events List

| Bit Name | Bit | Event |
|----------------------|-----|---|
| BUS_ERR | 0 | Error occurred on bus |
| CHAN0_BLOCK_DONE_IRQ | 16 | Channel 0 has completed transfer of one 2D block. |
| CHAN1_BLOCK_DONE_IRQ | 17 | Channel 1 has completed transfer of one 2D block. |
| CHAN2_BLOCK_DONE_IRQ | 18 | Channel 2 has completed transfer of one 2D block. |
| CHAN3_BLOCK_DONE_IRQ | 19 | Channel 3 has completed transfer of one 2D block. |
| CHAN4_BLOCK_DONE_IRQ | 20 | Channel 4 has completed transfer of one 2D block. |
| CHAN5_BLOCK_DONE_IRQ | 21 | Channel 5 has completed transfer of one 2D block. |
| CHAN6_BLOCK_DONE_IRQ | 22 | Channel 6 has completed transfer of one 2D block. |
| CHAN7_BLOCK_DONE_IRQ | 23 | Channel 7 has completed transfer of one 2D block. |
| CHAN0_FRAME_DONE_IRQ | 24 | Channel 0 has completed transfer of the full frame. |
| CHAN1_FRAME_DONE_IRQ | 25 | Channel 1 has completed transfer of the full frame. |
| CHAN2_FRAME_DONE_IRQ | 26 | Channel 2 has completed transfer of the full frame. |
| CHAN3_FRAME_DONE_IRQ | 27 | Channel 3 has completed transfer of the full frame. |
| CHAN4_FRAME_DONE_IRQ | 28 | Channel 4 has completed transfer of the full frame. |
| CHAN5_FRAME_DONE_IRQ | 29 | Channel 5 has completed transfer of the full frame. |
| CHAN6_FRAME_DONE_IRQ | 30 | Channel 6 has completed transfer of the full frame. |
| CHAN7_FRAME_DONE_IRQ | 31 | Channel 7 has completed transfer of the full frame. |

8.4.3.3.4 ISS SIMCOP DMA Logical Channels

In the context of SIMCOP, multiple logical channels are required to offload the external initiator. Typical uses of multiple context are:

- Run a read transfer followed by a write transfer. That is the required mode to operate the NSF2 module. When the NSF2 completes processing, filtering outcome is first copied from the image buffers to system memory. When this transfer completes, new input data is fetched from system memory and stored in the image buffers.
- Read or write YUV4:2:0 data from system memory; YUV4:2:0 data is stored in two different system memory buffers.

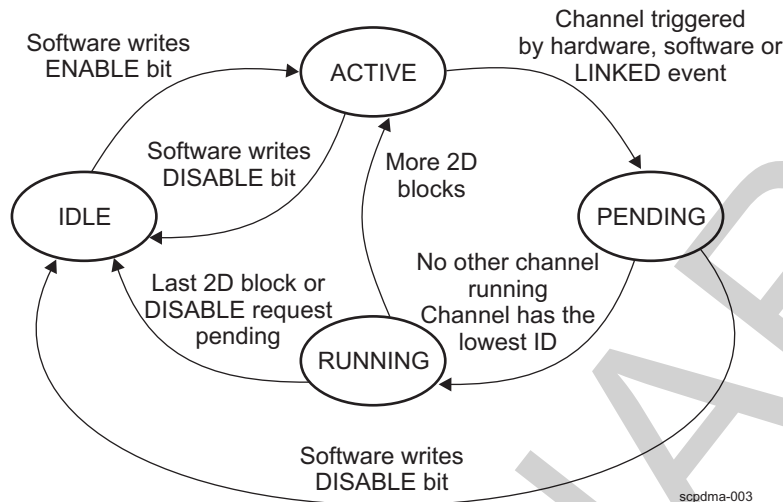
8.4.3.3.4.1 Logical Channel States

The SIMCOP DMA supports up to eight (([SIMCOP_DMA_HWINFO\[2\]](#) CHAN + 1)*4) logical channels. Each logical channel can be configured and triggered separately.

Idle logical channels must be configured and enabled ([SIMCOP_DMA_CHAN_CTRL_i\[0\]](#) ENABLE = 1) to be used.

[Figure 8-262](#) shows the different states of a logical channel. Software can poll the current state from the [SIMCOP_DMA_CHAN_CTRL_i\[4:3\]](#) STATUS bit field.

Figure 8-262. DMA Logical Channel States



When a trigger event is received by a channel in the ACTIVE state, it moves to the PENDING state. Trigger events received when the channel is in the IDLE, PENDING, or RUNNING state are discarded.

A logical channel is automatically disabled by hardware when a complete frame (all 2D blocks) is transferred. It can be disabled earlier by software by writing the [SIMCOP_DMA_CHAN_CTRL_i\[1\]](#) DISABLE bit. When a disable request occurs in the RUNNING state, it is memorized and executed when the channel leaves the RUNNING state. Pending disable requests have higher priority than channel trigger events.

When multiple logical channels are pending simultaneously, the following rules apply:

- An ongoing transfer of a 2D block is never stopped. It must complete before the next one starts.
- The logical channel with the lowest ID wins the arbitration (that is, CHAN0 has higher priority than CHAN1). Software can give higher priority to a channel by choosing a lower ID.

This situation can, for example, occur when software triggers a channel while a transfer is ongoing for another channel. Two types of interrupts can be generated:

- CHANx_BLOCK_DONE_IRQ (where x = channel number) is generated when the channel leaves the RUNNING state (RUNNING - ACTIVE or RUNNING - IDLE).
- CHANx_FRAME_DONE_IRQ (where x = channel number) is generated when the channel enters the IDLE state.

8.4.3.3.4.2 Logical Channel Chaining, Trigger, and Hardware Synchronization

Active logical channels can be triggered:

- By software. Writes the [SIMCOP_DMA_CHAN_CTRL_i\[2\]](#) SWTRIGGER bit
- By a hardware DMA request. A channel can be made sensitive to a pulse on the START[y] input when [SIMCOP_DMA_CHAN_CTRL_i\[19:17\]](#) HWSTART = y has been configured by software.
- When the previous channel in the linked list finishes. This feature is enabled through the [SIMCOP_DMA_CHAN_CTRL_i\[16:12\]](#) LINKED bit field of the preceding channel in the chain.

When a channel completes, it can optionally send a pulse to the DONE[y] output. Software enables this feature by configuring [SIMCOP_DMA_CHAN_CTRL_i\[22:20\]](#) HWSTOP = y.

Typically, the START + DONE synchronization mechanism is used together with the SIMCOP hardware sequencer. The hardware sequencer sends a pulse to START[y] a data transfer and the SIMCOP DMA responds with a DONE[y] pulse when the transfer completes. A transfer can be composed of one or multiple logical channels. For example, a YUV4:2:0-NV12 block copy from system memory to SIMCOP local memories requires two chained logical channels.

CAUTION

Software must ensure that only one trigger event source is selected at a given time for a logical channel; otherwise, unpredictable behavior may occur.

Typically, the following combinations can be used:

- Single channel triggered by software: Hardware synchronization and linking are disabled. Software writes the [SIMCOP_DMA_CHAN_CTRL_i\[2\]](#) SWTRIGGER bit to start the transfer of one 2D block. Software must not trigger the channel again before the [CHANx_BLOCK_DONE_IRQ](#) (where x = channel number) event is generated by the DMA.
- Channels chain-triggered by software: Multiple channels are linked together using the [SIMCOP_DMA_CHAN_CTRL_i\[16:12\]](#) LINKED bit field. Software triggers the first one in the chain and monitors the [CHANx_BLOCK_DONE_IRQ](#) (where x = channel number) event to know when the chain can be triggered again.
- Single channel triggered by hardware synchronization: Sensitivity on START pulses is activated through the [SIMCOP_DMA_CHAN_CTRL_i\[19:17\]](#) HWSTART bit field. DONE pulses are activated using the [SIMCOP_DMA_CHAN_CTRL_i\[22:20\]](#) HWSTOP bit field.
- Channels chain-triggered by hardware: Multiple channels are linked together using the [SIMCOP_DMA_CHAN_CTRL_i\[16:12\]](#) LINKED bit field. Sensitivity on START pulses is activated for the first channel in the chain through the [SIMCOP_DMA_CHAN_CTRL_i\[19:17\]](#) HWSTART bit field. DONE pulses for the last channel in the chain are activated using the [SIMCOP_DMA_CHAN_CTRL_i\[22:20\]](#) HWSTOP bit field.

8.4.3.3.4.3 Logical Channel Data Transfer

Each logical channel can handle 4D transfers from system memory to SIMCOP memory and vice versa.

A frame is composed of [SIMCOP_DMA_CHAN_FRAME_i\[9:0\]](#) XCNT * [SIMCOP_DMA_CHAN_FRAME_i\[25:16\]](#) YCNT 2D blocks of data. One 2D block of data is transferred each time a logical channel is in the RUNNING state.

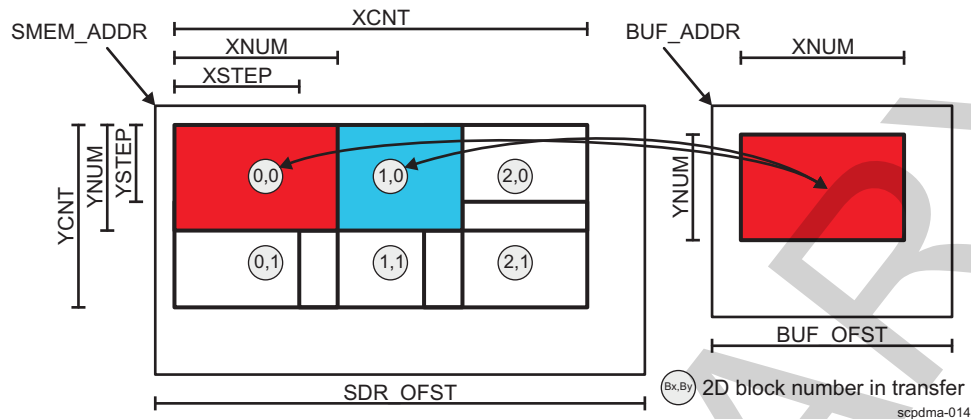
The size of a 2D block is [SIMCOP_DMA_CHAN_BLOCK_SIZE_i\[13:4\]](#) XNUM * [SIMCOP_DMA_CHAN_BLOCK_SIZE_i\[28:16\]](#) YNUM words of 128 bits. The SIMCOP DMA can transfer only full 128-bit words.

2D blocks may overlap in system memory. This feature is typically used for source data fetches from system memory to handle filter dependencies. If this feature is not used, software must set:

- [SIMCOP_DMA_CHAN_BLOCK_SIZE_i\[13:4\]](#) XNUM = [SIMCOP_DMA_CHAN_BLOCK_STEP_i\[14:4\]](#) XSTEP
- [SIMCOP_DMA_CHAN_BLOCK_SIZE_i\[28:16\]](#) YNUM = [SIMCOP_DMA_CHAN_BLOCK_STEP_i\[29:16\]](#) YSTEP

Figure 8-263 shows DMA addressing.

Figure 8-263. DMA Addressing



The base position of 2D blocks in system memory is automatically computed by the SIMCOP DMA. The base address is computed using the following formula:

$$\text{SMEM_BASE} = \text{SIMCOP_DMA_CHAN_SMEM_ADDR_i}[31:4] \text{ ADDR} + \\ \text{Bx} * \text{SIMCOP_DMA_CHAN_BLOCK_STEP_i}[14:4] \text{ XSTEP} + \\ \text{By} * \text{SIMCOP_DMA_CHAN_BLOCK_STEP_i}[29:16] \text{ YSTEP} * \\ \text{SIMCOP_DMA_CHAN_SMEM_OFST_i}[19:4] \text{ OFST}$$

All 2D blocks of a logical channel have the same location in SIMCOP local memories:

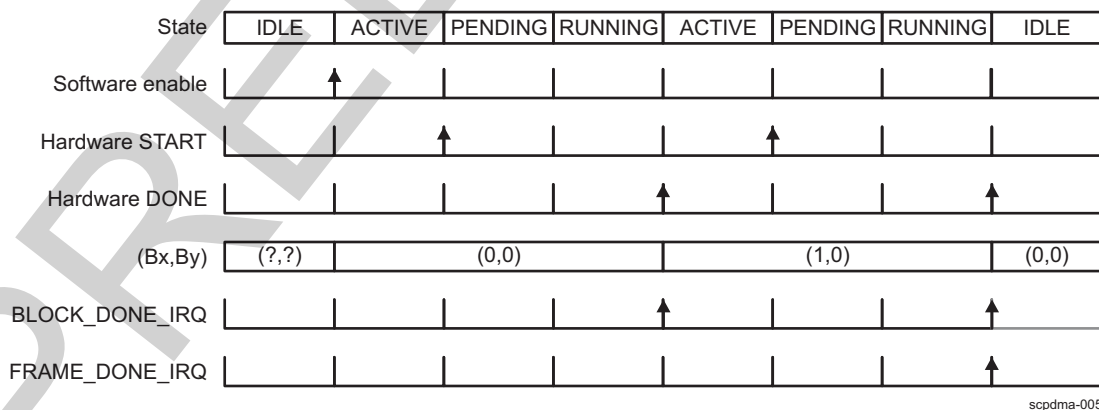
$$\text{BUF_BASE} = \text{SIMCOP_DMA_CHAN_BUF_ADDR_i}[23:4] \text{ ADDR}$$

The same functionality can also be used to read or write sparse data from synchronous dynamic random access memory (SDRAM). Typically, that is useful to split processing between two SIMCOP accelerators (that is, iMX).

Software can poll the status of a channel using the [SIMCOP_DMA_CHAN_CURRENT_BLOCK_i](#) register. It holds the Bx, By values of the last-transferred 2D block. The Bx, By values are reset when a channel is enabled (set the [SIMCOP_DMA_CHAN_CTRL_i\[0\]](#) ENABLE bit) and they are updated when a channel enters the RUNNING state.

Figure 8-264 shows an example of a 2-block large transfer.

Figure 8-264. 2-Block Large Transfer Example



8.4.3.3.5 Transaction Generation

Each transfer is decomposed into one or multiple transactions by the DMA engine. The firmware can define:

- Burst generation for regular or tiled accesses ([SIMCOP_DMA_CHAN_CTRL_i\[6\] TILERMODE](#)). Additional parameters must be defined for tiled accesses. See [Section 8.4.3.3.5.2, Block Bursts for Tiled Transfers](#).
- The maximum burst size ([SIMCOP_DMA_CTRL\[1:0\] MAX_BURST_SIZE](#)). It must be aligned with the interconnect configuration.
- Use of posted or nonposted writes ([SIMCOP_DMA_CTRL\[3\] POSTED_WRITES](#)). It must be aligned with the interconnect configuration. Mainly, in a multichannel system memory, system bursts must be issued nonposted.

8.4.3.3.5.1 Incrementing Bursts for Regular Transfers

Lines of 2D blocks are processed sequentially. The following transaction process is used for a given line:

1. Perform a single nonaligned burst from the start address to the next [SIMCOP_DMA_CTRL\[1:0\] MAX_BURST_SIZE](#) boundary (or less if the transfer is smaller).
2. Perform "n" aligned bursts (n can be 0).
3. Perform a single nonaligned burst up to the end address (if needed).

A transaction is aligned when the start address modulo burst length is 0.

8.4.3.3.5.2 Block Bursts for Tiled Transfers

The line stride is configured using the [SIMCOP_DMA_CHAN_SMEM_OFST_i\[19:4\] OFST](#) bit field. The full register content is used for internal address computation. The [SIMCOP_DMA_CHAN_SMEM_OFST_i\[19:4\] OFST](#) bit field must be a multiple of the [SIMCOP_DMA_CTRL\[1:0\] MAX_BURST_SIZE](#) bit field.

The SIMCOP DMA has the following alignment constraints:

- [SIMCOP_DMA_CHAN_SMEM_ADDR_i\[31:4\] ADDR](#) is 128 bit-aligned.
- [SIMCOP_DMA_CHAN_BLOCK_SIZE_i\[13:4\] XNUM](#) is 128 bit-aligned.

Only the values in [Table 8-1309](#) are allowed for the [SIMCOP_DMA_CTRL\[1:0\] MAX_BURST_SIZE](#) bit field. Other values lead to undefined behavior.

Table 8-1309. Allowed Maximum Burst Size

| Minimum Burst Height | MAX_BURST_SIZE |
|----------------------|-----------------------|
| 2 | 2, 4, or 8 x 128 bits |
| 4 | 4 or 8 x 128 bits |

8.4.3.4 ISS SIMCOP DMA Basic Programming Model

8.4.3.4.1 Initialization of Surrounding Modules

To initialize the DMA, the surrounding modules must be initialized. [Table 8-1310](#) lists these modules.

Table 8-1310. Initialization of Surrounding Modules

| Module | Minimum Required Setting | Optional Settings |
|-------------|---------------------------------------|---|
| CLKC | Enable SIMCOP clock. | |
| Buffers | Configure DMA access to image buffer. | |
| SIMCOP CTRL | | Configure SIMCOP CTRL to handle DMA interrupts. |

8.4.3.4.2 ISS SIMCOP DMA Channel Configuration and Hardware Synchronization

Software must fully configure a DMA channel before enabling it. It then configures channel linking and the used synchronization method.

The following example shows four logical channels chained with hardware synchronization used to copy YUV4:2:0-NV12 data from SIMCOP local memories to system memory, and then to copy YUV4:2:0-NV12 data from system memory to SIMCOP local memories.

YUV4:2:0-NV12 data is stored in two separate buffers in SDRAM. Therefore, two channels are used for the SIMCOP - system copy, and two channels are used for the system - SIMCOP copy.

In this example, the intent is to transfer a 2 x 2 array of 64 x 32 pixel blocks. It is assumed that input data is stored contiguously in system memory and that the output buffer size in system memory is 256 x 32 pixels. In SIMCOP local memories, data is contiguously stored starting at address 0.

The following configuration is used:

- Channel i = 0, input Y buffer:
 - [SIMCOP_DMA_CHAN_SMEM_ADDR_i\[31:4\]](#) ADDR = Start address of Y input buffer
 - [SIMCOP_DMA_CHAN_SMEM_OFST_i\[19:4\]](#) OFST = 16 (= 256 bytes)
 - [SIMCOP_DMA_CHAN_BUF_ADDR_i\[23:4\]](#) ADDR = 0
 - [SIMCOP_DMA_CHAN_BUF_OFST_i\[23:4\]](#) OFST = 8 (= 128 bytes)
 - [SIMCOP_DMA_CHAN_BLOCK_SIZE_i\[13:4\]](#) XNUM = 4 (= 64 bytes)
 - [SIMCOP_DMA_CHAN_BLOCK_SIZE_i\[28:16\]](#) YNUM = 32
 - [SIMCOP_DMA_CHAN_FRAME_i\[9:0\]](#) XCNT = 2
 - [SIMCOP_DMA_CHAN_FRAME_i\[25:16\]](#) YCNT = 2
 - [SIMCOP_DMA_CHAN_BLOCK_STEP_i\[14:4\]](#) XSTEP = 4 (= 64 bytes)
 - [SIMCOP_DMA_CHAN_BLOCK_STEP_i\[29:16\]](#) YSTEP = 32
- Channel i = 1, input UV buffer:
 - [SIMCOP_DMA_CHAN_SMEM_ADDR_i\[31:4\]](#) ADDR = Start address of UV input buffer
 - [SIMCOP_DMA_CHAN_SMEM_OFST_i\[19:4\]](#) OFST = 16 (= 256 bytes)
 - [SIMCOP_DMA_CHAN_BUF_ADDR_i\[23:4\]](#) ADDR = 128 (2KB)
 - [SIMCOP_DMA_CHAN_BUF_OFST_i\[23:4\]](#) OFST = 8 (= 128 bytes)
 - [SIMCOP_DMA_CHAN_BLOCK_SIZE_i\[13:4\]](#) XNUM = 4 (= 64 bytes)
 - [SIMCOP_DMA_CHAN_BLOCK_SIZE_i\[28:16\]](#) YNUM = 16
 - [SIMCOP_DMA_CHAN_FRAME_i\[9:0\]](#) XCNT = 2
 - [SIMCOP_DMA_CHAN_FRAME_i\[25:16\]](#) YCNT = 2
 - [SIMCOP_DMA_CHAN_BLOCK_STEP_i\[14:4\]](#) XSTEP = 4 (= 64 bytes)
 - [SIMCOP_DMA_CHAN_BLOCK_STEP_i\[29:16\]](#) YSTEP = 16
- Channel i = 2, output Y buffer:
 - [SIMCOP_DMA_CHAN_SMEM_ADDR_i\[31:4\]](#) ADDR = Start address of Y output buffer
 - [SIMCOP_DMA_CHAN_SMEM_OFST_i\[19:4\]](#) OFST = 16 (= 256 bytes)
 - [SIMCOP_DMA_CHAN_BUF_ADDR_i\[23:4\]](#) ADDR = 0
 - [SIMCOP_DMA_CHAN_BUF_OFST_i\[23:4\]](#) OFST = 8 (= 128 bytes)
 - [SIMCOP_DMA_CHAN_BLOCK_SIZE_i\[13:4\]](#) XNUM = 4 (= 64 bytes)
 - [SIMCOP_DMA_CHAN_BLOCK_SIZE_i\[28:16\]](#) YNUM = 32
 - [SIMCOP_DMA_CHAN_FRAME_i\[9:0\]](#) XCNT = 2
 - [SIMCOP_DMA_CHAN_FRAME_i\[25:16\]](#) YCNT = 2
 - [SIMCOP_DMA_CHAN_BLOCK_STEP_i\[14:4\]](#) XSTEP = 4 (= 64 bytes)
 - [SIMCOP_DMA_CHAN_BLOCK_STEP_i\[29:16\]](#) YSTEP = 32
- Channel i = 3, output UV buffer:

- `SIMCOP_DMA_CHAN_SMEM_ADDR_i[31:4]` ADDR = Start address of UV output buffer
- `SIMCOP_DMA_CHAN_SMEM_OFST_i[19:4]` OFST = 16 (= 256 bytes)
- `SIMCOP_DMA_CHAN_BUF_ADDR_i[23:4]` ADDR = 128 (= 2KB)
- `SIMCOP_DMA_CHAN_BUF_OFST_i[23:4]` OFST = 8 (= 128 bytes)
- `SIMCOP_DMA_CHAN_BLOCK_SIZE_i[13:4]` XNUM = 4 (= 64 bytes)
- `SIMCOP_DMA_CHAN_BLOCK_SIZE_i[28:16]` YNUM = 16
- `SIMCOP_DMA_CHAN_FRAME_i[9:0]` XCNT = 2
- `SIMCOP_DMA_CHAN_FRAME_i[25:16]` YCNT = 2
- `SIMCOP_DMA_CHAN_BLOCK_STEP_i[14:4]` XSTEP = 4 (= 64 bytes)
- `SIMCOP_DMA_CHAN_BLOCK_STEP_i[29:16]` YSTEP = 16

Figure 8-265 shows the channel linking chain used. All four channels are executed sequentially. Doing so prevents access collision in SIMCOP local memories or system memories. Channel 0 is started by a START[0] pulse from SIMCOP. When Channel 3 completes the last transfer, a pulse to DONE[0] is sent back to SIMCOP.

Figure 8-266 shows the temporal channel sequence.

Figure 8-265. YUV4:2:0-NV12 Read/Write Chain

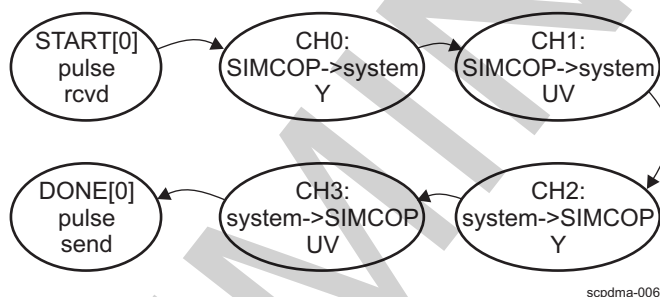
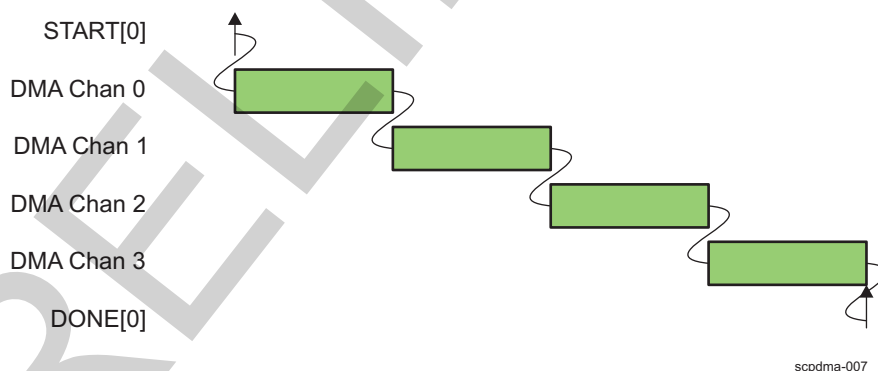


Figure 8-266. Temporal Channel Sequence



The following configuration is used for each channel:

- Channel $i = 0$, input Y buffer, first in sequence:
 - `SIMCOP_DMA_CHAN_CTRL_i[16:12]` LINKED = 0x11 (= CHAN1)
 - `SIMCOP_DMA_CHAN_CTRL_i[19:17]` HWSTART = 0x4 (= CHAN0)
 - `SIMCOP_DMA_CHAN_CTRL_i[5]` DIR = 1 (=SIMCOP buffers - system memory)
 - `SIMCOP_DMA_CHAN_CTRL_i[0]` ENABLE = 1
- Channel $i = 1$, input UV buffer, second in sequence:
 - `SIMCOP_DMA_CHAN_CTRL_i[16:12]` LINKED = 0x12 (= CHAN2)
 - `SIMCOP_DMA_CHAN_CTRL_i[5]` DIR = 1 (= SIMCOP buffers - system memory)
 - `SIMCOP_DMA_CHAN_CTRL_i[0]` ENABLE = 1

- Channel i = 2, output Y buffer, third in sequence:
 - [SIMCOP_DMA_CHAN_CTRL_i\[16:12\]](#) LINKED = 0x13 (= CHAN3)
 - [SIMCOP_DMA_CHAN_CTRL_i\[5\]](#) DIR = 0 (= system memory - SIMCOP buffers)
 - [SIMCOP_DMA_CHAN_CTRL_i\[0\]](#) ENABLE = 1
- Channel i = 3, output UV buffer, last in sequence:
 - [SIMCOP_DMA_CHAN_CTRL_i\[16:12\]](#) LINKED = 0x00 (no link)
 - [SIMCOP_DMA_CHAN_CTRL_i\[22:20\]](#) HWSTART = 0x4 (= CHAN0)
 - [SIMCOP_DMA_CHAN_CTRL_i\[5\]](#) DIR = 0 (= system memory - SIMCOP buffers)
 - [SIMCOP_DMA_CHAN_CTRL_i\[0\]](#) ENABLE = 1

Software can read the status of a logical channel at any time. However, logical channel configuration registers can be changed only when the channel is in the IDLE state.

Software can disable a logical channel by writing the [SIMCOP_DMA_CHAN_CTRL_i\[1\]](#) DISABLE bit. A channel is effectively disabled when [SIMCOP_DMA_CHAN_CTRL_i\[4:3\]](#) STATUS = IDLE. In case of linked channels, software must disable all channels in the chain and wait until all of them are back in the IDLE state before channels can be reprogrammed.

8.4.3.4.3 Software Synchronization

Software performs the following sequence:

1. Configures the channel
2. Enables the channel
3. Triggers the channel by writing the [SIMCOP_DMA_CHAN_CTRL_i\[2\]](#) SWTRIGGER bit
4. Waits for BLOCK_DONE_IRQ

Step 2 and Step 4 are repeated until all 2D blocks have been transferred.

8.4.3.5 ISS SIMCOP DMA Register Manual

8.4.3.5.1 ISS SIMCOP DMA Instance Summary

Table 8-1311 summarizes the DMA instance.

Table 8-1311. SIMCOP DMA Instance Summary

| Module Name | Base Address L3 Interconnect | Base Address Cortex-M3 Private Access | Size |
|-------------|---------------------------------|--|-----------|
| DMA | 0x5202 0200 | 0x5506 0200 | 512 bytes |

NOTE: Private Access is an access that does not use the L3/L4 interconnects.

8.4.3.5.2 ISS SIMCOP DMA Registers

8.4.3.5.2.1 ISS SIMCOP DMA Register Summary

Table 8-1312 summarizes the SIMCOP DMA register mapping.

Table 8-1312. DMA Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-M3 Private Access |
|--|------|--------------------------|-----------------------------|-------------------------------------|---|
| SIMCOP_DMA_REVISION | R | 32 | 0x0000 0000 | 0x5202 0200 | 0x5506 0200 |
| SIMCOP_DMA_HWINFO | R | 32 | 0x0000 0004 | 0x5202 0204 | 0x5506 0204 |
| SIMCOP_DMA_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5202 0210 | 0x5506 0210 |
| RESERVED | R | 32 | 0x0000 0018 | 0x5202 0218 | 0x5506 0218 |
| SIMCOP_DMA_CTRL | RW | 32 | 0x0000 001C | 0x5202 021C | 0x5506 0218 |
| SIMCOP_DMA_IRQSTATUS_RAW_j ⁽¹⁾ | RW | 32 | 0x0000 0020 + (0x10 * j) | 0x5202 0220 + (0x10 * j) | 0x5506 0220 + (0x10 * j) |
| SIMCOP_DMA_IRQSTATUS_j ⁽¹⁾ | RW | 32 | 0x0000 0024 + (0x10 * j) | 0x5202 0224 + (0x10 * j) | 0x5506 0224 + (0x10 * j) |
| SIMCOP_DMA_IRQENABLE_SET_j ⁽¹⁾ | RW | 32 | 0x0000 0028 + (0x10 * j) | 0x5202 0228 + (0x10 * j) | 0x5506 0228 + (0x10 * j) |
| SIMCOP_DMA_IRQENABLE_CLR_j ⁽¹⁾ | RW | 32 | 0x0000 002C + (0x10 * j) | 0x5202 022C + (0x10 * j) | 0x5506 022C + (0x10 * j) |
| SIMCOP_DMA_CHAN_CTRL_i ⁽²⁾ | RW | 32 | 0x0000 0080 + (0x30 * i) | 0x5202 0280 + (0x30 * i) | 0x5506 0280 + (0x30 * i) |
| SIMCOP_DMA_CHAN_SMEM_ADD_R_j ⁽²⁾ | RW | 32 | 0x0000 0084 + (0x30 * i) | 0x5202 0284 + (0x30 * i) | 0x5506 0284 + (0x30 * i) |
| SIMCOP_DMA_CHAN_SMEM_OFST_T_j ⁽²⁾ | RW | 32 | 0x0000 0088 + (0x30 * i) | 0x5202 0288 + (0x30 * i) | 0x5506 0288 + (0x30 * i) |
| SIMCOP_DMA_CHAN_BUF_OFST_i ⁽²⁾ | RW | 32 | 0x0000 008C + (0x30 * i) | 0x5202 028C + (0x30 * i) | 0x5506 028C + (0x30 * i) |
| SIMCOP_DMA_CHAN_BUF_ADDR_i ⁽²⁾ | RW | 32 | 0x0000 0090 + (0x30 * i) | 0x5202 0290 + (0x30 * i) | 0x5506 0290 + (0x30 * i) |
| SIMCOP_DMA_CHAN_BLOCK_SIZE_j ⁽²⁾ | RW | 32 | 0x0000 0094 + (0x30 * i) | 0x5202 0294 + (0x30 * i) | 0x5506 0294 + (0x30 * i) |
| SIMCOP_DMA_CHAN_FRAME_i ⁽²⁾ | RW | 32 | 0x0000 0098 + (0x30 * i) | 0x5202 0298 + (0x30 * i) | 0x5506 0298 + (0x30 * i) |
| SIMCOP_DMA_CHAN_CURRENT_BLOCK_i ⁽²⁾ | R | 32 | 0x0000 00A0 + (0x30 * i) | 0x5202 02A0 + (0x30 * i) | 0x5506 02A0 + (0x30 * i) |
| SIMCOP_DMA_CHAN_BLOCK_STEP_j ⁽²⁾ | RW | 32 | 0x0000 00A4 + (0x30 * i) | 0x5202 02A4 + (0x30 * i) | 0x5506 02A4 + (0x30 * i) |

⁽¹⁾ j = 0 to 7

⁽²⁾ i = 0 to 1

8.4.3.5.2.2 ISS SIMCOP DMA Register Descriptions

through describe the registers in details.

Table 8-1313. SIMCOP_DMA_REVISION

| | | | |
|-------------------------|---|-----------------|-------------------------|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x5202 0200 0x5506 0200 | Instance | DMA_L3 DMA_CORTEX-M3 |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------|
| 31:0 | REV | Revision ID | R | _(1) |

(1) TI internal data

Table 8-1314. Register Call Summary for Register SIMCOP_DMA_REVISION

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Register Manual: \[0\]](#)

Table 8-1315. SIMCOP_DMA_HWINFO

| | | | |
|-------------------------|---|-----------------|-------------------------|
| Address Offset | 0x0000 0004 | | |
| Physical Address | 0x5202 0204 0x5506 0204 | Instance | DMA_L3 DMA_CORTEX-M3 |
| Description | Information about the IP module's hardware configuration, that is, typically the module's HDL generics. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------|---------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | CHAN | CONTEXT | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | CHAN | Logical channels Read 0x0: 4 Read 0x1: 8 | R | 1 |
| 1:0 | CONTEXT | Maximum outstanding OCP transactions Read 0x0: 4 Read 0x1: 8 Read 0x2: 16 | R | 0x2 |

Table 8-1316. Register Call Summary for Register SIMCOP_DMA_HWINFO

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\]](#)
- [ISS SIMCOP DMA Register Manual: \[1\]](#)

Table 8-1317. SIMCOP_DMA_SYSCONFIG

| | | | |
|-------------------------|--------------------------------|-----------------|-------------------------|
| Address Offset | 0x0000 0010 | Instance | DMA_L3 DMA_CORTEX-M3 |
| Physical Address | 0x5202 0210 0x5506 0210 | | |
| Description | Clock management configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STANDBYMODE | | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5:4 | STANDBYMODE | Configuration of the local initiator state management mode. By definition, initiator may generate read/write transaction as long as it is out of STANDBY state. 0x0: Force-standby mode: local initiator is unconditionally placed in standby state. Backup mode, for debug only. 0x1: No-standby mode: local initiator is unconditionally placed out of standby state. Backup mode, for debug only. 0x2: Smart-standby mode. 0x3: Smart-standby mode. | RW | 0x2 |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-1318. Register Call Summary for Register SIMCOP_DMA_SYSCONFIG

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\]](#)
- [ISS SIMCOP DMA Register Manual: \[1\]](#)

Table 8-1319. SIMCOP_DMA_CTRL

| | | | |
|-------------------------|----------------------------|-----------------|-------------------------|
| Address Offset | 0x0000 001C | Instance | DMA_L3 DMA_CORTEX-M3 |
| Physical Address | 0x5202 021C 0x5506 0218 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|---------|----|----|----|---------------|----|----------|---|----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BW_LIMITER | | | | | | | | RESERVED | | | | | | | | TAG_CNT | | | | POSTED_WRITES | | RESERVED | | MAX_BURST_SIZE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|--------|
| 31:16 | BW_LIMITER | SIMCOP DMA guarantees that there are at least BW_LIMITER functional clock cycles between two OCP requests. No IDLE cycles are inserted during an OCP transaction. This parameter could be used to reduce traffic generated by the SIMCOP DMA for non timing critical applications. Doing so leaves more BW for other system initiators. Default value corresponds to maximum performance. | RW | 0x0000 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:4 | TAG_CNT | Limits the outstanding transactions count. Only tags 0 - TAG_CNT will be used by SIMCOP DMA. The maximum allowed value is $2^{(\text{SIMCOP_DMA_GNC_CONTEXT}+2)-1}$ | RW | 0x3 |
| 3 | POSTED_WRITES | Select write type. Setting depend on the used interconnect 0x0: Only nonposted writes are generated 0x1: Only posted writes are generated | RW | 0 |
| 2 | RESERVED | | R | 0 |
| 1:0 | MAX_BURST_SIZE | Defines the maximum burst length for INCR bursts. In case of 2D bursts, length x height is less or equal to this value. 0x0: Single requests only 0x1: less or equal to 2 0x2: less or equal to 4 0x3: less or equal to 8 | RW | 0x0 |

Table 8-1320. Register Call Summary for Register SIMCOP_DMA_CTRL

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\] \[1\] \[2\] \[3\] \[5\]](#)
- [ISS SIMCOP DMA Register Manual: \[6\]](#)

Table 8-1321. SIMCOP_DMA_IRQSTATUS_RAW_j

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0020 + (0x10 * j) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5202 0220 + (0x10 * j) 0x5506 0220 + (0x10 * j) | | | | | | | | | | | | | | | | Instance DMA_L3 DMA_CORTEX-M3 | | | | | | | | | | | | | | | |
| Description | Per-event raw interrupt status vector Raw status is set even if event is not enabled. Write 1 to set the (raw) status, mostly for debug. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| CHAN7_FRAME_DONE_IRQ | CHAN6_FRAME_DONE_IRQ | CHAN5_FRAME_DONE_IRQ | CHAN4_FRAME_DONE_IRQ | CHAN3_FRAME_DONE_IRQ | CHAN2_FRAME_DONE_IRQ | CHAN1_FRAME_DONE_IRQ | CHAN0_FRAME_DONE_IRQ | CHAN7_BLOCK_DONE_IRQ | CHAN6_BLOCK_DONE_IRQ | CHAN5_BLOCK_DONE_IRQ | CHAN4_BLOCK_DONE_IRQ | CHAN3_BLOCK_DONE_IRQ | CHAN2_BLOCK_DONE_IRQ | CHAN1_BLOCK_DONE_IRQ | CHAN0_BLOCK_DONE_IRQ | RESERVED | | | | | | | | | | | | | | | | OCP_ERR |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|-------|
| 31 | CHAN7_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 30 | CHAN6_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 29 | CHAN5_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 28 | CHAN4_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 27 | CHAN3_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 26 | CHAN2_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 25 | CHAN1_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 24 | CHAN0_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 23 | CHAN7_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|--------|
| 22 | CHAN6_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 21 | CHAN5_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 20 | CHAN4_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 19 | CHAN3_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 18 | CHAN2_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 17 | CHAN1_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 16 | CHAN0_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW | 0 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | OCP_ERR | OCP error Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |

Table 8-1322. Register Call Summary for Register SIMCOP_DMA_IRQSTATUS_RAW_j

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\] \[1\]](#)
- [ISS SIMCOP DMA Register Manual: \[2\]](#)

Table 8-1323. SIMCOP_DMA_IRQSTATUS_j

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|-------------------------|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0024 + (0x10 * j) | | | | | | | | | | | | | | | | Instance | | DMA_L3 DMA_CORTEX-M3 | | | | | | | | | | | |
| Physical Address | | 0x5202 0224 + (0x10 * j) 0x5506 0224 + (0x10 * j) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Per-event "enabled" interrupt status vector Enabled status is not set unless event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|----|----|----|----|----|---|---|---|---|---|---|---|---------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CHAN7_FRAME_DONE_IRQ | CHAN6_FRAME_DONE_IRQ | CHAN5_FRAME_DONE_IRQ | CHAN4_FRAME_DONE_IRQ | CHAN3_FRAME_DONE_IRQ | CHAN2_FRAME_DONE_IRQ | CHAN1_FRAME_DONE_IRQ | CHAN0_FRAME_DONE_IRQ | CHAN7_BLOCK_DONE_IRQ | CHAN6_BLOCK_DONE_IRQ | CHAN5_BLOCK_DONE_IRQ | CHAN4_BLOCK_DONE_IRQ | CHAN3_BLOCK_DONE_IRQ | CHAN2_BLOCK_DONE_IRQ | CHAN1_BLOCK_DONE_IRQ | CHAN0_BLOCK_DONE_IRQ | RESERVED | | | | | | | | | | | | | BUS_ERR | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|-------|
| 31 | CHAN7_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 30 | CHAN6_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 29 | CHAN5_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 28 | CHAN4_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 27 | CHAN3_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 26 | CHAN2_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|-------|
| 25 | CHAN1_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 24 | CHAN0_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 23 | CHAN7_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 22 | CHAN6_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 21 | CHAN5_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 20 | CHAN4_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 19 | CHAN3_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 18 | CHAN2_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 17 | CHAN1_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|--------|
| 16 | CHAN0_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | BUS_ERR | BUS error Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |

Table 8-1324. Register Call Summary for Register SIMCOP_DMA_IRQSTATUS_j

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\] \[1\]](#)
- [ISS SIMCOP DMA Register Manual: \[2\]](#)

Table 8-1325. SIMCOP_DMA_IRQENABLE_SET_j

| | | | | | |
|------------------|--|--|--|----------|---------------|
| Address Offset | 0x0000 0028 + (0x10 * j) | | | Instance | DMA_L3 |
| Physical Address | 0x5202 0228 + (0x10 * j) 0x5506 0228 + (0x10 * j) | | | | DMA_CORTEX-M3 |
| Description | Per-event interrupt enable bit vector Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. | | | | |
| Type | RW | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|----|----|----|----|----|---|---|---|---|---------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CHAN7_FRAME_DONE_IRQ | CHAN6_FRAME_DONE_IRQ | CHAN5_FRAME_DONE_IRQ | CHAN4_FRAME_DONE_IRQ | CHAN3_FRAME_DONE_IRQ | CHAN2_FRAME_DONE_IRQ | CHAN1_FRAME_DONE_IRQ | CHAN0_FRAME_DONE_IRQ | CHAN7_BLOCK_DONE_IRQ | CHAN6_BLOCK_DONE_IRQ | CHAN5_BLOCK_DONE_IRQ | CHAN4_BLOCK_DONE_IRQ | CHAN3_BLOCK_DONE_IRQ | CHAN2_BLOCK_DONE_IRQ | CHAN1_BLOCK_DONE_IRQ | CHAN0_BLOCK_DONE_IRQ | RESERVED | | | | | | | | | | OCP_ERR | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|-------|
| 31 | CHAN7_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 30 | CHAN6_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|-------|
| 29 | CHAN5_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 28 | CHAN4_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 27 | CHAN3_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 26 | CHAN2_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 25 | CHAN1_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 24 | CHAN0_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 23 | CHAN7_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 22 | CHAN6_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 21 | CHAN5_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|--------|
| 20 | CHAN4_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 19 | CHAN3_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 18 | CHAN2_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 17 | CHAN1_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 16 | CHAN0_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | OCP_ERR | OCP error Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |

Table 8-1326. Register Call Summary for Register SIMCOP_DMA_IRQENABLE_SET_j

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\]](#)
- [ISS SIMCOP DMA Register Manual: \[1\]](#)

Table 8-1327. SIMCOP_DMA_IRQENABLE_CLR_j

| | | | |
|-------------------------|---|-----------------|-------------------------|
| Address Offset | 0x0000 002C + (0x10 * j) | | |
| Physical Address | 0x5202 022C + (0x10 * j) 0x5506 022C + (0x10 * j) | Instance | DMA_L3 DMA_CORTEX-M3 |
| Description | Per-event interrupt enable bit vector Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|----|----|----|----|----|---|---|---|---|---|---|---|---------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CHAN7_FRAME_DONE_IRQ | CHAN6_FRAME_DONE_IRQ | CHAN5_FRAME_DONE_IRQ | CHAN4_FRAME_DONE_IRQ | CHAN3_FRAME_DONE_IRQ | CHAN2_FRAME_DONE_IRQ | CHAN1_FRAME_DONE_IRQ | CHAN0_FRAME_DONE_IRQ | CHAN7_BLOCK_DONE_IRQ | CHAN6_BLOCK_DONE_IRQ | CHAN5_BLOCK_DONE_IRQ | CHAN4_BLOCK_DONE_IRQ | CHAN3_BLOCK_DONE_IRQ | CHAN2_BLOCK_DONE_IRQ | CHAN1_BLOCK_DONE_IRQ | CHAN0_BLOCK_DONE_IRQ | RESERVED | | | | | | | | | | | | | OCP_ERR | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|---------------|-------|
| 31 | CHAN7_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 30 | CHAN6_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 29 | CHAN5_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 28 | CHAN4_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 27 | CHAN3_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 26 | CHAN2_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 25 | CHAN1_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|---------------|--------|
| 24 | CHAN0_FRAME_DONE_IRQ | Channel has completed transfer of the full frame Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 23 | CHAN7_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 22 | CHAN6_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 21 | CHAN5_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 20 | CHAN4_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 19 | CHAN3_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 18 | CHAN2_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 17 | CHAN1_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 16 | CHAN0_BLOCK_DONE_IRQ | Channel has completed transfer of one 2D block Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 15:1 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 0 | OCP_ERR | OCP error Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |

Table 8-1328. Register Call Summary for Register SIMCOP_DMA_IRQENABLE_CLR_j

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\]](#)
- [ISS SIMCOP DMA Register Manual: \[1\]](#)

Table 8-1329. SIMCOP_DMA_CHAN_CTRL_i

| | | | |
|-------------------------|--|-----------------|-------------------------|
| Address Offset | 0x0000 0080 + (0x30 * i) | | |
| Physical Address | 0x5202 0280 + (0x30 * i) 0x5506 0280 + (0x30 * i) | Instance | DMA_L3 DMA_CORTEX-M3 |
| Description | Logical channel control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|---------|----|----|----|--------|----|----|----|----------|----|---|---|----------|-----|--------|---|-----------|---------|--------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | HWSTOP | | | | HWSTART | | | | LINKED | | | | RESERVED | | | | TLERMODE | DIR | STATUS | | SWTRIGGER | DISABLE | ENABLE | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:23 | RESERVED | | R | 0x000 |
| 22:20 | HWSTOP | DMA logical channel hardware synchronization. Controls generation of the DONE pulse for the logical channel Only the values listed below are allowed. Other values lead to undefined behavior. 0x0: Disabled. 0x4: Use hardware synchronization channel 0 0x5: Use hardware synchronization channel 1 0x6: Use hardware synchronization channel 2 0x7: Use hardware synchronization channel 3 | RW | 0x0 |
| 19:17 | HWSTART | DMA logical channel hardware synchronization. Controls sensitivity of the logical channel on a START pulse Only the values listed below are allowed. Other values lead to undefined behavior. 0x0: Disabled. 0x4: Use hardware synchronization channel 0 0x5: Use hardware synchronization channel 1 0x6: Use hardware synchronization channel 2 0x7: Use hardware synchronization channel 3 | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 16:12 | LINKED | <p>DMA logical channel linking. Only the values listed below are allowed. Other values lead to undefined behavior.</p> <p>0x0: Disabled.</p> <p>0x10: Start channel 0 when this channel has completed transfer of one 2D block</p> <p>0x11: Start channel 1 when this channel has completed transfer of one 2D block</p> <p>0x12: Start channel 2 when this channel has completed transfer of one 2D block</p> <p>0x13: Start channel 3 when this channel has completed transfer of one 2D block</p> <p>0x14: Start channel 4 when this channel has completed transfer of one 2D block</p> <p>0x15: Start channel 5 when this channel has completed transfer of one 2D block</p> <p>0x16: Start channel 6 when this channel has completed transfer of one 2D block</p> <p>0x17: Start channel 7 when this channel has completed transfer of one 2D block</p> | RW | 0x00 |
| 11:7 | RESERVED | | R | 0x0 |
| 6 | TILERMODE | <p>Selects OCP transaction breakdown algorithm</p> <p>0x0: Regular mode. INCR burst are used. ADDR[32]=0 for OCP transactions</p> <p>0x1: Tiler mode. BLCK burst are used. ADDR[32]=1 for OCP transactions</p> | RW | - |
| 5 | DIR | <p>Transfer direction</p> <p>0x0: System memory - SIMCOP buffers</p> <p>0x1: SIMCOP buffers - system memory</p> | RW | 0 |
| 4:3 | STATUS | <p>SW could poll this bit to know the state of the channel</p> <p>Read 0x0: Idle</p> <p>Read 0x1: Active</p> <p>Read 0x2: Pending</p> <p>Read 0x3: Running</p> | R | 0x0 |
| 2 | SWTRIGGER | <p>Software trigger of the DMA channel. Read of this register always returns 0.</p> <p>Write 0x0: No effect</p> <p>Write 0x1: Change the logical channel state to PENDING if it is in ACTIVE state. No effect if the channel is in RUNNING, PENDING or IDLE state</p> | W | 0 |
| 1 | DISABLE | <p>Disable control of the logical channel. Read of this register always returns 0.</p> <p>Write 0x0: No effect.</p> <p>Write 0x1: Disable the channel. Changes the logical channel state to IDLE when it is in ACTIVE state. Memorize a disable request when the channel is in RUNNING or PENDING state.</p> | W | 0 |
| 0 | ENABLE | <p>Enable control of the logical channel. Read of this register always returns 0.</p> <p>Write 0x0: No effect</p> <p>Write 0x1: Enable the channel. Changes the state of the logical channel from IDLE to ACTIVE.</p> | W | 0 |

Table 8-1330. Register Call Summary for Register SIMCOP_DMA_CHAN_CTRL_i

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)
- [ISS SIMCOP DMA Basic Programming Model: \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\]](#)
- [ISS SIMCOP DMA Register Manual: \[35\]](#)

Table 8-1331. SIMCOP_DMA_CHAN_SMEM_ADDR_i

| | | | | |
|-------------------------|--|--|-----------------|-------------------------|
| Address Offset | 0x0000 0084 + (0x30 * i) | | Instance | DMA_L3 DMA_CORTEX-M3 |
| Physical Address | 0x5202 0284 + (0x30 * i) 0x5506 0284 + (0x30 * i) | | | |
| Description | System memory address | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------|------|---------|
| 31:4 | ADDR | Address in 128-bit words | RW | 0x----- |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-1332. Register Call Summary for Register SIMCOP_DMA_CHAN_SMEM_ADDR_i

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\] \[1\]](#)
- [ISS SIMCOP DMA Basic Programming Model: \[2\] \[3\] \[4\] \[5\]](#)
- [ISS SIMCOP DMA Register Manual: \[6\]](#)

Table 8-1333. SIMCOP_DMA_CHAN_SMEM_OFST_i

| | | | | |
|-------------------------|--|--|-----------------|-------------------------|
| Address Offset | 0x0000 0088 + (0x30 * i) | | Instance | DMA_L3 DMA_CORTEX-M3 |
| Physical Address | 0x5202 0288 + (0x30 * i) 0x5506 0288 + (0x30 * i) | | | |
| Description | System memory line offset in 128-bit words. Maximum stride = 1MB | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | OFST | | | | | | | | | | | | | | | | | | | | | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------------|------|--------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:4 | OFST | Line offset. In 128-bit words. | RW | 0x---- |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-1334. Register Call Summary for Register SIMCOP_DMA_CHAN_SMEM_OFST_i

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\] \[1\] \[2\]](#)
- [ISS SIMCOP DMA Basic Programming Model: \[3\] \[4\] \[5\] \[6\]](#)
- [ISS SIMCOP DMA Register Manual: \[7\]](#)

Table 8-1335. SIMCOP_DMA_CHAN_BUF_OFST_i

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 008C + (0x30 * i) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5202 028C + (0x30 * i) | | | | | | | | | | | | | | | | Instance DMA_L3 DMA_CORTEX-M3 | | | | | | | | | | | | | | | |
| | 0x5506 028C + (0x30 * i) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | SIMCOP memory line offset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | OFST | | | | | | | | | | | | | | | | | | | | | | | | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------------|------|--------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:4 | OFST | Line offset. In 128-bit words. | RW | 0x---- |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-1336. Register Call Summary for Register SIMCOP_DMA_CHAN_BUF_OFST_i

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Basic Programming Model: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS SIMCOP DMA Register Manual: \[4\]](#)

Table 8-1337. SIMCOP_DMA_CHAN_BUF_ADDR_i

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0090 + (0x30 * i) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5202 0290 + (0x30 * i) | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | |
| | 0x5506 0290 + (0x30 * i) | | | | | | | | | | | | | | | | DMA_L3 DMA_CORTEX-M3 | | | | | | | | | | | | | | | |
| Description | SIMCOP memory address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------------------|------|--------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:4 | ADDR | Address in 128-bit words. | RW | 0x---- |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-1338. Register Call Summary for Register SIMCOP_DMA_CHAN_BUF_ADDR_i

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\]](#)
- [ISS SIMCOP DMA Basic Programming Model: \[1\] \[2\] \[3\] \[4\]](#)
- [ISS SIMCOP DMA Register Manual: \[5\]](#)

Table 8-1339. SIMCOP_DMA_CHAN_BLOCK_SIZE_i

| | | | |
|-------------------------|--|-----------------|-------------------------|
| Address Offset | 0x0000 0094 + (0x30 * i) | | |
| Physical Address | 0x5202 0294 + (0x30 * i) 0x5506 0294 + (0x30 * i) | Instance | DMA_L3 DMA_CORTEX-M3 |
| Description | 2D block size | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|----|------|----|----|----|---|---|---|---|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | YNUM | | | | | | | | RESERVED | | XNUM | | | | | | | | RESERVED | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------------|
| 31:29 | RESERVED | | R | 0x0 |
| 28:16 | YNUM | Height, in lines, per 2D block Valid values are 1- 8191. | RW | 0bxxxxxxxxxxxx |
| 15:14 | RESERVED | | R | 0x0 |
| 13:4 | XNUM | Width, in 128-bit words, per 2D block. Valid values are 1-1023, that corresponds to 16 bytes to 16KB. | RW | 0bxxxxxxxxxx |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-1340. Register Call Summary for Register SIMCOP_DMA_CHAN_BLOCK_SIZE_i

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [ISS SIMCOP DMA Basic Programming Model: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [ISS SIMCOP DMA Register Manual: \[13\]](#)

Table 8-1341. SIMCOP_DMA_CHAN_FRAME_i

| | | | |
|-------------------------|--|-----------------|-------------------------|
| Address Offset | 0x0000 0098 + (0x30 * i) | | |
| Physical Address | 0x5202 0298 + (0x30 * i) 0x5506 0298 + (0x30 * i) | Instance | DMA_L3 DMA_CORTEX-M3 |
| Description | Defines a frame. A frame is composed of 2D blocks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|----|----|----|------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | YCNT | | | | | | | | RESERVED | | | | XCNT | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------------|
| 31:26 | RESERVED | Reserved. | R | 0x00 |
| 25:16 | YCNT | Vertical count of 2D blocks per frame. Valid values are 1-1023 | RW | 0bxxxxxxxxxx |
| 15:10 | RESERVED | Reserved. | R | 0x00 |
| 9:0 | XCNT | Horizontal count of 2D blocks per frame. Valid values are 1-1023 | RW | 0bxxxxxxxxxx |

Table 8-1342. Register Call Summary for Register SIMCOP_DMA_CHAN_FRAME_i

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\] \[1\]](#)
- [ISS SIMCOP DMA Basic Programming Model: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [ISS SIMCOP DMA Register Manual: \[10\]](#)

Table 8-1343. SIMCOP_DMA_CHAN_CURRENT_BLOCK_i

| | | | | |
|-------------------------|---|--|-----------------|-------------------------|
| Address Offset | 0x0000 00A0 + (0x30 * i) | | Instance | DMA_L3 DMA_CORTEX-M3 |
| Physical Address | 0x5202 02A0 + (0x30 * i) 0x5506 02A0 + (0x30 * i) | | | |
| Description | SW could read the coordinates of the last transferred block. The status is reset when the channel is enabled (change the state of CTRL.ENABLE from 0 to 1). | | | |
| Type | R | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | BY | | | | | | | | RESERVED | | | | | | | | BX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------------|
| 31:26 | RESERVED | Reserved. | R | 0x00 |
| 25:16 | BY | Vertical position of the last transferred 2D block in the frame. | R | 0bxxxxxxxxxx |
| 15:10 | RESERVED | Reserved. | R | 0x00 |
| 9:0 | BX | Horizontal position of the last transferred 2D block in the frame. | R | 0bxxxxxxxxxx |

Table 8-1344. Register Call Summary for Register SIMCOP_DMA_CHAN_CURRENT_BLOCK_i

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\]](#)
- [ISS SIMCOP DMA Register Manual: \[1\]](#)

Table 8-1345. SIMCOP_DMA_CHAN_BLOCK_STEP_i

| | | | | |
|-------------------------|--|--|-----------------|-------------------------|
| Address Offset | 0x0000 00A4 + (0x30 * i) | | Instance | DMA_L3 DMA_CORTEX-M3 |
| Physical Address | 0x5202 02A4 + (0x30 * i) 0x5506 02A4 + (0x30 * i) | | | |
| Description | Offset between 2D blocks. | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | YSTEP | | | | | | | | XSTEP | | | | | | | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|------------------|
| 31:30 | RESERVED | | R | 0x0 |
| 29:16 | YSTEP | Vertical offset, in lines, between rows of 2D blocks. For contiguous 2D blocks YSTEP=YNUM Valid values are -8192 to +8191. | RW | 0b0xxxxxxxxxxxxx |
| 15 | RESERVED | | R | 0 |
| 14:4 | XSTEP | Horizontal offset, in 128-bit words, between 2D block columns. For contiguous 2D blocks XSTEP=XNUM Valid values are -1024 to +1023, that corresponds to 16 bytes to 16KB. | RW | 0bxxxxxxxxxxxx |
| 3:0 | RESERVED | | R | 0x0 |

Table 8-1346. Register Call Summary for Register SIMCOP_DMA_CHAN_BLOCK_STEP_i

ISS Still Image Coprocessor

- [ISS SIMCOP DMA Functional Description: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS SIMCOP DMA Basic Programming Model: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [ISS SIMCOP DMA Register Manual: \[12\]](#)

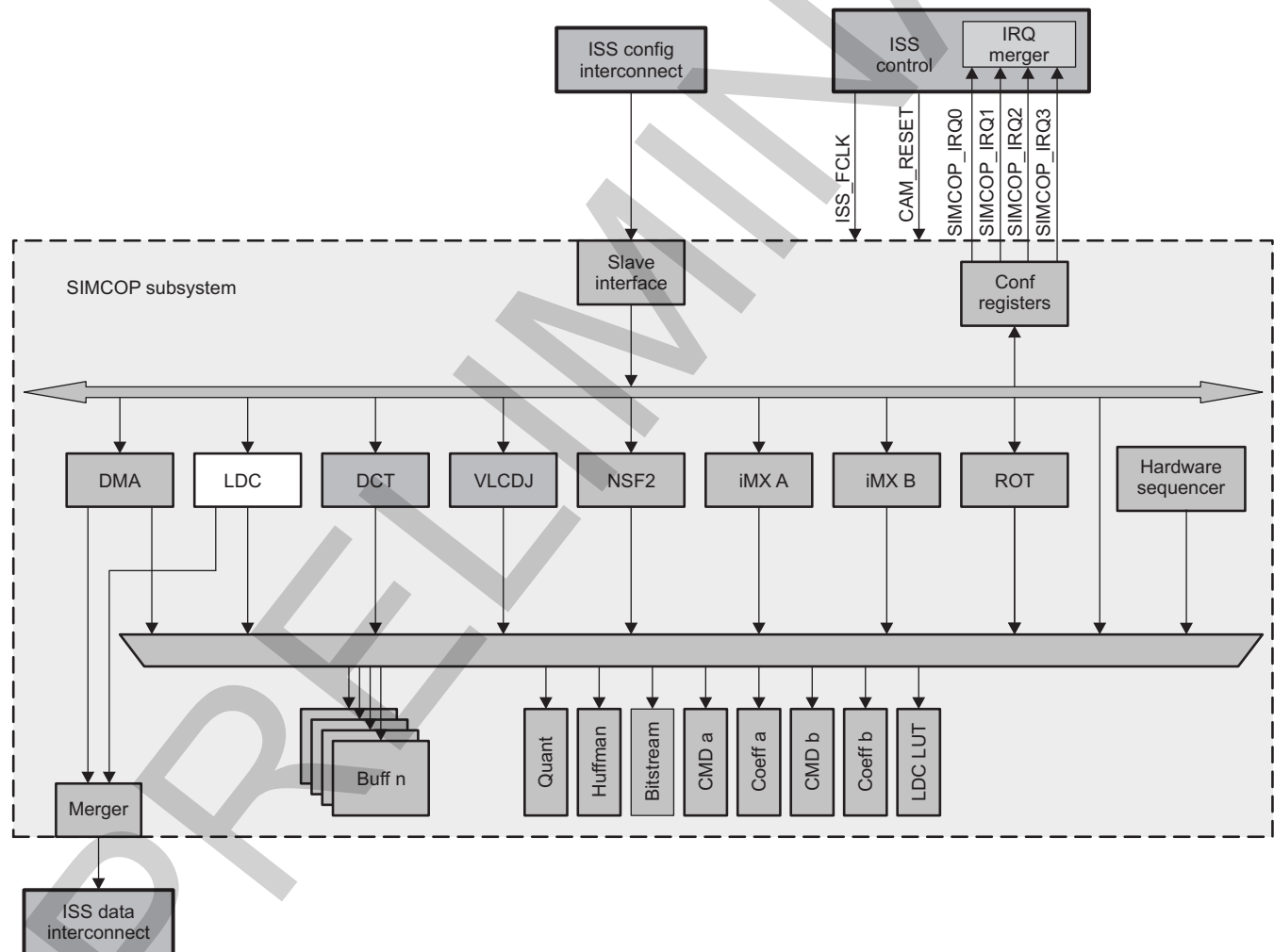
8.4.4 ISS SIMCOP LDC Module

This chapter describes the lens distortion correction (LDC) module in the still image coprocessor (SIMCOP) subsystem.

8.4.4.1 ISS SIMCOP LDC Overview

The LDC deals with lens geometric distortion issues, chromatic aberration, and affine transformation for camera images. [Figure 8-267](#) is an overview of the LDC in the SIMCOP subsystem.

Figure 8-267. LDC in the SIMCOP Subsystem



ldc-001

For still image or video applications the LDC supports:

- Lens distortion correction:
 - YCbCr 4:2:2/4:2:0 data format input/output (I/O) for post-image-pipe correction
 - Correct barrel distortion and pin-cushion distortion
 - Radius-to-magnification-factor table to accommodate various distortion functions through

- programming
 - Configurable center point and horizontal/vertical adjustment
 - One 256-entry look-up table (LUT) for Y, Cb, and Cr
 - 8 bits for YCbCr
 - Bicubic interpolation for Y and bilinear interpolation for Cb/Cr
 - Bilinear interpolation mode for Y to offer faster processing
 - Up to 16,383 x 16,383 image dimension
 - Format restriction:
 - YCbCr 4:2:2 format: Tile width must be a multiple of 16.
 - YCbCr 4:2:0 format: Tile width must be a multiple of 32.
- Image warping, scaling, and rotation:
 - Affine transformation for image warping, scaling, and rotation
 - 8 bits for YCbCr
 - Bicubic interpolation for Y and bilinear interpolation for Cb/Cr
 - Bilinear interpolation mode for Y to offer double throughput
 - Format restriction:
 - YCbCr 4:2:2 format: Tile width must be a multiple of 16.
 - YCbCr 4:2:0 format: Tile width must be a multiple of 32.
- Chromatic aberration correction:
 - Supports Bayer data in unpacked 12-bit per pixel, 8-bit per pixel A-Law, 8-bit per pixel unpacked, and 12-bit per pixel packed formats
 - Radius-to-magnification-factor table to accommodate various distortion functions through programming
 - Configurable center point and horizontal/vertical adjustment
 - Red and blue distortion only. Green pixels are copied to output.
 - Independent 128-entry LUTs for red and blue
 - Bilinear interpolation
 - Up to 16,383 x 16,383 image dimension
 - Format restriction:
 - Unpacked 12-bit format: Tile width must be a multiple of 16.
 - A-Law 8-bit format: Tile width must be a multiple of 32.
 - Unpacked 8-bit format: Tile width must be a multiple of 32.
 - Packed 12-bit format: Tile width must be a multiple of 64.

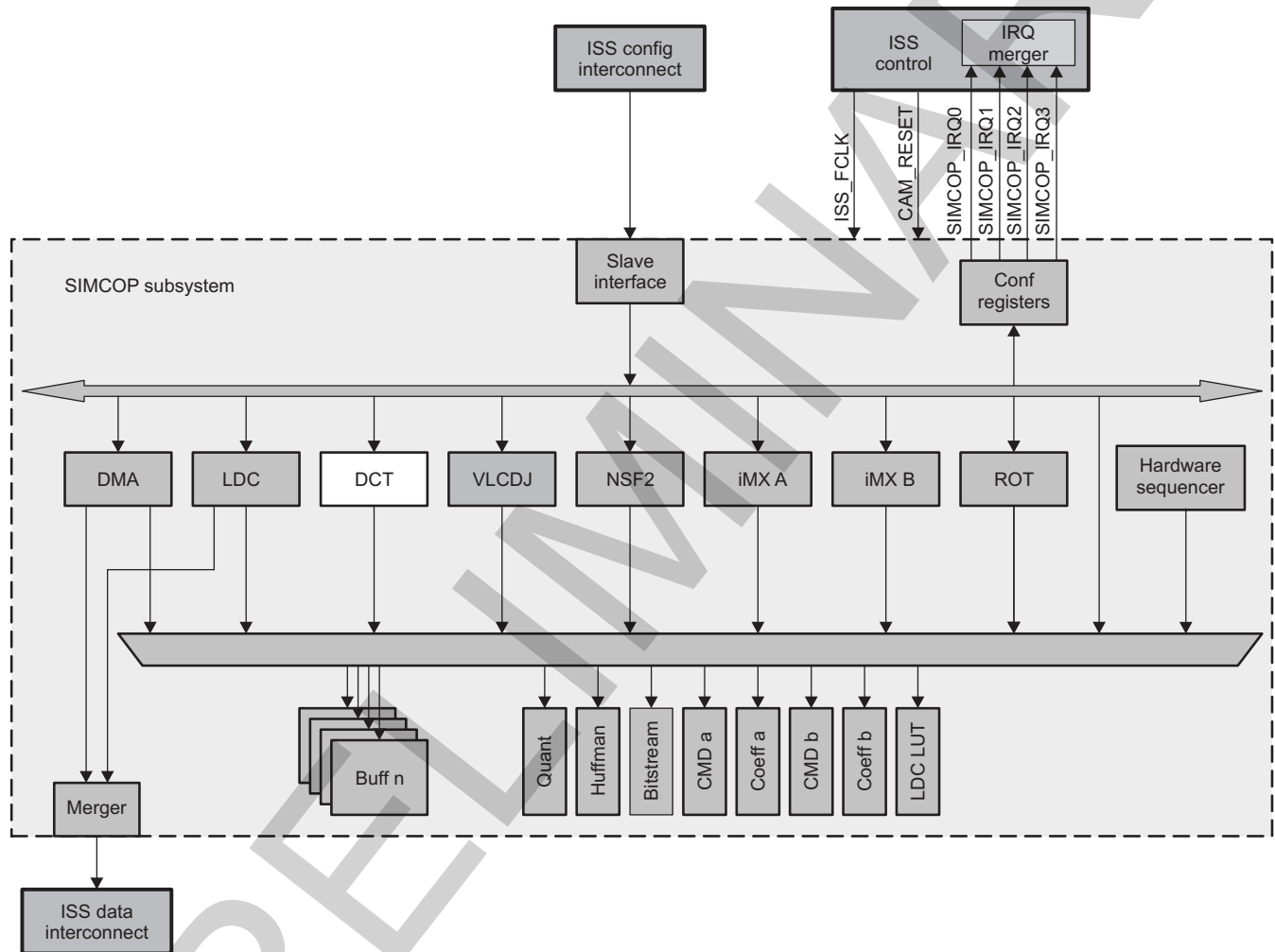
8.4.5 ISS SIMCOP Discrete Cosine Transform Module

This section describes the discrete cosine transform (DCT) module in the still-image coprocessor (SIMCOP) subsystem.

8.4.5.1 ISS SIMCOP DCT Overview

The DCT module performs DCT and inverse DCT (IDCT) operations required for still-image coder/decoder (codec) applications. [Figure 8-268](#) is an overview of the DCT in the SIMCOP subsystem.

Figure 8-268. DCT in the SIMCOP Subsystem



dct-001

For still-image or video applications, the DCT supports:

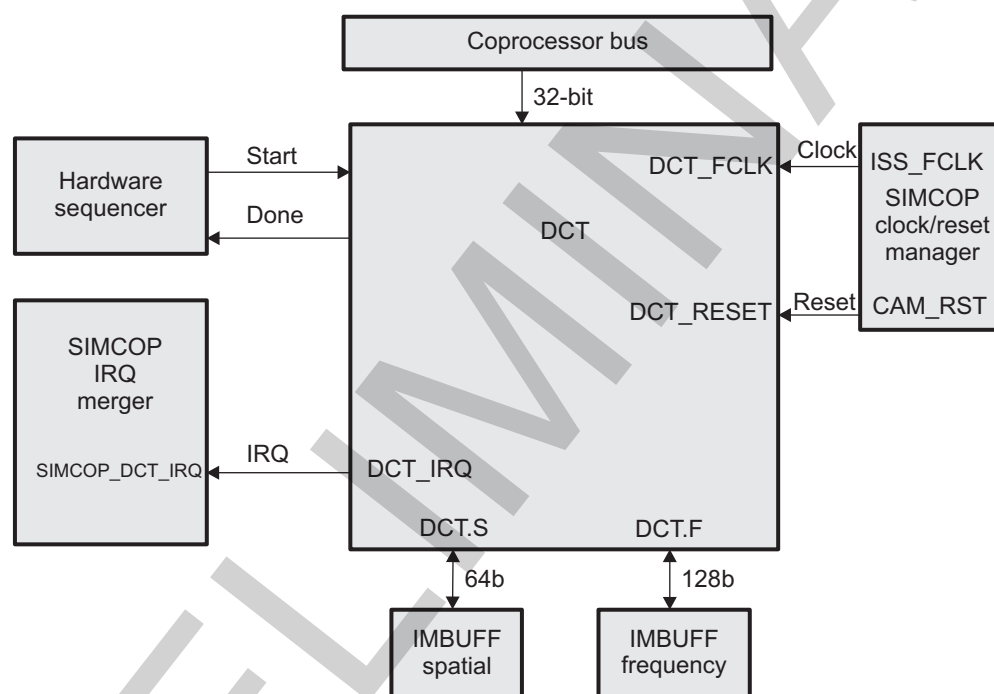
- 8-bit data in the spatial domain (input to DCT or output of IDCT) with –128 offset on color components
- 16-bit data in the frequency domain
- Exact input/output (I/O) range:
 - DCT expected input range [0, 255], subtracting 128 offset before transform, output saturated to [–1024, 1023]
 - IDCT expected input range [–1280, 1079], adding 128 to inverse transform outcome and saturating to [0, 255]
 - IDCT input range is from DCT output range plus [–256, 256] worst-case quantization error
- Configurable to process up to 32 microcontroller units (MCUs) at a time (21 MCUs for YUV4:2:0, and 32 MCUs for YUV4:2:2, because of memory size limitations)

- The following formats are supported by the DCT:
 - 16 x 16-pixel block MCU for YUV4:2:0 format, spatial data storage follows NV12
 - 16 x 8-pixel block MCU for YUV4:2:2 format, spatial data storage follows UYVY
 - Sequential 8 x 8 block mode, other than YUV4:2:0 and YUV4:2:2, a color-neutral format to allow flexibility in color component configuration in MCU, processes up to 64 blocks per task
- JPEG baseline sequential is supported by sequential 8 x 8 block mode. Some post-processing to reorder data and color space conversion may be required.
- All frequency domain data are stored sequentially for each 8 x 8 block, 16 bits per data point.

8.4.5.2 ISS SIMCOP DCT Integration

The DCT is part of the SIMCOP subsystem in the imaging subsystem (ISS). [Figure 8-269](#) shows the integration of the DCT in the SIMCOP subsystem.

Figure 8-269. DCT Engine Integration



dct-002

[Table 8-1347](#) through [Table 8-1349](#) list the integration attributes, clocks and resets, and hardware requests, respectively, for the DCT.

Table 8-1347. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| DCT | PD_CAM | |

Table 8-1348. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|---|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| DCT | DCT_FCLK | ISS_FCLK | PRCM | Functional clock provided by ISS_CLK from the power, reset, and clock management (PRCM) module. It is used by all ISS submodules and ISS top-level resources. |
| Resets | | | | |
| DCT | DCT_RESET | CAM_RST | PRCM | ISS and SIMCOP global reset |

For information about clock and reset management, see [Section 8.4.1.2.1](#), *ISS SIMCOP Local Power and Clock Management*.

Table 8-1349. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------------|----------------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| DCT | DCT_IRQ | SIMCOP_DCT_IRQ | SIMCOP IRQ merger | DCT operation is complete. |

For more information about interrupt requests, see [Section 8.4.1.2.3](#), *Interrupt Merger*.

8.4.5.3 ISS SIMCOP DCT Functional Description

8.4.5.3.1 ISS SIMCOP DCT Block Diagram

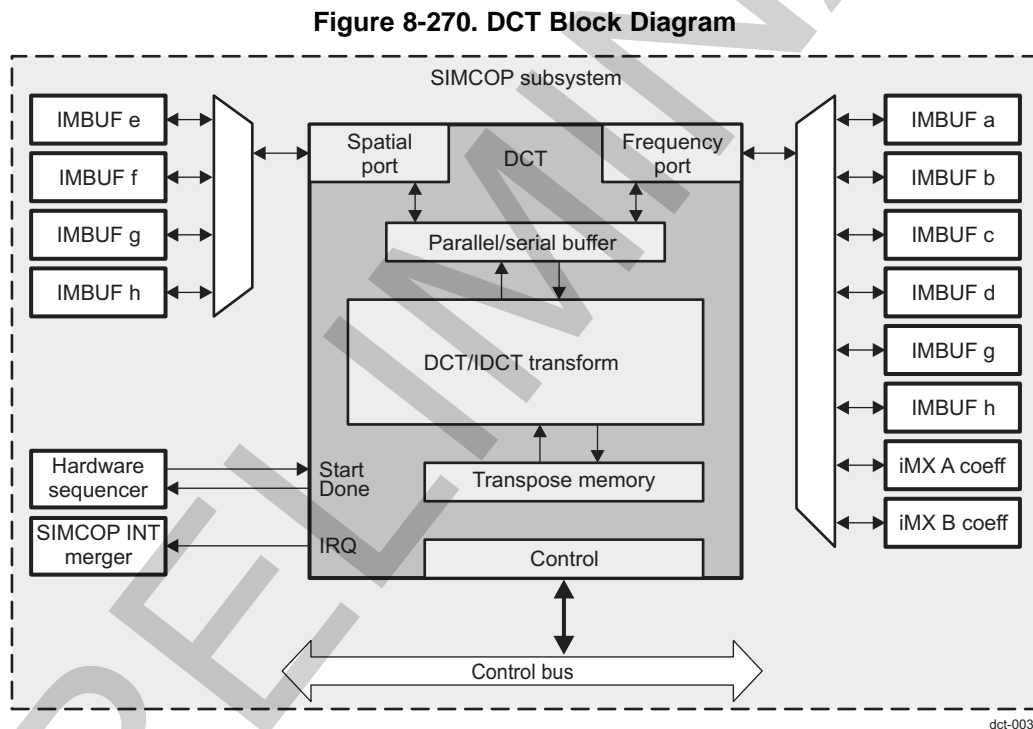
The DCT implements 8×8 , 2-dimensional (2D) DCT and IDCT specified in JPEG image coding standards:

- In 4:2:0 mode, spatial domain data is organized in NV12 format. The frequency domain is organized as six blocks of 8×8 .
- In 4:2:2 mode, spatial domain data is organized in UYVY format. The frequency domain is organized as four blocks of 8×8 .
- In sequential 8×8 block mode, spatial and frequency domain data are organized as N blocks of 8×8 blocks.

NOTE:

- The spatial domain is the DCT input and IDCT output.
- The frequency domain is the DCT output and IDCT input.

Figure 8-270 is a block diagram of the DCT.



8.4.5.3.2 ISS SIMCOP DCT Power Management

Table 8-1350 describes the power-management features available for the DCT.

Table 8-1350. Local Power-Management Features

| Feature | Registers | Description |
|------------------|---------------------------------------|---|
| Clock autogating | DCT_CFG[5] AUTOGATING | Free-running or autogating modes are available. |

8.4.5.3.3 ISS SIMCOP DCT Interrupt Requests

Table 8-1351 lists the event flags, and their mask, that can cause module interrupts.

Table 8-1351. Events

| Event Flag | Event Mask | Map to | Description |
|------------|----------------------------------|---------|-------------------|
| N/A | DCT_CFG[3] INTEN | DCT_IRQ | End of processing |

8.4.5.3.4 Control and Status

The DCT is controlled through the control registers accessed through the coprocessor bus by an external initiator. Before starting the DCT, the buffer memory must be configured for DCT access and initialized, and the control register must be set (for more information about DCT/IDCT processing, see [Section 8.4.5.3.4.1, DCT Configuration](#)).

The [DCT_CFG\[4\]](#) TRIG_SRC bit is used to select the DCT start source:

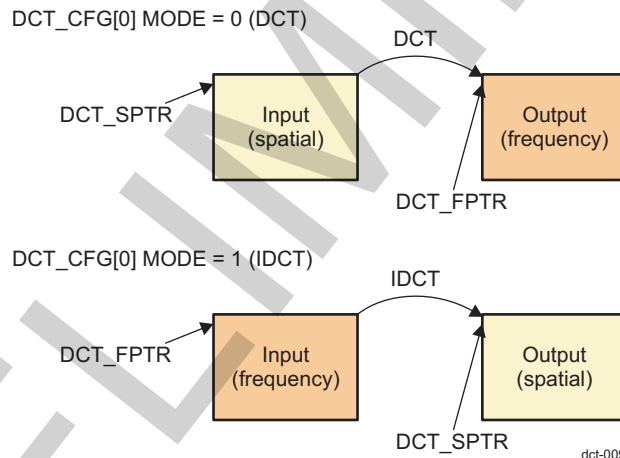
- If TRIG_SRC = 0, the DCT is started through the [DCT_CTRL\[0\]](#) EN bit.
- If TRIG_SRC = 1, the DCT is started by a hardware-start signal generated by the SIMCOP hardware sequencer.

When the DCT is configured for one trigger, the other trigger has no effect on the DCT.

An external initiator can read the state of the DCT (running or not running) by reading the [DCT_CTRL\[15\]](#) BUSY bit. When the BUSY bit goes back to 0, processing is complete (TRIG_SRC = 0 or 1).

Before starting the DCT, the [DCT_SPTR](#) and [DCT_FPTR](#) registers must be configured with spatial and frequency addresses. [Figure 8-271](#) shows the use of spatial and frequency addresses.

Figure 8-271. DCT I/O Address Configuration



An interrupt can be generated when DCT operation completes (the configured number of MCUs for YUV4:2:0/4:2:2 mode, or the number of blocks for sequential block mode). To enable interrupt generation, set the [DCT_CFG\[3\]](#) INTEN bit to 1.

When the [DCT_CFG\[3\]](#) INTEN bit is set to 0, no interrupt generation is performed.

8.4.5.3.4.1 DCT Configuration

The following features can be configured in the DCT register:

- DCT module operation: The [DCT_CFG\[0\]](#) MODE bit configures the processing:
 - MODE = 0: DCT processing
 - MODE = 1: IDCT processing
- Number of MCUs to process: The number of MCUs to process –1 is configured in the [DCT_CFG\[13:8\]](#) NMCUS bit field:
 - YUV4:2:0 maximum MCUs = 21 (memory limitation, 126 blocks)
 - YUV4:2:2 maximum MCUs = 32 (128 blocks)

- Sequential maximum MCUs = 64 (64 blocks)

8.4.5.3.5 Data Format

The DCT reads and writes data from and to image buffers. I/O format can be configured in the [DCT_CFG\[2:1\]](#) FMT bit field. The following formats can be configured:

- YUV4:2:0
- YUV4:2:2
- Sequential

8.4.5.3.5.1 YUV4:2:0 Format

In JPEG YUV4:2:0 format, each MCU is 16×16 pixels, and has 16×16 Y data points, 8×8 U data points, and 8×8 V data points. Each square array of 8×8 data points is called a block. Thus, an MCU with a YUV4:2:0 format has four Y blocks, one U block, and one V block.

This module follows the NV12 data storage format for YUV4:2:0 spatial data. For YUV4:2:0 format:

- $\text{line_offset_in_bytes} = (\text{DCT_CFG}[13:8] \text{ NMCUS} + 1) \cdot 16$
- $\text{starting_addr_uv} = \text{DCT_SPTR} + (\text{DCT_CFG}[13:8] \text{ NMCUS} + 1) \cdot 256$

[Figure 8-272](#) shows the organization of the data for two MCUs in the spatial domain, when the DCT is configured to process two MCUs. To select the YUV4:2:0 format, write 0x0 in the [DCT_CFG\[2:1\]](#) FMT bit field. YUV4:2:0 processes six blocks (four Y, one U, and one V) during each MCU DCT processing.

Figure 8-272. YUV4:2:0 Format Data Order

Byte offset

| | 0 | 1 | 2 | 3 | ... | 31 |
|-----|---------|---------|---------|---------|-----|----------|
| 0 | Y(0,0) | Y(1,0) | Y(2,0) | Y(3,0) | ... | Y(15,0) |
| 32 | Y(0,1) | Y(1,1) | Y(2,1) | Y(3,1) | ... | Y(15,1) |
| 64 | Y(0,2) | Y(1,2) | Y(2,2) | Y(3,2) | ... | Y(15,2) |
| | ... | | | | | |
| 480 | Y(0,15) | Y(1,15) | Y(2,15) | Y(3,15) | ... | Y(15,15) |
| 512 | U(0,0) | V(0,0) | U(2,0) | V(2,0) | ... | V(14,0) |
| 544 | U(0,2) | V(0,2) | U(2,2) | V(2,2) | ... | V(14,2) |
| | | | | | | |
| 736 | U(0,14) | V(0,14) | U(2,14) | V(2,14) | ... | V(14,14) |

dct-005

Each YUV4:2:0 has four Y blocks, one U block, and one V block. For the first MCU in [Figure 8-272](#), the blocks are:

- Y_Block 0:
 - Y(0, 0), Y(1, 0), ..., Y(7, 0)
 - Y(0, 1), Y(1, 1), ..., Y(7, 1)
 -
 - Y(0, 7), Y(1, 7), ..., Y(7, 7)
- Y_Block 1:
 - Y(8, 0), Y(9, 0), ..., Y(15, 0)
 - Y(8, 1), Y(9, 1), ..., Y(15, 1)
 -
 - Y(8, 7), Y(9, 7), ..., Y(15, 7)
- Y_Block 2:
 - Y(0, 8), Y(1, 8), ..., Y(7, 8)
 - Y(0, 9), Y(1, 9), ..., Y(7, 9)

-
- Y(0, 15), Y(1, 15), ..., Y(7, 15)
- Y_Block 3:
 - Y(8, 8), Y(9, 8), ..., Y(15, 8)
 - Y(8, 9), Y(9, 9), ..., Y(15, 9)
 -
 - Y(8, 15), Y(9, 15), ..., Y(15, 15)
- U_Block:
 - U(0, 0), U(2, 0), ..., U(14, 0)
 - U(0, 2), U(2, 2), ..., U(14, 2)
 -
 - U(0, 14), U(2, 14), ..., U(14, 14)
- V_Block:
 - V(0, 0), V(2, 0), ..., V(14, 0)
 - V(0, 2), V(2, 2), ..., V(14, 2)
 -
 - V(0, 14), V(2, 14), ..., V(14, 14)

8.4.5.3.5.2 YUV4:2:2 Format

In JPEG YUV4:2:2 format, each MCU is 16×8 pixels and has 16×8 Y data points, 8×8 U data points, and 8×8 V data points. Thus, an MCU with a YUV4:2:2 format has two Y blocks, one U block, and one V block.

This module follows the UYVY data storage format for YUV4:2:2 spatial data. For YUV4:2:2 format: $\text{line_offset_in_bytes} = (\text{DCT_CFG}[13:8] \text{ NMCUS} + 1) 32$

Figure 8-273 shows the organization of the data for two MCUs in the spatial domain when the DCT is configured to process two MCUs. To select the YUV4:2:2 format, write 0x1 in the [DCT_CFG\[2:1\]](#) FMT bit field. YUV4:2:2 processes four blocks (two Y, one U, and one V) during each MCU DCT processing.

Figure 8-273. YUV4:2:2 Format Data Order

| Byte offset | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | 31 | 32 | 33 | 34 | | 63 |
|-------------|--------|--------|--------|--------|--------|--------|--------|--------|-----|---------|---------|---------|---------|-----|---------|
| 0 | U(0,0) | Y(0,0) | V(0,0) | Y(1,0) | U(2,0) | Y(2,0) | V(2,0) | Y(3,0) | ... | Y(15,0) | U(16,0) | Y(16,0) | V(16,0) | ... | Y(31,0) |
| 64 | U(0,1) | Y(0,1) | V(0,1) | Y(1,1) | U(2,1) | Y(2,1) | V(2,1) | Y(3,1) | ... | Y(15,1) | U(16,1) | Y(16,1) | V(16,1) | ... | Y(31,1) |
| 128 | U(0,2) | Y(0,2) | V(0,2) | Y(1,2) | U(2,2) | Y(2,2) | V(2,2) | Y(3,2) | ... | Y(15,2) | U(16,2) | Y(16,2) | V(16,2) | ... | Y(31,2) |
| | ⋮ | | | | | | | | ... | | | | | ... | |
| 448 | U(0,7) | Y(0,7) | V(0,7) | Y(1,7) | U(2,7) | Y(2,7) | V(2,7) | Y(3,7) | ... | Y(15,7) | U(16,7) | Y(16,7) | V(16,7) | ... | Y(31,7) |

dct-011

Each YUV4:2:2 has two Y blocks, one U block, and one V block. The four blocks of the first MCU are:

- Y_Block 0:
 - Y(0, 0), Y(1, 0), ..., Y(7, 0)
 - Y(0, 1), Y(1, 1), ..., Y(7, 1)
 -
 - Y(0, 7), Y(1, 7), ..., Y(7, 7)
- Y_Block 1:
 - Y(8, 0), Y(9, 0), ..., Y(15, 0)
 - Y(8, 1), Y(9, 1), ..., Y(15, 1)

-
- $Y(8, 7), Y(9, 7), \dots, Y(15, 7)$

8.4.5.3.5.3 Sequential Block Format

The sequential block format supports any color format other than YUV4:2:0 or YUV4:2:2. There is no notion of colors, and each 8×8 block is ordered sequentially. The DCT can be configured to process N blocks (versus N MCUs for YUV4:2:0 and YUV4:2:2, N is up to 64). In this format:

- Block i =
 - $X(8*i, 0), X(8*i+1, 0), \dots, X(8*i+7, 0)$
 - $X(8*i, 1), X(8*i+1, 1), \dots, X(8*i+7, 1)$
 -
 - $X(8*i, 7), X(8*i+1, 7), \dots, X(8*i+7, 7)$

To select sequential block format, write 0x2 in the [DCT_CFG\[2:1\]](#) FMT bit field.

8.4.5.4 ISS SIMCOP DCT Basic Programming Model

8.4.5.4.1 Initialization of Surrounding Modules

To initialize the DCT, the surrounding modules must be initialized. [Table 8-1352](#) lists these modules.

Table 8-1352. Initialization of Surrounding Modules

| Module | Minimum Required Setting | Optional Settings |
|-------------|---|---|
| CLKC | Enable the SIMCOP clock. | |
| Buffers | Configure DCT access to the image buffer. | |
| SIMCOP CTRL | | Configure SIMCOP CTRL to handle DCT interrupts. |

8.4.5.4.2 Using the DCT for DCT Processing

To configure the DCT for DCT processing, software must follow the procedure listed in [Table 8-1353](#).

Table 8-1353. DCT Processing Procedure

| Step | Register/Bit Field | Value |
|---|--------------------------------------|---|
| Prepare data in buffer memory. | SIMCOP buffers | |
| Switch buffer access to the DCT. | SIMCOP buffers | |
| Configure the start of the DCT input address (address must be in the memory buffer). | DCT_SPTR [12:5] ADDR | Start address (spatial domain) |
| Configure the start of the DCT output address (address must be in the memory buffer). | DCT_FPTR [13:4] ADDR | Start address (frequency domain) |
| Set the DCT_CFG register. | DCT_CFG [0] MODE | 0 (DCT mode) |
| | DCT_CFG [2:1] FMT | Depends on data format |
| | DCT_CFG [3] INTEN | 0: No interrupt 1: Interrupt at end of processing |
| | DCT_CFG [4] TRIG_SRC | 1: Start controlled by hardware signal 0: Start controlled by a register |
| | DCT_CFG [13:8] NMCUS | Number of MCUs to process |
| IF: DCT_CFG[4] TRIG_SRC = 0 | | |
| Start DCT through the register. | DCT_CTRL [0] EN | 1 |
| ELSE | | |
| Start the DCT using the hardware sequencer. | SIMCOP hardware sequencer | |
| ENDIF | | |

The DCT is now processing the blocks. To detect the end of DCT processing:

- If [DCT_CFG](#)[3] INTEN = 1, wait for the interrupt signal.
- If [DCT_CFG](#)[3] INTEN = 0, the processor must poll the [DCT_CTRL](#)[15] BUSY bit. When the BUSY bit is 0, processing is complete.

When DCT processing completes, the frequency output result is stored in the memory buffer at the address given by the [DCT_FPTR](#)[13:4] ADDR bit field.

8.4.5.4.3 Using the DCT for IDCT Processing

To configure the DCT for IDCT processing, software must follow the procedure listed in [Table 8-1354](#).

Table 8-1354. IDCT Processing Procedure

| Step | Register/Bit Field | Value |
|----------------------------------|--------------------|-------|
| Prepare data in buffer memory. | SIMCOP buffers | |
| Switch buffer access to the DCT. | SIMCOP buffers | |

Table 8-1354. IDCT Processing Procedure (continued)

| Step | Register/Bit Field | Value |
|---|--------------------------------------|---|
| Configure the start of the DCT output address (address must be in the memory buffer). | DCT_SPTR [12:5] ADDR | Start address (spatial domain) |
| Configure the start of the DCT input address (address must be in the memory buffer). | DCT_FPTR [13:4] ADDR | Start address (frequency domain) |
| Set the DCT_CFG register. | DCT_CFG [0] MODE | 1 (IDCT mode) |
| | DCT_CFG [2:1] FMT | Depends on data format |
| | DCT_CFG [3] INTEN | 0: No interrupt 1: Interrupt at end of processing |
| | DCT_CFG [4] TRIG_SRC | 1: Start controlled by a hardware signal 0: Start controlled by a register |
| | DCT_CFG [13:8] NMCUS | Number of MCUs to process |
| IF: DCT_CFG [4] TRIG_SRC = 0 | | |
| Start the DCT through a register. | DCT_CTRL [0] EN | 1 |
| ELSE | | |
| Start the DCT using hardware sequencer. | SIMCOP hardware sequencer | |
| ENDIF | | |

The DCT is now processing the blocks. To detect the end of IDCT processing:

- If [DCT_CFG](#)[3] INTEN = 1, wait for the interrupt signal.
- If [DCT_CFG](#)[3] INTEN = 0, the processor must poll the [DCT_CTRL](#)[15] BUSY bit. When the BUSY bit is 0, processing is complete.

When IDCT processing completes, the spatial output result is stored in the memory buffer at the address given by the [DCT_SPTR](#)[12:5] ADDR bit field.

8.4.5.5 ISS SIMCOP DCT Register Manual

8.4.5.5.1 ISS SIMCOP DCT Instance Summary

[Table 8-1355](#) summarizes the DCT instance.

Table 8-1355. ISS SIMCOP DCT Instance Summary

| Module Name | Base Address L3 Interconnect | Base Address Cortex-M3 Private Access | Size |
|-------------|---------------------------------|--|----------|
| DCT | 0x5202 0800 | 0x5506 0800 | 32 bytes |

NOTE: Private Access is an access that does not use the L3/L4 interconnects.

8.4.5.5.2 DCT Registers

8.4.5.5.2.1 DCT Register Summary

[Table 8-1356](#) summarizes the DCT register mapping.

Table 8-1356. DCT Register Mapping Summary

| Register | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-M3 Private Access |
|-----------------------------|------|--------------------------|----------------|-------------------------------------|---|
| DCT_VERSION | R | 32 | 0x0000 0000 | 0x5202 0800 | 0x5506 0800 |
| DCT_CTRL | RW | 32 | 0x0000 0004 | 0x5202 0804 | 0x5506 0804 |
| DCT_CFG | RW | 32 | 0x0000 0008 | 0x5202 0808 | 0x5506 0808 |
| DCT_SPTR | RW | 32 | 0x0000 000C | 0x5202 080C | 0x5506 080C |
| DCT_FPTR | RW | 32 | 0x0000 0010 | 0x5202 0810 | 0x5506 0810 |

8.4.5.5.2.2 DCT Register Descriptions

through describe the registers in detail.

Table 8-1357. DCT_VERSION

| | | | |
|-------------------------|----------------------------|-----------------|-------------------------|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x5202 0800 0x5506 0800 | Instance | DCT_L3 DCT_CORTEX-M3 |
| Description | IP Revision | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP Revision | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 8-1358. Register Call Summary for Register DCT_VERSION

ISS Still Image Coprocessor

- [ISS SIMCOP DCT Register Manual: \[0\]](#)

Table 8-1359. DCT_CTRL

| | | | |
|-------------------------|----------------------------|-----------------|-------------------------|
| Address Offset | 0x0000 0004 | | |
| Physical Address | 0x5202 0804 0x5506 0804 | Instance | DCT_L3 DCT_CORTEX-M3 |
| Description | DCT control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BUSY | RESERVED | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Read returns 0. | R | 0x0000 |
| 15 | BUSY | IDCT/busy status 0: Idle 1: Busy | R | 0x0 |
| 14:1 | RESERVED | Read returns 0. | R | 0x0000 |
| 0 | EN | Write 1 when DCT_CFG[4] TRIG_SRC = 0 to start module operation. Read returns 0. | W | 0x0 |

Table 8-1360. Register Call Summary for Register DCT_CTRL

ISS Still Image Coprocessor

- [ISS SIMCOP DCT Functional Description: \[0\] \[1\]](#)
- [ISS SIMCOP DCT Basic Programming Model: \[2\] \[3\] \[4\] \[5\]](#)
- [ISS SIMCOP DCT Register Manual: \[6\]](#)

Table 8-1361. DCT_CFG

| | | | |
|-------------------------|----------------------------|-----------------|-------------------------|
| Address Offset | 0x0000 0008 | Instance | DCT_L3 DCT_CORTEX-M3 |
| Physical Address | 0x5202 0808 0x5506 0808 | | |
| Description | DCT configuration register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|----------|------------|----------|-------|-----|------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | NMCUS | | | | | | | | RESERVED | AUTOGATING | TRIG_SRC | INTEN | FMT | MODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | Read returns 0. | R | 0x00000 |
| 13:8 | NMCUS | Number of MCUs (for FMT = 0, 1) or blocks (for FMT = 2) 0 = 1 MCU or block 1 = 2 MCUs or blocks ... 63 = 64 MCUs or blocks | RW | 0x00 |
| 7:6 | RESERVED | Read returns 0. | R | 0x0 |
| 5 | AUTOGATING | Internal clock gating on interface and functional clocks 0: Clocks are free-running 1: Clocks are gated off in subblocks that are not required for operation. | RW | 0x0 |
| 4 | TRIG_SRC | Trigger source 0: Memory mapper register 1: Hardware start signal | RW | 0x0 |
| 3 | INTEN | 0: Interrupt disabled 1: Interrupt enabled | RW | 0x0 |
| 2:1 | FMT | Data format 0: YUV4:2:0 format 1: YUV4:2:2 format 2: Sequential blocks format 3: Reserved | RW | 0x0 |
| 0 | MODE | 0: DCT 1: IDCT | RW | 0x0 |

Table 8-1362. Register Call Summary for Register DCT_CFG

ISS Still Image Coprocessor

- [ISS SIMCOP DCT Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [ISS SIMCOP DCT Basic Programming Model: \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\]](#)
- [ISS SIMCOP DCT Register Manual: \[32\] \[33\]](#)

Table 8-1363. DCT_SPTR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 000C | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | DCT_L3 DCT_CORTEX-M3 | | | | | | | | | | | | | | | |
| Physical Address | 0x5202 080C 0x5506 080C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Spatial-domain data pointer, byte address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ADDR | | | | | | | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | Read returns 0. | R | 0x00000 |
| 12:5 | ADDR | Address in 256-bit words Intention is that software write a byte address into the register. Hardware ignores the lowest 5 bits and bits 12..5 specifies the 256-bit/word memory address.. | RW | 0x00 |
| 4:0 | RESERVED | Read returns 0. | R | 0x00 |

Table 8-1364. Register Call Summary for Register DCT_SPTR

ISS Still Image Coprocessor

- [ISS SIMCOP DCT Functional Description: \[0\] \[1\]](#)
- [ISS SIMCOP DCT Basic Programming Model: \[2\] \[3\] \[4\]](#)
- [ISS SIMCOP DCT Register Manual: \[5\]](#)

Table 8-1365. DCT_FPTR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0008 | | | | | | | | | | | | | | | | Instance | DCT_L3 DCT_CORTEX-M3 | | | | | | | | | | | | | | | |
| Physical Address | 0x5202 0810 0x5506 0810 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Frequency-domain data pointer, byte address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ADDR | | | | | | | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:14 | RESERVED | Read returns 0. | R | 0x00000 |
| 13:4 | ADDR | Address in 128-bit words. Intention is that software write a byte address into the register. Hardware ignores the lowest 4 bits and bits 13..4 specifies the 128-bit/word memory address. | RW | 0x000 |
| 3:0 | RESERVED | Read returns 0. | R | 0x0 |

Table 8-1366. Register Call Summary for Register DCT_FPTR

ISS Still Image Coprocessor

- [ISS SIMCOP DCT Functional Description: \[0\]](#)
- [ISS SIMCOP DCT Basic Programming Model: \[1\] \[2\] \[3\]](#)
- [ISS SIMCOP DCT Register Manual: \[4\]](#)

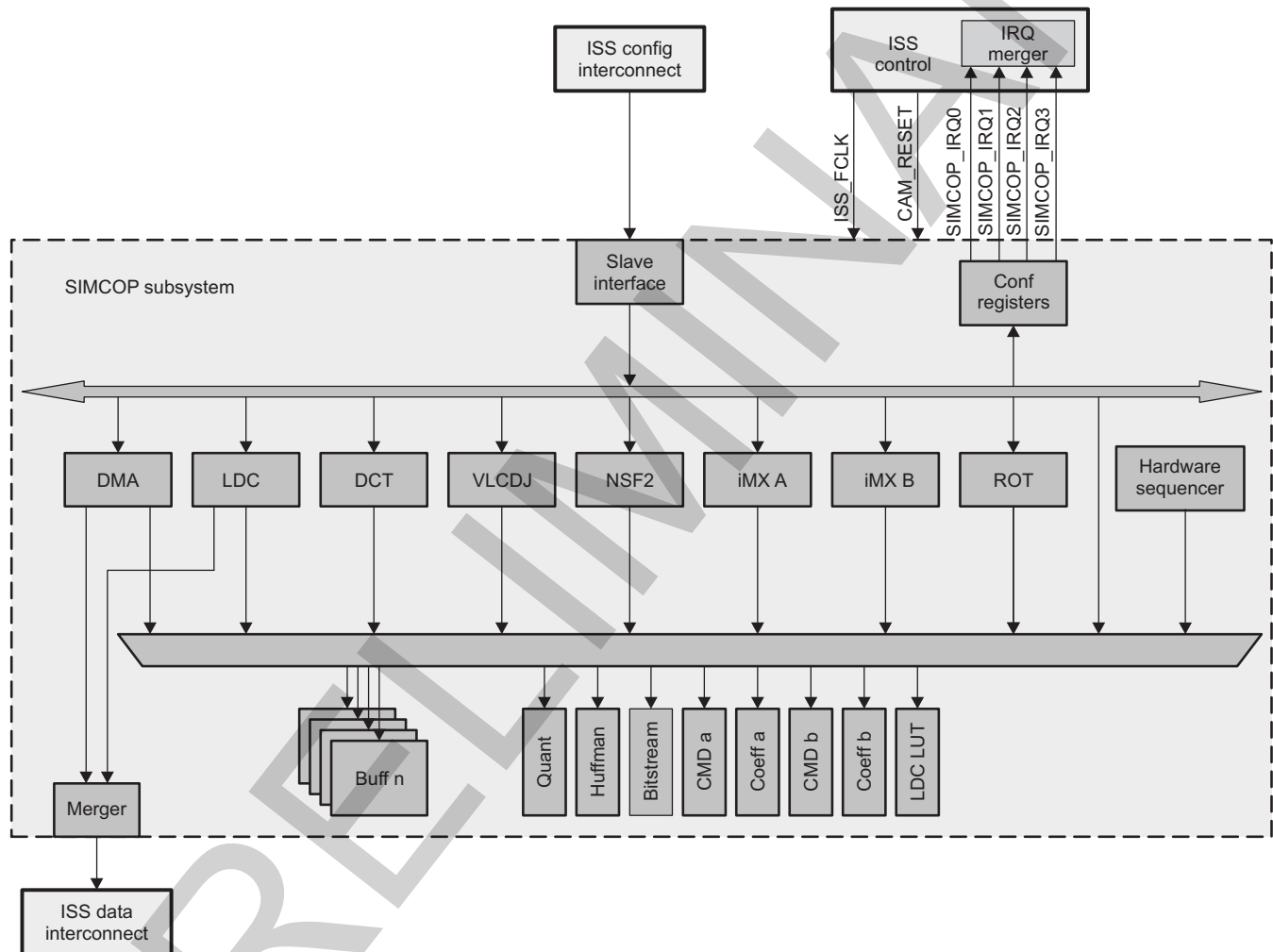
8.4.6 ISS SIMCOP Variable Length Coder/Decoder for JPEG Module

This section describes the variable-length coder/decoder for JPEG (VLCDJ) module in the still-image coprocessor (SIMCOP) subsystem.

8.4.6.1 ISS SIMCOP VLCDJ Overview

The VLCDJ module handles quantization (Q) and variable-length coding (VLC) in JPEG encoding, and variable-length decoding (VLD) and inverse quantization (IQ) in JPEG decoding. These operations are required for JPEG image compression and decompression. Figure 8-274 is an overview of the VLCDJ in the SIMCOP subsystem.

Figure 8-274. VLCDJ in the SIMCOP Subsystem



vldj-001

The VLCDJ supports the following operations:

- Q and VLC for JPEG encoding
- VLD and IQ for JPEG decoding
- Data formats:
 - YUV4:2:0 format in 16 × 16-pixel microcontroller unit (MCU)
 - YUV4:2:2 format in 16 × 8-pixel MCU
 - Sequential block mode to support arbitrary color component configuration within JPEG baseline sequential (software intervention required to context-switch among color components)
- Configurable for number of MCUs per initiation (up to 21 MCUs for YUV4:2:0, 32 MCUs for YUV4:2:2,

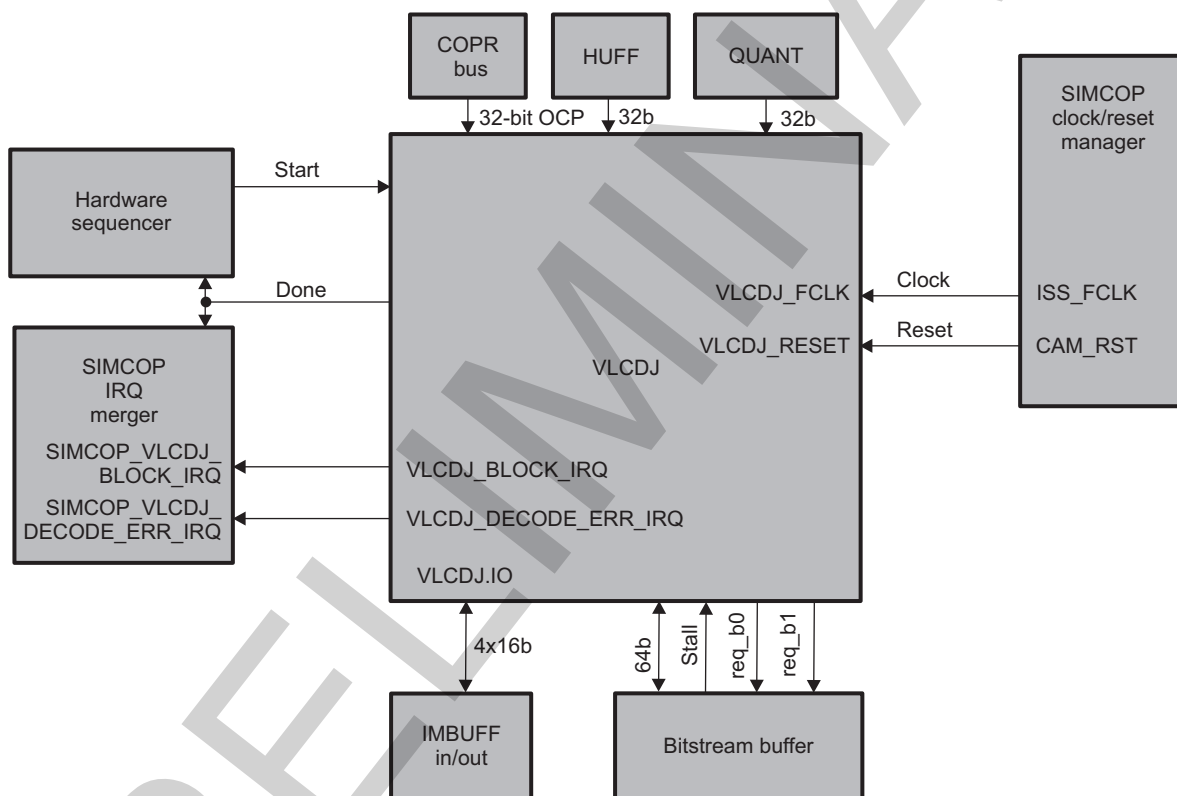
64 8×8 blocks for sequential block mode)

- Discrete cosine transform (DCT) coefficients are stored sequentially for each 8×8 block, 16 bits per data point
- Stall processing for interface with bitstream data overrun/underrun protection
- Insertion of restart markers during encoding (YUV4:2:0, YUV4:2:2, sequential block modes)
- Record of restart marker locations during encoding (YUV4:2:0, YUV4:2:2 only)
- Processing of restart markers on the MCU boundary during decoding, reset of direct coefficient (DC) predictors as required by the JPEG standard (YUV4:2:0, YUV4:2:2, sequential block modes)

8.4.6.2 ISS SIMCOP VLCDJ Integration

The VLCDJ is part of the SIMCOP subsystem in the imaging subsystem (ISS). Figure 8-275 shows the integration of the VLCDJ in the SIMCOP subsystem.

Figure 8-275. VLCDJ Engine Integration



simcop-013

Table 8-1367 through Table 8-1369 list the integration attributes, clocks and resets, and hardware requests, respectively, for the VLCDJ.

Table 8-1367. Integration Attributes

| Module Instance | Attributes |
|-----------------|--------------|
| | Power Domain |
| VLCDJ | PD_CAM |

Table 8-1368. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|-------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |

Table 8-1368. Clocks and Resets (continued)

| VLCDJ | VLCDJ_FCLK | ISS_FCLK | PRCM | Functional clock provided by ISS_CLK from the power, reset, and clock management (PRCM) module. It is used by all ISS submodules and ISS top-level resources. |
|-----------------|-------------------------|--------------------|--------|---|
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| VLCDJ | VLCDJ_RESET | CAM_RST | PRCM | ISS and SIMCOP global reset |

For information about clock and reset management, see [Section 8.4.1.2.1](#), *ISS SIMCOP Local Power and Clock Management*.

Table 8-1369. Hardware Requests

| Interrupt Requests | | | | |
|---------------------------|------------------------|-------------------------------|-------------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| VLCDJ | VLCDJ_BLOCK_IRQ | SIMCOP_VLCDJ_BLOCK_IRQ | SIMCOP IRQ merger | A macroblock has been processed. |
| VLCDJ | VLCDJ_DECODE_ERROR_IRQ | SIMCOP_VLCDJ_DECODE_ERROR_IRQ | SIMCOP IRQ merger | A decode error has been signaled by the VLCDJ. |

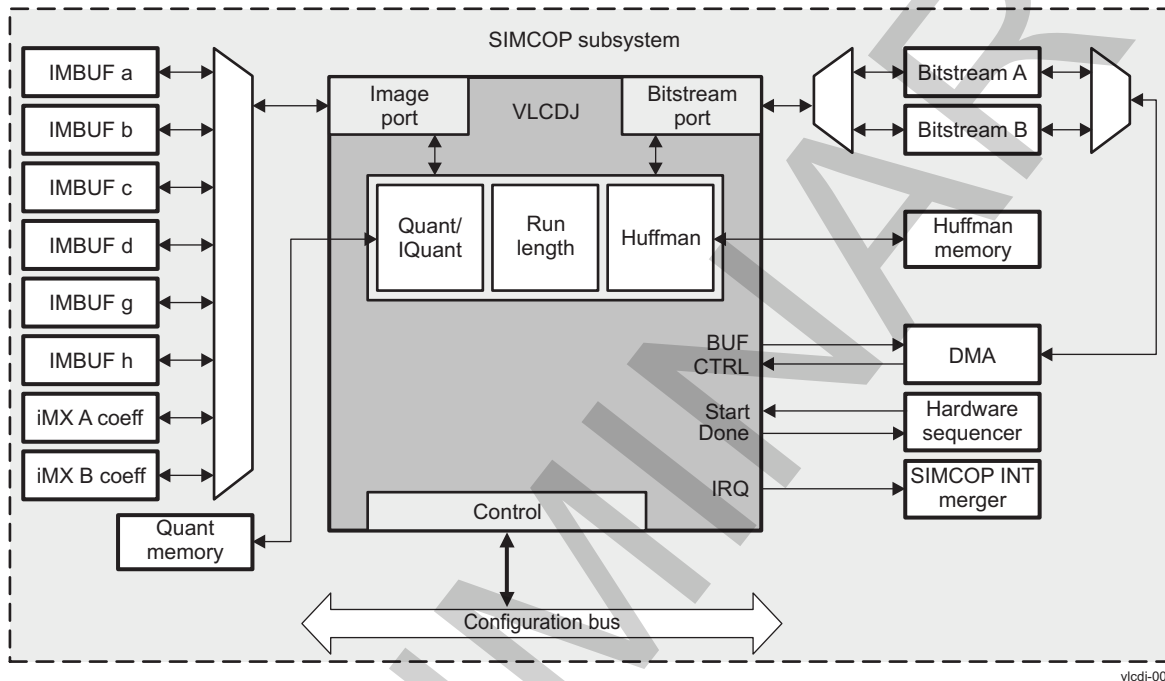
For more information about interrupt requests, see [Section 8.4.1.2.3](#), *Interrupt Merger*.

8.4.6.3 ISS SIMCOP VLCDJ Functional Description

8.4.6.3.1 ISS SIMCOP VLCDJ Block Diagram

The VLCDJ implements quantization, run-length encode, and Huffman encode stages of JPEG compression, and Huffman decode, run-length expansion, and dequantization stages of JPEG decompression. [Figure 8-276](#) is a block diagram of the VLCDJ with connected memories and modules.

Figure 8-276. VLCDJ Block Diagram



vldcj-003

8.4.6.3.2 ISS SIMCOP VLCDJ Power Management

The VLCDJ uses clock autogating to conserve power. When any substantial subblocks are not in use, the corresponding clock trees are gated off. [Table 8-1370](#) describes the power-management feature available for the VLCDJ.

Table 8-1370. Local Power-Management Feature

| Feature | Registers | Description |
|------------------|---|---|
| Clock autogating | VLCDJ_CTRL [3] AUTOGATING | Free-running or autogating modes are available. |

8.4.6.3.3 ISS SIMCOP VLCDJ Interrupt Requests

[Table 8-1371](#) lists the event flags and their masks that can cause module interrupts.

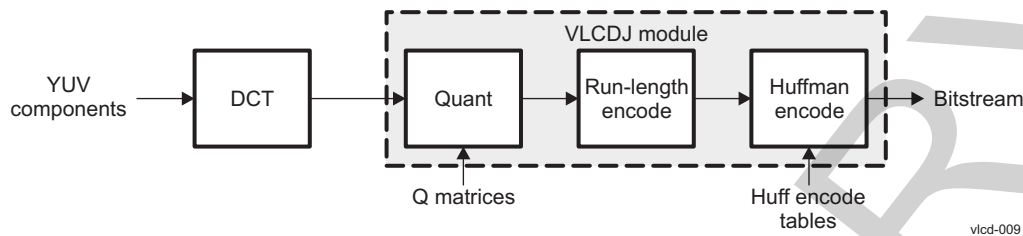
Table 8-1371. Events

| Event Flag | Event Mask | Map to | Description |
|------------|---|----------------------|-------------------------|
| N/A | VLCDJ_CTRL [4] INTEN_DONE | VLCDJ_BLOCK_IRQ | End of block processing |
| N/A | VLCDJ_CTRL [5] INTEN_ERR | VLCDJ_DECODE_ERR_IRQ | Error occurred |

8.4.6.3.4 ISS SIMCOP VLCDJ in JPEG Encoding Flow

Figure 8-277 shows the JPEG compression or encoding flow.

Figure 8-277. JPEG Encoding Flow



The DCT coefficients are quantized by dividing each data point with a quantizer. The quantizers form an 8×8 matrix for Luma Y, and another 8×8 matrix for U and V, and the matrices are fixed in each image. The quantizer matrices can vary between images, and are sometimes fine-tuned in a multiple-pass process to regulate the compressed JPEG file size.

For quantization, the VLCDJ reads a reciprocal of the quantizer values ($16 \text{ bits per entry carrying } 2^{15}/\text{quant}$) so that hardware performs multiplications rather than divisions. The result is rounded to the nearest integer.

After quantization, the DC terms (the first term in each 8×8 block of DCT coefficients) are differentially coded within each color. Thus, three predictors are used for the common formats.

Next, the coefficients are scanned in a zigzag order (the same order for all colors) to form DC term + zero-run and nonzero level pairs for the alternative coefficient (AC) terms. The run-level pairs are then coded with a Huffman table.

The DC level is first categorized into size groups, basically the number of bits that represents the absolute value of the level. This size is translated to a bit segment using the Huffman table. Then, additional bits are appended to represent the exact DC level.

For AC run-level pairs, the process is similar. Each AC level is first categorized into size groups, basically the number of bits that represents the absolute value of the level. The size and the run are combined and translated to a bit segment using the Huffman table. Then, additional bits are appended to represent the exact AC level.

The number of additional bits to encode after the Huffman-coded segment, for DC or AC level, equals the size value. For example, coefficient values -3 , -2 , and 3 are of size 2, because 2 bits are required to represent the absolute values 2 and 3. There are four coefficient values in the size -2 category, so 2 additional bits are required to uniquely identify each value.

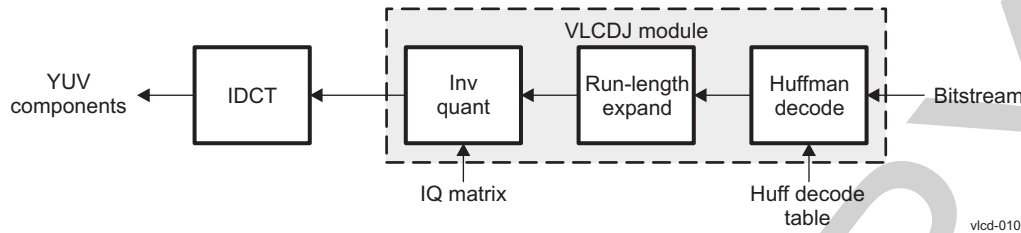
Some special symbols go with the AC run/size pairs. The ZRL symbol represents a run of 15 zeros, and is used to code unusually long zero runs. The EOB symbol represents end of block, meaning that there are only 0 AC coefficients at the end.

In the bitstream management level, after each byte of $0xFF$, a byte of 0 is inserted to prevent the decoder from detecting special markers in the bitstream.

Because the VLCDJ handles multiple MCUs and allows restart marker insertion in MCU boundaries inside a task, the inserted flags are flagged to prevent the insertion of a 0 byte after $0xFF$.

8.4.6.3.5 ISS SIMCOP VLCDJ in JPEG Decoding Flow

Decoding or decompression operates in the reverse order, as shown in Figure 8-278.

Figure 8-278. JPEG Decoding Flow

1. In decoding, in the MCU data section, when the VLCDJ recognizes the 0xFF byte in the bitstream, it detects whether the next byte is a 0 byte. If it is, the 0 byte is removed and decoding continues as if the 0 byte is not there (the 0xFF byte is kept). If the next byte is not a 0 byte, the VLCDJ flags this as a JPEG data error. This can be caused by an earlier bitstream error that causes the module to parse outside the MCU entropy data and into markers that are not supported by the module.
2. Because the VLCDJ decodes for multiple MCUs, restart markers can occur in MCU boundaries. Restart marker detection and processing work with the 0 byte removal logic to ensure that restart markers are detected and removed correctly. When the VLCDJ detects a restart marker, it resets the DC predictors in the IQ stage.
3. The VLCDJ looks up the Huffman table to convert a variable-length bit segment into a DC size or an AC run/size pair. The number of additional bits equal to the size is extracted and the DC/AC coefficient is reconstructed. Then, zero runs are expanded.
4. IQ is performed, which is simply multiplication of the coefficients with values in the quantizer matrices.

8.4.6.3.6 Memory Interfaces

The VLCDJ has four memory interfaces (all memories are inside the SIMCOP subsystem):

- Image buffer (input DCT coefficients for encoding and output DCT coefficients for decoding)
- Quantizer memory
- Huffman memory
- Bitstream memory (output for encoding and input for decoding)

8.4.6.3.6.1 Image Buffer

An image buffer stores DCT data in the context of the VLCDJ. This is an input in encode mode and an output in decode mode.

When multiple MCUs are configured, DCT coefficients for the MCUs are stored sequentially (MCU 0 is stored first, followed by MCU 1, and so on).

Blocks in an MCU are stored sequentially; that is, block 0 first, block 1 next, and so on. There are six blocks per MCU in YUV4:2:0 format, {Y0, Y1, Y2, Y3, U, V}, and four blocks per MCU in YUV4:2:2 format, {Y0, Y1, U, V}.

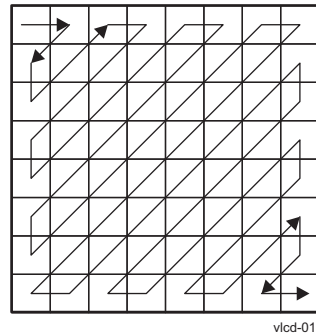
The 64 DCT coefficients for each block are stored in an 8×8 transposed format (the companion DCT module handles the transposed format). Each coefficient, up to $[-2047, 2047]$ in range is stored on a 16-bit word. [Table 8-1372](#) lists the data format in each 8×8 block of coefficients.

Table 8-1372. Image Buffer Block Format

| Byte Offset | | | | | | | | |
|-------------|---|---------|---|---------|---|-----|---------|----|
| 0 | 1 | 2 | 3 | 4 | 5 | ... | 14 | 15 |
| c(0, 0) | | c(0, 1) | | c(0, 2) | | ... | c(0, 7) | |
| c(1, 0) | | c(1, 1) | | c(1, 2) | | ... | c(1, 7) | |
| c(2, 0) | | c(2, 1) | | c(2, 2) | | ... | c(2, 7) | |
| : | | | | | | | | |
| c(7, 0) | | c(7, 1) | | c(7, 2) | | ... | c(7, 7) | |

The DCT coefficients are processed in zigzag order (see [Figure 8-279](#)), as required by JPEG.

Figure 8-279. JPEG Zigzag Order



8.4.6.3.6.2 Quantizer Memory

The quantization memory stores the reciprocal of quantizers, $2^{15}/\text{qmat}[i][j]$ so that hardware performs multiplications rather than divisions. Each data point is stored in 16 bits.

The quantizer matrices have a fixed size, 64 16-bit elements each. The quantizer memory (QMEM) is sized to hold up to four matrices ([Table 8-1373](#) lists the recommended allocation for YUV4:2:0 and YUV4:2:2).

Table 8-1373. Recommended QMEM Allocation for YUV4:2:0 and YUV4:2:2

| Quadrant of QMEM | Address Offset (Bytes) | Contents |
|------------------|------------------------|---|
| 00 | 0x000 | (Encode) Quantizer reciprocal for Y ($2^{15}/\text{qmat}[i][j]$) |
| 01 | 0x080 | (Encode) Quantizer reciprocal for UV ($2^{15}/\text{qmat}[i][j]$) |
| 10 | 0x100 | (Decode) Quantizer for Y ($\text{qmat}[i][j]$) |
| 11 | 0x180 | (Decode) Quantizer for UV ($\text{qmat}[i][j]$) |

Each matrix is stored in zigzag order to make quantization and inverse quantization more efficient.

8.4.6.3.6.3 Huffman Memory

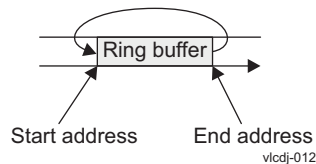
Huffman memories store Huffman encode tables and Huffman control/decode tables. For information about Huffman tables, see [Section 8.4.6.3.7, Huffman Table Organization](#).

8.4.6.3.6.4 Bitstream Memory

Bitstream memory is for input/output (I/O) bitstream. Bitstream data is stored in little-endian format in the memory. Circular buffer (CBUFF) start and end addresses are provided in registers to facilitate bitstream data management:

- [VLCDJE_CBUF\[11:10\]](#) START, start of ring buffer for encode mode (address must be 1KB-aligned)
- [VLCDJE_CBUF\[27:26\]](#) END, end of ring buffer for encode mode (address must be 1KB-aligned)
- [VLCDJD_CBUF\[11:10\]](#) START, start of ring buffer for decode mode (address must be 1KB-aligned)
- [VLCDJD_CBUF\[27:26\]](#) END, end of ring buffer for decode mode (address must be 1KB-aligned)

[Figure 8-280](#) shows the start and end addresses of a ring buffer.

Figure 8-280. VLCDJ Ring Buffer

In encoding and decoding, a bit-level boundary defines bitstream data written (for encoding) or parsed (for decoding). To point to that boundary, bit and byte pointers are provided in the registers:

- [VLCDJE_BSPTR](#)[19:16] BITPTR (encoding)
- [VLCDJE_BSPTR](#)[11:0] BYTEPTR (encoding)
- [VLCDJD_BSPTR](#)[19:16] BITPTR (decoding)
- [VLCDJD_BSPTR](#)[11:0] BYTEPTR (decoding)

BYTEPTR (byte pointer) points to the byte where the boundary lies, and BITPTR (bit pointer) specifies the number of available vacant data bits (for encoding) or remaining data bits (for decoding). BITPTR is always in the range of 1 to 8, where 8 indicates that an entire byte is available for writing or reading.

For example, for encoding, if BYTEPTR = 0 and BITPTR = 8, after the hardware encodes a specified number of MCUs that together generate 30 bits, or 3 full bytes and 6 bits, BYTEPTR = 3 and BITPTR = 2. The JPEG standard requires that at the end of MCU data, any remaining bits of the last byte are padded with 1s. For example, if the last byte has 4 bits written 0101, the last byte of MCU data in the JPEG data is 0x5F.

8.4.6.3.7 Huffman Table Organization

8.4.6.3.7.1 Huffman Table for Encode Mode

Because the Huffman encode tables are compact, they are fixed relative to a common pointer:

- The Luma DC table starts at [VLCDJE_VLCTBL](#)[11:2] ADDR (12 entries \times 4 = 48 bytes)
- The Luma AC table starts at [VLCDJE_VLCTBL](#)[11:2] ADDR + 48 bytes (11 \times 16 \times 4 = 704 bytes)
- The Chroma DC table starts at [VLCDJE_VLCTBL](#)[11:2] ADDR + 752 bytes (12 entries \times 4 = 48 bytes)
- The Chroma AC table starts at [VLCDJE_VLCTBL](#)[11:2] ADDR + 800 bytes (11 \times 16 \times 4 = 704 bytes)

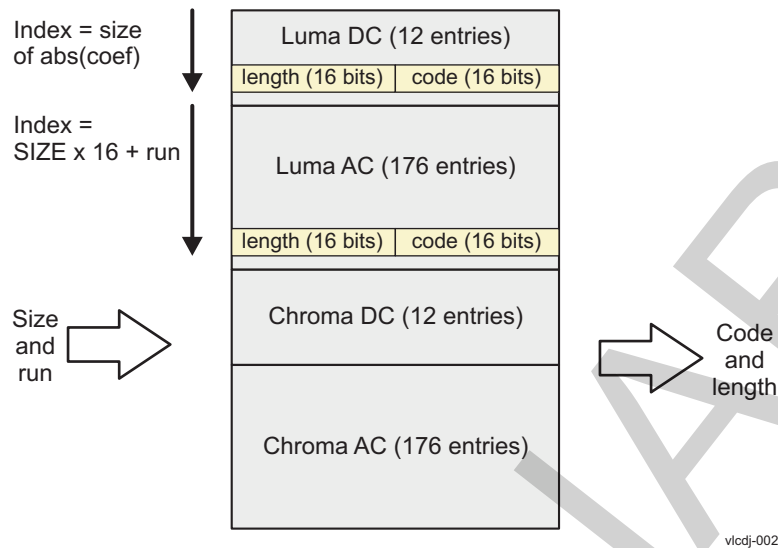
For DC tables, the index of each table corresponds to the size of the absolute value of the DC coefficient.

For AC tables, the index of each table corresponds to a formula including the size (of absolute value of nonzero AC coefficients) and the zero run: Index = SIZE \times 16 + run. Because the size cannot be 0, the first 16 entries hold special symbols. EOB is at entry 0, and ZRL is at entry 15.

The size of a nonnegative value is the number of bits required to represent the value (for example, a size of 4..7 = 3).

[Figure 8-281](#) shows the organization of the Huffman encode table.

Figure 8-281. Huffman Encode Table Organization



8.4.6.3.8 Restart Marker

8.4.6.3.8.1 Restart Marker Insertion for Encode

As specified in the JPEG standard, the VLCDJ can insert a restart marker at a specified MCU interval (for information about restart markers, see [Section 8.4.6.3.5, ISS SIMCOP VLDCJ in JPEG Decoding Flow](#)). Any remaining bits in the last partial byte are padded with 1s.

When enabled, the VLCDJ inserts a restart marker at the end of a group of MCUs. A partial byte is automatically padded with 1s.

8.4.6.3.8.2 Restart Marker Location Recording

To facilitate reordering of compressed JPEG data sections to achieve JPEG rotation, the VLCDJ also records the restart marker locations.

8.4.6.3.8.3 Restart Marker Handling for Decoding

Restart markers are handled automatically during MCU data decoding according to the JPEG standard. The DC predictors are reset at the MCU boundary where restart markers are present.

Because the handling of restart markers is complex, there is no check of the consistency of restart marker value or existence/nonexistence with the restart interval (which is not part of the decoder register setting). Correct JPEG files are decoded correctly. Incorrect JPEG files can escape error detection.

To decode correctly, in spite of the presence of restart markers, software must configure the VLCDJ with the correct byte pointer for the VLCDJ. To reset DC predictors to occur before an MCU, the byte pointer must point to the restart marker before the MCU data in the bitstream data. In other words, the VLCDJ does not search for the correct marker and resume MCU decoding after the marker. The VLCDJ detects the presence of the marker only at the MCU boundaries.

8.4.6.3.9 Encode/Decode Context Switching

The bitstream memory is organized as two banks of memory. When the VLCDJ performs only encoding or only decoding, the two banks are used to achieve VLCDJ and DMA concurrence, and automatic bitstream data DMA is supported.

When the VLCDJ performs one encode and one decode concurrently, both contexts can coexist in the configuration registers, because encode and decode configurations are in separate registers. The bitstream memory must be partitioned half-and-half between encode and decode. For example:

- [VLCDJE_CBUF](#)[11:10] START = 0x0
- [VLCDJE_CBUF](#)[27:26] END = 0x7FF
- [VLCDJD_CBUF](#)[11:10] START = 0x800
- [VLCDJD_CBUF](#)[27:26] END = 0xFFF

The byte pointers and the bitstream data DMA must be set up accordingly.

When the VLCDJ is encoding, the decode half of bitstream memory can be refilled by DMA. When the VLCDJ is decoding, the encode half of bitstream memory can be transferred out by DMA. Hardware does not support automatic triggering of DMA; software must submit DMA based on the byte pointer value of each context. For good SDRAM efficiency, the DMA block must be aligned correctly.

8.4.6.3.10 Using Sequential Block Mode for YUV4:4:4 Encoding/Decoding

In sequential block mode, because it deals with only one color component, the VLCDJ does the following:

- Uses DCPREDY for the DC predictor
- Uses the first quantizer matrix pointed by QM/QMR
- Starts from the first block pointed to by DCT
- Uses the first VLC/VLD table

Thus, to encode/decode YUV4:4:4 format using sequential block mode, software must switch context among Y, U, and V between initiations of the VLCDJ. Memory organization and registers are designed so that QM/QMR, DCT, and VLC/VLD tables can be swapped by changing the corresponding pointers in the registers. The DC predictor must be saved and restored.

For more information, see [Section 8.4.6.4.6, Example of YUV4:4:4 Encoding](#).

8.4.6.3.11 Error Reporting

The VLCDJ can report the following decode errors:

- Invalid Huffman code
- Block exceeding 64 coefficients

NOTE: Decoding of an 0xFF byte followed by a nonzero byte is not reported as an error (for more information, see [Section 8.4.6.3.5, ISS SIMCOP VLCDJ in JPEG Decoding Flow](#)).

When there is a decode error, VLCDJ operation is suspended immediately. Bit and byte pointers to the bitstream near where the error occurs are reflected in the [VLCDJD_BSPTTR](#)[19:16] BITPTR and [VLCDJD_BSPTTR](#)[11:0] BYTEPTR bit fields. The DCT coefficient index, in zigzag order of the task, near where the error occurs, is also reflected in a read-only bit field, [VLCDJD_DCTERR](#)[13:0] ERRPTR. For example, if decoding fails at the fifth coefficient of the third block of the VLCDJ task (which can be multiple MCUs), ERRPTR returns $2 \times 64 + 4 = 195$.

The IQ stage of the hardware does not stop and runs to completion. When there is a decode error, the DC predictor and decoded DCT coefficient outcomes are indeterminate.

Because the VLCDJ does not start in the middle of an MCU, software must recover from the error and configure the VLCDJ from an MCU boundary.

8.4.6.4 ISS SIMCOP VLCDJ Basic Programming Model

8.4.6.4.1 Initialization of Surrounding Modules

To initialize the VLCDJ, surrounding modules must be initialized. [Table 8-1374](#) lists these modules.

Table 8-1374. Initialization of Surrounding Modules

| Module | Minimum Required Setting | Optional Settings |
|-------------|---|---|
| CLKC | Enable the SIMCOP clock. | |
| Buffers | Configure VLCDJ access to the image buffer. | |
| SIMCOP CTRL | | Configure SIMCOP CTRL to handle VLCDJ interrupts. |

8.4.6.4.2 ISS SIMCOP VLCDJ Start and Register Modification During Processing

The module operation can be started with two mechanisms, depending on the status of the [VLCDJ_CTRL\[2\]](#) TRIG_SRC bit.

When the [VLCDJ_CTRL\[2\]](#) TRIG_SRC bit is set to 0 and the module is idle (the [VLCDJ_CTRL\[16\]](#) BUSY bit is set to 0), the module is started by setting the [VLCDJ_CTRL\[0\]](#) EN bit to 1. Any hardware start pulses are ignored. To simplify software control, in the same register write, changing the [VLCDJ_CTRL\[2\]](#) TRIG_SRC bit from 1 to 0 and setting the [VLCDJ_CTRL\[0\]](#) EN bit to 1 is recognized as a valid starting condition.

When the [VLCDJ_CTRL\[2\]](#) TRIG_SRC bit is set to 1 and the module is idle (the [VLCDJ_CTRL\[16\]](#) BUSY bit is set to 0), the module is started by the START signal going active. Any software write to the [VLCDJ_CTRL\[0\]](#) EN bit is ignored.

During encoding, encode configuration registers must not be modified by software, whereas decode configuration registers can be freely modified.

During decoding, decode configuration registers must not be modified by software, whereas encode configuration registers can be freely modified.

8.4.6.4.3 JPEG Encoding

For JPEG encoding of a YUV4:2:0 image consisting of eight MCUs per task, software first composes the JPEG header, which includes image dimension, YUV4:2:0 format, Huffman tables, quantizer matrices, and the start-of-scan marker and scan header, all before the MCU data. Software then sets up the encoding task, once per image, with the procedure listed in [Table 8-1375](#).

Table 8-1375. JPEG Encoding Procedure

| Step | Register/Bit Field | Value |
|--|--|---|
| Configure the encode configuration register. | VLCDJE_CFG[1:0] FMT | 0 (YUV4:2:0 mode) |
| | VLCDJE_CFG[13:8] NMCUS | 7 (eight MCUs) |
| | VLCDJE_CFG[2] RSTEN | 0 (no restart marker) |
| Configure the DC predictor. | VLCDJE_DCPREDY[11:0] PREDY | 0 (reset DC predictor for Y) |
| | VLCDJE_DCPREDUV[11:0] PREDU | 0 (reset DC predictors for U) |
| | VLCDJE_DCPREDUV[27:16] PREDV | 0 (reset DC predictors for V) |
| Configure the input and output memories. | VLCDJE_BSPTTR[11:0] BYTEPTR | 0 (beginning of bitstream memory) |
| | VLCDJE_BSPTTR[19:16] BITPTR | 8 (initially empty byte, thus 8 free bits) |
| | VLCDJE_CBUF[11:10] START | 0 (bitstream starts from beginning of first quadrant of bitstream memory) |
| | VLCDJE_CBUF[27:26] END | 3 (bitstream ends at end of fourth quadrant of bitstream memory) |
| | VLCDJE_DCTQM[13:4] DCT | 0 (DCT coefficients at beginning of image buffer) |

Table 8-1375. JPEG Encoding Procedure (continued)

| Step | Register/Bit Field | Value |
|---|---|--|
| Configure Huffman and quantizer memory pointers. | VLCDJE_DCTQM [24:23] QMR | 0 (quantizer matrix reciprocal at beginning of QMEM) |
| | VLCDJE_VLCTBL [11:2] ADDR | 0 (VLC table at beginning of HUFMEM) |
| Start encode with automatic ring buffer management. | VLCDJ_CTRL [1] MODE | 0 (encode mode) |
| | VLCDJ_CTRL [0] EN | 1 (start VLCDJ operation) |

For each group of eight MCUs (the VLCDJ does not care if these MCUs cross multiple MCU rows), software sets the [VLCDJ_CTRL](#)[0] EN bit to 1 (restart VLCDJ operation).

Alternately, the hardware sequencer can start the VLCDJ. Usually, DMA is also configured to bring in YUV4:2:0 image data as input to DCT, and DMA, DCT, and VLCDJ are all put under control of the hardware sequencer.

Bitstream data is managed automatically between the VLCDJ and DMA throughout JPEG encoding of MCUs.

NOTE: Many registers change during the encoding of a frame, but software is not required to access these registers, because the VLCDJ manages the status information between tasks.

The last hardware task may require a smaller number of MCUs (the [VLCDJE_CFG](#)[13:8] NMCUS bit field) to adjust for the number of MCUs in the last group.

After the last VLCDJ task for the image, software must disable the automatic bitstream buffer management and prepare for the next image by setting the following values (these can be issued as a single write):

- [VLCDJ_CTRL](#)[6] RBEN = 0 (disable automatic DMA interaction)
- [VLCDJ_CTRL](#)[7] CLRRB = 1

Finally, software must pad the last data byte with bit 1s, then place an end-of-image marker after the last data byte. The [VLCDJE_BSPTR](#)[11:0] BYTEPTR and [VLCDJE_BSPTR](#)[19:16] BITPTR bit fields indicate the locations of the last data byte and bit, respectively. Software must then set up DMA to transfer out the remaining data in bitstream memory.

The number of MCUs processed by hardware per task must be set according to image buffer allocation. For example, with 8KB available for DCT coefficient memory, and YUV4:2:0 format, it is possible to process $8K/(16 \times 16 \times 1.5 \times 2) = 10$ MCUs. Because the bitstream DMA is automatic, bitstream data does not overflow bitstream memory for this many MCUs in densely coded JPEG.

8.4.6.4.4 JPEG Decoding

For JPEG decoding of an image, software first parses the JPEG header, which includes image dimension, YUV sampling, Huffman tables, quantizer matrices, and start-of-scan marker and scan header, before the MCU data. Software then sets up DMA to load bitstream data into the first half of bitstream memory.

The Huffman tables must be processed to generate hardware control tables and decode tables for a particular JPEG file, unless the Huffman tables match previously processed tables for which the hardware control and decode tables are known. The hardware control and decode tables must be transferred to HUFMEM.

If the JPEG file is YUV4:2:0, and image buffer memory is sufficient to process eight MCUs per hardware task, software must set up the decode task, once per image, with the procedure listed in [Table 8-1376](#).

Table 8-1376. JPEG Decoding Procedure

| Step | Register/Bit Field | Value |
|--|--------------------------------------|-------------------|
| Configure the decode configuration register. | VLCDJD_CFG [1:0] FMT | 0 (YUV4:2:0 mode) |

Table 8-1376. JPEG Decoding Procedure (continued)

| Step | Register/Bit Field | Value |
|---|---|--|
| Configure the DC predictor. | VLCDJD_CFG [13:8] NMCUS | 7 (eight MCUs) |
| | VLCDJD_CFG [2] RSTEN | 0 (no restart marker) |
| | VLCDJD_DCPREDY [11:0] PREDY | 0 (reset DC predictor for Y) |
| | VLCDJD_DCPREDUV [11:0] PREDU | 0 (reset DC predictors for U) |
| Configure the input and output memories. | VLCDJD_DCPREDUV [27:16] PREDV | 0 (reset DC predictors for V) |
| | VLCDJD_BSPTR [11:0] BYTEPTR | 0 (beginning of bitstream memory) |
| | VLCDJD_BSPTR [19:16] BITPTR | 8 (initially empty byte, thus 8 free bits) |
| | VLCDJD_CBUF [11:10] START | 0 (bitstream starts from beginning of first quadrant of bitstream memory) |
| | VLCDJD_CBUF [27:26] END | 3 (bitstream ends at end of fourth quadrant of bitstream memory) |
| | VLCDJD_DCTQM [13:4] DCT | 0 (DCT coefficients at the beginning of the image buffer) |
| | VLCDJD_DCTQM [24:23] QMR | 0 (quantizer matrix at beginning of QMEM) |
| Configure Huffman and quantizer memory pointers. | VLCDJD_CTRLTBL [11:2] ADDR | 0 (typically, control table is placed at the beginning of HUFMEM) |
| | VLCDJD_DCDTBL0 [11:2] TBL0 | 30 (typically, the first decode table follows the control table, 60 shorts = 120 bytes = 30 words) |
| | VLCDJD_DCDTBL0 [27:18] TBL1 | ? (where the second decode table starts) |
| | VLCDJD_DCDTBL23 [11:2] TBL2 | ? (where the third decode table starts) |
| | VLCDJD_DCDTBL23 [27:18] TBL3 | ? (where the fourth decode table starts) |
| Start decode with automatic ring buffer management. | VLCDJ_CTRL [1] MODE | 1 (decode mode) |
| | VLCDJ_CTRL [0] EN | 1 (start VLCDJ operation) |

For each group of eight MCUs (the VLCDJ does not care if these MCUs cross multiple MCU rows), software sets the [VLCDJ_CTRL](#)[0] EN bit to 1 (restart VLCDJ operation).

Alternately, the hardware sequencer can start the VLCDJ, as well as control buffer switches and coordinate among the VLCDJ, DCT, and DMA.

Bitstream data is managed automatically between the VLCDJ and DMA throughout JPEG encoding of MCUs.

NOTE: Many registers change during the decoding of a frame, but software is not required to access these registers, because the VLCDJ manages the status information between tasks.

The last hardware task may require a smaller number of MCUs (the [VLCDJD_CFG](#)[13:8] NMCUS bit field) to adjust for the number of MCUs in the last group.

After the last VLCDJ task for the image, software must disable the automatic bitstream buffer management and prepare for the next image by setting the following values (these can be issued as a single write):

- [VLCDJ_CTRL](#)[6] RBEN = 0 (disable automatic DMA interaction)
- [VLCDJ_CTRL](#)[7] CLRRB = 1

Before the VLCDJ processes the next image decode, new bitstream data must be brought in, thereby overwriting the old data, and bit/byte pointers must be reset to the beginning of bitstream memory. As a result, any remaining bitstream data in bitstream memory afterward is harmless.

The number of MCUs processed by hardware per task must be set according to image buffer allocation. For example, with 16KB available for DCT coefficient memory, and YUV4:2:0 format, it is possible to process $16K/(16 \times 16 \times 1.5 \times 2) = 21$ MCUs. Because the bitstream DMA is automatic, there is no bitstream data underrun for this many MCUs.

8.4.6.4.5 Concurrent JPEG Encoding and Decoding

For concurrent decoding and encoding, the two operations are configured separately but similarly.

Half of bitstream memory is used for encoding (for example, the first half), and the rest is used for decoding. Automatic bitstream DMA does not work in this case, so the number of MCUs must accommodate the worst-case bitstream size per MCU.

Theoretically, the worst case is 16 bits of Huffman code plus 12 additional bits per coefficient, or 28 bits per coefficient. With natural images, there are typically about 8 bits per pixel when quantizers are minimal (that is, all 1s). With 16 bits per coefficient, or 768 bytes per MCU in YUV4:2:0 (this is 24 bits per pixel and three times the typical worst case), half of bitstream memory is 2KB, which can safely hold two MCUs.

In this case, half of QMEM is used for encoding and half is used for decoding. Encode and decode Huffman tables are placed so that they coexist in HUFFMEM.

The Huffman tables for encoding, decoding, and quantizer matrices must be placed accordingly in HUFFMEM and QMEM. Bitstream data is filled at the second half of bitstream memory for decoding.

Register fields are configured as listed in [Table 8-1377](#).

Table 8-1377. Concurrent JPEG Encoding and Decoding

| Step | Register/Bit Field | Value |
|---|--|---|
| Configure the encode register. | VLCDJE_CFG [1:0] FMT | 0 (YUV4:2:0 mode) |
| | VLCDJE_CFG [13:8] NMCUS | 1 (two MCUs) |
| | VLCDJD_CFG [2] RSTEN | 0 (no restart marker) |
| | VLCDJE_DCPREDY [11:0] PREDY | 0 (reset DC predictor for Y) |
| | VLCDJE_DCPREDU [11:0] PREDU | 0 (reset DC predictors for U) |
| | VLCDJE_DCPREDV [27:16] PREDV | 0 (reset DC predictors for V) |
| | VLCDJE_BSPTR [19:16] BITPTR | 8 (initially empty byte, thus 8 free bits) |
| | VLCDJE_DCTQM [13:4] DCT | 0 (DCT coefficients at beginning of image buffer) |
| Configure the decode register. | VLCDJD_CFG [1:0] FMT | 0 (YUV4:2:0 mode) |
| | VLCDJD_CFG [13:8] NMCUS | 1 (two MCUs) |
| | VLCDJD_CFG [2] RSTEN | 0 (no restart marker) |
| | VLCDJD_DCPREDY [11:0] PREDY | 0 (reset DC predictor for Y) |
| | VLCDJD_DCPREDU [11:0] PREDU | 0 (reset DC predictors for U) |
| | VLCDJD_DCPREDV [27:16] PREDV | 0 (reset DC predictors for V) |
| | VLCDJD_BSPTR [19:16] BITPTR | 8 (initially empty byte, thus 8 free bits) |
| | VLCDJD_DCTQM [13:4] DCT | 0 (DCT coefficients at the beginning of the image buffer) |
| Configure the byte pointer to bitstream memory. | VLCDJE_BSPTR [11:0] BYTEPTR | 0 (beginning of bitstream memory) |
| | VLCDJD_BSPTR [11:0] BYTEPTR | 0x800 (beginning of bitstream memory second half) |
| Configure the bitstream memory partition. | VLCDJE_CBUF [11:10] START | 0 (bitstream starts at beginning of first quadrant of bitstream memory) |
| | VLCDJE_CBUF [27:26] END | 1 (bitstream ends at end of second quadrant of bitstream memory) |
| | VLCDJD_CBUF [11:10] START | 2 (bitstream starts at beginning of third quadrant of bitstream memory) |
| | VLCDJD_CBUF [27:26] END | 3 (bitstream ends at end of fourth quadrant of bitstream memory) |

Table 8-1377. Concurrent JPEG Encoding and Decoding (continued)

| Step | Register/Bit Field | Value |
|---|---|---|
| Configure the quantizer matrix pointer. | VLCDJE_DCTQM [24:23] QMR | 0 (quantizer matrix at beginning of QMEM) |
| | VLCDJD_DCTQM [24:23] QMR | 2 (quantizer matrix at second half of QMEM) |
| Configure Huffman tables. | VLCDJE_VLCTBL [11:2] ADDR | 0 (VLC table at beginning of HUFMEM) |
| | VLCDJD_CTRLTBL [11:2] ADDR | 376 (after VLC table, $2 \times (24 + 352)$ shorts = 376 words) |
| | VLCDJD_DCDTBL0 [11:2] TBL0 | 406 (after control table of 30 words) |
| | VLCDJD_DCDTBL0 [27:18] TBL1 | ? (where the second decode table starts) |
| | VLCDJD_DCDTBL2 [11:2] TBL2 | ? (where the third decode table starts) |
| | VLCDJD_DCDTBL2 [27:18] TBL3 | ? (where the fourth decode table starts) |

Software sets the following values to start encoding:

- [VLCDJ_CTRL](#)[1] MODE = 0 (encode mode)
- [VLCDJ_CTRL](#)[0] EN = 1 (start VLCDJ operation)

When the VLCDJ completion interrupt is detected by software, encoding is complete and software must service the encoded bitstream data in the first half of bitstream memory, letting hardware access the second half of the bitstream for decoding. Software sets up bitstream writes to transfer the encoded bitstream from bitstream memory[0] to bitstream memory[$128 \times (\text{VLCDJE_BSPTR}[11:0] \text{ BYTEPTR}/128)$] (rounding down to 128-byte alignment improves SDRAM efficiency). Software must identify the bitstream data already transferred out, for the next round of servicing encoded bitstream data. Software must also service to-encode input data to the DCT.

After kicking off encode DMAs, without waiting for DMA completion, software must set the following values to start VLCDJ decoding in parallel with the DMA:

- [VLCDJ_CTRL](#)[1] MODE = 1 (decode mode)
- [VLCDJ_CTRL](#)[0] EN = 1 (start VLCDJ operation)

When the VLCDJ completion interrupt is detected by software, decoding is complete and software must service the decoded bitstream data in the second half of bitstream memory, letting hardware access the first half of the bitstream for encoding. Software sets up bitstream writes to transfer the bitstream to be decoded from bitstream memory[0] to bitstream memory[$128 \times (\text{VLCDJD_BSPTR}[11:0] \text{ BYTEPTR}/128)$] (rounding down to 128-byte alignment improves SDRAM efficiency). Software must identify the bitstream data already transferred in, for the next round of servicing bitstream data to be decoded. Software must also service decoded image data in the output image buffer of the DCT.

After kicking off decode DMAs, without waiting for DMA completion, software must start VLCDJ encoding in parallel with the DMA.

Software must continue to alternate between encoding and decoding until the image completes.

[Figure 8-282](#) shows the concurrence schedule for JPEG encoding and decoding.

Figure 8-282. Concurrence Schedule for JPEG Encoding and Decoding

| | | | | | | | | | | | | |
|---------|------|------|------|------|------|------|------|------|------|------|------|--|
| DMA in | E[0] | | E[1] | | E[2] | | E[3] | | | | | |
| | | | D[0] | | D[1] | | D[2] | | D[3] | | | |
| DCT | | E[0] | | E[1] | D[0] | E[2] | D[1] | E[3] | D[2] | | D[3] | |
| VLCDJ | | | E[0] | D[0] | E[1] | D[1] | E[2] | D[2] | E[3] | D[3] | | |
| DMA out | | | | E[0] | | E[1] | | E[2] | | E[3] | | |
| | | | | | D[0] | | D[1] | | D[2] | | D[3] | |

vldj-007

Management of bitstream I/O and image I/O is heavy in intervals of only two MCUs. It is better to run only encoding for many MCUs, switch context, and then run decoding for many MCUs.

When running JPEG transcoding, decoding a picture and re-encoding it, to adjust quantizers and/or remove/insert restart markers, it can be more efficient to run encode and decode concurrently in VLCDJ, skipping DCT and image I/O DMA altogether. In this case, software handles only bitstream data I/O, which is more manageable.

Figure 8-283 shows the concurrence schedule for JPEG transcoding.

Figure 8-283. Concurrence Schedule for JPEG Transcoding

| | | | | | | | | | | |
|---------|------|------|------|------|------|------|------|------|------|------|
| DMA in | D[0] | | D[1] | | D[2] | | D[3] | | | |
| VLCDJ | | D[0] | E[0] | D[1] | E[1] | D[2] | E[2] | D[3] | E[3] | |
| DMA out | | | | E[0] | | E[1] | | E[2] | | E[3] |

vldj-008

8.4.6.4.5.1 DMA and Buffer Manual Management

When the VLCDJ performs one encode and one decode concurrently, both contexts can coexist in the configuration registers, because encode and decode configurations are in separate registers. The bitstream memory must be partitioned half-and-half between encode and decode:

- `VLCDJE_CBUF[11:10] START = 0 (0x0)`
- `VLCDJE_CBUF[27:26] END = 1 (0x7FF)`
- `VLCDJD_CBUF[11:10] START = 2 (0x800)`
- `VLCDJD_CBUF[27:26] END = 3 (0xFFF)`

The byte pointers and the bitstream data DMA must be set up accordingly.

When the VLCDJ is encoding, the decode half of the bitstream memory can be refilled by DMA. When the VLCDJ is decoding, the encode half of the bitstream memory can be transferred out by DMA. Hardware does not support automatic triggering of DMA; software must submit DMA based on the byte pointer value of each context. For greater SDRAM efficiency, the DMA block must be aligned correctly. For example, the pseudocode that sets up the DMA for an encode task may appear as:

```
new_dma_ptr = VLCDJ_BSPTR.BYTEPTR ~0x3F; // align to 64-byte
if (new_dma_ptr == saved_dma_ptr)
{
    setup_dma(saved_dma_ptr, new_dma_ptr - saved_dma_ptr);
    // start DMA at saved_dma_ptr, length = new_dma_ptr - saved_dma_ptr
}
else // wraps around, need to DMA 2 blocks
{
    setup_dma(saved_dma_ptr, 0x800 - saved_dma_ptr);
    setup_dma(saved_dma_ptr, new_dma_ptr);
}
saved_dma_ptr = new_dma_ptr;
```

This DMA setup can be carried out concurrently with VLCDJ operation; thus, this code is executed with each encode or decode task. When the VLCDJ is encoding, software can access the decode bit/byte points to set up DMA for decoding, and vice versa.

Because hardware stalling does not work in this case, the number of MCUs must be configured so that in the worst case there is no bitstream data overrun or underrun.

The bitstream buffer can be allocated at a quarter of bitstream memory granularity, or 1KB. This allows at most four separate buffers to coexist in bitstream memory.

If multiple encode and/or decode threads are performed concurrently, software must save and restore the appropriate configuration registers. The register map has common registers in one group, encode registers in another group, and decode registers in a third group. Bitstream memory partitioning and corresponding DMA submission are left to software.

8.4.6.4.6 Example of YUV4:4:4 Encoding

The following pseudocode shows the general sequence involved in YUV4:4:4 encoding. Decoding can be similarly derived.

```
encode_yuv444()
{
    VLCDJ_CTRL[1] MODE = 0; /* encode */
    VLCDJE_CFG[1:0] FMT = 2; /* sequential block mode */
    VLCDJE_CFG[13:8] NMCUS = 0; /* 1 block at a time */
    pred_y = 0;
    pred_u = 0;
    pred_v = 0;
    for (i=0; inum_mcus; i++)
    {
        VLCDJE_DCPREDY = pred_y; /* restore Y context */
        VLCDJE_DCT = DCT_Y;
        VLCDJE_QMR = QMR_Y;
        VLCDJE_VLCTBL = VLC_Y;
        VLCDJ_CTRL[0] EN = 1; /* kick off VLCDJ for Y */
        pred_y = VLCDJE_DCPREDY; /* save Y context */
        VLCDJE_DCPREDY = pred_u; /* restore U context */
        VLCDJE_DCT = DCT_U;
        VLCDJE_QMR = QMR_UV;
        VLCDJE_VLCTBL = VLC_UV;
        VLCDJ_CTRL[0] EN = 1; /* kick off VLCDJ for U */
        pred_u = VLCDJE_DCPREDY; /* save U context */
        VLCDJE_DCPREDY = pred_v; /* restore V context */
        VLCDJE_DCT = DCT_V;
        VLCDJ_CTRL[0] EN = 1; /* kick off VLCDJ for V */
        pred_v = VLCDJE_DCPREDY; /* save V context */
    }
}
```

8.4.6.4.7 Example of Huffman Encode and Decode Tables

8.4.6.4.7.1 Huffman Encode Table

Sample JPEG Luma DC encode table:

```
unsigned short jpeg_dc_y[24] =
{
    0x0000, 0x0002, 0x0002, 0x0003, 0x0003, 0x0003, 0x0004, 0x0003,
    0x0005, 0x0003, 0x0006, 0x0003, 0x000e, 0x0004, 0x001e, 0x0005,
    0x003e, 0x0006, 0x007e, 0x0007, 0x00fe, 0x0008, 0x01fe, 0x0009
};
```

Table 8-1378 corresponds to Table 17 in the JPEG standard *ISO/IEC JTC1/SC29/WG10 Standard 10918-1 (JPEG), Information Technology – Digital Compression and Coding of Continuous-Tone Still Images – Requirements and Guidelines*.

Table 8-1378. Sample Luma DC Huffman Code Table

| Category | Code Length | Code Word |
|----------|-------------|-----------|
| 0 | 2 | 00 |
| 1 | 3 | 010 |
| 2 | 3 | 011 |
| 3 | 3 | 100 |
| 4 | 3 | 101 |
| 5 | 3 | 110 |
| 6 | 4 | 1110 |
| 7 | 5 | 11110 |
| 8 | 6 | 111110 |

**Table 8-1378. Sample Luma DC Huffman Code Table
(continued)**

| Category | Code Length | Code Word |
|----------|-------------|-----------|
| 9 | 7 | 1111110 |
| 10 | 8 | 11111110 |
| 11 | 9 | 111111110 |

To code a DC coefficient value of -5 :

Use $\text{abs}(-5) = 5$ to select a size of 3. Look up the encode table to find:

- $\text{jpeg_dc_y}[2 \times 3] = 4$ (code)
- $\text{jpeg_dc_y}[2 \times 3 + 1] = 3$ (length)

Thus, the VLCDJ adds 100 to the bitstream as the Huffman code of the size.

The additional bits for negative coefficients are ones complement of the absolute value, so for -5 , this is 010, or 2. After the Huffman code of the size, the VLCDJ adds 010 to the bitstream.

The AC coefficient table is the same, except that the VLCDJ uses $16 \times \text{size} + \text{run}$ to index the encode table.

8.4.6.4.7.2 Huffman Decode Tables

Sample JPEG Luma DC control and decode tables:

```
unsigned short jpeg_dc_yctl_tbl[13]=
{
    0x0000,0x0000,0x0000,0x0000,0x1800,0x2001,0x2802,0x3003,
    0x3804,0x4005,0x4806,0x4806,0x4806
};
unsigned short jpeg_dc_ydcd_tbl[14]=
{
    0x0000,0x480b,0x400a,0x3809,0x3008,0x2807,0x2006,0x1805,
    0x1804,0x1803,0x1802,0x1801,0x1000,0x1000
};
```

These tables contain the same information as [Table 8-1378](#), which complies with the JPEG standard.

8.4.6.5 ISS SIMCOP VLCDJ Register Manual

8.4.6.5.1 ISS SIMCOP VLCDJ Instance Summary

Table 8-1379 summarizes the VLDCJ instance.

Table 8-1379. ISS SIMCOP VLCDJ Instance Summary

| Module Name | Base Address L3 Interconnect | Base Address Cortex-M3 Private Access | Size |
|-------------|---------------------------------|--|-----------|
| VLCDJ | 0x5202 0600 | 0x5506 0600 | 128 bytes |

NOTE: Private Access is an access that does not use the L3/L4 interconnects.

8.4.6.5.2 VLCDJ Registers

8.4.6.5.2.1 VLCDJ Register Summary

Table 8-1380 summarizes VLDCJ register mapping.

Table 8-1380. VLCDJ Register Mapping Summary

| Register | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-M3 Private Access |
|-----------------|------|--------------------------|----------------|-------------------------------------|---|
| VLCDJ_REVISION | RW | 32 | 0x0000 0000 | 0x5202 0600 | 0x5506 0600 |
| VLCDJ_CTRL | RW | 32 | 0x0000 0004 | 0x5202 0604 | 0x5506 0604 |
| VLCDJE_CFG | RW | 32 | 0x0000 0008 | 0x5202 0608 | 0x5506 0608 |
| VLCDJE_DCPREDY | RW | 32 | 0x0000 000C | 0x5202 060C | 0x5506 060C |
| VLCDJE_DCPREDUV | RW | 32 | 0x0000 0010 | 0x5202 0610 | 0x5506 0610 |
| VLCDJE_BSPTR | RW | 32 | 0x0000 0014 | 0x5202 0614 | 0x5506 0614 |
| VLCDJE_CBUF | RW | 32 | 0x0000 0018 | 0x5202 0618 | 0x5506 0618 |
| VLCDJE_RSTCFG | RW | 32 | 0x0000 001C | 0x5202 061C | 0x5506 061C |
| VLCDJE_DCTQM | RW | 32 | 0x0000 0020 | 0x5202 0620 | 0x5506 0620 |
| VLCDJE_VLCTBL | RW | 32 | 0x0000 0024 | 0x5202 0624 | 0x5506 0624 |
| VLCDJE_RSTPTR | RW | 32 | 0x0000 0028 | 0x5202 0628 | 0x5506 0628 |
| VLCDJE_RSTOFST | RW | 32 | 0x0000 002C | 0x5202 062C | 0x5506 062C |
| VLCDJD_CFG | RW | 32 | 0x0000 0040 | 0x5202 0640 | 0x5506 0640 |
| VLCDJD_DCPREDY | RW | 32 | 0x0000 0044 | 0x5202 0644 | 0x5506 0644 |
| VLCDJD_DCPREDUV | RW | 32 | 0x0000 0048 | 0x5202 0648 | 0x5506 0648 |
| VLCDJD_BSPTR | RW | 32 | 0x0000 004C | 0x5202 064C | 0x5506 064C |
| VLCDJD_CBUF | RW | 32 | 0x0000 0050 | 0x5202 0650 | 0x5506 0650 |
| VLCDJD_DCTQM | RW | 32 | 0x0000 0054 | 0x5202 0654 | 0x5506 0654 |
| VLCDJD_CTRLTBL | RW | 32 | 0x0000 0058 | 0x5202 0658 | 0x5506 0658 |
| VLCDJD_DCDTBL01 | RW | 32 | 0x0000 005C | 0x5202 065C | 0x5506 065C |
| VLCDJD_DCDTBL23 | RW | 32 | 0x0000 0060 | 0x5202 0660 | 0x5506 0660 |
| VLCDJD_DCTERR | R | 32 | 0x0000 0064 | 0x5202 0664 | 0x5506 0664 |

8.4.6.5.2.2 VLCDJ Register Descriptions

through describe the individual registers.

Table 8-1381. VLCDJ_REVISION

| | | | |
|-------------------------|----------------------------|-----------------|-----------------------------|
| Address Offset | 0x0000 0000 | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 0600 0x5506 0600 | | |
| Description | IP revision | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP Revision | R | TI internal data |

Table 8-1382. Register Call Summary for Register VLCDJ_REVISION

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Register Manual: \[0\]](#)

Table 8-1383. VLCDJ_CTRL

| | | | |
|-------------------------|--|-----------------|-----------------------------|
| Address Offset | 0x0000 0004 | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 0604 0x5506 0604 | | |
| Description | Controls common to encoding and decoding | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | <div> <div>CLRRB</div> <div>RBEN</div> <div>INTEN_ERR</div> <div>INTEN_DONE</div> <div>AUTOGATING</div> <div>TRIG_SRC</div> <div>MODE</div> <div>EN</div> </div> | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:17 | RESERVED | Read returns 0. | R | 0x00 |
| 16 | BUSY | Idle/busy status 0: Idle 1: Busy | R | 0 |
| 15:8 | RESERVED | Read returns 0. | R | 0x00 |
| 7 | CLRRB | Write only; read returns 0. | W | 0 |
| 6 | RBEN | Enable RB signaling. | RW | 0 |
| 5 | INTEN_ERR | Interrupt enable for decode error 0: No interrupt generated on decode error 1: Interrupt generated on decode error | RW | 0 |
| 4 | INTEN_DONE | Interrupt enable for task completion. DONE_VLCD is not gated by this and is always asserted at task completion. 0: No interrupt generated on task completion 1: Interrupt generated on task completion | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 3 | AUTOGATING | Internal clock gating on OCP clock and functional clock 0: Clocks are free-running. 1: Clocks are gated off in sub-blocks that are not required for operation. | RW | 1 |
| 2 | TRIG_SRC | Which mechanism starts VLCDJ operation 0: MMR write to VLCDJ_CTRL.EN 1: Hardware start signal | RW | 0 |
| 1 | MODE | 0: Encode 1: Decode | RW | 0 |
| 0 | EN | Module enable by software (write-only, read returns 0). When TRIG_SRC = 0 and BUSY = 0, set this field to 1 to start VLCDJ. When TRIG_SRC = 1, writes to this field are ignored. Setting TRIG_SRC = 0 and EN = 1 on the same register write is recognized. | W | 0 |

Table 8-1384. Register Call Summary for Register VLCDJ_CTRL

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description: \[0\] \[1\] \[2\]](#)
- [ISS SIMCOP VLCDJ Basic Programming Model: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[17\] \[18\] \[21\] \[22\] \[23\] \[25\] \[26\] \[29\] \[30\] \[32\] \[33\] \[34\] \[35\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[37\] \[38\]](#)

Table 8-1385. VLCDJE_CFG

| | | | |
|-------------------------|--|-----------------|-----------------------------|
| Address Offset | 0x0000 0008 | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 0608 0x5506 0608 | | |
| Description | Encode configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----------|----|---|---|--------|-------|-----|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | NMCUS | | | | RESERVED | | | | RLOCEN | RSTEN | FMT | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | Read returns 0. | R | 0x00000 |
| 13:8 | NMCUS | Number of MCUs (FMT = 0, 1) or blocks (FMT = 2) to encode 0: 1 MCU 1: 2 MCUs, etc. | RW | 0x00 |
| 7:4 | RESERVED | Read returns 0. | R | 0x0 |
| 3 | RLOCEN | Restart marker location recording enable 0: Restart marker location recording disabled 1: Restart marker location recording enabled | RW | 0 |
| 2 | RSTEN | Restart marker insertion enable 0: Restart marker insertion disabled 1: Restart marker insertion enabled | RW | 0 |
| 1:0 | FMT | 0: YUV4:2:0 1: YUV4:2:2 2: Sequential blocks | RW | 0x0 |

Table 8-1386. Register Call Summary for Register VLCDJE_CFG

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description](#):
- [ISS SIMCOP VLCDJ Basic Programming Model](#): [1] [2] [3] [4] [5] [6]
- [ISS SIMCOP VLCDJ Register Manual](#): [9]

Table 8-1387. VLCDJE_DCPREDY

| | | |
|------------------|----------------------------|---|
| Address Offset | 0x0000 000C | Instance VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 060C 0x5506 060C | |
| Description | Encode DC predictor for Y | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PREDY | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------|------|---------|
| 31:12 | RESERVED | Read returns 0. | R | 0x00000 |
| 11:0 | PREDY | DC predictor for Y | RW | 0x000 |

Table 8-1388. Register Call Summary for Register VLCDJE_DCPREDY

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Basic Programming Model](#): [0] [1]
- [ISS SIMCOP VLCDJ Register Manual](#): [2]

Table 8-1389. VLCDJE_DCPREDUV

| | | | |
|-------------------------|--|-----------------|-----------------------------|
| Address Offset | 0x0000 0010 | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 0610 0x5506 0610 | | |
| Description | Encode DC predictor for U and V | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | PREDV | | | | | | | | RESERVED | | | | | | | | PREDU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------|------|-------|
| 31:28 | RESERVED | Read returns 0. | R | 0x0 |
| 27:16 | PREDV | DC predictor for V | RW | 0x000 |
| 15:12 | RESERVED | Read returns 0. | R | 0x0 |
| 11:0 | PREDU | DC predictor for U | RW | 0x000 |

Table 8-1390. Register Call Summary for Register VLCDJE_DCPREDUV

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Basic Programming Model](#): [0] [1] [2] [3]
- [ISS SIMCOP VLCDJ Register Manual](#): [4]

Table 8-1391. VLCDJE_BSPTTR

| | | | |
|-------------------------|----------------------------|-----------------|-----------------------------|
| Address Offset | 0x0000 0014 | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 0614 0x5506 0614 | | |
| Description | Encode bitstream pointer | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | BITPTR | | | | | | | | RESERVED | | | | | | | | BYTEPTR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:20 | RESERVED | Read returns 0. | R | 0x000 |
| 19:16 | BITPTR | Bit pointer, 1..8, indicates number of available bits | RW | 0x8 |
| 15:12 | RESERVED | Read returns 0. | R | 0x0 |
| 11:0 | BYTEPTR | Byte pointer (to BSMEM) | RW | 0x000 |

Table 8-1392. Register Call Summary for Register VLCDJE_BSPTTR

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description: \[0\] \[1\]](#)
- [ISS SIMCOP VLCDJ Basic Programming Model: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[9\]](#)

Table 8-1393. VLCDJE_CBUF

| | | | |
|------------------|----------------------------------|----------|-----------------|
| Address Offset | 0x0000 0018 | Instance | VLCDJ_L3 |
| Physical Address | 0x5202 0618 0x5506 0618 | | VLCDJ_CORTEX-M3 |
| Description | Encode bitstream circular buffer | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|-----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|-------|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | END | | RESERVED | | | | | | | | RESERVED | | | | START | | RESERVED | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|---------------------|-------|
| 31:28 | RESERVED | Read returns 0. | R | 0x0 |
| 27:26 | END | Ending quarter (1KB each unit) of bitstream buffer. Software can write a byte address into the upper 16 bits of the register. | RW | 0x3 |
| 25:16 | RESERVED | Read returns 0x3FF. | R; returns 1s | 0x3FF |
| 15:12 | RESERVED | Read returns 0. | R | 0x0 |
| 11:10 | START | Starting quarter (1KB each unit) of bitstream buffer. Software can write a byte address to the lower 16 bits of the register. | RW | 0x0 |
| 9:0 | RESERVED | Read returns 0. | R | 0x000 |

Table 8-1394. Register Call Summary for Register VLCDJE_CBUF

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS SIMCOP VLCDJ Basic Programming Model: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[10\]](#)

Table 8-1395. VLCDJE_RSTCFG

| | | | |
|-------------------------|-------------------------------------|-----------------|-----------------------------|
| Address Offset | 0x0000 001C | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 061C 0x5506 061C | | |
| Description | Encode restart marker configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|-----|----|----|----------|------|----|----|----------|-------|----|----|----|----|----|----|----|----------|--------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | INC | | | RESERVED | INIT | | | RESERVED | PHASE | | | | | | | | RESERVED | INTRVL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------------|------|-------|
| 31 | RESERVED | Read returns 0. | R | 0 |
| 30:28 | INC | Restart count increment value | RW | 0x1 |
| 27 | RESERVED | Read returns 0. | R | 0 |
| 26:24 | INIT | Restart marker initial count | RW | 0x0 |
| 23:22 | RESERVED | Read returns 0. | R | 0x0 |
| 21:12 | PHASE | MCU count within the interval | RW | 0x000 |
| 11:10 | RESERVED | Read returns 0. | R | 0x0 |
| 9:0 | INTRVL | Restart interval (in MCUs) | RW | 0x000 |

Table 8-1396. Register Call Summary for Register VLCDJE_RSTCFG

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description:](#)
- [ISS SIMCOP VLCDJ Basic Programming Model:](#)
- [ISS SIMCOP VLCDJ Register Manual: \[13\]](#)

Table 8-1397. VLCDJE_DCTQM

| | | | |
|-------------------------|--|-----------------|-----------------------------|
| Address Offset | 0x0000 0020 | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 0620 0x5506 0620 | | |
| Description | Encode DCT coefficient and quantizer matrix pointers | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----------|----|----|----|----|----|----|----|-----|----|----|----|----|---|---|---|----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | QMR | RESERVED | | | | | | | | DCT | | | | | | | | RESERVED | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:25 | RESERVED | Read returns 0. | R | 0x00 |
| 24:23 | QMR | Quarter (128 bytes/unit) of quantization matrix reciprocal. Software can write a byte address to the upper 16 bits of the register. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 22:14 | RESERVED | Read returns 0. | R | 0x000 |
| 13:4 | DCT | 128-bit/word address of DCT coefficients. Software can write a byte address to the lower 16 bits of the register. | RW | 0x000 |
| 3:0 | RESERVED | Read returns 0. | R | 0x0 |

Table 8-1398. Register Call Summary for Register VLCDJE_DCTQM

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Basic Programming Model: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[4\]](#)

Table 8-1399. VLCDJE_VLCTBL

| | | | |
|-------------------------|--|-----------------|-----------------------------|
| Address Offset | 0x0000 0024 | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 0624 0x5506 0624 | | |
| Description | Encode Huffman table pointer | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|----------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ADDR | | | | | | | | | | | RESERVED | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | RESERVED | Read returns 0. | R | 0x00000 |
| 11:2 | ADDR | Encode Huffman table pointer, 32-bit word address. Software can write a byte address into the entire register. | RW | 0x000 |
| 1:0 | RESERVED | Read returns 0. | R | 0x0 |

Table 8-1400. Register Call Summary for Register VLCDJE_VLCTBL

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS SIMCOP VLCDJ Basic Programming Model: \[4\] \[5\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[6\]](#)

Table 8-1401. VLCDJE_RSTPTR

| | | | |
|-------------------------|--|-----------------|-----------------------------|
| Address Offset | 0x0000 0028 | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 0628 0x5506 0628 | | |
| Description | Encode restart marker locations | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|----------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ADDR | | | | | | | | | | | RESERVED | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | Read returns 0. | R | 0x00000 |
| 13:4 | ADDR | Pointer to restart marker locations in image buffer, 128-bit/word address Software can write a byte address into the entire register. | RW | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|-------|
| 3:0 | RESERVED | Read returns 0. | R | 0x0 |

Table 8-1402. Register Call Summary for Register VLCDJE_RSTPTR

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description](#):
- [ISS SIMCOP VLCDJ Register Manual: \[2\]](#)

Table 8-1403. VLCDJE_RSTOFST

| | | | |
|-------------------------|--|-----------------|-----------------|
| Address Offset | 0x0000 002C | Instance | VLCDJ_L3 |
| Physical Address | 0x5202 062C 0x5506 062C | | VLCDJ_CORTEX-M3 |
| Description | SDRAM address to add to encode restart marker locations | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| OFFSET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | OFFSET | SDRAM address of bitstream buffer, to be added to the restart marker locations | RW | 0x0000 0000 |

Table 8-1404. Register Call Summary for Register VLCDJE_RSTOFST

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description](#):
- [ISS SIMCOP VLCDJ Register Manual: \[1\]](#)

Table 8-1405. VLCDJD_CFG

| | | | |
|-------------------------|--|-----------------|-----------------|
| Address Offset | 0x0000 0040 | Instance | VLCDJ_L3 |
| Physical Address | 0x5202 0640 0x5506 0640 | | VLCDJ_CORTEX-M3 |
| Description | Decode configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----------|----|---|---|-------|-----|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | NMCUS | | | | RESERVED | | | | RSTEN | FMT | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | Read returns 0. | R | 0x00000 |
| 13:8 | NMCUS | Number of MCUs (FMT = 0, 1) or blocks (FMT = 2) to decode 0: 1 MCU 1: 2 MCUs, etc. | RW | 0x00 |
| 7:3 | RESERVED | Read returns 0. | R | 0x00 |
| 2 | RSTEN | Restart marker detection/processing enable 0: Restart marker detection/processing disabled 1: Restart marker detection/processing enabled | RW | 1 |
| 1:0 | FMT | 0: YUV4:2:0 1: YUV4:2:2 2: Sequential blocks | RW | 0x0 |

Table 8-1406. Register Call Summary for Register VLCDJD_CFG

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Basic Programming Model: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[8\]](#)

Table 8-1407. VLCDJD_DCPREDY

| | | | |
|-------------------------|--|-----------------|-----------------------------|
| Address Offset | 0x0000 0044 | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 0644 0x5506 0644 | | |
| Description | Decode DC predictor for Y | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PREDY | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------|------|---------|
| 31:12 | RESERVED | Read returns 0. | R | 0x00000 |
| 11:0 | PREDY | DC predictor for Y | RW | 0x000 |

Table 8-1408. Register Call Summary for Register VLCDJD_DCPREDY

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Basic Programming Model: \[0\] \[1\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[2\]](#)

Table 8-1409. VLCDJD_DCPREDUV

| | | | |
|-------------------------|--|-----------------|-----------------------------|
| Address Offset | 0x0000 0048 | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 0648 0x5506 0648 | | |
| Description | Decode DC predictor for U and V | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | PREDV | | | | | | | | RESERVED | | | | | | | | PREDU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------|------|-------|
| 31:28 | RESERVED | Read returns 0. | R | 0x0 |
| 27:16 | PREDV | DC predictor for V | RW | 0x000 |
| 15:12 | RESERVED | Read returns 0. | R | 0x0 |
| 11:0 | PREDU | DC predictor for U | RW | 0x000 |

Table 8-1410. Register Call Summary for Register VLCDJD_DCPREDUV

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Basic Programming Model: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[4\]](#)

Table 8-1411. VLCDJD_BSPTTR

| | | | |
|-------------------------|----------------------------|-----------------|-----------------------------|
| Address Offset | 0x0000 004C | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 064C 0x5506 064C | | |
| Description | Decode bitstream pointer | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | BITPTR | | | | | | | | RESERVED | | | | | | | | BYTEPTR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:20 | RESERVED | Read returns 0. | R | 0x000 |
| 19:16 | BITPTR | Bit pointer, 1..8, indicates number of available bits | RW | 0x8 |
| 15:12 | RESERVED | Read returns 0. | R | 0x0 |
| 11:0 | BYTEPTR | Byte pointer (to BSMEM) | RW | 0x000 |

Table 8-1412. Register Call Summary for Register VLCDJD_BSPTTR

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS SIMCOP VLCDJ Basic Programming Model: \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[9\]](#)

Table 8-1413. VLCDJD_CBUF

| | | | |
|-------------------------|----------------------------------|-----------------|-----------------------------|
| Address Offset | 0x0000 0050 | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 0650 0x5506 0650 | | |
| Description | Decode bitstream circular buffer | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|-----|----|----------|----|----|----|----|----|----|----|----|----|----------|----|----|----|-------|----|----------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | END | | RESERVED | | | | | | | | | | RESERVED | | | | START | | RESERVED | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------------------|-------|
| 31:28 | RESERVED | Read returns 0. | R | 0x0 |
| 27:26 | END | Ending quarter (1KB each unit) of bitstream buffer. Software can write a byte address into the upper 16 bits of the register. | RW | 0x3 |
| 25:16 | RESERVED | Read returns 0x3FF. | R; returns 1s | 0x3FF |
| 15:12 | RESERVED | Read returns 0. | R | 0x0 |
| 11:10 | START | Starting quarter (1KB each unit) of bitstream buffer. Software can write a byte address to the lower 16 bits of the register. | RW | 0x0 |
| 9:0 | RESERVED | Read returns 0. | R | 0x000 |

Table 8-1414. Register Call Summary for Register VLCDJD_CBUF

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS SIMCOP VLCDJ Basic Programming Model: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[10\]](#)

Table 8-1415. VLCDJD_DCTQM

| | | | |
|------------------|--|----------|-----------------|
| Address Offset | 0x0000 0054 | Instance | VLCDJ_L3 |
| Physical Address | 0x5202 0654 0x5506 0654 | | VLCDJ_CORTEX-M3 |
| Description | Decode DCT coefficient and quantizer matrix pointers | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|----|----|----|---|---|---|---|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | QM | | RESERVED | | | | | | | | DCT | | | | | | | | RESERVED | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:25 | RESERVED | Read returns 0. | R | 0x00 |
| 24:23 | QM | Quarter (128 bytes/unit) of quantization matrix. Software can write a byte address to the upper 16 bits of the register. | RW | 0x0 |
| 22:14 | RESERVED | Read returns 0. | R | 0x000 |
| 13:4 | DCT | 128-bit/word address of DCT coefficients. Software can write a byte address to the lower 16 bits of the register. | RW | 0x000 |
| 3:0 | RESERVED | Read returns 0. | R | 0x0 |

Table 8-1416. Register Call Summary for Register VLCDJD_DCTQM

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Basic Programming Model: \[0\] \[1\] \[2\] \[3\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[4\]](#)

Table 8-1417. VLCDJD_CTRLTBL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----------------------------|-----------------|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----|----|----------|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|----------|--|
| Address Offset | 0x0000 0058 | Instance | VLCDJ_L3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5202 0658 0x5506 0658 | | VLCDJ_CORTEX-M3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Decode control table base | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="10">ADDR</td><td colspan="2">RESERVED</td></tr></table> | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | ADDR | | | | | | | | | | RESERVED | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | ADDR | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | RESERVED | Read returns 0. | R | 0x00000 |
| 11:2 | ADDR | Starting address of decode control table, 32-bit word. Software can write a byte address into the entire register. | RW | 0x000 |
| 1:0 | RESERVED | Read returns 0. | R | 0x0 |

Table 8-1418. Register Call Summary for Register VLCDJD_CTRLTBL

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Basic Programming Model: \[0\] \[1\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[2\]](#)

Table 8-1419. VLCDJD_DCDTBL01

| | | | |
|-------------------------|-------------------------------|-----------------|-----------------------------|
| Address Offset | 0x0000 005C | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 065C 0x5506 065C | | |
| Description | Decode Huffman tables 0 and 1 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|---------|----|----|----|----|----|----|----|----------|----|----|----|---------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | DCDTBL1 | | | | | | | | RESERVED | | | | DCDTBL0 | | | | | | | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | Read returns 0. | R | 0x0 |
| 27:18 | DCDTBL1 | Starting byte address of decode table 1, 32-bit word. Software can write a byte address into the lower 16 bits of the register. This is for Luma AC. | RW | 0x000 |
| 17:12 | RESERVED | Read returns 0. | R | 0x00 |
| 11:2 | DCDTBL0 | Starting byte address of decode table 0, 32-bit word. Software can write a byte address into the lower 16 bits of the register. This is for Luma DC. | RW | 0x000 |
| 1:0 | RESERVED | Read returns 0. | R | 0x0 |

Table 8-1420. Register Call Summary for Register VLCDJD_DCDTBL01

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description:](#)
- [ISS SIMCOP VLCDJ Basic Programming Model: \[2\] \[3\] \[4\] \[5\]](#)
- [ISS SIMCOP VLCDJ Register Manual: \[6\]](#)

Table 8-1421. VLCDJD_DCDTBL23

| | | | |
|-------------------------|-------------------------------|-----------------|-----------------------------|
| Address Offset | 0x0000 0060 | Instance | VLCDJ_L3 VLCDJ_CORTEX-M3 |
| Physical Address | 0x5202 0660 0x5506 0660 | | |
| Description | Decode Huffman tables 2 and 3 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|---------|----|----|----|----|----|----|----|----------|----|----|----|---------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | DCDTBL3 | | | | | | | | RESERVED | | | | DCDTBL2 | | | | | | | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | Read returns 0. | R | 0x0 |
| 27:18 | DCDTBL3 | Starting byte address of decode table 3, 32-bit word. Software can write a byte address into the lower 16 bits of the register. This is for Chroma AC. | RW | 0x000 |
| 17:12 | RESERVED | Read returns 0. | R | 0x00 |
| 11:2 | DCDTBL2 | Starting byte address of decode table 2, 32-bit word. Software can write a byte address into the lower 16 bits of the register. This is for Chroma DC. | RW | 0x000 |
| 1:0 | RESERVED | Read returns 0. | R | 0x0 |

Table 8-1422. Register Call Summary for Register VLCDJD_DCDTBL23

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description](#):
- [ISS SIMCOP VLCDJ Basic Programming Model](#): [2] [3] [4] [5]
- [ISS SIMCOP VLCDJ Register Manual](#): [6]

Table 8-1423. VLCDJD_DCTERR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|----------------------------|----|--|----|------|----|---------|----|----|----|----|----|----|----|--------|----|---|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|
| Address Offset | | 0x0000 0064 | | | | | | | | | | | | | | | | Instance VLCDJ_L3 VLCDJ_CORTEX-M3 | | | | | | | | | | | | | | | |
| Physical Address | | 0x5202 0664 0x5506 0664 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | ERRPTR | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | | Field Name | | Description | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:14 | | RESERVED | | Read returns 0. | | R | | 0x00000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13:0 | | ERRPTR | | Byte address pointer to DCT coefficients, near where decode error occurs (read-only) | | R | | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 8-1424. Register Call Summary for Register VLCDJD_DCTERR

ISS Still Image Coprocessor

- [ISS SIMCOP VLCDJ Functional Description](#): [0]
- [ISS SIMCOP VLCDJ Register Manual](#): [1]

8.4.7 ISS SIMCOP Rotation Accelerator Module

This section describes the rotation accelerator (ROT) module in the still-image coprocessor (SIMCOP) subsystem.

8.4.7.1 ISS SIMCOP ROT Overview

The ROT module is intended to be used in the SIMCOP to perform block data rotation and data shifting from one SIMCOP local memory to another. The following formats and operations are supported:

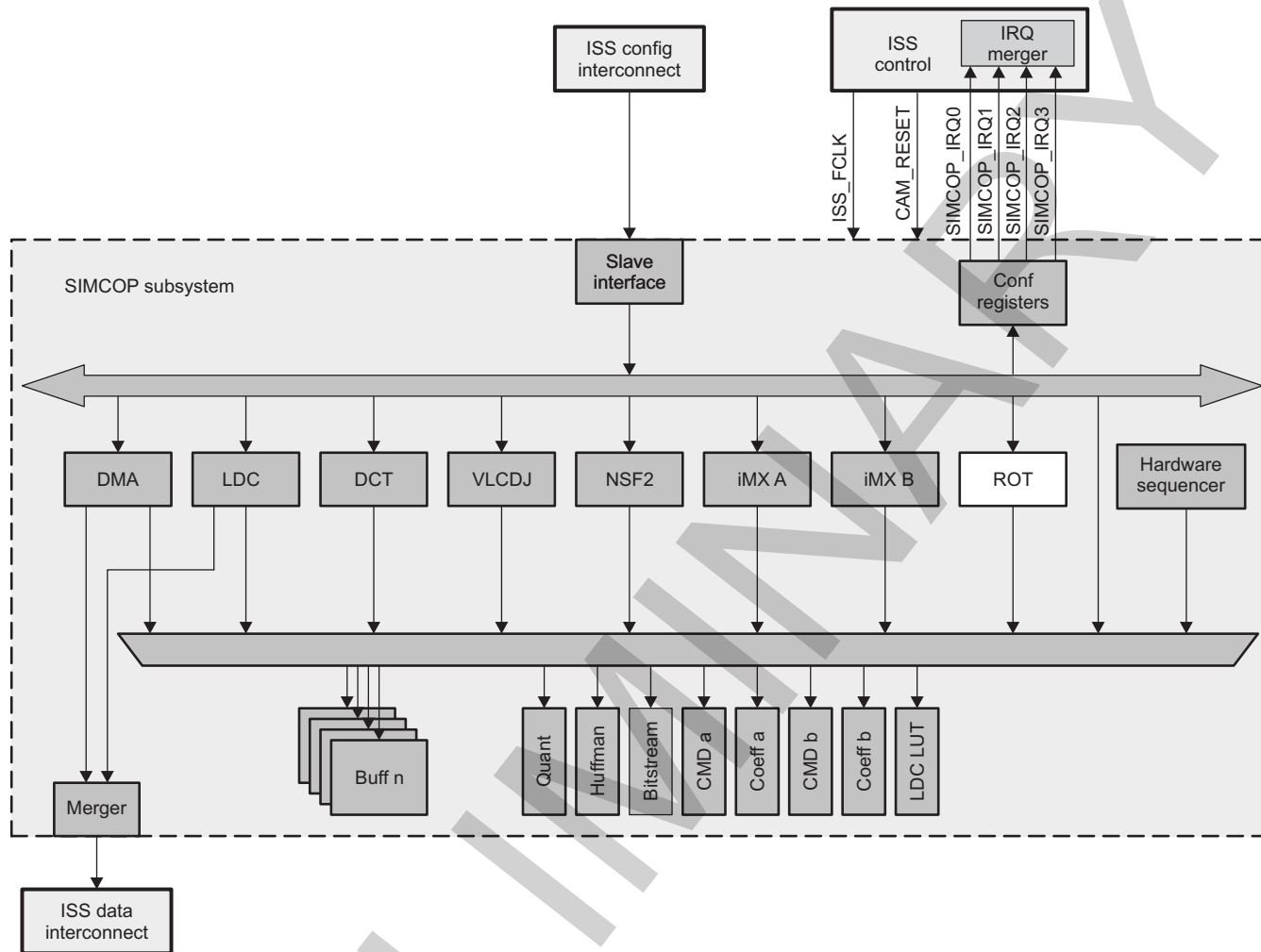
- YUV4:2:2 and generic 8-/16-/32-bit data block rotation by 90, 180, and 270 degrees
- YUV4:2:0 rotation by 90, 180, and 270 degrees
- Multiple-block rotation
- Data block shifting
- Data block horizontal circular shifting

The ROT supports a simple 1-block-per-initiation interaction, and includes a microcontroller unit (MCU) software-writable enable bit and hardware trigger signal to start the processing (see [Section 8.4.7.3.7, ISS SIMCOP ROT Synchronization](#)). It relies on external direct memory access (DMA) for transfers, and can work with the MCU or hardware sequencer to coordinate between transfer and computation.

The ROT has an input and output memory interface (see [Figure 8-286](#)). The rotation and horizontal-shifting operations read from the input memory and write to the output memory. The module connects to an input memory of up to 16KB (2048 × 64-bit), and an output memory of up to 16KB (2048 × 64-bit) using synchronous single-port memory interface.

[Figure 8-284](#) is an overview of the ROT.

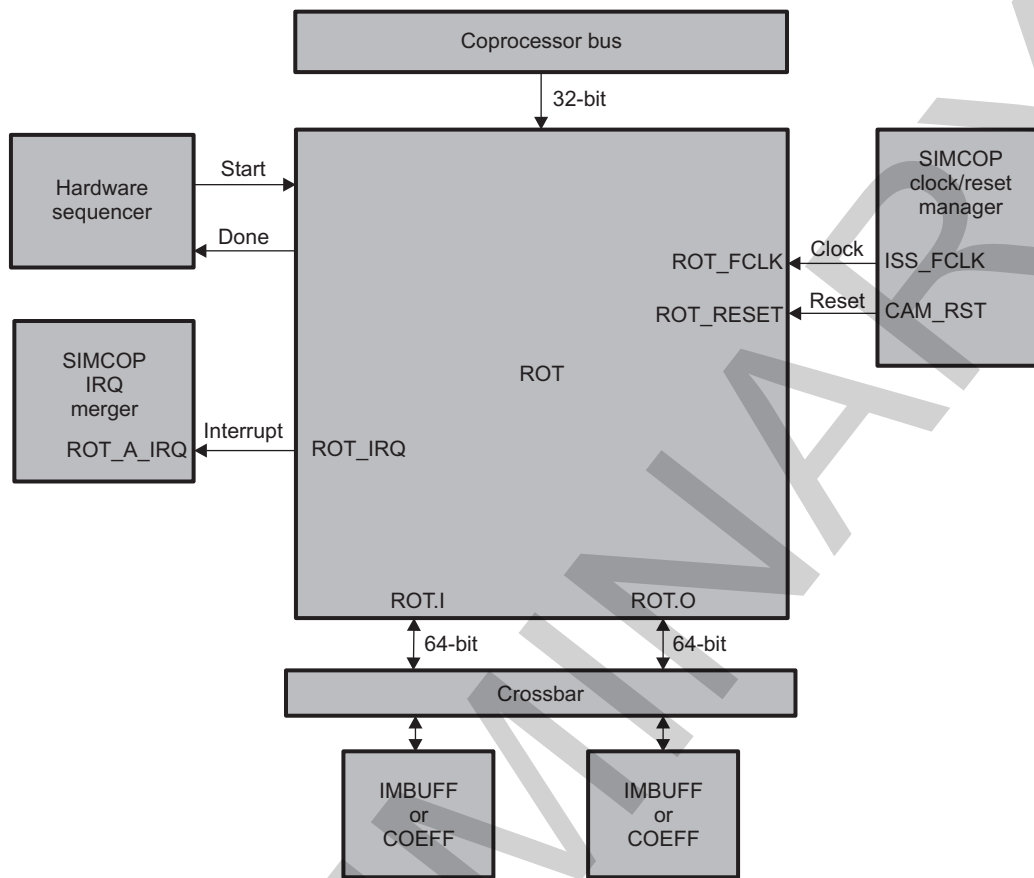
Figure 8-284. ISS SIMCOP ROT Module Overview



rot-001

8.4.7.2 ISS SIMCOP ROT Integration

The ROT is part of the SIMCOP subsystem in the imaging subsystem (ISS). [Figure 8-285](#) shows the integration of the ROT in the SIMCOP subsystem.

Figure 8-285. ISS SIMCOP ROT Engine Integration

rot-013

Table 8-1425 through Table 8-1427 list the integration attributes, clocks and resets, and hardware requests, respectively, of the SIMCOP ROT.

Table 8-1425. ISS SIMCOP ROT Integration Attributes

| Module Instance | Attributes |
|-----------------|--------------|
| | Power Domain |
| ROT | PD_CAM |

Table 8-1426. ISS SIMCOP ROT Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|---|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| ROT | ROT_FCLK | ISS_FCLK | PRCM | Functional clock provided by ISS_CLK from the power, reset, and clock management (PRCM) module. It is used by all ISS submodules and ISS top-level resources. |
| Resets | | | | |
| ROT | ROT_RESET | CAM_RST | PRCM | ISS and SIMCOP global reset |

For information about clock and reset management, see [Section 8.4.1.2.1, ISS SIMCOP Local Power and Clock Management](#).

Table 8-1427. ISS SIMCOP ROT Hardware Requests

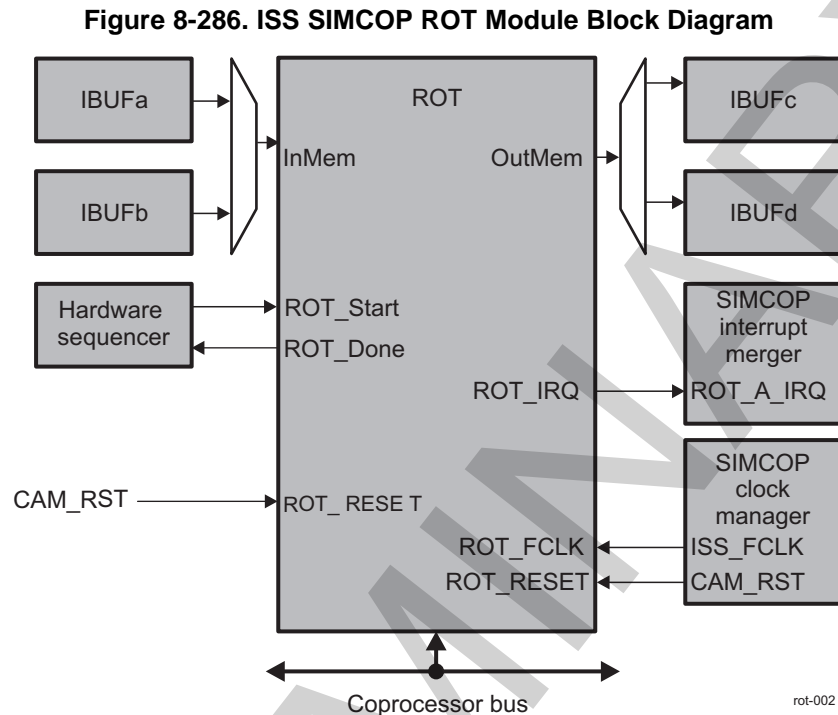
| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------------|------------------------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| ROT | ROT_IRQ | ROT_A_IRQ | SIMCOP IRQ merger | Event triggered by the ROT engine. |

For more information about interrupt requests, see [Section 8.4.1.2.3](#), *Interrupt Merger*.

8.4.7.3 ISS SIMCOP ROT Functional Description

8.4.7.3.1 ISS SIMCOP ROT Block Diagram

Figure 8-286 shows the block diagram of the ROT.



8.4.7.3.2 ISS SIMCOP ROT Clock Configuration

The ROT receives a functional clock (ISS_FCLK) from the ISS SIMCOP. The configuration clock is derived from the functional clock and interconnect clock enable signal (the [ROT_CFG\[9\]](#) AUTOGATING bit).

8.4.7.3.3 ISS SIMCOP ROT Reset

The ROT receives an asynchronous hardware reset signal (CAM_RST) from the ISS SIMCOP.

8.4.7.3.4 ISS SIMCOP ROT Power Management

The ROT uses clock autogating to conserve power. When a subblock is not in use, the corresponding clock tree is gated. The [ROT_CFG\[9\]](#) AUTOGATING bit controls whether autogating is enabled.

8.4.7.3.5 ISS SIMCOP ROT Interrupt Requests

One interrupt output line, ROT_A_IRQ, is used as a sideband signal of the interconnect slave port. This signal is connected to the SIMCOP interrupt merger. See [Section 8.4.1.2.3, Interrupt Merger](#).

8.4.7.3.6 ISS SIMCOP ROT DMA Requests

The ROT has no DMA requests from the module.

8.4.7.3.7 ISS SIMCOP ROT Synchronization

The ROT has a simple one-block-per-task interaction with outside logic/microprocessor unit (MPU). The module can be started by setting the [ROT_CTRL\[0\]](#) EN bit to 0x1, or through the ROT_START signal of the hardware sequencer interface. When the ROT completes the specified rotation or data shift task, it sends a pulse on the ROT_DONE signal and, when the interrupt is enabled, sends a pulse on the ROT_A_IRQ interrupt output.

The [ROT_CFG\[8\]](#) TRIG_SRC bit specifies to which source the hardware must respond:

- When the ROT is idle and the [ROT_CFG\[8\]](#) TRIG_SRC bit is set to 0x0, hardware responds to the memory mapped register (MMR) mechanism, and any pulses on the start signal are ignored.
- When the ROT is idle and the [ROT_CFG\[8\]](#) TRIG_SRC bit is set to 0x1, hardware responds to the hardware start signal, and any write operation to the enable bit field is ignored.

When the ROT is busy, both triggering mechanisms are ignored.

8.4.7.3.8 ISS SIMCOP ROT Formats and Operations

The ROT supports the formats and operations described in the following sections.

8.4.7.3.8.1 ISS SIMCOP ROT YUV4:2:0 and Generic 8-/16-/32-Bit Data Block Rotation

Rotation of YUV4:2:0 and generic 8-bit, 16-bit, 32-bit data blocks is straightforward. None of the data points are altered; each data point is copied to an appropriate address location. Zero-degree rotation is included for completeness of the programming model, and involves only data copy.

When YUV4:2:0 data have separate Y and UV processing and must be separately rotated, Y data can use generic 8-bit data rotation, and UV data can use generic 16-bit data rotation.

8.4.7.3.8.2 ISS SIMCOP ROT YUV4:2:2 Rotation

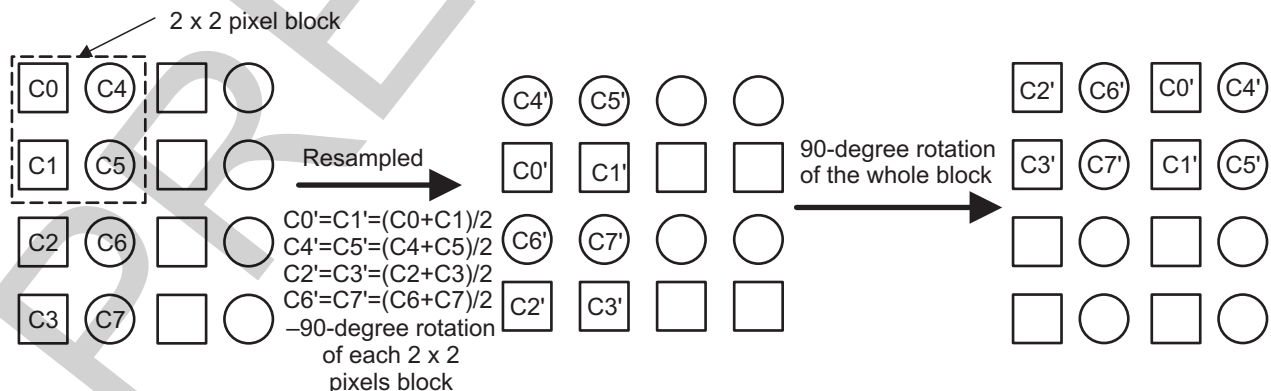
Various rotation cases of YUV4:2:2 data are described in the following and shown in [Figure 8-287](#) through [Figure 8-289](#) using 4 × 4-pixel block as an example.

The degree of rotation is defined as rotating clockwise. For 90-degree rotation:

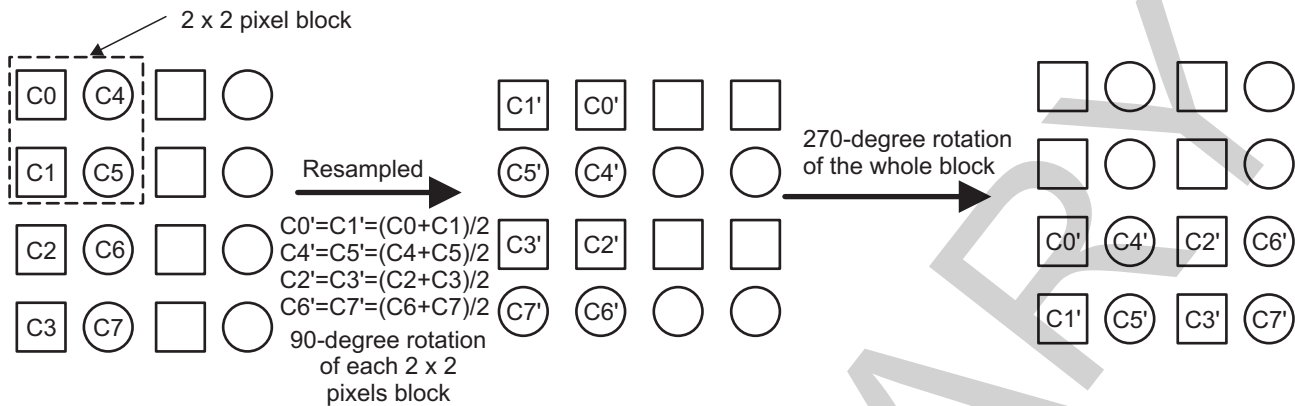
- The two U samples in each 2 × 2-pixel input block are averaged and then replicated to provide the two U samples in the 2 × 2-pixel output block.
- V samples - processed in the same way.

Thus, each 2N × 2N-pixel output block depends on only one 2N × 2N-pixel input block. After resampling every 2 × 2-pixel block, it is rotated –90 degrees, and then the whole 2N × 2N block is rotated 90 degrees.

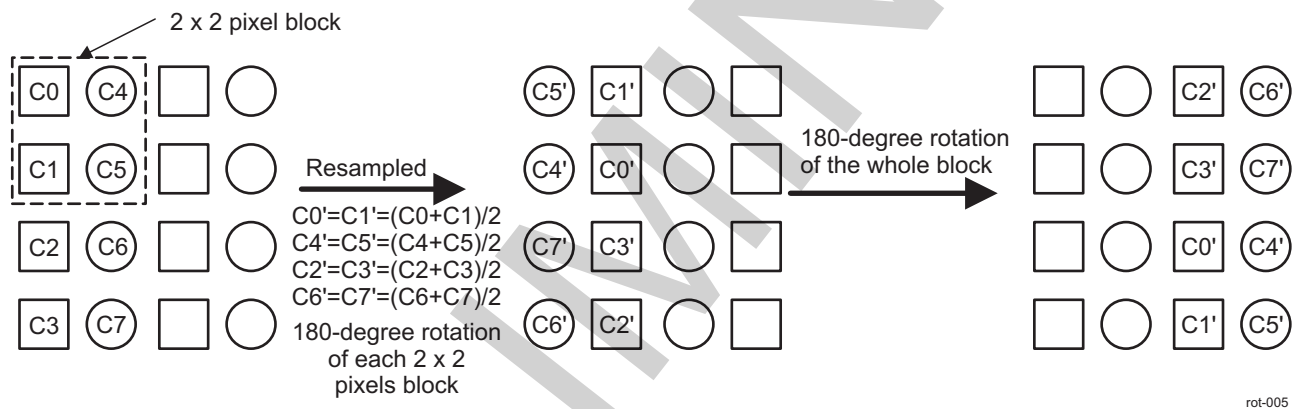
Figure 8-287. ISS SIMCOP ROT 90-Degree Rotation of YUV4:2:2 Data



The same algorithm is used for 270-degree rotation.

Figure 8-288. ISS SIMCOP ROT 270-Degree Rotation of YUV4:2:2 Data

For 180-degree rotation, there is no arithmetic operation; Chroma values are simply shifted horizontally before being rotated.

Figure 8-289. ISS SIMCOP ROT 180-Degree Rotation of YUV4:2:2 Data

NOTE: The intermediate process of 2 × 2 pixel block rotation, represented in the middle section in [Figure 8-287](#) through [Figure 8-289](#), does not involve data storage and reading into memory. This middle section is for better visualization of the process. The whole process is performed with a single memory reading and writing.

Zero-degree rotation is included for completeness of programming model, and involves only data copy.

8.4.7.3.8.3 ISS SIMCOP ROT Multiple-Block Rotation

For generic 8-/16-/32-bit data rotation and YUV4:2:0/4:2:2 rotation, multiple-block operation per hardware task is supported.

[Figure 8-290](#) through [Figure 8-293](#) show the multiple-block rotation feature.

The multiple blocks are in the horizontal dimension, and the blocks are horizontally adjacent to one another. In other words, in the source data and 180-degree rotated data, address offset between blocks is the source block width times the data size.

In the 90-degree and 270-degree rotated data, address offset is the source block height times the data size. The source/destination line offsets must be sufficiently large to accommodate the multiple blocks.

Figure 8-290. ISS SIMCOP ROT Block Representation Before Rotation

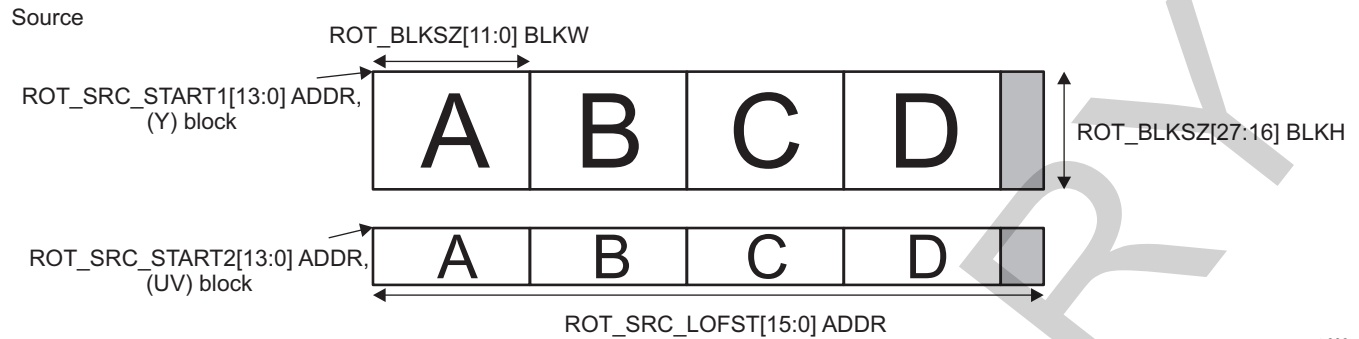


Figure 8-291. ISS SIMCOP ROT 90-Degree Block Rotation

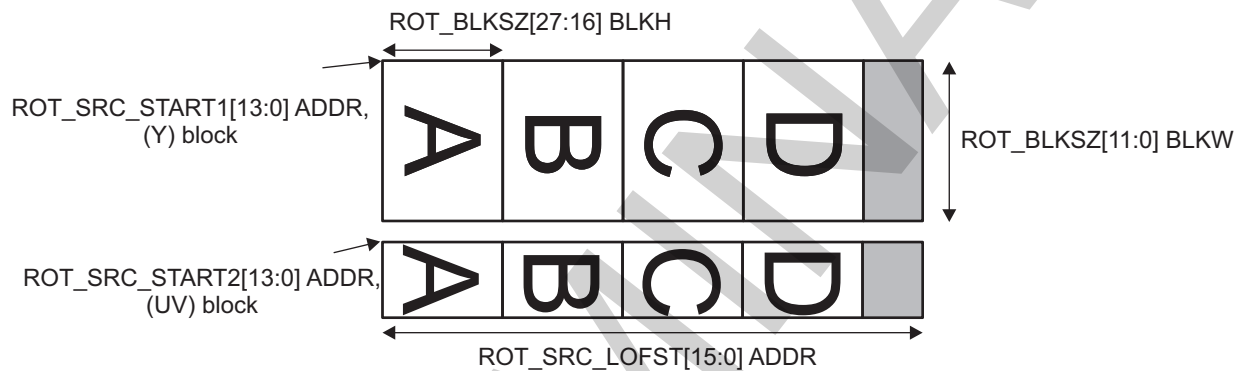


Figure 8-292. ISS SIMCOP ROT 180-Degree Block Rotation

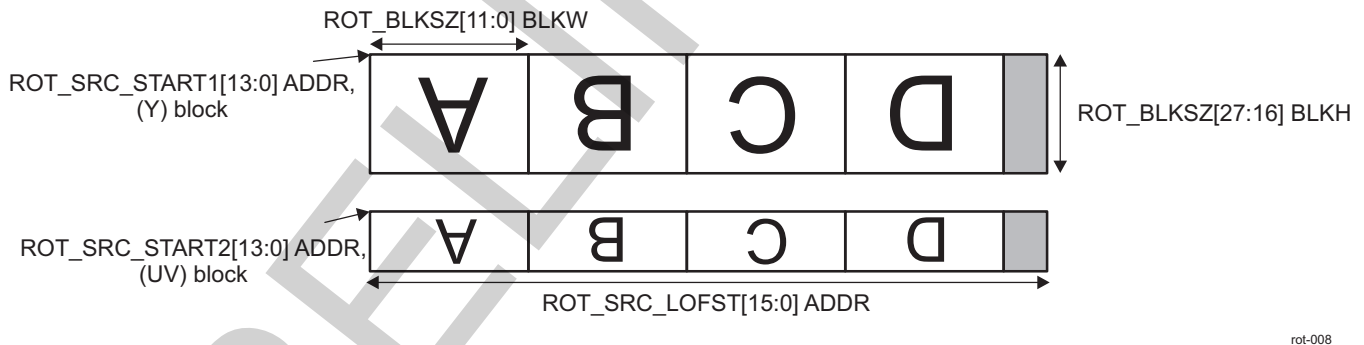
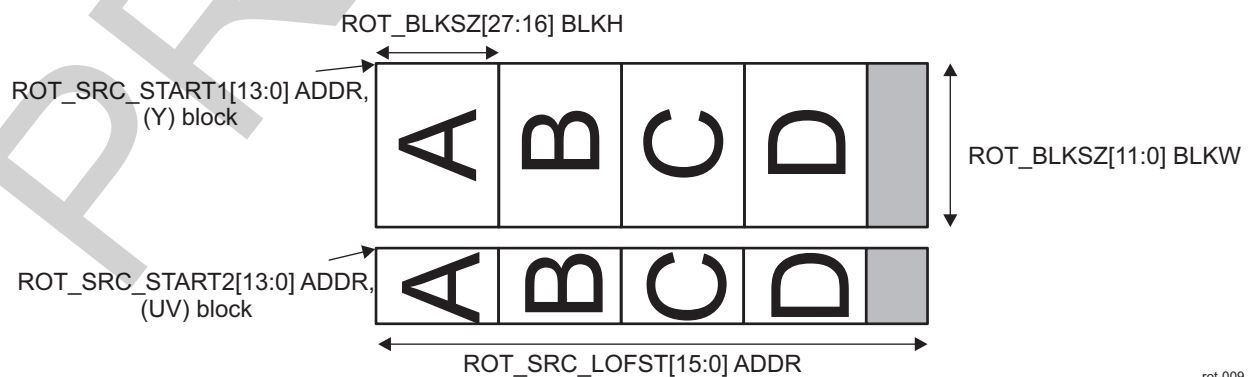


Figure 8-293. ISS SIMCOP ROT 270-Degree Block Rotation



The operation is configured with these parameters:

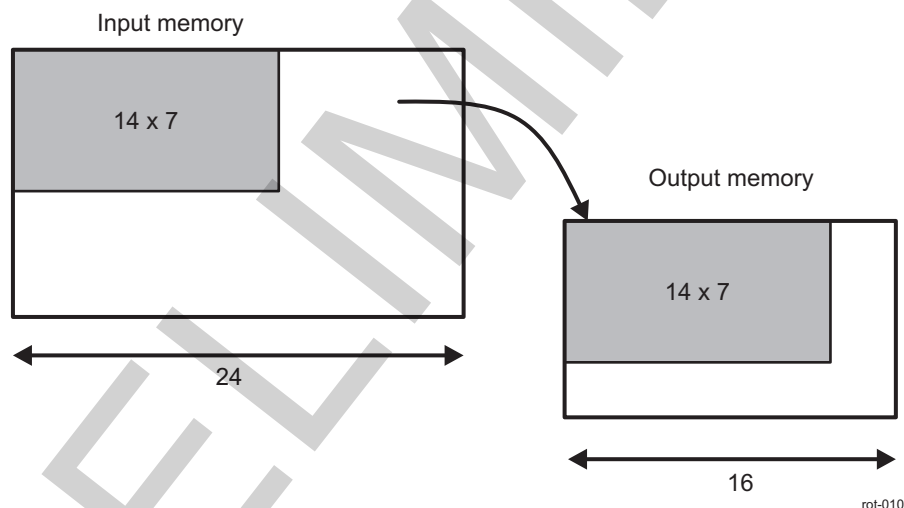
- [ROT_CFG\[2:0\]](#) OP (rotation orientation)
- [ROT_CFG\[6:4\]](#) FMT (data format)
- [ROT_CFG\[15:12\]](#) NBLKS (number of blocks minus 1; register value of 0 means one block, etc.)
- [ROT_BLKSZ\[11:0\]](#) BLKW (width of each block; all blocks have the same width/height)
- [ROT_BLKSZ\[27:16\]](#) BLKH (height of each block)
- [ROT_SRC_START1\[13:0\]](#) ADDR (starting address of the first input block)
- [ROT_SRC_LOFST\[15:0\]](#) ADDR (line offset of input block)
- [ROT_DST_START1\[13:0\]](#) ADDR (starting address of the first output block)
- [ROT_DST_LOFST\[15:0\]](#) ADDR (line offset of output block)
- [ROT_SRC_START2\[13:0\]](#) ADDR (starting address of the first input UV block, if format is YUV4:2:0)
- [ROT_DST_START2\[13:0\]](#) ADDR (starting address of the first output UV block, if format is YUV4:2:0)

8.4.7.3.8.4 ISS SIMCOP ROT Data-Block Shifting

The ROT supports shifting of 2-dimensional (2D) data blocks in 8-bit granularity. This function is intended to supplement the SIMCOP DMA module, which operates on 128-bit alignment.

[Figure 8-294](#) is an example of a 14 × 7-byte data block copied from one location in input memory to another location in output memory.

Figure 8-294. ISS SIMCOP ROT Data-Block Shifting Example



The following parameters are specified:

- [ROT_BLKSZ\[11:0\]](#) BLKW = 14 (in bytes)
- [ROT_BLKSZ\[27:16\]](#) BLKH = 7 (in rows)
- [ROT_SRC_LOFST\[15:0\]](#) LOFST = 24 (in bytes)
- [ROT_DST_LOFST\[15:0\]](#) LOFST = 16 (in bytes)

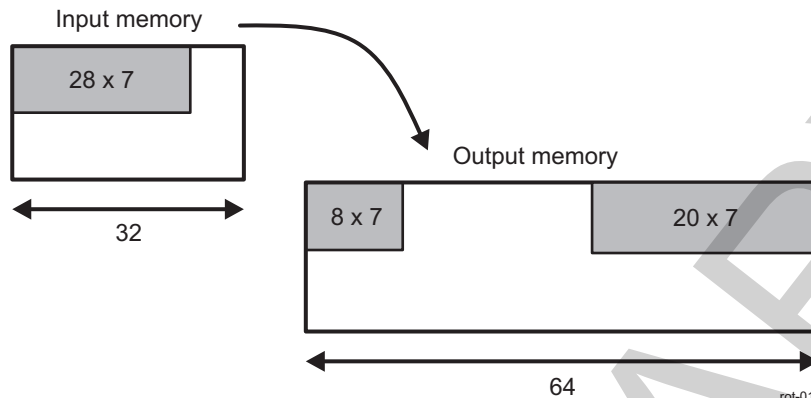
NOTE: This function can be used to shift horizontally as well as vertically.

8.4.7.3.8.5 ISS SIMCOP ROT Data-Block Horizontal Circular Shifting

The ROT supports shifting of 2D data blocks in 8-bit granularity, with horizontal circular buffer addressing. This function is intended to supplement the SIMCOP DMA module, which operates on 128-bit alignment.

[Figure 8-295](#) is an example of a 28 × 7-byte data block copied from one location in input memory to another location in output memory, and horizontal wrap-around occurs in the output memory.

Figure 8-295. ISS SIMCOP ROT Horizontal Circular Shifting Example



The following parameters are specified:

- `ROT_BLKSZ[11:0]` BLKW = 28 (in bytes)
- `ROT_BLKSZ[27:16]` BLKH = 7 (in rows)
- `ROT_SRC_LOFST[15:0]` LOFST = 32 (in bytes)
- `ROT_DST_LOFST[15:0]` LOFST = 64 (in bytes)

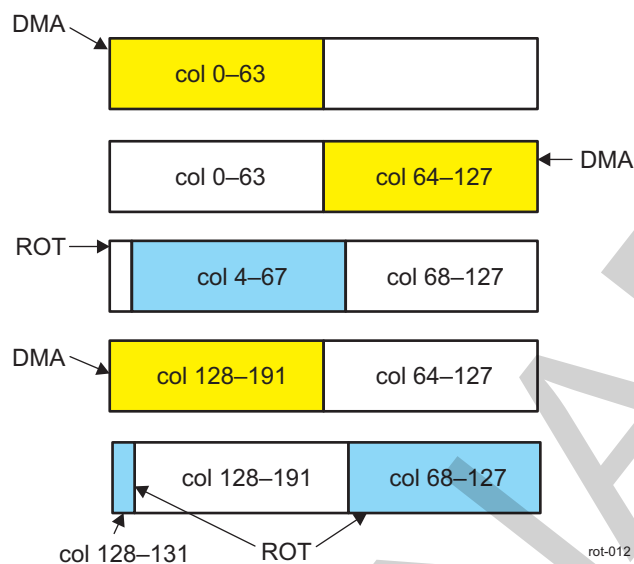
Wrapping around is allowed in the input memory, in the output memory, or in both. For this mode of operation, the line offset of the source and destination must be a power of 2, and at least 32 bytes. Source and destination line offsets can be different. This function is used to handle misaligned SDRAM data. The following example shows that the line offset is at least the minimal transfer width, or the SDRAM burst. For target applications, 32 bytes is the minimal burst size to support.

NOTE: This function can be used to shift horizontally as well as vertically. Input and output blocks can also have different line offsets.

This mode of operation is intended to be used to manage 2D data blocks that are out of SDRAM alignment (for example, to crop out the left-most 2 pixels of the ISP YUV4:2:2 output image before JPEG compression). Assume that the ISP output is 64-byte SDRAM burst-aligned; thus, the starting address for JPEG input is 4 bytes out of alignment. Without the horizontal circular shifting function, the best solution is to use wide data blocks (for example, 128 pixels = 256 bytes wide) to reduce the bandwidth penalty of misalignment (costing five bursts to get four bursts worth of data). With horizontal circular shifting, the bandwidth penalty can be eliminated. In this example, the SIMCOP DMA is configured to transfer aligned data, and the ROT is used to perform the crop-out. A memory transaction log would be:

- The DMA writes columns 0–63, starting at byte address 0.
- The DMA writes columns 64–127, starting at byte address 64.
- The ROT module reads columns 4–67, starting at byte address 4.
- The DMA writes columns 128–191, starting at byte address 0.
- The ROT module reads columns 68–131, starting at byte address 68, and so on.

Figure 8-296 shows the data movement by the DMA and the ROT.

Figure 8-296. ISS SIMCOP ROT Using Horizontal Circular Shifting to Manage Misaligned Data

8.4.7.4 ISS SIMCOP ROT Module Programming Guide

8.4.7.4.1 ISS SIMCOP ROT Low-Level Programming Models

This section describes the low-level programming sequences for configuration and use of the ROT.

8.4.7.4.1.1 ISS SIMCOP ROT Global Initialization

8.4.7.4.1.1.1 ISS SIMCOP ROT Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the ROT is to be used for the first time after a device reset. Initialization of surrounding modules is based on the integration and environment of the module.

[Table 8-1428](#) describes the global initialization of the surrounding modules.

Table 8-1428. ISS SIMCOP ROT Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------------|--|
| SIMCOP (clock management) | The ROT functional clock must be enabled. See Section 8.4.7.3.2, ISS SIMCOP ROT Clock Configuration . |
| SIMCOP (power management) | The ROT must be enabled (SIMCOP_CLKCTRL[7] ROT_A). See Section 8.4.1.2.1, ISS SIMCOP Local Power and Clock Management . |
| Buffers | Configure the ROT access to the image buffer inside the SIMCOP_HWSEQ_STEP_SWITCH_i register. See Section 8.4.2, ISS SIMCOP Hardware Sequencer and Buffers Module . |
| SIMCOP IRQ merger | Configure SIMCOP to handle the ROT interrupts. See Section 8.4.1.2.3, Interrupt Merger . |
| SIMCOP hardware sequencer | Configure the hardware sequencer to activate the ROT. See Section 8.4.2, ISS SIMCOP Hardware Sequencer and Buffers Module . |

8.4.7.4.1.1.2 ISS SIMCOP ROT Global Initialization

[Table 8-1429](#) describes the global initialization of the ROT.

Table 8-1429. ISS SIMCOP ROT Global Initialization of the ROT

| Step | Register/Bit Field/Programming Model | Value |
|-----------------|--------------------------------------|-------|
| Enable the ROT. | ROT_CTRL [0] EN | 0x0 |

8.4.7.4.1.2 ISS SIMCOP ROT Operational Modes Configuration

8.4.7.4.1.2.1 ISS SIMCOP ROT Rotation

The proper value for the trigger source bit ([ROT_CFG](#)[8] TRIG_SRC) is set depending on whether the operation is to be triggered by software, writing to MMR, or by the hardware sequencer. [Table 8-1430](#) lists the procedure to set the value of the trigger source bit.

Table 8-1430. ISS SIMCOP ROT Trigger Source Bit Value

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Configure the degree of rotation. | ROT_CFG [2:0] OP | xxx |
| Configure the data format. | ROT_CFG [6:4] FMT | xxx |
| Specify the block width and height. | ROT_BLKSZ [11:0] BLKW ROT_BLKSZ [27:16] BLKH | xxx |
| Specify the input and output starting addresses. | ROT_SRC_START1 [13:0] ADDR, ROT_DST_START1 [13:0] ADDR | xxx |
| Specify the line offsets. | ROT_SRC_LOFST [15:0] LOFST, ROT_DST_LOFST [15:0] LOFST | xxx |

Table 8-1430. ISS SIMCOP ROT Trigger Source Bit Value (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| For UV data of YUV4:2:0, input and output second starting addresses. | ROT_SRC_START2 [13:0] ADDR, ROT_DST_START2 [13:0] ADDR | xxx |

8.4.7.4.1.2.2 ISS SIMCOP ROT Data-Block Shifting

[Table 8-1431](#) lists the bit field values for data-block shifting.

Table 8-1431. ISS SIMCOP ROT Data-Block Shifting

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Configure shifting. | ROT_CFG [2:0] OP | xxx |
| Set the data shifting block. | ROT_CFG [6:4] FMT | xxx |
| Specify the block width and height. | ROT_BLKSZ [11:0] BLKW, ROT_BLKSZ [27:16] BLKH | xxx |
| Specify the input and output starting addresses. | ROT_SRC_START1 [13:0] ADDR, ROT_DST_START1 [13:0] ADDR | xxx |
| Specify the line offsets. | ROT_SRC_LOFST [15:0] LOFST, ROT_DST_LOFST [15:0] LOFST | xxx |

Once the input data and output buffer are available, the [ROT_CTRL](#)[0] EN bit is set to 1 to trigger the operation through software. Alternatively, DMA transfer(s) and the hardware sequencer are configured to trigger the ROT with the hardware start signal when appropriate.

8.4.7.5 ISS SIMCOP ROT Register Manual

8.4.7.5.1 ISS SIMCOP ROT Instance Summary

Table 8-1432 lists the ROT instance.

Table 8-1432. ISS SIMCOP ROT Instance Summary

| Module Name | Base Address L3 Interconnect | Base Address Cortex-M3 Private Access | Size |
|-------------|---------------------------------|--|----------|
| ROT | 0x5202 0700 | 0x5506 0700 | 64 bytes |

NOTE: Private Access is an access that does not use the L3/L4 interconnects.

8.4.7.5.2 ISS SIMCOP ROT Registers

8.4.7.5.2.1 ISS SIMCOP ROT Register Summary

Table 8-1433 summarizes the ROT registers.

Table 8-1433. ROT Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-M3 Private Access |
|----------------|------|--------------------------|----------------|-------------------------------------|---|
| ROT_REVISION | R | 32 | 0x0000 0000 | 0x5202 0700 | 0x5506 0700 |
| ROT_CTRL | W | 32 | 0x0000 0004 | 0x5202 0704 | 0x5506 0704 |
| ROT_CFG | RW | 32 | 0x0000 0008 | 0x5202 0708 | 0x5506 0708 |
| ROT_BLKSZ | RW | 32 | 0x0000 000C | 0x5202 070C | 0x5506 070C |
| ROT_SRC_START1 | RW | 32 | 0x0000 0010 | 0x5202 0710 | 0x5506 0710 |
| ROT_SRC_LOFST | RW | 32 | 0x0000 0014 | 0x5202 0714 | 0x5506 0714 |
| ROT_DST_START1 | RW | 32 | 0x0000 0018 | 0x5202 0718 | 0x5506 0718 |
| ROT_DST_LOFST | RW | 32 | 0x0000 001C | 0x5202 071C | 0x5506 071C |
| ROT_SRC_START2 | RW | 32 | 0x0000 0020 | 0x5202 0720 | 0x5506 0720 |
| ROT_DST_START2 | RW | 32 | 0x0000 0024 | 0x5202 0724 | 0x5506 0724 |

8.4.7.5.2.2 ISS SIMCOP ROT Register Descriptions

through describe the ROT registers.

Table 8-1434. ROT_REVISION

| | | | |
|------------------|----------------------------|----------|-------------------------|
| Address Offset | 0x0000 0000 | Instance | ROT_L3 ROT_CORTEX-M3 |
| Physical Address | 0x5202 0700 0x5506 0700 | | |
| Description | Module revision | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | RESERVED | IP Revision | R | TI Internal Data |

Table 8-1435. Register Call Summary for Register ROT_REVISION

ISS Still Image Coprocessor

- [ISS SIMCOP ROT Register Manual: \[0\]](#)

Table 8-1436. ROT_CTRL

| | | | |
|------------------|----------------------------|----------|---------------|
| Address Offset | 0x0000 0004 | Instance | ROT_L3 |
| Physical Address | 0x5202 0704 0x5506 0704 | | ROT_CORTEX-M3 |
| Description | Control | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----------|----|----|----|----|---|---|---|---|---|---|----|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BUSY | RESERVED | | | | | | | | | | | EN | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | BUSY | Idle/busy status (read-only) 0 = Idle, 1 = Busy | R | 0 |
| 14:1 | RESERVED | | R | 0x0000 |
| 0 | EN | Module enable, writing 1 starts the module; always reads as 0. | W | 0 |

Table 8-1437. Register Call Summary for Register ROT_CTRL

ISS Still Image Coprocessor

- [ISS SIMCOP ROT Functional Description: \[0\]](#)
- [ISS SIMCOP ROT Module Programming Guide: \[1\] \[2\]](#)
- [ISS SIMCOP ROT Register Manual: \[3\]](#)

Table 8-1438. ROT_CFG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0008 | | | | | | | | | | | | | | | | Instance ROT_L3 ROT_CORTEX-M3 | | | | | | | | | | | | | | | |
| Physical Address | 0x5202 0708 0x5506 0708 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Configuration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----------|------------|----------|----------|-----|---|----------|----|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | NBLKS | | RESERVED | AUTOGATING | TRIG_SRC | RESERVED | FMT | | RESERVED | OP | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | NBLKS | Number of blocks minus 1 0: 1 block, 1: 2 blocks, etc. | RW | 0x0 |
| 11:10 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 9 | AUTOGATING | Internal interconnect and functional clock gating 0: Interconnect and functional clocks are free-running. 1: Automatic clock gating is applied, based on the interface activity for the interface clock, and on the functional activity for the functional clocks. | RW | 1 |
| 8 | TRIG_SRC | Trigger source 0 = MMR write 1 = Hardware start signal | RW | 0 |
| 7 | RESERVED | | R | 0 |
| 6:4 | FMT | Data format 0 = 8-bit data 1 = 16-bit data 2 = 32-bit data 3 = YUV4:2:2 data 4 = YUV4:2:0 data | RW | 0x0 |
| 3 | RESERVED | | R | 0 |
| 2:0 | OP | Operation 0 = Rotate 0 degree 1 = Rotate 90 degrees 2 = Rotate 180 degrees 3 = Rotate 270 degrees 4 = Data shift (FMT = 0) 5 = Horizontal circular (FMT = 0) shift | RW | 0x0 |

Table 8-1439. Register Call Summary for Register ROT_CFG

ISS Still Image Coprocessor

- [ISS SIMCOP ROT Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [ISS SIMCOP ROT Module Programming Guide: \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [ISS SIMCOP ROT Register Manual: \[13\]](#)

Table 8-1440. ROT_BLKSZ

| | | | |
|-------------------------|----------------------------|-----------------|-------------------------|
| Address Offset | 0x0000 000C | Instance | ROT_L3 ROT_CORTEX-M3 |
| Physical Address | 0x5202 070C 0x5506 070C | | |
| Description | Block size | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | BLKH | | | | | | | | RESERVED | | | | | | | | BLKW | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:16 | BLKH | Block height, in pixels (YUV4:2:0/4:2:2) or number of rows (8-/16-/32-bit). Should be a multiple of 8, and at least 8, for rotation. Should be at least 1 for data shifting. | RW | 0x000 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:0 | BLKW | Block width, in pixels (YUV4:2:0/4:2:2) or data units (8-/16-/32-bit). Should be a multiple of 8, and at least 8, for rotation. Should be at least 4 for data shifting. | RW | 0x000 |

Table 8-1441. Register Call Summary for Register ROT_BLKSZ

ISS Still Image Coprocessor

- [ISS SIMCOP ROT Functional Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [ISS SIMCOP ROT Module Programming Guide: \[6\] \[7\] \[8\] \[9\]](#)
- [ISS SIMCOP ROT Register Manual: \[10\]](#)

Table 8-1442. ROT_SRC_START1

| | | | |
|-------------------------|--|-----------------|-------------------------|
| Address Offset | 0x0000 0010 | Instance | ROT_L3 ROT_CORTEX-M3 |
| Physical Address | 0x5202 0710 0x5506 0710 | | |
| Description | Source starting address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | ADDR | Byte address Should be a multiple of 8 for rotation. No constraint for data shifting. | RW | 0x0000 |

Table 8-1443. Register Call Summary for Register ROT_SRC_START1

ISS Still Image Coprocessor

- [ISS SIMCOP ROT Functional Description: \[0\]](#)
- [ISS SIMCOP ROT Module Programming Guide: \[1\] \[2\]](#)
- [ISS SIMCOP ROT Register Manual: \[3\]](#)

Table 8-1444. ROT_SRC_LOFST

| | | | |
|-------------------------|--|-----------------|-------------------------|
| Address Offset | 0x0000 0014 | Instance | ROT_L3 ROT_CORTEX-M3 |
| Physical Address | 0x5202 0714 0x5506 0714 | | |
| Description | Source line offset | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOFST | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | LOFST | Line offset in bytes Should be a multiple of 8 for rotation and normal data shifting. Should be a power of 2 and at least 32 for horizontal circular shifting. | RW | 0x0000 |

Table 8-1445. Register Call Summary for Register ROT_SRC_LOFST

ISS Still Image Coprocessor

- [ISS SIMCOP ROT Functional Description: \[0\] \[1\] \[2\]](#)
- [ISS SIMCOP ROT Module Programming Guide: \[3\] \[4\]](#)
- [ISS SIMCOP ROT Register Manual: \[5\]](#)

Table 8-1446. ROT_DST_START1

| | | | |
|-------------------------|------------------------------|-----------------|-------------------------|
| Address Offset | 0x0000 0018 | Instance | ROT_L3 ROT_CORTEX-M3 |
| Physical Address | 0x5202 0718 0x5506 0718 | | |
| Description | Destination starting address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | ADDR | Byte address Should be a multiple of 8 for rotation. No constraint for data shifting. | RW | 0x0000 |

Table 8-1447. Register Call Summary for Register ROT_DST_START1

ISS Still Image Coprocessor

- [ISS SIMCOP ROT Functional Description: \[0\]](#)
- [ISS SIMCOP ROT Module Programming Guide: \[1\] \[2\]](#)
- [ISS SIMCOP ROT Register Manual: \[3\]](#)

Table 8-1448. ROT_DST_LOFST

| | | | |
|-------------------------|----------------------------|-----------------|-------------------------|
| Address Offset | 0x0000 001C | Instance | ROT_L3 ROT_CORTEX-M3 |
| Physical Address | 0x5202 071C 0x5506 071C | | |
| Description | Destination line offset | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LOFST | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | LOFST | Line offset in bytes Should be a multiple of 8 for rotation and normal data shifting. Should be a power of 2 and at least 32 for horizontal circular shifting. | RW | 0x0000 |

Table 8-1449. Register Call Summary for Register ROT_DST_LOFST

ISS Still Image Coprocessor

- [ISS SIMCOP ROT Functional Description: \[0\] \[1\] \[2\]](#)
- [ISS SIMCOP ROT Module Programming Guide: \[3\] \[4\]](#)
- [ISS SIMCOP ROT Register Manual: \[5\]](#)

Table 8-1450. ROT_SRC_START2

| | | | |
|-------------------------|--|-----------------|-------------------------|
| Address Offset | 0x0000 0020 | Instance | ROT_L3 ROT_CORTEX-M3 |
| Physical Address | 0x5202 0720 0x5506 0720 | | |
| Description | Source starting address 2 (only form YUV4:2:0 FMT = 2) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | ADDR | Byte address, should be a multiple of 8. | RW | 0x0000 |

Table 8-1451. Register Call Summary for Register ROT_SRC_START2

ISS Still Image Coprocessor

- [ISS SIMCOP ROT Functional Description: \[0\]](#)
- [ISS SIMCOP ROT Module Programming Guide: \[1\]](#)
- [ISS SIMCOP ROT Register Manual: \[2\]](#)

Table 8-1452. ROT_DST_START2

| | | | |
|-------------------------|---|-----------------|-------------------------|
| Address Offset | 0x0000 0024 | Instance | ROT_L3 ROT_CORTEX-M3 |
| Physical Address | 0x5202 0724 0x5506 0724 | | |
| Description | Destination starting address 2 (only form YUV4:2:0 FMT = 2) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:0 | ADDR | Byte address, should be a multiple of 8. | RW | 0x0000 |

Table 8-1453. Register Call Summary for Register ROT_DST_START2

ISS Still Image Coprocessor

- [ISS SIMCOP ROT Functional Description: \[0\]](#)
- [ISS SIMCOP ROT Module Programming Guide: \[1\]](#)
- [ISS SIMCOP ROT Register Manual: \[2\]](#)

Face Detect

This chapter describes the features and functions of the Face Detect (FDIF) module of the multimedia device.

| Topic | Page |
|---------------------------------------|------|
| 9.1 Face Detect Overview | 2120 |
| 9.2 FDIF Integration | 2122 |
| 9.3 FDIF Functional Description | 2124 |
| 9.4 FDIF Programming Guide | 2128 |
| 9.5 FDIF Register Manual | 2131 |

9.1 Face Detect Overview

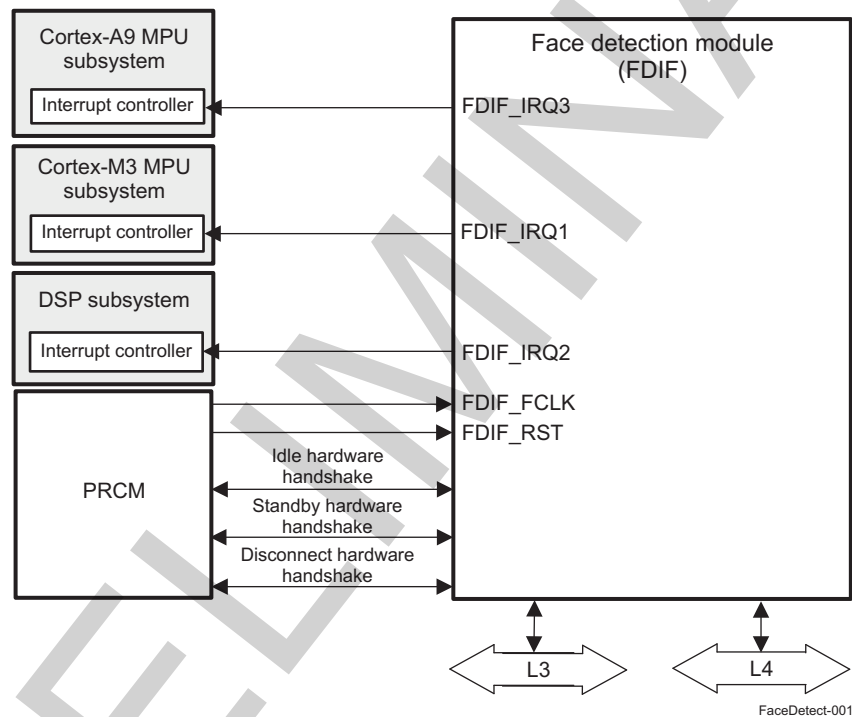
The FDIF module performs face detection within a picture stored in memory (QVGA luminance data resolution). This module is typically used for video encoding and face-based priority auto-focusing.

The face detect (FD) core is a standalone module: it embeds its own direct memory access (DMA) engine for accessing data in memory. The FD core is under microprocessor unit (MPU) control for its initialization and to start the processing operation.

The FD core supports single input resolution (QVGA) in a single format (8-bit luma). The FD core requires the input image to be stored in synchronous dynamic random access memory (SDRAM). The core also requires working memory mapped in SDRAM. The input image data (320x240) requires 75KB for the SDRAM and 51.25KB for the working memory.

Figure 9-1 is an overview of the FDIF. Three interrupt lines go to the three central processing units (CPUs) to allow control of the FD core module by different processors, but only one interrupt at a time can be active. The three interrupt lines provide flexibility for controlling the module.

Figure 9-1. Face Detect Highlight



9.1.1 Main Features

The FDIF has the following features:

- Two interconnects interface:
 - 32-bit-wide level 4 (L4) interface for register configuration
 - 32-bit-wide level 3 (L3) interface for command
- Supports the IDLE, STANDBY, and DISCONNECT protocols
- 3rd party IP features: For information about the input image features and detection capabilities, see [Table 9-1](#).

Table 9-1. 3rd Party IP Features

| Items | Description |
|------------------|--|
| Input image size | QVGA input image size H x V = 320 x 240 |

Table 9-1. 3rd Party IP Features (continued)

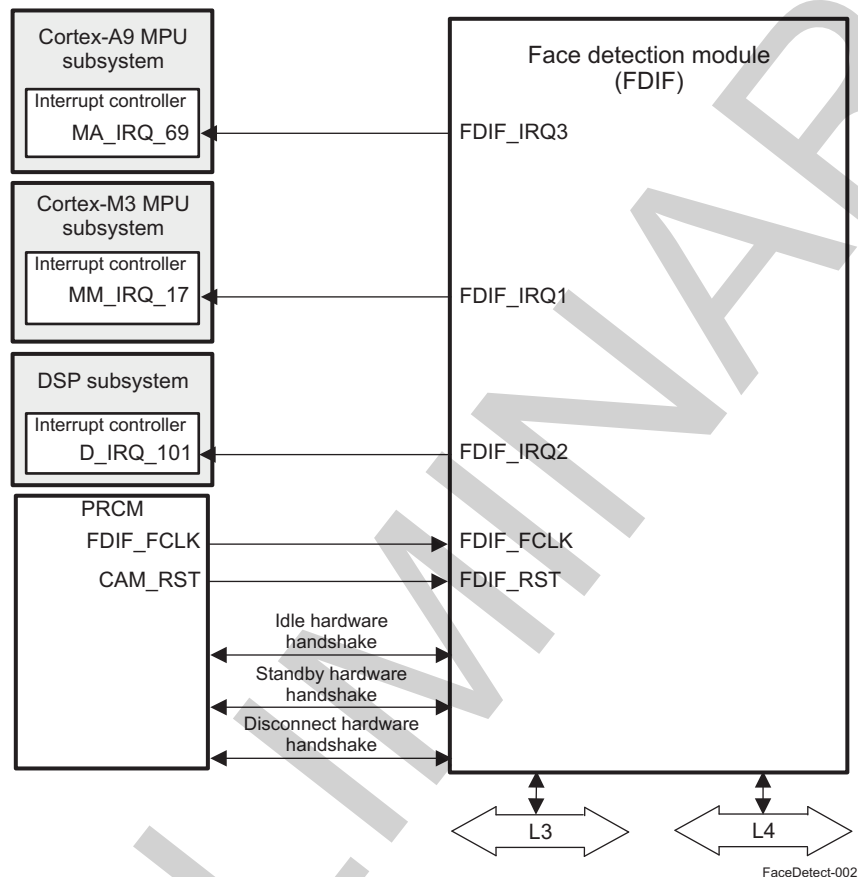
| Items | Description |
|-----------------------------|--|
| Input data format | 8-bit gray scale data in little-endian format (color pictures must be converted before FD can be applied) 0x00 = black and 0xFF = white |
| Face inclination | ± 45 degrees |
| Face direction | Up/down: ± 30 degrees Left/right: ± 60 degrees |
| Maximum detection count | 35 faces |
| Detection direction | The face orientation must be selected from the following possibilities: 0 degrees: Faces are vertical. + 90 degrees: Faces are rotated right by 90 degrees. – 90 degrees: Faces are rotated left by 90 degrees. |
| Detection minimum face size | Four grades are available: 20 pixels 25 pixels 32 pixels 40 pixels |
| Detection area | Detection start position: X = 0 to 160 Y = 0 to 120 Detection area size: X = 160 to 320 Y = 120 to 240 |
| Detection result | The following information is provided by the module for each face: Size Position Angle Confidence level |

9.2 FDIF Integration

This section describes the integration of FDIF in the device, including information about clocks, resets, and hardware requests.

Figure 9-2 shows the integration of the module in the device.

Figure 9-2. FDIF Integration



NOTE: For more information about the IDLE, STANDBY, and DISCONNECT hardware handshakes, see [Chapter 3, Power, Reset, and Clock Management](#).

Table 9-2 through Table 9-4 summarize the integration of the module in the device. For more information about the power domain or the clock and reset signals, see [Chapter 3, Power, Reset, and Clock Management](#).

Table 9-2. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| Face Detect | PD_CAM | No | L3 |

Table 9-3. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|-------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |

Table 9-3. Clocks and Resets (continued)

| | | | | |
|------------------------|--------------------------------|---------------------------|---------------|--|
| Face detect | FDIF_FCLK | FDIF_FCLK | PRCM | For information about PRCM clock gating and management, see Chapter 3, Power, Reset, and Clock Management . |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| Face detect | FDIF_RST | CAM_RST | PRCM | For information about PRCM reset sources and distribution, see Chapter 3, Power, Reset, and Clock Management . |

Table 9-4. Hardware Requests

| | | | | |
|---------------------------|---------------------------|--------------------------------|--------------------------|--|
| Interrupt Requests | | | | |
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| Face detect | FDIF_IRQ3 | MA_IRQ_69 | Cortex™-A9 MPU subsystem | FDIF interrupt to the Cortex-A9 MPU subsystem |
| Face detect | FDIF_IRQ1 | MM_IRQ_17 | Cortex™-M3 MPU subsystem | FDIF interrupt to the Cortex-M3 MPU subsystem |
| Face detect | FDIF_IRQ2 | D_IRQ_101 | DSP subsystem | FDIF interrupt to the digital signal processor (DSP) subsystem |
| No DMA Requests | | | | |

NOTE: For more information about interrupt sources, see [Section 9.3.4, Interrupts and Events](#).

9.3 FDIF Functional Description

9.3.1 FDIF Block Description

The FDIF is a standalone module. It has a port connected to the L4 interconnect, which is used for configuration, and a port connected to the L3 interconnect, which is used to read and write data to the system memory.

CAUTION

These ports are accessible only in 32 bits.

The FDIF core contains the following submodules:

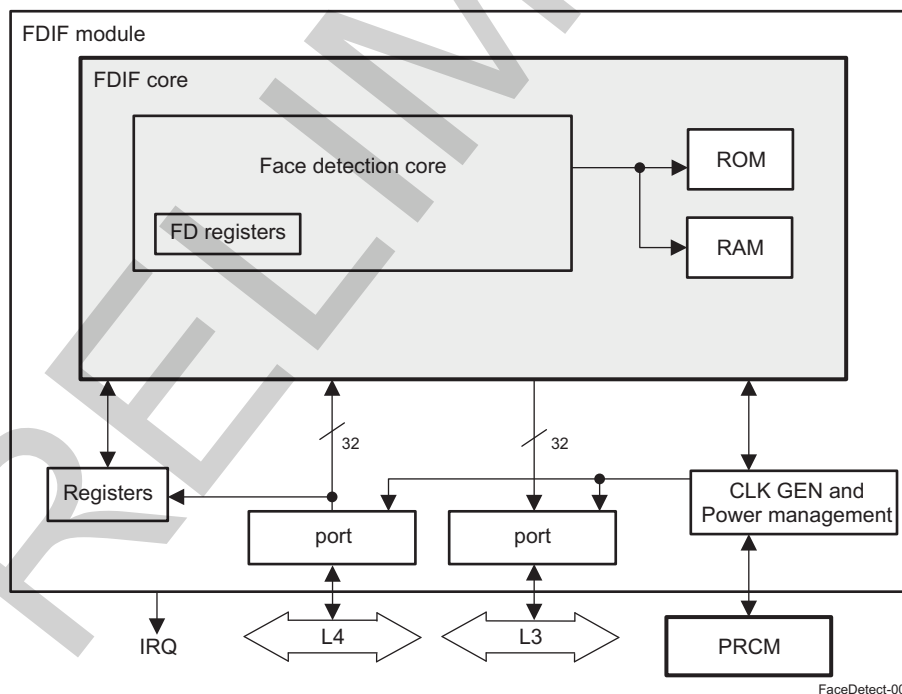
- Face detection (FD) IP core
- RAM and ROM memories

The FDIF module wraps the FD core for integration in the device. The following submodules are added:

- Clock generation
- Interrupt generation
- Power management
- L3 and L4 interface ports: Two ports required to decorrelate the FDIF clocks from other system clocks, one on the L3 port interface, and one on the L4 port interface.

Figure 9-3 shows the overall architecture of the FDIF.

Figure 9-3. FDIF Block Diagram



9.3.2 Software Reset

The module is reset by writing the [FDIF_SYSCONFIG\[0\]](#) SOFTRESET bit to 1. The bit is automatically reset by hardware. During reads, it always returns 0.

The FD core also provides a software reset setup by the [FD_CTRL\[0\]](#) SRST bit, but it is strongly recommended to use only the [FDIF_SYSCONFIG\[0\]](#) SOFTRESET bit.

9.3.3 System Power Management

There is one clock domain in FDIF: the L4 port domain and L3 port domain are synchronized with the module functional clock domain, FDIF_FCLK.

Table 9-5 lists the power-management features available for FDIF.

NOTE:

- For more information about source clock gating, see [Chapter 3, Power, Reset, and Clock Management](#).
- For descriptions of idle mode and standby mode and the power, reset, and clock management (PRCM) power handshake, see [Chapter 3, Power, Reset, and Clock Management](#).

Table 9-5. Local Power-Management Features

| Feature | Registers | Description |
|------------------------|------------------------------------|---|
| Clock autogating | No software control for it. | It is always enabled. |
| Slave idle modes | FDIF_SYSCONFIG[3:2] IDLEMODE | Force-idle, no-idle, and smart-idle modes are available |
| Clock activity | N/A | |
| Master standby modes | FDIF_SYSCONFIG[5:4] STANDBYMODE | Force-standby, no-standby, and smart-standby mode modes are available. See Section 9.3.3.2.1 for more information. |
| Global wake-up enable | N/A | |
| Wake-up sources enable | N/A | |

9.3.3.1 Autogating

The FDIF performs clock autogating whenever possible. There is no software control for it; it is always enabled.

9.3.3.2 PRCM Hardware Handshake

The FDIF supports the IDLE protocol between the L4 port and the PRCM module and the STANDBY protocol between the L3 port and the PRCM module. The FDIF also supports the DISCONNECT protocol on the L4 and L3 ports.

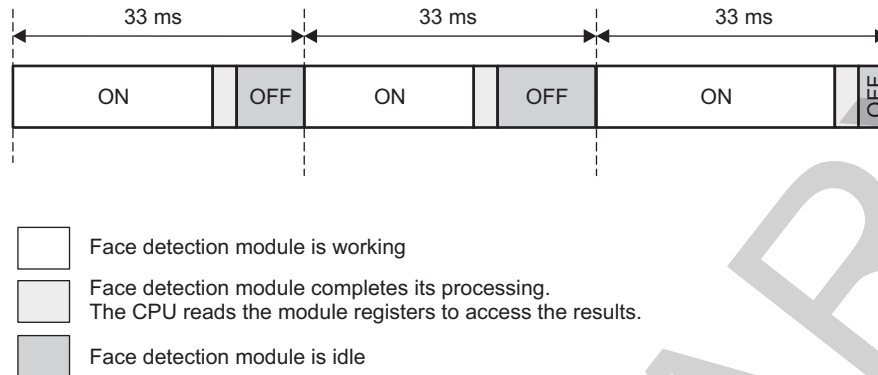
The FDIF first initiates the STANDBY protocol with the PRCM module, which in turn generates the IDLE protocol with the FDIF. The functional clock is gated by the PRCM module only when the IDLE and STANDBY power-management protocols are complete.

For more information about these protocols, see [Chapter 3, Power, Reset, and Clock Management](#).

9.3.3.2.1 Protocol Transitions

The FDIF goes to IDLE as soon as it is done processing and the MPU has read the results of the computation.

Figure 9-4 shows the principle. The 33-ms period corresponds to 30 fps, which is usually the target for imaging applications. Time spent in READ state (= ON state) is always the same, and the time in OFF state depends on the time spent in ON state.

Figure 9-4. FDIF Power-Management Transitions

FaceDetect-004

9.3.3.2.1.1 Normal Mode to Idle Mode

Software programs [FDIF_SYSCONFIG\[5:4\] STANDBYMODE = 0x2](#) to program the power-management mode.

When its processing is complete, the FD core generates the [FINISH_IRQ](#) event. At this time the [FD_CTRL\[1\] RUN](#) bit reflects that the FD core is idle.

Software running on the MPU reads the results of the FD algorithm. When it finishes reading the results, it clears the [FDIF_IRQSTATUS_RAW_j\[8\] FINISH_IRQ](#) bit and writes [FDIF_CTRL\[5\] MSTANDBY = 1](#) to initiate the MStandby signal generation. For more information about the STANDBY and IDLE hardware handshakes, see [Chapter 3, Power, Reset, and Clock Management](#).

The FDIF clock can be gated only when the STANDBY and IDLE protocols are complete.

9.3.3.2.1.2 Idle Mode to Normal Mode

The PRCM module deasserts a signal to the FDIF under software control so that the module can switch back to normal mode. Then, the module functional clock is ensured and stable. Software disables the MStandby signal generation by writing [FDIF_CTRL\[5\] MSTANDBY = 0](#), and then polls for [FDIF_CTRL\[6\] MSTANDBY_HDSHK = 1](#) to ensure that the power-management handshaking is complete. For more information about the standby and idle modes, see [Chapter 3, Power, Reset, and Clock Management](#).

9.3.4 Interrupts and Events

The FDIF has three interrupt lines ([FDIF_IRQ1](#), [FDIF_IRQ2](#), and [FDIF_IRQ3](#)) to enable flexibility for controlling the module. Each event can be enabled to only a single interrupt line (that is, to only one interrupt controller), because only one interrupt at a time can be active.

The FDIF generates events listed in [Table 9-6](#). An interrupt can be enabled by using the [FDIF_IRQENABLE_SET_j](#) register and can be disabled by using the [FDIF_IRQENABLE_CLR_j](#) register.

Table 9-6. Interrupts and Events Description

| Event Name | Description |
|---|---|
| FDIF_IRQSTATUS_RAW_j / FDIF_IRQSTATUS_j[8] FINISH_IRQ | This event is generated by the FD IP core. It flags the completion of the processing by the IP. |
| FDIF_IRQSTATUS_RAW_j / FDIF_IRQSTATUS_j[0] ERR_IRQ | This event flags that the L3 port has received an error. |

The [FDIF_IRQSTATUS_RAW_j](#) and [FDIF_IRQSTATUS_j](#) registers give the interrupt status. The difference between them is that the [FDIF_IRQSTATUS_RAW_j](#) register is set even if events are not enabled.

The [FDIF_IRQSTATUS_j](#) register can be used to clear events.

9.3.5 Typical Use

Typically, FD processing is applied to buffers provided by the ISP module, already in the correct format.

To enable FD processing, the 32-bit address of the input image in memory must be set up in the [FDIF_PICADDR](#) register, and the 32-bit address of the working memory must be set up in the [FDIF_WKADDR](#) register.

The detection condition settings can be set with the following registers:

- [FD_DCOND](#)
- [FD_STARTX](#)
- [FD_STARTY](#)
- [FD_SIZEX](#)
- [FD_STARTY](#)

For more information, see [Section 9.4, FDIF Programming Guide](#).

When the [FD_CTRL\[1\]](#) RUN bit is set to 1, the process starts. When the process is complete ([FD_CTRL\[2\]](#) FINISH = 1), the results are available in the following registers:

- [FD_DNUM](#)
- [FD_CENTERX_j](#)
- [FD_CENTERY_j](#)
- [FD_CONFSIZE_j](#)
- [FD_ANGLE_j](#)

For more information, see [Section 9.4, FDIF Programming Guide](#).

9.3.6 Performance Parameters

[Table 9-7](#) lists the register settings that affect performance.

Table 9-7. Performance Parameters

| Parameter | Comments |
|-----------------------------------|---|
| FD_DCOND[1:0] MIN | Sets the minimum face size. The permitted values are 20x20, 25x25, 32x32, and 40x40. A high value leads to higher performance. |
| FD_DCOND[3:2] DIR | Sets the detection direction setting. The permitted values are UP, RIGHT, and LEFT. The UP value should lead to better performance than RIGHT and LEFT. |
| FD_LHIT[3:0] LHIT | Sets the detection threshold. The permitted values are in the range of 0 to 9. A low value increases the FD probability detection, but it also increases false detections. |

9.3.7 L3 Interconnect Parameters

The FDIF is an initiator on the L3 interconnect. L3 accesses can be configured with the [FDIF_CTRL\[4:1\]](#) MAX_TAGS bit field and the [FDIF_CTRL\[0\]](#) WRNP bit. For more information about these parameters, see [Section 14.2 L3 interconnect](#).

9.4 FDIF Programming Guide

9.4.1 FDIF Low-level Programming Models

This section describes the low-level hardware programming sequences for the configuration and use of the FDIF.

9.4.1.1 Global Initialization

9.4.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the FDIF is to be used for the first time after a device reset. This initialization of the surrounding modules is based on the integration of the FDIF.

For more information, see [Section 9.2, FDIF Integration](#).

Table 9-8. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---|---|
| PRCM | FDIF_FCLK functional clock must be enabled. See Section 3.6.22, CD_CAM Clock Domain , in Chapter 3, Power, Reset, and Clock Management . |
| Cortex-A9 MPU interrupt controller (INTC) (or Cortex-M3 MPU INTC or DSP INTC) | The Cortex-A9 MPU (or Cortex-M3 MPU or DSP) interrupt controller must be configured to enable the interrupt request generation to the Cortex-A9 MPU (or Cortex-M3 MPU or DSP) subsystem when interrupt requests are generated by the FDIF. See the respective Functional Description in Chapter 18, Interrupt Controller , for the MPUs Section 18.4.1 , Section 18.4.2 , and the DSP interrupt request lines in Chapter 5, DSP Subsystem , for the DSP. |
| Interconnect (L3 and L4) | For more information, see Section 14.2, L3 Interconnect , and Section 14.3, L4 Interconnect . |

9.4.1.1.2 FDIF Global Initialization

9.4.1.1.2.1 Main Sequence – FDIF Global Initialization

[Table 9-9](#) lists the procedure to initialize the FDIF after a power-on or software reset.

Table 9-9. FDIF Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|------------------------------------|--------------------------------------|-------|
| Perform a software reset. | FDIF_SYSCONFIG[0] SOFTRESET | 0x1 |
| Wait until reset is finished. | FDIF_SYSCONFIG[0] SOFTRESET | 0x0 |
| Set the maximum interconnect tags. | FDIF_CTRL[4:1] MAX_TAGS | 0xA |
| Enable ERROR type Interrupt. | FDIF_IRQENABLE_SET_j[0] ERR_IRQ | 0x1 |

9.4.1.2 FD Operational Modes Configuration

9.4.1.2.1 FD Processing Modes

9.4.1.2.1.1 Main Sequence – FDIF Polling Method

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------------|---|-------|
| Set image parameters. | See Section 9.4.1.2.1.3, Subsequence – Set Image Parameters . | |
| Request the processing. | FD_CTRL[1] RUN | 0x1 |
| Wait until process is finished. | FD_CTRL[2] FINISH | 0x1 |
| Read the results. | See Section 9.4.1.2.1.4 | |

9.4.1.2.1.2 Main Sequence – FDIF Interrupt Method

| Step | Register/Bit Field/Programming Model | Value |
|-------------------------------|---|-------|
| Set image parameters. | See Section 9.4.1.2.1.3, Subsequence – Set Image Parameters . | |
| Enable FINISH type interrupt. | FDIF_IRQENABLE_SET_j[8] FINISH IRQ | 0x1 |
| Request the processing. | FD_CTRL[1] RUN | 0x1 |

WHEN INTERRUPT OCCURS:

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| IF: This is FD Process Complete Event? | FDIF_IRQSTATUS_j[8] FINISH_IRQ | 0x1 |
| Clear (Disable) FINISH type interrupt. | FDIF_IRQENABLE_CLR_j[8] FINISH IRQ | 0x1 |
| Read the results | See Section 9.4.1.2.1.4, Subsequence – Read the Results . | |
| ELSE | | |
| Clear (Disable) ERROR type Interrupt. | FDIF_IRQENABLE_CLR_j[0] ERR_IRQ | 0x1 |
| Perform a software reset. | FDIF_SYSCONFIG[0] SOFTRESET | 0x1 |
| For possible errors and the explanations of them, see Chapter 14, Interconnect . | | |
| ENDIF | | |

9.4.1.2.1.3 Subsequence – Set Image Parameters

| Step | Register/Bit Field/Programming Model | Value |
|--|---|--------|
| Set input image 32-bit address. | FDIF_PICADDR[31:5] ADDR | 0x---- |
| Set working memory 32-bit address. | FDIF_WKADDR[31:5] ADDR | 0x---- |
| Set the minimum face size. | FD_DCOND[1:0] MIN | 0x- |
| Set the face direction. | FD_DCOND[3:2] DIR | 0x- |
| Set the horizontal start position of the detection area. | FD_STARTX[7:0] STARTX | 0x- |
| Set the vertical start position of the detection area. | FD_STARTY[6:0] STARTY | 0x- |
| Set the horizontal start size of the detection area. | FD_SIZEX[8:0] SIZEX | 0x- |
| Set the vertical start size of the detection area. | FD_SIZEY[7:0] SIZEY | 0x- |
| Set the detection threshold. | FD_LHIT[3:0] LHIT | 0x- |

9.4.1.2.1.4 Subsequence – Read the Results

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Read the number of found faces | FD_DNUM [5:0] DNUM | 0x- |
| For each face detected, read the following parameters by processing loop until FD_DNUM [5:0] DNUM = 0: | | |
| For each face read X _i coordinate | FD_CENTERX_i [8:0] CENTERX | 0x- |
| For each face read Y _i coordinate | FD_CENTERY_i [7:0] CENTRY | 0x- |
| For each face read confidence level | FD_CONFSIZE_i [11:8] CONF | 0x- |
| For each face read size _i | FD_CONFSIZE_i [7:0] SIZE | 0x- |
| For each face read the angle | FD_ANGLE_i [8:0] ANGLE | 0x- |

9.5 FDIF Register Manual

9.5.1 FDIF Instance Summary

Table 9-10 is the FDIF instance.

Table 9-10. FDIF Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|------|
| FDIF | 0x4A10 A000 | 4 KB |

9.5.2 FDIF Registers

Table 9-11 summarizes the FDIF register mapping. Table 9-12 through Table 9-54 describe the register bits.

9.5.2.1 FDIF Register Summary

Table 9-11. FDIF Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | FDIF L4 Base Address |
|--|------|-----------------------|--------------------------|--------------------------|
| FDIF_REVISION | R | 32 | 0x0000 0000 | 0x4A10 A000 |
| FDIF_HWINFO | R | 32 | 0x0000 0004 | 0x4A10 A004 |
| FDIF_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4A10 A010 |
| RESERVED | R | 32 | 0x0000 0020 | 0x4A10 A020 |
| FDIF_IRQSTATUS_RA W _j ⁽¹⁾ | RW | 32 | 0x0000 0024 + (0x10 * j) | 0x4A10 A024 + (0x10 * j) |
| FDIF_IRQSTATUS _j ⁽¹⁾ | RW | 32 | 0x0000 0028 + (0x10 * j) | 0x4A10 A028 + (0x10 * j) |
| FDIF_IRQENABLE_SET j ⁽¹⁾ | RW | 32 | 0x0000 002C + (0x10 * j) | 0x4A10 A02C + (0x10 * j) |
| FDIF_IRQENABLE_CLR j ⁽¹⁾ | RW | 32 | 0x0000 0030 + (0x10 * j) | 0x4A10 A030 + (0x10 * j) |
| FDIF_PICADDR | RW | 32 | 0x0000 0060 | 0x4A10 A060 |
| FDIF_CTRL | RW | 32 | 0x0000 0064 | 0x4A10 A064 |
| FDIF_WKADDR | RW | 32 | 0x0000 0068 | 0x4A10 A068 |
| FD_CTRL | RW | 32 | 0x0000 0080 | 0x4A10 A080 |
| FD_DNUM | R | 32 | 0x0000 0084 | 0x4A10 A084 |
| FD_DCOND | RW | 32 | 0x0000 0088 | 0x4A10 A088 |
| FD_STARTX | RW | 32 | 0x0000 008C | 0x4A10 A08C |
| FD_STARTY | RW | 32 | 0x0000 0090 | 0x4A10 A090 |
| FD_SIZEX | RW | 32 | 0x0000 0094 | 0x4A10 A094 |
| FD_SIZEY | RW | 32 | 0x0000 0098 | 0x4A10 A098 |
| FD_LHIT | RW | 32 | 0x0000 009C | 0x4A10 A09C |
| FD_CENTERX _i ⁽²⁾ | R | 32 | 0x0000 0160 + (0x10 * i) | 0x4A10 A160 + (0x10 * i) |
| FD_CENTERY _i ⁽²⁾ | R | 32 | 0x0000 0164 + (0x10 * i) | 0x4A10 A164 + (0x10 * i) |
| FD_CONFSIZE _i ⁽²⁾ | R | 32 | 0x0000 0168 + (0x10 * i) | 0x4A10 A168 + (0x10 * i) |
| FD_ANGLE _i ⁽²⁾ | R | 32 | 0x0000 016C + (0x10 * i) | 0x4A10 A16C + (0x10 * i) |

⁽¹⁾ j = 0 to 2

⁽²⁾ i = 0 to 34

9.5.2.2 FDIF Register Description

Table 9-12. FDIF_REVISION

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0000 | Instance | FDIF |
| Physical Address | 0x4A10 A000 | | |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------|------|---------------------------------|
| 31:0 | REVISION | IP Revision number | R | 0x---- ---- TI Internal Data |

Table 9-13. Register Call Summary for Register FDIF_REVISION

FDIF Register Manual

- [FDIF Register Summary: \[0\]](#)

Table 9-14. FDIF_HWINFO

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0004 | Instance | FDIF |
| Physical Address | 0x4A10 A004 | | |
| Description | Information about the IP module's hardware configuration, that is, typically the module's HDL generics (if any). Actual field format and encoding is up to the module's designer to decide. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | FDIF_TAGS | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3:0 | FDIF_TAGS | Hardware design value. This bit field reflects the value of the FDIF_TAG generic parameter. 0x0: 1 tag supported 0x1: 2 tags supported [...] 0xF: 16 tags supported | R | 0xF |

Table 9-15. Register Call Summary for Register FDIF_HWINFO

FDIF Register Manual

- [FDIF Register Summary: \[0\]](#)

Table 9-16. FDIF_SYSCONFIG

| | | | |
|------------------|--------------------------------|----------|------|
| Address Offset | 0x0000 0010 | Instance | FDIF |
| Physical Address | 0x4A10 A010 | | |
| Description | Clock management configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------------|---|----------|---|----------|---|-----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | STANDBYMODE | | IDLEMODE | | RESERVED | | SOFTRESET | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|------------|
| 31:6 | RESERVED | Reserved | R | 0x00000000 |
| 5:4 | STANDBYMODE | Configuration of the local initiator state management mode. By definition, initiator may generate read/write transaction as long as it is out of STANDBY state. 0x0: Force-standby mode: local initiator is unconditionally placed in standby state. Backup mode, for debug only. 0x1: No-standby mode: local initiator is unconditionally placed out of standby state. Backup mode, for debug only. 0x2: Smart-standby mode: local initiator standby status depends on local conditions, that is, the module's functional requirement from the initiator. IP module shall not generate (initiator-related) wake-up events. 0x3: Reserved | RW | 0x2 |
| 3:2 | IDLEMODE | Configuration of the local target state management mode. By definition, target can handle read/write transaction as long as it is out of IDLE state. 0x0: Force-idle mode: local target's idle state follows (acknowledges) the system's idle requests unconditionally, that is, regardless of the IP module's internal requirements. Backup mode, for debug only. 0x1: No-idle mode: local target never enters idle state. Backup mode, for debug only. 0x2: Smart-idle mode: local target's idle state eventually follows (acknowledges) the system's idle requests, depending on the IP module's internal requirements. IP module shall not generate (IRQ- or DMA-request-related) wake-up events. 0x3: Reserved | RW | 0x2 |
| 1 | RESERVED | Reserved | R | 0 |
| 0 | SOFTRESET | Software reset. Read 0x0: Reset done, no pending action Write 0x0: No action Write 0x1: Initiate software reset Read 0x1: Reset (software or other) ongoing | RW | 0 |

Table 9-17. Register Call Summary for Register FDIF_SYSCONFIG

FDIF Functional Description

- [Software Reset: \[0\] \[1\]](#)
- [System Power Management: \[2\] \[3\]](#)
- [Protocol Transitions: \[4\]](#)

Table 9-17. Register Call Summary for Register FDIF_SYSCONFIG (continued)

FDIF Programming Guide

- [FDIF Global Initialization: \[5\] \[6\]](#)
- [FD Processing Modes: \[7\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[8\]](#)
- [FDIF Register Description: \[9\]](#)

Table 9-18. FDIF_IRQSTATUS_RAW_j

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0024 + (0x10 * j) | Instance | FDIF |
| Physical Address | 0x4A10 A024 + (0x10 * j) | | |
| Description | Per-event raw interrupt status vector, line #n. Raw status is set even if event is not enabled. Write 1 to set the (raw) status, mostly for debug. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FINISH_IRQ | RESERVED | | | | | | | | | | | | | | ERR_IRQ |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|----------|
| 31:9 | RESERVED | Reserved | R | 0x000000 |
| 8 | FINISH_IRQ | Face detection processing done. Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |
| 7:1 | RESERVED | Reserved | R | 0x00 |
| 0 | ERR_IRQ | Error received by the L3 port. Write 0x0: No action Read 0x0: No event pending Read 0x1: Event pending Write 0x1: Set event (debug) | RW W1toSet | 0 |

Table 9-19. Register Call Summary for Register FDIF_IRQSTATUS_RAW_j

FDIF Functional Description

- [Protocol Transitions: \[0\]](#)
- [Interrupts and Events: \[1\] \[2\] \[3\] \[4\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[5\]](#)

Table 9-20. FDIF_IRQSTATUS_j

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0028 + (0x10 * j) | | | | | | | | | | | | | | | | Instance | FDIF | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 A028 + (0x10 * j) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Per-event "enabled" interrupt status vector, line #n. Enabled status is not set unless event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------------|----------|---|---|---|---|---|---|--|--|--|--|--|--|--|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | FINISH_IRQ | RESERVED | | | | | | | | | | | | | | ERR_IRQ |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|----------|
| 31:9 | RESERVED | Reserved | R | 0x000000 |
| 8 | FINISH_IRQ | Face detection processing done. Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |
| 7:1 | RESERVED | Reserved | R | 0x00 |
| 0 | ERR_IRQ | Error received by the L3 port. Write 0x0: No action Read 0x0: No (enabled) event pending Read 0x1: Event pending Write 0x1: Clear (raw) event | RW W1toClr | 0 |

Table 9-21. Register Call Summary for Register FDIF_IRQSTATUS_j

FDIF Functional Description

- [Interrupts and Events: \[0\] \[1\] \[2\] \[3\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[4\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[5\]](#)

Table 9-22. FDIF_IRQENABLE_SET_j

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000_002C + (0x10 * j) | | | | | | | | | | | | | | | | Instance | FDIF | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10_A02C + (0x10 * j) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Per-event interrupt enable bit vector, line #n. Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------------|----------|---|---|---|---|---|---|--|--|--|--|--|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | FINISH_IRQ | RESERVED | | | | | | | | | | | | ERR_IRQ |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|----------|
| 31:9 | RESERVED | Reserved | R | 0x000000 |
| 8 | FINISH_IRQ | Face detection processing done. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |
| 7:1 | RESERVED | Reserved | R | 0x00 |
| 0 | ERR_IRQ | Error received by the L3 port. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW W1toSet | 0 |

Table 9-23. Register Call Summary for Register FDIF_IRQENABLE_SET_j

FDIF Functional Description

- [Interrupts and Events: \[0\]](#)

FDIF Programming Guide

- [FDIF Global Initialization: \[1\]](#)
- [FD Processing Modes: \[2\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[3\]](#)

Table 9-24. FDIF_IRQENABLE_CLR_j

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0030 + (0x10 * j) | | | | | | | | | | | | | | | | Instance | FDIF | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 A030 + (0x10 * j) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Per-event interrupt enable bit vector, line #n. Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------------|----------|---|---|---|---|---|---|--|--|--|--|--|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | FINISH_IRQ | RESERVED | | | | | | | | | | | | ERR_IRQ |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|----------|
| 31:9 | RESERVED | Reserved | R | 0x000000 |
| 8 | FINISH_IRQ | Face detection processing done. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |
| 7:1 | RESERVED | Reserved | R | 0x00 |
| 0 | ERR_IRQ | Error received by the L3 port. Write 0x0: No action Read 0x0: Interrupt disabled (masked) Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW W1toClr | 0 |

Table 9-25. Register Call Summary for Register FDIF_IRQENABLE_CLR_j

FDIF Functional Description

- [Interrupts and Events: \[0\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[1\] \[2\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[3\]](#)

Table 9-26. FDIF_PICADDR

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0060 | Instance | FDIF |
| Physical Address | 0x4A10 A060 | | |
| Description | Picture data store address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------|---|---|---|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| ADDR | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:5 | ADDR | Picture data store address. The 5 least significant bits are forced to 0. | RW | 0x0000000 |
| 4:0 | RESERVED | Read returns 0. | R | 0x00 |

Table 9-27. Register Call Summary for Register FDIF_PICADDR

FDIF Functional Description

- [Typical Use: \[0\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[1\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[2\]](#)

Table 9-28. FDIF_CTRL

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0064 | Instance | FDIF |
| Physical Address | 0x4A10 A064 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|----------------|---|----------|---|----------|---|---|------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | MSTANDBY_HDSHK | | MSTANDBY | | MAX_TAGS | | | WRNP | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|------------|
| 31:7 | RESERVED | Reserved | R | 0x00000000 |
| 6 | MSTANDBY_HDSHK | <p>MStandby / Wait power management handshaking status bit</p> <p>The power management framework of the FDIF module is based on the handshaking of the MSTANDBY and WAIT signals. When going from a idle to normal power management transition, the software polls for FDIF_CTRL.MSTANDBY_HDSHK = 1 before starting the face detection processing.</p> <p>Read 0x0: Handshaking not completed. Do not initiate traffic on L3.</p> <p>Read 0x1: Handshaking completed. Can safely use the FDIF module.</p> | R | 0 |
| 5 | MSTANDBY | <p>MStandby signal generation. This bit shall be set to initiate a power management transition from NORMAL to IDLE or IDLE to NORMAL.</p> <p>0x0: Write: Clear MStandby signal. One polls FDIF_CTRL.MSTANDBY_HDSHK = 1 after writing this bit to ensure that the power management handshaking is completed.</p> <p>0x1: Write: Asserts MStandby signal</p> | RW | 1 |
| 4:1 | MAX_TAGS | <p>Max interconnect tags. This bit field sets the maximum number of interconnect tags that the module shall use. This number is programmable between 1 (MAX_TAGS = 0) and FDIF_TAGS (MAX_TAGS = FDIF_TAGS - 1). The value of MAX_TAGS is reflected in the FDIF_HWINFO register setting. This register setting is expected to have impact on performance. It shall be set once at initialization. Higher value will give more bandwidth to the initiator. Lower value will give less bandwidth to the initiator. This value shall be set as low as possible such that other system initiators are not penalized.</p> | RW | 0xF |
| 0 | WRNP | <p>L3 port non-posted write control. Dynamic usage of this feature is not supported. This bit shall be set at initialization and not modified hereafter until the processing is completed. When non-posted writes are used, tags shall be used for best performance (MAX_TAGS 1).</p> <p>0x0: All writes are non posted</p> <p>0x1: All writes are posted</p> | RW | 0 |

Table 9-29. Register Call Summary for Register FDIF_CTRL

FDIF Functional Description

- [Protocol Transitions: \[0\] \[1\] \[2\]](#)
- [L3 Interconnect Parameters: \[3\] \[4\]](#)

FDIF Programming Guide

- [FDIF Global Initialization: \[5\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[6\]](#)
- [FDIF Register Description: \[7\] \[8\]](#)

Table 9-30. FDIF_WKADDR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|------|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0068 | | | | | | | | | | | | | | | | Instance | | FDIF | | | | | | | | | |
| Physical Address | | 0x4A10 A068 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | | | | | | | | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:5 | ADDR | Work area address The 5 least significant bits are forced to 0. | RW | 0x0000000 |
| 4:0 | RESERVED | Read returns 0. | R | 0x00 |

Table 9-31. Register Call Summary for Register FDIF_WKADDR

FDIF Functional Description

- [Typical Use: \[0\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[1\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[2\]](#)

Table 9-32. FD_CTRL

| | | | |
|------------------|--|----------|------|
| Address Offset | 0x0000 0080 | Instance | FDIF |
| Physical Address | 0x4A10 A080 | | |
| Description | Control register Don't set more than 2 bits to "1" at the same time. Otherwise, operations cannot be guaranteed. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|-----|----|----|------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FINISH | | | RUN | | | SRST | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2 | FINISH | Process Completion Flag Clear 0x0: Write: Disable Read: Process incomplete 0x1: Write: Process complete flag clear Read: Process complete | RW | 0 |
| 1 | RUN | Process Start Request 0x0: Write: Disable Read: No processing 0x1: Write: Process start request Read: Processing data | RW | 0 |
| 0 | SRST | Software Reset This bit shall not be used to reset the FDIF module. Instead, the FDIF_SYSCONFIG[0] SOFTRESET bit shall be used for complete soft reset. 0x0: Write: Disable Read: Reset cancel 0x1: Write: Reset Read: Under reset | RW | 0 |

Table 9-33. Register Call Summary for Register FD_CTRL

FDIF Functional Description

- [Software Reset: \[0\]](#)
- [Protocol Transitions: \[1\]](#)
- [Typical Use: \[2\] \[3\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[4\] \[5\] \[6\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[7\]](#)

Table 9-34. FD_DNUM

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0084 | | | | | | | | | | | | | | | | Instance | FDIF | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 A084 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Face Detection Result Count Register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | DNUM | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:6 | RESERVED | Reserved | R | 0x00000000 |
| 5:0 | DNUM | Face detection result count. Up to 35 faces can be detected. Number of face(s) detected: 0x0: 0 face detected 0x1: 1 face detected 0x2: 2 faces detected [...] 0x23: 35 faces detected 0x24 to 0x3F: unused | R | 0x00 |

Table 9-35. Register Call Summary for Register FD_DNUM

FDIF Functional Description

- [Typical Use: \[0\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[1\] \[2\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[3\]](#)

Table 9-36. FD_DCOND

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0088 | | | | | | | | | | | | | | | | Instance | FDIF | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 A088 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Detection Condition Setting Register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----|---|-----|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | DIR | | MIN | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3:2 | DIR | Detection direction setting 0x0: Executes only for UP 0x1: Executes only for RIGHT 0x2: Executes only for LEFT 0x3: Reserved | RW | 0x0 |
| 1:0 | MIN | Reserved 0x0: Set the min face size to 20 pixels 0x1: Set the min face size to 25 pixels 0x2: Set the min face size to 32 pixels 0x3: Set the min face size to 40 pixels | RW | 0x0 |

Table 9-37. Register Call Summary for Register FD_DCOND

FDIF Functional Description

- [Typical Use: \[0\]](#)
- [Performance Parameters: \[1\] \[2\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[3\] \[4\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[5\]](#)

Table 9-38. FD_STARTX

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 008C | Instance | FDIF |
| Physical Address | 0x4A10 A08C | | |
| Description | Detection Area Setting Register: X Start Coordinate. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STARTX | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:8 | RESERVED | Reserved | R | 0x0000000 |
| 7:0 | STARTX | Starting X coordinates Permitted values are 0=STARTX=160 | RW | 0x00 |

Table 9-39. Register Call Summary for Register FD_STARTX

FDIF Functional Description

- [Typical Use: \[0\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[1\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[2\]](#)

Table 9-40. FD_STARTY

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0090 | Instance | FDIF |
| Physical Address | 0x4A10 A090 | | |
| Description | Detection Area Setting Register: Y Start Coordinate. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STARTY | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:7 | RESERVED | Reserved | R | 0x00000000 |
| 6:0 | STARTY | Starting Y coordinates Permitted values are 0=STARTY=120 | RW | 0x00 |

Table 9-41. Register Call Summary for Register FD_STARTY

FDIF Functional Description

- [Typical Use: \[0\] \[1\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[2\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[3\]](#)

Table 9-42. FD_SIZEX

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0094 | Instance | FDIF |
| Physical Address | 0x4A10 A094 | | |
| Description | Detection Area Setting Register: X Direction Size | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SIZEX | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------|------|------------|
| 31:9 | RESERVED | Reserved | R | 0x00000000 |
| 8:0 | SIZEX | X Direction Size | RW | 0x140 |

Table 9-43. Register Call Summary for Register FD_SIZEX

FDIF Functional Description

- [Typical Use: \[0\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[1\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[2\]](#)

Table 9-44. FD_SIZEY

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0098 | Instance | FDIF |
| Physical Address | 0x4A10 A098 | | |
| Description | Detection Area Setting Register: Y Direction Size | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SIZEY | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7:0 | SIZEY | Y Direction Size | RW | 0xF0 |

Table 9-45. Register Call Summary for Register FD_SIZEY

FDIF Programming Guide

- [FD Processing Modes: \[0\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[1\]](#)

Table 9-46. FD_LHIT

| | | | |
|-------------------------|----------------------------|-----------------|------|
| Address Offset | 0x0000 009C | Instance | FDIF |
| Physical Address | 0x4A10 A09C | | |
| Description | Threshold Setting Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LHIT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3:0 | LHIT | Threshold Permitted values are 0x0 to 0x9 | RW | 0x5 |

Table 9-47. Register Call Summary for Register FD_LHIT

FDIF Functional Description

- [Performance Parameters: \[0\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[1\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[2\]](#)

Table 9-48. FD_CENTERX_i

| | | |
|-------------------------|---|----------------------|
| Address Offset | 0x0000 0160 + (0x10 * i) | |
| Physical Address | 0x4A10 A160 + (0x10 * i) | Instance FDIF |
| Description | Detection Result: X Coordinate. Its value is undefined after reset. | |
| Type | R | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CENTERX | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 31:9 | RESERVED | Reserved. Read returns reset value. | R | 0x– |
| 8:0 | CENTERX | Face position: center X coordinate The coordinates given by (FD_CENTERX_i, FD_CENTERY_i) give the central coordinates of the face position. Permitted values are 0x0 to 0x13F | R | 0x– |

Table 9-49. Register Call Summary for Register FD_CENTERX_i

FDIF Functional Description

- [Typical Use: \[0\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[1\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[2\]](#)
- [FDIF Register Description: \[3\] \[4\]](#)

Table 9-50. FD_CENTERY_i

| | | |
|-------------------------|---|----------------------|
| Address Offset | 0x0000 0164 + (0x10 * i) | |
| Physical Address | 0x4A10 A164 + (0x10 * i) | Instance FDIF |
| Description | Detection Result: Y Coordinate. Its value is undefined after reset. | |
| Type | R | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CENTERY | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31:8 | RESERVED | Reserved. Read returns reset value. | R | 0x– |
| 7:0 | CENTERY | Face position: center Y coordinate The coordinates given by (FD_CENTERX_i, FD_CENTERY_i) give the central coordinates of the face position. Permitted values are 0x0 to 0xEF | R | 0x– |

Table 9-51. Register Call Summary for Register FD_CENTERY_i

FDIF Functional Description

- [Typical Use: \[0\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[1\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[2\]](#)
- [FDIF Register Description: \[3\] \[4\]](#)

Table 9-52. FD_CONFSIZE_i

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0168 + (0x10 * i) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 A168 + (0x10 * i) | | | | | | | | | | | | | | | | Instance | FDIF | | | | | | | | | | | | | | | |
| Description | Detection Result: Confidence Level and Size. Its value is undefined after reset. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | CONF | | | | SIZE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:12 | RESERVED | Reserved. Read returns reset value. | R | 0x- |
| 11:8 | CONF | Confidence level Permitted values are 0x0 (high) to 0x9 (low) | R | 0x- |
| 7:0 | SIZE | Detection result face size Permitted values 0x14 to 0xF0 | R | 0x- |

Table 9-53. Register Call Summary for Register FD_CONFSIZE_i

FDIF Functional Description

- [Typical Use: \[0\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[1\] \[2\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[3\]](#)

Table 9-54. FD_ANGLE_i

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 016C + (0x10 * i) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 A16C + (0x10 * i) | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | FDIF | | | | | | | | | | | | | | | |
| Description | Detection Result: Angle. Its value is undefined after reset. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | ANGLE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31:9 | RESERVED | Reserved. Read returns reset value. | R | 0x- |
| 8:0 | ANGLE | Detection result face angle Permitted values: When DIR = 0: 0x0 (0 deg) to 0x1E (30 deg) and 0x14A (330 deg) to 0x167 (359 deg) When DIR = 1: 0x03C (60 deg) to 0x078 (120 deg) When DIR = 2: 0x0F0 (240 deg) to 0x12C (300 deg) | R | 0x– |

Table 9-55. Register Call Summary for Register FD_ANGLE_i

FDIF Functional Description

- [Typical Use: \[0\]](#)

FDIF Programming Guide

- [FD Processing Modes: \[1\]](#)

FDIF Register Manual

- [FDIF Register Summary: \[2\]](#)

PRELIMINARY

Display Subsystem

This chapter describes the display subsystem (DSS) for the device.

| Topic | Page |
|---|------|
| 10.1 Display Subsystem Overview | 2148 |
| 10.2 Display Controller | 2171 |
| 10.3 MIPI Display Serial Interface | 2423 |
| 10.4 High-Definition Multimedia Interface | 2616 |
| 10.5 Remote Frame Buffer Interface | 2619 |

10.1 Display Subsystem Overview

The display subsystem (DSS) provides the logic to display a video frame from the memory frame buffer on a liquid-crystal display (LCD) panel or a TV set.

The DSS can display different pictures simultaneously by using the primary LCD1 and secondary LCD2 outputs, in addition to the TV output.

The primary LCD output can be one of the following:

- Display serial interface (DSI) (MIPI® DSI)
- Remote frame buffer interface (RFBI) (MIPI DBI 2.0)

The secondary LCD output can be one of the following:

- Parallel CMOS output (MIPI DPI 1.0)
- DSI (MIPI DSI)
- RFBI (MIPI DBI 2.0)

The TV output can be:

- High-definition multimedia interface (HDMI)

The modules integrated in the DSS are:

- Display controller (DISPC):
 - One direct memory access (DMA) engine
 - Two LCD outputs and one TV output, each one with a dedicated overlay manager
 - One graphics pipeline (GFX), three video pipelines, and one write-back pipeline
- RFBI:
 - 8-, 9-, 16-bit parallel interface
 - Programmable pixel memory formats
 - Programmable output formats on one or multiple cycles per pixel
- Two DSI protocol engines:
 - 4-data lane complex input/output (I/O) for DSI1 and 2-data lane complex I/O for DSI2
 - Bidirectional data link support (only one data lane is used in reverse direction in command mode)
 - Supports video mode and command mode
 - Supports data interleaving
 - Supports up to 2048x1536 resolution through DSI1 and DSI2 linked to an external bridge
- HDMI protocol engine:
 - Supports HDMI 1.3 (including HDMI 1.4 3D frame-packing support up to 1080p, 24 Hz)
 - 30-bit RGB color
 - HDCP key protection
 - Deep color mode support (10-bit for 1080p and up to 12-bit for 1080i/720p)

The necessary phase-locked loops (PLLs) with their control modules and the physical layers (PHYs) are outside the DSS. The PHYs can be:

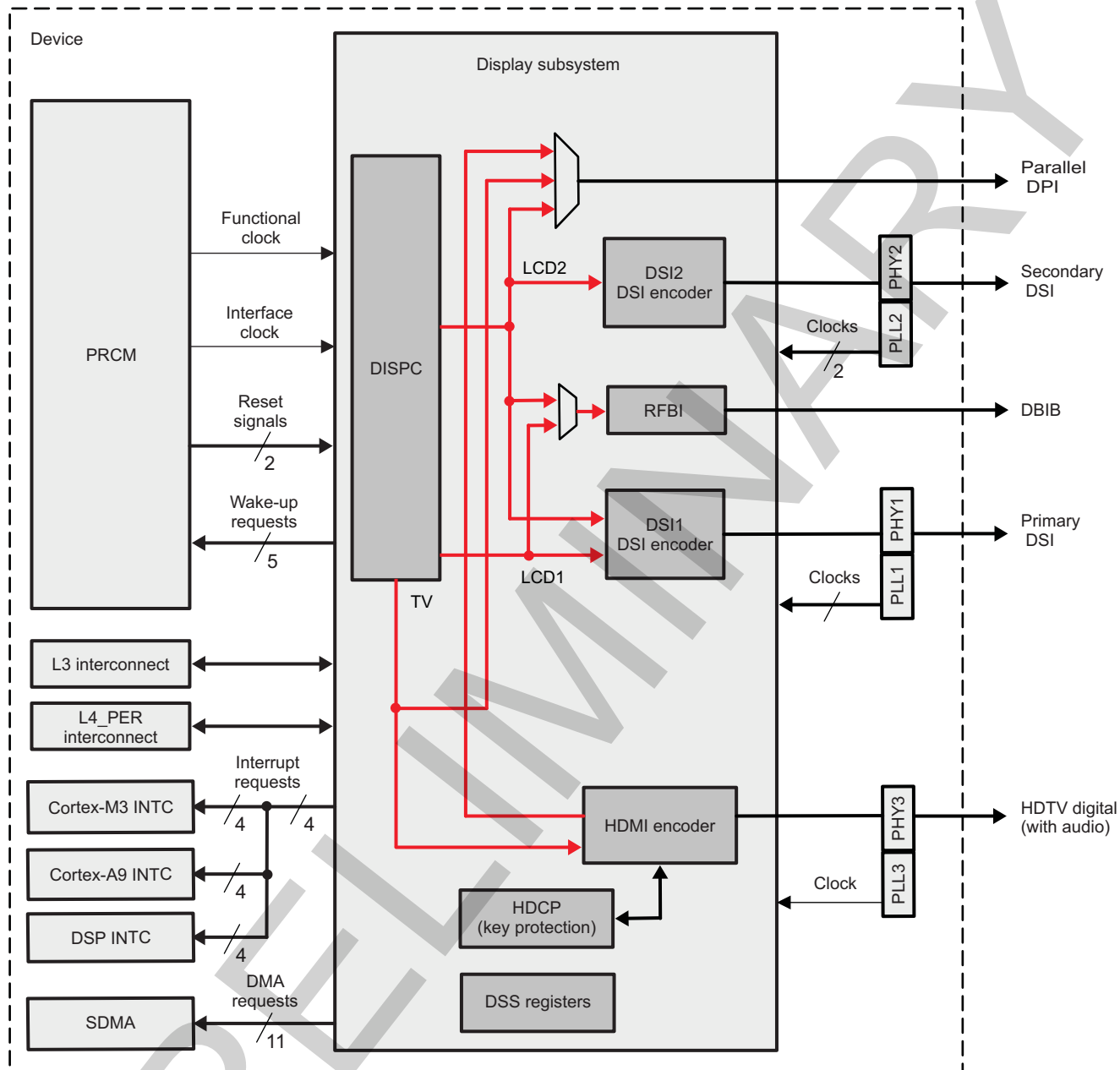
- HDMI-PHY
- DSI-PHY

To ensure efficient bandwidth, the DSS integrates:

- Local 32-bit interconnect with a level 4 (L4_PER) connection to configure the DSS modules
- Connection between level 3 (L3) interconnect and the DISPC to exchange data with synchronous dynamic random access memory (SDRAM) and memory using the DISPC DMA engine

Figure 10-1 is a high-level diagram of the DSS.

Figure 10-1. DSS Overview



dss-001

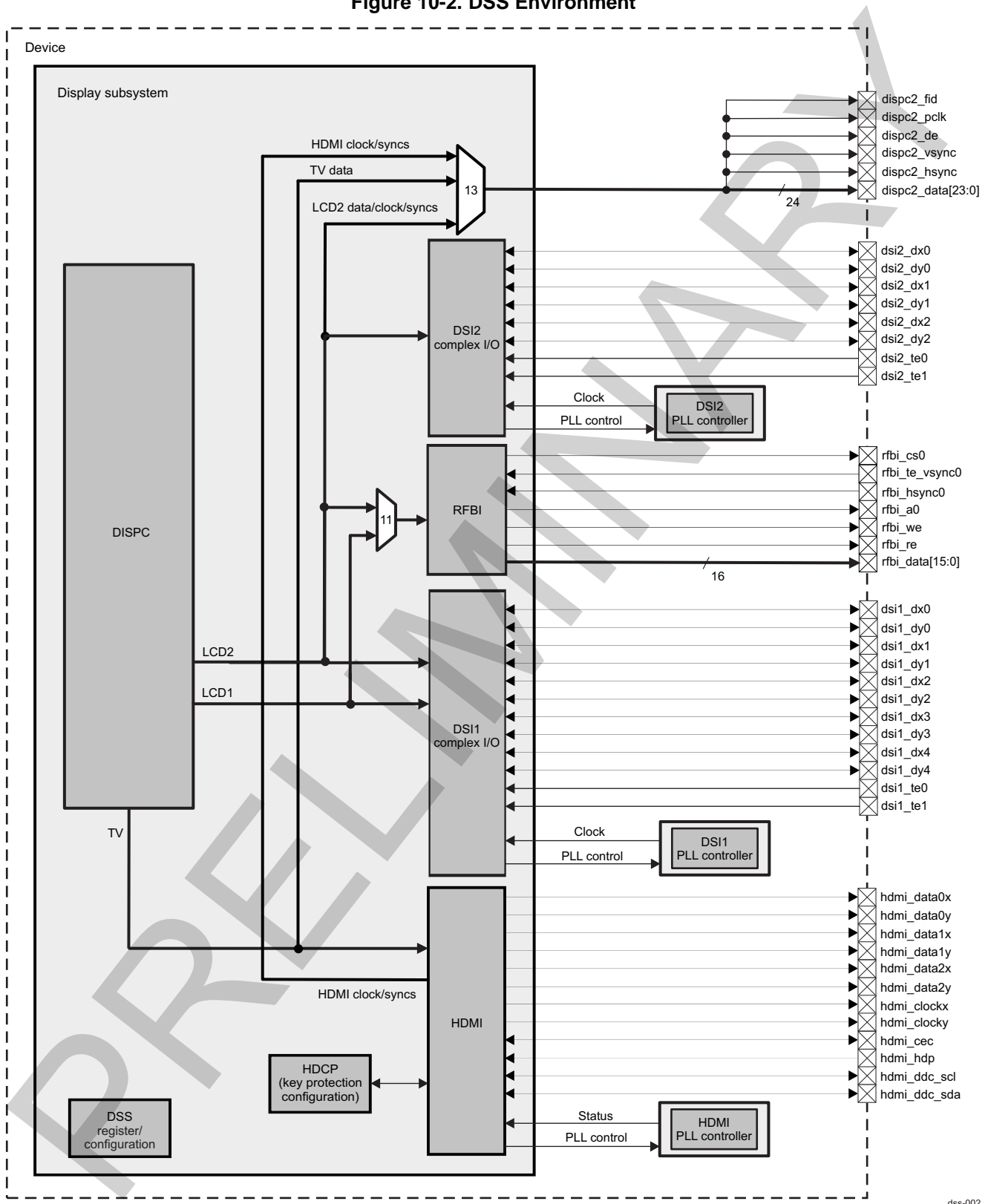
10.1.1 DSS Environment

This section describes the various outputs handled by the DSS:

- LCD support
- TV display support

[Figure 10-2](#) is a diagram of the DSS environment.

Figure 10-2. DSS Environment



dss-002

10.1.1.1 DSS LCD Support

LCD panels must be connected to the DSS of the device using parallel and/or serial interfaces. Two modes are supported in parallel:

- DBIB
- Display parallel interface (DPI)

10.1.1.1.1 Parallel Interface

In parallel interface, the modules of the DSS path are the DISPC and the RFBI.

The DISPC is connected to the memory through the L3 interconnect and uses its own DMA (with embedded FIFO) to read data from the system memory.

The remote frame buffer (RFB) of the LCD panel is connected directly to the RFBI module of the device. The RFBI controls the reads/writes from/to the RFB. The RFBI receives the output data from the DISPC and generates the signals to control the LCD panel. Through the RFBI, the microprocessor unit (MPU) can send commands or parameter/display data to the LCD panel and directly set the DISPC registers to read/write the data from/to the memory in the LCD panel.

The RFBI can be connected to either of the DISPC LCD outputs, but only one at a time can be used. The selection (multiplexer 11 in [Figure 10-2](#)) is done through the [DSS_CTRL\[14\]](#) RFBI_SWITCH bit. It is not allowed to change the configuration, when the DISPC or RFBI modules are active.

For more details, see [Section 10.2, Display Controller](#), and [Section 10.5, Remote Frame Buffer Interface](#).

In synchronous parallel interface, the required data and control signals are provided directly to an external MIPI DPI-compatible parallel panel.

Two configuration options are available, selected through the [DSS_CTRL\[17\]](#) LCD2_TV_SEL bit field (multiplexer 13 in [Figure 10-2](#)):

- LCD2_TV_SEL = 0 (default): The LCD2 channel of DISPC (pixel data, clock and synchronization signals) is output on the parallel interface.
- LCD2_TV_SEL = 1: The TV channel of DISPC (pixel data), together with the pixel clock and synchronization signals of HDMI, is output on the parallel interface.

, [Table 10-1](#) lists the exact DSS signals outgoing on the device boundary pads.

Table 10-1. Display Parallel Interface Signals Mapping

| Signal names at device pads (See Figure 10-2) | DSS_CTRL[17] LCD2_TV_SEL = 0 DISPC LCD2 channel out (pixel data, clock, syncs) | DSS_CTRL[17] LCD2_TV_SEL = 1 DISPC TV channel out (pixel data) HDMI (pixel clock, syncs) |
|---|---|--|
| dispc2_fid | DISPC_LCD2_FID | HDMI_M_FID |
| dispc2_pclk | DISPC_LCD2_PCLK | HDMI_M_PCLK |
| dispc2_de | DISPC_LCD2_DE | HDMI_M_DE |
| dispc2_vsync | DISPC_LCD2_VSYNC | HDMI_M_VS |
| dispc2_hsync | DISPC_LCD2_HSYNC | HDMI_M_HS |
| dispc2_data[23:0] | DISPC_LCD2_DATA[23:0] | DISPC_TV_DATA[29:0] |

For more details on LCD2 and TV out pixel data formats for the parallel interface, see [Section 10.2.2, Display Controller Environment](#).

10.1.1.1.2 Serial Interfaces

In serial interface, the DISPC and the two DSI modules with their associated PLLs are used in the data path. The DISPC is connected to the memory through the L3 interconnect and uses its own DMA to read the data from the system memory.

The DSI module contains a PLL to multiply the pixel clock by an appropriate factor. The resulting serialized data is then transmitted on one to four differential data pairs and an additional clock pair that has a reference transition at the boundary between pixels.

For more details, see [Section 10.3](#), *MIPI DSI*.

10.1.1.2 DSS TV Display Support

10.1.1.2.1 HDMI

In an HDMI configuration, the DISPC, HDMI, and HDCP modules and the associated PLL modules are used in the data path. The HDMI module converts the RGB video into standard high-definition digital video format. The module has a PLL, which can multiply the pixel clock by an appropriate factor. The data is transmitted on three differential data pairs and an additional clock pair.

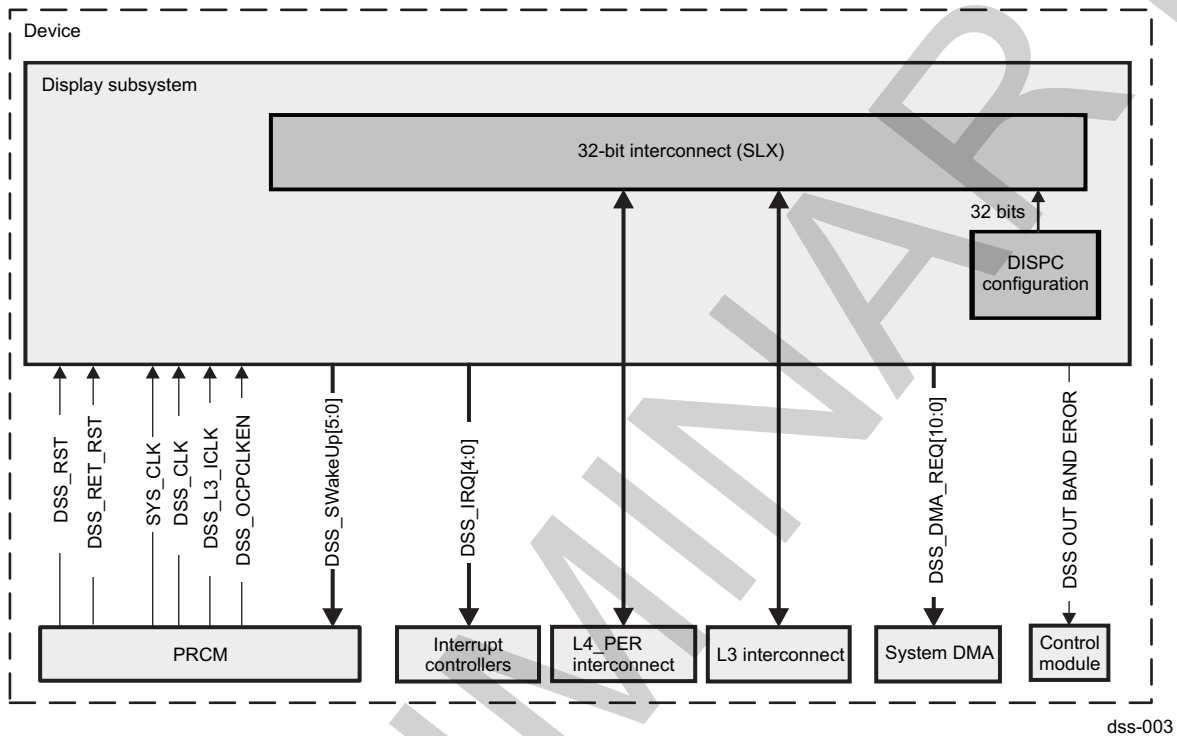
For more details, see [Section 10.4](#), *HDMI*.

10.1.2 DSS Integration

This section describes the integration of the DSS module in the device, including information about clocks, resets, and hardware requests.

Figure 10-3 shows the integration of the DSS in the device.

Figure 10-3. DSS Integration



10.1.2.1 DSS Clocks

The power, reset, and clock management (PRCM) module provides clock signals to the DSS.

Figure 10-4 shows the details of the DSS clock tree.

Figure 10-4. DSS Clock Tree

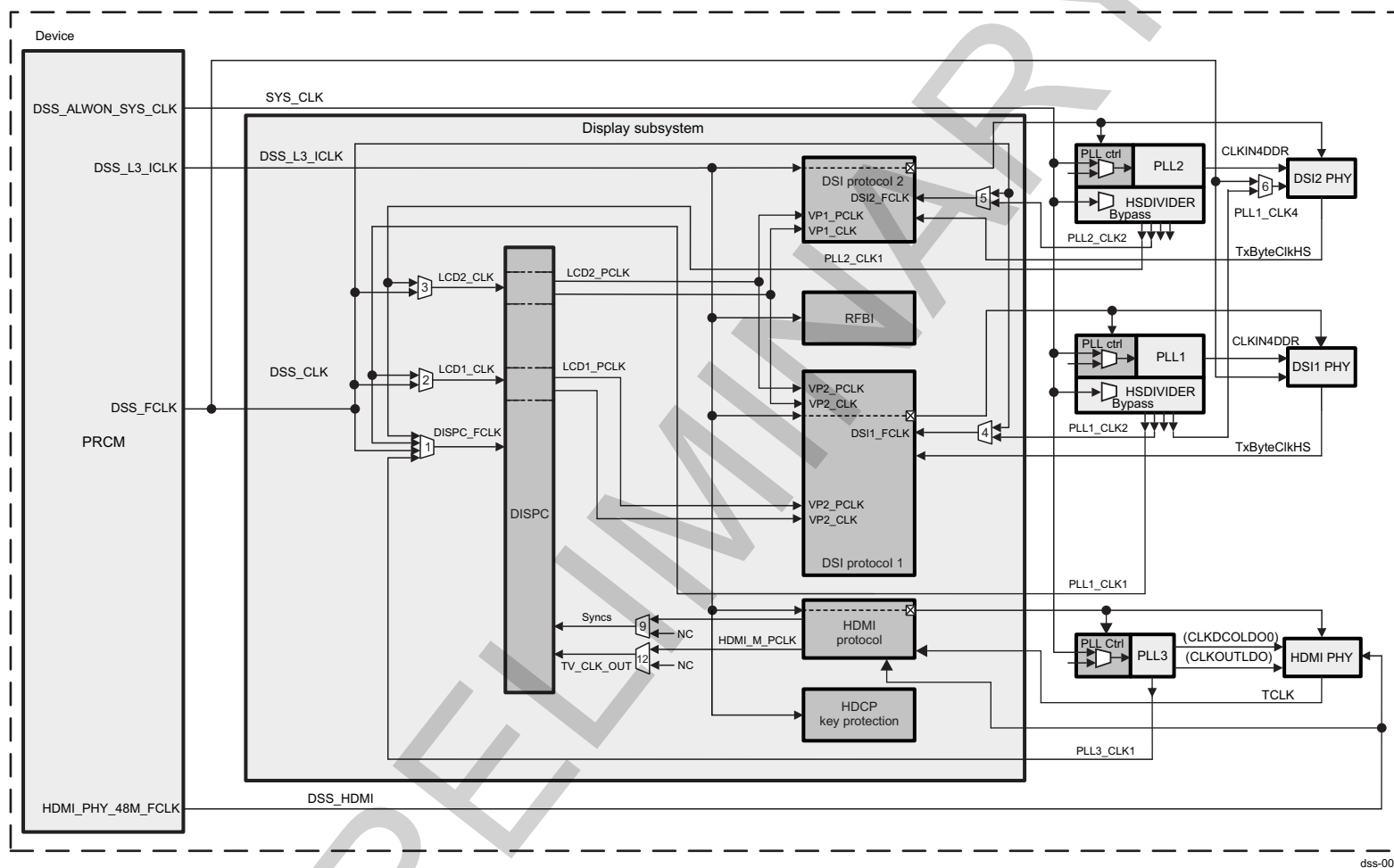


Table 10-2 lists the main DSS clocks and their sources.

Table 10-2. DSS Clocks

| Clocks | | | | |
|-----------------|-------------------------|--------------------|-------------|------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| DSS | DSS_HDMI | HDMI_PHY_48M_FCLK | PRCM module | Functional clock |
| | DSS_CLK | DSS_FCLK | PRCM module | Functional clock |
| | SYS_CLK | DSS_ALWON_SYS_CLK | PRCM module | System clock |
| | DSS_L3_ICLK | DSS_L3_ICLK | PRCM module | Interface clock |

- The clock source for the L3 interface clock is DSS_L3_ICLK.
- The clock sources for the DSS modules are listed in [Table 10-3](#).

Table 10-3. DSS Modules Clock Sources

| Destination | Source Signal Name | Source | Multiplexer Number | DSS_CTRL Register Bit Field |
|---|--------------------|-----------------|--------------------|-----------------------------|
| DISPC functional clock (DISPC_FCLK) | DSS_CLK | DPLL_PER (PRCM) | 1 | [9:8] FCK_CLK_SWITCH |
| | PLL1_CLK1 | PLL1 | 1 | |
| | PLL2_CLK1 | PLL2 | 1 | |
| | PLL3_CLK1 | PLL3 | 1 | |
| DSI1 functional clock (LCD1_CLK) | DSS_CLK | DPLL_PER (PRCM) | 2 | [0] LCD1_CLK_SWITCH |
| | PLL1_CLK1 | PLL1 | 2 | |
| DSI2 functional clock (LCD2_CLK) | DSS_CLK | DPLL_PER (PRCM) | 3 | [12] LCD2_CLK_SWITCH |
| | PLL2_CLK1 | PLL2 | 3 | |
| DSI1 protocol engine functional clock (DSI1_FCLK) | DSS_CLK | DPLL_PER (PRCM) | 4 | [1] DSI1_CLK_SWITCH |
| | PLL1_CLK2 | PLL1 | 4 | |
| DSI2 protocol engine functional clock (DSI2_FCLK) | DSS_CLK | DPLL_PER (PRCM) | 5 | [10] DSI2_CLK_SWITCH |
| | PLL2_CLK2 | PLL2 | 5 | |
| DISPC external clock (TV_CLK_OUT) | HDMI_M_PCLK | HDMI | 12 | [15] VENC_HDMI_SWITCH |

NOTE: : For more information about the DSI1 and DSI2 video port clocks (VPn_PCLK and VPn_CLK, where n = 1 or 2), see [Table 10-4](#) and [Section 10.3.4.2, DSI Clock Configuration](#).

NOTE: Multiplexer 9 in [Figure 10-4](#) has the same control as multiplexer 12.

Multiplexer 6 in [Figure 10-4](#) allows the DSS_FCLK or PLL1_CLK4 clock to be sent on the DSI2 PHY bypass input. The use of the bypassed clock allows both DSI modules to run on DSS_FCLK or on a single PLL. The selection is done on device control module level. For more information, see [Section 10.3.4.2, DSI Clock Configuration](#) in [Section 10.3, MIPI Display Serial Interface](#).

[Table 10-4](#) lists the maximum frequencies of various DSS clocks for OPP119, OPP100 and OPP50. When the VDD_CORE_L voltage domain is defined for the first set of OPPs, then only OPP119 and OPP50 are supported. When the VDD_CORE_L voltage domain is defined for the second set of OPPs, then OPP119, OPP100 and OPP50 are supported.

The frequencies of listed DSS clocks for OPP119 and OPP100 are identical, except for the DSS_L3_ILCK, which has specific dependency on the selection of the VDD_CORE_L set of OPPs.

For more details on the device voltage management see [Section 3.8.1, Overview](#), in [Chapter 3, PRCM](#).

Table 10-4. DSS Clock Frequencies

| Clock Name | OPP100 OPP119 | OPP50 | Notes |
|------------------------|------------------|-------------|--|
| DSS_L3_ICLK | 233 MHz | 116.5 MHz | For the description and clock source, see Table 10-2 . DSS_L3_ICLK frequency is up to 233 MHz for OPP119 (up to 116.5 MHz for OPP50), only when the VDD_CORE_L voltage domain is defined for the first supported set of OPPs. When the VDD_CORE_L voltage domain is defined for the second set of OPPs, then DSS_L3_ICLK is available for OPP119 and OPP100 at up to 200 MHz, and for OPP50 at up to 100 MHz. |
| DSS_CLK | 186 MHz | 186 MHz | For the description and clock source, see Table 10-2 . |
| DISPC_FCLK | 186 MHz | 186 MHz | For the description and clock source, see Table 10-3 . |
| DISPC_CORE_CLK | 186 MHz | 93 MHz | DISPC internal functional clock. Generated from DISPC_CLK after LCD divider at the DISPC module level. For more details, see Section 10.2.4.1, Clock Configuration . |
| LCDn_CLK (n = 1 or 2) | 186 MHz | 93 MHz | For description and clock source, see Table 10-3 . |
| LCDn_PCLK (n = 1 or 2) | 170 MHz | 93 MHz | DISPC LCD output pixel clock. Generated from LCDn_CLK after two dividers (LCDn and PCDn) at the DISPC module level. For more details, see Section 10.2.4.1, Clock Configuration . |
| VPn_PCLK (n = 1 or 2) | 148.5 MHz | 74.25 MHz | DSI video port pixel clock. Sourced from LCDn_PCLK. |
| VPn_CLK (n = 1 or 2) | 186 MHz | 93 MHz | DSI video port clock. Generated from LCDn_CLK after a divider (LCDn) at DISPC module level. For more details, see Section 10.2.4.1, Clock Configuration . |
| DSIn_FCLK (n = 1 or 2) | 170 MHz | 93 MHz | For the description and clock source, see Table 10-3 . |
| DSS_HDMI_TCLK | 185.625 MHz | 92.8125 MHz | TMDS clock from the HDMI PHY. For the clock source, see Figure 10-4 . |
| TXCLKESC | 20 MHz | 20 MHz | DSI escape-mode transmit clock. For more details, see Section 10.3.4.4.4, Clock Requirements . |
| TXBYTECLKHS | 112.5 MHz | 103 MHz | DSI high-speed transmit byte clock (generated by the complex I/Os) TXBYTECLKHS = 112.5 MHz for up to three data lanes (900 Mbps per lane); TXBYTECLKHS = 103 MHz for four data lanes (824 Mbps per lane) |
| DSS_HDMI | 48 MHz | 48 MHz | For the description and clock source, see Table 10-2 . |

10.1.2.2 DSS Resets

The PRCM module provides two reset signals to the DSS.

[Figure 10-5](#) shows the details of the reset tree for the DSS.

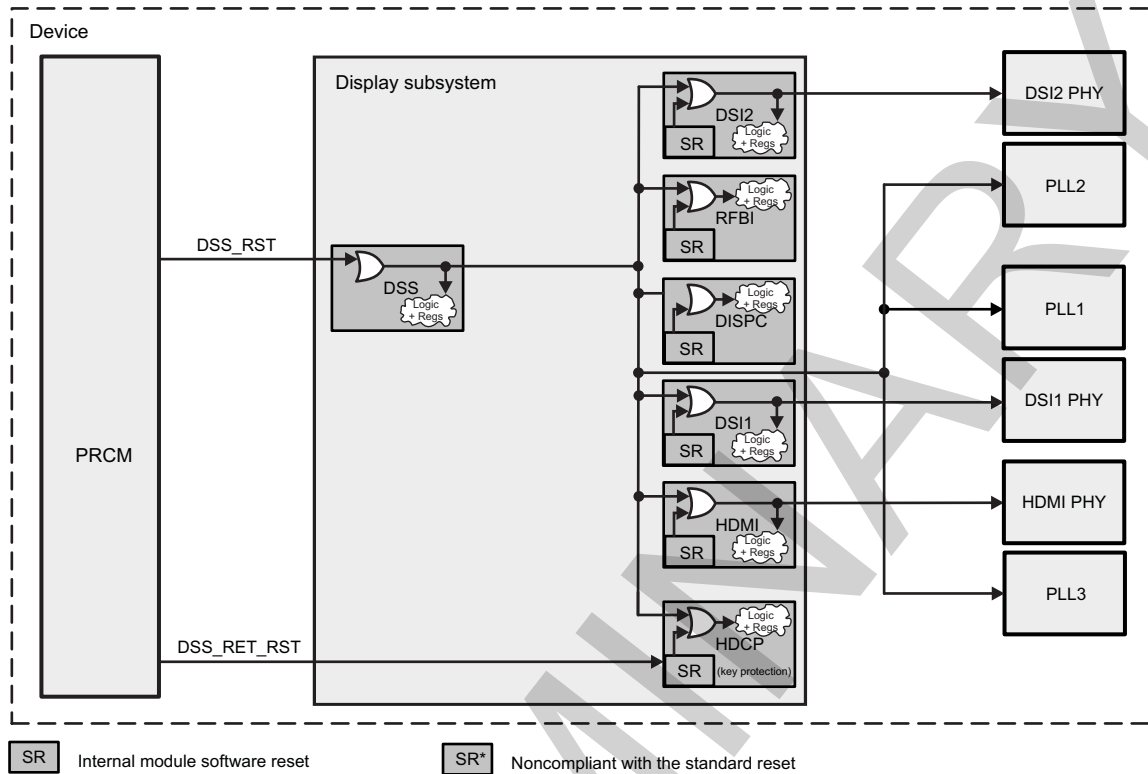
Figure 10-5. DSS Reset Scheme

Table 10-5 lists the resets for the DSS.

Table 10-5. DSS Resets

| Resets | | | | |
|-----------------|-------------------------|--------------------|-------------|--------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| DSS | DISPSS_RET_RST | DSS_RET_RST | PRCM module | Retention reset |
| | DISPSS_RST | DSS_RST | PRCM module | Nonretention reset |

10.1.2.2.1 Hardware Reset

The DSS receives its DISPSS_RST reset signal (the reset signal of the DSS power domain) from the PRCM module. The DISPSS_RET_RST is used only for the HDCP key protection module.

10.1.2.3 DSS Power Management

The DSS modules are in the DSS power domain.

Table 10-6 lists the DSS power domains.

Table 10-6. DSS Power Domains

| Module Instance | Attributes |
|-------------------|---|
| | Power Domain |
| Display subsystem | PD_DSS |
| DISPC | For more details, see Section 10.2, Display Controller . |
| MIPI DSI1 | For more details, see Section 10.3, MIPI Display Serial Interface . |
| MIPI DSI2 | For more details, see Section 10.3, MIPI Display Serial Interface . |
| RFB | For more details, see Section 10.5, Remote Frame Buffer Interface . |

Table 10-6. DSS Power Domains (continued)

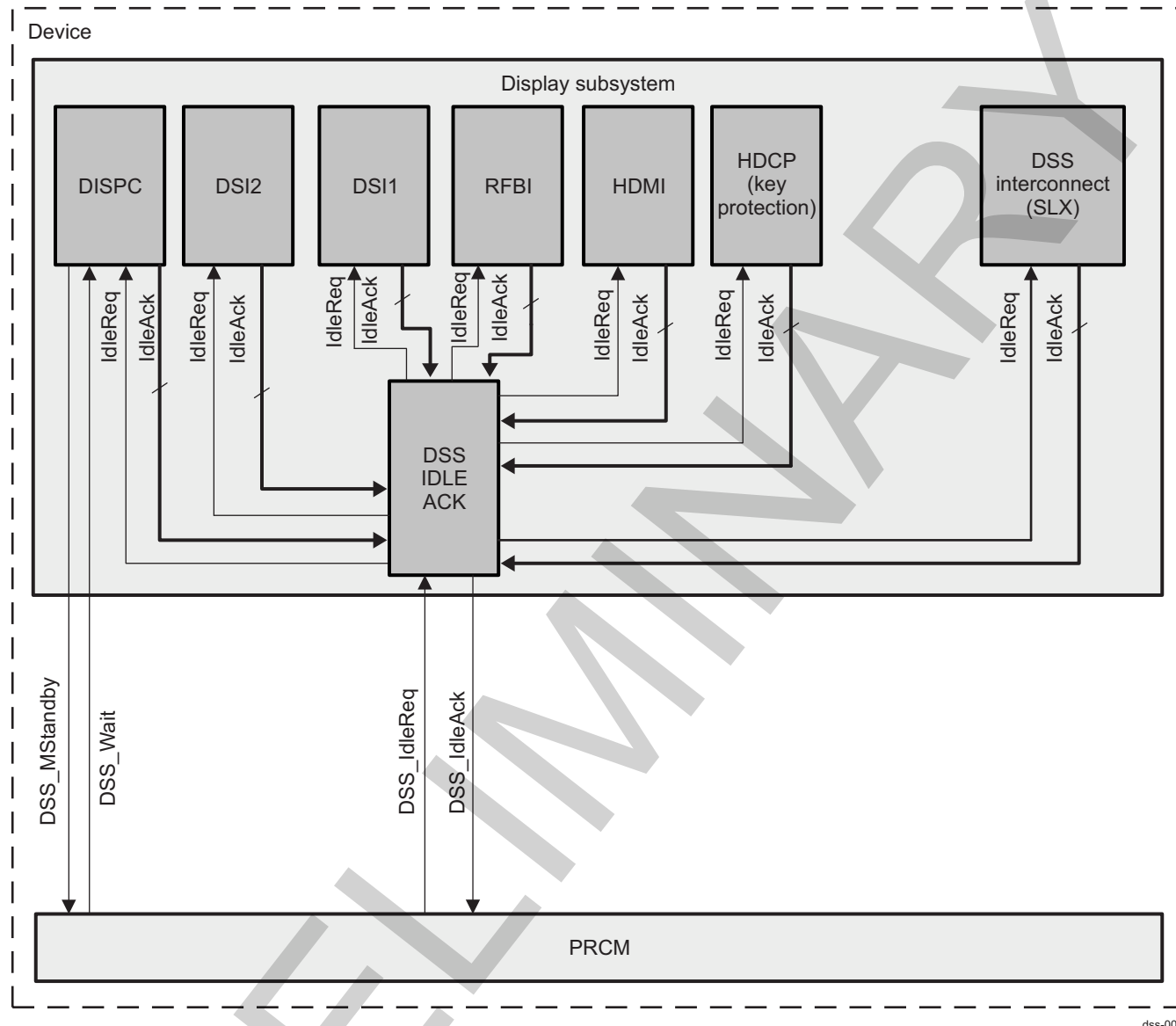
| | |
|------|--|
| HDMI | For more details, see Section 10.4 , <i>High-Definition Multimedia Interface</i> . |
|------|--|

10.1.2.3.1 Standby Mode

As part of the system-wide power-management scheme, the DSS supports the MStandby/MWait and SIdleReq/SIdleAck protocols:

- MStandby/MWait
 - DISPC
- SIdleReq/SIdleAck
 - DISPC
 - DSI1
 - DSI2
 - RFBI
 - HDMI
 - HDCP (key protection)
 - DSS interconnect

[Figure 10-6](#) shows the details of the DSS wake-up generation.

Figure 10-6. DSS IdleAck/MStandby Generation

dss-007

10.1.2.3.1.1 Conditions to Exit Standby Mode

For information about the conditions that allow the subsystem to exit standby mode, see [Section 10.2, Display Controller](#).

10.1.2.3.1.2 Standby Procedure Description

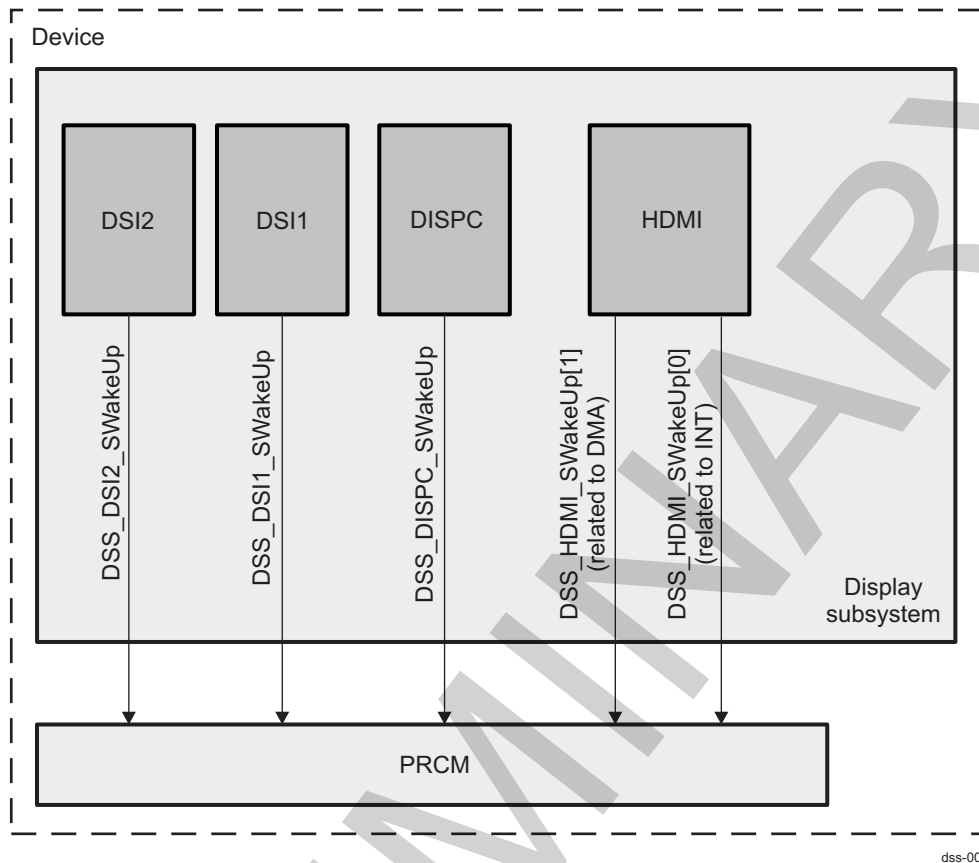
When the DSS initiates a standby procedure, it also initiates a standby/wait handshake protocol with the PRCM module that lets the PRCM module cut the DSS clocks.

10.1.2.3.2 Wake-Up Mode

The DISPC, DSI1, DSI2, and HDMI modules support the wake-up protocol. DSS_HDMI_SWakeUp is associated with DSS_HDMI_IRQ, which is generated by the HDMI module. For the events that generate an Swakeup and the description and configuration of the registers, see the DISPC, DSI, and HDMI TRM chapters.

[Figure 10-7](#) shows DSS wake-up generation.

Figure 10-7. DSS Wake-Up Generation



10.1.2.4 DSS Interrupt Requests

The DSS has four interrupt lines. The interrupt signals are connected to the MPUs and DSP interrupt controller (INTC) modules. The interrupts are generated from the DISPC, DSI1 and DSI2 protocol engines, and HDMI.

Figure 10-8 shows DSS interrupt generation.

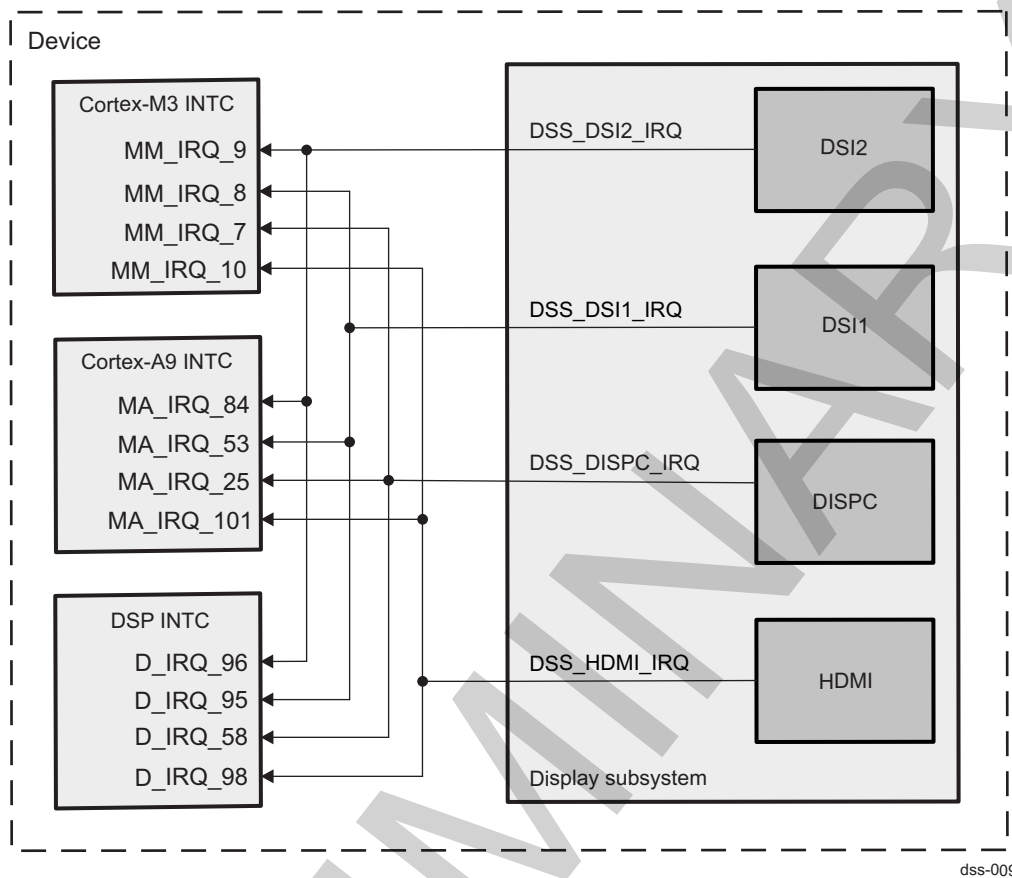
Figure 10-8. DSS Interrupt Generation

Table 10-7 lists the DSS interrupts.

Table 10-7. DSS Interrupts

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-----------------|--------------------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| DSS | | | | |
| DISPC | DSS_DISPC_IRQ | D_IRQ_58 | DSP INTC | DISPC interrupt request |
| | | MA_IRQ_25 | Cortex™-A9 INTC | DISPC interrupt request |
| | | MM_IRQ_7 | Cortex™-M3 INTC | DISPC interrupt request |
| MIPI DSI1 | DSS_DSI1_IRQ | D_IRQ_95 | DSP INTC | Display DSI1 interrupt request |
| | | MA_IRQ_53 | Cortex-A9 INTC | Display DSI1 interrupt request |
| | | MM_IRQ_8 | Cortex-M3 INTC | Display DSI1 interrupt request |
| MIPI DSI2 | DSS_DSI2_IRQ | D_IRQ_96 | DSP INTC | Display DSI2 interrupt request |
| | | MA_IRQ_84 | Cortex-A9 INTC | Display DSI2 interrupt request |
| | | MM_IRQ_9 | Cortex-M3 INTC | Display DSI2 interrupt request |
| HDMI | DSS_HDMI_IRQ | D_IRQ_98 | DSP INTC | Display HDMI interrupt request |
| | | MA_IRQ_101 | Cortex-A9 INTC | Display HDMI interrupt request |
| | | MM_IRQ_10 | Cortex-M3 INTC | Display HDMI interrupt request |

10.1.2.5 DSS DMA Requests

Eleven DMA requests are connected to the system DMA (sDMA).

The DMA requests are:

- Four DMA request signals from each DSI protocol engine (data traffic: from SDRAM or IVA-HD SL2 to DSI protocol engine and from DSI protocol engine to SDRAM or IVA-HD SL2)
- One DMA request signal from RFBI module (data traffic: from SDRAM to RFBI)
- One DMA request signal from HDMI module (audio traffic: from SDRAM or IVA-HD SL2 to HDMI)
- One DMA request signal from DISPC module (used for synchronization of a logical channel in the sDMA for memory-to-memory transfers)

Figure 10-9 shows the details of DSS DMA request generation.

Figure 10-9. DSS DMA Request Generation

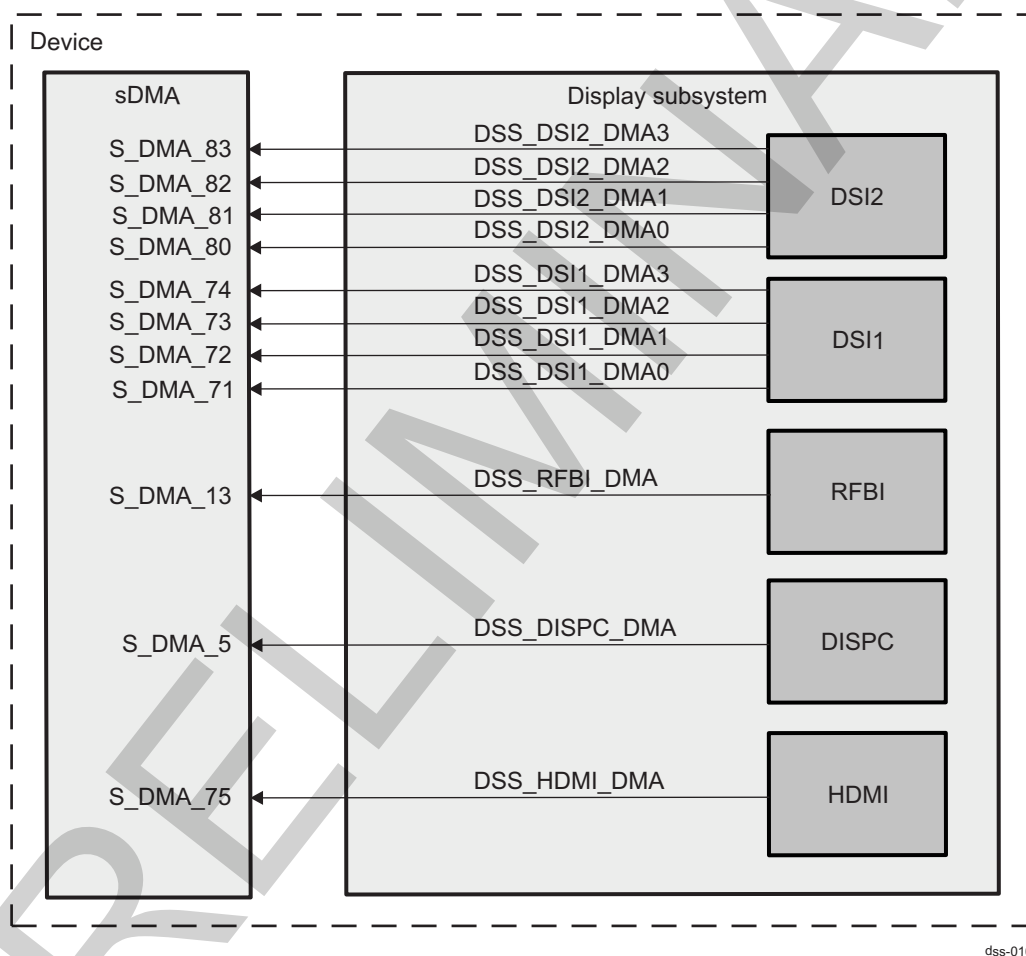


Table 10-8 lists the DSS DMA requests.

Table 10-8. DSS DMA Requests

| DMA Requests | | | | |
|-----------------|--------------------|-------------------------|-------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| RFBI | DSS_RFBI_DMA | S_DMA_13 | sDMA | DSS RFBI DMA request |
| DISPC | DSS_DISPC_DMA | S_DMA_5 | sDMA | The line trigger signal to synchronize a memory-to-memory logical channel in the DMA4 sDMA is generated by the DISPC IP. |

Table 10-8. DSS DMA Requests (continued)

| | | | | |
|-----------|---------------|----------|------|----------------------------|
| MIPI DSI1 | DSS_DSI1_DMA0 | S_DMA_71 | sDMA | DSS DSI1 DMA request 0 |
| | DSS_DSI1_DMA1 | S_DMA_72 | sDMA | DSS DSI1 DMA request 1 |
| | DSS_DSI1_DMA2 | S_DMA_73 | sDMA | DSS DSI1 DMA request 2 |
| | DSS_DSI1_DMA3 | S_DMA_74 | sDMA | DSS DSI1 DMA request 3 |
| MIPI DSI2 | DSS_DSI2_DMA0 | S_DMA_80 | sDMA | DSS DSI2 DMA request 0 |
| | DSS_DSI2_DMA1 | S_DMA_81 | sDMA | DSS DSI2 DMA request 1 |
| | DSS_DSI2_DMA2 | S_DMA_82 | sDMA | DSS DSI2 DMA request 2 |
| | DSS_DSI2_DMA3 | S_DMA_83 | sDMA | DSS DSI2 DMA request 3 |
| HDMI | DSS_HDMI_DMA | S_DMA_75 | sDMA | DSS HDMI audio DMA request |

10.1.3 DSS Register Manual

CAUTION

The main access to all DSS registers is through the L3 interconnect.
The access through the L4_PER interconnect is provided for back software compatibility.

10.1.3.1 DSS Instance Summary

Table 10-9. DSS Instance Summary

| Module Name | L4_PER Base Address | L3 Base Address | Size |
|-------------|---------------------|-----------------|------|
| DSS | 0x4804 0000 | 0x5800 0000 | 4KB |

10.1.3.2 DSS Registers

10.1.3.2.1 DSS Registers Mapping Summary

Table 10-10 summarizes the DSS register mapping.

Table 10-10. DSS Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DSS L4_PER Physical Address | DSS L3 Physical Address |
|---------------|------|-----------------------|----------------|-----------------------------|-------------------------|
| DSS_REVISION | R | 32 | 0x0000 0000 | 0x4804 0000 | 0x5800 0000 |
| RESERVED | R | 32 | 0x0000 0010 | 0x4804 0010 | 0x5800 0010 |
| DSS_SYSSTATUS | R | 32 | 0x0000 0014 | 0x4804 0014 | 0x5800 0014 |
| DSS_CTRL | RW | 32 | 0x0000 0040 | 0x4804 0040 | 0x5800 0040 |
| DSS_STATUS | R | 32 | 0x0000 005C | 0x4804 005C | 0x5800 005C |

10.1.3.2.2 DSS Register Description

NOTE: The VDAC function is not supported.

Table 10-11 through Table 10-17 describe the register bits.

Table 10-11. DSS_REVISION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 0000 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | DSS_PER_L4 | | | | | | | | | | | | | | | |
| | 0x5800 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DSS_L3 | | | | | | | | | | | | | | | |
| Description | This register contains the DSS revision number. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

⁽¹⁾ TI internal data

Table 10-12. Register Call Summary for Register DSS_REVISION

Display Subsystem Overview

- [DSS Registers Mapping Summary: \[0\]](#)

Table 10-13. DSS_SYSSTATUS

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0014 | Instance | DSS_PER_L4 DSS_L3 |
| Physical Address | 0x4804 0014 0x5800 0014 | | |
| Description | This register provides status information about the module. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESETDONE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | RESETDONE | Internal reset monitoring Read 0x0: Internal module reset is ongoing. Read 0x1: Reset complete | R | 0x1 |

Table 10-14. Register Call Summary for Register DSS_SYSSTATUS

Display Subsystem Overview

- [DSS Registers Mapping Summary: \[0\]](#)

Table 10-15. DSS_CTRL

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0040 | Instance | DSS_PER_L4 DSS_L3 |
| Physical Address | 0x4804 0040 0x5800 0040 | | |
| Description | This register contains the DSS control bits. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----------|------------------|-------------|----------|-----------------|----------|-----------------|----------------|----------|----------|----------|----------|----------|----------|-----------------|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | LCD2_TV_SEL | RESERVED | VENC_HDMI_SWITCH | RFBI_SWITCH | RESERVED | LCD2_CLK_SWITCH | RESERVED | DSI2_CLK_SWITCH | FCK_CLK_SWITCH | RESERVED | RESERVED | RESERVED | RESERVED | RESERVED | RESERVED | DSI1_CLK_SWITCH | LCD1_CLK_SWITCH |

| Bits | Field Name | Description | Type | Reset |
|--------|-------------|--|------|--------|
| 31: 18 | RESERVED | Reserved | R | 0x0000 |
| 17 | LCD2_TV_SEL | Selection between LCD2 and TV channel out on the LCD2 parallel output (multiplexer 13) 0x0: Select LCD2 channel output (default selection) 0x1: Select TV channel output | RW | 0x0 |
| 16 | RESERVED | Reserved | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-------|
| 15 | VENC_HDMI_SWITCH | Selects HDMI sync and associated clock 0x0: Reserved 0x1: HDMI selected | RW | 0x0 |
| 14 | RFBI_SWITCH | Selects the video port from DISPC between video port 1 and video port 2 (multiplexer 11). Read 0x0: Video port 1 (also named primary LCD output or LCD1) is selected (backward-compatible mode). Read 0x1: Video port 2 (also named secondary LCD output or LCD2) is selected. | RW | 0x0 |
| 13 | RESERVED | Reserved | R | 0x0 |
| 12 | LCD2_CLK_SWITCH | DSS_CLK/PLL2_CLK1 clock switch (multiplexer 3) Selects the clock source for the DISPC LCD2_CLK clock 0x0: DSS_CLK selected (from PRCM) 0x1: PLL2_CLK1 selected | RW | 0x0 |
| 11 | RESERVED | Reserved | R | 0x0 |
| 10 | DSI2_CLK_SWITCH | DSS_CLK/PLL2_CLK2 clock switch Selects the clock source for the DSI2 functional clock DSI2_CLK 0x0: DSS_CLK selected (from PRCM) 0x1: PLL2_CLK2 selected (from DSI2 PLL) | RW | 0x0 |
| 9:8 | FCK_CLK_SWITCH | Selects the clock source for the DISPC functional clock DISPC_FCLK 0x0: DSS_CLK selected (from PRCM) 0x1: PLL1_CLK1 selected (from DSI1 PLL) 0x2: PLL2_CLK1 selected (from DSI2 PLL) 0x3: PLL3_CLK1 selected (from HDMI PLL) | RW | 0x0 |
| 7 | RESERVED | Write 0's for future compatibility. Reads returns 0. | R | 0x0 |
| 6 | RESERVED | Reserved | R | 0x0 |
| 5 | RESERVED | Reserved | R | 0x0 |
| 4 | RESERVED | Reserved | R | 0x0 |
| 3 | RESERVED | Reserved | R | 0x0 |
| 2 | RESERVED | Reserved | R | 0x0 |
| 1 | DSI1_CLK_SWITCH | DSS_CLK/PLL1_CLK2 clock switch Selects the clock source for the DSI1 functional clock DSI1_CLK 0x0: DSS_CLK selected (from PRCM) 0x1: PLL1_CLK2 selected (from DSI1 PLL) | RW | 0x0 |
| 0 | LCD1_CLK_SWITCH | DSS_CLK/PLL1_CLK1 clock switch (multiplexer 2) Selects the clock source for the DISPC LCD1_CLK clock 0x0: DSS_CLK selected (from PRCM) 0x1: PLL1_CLK1 selected (from DSI1 PLL) | RW | 0x0 |

Table 10-16. Register Call Summary for Register DSS_CTRL

Display Subsystem Overview

- [Parallel Interface: \[0\] \[1\] \[2\] \[3\]](#)
- [DSS Clocks: \[4\]](#)
- [DSS Registers Mapping Summary: \[5\]](#)

Table 10-17. DSS_STATUS

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 005C | Instance | DSS_PER_L4 DSS_L3 |
| Physical Address | 0x4804 005C 0x5800 005C | | |
| Description | This register contains the DSS status. | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------|----|----|----|-------------|----|----|----|----------------|----|----|----|----------|----|---|---|-----------------|---|---|---|-----------------|---|---|---|-----------------|--|--|--|-------------------|--|--|--|----------|--|--|--|-----------------|--|--|--|
| RESERVED | | | | | | | | RFBI_STATUS | | | | SYNC_STATUS | | | | FCK_CLK_STATUS | | | | RESERVED | | | | LCD2_CLK_STATUS | | | | DSI2_CLK_STATUS | | | | DSI1_CLK_STATUS | | | | TV_CLK_OUT_STATUS | | | | RESERVED | | | | LCD1_CLK_STATUS | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:22 | RESERVED | Reserved | R | 0x000 |
| 21 | RFBI_STATUS | Video port selection status (multiplexer 11) Indicates if video port 1 or video 2 from DISPC is used to provide data to the RFBI Read 0x0: Video port 1 (named also primary LCD output or LCD1) used to provide data to RFBI Read 0x1: Video port 2 (named also secondary LCD output or LCD2) used to provide data to RFBI | R | 0x0 |
| 20:19 | SYNC_STATUS | Sync generator selection status (multiplexer 9) Indicates the component selected as syncs generator (master mode) Read 0x0: Reserved Read 0x1: Reserved Read 0x2: HDMI selected | R | 0x0 |
| 18:15 | FCK_CLK_STATUS | DISPC_FCLK clock selection status (multiplexer 1), indicates which clock is used by the glitch-free multiplexer selecting the source of DISPC_FCLK. The current and the new-selected clocks must be running to be able to switch. Both clocks are used at the same time while the switching is ongoing. Read 0x0: DSS_CLK clock switching is ongoing. Read 0x1: DSS_CLK is used by DISPC as DISPC_FCLK clock. Read 0x2: PLL1_CLK1 is used by DISPC as DISPC_FCLK clock. Read 0x4: PLL2_CLK1 is used by DISPC as DISPC_FCLK clock. Read 0x8: PLL3_CLK1 is used by DISPC as DISPC_FCLK clock. | R | 0x1 |
| 14:13 | RESERVED | Reserved | R | 0x1 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 12:11 | LCD2_CLK_STATUS | <p>LCD2_CLK clock selection status (multiplexer 3), indicates which clock is used by the glitch-free multiplexer selecting the source of LCD2_CLK. The current and the new-selected clocks must be running to be able to switch. Both clocks are used at the same time while the switching is ongoing.</p> <p>Read 0x0: LCD2_CLK clock switching is ongoing.</p> <p>Read 0x1: DSS_CLK is used as LCD2_CLK.</p> <p>Read 0x2: PLL2_CLK1 is used by DISPC as LCD2_CLK clock.</p> | R | 0x1 |
| 10:9 | DSI2_CLK_STATUS | <p>DSI2_CLK clock selection status (multiplexer 5), indicates which clock is used by the glitch-free multiplexer selecting the source of DSI2_CLK. The current and the new-selected clocks must be running to be able to switch. Both clocks are used at the same time while the switching is ongoing.</p> <p>Read 0x0: DSI2_CLK clock switching is ongoing</p> <p>Read 0x1: DSS_CLK is used by DSI2 as DSI2_CLK clock.</p> <p>Read 0x2: PLL2_CLK2 is used by DSI2 as DSI2_CLK clock.</p> | R | 0x1 |
| 8:7 | DSI1_CLK_STATUS | <p>DSI1_CLK clock selection status (multiplexer 4), indicates which clock is used by the glitch-free multiplexer selecting the source of DSI1_CLK. The current and the new-selected clocks must be running to be able to switch. Both clocks are used at the same time while the switching is ongoing.</p> <p>Read 0x0: DSI1_CLK clock switching is ongoing.</p> <p>Read 0x1: DSS_CLK is used by DSI1 as DSI1_CLK clock.</p> <p>Read 0x2: PLL1_CLK2 is used by DSI1 as DSI1_CLK clock.</p> | R | 0x1 |
| 6:5 | TV_CLK_OUT_STATUS | <p>TV_CLK_OUT selection status (multiplexer 12) indicates which clock is used by the multiplexer selecting the TV_CLK_OUT of the DISPC. The current and the new-selected clocks must be running to be able to switch. Both clocks are used at the same time while the switching is ongoing.</p> <p>Read 0x1: Reserved</p> <p>Read 0x2: HDMI_M_PCLK is used by DISPC as TV_CLK_OUT clock.</p> | R | 0x1 |
| 4:2 | RESERVED | Reserved | R | 0x0 |
| 1:0 | LCD1_CLK_STATUS | <p>LCD1_CLK clock selection status (multiplexer 2), indicates which clock is used by the glitch-free multiplexer selecting the source of LCD1_CLK. The current and the new-selected clocks must be running to be able to switch. Both clocks are used at the same time while the switching is ongoing.</p> <p>Read 0x0: LCD1_CLK clock switching is ongoing.</p> <p>Read 0x1: DSS_CLK is used as LCD1_CLK.</p> <p>Read 0x2: PLL1_CLK1 is used by DISPC as LCD1_CLK clock.</p> | R | 0x1 |

Table 10-18. Register Call Summary for Register DSS_STATUS

Display Subsystem Overview

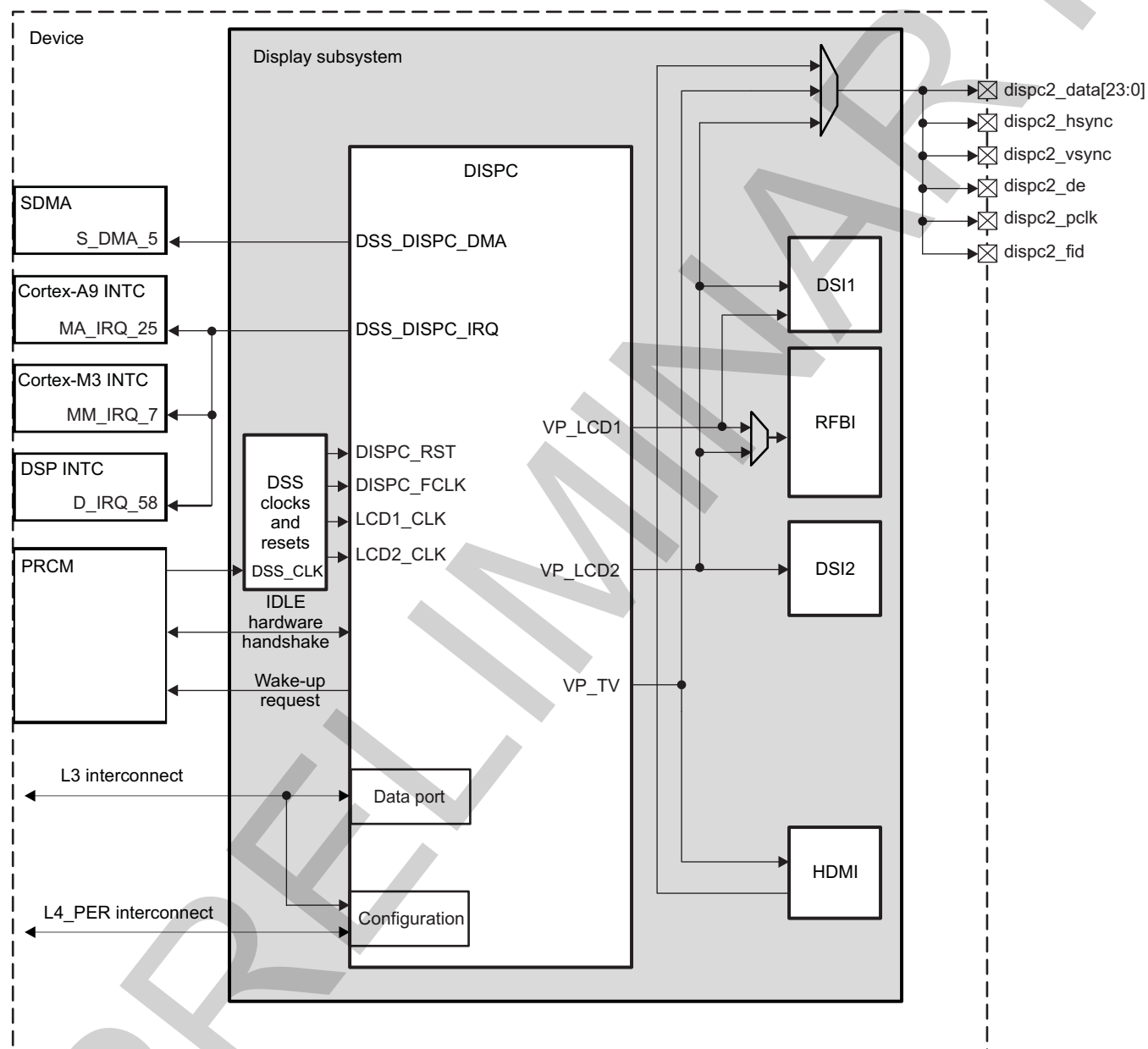
- [DSS Registers Mapping Summary: \[0\]](#)

10.2 Display Controller

10.2.1 Display Controller Overview

Figure 10-10 shows a block diagram of the display subsystem.

Figure 10-10. Display Subsystem Highlight



dispc-064

The DISPC includes the following main features:

- Five pipelines for processing:
 - One graphics pipeline (GFX):
 - Pixel formats: ARGB16-4444, xRGB12-4444, RGBA16-4444, RGBx12-4444, RGB16-565, ARGB16-1555, xRGB16-1555, ARGB32-8888, RGBA32-8888, xRGB32-8888, RGBx32-8888, RGB24-888, and BITMAP (1, 2, 4, or 8 bits per pixel) (x means that the correspond bits in the container are not used)
 - Selection of the color depth expansion from ARGB16-4444, RGBA16-4444, and ARGB16-1555

- to ARGB32-8888 and from xRGB12-4444, RGBx12-4444, and xRGB16-1555 to xRGB32-8888 (replication of the MSBs or adding 0s)
- Support for color look-up table (CLUT): 256 × 24-bit entries palette in RGB
- Support for antiflicker on RGB pixel formats using 3-tap filter.
- Three video pipelines (VID1, VID2, and VID3):
 - Pixel formats: ARGB16-4444, xRGB12-4444, RGBx12-4444, RGBA12-3333, RGBA16-4444, RGB16-565, ARGB16-1555, xRGB16-1555, ARGB32-8888, RGBA32-8888, xRGB32-8888, RGBx32-8888, RGB24-888, YUV4:2:2-UYVY, YUV4:2:2-YUV2, and YUV4:2:0-NV12 (x means that the correspond bits in the container are not used)
 - Selection of the color depth expansion from ARGB16-4444, RGBA16-4444, and ARGB16-1555 to ARGB32-8888 and from xRGB12-4444, RGBx12-4444, and xRGB16-1555 to xRGB32-8888 (replication of the MSBs or adding 0s)
 - Programmable polyphase filter:
 - Independent horizontal and vertical resampling: upsampling (up to x8) and downsampling (down to 1/4)
 - Maximum input width of 1920 pixels
 - No limitation on the input height
 - Supported input formats are ARGB32-8888, YUV4:2:2-UYVY, YUV4:2:2-YUV2, and YUV4:2:0-NV12.
 - Alpha blending factor is rescaled like the R, G, and B color components.
 - Programmable color space conversion from YUV4:2:2 (YUV4:4:4, YUV4:2:0 after Chroma upsampling through the scaler) into ARGB32-8888. Images in YUV4:2:2 format with 90/270 degree rotation are preprocessed to YUV4:4:4 before the scaler, by duplicating the missing Chroma.
 - Programmable VC-1 range mapping
- One Write-back pipeline (WB): allows to take benefit of the hardware processing available inside the DISPC like color space conversion, rescaling, compositing to perform memory-to-memory transfer with data processing or capturing a displayed frame.
 - Programmable color space conversion RGB24 into YUV4:4:4 or to YUV4:2:2-UYVY, YUV4:2:2-YUV2, or YUV4:2:0-NV12 using programmable polyphase filter.
 - Programmable color space conversion RGB24 into YUV4:2:2-UYVY, YUV4:2:2-YUV2, or YUV4:2:0-NV12
 - Selection of the color depth reduction from RGB24 to RGB16
 - Programmable polyphase filter:
 - Independent horizontal and vertical resampling: upsampling (up to x8) and downsampling (down to 1/4)
 - Maximum input width of 1920 pixels
 - No limitation on the input height
 - Supported input formats are ARGB32-8888, YUV4:2:2-UYVY, YUV4:2:2-YUV2, and YUV4:2:0-NV12.
 - Alpha blending factor is rescaled like the R, G, and B color components.
 - Selection of the source of the data:
 - Overlay output:
 - Primary LCD
 - Secondary LCD
 - TV
 - Pipelines:
 - Graphic
 - Video 1
 - Video 2

- Video 3
- Two LCD outputs, primary (LCD1) and secondary (LCD2):
 - Input pixel format: ARGB32-8888
 - Output pixel format: RGB24-888
 - Overlay of graphic and video 1, 2, and 3 pipelines
 - Source and destination transparency color key
 - Global and pixel alpha blending (up to 8-bit blending factor)
 - Z-order programmable (full flexibility)
 - Three types of displays are supported:
 - Passive matrix monochrome: 4-/8-bit monochrome panel interface support (15 grayscale levels supported using dithering block)
 - Passive matrix color: 8-bit color panel interface support (3375 colors supported for a color panel using dithering block)
 - Active matrix color: 12-/16-/18-/24-bit panel interface support (replicated or dithered encoded pixel values)
 - Independent programmable timing generators for LCD1 and LCD2 to support:

| | | |
|----------------------|----------------------|---|
| Primary LCD | Using DSI1 interface | SXGA VESA timing @ 60 FPS |
| | Using RFBI | WVGA @ 30 fps |
| Secondary LCD | Using DSI2 interface | SXGA VESA timing @ 85 fps |
| | Using RFBI | WVGA @ 30 fps |
| | Using CMOS interface | SXGA VESA timing @ 85 fps1080i/720p CEA-861-D |

- Configurable LCD output mode: progressive or interlace mode
- Selection between RGB and YUV4:2:2 output pixel format
- Remote frame buffer support through the RFBI module
- Partial display through the RFBI
- Multiple-cycle output format on 8-/9-/12-/16-bit interface time division multiplexing (TDM)
- One TV output
 - Input pixel format: ARGB40-10.10.10.10
 - Output pixel format: ARGB40-10.10.10.10
 - Overlay of graphic and video 1, 2, and 3 pipelines
 - Source and destination transparency color key
 - Global and pixel alpha blending (up to 10-bit blending factor)
 - Z-order programmable (full flexibility)
 - Slave mode support (no master mode support) with synchronization signals provided by the HDMI TX
 - HSYNC (horizontal synchronization signal)
 - VSYNC (vertical synchronization signal)
 - RE (data request signal)
 - FID (field ID: odd/even field information)
 - RGB30-10.10.10 data bus output for connection to HDMI TX and extended to 36 by duplication of the MSBs
 - HD-1080p, HD-1080i, HD-720p, SD-480p, SD-576p, SD-576i, and SD-480i using HDMI
 - HDMI deep color mode support, 30-bit data output to HDMI encoder
 - Pixel duplication capability (from one pixel clock cycle up to eight cycles)
- Panel support with MIPI DPI protocol

- 4-/8-bit monochrome passive matrix panel interface support (15 grayscale levels supported using dithering block)
- 8-bit color passive matrix panel interface support (3375 colors supported for a color panel using dithering block)
- 12-/16-/18-/24-bit active matrix panel interface support (replicated or dithered encoded pixel values)
- Common
 - Rotation 0, 90, 180, and 270 using DMM-TILER
 - Synchronized buffer update
 - Hardware cursor (using the graphics pipeline or one of the video pipelines)
 - Independent gamma curve support on primary LCD output, secondary LCD output and TV output
 - Multiple-buffer support
 - Mirroring/flip-flop support (using DMM-TILER)
 - Programmable color-phase rotation (CPR)
 - Alpha blending support:
 - Embedded pixel factor (ARGB and RGBA)
 - Global alpha
- DMA (internal to the DISPC)
 - Support for accessing tiled structure through the TILER inside the dynamic memory management (DMM)
 - Support for rotation, flip-flop, and mirroring through the TILER inside the DMM
 - Support for memory fragmentation through the TILER inside the DMM
 - Integrated shared buffers between DMA engine and pipelines
 - Programmable buffer thresholds
 - Bandwidth limiter on write request (insertion on idle cycles between requests)
 - Support for immediate flip of the base address (GFX, VID1, VID2, and VID3 pipelines)
 - Support for MFLAG mechanism (dynamic increase of the priority of real-time data traffic)
- Advanced
 - Mode outputting data on display only from the DMA buffer (self-refresh using the DMA FIFO)
 - DMA buffer hand-check in stall mode
 - Arbitration between high/low priority (GFX, VID1, VID2, VID3, and WB pipelines)
- Power modes
 - Low-power saving modes
 - Support on-the-fly dynamic voltage and frequency scaling (DVFS)
 - Merge capability of the DMA buffers to support greater OFF period on the L3 interconnect
 - All buffers associated to a single pipeline
 - Reallocation of the buffers of the nonactive pipelines to the active pipelines

10.2.2 Display Controller Environment

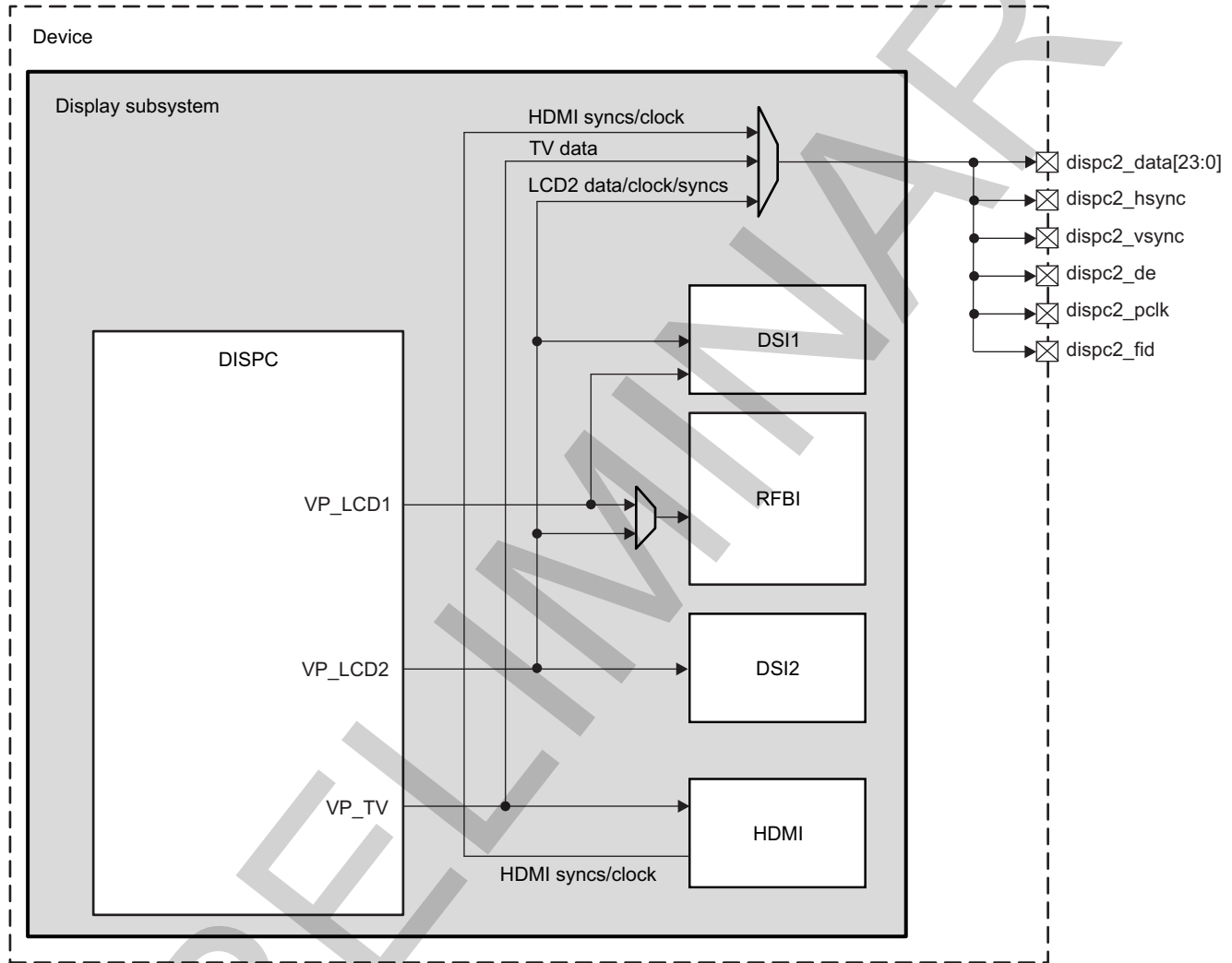
The DISPC provides the required control signals to interface directly to an external parallel panel for the MIPI DPI protocol.

[Figure 10-11](#) shows the LCD support parallel interface.

NOTE: Parallel interface is available through the LCD2 and TV outputs of the DISPC.

The LCD2 data and control signals are multiplexed with the TV output data, and control signals provided by the HDMI module.
The selection can be done at the DSS top level. For further details and signals mapping, see [Section 10.1.1.1.1 Parallel Interface](#).

Figure 10-11. LCD Support Parallel Interface



dispc-083

Table 10-19 describes the interface signals to/from the LCD panel in bypass mode.

Table 10-19. Parallel Interface Signals

| Signal Name | Type ⁽¹⁾ | Description |
|-------------------|---------------------|--|
| dispc2_data[23:0] | O | Pixels data |
| dispc2_pclk | O | Pixel clock |
| dispc2_vsync | O | Vertical synchronization. The LCD frame clock (vsync) toggles after all the lines in a frame are transmitted to the LCD panel and a programmable number of line clock cycles has elapsed at the beginning and the end of each frame. |
| dispc2_hsync | O | Horizontal synchronization. The LCD line clock (hsync) toggles after all pixels in a line are transmitted to the LCD panel and a programmable number of pixel clock wait-states elapse, at the beginning and the end of each line. |

⁽¹⁾ I = Input, O = Output, I/O = Bidirectional

Table 10-19. Parallel Interface Signals (continued)

| Signal Name | Type ⁽¹⁾ | Description |
|-------------|---------------------|---|
| dispc2_de | O | <ul style="list-style-type: none"> In passive matrix technology, the de signal is configured to transition each time a programmable number of line clocks occurs. To prevent a DC charge within the screen pixels, the power and ground supplies of the panel are periodically switched. The DISPC signals the panel to switch the polarity by toggling the de pin. In active matrix technology, the de signal acts as an output-enable signal to indicate when data must be latched using the pixel clock. |
| dispc2_fid | O | The FID signal indicates the field identifier for the LCD output field. <ul style="list-style-type: none"> 0 means even. 1 means odd. |

10.2.2.1 LCD Output and Data Format for the Parallel Interface

This section describes the pixel data bus and shows timing diagrams of transactions and synchronizations.

Figure 10-12 through Figure 10-18 show the pixel data bus, depending on the use of 4-, 8-, 12-, 16-, 18-, or 24-pixel data output pins.

Table 10-20 lists the number of displayed pixels per pixel clock cycle based on the type of display panel.

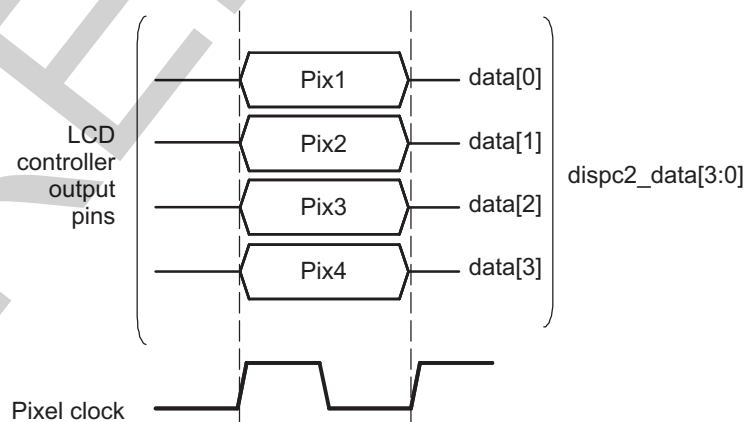
Table 10-20. Number of Displayed Pixels per Pixel Clock Cycle Based on Display Type

| Display Panel | Number of Displayed Pixels per Pixel Clock Cycle |
|----------------------|---|
| Monochrome 4-bit | 4 |
| Monochrome 8-bit | 8 |
| Passive matrix color | 8/3 |
| Active matrix | 1 |

- Passive matrix technology, monochrome mode

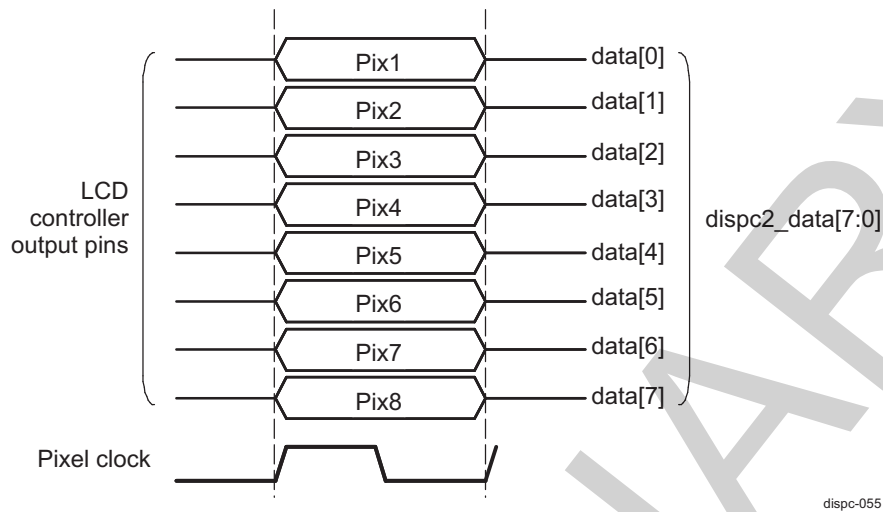
Monochrome displays use a 4-bit or 8-bit interface. Each bit represents one pixel (on or off), which means that 4 or 8 pixels are sent to the LCD at each pixel clock.

Figure 10-12 and Figure 10-13 show 4- and 8-bit monochrome displays, respectively.

Figure 10-12. LCD Pixel Data Monochrome4 Passive Matrix

dispc-054

Figure 10-13. LCD Pixel Data Monochrome8 Passive Matrix

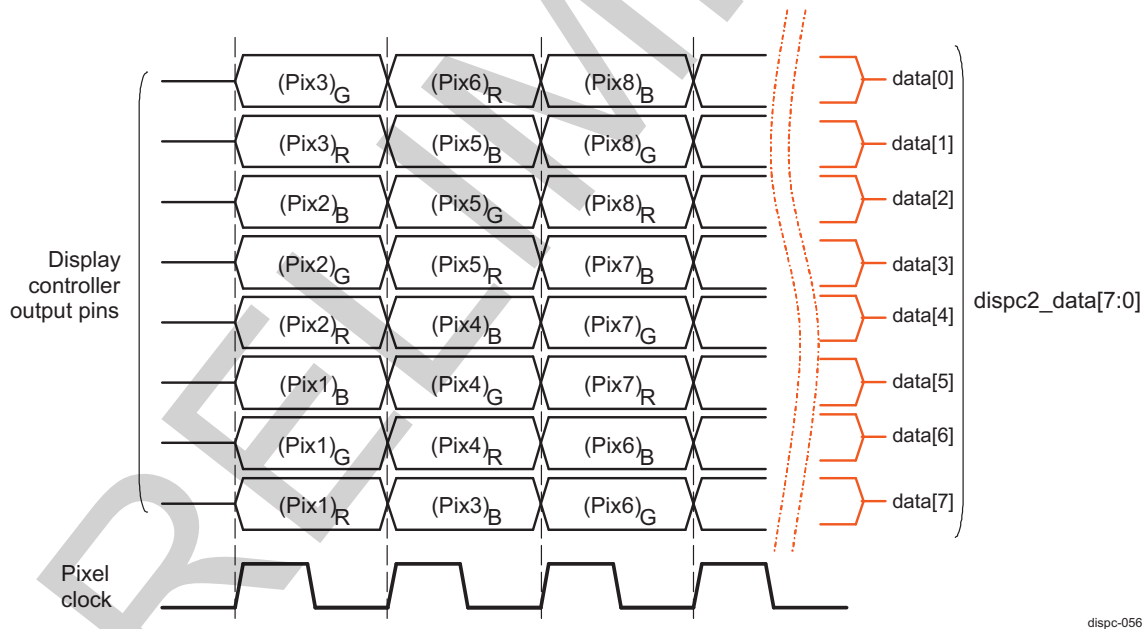


- Passive matrix technology, color mode

Color passive displays use 8-bit data input lines. In a given pixel clock cycle, each line represents one color component (red, green, or blue).

Figure 10-14 shows an 8-bit color passive matrix display.

Figure 10-14. LCD Pixel Data 8-Bit Color Passive Matrix

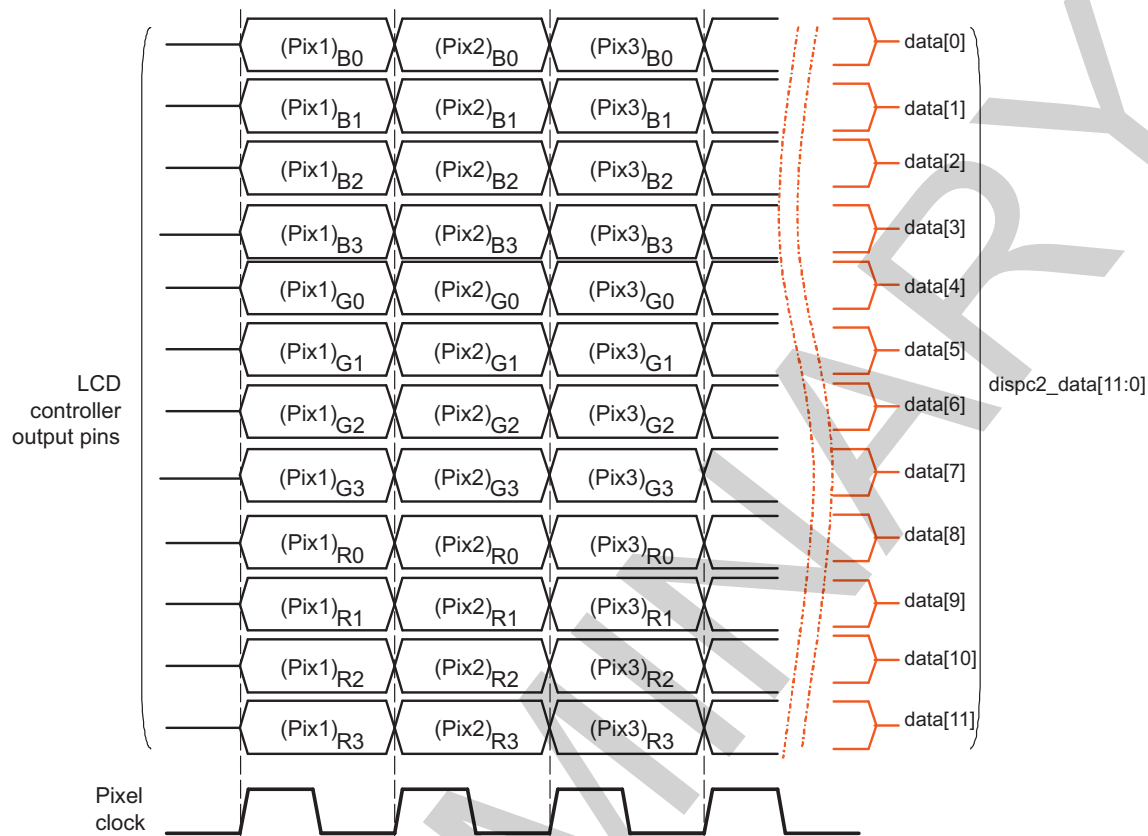


- Active matrix technology

Active matrix displays bypass the STN dithering logic block and the output FIFO. Each line represents one pixel.

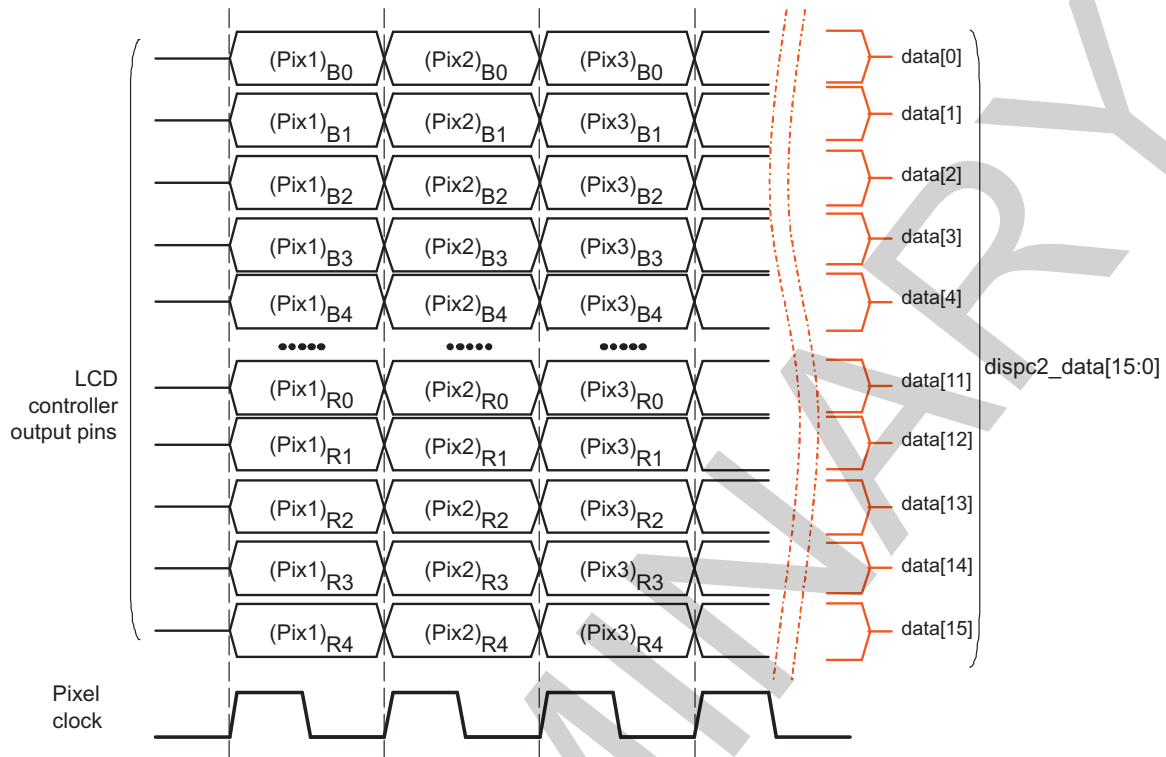
Figure 10-15 through Figure 10-18 show 12-, 16-, 18-, and 24-active matrix displays, respectively.

Figure 10-15. LCD Pixel Data Color12 Active Matrix



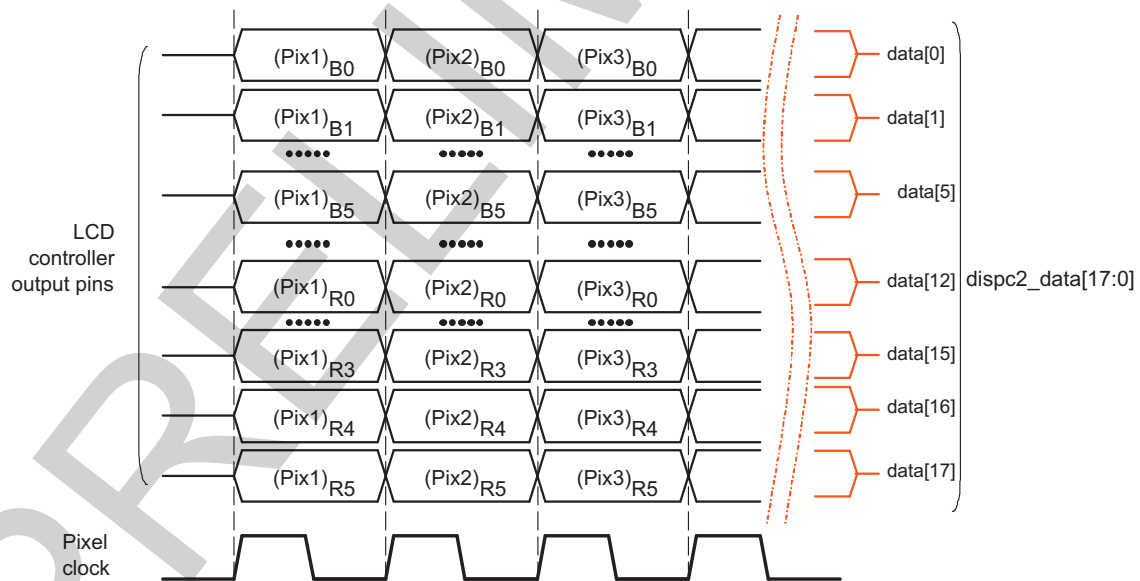
dispc-050

Figure 10-16. LCD Pixel Data Color16 Active Matrix

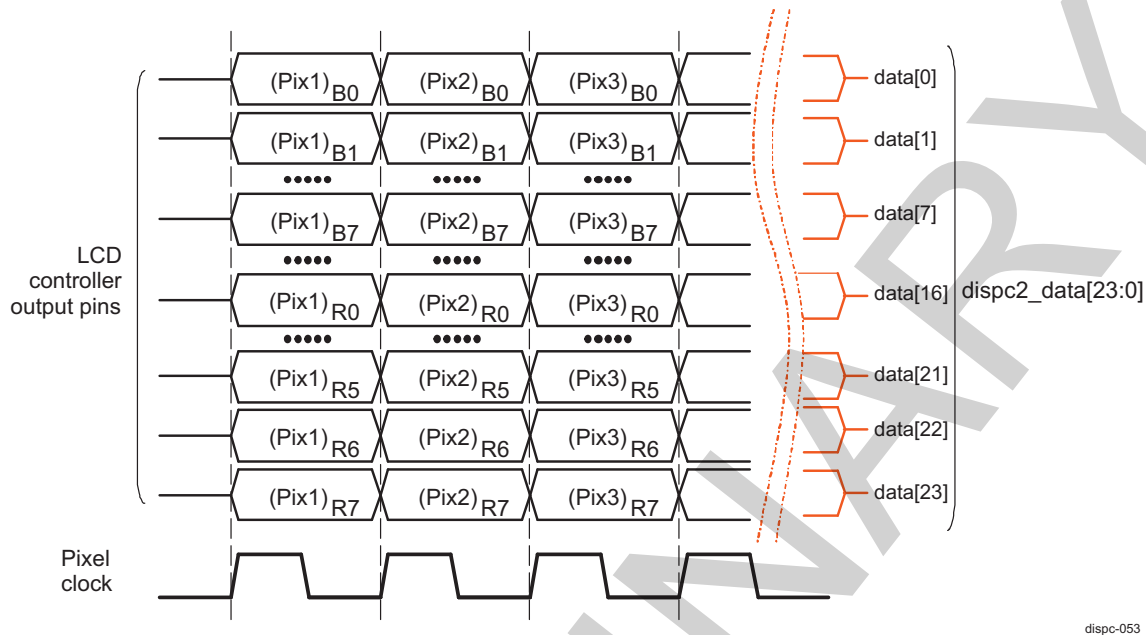


dispc-051

Figure 10-17. LCD Pixel Data Color18 Active Matrix



dispc-052

Figure 10-18. LCD Pixel Data Color24 Active Matrix

dispc-053

10.2.2.2 Transaction Timing Diagrams

Figure 10-19 through Figure 10-34 show timing diagrams of synchronization signals and pixel clock for passive matrix and active matrix panels. The DISPC directly drives these signals, which are related to the programmable fields described in Table 10-21.

Table 10-21. Programmable Fields in Bypass Mode

| Name | Register | Description |
|-------|--|--|
| PPL | DISPC_SIZE_LCD0[10:0] PPL bit field value + 1 | Pixels per line |
| LPP | DISPC_SIZE_LCD0[26:16] LPP bit field value + 1 | Lines per panel |
| HBP | DISPC_TIMING_Ho[31:20] HBP bit field value + 1 | Horizontal back porch |
| HFP | DISPC_TIMING_Ho[19:8] HFP bit field value + 1 | Horizontal front porch |
| HSW | DISPC_TIMING_Ho[7:0] HSW bit field value + 1 | Horizontal synchronization pulse width |
| VBP | DISPC_TIMING_Vo[31:20] VBP bit field value | Vertical back porch |
| VFP | DISPC_TIMING_Vo[19:8] VFP bit field value | Vertical front porch |
| VSW | DISPC_TIMING_Vo[7:0] VSW bit field value + 1 | Vertical synchronization pulse width |
| ONOFF | DISPC_POL_FREQo[17] ONOFF bit | DISPC_HSYNC and DISPC_VSYNC pixel clock control |
| RF | DISPC_POL_FREQo[16] RF bit | DISPC_HSYNC and DISPC_VSYNC pixel clock edge control |
| IEO | DISPC_POL_FREQo[15] IEO bit | Invert DISPC_ACBIAS |
| IPC | DISPC_POL_FREQo[14] IPC bit | Invert DISPC_PCLK |
| IHS | DISPC_POL_FREQo[13] IHS bit | Invert DISPC_HSYNC |
| IVS | DISPC_POL_FREQo[12] IVS bit | Invert DISPC_VSYNC |

- Active matrix timing configuration 1
 - DISPC_POL_FREQo[17] ONOFF bit = 0
 - DISPC_POL_FREQo[16] RF bit = 0
 - The HSYNC and VSYNC signals are driven on the opposite edge of PCLK from the pixel data.
 - DISPC_POL_FREQo[15] IEO = 0

- The DE signal is active high.
- DISPC_POL_FREQo[14] IPC = 0
The pixel data are driven on the rising edge of PCLK.
- DISPC_POL_FREQo[13] IHS = 0
The HSYNC signal is active high.
- DISPC_POL_FREQo[12] IVS = 0
The VSYNC signal is active high.

Figure 10-19. Active Matrix Timing Diagram of Configuration 1 (Start of Frame)

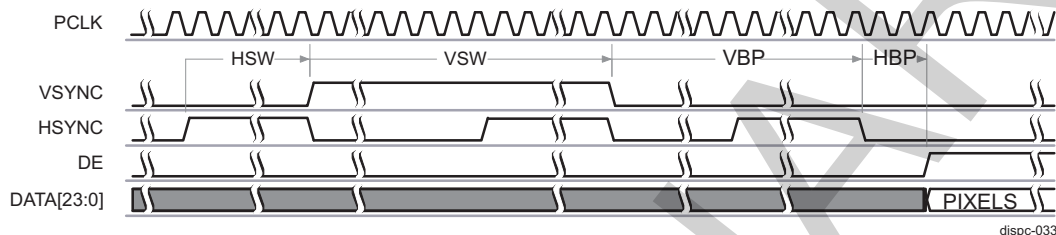


Figure 10-20. Active Matrix Timing Diagram of Configuration 1 (Between Lines)

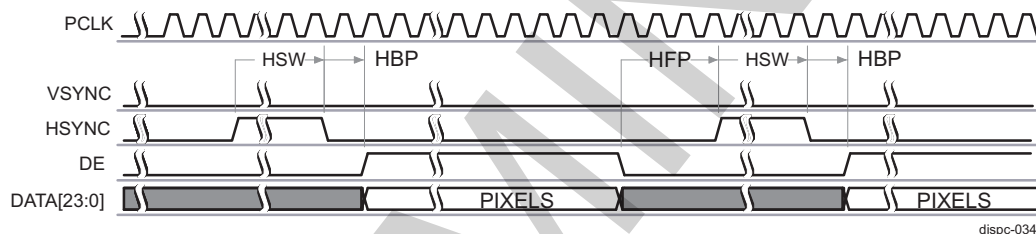


Figure 10-21. Active Matrix Timing Diagram of Configuration 1 (Between Frames)

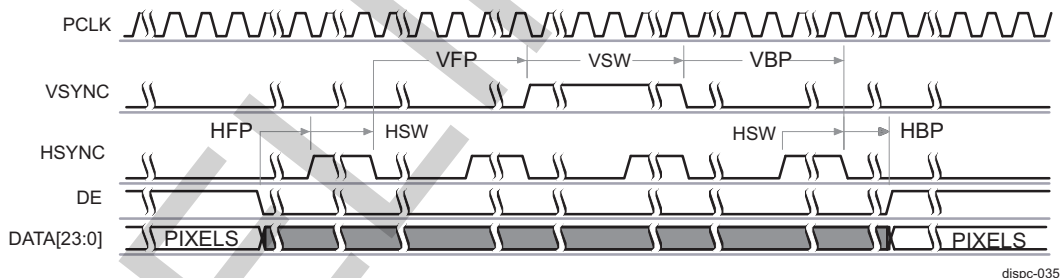
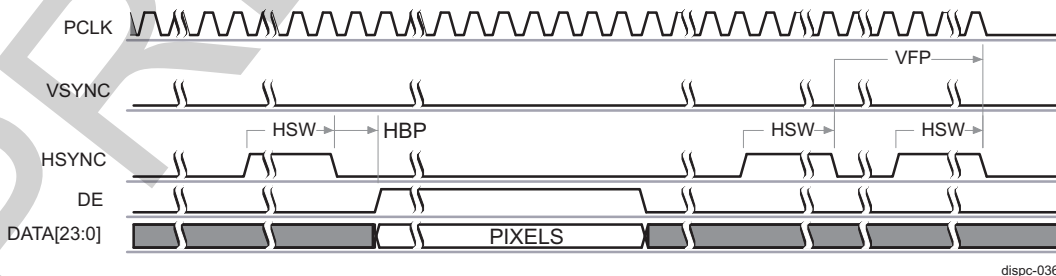
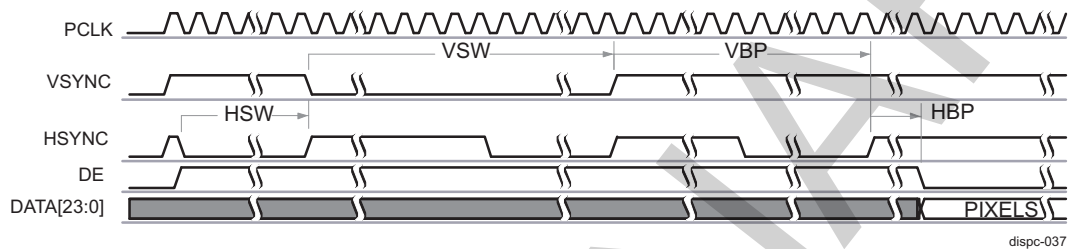
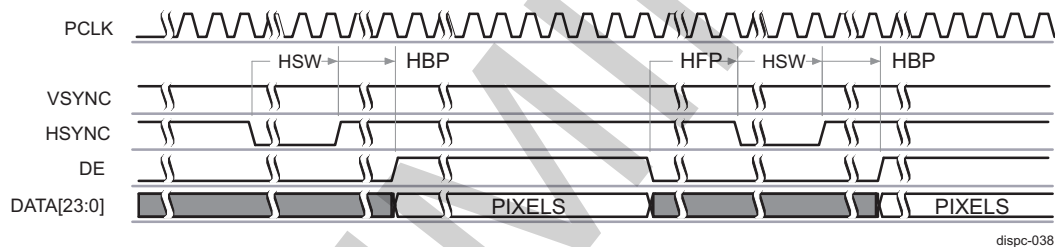
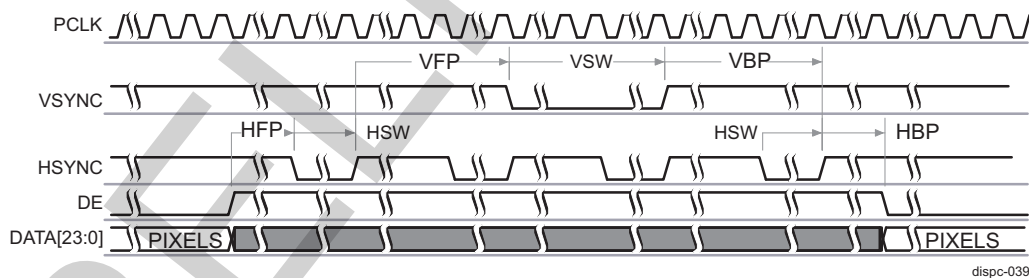
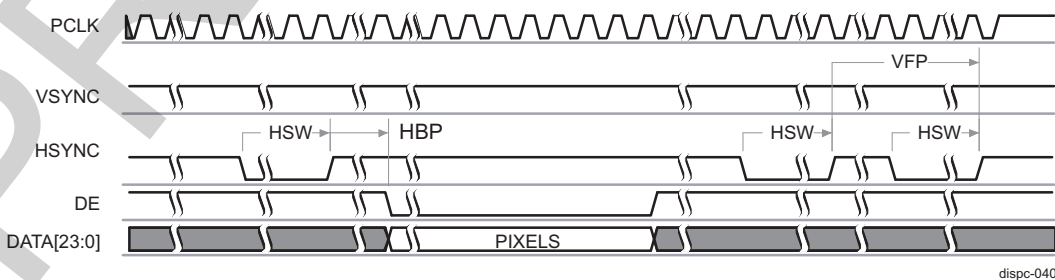


Figure 10-22. Active Matrix Timing Diagram of Configuration 1 (End of Frame)



- Active matrix timing configuration 2
 - DISPC_POL_FREQo[17] ONOFF bit = 1
 - DISPC_POL_FREQo[16] RF bit = 1
 - The HSYNC and VSYNC signals are driven on the rising edge of PCLK.

- DISPC_POL_FREQo[15] IEO = 1
The DE signal is active low.
- DISPC_POL_FREQo[14] IPC = 1
The pixel data is driven on the falling edge of PCLK.
- DISPC_POL_FREQo[13] IHS = 1
The HSYNC signal is active low.
- DISPC_POL_FREQo[12] IVS = 1
The VSYNC signal is active low.

Figure 10-23. Active Matrix Timing Diagram of Configuration 2 (Start of Frame)**Figure 10-24. Active Matrix Timing Diagram of Configuration 2 (Between Lines)****Figure 10-25. Active Matrix Timing Diagram of Configuration 2 (Between Frames)****Figure 10-26. Active Matrix Timing Diagram of Configuration 2 (End of Frame)**

- Active matrix timing configuration 3
 - DISPC_POL_FREQo[17] ONOFF bit = 1
 - DISPC_POL_FREQo[16] RF bit = 1

- The HSYNC and VSYNC signals are driven on the rising edge of PCLK.
- DISPC_POL_FREQo[15] IEO = 0
The DE signal is active high.
 - DISPC_POL_FREQo[14] IPC = 0
The pixel data are driven on the rising edge of PCLK.
 - DISPC_POL_FREQo[13] IHS = 0
The HSYNC signal is active high.
 - DISPC_POL_FREQo[12] IVS = 0
The VSYNC signal is active high.

Figure 10-27. Active Matrix Timing Diagram of Configuration 3 (Start of Frame)

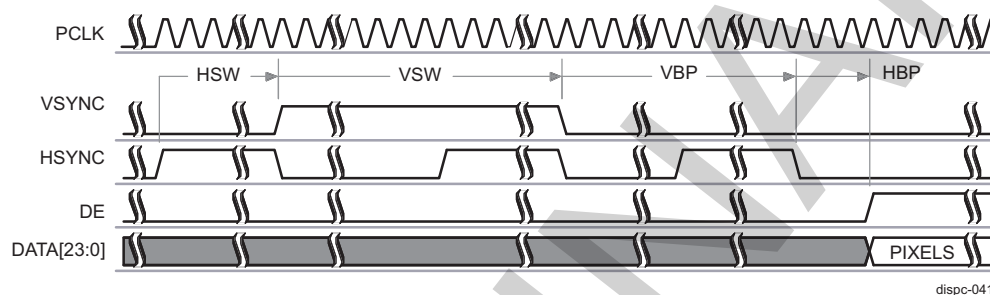


Figure 10-28. Active Matrix Timing Diagram of Configuration 3 (Between Lines)

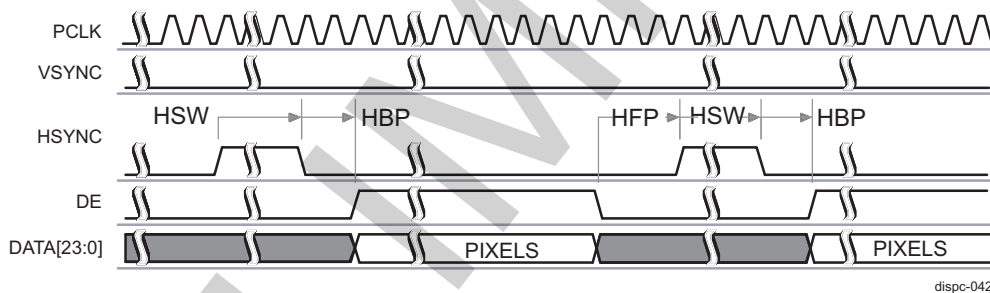


Figure 10-29. Active Matrix Timing Diagram of Configuration 3 (Between Frames)

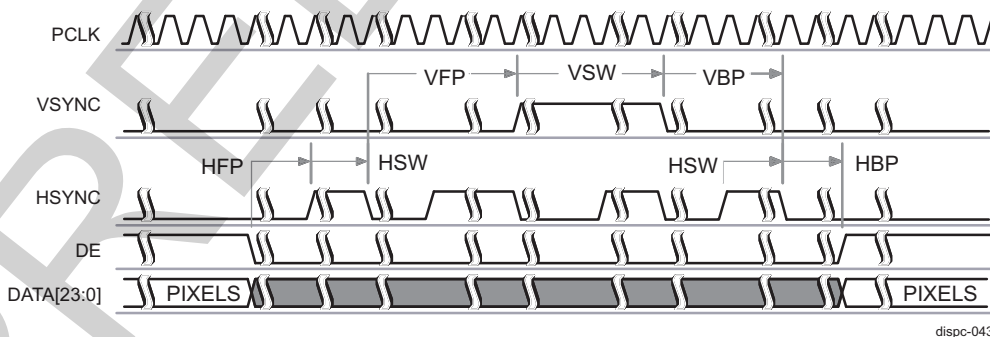
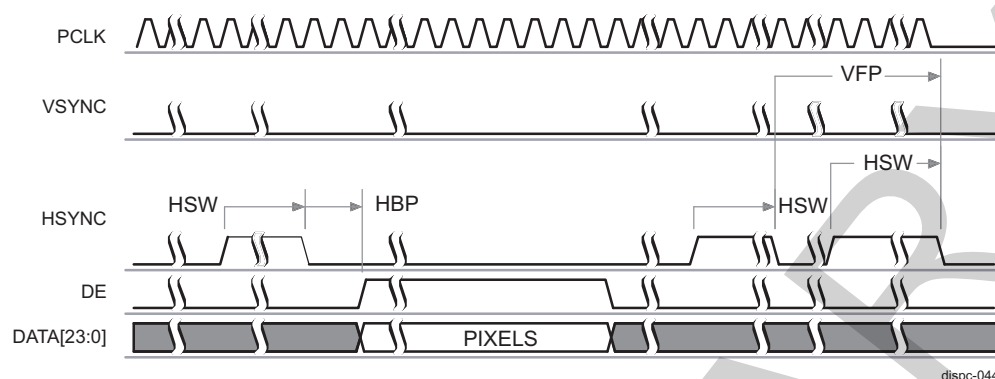


Figure 10-30. Active Matrix Timing Diagram of Configuration 3 (End of Frame)

- Passive matrix timing configuration
 - DISPC_POL_FREQo[17] ONOFF bit = 0
 - DISPC_POL_FREQo[16] RF bit = 0
The HSYNC and VSYNC signals are driven on the opposite edge of PCLK from the pixel data.
 - DISPC_POL_FREQo[15] IEO = 0
The DE signal is active high.
 - DISPC_POL_FREQo[14] IPC = 0
The pixel data are driven on the rising edge of PCLK.
 - DISPC_POL_FREQo[13] IHS = 0
The HSYNC signal is active high.
 - DISPC_POL_FREQo[12] IVS = 0
The VSYNC signal is active high.

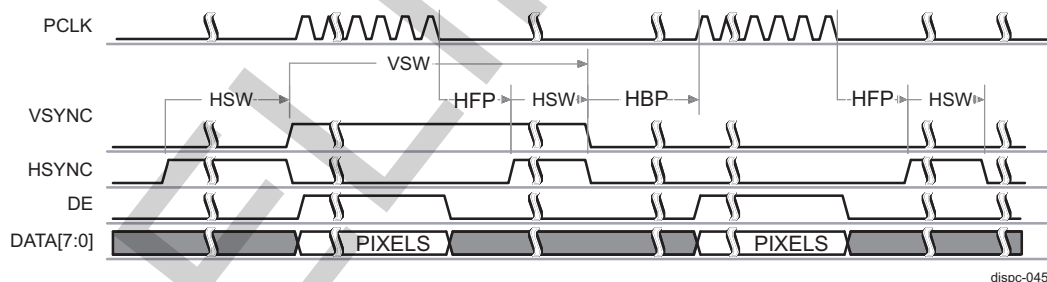
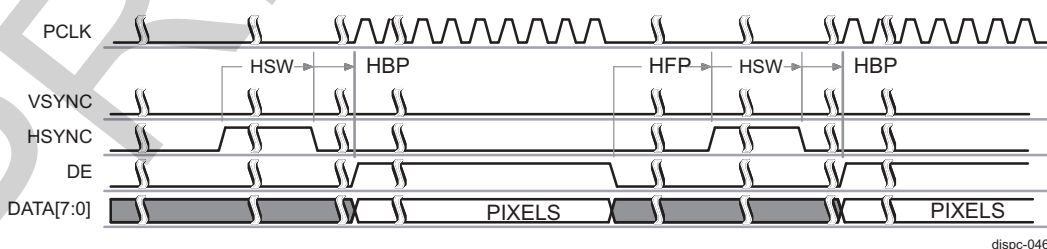
Figure 10-31. Passive Matrix Timing Diagram (Start of Frame)**Figure 10-32. Passive Matrix Timing Diagram (Between Lines)**

Figure 10-33. Passive Matrix Timing Diagram (Between Frames)

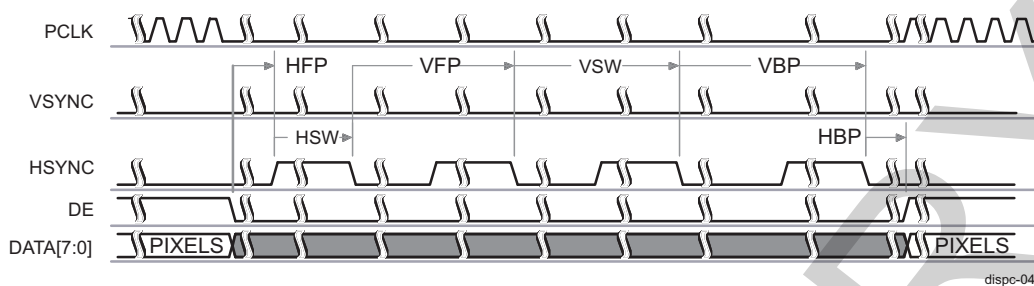
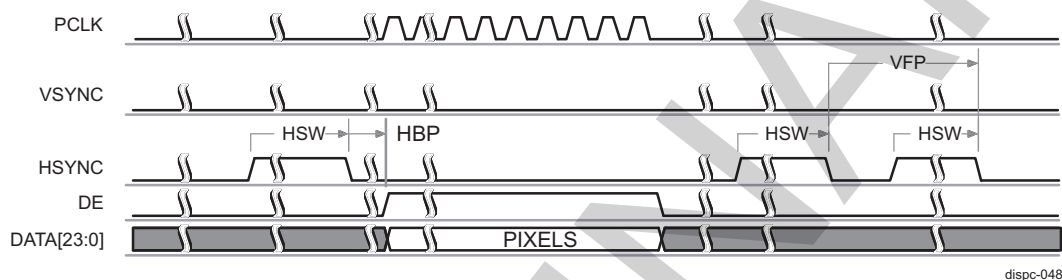


Figure 10-34. Passive Matrix Timing Diagram (End of Frame)

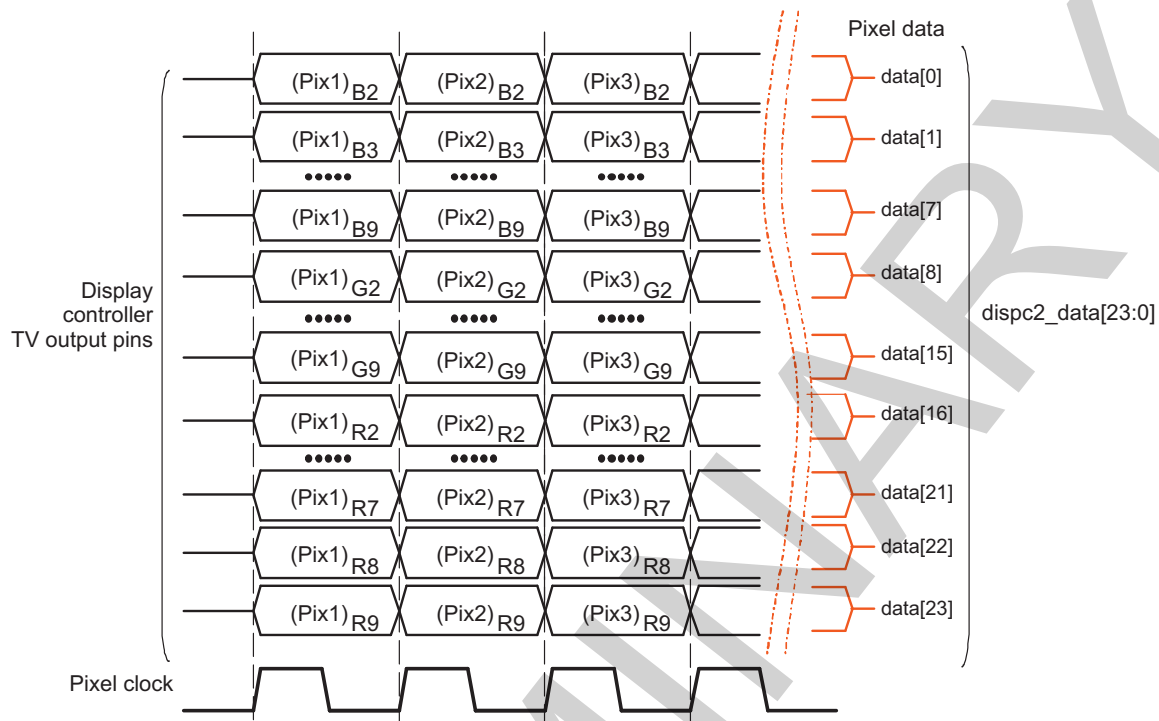


10.2.2.3 TV Output and Data Format for the Parallel Interface

This section describes the TV output pixel data bus for the parallel interface.

The TV pixel data interface is a 30-bit RGB interface. Only the MSB part of each color component is connected to the DSS boundary: R[9:2], G[9:2], and B[9:2]. The output of the data is synchronized to the data request signal (HDMI_M_DE) from the HDMI encoder.

Figure 10-35 shows the TV output pixel data format.

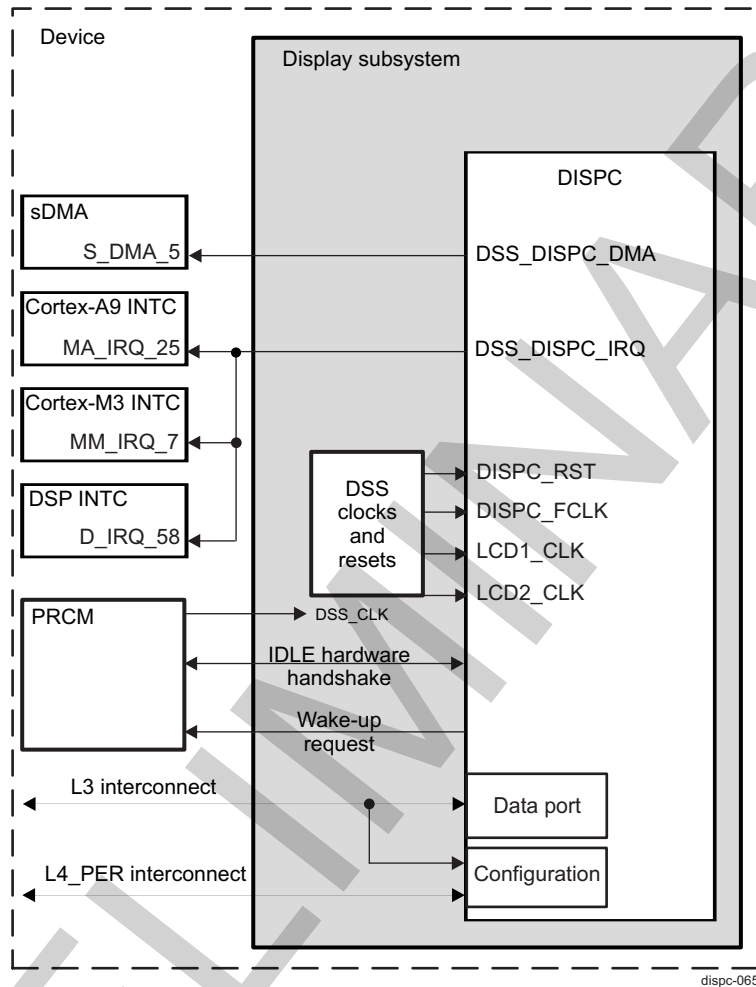
Figure 10-35. TV Output Pixel Data

dispc-093

10.2.3 Display Controller Integration

This section describes the DISPC integration in the device. The complete details about clocks, resets are detailed in the [Section 10.1, Display Subsystem Overview](#).

Figure 10-36. Display Controller Integration



[Table 10-22](#) and [Table 10-23](#) list the integration attributes and clock and resets, respectively.

[Table 10-24](#) summarizes the integration of the module in the device.

Table 10-22. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--|
| | Power Domain | Interconnect |
| DISPC | PD_DSS | L3 for data transfer L4_PER for configuration |

Table 10-23. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|---------------------------------------|-----------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| DISPC | DISPC_FCLK | DSS_CLK/PLL1_CLK1/PLL2_CLK1/PLL3_CLK1 | PRCM/PLLs | Functional clock for the DISPC logic. For multiplexing description and frequency ratings, see Section 10.1.2.1, DSS Clocks . |
| | LCD1_CLK | DSS_CLK/PLL1_CLK1 | PRCM/PLL1 | Clock used to generate the divided pixel clock for the primary LCD interface. For multiplexing description and frequency ratings, see Section 10.1.2.1, DSS Clocks . |
| | LCD2_CLK | DSS_CLK/PLL2_CLK1 | PRCM/PLL2 | Clock used to generate the divided pixel clock for the secondary LCD interface. For multiplexing description and frequency ratings, see Section 10.1.2.1, DSS Clocks . |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| DISPC | DISPC_RST | DISPSS_RST | PRCM/DSS | Hardware reset is coming from PRCM, or via a software reset performed at DSS level. For the tree reset description, see Section 10.1.2.2, DSS Resets . |

NOTE: If video mode is used, the VPn_PCLK and VPn_CLK clocks must be generated using a CLKIN4DDR clock.

Table 10-24. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| DISPC | DSS_DISPC_IRQ | MM_IRQ_ | Cortex-M3 | Display controller interrupt. For information about Cortex-M3 interrupt control, see Chapter 7 . |
| | DSS_DISPC_IRQ | D_IRQ_58 | DSP | Display controller interrupt. For information about DSP interrupt control, see Chapter 5 . |
| | DSS_DISPC_IRQ | MA_IRQ_25 | Cortex-A9 | Display controller interrupt. For information about Cortex-A9 interrupt control, see Chapter 4 . |

Table 10-24. Hardware Requests (continued)

| DMA Requests | | | | |
|-----------------|--------------------|-------------------------|-------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| DISPC | DSS_DISPC_DMA | S_DMA_5 | System DMA | The line trigger signal informs the sDMA that a programmable number of lines are output to the LCD, and that the system memory can be updated. For more details, see Section 10.2.4.5, sDMA Requests . |

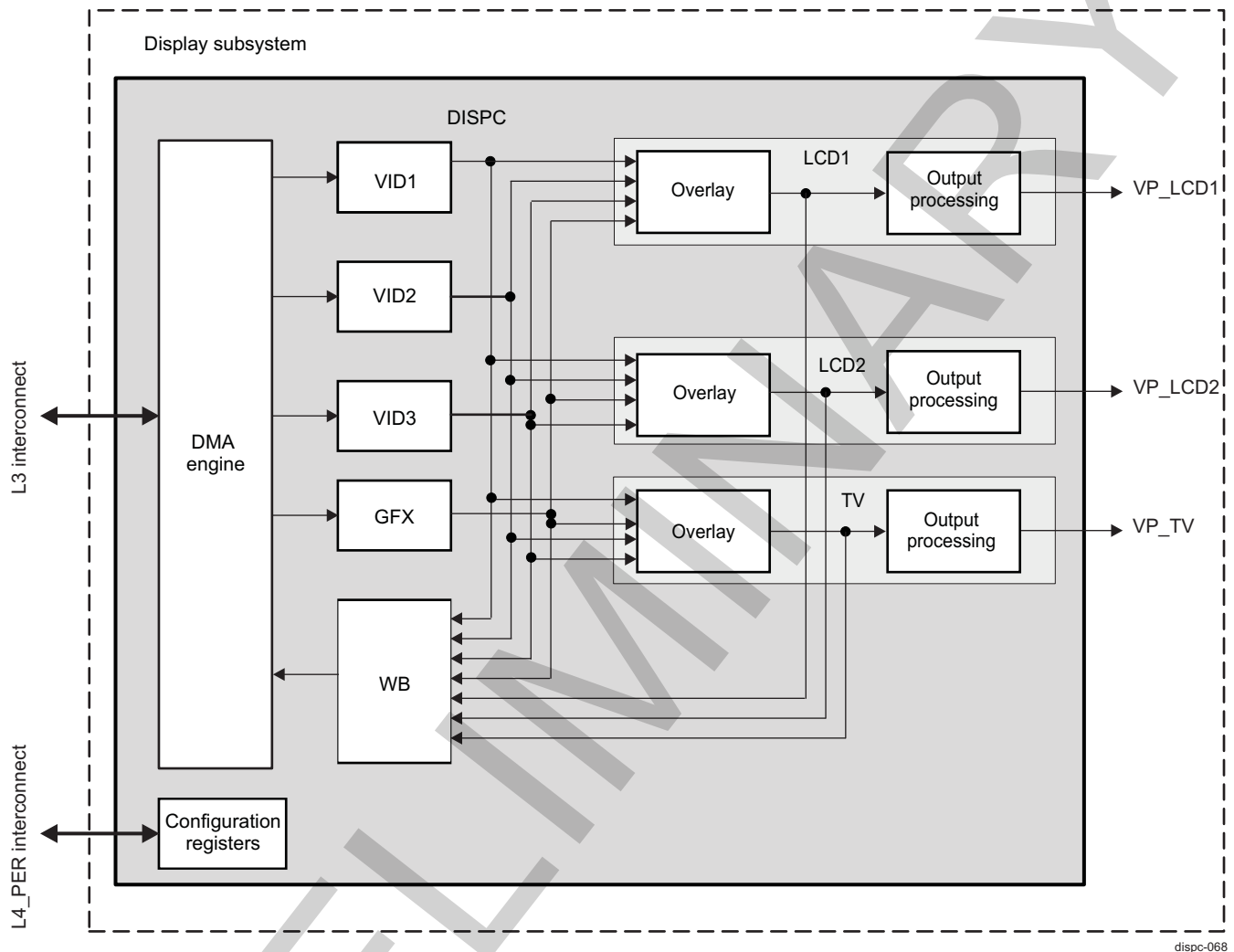
NOTE:

- For a description of interrupt sources, see [Section 10.2.4.4, Interrupt Requests](#).
- For a description of DMA sources, see [Section 10.2.4.5, sDMA Requests](#).

10.2.4 Display Controller Functional Description

The DISPC can read and display the encoded pixel data stored in memory (see [Figure 10-37](#)).

Figure 10-37. DISPC Architecture Overview



dispc-068

The DISPC can read and display the encoded pixel data stored in memory and write the output of one of the overlays or one of the pipelines into system memory.

Several processes can be configured to manage the graphics pipeline (palette, antiflicker) and video pipelines (VC-1, color space conversion, scaling, overlay, and transparency, etc.).

The data coming out of a pipeline is sent to one of the three outputs depending on user configuration. An overlay manager manages inputs of multiple pipelines. User configuration of timings for LCD and TV are available.

The DISPC allows capturing of one output of the pipeline or overlay manager to redirect it into the WB pipeline. It allows to take benefit of the hardware processing available inside the DISPC like color space conversion, rescaling, compositing, etc., to perform memory-to-memory transfer with data processing.

10.2.4.1 Clock Configuration

The PCLK frequency for each LCD output is derived from a dedicated input clock: LCD1_CLK and LCD2_CLK for the primary and secondary LCD outputs, respectively. Each input clock is divided by the values of the DISPC_DIVISORo[23:16] LCD bit field and then the DISPC_DIVISORo[7:0] PCD bit field independently for each LCD pixel clock (see [Figure 10-38](#)). LCD1_PCLK and LCD2_PCLK are independent.

$$\text{LCD1_PCLK} = (\text{LCD1_CLK} / \text{LCD1}) / \text{PCD1}$$

$$\text{LCD2_PCLK} = (\text{LCD2_CLK} / \text{LCD2}) / \text{PCD2}$$

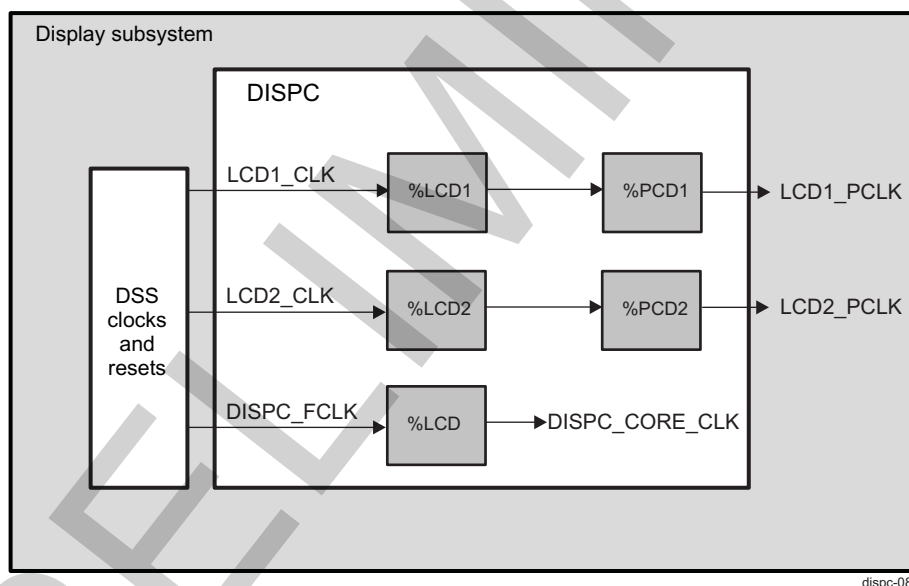
The functional clock of the DISPC (DISPC_CORE_CLK) is derived from DISPC_FCLK by an independent divisor. The dividing value is set in the [DISPC_DIVISOR\[23:16\]](#) LCD bit field.

NOTE: DISPC_CORE_CLK must be higher than or equal to the LCD1_PCLK, LCD2_PCLK, and TV_CLK clocks.

For more information about the DISPC clocks and frequency ratings, see [Section 10.1.2.1, DSS Clocks](#).

For backward compatibility, the divisor value LCD can be set to the value of LCD1. To enable this functionality, the [DISPC_DIVISOR\[0\]](#) ENABLE bit must be set to 1.

Figure 10-38. DISPC Clock Tree Overview



10.2.4.2 Software Reset

To perform a software reset on the DISPC, set the [DISPC_SYSCONFIG\[1\]](#) SOFTRESET bit to 0x1. The [DISPC_SYSSTATUS\[0\]](#) RESETDONE bit indicates that the software reset is complete when its value is 0x1. When the software reset completes, the [DISPC_SYSCONFIG\[1\]](#) SOFTRESET bit is automatically reset. Software must ensure that the software reset completes before doing DISPC operations.

10.2.4.3 Power Management

The DISPC supports the MStandby/Wait, IdleReq/SidleAck, and wake-up protocols as defined in PRCM chapter.

10.2.4.3.1 Idle Mode

The DISPC supports no-idle mode, force-idle mode, and smart-idle mode. The mode can be selected by programming the appropriate value in the [DISPC_SYSCONFIG](#)[4:3] SIDLEMODE bit field.

Conditions of assertion of the SIdleAck signal:

- In no-idle mode, SIdleAck is never asserted.
- In force-idle mode, SIdleAck is asserted unconditionally with a 1-configuration port interface clock cycle delay with respect to IdleReq assertion.

NOTE: A proper use of force-idle mode assumes that no interrupt need to be generated.

- In smart-idle mode, SIdleAck is asserted when at least the following conditions are satisfied:
 - No interrupt is pending.
 - The DISPC no longer uses the interface clock for the slave port.

Once SIdleAck is asserted:

- The DISPC interface lock used by the slave port can be shut down at any time.
- Any transactions on the configuration port (L4_PER interconnect) are ignored.

The conditions of deassertion of SIdleAck signal are:

- In force-idle mode, SIdleAck is deasserted with a 1-configuration port interface clock cycle delay with respect to IdleReq deassertion.
- In smart-idle mode, SIdleAck is deasserted with a 1-configuration port interface clock cycle delay with respect to IdleReq deassertion.

When SIdleAck is released, the DISPC is fully operational and a DMA request can be processed normally.

10.2.4.3.2 StandBy Mode

The DISPC supports no-standby mode, force-standby mode, and single smart-standby mode. The mode is set in the [DISPC_SYSCONFIG](#)[13:12] MIDDLEMODE bit field. The functional clock is always active if the module is enabled. The L3 clock can be shut down at any time independently of the status of MStandby.

The conditions of assertion of the MStandby signal are:

- In no-standby mode, MStandby is never asserted.
- In force-standby mode, MStandby is asserted when the module is disabled.
- In smart-standby, in the case of one of the following conditions:
 - GFX pipeline is disabled, or GFX pipeline is enabled but the data fetch is completed for GFX window, or GFX pipeline is enabled and the data fetch did not complete and data in the DMA buffer is greater than high threshold value.
 - VID1 pipeline is disabled, or VID1 pipeline is enabled but the data fetch is completed for VID1 window, or VID1 pipeline is enabled and the data fetch did not complete and data in the DMA buffer is greater than high threshold value.
 - VID2 pipeline is disabled, or VID2 pipeline is enabled but the data fetch is completed for VID2 window, or VID2 pipeline is enabled and the data fetch did not complete and data in the DMA buffer is greater than high threshold value.
 - VID3 pipeline is disabled, or VID3 pipeline is enabled but the data fetch is completed for VID3 window, or VID3 pipeline is enabled and the data fetch did not complete and data in the DMA buffer is greater than high threshold value.
 - WB pipeline is disabled, or WB pipeline is enabled but the data store to memory is completed for WB picture, or WB pipeline is enabled and the data storage did not complete but data in the DMA buffer is lower than low threshold value.

The MStandby signal asserts whenever all five events have occurred or the DISPC is disabled. While MStandby is asserted, the DISPC does not generate any transaction on the L3 master port.

The conditions of deassertion of the MStandby signal are:

- In force-standby mode, MStandby is deasserted only when the DISPC is enabled.
- In smart-standby mode, in the case of one of the following conditions:
 - GFX pipeline is enabled and the data fetch did not complete for GFX window and the data in the DMA buffer is less than low threshold value.
 - VID1 pipeline is enabled and the data fetch did not complete for VID1 window and the data in the DMA buffer is less than low threshold value.
 - VID2 pipeline is enabled and the data fetch did not complete for VID2 window and the data in the DMA buffer is less than low threshold value.
 - VID3 pipeline is enabled and the data fetch did not complete for VID3 window and the data in the DMA buffer is less than low threshold value.
 - WB pipeline is enabled and the data store did not complete for WB picture and the data in the DMA buffer is more than high threshold value.

Detection of the deassertion conditions assumes that the interface clocks are active.

10.2.4.3.3 Wakeup

The DISPC supports wake-up signaling. The mode can be selected by programming the appropriate value in the [DISPC_SYSCONFIG](#)[2] ENAWAKEUP bit. The SWakeup signal is asynchronous so it does not require the interface clock.

The conditions of assertion of the SWakeup signal are:

- GFX pipeline is enabled and the data fetch did not complete for the GFX window and the data in DMA buffer are less than low threshold value.
- VID1 pipeline is enabled and the data fetch did not complete for the VID1 window and the data in DMA buffer are less than low threshold value.
- VID2 pipeline is enabled and the data fetch did not complete for the VID2 window and the data in DMA buffer are less than low threshold value.
- VID3 pipeline is enabled and the data fetch did not complete for the VID3 window and the data in DMA buffer are less than low threshold value.
- WB pipeline is enabled and the data in DMA buffer are more than high threshold value.
- The last pixel is displayed into LCD1 panel if it is not the last frame.
- The last pixel is displayed into LCD2 panel if it is not the last frame.
- The last pixel is displayed into TV panel if it is not the last frame.

The SWakeup signal is asserted whenever any one of eight events occurs and IdleAck is asserted.

When one of the active pipelines reaches the low threshold and must refill its DMA buffer for the current frame, all other pipelines refill their own DMA buffer even if their low threshold has not been reached. The [DISPC_CONFIG](#)[17] BUFFERFILLING bit is used to increase the probability that the time increases, where there is no access to the L3 interconnect.

The condition of deassertion of SWakeup signal is: Immediately after deassertion of IdleReq.

10.2.4.4 Interrupt Requests

[Table 10-25](#) details the interrupts generated for the DISPC.

The interrupt line, DSS_DISPC_IRQ, indicates when one or more events are detected by the hardware. Each event is independently maskable by setting the [DISPC_IRQENABLE](#) register.

To check when a particular interrupt event occurs and to reset a particular event, the [DISPC_IRQSTATUS](#) register must be accessed. This register regroups all the status of the module internal events that generate an interrupt (read 0: No interrupt occurred; read 1: Interrupt occurred; write 1: Status bit reset). For more information on checking and clearing interrupt events, see *Display Subsystem Register Manual*.

[Table 10-25](#) lists the DISPC interrupt events.

Table 10-25. DISPC Interrupts

| Interrupt Name | Description |
|--------------------------|---|
| FRAMEDONE1_IRQ | Frame done for LCD1 output: Active frame related to the LCD1 has completed and LCD1 output of the DISPC is disabled. |
| FRAMEDONE2_IRQ | Frame done for LCD2 output: Active frame related to the LCD2 has completed and LCD2 output of the DISPC is disabled. |
| FRAMEDONETV_IRQ | Frame done for TV output: Active frame related to the TV output has completed and TV output of the DISPC is disabled. |
| FRAMEDONEWB_IRQ | Frame done for WB output: Active frame related to the WB has completed. First, it is used when the WB channel is connected to one of the pipelines to determine when the memory-to-memory transfer through DISPC is completed. Second, it is used when the WB channel is connected to one of the overlay output in nonreal-time mode to determine when the memory-to-memory transfer with overlay processing is completed. |
| VSYNC1_IRQ | VSYNC for primary LCD output: VSYNC interrupt for the primary LCD has occurred at the end of the frame. |
| VSYNC2_IRQ | VSYNC for secondary LCD output: VSYNC interrupt for the secondary LCD has occurred at the end of the frame. |
| EVSYNC_EVEN_IRQ | VSYNC for even field: EVSYNC_EVEN interrupt has occurred at the end of the frame (EVSYNC received and the field polarity is even) (HDMI) |
| EVSYNC_ODD_IRQ | VSYNC for odd field: EVSYNC_ODD interrupt has occurred at the end of the frame (EVSYNC received and the field polarity is odd) (HDMI) |
| ACBIASCOUNTSTATUS1_IRQ | AC bias count status for LCD1 output: AC Bias transition counter has decremented to 0. |
| ACBIASCOUNTSTATUS2_IRQ | AC bias count status for LCD2 output: AC Bias transition counter has decremented to 0 |
| PROGRAMMEDLINENUMBER_IRQ | Programmed line number: The primary LCD has reached the user programmed line number. |
| VID1ENDWINDOW_IRQ | End of the VID1 window: The DMA engine has fetched all the data from memory for VID1 for the current frame. |
| VID2ENDWINDOW_IRQ | End of the VID2 window: The DMA engine has fetched all the data from memory for VID2 for the current frame. |
| VID3ENDWINDOW_IRQ | End of the VID3 window: The DMA engine has fetched all the data from memory for VID3 for the current frame. |
| GFXENDWINDOW_IRQ | End of the graphics window: The DMA engine has fetched all the data from memory for the graphics for the current frame. |
| VID1BUFFERUNDERFLOW_IRQ | VID1 DMA buffer underflow: The input VID1 DMA buffer goes underflow. |
| VID2BUFFERUNDERFLOW_IRQ | VID2 DMA buffer underflow: The input VID2 DMA buffer goes underflow. |
| VID3BUFFERUNDERFLOW_IRQ | VID3 DMA buffer underflow: The input VID3 DMA buffer goes underflow. |
| WBBUFFEROVERFLOW_IRQ | WB DMA buffer overflow: The output WB DMA buffer goes overflow. It cannot occur when WB channel is used in memory-to-memory transfer mode but only in capture mode. In capture mode the timings are defined by the timer associated with the output. In memory-to-memory mode, there is timing constraint. |
| GFXBUFFERUNDERFLOW_IRQ | GFX DMA buffer underflow: The input Graphics DMA buffer goes underflow. |
| PALETTEGAMMALOADING_IRQ | Palette/gamma table loading: The palette/gamma table in the graphics pipeline has been loaded using the DISPC DMA engine. |
| WBUNCOMPLETEERROR_IRQ | The write back buffer has been flushed before being fully drained. In WB capture mode, if the new frame starts before the WB DMA buffers are fully drained (onto external memory), then the contents of the WB DMA buffers are lost (implying last few pixels/lines are corrupted in the captured frame in memory). This interrupt is an indication of that and will trigger every frame. |

Table 10-25. DISPC Interrupts (continued)

| Interrupt Name | Description |
|-----------------------|---|
| OCPERROR_IRQ | OCP error: L3 interconnect has sent SResp = ERR |
| SYNCLOST1_IRQ | Synchronization lost on LCD1 output: Occurs when VSYNC width/front or back porches are not wide enough to load the pipelines with data (LCD output). |
| SYNCLOST2_IRQ | Synchronization lost on LCD2 output: Occurs when VSYNC width/front or back porches are not wide enough to load the pipelines with data (LCD output). |
| SYNCLOSTTV_IRQ | Synchronization lost on TV output: Occurs when porches are not wide enough to load the pipelines with data (TV output connected to HDMI). |
| WAKEUP_IRQ | Wakeup: Occurs when the SWakeup signal is asserted. |
| FLIPIMMEDIATEDONE_IRQ | Flip immediate done: Occurs when the DMA engine has acknowledged the immediate BA change, and software can write the new BA0. |

10.2.4.5 sDMA Requests

The DMA synchronization line, DSS_DISPC_DMA, is connected to the sDMA. This DMA request is not a classical one but rather a synchronization signal between the DISPC and sDMA. The sDMA is informed that a programmable number of lines are output to the LCD, and that a system memory can be updated. This request is related to the interrupt event PROGRAMMEDLINENUMBER_IRQ described in [Table 10-25](#). This allows the sDMA channel to be synchronized with the display subsystem internal DMA controller.

In other words, it allows to synchronize a memory-to-memory frame buffer update based on the scan line of the frame buffer in system memory (SDRAM or SRAM) by the DISPC. The DSS_DISPC_DMA DMA request is generated at a programmable line number defined in the [DISPC_LINE_NUMBER](#)[10:0] LINENUMBER bit field. This process allows an application to use a single frame buffer and update it after a certain number of lines has been read by the DISPC.

10.2.4.6 DMA Engine

The DMA engine:

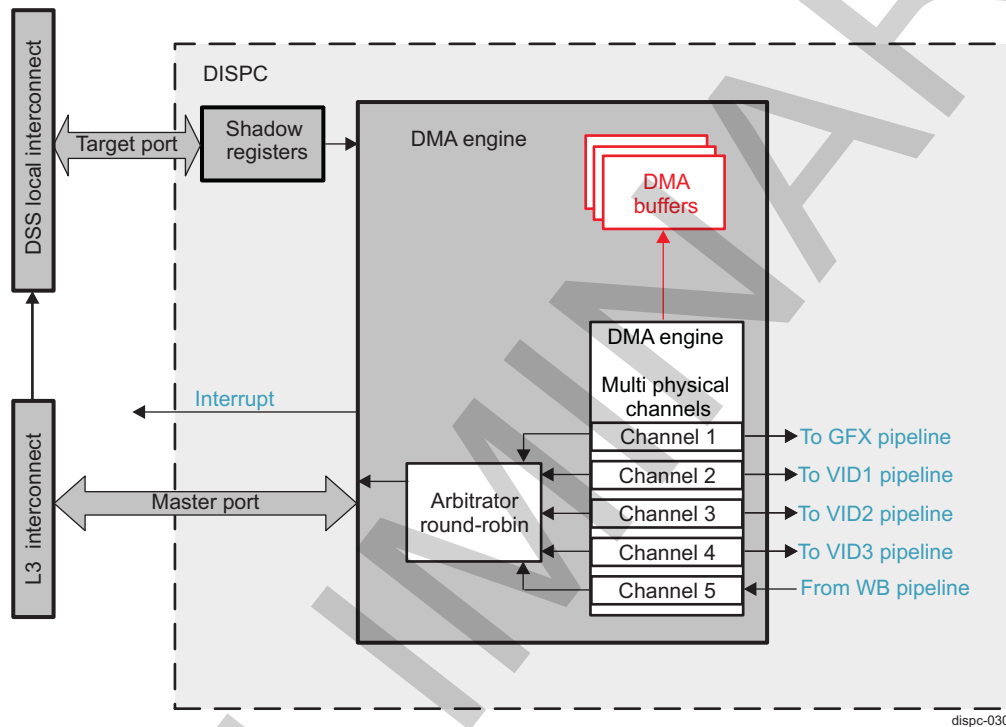
- Supplies data (encoded pixel data, palette, and gamma curve) from memories to GFX, VID1, VID2, and VID3 pipelines through the interconnect based on the configuration of the DISPC and pipelines settings.
- Stores (encoded pixel data) from the GFX/VID pipelines or overlays to memories through the WB pipeline and interconnect based on the configuration of the DISPC and WB pipeline settings.

Each pipeline has a dedicated buffer and a channel with independent settings. The default size and allocation of the DMA buffer is detailed in [Table 10-26](#). Each DMA buffer is divided into two spaces, a top and a bottom buffer. Depending on the application, a DMA buffer space can be associated to a pipeline or merged with other spaces. The total number of spaces for each individual pipeline is from 0 (pipeline inactive) to the number of pipelines ×2 (in that case, all the DMA buffers are associated to a single pipeline). The sum of the number of spaces allocated for each pipeline must not be greater than the maximum number of spaces available. The correct number of spaces must be allocated to ensure no underflow. The spaces allocated to each pipeline must be greater than or equal to the minimum number of spaces required to support the throughput and the system latency. The space is assigned in the [DISPC_GLOBAL_BUFFER](#) register.

[Figure 10-39](#) shows an overview of the DMA engine.

Table 10-26. DMA Buffer Size

| Pipelines | DMA Buffer Size |
|-----------|---------------------------|
| GFX | 2 lines × 640 × 128 bits |
| VID1 | 2 lines × 1024 × 128 bits |
| VID2 | 2 lines × 1024 × 128 bits |
| VID3 | 2 lines × 1024 × 128 bits |
| WB | 2 lines × 1024 × 128 bits |

Figure 10-39. DMA Engine Overview**10.2.4.6.1 Addressing and Bursts**

For each line to be fetched/stored, the DMA engine:

- Calculates the pixel address.
- Aligns the address.
- Defines the burst structure:
 - Type of the burst (one-dimensional [1D] or two-dimensional [2D] burst structure)
 - Length of the burst

The DMA engine generates scan addresses to read/write data from/to system memory. The base address defines the start address of the first pixel, then the address is incremented based on the number of pixels per line, offset between two consecutive lines and number of lines. The byte address of each pixel in the frame buffer in the system memory is determined by:

$$\text{Pixel address} = \text{Base address} + x \times \text{bpp} + (y \times ((\text{width} \times \text{bpp}) + \text{increment}))$$

where:

- Base address corresponds to the base address (for YUV–NV12 format) defined by:
 - DISPC_GFX_BA_0[31:0] BA bit field
 - DISPC_GFX_BA_1[31:0] BA bit field
 - DISPC_VIDp_BA_0[31:0] BA bit field

- DISPC_VIDp_BA_1[31:0] BA bit field
- DISPC_VIDp_BA_UV_0[31:0] BA bit field
- DISPC_VIDp_BA_UV_1[31:0] BA bit field
- bpp corresponds to the number of bits per pixel defined by the [DISPC_GFX_ATTRIBUTES\[4:1\] FORMAT](#) bit field or [DISPC_VIDp_ATTRIBUTES\[4:1\] FORMAT](#) bit field.
- width corresponds to the number of pixels per line defined by [DISPC_GFX_SIZE\[10:0\] SIZE](#)+1 bit field or [DISPC_VIDp_SIZE\[10:0\] SIZE](#)+1 bit field.
- increment corresponds to the number of bytes to skip between two contiguous lines defined by [DISPC_GFX_ROW_INC\[31:0\] ROWINC](#) –1 bit field or [DISPC_VIDp_ROW_INC\[31:0\] ROWINC](#) –1 bit field.
- x corresponds to the pixel position on the x-axis.
- y corresponds to the pixel position on the y-axis.

NOTE: For YUV format, the pixel values are defined in two separated buffers (Y and UV). The Y buffers base address are defined in the [DISPC_VIDp_BA_j\[31:0\] BA](#) bit field. The UV buffers base address are defined in the [DISPC_VIDp_BA_UV_j\[31:0\] BA](#) bit field.

[Table 10-27](#) lists the registers settings for a simple access of a picture in system memory.

Table 10-27. Register Settings for Accessing Image in Internal Memory

| Registers | Value |
|---|--|
| DISPC_GFX_BA_j/DISPC_VIDp_BA_j/DISPC_WB_BA_j | PBA, the physical base address of image in the memory |
| DISPC_VIDp_BA_UV_j/DISPC_WB_BA_UV_j | PBA, the physical base address of UV buffers image in the memory |
| DISPC_GFX_PIXEL_INC / DISPC_VIDp_PIXEL_INC/DISPC_WB_PIXEL_INC | 1 or other in pixel incremental value |
| DISPC_GFX_ROW_INC / DISPC_VIDp_ROW_INC/DISPC_WB_ROW_INC | 1 or other in row incremental value |

A 128-bit interconnect request corresponds to one or several pixels depending on bits per pixels. Therefore, the DMA engine determines the appropriate burst sequence to optimize each new line fetching/storing. The DMA engine must prevent a single burst from crossing two lines. The DMA engine supports bursts of 2 × 128 bits, 4 × 128 bits, and 8 × 128 bits. The default burst size at reset time is 8 × 128 bits. The maximum burst size can be configured for each pipeline by setting the [DISPC_GFX_ATTRIBUTES\[7:6\] BURSTSIZE](#) bit field or [DISPC_VIDp_ATTRIBUTES\[15:14\] BURSTSIZE](#) bit field. Because the burst size must be aligned to the burst boundary, in case of misalignment, the DMA engine may issue single and/or smaller burst requests. Two types of burst are present:

- 1D-burst is used if the fetch/storage is linear in memory through the TILER. There is no rotation of the frame buffer. The frame buffer is not tiled.
- 2D-burst is used if the frame buffer is tiled.

Even if the [DISPC_VIDp_ROW_INC](#) does not equal 1, the 2D-burst can be selected by the user. It is used when the DISPC is configured to read one field of a frame by accessing only the even and odd lines.

NOTE: The burst size is initialized once at configuration and can be changed when the DISPC is disabled.

10.2.4.6.2 Immediate Base Address Flip Mechanism

The Flip Immediate mechanism is used to change of the fly the content of the frame buffer which is currently being displayed. The mechanism allows multiple changes (flips) of the base address (BA) during a frame. The mechanism is available for all pipelines (VID1, VID2, VID3, and GFX). Changes to the base address can be applied during the same line, or during different lines.

The following considerations must be considered:

- Data fetching from a new immediate BA is aligned with the data fetch mechanism of the DISPC DMA engine itself, and not with HSYNC or any other DISPC timing signal. After new VSYNC frame pulse, new BA will be taken by hardware, as soon as the first set of lines has been sent to internal pipeline of the DMA engine.
 - If multiple new BAs are written during the same line (before DMA engine acknowledges the first BA change), then programming steps 1 and 2 must be applied for each new BA (see the programming sequence in this section). The DMA will take only the last BA provided within the current line scan.
 - If multiple new BAs are written during different lines within the current frame, then programming steps #1 and #2 need to be applied for each new BA (see the programming flow further below in this section). The DMA takes the new BA each time it is updated.
- Immediate BA change cannot be achieved synchronously for two or more pipelines.
- Immediate BA change is possible only for BA0, and not possible for BA1. Interlaced mode using BA0 and BA1 is not supported.
- Immediate BA change is supported only in RGB color space.

The Flip Immediate mechanism programming flow follows:

1. Software writes the new immediate BA to the [DISPC_GFX_BA_j](#) register (where j=0) for the GFX pipeline, or to the [DISPC_VIDp_BA_j](#) register (where j=0) for the required VID pipeline.
2. Software sets to 0x1 the corresponding EN bit for the required pipeline in the [DISPC_BA0_FLIPIMMEDIATE_EN](#) register.
3. The DISPC DMA engine, after completing its current line (or set of lines) fetch, takes the new immediate BA.
4. Hardware resets the EN bit in [DISPC_BA0_FLIPIMMEDIATE_EN](#) register and asserts a flip immediate IRQ. The IRQ can be enabled through the [DISPC_IRQENABLE\[31\]](#) FLIPIMMEDIATEDONE_EN bit. The status of the event is available in the [DISPC_IRQSTATUS\[31\]](#) FLIPIMMEDIATEDONE_IRQ bit.

10.2.4.6.3 DMA Buffers

10.2.4.6.3.1 READ DMA Buffers (GFX and VID Pipelines)

When the vertical front porch (VFP) period starts after the last horizontal front porch (HFP) of the last line or the external VSYNC is received, the DMA buffers are flushed according to the selected output associated with the pipeline. The DMA engine restarts fetching data from the memory through the L3 interconnect. Enabling/disabling the DISPC flushes the DMA buffers (except WB DMA buffers).

Programmable high and low thresholds, independent for each DMA buffer, are used by the DMA engine to start and stop requesting data to the L3 interconnect.

- When low threshold (set in the [DISPC_GFX_BUF_THRESHOLD\[15:0\]](#) BUFLOWTHRESHOLD bit field or [DISPC_VIDp_BUF_THRESHOLD\[15:0\]](#) BUFLOWTHRESHOLD bit field) is reached, the DMA engine starts a request on the L3 interconnect to fill the DMA buffer.
- When high threshold (set in the [DISPC_GFX_BUF_THRESHOLD\[31:16\]](#) BUFHIGHTHRESHOLD bit field or [DISPC_VIDp_BUF_THRESHOLD\[31:16\]](#) BUFHIGHTHRESHOLD bit field) is reached, the DMA engine stops requesting encoded pixels.

To avoid underflow at the beginning of a frame and have sufficient encoded pixel data to start some processing, a preloading of the DMA buffer is configurable between a fixed value of bytes or the high threshold value. The preload ensures a minimum number of pixels present in the buffer. When the preload value is reached, the associated channel must start pulling pixels out of the DMA buffer. To enable the preload based on the value entered in the [DISPC_GFX_PRELOAD\[11:0\]](#) PRELOAD bit field or [DISPC_VIDp_PRELOAD\[11:0\]](#) PRELOAD bit field, the [DISPC_GFX_BUF_THRESHOLD\[11\]](#) BUFPRELOAD bit or [DISPC_VIDp_BUF_THRESHOLD\[19\]](#) BUFPRELOAD bit must be set to 0x0.

NOTE: When self-refresh mode is selected, meaning the data in the DMA buffers are used for multiple frames, and at the end of each frame, the DMA buffers are not flushed.

10.2.4.6.3.2 WRITE DMA Buffer (WB Pipeline)

Two modes are supported by the WB channel, selectable through the [DISPC_WB_ATTRIBUTES\[19\]](#) WRITEBACKMODE bit:

- Capture mode, WRITEBACKMODE bit set to 0: One of the overlay outputs going to LCD or TV outputs is captured and at the same time the data are sent on the output. The WB timings are controlled by the LCD or TV timings.
- Memory-to-memory mode, WRITEBACKMODE bit set to 1: One of the overlay outputs or one of the pipelines is captured to perform memory-to-memory transfer with some processing by the DISPC (rescaling, overlaying, color space conversion, etc.).

In capture mode: The WB DMA buffers are flushed when the VFP period starts after the HFP following the last line, or when the external VSYNC is received, depending on which output (LCD/TV) the WB pipeline is capturing data, if the programmed value in the [DISPC_WB_ATTRIBUTES2\[7:0\]](#) WBDELAYCOUNT bit field is set to 0. If the programmed value in the [DISPC_WB_ATTRIBUTES2\[7:0\]](#) WBDELAYCOUNT bit field is set to N (1:255), the write buffers DMA are flushed N lines later. The DMA engine starts storing data to memory through the L3-based interconnect as soon as enough data are available for the programmed burst size. When enabling/disabling the DISPC, the DMA buffers are flushed. The programmable low and high thresholds are used by the DMA engine to start and stop sending data to the L3 interconnect.

NOTE: If the [DISPC_WB_ATTRIBUTES2\[7:0\]](#) WBDELAYCOUNT bit field is set to 0, the WB is reinitialized just at the end of the last line of a frame at the beginning of the VFP signal. To let the WB complete the data write to the external memory, the highest possible value compatible with the vertical blanking period must be set.

NOTE: In WB capture mode, if a new frame starts before the WB DMA buffers contents are fully written onto external memory, then the contents of the WB DMA buffers are lost (implying last few pixels/lines are corrupted in the captured frame in memory). The [DISPC_IRQSTATUS\[26\]](#) WBUNCOMPLETEERROR_IRQ interrupt bit indicates this situation and will trigger every frame. The WBUNCOMPLETEERROR interrupt can be enabled through the [DISPC_IRQENABLE\[26\]](#) WBUNCOMPLETEERROR_EN register bit. Software can avoid this case, by delaying the flush of WB DMA buffers through proper programming of the [DISPC_WB_ATTRIBUTES2\[7:0\]](#) WBDELAYCOUNT bit-field.

In memory-to-memory mode: The WB pipeline is not synchronized to any internal or external timing generator. The WB pipeline stores the output of one of the overlay outputs or one of the pipelines. When enabling/disabling the DISPC, the DMA buffers are flushed. The programmable low and high thresholds are used by the DMA engine to start and stop sending data to the L3 interconnect.

Programmable high and low thresholds are used by the DMA engine to start and stop sending data to the L3 interconnect.

- When high threshold (set in the [DISPC_WB_BUF_THRESHOLD\[31:16\]](#) BUFHIGHTHRESHOLD bit field) is reached, the DMA engines start sending data on the L3 interconnect to empty buffer.
- When low threshold (set in the [DISPC_WB_BUF_THRESHOLD\[15:0\]](#) BUFLOWTHRESHOLD bit field) is reached, the DMA engine stops sending encoded pixels.

At the end of the frame, to drain the DMA buffer, some smaller bursts (even single requests) must be issued to completely empty the DMA buffer. To limit the number of interconnect requests from the DISPC, a number of IDLE cycles between requests can be inserted. IDLE cycles can be inserted only when WB is used in memory-to-memory mode. It is ignored when WB is in capture mode.

The number of idle between requests can be activated and determined by :

- Setting the [DISPC_WB_ATTRIBUTES\[27\]](#) IDLESIZE bit to 0x0 (default value) and entering the number of idles between requests in the [DISPC_WB_ATTRIBUTES\[31:28\]](#) IDLENUMBER bit field. Idle numbers vary from 0 to 15.
- Setting the [DISPC_WB_ATTRIBUTES\[27\]](#) IDLESIZE bit to 0x1, which considers the size of the burst (the [DISPC_WB_ATTRIBUTES\[15:14\]](#) BURSTSIZE bit field) to determine the number of idles.

- If BURSTSIZE = 0x0, then idle equals IDLENUMBER (0 to 15).
- If BURSTSIZE = 0x1, then idle equals IDLENUMBER × 4 (0 to 60).
- If BURSTSIZE = 0x2, then idle equals IDLENUMBER × 8 (0 to 120).

10.2.4.6.4 MFLAG Mechanism and Arbitration

The MFLAG mechanism allows a dynamic increase of the priority of DISPC real-time traffic, when required, based on the fullness of the DISPC DMA read and write buffers.

The mechanism is implemented for all DMA buffers (GFX, VID1, VID2, VID3 and WB). Only high-priority pipelines can contribute to the MFLAG mechanism.

Programmable buffer thresholds (hysteresis) for each pipeline are used to indicate when the local MFLAG signal for each pipeline is generated. All local MFLAG signals are ORed to generate a single DSS MFLAG out band signal, which is provided to the L3 interconnect for granting OCP requests. The out band DSS MFLAG signal is asynchronous to any on-going OCP transaction.

The threshold for each pipeline corresponds to the fullness of the associated DMA buffer, and is defined by two threshold parameters:

- HT_MFLAG: High threshold.
 - For read access from the GFX, VID1, VID2, and VID3 pipelines, when the corresponding pipeline buffer reaches the programmed value, the associated local MFLAG signal goes low (deasserted).
 - For write access from the WB pipeline, when the corresponding pipeline buffer reaches the programmed value, the associated local MFLAG signal goes high (asserted).
 - This threshold can be programmed in the following bit fields:
 - For the GFX pipeline in the [DISPC_GFX_MFLAG_THRESHOLD__1](#)[31:16] HT_MFLAG bit field
 - For the VID1 pipeline in the [DISPC_VID1_MFLAG_THRESHOLD](#)[31:16] HT_MFLAG bit field
 - For the VID2 pipeline in the [DISPC_VID2_MFLAG_THRESHOLD__1](#)[31:16] HT_MFLAG bit field
 - For the VID3 pipeline in the [DISPC_VID3_MFLAG_THRESHOLD__1](#)[31:16] HT_MFLAG bit field
 - For the WB pipeline in the [DISPC_WB_MFLAG_THRESHOLD](#)[31:16] HT_MFLAG bit field
- LT_MFLAG: Low threshold.
 - For read access from the GFX, VID1, VID2, and VID3 pipelines, when the corresponding pipeline buffer reaches the programmed value, the associated local MFLAG signal goes high (asserted).
 - For write access from the WB pipeline, when the corresponding pipeline buffer reaches the programmed value, the associated local MFLAG signal goes low (deasserted).
 - This threshold can be programmed in the following bit fields:
 - For the GFX pipeline in the [DISPC_GFX_MFLAG_THRESHOLD__1](#)[15:0] LT_MFLAG bit field
 - For the VID1 pipeline in the [DISPC_VID1_MFLAG_THRESHOLD](#)[15:0] LT_MFLAG bit field
 - For the VID2 pipeline in the [DISPC_VID2_MFLAG_THRESHOLD__1](#)[15:0] LT_MFLAG bit field
 - For the VID3 pipeline in the [DISPC_VID3_MFLAG_THRESHOLD__1](#)[15:0] LT_MFLAG bit field
 - For the WB pipeline in the [DISPC_WB_MFLAG_THRESHOLD](#) [15:0] LT_MFLAG bit field

By default, the MFLAG mechanism is disabled ([DISPC_GLOBAL_MFLAG_ATTRIBUTE](#)[1:0] MFLAG_CTRL bit field = 0x0), and the DSS MFLAG out band signal is low (deasserted). The arbitration scheme for the DISPC pipelines is the same as described in [Section 10.2.4.6.7, Arbitration](#). That is, round-robin either between high-priority pipelines, or between normal-priority pipelines (if all pipelines are of normal priority)

When the [DISPC_GLOBAL_MFLAG_ATTRIBUTE](#)[1:0] MFLAG_CTRL bit field is set to 0x2, the MFLAG mechanism is enabled, and the DSS MFLAG out band signal is dynamically set to 0 or 1, depending on

DMA buffers fullness and programmed threshold levels, as explained previously in this section. In this case, the arbitration scheme for DISPC pipelines is round-robin between those high-priority pipelines, which have their local MFLAG signals asserted. If there are no high-priority pipelines with their local MFLAG signals asserted, then the arbitration scheme is the same as described in [Section 10.2.4.6.7, Arbitration](#).

The [DISPC_GLOBAL_MFLAG_ATTRIBUTE\[2\]](#) MFLAG_START bit defines additional rules for the MFLAG mechanism:

- If the MFLAG_START bit is set to 0x0 (default value), then in the beginning of the frame when the DMA buffer is empty, the local MFLAG signal of each pipeline is kept at 0 until PRELOAD is reached (for more information on preloading, see [Section 10.2.4.6.3.1, READ DMA Buffers \(GFX and VID Pipelines\)](#)). Then, based on the setting of the [DISPC_GLOBAL_MFLAG_ATTRIBUTE\[1:0\]](#) MFLAG_CTRL bit field, the MFLAG signal is generated and internal logic is arbitrating between pipeline requests.
- If the MFLAG_START bit is set to 0x1, then even in the beginning of the frame when the DMA buffer is empty, the [DISPC_GLOBAL_MFLAG_ATTRIBUTE\[1:0\]](#) MFLAG_CTRL bit field defines the generation of the MFLAG signal for each pipeline.

10.2.4.6.5 Predecimation

The predecimation process consists of downscaling an image by fetching only the necessary pixels in the memory. Vertical and horizontal predecimation are possible:

- Vertical predecimation: The picture store in memory can be predecimated vertically by skipping lines. Burst mode is used to fetch the data when skipping lines. Only the lines that will be used by the DISPC are fetched from memory; the other lines are skipped. The DMA engine sends requests only for the useful lines using 1D burst or 2D burst, depending on the setting. The base address indicates the first valid pixel to fetch from memory. The number of lines to skip is set in the [DISPC_GFX_ROW_INC\[31:0\]](#) ROWINC bit field or [DISPC_VIDp_ROW_INC\[31:0\]](#) ROWINC bit field.

NOTE: When 2D burst mode is used, the access to data in memory is performed through the TILER module of DMM (for more details, see [Section 16.2.3.6, TILER](#)), and as a result a maximum of one line can be skipped.

- Horizontal predecimation: When fetching data from memory, it is possible to skip 1 out of 2 pixel data containers, up to 1 out of 16 pixel data containers, by setting the [DISPC_GFX_PIXEL_INC\[7:0\]](#) PIXELINC bit field or [DISPC_VIDp_PIXEL_INC\[7:0\]](#) PIXELINC bit field to the number of pixel data containers to skip (n), multiplied by the size of a pixel data container (in bytes) + 1. See the following note for more details.

NOTE: The restriction to horizontal predecimation is that there is at least one useful pixel per 128-bit request. In that case, the DMA engine uses burst mode instead of singles to optimize the requests in terms of latency and SDRAM efficiency.

No decimation is supported when the input format is 1, 2, 4, 8 BITMAP.

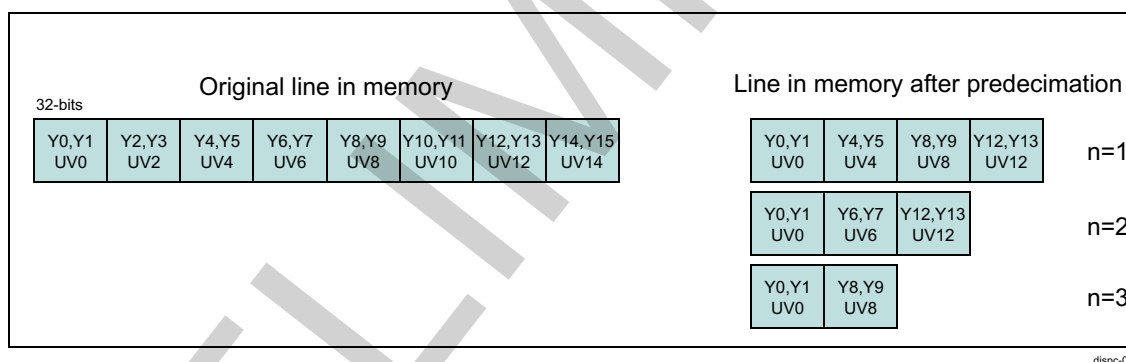
For RGB and YUV4:2:0 data formats, each pixel data container in memory holds 1 pixel. Thus, when configuring the PIXELINC bit field, the value of n equals the number of pixels to skip:

- For RGB format, one pixel data container = 32 bits = 1 pixel
- For YUV format:
 - One Y pixel data container = 8 bits = 1 pixel
 - One UV pixel data container = 16 bits = 1 pixel

For YUV4:2:2 format, each 32-bit pixel data container holds the Luma components for 2 pixels and the Chrominance component of 1 pixel (see [Figure 10-40](#)). Therefore, for the valid values of the PIXELINC bit field in the following YUV4:2:2 format, caution must be taken, because n does not equal the number of pixels, but instead the number of pixel data containers to skip:

- For n = 1, PIXELINC = 5
- For n = 2, PIXELINC = 9
- For n = 3, PIXELINC = 13
- For n = 4, PIXELINC = 17, etc.

Figure 10-40. YUV4:2:2 Predecimation



10.2.4.6.6 Progressive-to-Interlaced Format Conversion

The DMA engine can be used to perform YUV4:2:0 NV12 progressive-to-interlaced data conversion with 0-degree orientation. This section provides generic approach details.

Two possible configurations are available, depending on the setting of the DISPC_VIDp_ATTRIBUTES[22] DOUBLESTRIDE bit, which defines the stride of each pixel value buffer for the YUV format. The following must be considered for both configurations:

- Bit [31] in the DISPC_VIDn_BA_j and DISPC_VIDn_BA_UV_j[31:0] BA bit fields, and the DISPC_VIDn_ATTRIBUTES[13:12] ROTATION bit field must be set to 0x0 to indicate 0-degree orientation.

Configuration 1 – YUV4:2:0 progressive to interlaced conversion

The DISPC_VIDp_ATTRIBUTES[22] DOUBLESTRIDE bit is set to 0x1. The CbCr container is twice the size of the Y container. All Luma and Chroma lines for even and odd fields are fetched from memory. The scaler unit of the respective pipeline can be used to downscale by 2 (through filtering) the fetched data to create the interlaced output. For more information about the scaler configuration, see [Section 10.2.4.10.4, Scaler Unit](#).

Configuration 2 – YUV4:2:0 progressive to YUV4:2:2 interlaced conversion

The DISPC_VIDp_ATTRIBUTES[22] DOUBLESTRIDE bit is set to 0x0. The CbCr container is the same size as the Y container. The DISPC_VIDn_ROW_INC register for the respective pipeline must be configured so that only the Y data is vertically predecimated by 2 (for more information, see [Section 10.2.4.6.5, Predecimation](#)). The CbCr data must not be predecimated. As a result, only the even Luma lines for the even field and the odd Luma lines for the odd field are fetched from memory. To create the interlaced output, the Chroma lines are all fetched from memory.

10.2.4.6.7 Arbitration

The requests (reads or writes) sent to the L3 interconnect are pipelined and are arbitrated in a round-robin scheme. The default arbitration scheme must be modified by setting the priority attribute of each pipeline as defined in the [DISPC_GFX_ATTRIBUTES\[14\] ARBITRATION](#) bit, [DISPC_VIDp_ATTRIBUTES\[14\] ARBITRATION](#) bit, or [DISPC_WB_ATTRIBUTES\[14\] ARBITRATION](#) bit.

By default, all pipelines have the same priority (normal), which means all pipelines requests are treated in a round-robin order manner. If one or more pipelines require a higher number of requests going to the L3 interconnect, its priority can be moved up to high priority. In this case, the high-priority pipeline is granted access before any pipeline in normal priority. If more than one active pipeline is in high priority, the behavior is the same as all active pipelines in normal priority. Normal active pipelines are not treated until all high active pipelines are finished. The ARBITRATION bit cannot be modified during the entire frame.

This function balances the bandwidth of the pipeline depending on its constraint. It can be used to give a higher priority to the pipelines with real-time constraints versus nonreal-time pipelines. For example, pipelines associated with the LCD output in stall mode must have a lower priority than pipelines associated with TV output.

10.2.4.6.8 DMA Power Modes

10.2.4.6.8.1 Low-Power Mode

Each DMA buffer is divided into two spaces. Each space can be associated with the pipeline or merged with other spaces. The total number of spaces for each individual pipeline is from 0 (pipeline inactive) to the number of pipelines \times 2 (in that case all the DMA buffers are associated with one pipeline). The sum of the number of spaces allocated for each pipeline must not be greater than the maximum available. The correct number of spaces must be allocated to ensure no underflow. The spaces allocated to each pipeline must be greater than or equal to the minimum required to support the throughput and the system latency.

NOTE: When the number of spaces is changed, the thresholds must be reprogrammed to reflect the new DMA buffer configuration.

10.2.4.6.8.2 Ultralow-Power Mode

In low-power mode, the L3 interconnect is used to fill up the DMA buffers to store all the data required to display a full frame. The L3 interconnect is not used to fetch the new pixels for the following frames. The data in the DMA buffer are reused to display on the screen.

The setting of the mode is independent for each pipeline. One pipeline may have all the frame pixels in its DMA buffer and the other pipelines may have to refill their respective DMA buffers along the display scan because the frame buffer is too big to be stored in the DMA buffer.

The DMA buffers can be merged to optimize the L3 interconnect off time. Merging the DMA buffers into one buffer can be used at the same time to improve ultralow-power mode (see [Section 10.2.4.6.8.1, Low-Power Mode](#)).

During the time in which the frames are fetched in the internal DMA buffer, MStandby must be asserted if the [DISPC_SYSCONFIG\[13:12\] MIDDLEMODE](#) bit field is set to 0x2 (smart-standby mode).

Two ultralow-power modes can be entered manually or automatically:

- Self-refresh mode: Self-refresh mode is started manually by setting the [DISPC_GFX_ATTRIBUTES\[15\]](#) SELFREFRESH bit or [DISPC_VIDp_ATTRIBUTES\[15\]](#) SELFREFRESH bit to 0x1 after capturing a frame in the DMA buffers. Stopping self-refresh mode is done by setting the SELFREFRESH bit to 0x0.
- Automatic self-refresh mode: By setting the [DISPC_GFX_ATTRIBUTES\[17\]](#) SELFREFRESHAUTO bit or [DISPC_VIDp_ATTRIBUTES\[17\]](#) SELFREFRESHAUTO bit to 0x1, the transition from OFF to ON self-refresh mode is done by hardware after capturing the first frame. Hardware reflects the status of the self-refresh mode by setting the SELFREFRESH bit to 0x1, which means that the data are read inside the DMA buffer without accessing the interconnect and system memory during the frame. Setting the SELFREFRESH bit to 0x0 updates the DMA buffer.

NOTE: The WB pipeline does not support ultralow-power mode.

10.2.4.7 Rotation and Mirroring

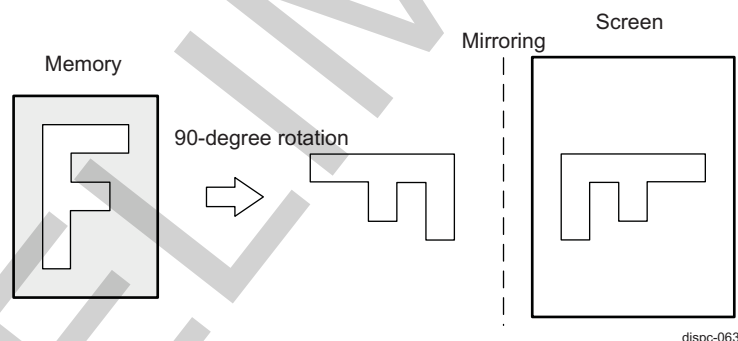
The DISPC provides flexible mechanisms for an efficient implementation of rotation using the DISPC, its DMA engine, and the rotation engine of the TILER module. The rotation is handled only through the TILER, which supplies the encoded pixels to the DISPC.

NOTE: No rotation or mirroring is supported when accessing internal SDRAM directly.

The TILER supports:

- Rotation 0-, 90-, 180-, 270-degree views
- Mirroring
- Any combination of the two previous (for example, Rot-90 + mirroring, etc.)

Figure 10-41. 90-Degree Rotation With Mirroring



When accessing YUV4:2:2 data, each 32-bit value loaded into the DMA buffer can represent either:

- Two consecutive pixels on the same line (for instance, 0-/180-degree rotation)
- Two pixels adjacent vertically (for instance, 90-/270-degree rotation)

The reading from the DMA buffer supports the extraction of the two pixels regardless of the rotation. When the pixels are not consecutive on the same line (90-/270-degree rotation), the chrominance sample of the first pixel of each 32-bit value is duplicated for the second pixel in the same 32-bit value.

The rotation flag [DISPC_VIDn_ATTRIBUTES\[13:12\]](#) ROTATION and the [DISPC_VIDn_ATTRIBUTES\[4:1\]](#) FORMAT bit fields define the processing to extract the pixels from YUV4:2:2 32-bit values. Software must ensure that the settings of the ROTATION and FORMAT bit fields are coherent with the rotation/mirroring defined through the address format in the TILER-specific address map. For more information, see [Section 16.2.3.6.2, TILER Macro-Architecture](#), in [Section 16.2, Dynamic Memory Manager](#).

[Table 10-28](#) describes the register settings of the DISPC when accessing, rotating, and mirroring an image using the TILER. A physical base address (PBA) for each rotation is determined and set as the buffer address (BA). The row incremental is determined and set in ROW_INC. The value of the pixel increment, PIXEL_INC, is set to 0x1 (contiguous pixels).

Table 10-28. Register Settings for Rotation Using TILER

| Rotation | Registers | Rotation With and Without Mirroring |
|-------------|--|-------------------------------------|
| 0 degree | DISPC_GFX_BA_j/DISPC_VIDp_BA_j/DISPC_WB_BA_j DISPC_GFX_PIXEL_INC/DISPC_VIDp_PIXEL_INC/DISPC_WB_PIXEL_INC DISPC_GFX_ROW_INC/DISPC_VIDp_ROW_INC/DISPC_WB_ROW_INC | PBA0 1 to 16 ROW0 |
| 90 degrees | DISPC_GFX_BA_j/DISPC_VIDp_BA_j/DISPC_WB_BA_j DISPC_GFX_PIXEL_INC/DISPC_VIDp_PIXEL_INC/DISPC_WB_PIXEL_INC DISPC_GFX_ROW_INC/DISPC_VIDp_ROW_INC/DISPC_WB_ROW_INC | PBA90 1 to 16 ROW90 |
| 180 degrees | DISPC_GFX_BA_j/DISPC_VIDp_BA_j/DISPC_WB_BA_j DISPC_GFX_PIXEL_INC/DISPC_VIDp_PIXEL_INC/DISPC_WB_PIXEL_INC DISPC_GFX_ROW_INC/DISPC_VIDp_ROW_INC/DISPC_WB_ROW_INC | PBA180 1 to 16 ROW180 |
| 270 degrees | DISPC_GFX_BA_j/DISPC_VIDp_BA_j/DISPC_WB_BA_j DISPC_GFX_PIXEL_INC/DISPC_VIDp_PIXEL_INC/DISPC_WB_PIXEL_INC DISPC_GFX_ROW_INC/DISPC_VIDp_ROW_INC/DISPC_WB_ROW_INC | PBA270 1 to 16 ROW270 |

NOTE: For YUV format, in addition to the DISPC_VIDp_BA_j register used for the Y component, the DISPC_VIDp_BA_UV_j register must be set to define the base address of the UV frame buffer in memory.

The PBA rotation is determined by:

- $PBA0 = PBA \mid (\text{mode } 27) \mid (\text{orientation } 29) \mid (132)$
- $PBA90 = PBA \mid (\text{mode } 27) \mid (\text{orientation } 29) \mid (132)$
- $PBA180 = PBA \mid (\text{mode } 27) \mid (\text{orientation } 29) \mid (132)$
- $PBA270 = PBA \mid (\text{mode } 27) \mid (\text{orientation } 29) \mid (132)$

Where PBA is the physical base address of image in the memory.

The ROW rotation is determine by:

- If 8 bits per pixel:
 - ROW0 = 16384: Width of the video picture in memory (in bytes) + 1
 - ROW90 = 8192: Width of the video picture in memory (in bytes) + 1
 - ROW180 = 16384: Width of the video picture in memory (in bytes) + 1
 - ROW270 = 8192: Width of the video picture in memory (in bytes) + 1
- If 16 bits per pixel:
 - ROW0 = 32768: Width of the video picture in memory (in bytes) + 1
 - ROW90 = 8192: Width of the video picture in memory (in bytes) + 1
 - ROW180 = 32768: Width of the video picture in memory (in bytes) + 1
 - ROW270 = 8192: Width of the video picture in memory (in bytes) + 1
- If 32 bits per pixel:
 - ROW0 = 32768: Width of the video picture in memory (in bytes) + 1
 - ROW90 = 16384: Width of the video picture in memory (in bytes) + 1
 - ROW180 = 32768: Width of the video picture in memory (in bytes) + 1
 - ROW270 = 16384: Width of the video picture in memory (in bytes) + 1

Table 10-29. Mode Definition

| | 8-Bit Tiled | 16-Bit Tiled | 32-Bit Tiled | Page Tiled |
|------|-------------|--------------|--------------|------------|
| Mode | 0 | 1 | 2 | 3 |

Table 10-30. Orientation Definition

| Type of Orientation | Value |
|--------------------------------|-------|
| 0-degree view | 0x0 |
| 180-degree view with mirroring | 0x1 |
| 0-degree view with mirroring | 0x2 |
| 180-degree view | 0x3 |
| 270-degree view with mirroring | 0x4 |
| 270-degree view | 0x5 |
| 90-degree view | 0x6 |
| 90-degree view with mirroring | 0x7 |

NOTE: For YUV4:2:0 progressive pixel format, because the value of the DISPC_VIDp_ROW_INC register is defined for the Y buffer, the DISPC_VIDp_ATTRIBUTES[22] DOUBLESTRIDE bit must be set to 1 when rotating the picture by 0 and 180 degrees and must be reset to 0 when rotating the picture by 90 and 270 degrees.

For YUV4:2:0 interlaced pixel format, because the value of the DISPC_VIDp_ROW_INC register is defined for the Y buffer, the DISPC_VIDp_ATTRIBUTES[22] DOUBLESTRIDE bit must be set to 1 when rotating the picture by 0 and 180 degrees. Rotations of 90 and 270 degrees are not supported with this pixel format.

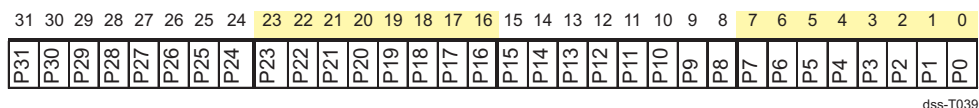
10.2.4.8 Memory Format

The graphic and video pipelines support various types of memory format. [Table 10-31](#) list all supported formats for each pipeline. The nibble mode is enabled by setting the [DISPC_GFX_ATTRIBUTES\[9\]](#) NIBBLEMODE bit to 0x1 and applies only to BITMAP format for the GFX pipeline.

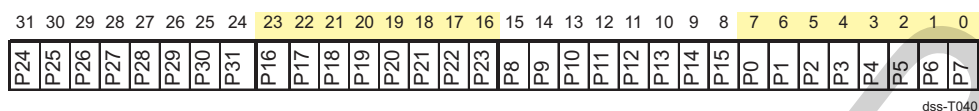
Table 10-31. Memory Formats Supported

| Formats | GFX | VID1 | VID2 | VID3 | WB |
|---------------|-----|------|------|------|----|
| BITMAP 1-BPP | x | | | | |
| BITMAP 2-BPP | x | | | | |
| BITMAP 4-BPP | x | | | | |
| BITMAP 8-BPP | x | | | | |
| xRGB12-4444 | x | x | x | x | x |
| RGBx12-4444 | x | x | x | x | x |
| ARGB16-4444 | x | x | x | x | x |
| RGBA16-4444 | x | x | x | x | x |
| RGB16-565 | x | x | x | x | x |
| xRGB16-1555 | x | x | x | x | x |
| ARGB16-1555 | x | x | x | x | x |
| xRGB24-8888 | x | x | x | x | x |
| RGBx24-8888 | x | x | x | x | |
| RGB24-888 | x | x | x | x | x |
| ARGB32-8888 | x | x | x | x | x |
| RGBA32-8888 | x | x | x | x | x |
| UYUV4:2:2 | | x | x | x | x |
| YUV2 4:2:2 | | x | x | x | x |
| YUV4:2:0-NV12 | | x | x | x | x |

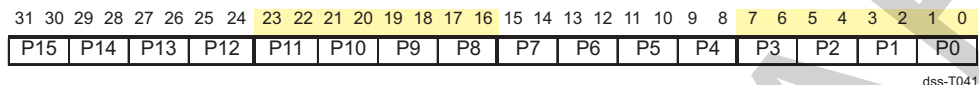
- BITMAP 1-bpp data memory organization (CLUT)



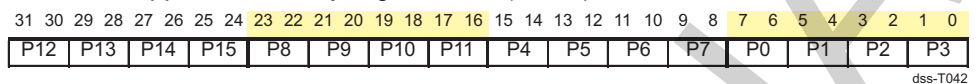
- BITMAP 1-bpp data memory organization (CLUT) in nibble mode



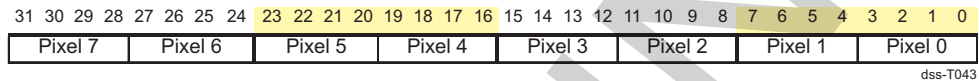
- BITMAP 2-bpp data memory organization (CLUT)



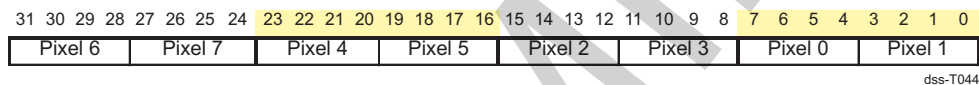
- BITMAP 2-bpp data memory organization (CLUT) in nibble mode



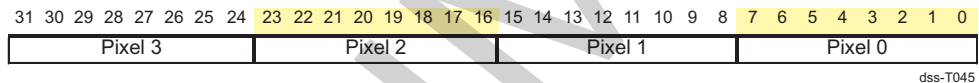
- BITMAP 4-bpp data memory organization (CLUT)



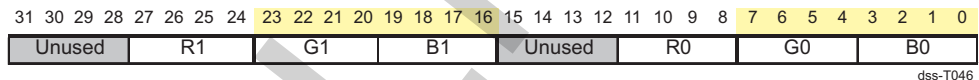
- BITMAP 4-bpp data memory organization (CLUT) in nibble mode



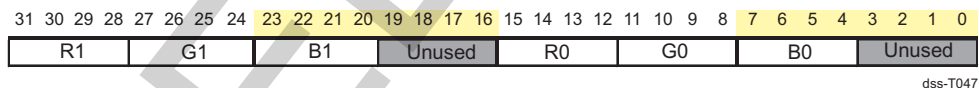
- BITMAP 8-bpp data memory organization (CLUT)



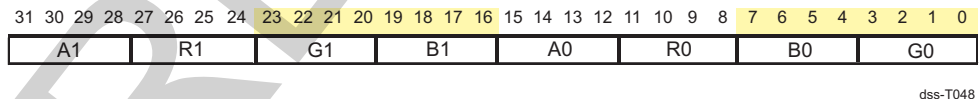
- xRGB12-4444 bpp data memory organization



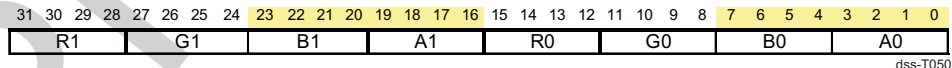
- RGBx12-4444 bpp data memory organization



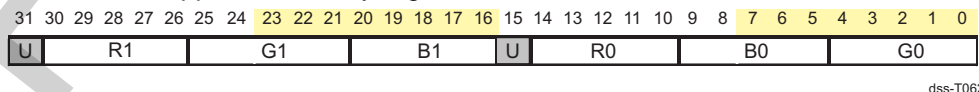
- ARGB16-4444 bpp data memory organization



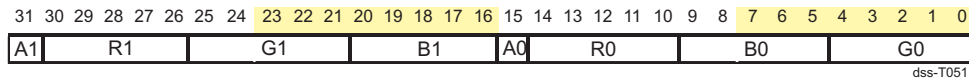
- RGBA16-4444 bpp data memory organization



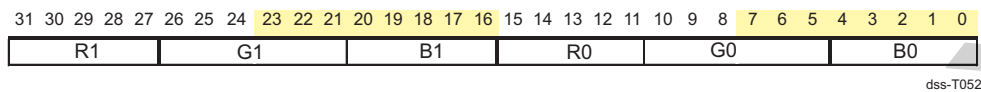
- xRGB16-555 bpp data memory organization



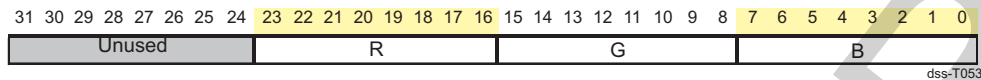
- ARGB16-1555 bpp data memory organization



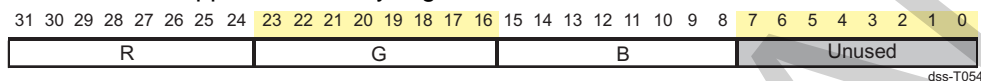
- RGB16-565 bpp data memory organization



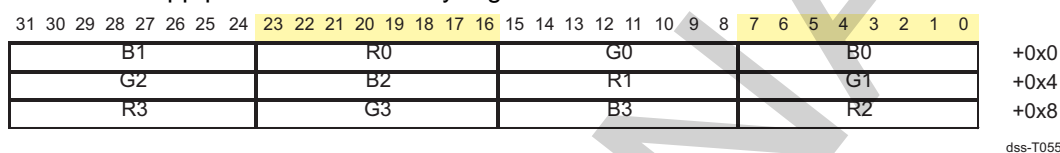
- xRGB24-8888 bpp data memory organization



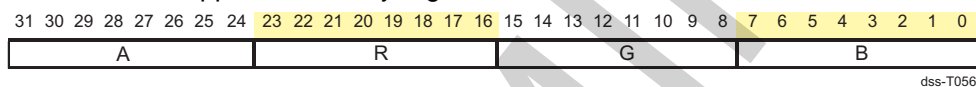
- RGBx24-8888 bpp data memory organization



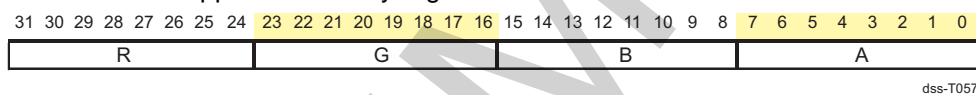
- RGB24-888 bpp packed data memory organization



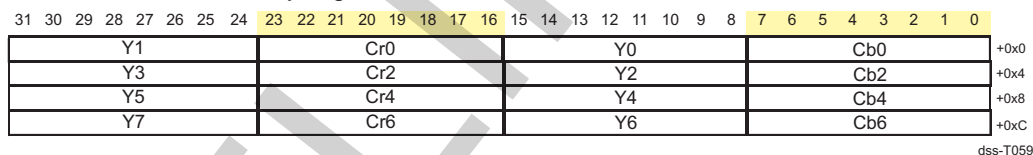
- ARGB32-8888 bpp data memory organization



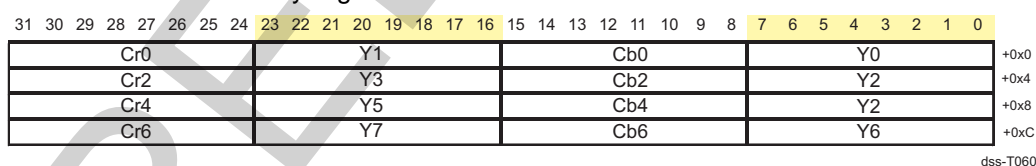
- RGBA32-8888 bpp data memory organization



- UYVY4:2:2 data memory organization



- YUV2 4:2:2 data memory organization



- YUV4:2:0-NV12 data memory organization

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Y3 | | | | | | | | Y2 | | | | | | | | Y1 | | | | | | | | Y0 | | | | | | | | +0x0 |
| Y7 | | | | | | | | Y6 | | | | | | | | Y5 | | | | | | | | Y4 | | | | | | | | +0x4 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Cr1 | | | | | | | | Cb1 | | | | | | | | Cr0 | | | | | | | | Cb0 | | | | | | | | +0x0 + Offset |
| Cr3 | | | | | | | | Cb3 | | | | | | | | Cr2 | | | | | | | | Cb2 | | | | | | | | +0x4 + Offset |
| Cr5 | | | | | | | | Cb5 | | | | | | | | Cr4 | | | | | | | | Cb4 | | | | | | | | +0x8 + Offset |
| Cr7 | | | | | | | | Cb7 | | | | | | | | Cr6 | | | | | | | | Cb6 | | | | | | | | +0xC + Offset |

dss-T061

10.2.4.9 Graphics Pipeline

The graphics pipeline is connected to the GFX FIFO for the input port and to the three overlay managers for the output or WB pipeline. The pixel output is directed to an LCD, TV, or WB path by setting the [DISPC_GFX_ATTRIBUTES](#)[8] CHANNELOUT bit and the [DISPC_GFX_ATTRIBUTES](#)[31:30] CHANNELOUT2 bit field. [Table 10-50](#) lists the bit field settings to orient a pipeline to an LCD, TV, or WB output. The default value directs the GFX pipeline to LCD1.

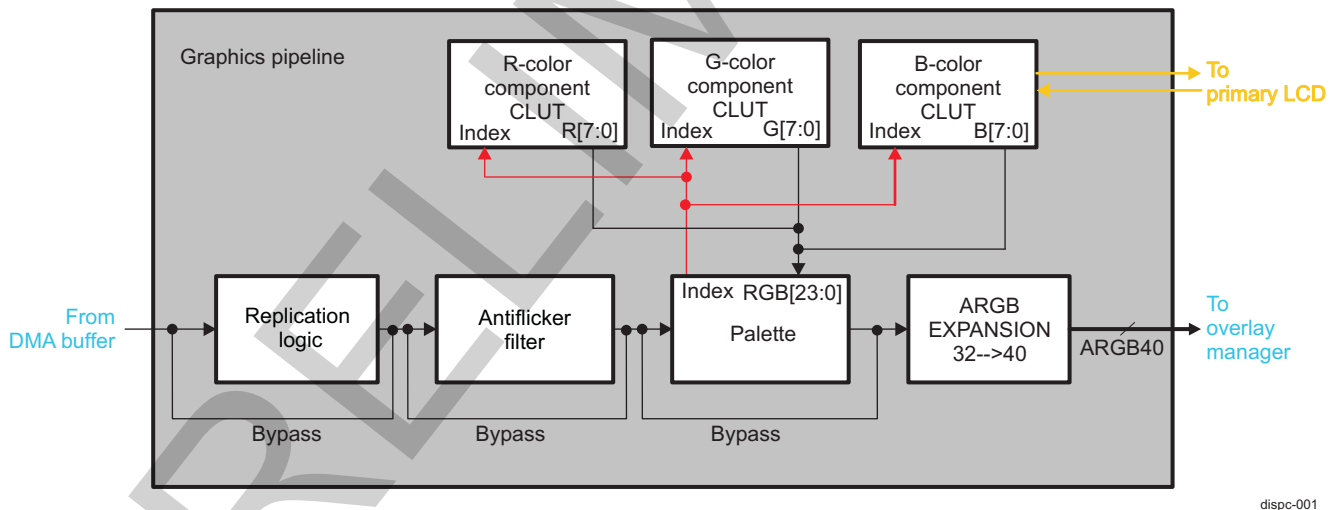
The pipeline consists of programmable replication logic, an antiflicker filter, and one 256-entry palette table. The replication logic is used to convert the RGB pixels, excluding the RGB24 format, into an ARGB32-based format. The antiflicker filter processes the graphics data in RGB format to remove some of the vertical flicker. The 256-entry palette is used to convert bitmap formats into RGB formats or for gamma corrections when RGB format is inputted.

[Table 10-31](#) lists the input formats supported by the graphics pipeline.

The graphics pipeline is enabled by setting the [DISPC_GFX_ATTRIBUTES](#)[0] ENABLE bit to 0x1.

[Figure 10-42](#) shows the graphics pipeline.

Figure 10-42. Graphics Pipeline



10.2.4.9.1 Replication Logic

The replication logic increases the color depth of the graphics-encoded pixels (from true color RGB 12, and 16 to 40 bpp).

- When the replication logic is enabled by setting the [DISPC_GFX_ATTRIBUTES](#)[5] REPLICATIONENABLE bit to 0x1, the MSBs are copied to the missing LSB. [Table 10-34](#) describes the remapping of the RGB pixels into ARGB 40-bit values.

Table 10-32. Replication Enabled: RGB Pixel Formats Remapping Into ARGB40-10.10.10.10

| Formats | A[7:0] | R[7:0] | G[7:0] | B[7:0] |
|-------------|--------------------|--------------------|--------------------|--------------------|
| | MSB LSB | MSB LSB | MSB LSB | MSB LSB |
| xRGB12-4444 | 11111111 | R[3:0]R[3:0]R[3:2] | G[3:0]G[3:0]G[3:2] | B[3:0]B[3:0]B[3:2] |
| RGBx12-4444 | 11111111 | R[3:0]R[3:0]R[3:2] | G[3:0]G[3:0]G[3:2] | B[3:0]B[3:0]B[3:2] |
| RGB16-565 | 11111111 | R[4:0]R[4:0] | G[5:0]G[5:2] | B[4:0]B[4:0] |
| xRGB16-1555 | 11111111 | R[4:0]R[4:0] | G[4:0]G[4:0] | B[4:0]B[4:0] |
| ARGB16-1555 | AAAAAAAA | R[4:0]R[4:0] | G[4:0]G[4:0] | B[4:0]B[4:0] |
| ARGB16-4444 | A[3:0]A[3:0]A[3:2] | R[3:0]R[3:0]R[3:2] | G[3:0]G[3:0]G[3:2] | B[3:0]B[3:0]B[3:2] |
| RGBA16-4444 | A[3:0]A[3:0]A[3:2] | R[3:0]R[3:0]R[3:2] | G[3:0]G[3:0]G[3:2] | B[3:0]B[3:0]B[3:2] |

- When the replication logic is disabled by setting the [DISPC_GFX_ATTRIBUTES\[5\]](#) REPLICATIONENABLE bit to 0x0, the encoded pixel values are shifted to the MSB boundary of the 24-bit format. The missing bit values are filled with 0s. [Table 10-35](#) describes the remapping of the RGB pixels into ARGB 40-bit values.

Table 10-33. Replication Disabled: RGB Pixel Formats Remapping Into ARGB40-10.10.10.10

| Formats | A[7:0] | R[7:0] | G[7:0] | B[7:0] |
|-------------|--------------------|--------------|--------------|--------------|
| | MSB LSB | MSB LSB | MSB LSB | MSB LSB |
| xRGB12-4444 | 1111111111 | R[3:0]000000 | G[3:0]000000 | B[3:0]000000 |
| RGBx12-4444 | 1111111111 | R[3:0]000000 | G[3:0]000000 | B[3:0]000000 |
| RGB16-565 | 1111111111 | R[4:0]00000 | G[5:0]0000 | B[4:0]00000 |
| xRGB16-1555 | 1111111111 | R[4:0]00000 | G[4:0]00000 | B[4:0]00000 |
| ARGB16-1555 | AAAAAAAAAA | R[4:0]00000 | G[4:0]00000 | B[4:0]00000 |
| ARGB16-4444 | A[3:0]A[3:0]A[3:2] | R[3:0]000000 | G[3:0]000000 | B[3:0]000000 |
| RGBA16-4444 | A[3:0]A[3:0]A[3:2] | R[3:0]000000 | G[3:0]000000 | B[3:0]000000 |

10.2.4.9.2 Antiflicker Filter

The antiflicker filter processes the graphics data to remove some of the vertical flicker. It is based on 3-tap finite impulse response (FIR) filter with fixed coefficients. For each pixel to be output from the graphics pipeline, the pixel above and the pixel below the current line must be read from the DMA graphics FIFO. Therefore, three lines of pixels must be stored in the DMA graphics FIFO.

The antiflickering equations for A, R, G, and B components are:

$$A_{out}(x,y) = 0.25 \cdot A_{in}(x,y-1) + 0.5 \cdot A_{in}(x,y) + 0.25 \cdot A_{in}(x,y+1)$$

$$R_{out}(x,y) = 0.25 \cdot R_{in}(x,y-1) + 0.5 \cdot R_{in}(x,y) + 0.25 \cdot R_{in}(x,y+1)$$

$$G_{out}(x,y) = 0.25 \cdot G_{in}(x,y-1) + 0.5 \cdot G_{in}(x,y) + 0.25 \cdot G_{in}(x,y+1)$$

$$B_{out}(x,y) = 0.25 \cdot B_{in}(x,y-1) + 0.5 \cdot B_{in}(x,y) + 0.25 \cdot B_{in}(x,y+1)$$

For the first line of processing, because there is no pixel above, the value (x, y) is duplicated.

$$Out(x,y) = 0.25 \cdot In(x,y) + 0.5 \cdot In(x,y) + 0.25 \cdot In(x,y+1)$$

For the last line of processing, because there is no pixel below, the value (x, y) is duplicated.

$$Out(x,y) = 0.25 \cdot In(x,y-1) + 0.5 \cdot In(x,y) + 0.25 \cdot In(x,y)$$

NOTE: Antiflicker filtering is supported only in RGB formats and not in BITMAP formats.

Antiflickering is not supported for pictures with fewer than two lines. In this case, the user must disable the antiflickering processing.

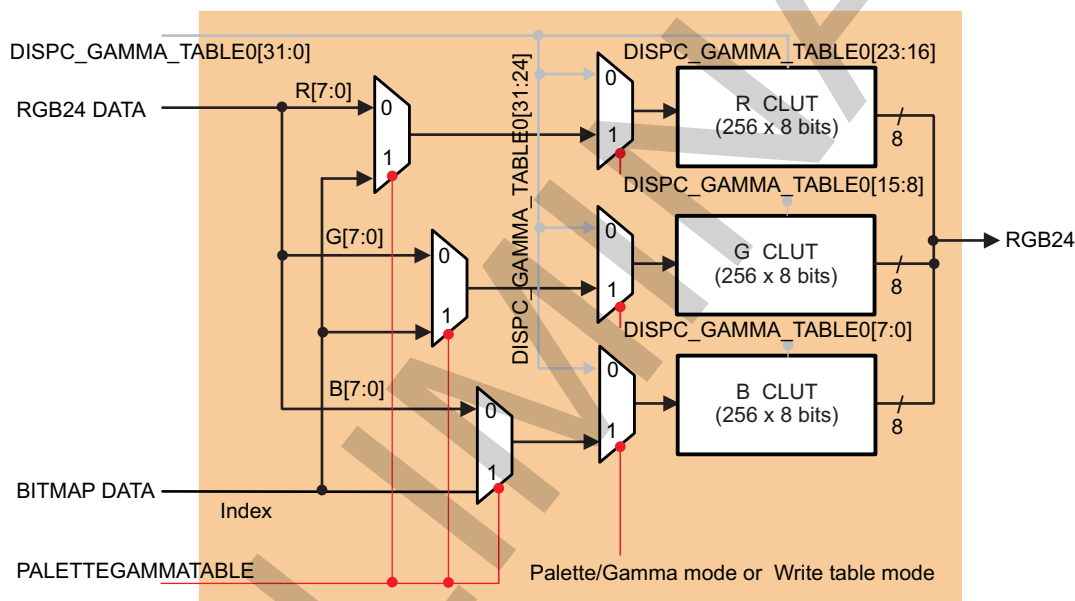
10.2.4.9.3 Color Look-Up Table (CLUT)

The graphics pipeline supports conversion of the BITMAP formats into RGB24 formats through a palette table. To enable palette mode, the `DISPC_CONFIG1[3]` PALETTEGAMMABLE bit must be set to 0x0. Figure 10-43 shows the internal architecture of the color look-up/gamma table.

The palette is split into three memories of 256-bit × 8-bit entries. For bitmap (CLUT) indexes, the same value (1-, 2-, 4-, or 8-bpp) indexes the three memories. The table can be reloaded every frame, once, or never (at the beginning of the frame before fetching pixels for the graphics). The table is loaded dynamically at the beginning of the frame by the DISPC DMA engine. The base address of the table buffer is set in the `DISPC_GFX_TABLE_BA[31:0]` TABLEBA bit field. It is possible to load the table for every frame or only for a specific frame by setting the `DISPC_CONFIG1[2:1]` LOADMODE bit field.

The table can be loaded without fetching data for the graphics pipeline. The DMA buffer associated with the graphics pipeline is used to fetch the table from memory. Regardless of the mode (color or monochrome) for each entry into the table, one 32-bit value is fetched from memory.

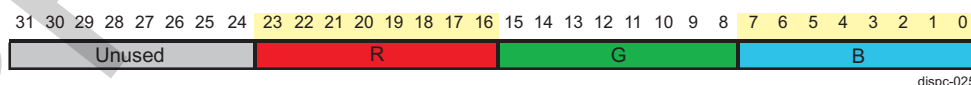
Figure 10-43. Palette/Gamma Correction Architecture



dispc-002

The palette mode uses the encoded pixel values from the input graphics FIFO as pointers to index the 24-bit-wide palette: 1-bpp pixels address 2 palette entries, 2-bpp pixels address 4 palette entries, 4-bpp pixels address 16 palette entries, and 8-bpp pixels address 256 palette entries. In color mode, the value within the palette is made up of three 8-bit fields, one for each color component: red, green, and blue (see Figure 10-44). For color operation, an individual frame is limited to a selection of 256 colors (the number of palette entries). In monochrome mode, only one 8-bit value is present. After passing through the palette, 256 grayscales and 16,777,216 colors are obtained (see Figure 10-45).

Figure 10-44. Data Memory Organization: Color Mode



dispc-025

Figure 10-45. Data Memory Organization: Gray Mode



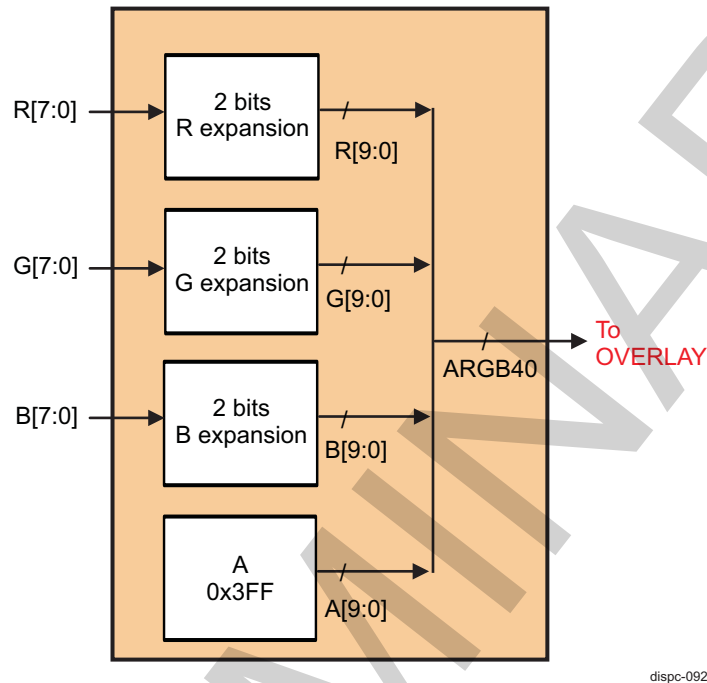
dispc-026

When a palette entry is selected by the encoded pixel value, the content of the entry and the index are sent to the LCD1 overlay manager.

10.2.4.9.4 Expansion to ARGB40

The expansion module takes in inputs the RGB24 pixel format outputted from the palette module. The module automatically replicates the 2 MSBs of each color component to create an ARGB40 pixel with the A component set to 0x3FF (see [Figure 10-46](#)).

Figure 10-46. Expansion to ARGB40



10.2.4.10 Video Pipelines

Three identical video pipelines are available, VID1, VID2, and VID3. Each video pipeline is connected to its video FIFO controller for the input port and to the three overlay managers LCD 1, LCD2, and TV or WB pipeline. The pixel output is directed to the LCD, TV, or WB path by setting the DISPC_VIDp_ATTRIBUTES[8] CHANNELOUT bit and the DISPC_VIDp_ATTRIBUTES[31:30] CHANNELOUT2 bit field. [Table 10-50](#) lists the bit field settings to orient a pipeline to an LCD, TV, or WB output. The default value directs all video pipelines to LCD1.

A video pipeline consists of a scaler unit, a color space conversion unit (CSC), a VC-1 range mapping unit, and some programmable replication logic. The video pipeline unit order can be configured in two manners (see [Figure 10-47](#) and [Figure 10-48](#)):

- Configuration 1: VC-1 range mapping unit followed by CSC a unit and then a scaler unit. The configuration is used to support RGB, ARGB, and RGBA formats, and YUV4:2:2 format in backward mode for both data types. Each block can be independently bypassed.
- Configuration 2: VC-1 range mapping unit followed by scaler unit and then a CSC unit. The configuration is used to support RGB, ARGB, and RGBA formats, and YUV4:2:2 format and YUV420-NV12 formats taking advantage of the scaler to resample the chrominance using five taps horizontally and three or five taps vertically. Each block can be independently bypassed.

The DISPC_VIDn_ATTRIBUTES2[8] YUVCHROMARESAMPLING bit controls the order of the scaler unit in the video pipeline:

- When the YUVCHROMARESAMPLING bit is set to 0x0, the video pipeline is in configuration 1, and the scaler follows the CSC unit. In case of YUV input data in 4:2:2 format, the chrominance resampling (4:2:2 to 4:4:4 format) is done by averaging the chrominance adjacent samples for only 0 degrees (zero rotation), because other rotation (90/180/270 degrees) is not supported in this mode. For more information about the supported chrominance resampling methods, see [Section 10.2.4.10.3.1, Chrominance Resampling](#).

- When the YUVCHROMARESAMPLING bit is set to 0x1, the video pipeline is in configuration 2, and the scaler precedes the CSC unit.
 - In case of YUV4:2:2 input data with 90-/270-degree rotation, the data is preprocessed by duplicating the missing chrominance samples.
 - In case of YUV4:2:2 input data with 0-/180-degree rotation, the chroma upsampling is performed in the scaler unit.

Table 10-31 lists the input formats supported by the video pipelines.

The video pipeline is enabled by setting ENABLE bit DISPC_VIDp_ATTRIBUTES[0] to 0x1.

Figure 10-47. Configuration 1: Video Pipeline

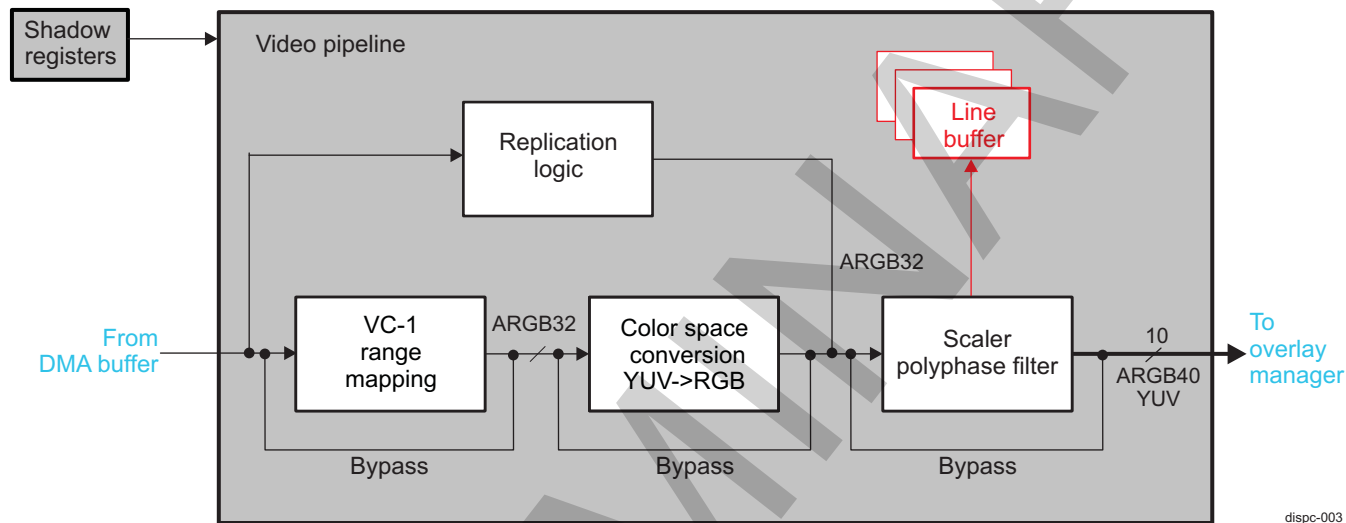
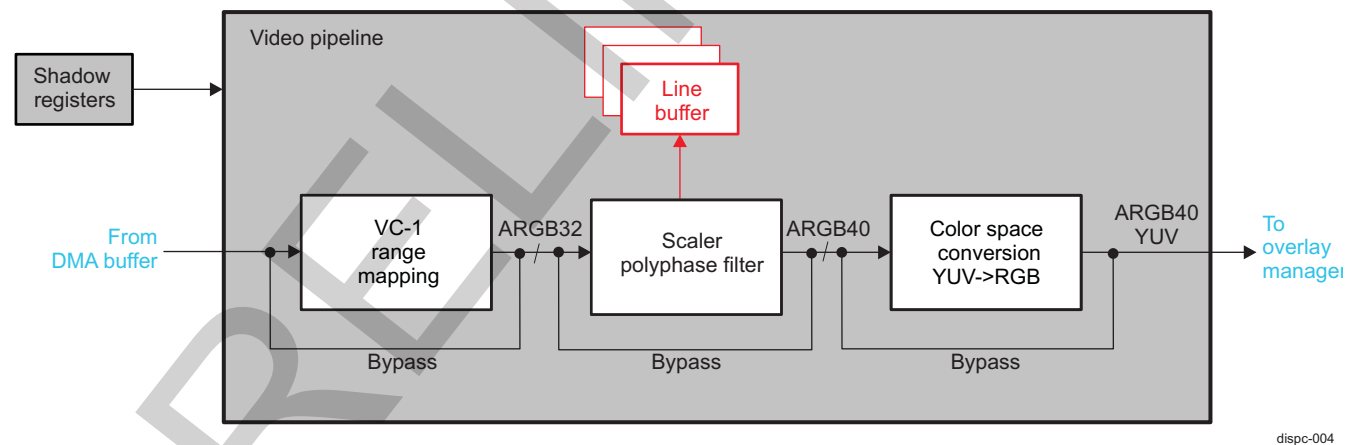


Figure 10-48. Configuration 2: Video Pipeline



10.2.4.10.1 Replication Logic

The replication logic increases the color depth of the video-encoded pixels (from true color RGB 12, and 16 to 32 bpp) and available only in configuration 1.

The expansion from 8 to 10 bits color component is done by:

- The CSC unit, when the scaler follows the CSC module and when the vertical scaler is disabled.
- The vertical scaler, when the scaler follows the CSC unit and is enabled.
- The replication bit module, when both the CSC unit and scaler are disabled.
- When the replication logic is enabled by setting the DISPC_VIDp_ATTRIBUTES[10]

REPLICATIONENABLE bit to 0x1, the MSBs are copied to the missing LSBs. [Table 10-34](#) describes the remapping of the RGB pixels into ARGB 32-bit values.

Table 10-34. Replication Enabled: RGB Pixel Formats Remapping Into ARGB32-8888

| Formats | A[7:0] | R[7:0] | G[7:0] | B[7:0] |
|-------------|--------------|--------------|--------------|--------------|
| | MSB LSB | MSB LSB | MSB LSB | MSB LSB |
| xRGB12-4444 | 11111111 | R[3:0]R[3:0] | G[3:0]G[3:0] | B[3:0]B[3:0] |
| RGBx12-4444 | 11111111 | R[3:0]R[3:0] | G[3:0]G[3:0] | B[3:0]B[3:0] |
| RGB16-565 | 11111111 | R[4:0]R[4:2] | G[5:0]G[5:4] | B[4:0]B[4:2] |
| xRGB16-1555 | 11111111 | R[4:0]R[4:2] | G[4:0]G[4:2] | B[4:0]B[4:2] |
| ARGB16-1555 | AAAAAAAA | R[4:0]R[4:2] | G[4:0]G[4:2] | B[4:0]B[4:2] |
| ARGB16-4444 | A[3:0]A[3:0] | R[3:0]R[3:0] | G[3:0]G[3:0] | B[3:0]B[3:0] |
| RGBA16-4444 | A[3:0]A[3:0] | R[3:0]R[3:0] | G[3:0]G[3:0] | B[3:0]B[3:0] |

- When the replication logic is disabled by setting the DISPC_VIDp_ATTRIBUTES[10] REPLICATIONENABLE bit to 0x0, the encoded pixel values are shifted to the MSB boundary of the 24-bit format. The missing bit values are filled with 0s. [Table 10-35](#) describes the remapping of the RGB pixels into ARGB 32-bit values.

Table 10-35. Replication Disabled: RGB Pixel Formats Remapping Into ARGB32-8888

| Formats | A[7:0] | R[7:0] | G[7:0] | B[7:0] |
|-------------|--------------|------------|------------|------------|
| | MSB LSB | MSB LSB | MSB LSB | MSB LSB |
| xRGB12-4444 | 11111111 | R[3:0]0000 | G[3:0]0000 | B[3:0]0000 |
| RGBx12-4444 | 11111111 | R[3:0]0000 | G[3:0]0000 | B[3:0]0000 |
| RGB16-565 | 11111111 | R[4:0]000 | G[5:0]00 | B[4:0]000 |
| xRGB16-1555 | 11111111 | R[4:0]000 | G[4:0]000 | B[4:0]000 |
| ARGB16-1555 | AAAAAAAA | R[4:0]000 | G[4:0]000 | B[4:0]000 |
| ARGB16-4444 | A[3:0]A[3:0] | R[3:0]0000 | G[3:0]0000 | B[3:0]0000 |
| RGBA16-4444 | A[3:0]A[3:0] | R[3:0]0000 | G[3:0]0000 | B[3:0]0000 |

10.2.4.10.2 VC-1 Range Mapping Unit

The VC-1 range mapping unit is used when the video frame picture is decoded using a VC-1 codec by the video accelerator. It remaps the Y, Cb, and Cr components. The unit is used primarily for YUV4:2:0-NV12 pixel format but also can be applied to YUV4:2:2 pixel formats (YUV2 and UYVY).

The VC-1 range mapping unit is enabled by setting the DISPC_VIDp_ATTRIBUTES2[0] VC1ENABLE bit to 0x1. The DISPC_VIDp_ATTRIBUTES2[3:1] VC1_RANGE_Y and DISPC_VIDp_ATTRIBUTES2[6:4] VC1_RANGE_CBCR bit fields are two 3-bit values programmed by the user and are independent for each video pipeline. The module is governed by the equations:

$$Y_{out} = \text{CLIP}((((Y_{int} - 128) \times (VC1_RANGE_Y + 9) + 4) / 8) + 128)$$

$$C_b = \text{CLIP}((((C_b - 128) \times (VC1_RANGE_CBCR + 9) + 4) / 8) + 128)$$

$$C_r = \text{CLIP}((((C_r - 128) \times (VC1_RANGE_CBCR + 9) + 4) / 8) + 128)$$

NOTE: The input and output pixel values are unsigned (Y, Cr, and Cb).

The function CLIP () clips to 0 or 255 when min or max are reached, respectively; otherwise resulting output stay identical.

10.2.4.10.3 CSC Unit YUV to RGB

The CSC unit converts the video-encoded pixel values from YUV4:4:4 format into RGB24 or RGB30 format. The output format depends on the video pipeline configuration selected:

- Configuration 1: RGB24 output format, with 8-bit value per component: red, green, and blue
- Configuration 2: RGB30 output format, with 10-bit value per component: red, green, and blue

In case of YUV4:2:0 or YUV4:2:2 formats, a chrominance resampling to YUV4:4:4 is required before converting the YUV into RGB values (see [Section 10.2.4.10.3.1, Chrominance Resampling](#)). YUV4:2:2 or YUV4:2:0 to YUV4:4:4 chrominance resampling is a preprocessing to the color space conversion.

[Figure 10-49](#) to [Figure 10-52](#) show the 3×3 11-bit coefficients used to convert from YUV4:4:4 into RGB24. The coefficients are set according to the standard used to encode the pixel data in YUV color space. [Table 10-36](#) resumes the coefficients with their respective bit fields.

Table 10-36. Color Space Conversion YUV to RGB Bit Field Setting

| Coefficients | Bit Field Registers |
|--------------|----------------------------------|
| R_Y | DISPC_VIDp_CONV_COEF0[10:0] RY |
| R_{Cr} | DISPC_VIDp_CONV_COEF0[26:16] RCR |
| R_{Cb} | DISPC_VIDp_CONV_COEF1[10:0] RGB |
| G_Y | DISPC_VIDp_CONV_COEF1[26:16] GY |
| G_{Cr} | DISPC_VIDp_CONV_COEF2[10:0] GCR |
| G_{Cb} | DISPC_VIDp_CONV_COEF2[26:16] GCB |
| B_Y | DISPC_VIDp_CONV_COEF3[10:0] BY |
| B_{Cr} | DISPC_VIDp_CONV_COEF3[26:16] BCR |
| B_{Cb} | DISPC_VIDp_CONV_COEF4[10:0] BCB |

- For configuration 1 with an RGB24 output:
If the active range for the luminance samples (Y) is [235:16] and [240:16] for the chrominance samples (Cb and Cr), the range selection is done by setting the DISPC_VIDp_ATTRIBUTES[11] FULLRANGE bit to 0x0. The values of R, G, and B output components are clipped to the range [255:0].

NOTE: The scaling and CSC clipping is set by the same bit, DISPC_VIDp_ATTRIBUTES[11] FULLRANGE.

Figure 10-49. YCbCr to RGB Registers (FULLRANGE = 0), 8-Bit Outputs

$$\begin{bmatrix} R_{OUT} \\ G_{OUT} \\ B_{OUT} \end{bmatrix} = \frac{1}{256} * \begin{bmatrix} R_Y & R_{Cr} & R_{Cb} \\ G_Y & G_{Cr} & G_{Cb} \\ B_Y & B_{Cr} & B_{Cb} \end{bmatrix} * \begin{bmatrix} Y_{IN} - 16 \\ Cr_{IN} - 128 \\ Cb_{IN} - 128 \end{bmatrix}$$

dispc-005

If the active range for the luminance samples (Y) and chrominance samples (Cb and Cr) is [0:255], the range selection is done by setting the DISPC_VIDp_ATTRIBUTES[11] FULLRANGE bit to 0x1. The values of R, G, and B output components are clipped to the range [0:255].

Figure 10-50. YCbCr to RGB Registers (FULLRANGE = 1), 8-Bit Outputs

$$\begin{bmatrix} R_{OUT} \\ G_{OUT} \\ B_{OUT} \end{bmatrix} = \frac{1}{256} * \begin{bmatrix} R_Y & R_{Cr} & R_{Cb} \\ G_Y & G_{Cr} & G_{Cb} \\ B_Y & B_{Cr} & B_{Cb} \end{bmatrix} * \begin{bmatrix} Y_{IN} \\ Cr_{IN} - 128 \\ Cb_{IN} - 128 \end{bmatrix}$$

dispc-006

- For configuration 2 with an RGB30 output:
If the active range for the luminance samples (Y) is [940:64] and [960:64] for the chrominance samples (Cb and Cr), the range selection is done by setting the DISPC_VIDp_ATTRIBUTES[11] FULLRANGE bit to 0x0. The values of R, G, and B output components are clipped to the range [1023:0].

NOTE: The scaling and CSC clipping is set by the same bit, DISPC_VIDp_ATTRIBUTES[11] FULLRANGE.

Figure 10-51. YCbCr to RGB Registers (FULLRANGE = 0), 10-Bit Outputs

$$\begin{bmatrix} R_{OUT} \\ G_{OUT} \\ B_{OUT} \end{bmatrix} = \frac{1}{256} * \begin{bmatrix} R_Y & R_{Cr} & R_{Cb} \\ G_Y & G_{Cr} & G_{Cb} \\ B_Y & B_{Cr} & B_{Cb} \end{bmatrix} * \begin{bmatrix} Y_{IN} - 64 \\ Cr_{IN} - 512 \\ Cb_{IN} - 512 \end{bmatrix}$$

dispc-074

If the active range for the luminance samples (Y) and chrominance samples (Cb and Cr) is [1023:0], the range selection is done by setting the DISPC_VIDp_ATTRIBUTES[11] FULLRANGE bit to 0x1. The values of R, G, and B output components are clipped to the range [1023:0].

Figure 10-52. YCbCr to RGB Registers (FULLRANGE = 1), 10-Bit Outputs

$$\begin{bmatrix} R_{OUT} \\ G_{OUT} \\ B_{OUT} \end{bmatrix} = \frac{1}{256} * \begin{bmatrix} R_Y & R_{Cr} & R_{Cb} \\ G_Y & G_{Cr} & G_{Cb} \\ B_Y & B_{Cr} & B_{Cb} \end{bmatrix} * \begin{bmatrix} Y_{IN} \\ Cr_{IN} - 512 \\ Cb_{IN} - 512 \end{bmatrix}$$

dispc-075

10.2.4.10.3.1 Chrominance Resampling

Two methods are supported to resample chrominance:

- Averaging of the chrominance is done by software followed by hardware conversion when the video pipeline is in configuration 1.
- Filtering of the chrominance using the scaler unit (chrominance resampling and rescaling can be combined to support native rescaling of YUV format) when the video pipeline is in configuration 2.

To convert the YUV4:2:2 encoded pixel values into YUV4:4:4 format, the averaging of the chrominance technique can be used as shown in [Figure 10-53](#). The missing chrominance samples (Cb and Cr) are interpolated using the average values of the two closest values on the same line (,) or are repeated from the second pixel in the same 32-bit container (see [Figure 10-54](#)). For the last pixel, the chrominance samples are duplicated using the values from the previous pixel; otherwise, the chrominance samples are averaged using the two adjacent values. [Figure 10-55](#) shows the flow of the pixel.

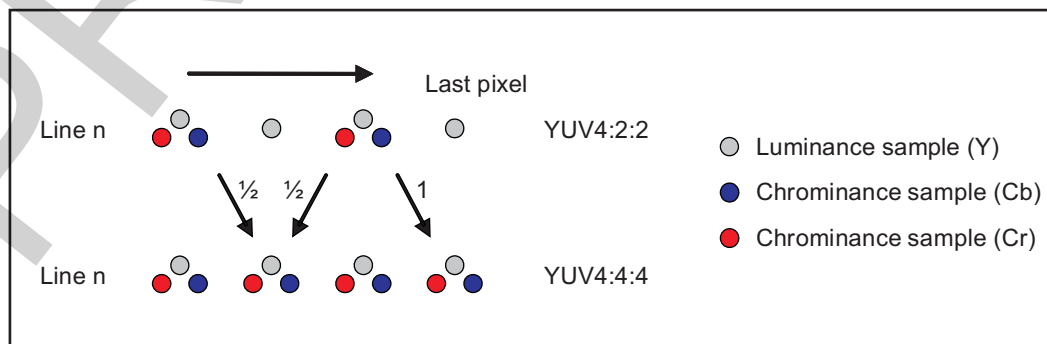
Figure 10-53. Averaging of the Chrominance Formula

$$Cb_n(YCbCr\ 444) = \frac{Cb_{n-1}(YCbCr\ 422) + Cb_{n+1}(YCbCr\ 422)}{2} \text{ (n odd)}$$

$$Cr_n(YCbCr\ 444) = \frac{Cr_{n-1}(YCbCr\ 422) + Cr_{n+1}(YCbCr\ 422)}{2} \text{ (n odd)}$$

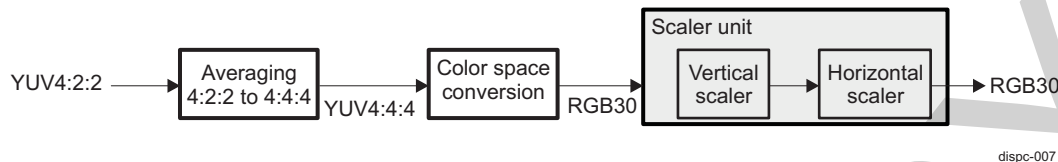
dispc-010

Figure 10-54. Averaging of the Chrominance Representation



dispc-011

Figure 10-55. YUV4:2:2 to RGB30 Using Averaging of the Chrominance



The scaler unit can be used to resample the chrominance of YUV4:2:0 and YUV4:2:2, as shown in [Figure 10-56](#) and [Figure 10-57](#), respectively. The settings of the scaler unit to perform chrominance resampling are described in [Section 10.2.4.10.4, Scaler Unit](#).

Figure 10-56. YUV4:2:0 to RGB30 Using Scaler Unit for Resampling Chrominance

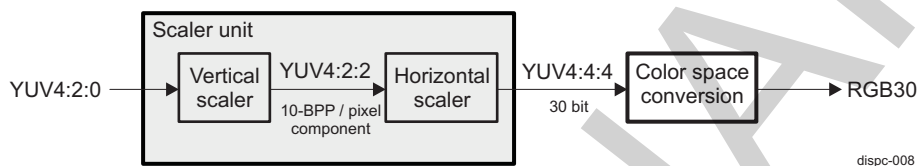
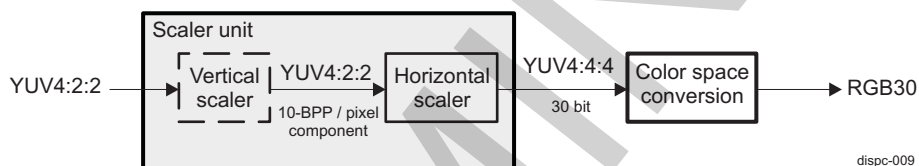


Figure 10-57. YUV4:2:2 to RGB30 Using Scaler Unit for Resampling Chrominance



NOTE: If rotation must be supported, YUV4:2:2 and YUV4:2:0 (0-/180-degree rotation) chrominance resampling is done as shown in [Figure 10-57](#) and [Figure 10-56](#), respectively. For YUV4:2:2 (90-/270-degree rotation) data are preprocessed to present YUV4:4:4 on the scaler input (duplication of the missing chroma), as shown in [Figure 10-55](#).

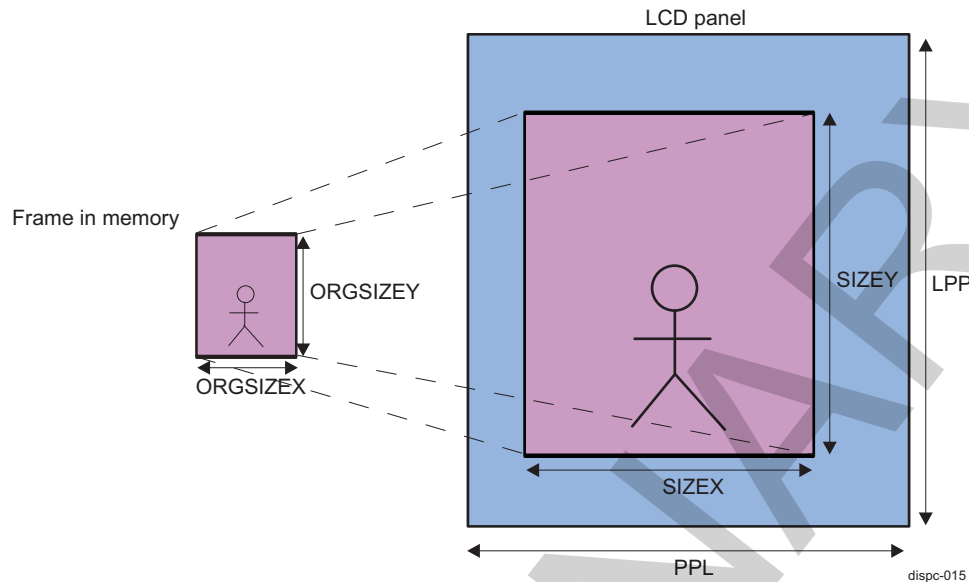
10.2.4.10.4 Scaler Unit

All video formats are supported, including formats with alpha blending. Alpha blending is scaled with the same parameters as RGB color components. For the YUV formats, Y and Cb/Cr are processed independently. The filter is based on a FIR filter. The filtering can be used for different processing:

- Upsampling of the picture
- Downsampling of the picture
- Antiflicker reduction
- De-interlacing using "bob" algorithm
- Chrominance resampling in case of YUV data formats

NOTE: The user must ensure the resizing frame displays in the LCD/screen boundaries.

[Figure 10-58](#) shows an example of video upsampling.

Figure 10-58. Video Upsampling

The up/downsampling filter is a polyphase filter with five taps and eight phases for the horizontal filter, and a programmable number of taps (three or five) and eight phases for vertical filter. The input buffer has five input memory lines. The following limitations must be considered:

- The upsampling ratio is up to x8.
- The downsampling ratio using 3-tap configuration is down to x0.5 for RGB format.
- The downsampling ratio using 5-tap configuration is down to x0.25 for RGB format.
- If the input format is changed from YUV4:2:2 to YUV4:2:0 (WB pipeline), the downsampling ratio is further reduced:
 - Using 5-tap configuration, the ratio is down to x0.5 for RGB format.
 - Using 3-tap configuration, no downscaling is available.

For the vertical up/downsampling in 3-tap configuration, the equations are:

| For RGB formats | For YUV formats |
|--|---|
| $A_{out}(n) = (\sum_{i=-1}^{i=1} C_{vi}(\Phi) * A_{in}(n+i)) >> 5$ | $Y_{out}(n) = (\sum_{i=-1}^{i=1} C_{vi}(\Phi) * Y_{in}(n+i)) >> 5$ |
| $R_{out}(n) = (\sum_{i=-1}^{i=1} C_{vi}(\Phi) * R_{in}(n+i)) >> 5$ | $Cr_{out}(n) = (\sum_{i=-1}^{i=1} C_{vci}(\Phi) * Cb_{in}(n+i)) >> 5$ |
| $G_{out}(n) = (\sum_{i=-1}^{i=1} C_{vi}(\Phi) * G_{in}(n+i)) >> 5$ | $Cb_{out}(n) = (\sum_{i=-1}^{i=1} C_{vci}(\Phi) * Cr_{in}(n+i)) >> 5$ |
| $B_{out}(n) = (\sum_{i=-1}^{i=1} C_{vi}(\Phi) * B_{in}(n+i)) >> 5$ | |

dispc-013

(7)

For the vertical up/downsampling in 5-tap configuration, the equations are:

| For RGB formats | For YUV formats |
|--|---|
| $A_{out}(n) = (\sum_{i=-2}^{i=2} C_{vi}(\Phi) * A_{in}(n+i)) >> 5$ | $Y_{out}(n) = (\sum_{i=-2}^{i=2} C_{vi}(\Phi) * Y_{in}(n+i)) >> 5$ |
| $R_{out}(n) = (\sum_{i=-2}^{i=2} C_{vi}(\Phi) * R_{in}(n+i)) >> 5$ | $Cb_{out}(n) = (\sum_{i=-2}^{i=2} C_{vci}(\Phi) * Cb_{in}(n+i)) >> 5$ |
| $G_{out}(n) = (\sum_{i=-2}^{i=2} C_{vi}(\Phi) * G_{in}(n+i)) >> 5$ | $Cr_{out}(n) = (\sum_{i=-2}^{i=2} C_{vci}(\Phi) * Cr_{in}(n+i)) >> 5$ |
| $B_{out}(n) = (\sum_{i=-2}^{i=2} C_{vi}(\Phi) * B_{in}(n+i)) >> 5$ | |

dispc-012

(8)

For the horizontal up/downsampling in 5-tap configuration, the equations are:

| For RGB formats | For YUV formats |
|---|--|
| $A_{out}(n) = \left(\sum_{i=-2}^{i=2} C_{hi}(\Phi) * A_{in}(n+i) \right) >> 7$ | $Y_{out}(n) = \left(\sum_{i=-2}^{i=2} C_{hi}(\Phi_y) * Y_{in}(n+i) \right) >> 7$ |
| $R_{out}(n) = \left(\sum_{i=-2}^{i=2} C_{hi}(\Phi) * R_{in}(n+i) \right) >> 7$ | $Cb_{out}(n) = \left(\sum_{i=-2}^{i=2} C_{hcb}(\Phi_c) * Cb_{in}(n+i) \right) >> 7$ |
| $G_{out}(n) = \left(\sum_{i=-2}^{i=2} C_{hi}(\Phi) * G_{in}(n+i) \right) >> 7$ | $Cr_{out}(n) = \left(\sum_{i=-2}^{i=2} C_{hcb}(\Phi_c) * Cr_{in}(n+i) \right) >> 7$ |
| $B_{out}(n) = \left(\sum_{i=-2}^{i=2} C_{hi}(\Phi) * B_{in}(n+i) \right) >> 7$ | |

dispc-014

(9)

NOTE: The pixel (n + 1) is the previous pixel with respect to pixel (n). The line (n + 1) is the previous line with respect to line (n).

The coefficients $Ci()$ depend on the phase between input and output pixels.

NOTE: The coefficients are different for Y and Cr, Cb filtering because the calculations are independent due to the chrominance resampling for YUV4:2:2 and YUV4:2:0.

First, the vertical filter is applied to the encoded input pixel data, and then the horizontal filter is applied on the resulting pixel values to generate the output pixel values. The vertical input of the filter consists of five lines of 2048×32 bits for 3-tap and 5-tap configurations (see [Table 10-37](#)).

Table 10-37. Line Buffer Width for Scaler Unit

| Vertical Taps | Maximum Input Width (Pixels) |
|---------------|------------------------------|
| 3, 5 | 2048×32 bits |

At the beginning of frame scaling processing, the first line is duplicated to fill the first two lines in 3-tap configuration and the first three lines in 5-tap configuration.

At the end of frame scaling processing, the last line is duplicated if the scaling logic requires loading more lines and the last line has been reached.

The programmable coefficients of the polyphase filters are signed 8-bit values (except for the central coefficient, which is unsigned). The video scalers have an 8-bit input and a 10-bit output. The vertical scaling changes the 8-bit input into a 10-bit clipped output and the horizontal scaling takes the 10-bit input.

[Figure 10-59](#) and [Figure 10-60](#) show the scaler macro-architecture for the component A, R, G, B, and Y. [Figure 10-61](#) and [Figure 10-62](#) show the scaler macro-architecture for component Cr and Cb.

The scaling output can be clipped to an output range of [1023:0] or [960:64] by configuring the DISPC_VIDp_ATTRIBUTES[11] FULLRANGE bit.

NOTE: The scaling and CSC clipping is set by the same bit, DISPC_VIDp_ATTRIBUTES[11] FULLRANGE.

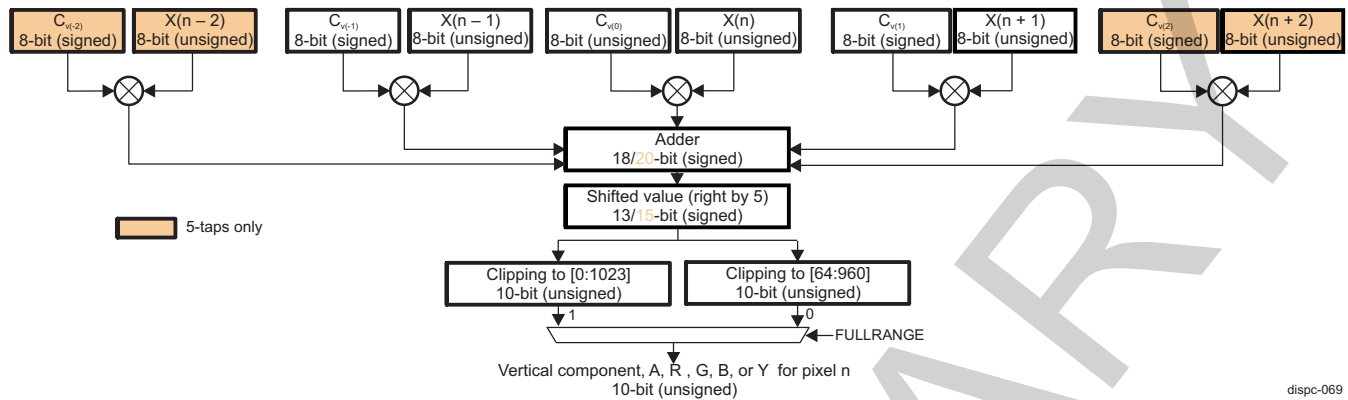
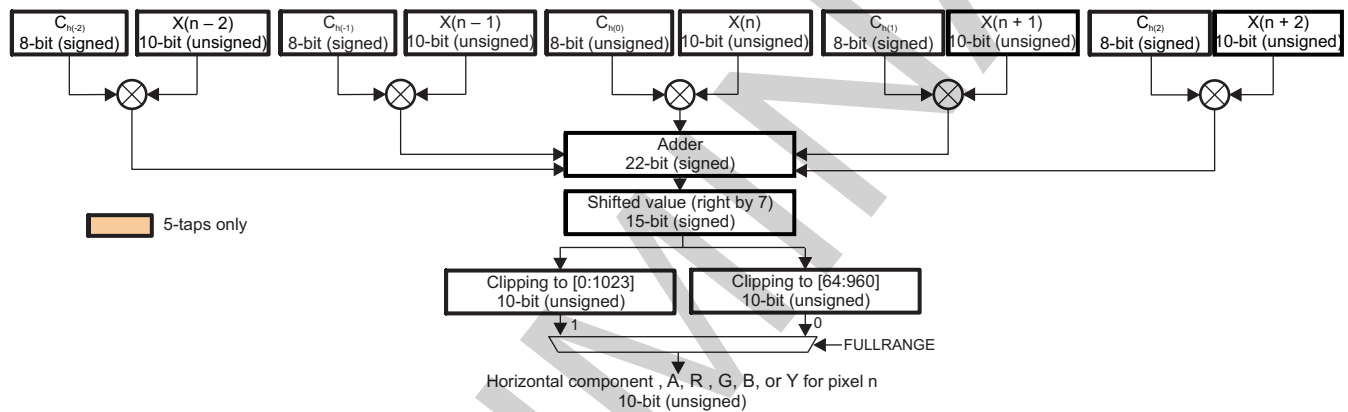
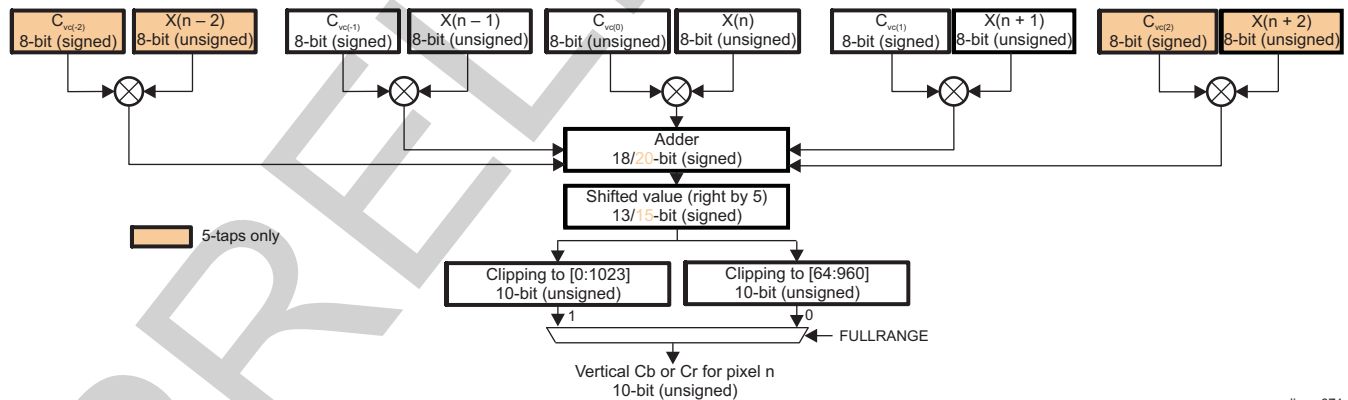
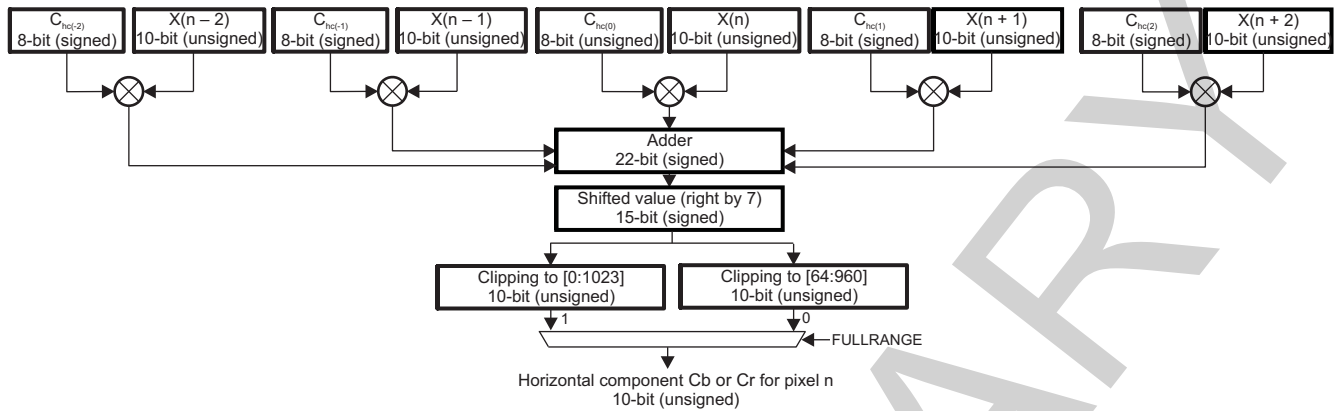
Figure 10-59. Macro-Architecture of the Vertical Scaling for A, R, G, B, and Y Component**Figure 10-60. Macro-Architecture of the Horizontal Scaling for A, R, G, B and Y Component****Figure 10-61. Macro-Architecture of the Vertical Scaling for Cr and Cb Component**

Figure 10-62. Macro-Architecture of the Horizontal Scaling for Cr and Cb Component



dispc-072

Table 10-38 and Table 10-39 list all the bit fields in function to set for each coefficient.

Table 10-38. Register Bit Field Associated to Coefficient for ARGB and Y Configuration in VIDp Scaler

| Taps | Coefficient | 3 Taps | 5 Taps | Registers |
|------------|-------------|----------------------------|-----------|---------------------------|
| | | Bit Field | Bit Field | |
| Vertical | Cv(-2) | FIRVC2 FIRVC1 FIRVC0 | FIRVC22 | DISPC_VIDp_FIR_COE F_V_i |
| | Cv(-1) | | FIRVC2 | DISPC_VIDp_FIR_COE F_HV_i |
| | Cv(0) | | FIRVC1 | DISPC_VIDp_FIR_COE F_HV_i |
| | Cv(1) | | FIRVC0 | DISPC_VIDp_FIR_COE F_HV_i |
| | Cv(2) | | FIRVC00 | DISPC_VIDp_FIR_COE F_V_i |
| Horizontal | Ch(-2) | N/A | FIRHC4 | DISPC_VIDp_FIR_COE F_HV_i |
| | Ch(-1) | | FIRHC3 | DISPC_VIDp_FIR_COE F_H_i |
| | Ch(0) | | FIRHC2 | DISPC_VIDp_FIR_COE F_H_i |
| | Ch(1) | | FIRHC1 | DISPC_VIDp_FIR_COE F_H_i |
| | Ch(2) | | FIRHC0 | DISPC_VIDp_FIR_COE F_H_i |

Table 10-39. Register Bit Field Associated to Coefficient for Cb and Cr Configuration in VIDp Scaler

| Taps | Coefficient | 3 Taps | 5 Taps | Registers |
|----------|-------------|----------------------------|-----------|----------------------------|
| | | Bit Field | Bit Field | |
| Vertical | Cvc(-2) | FIRVC2 FIRVC1 FIRVC0 | FIRVC22 | DISPC_VIDp_FIR_COE F_V2_i |
| | Cvc(-1) | | FIRVC2 | DISPC_VIDp_FIR_COE F_HV2_i |
| | Cvc(0) | | FIRVC1 | DISPC_VIDp_FIR_COE F_HV2_i |
| | Cvc(1) | | FIRVC0 | DISPC_VIDp_FIR_COE F_HV2_i |
| | Cvc(2) | | FIRVC00 | DISPC_VIDp_FIR_COE F_V2_i |

Table 10-39. Register Bit Field Associated to Coefficient for Cb and Cr Configuration in VIDp Scaler (continued)

| Taps | Coefficient | 3 Taps | 5 Taps | Registers |
|------------|-------------|-----------|-----------|----------------------------|
| | | Bit Field | Bit Field | |
| Horizontal | Chc(–2) | N/A | FIRHC4 | DISPC_VIDp_FIR_COE_F_HV2_i |
| | Chc(–1) | | FIRHC3 | DISPC_VIDp_FIR_COE_F_H2_i |
| | Chc(0) | | FIRHC2 | DISPC_VIDp_FIR_COE_F_H2_i |
| | Chc(1) | | FIRHC1 | DISPC_VIDp_FIR_COE_F_H2_i |
| | Chc(2) | | FIRHC0 | DISPC_VIDp_FIR_COE_F_H2_i |

The VID scaler unit vertical or/and horizontal sampling is defined by setting/resetting the DISPC_VIDp_ATTRIBUTES[6:5] RESIZEENABLE bit field.

A set of configurations must be valid before enabling the video up/downsampling block.

The following bit fields define the configuration of the video up/downsampling block for VIDp:

- Vertical up/downsampling increment the value of the DISPC_VIDp_FIR[28:16] FIRVINC bit field. The unsigned integer value range is [4096:1]. Software calculates the value using the following equation:

$$FIRVINC = 1024 * \left(\frac{ORGSIZEY}{SIZEY} \right) \quad \text{dispc-066} \quad (10)$$

NOTE:

- If the value of the DISPC_VIDp_FIR[28:16] FIRVINC bit field is greater than 4096, it is clipped to 4096.
- If the DISPC_VIDp_SIZE[26:16] SIZEY bit field equals 0x1, SIZEY is replaced by 0x2 in the previous equation.
- The values of the DISPC_VIDp_PICTURE_SIZE[26:16] ORGSIZEY and DISPC_VIDp_SIZE[26:16] SIZEY bit fields must be programmed with the value desired minus 1.

- Horizontal up/downsampling increments the value of the DISPC_VIDp_FIR[12:0] FIRHINC bit field: The unsigned integer value range is [1:4096]. Software calculates the value using the following equation:

$$FIRHINC = 1024 * \left(\frac{ORGSEX}{SEX} \right) \quad \text{dispc-067} \quad (11)$$

NOTE:

- If the value of the DISPC_VIDp_FIR[12:0] FIRHINC bit field is greater than 4096, it is clipped to 4096.
- If the DISPC_VIDp_SIZE[10:0] SEX bit field equals 1, the DISPC_VIDp_SIZE[10:0] SEX bit field is replaced by 2 in the previous equation.
- The values of the DISPC_VIDp_PICTURE_SIZE[10:0] ORGSSEX and DISPC_VIDp_SIZE[10:0] SEX bit fields must be programmed with the value desired minus 1.

- Vertical up/downsampling accumulator value DISPC_VIDp_ACCU_j[26:16] VERTICALACCU bit field: The signed integer value range is [–1024:1023]. The accumulator value indicates on which phase the vertical filtering starts. The DISPC_VIDp_ACCU_0 register is used for progressive output and for interlace output; the DISPC_VIDp_ACCU_0 and DISPC_VIDp_ACCU_1 registers are used. Similarly, DISPC_VIDp_ACCU2_0 and DISPC_VIDp_ACCU2_1 are used in progressive or interlace output to

set the accumulator value of the Cb and Cr components when scaling YUV format.

- Vertical up/downsampling line buffer configuration DISPC_VIDp_ATTRIBUTES[21] VERTICALTAPS bit: The default value at reset time is 0x0 (3-tap configuration is used). If the bit is reset, the 3-tap configuration is used.
- Horizontal up/downsampling accumulator value DISPC_VIDp_ACCU_j[10:0] HORIZONTALACCU bit field: The signed integer value range is [–1024:1023]. The accumulator value indicates on which phase the horizontal filtering starts. The DISPC_VIDp_ACCU_0 register is used for progressive output and for interlace output; the DISPC_VIDp_ACCU_0 and DISPC_VIDp_ACCU_1 registers are used. Similarly, DISPC_VIDp_ACCU2_0 and DISPC_VIDp_ACCU2_1 are used in progressive or interlace output to set the accumulator value of the Cb and Cr components when scaling YUV format.

Table 10-40. Vertical/Horizontal Accumulator Phase

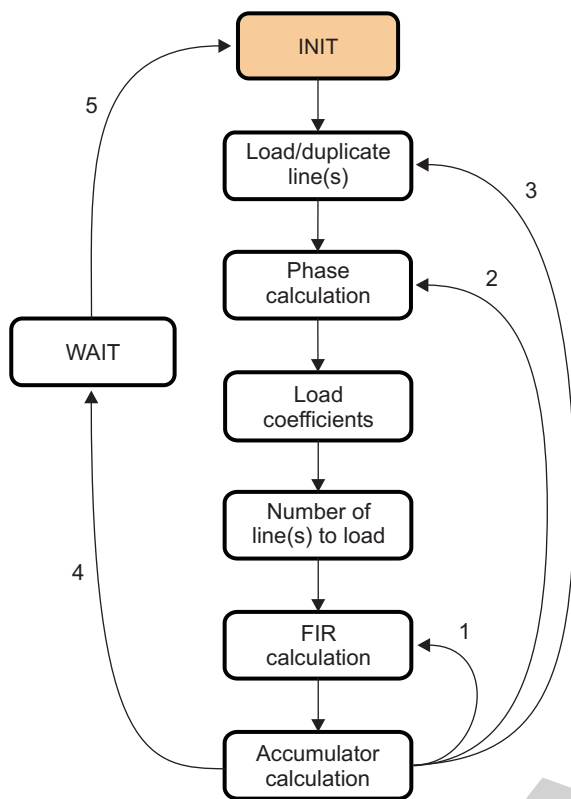
| Accumulator Value | Phases f |
|-------------------|----------|
| 0 | 0 |
| 128 or –896 | 1 |
| 256 or –768 | 2 |
| 384 or –640 | 3 |
| 512 or –512 | 4 |
| 640 or –384 | 5 |
| 768 or –256 | 6 |
| 896 or –128 | 7 |

- Vertical up/downsampling coefficients:
 - The 3-tap vertical up/downsampling coefficients are defined in the DISPC_VIDp_FIR_COEF_HV_i registers. There are eight registers for the eight phases with three coefficients for each, or a total of 24 programmable coefficients for the vertical up/downsampling block. Each register contains two 8-bit signed coefficients and one 8-bit unsigned coefficient (the central one).
 - The 5-tap vertical up/downsampling coefficients: Two extra-tap vertical up/downsampling coefficients are defined in the DISPC_VIDp_FIR_COEF_V_i registers. There are 8 registers for the 8 phases with 2 coefficients for each of them, so a total of 16 programmable coefficients for the vertical up/downsampling block are used in addition to the 3-tap registers previously defined. Four YUV vertical up/downsampling coefficients are set in DISPC_VIDp_FIR_COEF_HV2_i and DISPC_VIDp_FIR_COEF_V2_i registers. [Table 10-38](#) and [Table 10-39](#) list all coefficients and their respective registers.
- Horizontal up/downsampling coefficients:
 - The DISPC_VIDp_FIR_COEF_H_i and DISPC_VIDp_FIR_COEF_HV_i registers define the 5-tap horizontal up/downsampling coefficients. Each DISPC_VIDp_FIR_COEF_H_i register contains three 8-bit signed coefficients and one 8-bit unsigned coefficient (the central one). Each DISPC_VIDp_FIR_COEF_HV_i register contains one 8-bit signed coefficient. A total of 40 programmable coefficients for the horizontal up/downsampling block are used. Four YUV horizontal up/downsampling coefficients are set in the DISPC_VIDp_FIR_COEF_HV2_i and DISPC_VIDp_FIR_COEF_H2_i registers. [Table 10-38](#) and [Table 10-39](#) list all coefficients and their respective registers.

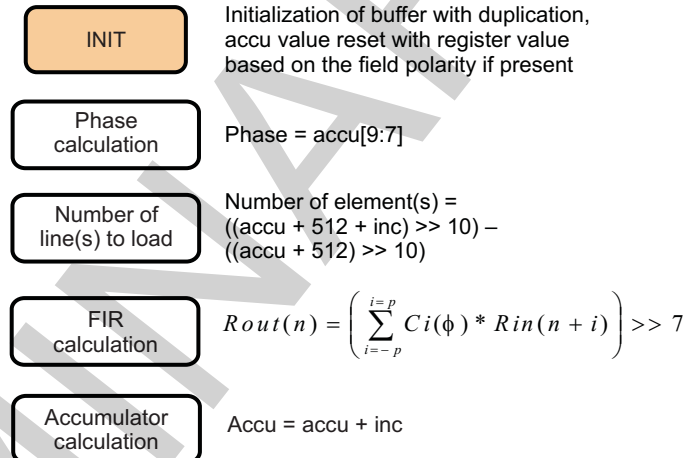
10.2.4.10.4.1 Scaling Algorithms

[Figure 10-63](#) and [Figure 10-64](#) show details of the up/downsampling finite state-machines (FSMs).

[Figure 10-63](#) shows the vertical up/downsampling FSM.

Figure 10-63. Vertical Up/Downsampling Algorithm

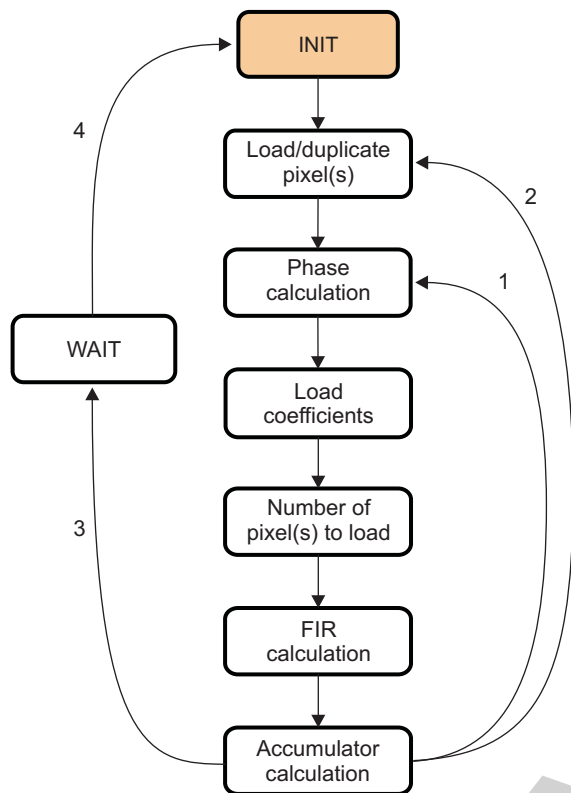
- 1: New pixel on the same line
- 2: New pixel on following line (no line to load)
- 3: New pixel on following line (line[s] to load)
- 4: End of frame
- 5: Restart of a new frame



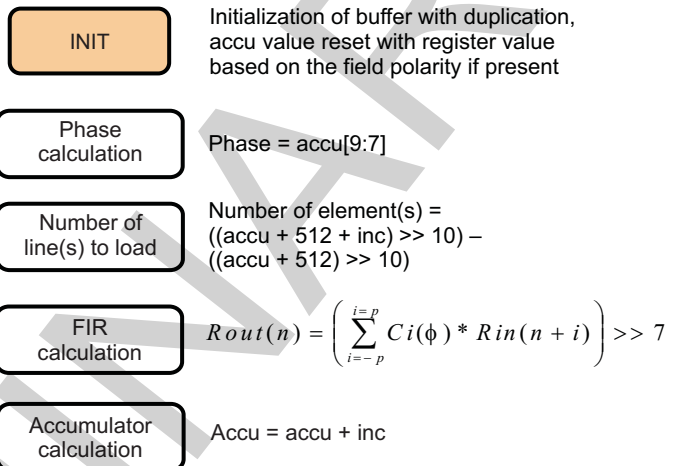
dispc-086

Figure 10-64 shows the horizontal up/downsampling FSM.

Figure 10-64. Horizontal Up/Downsampling Algorithm



- 1: New pixel (no pixel to load)
- 2: New pixel (pixel(s) to load)
- 3: End of line
- 4: Restart of a line



dispc-087

10.2.4.10.4.2 Scaling Limitations

Table 10-41 through Table 10-44 list the minimum ratio between the pixel clock frequency (PCLK) and the functional clock (DISPC_CORE_CLK) in the input pixel format when using the scaler unit. PCLK and FCLK are asynchronous. For each LCD output, a dedicated LCD clock is programmable with the LCD and PCD divisor values in DISPC_DIVISORo[23:16][7:0].

NOTE: The DISPC_CORE_CLK is derived from DISPC_FCLK through the LCD divisor.

NOTE: The downscaling ratio is not an integer, but it is the ratio DISPC_CORE_CLK/LCDn_PCLK, meaning if the ratio is 2.7, then the downscaling ratio is 2.7 and not 2.

Table 10-41. Pixel Clock Frequency Limitations (Any Pixel Format), Active Matrix Display

| DISPC_CORE_CLK/LCDn_PCLK Minimum Ratio | Horizontal Resampling | | | | |
|---|-----------------------|----------------------|---------|---------|---------|
| | Off | Up | 1:1–1:2 | 1:2–1:3 | 1:3–1:4 |
| | 2(1 ⁽¹⁾) | 2(1 ⁽¹⁾) | 2 | 3 | 4 |

(1) The minimum ratio can be 1 if the data are output on the rising edge of the PCLK (DISPC_POL_FREQo.IPC = 0); otherwise, the minimum ratio must be 2.

Table 10-42. Pixel Clock Frequency Limitations (Any Pixel Format), Passive Matrix Display – Mono4

| DISPC_CORE_CLK/LCDn_PCLK Minimum Ratio | Horizontal Resampling | | | | |
|---|-----------------------|----|---------|---------|---------|
| | Off | Up | 1:1–1:2 | 1:2–1:3 | 1:3–1:4 |
| | | | | | |

Table 10-42. Pixel Clock Frequency Limitations (Any Pixel Format), Passive Matrix Display – Mono4 (continued)

| DISPC_CORE_CLK/LCDn_PCLK Minimum Ratio | Horizontal Resampling | | | | |
|---|-----------------------|---|---|----|----|
| | 4 | 4 | 8 | 12 | 16 |

Table 10-43. Pixel Clock Frequency Limitations (Any Pixel Format), Passive Matrix Display – Mono8

| DISPC_CORE_CLK/LCDn_PCLK Minimum Ratio | Horizontal Resampling | | | | |
|---|-----------------------|----|---------|---------|---------|
| | Off | Up | 1:1–1:2 | 1:2–1:3 | 1:3–1:4 |
| | 8 | 8 | 16 | 24 | 32 |

Table 10-44. Pixel Clock Frequency Limitations (Any Pixel Format), Passive Matrix Display – Color

| DISPC_CORE_CLK/LCDn_PCLK Minimum Ratio | Horizontal Resampling | | | | |
|---|-----------------------|----|---------|---------|---------|
| | Off | Up | 1:1–1:2 | 1:2–1:3 | 1:3–1:4 |
| | 8 | 8 | 16 | 24 | 32 |

10.2.4.11 Write-Back Pipeline

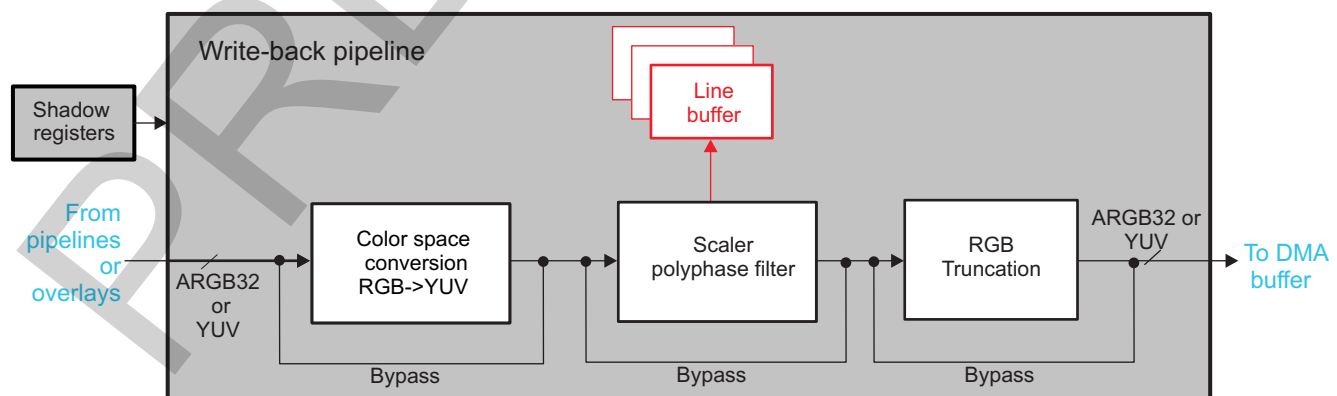
The write-back pipeline is used to store in the system memory the capture of the overlay output or the output of one of the pipelines. The WB pipeline consists of a CSC unit, a scaler unit, and an RGB truncation logic. Because the overlay works on ARGB32-8888 format and the video accelerator works on YUV format, the color space conversion from RGB to YUV is used to directly output to memory the format that can be encoded with no extra processing.

The write-back pipeline is connected to all the pipeline outputs (GFX, VD1, VID2, and VID3 pipelines) and to the output of the three overlay managers (LCD1, LCD2, and TV). The input is selected by setting the [DISPC_WB_ATTRIBUTES\[18:16\]](#) CHANNELIN bit field, and the capture frame rate is set in the [DISPC_WB_ATTRIBUTES\[26:24\]](#) CAPTUREMODE bit field.

Because the output format of the TV overlay manager is ARGB40, the graphics pipeline output is ARGB40, the video pipeline outputs are YUV4:2:2, YUV4:2:0, or ARGB40, and the WB input is ARGB32, the WB input does not consider the 2 LSBs of each ARGB component.

The WB pipeline is enabled by setting the [DISPC_WB_ATTRIBUTES\[0\]](#) ENABLE bit to 0x1.

[Figure 10-65](#) shows the graphics pipeline.

Figure 10-65. Write-Back Pipeline


dispc-016

10.2.4.11.1 CSC Unit RGB to YUV

The RGB-to-YUV CSC unit converts the encoded pixel values from RGB24 into YUV4:4:4 format. For YUV4:2:0 or YUV4:2:2 formats, a chrominance subsampling is required after converting the RGB into YUV values. Because of the subsampling, the following limitations must be considered:

- When converting RGB into YUV4:2:0 NV12 format:
 - Maximum horizontal downscale = x0.5
 - Maximum vertical downscale = x0.5
- When converting RGB into YUV4:2:2 format:
 - Maximum horizontal downscale = x0.5
 - Maximum vertical downscale = x0.25

Figure 10-66 and Figure 10-67 show the 3 × 3 11-bit coefficients used to convert from RGB24 into YUV4:4:4. The user sets the coefficients according to the standard used to encode the pixel data in YUV color space. Table 10-45 lists the coefficients with their respective bit fields.

Table 10-45. CSC RGB to YUV Bit Field Setting

| Coefficients | Bit Fields |
|--------------|--------------------------------|
| Y_R | DISPC_WB_CONV_COEF0[10:0] YR |
| Y_G | DISPC_WB_CONV_COEF0[26:16] YG |
| Y_B | DISPC_WB_CONV_COEF1[10:0] YB |
| Cr_R | DISPC_WB_CONV_COEF1[26:16] CRR |
| Cr_G | DISPC_WB_CONV_COEF2[10:0] CRG |
| Cr_B | DISPC_WB_CONV_COEF2[26:16] CRB |
| Cb_R | DISPC_WB_CONV_COEF3[10:0] CBR |
| Cb_G | DISPC_WB_CONV_COEF3[26:16] CBG |
| Cb_B | DISPC_WB_CONV_COEF4[10:0] CBB |

If the active range for the luminance samples (Y) is [235:16] and [240:16] for the chrominance samples (Cb and Cr), the values of Y, Cb, and Cr output components are clipped to the range [255:0]. The range selection is done by setting the DISPC_WB_ATTRIBUTES[11] FULLRANGE bit to 0x0.

Figure 10-66. RGB to YCbCr (FULLRANGE = 0)

$$\begin{bmatrix} Y_{OUT} \\ Cb_{OUT} \\ Cr_{OUT} \end{bmatrix} = \frac{1}{256} * \begin{bmatrix} Y_R & Y_G & Y_B \\ Cb_R & Cb_G & Cb_B \\ Cr_R & Cr_G & Cr_B \end{bmatrix} * \begin{bmatrix} R_{IN} \\ G_{IN} \\ B_{IN} \end{bmatrix} + \begin{bmatrix} 16 \\ 128 \\ 128 \end{bmatrix}$$

dispc-017

If the active range for the luminance samples (Y) and or the chrominance samples (Cb and Cr) is [255:0], the values of Y, Cb, and Cr output components are clipped to the range [255:0]. The range selection is done by setting the DISPC_WB_ATTRIBUTES[11] FULLRANGE bit to 0x1.

Figure 10-67. RGB to YCbCr (FULLRANGE = 1)

$$\begin{bmatrix} Y_{OUT} \\ Cb_{OUT} \\ Cr_{OUT} \end{bmatrix} = \frac{1}{256} * \begin{bmatrix} Y_R & Y_G & Y_B \\ Cb_R & Cb_G & Cb_B \\ Cr_R & Cr_G & Cr_B \end{bmatrix} * \begin{bmatrix} R_{IN} \\ G_{IN} \\ B_{IN} \end{bmatrix} + \begin{bmatrix} 0 \\ 128 \\ 128 \end{bmatrix}$$

dispc-018

10.2.4.11.2 Scaler Unit

The functional aspect of the WB pipeline scaler unit is identical to the video pipeline scaler unit (see

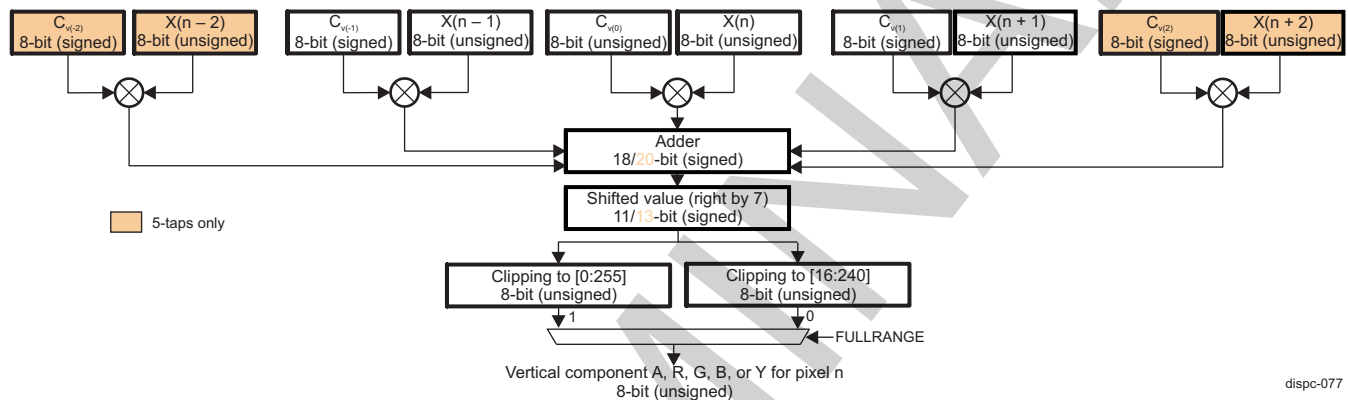
Section 10.2.4.10.4), except in the output width when scaling ARGB components. The resulting output format is ARGB32 instead of ARGB40. In addition, the scaling limitations described in Section 10.2.4.10.4.2, *Scaling Limitations*, are relevant only to the video pipelines scaler units. In WB memory-to-memory mode there are no limitations on the DISPC_CORE_CLK/LCDn_PCLK ratio for horizontal resampling.

The programmable coefficients of the polyphase filters are signed 8-bit values (except for the central coefficient, which is unsigned). The WB scaler component has an 8-bit input and an 8-bit output.

Figure 10-68 and Figure 10-69 show the scaler macro-architecture for the component A, R, G, B, and Y. Figure 10-70 and Figure 10-71 show the scaler macro-architecture for component Cr and Cb.

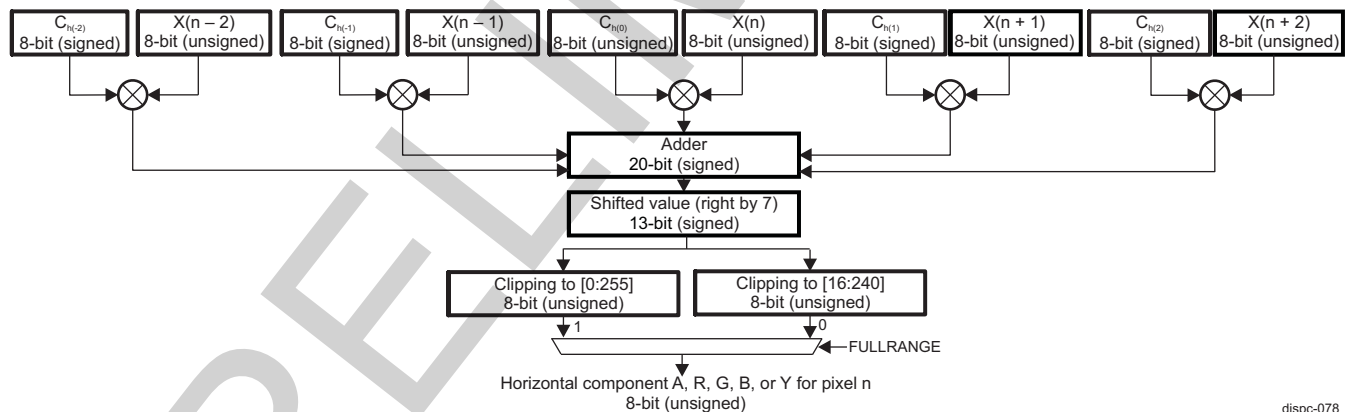
The scaling output can be clipped to an output range of [0:255] or [16:240] by configuring the DISPC_WB_ATTRIBUTES[11] FULLRANGE bit.

Figure 10-68. Macro-Architecture of the Vertical Scaling for A, R, G, B, and Y Component



dispc-077

Figure 10-69. Macro-Architecture of the Horizontal Scaling for A, R, G, B, and Y Component



dispc-078

Figure 10-70. Macro-Architecture of the Vertical Scaling for Cr and Cb Component

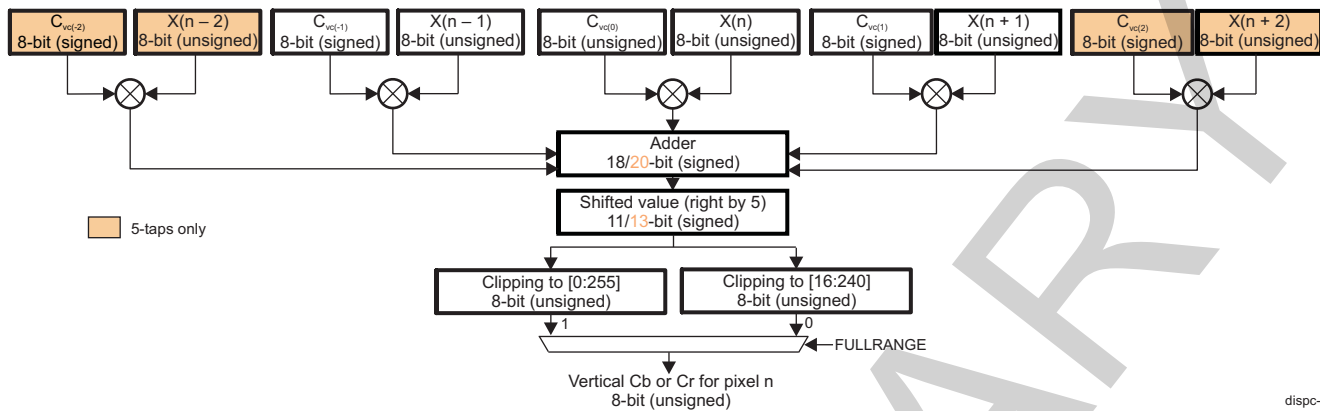


Figure 10-71. Macro-Architecture of the Horizontal Scaling for Cr and Cb Component

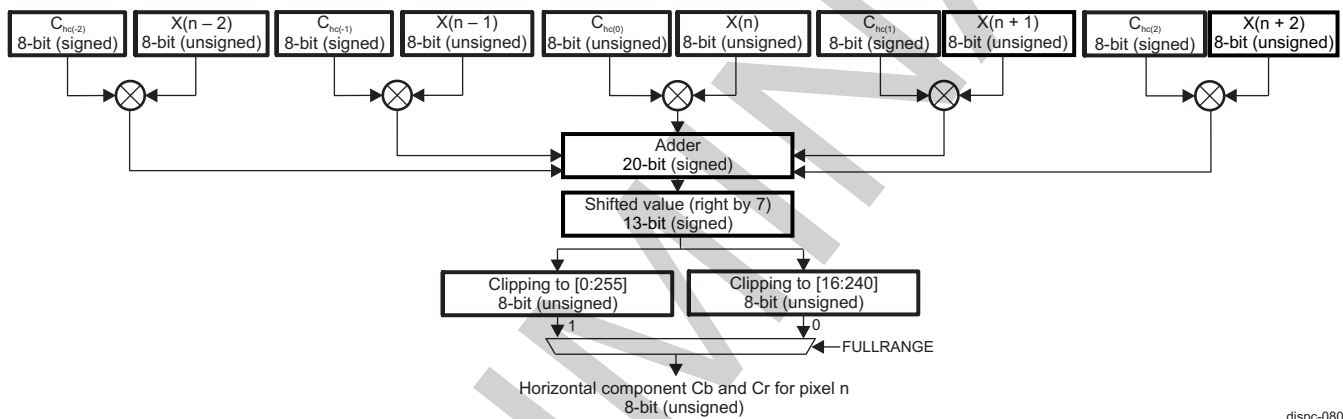


Table 10-46 and Table 10-47 list all the bit fields in the function to set each coefficient.

Table 10-46. Register Bit Field Associated With Coefficient for ARGB and Y Configuration in WB Scaler

| Taps | Coefficient | 3 Taps | 5 Taps | Registers |
|----------|-------------|-----------|-----------|------------------------|
| | | Bit Field | Bit Field | |
| Vertical | Cv(-2) | | FIRVC22 | DISPC_WB_FIR_COEF_V_i |
| | Cv(-1) | FIRVC2 | FIRVC2 | DISPC_WB_FIR_COEF_HV_i |
| | Cv(0) | FIRVC1 | FIRVC1 | DISPC_WB_FIR_COEF_HV_i |
| | Cv(1) | FIRVC0 | FIRVC0 | DISPC_WB_FIR_COEF_HV_i |
| | Cv(2) | | FIRVC00 | DISPC_WB_FIR_COEF_V_i |

Table 10-46. Register Bit Field Associated With Coefficient for ARGB and Y Configuration in WB Scaler (continued)

| Taps | Coefficient | 3 Taps | 5 Taps | Registers |
|------------|-------------|-----------|-----------|------------------------|
| | | Bit Field | Bit Field | |
| Horizontal | Ch(-2) | N/A | FIRHC4 | DISPC_WB_FIR_COEF_HV_i |
| | Ch(-1) | | FIRHC3 | DISPC_WB_FIR_COEF_H_i |
| | Ch(0) | | FIRHC2 | DISPC_WB_FIR_COEF_H_i |
| | Ch(1) | | FIRHC1 | DISPC_WB_FIR_COEF_H_i |
| | Ch(2) | | FIRHC0 | DISPC_WB_FIR_COEF_H_i |

Table 10-47. Register Bit Field Associated With Coefficient for Cb and Cr Configuration in WB Scaler

| Taps | Coefficient | 3 Taps | 5 Taps | Registers |
|------------|-------------|----------------------------|-----------|-------------------------|
| | | Bit Field | Bit Field | |
| Vertical | Cvc(-2) | FIRVC2 FIRVC1 FIRVC0 | FIRVC22 | DISPC_WB_FIR_COEF_V2_i |
| | Cvc(-1) | | FIRVC2 | DISPC_WB_FIR_COEF_HV2_i |
| | Cvc(0) | | FIRVC1 | DISPC_WB_FIR_COEF_HV2_i |
| | Cvc(1) | | FIRVC0 | DISPC_WB_FIR_COEF_HV2_i |
| | Cvc(2) | | FIRVC00 | DISPC_WB_FIR_COEF_V2_i |
| Horizontal | Chc(-2) | N/A | FIRHC4 | DISPC_WB_FIR_COEF_HV2_i |
| | Chc(-1) | | FIRHC3 | DISPC_WB_FIR_COEF_H2_i |
| | Chc(0) | | FIRHC2 | DISPC_WB_FIR_COEF_H2_i |
| | Chc(1) | | FIRHC1 | DISPC_WB_FIR_COEF_H2_i |
| | Chc(2) | | FIRHC0 | DISPC_WB_FIR_COEF_H2_i |

The WB scaler unit vertical or/and horizontal sampling is defined by setting/resetting the [DISPC_WB_ATTRIBUTES\[6:5\] RESIZEENABLE](#) bit field.

A set of configuration must be valid before enabling the video up/downsampling block.

The following fields define the configuration of the video up/downsampling block for WB:

- Vertical up/downsampling increments the value of the [DISPC_WB_FIR\[28:16\] FIRVINC](#) bit field. The unsigned integer value range is [4096:1]. Software calculates the value using the following equation:

$$FIRVINC = 1024 * \left(\frac{ORGSIZEY}{SIZEY} \right)$$

dispc-066

(12)

NOTE:

- If the value of the [DISPC_WB_FIR\[28:16\]](#) FIRVINC bit field is greater than 4096, it is clipped to 4096.
- If the [DISPC_WB_SIZE\[26:16\]](#) SIZEY bit field equals 0x1, SIZEY is replaced by 0x2 in the previous equation.
- The values of the [DISPC_WB_PICTURE_SIZE\[26:16\]](#) ORGSIZEY and [DISPC_WB_SIZE\[26:16\]](#) SIZEY bit fields must be programmed with the value desired minus 1.

- Horizontal up/downsampling increments the value of the [DISPC_WB_FIR\[12:0\]](#) FIRHINC bit field: The unsigned integer value range is [4096:1]. Software calculates the value using the following equation:

$$FIRHINC = 1024 * \left(\frac{ORGSIZEY}{SIZEY} \right) \quad \text{dispc-067} \quad (13)$$

NOTE:

- If the value of the [DISPC_WB_FIR\[12:0\]](#) FIRHINC bit field is greater than 4096, it is clipped to 4096.
 - If the [DISPC_WB_SIZE\[10:0\]](#) SIZEX bit field equals 1, the [DISPC_WB_SIZE\[10:0\]](#) SIZEX bit field is replaced by 2 in the previous equation.
 - The values of the [DISPC_WB_PICTURE_SIZE\[10:0\]](#) ORGSIZEX and [DISPC_WB_SIZE\[10:0\]](#) SIZEX bit fields must be programmed with the value desired minus 1.
- Vertical up/downsampling accumulator value [DISPC_WB_ACCU_j\[26:16\]](#) VERTICALACCU bit field: The signed integer value range is [−1024:1023]. The accumulator value indicates on which phase the vertical filtering starts. The DISPC_WB_ACCU_0 register is used for progressive output and for interlace output; the DISPC_WB_ACCU_0 and DISPC_WB_ACCU_1 registers are used. Similarly, DISPC_WB_ACCU2_0 and DISPC_WB_ACCU2_1 are used in progressive or interlace output to set the accumulator value of the Cb and Cr components when scaling YUV format.
 - Vertical up/downsampling line buffer configuration [DISPC_WB_ATTRIBUTES\[21\]](#) VERTICALTAPS bit: The default value at reset time is 0x0 (3-tap configuration is used). If the bit field is reset, the 3-tap configuration is used.
 - Horizontal up/downsampling accumulator value [DISPC_WB_ACCU_j\[10:0\]](#) HORIZONTALACCU bit field: The signed integer value range is [−1024:1023]. The accumulator value indicates on which phase the horizontal filtering starts. The DISPC_WB_ACCU_0 register is used for progressive output and for interlace output; the DISPC_WB_ACCU_0 and DISPC_WB_ACCU_1 registers are used. Similarly, DISPC_WB_ACCU2_0 and DISPC_WB_ACCU2_1 are used in progressive or interlace output to set the accumulator value of Cb and Cr components when scaling YUV format.

Table 10-48. Vertical/Horizontal Accumulator Phase

| Accumulator Value | | Phases f |
|-------------------|------|----------|
| | 0 | 0 |
| 128 or | −896 | 1 |
| 256 or | −768 | 2 |
| 384 or | −640 | 3 |
| 512 or | −512 | 4 |
| 640 or | −384 | 5 |
| 768 or | −256 | 6 |
| 896 or | −128 | 7 |

- Vertical up/downsampling coefficients:
 - The 3-tap vertical up/downsampling coefficients are defined in the [DISPC_WB_FIR_COEF_HV_i](#) registers. There are 8 registers for the 8 phases with 3 coefficients for each, or a total of 24 programmable coefficients for the vertical up/downsampling block. Each register contains two 8-bit signed coefficients and one 8-bit unsigned coefficient (the central one).
 - The 5-tap vertical up/downsampling coefficients: Two extra-tap vertical up/downsampling coefficients are defined in the [DISPC_WB_FIR_COEF_V_i](#) registers. There are 8 registers for the 8 phases with 2 coefficients for each of them, so a total of 16 programmable coefficients for the vertical up/downsampling block are used in addition to the 3-tap registers previously defined. Four YUV vertical up/downsampling coefficients are set in the [DISPC_WB_FIR_COEF_HV2_i](#) and [DISPC_WB_FIR_COEF_V2_i](#) registers. [Table 10-46](#) and [Table 10-47](#) list all coefficients and their respective registers.
- Horizontal up/downsampling coefficients:
 - The [DISPC_WB_FIR_COEF_H_i](#) and [DISPC_WB_FIR_COEF_HV_i](#) registers define the 5-tap horizontal up/downsampling coefficients. Each [DISPC_WB_FIR_COEF_H_i](#) register contains three 8-bit signed coefficients and one 8-bit unsigned coefficient (the central one). Each [DISPC_WB_FIR_COEF_HV_i](#) register contains one 8-bit signed coefficient. A total of 40 programmable coefficients for the horizontal up/downsampling block are used. Four YUV horizontal up/downsampling coefficients are set in the [DISPC_WB_FIR_COEF_HV2_i](#) and [DISPC_WB_FIR_COEF_H2_i](#) registers. [Table 10-46](#) and [Table 10-47](#) list all coefficients and their respective registers.

10.2.4.11.3 RGB Truncation Logic

Truncation logic is used to convert a pixel from ARGB 32-bit format into a lower color depth: 12- or 16-bit format based. Setting the [DISPC_WB_ATTRIBUTES\[10\]](#) TRUNCATIONENABLE bit to 0x1 enables the truncation to the pixel format defined by the [DISPC_WB_ATTRIBUTES\[4:1\]](#) FORMAT bit field. The truncation is done by removing the necessary LSB of each component to match the output format. [Table 10-49](#) describes the truncation done on each component of the pixel.

Table 10-49. Truncation Logic

| Output Formats | A[7:0] | R[7:0] | G[7:0] | B[7:0] |
|----------------|---------|---------|---------|---------|
| | MSB LSB | MSB LSB | MSB LSB | MSB LSB |
| xRGB12-4444 | Ignored | R[7:4] | G[7:4] | B[7:4] |
| RGBx12-4444 | Ignored | R[7:4] | G[7:4] | B[7:4] |
| RGB16-565 | Ignored | R[7:3] | G[7:2] | B[7:3] |
| xRGB16-1555 | Ignored | R[7:3] | G[7:3] | B[7:3] |
| ARGB16-4444 | A[7:4] | R[7:4] | G[7:4] | B[7:4] |
| RGBA16-4444 | A[7:4] | R[7:4] | G[7:4] | B[7:4] |
| ARGB16-1555 | A[7] | R[7:3] | G[7:3] | B[7:3] |

NOTE: If there is no alpha field in the pixel format description, 0s or 1s must fill the container. 0s must be used for transparent and 1s for opaque. For example, in the xRGB12 pixel format, the upper 4 bits are set to 0s because the RGB value is only 12 bits inside a 16-bit container.

10.2.4.12 LCD Outputs

The LCD1 and LCD2 output paths consist of several processing blocks (see [Figure 10-72](#)):

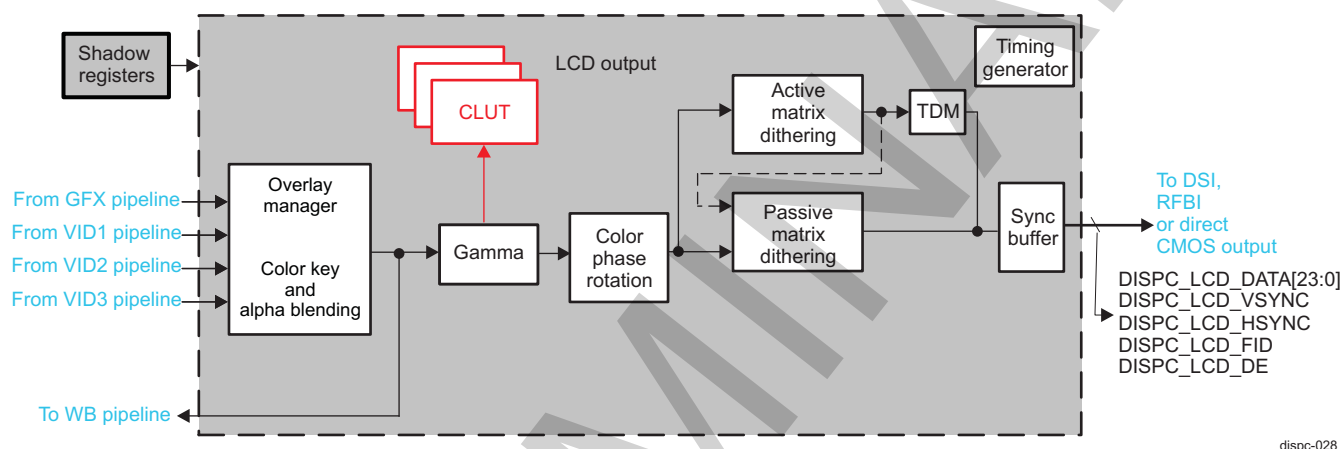
- Overlay manager
- Gamma correction unit
- CPR is also used for RGB-to-YUV conversion.
- Active matrix dithering with TDM
- Passive matrix dithering

- Synchronization buffer
- Timing generator

The display subsystem supports two types of display technologies (both monochrome and color modes):

- Passive matrix displays: supporting up to 16, 256, or 3375 colors to be displayed in each frame, depending on the color depth. The monochrome LCD has 15 grayscale levels available.
- Active matrix displays: the configuration of colors depends on the color depth:
 - 24 bpp supports 16,777,216 colors.
 - 18 bpp supports 262,144 colors.
 - 16 bpp supports 65,536 colors.
 - 12 bpp supports 4096 colors.

Figure 10-72. LCD Output Architecture



dispc-028

10.2.4.12.1 Overlay Manager

The overlay mechanism consists of displaying more than one layer (GFX, VID1 to VID3 layers) using:

- A priority rule based on a Z-order: Application can set the ordering layer of the frames.
- Transparency color keys: Destination and source transparency color keys can be set.
- Alpha blending values: Using the A component of a pixel or a blending set by the user for a layer, a level of transparency can be determined.

Each pipeline (GFX, VID1, VID2, and VID3) is assigned to a single overlay and, as a consequence, to a single display controller output, LCD1, LCD2, TV, or WB pipeline. An overlay manager can be connected to all four pipeline outputs simultaneously. The pipeline output is directed using the [DISPC_GFX_ATTRIBUTES\[8\]](#) CHANNELOUT bit and the [DISPC_VIDp_ATTRIBUTES\[31:30\]](#) CHANNELOUT2 bit field. [Table 10-50](#) lists the bit field settings to direct a pipeline to an LCD/TV or WB output. The default value directs all pipelines to LCD1.

Table 10-50. Pipeline Connection to LCD, TV, or WB Output

| Overlay Manager/Output | DISPC_GFX_ATTRIBUTES/DISPC_VIDp_ATTRIBUTES | |
|------------------------|--|---|
| | CHANNELOUT Bit | CHANNELOUT2 Bit Field |
| LCD1 | 0x0 | 0x0 |
| LCD2 | 0x0 | 0x1 |
| WB | 0x0 | 0x3 |
| TV | 0x1 | 0x0 (or 0x2 for VID2; see the following Note) |

NOTE: The combination of settings CHANNELOUT = 0x1 and CHANNELOUT2 = 0x1, 0x2, or 0x3 is reserved for the VID1 and VID3 pipelines. For the VID2 pipeline, this combination is reserved when any TV format other than HDMI 1.4 3D 1080p is to be output. Setting the [DISPC_VID2_ATTRIBUTES](#) register bit fields CHANNELOUT to 0x1 and CHANNELOUT2 to 0x2, is used in case of HDMI 1.4 3D 1080p format. For more information, see [Section 10.2.4.13.4, Timing and TV Format Settings](#).

The output of each LCD overlay manager is connected to the CPR block through the palette unit in the case of Gamma correction.

NOTE:

- When the pixel format is ARGB or RGBA, the color key match logic uses only the RGB value defined by ARGB or RGBA. The alpha blending factor is ignored.
- For LCD1 output, the same CLUT is used for BITMAP support by the graphics pipeline and for Gamma correction. In case of BITMAP format for graphics, Gamma correction is not available on the primary LCD output.

10.2.4.12.1.1 Priority Rule

The overlay manager is configured using the Z-order parameter. The Z-order value defined for each pipeline indicates the visibility order to the window on the screen. If the Z-order value of window A is lower than the Z-order to layer B, layer A is displayed below layer B. The transparency color keys and the alpha blending factors are then used to blend the layers together (see [Section 10.2.4.12.1.2](#) and [Section 10.2.4.12.1.3](#)). The Z-order is enabled by setting the [DISPC_GFX_ATTRIBUTES](#)[25] ZORDERENABLE bit or the DISPC_VIDp_ATTRIBUTES[25] ZORDERENABLE bit to 0x1 and by defining the Z-order in the [DISPC_GFX_ATTRIBUTES](#)[27:26] and DISPC_VIDp_ATTRIBUTES[27:26] ZORDER bit fields. [Table 10-51](#) resumes the register settings to enable and set the Z-order of a pipeline. [Table 10-51](#) shows the default Z-order values when LCDALPHABLENDERENABLE and ZORDERENABLE are disabled.

Table 10-51. Z-Order Register Settings and Default Configuration

| Pipeline | LCDALPHA BLENDERENABLE ⁽¹⁾ | ZORDERENABLE Bit | ZORDER Bit Field | Resulting Z-Order Number |
|----------|---------------------------------------|------------------|------------------|--------------------------|
| GFX | 0 | 0 | Don't care | 0 |
| | 0 | 1 | ZORDER | ZORDER |
| | 1 | Don't care | Don't care | 3 |
| VID1 | 0 | 0 | Don't care | 1 |
| | 0 | 1 | ZORDER | ZORDER |
| | 1 | Don't care | Don't care | 0 |
| VID2 | 0 | 0 | Don't care | 2 |
| | 0 | 1 | ZORDER | ZORDER |
| | 1 | Don't care | Don't care | 1 |
| VID3 | 0 | 0 | Don't care | 3 |
| | 0 | 1 | ZORDER | ZORDER |
| | 1 | Don't care | Don't care | 2 |

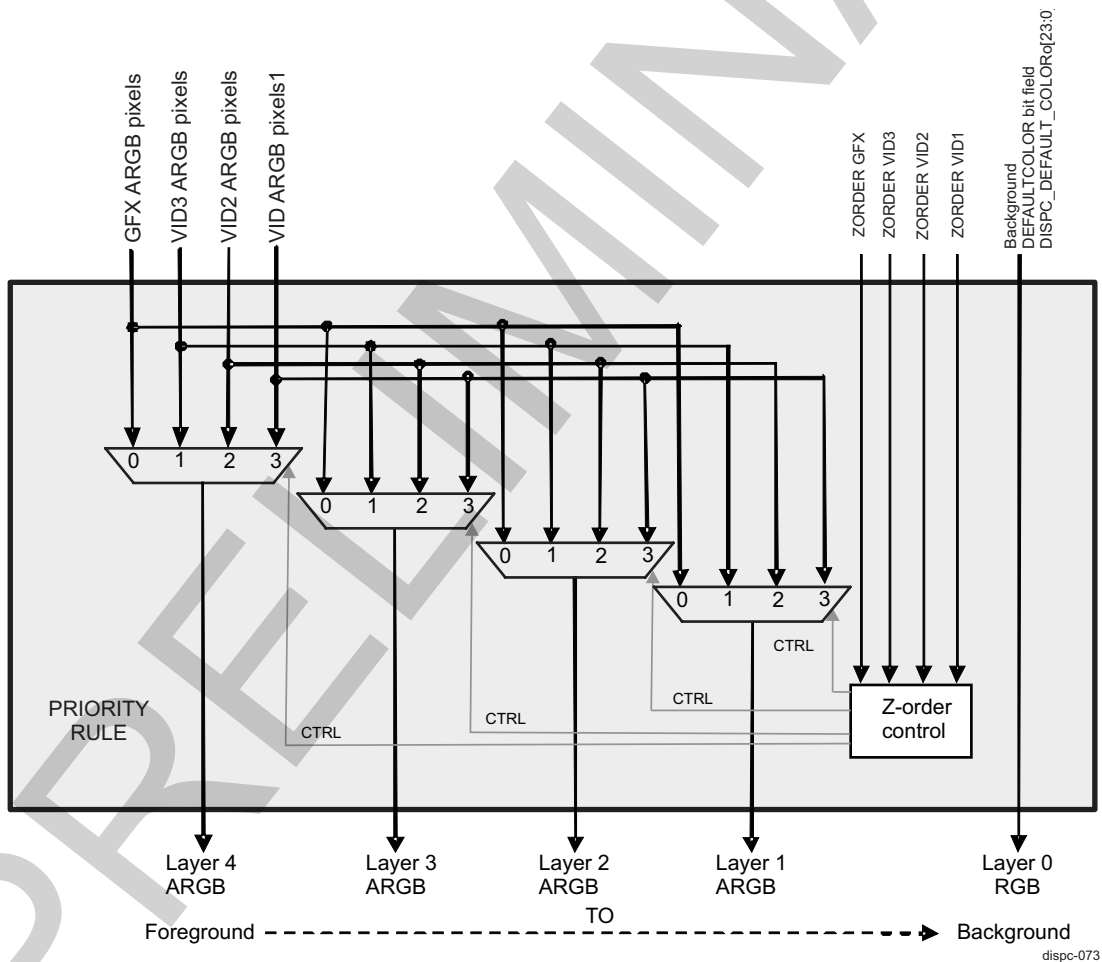
⁽¹⁾ Applies only to LCD1

Figure 10-73 shows the architecture of the priority rule.

NOTE:

- If ZORDERENABLE = 1, each Z-order must be different for each active pipeline. It is not possible to use the same value for more than one pipeline.
- Two modes are maintained for backward compatibility with OMAP3430:
 - LCDALPHABLENDERENABLE = 0 and ZORDERENABLE = 0 equivalent to the normal mode overlay settings
 - LCDALPHABLENDERENABLE = 1 equivalent to the alpha mode overlay settings
- When OMAP3430 backward compatibility mode is to be used, the following must be considered:
 - If Z-order is disabled for the VID1 and VID2 pipelines, the pipeline data is output on the LCD1/LCD2/TV overlay.
 - If Z-order is disabled for the VID3 pipeline, the pipeline data is output only on the LCD2 overlay.

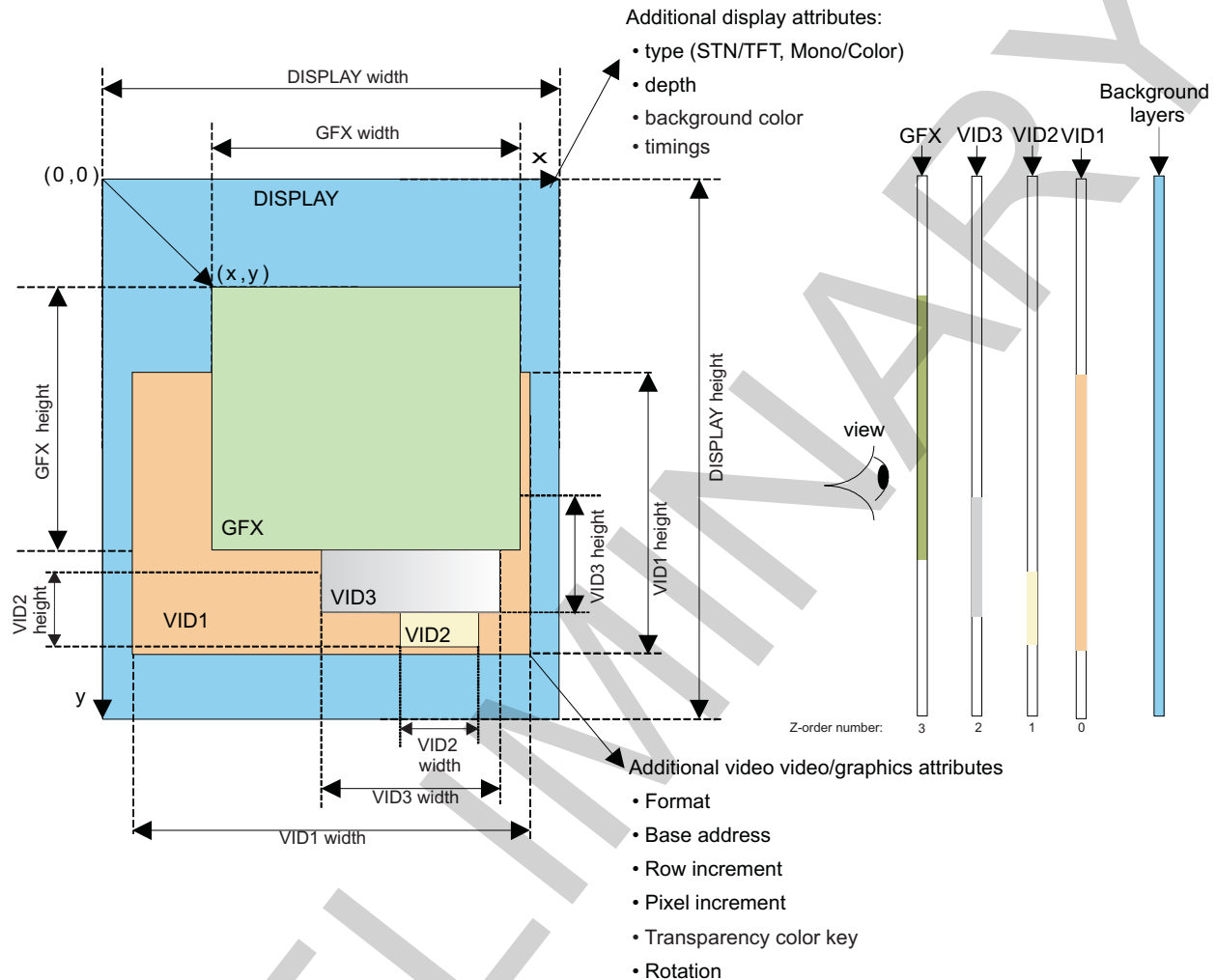
Figure 10-73. Priority Rule Architecture



The height and width of each enabled layer (pipeline) must be defined in the SIZEX and SIZEY bit fields [DISPC_GFX_SIZE\[26:16\]\[10:0\]](#)/[DISPC_VIDp_SIZE\[26:16\]\[10:0\]](#), and its x and y positions defined in the POSX and POSY bit fields [DISPC_GFX_POSITION\[26:16\]\[10:0\]](#)/[DISPC_VIDp_POSITION\[26:16\]\[10:0\]](#). If there are no graphics or video-encoded pixels at a specific position, the programmable, solid background color appears. The solid background color is set in the [DISPC_DEFAULT_COLOR\[23:0\]](#) DEFAULTCOLOR bit field. [Figure 10-74](#) is an example of priority rule.

The Z-order reordering block must always map the pipelines to the blender logic in the same order—from background to foreground.

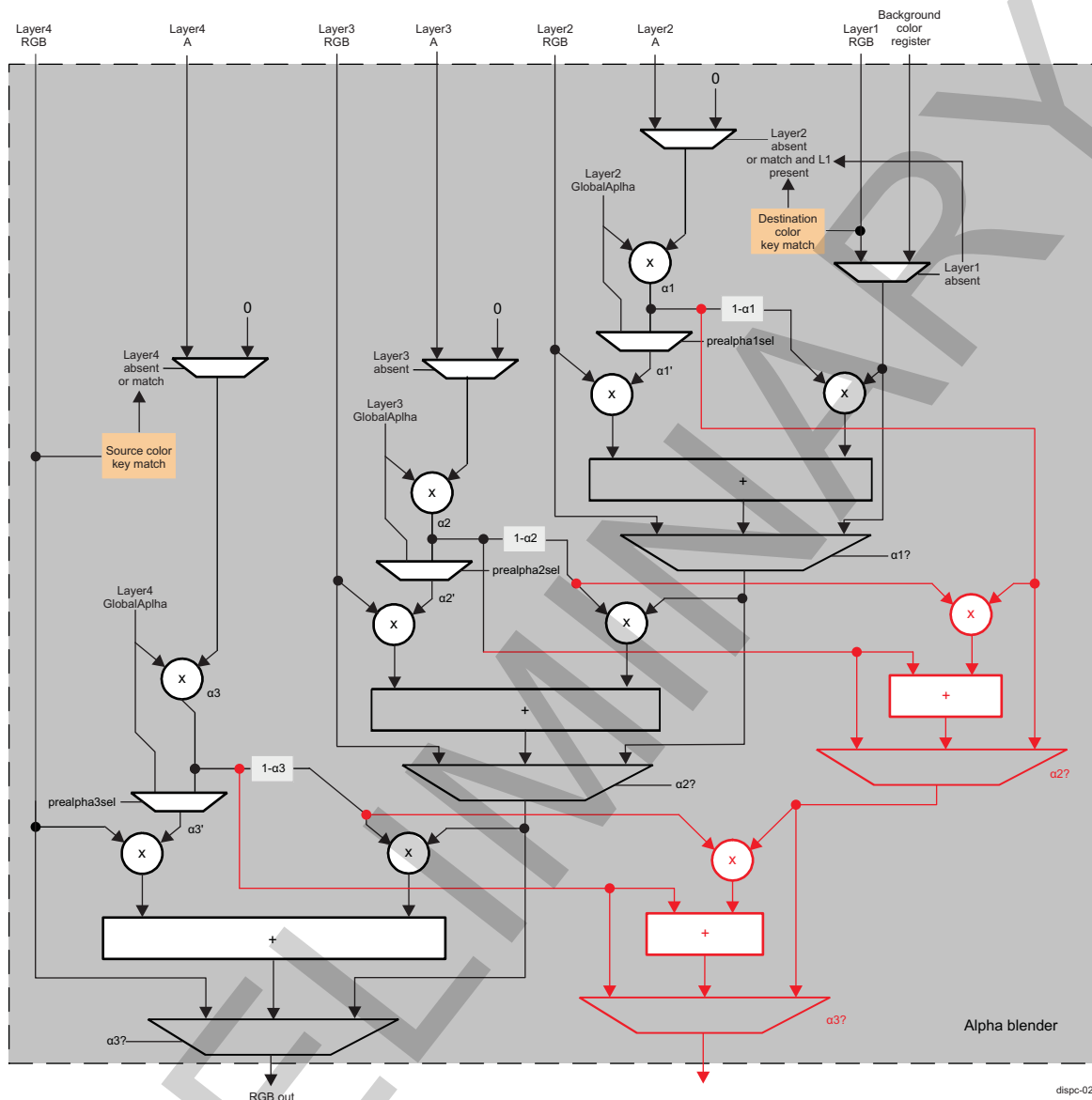
Figure 10-74. Example of Priority Rule: From Lower to Higher VID1, VID2, VID3, GFX



dispc-019

10.2.4.12.1.2 Alpha Blender

Figure 10-75 shows the alpha blending processing in detail.

Figure 10-75. Alpha Blending Architecture With Premultiplied Alpha Support


NOTE: "1-alpha" operator corresponds to the basic 1s-complement operation.

The alpha blending value is defined by:

- The component value A when using an ARGB or RGBA pixel format.
 - For ARGB-1555, the alpha blending is defined using a 1-bit value. It is converted into an 8-bit value by duplicating the 1-bit value (see [Table 10-52](#)).
 - For ARGB-4444, the alpha blending is defined using a 4-bit value. It is converted into an 8-bit value by duplicating the 4-bit value (see [Table 10-52](#)).
 - If the pixel format contains no alpha blending value, the pixel alpha value is considered to be 0xFF; if alpha is equal to 0xFF, there is no multiplication.
 - For BITMAP or YUV formats, there is no alpha blending factor associated with each pixel value. Only the global alpha blending factor associated with the window displaying the BITMAP or YUV format is used.
- The global alpha blending value set in the individual bit fields of the [DISPC_GLOBAL_ALPHA\[31:0\]](#)

register for LCD:

- VID3GLOBALALPHA
 - VID2GLOBALALPHA
 - VID1GLOBALALPHA
 - GFXGLOBALALPHA
- A total alpha blending value can be used when a combination of the pixel alpha blending value A and a global alpha blending is present. The resulting alpha value is determined as : $\text{Alpha} = (\text{Pixel Alpha} * \text{Global Alpha}) / 256$.

Table 10-52 lists the percentage of alpha blending in the function of the alpha blending value on 8 bits.

Table 10-52. Alpha Blending – ARGB

| Alpha Blending 1-Bit Value | Alpha Blending 4-Bit Value | Alpha Blending 8-Bit Value (Converted Value or Resulting Alpha) | % Blending |
|----------------------------|----------------------------|---|--------------------|
| 0x0 | 0x0 | 0x00 | 100% (transparent) |
| N/A | 0x1 | 0x11 | 93.33% |
| N/A | 0x2 | 0x22 | 86.6% |
| N/A | ... | ... | ... |
| N/A | 0xE | 0xEE | 6.6% |
| 0x1 | 0xF | 0xFF | 0% (opaque) |

Premultiplied Alpha

The image ARGB may have its RGB component already premultiplied with the alpha (ARGB) where:

- $R = A \times R$
- $G = A \times G$
- $B = A \times B$

In that case, the processing is as follows:

- Color component of premultiplied layers are multiplied with the Global Alpha, if Global Alpha is not equal to 0.
- Color component of the composed underlying layers are multiplied with $(1-A) * \text{Global Alpha}$

The additional premultiplied alpha option is associated with the pipelines GFX, VID1, VID2, and VID3. The option is accessible through the [28] PREMULIPLYALPHA bit for the respective pipeline register:

- [DISPC_GFX_ATTRIBUTES](#)
- [DISPC_VID1_ATTRIBUTES](#)
- [DISPC_VID2_ATTRIBUTES](#)
- [DISPC_VID3_ATTRIBUTES](#)

The following settings are available:

- PREMULIPLYALPHA bit = 0: Source is not premultiplied with alpha. Full blending is done in the DISPC.
- PREMULIPLYALPHA bit = 1: Source is premultiplied with alpha. Partial blending is done.

NOTE: The prealphasel controls in [Figure 10-75](#) correspond to the PREMULIPLYALPHA of the pipelines mapped on the respective layers.

The logic marked with red in [Figure 10-75](#) corresponds to the alpha value, computed when the Write Back channel copies back to memory the premultiplied color component: $A(\text{destination}) = A(\text{source}) + (1-A(\text{source}) \times A(\text{destination}))$

When the [DISPC_WB_ATTRIBUTES](#)[7] ALPHAENABLE bit is cleared, or when the overlay channel is not selected for WB, the computation of the A(destination) is disabled. The default value for the [DISPC_WB_ATTRIBUTES](#)[7] ALPHAENABLE bit is 0x0. When the WB is configured to copy back one of the output channels (output of overlay), the following configurations are available:

- The ALPHAENABLE bit is set to 0x1: The WB pipe copies back to memory the premultiplied alpha calculated through the overlay.
- The ALPHAENABLE bit is set to 0x0: The alpha value is not written back.

NOTE: The [DISPC_WB_ATTRIBUTES](#)[7] ALPHAENABLE bit is effective only when one of the output channels is written back, otherwise it is ignored.

10.2.4.12.1.3 Transparency Color Keys

The two transparency color keys are the video source transparency color key and the graphics destination transparency color key. The transparency color key can be used only with BITMAP formats (1, 2, 4, and 8 bits per pixel) and RGB formats (ARGB, RGB, RGBA, and RGBx). In this case the A information is ignored for the comparison between the pixel value and the color key value. It is possible to use YUV formats with some care because the comparison is between the input pixel value of the overlay manager from pipeline (GFX or one of the VID pipelines depending on the Z-order) and the color key value. The YUV data is converted to RGB format. If the original format is YUV, the user must consider color space conversion processing to define the RGB color key value used for the comparison.

The transparency color key is enabled by setting the following bits to 0x1:

- [DISPC_CONFIG1](#)[10] TCKLCDENABLE for LCD1
- [DISPC_CONFIG2](#)[10] TCKLCDENABLE for LCD2
- [DISPC_CONFIG1](#)[12] TCKTVENABLE for TV

The transparency color key is determined in the following bit fields.

- [DISPC_TRANS_COLOR0](#)[23:0] TRANSCOLORKEY for LCD1
- [DISPC_TRANS_COLOR2](#)[23:0] TRANSCOLORKEY for LCD2
- [DISPC_TRANS_COLOR1](#)[23:0] TRANSCOLORKEY for TV

NOTE:

- The video source transparency color key and graphics destination transparency color key cannot be active at the same time.
 - For CLUT bitmaps, the palette index is compared to the transparency color key and not to the palette value pointed to by the palette index.
-

- Video source transparency color key

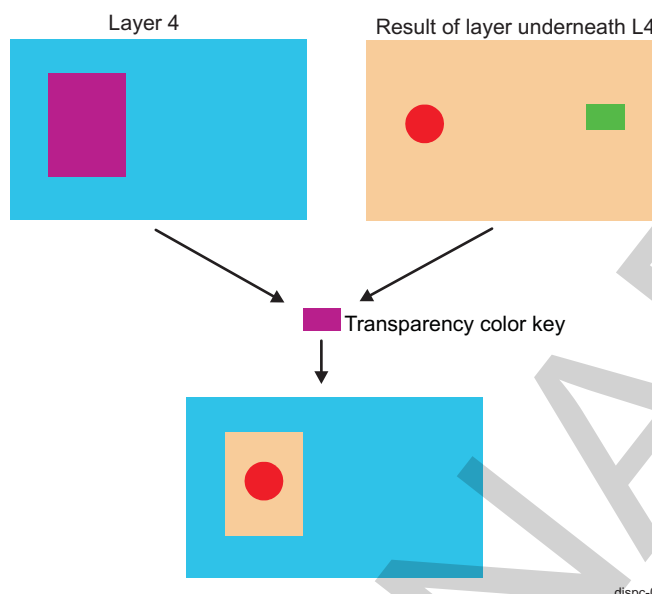
The video source transparency color key value defines the encoded pixel data considered as transparent pixel. The encoded pixel values with the source color key value are not visible and the under layers encoded pixel values or solid background color are visible (the pixel alpha blending value of layer 4 is forced to 0x00, fully transparent).

The scaler can be enabled as a preprocessing in the VID pipeline. But it is necessary to consider the pixel scaling preprocessing to define the color key value to be used after the rescaling for the comparison between the input pixel value to the overlay manager and the color key value.

The video source transparency color key mode is selected by setting the following bits to 0x1:

- [DISPC_CONFIG1](#)[11] TCKLCDSELECTION bit for LCD1
- [DISPC_CONFIG2](#)[11] TCKLCDSELECTION bit for LCD2
- [DISPC_CONFIG1](#)[13] TCKTVENABLE bit for TV

[Figure 10-76](#) shows an example of source color key. The pixels with the transparency color key are not displayed; instead, pixels of the resulting layer underneath are shown.

Figure 10-76. Source Transparency Color Key Example

- Graphics destination transparency color key value

The graphics destination transparency color key value defines the encoded pixels in layer 1 that are not displayed. Other layer 1 pixels (nonequal to destination transparency color key) are displayed over layer 2. The encoded pixel values with the destination color key value are pixels not visible on the screen because pixels at the same position in layer 2 are visible, otherwise encoded pixels are visible above layer 2. The destination transparency color key applies only if layer 1 overlaps layer 2 (for details on layer position depending on the Z-order parameter, see [Section 10.2.4.12.1.1, Priority Rule](#)); otherwise, the destination transparency color key is ignored.

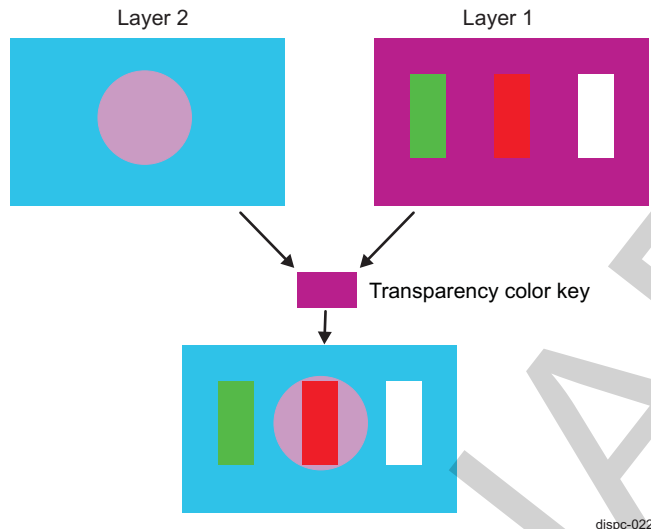
The scaler can be enabled as a preprocessor in the VID pipeline. It is necessary, however, to consider the pixel scaling preprocessing to define the color key value to be used after rescaling for the comparison between the input pixel value to the overlay manager and the color key value.

The destination transparency color key mode is selected by setting the following bits to 0x0:

- [DISPC_CONFIG1](#)[11] TCKLCDSELECTION bit for LCD
- [DISPC_CONFIG2](#)[11] TCKLCDSELECTION bit for LCD2
- [DISPC_CONFIG1](#)[13] TCKTVSELECTION bit for TV

[Figure 10-77](#) shows an example of the destination color key. The pixels, equal to the transparency color key, are not displayed and are replaced by layer 2 pixels. All other layer 1 pixels, different from the transparency color key, are displayed over layer 2.

Figure 10-77. Destination Transparency Color Key Example



10.2.4.12.1.4 Overlay Optimization

The overlay optimization consists in fetching only the required pixels; that is, pixels that contribute to the final picture to be displayed (LCD1, LCD2, or TV). The decision to fetch the pixel from memory is based on the information available in the registers and on the following rules:

- The layer is enabled.
- The global alpha blending factor for the layer is different than 0x00.
- The current layer is behind a nonopaque layer (the global alpha blending factor is different than 0xFF for the layer in the preceding).

The result of the overlay optimization is a reduction of the bandwidth by fetching only the mandatory pixels. The overlay mechanism is independent for each overlay: LCD1, LCD2, and TV. Because each layer (GFX, VID1, VID2, and VID3) can be associated to only one overlay at a time, it is possible to optimize the fetch of the pixels for each layer based on the overlay information. The overlay optimization must be run on the DMA engine time window and not on the display time window. The pixels are fetched by the DMA engine before the display processing.

The overlay optimization is enabled by setting the following bits to 0x1:

- [DISPC_CONTROL1](#)[12] OVERLAYOPTIMIZATION bit for LCD1
- [DISPC_CONTROL2](#)[12] OVERLAYOPTIMIZATION bit for LCD2
- [DISPC_CONTROL2](#)[13] TVOVERLAYOPTIMIZATION bit for TV

NOTE:

- The overlay optimization is not functional when a layer uses BITMAP1, BITMAP2, or BITMAP4 pixel formats.
- The pixel alpha blending factor in case of ARGB and RGBA formats cannot be used to take advantage of the pixel fully transparent (alpha blending factor equals 0x00).

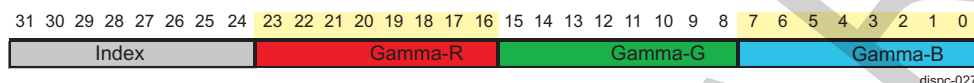
10.2.4.12.2 Gamma Correction Unit

In gamma curve mode, the selected encoded pixel values based on the color keys by the overlay manager from the video or graphics paths are sent to the gamma curve table. Each component of encoded pixel value is used as a pointer to index 1 out of 256 24-bit gamma curve entries in the table.

Each 8-bit component is replaced with the 8-bit table value corresponding to R, G, or B component. The table is loaded by software. It is possible to load only part of the table. For each access to the table, the 24-bit value is associated with index in the table by concatenating the 24-bit value (LSB of 32-bit access) and the 8-bit index value (MSB of the 32-bit access). [Figure 10-78](#) describes the format of one of the gamma curve values in the memory.

NOTE: If the CLUT is used in the GFX pipeline for palette, the gamma correction unit is not available on the primary LCD.

Figure 10-78. Data Memory Organization for Gamma Mode in LCD Output



10.2.4.12.3 CPR Unit

The CPR unit can be used to correct the LCD output colorimetry in case of nonpure white backlight.

The CPR is enabled by setting the DISPC_CONFIGo[15] CPR bit to 0x1. The coefficients are programmed in the following registers:

- Red 10-bit signed coefficients in DISPC_CPRo_COEF_R
- Green 10-bit signed coefficients in DISPC_CPRo_COEF_G
- Blue 10-bit signed coefficients in DISPC_CPRo_COEF_B

The CPR can be selected for passive and active matrix panel. The logic is integrated after the LCD overlay manager or the palette while using the gamma correction and before the spatial/temporal dithering. The CPR can be selected to correct the nonpure white backlight of the LCD module by using a programmable matrix to convert the 24-bit RGB pixel value into a new 24-bit RGB pixel value. The matrix is programmed through a set of nine 10-bit signed coefficients. The output of the calculation is clipped to [255:0]. The CPR is processed by the equation shown in [Figure 10-79](#). [Table 10-53](#) lists all coefficients with their respective bit field registers for settings.

Figure 10-79. CPR Matrix

$$\begin{bmatrix} R_{out} \\ G_{out} \\ B_{out} \end{bmatrix} = \begin{bmatrix} R_r & R_g & R_b \\ G_r & G_g & G_b \\ B_r & B_g & B_b \end{bmatrix} * \begin{bmatrix} R_{in} \\ G_{in} \\ B_{in} \end{bmatrix}$$

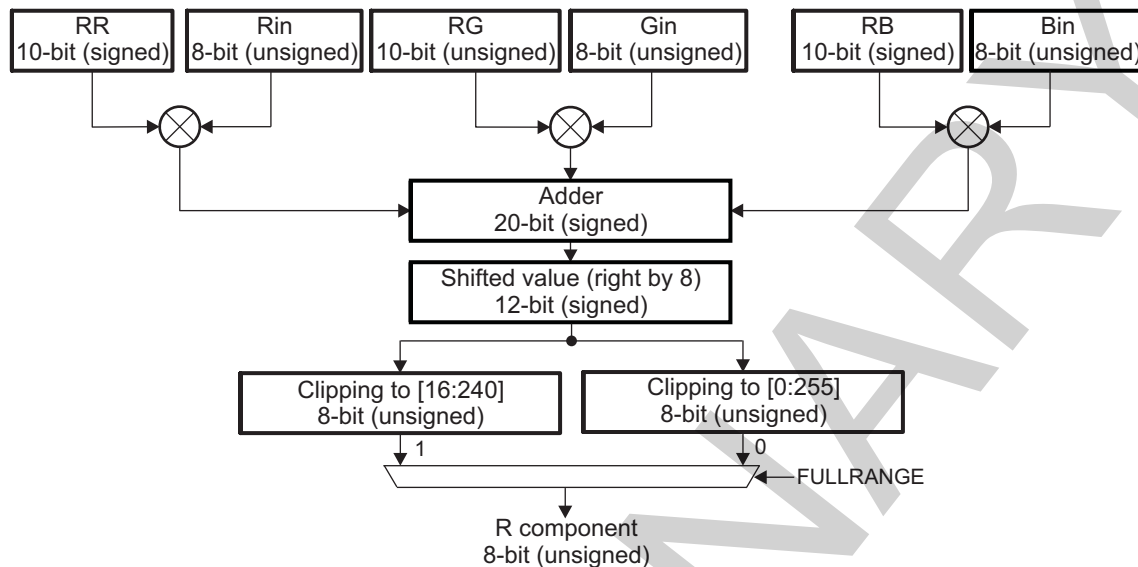
dispc-023

Table 10-53. CPR or RGB to YUV Coefficients With Associated Bit Fields

| Registers | Bit Field | Color Space Conversion | RGB to YUV |
|-------------------|-----------|------------------------|------------|
| DISPC_CPRo_COEF_R | RR | Rr | Yr |
| | RG | Rg | Yg |
| | RB | Rb | Yb |
| DISPC_CPRo_COEF_G | GR | Gr | Cbr |
| | GG | Gg | Cbg |
| | GB | Gb | Cbb |
| DISPC_CPRo_COEF_B | BR | Br | Crr |
| | BG | Bg | Crg |
| | BB | Bb | Crb |

Figure 10-80 shows the CPR macro-architecture.

Figure 10-80. CPR Macro-Architecture



dispc-024

10.2.4.12.4 Passive Matrix

The passive matrix display supports 16, 256, or 3375 colors to be displayed in each frame, depending on the color depth. The monochrome LCD has 15 grayscale levels available. To enable a passive matrix output, the DISPC_CONTROL0[3] STNTFT bit must be set to 0x0.

Spatial/temporal dithering is performed when using the passive matrix data path. The spatial/temporal dithering logic can be selected to enhance the quality of the passive matrix. When selected, the pixels are preprocessed by the spatial/temporal dithering logic before the passive matrix display dithering logic. The output format of the spatial/temporal dithering logic is RGB 12-bit (not configurable). The dithering logic is integrated after the CPR. The dithering algorithm is based on the frame rate control. The dithering logic can process the pixels one frame, two frames, or four frames. The number of frames is selected by setting the DISPC_CONTROL0[31:30] SPATIALTEMPORALDITHERINGFRAMES bit field. The temporal dithering logic is enabled by setting the DISPC_CONTROL0[7] STDITHERENABLE bit to 0x1. The output format of the dithering logic is RGB 12-bit (not configurable).

After the pixels, from GFX, VID pipelines, are merged depending on the transparency status and overlay, the result is sent to a color/grayscale temporal dither generator. The monochrome data or each RGB color component are encoded on 4 bits, which are the 4 MSBs of 8-bit pixel-encoded component defined by the merge of the graphics data and the video data.

These 4-bit values are used to select on the 16 intensity levels. The gray/color intensity is controlled by turning individual pixels on and off at varying period rates, making the average time the pixel is off longer than the average time the pixel is on, thus producing more intense grays/colors. The dithering generator also uses the intensity of adjacent pixels in the calculation to give the screen image a smooth appearance. The proprietary dither algorithm is optimized to provide a range of intensity values that matches the visual perception of color/gray graduations.

Single-panel monochrome screens use four or eight data lines; single-panel color screens use eight data pins. The output width is configured by setting the DISPC_CONTROL0[4] M8B bit, and the monochrome or color mode is selected by setting the DISPC_CONTROL0[2] MONOCOLOR bit.

10.2.4.12.5 Active Matrix

Depending on the color depth, the active matrix output:

- 24 bpp supports 16,777,216 colors.
- 18 bpp supports 262,144 colors.

- 16 bpp supports 65,536 colors.
- 12 bpp supports 4096 colors.

When in active matrix path configuration, after setting the DISPC_CONTROLo[3] STNTFT bit to 0x1, two submodules must be configured:

- Spatial/temporal dithering
- Multiple cycle output format (TDM)

10.2.4.12.5.1 Spatial/Temporal Dithering

When the active matrix path is used, the spatial/temporal dithering logic can be selected to enhance the quality of the active matrix outputs. The encoded pixel values are used by spatial/temporal dithering logic to display the data in a lower color depth on the LCD panel. The dithering logic is integrated after the CPR and before the TDM. The spatial/temporal dithering algorithm is based on the (x,y) pixel position and frame rate control. The dithering logic can process the pixels over one, two, or four frames. The number of frames is selected by setting the DISPC_CONTROLo[31:30] SPATIALTEMPORALDITHERINGFRAMES bit field. In the case of a single frame, only spatial processing is applied; with multiple frames, spatial and temporal processing are applied to the pixels. The spatial/temporal dithering logic is enabled by setting the DISPC_CONTROLo[7] STDITHERENABLE bit to 0x1.

NOTE:

- If the interface data bus is smaller than the pixel format size and spatial/temporal dithering is not enabled, the MSBs of the pixel color components are output on the interface data bus.
 - If the interface data bus is wider than the pixel format size, by programming the pixel components replication active/inactive, the MSB is replicated to the LSB of the interface data bus or the LSB is filled with 0s.
-

10.2.4.12.5.2 Multiple Cycle Output Format (TDM)

The pixels, after the active matrix display processing, are formatted on one or multiple cycles (from one to three cycles). The number of bits for each cycle is set in the DISPC_DATAo_CYCLE1 register for the first cycle, the DISPC_DATAo_CYCLE2 register for the second cycle, and DISPC_DATAo_CYCLE3 register for the third cycle. The interface data bus width can be 8, 9, 12, or 16 bits. The configuration of the data bus is done in the DISPC_CONTROLo[9:8] TFTDATALINES bit field.

When the TDM is disabled, the DISPC outputs the pixels using the conventional formats: Passive matrix display/active matrix display monochrome/color.

NOTE: The passive matrix dithering logic is always bypassed in active matrix display.

Figure 10-81 through Figure 10-84 show various examples of TDM settings in the function of pixel data formats and the interface data bus width.

Figure 10-81. 8-Bit Interface Settings

| 24-BPP | | | |
|---------|-----------|-----------|-----------|
| | 1st cycle | 2nd cycle | 3rd cycle |
| Data[7] | R0[7] | G0[7] | B0[7] |
| Data[6] | R0[6] | G0[6] | B0[6] |
| Data[5] | R0[5] | G0[5] | B0[5] |
| Data[4] | R0[4] | G0[4] | B0[4] |
| Data[3] | R0[3] | G0[3] | B0[3] |
| Data[2] | R0[2] | G0[2] | B0[2] |
| Data[1] | R0[1] | G0[1] | B0[1] |
| Data[0] | R0[0] | G0[0] | B0[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x2
 DISPC_DATA0_CYCLE1 = 0x00000008
 DISPC_DATA0_CYCLE2 = 0x00000008
 DISPC_DATA0_CYCLE3 = 0x00000008

| 18-BPP | | | |
|---------|-----------|-----------|-----------|
| | 1st cycle | 2nd cycle | 3rd cycle |
| Data[7] | R0[5] | G0[3] | x |
| Data[6] | R0[4] | G0[2] | x |
| Data[5] | R0[3] | G0[1] | x |
| Data[4] | R0[2] | G0[0] | x |
| Data[3] | R0[1] | B0[5] | x |
| Data[2] | R0[0] | B0[4] | x |
| Data[1] | G0[5] | B0[3] | B0[1] |
| Data[0] | G0[4] | B0[2] | B0[0] |

DISPC_CONTROL0.TDMCycleFormat = 0x2
 DISPC_DATA0_CYCLE1 = 0x00000008
 DISPC_DATA0_CYCLE2 = 0x00000008
 DISPC_DATA0_CYCLE3 = 0x00000002

| 16-BPP | | |
|---------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[7] | R0[4] | G0[2] |
| Data[6] | R0[3] | G0[1] |
| Data[5] | R0[2] | G0[0] |
| Data[4] | R0[1] | B0[4] |
| Data[3] | R0[0] | B0[3] |
| Data[2] | G0[5] | B0[2] |
| Data[1] | G0[4] | B0[1] |
| Data[0] | G0[3] | B0[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x1
 DISPC_DATA0_CYCLE1 = 0x00000008
 DISPC_DATA0_CYCLE2 = 0x00000008

| 12-BPP | | |
|---------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[7] | R0[3] | x |
| Data[6] | R0[2] | x |
| Data[5] | R0[1] | x |
| Data[4] | R0[0] | x |
| Data[3] | G0[3] | B0[3] |
| Data[2] | G0[2] | B0[2] |
| Data[1] | G0[1] | B0[1] |
| Data[0] | G0[0] | B0[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x1
 DISPC_DATA0_CYCLE1 = 0x00000008
 DISPC_DATA0_CYCLE2 = 0x00000004

dispc-057

Figure 10-82. 9-Bit Interface Settings

| 24-BPP | | | |
|---------|-----------|-----------|-----------|
| | 1st cycle | 2nd cycle | 3rd cycle |
| Data[8] | R0[7] | G0[6] | x |
| Data[7] | R0[6] | G0[5] | x |
| Data[6] | R0[5] | G0[4] | x |
| Data[5] | R0[4] | G0[3] | B0[5] |
| Data[4] | R0[3] | G0[2] | B0[4] |
| Data[3] | R0[2] | G0[1] | B0[3] |
| Data[2] | R0[1] | G0[0] | B0[2] |
| Data[1] | R0[0] | B0[7] | B0[1] |
| Data[0] | G0[7] | B0[6] | B0[0] |

DISPC_CONTROL0.TDMCycleFormat = 0x2
 DISPC_DATA0_CYCLE1 = 0x00000009
 DISPC_DATA0_CYCLE2 = 0x00000009
 DISPC_DATA0_CYCLE3 = 0x00000006

| 18-BPP | | |
|---------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[8] | R0[5] | G0[2] |
| Data[7] | R0[4] | G0[1] |
| Data[6] | R0[3] | G0[0] |
| Data[5] | R0[2] | B0[5] |
| Data[4] | R0[1] | B0[4] |
| Data[3] | R0[0] | B0[3] |
| Data[2] | G0[5] | B0[2] |
| Data[1] | G0[4] | B0[1] |
| Data[0] | G0[3] | B0[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x1
 DISPC_DATA0_CYCLE1 = 0x00000009
 DISPC_DATA0_CYCLE2 = 0x00000009

| 16-BPP | | |
|---------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[8] | R0[4] | x |
| Data[7] | R0[3] | x |
| Data[6] | R0[2] | G0[1] |
| Data[5] | R0[1] | G0[0] |
| Data[4] | R0[0] | B0[4] |
| Data[3] | G0[5] | B0[3] |
| Data[2] | G0[4] | B0[2] |
| Data[1] | G0[3] | B0[1] |
| Data[0] | G0[2] | B0[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x1
 DISPC_DATA0_CYCLE1 = 0x00000009
 DISPC_DATA0_CYCLE2 = 0x00000007

| 12-BPP | | |
|---------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[8] | R0[3] | x |
| Data[7] | R0[2] | x |
| Data[6] | R0[1] | x |
| Data[5] | R0[0] | x |
| Data[4] | G0[3] | x |
| Data[3] | G0[2] | x |
| Data[2] | G0[1] | B0[2] |
| Data[1] | G0[0] | B0[1] |
| Data[0] | B0[3] | B0[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x1
 DISPC_DATA0_CYCLE1 = 0x00000009
 DISPC_DATA0_CYCLE2 = 0x00000003

dispc-058

Figure 10-83. 12-Bit Interface Settings

| 24-BPP | | |
|----------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[11] | R0[7] | G0[3] |
| Data[10] | R0[6] | G0[2] |
| Data[9] | R0[5] | G0[1] |
| Data[8] | R0[4] | G0[0] |
| Data[7] | R0[3] | B0[7] |
| Data[6] | R0[2] | B0[6] |
| Data[5] | R0[1] | B0[5] |
| Data[4] | R0[0] | B0[4] |
| Data[3] | G0[7] | B0[3] |
| Data[2] | G0[6] | B0[2] |
| Data[1] | G0[5] | B0[1] |
| Data[0] | G0[4] | B0[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x1
DISPC_DATA0_CYCLE1 = 0x0000000C
DISPC_DATA0_CYCLE2 = 0x0000000C

| 18-BPP | | | |
|----------|-----------|-----------|-----------|
| | 1st cycle | 2nd cycle | 3rd cycle |
| Data[11] | R0[5] | B0[5] | G1[5] |
| Data[10] | R0[4] | B0[4] | G1[4] |
| Data[9] | R0[3] | B0[3] | G1[3] |
| Data[8] | R0[2] | B0[2] | G1[2] |
| Data[7] | R0[1] | B0[1] | G1[1] |
| Data[6] | R0[0] | B0[0] | G1[0] |
| Data[5] | G0[5] | R1[5] | B1[5] |
| Data[4] | G0[4] | R1[4] | B1[4] |
| Data[3] | G0[3] | R1[3] | B1[3] |
| Data[2] | G0[2] | R1[2] | B1[2] |
| Data[1] | G0[1] | R1[1] | B1[1] |
| Data[0] | G0[0] | R1[0] | B1[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x3
DISPC_DATA0_CYCLE1 = 0x0000000C
DISPC_DATA0_CYCLE2 = 0x00060606
DISPC_DATA0_CYCLE3 = 0x000C0000

| 16-BPP | | |
|----------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[11] | R0[4] | x |
| Data[10] | R0[3] | x |
| Data[9] | R0[2] | x |
| Data[8] | R0[1] | x |
| Data[7] | R0[0] | x |
| Data[6] | G0[5] | x |
| Data[5] | G0[4] | x |
| Data[4] | G0[3] | x |
| Data[3] | G0[2] | B0[3] |
| Data[2] | G0[1] | B0[2] |
| Data[1] | G0[0] | B0[1] |
| Data[0] | B0[4] | B0[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x1
DISPC_DATA0_CYCLE1 = 0x0000000C
DISPC_DATA0_CYCLE2 = 0x00000004

| 12-BPP | |
|----------|-----------|
| | 1st cycle |
| Data[11] | R0[3] |
| Data[10] | R0[2] |
| Data[9] | R0[1] |
| Data[8] | R0[0] |
| Data[7] | G0[3] |
| Data[6] | G0[2] |
| Data[5] | G0[1] |
| Data[4] | G0[0] |
| Data[3] | B0[3] |
| Data[2] | B0[2] |
| Data[1] | B0[1] |
| Data[0] | B0[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x0
DISPC_DATA0_CYCLE1 = 0x0000000C

dispc-059

Figure 10-84. 16-Bit Interface Settings

| 24-BPP | | | |
|----------|-----------|-----------|-----------|
| | 1st cycle | 2nd cycle | 3rd cycle |
| Data[15] | R0[7] | B0[7] | G1[7] |
| Data[14] | R0[6] | B0[6] | G1[6] |
| Data[13] | R0[5] | B0[5] | G1[5] |
| Data[12] | R0[4] | B0[4] | G1[4] |
| Data[11] | R0[3] | B0[3] | G1[3] |
| Data[10] | R0[2] | B0[2] | G1[2] |
| Data[9] | R0[1] | B0[1] | G1[1] |
| Data[8] | R0[0] | B0[0] | G1[0] |
| Data[7] | G0[7] | R1[7] | B1[7] |
| Data[6] | G0[6] | R1[6] | B1[6] |
| Data[5] | G0[5] | R1[5] | B1[5] |
| Data[4] | G0[4] | R1[4] | B1[4] |
| Data[3] | G0[3] | R1[3] | B1[3] |
| Data[2] | G0[2] | R1[2] | B1[2] |
| Data[1] | G0[1] | R1[1] | B1[1] |
| Data[0] | G0[0] | R1[0] | B1[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x3
 DISPC_DATA0_CYCLE1 = 0x00000010
 DISPC_DATA0_CYCLE2 = 0x00080808
 DISPC_DATA0_CYCLE3 = 0x00100000

| 18-BPP | | |
|----------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[15] | R0[5] | x |
| Data[14] | R0[4] | x |
| Data[13] | R0[3] | x |
| Data[12] | R0[2] | x |
| Data[11] | R0[1] | x |
| Data[10] | R0[0] | x |
| Data[9] | G0[5] | x |
| Data[8] | G0[4] | x |
| Data[7] | G0[3] | x |
| Data[6] | G0[2] | x |
| Data[5] | G0[1] | x |
| Data[4] | G0[0] | x |
| Data[3] | B0[5] | x |
| Data[2] | B0[4] | x |
| Data[1] | B0[3] | B0[1] |
| Data[0] | B0[2] | B0[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x1
 DISPC_DATA0_CYCLE1 = 0x00000010
 DISPC_DATA0_CYCLE2 = 0x00000002

| 16-BPP | |
|----------|-----------|
| | 1st cycle |
| Data[15] | R0[4] |
| Data[14] | R0[3] |
| Data[13] | R0[2] |
| Data[12] | R0[1] |
| Data[11] | R0[0] |
| Data[10] | G0[5] |
| Data[9] | G0[4] |
| Data[8] | G0[3] |
| Data[7] | G0[2] |
| Data[6] | G0[1] |
| Data[5] | G0[0] |
| Data[4] | B0[4] |
| Data[3] | B0[3] |
| Data[2] | B0[2] |
| Data[1] | B0[1] |
| Data[0] | B0[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x0
 DISPC_DATA0_CYCLE1 = 0x00000010

| 12-BPP | |
|----------|-----------|
| | 1st cycle |
| Data[15] | x |
| Data[14] | x |
| Data[13] | x |
| Data[12] | x |
| Data[11] | R0[3] |
| Data[10] | R0[2] |
| Data[9] | R0[1] |
| Data[8] | R0[0] |
| Data[7] | G0[3] |
| Data[6] | G0[2] |
| Data[5] | G0[1] |
| Data[4] | G0[0] |
| Data[3] | B0[3] |
| Data[2] | B0[2] |
| Data[1] | B0[1] |
| Data[0] | B0[0] |

DISPC_CONTROL0.TDMCYCLEFORMAT = 0x0
 DISPC_DATA0_CYCLE1 = 0x0000000C

dispc-060

10.2.4.12.6 Synchronized Buffer Update

A synchronization mismatch between the frame buffer and the display refreshes, named tearing effect, can lead to images that appear to be stretched on the screen. To avoid it, a synchronization mechanism is used between the DISPC and the process that updates the buffer. An interrupt is generated when the display reaches a predefined line number. The PROGRAMMEDLINENUMBER_IRQ interrupt ([DISPC_IRQSTATUS](#) and [DISPC_IRQENABLE](#)) is a level signal and stays active during the programmed line of the display.

10.2.4.12.7 Timing Generator and Panel Settings

The size of and panel is defined by:

- Number of lines, DISPC_SIZE_LCD0[26:16] LPP bit field, with a value from 1 to 2048
- Number of pixels per line, DISPC_SIZE_LCD0[10:0] PPL bit field, with a value from 1 to 2048

Standard HSYNC/VSYNC timing generation are programmable for each LCD outputs independently:

- Horizontal front porch is set in the DISPC_TIMING_Ho[19:8] HFP bit field.
- Horizontal back porch is set in the DISPC_TIMING_Ho[31:20] HBP bit field.
- Horizontal synchronization pulse width is set in the DISPC_TIMING_Ho[7:0] HSW bit field.
- Vertical front porch is set in the DISPC_TIMING_Vo[19:8] VFP bit field.
- Vertical back porch is set in the DISPC_TIMING_Vo[31:20] VBP bit field.
- Vertical synchronization pulse width is set in the DISPC_TIMING_Vo[7:0] VSW bit field.

Horizontal/vertical synchronization and the polarity of ACBIAS signals are programmable by setting the DISPC_POL_FREQ0[12] IVS, DISPC_POL_FREQ0[13] IHS, and DISPC_POL_FREQ0[15] IEO bits. These signals can be gated by setting the DISPC_CONFIG0[7] VSYNCGATED and DISPC_CONFIG0[6] HSYNCGATED bits.

The latch of data can be driven on the rising or falling edge of the pixel clock by setting the DISPC_POL_FREQ0[14] IPC bit. The drive of the SYNC and VSYNC signals in the function of the pixel clock is done by setting the DISPC_POL_FREQ0[16] RF bit.

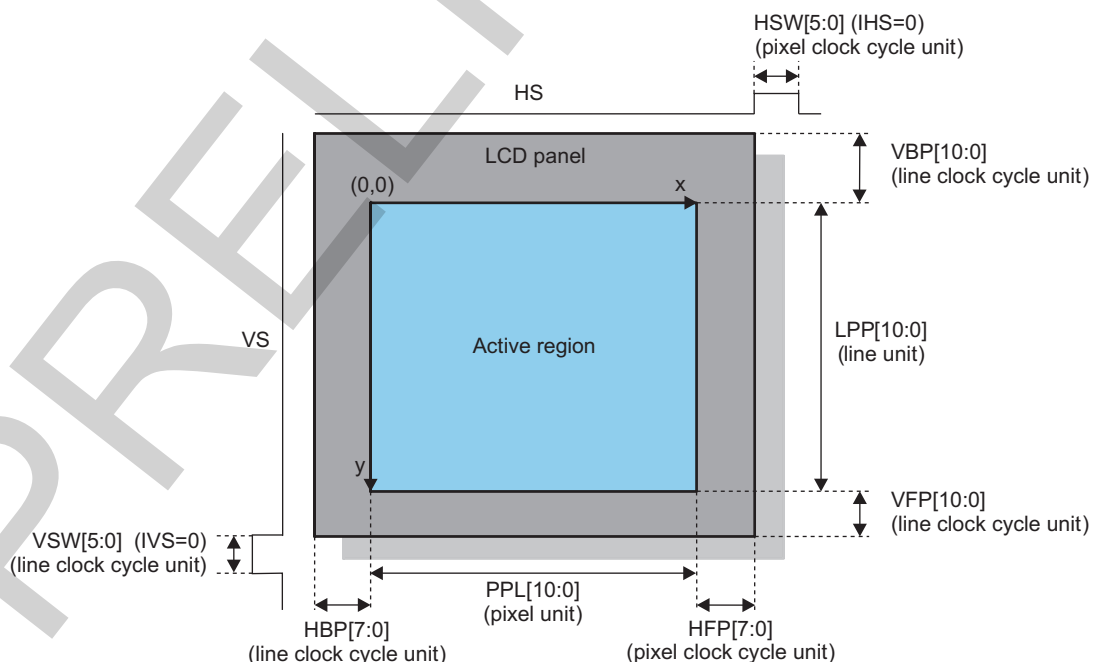
Table 10-54 describes the programming rules for LCD timing.

Table 10-54. Programming Rules

| | No Downsampling | Downsampling H or V | Downsampling H + V |
|--------------------------------|--------------------|------------------------|-----------------------|
| $(HBP + HSW + HFP) \times PCD$ | 8 | 10 | 20 |

Figure 10-85 shows the timing values description in the case of an active matrix display.

Figure 10-85. Timing Values (Active Matrix Display)



dispc-031

The 8-bit pixel clock divider (the [DISPC_DIVISOR](#)[7:0] PCD bit field) selects the pixel clock frequency. This bit field generates a range of pixel clock frequencies from LC/2 to LC/256, where LC is the logic clock from the divided functional clock of the DISPC by the [DISPC_DIVISOR](#)[23:16] LCD bit field.

The pixel clock is defined by the following equation:

$$\text{Pixel Clock} = (\text{FunctionalClock} / \text{LCD}[7:0]) / \text{PCD}[7:0]$$

The pixel clock can be gated by setting the [DISPC_CONFIGo](#)[5] [PIXELCLOCKGATED](#) bit to 0x1.

The LCD output can be configured in progressive output or interlace output. The selection is done by writing into the [DISPC_CONFIGo](#)[22] [OUTPUTMODEENABLE](#) bit. The reset value is 0x0, which means progressive mode. When progressive mode is selected, the FID signal associated to the LCD output is driven low (INACTIVE state). The selection can be changed only if the corresponding LCD output is disabled. The configuration is independent for each LCD output.

When in interlaced mode, the [DISPC_CONFIGo](#)[23] [FIDFIRST](#) bit indicates which field is output first:

- 0x0: Even field first (FID = 0)
- 0x1: Odd field first (FID = 1)

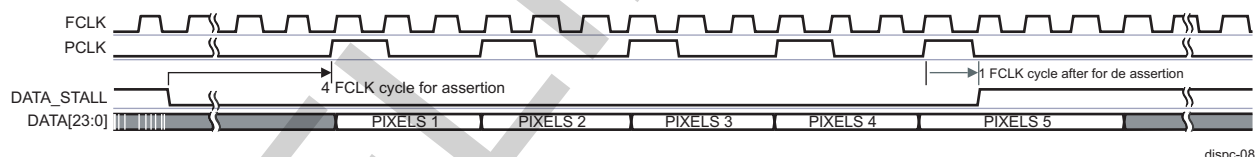
10.2.4.12.8 Stall Mode

Stall mode is used to indicate when the DISPC must stop sending data on the corresponding LCD output interface to avoid an overflow on the interface level. Stall mode is available when RFBI and DSI interface are used. The interface asserts the STALL signal to stop data output by the DISPC. It is deasserted by the interface to indicate when new data must be output by the DISPC. [Figure 10-86](#) shows the RFBI data stall mode activated.

Stall mode is selected by setting the [DISPC_CONTROLo](#)[11] [STALLMODE](#) bit.

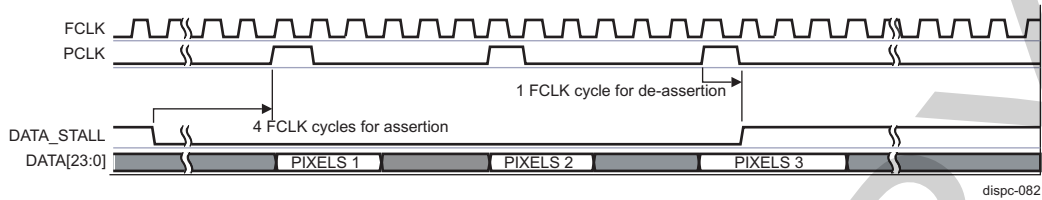
NOTE: The [DISPC_CONTROLo](#)[5] [GOLCD](#) bit must not be set, but the DISPC configuration (DMA engine, pipelines associated with the LCD output) must be set before enabling the LCD output by setting the [DISPC_CONTROLo](#)[1] [LCDENABLE](#) bit.

Figure 10-86. RFBI Data Stall Signal Diagram



To avoid an underflow of the DMA buffer, the DMA buffer handshake must be enabled by setting the [DISPC_CONFIGo](#)[16] [BUFFERHANDCHECK](#) bit. The fullness of the buffers associated to the pipelines used for the LCD output is checked before providing data to the pipeline when the STALL signal is inactive. It prevents emptying the DMA buffer when the RFBI or DSI module requests data and there is not enough data in the DMA buffer of the DISPC. This feature must be enabled only when stall mode is used (the [STALLMODE](#) bit set to 0x1). When the DMA buffer handshake is activated, the pixel transfer to the RFBI or DSI module, outside a STALL period, can be stopped and restarted when there are enough data in the DMA buffer. The DMA buffer handshake ensures that the underflow does not occur for the pipelines associated with the LCD output when RFBI/DSI interfaces are used. The rate of the data transfer to the RFBI or DSI is, then, fully dependent on the state of the DMA buffer. [Figure 10-87](#) shows the RFBI data stall with FIFO handcheck mode activated.

Figure 10-87. RFBI Data Stall Signal Diagram With Handcheck



Stall mode is independently used when the RFBI or DSI protocol engines are connected to the LCD outputs and receive the pixels to reformat the data.

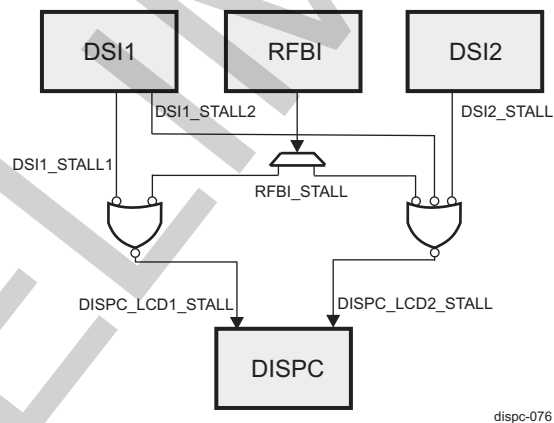
The STALL signals from the RFBI and DSI interfaces are merged into a single signal in the display subsystem. Only one signal for each LCD output is connected to the DISPC. [Figure 10-88](#) shows the STALL signal implementation.

One STALL signal is generated by the RFBI. The RFBI module asserts the stall signal when no more data must be output by the DISPC. It is deasserted to indicate when new data must be output by the DISPC.

Two STALL signals are generated by the DSI1 protocol engine IP. It is used by the DSI1 protocol engine when data are provided from the DISPC to the DSI1 protocol engine using the two video ports in command mode only. If one of the two video ports is in video mode, the STALL signal associated with the video port from the DSI1 protocol engine is not used (must be in INACTIVE state from the DSI1 protocol engine IP).

One STALL signal is generated by the DSI2 P\protocol engine IP. It is used by the DSI2 protocol engine when data are provided from the DISPC to the DSI2 protocol engine using the single video port in command mode only. If the video port is in video mode, the STALL signal associated with the video port from the DSI2 protocol engine is not used (must be in INACTIVE state from the DSI2 protocol engine IP).

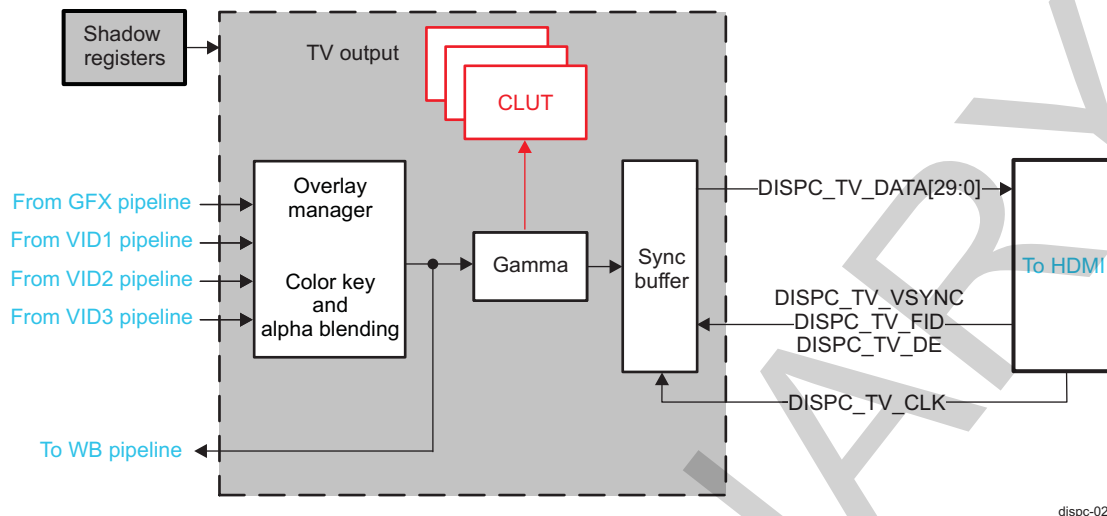
Figure 10-88. STALL Signal



10.2.4.13 TV Output

The TV output paths consist of several processing blocks (see [Figure 10-89](#)):

- Overlay manager
- Gamma correction unit
- Synchronization buffer

Figure 10-89. TV Output Architecture

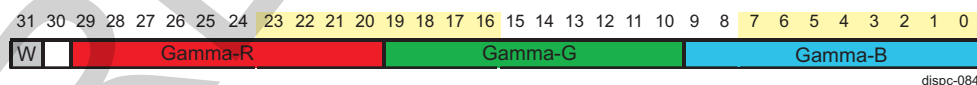
The TV output is connected to the HDMI. The DISPC TV output receives an external clock, DISPC_TV_CLK, and based on the VSYNC generated by the HDMI, hold time, vertical offset, and horizontal offset, outputs the pixels synchronously. The size of the field/frame to output defines the number of pixels to output on each line and the number of lines for each field/frame.

10.2.4.13.1 Overlay Manager

The overlay mechanism is identical in LCD1 and LCD2 (see [Section 10.2.4.12.1, Overlay Manager](#)).

10.2.4.13.2 Gamma Correction Unit

The gamma correction unit works as described in [Section 10.2.4.12.2, Gamma Correction Unit](#). The only difference resides in the input pixel format RGB30. Each component of encoded pixel value is used as a pointer to index 1 out of 1024 30-bit gamma curve entries in the table. Each 10-bit component is replaced with the 10-bit table value corresponding to R, G, or B component. The table is loaded by software, through the DISPC_GAMMA_TABLE2 register. It is possible to load only part of the table. For each write access to the table, the 30-bit gamma value is associated with bit [31] INDEX to indicate that a new table is defined. Setting bit [31] INDEX to 0x1 for the first time, resets the internal index counter. All the following accesses are considered to be for incremented index addressing in the table (bit [31] INDEX set to 0 for each subsequent access). [Figure 10-90](#) shows the format of one of the gamma curve values in the memory.

Figure 10-90. Data Memory Organization for Gamma Mode in TV Output

10.2.4.13.3 Synchronized Buffer Update

The synchronized buffer update is identical in LCD1 and LCD2 (see [Section 10.2.4.12.6, Synchronized Buffer Update](#)).

10.2.4.13.4 Timing and TV Format Settings

[Figure 10-91](#) shows the TV formats supported.

Figure 10-91. TV Formats



The size of a TV output format is defined by:

- Number of lines, [DISPC_SIZE_TV\[26:16\]](#) LPP bit field, with a value from 1 to 2048
- Number of pixels per line, [DISPC_SIZE_TV\[10:0\]](#) PPL bit field, with a value from 1 to 2048
- Delta size between odd/even field, [DISPC_SIZE_TV\[15:14\]](#) DELTA_LPP bit field. This bit field controls only the output channel and not the size of the data field fetched from the frame buffer in memory.

The hold time of the pixels on the data bus is determined in clock cycles by the [DISPC_CONTROL1\[19:17\]](#) HT bit field. The default value at reset time is 0x0 (one cycle).

- When connected to the HDMI encoder, [Table 10-55](#) indicates the [DISPC_SIZE_TV](#) (PPL and LPP) value for each HD standard.

Table 10-55. PPL and LLP Value for HD Standard

| Standards | Active Pixels/Line | Active Lines | Digital Clock | DISPC_SIZE_TV |
|-------------|--------------------|--------------|--|-------------------------------|
| HD standard | 720p | 1280 | 74.25/74.125 MHz (60/59.99..frames/s) | 0x02CF04FF |
| | 1080i | 1920 | 74.25/74.125 MHz (60/59.99..frames/s) | 0x021B07FF |
| | 1080p | 1920 | 148.5/148.25 MHz (60/59.99..frames/s) | 0x043707FF |

- When connected to the HDMI encoder, to output any of the 3D frame-packing formats (720p @ 50 Hz, 720p @ 60 Hz, and 1080p @ 24 Hz, as defined in the HDMI v1.4 specification) supported by the device, [Table 10-56](#) lists the [DISPC_SIZE_TV](#) (PPL and LPP) value for each 3D standard.

Table 10-56. PPL and LLP Value for 3D Standard

| Standards | Active Pixels/Line | Active Lines | Digital Clock | DISPC_SIZE_TV |
|-------------|--------------------|--------------|-----------------------------|-------------------------------|
| 3D standard | 720p | 1280 | 148.5 MHz (50; 60 frames/s) | 5BD04FF |
| | 1080p | 1920 | 148.5 MHz (24 frames/s) | 9C0780 |

⁽¹⁾ See the following Note for information about configuring the 3D 1080p format.

NOTE: When configuring the DISPC to output any supported 3D frame-packing format, the following generic details must be considered:

- As defined by the HDMI v1.4 specification, Section 8.2.3.2, 3D frame-packing is a video format structure composed of two stereoscopic pictures: left and right.
- The stereoscopic pictures can be processed through the three video pipelines (VID1, VID2, or VID3). For more information about the configuration of video pipelines, see [Section 10.2.4.10, Video Pipelines](#).
- The 3D frame is generated by setting the TV overlay manager to combine the outputs of the selected video pipelines that hold the pictures. The VID1 or VID3 pipeline must carry the top field of the 3D frame (left stereoscopic picture), and the VID2 pipeline must always carry the bottom field of the frame (right stereoscopic picture). The top and bottom fields are separated by an active space area. For more information, see the HDMI v1.4 specification, Section 8.2.3.2.
- The pipeline carrying each field (top and bottom) of the 3D frame must have its height and width parameters defined in the [26:16] SIZEY and [10:0] SIZEX bit fields of DISPC_VIDp_SIZE register, and its Y and X positions defined in the [26:16] POSY and [10:0] POSX bit fields of the DISPC_VIDp_POSITION register. The active space area of the 3D frame can be encoded by setting the solid background color for the TV output (the [DISPC_DEFAULT_COLOR1\[23:0\] DEFAULTCOLOR](#) bit field). For more information about the overlay mechanism, see [Section 10.2.4.13.1, Overlay Manager](#).
- If the 3D 1080p format must be output, the following specific settings must be applied:
 - [DISPC_VID2_ATTRIBUTES\[31:30\] CHANNELOUT2](#) bit field = 0x2
 - [DISPC_SIZE_TV\[26:16\] LPP](#) = 0x9C

10.2.4.14 Shadow Registers

Some DISPC registers are termed *shadow registers*. A shadow register change has no direct effect on the configuration of the DISPC. The registers are shadow registers to allow software change the values of the registers at any time. When all the registers for a given configuration are into the registers, software must set 1 bit only to validate the configuration. When hardware reaches the end of the current frame and sees that the bit field has been set by software, the new configuration is now the configuration used by hardware.

The bits enabling hardware to use the new configuration are:

- The [DISPC_CONTROL1\[5\] GOLCD](#) bit for all the registers associated to the LCD1 output, and for all registers of WB and DMA, if the LCD1 channel is captured. The update of the registers of the WB and DMA is further delayed by the [DISPC_WB_ATTRIBUTES2\[7:0\] WBDELAYCOUNT](#) bit field or done when the next frame is captured (the [DISPC_WB_ATTRIBUTES\[26:24\] CAPTUREMODE](#) bit field must be different from 0). The update of the registers occurs at the VFP start period.
- The [DISPC_CONTROL1\[6\] GOTV](#) bit for all the registers associated to the TV output, and for all registers of WB and DMA, if the TV channel is captured. The update of the registers of the WB and DMA is further delayed by the [DISPC_WB_ATTRIBUTES2\[7:0\] WBDELAYCOUNT](#) bit field or done when the next frame is captured (the [DISPC_WB_ATTRIBUTES\[26:24\] CAPTUREMODE](#) bit field must be different from 0). The update of the registers occurs at the external EVSYNC.
- The [DISPC_CONTROL2\[5\] GOLCD](#) bit for all the registers associated to the LCD2 output, and for all registers of WB and DMA, if the LCD2 channel is captured. The update of the registers of the WB and DMA is further delayed by the [DISPC_WB_ATTRIBUTES2\[7:0\] WBDELAYCOUNT](#) bit field or done when the next frame is captured (the [DISPC_WB_ATTRIBUTES\[26:24\] CAPTUREMODE](#) bit field must be different from 0). The update of the registers occurs at the VFP start period.
- The [DISPC_WB_ATTRIBUTES\[0\] ENABLE](#) bit for all the registers associated to the WB, if the transfer memory-to-memory is not associated with a channel out
- The [DISPC_CONTROL2\[6\] GOWB](#) bit and the [5]GOLCD and [6]GOTV bits in the [DISPC_CONTROL1/DISPC_CONTROL2](#) registers, combined with the synchronization event of the channel output selected for write back. This applies to all registers associated with the selected channel out and further delayed by the setting in the [DISPC_WB_ATTRIBUTES2\[7:0\] WBDELAYCOUNT](#) bit field for all registers of the write back and DMA. The GOWB bit must be set only in WB capture mode; it is not required when WB memory-to-memory mode is used.

NOTE: Before setting the GOLCD, GOTV, or GOWB bits, the user must ensure that the bits are cleared. Hardware resets the bit when the update completes.

Table 10-57 lists the shadow registers. Registers that do not have a cross mark in any table column are not shadowed.

Table 10-57. Shadow Registers

| Shadow Register Name | Updated on VFP Start Period (LCD1 Pipeline) | Updated on VFP Start Period (LCD2 Pipeline) | Updated on External VSYNC (TV Pipeline) | Updated on END of Frame (WB Pipeline) |
|--------------------------------|---|---|---|---------------------------------------|
| DISPC_REVISION | | | | |
| DISPC_SYSCONFIG | | | | |
| DISPC_SYSSTATUS | | | | |
| DISPC_IRQSTATUS | | | | |
| DISPC_IRQENABLE | | | | |
| DISPC_CONTROL1 | x | | x | |
| DISPC_CONFIG1 | x | x | x | x |
| DISPC_DEFAULT_COL OR0 | x | | | |
| DISPC_DEFAULT_COL OR1 | | x | | |
| DISPC_TRANS_COLO R0 | x | | | |
| DISPC_TRANS_COLO R1 | | | x | |
| DISPC_LINE_STATUS | | | | |
| DISPC_LINE_NUMBER | x | | | |
| DISPC_TIMING_H1 | x | | | |
| DISPC_TIMING_V1 | x | | | |
| DISPC_POL_FREQ1 | x | | | |
| DISPC_DIVISOR1 | x | | | |
| DISPC_GLOBAL_ALPH A | x | x | x | x |
| DISPC_SIZE_TV | | | x | |
| DISPC_SIZE_LCD1 | x | | | |
| DISPC_GFX_BA_j ⁽¹⁾ | x | x | x | x |
| DISPC_GFX_POSITION | x | x | x | x |
| DISPC_GFX_SIZE | x | x | x | x |
| DISPC_GFX_ATTRIBU TES | x | x | x | x |
| DISPC_GFX_BUF_THR ESHOLD | x | x | x | x |
| DISPC_GFX_BUF_SIZE _STATUS | | | | |
| DISPC_GFX_ROW_INC | x | x | x | x |
| DISPC_GFX_PIXEL_IN C | x | x | x | x |
| DISPC_GFX_TABLE_B A | x | x | x | x |
| DISPC_VID1_BA_j ⁽¹⁾ | x | x | x | x |
| DISPC_VID1_POSITIO N | x | x | x | x |
| DISPC_VID1_SIZE | x | x | x | x |

⁽¹⁾ j = 0 to 1

Table 10-57. Shadow Registers (continued)

| Shadow Register Name | Updated on VFP Start Period (LCD1 Pipeline) | Updated on VFP Start Period (LCD2 Pipeline) | Updated on External VSYNC (TV Pipeline) | Updated on END of Frame (WB Pipeline) |
|---|---|---|---|---------------------------------------|
| DISPC_VID1_ATTRIBUTES | x | x | x | x |
| DISPC_VID1_BUF_THRESHOLD | x | x | x | x |
| DISPC_VID1_BUF_SIZE_STATUS | | | | |
| DISPC_VID1_ROW_IN_C | x | x | x | x |
| DISPC_VID1_PIXEL_IN_C | x | x | x | x |
| DISPC_VID1_FIR | x | x | x | x |
| DISPC_VID1_PICTURE_SIZE | x | x | x | x |
| DISPC_VID1_ACCU_j ⁽¹⁾ | x | x | x | x |
| DISPC_VID1_FIR_COEF_H_i ⁽²⁾ | x | x | x | x |
| DISPC_VID1_FIR_COEF_HV_i ⁽²⁾ | x | x | x | x |
| DISPC_VID1_CONV_C_OEF0 | x | x | x | x |
| DISPC_VID1_CONV_C_OEF1 | x | x | x | x |
| DISPC_VID1_CONV_C_OEF2 | x | x | x | x |
| DISPC_VID1_CONV_C_OEF3 | x | x | x | x |
| DISPC_VID1_CONV_C_OEF4 | x | x | x | x |
| DISPC_VID2_BA_j ⁽³⁾ | x | x | x | x |
| DISPC_VID2_POSITION | x | x | x | x |
| DISPC_VID2_SIZE | x | x | x | x |
| DISPC_VID2_ATTRIBUTES | x | x | x | x |
| DISPC_VID2_BUF_THRESHOLD | x | x | x | x |
| DISPC_VID2_BUF_SIZE_STATUS | | | | |
| DISPC_VID2_ROW_IN_C | x | x | x | x |
| DISPC_VID2_PIXEL_IN_C | x | x | x | x |
| DISPC_VID2_FIR | x | x | x | x |
| DISPC_VID2_PICTURE_SIZE | x | x | x | x |
| DISPC_VID2_ACCU_j ⁽³⁾ | x | x | x | x |
| DISPC_VID2_FIR_COEF_H_i ⁽²⁾ | x | x | x | x |
| DISPC_VID2_FIR_COEF_HV_i ⁽²⁾ | x | x | x | x |

⁽²⁾ i = 0 to 7⁽³⁾ j = 0 to 1

Table 10-57. Shadow Registers (continued)

| Shadow Register Name | Updated on VFP Start Period (LCD1 Pipeline) | Updated on VFP Start Period (LCD2 Pipeline) | Updated on External VSYNC (TV Pipeline) | Updated on END of Frame (WB Pipeline) |
|--|---|---|---|---------------------------------------|
| DISPC_VID2_CONV_C OEF0 | x | x | x | x |
| DISPC_VID2_CONV_C OEF1 | x | x | x | x |
| DISPC_VID2_CONV_C OEF2 | x | x | x | x |
| DISPC_VID2_CONV_C OEF3 | x | x | x | x |
| DISPC_VID2_CONV_C OEF4 | x | x | x | x |
| DISPC_DATA1_CYCLE 1 | x | | | |
| DISPC_DATA1_CYCLE 2 | x | | | |
| DISPC_DATA1_CYCLE 3 | x | | | |
| DISPC_VID1_FIR_COE F_V_i ⁽²⁾ | x | x | x | x |
| DISPC_VID2_FIR_COE F_V_i ⁽⁴⁾ | x | x | x | x |
| DISPC_CPR1_COEF_R | x | | | |
| DISPC_CPR1_COEF_G | x | | | |
| DISPC_CPR1_COEF_B | x | | | |
| DISPC_GFX_PRELOAD | x | x | x | x |
| DISPC_VID1_PRELOAD | x | x | x | x |
| DISPC_VID2_PRELOAD | x | x | x | x |
| DISPC_CONTROL2 | | x | x | x |
| DISPC_VID3_ACCU_i ⁽⁴⁾ | x | x | x | x |
| DISPC_VID3_BA_i ⁽⁴⁾ | x | x | x | x |
| DISPC_VID3_FIR_COE F_H_i ⁽⁴⁾ | x | x | x | x |
| DISPC_VID3_FIR_COE F_HV_i ⁽⁴⁾ | x | x | x | x |
| DISPC_VID3_FIR_COE F_V_i ⁽⁴⁾ | x | x | x | x |
| DISPC_VID3_ATTRIBUTES | x | x | x | x |
| DISPC_VID3_CONV_C OEF0 | x | x | x | x |
| DISPC_VID3_CONV_C OEF1 | x | x | x | x |
| DISPC_VID3_CONV_C OEF2 | x | x | x | x |
| DISPC_VID3_CONV_C OEF3 | x | x | x | x |
| DISPC_VID3_CONV_C OEF4 | x | x | x | x |
| DISPC_VID3_BUF_SIZE_STATUS | | | | |

⁽⁴⁾ i = 0 to 7

Table 10-57. Shadow Registers (continued)

| Shadow Register Name | Updated on VFP Start Period (LCD1 Pipeline) | Updated on VFP Start Period (LCD2 Pipeline) | Updated on External VSYNC (TV Pipeline) | Updated on END of Frame (WB Pipeline) |
|--|---|---|---|---------------------------------------|
| DISPC_VID3_BUF_THR ESHOLD | x | x | x | x |
| DISPC_VID3_FIR | x | x | x | x |
| DISPC_VID3_PICTURE_SIZE | x | x | x | x |
| DISPC_VID3_PIXEL_IN C | x | x | x | x |
| DISPC_VID3_POSITIO N | x | x | x | x |
| DISPC_VID3_PRELOA D | x | x | x | x |
| DISPC_VID3_ROW_IN C | x | x | x | x |
| DISPC_VID3_SIZE | x | x | x | x |
| DISPC_DEFAULT_COL OR2 | | x | | |
| DISPC_TRANS_COLO R2 | | x | | |
| DISPC_CPR2_COEF_B | | x | | |
| DISPC_CPR2_COEF_G | | x | | |
| DISPC_CPR2_COEF_R | | x | | |
| DISPC_DATA2_CYCLE 1 | | x | | |
| DISPC_DATA2_CYCLE 2 | | x | | |
| DISPC_DATA2_CYCLE 3 | | x | | |
| DISPC_SIZE_LCD2 | | x | | |
| DISPC_TIMING_H2 | | x | | |
| DISPC_TIMING_V2 | | x | | |
| DISPC_POL_FREQ2 | | x | | |
| DISPC_DIVISOR2 | | x | | |
| DISPC_WB_ACCU_j ⁽⁵⁾ | x | x | x | x |
| DISPC_WB_BA_j ⁽⁵⁾ | x | x | x | x |
| DISPC_WB_FIR_COEF _H_i ⁽⁶⁾ | x | x | x | x |
| DISPC_WB_FIR_COEF _HV_i ⁽⁶⁾ | x | x | x | x |
| DISPC_WB_FIR_COEF _V_i ⁽⁶⁾ | x | x | x | x |
| DISPC_WB_ATTRIBUT ES | x | x | x | x |
| DISPC_WB_CONV_CO EF0 | x | x | x | x |
| DISPC_WB_CONV_CO EF1 | x | x | x | x |
| DISPC_WB_CONV_CO EF2 | x | x | x | x |
| DISPC_WB_CONV_CO EF3 | x | x | x | x |

⁽⁵⁾ j = 0 to 1⁽⁶⁾ i = 0 to 7

Table 10-57. Shadow Registers (continued)

| Shadow Register Name | Updated on VFP Start Period (LCD1 Pipeline) | Updated on VFP Start Period (LCD2 Pipeline) | Updated on External VSYNC (TV Pipeline) | Updated on END of Frame (WB Pipeline) |
|--|---|---|---|---------------------------------------|
| DISPC_WB_CONV_COEF4 | x | x | x | x |
| DISPC_WB_BUF_SIZE_STATUS | x | x | x | x |
| DISPC_WB_BUF_THRESHOLD | x | x | x | x |
| DISPC_WB_FIR | x | x | x | x |
| DISPC_WB_PICTURE_SIZE | x | x | x | x |
| DISPC_WB_PIXEL_INC | x | x | x | x |
| DISPC_WB_ROW_INC | x | x | x | x |
| DISPC_WB_SIZE | x | x | x | x |
| DISPC_VID1_BA_UV_j ⁽⁵⁾ | x | x | x | x |
| DISPC_VID2_BA_UV_j ⁽⁵⁾ | x | x | x | x |
| DISPC_VID3_BA_UV_j ⁽⁵⁾ | x | x | x | x |
| DISPC_WB_BA_UV_j ⁽⁷⁾ | x | x | x | x |
| DISPC_CONFIG2 | | x | | |
| DISPC_VID1_ATTRIBUTES2 | x | x | x | x |
| DISPC_VID2_ATTRIBUTES2 | x | x | x | x |
| DISPC_VID3_ATTRIBUTES2 | x | x | x | x |
| DISPC_GAMMA_TABLE0 | | | | |
| DISPC_GAMMA_TABLE1 | | | | |
| DISPC_GAMMA_TABLE2 | | | | |
| DISPC_VID1_FIR2 | x | x | x | x |
| DISPC_VID1_ACCU2_j ⁽⁷⁾ | x | x | x | x |
| DISPC_VID1_FIR_COEF_H2_i ⁽⁸⁾ | x | x | x | x |
| DISPC_VID1_FIR_COEF_HV2_i ⁽⁸⁾ | x | x | x | x |
| DISPC_VID1_FIR_COEF_V2_i ⁽⁸⁾ | x | x | x | x |
| DISPC_VID2_FIR2 | x | x | x | x |
| DISPC_VID2_ACCU2_j ⁽⁷⁾ | x | x | x | x |
| DISPC_VID2_FIR_COEF_H2_i ⁽⁸⁾ | x | x | x | x |
| DISPC_VID2_FIR_COEF_HV2_i ⁽⁸⁾ | x | x | x | x |
| DISPC_VID2_FIR_COEF_V2_i ⁽⁸⁾ | x | x | x | x |
| DISPC_VID3_FIR2 | x | x | x | x |

⁽⁷⁾ j = 0 to 1

⁽⁸⁾ i = 0 to 7

Table 10-57. Shadow Registers (continued)

| Shadow Register Name | Updated on VFP Start Period (LCD1 Pipeline) | Updated on VFP Start Period (LCD2 Pipeline) | Updated on External VSYNC (TV Pipeline) | Updated on END of Frame (WB Pipeline) |
|--|---|---|---|---------------------------------------|
| DISPC_VID3_ACCU2_j ⁽⁷⁾ | x | x | x | x |
| DISPC_VID3_FIR_COEF_F_H2_i ⁽⁸⁾ | x | x | x | x |
| DISPC_VID3_FIR_COEF_F_HV2_i ⁽⁸⁾ | x | x | x | x |
| DISPC_VID3_FIR_COEF_F_V2_i ⁽⁸⁾ | x | x | x | x |
| DISPC_WB_FIR2 | x | x | x | x |
| DISPC_WB_ACCU2_j ⁽⁷⁾ | x | x | x | x |
| DISPC_WB_FIR_COEF_H2_i ⁽⁸⁾ | x | x | x | x |
| DISPC_WB_FIR_COEF_HV2_i ⁽⁸⁾ | x | x | x | x |
| DISPC_WB_FIR_COEF_V2_i ⁽⁸⁾ | x | x | x | x |
| DISPC_GLOBAL_BUFFER | | | | |
| DISPC_DIVISOR | | | | |
| DISPC_BA0_FLIPIMMEDIATE_EN | | | | |
| DISPC_GLOBAL_MFLAG_ATTRIBUTE | | | | |
| DISPC_GFX_MFLAG_THRESHOLD__1 | x | x | x | x |
| DISPC_VID1_MFLAG_THRESHOLD | x | x | x | x |
| DISPC_VID2_MFLAG_THRESHOLD__1 | x | x | x | x |
| DISPC_VID3_MFLAG_THRESHOLD__1 | x | x | x | x |
| DISPC_WB_MFLAG_THRESHOLD | x | x | x | x |

10.2.5 Display Controller Programming Guide

10.2.5.1 Display Controller Low-Level Programming Models

This section covers the low-level hardware programming sequences for the configuration and use of the module.

10.2.5.1.1 Global Initialization

10.2.5.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements of initializing the surrounding modules when the DISPC module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the DISPC. See the DISPC Module Integration and Environment Sections for more information.

Table 10-58. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|----------------------|---|
| PRCM | Module interface and functional clocks must be enabled. See Chapter 3, Power, Reset, and Clock Management . |
| Control Module | Module-specific pad muxing and configuration must be set in the control module. See Chapter 19, Control Module . |
| MPU INTC or DSP INTC | MPU and/or DSP interrupt controller configuration must be done to enable the interrupts from DISPC module. See Chapter 18, Interrupt Controller . |
| Interconnect | For more information about the interconnect configuration, see Chapter 14, Interconnect . |

10.2.5.1.2 Operational Modes Configuration

Table 10-59. DISPC Configuration

| Step | Register / Bit Field / Programming Model |
|------------------------------------|---|
| For a GFX pipeline configuration | |
| Configure the GFX DMA channel | See Table 10-60 |
| Configure the GFX pipeline | See Table 10-63 |
| Configure the LCD or TV output | For LCD output, see Table 10-81 For TV output, see Table 10-87 |
| For a Video pipeline configuration | |
| Configure the video DMA channel | See Table 10-61 |
| Configure the video pipeline | See Table 10-68 |
| Configure the LCD or TV output | For LCD output, see Table 10-81 For TV output, see Table 10-87 |
| For a WB pipeline configuration | |
| Configure the WB DMA channel | Refer to Table 10-62 |
| Configure the WB pipeline | For video pipelines, see Table 10-76 |

10.2.5.1.2.1 DMA Configuration

10.2.5.1.2.1.1 Main Sequence – DISPC DMA Channel Configuration

This subsequence describes the parameters of the GFX, video, or WB DMA channel parameters.

Table 10-60. Configure the GFX DMA Channel

| Step | Register / Bit Field / Programming Model | Value |
|---|---|-------|
| Set the base address for RGB pixel format or BITMAP component format according to memory access type, rotation, mirroring (see section DMA) | DISPC_GFX_BA_j [31:0] BA | 0x— |
| Set the rotation flag | DISPC_GFX_ATTRIBUTES [13:12] ROTATION | 0x— |
| Set the number of bytes to increment at the end of the row | DISPC_GFX_ROW_INC [31:0] ROWINC | 0x— |
| Set the number of bytes to increment between two pixels | DISPC_GFX_PIXEL_INC [7:0] PIXELINC | 0x— |
| Determine the FIFO preload mode | DISPC_GFX_ATTRIBUTES [11] BUFPRELOAD | 0x— |
| Set the preload value | DISPC_GFX_PRELOAD [11:0] PRELOAD | 0x— |
| Determine the burst type | DISPC_GFX_ATTRIBUTES [29] BURSTTYPE | 0x— |
| Set the burst size | DISPC_GFX_ATTRIBUTES [7:6] BURSTSIZE | 0x— |
| Set the high level of DMA FIFO threshold | DISPC_GFX_BUF_THRESHOLD [31:16] BUFHIGHTRESHOLD | 0x— |

Table 10-60. Configure the GFX DMA Channel (continued)

| Step | Register / Bit Field / Programming Model | Value |
|---|---|-------|
| Set the low level of DMA FIFO threshold | DISPC_GFX_BUF_THRESHOLD[15:0] BUFLOWTRESHOLD | 0x— |
| Enable Selfrefresh | DISPC_GFX_ATTRIBUTES[24] SELFREFRESH | 0x— |
| Select priority over the other pipeline | DISPC_GFX_ATTRIBUTES[23] ARBITRATION | 0x— |

Table 10-61. Configure the Video DMA Channel

| Step | Register / Bit Field / Programming Model | Value |
|---|--|-------|
| Set the base address for RGB pixel format or Y component format according to memory access type, rotation, mirroring (refer to section DMA) | DISPC_VIDp_BA_j[31:0] BA | 0x— |
| Set the base address for Cb and Cr components according to memory access type, rotation, mirroring (refer to section DMA) ⁽¹⁾ | DISPC_VIDp_BA_UV_j[31:0] BA | 0x— |
| Set the rotation flag | DISPC_VIDp_ATTRIBUTES[13:12] ROTATION | 0x— |
| Set the number of bytes to increment at the end of the row | DISPC_VIDp_ROW_INC[31:0] ROWINC | 0x— |
| Set the number of bytes to increment between two pixels | DISPC_VIDp_PIXEL_INC[7:0] PIXELINC | 0x— |
| Set the X original image size | DISPC_VIDp_PICTURE_SIZE[10:0] ORGSIZE_X | 0x— |
| Set the Y original image size | DISPC_VIDp_PICTURE_SIZE[26:16] ORGSIZE_Y | 0x— |
| Determine the FIFO preload mode | DISPC_VIDp_ATTRIBUTES[19] BUFPRELOAD | 0x— |
| Set the preload value | DISPC_VIDp_PRELOAD[11:0] PRELOAD | 0x— |
| Determine the burst type | DISPC_VIDp_ATTRIBUTES[29] BURSTTYPE | 0x— |
| Set the burst size | DISPC_VIDp_ATTRIBUTES[15:14] BURSTSIZE | 0x— |
| Set the high level of DMA FIFO threshold | DISPC_VIDp_BUF_THRESHOLD[31:16] BUFHIGHTRESHOLD | 0x— |
| Set the low level of DMA FIFO threshold | DISPC_VIDp_BUF_THRESHOLD[15:0] BUFLOWTRESHOLD | 0x— |
| Enable Selfrefresh | DISPC_VIDp_ATTRIBUTES[24] SELFREFRESH | 0x— |
| Select priority over the other pipeline | DISPC_VIDp_ATTRIBUTES[23] ARBITRATION | 0x— |

⁽¹⁾ Applicable only for YUV pixel format

Table 10-62. Configure the WB DMA Channel

| Step | Register / Bit Field / Programming Model | Value |
|---|--|-------|
| Set the base address for RGB pixel format or Y component format according to memory access type, rotation, mirroring (refer to section DMA) | DISPC_WB_BA_j[31:0] BA | 0x— |
| Set the base address for Cb and Cr components according to memory access type, rotation, mirroring (refer to section DMA) ⁽¹⁾ | DISPC_WB_BA_UV_j[31:0] BA | 0x— |
| Set the stride of CbCr component ⁽²⁾ | DISPC_WB_ATTRIBUTES[22] DOUBLESTRIDE | 0x— |
| Set the rotation flag | DISPC_WB_ATTRIBUTES[13:12] ROTATION | 0x— |
| Set the number of bytes to increment at the end of the row | DISPC_WB_ROW_INC[31:0] ROWINC | 0x— |
| Set the number of bytes to increment between two pixels | DISPC_WB_PIXEL_INC[7:0] PIXELINC | 0x— |
| Set the X final image size in system memory | DISPC_WB_PICTURE_SIZE[10:0] ORGSIZE_X | 0x— |
| Set the Y final image size in system memory | DISPC_WB_PICTURE_SIZE[26:16] ORGSIZE_Y | 0x— |
| Set the burst size | DISPC_WB_ATTRIBUTES[15:14] BURSTSIZE | 0x— |

⁽¹⁾ Applicable only for YUV pixel format

⁽²⁾ Applicable only for YUV pixel format

Table 10-62. Configure the WB DMA Channel (continued)

| Step | Register / Bit Field / Programming Model | Value |
|--|---|-------|
| Set the high level of DMA FIFO threshold | DISPC_WB_BUF_THRESHOLD [31:16] BUFHIGHTRESHOLD | 0x– |
| Set the low level of DMA FIFO threshold | DISPC_WB_BUF_THRESHOLD [15:0] BUFLOWTRESHOLD | 0x– |
| Select priority over the other pipeline | DISPC_WB_ATTRIBUTES [23] ARBITRATION | 0x– |

10.2.5.1.2.2 GFX Pipeline Configuration

10.2.5.1.2.2.1 Main Sequence - Configure the GFX Pipeline

This procedure details the steps for a GFX pipeline configuration described in [Table 10-63](#)

Table 10-63. Configure the GFX Pipeline

| Step | Register / Bit Field / Programming Model | Value |
|--|---|-------|
| Configure the GFX Window | Refer to Table 10-64 | |
| Configure the GFX pipeline processing | Refer to Table 10-65 | |
| Configure the GFX pipeline layer output | Refer to Table 10-67 | |
| Validate the GFX configuration according to outputs associated to the pipeline | DISPC_CONTROL1 [5] GOLCD | |
| | DISPC_CONTROL2 [5] GOLCD | |
| | DISPC_CONTROL2 [6] GOWB | |
| | DISPC_CONTROL1 [6] GOTV | |
| Enable the GFX pipeline | DISPC_GFX_ATTRIBUTES [0] ENABLE | 0x1 |

10.2.5.1.2.2.2 Subsequence - Configure the GFX Window

This subsequence describes the parameters of the image to be displayed on the LCD panel.

Table 10-64. Configure the GFX Window

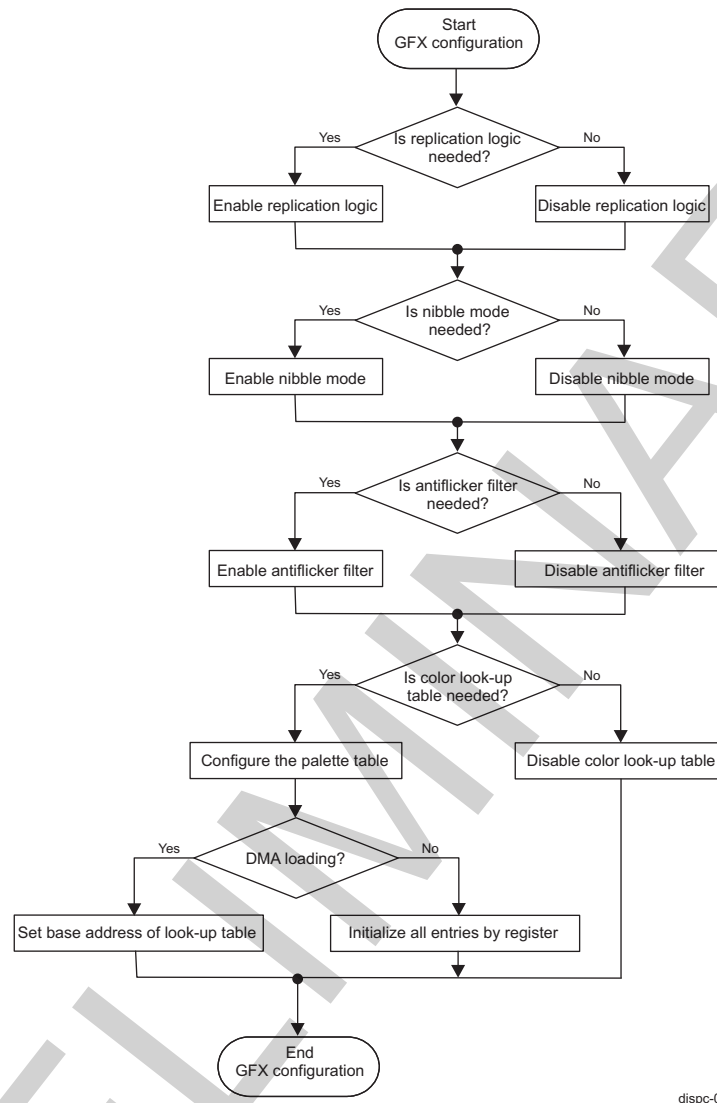
| Step | Register / Bit Field / Programming Model | Value |
|--|---|-------|
| Select the format of image | DISPC_GFX_ATTRIBUTES [4:1] FORMAT | 0x– |
| Set the X size of image to be displayed onto LCD panel | DISPC_GFX_SIZE [10:0] SIZEX | 0x– |
| Set the Y size of image to be displayed onto LCD panel | DISPC_GFX_SIZE [26:16] SIZEY | 0x– |
| Set the X position of image in respect to LCD panel | DISPC_GFX_POSITION [10:0] POSX | 0x– |
| Set the Y position of image in respect to LCD panel | DISPC_GFX_POSITION [26:16] POSY | 0x– |

10.2.5.1.2.2.3 Subsequence - Configure the GFX Pipeline Processing

Table 10-65. Configure the GFX Pipeline Processing

| Step | Register / Bit Field / Programming Model | Value |
|-----------------------------|--|-------|
| Enable replication logic | DISPC_GFX_ATTRIBUTES [5] REPLICATIONENABLE | 0x1 |
| Enable nibble mode | DISPC_GFX_ATTRIBUTES [9] NIBBLEMODE | 0x1 |
| Enable anti flicker filter | DISPC_GFX_ATTRIBUTES [24] ANTIFLICKER | 0x1 |
| Configure the palette table | Refer to Table 10-66 | 0x– |

Figure 10-92. Video Pipeline Processing Configuration



10.2.5.1.2.2.4 Subsequence - Configure the Palette Table

This subsequence resumes the settings for configuring the Color Look-Up table as palette for GFX pipeline,

NOTE:

- Software must ensure there is no visible effect when modifying the table since it is not under hardware control and the synchronization done using the DMA engine inside the DISPC to load the table when it is not used for displaying the picture on the screen is not present for this mode.
- If GFX pipeline is in BITMAP pixel format, gamma corrections is not available for LCD1.

Table 10-66. Configure the Palette Table

| Step | Register / Bit Field / Programming Model | Value |
|---|--|-------|
| Set look up table as palette table | DISPC_CONFIG1[3] PALETTEGAMMATALE | 0x0 |
| Select the load mode of the palette look-up table | DISPC_CONFIG1[2:1] LOADMODE | 0x– |

Table 10-66. Configure the Palette Table (continued)

| Step | Register / Bit Field / Programming Model | Value |
|---|---|-------|
| DMA loading | | |
| Set base address of look-up table | DISPC_GFX_TABLE_BA[31:0] TABLEBA | 0x– |
| Initialize all entries by register | | |
| Initialize all entries for the palette table by setting the table index and the RGB values associated to this index | DISPC_GAMMA_TABLE0[31:24][23:16][15:8][7:0], INDEX, VALUE_R, VALUE_G, VALUE_B | 0x– |

10.2.5.1.2.2.5 Subsequence - Configure the GFX Pipeline Layer Output

This subsequence resume the video layer settings available at the pipeline level necessary when using the overlay manager.

Table 10-67. Configure the GFX Pipeline Layer Output

| Step | Register / Bit Field / Programming Model | Value |
|---|--|-------|
| Set the LCD/TV output | DISPC_GFX_ATTRIBUTES[8] CHANNELOUT | 0x– |
| If DISPC_GFX_ATTRIBUTES[8]=0, set the LCD output | DISPC_GFX_ATTRIBUTES[31:30] CHANNELOUT2 | 0x– |
| Set the Z-order priority of the layer for overlay manager | DISPC_GFX_ATTRIBUTES[27:26] ZORDER | 0x– |
| Enable the video pipeline Z-order | DISPC_GFX_ATTRIBUTES[25] ZORDERENABLE | 0x– |
| Set the Global Alpha value for the Alpha blender unit | DISPC_GLOBAL_ALPHA[7:0] GFXGLOBALALPHA | 0x– |

10.2.5.1.2.3 Video Pipeline Configuration

10.2.5.1.2.3.1 Main Sequence - Configure the Video Pipeline

This procedure details the steps for a video pipeline configuration described in [Table 10-68](#).

Table 10-68. Configure the Video Pipeline

| Step | Register / Bit Field / Programming Model | Value |
|--|--|-------|
| Configure the video window | Refer to Table 10-69 | |
| Configure the video pipeline processing | Refer to Table 10-70 | |
| Configure the video pipeline layer output | Refer to Table 10-75 | |
| Validate the video configuration according to outputs associated to the pipeline | DISPC_CONTROL1[5] GOLCD | |
| | DISPC_CONTROL2[5] GOLCD | |
| | DISPC_CONTROL2[6] GOWB | |
| | DISPC_CONTROL1[6] GOTV | |
| Enable video pipeline | DISPC_VIDp_ATTRIBUTES[0] ENABLE | 0x1 |

10.2.5.1.2.3.2 Subsequence - Configure the Video Window

This subsequence describes the parameters of the image to be displayed on the LCD panel.

Table 10-69. Configure the Video Window

| Step | Register / Bit Field / Programming Model | Value |
|--|--|-------|
| Select the format of image | DISPC_VIDp_ATTRIBUTES[4:1] FORMAT | 0x– |
| Set the X size of image to be displayed onto LCD panel | DISPC_VIDp_SIZE[10:0] SIZE_X | 0x– |

Table 10-69. Configure the Video Window (continued)

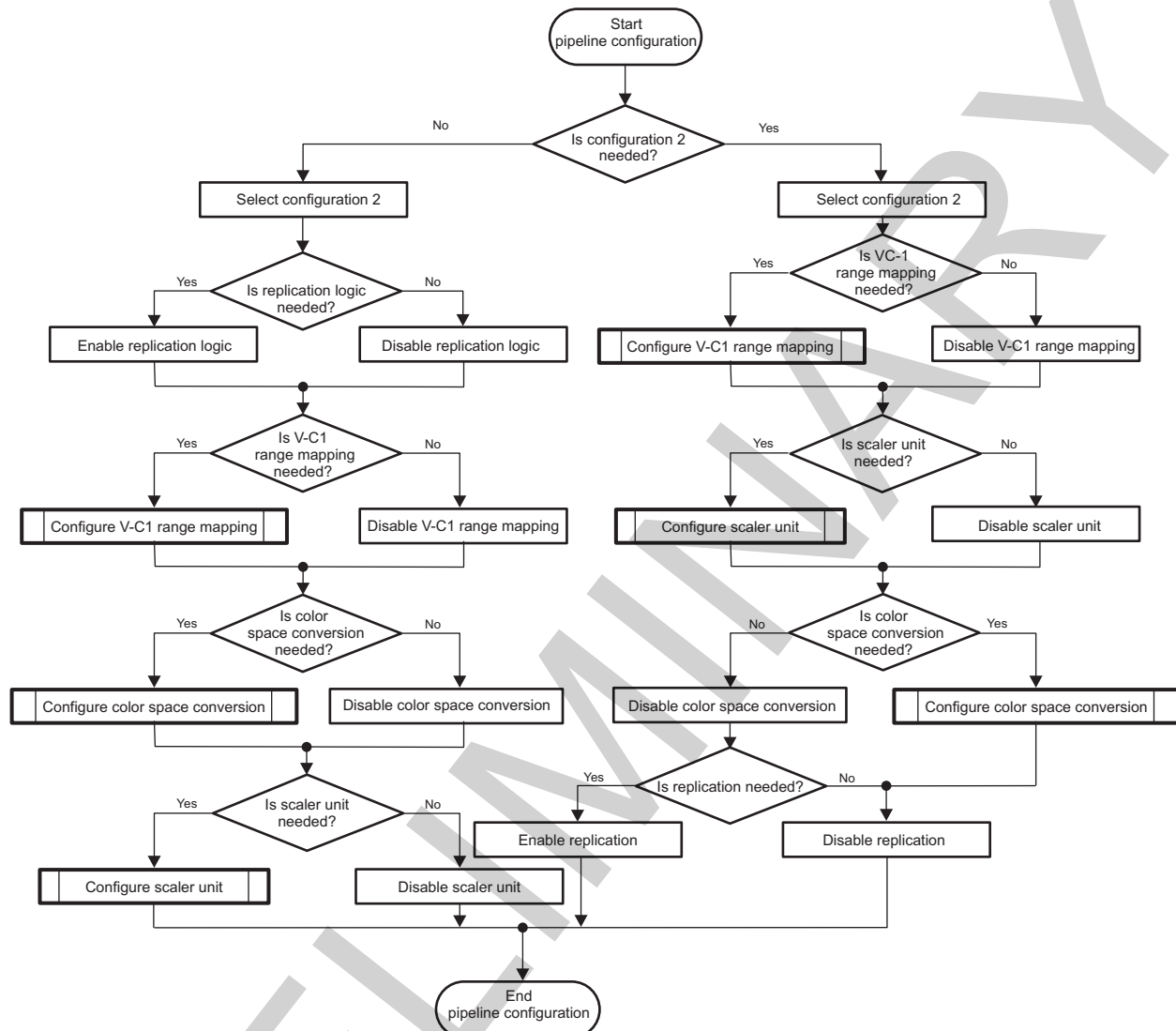
| Step | Register / Bit Field / Programming Model | Value |
|--|--|-------|
| Set the Y size of image to be displayed onto LCD panel | DISPC_VIDp_SIZE[10:0] SIZEY | 0x– |
| Set the X position of image in respect to LCD panel | DISPC_VIDp_POSITION[10:0] POSX | 0x– |
| Set the Y position of image in respect to LCD panel | DISPC_VIDp_POSITION[26:16] POSY | 0x– |

10.2.5.1.2.3.3 Subsequence - Configure the Video Pipeline Processing

Table 10-70. Configure the Video Pipeline Processing

| Step | Register / Bit Field / Programming Model | Value |
|---|---|-------|
| Select the video pipeline configuration 1 or 2 | DISPC_VIDp_ATTRIBUTES2[8] YUVCHROMARESAMPLING | 0x– |
| Enable/disable Replication Logic ⁽¹⁾ | DISPC_VIDp_ATTRIBUTES[10] REPLICATIONENABLE | 0x1 |
| Configure the VC-1 range mapping ⁽¹⁾ | Refer to Section 10.2.5.1.2.3.4 | |
| Configure the video Color Space Conversion ⁽¹⁾ | Refer to Section 10.2.5.1.2.3.5 | |
| Configure the video Scaler Unit ⁽¹⁾ | Refer to Section 10.2.5.1.2.3.6 | |

- ⁽¹⁾ This module configuration can be optional depending on:
- The video mode configuration selected, refer to [Figure 10-93](#)
 - The video format and application needs

Figure 10-93. Video Pipeline Processing Configuration

dispc-089

10.2.5.1.2.3.4 Subsequence - Configure the VC-1 Range Mapping**Table 10-71. Configure the VC-1 Range Mapping**

| Step | Register / Bit Field / Programming Model | Value |
|--|--|-------|
| Set the Y component VC-1 range mapping | DISPC_VIDp_ATTRIBUTES2[3:1] VC1_RANGE_Y | 0x– |
| Set the Cb and Cr component VC-1 range mapping | DISPC_VIDp_ATTRIBUTES2[6:4] VC1_RANGE_CBCR | 0x– |
| Enable VC-1 range mapping | DISPC_VIDp_ATTRIBUTES2[0] VC1ENABLE | 0x1 |

10.2.5.1.2.3.5 Subsequence - Configure the Video Color Space Conversion

Table 10-72. Configure the Video Color Space Conversion

| Step | Register / Bit Field / Programming Model | Value |
|--|---|-------|
| Select the range of the Color Space Conversion | DISPC_VIDp_ATTRIBUTES[11] FULLRANGE | 0x– |
| Set the RCr and RY coefficients | DISPC_VIDp_CONV_COEF0[26:16][10:0] RCR, RY | 0x– |
| Set the GY and RCB coefficients | DISPC_VIDp_CONV_COEF1[26:16][10:0] GY, RCB | 0x– |
| Set the GCb and GCr coefficients | DISPC_VIDp_CONV_COEF2[26:16][10:0] GCB, GCR | 0x– |
| Set the BCr and BY coefficients | DISPC_VIDp_CONV_COEF3[26:16][10:0] BCR, BY | 0x– |
| Set the BCb coefficient | DISPC_VIDp_CONV_COEF4[10:0] BCB | 0x– |
| Enable Color Space Conversion | DISPC_VIDp_ATTRIBUTES[9] COLORCONVENABLE | 0x1 |

10.2.5.1.2.3.6 Subsequence - Configure the Video Scaler Unit

This subsequence configures the video scaler unit. [Table 10-73](#) is applies to RGB pixel format. [Table 10-73](#) and [Table 10-74](#) apply to YUV pixel format.

Table 10-73. Configure the Video Scaler Unit for RGB Pixel Formats or Y Component

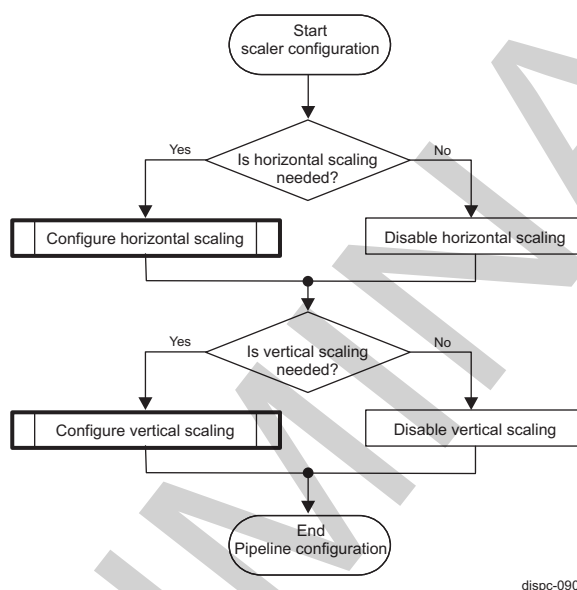
| Step | Register / Bit Field / Programming Model | Value |
|---|--|-------|
| Configure horizontal scaling | | |
| Set the horizontal resizing ratio | DISPC_VIDp_FIR[12:0] FIRHINC | 0x– |
| Set the horizontal FIR coefficients | DISPC_VIDp_FIR_COEF_H_i[31:24][23:16][15:8][7:0] FIRHC3, FIRHC2, FIRHC1, FIRHC0 | 0x– |
| | DISPC_VIDp_FIR_COEF_HV_i[7:0] FIRHC4 | 0x– |
| Set the horizontal accumulators value | DISPC_VIDp_ACCU_i[10:0] HORIZONTALACCU | 0x– |
| Configure vertical scaling | | |
| Select number of vertical taps | DISPC_VIDp_ATTRIBUTES[21] VERTICALTAPS | 0x– |
| Set the vertical resizing ratio | DISPC_VIDp_FIR[28:16] FIRVINC | 0x– |
| Set the vertical FIR coefficients for RGB pixel format or Y component | DISPC_VIDp_FIR_COEF_HV_i[31:24][23:16][15:8] FIRVC2, FIRVC1, FIRVC0 | 0x– |
| | Only for 5-taps vertical: DISPC_VIDp_FIR_COEF_V_i[15:8][7:0] FIRVC22, FIRVC00 | 0x– |
| Set the vertical accumulators value for RGB pixel format or Y component | DISPC_VIDp_ACCU_j[26:16] VERTICALACCU | 0x– |
| Enable horizontal and vertical Scaler Unit | DISPC_VIDp_ATTRIBUTES[6:5] RESIZEENABLE | 0x– |

Table 10-74. Configure the Video Scaler Unit for Cb and Cr Components

| Step | Register / Bit Field / Programming Model | Value |
|--|--|-------|
| Configure horizontal scaling | | |
| Set the horizontal resizing ratio for Cb and Cr components | DISPC_VIDp_FIR2[12:0] FIRHINC | 0x– |
| Set the horizontal FIR coefficients for Cb and Cr components | DISPC_VIDp_FIR_COEF_H2_i[31:24][23:16][15:8][7:0] FIRHC3, FIRHC2, FIRHC1, FIRHC0 | 0x– |
| | DISPC_VIDp_FIR_COEF_HV2_i[7:0] FIRHC4 | 0x– |
| Set the horizontal accumulators value for Cb and Cr components | DISPC_VIDp_ACCU2_i[10:0] HORIZONTALACCU | 0x– |
| Configure vertical scaling | | |
| Set the vertical resizing ratio for Cb and Cr components | DISPC_VIDp_FIR2[28:16] FIRVINC | 0x– |

Table 10-74. Configure the Video Scaler Unit for Cb and Cr Components (continued)

| Step | Register / Bit Field / Programming Model | Value |
|--|--|-------|
| Set the vertical FIR coefficients for Cb and Cr components | DISPC_VIDp_FIR_COEF_HV2_i[31:24][23:16][15:8] FIRVC2, FIRVC1, FIRVC0 | 0x– |
| | Only for 5-taps vertical: DISPC_VIDp_FIR_COEF_V2_i[15:8][7:0] FIRVC22, FIRVC00 | 0x– |
| Set the vertical accumulators value for Cb and Cr components | DISPC_VIDp_ACCU2_j[26:16] VERTICALACCU | 0x– |

Figure 10-94. Scaler Unit Programming Flow

10.2.5.1.2.3.7 Subsequence - Configure the Video Pipeline Layer Output

This subsequence resume the video layer settings available at the pipeline level necessary when using the overlay manager.

Table 10-75. Configure the Video Pipeline Layer Output

| Step | Register / Bit Field / Programming Model | Value |
|---|---|-------|
| Set the LCD/TV output | DISPC_VIDp_ATTRIBUTES[16] CHANNELOUT | 0x– |
| If DISPC_VIDp_ATTRIBUTES[16]=0, set the LCD output | DISPC_VIDp_ATTRIBUTES[31:30] CHANNELOUT2 | 0x– |
| Set the Z-order priority of the layer for overlay manager | DISPC_VIDp_ATTRIBUTES[27:26] ZORDER | 0x– |
| Enable the video pipeline Z-order | DISPC_VIDp_ATTRIBUTES[25] ZORDERENABLE | 0x– |
| Set the Global Alpha value for the Alpha blender unit | DISPC_GLOBAL_ALPHA[31:24][23:16][15:8] VID3GLOBALALPHA, VID2GLOBALALPHA , VID1GLOBALALPHA | 0x– |

10.2.5.1.2.4 WB Pipeline Configuration

10.2.5.1.2.4.1 Main Sequence - Configure the WB Pipeline

This procedure details the steps for a WB pipeline configuration described in [Table 10-76](#).

Table 10-76. Configure the WB Pipeline

| Step | Register / Bit Field / Programming Model | Value |
|--|---|-------|
| Configure the Capture window | Refer to Table 10-77 | |
| Configure the WB Scaler unit | Refer to Table 10-78 | |
| Enable truncation logic to match pixel size defined in the format of image DISPC_WB_ATTRIBUTES [4:1] FORMAT | DISPC_WB_ATTRIBUTES [10] TRUNCATIONENABLE | 0x– |
| if DISPC_WB_ATTRIBUTES [10] != , Configure the WB Color Space Conversion unit | Refer to Table 10-80 | |
| Validate the configuration according to the registers modification. ⁽¹⁾ | DISPC_CONTROL2 [6] GOWB | |
| Enable WB pipeline | DISPC_WB_ATTRIBUTES [0] ENABLE | 0x1 |

⁽¹⁾ Setting the GOWB bit is required only in WB capture mode; it is not required in WB memory-to-memory mode.

10.2.5.1.2.4.2 Subsequence - Configure the Capture Window

This subsequence describes the parameters of the image to be captured in the system memory.

Table 10-77. Configure the Capture Window

| Step | Register / Bit Field / Programming Model | Value |
|--|---|-------|
| Set the input source | DISPC_WB_ATTRIBUTES [18:16] CHANNELIN | 0x– |
| Select the format of image | DISPC_WB_ATTRIBUTES [4:1] FORMAT | 0x– |
| Set the X size of image to be captured | DISPC_WB_SIZE [10:0] SIZEX | 0x– |
| Set the Y size of image to be captured | DISPC_WB_SIZE [10:0] SIZEY | 0x– |

10.2.5.1.2.4.3 Subsequence - Configure the WB Scaler Unit

This subsequence configures the scaler unit. [Table 10-73](#) is applicable for RGB pixel format. [Table 10-73](#) and [Table 10-74](#) are applicable for YUV pixel format.

Table 10-78. Configure the WB Scaler Unit for RGB Pixel Formats or Y Component

| Step | Register / Bit Field / Programming Model | Value |
|---|---|-------|
| Configure horizontal scaling | | |
| Set the horizontal resizing ratio | DISPC_WB_FIR [12:0] FIRHINC | 0x– |
| Set the horizontal FIR coefficients | DISPC_WB_FIR_COEF_H_i [31:24][23:16][15:8][7:0] FIRHC3, FIRHC2, FIRHC1, FIRHC0 | 0x– |
| | DISPC_WB_FIR_COEF_HV_i [7:0] FIRHC4 | 0x– |
| Set the horizontal accumulators value | DISPC_WB_ACCU_i [10:0] HORIZONTALACCU | 0x– |
| Configure vertical scaling | | |
| Select number of vertical taps | DISPC_WB_ATTRIBUTES [21] VERTICALTAPS | 0x– |
| Set the vertical resizing ratio | DISPC_WB_FIR [28:16] FIRVINC | 0x– |
| Set the vertical FIR coefficients for RGB pixel format or Y component | DISPC_WB_FIR_COEF_HV_i [31:24][23:16][15:8] FIRVC2, FIRVC1, FIRVC0 | 0x– |
| | Only for 5-taps vertical: DISPC_WB_FIR_COEF_V_i [15:8][7:0] FIRVC22, FIRVC00 | 0x– |
| Set the vertical accumulators value for RGB pixel format or Y component | DISPC_WB_ACCU_i [26:16] VERTICALACCU | 0x– |
| Enable horizontal and vertical Scaler Unit | DISPC_WB_ATTRIBUTES [6:5] RESIZEENABLE | 0x– |

Table 10-79. Configure the WB Scaler Unit for Cb and Cr Components

| Step | Register / Bit Field / Programming Model | Value |
|--|---|-------|
| Configure horizontal scaling | | |
| Set the horizontal resizing ratio for Cb and Cr components | DISPC_WB_FIR2[12:0] FIRHINC | 0x– |
| Set the horizontal FIR coefficients for Cb and Cr components | DISPC_WB_FIR_COEF_H2_i[31:24][23:16][15:8][7:0] FIRHC3, FIRHC2, FIRHC1, FIRHC0 | 0x– |
| | DISPC_WB_FIR_COEF_HV2_i[7:0] FIRHC4 | 0x– |
| Set the horizontal accumulators value for Cb and Cr components | DISPC_WB_ACCU2_i[10:0] HORIZONTALACCU | 0x– |
| Configure vertical scaling | | |
| Set the vertical resizing ratio for Cb and Cr components | DISPC_WB_FIR2[28:16] FIRVINC | 0x– |
| Set the vertical FIR coefficients for Cb and Cr components | DISPC_WB_FIR_COEF_HV2_i[31:24][23:16][15:8] FIRVC2, FIRVC1, FIRVC0 | 0x– |
| | Only for 5-taps vertical: DISPC_WB_FIR_COEF_V2_i[15:8][7:0] FIRVC22, FIRVC00 | 0x– |
| Set the vertical accumulators value for Cb and Cr components | DISPC_WB_ACCU2_i[26:16] VERTICALACCU | 0x– |

10.2.5.1.2.4.4 Subsequence - Configure the WB Color Space Conversion Unit

Table 10-80. Configure the WB Color Space Conversion Unit

| Step | Register / Bit Field / Programming Model | Value |
|--|---|-------|
| Select the range of the Color Space Conversion | DISPC_WB_ATTRIBUTES[11] FULLRANGE | 0x– |
| Set the RCr and RY coefficients | DISPC_WB_CONV_COEF0[26:16][10:0] YG, YR | 0x– |
| Set the GY and RCb coefficients | DISPC_WB_CONV_COEF1[26:16][10:0] CRR, YB | 0x– |
| Set the GCb and GCr coefficients | DISPC_WB_CONV_COEF2[26:16][10:0] CRB, CRG | 0x– |
| Set the BCr and BY coefficients | DISPC_WB_CONV_COEF3[26:16][10:0] CBG, CBR | 0x– |
| Set the BCb coefficient | DISPC_WB_CONV_COEF4[10:0] CBB | 0x– |
| Enable Color Space Conversion | DISPC_WB_ATTRIBUTES[9] COLORCONVENABLE | 0x1 |

10.2.5.1.2.5 LCD Output Configuration

10.2.5.1.2.5.1 Main Sequence - Configure the LCD Output

This procedure details the LCD output configuration.

Table 10-81. Configure the LCD Output

| Step | Register / Bit Field / Programming Model |
|---|--|
| Configure the LCD overlay manager | Table 10-82 |
| Configure the gamma table for gamma correction | Section 10.2.5.1.2.5.3 |
| Configure the Color Phase Rotation | Table 10-85 |
| Configure the LCD panel timings and parameters | Table 10-86 |
| Validate the LCD output configuration according | DISPC_CONTROL1[5] GOLCD |
| | DISPC_CONTROL2[5] GOLCD |
| Enable LCD output | DISPC_CONTROL1[0] LCDENABLE |
| | DISPC_CONTROL2[0] LCDENABLE |

10.2.5.1.2.5.2 Subsequence - Configure the Overlay Manager

This subsequence resumes the overlay manager settings and transparency color key configuration.

Table 10-82. Configure the LCD Overlay Manager

| Step | Register / Bit Field / Programming Model | Value |
|---|--|-------|
| Set the LCD panel background color | DISPC_DEFAULT_COLORo[23:0] DEFAULTCOLOR | 0x– |
| Enable/Disable overlay optimization | DISPC_CONTROLo[12] OVERLAYOPTIMIZATION | 0x– |
| Enable the Alpha blender ⁽¹⁾ | DISPC_CONFIG1[18] LCDALPHABLENDERENABLE | 0x1 |
| Configure the transparency color key | | |
| Set source or destination transparency color key mode | DISPC_CONFIGo[11] TCKLCDSELECTION | 0x– |
| Set the transparency color value | DISPC_TRANS_COLORo[23:0] TRANSCOLORKEY | 0x– |
| Enable transparency color key mode | DISPC_CONFIGo[10] TCKLCDENABLE | 0x– |

⁽¹⁾ Backward compatibility with only available for LCD1.

10.2.5.1.2.5.3 Subsequence - Configure the Gamma Table for Gamma Correction

This subsequence resumes the settings for configuring the gamma correction for LCD1, see [Table 10-83](#) and LCD2, see [Table 10-84](#).

NOTE:

- Software must ensure there is no visible effect when modifying the table because it is not under hardware control and the synchronization done using the DMA engine inside the DISPC to load the table when it is not used for displaying the picture on the screen is not present for this mode.
- If GFX pipeline is in BITMAP pixel format, gamma corrections is not available for LCD1.

Table 10-83. Configure the Gamma Table for LCD1

| Step | Register / Bit Field / Programming Model | Value |
|---|---|-------|
| Initialize all entries for the gamma table by setting the table index and the RGB values associated to this index | DISPC_GAMMA_TABLE0[31:24][23:16][15:8][7:0], INDEX, VALUE_R, VALUE_G, VALUE_B | 0x– |
| Set look up table as gamma table | DISPC_CONFIG1[3] PALETTEGAMMATALE | 0x1 |
| Select the load mode of the Gamma look-up table | DISPC_CONFIG1[2:1] LOADMODE | 0x– |

Table 10-84. Configure the Gamma Table for LCD2

| Step | Register / Bit Field / Programming Model | Value |
|--|---|-------|
| Enable Gamma table for LCD2 and TV | DISPC_CONFIG1[9] GAMATABLEENABLE | 0x1 |
| Initialize all entries for the gamma table by setting the table index and the RGB values associated to this index. | DISPC_GAMMA_TABLE1[31:24][23:16][15:8][7:0], INDEX, VALUE_R, VALUE_G, VALUE_B | 0x– |

10.2.5.1.2.5.4 Subsequence - Configure the Color Phase Rotation

[Table 10-85](#) resumes the settings for the Color Phase Rotation unit.

Table 10-85. Configure the Color Phase Rotation

| Step | Register / Bit Field / Programming Model | Value |
|----------------------------|--|-------|
| Set the Red coefficients | DISPC_CPRo_COEF_R [31:22][20:11][9:0] RR, RG, RB | 0x– |
| Set the Green coefficients | DISPC_CPRo_COEF_G [31:22][20:11][9:0] GR, GG, GB | 0x– |

Table 10-85. Configure the Color Phase Rotation (continued)

| Step | Register / Bit Field / Programming Model | Value |
|--|--|-------|
| Set the Blue coefficients | DISPC_CPRo_COEF_B [31:22][20:11][9:0] BR, BG, BB | 0x– |
| Disable Color Phase Rotation unit in RGB to YUV conversion | DISPC_CONFIGo[24] COLORCONVENABLE | 0x0 |
| Enable Color Phase Rotation unit | DISPC_CONFIGo[15] CPR | 0x1 |

10.2.5.1.2.5.5 Subsequence - Configure the LCD Panel Timings and Parameters

This subsequence resumes the setting for horizontal and vertical synchronization and also the signals polarity.

Table 10-86. Configure the LCD Panel Timings and Parameters

| Step | Register / Bit Field / Programming Model | Value |
|---|--|-------|
| Configure Spatial/Temporal Dithering | | |
| Select Spatial/Temporal number of frames | DISPC_CONTROLo[31:30] SPATIALTEMPORALDITHERINGFRAMES | 0x– |
| Enable Spatial/Temporal dithering | DISPC_CONTROLo[7] STDITHERENABLE | 0x– |
| Configure AC-bias | | |
| Configure the VSYNC, HSYNC and AC bias polarity | DISPC_POL_FREQo | 0x– |
| Configure the gating of AC bias polarity | DISPC_CONFIGo[8] ACBIASGATED | 0x– |
| Configure the AC bias polarity | DISPC_POL_FREQo[15] IEO | 0x– |
| Set the AC bias frequency | DISPC_POL_FREQo[7:0] ACB | 0x– |
| Set the number of AC bias transitions per interrupt | DISPC_POL_FREQo[11:8] ACBI | 0x– |
| Configure the pixel clock | | |
| Set the DISPC logic clock divisor | DISPC_DIVISORo[23:16] LCD | 0x– |
| Set the pixel clock divisor | DISPC_DIVISORo[7:0] PCD | 0x– |
| Configure the gating of Pixel clock | DISPC_CONFIGo[5] PIXELCLOCKGATED | 0x– |
| Configure the data | | |
| Set the pixel clock edge to drive data output | DISPC_POL_FREQo[14] IPC | 0x– |
| Configure the gating of data output | DISPC_CONFIGo[4] PIXELDATAGATED | 0x– |
| Set the data output mode | DISPC_CONFIGo[22] OUTPUTMODEENABLE | 0x– |
| Configure the panel parameters | | |
| Set the vertical TV size | DISPC_SIZE_LCDo[26:16] LPP | 0x– |
| Set the horizontal TV size | DISPC_SIZE_LCDo[10:0] PPL | 0x– |
| Set the panel type | DISPC_CONTROLo[3] STNTFT | 0x– |
| Configure the refresh rate and horizontal and vertical parameters | | |
| Set the vertical synchronization timing | DISPC_TIMING_Vo[31:20][19:8][7:0], VBP, VFP, VSW | 0x– |
| Configure the VSYNC polarity | DISPC_POL_FREQo[12] IVS | 0x– |
| Configure the gating of VSYNC | DISPC_CONFIGo[7] VSYNCGATED | 0x– |
| Set the horizontal synchronization timing | DISPC_TIMING_Ho[31:20][19:8][7:0], HBP, HFP, HSW | 0x– |
| Configure the HSYNC polarity | DISPC_POL_FREQo[13] IHS | 0x– |
| Configure the gating of HSYNC | DISPC_CONFIGo[6] HSYNCGATED | 0x– |
| Set the opposition of HSYNC and VSYNC driving | DISPC_POL_FREQo[17] ONOFF | 0x– |
| If DISPC_POL_FREQo[17] = 1, set the pixel clock edge to drive HSYNC and VSYNC | DISPC_POL_FREQo[16] RF | 0x– |
| Set the alignment of HSYNC and VSYNC | DISPC_POL_FREQo[18] ALIGN | 0x– |

10.2.5.1.2.6 TV Output Configuration

Main Sequence - Configure the TV Output

This procedure details the TV output configuration.

Table 10-87. Configure the TV Output

| Step | Register / Bit Field / Programming Model |
|--|---|
| Configure the TV overlay manager | Refer to Table 10-88 |
| Configure the gamma table for gamma correction | Refer to Table 10-89 |
| Configure the TV panel timings and parameters | Refer to Table 10-90 |
| Validate the TV output configuration according | DISPC_CONTROL1 [6] GOTV |
| Enable TV output | DISPC_CONTROL1 [1] TVENABLE |

10.2.5.1.2.6.1 Subsequence - Configure the TV Overlay Manager

This subsequence resumes the overlay manager settings and transparency color key configuration.

Table 10-88. Configure the TV Overlay Manager

| Step | Register / Bit Field / Programming Model | Value |
|---|--|-------|
| Set the TV panel background color | DISPC_DEFAULT_COLOR1 [23:0] DEFAULTCOLOR | 0x– |
| Enable/Disable overlay optimization | DISPC_CONTROL2 [13] TVOVERLAYOPTIMIZATION | 0x– |
| Enable the Alpha blender ⁽¹⁾ | DISPC_CONFIG1 [19] TVALPHABLENDERENABLE | 0x1 |
| Configure the transparency color key | | |
| Set source or destination transparency color key mode | DISPC_CONFIG1 [13] TCKTVSELECTION | 0x– |
| Set the transparency color value | DISPC_TRANS_COLOR1 [23:0] TRANSCOLORKEY | 0x– |
| Enable transparency color key mode | DISPC_CONFIG1 [10] TCKTVENABLE | 0x– |

⁽¹⁾ Backward compatibility with .

10.2.5.1.2.6.2 Subsequence - Configure the Gamma Table for Gamma Correction

NOTE:

- Software must ensure there is no visible effect when modifying the table since it is not under hardware control and the synchronization done using the DMA engine inside the DISPC to load the table when it is not used for displaying the picture on the screen is not present for this mode.

Table 10-89. Configure the Gamma Table for TV Output

| Step | Register / Bit Field / Programming Model | Value |
|--|---|-------|
| Enable Gamma table for LCD2 and TV | DISPC_CONFIG1 [9] GAMATABLEENABLE | 0x1 |
| Initialize all entries for the gamma table by setting the table index and the RGB values. For more information, see Section 10.2.4.13.2, Gamma Correction Unit . | DISPC_GAMMA_TABLE2 [31][29:20][19:10][9:0], INDEX, VALUE_R, VALUE_G, VALUE_B | 0x– |

10.2.5.1.2.6.3 Subsequence - Configure the TV Panel Timings and Parameters

This subsequence resumes the setting for horizontal and vertical synchronization and also the signals polarity.

Table 10-90. Configure the TV Panel Timings and Parameters

| Step | Register / Bit Field / Programming Model | Value |
|---------------------------------------|--|--|
| Set the hold time for TV data outputs | DISPC_CONFIG1[19:17] | 0x– |
| Set the vertical TV size | DISPC_SIZE_TV[26:16] LPP | See Table 10-91 for HD standards |
| Set the horizontal TV size | DISPC_SIZE_TV[10:0] PPL | |

Table 10-91. DISPC_SIZE_TV Values HD Standard

| Standards | | Active Pixels/line (PPL) | Active Lines (LPP) | Digital clock (DISPC_CTRL01. HT=0) | DISPC_SIZE_TV |
|-----------|-------|--------------------------|--------------------|---------------------------------------|---------------|
| HDTV | 720p | 1280 | 720 | 74.25/74.125 MHz (60/59.99..frames/s) | 0x02CF04FF |
| | 1080i | 1920 | 540 | 74.25/74.125 MHz (60/59.99..fields/s) | 0x021B07FF |
| | 1080p | 1920 | 1080 | 148.5/148.25 MHz (60/59.99..frames/s) | 0x043707FF |

10.2.6 Display Controller Use Cases and Tips

10.2.6.1 Hardware Cursor

The video layer or graphics layer can be used to display the hardware cursor. The encoded pixel data for the cursor image are in xRGB12-4444, ARGB16-4444, RGBx12-4444, RGBA16-4444, ARGB16-1555, RGB16-565, RGB24-888, xRGB24-88888, RGBA32-8888 or ARGB32-8888 formats if the source transparency color key is used; otherwise, any pixel format can be used for the cursor image considering the limitation in term of pixel supported by the pipeline used to display the cursor image. To display nonrectangle cursor, the transparency color key can be used or the alpha blending (pixel alpha blending); see [Section 10.2.4.12.1.3](#). The global alpha blending can be used in addition to the transparency source color key to make some fading effect when the cursor (with a nonrectangle shape) appears and disappears on the screen. The image of the cursor can be stored totally inside the DMA buffer in order to use the self-refresh mode (see [Section 10.2.4.6.8.2](#)). In that case, the image is loaded once and then displayed without accessing the system memory for loading the image for each frame. This saves bandwidth on interconnect and memory.

10.2.7 Display Controller Register Manual

CAUTION

The main access to all DISPC registers is through the L3 interconnect.
The access through L4_PER interconnect is provided for back software compatibility.

10.2.7.1 Display Controller Instance Summary

Table 10-92. DISPC Instance Summary

| Module Name | L4_PER Base Address | L3 Base Address | Size |
|-------------|---------------------|-----------------|------|
| DISPC | 0x4804 1000 | 0x5800 1000 | 4KB |

10.2.7.2 Display Controller Logical Register Mapping

Table 10-93. DISPC_VIDp_BA_j Logical Register Mapping

| Hardware Register | Description |
|---------------------------------|----------------------------------|
| DISPC_VID1_BA_j | Base Address of Video Pipeline 1 |
| DISPC_VID2_BA_j | Base Address of Video Pipeline 2 |
| DISPC_VID3_BA_j | Base Address of Video Pipeline 3 |

Table 10-94. DISPC_VIDp_BA_UV_j Logical Register Mapping

| Hardware Register | Description |
|------------------------------------|--|
| DISPC_VID1_BA_UV_j | Base Address of UV components for Video Pipeline 1 |
| DISPC_VID2_BA_UV_j | Base Address of UV components for Video Pipeline 2 |
| DISPC_VID3_BA_UV_j | Base Address of UV components for Video Pipeline 3 |

Table 10-95. DISPC_VIDp_POSITION Logical Register Mapping

| Hardware Register | Description |
|-------------------------------------|--------------------------------|
| DISPC_VID1_POSITION | Position of the video window 1 |
| DISPC_VID2_POSITION | Position of the video window 2 |
| DISPC_VID3_POSITION | Position of the video window 3 |

Table 10-96. DISPC_VIDp_SIZE Logical Register Mapping

| Hardware Register | Description |
|---------------------------------|----------------------------|
| DISPC_VID1_SIZE | Size of the video window 1 |
| DISPC_VID2_SIZE | Size of the video window 2 |
| DISPC_VID3_SIZE | Size of the video window 3 |

Table 10-97. DISPC_VIDp_ATTRIBUTES Logical Register Mapping

| Hardware Register | Description |
|---------------------------------------|---------------------------------------|
| DISPC_VID1_ATTRIBUTES | Configuration of the video pipeline 1 |
| DISPC_VID2_ATTRIBUTES | Configuration of the video pipeline 2 |
| DISPC_VID3_ATTRIBUTES | Configuration of the video pipeline 3 |

Table 10-98. DISPC_VIDp_ATTRIBUTES2 Logical Register Mapping

| Hardware Register | Description |
|--|---------------------------------------|
| DISPC_VID1_ATTRIBUTES2 | Configuration of the video pipeline 1 |
| DISPC_VID2_ATTRIBUTES2 | Configuration of the video pipeline 2 |
| DISPC_VID3_ATTRIBUTES2 | Configuration of the video pipeline 3 |

Table 10-99. DISPC_VIDp_BUF_THRESHOLD Logical Register Mapping

| Hardware Register | Description |
|--|--|
| DISPC_VID1_BUF_THRESHOLD | Configuration of the buffer for the video pipeline 1 |
| DISPC_VID2_BUF_THRESHOLD | Configuration of the buffer for the video pipeline 2 |
| DISPC_VID3_BUF_THRESHOLD | Configuration of the buffer for the video pipeline 3 |

Table 10-100. DISPC_VIDp_ROW_INC Logical Register Mapping

| Hardware Register | Description |
|------------------------------------|---|
| DISPC_VID1_ROW_INC | Configuration of the row increment for the video pipeline 1 |
| DISPC_VID2_ROW_INC | Configuration of the row increment for the video pipeline 2 |
| DISPC_VID3_ROW_INC | Configuration of the row increment for the video pipeline 3 |

Table 10-101. DISPC_VIDp_PIXEL_INC Logical Register Mapping

| Hardware Register | Description |
|--------------------------------------|---|
| DISPC_VID1_PIXEL_INC | Configuration of the pixel increment for the video pipeline 1 |
| DISPC_VID2_PIXEL_INC | Configuration of the pixel increment for the video pipeline 2 |
| DISPC_VID3_PIXEL_INC | Configuration of the pixel increment for the video pipeline 3 |

Table 10-102. DISPC_VIDp_FIR Logical Register Mapping

| Hardware Register | Description |
|--------------------------------|--|
| DISPC_VID1_FIR | Configuration of the scaler for the video pipeline 1 |
| DISPC_VID2_FIR | Configuration of the scaler for the video pipeline 2 |
| DISPC_VID3_FIR | Configuration of the scaler for the video pipeline 3 |

Table 10-103. DISPC_VIDp_PICTURE_SIZE Logical Register Mapping

| Hardware Register | Description |
|---|--|
| DISPC_VID1_PICTURE_SIZE | Size of the video window 1 before processing |
| DISPC_VID2_PICTURE_SIZE | Size of the video window 2 before processing |
| DISPC_VID3_PICTURE_SIZE | Size of the video window 3 before processing |

Table 10-104. DISPC_VIDp_ACCU_j Logical Register Mapping

| Hardware Register | Description |
|-----------------------------------|---|
| DISPC_VID1_ACCU_j | Configuration of the accumulator for the video pipeline 1 |
| DISPC_VID2_ACCU_j | Configuration of the accumulator for the video pipeline 2 |
| DISPC_VID2_ACCU_j | Configuration of the accumulator for the video pipeline 3 |

Table 10-105. DISPC_VIDp_FIR_COEF_H_i Logical Register Mapping

| Hardware Register | Description |
|---|---|
| DISPC_VID1_FIR_COEF_H_i | Configuration of the horizontal scaling coefficients for the video pipeline 1 |
| DISPC_VID2_FIR_COEF_H_i | Configuration of the horizontal scaling coefficients for the video pipeline 2 |
| DISPC_VID3_FIR_COEF_H_i | Configuration of the horizontal scaling coefficients or the video pipeline 3 |

Table 10-106. DISPC_VIDp_FIR_COEF_HV_i Logical Register Mapping

| Hardware Register | Description |
|--|---|
| DISPC_VID1_FIR_COEF_HV_i | Configuration of the horizontal scaling coefficients for the video pipeline 1 |
| DISPC_VID2_FIR_COEF_HV_i | Configuration of the horizontal scaling coefficients for the video pipeline 2 |
| DISPC_VID3_FIR_COEF_HV_i | Configuration of the horizontal scaling coefficients for the video pipeline 3 |

Table 10-107. DISPC_VIDp_FIR_COEF_V_i Logical Register Mapping

| Hardware Register | Description |
|---|---|
| DISPC_VID1_FIR_COEF_V_i | Configuration of the vertical scaling coefficients for the video pipeline 1 |
| DISPC_VID2_FIR_COEF_V_i | Configuration of the vertical scaling coefficients for the video pipeline 2 |
| DISPC_VID3_FIR_COEF_V_i | Configuration of the vertical scaling coefficients for the video pipeline 3 |

Table 10-108. DISPC_VIDp_FIR_COEF_H2_i Logical Register Mapping

| Hardware Register | Description |
|--|---|
| DISPC_VID1_FIR_COEF_H2_i | Configuration of the horizontal Cb and Cr scaling coefficients for the video pipeline 1 |
| DISPC_VID2_FIR_COEF_H2_i | Configuration of the horizontal Cb and Cr scaling coefficients for the video pipeline 2 |
| DISPC_VID3_FIR_COEF_H2_i | Configuration of the horizontal Cb and Cr scaling coefficients or the video pipeline 3 |

Table 10-109. DISPC_VIDp_FIR_COEF_HV2_i Logical Register Mapping

| Hardware Register | Description |
|---|---|
| DISPC_VID1_FIR_COEF_HV2_i | Configuration of the horizontal Cb and Cr scaling coefficients for the video pipeline 1 |
| DISPC_VID2_FIR_COEF_HV2_i | Configuration of the horizontal Cb and Cr scaling coefficients for the video pipeline 2 |
| DISPC_VID3_FIR_COEF_HV2_i | Configuration of the horizontal Cb and Cr scaling coefficients for the video pipeline 3 |

Table 10-110. DISPC_VIDp_FIR_COEF_V2_i Logical Register Mapping

| Hardware Register | Description |
|--|---|
| DISPC_VID1_FIR_COEF_V2_i | Configuration of the vertical Cb and Cr scaling coefficients for the video pipeline 1 |
| DISPC_VID2_FIR_COEF_V2_i | Configuration of the vertical Cb and Cr scaling coefficients for the video pipeline 2 |
| DISPC_VID3_FIR_COEF_V2_i | Configuration of the vertical Cb and Cr scaling coefficients for the video pipeline 3 |

Table 10-111. DISPC_VIDp_CONV_COEF0 Logical Register Mapping

| Hardware Register | Description |
|---------------------------------------|---|
| DISPC_VID1_CONV_COEF0 | Configuration of the Color Space Conversion coefficients for the video pipeline 1 |
| DISPC_VID2_CONV_COEF0 | Configuration of the Color Space Conversion coefficient for the video pipeline 2 |
| DISPC_VID3_CONV_COEF0 | Configuration of the Color Space Conversion coefficient for the video pipeline 3 |

Table 10-112. DISPC_VIDp_CONV_COEF1 Logical Register Mapping

| Hardware Register | Description |
|---------------------------------------|---|
| DISPC_VID1_CONV_COEF1 | Configuration of the Color Space Conversion coefficients for the video pipeline 1 |
| DISPC_VID2_CONV_COEF1 | Configuration of the Color Space Conversion coefficient for the video pipeline 2 |
| DISPC_VID3_CONV_COEF1 | Configuration of the Color Space Conversion coefficient for the video pipeline 3 |

Table 10-113. DISPC_VIDp_CONV_COEF2 Logical Register Mapping

| Hardware Register | Description |
|---------------------------------------|---|
| DISPC_VID1_CONV_COEF2 | Configuration of the Color Space Conversion coefficients for the video pipeline 1 |
| DISPC_VID2_CONV_COEF2 | Configuration of the Color Space Conversion coefficient for the video pipeline 2 |
| DISPC_VID3_CONV_COEF2 | Configuration of the Color Space Conversion coefficient for the video pipeline 3 |

Table 10-114. DISPC_VIDp_CONV_COEF3 Logical Register Mapping

| Hardware Register | Description |
|---------------------------------------|---|
| DISPC_VID1_CONV_COEF3 | Configuration of the Color Space Conversion coefficients for the video pipeline 1 |
| DISPC_VID2_CONV_COEF3 | Configuration of the Color Space Conversion coefficient for the video pipeline 2 |
| DISPC_VID3_CONV_COEF3 | Configuration of the Color Space Conversion coefficient for the video pipeline 3 |

Table 10-115. DISPC_VIDp_CONV_COEF4 Logical Register Mapping

| Hardware Register | Description |
|---------------------------------------|---|
| DISPC_VID1_CONV_COEF4 | Configuration of the Color Space Conversion coefficients for the video pipeline 1 |
| DISPC_VID2_CONV_COEF4 | Configuration of the Color Space Conversion coefficient for the video pipeline 2 |
| DISPC_VID3_CONV_COEF4 | Configuration of the Color Space Conversion coefficient for the video pipeline 3 |

Table 10-116. DISPC_CONTROLo Logical Register Mapping

| Hardware Register | Description |
|--------------------------------|---|
| DISPC_CONTROL1 | Configuration control of the LCD1 and TV. |
| DISPC_CONTROL2 | Configuration control of the LCD2. |

Table 10-117. DISPC_CONFIGo Logical Register Mapping

| Hardware Register | Description |
|-------------------------------|-----------------------------------|
| DISPC_CONFIG1 | Configuration of the LCD1 and TV. |
| DISPC_CONFIG2 | Configuration of the LCD2. |

Table 10-118. DISPC_DEFAULT_COLORo Logical Register Mapping

| Hardware Register | Description |
|--------------------------------------|---|
| DISPC_DEFAULT_COLOR0 | Configuration of the background color for LCD1. |
| DISPC_DEFAULT_COLOR1 | Configuration of the background color for LCD2. |

Table 10-119. DISPC_TRANS_COLORo Logical Register Mapping

| Hardware Register | Description |
|------------------------------------|---|
| DISPC_TRANS_COLOR0 | Configuration of the transparency color key for LCD1. |
| DISPC_TRANS_COLOR1 | Configuration of the transparency color key for LCD2. |

Table 10-120. DISPC_GAMMA_TABLEo Logical Register Mapping

| Hardware Register | Description |
|------------------------------------|---|
| DISPC_GAMMA_TABLE0 | Configuration of the palette table for GFX or the gamma table for LCD1. |
| DISPC_GAMMA_TABLE1 | Configuration of the gamma table for LCD2. |
| DISPC_GAMMA_TABLE2 | Configuration of the gamma table for TV output. |

Table 10-121. DISPC_TIMING_Ho Logical Register Mapping

| Hardware Register | Description |
|---------------------------------|--|
| DISPC_TIMING_H1 | Configuration of the horizontal timing for LCD1. |
| DISPC_TIMING_H2 | Configuration of the horizontal timing for LCD2. |

Table 10-122. DISPC_TIMING_Vo Logical Register Mapping

| Hardware Register | Description |
|---------------------------------|--|
| DISPC_TIMING_V1 | Configuration of the vertical timing for LCD1. |
| DISPC_TIMING_V2 | Configuration of the vertical timing for LCD2. |

Table 10-123. DISPC_POL_FREQo Logical Register Mapping

| Hardware Register | Description |
|---------------------------------|---|
| DISPC_POL_FREQ1 | Configuration of the output signals for LCD1. |
| DISPC_POL_FREQ2 | Configuration of the output signals for LCD2. |

Table 10-124. DISPC_DIVISORo Logical Register Mapping

| Hardware Register | Description |
|--------------------------------|---|
| DISPC_DIVISOR1 | Configuration of the divisors for LCD1. |
| DISPC_DIVISOR2 | Configuration of the divisors for LCD2. |

Table 10-125. DISPC_SIZE_LCDo Logical Register Mapping

| Hardware Register | Description |
|---------------------------------|---|
| DISPC_SIZE_LCD1 | Configuration of the divisors for LCD1. |
| DISPC_SIZE_LCD2 | Configuration of the divisors for LCD2. |

Table 10-126. DISPC_SIZE Logical Register Mapping

| Hardware Register | Description |
|---------------------------------|--|
| DISPC_SIZE_LCD1 | Configuration of the LCD size on LCD1. |
| DISPC_SIZE_LCD2 | Configuration of the LCD size on LCD2. |

Table 10-127. DISPC_DATAo_CYCLE1 Logical Register Mapping

| Hardware Register | Description |
|------------------------------------|--|
| DISPC_DATA1_CYCLE1 | Configuration of the output data format for 1st cycle on LCD1. |
| DISPC_DATA2_CYCLE1 | Configuration of the output data format for 1st cycle on LCD2. |

Table 10-128. DISPC_DATAo_CYCLE2 Logical Register Mapping

| Hardware Register | Description |
|------------------------------------|--|
| DISPC_DATA1_CYCLE2 | Configuration of the output data format for 2nd cycle on LCD1. |
| DISPC_DATA2_CYCLE2 | Configuration of the output data format for 2nd cycle on LCD2. |

Table 10-129. DISPC_DATAo_CYCLE3 Logical Register Mapping

| Hardware Register | Description |
|------------------------------------|--|
| DISPC_DATA1_CYCLE3 | Configuration of the output data format for 3rd cycle on LCD1. |
| DISPC_DATA2_CYCLE3 | Configuration of the output data format for 3rd cycle on LCD2. |

Table 10-130. DISPC_CPRo_COEF_R Logical Register Mapping

| Hardware Register | Description |
|-----------------------------------|---|
| DISPC_CPR1_COEF_R | Configuration of the CPR matrix coefficients for the Red component on LCD1. |
| DISPC_CPR2_COEF_R | Configuration of the CPR matrix coefficients for the Red component on LCD2. |

Table 10-131. DISPC_CPRo_COEF_G Logical Register Mapping

| Hardware Register | Description |
|-----------------------------------|---|
| DISPC_CPR1_COEF_G | Configuration of the CPR matrix coefficients for the Green component on LCD1. |
| DISPC_CPR2_COEF_G | Configuration of the CPR matrix coefficients for the Green component on LCD2. |

Table 10-132. DISPC_CPRo_COEF_B Logical Register Mapping

| Hardware Register | Description |
|-----------------------------------|--|
| DISPC_CPR1_COEF_B | Configuration of the CPR matrix coefficients for the Blue component on LCD1. |
| DISPC_CPR2_COEF_B | Configuration of the CPR matrix coefficients for the Blue component on LCD2. |

10.2.7.3 Display Controller Registers

10.2.7.3.1 Display Controller Register Summary

Table 10-133. Display Controller Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DISPC L4_PER Physical Address | DISPC L3 Physical Address |
|--------------------------------------|------|-----------------------|----------------|-------------------------------|---------------------------|
| DISPC_REVISION | R | 32 | 0x0000 0000 | 0x4804 1000 | 0x5800 1000 |
| DISPC_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4804 1010 | 0x5800 1010 |
| DISPC_SYSSTATUS | R | 32 | 0x0000 0014 | 0x4804 1014 | 0x5800 1014 |
| DISPC_IRQSTATUS | RW | 32 | 0x0000 0018 | 0x4804 1018 | 0x5800 1018 |
| DISPC_IRQENABLE | RW | 32 | 0x0000 001C | 0x4804 101C | 0x5800 101C |
| DISPC_CONTROL1 | RW | 32 | 0x0000 0040 | 0x4804 1040 | 0x5800 1040 |
| DISPC_CONFIG1 | RW | 32 | 0x0000 0044 | 0x4804 1044 | 0x5800 1044 |
| RESERVED | R | 32 | 0x0000 0048 | 0x4804 1048 | 0x5800 1048 |
| DISPC_DEFAULT_COLOR0 | RW | 32 | 0x0000 004C | 0x4804 104C | 0x5800 104C |
| DISPC_DEFAULT_COLOR1 | RW | 32 | 0x0000 0050 | 0x4804 1050 | 0x5800 1050 |

Table 10-133. Display Controller Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | DISPC L4_PER Physical Address | DISPC L3 Physical Address |
|---|------|-----------------------|-------------------------|-------------------------------|---------------------------|
| DISPC_TRANS_COLOR0 | RW | 32 | 0x0000 0054 | 0x4804 1054 | 0x5800 1054 |
| DISPC_TRANS_COLOR1 | RW | 32 | 0x0000 0058 | 0x4804 1058 | 0x5800 1058 |
| DISPC_LINE_STATUS | R | 32 | 0x0000 005C | 0x4804 105C | 0x5800 105C |
| DISPC_LINE_NUMBER | RW | 32 | 0x0000 0060 | 0x4804 1060 | 0x5800 1060 |
| DISPC_TIMING_H1 | RW | 32 | 0x0000 0064 | 0x4804 1064 | 0x5800 1064 |
| DISPC_TIMING_V1 | RW | 32 | 0x0000 0068 | 0x4804 1068 | 0x5800 1068 |
| DISPC_POL_FREQ1 | RW | 32 | 0x0000 006C | 0x4804 106C | 0x5800 106C |
| DISPC_DIVISOR1 | RW | 32 | 0x0000 0070 | 0x4804 1070 | 0x5800 1070 |
| DISPC_GLOBAL_ALPHA | RW | 32 | 0x0000 0074 | 0x4804 1074 | 0x5800 1074 |
| DISPC_SIZE_TV | RW | 32 | 0x0000 0078 | 0x4804 1078 | 0x5800 1078 |
| DISPC_SIZE_LCD1 | RW | 32 | 0x0000 007C | 0x4804 107C | 0x5800 107C |
| DISPC_GFX_BA_j ⁽¹⁾ | RW | 32 | 0x0000 0080 + (0x4 * j) | 0x4804 1080 + (0x4 * j) | 0x5800 1080 + (0x4 * j) |
| DISPC_GFX_POSITION | RW | 32 | 0x0000 0088 | 0x4804 1088 | 0x5800 1088 |
| DISPC_GFX_SIZE | RW | 32 | 0x0000 008C | 0x4804 108C | 0x5800 108C |
| DISPC_GFX_ATTRIBUTES | RW | 32 | 0x0000 00A0 | 0x4804 10A0 | 0x5800 10A0 |
| DISPC_GFX_BUF_THRESHOLD | RW | 32 | 0x0000 00A4 | 0x4804 10A4 | 0x5800 10A4 |
| DISPC_GFX_BUF_SIZE_STATUS | R | 32 | 0x0000 00A8 | 0x4804 10A8 | 0x5800 10A8 |
| DISPC_GFX_ROW_INC | RW | 32 | 0x0000 00AC | 0x4804 10AC | 0x5800 10AC |
| DISPC_GFX_PIXEL_INC | RW | 32 | 0x0000 00B0 | 0x4804 10B0 | 0x5800 10B0 |
| RESERVED | R | 32 | 0x0000 00B4 | 0x4804 10B4 | 0x5800 10B4 |
| DISPC_GFX_TABLE_BA | RW | 32 | 0x0000 00B8 | 0x4804 10B8 | 0x5800 10B8 |
| DISPC_VID1_BA_j ⁽²⁾ | RW | 32 | 0x0000 00BC + (0x4 * j) | 0x4804 10BC + (0x4 * j) | 0x5800 10BC + (0x4 * j) |
| DISPC_VID1_POSITION | RW | 32 | 0x0000 00C4 | 0x4804 10C4 | 0x5800 10C4 |
| DISPC_VID1_SIZE | RW | 32 | 0x0000 00C8 | 0x4804 10C8 | 0x5800 10C8 |
| DISPC_VID1_ATTRIBUTES | RW | 32 | 0x0000 00CC | 0x4804 10CC | 0x5800 10CC |
| DISPC_VID1_BUF_THRESHOLD | RW | 32 | 0x0000 00D0 | 0x4804 10D0 | 0x5800 10D0 |
| DISPC_VID1_BUF_SIZE_STATUS | R | 32 | 0x0000 00D4 | 0x4804 10D4 | 0x5800 10D4 |
| DISPC_VID1_ROW_INC | RW | 32 | 0x0000 00D8 | 0x4804 10D8 | 0x5800 10D8 |
| DISPC_VID1_PIXEL_INC | RW | 32 | 0x0000 00DC | 0x4804 10DC | 0x5800 10DC |
| DISPC_VID1_FIR | RW | 32 | 0x0000 00E0 | 0x4804 10E0 | 0x5800 10E0 |
| DISPC_VID1_PICTURE_SIZE | RW | 32 | 0x0000 00E4 | 0x4804 10E4 | 0x5800 10E4 |
| DISPC_VID1_ACCU_j ⁽²⁾ | RW | 32 | 0x0000 00E8 + (0x4 * j) | 0x4804 10E8 + (0x4 * j) | 0x5800 10E8 + (0x4 * j) |
| DISPC_VID1_FIR_COEF_H_i ⁽³⁾ | RW | 32 | 0x0000 00F0 + (0x8 * i) | 0x4804 10F0 + (0x8 * i) | 0x5800 10F0 + (0x8 * i) |
| DISPC_VID1_FIR_COEF_HV_i ⁽³⁾ | RW | 32 | 0x0000 00F4 + (0x8 * i) | 0x4804 10F4 + (0x8 * i) | 0x5800 10F4 + (0x8 * i) |
| DISPC_VID1_CONV_COEF0 | RW | 32 | 0x0000 0130 | 0x4804 1130 | 0x5800 1130 |
| DISPC_VID1_CONV_COEF1 | RW | 32 | 0x0000 0134 | 0x4804 1134 | 0x5800 1134 |
| DISPC_VID1_CONV_COEF2 | RW | 32 | 0x0000 0138 | 0x4804 1138 | 0x5800 1138 |
| DISPC_VID1_CONV_COEF3 | RW | 32 | 0x0000 013C | 0x4804 113C | 0x5800 113C |
| DISPC_VID1_CONV_COEF4 | RW | 32 | 0x0000 0140 | 0x4804 1140 | 0x5800 1140 |

⁽¹⁾ j = 0 to 1

⁽²⁾ j = 0 to 1

⁽³⁾ i = 0 to 7

Table 10-133. Display Controller Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | DISPC L4_PER Physical Address | DISPC L3 Physical Address |
|---|------|-----------------------|-------------------------|-------------------------------|---------------------------|
| DISPC_VID2_BA_j ⁽²⁾ | RW | 32 | 0x0000 014C + (0x4 * j) | 0x4804 114C + (0x4 * j) | 0x5800 114C + (0x4 * j) |
| DISPC_VID2_POSITION | RW | 32 | 0x0000 0154 | 0x4804 1154 | 0x5800 1154 |
| DISPC_VID2_SIZE | RW | 32 | 0x0000 0158 | 0x4804 1158 | 0x5800 1158 |
| DISPC_VID2_ATTRIBUTES | RW | 32 | 0x0000 015C | 0x4804 115C | 0x5800 115C |
| DISPC_VID2_BUF_THRESHOLD | RW | 32 | 0x0000 0160 | 0x4804 1160 | 0x5800 1160 |
| DISPC_VID2_BUF_SIZE_STATUS | R | 32 | 0x0000 0164 | 0x4804 1164 | 0x5800 1164 |
| DISPC_VID2_ROW_INC | RW | 32 | 0x0000 0168 | 0x4804 1168 | 0x5800 1168 |
| DISPC_VID2_PIXEL_INC | RW | 32 | 0x0000 016C | 0x4804 116C | 0x5800 116C |
| DISPC_VID2_FIR | RW | 32 | 0x0000 0170 | 0x4804 1170 | 0x5800 1170 |
| DISPC_VID2_PICTURE_SIZE | RW | 32 | 0x0000 0174 | 0x4804 1174 | 0x5800 1174 |
| DISPC_VID2_ACCU_j ⁽²⁾ | RW | 32 | 0x0000 0178 + (0x4 * j) | 0x4804 1178 + (0x4 * j) | 0x5800 1178 + (0x4 * j) |
| DISPC_VID2_FIR_COEF_H_j ⁽³⁾ | RW | 32 | 0x0000 0180 + (0x8 * i) | 0x4804 1180 + (0x8 * i) | 0x5800 1180 + (0x8 * i) |
| DISPC_VID2_FIR_COEF_HV_j ⁽³⁾ | RW | 32 | 0x0000 0184 + (0x8 * i) | 0x4804 1184 + (0x8 * i) | 0x5800 1184 + (0x8 * i) |
| DISPC_VID2_CONV_COEF0 | RW | 32 | 0x0000 01C0 | 0x4804 11C0 | 0x5800 11C0 |
| DISPC_VID2_CONV_COEF1 | RW | 32 | 0x0000 01C4 | 0x4804 11C4 | 0x5800 11C4 |
| DISPC_VID2_CONV_COEF2 | RW | 32 | 0x0000 01C8 | 0x4804 11C8 | 0x5800 11C8 |
| DISPC_VID2_CONV_COEF3 | RW | 32 | 0x0000 01CC | 0x4804 11CC | 0x5800 11CC |
| DISPC_VID2_CONV_COEF4 | RW | 32 | 0x0000 01D0 | 0x4804 11D0 | 0x5800 11D0 |
| DISPC_DATA1_CYCLE1 | RW | 32 | 0x0000 01D4 | 0x4804 11D4 | 0x5800 11D4 |
| DISPC_DATA1_CYCLE2 | RW | 32 | 0x0000 01D8 | 0x4804 11D8 | 0x5800 11D8 |
| DISPC_DATA1_CYCLE3 | RW | 32 | 0x0000 01DC | 0x4804 11DC | 0x5800 11DC |
| DISPC_VID1_FIR_COEF_V_j ⁽⁴⁾ | RW | 32 | 0x0000 01E0 + (0x4 * i) | 0x4804 11E0 + (0x4 * i) | 0x5800 11E0 + (0x4 * i) |
| DISPC_VID2_FIR_COEF_V_j ⁽⁴⁾ | RW | 32 | 0x0000 0200 + (0x4 * i) | 0x4804 1200 + (0x4 * i) | 0x5800 1200 + (0x4 * i) |
| DISPC_CPR1_COEF_R | RW | 32 | 0x0000 0220 | 0x4804 1220 | 0x5800 1220 |
| DISPC_CPR1_COEF_G | RW | 32 | 0x0000 0224 | 0x4804 1224 | 0x5800 1224 |
| DISPC_CPR1_COEF_B | RW | 32 | 0x0000 0228 | 0x4804 1228 | 0x5800 1228 |
| DISPC_GFX_PRELOAD | RW | 32 | 0x0000 022C | 0x4804 122C | 0x5800 122C |
| DISPC_VID1_PRELOAD | RW | 32 | 0x0000 0230 | 0x4804 1230 | 0x5800 1230 |
| DISPC_VID2_PRELOAD | RW | 32 | 0x0000 0234 | 0x4804 1234 | 0x5800 1234 |
| DISPC_CONTROL2 | RW | 32 | 0x0000 0238 | 0x4804 1238 | 0x5800 1238 |
| DISPC_VID3_ACCU_j ⁽⁵⁾ | RW | 32 | 0x0000 0300 + (0x4 * j) | 0x4804 1300 + (0x4 * j) | 0x5800 1300 + (0x4 * j) |
| DISPC_VID3_BA_j ⁽⁵⁾ | RW | 32 | 0x0000 0308 + (0x4 * j) | 0x4804 1308 + (0x4 * j) | 0x5800 1308 + (0x4 * j) |
| DISPC_VID3_FIR_COEF_H_j ⁽⁴⁾ | RW | 32 | 0x0000 0310 + (0x8 * i) | 0x4804 1310 + (0x8 * i) | 0x5800 1310 + (0x8 * i) |
| DISPC_VID3_FIR_COEF_HV_j ⁽⁴⁾ | RW | 32 | 0x0000 0314 + (0x8 * i) | 0x4804 1314 + (0x8 * i) | 0x5800 1314 + (0x8 * i) |
| DISPC_VID3_FIR_COEF_V_j ⁽⁴⁾ | RW | 32 | 0x0000 0350 + (0x4 * i) | 0x4804 1350 + (0x4 * i) | 0x5800 1350 + (0x4 * i) |
| DISPC_VID3_ATTRIBUTES | RW | 32 | 0x0000 0370 | 0x4804 1370 | 0x5800 1370 |
| DISPC_VID3_CONV_COEF0 | RW | 32 | 0x0000 0374 | 0x4804 1374 | 0x5800 1374 |

⁽⁴⁾ i = 0 to 7⁽⁵⁾ j = 0 to 1

Table 10-133. Display Controller Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | DISPC L4_PER Physical Address | DISPC L3 Physical Address |
|---------------------------------------|------|-----------------------|-------------------------|-------------------------------|---------------------------|
| DISPC_VID3_CONV_COEF1 | RW | 32 | 0x0000 0378 | 0x4804 1378 | 0x5800 1378 |
| DISPC_VID3_CONV_COEF2 | RW | 32 | 0x0000 037C | 0x4804 137C | 0x5800 137C |
| DISPC_VID3_CONV_COEF3 | RW | 32 | 0x0000 0380 | 0x4804 1380 | 0x5800 1380 |
| DISPC_VID3_CONV_COEF4 | RW | 32 | 0x0000 0384 | 0x4804 1384 | 0x5800 1384 |
| DISPC_VID3_BUF_SIZE_STATUS | R | 32 | 0x0000 0388 | 0x4804 1388 | 0x5800 1388 |
| DISPC_VID3_BUF_THRESHOLD | RW | 32 | 0x0000 038C | 0x4804 138C | 0x5800 138C |
| DISPC_VID3_FIR | RW | 32 | 0x0000 0390 | 0x4804 1390 | 0x5800 1390 |
| DISPC_VID3_PICTURE_SIZE | RW | 32 | 0x0000 0394 | 0x4804 1394 | 0x5800 1394 |
| DISPC_VID3_PIXEL_INC | RW | 32 | 0x0000 0398 | 0x4804 1398 | 0x5800 1398 |
| DISPC_VID3_POSITION | RW | 32 | 0x0000 039C | 0x4804 139C | 0x5800 139C |
| DISPC_VID3_PRELOAD | RW | 32 | 0x0000 03A0 | 0x4804 13A0 | 0x5800 13A0 |
| DISPC_VID3_ROW_INC | RW | 32 | 0x0000 03A4 | 0x4804 13A4 | 0x5800 13A4 |
| DISPC_VID3_SIZE | RW | 32 | 0x0000 03A8 | 0x4804 13A8 | 0x5800 13A8 |
| DISPC_DEFAULT_COLOR2 | RW | 32 | 0x0000 03AC | 0x4804 13AC | 0x5800 13AC |
| DISPC_TRANS_COLOR2 | RW | 32 | 0x0000 03B0 | 0x4804 13B0 | 0x5800 13B0 |
| DISPC_CPR2_COEF_B | RW | 32 | 0x0000 03B4 | 0x4804 13B4 | 0x5800 13B4 |
| DISPC_CPR2_COEF_G | RW | 32 | 0x0000 03B8 | 0x4804 13B8 | 0x5800 13B8 |
| DISPC_CPR2_COEF_R | RW | 32 | 0x0000 03BC | 0x4804 13BC | 0x5800 13BC |
| DISPC_DATA2_CYCLE1 | RW | 32 | 0x0000 03C0 | 0x4804 13C0 | 0x5800 13C0 |
| DISPC_DATA2_CYCLE2 | RW | 32 | 0x0000 03C4 | 0x4804 13C4 | 0x5800 13C4 |
| DISPC_DATA2_CYCLE3 | RW | 32 | 0x0000 03C8 | 0x4804 13C8 | 0x5800 13C8 |
| DISPC_SIZE_LCD2 | RW | 32 | 0x0000 03CC | 0x4804 13CC | 0x5800 13CC |
| DISPC_TIMING_H2 | RW | 32 | 0x0000 0400 | 0x4804 1400 | 0x5800 1400 |
| DISPC_TIMING_V2 | RW | 32 | 0x0000 0404 | 0x4804 1404 | 0x5800 1404 |
| DISPC_POL_FREQ2 | RW | 32 | 0x0000 0408 | 0x4804 1408 | 0x5800 1408 |
| DISPC_DIVISOR2 | RW | 32 | 0x0000 040C | 0x4804 140C | 0x5800 140C |
| DISPC_WB_ACCU_j ⁽⁶⁾ | RW | 32 | 0x0000 0500 + (0x4 * j) | 0x4804 1500 + (0x4 * j) | 0x5800 1500 + (0x4 * j) |
| DISPC_WB_BA_j ⁽⁶⁾ | RW | 32 | 0x0000 0508 + (0x4 * j) | 0x4804 1508 + (0x4 * j) | 0x5800 1508 + (0x4 * j) |
| DISPC_WB_FIR_COEF_H_i ⁽⁷⁾ | RW | 32 | 0x0000 0510 + (0x8 * i) | 0x4804 1510 + (0x8 * i) | 0x5800 1510 + (0x8 * i) |
| DISPC_WB_FIR_COEF_HV_i ⁽⁷⁾ | RW | 32 | 0x0000 0514 + (0x8 * i) | 0x4804 1514 + (0x8 * i) | 0x5800 1514 + (0x8 * i) |
| DISPC_WB_FIR_COEF_V_i ⁽⁷⁾ | RW | 32 | 0x0000 0550 + (0x4 * i) | 0x4804 1550 + (0x4 * i) | 0x5800 1550 + (0x4 * i) |
| DISPC_WB_ATTRIBUTES | RW | 32 | 0x0000 0570 | 0x4804 1570 | 0x5800 1570 |
| DISPC_WB_CONV_COEF0 | RW | 32 | 0x0000 0574 | 0x4804 1574 | 0x5800 1574 |
| DISPC_WB_CONV_COEF1 | RW | 32 | 0x0000 0578 | 0x4804 1578 | 0x5800 1578 |
| DISPC_WB_CONV_COEF2 | RW | 32 | 0x0000 057C | 0x4804 157C | 0x5800 157C |
| DISPC_WB_CONV_COEF3 | RW | 32 | 0x0000 0580 | 0x4804 1580 | 0x5800 1580 |
| DISPC_WB_CONV_COEF4 | RW | 32 | 0x0000 0584 | 0x4804 1584 | 0x5800 1584 |
| DISPC_WB_BUF_SIZE_STATUS | R | 32 | 0x0000 0588 | 0x4804 1588 | 0x5800 1588 |
| DISPC_WB_BUF_THRESHOLD | RW | 32 | 0x0000 058C | 0x4804 158C | 0x5800 158C |
| DISPC_WB_FIR | RW | 32 | 0x0000 0590 | 0x4804 1590 | 0x5800 1590 |
| DISPC_WB_PICTURE_SIZE | RW | 32 | 0x0000 0594 | 0x4804 1594 | 0x5800 1594 |

⁽⁶⁾ j = 0 to 1

⁽⁷⁾ i = 0 to 7

Table 10-133. Display Controller Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | DISPC L4_PER Physical Address | DISPC L3 Physical Address |
|--|------|-----------------------|-------------------------|-------------------------------|---------------------------|
| DISPC_WB_PIXEL_INC | RW | 32 | 0x0000 0598 | 0x4804 1598 | 0x5800 1598 |
| DISPC_WB_ROW_INC | RW | 32 | 0x0000 05A4 | 0x4804 15A4 | 0x5800 15A4 |
| DISPC_WB_SIZE | RW | 32 | 0x0000 05A8 | 0x4804 15A8 | 0x5800 15A8 |
| DISPC_VID1_BA_UV_j ⁽⁶⁾ | RW | 32 | 0x0000 0600 + (0x4 * j) | 0x4804 1600 + (0x4 * j) | 0x5800 1600 + (0x4 * j) |
| DISPC_VID2_BA_UV_j ⁽⁶⁾ | RW | 32 | 0x0000 0608 + (0x4 * j) | 0x4804 1608 + (0x4 * j) | 0x5800 1608 + (0x4 * j) |
| DISPC_VID3_BA_UV_j ⁽⁶⁾ | RW | 32 | 0x0000 0610 + (0x4 * j) | 0x4804 1610 + (0x4 * j) | 0x5800 1610 + (0x4 * j) |
| DISPC_WB_BA_UV_j ⁽⁶⁾ | RW | 32 | 0x0000 0618 + (0x4 * j) | 0x4804 1618 + (0x4 * j) | 0x5800 1618 + (0x4 * j) |
| DISPC_CONFIG2 | RW | 32 | 0x0000 0620 | 0x4804 1620 | 0x5800 1620 |
| DISPC_VID1_ATTRIBUTES2 | RW | 32 | 0x0000 0624 | 0x4804 1624 | 0x5800 1624 |
| DISPC_VID2_ATTRIBUTES2 | RW | 32 | 0x0000 0628 | 0x4804 1628 | 0x5800 1628 |
| DISPC_VID3_ATTRIBUTES2 | RW | 32 | 0x0000 062C | 0x4804 162C | 0x5800 162C |
| DISPC_GAMMA_TABLE0 | W | 32 | 0x0000 0630 | 0x4804 1630 | 0x5800 1630 |
| DISPC_GAMMA_TABLE1 | W | 32 | 0x0000 0634 | 0x4804 1634 | 0x5800 1634 |
| DISPC_GAMMA_TABLE2 | W | 32 | 0x0000 0638 | 0x4804 1638 | 0x5800 1638 |
| DISPC_VID1_FIR2 | RW | 32 | 0x0000 063C | 0x4804 163C | 0x5800 163C |
| DISPC_VID1_ACCU2_j ⁽⁸⁾ | RW | 32 | 0x0000 0640 + (0x4 * j) | 0x4804 1640 + (0x4 * j) | 0x5800 1640 + (0x4 * j) |
| DISPC_VID1_FIR_COEF_H2_i ⁽⁹⁾ | RW | 32 | 0x0000 0648 + (0x8 * i) | 0x4804 1648 + (0x8 * i) | 0x5800 1648 + (0x8 * i) |
| DISPC_VID1_FIR_COEF_HV2_i ⁽⁹⁾ | RW | 32 | 0x0000 064C + (0x8 * i) | 0x4804 164C + (0x8 * i) | 0x5800 164C + (0x8 * i) |
| DISPC_VID1_FIR_COEF_V2_i ⁽⁹⁾ | RW | 32 | 0x0000 0688 + (0x4 * i) | 0x4804 1688 + (0x4 * i) | 0x5800 1688 + (0x4 * i) |
| DISPC_VID2_FIR2 | RW | 32 | 0x0000 06A8 | 0x4804 16A8 | 0x5800 16A8 |
| DISPC_VID2_ACCU2_j ⁽⁸⁾ | RW | 32 | 0x0000 06AC + (0x4 * j) | 0x4804 16AC + (0x4 * j) | 0x5800 16AC + (0x4 * j) |
| DISPC_VID2_FIR_COEF_H2_i ⁽⁹⁾ | RW | 32 | 0x0000 06B4 + (0x8 * i) | 0x4804 16B4 + (0x8 * i) | 0x5800 16B4 + (0x8 * i) |
| DISPC_VID2_FIR_COEF_HV2_i ⁽⁹⁾ | RW | 32 | 0x0000 06B8 + (0x8 * i) | 0x4804 16B8 + (0x8 * i) | 0x5800 16B8 + (0x8 * i) |
| DISPC_VID2_FIR_COEF_V2_i ⁽⁹⁾ | RW | 32 | 0x0000 06F4 + (0x4 * i) | 0x4804 16F4 + (0x4 * i) | 0x5800 16F4 + (0x4 * i) |
| DISPC_VID3_FIR2 | RW | 32 | 0x0000 0724 | 0x4804 1724 | 0x5800 1724 |
| DISPC_VID3_ACCU2_j ⁽⁸⁾ | RW | 32 | 0x0000 0728 + (0x4 * j) | 0x4804 1728 + (0x4 * j) | 0x5800 1728 + (0x4 * j) |
| DISPC_VID3_FIR_COEF_H2_i ⁽⁹⁾ | RW | 32 | 0x0000 0730 + (0x8 * i) | 0x4804 1730 + (0x8 * i) | 0x5800 1730 + (0x8 * i) |
| DISPC_VID3_FIR_COEF_HV2_i ⁽⁹⁾ | RW | 32 | 0x0000 0734 + (0x8 * i) | 0x4804 1734 + (0x8 * i) | 0x5800 1734 + (0x8 * i) |
| DISPC_VID3_FIR_COEF_V2_i ⁽⁹⁾ | RW | 32 | 0x0000 0770 + (0x4 * i) | 0x4804 1770 + (0x4 * i) | 0x5800 1770 + (0x4 * i) |
| DISPC_WB_FIR2 | RW | 32 | 0x0000 0790 | 0x4804 1790 | 0x5800 1790 |
| DISPC_WB_ACCU2_j ⁽⁸⁾ | RW | 32 | 0x0000 0794 + (0x4 * j) | 0x4804 1794 + (0x4 * j) | 0x5800 1794 + (0x4 * j) |
| DISPC_WB_FIR_COEF_H2_i ⁽⁹⁾ | RW | 32 | 0x0000 07A0 + (0x8 * i) | 0x4804 17A0 + (0x8 * i) | 0x5800 17A0 + (0x8 * i) |

⁽⁸⁾ j = 0 to 1⁽⁹⁾ i = 0 to 7

Table 10-133. Display Controller Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | DISPC L4_PER Physical Address | DISPC L3 Physical Address |
|--|------|-----------------------|-------------------------|-------------------------------|---------------------------|
| DISPC_WB_FIR_COEF_HV2_i ⁽⁹⁾ | RW | 32 | 0x0000 07A4 + (0x8 * i) | 0x4804 17A4 + (0x8 * i) | 0x5800 17A4 + (0x8 * i) |
| DISPC_WB_FIR_COEF_V2_i ⁽⁹⁾ | RW | 32 | 0x0000 07E0 + (0x4 * i) | 0x4804 17E0 + (0x4 * i) | 0x5800 17E0 + (0x4 * i) |
| DISPC_GLOBAL_BUFFER | RW | 32 | 0x0000 0800 | 0x4804 1800 | 0x5800 1800 |
| DISPC_DIVISOR | RW | 32 | 0x0000 0804 | 0x4804 1804 | 0x5800 1804 |
| DISPC_WB_ATTRIBUTES2 | RW | 32 | 0x0000 0810 | 0x4804 1810 | 0x5800 1810 |
| DISPC_BA0_FLIPIMMEDIATE_EN | RW | 32 | 0x0000 0854 | 0x4804 1854 | 0x5800 1854 |
| DISPC_GLOBAL_MFLAG_ATTRIBUTE | RW | 32 | 0x0000 085C | 0x4804 185C | 0x5800 185C |
| DISPC_GFX_MFLAG_THRESHOLD__1 | RW | 32 | 0x0000 0860 | 0x4804 1860 | 0x5800 1860 |
| DISPC_VID1_MFLAG_THRESHOLD | RW | 32 | 0x0000 0864 | 0x4804 1864 | 0x5800 1864 |
| DISPC_VID2_MFLAG_THRESHOLD__1 | RW | 32 | 0x0000 0868 | 0x4804 1868 | 0x5800 1868 |
| DISPC_VID3_MFLAG_THRESHOLD__1 | RW | 32 | 0x0000 086C | 0x4804 186C | 0x5800 186C |
| DISPC_WB_MFLAG_THRESHOLD | RW | 32 | 0x0000 0870 | 0x4804 1870 | 0x5800 1870 |

10.2.7.3.2 Display Controller Register Description

Table 10-134. DISPC_REVISION

| | | | |
|-------------------------|----------------------------|-----------------|--------------------------|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4804 1000 0x5800 1000 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | IP Revision | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP revision | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 10-135. Register Call Summary for Register DISPC_REVISION

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-136. DISPC_SYSCONFIG

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0010 | | |
| Physical Address | 0x4804 1010 0x5800 1010 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | This register allows to control various parameters of the OCP interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----------|----|---------------|----|----------|---|-----------|---|-----------|---|----------|---|-----------|---|----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | MIDLEMODE | | RESERVED | | CLOCKACTIVITY | | RESERVED | | WARMRESET | | SIDLEMODE | | ENWAKEUP | | SOFTRESET | | AUTOIDLE | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|----------|
| 31:14 | RESERVED | Write 0s for future compatibility. Reads returns 0 | R | 0x000000 |
| 13:12 | MIDLEMODE | Master interface power management, standby/wait control 0x0: Force-standby. MStandby is only asserted when the module is disabled. MStandby is only asserted when the module is disabled. 0x1: No-Standby: MStandby is never asserted. 0x2: Smart-Standby. MStandby is asserted based on the internal activity of the module 0x3: Reserved | RW | 0x0 |
| 11:10 | RESERVED | Write 0s for future compatibility. Reads returns 0 | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 9:8 | CLOCKACTIVITY | Clocks activity during wake up mode period 0x0: OCP and Functional clocks can be switched off 0x1: Functional clocks can be switched off and OCP clocks are maintained during wake up period 0x2: OCP clocks can be switched off and Functional clocks are maintained during wake up period 0x3: OCP and Functional clocks are maintained during wake up period | RW | 0x0 |
| 7:6 | RESERVED | Write 0s for future compatibility. Reads returns 0 | R | 0x0 |
| 5 | WARMRESET | Warm reset. Set this bit to 1 triggers a module warm reset. The bit is automatically reset by the hardware. During reads, it always returns 0. The warm reset keep the configuration registers unchanged. 0x0: Normal mode 0x1: the warmreset is set | RW | 0 |
| 4:3 | SIDLEMODE | Slave interface power management, Idle req/ack control 0x0: Force-idle. An idle request is acknowledged unconditionally 0x1: No-idle. An idle request is never acknowledged 0x2: Smart-idle. Acknowledgment to an idle request is given based on the internal activity of the module. 0x3: Reserved | RW | 0x0 |
| 2 | ENWAKEUP | WakeUp feature control 0x0: Wakeup is disabled 0x1: Wakeup is enabled | RW | 0 |
| 1 | SOFTRESET | Software reset. Set this bit to 1 to trigger a module reset. The bit is automatically reset by the hardware. During reads, it always returns 0. 0x0: Normal mode 0x1: The module is reset | RW | 0 |
| 0 | AUTOIDLE | Internal OCP clock gating strategy 0x0: OCP clock is free-running 0x1: Automatic OCP L3 and L4 clocks gating strategy is applied, based on the OCP interface activity. Automatic functional clock gating is also applied to the functional clock based on the module activity (for instance DISPC_pipe_ATTRIBUTES.ENABLE) | RW | 1 |

Table 10-137. Register Call Summary for Register DISPC_SYSCONFIG

Display Controller

- [Software Reset: \[0\] \[1\]](#)
- [Idle Mode: \[2\]](#)
- [StandBy Mode: \[3\]](#)
- [Wakeup: \[4\]](#)
- [DMA Power Modes: \[5\]](#)
- [Shadow Registers: \[6\]](#)
- [Display Controller Register Summary: \[7\]](#)

Table 10-138. DISPC_SYSSTATUS

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0014 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1014 0x5800 1014 | | |
| Description | This register provides status information about the module, excluding the interrupt status information. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-----------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | RESETDONE | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:1 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000000 |
| 0 | RESETDONE | Internal reset monitoring Read 0x0: Internal module reset is on-going Read 0x1: Reset completed | R | 1 |

Table 10-139. Register Call Summary for Register DISPC_SYSSTATUS

Display Controller

- [Software Reset: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-140. DISPC_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0018 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1018 0x5800 1018 | | |
| Description | This register regroups all the status of the module internal events that generate an interrupt. Write 1 to a given bit resets this bit | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
|-----------------------|----------|----|----|----|----|----|----|-----------------------|---------------------|-----------------|-----------------|----------------|------------------------|-------------------------|-------------------|------------|---------------|------------|----------------|---------------|-------------------|-------------------------|-------------------|-------------------------|---------------|-------------------------|------------------|------------------------|--------------------------|------------------------|---------------|----------------|------------|----------------|
| FLIPIMMEDIATEDONE_IRQ | RESERVED | | | | | | | WBUNCOMPLETEERROR_IRQ | WBUFFEROVERFLOW_IRQ | FRAMEDONETV_IRQ | FRAMEDONEWB_IRQ | FRAMEDONE2_IRQ | ACBIASCOUNTSTATUS2_IRQ | VID3BUFFERUNDERFLOW_IRQ | VID3ENDWINDOW_IRQ | VSYNC2_IRQ | SYNCLOST2_IRQ | WAKEUP_IRQ | SYNCLOSTTV_IRQ | SYNCLOST1_IRQ | VID2ENDWINDOW_IRQ | VID2BUFFERUNDERFLOW_IRQ | VID1ENDWINDOW_IRQ | VID1BUFFERUNDERFLOW_IRQ | OCPPERROR_IRQ | PALETTEGAMMALOADING_IRQ | GFXENDWINDOW_IRQ | GFXBUFFERUNDERFLOW_IRQ | PROGRAMMEDLINENUMBER_IRQ | ACBIASCOUNTSTATUS1_IRQ | EVSNC_ODD_IRQ | EVSNC_EVEN_IRQ | VSYNC1_IRQ | FRAMEDONE1_IRQ |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|--|---------------|-------|
| 31 | FLIPIMMEDIATEDONE_IRQ | Flip Immediate Done. The DMA engine has acknowledged the immediate BA change, and software can write the new BA0. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 30:27 | RESERVED | Write 0s for future compatibility. Reads returns 0 | R | 0x00 |
| 26 | WBUNCOMPLETEDERROR_IRQ | Write-back DMA buffer is flushed before it is completely drained. In WB capture mode, if the new frame starts before the WB DMA buffers are fully drained (onto external memory), then the contents of the WB DMA buffers are lost (implying last few pixels/lines are corrupted in the captured frame in memory). This interrupt is an indication of that case and will trigger every frame. 0x0 READS: Event is false. 0x0 WRITES: Status bit unchanged. 0x1 READS: Event is true (Pending) 0x1 WRITES: Status bit is reset | RW W1toClr | 0 |
| 25 | WBBUFFEROVERFLOW_IRQ | Write-back DMA Buffer Overflow. The DMA buffer is full. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 24 | FRAMEDONETV_IRQ | Frame Done for the TV. The TV output has been disabled by user. All the data have been sent. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 23 | FRAMEDONEWB_IRQ | Frame Done for the write-back channel. The write-back channel has output the frame. All the data of the frame have been sent to the memory. There is no pending data inside the DMA engine for the write-back channel to be transferred to memory. It is available only when the write-back pipeline transfers back to memory the output of one of the pipelines. In case of overlay capture, the interrupt is not generated and the user shall use the FrameDone for the corresponding captured output. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 22 | FRAMEDONE2_IRQ | Frame Done for the secondary LCD. The secondary LCD output has been disabled by user. All the data have been sent. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 21 | ACBIASCOUNTSTATUS2_IRQ | AC Bias Count Status for the secondary LCD 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 20 | VID3BUFFERUNDERFLOW_IRQ | Video 3 DMA Buffer Underflow. The DMA buffer is not necessarily empty but required data are not present in the DMA buffer (due to out of order responses) 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 19 | VID3ENDWINDOW_IRQ | The end of the video 3 Window has been reached. It is detected by the overlay manager when the full video 3 has been displayed. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 18 | VSYNC2_IRQ | Vertical Synchronization for the secondary LCD 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 17 | SYNCLOST2_IRQ | Synchronization Lost on the secondary LCD output. The required data are not output at the correct time due to too short blanking periods or stall of at least one pipelines associated with the secondary LCD output. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|---------------|-------|
| 16 | WAKEUP_IRQ | Wake-up 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 15 | SYNCLOST_TV_IRQ | Synchronization Lost on the TV output. The required data are not output at the correct time due to too short blanking periods or stall of at least one pipelines associated with the TV output. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 14 | SYNC_LOST1_IRQ | Synchronization Lost on the primary LCD output. The required data are not output at the correct time due to too short blanking periods or stall of at least one pipelines associated with the primary LCD output. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 13 | VID2END_WINDOW_IRQ | The end of the video 2 Window has been reached. It is detected by the overlay manager when the full video 2 has been displayed. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 12 | VID2BUFFER_UNDERFLOW_IRQ | Video 2 DMA Buffer Underflow. The DMA buffer is not necessarily empty but required data are not present in the DMA buffer (due to out of order responses) 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 11 | VID1END_WINDOW_IRQ | The end of the video 1 Window has been reached. It is detected by the overlay manager when the full video 1 has been displayed. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 10 | VID1BUFFER_UNDERFLOW_IRQ | Video 1 DMA Buffer Underflow. The DMA buffer is not necessarily empty but required data are not present in the DMA buffer (due to out of order responses) 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 9 | OCPERROR_IRQ | OCP Error. L3 Interconnect has sent SResp=ERR. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 8 | PALETTEGAMMA_LOADING_IRQ | Palette Gamma Loading status. The palette used as Color Look Up Table (CLUT) for the graphics BITMAP formats (1-, 2-, 4-, or 4-bpp) or as gamma table for the overlay output for the primary LCD output has been loaded successfully. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 7 | GFXEND_WINDOW_IRQ | The end of the graphics Window has been reached. It is detected by the overlay manager when the full graphics has been displayed. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 6 | GFXBUFFER_UNDERFLOW_IRQ | Graphics DMA Buffer Underflow. The DMA buffer is not necessarily empty but required data are not present in the DMA buffer (due to out of order responses) 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 5 | PROGRAMMED_LINENUMBER_IRQ | Programmed Line Number. It indicates that the scan of the primary LCD has reached the programmed user line number. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------|--|---------------|-------|
| 4 | ACBIASCOUNT STATUS1_IRQ | AC Bias Count Status for the primary LCD 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 3 | EVSYNC_ ODD_IRQ | VSYNC for odd field from the TV encoder (HDMI) 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 2 | EVSYNC_ EVEN_IRQ | VSYNC for even field from the TV encoder (HDMI) 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 1 | VSYNC1_IRQ | Vertical Synchronization for the primary LCD. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |
| 0 | FRAME DONE1_IRQ | Frame Done for the primary LCD. The primary LCD output has been disabled by user. All the data have been sent. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW W1toClr | 0 |

Table 10-141. Register Call Summary for Register DISPC_IRQSTATUS

Display Controller

- [Interrupt Requests: \[0\]](#)
- [Immediate Base Address Flip Mechanism: \[1\]](#)
- [Synchronized Buffer Update: \[2\]](#)
- [Shadow Registers: \[3\]](#)
- [Display Controller Register Summary: \[4\]](#)

Table 10-142. DISPC_IRQENABLE

| | | | |
|------------------|--|----------|--------------------------|
| Address Offset | 0x0000 001C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 101C 0x5800 101C | | |
| Description | This register allows to mask/unmask the module internal sources of interrupt, on an event-by-event basis | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----------|----|----|----|----|----|--------------------|----------------|----------------|---------------|-----------------------|------------------------|------------------|-----------|--------------|-----------|---------------|--------------|------------------|------------------------|------------------|------------------------|------------|-----------------|-----------------|-----------------------|-------------------------|-----------------------|---------------|----------------|-----------|--------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| FLIPIMMEDIATEDONE_EN | RESERVED | | | | | | WBUFFEROVERFLOW_EN | FRAMEDONETV_EN | FRAMEDONEWB_EN | FRAMEDONE2_EN | ACBIASCOUNTSTATUS2_EN | VID3BUFFERUNDERFLOW_EN | VID3ENDWINDOW_EN | VSYNC2_EN | SYNCLOST2_EN | WAKEUP_EN | SYNCLOSTTV_EN | SYNCLOST1_EN | VID2ENDWINDOW_EN | VID2BUFFERUNDERFLOW_EN | ENDVID1WINDOW_EN | VID1BUFFERUNDERFLOW_EN | OCERROR_EN | PALETTEGAMMA_EN | GFXENDWINDOW_EN | GFXBUFFERUNDERFLOW_EN | PROGRAMMEDLINENUMBER_EN | ACBIASCOUNTSTATUS1_EN | EVSYNC_ODD_EN | EVSYNC_EVEN_EN | VSYNC1_EN | FRAMEDONE_EN |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------|
| 31 | FLIPIMMEDIATEDONE _EN | Flip Immediate Done. The DMA engine has acknowledged the immediate BA change, and software can write the new BA0. 0x0: Flip Immediate Done is masked 0x1: Flip Immediate Done generates an interrupt when it occurs | RW | 0 |

Display Controller

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|--|------|-------|
| 30:27 | RESERVED | Write 0s for future compatibility. Reads returns 0 | R | 0x00 |
| 26 | WBUNCOMPLETEERR OR_EN | The write back buffer has been flushed before been fully drained. Enable. 0x0: Interrupt is masked. 0x1: Interrupt is enabled. | RW | 0 |
| 25 | WBBUFFER OVERFLOW_EN | Write-back DMA Buffer Overflow. The DMA buffer is full 0x0: WBBufferOverflow is masked 0x1: WBBufferOverflow generates an interrupt when it occurs | RW | 0 |
| 24 | FRAME DONETV_EN | Frame Done for the TV. The TV output has been disabled by user. All the data have been sent. 0x0: Frame Done for the TV output is masked 0x1: Frame Done for the TV output generates an interrupt when it occurs | RW | 0 |
| 23 | FRAME DONEWB_EN | Frame Done for the write-back channel. The write-back channel has output the frame. All the data have been sent for the frame have been sent to the memory. There is no pending data inside the DMA engine for the write-back channel to be transferred to memory. 0x0: Frame Done for the write-back is masked 0x1: Frame Done for the write-back generates an interrupt when it occurs | RW | 0 |
| 22 | FRAME DONE2_EN | Frame Done for the secondary LCD. The secondary LCD output has been disabled by user. All the data have been sent. 0x0: Frame Done for the secondary LCD is masked 0x1: Frame Done for the secondary LCD generates an interrupt when it occurs | RW | 0 |
| 21 | ACBIASCOUNT STATUS2_EN | AC Bias Count Status for the secondary LCD 0x0: ACBiasCountStatus for the secondary LCD output is masked 0x1: ACBiasCountStatus for the secondary LCD output generates an interrupt when it occurs | RW | 0 |
| 20 | VID3BUFFER UNDERFLOW_EN | Video 3 DMA Buffer Underflow. The DMA buffer is not necessary empty but required data are not present in the DMA buffer (due to out of order responses) 0x0: Vid3BufferUnderflow is masked 0x1: Vid3BufferUnderflow generates an interrupt when it occurs | RW | 0 |
| 19 | VID3END WINDOW_EN | The end of the video 3 Window has been reached. It is detected by the overlay manager when the full video 3 has been displayed. 0x0: Vid3EndWindow is masked 0x1: Vid3EndWindow generates an interrupt when it occurs | RW | 0 |
| 18 | VSYN2_EN | Vertical Synchronization for the secondary LCD 0x0: VSYNC for the secondary LCD output is masked 0x1: VSYNC for the secondary LCD output generates an interrupt when it occurs | RW | 0 |
| 17 | SYNC LOST2_EN | Synchronization Lost on the secondary LCD output. The required data are not output at the correct time due to too short blanking periods or stall of at least one pipelines associated with the secondary LCD output. 0x0: Synchronization Lost on the secondary LCD output is masked 0x1: Synchronization Lost on the secondary LCD output generates an interrupt when it occurs | RW | 0 |
| 16 | WAKEUP_EN | Wake Up Mask 0x0: WakeUp is masked 0x1: WakeUp generates an interrupt when it occurs | RW | 0 |
| 15 | SYNC LOSTTV_EN | Synchronization Lost on the TV output. The required data are not output at the correct time due to too short blanking periods or stall of at least one pipelines associated with the TV output. 0x0: Synchronization Lost on the TV output is masked 0x1: Synchronization Lost on the TV output generates an interrupt when it occurs | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|------|-------|
| 14 | SYNC LOST1_EN | Synchronization Lost for the primary LCD 0x0: SyncLost for the primary LCD output is masked 0x1: SyncLost for the primary LCD output generates an interrupt when it occurs | RW | 0 |
| 13 | VID2END WINDOW_EN | The end of the video 2 Window has been reached. It is detected by the overlay manager when the full video 2 has been displayed. 0x0: Vid2EndWindow is masked 0x1: Vid2EndWindow generates an interrupt when it occurs | RW | 0 |
| 12 | VID2BUFFER UNDERFLOW_EN | Video 2 DMA Buffer Underflow. The DMA buffer is not necessary empty but required data are not present in the DMA buffer (due to out of order responses) 0x0: Vid2BufferUnderflow is masked 0x1: Vid2BufferUnderflow generates an interrupt when it occurs | RW | 0 |
| 11 | ENDVID1 WINDOW_EN | The end of the video 1 Window has been reached. It is detected by the overlay manager when the full video 1 has been displayed. 0x0: EndVid1Window is masked 0x1: EndVid1Window generates an interrupt when it occurs | RW | 0 |
| 10 | VID1BUFFER UNDERFLOW_EN | Video 1 DMA Buffer Underflow. The DMA buffer is not necessary empty but required data are not present in the DMA buffer (due to out of order responses) 0x0: Vid1BufferUnderflow is masked 0x1: Vid1BufferUnderflow generates an interrupt when it occurs | RW | 0 |
| 9 | OCPELLOWER_EN | OCP Error. L3 Interconnect has sent SResp=ERR. 0x0: OCPELLOWER is masked 0x1: OCPELLOWER generates an interrupt when it occurs | RW | 0 |
| 8 | PALETTE GAMMA_EN | Palette Gamma Loading mask. The palette used as Color Look Up Table (CLUT) for the graphics BITMAP formats (1-, 2-, 4-, or 4-bpp) or as gamma table for the overlay output for the primary LCD output has been loaded successfully. 0x0: PaletteGamma is masked 0x1: PaletteGamma generates an interrupt when it occurs | RW | 0 |
| 7 | GFXEND WINDOW_EN | The end of the graphics Window has been reached. It is detected by the overlay manager when the full graphics has been displayed. 0x0: GfxEndWindow is masked 0x1: GfxEndWindow generates an interrupt when it occurs | RW | 0 |
| 6 | GFXBUFFER UNDERFLOW_EN | Graphics DMA Buffer Underflow. The DMA buffer is not necessarily empty but required data are not present in the DMA buffer (due to out of order responses) 0x0: GfxBufferUnderflow is masked 0x1: GfxBufferUnderflow generates an interrupt when it occurs | RW | 0 |
| 5 | PROGRAMMED LINENUMBER_EN | Programmed Line Number. It indicates that the scan of the primary LCD has reached the programmed user line number. 0x0: ProgrammedLineNumber is masked 0x1: ProgrammedLineNumber generates an interrupt when it occurs | RW | 0 |
| 4 | ACBIASCOUNT STATUS1_EN | AC Bias Count Status for the primary LCD 0x0: ACBiasCountStatus for the primary LCD output is masked 0x1: ACBiasCountStatus for the primary LCD output generates an interrupt when it occurs | RW | 0 |
| 3 | EVSYNC_ODD_EN | VSYSN for odd field from the TV encoder (HDMI) 0x0: EVSYNC_ODD for the TV output is masked 0x1: EVSYNC_ODD for the TV output generates an interrupt when it occurs | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------|
| 2 | EVSYNC_EVEN_EN | VSYNC for even field from the TV encoder (HDMI) 0x0: EVSYNC_EVEN for the TV output is masked 0x1: EVSYNC_EVEN for the TV output generates an interrupt when it occurs | RW | 0 |
| 1 | VSYN1_EN | Vertical Synchronization for the primary LCD. 0x0: VSYNC for the primary LCD output is masked 0x1: VSYNC for the primary LCD output generates an interrupt when it occurs | RW | 0 |
| 0 | FRAMEDONE_EN | Frame Done for the primary LCD. The primary LCD output has been disabled by user. All the data have been sent. 0x0: FrameDone for the primary LCD output is masked 0x1: FrameDone for the primary LCD output generates an interrupt when it occurs | RW | 0 |

Table 10-143. Register Call Summary for Register DISPC_IRQENABLE

Display Controller

- [Interrupt Requests: \[0\]](#)
- [Immediate Base Address Flip Mechanism: \[1\]](#)
- [Synchronized Buffer Update: \[2\]](#)
- [Shadow Registers: \[3\]](#)
- [Display Controller Register Summary: \[4\]](#)

Table 10-144. DISPC_CONTROL1

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0040 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | | 0x4804 1040 0x5800 1040 | | | | | | | | | | | | | | | | Instance | | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | | The control register configures the Display Controller module for the primary LCD and TV outputs. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|---------------|----|---------------|----|----------------|---|---------------------|---|-----------|---|----------|---|--------------|---|----------------|--|------|--|---------------------|--|-----------|--|----------|--|--------------|--|----------------|--|-----------|--|-------|--|-----|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | |
| SPATIALTEMPORALDITHERINGFRAMES | | | | | | | | H | | | | | | | | GPOUT1 | | GPOUT0 | | GPI1 | | GPI0 | | OVERLAYOPTIMIZATION | | STALLMODE | | RESERVED | | TFTDATALINES | | STDITHERENABLE | | GOTV | | GOLCD | | M8B | | STNTFT | | MONOCOLOR | | TVENABLE | | LCDENABLE | | | | | |
| LCDENABLEPOL | | | | | | | | | | | | | | | | LCDENABLESIGNAL | | PCKFREEENABLE | | TDMUNUSEDBITS | | TDMCYCLEFORMAT | | TDMPARALLELMODE | | TDMENABLE | | GPOUT1 | | GPOUT0 | | GPI1 | | GPI0 | | OVERLAYOPTIMIZATION | | STALLMODE | | RESERVED | | TFTDATALINES | | STDITHERENABLE | | GOTV | | GOLCD | | M8B | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|---|------|-------|
| 31:30 | SPATIALTEMPORAL DITHERINGFRAMES | Spatial/Temporal dithering number of frames for the primary LCD output wr: VFP start period of primary LCD 0x0: Spatial only 0x1: Spatial and temporal over 2 frames 0x2: Spatial and temporal over 4 frames 0x3: Reserved | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|-------|
| 29 | LCDENABLEPOL | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 28 | LCDENABLESIGNAL | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 27 | PCKFREEENABLE | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 26:25 | TDMUNUSEDBITS | State of unused bits (TDM mode only) for the primary LCD output. wr: VFP start period of primary LCD 0x0: low level (0) 0x1: high level (1) 0x2: unchanged from previous state 0x3: reserved | RW | 0x0 |
| 24:23 | TDMCYCLEFORMAT | Cycle format (TDM mode only) for the primary LCD output wr: VFP start period of primary LCD 0x0: 1 cycle for 1 pixel 0x1: 2 cycles for 1 pixel 0x2: 3 cycles for 1 pixel 0x3: 3 cycles for 2 pixels | RW | 0x0 |
| 22:21 | TDMPARALLELMODE | Output Interface width (TDM mode only) for the primary LCD output wr: VFP start period of primary LCD 0x0: 8-bit parallel output interface selected 0x1: 9-bit parallel output interface selected 0x2: 12-bit parallel output interface selected 0x3: 16-bit parallel output interface selected | RW | 0x0 |
| 20 | TDMENABLE | Enable the multiple cycle format (TDM mode only used for TFT mode with the RFBI enable bit off) for the primary LCD output. wr: VFP start period of primary LCD 0x0: TDM disabled 0x1: TDM enabled | RW | 0 |
| 19:17 | HT | Hold Time for TV output wr: EVSYNC Encoded value (from 1 to 8) to specify the number of external digital clock periods to hold the data (programmed value = value minus 1) | RW | 0x0 |
| 16 | GPOUT1 | General Purpose Output Signal wr:immediate 0x0: The GPout1 is reset 0x1: The GPout1 is set | RW | 0 |
| 15 | GPOUT0 | General Purpose Output Signal wr:immediate 0x0: The GPout0 is reset 0x1: The GPout0 is set | RW | 0 |
| 14 | GPIN1 | General Purpose Input Signal wr: immediately Read 0x0: The GPin1 has been reset Read 0x1: The GPin1 has been set | R | 0 |
| 13 | GPIN0 | General Purpose Input Signal wr: immediately Read 0x0: The GPin0 has been reset Read 0x1: The GPin0 has been set | R | 0 |
| 12 | OVERLAYOPTIMIZATION | Overlay Optimization for the primary LCD output wr: VFP start period of the primary LCD 0x0: All the data for all the enabled pipelines are fetched from memory regardless of the overlay/alpha blending configuration. 0x1: The data not used by the overlay manager because of overlap between layers with no alpha blending between them shall not be fetched from memory in order to optimize the bandwidth. | RW | 0 |

Display Controller

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------|
| 11 | STALLMODE | STALL Mode for the primary LCD output wr: VFP start period of primary LCD 0x0: Normal mode selected 0x1: STALL mode selected. The Display Controller sends the data without considering the VSYNC/HSYNC. The LCD output is disabled at the end of the transfer of the frame. The S/W has to re-enable the LCD output in order to generate a new frame. The stall mode is used in RFBI and DSI command modes. | RW | 0 |
| 10 | RESERVED | Reserved | R | 0 |
| 9:8 | TFTDATALINES | Number of lines of the primary LCD interface wr: VFP start period of primary LCD 0x0: 12-bit output aligned on the LSB of the pixel data interface 0x1: 16-bit output aligned on the LSB of the pixel data interface 0x2: 18-bit output aligned on the LSB of the pixel data interface 0x3: 24-bit output aligned on the LSB of the pixel data interface | RW | 0x0 |
| 7 | STDITHERENABLE | Spatial Temporal dithering enable for the primary LCD output wr: VFP start period of primary LCD 0x0: Spatial/Temporal dithering logic disabled 0x1: Spatial/Temporal dithering logic enabled | RW | 0 |
| 6 | GOTV | GO Command for the TV output. It is used to synchronized the pipelines (graphics and/or video ones) associated with the TV output. wr: immediate 0x0: The hardware has finished updating the internal shadow registers of the pipeline(s) associated with the TV output using the user values. The hardware resets the bit when the update is completed. 0x1: The user has finished to program the shadow registers of the pipeline(s) associated with the TV output and the hardware can update the internal registers at the external VSYNC. | RW | 0 |
| 5 | GOLCD | GO Command for the primary LCD output. It is used to synchronized the pipelines (graphics and/or video ones) associated with the primary LCD output. wr: immediate 0x0: The hardware has finished updating the internal shadow registers of the pipeline(s) connected to the LCD output using the user values. The hardware resets the bit when the update is completed. 0x1: The user has finished to program the shadow registers of the pipeline(s) associated with the LCD output and the hardware can update the internal registers at the VFP start period | RW | 0 |
| 4 | M8B | Mono 8-bit mode of the primary LCD wr: VFP start period of primary LCD output 0x0: Pixel data [3:0] is used to output four pixel values to the panel at each pixel clock transition. (only in Passive Mono 4-bit mode). 0x1: Pixel data [7:0] is used to output eight pixel values to the panel each pixel clock transition. (only in Passive Mono 8-bit mode). | RW | 0 |
| 3 | STNTFT | LCD Display type of the primary LCD wr: VFP start period of primary LCD output 0x0: Passive or STN display operation enabled. STN dither logic is enabled. 0x1: Active or TFT display operation enabled. STN Dither logic and output FIFO bypassed. | RW | 0 |
| 2 | MONOCOLOR | Monochrome/Color selection for the primary LCD wr: VFP start period of primary LCD output 0x0: Color operation enabled (STN mode only) 0x1: Monochrome operation enabled (STN mode only) | RW | 0 |
| 1 | TVENABLE | Enable the TV output wr: immediate effect only occurs at the end of the current frame. 0x0: TV output disabled (at the end of the current field if interlace output when the bit is reset) 0x1: TV output enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | LCDENABLE | Enable the primary LCD outputs wr: immediate Effect only occurs at the end of the current frame 0x0: LCD output disabled (at the end of the frame when the bit is reset) 0x1: LCD output enabled | RW | 0 |

Table 10-145. Register Call Summary for Register DISPC_CONTROL1

Display Controller

- [Overlay Manager: \[0\]](#)
- [Timing and TV Format Settings: \[1\]](#)
- [Shadow Registers: \[2\] \[3\] \[4\] \[5\]](#)
- [Operational Modes Configuration: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [Display Controller Logical Register Mapping: \[15\]](#)
- [Display Controller Register Summary: \[16\]](#)

Table 10-146. DISPC_CONFIG1

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0044 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1044 0x5800 1044 | | |
| Description | The control register configures the Display Controller module for the primary LCD output and TV output. Shadow register, updated on VFP start period of primary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|-----------|-----------------|----------|------------------|----------|----------------------|-----------------------|---------------|-----------------|-----|-------------|----------------|-------------|-----------------|--------------|-----------------|-------------|------------|------------|-----------------|----------------|-------------------|----------|------------|
| RESERVED | | | | | | | | FULLRANGE | COLORCONVENABLE | FIDFIRST | OUTPUTMODEENABLE | RESERVED | TVALPHABLENDERENABLE | LCDALPHABLENDERENABLE | BUFFERFILLING | BUFFERHANDCHECK | CPR | BUFFERMERGE | TCKTVSELECTION | TCKTVENABLE | TCKLCDSELECTION | TCKLCDENABLE | GAMATABLEENABLE | ACBIASGATED | VSYNCGATED | HSYNCGATED | PIXELCLOCKGATED | PIXELDATAGATED | PALETTEGAMMATABLE | LOADMODE | PIXELGATED |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|-------|
| 31:26 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 25 | FULLRANGE | Color Space Conversion full range setting. wr: VFP start of primary LCD 0x0: Limited range selected. 0x1: Full range selected. | RW | 0 |
| 24 | COLORCONV ENABLE | Enable the color space conversion. It shall be reset when CPR bit field is set to 0x1. wr: VFP start of primary LCD 0x0: Disable Color Space Conversion RGB to YUV 0x1: Enable Color Space Conversion RGB to YUV | RW | 0 |
| 23 | FIDFIRST | Selects the first field to output in case of interlace mode. In case of progressive mode, the value is not used. wr: VFP start of primary LCD 0x0: First field is even. 0x1: Odd field is first. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|---|------|-------|
| 22 | OUTPUTMODE ENABLE | Selects between progressive and interlace mode for the primary LCD output. wr: VFP start of primary LCD 0x0: Progressive mode selected. 0x1: Interlace mode selected. | RW | 0 |
| 21:20 | RESERVED | Write 0s for future compatibility. Reads return 0. | RW | 0 |
| 19 | TVALPHABLENDER ENABLE | Selects the alpha blender overlay manager for the TV output instead of the color key alpha blender (LCD output). The bit field is deprecated. It is present for software backward compatibility only. When it is enabled, the Z-order defined in each ATTRIBUTES registers for only the pipelines associated pipeline connected to the TV output are invalid and replaced by the following: graphics z-order = 3, video3 z-order = 2, video2 z-order =1 and video1 z-order=0 If it disabled, the z-order and z-order enable bit fields defined in each ATTRIBUTES register are used. wr: EVSYNC start of primary LCD 0x0: Alpha blender is disabled. 0x1: The alpha blender is enabled. | RW | 0 |
| 18 | LCDALPHABLENDER ENABLE | Selects the alpha blender overlay manager for the primary LCD output instead of the color key alpha blender (LCD output). The bit field is deprecated. It is present for software backward compatibility only. When it is enabled, the Z-order defined in each ATTRIBUTES registers for only the pipelines associated with the primary LCD output are invalid and replaced by the following: graphics z-order = 3, video3 z-order = 2, video2 z-order =1 and video1 z-order=0 If it disabled, the z-order and z-order enable bit fields defined in each ATTRIBUTES register are used. wr: VFP start of primary LCD 0x0: Alpha blender is disabled. The color key alpha blending is used. 0x1: The alpha blender is enabled. | RW | 0 |
| 17 | BUFFERFILLING | Controls if the DMA buffers are refilled only when the LOW threshold is reached or if all DMA buffers are refilled when at least one of them reaches the LOW threshold. wr: immediate 0x0: Each DMA buffer is refilled when it reaches LOW threshold. 0x1: All DMA buffers are refilled up to high threshold when at least one of them reaches the LOW threshold. (only active DMA buffers shall be considered and when reaching the end of the frame the DMA buffer goes to empty condition so no need to fill it again). | RW | 0 |
| 16 | BUFFERHAND CHECK | Controls the handcheck between DMA buffer and STALL signal in order to prevent from underflow. The bit shall be set to 0 when the module is not in STALL mode. (primary LCD output) wr: VFP start of primary LCD 0x0: Only the STALL signal (generated by RFBI, DSI1 or DSI2 depending on which IP uses the LCD output) is used regardless of the DMA buffer fullness information in order to provide data to the RFBI,DSI1 or DS2 module. 0x1: The STALL signal (generated by RFBI, DSI1 or DSI2 depending on which IP uses the LCD output) is used in combination with the DMA buffer fullness information in order to provide data to the RFBI, DSI1 or DSI2 module only when it does not generated buffer underflow. | RW | 0 |
| 15 | CPR | Color Phase Rotation Control (primary LCD output). It shall be reset when ColorConvEnable bit field is set to 1 wr: VFP start period of primary LCD output 0x0: Color Phase Rotation Disabled 0x1: Color Phase Rotation Enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------|
| 14 | BUFFERMERGE | Buffer merge control wr: EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory or VFP. When enabled, the DISPC_GLOBAL_BUFFER register is ignored. This bit must be set to zero when the write back channel is used. When DISPC_CONTROL2.GOWB is used BUFFERMERGE MUST be zero. When DISPC_CONTROL2.GOWB is used BUFFERMERGE MUST be zero. wr: immediate 0x0: DMA buffer merge disabled Each DMA buffer is dedicated to one pipeline. 0x1: DMA buffer merge enabled All the DMA buffers are merged into a single one to be used by the single active pipeline. | RW | 0 |
| 13 | TCKTV SELECTION | Transparency Color Key Selection (TV output) wr: EVSYNC 0x0: Destination transparency color key selected 0x1: Source transparency color key selected | RW | 0 |
| 12 | TCKTVENABLE | Transparency Color Key Enabled (TV output) wr: EVSYNC 0x0: Disable the transparency color key for the TV output 0x1: Enable the transparency color key for the TV output | RW | 0 |
| 11 | TCKLCD SELECTION | Transparency Color Key Selection (primary LCD output) wr: VFP start period of primary LCD output 0x0: Destination transparency color key selected 0x1: Source transparency color key selected | RW | 0 |
| 10 | TCKLCDENABLE | Transparency Color Key Enabled (primary LCD output) wr: VFP start period of primary LCD output 0x0: Disable the transparency color key for the LCD 0x1: Enable the transparency color key for the LCD | RW | 0 |
| 9 | GAMATABLE ENABLE | For backward compatibility, an enable bit has been added on the 2 additional gamma tables (secondary display TV). Gamma table of LCD1 is always enabled. 0x0: Gamma table LDC2 TV are bypassed 0x1: Gamma table LCD2 TV are enabled | RW | 0 |
| 8 | ACBIASGATED | ACBias Gated Enabled (primary LCD output) wr: VFP start period of primary LCD output 0x0: ACBias Gated Disabled 0x1: ACBias Gated Enabled | RW | 0 |
| 7 | VSYNCGATED | VSYNC Gated Enabled (primary LCD output) wr: VFP start period of primary LCD output 0x0: VSYNC Gated Disabled 0x1: VSYNC Gated Enabled | RW | 0 |
| 6 | HSYNCGATED | HSYNC Gated Enabled (primary LCD output) wr: VFP start period of primary LCD output 0x0: HSYNC Gated Disabled 0x1: HSYNC Gated Enabled | RW | 0 |
| 5 | PIXELCLOCK GATED | Pixel Clock Gated Enabled (primary LCD output) wr: VFP start period of primary LCD output 0x0: Pixel Clock Gated Disabled 0x1: Pixel Clock Gated Enabled | RW | 0 |
| 4 | PIXELDATAGATED | Pixel Data Gated Enabled (primary LCD output) wr: VFP start period of primary LCD output 0x0: Pixel Data Gated Disabled 0x1: Pixel Data Gated Enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------|
| 3 | PALETTEGAMMA TABLE | <p>Palette/Gamma Table selection wr: VFP start period of primary LCD output or VFP start period of secondary LCD output or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the graphics pipeline: primary LCD, secondary LCD, TV output or write-back to the memory. In case of the table is used as gamma table, it is used for the primary LCD output only.</p> <p>0x0: LUT used as palette (only if graphics format is BITMAP1, 2, 4, and 8)</p> <p>0x1: LUT used as gamma table (only if graphics format is NOT BITMAP1, 2, 4, and 8 or no graphics window present)</p> | RW | 0 |
| 2:1 | LOADMODE | <p>Loading Mode for the Palette/Gamma Table wr: VFP start period of primary LCD output or VFP start period of secondary LCD output or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory</p> <p>0x0: Palette/Gamma Table and data are loaded every frame</p> <p>0x1: Palette/Gamma Table to be loaded. The user sets the bit when the palette/gamma table has to be loaded. Hardware resets the bit to 0x2 when table has been loaded. (DISPC_GFX_ATTRIBUTES.ENABLE has to be set to 1).</p> <p>0x2: Frame data only loaded every frame</p> <p>0x3: Palette/Gamma Table and frame data loaded on first frame then switch to 0x2 (Hardware).</p> | RW | 0x0 |
| 0 | PIXELGATED | <p>Pixel Gated Enable (only for TFT) (primary LCD output) wr: VFP start period of primary LCD output</p> <p>0x0: Pixel clock always toggles (only in TFT mode)</p> <p>0x1: Pixel clock only toggles when there is valid data to display. (only in TFT mode)</p> | RW | 0 |

Table 10-147. Register Call Summary for Register DISPC_CONFIG1

Display Controller

- [Wakeup: \[0\]](#)
- [Color Look-Up Table \(CLUT\): \[1\] \[2\]](#)
- [Overlay Manager: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [Shadow Registers: \[9\]](#)
- [Operational Modes Configuration: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\]](#)
- [Display Controller Logical Register Mapping: \[21\]](#)
- [Display Controller Register Summary: \[22\]](#)

Table 10-148. DISPC_DEFAULT_COLOR0

| | | | |
|------------------|--|----------|--------------------------|
| Address Offset | 0x0000 004C | | |
| Physical Address | 0x4804 104C 0x5800 104C | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The control register allows to configure the default solid background color for the primary LCD. Shadow register, updated on VFP start period of the primary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DEFAULTCOLOR | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|----------|
| 31:24 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 23:0 | DEFAULTCOLOR | 24-bit RGB color value to specify the default solid color to display when there is no data from the overlays. | RW | 0x000000 |

Table 10-149. Register Call Summary for Register DISPC_DEFAULT_COLOR0

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-150. DISPC_DEFAULT_COLOR1

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0050 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1050 0x5800 1050 | | |
| Description | The control register allows to configure the default solid background color for the TV output. Shadow register, updated on EVSYNC | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DEFAULTCOLOR | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|----------|
| 31:24 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 23:0 | DEFAULTCOLOR | 24-bit RGB color value to specify the default solid color to display when there is no data from the overlays. | RW | 0x000000 |

Table 10-151. Register Call Summary for Register DISPC_DEFAULT_COLOR1

Display Controller

- [Timing and TV Format Settings: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Operational Modes Configuration: \[2\]](#)
- [Display Controller Logical Register Mapping: \[3\]](#)
- [Display Controller Register Summary: \[4\]](#)

Table 10-152. DISPC_TRANS_COLOR0

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0054 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1054 0x5800 1054 | | |
| Description | The register sets the transparency color value for the video/graphics overlays for the primary LCD output. Shadow register, updated on VFP start period of the primary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | TRANSCOLORKEY | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|----------|
| 31:24 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 23:0 | TRANSCOLORKEY | Transparency Color Key Value in RGB format [0] BITMAP 1 (CLUT), [23,1] set to 0s [1:0] BITMAP 2 (CLUT), [23,2] set to 0s [3:0] BITMAP 4 (CLUT), [23,4] set to 0s [7:0] BITMAP 8 (CLUT), [23,8] set to 0s [11:0] RGB 12, [23,12] set to 0s [15:0] RGB 16, [23,16] set to 0s [23:0] RGB 24 | RW | 0x000000 |

Table 10-153. Register Call Summary for Register DISPC_TRANS_COLOR0

Display Controller

- [Overlay Manager: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Display Controller Logical Register Mapping: \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-154. DISPC_TRANS_COLOR1

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0058 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1058 0x5800 1058 | | |
| Description | The register sets the transparency color value for the video/graphics overlays for the TV output. Shadow register, updated on EVSYNC | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | TRANSCOLORKEY | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|----------|
| 31:24 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 23:0 | TRANSCOLORKEY | Transparency Color Key Value in RGB format [0] BITMAP 1 (CLUT), [23,1] set to 0s [1:0] BITMAP 2 (CLUT), [23,2] set to 0s [3:0] BITMAP 4 (CLUT), [23,4] set to 0s [7:0] BITMAP 8 (CLUT), [23,8] set to 0s [11:0] RGB 12, [23,12] set to 0s [15:0] RGB 16, [23,16] set to 0s [23:0] RGB 24 | RW | 0x000000 |

Table 10-155. Register Call Summary for Register DISPC_TRANS_COLOR1

Display Controller

- [Overlay Manager: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Operational Modes Configuration: \[2\]](#)
- [Display Controller Logical Register Mapping: \[3\]](#)
- [Display Controller Register Summary: \[4\]](#)

Table 10-156. DISPC_LINE_STATUS

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 005C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 105C 0x5800 105C | | |
| Description | The control register indicates the current primary LCD panel display line number. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINENUMBER | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------|
| 31:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x000000 |
| 10:0 | LINENUMBER | Current LCD panel line number Current display line number. The first active line has the value 0. During blanking lines the line number is not incremented. | R | 0x000 |

Table 10-157. Register Call Summary for Register DISPC_LINE_STATUS

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-158. DISPC_LINE_NUMBER

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0060 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1060 0x5800 1060 | | |
| Description | The control register indicates the primary LCD panel display line number for the interrupt and the DMA request. Shadow register, updated on VFP start period of primary LCD. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINENUMBER | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------|
| 31:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x000000 |
| 10:0 | LINENUMBER | LCD panel line number programming LCD line number defines the line on which the programmable interrupt is generated and the DMA request occurs. | RW | 0x000 |

Table 10-159. Register Call Summary for Register DISPC_LINE_NUMBER

Display Controller

- [sDMA Requests: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-160. DISPC_TIMING_H1

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0064 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 1064 0x5800 1064 | | | | | | | | | | | | | | | | InstanceDISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the timing logic for the HSYNC signal. It is used for the primary LCD output. Shadow register, updated on VFP start period of primary LCD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HBP | | | | | | | | | | | | HFP | | | | | | | | | | | | HSW | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:20 | HBP | Horizontal Back Porch. Encoded value (from 1 to 4096) to specify the number of pixel clock periods to add to the beginning of a line transmission before the first set of pixels is output to the display (program to value minus 1). When in BT mode and interlaced, this field corresponds to the vertical field blanking No 2 for Even Field. | RW | 0x000 |
| 19:8 | HFP | Horizontal front porch. Encoded value (from 1 to 4096) to specify the number of pixel clock periods to add to the end of a line transmission before line clock is asserted (program to value minus 1). When in BT mode and interlaced, this field corresponds to the vertical field blanking No 1 for Even Field. | RW | 0x000 |
| 7:0 | HSW | Horizontal synchronization pulse width Encoded value (from 1 to 256) to specify the number of pixel clock periods to pulse the line clock at the end of each line (program to value minus 1). When in BT mode, this field corresponds to the horizontal blanking | RW | 0x00 |

Table 10-161. Register Call Summary for Register DISPC_TIMING_H1

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-162. DISPC_TIMING_V1

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0068 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 1068 0x5800 1068 | | | | | | | | | | | | | | | | Instance DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the timing logic for the VSYNC signal. It is used for the primary LCD output. Shadow register, updated on VFP start period of primary LCD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VBP | | | | | | | | | | | | VFP | | | | | | | | | | | | VSW | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:20 | VBP | Vertical back porch Encoded value (from 0 to 4095) to specify the number of line clock periods to add to the beginning of a frame. | RW | 0x000 |
| 19:8 | VFP | Vertical front porch Encoded value (from 0 to 4095) to specify the number of line clock periods to add to the end of each frame. | RW | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7:0 | VSW | Vertical synchronization pulse width In active mode, encoded value (from 1 to 256) to specify the number of line clock periods (program to value minus 1) to pulse the frame clock (VSYNC) pin at the end of each frame after the end of frame wait (VFP) period elapses. Frame clock uses as VSYNC signal in active mode. In passive mode, encoded value (from 1 to 256) to specify the number of extra line clock periods (program to value minus 1) to insert after the vertical front porch (VFP) period has elapsed. | RW | 0x00 |

Table 10-163. Register Call Summary for Register DISPC_TIMING_V1

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-164. DISPC_POL_FREQ1

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 006C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 106C 0x5800 106C | | |
| Description | The register configures the signal configuration. It is used for the primary LCD output. Shadow register, updated on VFP start period of primary LCD. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|-------|-------|----|-----|-----|-----|-----|------|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | ALIGN | ONOFF | RF | IEO | IPC | IHS | IVS | ACBI | | | | ACB | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:19 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 18 | ALIGN | Defines the alignment between HSYNC and VSYNC assertion. 0x0: VSYNC and HSYNC are not aligned 0x1: VSYNC and HSYNC assertions are aligned. | RW | 0 |
| 17 | ONOFF | HSYNC/VSYNC Pixel clock Control On/Off 0x0: HSYNC and VSYNC are driven on opposite edges of pixel clock than pixel data 0x1: HSYNC and VSYNC are driven according to bit 16 | RW | 0 |
| 16 | RF | Program HSYNC/VSYNC Rise or Fall 0x0: HSYNC and VSYNC are driven on falling edge of pixel clock (if bit 17 set to 1) 0x1: HSYNC and VSYNC are driven on rising edge of pixel clock (if bit 17 set to 1) | RW | 0 |
| 15 | IEO | Invert output enable 0x0: Ac-bias is active high (active display mode) 0x1: Ac-bias is active low (active display mode) | RW | 0 |
| 14 | IPC | Invert pixel clock 0x0: Data is driven on the LCD data lines on the rising-edge of the pixel clock 0x1: Data is driven on the LCD data lines on the falling-edge of the pixel clock | RW | 0 |
| 13 | IHS | Invert HSYNC 0x0: Line clock pin is active high and inactive low 0x1: Line clock pin is active low and inactive high | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 12 | IVS | Invert VSYNC 0x0: Frame clock pin is active high and inactive low 0x1: Frame clock pin is active low and inactive high | RW | 0 |
| 11:8 | ACBI | AC Bias Pin transitions per interrupt Value (from 0 to 15) used to specify the number of AC Bias pin transitions | RW | 0x0 |
| 7:0 | ACB | AC Bias Pin Frequency Value (from 0 to 255) used to specify the number of line clocks to count before transitioning the AC Bias pin. This pin is used to periodically invert the polarity of the power supply to prevent DC charge build-up within the display. | RW | 0x00 |

Table 10-165. Register Call Summary for Register DISPC_POL_FREQ1

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-166. DISPC_DIVISOR1

| | | | |
|-------------------------|--|---|---|
| Address Offset | | 0x0000 0070 | |
| Physical Address | | 0x4804 1070 0x5800 1070 | Instance DISPC_PER_L4 DISPC_L3 |
| Description | | The register configures the divisors. It is used for the primary LCD output Shadow register, updated on VFP start period of primary LCD | |
| Type | | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | LCD | | | | | | | | RESERVED | | | | | | | | PCD | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 23:16 | LCD | Display Controller Logic Clock Divisor Value (from 1 to 255) to specify the intermediate pixel clock frequency based on the LCD1_CLK. The value 0 is invalid. | RW | 0x04 |
| 15:8 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 7:0 | PCD | Pixel Clock Divisor Value (from 1 to 255) to specify the frequency of the pixel clock based on the LCD1_CLK divided by DISPC_DIVISOR1.LCD value. The values 0 is invalid. | RW | 0x01 |

Table 10-167. Register Call Summary for Register DISPC_DIVISOR1

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)
- [Display Controller Register Description: \[3\] \[4\] \[5\] \[6\]](#)

Table 10-168. DISPC_GLOBAL_ALPHA

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0074 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1074 0x5800 1074 | | |
| Description | The register defines the global alpha value for the graphics and three video pipelines. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory for each bit field depending on the association of the each pipeline with the primary LCD, secondary LCD or TV output. | | |
| Type | RW | | |

| | | | |
|-------------------------|-------------------------|-----------------------|-----------------|
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| VID3GLOBALALPHA | VID2GLOBALALPHA | VID1GLOBALALPHA | GFXGLOBALALPHA |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|-------|
| 31:24 | VID3GLOBALALPHA | Global alpha value from 0 to 255. 0 corresponds to fully transparent and 255 to fully opaque. | RW | 0xFF |
| 23:16 | VID2GLOBALALPHA | Global alpha value from 0 to 255. 0 corresponds to fully transparent and 255 to fully opaque. | RW | 0xFF |
| 15:8 | VID1GLOBALALPHA | Global alpha value from 0 to 255. 0 corresponds to fully transparent and 255 to fully opaque. | RW | 0xFF |
| 7:0 | GFXGLOBALALPHA | Global alpha value from 0 to 255. 0 corresponds to fully transparent and 255 to fully opaque. | RW | 0xFF |

Table 10-169. Register Call Summary for Register DISPC_GLOBAL_ALPHA

Display Controller

- [Overlay Manager: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Operational Modes Configuration: \[2\] \[3\]](#)
- [Display Controller Register Summary: \[4\]](#)

Table 10-170. DISPC_SIZE_TV

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0078 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1078 0x5800 1078 | | |
| Description | The register configures the size of the TV output field (interlace), frame (progressive) (horizontal and vertical). Shadow register, updated on EVSYNC. A delta value is used to indicate if the odd field has same vertical size as the even field or +/- one line. | | |
| Type | RW | | |

| | | | |
|-------------------------|-------------------------|-----------------------|-----------------|
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| RESERVED | LPP | DELTA_LPP RESERVED | PPL |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | LPP | Lines per panel (LPP). Encoded value (from 1 to 2048) to specify the number of LPP. If DISPC_VID2_ATTRIBUTES[16] CHANNELOUT = 0x1 and DISPC_VID2_ATTRIBUTES[31:30] CHANNELOUT2 = 0x2, then the total number of lines per frame is equal to 2048 + LPP. | RW | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 15:14 | DELTA_LPP | Indicates the delta size value of the odd field compared to the even field 0x0: Same size 0x1: Odd size = Even size +1 0x2: Odd size = Even Size -1 | RW | 0x0 |
| 13:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 10:0 | PPL | Pixels per line Encoded value (from 1 to 2048) to specify the number of pixels contains within each line on the display. | RW | 0x000 |

Table 10-171. Register Call Summary for Register DISPC_SIZE_TV

Display Controller

- [Timing and TV Format Settings: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [Shadow Registers: \[8\]](#)
- [Operational Modes Configuration: \[9\] \[10\] \[11\]](#)
- [Display Controller Register Summary: \[12\]](#)
- [Display Controller Register Description: \[13\]](#)

Table 10-172. DISPC_SIZE_LCD1

| | | | |
|------------------|---|----------|--------------|
| Address Offset | 0x0000 007C | Instance | DISPC_PER_L4 |
| Physical Address | 0x4804 107C 0x5800 107C | | DISPC_L3 |
| Description | The register configures the panel size (horizontal and vertical). Shadow register, updated on VFP start period of primary LCD. A delta value is used to indicate if the odd field has same vertical size as the even field or +/- one line. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|-----------|----|----------|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | LPP | | | | | | | | DELTA_LPP | | RESERVED | | PPL | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | LPP | Lines per panel Encoded value (from 1 to 2048) to specify the number of lines per panel (program to value minus 1). | RW | 0x000 |
| 15:14 | DELTA_LPP | Indicates the delta size value of the odd field compared to the even field 0x0: same size 0x1: Odd size = Even size +1 0x2: Odd size = Even Size -1 | RW | 0x0 |
| 13:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 10:0 | PPL | Pixels per line Encoded value (from 1 to 2048) to specify the number of pixels contains within each line on the display (program to value minus 1). In STALL mode, any value is valid. In non STALL mode, only values multiple of 8 pixels are valid. | RW | 0x000 |

Table 10-173. Register Call Summary for Register DISPC_SIZE_LCD1

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\] \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)
- [Display Controller Register Description: \[4\]](#)

Table 10-174. DISPC_GFX_BA_j

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0080 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1080 + (0x4 * j) 0x5800 1080 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the base address of the graphics buffer displayed in the graphics window (0 1 :for ping-pong mechanism with external trigger, based on the field polarity, 0 only used when graphics pipeline on the LCD output and 0 1 when on the TV output). Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | BA | Graphics base address Base address of the graphics buffer (aligned on pixel size boundary) (in case 1-, 2-, and 4-bpp, byte alignment is required, in case of RGB24 packed format, 4-pixel alignment is required) When the TILER is addressed, the bits: [28:27] = 0x0 for 8-bit tiled [28:27] = 0x1 for 16-bit tiled [28:27] = 0x2 for 32-bit tiled [28:27] = 0x3 for page mode [31:29] = 0x0 for 0-degree view [31:29] = 0x1 for 180-degree view + mirroring [31:29] = 0x2 for 0-degree view + mirroring [31:29] = 0x3 for 180-degree view [31:29] = 0x4 for 270-degree view + mirroring [31:29] = 0x5 for 270-degree view [31:29] = 0x6 for 90-degree view [31:29] = 0x7 for 90-degree view + mirroring Otherwise the bits indicated the corresponding bit address to access the SDRAM. | RW | 0x0000 0000 |

Table 10-175. Register Call Summary for Register DISPC_GFX_BA_j

Display Controller

- [Addressing and Bursts: \[0\]](#)
- [Immediate Base Address Flip Mechanism: \[1\]](#)
- [Rotation and Mirroring: \[2\] \[3\] \[4\] \[5\]](#)
- [Shadow Registers: \[6\]](#)
- [Operational Modes Configuration: \[7\]](#)
- [Display Controller Register Summary: \[8\]](#)

Table 10-176. DISPC_GFX_POSITION

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0088 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1088 0x5800 1088 | | |
| Description | The register configures the position of the graphics window. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | POSY | | | | | | | | RESERVED | | | | | | | | POSX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | POSY | Y position of the graphics window. Encoded value (from 0 to 2047) to specify the Y position of the graphics window on the screen. The line at the top has the Y-position 0. | RW | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | POSX | X position of the graphics window. Encoded value (from 0 to 2047) to specify the X position of the graphics window on the screen. The first pixel on the left of the screen has the X-position 0. | RW | 0x000 |

Table 10-177. Register Call Summary for Register DISPC_GFX_POSITION

Display Controller

- [Overlay Manager: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Operational Modes Configuration: \[2\] \[3\]](#)
- [Display Controller Register Summary: \[4\]](#)

Table 10-178. DISPC_GFX_SIZE

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 008C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 108C 0x5800 108C | | |
| Description | The register configures the size of the graphics window. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SIZEY | | | | | | | | RESERVED | | | | | | | | SIZEX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | SIZEY | Number of lines of the graphics window. Encoded value (from 1 to 2048) to specify the number of lines of the graphics window (program to value minus 1). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | SIZEX | Number of pixels of the graphics window. Encoded value (from 1 to 2048) to specify the number of pixels per line of the graphics window (program to value minus 1). | RW | 0x000 |

Table 10-179. Register Call Summary for Register DISPC_GFX_SIZE

Display Controller

- [Addressing and Bursts: \[0\]](#)
- [Overlay Manager: \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Operational Modes Configuration: \[3\] \[4\]](#)
- [Display Controller Register Summary: \[5\]](#)

Table 10-180. DISPC_GFX_ATTRIBUTES

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 00A0 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 10A0 0x5800 10A0 | | |
| Description | The register configures the graphics attributes. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------|------------------|--------|--------------|-------------|----------|----|----|----|----|----|----|----|-----------------|----------|-------------|-------------|----------|------------|----------|------------|------------|-----------|-------------------|--------|---|---|---|--------|---|---|
| CHANNELOUT2 | BURSTTYPE | PREMULTIPLYALPHA | ZORDER | ZORDERENABLE | ANTIFLICKER | RESERVED | | | | | | | | SELFREFRESHAUTO | RESERVED | SELFREFRESH | ARBITRATION | ROTATION | BUFPRELOAD | RESERVED | NIBBLEMODE | CHANNELOUT | BURSTSIZE | REPLICATIONENABLE | FORMAT | | | | ENABLE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 31:30 | CHANNELOUT2 | It is not used if CHANNELOUT is set to TV. Reserved when CHANNELOUT = 1 (should set to zero) wr: immediate 0x0: primary LCD output selected. 0x1: Secondary LCD output selected. 0x3: Write-back output to the memory selected. | RW | 0x0 |
| 29 | BURSTTYPE | The type of burst can be INCR (incremental) or BLCK (2D block). The 2D block is required when the TILER is targeted by the DMA engine. (It does not apply to the palette loading OCP requests using INCR burst only) 0x0: INC burst type is used. 0x1: 2D block burst type is used. | RW | 0 |
| 28 | PREMULTIPLYALPHA | The field configures the DISPC GFX to process incoming data as premultiplied alpha data or non premultiplied alpha data. Default setting is non premultiplied alpha data. 0x0: Non premultiplied alpha data color component 0x1: Premultiplied alpha data color component | RW | 0 |
| 27:26 | ZORDER | Z-Order defining the priority of the layer compared to others when overlaying. It is software responsibility to ensure that each layer connected to the same overlay manager has a different z-order value. If bit 25 is set to 0, the ZORDER bit field is ignored and replaced by the value 0. 0x0: Z-order 0: layer above solid background color and below layer with higher Z-order values. 0x1: Z-order 1: layer above layer with z-order value of 0 and below layers with z-order values of 2 and 3 0x3: Z-order 3: layer above all the other layers 0x2: Z-order 2: layer above layers with z-order value of 0 and 1 and below layer with z-order value of 3 | RW | 0x0 |

Display Controller

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|-------|
| 25 | ZORDERENABLE | Z-order Enable. The bit field ZORDER is only used when the Z-order is enabled. 0x0: Z-order disabled. The Z-order of the layer is 0. 0x1: Z-order enabled. The Z-order is defined by the bit field ZORDER (bits 26 and 27). | RW | 0 |
| 24 | ANTIFLICKER | Antiflicker filtering using a 3-tap filter with hardcoded coefficients (1/4, 1/2, 1/4) 0x0: Antiflicker disabled. 0x1: Antiflicker enabled. | RW | 0 |
| 23:18 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 17 | SELFREFRESHAUTO | Automatic self-refresh mode 0x0: The transition from Selfrefresh "disabled" to "enabled" is controlled by software 0x1: The transition from Selfrefresh "disabled" to "enabled" is controlled only by hardware | RW | 0 |
| 16 | RESERVED | | R | 0 |
| 15 | SELFREFRESH | Enables the self refresh of the graphics window from its own DMA buffer. This bit should be set only after having set the GO bit of the channel and read back a zero in its field. 0x0: The graphics pipeline accesses the interconnect to fetch data from the system memory. 0x1: The graphics pipeline does not need anymore to fetch data from memory. Only the graphics DMA buffer is used. It takes effect after the frame has been loaded in the DMA buffer. | RW | 0 |
| 14 | ARBITRATION | Determines the priority of the graphics pipeline. When the graphics pipeline is one of the high priority pipelines. The arbitration wheel gives always the priority first to the high priority pipelines using round-robin between them. When there is only normal priority pipelines sending requests, the round-robin applies between them. 0x0: The graphics pipeline is one of the normal priority pipeline. 0x1: The graphics pipeline is one of the high priority pipeline. | RW | 0 |
| 13:12 | ROTATION | Graphics Rotation Flag 0x0: No rotation 0x1: Rotation by 90 degrees 0x3: Rotation by 270 degrees 0x2: Rotation by 180 degrees | RW | 0x0 |
| 11 | BUFPRELOAD | Graphics Preload Value 0x0: Hardware prefetches pixels up to the preload value defined in the preload register 0x1: Hardware prefetches pixels up to high threshold value | RW | 0 |
| 10 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 9 | NIBBLEMODE | Graphics Nibble Mode (only for 1-, 2- and 4-bpp) 0x0: Nibble mode is disabled 0x1: Nibble mode is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|-------|
| 8 | CHANNELOUT | Graphics Channel Out configuration: LCD, WB or TV. wr: immediate 0x0: LCD output or WB to the memory selected. bit fields 31 and 30 defines the output associated (primary, secondary or write-back). 0x1: TV output selected | RW | 0 |
| 7:6 | BURSTSIZE | Graphics DMA Burst Size 0x0: 2x128bit bursts 0x1: 4x128bit bursts 0x3: Reserved 0x2: 8x128bit bursts | RW | 0x2 |
| 5 | REPLICATIONENABLE | Graphics Replication Enabled: RGB, ARGB, and RGBA formats are converted into ARGB32-8888 using replication of the MSBs or '0s 0x0: Disable Graphics replication logic. The conversion to ARGB32-8888 is done by adding 0s for the LSBs 0x1: Enable Graphics replication logic. The conversion to ARGB32-8888 is done by duplicating the MSBs for the LSBs | RW | 1 |
| 4:1 | FORMAT | Graphics format. It defines the pixel format when fetching the graphics picture into memory. 0x6: RGB16-565 0x1: BITMAP2 (CLUT is required to be used) 0xA: RGBx12-4444 0x7: ARGB16-1555 0xD: RGBA32-8888 0x0: BITMAP1 (CLUT is required to be used) 0x2: BITMAP4 (CLUT is required to be used) 0x8: xRGB24-8888 (32-bit container) 0x9: RGB24-888 (24-bit container) 0xB: RGBA12-4444 0x4: xRGB12-4444 0x5: ARGB16-4444 0xF: xRGB15-1555 0xC: ARGB32-8888 0x3: BITMAP8 (CLUT is required to be used) 0xE: RGBx24-8888 (24-bit RGB aligned on MSB of the 32-bit container) | RW | 0x0 |
| 0 | ENABLE | Graphics Enable 0x0: Graphics disabled (graphics pipeline inactive and graphics window not present) 0x1: Graphics enabled (graphics pipeline active and graphics window present on the screen) | RW | 0 |

Table 10-181. Register Call Summary for Register DISPC_GFX_ATTRIBUTES

Display Controller

- [Addressing and Bursts: \[0\] \[1\]](#)
- [Arbitration: \[2\]](#)
- [DMA Power Modes: \[3\] \[4\]](#)
- [Memory Format: \[5\]](#)
- [Graphics Pipeline: \[6\] \[7\] \[8\]](#)
- [Replication Logic: \[9\] \[10\]](#)
- [Overlay Manager: \[11\] \[12\] \[13\] \[14\] \[15\]](#)
- [Shadow Registers: \[16\]](#)
- [Operational Modes Configuration: \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\]](#)
- [Display Controller Register Summary: \[33\]](#)
- [Display Controller Register Description: \[34\]](#)

Table 10-182. DISPC_GFX_BUF_THRESHOLD

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00A4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 10A4 0x5800 10A4 | | | | | | | | | | | | | | | | Instance DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the graphics buffer. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BUFHIGHTHRESHOLD | | | | | | | | | | | | | | | | BUFLOWTHRESHOLD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|--------|
| 31:16 | BUFHIGHTHRESHOLD | DMA buffer High Threshold Number of 128-bits defining the threshold value. | RW | 0x04FF |
| 15:0 | BUFLOWTHRESHOLD | DMA buffer Low Threshold Number of 128-bits defining the threshold value. The value put in this register should always be greater than zero. | RW | 0x04F8 |

Table 10-183. Register Call Summary for Register DISPC_GFX_BUF_THRESHOLD

Display Controller

- [DMA Buffers: \[0\] \[1\] \[2\]](#)
- [Shadow Registers: \[3\]](#)
- [Operational Modes Configuration: \[4\] \[5\]](#)
- [Display Controller Register Summary: \[6\]](#)

Table 10-184. DISPC_GFX_BUF_SIZE_STATUS

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00A8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 10A8 0x5800 10A8 | | | | | | | | | | | | | | | | Instance DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | The register defines the Graphics buffer size | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BUFSIZE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 15:0 | BUFSIZE | DMA buffer Size in number of 128-bits | R | 0x0500 |

Table 10-185. Register Call Summary for Register DISPC_GFX_BUF_SIZE_STATUS

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-186. DISPC_GFX_ROW_INC

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|--|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------------------------------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00AC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 10AC 0x5800 10AC | | | | | | | | | | | | | | | | InstanceDISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | The register configures the number of bytes to increment at the end of the row. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16"></td><td colspan="17">ROWINC</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | ROWINC | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | ROWINC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:0 | ROWINC | | Number of bytes to increment at the end of the row Encoded unsigned value to specify the number of bytes to increment at the end of the row in the graphics buffer. The value 0 is invalid. The value 1 means next pixel. The value 1+n*bpp means increment of n pixels. The value 1- (n+1)*bpp means decrement of n pixels. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RW | 0x0000 0001 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | ROWINC | Number of bytes to increment at the end of the row Encoded unsigned value to specify the number of bytes to increment at the end of the row in the graphics buffer. The value 0 is invalid. The value 1 means next pixel. The value 1+n*bpp means increment of n pixels. The value 1- (n+1)*bpp means decrement of n pixels. | RW | 0x0000 0001 |

Table 10-187. Register Call Summary for Register DISPC_GFX_ROW_INC

Display Controller

- [Addressing and Bursts: \[0\] \[1\]](#)
- [Predecimation: \[2\]](#)
- [Rotation and Mirroring: \[3\] \[4\] \[5\] \[6\]](#)
- [Shadow Registers: \[7\]](#)
- [Operational Modes Configuration: \[8\]](#)
- [Display Controller Register Summary: \[9\]](#)

Table 10-188. DISPC_GFX_PIXEL_INC

| | | | |
|------------------|--|----------|--------------------------|
| Address Offset | 0x0000 00B0 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 10B0 0x5800 10B0 | | |
| Description | The register configures the number of bytes to increment between two pixels. For more information, see Section 10.2.4.6.5, Predecimation . Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | PIXELINC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x000000 |
| 7:0 | PIXELINC | Number of bytes to increment between two pixels. Encoded unsigned value (from 1 to 255) to specify the number of bytes between two pixels in the graphics buffer. The value 0 is invalid. The value 1 means next pixel. The value 1+n*bpp means increment of n pixels. | RW | 0x01 |

Table 10-189. Register Call Summary for Register DISPC GFX_PIXEL_INC

Display Controller

- Addressing and Bursts: [0]
- Predecimation: [1]
- Rotation and Mirroring: [2] [3] [4] [5]
- Shadow Registers: [6]
- Operational Modes Configuration: [7]
- Display Controller Register Summary: [8]

Table 10-190. DISPC GFX TABLE BA

| | | |
|-------------------------|--|---|
| Address Offset | 0x0000 00B8 | |
| Physical Address | 0x4804 10B8 0x5800 10B8 | Instance DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the base address of the palette buffer or the gamma table buffer. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TABLEBA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | TABLEBA | Base address of the palette/gamma table buffer (24-bit entries in 32-bit containers, aligned on 32-bit boundary). | RW | 0x0000 0000 |

Table 10-191. Register Call Summary for Register DISPC_GFX_TABLE_BA

Display Controller

- [Color Look-Up Table \(CLUT\): \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Operational Modes Configuration: \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-192. DISPC_VID1_BA_j

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 00BC + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 10BC + (0x4 * j) 0x5800 10BC + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the base address of the video buffer for the video window 1 (DISPC_VID1_BA_0 DISPC_VID1_BA_1 for ping-pong mechanism with external trigger, based on the field polarity otherwise only DISPC_VID1_BA_0 is used). Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | BA | Video base address Base address of the video buffer (aligned on pixel size boundary except in case of RGB24 packed format, 4-pixel alignment is required; in case of YUV4:2:2, 2-pixel alignment is required, and YUV4:2:0, byte alignment is supported)). It case of YUV4:2:0 format, it indicates the base address of the Y buffer. When the TILER is addressed, the bits: [28:27] = 0x0 for 8-bit tiled [28:27] = 0x1 for 16-bit tiled [28:27] = 0x2 for 32-bit tiled [28:27] = 0x3 for page mode [31:29] = 0x0 for 0-degree view [31:29] = 0x1 for 180-degree view + mirroring [31:29] = 0x2 for 0-degree view + mirroring [31:29] = 0x3 for 180-degree view [31:29] = 0x4 for 270-degree view + mirroring [31:29] = 0x5 for 270-degree view [31:29] = 0x6 for 90-degree view [31:29] = 0x7 for 90-degree view + mirroring Otherwise the bits indicated the corresponding bit address to access the SDRAM. | RW | 0x0000 0000 |

Table 10-193. Register Call Summary for Register DISPC_VID1_BA_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-194. DISPC_VID1_POSITION

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00C4 | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 10C4 0x5800 10C4 | | | | | | | | | | | | | | | |
| | Instance | | | | | | | | | | | | | | | |
| | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the position of the video window 1. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 . GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | POSY | | | | | | | | RESERVED | | | | | | | | POSX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | POSY | Y position of the video window 1 Encoded value (from 0 to 2047) to specify the Y position of the video window 1 .The line at the top has the Y-position 0. | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | POSX | X position of the video window 1 Encoded value (from 0 to 2047) to specify the X position of the video window 1. The first pixel on the left of the display screen has the X-position 0. | RW | 0x000 |

Table 10-195. Register Call Summary for Register DISPC_VID1_POSITION

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-196. DISPC_VID1_SIZE

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00C8 | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 10C8 0x5800 10C8 | | | | | | | | | | | | | | | |
| | Instance | | | | | | | | | | | | | | | |
| | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the size of the video window 1. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 . GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SIZEY | | | | | | | | RESERVED | | | | | | | | SIZEX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | SIZEY | Number of lines of the video 1 Encoded value (from 1 to 2048) to specify the number of lines of the video window 1. Program to value minus 1. | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | SIZEX | Number of pixels of the video window 1 Encoded value (from 1 to 2048) to specify the number of pixels of the video window 1. Program to value minus 1. | RW | 0x000 |

Table 10-197. Register Call Summary for Register DISPC_VID1_SIZE

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-198. DISPC_VID1_ATTRIBUTES

| | | |
|-------------------------|---|---|
| Address Offset | 0x0000 00CC | |
| Physical Address | 0x4804 10CC 0x5800 10CC | Instance DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the attributes of the video window 1. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | |
| Type | RW | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----|-----------|------------------|--------|--------------|-------------|-------------|--------------|--------------|-----------------|------------|----------|-----------------|------------|----|-----------|----|----------|----|-----------|-------------------|-----------------|-------------|-------------|--------------|--------|---|---|---|--------|---|
| CHANNELOUT2 | | BURSTTYPE | PREMULTIPLYALPHA | ZORDER | ZORDERENABLE | SELFREFRESH | ARBITRATION | DOUBLESTRIDE | VERTICALTAPS | DMAOPTIMIZATION | BUFPRELOAD | RESERVED | SELFREFRESHAUTO | CHANNELOUT | | BURSTSIZE | | ROTATION | | FULLRANGE | REPLICATIONENABLE | COLORCONVENABLE | VRESIZECONF | HRESIZECONF | RESIZEENABLE | FORMAT | | | | ENABLE | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 31:30 | CHANNELOUT2 | It is not used if CHANNELOUT is set to TV. Reserved when CHANNELOUT = 1 (should be set to zero) wr: immediate 0x0: primary LCD output selected. 0x1: Secondary LCD output selected. 0x3: Write-back output to the memory selected. | RW | 0x0 |
| 29 | BURSTTYPE | The type of burst can be INCR (incremental) or BLCK (2D block). The 2D block is required when the TILER is targeted by the DMA engine. 0x0: INC burst type is used. 0x1: 2D block burst type is used. | RW | 0 |
| 28 | PREMULTIPHYALPHA | The field configures the DISPC VID1 to process incoming data as premultiplied alpha data or non premultiplied alpha data. Default setting is non premultiplied alpha data. 0x0: Non premultiplied alpha data color component 0x1: Premultiplied alpha data color component | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|-------|
| 27:26 | ZORDER | <p>Z-Order defining the priority of the layer compared to others when overlaying. It is software responsibility to ensure that each layer connected to the same overlay manager has a different z-order value. If bit 25 is set to 0, the ZORDER bit field is ignored and replaced by the value 0.</p> <p>0x0: Z-order 0: layer above solid background color and below layer with higher Z-order values.</p> <p>0x1: Z-order 1: layer above layer with z-order value of 0 and below layers with z-order values of 2 and 3</p> <p>0x3: Z-order 3: layer above all the other layers</p> <p>0x2: Z-order 2: layer above layers with z-order value of 0 and 1 and below layer with z-order value of 3</p> | RW | 0x0 |
| 25 | ZORDERENABLE | <p>Z-order Enable. The bit field ZORDER is only used when the Z-order is enabled.</p> <p>0x0: Z-order disabled. The Z-order of the layer is 0.</p> <p>0x1: Z-order enabled. The Z-order is defined by the bit field ZORDER (bits 26 and 27).</p> | RW | 0 |
| 24 | SELFREFRESH | <p>Enables the self refresh of the video window from its own DMA buffer only.</p> <p>0x0: The video pipeline accesses the interconnect to fetch data from the system memory.</p> <p>0x1: The video pipeline does not need anymore to fetch data from memory. Only the DMA buffer associated with the video1 is used. It takes effect after the frame has been loaded in the DMA buffer.</p> | RW | 0 |
| 23 | ARBITRATION | <p>Determines the priority of the video pipeline. The video pipeline is one of the high priority pipeline. The arbitration gives always the priority first to the high priority pipelines using round-robin between them. When there is only normal priority pipelines sending requests, the round-robin applies between them.</p> <p>0x0: The video pipeline is one of the normal priority pipeline.</p> <p>0x1: The video pipeline is one of the high priority pipeline.</p> | RW | 0 |
| 22 | DOUBLESTRIDE | <p>Determines if the stride for CbCr buffer is the 1x or 2x of the Y buffer stride.</p> <p>It is only used in case of YUV4:2:0.</p> <p>0x0: The CbCr stride value is equal to the Y stride.</p> <p>0x1: The CbCr stride value is double to the Y stride.</p> | RW | 0 |
| 21 | VERTICALTAPS | <p>Video Vertical Resize Tap Number. The vertical polyphase filter can be configured in 3-tap or 5-tap configuration.</p> <p>According to the number of taps, the maximum input picture width is double while using 3-tap compared to 5-tap.</p> <p>0x0: 3 taps are used for the vertical filtering logic. The 2 other taps are not used.</p> <p>The associated bit fields for the 2 other taps coefficients do not need to be initialized.</p> <p>0x1: 5 taps are used for the vertical filtering logic.</p> | RW | 0 |
| 20 | DMAOPTIMIZATION | <p>Write 0s for future compatibility.</p> <p>Reads return 0.</p> | R | 0 |
| 19 | BUFPRELOAD | <p>Video Preload Value</p> <p>0x0: Hardware prefetches pixels up to the preload value defined in the preload register</p> <p>0x1: Hardware prefetches pixels up to high threshold value</p> | RW | 0 |
| 18 | RESERVED | <p>Write 0s for future compatibility.</p> <p>Reads return 0.</p> | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 17 | SELFREFRESHAUTO | Automatic self-refresh mode 0x0: The transition from SELFREFRESH "disabled" to "enabled" is controlled by SW. 0x1: The transition from SELFREFRESH "disabled" to "enabled" is controlled only by hardware. | RW | 0 |
| 16 | CHANNELOUT | Video Channel Out configuration: LCD, WB or TV. wr: immediate 0x0: LCD output or WB to the memory selected. bit fields 31 and 30 defines the output associated (primary, secondary or write-back). 0x1: TV output selected | RW | 0 |
| 15:14 | BURSTSIZE | Video DMA Burst Size 0x0: 2x128bit bursts 0x1: 4x128bit bursts 0x3: Reserved 0x2: 8x128bit bursts | RW | 0x2 |
| 13:12 | ROTATION | Video Rotation Flag 0x0: No rotation 0x1: Rotation by 90 degrees 0x3: Rotation by 270 degrees 0x2: Rotation by 180 degrees | RW | 0x0 |
| 11 | FULLRANGE | Color Space Conversion full range setting. 0x0: Limited range selected: 16 subtracted from Y before color space conversion 0x1: Full range selected: Y is not modified before the color space conversion | RW | 0 |
| 10 | REPLICATIONENABLE | Replication Enable 0x0: Disable Video replication logic 0x1: Enable Video replication logic | RW | 1 |
| 9 | COLORCONVENABLE | Enable the color space conversion. The hardware does not enable/disable the conversion based on the pixel format. The bit field shall be reset when the format is not YUV. 0x0: Disable Color Space Conversion YUV to RGB 0x1: Enable Color Space Conversion YUV to RGB | RW | 0 |
| 8 | VRESIZECONF | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 7 | HRESIZECONF | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 6:5 | RESIZEENABLE | Video Resize Enable 0x0: Disable both horizontal and vertical resize processing 0x1: Enable the horizontal resize processing 0x3: Enable both horizontal and vertical resize processing 0x2: Enable the vertical resize processing | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 4:1 | FORMAT | Video Format. It defines the pixel format when fetching the video 1 picture into memory. 0x6: RGB16-565 0x1: RGB12x-4444 0xA: YUV2 4:2:2 co-sited 0x7: ARGB16-1555 0xD: RGBA32-8888 0x0: NV12 4:2:0 2 buffers (Y + UV) 0x2: RGBA12-4444 0x8: xRGB24-8888 (32-bit container) 0x9: RGB24-888 (24-bit container) 0xB: UYVY 4:2:2 co-sited 0x5: ARGB16-4444 0xF: xRGB15-1555 0xC: ARGB32-8888 0x4: xRGB12-4444 0xE: RGBx24-8888 (24-bit RGB aligned on MSB of the 32-bit container) | RW | 0x0 |
| 0 | ENABLE | Video Enable 0x0: Video disabled (video pipeline inactive and window not present) 0x1: Video enabled (video pipeline active and window present on the screen) | RW | 0 |

Table 10-199. Register Call Summary for Register DISPC_VID1_ATTRIBUTES

Display Controller

- [Overlay Manager: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Display Controller Logical Register Mapping: \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)
- [Display Controller Register Description: \[4\] \[5\] \[6\]](#)

Table 10-200. DISPC_VID1_BUF_THRESHOLD

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|----|--|----|------|----|--------|----|----|----|----|----|----|----|----|-----------------|----------------------------------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00D0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 10D0 0x5800 10D0 | | | | | | | | | | | | | | | | InstanceDISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | The register configures the video buffer associated with the video pipeline 1. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">BUFHIGHTHRESHOLD</td><td colspan="16">BUFLOWTHRESHOLD</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | BUFHIGHTHRESHOLD | | | | | | | | | | | | | | | | BUFLOWTHRESHOLD | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BUFHIGHTHRESHOLD | | | | | | | | | | | | | | | | BUFLOWTHRESHOLD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:16 | BUFHIGHTHRESHOLD | | Video DMA buffer High Threshold Number of 128-bits defining the threshold value. | | RW | | 0x07FF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15:0 | BUFLOWTHRESHOLD | | DMA buffer High Threshold Number of 128-bits defining the threshold value. | | RW | | 0x07F8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 10-201. Register Call Summary for Register DISPC_VID1_BUF_THRESHOLD

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-202. DISPC_VID1_BUF_SIZE_STATUS

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|----|--|----|----|----|----|----|----|----|----|----|----|----|----|---------|------------------------------|----|----|----|----|---|---|---|---|---|---|---|---|---|------|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00D4 | | | | | | | | | | | | | | | | InstanceDISPC_PER_L4DISPC_L3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 10D40x5800 10D4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | The register defines the Video buffer size for the video pipeline 1. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="16">BUFSIZE</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | BUFSIZE | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | BUFSIZE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:16 | RESERVED | | Write 0s for future compatibility. Reads return 0. | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15:0 | BUFSIZE | | Video 1 DMA buffer Size in number of 128-bits | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x0800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 10-203. Register Call Summary for Register DISPC_VID1_BUF_SIZE_STATUS

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-204. DISPC_VID1_ROW_INC

| Address Offset | 0x0000 00D8 | Instance | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|--|--------------------------|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Physical Address | 0x4804 10D8 0x5800 10D8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | The register configures the number of bytes to increment at the end of the row for the buffer associated with the video window 1. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="32">ROWINC</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | ROWINC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ROWINC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:0 | ROWINC | Number of bytes to increment at the end of the row Encoded signed value (from $2^{31}1$ to 2^{31}) to specify the number of bytes to increment at the end of the row in the video buffer. The value 0 is invalid. The value 1 means next pixel. The value $1 + n * \text{bpp}$ means increment of n pixels. The value $1 (n + 1) * \text{bpp}$ means decrement of n pixels. | RW | 0x0000 0001 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 10-205. Register Call Summary for Register DISPC_VID1_ROW_INC

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-206. DISPC_VID1_PIXEL_INC

| | | | | |
|-------------------------|---|-----------------|--------------------------|--|
| Address Offset | 0x0000 00DC | | | |
| Physical Address | 0x4804 10DC 0x5800 10DC | Instance | DISPC_PER_L4 DISPC_L3 | |
| Description | The register configures the number of bytes to increment between two pixels for the buffer associated with the video window 2. For more information, see Section 10.2.4.6.5, Predecimation . The register is used only when the TILER is not present in the system in order to perform low performance rotation. When the TILER IP is present it is highly recommended to use it for performing the rotation. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PIXELINC | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x000000 |
| 7:0 | PIXELINC | Number of bytes to increment between two pixels. Encoded unsigned value (from 1 to 255) to specify the number of bytes between two pixels in the video buffer. The value 0 is invalid. The value 1 means next pixel. The value 1+n*bpp means increment of n pixels. For YUV4:2:0, Max supported value is 128. | RW | 0x01 |

Table 10-207. Register Call Summary for Register DISPC_VID1_PIXEL_INC

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-208. DISPC_VID1_FIR

| | | | | |
|-------------------------|--|-----------------|--------------------------|--|
| Address Offset | 0x0000 00E0 | | | |
| Physical Address | 0x4804 10E0 0x5800 10E0 | Instance | DISPC_PER_L4 DISPC_L3 | |
| Description | The register configures the resize factors for horizontal and vertical up/downsampling of the video window 1. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVINC | | | | | | | | RESERVED | | | | | | | | FIRHINC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:29 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 28:16 | FIRVINC | Vertical increment of the up/downsampling filter. Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |
| 15:13 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|--------|
| 12:0 | FIRHINC | Horizontal increment of the up/downsampling filter. Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |

Table 10-209. Register Call Summary for Register DISPC_VID1_FIR

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-210. DISPC_VID1_PICTURE_SIZE

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 00E4 | | |
| Physical Address | 0x4804 10E4 0x5800 10E4 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the size of the video picture associated with the video layer 1 before up/down-scaling. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | ORGSIZEY | | | | | | | | RESERVED | | | | | | | | ORGSIZEX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | ORGSIZEY | Number of lines of the video picture. Encoded value (from 1 to 2048) to specify the number of lines of the video picture in memory (program to value minus 1). When predecimation is set, the value represents the size of the image after predecimation but the max size of the unpredecimated image size in memory is still bounded to 2 ¹¹ . | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | ORGSIZEX | Number of pixels of the video picture Encoded value (from 1 to 2048) to specify the number of pixels of the video picture in memory (program to value minus 1). The size is limited to the size of the line buffer of the vertical sampling block in case the video picture is processed by the vertical filtering unit. (program to value minus 1). When predecimation is set, the value represents the size of the image after predecimation but the max size of the unpredecimated image size in memory is still bounded to 2 ¹¹ . | RW | 0x000 |

Table 10-211. Register Call Summary for Register DISPC_VID1_PICTURE_SIZE

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-212. DISPC_VID1_ACCU_j

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 00E8 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 10E8 + (0x4 * j) 0x5800 10E8 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the resize accumulator init values for horizontal and vertical up/downsampling of the video window 1 (DISPC_VID1_ACCU_0 DISPC_VID1_ACCU_1 for ping-pong mechanism with external trigger, based on the field polarity) It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VERTICALACCU | | | | | | | | RESERVED | | | | | | | | HORIZONTALACCU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | VERTICALACCU | Vertical initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | HORIZONTALACCU | Horizontal initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |

Table 10-213. Register Call Summary for Register DISPC_VID1_ACCU_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-214. DISPC_VID1_FIR_COEF_H_i

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 00F0 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 10F0 + (0x8 * i) 0x5800 10F0 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the up/down-scaling coefficients for the horizontal resize of the video picture associated with the video window 1 for the phases from 0 to 7. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRHC3 | | | | | | | | FIRHC2 | | | | | | | | FIRHC1 | | | | | | | | FIRHC0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRHC3 | Signed coefficient C3 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRHC2 | Unsigned coefficient C2 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRHC1 | Signed coefficient C1 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC0 | Signed coefficient C0 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-215. Register Call Summary for Register DISPC_VID1_FIR_COEF_H_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-216. DISPC_VID1_FIR_COEF_HV_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 00F4 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 10F4 + (0x8 * i) 0x5800 10F4 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical and horizontal resize of the video picture associated with the video window 1 for the phases from 0 to 7. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRVC2 | | | | | | | | FIRVC1 | | | | | | | | FIRVC0 | | | | | | | | FIRHC4 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRVC2 | Signed coefficient C2 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRVC1 | Unsigned coefficient C1 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRVC0 | Signed coefficient C0 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC4 | Signed coefficient C4 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-217. Register Call Summary for Register DISPC_VID1_FIR_COEF_HV_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-218. DISPC_VID1_CONV_COEF0

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0130 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1130 0x5800 1130 | | |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 1. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RCR | | | | | | | | RESERVED | | | | | | | | RY | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | RCR | RCr Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 10:0 | RY | RY Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-219. Register Call Summary for Register DISPC_VID1_CONV_COEF0

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-220. DISPC_VID1_CONV_COEF1

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0134 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1134 0x5800 1134 | | |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 1. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | GY | | | | | | | | RESERVED | | | | | | | | RCB | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | GY | GY Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | RCB | RCb Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-221. Register Call Summary for Register DISPC_VID1_CONV_COEF1

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-222. DISPC_VID1_CONV_COEF2

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0138 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1138 0x5800 1138 | | |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 1. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | GCB | | | | | | | | RESERVED | | | | | | | | GCR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | GCB | GCB Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | GCR | GCR Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-223. Register Call Summary for Register DISPC_VID1_CONV_COEF2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-224. DISPC_VID1_CONV_COEF3

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 013C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 113C 0x5800 113C | | |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 1. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | BCR | | | | | | | | RESERVED | | | | | | | | BY | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | BCR | BCr coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | BY | BY coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-225. Register Call Summary for Register DISPC_VID1_CONV_COEF3

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-226. DISPC_VID1_CONV_COEF4

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|--------------------------|----|----|----|-----|---|---|---|---|---|---|---|---|------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0140 | | | | | | | | | | | | | | | | Instance | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 1140 0x5800 1140 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 1. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="22">RESERVED</td><td colspan="10">BCB</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | BCB | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | BCB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:11 | RESERVED | | Write 0s for future compatibility. Reads return 0. | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10:0 | BCB | | BCb Coefficient Encoded signed value (from -1024 to 1023). | | | | | | | | | | | | | | | | | | | | | | | | | | | | RW | 0x000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 10-227. Register Call Summary for Register DISPC_VID1_CONV_COEF4

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-228. DISPC_VID2_BA_j

| | | | |
|------------------|---|----------|--------------------------|
| Address Offset | 0x0000 014C + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 114C + (0x4 * j) 0x5800 114C + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the base address of the video buffer for the video window 2 (DISPC_VID2_BA_0 DISPC_VID2_BA_1 for ping-pong mechanism with external trigger, based on the field polarity otherwise only DISPC_VID2_BA_0 is used)). Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | BA | Video base address Base address of the video buffer (aligned on pixel size boundary except in case of RGB24 packed format, 4-pixel alignment is required; in case of YUV4:2:2, 2-pixel alignment is required, and YUV4:2:0, byte alignment is supported)). It case of YUV4:2:0 format, it indicates the base address of the Y buffer. When the TILER is addressed, the bits: [28:27] = 0x0 for 8-bit tiled [28:27] = 0x1 for 16-bit tiled [28:27] = 0x2 for 32-bit tiled [28:27] = 0x3 for page mode [31:29] = 0x0 for 0-degree view [31:29] = 0x1 for 180-degree view + mirroring [31:29] = 0x2 for 0-degree view + mirroring [31:29] = 0x3 for 180-degree view [31:29] = 0x4 for 270-degree view + mirroring [31:29] = 0x5 for 270-degree view [31:29] = 0x6 for 90-degree view [31:29] = 0x7 for 90-degree view + mirroring Otherwise the bits indicated the corresponding bit address to access the SDRAM. | RW | 0x0000 0000 |

Table 10-229. Register Call Summary for Register DISPC_VID2_BA_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-230. DISPC_VID2_POSITION

| | | | |
|-------------------------|---|--|--------------------------|
| Address Offset | 0x0000 0154 | | |
| Physical Address | 0x4804 1154 0x5800 1154 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the position of the video window 2. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| RESERVED | POSX | RESERVED | POSX |
| Bits | Field Name | Description | Type Reset |
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R 0x00 |
| 26:16 | POSX | Y position of the video window 2 Encoded value (from 0 to 2047) to specify the Y position of the video window 2. The line at the top has the Y-position 0. | RW 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R 0x00 |
| 10:0 | POSX | X position of the video window 2 Encoded value (from 0 to 2047) to specify the X position of the video window 2. The first pixel on the left of the display screen has the X-position 0. | RW 0x000 |

Table 10-231. Register Call Summary for Register DISPC_VID2_POSITION

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-232. DISPC_VID2_SIZE

| | | | |
|-------------------------|---|-----------------------|--------------------------|
| Address Offset | 0x0000 0158 | | |
| Physical Address | 0x4804 1158 0x5800 1158 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the size of the video window 2. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| RESERVED | SIZEY | RESERVED | SIZEX |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | SIZEY | Number of lines of the video 2 Encoded value (from 1 to 2048) to specify the number of lines of the video window 2. Program to value minus 1. | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | SIZEX | Number of pixels of the video window 2 Encoded value (from 1 to 2048) to specify the number of pixels of the video window 2. Program to value minus 1. | RW | 0x000 |

Table 10-233. Register Call Summary for Register DISPC_VID2_SIZE

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-234. DISPC_VID2_ATTRIBUTES

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 015C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 115C 0x5800 115C | | |
| Description | The register configures the attributes of the video window 2. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
|-------------|----|-----------|----|------------------|----|--------|----|--------------|-------------|-------------|--------------|--------------|-----------------|------------|----------|-----------------|------------|-----------|----|----------|----|-----------|---|-------------------|-----------------|-------------|-------------|--------------|---|--------|---|--|--|--------|
| CHANNELOUT2 | | BURSTTYPE | | PREMULTIPLYALPHA | | ZORDER | | ZORDERENABLE | SELFREFRESH | ARBITRATION | DOUBLESTRIDE | VERTICALTAPS | DMAOPTIMIZATION | BUFPRELOAD | RESERVED | SELFREFRESHAUTO | CHANNELOUT | BURSTSIZE | | ROTATION | | FULLRANGE | | REPLICATIONENABLE | COLORCONVENABLE | VRESIZECONF | HRESIZECONF | RESIZEENABLE | | FORMAT | | | | ENABLE |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|-------|
| 31:30 | CHANNELOUT2 | Value 0x2 is reserved when bit [16] CHANNELOUT = 0. Values 0x1, 0x2 and 0x3 are reserved when bit CHANNELOUT = 1 and TV format other than HDMI 1.4 3D 1080p is to be output. wr: immediate. 0x0: primary LCD output selected. 0x2: TV output selected. Used only for HDMI 1.4 3D 1080p format. 0x1: Secondary LCD output selected. 0x3: Write-back output to the memory selected. | RW | 0x0 |
| 29 | BURSTTYPE | The type of burst can be INCR (incremental) or BLCK (2D block). The 2D block is required when the TILER is targeted by the DMA engine. 0x0: INC burst type is used. 0x1: 2D block burst type is used. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 28 | PREMULTIPLYALPHA | The field configures the DISPC VID2 to process incoming data as premultiplied alpha data or non premultiplied alpha data. Default setting is non premultiplied alpha data. 0x0: Non premultiplied alpha data color component 0x1: Premultiplied alpha data color component | RW | 0 |
| 27:26 | ZORDER | Z-Order defining the priority of the layer compared to others when overlaying. It is software responsibility to ensure that each layer connected to the same overlay manager has a different z-order value. If bit 25 is set to 0, the ZORDER bit field is ignored and replaced by the value 0. 0x0: Z-order 0: layer above solid background color and below layer with higher Z-order values. 0x1: Z-order 1: layer above layer with z-order value of 0 and below layers with z-order values of 2 and 3 0x3: Z-order 3: layer above all the other layers 0x2: Z-order 2: layer above layers with z-order value of 0 and 1 and below layer with z-order value of 3 | RW | 0x0 |
| 25 | ZORDERENABLE | Z-order Enable. The bit field ZORDER is only used when the Z-order is enabled. 0x0: Z-order disabled. The Z-order of the layer is 0. 0x1: Z-order enabled. The Z-order is defined by the bit field ZORDER (bits 26 and 27). | RW | 0 |
| 24 | SELFREFRESH | Enables the self refresh of the video window from its own DMA buffer only. 0x0: The video pipeline accesses the interconnect to fetch data from the system memory. 0x1: The video pipeline does not need anymore to fetch data from memory. Only the DMA buffer associated with the video2 is used. It takes effect after the frame has been loaded in the DMA buffer. | RW | 0 |
| 23 | ARBITRATION | Determines the priority of the video pipeline. The video pipeline is one of the high priority pipeline. The arbitration gives always the priority first to the high priority pipelines using round-robin between them. When there is only normal priority pipelines sending requests, the round-robin applies between them. 0x0: The video pipeline is one of the normal priority pipeline. 0x1: The video pipeline is one of the high priority pipeline. | RW | 0 |
| 22 | DOUBLESTRIDE | Determines if the stride for CbCr buffer is the 1x or 2x of the Y buffer stride. It is only used in case of YUV4:2:0. 0x0: The CbCr stride value is equal to the Y stride. 0x1: The CbCr stride value is double to the Y stride. | RW | 0 |
| 21 | VERTICALTAPS | Video Vertical Resize Tap Number 0x0: 3 taps are used for the vertical filtering logic. The 2 other taps are not used. The associated bit fields for the 2 other taps coefficients do not need to be initialized. 0x1: 5 taps are used for the vertical filtering logic. | RW | 0 |
| 20 | DMAOPTIMIZATION | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 19 | BUFPRELOAD | Video Preload Value 0x0: Hardware prefetches pixels up to the preload value defined in the preload register 0x1: Hardware prefetches pixels up to high threshold value | RW | 0 |

Display Controller

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 18 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 17 | SELFREFRESHAUTO | Automatic self-refresh mode 0x0: The transition from SELFREFRESH "disabled" to "enabled" is controlled by SW. 0x1: The transition from SELFREFRESH "disabled" to "enabled" is controlled only by hardware. | RW | 0 |
| 16 | CHANNELOUT | Video Channel Out configuration: LCD, WB or TV. wr: immediate 0x0: LCD output or WB to the memory selected. bit fields 31 and 30 defines the output associated (primary, secondary or write-back). 0x1: TV output selected | RW | 0 |
| 15:14 | BURSTSIZE | Video DMA Burst Size 0x0: 2x128bit bursts 0x1: 4x128bit bursts 0x3: Reserved 0x2: 8x128bit bursts | RW | 0x2 |
| 13:12 | ROTATION | Video Rotation Flag 0x0: No rotation 0x1: Rotation by 90 degrees 0x3: Rotation by 270 degrees 0x2: Rotation by 180 degrees | RW | 0x0 |
| 11 | FULLRANGE | Color Space Conversion full range setting. 0x0: Limited range selected: 16 subtracted from Y before color space conversion 0x1: Full range selected: Y is not modified before the color space conversion | RW | 0 |
| 10 | REPLICATIONENABLE | Replication Enable 0x0: Disable Video replication logic 0x1: Enable Video replication logic | RW | 1 |
| 9 | COLORCONVENABLE | Enable the color space conversion. The hardware does not enable/disable the conversion based on the pixel format. The bit field shall be reset when the format is not YUV. 0x0: Disable Color Space Conversion YUV to RGB 0x1: Enable Color Space Conversion YUV to RGB | RW | 0 |
| 8 | VRESIZECONF | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 7 | HRESIZECONF | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 6:5 | RESIZEENABLE | Video Resize Enable 0x0: Disable both horizontal and vertical resize processing 0x1: Enable the horizontal resize processing 0x3: Enable both horizontal and vertical resize processing 0x2: Enable the vertical resize processing | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 4:1 | FORMAT | <p>Video Format. It defines the pixel format when fetching the video 2 picture into memory.</p> <p>0x6: RGB16-565</p> <p>0x1: RGB12x-4444</p> <p>0xA: YUV2 4:2:2 co-sited</p> <p>0x7: ARGB16-1555</p> <p>0xD: RGBA32-8888</p> <p>0x0: NV12 4:2:0 2 buffers (Y + UV)</p> <p>0x2: RGBA12-4444</p> <p>0x8: xRGB24-8888 (32-bit container)</p> <p>0x9: RGB24-888 (24-bit container)</p> <p>0xB: UYVY 4:2:2 co-sited</p> <p>0x5: ARGB16-4444</p> <p>0xF: xRGB15-1555</p> <p>0xC: ARGB32-8888</p> <p>0x4: xRGB12-4444</p> <p>0xE: RGBx24-8888 (24-bit RGB aligned on MSB of the 32-bit container)</p> | RW | 0x0 |
| 0 | ENABLE | <p>VidEnable</p> <p>0x0: Video disabled (video pipeline inactive and window not present)</p> <p>0x1: Video enabled (video pipeline active and window present on the screen)</p> | RW | 0 |

Table 10-235. Register Call Summary for Register DISPC_VID2_ATTRIBUTES

Display Controller

- **Overlay Manager:** [0] [1]
- **Timing and TV Format Settings:** [2]
- **Shadow Registers:** [3]
- **Display Controller Logical Register Mapping:** [4]
- **Display Controller Register Summary:** [5]

Table 10-236. DISPC VID2 BUF THRESHOLD

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0160 | | |
| Physical Address | 0x4804 1160 0x5800 1160 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the DMA buffer associated with the video pipeline 2. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BUFHIGHTHRESHOLD | | | | | | | | | | | | | | | | BUFLOWTHRESHOLD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|--------|
| 31:16 | BUFHIGHTHRESHOLD | DMA buffer High Threshold Number of 128-bits defining the threshold value. | RW | 0x07FF |
| 15:0 | BUFLOWTHRESHOLD | DMA buffer High Threshold Number of 128-bits defining the threshold value. | RW | 0x07F8 |

Table 10-237. Register Call Summary for Register DISPC_VID2_BUF_THRESHOLD

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-238. DISPC_VID2_BUF_SIZE_STATUS

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0164 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1164 0x5800 1164 | | |
| Description | The register defines the DMA buffer size for the video pipeline 2. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BUFSIZE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 15:0 | BUFSIZE | DMA buffer size in number of 128 bits | R | 0x0800 |

Table 10-239. Register Call Summary for Register DISPC_VID2_BUF_SIZE_STATUS

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-240. DISPC_VID2_ROW_INC

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0168 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1168 0x5800 1168 | | |
| Description | The register configures the number of bytes to increment at the end of the row for the buffer associated with the video window 2. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ROWINC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | ROWINC | Number of bytes to increment at the end of the row Encoded signed value (from $2^{31}1$ to 2^{31}) to specify the number of bytes to increment at the end of the row in the video buffer. The value 0 is invalid. The value 1 means next pixel. The value $1 + n * \text{bpp}$ means increment of n pixels. The value $1 (n + 1) * \text{bpp}$ means decrement of n pixels. | RW | 0x0000 0001 |

Table 10-241. Register Call Summary for Register DISPC_VID2_ROW_INC

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-242. DISPC_VID2_PIXEL_INC

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 016C | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 116C 0x5800 116C | | | | | | | | | | | | | | | |
| | Instance | | | | | | | | | | | | | | | |
| | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the number of bytes to increment between two pixels for the buffer associated with the video window 2. For more information, see Section 10.2.4.6.5, Predecimation . The register is used only when the TILER is not present in the system in order to perform low performance rotation. When the TILER IP is present it is highly recommended to use it for performing the rotation. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PIXELINC | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x000000 |
| 7:0 | PIXELINC | Number of bytes to increment between two pixels. Encoded unsigned value (from 1 to 255) to specify the number of bytes between two pixels in the video buffer. The value 0 is invalid. The value 1 means next pixel. The value 1+n*bpp means increment of n pixels. For YUV4:2:0, Max supported value is 128. | RW | 0x01 |

Table 10-243. Register Call Summary for Register DISPC_VID2_PIXEL_INC

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-244. DISPC_VID2_FIR

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0170 | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 1170 0x5800 1170 | | | | | | | | | | | | | | | |
| | Instance | | | | | | | | | | | | | | | |
| | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the resize factors for horizontal and vertical up/downsampling of the video window 2. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVINC | | | | | | | | RESERVED | | | | | | | | FIRHINC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:29 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 28:16 | FIRVINC | Vertical increment of the up/downsampling filter Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |
| 15:13 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|--------|
| 12:0 | FIRHINC | Horizontal increment of the up/downsampling filter Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |

Table 10-245. Register Call Summary for Register DISPC_VID2_FIR

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-246. DISPC_VID2_PICTURE_SIZE

| | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0174 | | | | | | | | | | | | | | |
| Physical Address | 0x4804 1174 0x5800 1174 | | | | | | | | | | | | | | |
| Description | The register configures the size of the video picture associated with the video layer 2 before up/down-scaling. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | ORGSIZEY | | | | | | | | RESERVED | | | | | | | | ORGSIZEX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | ORGSIZEY | Number of lines of the video picture Encoded value (from 1 to 2048) to specify the number of lines of the video picture in memory (program to value minus 1). When predecimation is set, the value represents the size of the image after predecimation but the max size of the unpredecimated image size in memory is still bounded 2^{11} . | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | ORGSIZEX | Number of pixels of the video picture Encoded value (from 1 to 2048) to specify the number of pixels of the video picture in memory (program to value minus 1). The size is limited to the size of the line buffer of the vertical sampling block in case the video picture is processed by the vertical filtering unit. (program to value minus 1). When predecimation is set, the value represents the size of the image after predecimation but the max size of the unpredecimated image size in memory is still bounded 2^{11} . | RW | 0x000 |

Table 10-247. Register Call Summary for Register DISPC_VID2_PICTURE_SIZE

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-248. DISPC_VID2_ACCU_j

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0178 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1178 + (0x4 * j) 0x5800 1178 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the resize accumulator init values for horizontal and vertical up/downsampling of the video window 2 (DISPC_VID2_ACCU_0 DISPC_VID2_ACCU_1 for ping-pong mechanism with external trigger, based on the field polarity). It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VERTICALACCU | | | | | | | | RESERVED | | | | | | | | HORIZONTALACCU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | VERTICALACCU | Vertical initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | HORIZONTALACCU | Horizontal initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |

Table 10-249. Register Call Summary for Register DISPC_VID2_ACCU_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\] \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-250. DISPC_VID2_FIR_COEF_H_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0180 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1180 + (0x8 * i) 0x5800 1180 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the up/down-scaling coefficients for the horizontal resize of the video picture associated with the video window 2 for the phases from 0 to 7. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRHC3 | | | | | | | | FIRHC2 | | | | | | | | FIRHC1 | | | | | | | | FIRHC0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRHC3 | Signed coefficient C3 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRHC2 | Unsigned coefficient C2 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRHC1 | Signed coefficient C1 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC0 | Signed coefficient C0 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-251. Register Call Summary for Register DISPC_VID2_FIR_COEF_H_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-252. DISPC_VID2_FIR_COEF_HV_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0184 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1184 + (0x8 * i) 0x5800 1184 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical and horizontal resize of the video picture associated with the video window 2 for the phases from 0 to 7. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRVC2 | | | | | | | | FIRVC1 | | | | | | | | FIRVC0 | | | | | | | | FIRHC4 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRVC2 | Signed coefficient C2 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRVC1 | Unsigned coefficient C1 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRVC0 | Signed coefficient C0 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC4 | Signed coefficient C4 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-253. Register Call Summary for Register DISPC_VID2_FIR_COEF_HV_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-254. DISPC_VID2_CONV_COEF0

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 01C0 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 11C0 0x5800 11C0 | | |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 2. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RCR | | | | | | | | RESERVED | | | | | | | | RY | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | RCR | RCr Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 10:0 | RY | RY Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-255. Register Call Summary for Register DISPC_VID2_CONV_COEF0

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-256. DISPC_VID2_CONV_COEF1

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 01C4 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 11C4 0x5800 11C4 | | |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 2. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | GY | | | | | | | | RESERVED | | | | | | | | RCB | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | GY | GY Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | RCB | RCb Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-257. Register Call Summary for Register DISPC_VID2_CONV_COEF1

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-258. DISPC_VID2_CONV_COEF2

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 01C8 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 11C8 0x5800 11C8 | | |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 2. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | GCB | | | | | | | | RESERVED | | | | | | | | GCR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | GCB | GCB Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | GCR | GCR Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-259. Register Call Summary for Register DISPC_VID2_CONV_COEF2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-260. DISPC_VID2_CONV_COEF3

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 01CC | | |
| Physical Address | 0x4804 11CC 0x5800 11CC | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 2. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | BCR | | | | | | | | RESERVED | | | | | | | | BY | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | BCR | BCr coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | BY | BY coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-261. Register Call Summary for Register DISPC_VID2_CONV_COEF3

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-262. DISPC_VID2_CONV_COEF4

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 01D0 | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 11D0 0x5800 11D0 | | | | | | | | | | | | | | | |
| Instance | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 2. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BCB | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|----------|
| 31:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x000000 |
| 10:0 | BCB | BCb Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-263. Register Call Summary for Register DISPC_VID2_CONV_COEF4

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-264. DISPC_DATA1_CYCLE1

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 01D4 | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 11D4 0x5800 11D4 | | | | | | | | | | | | | | | |
| Instance | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The control register configures the output data format for 1st cycle. Shadow register, updated on VFP start period of primary LCD | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|--------------|----|----|----|----------|----|----|----|--------------------|----|---|---|----------|---|---|---|--------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | NBBITSPIXEL2 | | | | RESERVED | | | | BITALIGNMENTPIXEL1 | | | | RESERVED | | | | NBBITSPIXEL1 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31:28 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 27:24 | BITALIGNMENTPIXEL2 | Bit alignment. Alignment of the bits from pixel 2 on the output interface | RW | 0x0 |
| 23:21 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 20:16 | NBBITSPIXEL2 | Number of bits Number of bits from the pixel 2 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |
| 15:12 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 11:8 | BITALIGNMENTPIXEL1 | Bit alignment. Alignment of the bits from pixel 1 on the output interface | RW | 0x0 |
| 7:5 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 4:0 | NBBITSPIXEL1 | Number of bits Number of bits from the pixel 1 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |

Table 10-265. Register Call Summary for Register DISPC_DATA1_CYCLE1

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-266. DISPC_DATA1_CYCLE2

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 01D8 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 11D8 0x5800 11D8 | | |
| Description | The control register configures the output data format for 2nd cycle. Shadow register, updated on VFP start period of primary LCD | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|--------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | |
| BITALIGNMENTPIXEL2 | | | | | | | | NBBITSPIXEL2 | | | | | | | | BITALIGNMENTPIXEL1 | | | | | | | | NBBITSPIXEL1 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31:28 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 27:24 | BITALIGNMENTPIXEL2 | Bit alignment. Alignment of the bits from pixel 2 on the output interface | RW | 0x0 |
| 23:21 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 20:16 | NBBITSPIXEL2 | Number of bits Number of bits from the pixel 2 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |
| 15:12 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 11:8 | BITALIGNMENTPIXEL1 | Bit alignment. Alignment of the bits from pixel 1 on the output interface | RW | 0x0 |
| 7:5 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 4:0 | NBBITSPIXEL1 | Number of bits Number of bits from the pixel 1 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |

Table 10-267. Register Call Summary for Register DISPC_DATA1_CYCLE2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-268. DISPC_DATA1_CYCLE3

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 01DC | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 11DC 0x5800 11DC | | |
| Description | The control register configures the output data format for 3rd cycle. Shadow register, updated on VFP start period of primary LCD | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|--------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | |
| BITALIGNMENTPIXEL2 | | | | | | | | NBBITSPIXEL2 | | | | | | | | BITALIGNMENTPIXEL1 | | | | | | | | NBBITSPIXEL1 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31:28 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 27:24 | BITALIGNMENTPIXEL2 | Bit alignment. Alignment of the bits from pixel 2 on the output interface | RW | 0x0 |
| 23:21 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 20:16 | NBBITSPIXEL2 | Number of bits Number of bits from the pixel 2 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |
| 15:12 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 11:8 | BITALIGNMENTPIXEL1 | Bit alignment. Alignment of the bits from pixel 1 on the output interface | RW | 0x0 |
| 7:5 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 4:0 | NBBITSPIXEL1 | Number of bits Number of bits from the pixel 1 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |

Table 10-269. Register Call Summary for Register DISPC_DATA1_CYCLE3

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-270. DISPC_VID1_FIR_COEF_V_i

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 01E0 + (0x4 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 11E0 + (0x4 * i) 0x5800 11E0 + (0x4 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical resize of the video picture associated with the video window 1 for the phases from 0 to 7. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVC22 | | | | | | | | FIRVC00 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 15:8 | FIRVC22 | Signed coefficient C22 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRVC00 | Signed coefficient C00 for the vertical up/down-scaling with the phase n | RW | 0x00 |

Table 10-271. Register Call Summary for Register DISPC_VID1_FIR_COEF_V_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-272. DISPC_VID2_FIR_COEF_V_i

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0200 + (0x4 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1200 + (0x4 * i) 0x5800 1200 + (0x4 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical resize of the video picture associated with the video window 2 for the phases from 0 to 7. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVC22 | | | | | | | | FIRVC00 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 15:8 | FIRVC22 | Signed coefficient C22 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRVC00 | Signed coefficient C00 for the vertical up/down-scaling with the phase n | RW | 0x00 |

Table 10-273. Register Call Summary for Register DISPC_VID2_FIR_COEF_V_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-274. DISPC_CPR1_COEF_R

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0220 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1220 0x5800 1220 | | |
| Description | The register configures the color phase rotation matrix coefficients for the Red component. It is used for the primary LCD output. Shadow register, updated on VFP start period of primary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RR | | | | | | | | RESERVED | | RG | | | | | | | | RESERVED | | RB | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:22 | RR | RR Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |
| 21 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 20:11 | RG | RG Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |
| 10 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 9:0 | RB | RB Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |

Table 10-275. Register Call Summary for Register DISPC_CPR1_COEF_R

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-276. DISPC_CPR1_COEF_G

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0224 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1224 0x5800 1224 | | |
| Description | The register configures the color phase rotation matrix coefficients for the Green component. It is used for the primary LCD output. Shadow register, updated on VFP start period of primary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GR | | | | | | | | RESERVED | | GG | | | | | | | | RESERVED | | GB | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:22 | GR | GR Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |
| 21 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 20:11 | GG | GG Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |
| 10 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 9:0 | GB | GB Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |

Table 10-277. Register Call Summary for Register DISPC_CPR1_COEF_G

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-278. DISPC_CPR1_COEF_B

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0228 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1228 0x5800 1228 | | |
| Description | The register configures the color phase rotation matrix coefficients for the Blue component. It is used for the primary LCD output. Shadow register, updated on VFP start period of primary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BR | | | | | | | | RESERVED | | BG | | | | | | | | RESERVED | | BB | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:22 | BR | BR Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |
| 21 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 20:11 | BG | BG Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |
| 10 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 9:0 | BB | BB Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |

Table 10-279. Register Call Summary for Register DISPC_CPR1_COEF_B

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-280. DISPC_GFX_PRELOAD

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 022C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 122C 0x5800 122C | | |
| Description | The register configures the graphics DMA buffer Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PRELOAD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00000 |
| 11:0 | PRELOAD | DMA buffer preload value Number of 128-bit words defining the preload value. | RW | 0x100 |

Table 10-281. Register Call Summary for Register DISPC GFX PRELOAD

Display Controller

- DMA Buffers: [0]
- Shadow Registers: [1]
- Operational Modes Configuration: [2]
- Display Controller Register Summary: [3]

Table 10-282. DISPC VID1 PRELOAD

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0230 | | |
| Physical Address | 0x4804 1230 0x5800 1230 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the DMA buffer of the video 1 pipeline. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 . GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PRELOAD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|----------|
| 31:12 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x000000 |
| 11:0 | PRELOAD | DMA buffer preload value Number of 128-bit words defining the preload value. | RW | 0x100 |

Table 10-283. Register Call Summary for Register DISPC VID1 PRELOAD

Display Controller

- Shadow Registers: [0]
- Display Controller Register Summary: [1]

Table 10-284. DISPC VID2 PRELOAD

| | | | |
|------------------|--|----------|--------------------------|
| Address Offset | 0x0000 0234 | | |
| Physical Address | 0x4804 1234 0x5800 1234 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the DMA buffer of the video 2 pipeline. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PRELOAD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00000 |
| 11:0 | PRELOAD | DMA buffer preload value Number of 128-bit words defining the preload value. | RW | 0x100 |

Table 10-285. Register Call Summary for Register DISPC_VID2_PRELOAD

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-286. DISPC_CONTROL2

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0238 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1238 0x5800 1238 | | |
| Description | The control register configures the Display Controller module for the secondary LCD output. Shadow registers are updated during the VFP start period of the secondary LCD, EVSYNC, or when DISPC_CONTROL2 .GOWB is set to 1 by software and the current WB frame is complete (that is, has no more data in the write-back pipeline). | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------------------|----|----------|----|----|----|---------------|----------------|-----------------|-----------|----------|----|----|----|----|----|----|-----------------------|---------------------|-----------|----------|--------------|----------------|------|-------|-----|--------|-----------|----------|-----------|---|---|
| SPATIALTEMPORALDITHERINGFRAMES | | RESERVED | | | | TDMUNUSEDBITS | TDMCYCLEFORMAT | TDMPARALLELMODE | TDMENABLE | RESERVED | | | | | | | TVOVERLAYOPTIMIZATION | OVERLAYOPTIMIZATION | STALLMODE | RESERVED | TFTDATALINES | STDITHERENABLE | GOWB | GOLCD | M8B | STNTFT | MONOCOLOR | RESERVED | LCDENABLE | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 31:30 | SPATIALTEMPORALDITHERINGFRAMES | Spatial/Temporal dithering number of frames for the secondary LCD output wr: VFP start period of secondary LCD output 0x0: Spatial only 0x1: Spatial and temporal over 2 frames 0x2: Spatial and temporal over 4 frames 0x3: Reserved | RW | 0x0 |
| 29:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 26:25 | TDMUNUSEDBITS | State of unused bits (TDM mode only) for the secondary LCD output wr: VFP start period of secondary LCD output 0x0: low level (0) 0x1: high level (1) 0x2: unchanged from previous state 0x3: reserved | RW | 0x0 |
| 24:23 | TDMCYCLEFORMAT | Cycle format (TDM mode only) for the secondary LCD output wr: VFP start period of secondary LCD output 0x0: 1 cycle for 1 pixel 0x1: 2 cycles for 1 pixel 0x2: 3 cycles for 1 pixel 0x3: 3 cycles for 2 pixels | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|--|------|-------|
| 22:21 | TDMPARALLEL MODE | Output Interface width (TDM mode only) for the secondary LCD output wr: VFP start period of secondary LCD output 0x0: 8-bit parallel output interface selected 0x1: 9-bit parallel output interface selected 0x2: 12-bit parallel output interface selected 0x3: 16-bit parallel output interface selected | RW | 0x0 |
| 20 | TDMENABLE | Enable the multiple cycle format (TDM mode only used for Active Matrix mode with the RFBI enable bit off) for the secondary LCD output wr: VFP start period of secondary LCD output 0x0: TDM disabled 0x1: TDM enabled | RW | 0 |
| 19:14 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 13 | TVOVERLAY OPTIMIZATION | Overlay Optimization for the TV output wr: VFP or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory 0x0: All the data for all the enabled pipelines are fetched from memory regardless of the overlay/alpha blending configuration. 0x1: The data not used by the overlay manager because of overlap between layers with no alpha blending between them shall not be fetched from memory in order to optimize the bandwidth. | RW | 0 |
| 12 | OVERLAY OPTIMIZATION | Overlay Optimization for the secondary LCD output wr: VFP or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory 0x0: All the data for all the enabled pipelines are fetched from memory regardless of the overlay/alpha blending configuration. 0x1: The data not used by the overlay manager because of overlap between layers with no alpha blending between them shall not be fetched from memory in order to optimize the bandwidth. | RW | 0 |
| 11 | STALLMODE | STALL Mode for the secondary LCD output wr: VFP start period of secondary LCD output 0x0: Normal mode selected 0x1: STALL mode selected. The Display Controller sends the data without considering the VSYNC/HSYNC. The LCD output is disabled at the end of the transfer of the frame. The S/W has to re-enable the LCD output in order to generate a new frame. | RW | 0 |
| 10 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 9:8 | TFTDATALINES | Number of lines of the secondary LCD interface wr: VFP start period of secondary LCD output 0x0: 12-bit output aligned on the LSB of the pixel data interface 0x1: 16-bit output aligned on the LSB of the pixel data interface 0x2: 18-bit output aligned on the LSB of the pixel data interface 0x3: 24-bit output aligned on the LSB of the pixel data interface | RW | 0x0 |
| 7 | STDITHER ENABLE | Spatial Temporal dithering enable for the secondary LCD output wr: VFP start period of secondary LCD output 0x0: Spatial/Temporal dithering logic disabled 0x1: Spatial/Temporal dithering logic enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 6 | GOWB | GO Command for the write-back output. It is used to synchronized the pipelines (graphics and/or video ones) associated with the write-back output to the memory. wr:immediate 0x0: The hardware has finished updating the internal shadow registers of the pipeline(s) connected to the write-back pipeline using the user values. The hardware resets the bit when the update is completed. 0x1: The user has finished to program the shadow registers of the pipeline(s) associated with the write-back pipeline and the hardware can update the internal registers immediately | RW | 0 |
| 5 | GOLCD | GO Command for the secondary LCD output. It is used to synchronized the pipelines (graphics and/or video ones) associated with the secondary LCD output. wr:immediate 0x0: The hardware has finished updating the internal shadow registers of the pipeline(s) connected to the LCD output using the user values. The hardware resets the bit when the update is completed. 0x1: The user has finished to program the shadow registers of the pipeline(s) associated with the LCD output and the hardware can update the internal registers at the VFP start period | RW | 0 |
| 4 | M8B | Mono 8-bit mode of the secondary LCD wr: VFP start period of secondary LCD output 0x0: Pixel data [3:0] is used to output four pixel values to the panel at each pixel clock transition. (only in Passive Mono 4-bit mode). 0x1: Pixel data [7:0] is used to output eight pixel values to the panel each pixel clock transition. (only in Passive Mono 8-bit mode). | RW | 0 |
| 3 | STNTFT | LCD Display type of the secondary LCD wr: VFP start period of secondary LCD output 0x0: Passive Matrix display operation enabled. Passive Matrix dither logic is enabled. 0x1: Active or TFT display operation enabled. STN Dither logic and output FIFO bypassed. | RW | 0 |
| 2 | MONOCOLOR | Monochrome/Color selection for the secondary LCD wr: VFP start period of secondary LCD output 0x0: Color operation enabled (Passive Matrix mode only) 0x1: Monochrome operation enabled (Passive Matrix mode only) | RW | 0 |
| 1 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 0 | LCDENABLE | Enable the secondary LCD output wr:immediate 0x0: LCD output disabled (at the end of the frame when the bit is reset) 0x1: LCD output enabled | RW | 0 |

Table 10-287. Register Call Summary for Register DISPC_CONTROL2

Display Controller

- [Overlay Manager: \[0\] \[1\]](#)
- [Shadow Registers: \[2\] \[3\] \[4\] \[5\]](#)
- [Operational Modes Configuration: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [Display Controller Logical Register Mapping: \[14\]](#)
- [Display Controller Register Summary: \[15\]](#)
- [Display Controller Register Description: \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\] \[44\] \[45\] \[46\] \[47\] \[48\] \[49\] \[50\] \[51\] \[52\] \[53\] \[54\] \[55\] \[56\] \[57\] \[58\] \[59\] \[60\] \[61\] \[62\] \[63\] \[64\] \[65\] \[66\] \[67\] \[68\] \[69\] \[70\] \[71\] \[72\] \[73\] \[74\] \[75\] \[76\] \[77\] \[78\] \[79\] \[80\] \[81\] \[82\] \[83\] \[84\] \[85\] \[86\] \[87\] \[88\] \[89\] \[90\] \[91\] \[92\] \[93\] \[94\] \[95\] \[96\] \[97\] \[98\] \[99\] \[100\] \[101\] \[102\] \[103\] \[104\] \[105\] \[106\] \[107\] \[108\] \[109\] \[110\] \[111\] \[112\] \[113\] \[114\] \[115\] \[116\] \[117\] \[118\] \[119\] \[120\] \[121\] \[122\] \[123\] \[124\] \[125\] \[126\] \[127\] \[128\] \[129\] \[130\] \[131\] \[132\] \[133\] \[134\] \[135\] \[136\] \[137\] \[138\] \[139\] \[140\]](#)

Table 10-288. DISPC_VID3_ACCU_j

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0300 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1300 + (0x4 * j) 0x5800 1300 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the resize accumulator init values for horizontal and vertical up/downsampling of the video window 3 (DISPC_VID3_ACCU_0 DISPC_VID3_ACCU_1 for ping-pong mechanism with external trigger, based on the field polarity). It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VERTICALACCU | | | | | | | | RESERVED | | | | | | | | HORIZONTALACCU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | VERTICALACCU | Vertical initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | HORIZONTALACCU | Horizontal initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |

Table 10-289. Register Call Summary for Register DISPC_VID3_ACCU_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-290. DISPC_VID3_BA_j

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0308 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1308 + (0x4 * j) 0x5800 1308 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the base address of the video buffer for the video window 3 (DISPC_VID3_BA_0 DISPC_VID3_BA_1 for ping-pong mechanism with external trigger, based on the field polarity otherwise only DISPC_VID3_BA_0 is used)). Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | BA | Video base address Base address of the video buffer (aligned on pixel size boundary except in case of RGB24 packed format, 4-pixel alignment is required; in case of YUV4:2:2, 2-pixel alignment is required, and YUV4:2:0, byte alignment is supported)). It case of YUV4:2:0 format, it indicates the base address of the Y buffer. When the TILER is addressed, the bits: [28:27] = 0x0 for 8-bit tiled [28:27] = 0x1 for 16-bit tiled [28:27] = 0x2 for 32-bit tiled [28:27] = 0x3 for page mode [31:29] = 0x0 for 0-degree view [31:29] = 0x1 for 180-degree view + mirroring [31:29] = 0x2 for 0-degree view + mirroring [31:29] = 0x3 for 180-degree view [31:29] = 0x4 for 270-degree view + mirroring [31:29] = 0x5 for 270-degree view [31:29] = 0x6 for 90-degree view [31:29] = 0x7 for 90-degree view + mirroring Otherwise the bits indicated the corresponding bit address to access the SDRAM. | RW | 0x0000 0000 |

Table 10-291. Register Call Summary for Register DISPC_VID3_BA_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-292. DISPC_VID3_FIR_COEF_H_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0310 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1310 + (0x8 * i) 0x5800 1310 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the up/down-scaling coefficients for the horizontal resize of the video picture associated with the video window 3 for the phases from 0 to 7. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRHC3 | | | | | | | | FIRHC2 | | | | | | | | FIRHC1 | | | | | | | | FIRHC0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRHC3 | Signed coefficient C3 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRHC2 | Unsigned coefficient C2 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRHC1 | Signed coefficient C1 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC0 | Signed coefficient C0 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-293. Register Call Summary for Register DISPC_VID3_FIR_COEF_H_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-294. DISPC_VID3_FIR_COEF_HV_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0314 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1314 + (0x8 * i) 0x5800 1314 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical and horizontal resize of the video picture associated with the video window 3 for the phases from 0 to 7. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRVC2 | | | | | | | | FIRVC1 | | | | | | | | FIRVC0 | | | | | | | | FIRHC4 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRVC2 | Signed coefficient C2 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRVC1 | Unsigned coefficient C1 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRVC0 | Signed coefficient C0 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC4 | Signed coefficient C4 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-295. Register Call Summary for Register DISPC_VID3_FIR_COEF_HV_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-296. DISPC_VID3_FIR_COEF_V_i

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0350 + (0x4 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1350 + (0x4 * i) 0x5800 1350 + (0x4 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical resize of the video picture associated with the video window 3 for the phases from 0 to 7. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVC22 | | | | | | | | FIRVC00 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 15:8 | FIRVC22 | Signed coefficient C22 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRVC00 | Signed coefficient C00 for the vertical up/down-scaling with the phase n | RW | 0x00 |

Table 10-297. Register Call Summary for Register DISPC_VID3_FIR_COEF_V_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-298. DISPC_VID3_ATTRIBUTES

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0370 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1370 0x5800 1370 | | |
| Description | The register configures the attributes of the video window 3. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----|-----------|----|------------------|----|--------|----|--------------|-------------|-------------|--------------|--------------|-----------------|------------|----------|-----------------|------------|-----------|----------|-----------|-------------------|-----------------|-------------|-------------|--------------|--------|---|---|---|--------|---|
| CHANNELOUT2 | | BURSTTYPE | | PREMULTIPLYALPHA | | ZORDER | | ZORDERENABLE | SELFREFRESH | ARBITRATION | DOUBLESTRIDE | VERTICALTAPS | DMAOPTIMIZATION | BUFPRELOAD | RESERVED | SELFREFRESHAUTO | CHANNELOUT | BURSTSIZE | ROTATION | FULLRANGE | REPLICATIONENABLE | COLORCONVENABLE | VRESIZECONF | HRESIZECONF | RESIZEENABLE | FORMAT | | | | ENABLE | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 31:30 | CHANNELOUT2 | It is not used if CHANNELOUT is set to TV. Reserved when CHANNELOUT = 1 (should be set to zero) wr: immediate 0x0: primary LCD output selected. 0x1: Secondary LCD output selected. 0x3: Write-back output to the memory selected. | RW | 0x0 |
| 29 | BURSTTYPE | The type of burst can be INCR (incremental) or BLCK (2D block). The 2D block is required when the TILER is targeted by the DMA engine. 0x0: INC burst type is used. 0x1: 2D block burst type is used. | RW | 0 |
| 28 | PREMULTIPLYALPHA | The field configures the DISPC VID3 to process incoming data as premultiplied alpha data or non premultiplied alpha data. Default setting is non premultiplied alpha data. 0x0: Non premultiplied alpha data color component 0x1: Premultiplied alpha data color component | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|-------|
| 27:26 | ZORDER | <p>Z-Order defining the priority of the layer compared to others when overlaying. It is software responsibility to ensure that each layer connected to the same overlay manager has a different z-order value.</p> <p>If bit 25 is set to 0, the ZORDER bit field is ignored and replaced by the value 0.</p> <p>0x0: Z-order 0: layer above solid background color and below layer with higher Z-order values.</p> <p>0x1: Z-order 1: layer above layer with z-order value of 0 and below layers with z-order values of 2 and 3</p> <p>0x3: Z-order 3: layer above all the other layers</p> <p>0x2: Z-order 2: layer above layers with z-order value of 0 and 1 and below layer with z-order value of 3</p> | RW | 0x0 |
| 25 | ZORDERENABLE | <p>Z-order Enable. The bit field ZORDER is only used when the Z-order is enabled.</p> <p>0x0: Z-order disabled. The Z-order of the layer is 0.</p> <p>0x1: Z-order enabled. The Z-order is defined by the bit field ZORDER (bits 26 and 27).</p> | RW | 0 |
| 24 | SELFREFRESH | <p>Enables the self refresh of the video window from its own DMA buffer only.</p> <p>0x0: The video pipeline accesses the interconnect to fetch data from the system memory.</p> <p>0x1: The video pipeline does not need anymore to fetch data from memory. Only the DMA buffer associated with the video3 is used. It takes effect after the frame has been loaded in the DMA buffer.</p> | RW | 0 |
| 23 | ARBITRATION | <p>Determines the priority of the video pipeline.</p> <p>The video pipeline is one of the high priority pipeline. The arbitration gives always the priority first to the high priority pipelines using round-robin between them. When there is only normal priority pipelines sending requests, the round-robin applies between them.</p> <p>0x0: The video pipeline is one of the normal priority pipeline.</p> <p>0x1: The video pipeline is one of the high priority pipeline.</p> | RW | 0 |
| 22 | DOUBLESTRIDE | <p>Determines if the stride for CbCr buffer is the 1x or 2x of the Y buffer stride.</p> <p>It is only used in case of YUV4:2:0.</p> <p>0x0: The CbCr stride value is equal to the Y stride.</p> <p>0x1: The CbCr stride value is double to the Y stride.</p> | RW | 0 |
| 21 | VERTICALTAPS | <p>Video Vertical Resize Tap Number</p> <p>0x0: 3 taps are used for the vertical filtering logic. The 2 other taps are not used.</p> <p>The associated bit fields for the 2 other taps coefficients do not need to be initialized.</p> <p>0x1: 5 taps are used for the vertical filtering logic.</p> | RW | 0 |
| 20 | DMAOPTIMIZATION | <p>Write 0s for future compatibility.</p> <p>Reads return 0.</p> | R | 0 |
| 19 | BUFPRELOAD | <p>Video Preload Value</p> <p>0x0: Hardware prefetches pixels up to the preload value defined in the preload register</p> <p>0x1: Hardware prefetches pixels up to high threshold value</p> | RW | 0 |
| 18 | RESERVED | <p>Write 0s for future compatibility.</p> <p>Reads return 0.</p> | R | 0 |

Display Controller

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 17 | SELFREFRESHAUTO | Automatic self-refresh mode 0x0: The transition from SELFREFRESH "disabled" to "enabled" is controlled by SW. 0x1: The transition from SELFREFRESH "disabled" to "enabled" is controlled only by hardware. | RW | 0 |
| 16 | CHANNELOUT | Video Channel Out configuration: LCD, WB or TV. wr: immediate 0x0: LCD output or WB to the memory selected. bit fields 31 and 30 defines the output associated (primary, secondary or write-back). 0x1: TV output selected | RW | 0 |
| 15:14 | BURSTSIZE | Video DMA Burst Size 0x0: 2x128bit bursts 0x1: 4x128bit bursts 0x3: Reserved 0x2: 8x128bit bursts | RW | 0x2 |
| 13:12 | ROTATION | Video Rotation Flag 0x0: No rotation 0x1: Rotation by 90 degrees 0x3: Rotation by 270 degrees 0x2: Rotation by 180 degrees | RW | 0x0 |
| 11 | FULLRANGE | Color Space Conversion full range setting. 0x0: Limited range selected: 16 subtracted from Y before color space conversion 0x1: Full range selected: Y is not modified before the color space conversion | RW | 0 |
| 10 | REPLICATIONENABLE | Replication Enable 0x0: Disable Video replication logic 0x1: Enable Video replication logic | RW | 1 |
| 9 | COLORCONVENABLE | Enable the color space conversion. The hardware does not enable/disable the conversion based on the pixel format. The bit field shall be reset when the format is not YUV. 0x0: Disable Color Space Conversion YUV to RGB 0x1: Enable Color Space Conversion YUV to RGB | RW | 0 |
| 8 | VRESIZECONF | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 7 | HRESIZECONF | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 6:5 | RESIZEENABLE | Video Resize Enable 0x0: Disable both horizontal and vertical resize processing 0x1: Enable the horizontal resize processing 0x3: Enable both horizontal and vertical resize processing 0x2: Enable the vertical resize processing | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 4:1 | FORMAT | Video Format. It defines the pixel format when fetching the video 3 picture into memory. 0x6: RGB16-565 0x1: RGB12x-4444 0xA: YUV2 4:2:2 co-sited 0x7: ARGB16-1555 0xD: RGBA32-8888 0x0: NV12 4:2:0 2 buffers (Y + UV) 0x2: RGBA12-4444 0x8: RGB24-8888 (32-bit container) 0x9: RGB24-888 (24-bit container) 0xB: UYVY 4:2:2 co-sited 0x5: ARGB16-4444 0xF: xRGB15-1555 0xC: ARGB32-8888 0x4: xRGB12-4444 0xE: RGBx24-8888 (24-bit RGB aligned on MSB of the 32-bit container) | RW | 0x0 |
| 0 | ENABLE | Video Enable 0x0: Video disabled (video pipeline inactive and window not present) 0x1: Video enabled (video pipeline active and window present on the screen) | RW | 0 |

Table 10-299. Register Call Summary for Register DISPC_VID3_ATTRIBUTES

Display Controller

- [Overlay Manager: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Display Controller Logical Register Mapping: \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-300. DISPC_VID3_CONV_COEF0

| | | | | | |
|------------------|--|--|----------|--------------------------|--|
| Address Offset | 0x0000 0374 | | Instance | DISPC_PER_L4 DISPC_L3 | |
| Physical Address | 0x4804 1374 0x5800 1374 | | | | |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 3. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | |
| Type | RW | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RCR | | | | | | | | RESERVED | | | | | | | | RY | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | RCR | RCr Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | RY | RY Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-301. Register Call Summary for Register DISPC_VID3_CONV_COEF0

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-302. DISPC_VID3_CONV_COEF1

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0378 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1378 0x5800 1378 | | |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 3. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | GY | | | | | | | | RESERVED | | | | | | | | RCB | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | GY | GY Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | RCB | RCb Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-303. Register Call Summary for Register DISPC_VID3_CONV_COEF1

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-304. DISPC_VID3_CONV_COEF2

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 037C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 137C 0x5800 137C | | |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 3. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | GCB | | | | | | | | RESERVED | | | | | | | | GCR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | GCB | GCB Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | GCR | GCR Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-305. Register Call Summary for Register DISPC_VID3_CONV_COEF2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-306. DISPC_VID3_CONV_COEF3

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0380 | | |
| Physical Address | 0x4804 1380 0x5800 1380 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 3. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | BCR | | | | | | | | RESERVED | | | | | | | | BY | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | BCR | BCr coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | BY | BY coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-307. Register Call Summary for Register DISPC_VID3_CONV_COEF3

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-308. DISPC_VID3_CONV_COEF4

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0384 | | |
| Physical Address | 0x4804 1384 0x5800 1384 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the color space conversion matrix coefficients for the video pipeline 3. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BCB | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-----------|
| 31:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000000 |
| 10:0 | BCB | BCb Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-309. Register Call Summary for Register DISPC_VID3_CONV_COEF4

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-310. DISPC_VID3_BUF_SIZE_STATUS

| | | | |
|------------------|--|----------|--------------|
| Address Offset | 0x0000 0388 | Instance | DISPC_PER_L4 |
| Physical Address | 0x4804 1388 0x5800 1388 | | DISPC_L3 |
| Description | The register defines the DMA buffer size for the video pipeline 3. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BUFSIZE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 15:0 | BUFSIZE | DMA buffer Size in number of 128-bits. | R | 0x0800 |

Table 10-311. Register Call Summary for Register DISPC_VID3_BUF_SIZE_STATUS

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-312. DISPC_VID3_BUF_THRESHOLD

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 038C | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | DISPC_PER_L4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 138C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DISPC_L3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5800 138C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | The register configures the DMA buffer associated with the video pipeline 3. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BUFHIGHTHRESHOLD | | | | | | | | | | | | | | | | BUFLOWTHRESHOLD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|--------|
| 31:16 | BUFHIGHTHRESHOLD | DMA buffer High Threshold Number of 128-bits defining the threshold value. | RW | 0x07FF |
| 15:0 | BUFLOWTHRESHOLD | DMA buffer High Threshold Number of 128-bits defining the threshold value. | RW | 0x07F8 |

Table 10-313. Register Call Summary for Register DISPC_VID3_BUF_THRESHOLD

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-314. DISPC_VID3_FIR

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0390 | | |
| Physical Address | 0x4804 1390 0x5800 1390 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the resize factors for horizontal and vertical up/downsampling of the video window 3. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVINC | | | | | | | | RESERVED | | | | | | | | FIRHINC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:29 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 28:16 | FIRVINC | Vertical increment of the up/downsampling filter Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |
| 15:13 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 12:0 | FIRHINC | Horizontal increment of the up/downsampling filter Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |

Table 10-315. Register Call Summary for Register DISPC_VID3_FIR

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-316. DISPC_VID3_PICTURE_SIZE

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0394 | | |
| Physical Address | 0x4804 1394 0x5800 1394 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the size of the video picture associated with the video layer 3 before up/down-scaling. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | ORGSIZEY | | | | | | | | RESERVED | | | | | | | | ORGSIZEX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | ORGSIZEY | Number of lines of the video picture Encoded value (from 1 to 2048) to specify the number of lines of the video picture in memory (program to value minus 1). When predecimation is set, the value represents the size of the image after predecimation but the max size of the unpredecimated image size in memory is still bounded 2^{11} . | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 10:0 | ORGSIZE_X | Number of pixels of the video picture Encoded value (from 1 to 2048) to specify the number of pixels of the video picture in memory (program to value minus 1). The size is limited to the size of the line buffer of the vertical sampling block in case the video picture is processed by the vertical filtering unit. (program to value minus 1). When predecimation is set, the value represents the size of the image after predecimation but the max size of the unpredecimated image size in memory is still bounded 2^{11} . | RW | 0x000 |

Table 10-317. Register Call Summary for Register DISPC_VID3_PICTURE_SIZE

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-318. DISPC_VID3_PIXEL_INC

| | | | |
|------------------|---|----------|--------------------------|
| Address Offset | 0x0000 0398 | | |
| Physical Address | 0x4804 1398 0x5800 1398 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the number of bytes to increment between two pixels for the buffer associated with the video window 3. For more information, see Section 10.2.4.6.5, Predecimation . The register is used only when the TILER is not present in the system in order to perform low performance rotation. When the TILER IP is present it is highly recommended to use it for performing the rotation. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PIXELINC | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x000000 |
| 7:0 | PIXELINC | Number of bytes to increment between two pixels. Encoded unsigned value (from 1 to 255) to specify the number of bytes between two pixels in the video buffer. The value 0 is invalid. The value 1 means next pixel. The value 1+n* <i>bpp</i> means increment of <i>n</i> pixels. For YUV4:2:0, Max supported value is 128. | RW | 0x01 |

Table 10-319. Register Call Summary for Register DISPC_VID3_PIXEL_INC

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-320. DISPC_VID3_POSITION

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 039C | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 139C 0x5800 139C | | | | | | | | | | | | | | | |
| | Instance | | | | | | | | | | | | | | | |
| | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the position of the video window 3. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | POSY | | | | | | | | RESERVED | | | | | | | | POSX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | POSY | Y position of the video window 2 Encoded value (from 0 to 2047) to specify the Y position of the video window 2 .The line at the top has the Y-position 0. | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | POSX | X position of the video window 2 Encoded value (from 0 to 2047) to specify the X position of the video window 2. The first pixel on the left of the display screen has the X-position 0. | RW | 0x000 |

Table 10-321. Register Call Summary for Register DISPC_VID3_POSITION

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-322. DISPC_VID3_PRELOAD

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 03A0 | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 13A0 0x5800 13A0 | | | | | | | | | | | | | | | |
| | Instance | | | | | | | | | | | | | | | |
| | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the DMA buffer of the video 3 pipeline. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PRELOAD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00000 |
| 11:0 | PRELOAD | DMA buffer preload value Number of 128-bit words defining the preload value. | RW | 0x100 |

Table 10-323. Register Call Summary for Register DISPC_VID3_PRELOAD

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-324. DISPC_VID3_ROW_INC

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 03A4 | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 13A4 0x5800 13A4 | | | | | | | | | | | | | | | |
| | Instance | | | | | | | | | | | | | | | |
| | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the number of bytes to increment at the end of the row for the buffer associated with the video window 3. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ROWINC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | ROWINC | Number of bytes to increment at the end of the row Encoded signed value (from $2^{31}1$ to 2^{31}) to specify the number of bytes to increment at the end of the row in the video buffer. The value 0 is invalid. The value 1 means next pixel. The value $1 + n * \text{bpp}$ means increment of n pixels. The value $1 (n + 1) * \text{bpp}$ means decrement of n pixels. | RW | 0x0000 0001 |

Table 10-325. Register Call Summary for Register DISPC_VID3_ROW_INC

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-326. DISPC_VID3_SIZE

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 03A8 | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 13A8 0x5800 13A8 | | | | | | | | | | | | | | | |
| | Instance | | | | | | | | | | | | | | | |
| | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the size of the video window 3. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SIZEY | | | | | | | | RESERVED | | | | | | | | SIZEX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | SIZEY | Number of lines of the video 3 Encoded value (from 1 to 2048) to specify the number of lines of the video window 3. Program to value minus 1. | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | SIZEX | Number of pixels of the video window 3 Encoded value (from 1 to 2048) to specify the number of pixels of the video window 3. Program to value minus 1. | RW | 0x000 |

Table 10-327. Register Call Summary for Register DISPC VID3 SIZE

Display Controller

- Shadow Registers: [0]
- Display Controller Logical Register Mapping: [1]
- Display Controller Register Summary: [2]

Table 10-328. DISPC DEFAULT COLOR2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 03AC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 13AC | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | |
| | 0x5800 13AC | | | | | | | | | | | | | | | | DISC_PER_L4 DISC_L3 | | | | | | | | | | | | | | | |
| Description | The control register allows to configure the default solid background color for the secondary LCD Shadow register, updated on VFP start period of secondary LCD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DEFAULTCOLOR | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|----------|
| 31:24 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 23:0 | DEFAULTCOLOR | 24-bit RGB color value to specify the default solid color to display when there is no data from the overlays. | RW | 0x000000 |

Table 10-329. Register Call Summary for Register DISPC_DEFAULT_COLOR2

Display Controller

- Shadow Registers: [0]
- Display Controller Register Summary: [1]

Table 10-330. DISPC TRANS COLOR2

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 03B0 | | |
| Physical Address | 0x4804 13B0 0x5800 13B0 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register sets the transparency color value for the video/graphics overlays for the secondary LCD output. Shadow register, updated on VFP start period of the secondary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | TRANSCOLORKEY | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|----------|
| 31:24 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 23:0 | TRANSCOLORKEY | Transparency Color Key Value in RGB format [0] BITMAP 1 (CLUT), [23,1] set to 0s [1:0] BITMAP 2 (CLUT), [23,2] set to 0s [3:0] BITMAP 4 (CLUT), [23,4] set to 0s [7:0] BITMAP 8 (CLUT), [23,8] set to 0s [11:0] RGB 12, [23,12] set to 0s [15:0] RGB 16, [23,16] set to 0s [23:0] RGB 24 | RW | 0x000000 |

Table 10-331. Register Call Summary for Register DISPC_TRANS_COLOR2

Display Controller

- Overlay Manager: [0]
- Shadow Registers: [1]
- Display Controller Register Summary: [2]

Table 10-332. DISPC_CPR2_COEF_B

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 03B4 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 13B4 0x5800 13B4 | | |
| Description | The register configures the color phase rotation matrix coefficients for the Blue component. It is used for the secondary LCD output. Shadow register, updated on VFP start period of secondary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BR | | | | | | | | RESERVED | | BG | | | | | | | | RESERVED | | BB | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:22 | BR | BR Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |
| 21 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 20:11 | BG | BG Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |
| 10 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 9:0 | BB | BB Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |

Table 10-333. Register Call Summary for Register DISPC_CPR2_COEF_B

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-334. DISPC_CPR2_COEF_G

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 03B8 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 13B8 0x5800 13B8 | | |
| Description | The register configures the color phase rotation matrix coefficients for the Green component. It is used for the secondary LCD output. Shadow register, updated on VFP start period of secondary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GR | | | | | | | | RESERVED | | GG | | | | | | | | RESERVED | | GB | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:22 | GR | GR Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |
| 21 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 20:11 | GG | GG Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |
| 10 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 9:0 | GB | GB Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |

Table 10-335. Register Call Summary for Register DISPC_CPR2_COEF_G

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-336. DISPC_CPR2_COEF_R

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 03BC | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 13BC 0x5800 13BC | | |
| Description | The register configures the color phase rotation matrix coefficients for the Red component. Shadow register, updated on VFP start period of secondary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RR | | | | | | | | RESERVED | | RG | | | | | | | | RESERVED | | RB | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:22 | RR | RR Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |
| 21 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 20:11 | RG | RG Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |
| 10 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 9:0 | RB | RB Coefficient Encoded signed value (from -512 to 511). | RW | 0x000 |

Table 10-337. Register Call Summary for Register DISPC_CPR2_COEF_R

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-338. DISPC_DATA2_CYCLE1

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 03C0 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 13C0 0x5800 13C0 | | |
| Description | The control register configures the output data format for 1st cycle. Shadow register, updated on VFP start period of secondary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|--------------------|----|----|----|----------|----|----|----|--------------|----|----|----|----------|----|----|----|--------------------|----|---|---|----------|---|---|---|--------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | BITALIGNMENTPIXEL2 | | | | RESERVED | | | | NBBITSPIXEL2 | | | | RESERVED | | | | BITALIGNMENTPIXEL1 | | | | RESERVED | | | | NBBITSPIXEL1 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31:28 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 27:24 | BITALIGNMENTPIXEL2 | Bit alignment. Alignment of the bits from pixel 2 on the output interface | RW | 0x0 |
| 23:21 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 20:16 | NBBITSPIXEL2 | Number of bits Number of bits from the pixel 2 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |
| 15:12 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 11:8 | BITALIGNMENTPIXEL1 | Bit alignment. Alignment of the bits from pixel 1 on the output interface | RW | 0x0 |
| 7:5 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 4:0 | NBBITSPIXEL1 | Number of bits Number of bits from the pixel 1 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |

Table 10-339. Register Call Summary for Register DISPC_DATA2_CYCLE1

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-340. DISPC_DATA2_CYCLE2

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 03C4 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 13C4 0x5800 13C4 | | |
| Description | The control register configures the output data format for 2nd cycle. Shadow register, updated on VFP start period of secondary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|--------------------|----|----|----|----------|----|----|----|--------------|----|----|----|----------|----|----|----|--------------------|----|---|---|----------|---|---|---|--------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | BITALIGNMENTPIXEL2 | | | | RESERVED | | | | NBBITSPIXEL2 | | | | RESERVED | | | | BITALIGNMENTPIXEL1 | | | | RESERVED | | | | NBBITSPIXEL1 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31:28 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 27:24 | BITALIGNMENTPIXEL2 | Bit alignment. Alignment of the bits from pixel 2 on the output interface | RW | 0x0 |
| 23:21 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 20:16 | NBBITSPIXEL2 | Number of bits Number of bits from the pixel 2 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |
| 15:12 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 11:8 | BITALIGNMENTPIXEL1 | Bit alignment. Alignment of the bits from pixel 1 on the output interface | RW | 0x0 |
| 7:5 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 4:0 | NBBITSPIXEL1 | Number of bits Number of bits from the pixel 1 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |

Table 10-341. Register Call Summary for Register DISPC_DATA2_CYCLE2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-342. DISPC_DATA2_CYCLE3

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 03C8 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 13C8 0x5800 13C8 | | |
| Description | The control register configures the output data format for 3rd cycle. Shadow register, updated on VFP start period of secondary LCD | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|--------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | |
| BITALIGNMENTPIXEL2 | | | | | | | | NBBITSPIXEL2 | | | | | | | | BITALIGNMENTPIXEL1 | | | | | | | | NBBITSPIXEL1 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31:28 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 27:24 | BITALIGNMENTPIXEL2 | Bit alignment. Alignment of the bits from pixel 2 on the output interface | RW | 0x0 |
| 23:21 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 20:16 | NBBITSPIXEL2 | Number of bits Number of bits from the pixel 2 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |
| 15:12 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 11:8 | BITALIGNMENTPIXEL1 | Bit alignment. Alignment of the bits from pixel 1 on the output interface | RW | 0x0 |
| 7:5 | RESERVED | Write 0s for future compatibility Reads return 0. | R | 0x0 |
| 4:0 | NBBITSPIXEL1 | Number of bits Number of bits from the pixel 1 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |

Table 10-343. Register Call Summary for Register DISPC_DATA2_CYCLE3

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-344. DISPC_SIZE_LCD2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 03CC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 13CC 0x5800 13CC | | | | | | | | | | | | | | | | Instance | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the panel size (horizontal and vertical). It is used for the secondary LCD output. Shadow register, updated on VFP start period of secondary LCD. A delta value is used to indicate if the odd field has same vertical size as the even field or +/- one line. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|-----------|----|----------|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | LPP | | | | | | | | DELTA_LPP | | RESERVED | | PPL | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | LPP | Lines per panel Encoded value (from 1 to 2048) to specify the number of lines per panel (program to value minus 1). | RW | 0x000 |
| 15:14 | DELTA_LPP | Indicates the delta size value of the odd field compared to the even field 0x0: same size 0x1: odd size = even size +1 0x2: Odd size = even size -1 | RW | 0x0 |
| 13:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 10:0 | PPL | Pixels per line Encoded value (from 1 to 2048) to specify the number of pixels contains within each line on the display (program to value minus 1). In STALL mode, any value is valid. In non STALL mode, only values multiple of 8 pixels are valid. | RW | 0x000 |

Table 10-345. Register Call Summary for Register DISPC_SIZE_LCD2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\] \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)
- [Display Controller Register Description: \[4\]](#)

Table 10-346. DISPC_TIMING_H2

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0400 | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 1400 0x5800 1400 | | | | | | | | | | | | | | | |
| | Instance | | | | | | | | | | | | | | | |
| | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the timing logic for the HSYNC signal. It is used for the secondary LCD output. Shadow register, updated on VFP start period of secondary LCD | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HBP | | | | | | | | HFP | | | | | | | | HSW | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:20 | HBP | Horizontal Back Porch. Encoded value (from 1 to 4096) to specify the number of pixel clock periods to add to the beginning of a line transmission before the first set of pixels is output to the display (program to value minus 1). | RW | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 19:8 | HFP | Horizontal front porch. Encoded value (from 1 to 4096) to specify the number of pixel clock periods to add to the end of a line transmission before line clock is asserted (program to value minus 1). | RW | 0x000 |
| 7:0 | HSW | Horizontal synchronization pulse width Encoded value (from 1 to 256) to specify the number of pixel clock periods to pulse the line clock at the end of each line (program to value minus 1). | RW | 0x00 |

Table 10-347. Register Call Summary for Register DISPC_TIMING_H2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-348. DISPC_TIMING_V2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0404 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 1404 0x5800 1404 | | | | | | | | | | | | | | | | Instance | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the timing logic for the VSYNC signal. It is used for the secondary LCD output. Shadow register, updated on VFP start period of secondary LCD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| VBP | | | | | | | | | | | | VFP | | | | | | | | | | | | VSW | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:20 | VBP | Vertical back porch Encoded value (from 0 to 4095) to specify the number of line clock periods to add to the beginning of a frame before the first set of pixels is output to the display. | RW | 0x000 |
| 19:8 | VFP | Vertical front porch Encoded value (from 0 to 4095) to specify the number of line clock periods to add to the end of each frame. | RW | 0x000 |
| 7:0 | VSW | Vertical synchronization pulse width In active mode, encoded value (from 1 to 256) to specify the number of line clock periods (program to value minus 1) to pulse the frame clock (VSYNC) pin at the end of each frame after the end of frame wait (VFP) period elapses. Frame clock uses as VSYNC signal in active mode. In passive mode, encoded value (from 1 to 256) to specify the number of extra line clock periods (program to value minus 1) to insert after the vertical front porch (VFP) period has elapsed. | RW | 0x00 |

Table 10-349. Register Call Summary for Register DISPC_TIMING_V2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-350. DISPC_POL_FREQ2

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0408 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1408 0x5800 1408 | | |
| Description | The register configures the signal configuration. It is used for the secondary LCD output. Shadow register, updated on VFP start period of secondary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|-------|-------|----|-----|-----|-----|-----|------|----|---|---|---|-----|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | ALIGN | ONOFF | RF | IEO | IPC | IHS | IVS | ACBI | | | | | ACB | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:19 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 18 | ALIGN | Defines the alignment between HSYNC and VSYNC assertion. 0x0: VSYNC and HSYNC are not aligned 0x1: VSYNC and HSYNC assertions are aligned. | RW | 0 |
| 17 | ONOFF | HSYNC/VSYNC Pixel clock Control On/Off 0x0: HSYNC and VSYNC are driven on opposite edges of pixel clock than pixel data 0x1: HSYNC and VSYNC are driven according to bit 16 | RW | 0 |
| 16 | RF | Program HSYNC/VSYNC Rise or Fall 0x0: HSYNC and VSYNC are driven on falling edge of pixel clock (if bit 17 set to 1) 0x1: HSYNC and VSYNC are driven on rising edge of pixel clock (if bit 17 set to 1) | RW | 0 |
| 15 | IEO | Invert output enable 0x0: Ac-bias is active high (active display mode) 0x1: Ac-bias is active low (active display mode) | RW | 0 |
| 14 | IPC | Invert pixel clock 0x0: Data is driven on the LCD data lines on the rising-edge of the pixel clock 0x1: Data is driven on the LCD data lines on the falling-edge of the pixel clock | RW | 0 |
| 13 | IHS | Invert HSYNC 0x0: Line clock pin is active high and inactive low 0x1: Line clock pin is active low and inactive high | RW | 0 |
| 12 | IVS | Invert VSYNC 0x0: Frame clock pin is active high and inactive low 0x1: Frame clock pin is active low and inactive high | RW | 0 |
| 11:8 | ACBI | AC Bias Pin transitions per interrupt Value (from 0 to 15) used to specify the number of AC Bias pin transitions | RW | 0x0 |
| 7:0 | ACB | AC Bias Pin Frequency Value (from 0 to 255) used to specify the number of line clocks to count before transitioning the AC Bias pin. This pin is used to periodically invert the polarity of the power supply to prevent DC charge build-up within the display. | RW | 0x00 |

Table 10-351. Register Call Summary for Register DISPC_POL_FREQ2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-352. DISPC_DIVISOR2

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 040C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 140C 0x5800 140C | | |
| Description | The register configures the divisors. It is used for the secondary LCD output. Shadow register, updated on VFP start period of secondary LCD | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | LCD | | | | | | | | RESERVED | | | | | | | | PCD | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 23:16 | LCD | Display Controller Logic Clock Divisor Value (from 1 to 255) to specify the intermediate pixel clock frequency based on the LCD2_CLK. The value 0 is invalid. | RW | 0x04 |
| 15:8 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 7:0 | PCD | Pixel Clock Divisor Value (from 1 to 255) to specify the frequency of the pixel clock based on the LCD2_CLK divided by DISPC_DIVISOR2.LCD value. The values 0 is invalid. | RW | 0x01 |

Table 10-353. Register Call Summary for Register DISPC_DIVISOR2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)
- [Display Controller Register Description: \[3\]](#)

Table 10-354. DISPC_WB_ACCU_j

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0500 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1500 + (0x4 * j) 0x5800 1500 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the resize accumulator init values for horizontal and vertical up/downsampling of the write back pipeline (DISPC_WB_ACCU_0 DISPC_WB_ACCU_1 for ping-pong mechanism with external trigger, based on the field polarity). It is used for ARGB and Y setting. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VERTICALACCU | | | | | | | | RESERVED | | | | | | | | HORIZONTALACCU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | VERTICALACCU | Vertical initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | HORIZONTALACCU | Horizontal initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |

Table 10-355. Register Call Summary for Register DISPC_WB_ACCU_j

Display Controller

- [Scaler Unit: \[0\] \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Operational Modes Configuration: \[3\] \[4\]](#)
- [Display Controller Register Summary: \[5\]](#)

Table 10-356. DISPC_WB_BA_j

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0508 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1508 + (0x4 * j) 0x5800 1508 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the base address of the WB buffer (DISPC_WB_BA_0 DISPC_WB_BA_1 for ping-pong mechanism with external trigger, based on the field polarity otherwise only DISPC_WB_BA_0 is used). Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | BA | Write-back base address Base address of the WB buffer (aligned on pixel size boundary except in case of RGB24 packed format, 4-pixel alignment is required; in case of YUV4:2:2, 2-pixel alignment is required, and YUV4:2:0, byte alignment is supported)). It case of YUV4:2:0 format, it indicates the base address of the Y buffer. When the TILER is addressed, the bits: [28:27] = 0x0 for 8-bit tiled [28:27] = 0x1 for 16-bit tiled [28:27] = 0x2 for 32-bit tiled [28:27] = 0x3 for page mode [31:29] = 0x0 for 0-degree view [31:29] = 0x1 for 180-degree view + mirroring [31:29] = 0x2 for 0-degree view + mirroring [31:29] = 0x3 for 180-degree view [31:29] = 0x4 for 270-degree view + mirroring [31:29] = 0x5 for 270-degree view [31:29] = 0x6 for 90-degree view [31:29] = 0x7 for 90-degree view + mirroring Otherwise the bits indicated the corresponding bit address to access the SDRAM. | RW | 0x0000 0000 |

Table 10-357. Register Call Summary for Register DISPC_WB_BA_j

Display Controller

- [Addressing and Bursts: \[0\]](#)
- [Rotation and Mirroring: \[1\] \[2\] \[3\] \[4\]](#)
- [Shadow Registers: \[5\]](#)
- [Operational Modes Configuration: \[6\]](#)
- [Display Controller Register Summary: \[7\]](#)

Table 10-358. DISPC_WB_FIR_COEF_H_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0510 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1510 + (0x8 * i) 0x5800 1510 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the up/down-scaling coefficients for the horizontal resize of the video picture associated with the write back pipeline for the phases from 0 to 7. It is used for ARGB and Y setting. Shadow register, updated when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRHC3 | | | | | | | | FIRHC2 | | | | | | | | FIRHC1 | | | | | | | | FIRHC0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRHC3 | Signed coefficient C3 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRHC2 | Unsigned coefficient C2 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRHC1 | Signed coefficient C1 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC0 | Signed coefficient C0 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-359. Register Call Summary for Register DISPC_WB_FIR_COEF_H_i

Display Controller

- [Scaler Unit: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Shadow Registers: \[6\]](#)
- [Operational Modes Configuration: \[7\]](#)
- [Display Controller Register Summary: \[8\]](#)

Table 10-360. DISPC_WB_FIR_COEF_HV_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0514 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1514 + (0x8 * i) 0x5800 1514 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical and horizontal resize of the video picture associated with the write back pipeline for the phases from 0 to 7. It is used for ARGB and Y setting. Shadow register, updated when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRVC2 | | | | | | | | FIRVC1 | | | | | | | | FIRVC0 | | | | | | | | FIRHC4 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRVC2 | Signed coefficient C2 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRVC1 | Unsigned coefficient C1 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRVC0 | Signed coefficient C0 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC4 | Signed coefficient C4 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-361. Register Call Summary for Register DISPC_WB_FIR_COEF_HV_i

Display Controller

- [Scaler Unit: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [Shadow Registers: \[7\]](#)
- [Operational Modes Configuration: \[8\] \[9\]](#)
- [Display Controller Register Summary: \[10\]](#)

Table 10-362. DISPC_WB_FIR_COEF_V_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0550 + (0x4 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1550 + (0x4 * i) 0x5800 1550 + (0x4 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical resize of the video picture associated with the write back pipeline for the phases from 0 to 7. It is used for ARGB and Y setting. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVC22 | | | | | | | | FIRVC00 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 15:8 | FIRVC22 | Signed coefficient C22 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRVC00 | Signed coefficient C00 for the vertical up/down-scaling with the phase n | RW | 0x00 |

Table 10-363. Register Call Summary for Register DISPC_WB_FIR_COEF_V_i

Display Controller

- [Scaler Unit: \[0\] \[1\] \[2\]](#)
- [Shadow Registers: \[3\]](#)
- [Operational Modes Configuration: \[4\]](#)
- [Display Controller Register Summary: \[5\]](#)

Table 10-364. DISPC_WB_ATTRIBUTES

| | | | |
|------------------|--|----------|--------------------------|
| Address Offset | 0x0000 0570 | | |
| Physical Address | 0x4804 1570 0x5800 1570 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the attributes of the viwrite back pipeline. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----------|-------------|----|----|-------------|--------------|--------------|----------|---------------|-----------|----|----|-----------|----------|----|-----------|------------------|-----------------|-----------|-------------|--------------|--------|---|---|--------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| IDLENUMBER | | | | IDLESIZE | CAPTUREMODE | | | ARBITRATION | DOUBLESTRIDE | VERTICALTAPS | RESERVED | WRITEBACKMODE | CHANNELIN | | | BURSTSIZE | RESERVED | | FULLRANGE | TRUNCATIONENABLE | COLORCONVENABLE | BURSTTYPE | ALPHAENABLE | RESIZEENABLE | FORMAT | | | ENABLE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|-------|
| 31:28 | IDLENUMBER | Determines the number of idles between requests on the L3 interconnect. It is only used when the write-back pipeline does data transfer from memory to memory. When the output of an overlay is stored in memory through the write-back pipeline in capture mode, the bit field IDLENUMBER is ignored since a timing generator is used to time the transfer. The number of IDLE cycles is IDLENUMBER (from 0 to 15) if IDLESIZE=0. The number of IDLE cycles is IDLENUMBERx8 (from 0 to 120) if IDLESIZE=1 and BURSTSIZE=2. The number of IDLE cycles is IDLENUMBERx4 (from 0 to 60) if IDLESIZE=1 and BURSTSIZE=1. The number of IDLE cycles is IDLENUMBERx2 (from 0 to 30) if IDLESIZE=1 and BURSTSIZE=0. | RW | 0x0 |
| 27 | IDLESIZE | Determines if the IDLENUMBER corresponds to a number of bursts or singles. 0x0: The number of idles between requests is defined by IDLENUMBER as number of cycles. 0x1: The number of idles between requests is defined by IDLENUMBER multiplied by burst size as number of cycles. | RW | 0 |
| 26:24 | CAPTUREMODE | Defines the frame rate capture. 0x6: Only one out of six frames is captured. The first one is captured then the second one is skipped and so on. 0x1: Only one frame is captured. 0x7: Only one out of seven frames is captured. The first one is captured then the second one is skipped and so on. 0x0: All frames are captures until the write-back channel is disabled or there is no more data generated by the overlay or the pipeline attached to the write-back channel. 0x2: Only one out of two frames is captured. The first one is captured then the second one is skipped and so on. 0x4: Only one out of four frames is captured. The first one is captured then the second one is skipped and so on. 0x5: Only one out of five frames is captured. The first one is captured then the second one is skipped and so on. 0x3: Only one out of three frames is captured. The first one is captured then the second one is skipped and so on. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 23 | ARBITRATION | Determines the priority of the write-back pipeline. The write-back pipeline is one of the high priority pipeline. The arbitration gives always the priority first to the high priority pipelines using round-robin between them. When there is only normal priority pipelines sending requests, the round-robin applies between them. 0x0: The write-back pipeline is one of the normal priority pipeline. 0x1: The write-back pipeline is one of the high priority pipeline. | RW | 0 |
| 22 | DOUBLESTRIDE | Determines if the stride for CbCr buffer is the 1x or 2x of the Y buffer stride. It is only used in case of YUV4:2:0. 0x0: The CbCr stride value is equal to the Y stride. 0x1: The CbCr stride value is double to the Y stride. | RW | 0 |
| 21 | VERTICALTAPS | Video Vertical Resize Tap Number 0x0: 3 taps are used for the vertical filtering logic. The 2 other taps are not used. 0x1: 5 taps are used for the vertical filtering logic. | RW | 0 |
| 20 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 19 | WRITEBACKMODE | When connected to the overlay output of a channel the write back can operate as a simple transfer from memory to memory (composition engine) or as a capture channel. 0x0: Capture mode (default mode) 0x1: Memory-to-memory mode | RW | 0x0 |
| 18:16 | CHANNELIN | Video Channel In configuration wr: immediate 0x6: Video3 pipeline output 0x1: Secondary LCD output 0x0: Primary LCD overlay output 0x2: TV overlay output 0x4: Video1 pipeline output 0x5: Video2 pipeline output 0x3: Graphics pipeline output | RW | 0x0 |
| 15:14 | BURSTSIZE | Write-back DMA Burst Size 0x0: 2x128bit bursts 0x1: 4x128bit bursts 0x3: Reserved 0x2: 8x128bit bursts | RW | 0x2 |
| 13:12 | RESERVED | RESERVED | RW | 0x0 |
| 11 | FULLRANGE | Color Space Conversion full range setting. 0x0: Limited range selected: 16 subtracted from Y before color space conversion 0x1: Full range selected: Y is not modified before the color space conversion | RW | 0 |
| 10 | TRUNCATIONENABLE | It applies only when the input format to the write-back pipeline from the overlay or directly from one of the pipelines is ARGB32. If the format is one of the YUV supported formats, the bit field is ignored. 0x0: Disable truncation logic 0x1: Enable truncation logic from ARGB32 to the pixel format defined in the field FORMAT. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------|
| 9 | COLORCONVENABLE | Enable the color space conversion. The hardware does not enable/disable the conversion based on the pixel format. The bit field shall be reset when the format is not YUV. 0x0: Disable Color Space Conversion RGB to YUV 0x1: Enable Color Space Conversion RGB to YUV | RW | 0 |
| 8 | BURSTTYPE | The type of burst can be INCR (incremental) or BLCK (2D block). The 2D block is required when the TILER is targeted by the DMA engine. 0x0: INC burst type is used. 0x1: 2D block burst type is used. | RW | 0 |
| 7 | ALPHAENABLE | Premultiplied alpha enable Read 0x1: Enabled Read 0x0: Disabled. This bit also disable the logic present in the associated channel out that compute the alpha component sent to the WB pipe. When the WB is configured to copy back one of the output channels (output of overlay), the following configurations are available: 0x1: The WB pipe copies back to memory the premultiplied alpha calculated through the overlay. 0x0: The alpha value is not written back. | RW | 0 |
| 6:5 | RESIZEENABLE | Resize Enable 0x0: Disable the resize processing 0x1: Enable the horizontal resize processing 0x3: Enable both horizontal and vertical resize processing 0x2: Enable the vertical resize processing | RW | 0x0 |
| 4:1 | FORMAT | Write-back Format. It defines the pixel format when storing the write-back picture into memory. 0x6: RGB16-565 0x1: RGB12x-4444 0xA: YUV2 4:2:2 co-sited 0x7: ARGB16-1555 0xD: RGBA32-8888 0x0: NV12 4:2:0 2 buffers (Y + UV) 0x2: RGBA12-4444 0x8: xRGB24-8888 (32-bit container) 0x9: RGB24-888 (24-bit container) 0xB: UYVY 4:2:2 co-sited 0x5: ARGB16-4444 0xF: xRGB15-1555 0xC: ARGB32-8888 0x4: xRGB12-4444 0xE: RGBx24-8888 (24-bit RGB aligned on MSB of the 32-bit container) | RW | 0x0 |
| 0 | ENABLE | Write-back Enable. wr: immediate 0x0: Write-back disabled 0x1: Write-back enabled | RW | 0 |

Table 10-365. Register Call Summary for Register DISPC_WB_ATTRIBUTES

Display Controller

- [DMA Buffers: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [Arbitration: \[5\]](#)
- [Write-Back Pipeline: \[6\] \[7\] \[8\]](#)
- [CSC Unit RGB to YUV: \[9\] \[10\]](#)
- [Scaler Unit: \[11\] \[12\] \[13\]](#)
- [RGB Truncation Logic: \[14\] \[15\]](#)
- [Overlay Manager: \[16\] \[17\] \[18\]](#)
- [Shadow Registers: \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [Operational Modes Configuration: \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\]](#)
- [Display Controller Register Summary: \[38\]](#)

Table 10-366. DISPC_WB_CONV_COEF0

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----------|----------|--------------------------|----|----|----|---|---|----|---|---|---|---|---|---|------|--|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0574 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 1574 0x5800 1574 | | | | | | | | | | | | | | | | Instance | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | The register configures the color space conversion matrix coefficients for the write back pipeline (YUV4:4:4 to RGB24) Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="8">RESERVED</td><td colspan="8">YG</td><td colspan="8">RESERVED</td><td colspan="8">YR</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | YG | | | | | | | | RESERVED | | | | | | | | YR | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | YG | | | | | | | | RESERVED | | | | | | | | YR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:27 | RESERVED | | Write 0s for future compatibility. Reads return 0. | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | | 0x00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26:16 | YG | | YG Coefficient Encoded signed value (from -1024 to 1023). | | | | | | | | | | | | | | | | | | | | | | | | | | | | RW | | 0x000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15:11 | RESERVED | | Write 0s for future compatibility. Reads return 0. | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | | 0x00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10:0 | YR | | YR Coefficient Encoded signed value (from -1024 to 1023). | | | | | | | | | | | | | | | | | | | | | | | | | | | | RW | | 0x000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 10-367. Register Call Summary for Register DISPC_WB_CONV_COEF0

Display Controller

- [CSC Unit RGB to YUV: \[0\] \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Operational Modes Configuration: \[3\]](#)
- [Display Controller Register Summary: \[4\]](#)

Table 10-368. DISPC_WB_CONV_COEF1

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0578 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1578 0x5800 1578 | | |
| Description | The register configures the color space conversion matrix coefficients for the write back pipeline. Shadow register, updated when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CRR | | | | | | | | RESERVED | | | | | | | | YB | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | CRR | CrR Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | YB | YB Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-369. Register Call Summary for Register DISPC_WB_CONV_COEF1

Display Controller

- [CSC Unit RGB to YUV: \[0\] \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Operational Modes Configuration: \[3\]](#)
- [Display Controller Register Summary: \[4\]](#)

Table 10-370. DISPC_WB_CONV_COEF2

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 057C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 157C 0x5800 157C | | |
| Description | The register configures the color space conversion matrix coefficients for the write back pipeline. Shadow register, updated when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CRB | | | | | | | | RESERVED | | | | | | | | CRG | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | CRB | CrB Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | CRG | CrG Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-371. Register Call Summary for Register DISPC_WB_CONV_COEF2

Display Controller

- [CSC Unit RGB to YUV: \[0\] \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Operational Modes Configuration: \[3\]](#)
- [Display Controller Register Summary: \[4\]](#)

Table 10-372. DISPC_WB_CONV_COEF3

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0580 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1580 0x5800 1580 | | |
| Description | The register configures the color space conversion matrix coefficients for the write back pipeline. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CBG | | | | | | | | RESERVED | | | | | | | | CBR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | CBG | CbG coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | CBR | CbR coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-373. Register Call Summary for Register DISPC_WB_CONV_COEF3

Display Controller

- [CSC Unit RGB to YUV: \[0\] \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Operational Modes Configuration: \[3\]](#)
- [Display Controller Register Summary: \[4\]](#)

Table 10-374. DISPC_WB_CONV_COEF4

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0584 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1584 0x5800 1584 | | |
| Description | The register configures the color space conversion matrix coefficients for the write back pipeline. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CBB | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|----------|
| 31:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x000000 |
| 10:0 | CBB | CbB Coefficient Encoded signed value (from -1024 to 1023). | RW | 0x000 |

Table 10-375. Register Call Summary for Register DISPC_WB_CONV_COEF4

Display Controller

- [CSC Unit RGB to YUV: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Operational Modes Configuration: \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-376. DISPC_WB_BUF_SIZE_STATUS

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0588 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1588 0x5800 1588 | | |
| Description | The register defines the DMA buffer size for the write back pipeline. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BUFSIZE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 15:0 | BUFSIZE | DMA buffer Size in number of 128-bits. | R | 0x0800 |

Table 10-377. Register Call Summary for Register DISPC_WB_BUF_SIZE_STATUS

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-378. DISPC_WB_BUF_THRESHOLD

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 058C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 158C 0x5800 158C | | |
| Description | The register configures the DMA buffer associated with the write-back pipeline. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BUFHIGHTHRESHOLD | | | | | | | | | | | | | | | | BUFLOWTHRESHOLD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|--------|
| 31:16 | BUFHIGHTHRESHOLD | DMA buffer High Threshold Number of 128-bits defining the threshold value. | RW | 0x07FF |
| 15:0 | BUFLOWTHRESHOLD | DMA buffer High Threshold Number of 128-bits defining the threshold value. | RW | 0x07F8 |

Table 10-379. Register Call Summary for Register DISPC_WB_BUF_THRESHOLD

Display Controller

- [DMA Buffers: \[0\] \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Operational Modes Configuration: \[3\] \[4\]](#)
- [Display Controller Register Summary: \[5\]](#)

Table 10-380. DISPC_WB_FIR

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0590 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1590 0x5800 1590 | | |
| Description | The register configures the resize factors for horizontal and vertical up/downsampling of the write back pipeline. It is used for ARGB and Y setting. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----------|----|----|----|---------|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | FIRVINC | | | | | | | | RESERVED | | | | FIRHINC | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:29 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 28:16 | FIRVINC | Vertical increment of the up/downsampling filter Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |
| 15:13 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 12:0 | FIRHINC | Horizontal increment of the up/downsampling filter Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |

Table 10-381. Register Call Summary for Register DISPC_WB_FIR

Display Controller

- [Scaler Unit: \[0\] \[1\] \[2\] \[3\]](#)
- [Shadow Registers: \[4\]](#)
- [Operational Modes Configuration: \[5\] \[6\]](#)
- [Display Controller Register Summary: \[7\]](#)

Table 10-382. DISPC_WB_PICTURE_SIZE

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0594 | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 1594 0x5800 1594 | | | | | | | | | | | | | | | |
| | Instance DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the size of the write-back picture associated with the write back pipeline after up/down-scaling. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | ORGSIZEY | | | | | | | | RESERVED | | | | | | | | ORGSIZEX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | ORGSIZEY | Number of lines of the video picture Encoded value (from 1 to 2048) to specify the number of lines of the video picture in memory (program to value minus 1). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | ORGSIZEX | Number of pixels of the video picture Encoded value (from 1 to 2048) to specify the number of pixels of the video picture in memory (program to value minus 1). The size is limited to the size of the line buffer of the vertical sampling block in case the video picture is processed by the vertical filtering unit. | RW | 0x000 |

Table 10-383. Register Call Summary for Register DISPC_WB_PICTURE_SIZE

Display Controller

- [Scaler Unit: \[0\] \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Operational Modes Configuration: \[3\] \[4\]](#)
- [Display Controller Register Summary: \[5\]](#)

Table 10-384. DISPC_WB_PIXEL_INC

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0598 | | | | | | | | | | | | | | | |
| Physical Address | 0x4804 1598 0x5800 1598 | | | | | | | | | | | | | | | |
| | Instance DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Description | The register configures the number of bytes to increment between two pixels for the buffer associated with the write back pipeline. The register is used only when the TILER is not present in the system in order to perform low performance rotation. When the TILER IP is present it is highly recommended to use it for performing the rotation. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PIXELINC | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x000000 |
| 7:0 | PIXELINC | Values other than 1 are invalid | RW | 0x01 |

Table 10-385. Register Call Summary for Register DISPC_WB_PIXEL_INC

Display Controller

- [Addressing and Bursts: \[0\]](#)
- [Rotation and Mirroring: \[1\] \[2\] \[3\] \[4\]](#)
- [Shadow Registers: \[5\]](#)
- [Operational Modes Configuration: \[6\]](#)
- [Display Controller Register Summary: \[7\]](#)

Table 10-386. DISPC_WB_ROW_INC

| | | | |
|------------------|---|----------|--------------------------|
| Address Offset | 0x0000 05A4 | | |
| Physical Address | 0x4804 15A4 0x5800 15A4 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the number of bytes to increment at the end of the row for the buffer associated with the vwrite back pipeline. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ROWINC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | ROWINC | Number of bytes to increment at the end of the row Encoded signed value (from $2^{31}1$ to 2^{31}) to specify the number of bytes to increment at the end of the row in the video buffer. The value 0 is invalid. The value 1 means next pixel. The value $1 + n * \text{bpp}$ means increment of n pixels. The value $1 (n + 1) * \text{bpp}$ means decrement of n pixels. | RW | 0x0000 0001 |

Table 10-387. Register Call Summary for Register DISPC_WB_ROW_INC

Display Controller

- [Addressing and Bursts: \[0\]](#)
- [Rotation and Mirroring: \[1\] \[2\] \[3\] \[4\]](#)
- [Shadow Registers: \[5\]](#)
- [Operational Modes Configuration: \[6\]](#)
- [Display Controller Register Summary: \[7\]](#)

Table 10-388. DISPC_WB_SIZE

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 05A8 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 15A8 0x5800 15A8 | | |
| Description | The register configures the size of the output of overlay connected to the write-back pipeline when the overlay output is only used by the write-back pipeline. When the overlay is output on the primary LCD or secondary LCD or TV outputs, the size of the frame is defined in the DISPC_SIZE_LCD1 , DISPC_SIZE_LCD2 , and DISPC_SIZE_TV respectively. Shadow register, updated when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SIZEY | | | | | | | | RESERVED | | | | | | | | SIZEX | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | SIZEY | Number of lines of the Write-back picture Encoded value (from 1 to 2048) to specify the number of lines of the write-back picture. Program to value minus 1. | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | SIZEX | Number of pixels of the Write-back picture Encoded value (from 1 to 2048) to specify the number of pixels of the write-back picture. Program to value minus 1. | RW | 0x000 |

Table 10-389. Register Call Summary for Register DISPC_WB_SIZE

Display Controller

- [Scaler Unit: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [Shadow Registers: \[5\]](#)
- [Operational Modes Configuration: \[6\] \[7\]](#)
- [Display Controller Register Summary: \[8\]](#)

Table 10-390. DISPC_VID1_BA_UV_j

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0600 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1600 + (0x4 * j) 0x5800 1600 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the base address of the UV buffer for the video window 1. (DISPC_VID1_BA_UV_0 DISPC_VID1_BA_UV_1 for ping-pong mechanism with external trigger, based on the field polarity otherwise only DISPC_VID1_BA_UV_0 is used). Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | BA | Video base address aligned on 16-bit boundary Base address of the UV video buffer used only in case of YUV4:2:0-NV12 When the TILER is addressed, the bits: [28:27] = 0x0 for 8-bit tiled [28:27] = 0x1 for 16-bit tiled [28:27] = 0x2 for 32-bit tiled [28:27] = 0x3 for page mode [31:29] = 0x0 for 0-degree view [31:29] = 0x1 for 180-degree view + mirroring [31:29] = 0x2 for 0-degree view + mirroring [31:29] = 0x3 for 180-degree view [31:29] = 0x4 for 270-degree view + mirroring [31:29] = 0x5 for 270-degree view [31:29] = 0x6 for 90-degree view [31:29] = 0x7 for 90-degree view + mirroring Otherwise the bits indicated the corresponding bit address to access the SDRAM. | RW | 0x0000 0000 |

Table 10-391. Register Call Summary for Register DISPC_VID1_BA_UV_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-392. DISPC_VID2_BA_UV_j

| | | | |
|------------------|--|----------|--------------------------|
| Address Offset | 0x0000 0608 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1608 + (0x4 * j) 0x5800 1608 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the base address of the UV buffer for the video window 2. (DISPC_VID2_BA_UV_0 DISPC_VID2_BA_UV_1 for ping-pong mechanism with external trigger, based on the field polarity otherwise only DISPC_VID2_BA_UV_0 is used). Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | BA | Video base address aligned on 16-bit boundary Base address of the UV video buffer used only in case of YUV4:2:0-NV12 When the TILER is addressed, the bits: [28:27] = 0x0 for 8-bit tiled [28:27] = 0x1 for 16-bit tiled [28:27] = 0x2 for 32-bit tiled [28:27] = 0x3 for page mode [31:29] = 0x0 for 0-degree view [31:29] = 0x1 for 180-degree view + mirroring [31:29] = 0x2 for 0-degree view + mirroring [31:29] = 0x3 for 180-degree view [31:29] = 0x4 for 270-degree view + mirroring [31:29] = 0x5 for 270-degree view [31:29] = 0x6 for 90-degree view [31:29] = 0x7 for 90-degree view + mirroring Otherwise the bits indicated the corresponding bit address to access the SDRAM. | RW | 0x0000 0000 |

Table 10-393. Register Call Summary for Register DISPC_VID2_BA_UV_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-394. DISPC_VID3_BA_UV_j

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0610 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1610 + (0x4 * j) 0x5800 1610 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the base address of the UV buffer for the video window 3. (DISPC_VID3_BA_UV_0 DISPC_VID3_BA_UV_1 for ping-pong mechanism with external trigger, based on the field polarity otherwise only DISPC_VID3_BA_UV_0 is used)). Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | BA | Video base address aligned on 16-bit boundary Base address of the UV video buffer used only in case of YUV4:2:0-NV12 When the TILER is addressed, the bits: [28:27] = 0x0 for 8-bit tiled [28:27] = 0x1 for 16-bit tiled [28:27] = 0x2 for 32-bit tiled [28:27] = 0x3 for page mode [31:29] = 0x0 for 0-degree view [31:29] = 0x1 for 180-degree view + mirroring [31:29] = 0x2 for 0-degree view + mirroring [31:29] = 0x3 for 180-degree view [31:29] = 0x4 for 270-degree view + mirroring [31:29] = 0x5 for 270-degree view [31:29] = 0x6 for 90-degree view [31:29] = 0x7 for 90-degree view + mirroring Otherwise the bits indicated the corresponding bit address to access the SDRAM. | RW | 0x0000 0000 |

Table 10-395. Register Call Summary for Register DISPC_VID3_BA_UV_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-396. DISPC_WB_BA_UV_j

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0618 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1618 + (0x4 * j) 0x5800 1618 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the base address of the UV buffer for the write-back pipeline. (DISPC_WB_BA_UV_0 DISPC_WB_BA_UV_1 for ping-pong mechanism with external trigger, based on the field polarity otherwise only DISPC_WB_BA_UV_0 is used)). Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | BA | Video base address aligned on 16-bit boundary Base address of the UV video buffer used only in case of YUV4:2:0-NV12 When the TILER is addressed, the bits: [28:27] = 0x0 for 8-bit tiled [28:27] = 0x1 for 16-bit tiled [28:27] = 0x2 for 32-bit tiled [28:27] = 0x3 for page mode [31:29] = 0x0 for 0-degree view [31:29] = 0x1 for 180-degree view + mirroring [31:29] = 0x2 for 0-degree view + mirroring [31:29] = 0x3 for 180-degree view [31:29] = 0x4 for 270-degree view + mirroring [31:29] = 0x5 for 270-degree view [31:29] = 0x6 for 90-degree view [31:29] = 0x7 for 90-degree view + mirroring Otherwise the bits indicated the corresponding bit address to access the SDRAM. | RW | 0x0000 0000 |

Table 10-397. Register Call Summary for Register DISPC_WB_BA_UV_j

Display Controller

- [Addressing and Bursts: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Operational Modes Configuration: \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-398. DISPC_CONFIG2

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0620 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1620 0x5800 1620 | | |
| Description | The control register configures the Display Controller module for the secondary LCD output. Shadow register, updated on VFP start period of secondary LCD or EVSYNC | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
|----------|----|----|----|----|----|----|----|-----------|-----------------|----------|------------------|----------|----|----|----|-----------------|-----|----------|----|----|----|-----------------|--------------|----------|-------------|------------|------------|-----------------|----------------|----------|---|--|--|------------|
| RESERVED | | | | | | | | FULLRANGE | COLORCONVENABLE | FIDFIRST | OUTPUTMODEENABLE | RESERVED | | | | BUFFERHANDCHECK | CPR | RESERVED | | | | TCKLCDSELECTION | TCKLCDENABLE | RESERVED | ACBIASGATED | VSYNCGATED | HSYNCGATED | PIXELCLOCKGATED | PIXELDATAGATED | RESERVED | | | | PIXELGATED |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|-------|
| 31:26 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 25 | FULLRANGE | Color Space Conversion full range setting. 0x0: Limited range selected. 0x1: Full range selected. | RW | 0 |
| 24 | COLORCONV ENABLE | Enable the color space conversion. It shall be reset when CPR bit field is set to 0x1. 0x0: Disable Color Space Conversion RGB to YUV 0x1: Enable Color Space Conversion RGB to YUV | RW | 0 |
| 23 | FIDFIRST | Selects the first field to output in case of interlace mode. In case of progressive mode, the value is not used. 0x0: First field is even. 0x1: Odd field is first. | RW | 0 |
| 22 | OUTPUTMODE ENABLE | Selects between progressive and interlace mode for the secondary LCD output. 0x0: Progressive mode selected. 0x1: Interlace mode selected. | RW | 0 |
| 21:17 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 16 | BUFFERHAND CHECK | Controls the handcheck between DMA buffer and STALL signal in order to prevent from underflow. The bit shall be set to 0 when the module is not in STALL mode. (secondary LCD output) 0x0: Only the STALL signal (generated by RFBI or DSI2 depending on which IP uses the LCD output) is used regardless of the DMA buffer fullness information in order to provide data to the RFBI or DSI2 module. 0x1: The STALL signal (generated by RFBI or DSI2 depending on which IP uses the LCD output) is used in combination with the DMA buffer fullness information in order to provide data to the RFBI or DSI2 module only when it does not generated buffer underflow. | RW | 0 |
| 15 | CPR | Color Phase Rotation Control (secondary LCD output). It shall be reset when ColorConvEnable bit field is set to 1. wr: VFP start period of secondary LCD output 0x0: Color Phase Rotation Disabled 0x1: Color Phase Rotation Enabled | RW | 0 |
| 14:12 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 11 | TCKLCD SELECTION | Transparency Color Key Selection (secondary LCD output) wr: VFP start period of secondary LCD output 0x0: Destination transparency color key selected 0x1: Source transparency color key selected | RW | 0 |
| 10 | TCKLCDENABLE | Transparency Color Key Enabled (secondary LCD output) wr: VFP start period of secondary LCD output 0x0: Disable the transparency color key for the LCD 0x1: Enable the transparency color key for the LCD | RW | 0 |
| 9 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 8 | ACBIASGATED | ACBias Gated Enabled (secondary LCD output) wr: VFP start period of secondary LCD output 0x0: ACBias Gated Disabled 0x1: ACBias Gated Enabled | RW | 0 |
| 7 | VSYNCGATED | VSYNC Gated Enabled (secondary LCD output) wr: VFP start period of secondary LCD output 0x0: VSYNC Gated Disabled 0x1: VSYNC Gated Enabled | RW | 0 |
| 6 | HSYNCGATED | HSYNC Gated Enabled (secondary LCD output) wr: VFP start period of secondary LCD output 0x0: HSYNC Gated Disabled 0x1: HSYNC Gated Enabled | RW | 0 |
| 5 | PIXELCLOCK GATED | Pixel Clock Gated Enabled (secondary LCD output) wr: VFP start period of secondary LCD output 0x0: Pixel Clock Gated Disabled 0x1: Pixel Clock Gated Enabled | RW | 0 |
| 4 | PIXELDATA GATED | Pixel Data Gated Enabled (secondary LCD output) wr: VFP start period of secondary LCD output 0x0: Pixel Data Gated Disabled 0x1: Pixel Data Gated Enabled | RW | 0 |
| 3:1 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 0 | PIXELGATED | Pixel Gated Enable (only for Active Matrix) (secondary LCD output) wr: VFP start period of secondary LCD output 0x0: Pixel clock always toggles (only in Active Matrix mode) 0x1: Pixel clock only toggles when there is valid data to display. (only in Active Matrix mode) | RW | 0 |

Table 10-399. Register Call Summary for Register DISPC_CONFIG2

Display Controller

- [Overlay Manager: \[0\] \[1\] \[2\]](#)
- [Shadow Registers: \[3\]](#)
- [Display Controller Logical Register Mapping: \[4\]](#)
- [Display Controller Register Summary: \[5\]](#)

Table 10-400. DISPC_VID1_ATTRIBUTES2

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0624 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1624 0x5800 1624 | | |
| Description | The register configures the attributes of the video window 1. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|---|----------|---|----------------|---|---|---|-------------|---|--|--|-----------|--|
| RESERVED | | | | | | | | | | | | | | | | YUVCHROMARESAMPLING | | | | | | | | RESERVED | | VC1_RANGE_CBCR | | | | VC1_RANGE_Y | | | | VC1ENABLE | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-----------|
| 31:9 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000000 |
| 8 | YUVCHROMARE SAMPLING | The YUV chrominance can be resampled using averaging of the adjacent chrominance samples, without using the polyphase filter for 4:2:2 input or can be calculated using the polyphase filter for 4:2:2/4:2:0. The polyphase filter is mandatory for the 4:2:0 format. This bit controls the order in which the processing is done on the video pipe. 0x0: When input is 4:2:2, the missing chrominance samples are calculated by averaging the adjacent samples if DISPC_VID1_ATTRIBUTES.ROTATION=0 only. Other rotation configurations are not supported. 0x1: For 4:2:2 (or 4:2:0), the missing chrominance samples are calculated by filtering the adjacent samples (5-tap polyphase filter). See Figure 10-48, Configuration 2: Video Pipeline . All rotation configurations are supported. | RW | 0 |
| 7 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 6:4 | VC1_RANGE_ CBCR | Defines the VC-1 range value for the CbCr component from 0 to 7. | RW | 0x0 |
| 3:1 | VC1_RANGE_Y | Defines the VC-1 range value for the Y component from 0 to 7. | RW | 0x0 |
| 0 | VC1ENABLE | Enable/disable the VC-1 range mapping processing. The bit field is ignored if the format is not one of the supported YUV formats. 0x0: VC-1 range mapping disabled 0x1: VC-1 range mapping enabled | RW | 0 |

Table 10-401. Register Call Summary for Register DISPC_VID1_ATTRIBUTES2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-402. DISPC_VID2_ATTRIBUTES2

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0628 | | |
| Physical Address | 0x4804 1628 0x5800 1628 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the attributes of the video window 2. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----------|----|----------------|----|---|-------------|---|---|-----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | YUVCHROMARESAMPLING | | RESERVED | | VC1_RANGE_CBCR | | | VC1_RANGE_Y | | | VC1ENABLE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|----------|
| 31:9 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x000000 |
| 8 | YUVCHROMARE SAMPLING | The YUV chrominance can be resampled using averaging of the adjacent chrominance samples, without using the polyphase filter for 4:2:2 input or can be calculated using the polyphase filter for 4:2:2/4:2:0. The polyphase filter is mandatory for the 4:2:0 format. This bit controls the order in which the processing is done on the video pipe. 0x0: When input is in 4:2:2, the missing chrominance samples are calculated by averaging the adjacent samples if DISPC_VID1_ATTRIBUTES. ROTATION=0 only. Other rotation configurations are not supported. 0x1: For 4:2:2 (or 4:2:0), the missing chrominance samples are calculated by filtering the adjacent samples (5-tap polyphase filter). See Figure 10-48, Configuration 2: Video Pipeline . All rotation configurations are supported. | RW | 0 |
| 7 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 6:4 | VC1_RANGE_CBCR | Defines the VC-1 range value for the CbCr component from 0 to 7. | RW | 0x0 |
| 3:1 | VC1_RANGE_Y | Defines the VC-1 range value for the Y component from 0 to 7. | RW | 0x0 |
| 0 | VC1ENABLE | Enable/disable the VC-1 range mapping processing. The bit field is ignored if the format is not one of the supported YUV formats. 0x0: VC-1 range mapping disabled 0x1: VC-1 range mapping enabled | RW | 0 |

Table 10-403. Register Call Summary for Register DISPC_VID2_ATTRIBUTES2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-404. DISPC_VID3_ATTRIBUTES2

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 062C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 162C 0x5800 162C | | |
| Description | The register configures the attributes of the video window 3. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----------|----|----------------|----|---|-------------|---|---|-----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | YUVCHROMARESAMPLING | | RESERVED | | VC1_RANGE_CBCR | | | VC1_RANGE_Y | | | VC1ENABLE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|----------|
| 31:9 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x000000 |
| 8 | YUVCHROMARE SAMPLING | The YUV chrominance can be resampled using averaging of the adjacent chrominance samples, without using the polyphase filter for 4:2:2 input or can be calculated using the polyphase filter for 4:2:2/4:2:0. The polyphase filter is mandatory for the 4:2:0 format. This bit controls the order in which the processing is done on the video pipe. 0x0: When input is in 4:2:2, the missing chrominance samples are calculated by averaging the adjacent samples if DISPC_VID1_ATTRIBUTES . ROTATION=0 only. Other rotation configurations are not supported. 0x1: For 4:2:2 (or 4:2:0), the missing chrominance samples are calculated by filtering the adjacent samples (5-tap polyphase filter). See Figure 10-48, Configuration 2: Video Pipeline . All rotation configurations are supported. | RW | 0 |
| 7 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 6:4 | VC1_RANGE_CBCR | Defines the VC-1 range value for the CbCr component from 0 to 7. | RW | 0x0 |
| 3:1 | VC1_RANGE_Y | Defines the VC-1 range value for the Y component from 0 to 7. | RW | 0x0 |
| 0 | VC1ENABLE | Enable/disable the VC-1 range mapping processing. The bit field is ignored if the format is not one of the supported YUV formats. 0x0: VC-1 range mapping disabled 0x1: VC-1 range mapping enabled | RW | 0 |

Table 10-405. Register Call Summary for Register DISPC_VID3_ATTRIBUTES2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-406. DISPC_GAMMA_TABLE0

| | | | |
|-------------------------|---|-----------------------|--------------------------|
| Address Offset | 0x0000 0630 | | |
| Physical Address | 0x4804 1630 0x5800 1630 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the look up table used as color look up table for BITMAP formats (1-, 2-, 4, and 8-bpp) on the graphics pipeline or as gamma table on the primary LCD output. | | |
| Type | W | | |
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| INDEX | VALUE_R | VALUE_G | VALUE_B |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | INDEX | Defines the location in the table where the bit field VALUE is stored. | W | 0x00 |
| 23:16 | VALUE_R | 8-bit value used to defined the value to store at the location in the table defined by the bit field INDEX. | W | 0x00 |
| 15:8 | VALUE_G | 8-bit value used to defined the value to store at the location in the table defined by the bit field INDEX. | W | 0x00 |
| 7:0 | VALUE_B | 8-bit value used to defined the value to store at the location in the table defined by the bit field INDEX. | W | 0x00 |

Table 10-407. Register Call Summary for Register DISPC_GAMMA_TABLE0

Display Controller

- [Shadow Registers: \[0\]](#)
- [Operational Modes Configuration: \[1\] \[2\]](#)
- [Display Controller Logical Register Mapping: \[3\]](#)
- [Display Controller Register Summary: \[4\]](#)

Table 10-408. DISPC_GAMMA_TABLE1

| | | | |
|-------------------------|--|-----------------------|--------------------------|
| Address Offset | 0x0000 0634 | | |
| Physical Address | 0x4804 1634 0x5800 1634 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the gamma table on the secondary LCD output. | | |
| Type | W | | |
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| INDEX | VALUE_R | VALUE_G | VALUE_B |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | INDEX | Defines the location in the table where the bit field VALUE is stored. | W | 0x00 |
| 23:16 | VALUE_R | 8-bit value used to defined the value to store at the location in the table defined by the bit field INDEX. | W | 0x00 |
| 15:8 | VALUE_G | 8-bit value used to defined the value to store at the location in the table defined by the bit field INDEX. | W | 0x00 |
| 7:0 | VALUE_B | 8-bit value used to defined the value to store at the location in the table defined by the bit field INDEX. | W | 0x00 |

Table 10-409. Register Call Summary for Register DISPC_GAMMA_TABLE1

Display Controller

- [Shadow Registers: \[0\]](#)
- [Operational Modes Configuration: \[1\]](#)
- [Display Controller Logical Register Mapping: \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-410. DISPC_GAMMA_TABLE2

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0638 | | |
| Physical Address | 0x4804 1638 0x5800 1638 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the gamma table on the TV output. | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----------|---------|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----|----|---------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INDEX | RESERVED | VALUE_R | | | | | | | | | | VALUE_G | | | | | | | | | | VALUE_B | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31 | INDEX | Setting this bit to 1 resets the internal index counter to zero. Each subsequent access to the register (with the INDEX bit kept at 0) increments the address for the next storage location into the table memory. | W | 0 |
| 30 | RESERVED | | W | 0 |
| 29:20 | VALUE_R | 10-bit color component value to store in the table. | W | 0x000 |
| 19:10 | VALUE_G | 10-bit color component value to store in the table. | W | 0x000 |
| 9:0 | VALUE_B | 10-bit color component value to store in the table. | W | 0x000 |

Table 10-411. Register Call Summary for Register DISPC_GAMMA_TABLE2

Display Controller

- [Gamma Correction Unit: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Operational Modes Configuration: \[2\]](#)
- [Display Controller Logical Register Mapping: \[3\]](#)
- [Display Controller Register Summary: \[4\]](#)

Table 10-412. DISPC_VID1_FIR2

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 063C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 163C 0x5800 163C | | |
| Description | <p>The register configures the resize factors for horizontal and vertical up/downsampling of the video window 1. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory</p> | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVINC | | | | | | | | RESERVED | | | | | | | | FIRHINC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:29 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 28:16 | FIRVINC | Vertical increment of the up/downsampling filter for Cb and Cr. Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |
| 15:13 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 12:0 | FIRHINC | Horizontal increment of the up/downsampling filter for Cb and Cr. Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |

Table 10-413. Register Call Summary for Register DISPC_VID1_FIR2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-414. DISPC_VID1_ACCU2_j

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0640 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1640 + (0x4 * j) 0x5800 1640 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the resize accumulator init values for horizontal and vertical up/downsampling of the video window 1 (DISPC_VID1_ACCU2_0 DISPC_VID1_ACCU2_1 for ping-pong mechanism with external trigger, based on the field polarity) It is used for Cb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VERTICALACCU | | | | | | | | RESERVED | | | | | | | | HORIZONTALACCU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | VERTICALACCU | Vertical initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | HORIZONTALACCU | Horizontal initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |

Table 10-415. Register Call Summary for Register DISPC_VID1_ACCU2_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-416. DISPC_VID1_FIR_COEF_H2_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0648 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1648 + (0x8 * i) 0x5800 1648 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the up/down-scaling coefficients for the horizontal resize of the video picture associated with the video window 1 for the phases from 0 to 7. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRHC3 | | | | | | | | FIRHC2 | | | | | | | | FIRHC1 | | | | | | | | FIRHC0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRHC3 | Signed coefficient C3 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRHC2 | Unsigned coefficient C2 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRHC1 | Signed coefficient C1 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7:0 | FIRHC0 | Signed coefficient C0 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-417. Register Call Summary for Register DISPC_VID1_FIR_COEF_H2_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-418. DISPC_VID1_FIR_COEF_HV2_i

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 064C + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 164C + (0x8 * i) 0x5800 164C + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical and horizontal resize of the video picture associated with the video window 1 for the phases from 0 to 7. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRVC2 | | | | | | | | FIRVC1 | | | | | | | | FIRVC0 | | | | | | | | FIRHC4 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRVC2 | Signed coefficient C2 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRVC1 | Unsigned coefficient C1 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRVC0 | Signed coefficient C0 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC4 | Signed coefficient C4 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-419. Register Call Summary for Register DISPC_VID1_FIR_COEF_HV2_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-420. DISPC_VID1_FIR_COEF_V2_i

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0688 + (0x4 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1688 + (0x4 * i) 0x5800 1688 + (0x4 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical resize of the video picture associated with the video window 1 for the phases from 0 to 7. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVC22 | | | | | | | | FIRVC00 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 15:8 | FIRVC22 | Signed coefficient C22 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRVC00 | Signed coefficient C00 for the vertical up/down-scaling with the phase n | RW | 0x00 |

Table 10-421. Register Call Summary for Register DISPC_VID1_FIR_COEF_V2_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-422. DISPC_VID2_FIR2

| | | | |
|------------------|---|----------|--------------------------|
| Address Offset | 0x0000 06A8 | | |
| Physical Address | 0x4804 16A8 0x5800 16A8 | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the resize factors for horizontal and vertical up/downsampling of the video window 2. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVINC | | | | | | | | RESERVED | | | | | | | | FIRHINC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:29 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 28:16 | FIRVINC | Vertical increment of the up/downsampling filter for Cb and Cr. Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |
| 15:13 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 12:0 | FIRHINC | Horizontal increment of the up/downsampling filter for Cb and Cr. Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |

Table 10-423. Register Call Summary for Register DISPC_VID2_FIR2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-424. DISPC_VID2_ACCU2_j

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 06AC + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 16AC + (0x4 * j) 0x5800 16AC + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the resize accumulator init values for horizontal and vertical up/downsampling of the video window 2 (DISPC_VID2_ACCU2_0 DISPC_VID2_ACCU2_1 for ping-pong mechanism with external trigger, based on the field polarity). It is used for Cb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VERTICALACCU | | | | | | | | RESERVED | | | | | | | | HORIZONTALACCU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | VERTICALACCU | Vertical initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | HORIZONTALACCU | Horizontal initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |

Table 10-425. Register Call Summary for Register DISPC_VID2_ACCU2_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-426. DISPC_VID2_FIR_COEF_H2_i

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 06B4 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 16B4 + (0x8 * i) 0x5800 16B4 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the up/down-scaling coefficients for the horizontal resize of the video picture associated with the video window 2 for the phases from 0 to 7. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRHC3 | | | | | | | | FIRHC2 | | | | | | | | FIRHC1 | | | | | | | | FIRHC0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRHC3 | Signed coefficient C3 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRHC2 | Unsigned coefficient C2 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRHC1 | Signed coefficient C1 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC0 | Signed coefficient C0 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-427. Register Call Summary for Register DISPC_VID2_FIR_COEF_H2_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-428. DISPC_VID2_FIR_COEF_HV2_i

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 06B8 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 16B8 + (0x8 * i) 0x5800 16B8 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical and horizontal resize of the video picture associated with the video window 2 for the phases from 0 to 7. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRVC2 | | | | | | | | FIRVC1 | | | | | | | | FIRVC0 | | | | | | | | FIRHC4 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRVC2 | Signed coefficient C2 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRVC1 | Unsigned coefficient C1 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRVC0 | Signed coefficient C0 for the vertical up/down-scaling with the phase n | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7:0 | FIRHC4 | Signed coefficient C4 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-429. Register Call Summary for Register DISPC_VID2_FIR_COEF_HV2_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-430. DISPC_VID2_FIR_COEF_V2_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 06F4 + (0x4 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 16F4 + (0x4 * i) 0x5800 16F4 + (0x4 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical resize of the video picture associated with the video window 2 for the phases from 0 to 7. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FIRVC22 | | | | | | | | FIRVC00 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 15:8 | FIRVC22 | Signed coefficient C22 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRVC00 | Signed coefficient C00 for the vertical up/down-scaling with the phase n | RW | 0x00 |

Table 10-431. Register Call Summary for Register DISPC_VID2_FIR_COEF_V2_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-432. DISPC_VID3_FIR2

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0724 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1724 0x5800 1724 | | |
| Description | The register configures the resize factors for horizontal and vertical up/downsampling of the video window 3. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVINC | | | | | | | | RESERVED | | | | | | | | FIRHINC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:29 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 28:16 | FIRVINC | Vertical increment of the up/downsampling filter for Cb and Cr. Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |
| 15:13 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 12:0 | FIRHINC | Horizontal increment of the up/downsampling filter for Cb and Cr. Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |

Table 10-433. Register Call Summary for Register DISPC_VID3_FIR2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-434. DISPC_VID3_ACCU2_j

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0728 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1728 + (0x4 * j) 0x5800 1728 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the resize accumulator init values for horizontal and vertical up/downsampling of the video window 3 (DISPC_VID3_ACCU2_0 DISPC_VID3_ACCU2_1 for ping-pong mechanism with external trigger, based on the field polarity). It is used for Cb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VERTICALACCU | | | | | | | | RESERVED | | | | | | | | HORIZONTALACCU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | VERTICALACCU | Vertical initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | HORIZONTALACCU | Horizontal initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |

Table 10-435. Register Call Summary for Register DISPC_VID3_ACCU2_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Register Summary: \[1\]](#)

Table 10-436. DISPC_VID3_FIR_COEF_H2_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0730 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1730 + (0x8 * i) 0x5800 1730 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the up/down-scaling coefficients for the horizontal resize of the video picture associated with the video window 3 for the phases from 0 to 7. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRHC3 | | | | | | | | FIRHC2 | | | | | | | | FIRHC1 | | | | | | | | FIRHC0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRHC3 | Signed coefficient C3 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRHC2 | Unsigned coefficient C2 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRHC1 | Signed coefficient C1 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7:0 | FIRHC0 | Signed coefficient C0 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-437. Register Call Summary for Register DISPC_VID3_FIR_COEF_H2_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-438. DISPC_VID3_FIR_COEF_HV2_i

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0734 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1734 + (0x8 * i) 0x5800 1734 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical and horizontal resize of the video picture associated with the video window 3 for the phases from 0 to 7. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRVC2 | | | | | | | | FIRVC1 | | | | | | | | FIRVC0 | | | | | | | | FIRHC4 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRVC2 | Signed coefficient C2 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRVC1 | Unsigned coefficient C1 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRVC0 | Signed coefficient C0 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC4 | Signed coefficient C4 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-439. Register Call Summary for Register DISPC_VID3_FIR_COEF_HV2_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-440. DISPC_VID3_FIR_COEF_V2_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0770 + (0x4 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 1770 + (0x4 * i) 0x5800 1770 + (0x4 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical resize of the video picture associated with the video window 3 for the phases from 0 to 7. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or EVSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVC22 | | | | | | | | FIRVC00 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 15:8 | FIRVC22 | Signed coefficient C22 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRVC00 | Signed coefficient C00 for the vertical up/down-scaling with the phase n | RW | 0x00 |

Table 10-441. Register Call Summary for Register DISPC_VID3_FIR_COEF_V2_i

Display Controller

- [Shadow Registers: \[0\]](#)
- [Display Controller Logical Register Mapping: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)

Table 10-442. DISPC_WB_FIR2

| | | | |
|------------------|--|----------|--------------|
| Address Offset | 0x0000 0790 | Instance | DISPC_PER_L4 |
| Physical Address | 0x4804 1790 0x5800 1790 | | DISPC_L3 |
| Description | The register configures the resize factors for horizontal and vertical up/downsampling of the write-back pipeline. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVINC | | | | | | | | RESERVED | | | | | | | | FIRHINC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:29 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 28:16 | FIRVINC | Vertical increment of the up/downsampling filter for Cb and Cr. Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |
| 15:13 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 12:0 | FIRHINC | Horizontal increment of the up/downsampling filter for Cb and Cr. Encoded value (from 1 to 4096). The value 0 is invalid. The values greater than 4096 are invalid. | RW | 0x0400 |

Table 10-443. Register Call Summary for Register DISPC_WB_FIR2

Display Controller

- [Shadow Registers: \[0\]](#)
- [Operational Modes Configuration: \[1\] \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-444. DISPC_WB_ACCU2_j

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0794 + (0x4 * j) | Index | j = 0 to 1 |
| Physical Address | 0x4804 1794 + (0x4 * j) 0x5800 1794 + (0x4 * j) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The register configures the resize accumulator init values for horizontal and vertical up/downsampling of the write back pipeline (DISPC_WB_ACCU2_0 DISPC_WB_ACCU2_1 for ping-pong mechanism with external trigger, based on the field polarity). It is used for Cb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VERTICALACCU | | | | | | | | RESERVED | | | | | | | | HORIZONTALACCU | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:27 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 26:16 | VERTICALACCU | Vertical initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |
| 15:11 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 10:0 | HORIZONTALACCU | Horizontal initialization accu value Encoded value (from -1024 to 1023). | RW | 0x000 |

Table 10-445. Register Call Summary for Register DISPC_WB_ACCU2_j

Display Controller

- [Shadow Registers: \[0\]](#)
- [Operational Modes Configuration: \[1\] \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-446. DISPC_WB_FIR_COEF_H2_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 07A0 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 17A0 + (0x8 * i) 0x5800 17A0 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the up/down-scaling coefficients for the horizontal resize of the video picture associated with the write back pipeline for the phases from 0 to 7. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRHC3 | | | | | | | | FIRHC2 | | | | | | | | FIRHC1 | | | | | | | | FIRHC0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRHC3 | Signed coefficient C3 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRHC2 | Unsigned coefficient C2 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRHC1 | Signed coefficient C1 for the horizontal up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC0 | Signed coefficient C0 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-447. Register Call Summary for Register DISPC_WB_FIR_COEF_H2_i

Display Controller

- [Scaler Unit: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [Shadow Registers: \[5\]](#)
- [Operational Modes Configuration: \[6\]](#)
- [Display Controller Register Summary: \[7\]](#)

Table 10-448. DISPC_WB_FIR_COEF_HV2_i

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 07A4 + (0x8 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 17A4 + (0x8 * i) 0x5800 17A4 + (0x8 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical and horizontal resize of the video picture associated with the write back pipeline for the phases from 0 to 7. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIRVC2 | | | | | | | | FIRVC1 | | | | | | | | FIRVC0 | | | | | | | | FIRHC4 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FIRVC2 | Signed coefficient C2 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 23:16 | FIRVC1 | Unsigned coefficient C1 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 15:8 | FIRVC0 | Signed coefficient C0 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRHC4 | Signed coefficient C4 for the horizontal up/down-scaling with the phase n | RW | 0x00 |

Table 10-449. Register Call Summary for Register DISPC_WB_FIR_COEF_HV2_i

Display Controller

- [Scaler Unit: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Shadow Registers: \[6\]](#)
- [Operational Modes Configuration: \[7\] \[8\]](#)
- [Display Controller Register Summary: \[9\]](#)

Table 10-450. DISPC_WB_FIR_COEF_V2_i

| | | | |
|------------------|--|----------|--------------------------|
| Address Offset | 0x0000 07E0 + (0x4 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4804 17E0 + (0x4 * i) 0x5800 17E0 + (0x4 * i) | Instance | DISPC_PER_L4 DISPC_L3 |
| Description | The bank of registers configure the down/up/down-scaling coefficients for the vertical resize of the video picture associated with the write back pipeline for the phases from 0 to 7. It is used for Crb and Cr setting. It is used only when the pixel format at the input of the filter is one of the YUV formats. If the pixel format at the input of the filter is ARGB (all ARGB, RGB, RGBA are converted to ARGB32-8888 by the color space conversion before going to the filter is the color space conversion is done before the filter). When the register is not used by the hardware, any value can be used for the bit fields. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline) when the WB pipeline is directly connected to one of the pipelines (graphics or video), otherwise updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIRVC22 | | | | | | | | FIRVC00 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 15:8 | FIRVC22 | Signed coefficient C22 for the vertical up/down-scaling with the phase n | RW | 0x00 |
| 7:0 | FIRVC00 | Signed coefficient C00 for the vertical up/down-scaling with the phase n | RW | 0x00 |

Table 10-451. Register Call Summary for Register DISPC_WB_FIR_COEF_V2_i

Display Controller

- [Scaler Unit: \[0\] \[1\] \[2\]](#)
- [Shadow Registers: \[3\]](#)
- [Operational Modes Configuration: \[4\]](#)
- [Display Controller Register Summary: \[5\]](#)

Table 10-452. DISPC_GLOBAL_BUFFER

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0800 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1800 0x5800 1800 | | |
| Description | The register configures the DMA buffers allocations to the pipeline (graphics, video1, video2, video3 and write-back). Both TOP and BOTTOM must be allocated to the same pipeline. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------------------|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|--------------------|---|---|---|---|---|---|---|-----------------|--|--|--|--|--|--|--|--------------------|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--------------------|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|----------------|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | WB_BOTTOM_BUFFER | | | | | | | | WB_TOP_BUFFER | | | | | | | | VID3_BOTTOM_BUFFER | | | | | | | | VID3_TOP_BUFFER | | | | | | | | VID2_BOTTOM_BUFFER | | | | | | | | VID2_TOP_BUFFER | | | | | | | | VID1_BOTTOM_BUFFER | | | | | | | | VID1_TOP_BUFFER | | | | | | | | GFX_BOTTOM_BUFFER | | | | | | | | GFX_TOP_BUFFER | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|-------|
| 31:30 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 29:27 | WB_BOTTOM_BUFFER | Write-back DMA BOTTOM buffer (half of the full DMA buffer) allocation to one of the pipelines. By default to write-back pipeline. 0x0: DMA buffer allocated to the graphics pipeline. 0x1: DMA buffer allocated to the video1 pipeline. 0x2: DMA buffer allocated to the video2 pipeline. 0x3: DMA buffer allocated to the video3 pipeline. 0x4: DMA buffer allocated to the write-back pipeline. | RW | 0x4 |
| 26:24 | WB_TOP_BUFFER | Write-back DMA TOP buffer (half of the full DMA buffer) allocation to one of the pipelines. By default to write-back pipeline. 0x0: DMA buffer allocated to the graphics pipeline. 0x1: DMA buffer allocated to the video1 pipeline. 0x2: DMA buffer allocated to the video2 pipeline. 0x3: DMA buffer allocated to the video3 pipeline. 0x4: DMA buffer allocated to the write-back pipeline. | RW | 0x4 |
| 23:21 | VID3_BOTTOM_BUFFER | Video3 DMA BOTTOM buffer (half of the full DMA buffer) allocation to one of the pipelines. By default to video3 pipeline. 0x0: DMA buffer allocated to the graphics pipeline. 0x1: DMA buffer allocated to the video1 pipeline. 0x2: DMA buffer allocated to the video2 pipeline. 0x3: DMA buffer allocated to the video3 pipeline. 0x4: DMA buffer allocated to the write-back pipeline. | RW | 0x3 |
| 20:18 | VID3_TOP_BUFFER | Video3 DMA TOP buffer (half of the full DMA buffer) allocation to one of the pipelines. By default to video3 pipeline. 0x0: DMA buffer allocated to the graphics pipeline. 0x1: DMA buffer allocated to the video1 pipeline. 0x2: DMA buffer allocated to the video2 pipeline. 0x3: DMA buffer allocated to the video3 pipeline. 0x4: DMA buffer allocated to the write-back pipeline. | RW | 0x3 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|-------|
| 17:15 | VID2_BOTTOM_BUFFER | Video2 DMA BOTTOM buffer (half of the full DMA buffer) allocation to one of the pipelines. By default to video2 pipeline. 0x0: DMA buffer allocated to the graphics pipeline. 0x1: DMA buffer allocated to the video1 pipeline. 0x2: DMA buffer allocated to the video2 pipeline. 0x3: DMA buffer allocated to the video3 pipeline. 0x4: DMA buffer allocated to the write-back pipeline. | RW | 0x2 |
| 14:12 | VID2_TOP_BUFFER | Video2 DMA TOP buffer (half of the full DMA buffer) allocation to one of the pipelines. By default to video2 pipeline. 0x0: DMA buffer allocated to the graphics pipeline. 0x1: DMA buffer allocated to the video1 pipeline. 0x2: DMA buffer allocated to the video2 pipeline. 0x3: DMA buffer allocated to the video3 pipeline. 0x4: DMA buffer allocated to the write-back pipeline. | RW | 0x2 |
| 11:9 | VID1_BOTTOM_BUFFER | Video1 DMA BOTTOM buffer (half of the full DMA buffer) allocation to one of the pipelines. By default to video1 pipeline. 0x0: DMA buffer allocated to the graphics pipeline. 0x1: DMA buffer allocated to the video1 pipeline. 0x2: DMA buffer allocated to the video2 pipeline. 0x3: DMA buffer allocated to the video3 pipeline. 0x4: DMA buffer allocated to the write-back pipeline. | RW | 0x1 |
| 8:6 | VID1_TOP_BUFFER | Video1 DMA TOP buffer (half of the full DMA buffer) allocation to one of the pipelines. By default to video 1 pipeline. 0x0: DMA buffer allocated to the graphics pipeline. 0x1: DMA buffer allocated to the video1 pipeline. 0x2: DMA buffer allocated to the video2 pipeline. 0x3: DMA buffer allocated to the video3 pipeline. 0x4: DMA buffer allocated to the write-back pipeline. | RW | 0x1 |
| 5:3 | GFX_BOTTOM_BUFFER | Graphics DMA BOTTOM buffer (half of the full DMA buffer) allocation to one of the pipelines. By default to graphics pipeline. 0x0: DMA buffer allocated to the graphics pipeline. 0x1: DMA buffer allocated to the video1 pipeline. 0x2: DMA buffer allocated to the video2 pipeline. 0x3: DMA buffer allocated to the video3 pipeline. 0x4: DMA buffer allocated to the write-back pipeline. | RW | 0x0 |
| 2:0 | GFX_TOP_BUFFER | Graphics DMA TOP buffer (half of the full DMA buffer) allocation to one of the pipelines. By default to graphics pipeline. 0x0: DMA buffer allocated to the graphics pipeline. 0x1: DMA buffer allocated to the video1 pipeline. 0x2: DMA buffer allocated to the video2 pipeline. 0x3: DMA buffer allocated to the video3 pipeline. 0x4: DMA buffer allocated to the write-back pipeline. | RW | 0x0 |

Table 10-453. Register Call Summary for Register DISPC_GLOBAL_BUFFER

Display Controller

- [DMA Engine: \[0\]](#)
- [Shadow Registers: \[1\]](#)
- [Display Controller Register Summary: \[2\]](#)
- [Display Controller Register Description: \[3\]](#)

Table 10-454. DISPC_DIVISOR

| | | |
|------------------|---|----------------------------------|
| Address Offset | 0x0000 0804 | |
| Physical Address | 0x4804 1804 0x5800 1804 | InstanceDISPC_PER_L4 DISPC_L3 |
| Description | The register configures the divisor value for generating the core functional clock. There is a backward compatibility mode enabled by default in order to use DISPC_DIVISOR1 .LCD value instead of DISPC_DIVISOR .LCD bit field for generating the core functional clock. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|--------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | LCD | | | | | | | | RESERVED | | | | | | | | | | | | | ENABLE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:24 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00 |
| 23:16 | LCD | Display Controller Logic Clock Divisor Value (from 1 to 255) to specify the frequency of the Display Controller logic clock based on the function clock. The value 0 is invalid. | RW | 0x4 |
| 15:1 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 |
| 0 | ENABLE | When the bit field is set to 1, the bit field LCD is used to generated the core functional clock from the input clock. When the bit field is set to 0, the value DISPC_DIVISOR1 .LCD is used instead. 0x0: DISPC_DIVISOR1 .LCD bit field is used 0x1: DISPC_DIVISOR .LCD bit field is used | RW | 0 |

Table 10-455. Register Call Summary for Register DISPC_DIVISOR

Display Controller

- [Clock Configuration](#): [0] [1]
- [Timing Generator and Panel Settings](#): [2] [3]
- [Shadow Registers](#): [4]
- [Display Controller Register Summary](#): [5]
- [Display Controller Register Description](#): [6] [7]

Table 10-456. DISPC_WB_ATTRIBUTES2

| | |
|------------------|---|
| Address Offset | 0x0000 0810 |
| Physical Address | 0x4804 1810 0x5800 1810 |
| Description | The register set the counter to control the delay to flush the WB pipe after the end of the frame in capture mode. Shadow register, updated on VFP start period of primary LCD or VFP start period of secondary LCD or EVSYNC depending on which overlay output is selected as an input to the WB pipeline |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WBDELAYCOUNT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | WBDELAYCOUNT | Delays the WB pipe flush after the end of the frame.delay = n x (1/F_clk) n = 0:255 | RW | 0x00 |

Table 10-457. Register Call Summary for Register DISPC_WB_ATTRIBUTES2

Display Controller

- [DMA Buffers: \[0\] \[1\] \[2\]](#)
- [Shadow Registers: \[3\] \[4\] \[5\] \[6\]](#)
- [Display Controller Register Summary: \[7\]](#)

Table 10-458. DISPC_BA0_FLIPIMMEDIATE_EN

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0854 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1854 0x5800 1854 | | |
| Description | Indicates for individual pipeline when a new BA is written into BA0 register. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|-------------------|----|---|---|-------------------|---|---|---|------------------|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | VID3_IMMEDIATE_EN | | | | VID2_IMMEDIATE_EN | | | | VID1_IMMEDIATE_EN | | | | GFX_IMMEDIATE_EN | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x000 0000 |
| 3 | VID3_IMMEDIATE_EN | Indicates when there is a new BA for video3 pipeline. HW resets it when the new BA0 can be modified by SW. 0x1: New BA is available inside BA0 Read 0x0: HW resets it to 0 to indicate that BA0 can be modified by SW. | RW | 0 |
| 2 | VID2_IMMEDIATE_EN | Indicates when there is a new BA for video2 pipeline. HW resets it when the new BA0 can be modified by SW. 0x1: New BA is available inside BA0 Read 0x0: HW resets it to 0 to indicate that BA0 can be modified by SW. | RW | 0 |
| 1 | VID1_IMMEDIATE_EN | Indicates when there is a new BA for video1 pipeline. HW resets it when the new BA0 can be modified by SW. 0x1: New BA is available inside BA0 Read 0x0: HW resets it to 0 to indicate that BA0 can be modified by SW. | RW | 0 |
| 0 | GFX_IMMEDIATE_EN | Indicates when there is a new BA for Gfx pipeline. HW resets it when the new BA0 can be modified by SW. 0x1: New BA is available inside BA0 Read 0x0: HW resets it to 0 to indicate that BA0 can be modified by SW. | RW | 0 |

Table 10-459. Register Call Summary for Register DISPC_BA0_FLIPIMMEDIATE_EN

Display Controller

- [Immediate Base Address Flip Mechanism: \[0\] \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-460. DISPC_GLOBAL_MFLAG_ATTRIBUTE

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 085C | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 185C 0x5800 185C | | |
| Description | Controls the MFLAG out of band signal generation. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MFLAG_START | | MFLAG_CTRL | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | MFLAG_START | MFLAG Start 0x0: When the DMA buffer is empty at the beginning of the frame, MFLAG signal of each pipeline is kept at 0 until PRELOAD is reached, then based on MFLAG_CTRL bitfield MFLAG is generated and internal logic is arbitrating between pipeline requests 0x1: Even at the beginning of the frame when the DMA buffer is empty, MFLAG_CTRL bitfield is used to determine how MFLAG signal for each pipeline shall be driven. | RW | 0 |
| 1:0 | MFLAG_CTRL | MFLAG control 0x0: MFLAG mechanism is disabled: MFLAG out of band signal is set to 0 0x1: MFLAG mechanism is enabled: MFLAG out of band signal is always set to 1 (force mode for debug) 0x2: MFLAG mechanism is enabled and MFLAG out of band signal is dynamically set and reset depending on MFLAG rules. | RW | 0x0 |

Table 10-461. Register Call Summary for Register DISPC_GLOBAL_MFLAG_ATTRIBUTE

Display Controller

- [MFLAG Mechanism and Arbitration: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [Shadow Registers: \[5\]](#)
- [Display Controller Register Summary: \[6\]](#)

Table 10-462. DISPC_GFX_MFLAG_THRESHOLD__1

| | | | |
|-------------------------|--|-----------------|--------------------------|
| Address Offset | 0x0000 0860 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1860 0x5800 1860 | | |
| Description | MFLAG thresholds for graphics pipeline. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or external VSYNC or when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HT_MFLAG | | | | | | | | | | | | | | | | LT_MFLAG | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | HT_MFLAG | Graphics High Thresholds (in 128bits) for MFLAG generation: when FIFO fullness reaches HT_MFLAG level, MFLAG is reset to 0 | RW | 0x0000 |
| 15:0 | LT_MFLAG | Graphics Low Thresholds (in 128bits) for MFLAG generation: when FIFO fullness reaches LT_MFLAG level, MFLAG is set to 1 | RW | 0x0000 |

Table 10-463. Register Call Summary for Register DISPC_GFX_MFLAG_THRESHOLD__1

Display Controller

- [MFLAG Mechanism and Arbitration: \[0\] \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-464. DISPC_VID1_MFLAG_THRESHOLD

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0864 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1864 0x5800 1864 | | |
| Description | MFLAG thresholds for video1 pipeline. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or external VSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HT_MFLAG | | | | | | | | | | | | | | | | LT_MFLAG | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | HT_MFLAG | Video1 High Thresholds (in 128bits) for MFLAG generation: when FIFO fullness reaches HT_MFLAG level, MFLAG is reset to 0 | RW | 0x0000 |
| 15:0 | LT_MFLAG | Video1 Low Thresholds (in 128bits) for MFLAG generation: when FIFO fullness reaches LT_MFLAG level, MFLAG is set to 1 | RW | 0x0000 |

Table 10-465. Register Call Summary for Register DISPC_VID1_MFLAG_THRESHOLD

Display Controller

- [MFLAG Mechanism and Arbitration: \[0\] \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-466. DISPC_VID2_MFLAG_THRESHOLD__1

| | | | |
|-------------------------|---|-----------------|--------------------------|
| Address Offset | 0x0000 0868 | Instance | DISPC_PER_L4 DISPC_L3 |
| Physical Address | 0x4804 1868 0x5800 1868 | | |
| Description | MFLAG thresholds for video2 pipeline. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or external VSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory. | | |

Table 10-466. DISPC_VID2_MFLAG_THRESHOLD__1 (continued)

| Type | | | | | | | | | | | | | | | | RW | | | | | | | | | | | | | | | |
|----------|------------|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----------|--------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HT_MFLAG | | | | | | | | | | | | | | | | LT_MFLAG | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | |
| 31:16 | HT_MFLAG | | Video2 High Thresholds (in 128bits) for MFLAG generation: when FIFO fullness reaches HT_MFLAG level, MFLAG is reset to 0 | | | | | | | | | | | | | RW | 0x0000 | | | | | | | | | | | | | | |
| 15:0 | LT_MFLAG | | Video2 Low Thresholds (in 128bits) for MFLAG generation: when FIFO fullness reaches LT_MFLAG level, MFLAG is set to 1 | | | | | | | | | | | | | RW | 0x0000 | | | | | | | | | | | | | | |

Table 10-467. Register Call Summary for Register DISPC_VID2_MFLAG_THRESHOLD__1

Display Controller

- [MFLAG Mechanism and Arbitration: \[0\] \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-468. DISPC_VID3_MFLAG_THRESHOLD__1

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 086C | | | | | | | | | | | | | | | | Instance | | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | | | | | |
| Physical Address | | 0x4804 186C 0x5800 186C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | MFLAG thresholds for video3 pipeline. Shadow register, updated on VFP start period of primary LCD or VFP start period of the secondary LCD or external VSYNC or when DISPC_CONTROL2 .GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline). The synchronization event is defined based on the output using the pipeline: primary LCD, secondary LCD, TV output or write-back to the memory. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| HT_MFLAG | | | | | | | | | | | | | | | | LT_MFLAG | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | HT_MFLAG | Video3 High Thresholds (in 128bits) for MFLAG generation: when FIFO fullness reaches HT_MFLAG level, MFLAG is reset to 0 | RW | 0x0000 |
| 15:0 | LT_MFLAG | Video3 Low Thresholds (in 128bits) for MFLAG generation: when FIFO fullness reaches LT_MFLAG level, MFLAG is set to 1 | RW | 0x0000 |

Table 10-469. Register Call Summary for Register DISPC_VID3_MFLAG_THRESHOLD__1

Display Controller

- [MFLAG Mechanism and Arbitration: \[0\] \[1\]](#)
- [Shadow Registers: \[2\]](#)
- [Display Controller Register Summary: \[3\]](#)

Table 10-470. DISPC_WB_MFLAG_THRESHOLD

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--------------------------|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0870 | | | | | | | | | | | | | | | | Instance | | DISPC_PER_L4 DISPC_L3 | | | | | | | | | | | |
| Physical Address | | 0x4804 1870 0x5800 1870 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 10-470. DISPC_WB_MFLAG_THRESHOLD (continued)

| | |
|--------------------|---|
| Description | MFLAG thresholds for write-back pipeline. Shadow register, updated when DISPC_CONTROL2.GOWB is set to 1 by software and current WB frame is finished (no more data in the write-back pipeline), when the WB pipeline is directly connected to one of the pipelines (graphics or video). Otherwise, updated on VFP start period of primary LCD or VFP start period of secondary LCD or external VSYNC, depending on which overlay output is selected as an input to the WB pipeline. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HT_MFLAG | | | | | | | | | | | | | | | | LT_MFLAG | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | HT_MFLAG | Write-back High Thresholds (in 128bits) for MFLAG generation: when FIFO fullness reaches HT_MFLAG level, MFLAG is set to 1 | RW | 0x0000 |
| 15:0 | LT_MFLAG | Write-back Low Thresholds (in 128bits) for MFLAG generation: when FIFO fullness reaches LT_MFLAG level, MFLAG is reset to 0 | RW | 0x0000 |

Table 10-471. Register Call Summary for Register DISPC_WB_MFLAG_THRESHOLD

| |
|---|
| Display Controller |
| <ul style="list-style-type: none"> • MFLAG Mechanism and Arbitration: [0] [1] • Shadow Registers: [2] • Display Controller Register Summary: [3] |

10.3 MIPI Display Serial Interface

This section describes the MIPI® display serial interface (DSI) module for the device.

NOTE: This section contains information that is Copyright © 2005-2008 MIPI Alliance, Inc. All rights reserved.

MIPI Alliance Member Confidential.

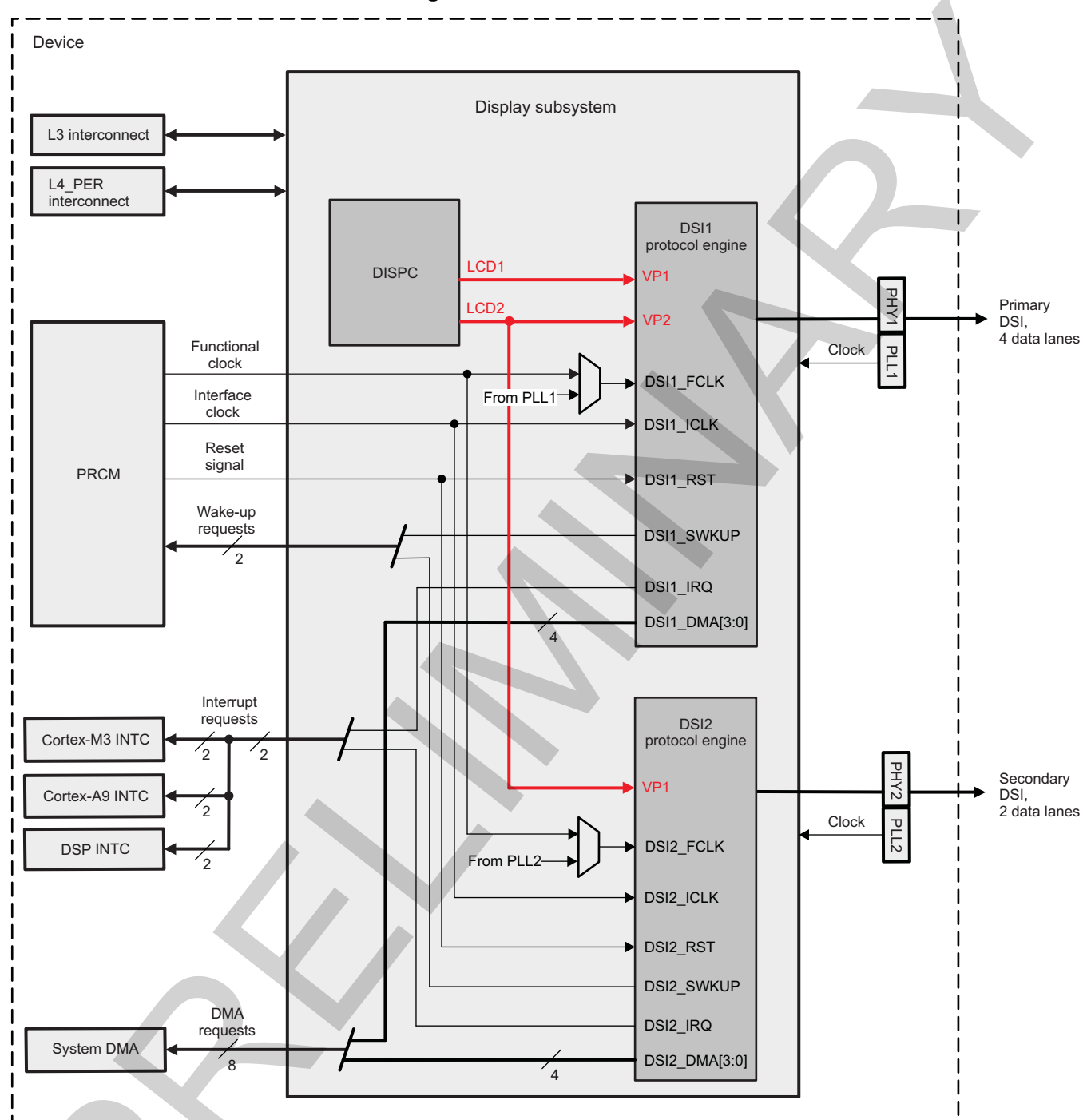
All rights reserved. This material is reprinted with the permission of the MIPI Alliance, Inc. No part(s) of this document may be disclosed, reproduced or used for any purpose other than as needed to support the use of the products of TI.

See [OMAP4470 MIPI Disclaimer](#) for details.

10.3.1 MIPI DSI Overview

The display serial interface (DSI) module connects to a DSI display module directly or through an external DSI bridge. The DSI module is connected to DISPC and L3/L4_PER interconnects

[Figure 10-95](#) is a block diagram of the DSI module.

Figure 10-95. DSI Overview

dsi-001

There are two DSI modules in the display subsystem (DSS) that provide the following main features:

- **DSI 1 (primary)**
 - Supports MIPI-DSI (up to four data lanes + one clock lane)
 - Supports video mode and command mode
 - Support multiple displays (one video mode and one command mode). In command mode, pixel data are provided from the level 3 (L3) interface or from one of the overlay manager outputs.
 - Bidirectional data link support for command mode (only one data lane is used in reverse direction)

- RGB16, RGB18 nonpacked, and RGB24 formats supported for command mode
- RGB16, RGB18 packed and nonpacked, and RGB24 formats supported for video mode
- Burst support for the video mode
- Supports up to four data-configurable lanes, in addition to the clock signaling
- Maximum data rate of 824 Mbps per data pair for four-data lane configuration, and 900 Mbps for up to three-data lane configuration
- Data splitter for 2-data, 3-data and 4-data lane configurations
- Data interleaving support for one synchronous stream (video mode) from the DISPC and up to three asynchronous streams (command mode) from the interconnect concurrently, or up to four asynchronous streams (command mode) from the interconnect
- Transfer of pixels and data received on the video port or L3 interconnect to the display through DSI DSI_PHY
- Serial configuration port (SCP) for the DSI_PHY complex input/output (I/O) and DSI phase-locked loop (PLL)
- Connection to the DSI_PHY complex I/O through PPI
- Error-correction code (ECC) and checksum generation
- MIPI DCS support
- DSI 2 (secondary)
 - Supports MIPI-DSI (up to two data lanes + one clock lane)
 - Supports video mode and command mode
 - Support multiple displays (one video mode and one command mode). In command mode, pixel data are provided from the L3 interface or from one of the overlay manager outputs.
 - Bidirectional data link support for command mode (only one data lane is used in reverse direction)
 - RGB16, RGB18 nonpacked, and RGB24 formats supported for command mode
 - RGB16, RGB18 packed and nonpacked, and RGB24 formats supported for video mode
 - Burst support for the video mode
 - Supports one data-configurable lane, in addition to the clock signaling
 - Maximum data rate of 900 Mbps per data pair
 - Data splitter for 2-data lane configuration
 - Data interleaving support for one synchronous stream (video mode) from the DISPC and up to three asynchronous streams (command mode) from the interconnect concurrently, or up to four asynchronous streams (command mode) from the interconnect
 - Transfer pixels and data received on the video port or Interface interconnect to the display through DSI DSI_PHY
 - Serial configuration port (SCP) for the DSI_PHY complex I/O and DSI PLL
 - Connection to the DSI_PHY complex I/O through the physical layer (PHY) protocol interface (PPI)
 - ECC and checksum generation
 - MIPI DCS support

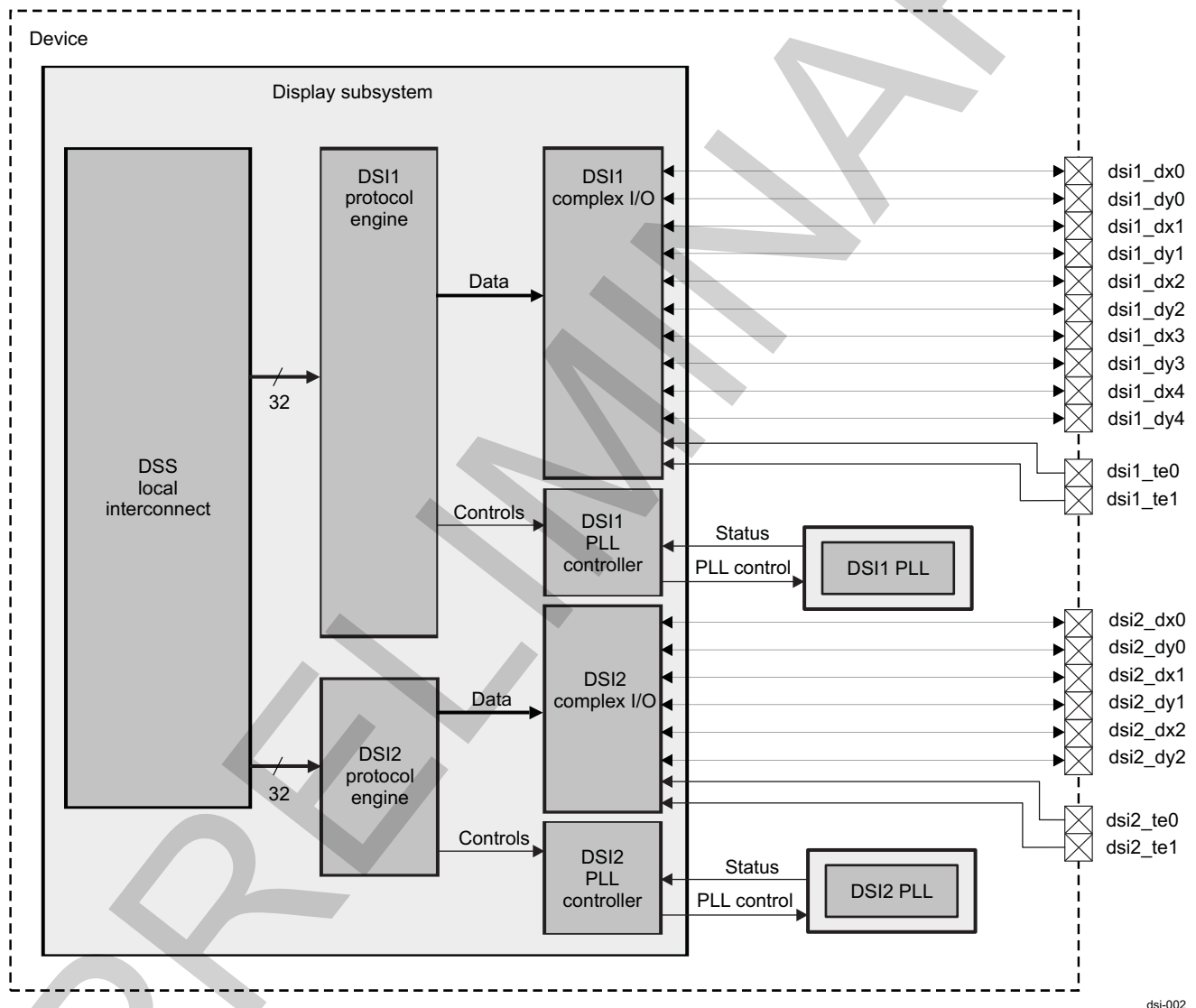
10.3.2 DSI Environment

NOTE: Copyright 2005-2008 MIPI Alliance, Inc. All rights reserved. MIPI Alliance Member Confidential.

This section describes the DSI application fields from an environment point of view (external connections). It describes the DSI connectivity options, lists all possible interfaces, and describes the protocol and data format used in each case.

Figure 10-96 is a block diagram of the DSI environment.

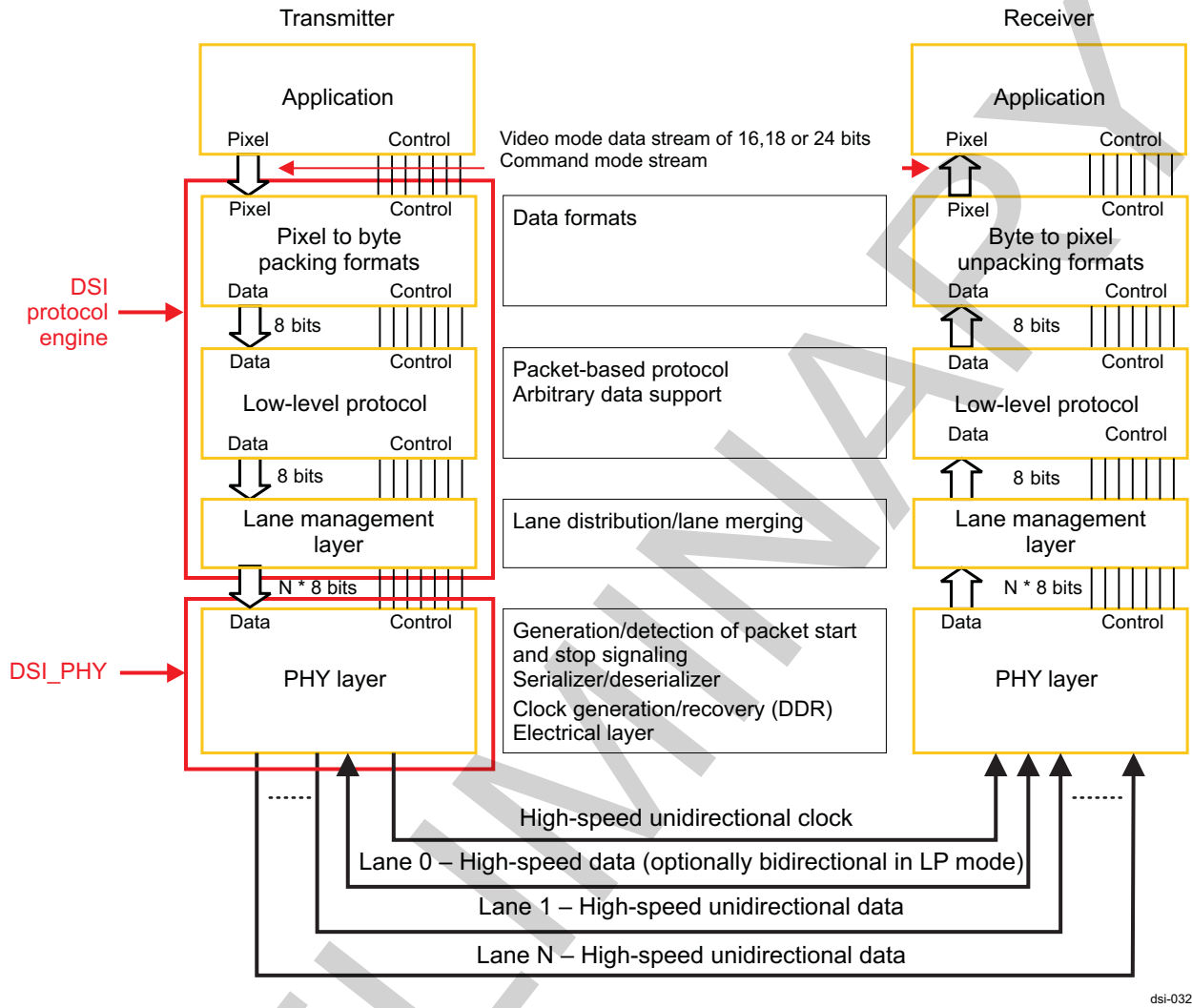
Figure 10-96. DSI Environment



The DSI is a bidirectional differential serial interface with data/clock for the PHY (configured in unidirectional link in case the display module is only unidirectional). The maximum capacity of a DSI data transfer is 824 Mbps for four data lanes. The speed of the link can be configured by software only when the DSI_PHY is in STOP state or ULTRALOW-POWER state (ULPS).

Figure 10-97 shows the high-level data flow of the DSI transmitter/receiver.

Figure 10-97. DSI Transmitter/Receiver Data Flow



10.3.2.1 DSI PHY

Table 10-472 lists the DSI1 I/Os.

Table 10-472. I/O Description of DSI1

| Signal Name | | I/O ⁽¹⁾ | Description | Value at Reset |
|-------------|--------|--------------------|----------------------------------|----------------|
| dsi1_dx0 | lane 1 | I/O | Serial data/clock lane | N/A |
| dsi1_dy0 | | | | |
| dsi1_dx1 | lane 2 | I/O | Serial data/clock lane | N/A |
| dsi1_dy1 | | | | |
| dsi1_dx2 | lane 3 | I/O | Serial data/clock lane | N/A |
| dsi1_dy2 | | | | |
| dsi1_dx3 | lane 4 | I/O | Serial data/clock lane | N/A |
| dsi1_dy3 | | | | |
| dsi1_dx4 | lane 5 | I/O | Serial data lane only | N/A |
| dsi1_dy4 | | | | |
| dsi1_te0 | te0 | I | DSI1 tearing effect (TE) input 0 | N/A |

⁽¹⁾ I = Input; O = Output; I/O = Bidirectional

Table 10-472. I/O Description of DSI1 (continued)

| Signal Name | | I/O ⁽¹⁾ | Description | Value at Reset |
|-------------|-----|--------------------|-----------------|----------------|
| dsi1_te1 | te1 | I | DSI1 TE input 1 | N/A |

NOTE: Each serial lane (lane 1 through lane 5) can be used as a data lane. Serial lanes 1 through 4 can be used as clock lanes (lane 5 can never be a clock lane). All polarities on all lanes are supported. The MIPI DSI 1.01 protocol requires at least one clock lane and one data lane.

Table 10-473 lists the DSI2 I/Os.

Table 10-473. I/O Description of DSI2

| Signal Name | | I/O ⁽¹⁾ | Description | Value at Reset |
|-------------|--------|--------------------|------------------------|----------------|
| dsi2_dx0 | lane 1 | I/O | Serial data/clock lane | N/A |
| dsi2_dy0 | | | | |
| dsi2_dx1 | lane 2 | I/O | Serial data/clock lane | N/A |
| dsi2_dy1 | | | | |
| dsi2_dx2 | lane 3 | I/O | Serial data/clock lane | N/A |
| dsi2_dy2 | | | | |
| dsi2_te0 | te0 | I | DSI2 TE input 0 | N/A |
| dsi2_te1 | te1 | I | DSI2 TE input 1 | N/A |

⁽¹⁾ I = Input; O = Output; I/O = Bidirectional

NOTE: Each serial lane (lane 1 through lane 3) can be used as a clock lane or a data lane. All polarities on all lanes are supported. The MIPI DSI 1.01 protocol requires at least one clock lane and one data lane.

Lanes support four operating modes:

- HS mode: High-speed transmit mode
- LP mode: Low-power transmit mode (also called low-power state [LPS])
- ULPS: ULTRALOW-POWER state used between two transmissions
- Off mode: Lane is off.

NOTE: The CONTROL_DSIPHY register in the control module of the device provides the following control over the DSI lanes:

- Enable and disable each lane (the DSI2_LANEENABLE[31:29] and DSI1_LANEENABLE[28:24] bit fields).
- Pulldown enable and disable on each lane (the DSI1_PIPD[23:19] and DSI2_PIPD[18:14] bit fields)

For more information, see [Section 19.6.6, SYSCTRL_PADCONF_CORE Register Summary](#), in [Chapter 19, Control Module](#).

10.3.2.1.1 Data/Clock Configuration

Data-clock signaling consists of one to four data pairs and one clock pair. The minimum configuration is one data pair and one clock pair.

- The data signal carries the bit serial data. The DSI transmitter in the host sends the data in-quadrature with the dual data rate (DDR) clock in HS mode; otherwise, the clock is extracted from the received data in LS mode. The data is transmitted byte-wise LSB first.
- The clock signal carries the DDR clock signal in HS transmission.
- Software users must configure the order of the data lanes to indicate the byte order while splitting the

byte stream for each DSI_PHY into bytes.

Table 10-474 lists some of the DSI lane configurations.

NOTE: All combinations for the order of the clock and data lanes are supported (except clock cannot be on lane 5) but not explicitly described in Table 10-474.

Table 10-474. DSI Lane Configuration

| DSI_PHY Lane Configuration | Data/Clock Lane Position | | | | | Description |
|--|--------------------------|-------|-------|-------|-------|------------------|
| | 1 | 2 | 3 | 4 | 5 | |
| Mode CLK + DATA1 | | | | | | Single data lane |
| | CLK | DATA1 | | | | |
| | DATA1 | CLK | | | | |
| Mode CLK + DATA1 + DATA2 | | | | | | Two data lanes |
| | CLK | DATA1 | DATA2 | | | |
| | CLK | DATA2 | DATA1 | | | |
| | DATA1 | CLK | DATA2 | | | |
| | DATA2 | CLK | DATA1 | | | |
| | DATA1 | DATA2 | CLK | | | |
| | DATA2 | DATA1 | CLK | | | |
| Mode CLK + DATA1 + DATA2 + DATA3 | | | | | | Three data lanes |
| | CLK | DATA1 | DATA2 | DATA3 | | |
| | CLK | DATA3 | DATA2 | DATA1 | | |
| | DATA1 | CLK | DATA2 | DATA3 | | |
| | DATA1 | CLK | DATA3 | DATA2 | | |
| | DATA2 | CLK | DATA1 | DATA3 | | |
| | DATA2 | CLK | DATA3 | DATA1 | | |
| | DATA3 | CLK | DATA1 | DATA2 | | |
| | DATA3 | CLK | DATA2 | DATA1 | | |
| | DATA3 | DATA1 | CLK | DATA2 | | |
| | DATA3 | DATA2 | CLK | DATA1 | | |
| | DATA3 | DATA2 | CLK | DATA1 | | |
| | DATA1 | DATA2 | CLK | DATA3 | | |
| | DATA2 | DATA3 | CLK | DATA1 | | |
| | DATA1 | DATA3 | CLK | DATA2 | | |
| | DATA1 | DATA2 | DATA3 | CLK | | |
| | DATA3 | DATA2 | DATA1 | CLK | | |
| Mode CLK + DATA1 + DATA2 + DATA3 + DATA4 | | | | | | Four data lanes |
| | CLK | DATA1 | DATA2 | DATA3 | DATA4 | |
| | DATA3 | DATA1 | CLK | DATA2 | DATA4 | |
| | DATA4 | DATA2 | CLK | DATA1 | DATA3 | |
| | DATA2 | DATA1 | CLK | DATA3 | DATA4 | |
| | DATA4 | DATA3 | CLK | DATA1 | DATA2 | |
| | DATA3 | DATA4 | CLK | DATA2 | DATA1 | |
| | DATA1 | DATA2 | CLK | DATA4 | DATA3 | |
| | DATA1 | DATA4 | CLK | DATA3 | DATA2 | |
| | DATA1 | DATA3 | CLK | DATA4 | DATA2 | |

NOTE:

- The byte on D_n is sent before the byte on $D_n + 1$; all the combinations of data and clock are supported through programming of the [DSI_COMPLEXIO_CFG1](#) register. The `CLOCK_POSITION` and `CLOCK_POL` bit fields configure which lane transmits the clock and define its polarity. Eight bit fields (`DATA1_POSITION` and `DATA1_POL`, through `DATA4_POSITION` and `DATA4_POL`) configure the data lanes and their polarity. The `DATA2_POSITION` through `DATA4_POSITION` bit fields can be set to 0; in this case, only the data lane defined in the `DATA1_POSITION` bit field is used, and data is transmitted on only one clock lane and one data lane.
- Only `DATA1` is bidirectional in command mode. The low-power received information is always sent by the display panel using `DATA1`. Because any lane of the DSI complex I/O can be configured as data lane `DATA1`, all lanes of the complex I/O are bidirectional.

10.3.2.1.2 ULPS

Each lane can be put in ULPS by software configuration. The ULPS mode requires the following conditions:

- The lane must be in ULP state.
- For data lanes, no data must be pending in the DSI module.
- For data lane 1, no bus turnaround (BTA) should have been sent. The DSI module must have control of the bus.

For more information on ULPS configuration, see [Section 10.3.4.4.16](#), *Ultralow-Power State Configuration*.

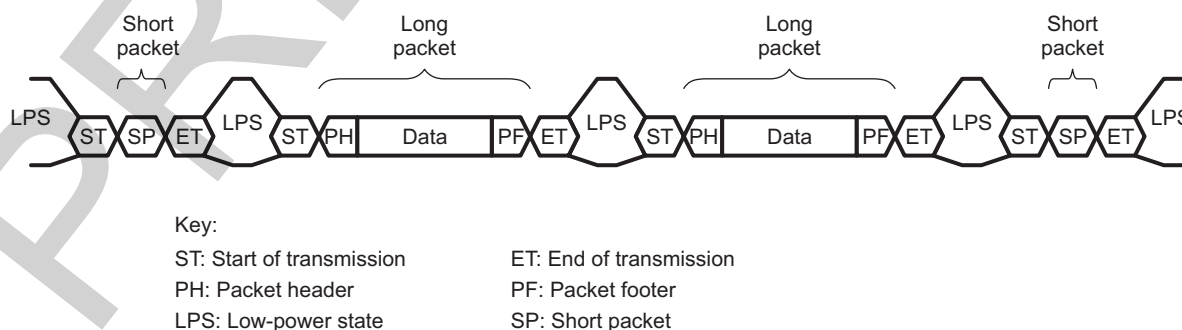
10.3.2.2 DSI Protocol Layer

Low-level protocol (LLP) is a byte-oriented protocol. It supports short and long packet formats. The DSI protocol layer defines how the display data is transported onto the PHY. Packets can be sent using HS mode or low-speed (LS) mode. LLP is selected through DSI registers. The features of the DSI protocol layer are:

- Transport of arbitrary data (payload independent)
- 8-bit word size
- Support for up to four interleaved VCs on the same link
- Special packets for frame start, frame end, line start, and line end information
- Descriptor for the type, pixel depth, and format of application-specific payload data
- ECC for 1-bit or 2-bit error detection in the header
- 16-bit checksum code for error detection

[Figure 10-98](#) shows the protocol layer with short and long packets.

Figure 10-98. Protocol Layer With Short and Long Packets

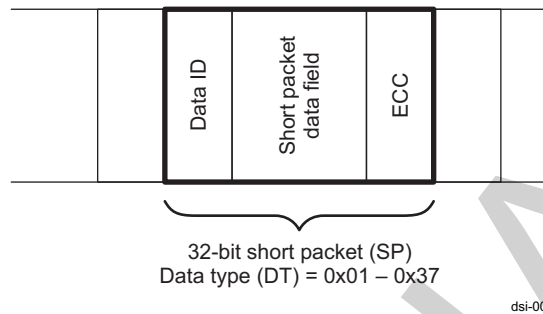


dsi-004

10.3.2.2.1 Short Packet

Figure 10-99 shows the structure of the short packet. A short packet must contain an 8-bit data ID followed by two command or data bytes and an 8-bit ECC. No packet footer (PF) should be present. Short packets must be 4 bytes long. The ECC byte allows correction of single-bit errors and detection of 2-bit errors in the short packet.

Figure 10-99. Short Packet Structure



NOTE: The short packets can be sent in LP mode or HS mode.

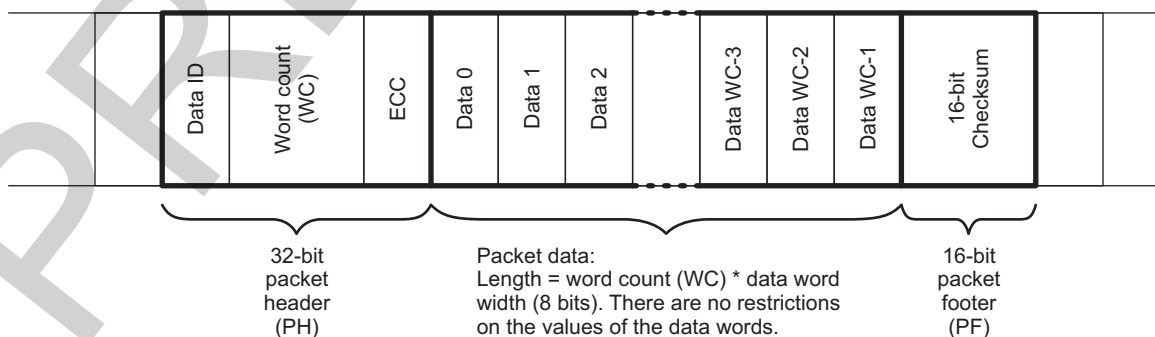
The [DSI_VC_SHORT_PACKET_HEADER_i](#) register is used to send only short packets (ECC can be calculated by hardware or by software users for debug purposes). This register is not used for video mode data because the short packets are generated by hardware based on the following events:

- Synchronization events received on the video port (assertion/deassertion of the HSYNC and VSYNC input signals)
- [DSI_CTRL\[18\]](#) VP_HSYNC_END
- [DSI_CTRL\[17\]](#) VP_HSYNC_START
- [DSI_CTRL\[16\]](#) VP_VSYNC_END
- [DSI_CTRL\[15\]](#) VP_VSYNC_START
- [DSI_CTRL\[11\]](#) VP_VSYNC_POL
- [DSI_CTRL\[10\]](#) VP_HSYNC_POL
- [DSI_VC_CTRL_i\[1\]](#) SOURCE

10.3.2.2.2 Long Packet

Figure 10-100 shows the structure of the long packet. A long packet must consist of three elements: 32-bit packet header (PH), application-specific data payload with a variable number of bytes, and 16-bit PF.

Figure 10-100. Long Packet Structure



The PH is further composed as follows:

- 8-bit data identifier: The data identifier defines the VC for the data and the DT for the application-specific payload data.
- 16-bit word count: The word count defines the number of bytes in the data payload between the end of the PH and the start of the PF. The PH and the PF must not be included in the word count.
- 8-bit ECC: The ECC byte allows single-bit errors to be corrected and 2-bit errors to be detected in the PH. This includes the data identifier and the word count fields.

After the end of the PH, the receiver reads the next word count × bytes of the data payload. There are no limitations on the value of a data word within the data payload block (that is, no embedded codes are used). Once the receiver has read the data payload, it reads the checksum in the PF. The host processor must always calculate and transmit a checksum in the PF. Peripherals are not required to calculate a checksum. In the special case of a 0-byte data payload, if the payload length is 0, the checksum calculation results in (0xFFFF). If the checksum is not calculated, the PF must consist of 2 bytes of 0s (0x0000). In the generic case, the length of the data payload must be a multiple of bytes. In addition, each data format can impose additional restrictions on the length of the payload data (that is, a multiple of 4 bytes). Each byte is transmitted LSB first. Payload data can be transmitted in any byte order, restricted only by data format requirements. Multibyte elements, such as word count and checksum, must be transmitted least-significant byte (LSByte) first.

NOTE: Long packets can be sent in LP or HS mode.

The [DSI_VC_LONG_PACKET_HEADER_i](#) register provides headers for long packets (ECC is always calculated by hardware). The register is used for video and command modes.

If video mode is enabled for a virtual channel, it is not possible to transfer data concurrently (interleaved in a frame) using long packets received on the video and L3 interconnect ports because the [DSI_VC_LONG_PACKET_HEADER_i](#) register is used by the video mode. The register can be unprogrammed by the user to send long packets received on the L3 interconnect port only when there is no expected data on the video port. Software must program the register correctly to send sequentially long packets in video and command modes.

The word count (WC) defined in the [DSI_VC_LONG_PACKET_HEADER_i](#) register for the VC associated with the video port indicates the number of bytes to receive (one line or two lines can be used, depending on the WC and the size of the line buffer). The total size defined in the WC of the header register cannot exceed the size of the line buffer multiplied by the number of buffer lines.

The [DSI_VC_LONG_PACKET_PAYLOAD_i](#) register is used to provide payload data for long packets (checksum is calculated by hardware when [DSI_VC_CTRL_i\[7\]](#) CS_TX_EN is set to 1; otherwise, the value is 0x00). The register is not used in video mode because payload data are provided by the video port.

Software must ensure that the following sequence for write accesses to the header and payload registers ([DSI_VC_LONG_PACKET_HEADER_i](#) and [DSI_VC_LONG_PACKET_PAYLOAD_i](#), respectively) is followed:

- A long PH value with WC = 0 written in the [DSI_VC_LONG_PACKET_HEADER_i](#) register can be followed by any access.
- A long PH value with WC 0 written in the [DSI_VC_LONG_PACKET_HEADER_i](#) register must be followed by one or more writes to the [DSI_VC_LONG_PACKET_PAYLOAD_i](#) register defined by the WC value before writing again to the same [DSI_VC_LONG_PACKET_HEADER_i](#) register.

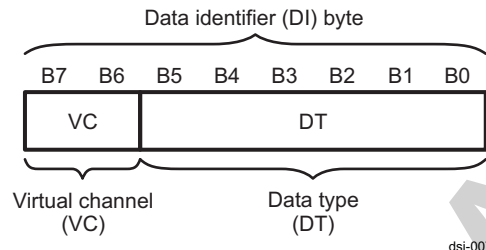
CAUTION

If this sequence is not followed, no error is generated. Access to other DSI registers during this sequence is allowed.

10.3.2.2.3 Data Identifier

The data identifier byte contains the values for the virtual channel ID and data type, as shown in [Figure 10-101](#). The virtual channel ID is contained in the 2 MSBs of the data identifier byte and identify the data as directed to one of four virtual channels. The value of the data type is contained in the 6 LSBs of the data identifier byte.

Figure 10-101. Data Identifier Structure

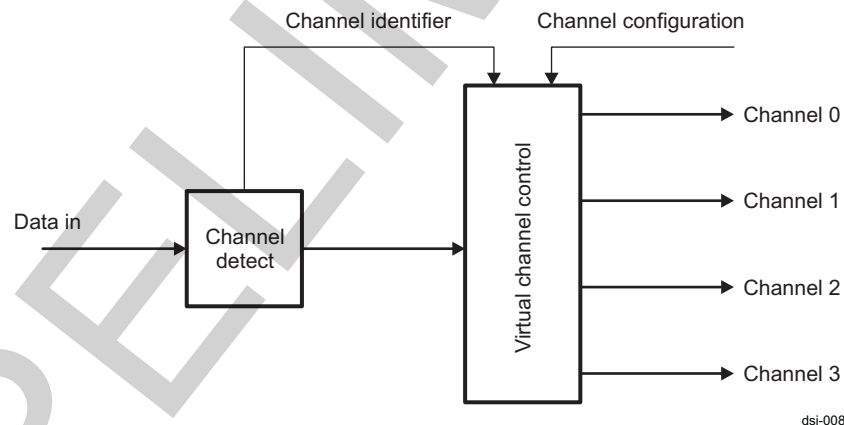


10.3.2.2.3.1 VC ID – VC Field, DI[7:6]

The host can service up to four peripherals with tagged commands or blocks of data using the VC ID field of the header for packets targeted at different peripherals. The VC ID enables one serial stream to service two or more virtual peripherals by multiplexing packets onto a common transmission channel. Each packet sent in a single transmission has its own VC assignment and can be directed to different peripherals. The VC ID is defined in the [DSI_VC_SHORT_PACKET_HEADER_i](#) and [DSI_VC_LONG_PACKET_HEADER_i](#) registers for short and long packets, respectively. It will not be modified by hardware. There is one set of registers for each VC. Each set of registers defines the characteristics of the traffic between the host and the display associated with the VC.

[Figure 10-102](#) shows the VC controller.

Figure 10-102. VC Controller



10.3.2.2.3.2 Data Type Field DT[5:0]

The data type field specifies whether the packet is long or short and the packet format. The data type field, and the word count field for long packets, informs the receiver about how many bytes to expect in the rest of the packet. This is necessary because the beginning and end of a packet are not indicated by special packet start/end sync codes. This permits packets to convey arbitrary data, but it also requires the PH to specify the size of the packet.

10.3.2.2.4 Synchronization Codes

Each frame can be identified by two synchronization codes:

- For the start of the vertical synchronization (VSSC) pulse

- For the end of the vertical synchronization (VSEC) pulse

Each line can be identified by two synchronization codes:

- For the start of the horizontal synchronization (HSSC) pulse
- For the end of the horizontal synchronization (HSEC) pulse

The synchronization events are not required by the display (peripheral): they are optional. Users can program which synchronization events are generated to the display from the timings received from the DISPC in video mode. When data are received on the L3 interconnect port, the synchronization codes are not automatically generated by the protocol engine. They can be provided on the L3 interconnect port by writing to the registers with limited timing control. It is highly recommended to use the video port from the DISPC to receive the synchronization events to automatically generate short synchronization packets to the peripheral.

When the DSI protocol engine detects that the VSYNC signal from the DISPC transitions from inactive to active state, the VSSC short packet replaces the following HSSC corresponding to the following HSYNC synchronization short packet (if the generation is enabled).

When the transition from active to inactive state is detected, the VSEC short packet is generated (if the generation is enabled) replacing the HSEC synchronization packet corresponding to the following HSYNC.

When the DSI protocol engine detects that the HSYNC signal from the DISPC transitions from inactive to active state, the HSSC short packet is generated (if the generation is enabled).

When the transition from active to inactive state is detected, the HSEC short packet is generated (if generation is enabled).

For the first frame, any HSYNC and data received on the video port before the first VSYNC must be ignored. Because the first VSYNC sent to the display is also recognized as an HSYNC for the first line, there is no HSYNC sent for the first line. To send the synchronization codes, the DSI protocol engine uses the short packets. [Table 10-475](#) lists the 6-bit DT synchronization code values.

Table 10-475. Synchronization Codes

| Synchronization Code | Value | Comments |
|-----------------------------------|-------|----------|
| Vertical sync start code (VSSC) | 0x1 | Optional |
| Vertical sync end code (VSEC) | 0x11 | Optional |
| Horizontal sync start code (HSSC) | 0x21 | Optional |
| Horizontal sync end code (HSEC) | 0x31 | Optional |

10.3.2.2.5 Blanking

To keep the DSI link in HS state while using video mode, during blanking periods, long blanking packets are sent to the display. The DSI_VM_TIMINGx (where x = 1 to 8) registers define the size of the long blanking packets after:

- Horizontal sync start code (short packet)
- Horizontal sync end code (short packet)
- Vertical sync start code (short packet)
- Vertical sync end code (short packet)
- Pixels (long packet)

[Table 10-476](#) defines the short packet values for the synchronization packets:

Table 10-476. Sync Short Packet Values

| VC ID | Sync Code | Header (First Byte) | Header (Second Byte): Data Field LSB | Header (Third Byte): Data Field MSB | Header (ECC) |
|-------|-----------|---------------------|--------------------------------------|-------------------------------------|---------------------------------|
| 0x0 | 0x1 | 0x1 | 0x0 | 0x0 | See Notes following this table. |
| | 0x11 | 0x11 | | | |
| | 0x21 | 0x21 | | | |
| | 0x31 | 0x31 | | | |
| 0x1 | 0x1 | 0x41 | | | |
| | 0x11 | 0x51 | | | |
| | 0x21 | 0x61 | | | |
| | 0x31 | 0x91 | | | |
| 0x2 | 0x1 | 0x81 | | | |
| | 0x11 | 0x81 | | | |
| | 0x21 | 0xA1 | | | |
| | 0x31 | 0xB1 | | | |
| 0x3 | 0x1 | 0xC1 | | | |
| | 0x11 | 0xD1 | | | |
| | 0x21 | 0xC1 | | | |
| | 0x31 | 0xF1 | | | |

NOTE:

- If the ECC is enabled by setting the [DSI_VC_CTRL\[i\]\[8\] ECC_TX_EN](#) bit to 1 for the VC in video mode, the ECC value is calculated; otherwise, 0x00 is used for the blanking long packets and sync short packets. If the CRC is enabled by setting the [DSI_VC_CTRL\[i\]\[7\] CS_TX_EN](#) bit to 1 for the VC in video mode, the checksum value is calculated; otherwise, 0x00 is used for the blanking long packets.
- In other cases, when the [DSI_VC_CTRL\[i\]\[7\] CS_TX_EN](#) bit is set to 0, the value 0x00 is always used for the CRC (long packets). When the [DSI_VC_CTRL\[i\]\[8\] ECC_TX_EN](#) bit is set to 0, the value 0x00 is used for the ECC for short and long packets, except when the header is provided by the register, because the ECC field is available in the register. It can be used to generate invalid ECC values when the header is provided by the register.

The DSI link (lanes and clock separately) can be put in ULPS. While using the blanking values formerly defined, the packets (short and long) are considered in HS mode.

Timing parameters VSA, VBP, VFP, HSA, HBP, HFP, VACT, and t_L are defined in the [DSI_VM_TIMING1](#) through [DSI_VM_TIMING8](#) registers. HSA, HBP, HFP, and t_L are defined using the byte clock unit (TXBYTECLKHS - HS transmit byte clock generated by DSI_PHY) and also in low-power clock cycles (TxClkEsc). VSA, VBP, VFP, and VACT are defined by the number of lines. When the HS blanking packets are sent during the blanking periods, the parameters are used to determine the blanking packet payload size (taking into account the 4-byte header and the 2-byte checksum).

The configuration of the DISPC timing generator must be used when the DISPC timings are used to generate DSI HS video mode transfer.

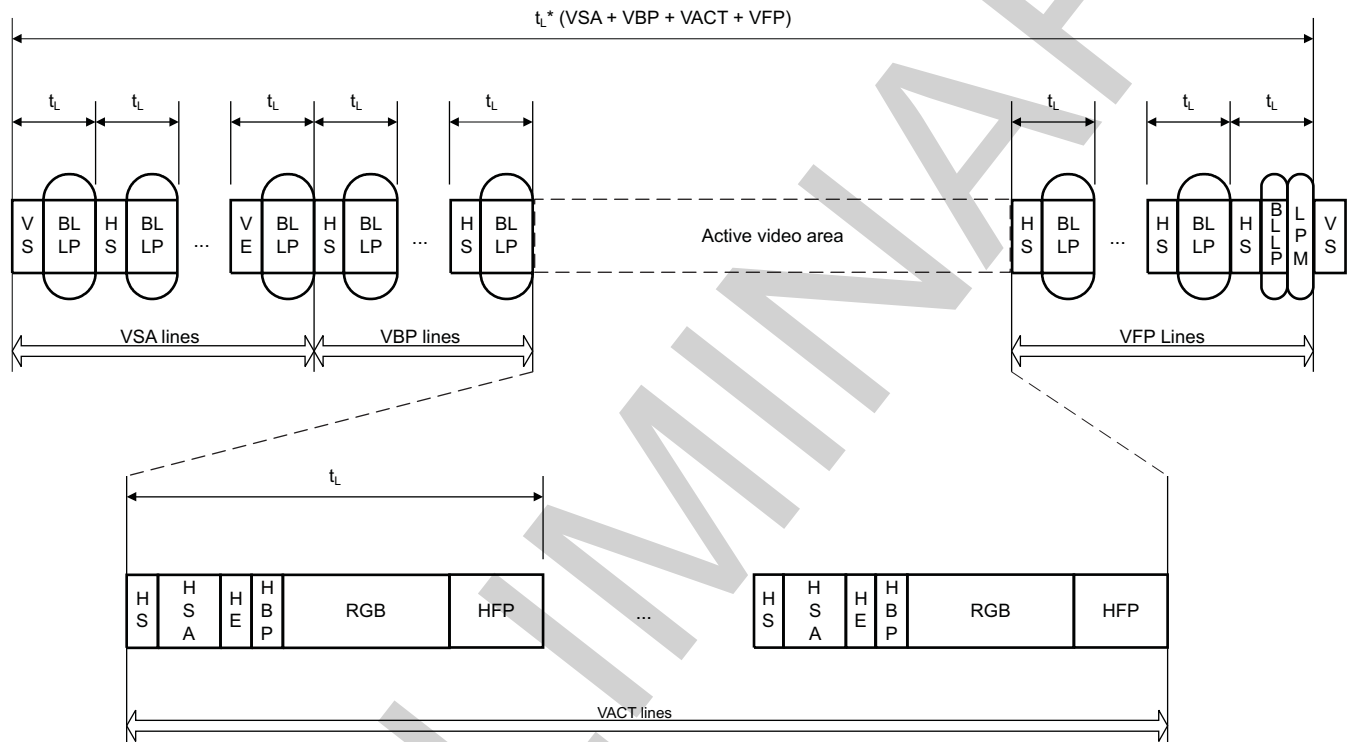
Special care must be taken in the case of the last line of the frame. The LPS transition is required when the link is in HS mode for the whole frame.

When BTA is sent for the data packets, the following blanking period cannot be used for sending any data from the TX FIFO. When the blanking period starts with one HS packet from one VC, it can be followed only by another HS packet from the same VC, or by a trigger (for example, BTA). When there is no more HS data to send for this VC, the lane is in LPS.

When the blanking period starts with one LP packet from one VC, it can be followed only by another LP packet from the same VC, by another VC, by trigger (BTA, for example), or by extra LP NULL packets. If the trigger is sent, it is not possible to send any more data. When there is no more data from the TX FIFO to send in LP mode or the trigger has been sent, the lane is put into LPS. If the lanes must be kept in HS mode during blanking periods (except for the last blanking period of the frame), the HS blanking packets must be used. If one trigger is sent at the beginning of the blanking period, the rest of the blanking period is in LPS.

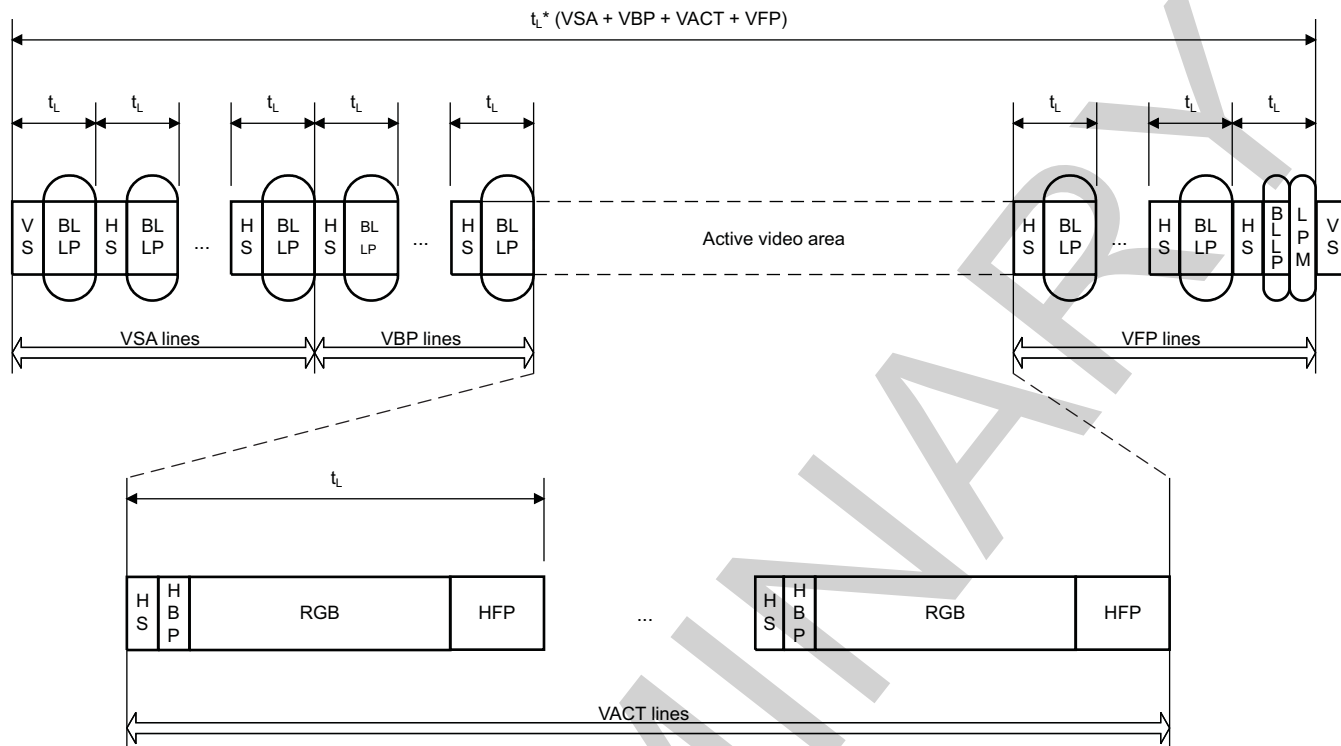
Figure 10-103 and Figure 10-104 show a nonburst transfer in DSI video mode with and without VE and HE, respectively. Figure 10-105 shows a burst transfer in DSI video mode without VE and HE.

Figure 10-103. DSI Video Mode: Nonburst Transfer With VE and HE



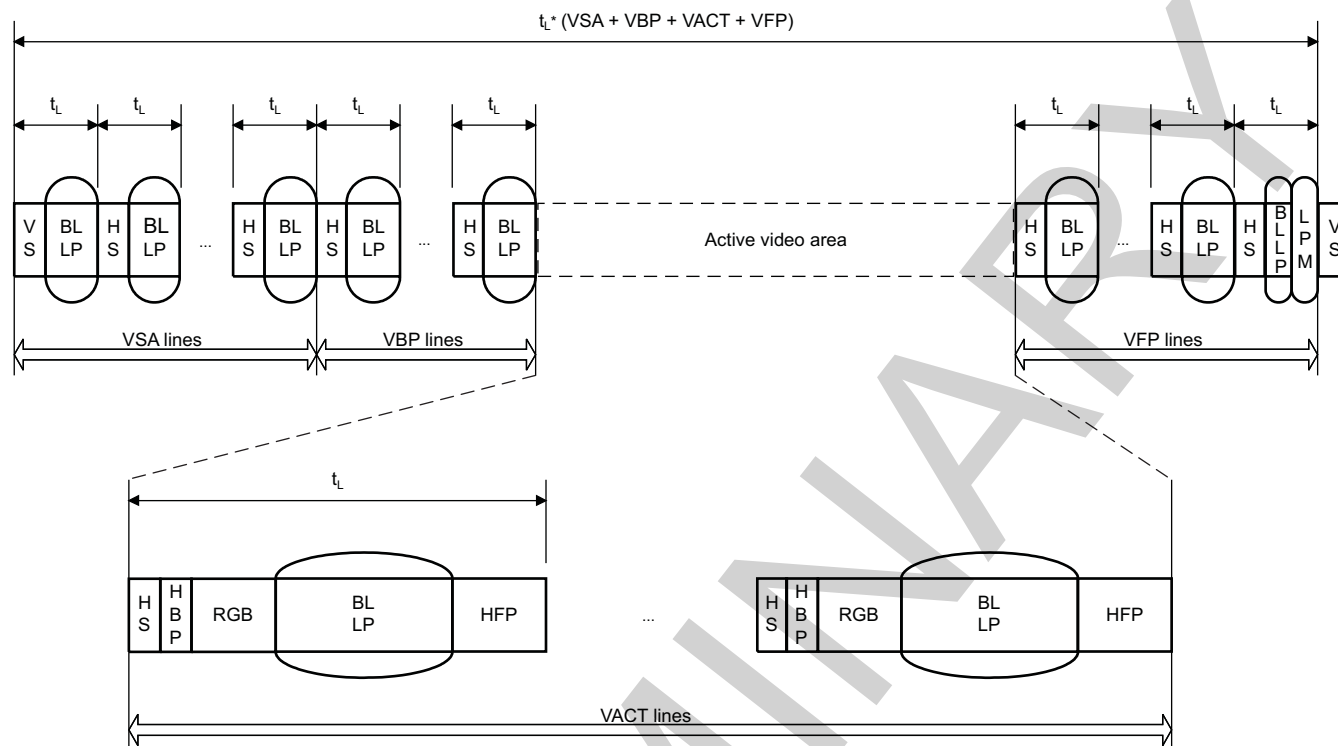
dsi-009

Figure 10-104. DSI Video Mode: Nonburst Transfer Without VE and HE



dss-010

NOTE: HSA timing is not used and does not have to be programmed when HE short packet is not generated.

Figure 10-105. DSI Video Mode: Burst Transfer Without VE and HE

dsi-011

NOTE: HSA timing is not used and does not have to be programmed when HE short packet is not generated.

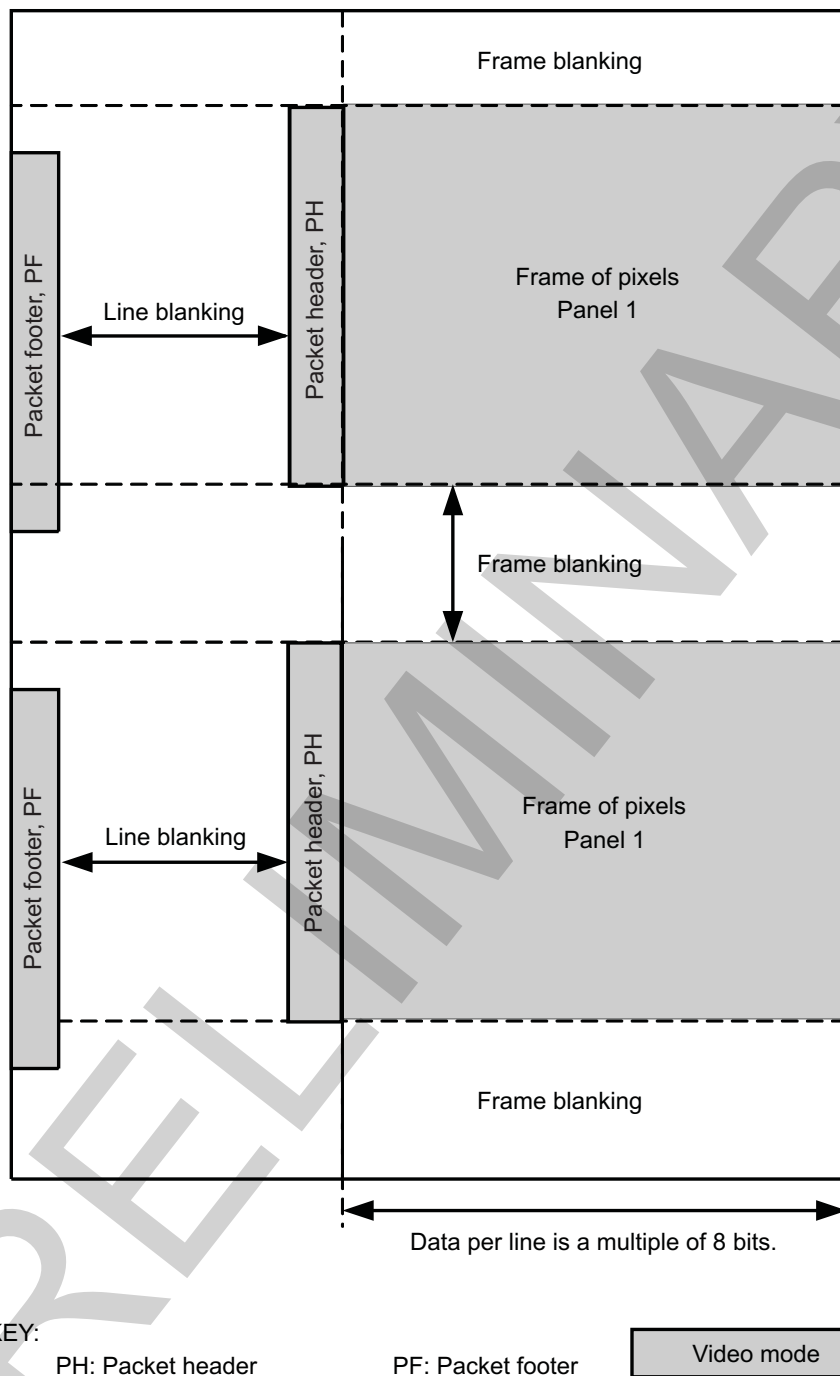
In [Figure 10-104](#) and [Figure 10-105](#), if HSYNC end short packet is not generated (HSA does not exist), HBP must not be 0.

10.3.2.2.6 Frame Structures

NOTE: The figures in this section show only pixel packets and blanking periods; they do not show synchronization packets.

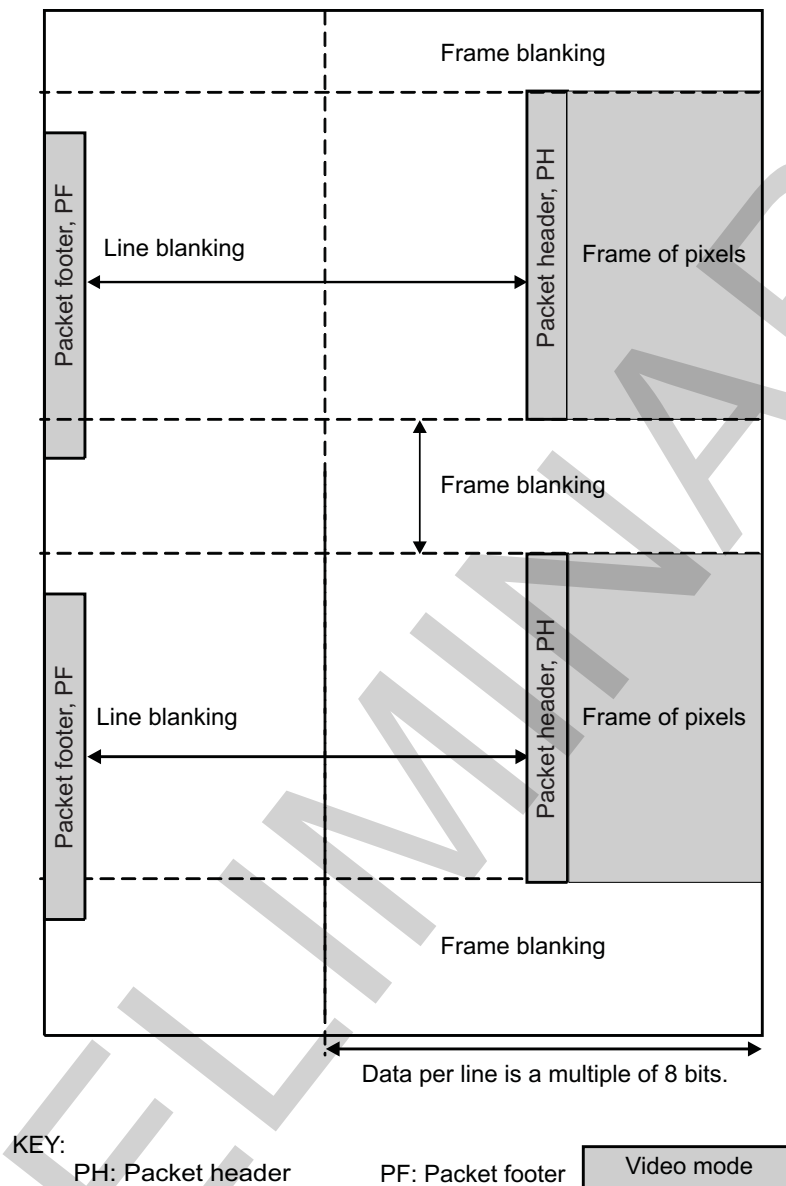
[Figure 10-106](#) shows the DSI general frame structure.

Figure 10-106. DSI General Frame Structure



dsi-012

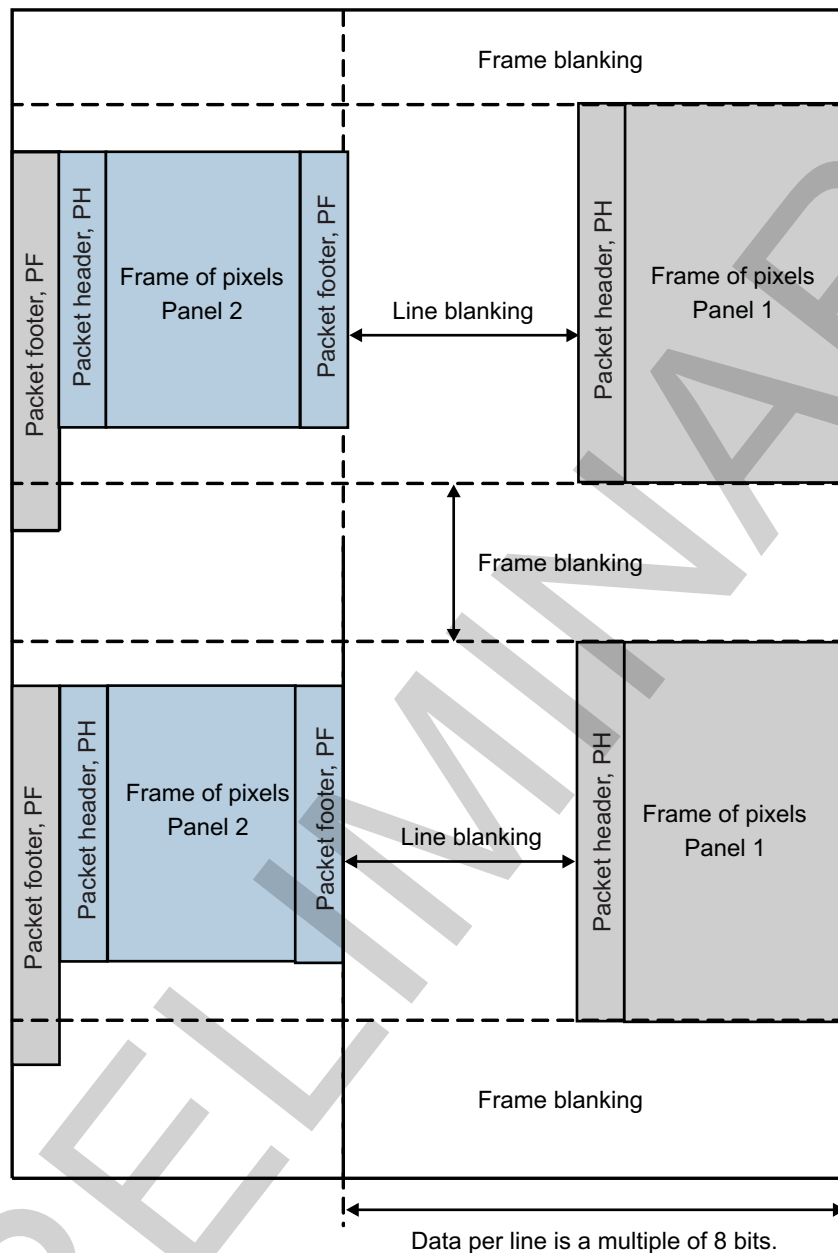
Figure 10-107 shows the general frame structure using burst mode.

Figure 10-107. DSI General Frame Structure Using Burst Mode

dsi-013

Figure 10-108 shows the general frame structure using burst mode and interleaving.

Figure 10-108. DSI General Frame Structure Using Burst Mode and Interleaving



KEY:

PH: Packet header

PF: Packet footer

Video mode

Command mode

dsi-014

10.3.2.2.7 VCs

The DSI protocol layer transports VCs. VCs separate different data flows, which are interleaved in the same data stream. Each VC is identified by a unique channel identification number in the PH. The channel identification number is encoded in 2 bits. The DSI protocol engine determines the channel identifier number to be used for generating the PH and multiplexes the interleaved data streams. The DSI protocol engine supports multiple (up to 4) concurrent VCs. [Table 10-477](#) summarizes the VC values used for each channel.

Table 10-477. VC Values

| VC Number | Value |
|-----------|-------|
| VC 0 | 0x0 |
| VC 1 | 0x1 |
| VC 2 | 0x2 |
| VC 3 | 0x3 |

If multiple displays are connected to a single DSI port on the host, a hub can be used to route the data stream to the appropriate display based on the VC ID. Typically, VC ID 0x0 is used for the primary display and 0x1 for the secondary. The hub may have its own VC ID to provide communication capability between the host and the hub.

There is one set of registers for each VC. The attributes of the VC define the following characteristics:

- Transfer mode ([DSI_VC_CTRL_i\[4\]](#) MODE bit):
 - Video mode
 - Command mode
- Data type
- Source ([DSI_VC_CTRL_i\[1\]](#) SOURCE bit)
 - Video port
 - Slave interconnect port
- HS or LP forward transmission
- Automatic BTA generation
 - Short packets ([DSI_VC_CTRL_i\[2\]](#) BTA_SHORT_EN bit)
 - Long packets ([DSI_VC_CTRL_i\[3\]](#) BTA_LONG_EN bit)
- DMA request configurations for RX and TX
 - DMA request number ([DSI_VC_CTRL_i\[29:27\]](#) DMA_RX_REQ_NB bit field for RX FIFO and [DSI_VC_CTRL_i\[23:21\]](#) DMA_TX_REQ_NB bit field for TX FIFO)
 - DMA threshold ([DSI_VC_CTRL_i\[26:24\]](#) DMA_RX_THRESHOLD bit field for RX FIFO and [DSI_VC_CTRL_i\[19:17\]](#) DMA_TX_THRESHOLD bit field for TX FIFO)
- Mode speed ([DSI_VC_CTRL_i\[9\]](#) MODE_SPEED bit)
- ECC transmission ([DSI_VC_CTRL_i\[8\]](#) ECC_TX_EN bit)
- CS transmission ([DSI_VC_CTRL_i\[7\]](#) CS_TX_EN bit)

NOTE: The VC ID is not calculated by the DSI module but is provided while writing into the [DSI_VC_SHORT_PACKET_HEADER_i](#) and [DSI_VC_LONG_PACKET_HEADER_i](#) registers.

10.3.2.3 DSI Multilane Layer

A layer consists of lane splitter logic to split the incoming byte stream into a serial stream. The bits are sent with the LSB first. The number of active lanes is configurable through a register. The order of the lanes is configurable. The number of lanes can be changed only in ULPS or when all data lanes are in STOP state.

10.3.2.3.1 SoT and EoT in Multilane Configurations

Because a HS transmission is composed of an arbitrary number of bytes that may not be an integer multiple of the number of lanes, some lanes may run out of data before others. Therefore, the lane management layer, as it buffers up the final set of less-than-N bytes, deasserts its valid data signal into lanes for which there is no further data. Although all lanes start simultaneously with parallel start-of-transmissions (SoTs), each lane operates independently and may complete the HS transmission before the other lanes, sending an end-of-transmission (EoT) one cycle (byte) earlier.

10.3.2.3.2 Lane Splitter

The lane splitter can split the byte stream into two, three, or four lanes (for one lane, the splitter is bypassed). Figure 10-109 through Figure 10-112 show the byte position in each serial link for one-, two-, three-, and four-data lane configurations. The byte stream always starts from lane 1. It finishes on one of the lanes, depending on the number of bytes to send and the number of lanes. The splitter module is used only when packets are sent using HS mode. In LS mode, only data lane 1 is used.

Figure 10-109. Four-Data Lane Configuration

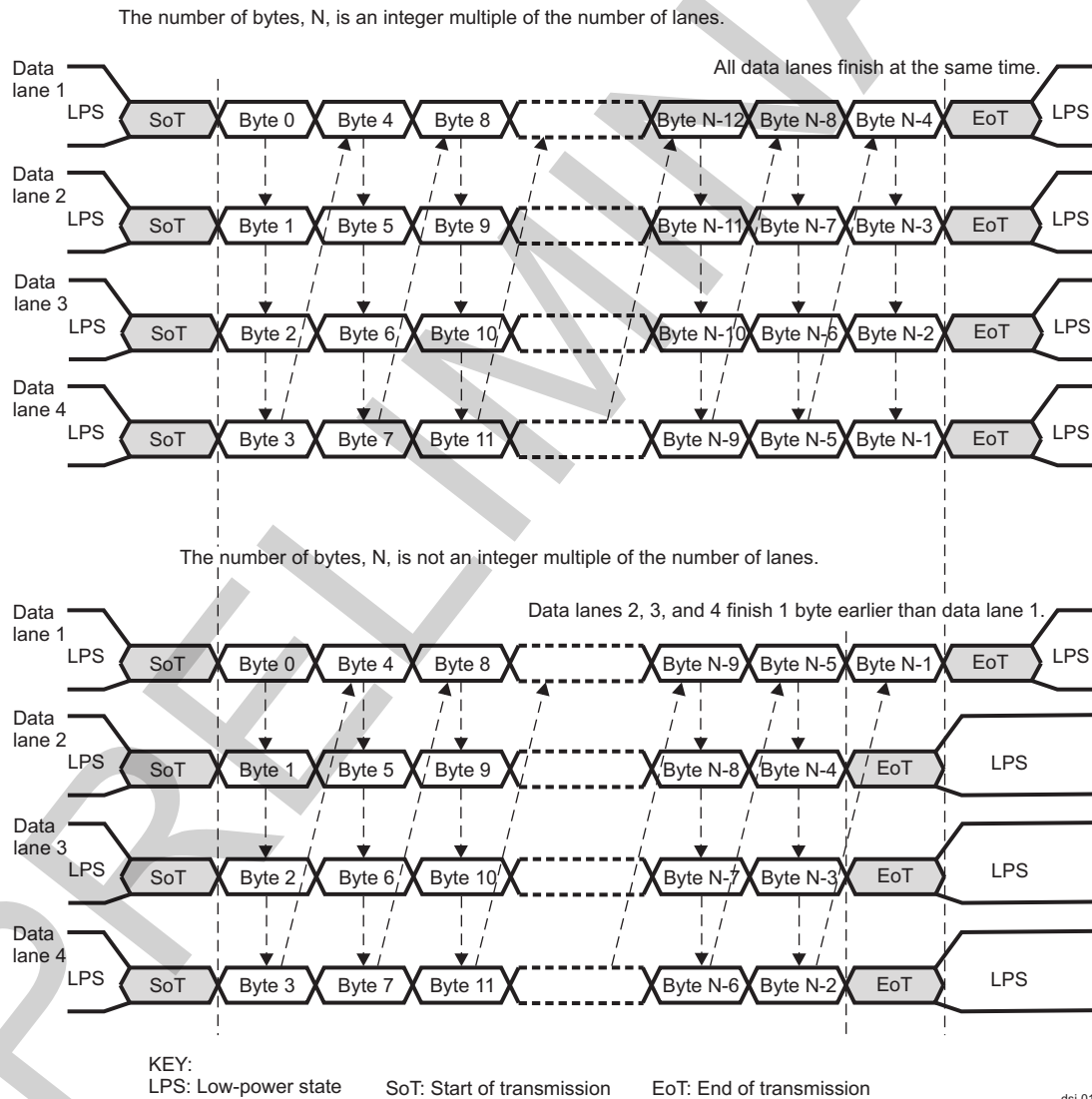
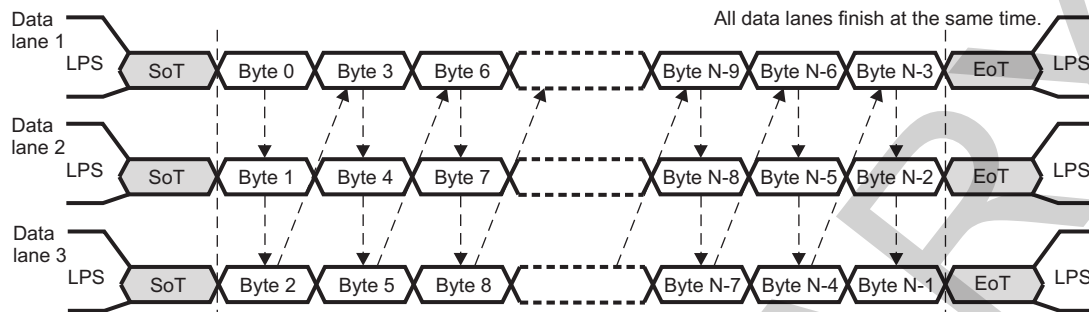
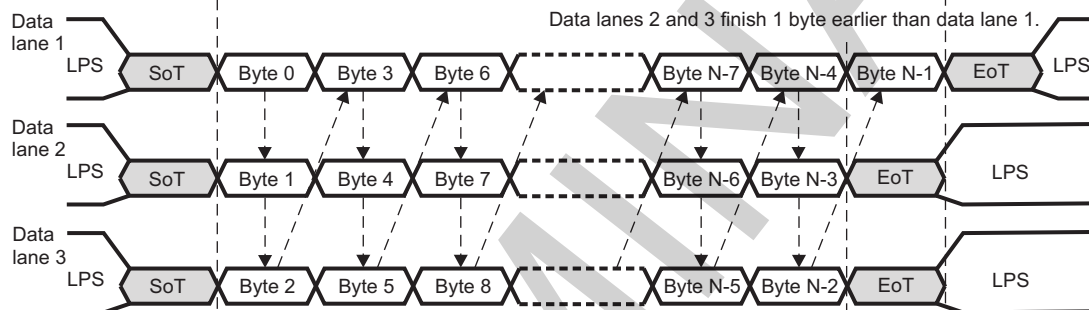


Figure 10-110. Three-Data Lane Configuration

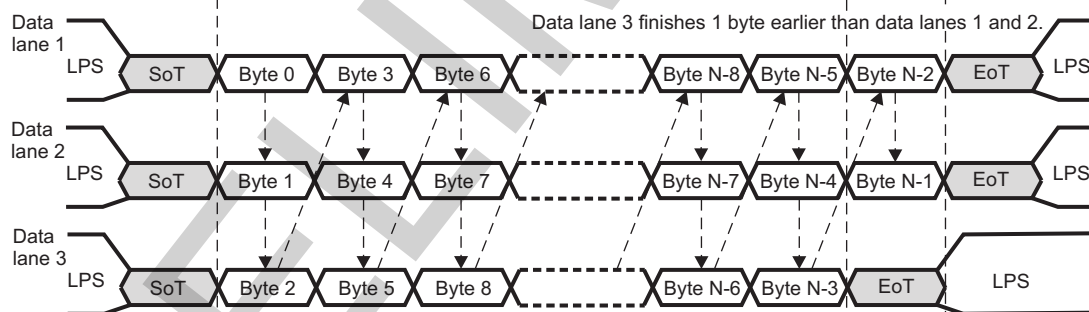
The number of bytes, N, is an integer multiple of the number of lanes.



The number of bytes, N, is not an integer multiple of the number of lanes (Example 1).



The number of bytes, N, is not an integer multiple of the number of lanes (Example 2).



Key:

LPS: Low-power state

SoT: Start of transmission

EoT: End of transmission

ds1-015

Figure 10-111. Two-Data Lane Configuration

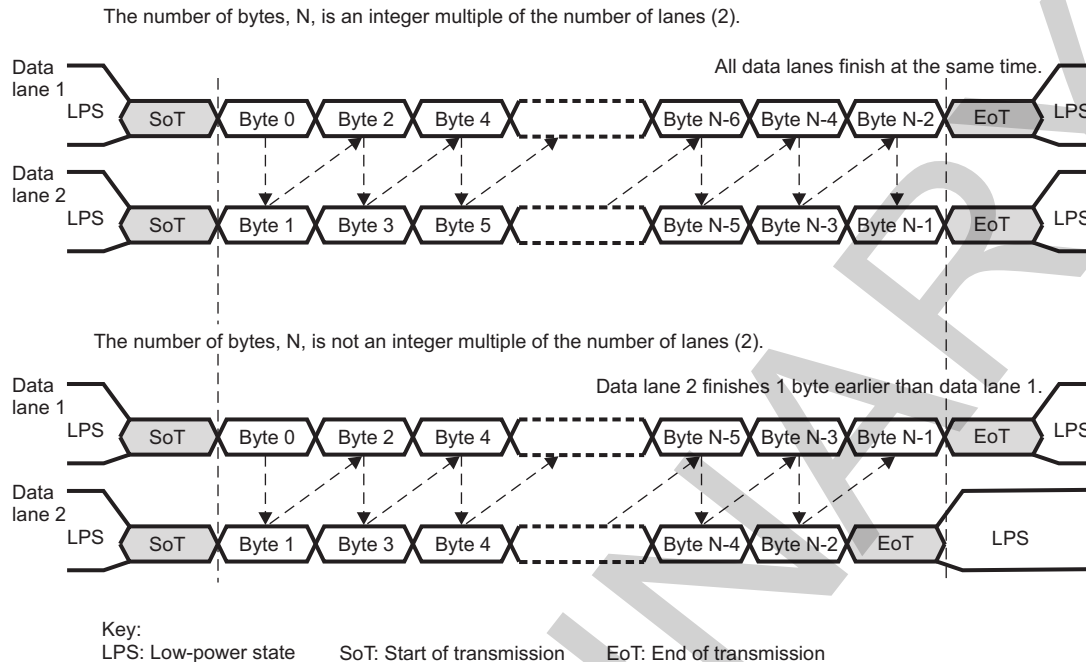
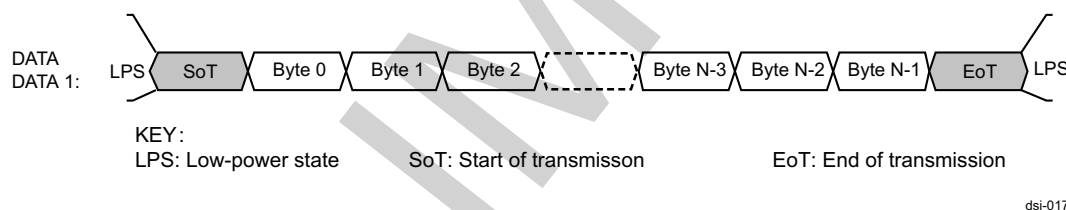
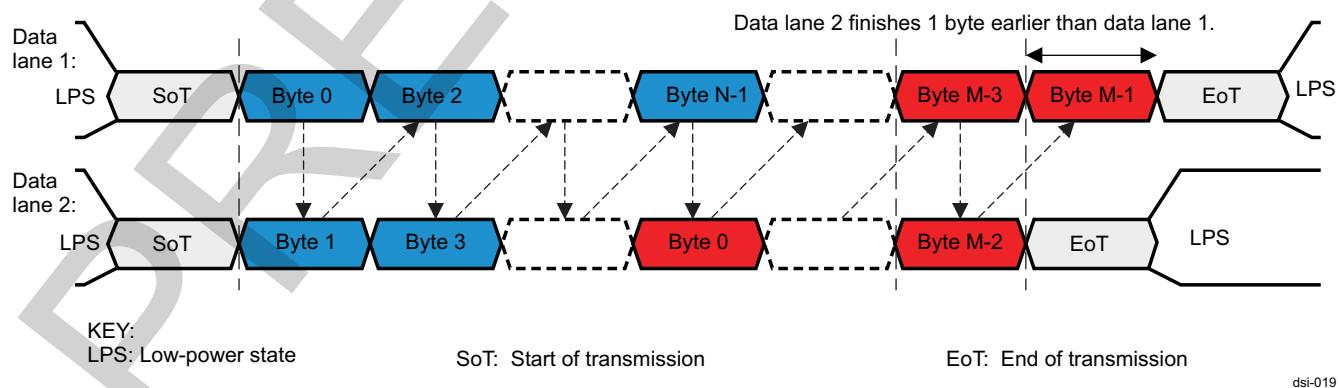


Figure 10-112. One-Data Lane Configuration



For back-to-back packets, the byte stream is considered as a single packet by the splitter module. [Figure 10-113](#) shows an example of two packets sent back-to-back. N bytes are used for the first packet and M bytes for the second packet.

Figure 10-113. Two Packets Using Two-Data Lane Configuration (Example)



10.3.2.4 DSI Pixel Data Formats

This section describes how the DSI-supported pixel data formats in video mode are transmitted over the serial interface. The DSI protocol engine can cope with all data formats if the data line length sent through the DSI physical protocol is a multiple of a pixel. This condition is required for the DSI protocol engine to work properly.

10.3.2.4.1 Pixel Data Formats in Video Mode

The host can send different pixel formats in video mode. [Table 10-478](#) lists the pixel formats supported by the DSI in video mode.

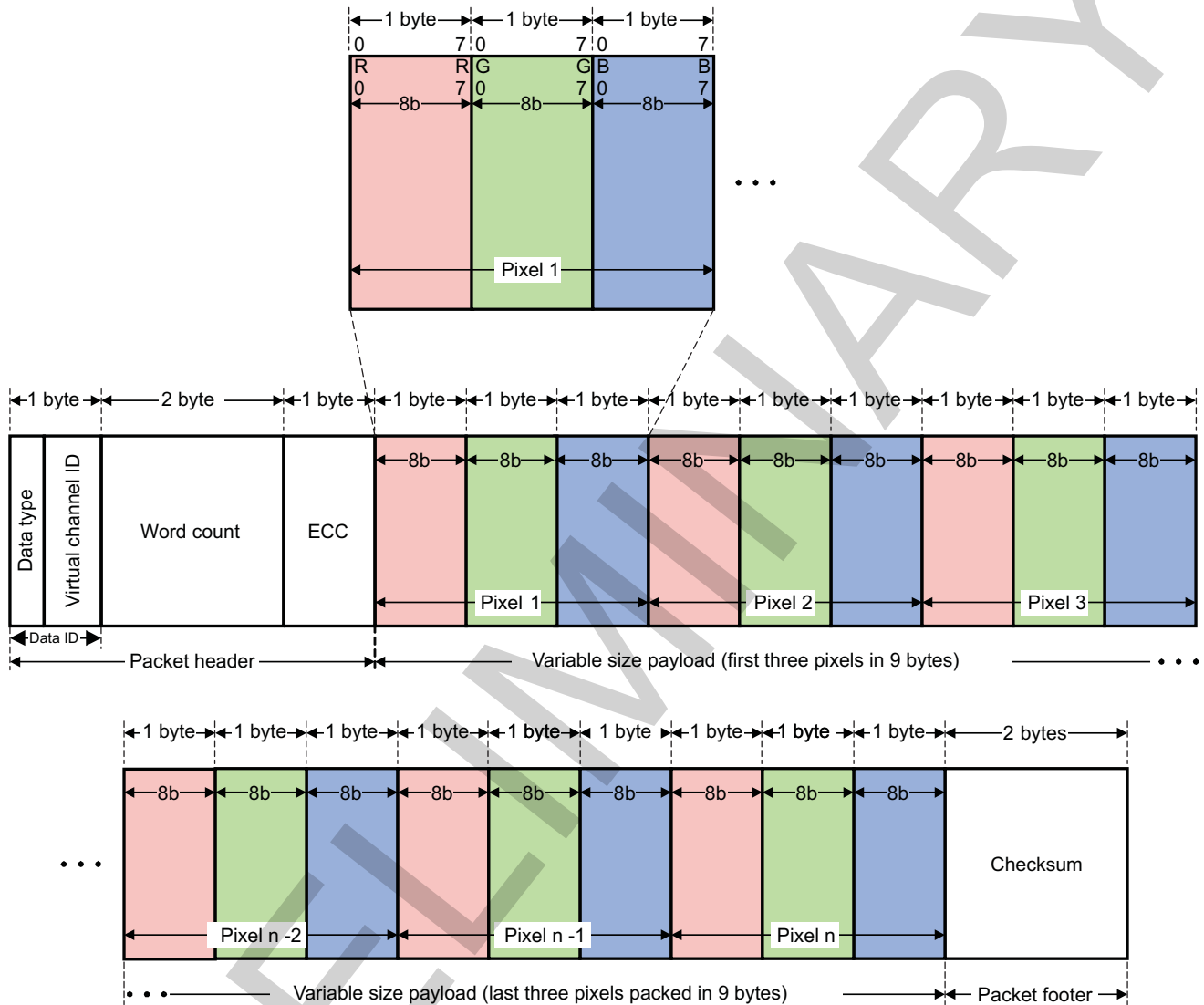
Table 10-478. Pixel Data Format in Video Mode

| Mode | Description |
|---|---------------|
| RGB888 (using 24-bit container) | RGB888 |
| RGB666 (using 24-bit container) | RGB666 |
| RGB666 (18-bit packet using 18-bit container) | RGB666_PACKET |
| RGB565 (using 16-bit container) | RGB565 |

10.3.2.4.2 24 bpp – RGB Color Format, Long Packet (Video Mode)

Figure 10-114 shows the RGB888 format.

Figure 10-114. 24-bpp RGB Color Format, Long Packet (Video Mode)

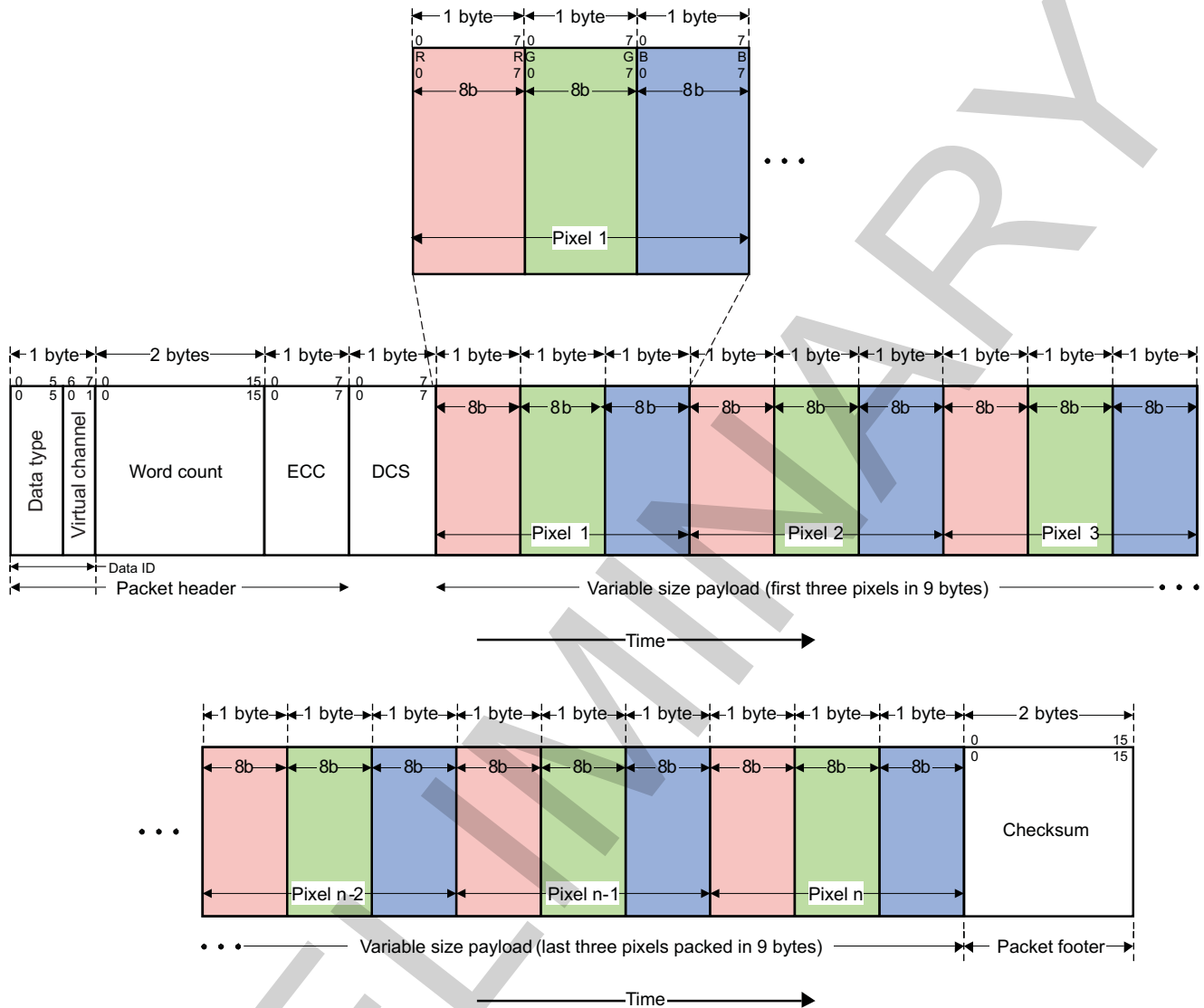


dsi-020

Packed-pixel stream, 24-bit format is a long packet used to transmit image data formatted as 24-bit pixels to a video-mode display module. The packet consists of the data ID byte, a 2-byte WC, an ECC byte, a payload of length WC bytes, and a 2-byte checksum. The pixel format is R (8 bits), G (8 bits), and B (8 bits), in that order. Each color component occupies 1 byte in the pixel stream; no components are split across byte boundaries. Within a color component, the LSB is sent first and the MSB last.

10.3.2.4.3 24 Bits per Pixel - RGB Color Format, Long Packet (Command Mode)

Figure 10-115 shows the RGB888 format.

Figure 10-115. 24-bpp RGB Color Format, Long Packet (Command Mode)

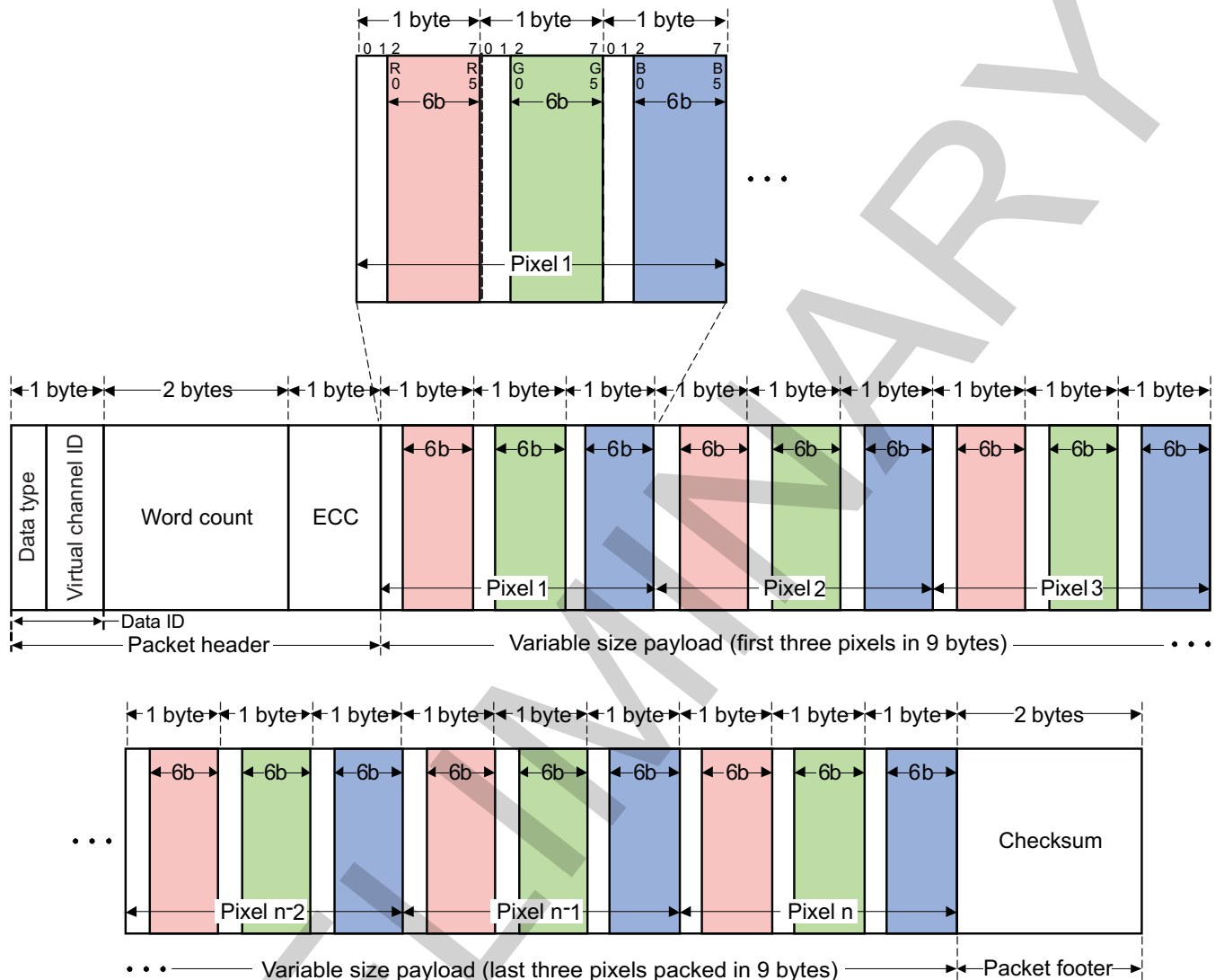
dsi-021

This format is the same as the packed pixel stream format.

10.3.2.4.4 18 bpp (Loosely Packed) – RGB Color Format, Long Packet (Transparent for DSI Protocol Engine) (Video Mode)

Figure 10-116 shows the RGB666 format.

Figure 10-116. 18-bpp (Loosely Packed) RGB Color Format, Long Packet (Transparent for DSI Protocol Engine) (Video Mode)

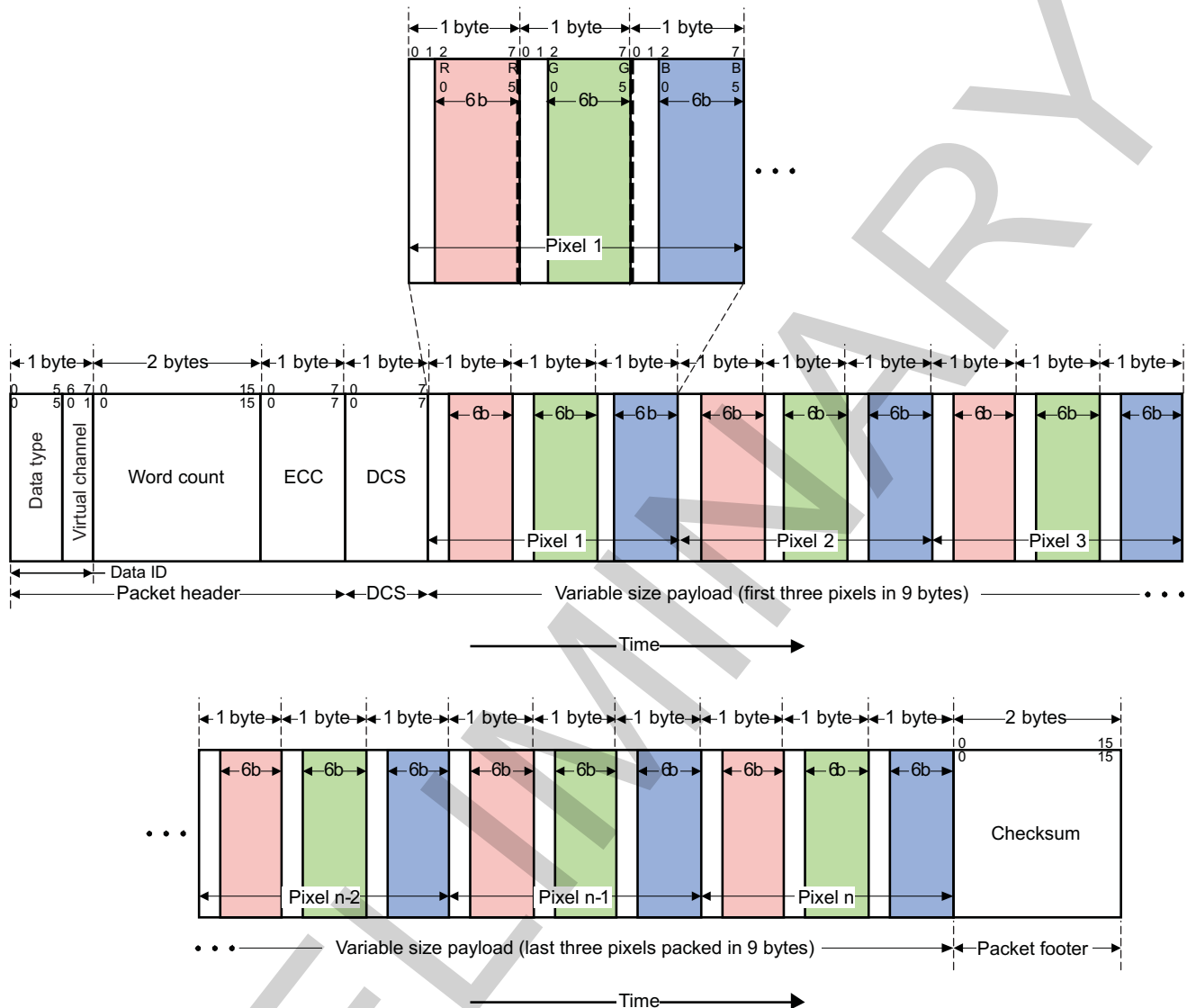


dsi-022

In 18-bit loosely packed pixel format, each R, G, and B color component is 6 bits but is shifted to the upper bits of the byte, such that the valid pixel bits occupy bits [7:2] of each byte. Bits [1:0] of each payload byte representing active pixels are ignored. As a result, each pixel requires 3 bytes as it is transmitted across the link. This requires more bandwidth than packed format but requires less shifting and multiplexing logic in the packing and unpacking functions on each end of the link. This format is used to transmit RGB image data formatted as pixels to a video mode display module that displays 18-bit pixels. The packet consists of the data ID byte, a 2-byte WC, an ECC byte, a payload of length WC bytes, and a 2-byte checksum. The pixel format is R (6 bits), G (6 bits), and B (6 bits), in that order. Within a color component, the LSB is sent first and the MSB last.

10.3.2.4.5 18-bpp (Loosely Packed) – RGB Color Format, Long Packet (Command Mode)

Figure 10-117 shows the RGB666 format.

Figure 10-117. 18-bpp (Loosely Packed) RGB Color Format, Long Packet (Command Mode)

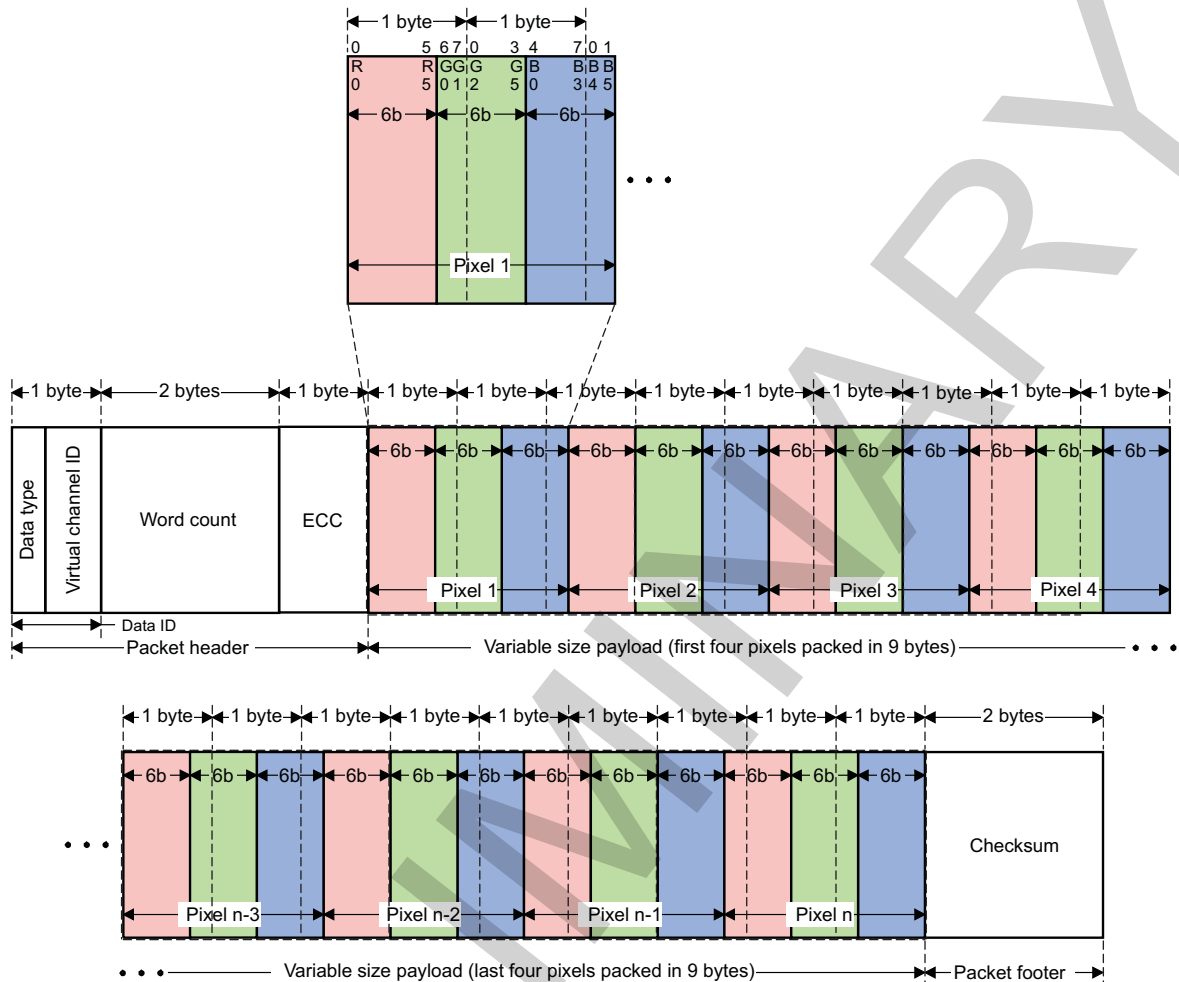
dsi-023

This format is the same as the packed-pixel stream format.

10.3.2.4.6 18-bpp (Packed) – RGB Color Format, Long Packet (Video Mode)

Figure 10-118 shows the RGB666_PACKED format.

Figure 10-118. 18-bpp (Packed) RGB Color Format, Long Packet (Video Mode)

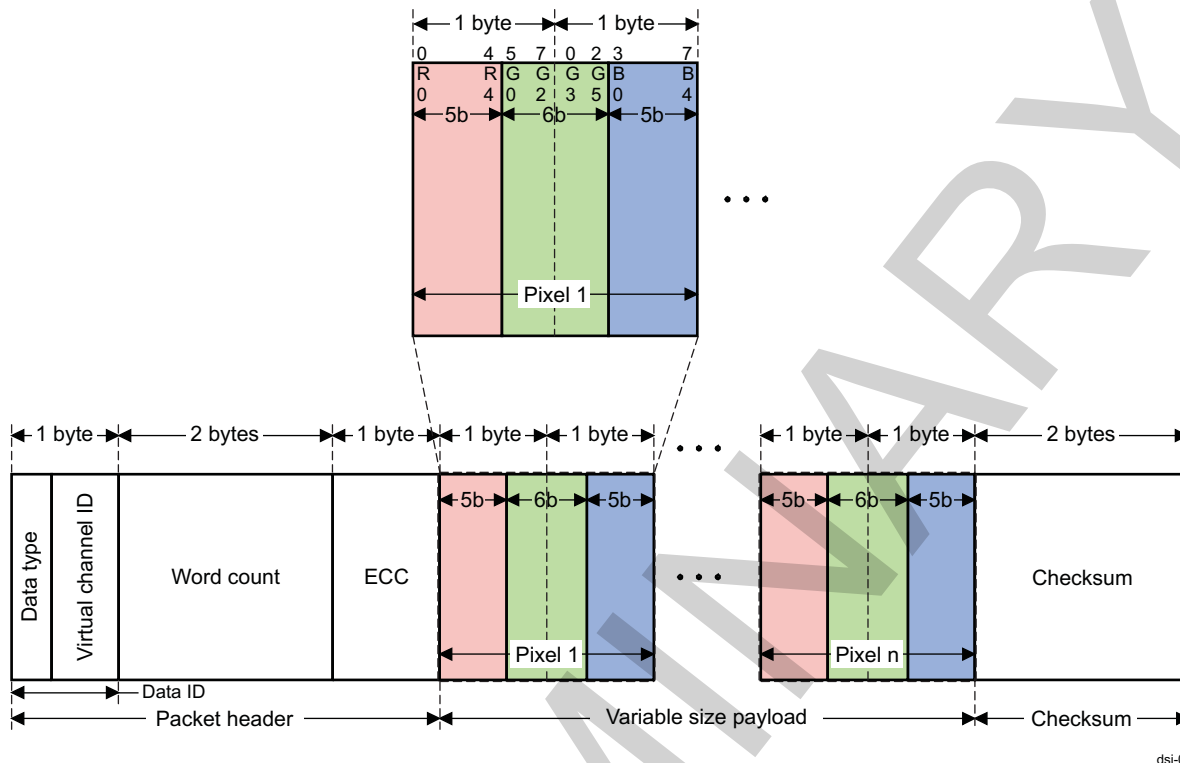


dsi-024

Packed pixel stream 18-bit format is a long packet. It is used to transmit RGB image data formatted as pixels to a video mode display module that displays 18-bit pixels. The packet consists of the data ID byte, a 2-byte WC, an ECC byte, a payload of length WC bytes, and a 2-byte checksum. The pixel format is R (6 bits), G (6 bits), and B (6 bits), in that order. Within a color component, the LSB is sent first and the MSB last. With this format, it is strongly recommended that the total line width be a multiple of 4 pixels (9 bytes). This format is not supported in command mode.

10.3.2.4.7 16 bpp – RGB Color Format, Long Packet (Video Mode)

Figure 10-119 shows the RGB565 format.

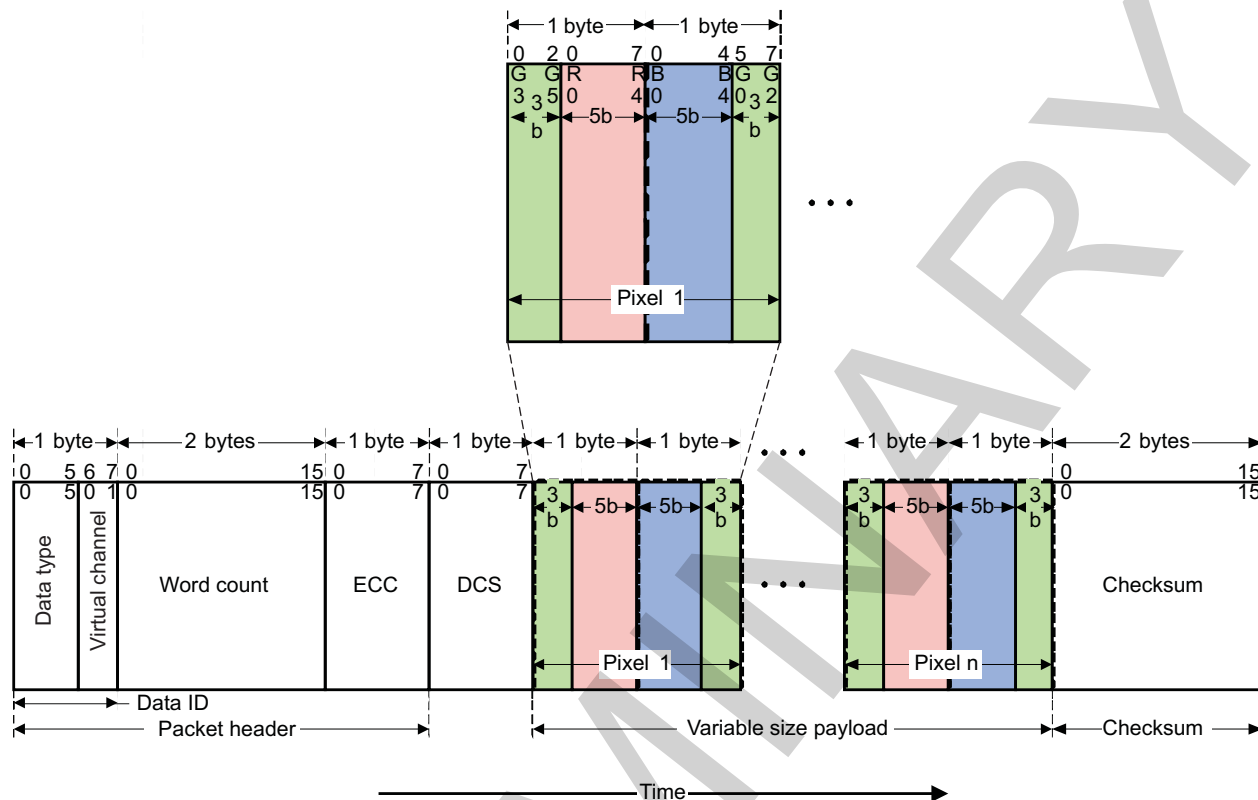
Figure 10-119. 16-bpp RGB Color Format, Long Packet (Video Mode)

Packed-pixel stream, 16-bit format is a long packet used to transmit image data formatted as 16-bit pixels to a video mode display module. The packet consists of the data ID byte, a 2-byte WC, an ECC byte, a payload of length WC bytes, and a 2-byte checksum. The pixel format is R (5 bits), G (6 bits; split across 2 bytes), and B (5 bits), in that order. Within a color component, the LSB is sent first and the MSB last.

10.3.2.4.8 16 bpp – RGB Color Format, Long Packet (Command Mode)

Figure 10-120 shows the RGB565 format.

Figure 10-120. 16-bpp RGB Color Format, Long Packet (Command Mode)



dsi-026

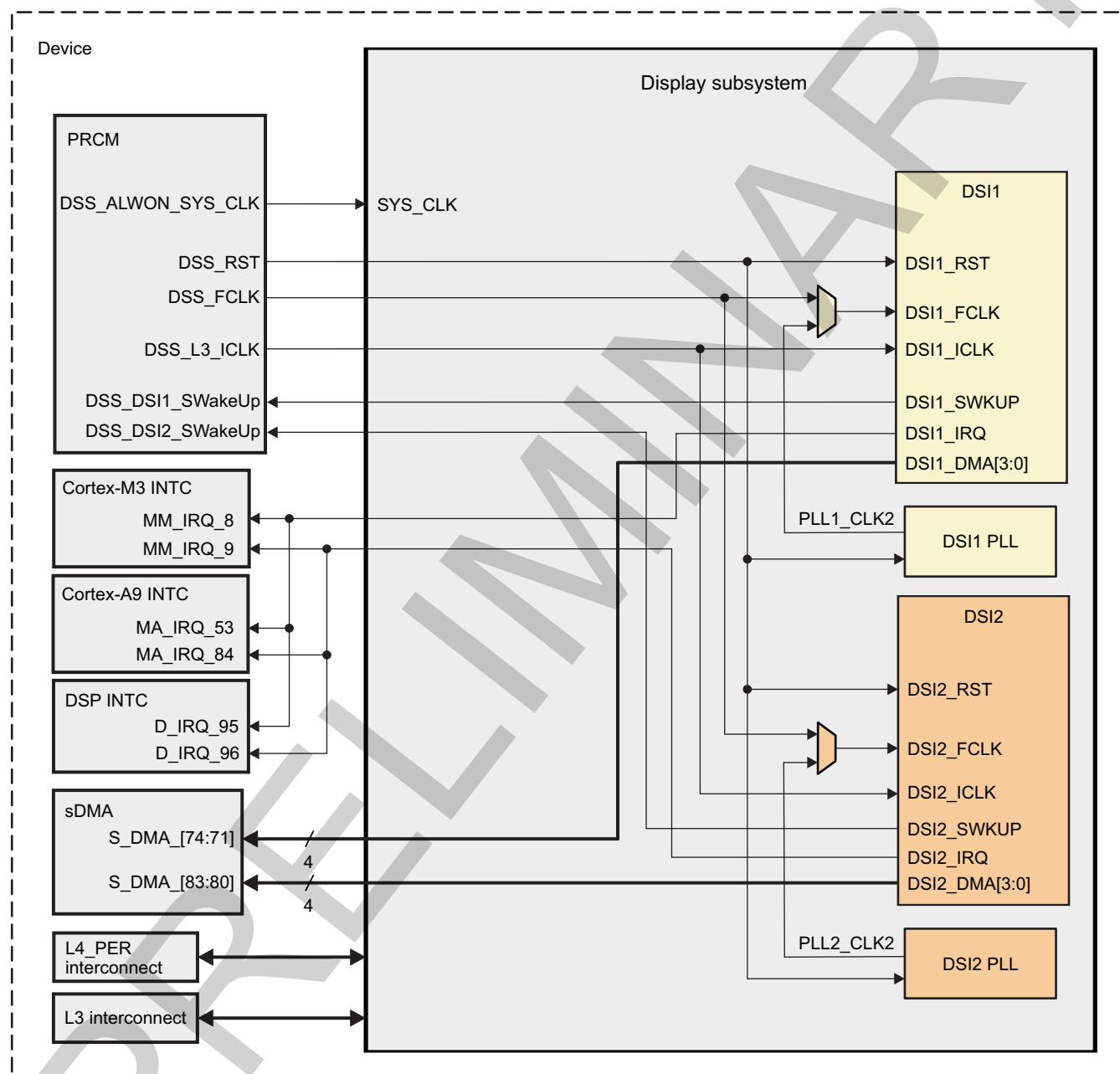
This is the opposite byte order from the packed pixel stream format. To retain flexibility, the byte order is made programmable using [DSI_VC_CTRL_i\[12\] RGB565_ORDER](#) bit, with this order the default for command mode through the video port.

10.3.3 DSI Integration

This section describes the integration of the DSI in the device, including information about clocks, resets, and hardware requests.

Figure 10-121 shows the integration of the DSI in the device.

Figure 10-121. DSI Integration



dsi-027

NOTE: For more information about the wake-up request, see [Section 3.1.1.1, Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 10-479 through Table 10-482 summarize the integration of the DSI module in the device.

Table 10-479. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|---|
| | Power Domain | Interconnect |
| MIPI DSI1 | PD_DSS | L3 for data L4_PER for configuration |
| MIPI DSI2 | PD_DSS | L3 for data L4_PER for configuration |

NOTE: L3 interconnect is used primarily for data.

L4_PER interconnect is used primarily for configuration but is also used for backward software compatibility.

Table 10-480. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|-----------------------|-------------------------|-----------------------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| | SYS_CLK | DSS_ALWON_SYS_CLK | PRCM module | Functional clock for the DSI PLLs |
| MIPI DSI1 | DSI1_FCLK | DSS_FCLK PLL1_CLK2 | PRCM module DSI1 PLL | Functional clock |
| | DSI1_ICLK | DSS_L3_ICLK | PRCM module | Interface clock |
| MIPI DSI2 | DSI2_FCLK | DSS_FCLK PLL2_CLK2 | PRCM module DSI2 PLL | Functional clock |
| | DSI2_ICLK | DSS_L3_ICLK | PRCM module | Interface clock |
| Resets | | | | |
| MIPI DSI1 | DSI1_RST | DISPSS_RST | PRCM module | Nonretention reset |
| MIPI DSI2 | DSI2_RST | DISPSS_RST | PRCM module | Nonretention reset |

NOTE: If video mode is used, the VPn_PCLK and VPn_CLK clocks must be generated using a CLKIN4DDR clock.

NOTE: For information about clock distribution and configuration inside the module, see [Section 10.3.4.2, DSI Clock Configuration](#).

Table 10-481. Interrupt Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|----------------|--------------------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| MIPI DSI1 | DSS_DSI1_IRQ | D_IRQ_95 | DSP INTC | Display DSI1 interrupt request |
| | DSS_DSI1_IRQ | MA_IRQ_53 | Cortex-A9 INTC | Display DSI1 interrupt request |
| | DSS_DSI1_IRQ | MM_IRQ_8 | Cortex-M3 INTC | Display DSI1 interrupt request |
| MIPI DSI2 | DSS_DSI2_IRQ | D_IRQ_96 | DSP INTC | Display DSI2 interrupt request |
| | DSS_DSI2_IRQ | MA_IRQ_84 | Cortex-A9 INTC | Display DSI2 interrupt request |
| | DSS_DSI2_IRQ | MM_IRQ_9 | Cortex-M3 INTC | Display DSI2 interrupt request |

NOTE: For a description of the interrupt source, see [Section 10.3.4.3, DSI Interrupt Requests](#).

Table 10-482. DMA Requests

| DMA Requests | | | | |
|-----------------|--------------------|-------------------------|-------------|--------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| MIPI DSI1 | DSS_DSI1_DMA0 | S_DMA_71 | sDMA | DSI1 DMA request 0 |
| | DSS_DSI1_DMA1 | S_DMA_72 | sDMA | DSI1 DMA request 1 |
| | DSS_DSI1_DMA2 | S_DMA_73 | sDMA | DSI1 DMA request 2 |
| | DSS_DSI1_DMA3 | S_DMA_74 | sDMA | DSI1 DMA request 3 |
| MIPI DSI2 | DSS_DSI2_DMA0 | S_DMA_80 | sDMA | DSI2 DMA request 0 |
| | DSS_DSI2_DMA1 | S_DMA_81 | sDMA | DSI2 DMA request 1 |
| | DSS_DSI2_DMA2 | S_DMA_82 | sDMA | DSI2 DMA request 2 |
| | DSS_DSI2_DMA3 | S_DMA_83 | sDMA | DSI2 DMA request 3 |

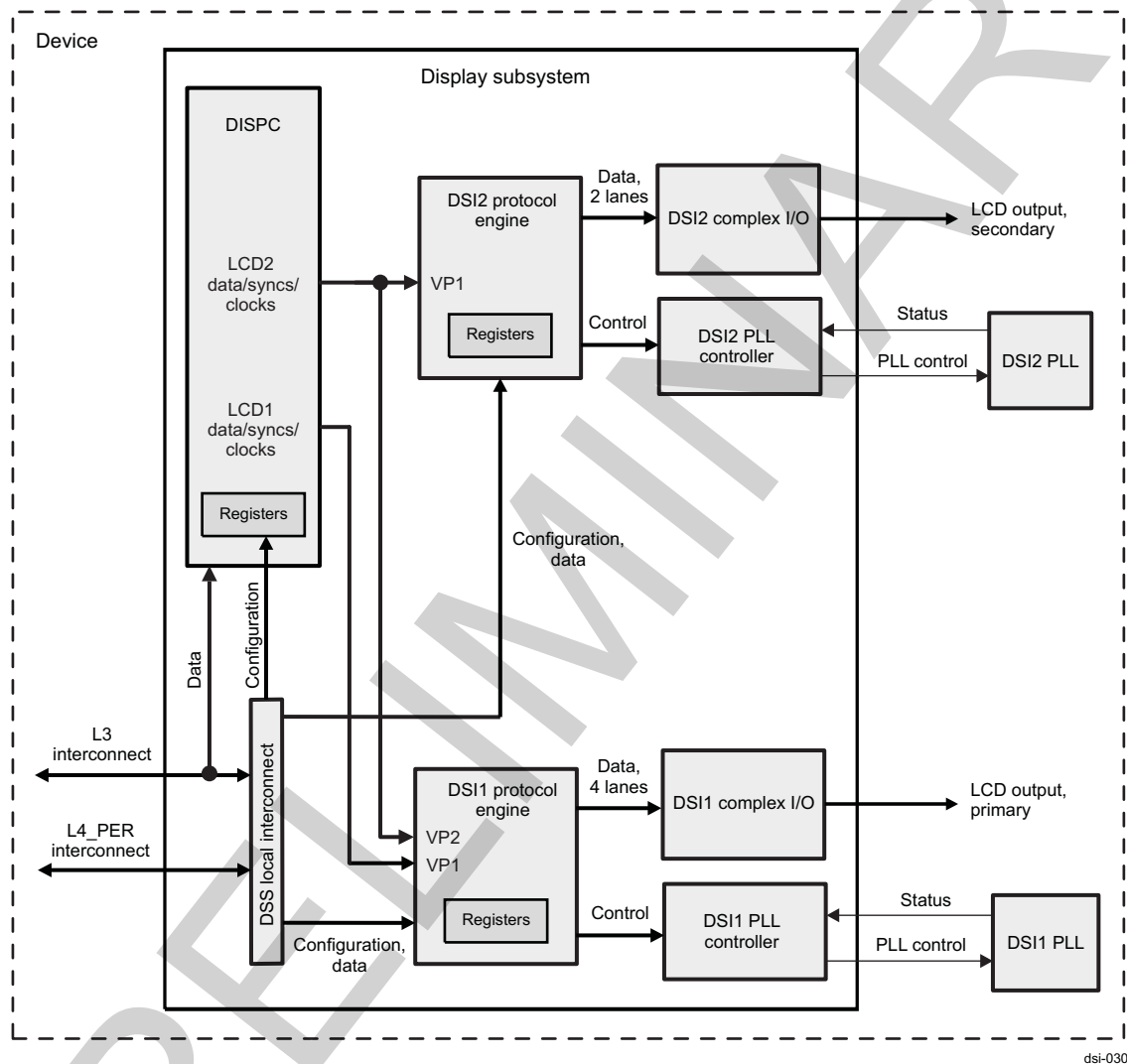
10.3.4 DSI Functional Description

This section describes the functions of the DSI1 and DSI2 modules.

10.3.4.1 DSI Block Diagram

Figure 10-122 is a schematic of DSI1 and DSI2.

Figure 10-122. DSI Schematic



10.3.4.2 DSI Clock Configuration

Figure 10-123 shows the clock tree for DSI1 and DSI2.

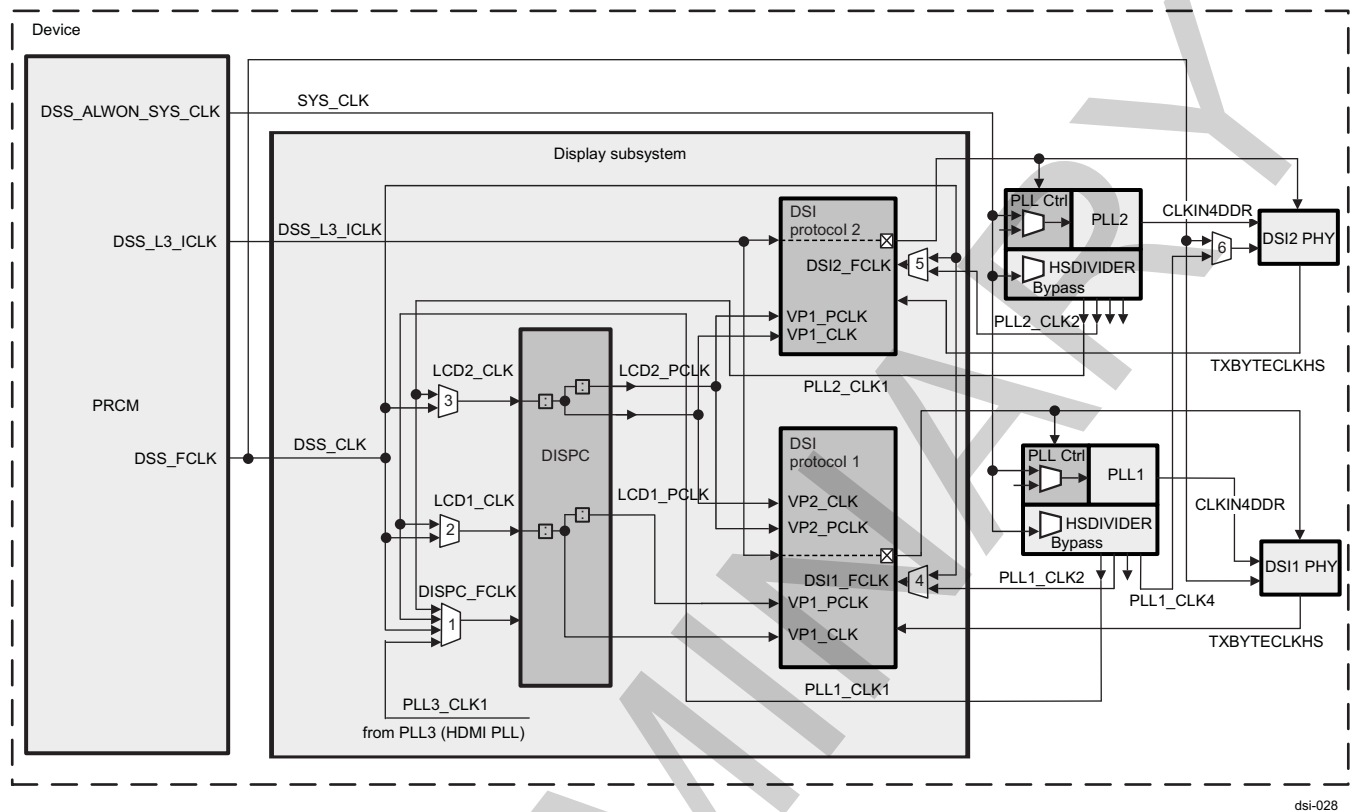
Figure 10-123. DSI Clock Tree

Table 10-483 shows the controls for clock multiplexers.

Table 10-483. DSI Multiplexer Controls

| Destination | Source Signal Name | Source | Multiplexer Number | DSS Register Bit Field |
|---|--------------------|-----------------|--------------------|---|
| DISPC functional clock (DISPC_FCLK) | DSS_CLK | DPLL_PER (PRCM) | 1 | For more information, see Section 10.1.2 , <i>DSS Integration</i> . |
| | PLL1_CLK1 | PLL1 | 1 | |
| | PLL2_CLK1 | PLL2 | 1 | |
| | PLL3_CLK1 | PLL3 | 1 | |
| DSI1 functional clock (LCD1_CLK) | DSS_CLK | DPLL_PER (PRCM) | 2 | For more information, see Section 10.1.2 , <i>DSS Integration</i> . |
| | PLL1_CLK1 | PLL1 | 2 | |
| DSI2 functional clock (LCD2_CLK) | DSS_CLK | DPLL_PER (PRCM) | 3 | For more information, see Section 10.1.2 , <i>DSS Integration</i> . |
| | PLL2_CLK1 | PLL2 | 3 | |
| DSI1 protocol engine functional clock (DSI1_FCLK) | DSS_CLK | DPLL_PER (PRCM) | 4 | For more information, see Section 10.1.2 , <i>DSS Integration</i> . |
| | PLL1_CLK2 | PLL1 | 4 | |
| DSI2 protocol engine functional clock (DSI2_FCLK) | DSS_CLK | DPLL_PER (PRCM) | 5 | For more information, see Section 10.1.2 , <i>DSS Integration</i> . |
| | PLL2_CLK2 | PLL2 | 5 | |

NOTE: For more information about the DSI1 and DSI2 video port clocks (VPn_CLK and VPn_PCLK, where n = 1 or 2), see [Section 10.3.4.4.5, Video Port Interface](#).

NOTE: For the frequency ratings of the various DSI clocks, see [Section 10.1.2.1, DSS Clocks](#).

NOTE: Multiplexer 6, shown in [Figure 10-123](#), allows the DSS_FCLK or PLL1_CLK4 clock to be sent on DSI2 PHY bypass input. The use of the bypassed clock allows both DSI modules to run on DSS_FCLK or on a single PLL (DSI1 PLL).

- To select the clock source for the DSI2 PHY bypass input, configure the CONTROL.CONTROL_DSS_CONTROL[0] DSS_MUX6_SELECT bit in the device control module. See [Chapter 19, Control Module](#).
- To enable the bypass input for the DSI1 PHY or DSI2 PHY module, set the DSI_PLL_CONFIGURATION2[15] BYPASSEN bit to 1.

10.3.4.3 DSI Interrupt Requests

The DSI protocol engine requires a single interrupt line. The [DSI_IRQSTATUS](#) register indicates the general interrupt events. Each VC and complex I/O has a dedicated interrupt register: [DSI_VC_IRQSTATUS_i](#) and [DSI_COMPLEXIO_IRQSTATUS](#), respectively.

[Table 10-484](#) lists the DSI global interrupt events.

Table 10-484. DSI Global Interrupts

| IRQ Name | Description |
|-----------------------|--|
| Resynchronization_IRQ | Resynchronization in video mode |
| TA_TO_IRQ | Turnaround timer expired |
| SYNC_LOST_IRQ | Synchronization with video port is lost (video mode only). |
| ACK_TRIGGER_IRQ | Acknowledge trigger is received. |
| TE_TRIGGER_IRQ | TE PHY trigger is received. |
| WAKEUP_IRQ | Occurs when the SWakeUp signal is asserted. |
| HS_TX_TO_IRQ | HS TX time-out Interrupt |
| LP_RX_TO_IRQ | LS RX time-out Interrupt |
| COMPLEXIO_ERR_IRQ | Error signaling from complex I/O: The interrupt is triggered when an error is received from the complex I/O (events are defined in DSI_COMPLEXIO_IRQSTATUS). |
| PLL_RECAL_IRQ | PLL recalibration event (assertion of DSIRecal signal from the DSI PLL control module) |
| PLL_UNLOCK_IRQ | PLL un-lock event (deassertion of DSILock signal from the DSI PLL control module) |
| PLL_LOCK_IRQ | PLL lock event (assertion of DSILock signal from the DSI PLL control module) |
| VIRTUAL_CHANNEL3_IRQ | VC 3 error signaling from DSI VC 3: The interrupt is triggered when an error is received from DSI VC 3 (events are defined in DSI_VC_IRQENABLE_i register, where i = 3). |
| VIRTUAL_CHANNEL2_IRQ | VC 2 error signaling from DSI VC 2: The interrupt is triggered when an error is received from DSI VC 2 (events are defined in DSI_VC_IRQENABLE_i register, where i = 2). |
| VIRTUAL_CHANNEL1_IRQ | VC 1 error signaling from DSI VC 1: The interrupt is triggered when an error is received from DSI VC 1 (events are defined in DSI_VC_IRQENABLE_i register, where i = 1). |
| VIRTUAL_CHANNEL0_IRQ | VC 0 error signaling from DSI VC 0: The interrupt is triggered when an error is received from DSI VC 0 (events are defined in DSI_VC_IRQENABLE_i register, where i = 0). |
| TE0_LINE_IRQ | TE detected on TE0 CMOS input signal |
| TE1_LINE_IRQ | TE detected on TE1 CMOS input signal |

Copyright © 2011, Texas Instruments Incorporated

Table 10-485. Register Access Width Limitations

| Register Name | Register Access Width |
|--|-----------------------|
| All DSI complex I/O registers (DSI_PHY SCP) | 32-bit only |
| All DSI PLL control module registers | 32-bit only |
| DSI_VC_LONG_PACKET_HEADER_i | 32-bit only |
| DSI_VC_SHORT_PACKET_HEADER_i | 32-bit only |
| DSI_VC_LONG_PACKET_PAYLOAD_i | 16- and 32-bit |
| All other DSI protocol engine registers | 8-, 16-, and 32-bit |

CAUTION

If a different access width than listed in [Table 10-485](#) is used, an interface error is generated in response to the write using SResp = ERR.

The DSI protocol engine is globally controlled by the [DSI_CTRL](#) register. The interface to the complex I/O is enabled by setting the [DSI_CTRL\[0\] IF_EN](#) bit. When the interface is disabled, it is possible to provide data to the TX FIFO and read pending data in the RX FIFO. When the [DSI_CTRL\[0\] IF_EN](#) bit is set to 1, the pending packets are sent to the DSI complex I/O, and the data transfer from the video port is ignored until the first vertical sync event is received.

When the [DSI_CTRL\[0\] IF_EN](#) bit is reset by software, the DSI protocol engine must finish the transfer of the pending data in the TX FIFO and wait for a response if BTA has been sent (the protocol engine is in receive mode); hardware then resets the [DSI_CTRL\[0\] IF_EN](#) bit. When using video mode, the VC associated with the video port must be enabled before enabling the interface according to the following sequence:

1. The [DSI_CTRL\[0\] IF_EN](#) bit is equal to 0.
2. Enable the VC associated with video mode by setting the [DSI_VC_CTRL_i\[0\] VC_EN](#) bit.
3. Set the [DSI_CTRL\[0\] IF_EN](#) bit to 1.

10.3.4.4.3 DSI Transfer Modes

Two main transfer modes are supported by the DSI modules:

- Video mode: Pixels are received from the video port (VP1 or VP2.) There are some real-time constraints (pixels must be sent at the pixel frequency required by the panel module).
- Command mode: Pixels can be received from the video port or from the L3 interconnect slave port. There are no real-time constraints except that the TE must be avoided by starting the transfer at the correct time during the scan of the display and that it must be fast enough.

10.3.4.4.3.1 Video Mode

Video mode refers to the MIPI display pixel interface (DPI) standard. The sync events and pixels must be sent according to the display mode timings. Data is received from the video ports. The DISPC fetches the data from the system memory and provides it to the DSI protocol engine through VP1 or VP2. The short packets used for the sync event use precalculated 32-bit values. The long packets are constructed using the header defined in the [DSI_VC_LONG_PACKET_HEADER_i](#) registers. In case of synchronization short packets for video mode, because hardware generates short packets without using the [DSI_VC_SHORT_PACKET_HEADER_i](#) register, if the [DSI_VC_CTRL_i\[8\] ECC_TX_EN](#) bit is set, the ECC is calculated; otherwise, 0 is used. The feature is used to generate incorrect ECC for debug purpose and to ease the check of the link and peripheral error detection and correction.

The [DSI_VM_TIMING1](#) through [DSI_VM_TIMING8](#) registers define the timings of the video mode.

The [DSI_VM_TIMING2\[27:24\] WINDOW_SYNC](#) bit field defines the synchronization period. The recommended value is 0x4 based on the implementation of the resynchronization scheme.

The [DSI_CTRL\[20\] BLANKING_MODE](#) bit defines whether long blanking packets or LPS are used during the blanking periods (except HFP, HBP, and HSA defined by other bits) when there is no pending data in TX FIFO ready to be sent. Software must ensure that there is no data in the TX FIFO, no BTA, no RESET trigger sent, and the [DSI_VC_CTRL_i\[9\] MODE_SPEED](#) bit is set to 1 (HS mode) to keep the video mode transfer in HS mode during blanking periods (except for the last blanking period, because it is required to go to LPS at least once per frame).

The [DSI_CTRL\[21\] HFP_BLANKING_MODE](#), [DSI_CTRL\[22\] HBP_BLANKING_MODE](#), and [DSI_CTRL\[23\] HSA_BLANKING_MODE](#) bits define whether during these blanking packets data from TX FIFO or long blanking packets are sent.

To ensure that the writes to the [DSI_VC_LONG_PACKET_HEADER_i](#) register are handled correctly as header information for video mode long packets, the following registers must be programmed:

- [DSI_VC_CTRL_i\[0\] VC_EN](#) bit set to 0
- [DSI_VC_CTRL_i\[4\] MODE](#) bit set to 1
- [DSI_VC_LONG_PACKET_HEADER_i](#) register access
- [DSI_VC_CTRL_i\[0\] VC_EN](#) bit set to 1

NOTE: The hardware ignores [DSI_VC_CTRL_i\[1\] SOURCE](#) and [DSI_VC_CTRL_i\[9\] MODE_SPEED](#) bits when video mode is selected (the [DSI_VC_CTRL_i\[4\] MODE](#) bit set to 1).

The [SYNC_LOST_IRQ](#) and [RESYNCHRONIZATION_IRQ](#) interrupt events indicate whether the DSI protocol engine has not been able to resynchronize the video port timing to its own timing base or if it has been done. The [RESYNCHRONIZATION_IRQ](#) indicates to the software user that the video port works but the configuration of the timings for the DISPC and for DSI protocol engine may need to be modified to avoid the resynchronization. The [SYNC_LOST_IRQ](#) and [RESYNCHRONIZATION_IRQ](#) events can be respectively monitored in [DSI_IRQSTATUS\[18\] SYNC_LOST_IRQ](#) and [DSI_IRQSTATUS\[5\] RESYNCHRONIZATION_IRQ](#) status bits.

10.3.4.4.3.2 Command Mode

The command mode refers to the MIPI display command set (DCS) standard. The commands, parameters, and pixels are sent to the display module with limited real-time constraints (as defined in [Section 10.3.4.4.3.1, Video Mode](#)). The pixels can be provided on one of the two video ports by the DISPC or on the L3 interconnect slave port.

The [DSI_VC_LONG_PACKET_HEADER_i](#) registers are used for the header of long packets; the [DSI_VC_SHORT_PACKET_HEADER_i](#) registers are used for the short packets.

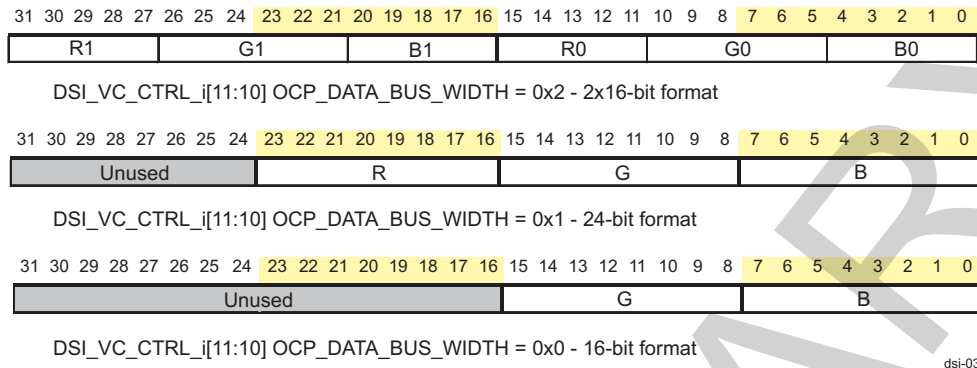
For the payload, the [DSI_VC_LONG_PACKET_PAYLOAD_i](#) register is used. Each 32-bit payload data is written to the [DSI_VC_LONG_PACKET_PAYLOAD_i](#) register from the MPU subsystem or sDMA. It is buffered to send packets with higher rate than the L3 interconnect frequency can provide. If [DSI_VC_CTRL_i\[30\] DCS_CMD_ENABLE](#) = 1, the word count defined in the [DSI_VC_LONG_PACKET_HEADER_i](#) register is used to determine the number of bytes to be sent using the [DSI_VC_LONG_PACKET_PAYLOAD_i](#) register minus the size of the DCS command header added by the protocol engine at the beginning of the payload (also sent using the [DSI_VC_LONG_PACKET_PAYLOAD_i](#) register). If [DSI_VC_CTRL_i\[30\] DCS_CMD_ENABLE](#) = 0, the word count defined in the register [DSI_VC_LONG_PACKET_HEADER_i](#) register is used to determine the number of bytes to be sent using the [DSI_VC_LONG_PACKET_PAYLOAD_i](#) register.

The [DSI_VC_CTRL_i\[11:10\] OCP_DATA_BUS_WIDTH](#) bit field is used to define the size of the data on the L3 interconnect slave port for the write access (read access to the RX FIFO is not affected by the bit field value):

- 0x0: 16-bit data width (LSB of the 32-bit interface port data bus)
- 0x1: 24-bit data width (LSB of the 32-bit interface port data bus)
- 0x2: 2x16-bit data width (first pixel on the LSB of the 32-bit Interface port data bus and second pixel on the MSB of the 32-bit interface port data bus for the same interface access)
- 0x3: 32-bit data width (no bit, no byte, no pixel manipulation)

Figure 10-125 shows the different data width configurations of the L3 interconnect slave port.

Figure 10-125. Interface Data Configuration



NOTE: To provide 18-bit pixel loosely packed format to the L3 interconnect slave port, the [DSI_VC_CTRL_i\[11:10\] OCP_DATA_BUS_WIDTH](#) bit field must be set to 0x1. The 18-bit pixel packed format is not supported in case of command mode on the L3 interconnect slave port.

The write into the [DSI_VC_LONG_PACKET_HEADER_i](#) register is required before accessing the [DSI_VC_LONG_PACKET_PAYLOAD_i](#) register. The DSI protocol engine must extract the length of the payload and discard the extra data sent using the [DSI_VC_LONG_PACKET_PAYLOAD_i](#) register. Writes into the [DSI_VC_LONG_PACKET_HEADER_i](#) register are valid only if the VC is enabled; otherwise, the write is ignored. When receiving pixels on the video port, only the [DSI_VC_LONG_PACKET_HEADER_i](#) register is used. The video port pixels are used for the payload.

10.3.4.4.3.2.1 Command Mode TX FIFO

The single TX FIFO is used to store data from the L3 interconnect before sending it to the panel. The configuration of the FIFO for a specific VC must be done only when the VC is disabled.

The VC must not be enabled when data is still pending in the TX FIFO for the corresponding space allocated for the VC from the previous active period. When the VC space in the TX FIFO is empty, the VC can be enabled.

For each VC, two dedicated registers ([DSI_VC_LONG_PACKET_HEADER_i](#) and [DSI_VC_LONG_PACKET_PAYLOAD_i](#)) are used to provide data for long packets. The [DSI_VC_SHORT_PACKET_HEADER_i](#) register is used to provide data for short packets (32 bits long).

For each long packet, the [DSI_VC_LONG_PACKET_HEADER_i](#) register must be written first, and then the [DSI_VC_LONG_PACKET_PAYLOAD_i](#) register. The only exception is when the word count defined in the header equals 0. In that case, it is not required to write into the payload register. For consecutive long packets, the header must be written into the [DSI_VC_LONG_PACKET_HEADER_i](#) register even if the value remains the same.

The TX FIFO stores all the pending bytes to be sent to the peripheral(s). Multiple receivers can be addressed using the VC capability.

The 32-bit write requests for each VC to the TX FIFO are kept in order while sending the data to the DSI_PHY inside the VC requests. The only exception is the last 32-bit write for the last bytes of the payload data, because it can be 1, 2, 3, or 4 bytes.

When the last transfer is a 32-bit write, but the number of valid bytes is only 1, 2, or 3 (calculated using the header word count and the number of bytes are received for the payload), hardware stores the 32-bit value into the TX FIFO but the invalid bytes are not sent and are discarded.

When the word count defined in the [DSI_VC_LONG_PACKET_HEADER_i](#) register is not a multiple of the request threshold value defined in the [DSI_VC_CTRL_i\[19:17\] DMA_TX_THRESHOLD](#) bit field, 32-bit requests and/or bytes are discarded by hardware to store in FIFO only the exact number of valid bytes.

The triggering event to send data to the DSI link is one of the following events:

- All bytes have been received in the FIFO (header + payload).
- The space of the FIFO allocated for the VC is full.
- The space of the FIFO allocated for the VC is not enough to request more data using DMA request (the threshold value is bigger than the space left in the TX FIFO for the VC).
- When the VC is disabled, the remaining bytes in the FIFO are sent to the DSI link.

NOTE: In case video mode is active, the blanking period must be large enough to allow the transfer of the packet(s).

Sequential arbitration must be set ([DSI_CTRL\[3\]](#) bit TX_FIFO_ARBITRATION = 0x1) if only one VC is used to send multiple packets during the same blanking period.

When consecutive packets should be sent in HS mode, to ensure that there is no LP transition between them, at least one of the following conditions must be valid:

- Packets from the same VC
- Short packets or long packets with a payload size multiple of 4 bytes

To stop a transfer immediately when packets are being transferred from the TX FIFO to DSI_PHY, a flush of the FIFO is necessary. It can be required in a dead-lock situation to flush the FIFO even if bytes are still in the FIFO. In that case, it is necessary to ensure having a known state of the whole DSI protocol engine module (software reset may be required) to start of new transfer through the TX FIFO.

To flush the FIFO (discard the data) for some pending bytes:

1. Change the size of the space of FIFO to 0 by writing [DSI_TX_FIFO_VC_SIZE](#) [VCi_FIFO_SIZE](#) bit fields (where i is the VC number from 0 to 3).
2. Disable the VC by resetting the [DSI_VC_CTRL_i\[0\]](#) VC_EN bit to 0.
3. Wait for [DSI_VC_CTRL_i\[15\]](#) VC_BUSY = 0 (VC_BUSY is set to 0 after TX FIFO flush is done).

It is necessary to check that there is no pending request before changing the size of the allocated FIFO for the VC by reading the relevant [DSI_VC_CTRL_i\[15\]](#) VC_BUSY bit or by using the interrupt PACKET_SENT_IRQ. This interrupt is monitored by reading the [DSI_VC_IRQSTATUS_i\[2\]](#) PACKET_SENT_IRQ status bit.

The [DSI_CTRL\[3\]](#) TX_FIFO_ARBITRATION bit defines the arbitration scheme:

- Round-robin between enabled VCs with pending ready requests (that is, all bytes for the packets are in the FIFO or the space of the FIFO for the VC is full) starting from the VC that has the lowest VC ID number.
- Sequential: All the pending ready requests for one VC are sent before moving to another VC. The condition of "space of the FIFO is full" is evaluated after the end of each packet.

To use in-order for all requests for all channels, a single VC must be used. (The VC ID defined in the header provided to hardware using the [DSI_VC_LONG_PACKET_HEADER_i](#) or [DSI_VC_SHORT_PACKET_HEADER_i](#) register is not used and not modified by the DSI protocol engine.)

The [DSI_TX_FIFO_VC_SIZE](#) register defines the allocated number of 33-bit values for each VC in the TX FIFO and the start address for each VC. The size of the space allocated in the TX FIFO is defined by the [DSI_TX_FIFO_VC_SIZE](#) register - [VCi_FIFO_SIZE](#) bit fields. It must be a multiple of the threshold defined in the [DSI_VC_CTRL_i\[19:17\]](#) DMA_TX_THRESHOLD bit field. To change the size of the space of the memory allocated for a specific VC, the VC must be disabled by setting the [DSI_VC_CTRL_i\[0\]](#) VC_EN bit to 0. The whole FIFO cannot be used by all the VCs at the same time because a VC can be disabled to change one or multiple parameters. Software users must configure the start address and size for each VC correctly.

[Table 10-486](#) lists the corresponding values for the size of the space allocated in the FIFO.

Table 10-486. VC TX FIFO Size Values

| DSI_TX_FIFO_VC_SIZE.VCi_FIFO_SIZE (where i = 0, 3) | Space Size (up to the Size of the FIFO) |
|--|---|
| 0 | 0 x 33 bits |
| 1 | 32 x 33 bits |
| 2 | 64 x 33 bits |
| 3 | 96 x 33 bits |
| 4 | 128 x 33 bits |

NOTE: TX FIFO is 128 x 33 bits. Therefore, the sum of all VC FIFO allocations cannot exceed 128 x 33 bits.

CAUTION

Bit 32 of each location in the FIFO is used by the DSI protocol engine to tag the data in the TX FIFO. It is for internal use only.

Table 10-487 lists the start address of the space in the FIFO.

Table 10-487. VC TX FIFO Start Address

| DSI_TX_FIFO_VC_SIZE.VCx_FIFO_ADD (where x = 0, 2) | Start Address |
|---|---------------|
| 0 | 0 |
| 1 | 32 |
| 2 | 64 |
| 3 | 96 |
| 4 | 128 |

CAUTION

The different VC spaces must not overlap.

When the TX FIFO is full:

- The overflow interrupt (FIFO_TX_OVF_IRQ) is generated in the [DSI_VC_IRQSTATUS_i\[3\]](#) FIFO_TX_OVF_IRQ status bit.
- There is no L3 interconnect error generated.
- The interface commands are accepted but the data are not written into the FIFO.

To ensure that all writes are stored correctly in the TX FIFO, the FIFO must not be full. The room in the space allocated for the VC in the TX FIFO is given in the [DSI_TX_FIFO_VC_EMPTYNESS](#) register. When there is no space allocated in the TX FIFO for the VC, the [DSI_TX_FIFO_VC_EMPTYNESS](#) register indicates a value of 0 for the VC space emptiness.

While waiting to receive the first VSYNC event on the video port to start video mode on the DSI link, no command data from TX FIFO is sent on the interface. This is required to ensure that, when receiving the VSYNC event, there is no ongoing command mode transfer that could delay the start of video mode on the the DSI link.

10.3.4.4.3.2.2 Command Mode RX FIFO

The RX FIFO stores the data received from the DSI complex I/O. The data are always packed in the RX FIFO (single or multiple packets received during single or multiple BTA periods).

The read requests (single or burst) can be less than, equal to, or greater than the packet size. If the packet size is smaller than the read request, the following packet(s) is also transferred. If the packet size is longer than the read request, only part of the packet is transferred. In that case, the logic keeps the VC information to provide the rest of the data during the next read request(s).

The [DSI_RX_FIFO_VC_SIZE](#) register defines the allocated number of 33-bit values for each VC in the RX FIFO and the start address for each VC. Only the enabled VCs are considered.

To change the size of the memory space allocated for a specific VC, the VC must be disabled by resetting the [DSI_VC_CTRL_i\[0\]](#) VC_EN bit to 0. The entire FIFO cannot be used by the entire VC at the same time because a VC can be disabled to change one or multiple parameters. Software users must configure the start address and size for each VC correctly.

Table 10-488 lists the corresponding values for the size of the space allocated in the FIFO:

Table 10-488. VC RX FIFO Size Values

| DSI_RX_FIFO_VC_SIZE .VCi_FIFO_SIZE (where i = 0, 3) | Space Size (up to the size of the FIFO) |
|---|---|
| 0 | 0 x 33 bits |
| 1 | 32 x 33 bits |
| 2 | 64 x 33 bits |
| 3 | 96 x 33 bits |
| 4 | 128 x 33 bits |

NOTE: RX FIFO is 128 x 33 bits. Therefore, the sum of all VC FIFO allocations cannot exceed 128 x 33 bits.

CAUTION

Bit 32 of each location in the FIFO is used by the DSI protocol engine to tag the data in the RX FIFO. It is for internal use only.

Table 10-489 lists the start address of the space in the FIFO.

Table 10-489. VC RX FIFO Start Address

| DSI_RX_FIFO_VC_SIZE .VCx_FIFO_ADD (where x = 0, 2) | Start Address |
|--|---------------|
| 0 | 0 |
| 1 | 32 |
| 2 | 64 |
| 3 | 96 |
| 4 | 128 |

CAUTION

The different VC spaces must not overlap.

While reading the received bytes in the RX FIFO, only the [DSI_VC_SHORT_PACKET_HEADER_i](#) register is used, because hardware does not keep track of the header position for long packets and the start/end of each packet. Software must extract the information from the bytes read from the RX FIFO. There is no specific hardware to track the received bytes in the RX FIFO. The [DSI_VC_LONG_PACKET_HEADER_i](#) and [DSI_VC_LONG_PACKET_PAYLOAD_i](#) registers are not used.

The ECC is used only by the first header when receiving multiple packets during the same LP RX transfer from the peripheral because the DSI protocol engine does not parse the header to identify the length of the packets. In case of multiple packets, the checksum is not enabled because hardware checks the checksum considering a single packet. The ECC in the first header is used to correct and check the header. For the following headers in the same LP RX transfer, hardware does not detect a header and cannot check and/or detect errors in the headers of the packets except for the first packet.

When the RX FIFO is empty:

- No interface error is generated.
- Commands are accepted and the data for the responses are 0s.

10.3.4.4.3.2.3 Command Mode DMA Requests

The DMA requests (DSI_DMA_REQ) are used to allow automatic transfer by the sDMA or MPU (with less efficiency and throughput capability) from the DSI RX FIFO to the system memory and from the system memory to the DSI TX FIFO. Two independent DMA requests for RX FIFO and TX FIFO for the same VC are supported. The read and write accesses can use burst structure.

The thresholds used for requests for the TX FIFO and RX FIFO are programmable through the [DSI_VC_CTRL_i\[19:17\] DMA_TX_THRESHOLD](#) and [DSI_VC_CTRL_i\[26:24\] DMA_RX_THRESHOLD](#) bit fields for TX FIFO and RX FIFO, respectively. DMA requests are asserted on the threshold value. The size of the space allocated in TX FIFO for each VC must be a multiple of the value of the [DSI_VC_CTRL_i\[19:17\] DMA_TX_THRESHOLD](#) bit field.

In the case of TX FIFO, if all the bytes defined by the word count field in the [DSI_VC_LONG_PACKET_HEADER_i](#) register are received, the DMA request is no longer asserted. Even during the last transfer, less than the DMA_TX_THRESHOLD number of bytes are received because the word count is not a multiple of the DMA_TX_THRESHOLD value.

In the case of RX FIFO, while the DMA request is used to transfer the data from the RX FIFO to the system memory, the sDMA must be programmed to read the exact number of received bytes in the FIFO. If users do not know the size of the received bytes, the direct access of the RX FIFO through the [DSI_VC_SHORT_PACKET_HEADER_i](#) register is performed until the [DSI_VC_CTRL_i\[20\] RX_FIFO_NOT_EMPTY](#) bit goes to 0.

The only exception is when the LP data transfer finishes and the threshold value is not reached. In this case, the DMA request is asserted. The drain of the FIFO is supported in that configuration to empty the FIFO even if the number of data received is not a multiple of the threshold value.

The use of each DMA request is programmable by software. The [DSI_VC_CTRL_i\[23:21\] DMA_TX_REQ_NB](#) bit field is dedicated to DMA request numbering for the TX FIFO. The [DSI_VC_CTRL_i\[29:27\] DMA_RX_REQ_NB](#) bit field is dedicated to DMA request numbering for the RX FIFO.

When the DMA request is used to indicate the number of 32-bit values ready in the RX FIFO that BTA has received from the peripheral, which indicates an end of the transfer from the peripheral to the host for a transfer to the system memory, the DMA request that corresponds to the VC ID is generated.

The sDMA transfers the number of 32-bit values defined in the threshold register or the exact number of bytes received from the peripheral (the user must know the number of expected received bytes to program the sDMA correctly). When the sDMA transfers a multiple number of threshold values, the DSI protocol engine sends 0s for the data when there is no more received data in the RX FIFO for the VC. Software users must parse the data and determine the valid bytes.

The size of the DMA transfer can be determined by reading the [DSI_RX_FIFO_VC_FULLNESS](#) register. The BTA interrupt (BTA_IRQ) must be used to know when to read the number of received bytes. The BTA interrupt must be monitored by reading the [DSI_VC_IRQSTATUS_i\[5\] BTA_IRQ](#) status bit. The DMA request must not be enabled until the sDMA is programmed with the correct number of data to read from RX FIFO.

This method must also be used when the RX FIFO space for the VC is expected to overflow because the expected number of data to be received is greater than the space allocated for the VC. Instead, the DMA request is asserted as soon as the threshold is reached or when BTA is received.

When the DMA request is used to indicate the number of 33-bit entries empty in the TX FIFO for a transfer from the system memory, the DMA request corresponding to the VC ID is generated.

NOTE: For the most efficient transfer, the size of the request (read or write, single or burst) must be aligned with the threshold value.

Concurrent access using interlaced requests (read/write) to the TX and RX FIFO is supported for the same VC ID or different VC IDs.

10.3.4.4.3.3 Video + Command Mode

The two modes can be interlaced to send two DSI streams to two types of panels: video or command. The number of concurrent video streams is limited to one. The number of concurrent command mode streams is limited to four when there is no video stream, and three when there is a video stream.

- For DSI1, which has two video ports (see [Section 10.3.4.4.5, Video Port Interface](#)), it is possible to send video or command mode streams from DISPC to DSI1 primary video port (VP1), and a command stream on the secondary VP (VP2) for interleaving. In addition, it is also possible to send concurrently a command mode stream on the L3 Interconnect slave port for interleaving.
- For DSI2, which has one video port, it is possible to send a video stream or a command mode stream from DISPC to DSI2 primary VP (VP1). There is no secondary VP. Interleaving of command mode transfers is only possible through L3 Interconnect slave port.

10.3.4.4.3.4 Burst Mode

Frequency and transparent burst modes are supported:

- Frequency burst mode is used to reduce the HS period by increasing the clock frequency on the DSI link. In some cases, it reduces power consumption on the link. The non-HS period used typically to drive the main panel can be used to send data to the secondary panel or to allow feedback (acknowledge) from the primary and secondary panels. The DSI protocol engine must buffer a full line before sending the HS packets for the line. A double-buffering mechanism is required to send a line while the following one is being received on the video port. For more information about double-buffering, see [Section 10.3.4.4.5.4, Ping-Pong Buffer](#).
- The transparent burst mode is used by increasing the pixel clock frequency generated by the DISPC with an increase of the horizontal blanking period.

10.3.4.4.3.5 Interleaving Mode

Video mode can output command mode packets, which are provided to DSI through the L3 interconnect, during the blanking periods of the video stream sequence on the PPI link. These command mode packets can be programmed as HS packets or low-power packets.

During a video stream sequence on the PPI link, four types of gap exist:

- BLLP gap: Blanking period during VSA, VBP, and VFP lines
- HSA gap: Blanking period during VACT lines; always between HS and HE short packet
- HBP gap: Blanking period during VACT lines; always between HS/HE short packet and data pixel long packet
- HFP gap: Blanking period during VACT lines; always between data pixel long packet and the end of the current VACT line

To perform interleaving in a particular gap, video mode must be set to go into LPS during the blanking gap. Each type of gap has separate configurable register bits that determine whether a blanking long packet will be sent or the link will go into LPS during the gap on the PPI link. If LPS is set during a gap, the DSI module performs interleaving during that period.

Two set of registers are available for:

- HS interleaving (when HS command mode packets must be sent during a video stream on the PPI link)

- Low-power interleaving (when low-power command mode packets must be sent during a video stream on the PPI link)

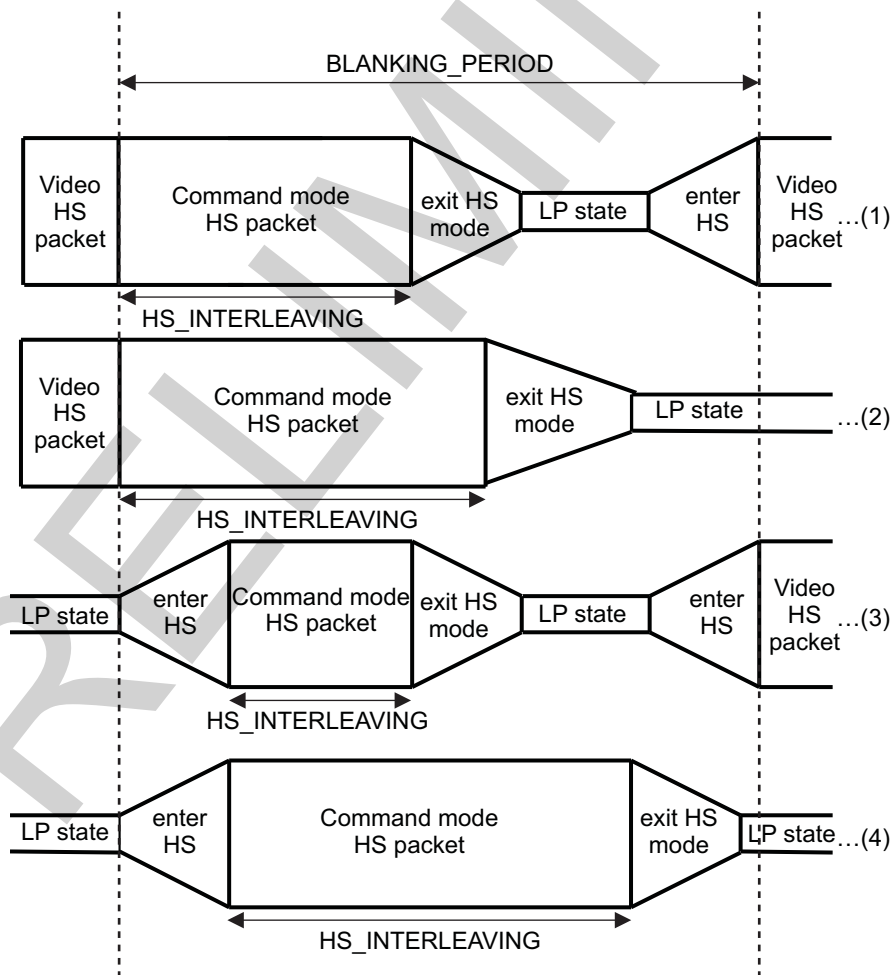
10.3.4.4.3.5.1 HS Command Mode Interleaving

Figure 10-126 shows the various HS mode scenarios in interleaving mode during a blanking gap. For each type of blanking gap, a dedicated bit field determines the number of TXBYTECLKHS clock cycles used for interleaving in HS command mode packets.

- The [DSI_VM_TIMING6](#)[31:16] BL_HS_INTERLEAVING bit field defines the number of TXBYTECLKHS clock cycles used to interleave HS command mode packets during a BLLP gap.
- The [DSI_VM_TIMING4](#)[7:0] HBP_HS_INTERLEAVING bit field defines the number of TXBYTECLKHS clock cycles used to interleave HS command mode packets during an HBP gap.
- The [DSI_VM_TIMING4](#)[15:8] HFP_HS_INTERLEAVING bit field defines the number of TXBYTECLKHS clock cycles used to interleave HS command mode packets during an HFP gap.
- The [DSI_VM_TIMING4](#)[23:16] HSA_HS_INTERLEAVING bit field defines the number of TXBYTECLKHS clock cycles used to interleave HS command mode packets during an HSA gap.

These programmable values must be programmed to satisfy the timings for the clock and data lane to enter and exit HS mode latency. According to the scenario, different equations must be considered when calculating the register values.

Figure 10-126. HS Command Mode Interleaving



dsi-327

NOTE: For calculations and equations, the following abbreviations are used: EXIT_CLK_HS_MODE represents the exit HS mode latency for the clock lane. There is no dedicated register for this value but the programmer must know this value for further calculations:

$$\text{EXIT_CLK_HS_MODE} = T_{\text{CLK-TRAIL}} + T_{\text{S-EXIT}}$$

NOTE: For more information about other timing parameters used in the following equations, see [Section 10.3.4.4.4.1, Timing Parameters for an LP to HS Transaction](#), and [Section 10.3.4.4.4.2, Timing Parameters for an HS to LP Transaction](#).

For the following equations, BLANKING_PERIOD represents the BLLP, HSA, HBP, or HFP blanking periods. The HS_INTERLEAVING period represents the maximal period HS command mode packets. Its value is set in the BL_HS_INTERLEAVING, HSA_HS_INTERLEAVING, HBP_HS_INTERLEAVING, or HFP_HS_INTERLEAVING bit fields, depending on the blanking type.

In each scenario, two calculations are present, depending on the value of the [DSI_CLK_CTRL\[13\]](#) DDR_CLK_ALWAYS_ON bit:

- DDR_CLK_ALWAYS_ON = 1: Clock lane is always active.
- DDR_CLK_ALWAYS_ON = 0: Clock lane is activated only when there are HS packets to be sent on the PPI link.

CAUTION

When the DDR_CLK_ALWAYS_ON bit is programmed to 1, the following must be considered:

- LP state can be achieved on the PPI link only if the data lane has enough time to go out from HS mode and enter a new HS mode during a period inside which the PPI link is meant to be in LP state.
- This can be expressed with the following equation:

$$\text{EXIT_HS_MODE_LATENCY} + \max\{\text{ENTER_HS_MODE_LATENCY}, 2\} + 1 \leq \text{BLANKING_PERIOD}$$
- If the equation cannot be satisfied, because the LP state period is too short, software must program the DSI module in a way that during this blanking period a HS blanking packet is sent.

When the DDR_CLK_ALWAYS_ON bit is programmed to 0, the following must be considered:

- LP state can be achieved on the PPI link only if the data and clock lanes have enough time to go out from HS mode and enter a new HS mode during a period inside which the PPI link is meant to be in LP state.
- This can be expressed with the following equations:

$$\text{EXIT_HS_MODE_LATENCY} + \max\{\text{ENTER_HS_MODE_LATENCY}, 2\} + 1 \leq \text{BLANKING_PERIOD}$$

$$\text{DDR_CLK_POST} + \text{EXIT_CLK_HS_MODE} + \text{DDR_CLK_PRE} + \text{ENTER_HS_MODE_LATENCY}(\text{data lane}) + 1 \leq \text{BLANKING_PERIOD}$$
- If both equations cannot be satisfied, because the LP state period is too short, software must program the DSI module in a way that during this blanking period a HS blanking packet is sent.

- Scenario 1: The gap for interleaving starts and ends with a regular video stream HS packet.
 - DDR_CLK_ALWAYS_ON = 1

$$\text{HS_INTERLEAVING} = \text{BLANKING_PERIOD} - (\text{EXIT_HS_MODE_LATENCY} + \max\{\text{ENTER_HS_MODE_LATENCY}, 2\} + 1)$$
 - DDR_CLK_ALWAYS_ON = 0

$$HS_INTER1 = BLANKING_PERIOD - (EXIT_HS_MODE_LATENCY + \max\{ENTER_HS_MODE_LATENCY, 2\} + 1)$$

$$HS_INTER2 = BLANKING_PERIOD - (DDR_CLK_POST + EXIT_CLK_HS_MODE + DDR_CLK_PRE + ENTER_HS_MODE_LATENCY + 1)$$

$$HS_INTERLEAVING = \min\{HS_INTER1, HS_INTER2\}$$

- Scenario 2: The gap for interleaving starts with a regular video stream HS packet and ends in LPS.
 - $DDR_CLK_ALWAYS_ON = 1$
 $HS_INTERLEAVING = BLANKING_PERIOD - (EXIT_HS_MODE_LATENCY + 3)$
 - $DDR_CLK_ALWAYS_ON = 0$
 $HS_INTER1 = BLANKING_PERIOD - (EXIT_HS_MODE_LATENCY + 3)$
 $HS_INTER2 = BLANKING_PERIOD - (DDR_CLK_POST + EXIT_CLK_HS_MODE + 3)$
 $HS_INTERLEAVING = \min\{HS_INTER1, HS_INTER2\}$
- Scenario 3: The gap for interleaving starts with the LPS and ends with a regular video stream HS packet.
 - $DDR_CLK_ALWAYS_ON = 1$
 $HS_INTERLEAVING = BLANKING_PERIOD - (ENTER_HS_MODE_LATENCY + EXIT_HS_MODE_LATENCY + \max\{ENTER_HS_MODE_LATENCY, 2\} + 1)$
 - $DDR_CLK_ALWAYS_ON = 0$
 $HS_INTER1 = BLANKING_PERIOD - (DDR_CLK_PRE + ENTER_HS_MODE_LATENCY + EXIT_HS_MODE_LATENCY + \max\{ENTER_HS_MODE_LATENCY, 2\} + 1)$
 $HS_INTER2 = BLANKING_PERIOD - (DDR_CLK_PRE + ENTER_HS_MODE_LATENCY + DDR_CLK_POST + EXIT_CLK_HS_MODE + DDR_CLK_PRE + ENTER_HS_MODE_LATENCY + 1)$
 $HS_INTERLEAVING = \min\{HS_INTER1, HS_INTER2\}$
- Scenario 4: The gap for interleaving starts with the LPS and ends with a regular video stream HS packet.
 - $DDR_CLK_ALWAYS_ON = 1$
 $HS_INTERLEAVING = BLANKING_PERIOD - (ENTER_HS_MODE_LATENCY + EXIT_HS_MODE_LATENCY + 3)$
 - $DDR_CLK_ALWAYS_ON = 0$
 $HS_INTER1 = BLANKING_PERIOD - (DDR_CLK_PRE + ENTER_HS_MODE_LATENCY + EXIT_HS_MODE_LATENCY + 3)$
 $HS_INTER2 = BLANKING_PERIOD - (DDR_CLK_PRE + ENTER_HS_MODE_LATENCY + DDR_CLK_POST + EXIT_CLK_HS_MODE + 1)$
 $HS_INTERLEAVING = \min\{HS_INTER1, HS_INTER2\}$

10.3.4.4.3.5.2 LP Command Mode Interleaving

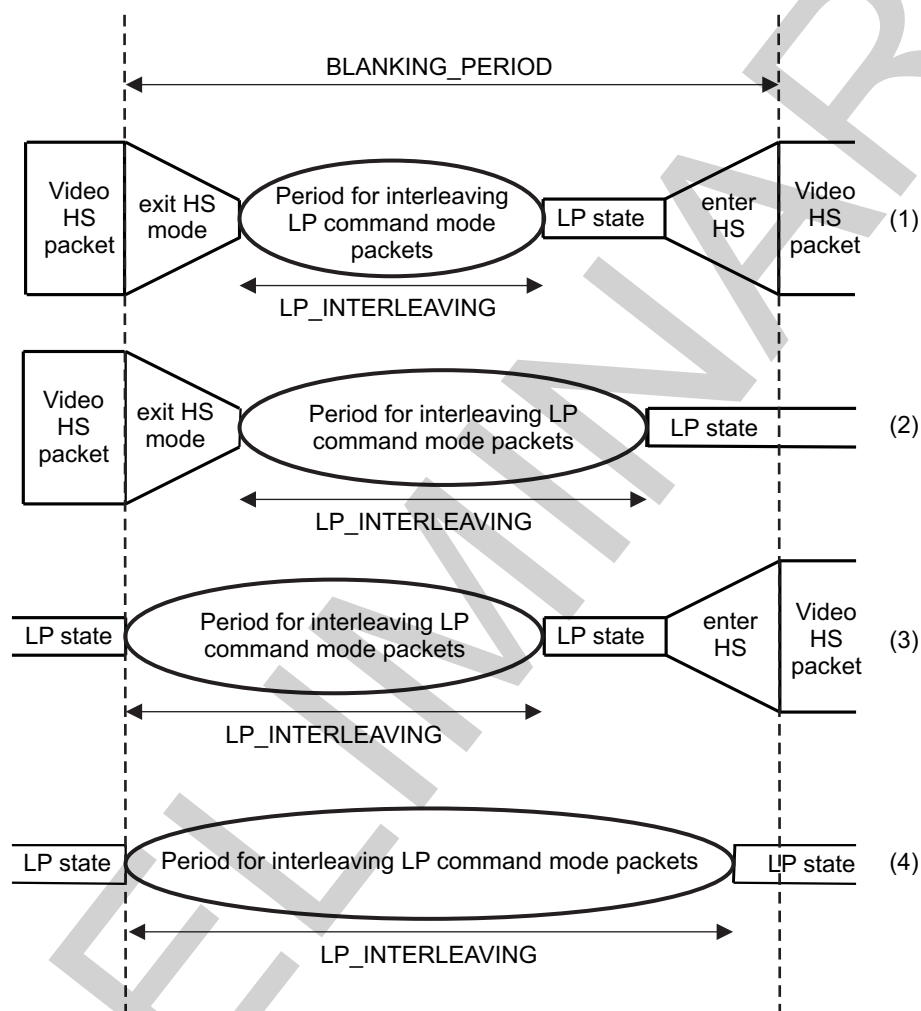
Figure 10-127 shows the various LP mode scenarios in interleaving mode during a blanking gap. For each type of blanking gap, a dedicated bit field determines the number of bytes of LP command mode packets that can be sent during a blanking period.

- The [DSI_VM_TIMING6](#)[15:0] BL_LP_INTERLEAVING bit field defines the number of bytes of LP command mode packets that can be sent during a BLLP gap.
- The [DSI_VM_TIMING5](#)[7:0] HBP_LP_INTERLEAVING bit field defines the number of bytes of LP command mode packets that can be sent during an HBP gap.
- The [DSI_VM_TIMING5](#)[15:8] HFP_LP_INTERLEAVING bit field defines the number of bytes of LP command mode packets that can be sent during an HFP gap.
- The [DSI_VM_TIMING5](#)[23:16] HSA_LP_INTERLEAVING bit field defines the number of bytes of LP command mode packets that can be sent during an HSA gap.

These values must be programmed to satisfy the timings for clock and data lane enter and exit LP mode latency. Clock lane timings do not affect LP command mode interleaving, because the clock lane can be controlled separately, compared with the data lane HS and low-power mutually exclusive control. Clock lanes can be in HS mode while the data lanes are in HS data transfer mode, low-power data transfer mode, or in LPS.

According to this scenario, different equations must be considered for calculating register values.

Figure 10-127. LP Command Mode Interleaving



dsi-328

For the following equations, BLANKING_PERIOD represents the BLLP, HSA, HBP, or HFP blanking periods. The LP_INTERLEAVING period represents the maximal period in LP command mode packets. Its value is set in the BL_LP_INTERLEAVING, HSA_LP_INTERLEAVING, HBP_LP_INTERLEAVING, or HFP_LP_INTERLEAVING bit fields, depending on the blanking type.

ALLOWED_HSBYTE_CLOCKS_FOR_LP represents the number of TXBYTECLKHS clock cycles during which LP interleaving can appear.

To calculate the LP_INTERLEAVING value:

1. Calculate how many TXBYTECLKHS clock cycles can be reserved for LP interleaving during the appropriate blanking video mode gap.
2. Calculate the value of LP_INTERLEAVING according to the results of Step 1.

Step 1:

- Scenario 1: The gap for interleaving starts and ends with a regular video stream HS packet.

$ALLOWED_HSBYTE_CLOCKS_FOR_LP = BLANKING_PERIOD - (EXIT_HS_MODE_LATENCY + \max\{ENTER_HS_MODE_LATENCY, 2\} + 1)$

- Scenario 2: The gap for interleaving starts with a regular video stream HS packet and ends in LPS.
 $ALLOWED_HSBYTE_CLOCKS_FOR_LP = BLANKING_PERIOD - (EXIT_HS_MODE_LATENCY + 1)$

- Scenario 3: The gap for interleaving starts with the LPS and ends with a regular video stream HS packet.

$ALLOWED_HSBYTE_CLOCKS_FOR_LP = BLANKING_PERIOD - (\max\{ENTER_HS_MODE_LATENCY, 2\} + 1)$

- Scenario 4: The gap for interleaving starts with the LPS and ends with a regular video stream HS packet.

$ALLOWED_HSBYTE_CLOCKS_FOR_LP = BLANKING_PERIOD - 1$

After finishing Step 1, the time period available for LP interleaving is known:

$T_{lp_available} = ALLOWED_HSBYTE_CLOCKS_FOR_LP * T_{TXBYTECLKHS}$

Step 2:

The resulting value must be programmed in the appropriate video mode register for LP interleaving.

$$LP_INTERLEAVING < \left\lceil \frac{T_{lp_available} - 8 * T_{hsbyte_clk} - 5 * T_{dsif_clk} - 26}{T_{txclkesc} / 16} \right\rceil$$

dsi-E124

T_{hsbyte_clk} : Period of TXBYTECLKHS clock of DSI_PHY module

T_{dsif_clk} : Period of DSI functional clock

$T_{txclkesc}$: Period of LP transmit escape clock

10.3.4.4.4 Clock Requirements

The serial clock generated by the DSI host and sent to the display can be a continuous clock. The clock lane supports clock transmission even if there is no data to send for displays that require continuous clock. It is software-programmed through the [DSI_CLK_CTRL\[13\] DDR_CLK_ALWAYS_ON](#) bit: This bit can be programmed only when the interface is disabled (the [DSI_CTRL\[0\] IF_EN](#) bit set to 0).

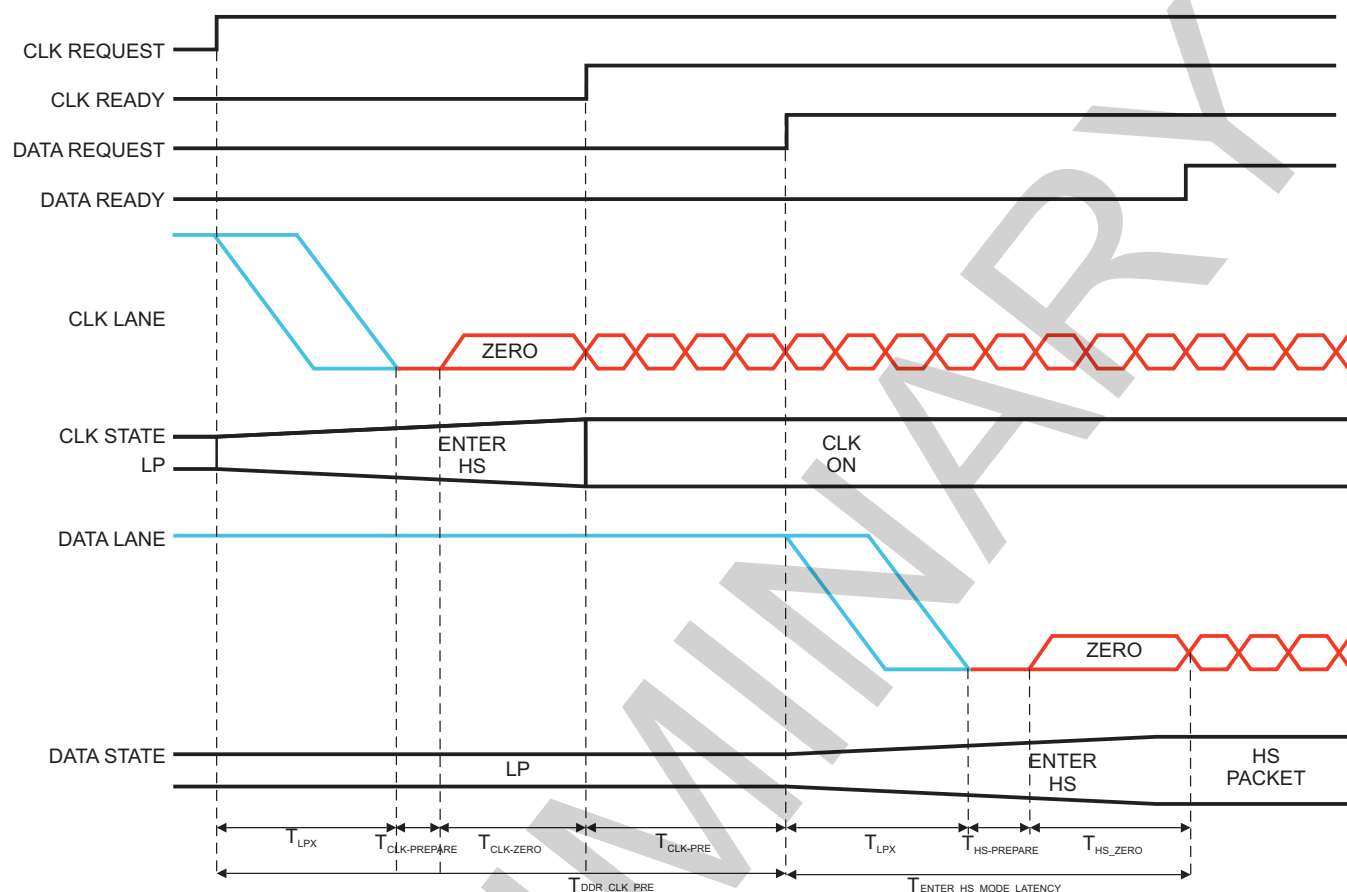
The peripheral can use two different kinds of clocks. The first one is the DDR clock provided on the clock lane. The second clock is some transitions on the data lane 1 even if there is no valid data to send using LP mode.

The LP clock ($TxClkEsc$) frequency provided to the DSI complex I/O is in the range of 67 percent to 150 percent of the peripheral low-power (LP) clock frequency. It is generated internally by the DSI protocol engine module using the DSI functional clock. The DSI functional clock is divided by 1, 2, 3, up to 8191 using the value programmed in the [DSI_CLK_CTRL\[12:0\] LP_CLK_DIVISOR](#) bit field. The LP clock generated from the DSI functional clock must be in the range of 20 MHz to 32 kHz. The duty cycle must be 50/50 (minimum high time = 24ns). LP clock frequency visible on the pads (DP x or DN) is half the frequency of $TxClkEsc$.

The [DSI_CLK_CTRL\[20\] LP_CLK_ENABLE](#) bit is used to enable or disable the clock. When disabled, the value of the [DSI_CLK_CTRL\[12:0\] LP_CLK_DIVISOR](#) bit field is ignored and does not have to be programmed by software users.

10.3.4.4.4.1 Timing Parameters for an LP to HS Transaction

[Figure 10-128](#) shows the timing requirement when switching the data and clock lane state from LP to HS. lists the LP to HS timing parameters.

Figure 10-128. LP to HS Timing

dsi-325

Table 10-490. LP to HS Timing Parameters

| Timings | Description | Registers/Associated Bit Fields | Register Settings | Timing Seen on the Line |
|---|--|--|--|--|
| T_{LPX} | Length of any low-power state period | DSI_PHY_REGISTER1 [20:16] REG_TLPXBY2 The value set in this bit field is half of the T_{LPX} | CEIL (25 ns / DDR_Clock_Period) | CEIL (2 * REG_TLPXBY2/4) * 4 * DDR_Clock_Period |
| $T_{CLK-PREPARE}$ | Time to drive the CLK lane to LP-00 state, to prepare for HS clock transmission | DSI_PHY_REGISTER2 [7:0] REG_TCLKPREPARE | CEIL (65 ns / DDR_Clock_Period) | REG_TCLKPREPARE * DDR_Clock_Period + (~ 25 ns – +5 ns) |
| $T_{CLK-ZERO}$ | Time to drive the CLK lane to HS-0 state, before starting the clock | DSI_PHY_REGISTER1 [7:0] REG_TCLKZERO | CEIL (265 ns / DDR_Clock_Period) | {CEIL [(REG_TCLKZERO + 3)/4] * 4 + CEIL (REG_TCLKPREPARE/ 4) * 4 – REG_TCLKPREPARE + 2} * DDR_Clock_Period + (~ 0 ns – +5 ns) |
| $T_{CLK-PRE}$ | Time that the HS clock must be driven before any associated data lane begins the transition from LP to HS mode | N/A | N/A | DDR_CLK_PRE - T_{LPX} - $T_{CLK-PREPARE}$ - $T_{CLK-ZERO}$ |
| $T_{HS-PREPARE}$ | Time to drive the data lane to LP-00 state, to prepare for HS packet transmission | DSI_PHY_REGISTER0 [31:24] REG_THSPREPARE | CEIL (70 ns / DDR_Clock_Period) + 2 | REG_THSPREPARE * DDR_Clock_Period + (~26.5 ns – + 4 ns) |
| $T_{HS-ZERO} + T_{HS-PREPARE}$ | $T_{HS-ZERO}$: Time to drive the data lane to HS-0 state before the synchronous sequence. | DSI_PHY_REGISTER0 [23:16] REG_THSPRPR_THSZERO | CEIL (175 ns / DDR_Clock_Period) + 2 | {CEIL [(N + 3)/4] * 4 + CEIL (M/4) * 4 + 3} * DDR_Clock_Period + (~ – 29 ns – 0 ns). Where N = REG_THSPREPARE_T HSZERO – REG_THSPREPARE M = REG_THSPREPARE |
| $T_{DDR_CLK_PRE}$ | Time between the CLK lane request assertion and the data request assertion to switch the data lanes to HS | DSI_CLK_TIMING [15:8] DDR_CLK_PRE | CEIL [($T_{LPX} + T_{CLK-PREPARE}$ + $T_{CLK-ZERO} + T_{CLK-PRE}$) / $T_{TXBYTECLKHS}$] ⁽¹⁾⁽²⁾ | |
| $T_{ENTER_HS_MODE_LATENCY}$ ⁽³⁾ | Time to enter data lane into HS mode. | DSI_VM_TIMING7 [31:6] ENTER_HS_MODE_LATENCY | CEIL [($T_{LPX} + T_{HS-PREPARE}$ + $T_{HS-ZERO}$) / $T_{TXBYTECLKHS}$] ⁽¹⁾ | |

⁽¹⁾ The timings seen on the line should be used to determine the register value.

⁽²⁾ See the MIPI D-PHY specification for the $T_{CLK-PRE}$ value.

⁽³⁾ ENTER_HS_MODE_LATENCY timing applies only to video mode. It does not need to be programmed in command mode.

In the example in [Table 10-491](#), the DDR clock = 400 MHz; TxByteClkHS = 100 MHz.

Table 10-491. LP to HS Timing Parameters Example for 400-MHz DDR Clock

| Timings | Registers/Associated Bit Fields | Default Register Settings (Programmed at Reset) | Timing Seen on the Line |
|-------------------|--|---|-------------------------|
| T_{LPX} | DSI_PHY_REGISTER1 [20:16] REG_TLPXBY2 | 10 | 50 ns |
| $T_{CLK-PREPARE}$ | DSI_PHY_REGISTER2 [7:0] REG_TCLKPREPARE | 26 | 40–70 ns |

Table 10-491. LP to HS Timing Parameters Example for 400-MHz DDR Clock (continued)

| Timings | Registers/Associated Bit Fields | Default Register Settings (Programmed at Reset) | Timing Seen on the Line |
|-------------------------------------|--|--|-------------------------|
| $T_{\text{CLK-ZERO}}$ | DSI_PHY_REGISTER1 [7:0] REG_TCLKZERO | 106 | 280–285 ns |
| $T_{\text{CLK-PRE}}$ ⁽¹⁾ | N/A | N/A | 80 ns |
| $T_{\text{HS-PREPARE}}$ | DSI_PHY_REGISTER0 [31:24] REG_THSPREPARE | 30 | 48.5–79 ns |
| $T_{\text{HS-ZERO}}$ | DSI_PHY_REGISTER0 [23:16] REG_THSPRPR_THSZERO | 72 | 178.5–207.5 ns |
| $T_{\text{DDR_CLK_PRE}}$ | DSI_CLK_TIMING [15:8] DDR_CLK_PRE | 45–49 ⁽²⁾ | 450–490 ns |
| $T_{\text{ENTER_HS_MODE_LATENCY}}$ | DSI_VM_TIMING7 [31:16] ENTER_HS_MODE_LATENCY | 24 * $T_{\text{TXBYTECLKHS}}$ or 96 * DDR_CLOCK 34 * $T_{\text{TXBYTECLKHS}}$ or 136 * DDR_CLOCK ⁽²⁾ | 277–336.5 ns |

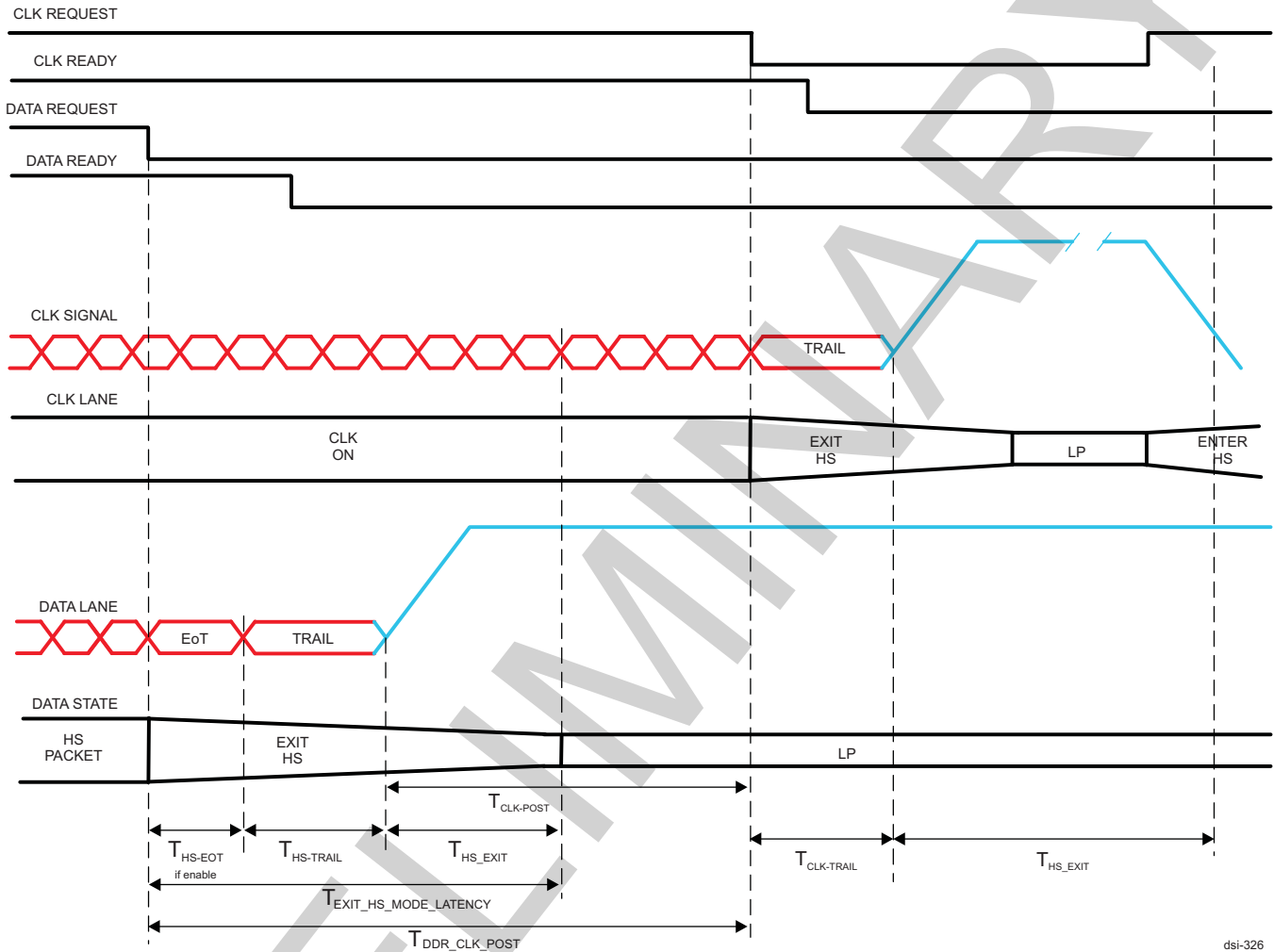
⁽¹⁾ See the MIPI D-PHY specification for the $T_{\text{CLK-PRE}}$ value.

⁽²⁾ Register setting calculated based on the values in the Timing Seen on the Line column.

10.3.4.4.2 Timing Parameters for an HS to LP Transaction

Figure 10-129 shows the timing requirement when switching the state of the data and clock lanes from HS to LP. lists the HS to LP timing parameters.

Figure 10-129. HS to LP Timing



dsi-326

Table 10-492. HS to LP Timing Parameters

| Timings | Description | Registers/Associated Bit Fields | Register Settings | Timing Seen on the Line |
|-------------------------------------|--|--|---|--|
| T_{HS-EOT} | If EoT is enabled, a delay is added to EXIT_HS_MODE_LATENCY to send the EoT packet. The EoT period depends on the number of data lanes. | N/A | N/A | DIVROUNDUP (4, NB_DATA_LANES) Thus: One data lane = Four DDR clocks Two data lanes = Two DDR clocks |
| $T_{HS-TRAIL}$ | Time to drive flipped differential state after last payload data bit of an HS transmission burst | DSI_PHY_REGISTER0 [15:8] REG_THSTRAIL | CEIL (60 ns / DDR_Clock_Period) + 5 | {CEIL [(REG_THSTRAIL + 3)/4] * 4 – 2.75} * DDR_Clock_Period + (~0 ns – 5 ns) |
| $T_{HS-EXIT}$ | Time to drive data lane to LP-11 state, after HS burst | DSI_PHY_REGISTER0 [7:0] REG_THSEXIT | CEIL (145 ns / DDR_Clock_Period) | {CEIL [(REG_THSEXIT/4) * 4] * DDR_Clock_Period – (~3 ns – 45 ns)} |
| $T_{CLK-POST}$ | Time that the transmitter must continue sending HS clock after the last associated data lane has transitioned to LP mode | N/A | N/A | DDR_CLK_POST - $T_{HS-EOT}^{(1)}$ - $T_{HS-TRAIL}$ |
| $T_{CLK-TRAIL}$ | Time to drive HS differential state after last payload clock bit of an HS transmission burst | DSI_PHY_REGISTER1 [15:8] REG_TCLKTRAIL | CEIL (60 ns / DDR_Clock_Period) + 2 | {CEIL [(REG_TCLKTRAIL + 3)/4] * 4 – 1.5} * DDR_Clock_Period + (~0 ns – 5 ns) |
| $T_{DDR_CLK_POST}$ | Time between the data lane request deassertion and the CLK request deassertion to switch the data lanes into LP mode. The DDR_CLK_POST value must follow the rule: $T_{DDR_CLK_POST} \geq T_{HS-TRAIL} + T_{HS-EOT} + T_{CLK-POST}$ | DSI_CLK_TIMING [7:0] DDR_CLK_POST | CEIL [($T_{HS-TRAIL} + T_{HS-EOT}^{(1)} + T_{CLK-POST}$) / $T_{TXBYTECLKHS}$] ^{(2) (3)} | |
| $T_{EXIT_HS_MODE_LATENCY}^{(4)}$ | Time to exit HS mode | DSI_VM_TIMING7 [15:0] EXIT_HS_MODE_LATENCY | CEIL [($T_{HS-TRAIL} + T_{HS-EXIT} + T_{HS-EOT}^{(1)}$) / $T_{TXBYTECLKHS}$] ⁽²⁾ | |

(1) If T_{HS-EOT} is enabled

(2) The timings seen on the line should be used to determine the register value.

(3) See the MIPI D-PHY specification for the $T_{CLK-POST}$ value.

(4) EXIT_HS_MODE_LATENCY timing applies only to video mode. It does not need to be programmed in command mode.

In the example in [Table 10-493](#), the DDR clock = 400 MHz; TxByteClkHS = 100 MHz; two data lanes.**Table 10-493. HS to LP Timing Parameters Example for 400-MHz DDR Clock and Two Data Lanes**

| Timings | Registers/Associated Bit Fields | Default Register Settings (Programmed at Reset) | Timing Seen on the Line (T_{HS-EOT} Enabled) | Timing Seen on the Line (T_{HS-EOT} Disabled) |
|----------------|---|---|---|--|
| T_{HS-EOT} | N/A | N/A | 5 ns | N/A |
| $T_{HS-TRAIL}$ | DSI_PHY_REGISTER0 [15:8] REG_THSTRAIL | 29 | 73.125–78.125 ns | 73.125–78.125 ns |

**Table 10-493. HS to LP Timing Parameters Example for 400-MHz DDR Clock and Two Data Lanes
(continued)**

| Timings | Registers/Associated Bit Fields | Default Register Settings (Programmed at Reset) | Timing Seen on the Line (T _{HS-EOT} Enabled) | Timing Seen on the Line (T _{HS-EOT} Disabled) |
|--------------------------------------|--|---|--|---|
| T _{HS-EXIT} | DSI_PHY_REGISTER0 [7:0] REG_THSEXIT | 58 | 105–147 ns | 105–147 ns |
| T _{CLK-POST} ⁽¹⁾ | N/A | N/A | 585 ns | 580 ns |
| T _{CLK-TRAIL} | DSI_PHY_REGISTER1 [15:8] REG_TCLKTRAIL | 26 | 76.25–81.25 ns | 76.25–81.25 ns |
| DDR_CLK_POST | DSI_CLK_TIMING [7:0] DDR_CLK_POST | 66 * TxByteClkHS or 264 * DDR_CLOCK 67 * TxByteClkHS or 268 * DDR_CLOCK ⁽²⁾ | 658.125–663.125 ns | 653.125–658.125 ns |
| EXIT_HS_MODE_LATE NCY | DSI_VM_TIMING7 [15:0] EXIT_HS_MODE_LATE NCY | 19 * TxByteClkHS or 76 * DDR_CLOCK 24 * TxByteClkHS or 96 * DDR_CLOCK ⁽²⁾ | 183.125–230.125 ns | 178.125–225.125 ns |

⁽¹⁾ See the MIPI D-PHY specification.

⁽²⁾ Register setting calculated based on the values in Timing Seen on the Line (T_{HS-EOT} Enabled) column.

10.3.4.4.3 Extra LP Transitions

Some DSI receivers require extra clock cycles in LP mode to process the data. The DSI protocol engine can be programmed to send automatically one NULL long packet. It applies only when no more data are ready to be sent from the internal FIFO to the peripheral on the last LS transfer. The same value is used for all the VCs sending packets in LS mode.

The size of the payload is defined by the [DSI_CLK_CTRL](#)[17:16] LP_CLK_NULL_PACKET_SIZE bit field. The header value depends on the size of the payload as described in [Table 10-494](#) and [Table 10-495](#).

NOTE: In [Table 10-494](#) and [Table 10-495](#), ECC and checksum are enabled.

Table 10-494. Extra NULL PH

| VC ID | Payload size (DSI_CLK_CTRL [17:16] LP_CLK_NULL_PACKET_SIZE) | Header (1st Byte) | Header (2nd Byte): WC LSB | Header (3rd Byte): WC MSB | Header (ECC) |
|-------|--|----------------------|------------------------------|------------------------------|--------------|
| 0x0 | 0 | 0x9 | 0x0 | 0x0 | 0x9 |
| | 1 | | 0x1 | | 0x13 |
| | 2 | | 0x2 | | 0x2F |
| | 3 | | 0x3 | | 0x35 |
| 0x1 | 0 | 0x49 | 0x0 | | 0x1F |
| | 1 | | 0x1 | | 0x05 |
| | 2 | | 0x2 | | 0x39 |
| | 3 | | 0x3 | | 0x23 |
| 0x2 | 0 | 0x89 | 0x0 | | 0x10 |
| | 1 | | 0x1 | | 0x0A |
| | 2 | | 0x2 | | 0x36 |
| | 3 | | 0x3 | | 0x2C |
| 0x3 | 0 | 0xC9 | 0x0 | | 0x06 |
| | 1 | | 0x1 | | 0x1C |
| | 2 | | 0x2 | | 0x20 |

Table 10-494. Extra NULL PH (continued)

| VC ID | Payload size (DSI_CLK_CTRL [17:16] LP_CLK_NULL_PACKET_SIZE) | Header (1st Byte) | Header (2nd Byte): WC LSB | Header (3rd Byte): WC MSB | Header (ECC) |
|-------|---|----------------------|------------------------------|------------------------------|--------------|
| | 3 | | 0x3 | | 0x3A |

Table 10-495. Extra NULL Packet Payload

| Payload size (DSI_CLK_CTRL [17:16] LP_CLK_NULL_PACKET_SIZE) | Payload (1st byte) | Payload (2nd byte) | Payload (3rd byte) | Payload (CRC) LSB | Payload (CRC) MSB |
|---|-----------------------|-----------------------|--------------------|----------------------|----------------------|
| 0 | NA ⁽¹⁾ | NA | NA | 0xFF | 0xFF |
| 1 | 0 | NA | NA | 0x87 | 0x0F |
| 2 | 0 | 0 | NA | 0xB8 | 0xF0 |
| 3 | 0 | 0 | 0 | 0x33 | 0x39 |

⁽¹⁾ N/A = Not available

10.3.4.4.5 Video Port Interface

NOTE: The signals described in this section are internal and not bounded outside the device. This section describes the internal connections between the DISPC and the DSI protocol engine.

[Table 10-496](#) and [Table 10-497](#) summarize the video interface signals.

- DSI1 has two video ports (VP1 and VP2):
 - VP1 is connected to the LCD1 output of DISPC.
 - VP2 is connected to the LCD2 output of DISPC.
- DSI2 has one video port (VP1):
 - VP1 is connected to the LCD2 output of DISPC.

These interfaces are used to connect the DISPC outputs to the DSI protocol engine to send real-time data streams. For video mode, only the active matrix timings are supported by DSI protocol engine.

When the two video ports of DSI1 are used for two video mode transfers, only the synchronization signals on video port 1 are used by the DSI protocol engine. The synchronization signals on video port 2 are ignored. When only one video mode is enabled, it must be connected to video port 1. It is not possible to enable video mode on video port 2 without enabling video mode on video 1 (dual-video mode). The HSYNC/VSNC/DE/DATA signals are driven on the rising or falling edge of the pixel clock (VP_PCLK).

Table 10-496. Video Port 1 Signals for DSI1 and DSI2 Protocol Engines

| Signal Name | Type ⁽¹⁾ | Description |
|----------------|---------------------|--|
| VP1_HSYNC | I | Horizontal synchronization signal |
| VP1_VSYNC | I | Vertical synchronization signal |
| VP1_DATA[23:0] | I | Parallel output data: Bits 0 to 23 |
| VP1_PCLK | I | Pixel clock. In case of STALL configuration, it is used to indicate when new data is on the data bus during the clock period of VP1_CLK. The VP1_PCLK is generated from VP1_CLK through division inside the DISPC. The clock ratio is indicated in the DSI_CTRL [4] VP_CLK_RATIO bit and must be aligned with the configuration of the clock divisor in the display controller (DISPC_DIVISOR1[7:0] PCD bit field for DISPC LCD1 output, and the DISPC_DIVISOR2[7:0] PCD bit field for DISPC LCD2 output). The source of the VP1_PCLK for DSI1 is the LCD1_PCLK. The source of the VP1_PCLK for DSI2 is LCD2_PCLK. For more information, see Section 10.2.4.1, Clock Configuration , and Section 10.3.4.2, DSI Clock Configuration . |

⁽¹⁾ I = Input; O = Output

Table 10-496. Video Port 1 Signals for DSI1 and DSI2 Protocol Engines (continued)

| Signal Name | Type ⁽¹⁾ | Description |
|-------------|---------------------|---|
| VP1_DE | I | Data enable |
| VP1_STALL | O | The stall signal must be deasserted to receive pixel and asserted to stop receiving pixel. (It can be used only while the DISPC is configured in STALL mode; in that mode, HSYNC and VSYNC are not generated). |
| VP1_CLK | I | DISPC internal clock. It is a free-running clock. The source of VP1_CLK for DSI1 is LCD1_CLK, divided down. The source of VP1_CLK for DSI2 is LCD2_CLK, divided down. For more information, see Section 10.2.4.1, Clock Configuration , and Section 10.3.4.2, DSI Clock Configuration . |

Table 10-497. Video Port 2 Signals for DSI1 Protocol Engine

| Signal Name | Type ⁽¹⁾ | Description |
|----------------|---------------------|---|
| VP2_HSYNC | I | Horizontal synchronization signal |
| VP2_VSYNC | I | Vertical synchronization signal |
| VP2_DATA[23:0] | I | Parallel output data: Bits 0 to 23 |
| VP2_PCLK | I | Pixel clock. In case of STALL configuration, it is used to indicate when new data is on the data bus during the clock period of VP2_CLK. The VP2_PCLK is generated from VP2_CLK through division inside the DISPC. The clock ratio is indicated in the DSI_CTRL2[4] VP_CLK_RATIO bit and must be aligned with the configuration of the clock divisor in the display controller (DISPC_DIVISOR2[7:0] PCD bit field for DISPC LCD2 output). The source of the VP2_PCLK for DSI1 is LCD2_PCLK. For more information, see Section 10.2.4.1, Clock Configuration , and Section 10.3.4.2, DSI Clock Configuration . |
| VP2_DE | I | Data enable |
| VP2_STALL | O | The stall signal must be deasserted to receive pixel and asserted to stop receiving pixel. (It can be used only while the DISPC is configured in STALL mode; in that mode, HSYNC and VSYNC are not generated). |
| VP2_CLK | I | DISPC internal clock. It is a free-running clock. The source of the VP2_CLK for DSI1 is LCD2_CLK, divided down. For more information, see Section 10.2.4.1, Clock Configuration , and Section 10.3.4.2, DSI Clock Configuration . |

⁽¹⁾ I = Input; O = Output

NOTE:

- The polarities of VP_HSYNC and VP_VSYNC are programmable by setting the [DSI_CTRL](#) and [DSI_CTRL2](#) registers.
- Clocks VP_CLK and VP_PCLK can have the same frequency.
- The number of bits to be captured on the video port (the width of the data bus) is defined in the [DSI_CTRL\[7:6\] VP_DATA_BUS_WIDTH](#) bit field for DSI1 and the [DSI_CTRL2\[7:6\] VP_DATA_BUS_WIDTH](#) for DSI2. The supported formats are 16, 18, and 24 bits.
- For the 18-bit pixel format using 24 bits on the DSI link, the format to be used by the DSI protocol engine is 24-bit because the DISPC must convert the 18-bit pixels into 24-bit pixels. There is no logic inside the DSI protocol engine to convert from 18-bit format to 24-bit format.

The data received on the video port can be stored in the line buffer memories or sent directly on the DSI interface in two cases:

- The line buffer size is too small compared to the line from the DISPC.
- There is no line buffer instantiated. If there is no line buffer, the burst mode, defined as frequency burst mode, cannot be used. Only transparency burst mode is supported.

NOTE: The [DSI_CTRL\[13:12\] LINE_BUFFER](#) and [DSI_CTRL2\[13:12\] LINE_BUFFER](#) bit fields define the number of lines to be used for transferring data from the video port to the DSI1 and DSI2 link.

10.3.4.4.5.1 Video Port Used for Video Mode

If the video port is used for video mode, VP_STALL is not used. [Table 10-498](#) and [Table 10-499](#) list the active signals on the video port.

Table 10-498. Video Port 1 for DSI1 and DSI2 in the Context of Video Mode

| Signal Name | Type ⁽¹⁾ | Description |
|----------------|---------------------|--|
| VP1_HSYNC | I | Horizontal synchronization signal |
| VP1_VSYNC | I | Vertical synchronization signal |
| VP1_DATA[23:0] | I | Parallel output data: Bits 0 to 23 |
| VP1_PCLK | I | Pixel clock |
| VP1_DE | I | Data enable |
| VP1_CLK | I | It is a free-running clock used as the DISPC functional clock. |

⁽¹⁾ I = Input; O = Output

Table 10-499. Video Port 2 for DSI1 in the Context of Video Mode

| Signal Name | Type ⁽¹⁾ | Description |
|----------------|---------------------|--|
| VP2_HSYNC | I | Horizontal synchronization signal |
| VP2_VSYNC | I | Vertical synchronization signal |
| VP2_DATA[23:0] | I | Parallel output data: Bits 0 to 23 |
| VP2_PCLK | I | Pixel clock |
| VP2_DE | I | Data enable |
| VP2_CLK | I | It is a free-running clock used as the DISPC functional clock. |

⁽¹⁾ I = Input; O = Output

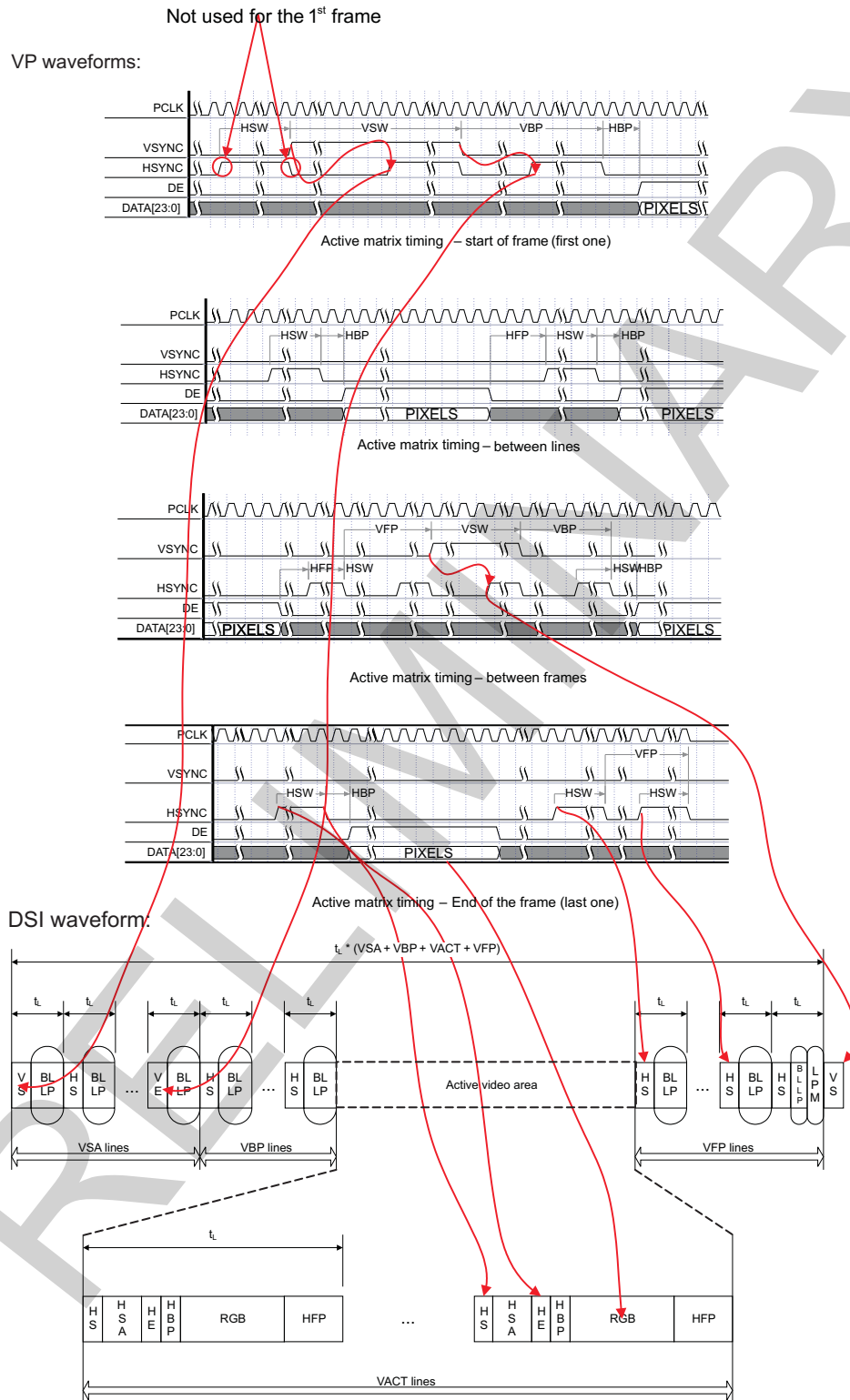
Three video modes are available:

- No-line buffer: The data received on the video port are directly outputted to the DSI port without buffering. The ratio of VP_PCLK and the DSI HS clock period must ensure the same throughput on the two ports (the two clocks must be generated using the same PLL; the subsystem must provide this configuration).
- One-line buffer:
 - The data can be transferred as described in the no-line buffer configuration.
 - The data are first stored in the line buffer; and then when all the data for one line are received, the DSI protocol engine sends the entire line. Software must adjust timings to let enough time for storing all line data into the line buffer before sending to DSI outputs. The synchronization packets are never stored in the line buffer.
- Two-line buffers:
 - The data can be transferred as described in the one-line buffer configuration.
 - One line is stored when the second line is output on the DSI port. This allows burst capability. While receiving the first line of the frame, no RGB packets are sent, because the line buffers are empty. To send the last line of the frame, a dummy line must be provided by the display controller to flush the line buffers. The synchronization packets are never stored in the line buffer.

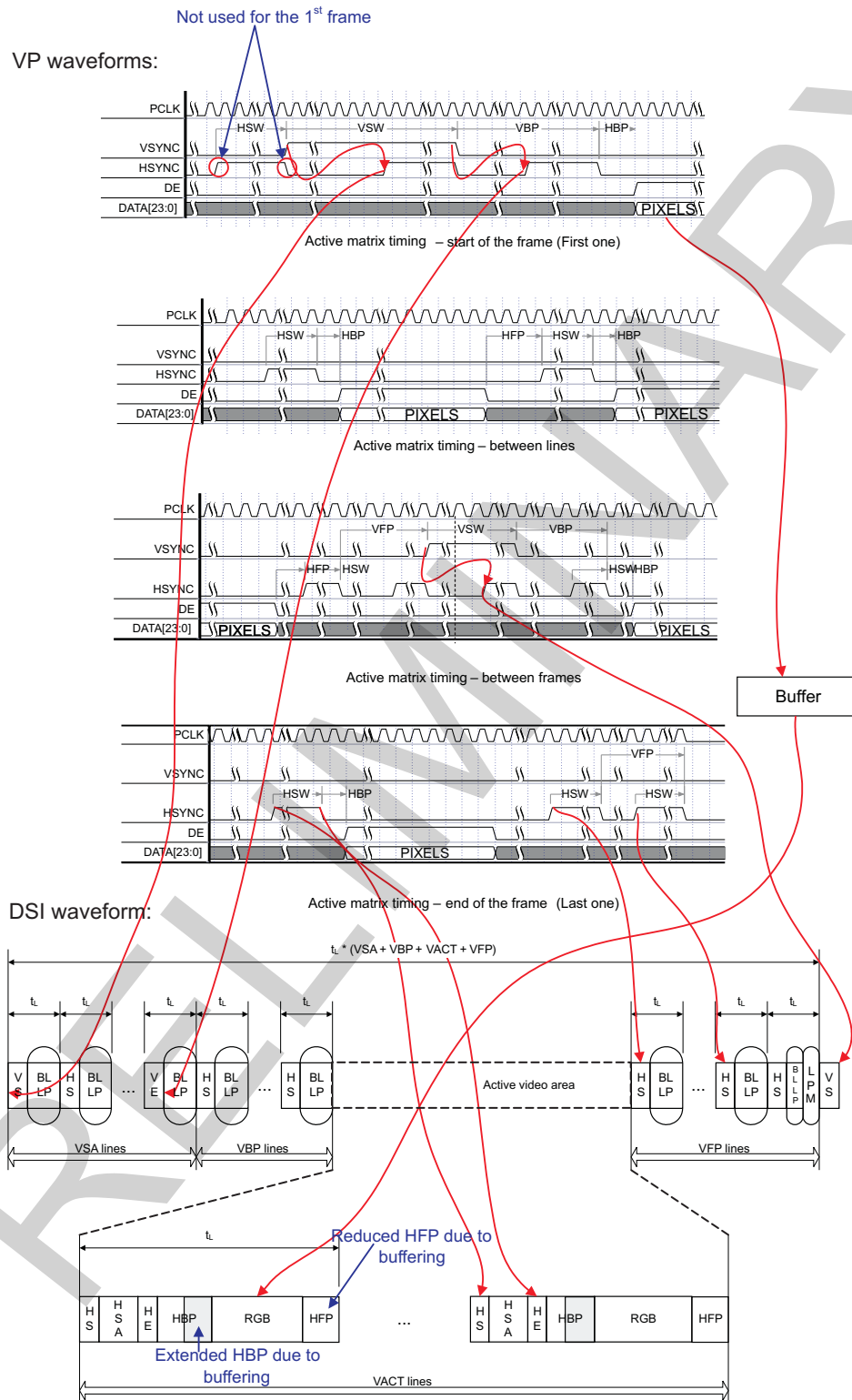
NOTE: If more active lines are received on the video port than the number of lines defined in the [DSI_VM_TIMING3\[15:0\]](#) VACT bit field, the extra lines are discarded by the DSI protocol engine. These lines are treated as blanking lines.

[Figure 10-130](#) through [Figure 10-132](#) show these three video modes.

Figure 10-130. DSI Video Mode Without Burst (No-Line Buffer)



dsi-035

Figure 10-131. DSI Video Mode Without Burst (One-Line Buffer)

dsi-036

Timing diagrams for active matrix display showing PCLK, VSYNC, HSYNC, DE, and DATA[23:0] signals across four scenarios: start of frame, between lines, between frames, and end of frame. Includes a timeline at the bottom for VACT lines and a note about the first frame.

Not used for the 1st frame

forms:

Active matrix timing – start of the frame (First one)

Active matrix timing – between lines

Active matrix timing – between frames

Active matrix timing – end of the frame (Last one)

form:

t_L^* (VSA + VBP + VACT + VFP)

Active video area

VBP lines

VFP lines

VACT lines

Timeline labels: H S A, H E, H B P, RGB, HFP

Display Subsystem 2485

NOTE: In [Figure 10-130](#) through [Figure 10-132](#):

- When HSYNC start and HSYNC end short packets are not generated (HSA does not exist), the HBP signal must not be 0.
- Software must ensure that VBP is always defined so that there is at least one HSYNC during VBP.
- In blanking low-power mode (BL-LP), two options are possible:
 - The lane remains in ULPS, and the [DSI_CTRL\[20\]](#) BLANKING_MODE bit is set to 0x0.
 - Dummy bytes are sent during LP with the [DSI_CTRL\[20\]](#) BLANKING_MODE bit set to 0x1; the number of sent bytes is determined by the [DSI_VM_TIMING6\[15:0\]](#) BL_LP_INTERLEAVING bit field.

In DSI video mode, if the VSA bit field in [DSI_VM_TIMING2](#) is set to 0x0, no vertical synchronization packet will be sent even if VP_VSYNC_START is set to 0x1 in [DSI_CTRL](#).

If the signal VP_DE is not asserted during enough VP_PCLK cycles to be able to capture the number of bytes defined in the word count of the header, the module must send the valid data received on the video port followed by bytes of 0s to match the required number of bytes to transmit. The VP_PCLK must be present during all extra cycles where the DSI protocol engine is expecting pixels.

If the VP_DE signal is asserted for too many VP_PCLK cycles, the module stops capturing the data on the video port while the number of bytes to capture, as defined in the word count field of the header, is reached.

The HS checks that the received synchronization events on the video port (VSYNC and HSYNC) are within the synchronization window based on expected timings. If the timings (internal and received) are out of sync, the interrupt for out-of-sync is generated and the interface is disabled (the [DSI_CTRL\[0\]](#) IF_EN bit is automatically reset by hardware). The unsynchronization window is defined by the [DSI_VM_TIMING2\[27:24\]](#) WINDOW_SYNC bit field.

10.3.4.4.5.2 Video Port Used for Command Mode

If the video port is used for command mode, the VP_HSYNC, VP_VSYNC, and VP_DE signals are not used. [Table 10-500](#) and [Table 10-501](#) describe the active signals on video port 1 and video port 2, respectively.

Table 10-500. Video Port 1 for DSI1 and DSI2 in the Context of Command Mode

| Signal Name | Type ⁽¹⁾ | Description |
|----------------|---------------------|--|
| VP1_DATA[23:0] | I | Parallel output data: Bits 0 to 23 |
| VP1_PCLK | I | One pulse is generated every time new data is output on the data bus. |
| VP1_STALL | O | The stall signal must be deasserted to receive pixel and asserted to stop receiving pixel. (It can be used only while the DISPC is configured in stall mode; in that mode, HSYNC and VSYNC are not generated). |
| VP1_CLK | I | DISPC internal clock: It is a free-running clock used as the DISPC functional clock. |

⁽¹⁾ I = Input; O = Output

Table 10-501. Video Port 2 for DSI1 in the Context of Command Mode

| Signal Name | Type ⁽¹⁾ | Description |
|----------------|---------------------|--|
| VP2_DATA[23:0] | I | Parallel output data: Bits 0 to 23 |
| VP2_PCLK | I | One pulse is generated every time new data is output on the data bus. |
| VP2_STALL | O | The stall signal must be deasserted to receive pixel and asserted to stop receiving pixel. (It can be used only while the DISPC is configured in stall mode; in that mode, HSYNC and VSYNC are not generated). |
| VP2_CLK | I | DISPC internal clock: It is a free running-clock used as the DISPC functional clock. |

⁽¹⁾ I = Input; O = Output

NOTE: The stall signal must be deasserted to receive pixels and asserted to stop receiving pixels.

Figure 10-133 and Figure 10-134 show the VP_STALL signal assertion and deassertion on rising and falling edges, respectively.

Figure 10-133. Stall Timing With Pixel on Rising Edge

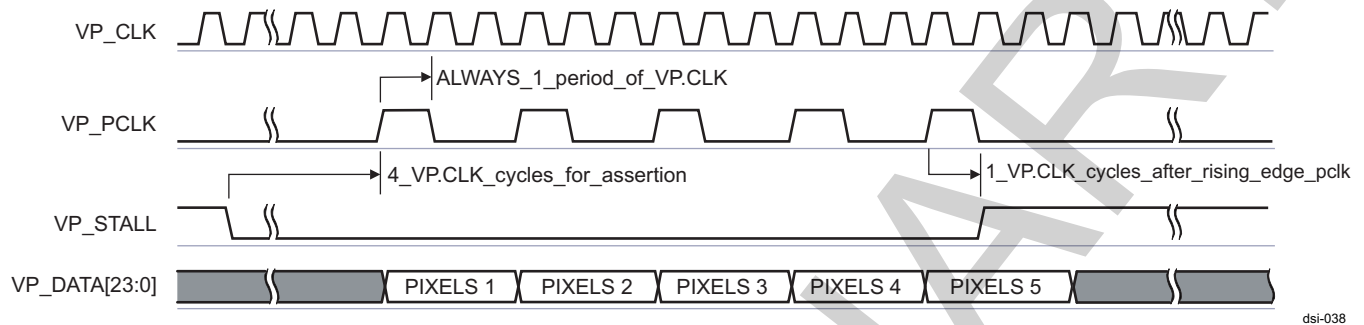
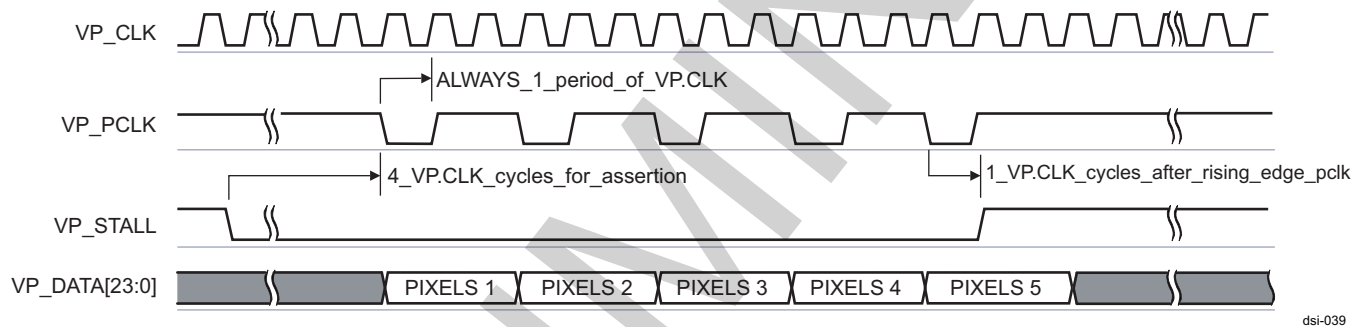


Figure 10-134. Stall Timing With Pixel on Falling Edge



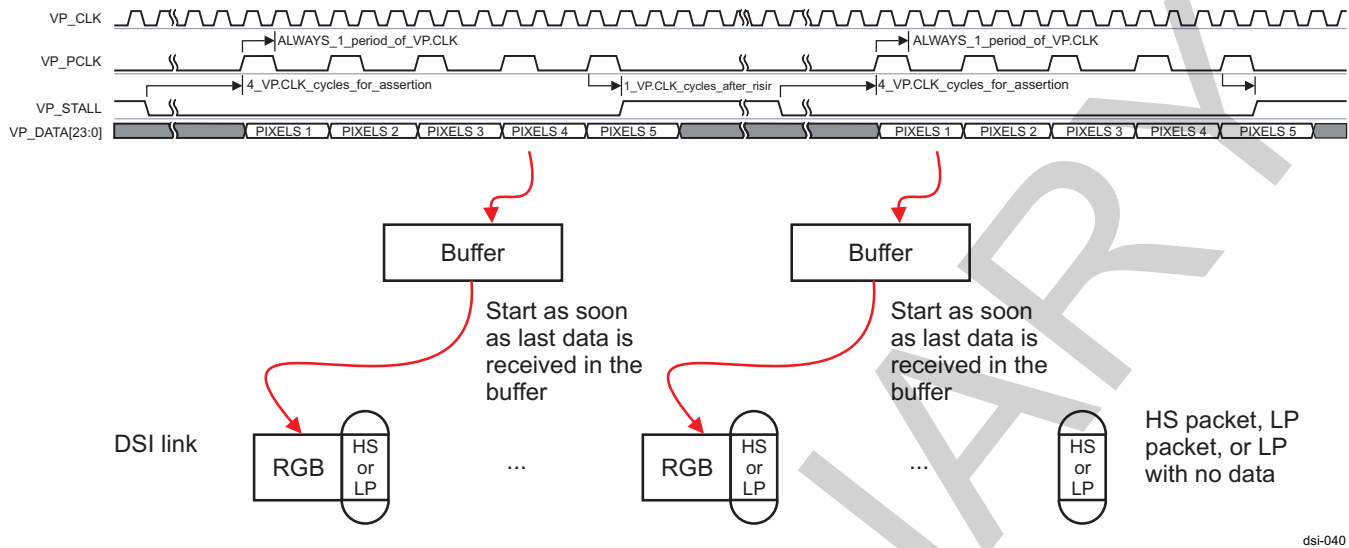
The VP_STALL signal is asserted to stop the transfer when the last data is output. The data can be output on the rising or falling edge of the VP_PCLK through registers in the DISPC module. Data output on the falling edge of VP_PCLK is supported by the DSI protocol engine.

The VP_PCLK clock is generated from VP_CLK; these two clocks are balanced. Assertion and deassertion of VP_PCLK is done on the rising edge of VP_CLK. The width of the VP_PCLK pulse depends on the configuration of the clock divisor in the DISPC. For more information, see [Section 10.2, Display Controller](#). In the DSI protocol engine, the information is defined in the [DSI_CTRL\[4\]](#) VP_CLK_RATIO bit and must be aligned with the DISPC configuration.

Deassertion of the VP_STALL signal occurs at least four VP_CLK cycles before assertion of VP_PCLK. Assertion of VP_STALL occurs one cycle VP_CLK after deassertion of VP_PCLK for the last pixel to be transferred. The VP_CLK clock is generated by the DISPC under software control. It can be kept running between assertion and deassertion of VP_STALL.

The stall assertion/deassertion depends on the number of bytes to be received considering the size of the video port bus defined in the [DSI_CTRL\[7:6\]](#) VP_DATA_BUS_WIDTH bit field for video port 1 and the [DSI_CTRL2\[7:6\]](#) VP_DATA_BUS_WIDTH bit field for video port 2.

Figure 10-135 shows the data flow in command mode using the video port.

Figure 10-135. Data Flow in Command Mode Using the Video Port

Two command modes are available:

- One-line buffer: The data are stored in the line buffer before being sent.
- Two-line buffers: The two lines are used if the word count defined in the [DSI_VC_LONG_PACKET_HEADER_i](#) register is bigger than the line size; otherwise, one-line buffer must be used.

NOTE: In command mode, the video port can be used only in one- or two-line buffer configuration. No-line buffer configuration is not allowed.

The packets can be sent using high speed or low speed.

The DCS command in the payload can be inserted automatically using the [DSI_VC_CTRL_i\[30\]](#) DCS_CMD_ENABLE bit. If TE is used, hardware automatically inserts the DCS Write Start command for the first packet of the frame transfer and DCS Write Continue command for all subsequent packets. The [DSI_VC_CTRL_i\[31\]](#) DCS_CMD_CODE bit is ignored.

10.3.4.4.5.3 Burst Mode

When burst mode is enabled, the video port receives data from the DISPC at the pixel clock. The DSI protocol engine buffers the data in its own line FIFO (double-line buffer size). The read speed of the line can be twice the pixel clock to increase the blanking time of the video mode and to allow command mode traffic to be interleaved during the blanking period. Burst mode uses a dual-line buffer.

The DSI port can output data from one line buffer while the second line buffer is accessed by the video port. The two processes are concurrent but they do not access the same line at the same time. The DSI transfer can start only when the entire video port line is transferred into a line buffer. The switch is controlled by the VP_HS signal on the video port side and by an internal signal on the DSI port indicating that the last data for the current line has been written into the line buffer.

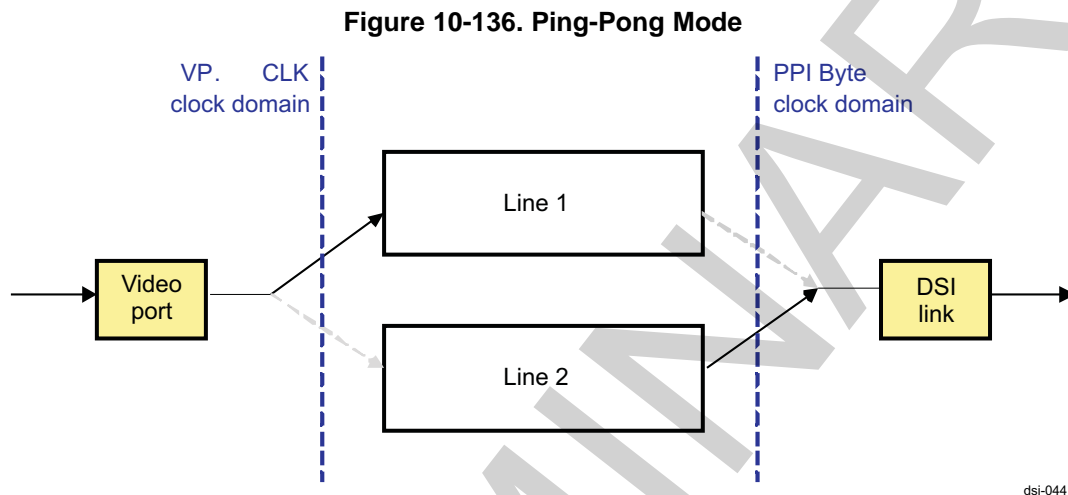
NOTE: The line buffers are used to store only the pixels. The synchronization codes are not stored in the line buffers; they must be sent according to the video port timings.

NOTE: The number of line buffers to be used while receiving data on the video port can be selected by setting the [DSI_CTRL\[13:12\]](#) LINE_BUFFER bit field.

10.3.4.4.5.4 Ping-Pong Buffer

The ping-pong buffer stores data incoming from the DISPC in one of the two line buffers. When one line buffer is used to store the pixels received on the video port, the second line buffer is used to provide data on the DSI link. The ping-pong buffer is supported in command mode, provided the size of the packet defined in the header register is less than the size of each line buffer (768 x 32 bits for VP1 of DSI2 and VP2 of DSI1, and 960 x 32 bits for VP1 of DSI1). If the size of the packet is greater than the size of the line buffer, the ping-pong mechanism cannot be used (both lines are used as a single line).

Figure 10-136 shows the video port used in ping-pong mode .



The ping-pong buffer status can be checked by the [DSI_VC_CTRL_i\[14\]](#) PP_BUSY bit.

- When PP_BUSY equals 1, the ping-pong buffer is active and the line buffers are not ready to receive data; therefore, a new header cannot be updated.
- When PP_BUSY equals 0, at least one line buffer is empty; therefore, a new header can be updated. PP_BUSY is then set to 0x1. If both line buffers are empty, two headers can be written, one following the other. PP_BUSY remains at 0x0 after the first header is written, and is set to 0x1 after second header is written.

An IRQ is available to update header on events. The IRQ is enabled by setting the [DSI_VC_IRQENABLE_i\[8\]](#) PP_BUSY_CHANGE_IRQ bit to 0x1, and its status is accessible on the [DSI_VC_IRQSTATUS_i\[8\]](#) PP_BUSY_CHANGE_IRQ bit.

10.3.4.4.6 SCP Interface

The SCP interface is used to transfer register values from the DSI protocol engine to the DSI PLL control module and to the DSI complex I/O. It spends several cycles to serialize the data to be sent. Software users must consider the delay in processing the transfer of the data from/to the L3 Interconnect slave port to/from the module.

10.3.4.4.6.1 Shadowing Register

The first three SCP registers for the DSI complex I/O address map must be implemented as shadow registers. The shadowing mechanism is enabled and disabled using the [DSI_COMPLEXIO_CFG1\[31\]](#) SHADOWING bit:

- When setting the [DSI_COMPLEXIO_CFG1\[31\]](#) SHADOWING bit to 1, the transfer of the values from the three first local interconnect port registers into the three first registers of the DSI complex I/O ([DSI_PHY_REGISTER0](#) through [DSI_PHY_REGISTER2](#)) is done only when the DISPC_UPDATE_SYNC signal from the DISPC is active and the [DSI_COMPLEXIO_CFG1\[30\]](#) GOBIT bit is set to 1. If there is no pending update for the three registers when the DISPC_UPDATE_SYNC signal is asserted, the [DSI_COMPLEXIO_CFG1\[30\]](#) GOBIT bit is reset by hardware and there is no SCP transfer.
 - If there is only one register to update, only the corresponding new value is transferred. The second

and third registers in the DSI complex I/O are not updated. When the transfer completes, the [DSI_COMPLEXIO_CFG1\[30\]](#) GOBIT bit is reset by hardware.

- If the two registers need to be updated, the register with the lower address is transferred first, followed by the second register. When the transfers complete, the [DSI_COMPLEXIO_CFG1\[30\]](#) GOBIT bit is reset by hardware.
- If the three registers need to be updated, the register with the lowest address is transferred first, and then the other registers are transferred according to incremental address. When the transfers complete, the GOBIT bit is reset by hardware.

When there is an on-going transfer (read or write) to any SCP register, the transfer must complete before updating the shadowing registers.

- When unsetting the [DSI_COMPLEXIO_CFG1\[31\]](#) SHADOWING bit to 0, if the transfer into the first two DSI complex I/O registers has already started, it should be finished.

NOTE: When reading the shadow registers, the local value stored in the DSI protocol engine is returned if the update is pending; otherwise, the values stored in the DSI complex I/O are returned.

10.3.4.4.6.2 *Busy Signal*

The SCPBusy signal indicates there is still activity using the SCPClk clock provided by the PRCM module. The SCPClk clock is the divided DSS_L3_ICLK/4 clock.

10.3.4.4.7 *Timers*

NOTE: Among the timers described in this section, only the HS TX, LP RX, and TurnRequests timers generate interrupts immediately when the timer value is null. The ForceTxStopMode timer ends counting instantly and ForceTxStopMode is not asserted.

10.3.4.4.7.1 *T_{wakeup} Timer*

The T_{wakeup} timer is not implemented in the DSI protocol engine. The general-purpose (GP) timer must be used to handle wakeup. This timer is used for exiting ULP status mode for the active lanes (clock and/or data lanes). The sequence to exit ULP state is:

1. Change the state of TxULPSExit for each lane to ACTIVE.
2. Wait for the interrupt that indicates all lanes with TxULPSExit ACTIVE have acknowledged by asserting ULPSActiveNot. This is done by reading the [DSI_COMPLEXIO_IRQSTATUS](#) register - ULPSACTIVENOT_ALLi_IRQ bit fields (where i = 0, 1).
3. Start the application wake-up timer (GP timer).
4. Wait for the time-out.
5. Change the TxUlpsClk signals to INACTIVE state for the clock lane and/or TxRequestEsc INACTIVE state for the data lane(s).

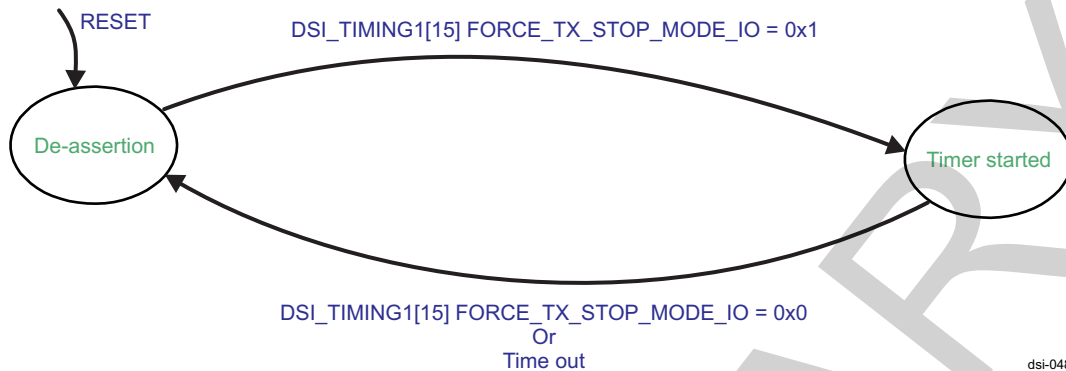
NOTE: The minimum time for the wake-up period is 1 ms.

To enter ULPS mode for clock lane, TxUlpsClk state must be changed to ACTIVE state. To enter ULPS mode for data lane, TxRequestEsc state must be changed to ACTIVE state (also TxUlpsEsc, if it is not in ACTIVE state already).

10.3.4.4.7.2 *ForceTxStopMode FSM*

The ForceTxStopMode signal is used at initialization time (DSI complex I/O). [Figure 10-137](#) shows the ForceTxStopMode finite state-machine (FSM) to assert and deassert the ForceTxStopMode signal.

Figure 10-137. ForceTxStopMode FSM



The DSI protocol engine asserts the ForceTxStopMode signal by setting the [DSI_TIMING1\[15\]](#) FORCE_TX_STOP_MODE_IO bit to 1. Asserting the FORCE_TX_STOP_MODE_IO bit allows the lanes to be initialized. The lanes are in STOP state when the ForceTxStopMode signal is high.

No data can be sent before the ForceTxStopMode signal is deasserted. The deassertion time is defined by the STOP_STATE_COUNTER_IO, STOP_STATE_X4_IO and STOP_STATE_X16_IO bit fields in [DSI_TIMING1\[14:0\]](#) register. The [DSI_TIMING1\[15:0\]](#) FORCE_TX_STOP_MODE_IO bit is reset by hardware when the time is reached.

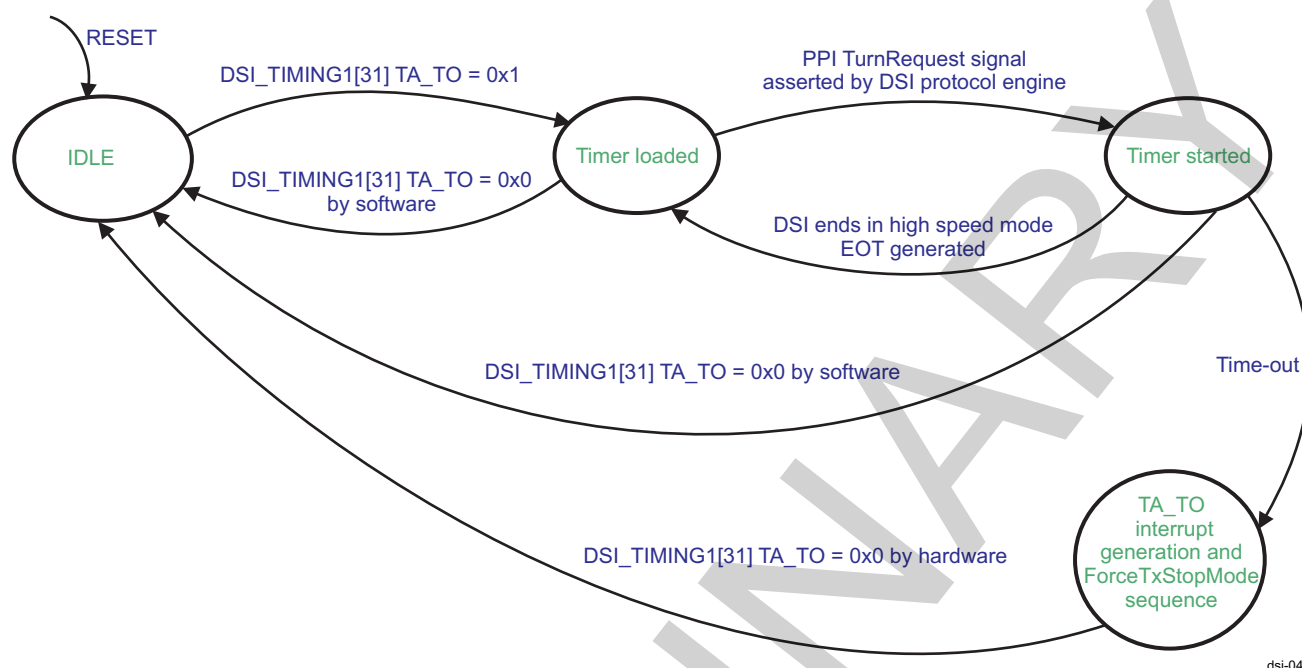
This bit can be reset by software.

The calculation of the number of DSI_CLK functional clock cycles assertion period is defined by:

Total period in DSI_FCLK cycles = STOP_STATE_COUNTER_IO x ((STOP_STATE_X16_IO x 15) + 1) x ((STOP_STATE_X4_IO x 3)).

10.3.4.4.7.3 TurnRequest FSM

The TurnRequest signal is used to request a turnaround. It is valid only for the data lane 1 because the other data lanes cannot be used in reverse direction to receive data from the DSI receiver. When the TurnRequest signal is asserted, the TA_TO timer is started. [Figure 10-138](#) shows the TurnRequest FSM to assert and deassert the TurnRequest signal.

Figure 10-138. TurnRequest FSM

dsi-049

The DSI protocol engine asserts the TurnRequest signal during one TxClkEsc cycle when turnaround is enabled through the [DSI_VC_CTRL_i\[6\] BTA_EN](#) bit (for more information, see [Section 10.3.4.4.8, Bus Turnaround](#)). The [DSI_TIMING1\[31\] TA_TO](#) bit is set/reset by software to enable or disable the timer for turnaround procedure failure. It can be reset by software or automatically by hardware when the time-out occurs.

The timer is loaded with the value in the number of DSI_FCLK cycles:

$$\text{DSI_TIMING1}[28:16] \text{ TA_TO_COUNTER} \times ((\text{DSI_TIMING1}[30] \text{ TA_TO_X16} \times 15) + 1) \times ((\text{DSI_TIMING1}[29] \text{ TA_TO_X8} \times 7) + 1).$$

When the TA_TO_IRQ interrupt is generated (the turnaround timer expired and the procedure failed), hardware automatically resets the [DSI_TIMING1\[31\] TA_TO](#) bit and asserts the ForceTXStopMode signal (see [Section 10.3.4.4.7.2, ForceTxStopMode FSM](#)) for the DSI_PHY to drive the LP-11 STOP state. The ForceTXStopMode timer is used to define the minimum duration of the LP-11 state. The STOP state can be longer if there is no activity.

Hardware resets the [DSI_TIMING1\[15\] FORCE_TX_STOP_MODE_IO](#) bit, followed by an internal logic reset except for all register values and TX FIFO content, and then resets the [DSI_CTRL\[0\] IF_EN](#) bit. Software must take action to recover (for example, by resetting the peripheral if it is not responding). It must wait for the [DSI_CTRL\[0\] IF_EN](#) bit to be reset to 0 before starting the recovery sequence.

10.3.4.4.7.4 Peripheral Reset Timer

The peripheral reset timer is not implemented in the DSI protocol engine module. Instead, a GP timer must be used in case of reset of the peripheral to determine when the peripheral is ready to operate again.

10.3.4.4.7.5 HS TX Timer

The HS TX timer is used to detect when the host has been in TX mode for too long. When time-out occurs, the EOT is forced. The timer is reloaded when a start of HS transmission occurs. It is enabled and disabled by software through the [DSI_TIMING2\[31\] HS_TX_TO](#) bit. The interrupt HS_TX_TO_IRQ is generated when the timer expires. The [DSI_IRQSTATUS\[14\] HS_TX_TO_IRQ](#) bit is set to 1 when the HS TX time-out occurs.

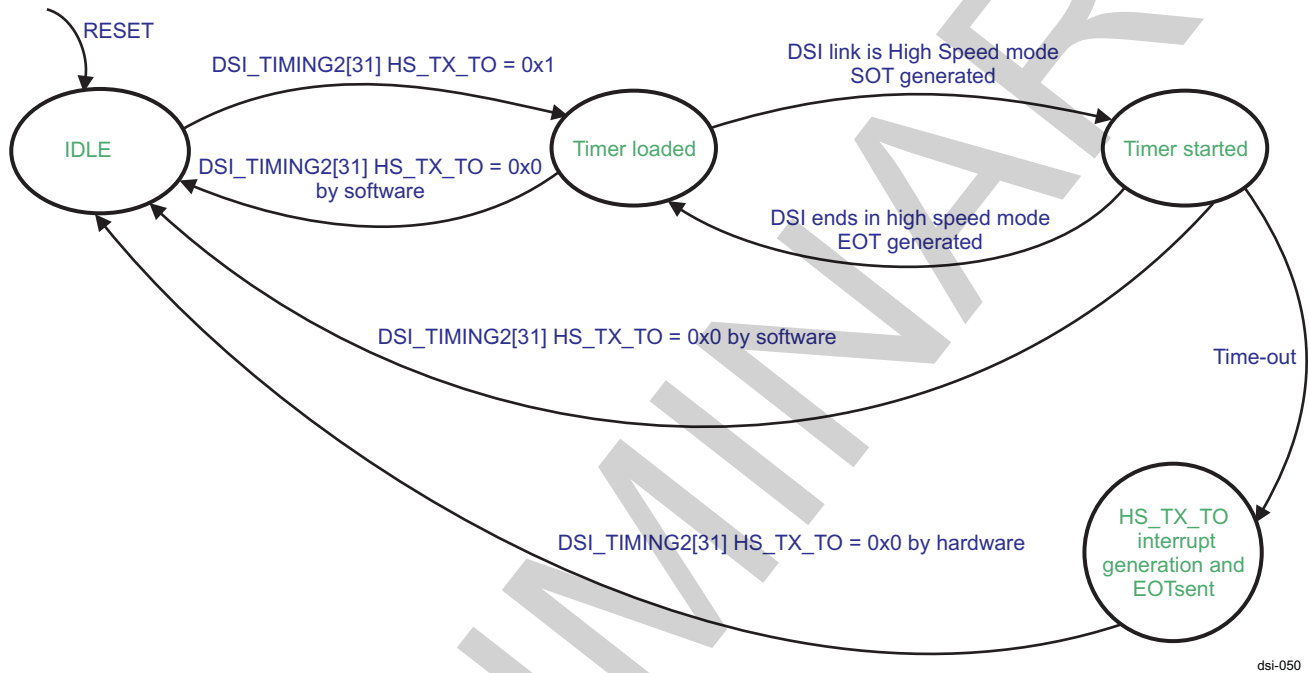
The maximum time supported is 20 ms. It can be used to determine that at least once per frame in video mode, the HS mode is stopped to enter ULPS.

The timer is loaded with the value in the number of TXBYTECLKHS:

$DSI_TIMING2[28:16] \text{ HS_TX_TO_COUNTER} \times (1 + (DSI_TIMING2[30] \text{ HS_TX_TO_X64} \times 63) \times (1 + (DSI_TIMING2[29] \text{ HS_TX_TO_X16} \times 15)))$

Figure 10-139 shows the HS TX timer FSM.

Figure 10-139. HS TX Timer FSM



When the time-out occurs, hardware sends an EOT request for the DSI complex I/O to drive LP-11 STOP state. This is followed by the generation of the interrupt. Hardware performs an internal logic reset including the TX FIFO content but excluding the register values, and then resets the [DSI_CTRL\[0\] IF_EN](#) bit.

Software must take action to recover (for example, by resetting the peripheral if it is not responding). It must wait for the [DSI_CTRL\[0\] IF_EN](#) bit to be reset to 0 before taking any recovery action.

10.3.4.4.7.6 LP RX Timer

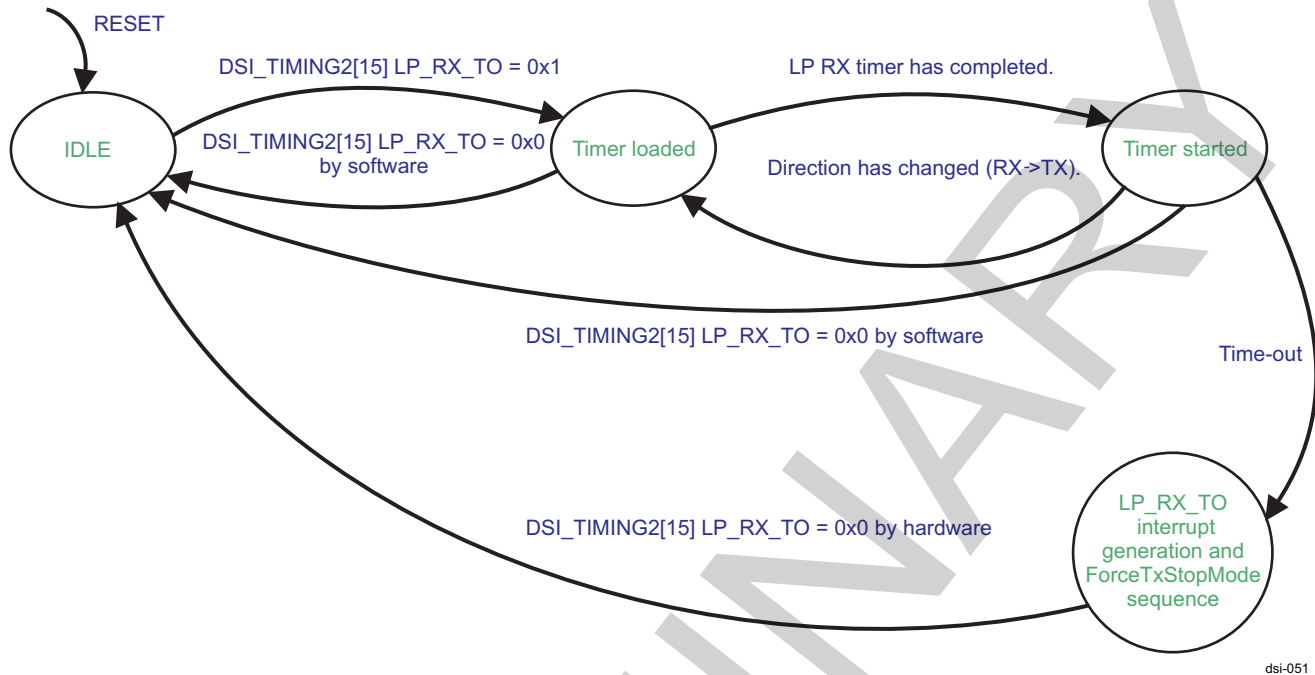
When the host is in low-power receive mode after a BTA, the LP RX timer is loaded. When the timer expires, the host requests the DSI complex I/O to drive LP-11. The interrupt [LP_RX_TO_IRQ](#) is generated when the timer expires. The [DSI_IRQSTATUS\[15\] LP_RX_TO_IRQ](#) bit is set to 1 when the LP RX time-out occurs.

The [DSI_TIMING2\[15\] LP_RX_TO](#) bit is set/reset by software to enable or disable the timer.

The timer is loaded with the value in the number of DSI_CLK functional clock cycles:

$DSI_TIMING2[12:0] \text{ LP_RX_TO_COUNTER} \times ((DSI_TIMING2[14] \text{ LP_RX_TO_X16} \times 15) + 1) \times ((DSI_TIMING2[13] \text{ LP_RX_TO_X4} \times 3) + 1)$

Figure 10-140 shows the LP RX timer FSM.

Figure 10-140. LP RX Timer FSM

dsi-051

When the interrupt is generated, hardware automatically resets the [DSI_TIMING2\[15\] LP_RX_TO](#) bit and then asserts `ForceTxStopMode` for the DSI complex I/O to drive LP-11 STOP state. The `ForceTxStopMode` timer is used to define the minimum duration of the LP-11 state. The STOP state can be longer if there is no activity.

Hardware resets the `ForceTxStopMode` bit, followed by an internal logic reset except for all register values and TX FIFO content, and then resets the [DSI_CTRL\[0\] IF_EN](#) bit. Software must take action to recover (for example, by resetting the peripheral if it is not responding). It must wait for the [DSI_TIMING1\[15\] FORCE_TX_STOP_MODE_IO](#) and [DSI_CTRL\[0\] IF_EN](#) bits to be reset before starting the recovery sequence. The TX FIFO is not flushed (the FIFO is flushed only when [DSI_VC_CTRL_i\[0\] VC_EN](#) is set to 1).

10.3.4.4.8 Bus Turnaround

The bus turnaround (BTA) is not automatically sent by default after each packet is sent to the panel(s). It is programmable independently for each VC ID. BTA generation can be enabled when the [DSI_VC_CTRL_i\[6\] BTA_EN](#) bit is set to 1 by software. Software must ensure that when the BTA is sent to the peripheral, enough time is allocated for the response and for the BTA from the peripheral to the host. For more information about possible DSI PHY timing adjustments during the turnaround procedure, see [Section 10.3.4.6.5.3, Turnaround Request in Transmit Mode](#), and [Section 10.3.4.6.5.4, Turnaround Request in Receive Mode](#).

When setting the [DSI_VC_CTRL_i\[6\] BTA_EN](#) bit to 1, one BTA is sent manually to the peripheral. This manual mode can be used for packets in command or video mode.

Acknowledgment from the peripheral for successful BTA is indicated by asserting the `BTA_IRQ` interrupt, if it is enabled in the [DSI_VC_IRQENABLE_i\[5\] BTA_IRQ_EN](#) bit. To monitor the BTA interrupt, the user must read the [DSI_VC_IRQSTATUS_i\[5\] BTA_IRQ](#) status bit.

CAUTION

The BTA should be sent when the RX FIFO is empty. Users must empty the RX FIFO before sending BTA to the peripheral to ensure that when receiving new data from the peripheral, the allocated spaces for all the VCs are empty.

In automatic mode, the BTA is sent automatically at the end of short or long packet transmission, if the [DSI_VC_CTRL_i\[2\]](#) BTA_SHORT_EN or [DSI_VC_CTRL_i\[3\]](#) BTA_LONG_EN bit is set to 1.

Two modes can be used for each VC ID:

- Automatic: After each packet, a BTA is sent. To determine the size of the long packet, the protocol engine on the host side reads the word count defined in the header (in the [DSI_VC_LONG_PACKET_HEADER_i](#) register) and uses it to determine the last data to be sent on the DSI link. For short packets, the size is always 4 bytes. The BTA is then sent to the peripheral. The word count is also used to determine how many bytes are to be transferred from the 32-bit write access to the payload register ([DSI_VC_LONG_PACKET_PAYLOAD_i](#)).
- Manual:
 - Data transfer through L3 interconnect: When transferring data using the L3 interconnect port, while all data have been provided to the DSI protocol engine, users can select the BTA for the last packet provided to the L3 interconnect port only by setting the [DSI_VC_CTRL_i\[6\]](#) BTA_EN bit, or for the last packets and the following ones by setting automatic mode.
 - Data transfer through video port: In the case of data transfer using the video port, the [DSI_VC_CTRL_i\[6\]](#) BTA_EN bit can be selected at any time during the transfer of the packet.
- For video mode packets (data and synchronization events), it is not possible to determine when the BTA is sent; therefore, it is highly recommended to use manual BTA mode only in command mode. It is possible, however, to use the BTA for a VC in video mode.

For data provided on the video port, an interrupt for end of packet transfer [PACKET_SENT_IRQ](#) is provided to indicate when the packet is completely sent by the DSI complex I/O. [PACKET_SENT_IRQ](#) can be monitored in the [DSI_VC_IRQSTATUS_i\[2\]](#) [PACKET_SENT_IRQ](#) status bit. The BTA is available even if the space allocated in the TX FIFO for the corresponding VC is empty. It must be sent later even if no packet was sent before the BTA request. The [DSI_VC_CTRL_i\[6\]](#) BTA_EN bit must be reset if the BTA request was sent, even if automatic mode for this specific type of packets is enabled.

The BTA is supported for video and command mode packets. It is not possible to send the BTA during the blanking periods of video mode when HS blanking packets should be sent; that is, when one of the following bits is set to 1:

- [DSI_CTRL\[20\]](#) BLANKING_MODE
- [DSI_CTRL\[21\]](#) HFP_BLANKING_MODE
- [DSI_CTRL\[22\]](#) HBP_BLANKING_MODE
- [DSI_CTRL\[23\]](#) HSA_BLANKING_MODE

Therefore, in video mode, the BTA request is delayed until there is a blanking period without HS blanking packets.

When the TurnRequest signal is asserted (always only for data lane 1), the TA_TO timer is started. If the direction signal is not changed according to the turnaround request, the TA_TO interrupt is generated. When the direction signal is in output mode, any data on the input data bus is ignored because the DSI is in transmission mode (data and triggers must be ignored). For more information about the TA_TO timer, see [Section 10.3.4.4.7.3, TurnRequest FSM](#).

10.3.4.4.9 PHY Triggers

The DSI protocol engine uses three triggers that are supported only for data lane 1:

- Reset trigger from host to display
- Tearing effect (TE) trigger from display to host
- Acknowledge trigger from display to host

CAUTION

Each trigger is associated with a dedicated user-configurable receive or transmit pattern, which is loaded in the [DSI_PHY_REGISTER3](#) or [DSI_PHY_REGISTER4](#) bit fields. The default (reset) values of the bit fields are aligned with the *MIPI D-PHY Specification v1.0*. If any of these values need to be changed, the following must be considered:

- If any of the bit fields is written with a nondefault value, the other bit fields in the same register must also be configured with different values. This is to ensure that two different trigger bit fields are not programmed with the same pattern.
- If two or more bit fields are written with equal values, unpredictable behavior of the DSI PHY module may occur.

10.3.4.4.9.1 Reset

The DSI protocol engine can use one of the triggers of the DSI_PHY to send a reset to the display. The reset trigger pattern is configurable through the [DSI_PHY_REGISTER3](#)[31:24] REG_TXTRIGGERESC3 bit field. To send the reset pattern to the peripheral, the [DSI_CTRL](#)[5] TRIGGER_RESET bit must be set to 1. When software requires the trigger reset pattern to be sent, the DSI protocol engine resets its own logic, but not the registers. Software can select between two reset modes:

- Immediate reset: All pending requests in TX FIFO not already considered for transfer scheduling, the RX FIFO requests, and the data from video port are ignored. Only the current transfer on the DSI link and those already scheduled are transmitted. All the other transfers are discarded.
- Synchronized reset: The mode is valid only if there is VC using the video mode and if it is active. The principle is to wait for the current video frame to be transferred on the link. Any data on the video port after the current frame are ignored.

To select reset mode, the [DSI_CTRL](#)[14] TRIGGER_RESET_MODE bit must be programmed.

CAUTION

For both reset modes, the DSI protocol engine flushes the FIFOs, synchronization buffers, and line buffers before resetting the [DSI_CTRL](#)[0] IF_EN bit.

10.3.4.4.9.2 Tearing Effect

TE on the display is avoided by having synchronization information from the display. It is used only in command mode and is not functional in video mode.

There are two types of TE triggers:

- DSI PHY TE trigger
- CMOS TE line (one of the two input signals can be selected for the TE trigger of a VC; the signal is asynchronous).

Software must set and send the appropriate sequence to receive the TE trigger pattern from the peripheral on the DSI link, or use the CMOS TE line. The value of the expected TE trigger pattern can be configured through the [DSI_PHY_REGISTER4](#)[23:16] REG_RXTRIGGERESC2 bit field.

When the TE PHY trigger pattern is received, the DSI protocol engine generates the TE_TRIGGER_IRQ interrupt with a TE event, if the interrupt is enabled. To enable the interrupt, the [DSI_IRQENABLE](#)[16] TE_TRIGGER_IRQ_EN bit must be set to 1. The [DSI_IRQSTATUS](#)[16] TE_TRIGGER_IRQ status bit indicates whether the interrupt event has been generated.

When using the TE CMOS signal, the DSI protocol engine generates the TE0_LINE or TE1_LINE interrupt, if it is enabled, depending on which line is used. One or multiple VCs can be synchronized using the same TE line. Both lines can be active at the same time for different VCs.

The [DSI_VC_TE_i\[30\]](#) TE_EN bit must be set and the [DSI_VC_TE_i\[29\]](#) TE_LINE bit must be reset to indicate that hardware must use the TE PHY trigger to start the transfer of the data from the related VC. TE_EN is reset when all the data are sent to the peripheral.

The [DSI_VC_TE_i\[30\]](#) TE_EN, [DSI_VC_TE_i\[29\]](#) TE_LINE, and [DSI_VC_TE_i\[28\]](#) TE_LINE_NB bits must be set to select between the TE0 and TE1 line to indicate that hardware must use the TE0 line or TE1 line to start the transfer of the data from the related VC. The bits are reset when all the data are sent to the peripheral.

The [DSI_TE_VSYNC_WIDTH_j](#), [DSI_TE_HSYNC_WIDTH_j](#), and [DSI_TE_HSYNC_NUMBER_j](#) registers indicate which mode is used to detect the start of the transfer:

- If [DSI_TE_HSYNC_NUMBER_j\[10:0\]](#) LINE_NUMBER = 0, [DSI_TE_HSYNC_WIDTH_j](#) is ignored. When a pulse on the TE line is detected to be wider than the [DSI_TE_VSYNC_WIDTH_j\[19:8\]](#) MIN_VSYNC_PULSE_WIDTH bit field, data transfer starts from the protocol engine to the peripheral at the falling edge of the TE CMOS line.
- If the [DSI_TE_HSYNC_NUMBER_j\[10:0\]](#) LINE_NUMBER bit field is greater than 0, [DSI_TE_HSYNC_WIDTH_j](#) is used. The DSI protocol engine waits until it detects a pulse wider than the [DSI_TE_VSYNC_WIDTH_j\[19:8\]](#) MIN_VSYNC_PULSE_WIDTH bit field, and then counts each pulse wider than [DSI_TE_HSYNC_WIDTH_j\[19:8\]](#) MIN_HSYNC_PULSE_WIDTH but smaller than [DSI_TE_VSYNC_WIDTH_j\[19:8\]](#) MIN_VSYNC_PULSE_WIDTH. When the number of HSYNC pulses is reached, data transfer from the DSI protocol engine to the peripheral starts. In case the number of HSYNC pulses is not reached due to a new VSYNC pulse being detected, the counter of HSYNC pulses restarts from 0.

NOTE: [DSI_TE_HSYNC_WIDTH_j\[19:8\]](#) MIN_HSYNC_PULSE_WIDTH is always programmed with a value smaller than [DSI_TE_VSYNC_WIDTH_j\[19:8\]](#) MIN_VSYNC_PULSE_WIDTH.

NOTE: The following must always be set before [DSI_VC_TE_i\[30\]](#) TE_EN is enabled:

- [DSI_TE_HSYNC_WIDTH_j\[19:8\]](#) MIN_HSYNC_PULSE_WIDTH
 - [DSI_TE_VSYNC_WIDTH_j\[19:8\]](#) MIN_VSYNC_PULSE_WIDTH
 - [DSI_VC_TE_i\[29\]](#) TE_LINE
 - [DSI_VC_TE_i\[28\]](#) TE_LINE_NB
-

The [DSI_VC_TE_i\[31\]](#) TE_START bit must be used when automatic mode is disabled ([DSI_VC_TE_i\[30\]](#) TE_EN bit = 0). It allows users to start the transfer manually based on application events or based on the TE trigger interrupt (TE_TRIGGER_IRQ).

The number of bytes to be transferred is defined by using the [DSI_VC_TE_i\[23:0\]](#) TE_SIZE bit field. The TE_SIZE bit field is decremented for each payload byte (it does not include checksum) sent on the DSI link. The register content must not be modified by software during a transfer. The [DSI_VC_TE_i\[23:0\]](#) TE_SIZE bit field must be set first to indicate that the following accesses to the [DSI_VC_LONG_PACKET_HEADER_i](#) register must be used for TE transfer.

The data can be provided from two sources (select by setting the [DSI_VC_CTRL_i\[1\]](#) SOURCE bit):

- L3 interconnect slave port using DMA request: The DMA request [DSI_DMA_REQ_i](#) must be asserted only when the TE trigger is received or when the [DSI_VC_TE_i\[31\]](#) TE_START bit is set by the user and must no longer be asserted when all the bytes defined in the [DSI_VC_TE_i\[23:0\]](#) TE_SIZE bit field are sent on the DSI link. The VC is associated with a DMA request by programming the number in the [DSI_VC_CTRL_i\[23:21\]](#) DMA_TX_REQ_NB bit field. The [DSI_VC_LONG_PACKET_PAYLOAD_i](#) register is used to provide the number of bytes defined by the [DSI_VC_TE_i\[23:0\]](#) TE_SIZE bit field (the checksum value is not provided in the [DSI_VC_LONG_PACKET_PAYLOAD_i](#) register). The size of the header is not considered in the number of bytes to transfer. The [DSI_VC_SHORT_PACKET_HEADER_i](#) register is not used.
-

NOTE: All DMA requests associated to a VC must be disabled when they are not used ([DSI_VC_CTRL_i\[23:21\]](#) DMA_TX_REQ_NB = 0x4).

- Video port: The DMA request is not asserted. The data are captured in the line buffer using the STALL mechanism. If no line buffer is instantiated (that is, the [DSI_CTRL\[13:12\] LINE_BUFFER](#) bit field is set to 0), it is not possible to use the video port to provide data. The line buffer is filled according to the word count defined in the [DSI_VC_LONG_PACKET_HEADER_i](#) register header. The value must be written before the TE trigger event is received or before the [DSI_VC_TE_i\[31\] TE_START](#) bit is set to 1 by software. If the total number of bytes defined by the [DSI_VC_TE_i\[23:0\] TE_SIZE](#) bit field is not a multiple of the word count defined in the [DSI_VC_LONG_PACKET_HEADER_i](#) register, all the packets are the same size defined by the WC of the header, except the last transfer. The size of the last transfer is defined by the remaining bytes to send. Because the [DSI_VC_TE_i\[23:0\] TE_SIZE](#) bit field is modified after each packet transfer, the size of the last packet is equal to the value of the [DSI_VC_TE_i\[23:0\] TE_SIZE](#) bit field before the last transfer (the header and the payload checksum sizes are not included in the [DSI_VC_TE_i\[23:0\] TE_SIZE](#) bit field).

When the transfer completes, the value of the [DSI_VC_TE_i\[23:0\] TE_SIZE](#) bit field is equal to 0. Software must ensure that the pending data in the TX FIFO for the corresponding VC using TE are related to the TE transfer. Any data in the TX FIFO that must be sent before the reception of the TE trigger must be sent before the TE. This is done by not enabling the TE trigger until all data for the corresponding VC are sent to the peripheral. Software can check that the space allocated for the VC in the TX FIFO is empty by reading the [DSI_VC_CTRL_i\[5\] TX_FIFO_NOT_EMPTY](#) status bit.

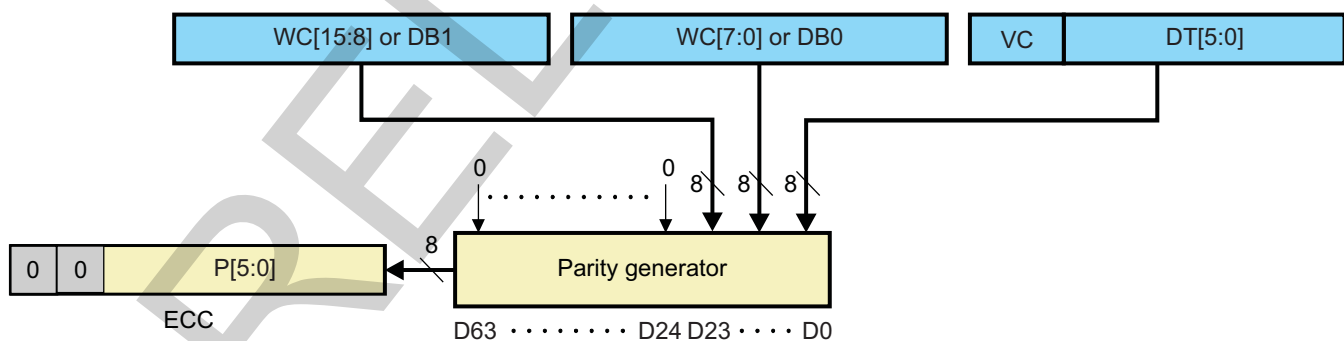
10.3.4.4.9.3 Acknowledge

The corresponding acknowledge interrupt (ACK_TRIGGER_IRQ) is generated when the acknowledge trigger is received. The value of the expected acknowledge trigger pattern can be configured through the [DSI_PHY_REGISTER4\[15:8\] REG_RXTRIGGERESC1](#) bit field. To enable the acknowledge interrupt, set the [DSI_IRQENABLE\[17\] ACK_TRIGGER_IRQ_EN](#) bit to 1. When the interrupt is generated, the [DSI_IRQSTATUS\[17\] ACK_TRIGGER_IRQ](#) status bit is set to 1.

10.3.4.4.10 ECC Generation

The DSI protocol uses a 4-byte PH. Because ECC generation requires a fixed word length of 64-bits, the packet headers must be padded with additional bits to form a full 8-byte value for ECC generation and checking. The PH minus the ECC byte should occupy bits D[23:0], and the pad bits should occupy bits D[63:24]. All padding bits must be 0 to generate the ECC byte. ECC can be generated using a parallel approach, as shown in [Figure 10-141](#).

Figure 10-141. 64-Bit ECC Generation on TX Side



dsi-052

The ECC generation/check can be enabled and disabled by software. It is defined by a common bit for all the VCs:

- The [DSI_CTRL\[2\] ECC_RX_EN](#) bit enables and disables ECC generation in the receive direction.
- The [DSI_VC_CTRL_i\[8\] ECC_TX_EN](#) bit enables and disables ECC generation in the transmit direction.

The ECC can be provided while writing the ECC value directly into the [DSI_VC_LONG_PACKET_HEADER_i](#) and [DSI_VC_SHORT_PACKET_HEADER_i](#) registers. The [DSI_VC_CTRL_i\[8\] ECC_TX_EN](#) bit indicates whether the ECC value will be calculated or whether the value written in the register will be used instead for command and video modes.

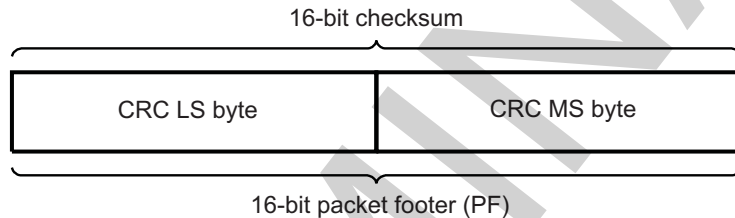
10.3.4.4.11 Checksum Generation for Long Packet Payloads

Long packets are comprised of a PH protected by an ECC byte and a payload of 0 to $2^{16} - 1$ bytes. To detect the errors during the transmission of long packets, a checksum is calculated over the payload portion of the data packet. For the special case of a 0-length payload, the 2-byte checksum is set to 0xFFFF. The checksum can only indicate the presence of one or more errors in the payload. Unlike ECC, the checksum does not enable error correction. For this reason, checksum calculation is not useful for some unidirectional DSI implementations, because the peripheral has no way to report errors to the host processor. Checksum generation and transmission is mandatory for host processors sending long packets to peripherals; it is optional for peripherals transmitting long packets to the host processor. However, the format of long packets is fixed; the peripherals that do not support checksum generation must transmit 2 bytes with a value of 0x0000 in place of the checksum bytes when sending long packets to the host processor. The host processor must disable checksum checking for received long packets from peripherals that do not support checksum generation.

Checksum must be realized as a 16-bit CRC with a generator polynomial of $x^{16} + x^{12} + x^5 + x^0$. The LSByte is sent first, followed by the MSByte. Within the byte, the LSB is sent first.

Figure 10-142 shows the checksum transmission.

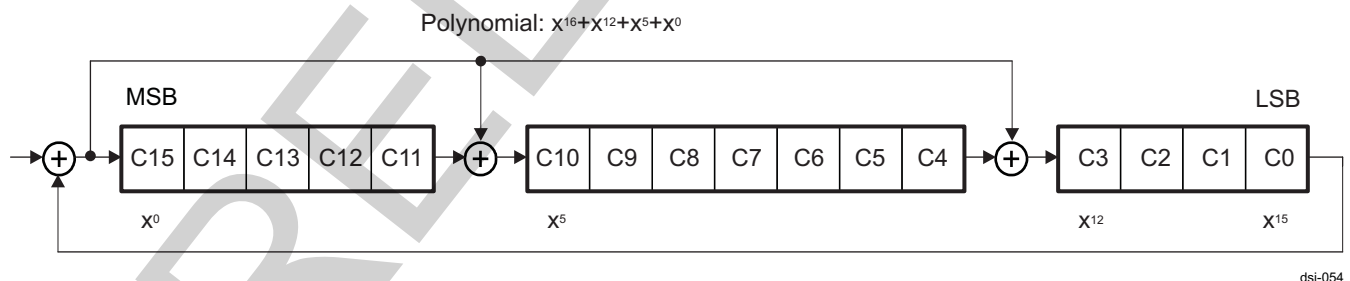
Figure 10-142. Checksum Transmission



dsi-053

Figure 10-143 shows the CRC implementation. The CRC shift register is initialized to 0xFFFF before packet data enters. Packet data not including the PH then enters as a bitwise data stream from the left, LSB first. Each bit is fed through the CRC shift register before it is passed to the output for transmission to the peripheral. After all bytes in the packet payload have passed through the CRC shift register, the shift register contains the checksum. C15 contains the MSB of the checksum, and C0 contains the LSB of the 16-bit checksum. The checksum is then appended to the data stream and sent to the receiver.

Figure 10-143. 16 Bit CRC Generation Using a Shift Register



dsi-054

Checksum generation/check can be enabled and disabled by software. It is defined by a common bit for all the VCs:

- The [DSI_CTRL\[1\]](#) CS_RX_EN bit enables and disables checksum generation in the receive direction.
- The [DSI_VC_CTRL\[i\]\[7\]](#) CS_TX_EN bit enables and disables checksum generation in the transmit direction

10.3.4.4.12 EOT Packet

A new packet type allows the DSI protocol (rather than the DSI_PHY) at the display to detect the HS EOT. This is a fixed short packet (4 bytes) that is added at every HS to LP transition. This function is enabled by the [DSI_CTRL\[19\]](#) EOT_ENABLE bit.

The EOT packet has a fixed format:

- Data Type = DI [5:0] = 0b001000
- Virtual Channel = DI [7:6] = 0b00
- Payload Data [15:0] = 0x0F0F
- ECC [7:0] = 0x01

When more than one data lane is used, the EOT packet bytes are distributed across the multiple lanes. EOT packet generation is supported only for the end of HS transmissions. No EOT packet is added at the end of LP transmissions. For LP reception, any EOT packet received is simply passed through as any other packet, but no internal decode or use is made of the EOT information.

10.3.4.4.13 Software Reset

The DSI protocol engine can be reset by software. This reset can be done for debug purposes or after a protocol error and has the same effect as the hardware reset. The DSI protocol engine can be reset by setting the [DSI_SYSCONFIG](#)[1] SOFT_RESET bit to 1. Software can monitor the [DSI_SYSSTATUS](#)[0] RESET_DONE status bit to wait for the reset to complete. If after five reads the [DSI_SYSSTATUS](#)[0] RESET_DONE status bit still returns 0, it can be assumed that an error occurred during the reset stage.

NOTE: This software reset is optional because a hardware reset is always performed on the DSI protocol engine at device reset.

10.3.4.4.14 Power Management

The power-management behavior of the DSI protocol engine is controlled by the [DSI_SYSCONFIG](#) register. This register controls the way the module interacts with the PRCM module. The [DSI_SYSCONFIG](#)[0] AUTO_IDLE bit must be set to 1 (default value) to enable automatic clock gating in the module.

The DSI protocol engine implements a handshake protocol on the L3 interconnect slave port with the PRCM module. The protocol engine provides control signal CIO_CLK_ICG to gate the SCPClk (DSS_L3_ICLK/4). It allows reduction of the power consumption of the complex I/O while the DSI link is not in use ([DSI_CLK_CTRL](#)[14] CIO_CLK_ICG).

10.3.4.4.15 Power Control of DSI PHY Complex I/O and DSI PLL

The DSI protocol engine can control and send power commands for the DSI complex I/O and DSI PLL controller modules.

10.3.4.4.15.1 Complex I/O Power Control Commands

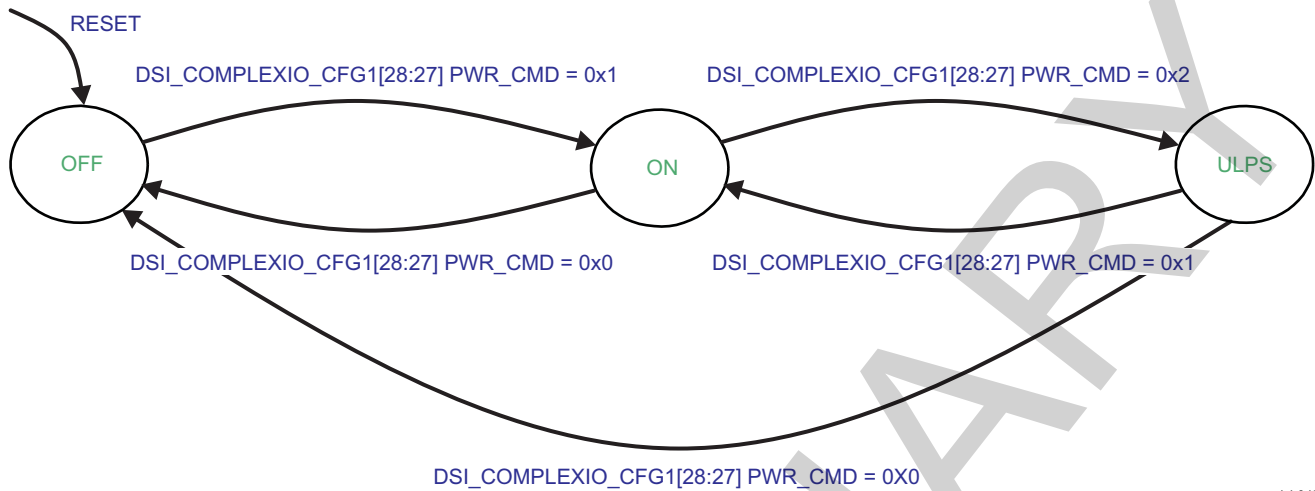
10.3.4.4.15.1.1 Complex I/O Power Control Commands

The DSI complex I/O can be set in three modes:

- OFF: In this power state, the complete DSI_PHY circuit is powered down. The internal LDO is OFF.
- ON: In this power state, the complete DSI_PHY circuit is powered on and functional.
- ULPS: In this power state, the ULPS exit detection circuit power switch is ON for the lanes that are in receive ULPS. For the lanes that are in transmit ULPS, the circuitry for weak pulldown is ON. The ULTRALOW POWER state must be used only when all the three lanes are in ULPS (transmit or receive).

10.3.4.4.15.1.2 Complex I/O Power FSM

[Figure 10-144](#) shows the FSM to control the power state of the complex I/O.

Figure 10-144. Complex I/O Power FSM


ds1-045

The PwrCmdOff, PwrCmdUlp, and PwrCmdOn commands control the state transition of the DSI complex I/O. The [DSI_COMPLEXIO_CFG1\[28:27\] PWR_CMD](#) bit field allows the state to be modified. The allowed transitions are: OFF - ON, and ON - ULPS, and ULPS - OFF. The [DSI_COMPLEXIO_CFG1\[26:25\] PWR_STATUS](#) bit field gives a status on the current state of the DSI complex I/O.

CAUTION

- In automatic mode, software must ensure that the DSI complex I/O is in ON state (that is, ON command already sent) before sending requests to the complex I/O.
- In a command request to change to a state that is the current one (acknowledge has been received), the command is ignored (nothing is sent to the DSI complex I/O).
- To change the state to ULPS, all ULPSActiveNot signals must be low. The ULPSActiveNot_ALL0_IRQ interrupt indicates the state of the ULPSActiveNot signals. The change from ULPS to ON state is required before starting the ULP exit sequence (for information, see [Section 10.3.4.4.7.1, T_{wakeup} Timer](#)).

10.3.4.4.15.2 DSI PLL Power Control Commands

The DSI PLL controller module can be set in four modes:

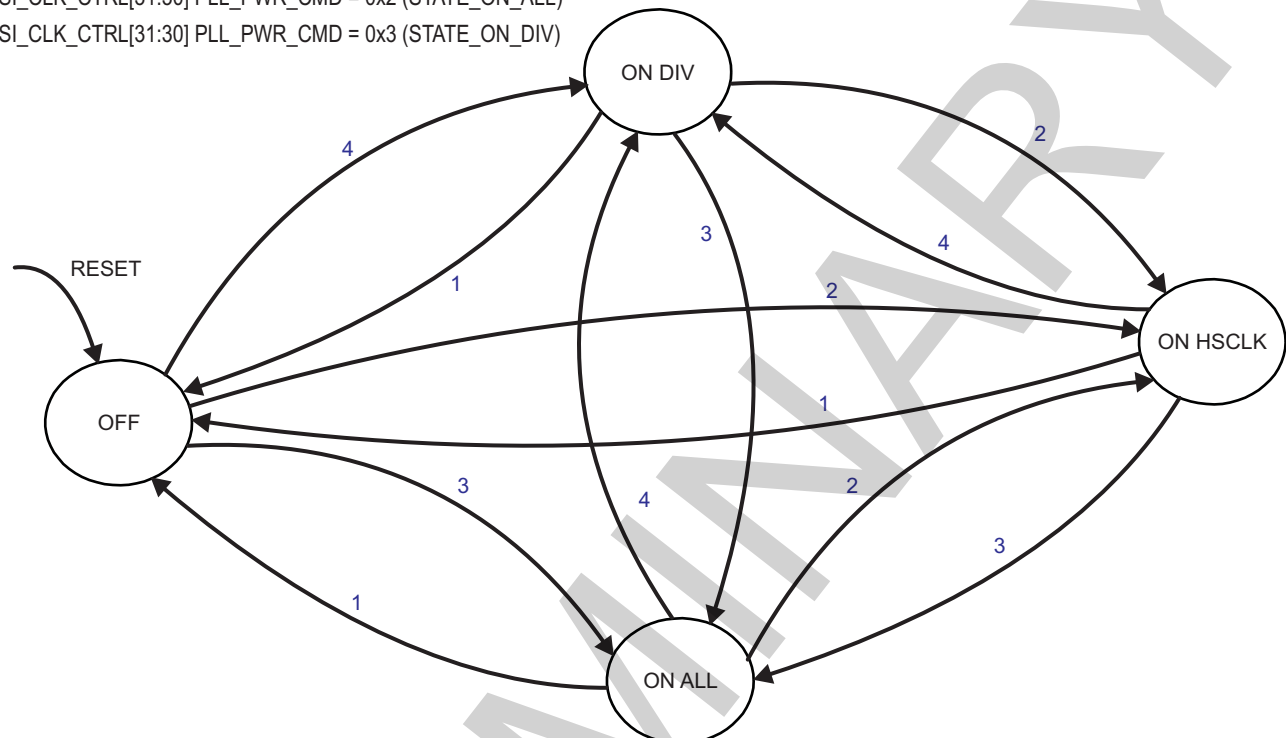
- OFF: DSI PLL and HSDIVIDER are OFF.
- ON ALL: Both DSI PLL and HSDIVIDER are ON. The CLKIN4DDR clock is provided to the DSI complex I/O and the second clock output is provided to the HSDIVIDER.
- ON HSCLK: The DSI PLL is ON. The HSDIVIDER is OFF. The CLKIN4DDR clock is provided to the DSI complex I/O, but the second clock output is not provided to the HSDIVIDER.
- ON DIV: DSI PLL and HSDIVIDER are ON. The CLKIN4DDR clock is not provided to the DSI complex I/O, but the second clock output is provided to the HSDIVIDER.

10.3.4.4.15.2.1 DSI-PLL Power FSM

[Figure 10-145](#) shows the DSI PLL power FSM.

Figure 10-145. DSI PLL Power FSM

- 1 = DSI_CLK_CTRL[31:30] PLL_PWR_CMD = 0x0 (STATE_OFF)
 2 = DSI_CLK_CTRL[31:30] PLL_PWR_CMD = 0x1 (STATE_ON_HSCLK)
 3 = DSI_CLK_CTRL[31:30] PLL_PWR_CMD = 0x2 (STATE_ON_ALL)
 4 = DSI_CLK_CTRL[31:30] PLL_PWR_CMD = 0x3 (STATE_ON_DIV)



dsi-046

The following commands control the state transition of the DSI PLL control module:

- PLLPwrCmdOff
- PLLPwrCmdOnAll
- PLLPwrCmdOnDIV
- PLLPwrCmdOnHSClk

Setting the [DSI_CLK_CTRL\[31:30\] PLL_PWR_CMD](#) bit field modifies the state. The [DSI_CLK_CTRL\[29:28\] PLL_PWR_STATUS](#) bit field gives a status on the current state of the DSI PLL controller.

NOTE: If a command requests to change to a state that is the current one (acknowledge has been received), the command is ignored (nothing is sent to the DSI PLL control module).

10.3.4.4.15.2.1.1 DSI PLL HS Clock Signals

The DSIStopClk signal is provided to the DSI PLL control module. It indicates when the DSI protocol engine does not need to use the HS mode and the PLL HS output (CLKIN4DDR clock) can be stopped. The following conditions must also be met when DISPC_UPDATE_SYNC may be generated by the DISPC, because that must result in the PLL HS output being stopped.

When the interface is disabled ([DSI_CTRL\[0\] IF_EN](#) bit set to 0) and the clock lane is stopped ([DSI_CLK_CTRL\[13\] DDR_CLK_ALWAYS_ON](#) = 0), the signal DSIStopClk is asserted.

Assertion of the DSIStopClk depends on the following conditions:

- Clock lane TxRequestHS is deasserted (the DDR clock on the clock lane is no longer required). For TxRequestHS deassertion, the following conditions are required:

- The [DSI_CLK_CTRL\[13\]](#) `DDR_CLK_ALWAYS_ON` bit must be reset to 0 and no HS data transfer must be on-going or already scheduled.
- No VC ACTIVE in video mode. No VC using the video mode is enabled. If the VC is enabled, the mode is command mode only (the [DSI_VC_CTRL_i\[0\]](#) `VC_EN` bit set to 1 and [DSI_VC_CTRL_i\[4\]](#) `MODE` bit set to 0).
- No command mode requiring HS transfer (one or more VCs using command mode can be active)
- Or [DSI_CTRL\[0\]](#) `IF_EN` bit is reset to 0 (the previous conditions are not all required, except the [DSI_CLK_CTRL\[13\]](#) `DDR_CLK_ALWAYS_ON` bit must be set to 0 after resetting the [DSI_CTRL\[0\]](#) `IF_EN` bit)

The deassertion of the `DSISopClk` depends on one of the following conditions (the DSI interface is enabled by setting the [DSI_CTRL\[0\]](#) `IF_EN` bit to 1):

- Clock lane `TxRequestHS` must be asserted (the DDR clock on the clock lane is required).
- One video mode VC ACTIVE
- At least one VC in command mode requiring HS transfer
- The [DSI_CLK_CTRL\[13\]](#) `DDR_CLK_ALWAYS_ON` bit is set to 1 by software users (the [DSI_CTRL\[0\]](#) `IF_EN` bit must be reset to 0 for updating the value of the `DDR_CLK_ALWAYS_ON` bit).

Automatic assertion/deassertion is enabled by using the [DSI_CLK_CTRL\[18\]](#) `HS_AUTO_STOP_ENABLE` bit.

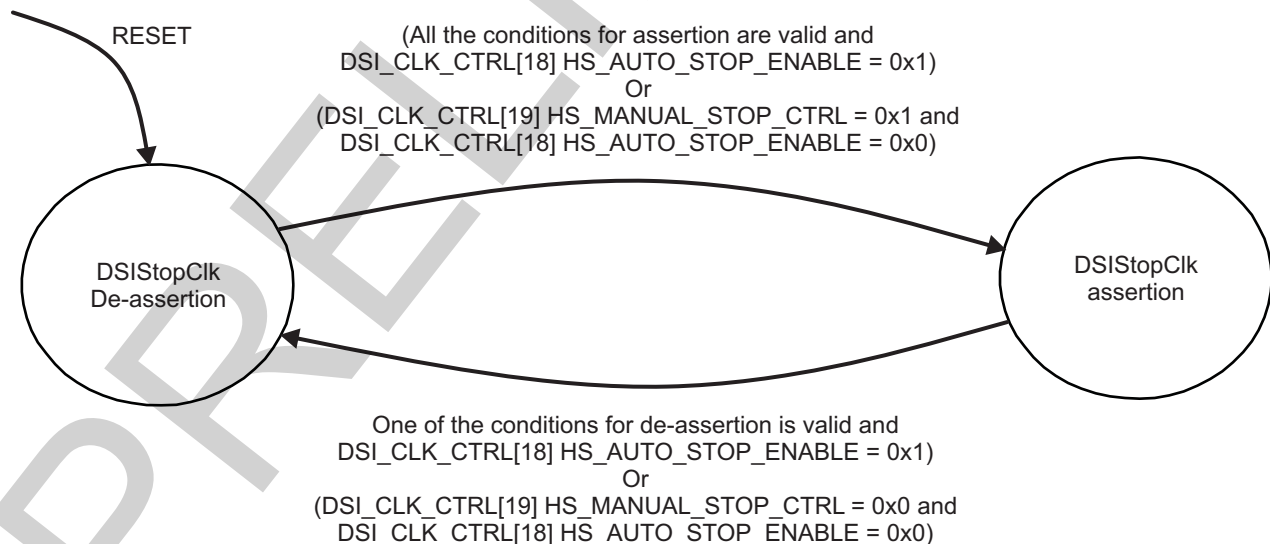
Manual mode can be used by setting/resetting the [DSI_CLK_CTRL\[19\]](#) `HS_MANUAL_STOP_CTRL` bit to assert/deassert the `DSISopClk` signal.

NOTE: Setting the [DSI_CTRL\[24\]](#) `DISPC_UPDATE_SYNC` bit to 0x1 enables the use of the `Dispc_Update_Sync` signal to synchronize.

10.3.4.4.15.2.1.2 DSI-PLL HS Clock FSM

Figure 10-146 shows the DSI PLL HS clock FSM.

Figure 10-146. DSI PLL HS Clock FSM



ds1-047

When `DSISopClk` is used there is a latency through other modules (DSI PLL controller and `DSI_PHY`) before `TXBYTECLKHS` is stopped. This latency must be considered to prevent any issue when `DSISopClk` is deasserted soon after being asserted. This is done using a hardware timer programmed using the [DSI_STOPCLK_TIMING\[7:0\]](#) `DSI_STOPCLK_LATENCY` bit field. This timer is programmed in number of periods of the DSI protocol functional clock (`DSI_FCLK`). At reset value, the timer is programmed with value 0x80 (128).

CAUTION

The programmed value in the [DSI_STOPCLK_TIMING\[7:0\]](#) DSI_STOPCLK_LATENCY bit field must be greater than $((3 \times L3_ICLK \text{ period}) + (5 \times CLKIN4DDR \text{ period})) / (DSI_FCLK \text{ period})$.

10.3.4.4.16 Ultralow-Power State Configuration

This section describes how to enter/exit to/from ULTRALOW-POWER state (ULPS).

NOTE: The [DSI_COMPLEXIO_CFG2\[9:0\]](#) LANEx_ULPS_SIGy bits (*x* range is 1 to 5, corresponding to lane 1 to lane 5 for DSI1, and 1 to 3, corresponding to lane 1 to lane 3 for DSI2; *y* range is 1 to 2) must be read back after writing to verify that the write operations are effective before proceeding to the next step. This is to take latency at low TxClkEsc frequencies into account.

10.3.4.4.16.1 Entering ULPS

To enter into ULPS for a clock lane, the following sequence is required:

1. Wait for [DSI_COMPLEXIO_CFG2\[16\]](#) HS_BUSY and [DSI_COMPLEXIO_CFG2\[17\]](#) LP_BUSY bits to be reset to 0 and ensure that the [DSI_CLK_CTRL\[13\]](#) DDR_CLK_ALWAYS_ON bit is 0.
2. TxUlpsClk state should change from inactive to active by setting the [DSI_COMPLEXIO_CFG2\[9:5\]](#) LANEx_ULPS_SIG2 bit to 1.

To enter into ULPS for a data lane, the following sequence is required:

1. Wait for all TX_FIFOs for all VCs working in HS are empty, for video mode is not active, and for [DSI_COMPLEXIO_CFG2\[16\]](#) HS_BUSY bit is reset to 0 (in addition for data lane 1, [DSI_COMPLEXIO_CFG2\[17\]](#) LP_BUSY bit is reset to 0)
2. TxRequestEsc state should change from inactive to active by setting the [DSI_COMPLEXIO_CFG2\[9:5\]](#) LANEx_ULPS_SIG2 bit to 1.

10.3.4.4.16.2 Exiting ULPS

To exit from ULPS for a clock lane, the following sequence is required:

1. Change the state of TxUlpsExit for each lane to ACTIVE by setting the [DSI_COMPLEXIO_CFG2\[4:0\]](#) LANEx_ULPS_SIG1 bit to 1.
2. Wait for the ULPSACTIVENOT_ALL1_IRQ interrupt indicating that all lanes with TxUlpsExit active have acknowledged by asserting UlpsActiveNot. This is performed by monitoring the [DSI_COMPLEXIO_IRQSTATUS\[31\]](#) ULPSACTIVENOT_ALL1_IRQ status bit.
3. Start the wake-up timer (GPTimer).
4. Wait for the time-out.
5. Change TxUlpsClk signals to INACTIVE state for the clock lane by resetting the [DSI_COMPLEXIO_CFG2\[9:5\]](#) LANEx_ULPS_SIG2 bit to 0.
6. Reset the [DSI_COMPLEXIO_CFG2\[4:0\]](#) LANEx_ULPS_SIG1 bit to 0.

NOTE: When the [DSI_COMPLEXIO_CFG2\[9:5\]](#) LANEx_ULPS_SIG2 and [DSI_COMPLEXIO_CFG2\[4:0\]](#) LANEx_ULPS_SIG1 bits are both being written to 0, they can be combined into one write. Both bits must be read back to confirm they are effective before proceeding.

To exit from ULPS for a clock lane, in case the complex I/O is in OFF state (the DSI protocol engine sends the complex I/O to OFF state (PWROFF command) by setting [DSI_COMPLEXIO_CFG1\[28:27\]](#) PWR_CMD = 0x0), the sequence is:

1. Change TxUlpsCk signals to INACTIVE state for the clock lane by resetting the [DSI_COMPLEXIO_CFG2\[9:5\]](#) LANEx_ULPS_SIG2 bit to 0.
2. Change the state of TxUlpsExit for clock lane to INACTIVE state by resetting the [DSI_COMPLEXIO_CFG2\[4:0\]](#) LANEx_ULPS_SIG1 bit to 0. This step is necessary only in case a PWROFF command (the command for power control of the complex I/O) is issued while the sequence for exiting is in progress (TxUlpsExit signal is already in ACTIVE state).

NOTE: When the [DSI_COMPLEXIO_CFG2](#) LANEx_ULPS_SIG2[9:5] and [DSI_COMPLEXIO_CFG2](#) LANEx_ULPS_SIG1 bits are both being written to 0, they can be combined into one write. Both bits must be read back to confirm they are effective before proceeding.

To exit from ULPS for a data lane, the following sequence is required:

1. Change the state of TxUlpsExit for each lane to ACTIVE by setting the [DSI_COMPLEXIO_CFG2\[4:0\]](#) LANEx_ULPS_SIG1 bit to 1.
2. Wait for the ULPSACTIVENOT_ALL1_IRQ interrupt indicating that all lanes with TxUlpsExit active have acknowledged by asserting UlpsActiveNot. This is performed by monitoring the [DSI_COMPLEXIO_IRQSTATUS\[31\]](#) ULPSACTIVENOT_ALL1_IRQ status bit.
3. Start the application wake-up timer (GPTimer).
4. Wait for the time-out.
5. Change TxRequestEsc signals to INACTIVE state for the data lane by resetting the [DSI_COMPLEXIO_CFG2\[9:5\]](#) LANEx_ULPS_SIG2 bit to 0.
6. Reset the [DSI_COMPLEXIO_CFG2\[4:0\]](#) LANEx_ULPS_SIG1 bit to 0.

NOTE: When the [DSI_COMPLEXIO_CFG2](#) LANEx_ULPS_SIG2 and [DSI_COMPLEXIO_CFG2](#) LANEx_ULPS_SIG1 bits are both being written to 0, they can be combined into one write. Both bits must be read back to confirm they are effective before proceeding.

To exit from ULPS for a data lane, in case the complex I/O is in OFF state (the DSI protocol engine sends the complex I/O into OFF state by setting [DSI_COMPLEXIO_CFG1\[28:27\]](#) PWR_CMD = 0x0), the sequence is:

1. Change TxRequestEsc signals to INACTIVE state by resetting the [DSI_COMPLEXIO_CFG2\[9:5\]](#) LANEx_ULPS_SIG2 bit to 0.
2. Change the state of TxUlpsExit to INACTIVE state by resetting the [DSI_COMPLEXIO_CFG2\[4:0\]](#) LANEx_ULPS_SIG1 bit to 0. This step is necessary only in case a PWROFF command is issued while the sequence for exiting is in progress (TxUlpsExit signal is already in ACTIVE state).

NOTE: When the [DSI_COMPLEXIO_CFG2](#) LANEx_ULPS_SIG2 and [DSI_COMPLEXIO_CFG2](#) LANEx_ULPS_SIG1 bits are both being written to 0, they can be combined into one write. Both bits must be read back to confirm they are effective before proceeding.

When the sequence for entering/exiting into/from ULP state is started for specific lanes, users should wait for the completion of the sequence before changing the state of the same or other lanes.

10.3.4.4.17 Interrupts

There is a single interrupt request generated by each DSI: DSI_IRQ. This interrupt line is merged with another interrupt line from the DISPC_IRQ into a single interrupt request IRQ. The DSI_IRQ events are generated only for the enabled VC(s). Two registers are used to enable and monitor the DSI interrupt events:

- **DSI_IRQENABLE**: This register enables and disables interrupt event reporting for the VCs. Each event for the VC is configured in the **DSI_VC_IRQENABLE_i** register dedicated to the VC number. In addition, it includes 1 bit to enable error reporting for the complex I/O. The interrupt is triggered when any error is received from the complex I/O.
- **DSI_IRQSTATUS**: The register flags which VC(s) have generated an interrupt. Based on the VC number, the **DSI_VC_IRQSTATUS_i** register indicates the event generating the interrupt. In addition, it includes 1 bit for the status of error reporting for the complex I/O.

Table 10-502 lists the DSI VC interrupt events

Table 10-502. DSI VC Interrupts

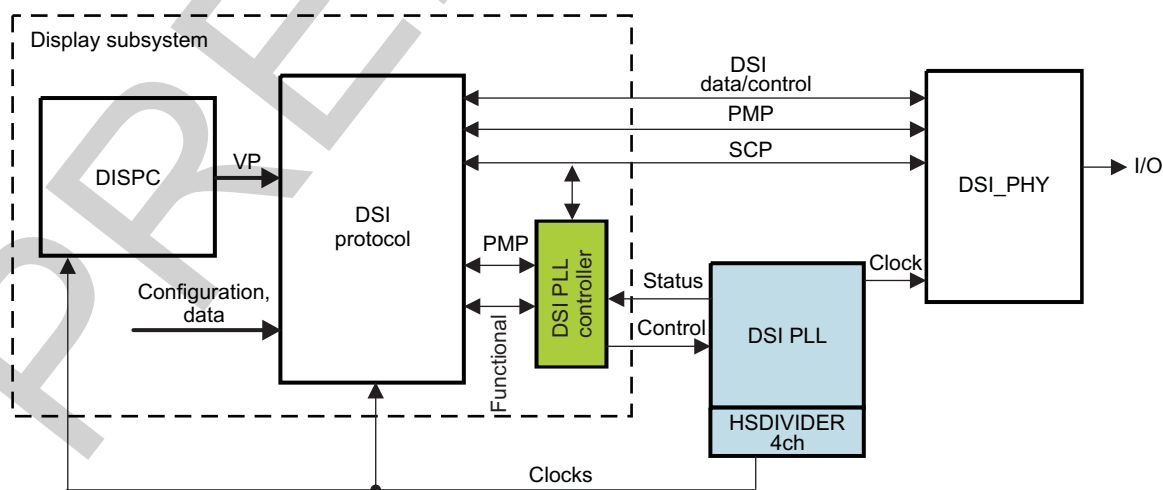
| IRQ Name | Description |
|-----------------------|---|
| ECC_CORRECTION_IRQ | Indicates whether a 1-bit error correction has occurred using ECC (short and long packets). |
| PACKET_SENT_IRQ | Indicates that a packet has been sent. It is used when BTA manual mode is used. |
| CS_IRQ | Virtual channel. Checksum of the payload mismatch detection. |
| FIFO_RX_OVF_IRQ | RX FIFO overflow. The FIFO used on the L3 interconnect slave port for buffering the data received on the DSI link has overflowed. |
| FIFO_TX_OVF_IRQ | TX FIFO overflow. The FIFO used on the L3 interconnect slave port for buffering the data received on the interface slave port has overflowed. |
| BTA_IRQ | BTA is received from the peripheral (the VC ID used for the last BTA request transfer to the peripheral will be used to determine which VC will be used to flag the interrupt). |
| ECC_NO_CORRECTION_IRQ | ECC error (short and long packets). No correction of the header because of more than 1-bit error. |
| FIFO_TX_UDF_IRQ | TX FIFO underflow. The FIFO used on the slave port for buffering the data received on the L3 interconnect slave port has underflowed in the middle of a packet transfer. |

10.3.4.5 DSI PLL Controllers

10.3.4.5.1 DSI PLL Controllers Overview

Two DSI PLL controller modules are part of the DSS. They use the SCP (see [Section 10.3.4.4.6, Serial Configuration Port Interface](#)) and power-management port (PMP) as the primary interfaces to the DSI protocol engines. The SCP interface is used to set the configuration of the digital phase-locked loop (DPLL) and HSDIVIDER modules, primarily the various counter values. The PMP is used to control the power state of the DPLL and HSDIVIDER modules. [Figure 10-147](#) is an overview of a single DSI PLL controller module in the display subsystem.

Figure 10-147. DSI PLL Controller Overview



dsi-056

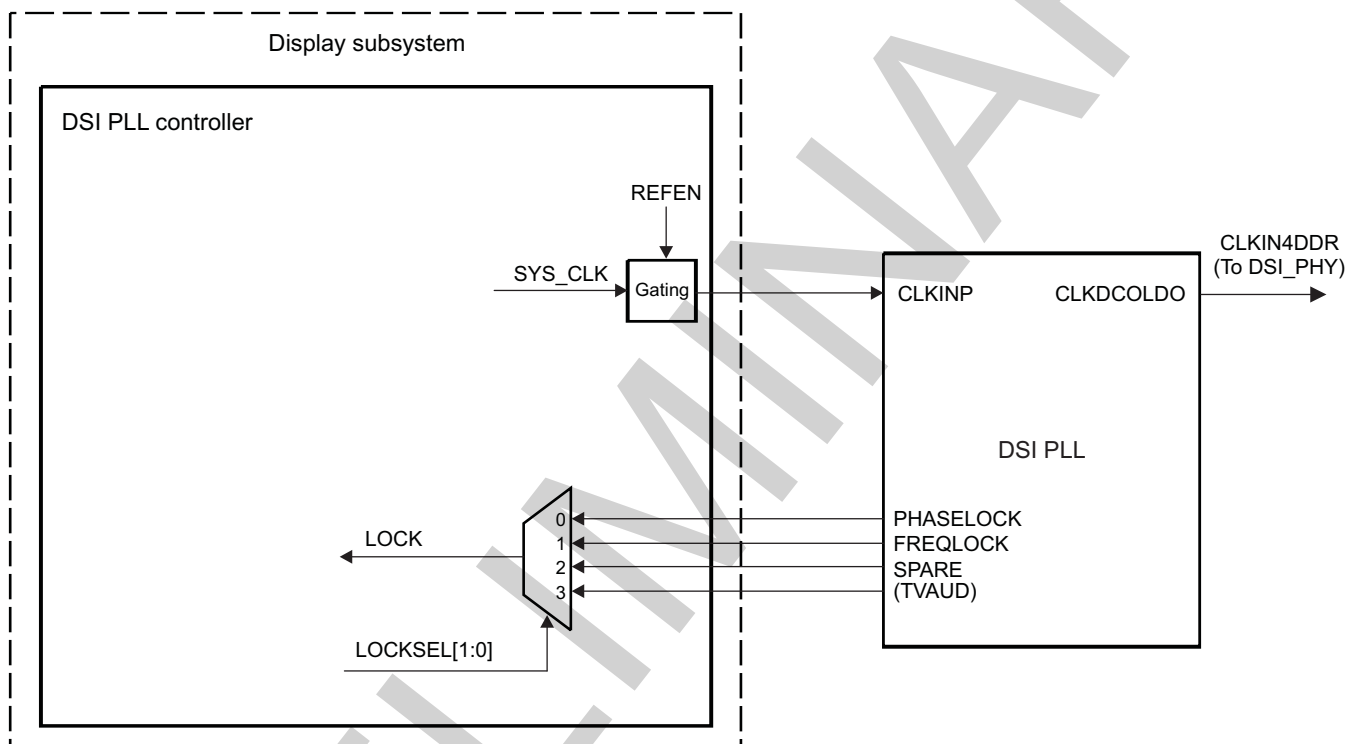
NOTE: The DSI PLL controller modules do not have an interface to L3/L4_PER interconnects. The programmable features are managed by registers mapped into the DSI protocol engines.

10.3.4.5.2 DSI PLL Controllers Architecture

The DSI PLLs use instances of the DPLL modules of type A. For more information regarding various DPLL types within the device, see , *Generic DPLL Overview*, in [Chapter 3, Power, Reset, and Clock Management](#).

[Figure 10-148](#) shows the internal reference diagram of a single DSI PLL.

Figure 10-148. DSI PLL Reference Diagram

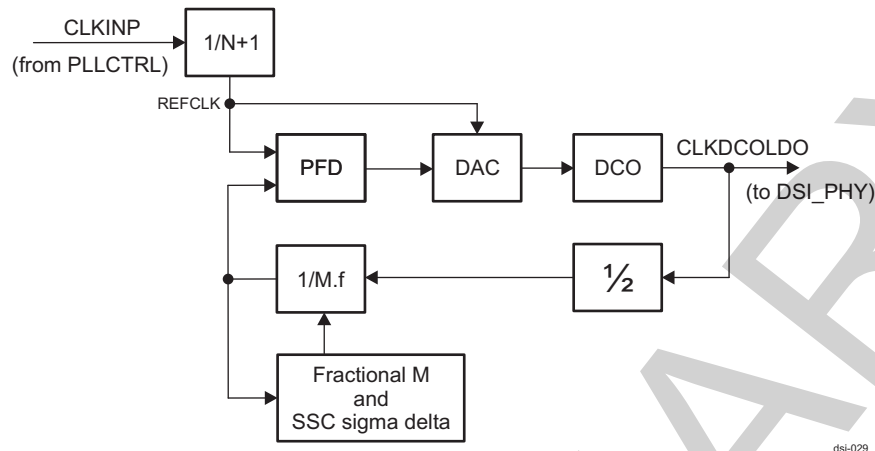


dsi-057

The DSI PLL clock output (CLKDCOLDO) corresponds to the CLKIN4DDR clock of a DSI complex I/O (DSI_PHY) module.

Only the SYS_CLK clock is used as an input reference clock for the DSI PLL. The DSI PLL controller can gate this clock by setting the [DSI_PLL_CONFIGURATION2\[13\]](#) PLL_REFEN bit.

[Figure 10-149](#) is a simplified block diagram of the DSI PLL instance used for the DSI modules.

Figure 10-149. DSI PLL Functional Block Diagram

The input clock **CLKINP** goes to a predivider $N + 1$. The entire loop runs on the **REFCLK** clock after this predivider. The value of $N + 1$ is controlled through the [DSI_PLL_CONFIGURATION1\[8:1\]](#) **PLL_REGN** bit field. The frequency range for the **CLKINP** and **REFCLK** clocks is 0.032 MHz to 52 MHz.

The output clock **CLKDCOLDO** is synthesized by digitally controlled oscillator (the **DCO** block), that automatically detects the frequency range. The **CLKDCOLDO** frequency can be given with $\text{CLKDCOLDO} = \text{CLKINP} \times 2 \times M / (N + 1)$. For that purpose the feedback multiplier M must be configured through the [DSI_PLL_CONFIGURATION1\[20:9\]](#) **PLL_REGM** bit field.

The DSI PLL module supports fractional synthesis; that is, the frequency multiplication factor M can be programmed as fractional. This is done through the use of a sigma delta feedback divider (M). A fractional value (**REGM.f**) of 18 bits is supported, thus enabling control for better accuracy. Programming the fractional value is done by setting the [DSI_PLL_CONFIGURATION4\[17:0\]](#) **PLL_REGM_F** register bit field. Fractional synthesis is supported only in the following range: $20 \leq M \leq 2045$.

The module also supports spread spectrum clocking (SSC) on its output clocks. SSC is used to spread the spectral peaking of the clock to reduce electromagnetic interference (EMI). When SSC is enabled, the clock spectrum is spread by the amount of frequency spread, and the attenuation is given by the ratio of the frequency spread (df) and the modulation frequency (fm); that is, $\{10 \times \log_{10}(df/fm)\} - 10$ dB.

The SSC is performed by changing the feedback divider (M) in a triangular pattern, which means the frequency of the output clock varies in a triangular pattern. The frequency of the triangular pattern is modulation frequency (fm). The peak (dM) or the amplitude of the triangular pattern as a percent of M is equal to the percent of the frequency spread (df) (that is, $dM/M = df/F_{out}$).

Because this is in band modulation for the DSI PLL, the modulation frequency (fm) must be within the bandwidth of the PLL (lowest BW of **REFCLK**/70; that is, **REFCLK** must be $> fm \times 70$). A higher modulation frequency results in less spreading in the output clock.

The SSC can be enabled and disabled by asserting the [DSI_PLL_SSC_CONFIGURATION1\[0\]](#) **EN_SSC** bit. The acknowledge signal **SSCACK**, observed by the [DSI_PLL_STATUS\[12\]](#) **SSC_EN_ACK** bit, notifies the exact start and end of SSC. When **EN_SSC** is deasserted, SSC is disabled only after completion of one full cycle of the triangular pattern given by the modulation frequency. This is done to maintain the average frequency.

The modulation frequency (fm) can be programmed as a ratio of **REFCLK**/4; that is, the value of **ModFreqDivider** programmed in the [DSI_PLL_SSC_CONFIGURATION2\[29:20\]](#) **MODFREQDIVIDER** bit field must be $= \text{REFCLK} / (4 \times fm)$. The **ModFreqDivider** is split into Mantissa and 2^{Exponent} ($\text{ModFreqDivider} = \text{ModFreqDividerMantissa} \times 2^{\text{ModFreqDividerExponent}}$).

- The Mantissa is controlled by bits [29:23] of the **MODFREQDIVIDER** bit field.
- The Exponent is controlled by bits [22:20] of the **MODFREQDIVIDER** bit field.

Although the same value of **ModFreqDivider** can be obtained by different combinations of Mantissa and Exponent values, it is preferred to get the target **ModFreqDivider** by programming maximum Mantissa and minimum Exponent values.

To define the frequency spread (df), M must be controlled as explained previously. To define M, the step size of M for each REFCLK during the triangular pattern must be programmed (that is, $M = \text{ModFreqDivider} * \text{DeltaMStep}$). DeltaMStep is controlled by the [DSI_PLL_SSC_CONFIGURATION2\[19:0\]](#) DELTAM bit field. DeltaMStep is split into an integer part and a fractional part:

- The integer part is controlled by bits [19:18] of the DELTAM bit field.
- The fractional part is controlled by bits [17:0] of the DELTAM bit field.

The frequency spread achieved, however, has an overshoot of 20% or an inaccuracy of +20%.

If the [DSI_PLL_SSC_CONFIGURATION1\[2\]](#) DOWNSPREAD bit is set to 1, the frequency spread on the lower side is twice the programmed value. The frequency spread on the higher side is 0 (except for the overshoot, as described above).

NOTE: There is a restriction in the range of M values. The restriction is that $(M - dM)$ must be ≥ 20 . Also, $M + dM$ must be ≤ 2045 . If the [DSI_PLL_SSC_CONFIGURATION1\[2\]](#) DOWNSPREAD bit is set to 1, then $(M - 2*dM)$ must be ≥ 20 and $M \leq 2045$.

10.3.4.5.3 DSI PLL Operations

The DSI PLL configuration signals operate according to [Table 10-503](#), which indicates the operation when the PLLs are not locked.

Table 10-503. DSI PLL Operation Modes When Not Locked

| DSI PLL Operation Mode | Stop Mode Low Power ⁽¹⁾ | Stop Mode Fast Relock ⁽¹⁾ | Idle Bypass |
|--|---|---|--|
| Mode Description | Output clocks stopped Lowest power standby | Output clocks stopped Fastest start-up time | Selects when PLLs and HSDIVIDERS bypass clocks are used |
| DSI_PLL_CONFIGURATION2[0] PLL_IDLE | 0 | 0 | 1 |
| DSI_PLL_CONFIGURATION2[6] PLL_LOWCURRSTBY | 1 | 0 | 1 |
| DSI_PLL_CONFIGURATION1[0] PLL_STOPMODE | 1 | 1 | x |

⁽¹⁾ This mode must be used for better performance.

When locked, the PLL output frequency is: Input frequency * 2 * M/(N + 1), where:

- M multiplier is programmed in the [DSI_PLL_CONFIGURATION1\[20:9\]](#) PLL_REGM bit field.
- N divider is programmed in the [DSI_PLL_CONFIGURATION1\[8:1\]](#) PLL_REGN bit field.

10.3.4.5.4 DSI PLL Controllers Shadowing Mechanism

The configuration registers are accessed through the DSI protocol engine register spaces using the SCP interface. This includes all the configuration signals and returning status signals.

CAUTION

All writes must be 32-bit operations, because the SCP interface always transfers 32 bits; 16-or 8-bit operations may lead to unpredictable errors.

A shadow mechanism is implemented for appropriate register values so that configurations can optionally be updated in synchronization with the DISPC and DSI protocol engines. The front porch time from the DISPC indicates the time when making the update of the value. All the required updated values must be written before this signal is asserted. For more information, see [Section 10.3.4.4.6.1, Shadowing Register](#).

10.3.4.5.5 Error Handling

The PLL lock and recalibration signals can be monitored to detect the loss of lock or the requirement to recalibrate (caused by a large temperature change since the last lock request):

- The [DSI_PLL_STATUS](#)[1] PLL_LOCK status bit gives the DSI PLL lock state.
- The [DSI_PLL_STATUS](#)[2] PLL_RECAL status bit informs whether the PLL must be uncalibrated.

These signals can also generate interrupts at the DSI protocol engine level:

- The PLL_LOCK_IRQ interrupt indicates that the DSI PLL control module has sent a lock request to the DSI PLL. To monitor this event, read the [DSI_IRQSTATUS](#)[7] PLL_LOCK_IRQ bit. Set this bit to 1 to clear the status bit.
- The PLL_UNLOCK_IRQ interrupt indicates that the DSI PLL control module has sent an unlock request to the DSI PLL. To monitor this event, read the [DSI_IRQSTATUS](#)[8] PLL_UNLOCK_IRQ bit. Set this bit to 1 to clear the status bit.
- The PLL_RECAL_IRQ interrupt indicates that the DSI PLL control module has sent a recalibration request to the DSI PLL. To monitor this event, read the [DSI_IRQSTATUS](#)[9] PLL_RECAL_IRQ bit. Set this bit to 1 to clear the status bit.

The PLL reference loss and limp status signals can also be monitored:

- The [DSI_PLL_STATUS](#)[3] PLL_LOSSREF status bit informs whether the DSI PLL has lost the reference.
- The [DSI_PLL_STATUS](#)[4] PLL_LIMP bit informs about the DSI PLL limp status.

10.3.4.5.6 Software Reset

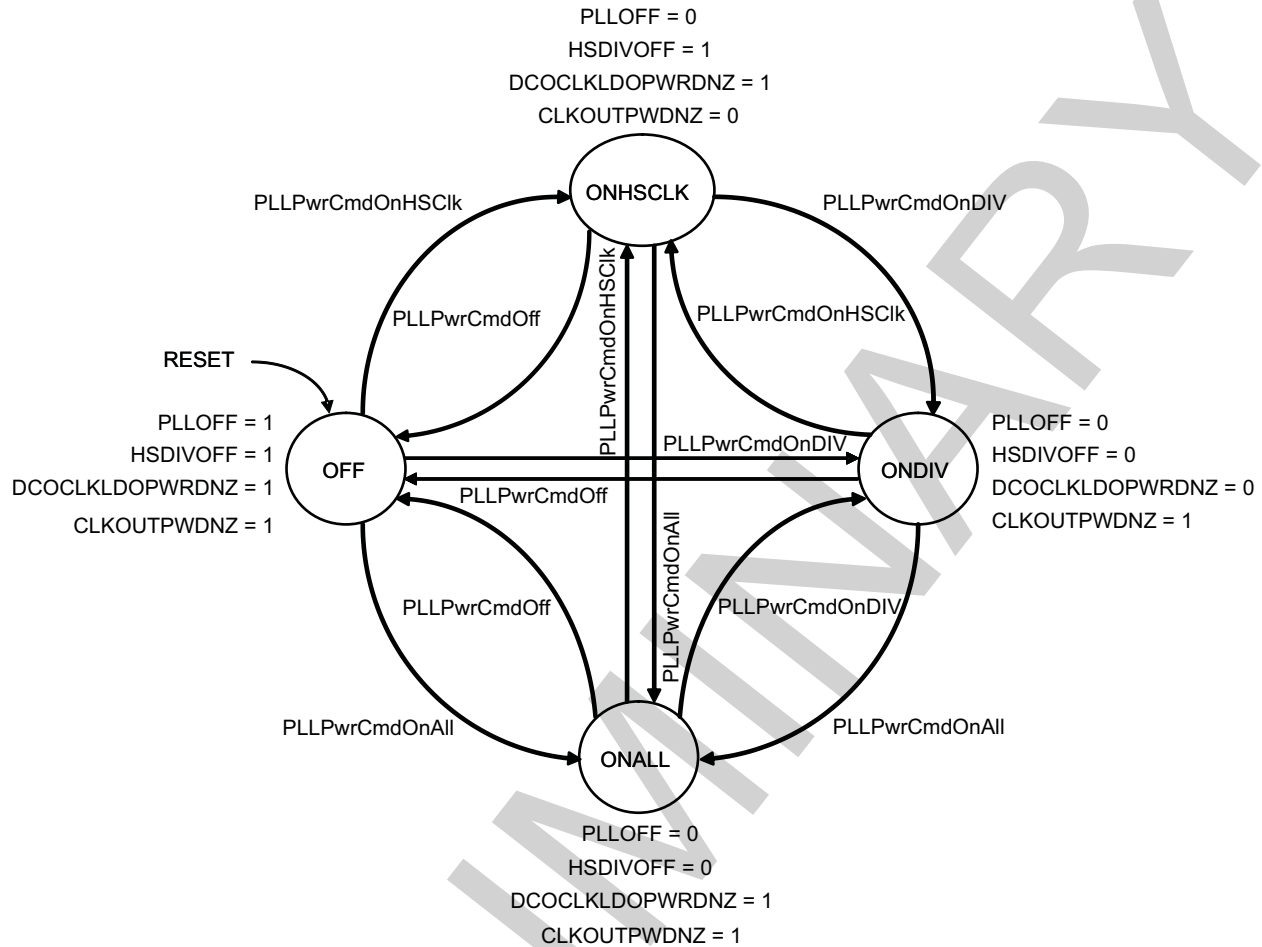
The DSI PLL control modules do not have their own software reset. They are reset by the global DSS_RST signal at PRCM module level. See [Section 10.1.2.2, DSS Resets](#). Nevertheless, software users can monitor the reset statuses of the DSI PLL control modules by reading the [DSI_PLL_STATUS](#)[0] PLLCTRL_RESET_DONE status bits.

10.3.4.5.7 Power Management

The PLLCTRL manages only the LDO power of the DSI PLL and HSDIVIDER; this is done by overriding the SYSRESET signals. All other power-management signals are integrated with the display subsystem power management..

[Figure 10-150](#) shows the power states that are controlled through the PMP.

Figure 10-150. Power State Diagram



dsi-058

10.3.4.5.8 DSI PLL Clock-Gating Sequence

Clock gating can be used to reduce system power consumption when the DSI protocol engine indicates that it does not need the clock. If the HSDIVIDER is not used, the PLL can also be stopped (at the cost of additional unstating latency).

The DSI protocol engines must verify when the PLLs have unstated by inspecting the LOCK signal (the [DSI_PLL_STATUS\[1\]](#) PLL_LOCK status bit), because the TXBYTECLKHS clocks are stopped when the CLKIN4DDR clocks generated by the DSI PLL are stopped. This eliminates the need for any explicit feedback that the clock has been unstated. This flow chart should run even if the [DSI_PLL_GO\[0\]](#) PLL_GO bit is not set.

[Figure 10-151](#) shows the DSI PLL gated mode sequence.

Figure 10-151. Gated Mode Sequence



- Table 10-504. Register Call Summary for Gated Mode Sequence**

| Register Name | Register Name | Register Name |
|------------------------|-----------------|---------------|
| DSI_PLL_CONFIGURATION2 | DSI_PLL_CONTROL | DSI_PLL_GO |

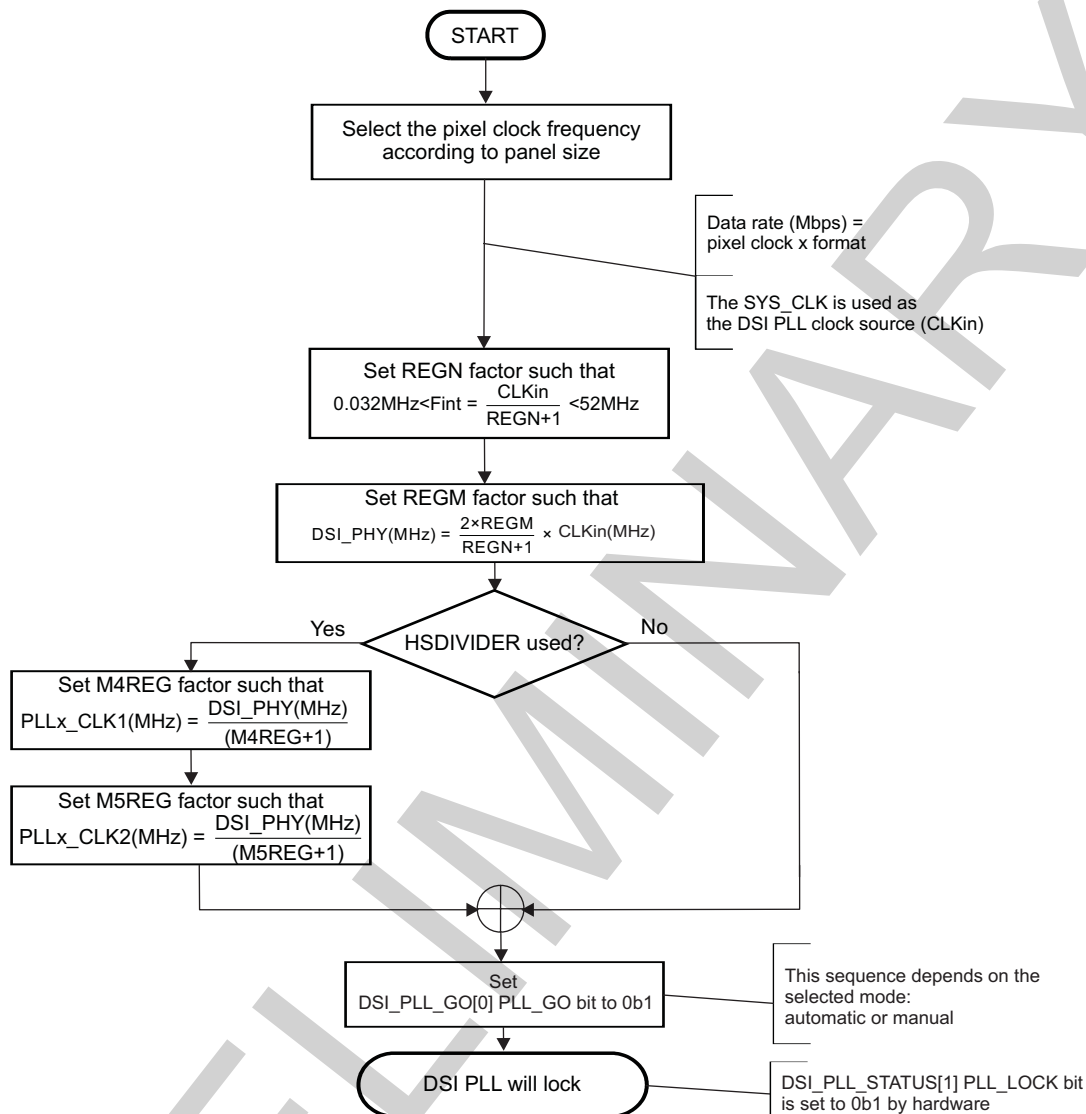
10.3.4.5.9 DSI PLL Clock Sequence

The two DSI PLLs generate the CLKIN4DDR clocks. Each HSDIVIDER outputs two clocks: PLLx_CLK1, connected to the DISPC; and PLLx_CLK2, connected to the DSI protocol engine (where x is the number of the dedicated DSI PLLs [1 or 2]). If these two clocks are not used, the HSDIVIDER functions are not required. In addition, the HSDIVIDER of the DSI1 PLL generates one more clock, PLL1_CLK4, which is used as bypass input for DSI2_PHY.

The CLKIN4DDR clocks are twice the data rate and four times the DSI output clock frequency. The DSI PLL factors must be calculated based on the required input and output frequencies, keeping the PLL internal reference frequency in the appropriate range:

- REGM factor is programmed by the [DSI_PLL_CONFIGURATION1](#)[20:9] PLL_REGM bit field.
- REGN factor is programmed by the [DSI_PLL_CONFIGURATION1](#)[8:1] PLL_REGN bit field.
- M4REG factor is programmed by the [DSI_PLL_CONFIGURATION1](#)[25:21] M4_CLOCK_DIV bit field, and applies to PLLx_CLK1.
- M5REG factor is programmed by the [DSI_PLL_CONFIGURATION1](#)[30:26] M5_CLOCK_DIV bit field, and applies to PLLx_CLK2.
- M7 factor is programmed by the [DSI_PLL_CONFIGURATION3](#)[9:5] M7_CLOCK_DIV field, and applies to PLL1_CLK4.

[Figure 10-152](#) shows the programming sequence.

Figure 10-152. DSI PLL Programming Sequence**NOTE:**

- The M4REG and M5REG factors must be set respecting the following conditions:
 - The PLLx_CLK1 frequency must be a multiple of PCLK frequency (for proper settings of the PCD and LCD factors in the DISPC).
 - The PLLx_CLK1 and PLLx_CLK2 frequencies must be lower than 186 MHz. For more information about clock frequency ratings, see [Section 10.1.2.1, DSS Clocks](#).
- Most of the other DSI PLL programming values are available for software flexibility, but it is not recommended to update the values in normal use. For the recommended DSI PLL values, see [Section 10.3.4.5.11, DSI PLL Recommended Values](#).

Table 10-505. Register Call Summary for DSI PLL Programming Sequence

| Register Name | Register Name | Register Name |
|--|----------------------------|--------------------------------|
| DSI_PLL_CONFIGURATION2 | DSI_PLL_GO | DSI_PLL_STATUS |

10.3.4.5.10 DSI PLL Go Sequence

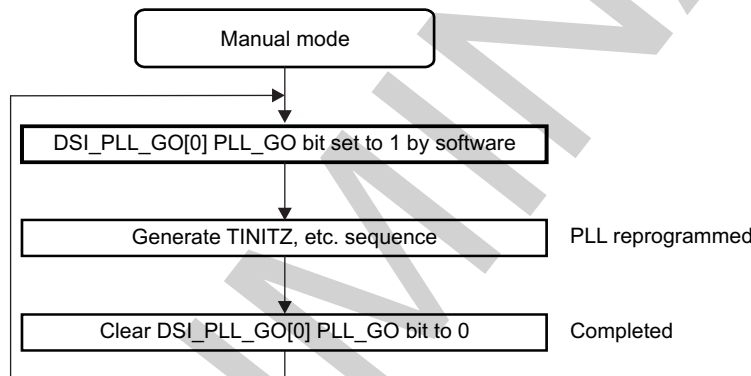
In manual mode (the [DSI_PLL_CONTROL\[0\] PLL_AUTOMODE](#) bit is set to 0), the DPLL requires a sequence on TINITZ, TENABLE, and TENABLEDIV to update the configuration values and start the locking sequence.

When all the configuration values are programmed into the registers, the GO bit must be set. The appropriate sequence is then sent on the TINITZ, TENABLE, and TENABLEDIV pins, respecting the timing requirements of the DSI PLL. The [DSI_PLL_GO\[0\] PLL_GO](#) bit is cleared to 0 at the end of the sequence.

The TENABLEDIV signal is shared with the HSDIVIDER module so that it is programmed at the same time. In this mode, software must deassert CLKINEN by unsetting the [DSI_PLL_CONFIGURATION2\[14\] PHY_CLKINEN](#) to 0 and assert HSDIVBYPASS correctly by setting the [DSI_PLL_CONFIGURATION2\[20\] HSDIVBYPASS](#) bit to 1 to prevent uncontrolled frequencies affecting DSI_PHY and the display subsystem during PLL locking. In manual mode, the shadow register is updated anyway so that valid values are present when later selecting automatic mode.

[Figure 10-153](#) shows the DSI PLL Go flow chart in manual mode (the [DSI_PLL_CONTROL\[0\] PLL_AUTOMODE](#) bit is set to 0).

Figure 10-153. DSI PLL Go Sequence (Manual Mode)

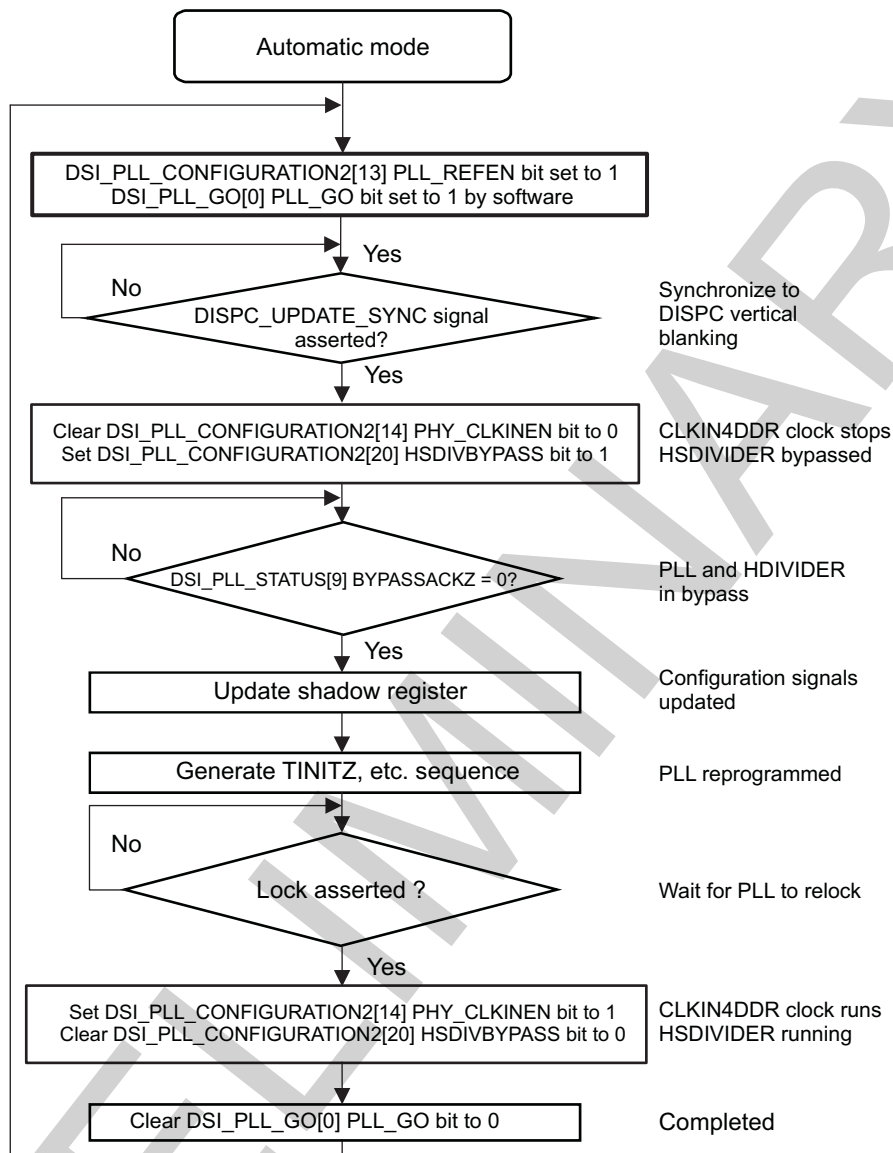


dsi-062

- (1) All thick-outlined blocks show operations performed by software. Other blocks show operations performed by hardware.

In automatic mode (the [DSI_PLL_CONTROL\[0\] PLL_AUTOMODE](#) bit is set to 1), the TINITZ, TENABLE, and TENABLEDIV sequence and the update of the PLL configuration from the [DSI_PLL_CONFIGURATION2](#) register are deferred until the time of the front porch time signal sent by the DISPC module. This is intended to simplify the software to implement a configuration change (such as a frequency change to support a different link bandwidth). In this mode, CLKINEN, HSDIVBYPASS, and REFEN are automatically controlled and the register value is overridden.

[Figure 10-154](#) shows the DSI PLL Go flow chart in automatic mode (the [DSI_PLL_CONTROL\[0\] PLL_AUTOMODE](#) bit is set to 1).

Figure 10-154. DSI PLL Go Sequence (Automatic Mode)

dsi-063

- (1) All thick-outlined blocks show operations performed by software. Other blocks show operations performed by hardware.

Table 10-506. Register Call Summary for DSI PLL Go Sequence (Automatic Mode)

| Register Name | Register Name | Register Name |
|--|--------------------------------|----------------------------|
| DSI_PLL_CONFIGURATION2 | DSI_PLL_STATUS | DSI_PLL_GO |

10.3.4.5.11 DSI PLL Recommended Values

[Table 10-507](#) shows the DSI PLL recommended values.

Table 10-507. Recommended Programming Values

| Field Name | Value | Description |
|--|-------|----------------------------|
| DSI_PLL_CONTROL [4] HSDIV_SYSRESET | 0 | Allow power FSM to control |
| DSI_PLL_CONTROL [3] PLL_SYSRESET | 0 | Allow power FSM to control |

Table 10-507. Recommended Programming Values (continued)

| Field Name | Value | Description |
|---|----------------------|---|
| DSI_PLL_CONTROL[2] PLL_HALTMODE | - | For information, see Section 10.3.4.5.8, DSI PLL Clock-Gating Sequence . |
| DSI_PLL_CONTROL[1] PLL_GATEMODE | - | For information, see Section 10.3.4.5.8, DSI PLL Clock-Gating Sequence . |
| DSI_PLL_CONTROL[0] PLL_AUTOMODE | - | For information, see Section 10.3.4.5.8, DSI PLL Clock-Gating Sequence . |
| DSI_PLL_GO[0] PLL_GO | 1 - 0 | Write 1 when PLL is to be (re)locked with new parameters. This bit is cleared by hardware when the PLL request completes. |
| DSI_PLL_CONFIGURATION1[30:36] M5_CLOCK_DIV | See ⁽¹⁾ . | DSI protocol engine clock divider |
| DSI_PLL_CONFIGURATION1[25:21] M4_CLOCK_DIV | See ⁽¹⁾ . | DSS clock divider |
| DSI_PLL_CONFIGURATION1[20:9] PLL_REGM | See ⁽¹⁾ . | Feedback clock divider |
| DSI_PLL_CONFIGURATION1[8:1] PLL_REGN | See ⁽²⁾ . | Reference clock divider |
| DSI_PLL_CONFIGURATION1[0] PLL_STOPMODE | 1 | Required to use the GATEMODE bit |
| DSI_PLL_CONFIGURATION2[20] HSDIVBYPASS | 0 | PLL controls HSDIVIDER bypass |
| DSI_PLL_CONFIGURATION2[19] M5_CLOCK_PWDN | 0 | If PLL/HSDIVIDER is used as the DSI protocol clock source |
| DSI_PLL_CONFIGURATION2[18] M5_CLK_EN | 1 | If PLL/HSDIVIDER is used as the DSI protocol clock source |
| DSI_PLL_CONFIGURATION2[17] M4_CLOCK_PWDN | 0 | If PLL/HSDIVIDER is used as the clock source |
| DSI_PLL_CONFIGURATION2[16] M4_CLOCK_EN | 1 | If PLL/HSDIVIDER is used as the clock source |
| DSI_PLL_CONFIGURATION2[15] BYPASSEN | 0 | To use PLL as the clock source. For small displays, it may be possible to use the display subsystem functional clock, DSS_CLK, in which case this bit must be set to 1. See Section 10.3.4.2, DSI Clock Configuration . |
| DSI_PLL_CONFIGURATION2[14] PHY_CLKINEN | 1 | Enable CLKIN4DDR clock |
| DSI_PLL_CONFIGURATION2[13] PLL_REFEN | 1 | Enable PLL reference |
| DSI_PLL_CONFIGURATION2[10:9] PLL_LOCKSEL | 0x0 | Phase lock criteria to lock the PLL |
| DSI_PLL_CONFIGURATION2[8] PLL_DRIFTGUARDEN | 0x0 | The RECAL status/interrupt must be used to decide when to perform a PLL uncalibration. No automatic uncalibration is performed |
| DSI_PLL_CONFIGURATION2[6] PLL_LOWCURRSTDBY | 0/1 | Set to 0 for fast PLL unlock, but higher standby current. Set to 1 for leakage level standby current, but longer unlock time. |
| DSI_PLL_CONFIGURATION2[5] PLLLPMODE | 0 | Normal operation. For smaller display sizes, it may be possible to set to 1. |
| DSI_PLL_CONFIGURATION2[0] PLL_IDLE | 0 | PLL active |

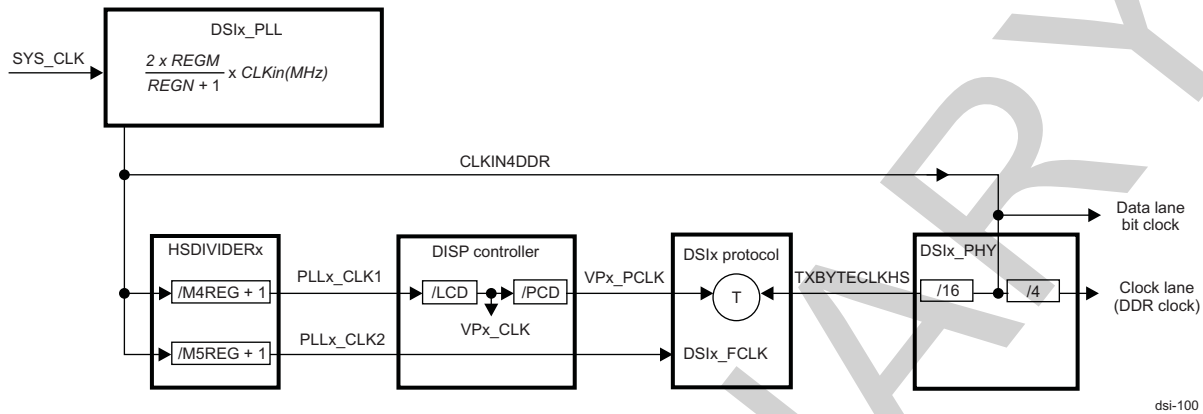
⁽¹⁾ The value of the bit field must be set according to the desired clock frequency.

⁽²⁾ The value of the bit field must be set according to the desired clock frequency.

10.3.4.5.12 How to Configure the DSI PLL in Video Mode

Figure 10-155 is a global overview of the DSI1 and DSI2 clock trees when used in video mode.

Figure 10-155. DSI Clock Tree in Video Mode



The settings of the DSI PLL registers can be summarized by the following equations.

Equation 1

$$N \times T_{VP_CLK} = T_L \times T_{TXBYTECLKHS}$$

ds1-e101

where

- $T_L = T_{HS} + HSA_{DSI} + T_{HE} + HFP_{DSI} + \text{ceiling}((WC + 6) / NDL) + HBP_{DSI}$
- N is an integer.
- NDL: Number of data lanes
- WC: Word count or payload in bytes
- HSA_{DSI} is HSA period in video mode.
- HBP_{DSI} is HBP period in video mode.
- HFP_{DSI} is HFP period in video mode.

T_{HS} is the length of HSYNC start short packet in the number of byte clock cycles (TXBYTECLKHS).

- The generation of this packet can be enabled by setting the [DSI_CTRL\[17\]](#) VP_HSYNC_START bit to 1.
- T_{HS} is equal to $\text{ceiling}(4 / NDL)$, if VP_HSYNC_START = 1; else, it is 0.

T_{HE} is the length of HSYNC end short packet in the number of byte clock cycles (TXBYTECLKHS).

- The generation of this packet can be enabled by setting the [DSI_CTRL\[18\]](#) VP_HSYNC_END bit to 1.
- T_{HE} is equal to 1, if (VP_HSYNC_START = 1, VP_HSYNC_END = 1, $HSA_{DSI} = 0$, and NDL = 3), else
- T_{HE} is equal to $\text{ceiling}(4 / NDL)$, if (VP_HSYNC_START = 1 and VP_HSYNC_END = 1); else, it is 0.

NOTE: HSA_{DSI} timing is not used and does not have to be programmed when HE short packet is not generated.

Equation 2

$$R = T_{TXBYTECLKHS} / T_{VP_PCLK}$$

ds1-e102

To synchronize the DISPC and DSI protocol engines, users must follow the ratio R between TXBYTECLKHS and VP_PCLK, as listed in [Table 10-508](#).

Table 10-508. Ratio R

| Number of Data Lanes (Up to 4 Data Lanes for DSI1) (Up to 2 Data Lanes for DSI2) | Pixel Format | Ratio R |
|--|--------------|---------|
| 1 | 16-bit pixel | 1/2 |
| 1 | 18-bit pixel | 4/9 |
| 1 | 24-bit pixel | 1/3 |
| 2 | 16-bit pixel | 1 |
| 2 | 18-bit pixel | 8/9 |
| 2 | 24-bit pixel | 2/3 |
| 3 | 16-bit pixel | 3/2 |
| 3 | 18-bit pixel | 4/3 |
| 3 | 24-bit pixel | 1 |
| 4 | 16-bit pixel | 2 |
| 4 | 18-bit pixel | 16/9 |
| 4 | 24-bit pixel | 4/3 |

All cases are covered by:

$$F_{VP_PCLK} \times \text{bits_per_pixel} = F_{TXBYTECLKHS} \times NDL \times 8$$

dsi-e110

Equation 3

$$(HSA_{DISPC} + HFP_{DISPC} + PPL + HBP_{DISPC}) \times T_{VP_PCLK} = (4/NDL + HFP_{DSI} + (WC + 6)/NDL + HBP_{DSI}) \times T_{TXBYTECLKHS}$$

dsi-e103

Equation 4

$$HFP_{DSI} = ((HFP_{DISPC} \times \text{bits_per_pixel}) / (NDL \times 8)) - (2 / NDL)$$

dsi-e109

Example

The desired performances are:

- Clock lane at 150 MHz
- RGB24-888
- 1-data lane
- LCD size 480 × 640 with $HSA_{DISP} = HFP_{DISP} = HBP_{DISP} = 20$, $VSA_{DISP} = VFP_{DISP} = VBP_{DISP} = 2$

Step 1. Determine REGM and REGN.

To obtain correct stability, F_{int} must be kept between 0.032 MHz and 52 MHz. In this case, F_{int} is maintained at 2 MHz. For more information, see [Section 10.3.4.5.2, DSI PLL Controllers Architecture](#), [Section 10.3.4.5.9, DSI PLL Clock Sequence](#), and [Section 10.3.5.2.1.1, Main Sequence – DSI PLL Setup](#).

$$REGN = (F_{SYS_CLK} / F_{int}) - 1$$

$$REGN = 12$$

$$REGM = (REGN + 1) \times F_{CLKIN4DDR} / (2 \times F_{SYS_CLK})$$

$$REGM = 150$$

dsi-e113

where

- $SYS_CLK = 26$ MHz is used as a reference clock.

Step 2. Determine VP_PCLK and TXBYTECLKHS clocks.

TXBYTECLKHS frequency is equal to 37.5 MHz. With ratio R equal to 1/3, VP_PCLK frequency is equal to 12.5 MHz. The frame rate can be estimated by:

$$\text{Frame rate} = F_{VP_PCLK} / (HSA_{DISPC} + HFP_{DISPC} + PPL + HBP_{DISPC}) \times (VSA_{DISPC} + LPP + VBP_{DISPC})$$

$$\text{Frame rate} = 12.5 \text{ MHz} / (540) \times (646)$$

$$\text{Frame rate} = 35.83 \text{ frame/sec}$$

dsi-e123

Step 3. Determine LCD, PCD, and M4REG.

$$T_{CLKIN4DDR} = T_{TXBYTECLKHS} / 16 = T_{VP_PCLK} / ((M4REG + 1) \times LCD \times PCD)$$

$$((M4REG + 1) \times LCD \times PCD) = 16 \times 3$$

dsi-e115

If LCD and PCD are set to 1 and 3, respectively, M4REG is equal to 15.

Step 4. Verify N as integer.

First, TL must be determined:

$$(HSA_{DISPC} + HFP_{DISPC} + PPL + HBP_{DISPC}) \times T_{VP_PCLK} / T_{TXBYTECLKHS} = T_L = 1620$$

dsi-e116

From **Equation 1** follows:

$$N \times T_{VP_CLK} = T_L \times T_{TXBYTECLKHS}$$

$$N = T_{TXBYTECLKHS} \times T_L / T_{VP_CLK} = T_L / (R \times PCD)$$

$$N = 14580$$

N is an integer.

Step 5. Determine HFP and HBP of the DSI protocol engine.

From **Equation 3** follows:

$$((HSA_{DISPC} + HFP_{DISPC} + PPL + HBP_{DISPC}) \times T_{VP_PCLK} / T_{TXBYTECLKHS}) - (4/NDL + (WC + 6)/NDL) = HFP_{DSI} + HBP_{DSI}$$

$$HFP_{DSI} + HBP_{DSI} = 170$$

dsi-e117

From **Equation 4** follows:

$$HFP_{DSI} = ((HFP_{DISP} \times \text{bits_per_pixel}) / NDL \times 8) - (2/NDL)$$

$$HFP_{DSI} = 58$$

$$HBP_{DSI} = 170 - 58 = 112$$

dsi-e121

10.3.4.6 DSI Complex I/O

10.3.4.6.1 DSI Complex I/O Overview

DSI_PHY is a complex I/O with five unidirectional (HS) lane modules. This includes four data lane modules and one clock lane module. Each lane module has two data pads (DX, DY). These data pads are connected with a complementary lane module on the DSI receiver device using a point-to-point interconnect.

Lane modules support HS burst mode. Forward direction and reverse direction escape modes are also supported. Escape modes can be used for low-power data transmission, among other things.

The maximum data rate supported in HS mode is 824 Mbps for four data lanes, and 900 Mbps for up to three data lanes. The lane module function and position are configurable; that is, any lane module can be chosen as a clock lane module, and the DX/DY data pad for each lane module can be configured as a DP or DN pin defined by the D-PHY specification.

DSI_PHY interacts with the higher layers of the DSI link through the PPI. DSI_PHY does not include a PLL; a high-frequency clock input is expected in HS mode (CLKIN4DDR). DSI_PHY also supports the SCP interface to set various configuration and control registers.

10.3.4.6.2 Software Reset

The clock domain using the TXBYTECLKHS byte clock from the DSI complex I/O has dedicated reset-done information in the [DSI_COMPLEXIO_CFG1](#)[29] RESET_DONE bit. The [DSI_SYSCONFIG](#)[1] SOFT_RESET bit is used to reset the byte clock power domain. A dummy read using the SCP interface to any DSI_PHY register is required after DSI_PHY reset to complete the reset of the DSI complex I/O.

10.3.4.6.3 Reset-Done Bits

The DSI complex I/O has several clock domains. The reset status for each clock domain is provided in the [DSI_PHY_REGISTER5](#) register:

- [DSI_PHY_REGISTER5](#)[31] RESETDONETXBYTECLK bit: Reset done for the TXBYTECLK domain.
- [DSI_PHY_REGISTER5](#)[28:24] RESETDONETXCLKESC_i bit field: Reset done for the TXCLKESC domain for lane *i* (where *i* = 0 to 4).
- [DSI_PHY_REGISTER5](#)[30] RESETDONESCPCCLK bit: Reset done for the SCP clock domain. Software users must perform a dummy read on this bit to initiate the reset sequence of the SCP FSM. When the reset sequence completes, the RESETDONESCPCCLK signal goes high, and software users can read again the [DSI_PHY_REGISTER5](#)[30] RESETDONESCPCCLK bit to ensure that the value is now 1.

NOTE: Software must not write in the DSI_PHY SCP registers before the [DSI_PHY_REGISTER5](#)[30] RESETDONESCPCCLK bit is set to 1.

- [DSI_PHY_REGISTER5](#)[29] RESETDONEPWRCLK bit: Reset done for the PWR clock domain. The reset sequence of the PWR FSM is complete when the RESETDONEPWRCLK signal goes high.

10.3.4.6.4 Pad Configuration

The number of lanes is configurable through the [DSI_COMPLEXIO_CFG1](#) register.

It is not allowed to change on the fly the position (by modifying the DATA_x_POSITION, where *x* = 1 through 4, and CLOCK_POSITION fields), the P/N order (positive/negative order of the differential pair by modifying the DATA_y_POL, where *y* = 1 through 4, and CLOCK_POL), or the number of active data lanes (by modifying the [DSI_COMPLEXIO_CFG1](#)[10:8] DATA2_POSITION, [DSI_COMPLEXIO_CFG1](#)[14:12] DATA3_POSITION, and [DSI_COMPLEXIO_CFG1](#)[18:16] DATA4_POSITION bit fields). To add or remove lanes 2, 3, or 4, it is required to be in OFF mode for the DSI complex I/O.

The configuration of the DSI complex I/O (number of data lanes, position, differential order) must not be changed while the [DSI_CLK_CTRL](#)[20] LP_CLK_ENABLE bit is set to 1. For hardware to recognize a new configuration of the complex I/O (done in the [DSI_COMPLEXIO_CFG1](#) register), the following sequence shall be followed:

1. Set the [DSI_CTRL](#)[0] IF_EN bit to 1.
2. Reset the [DSI_CTRL](#)[0] IF_EN bit to 0.
3. Set [DSI_CLK_CTRL](#)[20] LP_CLK_ENABLE bit to 1.
4. Set again the [DSI_CTRL](#)[0] IF_EN bit to 1.

If the sequence is not followed, the DSI complex I/O configuration is undetermined.

The minimum requirement for the number of lanes is one clock lane and one data lane. By default, data lanes 2, 3, and 4 are not connected (the reset value of the DATA_x_POSITION bit fields is 0).

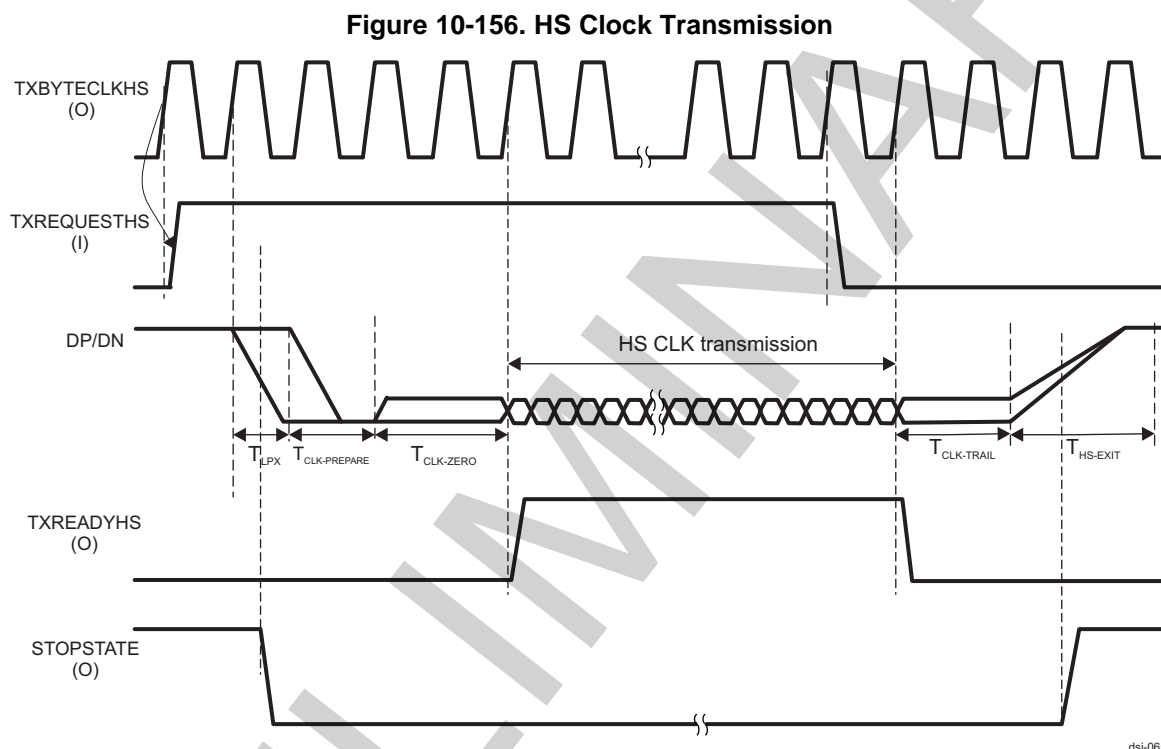
10.3.4.6.5 Display Timing Configuration

NOTE: Copyright 2005-2008 MIPI Alliance, Inc. All rights reserved. MIPI Alliance Member Confidential.

Depending on the CLKIN4DDR clock frequency settings programmed with the DSI PLL control module, software users must program accordingly the timing parameters in the DSI complex I/O registers.

10.3.4.6.5.1 High-Speed Clock Transmission

Figure 10-156 shows an example of HS clock transmission.



TXBYTECLKHS is an output clock that is derived by dividing CLKIN4DDR by 16.

The TXBYTECLKHS clock is driven by DSI_PHY when:

- The CLKIN4DDR is running and [DSI_PLL_CONFIGURATION2](#)[14] PHY_CLKINEN bit is set to '1'.
- DSI_PHY is in ON power state ([DSI_COMPLEXIO_CFG1](#)[28:27] PWR_CMD bit = 1) and at least one lane is enabled.

To begin transmission, the protocol drives TXREQUESTHS high on a rising edge of TXBYTECLKHS. The PHY detects this signal on the next rising edge, after which it initiates the LP SoT procedure.

During an HS clock transmission, these parameters are defined in multiples of CLKIN4DDR and are programmed by the following bit fields:

- TLPX timing is programmed by [DSI_PHY_REGISTER1](#)[20:16] TLPXBY2.
- THS-PREPARE timing is programmed by [DSI_PHY_REGISTER0](#)[31:24] THSPREPARE.
- TCLK-ZERO timing is programmed by [DSI_PHY_REGISTER1](#)[7:0] TCLKZERO.

TCLK-ZERO is extended, if required, so that the entire LP SoT procedure lasts an integer number of TXBYTECLKHS cycles.

At the end of the SoT procedure, HS clock transmission begins. At the same time, TXREADYHS is made high.

To stop clock transmission, the protocol drives TXREQUESTHS low on a rising edge of TXBYTECLKHS. The DSI_PHY detects this change in TXREQUESTHS on the next edge and stops clock transmission. TXREADYHS is made low.

The DSI_PHY then goes through the LP EoT procedure. The TCLK-TRAIL and THS-EXIT parameters are also multiples of CLKIN4DDR and are programmed by the following bit fields:

- TCLK-TRAIL timing is programmed by [DSI_PHY_REGISTER1\[15:8\]](#) TCLKTRAIL.
- THS-EXIT timing is programmed by [DSI_PHY_REGISTER0\[7:0\]](#) THSEXIT.

The DSI_PHY completes the SoT and EoT procedures, once begun, regardless of any change in the PPI signals. If TXREQUESTHS goes low during the SoT procedure, the PHY starts the EoT procedure immediately after finishing the SoT procedure and no clock is transmitted.

STOPSTATE is high whenever the line is in LP-11 state, as determined by the outputs of the low-power receivers. This signal is not synchronized with TXBYTECLKHS.

The HS clock must be present for a period of time before (TCLK-PRE) and after (TCLK-POST) HS data transmission. The protocol must ensure that these timings are met by asserting and deasserting TXREQUESTHS appropriately.

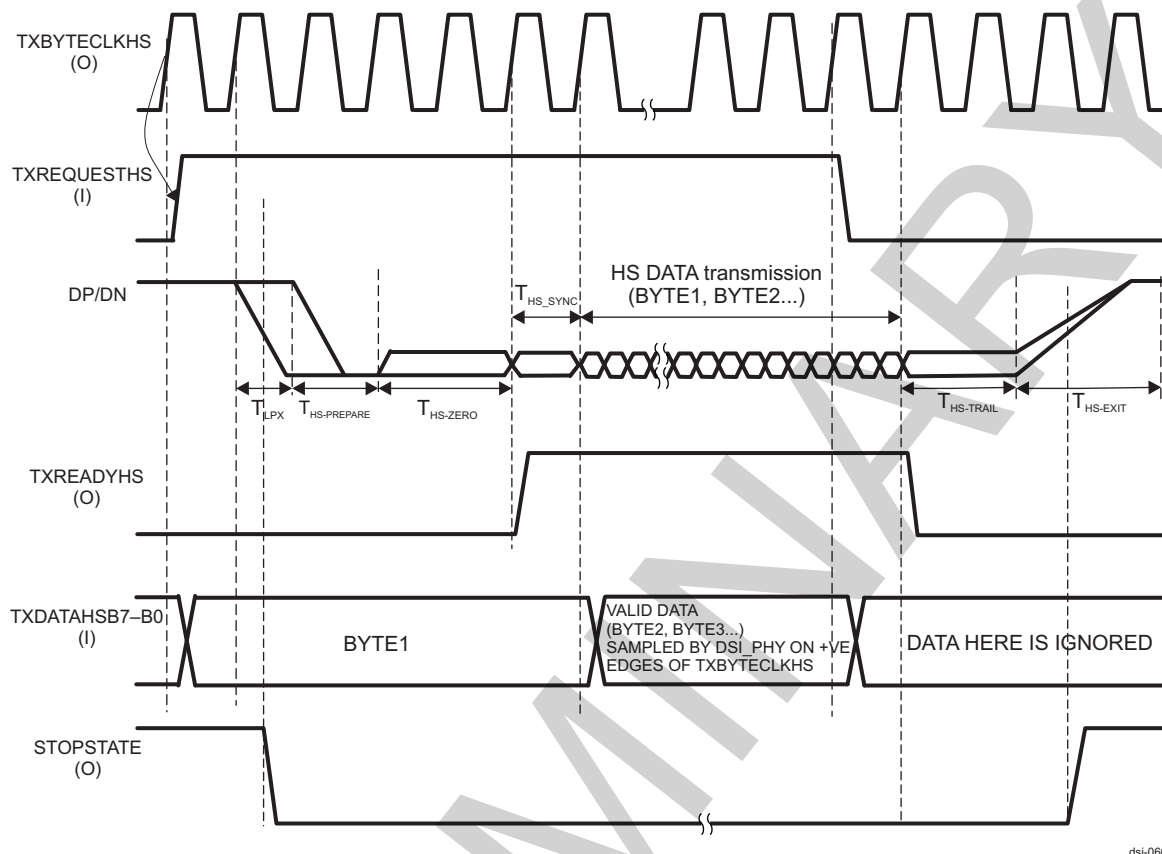
The PHY ensures that the clock signal has a quadrature phase with respect to a toggling bit sequence on any data lane, and a rising edge in the center of the first transmitted bit of each data byte. These relations are not described in the timing diagram.

CLKIN4DDR can be shut off 300 ns after the clock lane goes to STOPSTATE. Alternatively, CLKIN4DDR can be shut down after TCLK-Trail + THS-Exit + 2 Txbyteclk periods after the TxRequestHS falling edge is received by DSI_PHY.

The DSI protocol engine must ensure that TXREQUESTESC, TXULPSCLK, and TURNREQUEST are low whenever TXREQUESTHS is asserted.

10.3.4.6.5.2 High-Speed Data Transmission

[Figure 10-157](#) shows an example of HS data transmission.

Figure 10-157. HS Data Transmission

To begin transmission, the protocol drives TXDATAHS with the first byte of data on a rising edge of TXBYTECLKHS. It also makes TXREQUESTHS high on the same rising edge. The PHY detects TXREQUESTHS going high on the next rising edge of TXBYTECLKHS, following which it initiates the LP SoT procedure.

During an HS data transmission, these timings are multiples of CLKIN4DDR and are programmed by the following bit fields:

- TLPX timing is programmed by [DSI_PHY_REGISTER1](#)[20:16] TLPXBY2.
- THS-PREPARE + THS-ZERO timing is programmed by [DSI_PHY_REGISTER0](#)[23:16] THSPRPR_THSZERO.

THS-ZERO is extended, if required, so that the entire LP SoT procedure lasts an integer number of TXBYTECLKHS cycles. THS-SYNC corresponds to the length of the sync pattern (8 HS bits), and can be configured through the [DSI_PHY_REGISTER2](#)[31:24] HSSYNCPATTERN bit field.

Toward the end of the SoT procedure, the PHY makes TXREADYHS high on a positive edge of TXBYTECLKHS and then starts accepting data from TXDATAHS from the next positive edge onward. The protocol is expected to provide (new) valid data on TXDATAHS on every positive edge of TXBYTECLKHS if TXREADYHS is high.

At the end of the SoT procedure, HS data transmission begins. HS data transmission happens LSB first.

To stop data transmission, the protocol drives TXREQUESTHS low on a rising edge of TXBYTECLKHS. The PHY detects this change in TXREQUESTHS on the next edge and stops data transmission. TXREADYHS is made low and data on TXDATAHS, from that point, is ignored.

The PHY then goes through the LP EoT procedure. THS-TRAIL and THS-EXIT are also multiples of CLKIN4DDR and are programmed by the following bit fields:

- THS-TRAIL timing is programmed by [DSI_PHY_REGISTER0](#)[15:8] THSTRAIL.

- THS-EXIT timing is programmed by [DSI_PHY_REGISTER0\[7:0\] THSEXIT](#).

The PHY completes the SoT and EoT procedures, once begun, regardless of any change in PPI signals. If TXREQUESTHS goes low during the SoT procedure, the PHY starts the EoT procedure immediately after finishing the SoT procedure and no data is transmitted.

STOPSTATE is high whenever the line is in LP-11 state, as determined by the outputs of the low-power receivers. This signal is not synchronized with TXBYTECLKHS.

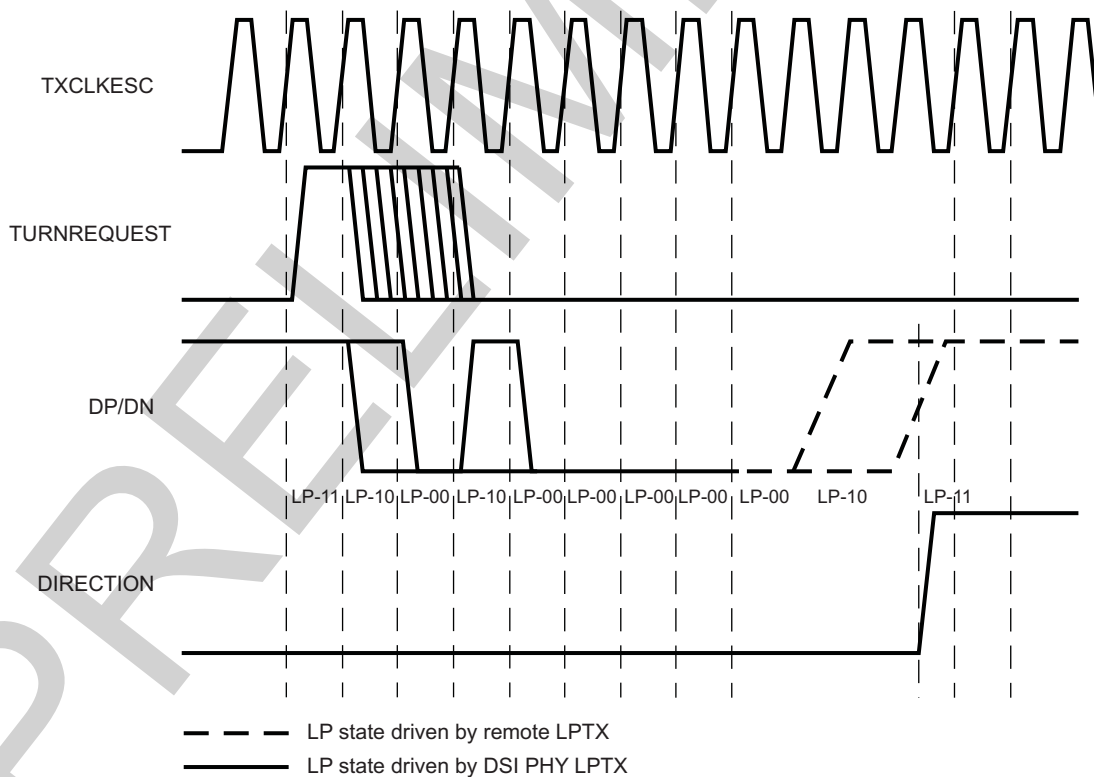
The protocol must ensure that TXREQUESTESC, TXULPSCLK, and TURNREQUEST are low whenever TXREQUESTHS is asserted.

10.3.4.6.5.3 Turnaround Request in Transmit Mode

When the DSI PHY is in transmit mode, the DSI protocol engine can request a turnaround by making the TurnRequest signal high for at least one clock cycle of TxClkEsc (see [Section 10.3.4.4.7.3, TurnRequest FSM](#)).

The DSI PHY transmits the turnaround request pattern (LP 11-10-00-10-00-00-00-00) (see [Figure 10-158](#)). The number of 00 states at the end of the pattern is defined by the T_{TA-GO} timing parameter and is programmable through the [DSI_PHY_REGISTER1\[31:29\] REG_TTAGO](#) bit field, in number of TxClkEsc clocks. Following the transmission of the pattern, the DSI PHY disables its LP transmitters and waits for an acknowledgment from the remote device. The remote device detects the turnaround request and acknowledges it by driving LP 10, followed by the STOP state. When this acknowledgment is received (BTA_IRQ is asserted, as described in [Section 10.3.4.4.8, Bus Turnaround](#)), the DSI PHY switches to receive mode and indicates the completion of the turnaround procedure by changing the direction (BTA_EN = 0).

Figure 10-158. Turnaround Request in Transmit Mode



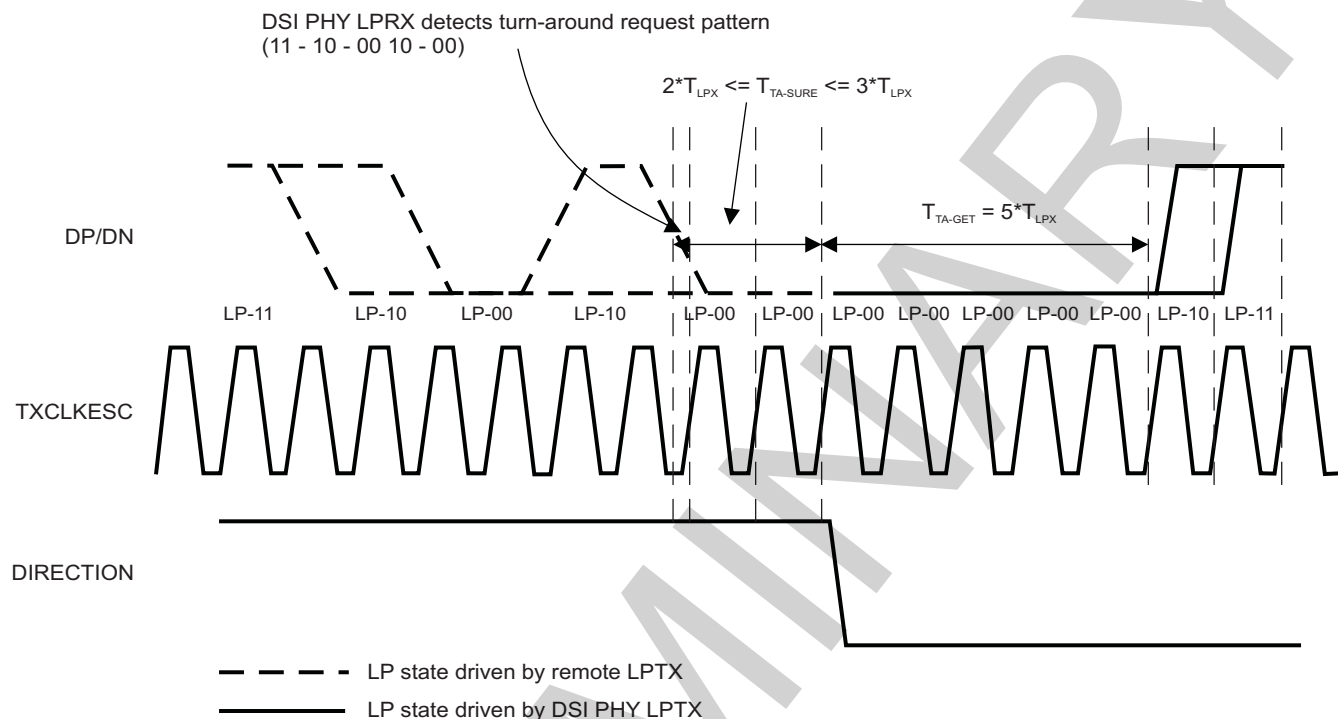
dsi-028

The DSI protocol engine must not stop TxClkEsc after the turnaround process completes (the [DSI_CLK_CTRL\[20\] LP_CLK_ENABLE](#) bit must be kept at 1), because TxClkEsc is also used in handling a turnaround request transmitted by a remote slave device (see [Section 10.3.4.6.5.4, Turnaround Request in Receive Mode](#)).

10.3.4.6.5.4 Turnaround Request in Receive Mode

When DSI PHY is in receive mode, an LP pattern of 11-10-00-10-00 on DP/DN lines indicates a turnaround request from the remote device (see [Figure 10-159](#)).

Figure 10-159. Turnaround Request in Receive Mode



dsi-029

If the line stays in LP-00 for a time $T_{TA-SURE}$, the DSI PHY accepts the turnaround request, changes the direction, transmits LP-00 for a time T_{TA-GET} , and then transmits the acknowledgment pattern LP-10, followed by the STOP state.

This completes the turnaround procedure (BTA_IRQ is asserted, as described in [Section 10.3.4.4.8, Bus Turnaround](#)). The $T_{TA-SURE}$ and T_{TA-GET} timing parameters are programmable through [DSI_PHY_REGISTER1](#) in number of TxClkEsc clocks:

- $T_{TA-SURE}$ can be configured in the [28:27] REG_TTASURE bit field.
- T_{TA-GET} can be configured in the [26:24] REG_TTAGET bit field.

10.3.4.6.5.5 Other DSI PHY Transmission and Reception

The timings of the following sequences defined in the DSI_PHY protocol cannot be programmed by the user:

- Low-power data transmission
- Escape mode trigger command transmission
- ULPS command transmission on data lanes
- ULPS transmission on clock lane
- Low-power data in receive mode
- Low-power trigger in receive mode
- ULPS command on clock lane in receive mode
- ULPS command on data lane in receive mode

10.3.4.6.6 Power Management

Power management of the DSI_PHY analog circuitry is done through the internal power FSM, which is

controlled by the subsystem. The control interface is a basic command and acknowledge protocol. The subsystem is the master of the interface. There is a dedicated command pin for each power state of DSI_PHY and a common acknowledge pin. The subsystem sends the power command and clock. The internal FSM does the sequencing and control generation of internal power domains. It then asserts the acknowledge, which signals the completion of the power state transition. The internal power control FSM is powered by a constant power supply.

The main features of the power control interface are:

- One dedicated command line per power state
- Only one command line can be asserted at a time.
- One acknowledge signal common to all command lines
- The command line cannot be cleared unless the acknowledge has been returned.
- All the command lines and the acknowledge signal must be cleared before triggering a new command.

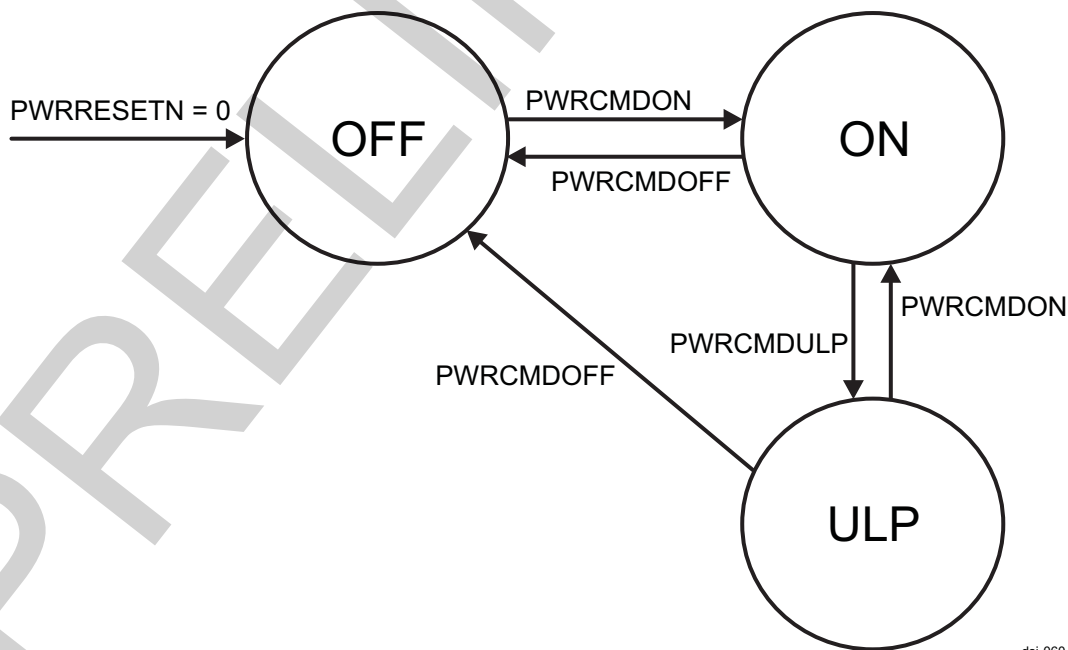
DSI_PHY supports three power states:

- OFF/GPIO mode (OFF): The entire analog circuit is powered down. Internal LDO is OFF. All analog circuitry on 1.8-V supply is powered down. The ULPS exit detection circuit power switch is OFF. DSI_PHY takes leakage level current.
- ON: Complete analog circuit is powered on and functional. LDO is ON. (DSI_PHY calibrates every time the module enters power on state.)
- ULPS: Only the DSI_PHY mode ULPS exit detection circuit power switch is ON. All the other analog circuitry is switched OFF. LDO is OFF.

NOTE: ULPS must be entered only when all used lane modules go into ULPS state. PHY power state must be returned to ON power state when any one of the used modules goes out of ULPS. No PPI signal except TXULPSEXIT must be toggled when in this power state.

Figure 10-160 shows the power states of the DSI complex I/O

Figure 10-160. Power State Diagram



dsi-060

10.3.4.6.7 Error Handling

A dedicated register for the DSI complex I/O ([DSI_COMPLEXIO_IRQSTATUS](#)) indicates the state of each error provided by the DSI complex I/O error signals. The DSI_PHY reports the following errors:

- [DSI_COMPLEXIO_IRQSTATUS](#)[9:5] ERRESCi_IRQ: ERRESC is asserted if an unrecognized Escape entry command is received. This remains high until the next change in the line state.
- [DSI_COMPLEXIO_IRQSTATUS](#)[4:0] ERRSYNCESCi_IRQ: If the number of bits received during a low-power data transmission is not a multiple of 8 when the transmission ends, ERRSYNCESC is made high and remains high until the next change in line state.
- [DSI_COMPLEXIO_IRQSTATUS](#)[14:10] ERRCONTROLi_IRQ: ERRCONTROL is asserted if an incorrect line state sequence is detected. For example, if a turnaround request or escape mode request is immediately followed by a STOP state instead of the required BRIDGE state, this signal is asserted and remains asserted until the next change in the line state.
- [DSI_COMPLEXIO_IRQSTATUS](#) ERRCONTENTIONLP0_i_IRQ: ERRCONTENTION0LPDX and ERRCONTENTION0LPDY are asserted when the lane module detects a contention situation on lines DX and DY, respectively, while trying to drive the lines low. Contention is detected only if it lasts at least 50 ns.
- [DSI_COMPLEXIO_IRQSTATUS](#) ERRCONTENTIONLP1_i_IRQ: ERRCONTENTION1LPDX and ERRCONTENTION1LPDY are asserted when the lane module detects a contention situation on lines DX and DY, respectively, while trying to drive the lines high. Contention is detected only if it lasts at least 50 ns.

The ULPSACTIVENOT signal goes low, which indicates to the protocol that the PHY has entered ULPS. When all the ULPSActiveNot signals are low, the [DSI_COMPLEXIO_IRQSTATUS](#)[30] ULPSACTIVENOT_ALL0_IRQ event is generated. When all the ULPSActiveNot signals are high, the [DSI_COMPLEXIO_IRQSTATUS](#)[31] ULPSACTIVENOT_ALL1_IRQ event is generated.

When any of the events defined in the [DSI_COMPLEXIO_IRQSTATUS](#) register happen, the [DSI_IRQSTATUS](#)[10] COMPLEXIO_ERR_IRQ bit is set to 1 at DSI protocol engine level.

Table 10-509 lists the DSI complex I/O interrupt events.

Table 10-509. DSI Complex I/O Interrupts

| IRQ Name | Description |
|------------------------|---|
| ULPSActiveNot_ALL0_IRQ | All the ULPSActiveNOT signals are 0. |
| ULPSActiveNot_ALL1_IRQ | All the ULPSActiveNOT signals corresponding to the lanes with TXULPSExit being high are high. |
| STATEULPM5_IRQ | Lane 5 in ULPS |
| STATEULPM4_IRQ | Lane 4 in ULPS |
| STATEULPM3_IRQ | Lane 3 in ULPS |
| STATEULPM2_IRQ | Lane 2 in ULPS |
| STATEULPM1_IRQ | Lane 1 in ULPS |
| ERRCONTROL5_IRQ | Control error for lane 5 |
| ERRCONTROL4_IRQ | Control error for lane 4 |
| ERRCONTROL3_IRQ | Control error for lane 3 |
| ERRCONTROL2_IRQ | Control error for lane 2 |
| ERRCONTROL1_IRQ | Control error for lane 1 |
| ERRESC5_IRQ | Escape entry error for lane 5 (edge trigger interrupt) |
| ERRESC4_IRQ | Escape entry error for lane 4 (edge trigger interrupt) |
| ERRESC3_IRQ | Escape entry error for lane 3 (edge trigger interrupt) |
| ERRESC2_IRQ | Escape entry error for lane 2 (edge trigger interrupt) |
| ERRESC1_IRQ | Escape entry error for lane 1 (edge trigger interrupt) |
| ERRCONTENTIONLP1_1_IRQ | Contention LP1 error for lane 1 |
| ERRCONTENTIONLP0_1_IRQ | Contention LP0 error for lane 1 |
| ERRCONTENTIONLP1_2_IRQ | Contention LP1 error for lane 2 |
| ERRCONTENTIONLP0_2_IRQ | Contention LP0 error for lane 2 |
| ERRCONTENTIONLP1_3_IRQ | Contention LP1 error for lane 3 |
| ERRCONTENTIONLP0_3_IRQ | Contention LP0 error for lane 3 |
| ERRCONTENTIONLP1_4_IRQ | Contention LP1 error for lane 4 |

Table 10-509. DSI Complex I/O Interrupts (continued)

| IRQ Name | Description |
|------------------------|--|
| ERRCONTENTIONLP0_4_IRQ | Contention LP0 error for lane 4 |
| ERRCONTENTIONLP1_5_IRQ | Contention LP1 error for lane 5 |
| ERRCONTENTIONLP0_5_IRQ | Contention LP0 error for lane 5 |
| ERRSYNCE5_IRQ | Low-power data transmission synchronization error for lane 5 |
| ERRSYNCE4_IRQ | Low-power data transmission synchronization error for lane 4 |
| ERRSYNCE3_IRQ | Low-power data transmission synchronization error for lane 3 |
| ERRSYNCE2_IRQ | Low-power data transmission synchronization error for lane 2 |
| ERRSYNCE1_IRQ | Low-power data transmission synchronization error for lane 1 |

Software must take appropriate action when receiving the interrupt indicating the error from the complex I/O. The action can be:

- Reset the DSI protocol engine module
- Reset the peripheral through the reset trigger or directly driving the hardware reset pin of the display module
- Ignore the error

10.3.5 DSI Programming Model

This section describes the low-level hardware programming sequences for the configuration and use of the DSI module.

10.3.5.1 DSI Global Initialization

10.3.5.1.1 Surrounding Modules Global Initialization

This section describes the requirements to initialize the surrounding modules when the DSI module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the DSI. For more information, see [Section 10.3.3, DSI Integration](#), and [Section 10.3.2, DSI Environment](#).

[Table 10-510](#) describes the global initialization of the surrounding modules.

Table 10-510. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|--------------------------|--|
| PRCM | DSI module interface and functional clocks must be enabled. The module power management (idle and sleep modes) must be configured. For more information, see Chapter 3, Power, Reset, and Clock Management . |
| MPU INTC | MPU interrupt controller (INTC) configuration must be done to enable interrupts from the DSI module. For more information about the module configuration, see Chapter 18, Interrupt Controllers . |
| DSP INTC | DSP INTC configuration must be done to enable interrupts from the DSI module. For more information about the module configuration, see Chapter 5, DSP Subsystem . |
| sDMA | DMA configuration must be done to enable DSI module DMA channel requests. For more information about the configuration, see Chapter 17, sDMA . |
| L3 / L4_PER Interconnect | For information about the interconnect configuration, see Chapter 14, Interconnect . |

10.3.5.1.2 DSI Global Initialization

10.3.5.1.2.1 Main Sequence - DSI Global Initialization

This procedure initializes the DSI after a power on or software reset.

[Table 10-511](#) summarizes the DSI global initialization.

Table 10-511. DSI Global Initialization

| Steps | Registers | Value |
|--|---|-------|
| Reset IRQ status. | DSI_IRQSTATUS [31:0] | 0x0 |
| Set clock activity. | DSI_SYSCONFIG [9:8] CLOCKACTIVITY | x |
| Configure power management. | DSI_SYSCONFIG [4:3] SIDLEMODE | x |
| Reset DSI protocol engine. | DSI_SYSCONFIG [1] SOFT_RESET | 0x1 |
| Wait until five reads of reset status? | Software test condition | |
| Read reset status. | DSI_SYSSTATUS [0] RESET_DONE | |
| IF: Is reset ongoing? | DSI_SYSSTATUS [0] RESET_DONE | = 0x0 |
| Error occurred during reset stage ⁽¹⁾ | | |
| ENDIF | | |

10.3.5.2 DSI Operational Modes Configuration

10.3.5.2.1 DSI Video Mode Using the DISPC Video Port

10.3.5.2.1.1 Main Sequence - DSI PLL Setup

Table 10-512 lists the steps required to configure DSI PLL.

Table 10-512. DSI PLL Configuration Registers

| Steps | Registers | Value |
|---|---|-------|
| Turn ON/OFF the PLL and HSDIVIDER. | DSI_CLK_CTRL [31:30] PLL_PWR_CMD | x |
| Wait until the status of the PLL is set (value according to the previous step)? | DSI_CLK_CTRL [29:28] PLL_PWR_STATUS | = x |
| Set the divider value for DSI protocol engine clock source M5REG. | DSI_PLL_CONFIGURATION1 [30:26] M5_CLOCK_DIV | x |
| Set the divider value for clock source M4REG. | DSI_PLL_CONFIGURATION1 [25:21] M4_CLOCK_DIV | x |
| Set the value for M divider for PLL. | DSI_PLL_CONFIGURATION1 [20:9] DSI_PLL_REGM | x |
| Set the value for N divider for PLL. | DSI_PLL_CONFIGURATION1 [8:1] DSI_PLL_REGN | x |
| Enable/disable PLL STOPMODE. | DSI_PLL_CONFIGURATION1 [0] PLL_STOPMODE | x |
| Enable/disable DSI protocol engine clock divider. | DSI_PLL_CONFIGURATION2 [18] M5_CLOCK_EN | x |
| Enable/disable M4 clock source divider. | DSI_PLL_CONFIGURATION2 [16] M4_CLOCK_EN | x |
| Enable/disable DSI PHY clock. | DSI_PLL_CONFIGURATION2 [14] PHY_CLKINEN | x |
| Enable/disable PLL reference clock. | DSI_PLL_CONFIGURATION2 [13] PLL_REFEN | x |
| Set PLL automatic update mode. | DSI_PLL_CONTROL [0] PLL_AUTOMODE | x |
| Request PLL locking sequence. | DSI_PLL_GO [0] PLL_GO | 0x1 |
| Read until PLL_GO bit = 0? | DSI_PLL_GO [0] PLL_GO | = 0x0 |
| Wait until PLL is locked? | DSI_PLL_STATUS [1] PLL_LOCK | = 0x1 |
| Set the ratio for the LP clock. | DSI_CLK_CTRL [12:0] LP_CLK_DIVISOR | x |
| Enable/disable DSS_L3_ICLK clock gating to DSI_PHY and PLL module. | DSI_CLK_CTRL [14] CIO_CLK_ICG | x |
| Enable/disable the automatic assertion/deassertion of DSISetpClk. | DSI_CLK_CTRL [18] HS_AUTO_STOP_ENABLE | x |
| Configure the DSI functional clock synchronization and clock speed. | DSI_CLK_CTRL [21] LP_RX_SYNCHRO_ENABLE | x |
| Turn ON/OFF PLL and HSDIVIDER. | DSI_CLK_CTRL [31:30] PLL_PWR_CMD | x |

10.3.5.2.1.2 Main Sequence - Set Up DSI Protocol Engine

10.3.5.2.1.2.1 Set Up DSI Control Registers

Table 10-513 lists the steps to set up the DSI control registers. Table 10-514 lists the steps to set up the DSI complex I/O registers.

Table 10-513. DSI Control Registers

| Steps | Registers | Value |
|--|---|-------|
| Enable the interrupt event for lost synchronization with the video port. | DSI_IRQENABLE [18] SYNC_LOST_IRQ_EN | 0x1 |
| Enable interrupt event for sent packet on desired VC. | DSI_VC_IRQENABLE_i [2] PACKET_SENT_IRQ_EN | x |
| Enable HSYNC END pulse detection (short packet generation). | DSI_CTRL [17] VP_HSYNC_START | 0x1 |
| Enable VSYNC START pulse detection (short packet generation). | DSI_CTRL [15] VP_VSYNC_START | 0x1 |

Table 10-513. DSI Control Registers (continued)

| Steps | Registers | Value |
|---|---|-------|
| Select trigger reset mode. | DSI_CTRL[14] TRIGGER_RESET_MODE | x |
| Set the number of line buffers. | DSI_CTRL[13:12] LINE_BUFFER | x |
| Set video port HSYNC signal polarity. | DSI_CTRL[10] VP_HSYNC_POL | x |
| Set video port VSYNC signal polarity. | DSI_CTRL[11] VP_VSYNC_POL | x |
| Set video port data enable signal polarity. | DSI_CTRL[9] VP_DE_POL | x |
| Set the size of the video port data bus. | DSI_CTRL[7:6] VP_DATA_BUS_WIDTH | x |
| Set the arbitration scheme for granting the VC pending ready requests in the TX FIFO. | DSI_CTRL[3] TX_FIFO_ARBITRATION | x |
| Enable/disable the ECC check for the received header. | DSI_CTRL[2] ECC_RX_EN | 0x1 |

Table 10-514. DSI Complex I/O Registers

| Steps | Registers | Value |
|---|--|-------------|
| Configure synchronized update on the shadow register. | DSI_COMPLEXIO_CFG1[30] GOBIT | x |
| Set the complex I/O power state. | DSI_COMPLEXIO_CFG1[28:27] PWR_CMD | x |
| Set the position of data lane 1. | DSI_COMPLEXIO_CFG1[6:4] DATA1_POSITION | x |
| Set the position of the clock lane. | DSI_COMPLEXIO_CFG1[2:0] CLOCK_POSITION | x |
| Clear the Interrupt status register. | DSI_COMPLEXIO_IRQSTATUS | 0xFFFF FFFF |
| Disable all interrupt events. | DSI_COMPLEXIO_IRQENABLE | 0x0 |
| Enable the DSI protocol engine. | DSI_CTRL[0] IF_EN | 0x1 |
| Disable the DSI protocol engine. | DSI_CTRL[0] IF_EN | 0x0 |
| Wait until the interface is disabled? | DSI_CTRL[0] IF_EN | = 0x0 |
| Enable the low-power clock (TXCLKESC). | DSI_CLK_CTRL[20] LP_CLK_ENABLE | 0x1 |
| Wait until reset is done? | DSI_COMPLEXIO_CFG1[29] RESET_DONE | = 0x1 |
| Check if power control is ON? | DSI_COMPLEXIO_CFG1[26:25] PWR_STATUS | = 0x1 |
| Wait until internal module reset is complete? | DSI_SYSSTATUS[0] RESETDONE | = 0x1 |

10.3.5.2.1.2.2 Configure DSI Timing and VCs

[Table 10-515](#) lists the steps to configure DSI timing and the VCs.

Table 10-515. DSI Timing Registers

| Steps | Registers | Value |
|---|---|-------|
| Determine the number of DSI_FCLK clock cycles for the STOP-STATE counter. | DSI_TIMING1[12:0] STOP_STATE_COUNTER_IO | 0x- |
| Determine the number of BYTE_CLK clock cycles for the HS RX timer. | DSI_TIMING2[28:16] HS_TX_TO_COUNTER | 0x- |
| Enable/disable the multiplication factor of 16 for the number of BYTE_CLK clock cycles for the HS TX timer. | DSI_TIMING2[29] HS_TX_TO_X16 | 0x- |
| Determine the number of DSI_FCLK clock cycles for the LP RX timer. | DSI_TIMING2[12:0] LP_RX_TO_COUNTER | 0x- |
| Enable/disable the multiplication factor of 16 for the number of DSI_FCLK clock cycles for the LP RX timer. | DSI_TIMING2[14] LP_RX_TO_X16 | 0x- |
| Set the horizontal sync active period. | DSI_VM_TIMING1[31:24] HSA | 0x- |
| Set the horizontal front porch. | DSI_VM_TIMING1[23:12] HFP | 0x- |
| Set the horizontal back porch. | DSI_VM_TIMING1[11:0] HBP | 0x- |

Table 10-515. DSI Timing Registers (continued)

| Steps | Registers | Value |
|---|--|-------|
| Set the number of BYTE clock cycles for the sync window. | DSI_VM_TIMING2 [27:24] WINDOW_SYNC | 0x- |
| Set the vertical sync active period. | DSI_VM_TIMING2 [23:16] VSA ⁽¹⁾ | 0x- |
| Set the vertical front porch. | DSI_VM_TIMING2 [15:8] VFP | 0x- |
| Set the vertical back porch. | DSI_VM_TIMING2 [7:0] VBP | 0x- |
| Set the line length. | DSI_VM_TIMING3 [31:16] TL | 0x- |
| Set the number of active lines. | DSI_VM_TIMING3 [15:0] VACT | 0x- |
| Set the number of TXBYTECLKHS clock cycles for entering HS mode. | DSI_VM_TIMING7 [31:16] ENTER_HS_MODE_LATENCY | 0x- |
| Set the number of TXBYTECLKHSe clock cycles for exiting HS mode. | DSI_VM_TIMING7 [15:0] EXIT_HS_MODE_LATENCY | 0x- |
| Set the number of TXBYTECLKHS clock cycles between the start of the DDR clock and the assertion of the data request signal. | DSI_CLK_TIMING [15:8] DDR_CLK_PRE | 0x- |
| Set the number of TXBYTECLKHS clock cycles after the deassertion of the data request signal and the stop of the DDR clock. | DSI_CLK_TIMING [7:0] DDR_CLK_POST | 0x- |
| Configure the RX FIFO DMA request. | DSI_VC_CTRL_i [29:27] DMA_RX_REQ_NB | 0x- |
| Configure the TX FIFO DMA request. | DSI_VC_CTRL_i [23:21] DMA_TX_REQ_NB | 0x- |
| Enable/disable the ECC generation for the transmit header. | DSI_VC_CTRL_i [8] ECC_TX_EN | 0x- |
| Enable/disable the checksum generation for the transmit payload. | DSI_VC_CTRL_i [7] CS_TX_EN | 0x- |
| Select video mode. | DSI_VC_CTRL_i [4] MODE | 0x- |

⁽¹⁾ In DSI video mode, if the VSA bit field in [DSI_VM_TIMING2](#) is set to 0x0, no vertical synchronization packet will be sent even if VP_VSYNC_START is set to 0x1 in [DSI_CTRL](#).

10.3.5.2.1.3 Main Sequence - Configure DSI_PHY

[Table 10-516](#) summarizes the timing in the functions of DDR_CLK_P. For more information about the timing calculation, see [Section 10.3.4.4.4, Clock Requirements](#).

Table 10-516. Calculate DSI_PHY Timing

| Steps | Registers | Value |
|--|--|----------------------------------|
| Settings of the DSI protocol timing. For a complete description of the timing specifications, see Section 10.3.4.4.4, Clock Requirements . | DSI_PHY_REGISTER0 [31:24] REG_THSPREPARE | ceil(70ns/DDR clock period) + 2 |
| | DSI_PHY_REGISTER0 [23:16] REG_PRPR_THSZERO | ceil(175ns/DDR clock period) + 2 |
| | DSI_PHY_REGISTER0 [7:0] REG_THSEXIT | ceil(145ns/DDR clock period) |
| | DSI_PHY_REGISTER0 [15:8] REG_THSTRAIL | ceil(60ns/DDR clock period) + 5 |
| | DSI_PHY_REGISTER2 [7:0] REG_TCLKPREPARE | ceil(65ns/DDR clock period) |
| | DSI_PHY_REGISTER1 [7:0] REG_TCLKZERO | ceil(265ns/DDR clock period) |
| | DSI_PHY_REGISTER1 [15:8] REG_TCLKTRAIL | ceil(60ns/DDR clock period) + 2 |
| | DSI_PHY_REGISTER1 [20:16] REG_TLPXBY2 | ceil(25ns/DDR clock period) |

10.3.5.2.1.4 Main Sequence - Drive STOP State

Table 10-517 lists the steps to drive STOP state.

Table 10-517. Drive STOP State

| Steps | Registers | Value |
|---------------------------------------|--|-------|
| Force TX stop mode. | DSI_TIMING1 [15] FORCE_TX_STOP_MODE_IO | 0x1 |
| Wait until FORCE_TX_STOP_MODE_IO = 0? | DSI_TIMING1 [15] FORCE_TX_STOP_MODE_IO | = 0x0 |

10.3.5.2.1.5 Main Sequence - Enable Video Mode

Table 10-517 lists the steps to enable video mode.

Table 10-518. Enable Video Mode

| Steps | Registers | Value |
|----------------------------|---|-------|
| Set up long packet header. | DSI_VC_LONG_PACKET_HEADER_i | 0x- |
| Enable desired VC. | DSI_VC_CTRL_i [1] VC_EN | 0x1 |
| Enable DSI module. | DSI_CTRL [0] IF_EN | 0x1 |
| Wait until IF_EN = 1? | DSI_CTRL [0] IF_EN | = 0x1 |

10.3.5.2.2 DSI Command Mode Using the DISPC Video Port

This section explains the basic programming model of command mode using the DISPC video port.

10.3.5.2.2.1 Main Sequence - Configure DSI PLL

Table 10-519 lists the steps required to configure the DSI PLL.

Table 10-519. Configure DSI PLL

| Steps | Register/Bit Field/Programming | Value |
|---|---|-------|
| Set PLL and HSDIVIDER to ON state. | DSI_CLK_CTRL [31:30] PLL_PWR_CMD | 0x2 |
| Wait until PLL and HSDIVIDER are enabled? | DSI_CLK_CTRL [29:28] PLL_PWR_STATUS | = 0x2 |
| Set the M5REG value. | DSI_PLL_CONFIGURATION1 [30:26] M5_CLK_DIV | x |
| Set the M4REG value. | DSI_PLL_CONFIGURATION1 [25:21] M4_CLOCK_DIV | x |
| Set the REGN value. | DSI_PLL_CONFIGURATION1 [8:1] PLL_REGN | x |
| Set the REGM value. | DSI_PLL_CONFIGURATION1 [20:9] PLL_REGM | x |
| Select PLL STOPMODE. | DSI_PLL_CONFIGURATION1 [0] PLL_STOPMODE | 0x1 |
| Enable/disable PLL reference clock control. | DSI_PLL_CONFIGURATION2 [13] PLL_REFEN | x |
| Enable/disable CLKIN4DDR control. | DSI_PLL_CONFIGURATION2 [14] PHY_CLKINEN | x |
| Enable/disable DSS clock divider. | DSI_PLL_CONFIGURATION2 [16] M4_CLOCK_EN | x |
| Enable/disable DSI protocol engine clock divider. | DSI_PLL_CONFIGURATION2 [18] M5_CLOCK_EN | x |
| Configure synchronization of configuration update with DISPC_UPDATE_SYNC. | DSI_PLL_CONTROL [0] PLL_AUTOMODE | x |
| Start PLL locking sequence. | DSI_PLL_GO [0] PLL_GO | 0x1 |
| Wait until there is no pending action? | DSI_PLL_GO [0] PLL_GO | = 0x0 |
| Check whether PLL is locked? | DSI_PLL_STATUS [1] PLL_LOCK | = 0x1 |
| Set the LP mode clock ratio. | DSI_CLK_CTRL [12:0] LP_CLK_DIVISOR | x |
| Configure DSS_L3_ICLK clock to the DSI complex I/O. | DSI_CLK_CTRL [14] CIO_CLK_ICG | x |
| Enable/disable the automatic assertion/deassertion of the DSISopClk signal. | DSI_CLK_CTRL [18] HS_AUTO_STOP_ENABLE | x |

Table 10-519. Configure DSI PLL (continued)

| Steps | Register/Bit Field/Programming | Value |
|--|---|-------|
| Define the DSI functional clock value and synchronization. | DSI_CLK_CTRL[21] LP_RX_SYNCHRO_ENABLE | x |
| Turn on PLL and HSDIVIDER. | DSI_CLK_CTRL[31:30] PLL_PWR_CMD | 0x2 |

10.3.5.2.2.2 Main Sequence - Switch to DSI PLL Clock Source

[Table 10-520](#) lists the sequence to switch the DSI and DISPC module clocks to DSI PLL clock source.

Table 10-520. Switch to DSI PLL Clock Source

| Steps | Reference | Value |
|----------------------------------|---|-------|
| Switch DISPC clock to PLL1_CLK1. | For more information, see Section 10.1.2, DSS Integration | |
| Switch DSI clock to PLL1_CLK2. | For more information, see Section 10.1.2, DSS Integration . | |

10.3.5.2.2.3 Main Sequence - Configure DSI Protocol Engine

10.3.5.2.2.3.1 Set Up DSI Control Registers

[Table 10-521](#) lists the steps required to set up the DSI control registers. [Table 10-522](#) lists the steps to set up the DSI complex I/O registers.

Table 10-521. DSI Control Registers

| Steps | Register/Bit Field/Programming | Value |
|---|--|-------|
| Enable IRQ for lost synchronization with video port. | DSI_IRQENABLE[18] SYNC_LOST_IRQ_EN | 0x1 |
| Enable IRQ to indicate that packet has been sent on desired VC. | DSI_VC_IRQENABLE_i[2] PACKET_SENT_IRQ_EN | 0x1 |
| Set the trigger reset mode. | DSI_CTRL[14] TRIGGER_RESET_MODE | x |
| Configure the number of active line buffers. | DSI_CTRL[13:12] LINE_BUFFER | x |
| Set the size of the video port data bus. | DSI_CTRL[7:6] VP_DATA_BUS_WIDTH | x |
| Define the ratio between VP_CLK and VP_PCLK. | DSI_CTRL[4] VP_CLK_RATIO | x |
| Set the arbitration scheme for granting the VC pending ready requests in the TX FIFO. | DSI_CTRL[3] TX_FIFO_ARBITRATION | x |
| Enable/disable the ECC check for the received header. | DSI_CTRL[2] ECC_RX_EN | x |

Table 10-522. DSI Complex I/O Registers

| Steps | Register/Bit Field/Programming | Value |
|--|--|-------------|
| Determine the position of the clock lane. | DSI_COMPLEXIO_CFG1[2:0] CLOCK_POSITION | x |
| Set the position of data lane 1. | DSI_COMPLEXIO_CFG1[6:4] DATA1_POSITION | x |
| Configure the power state of the complex I/O. | DSI_COMPLEXIO_CFG1[28:27] PWR_CMD | x |
| Enable the synchronization of the shadow registers with DISPC_UPDATE_SYNC. | DSI_COMPLEXIO_CFG1[30] GOBIT | 0x1 |
| Clear the complex I/O IRQ status. | DSI_COMPLEXIO_IRQSTATUS | 0xFFFF FFFF |
| Disable all complex I/O IRQ events. | DSI_COMPLEXIO_IRQENABLE | 0x0 |
| Enable the DSI protocol engine interface. | DSI_CTRL[0] IF_EN | 0x1 |
| Disable the DSI protocol engine interface. | DSI_CTRL[0] IF_EN | 0x0 |
| Wait until interface is disabled? | DSI_CTRL[0] IF_EN | = 0x0 |
| Enable the LP clock. | DSI_CLK_CTRL[20] LP_CLK_ENABLE | 0x1 |

Table 10-522. DSI Complex I/O Registers (continued)

| Steps | Register/Bit Field/Programming | Value |
|---|---|-------|
| Check whether internal reset is complete? | DSI_COMPLEXIO_CFG1 [29] RESET_DONE | = 0x1 |
| Check whether power state of complex I/O is ON? | DSI_COMPLEXIO_CFG1 [26:25] PWR_STATUS | = 0x1 |
| Check whether reset is complete? | DSI_SYSSTATUS [0] RESETDONE | = 0x1 |

10.3.5.2.2.3.2 Configure DSI Timing and VCs

[Table 10-523](#) lists the steps to configure DSI timing and the VCs.

Table 10-523. DSI Timing Registers

| Steps | Register/Bit Field/Programming | Value |
|--|---|-------|
| Determine the number of DSI_FCLK clock cycles for the STOP-STATE counter. | DSI_TIMING1 [12:0] STOP_STATE_COUNTER_IO | 0x- |
| Enable/disable the multiplication factor of 4 for the number of DSI_FCLK clock cycles for the STOP-STATE counter. | DSI_TIMING1 [13] STOP_STATE_X4_IO | 0x- |
| Enable/disable the multiplication factor of 16 for the number of DSI_FCLK clock cycles for the STOP-STATE counter. | DSI_TIMING1 [14] STOP_STATE_X16_IO | 0x- |
| Clear turnaround timer settings. | DSI_TIMING1 [30:16] | 0x0 |
| Determine the number of DSI_FCLK clock cycles for the LP RX timer. | DSI_TIMING2 [12:0] LP_RX_TO_COUNTER | 0x- |
| Enable/disable the multiplication factor of 4 for the number of DSI_FCLK clock cycles for the LP RX timer. | DSI_TIMING2 [13] LP_RX_TO_X4 | 0x- |
| Enable/disable the multiplication factor of 16 for the number of DSI_FCLK clock cycles for the LP RX timer. | DSI_TIMING2 [14] LP_RX_TO_X16 | 0x- |
| Determine the number of BYTE_CLK clock cycles for the HS RX timer. | DSI_TIMING2 [28:16] HS_TX_TO_COUNTER | 0x- |
| Enable/disable the multiplication factor of 16 for the number of BYTE_CLK clock cycles for the HS TX timer. | DSI_TIMING2 [29] HS_TX_TO_X16 | 0x- |
| Enable/disable the multiplication factor of 64 for the number of BYTE_CLK clock cycles for the HS TX timer. | DSI_TIMING2 [30] HS_TX_TO_X64 | 0x- |
| Set the number of TXBYTECLKHS clock cycles | DSI_CLK_TIMING [15:8] DDR_CLK_PRE and DSI_CLK_TIMING [7:0] DDR_CLK_POST | 0x- |
| Configuration of VCI | | |
| Select source of data and enable VP_STALL. | DSI_VC_CTRL_i [1] SOURCE | 0x1 |
| Enable/disable the checksum generation for the transmit payload. | DSI_VC_CTRL_i [7] CS_TX_EN | 0x- |
| Enable/disable the ECC generation for the transmit header. | DSI_VC_CTRL_i [8] ECC_TX_EN | 0x- |
| Enable/disable HS mode to send short and long packets to the peripheral. | DSI_VC_CTRL_i [9] MODE_SPEED | 0x- |
| Configure DMA request for TX FIFO. | DSI_VC_CTRL_i [23:21] DMA_TX_REQ_NB | 0x- |
| Configure DMA request for RX FIFO. | DSI_VC_CTRL_i [29:27] DMA_RX_REQ_NB | 0x- |
| Configuration TX and RX FIFO | | |
| Set size of the RX FIFO allocated for used VC. | DSI_RX_FIFO_VC_SIZE | 0x- |
| Set size of the TX FIFO allocated for used VC. | DSI_TX_FIFO_VC_SIZE | 0x- |

10.3.5.2.2.4 Main Sequence - Configure DSI_PHY Timing

Table 10-524 summarizes DSI_PHY timing settings. For more information about timing calculation, see Section 10.3.4.4.4, *Clock Requirements*.

Table 10-524. Configure DSI_PHY Timing

| Steps | Register/Bit Field/Programming | Value |
|---|--|----------------------------------|
| Settings of the DSI protocol timing. For a complete description of timing specifications, see Section 10.3.4.4.4, <i>Clock Requirements</i> . | DSI_PHY_REGISTER0[31:24] REG_THSPREPARE | ceil(70ns/DDR clock period) + 2 |
| | DSI_PHY_REGISTER0[23:16] REG_THSPRPR_THSZERO | ceil(175ns/DDR clock period) + 2 |
| | DSI_PHY_REGISTER0[7:0] REG_THSEXIT | ceil(145ns/DDR clock period) |
| | DSI_PHY_REGISTER0[15:8] REG_THSTRAIL | ceil(60ns/DDR clock period) + 5 |
| | DSI_PHY_REGISTER2[7:0] REG_TCLKPREPARE | ceil(65ns/DDR clock period) |
| | DSI_PHY_REGISTER1[7:0] REG_TCLKZERO | ceil(265ns/DDR clock period) |
| | DSI_PHY_REGISTER1[15:8] REG_TCLKTRAIL | ceil(60ns/DDR clock period) + 2 |
| | DSI_PHY_REGISTER1[20:16] REG_TLPXBY2 | ceil(25ns/DDR clock period) |

10.3.5.2.2.5 Main Sequence - Drive STOP State

Table 10-525 lists the steps to drive the STOP state.

Table 10-525. Drive STOP State

| Steps | Register/Bit Field/Programming | Value |
|---|---------------------------------------|-------|
| Force TX stop mode. | DSI_TIMING1[15] FORCE_TX_STOP_MODE_IO | 0x1 |
| Wait until the end of TX stop mode assertion? | DSI_TIMING1[15] FORCE_TX_STOP_MODE_IO | = 0x1 |

10.3.5.2.2.6 Main Sequence - Enable Command Mode Using DISPC Video Port

Table 10-526 lists the steps to enable DISPC to send frames continuously. Two BTAs must be generated:

- The first BTA gives bus possession to the display module.
- The second BTA obtains the TE trigger.

Table 10-526. Enable Command Mode and Automatic TE

| Steps | Register/Bit Field/Programming | Value |
|---|---|-------|
| Insert DCS write memory continue/start code. | DSI_VC_CTRL_i[31] DCS_CMD_CODE | 0x- |
| Enable/disable automatic insertion of DCS command codes when data is sourced by the video port. | DSI_VC_CTRL_i[30] DCS_CMD_ENABLE | 0x- |
| Enable used VC. | DSI_VC_CTRL_i[0] VC_EN | 0x1 |
| Enable DSI protocol engine interface. | DSI_CTRL[0] IF_EN | 0x1 |
| Wait until interface is enabled? | DSI_CTRL[0] IF_EN | = 0x0 |
| Send the sequence to receive the TE trigger from the peripheral. | DSI_VC_SHORT_PACKET_HEADER_i[31:0] HEADER | 0x- |
| Wait until packet is sent? | DSI_VC_IRQSTATUS_i[2] PACKET_SENT_IRQ | = 0x1 |
| Write 1 to reset the status bit. | DSI_VC_IRQSTATUS_i[2] PACKET_SENT_IRQ | 0x1 |

NOTE: Keep Reserved bits at reset value in [DSI_PHY_REGISTER1](#) and [DSI_PHY_REGISTER2](#).

10.3.5.2.2.7 Main Sequence - Send Frame Data to LCD Panel Using Automatic TE

[Table 10-527](#) summarizes the steps to send a frame data to the LCD panel using automatic TE.

Table 10-527. Send Frame Data to LCD Panel Using Automatic TE

| Steps | Register/Bit Field/Programming | Value |
|--|---|------------|
| Enable the transfer between DISPC and DSI. Reset after the transfer is done. | For more information, see Section 10.2 , <i>Display Controller</i> chapter. | |
| Specify the number of bytes to send. When DCS insertion is used, word count (WC) must include this one DCS byte. | DSI_VC_TE_i[23:0] TE_SIZE | (WC+1)*LPP |
| Set up long packet header. | DSI_VC_LONG_PACKET_HEADER_i[31:0] HEADER | 0x- |
| Enable/disable TE control. | DSI_VC_TE_i[30] TE_EN | 0x1 |
| Wait until RX FIFO is empty? | DSI_VC_CTRL_i[20] RX_FIFO_NOT_EMPTY | = 0x0 |
| Wait until TX FIFO is not full? | DSI_VC_CTRL_i[16] TX_FIFO_FULL | = 0x0 |
| Enable first BTA to give bus possession to the display module. | DSI_VC_CTRL_i[6] BTA_EN | 0x1 |
| Wait until BTA IRQ event occurs? | DSI_VC_IRQSTATUS_i[5] BTA_IRQ | = 0x1 |
| Write 1 to clear BTA IRQ status bit. | DSI_VC_IRQSTATUS_i[5] BTA_IRQ | 0x1 |
| Enable the second BTA to get the TE trigger. | DSI_VC_CTRL_i[6] BTA_EN | 0x1 |
| Wait until BTA IRQ event occurs? | DSI_VC_IRQSTATUS_i[5] BTA_IRQ | = 0x1 |
| Write 1 to clear BTA IRQ status bit. | DSI_VC_IRQSTATUS_i[5] BTA_IRQ | 0x1 |
| Wait until transfer is complete? | DSI_VC_TE_i[30] TE_EN | = 0x0 |

10.3.6 DSI Register Manual

This section describes the DSI module registers.

CAUTION

The main access to all DSI registers is through the L3 interconnect.

The access through L4_PER interconnect is provided for back software compatibility.

10.3.6.1 DSI Instance Summary

Table 10-528 summarizes the DSI module instances.

Table 10-528. DSI Instance Summary

| Module Name | L3 Base Address | L4_PER Base Address | Size |
|----------------------|-----------------|---------------------|-----------|
| DSI1_PROTOCOL_ENGINE | 0x5800 4000 | 0x4804 4000 | 512 bytes |
| DSI1_PHY | 0x5800 4200 | 0x4804 4200 | 64 bytes |
| DSI1_PLLCTRL | 0x5800 4300 | 0x4804 4300 | 32 bytes |
| DSI2_PROTOCOL_ENGINE | 0x5800 5000 | 0x4804 5000 | 512 bytes |
| DSI2_PHY | 0x5800 5200 | 0x4804 5200 | 64 bytes |
| DSI2_PLLCTRL | 0x5800 5300 | 0x4804 5300 | 32 bytes |

10.3.6.2 DSI_PROTOCOL_ENGINE Registers

10.3.6.2.1 DSI_PROTOCOL_ENGINE Register Summary

Table 10-529. DSI1_PROTOCOL_ENGINE Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DSI1_PROTOCOL_ENGINE L3 Physical Address | DSI1_PROTOCOL_ENGINE L4_PER Physical Address |
|-------------------------|------|-----------------------|----------------|--|--|
| DSI_REVISION | R | 32 | 0x0000 0000 | 0x5800 4000 | 0x4804 4000 |
| DSI_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5800 4010 | 0x4804 4010 |
| DSI_SYSSTATUS | R | 32 | 0x0000 0014 | 0x5800 4014 | 0x4804 4014 |
| DSI_IRQSTATUS | RW | 32 | 0x0000 0018 | 0x5800 4018 | 0x4804 4018 |
| DSI_IRQENABLE | RW | 32 | 0x0000 001C | 0x5800 401C | 0x4804 401C |
| DSI_CTRL | RW | 32 | 0x0000 0040 | 0x5800 4040 | 0x4804 4040 |
| DSI_GNQ | R | 32 | 0x0000 0044 | 0x5800 4044 | 0x4804 4044 |
| DSI_COMPLEXIO_CFG1 | RW | 32 | 0x0000 0048 | 0x5800 4048 | 0x4804 4048 |
| DSI_COMPLEXIO_IRQSTATUS | RW | 32 | 0x0000 004C | 0x5800 404C | 0x4804 404C |
| DSI_COMPLEXIO_IRQENABLE | RW | 32 | 0x0000 0050 | 0x5800 4050 | 0x4804 4050 |
| DSI_CLK_CTRL | RW | 32 | 0x0000 0054 | 0x5800 4054 | 0x4804 4054 |
| DSI_TIMING1 | RW | 32 | 0x0000 0058 | 0x5800 4058 | 0x4804 4058 |
| DSI_TIMING2 | RW | 32 | 0x0000 005C | 0x5800 405C | 0x4804 405C |
| DSI_VM_TIMING1 | RW | 32 | 0x0000 0060 | 0x5800 4060 | 0x4804 4060 |
| DSI_VM_TIMING2 | RW | 32 | 0x0000 0064 | 0x5800 4064 | 0x4804 4064 |
| DSI_VM_TIMING3 | RW | 32 | 0x0000 0068 | 0x5800 4068 | 0x4804 4068 |
| DSI_CLK_TIMING | RW | 32 | 0x0000 006C | 0x5800 406C | 0x4804 406C |

Table 10-529. DSI1_PROTOCOL_ENGINE Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | DSI1_PROTOCOL_ENGINE L3 Physical Address | DSI1_PROTOCOL_ENGINE L4_PER Physical Address |
|--|------|-----------------------|--------------------------|--|--|
| DSI_TX_FIFO_VC_SIZE | RW | 32 | 0x0000 0070 | 0x5800 4070 | 0x4804 4070 |
| DSI_RX_FIFO_VC_SIZE | RW | 32 | 0x0000 0074 | 0x5800 4074 | 0x4804 4074 |
| DSI_COMPLEXIO_CFG2 | RW | 32 | 0x0000 0078 | 0x5800 4078 | 0x4804 4078 |
| DSI_RX_FIFO_VC_FULLNESS | R | 32 | 0x0000 007C | 0x5800 407C | 0x4804 407C |
| DSI_VM_TIMING4 | RW | 32 | 0x0000 0080 | 0x5800 4080 | 0x4804 4080 |
| DSI_TX_FIFO_VC_EMPTYNESS | R | 32 | 0x0000 0084 | 0x5800 4084 | 0x4804 4084 |
| DSI_VM_TIMING5 | RW | 32 | 0x0000 0088 | 0x5800 4088 | 0x4804 4088 |
| DSI_VM_TIMING6 | RW | 32 | 0x0000 008C | 0x5800 408C | 0x4804 408C |
| DSI_VM_TIMING7 | RW | 32 | 0x0000 0090 | 0x5800 4090 | 0x4804 4090 |
| DSI_STOPCLK_TIMING | RW | 32 | 0x0000 0094 | 0x5800 4094 | 0x4804 4094 |
| DSI_CTRL2 | RW | 32 | 0x0000 0098 | 0x5800 4098 | 0x4804 4098 |
| DSI_VM_TIMING8 | RW | 32 | 0x0000 009C | 0x5800 409C | 0x4804 409C |
| DSI_TE_HSYNC_WIDTH _j ⁽¹⁾ | RW | 32 | 0x0000 00A0 + (0xc * j) | 0x5800 40A0 + (0xc * j) | 0x4804 40A0 + (0xc * j) |
| DSI_TE_VSYNC_WIDTH _j ⁽¹⁾ | RW | 32 | 0x0000 00A4 + (0xc * j) | 0x5800 40A4 + (0xc * j) | 0x4804 40A4 + (0xc * j) |
| DSI_TE_HSYNC_NUMBER _j ⁽¹⁾ | RW | 32 | 0x0000 00A8 + (0xc * j) | 0x5800 40A8 + (0xc * j) | 0x4804 40A8 + (0xc * j) |
| DSI_VC_CTRL _i ⁽²⁾ | RW | 32 | 0x0000 0100 + (0x20 * i) | 0x5800 4100 + (0x20 * i) | 0x4804 4100 + (0x20 * i) |
| DSI_VC_TE _i ⁽²⁾ | RW | 32 | 0x0000 0104 + (0x20 * i) | 0x5800 4104 + (0x20 * i) | 0x4804 4104 + (0x20 * i) |
| DSI_VC_LONG_PACKET_HEADER _i ⁽²⁾ | W | 32 | 0x0000 0108 + (0x20 * i) | 0x5800 4108 + (0x20 * i) | 0x4804 4108 + (0x20 * i) |
| DSI_VC_LONG_PACKET_PAYLOAD _i ⁽²⁾ | W | 32 | 0x0000 010C + (0x20 * i) | 0x5800 410C + (0x20 * i) | 0x4804 410C + (0x20 * i) |
| DSI_VC_SHORT_PACKET_HEADER _i ⁽²⁾ | RW | 32 | 0x0000 0110 + (0x20 * i) | 0x5800 4110 + (0x20 * i) | 0x4804 4110 + (0x20 * i) |
| DSI_VC_IRQSTATUS _i ⁽²⁾ | RW | 32 | 0x0000 0118 + (0x20 * i) | 0x5800 4118 + (0x20 * i) | 0x4804 4118 + (0x20 * i) |
| DSI_VC_IRQENABLE _i ⁽²⁾ | RW | 32 | 0x0000 011C + (0x20 * i) | 0x5800 411C + (0x20 * i) | 0x4804 411C + (0x20 * i) |

⁽¹⁾ j = 0 to 1⁽²⁾ i = 0 to 3**Table 10-530. DSI2_PROTOCOL_ENGINE Registers Mapping Summary**

| Register Name | Type | Register Width (Bits) | Address Offset | DSI2_PROTOCOL_ENGINE L3 Physical Address | DSI2_PROTOCOL_ENGINE L4_PER Physical Address |
|---------------|------|-----------------------|----------------|--|--|
| DSI_REVISION | R | 32 | 0x0000 0000 | 0x5800 5000 | 0x4804 5000 |
| DSI_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5800 5010 | 0x4804 5010 |
| DSI_SYSSTATUS | R | 32 | 0x0000 0014 | 0x5800 5014 | 0x4804 5014 |

Table 10-530. DSI2_PROTOCOL_ENGINE Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | DSI2_PROTOCOL_ ENGINE L3 Physical Address | DSI2_PROTOCOL_ ENGINE L4_PER Physical Address |
|---|------|--------------------------|-----------------------------|--|--|
| DSI_IRQSTATUS | RW | 32 | 0x0000 0018 | 0x5800 5018 | 0x4804 5018 |
| DSI_IRQENABLE | RW | 32 | 0x0000 001C | 0x5800 501C | 0x4804 501C |
| DSI_CTRL | RW | 32 | 0x0000 0040 | 0x5800 5040 | 0x4804 5040 |
| DSI_GNQ | R | 32 | 0x0000 0044 | 0x5800 5044 | 0x4804 5044 |
| DSI_COMPLEXIO_ CFG1 | RW | 32 | 0x0000 0048 | 0x5800 5048 | 0x4804 5048 |
| DSI_COMPLEXIO_I RQSTATUS | RW | 32 | 0x0000 004C | 0x5800 504C | 0x4804 504C |
| DSI_COMPLEXIO_I RQENABLE | RW | 32 | 0x0000 0050 | 0x5800 5050 | 0x4804 5050 |
| DSI_CLK_CTRL | RW | 32 | 0x0000 0054 | 0x5800 5054 | 0x4804 5054 |
| DSI_TIMING1 | RW | 32 | 0x0000 0058 | 0x5800 5058 | 0x4804 5058 |
| DSI_TIMING2 | RW | 32 | 0x0000 005C | 0x5800 505C | 0x4804 505C |
| DSI_VM_TIMING1 | RW | 32 | 0x0000 0060 | 0x5800 5060 | 0x4804 5060 |
| DSI_VM_TIMING2 | RW | 32 | 0x0000 0064 | 0x5800 5064 | 0x4804 5064 |
| DSI_VM_TIMING3 | RW | 32 | 0x0000 0068 | 0x5800 5068 | 0x4804 5068 |
| DSI_CLK_TIMING | RW | 32 | 0x0000 006C | 0x5800 506C | 0x4804 506C |
| DSI_TX_FIFO_VC_ SIZE | RW | 32 | 0x0000 0070 | 0x5800 5070 | 0x4804 5070 |
| DSI_RX_FIFO_VC_ SIZE | RW | 32 | 0x0000 0074 | 0x5800 5074 | 0x4804 5074 |
| DSI_COMPLEXIO_ CFG2 | RW | 32 | 0x0000 0078 | 0x5800 5078 | 0x4804 5078 |
| DSI_RX_FIFO_VC_ FULLNESS | R | 32 | 0x0000 007C | 0x5800 507C | 0x4804 507C |
| DSI_VM_TIMING4 | RW | 32 | 0x0000 0080 | 0x5800 5080 | 0x4804 5080 |
| DSI_TX_FIFO_VC_ EMPTYNESS | R | 32 | 0x0000 0084 | 0x5800 5084 | 0x4804 5084 |
| DSI_VM_TIMING5 | RW | 32 | 0x0000 0088 | 0x5800 5088 | 0x4804 5088 |
| DSI_VM_TIMING6 | RW | 32 | 0x0000 008C | 0x5800 508C | 0x4804 508C |
| DSI_VM_TIMING7 | RW | 32 | 0x0000 0090 | 0x5800 5090 | 0x4804 5090 |
| DSI_STOPCLK_TI MING | RW | 32 | 0x0000 0094 | 0x5800 5094 | 0x4804 5094 |
| DSI_CTRL2 | RW | 32 | 0x0000 0098 | 0x5800 5098 | 0x4804 5098 |
| DSI_VM_TIMING8 | RW | 32 | 0x0000 009C | 0x5800 509C | 0x4804 509C |
| DSI_TE_HSYNC_W IDTH _j ⁽¹⁾ | RW | 32 | 0x0000 00A0 + (0xc * j) | 0x5800 50A0 + (0xc * j) | 0x4804 50A0 + (0xc * j) |
| DSI_TE_VSYNC_W IDTH _j ⁽¹⁾ | RW | 32 | 0x0000 00A4 + (0xc * j) | 0x5800 50A4 + (0xc * j) | 0x4804 50A4 + (0xc * j) |
| DSI_TE_HSYNC_N UMBER _j ⁽¹⁾ | RW | 32 | 0x0000 00A8 + (0xc * j) | 0x5800 50A8 + (0xc * j) | 0x4804 50A8 + (0xc * j) |
| DSI_VC_CTRL _i ⁽²⁾ | RW | 32 | 0x0000 0100 + (0x20 * i) | 0x5800 5100 + (0x20 * i) | 0x4804 5100 + (0x20 * i) |
| DSI_VC_TE _i ⁽²⁾ | RW | 32 | 0x0000 0104 + (0x20 * i) | 0x5800 5104 + (0x20 * i) | 0x4804 5104 + (0x20 * i) |
| DSI_VC_LONG_PA CKET_HEADER _i ⁽²⁾ | W | 32 | 0x0000 0108 + (0x20 * i) | 0x5800 5108 + (0x20 * i) | 0x4804 5108 + (0x20 * i) |

⁽¹⁾ j = 0 to 1

⁽²⁾ i = 0 to 3

Table 10-530. DSI2_PROTOCOL_ENGINE Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | DSI2_PROTOCOL_ENGINE L3 Physical Address | DSI2_PROTOCOL_ENGINE L4_PER Physical Address |
|---|------|-----------------------|--------------------------|--|--|
| DSI_VC_LONG_PACKET_PAYLOAD_i ⁽²⁾ | W | 32 | 0x0000 010C + (0x20 * i) | 0x5800 510C + (0x20 * i) | 0x4804 510C + (0x20 * i) |
| DSI_VC_SHORT_PACKET_HEADER_i ⁽²⁾ | RW | 32 | 0x0000 0110 + (0x20 * i) | 0x5800 5110 + (0x20 * i) | 0x4804 5110 + (0x20 * i) |
| DSI_VC_IRQSTAT_US_i ⁽²⁾ | RW | 32 | 0x0000 0118 + (0x20 * i) | 0x5800 5118 + (0x20 * i) | 0x4804 5118 + (0x20 * i) |
| DSI_VC_IRQENAB_LE_i ⁽²⁾ | RW | 32 | 0x0000 011C + (0x20 * i) | 0x5800 511C + (0x20 * i) | 0x4804 511C + (0x20 * i) |

10.3.6.2.2 DSI_PROTOCOL_ENGINE Register Description**Table 10-531. DSI_REVISION**

| | | | | |
|-------------------------|--|-----------------|--|--|
| Address Offset | 0x0000 0000 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PER_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PER_L4 | |
| Physical Address | 0x5800 4000 0x4804 4000 0x5800 5000 0x4804 5000 | | | |
| Description | IP Revision | | | |
| Type | R | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP Revision | R | See ⁽¹⁾ |

⁽¹⁾ TI Internal data**Table 10-532. Register Call Summary for Register DSI_REVISION**

MIPI Display Serial Interface

- [DSI_PROTOCOL_ENGINE Register Summary: \[0\] \[1\]](#)

Table 10-533. DSI_SYSCONFIG

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0010 | | |
| Physical Address | 0x5800 4010 0x4804 4010 0x5800 5010 0x4804 5010 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_P R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_P R_L4 |
| Description | SYSTEM CONFIGURATION REGISTER | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----------|----|-----------|----|----------|---|------------|---|-----------|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | CLOCKACTIVITY | | RESERVED | | SIDLEMODE | | ENWAKEUP | | SOFT_RESET | | AUTO_IDLE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|-----------|
| 31:10 | RESERVED | | R | 0x0000000 |
| 9:8 | CLOCKACTIVITY | Clocks activity during wake up mode period 0x0: Interface and Functional clocks can be switched off 0x1: Functional clocks can be switched off and Interface clocks are maintained during wake up period 0x2: Interface clocks can be switched off and Functional clocks are maintained during wake up period 0x3: Interface and Functional clocks are maintained during wake up period | RW | 0x0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4:3 | SIDLEMODE | Slave interface power management, Idle req/ack control 0x0: Force-idle. An idle request is acknowledged unconditionally 0x1: No-idle. An idle request is never acknowledged 0x2: Smart-idle. Acknowledgement to an idle request is given based on the internal activity of the module. 0x3: Reserved | RW | 0x2 |
| 2 | ENWAKEUP | Wake-up mode enable bit 0x0: Wakeup is disabled 0x1: Wakeup is enabled | RW | 0 |
| 1 | SOFT_RESET | Software reset. Set the bit to 1 to trigger a module reset. The bit is automatically reset by the hardware. During reads return 0. 0x0: Normal mode. 0x1: The module is reset | RW | 0 |
| 0 | AUTO_IDLE | Internal interface gating strategy 0x0: Interface clock is free-running. 0x1: Automatic Interface clock gating strategy is applied based on the interface activity. | RW | 1 |

Table 10-534. Register Call Summary for Register DSI_SYSCONFIG

MIPI Display Serial Interface

- [Software Reset: \[0\]](#)
- [Power Management: \[1\] \[2\]](#)
- [Software Reset: \[3\]](#)
- [DSI Global Initialization: \[4\] \[5\] \[6\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[7\] \[8\]](#)

Table 10-535. DSI_SYSSTATUS

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0014 | | |
| Physical Address | 0x5800 4014 0x4804 4014 0x5800 5014 0x4804 5014 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_P R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_P R_L4 |
| Description | SYSTEM STATUS REGISTER This register provides status information about the module, excluding the interrupt status register. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESET_DONE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | RESET_DONE | Internal reset monitoring Read 0x0: Internal module reset is on going. Read 0x1: Reset completed. | R | 1 |

Table 10-536. Register Call Summary for Register DSI_SYSSTATUS

MIPI Display Serial Interface

- [Software Reset: \[0\] \[1\]](#)
- [DSI Global Initialization: \[2\] \[3\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[4\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[5\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[6\] \[7\]](#)

Table 10-537. DSI_IRQSTATUS

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0018 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PER_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PER_L4 |
| Physical Address | 0x5800 4018 0x4804 4018 0x5800 5018 0x4804 5018 | | |
| Description | <p>INTERRUPT STATUS REGISTER - All virtual channels + Complex I/O + PLL</p> <p>This register associates one bit for each virtual channel in order to determine which virtual channel has generated the interrupt. The virtual channel shall be enabled for events to be generated on that virtual channel.</p> <p>If the virtual channel is disabled, the interrupt is not generated.</p> | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|--------------|--------------|-----------|----------|---------------|-----------------|----------------|--------------|--------------|----------|----|----|----|-------------------|---------------|----------------|--------------|----------|-----------------------|------------|----------------------|----------------------|----------------------|----------------------|
| RESERVED | | | | | | | | TE1_LINE_IRQ | TE0_LINE_IRQ | TA_TO_IRQ | RESERVED | SYNC_LOST_IRQ | ACK_TRIGGER_IRQ | TE_TRIGGER_IRQ | LP_RX_TO_IRQ | HS_TX_TO_IRQ | RESERVED | | | | COMPLEXIO_ERR_IRQ | PLL_RECAL_IRQ | PLL_UNLOCK_IRQ | PLL_LOCK_IRQ | RESERVED | RESYNCHRONIZATION_IRQ | WAKEUP_IRQ | VIRTUAL_CHANNEL3_IRQ | VIRTUAL_CHANNEL2_IRQ | VIRTUAL_CHANNEL1_IRQ | VIRTUAL_CHANNEL0_IRQ |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|-------|
| 31:23 | RESERVED | | R | 0x000 |
| 22 | TE1_LINE_IRQ | <p>The VSYNC and corresponding HSYNC pulses defined in DSI_TE_HSYNC_NUMBER for the line TE1 have been received by the DSI protocol engine and have trigger the start of the data transfer to the peripheral.</p> <p>0x0: READS: Event is false. WRITES: Status bit unchanged.</p> <p>0x1: READS: Event is true (pending). WRITES: Status bit is reset.</p> | RW | 0 |
| 21 | TE0_LINE_IRQ | <p>The VSYNC and corresponding HSYNC pulses defined in DSI_TE_HSYNC_NUMBER for the line TE0 have been received by the DSI protocol engine and have trigger the start of the data transfer to the peripheral.</p> <p>0x0: READS: Event is false. WRITES: Status bit unchanged.</p> <p>0x1: READS: Event is true (pending). WRITES: Status bit is reset.</p> | RW | 0 |
| 20 | TA_TO_IRQ | <p>Turn-around Time out.</p> <p>0x0: READS: Event is false. WRITES: Status bit unchanged.</p> <p>0x1: READS: Event is true (pending). WRITES: Status bit is reset.</p> | RW | 0 |
| 19 | RESERVED | Reserved. Keep at reset value. | RW | 0 |
| 18 | SYNC_LOST_IRQ | <p>Synchronization with Video port is lost (Video mode only)</p> <p>0x0: READS: Event is false. WRITES: Status bit unchanged.</p> <p>0x1: READS: Event is true (pending). WRITES: Status bit is reset.</p> | RW | 0 |

MIPI Display Serial Interface

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|-------|
| 17 | ACK_TRIGGER_IRQ | Acknowledge Trigger 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 16 | TE_TRIGGER_IRQ | Tearing Effect Trigger 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 15 | LP_RX_TO_IRQ | Interrupt for Low Power Rx Time out 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 14 | HS_TX_TO_IRQ | Interrupt for High Speed Tx Time out. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 13:11 | RESERVED | | R | 0x0 |
| 10 | COMPLEXIO_ERR_IRQ | Error signaling from Complex I/O: status of the complex I/O errors received from the complex I/O (events are defined in DSI_COMPLEXIO_IRQSTATUS). Read 0x0: READS: Event is false. Read 0x1: READS: Event is true (pending). | R | 0 |
| 9 | PLL_RECAL_IRQ | PLL recal event (assertion of DSIRecal signal from the DSI PLL Control module) 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 8 | PLL_UNLOCK_IRQ | PLL un-clock event (de-assertion of DSILock signal from the DSI PLL Control module) 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 7 | PLL_LOCK_IRQ | PLL clock event (assertion of DSILock signal from the DSI PLL Control module) 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 6 | RESERVED | | R | 0 |
| 5 | RESYNCHRONIZATION_IRQ | Video mode resynchronization indicates to the software users that the video port works but the configuration of the timings for the display controller (DISPC) and for DSI Protocol engine may need to be modified to avoid the resynchronization to occur. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|-------|
| 4 | WAKEUP_IRQ | Wakeup 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 3 | VIRTUAL_CHANNEL3_IRQ | Virtual channel 3 Read 0x0: READS: Event is false. Read 0x1: READS: Event is true (pending). | R | 0 |
| 2 | VIRTUAL_CHANNEL2_IRQ | Virtual channel 2 Read 0x0: READS: Event is false. Read 0x1: READS: Event is true (pending). | R | 0 |
| 1 | VIRTUAL_CHANNEL1_IRQ | Virtual channel 1 Read 0x0: READS: Event is false. Read 0x1: READS: Event is true (pending). | R | 0 |
| 0 | VIRTUAL_CHANNEL0_IRQ | Virtual channel 0 Read 0x0: READS: Event is false. Read 0x1: READS: Event is true (pending). | R | 0 |

Table 10-538. Register Call Summary for Register DSI_IRQSTATUS

MIPI Display Serial Interface

- [DSI Interrupt Requests: \[0\]](#)
- [DSI Transfer Modes: \[1\] \[2\]](#)
- [Timers: \[3\] \[4\]](#)
- [PHY Triggers: \[5\] \[6\]](#)
- [Interrupts: \[7\]](#)
- [Error Handling: \[8\] \[9\] \[10\]](#)
- [Error Handling: \[11\]](#)
- [DSI Global Initialization: \[12\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[13\] \[14\]](#)

Table 10-539. DSI_IRQENABLE

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 001C | | |
| Physical Address | 0x5800 401C 0x4804 401C 0x5800 501C 0x4804 501C | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | INTERRUPT ENABLE REGISTER - This register associates one bit for each virtual channel in order to enable/disable each virtual channel individually. | | |
| Type | RW | | |

MIPI Display Serial Interface

www.ti.com

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|-----------------|--------------|----------|------------------|--------------------|-------------------|-----------------|-----------------|----------|----|----|----|----|------------------|-------------------|-----------------|----------|--------------------------|---------------|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | TE1_LINE_IRQ_EN | TE0_LINE_IRQ_EN | TA_TO_IRQ_EN | RESERVED | SYNC_LOST_IRQ_EN | ACK_TRIGGER_IRQ_EN | TE_TRIGGER_IRQ_EN | LP_RX_TO_IRQ_EN | HS_TX_TO_IRQ_EN | RESERVED | | | | | PLL_RECAL_IRQ_EN | PLL_UNLOCK_IRQ_EN | PLL_LOCK_IRQ_EN | RESERVED | RESYNCHRONIZATION_IRQ_EN | WAKEUP_IRQ_EN | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31:23 | RESERVED | | R | 0x000 |
| 22 | TE1_LINE_IRQ_EN | The VSYNC and corresponding HSYNC pulses defined in DSI_TE_HSYNC_NUMBER for the line TE1 have been received by the DSI protocol engine and have trigger the start of the data transfer to the peripheral. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 21 | TE0_LINE_IRQ_EN | The VSYNC and corresponding HSYNC pulses defined in DSI_TE_HSYNC_NUMBER for the line TE0 have been received by the DSI protocol engine and have trigger the start of the data transfer to the peripheral. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 20 | TA_TO_IRQ_EN | Turn-around Time out. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 19 | RESERVED | Reserved. Keep at reset value. | RW | 0 |
| 18 | SYNC_LOST_IRQ_EN | Synchronization with Video port is lost (Video mode only) 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 17 | ACK_TRIGGER_IRQ_EN | Acknowledge trigger 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 16 | TE_TRIGGER_IRQ_EN | Tearing Effect trigger 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 15 | LP_RX_TO_IRQ_EN | Interrupt for Low Power Rx Time out. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 14 | HS_TX_TO_IRQ_EN | Interrupt for High Speed Tx Time out. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 13:10 | RESERVED | | R | 0x0 |
| 9 | PLL_RECAL_IRQ_EN | PLL recal event (assertion of DSIRecal signal from the DSI PLL Control module) 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------|
| 8 | PLL_UNLOCK_IRQ_EN | PLL un-clock event (de-assertion of DSILock signal from the DSI PLL Control module) 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 7 | PLL_LOCK_IRQ_EN | PLL clock event (assertion of DSILock signal from the DSI PLL Control module) 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 6 | RESERVED | | R | 0 |
| 5 | RESYNCHRONIZATION_IRQ_EN | Video mode resynchronization 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 4 | WAKEUP_IRQ_EN | Wakeup 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 3:0 | RESERVED | | R | 0x0 |

Table 10-540. Register Call Summary for Register DSI_IRQENABLE

MIPI Display Serial Interface

- [PHY Triggers: \[0\] \[1\]](#)
- [Interrupts: \[2\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[3\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[4\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[5\] \[6\]](#)

Table 10-541. DSI_CTRL

| | | | |
|------------------|--|----------|-------------------------|
| Address Offset | 0x0000 0040 | Instance | DSI1_PROTOCOL_ENGINE_L3 |
| Physical Address | 0x5800 4040 | | DSI1_PROTOCOL_ENGINE_PE |
| | 0x4804 4040 | | R_L4 |
| | 0x5800 5040 | | DSI2_PROTOCOL_ENGINE_L3 |
| | 0x4804 5040 | | DSI2_PROTOCOL_ENGINE_PE |
| | | | R_L4 |
| Description | GLOBAL CONTROL REGISTER This register controls the DSI Protocol Engine module. This register shall not be modified dynamically (except IF_EN bit fields). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|-------------------|-------------------|-------------------|---------------|------------|--------------|----------------|--------------|----------------|--------------------|-------------|--------------|--------------|-----------|------------|-------------------|---------------|--------------|---------------------|-----------|----------|-------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DISPC_UPDATE_SYNC | HSA_BLANKING_MODE | HBP_BLANKING_MODE | HFP_BLANKING_MODE | BLANKING_MODE | EOT_ENABLE | VP_HSYNC_END | VP_HSYNC_START | VP_VSYNC_END | VP_VSYNC_START | TRIGGER_RESET_MODE | LINE_BUFFER | VP_VSYNC_POL | VP_HSYNC_POL | VP_DE_POL | VP_CLK_POL | VP_DATA_BUS_WIDTH | TRIGGER_RESET | VP_CLK_RATIO | TX_FIFO_ARBITRATION | ECC_RX_EN | CS_RX_EN | IF_EN | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | DISPC_UPDATE_SYNC | Determines if the Dispc_Update_Sync signal from the display controller is used. 0x0: Dispc_Update_Sync signal is not used. 0x1: Dispc_Update_Sync signal is used. | RW | 0 |
| 23 | HSA_BLANKING_MODE | Blanking mode 0x0: Packets in TX FIFO are sent during HSA blanking period of video mode or LPS is used. 0x1: LONG BLANKING PACKETS only are used during HSA blanking period of video mode. | RW | 0 |
| 22 | HBP_BLANKING_MODE | Blanking mode 0x0: Packets in TX FIFO are sent during HBP blanking period of video mode or LPS is used. 0x1: LONG BLANKING PACKETS only are used during HBP blanking period of video mode. | RW | 0 |
| 21 | HFP_BLANKING_MODE | Blanking mode 0x0: Packets in TX FIFO are sent during HFP blanking period of video mode or LPS is used. 0x1: LONG BLANKING PACKETS only are used during HFP blanking period of video mode. | RW | 0 |
| 20 | BLANKING_MODE | Blanking mode 0x0: LPS is used during blanking periods of video mode (except HSA, HBP, HFP defined in HSA_BLANKING_MODE, HBP_BLANKING_MODE AND HFP_BLANKING_MODE respectively) when there is no command mode data in TX FIFO ready to be sent. So blanking periods can be different during the frame depending on the TX FIFO. 0x1: LONG BLANKING PACKETS are used during blanking periods of video mode (except HSA, HBP, HFP defined in HSA_BLANKING_MODE, HBP_BLANKING_MODE AND HFP_BLANKING_MODE respectively) regardless of the packets present in the TX FIFO ready to be sent | RW | 0 |
| 19 | EOT_ENABLE | Enable EOT packets at the end of HS transmission. 0x0: No EOT packets 0x1: EOT packet is sent at all HS to LP transitions. | RW | 0 |
| 18 | VP_HSYNC_END | HSYNC end pulse. 0x0: Disabled. No HSYNC END short packet is generated. 0x1: Enabled. While the HSYNC END pulse is detected, the associated short packet HSYNC END is generated. | RW | 0 |
| 17 | VP_HSYNC_START | HSYNC start pulse. 0x0: Disabled. No HSYNC START short packet is generated. 0x1: Enabled. While the HSYNC start pulse is detected, the associated short packet HSYNC START is generated. | RW | 0 |
| 16 | VP_VSYNC_END | VSYNC end pulse. 0x0: Disabled. No VSYNC END short packet is generated. 0x1: Enabled. While the VSYNC END pulse is detected, the associated short packet VSYNC END is generated. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 15 | VP_VSYNC_START | <p>VSYNC start pulse.</p> <p>0x0: Disabled. No VSYNC START short packet is generated.</p> <p>0x1: Enabled. While the VSYNC START pulse is detected, the associated short packet VSYNC START is generated.⁽¹⁾</p> | RW | 0 |
| 14 | TRIGGER_RESET_MODE | <p>Selection of the trigger reset mode</p> <p>0x0: Synchronized: the mode is only valid if there is virtual channel using the video mode and it is active. The principal is to wait for the current video frame to be transferred on the link. Any data received after the VSYNC are ignored.</p> <p>0x1: Immediate: all pending requests in TX FIFO are taken into account for transfer scheduling, the RX FIFO is ignored, and the data from video port are ignored as soon as possible. Only the current transfer on DSI link and already scheduled ones are transmitted. All the other transfers are discarded.</p> | RW | 0 |
| 13:12 | LINE_BUFFER | <p>Number of line buffers to be used while receiving data on the video port. The valid values are from 0 to DSI_GNQ[17:16] VP1_NB_LINE_BUFFER.</p> <p>0x0: No line buffer</p> <p>0x1: 1 line buffer</p> <p>0x2: 2 line buffers</p> | RW | 0x0 |
| 11 | VP_VSYNC_POL | <p>VP vertical synchronization signal polarity</p> <p>0x0: VSYNC signal on the video port is active low.</p> <p>0x1: VSYNC signal on the video port is active high.</p> | RW | 0 |
| 10 | VP_HSYNC_POL | <p>VP horizontal synchronization signal polarity</p> <p>0x0: HSYNC signal on the video port is active low.</p> <p>0x1: HSYNC signal on the video port is active high.</p> | RW | 0 |
| 9 | VP_DE_POL | <p>VP data enable signal polarity</p> <p>0x0: DE signal on the video port is active low.</p> <p>0x1: DE signal on the video port is active high.</p> | RW | 0 |
| 8 | VP_CLK_POL | <p>VP pixel clock polarity</p> <p>0x0: The DSI Protocol Engine module captures the data on the VP on the pixel clock falling edge. The module connected to the VP shall drive the data on the pixel clock rising edge.</p> <p>0x1: The DSI Protocol Engine module captures the data on the VP on the pixel clock raising edge. The module connected to the VP shall drive the data on the pixel clock falling edge.</p> | RW | 1 |
| 7:6 | VP_DATA_BUS_WIDTH | <p>Defines the size of the video port data bus</p> <p>0x0: 16-bits data width (LSB of the 24-bit video port data bus)</p> <p>0x1: 18-bits data width (LSB of the 24-bit video port data bus)</p> <p>0x2: 24-bits data width (LSB of the 24-bit video port data bus)</p> | RW | 0x0 |

⁽¹⁾ In DSI video mode, if the VSA bit field in DSI_VM_TIMING2 is set to 0x0, no vertical synchronization packet will be sent even if VP_VSYNC_START is set to 0x1 in DSI_CTRL.

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|-------|
| 5 | TRIGGER_RESET | Send the reset trigger to the peripheral. 0x0: READS: Reset trigger generation is completed. It is reset by hardware when it is completed. WRITES: Cancellation of the request for Reset trigger generation (maybe too late since it is already on going) 0x1: READS: Generation of the reset trigger has been requested by user (could be on going but not completed yet). WRITES: Request for Reset trigger to be sent to the peripheral. | RW | 0 |
| 4 | VP_CLK_RATIO | The field indicates the clock ratio between VP_CLK and VP_PCLK. The clock VP_PCLK is generated from VP_CLK. It is divided down. The information is only used when the video port is used to provide data in command mode. In the case of video mode, it is not used. 0x0: The clock VP_PCLK is the clock VP_CLK divided by 2. The duty cycle of VP_PCLK is 50/50. 0x1: The clock VP_PCLK is the clock VP_CLK divided by 3 or more. The duty cycle of VP_PCLK is not 50/50 for odd ratio numbers (3,5,7,...). | RW | 0 |
| 3 | TX_FIFO_ARBITRATION | Defines the arbitration scheme for granting the virtual channel pending ready requests in the TX FIFO 0x0: Round-Robin Scheme is used 0x1: Sequential Scheme is used | RW | 0 |
| 2 | ECC_RX_EN | Enables the Error Correction Code check for the received header (short and long packets for all virtual channel ids). 0x0: Disabled 0x1: Enabled | RW | 0 |
| 1 | CS_RX_EN | Enables the checksum check for the received payload (long packet only for all virtual channel ids). 0x0: Disabled 0x1: Enabled | RW | 0 |
| 0 | IF_EN | Enables the module. When the module is disabled the signals from the complex I/O are gated (no updates of the interrupt status register). It is not possible to change the bit fields in the register DSI_CTRL except IF_EN when it is enabled. All the other registers can be changed except the ones that require DSI_VC_CTRL_i[0] VC_EN to be equal to 0 to be modified. 0x0: The interface is disabled. If one of the virtual channel uses the video mode with the video port to receive the data, the DSI protocol engines is disabled when the next VSYNC is received and all the data in the FIFO for the other virtual channels in command mode are sent to the peripherals (if BTA_EN is enabled, the DSI protocol needs to wait for the response and BTA from the peripheral before disabling all the internal logic since an acknowledge is requested). 0x1: The interface is enabled immediately, the data acquisition on the video port starts on the next VSYNC (video mode) or first data received in the Slave port FIFO (command mode). | RW | 0 |

Table 10-542. Register Call Summary for Register DSI_CTRL
MIPI Display Serial Interface

- [Short Packet: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [DSI Global Register Controls: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [DSI Transfer Modes: \[13\] \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [Clock Requirements: \[19\]](#)
- [Video Port Interface: \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\]](#)
- [Timers: \[31\] \[32\] \[33\] \[34\] \[35\] \[36\]](#)
- [Bus Turnaround: \[37\] \[38\] \[39\] \[40\]](#)
- [PHY Triggers: \[41\] \[42\] \[43\] \[44\]](#)
- [ECC Generation: \[45\]](#)
- [Checksum Generation for Long Packet Payloads: \[46\]](#)
- [EOT Packet: \[47\]](#)
- [Power Control of DSI PHY Complex I/O and DSI PLL: \[48\] \[49\] \[50\] \[51\] \[52\] \[53\]](#)
- [How to Configure the DSI PLL in Video Mode: \[54\] \[55\]](#)
- [Pad Configuration: \[56\] \[57\] \[58\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[59\] \[60\] \[61\] \[62\] \[63\] \[64\] \[65\] \[66\] \[67\] \[68\] \[69\] \[70\] \[71\] \[72\] \[73\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[74\] \[75\] \[76\] \[77\] \[78\] \[79\] \[80\] \[81\] \[82\] \[83\] \[84\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[85\] \[86\]](#)
- [DSI_PROTOCOL_ENGINE Register Description: \[87\] \[88\] \[89\] \[90\] \[91\] \[92\] \[93\] \[94\]](#)

Table 10-543. DSI_GNQ

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0044 | Instance | DSI1_PROTOCOL_ENGINE_L3 |
| Physical Address | 0x5800 4044 0x4804 4044 0x5800 5044 0x4804 5044 | | DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | GENERIC PARAMETER REGISTER This register provide a way to read the generic parameters used in the design. | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----------------|--------------------|----------|----------------------|--------------------|----------|----------------------|---------------|----|----|----|----------------|--------------|----|---|---|--------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | NB_VIDEO_PORTS | VP2_NB_LINE_BUFFER | RESERVED | VP2_LINE_BUFFER_SIZE | VP1_NB_LINE_BUFFER | RESERVED | VP1_LINE_BUFFER_SIZE | NB_DATA_LANES | | | | NB_DMA_REQUEST | RX_FIFODEPTH | | | | TX_FIFODEPTH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | NB_VIDEO_PORTS | Number of video ports Read 0x0: Video port 1 only is present Read 0x1: Video port 1 and video port 2 are present | R | 0 |

MIPI Display Serial Interface

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|------------------------------|
| 23:22 | VP2_NB_LINE_BUFFER | Determines the number of video buffer lines associated to video port 2. Read 0x0: No line buffer Read 0x1: 1 line buffer of the size defined in LINE_BUFFER_SIZE Read 0x2: 2 line buffers of the size defined in LINE_BUFFER_SIZE | R | 0x2 for DSI1 0x0 for DSI2 |
| 21 | RESERVED | | R | 0 |
| 20:18 | VP2_LINE_BUFFER_SIZE | Determines the video line buffer size associated to video port 2 . Read 0x1: 512x24-bits, 682x18-bits, 768x16bits (memory of 384x32-bits) Read 0x2: 682x24-bits, 910x18-bits, 1024x16bits (memory of 512x32-bits) Read 0x3: 853x24-bits, 1137x18-bits, 1280x16bits (memory of 640x32-bits) Read 0x4: 1024x24-bits, 1365x18-bits, 1536x16bits (memory of 768x32-bits) Read 0x5: 1194x24-bits, 1592x18-bits, 1792x16bits (memory of 896x32-bits) Read 0x6: 1365x24-bits, 1820x18-bits, 2048x16bits (memory of 1024x32-bits) | R | 0x4 for DSI1 0x1 for DSI2 |
| 17:16 | VP1_NB_LINE_BUFFER | Determines the number of video buffer lines associated to video port 1. Read 0x0: No line buffer Read 0x1: 1 line buffer of the size defined in LINE_BUFFER_SIZE Read 0x2: 2 line buffers of the size defined in LINE_BUFFER_SIZE | R | 0x2 |
| 15 | RESERVED | | R | 0 |
| 14:12 | VP1_LINE_BUFFER_SIZE | Determines the video line buffer size associated to video port 1 . Read 0x1: 512x24-bits, 682x18-bits, 768x16bits (memory of 384x32-bits) Read 0x2: 682x24-bits, 910x18-bits, 1024x16bits (memory of 512x32-bits) Read 0x3: 853x24-bits, 1137x18-bits, 1280x16bits (memory of 640x32-bits) Read 0x4: 1024x24-bits, 1365x18-bits, 1536x16bits (memory of 768x32-bits) Read 0x5: 1194x24-bits, 1592x18-bits, 1792x16bits (memory of 896x32-bits) Read 0x6: 1365x24-bits, 1820x18-bits, 2048x16bits (memory of 1024x32-bits) | R | 0x6 for DSI1 0x4 for DSI2 |
| 11:9 | NB_DATA_LANES | Determines the number of data lanes supported by the DSI protocol engine . Read 0x1: 1 Data lane Read 0x2: 2 Data lanes Read 0x3: 3 Data lanes Read 0x4: 4 Data lanes | R | 0x4 for DSI1 0x2 for DSI2 |
| 8:6 | NB_DMA_REQUEST | Determines the number of DMA_REQ signals. Read 0x0: No DMA request Read 0x1: 1 DMA request Read 0x2: 2 DMA requests Read 0x3: 3 DMA requests Read 0x4: 4 DMA requests | R | 0x4 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 5:3 | RX_FIFODEPTH | Determines the data RX FIFO depth (32-bit words) on the slave port. Read 0x4: 32x 33 bits Read 0x5: 64x 33 bits Read 0x6: 128 x 33 bits Read 0x7: 256 x 33 bits | R | 0x6 |
| 2:0 | TX_FIFODEPTH | Determines the data TX FIFO depth (33-bit words) on the slave port. Read 0x4: 32x 33 bits Read 0x5: 64x 33 bits Read 0x6: 128 x 33 bits Read 0x7: 256 x 33 bits | R | 0x6 |

Table 10-544. Register Call Summary for Register DSI_GNQ

MIPI Display Serial Interface

- [DSI_PROTOCOL_ENGINE Register Summary: \[0\] \[1\]](#)
- [DSI_PROTOCOL_ENGINE Register Description: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\]](#)

Table 10-545. DSI_COMPLEXIO_CFG1

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0048 | | |
| Physical Address | 0x5800 4048 0x4804 4048 0x5800 5048 0x4804 5048 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | COMPLEXIO CONFIGURATION REGISTER for the complex I/O This register contains the lane configuration for the order and position of the lanes (clock and data) and the polarity order for the control of the PHY differential signals in addition to the control bit for the power FSM. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|-------|------------|---------|----|------------|----|----------|----------|----------|-----------|----------------|-----------|----|----------------|-----------|----------------|-----------|----|----------------|-----------|----------------|---|---|---|---|---|---|---|---|---|---|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| SHADOWING | GOBIT | RESET_DONE | PWR_CMD | | PWR_STATUS | | RESERVED | RESERVED | RESERVED | DATA4_POL | DATA4_POSITION | DATA3_POL | | DATA3_POSITION | DATA2_POL | DATA2_POSITION | DATA1_POL | | DATA1_POSITION | CLOCK_POL | CLOCK_POSITION | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31 | SHADOWING | Shadowing configuration. 0x0: Disabled. The writes to the DSI_PHY_REGISTER0 through DSI_PHY_REGISTER2 registers is done like the other SCP registers. 0x1: Enabled. The writes to the DSI_PHY_REGISTER0 through DSI_PHY_REGISTER2 registers is done only when the GOBIT is set and when the signal DISPCupdateSync from the display controller module is active. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|-------|
| 30 | GOBIT | Allows the synchronized update of the shadow registers when the signal DISPCUpdateSync is active. 0x0: Resets the GOBIT. The hardware has finished the update of the shadow SCP registers. The bit is reset by Hardware. The software can reset the bit in case the user decides to abort it. There is no guarantee that the software reset is done before the transfer of the values to the complex IO. 0x1: Set the GOBIT. Only when the transfer of the new values for the three first registers is completed (3, 2, 1, or 0 transfers are performed based on the number of registers to update), the GOBIT is reset. The DISPCUpdateSync signal is used to synchronize the update. The bit shall be set only when it is in reset state. | RW | 0 |
| 29 | RESET_DONE | Internal reset monitoring of the power domain using the TXBYTECLKHS clock from the complex I/O Read 0x0: Internal module reset is on going. Read 0x1: Reset completed. | R | 1 |
| 28:27 | PWR_CMD | Command for power control of the complex I/O 0x0: Command to change to OFF state 0x1: Command to change to ON state 0x2: Command to change to ULTRALOW-POWER state | RW | 0x0 |
| 26:25 | PWR_STATUS | Status of the power control of the complex I/O Read 0x0: Complex I/O in OFF state Read 0x1: Complex I/O in ON state Read 0x2: Complex I/O in ULTRALOW-POWER state | R | 0x0 |
| 24:22 | RESERVED | Reserved | R | 0x0 |
| 21 | RESERVED | Reserved | R | 0 |
| 20 | RESERVED | Reserved | RW | 0 |
| 19 | DATA4_POL | +/- differential pin order of DATA lane 4. Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: +/- pin order (DSI.DX=+ and DSI.DY=-) 0x1: -/+ pin order (DSI.DX=- and DSI.DY=+) | RW | 0 |
| 18:16 | DATA4_POSITION | Position and order of the DATA lane 4. Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: Not used/connected 0x1: Data lane 4 is at the position 1 (lane 1). 0x2: Data lane 4 is at the position 2 (lane 2). 0x3: Data lane 4 is at the position 3 (lane 3). 0x4: Data lane 4 is at the position 4 (lane 4). 0x5: Data lane 4 is at the position 5 (lane 5). | RW | 0x0 |
| 15 | DATA3_POL | +/- differential pin order of DATA lane 3. Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: +/- pin order (DSI.DX=+ and DSI.DY=-) 0x1: -/+ pin order (DSI.DX=- and DSI.DY=+) | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|-------|
| 14:12 | DATA3_POSITION | Position and order of the DATA lane 3. Applicable only to DS1. For DS12 this bit field is RESERVED. 0x0: Not used/connected 0x1: Data lane 3 is at the position 1 (lane 1). 0x2: Data lane 3 is at the position 2 (lane 2). 0x3: Data lane 3 is at the position 3 (lane 3). 0x4: Data lane 3 is at the position 4 (lane 4). 0x5: Data lane 3 is at the position 5 (lane 5). | RW | 0x0 |
| 11 | DATA2_POL | +/- differential pin order of DATA lane 2. 0x0: +/- pin order (DSI.DX=+ and DSI.DY=-) 0x1: -/+ pin order (DSI.DX=- and DSI.DY=+) | RW | 0 |
| 10:8 | DATA2_POSITION | Position and order of the DATA lane 2. 0x0: Not used/connected 0x1: Data lane 2 is at the position 1 (lane 1). 0x2: Data lane 2 is at the position 2 (lane 2). 0x3: Data lane 2 is at the position 3 (lane 3). 0x4: Data lane 2 is at the position 4 (lane 4). 0x5: Data lane 2 is at the position 5 (lane 5). | RW | 0x0 |
| 7 | DATA1_POL | +/- pin differential pin order of DATA lane 1 0x0: +/- pin order (DSI.DX=+ and DSI.DY=-) 0x1: -/+ pin order (DSI.DX=- and DSI.DY=+) | RW | 0 |
| 6:4 | DATA1_POSITION | Position and order of the DATA lane 1. The data lane 1 is always present. 0x0: Not used/connected 0x1: Data lane 1 is at the position 1 (lane 1). 0x2: Data lane 1 is at the position 2 (lane 2). 0x3: Data lane 1 is at the position 3 (lane 3). 0x4: Data lane 1 is at the position 4 (lane 4). 0x5: Data lane 1 is at the position 5 (lane 5). | RW | 0x0 |
| 3 | CLOCK_POL | +/- differential pin order of CLOCK lane. 0x0: +/- pin order (DSI.DX=+ and DSI.DY=-) 0x1: -/+ pin order (DSI.DX=- and DSI.DY=+) | RW | 0 |
| 2:0 | CLOCK_POSITION | Position and order of the CLOCK lane. 0, 5, 6 and 7 are reserved. The clock lane is always present but cannot be at the position 5 even if the COMPLEX I/O consists of 5 lanes. 0x0: Not used/connected 0x1: Clock lane is at the position 1 (lane 1). 0x2: Clock lane is at the position 2 (lane 2). 0x3: Clock lane is at the position 3 (lane 3). 0x4: Clock lane is at the position 4 (lane 4). 0x5: Reserved 0x6: Reserved 0x7: Reserved | RW | 0x0 |

Table 10-546. Register Call Summary for Register DSI_COMPLEXIO_CFG1

MIPI Display Serial Interface

- [Data/Clock Configuration: \[0\]](#)
- [DSI Protocol Overview: \[1\]](#)
- [SCP Interface: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [Power Control of DSI PHY Complex I/O and DSI PLL: \[9\] \[10\]](#)
- [Ultralow-Power State Configuration: \[11\] \[12\]](#)
- [Software Reset: \[13\]](#)
- [Pad Configuration: \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [Display Timing Configuration: \[19\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[20\] \[21\] \[22\] \[23\] \[24\] \[25\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[26\] \[27\] \[28\] \[29\] \[30\] \[31\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[32\] \[33\]](#)

Table 10-547. DSI_COMPLEXIO_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 004C | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Physical Address | 0x5800 404C 0x4804 404C 0x5800 504C 0x4804 504C | | |
| Description | INTERRUPT STATUS REGISTER - All errors from complex I/O | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------|-------------|-------------|-------------|-------------|----------------|----------------|----------------|----------------|----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ULPSACTIVENOT_ALL1_IRQ | ULPSACTIVENOT_ALL0_IRQ | ERRCONTENTIONLP1_5_IRQ | ERRCONTENTIONLP0_5_IRQ | ERRCONTENTIONLP1_4_IRQ | ERRCONTENTIONLP0_4_IRQ | ERRCONTENTIONLP1_3_IRQ | ERRCONTENTIONLP0_3_IRQ | ERRCONTENTIONLP1_2_IRQ | ERRCONTENTIONLP0_2_IRQ | ERRCONTENTIONLP1_1_IRQ | ERRCONTENTIONLP0_1_IRQ | STATEULPS5_IRQ | STATEULPS4_IRQ | STATEULPS3_IRQ | STATEULPS2_IRQ | STATEULPS1_IRQ | ERRCONTROL5_IRQ | ERRCONTROL4_IRQ | ERRCONTROL3_IRQ | ERRCONTROL2_IRQ | ERRCONTROL1_IRQ | ERRCSC5_IRQ | ERRCSC4_IRQ | ERRCSC3_IRQ | ERRCSC2_IRQ | ERRCSC1_IRQ | ERRSYNCEC5_IRQ | ERRSYNCEC4_IRQ | ERRSYNCEC3_IRQ | ERRSYNCEC2_IRQ | ERRSYNCEC1_IRQ |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------|
| 31 | ULPSACTIVENOT_ALL1_IRQ | All the ULPSActiveNOT signals corresponding to the lanes with TXULPSExit being high are high. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 30 | ULPSACTIVENOT_ALL0_IRQ | All signals ULPSActiveNOT are 0 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 29 | ERRCONTENTIONLP1_5_IRQ | Contention LP1 error for lane 5 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------|
| 28 | ERRCONTENTIONLP0_5_IRQ | Contention LP0 error for lane 5 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 27 | ERRCONTENTIONLP1_4_IRQ | Contention LP1 error for lane 4 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 26 | ERRCONTENTIONLP0_4_IRQ | Contention LP0 error for lane 4 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 25 | ERRCONTENTIONLP1_3_IRQ | Contention LP1 error for lane 3 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 24 | ERRCONTENTIONLP0_3_IRQ | Contention LP0 error for lane 3 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 23 | ERRCONTENTIONLP1_2_IRQ | Contention LP1 error for lane 2 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 22 | ERRCONTENTIONLP0_2_IRQ | Contention LP0 error for lane 2 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 21 | ERRCONTENTIONLP1_1_IRQ | Contention LP1 error for lane 1 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 20 | ERRCONTENTIONLP0_1_IRQ | Contention LP0 error for lane 1 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 19 | STATEULPS5_IRQ | lane 5 in ULTRALOW-POWER State Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------|
| 18 | STATEULPS4_IRQ | lane 4 in ultralow-power mode Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 17 | STATEULPS3_IRQ | lane 3 in ULTRALOW-POWER state 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 16 | STATEULPS2_IRQ | lane 2 in ULTRALOW-POWER state 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 15 | STATEULPS1_IRQ | lane 1 in ULTRALOW-POWER state 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 14 | ERRCONTROL5_IRQ | Control error for lane 5 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 13 | ERRCONTROL4_IRQ | Control error for lane 4 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 12 | ERRCONTROL3_IRQ | Control error for lane 3 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 11 | ERRCONTROL2_IRQ | Control error for lane 2 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 10 | ERRCONTROL1_IRQ | Control error for lane 1 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 9 | ERRESC5_IRQ | Escape entry error for lane 5 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------|
| 8 | ERRESC4_IRQ | Escape entry error for lane 4 Applicable only to DS1. For DS12 this bit field is RESERVED. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 7 | ERRESC3_IRQ | Escape entry error for lane 3 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 6 | ERRESC2_IRQ | Escape entry error for lane 2 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 5 | ERRESC1_IRQ | Escape entry error for lane 1 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 4 | ERRSYNCESC5_IRQ | Low power Data transmission synchronization error for lane 5 Applicable only to DS1. For DS12 this bit field is RESERVED. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 3 | ERRSYNCESC4_IRQ | Low power Data transmission synchronization error for lane 4 Applicable only to DS1. For DS12 this bit field is RESERVED. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 2 | ERRSYNCESC3_IRQ | Low power Data transmission synchronization error for lane 3 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 1 | ERRSYNCESC2_IRQ | Low power Data transmission synchronization error for lane 2 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 0 | ERRSYNCESC1_IRQ | Low power Data transmission synchronization error for lane 1 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |

Table 10-548. Register Call Summary for Register DSI_COMPLEXIO_IRQSTATUS

MIPI Display Serial Interface

- [DSI Interrupt Requests: \[0\] \[1\]](#)
- [Timers: \[2\]](#)
- [Ultralow-Power State Configuration: \[3\] \[4\]](#)
- [Error Handling: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[14\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[15\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[16\] \[17\]](#)
- [DSI_PROTOCOL_ENGINE Register Description: \[18\]](#)

Table 10-549. DSI_COMPLEXIO_IRQENABLE

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0050 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_P R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_P R_L4 |
| Physical Address | 0x5800 4050 0x4804 4050 0x5800 5050 0x4804 5050 | | |
| Description | INTERRUPT ENABLE REGISTER - All errors from complex I/O | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------------|----------------|----------------|----------------|----------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| ULPSACTIVENOT_ALL1_IRQ_EN | ULPSACTIVENOT_ALL0_IRQ_EN | ERRCONTENTIONLP1_5_IRQ_EN | ERRCONTENTIONLP0_5_IRQ_EN | ERRCONTENTIONLP1_4_IRQ_EN | ERRCONTENTIONLP0_4_IRQ_EN | ERRCONTENTIONLP1_3_IRQ_EN | ERRCONTENTIONLP0_3_IRQ_EN | ERRCONTENTIONLP1_2_IRQ_EN | ERRCONTENTIONLP0_2_IRQ_EN | ERRCONTENTIONLP1_1_IRQ_EN | ERRCONTENTIONLP0_1_IRQ_EN | STATEULPS5_IRQ_EN | STATEULPS4_IRQ_EN | STATEULPS3_IRQ_EN | STATEULPS2_IRQ_EN | STATEULPS1_IRQ_EN | ERRCONTROL5_IRQ_EN | ERRCONTROL4_IRQ_EN | ERRCONTROL3_IRQ_EN | ERRCONTROL2_IRQ_EN | ERRCONTROL1_IRQ_EN | ERRCSC5_IRQ_EN | ERRCSC4_IRQ_EN | ERRCSC3_IRQ_EN | ERRCSC2_IRQ_EN | ERRCSC1_IRQ_EN | ERRSYNCSESC5_IRQ_EN | ERRSYNCSESC4_IRQ_EN | ERRSYNCSESC3_IRQ_EN | ERRSYNCSESC2_IRQ_EN | ERRSYNCSESC1_IRQ_EN |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|-------|
| 31 | ULPSACTIVENOT_ALL1_IRQ_EN | All the ULPSActiveNOT signals corresponding to the lanes with TXULPSExit being high are high. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 30 | ULPSACTIVENOT_ALL0_IRQ_EN | All signals ULPSActiveNOT are 0 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 29 | ERRCONTENTIONLP1_5_IRQ_EN | Contention LP1 error for lane 5 Applicable only to DS1. For DS12 this bit field is RESERVED. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 28 | ERRCONTENTIONLP0_5_IRQ_EN | Contention LP0 error for lane 5 Applicable only to DS1. For DS12 this bit field is RESERVED. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|-------|
| 27 | ERRCONTENTIONLP1_4_IRQ_EN | Contention LP1 error for lane 4 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 26 | ERRCONTENTIONLP0_4_IRQ_EN | Contention LP0 error for lane 4 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 25 | ERRCONTENTIONLP1_3_IRQ_EN | Contention LP1 error for lane 3 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 24 | ERRCONTENTIONLP0_3_IRQ_EN | Contention LP0 error for lane 3 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 23 | ERRCONTENTIONLP1_2_IRQ_EN | Contention LP1 error for lane 2 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 22 | ERRCONTENTIONLP0_2_IRQ_EN | Contention LP0 error for lane 2 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 21 | ERRCONTENTIONLP1_1_IRQ_EN | Contention LP1 error for lane 1 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 20 | ERRCONTENTIONLP0_1_IRQ_EN | Contention LP0 error for lane 1 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 19 | STATEULPS5_IRQ_EN | lane 5 in ULTRALOW-POWER state Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 18 | STATEULPS4_IRQ_EN | lane 4 in ULTRALOW-POWER state Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 17 | STATEULPS3_IRQ_EN | lane 3 in ULTRALOW-POWER state 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 16 | STATEULPS2_IRQ_EN | lane 2 in ULTRALOW-POWER state 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 15 | STATEULPS1_IRQ_EN | lane 1 in ULTRALOW-POWER state 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 14 | ERRCONTROL5_IRQ_EN | Control error for lane 5 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|------|-------|
| 13 | ERRCONTROL4_IRQ_EN | Control error for lane 4 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 12 | ERRCONTROL3_IRQ_EN | Control error for lane 3 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 11 | ERRCONTROL2_IRQ_EN | Control error for lane 2 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 10 | ERRCONTROL1_IRQ_EN | Control error for lane 1 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 9 | ERRESC5_IRQ_EN | Escape entry error for lane 5 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 8 | ERRESC4_IRQ_EN | Escape entry error for lane 4 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 7 | ERRESC3_IRQ_EN | Escape entry error for lane 3 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 6 | ERRESC2_IRQ_EN | Escape entry error for lane 2 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 5 | ERRESC1_IRQ_EN | Escape entry error for lane 1 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 4 | ERRSYNCESC5_IRQ_EN | Low power Data transmission synchronization error for lane 5 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 3 | ERRSYNCESC4_IRQ_EN | Low power Data transmission synchronization error for lane 4 Applicable only to DS1. For DSI2 this bit field is RESERVED. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 2 | ERRSYNCESC3_IRQ_EN | Low power Data transmission synchronization error for lane 3 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 1 | ERRSYNCESC2_IRQ_EN | Low power Data transmission synchronization error for lane 2 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|-------|
| 0 | ERRSYNCSESC1_IRQ_EN | Low power Data transmission synchronization error for lane 1 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

Table 10-550. Register Call Summary for Register DSI_COMPLEXIO_IRQENABLE

MIPI Display Serial Interface

- [DSI Video Mode Using the DISPC Video Port: \[0\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[1\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[2\] \[3\]](#)

Table 10-551. DSI_CLK_CTRL

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0054 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PEL4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PEL4 |
| Physical Address | 0x5800 4054 0x4804 4054 0x5800 5054 0x4804 5054 | | |
| Description | CLOCK CONTROL This register controls the CLOCK GENERATION. The register can be modified only when IF_EN is reset. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
|-------------|----|----------------|----|----------|----|----|----|----|----------------------|----|---------------|----|---------------------|----|---------------------|----|-------------------------|----|---------------------------|----|-------------|---|-------------------|---|----------------|---|---|---|---|---|---|--|--|--|--|--|
| PLL_PWR_CMD | | PLL_PWR_STATUS | | RESERVED | | | | | LP_RX_SYNCHRO_ENABLE | | LP_CLK_ENABLE | | HS_MANUAL_STOP_CTRL | | HS_AUTO_STOP_ENABLE | | LP_CLK_NULL_PACKET_SIZE | | LP_CLK_NULL_PACKET_ENABLE | | CIO_CLK_ICG | | DDR_CLK_ALWAYS_ON | | LP_CLK_DIVISOR | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|-------|
| 31:30 | PLL_PWR_CMD | Command for power control of the DSI PLL Control module 0x0: Command to change to OFF state 0x1: Command to change to ON state for PLL only (HSDIVISER is OFF) 0x2: Command to change to ON state for both PLL and HSDIVISER 0x3: Command to change to ON state for both PLL and HSDIVISER (no clock output to the DSI complex I/O) | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|---|------|--------|
| 29:28 | PLL_PWR_STATUS | Status of the power control of the DSI PLL Control module Read 0x0: DSI PLL Control module in OFF state Read 0x1: DSI PLL Control module in ON state for PLL only (HSDIVISER is OFF) Read 0x2: DSI PLL Control module in ON state for both PLL and HSDIVISER Read 0x3: DSI PLL Control module in ON state for both PLL and HSDIVISER (no clock output to the DSI complex I/O) | R | 0x0 |
| 27:22 | RESERVED | | R | 0x00 |
| 21 | LP_RX_SYNCHRO_ENABLE | Defines if the functional is higher or lower than 30 MHz. The information is used to define synchronization to be used for RxValidEsc. 0x0: The DSI functional clock is equal or slower than 30 MHz. The synchronization is falling/rising. 0x1: The DSI functional clock is higher than 30 MHz. The synchronization is rising/rising. | RW | 0 |
| 20 | LP_CLK_ENABLE | Controls the gating of the TXCLKESC clock. 0x0: Disabled. The clock is not generated. The value of LP_CLK_DIVISOR is not used and does not need to be programmed. 0x1: Enabled. The clock is generated. The value of LP_CLK_DIVISOR is used and needs to be programmed. | RW | 0 |
| 19 | HS_MANUAL_STOP_CTRL | In case HS_AUTO_STOP_ENABLE=0, the bit field allows manual control of the assertion/de-assertion of the signal DSISStopClk by the user. 0x0: DSISStopClk de-assertion unconditionally. 0x1: DSISStopClk assertion unconditionally. | RW | 0 |
| 18 | HS_AUTO_STOP_ENABLE | Enables the automatic assertion/de-assertion of DSISStopClk signal. 0x0: Auto mode disabled. 0x1: Auto mode enabled. | RW | 0 |
| 17:16 | LP_CLK_NULL_PACKET_SIZE | Indicates the size of LP NULL Packets to be sent automatically when after the last LP packet transfer. It is used by the receiver to drain its internal pipeline. The valid values are from 0 to 3 bytes for the payload size. | RW | 0x0 |
| 15 | LP_CLK_NULL_PACKET_ENABLE | Enables the generation of NULL packet in low speed. 0x0: Disabled. The NULL packet is not sent in LP mode after the last LP packet. 0x1: Enabled. The NULL packet is sent in LP mode after the last LP packet. | RW | 0 |
| 14 | CIO_CLK_ICG | Gates SCPClk clock provided to DSI_PHY and PLL-CTRL module. 0x0: Disabled. SCPClk is not generated. It remains at 0. 0x1: Enabled. SCPClk is generated (OCP_CLK/4) | RW | 0 |
| 13 | DDR_CLK_ALWAYS_ON | Defines if the DDR clock is also sent when there is no HS packets sent to the peripheral (low-power mode). So TXRequest for the clock lane is not de-asserted. 0x0: Disabled. The DDR clock is only provided when HS packets are sent. 0x1: Enabled. The DDR clock is always sent to the peripheral regardless of the state of the data lanes (HS or LS mode). | RW | 0 |
| 12:0 | LP_CLK_DIVISOR | Defines the ratio to be used for the generation of the low-power mode clock from DSI functional clock. The supported values are from 1 to 8191(the value 0 is invalid). The output frequency shall be in the range between 20 MHz and 32 kHz. | RW | 0x0001 |

Table 10-552. Register Call Summary for Register DSI_CLK_CTRL

MIPI Display Serial Interface

- [DSI Transfer Modes](#): [0]
- [Clock Requirements](#): [1] [2] [3] [4] [5] [6] [7]
- [Power Management](#): [8]
- [Power Control of DSI PHY Complex I/O and DSI PLL](#): [9] [10] [11] [12] [13] [14] [15] [16]
- [Ultralow-Power State Configuration](#): [17]
- [Pad Configuration](#): [18] [19]
- [Display Timing Configuration](#): [20]
- [DSI Video Mode Using the DISPC Video Port](#): [21] [22] [23] [24] [25] [26] [27] [28]
- [DSI Command Mode Using the DISPC Video Port](#): [29] [30] [31] [32] [33] [34] [35] [36]
- [DSI_PROTOCOL_ENGINE Register Summary](#): [37] [38]
- [DSI_PROTOCOL_ENGINE Register Description](#): [39] [40]

Table 10-553. DSI_TIMING1

| | | | |
|------------------|--|----------|--|
| Address Offset | 0x0000 0058 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Physical Address | 0x5800 4058 0x4804 4058 0x5800 5058 0x4804 5058 | | |
| Description | TIMING1 REGISTER This register controls the DSI Protocol Engine module timers. Any bit field can be modified while DSI_CTRL[0] IF_EN is set to '1'. It is used to indicate the number of DSI1_CLK and DSI2_CLK functional clocks cycles for the timers FORCE_TX_STOP_TIMER and TA_TO_TIMER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|-----------|----------|---------------|----|----|----|----|----|----|----|----|----|----|----|-----------------------|-------------------|------------------|-----------------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TA_TO | TA_TO_X16 | TA_TO_X8 | TA_TO_COUNTER | | | | | | | | | | | | FORCE_TX_STOP_MODE_IO | STOP_STATE_X16_IO | STOP_STATE_X4_IO | STOP_STATE_COUNTER_IO | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31 | TA_TO | Enables the turn-around timer 0x0: Turn-around counter is disabled. 0x1: Turn-around counter is enabled (required to receive TA interrupt in case the turn-around procedure is not successful). | RW | 0 |
| 30 | TA_TO_X16 | Multiplication factor for the number of DSI_CLK functional clocks cycles defined in TA_TO_COUNTER bit field 0x0: The number of DSI_CLK functional clock cycles defined in TA_TO_COUNTER is multiplied by 1x 0x1: The number of DSI_CLK functional clock cycles defined in TA_TO_COUNTER is multiplied by 16x | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|--------|
| 29 | TA_TO_X8 | Multiplication factor for the number of DSI_CLK functional clock cycles defined in TA_TO_COUNTER bit field 0x0: The number of DSI_CLK functional clock cycles defined in TA_TO_COUNTER is multiplied by 1x 0x1: The number of DSI_CLK functional clock cycles defined in TA_TO_COUNTER is multiplied by 8x | RW | 1 |
| 28:16 | TA_TO_COUNTER | Turn around counter. It indicates the number of DSI_CLK function clock to wait for the change of the Direction PPI signal according to the TurnRequest signal The value is from 0 to 8191. | RW | 0x1FFF |
| 15 | FORCE_TX_STOP_MODE_IO | Control of ForceTxStopMode signal 0x0: De-assertion of ForceTxStopMode. The hardware reset the bit at the end of the ForceTXStopMode assertion. The software can reset the bit in order to stop the assertion of the ForceTXStopMode signal prior to the completion of the period. 0x1: Assertion of ForceTxStopMode | RW | 0 |
| 14 | STOP_STATE_X16_IO | Multiplication factor for the number of DSI_CLK functional clock cycles defined in STOP_STATE_COUNTER_IO bit field 0x0: The number of DSI_CLK functional clock cycles defined in STOP_STATE_COUNTER_IO is multiplied by 1x 0x1: The number of DSI_CLK functional clock cycles defined in STOP_STATE_COUNTER_IO is multiplied by 16x | RW | 1 |
| 13 | STOP_STATE_X4_IO | Multiplication factor for the number of DSI_CLK functional clock cycles defined in STOP_STATE_COUNTER_IO bit field 0x0: The number of DSI_CLK functional clock cycles defined in STOP_STATE_COUNTER is multiplied by 1x 0x1: The number of DSI_CLK functional clock cycles defined in STOP_STATE_COUNTER_IO is multiplied by 4x | RW | 1 |
| 12:0 | STOP_STATE_COUNTER_IO | Stop state counter. It indicates the number of DSI_CLK function clock to assert ForceTXStopMode signal. The value is from 0 to 8191. | RW | 0x1FFF |

Table 10-554. Register Call Summary for Register DSI_TIMING1

MIPI Display Serial Interface

- [Timers: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[10\] \[11\] \[12\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[13\] \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[19\] \[20\]](#)

Table 10-555. DSI_TIMING2

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 005C | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Physical Address | 0x5800 405C 0x4804 405C 0x5800 505C 0x4804 505C | | |
| Description | <p>TIMING2 REGISTER</p> <p>This register controls the DSI Protocol Engine module timers. Any bit field can be modified while DSI_CTRL[0] IF_EN is set to '1'.</p> <p>It is used to indicate the number of DSI_FCLK clock cycles for the timer LP_RX_TIMER and the number of BYTE_CLK functional clock cycles for the timer HS_TX_TIMER</p> | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|--------------|--------------|------------------|----|----|----|----|----|----|----|----|----|----|----|----------|--------------|-------------|------------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HS_TX_TO | HS_TX_TO_X64 | HS_TX_TO_X16 | HS_TX_TO_COUNTER | | | | | | | | | | | | LP_RX_TO | LP_RX_TO_X16 | LP_RX_TO_X4 | LP_RX_TO_COUNTER | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|--------|
| 31 | HS_TX_TO | <p>Enables the HS TX timer.</p> <p>0x0: Time-out counter is disabled.</p> <p>0x1: Time-out counter is enabled (required to receive TA interrupt in case the turn-around procedure is not successful).</p> | RW | 0 |
| 30 | HS_TX_TO_X64 | <p>Multiplication factor for the number of BYTE_CLK functional clock cycles defined in HS_TX_COUNTER bit field.</p> <p>BYTE_CLK is a high speed transmit byte clock signal generated by the DSI_PHY.</p> <p>0x0: The number of BYTE_CLK functional clock cycles defined in HS_TX_TO_COUNTER is multiplied by 1x</p> <p>0x1: The number of BYTE_CLK functional clock cycles defined in HS_TX_TO_COUNTER is multiplied by 64x</p> | RW | 1 |
| 29 | HS_TX_TO_X16 | <p>Multiplication factor for the number of BYTE_CLK functional clock cycles defined in HS_TX_COUNTER bit</p> <p>0x0: The number of BYTE_CLK functional clock cycles defined in HS_TX_TO_COUNTER is multiplied by 1x</p> <p>0x1: The number of BYTE_CLK functional clock cycles defined in HS_TX_TO_COUNTER is multiplied by 16x</p> | RW | 1 |
| 28:16 | HS_TX_TO_COUNTER | <p>HS_TX_TIMER counter. It indicates the number of BYTE_CLK function clock for the HS TX timer.</p> <p>The value is from 0 to 8191.</p> | RW | 0x1FFF |
| 15 | LP_RX_TO | <p>Enables the LP RX timer.</p> <p>0x0: Turn-around counter is disabled.</p> <p>0x1: Turn-around counter is enabled (required to receive TA interrupt in case the turn-around procedure is not successful).</p> | RW | 0 |
| 14 | LP_RX_TO_X16 | <p>Multiplication factor for the number of DSI_FCLK clock cycles defined in LP_RX_COUNTER bit field</p> <p>0x0: The number of DSI_FCLK clock cycles defined in LP_RX_TO_COUNTER is multiplied by 1x</p> <p>0x1: The number of DSI_FCLK clock cycles defined in LP_RX_TO_COUNTER is multiplied by 16x</p> | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|--------|
| 13 | LP_RX_TO_X4 | Multiplication factor for the number of DSI_FCLK clock cycles defined in LP_RX_COUNTER bit 0x0: The number of DSI_FCLK clock cycles defined in LP_RX_TO_COUNTER is multiplied by 1x 0x1: The number of DSI_FCLK clock cycles defined in LP_RX_TO_COUNTER is multiplied by 4x | RW | 1 |
| 12:0 | LP_RX_TO_COUNTER | LP_RX_TIMER counter. It indicates the number of DSI_FCLK clock for the LP RX timer. The value is from 0 to 8191. | RW | 0x1FFF |

Table 10-556. Register Call Summary for Register DSI_TIMING2

MIPI Display Serial Interface

- [Timers: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[9\] \[10\] \[11\] \[12\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[13\] \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[19\] \[20\]](#)

Table 10-557. DSI_VM_TIMING1

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0060 | | |
| Physical Address | 0x5800 4060 0x4804 4060 0x5800 5060 0x4804 5060 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_P E_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_P E_L4 |
| Description | VIDEO MODE TIMING REGISTER This register defines the video mode timing. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HSA | | | | | | | | HFP | | | | | | | | HBP | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:24 | HSA | Defines the horizontal Sync active period used in video mode in number of byte clock cycles (TXBYTECLKHS clock) The supported values are from 0 to 255. | RW | 0x00 |
| 23:12 | HFP | Defines the horizontal front porch used in video mode in number of byte clock cycles (TXBYTECLKHS clock) The supported values are from 0 to 4095 | RW | 0x000 |
| 11:0 | HBP | Defines the horizontal back porch used in video mode in number of byte clock cycles (TXBYTECLKHS clock) The supported values are from 0 to 4095 | RW | 0x000 |

Table 10-558. Register Call Summary for Register DSI_VM_TIMING1

MIPI Display Serial Interface

- [Blanking: \[0\]](#)
- [DSI Transfer Modes: \[1\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[2\] \[3\] \[4\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[5\] \[6\]](#)

Table 10-559. DSI_VM_TIMING2

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0064 | | |
| Physical Address | 0x5800 4064 0x4804 4064 0x5800 5064 0x4804 5064 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | VIDEO MODE TIMING REGISTER This register defines the video mode timing. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|-------------|----|----|----|-----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | WINDOW_SYNC | | | | VSA | | | | | | | | VFP | | | | | | | | VBP | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOW_SYNC | Number of BYTE clock cycles for the synchronization window. An interrupt for synchronization lost is generated when the received synchronizaton on video port is not inside the window. DSI does not change its own timings if the synch is inside the window. The valid values are from 4 to 15. | RW | 0x0 |
| 23:16 | VSA | Defines the vertical Sync active period used in video mode in number of lines. The supported values are from 0 to 255 It is used to generate the short packet for End of Vertical synchronization. ⁽¹⁾ | RW | 0x00 |
| 15:8 | VFP | Defines the vertical front porch used in video mode in number of lines. The supported values are from 0 to 255 | RW | 0x00 |
| 7:0 | VBP | Defines the vertical back porch used in video mode in number of lines. The supported values are from 0 to 255 | RW | 0x00 |

⁽¹⁾ In DSI video mode, if the VSA bit field in DSI_VM_TIMING2 is set to 0x0, no vertical synchronization packet will be sent even if VP_VSYNC_START is set to 0x1 in DSI_CTRL.

Table 10-560. Register Call Summary for Register DSI_VM_TIMING2

MIPI Display Serial Interface

- [DSI Transfer Modes: \[0\]](#)
- [Video Port Interface: \[1\] \[2\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[3\] \[4\] \[5\] \[6\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[7\] \[8\]](#)

Table 10-561. DSI_VM_TIMING3

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0068 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Physical Address | 0x5800 4068 0x4804 4068 0x5800 5068 0x4804 5068 | | |
| Description | VIDEO MODE TIMING REGISTER This register defines the video mode timing. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TL | | | | | | | | | | | | | | | | VACT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | TL | Defines the number of length of the line in video mode in number of byte clock cycles (TXBYTECLKHS clock) The supported values are from 0 to 8192. The values from 8193 to 65535 are not supported. | RW | 0x0000 |
| 15:0 | VACT | Defines the number of active lines used in video mode. The supported values are from 0 to 65535 | RW | 0x0000 |

Table 10-562. Register Call Summary for Register DSI_VM_TIMING3

MIPI Display Serial Interface

- [Video Port Interface: \[0\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[1\] \[2\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[3\] \[4\]](#)

Table 10-563. DSI_CLK_TIMING

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 006C | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Physical Address | 0x5800 406C 0x4804 406C 0x5800 506C 0x4804 506C | | |
| Description | CLOCK TIMING REGISTER This register controls the DSI Protocol Engine module timers. This register shall not be modified while DSI_CTRL.IF_EN is set to '1'. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|--------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DDR_CLK_PRE | | | | | | | | DDR_CLK_POST | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | DDR_CLK_PRE | Indicates the number of TXBYTECLKHS clock cycles between the start of the DDR clock and the assertion of the data request signal. The values from 1 to 255 are valid. The value 0 is reserved. The value is not used if DSI_CLK_CTRL[13] DDR_CLK_ALWAYS_ON is set to '1' since the DDR clock is always present. | RW | 0x01 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------|
| 7:0 | DDR_CLK_POST | Indicates the number of TXBYTECLKHS clock cycles after the de-assertion of the data request signal and the stop of the DDR clock. The values from 1 to 255 are valid. The value 0 is reserved. The value is not used if DSI_CLK_CTRL [13] DDR_CLK_ALWAYS_ON is set to '1' since the DDR clock is always present. | RW | 0x01 |

Table 10-564. Register Call Summary for Register DSI_CLK_TIMING

MIPI Display Serial Interface

- [Clock Requirements](#): [0] [1] [2] [3]
- [DSI Video Mode Using the DISPC Video Port](#): [4] [5]
- [DSI Command Mode Using the DISPC Video Port](#): [6] [7]
- [DSI_PROTOCOL_ENGINE Register Summary](#): [8] [9]

Table 10-565. DSI_TX_FIFO_VC_SIZE

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0070 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Physical Address | 0x5800 4070 0x4804 4070 0x5800 5070 0x4804 5070 | | |
| Description | Defines the corresponding memory entries allocated for each virtual channel. The virtual channel shall be disabled in order to allocate/un-allocate some entries in the TX FIFO. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----------|----|--------------|----|---------------|----|----|----|----------|----|--------------|----|---------------|----|----|----|----------|----|--------------|---|---------------|---|---|---|----------|---|--------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VC3_FIFO_SIZE | | | | RESERVED | | VC3_FIFO_ADD | | VC2_FIFO_SIZE | | | | RESERVED | | VC2_FIFO_ADD | | VC1_FIFO_SIZE | | | | RESERVED | | VC1_FIFO_ADD | | VC0_FIFO_SIZE | | | | RESERVED | | VC0_FIFO_ADD | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|-------|
| 31:28 | VC3_FIFO_SIZE | Size of the FIFO allocated for virtual channel 3. For a complete description, refer to Table 10-486 , <i>Virtual Channel TX FIFO Size Values</i> . | RW | 0x0 |
| 27 | RESERVED | | R | 0 |
| 26:24 | VC3_FIFO_ADD | Address of the space allocated in the FIFO for virtual channel 3. For a complete description, refer to Table 10-487 , <i>Virtual Channel TX FIFO Start Address</i> . | RW | 0x0 |
| 23:20 | VC2_FIFO_SIZE | Size of the FIFO allocated for virtual channel 2. For a complete description, refer to Table 10-486 , <i>Virtual Channel TX FIFO Size Values</i> . | RW | 0x0 |
| 19 | RESERVED | | R | 0 |
| 18:16 | VC2_FIFO_ADD | Address of the space allocated in the FIFO for virtual channel 2. For a complete description, refer to Table 10-487 , <i>Virtual Channel TX FIFO Start Address</i> . | RW | 0x0 |
| 15:12 | VC1_FIFO_SIZE | Size of the FIFO allocated for virtual channel 1. For a complete description, refer to Table 10-486 , <i>Virtual Channel TX FIFO Size Values</i> . | RW | 0x0 |
| 11 | RESERVED | | R | 0 |
| 10:8 | VC1_FIFO_ADD | Address of the space allocated in the FIFO for virtual channel 1. For a complete description, refer to Table 10-487 , <i>Virtual Channel TX FIFO Start Address</i> . | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------|
| 7:4 | VC0_FIFO_SIZE | Size of the FIFO allocated for virtual channel 0. For a complete description, refer to Table 10-486 , <i>Virtual Channel TX FIFO Size Values</i> . | RW | 0x0 |
| 3 | RESERVED | | R | 0 |
| 2:0 | VC0_FIFO_ADD | Address of the space allocated in the FIFO for virtual channel 0. For a complete description, refer to Table 10-487 , <i>Virtual Channel TX FIFO Start Address</i> . | RW | 0x0 |

Table 10-566. Register Call Summary for Register DSI_TX_FIFO_VC_SIZE

MIPI Display Serial Interface

- [DSI Transfer Modes: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[5\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[6\] \[7\]](#)

Table 10-567. DSI_RX_FIFO_VC_SIZE

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0074 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Physical Address | 0x5800 4074 0x4804 4074 0x5800 5074 0x4804 5074 | | |
| Description | Defines the corresponding memory entries allocated for each virtual channel and the addresses. The virtual channel shall be disabled in order to allocate/un-allocate some entries in the RX FIFO. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----------|----|--------------|----|---------------|----|----|----|----------|----|--------------|----|---------------|----|----|----|----------|----|--------------|---|---------------|---|---|---|----------|---|--------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VC3_FIFO_SIZE | | | | RESERVED | | VC3_FIFO_ADD | | VC2_FIFO_SIZE | | | | RESERVED | | VC2_FIFO_ADD | | VC1_FIFO_SIZE | | | | RESERVED | | VC1_FIFO_ADD | | VC0_FIFO_SIZE | | | | RESERVED | | VC0_FIFO_ADD | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|-------|
| 31:28 | VC3_FIFO_SIZE | Size of the FIFO allocated for virtual channel 3. For a complete description, refer to Table 10-488 , <i>Virtual Channel RX FIFO Size Values</i> . | RW | 0x0 |
| 27 | RESERVED | | R | 0 |
| 26:24 | VC3_FIFO_ADD | Address of the space allocated in the FIFO for virtual channel 3. For a complete description, refer to Table 10-489 , <i>Virtual Channel RX FIFO Start Address</i> . | RW | 0x0 |
| 23:20 | VC2_FIFO_SIZE | Size of the FIFO allocated for virtual channel 2. For a complete description, refer to Table 10-488 , <i>Virtual Channel RX FIFO Size Values</i> . | RW | 0x0 |
| 19 | RESERVED | | R | 0 |
| 18:16 | VC2_FIFO_ADD | Address of the space allocated in the FIFO for virtual channel 2. For a complete description, refer to Table 10-489 , <i>Virtual Channel RX FIFO Start Address</i> . | RW | 0x0 |
| 15:12 | VC1_FIFO_SIZE | Size of the FIFO allocated for virtual channel 1. For a complete description, refer to Table 10-488 , <i>Virtual Channel RX FIFO Size Values</i> . | RW | 0x0 |
| 11 | RESERVED | | R | 0 |
| 10:8 | VC1_FIFO_ADD | Address of the space allocated in the FIFO for virtual channel 1. For a complete description, refer to Table 10-489 , <i>Virtual Channel RX FIFO Start Address</i> . | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------|
| 7:4 | VC0_FIFO_SIZE | Size of the FIFO allocated for virtual channel 0. For a complete description, refer to Table 10-488 , <i>Virtual Channel RX FIFO Size Values</i> . | RW | 0x0 |
| 3 | RESERVED | | R | 0 |
| 2:0 | VC0_FIFO_ADD | Address of the space allocated in the FIFO for virtual channel 0. For a complete description, refer to Table 10-489 , <i>Virtual Channel RX FIFO Start Address</i> . | RW | 0x0 |

Table 10-568. Register Call Summary for Register DSI_RX_FIFO_VC_SIZE

MIPI Display Serial Interface

- [DSI Transfer Modes](#): [0] [1] [2]
- [DSI Command Mode Using the DISPC Video Port](#): [3]
- [DSI_PROTOCOL_ENGINE Register Summary](#): [4] [5]

Table 10-569. DSI_COMPLEXIO_CFG2

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0078 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PER_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PER_L4 |
| Physical Address | 0x5800 4078 0x4804 4078 0x5800 5078 0x4804 5078 | | |
| Description | COMPLEXIO CONFIGURATION REGISTER for the complex I/O This register contains the lane configuration for the ULPS for each lane. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|---------|----|----------|----|----|----|----|----|----|----|-----------------|----|-----------------|---|-----------------|---|-----------------|---|-----------------|---|-----------------|---|-----------------|--|-----------------|--|-----------------|--|-----------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
| RESERVED | | | | | | | | LP_BUSY | | HS_BUSY | | RESERVED | | | | | | | | LANE5_ULPS_SIG2 | | LANE4_ULPS_SIG2 | | LANE3_ULPS_SIG2 | | LANE2_ULPS_SIG2 | | LANE1_ULPS_SIG2 | | LANE5_ULPS_SIG1 | | LANE4_ULPS_SIG1 | | LANE3_ULPS_SIG1 | | LANE2_ULPS_SIG1 | | LANE1_ULPS_SIG1 | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17 | LP_BUSY | Indicates when there are still pending operations for VCs configured for LP mode. Forced to 1 when at least one VC is enabled and configured for LP mode. Read 0x0: LP logic is idle Read 0x1: LP logic is active | R | 0 |
| 16 | HS_BUSY | Indicates when there are still pending operations for VCs configured for HS mode. Forced to 1 when at least one VC is enabled and configured for HS mode. Read 0x0: HS logic is idle Read 0x1: HS logic is active | R | 0 |
| 15:10 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------|
| 9 | LANE5_ULPS_SIG2 | <p>Applicable only to DS1. For DSI2 this bit field is RESERVED.</p> <p>Enables the ULPS for the lane 5. The hardware shall change the state of the lane to ULPS only when it is in stop state and there is no data pending inside the DSI protocol engine and the DSI protocol engine has control of the bus (BTA has not been sent).</p> <p>The state of the signal TxRequestEsc is changed if lane 5 is a data lane.</p> <p>The state of the signal TxUlpsClk is changed if lane 5 is a clock lane.</p> <p>There will be a latency depending on the frequency of TxClkExc. This bit should be read back to confirm a write has been effective.</p> <p>0x0: READ:Inactive state effective. WRITE: Request to change to inactive state</p> <p>0x1: READ:Active state effective. WRITE: Change request to active. If the lane is a data lane, TxRequestEsc is asserted and synchronously TxUlpsEsc is asserted for one period of TxClkExc.</p> | RW | 0 |
| 8 | LANE4_ULPS_SIG2 | <p>Applicable only to DS1. For DSI2 this bit field is RESERVED.</p> <p>Enables the ULPS for the lane 4. The hardware shall change the state of the lane to ULPS only when it is in stop state and there is no data pending inside the DSI protocol engine and the DSI protocol engine has control of the bus (BTA has not been sent).</p> <p>The state of the signal TxRequestEsc is changed if lane 4 is a data lane.</p> <p>The state of the signal TxUlpsClk is changed if lane 4 is a clock lane.</p> <p>There will be a latency depending on the frequency of TxClkExc. This bit should be read back to confirm a write has been effective.</p> <p>0x0: READ: Inactive state effective. WRITE: Request to change to inactive state</p> <p>0x1: READ:Active state effective. WRITE: Change request to active. If the lane is a data lane, TxRequestEsc is asserted and synchronously TxUlpsEsc is asserted for one period of TxClkExc.</p> | RW | 0 |
| 7 | LANE3_ULPS_SIG2 | <p>Enables the ULPS for the lane 3. The hardware shall change the state of the lane to ULPS only when it is in stop state and there is no data pending inside the DSI protocol engine and the DSI protocol engine has control of the bus (BTA has not been sent).</p> <p>The state of the signal TxRequestEsc is changed if lane 3 is a data lane.</p> <p>The state of the signal TxUlpsClk is changed if lane 3 is a clock lane.</p> <p>There will be a latency depending on the frequency of TxClkExc. This bit should be read back to confirm a write has been effective.</p> <p>0x0: READ: Inactive state effective. WRITE: Request to change to inactive state</p> <p>0x1: READ:Active state effective. WRITE: Change request to active. If the lane is a data lane, TxRequestEsc is asserted and synchronously TxUlpsEsc is asserted for one period of TxClkExc.</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------|
| 6 | LANE2_ULPS_SIG2 | <p>Enables the ULPS for the lane 2. The hardware shall change the state of the lane to ULPS only when it is in stop state and there is no data pending inside the DSI protocol engine and the DSI protocol engine has control of the bus (BTA has not been sent). The state of the signal TxRequestEsc is changed if lane 2 is a data lane. The state of the signal TxUlpsClk is changed if lane 2 is a clock lane. There will be a latency depending on the frequency of TxClkExc. This bit should be read back to confirm a write has been effective.</p> <p>0x0: READ: Inactive state effective. WRITE: Request to change to inactive state</p> <p>0x1: READ:Active state effective. WRITE: Change request to active. If the lane is a data lane, TxRequestEsc is asserted and synchronously TxUlpsEsc is asserted for one period of TxClkEsc.</p> | RW | 0 |
| 5 | LANE1_ULPS_SIG2 | <p>Enables the ULPS for the lane 1. The hardware shall change the state of the lane to ULPS only when it is in stop state and there is no data pending inside the DSI protocol engine and the DSI protocol engine has control of the bus (BTA has not been sent). The state of the signal TxRequestEsc is changed if lane 1 is a data lane. The state of the signal TxUlpsClk is changed if lane 1 is a clock lane. There will be a latency depending on the frequency of TxClkExc. This bit should be read back to confirm a write has been effective.</p> <p>0x0: READ: Inactive state effective. WRITE: Request to change to inactive state</p> <p>0x1: READ:Active state effective. WRITE: Change request to active. If the lane is a data lane, TxRequestEsc is asserted and synchronously TxUlpsEsc is asserted for one period of TxClkEsc.</p> | RW | 0 |
| 4 | LANE5_ULPS_SIG1 | <p>Applicable only to DS1. For DSI2 this bit field is RESERVED.</p> <p>Enables the ULPS for the lane 5. The hardware shall change the state of the lane to ULPS only when it is in stop state and there is no data pending inside the DSI protocol engine and the DSI protocol engine has control of the bus (BTA has not been sent). The state of the signal TxULPSExit is changed if the lane 5 is a clock lane. There will be a latency depending on the frequency of TxClkExc. This bit should be read back to confirm a write has been effective.</p> <p>0x0: READ:Inactive state effective. WRITE: Request to change to inactive state</p> <p>0x1: READ:Active state effective. WRITE: Change request to active. If the lane is a data lane, TxRequestEsc is asserted and synchronously TxUlpsEsc is asserted for one period of TxClkEsc</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------|
| 3 | LANE4_ULPS_SIG1 | <p>Applicable only to DS1. For DSI2 this bit field is RESERVED.</p> <p>Enables the ULPS for the lane 4. The hardware shall change the state of the lane to ULPS only when it is in stop state and there is no data pending inside the DSI protocol engine and the DSI protocol engine has control of the bus (BTA has not been sent).</p> <p>The state of the signal TxULPSExit is changed if the lane 4 is a clock lane.</p> <p>There will be a latency depending on the frequency of TxClkExc. This bit should be read back to confirm a write has been effective.</p> <p>0x0: READ: Inactive state effective. WRITE: Request to change to inactive state</p> <p>0x1: READ:Active state effective. WRITE: Change request to active. If the lane is a data lane, TxRequestEsc is asserted and synchronously TxUlpEsc is asserted for one period of TxClkEsc</p> | RW | 0 |
| 2 | LANE3_ULPS_SIG1 | <p>Enables the ULPS for the lane 3. The hardware shall change the state of the lane to ULPS only when it is in stop state and there is no data pending inside the DSI protocol engine and the DSI protocol engine has control of the bus (BTA has not been sent).</p> <p>The state of the signal TxULPSExit is changed if the lane 3 is a clock lane.</p> <p>There will be a latency depending on the frequency of TxClkExc. This bit should be read back to confirm a write has been effective.</p> <p>0x0: READ: Inactive state effective. WRITE: Request to change to inactive state</p> <p>0x1: READ:Active state effective. WRITE: Change request to active. If the lane is a data lane, TxRequestEsc is asserted and synchronously TxUlpEsc is asserted for one period of TxClkEsc</p> | RW | 0 |
| 1 | LANE2_ULPS_SIG1 | <p>Enables the ULPS for the lane 2. The hardware shall change the state of the lane to ULPS only when it is in stop state and there is no data pending inside the DSI protocol engine and the DSI protocol engine has control of the bus (BTA has not been sent).</p> <p>The state of the signal TxULPSExit is changed if the lane 2 is a clock lane.</p> <p>There will be a latency depending on the frequency of TxClkExc. This bit should be read back to confirm a write has been effective.</p> <p>0x0: READ: Inactive state effective. WRITE: Request to change to inactive state</p> <p>0x1: READ:Active state effective. WRITE: Change request to active. If the lane is a data lane, TxRequestEsc is asserted and synchronously TxUlpEsc is asserted for one period of TxClkEsc</p> | RW | 0 |
| 0 | LANE1_ULPS_SIG1 | <p>Enables the ULPS for the lane 1. The hardware shall change the state of the lane to ULPS only when it is in stop state and there is no data pending inside the DSI protocol engine and the DSI protocol engine has control of the bus (BTA has not been sent).</p> <p>The state of the signal TxULPSExit is changed if the lane 1 is a clock lane.</p> <p>There will be a latency depending on the frequency of TxClkExc. This bit should be read back to confirm a write has been effective.</p> <p>0x0: READ:Inactive state effective. WRITE: Request to change to inactive state</p> <p>0x1: READ:Active state effective WRITE: Change request to active. If the lane is a data lane, TxRequestEsc is asserted and synchronously TxUlpEsc is asserted for one period of TxClkEsc</p> | RW | 0 |

Table 10-570. Register Call Summary for Register DSI_COMPLEXIO_CFG2

MIPI Display Serial Interface

- [Ultralow-Power State Configuration: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[25\] \[26\]](#)

Table 10-571. DSI_RX_FIFO_VC_FULLNESS

| | | | | |
|-------------------------|--|--|--|---|
| Address Offset | 0x0000 007C | | | |
| Physical Address | 0x5800 407C 0x4804 407C 0x5800 507C 0x4804 507C | | | Instance DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_P R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_P R_L4 |
| Description | Defines the fullness of each space allocated for each virtual channel. | | | |
| Type | R | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|-------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VC3_FIFO_FULLNESS | | | | | | | | VC2_FIFO_FULLNESS | | | | | | | | VC1_FIFO_FULLNESS | | | | | | | | VC0_FIFO_FULLNESS | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31:24 | VC3_FIFO_FULLNESS | Fullness of the FIFO allocated for virtual channel 3.The valid values are from 0 to DSI_GNQ[5:3] RX_FIFODEPTH-1 corresponding to 1x33-bit,...up to DSI_GNQ[5:3] RX_FIFODEPTH x33-bit. | R | 0x00 |
| 23:16 | VC2_FIFO_FULLNESS | Fullness of the FIFO allocated for virtual channel 2.The valid values are from 0 to DSI_GNQ[5:3] RX_FIFODEPTH-1 corresponding to 1x33-bit,...up to DSI_GNQ[5:3] RX_FIFODEPTH x33-bit. | R | 0x00 |
| 15:8 | VC1_FIFO_FULLNESS | Fullness of the FIFO allocated for virtual channel 1.The valid values are from 0 to DSI_GNQ[5:3] RX_FIFODEPTH-1 corresponding to 1x33-bit,...up to DSI_GNQ[5:3] RX_FIFODEPTH x33-bit. | R | 0x00 |
| 7:0 | VC0_FIFO_FULLNESS | Fullness of the FIFO allocated for virtual channel 0.The valid values are from 0 to DSI_GNQ[5:3] RX_FIFODEPTH-1 corresponding to 1x33-bit,...up to DSI_GNQ[5:3] RX_FIFODEPTH x33-bit. | R | 0x00 |

Table 10-572. Register Call Summary for Register DSI_RX_FIFO_VC_FULLNESS

MIPI Display Serial Interface

- [DSI Transfer Modes: \[0\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[1\] \[2\]](#)

Table 10-573. DSI_VM_TIMING4

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0080 | | |
| Physical Address | 0x5800 4080 0x4804 4080 0x5800 5080 0x4804 5080 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_P R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_P R_L4 |
| Description | VIDEO MODE TIMING REGISTER This register defines the video mode timing. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|---|---------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | HSA_HS_INTERLEAVING | | | | | | | | HFP_HS_INTERLEAVING | | | | | | | | HBP_HS_INTERLEAVING | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|-------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:16 | HSA_HS_INTERLEAVING | Defines the number of TXBYTECLKHS clock cycles that can be used for interleaving High Speed command mode packet into Video Mode stream during HSA blanking period. The supported values are from 0 to 255. | RW | 0x00 |
| 15:8 | HFP_HS_INTERLEAVING | Defines the number of TXBYTECLKHS clock cycles that can be used for interleaving High Speed command mode packet into Video Mode stream during HFP blanking period. The supported values are from 0 to 255. | RW | 0x00 |
| 7:0 | HBP_HS_INTERLEAVING | Defines the number of TXBYTECLKHS clock cycles that can be used for interleaving High Speed command mode packet into Video Mode stream during HBP blanking period. The supported values are from 0 to 255. | RW | 0x00 |

Table 10-574. Register Call Summary for Register DSI_VM_TIMING4

MIPI Display Serial Interface

- [DSI Transfer Modes: \[0\] \[1\] \[2\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[3\] \[4\]](#)

Table 10-575. DSI_TX_FIFO_VC_EMPTYNESS

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0084 | | |
| Physical Address | 0x5800 4084 0x4804 4084 0x5800 5084 0x4804 5084 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_P R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_P R_L4 |
| Description | Defines the emptiness of each space allocated for each virtual channel. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|--------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VC3_FIFO_EMPTYNESS | | | | | | | | VC2_FIFO_EMPTYNESS | | | | | | | | VC1_FIFO_EMPTYNESS | | | | | | | | VC0_FIFO_EMPTYNESS | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31:24 | VC3_FIFO_EMPTYNESS | Emptiness of the FIFO allocated for virtual channel 3. The valid values are from 0 to DSI_GNQ[2:0] TX_FIFODEPTH-1 corresponding to 1x33-bit,...up to DSI_GNQ[2:0] TX_FIFODEPTH x33-bit. | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 23:16 | VC2_FIFO_EMPTYNESS | Emptiness of the FIFO allocated for virtual channel 2. The valid values are from 0 to DSI_GNQ[2:0] TX_FIFODEPTH-1 corresponding to 1x33-bit,...up to DSI_GNQ[2:0] TX_FIFODEPTH x33-bit. | R | 0x00 |
| 15:8 | VC1_FIFO_EMPTYNESS | Emptiness of the FIFO allocated for virtual channel 1. The valid values are from 0 to DSI_GNQ[2:0] TX_FIFODEPTH-1 corresponding to 1x33-bit,...up to DSI_GNQ[2:0] TX_FIFODEPTH x33-bit. | R | 0x00 |
| 7:0 | VC0_FIFO_EMPTYNESS | Emptiness of the FIFO allocated for virtual channel 0. The valid values are from 0 to DSI_GNQ[2:0] TX_FIFODEPTH-1 corresponding to 1x33-bit,...up to DSI_GNQ[2:0] TX_FIFODEPTH x33-bit. | R | 0x00 |

Table 10-576. Register Call Summary for Register DSI_TX_FIFO_VC_EMPTYNESS

MIPI Display Serial Interface

- [DSI Transfer Modes: \[0\] \[1\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[2\] \[3\]](#)

Table 10-577. DSI_VM_TIMING5

| | | | |
|-------------------------|--|-----------------------|--|
| Address Offset | 0x0000 0088 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Physical Address | 0x5800 4088 0x4804 4088 0x5800 5088 0x4804 5088 | | |
| Description | VIDEO MODE TIMING REGISTER This register defines the video mode timing. | | |
| Type | RW | | |
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| RESERVED | HSA_LP_INTERLEAVING | HFP_LP_INTERLEAVING | HBP_LP_INTERLEAVING |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|-------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:16 | HSA_LP_INTERLEAVING | Defines the number of bytes of Low Power command mode packets that can be sent on PPI link during HSA blanking period. The supported values are from 0 to 255. | RW | 0x00 |
| 15:8 | HFP_LP_INTERLEAVING | Defines the number of bytes of Low Power command mode packets that can be sent on PPI link during HFP blanking period. The supported values are from 0 to 255 | RW | 0x00 |
| 7:0 | HBP_LP_INTERLEAVING | Defines the number of bytes of Low Power command mode packets that can be sent on PPI link during HBP blanking period. The supported values are from 0 to 255 | RW | 0x00 |

Table 10-578. Register Call Summary for Register DSI_VM_TIMING5

MIPI Display Serial Interface

- [DSI Transfer Modes: \[0\] \[1\] \[2\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[3\] \[4\]](#)

Table 10-579. DSI_VM_TIMING6

| | | | |
|------------------|--|----------|--|
| Address Offset | 0x0000 008C | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Physical Address | 0x5800 408C 0x4804 408C 0x5800 508C 0x4804 508C | | |
| Description | VIDEO MODE TIMING REGISTER This register defines the video mode timing. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BL_HS_INTERLEAVING | | | | | | | | | | | | | | | | BL_LP_INTERLEAVING | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|--------|
| 31:16 | BL_HS_INTERLEAVING | Defines the number of TXBYTECLKHS clock cycles that can be used for interleaving High Speed command mode packet into Video Mode stream during blanking periods during VSA, VBP, VFP periods inside one video frame on PPI link. The supported values are from 0 to 65535 . | RW | 0x0000 |
| 15:0 | BL_LP_INTERLEAVING | Defines the maximum number of bytes of Low Power command mode packets that can be sent on PPI link during blanking periods during VSA, VBP or VFP periods inside one video frame on PPI link. The supported values are from 0 to 65535 | RW | 0x0000 |

Table 10-580. Register Call Summary for Register DSI_VM_TIMING6

MIPI Display Serial Interface

- [DSI Transfer Modes: \[0\] \[1\]](#)
- [Video Port Interface: \[2\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[3\] \[4\]](#)

Table 10-581. DSI_VM_TIMING7

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0090 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Physical Address | 0x5800 4090 0x4804 4090 0x5800 5090 0x4804 5090 | | |
| Description | Defines the minimum number of HS bytes clock cycles that are required to allow for the delays in entering and exiting HS mode. The supported values are from 0 to 65535 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ENTER_HS_MODE_LATENCY | | | | | | | | | | | | | | | | EXIT_HS_MODE_LATENCY | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|------|--------|
| 31:16 | ENTER_HS_MODE_LATENCY | Defines the number of TXBYTECLKHS clock cycles necessary for entering to HS mode. It corresponds to the delay in number of HS clock cycles from assertion of TxRequestHS signal to 1 until assertion of TxReadyHS signal to 1. The supported values are from 0 to 65535 . | RW | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|--------|
| 15:0 | EXIT_HS_MODE_LATENCY | Defines the number of TXBYTECLKHS clock cycles necessary for exiting from HS mode. It corresponds to the maximum delay in number of TXBYTECLKHS clock from de-assertion of TxRequestHS signal until PPI link is in LP-11 state from which a new entrance to HS mode can be initiated which does not take more than ENTER_HS_MODE_LATENCY clock cycles. The supported values are from 0 to 65535 | RW | 0x0000 |

Table 10-582. Register Call Summary for Register DSI_VM_TIMING7

MIPI Display Serial Interface

- [Clock Requirements: \[0\] \[1\] \[2\] \[3\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[4\] \[5\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[6\] \[7\]](#)

Table 10-583. DSI_STOPCLK_TIMING

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|--|----|----|----|---|-------------|---------------------|--------------|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0094 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5800 4094 0x4804 4094 0x5800 5094 0x4804 5094 | | | | | | | | | | | | | | | | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PERR_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PERR_L4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Number of functional clock cycles to wait for TXBYTECLKHS to stop/start after change in DSIStopClk signal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="24">RESERVED</td><td colspan="8">DSI_STOPCLK_LATENCY</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | DSI_STOPCLK_LATENCY | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | DSI_STOPCLK_LATENCY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:8 | RESERVED | | | | | | | | | | | | | | | | | | | | | | R | | 0x000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7:0 | DSI_STOPCLK_LATENCY | | Clock gating latency from DSI Protocol to TXBYTECLKHS | | | | | | | | | | | | | | | | | | | | RW | | 0x80 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 10-584. Register Call Summary for Register DSI_STOPCLK_TIMING

MIPI Display Serial Interface

- [Power Control of DSI PHY Complex I/O and DSI PLL: \[0\] \[1\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[2\] \[3\]](#)

Table 10-585. DSI_CTRL2

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0098 | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_P R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_P R_L4 |
| Physical Address | 0x5800 4098 0x4804 4098 0x5800 5098 0x4804 5098 | | |
| Description | Additional control bits for use with Video Port 2 | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|--------------|----|--------------|---|-----------|---|------------|---|-------------------|---|----------|---|--------------|--|----------|--|--|--|
| RESERVED | | | | | | | | | | | | | | | | LINE_BUFFER | | | | VP_VSYNC_POL | | VP_HSYNC_POL | | VP_DE_POL | | VP_CLK_POL | | VP_DATA_BUS_WIDTH | | RESERVED | | VP_CLK_RATIO | | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:12 | LINE_BUFFER | Number of line buffers to be used while receiving data on the video port. The valid values are from 0 to DSI_GNQ[23:22] VP2_NB_LINE_BUFFER. 0x0: No line buffer 0x1: 1 line buffer 0x2: 2 line buffers | RW | 0x0 |
| 11 | VP_VSYNC_POL | VP vertical synchronization signal polarity 0x0: VSYNC signal on the video port is active low. 0x1: VSYNC signal on the video port is active high. | RW | 0 |
| 10 | VP_HSYNC_POL | VP horizontal synchronization signal polarity 0x0: HSYNC signal on the video port is active low. 0x1: HSYNC signal on the video port is active high. | RW | 0 |
| 9 | VP_DE_POL | VP data enable signal polarity 0x0: DE signal on the video port is active low. 0x1: DE signal on the video port is active high. | RW | 0 |
| 8 | VP_CLK_POL | VP pixel clock polarity 0x0: The DSI Protocol Engine module captures the data on the VP on the pixel clock falling edge. The module connected to the VP shall drive the data on the pixel clock rising edge. 0x1: The DSI Protocol Engine module captures the data on the VP on the pixel clock raising edge. The module connected to the VP shall drive the data on the pixel clock falling edge. | RW | 1 |
| 7:6 | VP_DATA_BUS_WIDTH | Defines the size of the video port data bus 0x0: 16-bits data width (LSB of the 24-bit video port data bus) 0x1: 18-bits data width (LSB of the 24-bit video port data bus) 0x2: 24-bits data width (LSB of the 24-bit video port data bus) | RW | 0x0 |
| 5 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 4 | VP_CLK_RATIO | The field indicates the clock ratio between VP_CLK and VP_PCLK. The clock VP_PCLK is generated from VP_CLK. It is divided down. The information is only used when the video port is used to provide data in command mode. In the case of video mode, it is not used. 0x0: The clock VP_PCLK is the clock VP_CLK divided by 2. The duty cycle of VP_PCLK is 50/50. 0x1: The clock VP_PCLK is the clock VP_CLK divided by 3 or more. The duty cycle of VP_PCLK is not 50/50 for odd ratio numbers (3,5,7,...). | RW | 0 |
| 3:0 | RESERVED | | R | 0x0 |

Table 10-586. Register Call Summary for Register DSI_CTRL2

MIPI Display Serial Interface

- [Video Port Interface: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[5\] \[6\]](#)
- [DSI_PROTOCOL_ENGINE Register Description: \[7\] \[8\] \[9\] \[10\]](#)

Table 10-587. DSI_VM_TIMING8

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|---|-------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|--------------|---|---|------|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|
| Address Offset | 0x0000 009C | Instance | DSI1_PROTOCOL_ENGINE_L3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5800 409C | | DSI1_PROTOCOL_ENGINE_PE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4804 409C | | R_L4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x5800 509C | | DSI2_PROTOCOL_ENGINE_L3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4804 509C | | DSI2_PROTOCOL_ENGINE_PE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | VIDEO MODE TIMING REGISTER This register defines the video mode timing. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="26">RESERVED</td><td colspan="6">HFPX</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | HFPX | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | HFPX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:2 | RESERVED | | | | | | | | | | | | | | | | | | | | | R | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1:0 | HFPX | Extension to the HFP register. Additional bits added to MSB. | | | | | | | | | | | | | | | | | | | | RW | 0x0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 10-588. Register Call Summary for Register DSI_VM_TIMING8

MIPI Display Serial Interface

- [Blanking: \[0\]](#)
- [DSI Transfer Modes: \[1\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[2\] \[3\]](#)

Table 10-589. DSI_TE_HSYNC_WIDTH_j

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 00A0 + (0xc * j) | Index | j = 0 to 1 |
| Physical Address | 0x5800 40A0 + (0xc * j) 0x4804 40A0 + (0xc * j) 0x5800 50A0 + (0xc * j) 0x4804 50A0 + (0xc * j) | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | The register configures the TE HSYNC minimum pulse width for TE0 and TE1 CMOS signals The input TE signal is asynchronous and needs to be resynchronized to DSI_CLK clock domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | MIN_HSYNC_PULSE_WIDTH | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|-------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:8 | MIN_HSYNC_PULSE_WIDTH | Programmable min HSYNC pulse width Minimum HSYNC pulse width. Number of DSI_CLK clock cycles times 256 to determine when HSYNC pulse occurs. The value 0 is invalid. | RW | 0x001 |
| 7:0 | RESERVED | | R | 0x00 |

Table 10-590. Register Call Summary for Register DSI_TE_HSYNC_WIDTH_j

MIPI Display Serial Interface

- [PHY Triggers: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[5\] \[6\]](#)

Table 10-591. DSI_TE_VSYNC_WIDTH_j

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 00A4 + (0xc * j) | Index | j = 0 to 1 |
| Physical Address | 0x5800 40A4 + (0xc * j) 0x4804 40A4 + (0xc * j) 0x5800 50A4 + (0xc * j) 0x4804 50A4 + (0xc * j) | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | The register configures the TE VSYNC minimum pulse width for TE0 and TE1 CMOS signals The input TE signal is asynchronous and needs to be resynchronized to DSI_CLK clock domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | MIN_VSYNC_PULSE_WIDTH | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|-------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:8 | MIN_VSYNC_PULSE_WIDTH | Programmable min VSYNC pulse width Minimum VSYNC pulse width. Number of DSI_CLK clock cycles times 256 to determine when VSYNC pulse occurs. The value 0 is invalid. The value shall be greater than MIN_HSYNC_PULSE_WIDTH when DSI_TE_HSYNC_NUMBER is greater than 0 | RW | 0x001 |
| 7:0 | RESERVED | | R | 0x00 |

Table 10-592. Register Call Summary for Register DSI_TE_VSYNC_WIDTH_j

MIPI Display Serial Interface

- [PHY Triggers: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[6\] \[7\]](#)

Table 10-593. DSI_TE_HSYNC_NUMBER_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 00A8 + (0xc * j) | Index | j = 0 to 1 |
| Physical Address | 0x5800 40A8 + (0xc * j) 0x4804 40A8 + (0xc * j) 0x5800 50A8 + (0xc * j) 0x4804 50A8 + (0xc * j) | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | The register configures the number of HSYNC to synchronize the beginning of the transfer on DSI link based on the number of HSYNC pulse received on the TE line. The input TE signal is asynchronous and needs to be resynchronized to DSI_CLK clock domain. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINE_NUMBER | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10:0 | LINE_NUMBER | Programmable line number Line number from 0 to 2047. Number of HSYNC after the VSYNC occurs before the beginning of the transfer. Any HSYNC before VSYNC is ignored. | RW | 0x000 |

Table 10-594. Register Call Summary for Register DSI_TE_HSYNC_NUMBER_j

MIPI Display Serial Interface

- [PHY Triggers: \[0\] \[1\] \[2\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[3\] \[4\]](#)

Table 10-595. DSI_VC_CTRL_i

| | | | |
|------------------|--|----------|--|
| Address Offset | 0x0000 0100 + (0x20 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5800 4100 + (0x20 * i) 0x4804 4100 + (0x20 * i) 0x5800 5100 + (0x20 * i) 0x4804 5100 + (0x20 * i) | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | CONTROL REGISTER - Virtual channel This register controls the virtual channel. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----------------|----|---------------|----|----|------------------|----|----|---------------|----|----|-------------------|----|----|------------------|----|----|--------------|----|----|---------|---|---------|---|-----------|---|--------------|---|--------------------|---|--|------------|--|-----------|--|----------|--|--------|--|-------------------|--|------|--|-------------|--|--------------|--|--------|--|-------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | |
| DCS_CMD_CODE | | DCS_CMD_ENABLE | | DMA_RX_REQ_NB | | | DMA_RX_THRESHOLD | | | DMA_TX_REQ_NB | | | RX_FIFO_NOT_EMPTY | | | DMA_TX_THRESHOLD | | | TX_FIFO_FULL | | | VC_BUSY | | PP_BUSY | | VP_SOURCE | | RGB565_ORDER | | OCP_DATA_BUS_WIDTH | | | MODE_SPEED | | ECC_TX_EN | | CS_TX_EN | | BTA_EN | | TX_FIFO_NOT_EMPTY | | MODE | | BTA_LONG_EN | | BTA_SHORT_EN | | SOURCE | | VC_EN | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31 | DCS_CMD_CODE | DCS command code value to insert between header and video port or Interface slave data when enabled by DCS_CMD_ENABLE (only when TE mechanism is not used otherwise the bit field DCS_CMD_CODE is ignored by DSI protocol engine). 0x0: DCS write memory continue code is inserted. 0x1: DCS write memory start code is inserted. | RW | 0 |
| 30 | DCS_CMD_ENABLE | Enables automatic insertion of DCS command codes when data is sourced by the video port. 0x0: DCS command code is NOT inserted when command mode traffic is coming from the Video Port or Interface slave port. 0x1: DCS command code is inserted automatically when command mode traffic is coming from the Video Port or Interface slave port. | RW | 0 |
| 29:27 | DMA_RX_REQ_NB | Selection of the use of the DMA request (associated to the RX FIFO) 0x0: DMA_req0 is selected (valid only if DSI_GNQ[8:6] NB_DMA_REQUEST is greater than 0) 0x1: DMA_req1 is selected (valid only if DSI_GNQ[8:6] NB_DMA_REQUEST is greater than 1) 0x2: DMA_req2 is selected (valid only if DSI_GNQ[8:6] NB_DMA_REQUEST is greater than 2) 0x3: DMA_req3 is selected (valid only if DSI_GNQ[8:6] NB_DMA_REQUEST is equal to 3) 0x4: No DMA req selected | RW | 0x0 |
| 26:24 | DMA_RX_THRESHOLD | Defines the threshold value for the DMA request (associated to the RX FIFO) 0x0: 1x 32 bits 0x1: 2 x 32 bits 0x2: 4 x 32 bits 0x3: 8 x 32 bits 0x4: 16 x 32 bits 0x5: 32 x 32 bits | RW | 0x0 |
| 23:21 | DMA_TX_REQ_NB | Selection of the use of the DMA request (associated to the TX FIFO) 0x0: DMA_req0 is selected (valid only if DSI_GNQ[8:6] NB_DMA_REQUEST is greater than 0) 0x1: DMA_req1 is selected (valid only if DSI_GNQ[8:6] NB_DMA_REQUEST is greater than 1) 0x2: DMA_req2 is selected (valid only if DSI_GNQ[8:6] NB_DMA_REQUEST is greater than 2) 0x3: DMA_req3 is selected (valid only if DSI_GNQ[8:6] NB_DMA_REQUEST is equal to 3) 0x4: No DMA req selected | RW | 0x0 |
| 20 | RX_FIFO_NOT_EMPTY | FIFO status in command mode. Otherwise, this bit can be ignored. Read 0x0: The RX FIFO is empty (the FIFO does not contain any data for the virtual channel) Read 0x1: The RX FIFO is not empty (the FIFO contains at least one byte for the virtual channel) | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 19:17 | DMA_TX_THRESHOLD | Defines the threshold value for the DMA request (associated to the TX FIFO) 0x0: 1x 32 bits 0x1: 2 x 32 bits 0x2: 4 x 32 bits 0x3: 8 x 32 bits 0x4: 16 x 32 bits 0x5: 32 x 32 bits | RW | 0x0 |
| 16 | TX_FIFO_FULL | FIFO status in command mode. Otherwise, this bit can be ignored. Read 0x0: The TX FIFO is not full (the FIFO can accept at least one more 32-bit value) Read 0x1: The TX FIFO is full | R | 0 |
| 15 | VC_BUSY | Indicates if previously scheduled activities (packets, BTA) are still being processed. Forced to 1 if VC is enabled. Software should check this bit is 0 before changing channel configuration. Read 0x0: No pending operations for this VC Read 0x1: Pending operations for this VC | R | 0 |
| 14 | PP_BUSY | Ping-pong buffer busy status. Read 0x0: Software is permitted to write a new header for VP command mode traffic. Read 0x1: Software is NOT permitted to write a new header for VP command mode traffic. | R | 0 |
| 13 | VP_SOURCE | Selection between video port 1 and video port 2. If DSI_GNQ[24] NB_VIDEO_PORTS = 0, the bit field is ignored since only video port 1 is present. 0x0: The video port 1 is selected. 0x1: The video port 2 is selected. Note: This selection applies only to DSI1. For DSI2 to work properly, the VP_SOURCE bit must always be set to 0x0. | RW | 0 |
| 12 | RGB565_ORDER | Byte order for RGB565 0x0: Byte order as for DBI compliance 0x1: Byte order as for video mode | RW | 0 |
| 11:10 | OCP_DATA_BUS_WIDTH | Defines the size of the Interface data bus 0x0: 16-bits data width (LSB of the 32-bit Interface port data bus) 0x1: 24-bits data width (LSB of the 32-bit Interface port data bus) 0x2: 2x16-bits data width (first pixel on the LSB of the 32-bit Interface port data bus and second pixel on the MSB of the 32-bit Interface port data bus for the same Interface access) 0x3: 32-bits data width | RW | 0x0 |
| 9 | MODE_SPEED | Selection of the mode. The information is used by hardware only if MODE=COMMAND_MODE otherwise it is ignored. 0x0: Low-power mode (CMOS) is used to send short and long packets to the peripheral. 0x1: High Speed mode (SLVS) is used to send short and long packets to the peripheral. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|-------|
| 8 | ECC_TX_EN | Enables the Error Correction Code generation for the transmit header (short and long packets). 0x0: Disabled 0x1: Enabled | RW | 0 |
| 7 | CS_TX_EN | Enables the checksum generation for the transmit payload (long packet only). 0x0: Disabled. The value 0x00 is used. 0x1: Enabled. The checksum value is calculated by HW. | RW | 0 |
| 6 | BTA_EN | Send the bus turn around to the peripheral. It can be used when the automatic mode is enabled (BTA_SHORT_EN=1 or/and BTA_LONG_EN=1). In that case only one BTA is sent to the peripheral. The manual mode is used to allow the user to define for which packets, the turn around is required for example getting acknowledge from the peripheral. 0x0: READS: BTA generation is completed. It is reset by hardware when it is completed. WRITES: Cancellation of the BTA generation (not guarantee since it could already on going, shall not be used). 0x1: READS: BTA generation has been requested by user (it could be on going but not completed). WRITES: Request for BTA generation. | RW | 0 |
| 5 | TX_FIFO_NOT_EMPTY | FIFO status Read 0x0: The TX FIFO is empty (the FIFO does not contain any data for the virtual channel) Read 0x1: The TX FIFO is not empty (the FIFO contains at least one byte for the virtual channel) | R | 0 |
| 4 | MODE | Selection of the mode 0x0: Command mode. 0x1: Video mode. The bit fields MODE_SPEED and SOURCE are not used by hardware. The bit field VP_SOURCE is used to select between video port 1 and video port 2 when two video ports are present. | RW | 0 |
| 3 | BTA_LONG_EN | Enables the automatic bus turn-around after completion of each long packet transmission. 0x0: Disabled 0x1: Enabled | RW | 0 |
| 2 | BTA_SHORT_EN | Enables the automatic bus turn-around after completion of each short packet transmission. 0x0: Disabled 0x1: Enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 1 | SOURCE | <p>Selection of the source between Interface and the Video port(s) (used by the hardware only if MODE=COMMAND MODE (0x0) otherwise it is ignored). The number of available video ports is defined in DSI_GNQ[24] NB_VIDEO_PORTS bit.</p> <p>0x0: All the data are provided by the slave port. Any transfer on the video port is ignored for this virtual channel.</p> <p>0x1: If MODE=VIDEO_MODE, the data received on the video port 1 or video port 2, selected using VP_SOURCE (pixels and enabled synchronization events using DSI_CTRL[17] VP_HSYNC_START, DSI_CTRL[18] VP_HSYNC_END, DSI_CTRL[15] VP_VSYNC_START, DSI_CTRL[16] VP_VSYNC_END for video port 1 and DSI_CTRL2[] VP_HSYNC_START, DSI_CTRL2[] VP_HSYNC_END, DSI_CTRL2[] VP_VSYNC_START, DSI_CTRL2[] VP_VSYNC_END for video port 2) are sent on the virtual channel (only one virtual channel can be associated with the video port, it is the software responsibility to ensure that no more than one virtual channel is enabled with the video port as the main source for data).</p> <p>If MODE=COMMAND_MODE, the VP.STALL signal is used by the protocol engine to indicate when new data are required. The synchronization signals are not generated by the display controller. Regardless of the MODE, no data can be provided on the Interface slave port.</p> | RW | 0 |
| 0 | VC_EN | <p>Enables the virtual channel.</p> <p>0x0: Disabled. The virtual channel shall be disabled for any register change in the DSI_VC_... registers to the corresponding VC ID (except for setting the DSI_VC_CTRL_i[6] BTA_EN, DSI_VC_TE_i[23:0] TE_SIZE and DSI_VC_TE_i[31] TE_START bit fields, and DSI_VC_LONG_..., DSI_VC_SHORT_..., DSI_VC_IRQ... registers).</p> <p>0x1: Enabled. No change is allowed to the virtual channel registers expect resetting the VC_EN.</p> | RW | 0 |

Table 10-596. Register Call Summary for Register DSI_VC_CTRL_i

MIPI Display Serial Interface

- [Short Packet: \[0\]](#)
- [Long Packet: \[1\]](#)
- [Blanking: \[2\] \[3\] \[4\] \[5\]](#)
- [VCs: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [16 bpp – RGB Color Format, Long Packet \(Command Mode\): \[17\]](#)
- [DSI Global Register Controls: \[18\]](#)
- [DSI Transfer Modes: \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\]](#)
- [Video Port Interface: \[44\] \[45\] \[46\]](#)
- [Timers: \[47\] \[48\]](#)
- [Bus Turnaround: \[49\] \[50\] \[51\] \[52\] \[53\] \[54\] \[55\]](#)
- [PHY Triggers: \[56\] \[57\] \[58\]](#)
- [ECC Generation: \[59\] \[60\]](#)
- [Checksum Generation for Long Packet Payloads: \[61\]](#)
- [Power Control of DSI PHY Complex I/O and DSI PLL: \[62\] \[63\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[64\] \[65\] \[66\] \[67\] \[68\] \[69\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[70\] \[71\] \[72\] \[73\] \[74\] \[75\] \[76\] \[77\] \[78\] \[79\] \[80\] \[81\] \[82\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[83\] \[84\]](#)
- [DSI_PROTOCOL_ENGINE Register Description: \[85\] \[86\]](#)

Table 10-597. DSI_VC_TE_i

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0104 + (0x20 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5800 4104 + (0x20 * i) 0x4804 4104 + (0x20 * i) 0x5800 5104 + (0x20 * i) 0x4804 5104 + (0x20 * i) | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | CONTROL REGISTER - Virtual channel This register controls the tearing effect logic. It defines the size of the transfer when TE occurs and enables the automatic TE mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|-------|---------|------------|----------|----|----|----|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TE_START | TE_EN | TE_LINE | TE_LINE_NB | RESERVED | | | | TE_SIZE | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31 | TE_START | Manual control of the start of the transfer. The user can use the TE interrupt in order to know that the TE trigger has been received prior to set the TE_START bit field. It is not mandatory to use the TE interrupt. 0x0: Indicates the end of the transfer. The bit can be used by user to cancel the transfer if not already started. The FIFO shall be flushed by software to ensure there is no data remaining in it. 0x1: Starts the transfer of the data. The size is defined in TE_SIZE. The bit field is set until the transfer is completed. It is reset by hardware when the transfer is completed. | RW | 0 |
| 30 | TE_EN | Tearing Effect Control 0x0: Disables the automatic transfer. The user shall use the interruption in order to know when TE PHY trigger is received or when the TE is detected on the input CMOS signals. The hardware reset the bit field when the transfer is completed (TE_SIZE=0). 0x1: Enables the automatic transfer of the data using the TE PHY trigger or one of the TE input signals as a synchronization event. The bit field TE_LINE defines if the CMOS signal is used or if the PHY trigger is used. | RW | 0 |
| 29 | TE_LINE | 0x0: Disabled the TE CMOS signalling for the automatic data transfer. The DSI PHY trigger is used for the automatic data transfer. 0x1: Enables the TE CMOS signalling for the automatic data transfer. The DSI PHY trigger is not used for the automatic data transfer. | RW | 0 |
| 28 | TE_LINE_NB | Selection between TE0 and TE1 CMOS signals. 0x0: TE0 CMOS input line is selected 0x1: TE1 CMOS input line is selected | RW | 0 |
| 27:24 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 23:0 | TE_SIZE | Defines the number of byte (payload data excluding the check -sum) to be sent. The write into the register DSI_VC_LONG_PACKET_HEADER_i shall be performed by the user before sending data from the register DSI_VC_LONG_PACKET_PAYLOAD_i . The register value is decremented for every byte sent of the DSI link. At the end of the transfer (TE_SIZE=0), the bit field TE_EN is reset by hardware. The DMA request will be asserted when the trigger is received in order to receive data in the TX FIFO. It should not be deasserted until all data (TE_SIZE) have been received in the FIFO. | RW | 0x000000 |

Table 10-598. Register Call Summary for Register DSI_VC_TE_i

MIPI Display Serial Interface

- [PHY Triggers: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[21\] \[22\] \[23\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[24\] \[25\]](#)
- [DSI_PROTOCOL_ENGINE Register Description: \[26\] \[27\]](#)

Table 10-599. DSI_VC_LONG_PACKET_HEADER_i

| | | | |
|------------------|--|----------|--|
| Address Offset | 0x0000 0108 + (0x20 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5800 4108 + (0x20 * i) 0x4804 4108 + (0x20 * i) 0x5800 5108 + (0x20 * i) 0x4804 5108 + (0x20 * i) | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | LONG PACKET HEADER INFORMATION -Virtual channel This register sets the 32-bit DATA_ID + Word count + ECC (the virtual channel id can be different than VC). The ECC will be computed if ECC_TX_EN is set to 1. DATA_ID is located at bit[7:0] WC is located at bit[23:8] ECC is located at bit[31:24] (Least significant byte first and least significant bit first) | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HEADER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | HEADER | Packet header information: DATA ID + WORD COUNT +ECC | W | 0x0000 0000 |

Table 10-600. Register Call Summary for Register DSI_VC_LONG_PACKET_HEADER_i

MIPI Display Serial Interface

- [Long Packet: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [Data Identifier: \[7\]](#)
- [VCs: \[8\]](#)
- [DSI Global Register Controls: \[9\]](#)
- [DSI Transfer Modes: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\]](#)
- [Video Port Interface: \[26\]](#)
- [Bus Turnaround: \[27\]](#)
- [PHY Triggers: \[28\] \[29\] \[30\]](#)
- [ECC Generation: \[31\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[32\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[33\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[34\] \[35\]](#)
- [DSI_PROTOCOL_ENGINE Register Description: \[36\]](#)

Table 10-601. DSI_VC_LONG_PACKET_PAYLOAD_i

| | | | |
|------------------|---|----------|--|
| Address Offset | 0x0000 010C + (0x20 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5800 410C + (0x20 * i) 0x4804 410C + (0x20 * i) 0x5800 510C + (0x20 * i) 0x4804 510C + (0x20 * i) | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | LONG PACKET PAYLOAD INFORMATION -Virtual channel This register sets the payload information (excluding checksum). The hardware shall capture the word count in the packet header (in DSI_VC_LONG_PACKET_HEADER) in order to determine the last valid data (the virtual channel id can be different than VC). Byte1 is bit[7:0] Byte2 is bit[15:8] Byte3 is bit[23:16] Byte4 is bit[31:24] Byten is sent before Byten+1 (Least significant byte first and least significant bit first) | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| | | | | | | | | | | | | | | | | PAYLOAD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | PAYLOAD | Packet payload information (excluding checksum) | W | 0x0000 0000 |

Table 10-602. Register Call Summary for Register DSI_VC_LONG_PACKET_PAYLOAD_i

MIPI Display Serial Interface

- [Long Packet: \[0\] \[1\] \[2\]](#)
- [DSI Global Register Controls: \[3\]](#)
- [DSI Transfer Modes: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [Bus Turnaround: \[14\]](#)
- [PHY Triggers: \[15\] \[16\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[17\] \[18\]](#)
- [DSI_PROTOCOL_ENGINE Register Description: \[19\]](#)

Table 10-603. DSI_VC_SHORT_PACKET_HEADER_i

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0110 + (0x20 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5800 4110 + (0x20 * i) 0x4804 4110 + (0x20 * i) 0x5800 5110 + (0x20 * i) 0x4804 5110 + (0x20 * i) | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | SHORT PACKET HEADER INFORMATION -Virtual channel This register sets the 24-bit DATA_ID + Short Packet Data Field + ECC (the virtual channel id can be different than VC). The ECC will be computed if ECC_TX_EN is set to 1. DATA_ID is located at bit[7:0] Short Packet Data field is located at bit[23:8] ECC is located at bit[31:24] (Least significant byte first and least significant bit first) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HEADER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | HEADER | WRITES: Packet header information: DATA ID + DATA FIELD +ECC written into the TX FIFO READS: 32-bit values read from the RX FIFO | RW | 0x0000 0000 |

Table 10-604. Register Call Summary for Register DSI_VC_SHORT_PACKET_HEADER_i

MIPI Display Serial Interface

- [Short Packet: \[0\]](#)
- [Data Identifier: \[1\]](#)
- [VCs: \[2\]](#)
- [DSI Global Register Controls: \[3\]](#)
- [DSI Transfer Modes: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [PHY Triggers: \[10\]](#)
- [ECC Generation: \[11\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[12\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[13\] \[14\]](#)

Table 10-605. DSI_VC_IRQSTATUS_i

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0118 + (0x20 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5800 4118 + (0x20 * i) 0x4804 4118 + (0x20 * i) 0x5800 5118 + (0x20 * i) 0x4804 5118 + (0x20 * i) | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_PE R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_PE R_L4 |
| Description | INTERRUPT STATUS REGISTER - Virtual channel This register regroups all the events related to the virtual channel. | | |
| Type | RW | | |

MIPI Display Serial Interface

www.ti.com

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|-----------------|----|-----------------------|----|---------|---|-----------------|---|-----------------|---|-----------------|---|--------------------|---|--------|--|
| RESERVED | | | | | | | | | | | | | | | | PP_BUSY_CHANGE_IRQ | | FIFO_TX_UDF_IRQ | | ECC_NO_CORRECTION_IRQ | | BTA_IRQ | | FIFO_RX_OVF_IRQ | | FIFO_TX_OVF_IRQ | | PACKET_SENT_IRQ | | ECC_CORRECTION_IRQ | | CS_IRQ | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | PP_BUSY_CHANGE_IRQ | Video Port ping-pong buffer busy status. PP_BUSY has changed from 1 to 0. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 7 | FIFO_TX_UDF_IRQ | FIFO underflow status. The FIFO used on the L3 interconnect slave port for buffering the data for the virtual channel has underflowed which means that the data for the current packet have not been received in time since the transfer of the packet are already started (transfer started since the packet size is bigger than space allocated in the FIFO). 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 6 | ECC_NO_CORRECTION_IRQ | ECC error status (short and long packets). No correction of the header because of more than 1-bit error. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 5 | BTA_IRQ | Virtual channel - BTA status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 4 | FIFO_RX_OVF_IRQ | FIFO overflow error status. The FIFO used on the L3 interconnect slave port for buffering the data received on the DSI link for the virtual channel has overflowed. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 3 | FIFO_TX_OVF_IRQ | FIFO overflow error status. The FIFO used on the L3 interconnect slave port for buffering the data for the virtual channel has overflowed. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|------|-------|
| 2 | PACKET_SENT_IRQ | Indicates that a packet has been sent. It is used when BTA manual mode is used. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 1 | ECC_CORRECTION_IRQ | Virtual channel - ECC has been used to do the correction of the only 1-bit error status (short and long packet). 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |
| 0 | CS_IRQ | Virtual channel - checksum mismatch status. 0x0: READS: Event is false. WRITES: Status bit unchanged. 0x1: READS: Event is true (pending). WRITES: Status bit is reset. | RW | 0 |

Table 10-606. Register Call Summary for Register DSI_VC_IRQSTATUS_i

MIPI Display Serial Interface

- [DSI Interrupt Requests: \[0\]](#)
- [DSI Transfer Modes: \[1\] \[2\] \[3\]](#)
- [Video Port Interface: \[4\]](#)
- [Bus Turnaround: \[5\] \[6\]](#)
- [Interrupts: \[7\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[14\] \[15\]](#)

Table 10-607. DSI_VC_IRQENABLE_i

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 011C + (0x20 * i) | Index | i = 0 to 3 |
| Physical Address | 0x5800 411C + (0x20 * i) 0x4804 411C + (0x20 * i) 0x5800 511C + (0x20 * i) 0x4804 511C + (0x20 * i) | Instance | DSI1_PROTOCOL_ENGINE_L3 DSI1_PROTOCOL_ENGINE_P R_L4 DSI2_PROTOCOL_ENGINE_L3 DSI2_PROTOCOL_ENGINE_P R_L4 |
| Description | INTERRUPT ENABLE REGISTER - Virtual channel This register regroups all the events related to virtual channel. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|--------------------|----|--------------------------|----|------------|---|--------------------|---|--------------------|---|--------------------|---|-----------------------|---|-----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | PP_BUSY_CHANGE_IRQ_EN | | FIFO_TX_UDF_IRQ_EN | | ECC_NO_CORRECTION_IRQ_EN | | BTA_IRQ_EN | | FIFO_RX_OVF_IRQ_EN | | FIFO_TX_OVF_IRQ_EN | | PACKET_SENT_IRQ_EN | | ECC_CORRECTION_IRQ_EN | | CS_IRQ_EN | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | PP_BUSY_CHANGE_IRQ_EN | Video Port ping-pong buffer busy status. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 7 | FIFO_TX_UDF_IRQ_EN | FIFO underflow enable. The FIFO used for buffering the data received on the L3 interface slave port for the virtual channel has underflowed which means that the data for the current packet have not been received in time since the transfer of the packet are already started (transfer started since the packet size is bigger than space allocated in the FIFO). 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 6 | ECC_NO_CORRECTION_IRQ_EN | ECC error (short and long packets). No correction of the header because of more than 1-bit error. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 5 | BTA_IRQ_EN | Virtual channel -Bus turn around reception 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 4 | FIFO_RX_OVF_IRQ_EN | FIFO overflow enable. The FIFO used on the L3 interconnect slave port for buffering the data received on the DSI link for the virtual channel has overflowed. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 3 | FIFO_TX_OVF_IRQ_EN | FIFO overflow enable. The FIFO used on the L3 interconnect slave port for buffering the data received on the Interface slave port for the virtual channel has overflowed. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 2 | PACKET_SENT_IRQ_EN | Indicates that a packet has been sent. It is used when BTA manual mode is used. 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 1 | ECC_CORRECTION_IRQ_EN | Virtual channel - ECC has been used to correct the only 1-bit error (short and long packet). 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |
| 0 | CS_IRQ_EN | Virtual channel - checksum of the payload mismatch detection 0x0: Event is masked 0x1: Event generates an interrupt when it occurs | RW | 0 |

Table 10-608. Register Call Summary for Register DSI_VC_IRQENABLE_i

MIPI Display Serial Interface

- [DSI Interrupt Requests: \[0\] \[1\]](#)
- [Video Port Interface: \[2\]](#)
- [Bus Turnaround: \[3\]](#)
- [Interrupts: \[4\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[5\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[6\]](#)
- [DSI_PROTOCOL_ENGINE Register Summary: \[7\] \[8\]](#)

10.3.6.3 DSI_PHY Registers

10.3.6.3.1 DSI_PHY Register Summary

Table 10-609. DSI1_PHY Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DSI1_PHY L3 Physical Address | DSI1_PHY L4_PER Physical Address |
|-----------------------------------|------|-----------------------|----------------|------------------------------|----------------------------------|
| DSI_PHY_REGISTER0 | RW | 32 | 0x0000 0000 | 0x5800 4200 | 0x4804 4200 |
| DSI_PHY_REGISTER1 | RW | 32 | 0x0000 0004 | 0x5800 4204 | 0x4804 4204 |
| DSI_PHY_REGISTER2 | RW | 32 | 0x0000 0008 | 0x5800 4208 | 0x4804 4208 |
| DSI_PHY_REGISTER3 | RW | 32 | 0x0000 000C | 0x5800 420C | 0x4804 420C |
| DSI_PHY_REGISTER4 | RW | 32 | 0x0000 0010 | 0x5800 4210 | 0x4804 4210 |
| DSI_PHY_REGISTER5 | W | 32 | 0x0000 0014 | 0x5800 4214 | 0x4804 4214 |

Table 10-610. DSI2_PHY Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DSI2_PHY L3 Physical Address | DSI2_PHY L4_PER Physical Address |
|-----------------------------------|------|-----------------------|----------------|------------------------------|----------------------------------|
| DSI_PHY_REGISTER0 | RW | 32 | 0x0000 0000 | 0x5800 5200 | 0x4804 5200 |
| DSI_PHY_REGISTER1 | RW | 32 | 0x0000 0004 | 0x5800 5204 | 0x4804 5204 |
| DSI_PHY_REGISTER2 | RW | 32 | 0x0000 0008 | 0x5800 5208 | 0x4804 5208 |
| DSI_PHY_REGISTER3 | RW | 32 | 0x0000 000C | 0x5800 520C | 0x4804 520C |
| DSI_PHY_REGISTER4 | RW | 32 | 0x0000 0010 | 0x5800 5210 | 0x4804 5210 |
| DSI_PHY_REGISTER5 | W | 32 | 0x0000 0014 | 0x5800 5214 | 0x4804 5214 |

10.3.6.3.2 DSI_PHY Register Description

NOTE: Copyright 2005-2008 MIPI Alliance, Inc. All rights reserved. MIPI Alliance Member Confidential.

Table 10-611. DSI_PHY_REGISTER0

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x5800 4200 0x4804 4200 0x5800 5200 0x4804 5200 | Instance | DSI1_PHY_L3 DSI1_PHY_PER_L4 DSI2_PHY_L3 DSI2_PHY_PER_L4 |
| Description | Configuration register for HS mode timings | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|-------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REG_THSPREPARE | | | | | | | | REG_THSPRPR_THSZERO | | | | | | | | REG_THSTRAIL | | | | | | | | REG_THSEXIT | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|-------|
| 31:24 | REG_THSPREPARE | REG_THSPREPARE timing parameter in multiples of DDR clock period. DDR clock = CLKIN4DDR/4. D-PHY specification: $40\text{ ns} + 4 * \text{UI} \div 85\text{ ns} + 6 * \text{UI}$. UI = Unit Interval, equal to the duration of any HS state on the clock lane. Default value is programmed for 400 MHz. | RW | 0x1E |
| 23:16 | REG_THSPRPR_THSZERO | REG_THSPREPARE_THSZERO timing parameter in multiples of DDR clock period. DDR clock = CLKIN4DDR/4. D-PHY specification: $145\text{ ns} + 10 * \text{UI}$. Default value is programmed for 400 MHz. | RW | 0x48 |
| 15:8 | REG_THSTRAIL | REG_THSTRAIL timing parameter in multiples of DDR clock period. DDR clock = CLKIN4DDR/4. D-PHY specification: $60\text{ ns} + 4 * \text{UI}$. Default value is programmed for 400 MHz. | RW | 0x1D |
| 7:0 | REG_THSEXIT | REG_THSEXIT timing parameter in multiples of DDR clock frequency. DDR clock = CLKIN4DDR/4. D-PHY specification: 100 ns. Default value is programmed for 400 MHz. | RW | 0x3A |

Table 10-612. Register Call Summary for Register DSI_PHY_REGISTER0

MIPI Display Serial Interface

- [Clock Requirements: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [SCP Interface: \[8\]](#)
- [Display Timing Configuration: \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[14\] \[15\] \[16\] \[17\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[18\] \[19\] \[20\] \[21\]](#)
- [DSI_PROTOCOL_ENGINE Register Description: \[22\] \[23\]](#)
- [DSI_PHY Register Summary: \[24\] \[25\]](#)

Table 10-613. DSI_PHY_REGISTER1

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0004 | | |
| Physical Address | 0x5800 4204 0x4804 4204 0x5800 5204 0x4804 5204 | Instance | DSI1_PHY_L3 DSI1_PHY_PER_L4 DSI2_PHY_L3 DSI2_PHY_PER_L4 |
| Description | Configuration register for LP mode and HS mode timings | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|-------------|----|----|----|------------|----|----|----|----------|----|----|----|-------------|----|----|----|---------------|----|---|---|--------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REG_TTAGO | | | | REG_TTASURE | | | | REG_TTAGET | | | | RESERVED | | | | REG_TLPXBY2 | | | | REG_TCLKTRAIL | | | | REG_TCLKZERO | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|-------|
| 31:29 | REG_TTAGO | TTA-GO timing in terms of number of TXCLKESC clocks. 0x0: 2 cycles 0x1: 3 cycles 0x2: 4 cycles 0x3: 5 cycles 0x4: 6 cycles 0x5: 7 cycles 0x6: 8 cycles 0x7: 9 cycles Default value: 4 cycles | RW | 0x2 |
| 28:27 | REG_TTASURE | TTA-SURE timing in terms of number of TXCLKESC clocks. 0x0: 2 cycles 0x1: 1 cycles 0x2: 3 cycles 0x3: 4 cycles Default value: 2 cycles | RW | 0x0 |
| 26:24 | REG_TTAGET | TTA-GET timing in terms of number of TXCLKESC clocks. 0x0: 3 cycles 0x1: 4 cycles 0x2: 5 cycles 0x3: 6 cycles 0x4: 7 cycles 0x5: 8 cycles 0x6: 9 cycles 0x7: 10 cycles Default value: 5 cycles | RW | 0x2 |
| 23:21 | RESERVED | Reserved | R | 0x0 |
| 20:16 | REG_TLPXBY2 | (TLPX)/2 timing parameter in multiples of DDR clock frequency. DDR clock = CLKIN4DDR/4. Default value is programmed for 400 MHz. This is the internal timer value. The value seen on line will have variance due to rise/fall mismatch effects. | RW | 0x0A |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------|
| | | Note: TLPX is used to define the length of LP-01 state in HS start of Transmission sequences on clock and data lanes. For all other purposes TLPX is defined by the period of TXLPESC | | |
| 15:8 | REG_TCLKTRAIL | REG_TCLKTRAIL timing parameter in multiples of DDR clock frequency. DDR clock = CLKIN4DDR/4. D-PHY specification: 60 ns. Default value is programmed for 400 MHz | RW | 0x1A |
| 7:0 | REG_TCLKZERO | REG_TCLKZERO timing parameter in multiples of DDR clock period. DDR clock = CLKIN4DDR/4. D-PHY specification: (REG_TCLKPREPARE + REG_TCLKZERO) 300 ns. Derived specification for REG_TCLKZERO (Min REG_TCLKPREPARE = 38 ns): REG_TCLKZERO 262 ns. Default value is programmed for 400 MHz | RW | 0x6A |

Table 10-614. Register Call Summary for Register DSI_PHY_REGISTER1

MIPI Display Serial Interface

- [Clock Requirements: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Display Timing Configuration: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[12\] \[13\] \[14\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[15\] \[16\] \[17\] \[18\]](#)
- [DSI_PHY Register Summary: \[19\] \[20\]](#)

Table 10-615. DSI_PHY_REGISTER2

| | | | |
|-------------------------|--------------|-----------------|-----------------|
| Address Offset | 0x0000 0008 | Instance | DSI1_PHY_L3 |
| Physical Address | 0x5800 4208 | | DSI1_PHY_PER_L4 |
| | 0x4804 4208 | | DSI2_PHY_L3 |
| | 0x5800 5208 | | DSI2_PHY_PER_L4 |
| | 0x4804 5208 | | |
| Description | Sync pattern | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|------------|-----------|----|----|----|----------|-----------------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HSSYNCPATTERN | | | | | | | | RESERVED | | | | | | | | OVRDULPMTX | REGULPMTX | | | | RESERVED | REG_TCLKPREPARE | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|-------|
| 31:24 | HSSYNCPATTERN | Default : 184 (10111000). MSB (last received bit of sync pattern), LSB (first received bit of sync pattern). | RW | 0xB8 |
| 23:17 | RESERVED | Reserved. Read returns zero. Write only zero for future compatibility. | R | 0x00 |
| 16 | OVRDULPMTX | Global enable of the weak pulldown on the DSI lanes, configured through the [15:11] REGULPMTX bit field: 1: Enable weak pulldown on DSI lanes. 0: Disable weak pulldown on DSI lanes (default). | RW | 0 |
| 15:11 | REGULPMTX | Configuration of the weak pulldowns on the DSI lanes. For each bit, the following settings apply: 1: Enable weak pulldown on the lane. | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------|
| | | 0: Disable weak pulldown on the lane (default). | | |
| | | Bit [15]: DSI lane 4 (applies only to DSI1; reserved for DSI2) | | |
| | | Bit [14]: DSI lane 3 (applies only to DSI1; reserved for DSI2) | | |
| | | Bit [13]: DSI lane 2 (applies to DSI1 and DSI2) | | |
| | | Bit [12]: DSI lane 1 (applies to DSI1 and DSI2) | | |
| | | Bit [11]: DSI lane 0 (applies to DSI1 and DSI2) | | |
| 10:8 | RESERVED | Reserved | RW | 0x0 |
| 7:0 | REG_TCLKPREPARE | TCLK-PREPARE timing parameter in multiples of DDR clock period. D-PHY specification: 38 ns + 95 ns. Default value is programmed for 400 MHz. | RW | 0x1A |

Table 10-616. Register Call Summary for Register DSI_PHY_REGISTER2

MIPI Display Serial Interface

- [Clock Requirements: \[0\] \[1\]](#)
- [SCP Interface: \[2\]](#)
- [Display Timing Configuration: \[3\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[4\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[5\] \[6\]](#)
- [DSI_PROTOCOL_ENGINE Register Description: \[7\] \[8\]](#)
- [DSI_PHY Register Summary: \[9\] \[10\]](#)

Table 10-617. DSI_PHY_REGISTER3

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 000C | Instance | DSI1_PHY_L3 DSI1_PHY_PER_L4 DSI2_PHY_L3 DSI2_PHY_PER_L4 |
| Physical Address | 0x5800 420C 0x4804 420C 0x5800 520C 0x4804 520C | | |
| Description | Transmitted pattern | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|-------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REG_TXTRIGGERESC3 | | | | | | | | REG_TXTRIGGERESC2 | | | | | | | | REG_TXTRIGGERESC1 | | | | | | | | REG_TXTRIGGERESC0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:24 | REG_TXTRIGGERESC3 | Transmitted pattern when REG_TXTRIGGERESC3 is asserted (first bit transmitted to last bit transmitted). Default: 01100010 | RW | 0x62 |
| 23:16 | REG_TXTRIGGERESC2 | Default: 01011101 | RW | 0x5D |
| 15:8 | REG_TXTRIGGERESC1 | Default: 00100001 | RW | 0x21 |
| 7:0 | REG_TXTRIGGERESC0 | Default: 10100000 | RW | 0xA0 |

Table 10-618. Register Call Summary for Register DSI_PHY_REGISTER3

MIPI Display Serial Interface

- [PHY Triggers: \[0\] \[1\]](#)
- [DSI_PHY Register Summary: \[2\] \[3\]](#)

Table 10-619. DSI_PHY_REGISTER4

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0010 | | |
| Physical Address | 0x5800 4210 0x4804 4210 0x5800 5210 0x4804 5210 | Instance | DSI1_PHY_L3 DSI1_PHY_PER_L4 DSI2_PHY_L3 DSI2_PHY_PER_L4 |
| Description | Received pattern | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|-------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REG_RXTRIGGERESC3 | | | | | | | | REG_RXTRIGGERESC2 | | | | | | | | REG_RXTRIGGERESC1 | | | | | | | | REG_RXTRIGGERESC0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31:24 | REG_RXTRIGGERESC3 | Received pattern for which REG_RXTRIGGERESC3 is asserted (first bit transmitted to last bit transmitted). Default: 01100010 | RW | 0x62 |
| 23:16 | REG_RXTRIGGERESC2 | Default: 01011101 | RW | 0x5D |
| 15:8 | REG_RXTRIGGERESC1 | Default: 00100001 | RW | 0x21 |
| 7:0 | REG_RXTRIGGERESC0 | Default: 10100000 | RW | 0xA0 |

Table 10-620. Register Call Summary for Register DSI_PHY_REGISTER4

MIPI Display Serial Interface

- [PHY Triggers: \[0\] \[1\] \[2\]](#)
- [DSI_PHY Register Summary: \[3\] \[4\]](#)

Table 10-621. DSI_PHY_REGISTER5

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0014 | | |
| Physical Address | 0x5800 4214 0x4804 4214 0x5800 5214 0x4804 5214 | Instance | DSI1_PHY_L3 DSI1_PHY_PER_L4 DSI2_PHY_L3 DSI2_PHY_PER_L4 |
| Description | Reset done bits | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|-----------------|------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESETDONETXBYTECLK | RESETDONESCPCLK | RESETDONEPWRCCLK | RESETDONETXCLKESC4 | RESETDONETXCLKESC3 | RESETDONETXCLKESC2 | RESETDONETXCLKESC1 | RESETDONETXCLKESC0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------|
| 31 | RESETDONETXBYTECLK | RESETDONETXBYTECLK 0x0: No reset 0x1: Reset done for the TXBYTECLK domain | R | 0 |
| 30 | RESETDONESCPCLK | RESETDONESCPCLK 0x0: No reset 0x1: Reset done for the SCP clock domain | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|----------|
| 29 | RESETDONEPWRCLK | RESETDONEPWRCLK 0x0: No reset 0x1: Reset done for the PWR clock domain | R | 0 |
| 28 | RESETDONETXCLKESC4 | RESETDONETXCLKESC4 0x0: No reset 0x1: Reset done for the TXCLKESC domain for lane 4 | R | 0 |
| 27 | RESETDONETXCLKESC3 | RESETDONETXCLKESC3 0x0: No reset 0x1: Reset done for the TXCLKESC domain for lane 3 | R | 0 |
| 26 | RESETDONETXCLKESC2 | RESETDONETXCLKESC2 0x0: No reset 0x1: Reset done for the TXCLKESC domain for lane 2 | R | 0 |
| 25 | RESETDONETXCLKESC1 | RESETDONETXCLKESC1 0x0: No reset 0x1: Reset done for the TXCLKESC domain for lane 1 | R | 0 |
| 24 | RESETDONETXCLKESC0 | RESETDONETXCLKESC0 0x0: No reset 0x1: Reset done for the TXCLKESC domain for lane 0 | R | 0 |
| 23:0 | RESERVED | Read-Only register. Read returns zero. | R | 0x000000 |

Table 10-622. Register Call Summary for Register DSI_PHY_REGISTER5

MIPI Display Serial Interface

- [Reset-Done Bits: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [DSI_PHY Register Summary: \[7\] \[8\]](#)

10.3.6.4 DSI_PLLCTRL Registers

10.3.6.4.1 DSI_PLLCTRL Register Summary

Table 10-623. DSI1_PLLCTRL Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DSI1_PLLCTRL L3 Physical Address | DSI1_PLLCTRL L4_PER Physical Address |
|--|------|-----------------------|----------------|----------------------------------|--------------------------------------|
| DSI_PLL_CONTROL | RW | 32 | 0x0000 0000 | 0x5800 4300 | 0x4804 4300 |
| DSI_PLL_STATUS | R | 32 | 0x0000 0004 | 0x5800 4304 | 0x4804 4304 |
| DSI_PLL_GO | RW | 32 | 0x0000 0008 | 0x5800 4308 | 0x4804 4308 |
| DSI_PLL_CONFIGURATION1 | RW | 32 | 0x0000 000C | 0x5800 430C | 0x4804 430C |
| DSI_PLL_CONFIGURATION2 | RW | 32 | 0x0000 0010 | 0x5800 4310 | 0x4804 4310 |
| DSI_PLL_CONFIGURATION3 | RW | 32 | 0x0000 0014 | 0x5800 4314 | 0x4804 4314 |
| DSI_PLL_SSC_CONFIGURATION1 | RW | 32 | 0x0000 0018 | 0x5800 4318 | 0x4804 4318 |
| DSI_PLL_SSC_CONFIGURATION2 | RW | 32 | 0x0000 001C | 0x5800 431C | 0x4804 431C |
| DSI_PLL_CONFIGURATION4 | RW | 32 | 0x0000 0020 | 0x5800 4320 | 0x4804 4320 |

Table 10-624. DSI2_PLLCTRL Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DSI2_PLLCTRL L3 Physical Address | DSI2_PLLCTRL L4_PER Physical Address |
|--|------|-----------------------|----------------|----------------------------------|--------------------------------------|
| DSI_PLL_CONTROL | RW | 32 | 0x0000 0000 | 0x5800 5300 | 0x4804 5300 |
| DSI_PLL_STATUS | R | 32 | 0x0000 0004 | 0x5800 5304 | 0x4804 5304 |
| DSI_PLL_GO | RW | 32 | 0x0000 0008 | 0x5800 5308 | 0x4804 5308 |
| DSI_PLL_CONFIGURATION1 | RW | 32 | 0x0000 000C | 0x5800 530C | 0x4804 530C |
| DSI_PLL_CONFIGURATION2 | RW | 32 | 0x0000 0010 | 0x5800 5310 | 0x4804 5310 |
| DSI_PLL_CONFIGURATION3 | RW | 32 | 0x0000 0014 | 0x5800 5314 | 0x4804 5314 |
| DSI_PLL_SSC_CONFIGURATION1 | RW | 32 | 0x0000 0018 | 0x5800 5318 | 0x4804 5318 |
| DSI_PLL_SSC_CONFIGURATION2 | RW | 32 | 0x0000 001C | 0x5800 531C | 0x4804 531C |
| DSI_PLL_CONFIGURATION4 | RW | 32 | 0x0000 0020 | 0x5800 5320 | 0x4804 5320 |

10.3.6.4.2 DSI_PLLCTRL Register Description**Table 10-625. DSI_PLL_CONTROL**

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x5800 4300 0x4804 4300 0x5800 5300 0x4804 5300 | Instance | DSI1_PLLCTRL_L3 DSI1_PLLCTRL_PER_L4 DSI2_PLLCTRL_L3 DSI2_PLLCTRL_PER_L4 |
| Description | This register controls the PLL reset/power and modes | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------------|--------------|--------------|--------------|--------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | HSDIV_SYSRESET | PLL_SYSRESET | PLL_HALTMODE | PLL_GATEMODE | PLL_AUTOMODE |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-----------|
| 31:5 | RESERVED | Reads as zero. | R | 0x0000000 |
| 4 | HSDIV_SYSRESET | Force HSDIVIDER SYSRESET 0x0: HSDIVIDER SYSRESET controlled by power FSM 0x1: HSDIVIDER SYSRESET forced active | RW | 0 |
| 3 | PLL_SYSRESET | Force DSI PLL SYSRESET 0x0: PLL SYSRESET controlled by power FSM 0x1: PLL SYSRESET forced active | RW | 0 |
| 2 | PLL_HALTMODE | Allow PLL to be halted if no activity. Reserved when DSI1_PLLCTRL_AUTO is 0. 0x0: PLL will not be halted 0x1: PLL will be halted based on activity | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------|
| 1 | PLL_GATEMODE | Allow PLL clock gating for power saving Reserved when DSI1_PLLCTRL_AUTO is 0. 0x0: CLKIN4DDR clock on 0x1: CLKIN4DDR clock gated by DSI Protocol Engine activity | RW | 0 |
| 0 | PLL_AUTOMODE | Automatic update mode. If this bit is set then the configuration updates will be synchronised to DISPCUpdateSync. If this bit is clear configuration updates will be done immediately. Reserved when DSI1_PLLCTRL_AUTO is 0. 0x0: Manual mode 0x1: Automatic mode | RW | 0 |

Table 10-626. Register Call Summary for Register DSI_PLL_CONTROL

MIPI Display Serial Interface

- [DSI PLL Clock-Gating Sequence: \[0\]](#)
- [DSI PLL Go Sequence: \[1\] \[2\] \[3\] \[4\]](#)
- [DSI PLL Recommended Values: \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[10\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[11\]](#)
- [DSI_PLLCTRL Register Summary: \[12\] \[13\]](#)

Table 10-627. DSI_PLL_STATUS

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0004 | Instance | DSI1_PLLCTRL_L3 DSI1_PLLCTRL_PER_L4 DSI2_PLLCTRL_L3 DSI2_PLLCTRL_PER_L4 |
| Physical Address | 0x5800 4304 0x4804 4304 0x5800 5304 0x4804 5304 | | |
| Description | This register contains the status information | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|--------------|----------|------------|--------------|--------------|------------|----------------|----------|-------------|-----------|----------|-------------------------|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | SSC_EN_ACK | M7_CLOCK_ACK | RESERVED | BYPASSACKZ | M5_CLOCK_ACK | M4_CLOCK_ACK | PLL_BYPASS | PLL_HIGHJITTER | PLL_LIMP | PLL_LOSSREF | PLL_RECAL | PLL_LOCK | DSI1_PLLCTRL_RESET_DONE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | Reads as zero. | R | 0x00000 |
| 12 | SSC_EN_ACK | Spread Spectrum Clocking acknowledge Read 0x0: Spread Spectrum Clocking inactive Read 0x1: Spread Spectrum Clocking active | R | 0 |

MIPI Display Serial Interface

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------|
| 11 | M7_CLOCK_ACK | Acknowledge for enable of clock Verify the status before selecting this source in the clock mux Read 0x0: M7 clock inactive Read 0x1: M7 clock active | R | 0 |
| 10 | RESERVED | Reserved | R | 0 |
| 9 | BYPASSACKZ | State of bypass mode on PHY and HSDIVIDER Read 0x0: DSI_PHY and HSDIVIDER have switched to using the bypass clocks. Read 0x1: PLL outputs are still being used by DSI_PHY or HSDIVIDER | R | 0 |
| 8 | M5_CLOCK_ACK | Acknowledge for enable of DSI Protocol Engine clock Verify the status before selecting this source in the DSI Protocol Engine clock mux Read 0x0: M5 Protocol Engine clock inactive Read 0x1: M5 Protocol Engine clock active | R | 0 |
| 7 | M4_CLOCK_ACK | Acknowledge for enable of clock Verify the status before selecting this source in the clock mux Read 0x0: M4 clock inactive Read 0x1: M4 clock active | R | 0 |
| 6 | PLL_BYPASS | DSI PLL Bypass status Read 0x0: PLL not bypassing Read 0x1: PLL bypass | R | 0 |
| 5 | PLL_HIGHJITTER | PLL High Jitter status Read 0x0: PLL in normal jitter condition Read 0x1: PLL in high jitter condition: Phase error 24% | R | 0 |
| 4 | PLL_LIMP | PLL Limp status Read 0x0: LIMP mode inactive Read 0x1: LIMP mode active | R | 0 |
| 3 | PLL_LOSSREF | PLL Reference Loss status Read 0x0: Reference input active Read 0x1: Reference input inactive | R | 0 |
| 2 | PLL_RECAL | PLL recalibration status If this bit is active, the PLL needs to be recalibrated Read 0x0: Recalibration is not required Read 0x1: Recalibration is required | R | 0 |
| 1 | PLL_LOCK | PLL Lock status See the programming guide for the use of this bit Read 0x0: PLL is not locked Read 0x1: PLL is locked | R | 0 |
| 0 | DSI1_PLLCTRL_RESET_DONE | DSI1_PLLCTRL reset done status Read 0x0: Reset is in progress Read 0x1: Reset has completed | R | 0 |

Table 10-628. Register Call Summary for Register DSI_PLL_STATUS

MIPI Display Serial Interface

- [DSI PLL Controllers Architecture: \[0\]](#)
- [Error Handling: \[1\] \[2\] \[3\] \[4\]](#)
- [Software Reset: \[5\]](#)
- [DSI PLL Clock-Gating Sequence: \[6\]](#)
- [DSI PLL Clock Sequence: \[7\]](#)
- [DSI PLL Go Sequence: \[8\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[9\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[10\]](#)
- [DSI_PLLCTRL Register Summary: \[11\] \[12\]](#)

Table 10-629. DSI_PLL_GO

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0008 | | |
| Physical Address | 0x5800 4308 0x4804 4308 0x5800 5308 0x4804 5308 | Instance | DSI1_PLLCTRL_L3 DSI1_PLLCTRL_PER_L4 DSI2_PLLCTRL_L3 DSI2_PLLCTRL_PER_L4 |
| Description | This register contains the GO bit | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PLL_GO | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved. Write only zero for future compatibility. Reads return zero. | R | 0x0000 0000 |
| 0 | PLL_GO | Request (re-)locking sequence of the PLL. If the AutoMode bit is set, then this will be deferred until DISPCUpdate Sync goes active 0x0: No pending action 0x1: Request PLL (re-)locking/locking pending | RW | 0 |

Table 10-630. Register Call Summary for Register DSI_PLL_GO

MIPI Display Serial Interface

- [DSI PLL Clock-Gating Sequence: \[0\] \[1\]](#)
- [DSI PLL Clock Sequence: \[2\]](#)
- [DSI PLL Go Sequence: \[3\] \[4\]](#)
- [DSI PLL Recommended Values: \[5\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[6\] \[7\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[8\] \[9\]](#)
- [DSI_PLLCTRL Register Summary: \[10\] \[11\]](#)

Table 10-631. DSI_PLL_CONFIGURATION1

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 000C | | |
| Physical Address | 0x5800 430C 0x4804 430C 0x5800 530C 0x4804 530C | Instance | DSI1_PLLCTRL_L3 DSI1_PLLCTRL_PER_L4 DSI2_PLLCTRL_L3 DSI2_PLLCTRL_PER_L4 |
| Description | This register contains the latched PLL and HSDIVDER configuration bits | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|--------------|----|----|----|----|--------------|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----|---|----------|---|---|---|---|---|---|---|--------------|
| RESERVED | M5_CLOCK_DIV | | | | | M4_CLOCK_DIV | | | | | PLL_REGM | | | | | | | | | | | | PLL_REGN | | | | | | | | PLL_STOPMODE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|-------|
| 31 | RESERVED | | R | 0 |
| 30:26 | M5_CLOCK_DIV | Divider value for Protocol Engine clock source M5REG | RW | 0x00 |
| 25:21 | M4_CLOCK_DIV | Divider value for clock source M4REG | RW | 0x00 |
| 20:9 | PLL_REGM | M Divider for PLL | RW | 0x000 |
| 8:1 | PLL_REGN | N Divider for PLL (Reference) Note: As a result of device-specific integration, the 8th MSB of this field has no effect; thus, the divider factor can be 0 to 127. | RW | 0x00 |
| 0 | PLL_STOPMODE | PLL STOPMODE 0x0: STOPMODE is not selected 0x1: STOPMODE is selected | RW | 0 |

Table 10-632. Register Call Summary for Register DSI_PLL_CONFIGURATION1

MIPI Display Serial Interface

- [DSI PLL Controllers Architecture: \[0\] \[1\]](#)
- [DSI PLL Operations: \[2\] \[3\] \[4\]](#)
- [DSI PLL Clock Sequence: \[5\] \[6\] \[7\] \[8\]](#)
- [DSI PLL Recommended Values: \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [DSI_PLLCTRL Register Summary: \[24\] \[25\]](#)

Table 10-633. DSI_PLL_CONFIGURATION2

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0010 | Instance | DSI1_PLLCTRL_L3 DSI1_PLLCTRL_PER_L4 DSI2_PLLCTRL_L3 DSI2_PLLCTRL_PER_L4 |
| Physical Address | 0x5800 4310 0x4804 4310 0x5800 5310 0x4804 5310 | | |
| Description | This register contains the unlatched PLL and HSDIVDER configuration bits These bits are "shadowed" when automatic mode is selected | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|-------|
| 31:27 | RESERVED | Read as zero. | R | 0x00 |
| 26 | M7_CLOCK_PWDN | Power down for M7 clock source 0x0: M7 clock divider is active 0x1: M7 clock divider is powered-down | RW | 0 |
| 25 | M7_CLOCK_EN | Enable for M7 clock source 0x0: M7 clock divider is disbled 0x1: M7 clock divider is enabled | RW | 0 |
| 24 | RESERVED | Reserved | R | 0 |
| 23 | RESERVED | Reserved | R | 0 |
| 22:21 | RESERVED | Reserved | R | 0x0 |
| 20 | HSDIVBYPASS | Forces HSDIVIDER to bypass mode 0x0: HSDIVIDER in normal operation. Bypass controlled by PLL. 0x1: HSDIVIDER forced to bypass mode. | RW | 0 |
| 19 | M5_CLOCK_PWDN | Power down for Protocol Engine clock source 0x0: DSI Protocol Engine clock divider is active 0x1: DSI Protocol Engine clock divider is powered-down | RW | 0 |
| 18 | M5_CLOCK_EN | Enable for Protocol Engine clock source 0x0: DSI Protocol Engine clock divider is disabled 0x1: DSI Protocol Engine clock divider is enabled | RW | 0 |
| 17 | M4_CLOCK_PWDN | Power down for M4 clock source 0x0: clock divider is active 0x1: clock divider is powered-down | RW | 0 |
| 16 | M4_CLOCK_EN | Enable for M4 clock source 0x0: clock divider is disabled 0x1: clock divider is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-------|
| 15 | BYPASSEN | Selects functional clock as CLKIN4DDR clock source 0x0: PLL controls CLKIN4DDR clock source: PLL DCO if PLL is locked functional clock if not locked 0x1: Force functional clock to be used as CLKIN4DDR clock source | RW | 0 |
| 14 | PHY_CLKINEN | CLKIN4DDR clock control 0x0: CLKIN4DDR clock is disabled 0x1: CLKIN4DDR clock is enabled | RW | 0 |
| 13 | PLL_REFEN | PLL reference clock control 0x0: PLL reference clock disabled 0x1: PLL reference clock enabled | RW | 0 |
| 12 | RESERVED | Reserved. Keep at reset value. | R | 0 |
| 11 | RESERVED | Reserved. Keep at reset value. | R | 0 |
| 10:9 | PLL_LOCKSEL | Selects the lock criteria for the PLL 0x0: Phase Lock 0x1: Frequency Lock 0x2: Spare | RW | 0x0 |
| 8 | PLL_DRIFTGUARDEN | PLL DRIFTGUARDEN 0x0: Only RECAL flag is asserted in case of temperature drift. The programmer should take appropriate action. 0x1: Temperature drift will initiate automatic recalibration. RECAL flag will be asserted while this is taking place. | RW | 0 |
| 7 | RESERVED | | R | 0 |
| 6 | PLL_LOWCURRSTBY | PLL LOW CURRENT STANDBY 0x0: LOWCURRSTBY is not selected 0x1: LOWCURRSTBY is selected | RW | 0 |
| 5 | PLL_PLLPMODE | Select the power / performance of the PLL 0x0: Full performance, minimised jitter 0x1: Reduced power, increased jitter | RW | 0 |
| 4 | RESERVED | Reads return zero. | R | 0 |
| 3:1 | RESERVED | Reserved | R | 0 |
| 0 | PLL_IDLE | PLL IDLE: 0x0: IDLE is not selected 0x1: IDLE is selected | RW | 0 |

Table 10-634. Register Call Summary for Register DSI_PLL_CONFIGURATION2

MIPI Display Serial Interface

- [DSI Clock Configuration: \[0\]](#)
- [DSI PLL Controllers Architecture: \[1\]](#)
- [DSI PLL Operations: \[2\] \[3\]](#)
- [DSI PLL Clock-Gating Sequence: \[4\]](#)
- [DSI PLL Clock Sequence: \[5\]](#)
- [DSI PLL Go Sequence: \[6\] \[7\] \[8\] \[9\]](#)
- [DSI PLL Recommended Values: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\]](#)
- [Display Timing Configuration: \[23\]](#)
- [DSI Video Mode Using the DISPC Video Port: \[24\] \[25\] \[26\] \[27\]](#)
- [DSI Command Mode Using the DISPC Video Port: \[28\] \[29\] \[30\] \[31\]](#)
- [DSI_PLLCTRL Register Summary: \[32\] \[33\]](#)

Table 10-635. DSI_PLL_CONFIGURATION3

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0014 | | |
| Physical Address | 0x5800 4314 0x4804 4314 0x5800 5314 0x4804 5314 | Instance | DSI1_PLLCTRL_L3 DSI1_PLLCTRL_PER_L4 DSI2_PLLCTRL_L3 DSI2_PLLCTRL_PER_L4 |
| Description | HSDIVIDER configuration bits for the M5 and M6 dividers | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|--------------|----|----|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | M7_CLOCK_DIV | | | | RESERVED | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|-------------------------------|------|--------|
| 31:18 | RESERVED | Reserved | R | 0x0000 |
| 17:10 | RESERVED | Reserved | R | 0x000 |
| 9:5 | M7_CLOCK_DIV | Divider value for M7 divider. | RW | 0x00 |
| 4:0 | RESERVED | Reserved | R | 0x00 |

Table 10-636. Register Call Summary for Register DSI_PLL_CONFIGURATION3

MIPI Display Serial Interface

- [DSI PLL Clock Sequence: \[0\]](#)
- [DSI_PLLCTRL Register Summary: \[1\] \[2\]](#)

Table 10-637. DSI_PLL_SSC_CONFIGURATION1

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0018 | | |
| Physical Address | 0x5800 4318 0x4804 4318 0x5800 5318 0x4804 5318 | Instance | DSI1_PLLCTRL_L3 DSI1_PLLCTRL_PER_L4 DSI2_PLLCTRL_L3 DSI2_PLLCTRL_PER_L4 |
| Description | Configuration for PLL Spread Spectrum Clocking modulation | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------------|----------|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DOWNSPREAD | RESERVED | EN_SSC |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | RESERVED | R | 0x0000 0000 |
| 2 | DOWNSPREAD | Forces the clock spreading only in the down spectrum. 0x0: Clock spreading not forced. 0x1: Spectrum spreading only in down direction. | RW | 0 |
| 1 | RESERVED | Reserved. Reads return 0. | R | 0 |
| 0 | EN_SSC | Spread Spectrum Clocking enable 0x0: Spread Spectrum Clocking disabled 0x1: Spread Spectrum Clocking enabled | RW | 0 |

Table 10-638. Register Call Summary for Register DSI_PLL_SSC_CONFIGURATION1

MIPI Display Serial Interface

- [DSI PLL Controllers Architecture: \[0\] \[1\] \[2\]](#)
- [DSI_PLLCTRL Register Summary: \[3\] \[4\]](#)

Table 10-639. DSI_PLL_SSC_CONFIGURATION2

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 001C | Instance | DSI1_PLLCTRL_L3 DSI1_PLLCTRL_PER_L4 DSI2_PLLCTRL_L3 DSI2_PLLCTRL_PER_L4 |
| Physical Address | 0x5800 431C 0x4804 431C 0x5800 531C 0x4804 531C | | |
| Description | Configuration for PLL Spread Spectrum Clocking modulation | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----------------|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | MODFREQDIVIDER | | | | | | | | | | | DELTAM | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|---------|
| 31:30 | RESERVED | Reads as zero | R | 0x0 |
| 29:20 | MODFREQDIVIDER | Modulation Frequency Divider (ModFreqDivider) control for SSC The ModFreqDivider is split into Mantissa and 2^{Exponent} ($\text{ModFreqDivider} = \text{ModFreqDividerMantissa} * 2^{\text{ModFreqDividerExponent}}$). Bits [29:23] define the Mantissa. Bits [22:20] define the Exponent. | RW | 0x000 |
| 19:0 | DELTAM | DeltaM control for SSC. Split into integer and fractional parts. Bits [19:18] define the integer part. Bits [17:0] define the fractional part. | RW | 0x00000 |

Table 10-640. Register Call Summary for Register DSI_PLL_SSC_CONFIGURATION2

MIPI Display Serial Interface

- [DSI PLL Controllers Architecture: \[0\] \[1\]](#)
- [DSI_PLLCTRL Register Summary: \[2\] \[3\]](#)

Table 10-641. DSI_PLL_CONFIGURATION4

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0020 | Instance | DSI1_PLLCTRL_L3 DSI1_PLLCTRL_PER_L4 DSI2_PLLCTRL_L3 DSI2_PLLCTRL_PER_L4 |
| Physical Address | 0x5800 4320 0x4804 4320 0x5800 5320 0x4804 5320 | | |
| Description | Allows setting the fractional M divider for PLL. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | PLL REGM F | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------------|------|---------|
| 31:18 | RESERVED | Reads as zero. | R | 0x0000 |
| 17:0 | PLL_REGM_F | Fractional part of M divider. | RW | 0x00000 |

Table 10-642. Register Call Summary for Register DSI_PLL_CONFIGURATION4

MIPI Display Serial Interface

- [DSI PLL Controllers Architecture: \[0\]](#)
- [DSI_PLLCTRL Register Summary: \[1\] \[2\]](#)

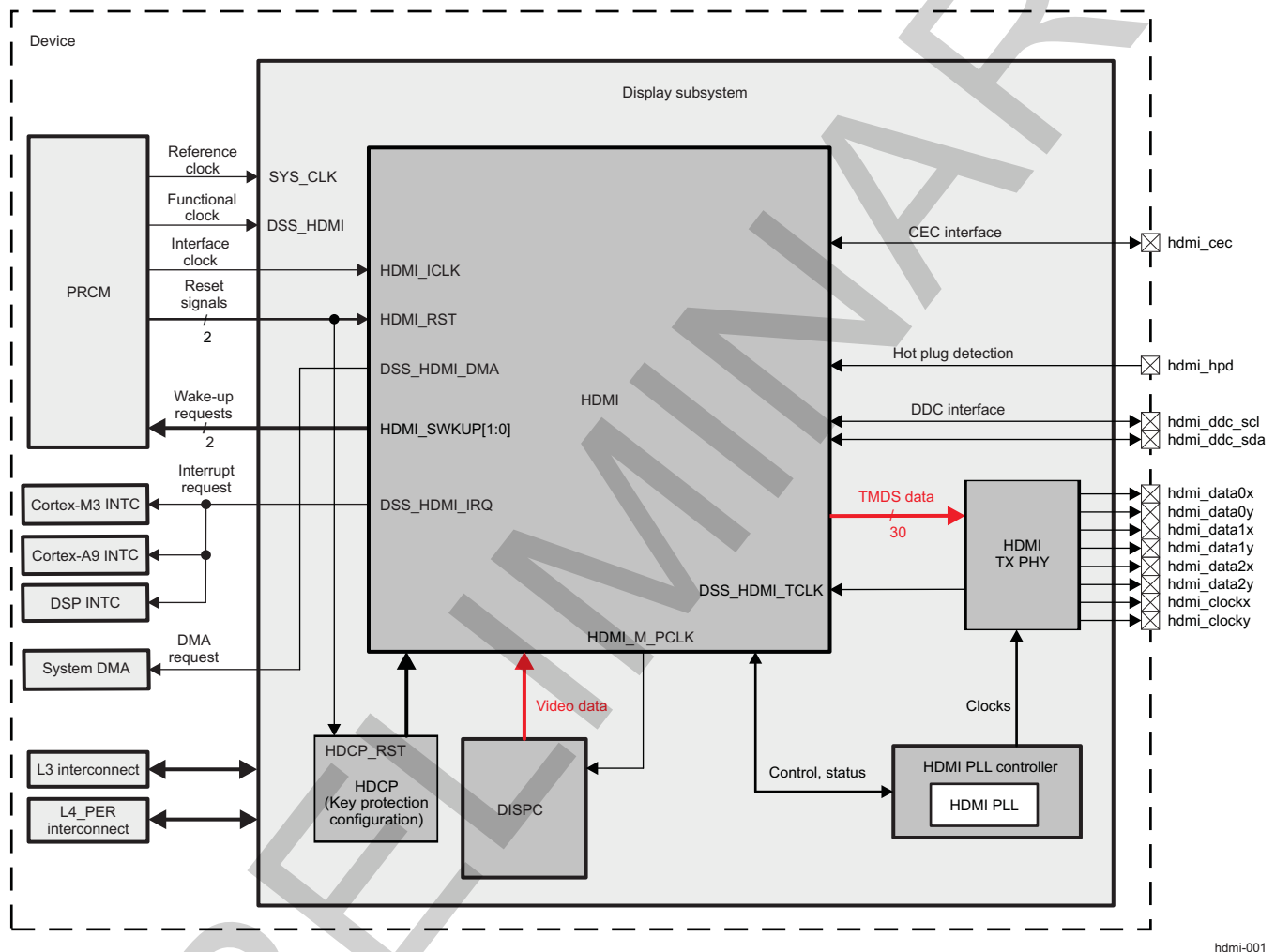
10.4 High-Definition Multimedia Interface

This section introduces the high-definition multimedia interface (HDMI) module. It also describes its main functions and connections in the device.

10.4.1 High-Definition Multimedia Interface (HDMI) Overview

Figure 10-161 shows an overview of the HDMI module.

Figure 10-161. HDMI Overview



hdmi-001

10.4.1.1 HDMI Main Features

The HDMI module provides the following main features:

- HDMI 1.3, HDCP 1.2, and DVI 1.0 compliant
 - Including support for the 3D stereoscopic frame-packing formats of the HDMI v1.4 standard (720p, 50 Hz; 720p, 60 Hz; and 1080p, 24 Hz)
- EIA/CEA-861-D video format support (refer to [Table 10-643](#) for more details)
- VESA DMT video format support (refer to [Table 10-644](#) for more details)
- Support for deep-color mode:
 - 10-bit/component color depth up to 1080p @60Hz
 - 12-bit/component color depth up to 720p/1080i @60Hz
- Supports up to 148.5 MHz pixel clock (1920 x 1080p @60Hz)

- Video formats: 24-bit RGB
- Uncompressed multi-channel (up to 8 channels) audio (L-PCM) support
- Master I2C interface for Display Data Channel (DDC) connection
- Consumer Electronic Control (CEC) interface
- Integrated High-bandwidth Digital Content Protection (HDCP) encryption engine for transmitting protected audio and video content (authentication performed by software)
- Integrated Transition Minimized Differential Signaling (TMDS) and TMDS Error Reduction Coding (TERC4) encoders for data island support
- Integrated TMDS PHY (3 TMDS differential data lanes + TMDS differential clock lane)
 - Up to 1,85625 Gbps per lane at (1080p @60Hz at 10 bits/component, lower resolutions at 12 bits/component)
 - 928,125Mbps per lane at (720p/1080i @60Hz 10 bits/component, lower resolutions at 12 bits/component)
 - 337,5 Mbps at (576p @50Hz/480p @60Hz 10 bits/component)

10.4.1.2 HDMI Video Formats and Timings

10.4.1.2.1 CEA-861-D video formats and timings

Table 10-643 presents the video timings supported by the HDMI module, according to the CEA-861-D standard:

Table 10-643. HDMI Video Timings (CEA-861-D)

| Refresh Rate | Resolution |
|------------------------|--------------|
| 24 Hz (Low field rate) | 1920 x 1080p |
| 50 Hz | 1920 x 1080p |
| | 1920 x 1080i |
| | 1280 x 720p |
| | 2880 x 576p |
| | 1440 x 576p |
| | 1440 x 576i |
| 59.94 Hz | 720 x 576p |
| | 1920 x 1080p |
| | 2880 x 480p |
| | 1440 x 480p |
| | 1440 x 480i |
| | 720 x 480p |
| 60 Hz | 640 x 480p |
| | 1920 x 1080p |
| | 1920 x 1080i |
| | 2880 x 480p |
| | 1280 x 720p |
| | 1440 x 480p |
| | 1440 x 480i |
| | 720 x 480p |
| | 640 x 480p |

10.4.1.2.2 VESA DMT video formats and timings

Table 10-644 presents the video timings supported by the HDMI module, according to the VESA DMT standard:

Table 10-644. HDMI Video timings (VESA DMT)

| Refresh Rate | Resolution |
|--------------------------|--------------|
| 60 Hz | 640 x 480p |
| | 800 x 600p |
| | 848 x 480p |
| | 1024 x 768p |
| | 1280 x 768p |
| | 1280 x 800p |
| | 1280 x 960p |
| | 1280 x 1024p |
| | 1360 x 768p |
| | 1366 x 768p |
| | 1400 x 1050p |
| | 1440 x 900p |
| | 1680 x 1050p |
| | 1920 x 1080p |
| 60 Hz (Reduced Blanking) | 1280 x 768p |
| | 1280 x 800p |
| | 1400 x 1050p |
| | 1440 x 900p |
| | 1680 x 1050p |

10.5 Remote Frame Buffer Interface

This section describes the remote frame buffer interface (RFBI).

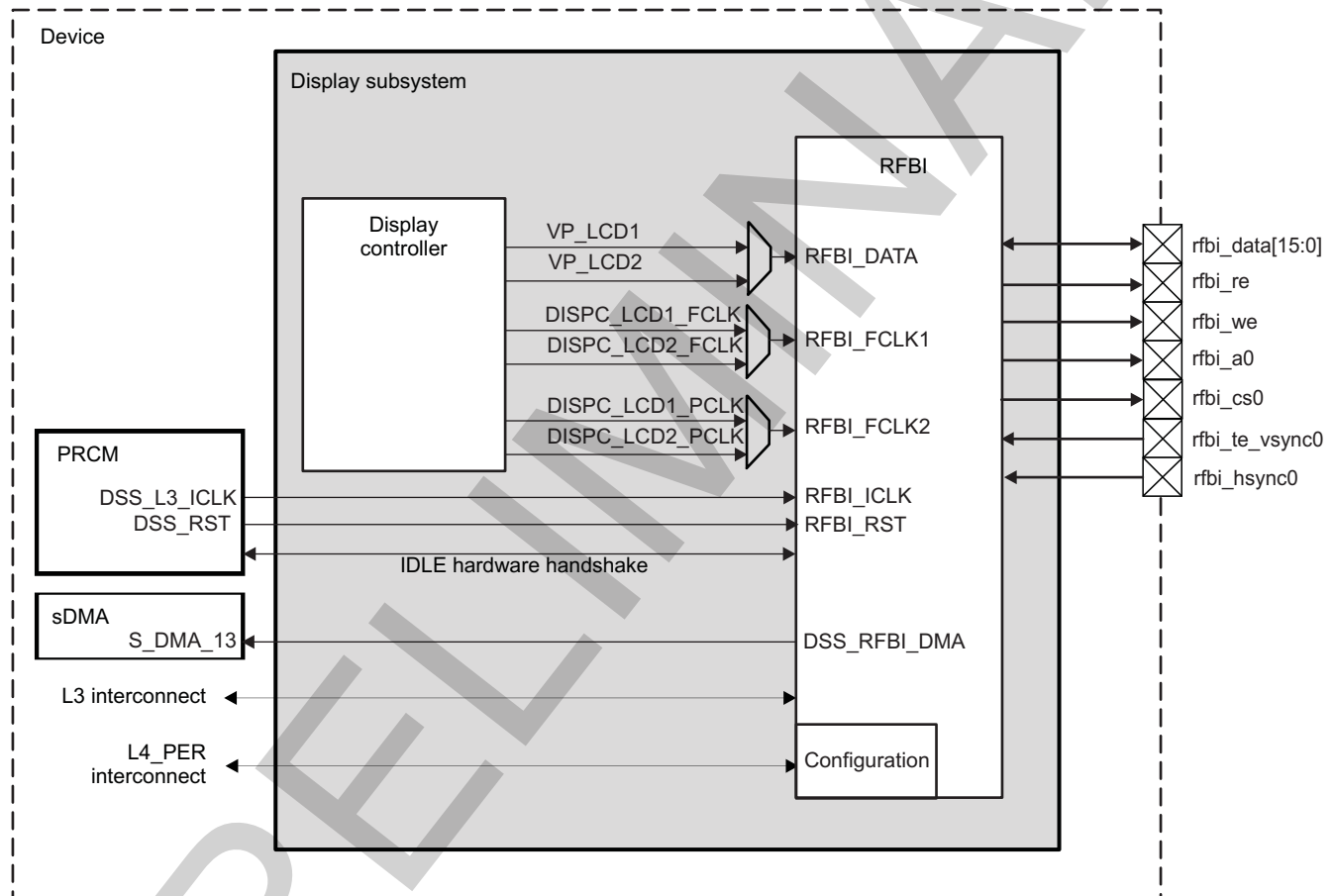
10.5.1 Remote Frame Buffer Interface Overview

The RFBI module is part of the display subsystem that provides the logic to display a picture from the memory frame buffer (SDRAM or SRAM) on a LCD panel.

The RFBI is connected to the L3 and L4_PER interconnect through the display subsystem local interconnect. It is preferred from a performance point of view to use the L4_PER interconnect for configuration and the L3 interconnect for data transfer.

Figure 10-162 shows an overview of the RFBI.

Figure 10-162. RFBI Highlight



rfbi-001

The RFBI supports the MIPI DBI protocol with the following features:

- Access to RFB direct MPU interface
 - Sends commands to the RFB panel through the slave port interconnect
 - Sends data, received from the DISPC or from the MPU through the DISPC pixel data bus, to the RFB panel
 - Reads data/status from the RFB to the slave port interconnect
- RFB interface
 - 8-/9-/16-bit parallel interface
 - One programmable configuration for one LCD connected to the RFBI
- Data formats

- Programmable pixel modes (12-/16-/18-/24-BPP modes in RGB format)
- Programmable output formats on one/multiple cycles per pixel (data from the DISPC and the L3 interconnect)
- FIFO
 - One slave port with DMA request and interconnect FIFO of 24×32 -bit depth (for write access to the [RFBI_DATA](#) register only)
 - One video port FIFO of 8×24 -bit depth receiving data from the DISPC through [RFBI_DATA](#)

10.5.2 RFBI Environment

In the display subsystem, data are read by the DISPC from the memory frame buffer (SDRAM, SRAM, IVA-HD SL2, etc.), and sent through the RFBI to the external LCD/RFB.

The DISPC associated with the RFBI implements the MIPI DBI protocol.

The DISPC provides the required control signals to interface the memory frame buffer (SDRAM, SRAM or IVAHD-SL2) directly to the external displays. The RFBI is connected to the memory through the L3 interconnect and has its own DMA (with embedded FIFOs) to read data from the system memory. There is one master port (L3 interconnect) and two slave ports (one for L4_PER interconnect and the other for L3 interconnect).

The DISPC_CONTROL1[16] GPOUT[1] and DISPC_CONTROL1[15] GPOUT[0] bits control selection of the display subsystem modules (see [Table 10-645](#)).

Table 10-645. I/O Pad Mode Selection

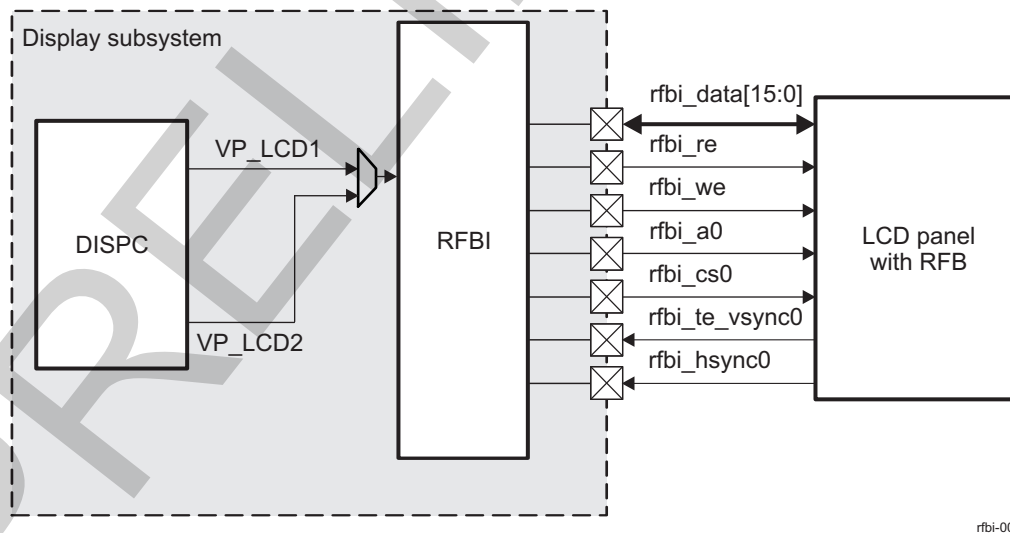
| DSS.DISPC_CONTROL[16] GPOUT1 | DSS.DISPC_CONTROL[15] GPOUT0 | Mode |
|------------------------------|------------------------------|-------------|
| 0 | 0 | Reset |
| 0 | 1 | RFBI mode |
| 1 | 0 | Invalid |
| 1 | 1 | Bypass mode |

The RFB of the LCD panel is directly connected to the RFBI of the device. The RFBI controls the reads/writes from/to the RFB. The RFBI receives data from its slave port or output from the DISPC and generates the signals to control the LCD panel. Through the RFBI, the MPU can send commands or parameter/display data to the LCD panel and directly set the DISPC registers to read/write data from/to the memory in the LCD panel. The RFBI can manage only one LCD panel.

10.5.2.1 RFBI Parallel Interface (MIPI DBI Protocol)

[Figure 10-163](#) shows the LCD support parallel interface in RFBI mode.

Figure 10-163. RFBI LCD Support Interface



[Table 10-646](#) describes the interface signals to/from the LCD panel.

Table 10-646. LCD Interface Signals

| Signal Name | Type ⁽¹⁾ | Description |
|-----------------|---------------------|---------------|
| rfbi_data[15:0] | I/O | RFBI I/O data |

⁽¹⁾ I = Input; O = Output; I/O = Input/Output

Table 10-646. LCD Interface Signals (continued)

| Signal Name | Type ⁽¹⁾ | Description |
|----------------|---------------------|--|
| rfbi_re | O | Read access signal |
| rfbi_we | O | Write access signal |
| rfbi_a0 | O | Command/data selection signal |
| rfbi_cs0 | O | Chip-select (CS) signal for LCD 1 |
| rfbi_te_vsync0 | I | Tearing effect (TE) synchronization signal (TE or VSYNC for LCD panel 1) |
| rfbi_hsync0 | I | HSYNC from LCD panel 1 |

- **rfbi_data[15:0]:** The pixel data comprises the RFBI pixel data (bits 15:0). A write/read command must be sent to the LCD panel to send/read the data.
Before any data access, the application must send commands and parameters when it is necessary to configure an LCD panel. The data is used as input in read operations during production test and also to read the status of the registers in the LCD panel and pixels from the embedded frame buffer in the LCD panel.
- **rfbi_re:** This is the read-enable signal used to indicate when a read from the embedded memory in the LCD panel is ongoing. The RFBI registers describe the behavior of the read signal (off/on/cycle time). The polarity of the read-enable signal is programmable. The read is used to get status/data information from the LCD panel.
- **rfbi_we:** The write-enable signal is used to indicate when a write is ongoing. The RFBI registers allow flexible behavior of the write signal (programmable off/on/cycle times and signal polarity).
- **rfbi_a0:** The signal is asserted to indicate its status: Command or data. The polarity is programmable and the status of the signal depends on the RFBI registers written by the application (CMD/READ/STATUS/PARAM/PIXEL). The register in use by the hardware defines the status of **rfbi_a0**. The order of the writes/reads to the RFBI registers CMD/READ/STATUS/PARAM/PIXEL defines the transitions of A0.
- **rfbi_cs0:** The signal is the chip-select (CS0) asserted to indicate which LCD panel is selected and must be ready to receive/transmit commands and data. When RE or WE is on, CS0 must not be changed.
To select the trigger mode, configure the [RFBI_CONFIG\[3:2\]](#) TRIGGERMODE bit field (0x0: Internal trigger mode with the [RFBI_CONTROL\[4\]](#) ITE bit, 0x1: External trigger mode with the TE signal **rfbi_te_vsync0**, 0x2: External trigger mode with the **rfbi_te_vsync0**, and **rfbi_hsync0** signals with the programmable line counter).
- **rfbi_te_vsync0** (only used by RFBI if [RFBI_CONFIG\[3:2\]](#) TRIGGERMODE = 0x1 or 0x2, otherwise ignored): Based on the trigger mode selected, the signal is the TE pulse signal or the LCD panel vertical synchronization (VSYNC) pulse signal. **rfbi_te_vsync0** is used by the TE logic as the synchronization signal to send the pixel to the LCD panel.
- **rfbi_hsync0** (only used by RFBI if [RFBI_CONFIG\[3:2\]](#) TRIGGERMODE = 0x2, otherwise ignored): The HSYNC pulse signals indicate to the RFBI when horizontal synchronization occurs. The polarity of the HSYNC signals is programmable. The minimum pulse width of the signal is two RFBI_ICLK clock cycles. **rfbi_hsync0** is used by the TE logic as a synchronization signal to send the pixel to the LCD panel.

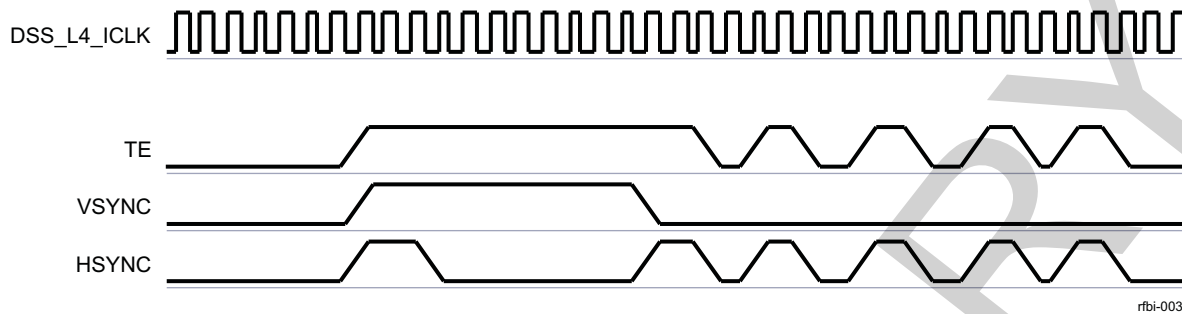
10.5.2.1.1 Description of the Tearing Effect Pulse Signal

The TE signal can be generated externally by the RFBI depending on the value of the [RFBI_CONFIG\[3:2\]](#) TRIGGERMODE bit field:

- TRIGGERMODE = 0x1: external trigger mode with TE signal. TE signal corresponds to **rfbi_te_vsync0** pad.
- TRIGGERMODE = 0x2: external trigger mode with HSYNC/VSYNC signals. HSYNC signal corresponds to **rfbi_hsync0** pad and VSYNC signal to **rfbi_te_vsync0** pad.

The externally generated TE synchronization signal is a logical OR or AND operation between the HSYNC and VSYNC signals (see [Figure 10-164](#)). The logical operation (OR or AND) depends on the HSYNC and VSYNC signals polarity. The VSYNC signal indicates to the RFBI when vertical synchronization occurs; the HSYNC signal indicates to the RFBI when horizontal synchronization occurs.

Figure 10-164. External Generation of TE Signal Based on Logical OR Operation Between HSYNC and VSYNC (Active-High)



- TE signal is connected to rfb_te_vsync0 external pad when the [RFBI_CONFIG\[3:2\] TRIGGERMODE](#) bit field is set to 0x1.
- HSYNC and VSYNC signals are connected to rfb_hsync0 and rfb_te_vsync0, respectively, when the [RFBI_CONFIG\[3:2\] TRIGGERMODE](#) bit field is set to 0x2.

The RFBI module detects the VSYNC and HSYNC pulses embedded in the received signal. VSYNC is detected based on the minimum pulse width defined by the [RFBI_VSYNC_WIDTH](#) register. VSYNC is not triggered by an inactive-to-active edge.

HSYNC is detected based on the minimum pulse width defined by the [RFBI_HSYNC_WIDTH](#) register. HSYNC is not triggered by an inactive-to-active edge.

The signal is generated from external logic based on VSYNC and HSYNC of the LCD panel. The automatic trigger can be programmed based on the external RFBI_TE signal or use the [RFBI_CONTROL\[4\] ITE](#) bit to start data capture (internal trigger mode).

The polarity of the TE signal is programmable in the [RFBI_CONFIG](#) register. HSYNC and VSYNC pulses embedded in the TE signal have the same polarity, which is active high for an ORed signal and active low for an ANDed signal. The minimum pulse width of the signal is two RFBI_ICLK clock cycles. Hardware resets the line counter when VSYNC occurs and increments it at every HSYNC. Transfer to the LCD panel begins when the line counter reaches the programmable line number.

10.5.2.2 Transaction Timing Diagrams

[Table 10-647](#) lists the programmable timing fields. [Figure 10-165](#) through [Figure 10-167](#) show timing diagrams of read/write transactions to the LCD panel for the RFBI. In these figures, the polarity 0 (active low) is used to describe the RFBI_A0, RFBI_CSi, RFBI_RE, and RFBI_WE signals.

Table 10-647. Programmable Timing Fields in RFBI Mode

| Timing Name | Register Field | Description |
|--------------|---|---|
| CSONTime | RFBI_ONOFF_TIME[3:0] CSONTIME bit field | CS assertion time from start access time |
| CSOffTime | RFBI_ONOFF_TIME[9:4] CSOFFTIME bit field | CS deassertion time from start access time |
| WECycleTime | RFBI_CYCLE_TIME[5:0] WECYCLETIME bit field | The time when A0 becomes valid until write cycle completion |
| WEOnTime | RFBI_ONOFF_TIME[13:10] WEONTIME bit field | WE assertion delay time from start access time |
| WEOffTime | RFBI_ONOFF_TIME[19:14] WEOFFTIME bit field | WE deassertion delay time from start access time |
| RECycleTime | RFBI_CYCLE_TIME[11:6] RECYCLETIME bit field | The time when A0 becomes valid until read cycle completion |
| REOnTime | RFBI_ONOFF_TIME[23:20] REONTIME bit field | RE assertion delay time from start access time |
| REOffTime | RFBI_ONOFF_TIME[29:24] REOFFTIME bit field | RE deassertion delay time from start access time |
| CSPulseWidth | RFBI_CYCLE_TIME[17:12] CSPULSEWIDTH bit field | The time when write cycle time or read cycle time completes |

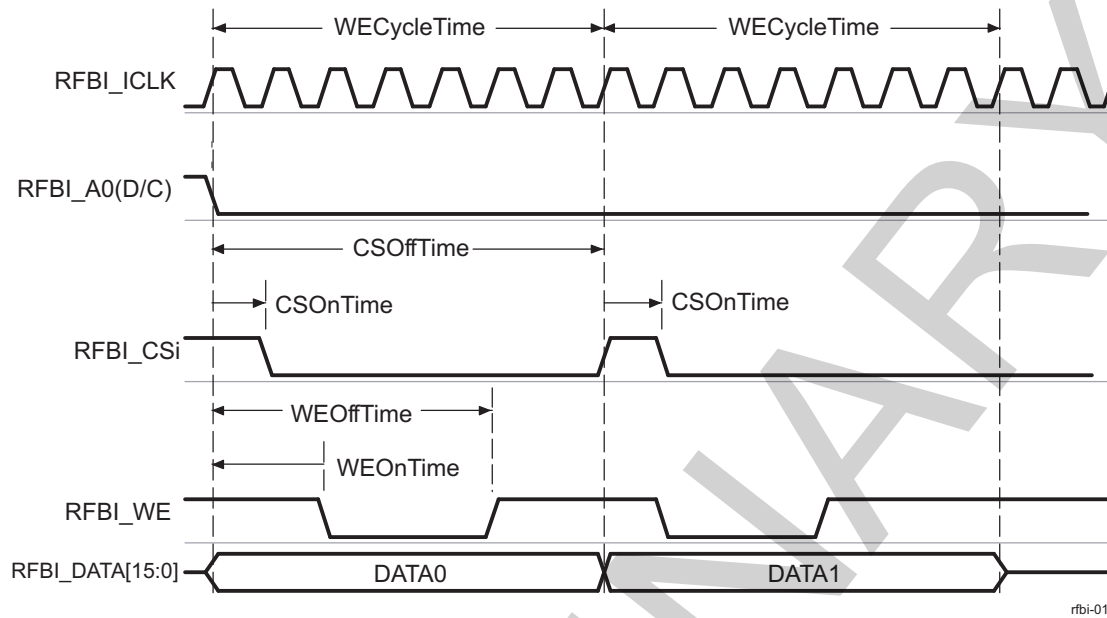
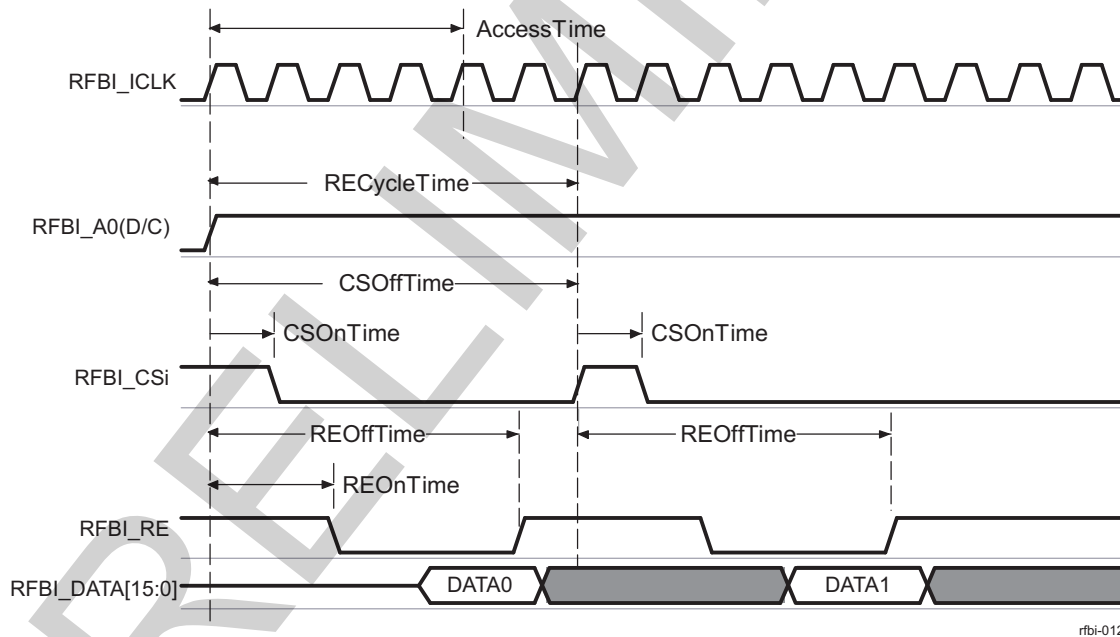
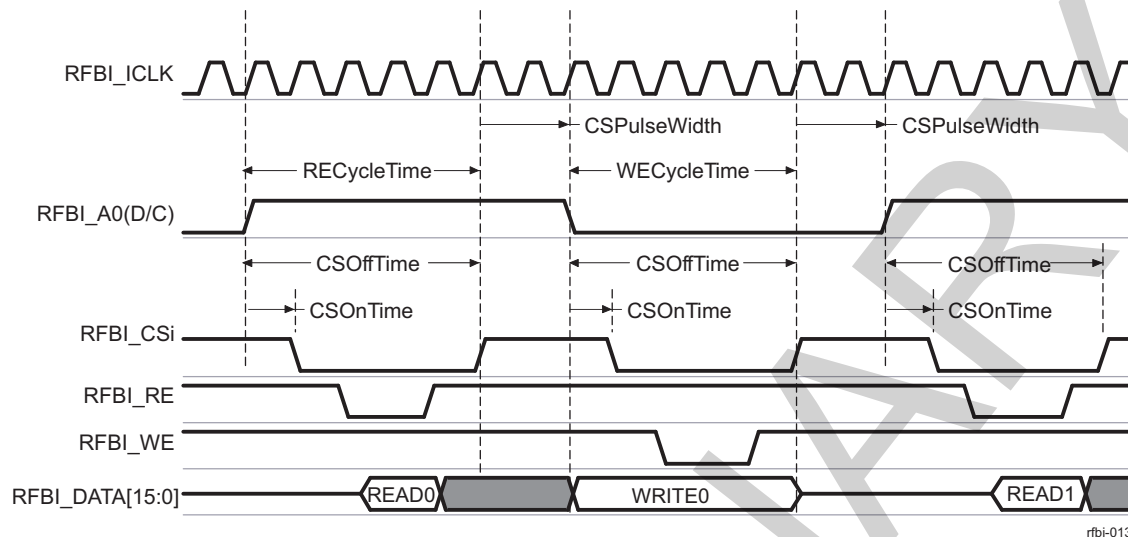
Figure 10-165. Command Data Write**Figure 10-166. Display Data Read**

Figure 10-167. Read to Write and Write to Read

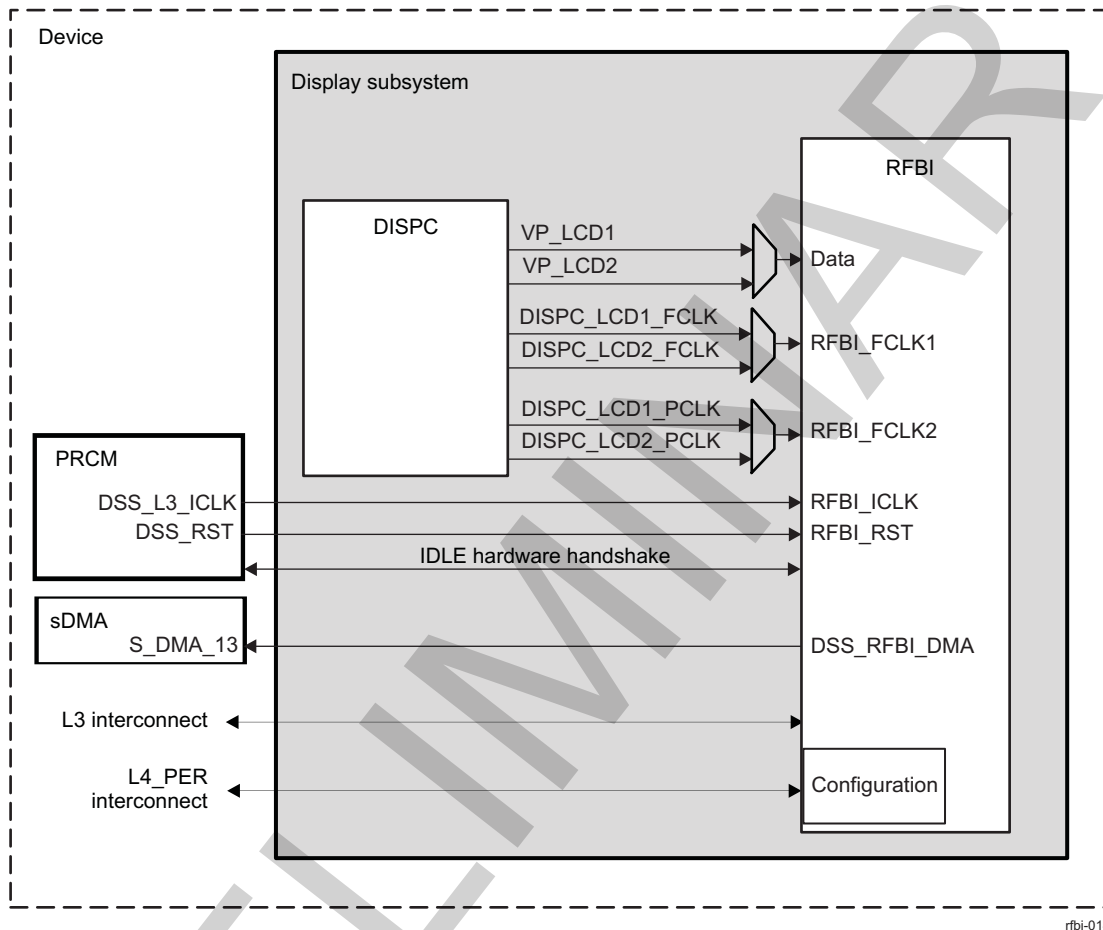


10.5.3 RFBI Integration

This section describes the RFBI integration in the device, including information about clocks, resets, and hardware requests.

Figure 10-168 shows the RFBI module integration.

Figure 10-168. RFBI Integration



NOTE: For more information about the IDLE hardware handshake, see [Section 3.1.1.1.2, Module-Level Clock Management, Chapter 3, Power, Reset, and Clock Management](#).

Table 10-648 through Table 10-650 summarize the integration of the module in the device.

Table 10-648. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| RFBI | PD_DSS | No | L3 L4_PER |

Table 10-649. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| RFBI | RFBI_FCLK1 | DISPC_LCDx_FCLK | DISPC | Logic clock used by the RFBI when capturing data on the video port and for the generation of the RFBI_STALL signal |
| | RFBI_FCLK2 | DISPC_LCDx_PCLK | DISPC | Pixel clock used by the RFBI to capture the pixels |
| | RFBI_ICLK | DSS_L3_ICLK | PRCM | L3 interface clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| RFBI | RFBI_RST | DSS_RST | PRCM | Display subsystem global hardware reset |

NOTE: If video mode is used, the VPn_PCLK and VPn_CLK clocks must be generated using a CLKIN4DDR clock.

Table 10-650. Hardware Requests

| DMA Requests | | | | |
|-----------------|--------------------|-------------------------|-------------|------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| RFBI | DSS_RFBI_DMA | S_DMA_13 | sDMA | RFBI DMA request |

NOTE: For DMA source description, see [Section 10.5.3.1, DMA Requests](#).

10.5.3.1 DMA Requests

All peripherals internal to the device use the transition-sensitive scheme for DMA requests. For more information about the transition-sensitive scheme, see [Chapter 17, sDMA](#).

[Table 10-651](#) describes the RFBI DMA request.

Table 10-651. RFBI DMA Request Description

| DMA | Source | Description | Sensitivity ⁽¹⁾ |
|----------|--------------|--|----------------------------|
| RFBI_DMA | DSS_RFBI_DMA | The DMA request can be used to transfer data using the sDMA T from memory to RFBI interconnect slave FIFO. | T |

⁽¹⁾ T: Transition-sensitive (fixed in hardware) active low request

10.5.4 RFBI Functional Description

This section describes the functions of the RFBI.

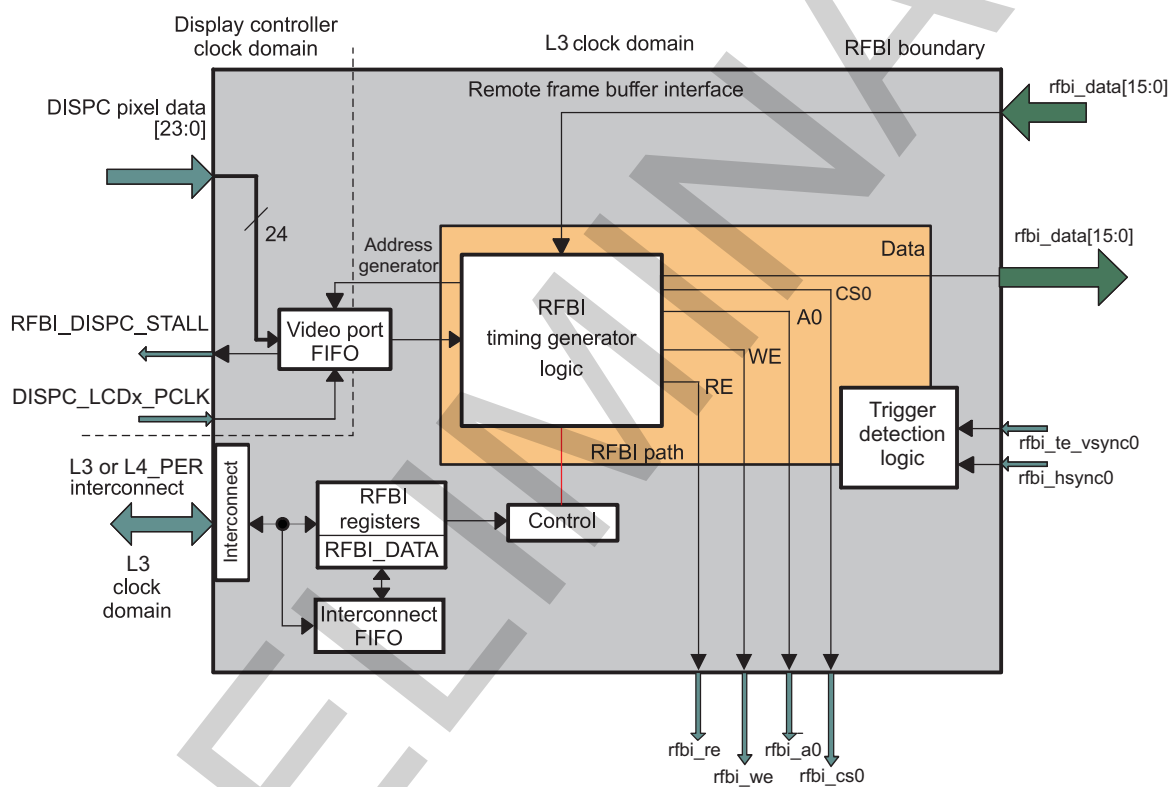
10.5.4.1 Block Diagram

The RFBI can capture the output pixel from the DISPC and send the data to the RFB in the LCD panel. The application configures the RFBI, sends commands, reads data, and configures the DISPC to send data fetched from the system memory by the DISPC DMA engine. The commands/data are sent using an 8-, 9-, or 16-bit parallel interface.

The DISPC is configured to send the data in 12-, 16-, 18-, or 24-BPP format. In the video port FIFO, the encoded pixel values are in an LSB alignment independent of the endianness in system memory.

Figure 10-169 is an overview of the RFBI architecture.

Figure 10-169. RFBI Architecture Overview



rfbi-015

10.5.4.2 Clock Configuration

The RFBI functional clocks (RFB_FCLK1 and RFB_FCLK2) are provided internally to the display subsystem by the DISPC. For more details about the DISPC clocks, see, [Section 10.2 Display Controller](#).

10.5.4.3 Software Reset

To perform a software reset, set the [RFB_SYSCONFIG\[1\] SOFTRESET](#) bit to 1. The [RFB_SYSSTATUS\[0\] RESETDONE](#) bit indicates that the software reset is complete when its value is 1. When the software reset completes, the [RFB_SYSCONFIG\[1\] SOFTRESET](#) bit is automatically reset. Software must ensure that the software reset completes before performing any RFBI operation.

10.5.4.4 Power Management

[Table 10-652](#) describes power-management features available for the RFBI.

NOTE: For information about source clock gating description, see [Section 3.1.1.2, Module-Level Clock Management](#) in [Chapter 3, Power, Reset and Clock Management](#).

Table 10-652. Local Power Management Features

| Feature | Registers | Description |
|------------------------|---|---|
| Clock autogating | RFBI_SYSCONFIG [0] AUTOIDLE bit | This bit allows a local power optimization inside the module by gating functional clocks (RFBI_FCLK1, RFBI_FCLK2) and interface clock (RFBI_ICLK) upon the internal activity. |
| Slave idle modes | RFBI_SYSCONFIG [4:3] SIDLEMODE bit field | Force-idle, no-idle, and smart-idle. For more details, see below. |
| Clock activity | N/A | Feature not available |
| Master standby modes | N/A | Feature not available |
| Global wake-up enable | N/A | Feature not available |
| Wake-up sources enable | N/A | Feature not available |

As shown in [Table 10-652](#), the RFBI supports the No-Idle, Force-idle, and Smart-Idle modes.

The conditions of assertion of the SIdleAck signal are:

- No-idle mode: SIdleAck is never asserted.
- Force-idle mode: SIdleAck is asserted unconditionally after one RFBI_ICLK clock cycle delay with respect to assertion of IdleReq.
- Smart-idle mode: SIdleAck is asserted when the following conditions are satisfied:
 - The RFBI stops using the RFBI_ICLK clock and all the data have been sent to the RFB (LCD panel).

Once SIdleAck signal is asserted:

- The RFBI_ICLK (DSS_L3_ICLK) clock can shutdown at any time.
- Any transaction on the RFBI configuration port is ignored

The conditions of deassertion of the SIdleAck signal are:

- Force-idle mode: In this mode SIdleAck is deasserted after one RFBI_ICLK clock cycle delay with respect to deassertion of IdleReq.
- Smart-idle mode: In this mode SIdleAck is deasserted after one RFBI_ICLK clock cycle delay with respect to deassertion of IdleReq.

Once SIdleAck is released, the RFBI is fully operational (guaranteed only in the case of smart-idle mode).

10.5.4.5 Interrupt Requests

The RFBI does not generate interrupts but the following DISPC interrupts can be enabled depending on which LCD output of DISPC is currently used for connection to the RFBI:

- FRAMEDONE1_IRQ
- PROGRAMMEDLINENUMBER_IRQ
- GFXFIFOUNDERFLOW_IRQ
- GFXENDWINDOW_IRQ
- PALETTEGAMMALOADING_IRQ
- OCPERROR_IRQ
- VID1FIFOUNDERFLOW_IRQ
- VID1ENDWINDOW_IRQ
- VID2FIFOUNDERFLOW_IRQ
- VID2ENDWINDOW_IRQ

- SYNCLOST1_IRQ
- WAKEUP_IRQ
- SYNCLOST2_IRQ
- VID3FIFOUNDERFLOW_IRQ
- VID3ENDWINDOW_IRQ
- FRAMEDONE2_IRQ

NOTE: For more details about DISPC interrupts, see, [Section 10.2 Display Controller](#).
The other DISPC interrupts are not used in the RFBI.

10.5.4.6 DMA Requests

[Table 10-653](#) lists event flags and their mask, that can cause RFBI DMA requests.

Table 10-653. DMA Requests Events

| DMA Request Name | DMA Request Mask | Map to | Description |
|------------------|---|----------|--|
| DSS_RFBI_DMA | RFBI_CONTROL [7] DISABLE_DMA_REQ | S_DMA_XX | DMA request used to transfer data using the sDMA from memory to the RFBI interconnect FIFO |

NOTE: For more details about DMA requests, see [Figure 10-175](#).

10.5.4.7 Video Port FIFO

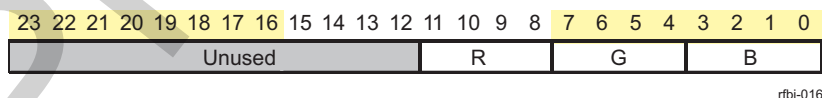
10.5.4.7.1 Description

The input video port FIFO receives data from the DISPC at the pixel clock. The data in the video port FIFO are read by the RFBI and sent to the LCD panel. The video port FIFO is 24 bits wide and each pixel in 12-, 16-, 18-, and 24-BPP format is stored in the video port FIFO using one 24-bit value aligned on the 24-bit LSB. [Section 10.5.4.9, RFBI Output Parallel Modes](#), provides examples of various output configurations based on the interface width (up to 16 bits) and pixel format output (up to 24 bits). Setting the [RFBI_CONTROL](#)[1] RFBIMODE bit to 0 directs the MPU to send commands, parameters, and data from the input video port FIFO.

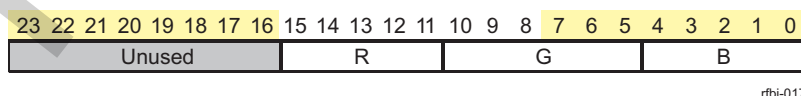
10.5.4.7.2 RFBI Input Formats

The encoded pixel formats supported at the RFBI input interface connected to the DISPC are: RGB12-444, RGB16-565, RGB18-666, and RGB24-888. This input data width is controlled by the [RFBI_CONFIG](#)[6:5] DATATYPE bit field. The following graphics describe the bit representation of each format in the video port FIFO. The output of the DISPC is aligned on the LSB of the interface. The pixels are then formatted in accordance with the configuration of the output interlaces (multiple cycles); for more details, see [Section 10.5.4.9.1, Cycle Mode Selection](#).

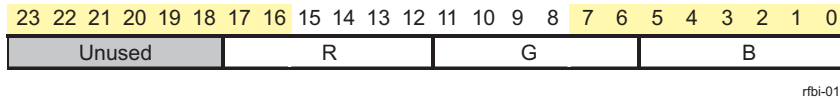
- RGB12-444 format:



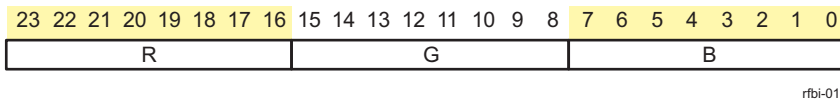
- RGB16-565 format:



- RGB18-666 format:



- RGB24-888 format:



NOTE: These pixel formats are also supported when data are provided from the slave port interconnect (for writing parameters).

10.5.4.7.3 Stall Mechanism

The stall signal (RFBI_STALL) is generated by the video port FIFO and used to indicate when the DISPC must stop sending data on the corresponding LCD output interface. This stall signal is used for both LCD outputs (DISPC_LCD1_DATA_STALL and DISPC_LCD2_DATA_STALL) only when the DISPC is configured in stall mode. The stall mode is activated by setting the DISPC_CONTROL0[11] STALLMODE bit to 1 for the primary LCD output and DISPC_CONTROL0[11] STALLMODE bit to 1 for the secondary LCD output.

NOTE: When the DISPC is configured in stall mode, the minimum transfer size is 1 byte.

The RFBI_STALL signal allows the RFBI to reformat the data.

RFBI_STALL is asserted when at least one of the following cases occurs:

- Default status when there is no data to capture from the DISPC
- High FIFO threshold reached
- End of transfer (number of data to output)
- RFBI reset
- [RFBI_CONTROL\[0\] ENABLE](#) bit reset to 0x0

RFBI_STALL is deasserted when the [RFBI_CONTROL\[0\] ENABLE](#) bit is set to 0x1 and at least one of the following cases occurs:

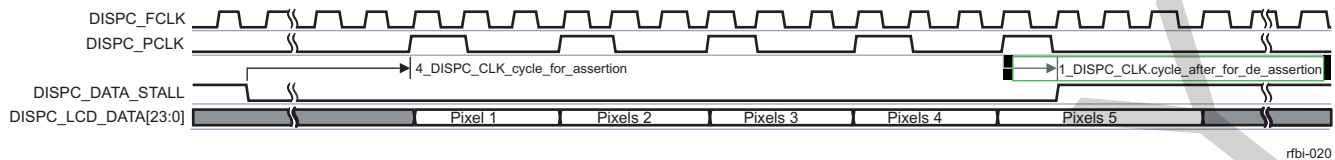
- Low FIFO threshold reached
- External TE occurs and the [RFBI_CONFIG\[3:2\] TRIGGERMODE](#) bit field is set to 0x1 for automatic external trigger (start of the transfer, the FIFO pointers are reset, the FIFO is empty).
- [RFBI_CONTROL\[4\] ITE](#) bit set to 0x1 by users (start of transfer, the FIFO pointers are reset, the FIFO is empty)

NOTE: This stall mechanism is also used by the DSI protocol engines. When multiple modules are connected to the same LCD output (RFBI and DSI protocol engines), the STALL signals from the modules are merged into a single DISPC_LCDx_DATA_STALL signal inside the display subsystem. Only one signal for each LCD output is connected the DISPC (two signals total for the two LCD outputs). In that case, only one module can control the STALL assertion/deassertion. The module which is not using the LCD output interface at that time is not disturbed because the STALL signal is asserted/deasserted by another module. For more details, see chapter *Display Subsystem*.

The RFBI asserts the STALL signal to stop data output by the DISPC. It is deasserted to indicate when new data must be output by the DISPC.

10.5.4.7.3.1 Data Stall Diagram Without DMA Buffer Handshake

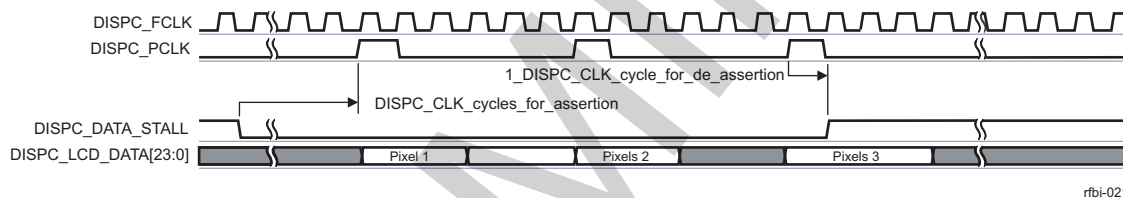
Figure 10-170 shows the RFBI data stall diagram when DISPC_DIVISOR[7:0] PCD bit field is set to 3.

Figure 10-170. RFBI Data Stall Signal Diagram With PCD=3

10.5.4.7.3.2 Data Stall Diagram with DMA Buffer Handshake

To avoid underflow of the DMA buffer, the DMA buffer handshake feature can be enabled by setting the DISPC_CONFIG0[16] BUFFERHANDCHECK bit to 1. The fullness of the FIFOs associated with the pipelines used for the LCD output is checked when the STALL signal is inactive before providing data to the pipeline. This prevents emptying the FIFO when the RFBI requests data and there is not enough data in the DISPC DMA buffer. This feature must be enabled only when stall mode is used (DISPC_CONTROL0[11] STALLMODE bit set to 1).

When the DMA buffer handshake feature is activated, the pixel transfer to the RFBI during STALL inactivity period can be stopped (no DISPC_LCD1_PCLK or DISPC_LCD2_PCLK pulse) and restarted when there is enough data in the DMA buffer. The DMA buffer handshake ensures that underflow cannot occur for the pipelines associated with the LCD output in stall mode. Figure 10-171 shows the RFBI data stall with DMA buffer handshake mode activated (PCD=3).

Figure 10-171. RFBI Data Stall Signal Diagram With Handshake With PCD=3

10.5.4.8 Interconnect FIFO

10.5.4.8.1 Description

The interconnect FIFO receives the data from RFBI_DATA write requests to the slave port interconnect slave port. The data in the interconnect FIFO are read by the RFBI and sent to the LCD panel. The interconnect FIFO is 32 bits wide. The size of the interconnect FIFO is 24 words of 32 bits (that is, 24 words of RFBI_DATA). The address of the RFBI_DATA register is used to access the interconnect FIFO. The DSS_RFBI_DMA DMA request can be used to transfer data using the system DMA from memory to interconnect FIFO.

10.5.4.8.2 Using DMA Request With Interconnect FIFO

10.5.4.8.2.1 Threshold for DMA Request Generation

The RFBI_CONTROL[6:5] HIGHTHRESHOLD bit field is used to define the threshold to be used for the generation of the DMA request to receive data into the interconnect FIFO (24 × 32 FIFO depth) through the address of the register RFBI_DATA. The sDMA configuration regarding the size of the burst depends on the value of the RFBI_CONTROL[6:5] HIGHTHRESHOLD bit field. The supported values are 4 × 32, 8 × 32 and 16 × 32. When for example, 4 words of 32 bits are set for the threshold, the sDMA sends a burst of 4 × 32 bits only. The sDMA receives the DMA request and is in charge of providing the correct number of bytes.

10.5.4.8.2.2 Disabling DMA Request

If the [RFBI_CONTROL](#)[7] DISABLE_DMA_REQ bit is reset, the DMA request is generated when there is enough room in the interconnect FIFO to accept the full burst. In case the RFBI receives writes slave port requests to the [RFBI_DATA](#) location when the interconnect FIFO is full, the request is not accepted. The RFBI waits for a free entry in the interconnect FIFO to accept the slave port request.

If the [RFBI_CONTROL](#)[7] DISABLE_DMA_REQ bit is set, the DMA request is not generated. The threshold value is ignored.

NOTE: Software users can access the [RFBI_DATA](#) location without using the DMA request and without programming the high threshold value (backward compatibility mode).

10.5.4.8.2.3 Smart DMA Request Mode

If the [RFBI_CONTROL](#)[8] SMART_DMA_REQ bit is reset (smart DMA mode disabled), the DMA request is asserted and deasserted depending on the interconnect FIFO space even if Midlreq is high in smart-idle/no-idle mode and the entire burst gets error responses from the RFBI. The RFBI waits for a free entry in the interconnect FIFO to accept the burst request.

If the [RFBI_CONTROL](#)[8] SMART_DMA_REQ bit is set (smart DMA mode enabled), the DMA request is deasserted after two [RFBI_ICLK](#) clock cycles if it has been asserted for more than or equal to two [RFBI_ICLK](#) clock cycles and Midlreq is high in smart-idle or no-idle mode. If asserting time is less than two [RFBI_ICLK](#) clock cycles, no more burst requests are accepted even if the space is available in the interconnect FIFO.

10.5.4.9 RFBI Output Parallel Modes

10.5.4.9.1 Cycle Mode Selection

The **RFBI_CONFIG**[10:9] **CYCLEFORMAT** bit field defines the number of cycles to output a pixel. The number of cycles determines the number of registers used to format the data in the interconnect FIFO with the appropriate number of bits (starting from the LSB) and with the alignment on the interface. The data are formatted based on the configuration of the **RFBI_DATA_CYCLEi** registers.

- One cycle: **RFBI_CONFIG**[10:9] **CYCLEFORMAT** bit field = 0x00 and the **RFBI_DATA_CYCLE1** register
- Two cycles: **RFBI_CONFIG** [10:9] **CYCLEFORMAT** bit field = 0x01 and the **RFBI_DATA_CYCLE1** and **RFBI_DATA_CYCLE2** registers
- Three cycles: **RFBI_CONFIG**[10:9] **CYCLEFORMAT** bit field = 0x10 and the **RFBI_DATA_CYCLE1**, **RFBI_DATA_CYCLE2**, and **RFBI_DATA_CYCLE3** registers

Figure 10-172 through Figure 10-174 list the bits position of the pixel during the cycles for an 8-, 9- and 16-bit parallel output, respectively.

Figure 10-172. 8-Bit Interface Settings

| 24-BPP | | | |
|---------|-----------|-----------|-----------|
| | 1st cycle | 2nd cycle | 3rd cycle |
| Data[7] | R0[7] | G0[7] | B0[7] |
| Data[6] | R0[6] | G0[6] | B0[6] |
| Data[5] | R0[5] | G0[5] | B0[5] |
| Data[4] | R0[4] | G0[4] | B0[4] |
| Data[3] | R0[3] | G0[3] | B0[3] |
| Data[2] | R0[2] | G0[2] | B0[2] |
| Data[1] | R0[1] | G0[1] | B0[1] |
| Data[0] | R0[0] | G0[0] | B0[0] |

| 18-BPP | | | |
|---------|-----------|-----------|-----------|
| | 1st cycle | 2nd cycle | 3rd cycle |
| Data[7] | R0[5] | G0[3] | x |
| Data[6] | R0[4] | G0[2] | x |
| Data[5] | R0[3] | G0[1] | x |
| Data[4] | R0[2] | G0[0] | x |
| Data[3] | R0[1] | B0[5] | x |
| Data[2] | R0[0] | B0[4] | x |
| Data[1] | G0[5] | B0[3] | B0[1] |
| Data[0] | G0[4] | B0[2] | B0[0] |

RFBI_CONFIG.CYCLEFORMAT = 0x2
 RFBI_DATA_CYCLE1 = 0x00000008
 RFBI_DATA_CYCLE2 = 0x00000008
 RFBI_DATA_CYCLE3 = 0x00000008

RFBI_CONFIG.CYCLEFORMAT = 0x2
 RFBI_DATA_CYCLE1 = 0x00000008
 RFBI_DATA_CYCLE2 = 0x00000008
 RFBI_DATA_CYCLE3 = 0x00000002

| 16-BPP | | |
|---------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[7] | R0[4] | G0[2] |
| Data[6] | R0[3] | G0[1] |
| Data[5] | R0[2] | G0[0] |
| Data[4] | R0[1] | B0[4] |
| Data[3] | R0[0] | B0[3] |
| Data[2] | G0[5] | B0[2] |
| Data[1] | G0[4] | B0[1] |
| Data[0] | G0[3] | B0[0] |

RFBI_CONFIG.CYCLEFORMAT = 0x1
 RFBI_DATA_CYCLE1 = 0x00000008
 RFBI_DATA_CYCLE2 = 0x00000008

| 12-BPP | | |
|---------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[7] | R0[3] | x |
| Data[6] | R0[2] | x |
| Data[5] | R0[1] | x |
| Data[4] | R0[0] | x |
| Data[3] | G0[3] | B0[3] |
| Data[2] | G0[2] | B0[2] |
| Data[1] | G0[1] | B0[1] |
| Data[0] | G0[0] | B0[0] |

RFBI_CONFIG.CYCLEFORMAT = 0x1
 RFBI_DATA_CYCLE1 = 0x00000008
 RFBI_DATA_CYCLE2 = 0x00000004

rfbi-026

Figure 10-173. 9-Bit Interface Settings

| 24-BPP | | | |
|---------|-----------|-----------|-----------|
| | 1st cycle | 2nd cycle | 3rd cycle |
| Data[8] | R0[7] | G0[6] | x |
| Data[7] | R0[6] | G0[5] | x |
| Data[6] | R0[5] | G0[4] | x |
| Data[5] | R0[4] | G0[3] | B0[5] |
| Data[4] | R0[3] | G0[2] | B0[4] |
| Data[3] | R0[2] | G0[1] | B0[3] |
| Data[2] | R0[1] | G0[0] | B0[2] |
| Data[1] | R0[0] | B0[7] | B0[1] |
| Data[0] | G0[7] | B0[6] | B0[0] |

RFBI_CONFIG.CYCLEFORMAT = 0x2
 RFBI_DATA_CYCLE1 = 0x00000009
 RFBI_DATA_CYCLE2 = 0x00000009
 RFBI_DATA_CYCLE3 = 0x00000006

| 18-BPP | | |
|---------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[8] | R0[5] | G0[2] |
| Data[7] | R0[4] | G0[1] |
| Data[6] | R0[3] | G0[0] |
| Data[5] | R0[2] | B0[5] |
| Data[4] | R0[1] | B0[4] |
| Data[3] | R0[0] | B0[3] |
| Data[2] | G0[5] | B0[2] |
| Data[1] | G0[4] | B0[1] |
| Data[0] | G0[3] | B0[0] |

RFBI_CONFIG.CYCLEFORMAT = 0x1
 RFBI_DATA_CYCLE1 = 0x0000000912
 RFBI_DATA_CYCLE2 = 0x00000009

| 16-BPP | | |
|---------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[8] | R0[4] | x |
| Data[7] | R0[3] | x |
| Data[6] | R0[2] | G0[1] |
| Data[5] | R0[1] | G0[0] |
| Data[4] | R0[0] | B0[4] |
| Data[3] | G0[5] | B0[3] |
| Data[2] | G0[4] | B0[2] |
| Data[1] | G0[3] | B0[1] |
| Data[0] | G0[2] | B0[0] |

RFBI_CONFIG.CYCLEFORMAT = 0x1
 RFBI_DATA_CYCLE1 = 0x00000009
 RFBI_DATA_CYCLE2 = 0x00000007

| 12-BPP | | |
|---------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[8] | R0[3] | x |
| Data[7] | R0[2] | x |
| Data[6] | R0[1] | x |
| Data[5] | R0[0] | x |
| Data[4] | G0[3] | x |
| Data[3] | G0[2] | x |
| Data[2] | G0[1] | B0[2] |
| Data[1] | G0[0] | B0[1] |
| Data[0] | B0[3] | B0[0] |

RFBI_CONFIG.CYCLEFORMAT = 0x1
 RFBI_DATA_CYCLE1 = 0x00000009
 RFBI_DATA_CYCLE2 = 0x00000003

rfbi-027

Figure 10-174. 16-Bit Interface Settings

| 24-BPP | | | |
|----------|-----------|-----------|-----------|
| | 1st cycle | 2nd cycle | 3rd cycle |
| Data[15] | R0[7] | B0[7] | G1[7] |
| Data[14] | R0[6] | B0[6] | G1[6] |
| Data[13] | R0[5] | B0[5] | G1[5] |
| Data[12] | R0[4] | B0[4] | G1[4] |
| Data[11] | R0[3] | B0[3] | G1[3] |
| Data[10] | R0[2] | B0[2] | G1[2] |
| Data[9] | R0[1] | B0[1] | G1[1] |
| Data[8] | R0[0] | B0[0] | G1[0] |
| Data[7] | G0[7] | R1[7] | B1[7] |
| Data[6] | G0[6] | R1[6] | B1[6] |
| Data[5] | G0[5] | R1[5] | B1[5] |
| Data[4] | G0[4] | R1[4] | B1[4] |
| Data[3] | G0[3] | R1[3] | B1[3] |
| Data[2] | G0[2] | R1[2] | B1[2] |
| Data[1] | G0[1] | R1[1] | B1[1] |
| Data[0] | G0[0] | R1[0] | B1[0] |

RFBI_CONFIG.CYCLEFORMAT = 0x3
 RFBI_DATA_CYCLE1 = 0x00000010
 RFBI_DATA_CYCLE2 = 0x00080808
 RFBI_DATA_CYCLE3 = 0x00100000

| 18-BPP | | |
|----------|-----------|-----------|
| | 1st cycle | 2nd cycle |
| Data[15] | R0[5] | x |
| Data[14] | R0[4] | x |
| Data[13] | R0[3] | x |
| Data[12] | R0[2] | x |
| Data[11] | R0[1] | x |
| Data[10] | R0[0] | x |
| Data[9] | G0[5] | x |
| Data[8] | G0[4] | x |
| Data[7] | G0[3] | x |
| Data[6] | G0[2] | x |
| Data[5] | G0[1] | x |
| Data[4] | G0[0] | x |
| Data[3] | B0[5] | x |
| Data[2] | B0[4] | x |
| Data[1] | B0[3] | B0[1] |
| Data[0] | B0[2] | B0[0] |

RFBI_CONFIG.CYCLEFORMAT = 0x1
 RFBI_DATA_CYCLE1 = 0x00000010
 RFBI_DATA_CYCLE2 = 0x00000002

| 16-BPP | |
|----------|-----------|
| | 1st cycle |
| Data[15] | R0[4] |
| Data[14] | R0[3] |
| Data[13] | R0[2] |
| Data[12] | R0[1] |
| Data[11] | R0[0] |
| Data[10] | G0[5] |
| Data[9] | G0[4] |
| Data[8] | G0[3] |
| Data[7] | G0[2] |
| Data[6] | G0[1] |
| Data[5] | G0[0] |
| Data[4] | B0[4] |
| Data[3] | B0[3] |
| Data[2] | B0[2] |
| Data[1] | B0[1] |
| Data[0] | B0[0] |

RFBI_CONFIG.CYCLEFORMAT = 0x0
 RFBI_DATA_CYCLE1 = 0x00000010

| 12-BPP | |
|----------|-----------|
| | 1st cycle |
| Data[15] | x |
| Data[14] | x |
| Data[13] | x |
| Data[12] | x |
| Data[11] | R0[3] |
| Data[10] | R0[2] |
| Data[9] | R0[1] |
| Data[8] | R0[0] |
| Data[7] | G0[3] |
| Data[6] | G0[2] |
| Data[5] | G0[1] |
| Data[4] | G0[0] |
| Data[3] | B0[3] |
| Data[2] | B0[2] |
| Data[1] | B0[1] |
| Data[0] | B0[0] |

RFBI_CONFIG.CYCLEFORMAT = 0x0
 RFBI_DATA_CYCLE1 = 0x0000000C

rfbi-028

10.5.4.9.2 Unmodified Bits

In a cycle, if every bit in the interface does not have a pixel value, the status of the unused bits can be programmed to be 0, 1, or the previous value (I/O power consumption optimization). Based on the configuration, the undefined bits for each cycle are defined with the previous values of the bits at the same position in the previous cycle, 0s, or 1s (the unused bits can be at any position). The [RFBI_CONFIG\[12:11\] UNUSEDBITS](#) bit field is used.

10.5.4.9.3 Number of Pixels to Transfer

The [RFBI_PIXEL_CNT](#)[31:0] PIXELCNT bit field indicates the number of pixels to be transferred to the LCD panel. The value can be changed only when the [RFBI_CONTROL](#)[0] ENABLE bit is reset.

During the transfer, the hardware decrements the register when a pixel is sent to the RFB. When the [RFBI_CONTROL](#)[0] ENABLE bit is set and a new value is written in the [RFBI_PIXEL_CNT](#) register, and the current value in the register is a not 0 (the remaining number of pixels to transfer), the ongoing transfer is aborted.

10.5.4.10 RFBI Timing Generator

10.5.4.10.1 Configuration Selection

The [RFBI_CONTROL](#)[3:2] CONFIGSELECT bit field selects the chip select.

10.5.4.10.2 Read/Write

Depending on the status of A0, WE, and RE, the commands and display/parameter data are written to the panel (handled by the state-machine for the commands/parameter data and stored in memory for the display data), or the display data/status values are read from the LCD panel (status and display data in the LCD panel memory). The polarity of A0 (RFBI_A0 signal), WE (RFBI_WE signal), RE (RFBI_RE signal), and CS0 (RFBI_CS0 signal) is programmable.

[Table 10-654](#) describes the read/write function.

Table 10-654. Read/Write Function Description

| A0 (RFBI_A0) | WE (RFBI_WE) | RE (RFBI_RE) | Function Description |
|--------------|--------------|--------------|--|
| 1 | 0 | 1 | Display data write, parameter data write |
| 1 | 1 | 0 | Display data read |
| 0 | 1 | 0 | Status read |
| 0 | 0 | 1 | Command data write |

A minimum of RFBI_Cs cycle time, as defined in [Table 10-655](#), is required to keep the RFBI_CS0 signal asserted between write transfers of multiple pixels.

[Table 10-655](#) lists the minimum cycle time for RFBI_CS0, depending on the source of pixels (DISPC or slave port) and the cycle format (1pixel/cycle, 1 pixel/2 cycles, or 1 pixel/3 cycles).

Table 10-655. Minimum Cycle Time for CS0/WE Always Asserted

| RFBI Performance | RFBI_CONFIG [10:9] CYCLEFORMAT | RFBI_CONFIG [8:7] PORTFORMAT | Minimum Cycle Time (in Number of RFBI_ICLK Clock Cycles) |
|-------------------------|---|---|---|
| Slave port interconnect | 1 pixel/cycle | 1 pixel | 5 |
| | 1 pixel/2 cycles | 1 pixel | 4 |
| | 1 pixel/3 cycles | 1 pixel | 4 |
| | 1 pixel/cycle | 2 pixels | 4 |
| | 1 pixel/2 cycles | 2 pixels | 4 |
| | 1 pixel/3 cycles | 2 pixels | 4 |
| DISPC | 1 pixel/cycle | N/A | 4 |
| | 1 pixel/2 cycles | N/A | 3 |
| | 1 pixel/3 cycles | N/A | 3 |
| | 2 pixel/3 cycles | N/A | 6 |

10.5.4.10.3 RFBI State-Machine

The RFBI_A0, RFBI_RE, and RFBI_WE signals are asserted and deasserted based on the register accessed (RFBI_CMD, RFBI_PARAM, RFBI_DATA, RFBI_READ, or RFBI_STATUS). (See Table 10-654.) When the RFBI_SYSSTATUS[8] BUSY bit is set by hardware, any access to the registers is stalled, except for the RFBI_DATA register.

The RFBI_SYSSTATUS[9] BUSYRFBIDATA bit indicates whether there are still pending data in the interconnect FIFO associated with the RFBI_DATA register only.

- Command register
Write one command at a time by writing through the slave port interconnect into the RFBI_CMD register. If the previous command is not processed, the RFBI_SYSSTATUS[8] BUSY bit is set by hardware and the access to writing a new command is stalled.
- Parameter register
Write one parameter at a time by writing in the RFBI_PARAM register.
If the previous parameter is not processed, the RFBI_SYSSTATUS[8] BUSY bit is set by hardware and the access to writing a new parameter is stalled.
- Data register
Write one or two pixels at a time by writing in the RFBI_DATA register.
The pixels are formatted based on the specified cycle format. If two pixels are written into the 32-data register, the RFBI_CONFIG[8:7] PORTFORMAT bit field indicates the number of pixels for each slave port access to the register and the order of the pixels.
If the previous data are not processed, the RFBI_SYSSTATUS[8] BUSY bit is set by hardware and any access for writing new data is stalled. When the RFBI_SYSSTATUS[8] BUSY bit is reset by hardware, the access is not stalled.
- Read/status register
Send through the command and parameter registers the correct information to receive data in the data or status register. The read data from the LCD panel is initiated by writing into the RFBI_READ or RFBI_STATUS registers. In this case, the RFBI_SYSSTATUS[8] BUSY bit is set until the data are available in the register.
When the RFBI_SYSSTATUS[8] BUSY bit is set by hardware, the read or write access is stalled until the register is updated with a new value from the LCD panel. To avoid the stall, the software can poll the RFBI_SYSSTATUS[8] BUSY bit until it is reset by hardware. To receive the data, send the appropriate command/parameters.

10.5.4.10.4 RFBI Timings

The timing registers can be accessed only when there is no transaction in progress (based on the value of the RFBI_CONTROL[3:2] CONFIGSELECT bit field). Granularity is defined using the RFBI_CONFIG[4] TIMEGRANULARITY bit. This feature allows the extension of programmable ranges of timing parameters for the RFBI interface. See Table 10-656 for the configuration values of the timing bits.

- Chip-select assertion/deassertion time (CSOnTime/CSOffTime)
RFBI_A0 setup time to chip-select assertion is assured by the programmable chip-select assertion time from the start access time:
RFBI_ONOFF_TIME[3:0] CSONTIME bit field.
The chip-select deassertion time from the start access time is programmable:
RFBI_ONOFF_TIME[9:4] CSOFFTIME bit field

CAUTION

Configuring RFBI_ONOFF_TIME[3:0] CSONTIME = RFBI_ONOFF_TIME[9:4] CSOFFTIME = 0 is not supported and must be avoided. This configuration creates contention on the bus and progressively damages the LCD panel.

- Chip-select pulse width (CSPulseWidth)

The total chip-select pulse width is the time when write cycle time or read cycle time has completed and is programmable:

[RFBI_CYCLE_TIME](#)[17:12] CSPULSEWIDTH bit field

It applies on the read-to-write, write-to-read, read-to-read, and write-to-write access based on:

- The [RFBI_CYCLE_TIME](#)[19] RRENABLE bit: Read-to-read access
- The [RFBI_CYCLE_TIME](#)[20] WWENABLE bit: Write-to-write access
- The [RFBI_CYCLE_TIME](#)[18] RWENABLE bit: Read-to-write access
- The [RFBI_CYCLE_TIME](#)[21] WRENABLE bit: Write-to-read access

By default, it applies to any access (read-to-read, read-to-write, write-to-read, write-to-write) when the chip-select CS0 is activated by setting the [RFBI_CONTROL](#)[3:2] CONFIGSELECT bit field to 0x1.

- Access time

Access time is the time delay between A0 assertion to data sampling before RE signal deassertion; access time is programmable:

[RFBI_CYCLE_TIME](#)[27:22] ACCESTIME bit field

When reading the data on the bus, the data are sampled at the end of the access time, which occurs before the end of the read off time ([RFBI_ONOFF_TIME](#)[29:24] REOFFTIME).

- Write-enable cycle time (WECycleTime)

The total write-enable cycle time is the time when A0 becomes valid until write cycle completion; the write-enable cycle time is programmable:

The [RFBI_CYCLE_TIME](#)[5:0] WECYCLETIME bit field

- Write-enable assertion/deassertion time (WEOnTime/WEOffTime)

The WE assertion delay time from start access time is programmable:

[RFBI_ONOFF_TIME](#)[13:10] WEONTIME bit field

The WE deassertion delay time from the start access time is programmable:

[RFBI_ONOFF_TIME](#)[19:14] WEOFFTIME bit field

- Read-enable cycle time (RECycleTime)

The total read-enable cycle time is the time when A0 becomes valid until read cycle completion; the read-enable cycle time is programmable:

The [RFBI_CYCLE_TIME](#)[11:6] RECYCLETIME bit field

- Read-enable assertion/deassertion time (REOnTime/REOffTime)

The RE assertion delay time from the start access time is programmable:

[RFBI_ONOFF_TIME](#)[23:20] REONTIME bit field

The RE deassertion delay time from the start access time is programmable:

[RFBI_ONOFF_TIME](#)[29:24] REOFFTIME bit field

At cycle time completion (read access or write access), all control signals (RFBI_CS0, RFBI_WE, and RFBI_RE) are deasserted regardless of their deassertion time parameter values, if they are not deasserted already.

However, an exception to this forced deassertion exists when a pipelined request to CS0 is pending. Also, a control signal with deassertion time parameters equal to the cycle time parameter is not necessarily deasserted when a pipelined request to the same chip-select or different chip-select is pending. This prevents any unnecessary glitch transitions.

If no inactive cycles are required between successive accesses to the same chip-select (the [RFBI_CYCLE_TIME](#)[17:12] CSPULSEWIDTH bit field = 0), and if assertion time parameters associated with the following access equal 0, the asserted control signals (RFBI_CS0, RFBI_WE, and RFBI_RE) stay asserted. This applies only to write-to-write access combination. In case of read-to-write, read-to-read, or write-to-read sequences, the RFBI_CS0, RFBI_WE, and RFBI_RE signals are always deasserted.

[Table 10-656](#) lists the configuration values for each timing bit.

Table 10-656. RFBI Timings Configuration

| Timing Configuration Bits | Granularity ⁽¹⁾ | |
|--|----------------------------|----------|
| | One | Two |
| RFBI_ONOFF_TIME [3:0] CSONTIME | 0 to 15 | 0 to 30 |
| RFBI_ONOFF_TIME [9:4] CSOFFTIME | 0 to 63 | 0 to 126 |
| RFBI_CYCLE_TIME [17:12] CSPULSEWIDTH | 0 to 63 | 0 to 126 |
| RFBI_CYCLE_TIME [27:22] ACCESSTIME | 0 to 63 | 0 to 126 |
| RFBI_CYCLE_TIME [5:0] WECYCLETIME | 0 to 63 | 0 to 126 |
| RFBI_ONOFF_TIME [13:10] WEONTIME | 0 to 15 | 0 to 30 |
| RFBI_ONOFF_TIME [19:14] WEOFFTIME | 0 to 63 | 0 to 126 |
| RFBI_CYCLE_TIME [11:6] RECYCLETIME | 0 to 63 | 0 to 126 |
| RFBI_ONOFF_TIME [23:20] REONTIME | 0 to 15 | 0 to 30 |
| RFBI_ONOFF_TIME [29:24] REOFFTIME | 0 to 63 | 0 to 126 |

⁽¹⁾ Number of RFBI_ICLK clock cycles. The granularity can be configured using the [RFBI_CONFIG](#)[4] TIMEGRANULARITY bit.

10.5.4.11 Trigger Detection Logic

10.5.4.11.1 Trigger Mode

Setting the [RFBI_CONFIG](#)[3:2] TRIGGERMODE bit field configures the different trigger modes:

- Internal trigger mode with the internal programmable [RFBI_CONTROL](#)[4] ITE bit
- External trigger mode with external TE signal ([RFBI_TE_VSYNC](#))
- External trigger mode with external VSYNC/HSYNC signals

10.5.4.11.2 Internal Trigger Mode

10.5.4.11.2.1 ITE Bit

Set the [RFBI_CONTROL](#)[4] ITE bit to start capturing the data from the DISPC. The DISPC must be configured in the RFBI mode to account for the [RFBI_DISPC_STALL](#) signal. Setting the trigger mode to external ([RFBI_CONFIG](#)[3:2] TRIGGERMODE bit field set to 0x1 or 0x2) causes the [RFBI_CONTROL](#)[4] ITE bit to be ignored. The chip-select CS0 must be selected ([RFBI_CONTROL](#)[3:2] CONFIGSELECT set to 0x1) when this bit is set by users.

10.5.4.11.3 External Trigger Mode

There are two external trigger modes:

- TE only: VSYNC and HSYNC are merged by logical OR operation, and are detected through VSYNC and HSYNC pulse widths.
- HSYNC/VSYNC: This mode uses the two external signals which are detected through VSYNC and HSYNC pulse widths.

10.5.4.11.3.1 Programmable Line Number

When the trigger mode is set to external trigger mode with HSYNC and VSYNC or the TE, hardware resets the line counter when the VSYNC occurs and, after a programmable number of lines programmed by the user in the [RFBI_LINE_NUMBER](#)[10:0] LINENUMBER bit field (the HSYNC pulse occurs for every line), the transfer to the LCD panel begins. When the programmable line number is 0, only the VSYNC pulse indicates the beginning of the transfer in both modes: HSYNC/VSYNC and TE (logical OR operation between HSYNC and VSYNC).

10.5.4.11.3.2 VSYNC Pulse Width (Minimum Value)

The [RFBI_VSYNC_WIDTH](#)[15:0] MINVSYNCPULSEWIDTH bit field defines the minimum number of RFBI_ICLK clock cycles of the VSYNC pulse for detection on VSYNC. It allows differentiation between VSYNC and HSYNC, which are ORed on the same signal, and is also used in HSYNC/VSYNC mode on the two separate input lines.

- The VSYNC pulse width must be equal to at least two RFBI_ICLK clock cycles when HSYNC is not present (TE trigger mode only).
- The VSYNC pulse width must be equal to at least four RFBI_ICLK clock cycles when HSYNC is present (TE trigger mode only).

10.5.4.11.3.3 HSYNC Pulse Width (Minimum Value)

The [RFBI_HSYNC_WIDTH](#)[15:0] MINHSYNCPULSEWIDTH bit field defines the minimum number of RFBI_ICLK clock cycles of the HSYNC pulse for detection on HSYNC. It allows differentiation between VSYNC and HSYNC, which are ORed on the same signal, and is also used in VSYNC/HSYNC mode on the separate two input lines. To be detected, the HSYNC/VSYNC pulse width must always be equal to at least two RFBI_ICLK clock cycles. See [Table 10-657](#).

Table 10-657. Minimum Pulse Width (HSYNC/VSYNC)

| Configuration Bits | TE Mode | HSYNC/VSYNC Mode |
|--|---------|------------------|
| RFBI_HSYNC_WIDTH [15:0] MINHSYNCPULSEWIDTH field value | 2 | 2 |
| RFBI_VSYNC_WIDTH [15:0] MINVSYNCPULSEWIDTH field value | 4 | 2 |

The pulse received by the RFBI must be at least two RFBI_ICLK clock cycles to be detected. In case of TE mode, since the minimum value for differentiate VSYNC and HSYNC is two RFBI_ICLK clock cycles, the VSYNC pulse width must be at least four RFBI_ICLK clock cycles and the HSYNC pulse width must be at least two RFBI_ICLK clock cycles

10.5.5 RFBI Programming Guide

10.5.5.1 RFBI Low-Level Programming Models

This section covers the low-level hardware programming sequences for configuration and use of the RFBI.

10.5.5.1.1 Global Initialization

10.5.5.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements of initializing the surrounding modules when the RFBI is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the RFBI. For more information, see [Section 10.5.2, RFBI Environment](#), and [Section 10.5.3, RFBI Integrator](#).

[Table 10-658](#) describes the global initialization of surrounding modules.

Table 10-658. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|--|
| PRCM | RFBI_ICLK interface clock must be enabled. See Chapter 3, Power, Reset, and Clock Management . |
| DISPC | RFBI_FCLK1 and RFBI_FCLK2 functional clocks must be enabled. See Section 10.2.1, Display Controller . |
| Control module | rfb_i_re pad muxing must be set in the SYSCTRL_PADCONF_CORE module. rfb_i_we pad muxing must be set in the SYSCTRL_PADCONF_CORE module. rfb_i_cs0 pad muxing must be set in the SYSCTRL_PADCONF_CORE module. rfb_i_te_vsync0 pad muxing must be set in the SYSCTRL_PADCONF_CORE module. rfb_i_data[15:0] pads muxing must be set in the SYSCTRL_PADCONF_CORE module. rfb_i_hsync0 pad muxing must be set in the SYSCTRL_PADCONF_CORE module. rfb_i_a0 pad muxing must be set in the SYSCTRL_PADCONF_CORE module. See Chapter 19, Control Module . |
| MPU INTC | MPU interrupt controller configuration must be done to enable the interrupts from the DISPC module. See Chapter 18, Interrupt Controllers . |
| sDMA | DMA configuration must be done to enable the RFBI module DMA channel requests. See Chapter 17, Direct Memory Access . |
| Interconnect | See Chapter 14, Interconnect , for more information about the interconnect configuration. |

NOTE: The MPU INTC and the sDMA configurations are necessary if the interrupt- and DMA-based communication modes are used.

10.5.5.1.1.2 RFBI Global Initialization

10.5.5.1.1.2.1 Main Sequence RFBI Global Initialization

This procedure initializes the RFB and DISPC after a power on or software reset. See [Table 10-659](#).

Table 10-659. RFBI Global Initialization

| Step | Register/Bit Field Programming Model | Value |
|----------------------------------|--|-------|
| DISPC configuration in RFBI mode | See Section 10.5.5.1.1.2.2, Subsequence: DISPC Configuration . | |
| RFBI configuration | See Section 10.5.5.1.1.2.3, Subsequence: RFBI Configuration . | |
| LCD panel configuration | See Section 10.5.5.1.1.2.4, Subsequence: LCD Panel Configuration . | |

10.5.5.1.1.2.2 Subsequence: DISPC Configuration

This procedure configures the DISPC registers in RFBI mode. See [Table 10-660](#).

Table 10-660. DISPC Configuration in RFBI Mode

| Step | Register/Bit Field Programming Model | Value |
|--|--|-------|
| DISPC pipeline configuration | Configuration of the pipeline associated to the LCD output (DMA engine, pipelines associated to the LCD output, etc.). See Section 10.2.4, Display Controller Functional Description | |
| Enable TFT mode. | DISPC_CONTROL0[3] STNTFT | 0x1 |
| Program the DISPC in RFBI mode. | DISPC_CONTROL0[11] STALLMODE | 0x1 |
| Reset the DISPC signal configuration to default value. | DISPC_POL_FREQ0 | 0x00 |
| Select the RFBI data path. | DISPC_CONTROL1[16:15] GPOUT | 0x1 |
| Enable the hardware handshake to avoid the DISPC FIFO underflow (applies to the pipeline connected to the LCD output). | DISPC_CONFIG0[16] BUFFERHANDCHECK | 0x1 |

NOTE: In RFBI mode, the DISPC_CONTROL0[5] GOLCD bit must not be set to 1. It must be disabled before resetting the DISPC_CONTROL0[11] STALLMODE bit to 0.

The hardware handshake applies to the pipelines connected to the LCD output. It must be disabled before resetting the DISPC_CONTROL0[11] STALLMODE bit to 0.

10.5.5.1.1.2.3 Subsequence: RFBI Configuration

This procedure configures the RFBI registers. See [Table 10-661](#).

CAUTION

The RFBI configuration registers for CS0 configuration can be accessed only when the configuration is not in use (that is, when the [RFBI_CONTROL\[3:2\] CONFIGSELECT](#) is set to 0x0).

Table 10-661. RFBI Configuration – Main Sequence

| Step | Register/Bit Field Programming Model | Value |
|----------------------------|---|-------|
| Enable the RFBI data path. | RFBI_CONTROL[1] RFBIMODE | 0x0 |
| DMA mode configuration | See Section 10.5.5.1.1.2.3.1, Subsequence: DMA Mode Configuration . | |

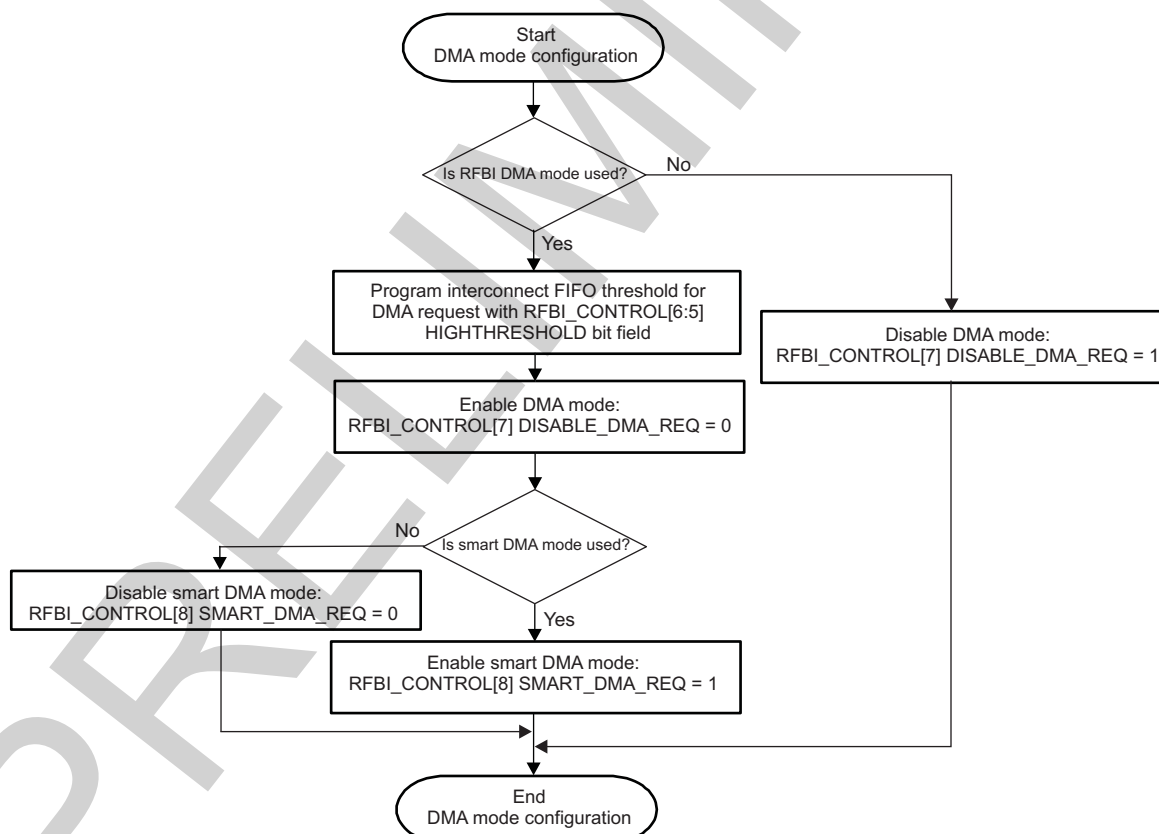
Table 10-661. RFBI Configuration – Main Sequence (continued)

| Step | Register/Bit Field Programming Model | Value |
|---|--|--------------------|
| Disable the chip-select and configuration (this step is necessary to configure the timing registers). | RFBI_CONTROL[3:2] CONFIGSELECT | 0x0 |
| Timing and polarity signals configuration | See Section 10.5.5.1.1.2.3.2, Subsequence: Timing and Polarity Signals Configuration . | |
| Configure the parallel input data width. | RFBI_CONFIG[6:5] DATATYPE | x ⁽¹⁾ |
| Configure the number of cycles. | RFBI_CONFIG[10:9] CYCLEFORMAT | x ⁽¹⁾ |
| Trigger mode settings | See Section 10.5.5.1.1.2.3.3, Subsequence: Trigger Mode Settings . | |
| Program the data format per cycle. | RFBI_DATA_CYCLE_1 | xxx ⁽¹⁾ |
| | RFBI_DATA_CYCLE_2 | xxx ⁽¹⁾ |
| | RFBI_DATA_CYCLE_3 | xxx ⁽¹⁾ |
| Select the configuration of CS0 | RFBI_CONTROL[3:2] CONFIGSELECT | 0x1 |

⁽¹⁾ Values depend on the application

10.5.5.1.1.2.3.1 Subsequence: DMA Mode Configuration

Figure 10-175 shows DMA mode configuration.

Figure 10-175. DMA Mode Configuration

rfbi-024

Table 10-662 describes DMA mode configuration.

Table 10-662. Register Call Summary for Subsequence: DMA Mode Configuration

| Register Name |
|------------------------------|
| RFBI_CONTROL |

10.5.5.1.1.2.3.2 Subsequence: Timing and Polarity Signals Configuration

[Table 10-663](#) describes timing and polarity signals configuration.

Table 10-663. Timing and Polarity Signals Configuration

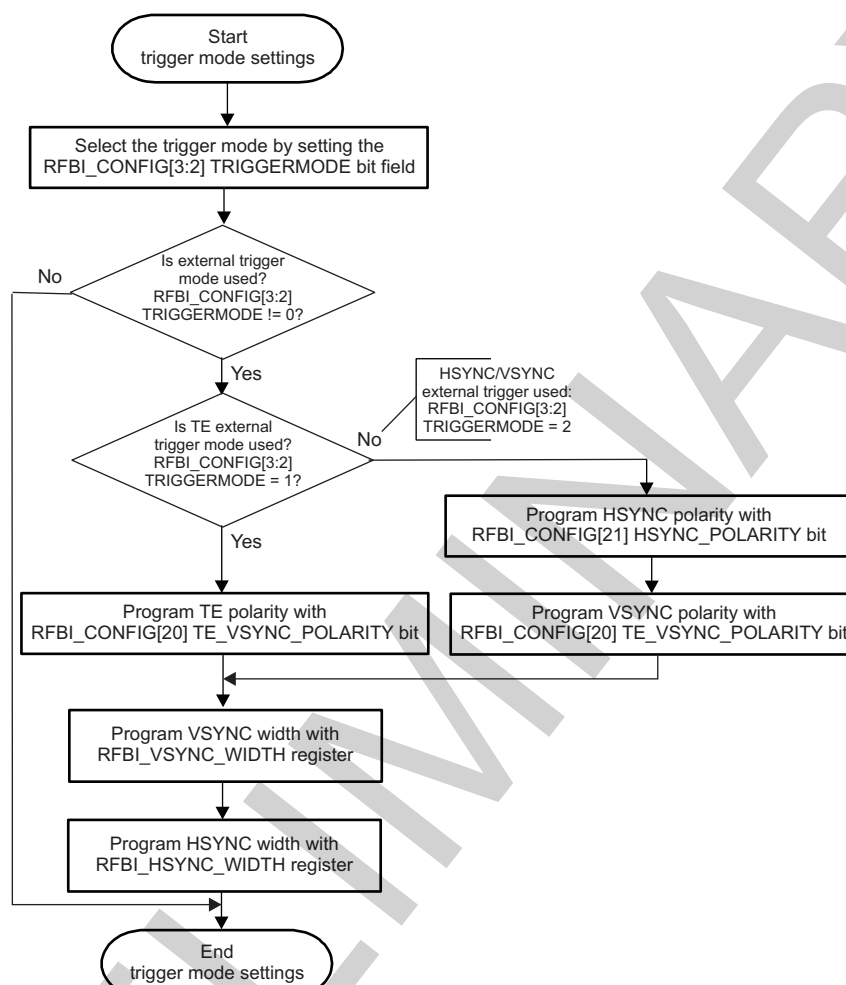
| Step | Register/Bit Field Programming Model | Value |
|--------------------------------|--|--------------------|
| Program ON/OFF timings. | RFBI_ONOFF_TIME | xxx ⁽¹⁾ |
| Program cycle timings. | RFBI_CYCLE_TIME | xxx ⁽¹⁾ |
| Program CS polarity. | RFBI_CONFIG[19] CSPOLARITY | x ⁽¹⁾ |
| Program WE polarity. | RFBI_CONFIG[18] WEPOLARITY | x ⁽¹⁾ |
| Program RE polarity. | RFBI_CONFIG[17] REPOLARITY | x ⁽¹⁾ |
| Program A0 polarity. | RFBI_CONFIG[16] A0POLARITY | x ⁽¹⁾ |
| Program unused bits. | RFBI_CONFIG[12:11] UNUSEDBITS | x ⁽¹⁾ |
| Program the factor x2 latency. | RFBI_CONFIG[4] TIMEGRANULARITY | x ⁽¹⁾ |

⁽¹⁾ Values depend on the application.

10.5.5.1.1.2.3.3 Subsequence: Trigger Mode Settings

Figure 10-176 shows trigger mode settings.

Figure 10-176. Trigger Mode Settings



rfbi-025

Table 10-664 describes register call summary for subsequence: trigger mode settings

Table 10-664. Register Call Summary for Subsequence: Trigger Mode Settings

| Register Name | | |
|---------------|------------------|------------------|
| RFBI_CONFIG | RFBI_VSYNC_WIDTH | RFBI_HSYNC_WIDTH |

10.5.5.1.1.2.4 Subsequence: LCD Panel Configuration

This procedure consists of sending and receiving commands. See Table 10-665 and Table 10-666.

Table 10-665. RFBI Command Interface: Writing Command to the LCD Panel

| Step | Register/Bit Field Programming Model | Value |
|---------------------------------|--------------------------------------|-------------------|
| Write command to the LCD panel. | RFBI_CMD[8:0] CMD | 0x ⁽¹⁾ |
| Wait until BUSY != 1. | RFBI_SYSSTATUS[8] BUSY | |

⁽¹⁾ Value depends on the command sent to the LCD panel.

Table 10-666. RFBI Command Interface: Reading Command From the LCD Panel

| Step | Register/Bit Field Programming Model | Value |
|----------------------------------|--------------------------------------|-------------------|
| Initialize reading command. | RFBI_STATUS[8:0] STATUS | 0x |
| Initialize reading command. | RFBI_READ [8:0] READ | 0x |
| Wait until BUSY != 1. | RFBI_SYSSTATUS[8] BUSY | |
| Read command from the LCD panel. | RFBI_STATUS[8:0] STATUS | 0x ⁽¹⁾ |
| | RFBI_READ [8:0] READ | 0x ⁽¹⁾ |

⁽¹⁾ Value depends on the command read from the LCD panel.

10.5.5.1.2 Operational Modes Configuration

10.5.5.1.2.1 RFBI Start Transfer

10.5.5.1.2.1.1 Main Sequence: RFBI Start Transfer With Polling Method

Table 10-667 describes the RFBI start transfer polling method.

Table 10-667. RFBI Start Transfer With Polling Method

| Step | Register/Bit Field Programming Model | Value |
|-----------------------------|--|-------|
| Enable DISPC module output. | See Section 10.5.5.1.2.1.4, Subsequence: DISPC Output Enable. | |
| Enable RFBI module output. | See Section 10.5.5.1.2.1.5, Subsequence: RFBI Interrupts Enable. | |
| Detect event. | See Table 10-673. | |

10.5.5.1.2.1.2 Main Sequence: RFBI Start Transfer With Interrupts and DMA Method

Table 10-668 describes the RFBI start transfer interrupts method.

Table 10-668. RFBI Start Transfer With Interrupts Method

| Step | Register/Bit Field Programming Model | Value |
|-----------------------------|---|-------|
| Enable DISPC interrupts. | See Table 10-669. | |
| Enable DISPC module output. | See Section 10.5.5.1.2.1.4, Subsequence: DISPC Output Enable. | |
| Enable RFBI module output. | See Section 10.5.5.1.2.1.5, RFBI Interrupts Enable. | |
| Detect Event. | See Table 10-673. | |

10.5.5.1.2.1.3 Subsequence: DISPC Interrupts Enable

This procedure enables the DISPC interrupts used in RFBI mode. See Table 10-669.

Table 10-669. DISPC Interrupts Enable

| Step | Register/Bit Field Programming Model | Value |
|---------------------------------|--------------------------------------|--------|
| Clears all interrupts | DISPC_IRQSTATUS | 0xFFFF |
| Enable the FRAMEDONEi IRQ. | DISPC_IRQENABLE FRAMEDONEi_EN | 0x1 |
| Enable the BUFFERUNDERFLOW IRQ. | DISPC_IRQENABLE BUFFERUNDERFLOW_EN | 0x1 |
| Enable the SYNCLOSTi IRQ. | DISPC_IRQENABLE SYNCLOSTi_EN | 0x1 |

NOTE: The other interrupts requests (see [Section 10.5.4.5, Interrupt Requests](#)) can also be enabled, depending on the application.

10.5.5.1.2.1.4 Subsequence: DISPC Output Enable

This procedure enables the DISPC output. See [Table 10-670](#).

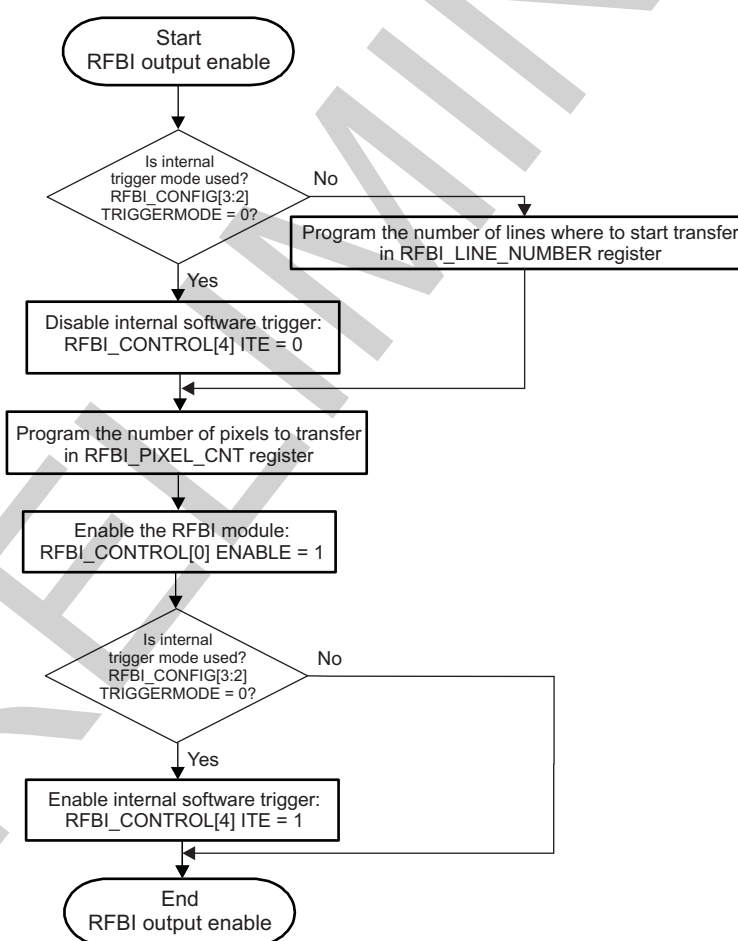
Table 10-670. DISPC Output Enable

| Step | Register/Bit Field Programming Model | Value |
|-----------------------------------|--------------------------------------|-------|
| Enable the video or GFX pipeline. | DISPC_VIDp_ATTRIBUTES[0] ENABLE | 0x1 |
| | DISPC_GFX_ATTRIBUTES[0] ENABLE | 0x1 |
| Enable the DISPC output. | DISPC_CONTROLo[0] LCDENABLE | 0x1 |

10.5.5.1.2.1.5 Subsequence: RFBI Output Enable

This procedure enables the RFBI output. [Figure 10-177](#) details the settings for this subsequence.

Figure 10-177. RFBI Output Enable Flow Chart



rfbi-022

[Table 10-671](#) describes RFBI output enable.

Table 10-671. Register Call Summary for Subsequence: RFBI Output Enable

| Register Name | | |
|----------------|--------------|------------------|
| RFBI_CONFIG | RFBI_CONTROL | RFBI_LINE_NUMBER |
| RFBI_PIXEL_CNT | | |

Table 10-672 describes the RFBI behavior depending on the RFBI output enable.

Table 10-672. RFBI Behavior

| RFBI_CONTROL[0] ENABLE Bit Value | RFBI Behavior |
|----------------------------------|--|
| 0 | Slave port interconnect can write command/parameter/data and read data/status from the RFB. Slave port interconnect access can only be done to the active CS0. |
| 1 | The DISPC sends pixels to the RFB. |

NOTE: The LCD output is disabled at the end of the transfer of the frame. The software must reenble the LCD output to generate a new frame by setting the DISPC_CONTROLo[0] LCDENABLE bit to 1.

CAUTION

The following registers must not be modified when the module is enabled (the RFBI_CONTROL[0] ENABLE bit set to 1):

- RFBI_CONTROL
- RFBI_PIXEL_CNT
- RFBI_LINE_NUMBER
- RFBI_STATUS
- RFBI_CONFIG
- RFBI_ONOFF_TIME
- RFBI_CYCLE_TIME
- RFBI_DATA_CYCLE_i (i = 1 to 3)
- RFBI_VSYNC_WIDTH
- RFBI_HSYNC_WIDTH

NOTE: The RFBI_STALL STALL signal is asserted when the RFBI is disabled. Through the slave port, pixels can be sent to the LCD panel only when the pixel count has reached 0x0.

10.5.5.1.2.1.6 Subsequence: Detect Event

Table 10-673 describes the detect event.

Table 10-673. Detect Event

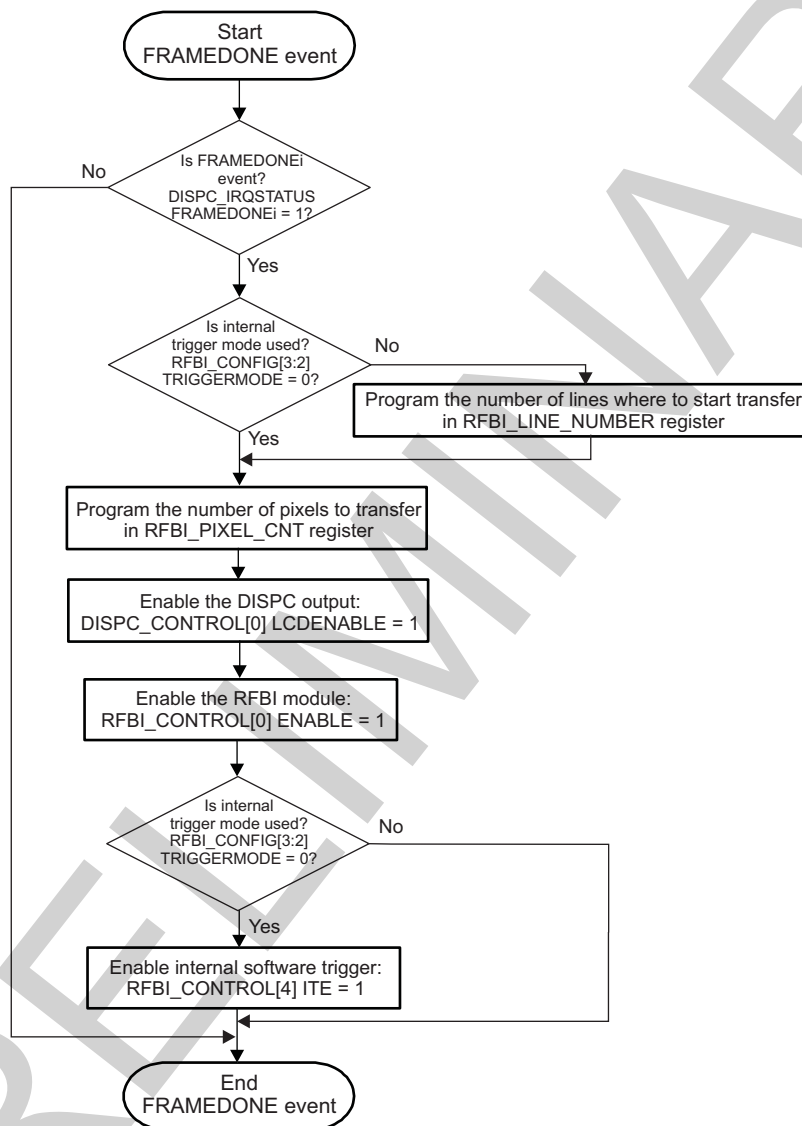
| Step | Register/Bit Field Programming Model | Value |
|----------------------------------|--|-------|
| Wait until DISPC_IRQSTATUS != 0. | DISPC_IRQSTATUS | |
| Service event. | See Section 10.5.5.1.3, RFBI Events Servicing. | |

10.5.5.1.3 RFBI Events Servicing

10.5.5.1.3.1 FRAMEDONE Interrupt Servicing

The FRAMEDONE event occurs each time a frame has been transferred to the LCD panel. [Figure 10-178](#) details how to serve this event.

Figure 10-178. FRAMEDONE Event Servicing Flow Chart



rfbi-023

[Table 10-674](#) describes FRAMEDONE interrupt servicing.

Table 10-674. Register Call Summary for RFBI Events Servicing: FRAMEDONE Interrupt Servicing

| Register Name | | |
|--------------------------------|-------------------------------|----------------------------------|
| DISPC_IRQSTATUS | RFBI_CONFIG | RFBI_LINE_NUMBER |
| RFBI_PIXEL_CNT | DISPC_CONTROL | RFBI_CONTROL |

10.5.6 RFBI Hardware Status Features

Table 10-675 lists the RFBI hardware status features.

Table 10-675. RFBI Hardware Status Features

| Feature | Type | Register/Bit Field/Observability Control | Description |
|---------------------|--------|--|--|
| Data pending | Status | RFBI_SYSTATUS[9] BUSYRFBIDATA | It is set to 1 when some data are pending to be processed from interconnect FIFO. |
| Slave port bus busy | Status | RFBI_SYSTATUS[9] BUSY | It is set to 1 when the slave port bus is busy and access of some RFBI registers (RFBI_CMD , RFBI_STATUS , RFBI_PARAM , and RFBI_READ) is stalled. |

10.5.7 RFBI Register Manual

CAUTION

The main access to all RFBI registers is through the L3 interconnect.
The access through L4_PER interconnect is provided for back software compatibility.

10.5.7.1 RFBI Instance Summary

Table 10-676. RFBI Instance Summary

| Module Name | L3 Base Address | L4_PER Base Address | Size |
|-------------|-----------------|---------------------|------|
| RFBI | 0x5800 2000 | 0x4804 2000 | 4KB |

10.5.7.2 RFBI Registers

10.5.7.2.1 RFBI Register Summary

Table 10-677. RFBI Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | RFBI L3 Physical Address | RFBI L4_PER Physical Address |
|------------------------------------|------|-----------------------|-----------------------------|-----------------------------|------------------------------|
| RFBI_REVISION | R | 32 | 0x0000 0000 | 0x5800 2000 | 0x4804 2000 |
| RFBI_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5800 2010 | 0x4804 2010 |
| RFBI_SYSSTATUS | R | 32 | 0x0000 0014 | 0x5800 2014 | 0x4804 2014 |
| RFBI_CONTROL | RW | 32 | 0x0000 0040 | 0x5800 2040 | 0x4804 2040 |
| RFBI_PIXEL_CNT | RW | 32 | 0x0000 0044 | 0x5800 2044 | 0x4804 2044 |
| RFBI_LINE_NUMB ER | RW | 32 | 0x0000 0048 | 0x5800 2048 | 0x4804 2048 |
| RFBI_CMD | W | 32 | 0x0000 004C | 0x5800 204C | 0x4804 204C |
| RFBI_PARAM | W | 32 | 0x0000 0050 | 0x5800 2050 | 0x4804 2050 |
| RFBI_DATA | W | 32 | 0x0000 0054 | 0x5800 2054 | 0x4804 2054 |
| RFBI_READ | RW | 32 | 0x0000 0058 | 0x5800 2058 | 0x4804 2058 |
| RFBI_STATUS | RW | 32 | 0x0000 005C | 0x5800 205C | 0x4804 205C |
| RFBI_CONFIG | RW | 32 | 0x0000 0060 | 0x5800 2060 | 0x4804 2060 |
| RFBI_ONOFF_TIM E | RW | 32 | 0x0000 0064 | 0x5800 2064 | 0x4804 2064 |
| RFBI_CYCLE_TIME | RW | 32 | 0x0000 0068 | 0x5800 2068 | 0x4804 2068 |
| RFBI_DATA_CYCL E ⁽¹⁾ | RW | 32 | 0x0000 006C + (0x04 * i) | 0x5800 206C + (0x04 * i) | 0x4804 206C + (0x04 * i) |
| RFBI_VSYNC_WID TH | RW | 32 | 0x0000 0090 | 0x5800 2090 | 0x4804 2090 |
| RFBI_HSYNC_WID TH | RW | 32 | 0x0000 0094 | 0x5800 2094 | 0x4804 2094 |

⁽¹⁾ i = 0 to 2

10.5.7.2.2 RFBI Register Description

Table 10-678. RFBI_REVISION

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0000 | | |
| Physical Address | See Table 10-677 . | Instance | RFBI |
| Description | This register contains the IP revision. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP revision | R | See ⁽¹⁾ |

⁽¹⁾ Ti internal data

Table 10-679. Register Call Summary for Register RFBI_REVISION

Remote Frame Buffer Interface

- [RFBI Register Summary: \[0\]](#)

Table 10-680. RFBI_SYSCONFIG

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0010 | | |
| Physical Address | See Table 10-677 . | Instance | RFBI |
| Description | This register controls various parameters of the slave port interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|----------|-----------|----------|-----------|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RESERVED | RESERVED | SIDLEMODE | RESERVED | SOFTRESET | AUTOIDLE | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:7 | RESERVED | Write 0's for future compatibility. Reads returns 0. | RO | 0x0000000 |
| 6 | RESERVED | Write 0's for future compatibility. Reads returns 0. | RO | 0 |
| 5 | RESERVED | Write 0's for future compatibility. Reads returns 0. | RO | 0 |
| 4:3 | SIDLEMODE | Slave interface power management, Idle req/ack control. 0x0: Force-idle. An idle request is acknowledged unconditionally. 0x1: No-idle. An idle request is never acknowledged 0x2: Smart-idle. Acknowledgement to an idle request is given based on the internal activity of the module. | RW | 0x0 |
| 2 | RESERVED | Write 0's for future compatibility. Reads returns 0. | RO | 0 |
| 1 | SOFTRESET | Software reset Sets this bit to 1 to trigger a module reset. The bit is automatically reset by the hardware. During reads, it always returns 0. 0x0: Normal mode 0x1: The module is reset | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | AUTOIDLE | Internal clock gating strategy (RFBI_ICLK clock and DISPC clock) 0x0: RFBI_ICLK clock and DISPC clock are free-running 0x1: Automatic clock gating strategy is applied for the RFBI_ICLK clock and DISPC clock, based on the slave port interface and internal activity. | RW | 1 |

Table 10-681. Register Call Summary for Register RFBI_SYSCONFIG

Remote Frame Buffer Interface

- [Software Reset: \[0\] \[1\]](#)
- [Power Management: \[2\] \[3\]](#)
- [RFBI Register Summary: \[4\]](#)
- [RFBI Register Description: \[5\]](#)

Table 10-682. RFBI_SYSSTATUS

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0014 | Instance | RFBI |
| Physical Address | See Table 10-677 . | | |
| Description | This register provides status information about the module, excluding the interrupt status information. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|------|----|----------|----|---|---|---|---|---|---|-----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BUSYRFBIDATA | | BUSY | | RESERVED | | | | | | | | RESETDONE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|----------|
| 31:10 | RESERVED | Reserved for module-specific status information Read returns 0 | RO | 0x000000 |
| 9 | BUSYRFBIDATA | Data are pending to be processed from interconnect FIFO. Read 0x0: No data pending Read 0x1: Some data are pending | R | 0 |
| 8 | BUSY | Slave port busy status bit Read 0x0: The access to the following register is not stalled: RFBI_CMD , RFBI_STATUS , RFBI_PARAM , RFBI_READ . Read 0x1: The access to any of the following registers is stalled: RFBI_CMD , RFBI_STATUS , RFBI_PARAM , RFBI_READ . | R | 0 |
| 7:1 | RESERVED | Reserved. Read returns 0. | RO | 0x00 |
| 0 | RESETDONE | Internal reset monitoring. It can be used to determine when a hardware reset is completed or when a software reset is completed (software has set RFBI_SYSCONFIG[0] SOFTRESET to 1). Read 0x0: Internal module reset is ongoing Read 0x1: Reset completed | R | 1 |

Table 10-683. Register Call Summary for Register RFBI_SYSSTATUS

Remote Frame Buffer Interface

- [Software Reset: \[0\]](#)
- [RFBI State-Machine: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [Global Initialization: \[10\] \[11\]](#)
- [RFBI Register Summary: \[12\]](#)

Table 10-684. RFBI_CONTROL

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0040 | Instance | RFBI |
| Physical Address | See Table 10-677 . | | |
| Description | The register configures the RFBI module. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|-----------------|----|---------------|----|-----|---|--------------|---|----------|---|--------|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | SMART_DMA_REQ | | DISABLE_DMA_REQ | | HIGHTHRESHOLD | | ITE | | CONFIGSELECT | | RFBIMODE | | ENABLE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|----------|
| 31:9 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x000000 |
| 8 | SMART_DMA_REQ | Smart DMA request 0x0: The dmareq is asserted and deasserted depending on FIFO space even if Midlreq is high in smart-idle/no-idle mode and the entire burst gets error responses from the module. 0x1: The dmareq is deasserted after 2 clock cycles if it has been asserted for more than or equal to 2 clock cycles and Midlreq is high in smart-idle or no-idle mode. No more burst requests will be given even if the space is available in the FIFO. | RW | 0 |
| 7 | DISABLE_DMA_REQ | Disable DMA request 0x0: The dmareq is enabled and the signal is generated based on the space available and the request coming into the data register. 0x1: The dmareq is disabled and the signal is not generated at all based on space in FIFO. It stays high until the DISABLE DM AREQ is high even if there is space in FIFO to take requests. | RW | 0 |
| 6:5 | HIGHTHRESHOLD | Defines the FIFO high threshold used by hardware to assert DMA request. Used only if data written to RFBI_DATA are sent using system DMA. 0x0: Size of the transfer of 4 words of 32-bit wide 0x1: Size of the transfer of 8 words of 32-bit wide 0x2: Size of the transfer of 16 words of 32-bit wide | RW | 0x0 |
| 4 | ITE | Internal Trigger 0x0: Hardware waits for ITE bit to be set if in internal trigger mode for the configuration in use. 0x1: User sets the ITE bit to start the transfer, when hardware takes into account the bit, the hardware resets it. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 3:2 | CONFIGSELECT | Select the CS and configuration 0x0: No CS selected 0x1: CS0 selected 0x2: Reserved 0x3: Reserved | RW | 0x0 |
| 1 | RFBIMODE | RFBIMode 0x0: The RFBIMode is selected. 0x1: The RFBIMode is not selected. | RW | 1 |
| 0 | ENABLE | Enable/Disable flag 0x0: Disable the RFBIModule. 0x1: Enable the RFBIModule. | RW | 0 |

Table 10-685. Register Call Summary for Register RFBIMODE

Remote Frame Buffer Interface

- [RFBIMode Parallel Interface \(MIPI DBI Protocol\): \[0\]](#)
- [Description of the Tearing Effect Pulse Signal: \[1\]](#)
- [DMA Requests: \[2\]](#)
- [Description: \[3\]](#)
- [Stall Mechanism: \[4\] \[5\] \[6\]](#)
- [Using DMA Request With Interconnect FIFO: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [Number of Pixels to Transfer: \[13\] \[14\]](#)
- [Configuration Selection: \[15\]](#)
- [RFBIMode Timings: \[16\] \[17\]](#)
- [Trigger Mode: \[18\]](#)
- [Internal Trigger Mode: \[19\] \[20\] \[21\]](#)
- [Global Initialization: \[22\] \[23\] \[24\] \[25\] \[26\]](#)
- [Operational Modes Configuration: \[27\] \[28\] \[29\] \[30\]](#)
- [RFBIMode Events Servicing: \[31\]](#)
- [RFBIMode Register Summary: \[32\]](#)

Table 10-686. RFBIMODE_PIXEL_CNT

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0044 | | |
| Physical Address | See Table 10-677 . | Instance | RFB1 |
| Description | The register configures the RFB1 pixel count value. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PIXELCNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | PIXELCNT | Pixel counter value The software indicates the number of pixels to transfer to the LCD panel frame buffer. The value is set when the module is disabled. During the transfer the hardware decrements the register when a pixel has been sent to the RFB. | RW | 0x0000 0000 |

Table 10-687. Register Call Summary for Register RFBI_PIXEL_CNT

Remote Frame Buffer Interface

- [Number of Pixels to Transfer: \[0\] \[1\]](#)
- [Operational Modes Configuration: \[2\] \[3\]](#)
- [RFBI Events Servicing: \[4\]](#)
- [RFBI Register Summary: \[5\]](#)

Table 10-688. RFBI_LINE_NUMBER

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0048 | Instance | RFBI |
| Physical Address | See Table 10-677 . | | |
| Description | The register configures the number of lines to synchronize the beginning of the transfer. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LINENUMBER | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|----------|
| 31:11 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x000000 |
| 10:0 | LINENUMBER | Programmable line number Line number from 0 to 2047. Number of HSYNC after the VSYNC occurs before the beginning of the transfer. | RW | 0x000 |

Table 10-689. Register Call Summary for Register RFBI_LINE_NUMBER

Remote Frame Buffer Interface

- [External Trigger Mode: \[0\]](#)
- [Operational Modes Configuration: \[1\] \[2\]](#)
- [RFBI Events Servicing: \[3\]](#)
- [RFBI Register Summary: \[4\]](#)
- [RFBI Register Description: \[5\] \[6\]](#)

Table 10-690. RFBI_CMD

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 004C | Instance | RFBI |
| Physical Address | See Table 10-677 . | | |
| Description | The register configures the RFBI command. | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CMD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x000000 |
| 7:0 | CMD | Command Value | W | 0x00 |

Table 10-691. Register Call Summary for Register RFBI_CMD

Remote Frame Buffer Interface

- [RFBI State-Machine: \[0\] \[1\]](#)
- [Global Initialization: \[2\]](#)
- [RFBI Hardware Status Features: \[3\]](#)
- [RFBI Register Summary: \[4\]](#)
- [RFBI Register Description: \[5\] \[6\]](#)

Table 10-692. RFBI_PARAM

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0050 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | See Table 10-677 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | RFBI | | | | | | | | | | | | | | | |
| Description | The register configures the RFBI parameter. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | PARAM | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x000000 |
| 7:0 | PARAM | Parameter value | W | 0x00 |

Table 10-693. Register Call Summary for Register RFBI_PARAM

Remote Frame Buffer Interface

- [RFBI State-Machine: \[0\] \[1\]](#)
- [RFBI Hardware Status Features: \[2\]](#)
- [RFBI Register Summary: \[3\]](#)
- [RFBI Register Description: \[4\] \[5\]](#)

Table 10-694. RFBI_DATA

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0054 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | See Table 10-677 . | | | | | | | | | | | | | | | | Instance RFBI | | | | | | | | | | | | | | | |
| Description | The register configures the RFBI data. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | DATA | Data value 12/16/18/24/2x16 bit value depending on: Data Type [11:0] 12-bit Data Type [15:0] 16-bit Data Type [17:0] 18-bit Data Type [23:0] 24-bit Data Type [31:0] 2x16-bit | W | 0x0000 0000 |

Table 10-695. Register Call Summary for Register RFBI_DATA

Remote Frame Buffer Interface

- [Remote Frame Buffer Interface Overview: \[0\] \[1\]](#)
- [Description: \[2\] \[3\] \[4\]](#)
- [Using DMA Request With Interconnect FIFO: \[5\] \[6\] \[7\]](#)
- [RFBI State-Machine: \[8\] \[9\] \[10\] \[11\]](#)
- [RFBI Register Summary: \[12\]](#)
- [RFBI Register Description: \[13\]](#)

Table 10-696. RFBI_READ

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0058 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | See Table 10-677 . | | | | | | | | | | | | | | | | Instance RFBI | | | | | | | | | | | | | | | |
| Description | The register configures the RFBI read. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | READ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x000000 |
| 7:0 | READ | Read value | RW | 0x00 |

Table 10-697. Register Call Summary for Register RFBI_READ

Remote Frame Buffer Interface

- [RFBI State-Machine: \[0\] \[1\]](#)
- [Global Initialization: \[2\] \[3\]](#)
- [RFBI Hardware Status Features: \[4\]](#)
- [RFBI Register Summary: \[5\]](#)
- [RFBI Register Description: \[6\] \[7\]](#)

Table 10-698. RFBI_STATUS

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 005C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | See Table 10-677 . | | | | | | | | | | | | | | | | Instance RFBI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | The register configures the RFBI status. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STATUS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x000000 |
| 7:0 | STATUS | Status value | RW | 0x00 |

Table 10-699. Register Call Summary for Register RFBI_STATUS

Remote Frame Buffer Interface

- [RFBI State-Machine: \[0\] \[1\]](#)
- [Global Initialization: \[2\] \[3\]](#)
- [Operational Modes Configuration: \[4\]](#)
- [RFBI Hardware Status Features: \[5\]](#)
- [RFBI Register Summary: \[6\]](#)
- [RFBI Register Description: \[7\] \[8\]](#)

Table 10-700. RFBI_CONFIG

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0060 | | | | | | | | | | | | | | | |
| Physical Address | See Table 10-677 . | | | | | | | | | | | | | | | |
| Instance | RFBI | | | | | | | | | | | | | | | |
| Description | The control register sets the configuration for the LCD 0 and LCD 1. | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|---------------|-------------------|------------|------------|------------|------------|----------|----|----|----|------------|----|-------------|----|------------|---|----------|---|-----------------|---|-------------|---|--------------|---|
| RESERVED | | | | | | | | HSYNCPOLARITY | TE_VSYNC_POLARITY | CSPOLARITY | WEPOLARITY | REPOLARITY | A0POLARITY | RESERVED | | | | UNUSEDBITS | | CYCLEFORMAT | | PORTFORMAT | | DATATYPE | | TIMEGRANULARITY | | TRIGGERMODE | | PARALLELMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:22 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x000 |
| 21 | HSYNCPOLARITY | HSYNC polarity 0x0: HSYNC active low 0x1: HSYNC active high | RW | 1 |
| 20 | TE_VSYNC_POLARITY | TE or VSYNC polarity 0x0: active low 0x1: active high | RW | 1 |
| 19 | CSPOLARITY | CS polarity 0x0: CS active low 0x1: CS active high | RW | 0 |
| 18 | WEPOLARITY | WE polarity 0x0: Active low 0x1: Active high | RW | 0 |
| 17 | REPOLARITY | RE polarity 0x0: Active low 0x1: Active high | RW | 0 |
| 16 | A0POLARITY | A0 polarity 0x0: A0 active low 0x1: A0 active high | RW | 1 |
| 15:13 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x0 |
| 12:11 | UNUSEDBITS | State of unused bits 0x0: Low level (0) 0x1: High level (1) 0x2: Unchanged from previous state | RW | 0x0 |
| 10:9 | CYCLEFORMAT | Cycle format 0x0: 1 cycle for 1 pixel 0x1: 2 cycles for 1 pixel 0x2: 3 cycles for 1 pixel 0x3: 3 cycles for 2 pixels | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------|
| 8:7 | PORTFORMAT | Slave port write access format 0x0: 1 pixel per slave port access to the register data 0x2: 2 pixels per slave port access to the register data with first pixel at the position [15:0] 0x3: 2 pixels per slave port access to the register data with first pixel at the position [31:16] | RW | 0x0 |
| 6:5 | DATATYPE | Data type from the DISPC and slave port 0x0: 12-bit 0x1: 16-bit 0x2: 18-bit 0x3: 24-bit | RW | 0x0 |
| 4 | TIMEGRANULARITY | Multiplies signal timing latencies by 2 0x0: x2 latencies disabled 0x1: x2 latencies enabled | RW | 0 |
| 3:2 | TRIGGERMODE | Trigger mode 0x0: 00 Internal trigger mode (ITE bit mode) 0x1: External trigger mode (Tearing Effect Signal, rfb_i_tevsync0 with programmable line counter defined in RFB_I_LINE_NUMBER register) 0x2: External trigger mode (rfb_i_tevsync0/rfb_i_hsync0 with programmable line counter defined in RFB_I_LINE_NUMBER register) | RW | 0x0 |
| 1:0 | PARALLELMODE | Parallel mode 0x0: 8-bit parallel output interface selected 0x1: 9-bit parallel output interface selected 0x2: Reserved 0x3: 16-bit parallel output interface selected | RW | 0x0 |

Table 10-701. Register Call Summary for Register RFB_I_CONFIG

Remote Frame Buffer Interface

- [RFB_I Parallel Interface \(MIPI DBI Protocol\): \[0\] \[1\] \[2\]](#)
- [Description of the Tearing Effect Pulse Signal: \[3\] \[4\] \[5\] \[6\]](#)
- [RFB_I Input Formats: \[7\]](#)
- [Stall Mechanism: \[8\]](#)
- [Cycle Mode Selection: \[9\] \[10\] \[11\] \[12\]](#)
- [Unmodified Bits: \[13\]](#)
- [Read/Write: \[14\] \[15\]](#)
- [RFB_I State-Machine: \[16\]](#)
- [RFB_I Timings: \[17\]](#)
- [Trigger Mode: \[18\]](#)
- [Internal Trigger Mode: \[19\]](#)
- [Global Initialization: \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\]](#)
- [Operational Modes Configuration: \[29\] \[30\]](#)
- [RFB_I Events Servicing: \[31\]](#)
- [RFB_I Register Summary: \[32\]](#)

Table 10-702. RFBI_ONOFF_TIME

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0064 | Instance | RFBI |
| Physical Address | See Table 10-677 . | | |
| Description | The control register configures the RFBI timings for the LCD 0 and LCD 1. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|-----------|----|----|----|----|----|----|----------|----|----|----|-----------|----|----|----|----------|----|----|----|-----------|----|---|---|----------|---|---|---|---|---|---|---|
| RESERVED | REOFFTIME | | | | | | | REONTIME | | | | WEOFFTIME | | | | WEONTIME | | | | CSOFFTIME | | | | CSONTIME | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:30 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x0 |
| 29:24 | REOFFTIME | Read enable deassertion time from start access time. Number of RFBI_ICLK cycles | RW | 0x00 |
| 23:20 | REONTIME | Read enable assertion time from start access time. Number of RFBI_ICLK cycles | RW | 0x0 |
| 19:14 | WEOFFTIME | Write enable deassertion time from start access time. Number of RFBI_ICLK cycles | RW | 0x00 |
| 13:10 | WEONTIME | Write enable assertion time from start access time. Number of RFBI_ICLK cycles | RW | 0x0 |
| 9:4 | CSOFFTIME | CS deassertion time from start access time. Number of RFBI_ICLK cycles | RW | 0x00 |
| 3:0 | CSONTIME | CS assertion time from start access time. Number of RFBI_ICLK cycles | RW | 0x0 |

Table 10-703. Register Call Summary for Register RFBI_ONOFF_TIME

Remote Frame Buffer Interface

- [Transaction Timing Diagrams: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [RFBI Timings: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\]](#)
- [Global Initialization: \[21\]](#)
- [Operational Modes Configuration: \[22\]](#)
- [RFBI Register Summary: \[23\]](#)

Table 10-704. RFBI_CYCLE_TIME

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0068 | Instance | RFBI |
| Physical Address | See Table 10-677 . | | |
| Description | The control register configures the RFBI timings for the LCD 0 and LCD 1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----------|----------|----------|--------------|----|----|----|-------------|----|----|----|-------------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | ACCESSTIME | | | | WRENABLE | WWENABLE | RRENABLE | RWENABLE | CSPULSEWIDTH | | | | RECYCLETIME | | | | WECYCLETIME | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|-------|
| 31:28 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x0 |
| 27:22 | ACCESSTIME | Access time number of RFBI_ICLK cycles | RW | 0x00 |
| 21 | WRENABLE | Write-to-read pulse width enable (same CS) 0x0: CSPULSEWIDTH does not apply on Write-to-Read access 0x1: CSPULSEWIDTH applies on Write-to-Read access | RW | 0 |
| 20 | WWENABLE | Write-to-write pulse width enable (same CS) 0x0: CSPULSEWIDTH does not apply on Write-to-Write access 0x1: CSPULSEWIDTH applies on Write-to-Write access | RW | 0 |
| 19 | RRENABLE | Read-to-read pulse width enable (same CS) 0x0: CSPULSEWIDTH does not apply on Read-to-Read access 0x1: CSPULSEWIDTH applies on Read-to-Read access | RW | 0 |
| 18 | RWENABLE | Read-to-write pulse width enable (same CS): 0x0: CSPULSEWIDTH does not apply on Read-to-Write access 0x1: CSPULSEWIDTH applies on Read-to-Write access | RW | 0 |
| 17:12 | CSPULSEWIDTH | CS pulse width number of RFBI_ICLK cycles | RW | 0x00 |
| 11:6 | RECYCLETIME | RE cycle time number of RFBI_ICLK cycles | RW | 0x00 |
| 5:0 | WECYCLETIME | WE cycle time number of RFBI_ICLK cycles | RW | 0x00 |

Table 10-705. Register Call Summary for Register RFBI_CYCLE_TIME

Remote Frame Buffer Interface

- [Transaction Timing Diagrams: \[0\] \[1\] \[2\]](#)
- [RFBI Timings: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)
- [Global Initialization: \[16\]](#)
- [Operational Modes Configuration: \[17\]](#)
- [RFBI Register Summary: \[18\]](#)

Table 10-706. RFBI_DATA_CYCLEi

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 006C + (0x04 * i) | Index | i = 0 to 2 |
| Physical Address | See Table 10-677 . | Instance | RFBI |
| Description | The control register configures the RFBI data format for ith cycle (i = 1 for firstcycle, i = 2 for second cycle, i = 3 for third cycle). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|--------------------|----|----|----|----------|----|----|----|--------------|----|----|----|----------|----|----|----|--------------------|----|---|---|----------|---|---|---|--------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | BITALIGNMENTPIXEL2 | | | | RESERVED | | | | NBBITSPIXEL2 | | | | RESERVED | | | | BITALIGNMENTPIXEL1 | | | | RESERVED | | | | NBBITSPIXEL1 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|-------|
| 31:28 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x0 |
| 27:24 | BITALIGNMENTPIXEL2 | Alignment of the bits from pixel 2 on the output interface | RW | 0x0 |
| 23:21 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|-------|
| 20:16 | NBBITSPIXEL2 | Number of bits from the pixel 2 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |
| 15:12 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x0 |
| 11:8 | BITALIGNMENTPIXEL1 | Alignment of the bits from pixel 1 on the output interface | RW | 0x0 |
| 7:5 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x0 |
| 4:0 | NBBITSPIXEL1 | Number of bits from the pixel 1 (value from 0 to 16 bits). The values from 17 to 31 are invalid. | RW | 0x00 |

Table 10-707. Register Call Summary for Register RFBI_DATA_CYCLE1

Remote Frame Buffer Interface

- [Cycle Mode Selection: \[0\]](#)
- [Operational Modes Configuration: \[1\]](#)
- [RFBI Register Summary: \[2\]](#)

Table 10-708. RFBI_VSYNC_WIDTH

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0090 | Instance | RFBI |
| Physical Address | See Table 10-677 . | | |
| Description | The register configures the RFBI VSYNC minimum pulse width. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | MINVSYNCPUSEWIDTH | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|--------|
| 31:16 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x0000 |
| 15:0 | MINVSYNCPUSEWIDTH | Programmable minimum VSYNC pulse width Minimum VSYNC pulse width from 0 to 65535. Number of RFBI_ICLK clock cycles to determine when VSYNC pulse occurs. The values 0 and 1 are invalid. | RW | 0x0000 |

Table 10-709. Register Call Summary for Register RFBI_VSYNC_WIDTH

Remote Frame Buffer Interface

- [Description of the Tearing Effect Pulse Signal: \[0\]](#)
- [External Trigger Mode: \[1\] \[2\]](#)
- [Global Initialization: \[3\]](#)
- [Operational Modes Configuration: \[4\]](#)
- [RFBI Register Summary: \[5\]](#)

Table 10-710. RFBI_HSYNC_WIDTH

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0094 | Instance | RFBI |
| Physical Address | See Table 10-677 . | | |
| Description | The register configures the RFBI HSYNC minimum pulse width. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | MINHSYNCPULSEWIDTH | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|--------|
| 31:16 | RESERVED | Write 0's for future compatibility. Reads return 0. | RO | 0x0000 |
| 15:0 | MINHSYNCPULSEWIDTH | Programmable minimum HSYNC pulse width minimum HSYNC pulse width from 0 to 65535. Number of RFBI_ICLK clock cycles to determine when HSYNC pulse occurs. The values 0 and 1 are invalid. | RW | 0x0000 |

Table 10-711. Register Call Summary for Register RFBI_HSYNC_WIDTH

Remote Frame Buffer Interface

- [Description of the Tearing Effect Pulse Signal: \[0\]](#)
- [External Trigger Mode: \[1\] \[2\]](#)
- [Global Initialization: \[3\]](#)
- [Operational Modes Configuration: \[4\]](#)
- [RFBI Register Summary: \[5\]](#)

PRELIMINARY

3D Graphics Accelerator

This chapter describes the 3D graphics accelerator for the device.

NOTE: The SGX subsystem is an instantiation by Texas Instruments of the POWERVR® SGX544-SC core from Imagination Technologies Ltd.

This document contains materials that are © Imagination Technologies Ltd.

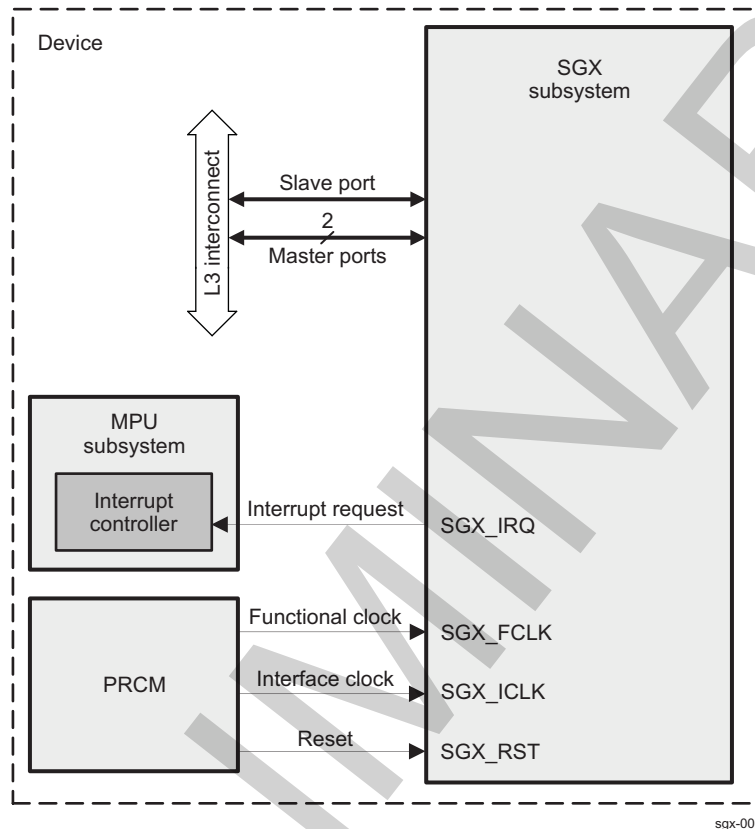
POWERVR and USSE are trademarks or registered trademarks of Imagination Technologies Ltd.

| Topic | Page |
|---------------------------------------|------|
| 11.1 SGX Overview | 2668 |
| 11.2 SGX Integration | 2670 |
| 11.3 SGX Functional Description | 2672 |
| 11.4 SGX Register Manual | 2674 |

11.1 SGX Overview

The 3D graphics subsystem accelerates 2-dimensional (2D) and 3-dimensional (3D) graphics and compute applications. It is based on the POWERVR® SGX544 core from Imagination Technologies. [Figure 11-1](#) shows the SGX subsystem.

Figure 11-1. SGX Overview



sgx-001

11.1.1 SGX Features Overview

- API support for industry standards:
 - OGL-ES 1.1 and 2.0
 - OpenVG™ 1.1
 - OpenCL™-EP 1.1
 - Direct3D™ Feature Level 9.3
- Single-core SGX architecture:
 - SGX544 core
- Tile-based deferred rendering architecture:
 - Reduces external bandwidth to SDRAM
- Second-generation Universal Scalable Shader Engines (USSE2™):
 - Multithreaded engine incorporating vertex and pixel shader functionality
 - Automatic load balancing of vertex and pixel processing tasks
- Present and texture load accelerator (PTLA):
 - Enables to move, rotate, twiddle, and scale texture surfaces
 - Supports RGB, ARGB, YUV4:2:2, and YUV4:2:0 surface formats
 - Supports bilinear upscale

- Supports source color key
- Fully virtualized memory addressing for operating system (OS) in a unified memory architecture:
 - Memory management unit (MMU)
 - Up to 4-GB virtual address space

11.1.2 Graphics Feature Overview

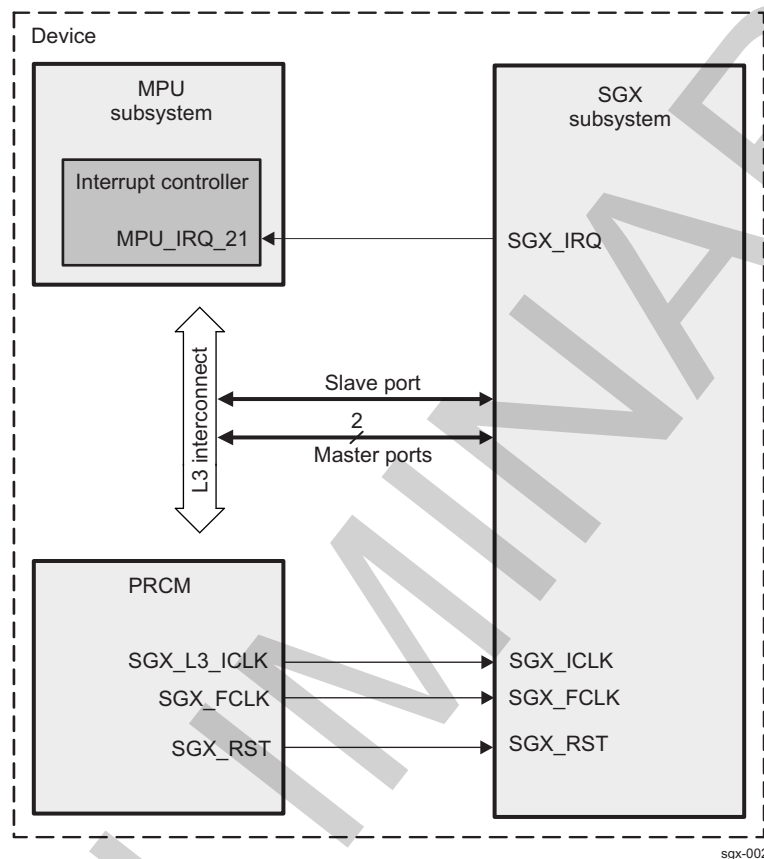
- Texture support:
 - Cube map
 - Projected textures
 - Nonsquare textures
- Texture formats:
 - RGBA 8888, 565, 1555, and 1565
 - Monochromatic 8, 16, 16f, 32f, and 32int
 - Dual channel, 8:8, 16:16, and 16f:16f
 - Compressed textures:
 - PVRTC-i 2 bpp
 - PVRTC-i 4 bpp
 - PVRTC-ii 2 bpp
 - PVRTC-ii 4 bpp
 - ETC1
 - Programmable support for YUV formats:
 - Programmable matrix in hardware, coefficients on 12 bits
 - YUV4:2:2, YUV4:2:0, two planes (NV12 or NV21); YUV4:2:0, three planes
- Resolution support:
 - Frame buffer maximum = 4096 × 4096
 - Texture maximum size = 4096 × 4096
- Texture filtering:
 - Bilinear, trilinear
 - Independent minimum and mag control
- Anti-aliasing:
 - 4× multisampling
 - Programmable sample positions

11.2 SGX Integration

This section describes the integration of the module in the device, including information about clocks, resets, and hardware requests.

Figure 11-2 shows the SGX integration.

Figure 11-2. SGX Integration



The SGX subsystem is connected to the level 3 (L3) interconnect by two 128-bit master and a 64-bit slave interfaces.

Table 11-1 through Table 11-3 summarize the integration of the module in the device.

Table 11-1. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| SGX | PD_SGX | L3 |

Table 11-2. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|----------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| SGX | SGX_ICLK | SGX_L3_ICLK | PRCM | SGX interface clock |
| SGX | SGX_FCLK | SGX_FCLK | PRCM | SGX functional clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| SGX | SGX_RST | SGX_RST | PRCM | SGX reset signal |

Table 11-3. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| SGX | SGX_IRQ | MPU_IRQ_21 | MPU INTC | SGX interrupt request to the microprocessor unit (MPU) interrupt controller (INTC) |

11.3 SGX Functional Description

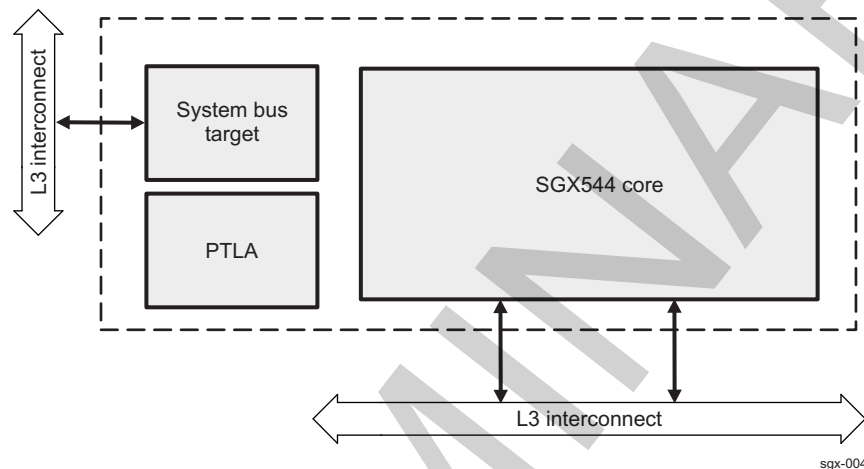
11.3.1 SGX Block Diagram

The SGX subsystem is based on the POWERVR SGX544-SC core. The SGX architecture comprises the following elements:

- SGX544 core
- PTLA

Figure 11-3 shows the SGX top-level block diagram.

Figure 11-3. SGX Block Diagram



11.3.2 SGX Clock Configuration

The SGX subsystem operates from two clocks: an interface clock (SGX_ICLK) and one functional clock (SGX_FCLK). The power, reset, and clock management (PRCM) module generates and distributes the clocks inside the device.

- The SGX_ICLK manages the data transfer on the L3 master and slave ports.

The SGX_ICLK frequency is selected based on the L3 interconnect clock frequency of the whole device. For more information about the interface clock, see [Section 3.6.11, CD_SGX Clock Domains](#).

When no longer required by the SGX subsystem, SGX_ICLK can be disabled by software at the PRCM level. For more information, see [PD_SGX Description](#), in *Power, Reset, and Clock Management*.

NOTE: SGX_ICLK is cut only if the SGX is ready to go into IDLE state.

- SGX_FCLK is the functional clocks and is used inside the SGX subsystem to generate clock signals to multiple SGX clock domains.

Using the clock source selection and the digital phase-locked loop (DPLL) settings, SGX_FCLK frequency can be adjusted.

The SGX_FCLK clock is provided by the peripheral DPLL, as described in [CD_SGX Clock Domain](#), in *Power, Reset, and Clock Management*.

When no longer needed by the SGX subsystem, SGX_FCLK can be cut by software at the PRCM level if the module is ready to enter IDLE state. For more information, see [PD_SGX Description](#), in *Power, Reset, and Clock Management*.

11.3.3 SGX Software Reset

The SGX subsystem has its own reset domain. Global reset of the SGX is performed by activating the SGX_RST signal in the SGX_RST domain.

NOTE: The APIs delivered with the SGX provide a software reset functionally equivalent to a hardware reset.

11.3.4 SGX Power Management

The SGX subsystem has its own power domain (SGX power domain). For additional information about the SGX power domain, see [PD_SGX Description](#), in *Power, Reset, and Clock Management*.

NOTE: The SGX handles automatic clock gating performed on the multiple internal module clock domains.

In addition, software-controlled clock gating is managed inside the SGX and handled by the related API delivered with the module.

11.3.5 SGX Interrupt Requests

The SGX subsystem can generate one interrupt signal to the MPU INTC mapped to SGX_IRQ.

11.4 SGX Register Manual

CAUTION

All SGX registers are limited to 32-bit data accesses; 8- and 16-bit accesses are not allowed because they can corrupt register content.

This section describes the TI-specific registers.

11.4.1 SGX Instance Summary

Table 11-4. SGX Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|-------|
| SGX | 0x5600 0000 | 64 KB |

11.4.2 SGX Registers

11.4.2.1 SGX Register Summary

Table 11-5. SGX Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address |
|-------------------------------------|------|-----------------------|----------------|------------------|
| SGX_REVISION | R | 32 | 0x0000 FE00 | 0x5600 FE00 |
| SGX_HWINFO | R | 32 | 0x0000 FE04 | 0x5600 FE04 |
| SGX_SYSCONFIG | RW | 32 | 0x0000 FE10 | 0x5600 FE10 |
| SGX_IRQSTATUS_RAW_0 | RW | 32 | 0x0000 FE24 | 0x5600 FE24 |
| SGX_IRQSTATUS_RAW_1 | RW | 32 | 0x0000 FE28 | 0x5600 FE28 |
| SGX_IRQSTATUS_RAW_2 | RW | 32 | 0x0000 FE2C | 0x5600 FE2C |
| SGX_IRQSTATUS_0 | RW | 32 | 0x0000 FE30 | 0x5600 FE30 |
| SGX_IRQSTATUS_1 | RW | 32 | 0x0000 FE34 | 0x5600 FE34 |
| SGX_IRQSTATUS_2 | RW | 32 | 0x0000 FE38 | 0x5600 FE38 |
| SGX_IRQENABLE_SET_0 | RW | 32 | 0x0000 FE3C | 0x5600 FE3C |
| SGX_IRQENABLE_SET_1 | RW | 32 | 0x0000 FE40 | 0x5600 FE40 |
| SGX_IRQENABLE_SET_2 | RW | 32 | 0x0000 0044 | 0x5600 FE44 |
| SGX_IRQENABLE_CLR_0 | RW | 32 | 0x0000 FE48 | 0x5600 FE48 |
| SGX_IRQENABLE_CLR_1 | RW | 32 | 0x0000 FE4C | 0x5600 FE4C |
| SGX_IRQENABLE_CLR_2 | RW | 32 | 0x0000 FE50 | 0x5600 FE50 |
| SGX_PAGE_CONFIG | RW | 32 | 0x0000 FF00 | 0x5600 FF00 |
| SGX_INTERRUPT_EVENT | RW | 32 | 0x0000 FF04 | 0x5600 FF04 |
| SGX_DEBUG_CONFIG | RW | 32 | 0x0000 FF08 | 0x5600 FF08 |
| SGX_DEBUG_STATUS_0 | R | 32 | 0x0000 FF0C | 0x5600 FF0C |
| SGX_DEBUG_STATUS_1 | R | 32 | 0x0000 FF10 | 0x5600 FF10 |

11.4.2.2 SGX Register Description

Table 11-6. SGX_REVISION

| | | | |
|-------------------------|-------------------|-----------------|-----|
| Address Offset | 0x0000 FE00 | Instance | SGX |
| Physical Address | 0x5600 FE00 | | |
| Description | Revision register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISIONID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------|------|--------------------|
| 31:0 | REVISIONID | Revision value | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 11-7. Register Call Summary for Register SGX_REVISION

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-8. SGX_HWINFO

| | | | |
|-------------------------|-------------------------------------|-----------------|-----|
| Address Offset | 0x0000 FE04 | Instance | SGX |
| Physical Address | 0x5600 FE04 | | |
| Description | Hardware implementation information | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|---------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MEM_BUS_WIDTH | | SYS_BUS_WIDTH | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | MEM_BUS_WIDTH | Memory bus width Read 0x0: 64 bits Read 0x1: 128 bits | R | 1 |
| 1:0 | SYS_BUS_WIDTH | System bus width Read 0x0: 32 bits Read 0x1: 64 bits Read 0x2: 128 bits Read 0x3: Reserved | R | 0x1 |

Table 11-9. Register Call Summary for Register SGX_HWINFO

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-10. SGX_SYSCONFIG

| | | | |
|-------------------------|-------------------------------|-----------------|-----|
| Address Offset | 0x0000 FE10 | Instance | SGX |
| Physical Address | 0x5600 FE10 | | |
| Description | System configuration register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|-----------|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STANDBY_MODE | | IDLE_MODE | | RESERVED | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|------------|
| 31:6 | RESERVED | | R | 0x000 0000 |
| 5:4 | STANDBY_MODE | Clock standby mode: 0x0: Force-standby 0x1: No-standby 0x2: Smart-standby 0x3: Reserved | RW | 0x2 |
| 3:2 | IDLE_MODE | Clock idle mode: 0x0: Force-standby 0x1: No-standby 0x2: Smart-standby 0x3: Reserved | RW | 0x2 |
| 1:0 | RESERVED | | R | 0x0 |

Table 11-11. Register Call Summary for Register SGX_SYSCONFIG

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-12. SGX_IRQSTATUS_RAW_0

| | | | |
|-------------------------|------------------|-----------------|-----|
| Address Offset | 0x0000 FE24 | Instance | SGX |
| Physical Address | 0x5600 FE24 | | |
| Description | Raw IRQ 0 status | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------|------------|-----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | INIT | MINTERRUPT | RAW |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | INIT_MINTERRUPT_RAW | Interrupt 0 raw event: Write 0x0: No action Write 0x1: Set event (used for debug) Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |

Table 11-13. Register Call Summary for Register SGX_IRQSTATUS_RAW_0

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-14. SGX_IRQSTATUS_RAW_1

| | | | |
|-------------------------|---|-----------------|-----|
| Address Offset | 0x0000 FE28 | Instance | SGX |
| Physical Address | 0x5600 FE28 | | |
| Description | Raw IRQ 1 status. Slave port interrupt. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TARGET_SINTERRUPT_RAW | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | TARGET_SINTERRUPT_RAW | Interrupt 1 raw event: Write 0x0: No action Write 0x1: Set event (used for debug) Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |

Table 11-15. Register Call Summary for Register SGX_IRQSTATUS_RAW_1

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-16. SGX_IRQSTATUS_RAW_2

| | | | |
|-------------------------|-----------------------------------|-----------------|-----|
| Address Offset | 0x0000 FE2C | Instance | SGX |
| Physical Address | 0x5600 FE2C | | |
| Description | Raw IRQ 2 status. Core interrupt. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | THALIA_IRQ_RAW | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | THALIA_IRQ_RAW | Interrupt 0 raw event: Write 0x0: No action Write 0x1: Set event (used for debug) Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |

Table 11-17. Register Call Summary for Register SGX_IRQSTATUS_RAW_2

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-18. SGX_IRQSTATUS_0

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 FE30 | Instance | SGX |
| Physical Address | 0x5600 FE30 | | |
| Description | Interrupt 0 status event. Master port interrupt. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | INIT_MINTERRUPT_STATUS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | INIT_MINTERRUPT_STATUS | Interrupt 0 raw event: Write 0x0: No action Write 0x1: Clear event Read 0x0: No event pending Read 0x1: Event pending and interrupt enabled | RW | 0 |

Table 11-19. Register Call Summary for Register SGX_IRQSTATUS_0

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-20. SGX_IRQSTATUS_1

| | | | |
|-------------------------|---------------------------------------|-----------------|-----|
| Address Offset | 0x0000 FE34 | Instance | SGX |
| Physical Address | 0x5600 FE34 | | |
| Description | Interrupt 1 - slave port status event | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TARGET_SINTERRUPT_STATUS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | TARGET_SINTERRUPT_STATUS | Interrupt 0 raw event: Write 0x0: No action Write 0x1: Clear event Read 0x0: No event pending Read 0x1: Event pending and interrupt enabled | RW | 0 |

Table 11-21. Register Call Summary for Register SGX_IRQSTATUS_1

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-22. SGX_IRQSTATUS_2

| | | | |
|-------------------------|---------------------------------|-----------------|-----|
| Address Offset | 0x0000 FE38 | Instance | SGX |
| Physical Address | 0x5600 FE38 | | |
| Description | Interrupt 2 - Core status event | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | THALIA_IRQ_STATUS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | THALIA_IRQ_STATUS | Interrupt 0 raw event: Write 0x0: No action Write 0x1: Clear event Read 0x0: No event pending Read 0x1: Event pending and interrupt enabled | RW | 0 |

Table 11-23. Register Call Summary for Register SGX_IRQSTATUS_2

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-24. SGX_IRQENABLE_SET_0

| | | | |
|-------------------------|-----------------------------------|-----------------|-----|
| Address Offset | 0x0000 FE3C | Instance | SGX |
| Physical Address | 0x5600 FE3C | | |
| Description | Enable Interrupt 0 - Master port. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | INIT_INTERRUPT_ENABLE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | INIT_INTERRUPT_ENABLE | To enable interrupt: Write 0x0: No action Write 0x1: Enable interrupt Read 0x0: Interrupt is disabled Read 0x1: Interrupt is enabled | RW | 0 |

Table 11-25. Register Call Summary for Register SGX_IRQENABLE_SET_0

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-26. SGX_IRQENABLE_SET_1

| | | | |
|-------------------------|-------------------------------------|-----------------|-----|
| Address Offset | 0x0000 FE40 | Instance | SGX |
| Physical Address | 0x5600 FE40 | | |
| Description | Enable Interrupt 1. Core interrupt. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TARGET_SINTERRUPT_ENABLE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | TARGET_SINTERRUPT_ENABLE | To enable interrupt: Write 0x0: No action Write 0x1: Enable interrupt Read 0x0: Interrupt is disabled Read 0x1: Interrupt is enabled | RW | 0 |

Table 11-27. Register Call Summary for Register SGX_IRQENABLE_SET_1

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-28. SGX_IRQENABLE_SET_2

| | | | |
|-------------------------|-------------------------------------|-----------------|-----|
| Address Offset | 0x0000 FE44 | Instance | SGX |
| Physical Address | 0x5600 FE44 | | |
| Description | Enable Interrupt 2. Core interrupt. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | THALIA_IRQ_ENABLE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | THALIA_IRQ_ENABLE | To enable interrupt: Write 0x0: No action Write 0x1: Enable interrupt Read 0x0: Interrupt is disabled Read 0x1: Interrupt is enabled | RW | 0 |

Table 11-29. Register Call Summary for Register SGX_IRQENABLE_SET_2

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-30. SGX_IRQENABLE_CLR_0

| | | | |
|-------------------------|------------------------------------|-----------------|-----|
| Address Offset | 0x0000 FE48 | Instance | SGX |
| Physical Address | 0x5600 FE48 | | |
| Description | Disable Interrupt 0 - Master port. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | INIT_INTERRUPT_DISABLE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | INIT_INTERRUPT_DISABLE | To disable interrupt: Write 0x0: No action Write 0x1: Disable interrupt Read 0x0: Interrupt is disabled Read 0x1: Interrupt is enabled | RW | 0 |

Table 11-31. Register Call Summary for Register SGX_IRQENABLE_CLR_0

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-32. SGX_IRQENABLE_CLR_1

| | | | |
|-------------------------|---------------------------------------|-----------------|-----|
| Address Offset | 0x0000 FE4C | Instance | SGX |
| Physical Address | 0x5600 FE4C | | |
| Description | Disable Interrupt 2 - Core interrupt. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | TARGET_INTERRUPT_DISABLE |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | TARGET_SINTERRUPT_DISABLE | To disable interrupt: Write 0x0: No action Write 0x1: Disable interrupt Read 0x0: Interrupt is disabled Read 0x1: Interrupt is enabled | RW | 0 |

Table 11-33. Register Call Summary for Register SGX_IRQENABLE_CLR_1

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-34. SGX_IRQENABLE_CLR_2

| | | | |
|-------------------------|---------------------------------------|-----------------|-----|
| Address Offset | 0x0000 FE50 | Instance | SGX |
| Physical Address | 0x5600 FE50 | | |
| Description | Disable Interrupt 2 - Core interrupt. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | THALIA_IRQ_DISABLE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | THALIA_IRQ_DISABLE | To disable interrupt: Write 0x0: No action Write 0x1: Disable interrupt Read 0x0: Interrupt is disabled Read 0x1: Interrupt is enabled | RW | 0 |

Table 11-35. Register Call Summary for Register SGX_IRQENABLE_CLR_2

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-36. SGX_PAGE_CONFIG

| | | | |
|-------------------------|-----------------------------|-----------------|-----|
| Address Offset | 0x0000 FF00 | Instance | SGX |
| Physical Address | 0x5600 FF00 | | |
| Description | Configure memory pages. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|-------------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---------------|---|-------------------|---|---------------|--|
| THALIA_INT_BYPASS | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | OCP_PAGE_SIZE | | MEM_PAGE_CHECK_EN | | MEM_PAGE_SIZE | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|------------|
| 31 | THALIA_INT_BYPASS | Bypass OCP IPG interrupt logic 0x0: Do not bypass 0x1 Bypass core interrupt to I/O pin; that is, disregard the interrupt enable setting in the IPG register. | RW | 0 |
| 30:5 | RESERVED | | R | 0x000 0000 |
| 4:3 | OCP_PAGE_SIZE | Defines the page size on OCP memory interface: 0x0: 4KB 0x1: 2KB 0x2: 1KB 0x3: 512B | RW | 0x2 |
| 2 | MEM_PAGE_CHECK_EN | To enable page boundary checking: 0x0: Disabled 0x1: Enabled | RW | 1 |
| 1:0 | MEM_PAGE_SIZE | Defines the page size on internal memory interface: 0x0: 4KB 0x1: 2KB 0x2: 1KB 0x3: 512B | RW | 0x0 |

Table 11-37. Register Call Summary for Register SGX_PAGE_CONFIG

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-38. SGX_INTERRUPT_EVENT

| | | | |
|------------------|------------------|----------|-----|
| Address Offset | 0x0000 FF04 | Instance | SGX |
| Physical Address | 0x5600 FF04 | | |
| Description | Interrupt events | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------------------------|----|----|----|----|----|----|----|----------------------|----|----|----|----|----|---|---|-----------------------|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|----------------------------|--|--|--|--|--|--|--|------------------------------|--|--|--|--|--|--|--|-------------------------|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|------------------------|--|--|--|--|--|--|--|------------------------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|------------------------------|--|--|--|--|--|--|--|-------------------------|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|------------------------|--|--|--|--|--|--|--|------------------------|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | TARGET_INVALID_OCP_CMD | | | | | | | | TARGET_CMD_FIFO_FULL | | | | | | | | TARGET_RESP_FIFO_FULL | | | | | | | | RESERVED | | | | | | | | INT_MEM_REQ_FIFO_OVERRUN_1 | | | | | | | | INIT_READ_TAG_FIFO_OVERRUN_1 | | | | | | | | INIT_PAGE_CROSS_ERROR_1 | | | | | | | | INIT_RESP_ERROR_1 | | | | | | | | INIT_RESP_UNUSED_TAG_1 | | | | | | | | INIT_RESP_UNEXPECTED_1 | | | | | | | | RESERVED | | | | | | | | INIT_MEM_REQ_FIFO_OVERRUN_0 | | | | | | | | INIT_READ_TAG_FIFO_OVERRUN_0 | | | | | | | | INIT_PAGE_CROSS_ERROR_0 | | | | | | | | INIT_RESP_ERROR_0 | | | | | | | | INIT_RESP_UNUSED_TAG_0 | | | | | | | | INIT_RESP_UNEXPECTED_0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|---|------|--------|
| 31:19 | RESERVED | | R | 0x0000 |
| 18 | TARGET_INVALID_OCP_CMD | Invalid command from OCP: Write 0x0: Clear the event Write 0x1: Set the event and interrupt if enabled (debug only) Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 17 | TARGET_CMD_FIFO_FULL | Command FIFO full: Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 16 | TARGET_RESP_FIFO_FULL | Response FIFO full: Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 15:14 | RESERVED | | R | 0x0 |
| 13 | INT_MEM_REQ_FIFO_OVERRUN_1 | Memory request FIFO overrun: Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 12 | INIT_READ_TAG_FIFO_OVERRUN_1 | Read tag FIFO overrun: Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 11 | INIT_PAGE_CROSS_ERROR_1 | Memory page had been crossed during a burst: Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 10 | INIT_RESP_ERROR_1 | Receiving error response: Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 9 | INIT_RESP_UNUSED_TAG_1 | Receiving response on an unused OCP TAG: Write 0x0: Clear the event Write 0x1: Set the event and interrupt if enabled (debug only) Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 8 | INIT_RESP_UNEXPECTED_1 | Receiving response when not expected: Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | INIT_MEM_REQ_FIFO_OVERRUN_0 | Memory request FIFO overrun; Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|---|------|-------|
| 4 | INIT_READ_TAG_FIFO_OVERRUN_0 | Read tag FIFO overrun: Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 3 | INIT_PAGE_CROSS_ERROR_0 | Memory page had been crossed during a burst. Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 2 | INIT_RESP_ERROR_0 | Receiving error response: Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 1 | INIT_RESP_UNUSED_TAG_0 | Receiving response on an unused OCP TAG: Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |
| 0 | INIT_RESP_UNEXPECTED_0 | Receiving response when not expected: Write 0x0: Clear the event. Write 0x1: Set the event and interrupt if enabled (debug only). Read 0x0: No event pending Read 0x1: Event pending | RW | 0 |

Table 11-39. Register Call Summary for Register SGX_INTERRUPT_EVENT

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-40. SGX_DEBUG_CONFIG

| | | | |
|-------------------------|------------------------------|-----------------|-----|
| Address Offset | 0x0000 FF08 | Instance | SGX |
| Physical Address | 0x5600 FF08 | | |
| Description | Configuration of debug modes | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|-----------------|----|---|---|-----------------|---|---|---|-------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SELECT_INT_IDLE | | | | FORCE_PASS_DATA | | | | FORCE_INIT_IDLE | | | | FORCE_TARGET_IDLE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|------------|
| 31:6 | RESERVED | | R | 0x000 0000 |
| 5 | SELECT_INT_IDLE | To select which idle the disconnect protocol should act on: 0x0: Whole SGX idle 0x1: OCP initiator idle | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|-------|
| 4 | FORCE_PASS_DATA | Forces the initiator to pass data independent of disconnect protocol: 0x0: Do not force, normal operation 0x1: Never fence request to OCP | RW | 0 |
| 3:2 | FORCE_INIT_IDLE | Forces initiator idle: 0x0, 0x3: Do not force, normal operation 0x1: Always idle 0x2: Never idle | RW | 0x0 |
| 1:0 | FORCE_TARGET_IDLE | Forces target idle: 0x0, 0x3: Do not force, normal operation 0x1: Always idle 0x2: Never idle | RW | 0x0 |

Table 11-41. Register Call Summary for Register SGX_DEBUG_CONFIG

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-42. SGX_DEBUG_STATUS_0

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|-----------------------------|----|-------------|----|----------------|----|---------------|----|------------|----|-----------------------|----|----|----|----------------|----|---------------|----|------------|----|---------------|---|---------------|---|-----------------|---|-----------------|---|-----------------|---|---------------|--|-----------------|--|-----------------|--|-----------------|--|-----------------|--|-----------------|--|
| Address Offset | | 0x0000 FF0C | | | | | | | | | | | | | | | | Instance | | SGX | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | | 0x5600 FF0C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Port0 debug status register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | |
| CMD_DEBUG_STATE | | CMD_RESP_DEBUG_STATE | | TARGET_IDLE | | RESP_FIFO_FULL | | CMD_FIFO_FULL | | RESP_ERROR | | WHICH_TARGET_REGISTER | | | | TARGET_CMD_OUT | | INIT_MSTANDBY | | INIT_MWAIT | | INIT_MDISCREQ | | INIT_MDISCACK | | INIT_SCONNECT_2 | | INIT_SCONNECT_1 | | INIT_SCONNECT_0 | | INIT_MCONNECT | | TARGET_SIDLEACK | | TARGET_SDISCACK | | TARGET_SIDLEREQ | | TARGET_SCONNECT | | TARGET_MCONNECT | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|-------|
| 31 | CMD_DEBUG_STATE | Target command state-machine: 0x0: IDLE 0x1: Accept command | R | 0 |
| 30 | CMD_RESP_DEBUG_STATE | Target response state-machine: 0x0: Send accept 0x1: Wait accept | R | 0 |
| 29 | TARGET_IDLE | Target idle | R | 0 |
| 28 | RESP_FIFO_FULL | Target response FIFO full | R | 0 |
| 27 | CMD_FIFO_FULL | Target command FIFO full | R | 0 |
| 26 | RESP_ERROR | Respond to OCP with error, which could be caused by either address misalignment or invalid byte enable. | R | 0 |
| 25:21 | WHICH_TARGET_REGISTER | Indicates which OCP target registers to read | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|-------|
| 20:18 | TARGET_CMD_OUT | Command received from OCP: 0x0: CMD_WRSYS 0x1: CMD_RDSYS 0x2: CMD_WR_ERROR 0x3: CMD_RD_ERROR 0x4: CMD_CHK_WRADDR_PAGE (not used) 0x5: CMD_CHK_RDADDR_PAGE (not used) 0x6: CMD_TARGET_REG_WRITE 0x7: CMD_TARGET_REG_READ | R | 0x0 |
| 17 | INIT_MSTANDBY | Status of init_MStandby signal | R | 0 |
| 16 | INIT_MWAIT | Status of init_MWait signal | R | 0 |
| 15 | INIT_MDISCREQ | Request to disconnect from OCP interface | R | 0 |
| 14:13 | INIT_MDISCACK | Disconnect status of the OCP interface: 0x0: FUNCT 0x1: TRANS 0x2: Reserved 0x3: IDLE | R | 0x0 |
| 12 | INIT_SCONNECT_2 | Defines whether to wait in M_WAIT state for MConnect FSM: 0x0: Skip M_WAIT state 0x1: Wait in M_WAIT state | R | 0 |
| 11 | INIT_SCONNECT_1 | Defines the busy-ness state of the slave: 0x0: Slave is drained 0x1: Slave is loaded | R | 0 |
| 10 | INIT_SCONNECT_0 | Disconnect from slave: 0x0: Disconnect request from slave 0x1: Connect request from slave | R | 0 |
| 9:8 | INIT_MCONNECT | Initiator MConnect state: 0x0: M_OFF 0x1: M_WAIT 0x2: M_DISC 0x3: M_CON | R | 0x0 |
| 7:6 | TARGET_SIDLEACK | Acknowledge the SIdleAck state-machine: 0x0: FUNCT 0x1: SLEEP TRANS 0x2: Reserved 0x3: IDLE | R | 0x0 |
| 5:4 | TARGET_SDISCACK | Acknowledge the SDiscAck state-machine: 0x0: FUNCT 0x1: TRANS 0x2: Reserved 0x3: IDLE | R | 0x0 |
| 3 | TARGET_SIDLEREQ | Request the target to go idle: 0 Do not go idle, or go active 1 Go idle | R | 0 |
| 2 | TARGET_SCONNECT | Target SConnect bit 0 state: 0x0: Disconnect interface 0x1: Connect OCP interface | R | 0 |
| 1:0 | TARGET_MCONNECT | Target MConnect state: 0x0: M_OFF 0x1: M_WAIT 0x2: M_DISC 0x3: M_CON | R | 0x0 |

Table 11-43. Register Call Summary for Register SGX_DEBUG_STATUS_0

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

Table 11-44. SGX_DEBUG_STATUS_1

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|-----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 FF10 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SGX | | | | | | | | | | | | | | | |
| Physical Address | | 0x5600 FF10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Port1 debug status register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----------------------|-------------|----------------|---------------|------------|----|----|-----------------------|----|----|----------------|----|----|---------------|------------|---------------|---------------|----|-----------------|-----------------|-----------------|---------------|---|-----------------|-----------------|-----------------|-----------------|-----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CMD_DEBUG_STATE | CMD_RESP_DEBUG_STATE | TARGET_IDLE | RESP_FIFO_FULL | CMD_FIFO_FULL | RESP_ERROR | | | WHICH_TARGET_REGISTER | | | TARGET_CMD_OUT | | | INIT_MSTANDBY | INIT_MWAIT | INIT_MDISCREQ | INIT_MDISCACK | | INIT_SCONNECT_2 | INIT_SCONNECT_1 | INIT_SCONNECT_0 | INIT_MCONNECT | | TARGET_SIDLEACK | TARGET_SDISCACK | TARGET_SIDLEREQ | TARGET_SCONNECT | TARGET_MCONNECT | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|-------|
| 31 | CMD_DEBUG_STATE | Target command state-machine: 0x0: IDLE 0x1: Accept command | R | 0 |
| 30 | CMD_RESP_DEBUG_STATE | Target response state-machine: 0x0: Send accept 0x1: Wait accept | R | 0 |
| 29 | TARGET_IDLE | Target idle | R | 0 |
| 28 | RESP_FIFO_FULL | Target response FIFO full | R | 0 |
| 27 | CMD_FIFO_FULL | Target command FIFO full | R | 0 |
| 26 | RESP_ERROR | Respond to OCP with error, which could be caused by either address misalignment or invalid byte enable. | R | 0 |
| 25:21 | WHICH_TARGET_REGISTER | Indicates which OCP target registers to read | R | 0x00 |
| 20:18 | TARGET_CMD_OUT | Command received from OCP: 0x0: CMD_WRSYS 0x1: CMD_RDSYS 0x2: CMD_WR_ERROR 0x3: CMD_RD_ERROR 0x4: CMD_CHK_WRADDR_PAGE (not used) 0x5: CMD_CHK_RDADDR_PAGE (not used) 0x6: CMD_TARGET_REG_WRITE 0x7: CMD_TARGET_REG_READ | R | 0x0 |
| 17 | INIT_MSTANDBY | Status of init_MStandby signal | R | 0 |
| 16 | INIT_MWAIT | Status of init_MWait signal | R | 0 |
| 15 | INIT_MDISCREQ | Request to disconnect from OCP interface | R | 0 |
| 14:13 | INIT_MDISCACK | Disconnect status of the OCP interface: 0x0: FUNCT 0x1: SLEEP TRANS 0x2: Reserved 0x3: IDLE | R | 0x0 |
| 12 | INIT_SCONNECT_2 | Defines whether to wait in M_WAIT state for MConnect FSM: 0x0: Skip M_WAIT state. 0x1: Wait in M_WAIT state. | R | 0 |
| 11 | INIT_SCONNECT_1 | Defines the busy-ness state of the slave: 0x0: Slave is drained. 0x1: Slave is loaded. | R | 0 |
| 10 | INIT_SCONNECT_0 | Disconnect from slave: 0x0: Disconnect request from slave 0x1: Connect request from slave | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------|
| 9:8 | INIT_MCONNECT | Initiator MConnect state: 0x0: M_OFF 0x1: M_WAIT 0x2: M_DISC 0x3: M_CON | R | 0x0 |
| 7:6 | TARGET_SIDLEACK | Acknowledge the SIdleAck state-machine: 0x0: FUNCT 0x1: SLEEP TRANS 0x2: Reserved 0x3: IDLE | R | 0x0 |
| 5:4 | TARGET_SDISCACK | Acknowledge the SDiscAck state-machine: 0x0: FUNCT 0x1: TRANS 0x2: Reserved 0x3: IDLE | R | 0x0 |
| 3 | TARGET_SIDLEREQ | Request the target to go idle: 0x0: Do not go idle, or go active 0x1: Go idle | R | 0 |
| 2 | TARGET_SCONNECT | Target SConnect bit 0 state: 0x0: Disconnect interface 0x1: Connect OCP interface | R | 0 |
| 1:0 | TARGET_MCONNECT | Target MConnect state: 0x0: M_OFF 0x1: M_WAIT 0x2: M_DISC 0x3: M_CON | R | 0x0 |

Table 11-45. Register Call Summary for Register SGX_DEBUG_STATUS_1

SGX Register Manual

- [SGX Register Summary: \[0\]](#)

2D Graphics Accelerator

This chapter describes the advanced bit blitter 2-dimensional (2D) graphics accelerator (BB2D) for the device.

NOTE: The BB2D subsystem is an instantiation by Texas Instruments of the GC320™ core from Vivante Corp.

This document contains materials that are © Vivante Corp.

GC320 is a trademark or registered trademark of Vivante Corp.

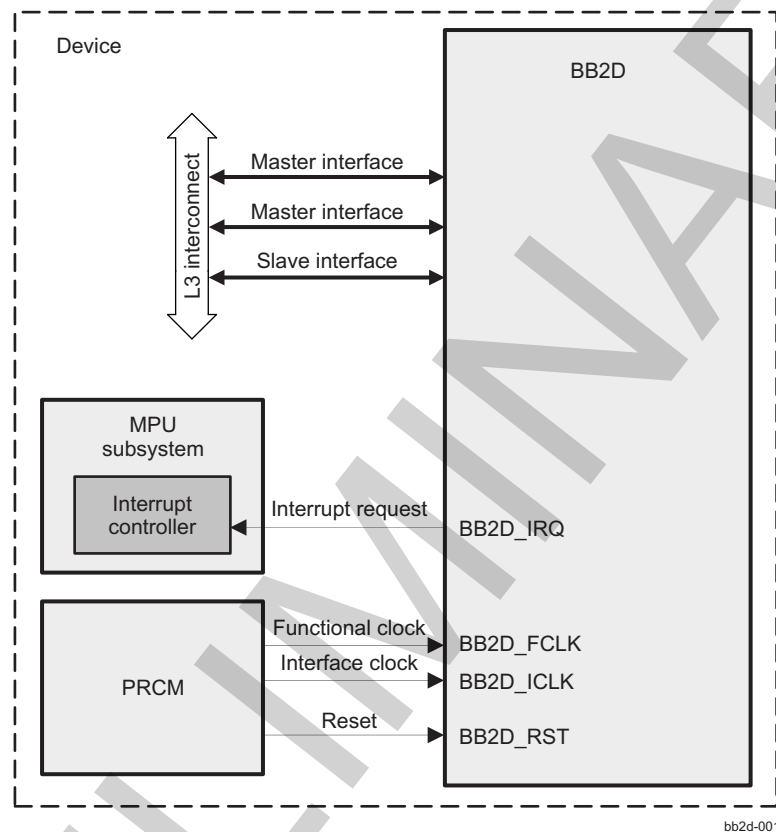
| Topic | Page |
|--|------|
| 12.1 BB2D Overview | 2692 |
| 12.2 BB2D Integration | 2694 |
| 12.3 BB2D Functional Description | 2696 |
| 12.4 BB2D Register Manual | 2698 |

12.1 BB2D Overview

The 2D graphics accelerator subsystem accelerates 2D graphics applications. The 2D graphics accelerator subsystem is based on the GC320 2D GPU core from Vivante Corporation. The hardware acceleration is brought to numerous 2D applications, including on-screen display and touch screen user interfaces, graphical user interfaces (GUIs) and menu displays, flash animation, and gaming.

Figure 12-1 shows the BB2D subsystem.

Figure 12-1. BB2D Overview



12.1.1 BB2D Features Overview

- API support:
 - OpenWF™, DirectFB
 - GDI/DirectDraw™
 - Flash
- BB2D architecture:
 - BitBlt and StretchBlt
 - DirectFB hardware acceleration
 - ROP2, ROP3, ROP4 full alpha blending and transparency
 - Clipping rectangle support
 - Alpha blending includes Java® 2 Porter-Duff compositing rules
 - 90-, 180-, 270-degree rotation on every primitive
 - YUV-to-RGB color space conversion
 - Programmable display format conversion with 14 source and 7 destination formats
 - High-quality 9-tap, 32-phase filter for image and video scaling at 1080p
 - Monochrome expansion for text rendering

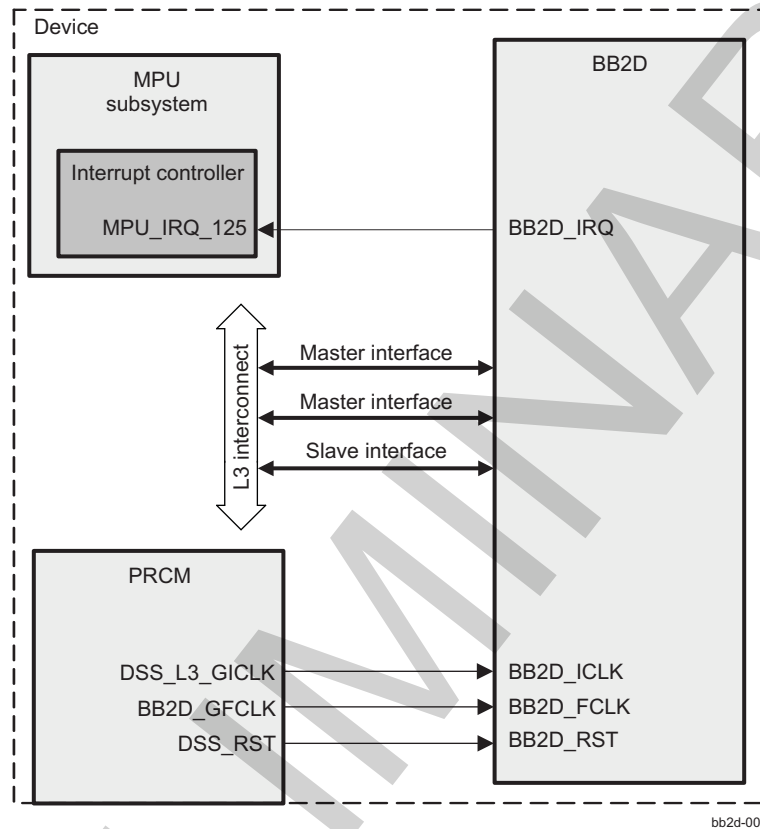
- 32 K × 32 K coordinate system
- Hardware acceleration for DirectFB:
 - High-speed video scaler
 - ROP2/3/4
 - Rectangle filling and drawing
 - Line drawing
 - Simple blitting
 - Stretch blitting
 - Blending with alpha channel (per-pixel alpha)
 - Blending with alpha factor (alpha modulation)
 - Nine source and destination blending functions
 - Porter-Duff rules support
 - Premultiplied alpha support
 - Colorized blitting (color modulation)
 - Source color keying
 - Destination color keying

12.2 BB2D Integration

This section describes module integration in the device, including information about clocks, resets, and hardware requests.

Figure 12-2 shows BB2D integration.

Figure 12-2. BB2D Integration



bb2d-002

The BB2D subsystem is connected to the level 3 (L3) interconnect by two 64-bit master interfaces and one 32-bit slave interface.

Table 12-1 through Table 12-3 summarize the integration of the module in the device.

Table 12-1. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| BB2D | PD_DSS | L3 |

Table 12-2. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| BB2D | BB2D_ICLK | DSS_L3_GICLK | PRCM | BB2D interface clock |
| | BB2D_FCLK | BB2D_GFCLK | PRCM | BB2D functional clock. Can be selected between PER_BB2D_FCLK from DPLL_PER and CORE_BB2D_FCLK from DPLL_CORE. See Chapter 3, PRCM. |
| Resets | | | | |

Table 12-2. Clocks and Resets (continued)

| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
|-----------------|-------------------------|--------------------|--------|-------------------|
| BB2D | BB2D_RST | DSS_RST | PRCM | BB2D reset signal |

Table 12-3. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------|---|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| BB2D | BB2D_IRQ | MPU_IRQ_125 | MPU INTC | BB2D interrupt request to the MPU interrupt controller (INTC) |

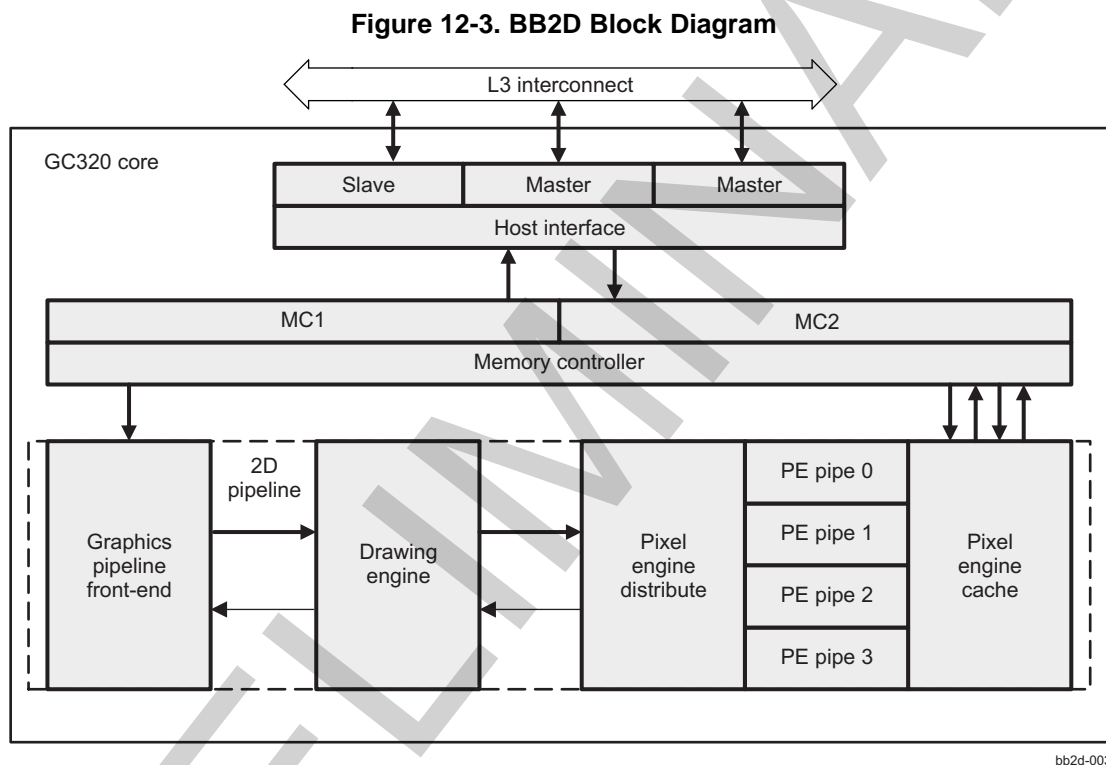
12.3 BB2D Functional Description

12.3.1 BB2D Block Diagram

The BB2D subsystem is based on the following main blocks:

- Host interface: Allows the BB2D core to communicate with external memory and the MPU through the L3 interconnect. In this block, data crosses clock domain boundaries.
- Memory controller: Internal memory unit that is the block-to-host interface for memory requests
- Graphics pipeline front-end: Inserts high-level primitives and commands into the graphics pipeline.
- 2D drawing and scaling engine: Draws 2D graphics primitives and rasterizes 2D images.
- Pixel engine: manipulates and filters pixels in rendered images. BB2D has four pixel pipes.

Figure 12-3 shows the BB2D top-level block diagram.



12.3.2 BB2D Clock Configuration

The BB2D subsystem operates from two clocks: an interface clock (BB2D_ICLK) and functional clock (BB2D_FCLK). The power, reset, and clock management (PRCM) module generates and distributes the clocks inside the device.

- The BB2D_ICLK interface clock manages the data transfer on the L3 master and slave ports.

The BB2D_ICLK frequency is selected based on the whole device L3 interconnect clock frequency. For more information on the interface clock, see [Section 3.6.13, CD_DSS Clock Domain](#).

When BB2D_ICLK is no longer required by the BB2D subsystem, it can be disabled by software at the PRCM level.

NOTE: BB2D_ICLK is cut only if the BB2D is ready to go into IDLE state.

- The BB2D_FCLK functional clock is used inside the BB2D subsystem to generate clock signals to multiple BB2D clock domains. The BB2D automatically gates clocks to domains, that are not currently in use.

Using the clock source selection and the DPLL settings, the frequency of BB2D_FCLK can be adjusted.

The BB2D_FCLK clock can be provided by the peripheral DPLL or the core DPLL, as described in [Section 3.6.13, CD_DSS Clock Domain](#). Selection is made at the PRCM level.

When BB2D_FCLK is no longer needed by the BB2D subsystem, it can be cut by software at the PRCM level, if the module is ready to enter IDLE state.

12.3.3 BB2D Software Reset

The BB2D subsystem is part of the DSS reset domain. A global reset of the BB2D is performed by activating the BB2D_RST signal in the DSS_RST domain.

NOTE: The APIs delivered with the BB2D provide a software reset functionally equivalent to a hardware reset.

12.3.4 BB2D Power Management

The BB2D subsystem is part of the DSS power domain (PD_DSS). For additional information about PD_DSS, see [Section 3.7.10, PD_DSS Description](#), in [Chapter 3, Power, Reset, and Clock Management](#).

NOTE: The BB2D handles automatic clock gating performed on the multiple internal clock domains.

When 2D operations are complete, software may set the [GCGPOUT0\[0\] GCHOLD](#) bit to 1 to enter a low-power state. Setting GCHOLD to 1 moves the BB2D operational state into IDLE. Once in IDLE state, the system standby hardware signal (mstandby) is asserted.

12.3.5 BB2D Interrupt Requests

The BB2D subsystem can generate one interrupt signal to the MPU INTC mapped to BB2D_IRQ.

12.4 BB2D Register Manual

CAUTION

All BB2D registers are limited to 32-bit data accesses; 8- and 16-bit accesses are not allowed because they can corrupt register content.

12.4.1 BB2D Instance Summary

Table 12-4. BB2D Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|------|
| BB2D | 0x5900 0000 | 2 KB |

12.4.2 BB2D Registers

12.4.2.1 BB2D Register Summary

Table 12-5. BB2D Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address |
|--------------------|------|-----------------------|----------------|------------------|
| AQHICLOCKCONTROL | RW | 32 | 0x0000 0000 | 0x5900 0000 |
| AQHIIDLE | R | 32 | 0x0000 0004 | 0x5900 0004 |
| AQAXICONFIG | RW | 32 | 0x0000 0008 | 0x5900 0008 |
| AQAXISTATUS | R | 32 | 0x0000 000C | 0x5900 000C |
| AQINTRACKNOWLEDGE | R | 32 | 0x0000 0010 | 0x5900 0010 |
| AQINTRENBL | RW | 32 | 0x0000 0014 | 0x5900 0014 |
| AQIDENT | R | 32 | 0x0000 0018 | 0x5900 0018 |
| GCFEATURES | R | 32 | 0x0000 001C | 0x5900 001C |
| GCCHIPID | R | 32 | 0x0000 0020 | 0x5900 0020 |
| GCCHIPREV | R | 32 | 0x0000 0024 | 0x5900 0024 |
| GCCHIPDATE | R | 32 | 0x0000 0028 | 0x5900 0028 |
| GCCHIPTIME | R | 32 | 0x0000 002C | 0x5900 002C |
| GCCHIPCUSTOMER | R | 32 | 0x0000 0030 | 0x5900 0030 |
| GCMINORFEATURES0 | R | 32 | 0x0000 0034 | 0x5900 0034 |
| GCRESETMEMCOUNTERS | W | 32 | 0x0000 003C | 0x5900 003C |
| GCTOTALREADS | R | 32 | 0x0000 0040 | 0x5900 0040 |
| GCTOTALWRITES | R | 32 | 0x0000 0044 | 0x5900 0044 |
| GCCHIPSPECS | R | 32 | 0x0000 0048 | 0x5900 0048 |
| GCTOTALWRITEBURSTS | R | 32 | 0x0000 004C | 0x5900 004C |
| GCTOTALWRITEREQS | R | 32 | 0x0000 0050 | 0x5900 0050 |
| GCTOTALWRITELASTS | R | 32 | 0x0000 0054 | 0x5900 0054 |
| GCTOTALREADBURSTS | R | 32 | 0x0000 0058 | 0x5900 0058 |
| GCTOTALREADREQS | R | 32 | 0x0000 005C | 0x5900 005C |
| GCTOTALREADLASTS | R | 32 | 0x0000 0060 | 0x5900 0060 |
| GCGPOUT0 | RW | 32 | 0x0000 0064 | 0x5900 0064 |
| GCGPOUT1 | RW | 32 | 0x0000 0068 | 0x5900 0068 |
| GCGPOUT2 | RW | 32 | 0x0000 006C | 0x5900 006C |
| GCAXICONTROL | RW | 32 | 0x0000 0070 | 0x5900 0070 |
| GCMINORFEATURES1 | R | 32 | 0x0000 0074 | 0x5900 0074 |

Table 12-5. BB2D Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address |
|----------------------------------|------|-----------------------|----------------|------------------|
| GCTOTALCYCLES | RW | 32 | 0x0000 0078 | 0x5900 0078 |
| GCTOTALIDLECYCLES | RW | 32 | 0x0000 007C | 0x5900 007C |
| GCCHIPSPECS2 | R | 32 | 0x0000 0080 | 0x5900 0080 |
| GCMINORFEATURES2 | R | 32 | 0x0000 0084 | 0x5900 0084 |
| GCMODULEPOWERCONTROLS | RW | 32 | 0x0000 0100 | 0x5900 0100 |
| GCMODULEPOWERMODULECONTROL | RW | 32 | 0x0000 0104 | 0x5900 0104 |
| GCMODULEPOWERMODULESTATUS | R | 32 | 0x0000 0108 | 0x5900 0108 |
| GCREGMMUSTATUS | R | 32 | 0x0000 0188 | 0x5900 0188 |
| GCREGMMUCONTROL | W | 32 | 0x0000 018C | 0x5900 018C |
| GCREGMMUEXCEPTION0 | RW | 32 | 0x0000 0190 | 0x5900 0190 |
| GCREGMMUEXCEPTION1 | RW | 32 | 0x0000 0194 | 0x5900 0194 |
| GCREGMMUEXCEPTION2 | RW | 32 | 0x0000 0198 | 0x5900 0198 |
| GCREGMMUEXCEPTION3 | RW | 32 | 0x0000 019C | 0x5900 019C |
| AQMEMORYDEBUG | RW | 32 | 0x0000 0414 | 0x5900 0414 |
| AQREGISTERTIMINGCONTROL | RW | 32 | 0x0000 042C | 0x5900 042C |
| GCMEMORYRESERVED | R | 32 | 0x0000 0430 | 0x5900 0430 |
| GCDISPLAYPRIORITY | RW | 32 | 0x0000 0434 | 0x5900 0434 |
| GCDBGCYCLECOUNTER | RW | 32 | 0x0000 0438 | 0x5900 0438 |
| GCOUTSTANDINGREADS0 | R | 32 | 0x0000 043C | 0x5900 043C |
| GCOUTSTANDINGREADS1 | R | 32 | 0x0000 0440 | 0x5900 0440 |
| GCOUTSTANDINGWRITES | R | 32 | 0x0000 0444 | 0x5900 0444 |
| GCDEBUGSIGNALSRA | R | 32 | 0x0000 0448 | 0x5900 0448 |
| GCDEBUGSIGNALSTX | R | 32 | 0x0000 044C | 0x5900 044C |
| GCDEBUGSIGNALSFE | R | 32 | 0x0000 0450 | 0x5900 0450 |
| GCDEBUGSIGNALSPE | R | 32 | 0x0000 0454 | 0x5900 0454 |
| GCDEBUGSIGNALSDE | R | 32 | 0x0000 0458 | 0x5900 0458 |
| GCDEBUGSIGNALSSH | R | 32 | 0x0000 045C | 0x5900 045C |
| GCDEBUGSIGNALSPA | R | 32 | 0x0000 0460 | 0x5900 0460 |
| GCDEBUGSIGNALSSE | R | 32 | 0x0000 0464 | 0x5900 0464 |
| GCDEBUGSIGNALSMC | R | 32 | 0x0000 0468 | 0x5900 0468 |
| GCDEBUGSIGNALSHI | R | 32 | 0x0000 046C | 0x5900 046C |
| GCDEBUGCONTROL0 | RW | 32 | 0x0000 0470 | 0x5900 0470 |
| GCDEBUGCONTROL1 | RW | 32 | 0x0000 0474 | 0x5900 0474 |
| GCDEBUGCONTROL2 | RW | 32 | 0x0000 0478 | 0x5900 0478 |
| GCDEBUGCONTROL3 | RW | 32 | 0x0000 047C | 0x5900 047C |
| GCBUSCONTROL | RW | 32 | 0x0000 0480 | 0x5900 0480 |
| GCREGENDIANNESS0 | RW | 32 | 0x0000 0484 | 0x5900 0484 |
| GCREGENDIANNESS1 | RW | 32 | 0x0000 0488 | 0x5900 0488 |
| GCREGENDIANNESS2 | RW | 32 | 0x0000 048C | 0x5900 048C |
| GCREGDRAWPRIMITIVESTARTTIMESTAMP | R | 32 | 0x0000 0490 | 0x5900 0490 |
| GCREGDRAWPRIMITIVEENDTIMESTAMP | R | 32 | 0x0000 0494 | 0x5900 0494 |
| GCREGCONTROL0 | RW | 32 | 0x0000 0558 | 0x5900 0558 |
| AQCMDBUFFERADDR | W | 32 | 0x0000 0654 | 0x5900 0654 |
| AQCMDBUFFERCTRL | W | 32 | 0x0000 0658 | 0x5900 0658 |
| AQFESTATUS | R | 32 | 0x0000 065C | 0x5900 065C |
| AQFEDEBUGSTATE | R | 32 | 0x0000 0660 | 0x5900 0660 |

Table 12-5. BB2D Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address |
|------------------------------------|------|-----------------------|----------------|------------------|
| AQFEDEBUGCURCMDADR | R | 32 | 0x0000 0664 | 0x5900 0664 |
| AQFEDEBUGCMDLOWREG | R | 32 | 0x0000 0668 | 0x5900 0668 |
| AQFEDEBUGCMDHIREG | R | 32 | 0x0000 066C | 0x5900 066C |

12.4.2.2 BB2D Register Description**Table 12-6. AQHICLOCKCONTROL**

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0000 | Instance | BB2D |
| Physical Address | 0x5900 0000 | | |
| Description | Clock control register. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|---------------------------|----|----|----|-----------------------|----|----|----|--|----|----|----|----------|----|----|----|--|----|---|---|--|---|---|---|---|---|---|---|
| RESERVED | | | | MULTI_PIPE_USE_SINGLE_AXI | | | | MULTI_PIPE_REG_SELECT | | | | ISOLATE_GPU IDLE_VG IDLE2_D IDLE3_D | | | | RESERVED | | | | SOFT_RESET DISABLE_DEBUG_REGISTERS DISABLE_RAM_CLOCK_GATING FSCALE_CMD_LOAD | | | | FSCALE_VAL CLK2D_DIS CLK3D_DIS | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|---|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | MULTI_PIPE_USE_SINGLE_AXI | Force all the transactions to go to one AXI. | RW | 0x0 |
| 23:20 | MULTI_PIPE_REG_SELECT | Determines which HI/MC to use while reading registers. | RW | 0x0 |
| 19 | ISOLATE_GPU | Isolate GPU bit | RW | 0 |
| 18 | IDLE_VG | VG pipe is idle. | R | 1 |
| 17 | IDLE2_D | 2D pipe is idle. | R | 1 |
| 16 | IDLE3_D | 3D pipe is idle. | R | 1 |
| 15:13 | RESERVED | | R | 0x0 |
| 12 | SOFT_RESET | Soft resets the IP. | RW | 0 |
| 11 | DISABLE_DEBUG_REGISTERS | Disable debug registers. If this bit is 1, debug registers are clock gated. | RW | 0 |
| 10 | DISABLE_RAM_CLOCK_GATING | Disables clock gating for rams. | RW | 0 |
| 9 | FSCALE_CMD_LOAD | | RW | 0 |
| 8:2 | FSCALE_VAL | | RW | 0x40 |
| 1 | CLK2D_DIS | Disable 2D clock. | RW | 0 |
| 0 | CLK3D_DIS | Disable 3D clock. | RW | 0 |

Table 12-7. Register Call Summary for Register AQHICLOCKCONTROL

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-8. AQHIIDLE

| | | | |
|-------------------------|-----------------------|-----------------|------|
| Address Offset | 0x0000 0004 | Instance | BB2D |
| Physical Address | 0x5900 0004 | | |
| Description | Idle status register. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| AXI_LP | UNUSED | | | | | | | | | | | | | | | IDLE_TS | IDLE_FP | IDLE_IM | IDLE_VG | IDLE_TX | IDLE_RA | IDLE_SE | IDLE_PA | IDLE_SH | IDLE_PE | IDLE_DE | IDLE_FE | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|----------|
| 31 | AXI_LP | AXI is in low power mode. | R | 0 |
| 30:12 | UNUSED | Unused bits reserved for future expansion. | R | 0x7 FFFF |
| 11 | IDLE_TS | TS is idle. | R | 1 |
| 10 | IDLE_FP | FP is idle. | R | 1 |
| 9 | IDLE_IM | IM is idle. | R | 1 |
| 8 | IDLE_VG | VG is idle. | R | 1 |
| 7 | IDLE_TX | TX is idle. | R | 1 |
| 6 | IDLE_RA | RA is idle. | R | 1 |
| 5 | IDLE_SE | SE is idle. | R | 1 |
| 4 | IDLE_PA | PA is idle. | R | 1 |
| 3 | IDLE_SH | SH is idle. | R | 1 |
| 2 | IDLE_PE | PE is idle. | R | 1 |
| 1 | IDLE_DE | DE is idle. | R | 1 |
| 0 | IDLE_FE | FE is idle. | R | 1 |

Table 12-9. Register Call Summary for Register AQHIIDLE

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-10. AQAXICONFIG

| | | | |
|-------------------------|-------------|-----------------|------|
| Address Offset | 0x0000 0008 | Instance | BB2D |
| Physical Address | 0x5900 0008 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|---------|----|---|---|------|---|---|---|------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ARCACHE | | | | AWCACHE | | | | ARID | | | | AWID | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | ARID | | RW | 0x0 |
| 11:8 | AWID | | RW | 0x0 |
| 7:4 | ARID | | RW | 0x0 |
| 3:0 | AWID | | RW | 0x0 |

Table 12-11. Register Call Summary for Register AQAXICONFIG

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-12. AQAXISTATUS

| | | | |
|-------------------------|-------------|-----------------|------|
| Address Offset | 0x0000 000C | Instance | BB2D |
| Physical Address | 0x5900 000C | | |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|------------|----|-----------|----|---|---|-----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DET_RD_ERR | | DET_WR_ERR | | RD_ERR_ID | | | | WR_ERR_ID | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|-----------|
| 31:10 | RESERVED | | R | 0x00 0000 |
| 9 | DET_RD_ERR | | R | 0 |
| 8 | DET_WR_ERR | | R | 0 |
| 7:4 | RD_ERR_ID | | R | 0x0 |
| 3:0 | WR_ERR_ID | | R | 0x0 |

Table 12-13. Register Call Summary for Register AQAXISTATUS

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-14. AQINTRACKNOWLEDGE

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0010 | Instance | BB2D |
| Physical Address | 0x5900 0010 | | |
| Description | Interrupt acknowledge register. Each bit represents a corresponding event being triggered. Reading from this register clears the outstanding interrupt. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTR_VEC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | INTR_VEC | | R | 0x0000 0000 |

Table 12-15. Register Call Summary for Register AQINTRACKNOWLEDGE

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-16. AQINTRENBL

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0014 | Instance | BB2D |
| Physical Address | 0x5900 0014 | | |
| Description | Interrupt enable register. Each bit enables a corresponding event. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTR_ENBL_VEC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|-------------|------|-------------|
| 31:0 | INTR_ENBL_VEC | | RW | 0x0000 0000 |

Table 12-17. Register Call Summary for Register AQINTRENBL

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-18. AQIDENT

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0018 | Instance | BB2D |
| Physical Address | 0x5900 0018 | | |
| Description | Identification register. This register has no set reset value. It varies with the implementation. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----------|----|----|----|------------|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FAMILY | | | | | | | | PRODUCT | | | | | | | | REVISION | | | | TECHNOLOGY | | | | CUSTOMER | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | FAMILY | Family value. 01=>GC500 02=>GC520 03=>GC530 04=>GC400 05=>GC450 08=>GC600 09=>GC700 0A=>GC350 0B=>GC380 0C=>GC800 10=>GC1000 14=>GC2000 | R | 0x14 |
| 23:16 | PRODUCT | Product value. | R | 0x01 |
| 15:12 | REVISION | Revision value. | R | 0x0 |
| 11:8 | TECHNOLOGY | Technology value. | R | 0x0 |
| 7:0 | CUSTOMER | Customer value. | R | 0x00 |

Table 12-19. Register Call Summary for Register AQIDENT

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-20. GCFEATURES

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 001C | Instance | BB2D |
| Physical Address | 0x5900 001C | | |
| Description | Shows which features are enabled in this chip. This register has no set reset value. It varies with the implementation. 0 => NONE 1 => AVAILABLE | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------|---------------|---------------|------|------|---------|-------------------|--------------------|---------------|---------------|----------------|-----------|---------------|---------------------|---------------|-------|----------|-----------|--------------|--------------------|-------------|--------------------------|---------|----|------|---------------|--------------|------------|-------------------------|---------|------------------------|------------|
| FE20_BIT_INDEX | RS_YUV_TARGET | BYTE_WRITE_3D | FE20 | VGTS | PIPE_VG | MEM32_BIT_SUPPORT | YUY2_RENDER_TARGET | HALF_TX_CACHE | HALF_PE_CACHE | YUY2_AVERAGING | NO_SCALER | BYTE_WRITE_2D | BUFFER_INTERLEAVING | NO422_TEXTURE | NO_EZ | MIN_AREA | MODULE_CG | YUV420_TILER | HIGH_DYNAMIC_RANGE | FAST_SCALER | ETC1_TEXTURE_COMPRESSION | PIPE_2D | DC | MSAA | YUV420_FILTER | ZCOMPRESSION | DEBUG_MODE | DXT_TEXTURE_COMPRESSION | PIPE_3D | SPECIAL_ANTLI_ALIASING | FAST_CLEAR |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------|
| 31 | FE20_BIT_INDEX | Supports 20 bit index. | R | 1 |
| 30 | RS_YUV_TARGET | Supports resolveing into YUV target. | R | 1 |
| 29 | BYTE_WRITE_3D | 3D PE has byte write capability. | R | 1 |
| 28 | FE20 | FE 2.0 is present. | R | 0 |
| 27 | VGTS | VG tessellator is present. | R | 0 |
| 26 | PIPE_VG | VG pipe is present. | R | 0 |
| 25 | MEM32_BIT_SUPPORT | 32 bit memory address support. | R | 0 |
| 24 | YUY2_RENDER_TARGET | YUY2 support in PE and YUY2 to RGB conversion in resolve. | R | 0 |
| 23 | HALF_TX_CACHE | TX cache is half. | R | 0 |
| 22 | HALF_PE_CACHE | PE cache is half. | R | 0 |
| 21 | YUY2_AVERAGING | YUY2 averaging support in resolve. | R | 1 |
| 20 | NO_SCALER | IP does not have 2D scaler. | R | 0 |
| 19 | BYTE_WRITE_2D | Supports byte write in 2D. | R | 1 |
| 18 | BUFFER_INTERLEAVING | IP supports interleaving depth and color buffers. | R | 1 |
| 17 | NO422_TEXTURE | IP does not have 422 texture input format. | R | 0 |
| 16 | NO_EZ | IP does not have early-Z. | R | 0 |
| 15 | MIN_AREA | IP is configured to have minimum area. | R | 1 |
| 14 | MODULE_CG | Second level clock gating is available. | R | 1 |
| 13 | YUV420_TILER | YUV 4:2:0 tiler is available. | R | 1 |
| 12 | HIGH_DYNAMIC_RANGE | Shows if the IP has HDR support. | R | 1 |
| 11 | FAST_SCALER | Shows if the IP has HD scaler. | R | 1 |
| 10 | ETC1_TEXTURE_COMPRESSION | ETC1 texture compression. | R | 1 |
| 9 | PIPE_2D | Shows if there is 2D engine. | R | 1 |
| 8 | DC | Shows if there is a display controller in the IP. | R | 0 |
| 7 | MSAA | MSAA support. | R | 1 |
| 6 | YUV420_FILTER | YUV 4:2:0 support in filter blit. | R | 1 |
| 5 | ZCOMPRESSION | Depth and color compression. | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|----------------------------|------|-------|
| 4 | DEBUG_MODE | Debug registers. | R | 0 |
| 3 | DXT_TEXTURE_COMPRESSION | DXT texture compression. | R | 1 |
| 2 | PIPE_3D | 3D pipe. | R | 0 |
| 1 | SPECIAL_ANTI_ALIASING | Full-screen anti-aliasing. | R | 1 |
| 0 | FAST_CLEAR | Fast clear. | R | 0 |

Table 12-21. Register Call Summary for Register GCFEATURES

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-22. GCCHIPID

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0020 | Instance | BB2D |
| Physical Address | 0x5900 0020 | | |
| Description | Shows the ID for the chip in BCD. This register has no set reset value. It varies with the implementation. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | ID | Id. | R | 0x0000 0320 |

Table 12-23. Register Call Summary for Register GCCHIPID

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-24. GCCHIPREV

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0024 | Instance | BB2D |
| Physical Address | 0x5900 0024 | | |
| Description | Shows the revision for the chip in BCD. This register has no set reset value. It varies with the implementation. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | REV | Revision. | R | 0x0000 5221 |

Table 12-25. Register Call Summary for Register GCCHIPREV

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-26. GCCHIPDATE

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0028 | Instance | BB2D |
| Physical Address | 0x5900 0028 | | |
| Description | Shows the release date for the IP. This register has no set reset value. It varies with the implementation. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DATE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | DATE | Date. | R | 0x2011 0607 |

Table 12-27. Register Call Summary for Register GCCHIPDATE

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-28. GCCHIPTIME

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 002C | Instance | BB2D |
| Physical Address | 0x5900 002C | | |
| Description | Shows the release time for the IP. This register has no set reset value. It varies with the implementation. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TIME | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | TIME | Time. | R | 0x2054 2100 |

Table 12-29. Register Call Summary for Register GCCHIPTIME

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-30. GCCHIPCUSTOMER

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0030 | Instance | BB2D |
| Physical Address | 0x5900 0030 | | |
| Description | Shows the customer and group for the IP. This register has no set reset value. It varies with the implementation. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COMPANY | | | | | | | | | | | | | | | | GROUP | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | COMPANY | Company | R | 0x0000 |
| 15:0 | GROUP | Group | R | 0x0000 |

Table 12-31. Register Call Summary for Register GCCHIPCUSTOMER

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-32. GCMINORFEATURES0

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0034 | Instance | BB2D |
| Physical Address | 0x5900 0034 | | |
| Description | Shows which minor features are enabled in this chip. This register has no set reset value. It varies with the implementation. 0 => NONE 1 => AVAILABLE | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|------------|----|-----------------|----|-------------------|----|-------------|----|----------------|----|---------------|----|-----|----|------------|----|-----------------|----|-------|----|--------------|----|----------------------------|----|---------------|----|-------|----|-----------|----|----------------------------|----|------------------------|----|----------------------|----|-------|----|-------------------|----|---------------------------------------|----|-------------------|---|-----------|---|----------------------|---|---------|---|------------------|---|-----------------|---|---------------------------|---|------------|---|-------------------|---|-----------------|---|--------|
| 31 | ENHANCE_VR | 30 | CORRECT_STENCIL | 29 | A8_TARGET_SUPPORT | 28 | NEW_TEXTURE | 27 | HIERARCHICAL_Z | 26 | BYPASS_IN_MSA | 25 | VAA | 24 | BUG_FIXES0 | 23 | SHADER_MSA_SIDE | 22 | MC_20 | 21 | DEFAULT_REG0 | 20 | EXTRA_SHADER_INSTRUCTIONS1 | 19 | SHADER_GETS_W | 18 | VG_21 | 17 | VG_FILTER | 16 | EXTRA_SHADER_INSTRUCTIONS0 | 15 | COMPRESSION_FIFO_FIXED | 14 | TS_EXTENDED_COMMANDS | 13 | VG_20 | 12 | SUPER_TILED_32X32 | 11 | SEPARATE_TILE_STATUS_WHEN_INTERLEAVED | 10 | TILE_STATUS_2BITS | 9 | RENDER_8K | 8 | CORRECT_AUTO_DISABLE | 7 | PE20_2D | 6 | FAST_CLEAR_FLUSH | 5 | SPECIAL_MSA_LOD | 4 | CORRECT_TEXTURE_CONVERTER | 3 | TEXTURE8_K | 2 | ENDIANNESS_CONFIG | 1 | DUAL_RETURN_BUS | 0 | FLIP_Y |
|----|------------|----|-----------------|----|-------------------|----|-------------|----|----------------|----|---------------|----|-----|----|------------|----|-----------------|----|-------|----|--------------|----|----------------------------|----|---------------|----|-------|----|-----------|----|----------------------------|----|------------------------|----|----------------------|----|-------|----|-------------------|----|---------------------------------------|----|-------------------|---|-----------|---|----------------------|---|---------|---|------------------|---|-----------------|---|---------------------------|---|------------|---|-------------------|---|-----------------|---|--------|

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|--|------|-------|
| 31 | ENHANCE_VR | Enhance VR and add a mode to walk 16 pixels in 16-bit mode in Vertical pass to improve \$ hit rate when rotating 90/270. | R | 1 |
| 30 | CORRECT_STENCIL | Correct stencil behavior in depth only. | R | 1 |
| 29 | A8_TARGET_SUPPORT | 2D engine supports A8 target. | R | 0 |
| 28 | NEW_TEXTURE | New texture unit is available. | R | 0 |
| 27 | HIERARCHICAL_Z | Hierarchiccal Z is supported. | R | 1 |
| 26 | BYPASS_IN_MSA | Shader supports bypass mode when MSA is enabled. | R | 0 |
| 25 | VAA | VAA is available or not. | R | 0 |
| 24 | BUG_FIXES0 | | R | 1 |
| 23 | SHADER_MSA | Put the MSA data into sideband fifo. | R | 0 |
| 22 | MC_20 | New style MC with separate paths for color and depth. | R | 0 |
| 21 | DEFAULT_REG0 | Unavailable registers will return 0. | R | 1 |
| 20 | EXTRA_SHADER_INSTRUCTION S1 | Sqrt, sin, cos instructions are available. | R | 1 |
| 19 | SHADER_GETS_W | W is sent to SH from RA. | R | 1 |
| 18 | VG_21 | Minor updates to VG pipe (Event generation from VG, TS, PE). Tiled image support. | R | 0 |
| 17 | VG_FILTER | VG filter is available. | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------------|--|------|-------|
| 16 | EXTRA_SHADER_INSTRUCTION0 | Floor, ceil, and sign instructions are available. | R | 1 |
| 15 | COMPRESSION_FIFO_FIXED | If this bit is not set, the FIFO counter should be set to 50. Else, the default should remain. | R | 1 |
| 14 | TS_EXTENDED_COMMANDS | New commands added to the tessellator. | R | 0 |
| 13 | VG_20 | Major updates to VG pipe (TS buffer tiling. State masking.). | R | 0 |
| 12 | SUPER_TILED_32X32 | 32x32 super tile is available. | R | 1 |
| 11 | SEPARATE_TILE_STATUS_WHEN_INTERLEAVED | Use 2 separate tile status buffers in interleaved mode. | R | 1 |
| 10 | TILE_STATUS_2BITS | 2 bits are used instead of 4 bits for tile status. | R | 1 |
| 9 | RENDER_8K | Supports 8K render target. | R | 1 |
| 8 | CORRECT_AUTO_DISABLE | Reserved. | R | 0 |
| 7 | PE20_2D | 2D PE 2.0 is present. | R | 1 |
| 6 | FAST_CLEAR_FLUSH | Proper flush is done in fast clear cache. | R | 1 |
| 5 | SPECIAL_MSAA_LOD | Special LOD calculation when MSAA is on. | R | 1 |
| 4 | CORRECT_TEXTURE_CONVERTER | Driver hack is not needed. | R | 1 |
| 3 | TEXTURE8_K | Supports 8Kx8K textures. | R | 1 |
| 2 | ENDIANNESS_CONFIG | Configurable endianness support. | R | 1 |
| 1 | DUAL_RETURN_BUS | Dual Return Bus from HI to clients. | R | 1 |
| 0 | FLIP_Y | Y flipping capability is added to resolve. | R | 1 |

Table 12-33. Register Call Summary for Register GCMINORFEATURES0

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-34. GCRESETMEMCOUNTERS

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 003C | Instance | BB2D |
| Physical Address | 0x5900 003C | | |
| Description | Writing 1 will reset the counters and stop counting. Write 0 to start counting again. This register is write only so it has no reset value. | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESET |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:1 | RESERVED | | W | 0x649C CF7F |
| 0 | RESET | | W | 1 |

Table 12-35. Register Call Summary for Register GCRESETMEMCOUNTERS

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-36. GCTOTALREADS

| | | | |
|-------------------------|---------------------------------|-----------------|------|
| Address Offset | 0x0000 0040 | Instance | BB2D |
| Physical Address | 0x5900 0040 | | |
| Description | Total reads in terms of 64bits. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | COUNT | | R | 0x0000 0000 |

Table 12-37. Register Call Summary for Register GCTOTALREADS

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-38. GCTOTALWRITES

| | | | |
|-------------------------|----------------------------------|-----------------|------|
| Address Offset | 0x0000 0044 | Instance | BB2D |
| Physical Address | 0x5900 0044 | | |
| Description | Total writes in terms of 64bits. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | COUNT | | R | 0x0000 0000 |

Table 12-39. Register Call Summary for Register GCTOTALWRITES

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-40. GCCHIPSPECS

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0048 | Instance | BB2D |
| Physical Address | 0x5900 0048 | | |
| Description | Specs for the chip. This register has no set reset value. It varies with the implementation. | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|------------------|----|----|----|----|----|---|---|----------|---|---|---|-------------------|---|---|---|--|--|--|--|--------------|--|--|--|--|--|--|--|----------------|--|--|--|--|--|--|--|---------|--|--|--|
| VERTEX_OUTPUT_BUFFER_SIZE | | | | | | | | NUM_PIXEL_PIPES | | | | | | | | NUM_SHADER_CORES | | | | | | | | RESERVED | | | | VERTEX_CACHE_SIZE | | | | | | | | THREAD_COUNT | | | | | | | | TEMP_REGISTERS | | | | | | | | STREAMS | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|-------------|------|-------|
| 31:28 | VERTEX_OUTPUT_BUFFER_SIZE | | R | 0x0 |
| 27:25 | NUM_PIXEL_PIPES | | R | 0x0 |
| 24:20 | NUM_SHADER_CORES | | R | 0x00 |
| 19:17 | RESERVED | | R | 0x0 |
| 16:12 | VERTEX_CACHE_SIZE | | R | 0x00 |
| 11:8 | THREAD_COUNT | | R | 0x0 |
| 7:4 | TEMP_REGISTERS | | R | 0x0 |
| 3:0 | STREAMS | | R | 0x0 |

Table 12-41. Register Call Summary for Register GCCHIPSPECS

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-42. GCTOTALWRITEBURSTS

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 004C | Instance | BB2D |
| Physical Address | 0x5900 004C | | |
| Description | Total write Data Count in terms of 64bits. This register has no reset value. | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | COUNT | | R | 0x0000 0000 |

Table 12-43. Register Call Summary for Register GCTOTALWRITEBURSTS

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-44. GCTOTALWRITEREQS

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0050 | Instance | BB2D |
| Physical Address | 0x5900 0050 | | |
| Description | Total write Request Count. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | COUNT | | R | 0x0000 0000 |

Table 12-45. Register Call Summary for Register GCTOTALWRITEREQS

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-46. GCTOTALWRITELASTS

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0054 | Instance | BB2D |
| Physical Address | 0x5900 0054 | | |
| Description | Total WLAST Count. This is used to match with GCTotalWriteReqs. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | COUNT | | R | 0x0000 0000 |

Table 12-47. Register Call Summary for Register GCTOTALWRITELASTS

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-48. GCTOTALREADBURSTS

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0058 | Instance | BB2D |
| Physical Address | 0x5900 0058 | | |
| Description | Total Read Data Count in terms of 64bits. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | COUNT | | R | 0x0000 0000 |

Table 12-49. Register Call Summary for Register GCTOTALREADBURSTS

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-50. GCTOTALREADREQS

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 005C | Instance | BB2D |
| Physical Address | 0x5900 005C | | |
| Description | Total Read Request Count. This register has no reset value. | | |

| Type | R |
|------|---|
|------|---|

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | COUNT | | R | 0x0000 0000 |

- BB2D Register Summary: [0]

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | COUNT | | R | 0x0000 0000 |

- BB2D Register Summary: [0]

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------|------|-------------|
| 31:1 | COUNT | | RW | 0x0000 0000 |
| 0 | GCHOLD | 1 => Low power mode | RW | 0 |

Table 12-55. Register Call Summary for Register GCGPOUT0

BB2D Functional Description

- [BB2D Power Management: \[0\]](#)

BB2D Register Manual

- [BB2D Register Summary: \[1\]](#)

Table 12-56. GCGPOUT1

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0068 | Instance | BB2D |
| Physical Address | 0x5900 0068 | | |
| Description | General Purpose output register. R/W but not connected to anywhere | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | COUNT | | RW | 0x0000 0000 |

Table 12-57. Register Call Summary for Register GCGPOUT1

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-58. GCGPOUT2

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 006C | Instance | BB2D |
| Physical Address | 0x5900 006C | | |
| Description | General Purpose output register. R/W but not connected to anywhere | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | COUNT | | RW | 0x0000 0000 |

Table 12-59. Register Call Summary for Register GCGPOUT2

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-60. GCAXICONTROL

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0070 | Instance | BB2D |
| Physical Address | 0x5900 0070 | | |
| Description | Special Handling on AXI Bus | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WR_FULL_BURST_MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | WR_FULL_BURST_MODE | 0=>NO_BURST_RESET_VALUE 1=>BURST_RESET_VALUE | RW | 0 |

Table 12-61. Register Call Summary for Register GCAXICONTROL

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-62. GCMINORFEATURES1

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0074 | Instance | BB2D |
| Physical Address | 0x5900 0074 | | |
| Description | Shows which features are enabled in this chip. This register has no set reset value. It varies with the implementation. 0 => NONE 1 => AVAILABLE | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|------------|-----------|-----|----------------------|----------------|------------------|---------------------|--------|------------------------|------------------|-------------------------------------|-------------------------------|--------|------------|---------------------------------|-----------------------|-----------------------|-----------------------|--------------|-----------------|--------------|------------|-----------------|----------------------|------------|----------------|------------|------------|------------------|----------------|--------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FC_FLUSH_STALL | BUG_FIXES6 | WIDE_LINE | MMU | OK_TO_GATE_AXI_CLOCK | RESOLVE_OFFSET | NEGATIVE_LOG_FIX | CORRECT_OVERFLOW_VG | HALTIO | LINEAR_TEXTURE_SUPPORT | NON_POWER_OF_TWO | TEXTURE_HORIZONTAL_ALIGNMENT_SELECT | NEW_FLOATING_POINT_ARITHMETIC | NEW_2D | BUG_FIXES5 | DITHER_AND_FILTER_PLUS_ALPHA_2D | CORRECT_MIN_MAX_DEPTH | EXTENDED_PIXEL_FORMAT | TWO_STENCIL_REFERENCE | PIXEL_DITHER | HALF_FLOAT_PIPE | L2_WINDOWING | BUG_FIXES4 | AUTO_RESTART_TS | CORRECT_AUTO_DISABLE | BUG_FIXES3 | TEXTURE_STRIDE | BUG_FIXES2 | BUG_FIXES1 | VG_DOUBLE_BUFFER | V2_COMPRESSION | RSUV_SWIZZLE |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|-------------|------|-------|
| 31 | FC_FLUSH_STALL | | R | 1 |
| 30 | BUG_FIXES6 | | R | 1 |
| 29 | WIDE_LINE | | R | 1 |
| 28 | MMU | | R | 1 |
| 27 | OK_TO_GATE_AXI_CLOCK | | R | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------------|--|------|-------|
| 26 | RESOLVE_OFFSET | | R | 1 |
| 25 | NEGATIVE_LOG_FIX | | R | 1 |
| 24 | CORRECT_OVERFLOW_VG | | R | 0 |
| 23 | HALTIO | | R | 0 |
| 22 | LINEAR_TEXTURE_SUPPORT | | R | 0 |
| 21 | NON_POWER_OF_TWO | | R | 0 |
| 20 | TEXTURE_HORIZONTAL_ALIGNMENT_SELECT | | R | 1 |
| 19 | NEW_FLOATING_POINT_ARITHMETIC | | R | 1 |
| 18 | NEW_2D | | R | 1 |
| 17 | BUG_FIXES5 | | R | 1 |
| 16 | DITHER_AND_FILTER_PLUS_ALPHA_2D | Dither and filter+alpha available. | R | 1 |
| 15 | CORRECT_MIN_MAX_DEPTH | EEZ and HZ are correct. | R | 1 |
| 14 | EXTENDED_PIXEL_FORMAT | | R | 0 |
| 13 | TWO_STENCIL_REFERENCE | | R | 1 |
| 12 | PIXEL_DITHER | | R | 1 |
| 11 | HALF_FLOAT_PIPE | | R | 0 |
| 10 | L2_WINDOWING | | R | 0 |
| 9 | BUG_FIXES4 | | R | 1 |
| 8 | AUTO_RESTART_TS | | R | 0 |
| 7 | CORRECT_AUTO_DISABLE | | R | 1 |
| 6 | BUG_FIXES3 | | R | 1 |
| 5 | TEXTURE_STRIDE | Texture has stride and memory addressing. | R | 0 |
| 4 | BUG_FIXES2 | | R | 1 |
| 3 | BUG_FIXES1 | | R | 1 |
| 2 | VG_DOUBLE_BUFFER | Double buffering support for VG (second TS-->VG semaphore is present). | R | 0 |
| 1 | V2_COMPRESSION | V2 compression. | R | 1 |
| 0 | RSUV_SWIZZLE | Resolve UV swizzle. | R | 1 |

Table 12-63. Register Call Summary for Register GCMINORFEATURES1

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-64. GCTOTALCYCLES

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0078 | Instance | BB2D |
| Physical Address | 0x5900 0078 | | |
| Description | Total cycles. This register is a free running counter. It can be reset by writing 0 to it. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CYCLES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | CYCLES | | RW | 0x0000 1DE2 |

Table 12-65. Register Call Summary for Register GCTOTALCYCLES

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-66. GCTOTALIDLECYCLES

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 007C | Instance | BB2D |
| Physical Address | 0x5900 007C | | |
| Description | Total cycles where the GPU is idle. It is reset when gcTotalCycles register is written to. It looks at all the blocks but FE when determining the IP is idle. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CYCLES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | CYCLES | | RW | 0x0000 1E08 |

Table 12-67. Register Call Summary for Register GCTOTALIDLECYCLES

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-68. GCCHIPSPECS2

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0080 | Instance | BB2D |
| Physical Address | 0x5900 0080 | | |
| Description | Specs for the chip. This register has no set reset value. It varies with the implementation. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|-------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| NUMBER_OF_CONSTANTS | | | | | | | | | | | | | | | | INSTRUCTION_COUNT | | | | | | | | BUFFER_SIZE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|-------------|------|--------|
| 31:16 | NUMBER_OF_CONSTANTS | | R | 0x0000 |
| 15:8 | INSTRUCTION_COUNT | | R | 0x00 |
| 7:0 | BUFFER_SIZE | | R | 0x00 |

Table 12-69. Register Call Summary for Register GCCHIPSPECS2

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-70. GCMINORFEATURES2

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0084 | Instance | BB2D |
| Physical Address | 0x5900 0084 | | |
| Description | Shows which features are enabled in this chip. This register has no set reset value. It varies with the implementation. 0 => NONE 1 => AVAILABLE | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|------------------|----------|----------|---------------|-------------|----------------|----------------|------------------|--------------|-------------|---------------------|--------------------|----------------|-----------|---------------------------|------------------|--------|--------|------|-----------|------------|----------------------------------|-------------|----------------|-----------|---------------------|-------------------|----------|-----------|
| RESERVED | | | NO_INDEX_PATTERN | RESERVED | NOT_USED | MIXED_STREAMS | INTERLEAVER | FLUSH_FIXED_2D | YUV_CONVERSION | MULTI_SOURCE_BLT | YUV_STANDARD | TILE_FILLER | THREAD_WALKER_IN_PS | ONE_PASS_2D_FILTER | FULL_DIRECT_FB | TX_FILTER | DYNAMIC_FREQUENCY_SCALING | TX_YUV_ASSEMBLER | RGB888 | HALT11 | S1S8 | END_EVENT | PE_SWIZZLE | CORRECT_AUTO_DISABLE_COUNT_WIDTH | COMPOSITION | RECT_PRIMITIVE | LINEAR_PE | SUPER_TILED_TEXTURE | SEAMLESS_CUBE_MAP | LOGIC_OP | LINE_LOOP |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------------|-------------|------|-------|
| 31:29 | RESERVED | | R | 0x0 |
| 28 | NO_INDEX_PATTERN | | R | 1 |
| 27 | RESERVED | | R | 1 |
| 26 | NOT_USED | | R | 0 |
| 25 | MIXED_STREAMS | | R | 1 |
| 24 | INTERLEAVER | | R | 0 |
| 23 | FLUSH_FIXED_2D | | R | 1 |
| 22 | YUV_CONVERSION | | R | 1 |
| 21 | MULTI_SOURCE_BLT | | R | 1 |
| 20 | YUV_STANDARD | | R | 1 |
| 19 | TILE_FILLER | | R | 1 |
| 18 | THREAD_WALKER_IN_PS | | R | 1 |
| 17 | ONE_PASS_2D_FILTER | | R | 1 |
| 16 | FULL_DIRECT_FB | | R | 1 |
| 15 | TX_FILTER | | R | 0 |
| 14 | DYNAMIC_FREQUENCY_SCALING | | R | 1 |
| 13 | TX_YUV_ASSEMBLER | | R | 0 |
| 12 | RGB888 | | R | 0 |
| 11 | HALT11 | | R | 0 |
| 10 | S1S8 | | R | 0 |
| 9 | END_EVENT | | R | 0 |
| 8 | PE_SWIZZLE | | R | 0 |
| 7 | CORRECT_AUTO_DISABLE_COUNT_WIDTH | | R | 1 |
| 6 | COMPOSITION | | R | 0 |
| 5 | RECT_PRIMITIVE | | R | 0 |
| 4 | LINEAR_PE | | R | 0 |
| 3 | SUPER_TILED_TEXTURE | | R | 0 |
| 2 | SEAMLESS_CUBE_MAP | | R | 0 |
| 1 | LOGIC_OP | | R | 0 |
| 0 | LINE_LOOP | | R | 0 |

Table 12-71. Register Call Summary for Register GCMINORFEATURES2

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-72. GCMODULEPOWERCONTROLS

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0100 | Instance | BB2D |
| Physical Address | 0x5900 0100 | | |
| Description | Control register for module level power controls. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----------------|---|---|----------|---|------------------------------------|-----------------------------------|----------------------------|
| TURN_OFF_COUNTER | | | | | | | | | | | | | | | | RESERVED | | | | | | | | TURN_ON_COUNTER | | | RESERVED | | DISABLE_STARVE_MODULE_CLOCK_GATING | DISABLE_STALL_MODULE_CLOCK_GATING | ENABLE_MODULE_CLOCK_GATING |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------------|--|------|--------|
| 31:16 | TURN_OFF_COUNTER | Counter value for clock gating the module if the module is idle for this amount of clock cycles. | RW | 0x0014 |
| 15:8 | RESERVED | | R | 0x00 |
| 7:4 | TURN_ON_COUNTER | Number of clock cycles to wait after turning on the clock. | RW | 0x2 |
| 3 | RESERVED | | R | 0 |
| 2 | DISABLE_STARVE_MODULE_CLOCK_GATING | Disables module level clock gating for starve/idle condition. | RW | 0 |
| 1 | DISABLE_STALL_MODULE_CLOCK_GATING | Disables module level clock gating for stall condition. | RW | 0 |
| 0 | ENABLE_MODULE_CLOCK_GATING | Enables module level clock gating. | RW | 0 |

Table 12-73. Register Call Summary for Register GCMODULEPOWERCONTROLS

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-74. GCMODULEPOWERMODULECONTROL

| | | | |
|-------------------------|---------------------------------|-----------------|------|
| Address Offset | 0x0000 0104 | Instance | BB2D |
| Physical Address | 0x5900 0104 | | |
| Description | Module level control registers. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------------|----|----|----|----|----|---|---|---|---|---|--------------------------------|---|---|---|---|--|--|--|--|--|--|--------------------------------|--|--|--|--|--|--|--|--|--|--|--------------------------------|--|--|--|--|--|--|--|--|--|--|--------------------------------|--|--|--|--|--|--|--|--|--|--|--------------------------------|--|--|--|--|--|--|--|--|--|--|--------------------------------|--|--|--|--|--|--|--|--|--|--|--------------------------------|--|--|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | DISABLE_MODULE_CLOCK_GATING_TX | | | | | | | | | | | DISABLE_MODULE_CLOCK_GATING_RA | | | | | | | | | | | DISABLE_MODULE_CLOCK_GATING_SE | | | | | | | | | | | DISABLE_MODULE_CLOCK_GATING_PA | | | | | | | | | | | DISABLE_MODULE_CLOCK_GATING_SH | | | | | | | | | | | DISABLE_MODULE_CLOCK_GATING_PE | | | | | | | | | | | DISABLE_MODULE_CLOCK_GATING_DE | | | | | | | | | | | DISABLE_MODULE_CLOCK_GATING_FE | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|--|------|-----------|
| 31:8 | RESERVED | | R | 0x00 0000 |
| 7 | DISABLE_MODULE_CLOCK_GATING_TX | Disables module level clock gating for starve/idle condition. | RW | 0 |
| 6 | DISABLE_MODULE_CLOCK_GATING_RA | Disables module level clock gating for stall condition. | RW | 0 |
| 5 | DISABLE_MODULE_CLOCK_GATING_SE | Enables module level clock gating. | RW | 0 |
| 4 | DISABLE_MODULE_CLOCK_GATING_PA | Counter value for clock gating the module if the module is idle for this amount of clock cycles. | RW | 0 |
| 3 | DISABLE_MODULE_CLOCK_GATING_SH | Number of clock cycles to wait after turning on the clock. | RW | 0 |
| 2 | DISABLE_MODULE_CLOCK_GATING_PE | Disables module level clock gating for starve/idle condition. | RW | 0 |
| 1 | DISABLE_MODULE_CLOCK_GATING_DE | Disables module level clock gating for stall condition. | RW | 0 |
| 0 | DISABLE_MODULE_CLOCK_GATING_FE | Enables module level clock gating. | RW | 0 |

Table 12-75. Register Call Summary for Register GCMODULEPOWERMODULECONTROL

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-76. GCMODULEPOWERMODULESTATUS

| | | | |
|------------------|-----------------------------|----------|------|
| Address Offset | 0x0000 0108 | Instance | BB2D |
| Physical Address | 0x5900 0108 | | |
| Description | Module level control status | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|-----------------------|----|-----------------------|----|-----------------------|---|-----------------------|---|-----------------------|---|-----------------------|---|-----------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MODULE_CLOCK_GATED_TX | | MODULE_CLOCK_GATED_RA | | MODULE_CLOCK_GATED_SE | | MODULE_CLOCK_GATED_PA | | MODULE_CLOCK_GATED_SH | | MODULE_CLOCK_GATED_PE | | MODULE_CLOCK_GATED_DE | | MODULE_CLOCK_GATED_FE | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|-----------|
| 31:8 | RESERVED | | R | 0x00 0000 |
| 7 | MODULE_CLOCK_GATED_TX | Module level clock gating is ON for TX. | R | 0 |
| 6 | MODULE_CLOCK_GATED_RA | Module level clock gating is ON for RA. | R | 0 |
| 5 | MODULE_CLOCK_GATED_SE | Module level clock gating is ON for SE. | R | 0 |
| 4 | MODULE_CLOCK_GATED_PA | Module level clock gating is ON for PA. | R | 0 |
| 3 | MODULE_CLOCK_GATED_SH | Module level clock gating is ON for SH. | R | 0 |
| 2 | MODULE_CLOCK_GATED_PE | Module level clock gating is ON for PE. | R | 0 |
| 1 | MODULE_CLOCK_GATED_DE | Module level clock gating is ON for DE. | R | 0 |
| 0 | MODULE_CLOCK_GATED_FE | Module level clock gating is ON for FE. | R | 0 |

Table 12-77. Register Call Summary for Register GCMODULEPOWERMODULESTATUS

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-78. GCREGMMUSTATUS

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0188 | Instance | BB2D |
| Physical Address | 0x5900 0188 | | |
| Description | Status register that holds which MMU generated an exception | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|-----|----|------------|----|-----|---|------------|---|-----|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| NA3 | | | | | | | | | | | | | | | | EXCEPTION3 | | NA2 | | EXCEPTION2 | | NA1 | | EXCEPTION1 | | NA0 | | EXCEPTION0 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|----------|
| 31:14 | NA3 | NOT USED | R | 0x0 0000 |
| 13:12 | EXCEPTION3 | MMU 3 caused an exception and the second gcregMMUException register holds the offending address. 1 => SLAVE_NOT_PRESENT 2 => PAGE_NOT_PRESENT 3 => WRITE_VIOLATION | R | 0x0 |
| 11:10 | NA2 | NOT USED | R | 0x0 |
| 9:8 | EXCEPTION2 | MMU 2 caused an exception and the second gcregMMUException register holds the offending address. 1 => SLAVE_NOT_PRESENT 2 => PAGE_NOT_PRESENT 3 => WRITE_VIOLATION | R | 0x0 |
| 7:6 | NA1 | NOT USED | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 5:4 | EXCEPTION1 | MMU 1 caused an exception and the second gcregMMUException register holds the offending address. 1 => SLAVE_NOT_PRESENT 2 => PAGE_NOT_PRESENT 3 => WRITE_VIOLATION | R | 0x0 |
| 3:2 | NA0 | NOT USED | R | 0x0 |
| 1:0 | EXCEPTION0 | MMU 0 caused an exception and the first gcregMMUException register holds the offending address. 1 => SLAVE_NOT_PRESENT 2 => PAGE_NOT_PRESENT 3 => WRITE_VIOLATION | R | 0x0 |

Table 12-79. Register Call Summary for Register GCREGMMUSTATUS

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-80. GCREGMMUCONTROL

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 018C | Instance | BB2D |
| Physical Address | 0x5900 018C | | |
| Description | Control register that enables the MMU (only time shot). | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|--------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| NA | | | | | | | | | | | | | | | | | | | | | | | | | | | | ENABLE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | NA | NOT USED | W | 0x0000 0000 |
| 0 | ENABLE | Enable the MMU. For security reasons, once the MMU is enabled it cannot be disabled anymore. | W | 0 |

Table 12-81. Register Call Summary for Register GCREGMMUCONTROL

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-82. GCREGMMUEXCEPTION0

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0190 | Instance | BB2D |
| Physical Address | 0x5900 0190 | | |
| Description | Holds the original address that generated an exception | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDRESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | ADDRESS | | RW | 0x0000 0000 |

Table 12-83. Register Call Summary for Register GCREGMMUEXCEPTION0

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-84. GCREGMMUEXCEPTION1

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0194 | Instance | BB2D |
| Physical Address | 0x5900 0194 | | |
| Description | Holds the original address that generated an exception | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDRESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | ADDRESS | | RW | 0x0000 0000 |

Table 12-85. Register Call Summary for Register GCREGMMUEXCEPTION1

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-86. GCREGMMUEXCEPTION2

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0198 | Instance | BB2D |
| Physical Address | 0x5900 0198 | | |
| Description | Holds the original address that generated an exception | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDRESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | ADDRESS | | RW | 0x0000 0000 |

Table 12-87. Register Call Summary for Register GCREGMMUEXCEPTION2

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-88. GCREGMMUEXCEPTION3

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 019C | Instance | BB2D |
| Physical Address | 0x5900 019C | | |
| Description | Holds the original address that generated an exception | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDRESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | ADDRESS | | RW | 0x0000 0000 |

Table 12-89. Register Call Summary for Register GCREGMMUEXCEPTION3

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-90. AQMEMORYDEBUG

| | | | |
|-------------------------|-------------|-----------------|------|
| Address Offset | 0x0000 0414 | Instance | BB2D |
| Physical Address | 0x5900 0414 | | |
| Description | | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|-----------------------------------|----|-------------|----|----|----|----|----|----------------------------|---------------------|----------------------|--------------------|---------------|----------|------------------------------------|----------|------------------------|----------|----|----|----|----|---|-----------------------|---|---|---|---|---|---|---|---|--|
| RESERVED | | ZCOMP_LIMIT | | | | | | DISABLE_WRITE_DATA_SPEEDUP | DISABLE_STALL_READS | DISABLE_ZCOMPRESSION | DISABLE_FAST_CLEAR | LIMIT_CONTROL | RESERVED | INTERLEAVE_BUFFER_LOW_LATENCY_MODE | RESERVED | DISABLE_MINI_MMU_CACHE | RESERVED | | | | | | MAX_OUTSTANDING_READS | | | | | | | | | |
| DONT_STALL_WRITES_TO_SAME_ADDRESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------------|---|------|-------|
| 31 | RESERVED | | R | 0 |
| 30 | DONT_STALL_WRITES_TO_SAME_ADDRESS | | RW | 0 |
| 29:24 | ZCOMP_LIMIT | | RW | 0x3C |
| 23 | DISABLE_WRITE_DATA_SPEEDUP | | RW | 0 |
| 22 | DISABLE_STALL_READS | | RW | 0 |
| 21 | DISABLE_ZCOMPRESSION | Reserved. | RW | 0 |
| 20 | DISABLE_FAST_CLEAR | Reserved. | RW | 0 |
| 19 | LIMIT_CONTROL | 0=>REQUESTS 1=>DATA | RW | 0 |
| 18 | RESERVED | | R | 0 |
| 17 | INTERLEAVE_BUFFER_LOW_LATENCY_MODE | | RW | 0 |
| 16:15 | RESERVED | | R | 0x0 |
| 14 | DISABLE_MINI_MMU_CACHE | | RW | 0 |
| 13:8 | RESERVED | | R | 0x00 |
| 7:0 | MAX_OUTSTANDING_READS | Limits the total number of outstanding read requests. | RW | 0x00 |

Table 12-91. Register Call Summary for Register AQMEMORYDEBUG

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-92. AQREGISTERTIMINGCONTROL

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 042C | Instance | BB2D |
| Physical Address | 0x5900 042C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------|------------|------------|----|----------|----|----------|----|----------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | LIGHT_SLEEP | DEEP_SLEEP | POWER_DOWN | | FAST_WTC | | FAST_RTC | | FOR_RF2P | | | | | | | | FOR_RF1P | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--------------------|------|-------|
| 31:23 | RESERVED | Reserved | RW | 0x000 |
| 22 | LIGHT_SLEEP | Light sleep | RW | 0 |
| 21 | DEEP_SLEEP | Deep sleep | RW | 0 |
| 20 | POWER_DOWN | Powerdown memory | RW | 0 |
| 19:18 | FAST_WTC | WTC for fast rams | RW | 0x0 |
| 17:16 | FAST_RTC | RTC for fast rams. | RW | 0x3 |
| 15:8 | FOR_RF2P | | RW | 0x00 |
| 7:0 | FOR_RF1P | | RW | 0x00 |

Table 12-93. Register Call Summary for Register AQREGISTERTIMINGCONTROL

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-94. GCMEMORYRESERVED

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0430 | Instance | BB2D |
| Physical Address | 0x5900 0430 | | |
| Description | This is reserved for future expansion. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | RESERVED | unused | R | 0x0000 0000 |

Table 12-95. Register Call Summary for Register GCMEMORYRESERVED

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-96. GCDISPLAYPRIORITY

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0434 | Instance | BB2D |
| Physical Address | 0x5900 0434 | | |
| Description | Controls the priority of the display controller requests. This works like a PWM. One register gives the period, and the other gives the ON time. When PWM is ON, display requests are accepted if both display and the other request is valid. If it is OFF, the other request will be accepted. If only one request is valid, it takes the bus regardless of the PWM bit. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | HIGH | | | | | | | | PERIOD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:8 | HIGH | | RW | 0x01 |
| 7:0 | PERIOD | | RW | 0x02 |

Table 12-97. Register Call Summary for Register GCDISPLAYPRIORITY

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-98. GCDBGCYCLECOUNTER

| | | | |
|-------------------------|-------------------------|-----------------|------|
| Address Offset | 0x0000 0438 | Instance | BB2D |
| Physical Address | 0x5900 0438 | | |
| Description | Increments every cycle. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | COUNT | | RW | 0x0000 1C5E |

Table 12-99. Register Call Summary for Register GCDBGCYCLECOUNTER

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-100. GCOUTSTANDINGREADS0

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 043C | Instance | BB2D |
| Physical Address | 0x5900 043C | | |
| Description | Number of outstanding reads per client in multiples of 8B. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| MMU | | | | | | | | FE | | | | | | | | PEZ | | | | | | | | PEC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|-------|
| 31:24 | MMU | | R | 0x00 |
| 23:16 | FE | | R | 0x00 |
| 15:8 | PEZ | | R | 0x00 |
| 7:0 | PEC | | R | 0x00 |

Table 12-101. Register Call Summary for Register GCOUTSTANDINGREADS0

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-102. GCOUTSTANDINGREADS1

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0440 | Instance | BB2D |
| Physical Address | 0x5900 0440 | | |
| Description | Number of outstanding reads per client in multiples of 8B. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TOTAL | | | | | | | | FC | | | | | | | | TX | | | | | | | | RA | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | TOTAL | This field keeps the value of total read requests or total requested data (in 64bits) depending on the value of LimitControl field in AQMemoryDebug register. | R | 0x00 |
| 23:16 | FC | | R | 0x00 |
| 15:8 | TX | | R | 0x00 |
| 7:0 | RA | | R | 0x00 |

Table 12-103. Register Call Summary for Register GCOUTSTANDINGREADS1

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-104. GCOUTSTANDINGWRITES

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0444 | Instance | BB2D |
| Physical Address | 0x5900 0444 | | |
| Description | Number of outstanding writes per client. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TOTAL | | | | | | | | FC | | | | | | | | PEZ | | | | | | | | PEC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|-------|
| 31:24 | TOTAL | | R | 0x00 |
| 23:16 | FC | | R | 0x00 |
| 15:8 | PEZ | | R | 0x00 |
| 7:0 | PEC | | R | 0x00 |

Table 12-105. Register Call Summary for Register GCOUTSTANDINGWRITES

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-106. GCDEBUGSIGNALSRA

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0448 | Instance | BB2D |
| Physical Address | 0x5900 0448 | | |
| Description | 32 bit debug signal from Ra. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SIGNAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | SIGNAL | Signals according to select signal: 0 -> Valid pixel count. 1 -> Total quad count (after EEZ). 2 -> Valid quad count (after EZ and EEZ). 3 -> Total primitive count. 4 -> Various signals from input stage. See RTL for details. 5 -> Various signals from input stage. See RTL for details. 6 -> Various signals from render pipe. See RTL for details. 7 -> Various signals from render cache. See RTL for details. 8 -> Various signals from raster engine. See RTL for details. 9 -> Cache miss count (in the pipeline). A -> Cache miss count (in the prefetcher). B -> EEZ culled quads. F -> Signature = 0x12344321. | R | 0x0000 0000 |

Table 12-107. Register Call Summary for Register GCDEBUGSIGNALSRA

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-108. GCDEBUGSIGNALSTX

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 044C | Instance | BB2D |
| Physical Address | 0x5900 044C | | |
| Description | 32 bit debug signal from Tx. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SIGNAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | SIGNAL | Signals according to select signal: 0 -> Total bilinear texture requests. 1 -> Total trilinear texture requests. 2 -> Total discarded texture requests. 3 -> Total texture requests. 4 -> Various signals from input stage. See RTL for details. 5 -> Memory read count. 6 -> Memory read count in 8B. 7 -> Cache miss count (in the pipeline). 8 -> Total hitting texels (in pre-fetcher). 9 -> Total missing texels (in pre-fetcher). F -> Signature = 0x12211221. | R | 0x0000 0000 |

Table 12-109. Register Call Summary for Register GCDEBUGSIGNALSTX

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-110. GCDEBUGSIGNALSFE

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0450 | Instance | BB2D |
| Physical Address | 0x5900 0450 | | |
| Description | 32 bit debug signal from Fe. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SIGNAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | SIGNAL | | R | 0x0000 0000 |

Table 12-111. Register Call Summary for Register GCDEBUGSIGNALSFE

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-112. GCDEBUGSIGNALSPE

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0454 | Instance | BB2D |
| Physical Address | 0x5900 0454 | | |
| Description | 32 bit debug signal from Pe. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SIGNAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | SIGNAL | Signals according to select signal: 0 -> pixel count killed by color pipe 1 -> pixel count killed by depth pipe 2 -> pixel count drawn by color pipe 3 -> pixel count drawn by depth pipe 4 -> debug signals for 3d_io, 2d_filter, 2d_fsm 5 -> debug signals for cache2d_cntrl 6 -> debug signals for cache2d_tag_alloc 7 -> debug signals for cache3d_c_cntrl, cache3d_c_tag_alloc 8 -> debug signals for cache3d_z_cntrl, cache3d_z_tag_alloc 9 -> debug signals for pref_2d, pref_3d a -> debug signals for cmd_state b -> 2d pixel count drawn by 2d pipe F -> Signature = 0xbabef00d. | R | 0x0000 0000 |

Table 12-113. Register Call Summary for Register GCDEBUGSIGNALSPE

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-114. GCDEBUGSIGNALSDE

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0458 | Instance | BB2D |
| Physical Address | 0x5900 0458 | | |
| Description | 32 bit debug signal from De. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SIGNAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | SIGNAL | | R | 0x0000 0000 |

Table 12-115. Register Call Summary for Register GCDEBUGSIGNALSDE

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-116. GCDEBUGSIGNALSSH

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 045C | Instance | BB2D |
| Physical Address | 0x5900 045C | | |
| Description | 32 bit debug signal from Sh. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SIGNAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | SIGNAL | Please refer the RTL for bit position information for all the signals Debug Reg: Description 0 : interface signals for debug 1 : Instruction Sequencing and vertex input state machine 2 : vertex input/output buffer full/empty. Context PC. Physical page valid 3 : vertex/pixel, output attribute counts. Some interface signals 4 : Shader cycle count, for determining the shader clock 5 : Current pixel XY value 6 : Last pixels XY value 7 : Total pixel instructions executed 8 : Total pixels shaded 9 : Total vertex instructions executed a : Total vertices shaded b : Total vertex branch instructions c : Total vertex texture instructions d : Total pixel branch instructions e : Total pixel texture instructoins f : Reserved signature deadbeef | R | 0x0000 0000 |

Table 12-117. Register Call Summary for Register GCDEBUGSIGNALSSH

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-118. GCDEBUGSIGNALSPA

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0460 | Instance | BB2D |
| Physical Address | 0x5900 0460 | | |
| Description | 32 bit debug signal from Pa. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SIGNAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | SIGNAL | Signals according to select signal: 0 -> Various signals from input stage. See RTL for details. 1 -> Various signals from input stage. See RTL for details. 2 -> Various signals from input stage. See RTL for details. 3 -> total vertex count 4 -> input primitive count 5 -> output primitive count 6 -> depth clipped primitive count 7 -> trivial rejected primitive count 8 -> culled primitive count F -> Signature = 0x0000aaaa | R | 0x0000 0000 |

Table 12-119. Register Call Summary for Register GCDEBUGSIGNALSPA

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-120. GCDEBUGSIGNALSSE

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0464 | Instance | BB2D |
| Physical Address | 0x5900 0464 | | |
| Description | 32 bit debug signal from Se. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SIGNAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | SIGNAL | Signals according to select signal: 0 -> culled triangles count. 1 -> culled lines count. 2 -> [31:18] goto signals, [17:8] main state machine state, [7:0] output state machine state. See RTL for details. 3 -> [31:22] unused, [21] early_isTriangle, [20] isTriangle, [19] increment_pc_e0, [18:14] jump_to_signals. See RTL for details. [13:12] max_x_p_e2, [11:10] mid_x_p_e2, [9:8] min_x_p_e2, [7:6] max_y_p_e2, [5:4] mid_y_p_e2. See RTL for details. [3:2] min_y_p_e2, [1:0] min_z_p_e2. See RTL for details. 4 -> area_e2. See RTL for details. 5 -> x0_e2. See RTL for details. 6 -> x1_e2. See RTL for details. 7 -> x2_e2. See RTL for details. 8 -> y0_e2. See RTL for details. 9 -> y1_e2. See RTL for details. A -> y2_e2. See RTL for details. B -> init_y_e2. See RTL for details. C -> init_y_e2. See RTL for details. D -> y2_e2. See RTL for details. E -> y2_e2. See RTL for details. F -> Signature = 0x5E5E5E5E. | R | 0x0000 0000 |

Table 12-121. Register Call Summary for Register GCDEBUGSIGNALSSE

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-122. GCDEBUGSIGNALSMC

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0468 | Instance | BB2D |
| Physical Address | 0x5900 0468 | | |
| Description | 32 bit debug signal from Mc. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SIGNAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | SIGNAL | Signals according to select signal: 0 -> Various signals from FC block. See RTL for details. 1 -> Total read req in terms of 8B from pipeline. 2 -> Total read req in terms of 8B sent out from the IP. 3 -> Total write req in terms of 8B from pipeline. F -> Signature = 0x12345678. | R | 0x0000 0000 |

Table 12-123. Register Call Summary for Register GCDEBUGSIGNALSMC

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-124. GCDEBUGSIGNALSHI

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 046C | Instance | BB2D |
| Physical Address | 0x5900 046C | | |
| Description | 32 bit debug signal from Hi. This register has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SIGNAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | SIGNAL | Signals according to select signal: 0 -> Number of cycles AXI read request is stalled. 1 -> Number of cycles AXI write request is stalled. 2 -> Number of cycles AXI write data is stalled. F -> Signature = 0xaaaaaaaa. | R | 0x0000 0000 |

Table 12-125. Register Call Summary for Register GCDEBUGSIGNALSHI

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-126. GCDEBUGCONTROL0

| | | | |
|-------------------------|-------------|-----------------|------|
| Address Offset | 0x0000 0470 | Instance | BB2D |
| Physical Address | 0x5900 0470 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------|---|---|---|----|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | SH | | | | RESERVED | | | | PE | | | | RESERVED | | | | DE | | | | RESERVED | | | | FE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | SH | Selects which set of 32 bit data to get from Sh. Resets the counters if set to 0xf. | RW | 0x0 |
| 23:20 | RESERVED | | R | 0x0 |
| 19:16 | PE | Selects which set of 32 bit data to get from Pe. Resets the counters if set to 0xf. | RW | 0x0 |
| 15:12 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 11:8 | DE | Selects which set of 32 bit data to get from De. Resets the counters if set to 0xf. | RW | 0x0 |
| 7:4 | RESERVED | | R | 0x0 |
| 3:0 | FE | Selects which set of 32 bit data to get from Fe. Resets the counters if set to 0xf. | RW | 0x0 |

Table 12-127. Register Call Summary for Register GCDEBUGCONTROL0

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-128. GCDEBUGCONTROL1

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0474 | Instance | BB2D |
| Physical Address | 0x5900 0474 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------|---|---|---|----|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | TX | | | | RESERVED | | | | RA | | | | RESERVED | | | | SE | | | | RESERVED | | | | PA | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | TX | Selects which set of 32 bit data to get from Tx. Resets the counters if set to 0xf. | RW | 0x0 |
| 23:20 | RESERVED | | R | 0x0 |
| 19:16 | RA | Selects which set of 32 bit data to get from Ra. Resets the counters if set to 0xf. | RW | 0x0 |
| 15:12 | RESERVED | | R | 0x0 |
| 11:8 | SE | Selects which set of 32 bit data to get from Se. Resets the counters if set to 0xf. | RW | 0x0 |
| 7:4 | RESERVED | | R | 0x0 |
| 3:0 | PA | Selects which set of 32 bit data to get from Pa. Resets the counters if set to 0xf. | RW | 0x0 |

Table 12-129. Register Call Summary for Register GCDEBUGCONTROL1

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-130. GCDEBUGCONTROL2

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0478 | Instance | BB2D |
| Physical Address | 0x5900 0478 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|----|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HI | | | | | | | | RESERVED | | | | MC | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------|
| 31:12 | RESERVED | | R | 0x0 0000 |
| 11:8 | HI | Selects which set of 32 bit data to get from Hi. Resets the counters if set to 0xf. | RW | 0x0 |
| 7:4 | RESERVED | | R | 0x0 |
| 3:0 | MC | Selects which set of 32 bit data to get from Mc. Resets the counters if set to 0xf. | RW | 0x0 |

Table 12-131. Register Call Summary for Register GCDEBUGCONTROL2

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-132. GCDEBUGCONTROL3

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 047C | Instance | BB2D |
| Physical Address | 0x5900 047C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----------|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PROBE1 | | | | RESERVED | | | | PROBE0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------|
| 31:12 | RESERVED | | R | 0x0 0000 |
| 11:8 | PROBE1 | Selects which module's output will be put in the MSB 32 bits of 64 bit debug signal. 0=>FE 1=>DE 2=>PE 3=>SH 4=>PA 5=>SE 6=>RA 7=>TX 8=>MC | RW | 0x0 |
| 7:4 | RESERVED | | R | 0x0 |
| 3:0 | PROBE0 | Selects which module's output will be put in the LSB 32 bits of 64 bit debug signal. 0=>FE 1=>DE 2=>PE 3=>SH 4=>PA 5=>SE 6=>RA 7=>TX 8=>MC | RW | 0x0 |

Table 12-133. Register Call Summary for Register GCDEBUGCONTROL3

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-134. GCBUSCONTROL

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0480 | Instance | BB2D |
| Physical Address | 0x5900 0480 | | |
| Description | Shows which features are enabled in this chip. This register has no set reset value. It varies with the implementation. 0 => NONE 1 => AVAILABLE | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|-----|----|----|-----|----------|----|----------|-----|-----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | FCC | TX | FC | MMU | RESERVED | FE | RESERVED | PEZ | PEC |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------------|------|-----------|
| 31:9 | RESERVED | | R | 0x00 0000 |
| 8 | FCC | Select the return bus for FCC | RW | 0 |
| 7 | TX | Select the return bus for TX | RW | 1 |
| 6 | FC | Select the return bus for FC-Depth | RW | 0 |
| 5 | MMU | Select the return bus for MMU | RW | 1 |
| 4 | RESERVED | | R | 0 |
| 3 | FE | Select the return bus for FE | RW | 1 |
| 2 | RESERVED | | R | 0 |
| 1 | PEZ | Select the return bus for PEZ | RW | 0 |
| 0 | PEC | Select the return bus for PEC | RW | 0 |

Table 12-135. Register Call Summary for Register GCBUSCONTROL

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-136. GCREGENDIANNES0

| | | | |
|-------------------------|-------------|-----------------|------|
| Address Offset | 0x0000 0484 | Instance | BB2D |
| Physical Address | 0x5900 0484 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WORD_SWAP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | WORD_SWAP | Flip the words of 32 bit data. 0x12345678 becomes 0x56781234 | RW | 0x0000 0000 |

Table 12-137. Register Call Summary for Register GCREGENDIANNES0

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-138. GCREGENDIANNES1

| | | | |
|-------------------------|-------------|-----------------|------|
| Address Offset | 0x0000 0488 | Instance | BB2D |
| Physical Address | 0x5900 0488 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BYTE_SWAP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | BYTE_SWAP | Flip the bytes of 16 bit data. 0x12345678 becomes 0x34127856 | RW | 0x0000 0000 |

Table 12-139. Register Call Summary for Register GCREGENDIANNES1

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-140. GCREGENDIANNES2

| | | | |
|-------------------------|-------------|-----------------|------|
| Address Offset | 0x0000 048C | Instance | BB2D |
| Physical Address | 0x5900 048C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BIT_SWAP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | BIT_SWAP | Flip the bits of 8 bit data. 0x12345678 becomes 0x84c2a6e1 | RW | 0x0000 0000 |

Table 12-141. Register Call Summary for Register GCREGENDIANNES2

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-142. GCREGDRAWPRIMITIVESTARTTIMESTAMP

| | | | |
|-------------------------|-------------|-----------------|------|
| Address Offset | 0x0000 0490 | Instance | BB2D |
| Physical Address | 0x5900 0490 | | |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| START_TIME | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | START_TIME | 32-bit timestamp when pe received draw_primitive_start command | R | 0x0000 0000 |

Table 12-143. Register Call Summary for Register GCREGDRAWPRIMITIVESTARTTIMESTAMP

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-144. GCREGDRAWPRIMITIVEENDTIMESTAMP

| | | | |
|-------------------------|-------------|-----------------|------|
| Address Offset | 0x0000 0494 | Instance | BB2D |
| Physical Address | 0x5900 0494 | | |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| END_TIME | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | END_TIME | 32-bit timestamp when pe received draw_primitive_end command | R | 0x0000 0000 |

Table 12-145. Register Call Summary for Register GCREGDRAWPRIMITIVEENDTIMESTAMP

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-146. GCREGCONTROL0

| | | | |
|-------------------------|----------------------|-----------------|------|
| Address Offset | 0x0000 0558 | Instance | BB2D |
| Physical Address | 0x5900 0558 | | |
| Description | Composition trigger. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------|----|----|----|----|----|----|----|-------------------------------|----|----|----|----|----|----|----|------------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| MISC1 | | | | | | | | OUTSTANDING_READS_PER_CHANNEL | | | | | | | | MISC0 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | ENABLE_UNALIGNED_WRITE_MERGE | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | ENABLE_WRITE_MERGE | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | ENABLE_UNALIGNED_MERGE | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | ENABLE_READ_MERGE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|-------------|------|-------|
| 31:26 | MISC1 | | RW | 0x00 |
| 25:16 | OUTSTANDING_READS_PER_CHANNEL | | RW | 0x080 |
| 15:4 | MISC0 | | RW | 0x000 |
| 3 | ENABLE_UNALIGNED_WRITE_MERGE | | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|-------------|------|-------|
| 2 | ENABLE_WRITE_MERGE | | RW | 1 |
| 1 | ENABLE_UNALIGNED_MERGE | | RW | 0 |
| 0 | ENABLE_READ_MERGE | | RW | 1 |

Table 12-147. Register Call Summary for Register GCREGCONTROL0

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-148. AQCMDBUFFERADDR

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0654 | Instance | BB2D |
| Physical Address | 0x5900 0654 | | |
| Description | Base address for the command buffer. The address must be 64-bit aligned and it is always physical. To use addresses above 0x8000_0000, program AQMemoryFE with the appropriate offset. Also, this register cannot be read. To check the value of the current fetch address use AQFEDebugCurCmdAdr. Since this is a write only register is has no reset value. | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TYPE | | ADDRESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------------|------|-------------|
| 31 | TYPE | 0=>SYSTEM 1=>VIRTUAL_SYSTEM | W | 0 |
| 30:0 | ADDRESS | ADDRESS | W | 0x0000 0000 |

Table 12-149. Register Call Summary for Register AQCMDBUFFERADDR

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-150. AQCMDBUFFERCTRL

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0658 | Instance | BB2D |
| Physical Address | 0x5900 0658 | | |
| Description | Since this is a write only register is has no reset value. | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| NA1 | | | | | | | | ENDIAN_CONTROL | | | | NA | | | | PREFETCH | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|--------|
| 31:22 | NA1 | | W | 0x000 |
| 21:20 | ENDIAN_CONTROL | 0=>NO_SWAP 1=>SWAP_WORD 2 => SWAP_DWORD | W | 0x0 |
| 19:17 | NA | | W | 0x0 |
| 16 | ENABLE | 0=>DISABLE 1=>ENABLE | W | 0 |
| 15:0 | PREFETCH | Number of 64-bit words to fetch from the command buffer. | W | 0x0000 |

Table 12-151. Register Call Summary for Register AQCMDBUFFERCTRL

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-152. AQFESTATUS

| | | | |
|-------------------------|-------------|-----------------|------|
| Address Offset | 0x0000 065C | Instance | BB2D |
| Physical Address | 0x5900 065C | | |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | COMMAND_DATA | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | COMMAND_DATA | Status of the command parser. 0 --> Idle 1 --> Busy | R | 0 |

Table 12-153. Register Call Summary for Register AQFESTATUS

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-154. AQFEDEBUGSTATE

| | | | |
|-------------------------|-------------|-----------------|------|
| Address Offset | 0x0000 0660 | Instance | BB2D |
| Physical Address | 0x5900 0660 | | |
| Description | Reserved. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|-----------|----|---------------|----|-----------------|----|---------------|---|----------|---|---|---|-----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | VE_REQ_STATE | | CAL_STATE | | REQ_DMA_STATE | | CMD_FETCH_STATE | | CMD_DMA_STATE | | RESERVED | | | | CMD_STATE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|-------------|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | VE_REQ_STATE | | R | 0x0 |
| 15:14 | CAL_STATE | | R | 0x0 |
| 13:12 | REQ_DMA_STATE | | R | 0x0 |
| 11:10 | CMD_FETCH_STATE | | R | 0x0 |
| 9:8 | CMD_DMA_STATE | | R | 0x0 |
| 7:5 | RESERVED | | R | 0x0 |
| 4:0 | CMD_STATE | | R | 0x00 |

Table 12-155. Register Call Summary for Register AQFEDEBUGSTATE

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-156. AQFEDEBUGCURCMDADR

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0664 | Instance | BB2D |
| Physical Address | 0x5900 0664 | | |
| Description | This is the command decoder address. The address is always physical so the MSB should always be 0. It has no reset value. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CUR_CMD_ADR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|-------------|------|-------------|
| 31:3 | CUR_CMD_ADR | | R | 0x0000 0000 |
| 2:0 | RESERVED | | R | 0x0 |

Table 12-157. Register Call Summary for Register AQFEDEBUGCURCMDADR

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-158. AQFEDEBUGCMDLOWREG

| | | | |
|-------------------------|--------------------------|-----------------|------|
| Address Offset | 0x0000 0668 | Instance | BB2D |
| Physical Address | 0x5900 0668 | | |
| Description | Reserved. No reset value | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CMD_LOW_REG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|------------------------------------|------|-------------|
| 31:0 | CMD_LOW_REG | Command register used by CmdState. | R | 0x0000 0000 |

Table 12-159. Register Call Summary for Register AQFEDEBUGCMDLOWREG

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Table 12-160. AQFEDEBUGCMDHIREG

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 066C | Instance | BB2D |
| Physical Address | 0x5900 066C | | |
| Description | Reserved. No reset value | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CMD_HI_REG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------------|------|-------------|
| 31:0 | CMD_HI_REG | Command register used by CmdState. | R | 0x0000 0000 |

Table 12-161. Register Call Summary for Register AQFEDEBUGCMDHIREG

BB2D Register Manual

- [BB2D Register Summary: \[0\]](#)

Audio Back End

This chapter describes the audio back end (ABE) module.

| Topic | Page |
|-------------------------|------|
| 13.1 ABE Overview | 2742 |

13.1 ABE Overview

The audio back end (ABE) module is a subsystem that manages various audio and voice uplink and downlink streams between the initiator (the Cortex™-A9 microprocessor unit [MPU], digital signal processor [DSP], or direct memory access [DMA] controller) and the peripheral physical interfaces (multichannel buffered serial port [McBSP], SLIMbus®, digital microcontroller [DMIC], multichannel pulse density modulation [McPDM], and multichannel audio serial port [McASP]).

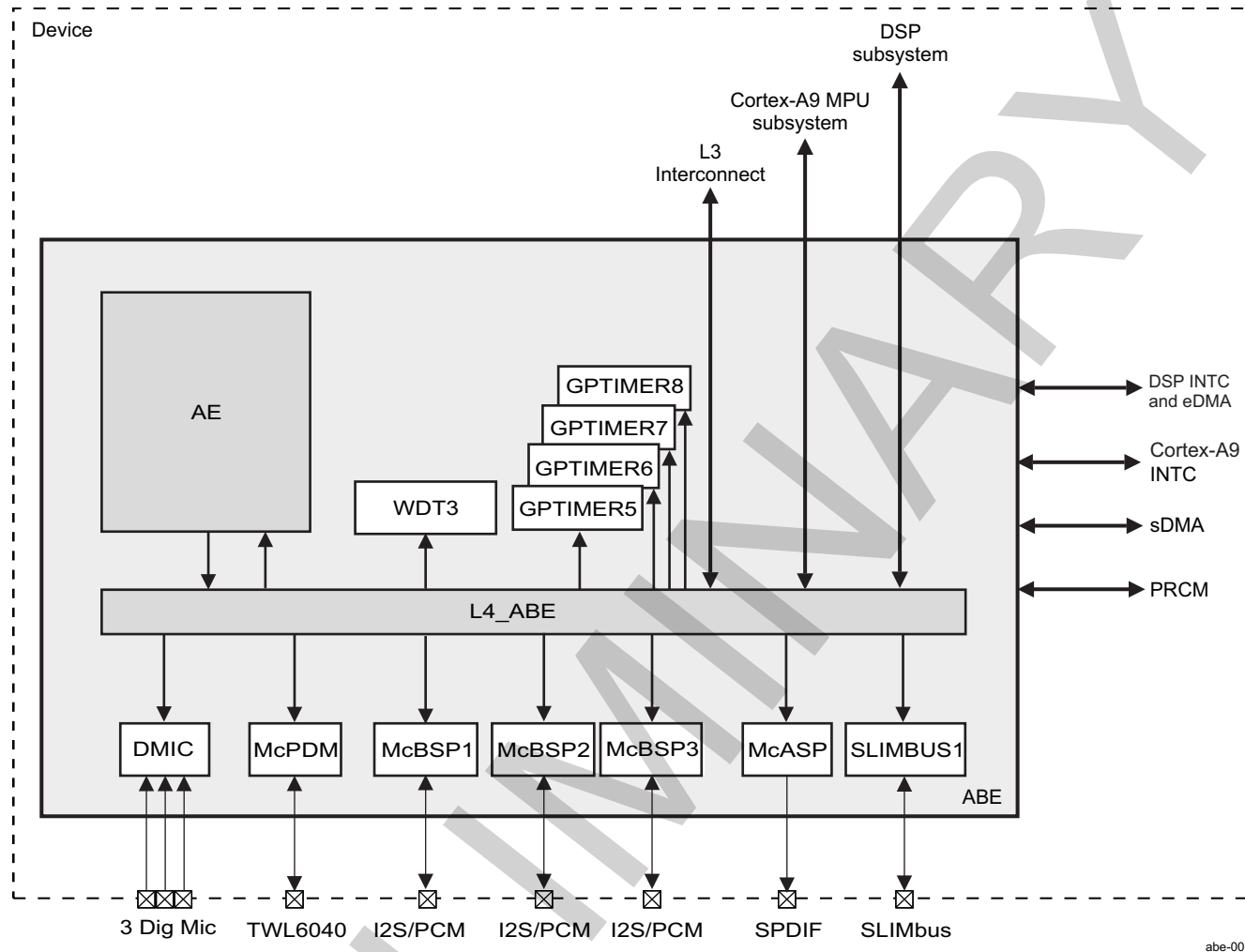
The ABE module handles the audio processing for the applications. It receives voice or audio samples from the initiator or the external audio chip (TWL6040 or other) and sends them to the peripheral interfaces or memories after processing. The ABE can perform buffering of audio samples, mix audio with a voice down stream and/or a microphone up stream (sidetone), and can apply some post-processing.

The ABE integrates the following modules:

- Peripheral physical interfaces:
 - Three McBSP modules
 - One McASP module
 - One mobile industry processor interface (MIPI) SLIMbus interface
 - One DMIC module to support up to six mono and up to three stereo digital microphones
 - One MCPDM module to support interconnect with an external audio chip.
- Audio engine (AE):
 - Performs real-time signal processing like sample rate conversion, filtering, equalizing, and side-tone
 - Audio traffic controller (ATC):
 - Performs data move in the ABE
 - Generates interrupt requests to the DSP and Cortex-A9 interrupt controllers
 - On-chip memory:
 - 64KB of RAM; 32-bit data memory (DMEM)
 - 6KB for coefficient memory RAM (CMEM)
 - 18KB for sample memory RAM (SMEM)
- Local L4 interconnect (L4_ABE) to:
 - L3 interconnect
 - Cortex-A9 MPU
 - DSP

The Cortex-A9 MPU and the DSP have private access to the L4_ABE interconnect. All other initiators (sDMA) can access the L4_ABE only through the L3 interconnect.
- Timers:
 - Four general-purpose (GP) timers
 - One watchdog timer
- Clock and reset management: Receives clock and reset signals from the device PRCM module. The audio engine operates from the DPLL_ABE, which is in the PRCM module. The ABE modules can be supplied with clock signals from the DPLL_ABE or the DPLL_PER. The ABE has its own hardware reset domain (AUDIO_RST).
- Power management: The ABE module is power-independent. It has its own dedicated power domain (PD_ABE) and can execute audio processing with the rest of the device in retention or in off mode.
- Each peripheral in the ABE can be accessed directly by the initiator when the AE is bypassed (legacy mode, for old software compatability).

Figure 13-1 is a high-level overview of the ABE.

Figure 13-1. Audio Back End


abe-001

13.1.1 AE Subsystem

The AE is the core of the ABE subsystem. It performs the real-time audio processing within the ABE: mixing, muxing, volume control, smooth muting, sampling rate conversion, and side-tone equalization. The AE subsystem also processes and executes all data transfers. To optimize the global processing, the ATC moves the data. An IRQ/DMA controller controls system IRQ and DMA requests. Input DMA requests come from the ABE peripherals, and output DMA requests and IRQ are generated and sent to the system (Cortex-A9 MPU interrupt controller, DSP interrupt controller, system DMA [sDMA], and the DSP enhanced direct memory access controller [eDMA]).

The AE subsystem contains:

- AE: processes the sample in SMEM with help of CMEM.
 - SMEM
 - CMEM
- DMEM contains the audio buffer and communication circular buffer.
- ATC: Transfers data between all modules in the ABE
- IRQ DMA controller

For more information about the audio engine, see the *Hardware Abstraction Layer (HAL) Addendum*.

13.1.2 Local Audio Interconnect

The ABE has its own audio local interconnect (L4_ABE), which interconnects and manages the data flow among all ABE modules.

L4_ABE main features are:

- Initiator ports: Cortex-A9 MPU, DSP, L3 interconnect, and AE subsystem. The sDMA operates with the L4_ABE interconnect through the L3 interconnect initiator port. The eDMA operates with the L4_ABE interconnect through the DSP initiator port.
- Target ports: AE subsystem, McBSP1/2/3, DMIC, McPDM, McASP, GPTIMER5/6/7/8, WDT3, and SLIMBUS1
- 8-, 16-, or 32-bit data, single access
- 4-bit x 32-bit initiator ports for each interconnect instance
- Auto clock-gating feature
- Little-endian transaction assumed for all packing/unpacking operations
- Nonblocking architecture with fair arbitration between threads
- Target interconnect interfaces support fully synchronous and divided synchronous accesses.

For more information, see [Chapter 14, Interconnect](#).

13.1.3 GP Timers

The ABE embeds four GP timers: GPTIMER5 through GPTIMER8. All GP timers have interrupts connected to the Cortex-A9 MPU, DSP, and AE subsystems.

GP timer controllers have the following functions:

- Interconnect slave interface (L4) supports:
 - 32-bit data bus width
 - 16-/32-bit access supported
 - 10-bit address bus width
 - Burst not supported
 - WNP (Write-Non-Posted) supported
- Interrupts generated on overflow, compare, and capture
- Free-running 32-bit upward counter
- Supported modes:
 - Compare and capture modes
 - Auto-reload mode
 - Start-stop mode
- Programmable divider clock source
- Dedicated input trigger for capture mode and dedicated OUT trigger/PWM signal
- On-the-fly read/write register
- Supports disconnect protocol

For more information, see [Section 23.2, General-Purpose Timers](#).

13.1.4 Watchdog Timer

The ABE embeds one watchdog timer, WDT3, that generates an interrupt condition to the Cortex-A9 MPU on overflow, which can be used by the application software through the PRCM module to indirectly trigger a global warm reset.

WDT3 main features are:

- Interconnect slave interface (L4) supports:
 - 32-bit data bus width

- 16- and 32-bit access supported
- 11-bit address bus width
- Burst not supported
- WNP supported
- Free-running 32-bit upward counter
- Programmable divider clock source
- Watchdog is reset on power up or after a warm reset and then starts counting.
- Reset or interrupt actions on a timer overflow condition and according to the watchdog timer source
- Support of disconnect protocol

For more information, see [Section 23.3](#), *Watchdog Timers*.

13.1.5 Digital Microphone Controller

The DMIC allows support of up to three digital stereo microphones that send it a pulse-density modulated stream of bits, transferred on one period or one half-period of the clock (over-sampling clock) provided to the DMIC. Each microphone is directly connected to the TX filter decimator to extract the audio samples with a maximum OF 96 db SNR with a frequency sampling set to 96 kHz.

The DMIC has the following features:

- Six external pin connections (three data lines and three clock lines)
- Delivers one common clock (on the three clock lines) for all digital microphones
- Supports idle request/acknowledge protocol
- Supports stereo and mono digital microphones (up to three)
- Rising or falling edge configuration for the clock signal sampling
- DMIC-clock-programmable
- Interconnect slave interface (internal interconnect) supports 32-bit data bus width.
- One DMA request capability on a programmable FIFO threshold
- One RX FIFO (16-bit x 24-bit word depth) per microphone
- Complies with PRCM interrupts to the Cortex-A9 MPU and DSP subsystems
- Interconnect sample format: 32 bits (only 24 are significant)
- Supports idle request/acknowledge PRCM protocol

For more information, see [Section 24.7](#), *DMIC*.

13.1.6 SLIMbus

There is one SLIMbus module instantiation inside the ABE, SLIMbus1. The SLIMbus controller provides a bidirectional, multidrop, multichannel 2-line serial interface between the ABE and up to seven off-chip components in a system such as an audio codec, a Bluetooth® module, or an FM radio receiver/transmitter. Because of its versatility, SLIMbus can accommodate a wide range of peripherals and clocked frame-oriented protocols (I2S, pulse code modulation [PCM], time division multiplexing [TDM]).

SLIMbus has the following features:

- Supports idle request/acknowledge PRCM protocol
- Complies with MIPI SLIMbus standard version 1.0
- Interconnect slave interface (L4) supports:
 - 32-bit data bus width
 - 8-, 16-, and 32-bit access supported
 - 11-bit address bus width
 - Burst not supported
 - WNP supported
- Support of seven SLIMbus devices:

- One manager
- One framer
- One interface
- Four generic
- Message protocol partially implemented in SLIMbus module hardware:
 - Information elements are not stored in the module.
 - Message interpretation is not processed in the module.
 - FIFO size: 32 bytes for TX, 32 bytes for RX
- Support for eight TX and eight RX independent ports (data channels):
 - Supported transport protocols: Isochronous, pulled, pushed, asynchronous
 - Programmable segment data length (sample size) from 8 to 32 bits (8, 12, 16, 20, 24, 28, 32), including DATA and AUX
 - Programmable FIFO sizes
 - Programmable port assignment to any of the four generic devices
 - One DMA request line per port
- Operating frequencies of 0 to 24.576 MHz
- Supports disconnect protocol

For more information, see [Section 24.9](#), *Serial Low-Power Inter-Chip Media Bus Controller*.

13.1.7 Multichannel Audio Serial Port

The multichannel audio serial port (McASP) is a GP audio serial port. It is useful for intercomponent (DIT) transmission. The McASP is intended to be flexible enough so that it may connect gluelessly to audio A/D, D/A, CODEC and SPDIF transmit physical layer components.

McASP has the following features:

- 2-interconnect slave interface supports:
 - One interconnect configuration slave interface
 - One interconnect DMA slave interface
 - 32-bit data bus width
 - 16- and 32-bit access
 - 10-bit address bus width
 - Burst not supported
 - WNP
- Supports idle request/acknowledge protocol
- Buffers for transmit/receive operations
- DMA requests (one per direction) link with the 32-bit register
- Up to four transmit channels
- Four serializers implemented
- Support of disconnect protocol

For more information, see [Section 24.8](#), *McASP*.

13.1.8 Multichannel Buffered Serial Port

There are three McBSP instantiations: McBSP1 through McBSP3. They provide a full-duplex direct serial interface between the ABE and external devices, such as other modems, BT chips, or codecs. Because of its versatility, a McBSP can accommodate a wide range of peripherals and clocked frame-oriented protocols (I2S, PCM, TDM).

List of recommended usage per McBSP:

- MCBSP1: BT voice/audio data
- MCBSP2: Digital baseband (DBB) voice data
- MCBSP3: MIDI FM data

The McBSP has the following features:

- Interconnect slave interface (internal interconnect) supports:
 - 32-bit data bus width
 - 8-, 16-, and 32-bit access
 - 10-bit address bus width
 - Burst not supported
 - WNP
- Buffers for transmit/receive operations: 128/128 32-bit words (McBSP1, 2, 3)
- Interrupts configurable in legacy mode (two requests) or PRCM-compliant (one request)
- DMA requests (one per direction) triggered with programmable FIFO thresholds
- Multidrop support
- Serial interface description
- Four-pin configuration (McBSP1, 2, 3)
- Full-duplex communication
- Multichannel selection modes
- Support to enable or block transfers in each channel
- Up to 128 channels for transmission and for reception
- Supported protocols
- Direct interface to industry-standard codecs, analog interface chips (AICs), and other serially connected A/D and D/A devices:
 - I2S-compliant devices
 - TDM bus devices
 - PCM devices
- A wide selection of data sizes: 8, 12, 16, 20, 24, and 32 bits
- Supports idle request/acknowledge protocol
- Clock generation support:
 - Independent clocking and framing for reception and for transmission up to 48 MHz
 - Support for external generation of clock signals and frame-synchronization (frame-sync) signals
 - A programmable sample rate generator for internal generation and control of clock signals and frame-sync signals
- Support of disconnect protocol

For a complete description, see [Section 24.5](#), *Multichannel Buffered Serial Port*.

13.1.9 Multichannel Pulse Density Modulation Module

The McPDM is a proprietary interface based on multichannel pulse density modulation. The module consists of five downlinks and three uplinks. Two other uplink channels are reserved for status communication.

The McPDM has the following features:

- Interconnect slave interface (L4_ABE internal interconnect) supports:
 - 32-bit data bus width
 - 10-bit address bus width
 - Burst not supported
 - WNP

- Full-duplex communication:
 - Five audio downstream channels
 - three audio upstream channels
- RX/TX FIFO operations: 32-bit words per channels
- Complies with PRCM interrupts:
 - One to the MPU subsystem
 - One to the DSP subsystem
- DMA requests (one per direction) triggered with programmable FIFO thresholds; depending on the FIFO implementation, one per channel or one per direction
- Decimation filter for embedded uplink paths (five paths if two status paths)
- Oversampling for embedded uplinks (five paths)
- Sigma delta for embedded downlinks (three paths)
- Deserializers for the two status upstream channels
- Support of disconnect protocol

For more information, see [Section 24.6](#), *Multichannel PDM Controller*.

Interconnect

This chapter describes the device interconnect.

NOTE: The L3 interconnect is instantiation of the NoC interconnect from Arteris, Inc. Arteris is a registered trademark of Arteris, Inc.

This document contains materials that are ©Arteris, Inc., and that constitute proprietary information of Arteris, Inc.

All materials and trademarks are used under license from Arteris, Inc. For additional information, see the Arteris Reference manuals, or contact Arteris, Inc.

NoC is an abbreviation for Network On Chip.

NOTE: The L4 interconnects are instantiations of the Sonics3220™ interconnect from Sonics, Inc.

This document contains materials that are ©2003-2010 Sonics, Inc., and that constitute proprietary information of Sonics, Inc.

SonicsMX and Sonics3220, are trademarks or registered trademarks of Sonics, Inc. All such materials and trademarks are used under license from Sonics, Inc. For additional information, see the SonicsMX or Sonics3220 Reference manuals, or contact Sonics, Inc.

SMX is an abbreviation for SonicsMX®.

| Topic | Page |
|---|-------------|
| 14.1 Interconnect Overview | 2750 |
| 14.2 L3 Interconnect | 2758 |
| 14.3 L4 Interconnects | 2902 |

14.1 Interconnect Overview

14.1.1 Terminology

The following terminology is critical to understanding the interconnect:

- **Initiator:** Module able to initiate read and write requests to the chip interconnect (typically: processors, direct memory access [DMA], etc.).
- **Target:** Unlike an initiator, a target module cannot generate read/write requests to the chip interconnect, but it can respond to these requests. However, it may generate interrupts or a DMA request to the system (typically: peripherals, memory controllers).

NOTE: A module can have several separate ports; therefore, a module can be an initiator and a target.

- **Agent:** Each connection of one module to one interconnect is done using an agent, which is an adaptation (sometimes configurable) between the module and the interconnect. A target module is connected by a target agent (TA), and an initiator module is connected by an initiator agent (IA).
- **Interconnect:** The decoding, routing, and arbitration logic that enables the connection between multiple initiator modules and multiple target modules connected on it.
- **Register target (RT):** Special TA used to access the interconnect internal configuration registers
- **Data-flow signal:** Any signal that is part of a clearly identified transfer or data flow (typically: command, address, byte enables, etc.). Signal behavior is defined by the protocol semantics.
- **Sideband signal:** Any signal whose behavior is not associated to a precise transaction or data flow.
- **Out-of-band error:** Any signal whose behavior is associated to a device error-reporting scheme, as opposed to in-band errors.

NOTE: Interrupt requests and DMA requests are not routed by the interconnect in the device.

- **Firewall:** A programmable feature integrated in a TA or level 4 (L4) interconnect to prevent unauthorized access to or from a module. A firewall can be configured using three criteria:
 - Initiator requesting access
 - Address space access
 - Type of access
- **ConnID:** Any transaction in the system interconnect is tagged by an in-band qualifier ConnID, which uniquely identifies the initiator at a given interconnect point. A ConnID is transmitted in band with the request and is used for firewall and error-logging mechanism.
- **Firewall comparison mechanism:** A comparison made in the firewall between access in-band qualifiers and access permissions that are programmed in the firewall configuration registers. If the comparison is successful, access is allowed; otherwise, access is denied.
- **MCcmd qualifier:** Command bus that indicates the type of transfer requested. [Table 14-1](#) lists the commands encoded. For information specific to level 3 (L3) interconnect error logging, see [Table 14-26](#).

Table 14-1. MCcmd Qualifier Description

| MCcmd[2:0] | Transaction Type |
|------------|------------------|
| 0 0 0 | Idle |
| 0 0 1 | Write |
| 0 1 0 | Read |
| 0 1 1 | ReadEx |
| 1 0 0 | Not used |
| 1 0 1 | Write nonposted |
| 1 1 0 | Not used |

Table 14-1. MCmd Qualifier Description (continued)

| MCmd[2:0] | Transaction Type |
|-----------|------------------|
| 1 1 1 | Not used |

- MReqInfo qualifier: Four MReqInfo qualifiers describe the access during the use of the firewall comparison mechanism, as described in [Table 14-2](#).

Table 14-2. MReqInfo Qualifier Description

| Qualifiers | Description |
|----------------|---|
| MReqType | 0: Data access 1: Opcode fetch |
| MReqSupervisor | 0: User mode 1: Supervisor mode |
| MReqDebug | 0: Functional access 1: Debug access |

- Register that configures the combination of the MReqInfo, allowing access permission to the TM based on the MReqInfo in-band qualifier values.
- SError: Target that indicates an error condition to the initiator.
- SResp qualifier: Response from the target to the initiator concerning the transaction, as described in [Table 14-3](#).

Table 14-3. SResp Qualifier Description

| SResp[1:0] | Description |
|------------|-------------------|
| 0 0 | No response |
| 0 1 | Data valid/accept |
| 1 0 | Not used |
| 1 1 | Error |

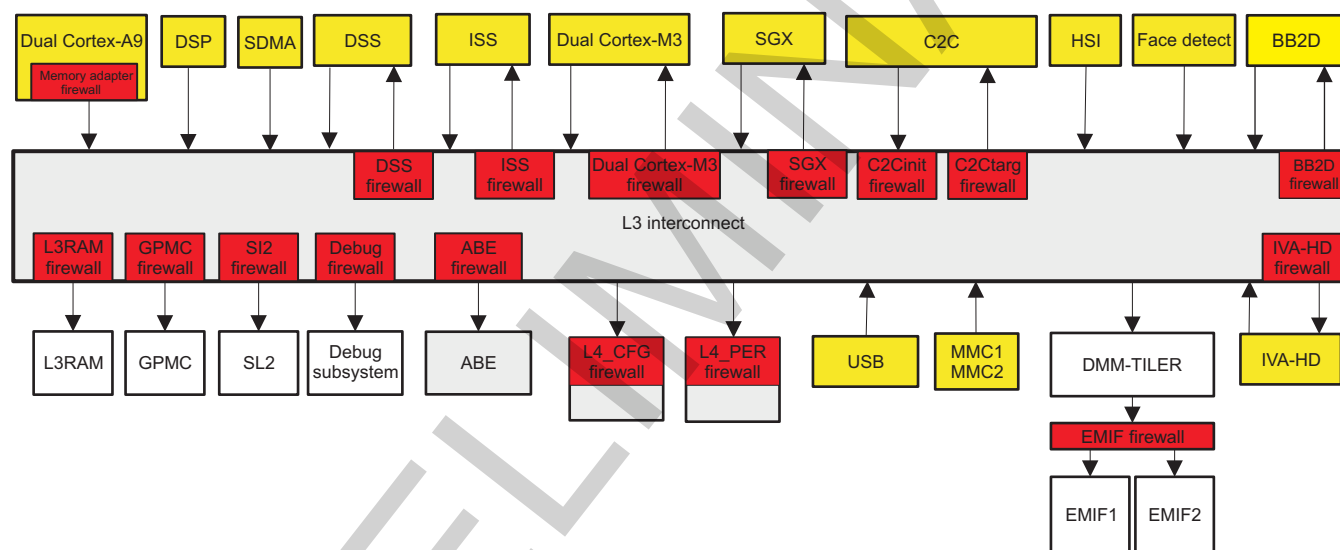
14.1.2 Architecture Overview

The device memory hierarchy includes four levels:

- Level 1 (L1) is internal to the central processing units (CPUs). It concerns data exchange with the internal L1 cache memory subsystem, and it is the closest memory to the microprocessor unit (MPU) core and the IVA-HD core.
- Level 2 (L2) is included in the IVA-HD subsystem and the MPU subsystem.
- The chip-level interconnect consists of one L3 interconnect and four L4 interconnects. It enables communication among the modules and subsystems in the device.

Figure 14-1 shows an overview of the L3 and L4 interconnect architecture.

Figure 14-1. Interconnect Overview



i3-012

- L3 handles many types of data transfers, especially exchanges with system-on-chip (SoC)/external memories. L3 transfers data with a maximum width of 128 bits from the initiator to the target. The L3 interconnect is a little-endian platform.
- The L4 is composed of the following:
 - L4_CFG: Includes the majority of the configuration interface for L3 system modules and peripheral interconnect; L4_PER: Includes the main peripherals that require system direct memory access (sDMA).
 - L4_WKUP: Includes peripherals attached to the WKUP power domain.

Modules are connected to the interconnect through an IA for the initiator module and a TA for target modules. Each module/subsystem connection is statically configured to tune the access, depending on the characteristics of the module.

To unauthorized a module or L4 interconnect access, some TAs include configurable firewalls (FWs). A firewall restricts or filters the accesses allowed to an initiator according to different access criteria. The firewalls can usually be configured by software.

The L3 and L4 interconnect default settings are fully functional; they enable all possible functional data paths and a minimal default protection setting. However, the interconnect parameters can be modified to fit user expectations.

14.1.3 Module Distribution

IAs and TAs provide the interface to connect the different modules and the interconnect.

Table 14-4 through Table 14-11 list the device modules, subsystems, and associated agents. The agents are listed for each interconnect domain:

- L3 initiator (master network interface units [NIUs] – MN) and target (slave NIUs – SN) agents
- L4_PER initiator and target agents
- L4_CFG initiator and target agents
- L4_WKUP initiator and target agents

14.1.3.1 L3 Interconnect Module Distribution

Table 14-4 and Table 14-5 list the IAs and TAs, respectively, of the L3 interconnect.

Table 14-4. Master NIUs

| Master NIU Name | Description |
|------------------|---|
| L3_MN_CORTEXA9 | Cortex-A9™ MPU subsystem |
| L3_MN_DSP | Digital signal processr (DSP) subsystem |
| L3_MN_DSS | Display subsystem |
| L3_MN_MMC1/2 | Multimedia controller |
| L3_MN_BB2D | 2D graphics accelerator |
| L3_MN_IVAHD | Video accelerator subsystem |
| L3_MN_SGX | Graphic accelerator |
| L3_MN_ISS | Imaging accelerator subsystem |
| L3_MN_CORTEXM3 | Cortex-M3™ MPU subsystem |
| L3_MN_FACEDETECT | Face detection module |
| L3_MN_SDMA_rd | sDMA |
| L3_MN_SDMA_wr | sDMA |
| L3_MN_HSI | HS synchronous serial interrupt controller (INTC) |
| L3_MN_HSUSBOTG | HS OTG USB controller |
| L3_MN_HSUSBHOST | Multiport USB host controller |
| L3_MN_C2C | C2C |
| L3_MN_DAP | JTAG®/emulation access to system resources |

Table 14-5. Slave NIUs

| Slave NIU Name | Description |
|----------------|--|
| L3_SN_OCM_RAM | On-chip memory controller |
| L3_SN_GPMC | General-purpose memory controller (GPMC) |
| L3_SN_C2C | Chip-to-chip |
| L3_SN_DMM1 | Dynamic memory management |

Table 14-5. Slave NIUs (continued)

| Slave NIU Name | Description |
|---------------------|---|
| L3_SN_DMM2 | Dynamic memory management |
| L3_SN_SGX | Graphic accelerator |
| L3_SN_BB2D | 2D graphics accelerator |
| L3_SN_ISS | Imaging accelerator subsystem |
| L3_SN_IVAHD_CFG | Video accelerator subsystem configuration |
| L3_SN_IVAHD_SL2 | Video accelerator subsystem shared memory |
| L3_SN_DSP | DSP subsystem |
| L3_SN_CORTEXM3 | Cortex-M3 MPU subsystem |
| L3_SN_DSS | Display subsystem |
| L3 interconnect | L3 internal registers |
| L3_SN_ABE | Audio back end |
| L3_SN_L4_CFG | L4 interconnect configuration |
| L3_SN_L4_PER0/1/2/3 | L4 interconnect peripherals |
| L3_SN_L3_INSTR | L3 instrumentation |

14.1.3.2 L4 Interconnect Module Distribution

IAs and TAs provide the interface to connect the different modules to their associated interconnect.

[Table 14-6](#) through [Table 14-11](#) list the device modules, subsystems, and their associated agents. The agents are listed for each L4 interconnect domain.

14.1.3.2.1 L4_PER Interconnect Agents

The L4_PER interconnect handles transfers only to peripherals in the PER power domain. [Table 14-6](#) lists the L4_PER TAs.

Table 14-6. L4_PER TAs

| Module Target Name | Description |
|--------------------|--|
| PER_TA_UART1 | Universal asynchronous receiver-transmitter (UART) port 1 module |
| PER_TA_UART2 | UART port 2 module |
| PER_TA_UART3 | UART port 3 module |
| PER_TA_UART4 | UART port 4 module |
| PER_TA_GPTIMER2 | General-purpose timer 2 (GPTIMER2) module |
| PER_TA_GPTIMER3 | GPTIMER3 module |
| PER_TA_GPTIMER4 | GPTIMER4 module |
| PER_TA_GPTIMER9 | GPTIMER9 module |
| PER_TA_GPTIMER10 | GPTIMER10 module |
| PER_TA_GPTIMER11 | GPTIMER11 module |
| PER_TA_DSS | Display subsystem configuration module |
| PER_TA_GPIO2 | General-purpose input/output 2 (GPIO2) module |
| PER_TA_GPIO3 | GPIO3 module |
| PER_TA_GPIO4 | GPIO4 module |
| PER_TA_GPIO5 | GPIO5 module |
| PER_TA_GPIO6 | GPIO6 module |
| PER_TA_I2C1 | Multimaster inter-integrated circuit 1 (I2C1) module |
| PER_TA_I2C2 | Multimaster I2C2 module |
| PER_TA_I2C3 | Multimaster I2C3 module |

Table 14-6. L4_PER TAs (continued)

| Module Target Name | Description |
|--------------------|--|
| PER_TA_I2C4 | Multimaster I2C4 module |
| PER_TA_SLIMBUS2 | SLIMBUS2 module |
| PER_TA_ELM | Error location module |
| PER_TA_MCBSP4 | Multichannel buffered serial port 4 (McBSP4) module |
| PER_TA_MCSPI1 | Multichannel serial peripheral interface 1 (McBSP1) module |
| PER_TA_MCSPI2 | McSPI2 module |
| PER_TA_MCSPI3 | McSPI3 module |
| PER_TA_MCSPI4 | McSPI4 module |
| PER_TA_HSMMC1 | Multimedia card (MMC) controller 1 module |
| PER_TA_HSMMC2 | MMC controller 2 module |
| PER_TA_HSMMC3 | MMC controller 3 module |
| PER_TA_HSMMC4 | MMC controller 4 module |
| PER_TA_HSMMC5 | MMC controller 5 module |
| PER_TA_HDQ1W | Single-wire serial link low-rate module |

Four ports communicate between the L3 interconnect and the L4_PER interconnect to allow the L3 initiators to access the L4_PER targets. [Table 14-7](#) lists the L4_PER initiator TAs.

For the list of initiators authorized to access the L4 peripheral peripherals, see [Section 14.2.3.2.2, Connectivity Matrix](#).

Table 14-7. L4_PER IAs

| Module Initiator Name | Description |
|-----------------------|------------------------------------|
| PER_IA_0 | L3 sDMA RD interconnect port |
| PER_IA_1 | L3 sDMA WR interconnect port |
| PER_IA_2 | L3 MPU subsystem interconnect port |
| PER_IA_3 | L3 others interconnect port |

14.1.3.2.2 L4_CFG Interconnect Agents

The L4_CFG interconnect handles transfers only to peripherals in the CORE power domain. [Table 14-8](#) lists the L4_CFG TAs.

Table 14-8. L4_CFG TAs

| Module Target Name | Description |
|-----------------------------|------------------------------------|
| CFG_TA_SYSCTRL_GENERAL_CORE | System control general core module |
| CFG_TA_SYSCTRL_PADCONF_CORE | System control padconf core module |
| CFG_TA_CM_CORE_AON | Clock manager 1 module |
| CFG_TA_CM_CORE | Clock manager 1 module core |
| CFG_TA_DMA_SYSTEM | sDMA module |
| CFG_TA_HSI | HS SSI module |
| CFG_TA_SAR_ROM | Save-and-restore (SAR) ROM |
| CFG_TA_HSUSBOTG | HS USB OTG module |
| CFG_TA_HSUSBHOST | HS USB host module |
| CFG_TA_HSUSBPHY | HS USB PHY module |
| CFG_TA_HSUSBTLL | USB TTL module |
| CFG_TA_DSP | DSP subsystem |

Table 14-8. L4_CFG TAs (continued)

| Module Target Name | Description |
|------------------------|-----------------------------------|
| CFG_TA_SR1 | SmartReflex1 module |
| CFG_TA_SR2 | SmartReflex2 module |
| CFG_TA_SR3 | SmartReflex3 module |
| CFG_TA_MAILBOX | Mailbox module |
| CFG_TA_SPINLOCK | Spinlock module |
| CFG_TA_FACEDETECT | Face detect module |
| CFG_TA_MAFW | Memory adapter firewall |
| CFG_TA_EMIFFW | EMIF firewall |
| CFG_TA_GPMCFW | GPMC firewall |
| CFG_TA_OCMCFW | OCMC_RAM firewall |
| CFG_TA_SGXFW | SGX firewall |
| CFG_TA_BB2DFW | BB2D firewall |
| CFG_TA_ISSFW | ISS firewall |
| CFG_TA_CORTEXM3FW | Cortex-M3 firewall |
| CFG_TA_DSSFW | Display subsystem (DSS) firewall |
| CFG_TA_SL2FW | SL2 firewall |
| CFG_TA_IVAHDFW | IVA-HD firewall |
| CFG_TA_L3_INSTR | EMU subsystem firewall |
| CFG_TA_ABEFW | ABE firewall |
| CFG_TA_L4_WKUP | L4_WKUP connection |
| CFG_TA_MODEM_ICR_PA/PB | Modem intercommunication register |

A unique port, CFG_IA_0, communicates between the L3 interconnect and the L4_CFG interconnect to allow the L3 initiators to access the L4_CFG targets (see [Table 14-9](#)).

For the list of initiators authorized to access the L4_CFG peripherals, see [Section 14.2.3.2.2, Connectivity Matrix](#).

Table 14-9. L4_CFG IAs

| Module Initiator Name | Description |
|-----------------------|----------------------|
| CFG_IA_0 | L3 interconnect port |

14.1.3.2.3 L4_WKUP Interconnect Agents

The L4_WKUP interconnect handles transfers only to peripherals in the WKUP power domain. [Table 14-10](#) lists the TAs. [Table 14-11](#) lists the L4_WKUP IAs.

Table 14-10. L4_WKUP TAs

| Module Target Name | Description |
|------------------------------|--|
| WKUP_TA_GPIO1 | GPIO1 module |
| WKUP_TA_32KTIMER | 32-kHz timer module |
| WKUP_TA_SAR_RAM | Save-and-restore RAM |
| WKUP_TA_KEYBOARD | Keyboard module |
| WKUP_TA_SYSCTRL_GENERAL_WKUP | System control general WKUP module |
| WKUP_TA_SYSCTRL_PADCONF_WKUP | System control padconf WKUP module |
| WKUP_TA_PRM | Power reset management module |
| WKUP_TA_SCRM | System clock and reset management module |
| WKUP_TA_WDTIMER2 | WDTIMER2 module |

Table 14-11. L4_WKUP IAs

| Module Initiator Name | Description |
|-----------------------|--------------------------|
| WKUP_IA_0 | L4_CFG interconnect port |

14.1.4 Connectivity Matrix

Figure 14-2 shows the functional paths between the L3 interconnect initiator modules and the L3 and L4 TAs. In the figure, functional paths are indicated by the following:

- A cell contains a + sign when a functional path exists.
- A cell is blank when a functional path does not exist.

Figure 14-2. L3 Connectivity Matrix

| | | Slave NIU (SN) | | | | | | | | | | | | | | | | |
|-----------------|------------------|----------------|--------------|-----------|------------|----------------|---------------|---------------|---------------|---------------|--------------|----------------|----------------|-----------|-----------|------------|-----------|-----------|
| | | L3_SN_DMM_P1 | L3_SN_DMM_P2 | L3_SN_C2C | L3_SN_GPMC | L3_SN_OCMC_RAM | L3_SN_L4_PER0 | L3_SN_L4_PER1 | L3_SN_L4_PER2 | L3_SN_L4_PER3 | L3_SN_L4_CFG | L3_SN_L3_INSTR | L3_SN_CORTEXM3 | L3_SN_ABE | L3_SN_SGX | L3_SN_BB2D | L3_SN_ISS | L3_SN_DSS |
| Master NIU (MN) | L3_MN_CORTEXA9 | + | | + | + | + | | + | | + | + | + | + | + | + | + | + | + |
| | L3_MN_CORTEXM3 | + | | + | + | + | | | | + | + | + | | + | + | + | | + |
| | L3_MN_DSP | + | | | + | | | | | + | + | + | | + | | | + | |
| | L3_MN_IVAHD | + | | | | | | | | | | | | | | | | |
| | L3_MN_SGX_P1 | + | | | | | | | | | | | | | | | | + |
| | L3_MN_SGX_P2 | | + | | | | | | | | | | | | | | | + |
| | L3_MN_BB2D_P1 | + | | | | | | | | | | | | | | | | + |
| | L3_MN_BB2D_P2 | | + | | | | | | | | | | | | | | | + |
| | L3_MN_ISS | | + | | | | | | | | | | | | | | | + |
| | L3_MN_DSS | | + | | | | | | | | | | | | | | | + |
| | L3_MN_SDMA_RD | + | | + | + | + | + | | | | + | + | + | + | | | + | + |
| | L3_MN_SDMA_WR | | + | + | + | + | + | | | | + | + | + | + | | | + | + |
| | L3_MN_HSUSBOTG | | + | | | + | | | | | | | | + | | | | |
| | L3_MN_DAP | | + | + | + | + | | | | + | + | + | + | + | + | + | + | + |
| | L3_MN_HSUSBHOST | | + | | | | | | | | | | | + | | | | |
| | L3_MN_HSI | | + | | | | | | | | | | | + | | | | |
| | L3_MN_MMC1 | + | | | | | | | | | | | | | | | | |
| | L3_MN_MMC2 | + | | | | | | | | | | | | | | | | |
| | L3_MN_C2C | | | | | | | | | + | + | | | + | | | | |
| | L3_MN_FACEDETECT | | + | | | | | | | | | | | | | | | + |

I3-001

14.2 L3 Interconnect

This section describes the L3 interconnect and its components. With the exception of register points, each component includes functions for the request and response networks.

14.2.1 L3 Interconnect Overview

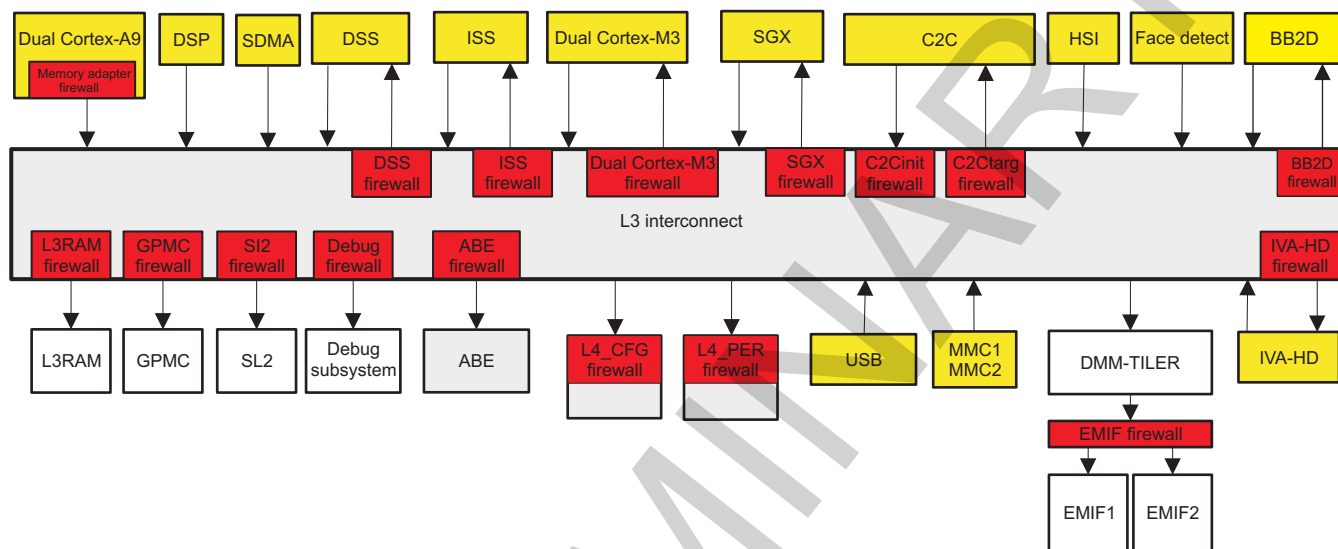
The L3 interconnect links cores in a flexible topology that couples low power with high performance. Innovative physical structures and advanced protocols ensure bandwidth and latency to individual IP cores, providing dedicated connections between IP cores and logical connections over a shared interconnect.

The main features of the L3 interconnects are:

- NIUs: Master NIUs for the IAs and slave NIUs for the TAs
- A partially depleted crossbar exchange network
- A special internal slave NIU for accessing L3 interconnect configuration registers
- True little-endian platform
- Transaction errors tracking and logging registers
- All signaling support for chip-level power-management infrastructure

[Figure 14-3](#) is an overview of the L3 interconnect and the peripherals attached to it.

Figure 14-3. L3 Interconnect Overview



i3-012

14.2.2 L3 Interconnect Integration

Table 14-12 through Table 14-14 summarize the integration of the module in the device.

Table 14-12. Integration Attributes

| Module Instance | Attributes |
|-----------------|--------------|
| | Power Domain |
| L3 | PD_CORE |

Table 14-13. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| L3 | L3_CLK2 | L3_ICLK2 | PRCM | Functional and interface clock |
| | L3_CLK1 | L3_ICLK1 | PRCM | Functional and interface clock |
| | L3_CLK3 | INSTR_L3_ICLK | PRCM | Functional and interface clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| L3 | L3_CORE_RET_RST | CORE_RET_RST | PRCM | Reset of L3_PER interconnect retention registers |
| | L3_CORE_RST | CORE_RST | PRCM | Reset of L3_PER interconnect |

Table 14-14. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|----------------|----------------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| L3 | L3_APP_IRQ | C2C_IRQ_18 | C2C INTC | Interrupt to the SSCM |
| | L3_DBG_IRQ | MA_IRQ_9 | Cortex-A9 INTC | Interrupt to the Cortex-A9 |
| | L3_APP_IRQ | D_IRQ_84 | DSP INTC | Interrupt to the DSP |
| | L3_APP_IRQ | MA_IRQ_10 | Cortex-A9 INTC | Interrupt to the Cortex-A9 |

14.2.3 L3 Interconnect Functional Description

14.2.3.1 Module Use in L3 Interconnect

The L3 interconnect network components have ConnID values for each master NIU or slave NIU. The ID uniquely identifies the master NIU or the slave NIU for an interconnect transfer. The interconnect uses ConnIDs for a number of purposes, including the following:

- Slave NIUs for error logging
- Power disconnect slave NIU for error logging
- FLAGMUX to mask interrupts: Three, one for each clock domain
- STATCOLL for configuring and monitoring: The STATCOLL components compute the traffic statistics within a user-defined window and periodically report to the user through the debug interface
- Bandwidth regulator for configuration: The bandwidth critical masters are IVA-HD, BB2D, and SGX
- Some rate adapters for configuration of throughput ratio

14.2.3.2 Module Distribution

Master NIUs and slave NIUs provide the interface to connect the different modules to their associated interconnect.

[Table 14-15](#) and [Table 14-16](#) list all the modules and subsystems with their associated agents. The agents are listed for each L3 interconnect domain.

14.2.3.2.1 L3 Interconnect Agents

Any initiator or target core is connected to the L3 interconnect through an NIU. NIUs act as entry points to the L3 interconnect, and also include various programming registers. [Table 14-15](#) lists the supported master NIU ports.

Table 14-15. Master NIUs

| Master NIU | Description |
|------------------|---|
| L3_MN_CORTEXA9 | Cortex-A9 MPU subsystem |
| L3_MN_DSP | DSP subsystem |
| L3_MN_DSS | Display subsystem |
| L3_MN_MMC1/2 | Multimedia controller |
| L3_MN_BB2D | 2D graphics accelerator |
| L3_MN_IVAHD | Video accelerator subsystem |
| L3_MN_SGX | Graphic accelerator |
| L3_MN_ISS | Imaging accelerator subsystem |
| L3_MN_CORTEXM3 | Cortex-M3 MPU subsystem |
| L3_MN_FACEDETECT | Face detection module |
| L3_MN_SDMA_rd | sDMA |
| L3_MN_SDMA_wr | sDMA |
| L3_MN_HSI | HS synchronous serial INTC |
| L3_MN_HSUSBOTG | HS OTG USB controller |
| L3_MN_HSUSBHOST | Multiport USB host controller |
| L3_MN_C2C | C2C |
| L3_MN_DAP | JTAG/emulation access to system resources |

[Table 14-16](#) lists the supported slave NIU ports.

Table 14-16. Slave NIUs

| Slave NIU | Description |
|---------------------|---|
| L3_SN_OCM_RAM | On-chip memory controller |
| L3_SN_GPMC | GPMC |
| L3_SN_C2C | C2C |
| L3_SN_DMM1 | Dynamic memory management |
| L3_SN_DMM2 | Dynamic memory management |
| L3_SN_SGX | Graphic accelerator |
| L3_SN_BB2D | 2D Graphics accelerator |
| L3_SN_ISS | Imaging accelerator subsystem |
| L3_SN_IVAHD_CFG | Video accelerator subsystem configuration |
| L3_SN_IVAHD_SL2 | Video accelerator subsystem shared memory |
| L3_SN_DSP | DSP subsystem |
| L3_SN_CORTEXM3 | Cortex-M3 MPU subsystem |
| L3_SN_DSS | Display subsystem |
| L3 interconnect | L3 internal registers |
| L3_SN_ABE | Audio back end |
| L3_SN_L4_CFG | L4 interconnect configuration |
| L3_SN_L4_PER0/1/2/3 | L4 interconnect peripherals |
| L3_SN_L3_INSTR | L3 instrumentation (debug) |

14.2.3.2.2 L3 Connectivity Matrix

The L3 interconnect is divided into three subclock domains:

- L3_CLK1: Low-power domain
- L3_CLK2: Peripherals and multimedia
- L3_CLK3: Instrumentation (debug)

Each subclock domain is implemented in a different clock domain.

14.2.3.2.2.1 Clock Domain Mapping of the L3 Interconnect Modules

Each clock domain (CLK1, CLK2, and CLK3) has its own host, flag mux, slave NIUs, and bandwidth regulators as listed in [Table 14-17](#).

Table 14-17. L3 Clock Domains and Elements

| L3 Clock Domain | Elements |
|-----------------|---|
| CLK1 | HOST_CLK1 DMM1/2 ABE L4_CFG FLAGMUX_CLK1 PWR_DISK_CLK2 RATE_ADAPT_ABE |
| CLK2 | HOST_CLK2 GPMC OCM_RAM DSS ISS CORTEX-M3 BB2D |

Table 14-17. L3 Clock Domains and Elements (continued)

| L3 Clock Domain | Elements |
|-----------------|--|
| | SGX IVAHD SL2 L4_PER0/1/2/3 FLAGMUX_CLK2 PWR_DISC_CLK1 RATE_ADAPT_GPMC IVAHD_BW BB2D_BW SGX_BW C2C |
| CLK3 | HOST_CLK3 L4_EMU FLAGMUX STATCOLL |

Figure 14-4 shows the functional paths between the L3 interconnect master NIUs and the L3 and L4 slave NIU agents. The functional paths in the figure are indicated by the following:

- A cell contains a plus sign when a functional path exists.
- A cell is blank when a functional path does not exist.

Figure 14-4. L3 Connectivity Matrix

| | | Slave NIU (SN) | | | | | | | | | | | | | | | | | | | |
|-----------------|------------------|----------------|--------------|-----------|------------|----------------|---------------|---------------|---------------|---------------|--------------|----------------|----------------|-----------|-----------|------------|-----------|-----------|-----------------|--------------------|--------------------|
| | | L3_SN_DMM_P1 | L3_SN_DMM_P2 | L3_SN_C2C | L3_SN_GPMC | L3_SN_OCMC_RAM | L3_SN_L4_PER0 | L3_SN_L4_PER1 | L3_SN_L4_PER2 | L3_SN_L4_PER3 | L3_SN_L4_CFG | L3_SN_L3_INSTR | L3_SN_CORTEXM3 | L3_SN_ABE | L3_SN_SGX | L3_SN_BB2D | L3_SN_ISS | L3_SN_DSS | L3_SN_IVAHD_SL2 | L3_SN_IVAHD_CONFIG | L3 SN L3 CONF REGS |
| Master NIU (MN) | L3_MN_CORTEXA9 | + | | + | + | + | | | + | | + | + | + | + | + | + | + | + | + | + | + |
| | L3_MN_CORTEXM3 | + | | + | + | + | | | | + | + | + | | + | + | + | | + | + | + | + |
| | L3_MN_DSP | + | | | + | | | | | + | + | + | | + | | | + | | | | |
| | L3_MN_IVAHD | + | | | | | | | | | | | | | | | | | | | |
| | L3_MN_SGX_P1 | + | | | | | | | | | | | | | | | | | + | | |
| | L3_MN_SGX_P2 | | + | | | | | | | | | | | | | | | | + | | |
| | L3_MN_BB2D_P1 | + | | | | | | | | | | | | | | | | | + | | |
| | L3_MN_BB2D_P2 | | + | | | | | | | | | | | | | | | | + | | |
| | L3_MN_ISS | | + | | | | | | | | | | | | | | | | + | | |
| | L3_MN_DSS | | + | | | | | | | | | | | | | | | | + | | |
| | L3_MN_SDMA_RD | + | | + | + | + | + | | | | + | + | + | + | | | + | + | + | + | + |
| | L3_MN_SDMA_WR | | + | + | + | + | + | | | | + | + | + | + | | | + | + | + | + | + |
| | L3_MN_HSUSBOTG | | + | | | + | | | | | | | | + | | | | | | | |
| | L3_MN_DAP | | + | + | + | + | | | | + | + | + | + | + | + | + | + | + | + | + | + |
| | L3_MN_HSUSBHOST | | + | | | | | | | | | | | + | | | | | | | |
| | L3_MN_HSI | | + | | | | | | | | | | | + | | | | | | | |
| | L3_MN_MMC1 | + | | | | | | | | | | | | | | | | | | | |
| | L3_MN_MMC2 | + | | | | | | | | | | | | | | | | | | | |
| | L3_MN_C2C | | | | | | | | | + | + | | | + | | | | | | | |
| | L3 MN FACEDETECT | | + | | | | | | | | | | | | | | | | + | | |

I3-001

14.2.3.2.3 Master NIU Identification

An master NIU ID (ConnID) is assigned to every module in the device. The ID uniquely identifies the master NIU for an interconnect transfer (see [Table 14-18](#)). The interconnect uses ConnID values for a number of purposes, including:

- Master source identification for the protection mechanism
- Response route generation
- Firewall error logging
- L3 interconnect error logging

Table 14-18. ConnID Values

| ConnID | Master NIU |
|--------|------------|
| 0x0 | Cortex-A9 |
| 0x4 | DAP |
| 0x8 | DSP |
| 0xC | IVAHD |

Table 14-18. ConnID Values (continued)

| ConnID | Master NIU |
|--------|------------|
| 0x10 | ISS |
| 0x11 | Cortex-M3 |
| 0x12 | FaceDetect |
| 0x14 | sDMA_rd |
| 0x15 | sDMA_wr |
| 0x18 | SGX_P1 |
| 0x19 | SGX_P2 |
| 0x1A | BB2D_P1 |
| 0x1B | BB2D_P2 |
| 0x1C | DSS |
| 0x20 | C2C |
| 0x22 | Reserved |
| 0x23 | Reserved |
| 0x24 | HSI |
| 0x28 | MMC1 |
| 0x29 | MMC2 |
| 0x2C | Reserved |
| 0x30 | HSUSBHOST |
| 0x31 | HSUSBOTG |
| 0x32 | FSUSB |
| 0x34 | Reserved |
| 0x38 | PERF_PROBE |

14.2.3.3 Bandwidth Regulators

The bandwidth regulators prevent master NIUs from consuming too much bandwidth of a link, or a slave NIU that is shared between several data flows: packets are then transported at a slower rate. The value of a bandwidth can be programmed in the bandwidth regulator. When the bandwidth is below the programmed value, the pressure bit is set to 1, thus giving priority to this master. When the bandwidth is above the programmed value, the pressure bit is set to 0 and the concerned master has the same weight as others.

The bandwidth registers regulate the packet flow by applying flow control on the RX port, thus ensuring that the traffic does not exceed the allocated bandwidth. The next packet is sent only when an internal timer expires. The registers in this group are:

- [L3_BW_R_WATERMARK](#): Gives the amount of data allowed to exceed the average bandwidth during a short time period
- [L3_BW_R_PRESS](#): Describes the pressure applied to outgoing packets
- [L3_BW_R_CLEARHISTORY](#): Resets the traffic counter when set to 1. It is used after an update in the [L3_BW_R_BANDWIDTH](#) and [L3_BW_R_WATERMARK](#) registers (see [Section 14.2.5.1.6, L3 BW Regulator Register Summary and Description](#)).

14.2.3.4 Bandwidth Limiter

The bandwidth limiter is added to control the bandwidth of the BB2D module. It is used to insert idle cycles between read requests. This prevents a large number of RD requests from getting processed together, thus avoiding a large number of RD responses; numerous RD responses could overflow the 128-to-64 bit width converter on the response path and block back to the DMM port.

The bandwidth limiter regulates the packet flow in the L3 interconnect by applying flow control when a user-defined bandwidth limit is reached. The next packet is served only after an internal timer expires, thus ensuring that traffic does not exceed the allocated bandwidth.

The registers in this group are:

- **WATERMARK:** Gives the amount of data allowed to exceed the average bandwidth during a short time period. To set the actual watermark to n bytes, the register must be set to $n + 1$
- **CLEARHISTORY:** Resets the traffic counter when set to 1
- **BANDWIDTH_FRACTIONAL** and **BANDWIDTH_INTEGER:** These two registers set the average payload bandwidth

NOTE: The bandwidth limiter is configured to be transparent at reset.

14.2.3.5 Flag Mux Generators

The flag mux generator collects information such as errors and interrupts from slave NIUs and the interconnect firewall. The result signals are then sent to the MPU INTC without interfering with the interconnect traffic. The L3_FLAGMUX_MASK registers can be used to prevent the flag mux from seeing certain events.

The unit has a standard COREREG register for identification of the attached core type. The [L3_FLAGMUX_STDHOSTHDR_VERSIONREG](#) register identifies the characteristics of the attached core. The unit-specific registers (MASK bit 0 or bit 1 of the flag inputs, and L3_FLAGMUX_REGERR bit 0 or bit 1) are used to read the input errors. Each register is dedicated to reporting the bit corresponding to the register number; for example, [L3_FLAGMUX_REGERR0](#) reports on bit 0, and [L3_FLAGMUX_REGERR1](#) reports on bit 1. Any given L3_FLAGMUX_REGERR register reports the same bit for all flag source inputs (see [Table 14-163](#)).

14.2.3.6 Rate Adapter Generators

The rate adapter generators give the option to configure the L3 interconnect to work in auto-adaptive mode or pipeline mode for sending the packets by using the CNF register. The rate adapter can be configured in store-and-forward mode when the throughput ratio is not well defined, or in auto-adaptive mode when the throughput ratio is predictable. Because the ratios are predictable in the L3 interconnect, the rate adapters are always used in auto-adaptive mode, except for the rate adapter on the L4_CFG and L4_ABE responses path. L4_CFG and L4_ABE are configured in store-and-forward mode. The main rate adapt registers are:

- **CLK1_RATE_ADAPT_RESP_32TO128_CLK1:** Removes WAIT cycles on responses coming from ABE, L4CFG, and power disconnect to host
- **CLK2_RATE_ADAPT_RESP_32TO128_CLK2:** Removes WAIT cycles on responses coming from CLK2 32-bit slaves (see [Table 14-207](#))

14.2.3.7 Statistic Collectors Group

Statistic collectors are internal masters that share the same master address as the master NIUs. These components compute the traffic statistics within a defined window and periodically report through the DEBUG interface. The key features of the statistic collector are:

- Nonintrusive monitoring
- Programmable filters and counters
- Results collected at a programmable time interval

Event detectors are programmed through the [L3_STCOL_REQEVT](#) and [L3_STCOL_RSPEVT](#) configuration registers for request and response ports, respectively. The following events can be identified:

- Word transfer
- WAIT cycles
- Flow control
- Payload transfers
- Latency measurements

Performance monitoring is enabled through the [L3_STCOL_EN](#) register. The [L3_STCOL_SOFTEN](#) register enables software to monitor the performance. Event muxes are programmed through the [L3_STCOL_EVTMUX_SELO](#) configuration register, which determines which port will be monitored by a filter configured by the filter registers (see [Table 14-216](#)).

Filters are programmed through the configuration register, along with additional selection criteria programmed through the mask/match registers (see [Table 14-216](#)). A filter can be configured to accept or reject:

- Read operations
- Write operations
- Errors
- Addresses

Filter operations are programmed through the [L3_STCOL_OP](#) registers (see [Table 14-216](#)).

14.2.3.8 L3 Protection and Firewalls

Device protection relies on L3 firewalls and their configuration.

14.2.3.8.1 L3 Firewall Reset

The values of L3 firewall registers on reset are tied in hardware or exported from the control module registers.

Values exported from the control module are intended to give defined rights to the firewalls at reset and thus ensure the content after going out of reset. Because the control module consists of retention flip-flops (RFFs), which immunize it against register content loss during retention power state, the registers of the control module storing the exported values are not subject to a soft reset.

The L3 firewall registers are also retention-capable and are immune against content loss during CORE RETENTION power state. The control module registers are reset only by a cold reset, whereas the L3 firewall registers are reset by clearing the [REGUPDATE_CONTROL\[1\] FW_LOAD_REQ](#) bit. When the [REGUPDATE_CONTROL\[1\] FW_LOAD_REQ](#) bit comes back automatically to 1, the exported values are loaded.

CAUTION

Before reprogramming the firewall registers and/or before using the [FW_LOAD_REQ](#) mechanism, the request must be asserted by configuring the [REGUPDATE_CONTROL\[0\] BUSY_REQ](#) bit.

To load the exported values at run time:

1. Set the [REGUPDATE_CONTROL\[0\] BUSY_REQ](#) bit to 0x1 to ensure that no transaction can reach the slave NIU (suspend).
2. Clear the [REGUPDATE_CONTROL\[1\] FW_LOAD_REQ](#) bit by setting it to 0x1.
3. Wait until hardware resets the [REGUPDATE_CONTROL\[1\] FW_LOAD_REQ](#) bit to 0x1.
4. Set the [REGUPDATE_CONTROL\[0\] BUSY_REQ](#) bit to 0x0 to allow transactions to reach the slave NIU (resume).

To reprogram the firewall registers at run time:

1. Set the [REGUPDATE_CONTROL\[0\] BUSY_REQ](#) bit to 0x1 to ensure that no transaction can reach the slave NIU (suspend).
2. Upload the new values to all firewall registers.
3. Set the [REGUPDATE_CONTROL\[0\] BUSY_REQ](#) bit to 0x0 to allow transactions to reach the slave NIU (resume).

NOTE: Hardware reset values can be modified by exported values from the control module at reset.

14.2.3.8.1.1 L3 Firewall – Exported Reset Values

Table 14-19 and Table 14-20 list the exported reset values and mapping, respectively.

Table 14-19. L3 Firewall Exported Reset Values

| MRM_PERMISSION_REGION_LOW_j [15:12] | MRM_PERMISSION_REGION_LOW_j [11:0] |
|--|---------------------------------------|
| 0x0 | 0xFFF |
| 0xF | 0xFFF |
| 0x0 | 0x038 |
| 0x2 | 0x038 |

Table 14-20. L3 Firewall Exported Values Mapping

| CONTROL_CORE_L3_HW_FW_EXPORTED_VALUES_CONF Bits | Slave NIU Firewall |
|---|----------------------------------|
| [0] and [16] | GPMC |
| [1] and [17] | C2CINIT |
| [2] and [18] | C2CTARG |
| [3] and [19] | L3 RAM |
| [4] and [20] | DSS |
| [5] and [21] | ISS and dual Cortex-M3 subsystem |
| [6] and [22] | SGX |
| [7] and [23] | SL2 |
| [8] and [24] | IVA-HD |
| [10] and [26] | BB2D |
| [11] and [27] | EMIF |
| [12] and [28] | DEBUG |
| [13] and [29] | L4 AUDIO |

For more information, see [Chapter 19, Control Module](#).

14.2.3.8.2 Power Management

As part of the system-wide power-management scheme, the L3 interconnect goes into IDLE state after receiving a request from the power, reset, and clock management (PRCM) module after all commands are serviced. This function is handled by hardware.

To reduce power consumption, the L3 interconnect automatically performs internal clock autogating. This is managed by hardware; no software configurations or settings are required.

Retention is performed on all software-accessible registers:

- Statistic collectors
- Internal rate adapters
- Bandwidth regulators
- TAs
- Firewalls

This process prevents reconfiguration after a clock domain switches off.

14.2.3.8.3 L3 Firewall Functionality

The access to the slave NIUs is granted only to master NIUs according to in-band attributes sent in each transaction crossing the L3 interconnect, such as:

- MCMD: Specifies the type of access (read or write) required by the master NIU
- ConnID: Used to determine the permission of the master NIU
- MReqInfo: Transaction attribute adding information about the access type

Table 14-21 lists the MReqInfo values.

Table 14-21. MReqInfo Values

| Qualifier | Access Definition | Access Description |
|----------------|---------------------------|--|
| MReqType | 0: Data 1: Opcode | Indicates whether the request is for instruction fetch or data access |
| MReqDebug | 0: Functional 1: Debug | When set, indicates that the request has been issued by a master NIU in DEBUG state |
| MReqSupervisor | 0: User 1: Privilege | When set, indicates that the request is qualified with the supervisor attribute. It can be provided by a processor running in supervisor mode or by a module that inherited this attribute from the processor (DMA channel with a supervisor attribute). |

The firewall comparison mechanism enables access to a protected slave NIU only when a correct combination of three MReqInfo in-band parameters is transmitted.

MReqInfo is a combination of a fixed 3-bit pattern that corresponds to a combination of the parameters MReqDebug, MReqType, and MReqSupervisor. See Table 14-22.

Table 14-22. L3 ReqInfo Mapping

| ReqInfo Name | | MReqDebug | MReqType | MReqSupervisor |
|--------------|---------------------|-----------|----------|----------------|
| Master NIUs | L3_MN_CORTEXA9 | x | x | x |
| | L3_MN_CORTEXM3 | x | x | x |
| | L3_MN_DSP | x | x | |
| | L3_MN_IVAHD | | | |
| | L3_MN_SGX_P1/P2 | | | |
| | L3_MN_BB2D_P1/P2 | | | |
| | L3_MN_DSS | | | |
| | L3_MN_ISS | | | |
| | L3_MN_C2C | x | x | x |
| | L3_MN_DAP | x | | x |
| | L3_MN_SDMA_RD | | x | x |
| | L3_MN_SDMA_WR | | x | x |
| | L3_MN_HSUSBOTG | | | |
| | L3_MN_HSUSBHOST | | | |
| | L3_MN_HSI | | | x |
| | L3_MN_FACEDETECT | | | |
| | L3_MN_MMC1/2 | | | |
| Slave NIUs | L3_SN_DMM1 | x | x | x |
| | L3_SN_DMM2 | x | x | x |
| | L3_SN_GPMC | | | |
| | L3_SN_OCM_RAM | | | |
| | L3_SN_L4_PER0/1/2/3 | x | | x |
| | L3_SN_L4_CFG | x | | x |
| | L3_SN_ABE | x | | |
| | L3_SN_CORTEXM3 | | | |

Table 14-22. L3 ReqInfo Mapping (continued)

| ReqInfo Name | MReqDebug | MReqType | MReqSupervisor |
|--------------|-----------|----------|----------------|
| L3_SN_SGX | | | |
| L3_SN_DAP | x | | |
| L3_SN_ISS | | | |
| L3_SN_DSS | | | x |
| L3_SN_IVAHD | x | | |
| L3_SN_SL2 | | | |
| L3_SN_C2C | x | x | x |

14.2.3.8.3.1 Protection Regions

Each slave NIU address space is subdivided into protection regions (maximum of 10). The regions are configurable with a size of 4-KB granularity. The firewalls can also be multiport while using the description of the same regions for dual access memories or to support interleaving mechanisms on several memories.

[Table 14-23](#) lists the number of protected regions and ports for each slave NIU.

Table 14-23. Slave NIU Firewall and Region Configuration

| Slave NIU | Firewall | Number of Regions | Number of Ports |
|--------------------------|----------------|-------------------|-----------------|
| L3 OCMC_RAM | L3 OCMC_RAM | 10 | 1 |
| GPMC | GPMC | 8 | 1 |
| SL2 | SL2 | 1 | 1 |
| SGX | SGX | 1 | 1 |
| C2C | C2CTARG | 1 | 1 |
| L3 interconnect | C2CINIT | 4 | 2 |
| ISS | ISS | 1 | 1 |
| Dual Cortex-M3 subsystem | Dual Cortex-M3 | 1 | 1 |
| DSS | DSS | 1 | 1 |
| IVA-HD | IVA-HD | 1 | 1 |
| BB2D | BB2D | 1 | 1 |
| ABE | ABE | 1 | 1 |
| EMIF | EMIF | 8 | 3 |

Two types of regions are distinguished in a slave NIU firewall:

- Default region: Available in all slave NIUs. It covers the entire slave NIU address range and must be reset or overlaid by other firewall configured regions, because it always has the lowest priority.
- Normal region: The number of normal regions varies in a slave NIU; they have identical capabilities (see [Table 14-23](#)).

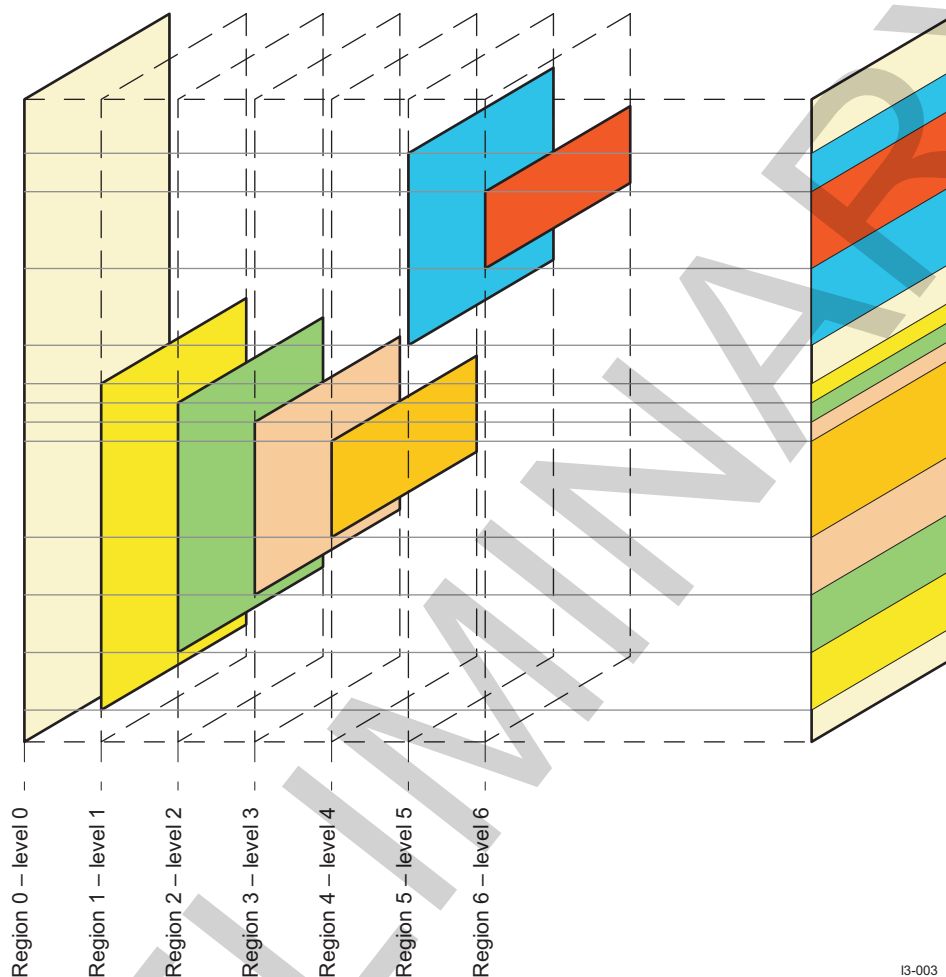
Each region has the following characteristics:

- Start address: Physical slave NIU start address
- End address: Physical slave NIU end address
- Specific access rights (see [Section 14.2.3.8.3.3, Protection Mechanism per Region Examples](#))
- Priority level from 0 (lowest) to 10 (highest)

Depending on its priority level, a region can override the settings of another region; the access rights of the region with the highest priority apply. All regions have a fixed (not configurable) priority level that corresponds to their number: Region 1 has priority level 1, region 2 has priority level 2, and so on.

Figure 14-5 shows the priority level with associated regions. This priority level scheme allows multiplying the flexibility and capability of the firewall. Figure 14-5 shows a 7-region firewall setting that creates 13 regions (twice the number of regions created than originally available).

Figure 14-5. L3 Interconnect Region Overlay and Priority Level Overview



13-003

The address range covered by the regions is defined in the [START_REGION_i](#) and [END_REGION_i](#) registers. The boundary checks are done on a minimum size of 4-KB pages; thus, bits [11:0] of those 32-bit registers are not checked.

The address space size of the slave NIUs (bits [31:12]) depends on the size of the slave NIU to protect; that is, if a memory is only 48KB, then the size is defined through bits [16:12] of the slave NIU start/end address registers of the firewall region ([START_REGION_i\[16:12\]](#) and [END_REGION_i\[16:12\]](#)).

On multiport firewalls (EMIF), the checking of each REGION {0, n} can be activated on one or several ports at the same time. However, if interleaving is not desired on some parts of the protected memory space, it is possible to apply or not apply region checking on selected ports using the region enable/disable on port instance capability of the [END_REGION_i](#) register.

Most slave NIUs support only one input port (port 0) except:

- The EMIF module protected by the EMIF firewall has three ports:
 - Port 0 for Cortex-A9 accesses
 - Port 1 for the first L3 interconnect accesses
 - Port 2 for the second L3 interconnect accesses

A region can be applied or not to each port independently. To enable and disable the regions:

- For port 0: Set/clear the [END_REGION_i\[0\]](#) REGION_ENABLE_PORT0 bit (for all L3 firewalls).

- For port 1: Set/clear the [END_REGION_i\[1\]](#) REGION_ENABLE_PORT1 bit (only for EMIF firewalls).
- For port 2: Set/clear the [END_REGION_i\[2\]](#) REGION_ENABLE_PORT2 bit (only for EMIF firewalls).

14.2.3.8.3.2 L3 Firewall Registers Overview

[Table 14-24](#) and [Table 14-25](#) list the L3 firewall permission-setting registers.

Table 14-24. L3 Firewall Read/Write Permission-Setting Register

| Register Name | Bits | Field Name | Description (See Table 14-18 .) | Field Modifiability |
|--|------|------------|---|---------------------|
| MRM_PERMISSION_REGION_HIGH_j | 31 | RESERVED | Reserved | – |
| | 30 | RESERVED | Reserved | – |
| | 29 | RESERVED | Reserved | – |
| | 28 | RESERVED | Reserved | – |
| | 27 | RESERVED | Reserved | – |
| | 26 | RESERVED | Reserved | – |
| | 25 | W12 | ConnID = 12 write permission | RW |
| | 24 | R12 | ConnID = 12 read permission | RW |
| | 23 | RESERVED | Reserved | – |
| | 22 | RESERVED | Reserved | – |
| | 21 | W10 | ConnID = 10 write permission | RW |
| | 20 | R10 | ConnID = 10 read permission | RW |
| | 19 | W9 | ConnID = 9 write permission | RW |
| | 18 | R9 | ConnID = 9 read permission | RW |
| | 17 | W8 | ConnID = 8 write permission | RW |
| | 16 | R8 | ConnID = 8 read permission | RW |
| | 15 | W7 | ConnID = 7 write permission | RW |
| | 14 | R7 | ConnID = 7 read permission | RW |
| | 13 | W6 | ConnID = 6 write permission | RW |
| | 12 | R6 | ConnID = 6 read permission | RW |
| | 11 | W5 | ConnID = 5 write permission | RW |
| | 10 | R5 | ConnID = 5 read permission | RW |
| | 9 | W4 | ConnID = 4 write permission | RW |
| | 8 | R4 | ConnID = 4 read permission | RW |
| | 7 | W3 | ConnID = 3 write permission | RW |
| | 6 | R3 | ConnID = 3 read permission | RW |
| | 5 | W2 | ConnID = 2 write permission | RW |
| | 4 | R2 | ConnID = 2 read permission | RW |
| | 3 | W1 | ConnID = 1 write permission | RW |
| | 2 | R1 | ConnID = 1 read permission | RW |
| | 1 | W0 | ConnID = 0 write permission | RW |
| | 0 | R0 | ConnID = 0 read permission | RW |

Table 14-25. L3 Firewall Permission-Setting Register

| Register name | Type of Permission | Bits | Field Name | Description | Field Modifiability |
|---|--------------------|-------|---------------|-------------------------|---------------------|
| MRM_PERMISSION_REGION_LOW_j | DEBUG | 15 | PUB_PRV_DEBUG | Privilege debug allowed | RW |
| | | 14 | PUB_USR_DEBUG | User debug allowed | RW |
| | | 13:12 | RESERVED | Reserved | RW |
| | | 11 | PUB_PRV_READ | Privilege read allowed | RW |
| | | 10 | PUB_PRV_WRITE | Privilege write allowed | RW |

Table 14-25. L3 Firewall Permission-Setting Register (continued)

| Register name | Type of Permission | Bits | Field Name | Description | Field Modifiability |
|---------------|--------------------|------|---------------|---------------------------|---------------------|
| | Access | 9 | PUB_PRV_EXE | Privilege exe allowed | RW |
| | | 8 | PUB_USR_READ | User read access allowed | RW |
| | | 7 | PUB_USR_WRITE | User write access allowed | RW |
| | | 6 | PUB_USR_EXE | User exe access allowed | RW |

14.2.3.8.3.3 Protection Mechanism per Region Examples

The access permission of each region is configurable and defined through the [MRM_PERMISSION_REGION_HIGH_j](#) and [MRM_PERMISSION_REGION_LOW_j](#) registers (see [Section 14.2.3.8.3.2, L3 Firewall Registers Overview](#)).

Master NIU permissions:

1. To give read access to the master NIU with ConnID = n, set the [MRM_PERMISSION_REGION_HIGH_j\[n × 2\] Rn](#) bit.
2. To give write access to the master NIU with ConnID = n, set the [MRM_PERMISSION_REGION_HIGH_j\[n × 2 + 1\] Wn](#) bit.

Debug permissions:

1. To give privilege debug access, set the [MRM_PERMISSION_REGION_LOW_j\[15\] PUB_PRV_DEBUG](#) bit.
2. To give user debug access, set the [MRM_PERMISSION_REGION_LOW_j\[14\] PUB_USR_DEBUG](#) bit.

User, read/write/executable permissions:

1. To give privilege write access, set the [MRM_PERMISSION_REGION_LOW_j\[11\] PUB_PRV_WRITE](#) bit.
2. To give privilege read access, set the [MRM_PERMISSION_REGION_LOW_j\[10\] PUB_PRV_READ](#) bit.
3. To give privilege exe access, set the [MRM_PERMISSION_REGION_LOW_j\[9\] PUB_PRV_EXE](#) bit.
4. To give user write access, set the [MRM_PERMISSION_REGION_LOW_j\[8\] PUB_USR_WRITE](#) bit.
5. To give user read access, set the [MRM_PERMISSION_REGION_LOW_j\[7\] PUB_USR_READ](#) bit.
6. To give user exe access, set the [MRM_PERMISSION_REGION_LOW_j\[6\] PUB_USR_EXE](#) bit.

Example: To provide debug write privilege access to the master NIU ConnID = 7, the following bits must be set:

- [MRM_PERMISSION_REGION_HIGH_j\[15\] W7](#)
- [MRM_PERMISSION_REGION_LOW_j\[15\] PUB_PRV_DEBUG](#)

14.2.3.8.3.4 L3 Firewall Error Logging

If a protection violation error is detected, the following signals are generated:

- An in-band error is generated to the master NIU of the access.
- An interrupt is generated to the Cortex-A9 and DSP INTCs.

The L3 interconnect does not differentiate errors generated by firewalls from all other supported types of errors.

An in-band error is generated by modules each time an access is not allowed. When an in-band error is sent back into the transaction it is seen as an external prefetch or data abort by the initiator, depending on whether the transaction was an instruction fetch or a data access.

Information about in-band errors is logged into two registers:

- **ERROR_LOG_k**: Logs the information about the start/end address of the hit region and the qualifiers of the transaction
- **LOGICAL_ADDR_ERRLOG_k[31:12]**: Logs the address of the failed access

NOTE: When a multiport firewall is implemented, these registers are duplicated for each port.

Table 14-26 lists the L3 firewall error-logging registers.

Table 14-26. L3 Firewall Error-Logging Registers

| Register Name | Register Field Name | Field Modifiability | Parameter Comments |
|--------------------|----------------------------|---------------------|---|
| ERROR_LOG_k | RESERVED[31:24] | Read only | Reads return 0s. |
| | BLK_BURST_VIOLATION[23] | Read/write | Read 0x1: 2D burst not allowed or exceeds allowed size. Write to clear the ERROR_LOG_k and LOGICAL_ADDR_ERRLOG_k registers. |
| | RESERVED[22] | Read only | Reads return 0s. |
| | REGION_START_ERRLOG[21:17] | Read/write | Read: Wrong access hit this region number. Write to clear the ERROR_LOG_k and LOGICAL_ADDR_ERRLOG_k registers. |
| | REGION_END_ERRLOG[16:12] | Read/write | Read: Wrong access hit this region number. Write to clear the ERROR_LOG_k and LOGICAL_ADDR_ERRLOG_k registers. |
| | REQINFO_ERRLOG[11:0] | Read/write | Mapping of the error according to the reqinfo vector: [11:8] ConnID [3:0] [7] MCMD [0] [3] MReqDebug [1] MReqSupervisor [0] MReqType |

L3 firewall errors can be cleared by writing to the **ERROR_LOG_k** register in the firewall that recorded the error. Clearing the **ERROR_LOG_k** register deasserts the corresponding error if it exists.

The L3 firewall register **ERROR_LOG_k** must be cleared before clearing the **CONTROL_CORE_SEC_ERR_STATUS_FUNC** and **CONTROL_CORE_SEC_ERR_STATUS_DEBUG** registers in the control module.

When a protection violation occurs, an interrupt is sent to the MPU and IVA-HD INTC (if enabled). An in-band error is sent back, and an error is logged in the **CONTROL_SEC_ERR_STATUS_FUNC** and **CONTROL_SEC_ERR_STATUS_DEBUG** registers, depending on the functional mode:

- In application mode:
 - **CONTROL_SEC_ERR_STATUS_FUNC[01]** - L3 RAM protection violation
 - **CONTROL_SEC_ERR_STATUS_FUNC[02]** - GPMC protection violation
 - **CONTROL_SEC_ERR_STATUS_FUNC[03]** - EMIF protection violation
 - **CONTROL_SEC_ERR_STATUS_FUNC[04]** - IVA-HD protection violation

- CONTROL_SEC_ERR_STATUS_FUNC[05] - Cortex-M3 protection violation
- CONTROL_SEC_ERR_STATUS_FUNC[06] - SL2 protection violation
- CONTROL_SEC_ERR_STATUS_FUNC[09] - BB2D protection violation
- CONTROL_SEC_ERR_STATUS_FUNC[12] - C2C slave NIU protection violation
- CONTROL_SEC_ERR_STATUS_FUNC[13] - SGX protection violation
- CONTROL_SEC_ERR_STATUS_FUNC[14] - DSS protection violation
- CONTROL_SEC_ERR_STATUS_FUNC[15] - ISS protection violation
- CONTROL_SEC_ERR_STATUS_FUNC[18] - DEBUG protection violation
- CONTROL_SEC_ERR_STATUS_FUNC[19] - ABE protection violation
- CONTROL_SEC_ERR_STATUS_FUNC[20] - C2C init protection violation
- In debug mode:
 - CONTROL_SEC_ERR_STATUS_DEBUG[01] - L3 RAM protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[02] - GPMC protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[03] - EMIF protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[04] - IVA-HD protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[05] - Cortex-M3 protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[06] - SL2 protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[09] - BB2D protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[12] - C2C slave NIU protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[13] - SGX protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[14] - DSS protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[15] - ISS protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[18] - DEBUG protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[19] - ABE protection violation
 - CONTROL_SEC_ERR_STATUS_DEBUG[20] - C2C init protection violation

For more information, see [Chapter 19, Control Module](#).

14.2.3.8.3.5 L3 Firewall Default Configuration

[Table 14-27](#) summarizes the configuration of the L3 firewalls.

Table 14-27. L3 Firewalls Default Configurations

| Device/Region: 0 | | | | | | |
|----------------------|-------------|------------------|------------|--------------|--|--|
| Permission Type | Reset Value | Reset Value | Reset Type | Run Time | Firewall Register (where j = 0) | Control Module Register |
| ACCESS_PERMISSION | All | 0xFFFF | Exported | Configurable | MRM_PERMISSION_REGION_LOW_j[11:0] | CONTROL_CORE_L3_HW_FW_EXPORTED_VALUES_CONF[k] |
| DEBUG_PERMISSION | All | 0xF | Exported | Configurable | MRM_PERMISSION_REGION_LOW_j[15:12] | CONTROL_CORE_L3_HW_FW_EXPORTED_VALUES_CONF[l] CONTROL_CORE_L3_HW_FW_EXPORTED_VALUES_CONF[k] |
| INITIATOR_PERMISSION | All | 0xFFFF FFFFFF | Tied | Configurable | MRM_PERMISSION_REGION_HIGH_j[31:0] | N/A |

NOTE: For the values of k and l, see [Table 14-28](#).

Table 14-28. Control Module Register – Factorization

| Variable Value | | Module Name | Regions |
|----------------|----|------------------------|----------------|
| k | l | | |
| 3 | 19 | L3 RAM firewall | Regions 1 to 9 |
| 0 | 16 | GPMC firewall | Regions 1 to 7 |
| 7 | 23 | SL2 firewall | Regions 1 to 7 |
| 6 | 22 | SGX firewall | Regions 1 to 7 |
| 5 | 21 | ISS firewall | Regions 1 to 7 |
| 5 | 21 | Cortex-M3 firewall | Regions 1 to 7 |
| 4 | 20 | DSS firewall | Regions 1 to 7 |
| 8 | 24 | IVAHD firewall | Regions 1 to 7 |
| 10 | 26 | BB2D firewall | Regions 1 to 7 |
| 12 | 28 | DEBUG firewall | Region 1 |
| 13 | 29 | ABE firewall | Region 1 |
| 1 | 17 | C2C slave NIU firewall | Region 1 |
| 9 | 25 | C2C init firewall | Regions 1 to 3 |
| 11 | 27 | EMIF firewall | Regions 1 to 7 |

14.2.3.9 L3 Interconnect Error Handling

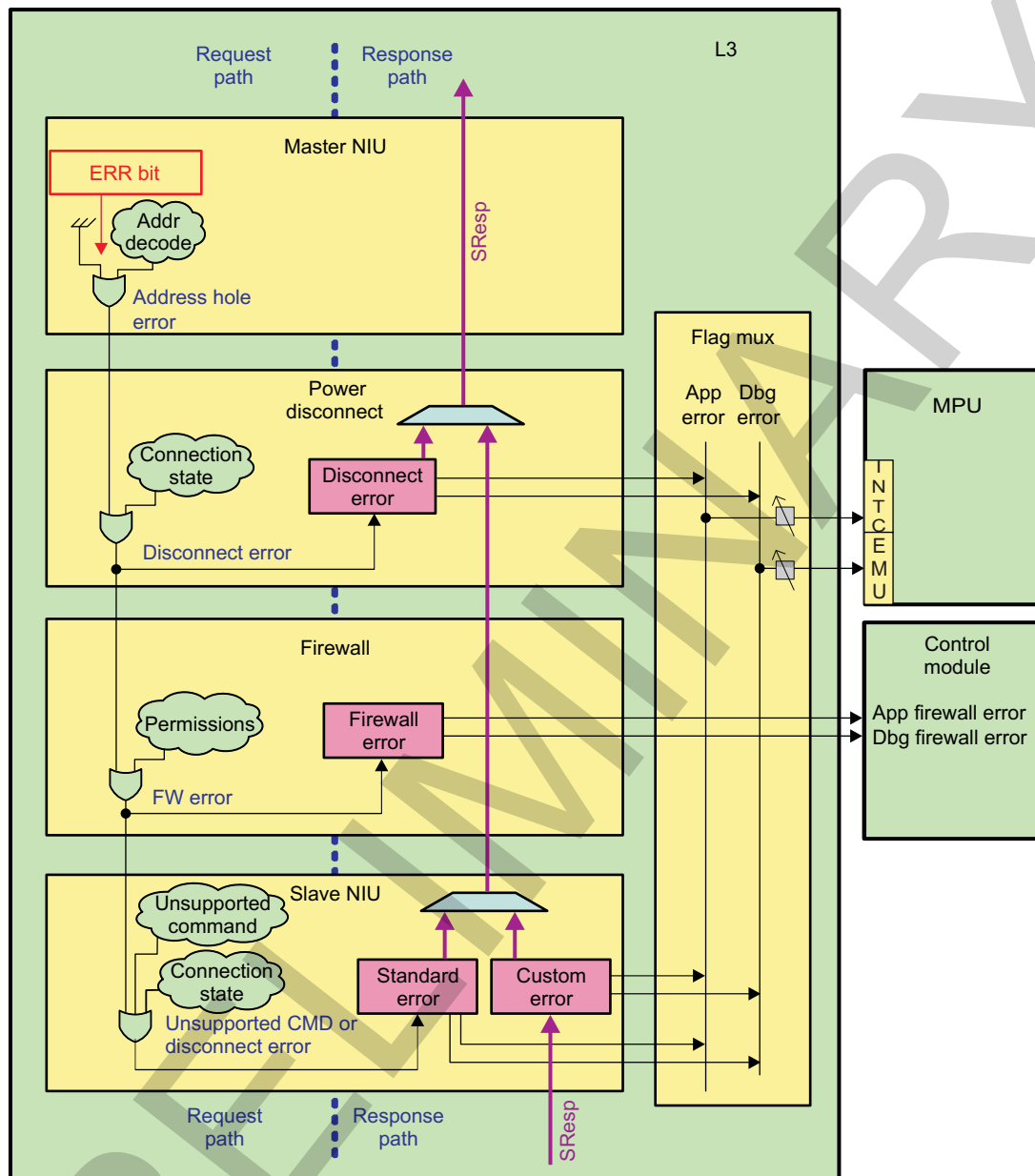
Error logging is enabled in the L3 interconnect. The three major types of errors are:

- Slave NIU errors
- Firewall errors (see [Section 14.2.3.8.3.4, L3 Firewall Error Logging](#))
- Flag mux errors

14.2.3.9.1 Global Error-Routing Scheme

[Figure 14-6](#) shows the L3 global error-routing scheme.

Figure 14-6. L3 Global Error-Routing Scheme



13-005

14.2.3.9.2 Slave NIU Error Logging

Error logging is implemented only at slave NIUs. Because the interconnect does not support master NIU error logging, an erroneous packet must be created and sent to one of the slave NIUs. The slave NIU that receives an erroneous packet is predictable but can change per master (see [Table 14-29](#)).

Table 14-29. L3 Connectivity and Holes Error Routing

| Master | Connectivity and Hole Errors Logged Into Slave NIUs |
|------------------|---|
| L3_MN_DAP | L3_SN_GPMC |
| L3_MN_CORTEXM3 | |
| L3_MN_CORTEXA9 | |
| L3_MN_SDMA_RD | |
| L3_MN_SDMA_WR | |
| L3_MN_DSP | L3_SN_DMM1 |
| L3_MN_IVANHD | |
| L3_MN_MMC1 | |
| L3_MN_MMC2 | |
| L3_MN_SGX_P1 | |
| L3_MN_BB2D_P1 | L3_SN_DMM2 |
| L3_MN_DSS | |
| L3_MN_ISS | |
| L3_MN_FACEDETECT | |
| L3_MN_SGX_P2 | |
| L3_MN_BB2D_P2 | L3_SN_OCM_RAM |
| L3_MN_HSUSBOTG | |
| L3_MN_HSI | L3_SN_ABE |
| L3_MN_HSUSBHOST | |
| L3_MN_C2C | L3_SN_L4_PER3 |

The slave NIU can be configured to report standard errors (errors generated within the interconnect):

- Firewall error: Protection violation; this error indicates that a request was rejected by a firewall and is reported to the control module. For more information, see [Section 14.2.3.8.3.4, L3 Firewall Error Logging](#).
- Address hole: This error reports an unknown address for a request. The address map is local to each master NIU; therefore, an address hole error is reported each time a master NIU requests an access to a slave NIU to which it is not logically connected, even if this address exists in the global L3 address map. This error is detected only once per burst.
- Unsupported commands: This error reports that the master NIU sent a command that cannot be processed, because the slave NIU cannot accept it and no conversion to another command is possible. This error is detected only once per burst.
- Report custom errors: Basically, when the slave answer is SResp = ERR
- Report severity level, for standard error and custom errors:
 - None: Error logging for this type of error is disabled.
 - Error: Error is logged for this type of error.
 - Fault: Error is logged and interrupt is generated for this type of error.
- Generate interrupt on 2 bits depending on the MReqDebug qualifier:
 - Application error - Fault[0]
 - Debug error - Fault[1]

By default, all slave NIUs are configured with standard and custom error levels set to FAULT. The errors are reported on the two flag muxes (see [Figure 14-6](#)), depending on the access type, application or debug. For more information, see [Section 14.2.3.9.3, Flag Mux Error Logging](#).

The slave NIU power-disconnect component also has error logging enabled. This is because the slave NIU in this case is in a clock domain that is switched off and therefore cannot catch the error. By nature, this component can generate only standard errors. By default, it is configured with the error level set to FAULT.

Wake up on demand: If an error packet reaches a slave NIU that is set with MDiscBehave = 1 (wake up on demand), then the active signal is asserted and L3 processes the error generation when the

slave is awake. This is inefficient but it simplifies NIU implementation and should not be a problem, because errors are supposed to occur only during software debug.

14.2.3.9.3 Flag Mux Error Logging

All fault signals are sent to a flag mux component. There are four important FLAGMUX registers:

- [L3_FLAGMUX_MASK0](#): Masks application error sources
- [L3_FLAGMUX_MASK1](#): Masks debug error sources
- [L3_FLAGMUX_REGERR0](#): Checks which application error sources are active
- [L3_FLAGMUX_REGERR1](#): Checks which debug error sources are active

The two L3_FLAGMUX_MASK registers mask bit 0 or bit 1 of the flag inputs, and the L3_FLAGMUX_REGERR registers read input errors. Each register is dedicated to reporting the bit corresponding to the register number.

[Table 14-30](#) describes the mapping of the flags to the corresponding sources.

Table 14-30. Interconnect Flag Mapping

| | Flag Mux Input | Source |
|---------------|----------------|-----------------|
| CLK1 flag mux | 0 | L3_SN_DMM1 |
| | 1 | L3_SN_DMM2 |
| | 2 | L3_SN_ABE |
| | 3 | L3_SN_L4CFG |
| | 4 | CLK2 PWR DISC |
| CLK2 flag mux | 0 | L3_SN_Cortex-M3 |
| | 1 | L3_SN_DSS |
| | 2 | L3_SN_GPMC |
| | 3 | L3_SN_ISS |
| | 4 | L3_SN_IVAHD |
| | 5 | Reserved |
| | 6 | L3_SN_L4PER0 |
| | 7 | L3_SN_OCMCRAM |
| | 8 | L3_SN_GPMC |
| | 9 | L3_SN_SGX |
| | 10 | L3_SN_SL2 |
| | 11 | L3_SN_C2C |
| | 12 | CLK1 PWR DISC |
| | 13 | Reserved |
| | 14 | Reserved |
| | 15 | L3_SN_L4PER3 |
| | 16 | L3_SN_L4PER1 |
| | 17 | L3_SN_L4PER2 |
| CLK3 flag mux | 18 | BB2D |
| | 0 | DEBUGSS |

14.2.3.9.4 Severity Level of Standard and Custom Errors

The slave NIU registers are important for error logging.

- The [L3_TARG_STDERRLOG_SVRTSTDLVL](#) register shows the severity level for standard errors. According to the severity level, error logging is disabled, enabled with level ERROR, or enabled with level ERROR and flag FAULT.
- The [L3_TARG_STDERRLOG_SVRTCUSTOMLVL](#) register shows the severity level for custom errors (see [L3_TARG_CUSTOMERRLOG_SVRTCUSTOMLVL](#)).

- The [L3_TARG_STDERRLOG_MAIN](#) register is the main register for error-logging management. It shows the validity of the logged information, standard or custom.
- The [L3_TARG_STDERRLOG_HDR](#) register stores packets in case of a standard error.
- The [L3_TARG_STDERRLOG_MSTADDR](#) register returns the MSTADDR field of the logged packet.
- The [L3_TARG_STDERRLOG_SLVADDR](#) register returns the SLVADDR field of the stored packet.
- The [L3_TARG_STDERRLOG_INFO](#) register saves the information field of the logged packet.

14.2.4 L3 Interconnect Programming Guide

14.2.4.1 L3 Interconnect Low-Level Programming Models

This section describes the low-level hardware programming sequences for configuring and using the L3 interconnect module.

14.2.4.1.1 Global Initialization

14.2.4.1.1.1 Global Initialization of Surrounding Modules

This section identifies the requirements for initializing the surrounding modules when the L3 interconnect module is to be used for the first time after a device reset. The initialization of surrounding modules is based on the integration and environment of the L3 interconnect. For more information, see [Section 14.2.2, L3 Interconnect Integration](#).

[Table 14-31](#) lists the surrounding modules.

Table 14-31. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|---|
| PRCM | For information about the configuration of the PRCM module, see Chapter 3, Power, Reset, and Clock Management . |
| Control module | For information about the configuration of the control module, see Chapter 19, Control Module . |
| MPU INTC | The MPU INTC must be configured to enable interrupts from the L3 interconnect module. See Chapter 18, Interrupt Controllers . |
| sDMA | For information about the configuration of the sDMA, see Chapter 17, sDMA . |
| L3 interconnect | For information about the configuration of the interconnect, see Chapter 14, Interconnect . |

14.2.4.2 Operational Modes Configuration

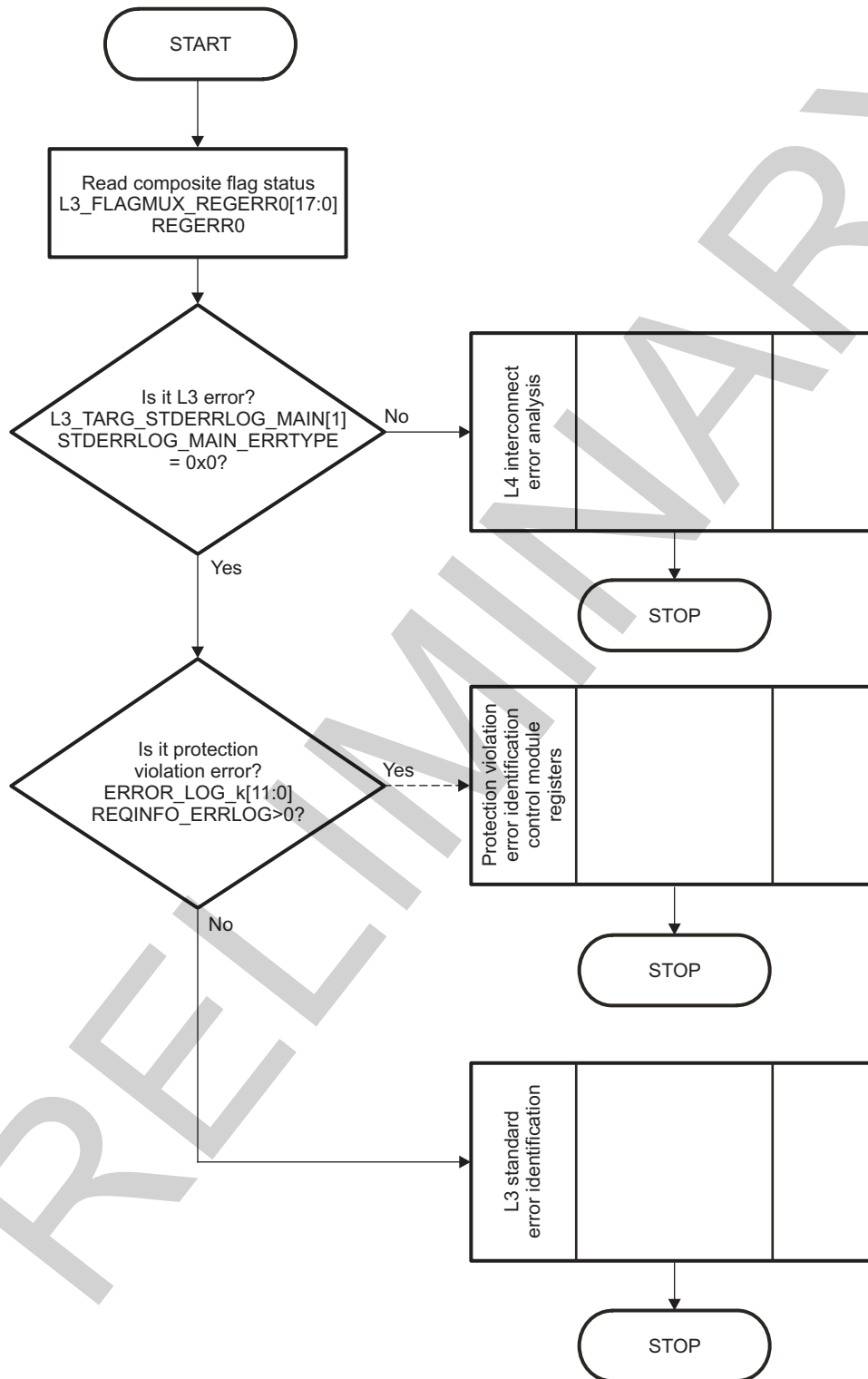
14.2.4.2.1 L3 Interconnect Error Analysis Mode

14.2.4.2.1.1 Main Sequence: L3 Interconnect Error Analysis Mode

The information required to analyze an error source is logged in several registers. The number of registers to access depends on the error source.

[Figure 14-7](#) shows the software sequence required in most cases.

Figure 14-7. Typical Error Analysis Sequence



I3-013

Table 14-32 lists the register call summary for error analysis mode in the main sequence.

Table 14-32. Register Call Summary: Main Sequence – Error Analysis Mode

| Register Name | Register Name | Register Name |
|--|---|--|
| ERROR_LOG_k | L3_FLAGMUX_REGERR0 | L3_FLAGMUX_REGERR1 |
| L3_TARG_STDERRLOG_MAIN | CONTROL.CONTROL_SEC_ERR_STAT US_FUNC | CONTROL.CONTROL_SEC_ERR_STAT US_DEBUG |

[Table 14-33](#) lists the subprocess call summary for error analysis mode in the main sequence.

Table 14-33. Subprocess Call Summary for Main Sequence – Error Analysis Mode

| Subprocess | Cross-Reference |
|---|--|
| L4 interconnect error analysis | See Section 14.2.4.2.1 , <i>L4 Interconnect Error Analysis Mode</i> . |
| L3 interconnect protection violation error identification | See Section 14.2.4.2.1.1.2 , <i>Subsequence: L3 Interconnect Protection Violation Error Identification</i> . |
| L3 interconnect unsupported command/address hole error identification | See Section 14.2.4.2.1.1.3 , <i>Subsequence: L3 Interconnect Unsupported Command/Address Hole Error Identification</i> . |
| L3 interconnect reset FLAGMUX and module | See Section 14.2.4.2.1.1.4 , <i>Subsequence: L3 Interconnect Reset FLAGMUX and Module</i> . |

14.2.4.2.1.1.1 L3 Custom Error Identification

[Table 14-34](#) demonstrates custom error identification.

Table 14-34. Custom Error Identification

| Step | Register | Value |
|--|---|-------|
| IF: Is CustomError detected? | L3_TARG_STDERRLOG_MAIN [1] STDERRLOG_MAIN_ERRTYPE | = 0x1 |
| Read info field of the response packet. | L3_TARG_STDERRLOG_CUSTOMINFO _INFO[7:0] STDERRLOG_CUSTOMINFO_INFO | xxx |
| Read the address of the initiator that caused the error. | L3_TARG_STDERRLOG_CUSTOMINFO _MSTADDR[7:0] STDERRLOG_CUSTOMINFO_MSTADDR | xxx |
| Read the type of the operation (read/write). | L3_TARG_STDERRLOG_CUSTOMINFO _OPCODE[1:0] STDERRLOG_CUSTOMINFO_OPCODE | xxx |
| ENDIF | | |

NOTE: To understand why the target IP has returned an error, the user must read the target IP registers.

14.2.4.2.1.1.2 Subsequence: L3 Interconnect Protection Violation Error Identification

The procedure listed in [Table 14-35](#) describes protection violation error identification and where it is logged in the control module registers. Two types of errors are logged: application errors and debug errors.

Table 14-35. Protection Violation Error Identification

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Read the burst violation. | ERROR_LOG_k [23] BLK_BURST_VIOLATION | xxx |
| Read the initiator ID. | ERROR_LOG_k [11:8] CONNID | xxx |
| Read the command that caused the error. | ERROR_LOG_k [7] MCMD | xxx |
| Read the address of the request that caused the error. | LOGICAL_ADDR_ERRLOG_k [31:0] SLVOFS_LOGICAL | xxx |

Table 14-35. Protection Violation Error Identification (continued)

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| IF: Is it an application error? | L3_FLAGMUX_REGERR0 [18:0] REGERROR0 | = 0x0 |
| Read the status bits to see which module firewall has worked. | CONTROL.CONTROL_SEC_ERR_STATUS_FUNC[20:0] | xxx |
| Clear the status bits. | CONTROL.CONTROL_SEC_ERR_STATUS_FUNC[20:0] | xxx |
| Clear the status bit. | L3_TARG_STDERRLOG_MAIN [31] STDERRLOG_MAIN_CLRLOG | 0x0 |
| ELSE IF | L3_FLAGMUX_REGERR1 [18:0] REGERROR1 | = 0x1 |
| Read the status bits to see the module. | CONTROL.CONTROL_SEC_ERR_STATUS_DEBUG[20:0] | xxx |
| Clear the status bits. | CONTROL.CONTROL_SEC_ERR_STATUS_DEBUG[20:0] | xxx |
| Clear the status bit. | L3_TARG_STDERRLOG_MAIN [31] STDERRLOG_MAIN_CLRLOG | 0x0 |
| ENDIF | | |
| Clear the burst violation. | ERROR_LOG_k [23] BLK_BURST_VIOLATION | 0x0 |
| Clear the error status. | ERROR_LOG_k [21:17] REGION_START_ERRLOG | 0x00 |

14.2.4.2.1.1.3 Subsequence: L3 Interconnect Standard Error Identification

The procedure listed in [Table 14-36](#) describes the identification of standard errors inside the L3 interconnect. The standard errors are: unsupported command, address hole, and disconnect.

Table 14-36. L3 Standard Error Identification

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| IF: Is an error detected? | L3_TARG_STDERRLOG_MAIN [18] STDERRLOG_MAIN_ERRCNT | = 0x1 |
| Read the corresponding flag. | L3_FLAGMUX_REGERR0 [18:0] REGERROR0 | xxx |
| Read the corresponding flag. | L3_FLAGMUX_REGERR1 [18:0] REGERROR1 | xxx |
| Localize the slave NIU that generated the error. | See Table 14-30 . | |
| ELSE | | |
| Clear the error log. | L3_TARG_STDERRLOG_MAIN [31] STDERRLOG_MAIN_CLRLOG | 0x0 |
| Clear the severity error status. | L3_TARG_STDERRLOG_SVRTSTDLVL [1:0] STDERRLOG_SVRTSTDLVL_0 | 0x2 |
| ENDIF | | |

14.2.4.2.1.1.4 Subsequence: L3 Interconnect FLAGMUX Configuration

The procedure listed in [Table 14-37](#) gives information about the configuration of FLAGMUX masks.

Table 14-37. FLAGMUX Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Set the FLAGMUX masks to mask an event. | L3_FLAGMUX_MASK0 [18:0] MASK0 L3_FLAGMUX_MASK1 [18:0] MASK1 | xxx |
| Read the REGERR bits to see if an error is recorded. | L3_FLAGMUX_REGERR0 [18:0] REGERR0 L3_FLAGMUX_REGERR1 [18:0] REGERR1 | xxx |
| Clear the slave NIU error log and the FLAGMUX error. | L3_TARG_STDERRLOG_MAIN [31] STDERRLOG_SVRTSTDLVL_0 | 0x2 |

PRELIMINARY

14.2.5 L3 Interconnect Register Manual

14.2.5.1 L3 Register Group Summary

The registers in the L3 interconnect are divided into eight groups:

- Firewall registers (See [Table 14-39](#))
- HOST registers (See [Table 14-62](#))
- TARG registers (See [Table 14-98](#))
- PWR_DISK registers (See [Table 14-140](#))
- FLAGMUX registers (See [Table 14-164](#))
- BW registers (See [Table 14-179](#))
- RA registers (See [Table 14-208](#))
- STATCOLL registers (See [Table 14-216](#))

14.2.5.1.1 L3 Firewall Registers Summary and Description

Table 14-38. L3 Firewall Instance Summary

| Module Name | Base Address | Size |
|-------------------------|--------------|------|
| C2C-Master NIU firewall | 0x4A20 4000 | 4KB |
| C2C-Slave NIU firewall | 0x4A20 6000 | 4KB |
| MA firewall | 0x4A20 A000 | 4KB |
| EMIF firewall | 0x4A20 C000 | 4KB |
| GPMC firewall | 0x4A21 0000 | 4KB |
| L3 RAM firewall | 0x4A21 2000 | 4KB |
| SGX firewall | 0x4A21 4000 | 4KB |
| ISS firewall | 0x4A21 6000 | 4KB |
| Dual Cortex-M3 firewall | 0x4A21 8000 | 4KB |
| BB2D firewall | 0x4A21 A000 | 4KB |
| DSS firewall | 0x4A21 C000 | 4KB |
| SL2 firewall | 0x4A21 E000 | 4KB |
| IVA-HD firewall | 0x4A22 0000 | 4KB |
| Debug firewall | 0x4A22 6000 | 4KB |
| L4-ABE firewall | 0x4A22 8000 | 4KB |

14.2.5.1.1.1 L3 Firewall Registers Summary

Table 14-39. L3 Firewall Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset | MA Firewall L3 Physical Address | EMIF Firewall L3 Physical Address | GPMC Firewall L3 Physical Address | L3 RAM Firewall L3 Physical Address |
|---|------|-----------------------|----------------|---------------------------------|-----------------------------------|-----------------------------------|-------------------------------------|
| ERROR_LOG_k⁽¹⁾ | RW | 32 | 0x000+(0x10*k) | 0x4A20 A000 + (0x10*k) | 0x4A20 C000 + (0x10*k) | 0x4A21 0000 + (0x10*k) | 0x4A21 2000 + (0x10*k) |
| LOGICAL_ADDR_ERRLOG_k⁽¹⁾ | RO | 32 | 0x004+(0x10*k) | 0x4A20 A004 + (0x10*k) | 0x4A20 C004 + (0x10*k) | 0x4A21 0004 + (0x10*k) | 0x4A21 2004 + (0x10*k) |
| REGUPDATE_CONTROL | RW | 32 | 0x040 | 0x4A20 A040 | 0x4A20 C040 | 0x4A21 0040 | 0x4A21 2040 |

⁽¹⁾ k = 0 to 2 for EMIF firewall
k = 0 to 2 for MA firewall
k = 0 for GPMC firewall
k = 0 for L3 RAM firewall

Table 14-39. L3 Firewall Registers Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | MA Firewall L3 Physical Address | EMIF Firewall L3 Physical Address | GPMC Firewall L3 Physical Address | L3 RAM Firewall L3 Physical Address |
|--|------|-----------------------|----------------|---------------------------------|-----------------------------------|-----------------------------------|-------------------------------------|
| START_REGION_i⁽²⁾ | RW | 32 | 0x080+(0x10*i) | 0x4A20 A080 + (0x10*i) | 0x4A20 C08 + (0x10*i) | 0x4A21 0080 + (0x10*i) | 0x4A21 2080 + (0x10*i) |
| END_REGION_i⁽²⁾ | RW | 32 | 0x084+(0x10*i) | 0x4A20 A084 + (0x10*i) | 0x4A20 C08 4+ (0x10*i) | 0x4A21 0084 + (0x10*i) | 0x4A21 2084 + (0x10*i) |
| MRM_PERMISSION_REGION_HIGH_j⁽³⁾ | RW | 32 | 0x08C+(0x10*j) | 0x4A20 A08C + (0x10*j) | 0x4A20 C08C + (0x10*j) | 0x4A21 008C + (0x10*j) | 0x4A21 208C + (0x10*j) |
| MRM_PERMISSION_REGION_LOW_j⁽³⁾ | RW | 32 | 0x088+(0x10*j) | 0x4A20 A088 + (0x10*j) | 0x4A20 C088 + (0x10*j) | 0x4A21 0088 + (0x10*j) | 0x4A21 2088 + (0x10*j) |

⁽²⁾ i = 1 to 7 for EMIF firewall
i = 1 to 7 for MA firewall
i = 1 to 7 for GPMC firewall
i = 1 to 9 for L3 RAM firewall

⁽³⁾ j = 0 to 7 for EMIF firewall
j = 0 to 7 for MA firewall
j = 0 to 7 for GPMC firewall
j = 0 to 9 for L3 RAM firewall

Table 14-40. L3 Firewall Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | SGX Firewall L3 Physical Address | ISS Firewall L3 Physical Address | Dual Cortex-M3 Firewall L3 Physical Address | BB2D Firewall L3 Physical Address |
|--|------|-----------------------|----------------|----------------------------------|----------------------------------|---|-----------------------------------|
| ERROR_LOG_k⁽¹⁾ | RW | 32 | 0x000+(0x10*k) | 0x4A21 4000 + (0x10*k) | 0x4A21 6000 + (0x10*k) | 0x4A21 8000 + (0x10*k) | 0x4A21 A000 + (0x10*k) |
| LOGICAL_ADDR_ERRLOG_k⁽¹⁾ | RO | 32 | 0x004+(0x10*k) | 0x4A21 4004 + (0x10*k) | 0x4A21 6004 + (0x10*k) | 0x4A21 8004 + (0x10*k) | 0x4A21 A004 + (0x10*k) |
| REGUPDATE_CONTROL | RW | 32 | 0x040 | 0x4A21 4040 | 0x4A21 6040 | 0x4A21 8040 | 0x4A21 A040 |
| START_REGION_i⁽²⁾ | RW | 32 | 0x080+(0x10*i) | N/A | N/A | N/A | N/A |
| END_REGION_i⁽²⁾ | RW | 32 | 0x084+(0x10*i) | N/A | N/A | N/A | N/A |
| MRM_PERMISSION_REGION_HIGH_j⁽³⁾ | RW | 32 | 0x08C+(0x10*j) | 0x4A21 408C + (0x10*j) | 0x4A21 608C + (0x10*j) | 0x4A21 808C + (0x10*j) | 0x4A21 A08C + (0x10*j) |
| MRM_PERMISSION_REGION_LOW_j⁽³⁾ | RW | 32 | 0x088+(0x10*j) | 0x4A21 4088 + (0x10*j) | 0x4A21 6088 + (0x10*j) | 0x4A21 8088 + (0x10*j) | 0x4A21 A088 + (0x10*j) |

⁽¹⁾ k = 0 for SGX firewall
k = 0 for ISS firewall
k = 0 for Dual Cortex-M3 firewall

⁽²⁾ i = 0 for SGX firewall
i = 0 for ISS firewall
i = 0 for Dual Cortex-M3 firewall

⁽³⁾ j = 0 for SGX firewall
j = 0 for ISS firewall
j = 0 for Dual Cortex-M3 firewall

Table 14-41. L3 Firewall Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DSS Firewall L3 Physical Address | SL2 Firewall L3 Physical Address | IVA-HD Firewall L3 Physical Address |
|--|------|-----------------------|----------------|----------------------------------|----------------------------------|-------------------------------------|
| ERROR_LOG_k⁽¹⁾ | RW | 32 | 0x000+(0x10*k) | 0x4A21 C000+(0x10*k) | 0x4A21 E000+(0x10*k) | 0x4A22 0000+(0x10*k) |
| LOGICAL_ADDR_ERRLOG_k⁽¹⁾ | RO | 32 | 0x004+(0x10*k) | 0x4A21 C004+(0x10*k) | 0x4A21 E004+(0x10*k) | 0x4A22 0004+(0x10*k) |
| REGUPDATE_CONTROL | RW | 32 | 0x040 | 0x4A21 C040 | 0x4A21 E040 | 0x4A22 0040 |
| START_REGION_i | RW | 32 | 0x080+(0x10*i) | N/A | N/A | N/A |
| END_REGION_i | RW | 32 | 0x084+(0x10*i) | N/A | N/A | N/A |
| MRM_PERMISSION_REGION_HIGH_j⁽²⁾ | RW | 32 | 0x08C+(0x10*j) | 0x4A21 C08C+(0x10*j) | 0x4A21 E08C+(0x10*j) | 0x4A22 008C+(0x10*j) |
| MRM_PERMISSION_REGION_LOW_j⁽²⁾ | RW | 32 | 0x088+(0x10*j) | 0x4A21 C088+(0x10*j) | 0x4A21 E088+(0x10*j) | 0x4A22 0088+(0x10*j) |

⁽¹⁾ k = 0 for DSS firewall
k = 0 for SL2 firewall
k = 0 for IVA-HD firewall

⁽²⁾ j = 0 for DSS firewall
j = 0 for SL2 firewall
j = 0 for IVA-HD firewall

Table 14-42. L3 Firewall Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Debug Firewall L3 Physical Address | L4-ABE Firewall L3 Physical Address |
|--|------|-----------------------|----------------|------------------------------------|-------------------------------------|
| ERROR_LOG_k⁽¹⁾ | RW | 32 | 0x000+(0x10*k) | 0x4A22 6000 + (0x10*k) | 0x4A22 8000 + (0x10*k) |
| LOGICAL_ADDR_ERRLOG_k⁽¹⁾ | RO | 32 | 0x004+(0x10*k) | 0x4A22 6004 + (0x10*k) | 0x4A22 8004 + (0x10*k) |
| REGUPDATE_CONTROL | RW | 32 | 0x040 | 0x4A22 6040 | 0x4A22 8040 |
| START_REGION_i⁽²⁾ | RW | 32 | 0x080+(0x10*i) | 0x4A22 6080 + (0x10*i) | N/A |
| END_REGION_i⁽²⁾ | RW | 32 | 0x084+(0x10*i) | 0x4A22 6084 + (0x10*i) | N/A |
| MRM_PERMISSION_REGION_HIGH_j⁽³⁾ | RW | 32 | 0x08C+(0x10*j) | 0x4A22 608C + (0x10*j) | 0x4A22 808C + (0x10*j) |
| MRM_PERMISSION_REGION_LOW_j⁽³⁾ | RW | 32 | 0x088+(0x10*j) | 0x4A22 6088 + (0x10*j) | 0x4A22 8088 + (0x10*j) |

⁽¹⁾ k = 0 for Debug firewall
k = 0 for L4-ABE firewall

⁽²⁾ i = 1 for Debug firewall
i = 0 for L4-ABE firewall

⁽³⁾ j = 0 to 1 for Debug firewall
j = 0 for L4-ABE firewall

Table 14-43. L3 Firewall Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | C2C-Master NIU Firewall L3 Physical Address | C2C-Slave NIU Firewall L3 Physical Address |
|---|------|-----------------------|----------------|---|--|
| ERROR_LOG_k⁽¹⁾ | RW | 32 | 0x000+(0x10*k) | 0x4A20 4000 + (0x10*k) | 0x4A20 6000 + (0x10*k) |
| LOGICAL_ADDR_ERRLOG_k⁽¹⁾ | RO | 32 | 0x004+(0x10*k) | 0x4A20 4004 + (0x10*k) | 0x4A22 6004 + (0x10*k) |
| REGUPDATE_CONTROL | RW | 32 | 0x040 | 0x4A20 4040 | 0x4A22 6040 |

⁽¹⁾ k = 0 for C2C-Master NIU firewall
k = 0 for C2C-Slave NIU firewall

Table 14-43. L3 Firewall Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | C2C-Master NIU Firewall L3 Physical Address | C2C-Slave NIU Firewall L3 Physical Address |
|---|------|-----------------------|----------------|---|--|
| START_REGION_i ⁽²⁾ | RW | 32 | 0x080+(0x10*i) | 0x4A20 4080 + (0x10*i) | N/A |
| END_REGION_i ⁽²⁾ | RW | 32 | 0x084+(0x10*i) | 0x4A20 4084 + (0x10*i) | N/A |
| MRM_PERMISSION_REGION_HIGH_j ⁽³⁾ | RW | 32 | 0x08C+(0x10*j) | 0x4A20 408C + (0x10*j) | 0x4A22 608C + (0x10*j) |
| MRM_PERMISSION_REGION_LOW_j ⁽³⁾ | RW | 32 | 0x088+(0x10*j) | 0x4A20 4088 + (0x10*j) | 0x4A22 6088 + (0x10*j) |

⁽²⁾ i = 1 to 3 for C2C-Master NIU firewall

⁽³⁾ j = 0 for C2C-Master NIU firewall

j = 0 to 3 for C2C-Slave NIU firewall

14.2.5.1.1.2 L3 Firewall Registers Description

NOTE: Hardware reset values can be modified by exported values from the control module at reset.

Table 14-44. ERROR_LOG_k

| | | | |
|-------------------------|--|--------------|---------------------------------|
| Address Offset | 0x0000 0000+(0x10*k) | Index | See Table 14-39 to Table 14-43. |
| Physical Address | 0x4A20 A000 + (0x10*k) 0x4A20 C000 + (0x10*k) 0x4A21 0000 + (0x10*k) 0x4A21 2000 + (0x10*k) 0x4A21 4000 + (0x10*k) 0x4A21 6000 + (0x10*k) 0x4A21 8000 + (0x10*k) 0x4A21 A000 + (0x10*k) 0x4A21 C000+(0x10*k) 0x4A21 E000+(0x10*k) 0x4A22 0000+(0x10*k) 0x4A22 6000 + (0x10*k) 0x4A22 8000 + (0x10*k) 0x4A20 4000 + (0x10*k) 0x4A20 6000 + (0x10*k) | | |
| Description | Error log register for port k | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------------------|----------|---------------------|----|----|----|-------------------|----|----|----|----------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | BLK_BURST_VIOLATION | RESERVED | REGION_START_ERRLOG | | | | REGION_END_ERRLOG | | | | REQINFO_ERRLOG | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|-------|
| 31:24 | RESERVED | Reads return 0s. | R | 0x00 |
| 23 | BLK_BURST_VIOLATION | Read 0x1: 2D burst not allowed or exceeding allowed size Write to clear ERROR_LOG_k and LOGICAL_ADDR_ERRLOG_k registers | RW | 0 |
| 22 | RESERVED | Reads return 0s. | R | 0 |
| 21:17 | REGION_START_ERRLOG | Read: Wrong access hit this region number Write to clear ERROR_LOG_k and LOGICAL_ADDR_ERRLOG_k registers | RW | 0x00 |
| 16:12 | REGION_END_ERRLOG | Read: Wrong access hit this region number Write to clear ERROR_LOG_k and LOGICAL_ADDR_ERRLOG_k registers | RW | 0x00 |
| 11:0 | REQINFO_ERRLOG | Read: Error in reqinfo vector mapped as follows: [11: 8] ConnID [3:0] [7] MCMD [0] [6:4] Reserved [3] MReqDebug [2] Reserved [1] MReqSupervisor [0] MReqType Write to clear ERROR_LOG_k and LOGICAL_ADDR_ERRLOG_k registers | RW | 0x000 |

Table 14-45. Register Call Summary for Register ERROR_LOG_k

L3 interconnect

- [L3 Firewall Functionality: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [L3 Interconnect Error Analysis Mode: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [L3 Firewall Registers Summary and Description: \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\]](#)

Table 14-46. LOGICAL_ADDR_ERRLOG_k

| Address Offset | 0x0000 0004+(0x10*k) | Index | See Table 14-39 to Table 14-43 . |
|------------------|--|-------|--|
| Physical Address | 0x4A20 A004 + (0x10*k) 0x4A20 C004 + (0x10*k) 0x4A21 0004 + (0x10*k) 0x4A21 2004 + (0x10*k) 0x4A21 4004 + (0x10*k) 0x4A21 6004 + (0x10*k) 0x4A21 8004 + (0x10*k) 0x4A21 A004 + (0x10*k) 0x4A21 C004+(0x10*k) 0x4A21 E004+(0x10*k) 0x4A22 0004+(0x10*k) 0x4A22 6004 + (0x10*k) 0x4A22 8004 + (0x10*k) 0x4A20 4004 + (0x10*k) 0x4A22 6004 + (0x10*k) | | |
| Description | Logical Physical Address Error log register for port k | | |
| Type | RO | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SLVOFS_LOGICAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|----------------------|----------------|--|------|---------|
| 31 ⁽¹⁾ :0 | SLVOFS_LOGICAL | Address generated by the Initiator before being translated | R | 0x00000 |

⁽¹⁾ * = Size of the target**Table 14-47. Register Call Summary for Register LOGICAL_ADDR_ERRLOG_k**

L3 interconnect

- [L3 Firewall Functionality: \[0\] \[1\] \[2\] \[3\]](#)
- [L3 Interconnect Error Analysis Mode: \[4\]](#)
- [L3 Firewall Registers Summary and Description: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)

Table 14-48. REGUPDATE_CONTROL

| | |
|-------------------------|---|
| Address Offset | 0x0000 0040 |
| Physical Address | 0x4A20 A040 0x4A20 C040 0x4A21 0040 0x4A21 2040 0x4A21 4040 0x4A21 6040 0x4A21 8040 0x4A21 A040 0x4A21 C040 0x4A21 E040 0x4A22 0040 0x4A22 6040 0x4A22 8040 0x4A20 4040 0x4A22 6040 |
| Description | Register update control register |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FW_LOAD_REQ | | BUSY_REQ | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|-----------------------------|------|-------------|
| 31:2 | RESERVED | Reads return 0s. | R | 0x0000 0000 |
| 1 | FW_LOAD_REQ | Hardware set/Software clear | R | 0x1 |
| 0 | BUSY_REQ | Busy request | RW | 0x0 |

Table 14-49. Register Call Summary for Register REGUPDATE_CONTROL

L3 interconnect

- [L3 Firewall Reset: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [L3 Firewall Registers Summary and Description: \[9\] \[10\] \[11\] \[12\] \[13\]](#)

Table 14-50. START_REGION_i

| | | | |
|-------------------------|---|--------------|--|
| Address Offset | 0x0000 0080+(0x10*i) | Index | See Table 14-39 to Table 14-43 . |
| Physical Address | 0x4A20 A080 + (0x10*i) 0x4A20 C08 + (0x10*i) 0x4A21 0080 + (0x10*i) 0x4A21 2080 + (0x10*i) 0x4A22 6080 + (0x10*i) 0x4A20 4080 + (0x10*i) | | |
| Description | Start physical address of region i | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| START REGION | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|---------|
| 31:12 | START_REGION | Physical target start address of firewall region i. The size of this bit field depends on target addressable space, the maximum is [31:12]. See Table 14-52 . | RW | 0x00000 |
| 11:0 | RESERVED | Reads return 0s. | R | 0x0000 |

Table 14-51. Register Call Summary for Register START_REGION_i

L3 interconnect

- [L3 Firewall Functionality: \[0\] \[1\]](#)
- [L3 Firewall Registers Summary and Description: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)

Table 14-52. Size of START_REGION_i[] START_REGION Bit Field

| Firewall | Bit Field |
|-------------------------|--|
| EMIF firewall | START_REGION_i[31:12] START_REGION |
| GPMC firewall | START_REGION_i[30:12] START_REGION |
| L3 RAM firewall | START_REGION_i[15:12] START_REGION |
| SGX firewall | N/A |
| ISS firewall | N/A |
| Dual Cortex-M3 firewall | N/A |
| DSS firewall | N/A |
| SL2 firewall | N/A |
| IVA-HD firewall | N/A |
| Debug firewall | START_REGION_i[21:12] START_REGION |
| L4-AUDIO firewall | N/A |
| C2C-Slave NIU firewall | N/A |
| C2C-Master NIU firewall | START_REGION_i[28:12] START_REGION |

Table 14-53. END_REGION_i

| | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0084+(0x10*i) | Index | See Table 14-39 to Table 14-43 . | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A20 A084 + (0x10*i) 0x4A20 C08 4+ (0x10*i) 0x4A21 0084 + (0x10*i) 0x4A21 2084 + (0x10*i) 0x4A22 6084 + (0x10*i) 0x4A20 4084 + (0x10*i) | | | | | | | | | | | | | | | | | | |
| Description | End physical address of region i | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---------------------|---------------------|---------------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| END_REGION | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | REGION_ENABLE_PORT2 | REGION_ENABLE_PORT1 | REGION_ENABLE_PORT0 | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|---------|
| 31:12 | END_REGION | Physical target end address of firewall region i. The size of this bit field depends on target addressable space, the maximum is [31:12]. See Table 14-55 . | RW | 0x00000 |
| 11:3 | RESERVED | Reads return 0s. | R | 0x0000 |
| 2 | REGION_ENABLE_PORT2 | Enable this region for port 2 ⁽¹⁾ . | RW | 0x0 |
| 1 | REGION_ENABLE_PORT1 | Enable this region for port 1 ⁽²⁾ . | RW | 0x0 |
| 0 | REGION_ENABLE_PORT0 | Enable this region for port 0. | RW | 0x0 |

⁽¹⁾ Only for multiport firewalls with at least 2 ports: second port for L3 accesses for EMIF Firewall

⁽²⁾ Only for multiport firewalls with at least 1 port: first port for L3 accesses for EMIF Firewall

Table 14-54. Register Call Summary for Register END_REGION_i

L3 interconnect

- [L3 Firewall Functionality: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [L3 Firewall Registers Summary and Description: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)

Table 14-55. Size of END_REGION_i[] END_REGION Bit Field

| Firewall | Bit Field |
|-------------------------|--|
| EMIF firewall | END_REGION_i[31:12] END_REGION |
| GPMC firewall | END_REGION_i[30:12] END_REGION |
| L3 RAM firewall | END_REGION_i[15:12] END_REGION |
| SGX firewall | N/A |
| ISS firewall | N/A |
| Dual Cortex-M3 firewall | N/A |
| BB2D firewall | N/A |
| DSS firewall | N/A |
| SL2 firewall | N/A |
| IVA-HD firewall | N/A |
| Debug firewall | END_REGION_i[21:12] END_REGION |
| L4-AUDIO firewall | N/A |
| C2C-Slave NIU firewall | N/A |
| C2C-Master NIU firewall | END_REGION_i[28:12] END_REGION |

Table 14-56. MRM_PERMISSION_REGION_HIGH_j

| | | | |
|-------------------------|--|--------------|---------------------------------|
| Address Offset | 0x0000 008C+(0x10*i) | Index | See Table 14-39 to Table 14-43. |
| Physical Address | 0x4A20 A08C + (0x10*j) 0x4A20 C08C + (0x10*j) 0x4A21 008C + (0x10*j) 0x4A21 208C + (0x10*j) 0x4A21 408C + (0x10*j) 0x4A21 608C + (0x10*j) 0x4A21 808C + (0x10*j) 0x4A21 A08C + (0x10*j) 0x4A21 C08C+(0x10*j) 0x4A21 E08C+(0x10*j) 0x4A22 008C+(0x10*j) 0x4A22 608C + (0x10*j) 0x4A22 808C + (0x10*j) 0x4A20 408C + (0x10*j) 0x4A22 608C + (0x10*j) | | |
| Description | Region j Permission High | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|-----|-----|----------|----------|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| RESERVED | | | | | | | W12 | R12 | RESERVED | RESERVED | W10 | R10 | W9 | R9 | W8 | R8 | W7 | R7 | W6 | R6 | W5 | R5 | W4 | R4 | W3 | R3 | W2 | R2 | W1 | R1 | W0 | R0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:26 | RESERVED | Reserved | RW | 0x3F |
| 25 | W12 | Master NIU ConnID = 12 write permission | RW | 0x1 |
| 24 | R12 | Master NIU ConnID = 12 read permission | RW | 0x1 |
| 23 | RESERVED | Reserved | RW | 0x1 |
| 22 | RESERVED | Reserved | RW | 0x1 |
| 21 | W10 | Master NIU ConnID = 10 write permission | RW | 0x1 |
| 20 | R10 | Master NIU ConnID = 10 read permission | RW | 0x1 |
| 19 | W9 | Master NIU ConnID = 9 write permission | RW | 0x1 |
| 18 | R9 | Master NIU ConnID = 9 read permission | RW | 0x1 |
| 17 | W8 | Master NIU ConnID = 8 write permission | RW | 0x1 |
| 16 | R8 | Master NIU ConnID = 8 read permission | RW | 0x1 |
| 15 | W7 | Master NIU ConnID = 7 write permission | RW | 0x1 |
| 14 | R7 | Master NIU ConnID = 7 read permission | RW | 0x1 |
| 13 | W6 | Master NIU ConnID = 6 write permission | RW | 0x1 |
| 12 | R6 | Master NIU ConnID = 6 read permission | RW | 0x1 |
| 11 | W5 | Master NIU ConnID = 5 write permission | RW | 0x1 |
| 10 | R5 | Master NIU ConnID = 5 read permission | RW | 0x1 |
| 9 | W4 | Master NIU ConnID = 4 write permission | RW | 0x1 |
| 8 | R4 | Master NIU ConnID = 4 read permission | RW | 0x1 |
| 7 | W3 | Master NIU ConnID = 3 write permission | RW | 0x1 |
| 6 | R3 | Master NIU ConnID = 3 read permission | RW | 0x1 |
| 5 | W2 | Master NIU ConnID = 2 write permission | RW | 0x1 |
| 4 | R2 | Master NIU ConnID = 2 read permission | RW | 0x1 |
| 3 | W1 | Master NIU ConnID = 1 write permission | RW | 0x1 |
| 2 | R1 | Master NIU ConnID = 1 read permission | RW | 0x1 |
| 1 | W0 | Master NIU ConnID = 0 write permission | RW | 0x1 |
| 0 | R0 | Master NIU ConnID = 0 read permission | RW | 0x1 |

Table 14-57. Register Call Summary for Register MRM_PERMISSION_REGION_HIGH_j

L3 interconnect

- [L3 Firewall Functionality: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [L3 Firewall Registers Summary and Description: \[6\] \[7\] \[8\] \[9\] \[10\]](#)

Table 14-58. MRM_PERMISSION_REGION_LOW_j

| | | | |
|-------------------------|--|--------------|--|
| Address Offset | 0x0000 0088+(0x10*i) | Index | See Table 14-39 to Table 14-43 . |
| Physical Address | 0x4A20 A088 + (0x10*j) 0x4A20 C088 + (0x10*j) 0x4A21 0088 + (0x10*j) 0x4A21 2088 + (0x10*j) 0x4A21 4088 + (0x10*j) 0x4A21 6088 + (0x10*j) 0x4A21 8088 + (0x10*j) 0x4A21 A088 + (0x10*j) 0x4A21 C088+(0x10*j) 0x4A21 E088+(0x10*j) 0x4A22 0088+(0x10*j) 0x4A22 6088 + (0x10*j) 0x4A22 8088 + (0x10*j) 0x4A20 4088 + (0x10*j) 0x4A22 6088 + (0x10*j) | | |
| Description | Region j Permission Low | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------------|---------------|----------|----|----|----------------|---------------|--------------|---------------|--------------|-------------|----------|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | PUB_PRIV_DEBUG | PUB_USR_DEBUG | RESERVED | | | PUB_PRIV_WRITE | PUB_PRIV_READ | PUB_PRIV_EXE | PUB_USR_WRITE | PUB_USR_READ | PUB_USR_EXE | RESERVED | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|----------------------------------|------|-----------------------------------|
| 31:16 | RESERVED | Reserved | RW | See Table 14-60 . |
| 15 | PUB_PRIV_DEBUG | Public Privilege Debug Allowed | RW | See Table 14-60 . |
| 14 | PUB_USR_DEBUG | Public User Debug Allowed | RW | See Table 14-60 . |
| 13:12 | RESERVED | Reserved | RW | See Table 14-60 . |
| 11 | PUB_PRIV_WRITE | Public Privilege Write Allowed | RW | See Table 14-60 . |
| 10 | PUB_PRIV_READ | Public Privilege Read Allowed | RW | See Table 14-60 . |
| 9 | PUB_PRIV_EXE | Public Privilege Exe Allowed | RW | See Table 14-60 . |
| 8 | PUB_USR_WRITE | Public User Write Access Allowed | RW | See Table 14-60 . |
| 7 | PUB_USR_READ | Public User Read Access Allowed | RW | See Table 14-60 . |
| 6 | PUB_USR_EXE | Public User Exe Access Allowed | RW | See Table 14-60 . |
| 5:0 | RESERVED | Reserved | RW | See Table 14-60 . |

Table 14-59. Register Call Summary for Register MRM_PERMISSION_REGION_LOW_j

L3 interconnect

- [L3 Firewall Reset: \[0\] \[1\]](#)
- [L3 Firewall Functionality: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [L3 Firewall Registers Summary and Description: \[15\] \[16\] \[17\] \[18\] \[19\]](#)

Table 14-60. Reset Value for MRM_PERMISSION_REGION_LOW_j

| Region | Reset Value |
|-------------------------------------|-------------|
| Region j = 0 (except EMIF firewall) | 0xFFFF0000 |
| Region j = 0 (for EMIF firewall) | 0xFFFFFFFF |
| Region j 0 (for all firewalls) | 0xFFFFFFFF |

14.2.5.1.2 L3 Host Register Summary and Description

Table 14-61. HOST Instance Summary

| Module Name | Base Address | Size |
|----------------|--------------|------|
| CLK1_HOST_CLK1 | 0x4400 0000 | 8MB |
| CLK2_HOST_CLK2 | 0x4480 0000 | 8MB |
| CLK3_HOST_CLK3 | 0x4500 0000 | 8MB |

14.2.5.1.2.1 L3 HOST Register Summary

Table 14-62. HOST Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK1_HOST_CLK1 | CLK1_HOST_C LK1 L3 Physical Address | Address Offset for CLK2_HOST_CLK2 | CLK2_HOST_CLK2 L3 Physical Address | Address Offset for CLK3_HOST_CLK3 | CLK3_HOST_C LK3 L3 Physical Address |
|---|------|-----------------------|-----------------------------------|-------------------------------------|-----------------------------------|------------------------------------|-----------------------------------|-------------------------------------|
| L3_HOST_STDHOSHDR_COREREG | R | 32 | 0x0000 0000 | 0x4400 0000 | 0x0080 0000 | 0x4480 0000 | 0x0100 0000 | 0x4500 0000 |
| L3_HOST_STDHOSHDR_VERSIONREG | R | 32 | 0x0000 0004 | 0x4400 0004 | 0x0080 0004 | 0x4480 0004 | 0x0100 0004 | 0x4500 0004 |
| L3_HOST_STDHOSHDR_MAINCTLREG | R | 32 | 0x0000 0008 | 0x4400 0008 | 0x0080 0008 | 0x4480 0008 | 0x0100 0008 | 0x4500 0008 |
| L3_HOST_STDERRLOG_SVRTSTDLVL | RW | 32 | 0x0000 0040 | 0x4400 0040 | 0x0080 0040 | 0x4480 0040 | 0x0100 0040 | 0x4500 0040 |
| L3_HOST_STDERRLOG_SVRTCUSTOMLVL | RW | 32 | 0x0000 0044 | 0x4400 0044 | 0x0080 0044 | 0x4480 0044 | 0x0100 0044 | 0x4500 0044 |
| L3_HOST_STDERRLOG_MAIN | RW | 32 | 0x0000 0048 | 0x4400 0048 | 0x0080 0048 | 0x4480 0048 | 0x0100 0048 | 0x4500 0048 |
| L3_HOST_STDERRLOG_HDR | R | 32 | 0x0000 004C | 0x4400 004C | 0x0080 004C | 0x4480 004C | 0x0100 004C | 0x4500 004C |
| L3_HOST_STDERRLOG_MSTADDR | R | 32 | 0x0000 0050 | 0x4400 0050 | 0x0080 0050 | 0x4480 0050 | 0x0100 0050 | 0x4500 0050 |
| L3_HOST_STDERRLOG_SLVADDR | R | 32 | 0x0000 0054 | 0x4400 0054 | 0x0080 0054 | 0x4480 0054 | 0x0100 0054 | 0x4500 0054 |
| L3_HOST_STDERRLOG_INFO | R | 32 | 0x0000 0058 | 0x4400 0058 | 0x0080 0058 | 0x4480 0058 | 0x0100 0058 | 0x4500 0058 |
| L3_HOST_STDERRLOG_SLVOFSLSB | R | 32 | 0x0000 005C | 0x4400 005C | 0x0080 005C | 0x4480 005C | 0x0100 005C | 0x4500 005C |
| L3_HOST_STDERRLOG_SLVOFSMSB | R | 32 | 0x0000 0060 | 0x4400 0060 | 0x0080 0060 | 0x4480 0060 | 0x0100 0060 | 0x4500 0060 |
| L3_HOST_STDERRLOG_CUSTOMINFO_MSTA DDR | R | 32 | 0x0000 0064 | 0x4400 0064 | 0x0080 0064 | 0x4480 0064 | 0x0100 0064 | 0x4500 0064 |
| L3_HOST_STDERRLOG_CUSTOMINFO_INFO | R | 32 | 0x0000 0068 | 0x4400 0068 | 0x0080 0068 | 0x4480 0068 | 0x0100 0068 | 0x4500 0068 |
| L3_HOST_STDERRLOG_CUSTOMINFO_WR | R | 32 | 0x0000 006C | 0x4400 006C | 0x0080 006C | 0x4480 006C | 0x0100 006C | 0x4500 006C |
| L3_HOST_STDERRLOG_CUSTOMINFO_ADDR | R | 32 | 0x0000 0070 | 0x4400 0070 | 0x0080 0070 | 0x4480 0070 | 0x0100 0070 | 0x4500 0070 |
| L3_HOST_STDERRLOG_CUSTOMINFO_DECE RR | R | 32 | 0x0000 0074 | 0x4400 0074 | 0x0080 0074 | 0x4480 0074 | 0x0100 0074 | 0x4500 0074 |

14.2.5.1.2.2 L3 HOST Register Description

Table 14-63. L3_HOST_STDHOSHTHDR_COREREG

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | See Table 14-62 . | | |
| Physical Address | 0x4400 0000 0x4480 0000 0x4500 0000 | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 |
| Description | | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------------------------|
| RESERVED | | | | | | | | STDHOSTHDR_COREREG_CORECODE | | | | | | | | RESERVED | | | | | | | | | | | | | | | | STDHOSTHDR_COREREG_VENDORCODE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|--------|
| 31:22 | RESERVED | | R | 0x000 |
| 21:16 | STDHOSHTHDR_COREREG_CORECODE | The Core Code field is a constant reporting a vendor-specific core generator code. Type: Constant. Reset value: 0x1A. | R | 0x1A |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | STDHOSHTHDR_COREREG_VENDORCODE | The Vendor Code field is a constant reporting the core generator vendor code. Type: Constant. Reset value: 0x1. Read 0x0: Third-party vendor. Read 0x1: | R | 1 |

Table 14-64. Register Call Summary for Register L3_HOST_STDHOSHTHDR_COREREG

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-65. L3_HOST_STDHOSTHDR_VERSIONREG

| | | | |
|------------------|---|----------|--|
| Address Offset | See Table 14-62 . | | |
| Physical Address | 0x4400 0004 0x4480 0004 0x4500 0004 | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STDHOSTHDR_VERSIONREG_REVISIONID | | | | | | | | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--|---|------|----------|
| 31:24 | STDHOSTHDR_VERSIONREG_REVISIONID | The Revision Identifier field is a constant reporting the core generator revision number. Type: Constant. Reset value: 0x0. | R | 0x00 |
| 23:0 | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | Reserved. Type: Reserved. Reset value: Reserved. | R | 0x000000 |

Table 14-66. Register Call Summary for Register L3_HOST_STDHOSTHDR_VERSIONREG

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-67. L3_HOST_STDHOSTHDR_MAINCTLREG

| | | | |
|------------------|---|----------|--|
| Address Offset | See Table 14-62 . | | |
| Physical Address | 0x4400 0008 0x4480 0008 0x4500 0008 | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDHOSTHDR_MAINCTLREG_FLT | | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | STDHOSTHDR_MAINCTLREG_FLT | Asserted when a Fault condition is detected: if the unit includes Error Logging, Flt is asserted when the FltCnt register field indicates a Fault, and deasserted when FltCnt is reset. If no Error Logging is implemented, this bit becomes unit-dependent. In all cases, Flt bit and Flt pin (service network) have the same logical level. Type: Status. Reset value: X. | R | 0 |
| 1:0 | RESERVED | | R | 0x0 |

Table 14-68. Register Call Summary for Register L3_HOST_STDHOSTHDR_MAINCTLREG

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-69. L3_HOST_STDERRLOG_SVRTSTDVLVL

| | | | |
|-------------------------|-----------------------------------|-----------------|----------------|
| Address Offset | See Table 14-62 . | | |
| Physical Address | 0x4400 0040 | Instance | CLK1_HOST_CLK1 |
| | 0x4480 0040 | | CLK2_HOST_CLK2 |
| | 0x4500 0040 | | CLK3_HOST_CLK3 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | STDERRLOG_SVRTSTDVLVL_0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | STDERRLOG_SVRTSTDLVL_0 | Severity level parameters Type: Control. Reset value: 0x0. 0x0: Error logging is disabled. 0x1: Errors are logged with severity level Error. 0x2: Errors are logged with severity level Fault. | RW | 0x0 |

Table 14-70. Register Call Summary for Register L3_HOST_STDERRLOG_SVRTSTDLVL

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-71. L3_HOST_STDERRLOG_SVRTCUSTOMLVL

| | | | | |
|------------------|---|--|----------|----------------|
| Address Offset | See Table 14-62 . | | Instance | CLK1_HOST_CLK1 |
| Physical Address | 0x4400 0044 0x4480 0044 0x4500 0044 | | | CLK2_HOST_CLK2 |
| | | | | CLK3_HOST_CLK3 |
| Description | | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_SVRTCUSTOMLVL_0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | STDERRLOG_SVRTCUSTOMLVL_0 | Severity level parameters Type: Control. Reset value: 0x0. 0x0: Error logging is disabled. 0x1: Errors are logged with severity level Error. 0x2: Errors are logged with severity level Fault. | RW | 0x0 |

Table 14-72. Register Call Summary for Register L3_HOST_STDERRLOG_SVRTCUSTOMLVL

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-73. L3_HOST_STDERRLOG_MAIN

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | See Table 14-62 . | | |
| Physical Address | 0x4400 0048 0x4480 0048 0x4500 0048 | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 |
| Description | | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------|----------|----|----|----|----|----|----|----|----|----|----|----|-----------------------|-----------------------|----------|----|----|----|----|----|----|---|---|---|---|---|------------------------|--------------------------|---|---|---|
| STDERRLOG_MAIN_CLRLOG | RESERVED | | | | | | | | | | | | STDERRLOG_MAIN_FLTCNT | STDERRLOG_MAIN_ERRCNT | RESERVED | | | | | | | | | | | | STDERRLOG_MAIN_ERRTYPE | STDERRLOG MAIN ERRLOGVLD | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|--------|
| 31 | STDERRLOG_MAIN_CLRLOG | Clears Error Logging Valid bit when written to 1. Type: Give_AutoCleared. Reset value: 0x0. | RW | 0 |
| 30:20 | RESERVED | | R | 0x000 |
| 19 | STDERRLOG_MAIN_FLTCNT | Asserted when at least one error with severity level FAULT is detected. Reset when written to 1. Type: Take. Reset value: 0x0. | RW | 0 |
| 18 | STDERRLOG_MAIN_ERRCNT | Asserted when at least one error with severity level ERROR is detected. Reset when written to 1. Type: Take. Reset value: 0x0. | RW | 0 |
| 17:2 | RESERVED | | R | 0x0000 |
| 1 | STDERRLOG_MAIN_ERRTYPE | Indicates logging type. Type: Status. Reset value: X. Read 0x0: Logged Error format is standard (header and necker recorded). Read 0x1: Logged Error format is module dependent. CustomInfo register(s) may be implemented to store additional information. | R | 0 |
| 0 | STDERRLOG_MAIN_ERRLOGVLD | Error Logging Valid. Asserted when logging information is valid(indicates that an error has been logged). Type: Status. Reset value: X. | R | 0 |

Table 14-74. Register Call Summary for Register L3_HOST_STDERRLOG_MAIN

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-75. L3_HOST_STDERRLOG_HDR

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | See Table 14-62 . | | |
| Physical Address | 0x4400 004C 0x4480 004C 0x4500 004C | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 |
| Description | | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|----|----|----|----|--------------------|----|----|----|----------|----|----|----|----------------------------|----|----|----|-------------------|----|----------|---|---|---|------------------------|---|----------|---|----------------------|---|--|--|
| RESERVED | | | | | | | | STDERRLOG_HDR_LEN1 | | | | RESERVED | | | | STDERRLOG_HDR_STOPOFSWRPSZ | | | | STDERRLOG_HDR_ERR | | RESERVED | | | | STDERRLOG_HDR_PRESSURE | | RESERVED | | STDERRLOG_HDR_OPCODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|---|------|-------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:18 | STDERRLOG_HDR_LEN1 | This field contains the number of payload cell(s) minus one of the logged packet. Type: Status. Reset value: X. | R | 0x00 |
| 17:16 | RESERVED | | R | 0x0 |
| 15:12 | STDERRLOG_HDR_STOPOFSWRPSZ | StopOfs or WrapSize field of the logged packet (meaning depends on Wrp bit of logged opcode). Type: Status. Reset value: X. | R | 0x0 |
| 11 | STDERRLOG_HDR_ERR | Err bit of the logged packet. Type: Status. Reset value: X. | R | 0 |
| 10:7 | RESERVED | | R | 0x0 |
| 6 | STDERRLOG_HDR_PRESSURE | Pressure field of the logged packet. Type: Status. Reset value: X. | R | 0 |
| 5:4 | RESERVED | | R | 0x0 |
| 3:0 | STDERRLOG_HDR_OPCODE | Opcode of the logged packet. Type: Status. Reset value: X. | R | 0x0 |

Table 14-76. Register Call Summary for Register L3_HOST_STDERRLOG_HDR

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-77. L3_HOST_STDERRLOG_MSTADDR

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | See Table 14-62 . | | |
| Physical Address | 0x4400 0050 0x4480 0050 0x4500 0050 | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_MSTADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-----------|
| 31:10 | RESERVED | | R | 0x0000000 |
| 9:0 | STDERRLOG_MSTADDR | Master Address field of the logged packet. Type: Status. Reset value: X. | R | 0x00 |

Table 14-78. Register Call Summary for Register L3_HOST_STDERRLOG_MSTADDR

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-79. L3_HOST_STDERRLOG_SLVADDR

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | See Table 14-62 . | | |
| Physical Address | 0x4400 0054 0x4480 0054 0x4500 0054 | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_SLVADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|------------|
| 31:5 | RESERVED | | R | 0x00000000 |
| 4:0 | STDERRLOG_SLVADDR | Slave Address field of the logged packet. Type: Status. Reset value: X. | R | 0x00 |

Table 14-80. Register Call Summary for Register L3_HOST_STDERRLOG_SLVADDR

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-81. L3_HOST_STDERRLOG_INFO

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|--|----|----|----|---|------|----------------|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------|--|--|--|--|--|--|--|
| Address Offset | See Table 14-62. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4400 0058 0x4480 0058 0x4500 0058 | | | | | | | | | | | | | | | | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="24">RESERVED</td><td colspan="8">STDERRLOG_INFO</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | STDERRLOG_INFO | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | STDERRLOG_INFO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:8 | RESERVED | | | | | | | | | | | | | | | | | | | | | | R | 0x000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7:0 | STDERRLOG_INFO | | Info field of the logged packet. Type: Status. Reset value: X. | | | | | | | | | | | | | | | | | | | | R | 0x00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-82. Register Call Summary for Register L3_HOST_STDERRLOG_INFO

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-83. L3_HOST_STDERRLOG_SLVOFSLSB

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|--|----|----|----|------|---|-------------|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | See Table 14-62. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4400 005C 0x4480 005C 0x4500 005C | | | | | | | | | | | | | | | | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="32">STDERRLOG_SLVOFSLSB</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | STDERRLOG_SLVOFSLSB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| STDERRLOG_SLVOFSLSB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:0 | STDERRLOG_SLVOFSLSB | | LSB of the slave offset field, concatenated with start offset field of the logged packet. Type: Status. Reset value: X. | | | | | | | | | | | | | | | | | | | R | | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-84. Register Call Summary for Register L3_HOST_STDERRLOG_SLVOFSLSB

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-85. L3_HOST_STDERRLOG_SLVOFSMSB

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | See Table 14-62 . | | |
| Physical Address | 0x4400 0060 0x4480 0060 0x4500 0060 | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_SLVOFSMSB | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | STDERRLOG_SLVOFSMSB | MSB of the slave offset field of the logged packet (according to NTP packet format, this register field may exceed the actual slave offset size. Unused bits are stuck at 0, if any). Type: Status. Reset value: X. | R | 0 |

Table 14-86. Register Call Summary for Register L3_HOST_STDERRLOG_SLVOFSMSB

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-87. L3_HOST_STDERRLOG_CUSTOMINFO_MSTADDR

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | See Table 14-62 . | | |
| Physical Address | 0x4400 0064 0x4480 0064 0x4500 0064 | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_CUSTOMINFO_MSTADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|-------------------------------|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 9:0 | STDERRLOG_CUSTOMINFO_MSTADDR | Type: Status. Reset value: X. | R | 0x00 |

Table 14-88. Register Call Summary for Register L3_HOST_STDERRLOG_CUSTOMINFO_MSTADDR

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-89. L3_HOST_STDERRLOG_CUSTOMINFO_INFO

| | | | | |
|-------------------------|---|--|-----------------|--|
| Address Offset | See Table 14-62 . | | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 |
| Physical Address | 0x4400 0068 0x4480 0068 0x4500 0068 | | | |
| Description | | | | |
| Type | R | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_CUSTOMINFO_INFO | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------|-------------------------------|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | STDERRLOG_CUSTOMINFO_I NFO | Type: Status. Reset value: X. | R | 0x00 |

Table 14-90. Register Call Summary for Register L3_HOST_STDERRLOG_CUSTOMINFO_INFO

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-91. L3_HOST_STDERRLOG_CUSTOMINFO_WR

| | | | | |
|-------------------------|---|--|-----------------|--|
| Address Offset | See Table 14-62. | | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 |
| Physical Address | 0x4400 006C 0x4480 006C 0x4500 006C | | | |
| Description | | | | |
| Type | R | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_CUSTOMINFO_WR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|-------------------------------|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | STDERRLOG_CUSTOMINFO_WR | Type: Status. Reset value: X. | R | 0 |

Table 14-92. Register Call Summary for Register L3_HOST_STDERRLOG_CUSTOMINFO_WR

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-93. L3_HOST_STDERRLOG_CUSTOMINFO_ADDR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | See Table 14-62. | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 | | | | | | | | | | | | | | | |
| Physical Address | 0x4400 0070 0x4480 0070 0x4500 0070 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|---------------------------|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | STDERRLOG_CUSTOMINFO_ADDR | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|--------------------------------------|------|----------|
| 31:21 | RESERVED | | R | 0x000 |
| 20:0 | STDERRLOG_CUSTOMINFO_A | Type: Status. Reset value: X. DDR | R | 0x000000 |

Table 14-94. Register Call Summary for Register L3_HOST_STDERRLOG_CUSTOMINFO_ADDR

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

Table 14-95. L3_HOST_STDERRLOG_CUSTOMINFO_DECERR

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | See Table 14-62 . | | |
| Physical Address | 0x4400 0074 0x4480 0074 0x4500 0074 | Instance | CLK1_HOST_CLK1 CLK2_HOST_CLK2 CLK3_HOST_CLK3 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|-------------------------------|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | STDERRLOG_CUSTOMINFO_DECERR | Type: Status. Reset value: X. | R | 0 |

Table 14-96. Register Call Summary for Register L3_HOST_STDERRLOG_CUSTOMINFO_DECERR

L3 interconnect

- [L3 Host Register Summary and Description: \[0\]](#)

14.2.5.1.3 L3 TARG Register Summary and Description

Table 14-97. TARG Instance Summary

| Module Name | Base Address | Size |
|--------------------|--------------|------|
| CLK1_DMM1_TARG | 0x4400 0100 | 4KB |
| CLK1_DMM2_TARG | 0x4400 0200 | 4KB |
| CLK1_ABE_TARG | 0x4400 0300 | 4KB |
| CLK1_L4CFG_TARG | 0x4400 0400 | 4KB |
| CLK2_GPMC_TARG | 0x4480 0100 | 4KB |
| CLK2_OCMRAM_TARG | 0x4480 0200 | 4KB |
| CLK2_DSS_TARG | 0x4480 0300 | 4KB |
| CLK2_ISS_TARG | 0x4480 0400 | 4KB |
| CLK2_CORTEXM3_TARG | 0x4480 0500 | 4KB |
| CLK2_SGX_TARG | 0x4480 0600 | 4KB |
| CLK2_IVAHD_TARG | 0x4480 0700 | 4KB |
| CLK2_SL2_TARG | 0x4480 0800 | 4KB |
| CLK2_L4PER0_TARG | 0x4480 0900 | 4KB |
| CLK2_L4PER1_TARG | 0x4480 0A00 | 4KB |

Table 14-97. TARG Instance Summary (continued)

| Module Name | Base Address | Size |
|------------------|--------------|------|
| CLK2_L4PER2_TARG | 0x4480 0B00 | 4KB |
| CLK2_L4PER3_TARG | 0x4480 0C00 | 4KB |
| CLK2_C2C_TARG | 0x4480 1600 | 4KB |
| CLK2_BB2D_TARG | 0x4480 1900 | 4KB |
| CLK3_L4EMU_TARG | 0x4500 0100 | 4KB |

14.2.5.1.3.1 L3 TARG Registers Summary

Table 14-98. TARG Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK1_DMM1 | CLK1_DMM1_TARG L3 Physical Address | Address Offset for CLK1_DMM2 | CLK1_DMM2_TARG L3 Physical Address | Address Offset for CLK1_ABE | CLK1_ABE_TARG L3 Physical Address |
|---|------|-----------------------|------------------------------|------------------------------------|------------------------------|------------------------------------|-----------------------------|-----------------------------------|
| L3_TARG_STDHOSTHDR_COREREG | R | 32 | 0x0000 0100 | 0x4400 0100 | 0x0000 0200 | 0x4400 0200 | 0x0000 0300 | 0x4400 0300 |
| L3_TARG_STDHOSTHDR_VERSIONREG | R | 32 | 0x0000 0104 | 0x4400 0104 | 0x0000 0204 | 0x4400 0204 | 0x0000 0304 | 0x4400 0304 |
| L3_TARG_STDHOSTHDR_MAINCTLREG | RW | 32 | 0x0000 0108 | 0x4400 0108 | 0x0000 0208 | 0x4400 0208 | 0x0000 0308 | 0x4400 0308 |
| L3_TARG_STDHOSTHDR_NTPPADDR_0 | R | 32 | 0x0000 0110 | 0x4400 0110 | 0x0000 0210 | 0x4400 0210 | 0x0000 0310 | 0x4400 0310 |
| L3_TARG_STDERRLOG_SVRTSTDLVL | RW | 32 | 0x0000 0140 | 0x4400 0140 | 0x0000 0240 | 0x4400 0240 | 0x0000 0340 | 0x4400 0340 |
| L3_TARG_STDERRLOG_SVRTCUSTOMLVL | RW | 32 | 0x0000 0144 | 0x4400 0144 | 0x0000 0244 | 0x4400 0244 | 0x0000 0344 | 0x4400 0344 |
| L3_TARG_STDERRLOG_MAIN | RW | 32 | 0x0000 0148 | 0x4400 0148 | 0x0000 0248 | 0x4400 0248 | 0x0000 0348 | 0x4400 0348 |
| L3_TARG_STDERRLOG_HDR | R | 32 | 0x0000 014C | 0x4400 014C | 0x0000 024C | 0x4400 024C | 0x0000 034C | 0x4400 034C |
| L3_TARG_STDERRLOG_MSTADDR | R | 32 | 0x0000 0150 | 0x4400 0150 | 0x0000 0250 | 0x4400 0250 | 0x0000 0350 | 0x4400 0350 |
| L3_TARG_STDERRLOG_SLVADDR | R | 32 | 0x0000 0154 | 0x4400 0154 | 0x0000 0254 | 0x4400 0254 | 0x0000 0354 | 0x4400 0354 |
| L3_TARG_STDERRLOG_INFO | R | 32 | 0x0000 0158 | 0x4400 0158 | 0x0000 0258 | 0x4400 0258 | 0x0000 0358 | 0x4400 0358 |
| L3_TARG_STDERRLOG_SLVOFSLSB | R | 32 | 0x0000 015C | 0x4400 015C | 0x0000 025C | 0x4400 025C | 0x0000 035C | 0x4400 035C |
| L3_TARG_STDERRLOG_SLVOFSMSB | R | 32 | 0x0000 0160 | 0x4400 0160 | 0x0000 0260 | 0x4400 0260 | 0x0000 0360 | 0x4400 0360 |
| L3_TARG_STDERRLOG_CUSTOMINFO_INFO | R | 32 | 0x0000 0164 | 0x4400 0164 | 0x0000 0264 | 0x4400 0264 | 0x0000 0364 | 0x4400 0364 |
| L3_TARG_STDERRLOG_CUSTOMINFO_MST ADDR | R | 32 | 0x0000 0168 | 0x4400 0168 | 0x0000 0268 | 0x4400 0268 | 0x0000 0368 | 0x4400 0368 |
| L3_TARG_STDERRLOG_CUSTOMINFO_OPC ODE | R | 32 | 0x0000 016C | 0x4400 016C | 0x0000 026C | 0x4400 026C | 0x0000 036C | 0x4400 036C |
| L3_TARG_ADDRSPACESIZELOG | RW | 32 | 0x0000 0180 | 0x4400 0180 | 0x0000 0280 | 0x4400 0280 | 0x0000 0380 | 0x4400 0380 |

Table 14-99. TARG Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK1_L4CFG | CLK1_L4CFG_TARG L3 Physical Address | Address Offset for CLK2_GPMC | CLK2_GPMC_TARG L3 Physical Address | Address Offset for CLK2_OCMRAM | CLK2_OCMRAM_TARG L3 Physical Address |
|---|------|-----------------------|-------------------------------|-------------------------------------|------------------------------|------------------------------------|--------------------------------|--------------------------------------|
| L3_TARG_STDHOSTHDR_COREREG | R | 32 | 0x0000 0400 | 0x4400 0400 | 0x0080 0100 | 0x4480 0100 | 0x0080 0200 | 0x4480 0200 |
| L3_TARG_STDHOSTHDR_VERSIONREG | R | 32 | 0x0000 0404 | 0x4400 0404 | 0x0080 0104 | 0x4480 0104 | 0x0080 0204 | 0x4480 0204 |
| L3_TARG_STDHOSTHDR_MAINCTLREG | RW | 32 | 0x0000 0408 | 0x4400 0408 | 0x0080 0108 | 0x4480 0108 | 0x0080 0208 | 0x4480 0208 |
| L3_TARG_STDHOSTHDR_NTPPADDR_0 | R | 32 | 0x0000 0410 | 0x4400 0410 | 0x0080 0110 | 0x4480 0110 | 0x0080 0210 | 0x4480 0210 |
| L3_TARG_STDERRLOG_SVRTSTDLVL | RW | 32 | 0x0000 0440 | 0x4400 0440 | 0x0080 0140 | 0x4480 0140 | 0x0080 0240 | 0x4480 0240 |
| L3_TARG_STDERRLOG_SVRTCUSTOMLVL | RW | 32 | 0x0000 0444 | 0x4400 0444 | 0x0080 0144 | 0x4480 0144 | 0x0080 0244 | 0x4480 0244 |

Table 14-99. TARG Registers Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset for CLK1_L4CFG | CLK1_L4CFG_TARG L3 Physical Address | Address Offset for CLK2_GPMC | CLK2_GPMC_TARG L3 Physical Address | Address Offset for CLK2_OCMRAM | CLK2_OCMRAM_TARG L3 Physical Address |
|--|------|-----------------------|-------------------------------|-------------------------------------|------------------------------|------------------------------------|--------------------------------|--------------------------------------|
| L3_TARG_STDERRLOG_MAIN | RW | 32 | 0x0000 0448 | 0x4400 0448 | 0x0080 0148 | 0x4480 0148 | 0x0080 0248 | 0x4480 0248 |
| L3_TARG_STDERRLOG_HDR | R | 32 | 0x0000 044C | 0x4400 044C | 0x0080 014C | 0x4480 014C | 0x0080 024C | 0x4480 024C |
| L3_TARG_STDERRLOG_MSTADDR | R | 32 | 0x0000 0450 | 0x4400 0450 | 0x0080 0150 | 0x4480 0150 | 0x0080 0250 | 0x4480 0250 |
| L3_TARG_STDERRLOG_SLVADDR | R | 32 | 0x0000 0454 | 0x4400 0454 | 0x0080 0154 | 0x4480 0154 | 0x0080 0254 | 0x4480 0254 |
| L3_TARG_STDERRLOG_INFO | R | 32 | 0x0000 0458 | 0x4400 0458 | 0x0080 0158 | 0x4480 0158 | 0x0080 0258 | 0x4480 0258 |
| L3_TARG_STDERRLOG_SLVOFSLSB | R | 32 | 0x0000 045C | 0x4400 045C | 0x0080 015C | 0x4480 015C | 0x0080 025C | 0x4480 025C |
| L3_TARG_STDERRLOG_SLVOFSMSB | R | 32 | 0x0000 0460 | 0x4400 0460 | 0x0080 0160 | 0x4480 0160 | 0x0080 0260 | 0x4480 0260 |
| L3_TARG_STDERRLOG_CUSTOMINFO_INFO | R | 32 | 0x0000 0464 | 0x4400 0464 | 0x0080 0164 | 0x4480 0164 | 0x0080 0264 | 0x4480 0264 |
| L3_TARG_STDERRLOG_CUSTOMINFO_MSTADDR | R | 32 | 0x0000 0468 | 0x4400 0468 | 0x0080 0168 | 0x4480 0168 | 0x0080 0268 | 0x4480 0268 |
| L3_TARG_STDERRLOG_CUSTOMINFO_OPCODE | R | 32 | 0x0000 046C | 0x4400 046C | 0x0080 016C | 0x4480 016C | 0x0080 026C | 0x4480 026C |
| L3_TARG_ADDRSPACESIZELOG | RW | 32 | 0x0000 0480 | 0x4400 0480 | 0x0080 0180 | 0x4480 0180 | 0x0080 0280 | 0x4480 0280 |

Table 14-100. TARG Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK2_DSS | CLK2_DSS_TARG L3 Physical Address | Address Offset for CLK2_ISS | CLK2_ISS_TARG L3 Physical Address | Address Offset for CLK2_CORTEXM3 | CLK2_CORTEXM3_TARG L3 Physical Address |
|---|------|-----------------------|-----------------------------|-----------------------------------|-----------------------------|-----------------------------------|----------------------------------|--|
| L3_TARG_STDHOSTHDR_COREREG | R | 32 | 0x0080 0300 | 0x4480 0300 | 0x0080 0400 | 0x4480 0400 | 0x0080 0500 | 0x4480 0500 |
| L3_TARG_STDHOSTHDR_VERSIONREG | R | 32 | 0x0080 0304 | 0x4480 0304 | 0x0080 0404 | 0x4480 0404 | 0x0080 0504 | 0x4480 0504 |
| L3_TARG_STDHOSTHDR_MAINCTLREG | RW | 32 | 0x0080 0308 | 0x4480 0308 | 0x0080 0408 | 0x4480 0408 | 0x0080 0508 | 0x4480 0508 |
| L3_TARG_STDHOSTHDR_NTTPADDR_0 | R | 32 | 0x0080 0310 | 0x4480 0310 | 0x0080 0410 | 0x4480 0410 | 0x0080 0510 | 0x4480 0510 |
| L3_TARG_STDERRLOG_SVRTSTDLVL | RW | 32 | 0x0080 0340 | 0x4480 0340 | 0x0080 0440 | 0x4480 0440 | 0x0080 0540 | 0x4480 0540 |
| L3_TARG_STDERRLOG_SVRTCUSTOMLVL | RW | 32 | 0x0080 0344 | 0x4480 0344 | 0x0080 0444 | 0x4480 0444 | 0x0080 0544 | 0x4480 0544 |
| L3_TARG_STDERRLOG_MAIN | RW | 32 | 0x0080 0348 | 0x4480 0348 | 0x0080 0448 | 0x4480 0448 | 0x0080 0548 | 0x4480 0548 |
| L3_TARG_STDERRLOG_HDR | R | 32 | 0x0080 034C | 0x4480 034C | 0x0080 044C | 0x4480 044C | 0x0080 054C | 0x4480 054C |
| L3_TARG_STDERRLOG_MSTADDR | R | 32 | 0x0080 0350 | 0x4480 0350 | 0x0080 0450 | 0x4480 0450 | 0x0080 0550 | 0x4480 0550 |
| L3_TARG_STDERRLOG_SLVADDR | R | 32 | 0x0080 0354 | 0x4480 0354 | 0x0080 0454 | 0x4480 0454 | 0x0080 0554 | 0x4480 0554 |
| L3_TARG_STDERRLOG_INFO | R | 32 | 0x0080 0358 | 0x4480 0358 | 0x0080 0458 | 0x4480 0458 | 0x0080 0558 | 0x4480 0558 |
| L3_TARG_STDERRLOG_SLVOFSLSB | R | 32 | 0x0080 035C | 0x4480 035C | 0x0080 045C | 0x4480 045C | 0x0080 055C | 0x4480 055C |
| L3_TARG_STDERRLOG_SLVOFSMSB | R | 32 | 0x0080 0360 | 0x4480 0360 | 0x0080 0460 | 0x4480 0460 | 0x0080 0560 | 0x4480 0560 |
| L3_TARG_STDERRLOG_CUSTOMINFO_INFO | R | 32 | 0x0080 0364 | 0x4480 0364 | 0x0080 0464 | 0x4480 0464 | 0x0080 0564 | 0x4480 0564 |

Table 14-100. TARG Registers Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset for CLK2_DSS | CLK2_DSS_T ARG L3 Physical Address | Address Offset for CLK2_ISS | CLK2_ISS_TA RG L3 Physical Address | Address Offset for CLK2_CORTEXM3 | CLK2_CORTEX M3_TARG L3 Physical Address |
|---|------|-----------------------|-----------------------------|------------------------------------|-----------------------------|------------------------------------|----------------------------------|---|
| L3_TARG_STDERRLOG_CUSTOMINFO_MSTA DDR | R | 32 | 0x0080 0368 | 0x4480 0368 | 0x0080 0468 | 0x4480 0468 | 0x0080 0568 | 0x4480 0568 |
| L3_TARG_STDERRLOG_CUSTOMINFO_OPCODE | R | 32 | 0x0080 036C | 0x4480 036C | 0x0080 046C | 0x4480 046C | 0x0080 056C | 0x4480 056C |
| L3_TARG_ADDRSPACESIZELOG | RW | 32 | 0x0080 0380 | 0x4480 0380 | 0x0080 0480 | 0x4480 0480 | 0x0080 0580 | 0x4480 0580 |

Table 14-101. TARG Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK2_SGX | CLK2_SGX_T ARG L3 Physical Address | Address Offset for CLK2_IVAHD | CLK2_IVAHD_T ARG L3 Physical Address | Address Offset for CLK2_SL2 | CLK2_SL2_T ARG L3 Physical Address |
|---|------|-----------------------|-----------------------------|------------------------------------|-------------------------------|--------------------------------------|-----------------------------|------------------------------------|
| L3_TARG_STDHOSTHDR_COREREG | R | 32 | 0x0080 0600 | 0x4480 0600 | 0x0080 0700 | 0x4480 0700 | 0x0080 0800 | 0x4480 0800 |
| L3_TARG_STDHOSTHDR_VERSIONREG | R | 32 | 0x0080 0604 | 0x4480 0604 | 0x0080 0704 | 0x4480 0704 | 0x0080 0804 | 0x4480 0804 |
| L3_TARG_STDHOSTHDR_MAINCTLREG | RW | 32 | 0x0080 0608 | 0x4480 0608 | 0x0080 0708 | 0x4480 0708 | 0x0080 0808 | 0x4480 0808 |
| L3_TARG_STDHOSTHDR_NTTPADDR_0 | R | 32 | 0x0080 0610 | 0x4480 0610 | 0x0080 0710 | 0x4480 0710 | 0x0080 0810 | 0x4480 0810 |
| L3_TARG_STDERRLOG_SVRTSTDLVL | RW | 32 | 0x0080 0640 | 0x4480 0640 | 0x0080 0740 | 0x4480 0740 | 0x0080 0840 | 0x4480 0840 |
| L3_TARG_STDERRLOG_SVRTCUSTOMLVL | RW | 32 | 0x0080 0644 | 0x4480 0644 | 0x0080 0744 | 0x4480 0744 | 0x0080 0844 | 0x4480 0844 |
| L3_TARG_STDERRLOG_MAIN | RW | 32 | 0x0080 0648 | 0x4480 0648 | 0x0080 0748 | 0x4480 0748 | 0x0080 0848 | 0x4480 0848 |
| L3_TARG_STDERRLOG_HDR | R | 32 | 0x0080 064C | 0x4480 064C | 0x0080 074C | 0x4480 074C | 0x0080 084C | 0x4480 084C |
| L3_TARG_STDERRLOG_MSTADDR | R | 32 | 0x0080 0650 | 0x4480 0650 | 0x0080 0750 | 0x4480 0750 | 0x0080 0850 | 0x4480 0850 |
| L3_TARG_STDERRLOG_SLVADDR | R | 32 | 0x0080 0654 | 0x4480 0654 | 0x0080 0754 | 0x4480 0754 | 0x0080 0854 | 0x4480 0854 |
| L3_TARG_STDERRLOG_INFO | R | 32 | 0x0080 0658 | 0x4480 0658 | 0x0080 0758 | 0x4480 0758 | 0x0080 0858 | 0x4480 0858 |
| L3_TARG_STDERRLOG_SLVOFSLSB | R | 32 | 0x0080 065C | 0x4480 065C | 0x0080 075C | 0x4480 075C | 0x0080 085C | 0x4480 085C |
| L3_TARG_STDERRLOG_SLVOFSMSB | R | 32 | 0x0080 0660 | 0x4480 0660 | 0x0080 0760 | 0x4480 0760 | 0x0080 0860 | 0x4480 0860 |
| L3_TARG_STDERRLOG_CUSTOMINFO_INFO | R | 32 | 0x0080 0664 | 0x4480 0664 | 0x0080 0764 | 0x4480 0764 | 0x0080 0864 | 0x4480 0864 |
| L3_TARG_STDERRLOG_CUSTOMINFO_MSTA DDR | R | 32 | 0x0080 0668 | 0x4480 0668 | 0x0080 0768 | 0x4480 0768 | 0x0080 0868 | 0x4480 0868 |
| L3_TARG_STDERRLOG_CUSTOMINFO_OPCODE | R | 32 | 0x0080 066C | 0x4480 066C | 0x0080 076C | 0x4480 076C | 0x0080 086C | 0x4480 086C |
| L3_TARG_ADDRSPACESIZELOG | RW | 32 | 0x0080 0680 | 0x4480 0680 | 0x0080 0780 | 0x4480 0780 | 0x0080 0880 | 0x4480 0880 |

Table 14-102. TARG Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK2_L4PER0 | CLK2_L4PER0_TARG L3 Physical Address | Address Offset for CLK2_L4PER1 | CLK2_L4PER1_TARG L3 Physical Address | Address Offset for CLK2_L4PER2 | CLK2_L4PER2_TARG L3 Physical Address |
|---|------|-----------------------|--------------------------------|--------------------------------------|--------------------------------|--------------------------------------|--------------------------------|--------------------------------------|
| L3_TARG_STDHOSTHDR_COREREG | R | 32 | 0x0080 0900 | 0x4480 0900 | 0x0080 0A00 | 0x4480 0A00 | 0x0080 0B00 | 0x4480 0B00 |
| L3_TARG_STDHOSTHDR_VERSIONREG | R | 32 | 0x0080 0904 | 0x4480 0904 | 0x0080 0A04 | 0x4480 0A04 | 0x0080 0B04 | 0x4480 0B04 |
| L3_TARG_STDHOSTHDR_MAINCTLREG | RW | 32 | 0x0080 0908 | 0x4480 0908 | 0x0080 0A08 | 0x4480 0A08 | 0x0080 0B08 | 0x4480 0B08 |
| L3_TARG_STDHOSTHDR_NTTPADDR_0 | R | 32 | 0x0080 0910 | 0x4480 0910 | 0x0080 0A10 | 0x4480 0A10 | 0x0080 0B10 | 0x4480 0B10 |
| L3_TARG_STDERRLOG_SVRTSTDLVL | RW | 32 | 0x0080 0940 | 0x4480 0940 | 0x0080 0A40 | 0x4480 0A40 | 0x0080 0B40 | 0x4480 0B40 |
| L3_TARG_STDERRLOG_SVRTCUSTOMLVL | RW | 32 | 0x0080 0944 | 0x4480 0944 | 0x0080 0A44 | 0x4480 0A44 | 0x0080 0B44 | 0x4480 0B44 |
| L3_TARG_STDERRLOG_MAIN | RW | 32 | 0x0080 0948 | 0x4480 0948 | 0x0080 0A48 | 0x4480 0A48 | 0x0080 0B48 | 0x4480 0B48 |
| L3_TARG_STDERRLOG_HDR | R | 32 | 0x0080 094C | 0x4480 094C | 0x0080 0A4C | 0x4480 0A4C | 0x0080 0B4C | 0x4480 0B4C |
| L3_TARG_STDERRLOG_MSTADDR | R | 32 | 0x0080 0950 | 0x4480 0950 | 0x0080 0A50 | 0x4480 0A50 | 0x0080 0B50 | 0x4480 0B50 |
| L3_TARG_STDERRLOG_SLVADDR | R | 32 | 0x0080 0954 | 0x4480 0954 | 0x0080 0A54 | 0x4480 0A54 | 0x0080 0B54 | 0x4480 0B54 |
| L3_TARG_STDERRLOG_INFO | R | 32 | 0x0080 0958 | 0x4480 0958 | 0x0080 0A58 | 0x4480 0A58 | 0x0080 0B58 | 0x4480 0B58 |
| L3_TARG_STDERRLOG_SLVOFSLSB | R | 32 | 0x0080 095C | 0x4480 095C | 0x0080 0A5C | 0x4480 0A5C | 0x0080 0B5C | 0x4480 0B5C |
| L3_TARG_STDERRLOG_SLVOFSMSB | R | 32 | 0x0080 0960 | 0x4480 0960 | 0x0080 0A60 | 0x4480 0A60 | 0x0080 0B60 | 0x4480 0B60 |
| L3_TARG_STDERRLOG_CUSTOMINFO_INFO | R | 32 | 0x0080 0964 | 0x4480 0964 | 0x0080 0A64 | 0x4480 0A64 | 0x0080 0B64 | 0x4480 0B64 |
| L3_TARG_STDERRLOG_CUSTOMINFO_MSTA DDR | R | 32 | 0x0080 0968 | 0x4480 0968 | 0x0080 0A68 | 0x4480 0A68 | 0x0080 0B68 | 0x4480 0B68 |
| L3_TARG_STDERRLOG_CUSTOMINFO_OPCO DE | R | 32 | 0x0080 096C | 0x4480 096C | 0x0080 0A6C | 0x4480 0A6C | 0x0080 0B6C | 0x4480 0B6C |
| L3_TARG_ADDRSPACESIZELOG | RW | 32 | 0x0080 0980 | 0x4480 0980 | 0x0080 0A80 | 0x4480 0A80 | 0x0080 0B80 | 0x4480 0B80 |

Table 14-103. TARG Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK2_L4PER3 | CLK2_L4PER3_TARG L3 Physical Address |
|---|------|-----------------------|--------------------------------|--------------------------------------|
| L3_TARG_STDHOSTHDR_COREREG | R | 32 | 0x0080 0C00 | 0x4480 0C00 |
| L3_TARG_STDHOSTHDR_VERSIONREG | R | 32 | 0x0080 0C04 | 0x4480 0C04 |
| L3_TARG_STDHOSTHDR_MAINCTLREG | RW | 32 | 0x0080 0C08 | 0x4480 0C08 |
| L3_TARG_STDHOSTHDR_NTTPADDR_0 | R | 32 | 0x0080 0C10 | 0x4480 0C10 |
| L3_TARG_STDERRLOG_SVRTSTDLVL | RW | 32 | 0x0080 0C40 | 0x4480 0C40 |
| L3_TARG_STDERRLOG_SVRTCUSTOMLVL | RW | 32 | 0x0080 0C44 | 0x4480 0C44 |
| L3_TARG_STDERRLOG_MAIN | RW | 32 | 0x0080 0C48 | 0x4480 0C48 |
| L3_TARG_STDERRLOG_HDR | R | 32 | 0x0080 0C4C | 0x4480 0C4C |
| L3_TARG_STDERRLOG_MSTADDR | R | 32 | 0x0080 0C50 | 0x4480 0C50 |
| L3_TARG_STDERRLOG_SLVADDR | R | 32 | 0x0080 0C54 | 0x4480 0C54 |

Table 14-103. TARG Registers Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset for CLK2_L4PER3 | CLK2_L4PER3_TARG L3 Physical Address |
|--|------|-----------------------|--------------------------------|--------------------------------------|
| L3_TARG_STDERRLOG_INFO | R | 32 | 0x0080 0C58 | 0x4480 0C58 |
| L3_TARG_STDERRLOG_SLVOFSLSB | R | 32 | 0x0080 0C5C | 0x4480 0C5C |
| L3_TARG_STDERRLOG_SLVOFSMSB | R | 32 | 0x0080 0C60 | 0x4480 0C60 |
| L3_TARG_STDERRLOG_CUSTOMINFO_INFO | R | 32 | 0x0080 0C64 | 0x4480 0C64 |
| L3_TARG_STDERRLOG_CUSTOMINFO_MSTADDR | R | 32 | 0x0080 0C68 | 0x4480 0C68 |
| L3_TARG_STDERRLOG_CUSTOMINFO_OPCODE | R | 32 | 0x0080 0C6C | 0x4480 0C6C |
| L3_TARG_ADDRSPACESIZELOG | RW | 32 | 0x0080 0C80 | 0x4480 0C80 |

Table 14-104. TARG Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK2_C2C | CLK2_C2C_TARG L3 Physical Address | CLK2_BB2D_TARG L3 Physical Address | Address Offset for CLK2_L4EMU | CLK3_L4EMU_TARG L3 Physical Address |
|--|------|-----------------------|-----------------------------|-----------------------------------|------------------------------------|-------------------------------|-------------------------------------|
| L3_TARG_STDHOSTHDR_COREREG | R | 32 | 0x0080 1600 | 0x4480 1600 | 0x4480 1900 | 0x0100 0100 | 0x4500 0100 |
| L3_TARG_STDHOSTHDR_VERSIONREG | R | 32 | 0x0080 1604 | 0x4480 1604 | 0x4480 1904 | 0x0100 0104 | 0x4500 0104 |
| L3_TARG_STDHOSTHDR_MAINCTLREG | RW | 32 | 0x0080 1608 | 0x4480 1608 | 0x4480 1908 | 0x0100 0108 | 0x4500 0108 |
| L3_TARG_STDHOSTHDR_NTPADDR_0 | R | 32 | 0x0080 1610 | 0x4480 1610 | 0x4480 1910 | 0x0100 0110 | 0x4500 0110 |
| L3_TARG_STDERRLOG_SVRTSTDLVL | RW | 32 | 0x0080 1640 | 0x4480 1640 | 0x4480 1940 | 0x0100 0140 | 0x4500 0140 |
| L3_TARG_STDERRLOG_SVRTCUSTOMLVL | RW | 32 | 0x0080 1644 | 0x4480 1644 | 0x4480 1944 | 0x0100 0144 | 0x4500 0144 |
| L3_TARG_STDERRLOG_MAIN | RW | 32 | 0x0080 1648 | 0x4480 1648 | 0x4480 1948 | 0x0100 0148 | 0x4500 0148 |
| L3_TARG_STDERRLOG_HDR | R | 32 | 0x0080 164C | 0x4480 164C | 0x4480 194C | 0x0100 014C | 0x4500 014C |
| L3_TARG_STDERRLOG_MSTADDR | R | 32 | 0x0080 1650 | 0x4480 1650 | 0x4480 1950 | 0x0100 0150 | 0x4500 0150 |
| L3_TARG_STDERRLOG_SLVADDR | R | 32 | 0x0080 1654 | 0x4480 1654 | 0x4480 1954 | 0x0100 0154 | 0x4500 0154 |
| L3_TARG_STDERRLOG_INFO | R | 32 | 0x0080 1658 | 0x4480 1658 | 0x4480 1958 | 0x0100 0158 | 0x4500 0158 |
| L3_TARG_STDERRLOG_SLVOFSLSB | R | 32 | 0x0080 165C | 0x4480 165C | 0x4480 195C | 0x0100 015C | 0x4500 015C |
| L3_TARG_STDERRLOG_SLVOFSMSB | R | 32 | 0x0080 1660 | 0x4480 1660 | 0x4480 1960 | 0x0100 0160 | 0x4500 0160 |
| L3_TARG_STDERRLOG_CUSTOMINFO_INFO | R | 32 | 0x0080 1664 | 0x4480 1664 | 0x4480 1964 | 0x0100 0164 | 0x4500 0164 |
| L3_TARG_STDERRLOG_CUSTOMINFO_MSTADDR | R | 32 | 0x0080 1668 | 0x4480 1668 | 0x4480 1968 | 0x0100 0168 | 0x4500 0168 |
| L3_TARG_STDERRLOG_CUSTOMINFO_OPCODE | R | 32 | 0x0080 166C | 0x4480 166C | 0x4480 196C | 0x0100 016C | 0x4500 016C |
| L3_TARG_ADDRSPACESIZELOG | RW | 32 | 0x0080 1680 | 0x4480 1680 | 0x4480 1980 | 0x0100 0180 | 0x4500 0180 |

PRELIMINARY

14.2.5.1.3.2 L3 TARG Registers Description

Table 14-105. L3_TARG_STDHOSTHDR_COREREG

| | | | |
|------------------|---|----------|---|
| Address Offset | See Table 14-98. | | |
| Physical Address | 0x4400 0100 0x4400 0200 0x4400 0300 0x4400 0400 0x4480 0100 0x4480 0200 0x4480 0300 0x4480 0400 0x4480 0500 0x4480 0600 0x4480 0700 0x4480 0800 0x4480 0900 0x4480 0A00 0x4480 0B00 0x4480 0C00 0x4480 1600 0x4480 1900 0x4500 0100 | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAHD_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG |
| Description | R | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | STDHOSTHDR_COREREG_CORECODE | | | | | | | | RESERVED | | | | | | | | | | | | | | | | STDHOSTHDR_COREREG_VENDORCODE |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|---|------|--------|
| 31:22 | RESERVED | | R | 0x000 |
| 21:16 | STDHOSTHDR_COREREG_CORECODE | The Core Code field is a constant reporting a vendor-specific core generator code. Type: Constant. Reset value: 0x13. | R | 0x13 |
| 15:1 | RESERVED | | R | 0x0000 |
| 0 | STDHOSTHDR_COREREG_VENDORCODE | The Vendor Code field is a constant reporting the core generator vendor code. Type: Constant. Reset value: 0x1. Read 0x0: Third-party vendor. Read 0x1: | R | 1 |

Table 14-106. Register Call Summary for Register L3_TARG_STDHOSTHDR_COREREG

L3 interconnect

- [L3 TARG Register Summary and Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

Table 14-107. L3_TARG_STDHOSTHDR_VERSIONREG

| | | | |
|------------------|---|----------|---|
| Address Offset | See Table 14-98 . | | |
| Physical Address | 0x4400 0104 0x4400 0204 0x4400 0304 0x4400 0404 0x4480 0104 0x4480 0204 0x4480 0304 0x4480 0404 0x4480 0504 0x4480 0604 0x4480 0704 0x4480 0804 0x4480 0904 0x4480 0A04 0x4480 0B04 0x4480 0C04 0x4480 1604 0x4480 1904 0x4500 0104 | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAHD_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STDHOSTHDR_VERSIONREG_REVISIONID | | | | | | | | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--|---|------|----------|
| 31:24 | STDHOSTHDR_VERSIONREG_REVISIONID | The Revision Identifier field is a constant reporting the core generator revision number. Type: Constant. Reset value: 0x0. | R | 0x00 |
| 23:0 | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | Reserved. Type: Reserved. Reset value: Reserved. | R | 0x000000 |

Table 14-108. Register Call Summary for Register L3_TARG_STDHOSTHDR_VERSIONREG

L3 interconnect

- [L3 TARG Register Summary and Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

Table 14-109. L3_TARG_STDHOSTHDR_MAINCTLREG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----------|----------|---|----|--------------------------|----|------|------------|---------------------------|---|---|---|----------|---|---|---|--------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--------------------------|--|--|--|---------------------------|--|--|--|----------|--|--|--|--------------------------|--|--|--|
| Address Offset | See Table 14-98. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4400 0108 0x4400 0208 0x4400 0308 0x4400 0408 0x4480 0108 0x4480 0208 0x4480 0308 0x4480 0408 0x4480 0508 0x4480 0608 0x4480 0708 0x4480 0808 0x4480 0908 0x4480 0A08 0x4480 0B08 0x4480 0C08 0x4480 1608 0x4480 1908 0x4500 0108 | | | | | | | | | | | | | | | | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAHD_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="4">RESERVED</td><td colspan="4">STDHOSTHDR_MAINCTLREG_CM</td><td colspan="4">STDHOSTHDR_MAINCTLREG_FLT</td><td colspan="4">RESERVED</td><td colspan="4">STDHOSTHDR_MAINCTLREG_EN</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | STDHOSTHDR_MAINCTLREG_CM | | | | STDHOSTHDR_MAINCTLREG_FLT | | | | RESERVED | | | | STDHOSTHDR_MAINCTLREG_EN | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | STDHOSTHDR_MAINCTLREG_CM | | | | STDHOSTHDR_MAINCTLREG_FLT | | | | RESERVED | | | | STDHOSTHDR_MAINCTLREG_EN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:5 | RESERVED | | Reserved | | | | | | | | | | | | | | | | | | | R | 0x00000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | RESERVED | | Reserved | | | | | | | | | | | | | | | | | | | R | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | STDHOSTHDR_MAINCTLREG_CM | | Reserved for internal testing. Must be set to 0. Type: Control. Reset value: 0x0. | | | | | | | | | | | | | | | | | | | R | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | STDHOSTHDR_MAINCTLREG_FLT | | Asserted when a Fault condition is detected: if the unit includes Error Logging, Flt is asserted when the FltCnt register field indicates a Fault, and deasserted when FltCnt is reset. If no Error Logging is implemented, this bit becomes unit-dependent. In all cases, Flt bit and Flt pin (service network) have the same logical level. Type: Status. Reset value: X. | | | | | | | | | | | | | | | | | | | R | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | RESERVED | | Reserved | | | | | | | | | | | | | | | | | | | R | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | STDHOSTHDR_MAINCTLREG_EN | | Sets the global core enable. Note: A disabled master does not generate any NTPP requests, and a disabled slave replies with an error packet to any request it receives. Type: Control. Reset value: 0x1. | | | | | | | | | | | | | | | | | | | RW | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-110. Register Call Summary for Register L3_TARG_STDHOSTHDR_MAINCTLREG

L3 interconnect

- [L3 TARG Register Summary and Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

Table 14-111. L3_TARG_STDHOSTHDR_NTTPADDR_0

| | | | |
|------------------|---|----------|---|
| Address Offset | See Table 14-98 . | | |
| Physical Address | 0x4400 0110 0x4400 0210 0x4400 0310 0x4400 0410 0x4480 0110 0x4480 0210 0x4480 0310 0x4480 0410 0x4480 0510 0x4480 0610 0x4480 0710 0x4480 0810 0x4480 0910 0x4480 0A10 0x4480 0B10 0x4480 0C10 0x4480 1610 0x4480 1910 0x4500 0110 | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAHD_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDHOSTHDR_NTTPADDR_0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4:0 | STDHOSTHDR_NTTPADDR_0 | Sets the RX port address. Type: Control. Reset value: 0x15. | R | 0x01 |

Table 14-112. Register Call Summary for Register L3_TARG_STDHOSTHDR_NTTPADDR_0

L3 interconnect

- [L3 TARG Register Summary and Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

Table 14-113. L3_TARG_STDERRLOG_SVRTSTDLVL

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-98 . | | |
| Physical Address | 0x4400 0140 0x4400 0240 0x4400 0340 0x4400 0440 0x4480 0140 0x4480 0240 0x4480 0340 0x4480 0440 0x4480 0540 0x4480 0640 0x4480 0740 0x4480 0840 0x4480 0940 0x4480 0A40 0x4480 0B40 0x4480 0C40 0x4480 1640 0x4480 1940 0x4500 0140 | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAHD_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_SVRTSTDLVL_0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1:0 | STDERRLOG_SVRTSTDLVL_0 | Severity level parameters Type: Control. Reset value: 0x2. 0x0: Error logging is disabled. 0x1: Errors are logged with severity level Error. 0x2: Errors are logged with severity level Fault. | RW | 0x2 |

Table 14-114. Register Call Summary for Register L3_TARG_STDERRLOG_SVRTSTDLVL

L3 interconnect

- [Severity Level of Standard and Custom Errors: \[0\]](#)
- [L3 Interconnect Error Analysis Mode: \[1\]](#)
- [L3 TARG Register Summary and Description: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)

Table 14-115. L3_TARG_STDERRLOG_SVRTCUSTOMLVL

| | | | | | | | | | | | | | | | | |
|------------------|-----------------------------------|----------|--|--|--|--|--|--|--|--|--|--------------------|--|--|--|--|
| Address Offset | See Table 14-98 . | | | | | | | | | | | | | | | |
| Physical Address | 0x4400 0144 | Instance | | | | | | | | | | CLK1_DMM1_TARG | | | | |
| | 0x4400 0244 | | | | | | | | | | | CLK1_DMM2_TARG | | | | |
| | 0x4400 0344 | | | | | | | | | | | CLK1_ABE_TARG | | | | |
| | 0x4400 0444 | | | | | | | | | | | CLK1_L4CFG_TARG | | | | |
| | 0x4480 0144 | | | | | | | | | | | CLK2_GPMC_TARG | | | | |
| | 0x4480 0244 | | | | | | | | | | | CLK2_OCMRAM_TARG | | | | |
| | 0x4480 0344 | | | | | | | | | | | CLK2_DSS_TARG | | | | |
| | 0x4480 0444 | | | | | | | | | | | CLK2_ISS_TARG | | | | |
| | 0x4480 0544 | | | | | | | | | | | CLK2_CORTEXM3_TARG | | | | |
| | 0x4480 0644 | | | | | | | | | | | CLK2_SGX_TARG | | | | |
| | 0x4480 0744 | | | | | | | | | | | CLK2_IVAHD_TARG | | | | |
| | 0x4480 0844 | | | | | | | | | | | CLK2_SL2_TARG | | | | |
| | 0x4480 0944 | | | | | | | | | | | CLK2_L4PER0_TARG | | | | |
| | 0x4480 0A44 | | | | | | | | | | | CLK2_L4PER1_TARG | | | | |
| | 0x4480 0B44 | | | | | | | | | | | CLK2_L4PER2_TARG | | | | |
| | 0x4480 0C44 | | | | | | | | | | | CLK2_L4PER3_TARG | | | | |
| | 0x4480 1644 | | | | | | | | | | | CLK2_C2C_TARG | | | | |
| | 0x4480 1944 | | | | | | | | | | | CLK2_BB2D_TARG | | | | |
| | 0x4500 0144 | | | | | | | | | | | CLK3_L4EMU_TARG | | | | |
| Description | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_SVRTCUSTOMLVL_0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1:0 | STDERRLOG_SVRTCUSTOMLVL_0 | Severity level parameters Type: Control. Reset value: 0x2. 0x0: Error logging is disabled. 0x1: Errors are logged with severity level Error. 0x2: Errors are logged with severity level Fault. | RW | 0x2 |

Table 14-116. Register Call Summary for Register L3_TARG_STDERRLOG_SVRTCUSTOMLVL

L3 interconnect

- [Severity Level of Standard and Custom Errors: \[0\]](#)
- [L3 TARG Register Summary and Description: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

Table 14-117. L3_TARG_STDERRLOG_MAIN

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | See Table 14-98 . | | |
| Physical Address | 0x4400 0148 0x4400 0248 0x4400 0348 0x4400 0448 0x4480 0148 0x4480 0248 0x4480 0348 0x4480 0448 0x4480 0548 0x4480 0648 0x4480 0748 0x4480 0848 0x4480 0948 0x4480 0A48 0x4480 0B48 0x4480 0C48 0x4480 1648 0x4480 1948 0x4500 0148 | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAH_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|----|----|----|----|----|----|----|----------|----|----|----|-----------------------|----|-----------------------|----|----------|----|----|----|----|----|---|---|---|---|---|---|------------------------|---|--------------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STDERRLOG_MAIN_CLRLOG | | | | | | | | RESERVED | | | | STDERRLOG_MAIN_FLTCNT | | STDERRLOG_MAIN_ERRCNT | | RESERVED | | | | | | | | | | | | STDERRLOG_MAIN_ERRTYPE | | STDERRLOG_MAIN_ERRLOGVLD | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|--------|
| 31 | STDERRLOG_MAIN_CLRLOG | Clears Error Logging Valid bit when written to 1. Type: Give_AutoCleared. Reset value: 0x0. | RW | 0 |
| 30:20 | RESERVED | Reserved | R | 0x000 |
| 19 | STDERRLOG_MAIN_FLTCNT | Asserted when at least one error with severity level FAULT is detected. Reset when written to 1. Type: Take. Reset value: 0x0. | RW | 0 |
| 18 | STDERRLOG_MAIN_ERRCNT | Asserted when at least one error with severity level ERROR is detected. Reset when written to 1. Type: Take. Reset value: 0x0. | RW | 0 |
| 17:2 | RESERVED | Reserved | R | 0x0000 |
| 1 | STDERRLOG_MAIN_ERRTYPE | Indicates logging type. Type: Status. Reset value: X. Read 0x0: Logged Error format is standard (header and necker recorded). Read 0x1: Logged Error format is module dependent. CustomInfo register(s) may be implemented to store additional information. | R | 0 |
| 0 | STDERRLOG_MAIN_ERRLOGVLD | Error Logging Valid. Asserted when logging information is valid(indicates that an error has been logged). Type: Status. Reset value: X. | R | 0 |

Table 14-118. Register Call Summary for Register L3_TARG_STDERRLOG_MAIN

L3 interconnect

- [Severity Level of Standard and Custom Errors: \[0\]](#)
- [L3 Interconnect Error Analysis Mode: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [L3 TARG Register Summary and Description: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)

Table 14-119. L3_TARG_STDERRLOG_HDR

| Address Offset | | See Table 14-98. | |
|------------------|--|--------------------|--|
| Physical Address | | Instance | |
| 0x4400 014C | | CLK1_DMM1_TARG | |
| 0x4400 024C | | CLK1_DMM2_TARG | |
| 0x4400 034C | | CLK1_ABE_TARG | |
| 0x4400 044C | | CLK1_L4CFG_TARG | |
| 0x4480 014C | | CLK2_GPMC_TARG | |
| 0x4480 024C | | CLK2_OCMRAM_TARG | |
| 0x4480 034C | | CLK2_DSS_TARG | |
| 0x4480 044C | | CLK2_ISS_TARG | |
| 0x4480 054C | | CLK2_CORTEXM3_TARG | |
| 0x4480 064C | | CLK2_SGX_TARG | |
| 0x4480 074C | | CLK2_IVAHD_TARG | |
| 0x4480 084C | | CLK2_SL2_TARG | |
| 0x4480 094C | | CLK2_L4PER0_TARG | |
| 0x4480 0A4C | | CLK2_L4PER1_TARG | |
| 0x4480 0B4C | | CLK2_L4PER2_TARG | |
| 0x4480 0C4C | | CLK2_L4PER3_TARG | |
| 0x4480 164C | | CLK2_C2C_TARG | |
| 0x4480 194C | | CLK2_BB2D_TARG | |
| 0x4500 014C | | CLK3_L4EMU_TARG | |
| Description | | | |
| Type | | R | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------------|----|----|----|----------|----|----|----|----------------------------|----|----|----|-------------------|----|---|---|----------|---|---|---|------------------------|---|---|---|----------|--|--|--|----------------------|--|--|--|
| RESERVED | | | | | | | | STDERRLOG_HDR_LEN1 | | | | RESERVED | | | | STDERRLOG_HDR_STOPOFSWRPSZ | | | | STDERRLOG_HDR_ERR | | | | RESERVED | | | | STDERRLOG_HDR_PRESSURE | | | | RESERVED | | | | STDERRLOG_HDR_OPCODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|---|------|-------|
| 31:24 | RESERVED | Reserved | R | 0x00 |
| 23:18 | STDERRLOG_HDR_LEN1 | This field contains the number of payload cell(s) minus one of the logged packet. Type: Status. Reset value: X. | R | 0x00 |
| 17:16 | RESERVED | Reserved | R | 0x0 |
| 15:12 | STDERRLOG_HDR_STOPOFSWRPSZ | StopOfs or WrapSize field of the logged packet (meaning depends on Wrp bit of logged opcode). Type: Status. Reset value: X. | R | 0x0 |
| 11 | STDERRLOG_HDR_ERR | Err bit of the logged packet. Type: Status. Reset value: X. | R | 0 |
| 10:7 | RESERVED | Reserved | R | 0x0 |
| 6 | STDERRLOG_HDR_PRESSURE | Pressure field of the logged packet. Type: Status. Reset value: X. | R | 0 |
| 5:4 | RESERVED | Reserved | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|-------|
| 3:0 | STDERRLOG_HDR_OPCODE | Opcode of the logged packet. Type: Status. Reset value: X. | R | 0x0 |

Table 14-120. Register Call Summary for Register L3_TARG_STDERRLOG_HDR

L3 interconnect

- Severity Level of Standard and Custom Errors: [0]
- L3 TARG Register Summary and Description: [1] [2] [3] [4] [5] [6] [7]

Table 14-121. L3_TARG_STDERRLOG_MSTADDR

| | | | |
|------------------|---|----------|---|
| Address Offset | See Table 14-98. | | |
| Physical Address | 0x4400 0150 0x4400 0250 0x4400 0350 0x4400 0450 0x4480 0150 0x4480 0250 0x4480 0350 0x4480 0450 0x4480 0550 0x4480 0650 0x4480 0750 0x4480 0850 0x4480 0950 0x4480 0A50 0x4480 0B50 0x4480 0C50 0x4480 1650 0x4480 1950 0x4500 0150 | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAHD_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | STDERRLOG_MSTADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-----------|
| 31:10 | RESERVED | Reserved | R | 0x0000000 |
| 9:0 | STDERRLOG_MSTADDR | Master Address field of the logged packet (see Table 14-18). Type: Status. Reset value: X. | R | 0x00 |

Table 14-122. Register Call Summary for Register L3_TARG_STDERRLOG_MSTADDR

L3 interconnect

- Severity Level of Standard and Custom Errors: [0]
- L3 TARG Register Summary and Description: [1] [2] [3] [4] [5] [6] [7]

Table 14-123. L3_TARG_STDERRLOG_SLVADDR

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-98 . | | |
| Physical Address | 0x4400 0154 0x4400 0254 0x4400 0354 0x4400 0454 0x4480 0154 0x4480 0254 0x4480 0354 0x4480 0454 0x4480 0554 0x4480 0654 0x4480 0754 0x4480 0854 0x4480 0954 0x4480 0A54 0x4480 0B54 0x4480 0C54 0x4480 1654 0x4480 1954 0x4500 0154 | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAHD_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_SLVADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4:0 | STDERRLOG_SLVADDR | Slave Address field of the logged packet. Type: Status. Reset value: X. | R | 0x00 |

Table 14-124. Register Call Summary for Register L3_TARG_STDERRLOG_SLVADDR

L3 interconnect

- [Severity Level of Standard and Custom Errors: \[0\]](#)
- [L3 TARG Register Summary and Description: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

Table 14-125. L3_TARG_STDERRLOG_INFO

| | | | |
|------------------|---|----------|---|
| Address Offset | See Table 14-98 . | | |
| Physical Address | 0x4400 0158 0x4400 0258 0x4400 0358 0x4400 0458 0x4480 0158 0x4480 0258 0x4480 0358 0x4480 0458 0x4480 0558 0x4480 0658 0x4480 0758 0x4480 0858 0x4480 0958 0x4480 0A58 0x4480 0B58 0x4480 0C58 0x4480 1658 0x4480 1958 0x4500 0158 | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAHD_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_INFO | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-----------|
| 31:8 | RESERVED | Reserved | R | 0x0000000 |
| 7:0 | STDERRLOG_INFO | Info field of the logged packet. Type: Status. Reset value: X. | R | 0x00 |

Table 14-126. Register Call Summary for Register L3_TARG_STDERRLOG_INFO

L3 interconnect

- [Severity Level of Standard and Custom Errors: \[0\]](#)
- [L3 TARG Register Summary and Description: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

Table 14-127. L3_TARG_STDERRLOG_SLVOFSLSB

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-98 . | | |
| Physical Address | 0x4400 015C 0x4400 025C 0x4400 035C 0x4400 045C 0x4480 015C 0x4480 025C 0x4480 035C 0x4480 045C 0x4480 055C 0x4480 065C 0x4480 075C 0x4480 085C 0x4480 095C 0x4480 0A5C 0x4480 0B5C 0x4480 0C5C 0x4480 165C 0x4480 195C 0x4500 015C | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAHD_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STDERRLOG_SLVOFSLSB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|-------------|
| 31:0 | STDERRLOG_SLVOFSLSB | LSB of the slave offset field, concatenated with start offset field of the logged packet. Type: Status. Reset value: X. | R | 0x0000 0000 |

Table 14-128. Register Call Summary for Register L3_TARG_STDERRLOG_SLVOFSLSB

L3 interconnect

- [L3 TARG Register Summary and Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

Table 14-129. L3_TARG_STDERRLOG_SLVOFSMSB

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|------------------|--------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---------------------|
| Address Offset | See Table 14-98. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | Instance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4400 0160 | CLK1_DMM1_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4400 0260 | CLK1_DMM2_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4400 0360 | CLK1_ABE_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4400 0460 | CLK1_L4CFG_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 0160 | CLK2_GPMC_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 0260 | CLK2_OCMRAM_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 0360 | CLK2_DSS_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 0460 | CLK2_ISS_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 0560 | CLK2_CORTEXM3_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 0660 | CLK2_SGX_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 0760 | CLK2_IVAHD_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 0860 | CLK2_SL2_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 0960 | CLK2_L4PER0_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 0A60 | CLK2_L4PER1_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 0B60 | CLK2_L4PER2_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 0C60 | CLK2_L4PER3_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 1660 | CLK2_C2C_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4480 1960 | CLK2_BB2D_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4500 0160 | CLK3_L4EMU_TARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | STDERRLOG_SLVOFSMSB |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | STDERRLOG_SLVOFSMSB | MSB of the slave offset field of the logged packet (according to NTP packet format, this register field may exceed the actual slave offset size. Unused bits are stuck at 0, if any). Type: Status. Reset value: X. | R | 0 |

Table 14-130. Register Call Summary for Register L3_TARG_STDERRLOG_SLVOFSMSB

L3 interconnect

- [L3 TARG Register Summary and Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

Table 14-131. L3_TARG_STDERRLOG_CUSTOMINFO_INFO

| | | |
|------------------|-----------------------------------|--------------------|
| Address Offset | See Table 14-98 . | |
| Physical Address | 0x4400 0164 | Instance |
| | 0x4400 0264 | CLK1_DMM1_TARG |
| | 0x4400 0364 | CLK1_DMM2_TARG |
| | 0x4400 0464 | CLK1_ABE_TARG |
| | 0x4480 0164 | CLK1_L4CFG_TARG |
| | 0x4480 0264 | CLK2_GPMC_TARG |
| | 0x4480 0364 | CLK2_OCMRAM_TARG |
| | 0x4480 0464 | CLK2_DSS_TARG |
| | 0x4480 0564 | CLK2_ISS_TARG |
| | 0x4480 0664 | CLK2_CORTEXM3_TARG |
| | 0x4480 0764 | CLK2_SGX_TARG |
| | 0x4480 0864 | CLK2_IVAHD_TARG |
| | 0x4480 0964 | CLK2_SL2_TARG |
| | 0x4480 0A64 | CLK2_L4PER0_TARG |
| | 0x4480 0B64 | CLK2_L4PER1_TARG |
| | 0x4480 0C64 | CLK2_L4PER2_TARG |
| | 0x4480 1664 | CLK2_L4PER3_TARG |
| | 0x4480 1964 | CLK2_C2C_TARG |
| | 0x4500 0164 | CLK2_BB2D_TARG |
| | | CLK3_L4EMU_TARG |
| Description | | |
| Type | R | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_CUSTOMINFO_INFO | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------|---|------|-----------|
| 31:8 | RESERVED | Reserved | R | 0x0000000 |
| 7:0 | STDERRLOG_CUSTOMINFO_I NFO | Info field of the response packet. Type: Status. Reset value: X. | R | 0x00 |

Table 14-132. Register Call Summary for Register L3_TARG_STDERRLOG_CUSTOMINFO_INFO

L3 interconnect

- [L3 Interconnect Error Analysis Mode: \[0\]](#)
- [L3 TARG Register Summary and Description: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

Table 14-133. L3_TARG_STDERRLOG_CUSTOMINFO_MSTADDR

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-98 . | | |
| Physical Address | 0x4400 0168 0x4400 0268 0x4400 0368 0x4400 0468 0x4480 0168 0x4480 0268 0x4480 0368 0x4480 0468 0x4480 0568 0x4480 0668 0x4480 0768 0x4480 0868 0x4480 0968 0x4480 0A68 0x4480 0B68 0x4480 0C68 0x4480 1668 0x4480 1968 0x4500 0168 | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAHD_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_CUSTOMINFO_MSTADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|---|------|----------|
| 31:10 | RESERVED | Reserved | R | 0x000000 |
| 9:0 | STDERRLOG_CUSTOMINFO_MSTADDR | MstAddr field of the response packet (see Table 14-18). Type: Status. Reset value: X. | R | 0x00 |

**Table 14-134. Register Call Summary for Register
L3_TARG_STDERRLOG_CUSTOMINFO_MSTADDR**

L3 interconnect

- [L3 Interconnect Error Analysis Mode: \[0\]](#)
- [L3 TARG Register Summary and Description: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

Table 14-135. L3_TARG_STDERRLOG_CUSTOMINFO_OPCODE

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-98 . | | |
| Physical Address | 0x4400 016C 0x4400 026C 0x4400 036C 0x4400 046C 0x4480 016C 0x4480 026C 0x4480 036C 0x4480 046C 0x4480 056C 0x4480 066C 0x4480 076C 0x4480 086C 0x4480 096C 0x4480 0A6C 0x4480 0B6C 0x4480 0C6C 0x4480 166C 0x4480 196C 0x4500 016C | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAHD_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_CUSTOMINFO_OPCODE | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|--|------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1:0 | STDERRLOG_CUSTOMINFO_OPCODE | Opcode of the response packet. Type: Status. Reset value: X. | R | 0x0 |

Table 14-136. Register Call Summary for Register L3_TARG_STDERRLOG_CUSTOMINFO_OPCODE

L3 interconnect

- [L3 Interconnect Error Analysis Mode: \[0\]](#)
- [L3 TARG Register Summary and Description: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

Table 14-137. L3_TARG_ADDRSPACESIZELOG

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-98 . | | |
| Physical Address | 0x4400 0180 0x4400 0280 0x4400 0380 0x4400 0480 0x4480 0180 0x4480 0280 0x4480 0380 0x4480 0480 0x4480 0580 0x4480 0680 0x4480 0780 0x4480 0880 0x4480 0980 0x4480 0A80 0x4480 0B80 0x4480 0C80 0x4480 1680 0x4480 1980 0x4500 0180 | Instance | CLK1_DMM1_TARG CLK1_DMM2_TARG CLK1_ABE_TARG CLK1_L4CFG_TARG CLK2_GPMC_TARG CLK2_OCMRAM_TARG CLK2_DSS_TARG CLK2_ISS_TARG CLK2_CORTEXM3_TARG CLK2_SGX_TARG CLK2_IVAHD_TARG CLK2_SL2_TARG CLK2_L4PER0_TARG CLK2_L4PER1_TARG CLK2_L4PER2_TARG CLK2_L4PER3_TARG CLK2_C2C_TARG CLK2_BB2D_TARG CLK3_L4EMU_TARG |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ADDRSPACESIZELOG | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4:0 | ADDRSPACESIZELOG | The address space size is equal to 2**AddrSpaceSizeLog * 4K in bytes. Type: Control. Reset value: 0x1F. | RW | 0x1F |

Table 14-138. Register Call Summary for Register L3_TARG_ADDRSPACESIZELOG

L3 interconnect

- [L3 TARG Register Summary and Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

14.2.5.1.4 L3 PWR_DISC Register Summary and Description

Table 14-139. PWR_DISC Instance Summary

| Module Name | Base Address | Size |
|------------------------------|--------------|------|
| CLK1_CLK1_TARG_PWR_DISC_CLK2 | 0x4400 0600 | 4KB |
| CLK2_CLK2_TARG_PWR_DISC_CLK1 | 0x4480 1100 | 4KB |

14.2.5.1.4.1 L3 PWR_DISC Register Summary

Table 14-140. PWR_DISC Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK1_CLK1_TARG_P WR_DISC_CLK2 | CLK1_CLK1_TARG_P WR_DISC_CLK2 L3 Physical Address | Address Offset for CLK2_CLK2_TARG_PWR _DISC_CLK1 | CLK2_CLK2_TARG_PWR _DISC_CLK1 L3 Physical Address |
|--|------|-----------------------|---|---|---|---|
| L3_PWR_DISC_STDHSTHDR_COREREG | R | 32 | 0x0000 0600 | 0x4400 0600 | 0x0080 1100 | 0x4480 1100 |
| L3_PWR_DISC_STDHSTHDR_VERSIONREG | R | 32 | 0x0000 0604 | 0x4400 0604 | 0x0080 1104 | 0x4480 1104 |
| L3_PWR_DISC_STDHSTHDR_MAINCTLREG | R | 32 | 0x0000 0608 | 0x4400 0608 | 0x0080 1108 | 0x4480 1108 |
| L3_PWR_DISC_STDERRLOG_SVRTSTDLVL | RW | 32 | 0x0000 0640 | 0x4400 0640 | 0x0080 1140 | 0x4480 1140 |
| L3_PWR_DISC_STDERRLOG_MAIN | RW | 32 | 0x0000 0648 | 0x4400 0648 | 0x0080 1148 | 0x4480 1148 |
| L3_PWR_DISC_STDERRLOG_HDR | R | 32 | 0x0000 064C | 0x4400 064C | 0x0080 114C | 0x4480 114C |
| L3_PWR_DISC_STDERRLOG_MSTADDR | R | 32 | 0x0000 0650 | 0x4400 0650 | 0x0080 1150 | 0x4480 1150 |
| L3_PWR_DISC_STDERRLOG_SLVADDR | R | 32 | 0x0000 0654 | 0x4400 0654 | 0x0080 1154 | 0x4480 1154 |
| L3_PWR_DISC_STDERRLOG_INFO | R | 32 | 0x0000 0658 | 0x4400 0658 | 0x0080 1158 | 0x4480 1158 |
| L3_PWR_DISC_STDERRLOG_SLVOFSLSB | R | 32 | 0x0000 065C | 0x4400 065C | 0x0080 115C | 0x4480 115C |
| L3_PWR_DISC_STDERRLOG_SLVOFSMSB | R | 32 | 0x0000 0660 | 0x4400 0660 | 0x0080 1160 | 0x4480 1160 |

14.2.5.1.4.2 L3 PWR_DISC Register Description

Table 14-141. L3_PWR_DISC_STDHOSTHDR_COREREG

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | See Table 14-140 . | | |
| Physical Address | 0x4400 0600 0x4480 1100 | Instance | CLK1_CLK1_TARG_PWR_DISC_CLK2 CLK2_CLK2_TARG_PWR_DISC_CLK1 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | STDHOSTHDR_COREREG_CORECODE | | | | | | | | RESERVED | | | | | | | | | | | | | | | | STDHOSTHDR_COREREG_VENDORCODE |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|--|------|--------|
| 31:22 | RESERVED | Reserved | R | 0x000 |
| 21:16 | STDHOSTHDR_COREREG_CORECODE | The Core Code field is a constant reporting a vendor-specific core generator code. Type: Constant. Reset value: 0x38. | R | 0x38 |
| 15:1 | RESERVED | Reserved | R | 0x0000 |
| 0 | STDHOSTHDR_COREREG_VENDORCODE | The Vendor Code field is a constant reporting the core generator vendor code. Type: Constant. Reset value: 0x1. Read 0x0: Third-party vendor. Read 0x1: Third-party vendor | R | 1 |

Table 14-142. Register Call Summary for Register L3_PWR_DISC_STDHOSTHDR_COREREG

L3 interconnect

- [L3_PWR_DISC Register Summary and Description: \[0\]](#)

Table 14-143. L3_PWR_DISC_STDHOSTHDR_VERSIONREG

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | See Table 14-140 . | | |
| Physical Address | 0x4400 0604 0x4480 1104 | Instance | CLK1_CLK1_TARG_PWR_DISC_CLK2 CLK2_CLK2_TARG_PWR_DISC_CLK1 |
| Description | | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|----------------------------------|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|--|--|
| STDHOSTHDR_VERSIONREG_REVISIONID | | | | | | | | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--|---|------|----------|
| 31:24 | STDHOSTHDR_VERSIONREG_REVISIONID | The Revision Identifier field is a constant reporting the core generator revision number. Type: Constant. Reset value: 0x0. | R | 0x00 |
| 23:0 | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | Reserved. Type: Reserved. Reset value: Reserved. | R | 0x000000 |

Table 14-144. Register Call Summary for Register L3_PWR_DISC_STDHOSTHDR_VERSIONREG

L3 interconnect

- [L3_PWR_DISC Register Summary and Description: \[0\]](#)

Table 14-145. L3_PWR_DISC_STDHOSTHDR_MAINCTLREG

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | See Table 14-140 . | | |
| Physical Address | 0x4400 0608 0x4480 1108 | Instance | CLK1_CLK1_TARG_PWR_DISC_CLK2 CLK2_CLK2_TARG_PWR_DISC_CLK1 |
| Description | | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|--------------------------|----|---------------------------|---|----------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | STDHOSTHDR_MAINCTLREG_CM | | STDHOSTHDR_MAINCTLREG_FLT | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4 | RESERVED | Reserved | R | 0 |
| 3 | STDHOSTHDR_MAINCTLREG_CM | Reserved for internal testing. Must be set to 0. Type: Control. Reset value: 0x0. | R | 0 |
| 2 | STDHOSTHDR_MAINCTLREG_FLT | Asserted when a Fault condition is detected: if the unit includes Error Logging, Flt is asserted when the FltCnt register field indicates a Fault, and deasserted when FltCnt is reset. If no Error Logging is implemented, this bit becomes unit-dependent. In all cases, Flt bit and Flt pin (service network) have the same logical level. Type: Status. Reset value: X. | R | 0 |
| 1:0 | RESERVED | Reserved | R | 0x0 |

Table 14-146. Register Call Summary for Register L3_PWR_DISC_STDHOSTHDR_MAINCTLREG

L3 interconnect

- [L3_PWR_DISC Register Summary and Description: \[0\]](#)

Table 14-147. L3_PWR_DISC_STDERRLOG_SVRTSTDVL

| | | | |
|-------------------------|------------------------------------|-----------------|--|
| Address Offset | See Table 14-140 . | | |
| Physical Address | 0x4400 0640 0x4480 1140 | Instance | CLK1_CLK1_TARG_PWR_DISC_CLK2 CLK2_CLK2_TARG_PWR_DISC_CLK1 |
| Description | | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | STDERRLOG_SVRTSTDVL_0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1:0 | STDERRLOG_SVRTSTDLVL_0 | Severity level parameters Type: Control. Reset value: 0x2. 0x0: Error logging is disabled. 0x1: Errors are logged with severity level Error. 0x2: Errors are logged with severity level Fault. | RW | 0x2 |

Table 14-148. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_SVRTSTDLVL

L3 interconnect

- [L3_PWR_DISC Register Summary and Description: \[0\]](#)

Table 14-149. L3_PWR_DISC_STDERRLOG_MAIN

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | See Table 14-140 . | | |
| Physical Address | 0x4400 0648 0x4480 1148 | Instance | CLK1_CLK1_TARG_PWR_DISC_CLK2 CLK2_CLK2_TARG_PWR_DISC_CLK1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|--------------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STDERRLOG_MAIN_CLRLOG | RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | STDERRLOG_MAIN_ERRTYPE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | STDERRLOG_MAIN_ERRLOGVLD |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|--------|
| 31 | STDERRLOG_MAIN_CLRLOG | Clears Error Logging Valid bit when written to 1. Type: Give_AutoCleared. Reset value: 0x0. | RW | 0 |
| 30:20 | RESERVED | Reserved | R | 0x000 |
| 19 | STDERRLOG_MAIN_FLTCNT | Asserted when at least one error with severity level FAULT is detected. Reset when written to 1. Type: Take. Reset value: 0x0. | RW | 0 |
| 18 | STDERRLOG_MAIN_ERRCNT | Asserted when at least one error with severity level ERROR is detected. Reset when written to 1. Type: Take. Reset value: 0x0. | RW | 0 |
| 17:2 | RESERVED | Reserved | R | 0x0000 |
| 1 | STDERRLOG_MAIN_ERRTYPE | Indicates logging type. Type: Status. Reset value: X. Read 0x0: Logged Error format is standard (header and necker recorded). Read 0x1: Logged Error format is module dependent. CustomInfo register(s) may be implemented to store additional information. | R | 0 |
| 0 | STDERRLOG_MAIN_ERRLOGVLD | Error Logging Valid. Asserted when logging information is valid(indicates that an error has been logged). Type: Status. Reset value: X. | R | 0 |

Table 14-150. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_MAIN

L3 interconnect

- [L3_PWR_DISC Register Summary and Description: \[0\]](#)

Table 14-151. L3_PWR_DISC_STDERRLOG_HDR

| | | | | |
|-------------------------|------------------------------------|--|-----------------|--|
| Address Offset | See Table 14-140 . | | Instance | CLK1_CLK1_TARG_PWR_DISC_CLK2 CLK2_CLK2_TARG_PWR_DISC_CLK1 |
| Physical Address | 0x4400 064C 0x4480 114C | | | |
| Description | | | | |
| Type | R | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------------|----|----|----|----------|----|----|----|----------------------------|----|----|----|-------------------|----|----------|---|---|---|------------------------|---|----------|---|----------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | STDERRLOG_HDR_LEN1 | | | | RESERVED | | | | STDERRLOG_HDR_STOPOFSWRPSZ | | | | STDERRLOG_HDR_ERR | | RESERVED | | | | STDERRLOG_HDR_PRESSURE | | RESERVED | | STDERRLOG_HDR_OPCODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|---|------|-------|
| 31:24 | RESERVED | Reserved | R | 0x00 |
| 23:18 | STDERRLOG_HDR_LEN1 | This field contains the number of payload cell(s) minus one of the logged packet. Type: Status. Reset value: X. | R | 0x00 |
| 17:16 | RESERVED | Reserved | R | 0x0 |
| 15:12 | STDERRLOG_HDR_STOPOFSWRPSZ | StopOfs or WrapSize field of the logged packet (meaning depends on Wrp bit of logged opcode). Type: Status. Reset value: X. | R | 0x0 |
| 11 | STDERRLOG_HDR_ERR | Err bit of the logged packet. Type: Status. Reset value: X. | R | 0 |
| 10:7 | RESERVED | Reserved | R | 0x0 |
| 6 | STDERRLOG_HDR_PRESSURE | Pressure field of the logged packet. Type: Status. Reset value: X. | R | 0 |
| 5:4 | RESERVED | Reserved | R | 0x0 |
| 3:0 | STDERRLOG_HDR_OPCODE | Opcode of the logged packet. Type: Status. Reset value: X. | R | 0x0 |

Table 14-152. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_HDR

L3 interconnect

- [L3_PWR_DISC Register Summary and Description: \[0\]](#)

Table 14-153. L3_PWR_DISC_STDERRLOG_MSTADDR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|-----------------|---|-------------|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|
| Address Offset | See Table 14-140 . | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4400 0650 0x4480 1150 | Instance | CLK1_CLK1_TARG_PWR_DISC_CLK2 CLK2_CLK2_TARG_PWR_DISC_CLK1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="22">RESERVED</td><td colspan="10">STDERRLOG_MSTADDR</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | STDERRLOG_MSTADDR | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | STDERRLOG_MSTADDR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:10 | RESERVED | | Reserved | R | 0x000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9:0 | STDERRLOG_MSTADDR | | Master Address field of the logged packet. Type: Status. Reset value: X. | R | 0x00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-154. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_MSTADDR

L3 interconnect

- [L3_PWR_DISC Register Summary and Description: \[0\]](#)

Table 14-155. L3_PWR_DISC_STDERRLOG_SLVADDR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-------------------|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|----|----|----|---|---|-------------------|---|---|---|---|---|---|---|------|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|
| Address Offset | | See Table 14-140 . | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | | 0x4400 0654 0x4480 1154 | | | | | | | | | | | | | | | | Instance CLK1_CLK1_TARG_PWR_DISC_CLK2 CLK2_CLK2_TARG_PWR_DISC_CLK1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="24">RESERVED</td><td colspan="8">STDERRLOG_SLVADDR</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | STDERRLOG_SLVADDR | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | STDERRLOG_SLVADDR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:5 | RESERVED | Reserved | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x00000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4:0 | STDERRLOG_SLVADDR | Slave Address field of the logged packet. Type: Status. Reset value: X. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-156. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_SLVADDR

L3 interconnect

- [L3_PWR_DISC Register Summary and Description: \[0\]](#)

Table 14-157. L3_PWR_DISC_STDERRLOG_INFO

| | | | | | | |
|---|------------------------------------|--|----------|--|------|----------------|
| Address Offset | See Table 14-140 . | | | | | |
| Physical Address | 0x4400 0658 0x4480 1158 | | Instance | CLK1_CLK1_TARG_PWR_DISC_CLK2 CLK2_CLK2_TARG_PWR_DISC_CLK1 | | |
| Description | | | | | | |
| Type | R | | | | | |
| 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 | | | | | | |
| RESERVED | | | | | | STDERRLOG_INFO |
| Bits | Field Name | Description | | | Type | Reset |
| 31:8 | RESERVED | Reserved | | | R | 0x0000000 |
| 7:0 | STDERRLOG_INFO | Info field of the logged packet. Type: Status. Reset value: X. | | | R | 0x00 |

Table 14-158. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_INFO

L3 interconnect

- [L3_PWR_DISC Register Summary and Description: \[0\]](#)

Table 14-159. L3_PWR_DISC_STDERRLOG_SLVOFSLSB

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|------------------------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|------|-------------|--|
| Address Offset | See Table 14-140 . | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4400 065C 0x4480 115C | | | | | | | | | | | | | | | | Instance | CLK1_CLK1_TARG_PWR_DISC_CLK2 CLK2_CLK2_TARG_PWR_DISC_CLK1 | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div>313029282726252423222120191817161514131211109876543210</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| STDERRLOG_SLVOFSLSB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | Type | Reset | |
| 31:0 | STDERRLOG_SLVOFSLSB | | LSB of the slave offset field, concatenated with start offset field of the logged packet. Type: Status. Reset value: X. | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | 0x0000 0000 | |

Table 14-160. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_SLVOFSLSB

L3 interconnect

- [L3_PWR_DISC Register Summary and Description: \[0\]](#)

Table 14-161. L3_PWR_DISC_STDERRLOG_SLVOFSMSB

| | | | |
|-------------------------|------------------------------------|-----------------|--|
| Address Offset | See Table 14-140 . | | |
| Physical Address | 0x4400 0660 0x4480 1160 | Instance | CLK1_CLK1_TARG_PWR_DISC_CLK2 CLK2_CLK2_TARG_PWR_DISC_CLK1 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | STDERRLOG_SLVOFSMSB |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | STDERRLOG_SLVOFSMSB | MSB of the slave offset field of the logged packet (according to NTP packet format, this register field may exceed the actual slave offset size. Unused bits are stuck at 0, if any). Type: Status. Reset value: X. | R | 0 |

Table 14-162. Register Call Summary for Register L3_PWR_DISC_STDERRLOG_SLVOFSMSB

L3 interconnect

- [L3_PWR_DISC Register Summary and Description: \[0\]](#)

14.2.5.1.5 L3 FLAGMUX Register Summary and Description

Table 14-163. FLAGMUX Instance Summary

| Module Name | Base Address | Size |
|-------------------|--------------|------|
| CLK1_FLAGMUX_CLK1 | 0x4400 0500 | 4KB |
| CLK2_FLAGMUX_CLK2 | 0x4480 1000 | 4KB |
| CLK3_FLAGMUX_CLK3 | 0x4500 0200 | 4KB |

14.2.5.1.5.1 L3 FLAGMUX Register Summary

Table 14-164. FLAGMUX Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK1 | CLK1_FLAGMUX_CLK1 L3 Physical Address |
|--|------|-----------------------|-------------------------|---------------------------------------|
| L3_FLAGMUX_STDHOSTHDR_COREREG | R | 32 | 0x0000 0500 | 0x4400 0500 |
| L3_FLAGMUX_STDHOSTHDR_VERSIONREG | R | 32 | 0x0000 0504 | 0x4400 0504 |
| L3_FLAGMUX_MASK0 | RW | 32 | 0x0000 0508 | 0x4400 0508 |
| L3_FLAGMUX_REGERR0 | R | 32 | 0x0000 050C | 0x4400 050C |
| L3_FLAGMUX_MASK1 | RW | 32 | 0x0000 0510 | 0x4400 0510 |
| L3_FLAGMUX_REGERR1 | RW | 32 | 0x0000 0514 | 0x4400 0514 |

PRELIMINARY

Table 14-165. FLAGMUX Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK2 | CLK2_FLAGMUX_CLK2 L3 Physical Address | Address Offset for CLK3 | CLK3_FLAGMUX_CLK3 L3 Physical Address |
|--|------|-----------------------|-------------------------|---------------------------------------|-------------------------|---------------------------------------|
| L3_FLAGMUX_STDHOSTHDR_COREREG | R | 32 | 0x0080 1000 | 0x4480 1000 | 0x0100 0200 | 0x4500 0200 |
| L3_FLAGMUX_STDHOSTHDR_VERSIONREG | R | 32 | 0x0080 1004 | 0x4480 1004 | 0x0100 0204 | 0x4500 0204 |
| L3_FLAGMUX_MASK0 | RW | 32 | 0x0080 1008 | 0x4480 1008 | 0x0100 0208 | 0x4500 0208 |
| L3_FLAGMUX_REGERR0 | R | 32 | 0x0080 100C | 0x4480 100C | 0x0100 0210 | 0x4500 020C |
| L3_FLAGMUX_MASK1 | RW | 32 | 0x0080 1010 | 0x4480 1010 | 0x0100 0240 | 0x4500 0210 |
| L3_FLAGMUX_REGERR1 | RW | 32 | 0x0080 1014 | 0x4480 1014 | 0x0100 0244 | 0x4500 0214 |

14.2.5.1.5.2 L3 FLAGMUX Register Description

Table 14-166. L3_FLAGMUX_STDHOSTHDR_COREREG

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-164 . | | |
| Physical Address | 0x4400 0500 0x4480 1000 0x4500 0200 | Instance | CLK1_FLAGMUX_CLK1 CLK2_FLAGMUX_CLK2 CLK3_FLAGMUX_CLK3 |
| Description | | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-------------------------------|---|---|---|---|
| RESERVED | | | | | | | | STDHOSTHDR_COREREG_CORECODE | | | | | | | | RESERVED | | | | | | | | | | | STDHOSTHDR_COREREG_VENDORCODE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|---|------|--------|
| 31:22 | RESERVED | Reserved | R | 0x000 |
| 21:16 | STDHOSTHDR_COREREG_CORECODE | The Core Code field is a constant reporting a vendor-specific core generator code. Type: Constant. Reset value: 0x37. | R | 0x37 |
| 15:1 | RESERVED | Reserved | R | 0x0000 |
| 0 | STDHOSTHDR_COREREG_VENDORCODE | The Vendor Code field is a constant reporting the core generator vendor code. Type: Constant. Reset value: 0x1. Read 0x0: Third-party vendor. Read 0x1: | R | 1 |

Table 14-167. Register Call Summary for Register L3_FLAGMUX_STDHOSTHDR_COREREG

L3 interconnect

- [L3 FLAGMUX Register Summary and Description: \[0\] \[1\]](#)

Table 14-168. L3_FLAGMUX_STDHOSTHDR_VERSIONREG

| | | | |
|------------------|---|----------|---|
| Address Offset | See Table 14-164. | | |
| Physical Address | 0x4400 0504 0x4480 1004 0x4500 0204 | Instance | CLK1_FLAGMUX_CLK1 CLK2_FLAGMUX_CLK2 CLK3_FLAGMUX_CLK3 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STDHOSTHDR_VERSIONREG_REVISIONID | | | | | | | | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--|---|------|----------|
| 31:24 | STDHOSTHDR_VERSIONREG_REVISIONID | The Revision Identifier field is a constant reporting the core generator revision number. Type: Constant. Reset value: 0x0. | R | 0x00 |
| 23:0 | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | Reserved. Type: Reserved. Reset value: Reserved. | R | 0x000000 |

Table 14-169. Register Call Summary for Register L3_FLAGMUX_STDHOSTHDR_VERSIONREG

L3 interconnect

- [Flag Mux Generators: \[0\]](#)
- [L3 FLAGMUX Register Summary and Description: \[1\] \[2\]](#)

Table 14-170. L3_FLAGMUX_MASK0

Address Offset

See Table 14-164.

Physical Address

0x4400 0508

0x4480 1008

0x4500 0208

Instance

CLK1_FLAGMUX_CLK1

CLK2_FLAGMUX_CLK2

CLK3_FLAGMUX_CLK3

Description

Type

RW

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | MASK0 | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:19 | RESERVED | Reserved | R | 0x0000 |
| 18:0 | MASK0 | Mask flag inputs 0 Type: Control. Reset value: 0x3FFFF. | RW | 0x1F |

Table 14-171. Register Call Summary for Register L3_FLAGMUX_MASK0

L3 interconnect

- [Flag Mux Error Logging: \[0\]](#)
- [L3 Interconnect Error Analysis Mode: \[1\]](#)
- [L3 FLAGMUX Register Summary and Description: \[2\] \[3\]](#)

Table 14-172. L3_FLAGMUX_REGERR0

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|---------|-------------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|---|---|---------|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | See Table 14-164 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK1_FLAGMUX_CLK1 CLK2_FLAGMUX_CLK2 CLK3_FLAGMUX_CLK3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4400 050C 0x4480 100C 0x4500 020C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="16">REGERR0</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | REGERR0 | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | REGERR0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | | | | | | | | | | Description | | | | | | | | | | | | | | | | Type | | | | | | | | | | | | | | | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:19 | | | | | | | | RESERVED | | | | | | | | | | | | | | | | Reserved | | | | | | | | | | | | | | | | R | | | | | | | | | | | | | | | | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18:0 | | | | | | | | REGERR0 | | | | | | | | | | | | | | | | Flag inputs 0 Type: Status. Reset value: X. | | | | | | | | | | | | | | | | R | | | | | | | | | | | | | | | | 0x00000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-173. Register Call Summary for Register L3_FLAGMUX_REGERR0

L3 interconnect

- [Flag Mux Generators: \[0\]](#)
- [Flag Mux Error Logging: \[1\]](#)
- [L3 Interconnect Error Analysis Mode: \[2\] \[3\] \[4\] \[5\]](#)
- [L3 FLAGMUX Register Summary and Description: \[6\] \[7\]](#)

Table 14-174. L3_FLAGMUX_MASK1

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|----|----|----|----|----|----|---|----|----|----|----|----|----|----|-------|---|----|----|----|----|---|------|---|---|---|--------|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | See Table 14-164 . | | | | | | | | | | | | | | | | Instance CLK1_FLAGMUX_CLK1 CLK2_FLAGMUX_CLK2 CLK3_FLAGMUX_CLK3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4400 0510 0x4480 1010 0x4500 0210 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">RESERVED</td><td colspan="16">MASK1</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | MASK1 | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | MASK1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | Description | | | | | | | | | | | | | | | Type | | | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:19 | RESERVED | | | | | | | Reserved | | | | | | | | | | | | | | | R | | | | 0x0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18:0 | MASK1 | | | | | | | Mask flag inputs 1 Type: Control. Reset value: 0x3FFFF. | | | | | | | | | | | | | | | RW | | | | 0x1F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-175. Register Call Summary for Register L3_FLAGMUX_MASK1

L3 interconnect

- [Flag Mux Error Logging: \[0\]](#)
- [L3 Interconnect Error Analysis Mode: \[1\]](#)
- [L3 FLAGMUX Register Summary and Description: \[2\] \[3\]](#)

Table 14-176. L3_FLAGMUX_REGERR1

Address Offset

See [Table 14-164](#).

Physical Address

0x4400 0514

0x4480 1014

0x4500 0214

Description

Type

R

Instance

CLK1_FLAGMUX_CLK1

CLK2_FLAGMUX_CLK2

CLK3_FLAGMUX_CLK3

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | REGERR1 | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:19 | RESERVED | Reserved | R | 0x0000 |
| 18:0 | REGERR1 | Flag inputs 1 Type: Status. Reset value: X. | R | 0x00000 |

Table 14-177. Register Call Summary for Register L3_FLAGMUX_REGERR1

L3 interconnect

- [Flag Mux Generators: \[0\]](#)
- [Flag Mux Error Logging: \[1\]](#)
- [L3 Interconnect Error Analysis Mode: \[2\] \[3\] \[4\] \[5\]](#)
- [L3 FLAGMUX Register Summary and Description: \[6\] \[7\]](#)

14.2.5.1.6 L3 BW Regulator Register Summary and Description**Table 14-178. BW_REGULATOR Instance Summary**

| Module Name | Base Address | Size |
|---------------------------|--------------|-----------|
| CLK2_IVAHD_BW_REGULATOR | 0x4480 1400 | 256 bytes |
| CLK2_SGX_P1_BW_REGULATOR | 0x4480 1700 | 256 bytes |
| CLK2_SGX_P2_BW_REGULATOR | 0x4480 1800 | 256 bytes |
| CLK2_BB2D_P1_BW_REGULATOR | 0x4480 1A00 | 256 bytes |
| CLK2_BB2D_P2_BW_REGULATOR | 0x4480 1B00 | 256 bytes |

14.2.5.1.6.1 L3 BW Regulator Register Summary

Table 14-179. BW_REGULATOR Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK2_IVAHD_BW_REGULATOR L3 Physical Address | Address Offset for CLK2_SGX_P1_BW_REGULATOR L3 Physical Address | Address Offset for CLK2_SGX_P2_BW_REGULATOR L3 Physical Address | Address Offset for CLK2_SGX_P1_BW_REGULATOR L3 Physical Address | Address Offset for CLK2_SGX_P2_BW_REGULATOR L3 Physical Address |
|---|------|-----------------------|--|---|---|---|---|
| L3_BW_R_STDHOSTHDR_CORE_REG | R | 32 | 0x0080 1400 | 0x4480 1400 | 0x0080 1700 | 0x4480 1700 | 0x0080 1800 |
| L3_BW_R_STDHOSTHDR_VERSIONREG | R | 32 | 0x0080 1404 | 0x4480 1404 | 0x0080 1704 | 0x4480 1704 | 0x0080 1804 |
| L3_BW_R_BANDWIDTH | RW | 32 | 0x0080 1408 | 0x4480 1408 | 0x0080 1708 | 0x4480 1708 | 0x0080 1808 |
| L3_BW_R_WATERMARK | RW | 32 | 0x0080 140C | 0x4480 140C | 0x0080 170C | 0x4480 170C | 0x0080 180C |
| L3_BW_R_PRESS | R | 32 | 0x0080 1410 | 0x4480 1410 | 0x0080 1710 | 0x4480 1710 | 0x0080 1810 |
| L3_BW_R_CLEARHISTORY | RW | 32 | 0x0080 1414 | 0x4480 1414 | 0x0080 1714 | 0x4480 1714 | 0x0080 1814 |

Table 14-180. BW_REGULATOR Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK2_BB2D_P1_BW_REGULATOR L3 Physical Address | Address Offset for CLK2_BB2D_P2_BW_REGULATOR L3 Physical Address | Address Offset for CLK2_BB2D_P1_BW_REGULATOR L3 Physical Address | Address Offset for CLK2_BB2D_P2_BW_REGULATOR L3 Physical Address |
|---|------|-----------------------|--|--|--|--|
| L3_BW_R_STDHOSTHDR_CORE_REG | R | 32 | 0x0080 1A00 | 0x4480 1A00 | 0x0080 1B00 | 0x4480 1B00 |
| L3_BW_R_STDHOSTHDR_VERSIONREG | R | 32 | 0x0080 1A04 | 0x4480 1A04 | 0x0080 1B04 | 0x4480 1B04 |
| L3_BW_R_BANDWIDTH | RW | 32 | 0x0080 1A08 | 0x4480 1A08 | 0x0080 1B08 | 0x4480 1B08 |
| L3_BW_R_WATERMARK | RW | 32 | 0x0080 1A0C | 0x4480 1A0C | 0x0080 1B0C | 0x4480 1B0C |
| L3_BW_R_PRESS | R | 32 | 0x0080 1A10 | 0x4480 1A10 | 0x0080 1B10 | 0x4480 1B10 |
| L3_BW_R_CLEARHISTORY | RW | 32 | 0x0080 1A14 | 0x4480 1A14 | 0x0080 1B14 | 0x4480 1B14 |

14.2.5.1.6.2 L3 BW Regulator Register Description

Table 14-181. L3_BW_R_STDHSTHDR_COREREG

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-179 . | | |
| Physical Address | 0x4480 1400 0x4480 1700 0x4480 1800 0x4480 1A00 0x4480 1B00 | Instance | CLK2_IVAHD_BW_REGULATOR OR CLK2_SGX_P1_BW_REGULATOR OR CLK2_SGX_P2_BW_REGULATOR OR CLK2_BB2D_P1_BW_REGULATOR OR CLK2_BB2D_P2_BW_REGULATOR OR |
| Description | | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------------------------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | STDHOSTHDR_COREREG_CORECODE | | | | | | | | RESERVED | | | | | | | | STDHOSTHDR_COREREG_VENDORCODE | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|---|------|--------|
| 31:22 | RESERVED | Reserved | R | 0x000 |
| 21:16 | STDHOSTHDR_COREREG_CORECODE | The Core Code field is a constant reporting a vendor-specific core generator code. Type: Constant. Reset value: 0x31. | R | 0x31 |
| 15:1 | RESERVED | Reserved | R | 0x0000 |
| 0 | STDHOSTHDR_COREREG_VENDORCODE | The Vendor Code field is a constant reporting the core generator vendor code. Type: Constant. Reset value: 0x1. Read 0x0: Third-party vendor. Read 0x1: | R | 1 |

Table 14-182. Register Call Summary for Register L3_BW_R_STDHSTHDR_COREREG

L3 interconnect

- [L3 BW Regulator Register Summary and Description: \[0\] \[1\]](#)

Table 14-183. L3_BW_R_STDHOSTHDR_VERSIONREG

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-179 . | | |
| Physical Address | 0x4480 1404 0x4480 1704 0x4480 1804 0x4480 1A04 0x4480 1B04 | Instance | CLK2_IVAHD_BW_REGULATOR CLK2_SGX_P1_BW_REGULATOR CLK2_SGX_P2_BW_REGULATOR CLK2_BB2D_P1_BW_REGULATOR CLK2_BB2D_P2_BW_REGULATOR |
| Description | | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
|----------------------------------|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|
| STDHOSTHDR_VERSIONREG_REVISIONID | | | | | | | | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--|---|------|----------|
| 31:24 | STDHOSTHDR_VERSIONREG_REVISIONID | The Revision Identifier field is a constant reporting the core generator revision number. Type: Constant. Reset value: 0x0. | R | 0x00 |
| 23:0 | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | Reserved. Type: Reserved. Reset value: Reserved. | R | 0x000000 |

Table 14-184. Register Call Summary for Register L3_BW_R_STDHOSTHDR_VERSIONREG

L3 interconnect

- [L3 BW Regulator Register Summary and Description: \[0\] \[1\]](#)

Table 14-185. L3_BW_R_BANDWIDTH

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-179 . | | |
| Physical Address | 0x4480 1408 0x4480 1708 0x4480 1808 0x4480 1A08 0x4480 1B08 | Instance | CLK2_IVAHD_BW_REGULATOR CLK2_SGX_P1_BW_REGULATOR OR CLK2_SGX_P2_BW_REGULATOR OR CLK2_BB2D_P1_BW_REGULATOR OR CLK2_BB2D_P2_BW_REGULATOR OR |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BANDWIDTH | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | BANDWIDTH | Bandwidth, in bytes per second. Type: Control. Reset value: 0x0. | RW | 0x0000 |

Table 14-186. Register Call Summary for Register L3_BW_R_BANDWIDTH

L3 interconnect

- [Bandwidth Regulators: \[0\]](#)
- [L3 BW Regulator Register Summary and Description: \[1\] \[2\]](#)

Table 14-187. L3_BW_R_WATERMARK

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|---|----|----|-----------|----|---|---|---|---|---|---|---|---|---|------|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | See Table 14-179 . | | | | | | | | | | | | | | | | Instance CLK2_IVAHD_BW_REGULATOR CLK2_SGX_P1_BW_REGULATOR OR CLK2_SGX_P2_BW_REGULATOR OR CLK2_BB2D_P1_BW_REGULATOR OR CLK2_BB2D_P2_BW_REGULATOR OR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4480 140C 0x4480 170C 0x4480 180C 0x4480 1A0C 0x4480 1B0C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="20">RESERVED</td><td colspan="12">WATERMARK</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | WATERMARK | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | WATERMARK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | Description | | | | | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:12 | RESERVED | | | | | | | Reserved | | | | | | | | | | | | | | | | | | | | | | | R | 0x00000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11:0 | WATERMARK | | | | | | | Peak permissible bandwidth, in bytes. Type: Control. Reset value: 0x1. | | | | | | | | | | | | | | | | | | | | | | | RW | 0x001 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-188. Register Call Summary for Register L3_BW_R_WATERMARK

L3 interconnect

- [Bandwidth Regulators: \[0\] \[1\]](#)
- [L3 BW Regulator Register Summary and Description: \[2\] \[3\]](#)

Table 14-189. L3_BW_R_PRESS

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | See Table 14-179 . | | |
| Physical Address | 0x4480 1410 0x4480 1710 0x4480 1810 0x4480 1A10 0x4480 1B10 | Instance | CLK2_IVAHD_BW_REGULATOR R CLK2_SGX_P1_BW_REGULATOR OR CLK2_SGX_P2_BW_REGULATOR OR CLK2_BB2D_P1_BW_REGULATOR OR CLK2_BB2D_P2_BW_REGULATOR OR |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | PRESS_LOW | PRESS_HIGH | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1 | PRESS_LOW | Pressure value inserted if the measured bandwidth is over the watermark. The pressure is bar graph encoded. Type: Control. Reset value: 0x0. | R | 0 |
| 0 | PRESS_HIGH | Pressure value inserted if the measured bandwidth is under the watermark. The pressure is bar graph encoded. Type: Control. Reset value: 0x1. | R | 1 |

Table 14-190. Register Call Summary for Register L3_BW_R_PRESS

L3 interconnect

- [Bandwidth Regulators: \[0\]](#)
- [L3 BW Regulator Register Summary and Description: \[1\] \[2\]](#)

Table 14-191. L3_BW_R_CLEARHISTORY

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-179 . | | |
| Physical Address | 0x4480 1414 0x4480 1714 0x4480 1814 0x4480 1A14 0x4480 1B14 | Instance | CLK2_IVAHD_BW_REGULATOR CLK2_SGX_P1_BW_REGULATOR CLK2_SGX_P2_BW_REGULATOR CLK2_BB2D_P1_BW_REGULATOR CLK2_BB2D_P2_BW_REGULATOR |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|--------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CLEARHISTORY |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | CLEARHISTORY | Write a 1 clear the traffic counter Type: Give_AutoCleared. Reset value: 0x0. | RW | 0 |

Table 14-192. Register Call Summary for Register L3_BW_R_CLEARHISTORY

L3 interconnect

- [Bandwidth Regulators: \[0\]](#)
- [L3 BW Regulator Register Summary and Description: \[1\] \[2\]](#)

14.2.5.1.7 L3 BW Limiter Register Summary and Description**Table 14-193. BW Limiter Instance Summary**

| Module Name | Base Address | Size |
|-----------------------------|--------------|-----------|
| CLK2_BB2D_P1_BW_LIMITE R | 0x4480 1C00 | 256 bytes |
| CLK2_BB2D_P2_BW_LIMITE R | 0x4480 1D00 | 256 bytes |

14.2.5.1.7.1 L3 BW Limiter Register Summary

Table 14-194. BW_LIMITER Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK2_BB2D_P1_BW_LIMITER | CLK2_BB2D_P1_BW_LIMITER L3 Physical Address | Address Offset for CLK2_BB2D_P2_BW_LIMITER | CLK2_BB2D_P2_BW_LIMITER L3 Physical Address |
|---|------|-----------------------|--|---|--|---|
| L3_BW_L_STDHOSTHDR_COREREG | R | 32 | 0x0080 1C00 | 0x4480 1C00 | 0x0080 1D00 | 0x4480 1D00 |
| L3_BW_L_STDHOSTHDR_VERSIONREG | R | 32 | 0x0080 1C04 | 0x4480 1C04 | 0x0080 1D04 | 0x4480 1D04 |
| L3_BW_L_BANDWIDTH_FRACTIONAL | RW | 32 | 0x0080 1C08 | 0x4480 1C08 | 0x0080 1D08 | 0x4480 1D08 |
| L3_BW_L_BANDWIDTH_INTEGER | RW | 32 | 0x0080 1C0C | 0x4480 1C0C | 0x0080 1D0C | 0x4480 1D0C |
| L3_BW_L_WATERMARK_0 | R | 32 | 0x0080 1C10 | 0x4480 1C10 | 0x0080 1D10 | 0x4480 1D10 |
| L3_BW_L_CLEARHISTORY | RW | 32 | 0x0080 1C14 | 0x4480 1C14 | 0x0080 1D14 | 0x4480 1D14 |

14.2.5.1.7.2 L3 BW LIMITER Register Description

Table 14-195. L3_BW_L_STDHOSTHDR_COREREG

| | | | |
|-------------------------|------------------------------------|-----------------|--|
| Address Offset | See Table 14-179 . | | |
| Physical Address | 0x4480 1C00 0x4480 1D00 | Instance | CLK2_BB2D_P1_BW_LIMITER CLK2_BB2D_P2_BW_LIMITER |
| Description | | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------------------------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | STDHOSTHDR_COREREG_CORECODE | | | | | | | | RESERVED | | | | | | | | STDHOSTHDR_COREREG_VENDORCODE | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|--|------|----------|
| 31:22 | RESERVED | Reserved | R | 0x000000 |
| 21:16 | STDHOSTHDR_COREREG_CORECODE | The Core Code field is a constant reporting a vendor-specific core generator code. Type: Constant. Reset value: 0x2C. | R | 0x2C |
| 15:1 | RESERVED | Reserved | R | 0x000000 |
| 0 | STDHOSTHDR_COREREG_VENDORCODE | The Vendor Code field is a constant reporting the core generator vendor code. Type: Constant. Reset value: 0x1. Read 0x1: Third-party vendor Read 0x0: Third-party vendor. | R | 1 |

Table 14-196. Register Call Summary for Register L3_BW_L_STDHOSTHDR_COREREG

L3 interconnect

- [L3 BW Limiter Register Summary and Description: \[0\]](#)

Table 14-197. L3_BW_L_STDHOSTHDR_VERSIONREG

| | | | |
|-------------------------|------------------------------------|-----------------|--|
| Address Offset | See Table 14-179 . | | |
| Physical Address | 0x4480 1C04 0x4480 1D04 | Instance | CLK2_BB2D_P1_BW_LIMITER CLK2_BB2D_P2_BW_LIMITER |
| Description | | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------------------|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| STDHOSTHDR_VERSIONREG_REVISIONID | | | | | | | | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--|---|------|----------|
| 31:24 | STDHOSTHDR_VERSIONREG_REVISIONID | The Revision Identifier field is a constant reporting the core generator revision number. Type: Constant. Reset value: 0x0. | R | 0x00 |
| 23:0 | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | Reserved. Type: Reserved. Reset value: Reserved. | R | 0x000000 |

Table 14-198. Register Call Summary for Register L3_BW_L_STDHOSTHDR_VERSIONREG

L3 interconnect

- [L3 BW Limiter Register Summary and Description: \[0\]](#)

Table 14-199. L3_BW_L_BANDWIDTH_FRACTIONAL

| | | |
|-------------------------|------------------------------------|---|
| Address Offset | See Table 14-179 . | |
| Physical Address | 0x4480 1C08 0x4480 1D08 | Instance CLK2_BB2D_P1_BW_LIMITER CLK2_BB2D_P2_BW_LIMITER |
| Description | | |
| Type | RW | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | BANDWIDTH_FRACTIONAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|----------|
| 31:5 | RESERVED | Reserved | R | 0x000000 |
| 4:0 | BANDWIDTH_FRACTIONAL | Fractional part of bandwidth in terms of bytes per second Type: Control. Reset value: 0x6. | RW | 0x06 |

Table 14-200. Register Call Summary for Register L3_BW_L_BANDWIDTH_FRACTIONAL

L3 interconnect

- [L3 BW Limiter Register Summary and Description: \[0\]](#)

Table 14-201. L3_BW_L_BANDWIDTH_INTEGER

| | | | |
|-------------------------|------------------------------------|-----------------|--|
| Address Offset | See Table 14-179 . | | |
| Physical Address | 0x4480 1C0C 0x4480 1D0C | Instance | CLK2_BB2D_P1_BW_LIMITER CLK2_BB2D_P2_BW_LIMITER |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BANDWIDTH_INTEGER | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|----------|
| 31:3 | RESERVED | Reserved | R | 0b000000 |
| 2:0 | BANDWIDTH_INTEGER | Integer part of bandwidth in terms of bytes per second Type: Control. Reset value: 0x1. | RW | 0x1 |

Table 14-202. Register Call Summary for Register L3_BW_L_BANDWIDTH_INTEGER

L3 interconnect

- [L3 BW Limiter Register Summary and Description: \[0\]](#)

Table 14-203. L3_BW_L_WATERMARK_0

| | | | |
|-------------------------|------------------------------------|-----------------|--|
| Address Offset | See Table 14-179 . | | |
| Physical Address | 0x4480 1C10 0x4480 1D10 | Instance | CLK2_BB2D_P1_BW_LIMITER CLK2_BB2D_P2_BW_LIMITER |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WATERMARK_0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|----------|
| 31:10 | RESERVED | Reserved | R | 0x000000 |
| 9:0 | WATERMARK_0 | Peak bandwidth allowed Type: Control. Reset value: 0x3FF. | RW | 0x3FF |

Table 14-204. Register Call Summary for Register L3_BW_L_WATERMARK_0

L3 interconnect

- [L3 BW Limiter Register Summary and Description: \[0\]](#)

Table 14-205. L3_BW_L_CLEARHISTORY

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | See Table 14-179 . | | |
| Physical Address | 0x4480 1C14 0x4480 1D14 | Instance | CLK2_BB2D_P1_BW_LIMITER CLK2_BB2D_P2_BW_LIMITER |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|--------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CLEARHISTORY |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | CLEARHISTORY | Write a 1 clear the traffic counter Type: Give_AutoCleared. Reset value: 0x0. | RW | 0 |

Table 14-206. Register Call Summary for Register L3_BW_L_CLEARHISTORY

L3 interconnect

- [L3 BW Limiter Register Summary and Description: \[0\]](#)

14.2.5.1.8 L3 Rate Adapt Register Summary and Description

Table 14-207. Rate Adapt Instance Summary

| Module Name | Base Address | Size |
|------------------------------------|--------------|------|
| CLK1_RATE_ADAPT_RESP_32TO128_C LK1 | 0x4400 0800 | 4KB |
| CLK2_RATE_ADAPT_RESP_32TO128_C LK2 | 0x4480 1200 | 4KB |

14.2.5.1.8.1 L3 Rate Adapt Register Summary

Table 14-208. Rate Adapt Register Summary

| Register Name | Type | Register Width (Bits) | Address Offset for CLK1_RATE_ADAPT_RESP_32TO128_CLK1 | CLK1_RATE_ADAPT_RESP_32TO128_CLK1 L3 Physical Address | Address Offset for CLK2_RATE_ADAPT_RESP_32TO128_CLK2 | CLK2_RATE_ADAPT_RESP_32TO128_CLK2 L3 Physical Address |
|---|------|-----------------------|--|---|--|---|
| L3_RA_STDHOSTHDR_COREREG | R | 32 | 0x0000 0800 | 0x4400 0800 | 0x0080 1200 | 0x4480 1200 |
| L3_RA_STDHOSTHDR_VERSIONREG | R | 32 | 0x0000 0804 | 0x4400 0804 | 0x0080 1204 | 0x4480 1204 |
| L3_RA_CNF | RW | 32 | 0x0000 0808 | 0x4400 0808 | 0x0080 1208 | 0x4480 1208 |

14.2.5.1.8.2 L3 Rate Adapt Register Description

Table 14-209. L3_RA_STDHOSTHDR_COREREG

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | See Table 14-208 . | | |
| Physical Address | 0x4400 0800 0x4480 1200 | Instance | CLK1_RATE_ADAPT_RESP_32 TO128_CLK1 CLK2_RATE_ADAPT_RESP_32 TO128_CLK2 |
| Description | | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------------------------|
| RESERVED | | | | | | | | STDHOSTHDR_COREREG_CORECODE | | | | | | | | RESERVED | | | | | | | | | | | | | | | | STDHOSTHDR_COREREG_VENDORCODE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|---|------|--------|
| 31:22 | RESERVED | Reserved | R | 0x000 |
| 21:16 | STDHOSTHDR_COREREG_CORECODE | The Core Code field is a constant reporting a vendor-specific core generator code. Type: Constant. Reset value: 0x2D. | R | 0x2D |
| 15:1 | RESERVED | Reserved | R | 0x0000 |
| 0 | STDHOSTHDR_COREREG_VENDORCODE | The Vendor Code field is a constant reporting the core generator vendor code. Type: Constant. Reset value: 0x1. Read 0x0: Third-party vendor. Read 0x1: | R | 1 |

Table 14-210. Register Call Summary for Register L3_RA_STDHOSTHDR_COREREG

L3 interconnect

- [L3 Rate Adapt Register Summary and Description: \[0\]](#)

Table 14-211. L3_RA_STDHOSTHDR_VERSIONREG

| | | | |
|------------------|--|----------|--|
| Address Offset | See Table 14-208 . | | |
| Physical Address | 0x4400 0804 0x4480 1204 | Instance | CLK1_RATE_ADAPT_RESP_32 TO128_CLK1 CLK2_RATE_ADAPT_RESP_32 TO128_CLK2 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STDHOSTHDR_VERSIONREG_REVISIONID | | | | | | | | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--|---|------|----------|
| 31:24 | STDHOSTHDR_VERSIONREG_REVISIONID | The Revision Identifier field is a constant reporting the core generator revision number. Type: Constant. Reset value: 0x0. | R | 0x00 |
| 23:0 | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | Reserved. Type: Reserved. Reset value: Reserved. | R | 0x000000 |

Table 14-212. Register Call Summary for Register L3_RA_STDHOSTHDR_VERSIONREG

L3 interconnect

- [L3 Rate Adapt Register Summary and Description: \[0\]](#)

Table 14-213. L3_RA_CNF

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | See Table 14-208 . | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4400 0808 0x4480 1208 | | | | | | | | Instance | CLK1_RATE_ADAPT_RESP_32 TO128_CLK1 CLK2_RATE_ADAPT_RESP_32 TO128_CLK2 | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|--------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | CNF_RATE | | | | CNF_STANDFWD | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-----------|
| 31:5 | RESERVED | Reserved | R | 0x0000000 |
| 4:1 | CNF_RATE | Indicates the throughput ratio between input and output (Rate = [16 x (Incoming_Throughput/Outgoing_Throuput)] - 1), when bit StAndFwd bit is reset. Ignored when StAndFwd bit is set. Type: Control. Reset value: 0x3. | RW | 0x3 |
| 0 | CNF_STANDFWD | When this bit is set, the Packet Transport Unit stores the entire NTP packet, then forwards it on TX port. Type: Control. Reset value: 0x0. | RW | 1 |

Table 14-214. Register Call Summary for Register L3_RA_CNF

L3 interconnect

- [L3 Rate Adapt Register Summary and Description: \[0\]](#)

14.2.5.1.9 L3 STATCOLL Register Summary and Description

Table 14-215. STATCOLL Instance Summary

| Module Name | Base Address | Size |
|---------------------|--------------|-----------|
| CLK3_STATCOLL_SDRAM | 0x4500 1000 | 512 bytes |
| CLK3_STATCOLL_LAT0 | 0x4500 2000 | 512 bytes |
| CLK3_STATCOLL_LAT1 | 0x4500 3000 | 512 bytes |

14.2.5.1.9.1 L3 STATCOLL Register Summary

Table 14-216. STATCOLL Register Summary

| Register Name | Type | Register Width (Bits) | Address Offset for SDRAM | CLK3_STATCOLL_SDRAM L3 Physical Address | Address Offset for LAT0 | CLK3_STATCOLL_LAT0 L3 Physical Address | Address Offset for LAT1 | CLK3_STATCOLL_LAT1 L3 Physical Address |
|--|------|-----------------------|--------------------------|---|-------------------------|--|-------------------------|--|
| L3_STCOL_STDHOSTHDR_CORER EG | R | 32 | 0x0100 1000 | 0x4500 1000 | 0x0100 2000 | 0x4500 2000 | 0x0100 3000 | 0x4500 3000 |
| L3_STCOL_STDHOSTHDR_VERSIONREG | R | 32 | 0x0100 1004 | 0x4500 1004 | 0x0100 2004 | 0x4500 2004 | 0x0100 3004 | 0x4500 3004 |
| L3_STCOL_EN | RW | 32 | 0x0100 1008 | 0x4500 1008 | 0x0100 2008 | 0x4500 2008 | 0x0100 3008 | 0x4500 3008 |
| L3_STCOL_SOFTEN | RW | 32 | 0x0100 100C | 0x4500 100C | 0x0100 200C | 0x4500 200C | 0x0100 300C | 0x4500 300C |
| L3_STCOL_IGNORESUSPEND | RW | 32 | 0x0100 1010 | 0x4500 1010 | 0x0100 2010 | 0x4500 2010 | 0x0100 3010 | 0x4500 3010 |
| L3_STCOL_TRIGEN | RW | 32 | 0x0100 1014 | 0x4500 1014 | 0x0100 2014 | 0x4500 2014 | 0x0100 3014 | 0x4500 3014 |
| L3_STCOL_REQEVT | RW | 32 | 0x0100 1018 | 0x4500 1018 | 0x0100 2018 | 0x4500 2018 | 0x0100 3018 | 0x4500 3018 |
| L3_STCOL_RSPEVT | RW | 32 | 0x0100 101C | 0x4500 101C | 0x0100 201C | 0x4500 201C | 0x0100 301C | 0x4500 301C |
| L3_STCOL_EVTMUX_SEL0 | RW | 32 | 0x0100 1020 | 0x4500 1020 | 0x0100 2020 | 0x4500 2020 | 0x0100 3020 | 0x4500 3020 |
| L3_STCOL_EVTMUX_SEL1 | RW | 32 | 0x0100 1024 | 0x4500 1024 | 0x0100 2024 | 0x4500 2024 | 0x0100 3024 | 0x4500 3024 |
| L3_STCOL_EVTMUX_SEL2 | RW | 32 | 0x0100 1028 | 0x4500 1028 | 0x0100 2028 | 0x4500 2028 | 0x0100 3028 | 0x4500 3028 |
| L3_STCOL_EVTMUX_SEL3 | RW | 32 | 0x0100 102C | 0x4500 102C | 0x0100 202C | 0x4500 202C | 0x0100 302C | 0x4500 302C |
| L3_STCOL_EVTMUX_SEL4 | RW | 32 | 0x0100 1030 | 0x4500 1030 | N/A | N/A | N/A | N/A |
| L3_STCOL_EVTMUX_SEL5 | RW | 32 | 0x0100 1034 | 0x4500 1034 | N/A | N/A | N/A | N/A |
| L3_STCOL_EVTMUX_SEL6 | RW | 32 | 0x0100 1038 | 0x4500 1038 | N/A | N/A | N/A | N/A |
| L3_STCOL_EVTMUX_SEL7 | RW | 32 | 0x0100 103C | 0x4500 103C | N/A | N/A | N/A | N/A |
| L3_STCOL_DUMP_IDENTIFIER | R | 32 | 0x0100 1040 | 0x4500 1040 | 0x0100 2040 | 0x4500 2040 | 0x0100 3040 | 0x4500 3040 |
| L3_STCOL_DUMP_COLLECTTIME | RW | 32 | 0x0100 1044 | 0x4500 1044 | 0x0100 2044 | 0x4500 2044 | 0x0100 3044 | 0x4500 3044 |
| L3_STCOL_DUMP_SLVADDR | R | 32 | 0x0100 1048 | 0x4500 1048 | 0x0100 2048 | 0x4500 2048 | 0x0100 3048 | 0x4500 3048 |
| L3_STCOL_DUMP_MSTADDR | R | 32 | 0x0100 104C | 0x4500 104C | 0x0100 204C | 0x4500 204C | 0x0100 304C | 0x4500 304C |
| L3_STCOL_DUMP_SLVOFS | RW | 32 | 0x0100 1050 | 0x4500 1050 | 0x0100 2050 | 0x4500 2050 | 0x0100 3050 | 0x4500 3050 |
| L3_STCOL_DUMP_MODE | RW | 32 | 0x0100 1054 | 0x4500 1054 | 0x0100 2054 | 0x4500 2054 | 0x0100 3054 | 0x4500 3054 |
| L3_STCOL_DUMP_SEND | RW | 32 | 0x0100 1058 | 0x4500 1058 | 0x0100 2058 | 0x4500 2058 | 0x0100 3058 | 0x4500 3058 |
| L3_STCOL_DUMP_DISABLE | RW | 32 | 0x0100 105C | 0x4500 105C | 0x0100 205C | 0x4500 205C | 0x0100 305C | 0x4500 305C |
| L3_STCOL_DUMP_ALARM_TRIG | RW | 32 | 0x0100 1060 | 0x4500 1060 | 0x0100 2060 | 0x4500 2060 | 0x0100 3060 | 0x4500 3060 |
| L3_STCOL_DUMP_ALARM_MINVAL | RW | 32 | 0x0100 1064 | 0x4500 1064 | 0x0100 2064 | 0x4500 2064 | 0x0100 3064 | 0x4500 3064 |
| L3_STCOL_DUMP_ALARM_MAXVAL | RW | 32 | 0x0100 1068 | 0x4500 1068 | 0x0100 2068 | 0x4500 2068 | 0x0100 3068 | 0x4500 3068 |
| L3_STCOL_DUMP_ALARM_MODE0 | RW | 32 | 0x0100 106C | 0x4500 106C | 0x0100 206C | 0x4500 206C | 0x0100 306C | 0x4500 306C |
| L3_STCOL_DUMP_ALARM_MODE1 | RW | 32 | 0x0100 1070 | 0x4500 1070 | 0x0100 2070 | 0x4500 2070 | 0x0100 3070 | 0x4500 3070 |
| L3_STCOL_DUMP_ALARM_MODE2 | RW | 32 | 0x0100 1074 | 0x4500 1074 | 0x0100 2074 | 0x4500 2074 | 0x0100 3074 | 0x4500 3074 |

Table 14-216. STATCOLL Register Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset for SDRAM | CLK3_STATCOLL_SDRAM L3 Physical Address | Address Offset for LAT0 | CLK3_STATCOLL_LAT0 L3 Physical Address | Address Offset for LAT1 | CLK3_STATCOLL_LAT1 L3 Physical Address |
|--|------|-----------------------|--------------------------|---|-------------------------|--|-------------------------|--|
| L3_STCOL_DUMP_ALARM_MODE3 | RW | 32 | 0x0100 1078 | 0x4500 1078 | 0x0100 2078 | 0x4500 2078 | 0x0100 3078 | 0x4500 3078 |
| L3_STCOL_DUMP_ALARM_MODE4 | RW | 32 | 0x0100 107C | 0x4500 107C | 0x0100 207C | 0x4500 207C | 0x0100 307C | 0x4500 3078 |
| L3_STCOL_DUMP_ALARM_MODE5 | RW | 32 | 0x0100 1080 | 0x4500 1080 | 0x0100 2080 | 0x4500 2080 | 0x0100 3080 | 0x4500 3080 |
| L3_STCOL_DUMP_ALARM_MODE6 | RW | 32 | 0x0100 1084 | 0x4500 1084 | 0x0100 2084 | 0x4500 2084 | 0x0100 3084 | 0x4500 3084 |
| L3_STCOL_DUMP_ALARM_MODE7 | RW | 32 | 0x0100 1088 | 0x4500 1088 | 0x0100 2088 | 0x4500 2088 | 0x0100 3088 | 0x4500 3088 |
| L3_STCOL_DUMP_CNT0 | RW | 32 | 0x0100 108C | 0x4500 108C | 0x0100 208C | 0x4500 208C | 0x0100 308C | 0x4500 308C |
| L3_STCOL_DUMP_CNT1 | RW | 32 | 0x0100 1090 | 0x4500 1090 | 0x0100 2090 | 0x4500 2090 | 0x0100 3090 | 0x4500 3090 |
| L3_STCOL_DUMP_CNT2 | RW | 32 | 0x0100 1094 | 0x4500 1094 | 0x0100 2094 | 0x4500 2094 | 0x0100 3094 | 0x4500 3094 |
| L3_STCOL_DUMP_CNT3 | RW | 32 | 0x0100 1098 | 0x4500 1098 | 0x0100 2098 | 0x4500 2098 | 0x0100 3098 | 0x4500 3098 |
| L3_STCOL_DUMP_CNT4 | RW | 32 | 0x0100 109C | 0x4500 109C | N/A | N/A | N/A | N/A |
| L3_STCOL_DUMP_CNT5 | RW | 32 | 0x0100 10A0 | 0x4500 10A0 | N/A | N/A | N/A | N/A |
| L3_STCOL_DUMP_CNT6 | RW | 32 | 0x0100 10A4 | 0x4500 10A4 | N/A | N/A | N/A | N/A |
| L3_STCOL_DUMP_CNT7 | RW | 32 | 0x0100 10A8 | 0x4500 10A8 | N/A | N/A | N/A | N/A |
| L3_STCOL_FILTER_i_GLOBALEN | RW | 32 | 0x0100 10AC | 0x4500 10AC | 0x0100 20AC | 0x4500 20AC | 0x0100 30AC | 0x4500 30AC |
| L3_STCOL_FILTER_i_ADDRMIN | RW | 32 | 0x0100 10B0 | 0x4500 10B0 | N/A | N/A | N/A | N/A |
| L3_STCOL_FILTER_i_ADDRMAX | RW | 32 | 0x0100 10B4 | 0x4500 10B4 | N/A | N/A | N/A | N/A |
| L3_STCOL_FILTER_i_ADDREN | RW | 32 | 0x0100 10B8 | 0x4500 10B8 | N/A | N/A | N/A | N/A |
| L3_STCOL_FILTER_i_EN_k | RW | 32 | 0x0100 10BC | 0x4500 10BC | 0x0100 20BC | 0x4500 20BC | 0x0100 30BC | 0x4500 30BC |
| L3_STCOL_FILTER_i_MASK_m_MS TADDR | RW | 32 | 0x0100 10C8 | 0x4500 10C8 | 0x0100 20C8 | 0x4500 20C8 | 0x0100 30C8 | 0x4500 30C8 |
| L3_STCOL_FILTER_i_MASK_m_RD | RW | 32 | 0x0100 10C0 | 0x4500 10C0 | 0x0100 20C0 | 0x4500 20C0 | 0x0100 30C0 | 0x4500 30C0 |
| L3_STCOL_FILTER_i_MASK_m_WR | RW | 32 | 0x0100 10C4 | 0x4500 10C4 | 0x0100 20C4 | 0x4500 20C4 | 0x0100 30C4 | 0x4500 30C4 |
| L3_STCOL_FILTER_i_MASK_m_ER R | RW | 32 | 0x0100 10D0 | 0x4500 10D0 | 0x0100 20D0 | 0x4500 20D0 | 0x0100 30D0 | 0x4500 30D0 |
| L3_STCOL_FILTER_i_MASK_m_US ERINFO | RW | 32 | 0x0100 10D4 | 0x4500 10D4 | N/A | N/A | N/A | N/A |
| L3_STCOL_FILTER_i_MATCH_m_M STADDR | RW | 32 | 0x0100 10E8 | 0x4500 10E8 | 0x0100 20E8 | 0x4500 20E8 | 0x0100 30E8 | 0x4500 30E8 |
| L3_STCOL_FILTER_i_MATCH_m_R D | RW | 32 | 0x0100 10E0 | 0x4500 10E0 | 0x0100 20E0 | 0x4500 20E0 | 0x0100 30E0 | 0x4500 30E0 |
| L3_STCOL_FILTER_i_MATCH_m_W R | RW | 32 | 0x0100 10E4 | 0x4500 10E4 | 0x0100 20E4 | 0x4500 20E4 | 0x0100 30E4 | 0x4500 30E4 |
| L3_STCOL_FILTER_i_MATCH_m_E RR | RW | 32 | 0x0100 10F0 | 0x4500 10F0 | 0x0100 20F0 | 0x4500 20F0 | 0x0100 30F0 | 0x4500 30F0 |

Table 14-216. STATCOLL Register Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset for SDRAM | CLK3_STATCOLL_SDRAM L3 Physical Address | Address Offset for LAT0 | CLK3_STATCOLL_LAT0 L3 Physical Address | Address Offset for LAT1 | CLK3_STATCOLL_LAT1 L3 Physical Address |
|--|------|-----------------------|--------------------------|---|-------------------------|--|-------------------------|--|
| L3_STCOL_FILTER_i_MATCH_m_USERINFO | RW | 32 | 0x0100 10F4 | 0x4500 10F4 | N/A | N/A | N/A | N/A |
| L3_STCOL_OP_i_THRESHOLD_MIN_VAL | RW | 32 | 0x0100 11F0 | 0x4500 11F0 | 0x0100 21F0 | 0x4500 21F0 | 0x0100 31F0 | 0x4500 31F0 |
| L3_STCOL_OP_i_THRESHOLD_MAX_VAL | RW | 32 | 0x0100 11F4 | 0x4500 11F4 | 0x0100 21F4 | 0x4500 21F4 | 0x0100 31F4 | 0x4500 31F4 |
| L3_STCOL_OP_i_EVTINFOSEL | RW | 32 | 0x0100 11F8 | 0x4500 11F8 | 0x0100 21F8 | 0x4500 21F8 | 0x0100 31F8 | 0x4500 31F8 |
| L3_STCOL_OP_i_SEL | RW | 32 | 0x0100 11FC | 0x4500 11FC | 0x0100 21FC | 0x4500 21FC | 0x0100 31FC | 0x4500 31FC |

14.2.5.1.9.2 L3 STATCOLL Register Description

Table 14-217. L3_STCOL_STDHOSTHDR_COREREG

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1000 0x4500 2000 0x4500 3000 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------------------------|
| RESERVED | | | | | | | | STDHOSTHDR_COREREG_CORECODE | | | | | | | | RESERVED | | | | | | | | | | | | | | | | STDHOSTHDR_COREREG_VENDORCODE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|--|------|--------|
| 31:22 | RESERVED | Reserved | R | 0x000 |
| 21:16 | STDHOSTHDR_COREREG_CORECODE | The Core Code field is a constant reporting a vendor-specific core generator code. Type: Constant. Reset value: 0x3A. (When the instance is CLK3_FLAGMUX_STATCOLL reset value is 0x37) | R | 0x3A |
| 15:1 | RESERVED | Reserved | R | 0x0000 |
| 0 | STDHOSTHDR_COREREG_VENDORCODE | The Vendor Code field is a constant reporting the core generator vendor code. Type: Constant. Reset value: 0x1. Read 0x0: Third-party vendor. Read 0x1: | R1 | 1 |

Table 14-218. Register Call Summary for Register L3_STCOL_STDHOSTHDR_COREREG

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-219. L3_STCOL_STDHOSTHDR_VERSIONREG

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1004 0x4500 2004 0x4500 3004 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STDHOSTHDR_VERSIONREG_REVISIONID | | | | | | | | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--|---|------|----------|
| 31:24 | STDHOSTHDR_VERSIONREG_REVISIONID | The Revision Identifier field is a constant reporting the core generator revision number. Type: Constant. Reset value: 0x1. | R | 0x1 |
| 23:0 | STDHOSTHDR_VERSIONREG_COREPARAMSCHECKSUM | Reserved. Type: Reserved. Reset value: Reserved. | R | 0x000000 |

Table 14-220. Register Call Summary for Register L3_STCOL_STDHOSTHDR_VERSIONREG

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-221. L3_STCOL_EN

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1008 0x4500 2008 0x4500 3008 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | EN | Enable performance monitoring, this will also shut down the clock if En = 0 Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-222. Register Call Summary for Register L3_STCOL_EN

L3 interconnect

- [Statistic Collectors Group: \[0\]](#)
- [L3 STATCOLL Register Summary and Description: \[1\]](#)

Table 14-223. L3_STCOL_SOFTEN

| | | | | | |
|-------------------------|---|--|--|-----------------|---|
| Address Offset | See Table 14-216 . | | | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Physical Address | 0x4500 100C 0x4500 200C 0x4500 300C | | | | |
| Description | | | | | |
| Type | RW | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | SOFTEN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | SOFTEN | Software enable for performance monitoring Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-224. Register Call Summary for Register L3_STCOL_SOFTEN

L3 interconnect

- [Statistic Collectors Group: \[0\]](#)
- [L3 STATCOLL Register Summary and Description: \[1\]](#)

Table 14-225. L3_STCOL_IGNORESUSPEND

| | | | | | |
|-------------------------|---|--|--|-----------------|---|
| Address Offset | See Table 14-216 . | | | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Physical Address | 0x4500 1010 0x4500 2010 0x4500 3010 | | | | |
| Description | | | | | |
| Type | RW | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | IGNORESUSPEND |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | IGNORESUSPEND | Ignore suspend if set to one for suspend mechanism Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-226. Register Call Summary for Register L3_STCOL_IGNORESUSPEND

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-227. L3_STCOL_TRIGEN

| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 | | | | | | | |
|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|-------------|--|--|--|--|--|--|
| Physical Address | 0x4500 1014 0x4500 2014 0x4500 3014 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div><div><div>313029282726252423222120191817161514131211109876543210</div><div>RESERVED</div><div>TRIGEN</div></div></div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | | | | | | | | | | Description | | | | | | | | | | | | | | | | Type | Reset | | | | | | |
| 31:1 | RESERVED | | | | | | | | | | | | | | | | Reserved | | | | | | | | | | | | | | | | R | 0x0000 0000 | | | | | | |
| 0 | TRIGEN | | | | | | | | | | | | | | | | TrigEn when set, it enable the external trigger start and stop Type: Control. Reset value: 0x0. | | | | | | | | | | | | | | | | RW | 0 | | | | | | |

Table 14-228. Register Call Summary for Register L3_STCOL_TRIGEN

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-229. L3_STCOL_REQEVT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | |
| Physical Address | 0x4500 1018 0x4500 2018 0x4500 3018 | | | | | | | | | | | | | | | | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div><div>313029282726252423222120191817161514131211109876543210</div><div>RESERVEDREQEVT</div></div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3:0 | REQEVT | Req event select Type: Control. Reset value: 0x0. 0x0: Collect is disabled default value 0x1: Collect all event: hit always (cycle) 0x2: Collect transfers: actually used cycle for transferring aN NTTP word 0x3: Collect wait cycle: transfer has been delayed by source 0x4: Collect busy: transfer has been delayed by destination 0x5: Collect packet: new packet start 0x6: Collect data: data cycle transfer, write for requests, read for responses 0x7: Collect idles: transfer is not initiated by source 0x8: Collect latency: hit when actually detecting debug bit on response links | RW | 0x0 |

Table 14-230. Register Call Summary for Register L3_STCOL_REQEVT

L3 interconnect

- [Statistic Collectors Group: \[0\]](#)
- [L3 STATCOLL Register Summary and Description: \[1\]](#)

Table 14-231. L3_STCOL_RSPEVT

| | | | |
|------------------|----|---|---|
| Address Offset | | See Table 14-216. | |
| Physical Address | | 0x4500 101C 0x4500 201C 0x4500 301C | Instance CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RSPEVT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3:0 | RSPEVT | Rsp event select Type: Control. Reset value: 0x0. 0x0: Collect is disabled default value 0x1: Collect all event: hit always (cycle) 0x2: Collect transfers: actually used cycle for transferring a NTTP word 0x3: Collect wait cycle: transfer has been delayed by source 0x4: Collect busy: transfer has been delayed by destination 0x5: Collect packet: new packet start 0x6: Collect data: data cycle transfer, write for requests, read for responses 0x7: Collect idles: transfer is not initiated by source 0x8: Collect latency: hit when actually detecting debug bit on response links | RW | 0x0 |

Table 14-232. Register Call Summary for Register L3_STCOL_RSPEVT

L3 interconnect

- [Statistic Collectors Group: \[0\]](#)
- [L3 STATCOLL Register Summary and Description: \[1\]](#)

Table 14-233. L3_STCOL_EVTMUX_SEL0

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|
| Address Offset | | See Table 14-216 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 | | | | | | | |
| Physical Address | | 0x4500 1020 0x4500 2020 0x4500 3020 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-234. Register Call Summary for Register L3_STCOL_EVTMUX_SEL0

L3 interconnect

- [Statistic Collectors Group: \[0\]](#)
- [L3 STATCOLL Register Summary and Description: \[1\]](#)

Table 14-235. L3_STCOL_EVTMUX_SEL1

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----------|----|----|----|----|---|---|------|---|---|---|-------------|---|---|---|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------|--|--|--|
| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4500 1024 0x4500 2024 0x4500 3024 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="28">RESERVED</td><td colspan="4">EVTMUX_SEL1</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | EVTMUX_SEL1 | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | EVTMUX_SEL1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | Description | | | | | | | | | | | | | | | | Type | | | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:3 | RESERVED | | | | | | | Reserved | | | | | | | | | | | | | | | | R | | | | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2:0 | EVTMUX_SEL1 | | | | | | | The select of the mux 1 Type: Control. Reset value: 0x0. | | | | | | | | | | | | | | | | RW | | | | 0x0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-236. Register Call Summary for Register L3_STCOL_EVTMUX_SEL1

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-237. L3_STCOL_EVTMUX_SEL2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|--|----|------|----|-------------|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|---|---|-------------|---|---|---|---|---|---|---|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------|--|--|--|--|--|--|--|
| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4500 1028 0x4500 2028 0x4500 3028 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="24">RESERVED</td><td colspan="8">EVTMUX_SEL2</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | EVTMUX_SEL2 | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | EVTMUX_SEL2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:3 | RESERVED | | Reserved | | R | | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2:0 | EVTMUX_SEL2 | | The select of the mux 2 Type: Control. Reset value: 0x0. | | RW | | 0x0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-238. Register Call Summary for Register L3_STCOL_EVTMUX_SEL2

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-239. L3_STCOL_EVTMUX_SEL3

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|--|----|-------------|----|--------------|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|---|---|---|---|---|---|-------------|---|---|---|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------|--|--|--|
| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4500 102C 0x4500 202C 0x4500 302C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="28">RESERVED</td><td colspan="4">EVTMUX_SEL3</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | EVTMUX_SEL3 | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | EVTMUX_SEL3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:3 | RESERVED | | Reserved | | R | | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2:0 | EVTMUX_SEL3 | | The select of the mux 3 Type: Control. Reset value: 0x0. | | RW | | 0x0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-240. Register Call Summary for Register L3_STCOL_EVTMUX_SEL3

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-241. L3_STCOL_EVTMUX_SEL4

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK3_STATCOLL_SDRAM | | | | | | | | | | | | | | | |
| Physical Address | 0x4500 1030 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | EVTMUX_SEL4 | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2:0 | EVTMUX_SEL4 | The select of the mux 4 Type: Control. Reset value: 0x0. | RW | 0x0 |

Table 14-242. Register Call Summary for Register L3_STCOL_EVTMUX_SEL4

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-243. L3_STCOL_EVTMUX_SEL5

Address Offset

See [Table 14-216](#).

Physical Address

0x4500 1034

Description

Type

RW

Instance

CLK3_STATCOLL_SDRAM

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | EVTMUX_SEL5 | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2:0 | EVTMUX_SEL5 | The select of the mux 5 Type: Control. Reset value: 0x0. | RW | 0x0 |

Table 14-244. Register Call Summary for Register L3_STCOL_EVTMUX_SEL5

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-245. L3_STCOL_EVTMUX_SEL6

| | | | |
|-------------------------|------------------------------------|-----------------|---------------------|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1038 | Instance | CLK3_STATCOLL_SDRAM |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|-------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EVTMUX_SEL6 | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2:0 | EVTMUX_SEL6 | The select of the mux 6 Type: Control. Reset value: 0x0. | RW | 0x0 |

Table 14-246. Register Call Summary for Register L3_STCOL_EVTMUX_SEL6

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-247. L3_STCOL_EVTMUX_SEL7

| | | | |
|-------------------------|------------------------------------|-----------------|---------------------|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 103C | Instance | CLK3_STATCOLL_SDRAM |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|-------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EVTMUX_SEL7 | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2:0 | EVTMUX_SEL7 | The select of the mux 7 Type: Control. Reset value: 0x0. | RW | 0x0 |

Table 14-248. Register Call Summary for Register L3_STCOL_EVTMUX_SEL7

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-249. L3_STCOL_DUMP_IDENTIFIER

| | | | |
|------------------|---|----------|---|
| Address Offset | See Table 14-216. | | |
| Physical Address | 0x4500 1040 0x4500 2040 0x4500 3040 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DUMP_IDENTIFIER | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1:0 | DUMP_IDENTIFIER | Probe identifier Type: Control. Reset value: 0x0. | R | 0x0 |

Table 14-250. Register Call Summary for Register L3_STCOL_DUMP_IDENTIFIER

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-251. L3_STCOL_DUMP_COLLECTTIME

| | | | |
|------------------|---|----------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1044 0x4500 2044 0x4500 3044 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DUMP_COLLECTTIME | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|--------|
| 31:0 | DUMP_COLLECTTIME | Number of cycle to wait between two statistics frame Type: Control. Reset value: 0x0. | RW | 0x0000 |

Table 14-252. Register Call Summary for Register L3_STCOL_DUMP_COLLECTTIME

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-253. L3_STCOL_DUMP_SLVADDR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|-------------------|----|----|----|--|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|-------------|---|--------------|---|---|---|---|---|---|---|--|---|--|--|--|--|--|--|--|
| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 | | | | | | | |
| Physical Address | 0x4500 1048 0x4500 2048 0x4500 3048 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | DUMP_SLVADDR | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | | Field Name | | | | Description | | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | |
| 31:5 | | RESERVED | | | | Reserved | | | | | | | | | | | | | | | | R | | 0x0000000 | | | | | | | | | | | | | | | | |
| 4:0 | | DUMP_SLVADDR | | | | Dump slave address Type: Control. Reset value: 0x19. | | | | | | | | | | | | | | | | R | | 0x19 | | | | | | | | | | | | | | | | |

Table 14-254. Register Call Summary for Register L3_STCOL_DUMP_SLVADDR

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-255. L3_STCOL_DUMP_MSTADDR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|----|----|----|----|---|---|--------------|---|---|---|---|---|---|---|----|---|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------------|--|--|--|--|--|--|--|
| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4500 104C 0x4500 204C 0x4500 304C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="24">RESERVED</td><td colspan="8">DUMP_MSTADDR</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | DUMP_MSTADDR | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | DUMP_MSTADDR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | | | | | | | | | | Description | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:10 | RESERVED | | | | | | | | | | | | | | | | Reserved | | | | | | | | | | | | | | | | R | 0x000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9:0 | DUMP_MSTADDR | | | | | | | | | | | | | | | | Dump master address Type: Control. Reset value: 0x380. | | | | | | | | | | | | | | | | R | 0x380 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 14-256. Register Call Summary for Register L3_STCOL_DUMP_MSTADDR

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-257. L3_STCOL_DUMP_SLVOFS

| | | | |
|------------------|---|----------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1050 0x4500 2050 0x4500 3050 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DUMP_SLVOFS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------------|
| 31:0 | DUMP_SLVOFS | Dump slave offset Type: Control. Reset value: 0x800. | RW | 0x0000 0800 |

Table 14-258. Register Call Summary for Register L3_STCOL_DUMP_SLVOFS

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-259. L3_STCOL_DUMP_MODE

| | | | |
|------------------|---|----------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1054 0x4500 2054 0x4500 3054 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------------|--|-------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DUMP_MODE_CONDITIONAL | | DUMP_MANUAL | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1 | DUMP_MODE_CONDITIONAL | Define the stat conditional dump, if one a dump will be generated when alarm is trigged Type: Control. Reset value: 0x0. | RW | 0 |
| 0 | DUMP_MANUAL | Define the dump mode: if != 0 the dump is controlled by the Send register. Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-260. Register Call Summary for Register L3_STCOL_DUMP_MODE

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-261. L3_STCOL_DUMP_SEND

| | | |
|------------------|---|---|
| Address Offset | See Table 14-216. | |
| Physical Address | 0x4500 1058 0x4500 2058 0x4500 3058 | Instance CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DUMP_SEND | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | DUMP_SEND | In manual mode, is used to send the dump content and initialize the counters. Type: Give_AutoCleared. Reset value: 0x0. <ul style="list-style-type: none">Dumping can be performed only if monitoring is enabledFor “one shot metrics dump” the DUMP_SEND command has to be issued before disabling monitoring | RW | 0 |

Table 14-262. Register Call Summary for Register L3_STCOL_DUMP_SEND

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-263. L3_STCOL_DUMP_DISABLE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | See Table 14-216. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4500 105C 0x4500 205C 0x4500 305C | | | | | | | | | | | | | | | | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DUMP_DISABLE |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------------|
| 31:1 | RESERVED | RESERVED | R | 0x0000 0000 |
| 0 | DUMP_DISABLE | If 1, the dump frame will be disabled, but counters still active.This is typically used when counters monitoring is enabled Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-264. Register Call Summary for Register L3_STCOL_DUMP_DISABLE

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-265. L3_STCOL_DUMP_ALARM_TRIG

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1060 0x4500 2060 0x4500 3060 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------------|
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DUMP_ALARM_TRIG |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------------|
| 31:1 | RESERVED | RESERVED | R | 0x0000 0000 |
| 0 | DUMP_ALARM_TRIG | In Alarm Mode, is used to reset Alarm Type: Take. Reset value: 0x0. | RW | 0 |

Table 14-266. Register Call Summary for Register L3_STCOL_DUMP_ALARM_TRIG

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-267. L3_STCOL_DUMP_ALARM_MINVAL

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1064 0x4500 2064 0x4500 3064 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| DUMP_ALARM_MINVAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|-------------|
| 31:0 | DUMP_ALARM_MINVAL | In Alarm Mode, used to trig an alert if any of counter value is less than AlarmMinVal Type: Control. Reset value: 0x0. | RW | 0x0000 0000 |

Table 14-268. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MINVAL

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-269. L3_STCOL_DUMP_ALARM_MAXVAL

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1068 0x4500 2068 0x4500 3068 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DUMP_ALARM_MAXVAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|-------------|
| 31:0 | DUMP_ALARM_MAXVAL | In Alarm Mode, used to trig an alert if any of counter value is larger or equal to AlarmMaxVal Type: Control. Reset value: 0x0. | RW | 0x0000 0000 |

Table 14-270. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MAXVAL

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-271. L3_STCOL_DUMP_ALARM_MODE0

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 106C 0x4500 206C 0x4500 306C | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DUMP_ALARM_MODE0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | DUMP_ALARM_MODE0 | Alarm Mode off/min/max/both Type: Control. Reset value: 0x0. 0x0: OFF 0x1: MIN 0x3: MAX 0x2: BOTH | RW | 0x0 |

Table 14-272. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE0

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-273. L3_STCOL_DUMP_ALARM_MODE1

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1070 0x4500 2070 0x4500 3070 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DUMP_ALARM_MODE1 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | DUMP_ALARM_MODE1 | Alarm Mode off/min/max/both Type: Control. Reset value: 0x0. 0x0: OFF 0x1: MIN 0x3: MAX 0x2: BOTH | RW | 0x0 |

Table 14-274. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE1

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-275. L3_STCOL_DUMP_ALARM_MODE2

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1074 0x4500 2074 0x4500 3074 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DUMP_ALARM_MODE2 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | DUMP_ALARM_MODE2 | Alarm Mode off/min/max/both Type: Control. Reset value: 0x0. 0x0: OFF 0x1: MIN 0x3: MAX 0x2: BOTH | RW | 0x0 |

Table 14-276. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE2

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-277. L3_STCOL_DUMP_ALARM_MODE3

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1078 0x4500 2078 0x4500 3078 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DUMP_ALARM_MODE3 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | DUMP_ALARM_MODE3 | Alarm Mode off/min/max/both Type: Control. Reset value: 0x0. 0x0: OFF 0x1: MIN 0x3: MAX 0x2: BOTH | RW | 0x0 |

Table 14-278. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE3

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-279. L3_STCOL_DUMP_ALARM_MODE4

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 107C 0x4500 207C 0x4500 3078 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DUMP_ALARM_MODE4 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | DUMP_ALARM_MODE4 | Alarm Mode off/min/max/both Type: Control. Reset value: 0x0. 0x0: OFF 0x1: MIN 0x3: MAX 0x2: BOTH | RW | 0x0 |

Table 14-280. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE4

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-281. L3_STCOL_DUMP_ALARM_MODE5

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1080 0x4500 2080 0x4500 3080 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DUMP_ALARM_MODE5 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | DUMP_ALARM_MODE5 | Alarm Mode off/min/max/both Type: Control. Reset value: 0x0. 0x0: OFF 0x1: MIN 0x3: MAX 0x2: BOTH | RW | 0x0 |

Table 14-282. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE5

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-283. L3_STCOL_DUMP_ALARM_MODE6

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Physical Address | 0x4500 1084 0x4500 2084 0x4500 3084 | | |
| Description | | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | DUMP_ALARM_MODE6 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | DUMP_ALARM_MODE6 | Alarm Mode off/min/max/both Type: Control. Reset value: 0x0. 0x0: OFF 0x1: MIN 0x3: MAX 0x2: BOTH | RW | 0x0 |

Table 14-284. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE6

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-285. L3_STCOL_DUMP_ALARM_MODE7

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Physical Address | 0x4500 1088 0x4500 2088 0x4500 3088 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DUMP_ALARM_MODE7 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1:0 | DUMP_ALARM_MODE7 | Alarm Mode off/min/max/both Type: Control. Reset value: 0x0. 0x0: OFF 0x1: MIN 0x3: MAX 0x2: BOTH | RW | 0x0 |

Table 14-286. Register Call Summary for Register L3_STCOL_DUMP_ALARM_MODE7

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-287. L3_STCOL_DUMP_CNT0

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 108C 0x4500 208C 0x4500 308C | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DUMP_CNT0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31:0 | DUMP_CNT0 | Dump counter value Type: Status. Reset value: X. | R | 0x0 |

Table 14-288. Register Call Summary for Register L3_STCOL_DUMP_CNT0

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-289. L3_STCOL_DUMP_CNT1

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 1090 0x4500 2090 0x4500 3090 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DUMP_CNT1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31:0 | DUMP_CNT1 | Dump counter value Type: Status. Reset value: X. | R | 0x0 |

Table 14-290. Register Call Summary for Register L3_STCOL_DUMP_CNT1

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-291. L3_STCOL_DUMP_CNT2

Address Offset See [Table 14-216](#).

Physical Address
0x4500 1094
0x4500 2094
0x4500 3094

Instance
CLK3_STATCOLL_SDRAM
CLK3_STATCOLL_LAT0
CLK3_STATCOLL_LAT1

Description
Type

R

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DUMP_CNT2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31:0 | DUMP_CNT2 | Dump counter value Type: Status. Reset value: X. | R | 0x0 |

Table 14-292. Register Call Summary for Register L3_STCOL_DUMP_CNT2

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-293. L3_STCOL_DUMP_CNT3

Address Offset See [Table 14-216](#).

Physical Address
0x4500 1098
0x4500 2098
0x4500 3098

Instance
CLK3_STATCOLL_SDRAM
CLK3_STATCOLL_LAT0
CLK3_STATCOLL_LAT1

Description
Type

R

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DUMP_CNT3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31:0 | DUMP_CNT3 | Dump counter value Type: Status. Reset value: X. | R | 0x0 |

Table 14-294. Register Call Summary for Register L3_STCOL_DUMP_CNT3

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-295. L3_STCOL_DUMP_CNT4

| | | | |
|-------------------------|------------------------------------|-----------------|---------------------|
| Address Offset | See Table 14-216 . | Instance | CLK3_STATCOLL_SDRAM |
| Physical Address | 0x4500 109C | | |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DUMP_CNT4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31:0 | DUMP_CNT4 | Dump counter value Type: Status. Reset value: X. | R | 0x0 |

Table 14-296. Register Call Summary for Register L3_STCOL_DUMP_CNT4

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-297. L3_STCOL_DUMP_CNT5

| | | | |
|-------------------------|------------------------------------|-----------------|---------------------|
| Address Offset | See Table 14-216 . | Instance | CLK3_STATCOLL_SDRAM |
| Physical Address | 0x4500 10A0 | | |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DUMP_CNT5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31:0 | DUMP_CNT5 | Dump counter value Type: Status. Reset value: X. | R | 0x0 |

Table 14-298. Register Call Summary for Register L3_STCOL_DUMP_CNT5

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-299. L3_STCOL_DUMP_CNT6

| | | | |
|-------------------------|------------------------------------|-----------------|---------------------|
| Address Offset | See Table 14-216 . | Instance | CLK3_STATCOLL_SDRAM |
| Physical Address | 0x4500 10A4 | | |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DUMP_CNT6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | DUMP_CNT6 | Dump counter value Type: Status. Reset value: X. | R | 0x---- ---- |

Table 14-300. Register Call Summary for Register L3_STCOL_DUMP_CNT6

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-301. L3_STCOL_DUMP_CNT7

| | | | |
|-------------------------|------------------------------------|-----------------|---------------------|
| Address Offset | See Table 14-216 . | Instance | CLK3_STATCOLL_SDRAM |
| Physical Address | 0x4500 10A8 | | |
| Description | | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DUMP_CNT7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | DUMP_CNT7 | Dump counter value Type: Status. Reset value: X. | R | 0x---- ---- |

Table 14-302. Register Call Summary for Register L3_STCOL_DUMP_CNT7

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-303. L3_STCOL_FILTER_i_GLOBALEN

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | See Table 14-216 . | Instance | CLK3_STATCOLL_SDRAM |
| Physical Address | 0x4500 10AC 0x4500 20AC 0x4500 30AC | | CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | FILTER i GLOBALEN |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | FILTER_i_GLOBALEN | Filter global enable Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-304. Register Call Summary for Register L3_STCOL_FILTER_i_GLOBALEN

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-305. L3_STCOL_FILTER_i_ADDRMIN

| | | | |
|-------------------------|------------------------------------|-----------------|---------------------|
| Address Offset | See Table 14-216 . | Instance | CLK3_STATCOLL_SDRAM |
| Physical Address | 0x4500 10B0 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FILTER0_ADDRMIN | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|-------------|
| 31:23 | RESERVED | Reserved | R | 0x0000 0000 |
| 22:0 | FILTER0_ADDRMIN | Min addr range Type: Control. Reset value: 0x0. | RW | 0x00 0000 |

Table 14-306. Register Call Summary for Register L3_STCOL_FILTER_i_ADDRMIN

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-307. CLK3_STCOL_FILTER_i_ADDRMAX

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | See Table 14-216 . | Instance | CLK3_STATCOLL_SDRAM |
| Physical Address | 0x4500 10B4 0x4500 20B4 0x4500 30B4 | | CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FILTER0_ADDRMAX | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|-------------|
| 31:23 | RESERVED | Reserved | R | 0x0000 0000 |
| 22:0 | FILTER0_ADDRMAX | Max addr range Type: Control. Reset value: 0x0. | RW | 0x00 0000 |

Table 14-308. L3_STCOL_FILTER_i_ADDREN

| | | | |
|-------------------------|------------------------------------|-----------------|---------------------|
| Address Offset | See Table 14-216 . | Instance | CLK3_STATCOLL_SDRAM |
| Physical Address | 0x4500 10B8 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FILTER0_ADDREN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|---|
| 31:1 | RESERVED | Reserved | R | 0bxxx xxxx xxxx xxxx xxxx xxxx xxxx xxxx |
| 0 | FILTER0_ADDREN | Max filtering enable Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-309. Register Call Summary for Register L3_STCOL_FILTER_i_ADDREN

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-310. L3_STCOL_FILTER_i_EN_k

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|------------------------------------|--|--|--|--|--|--|-------------------------|--|--|--|--|--|--|--|-----------------------|----------|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|---------------------|--|--|--|--|--|--|--|
| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK3_STATCOLL_SDRAM | | | | | | | |
| Physical Address | 0x4500 10BC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CLK3_STATCOLL_LAT0 | | | | | | | |
| | 0x4500 20BC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4500 30BC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CLK3_STATCOLL_LAT1 | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 30 29 28 27 26 25 24 | | | | | | | | 23 22 21 20 19 18 17 16 | | | | | | | | 15 14 13 12 11 10 9 8 | | | | | | | | 7 6 5 4 3 2 1 0 | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FILTER_LEN0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | FILTER_i_EN0 | Enable filter stage 0 Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-311. Register Call Summary for Register L3_STCOL_FILTER_i_EN_k

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-312. L3_STCOL_FILTER_i_MASK_m_MSTADDR

| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|----------------------------|--|--|--|-------------------------|--|--|------|----------|--|--|--|--|--|
| Physical Address | 0x4500 10C8 0x4500 20C8 0x4500 30C8 | | | | | | | | | | | | | | | | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div>31 30 29 28 27 26 25 24</div> <div>23 22 21 20 19 18 17 16</div> <div>15 14 13 12 11 10 9 8</div> | | | | | | | | | | | | | | | | | | | | | | | | <div>7 6 5 4 3 2 1 0</div> | | | | FILTER_i_MASK_m_MSTADDR | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | FILTER_i_MASK_m_MSTADDR | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | | | | | | | | | | Description | | | | | | | | | | | | | | Type | Reset | | | | | |
| 31:8 | RESERVED | | | | | | | | | | | | | | | | Reserved | | | | | | | | | | | | | | R | 0x000000 | | | | | |
| 7:0 | FILTER_i_MASK_m_MSTADDR | | | | | | | | | | | | | | | | Mask/Match of MstAddr Type: Control. Reset value: 0x0. | | | | | | | | | | | | | | RW | 0x00 | | | | | |

Table 14-313. Register Call Summary for Register L3_STCOL_FILTER_i_MASK_m_MSTADDR

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-314. L3_STCOL_FILTER_i_MASK_m_RD

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 10C0 0x4500 20C0 0x4500 30C0 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|--------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | FILTER_i_MASK_m_RD |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | FILTER_i_MASK_m_RD | Mask/Match of Rd Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-315. Register Call Summary for Register L3_STCOL_FILTER_i_MASK_m_RD

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-316. L3_STCOL_FILTER_i_MASK_m_WR

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 10C4 0x4500 20C4 0x4500 30C4 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|--------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | FILTER_i_MASK_m_WR |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | FILTER_i_MASK_m_WR | Mask/Match of Wr Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-317. Register Call Summary for Register L3_STCOL_FILTER_i_MASK_m_WR

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-318. L3_STCOL_FILTER_i_MASK_m_ERR

| | | | |
|------------------|---|----------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 10D0 0x4500 20D0 0x4500 30D0 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | FILTER_i_MASK_m_ERR | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | FILTER_i_MASK_m_ERR | Mask/Match of Err Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-319. Register Call Summary for Register L3_STCOL_FILTER_i_MASK_m_ERR

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-320. L3_STCOL_FILTER_i_MASK_m_USERINFO

| | | | | | | | | | | | | | | | | | |
|------------------|------------------------------------|--|--|--|--|--|--|--|----------|---------------------|--|--|--|--|--|--|--|
| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | |
| Physical Address | 0x4500 10D4 | | | | | | | | Instance | CLK3_STATCOLL_SDRAM | | | | | | | |
| Description | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | FILTER_i_MASK_m_USERINFO | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|---------|
| 31:18 | RESERVED | Reserved | R | 0x0000 |
| 17:0 | FILTER_i_MASK_m_USERINFO | Mask/Match of UserInfo Type: Control. Reset value: 0x0. | RW | 0x00000 |

Table 14-321. Register Call Summary for Register L3_STCOL_FILTER_i_MASK_m_USERINFO

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-322. L3_STCOL_FILTER_i_MASK_m_SLVADDR

| | | | | |
|-------------------------|------------------------------------|--|-----------------|--|
| Address Offset | See Table 14-216 . | | Instance | CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Physical Address | 0x4500 20CC 0x4500 30CC | | | |
| Description | | | | |
| Type | RW | | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | FILTER_i_MASK_m_SLVADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------------|
| 31:5 | RESERVED | Reserved | R | 0x0000 0000 |
| 4:0 | FILTER_i_MASK_m_SLVADDR | Mask/Match of SlvAddr Type: Control. Reset value: 0x0. | RW | 0x00 |

Table 14-323. L3_STCOL_FILTER_i_MASK_m_REQUSERINFO

| | | | | |
|-------------------------|------------------------------------|--|-----------------|--|
| Address Offset | See Table 14-216 . | | Instance | CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Physical Address | 0x4500 20D4 0x4500 30D4 | | | |
| Description | | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FILTER0_MASK0_REQUSERINFO | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|--|------|-------------|
| 31:24 | RESERVED | | R | 0x0000 0000 |
| 23:0 | FILTER_i_MASK_m_REQUSERINFO | Mask/Match of ReqUserInfo Type: Control. Reset value: 0x0. | RW | 0x00 |

Table 14-324. L3_STCOL_FILTER_i_MASK_m_RSPUSERINFO

| | | | | |
|-------------------------|------------------------------------|--|-----------------|--|
| Address Offset | See Table 14-216 . | | Instance | CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Physical Address | 0x4500 20D8 0x4500 30D8 | | | |
| Description | | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FILTER_i_MASK_m_RSPUSERINFO | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|--|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2:0 | FILTER_i_MASK_m_RSPUSERINFO | Mask/Match of RspUserInfo Type: Control. Reset value: 0x0. | RW | 0x0 |

Table 14-325. L3_STCOL_FILTER_i_MATCH_m_MSTADDR

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 10E8 0x4500 20E8 0x4500 30E8 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FILTER_i_MATCH_m_MSTADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|----------|
| 31:10 | RESERVED | Reserved | R | 0x000000 |
| 9:0 | FILTER_i_MATCH_m_MSTADDR | Mask/Match of MstAddr Type: Control. Reset value: 0x0. | RW | 0x00 |

Table 14-326. Register Call Summary for Register L3_STCOL_FILTER_i_MATCH_m_MSTADDR

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-327. L3_STCOL_FILTER_i_MATCH_m_SLVADDR

| | | | |
|-------------------------|------------------------------------|-----------------|--|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 30EC 0x4500 30EC | Instance | CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | FILTER_i_MATCH_m_SLVADDR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|------|-------------|
| 31:5 | RESERVED | Reserved | R | 0x0000 0000 |
| 4:0 | FILTER_i_MATCH_m_SLVADDR | Mask/Match of SlvAddr Type: Control. Reset value: 0x0. | RW | 0x00 |

Table 14-328. L3_STCOL_FILTER_i_MATCH_m_RD

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 10E0 0x4500 20E0 0x4500 30E0 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | FILTER_i_MATCH_m_RD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | FILTER_i_MATCH_m_RD | Mask/Match of Rd Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-329. Register Call Summary for Register L3_STCOL_FILTER_i_MATCH_m_RD

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-330. L3_STCOL_FILTER_i_MATCH_m_WR

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 10E4 0x4500 20E4 0x4500 30E4 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | FILTER_i_MATCH_m_WR |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | FILTER_i_MATCH_m_WR | Mask/Match of Wr Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-331. Register Call Summary for Register L3_STCOL_FILTER_i_MATCH_m_WR

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-332. L3_STCOL_FILTER_i_MATCH_m_ERR

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 10F0 0x4500 20F0 0x4500 30F0 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | FILTER_i_MATCH_m_ERR |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | FILTER_i_MATCH_m_ERR | Mask/Match of Err Type: Control. Reset value: 0x0. | RW | 0 |

Table 14-333. Register Call Summary for Register L3_STCOL_FILTER_i_MATCH_m_ERR

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-334. L3_STCOL_FILTER_i_MATCH_m_USERINFO

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|------------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------------|---|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|---------------------|--|--|--|---------|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK3_STATCOLL_SDRAM | | | | | | | | | | | | | | | |
| Physical Address | 0x4500 10F4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | FILTER_i_MATCH_m_USERINFO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | | | | | | | | | | Description | | | | | | | | | | | | | | | | Type | | | | Reset | | | | | | | | | | | |
| 31:18 | RESERVED | | | | | | | | | | | | | | | | Reserved | | | | | | | | | | | | | | | | R | | | | 0x0000 | | | | | | | | | | | |
| 17:0 | FILTER_i_MATCH_m_USERINFO | | | | | | | | | | | | | | | | Mask/Match of UserInfo Type: Control. Reset value: 0x0. | | | | | | | | | | | | | | | | RW | | | | 0x00000 | | | | | | | | | | | |

Table 14-335. Register Call Summary for Register L3_STCOL_FILTER_i_MATCH_m_USERINFO

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-336. L3_STCOL_FILTER_i_MATCH_m_REQUSERINFO

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | See Table 14-216 . | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CLK3_STATCOLL_LAT0 | | | | | | | | | | | | | | | |
| Physical Address | 0x4500 30F4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | CLK3_STATCOLL_LAT1 | | | | | | | | | | | | | | | |
| | 0x4500 20F4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FILTER_i_MASK_m_REQUSERINFO | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|--|------|-------------|
| 31:24 | RESERVED | Reserved | R | 0x0000 0000 |
| 23:0 | FILTER_i_MASK_m_REQUSERINFO | Mask/Match of ReqUserInfo Type: Control. Reset value: 0x0. | RW | 0x00 |

Table 14-337. L3_STCOL_FILTER_i_MATCH_m_RSPUSERINFO

| | | | |
|------------------|------------------------------------|----------|--|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 20F8 0x4500 30F8 | Instance | CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FILTER_i_MASK_m_RSPUSERINFO | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|--|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | FILTER_i_MASK_m_RSPUSERINFO | Mask/Match of RspUserInfo Type: Control. Reset value: 0x0. | RW | 0x0 |

Table 14-338. L3_STCOL_OP_i_THRESHOLD_MINVAL

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 11F0 0x4500 21F0 0x4500 31F0 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OP_i_THRESHOLD_MINVAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|------|----------|
| 31:12 | RESERVED | Reserved | R | 0x000000 |
| 11:0 | OP_i_THRESHOLD_MINVAL | Min value Type: Control. Reset value: 0x0. | RW | 0x000 |

Table 14-339. Register Call Summary for Register L3_STCOL_OP_i_THRESHOLD_MINVAL

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-340. L3_STCOL_OP_i_THRESHOLD_MAXVAL

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 11F4 0x4500 21F4 0x4500 31F4 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OP_i_THRESHOLD_MAXVAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|------|---------|
| 31:12 | RESERVED | Reserved | R | 0x00000 |
| 11:0 | OP_i_THRESHOLD_MAXVAL | Max value Type: Control. Reset value: 0x0. | RW | 0x000 |

Table 14-341. Register Call Summary for Register L3_STCOL_OP_i_THRESHOLD_MAXVAL

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-342. L3_STCOL_OP_i_EVTINFOSEL

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 11F8 0x4500 21F8 0x4500 31F8 | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OP_i_EVTINFOSEL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------------|
| 31:2 | RESERVED | Reserved | R | 0x0000 0000 |
| 1:0 | OP_i_EVTINFOSEL | Select event info data to add to counter (len/press or latency) Type: Control. Reset value: 0x0. 0x0: Select len from event info list 0x1: Select pressure if available from event info list 0x2: Select latency if available from event info list | RW | 0x0 |

Table 14-343. Register Call Summary for Register L3_STCOL_OP_i_EVTINFOSEL

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

Table 14-344. L3_STCOL_OP_i_SEL

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | See Table 14-216 . | | |
| Physical Address | 0x4500 11FC 0x4500 21FC 0x4500 31FC | Instance | CLK3_STATCOLL_SDRAM CLK3_STATCOLL_LAT0 CLK3_STATCOLL_LAT1 |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OP_i_SEL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:4 | RESERVED | Reserved | R | 0x0000000 |
| 3:0 | OP_i_SEL | Select logical operation Type: Control. Reset value: 0x0. 0x0: Increment counter on each mask/match filter hit 0x1: Increment counter on each min/max level hit 0x2: Add to counter the selected event info value (len/press or latency) 0x3: Increment counter when all filter event hits (And(Fi)) 0x4: Increment counter if any of filter event hits (Or(Fi)) 0x5: Add to counter the number of current request event that hit 0x6: Add to counter the number of current response event that hit 0x7: Add to counter the number of all event that hit 0x8: Increment counter on each selected external event hit | RW | 0x0 |

Table 14-345. Register Call Summary for Register L3_STCOL_OP_i_SEL

L3 interconnect

- [L3 STATCOLL Register Summary and Description: \[0\]](#)

14.3 L4 Interconnects

This section details the device L4 interconnects.

14.3.1 L4 Interconnect Overview

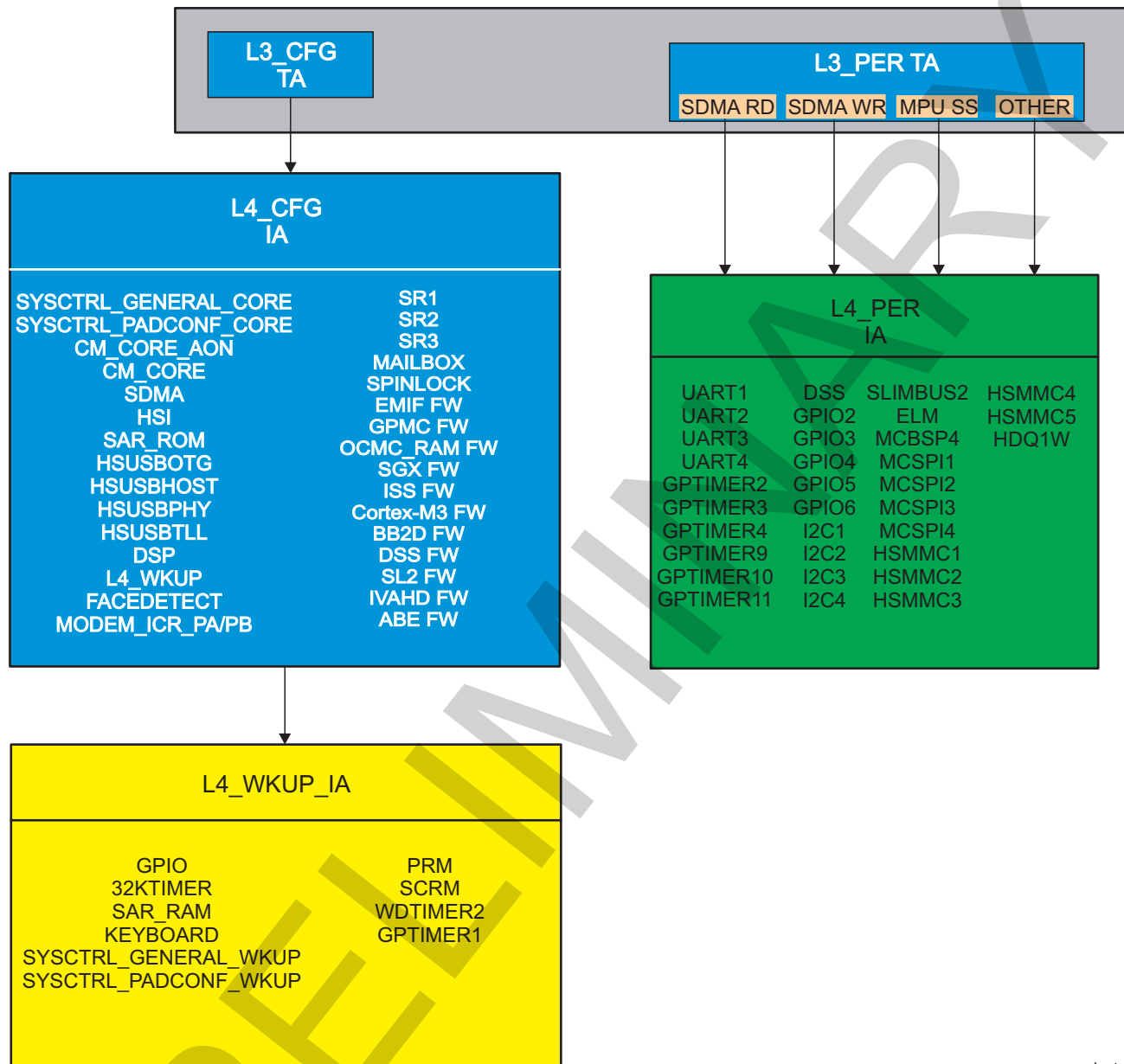
The device uses three separate L4 interconnect structures to connect peripheral modules. All L4s handle transfers with peripherals but are in distinct power domains.

[Figure 14-8](#) is an overview of the L4 interconnects and the peripherals attached to them.

The L4 interconnect is composed of the following interconnects:

- L4_CFG: Includes the majority of the configuration interface for L3 system modules and peripheral interconnect
- L4_PER: Includes the main peripherals that require sDMA access
- L4_WKUP: Includes peripherals attached to the WKUP power domain

Figure 14-8. L4 Interconnect Overview



icnt-013

The main features of the L4 interconnects are:

- From one to four 32-bit initiator ports for each L4 interconnect instance
- 8-, 16-, or 32-bit data, single, or burst transactions
- Little endian
- Nonblocking architecture with fair arbitration between threads
- Target interfaces: Fully synchronous or divided synchronous
- L4_CFG and L4_PER frequency equal half of L3 frequency
- Protection logic that provides user-configurable access control to targets by each initiator
- Implementation of RFFs to support low-voltage dynamic power switching

14.3.2 L4 Interconnect Integration

Table 14-346 and Table 14-347 summarize the integration of the module in the device.

Table 14-346. Integration Attributes

| Module Instance | Attributes |
|-----------------|--------------|
| | Power Domain |
| L4_PER | PD_L4_PER |
| L4_CFG | PD_CORE |
| L4_WKUP | PD_WKUP |

Table 14-347. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|-------------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| L4_PER | L4_PER_CLK | PER_L4_ICLK | PRCM module | Functional and interface clock |
| L4_CFG | L4_CFG_CLK | CFG_L4_ICLK | PRCM module | Functional and interface clock |
| L4_WKUP | L4_WKUP_CLK | WKUP_L4_ICLK2 | PRCM module | Functional and interface clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| L4_PER | L4_PER_RST | L4_PER_RST | PRCM module | Reset of L4_PER interconnect |
| | L4_PER_RET_RST | L4_PER_RET_RST | PRCM module | Reset of L4_PER interconnect retention registers. For information about retention reset, see Chapter 3, Power, Reset, and Clock Management . |
| L4_CFG | L4_CFG_RST | CORE_RST | PRCM module | Reset of L4_CFG interconnect |
| | L4_CFG_RET_RST | CORE_RET_RST | PRCM module | Reset of L4_CFG interconnect retention registers. For information about retention reset, see Chapter 3, Power, Reset, and Clock Management . |
| L4_WKUP | L4_WKUP_RST | WKUP_RST | PRCM module | Reset of L4_WKUP interconnect |

14.3.3 L4 Interconnect Functional Description

14.3.3.1 Module Distribution

IAs and TAs provide the interface to connect the different modules to their associated interconnect.

[Table 14-348](#) through [Table 14-353](#) list all the modules and subsystems with their associated agents. The agents are listed for each L4 interconnect domain.

14.3.3.1.1 L4_PER Interconnect Agents

The L4_PER interconnect handles transfers only to peripherals in the PER power domain. [Table 14-348](#) lists the PER TAs.

Table 14-348. L4 PER TAs

| Module Target Name | Description |
|--------------------|---|
| PER_TA_UART1 | UART port 1 module |
| PER_TA_UART2 | UART port 2 module |
| PER_TA_UART3 | UARTport 3 module |
| PER_TA_UART4 | UART port 4 module |
| PER_TA_GPTIMER2 | GPTIMER2 module |
| PER_TA_GPTIMER3 | GPTIMER3 module |
| PER_TA_GPTIMER4 | GPTIMER4 module |
| PER_TA_GPTIMER9 | GPTIMER9 module |
| PER_TA_GPTIMER10 | GPTIMER10 module |
| PER_TA_GPTIMER11 | GPTIMER11 module |
| PER_TA_DSS | Display subsystem configuration module |
| PER_TA_GPIO2 | General-purpose input/output 2 (GPIO2) module |
| PER_TA_GPIO3 | GPIO3 module |
| PER_TA_GPIO4 | GPIO4 module |
| PER_TA_GPIO5 | GPIO5 module |
| PER_TA_GPIO6 | GPIO6 module |
| PER_TA_I2C1 | Multimaster I2C1 module |
| PER_TA_I2C2 | Multimaster I2C2 module |
| PER_TA_I2C3 | Multimaster I2C3 module |
| PER_TA_I2C4 | Multimaster I2C4 module |
| PER_TA_SLIMBUS2 | SILMBUS2 module |
| PER_TA_ELM | Error location module |
| PER_TA_MCBSP4 | McBSP4 module |
| PER_TA_MCSPI1 | McSPI1 module |
| PER_TA_MCSPI2 | MCSPi2 module |
| PER_TA_MCSPI3 | MCSPi3 module |
| PER_TA_MCSPI4 | MCSPi4 module |
| PER_TA_HSMMC1 | MMC controller 1 module |
| PER_TA_HSMMC2 | MMC controller 2 module |
| PER_TA_HSMMC3 | MMC controller 3 module |
| PER_TA_HSMMC4 | MMC controller 4 module |
| PER_TA_HSMMC5 | MMC controller 5 module |
| PER_TA_HDQ1W | Single-wire serial link low-rate module |

Four ports communicate between the L3 interconnect and the L4_PER interconnect to allow the L3 initiators to access the L4_PER targets. [Table 14-349](#) lists the L4_PER initiator TAs.

For the list of initiators authorized to access the L4 peripheral peripherals, see [Section 14.2.3.2.2, Connectivity Matrix](#).

Table 14-349. L4_PER IAs

| Module Initiator Name | Description |
|-----------------------|--|
| PER_IA_0 | L3 system direct memory access (sDMA) RD interconnect port |
| PER_IA_1 | L3 sDMA WR interconnect port |
| PER_IA_2 | L3 MPU subsystem interconnect port |
| PER_IA_3 | L3 others interconnect port |

14.3.3.1.2 L4_CFG Interconnect Agents

The L4_CFG interconnect handles transfers only to peripherals in the core power domain. [Table 14-350](#) lists the L4_CFG TAs.

Table 14-350. L4_CFG TAs

| Module Target Name | Description |
|-----------------------------|------------------------------------|
| CFG_TA_SYSCTRL_GENERAL_CORE | System control general core module |
| CFG_TA_SYSCTRL_PADCONF_CORE | System control padconf core module |
| CFG_TA_CM_CORE_AON | Clock manager 1 module |
| CFG_TA_CM_CORE | Clock manager 1 module core |
| CFG_TA_DMA_SYSTEM | sDMA module |
| CFG_TA_HSI | HS SSI module |
| CFG_TA_SAR_ROM | SAR ROM |
| CFG_TA_HSUSBOTG | HS USB OTG module |
| CFG_TA_HSUSBHOST | HS USB host module |
| CFG_TA_HSUSBPHY | HS USB PHY module |
| CFG_TA_HSUSBTLL | USB TTL module |
| CFG_TA_DSP | DSP subsystem |
| CFG_TA_SR1 | SmartReflex1 module |
| CFG_TA_SR2 | SmartReflex2 module |
| CFG_TA_SR3 | SmartReflex3 module |
| CFG_TA_MAILBOX | Mailbox module |
| CFG_TA_SPINLOCK | Spinlock module |
| CFG_TA_FACEDETECT | Face detect module |
| CFG_TA_MAFW | Memory adapter firewall |
| CFG_TA_EMIFFW | EMIF firewall |
| CFG_TA_GPMCFW | GPMC firewall |
| CFG_TA_OCMCRAMFW | OCMC_RAM firewall |
| CFG_TA_SGXFW | SGX firewall |
| CFG_TA_BB2DFW | BB2D firewall |
| CFG_TA_ISSF | ISS firewall |
| CFG_TA_CORTEXM3FW | Cortex-M3 firewall |
| CFG_TA_DSSFW | Display subsystem (DSS) firewall |
| CFG_TA_SL2FW | SL2 firewall |
| CFG_TA_IVAHDFW | IVA-HD firewall |
| CFG_TA_L3_INSTR | EMU subsystem firewall |
| CFG_TA_ABEFW | ABE firewall |

Table 14-350. L4_CFG TAs (continued)

| Module Target Name | Description |
|------------------------|-----------------------------------|
| CFG_TA_L4_WKUP | L4_WKUP connection |
| CFG_TA_MODEM_ICR_PA/PB | Modem intercommunication register |

A unique port, CFG_IA_0, communicates between the L3 interconnect and the L4_CFG interconnect to allow the L3 initiators to access the L4_CFG targets (see [Table 14-351](#)).

For the list of initiators authorized to access the L4_CFG peripherals, see [Section 14.2.3.2.2, Connectivity Matrix](#).

Table 14-351. L4_CFG IAs

| Module Initiator Name | Description |
|-----------------------|----------------------|
| CFG_IA_0 | L3 interconnect port |

14.3.3.1.3 L4_WKUP Interconnect Agents

The L4-WKUP interconnect handles transfers only to peripherals in the WKUP power domain.

[Table 14-352](#) lists the TAs. [Table 14-353](#) lists the L4 WKUP initiator agents.

Table 14-352. L4_WKUP TAs

| Module Target Name | Description |
|------------------------------|--|
| WKUP_TA_GPIO1 | GPIO1 module |
| WKUP_TA_32KTIMER | 32-kHz timer module |
| WKUP_TA_SAR_RAM | SAR RAM |
| WKUP_TA_KEYBOARD | Keyboard module |
| WKUP_TA_SYSCTRL_GENERAL_WKUP | System control general WKUP module |
| WKUP_TA_SYSCTRL_PADCONF_WKUP | System control padconf WKUP module |
| WKUP_TA_PRM | Power reset management module |
| WKUP_TA_SCRM | System clock and reset management module |
| WKUP_TA_WDTIMER2 | WDTIMER2 module |
| WKUP_TA_GPTIMER1 | GPTIMER1 module |

Table 14-353. L4_WKUP IA

| Module Initiator Name | Description |
|-----------------------|--------------------------|
| WKUP_IA_0 | L4_CFG interconnect port |

14.3.3.2 Power Management

As part of the system-wide power-management scheme, the L4 interconnects go into IDLE state after receiving a request from the PRCM module after all commands are serviced. This function is handled by hardware. For more information, see [Chapter 3, Power, Reset, and Clock Management](#).

To reduce power consumption, each L4 interconnect automatically performs internal clock autogating. This is managed by hardware; no software configurations or settings are required.

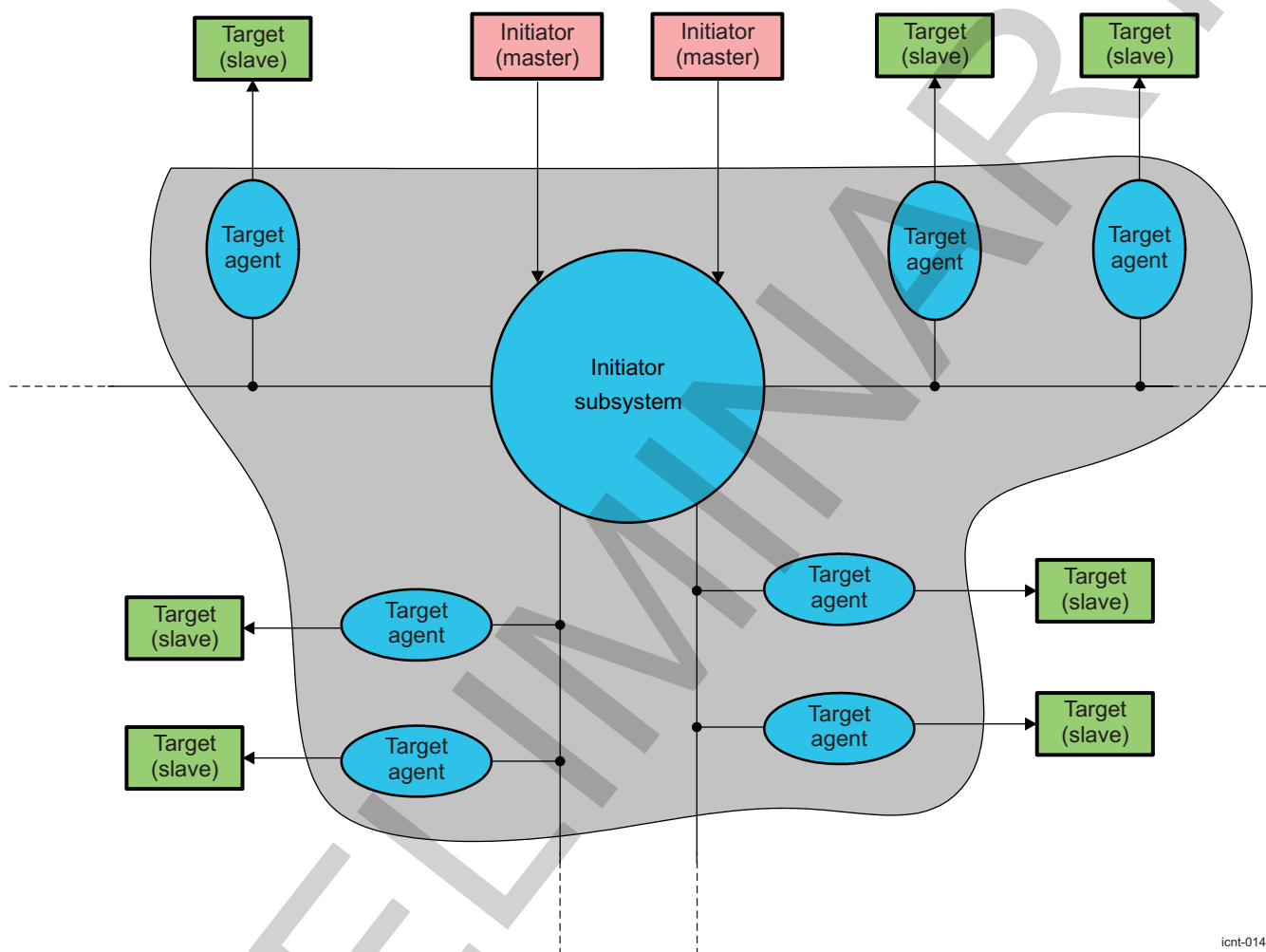
Retention is performed on all software-accessible registers at IAs, TAs, and firewalls. This process prevents reconfiguration after a clock domain switches off. For more information, see [Chapter 3, Power, Reset, and Clock Management](#).

14.3.3.3 L4 Firewalls

[Figure 14-9](#) is an internal view of the L4 interconnects in the overall interconnect. This architecture, with

one initiator subsystem centralizing all initiator master requests and distributing them to all target modules (peripherals), enables the L4 interconnect firewall functions to be centralized at the L4 initiator subsystem level. The L4 firewall filters the accesses based on the configurable protection groups defined in the L4 address protection (AP) registers. Each module or TA is assigned to a protection group. The configuration is also defined in the L4 AP and is programmable on a module-per-module basis.

Figure 14-9. L4 Initiator-Target Connectivity



icnt-014

NOTE: As Figure 14-9 shows, targets are attached to branches. Branches do not impact the function of the L4 interconnect but are present to simplify timing closure and reduce active power consumption.

Because of the large address spaces and the number of peripherals connected to an L4 interconnect, two parameters are used to set up access permission:

- Programmable groups for initiators
 - Eight protection groups for L4_PER and L4_CFG interconnect
- Segments divided into regions of 4KB
 - 100 regions for the L4_PER interconnect
 - 104 regions for the L4_CFG interconnect

NOTE:

- Regions and segments are present for the L4_WKUP interconnect but cannot be programmed.
- L4_WKUP protection is done through the L4_CFG interconnect.

Protection group members are TAs with the same protection settings. A region is programmed to allow access to a unique selectable protection group. For better protection, different regions are grouped into protection group regions and associated with a protection group member.

All L4 interconnect information, such as numbers of protection groups, regions, and segments, is available in the [L4_LA_INITIATOR_INFO_L](#) register.

14.3.3.3.1 Protection Group

A protection group is defined by its initiators and REQ_INFO is allowed. Two registers define these two settings:

- The CONNID_BIT_VECTOR field [L4_AP_PROT_GROUP_MEMBERS_k_L](#) is a 1-bit vector that defines which initiator belongs to a group. A protection group is accessible by an initiator when the bit position corresponding to its ConnID is set to 1 in the CONNID_BIT_VECTOR field. [Table 14-354](#) lists all the ConnIDs available at the L4 levels.
- The ENABLE field [L4_AP_PROT_GROUP_ROLES_k_L](#) lists all possible REQ_INFO combinations associated with the [L4_AP_PROT_GROUP_MEMBERS_k_L](#) register. Setting a Req bit in this register determines the initiators type of access. For more information, see [L3 Firewall Functionality](#). Two REQ_INFOS are used in L4 interconnects: MReqDebug and MReqSupervisor.

NOTE: Permissions are identical for read and write accesses in L4 interconnect.

k indicates the protection group number.

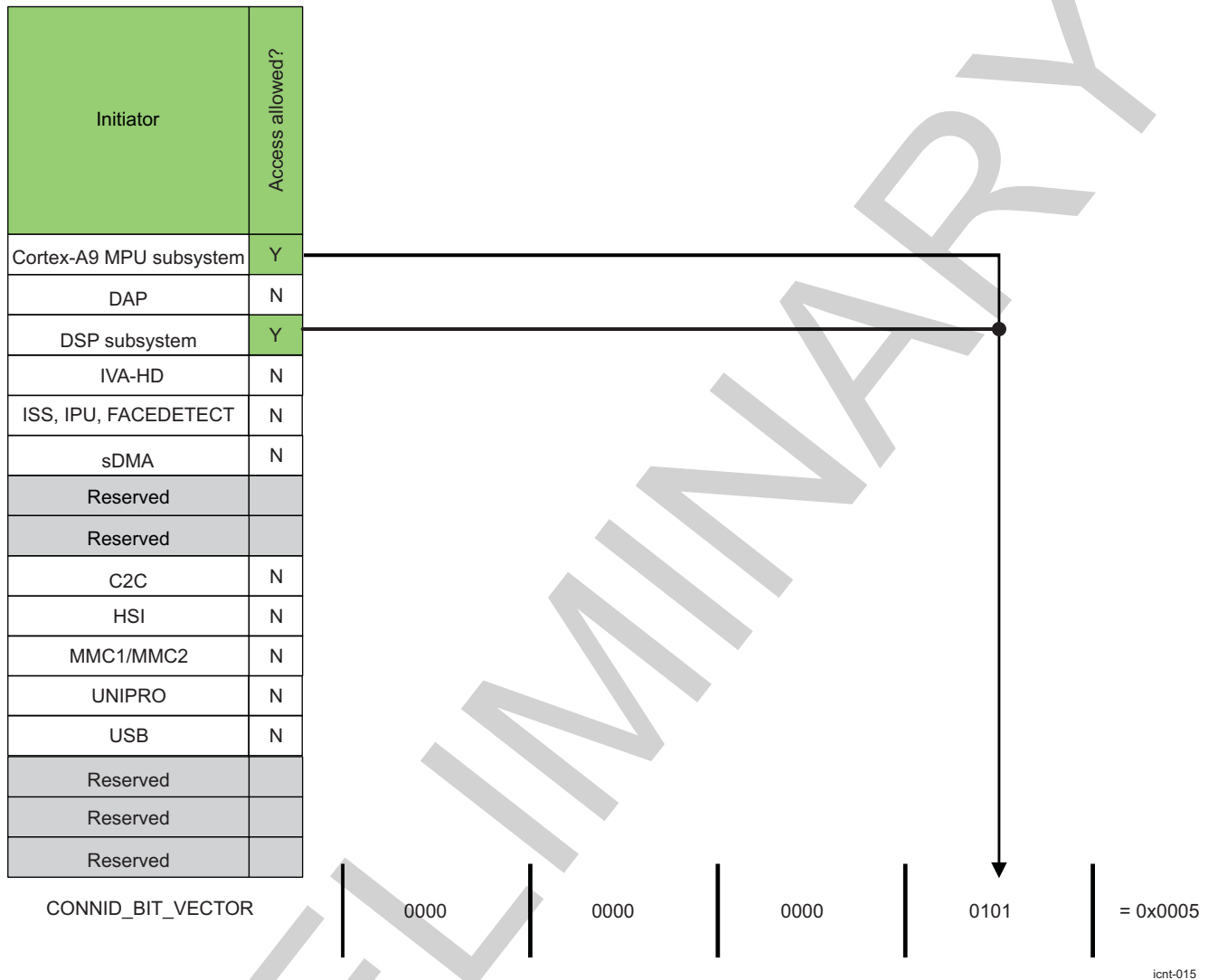
L indicates the region number.

Table 14-354. L4 ConnID Definition

| ConnID | Initiator |
|--------|-------------------------|
| 0 | Cortex-A9 MPU Subsystem |
| 1 | DAP |
| 2 | DSP |
| 3 | IVAHD |
| 4 | ISS, IPU, FACEDETECT |
| 5 | sDMA |
| 6 | RESERVED |
| 7 | RESERVED |
| 8 | C2C |
| 9 | HSI |
| A | MMC1/MMC2 |
| B | UNIPRO |
| C | USB |
| D | RESERVED |
| E | RESERVED |
| F | RESERVED |

Figure 14-10 is an example of CONNID_BIT_VECTOR.

Figure 14-10. Example of CONNID_BIT_VECTOR L4_AP_PROT_GROUP_MEMBERS_k



Setting bits 0 and 2 in the PROT_GROUP_ID_1 register defines a group initiator that can access targets in protection group 1, and includes the following:

- Cortex-A9 MPU subsystem
- DSP subsystem

Protection group 1 can be applied to multiple protection regions with no limitation. Each protection region that is configured with protection group 1 enables permission access only to the two initiators.

The L4_AP_REGION_I_H PROT_GROUP_ID field determines the region to which the protection group member is attached.

The values of some CONNID_BIT_VECTOR and ENABLE fields are exported by the system control module (SCM) at reset or are user writable (see Table 14-477 for more information).

Table 14-355 and Table 14-356 list the default configuration of the various groups for each L4 interconnect. For each group, some modules/regions are associated with it with default initiator members.

Table 14-355. L4_PER Firewall Default Configuration

| Group | Default Modules Associated With Group | Register | Modifiability | Default Value |
|--------------------------|---------------------------------------|--|---------------|-------------------|
| Group 0 AP registers | AP registers | L4_AP_PROT_GROUP_ROL ES_0_L | No | 0xFFFF FFFF (all) |
| | | L4_AP_PROT_GROUP_MEM BERS_0_L | No | 0xFFFF (all) |
| Group 1 | Reserved | L4_AP_PROT_GROUP_ROL ES_1_L | No | 0xFFFF FFFF (all) |
| | | L4_AP_PROT_GROUP_MEM BERS_1_L | No | 0xFFFF (all) |
| Group 2 | Reserved | L4_AP_PROT_GROUP_ROL ES_2_L | No | 0xFFFF FFFF (all) |
| | | L4_AP_PROT_GROUP_MEM BERS_2_L | No | 0xFFFF (All) |
| Groups 3–6 Free | No modules attached | L4_AP_PROT_GROUP_ROL ES_3_L L4_AP_PROT_GROUP_ROL ES_4_L L4_AP_PROT_GROUP_ROL ES_5_L L4_AP_PROT_GROUP_ROL ES_6_L | Yes | 0xFFFF FFFF (all) |
| | | L4_AP_PROT_GROUP_MEM BERS_3_L L4_AP_PROT_GROUP_MEM BERS_4_L L4_AP_PROT_GROUP_MEM BERS_5_L L4_AP_PROT_GROUP_MEM BERS_6_L | Yes | 0xFFFF (all) |
| Group 7 Other modules | Other L4_PER modules | L4_AP_PROT_GROUP_ROL ES_7_L | Yes | 0xFFFF FFFF (all) |
| | | L4_AP_PROT_GROUP_MEM BERS_7_L | Yes | 0xFFFF (all) |

Table 14-356. L4_CFG Firewall Default Configuration

| Group | Default Modules Associated With Group | Register | Modifiability | Default Value |
|-------------------------|---------------------------------------|----------------------------------|---------------|-------------------|
| Group 0 AP registers | AP registers | L4_AP_PROT_GROUP_ROL ES_0_L | No | 0xFFFF FFFF (all) |
| | | L4_AP_PROT_GROUP_MEM BERS_0_L | No | 0xFFFF (all) |
| Group 1 | SAR_RAM3, all firewall registers | L4_AP_PROT_GROUP_ROL ES_1_L | No | 0xFFFF FFFF (all) |
| | | L4_AP_PROT_GROUP_MEM BERS_1_L | No | 0xFFFF (all) |
| Group 3 SAR_RAM2 | SAR_RAM2 | L4_AP_PROT_GROUP_ROL ES_3_L | No | 0xFFFF FFFF (all) |
| | | L4_AP_PROT_GROUP_MEM BERS_3_L | No | 0xFFFF (all) |
| Group 4 SAR_RAM4 | SAR_RAM4 | L4_AP_PROT_GROUP_ROL ES_4_L | No | 0xFFFF FFFF (all) |
| | | L4_AP_PROT_GROUP_MEM BERS_4_L | No | 0xFFFF (all) |
| Group 5 Free | Reserved | L4_AP_PROT_GROUP_ROL ES_5_L | Yes | 0xFFFF FFFF (all) |
| | | L4_AP_PROT_GROUP_MEM BERS_5_L | Yes | 0xFFFF (all) |

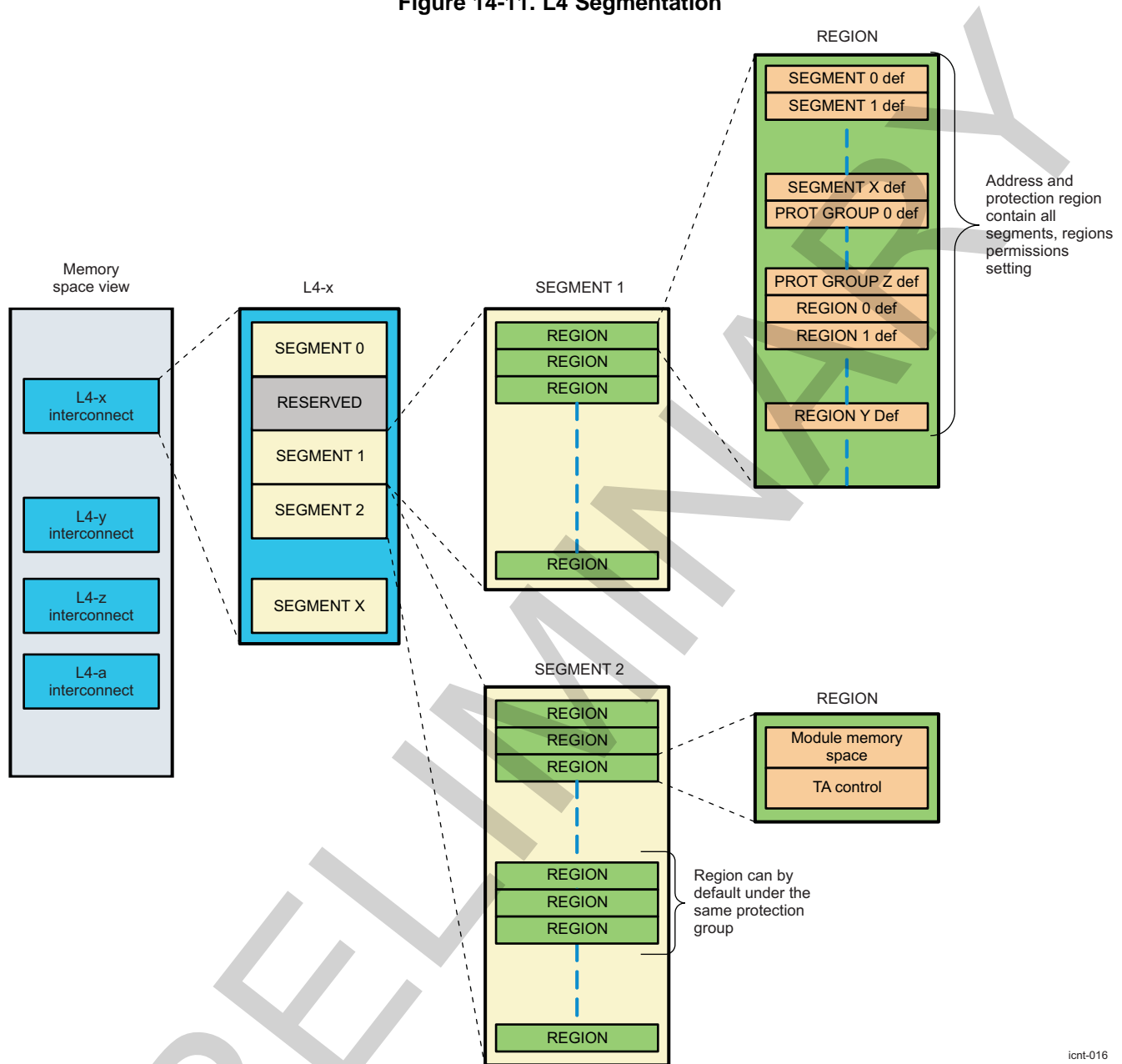
Table 14-356. L4_CFG Firewall Default Configuration (continued)

| Group | Default Modules Associated With Group | Register | Modifiability | Default Value |
|--------------------------|---------------------------------------|----------------------------------|---------------|-------------------|
| Group 6 Free | No modules attached | L4_AP_PROT_GROUP_ROL ES_6_L | Yes | 0xFFFF FFFF (all) |
| | | L4_AP_PROT_GROUP_MEM BERS_6_L | Yes | 0xFFFF (all) |
| Group 7 Other modules | Other L4_CFG modules | L4_AP_PROT_GROUP_ROL ES_7_L | Yes | 0xFFFF FFFF (all) |
| | | L4_AP_PROT_GROUP_MEM BERS_7_L | Yes | 0xFFFF (all) |

14.3.3.3.2 Segments and Regions

The protection mechanism for L4 interconnects is based on a hierarchical segmentation, as shown in [Figure 14-11](#). By default, some regions are attached to specific protection group members. This specificity lets users set up the permission access to certain types of modules requiring the same access protection without managing region allocation.

Figure 14-11. L4 Segmentation



icnt-016

All interconnect address spaces are covered by regions. [Table 14-357](#) through [Table 14-359](#) list the module mapping with their addresses, region numbers, and default protection group allocated to them.

NOTE: Module refers to the configuration registers of the module.

TA refers to the interconnect configuration registers of the TA associated with the module.

Table 14-357. Region Allocations for L4_PER Interconnect

| Module | Region | Description |
|---------------|--------|-------------|
| L4_PER CONFIG | 0 | Firewall |
| | 1 | PER_IA_0 |
| | 2 | Link agent |

Table 14-357. Region Allocations for L4_PER Interconnect (continued)

| Module | Region | Description |
|-----------|--------|-------------|
| UART3 | 3 | TA |
| | 4 | Module |
| GPTIMER2 | 5 | TA |
| | 6 | Module |
| GPTIMER3 | 7 | TA |
| | 8 | Module |
| GPTIMER4 | 9 | TA |
| | 10 | Module |
| GPTIMER9 | 11 | TA |
| | 12 | Module |
| DSS | 13 | TA |
| | 14 | Module |
| GPIO2 | 15 | TA |
| | 16 | Module |
| GPIO3 | 17 | TA |
| | 18 | Module |
| GPIO4 | 19 | TA |
| | 20 | Module |
| GPIO5 | 21 | TA |
| | 22 | Module |
| GPIO6 | 23 | TA |
| | 24 | Module |
| I2C3 | 36 | Module |
| | 25 | TA |
| UART1 | 26 | TA |
| | 27 | Module |
| UART2 | 28 | TA |
| | 29 | Module |
| UART4 | 30 | TA |
| | 31 | Module |
| I2C1 | 32 | TA |
| | 33 | Module |
| I2C2 | 34 | TA |
| | 35 | Module |
| MCBSP4 | 37 | TA |
| | 38 | Module |
| SLIMBUS2 | 39 | TA |
| | 40 | Module |
| ELM | 41 | TA |
| | 42 | Module |
| GPTIMER10 | 43 | TA |
| | 44 | Module |
| GPTIMER11 | 45 | TA |
| | 46 | Module |
| MCSPI1 | 49 | TA |
| | 50 | Module |
| MCSPI2 | 51 | TA |

Table 14-357. Region Allocations for L4_PER Interconnect (continued)

| Module | Region | Description |
|---------------|--------|-------------|
| HSMMC1 | 52 | Module |
| | 53 | TA |
| HSMMC3 | 54 | Module |
| | 63 | TA |
| HDQ | 64 | Module |
| | 65 | TA |
| HSMMC2 | 66 | Module |
| | 67 | TA |
| MCSP13 | 68 | Module |
| | 69 | TA |
| MCSP14 | 70 | Module |
| | 71 | TA |
| HSMMC4 | 72 | Module |
| | 73 | TA |
| HSMMC5 | 74 | Module |
| | 75 | TA |
| I2C4 | 76 | Module |
| | 77 | TA |
| L4_PER CONFIG | 78 | Module |
| | 81 | PER_IA_1 |
| | 82 | PER_IA_2 |
| | 83 | PER_IA_3 |

Table 14-358. Region Allocations for L4_CFG Interconnect

| Module | Region | Description |
|--------------------------|--------|-------------|
| L4_CFG CONFIG | 0 | Firewall |
| | 1 | CFG_IA_0 |
| | 2 | Link agent |
| CFG_SYSCTRL_GENERAL_CORE | 3 | TA |
| | 4 | Module |
| CM1 | 5 | TA |
| | 6 | Module |
| sDMA | 7 | TA |
| | 8 | Module |
| HSI | 9 | TA |
| | 10 | Module |
| HSUSBTL | 11 | TA |
| | 12 | Module |
| SR1 | 13 | TA |
| | 14 | Module |
| SR2 | 15 | TA |
| | 16 | Module |
| SR3 | 17 | TA |
| | 18 | Module |
| CFG_SYSCTRL_PADCONF_CORE | 21 | TA |
| | 22 | Module |
| CM2 | 23 | TA |

Table 14-358. Region Allocations for L4_CFG Interconnect (continued)

| Module | Region | Description |
|---------------|--------|----------------------------|
| | 24 | Module |
| DSP subsystem | 25 | TA |
| | 26 | Module |
| Mailbox | 27 | TA |
| | 28 | Module |
| SPINLOCK | 29 | TA |
| | 30 | Module |
| SL2FW | 31 | TA |
| | 32 | Module |
| MAFW | 33 | TA |
| | 34 | Module |
| C2CFW | 35 | TA |
| | 36 | Module |
| MODEMFW | 37 | TA |
| | 38 | Module |
| OCMCRAFW | 39 | TA |
| | 40 | Module |
| EMIFFW | 41 | TA |
| | 42 | Module |
| GPMCFW | 43 | TA |
| | 44 | Module |
| ISSFW | 45 | TA |
| | 46 | Module |
| SGXFW | 47 | TA |
| | 48 | Module |
| CORTEXM3FW | 49 | TA |
| | 50 | Module |
| IVAHDWF | 51 | TA |
| | 52 | Module |
| EMUSSFW | 53 | TA |
| | 54 | Module |
| ABEFW | 55 | TA |
| | 56 | Module |
| DSSFW | 59 | TA |
| | 60 | Module |
| FACEDTECT | 65 | TA |
| | 66 | Module |
| L4WKUP | 67 | L4_WKUP regions 0-4, 15-20 |
| | 68 | Module |
| MODEMICRA | 69 | TA |
| | 70 | Module |
| L4WKUP | 71 | L4_WKUP regions 23-26 |
| | 72 | L4_WKUP regions 27, 28 |
| | 73 | L4_WKUP region 13 |
| | 74 | L4_WKUP region 29 |
| | 75 | L4_WKUP region 30 |
| | 76 | L4_WKUP region 31 |

Table 14-358. Region Allocations for L4_CFG Interconnect (continued)

| Module | Region | Description |
|-----------|--------|-----------------------------|
| MODEMICRB | 78 | TA |
| | 79 | Module |
| SAR_ROM | 80 | TA |
| | 81 | Module |
| USBFS | 82 | TA |
| | 83 | Module |
| USBOTGHS | 84 | TA |
| | 85 | Module |
| USBHOSTHS | 86 | TA |
| | 87 | Module |
| USBPHY | 88 | TA |
| | 89 | Module |
| L4WKUP | 90 | L4_WKUP region 14 |
| | 91 | – |
| | 92 | L4_WKUP region (5, 6, 7, 8) |
| | 93 | L4_WKUP region (9, 10) |
| | 94 | L4_WKUP region (11, 12) |
| | 95 | L4_WKUP region (21, 22) |
| BB2DFW | 96 | TA |
| | 97 | Module |

Table 14-359. Region Allocations for L4_WKUP Interconnect

| Module | Region | Description |
|------------------------------|--------|-------------|
| L4 WKUP CONFIG | 0 | AP |
| | 1 | CFG_IA_0 |
| | 2 | Link agent |
| PRM | 3 | TA |
| | 4 | Module |
| GPIO1 | 5 | TA |
| | 6 | Module |
| WDTIMER2 | 7 | TA |
| | 8 | Module |
| GPTimer 1 ms | 9 | Module |
| | 10 | TA |
| KEYBOARD | 11 | TA |
| | 12 | Module |
| SAR_RAM | 13 | TA |
| | 14 | Module |
| SCRM | 15 | TA |
| | 16 | Module |
| 32KTIMER | 17 | TA |
| | 18 | Module |
| WKUP_SYSCTRL_GENERAL_WKUP | 19 | TA |
| | 20 | Module |
| WKUP_TA_SYSCTRL_PADCONF_WKUP | 21 | TA |
| | 22 | Module |

Table 14-359. Region Allocations for L4_WKUP Interconnect (continued)

| Module | Region | Description |
|---------|--------|-------------|
| SAR_RAM | 29 | TA |
| | 30 | TA |
| | 31 | TA |

14.3.3.3.3 L4 Firewall Address and Protection Register Settings

Table 14-360 lists the settings of the AP registers relative to an L4 interconnect firewall. These values are computed based on the physical implementation of each L4 interconnect.

Table 14-360. L4 Firewall Register Description Overview

| Register Type | Register Name | Bits | Field | Description |
|-------------------|---|-------|---------------------|--|
| Segment | L4_AP_SEGMENT_i_L ⁽¹⁾ | 23:0 | BASE | Segment base address |
| | L4_AP_SEGMENT_i_H ⁽¹⁾ | 4:0 | SIZE | Segment size equals 2 ^{SIZE} |
| Protection groups | L4_AP_PROT_GROUP_MEMBERS_k_L ⁽²⁾ | 15:0 | CONNID_BIT_VECTOR | For L4ConnID, see Table 14-354. |
| | L4_AP_PROT_GROUP_ROLES_k_L ⁽²⁾ | 31:0 | ENABLE | For REQ_INFO description, see Section 14.2.3, L3 Interconnect Functional Description. ⁽³⁾ |
| Region setting | L4_AP_REGION_l_L ⁽⁴⁾ | 23:0 | BASE | Defines the base address of region with respect to its segment base address |
| | L4_AP_REGION_l_H ⁽⁴⁾ | 27:24 | SEGMENT_ID | Segment ID number of the region |
| | | 22:20 | PROT_GROUP_ID | Protection group member attached to the region |
| | | 19:17 | BYTE_DATA_WIDTH_EXP | Determines the number of bytes in an access |
| | | 5:1 | SIZE | Region size equals 2 ^{SIZE} |
| | | 0 | ENABLE | Enables the region protection |

⁽¹⁾ i = 0 to 1 for PER_AP
i = 0 to 6 for CFG_AP

⁽²⁾ k = 0 to 7 for PER_AP
k = 0 to 7 for CFG_AP

⁽³⁾ For L interconnects, only MReqDebug and MReqSupervisor are available.

⁽⁴⁾ l = 0 to 96 for PER_AP
l = 0 to 113 for CFG_AP

14.3.3.4 L4 Error Detection and Reporting

14.3.3.4.1 IA and TA Error Detection and Logging

The L4 interconnect provides mechanisms for handling internally detected errors or errors reported by modules attached to the L4 target ports.

NOTE: L4_IA and L4_TA denote the IA and TA, respectively, for all L4 interconnects: L4_PER, L4_CFG, and L4_WKUP.

The L4 interconnects handle four types of errors:

- No target core found or address hole, detected and logged at IA
- Unsupported command, detected and logged at IA
- Protection violation, detected and logged at IA (see Section 14.3.3.3, L4 Firewalls)
- Target does not service a request before a time-out expires. The error is detected and logged at TA (see Section 14.3.3.4.2, Time-Out).

Table 14-361 lists the value of the [L4_IA_ERROR_LOG_L\[25:24\]](#) CODE bit field stored when an error occurs.

Table 14-361. L4 CODE Bit Field Definition

| CODE (bits 1:0) | Error Type | REQ_INFO | Secondary | ConnID | CMD |
|-----------------|----------------------|----------|-----------|--------|-----|
| 0 | No error | | | | |
| 1 | Unsupported command | x | x | x | x |
| 2 | Address hole | x | x | x | x |
| 3 | Protection violation | x | | x | x |

- No target core found/address hole: This error indicates that a request was addressed to a hole in the L4 address map. When this error occurs, an in-band error response is returned to the L3 level. The error is also logged into the [L4_IA_AGENT_STATUS_L\[27\]](#) INBAND_ERROR bit. Additionally, an address hole error code is logged to the [L4_IA_ERROR_LOG_L\[25:24\]](#) CODE bit field.
- Unsupported command: This error indicates that the command type of the request is not supported by the accessed target register. The error is logged into the [L4_IA_AGENT_STATUS_L\[27\]](#) INBAND_ERROR bit. An unsupported command error code is written to the [L4_IA_ERROR_LOG_L\[25:24\]](#) CODE bit field for the initiator interface.
- Protection violation: This error indicates that a request is not issued from an allowed initiator member or is issued with the inappropriate ReqInfo qualifiers associated with the target region. This error is reported using an in-band error and is written to the [L4_IA_AGENT_STATUS_L\[27\]](#) INBAND_ERROR bit. A protection violation error code is saved into the [L4_IA_ERROR_LOG_L\[25:24\]](#) CODE bit field for the same initiator interface. A protection violation is also logged in the [L4_IA_AGENT_STATUS_L\[31\]](#) PROT_ERROR_SECONDARY or [30] PROT_ERROR_PRIMARY bit when in debug or applicative mode, respectively.

The [L4_IA_ERROR_LOG_L\[30\]](#) SECONDARY bit indicates whether the error occurred in application or debug.

The [L4_IA_ERROR_LOG_H\[15:0\]](#) REQ_INFO bit field returns the type access (REQ_INFO qualifier) that caused the error.

The [L4_IA_ERROR_LOG_L\[11:8\]](#) CONNID bit field returns the ID of the initiator that caused the error.

The [L4_IA_ERROR_LOG_ADDR_L\[31:0\]](#) register logs the address for error conditions.

A [L4_IA_ERROR_LOG_L\[31\]](#) MULTI bit is asserted when multiple errors are detected. In this case, the error code corresponds to the first error that occurs.

14.3.3.4.2 Time-Out

A time-out mechanism can be enabled at the interconnect level and on a per-target basis. If the mechanism is enabled for a TA and interconnect and commands are not accepted or responses are not returned within the expected delay, the L4 interconnect generates an error event.

NOTE: The time-out mechanism is not available on the L4_WKUP interconnect, but L4_WKUP time-outs are detected in CFG_TA_L4WKUP of the L4_CFG interconnect.

The error is logged in the [L4_TA_AGENT_STATUS_L\[8\]](#) REQ_TIMEOUT bit. The affected TA enters an error state that causes it to send an error response to any new request targeted at it. To recover from this state, the TA must be reset by the system software. The time-out is counted starting from the moment a command is presented to the target, regardless of the target response to this command.

The L4 interconnect implements a centralized time-base circuit that broadcasts a set of four periodic pulse signals to all connected TAs. The time-base circuit offers four possible sets of four time-base signals. Selection is done by programming the [L4_LA_NETWORK_CONTROL_L\[10:8\]](#) TIMEOUT_BASE bit field.

The selected time-base signals are available at any TA. Each TA can be programmed to refer to one of these four time-base signals, using the [L4_TA_AGENT_CONTROL_L\[10:8\]](#) REQ_TIMEOUT bit field. These four signals are referred to as 1X time-base, 4X time-base, 16X time-base, and 64X time-base.

Table 14-362 lists all values in number of L4 clock cycles.

Table 14-362. L4 Time-Out Link and TA Programming

| L4_TA_AGENT_CONTROL_L REQ_TIMEOUT[2:0] | | | | | |
|--|--|------|--------|--------|---------|
| L4_LA_NETWORK_CON TROL_L TIMEOUT_BASE[2:0] | 0 | 1 | 2 | 3 | 4 |
| 0 | All L4 time-out features are disabled. | | | | |
| 1 | Locally disabled | 64 | 256 | 1024 | 4096 |
| 2 | | 256 | 1024 | 4096 | 16,384 |
| 3 | | 1024 | 4096 | 16,384 | 65,536 |
| 4 | | 4096 | 16,384 | 65,536 | 262,144 |

The default reset value is 0x2 for REQ_TIMEOUT and 0x4 for TIMEOUT_BASE, implying 16,384 clock cycles.

A time-out condition is detected when the command acceptance or the response is not received after a delay of from one to three time-base periods.

Example:

- L4 frequency = 65 MHz
- TIMEOUT_BASE = 4 in the L4_LA_NETWORK_CONTROL_L register
- REQ_TIMEOUT = 2 in the L4_TA_AGENT_CONTROL_L for TA A
- REQ_TIMEOUT = 4 in the L4_TA_AGENT_CONTROL_L for TA B

At agent A, the time-base unit is 16,384 cycles. A time-out is issued when a request to the attached module is not accepted, or no response is sent after a delay of 252 μ s to 756 μ s.

At agent B, the time-base unit is 262,144 cycles. A time-out is issued when a request to the attached module is not accepted, or no response is sent after a delay of 4 ms to 12 ms.

On detection of a time-out condition, the TA logs the error in the L4_TA_AGENT_STATUS_L[8] REQ_TIMEOUT bit, and it also reports the error to the IA, which forwards it to the L3 interconnects.

After the time-out is detected and logged, the behavior of the attached module is ignored. A new request targeting the module arriving at the timed-out TA receives an error response. If the request is addressed to the agent internal registers, it is processed normally.

To recover from a time-out error, software is assumed to first reset the faulty module and then the TA using the L4_TA_AGENT_CONTROL_L[0] OCP_RESET bit.

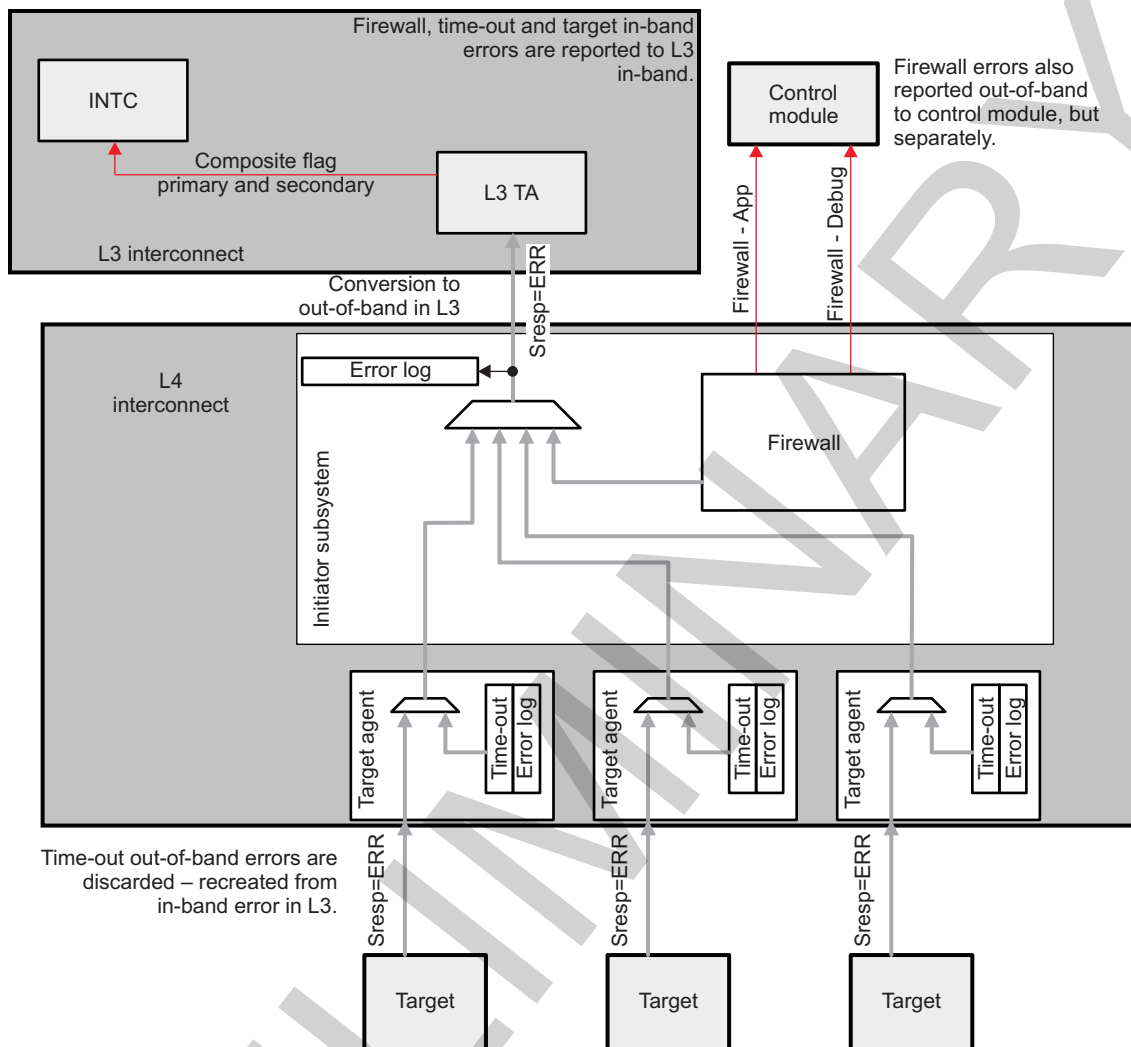
14.3.3.4.3 Error Reporting

Figure 14-12 shows the error-reporting scheme used in the L4 interconnects. All L4 in-band errors are reported to their respective L3 TA, where errors are converted in an out-of band error signal (the L3 applicative and debug composite flags) going to the L3 INTCs.

Two levels of mask are present to report the error at INTC level:

- At the applicative and debug composite flag, to enable interrupt reporting, the following bits must be set:
 - L4 CFG in L3_CLK1_FLAG_MASK_0[3] and L3_CLK1_FLAG_STATUS_1[3]
 - L4 PER in L3_CLK2_FLAG_MASK_0[17][16][15][6] and L3_CLK2_FLAG_STATUS_1[17][16][15][6]
- At the L3 TA level, see Section 14.2, L3 Interconnect.

Figure 14-12. L4 Error Reporting



icnt-017

14.3.3.4.4 Error Recovery

Setting the `L4_TA_AGENT_CONTROL_L[0] OCP_RESET` bit to 1 initiates the software reset period. Software reset must be asserted for at least 16 cycles of the target module interface clock, which can be a divided clock with respect to the L4 clock.

During the software reset period:

- Requests sent to the target module receive error responses. Therefore, if the faulty request is part of a DMA transfer, it is necessary to stop the DMA to prevent unwanted errors.
- Requests sent to the TA register block are processed as usual.
- The `L4_TA_AGENT_STATUS_L[8] REQ_TIMEOUT` status bit is cleared.

Setting the `L4_TA_AGENT_CONTROL_L[0] OCP_RESET` bit to 0 terminates the software reset period.

The attached module must then be reset to complete the recovery.

14.3.3.4.5 Firewall Error Logging in the Control Module

When a protection violation occurs, an interrupt is sent to the INTCs (if enabled). An in-band error is sent back to L3 IA and an out-band error can also be logged in the CONTROL.CONTROL_SEC_ERR_STATUS register in the SCM. These out-band errors are enabled and disabled at the L4 IA level by setting the [L4_IA_AGENT_CONTROL_L\[31\]\[30\]](#) PROT_ERROR_SECONDARY_REP or PROT_ERROR_PRIMARY_REP bit to 1 for debug and application mode, respectively.

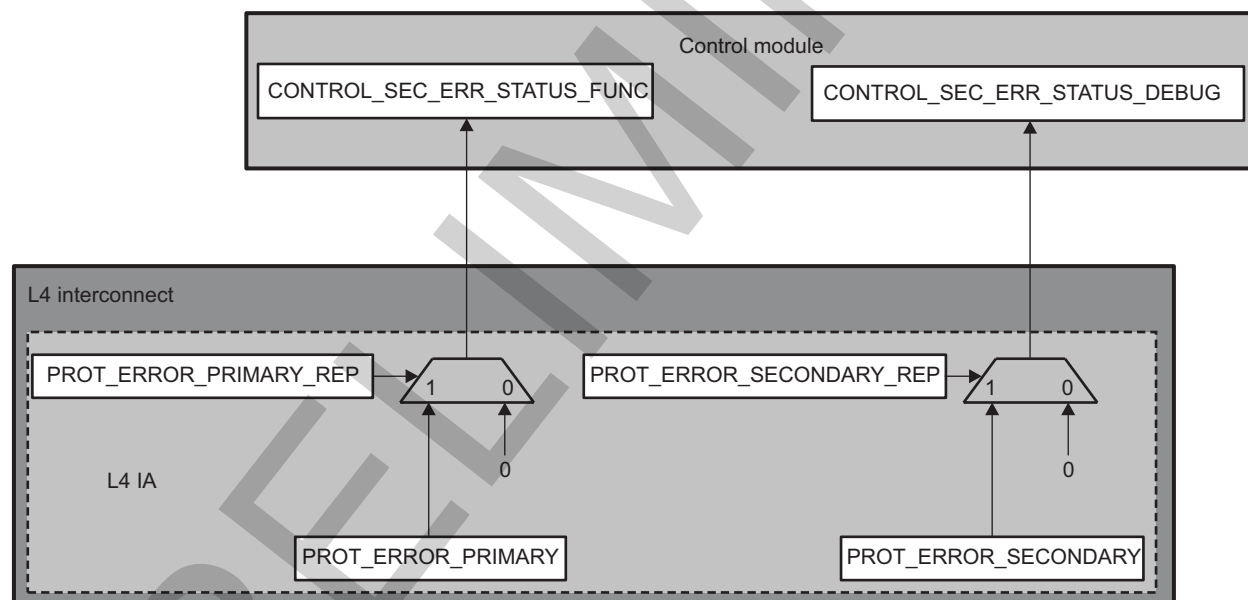
At the control module level, two logging registers are used, depending on the mode:

- In application mode or primary error reporting:
 - CONTROL.CONTROL_SEC_ERR_STATUS_FUNC[16] = L4_CFG protection violation
 - CONTROL.CONTROL_SEC_ERR_STATUS_FUNC[17] = L4_PER protection violation
- In debug mode or secondary error reporting:
 - CONTROL.CONTROL_SEC_ERR_STATUS_DEBUG[16] = L4_CFG protection violation
 - CONTROL.CONTROL_SEC_ERR_STATUS_DEBUG[17] = L4_PER protection violation

NOTE: The CONTROL.CONTROL_SEC_ERR_STATUS_xxx registers are only readable.

Figure 14-13 shows the global protection error reporting to the control module.

Figure 14-13. Protection Violation Out-of-Band Error Reporting



icnt-018

14.3.4 L4 Interconnect Programming Guide

14.3.4.1 L4 Interconnect Low-level Programming Models

This section describes the low-level hardware programming sequences for configuring and using the L4 interconnect module.

14.3.4.1.1 Global Initialization

14.3.4.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements of initializing the surrounding modules when the L4 interconnect module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the L4 interconnect. For more information, see [Section 14.3.2, L4 Interconnect Integration](#).

Table 14-363. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|---|
| PRCM | For more information about the configuration of the module, see Chapter 3, Power, Reset, and Clock Management . |
| Control module | For more information about the configuration of the module, see Chapter 19, Control Module . |
| MPU INTC | The MPU INTC must be configured to enable the interrupts from L4 interconnect module. See Chapter 18, Interrupt Controllers . |
| sDMA | For more information about the configuration of the sDMA, see Chapter 17, sDMA . |
| L3 interconnect | For more information about the interconnect configuration, see Chapter 14, Interconnect . |

14.3.4.1.2 Operational Modes Configuration

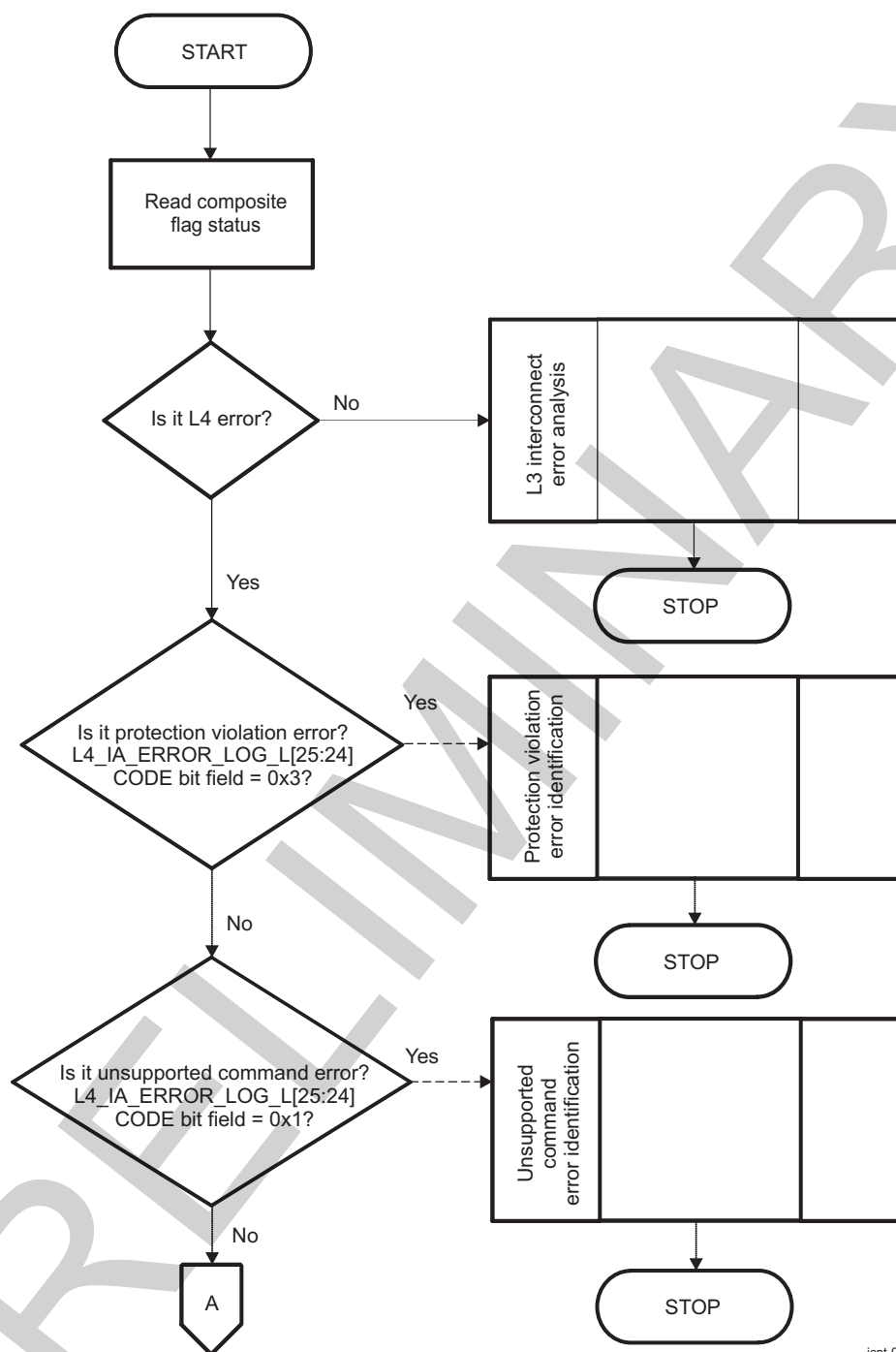
14.3.4.1.2.1 L4 Interconnect Error Analysis Mode

14.3.4.1.2.1.1 Main Sequence: L4 Interconnect Error Analysis Mode

The information required to analyze an error source is logged in several registers. The number of registers to access depends on the error source.

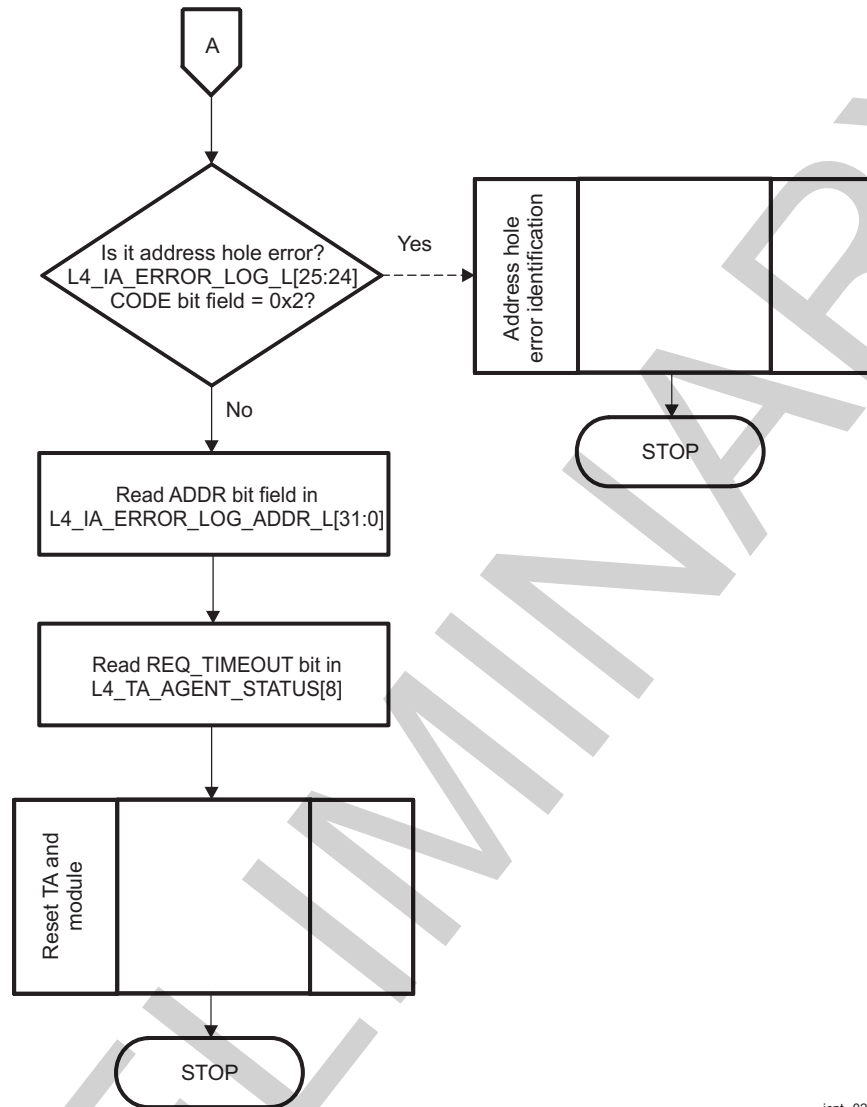
[Figure 14-14](#) and [Figure 14-15](#) show the software sequence required in most cases.

[Table 14-364](#) and [Table 14-365](#) show the main sequence for error analysis mode and its subprocess call summary, respectively.

Figure 14-14. Typical Error Analysis Sequence

icnt-019

Figure 14-15. Typical Error Analysis Sequence



icnt-020

Table 14-364. Main Sequence – Error Analysis Mode

| Register Name | Register Name | Register Name |
|---------------------------------------|---|--|
| L4_IA_ERROR_LOG_L | L4_IA_ERROR_LOG_ADDR_L | L4_IA_AGENT_STATUS_L |
| L4_IA_AGENT_CONTROL_L | CONTROL.CONTROL_SEC_ERR_STAT US_FUNC | CONTROL.CONTROL_SEC_ERR_STAT US_DEBUG |
| L4_TA_AGENT_STATUS_L | | |

Table 14-365. Subprocess Call Summary for Main Sequence – Error Analysis Mode

| Subprocess | Cross-Reference |
|---|--|
| L3 interconnect error analysis | Table 14-14, L3 Interconnect Error Handling |
| L4 interconnect protection violation error identification | Section 14.3.4.1.2.1.2, Subsequence: L4 Interconnect Protection Violation Error Identification |
| L4 interconnect unsupported command/address hole error identification | Section 14.3.4.1.2.1.3, Subsequence: L4 Interconnect Unsupported Command/Address Hole Error Identification |
| L4 interconnect reset TA and module | Section 14.3.4.1.2.1.4, Subsequence: L4 Interconnect Reset TA and Module |

14.3.4.1.2.1.2 Subsequence: L4 Interconnect Protection Violation Error Identification

This procedure describes the protection violation error identification (see [Table 14-366](#)).

Table 14-366. Protection Violation Error Identification

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Read multiple errors detection. | L4_IA_ERROR_LOG_L [31] MULTI | |
| Read initiator ID. | L4_IA_ERROR_LOG_L [11:8] CONNID | |
| Read command that cause the error. | L4_IA_ERROR_LOG_L [2:0] CMD | |
| Read address of request that caused the error. | L4_IA_ERROR_LOG_ADDR_L [31:0] ADDR | |
| IF: Is it a primary error? | L4_IA_AGENT_STATUS_L [30] PROT_ERROR_PRIMARY | =0x1 |
| Read status bits. | CONTROL.CONTROL_SEC_ERR_STATUS_FUNC[17:16] | |
| Write 1 to clear status bits. | CONTROL.CONTROL_SEC_ERR_STATUS_FUNC[17:16] | 0x3 |
| Write 1 to clear IA status bit. | L4_IA_AGENT_STATUS_L [30] PROT_ERROR_PRIMARY | 0x1 |
| ELSE | | |
| Read status bits. | CONTROL.CONTROL_SEC_ERR_STATUS_DEBUG[17:16] | |
| Write 1 to clear status bits. | CONTROL.CONTROL_SEC_ERR_STATUS_DEB_DEBUG[17:16] | 0x3 |
| Write 1 to clear IA status bit | L4_IA_AGENT_STATUS_L [31] PROT_ERROR_SECONDARY | 0x1 |
| ENDIF | | |
| Write 1 to clear multiple errors detection. | L4_IA_ERROR_LOG_L [31] MULTI | 0x1 |
| Write 1 to clear in-band error status. | L4_IA_AGENT_STATUS_L [24] INBAND_ERROR | 0x1 |

14.3.4.1.2.1.3 Subsequence: L4 Interconnect Unsupported Command/Address Hole Error Identification

This procedure describes the identification of unsupported command/address hole error (see [Table 14-367](#)).

Table 14-367. Unsupported Command/Address Hole Error Identification

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Read multiple errors detection. | L4_IA_ERROR_LOG_L [31] MULTI | |
| Read initiator ID. | L4_IA_ERROR_LOG_L [11:8] CONNID | |
| Read command that caused the error. | L4_IA_ERROR_LOG_L [2:0] CMD | |
| Read address of request that caused the error. | L4_IA_ERROR_LOG_ADDR_L [31:0] ADDR | |
| Read secondary status. | L4_IA_ERROR_LOG_L [30] SECONDARY | |
| Write 1 to clear secondary status. | L4_IA_ERROR_LOG_L [30] SECONDARY | 0x1 |
| Write 1 to clear multiple errors detection. | L4_IA_ERROR_LOG_L [31] MULTI | 0x1 |
| Write 1 to clear inband error status. | L4_IA_AGENT_STATUS_L [24] INBAND_ERROR | 0x1 |

14.3.4.1.2.1.4 Subsequence: L4 Interconnect Reset TA and Module

This procedure resets the TA and module (see [Table 14-368](#)).

Table 14-368. Reset TA and Module

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Reset TA. | L4_TA_AGENT_CONTROL_L [0] OCP_RESET | 0x1 |
| Wait until target module clock = 16 cycles. | | |

Table 14-368. Reset TA and Module (continued)

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Write 0 to clear TA time-out status. | L4_TA_AGENT_CONTROL_L [10:8] REQ_TIMEOUT | 0x0 |
| Write 0 to clear TA reset. | L4_TA_AGENT_CONTROL_L [0] OCP_RESET | 0x0 |
| Reset the attached module. ⁽¹⁾ | | |

⁽¹⁾ For more information, see the respective module chapter.

14.3.4.1.2.2 L4 Interconnect Time-Out Configuration Mode

14.3.4.1.2.2.1 Main Sequence: L4 Interconnect Time-Out Configuration Mode

This procedure describes the time-out configuration sequence (see [Table 14-369](#)).

Table 14-369. Time-Out Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Disable time-out. | L4_LA_NETWORK_CONTROL_L [10:8] TIMEOUT_BASE | 0x0 |
| Clear TA time-out error status. ⁽¹⁾ | L4_TA_AGENT_STATUS_L [8] REQ_TIMEOUT | 0x1 |
| Set time-out at TA level. ⁽¹⁾ | L4_TA_AGENT_CONTROL_L [10:8] REQ_TIMEOUT | xxx |
| Set time-out base. | L4_LA_NETWORK_CONTROL_L [10:8] TIMEOUT_BASE | xxx |

⁽¹⁾ Must be done for each TA.

14.3.4.1.2.3 L4 Interconnect Firewall Configuration Mode

14.3.4.1.2.3.1 Main Sequence: L4 Interconnect Firewall Configuration Mode

This procedure describes the firewall configuration sequence (see [Table 14-370](#)).

Table 14-370. Firewall Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Define the members of protection group k. ⁽¹⁾ | L4_AP_PROT_GROUP_MEMBERS_k_L [15:0] CONNID_BIT_VECTOR | xxx |
| Define the access type of a protection group k. ⁽¹⁾ | L4_AP_PROT_GROUP_ROLES_k_L [15:0] ENABLE | xx |
| Set region affiliation to protection group. ⁽²⁾ | L4_AP_REGION_I_L [22:20] PROT_GROUP_ID | xxx |

⁽¹⁾ Must be done for each protection group.

⁽²⁾ Must be done for each region.

14.3.5 L4 Interconnects Register Manual

Table 14-371 through Table 14-373 list all L4 register blocks for IA, TA, AP, and LA. Each module instance is shown with the module register mapping and bit and bit field definitions.

14.3.5.1 L4 Interconnects Instance Summary

Table 14-371. L4_PER Instance Summary

| Module Name | L3 Base Address | Size |
|------------------|-----------------|-----------|
| PER_AP | 0x4800 0000 | 2 KB |
| PER_IA_0 | 0x4800 1000 | 128 bytes |
| PER_IA_1 | 0x4800 1400 | 128 bytes |
| PER_IA_2 | 0x4800 1800 | 128 bytes |
| PER_IA_3 | 0x4800 1C00 | 128 bytes |
| PER_LA | 0x4800 0800 | 512 bytes |
| PER_TA_UART3 | 0x4802 1000 | 64 bytes |
| PER_TA_GPTIMER2 | 0x4803 3000 | 64 bytes |
| PER_TA_GPTIMER3 | 0x4803 5000 | 64 bytes |
| PER_TA_GPTIMER4 | 0x4803 7000 | 64 bytes |
| PER_TA_GPTIMER9 | 0x4803 F000 | 64 bytes |
| PER_TA_DSS | 0x4805 0000 | 64 bytes |
| PER_TA_GPIO2 | 0x4805 6000 | 64 bytes |
| PER_TA_GPIO3 | 0x4805 8000 | 64 bytes |
| PER_TA_GPIO4 | 0x4805 A000 | 64 bytes |
| PER_TA_GPIO5 | 0x4805 C000 | 64 bytes |
| PER_TA_GPIO6 | 0x4805 E000 | 64 bytes |
| PER_TA_I2C3 | 0x4806 1000 | 64 bytes |
| PER_TA_UART1 | 0x4806 B000 | 64 bytes |
| PER_TA_UART2 | 0x4806 D000 | 64 bytes |
| PER_TA_UART4 | 0x4806 F000 | 64 bytes |
| PER_TA_I2C1 | 0x4807 1000 | 64 bytes |
| PER_TA_I2C2 | 0x4807 3000 | 64 bytes |
| PER_TA_SLIMBUS2 | 0x4807 7000 | 64 bytes |
| PER_TA_ELM | 0x4807 9000 | 64 bytes |
| PER_TA_GPTIMER10 | 0x4808 7000 | 64 bytes |
| PER_TA_GPTIMER11 | 0x4808 9000 | 64 bytes |
| PER_TA_MCBSP4 | 0x4809 7000 | 64 bytes |
| PER_TA_MCSP1 | 0x4809 9000 | 64 bytes |
| PER_TA_MCSP2 | 0x4809 B000 | 64 bytes |
| PER_TA_HSMMC1 | 0x4809 D000 | 64 bytes |
| PER_TA_HSMMC3 | 0x480A E000 | 64 bytes |
| PER_TA_HDQ | 0x480B 3000 | 64 bytes |
| PER_TA_HSMMC2 | 0x480B 5000 | 64 bytes |
| PER_TA_MCSP3 | 0x480B 9000 | 64 bytes |
| PER_TA_MCSP4 | 0x480B B000 | 64 bytes |
| PER_TA_HSMMC4 | 0x480D 2000 | 64 bytes |
| PER_TA_HSMMC5 | 0x480D 6000 | 64 bytes |
| PER_TA_I2C4 | 0x4835 1000 | 64 bytes |

Table 14-372. L4_CFG Instance Summary

| Module Name | L3 Base Address | Size |
|-----------------------------|-----------------|-----------|
| CFG_AP | 0x4A00 0000 | 2 KB |
| CFG_IA_0 | 0x4A00 1000 | 128 bytes |
| CFG_LA | 0x4A00 0800 | 64 bytes |
| CFG_TA_SYSCTRL_GENERAL_CORE | 0x4A00 3000 | 64 bytes |
| CFG_TA_CM1 | 0x4A00 5000 | 64 bytes |
| CFG_TA_CM2 | 0x4A00 A000 | 64 bytes |
| CFG_TA_SDMA | 0x4A05 7000 | 64 bytes |
| CFG_TA_HSI | 0x4A05 C000 | 64 bytes |
| CFG_TA_SAR_ROM | 0x4A06 0000 | 64 bytes |
| CFG_TA_HSUSBTLL | 0x4A06 3000 | 64 bytes |
| CFG_TA_USBHOSTHS | 0x4A06 5000 | 64 bytes |
| CFG_TA_DSP | 0x4A06 7000 | 64 bytes |
| CFG_TA_USBFS | 0x4A0A A000 | 64 bytes |
| CFG_TA_USBOTGHS | 0x4A0A C000 | 64 bytes |
| CFG_TA_USBPBY | 0x4A0A E000 | 64 bytes |
| CFG_TA_SR1 | 0x4A0D A000 | 64 bytes |
| CFG_TA_SR2 | 0x4A0DC000 | 64 bytes |
| CFG_TA_SR3 | 0x4A0D E000 | 64 bytes |
| CFG_TA_MAILBOX | 0x4A0F 5000 | 64 bytes |
| CFG_TA_SPINLOCK | 0x4A0F 7000 | 64 bytes |
| CFG_TA_SYSCTRL_PADCONF_CORE | 0x4A10 1000 | 64 bytes |
| CFG_TA_FACEDETECT | 0x4A10 B000 | 64 bytes |
| CFG_TA_MAFW | 0x4A20 A000 | 64 bytes |
| CFG_TA_EMIFFW | 0x4A20 D000 | 64 bytes |
| CFG_TA_GPMCFW | 0x4A21 1000 | 64 bytes |
| CFG_TA_OCMCRAMFW | 0x4A21 3000 | 64 bytes |
| CFG_TA_SGXFW | 0x4A21 5000 | 64 bytes |
| CFG_TA_ISSF | 0x4A21 7000 | 64 bytes |
| CFG_TA_CORTEXM3FW | 0x4A21 9000 | 64 bytes |
| CFG_TA_BB2DFW | 0x4A21 B000 | 64 bytes |
| CFG_TA_DSSF | 0x4A21 D000 | 64 bytes |
| CFG_TA_SL2FW | 0x4A21 F000 | 64 bytes |
| CFG_TA_IVAHDFW | 0x4A22 1000 | 64 bytes |
| CFG_TA_EMUSFW | 0x4A22 7000 | 64 bytes |
| CFG_TA_ABEFW | 0x4A22 9000 | 64 bytes |
| CFG_TA_L4WKUP | 0x4A34 0000 | 64 bytes |

Table 14-373. L4_WKUP Instance Summary

| Module Name | L3 Base Address | Size |
|------------------------------|-----------------|------|
| WKUP_IA_0 | 0x4A30 1000 | 2 KB |
| WKUP_LA | 0x4A30 0800 | 4 KB |
| WKUP_TA_32KTIMER | 0x4A30 5000 | 4 KB |
| WKUP_TA_PRM | 0x4A30 8000 | 4 KB |
| WKUP_TA_SCRM | 0x4A30 B000 | 4 KB |
| WKUP_TA_SYSCTRL_GENERAL_WKUP | 0x4A30 D000 | 4 KB |
| WKUP_TA_GPIO1 | 0x4A31 1000 | 4 KB |
| WKUP_TA_WDTIMER2 | 0x4A31 5000 | 4 KB |

Table 14-373. L4_WKUP Instance Summary (continued)

| Module Name | L3 Base Address | Size |
|------------------------------|-----------------|------|
| WKUP_TA_DM_TIMER1MS_1 | 0x4A31 9000 | 4 KB |
| WKUP_TA_KEYBOARD | 0x4A31 D000 | 4 KB |
| WKUP_TA_SYSCTRL_PADCONF_WKUP | 0x4A31 F000 | 4 KB |
| WKUP_TA_SAR_RAM | 0x4A32 A000 | 4 KB |

14.3.5.2 L4 Initiator Agent (L4 IA)

14.3.5.2.1 L4 Initiator Agent (L4 IA) Register Summary

Table 14-374 summarizes the L4 IA register mapping.

Table 14-374. IA Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | PER_IA_0 L3 Physical Address | CFG_IA_0 L3 Physical Address | WKUP_IA_0 L3 Physical Address |
|------------------------|------|-----------------------|----------------|------------------------------|------------------------------|-------------------------------|
| L4_IA_COMPONENT_L | R | 32 | 0x0000 0000 | 0x4800 1000 | 0x4A00 1000 | 0x4A30 1000 |
| L4_IA_COMPONENT_H | R | 32 | 0x0000 0004 | 0x4800 1004 | 0x4A00 1004 | 0x4A30 1004 |
| L4_IA_CORE_L | R | 32 | 0x0000 0018 | 0x4800 1018 | 0x4A00 1018 | 0x4A30 1018 |
| L4_IA_CORE_H | R | 32 | 0x0000 001C | 0x4800 101C | 0x4A00 101C | 0x4A30 101C |
| L4_IA_AGENT_CONTROL_L | RW | 32 | 0x0000 0020 | 0x4800 1020 | 0x4A00 1020 | 0x4A30 1020 |
| L4_IA_AGENT_CONTROL_H | R | 32 | 0x0000 0024 | 0x4800 1024 | 0x4A00 1024 | 0x4A30 1024 |
| L4_IA_AGENT_STATUS_L | RW | 32 | 0x0000 0028 | 0x4800 1028 | 0x4A00 1028 | 0x4A30 1028 |
| L4_IA_AGENT_STATUS_H | R | 32 | 0x0000 002C | 0x4800 102C | 0x4A00 102C | 0x4A30 102C |
| L4_IA_ERROR_LOG_L | RW | 32 | 0x0000 0058 | 0x4800 1058 | 0x4A00 1058 | 0x4A30 1058 |
| L4_IA_ERROR_LOG_H | R | 32 | 0x0000 005C | 0x4800 105C | 0x4A00 105C | 0x4A30 105C |
| L4_IA_ERROR_LOG_ADDR_L | R | 32 | 0x0000 0060 | 0x4800 1060 | 0x4A00 1060 | 0x4A30 1060 |
| L4_IA_ERROR_LOG_ADDR_H | R | 32 | 0x0000 0064 | 0x4800 1064 | 0x4A00 1064 | 0x4A30 1064 |

14.3.5.2.2 L4 Initiator Agent (L4 IA) Register Description

Table 14-375 through Table 14-397 describe the L4 IA registers.

Table 14-375. L4_IA_COMPONENT_L

| | |
|-------------------------|---|
| Address Offset | 0x0000 0000 |
| Physical Address | 0x4800 1000 0x4A00 1000 0x4A30 1000 |
| Description | COMPONENT register identifies the component to which this register block belongs. The register contains a component code and revision, which are used to identify the hardware of the component. The COMPONENT register is read-only. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CODE | | | | | | | | | | | | | | | | REV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|----------------------|
| 31:16 | CODE | Interconnect code | R | See ⁽¹⁾ . |
| 15:0 | REV | Component revision code | R | See ⁽¹⁾ . |

⁽¹⁾ TI internal data

Table 14-376. Register Call Summary for Register L4_IA_COMPONENT_L

L4 interconnects

- [L4 Initiator Agent \(L4 IA\) Register Summary: \[0\]](#)

Table 14-377. L4_IA_COMPONENT_H

| | |
|-------------------------|---|
| Address Offset | 0x0000 0004 |
| Physical Address | 0x4800 1004 0x4A00 1004 0x4A30 1004 |
| Description | COMPONENT register identifies the component to which this register block belongs. The register contains a component code and revision, which are used to identify the hardware of the component. The COMPONENT register is read-only. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|--------|
| 31:0 | RESERVED | Read returns 0. | R | 0x0000 |

Table 14-378. Register Call Summary for Register L4_IA_COMPONENT_H

L4 interconnects

- [L4 Initiator Agent \(L4 IA\) Register Summary: \[0\]](#)

Table 14-379. L4_IA_CORE_L

| | |
|-------------------------|--|
| Address Offset | 0x0000 0018 |
| Physical Address | 0x4800 1018 0x4A00 1018 0x4A30 1018 |
| Description | Provide information about the core initiator |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CODE | | | | | | | | | | | | | | | | CORE_REV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|------------------------------|------|----------------------|
| 31:16 | CORE_CODE | Interconnect core code | R | See ⁽¹⁾ . |
| 15:0 | CORE_REV | Component revision code code | R | See ⁽¹⁾ . |

⁽¹⁾ TI internal data

Table 14-380. Register Call Summary for Register L4_IA_CORE_L

L4 interconnects

- [L4 Initiator Agent \(L4 IA\) Register Summary: \[0\]](#)

Table 14-381. L4_IA_CORE_H

| | |
|-------------------------|--|
| Address Offset | 0x0000 001C |
| Physical Address | 0x4800 101C 0x4A00 101C 0x4A30 101C |
| Description | Provide information about the core initiator |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VENDOR_CODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---------------------------|------|----------------------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | VENDOR_CODE | Vendor revision core code | R | See ⁽¹⁾ . |

⁽¹⁾ TI internal data

Table 14-382. Register Call Summary for Register L4_IA_CORE_H

L4 interconnects

- [L4 Initiator Agent \(L4 IA\) Register Summary: \[0\]](#)

Table 14-383. L4_IA_AGENT_CONTROL_L

| | |
|-------------------------|--|
| Address Offset | 0x0000 0020 |
| Physical Address | 0x4800 1020 0x4A00 1020 0x4A30 1020 |
| Description | Enable error reporting on an initiator interface. The error reporting mechanism is enabled when the INBAND_ERROR_REP bit field is set to 1. The out-of-band OCP MError reporting mechanism is enabled when the MERROR_REP bit field is set to 1. |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------------|------------------------|----------|----|------------------|----------|----|------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| PROT_ERROR_SECONDARY_REP | PROT_ERROR_PRIMARY_REP | RESERVED | | INBAND_ERROR_REP | RESERVED | | MERROR_REP | RESERVED | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|-------|
| 31 | PROT_ERROR_SECONDARY_REP | Out-of-band reporting of protection mechanism secondary errors | R | 1 |
| 30 | PROT_ERROR_PRIMARY_REP | Out-of-band reporting of protection mechanism primary errors | R | 1 |
| 29:28 | RESERVED | Read returns 0. | R | 0x0 |
| 27 | INBAND_ERROR_REP | Setting this field to 1 reports on in-band errors using the INBAND_ERROR log bit of IA.AGENT_STATUS register. | R | 1 |
| 26:25 | RESERVED | Read returns 0. | R | 0x0 |
| 24 | MERROR_REP | MError reporting control | R | 0 |
| 23:0 | RESERVED | Read returns 0. | R | 0x0 |

Table 14-384. Register Call Summary for Register L4_IA_AGENT_CONTROL_L

L4 interconnects

- [Firewall Error Logging in the Control Module: \[0\]](#)
- [Operational Modes Configuration: \[1\]](#)
- [L4 Initiator Agent \(L4 IA\) Register Summary: \[2\]](#)

Table 14-385. L4_IA_AGENT_CONTROL_H

| | |
|-------------------------|---|
| Address Offset | 0x0000 0024 |
| Physical Address | 0x4800 1024 0x4A00 1024 0x4A30 1024 |
| Description | Enable error reporting on an initiator interface. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|-------------|
| 31:0 | RESERVED | Read returns 0. | R | 0x0000 0000 |

Table 14-386. Register Call Summary for Register L4_IA_AGENT_CONTROL_H

L4 interconnects

- [L4 Initiator Agent \(L4 IA\) Register Summary: \[0\]](#)

Table 14-387. L4_IA_AGENT_STATUS_L

| | |
|-------------------------|--|
| Address Offset | 0x0000 0028 |
| Physical Address | 0x4800 1028 0x4A00 1028 0x4A30 1028 |
| Description | Stores status information for an initiator. The INBAND_ERROR and MERROR fields are read/write and are implemented as log bits. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|--------------------|----------|----|--------------|----------|----|--------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PROT_ERROR_SECONDARY | PROT_ERROR_PRIMARY | RESERVED | | INBAND_ERROR | RESERVED | | MERROR | RESERVED | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|-------|
| 31 | PROT_ERROR_SECONDARY | Out-of-band reporting of protection mechanism secondary errors | R | 0 |
| 30 | PROT_ERROR_PRIMARY | Out-of-band reporting of protection mechanism primary errors | R | 0 |
| 29:28 | RESERVED | Read returns 0. | R | 0x0 |
| 27 | INBAND_ERROR | Setting this field to 1 reports on in-band errors using the INBAND_ERROR log bit of IA.AGENT_STATUS register. | R | 0 |
| 26:25 | RESERVED | Read returns 0. | R | 0x0 |
| 24 | MERROR | MError reporting control | R | 0 |
| 23:0 | RESERVED | Read returns 0. | R | 0x0 |

Table 14-388. Register Call Summary for Register L4_IA_AGENT_STATUS_L

L4 interconnects

- [IA and TA Error Detection and Logging: \[0\] \[1\] \[2\] \[3\]](#)
- [Operational Modes Configuration: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [L4 Initiator Agent \(L4 IA\) Register Summary: \[10\]](#)

Table 14-389. L4_IA_AGENT_STATUS_H

| | |
|-------------------------|---|
| Address Offset | 0x0000 002C |
| Physical Address | 0x4800 102C 0x4A00 102C 0x4A30 102C |
| Description | Stores status information for an initiator. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|-------------|
| 31:0 | RESERVED | Read returns 0. | R | 0x0000 0000 |

Table 14-390. Register Call Summary for Register L4_IA_AGENT_STATUS_H

L4 interconnects

- [L4 Initiator Agent \(L4 IA\) Register Summary: \[0\]](#)

Table 14-391. L4_IA_ERROR_LOG_L

| | |
|-------------------------|---|
| Address Offset | 0x0000 0058 |
| Physical Address | 0x4800 1058 0x4A00 1058 0x4A30 1058 |
| Description | Log information about error conditions. The CODE field logs any protection violation or address hole errors detected by the initiator subsystem while decoding a request. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|-----------|----------|----|----|----|------|----|----------|----|----|----|----|----|----|----|--------|----|----|----|----------|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| MULTI | SECONDARY | RESERVED | | | | CODE | | RESERVED | | | | | | | | CONNID | | | | RESERVED | | | | CMD | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|---------------|-------|
| 31 | MULTI | Multiple errors detected | RW W1toClr | 0 |
| 30 | SECONDARY | Indicates whether protection violation was a primary or secondary error | RW W1toClr | 0 |
| 29:26 | RESERVED | Read returns 0. | R | 0x0 |
| 25:24 | CODE | The error code of an initiator request. 0x00: No errors 0x01: Reserved 0x10: Address hole 0x11: Protection violation | RW W1toClr | 0x0 |
| 23:14 | RESERVED | Read returns 0. | R | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 13:8 | CONNID | ConnID of request causing the error, refer to Table 14-354 | R | 0x00 |
| 7:3 | RESERVED | Read returns 0. | R | 0x00 |
| 2:0 | CMD | Command that caused error | R | 0x0 |

Table 14-392. Register Call Summary for Register L4_IA_ERROR_LOG_L

L4 interconnects

- [IA and TA Error Detection and Logging: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [Operational Modes Configuration: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\]](#)
- [L4 Initiator Agent \(L4 IA\) Register Summary: \[18\]](#)

Table 14-393. L4_IA_ERROR_LOG_H

| | |
|-------------------------|---|
| Address Offset | 0x0000 005C |
| Physical Address | 0x4800 105C 0x4A00 105C 0x4A30 105C |
| Description | Log information about error conditions. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | REQ_INFO | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Read returns 0. | R | 0x0000 |
| 15:0 | REQ_INFO | MReqInfo bits of request that caused the error REQ_INFO[0] = supervisor, REQ_INFO[1] = Debug | R | 0x0000 |

Table 14-394. Register Call Summary for Register L4_IA_ERROR_LOG_H

L4 interconnects

- [IA and TA Error Detection and Logging: \[0\]](#)
- [L4 Initiator Agent \(L4 IA\) Register Summary: \[1\]](#)

Table 14-395. L4_IA_ERROR_LOG_ADDR_L

| | |
|-------------------------|---|
| Address Offset | 0x0000 0060 |
| Physical Address | 0x4800 1060 0x4A00 1060 0x4A30 1060 |
| Description | Extended error log (address information) |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | ADDR | Address of request that caused the error. N is the number MAddr bits. | R | 0x0000 0000 |

Table 14-396. Register Call Summary for Register L4_IA_ERROR_LOG_ADDR_L

L4 interconnects

- [IA and TA Error Detection and Logging: \[0\]](#)
- [Operational Modes Configuration: \[1\] \[2\] \[3\]](#)
- [L4 Initiator Agent \(L4 IA\) Register Summary: \[4\]](#)

Table 14-397. L4_IA_ERROR_LOG_ADDR_H

| | |
|-------------------------|---|
| Address Offset | 0x0000 0064 |
| Physical Address | 0x4800 1064 0x4A00 1064 0x4A30 1064 |
| Description | Extended error log (address information) |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|-------------|
| 31:0 | RESERVED | Read returns 0. | R | 0x0000 0000 |

Table 14-398. Register Call Summary for Register L4_IA_ERROR_LOG_ADDR_H

L4 interconnects

- [L4 Initiator Agent \(L4 IA\) Register Summary: \[0\]](#)

14.3.5.3 L4 Target Agent (L4 TA)

14.3.5.3.1 L4 Target Agent (L4 TA) Register Summary

Table 14-399 through Table 14-429 summarizes the L4 TA mapping of the CFG_TA, PER_TA, and WKUP_TA registers.

Table 14-399. CFG_TA Register Mapping Summary 1

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_SYSCTRL_GEN ERAL_CORE L3 Physical Address | CFG_TA_CM1 L3 Physical Address | CFG_TA_CM2 L3 Physical Address |
|--|------|-----------------------|----------------|--|-----------------------------------|-----------------------------------|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4A00 3000 | 0x4A00 5000 | 0x4A00 A000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4A00 3004 | 0x4A00 5004 | 0x4A00 A004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A00 3018 | 0x4A00 5018 | 0x4A00 A018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A00 301C | 0x4A00 501C | 0x4A00 A01C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4A00 3020 | 0x4A00 5020 | 0x4A00 A020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4A00 3024 | 0x4A00 5024 | 0x4A00 A024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4A00 3028 | 0x4A00 5028 | 0x4A00 A028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x4A00 302C | 0x4A00 502C | 0x4A00 A02C |

Table 14-400. CFG_TA Register Mapping Summary 2

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_SDMA L3 Physical Address | CFG_TA_HSI L3 Physical Address | CFG_TA_SAR_ROM L3 Physical Address |
|------------------------|------|-----------------------|----------------|---------------------------------|--------------------------------|------------------------------------|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4A05 7000 | 0x4A05 C000 | 0x4A06 0000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4A05 7004 | 0x4A05 C004 | 0x4A06 0004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A05 7018 | 0x4A05 C018 | 0x4A06 0018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A05 701C | 0x4A05 C01C | 0x4A06 001C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4A05 7020 | 0x4A05 C020 | 0x4A06 0020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4A05 7024 | 0x4A05 C024 | 0x4A06 0024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4A05 7028 | 0x4A05 C028 | 0x4A06 0028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x4A05 702C | 0x4A05 C02C | 0x4A06 002C |

Table 14-401. CFG_TA Register Mapping Summary 3

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_HSUS BTLL L3 Physical Address | CFG_TA_USBH OSTHS L3 Physical Address | CFG_TA_DSP L3 Physical Address |
|------------------------|------|-----------------------|----------------|--------------------------------------|---------------------------------------|--------------------------------|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4A06 3000 | 0x4A06 5000 | 0x4A06 7000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4A06 3004 | 0x4A06 5004 | 0x4A06 7004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A06 3018 | 0x4A06 5018 | 0x4A06 7018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A06 301C | 0x4A06 501C | 0x4A06 701C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4A06 3020 | 0x4A06 5020 | 0x4A06 7020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4A06 3024 | 0x4A06 5024 | 0x4A06 7024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4A06 3028 | 0x4A06 5028 | 0x4A06 7028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x4A06 302C | 0x4A06 502C | 0x4A06 702C |

Table 14-402. CFG_TA Register Mapping Summary 4

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_USBF S L3 Physical Address | CFG_TA_USBO TGHS L3 Physical Address | CFG_TA_USBP HY L3 Physical Address |
|------------------------|------|-----------------------|----------------|-----------------------------------|--------------------------------------|------------------------------------|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4A0A A000 | 0x4A0A C000 | 0x4A0A E000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4A0A A004 | 0x4A0A C004 | 0x4A0A E004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A0A A018 | 0x4A0A C018 | 0x4A0A E018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A0A A01C | 0x4A0A C01C | 0x4A0A E01C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4A0A A020 | 0x4A0A C020 | 0x4A0A E020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4A0A A024 | 0x4A0A C024 | 0x4A0A E024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4A0A A028 | 0x4A0A C028 | 0x4A0A E028 |

Table 14-402. CFG_TA Register Mapping Summary 4 (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_USBF S L3 Physical Address | CFG_TA_USBO TGHS L3 Physical Address | CFG_TA_USBP HY L3 Physical Address |
|--------------------------------------|------|-----------------------|----------------|---|---|--|
| L4_TA_AGENT_STATUS_H | R | 32 | 0x0000 002C | 0x4A0A A02C | 0x4A0A C02C | 0x4A0A E02C |

Table 14-403. CFG_TA Register Mapping Summary 5

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_SR1 L3 Physical Address | CFG_TA_SR2 L3 Physical Address | CFG_TA_SR3 L3 Physical Address |
|---------------------------------------|------|-----------------------|----------------|--------------------------------------|--------------------------------------|--------------------------------------|
| L4_TA_COMPONENT_H | R | 32 | 0x0000 0000 | 0x4A0D A000 | 0x4A0D C000 | 0x4A0D E000 |
| L4_TA_COMPONENT_L | R | 32 | 0x0000 0004 | 0x4A0D A004 | 0x4A0D C004 | 0x4A0D E004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A0D A018 | 0x4A0D C018 | 0x4A0D E018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A0D A01C | 0x4A0D C01C | 0x4A0D E01C |
| L4_TA_AGENT_CONTROL_L | RW | 32 | 0x0000 0020 | 0x4A0D A020 | 0x4A0D C020 | 0x4A0D E020 |
| L4_TA_AGENT_CONTROL_H | R | 32 | 0x0000 0024 | 0x4A0D A024 | 0x4A0D C024 | 0x4A0D E024 |
| L4_TA_AGENT_STATUS_L | R | 32 | 0x0000 0028 | 0x4A0D A028 | 0x4A0D C028 | 0x4A0D E028 |
| L4_TA_AGENT_STATUS_H | R | 32 | 0x0000 002C | 0x4A0D A02C | 0x4A0D C02C | 0x4A0D E02C |

Table 14-404. CFG_TA Register Mapping Summary 6

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_MAILBOX L3 Physical Address |
|--|------|-----------------------|----------------|---------------------------------------|
| L4_TA_COMPONENT_H | R | 32 | 0x0000 0000 | 0x4A0F 5000 |
| L4_TA_COMPONENT_L | R | 32 | 0x0000 0004 | 0x4A0F 5004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A0F 5018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A0F 501C |
| L4_TA_AGENT_CONTR OL_L | RW | 32 | 0x0000 0020 | 0x4A0F 5020 |
| L4_TA_AGENT_CONTR OL_H | R | 32 | 0x0000 0024 | 0x4A0F 5024 |
| L4_TA_AGENT_STATUS _L | R | 32 | 0x0000 0028 | 0x4A0F 5028 |
| L4_TA_AGENT_STATUS _H | R | 32 | 0x0000 002C | 0x4A0F 502C |

Table 14-405. CFG_TA Register Mapping Summary 7

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_SYSCTRL_ PADCONF_CORE L3 Physical Address |
|--|------|-----------------------|----------------|--|
| L4_TA_COMPONENT_ H | R | 32 | 0x0000 0000 | 0x4A10 1000 |
| L4_TA_COMPONENT_ L | R | 32 | 0x0000 0004 | 0x4A10 1004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A10 1018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A10 101C |

Table 14-405. CFG_TA Register Mapping Summary 7 (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_SYSCTRL_PADCONF_CORE L3 Physical Address |
|------------------------|------|-----------------------|----------------|---|
| L4_TA_AGENT_CONTR_OL_L | RW | 32 | 0x0000 0020 | 0x4A10 1020 |
| L4_TA_AGENT_CONTR_OL_H | R | 32 | 0x0000 0024 | 0x4A10 1024 |
| L4_TA_AGENT_STATU_S_L | R | 32 | 0x0000 0028 | 0x4A10 1028 |
| L4_TA_AGENT_STATU_S_H | R | 32 | 0x0000 002C | 0x4A10 102C |

Table 14-406. CFG_TA Register Mapping Summary 8

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_FACEDETECT L3 Physical Address |
|------------------------|------|-----------------------|----------------|---------------------------------------|
| L4_TA_COMPONENT_H | R | 32 | 0x0000 0000 | 0x4A10 B000 |
| L4_TA_COMPONENT_L | R | 32 | 0x0000 0004 | 0x4A10 B004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A10 B018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A10 B01C |
| L4_TA_AGENT_CONTR_OL_L | RW | 32 | 0x0000 0020 | 0x4A10 B020 |
| L4_TA_AGENT_CONTR_OL_H | R | 32 | 0x0000 0024 | 0x4A10 B024 |
| L4_TA_AGENT_STATU_S_L | R | 32 | 0x0000 0028 | 0x4A10 B028 |
| L4_TA_AGENT_STATU_S_H | R | 32 | 0x0000 002C | 0x4A10 B02C |

Table 14-407. CFG_TA Register Mapping Summary 9

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_MAF W L3 Physical Address | CFG_TA_EMIF FW L3 Physical Address | CFG_TA_GPM CFW L3 Physical Address |
|-----------------------|------|-----------------------|----------------|----------------------------------|------------------------------------|------------------------------------|
| L4_TA_COMPONENT_H | R | 32 | 0x0000 0000 | 0x4A20 A000 | 0x4A20 D000 | 0x4A21 1000 |
| L4_TA_COMPONENT_L | R | 32 | 0x0000 0004 | 0x4A20 A004 | 0x4A20 D004 | 0x4A21 1004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A20 A018 | 0x4A20 D018 | 0x4A21 1018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A20 A01C | 0x4A20 D01C | 0x4A21 101C |
| L4_TA_AGENT_CONTROL_L | RW | 32 | 0x0000 0020 | 0x4A20 A020 | 0x4A20 D020 | 0x4A21 1020 |
| L4_TA_AGENT_CONTROL_H | R | 32 | 0x0000 0024 | 0x4A20 A024 | 0x4A20 D024 | 0x4A21 1024 |
| L4_TA_AGENT_STATUS_L | R | 32 | 0x0000 0028 | 0x4A20 A028 | 0x4A20 D028 | 0x4A21 1028 |
| L4_TA_AGENT_STATUS_H | R | 32 | 0x0000 002C | 0x4A20 A02C | 0x4A20 D02C | 0x4A21 102C |

Table 14-408. CFG_TA Register Mapping Summary 10

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_OCMC RAMFW L3 Physical Address | CFG_TA_SGXF W L3 Physical Address | CFG_TA_ISSF W L3 Physical Address |
|--------------------|------|-----------------------|----------------|---------------------------------------|-----------------------------------|-----------------------------------|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4A21 3000 | 0x4A21 5000 | 0x4A21 7000 |

Table 14-408. CFG_TA Register Mapping Summary 10 (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_OCMC RAMFW L3 Physical Address | CFG_TA_SGXF W L3 Physical Address | CFG_TA_ISSF W L3 Physical Address |
|---------------------------|------|-----------------------|----------------|--|---|---|
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4A21 3004 | 0x4A21 5004 | 0x4A21 7004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A21 3018 | 0x4A21 5018 | 0x4A21 7018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A21 301C | 0x4A21 501C | 0x4A21 701C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4A21 3020 | 0x4A21 5020 | 0x4A21 7020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4A21 3024 | 0x4A21 5024 | 0x4A21 7024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4A21 3028 | 0x4A21 5028 | 0x4A21 7028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x4A21 302C | 0x4A21 502C | 0x4A21 702C |

Table 14-409. CFG_TA Register Mapping Summary 11

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_CO RTEXM3FW L3 Physical Address | CFG_TA_BB2 DFW L3 Physical Address | CFG_TA_DSS FW L3 Physical Address | CFG_TA_SL2 FW L3 Physical Address |
|-------------------------------|------|-----------------------|----------------|---|---|--|--|
| L4_TA_COMP ONENT_H | R | 32 | 0x0000 0000 | 0x4A21 9000 | 0x4A21 B000 | 0x4A21 D000 | 0x4A21 F000 |
| L4_TA_COMP ONENT_L | R | 32 | 0x0000 0004 | 0x4A21 9004 | 0x4A21 B004 | 0x4A21 D004 | 0x4A21 F004 |
| L4_TA_CORE _L | R | 32 | 0x0000 0018 | 0x4A21 9018 | 0x4A21 B018 | 0x4A21 D018 | 0x4A21 F018 |
| L4_TA_CORE _H | R | 32 | 0x0000 001C | 0x4A21 901C | 0x4A21 B01C | 0x4A21 D01C | 0x4A21 F01C |
| L4_TA_AGEN T_CONTROL_ L | RW | 32 | 0x0000 0020 | 0x4A21 9020 | 0x4A21 B020 | 0x4A21 D020 | 0x4A21 F020 |
| L4_TA_AGEN T_CONTROL_ H | R | 32 | 0x0000 0024 | 0x4A21 9024 | 0x4A21 B024 | 0x4A21 D024 | 0x4A21 F024 |
| L4_TA_AGEN T_STATUS_L | R | 32 | 0x0000 0028 | 0x4A21 9028 | 0x4A21 B028 | 0x4A21 D028 | 0x4A21 F028 |
| L4_TA_AGEN T_STATUS_H | R | 32 | 0x0000 002C | 0x4A21 902C | 0x4A21 B02C | 0x4A21 D02C | 0x4A21 F02C |

Table 14-410. CFG_TA Register Mapping Summary 12

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_IVAHD FW L3 Physical Address | CFG_TA_EMUS SFW L3 Physical Address | CFG_TA_ABEF W L3 Physical Address |
|---------------------------|------|-----------------------|----------------|---|--|---|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4A22 1000 | 0x4A22 7000 | 0x4A22 9000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4A22 1004 | 0x4A22 7004 | 0x4A22 9004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A22 1018 | 0x4A22 7018 | 0x4A22 9018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A22 101C | 0x4A22 701C | 0x4A22 901C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4A22 1020 | 0x4A22 7020 | 0x4A22 9020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4A22 1024 | 0x4A22 7024 | 0x4A22 9024 |

Table 14-410. CFG_TA Register Mapping Summary 12 (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_IVAHD FW L3 Physical Address | CFG_TA_EMUS SFW L3 Physical Address | CFG_TA_ABEF W L3 Physical Address |
|----------------------|------|-----------------------|----------------|-------------------------------------|-------------------------------------|-----------------------------------|
| L4_TA_AGENT_STATUS_L | R | 32 | 0x0000 0028 | 0x4A22 1028 | 0x4A22 7028 | 0x4A22 9028 |
| L4_TA_AGENT_STATUS_H | R | 32 | 0x0000 002C | 0x4A22 102C | 0x4A22 702C | 0x4A22 902C |

Table 14-411. CFG_TA Register Mapping Summary 13

| Register Name | Type | Register Width (Bits) | Address Offset | CFG_TA_L4WKUP L3 Physical Address |
|------------------------|------|-----------------------|----------------|-----------------------------------|
| L4_TA_COMPONENT_H | R | 32 | 0x0000 0000 | 0x4A34 0000 |
| L4_TA_COMPONENT_L | R | 32 | 0x0000 0004 | 0x4A34 0004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A34 0018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A34 001C |
| L4_TA_AGENT_CONTR_OL_L | RW | 32 | 0x0000 0020 | 0x4A34 0020 |
| L4_TA_AGENT_CONTR_OL_H | R | 32 | 0x0000 0024 | 0x4A34 0024 |
| L4_TA_AGENT_STATUS_L | R | 32 | 0x0000 0028 | 0x4A34 0028 |
| L4_TA_AGENT_STATUS_H | R | 32 | 0x0000 002C | 0x4A34 002C |

Table 14-412. PER_TA Register Mapping Summary 1

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_UART 3 L3 Physical Address | PER_TA_GPTIM ER2 L3 Physical Address | PER_TA_GPTIM ER3 L3 Physical Address |
|-----------------------|------|-----------------------|----------------|-----------------------------------|--------------------------------------|--------------------------------------|
| L4_TA_COMPO_NENT_H | R | 32 | 0x0000 0000 | 0x4802 1000 | 0x4803 3000 | 0x4803 5000 |
| L4_TA_COMPO_NENT_L | R | 32 | 0x0000 0004 | 0x4802 1004 | 0x4803 3004 | 0x4803 5004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4802 1018 | 0x4803 3018 | 0x4803 5018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4802 101C | 0x4803 301C | 0x4803 501C |
| L4_TA_AGENT_CONTROL_L | RW | 32 | 0x0000 0020 | 0x4802 1020 | 0x4803 3020 | 0x4803 5020 |
| L4_TA_AGENT_CONTROL_H | R | 32 | 0x0000 0024 | 0x4802 1024 | 0x4803 3024 | 0x4803 5024 |
| L4_TA_AGENT_STATUS_L | R | 32 | 0x0000 0028 | 0x4802 1028 | 0x4803 3028 | 0x4803 5028 |
| L4_TA_AGENT_STATUS_H | R | 32 | 0x0000 002C | 0x4802 102C | 0x4803 302C | 0x4803 502C |

Table 14-413. PER_TA Register Mapping Summary 2

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_GPTIM ER4 L3 Physical Address | PER_TA_GPTIM ER9 L3 Physical Address | PER_TA_DSS L3 Physical Address |
|--------------------|------|-----------------------|----------------|--------------------------------------|--------------------------------------|--------------------------------|
| L4_TA_COMPO_NENT_H | R | 32 | 0x0000 0000 | 0x4803 7000 | 0x4803 F000 | 0x4805 0000 |

Table 14-413. PER_TA Register Mapping Summary 2 (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_GPTIMER4 L3 Physical Address | PER_TA_GPTIMER9 L3 Physical Address | PER_TA_DSS L3 Physical Address |
|------------------------|------|-----------------------|----------------|-------------------------------------|-------------------------------------|--------------------------------|
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4803 7004 | 0x4803 F004 | 0x4805 0004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4803 7018 | 0x4803 F018 | 0x4805 0018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4803 701C | 0x4803 F01C | 0x4805 001C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4803 7020 | 0x4803 F020 | 0x4805 0020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4803 7024 | 0x4803 F024 | 0x4805 0024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4803 7028 | 0x4803 F028 | 0x4805 0028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x4803 702C | 0x4803 F02C | 0x4805 002C |

Table 14-414. PER_TA Register Mapping Summary 3

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_GPIO2 L3 Physical Address | PER_TA_GPIO3 L3 Physical Address | PER_TA_GPIO4 L3 Physical Address |
|------------------------|------|-----------------------|----------------|----------------------------------|----------------------------------|----------------------------------|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4805 6000 | 0x4805 8000 | 0x4805 A000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4805 6004 | 0x4805 8004 | 0x4805 A004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4805 6018 | 0x4805 8018 | 0x4805 A018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4805 601C | 0x4805 801C | 0x4805 A01C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4805 6020 | 0x4805 8020 | 0x4805 A020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4805 6024 | 0x4805 8024 | 0x4805 A024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4805 6028 | 0x4805 8028 | 0x4805 A028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x4805 602C | 0x4805 802C | 0x4805 A02C |

Table 14-415. PER_TA Register Mapping Summary 4

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_GPIO5 L3 Physical Address | PER_TA_GPIO6 L3 Physical Address | PER_TA_I2C3 L3 Physical Address |
|------------------------|------|-----------------------|----------------|----------------------------------|----------------------------------|---------------------------------|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4805 C000 | 0x4805 E000 | 0x4806 1000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4805 C004 | 0x4805 E004 | 0x4806 1004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4805 C018 | 0x4805 E018 | 0x4806 1018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4805 C01C | 0x4805 E01C | 0x4806 101C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4805 C020 | 0x4805 E020 | 0x4806 1020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4805 C024 | 0x4805 E024 | 0x4806 1024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4805 C028 | 0x4805 E028 | 0x4806 1028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x4805 C02C | 0x4805 E02C | 0x4806 102C |

Table 14-416. PER_TA Register Mapping Summary 5

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_UART 1 L3 Physical Address | PER_TA_UART 2 L3 Physical Address | PER_TA_UART 4 L3 Physical Address |
|------------------------|------|-----------------------|----------------|-----------------------------------|-----------------------------------|-----------------------------------|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4806 B000 | 0x4806 D000 | 0x4806 F000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4806 B004 | 0x4806 D004 | 0x4806 F004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4806 B018 | 0x4806 D018 | 0x4806 F018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4806 B01C | 0x4806 D01C | 0x4806 F01C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4806 B020 | 0x4806 D020 | 0x4806 F020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4806 B024 | 0x4806 D024 | 0x4806 F024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4806 B028 | 0x4806 D028 | 0x4806 F028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x4806 B02C | 0x4806 D02C | 0x4806 F02C |

Table 14-417. PER_TA Register Mapping Summary 6

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_I2C1 L3 Physical Address | PER_TA_I2C2 L3 Physical Address |
|------------------------|------|-----------------------|----------------|---------------------------------|---------------------------------|
| L4_TA_COMPONE NT_H | R | 32 | 0x0000 0000 | 0x4807 1000 | 0x4807 3000 |
| L4_TA_COMPONE NT_L | R | 32 | 0x0000 0004 | 0x4807 1004 | 0x4807 3004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4807 1018 | 0x4807 3018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4807 101C | 0x4807 301C |
| L4_TA_AGENT_CO NTROL_L | RW | 32 | 0x0000 0020 | 0x4807 1020 | 0x4807 3020 |
| L4_TA_AGENT_CO NTROL_H | R | 32 | 0x0000 0024 | 0x4807 1024 | 0x4807 3024 |
| L4_TA_AGENT_ST ATUS_L | R | 32 | 0x0000 0028 | 0x4807 1028 | 0x4807 3028 |
| L4_TA_AGENT_ST ATUS_H | R | 32 | 0x0000 002C | 0x4807 102C | 0x4807 302C |

Table 14-418. PER_TA Register Mapping Summary 7

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_SLIMB US2 L3 Physical Address | PER_TA_ELM L3 Physical Address | PER_TA_GPTIM ER10 L3 Physical Address |
|------------------------|------|-----------------------|----------------|--------------------------------------|--------------------------------|---------------------------------------|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4807 7000 | 0x4807 9000 | 0x4808 7000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4807 7004 | 0x4807 9004 | 0x4808 7004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4807 7018 | 0x4807 9018 | 0x4808 7018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4807 701C | 0x4807 901C | 0x4808 701C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4807 7020 | 0x4807 9020 | 0x4808 7020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4807 7024 | 0x4807 9024 | 0x4808 7024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4807 7028 | 0x4807 9028 | 0x4808 7028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x4807 702C | 0x4807 902C | 0x4808 702C |

Table 14-419. PER_TA Register Mapping Summary 8

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_GPTIM ER11 L3 Physical Address | PER_TA_MCBS P4 L3 Physical Address | PER_TA_MCSP1 1 L3 Physical Address |
|---------------------------|------|-----------------------|----------------|--|--|--|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4808 9000 | 0x4809 7000 | 0x4809 9000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4808 9004 | 0x4809 7004 | 0x4809 9004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4808 9018 | 0x4809 7018 | 0x4809 9018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4808 901C | 0x4809 701C | 0x4809 901C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4808 9020 | 0x4809 7020 | 0x4809 9020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4808 9024 | 0x4809 7024 | 0x4809 9024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4808 9028 | 0x4809 7028 | 0x4809 9028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x4808 902C | 0x4809 702C | 0x4809 902C |

Table 14-420. PER_TA Register Mapping Summary 9

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_MCSP12 L3 Physical Address | PER_TA_HSMMC1 L3 Physical Address |
|---------------------------|------|-----------------------|----------------|---|---|
| L4_TA_COMPONE NT_H | R | 32 | 0x0000 0000 | 0x4809 B000 | 0x4809 D000 |
| L4_TA_COMPONE NT_L | R | 32 | 0x0000 0004 | 0x4809 B004 | 0x4809 D004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4809 B018 | 0x4809 D018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4809 B01C | 0x4809 D01C |
| L4_TA_AGENT_CO NTROL_L | RW | 32 | 0x0000 0020 | 0x4809 B020 | 0x4809 D020 |
| L4_TA_AGENT_CO NTROL_H | R | 32 | 0x0000 0024 | 0x4809 B024 | 0x4809 D024 |
| L4_TA_AGENT_ST ATUS_L | R | 32 | 0x0000 0028 | 0x4809 B028 | 0x4809 D028 |
| L4_TA_AGENT_ST ATUS_H | R | 32 | 0x0000 002C | 0x4809 B02C | 0x4809 D02C |

Table 14-421. PER_TA Register Mapping Summary 10

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_HSMMC3 L3 Physical Address |
|---------------------------|------|-----------------------|----------------|--------------------------------------|
| L4_TA_COMPONENT_ H | R | 32 | 0x0000 0000 | 0x480A E000 |
| L4_TA_COMPONENT_ L | R | 32 | 0x0000 0004 | 0x480A E004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x480A E018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x480A E01C |
| L4_TA_AGENT_CONTR OL_L | RW | 32 | 0x0000 0020 | 0x480A E020 |
| L4_TA_AGENT_CONTR OL_H | R | 32 | 0x0000 0024 | 0x480A E024 |
| L4_TA_AGENT_STATU S_L | R | 32 | 0x0000 0028 | 0x480A E028 |
| L4_TA_AGENT_STATU S_H | R | 32 | 0x0000 002C | 0x480A E02C |

Table 14-422. PER_TA Register Mapping Summary 11

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_HDQ L3 Physical Address | PER_TA_HSMM C2 L3 Physical Address | PER_TA_MCSPI 3 L3 Physical Address |
|------------------------|------|-----------------------|----------------|--------------------------------|------------------------------------|------------------------------------|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x480B 3000 | 0x480B 5000 | 0x480B 9000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x480B 3004 | 0x480B 5004 | 0x480B 9004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x480B 3018 | 0x480B 5018 | 0x480B 9018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x480B 301C | 0x480B 501C | 0x480B 901C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x480B 3020 | 0x480B 5020 | 0x480B 9020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x480B 3024 | 0x480B 5024 | 0x480B 9024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x480B 3028 | 0x480B 5028 | 0x480B 9028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x480B 302C | 0x480B 502C | 0x480B 902C |

Table 14-423. PER_TA Register Mapping Summary 12

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_MCSPI 4 L3 Physical Address | PER_TA_HSMM C4 L3 Physical Address | PER_TA_HSMM C5 L3 Physical Address |
|------------------------|------|-----------------------|----------------|------------------------------------|------------------------------------|------------------------------------|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x480B B000 | 0x480D 2000 | 0x480D 6000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x480B B004 | 0x480D 2004 | 0x480D 6004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x480B B018 | 0x480D 2018 | 0x480D 6018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x480B B01C | 0x480D 201C | 0x480D 601C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x480B B020 | 0x480D 2020 | 0x480D 6020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x480B B024 | 0x480D 2024 | 0x480D 6024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x480B B028 | 0x480D 2028 | 0x480D 6028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x480B B02C | 0x480D 202C | 0x480D 602C |

Table 14-424. PER_TA Register Mapping Summary 13

| Register Name | Type | Register Width (Bits) | Address Offset | PER_TA_I2C4 L3 Physical Address |
|------------------------|------|-----------------------|----------------|---------------------------------|
| L4_TA_COMPONENT_ H | R | 32 | 0x0000 0000 | 0x4835 1000 |
| L4_TA_COMPONENT_ L | R | 32 | 0x0000 0004 | 0x4835 1004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4835 1018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4835 101C |
| L4_TA_AGENT_CONTR OL_L | RW | 32 | 0x0000 0020 | 0x4835 1020 |
| L4_TA_AGENT_CONTR OL_H | R | 32 | 0x0000 0024 | 0x4835 1024 |
| L4_TA_AGENT_STATU S_L | R | 32 | 0x0000 0028 | 0x4835 1028 |
| L4_TA_AGENT_STATU S_H | R | 32 | 0x0000 002C | 0x4835 102C |

Table 14-425. WKUP_TA Register Mapping Summary 1

| Register Name | Type | Register Width (Bits) | Address Offset | WKUP_TA_32K TIMER L3 Physical Address | WKUP_TA_PR M L3 Physical Address | WKUP_TA_SCR M L3 Physical Address |
|---------------------------|------|-----------------------|----------------|--|--|---|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4A30 5000 | 0x4A30 8000 | 0x4A30 B000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4A30 5004 | 0x4A30 8004 | 0x4A30 B004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A30 5018 | 0x4A30 8018 | 0x4A30 B018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A30 501C | 0x4A30 801C | 0x4A30 B01C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4A30 5020 | 0x4A30 8020 | 0x4A30 B020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4A30 5024 | 0x4A30 8024 | 0x4A30 B024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4A30 5028 | 0x4A30 8028 | 0x4A30 B028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x4A30 502C | 0x4A30 802C | 0x4A30 B02C |

Table 14-426. WKUP_TA Register Mapping Summary 2

| Register Name | Type | Register Width (Bits) | Address Offset | WKUP_TA_SYS CTRL_ GENERAL_WK UP L3 Physical Address | WKUP_TA_GPI O1 L3 Physical Address | WKUP_TA_WD TIMER2 L3 Physical Address |
|---------------------------|------|-----------------------|----------------|---|--|--|
| L4_TA_COMPO NENT_H | R | 32 | 0x0000 0000 | 0x4A30 D000 | 0x4A31 1000 | 0x4A31 5000 |
| L4_TA_COMPO NENT_L | R | 32 | 0x0000 0004 | 0x4A30 D004 | 0x4A31 1004 | 0x4A31 5004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A30 D018 | 0x4A31 1018 | 0x4A31 5018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A30 D01C | 0x4A31 101C | 0x4A31 501C |
| L4_TA_AGENT_ CONTROL_L | RW | 32 | 0x0000 0020 | 0x4A30 D020 | 0x4A31 1020 | 0x4A31 5020 |
| L4_TA_AGENT_ CONTROL_H | R | 32 | 0x0000 0024 | 0x4A30 D024 | 0x4A31 1024 | 0x4A31 5024 |
| L4_TA_AGENT_ STATUS_L | R | 32 | 0x0000 0028 | 0x4A30 D028 | 0x4A31 1028 | 0x4A31 5028 |
| L4_TA_AGENT_ STATUS_H | R | 32 | 0x0000 002C | 0x4A30 D02C | 0x4A31 102C | 0x4A31 502C |

Table 14-427. WKUP_TA Register Mapping Summary 3

| Register Name | Type | Register Width (Bits) | Address Offset | WKUP_TA_DM_TI MER1MS_1 L3 Physical Address | WKUP_TA_KEYBO ARD L3 Physical Address |
|---------------------------|------|-----------------------|----------------|--|---|
| L4_TA_COMPONE NT_H | R | 32 | 0x0000 0000 | 0x4A31 9000 | 0x4A31 D000 |
| L4_TA_COMPONE NT_L | R | 32 | 0x0000 0004 | 0x4A31 9004 | 0x4A31 D004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A31 9018 | 0x4A31 D018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A31 901C | 0x4A31 D01C |
| L4_TA_AGENT_CO NTROL_L | RW | 32 | 0x0000 0020 | 0x4A31 9020 | 0x4A31 D020 |
| L4_TA_AGENT_CO NTROL_H | R | 32 | 0x0000 0024 | 0x4A31 9024 | 0x4A31 D024 |
| L4_TA_AGENT_ST ATUS_L | R | 32 | 0x0000 0028 | 0x4A31 9028 | 0x4A31 D028 |

Table 14-427. WKUP_TA Register Mapping Summary 3 (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | WKUP_TA_DM_TI MER1MS_1 L3 Physical Address | WKUP_TA_KEYBO ARD L3 Physical Address |
|--------------------------------------|------|-----------------------|----------------|--|---|
| L4_TA_AGENT_STATUS_H | R | 32 | 0x0000 002C | 0x4A31 902C | 0x4A31 D02C |

Table 14-428. WKUP_TA Register Mapping Summary 4

| Register Name | Type | Register Width (Bits) | Address Offset | WKUP_TA_ SYSCTRL_PADCONF_ WKUP L3 Physical Address |
|--|------|-----------------------|----------------|---|
| L4_TA_COMPONENT_H | R | 32 | 0x0000 0000 | 0x4A31 F000 |
| L4_TA_COMPONENT_L | R | 32 | 0x0000 0004 | 0x4A31 F004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A31 F018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A31 F01C |
| L4_TA_AGENT_CONTR_OL_L | RW | 32 | 0x0000 0020 | 0x4A31 F020 |
| L4_TA_AGENT_CONTR_OL_H | R | 32 | 0x0000 0024 | 0x4A31 F024 |
| L4_TA_AGENT_STATUS_L | R | 32 | 0x0000 0028 | 0x4A31 F028 |
| L4_TA_AGENT_STATUS_H | R | 32 | 0x0000 002C | 0x4A31 F02C |

Table 14-429. WKUP_TA Register Mapping Summary 5

| Register Name | Type | Register Width (Bits) | Address Offset | WKUP_TA_SAR_RAM L3 Physical Address |
|--|------|-----------------------|----------------|--|
| L4_TA_COMPONENT_H | R | 32 | 0x0000 0000 | 0x4A32 A000 |
| L4_TA_COMPONENT_L | R | 32 | 0x0000 0004 | 0x4A32 A004 |
| L4_TA_CORE_L | R | 32 | 0x0000 0018 | 0x4A32 A018 |
| L4_TA_CORE_H | R | 32 | 0x0000 001C | 0x4A32 A01C |
| L4_TA_AGENT_CONTR_OL_L | RW | 32 | 0x0000 0020 | 0x4A32 A020 |
| L4_TA_AGENT_CONTR_OL_H | R | 32 | 0x0000 0024 | 0x4A32 A024 |
| L4_TA_AGENT_STATUS_L | R | 32 | 0x0000 0028 | 0x4A32 A028 |
| L4_TA_AGENT_STATUS_H | R | 32 | 0x0000 002C | 0x4A32 A02C |

14.3.5.3.2 L4 Target Agent (L4 TA) Register Description

Table 14-430 through Table 14-444 describe the L4 TA registers.

Table 14-430. L4_TA_COMPONENT_H

| | |
|-------------------------|--|
| Address Offset | 0x0000 0000 |
| Physical Address | See Table 14-399 to Table 14-411 . |
| Description | Contains a component code and revision. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|------------|
| 31:0 | RESERVED | Read returns 0. | R | 0x0000 000 |

Table 14-431. Register Call Summary for Register L4_TA_COMPONENT_H

L4 interconnects

- L4 Target Agent (L4 TA) Register Summary: [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30]

Table 14-432. L4_TA_COMPONENT_L

| | |
|-------------------------|--|
| Address Offset | 0x0000 0004 |
| Physical Address | See Table 14-399 to Table 14-411 . |
| Description | Contains a component code and revision. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CODE | | | | | | | | | | | | | | | | REV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|----------------------|
| 31:16 | CODE | Interconnect code | R | See ⁽¹⁾ . |
| 15:0 | REV | Component revision code | R | See ⁽¹⁾ . |

⁽¹⁾ TI internal data

Table 14-433. Register Call Summary for Register L4_TA_COMPONENT_L

L4 interconnects

- L4 Target Agent (L4 TA) Register Summary: [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30]

Table 14-434. L4_TA_CORE_L

| | |
|-------------------------|--|
| Address Offset | 0x0000 0018 |
| Physical Address | See Table 14-399 to Table 14-411 . |
| Description | Contains a component code and revision. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CODE | | | | | | | | | | | | | | | | CORE_REV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|------------------------------|------|----------------------|
| 31:16 | CORE_CODE | Interconnect core code | R | See ⁽¹⁾ . |
| 15:0 | CORE_REV | Component revision code code | R | See ⁽¹⁾ . |

⁽¹⁾ TI internal data

Table 14-435. Register Call Summary for Register L4_TA_CORE_L

L4 interconnects

- L4 Target Agent (L4 TA) Register Summary: [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30]

Table 14-436. L4_TA_CORE_H

| | |
|-------------------------|---|
| Address Offset | 0x0000 001C |
| Physical Address | See Table 14-399 to Table 14-411. |
| Description | Contains a component code and revision. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | VENDOR_CODE | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---------------------------|------|----------------------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | VENDOR_CODE | Vendor revision core code | R | See ⁽¹⁾ . |

⁽¹⁾ TI internal data

Table 14-437. Register Call Summary for Register L4_TA_CORE_H

L4 interconnects

- L4 Target Agent (L4 TA) Register Summary: [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30]

Table 14-438. L4_TA_AGENT_CONTROL_L

| | |
|-------------------------|-----------------------------------|
| Address Offset | 0x0000 0020 |
| Physical Address | See Table 14-399 to Table 14-411. |
| Description | Enable error reporting |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-------------|----|----|----|----------|----|---|---|---|---|---|---|-----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | REQ_TIMEOUT | | | | RESERVED | | | | | | | | OCP_RESET | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|-----------------------------------|-------|
| 31:25 | RESERVED | Read returns 0. | R | 0x00 |
| 24 | SERROR_REP | Enable logging of error | R | 0x0 |
| 23:11 | RESERVED | Read returns 0. | UNDEFI NED_TY PE_STRI NG | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------|
| 10:8 | REQ_TIMEOUT | Time-out Bound. Values are: 0: No time-out 1: 1x base cycles. 2: 4x base cycles. 3: 16x base cycles. 4: 64x base cycles. | RW | 0x2 |
| 7:1 | RESERVED | Read returns 0. | R | 0x00 |
| 0 | OCP_RESET | The OCP_RESET field controls the OCP reset signal to the attached core. Setting this bit clears any pending transfers and resets the OCP interface. The bit must be cleared to deassert the OCP reset signal. When the software reset feature is available on a target agent, the target agent OCP must also have a reset signal directed to the target core. | RW | 0 |

Table 14-439. Register Call Summary for Register L4_TA_AGENT_CONTROL_L

L4 interconnects

- Time-Out: [0] [1] [2] [3] [4]
- Error Recovery: [5] [6]
- Operational Modes Configuration: [7] [8] [9] [10]
- L4 Target Agent (L4 TA) Register Summary: [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41]

Table 14-440. L4_TA_AGENT_CONTROL_H

| | |
|-------------------------|--|
| Address Offset | 0x0000 0024 |
| Physical Address | See Table 14-399 to Table 14-411 . |
| Description | Enable clock power management |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | EXT_CLOCK | RESERVED | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:9 | RESERVED | Read returns 0. | R | 0x000000 |
| 8 | EXT_CLOCK | When set to 1, the ext_clk_off_i signal on a target agent indicates when the target agent should shut off. | R | 0 |
| 7:0 | RESERVED | Read returns 0. | R | 0x00 |

Table 14-441. Register Call Summary for Register L4_TA_AGENT_CONTROL_H

L4 interconnects

- L4 Target Agent (L4 TA) Register Summary: [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30]

Table 14-442. L4_TA_AGENT_STATUS_L

| | |
|-------------------------|--|
| Address Offset | 0x0000 0028 |
| Physical Address | See Table 14-399 to Table 14-411 . |
| Description | Error reporting |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------------|----------|---|---|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | RESERVED | | | | | | | | | | | | | | | | REQ_TIMEOUT | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|-------------|--------|
| 31:24 | RESERVED | Read returns 0. | R | 0x00 |
| 23:9 | RESERVED | Read returns 0. | R | 0x0001 |
| 8 | REQ_TIMEOUT | Time-out status: 0x0: No request time-out 0x1: A request time-out has occurred | R 1toCLR | 0 |
| 7:0 | RESERVED | Read returns 0. | R | 0x00 |

Table 14-443. Register Call Summary for Register L4_TA_AGENT_STATUS_L

L4 interconnects

- [Time-Out: \[0\] \[1\]](#)
- [Error Recovery: \[2\]](#)
- [Operational Modes Configuration: \[3\] \[4\]](#)
- [L4 Target Agent \(L4 TA\) Register Summary: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\]](#)

Table 14-444. L4_TA_AGENT_STATUS_H

| | |
|-------------------------|--|
| Address Offset | 0x0000 002C |
| Physical Address | See Table 14-399 to Table 14-411 . |
| Description | Error reporting |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------|------|------------|
| 31:0 | RESERVED | Read returns 0 | R | 0x0000 000 |

Table 14-445. Register Call Summary for Register L4_TA_AGENT_STATUS_H

L4 interconnects

- [L4 Target Agent \(L4 TA\) Register Summary: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\]](#)

14.3.5.4 L4 Link Agent (L4 LA)

14.3.5.4.1 L4 Link Agent (L4 LA) Register Summary

Table 14-446 summarizes the L4 LA register mapping.

Table 14-446. LA Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | PER_LA L3 Physical Address | CFG_LA L3 Physical Address | WKUP_LA L3 Physical Address |
|-------------------------|------|-----------------------|----------------|----------------------------|----------------------------|-----------------------------|
| L4_LA_COMPONENT_L | R | 32 | 0x0000 0000 | 0x4800 0800 | 0x4A00 0800 | 0x4A30 0800 |
| L4_LA_COMPONENT_H | R | 32 | 0x0000 0004 | 0x4800 0804 | 0x4A00 0804 | 0x4A30 0804 |
| L4_LA_NETWORK_L | R | 32 | 0x0000 0010 | 0x4800 0810 | 0x4A00 0810 | 0x4A30 0810 |
| L4_LA_NETWORK_H | R | 32 | 0x0000 0014 | 0x4800 0814 | 0x4A00 0814 | 0x4A30 0814 |
| L4_LA_INITIATOR_INFO_L | R | 32 | 0x0000 0018 | 0x4800 0818 | 0x4A00 0818 | 0x4A30 0818 |
| L4_LA_INITIATOR_INFO_H | R | 32 | 0x0000 001C | 0x4800 081C | 0x4A00 081C | 0x4A30 081C |
| L4_LA_NETWORK_CONTROL_L | RW | 32 | 0x0000 0020 | 0x4800 0820 | 0x4A00 0820 | 0x4A30 0820 |
| L4_LA_NETWORK_CONTROL_H | RW | 32 | 0x0000 0024 | 0x4800 0824 | 0x4A00 0824 | 0x4A30 0824 |

14.3.5.4.2 L4 Link Agent (L4 LA) Register Description

Table 14-447 through Table 14-463 describe the L4 LA registers.

Table 14-447. L4_LA_COMPONENT_L

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4800 0800 0x4A00 0800 0x4A30 0800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Contain a component code and revision, which are used to identify the hardware of the component. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CODE | | | | | | | | | | | | | | | | REV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|----------------------|
| 31:16 | CODE | Interconnect code | R | See ⁽¹⁾ . |
| 15:0 | REV | Component revision code | R | See ⁽¹⁾ . |

⁽¹⁾ TI internal data

Table 14-448. Register Call Summary for Register L4_LA_COMPONENT_L

L4 interconnects

- L4 Link Agent (L4 LA) Register Summary: [0]

Table 14-449. L4_LA_COMPONENT_H

| | |
|-------------------------|--|
| Address Offset | 0x0000 0004 |
| Physical Address | 0x4800 0804 0x4A00 0804 0x4A30 0804 |
| Description | Contain a component code and revision, which are used to identify the hardware of the component. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|-------------|
| 31:0 | RESERVED | Read returns 0. | R | 0x0000 0000 |

Table 14-450. Register Call Summary for Register L4_LA_COMPONENT_H

L4 interconnects

- [L4 Link Agent \(L4 LA\) Register Summary: \[0\]](#)

Table 14-451. L4_LA_NETWORK_L

| | |
|-------------------------|---|
| Address Offset | 0x0000 0010 |
| Physical Address | 0x4800 0810 0x4A00 0810 0x4A30 0810 |
| Description | Identify the interconnect |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------|------|-------------|
| 31:0 | RESERVED | Read returns 0 | R | 0x0000 0000 |

Table 14-452. Register Call Summary for Register L4_LA_NETWORK_L

L4 interconnects

- [L4 Link Agent \(L4 LA\) Register Summary: \[0\]](#)

Table 14-453. L4_LA_NETWORK_H

| | |
|-------------------------|---|
| Address Offset | 0x0000 0014 |
| Physical Address | 0x4800 0814 0x4A00 0814 0x4A30 0814 |
| Description | Identify the interconnect |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ID | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:0 | ID | The ID field uniquely identifies this interconnect. | R | 0x00010000 |

Table 14-454. Register Call Summary for Register L4_LA_NETWORK_H

L4 interconnects

- [L4 Link Agent \(L4 LA\) Register Summary: \[0\]](#)

Table 14-455. L4_LA_INITIATOR_INFO_L

| | |
|-------------------------|---|
| Address Offset | 0x0000 0018 |
| Physical Address | 0x4800 0818 0x4A00 0818 0x4A30 0818 |
| Description | Contain initiator subsystem information. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|-------------|----|----|----|----------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | PROT_GROUPS | | | | NUMBER_REGIONS | | | | | | | | RESERVED | | | | | | | | SEGMENTS | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|----------------------------------|
| 31:28 | RESERVED | Read returns 0. | R | 0x0 |
| 27:24 | PROT_GROUPS | Number of protection group in the current L4 0x0: No protection group 0x1: 1 protection group 0x2: 2 protection groups 0x8: 8 protection groups 0x9 to 0xF: Reserved | R | See Table 14-457 |
| 23:16 | NUMBER_REGIONS | Number of regions in the current L4 0x0: Reserved 0x1: 1 region 0x2: 2 regions Max regions +1 to 0xFF: Reserved, maximum regions is listed in Table 14-457 . | R | See Table 14-457 |
| 15:4 | RESERVED | Read returns 0. | R | 0x000 |
| 3:0 | SEGMENTS | Number of segments in the current L4 0x0: Reserved 0x1: 1 segment 0x2: 2 segments 0x8: 8 segments | R | See Table 14-457 |

Table 14-456. Register Call Summary for Register L4_LA_INITIATOR_INFO_L

L4 interconnects

- [L4 Firewalls: \[0\]](#)
- [L4 Link Agent \(L4 LA\) Register Summary: \[1\]](#)

Table 14-457. Reset value for L4_LA_INITIATOR_INFO_L

| Field Name | L4_PER | L4_CFG | L4_WKUP |
|----------------|--------|--------|---------|
| PROT_GROUPS | 0x8 | 0x8 | 0x0 |
| NUMBER_REGIONS | 0x55 | 0x5C | 0x20 |
| SEGMENTS | 0x2 | 0x5 | 0x3 |

Table 14-458. L4_LA_INITIATOR_INFO_H

| | |
|-------------------------|---|
| Address Offset | 0x0000 001C |
| Physical Address | 0x4800 081C 0x4A00 081C 0x4A30 081C |
| Description | Contain initiator subsystem information. |
| Type | R |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----------|--------------|----|----|----|----------|---------------------|---|---|---|----------|---|---|------------|---|---|--|--|
| RESERVED | | | | | | | | | | | | | THREADS | | | RESERVED | CONNID_WIDTH | | | | RESERVED | BYTE_DATA_WIDTH_EXP | | | | RESERVED | | | ADDR_WIDTH | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|----------------------------------|
| 31:19 | RESERVED | Read returns 0. | R | 0x0000 |
| 18:16 | THREADS | The THREADS field specifies the number of initiator threads connected to the interconnect. The field contains read-only configuration information for the initiator subsystem. | R | See Table 14-460 |
| 15 | RESERVED | Read returns 0. | R | 0 |
| 14:12 | CONNID_WIDTH | The initiator subsystem ConnID width. The CONNID_WIDTH field contains read-only configuration information for the initiator subsystem. | R | See Table 14-460 |
| 11 | RESERVED | Read returns 0. | R | 0 |
| 10:8 | BYTE_DATA_WIDTH_EXP | This field specifies the initiator subsystem data width. The BYTE_DATA_WIDTH_EXP field contains read-only configuration information for the initiator subsystem. 0x1: 16-bit data width is specified. 0x2: 32-bit data width is specified. | R | See Table 14-460 |
| 7:5 | RESERVED | Read returns 0. | R | 0x0 |
| 4:0 | ADDR_WIDTH | This field specifies the initiator subsystem address width. The ADDR_WIDTH field contains read-only configuration information for the initiator subsystem. | R | See Table 14-460 |

Table 14-459. Register Call Summary for Register L4_LA_INITIATOR_INFO_H

L4 interconnects

- [L4 Link Agent \(L4 LA\) Register Summary: \[0\]](#)

Table 14-460. Reset Value for L4_LA_INITIATOR_INFO_H

| Field Name | L4_PER | L4_CFG | L4_WKUP |
|---------------------|--------|--------|---------|
| THREADS | 0x4 | 0x1 | 0x1 |
| CONNID_WIDTH | 0x4 | 0x4 | 0x0 |
| BYTE_DATA_WIDTH_EXP | 0x2 | 0x2 | 0x2 |
| ADDR_WIDTH | 0x18 | 0x18 | 0x12 |

Table 14-461. L4_LA_NETWORK_CONTROL_L

| | |
|-------------------------|---|
| Address Offset | 0x0000 0020 |
| Physical Address | 0x4800 0820 0x4A00 0820 0x4A30 0820 |
| Description | Control interconnect minimum time-out values. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TIMEOUT_BASE | | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|----------|
| 31:11 | RESERVED | Read returns 0. | R | 0x000000 |
| 10:8 | TIMEOUT_BASE | The TIMEOUT_BASE field indicates the time-out period (that is, base cycles) for the highest frequency time-base signal sent from the L4 initiator subsystem to all target agents that have time-out enabled. Values for the field are: 0: Time-out disabled 1: L4 interconnect clock cycles divided by 64 2: L4 interconnect clock cycles divided by 256 3: L4 interconnect clock cycles divided by 1024 4: L4 interconnect clock cycles divided by 4096 | RW | 0x4 |
| 7:0 | RESERVED | Read returns 0. | R | 0x00 |

Table 14-462. Register Call Summary for Register L4_LA_NETWORK_CONTROL_L

L4 interconnects

- [Time-Out: \[0\] \[1\] \[2\]](#)
- [Operational Modes Configuration: \[3\] \[4\]](#)
- [L4 Link Agent \(L4 LA\) Register Summary: \[5\]](#)

Table 14-463. L4_LA_NETWORK_CONTROL_H

| | |
|-------------------------|---|
| Address Offset | 0x0000 0024 |
| Physical Address | 0x4800 0824 0x4A00 0824 0x4A30 0824 |
| Description | Control interconnect global power control |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|--------------------|----------|----|-------------|----------|----|----|----|----|----|----|----|----|----|----|-----------|----------|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | CLOCK_GATE_DISABLE | RESERVED | | THREAD0_PRI | RESERVED | | | | | | | | | | | EXT_CLOCK | RESERVED | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|-------|
| 31:25 | RESERVED | Read returns 0. | R | 0x00 |
| 24 | CLOCK_GATE_DISABLE | When set to 1 this field disables all clock gating. | RW | 0 |
| 23:21 | RESERVED | Read returns 0. | R | 0x0 |
| 20 | THREAD0_PRI | Sets thread priority. If the field is set to 0, the default, all initiator threads are treated the same. Setting the THREAD0_PRI field to 1 assigns a higher arbitration priority to thread 0 of the first initiator OCP interface. To avoid starvation, arbitration is imposed by the initiator subsystem. When multiple requests from different initiator threads are dispatched to targets simultaneously, the oldest request is dispatched first. If thread 0 is assigned a higher priority, a request on thread 0 always wins arbitration. Assigning thread 0 of the first initiator OCP the highest priority on a request or response can result in the starvation of other threads. | R | 1 |
| 19:9 | RESERVED | Read returns 0. | R | 0x000 |
| 8 | EXT_CLOCK | When set to 1, the ext_clk_off_i signal on the initiator subsystem instructs the entire L4 to shut off. | R | 1 |
| 7:0 | RESERVED | Read returns 0. | R | 0x00 |

Table 14-464. Register Call Summary for Register L4_LA_NETWORK_CONTROL_H

L4 interconnects

- [L4 Link Agent \(L4 LA\) Register Summary: \[0\]](#)

14.3.5.5 L4 Address Protection (L4 AP)

14.3.5.5.1 L4 Address Protection (L4 AP) Register Summary

[Table 14-465](#) summarizes the L4 AP register mapping.

Table 14-465. L4 AP Register Summary

| Register Name | Type | Register Width (Bits) | Address Offset | PER_AP Physical Address | CFG_AP Physical Address |
|-----------------------------------|------|-----------------------|----------------|-------------------------|-------------------------|
| L4_AP_COMPONENT_L | R | 32 | 0x0000 0000 | 0x4800 0 000 | 0x4A00 0 000 |
| L4_AP_COMPONENT_H | R | 32 | 0x0000 0004 | 0x4800 0004 | 0x4A00 0004 |

Table 14-465. L4 AP Register Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | PER_AP Physical Address | CFG_AP Physical Address |
|---|------|-----------------------|------------------------|-------------------------|-------------------------|
| L4_AP_SEGMENT_i_L ⁽¹⁾ | RW | 32 | 0x0000 0100 + (0x08*i) | 0x4800 0100 + (0x08*i) | 0x4A00 0100 + (0x08*i) |
| L4_AP_SEGMENT_i_H ⁽¹⁾ | RW | 32 | 0x0000 0104 + (0x08*i) | 0x4800 0104 + (0x08*i) | 0x4A00 0104 + (0x08*i) |
| L4_AP_PROT_GROUP_MEMBERS_k_L ⁽²⁾ | R | 32 | 0x0000 0200 + (0x08*k) | 0x4800 0200 + (0x08*k) | 0x4A00 0200 + (0x08*k) |
| L4_AP_PROT_GROUP_MEMBERS_k_H ⁽²⁾ | R | 32 | 0x0000 0204 + (0x08*k) | 0x4800 0204 + (0x08*k) | 0x4A00 0204 + (0x08*k) |
| L4_AP_PROT_GROUP_ROLES_k_L ⁽²⁾ | R | 32 | 0x0000 0280 + (0x08*k) | 0x4800 0280 + (0x08*k) | 0x4A00 0280 + (0x08*k) |
| L4_AP_PROT_GROUP_ROLES_k_H ⁽²⁾ | R | 32 | 0x0000 0284 + (0x08*k) | 0x4800 0284 + (0x08*k) | 0x4A00 0284 + (0x08*k) |
| L4_AP_REGION_l_L ⁽³⁾ | RW | 32 | 0x0000 0300 + (0x08*l) | 0x4800 0300 + (0x08*l) | 0x4A00 0300 + (0x08*l) |
| L4_AP_REGION_l_H ⁽³⁾ | RW | 32 | 0x0000 0304 + (0x08*l) | 0x4800 0304 + (0x08*l) | 0x4A00 0304 + (0x08*l) |

- ⁽¹⁾ i = 0 to 1 for PER_AP
i = 0 to 6 for CFG_AP
- ⁽²⁾ k = 0 to 7 for PER_AP
k = 0 to 7 for CFG_AP
- ⁽³⁾ l = 0 to 96 for PER_AP
l = 0 to 113 for CFG_AP

14.3.5.5.2 L4 Address Protection (L4 AP) Register Description

[Table 14-466](#) through [Table 14-490](#) describe the L4 AP registers.

Table 14-466. L4_AP_COMPONENT_L

| | |
|-------------------------|---|
| Address Offset | 0x000 |
| Physical address | 0x4800 0 000 0x4A00 0 000 |
| Description | Contains a component code and revision, which are used to identify the hardware of the component. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CODE | | | | | | | | | | | | | | | | REV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------------------|------|----------------------|
| 31:16 | CODE | Interconnect code | R | See ⁽¹⁾ . |
| 15:0 | REV | Component revision code | R | See ⁽¹⁾ . |

- ⁽¹⁾ TI internal data

Table 14-467. Register Call Summary for Register L4_AP_COMPONENT_L

L4 interconnects

- [L4 Address Protection \(L4 AP\) Register Summary: \[0\]](#)

Table 14-468. L4_AP_COMPONENT_H

| | |
|-------------------------|---|
| Address Offset | 0x004 |
| Physical address | 0x4800 0004 0x4A00 0004 |
| Description | Contains a component code and revision, which are used to identify the hardware of the component. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------|------|-------------|
| 31:0 | RESERVED | Read returns 0 | R | 0x0000 0000 |

Table 14-469. Register Call Summary for Register L4_AP_COMPONENT_H

L4 interconnects

- [L4 Address Protection \(L4 AP\) Register Summary: \[0\]](#)

Table 14-470. L4_AP_SEGMENT_i_L

| | | | |
|-------------------------|--|--------------|--|
| Address Offset | 0x100 + (0x08*i) | Index | i = 0 to 1 for PER_AP i = 0 to 6 for CFG_AP |
| Physical address | 0x4800 0100 + (0x08*i) 0x4A00 0100 + (0x08*i) | | |
| Description | Define the base address of each segments | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | BASE | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------------------------------|
| 31:24 | RESERVED | Read returns 0. | R | 0x00 |
| 23:0 | BASE | The base address of the segment (with 0s from bit 0 to bit SIZE-1). | R | see Table 14-474 |

Table 14-471. Register Call Summary for Register L4_AP_SEGMENT_i_L

L4 interconnects

- [L4 Firewall Address and Protection Register Settings: \[0\]](#)
- [L4 Address Protection \(L4 AP\) Register Summary: \[1\]](#)

Table 14-472. L4_AP_SEGMENT_i_H

| | | | |
|-------------------------|--|--------------|--|
| Address Offset | 0x104 + (0x08*i) | Index | i = 0 to 1 for PER_AP i = 0 to 6 for CFG_AP |
| Physical address | 0x4800 0104 + (0x08*i) 0x4A00 0104 + (0x08*i) | | |
| Description | Define the size of each segments | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | SIZE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------------------------------|
| 31:5 | RESERVED | Read returns 0. | R | 0x00000000 |
| 4:0 | SIZE | Segment size is a power of 2, where 2 ^{SIZE} is the byte size of a segment (all segment registers use the same size). | R | see Table 14-474 |

Table 14-473. Register Call Summary for Register L4_AP_SEGMENT_i_H

L4 interconnects

- [L4 Firewall Address and Protection Register Settings: \[0\]](#)
- [L4 Address Protection \(L4 AP\) Register Summary: \[1\]](#)

Table 14-474. Reset Value for L4_AP_SEGMENT_i

| i | L4_PER | | L4_CFG | |
|---|-----------|------|-----------|------|
| | BASE | SIZE | BASE | SIZE |
| 0 | 0x00 0000 | 0x15 | 0x00 0000 | 0x13 |
| 1 | 0x02 0000 | 0x15 | 0x08 0000 | 0x13 |
| 2 | – | – | 0x10 0000 | 0x13 |
| 3 | – | – | 0x18 0000 | 0x13 |
| 4 | – | – | 0x20 0000 | 0x13 |
| 5 | – | – | 0x28 0000 | 0x13 |
| 6 | – | – | 0x30 0000 | 0x13 |

Table 14-475. L4_AP_PROT_GROUP_MEMBERS_k_L

| | | | |
|-------------------------|---|--------------|--|
| Address Offset | 0x200 + (0x08*k) | Index | k = 0 to 7 for PER_AP k = 0 to 7 for CFG_AP |
| Physical address | 0x4800 0200 + (0x08*k) 0x4A00 0200 + (0x08*k) | | |
| Description | Define ConnID bit vectors for a protection group. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|--|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DMM_PAGE_TABLE_WALK | | | | | | | | PERF_PROBE | | | | | | | | RESERVED | | | | | | | |
| | | | | | | | | HS USB_HOST USB | | | | | | | | RESERVED | | | | | | | | MMC1_MMC2 | | | | | | | |
| | | | | | | | | HSI | | | | | | | | C2C | | | | | | | | DSS | | | | | | | |
| | | | | | | | | SGX, BB2D | | | | | | | | sDMA | | | | | | | | CAM_CORTEXA9_MPU, SS_FACE_DETECT, CORTEXM3_MPU | | | | | | | |
| | | | | | | | | IVA_HD | | | | | | | | DSP_SS | | | | | | | | DAP | | | | | | | |
| | | | | | | | | CORTEXM3_MPU_SS | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

L4 Interconnects

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|--|--|------|------------------------------------|
| 31:16 | RESERVED | Reserved | R | 0x000000000000 |
| 15 | DMM_PAGE_TABLE_WALK | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 |
| 14 | PERF_PROBE | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 |
| 13 | RESERVED | Reserved | RW | See Table 14-477 |
| 12 | HS_USB_HOST_USB | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 . |
| 11 | RESERVED | Reserved | RW | See Table 14-477 . |
| 10 | MMC1_MMC2 | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 . |
| 9 | HSI | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 . |
| 8 | C2C | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 . |
| 7 | DSS | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 . |
| 6 | SGX, BB2D | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 . |
| 5 | sDMA | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 . |
| 4 | CAM_CORTEXA9_MPU, SS_FACE_DETECT, CORTEXM3_MPU | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 . |
| 3 | IVA_HD | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 . |
| 2 | DSP_SS | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 . |
| 1 | DAP | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 . |
| 0 | CORTEXM3_MPU_SS | Included in the protection group k 0x0: Not a member 0x1: Member | RW | See Table 14-477 |

Table 14-476. Register Call Summary for Register L4_AP_PROT_GROUP_MEMBERS_k_L

L4 interconnects

- [Protection Group: \[0\] \[1\]](#)
- [L4 Firewall Address and Protection Register Settings: \[2\]](#)
- [Operational Modes Configuration: \[3\]](#)
- [L4 Address Protection \(L4 AP\) Register Summary: \[4\]](#)

Table 14-477. Reset Value for L4_AP_PROT_GROUP_MEMBERS_k

| k | L4 PER | | L4 CFG | |
|---|--------|-----------------------|--------|-----------------------|
| | Type | Reset Value | Type | Reset Value |
| 0 | RW | 0xFFFF ⁽¹⁾ | RW | 0xFFFF ⁽¹⁾ |
| 1 | RW | 0xFFFF ⁽¹⁾ | RW | 0xFFFF ⁽¹⁾ |
| 2 | RW | 0xFFFF ⁽¹⁾ | RW | 0x0000 ⁽¹⁾ |
| 3 | RW | 0xFFFF | RW | 0xFFFF ⁽¹⁾ |
| 4 | RW | 0xFFFF | RW | 0xFFFF ⁽¹⁾ |
| 5 | RW | 0xFFFF | RW | 0xFFFF |
| 6 | RW | 0xFFFF | RW | 0xFFFF |
| 7 | RW | 0xFFFF | RW | 0xFFFF |

⁽¹⁾ Value exported from the SCM and valid for GP device only (see *System Control Module*). The values of the other protection registers can be modified during run time.

Table 14-478. L4_AP_PROT_GROUP_MEMBERS_k_H

| | | | |
|-------------------------|---|--------------|--|
| Address Offset | 0x204 + (0x08*k) | Index | k = 0 to 7 for PER_AP k = 0 to 7 for CFG_AP |
| Physical address | 0x4800 0204 + (0x08*k) 0x4A00 0204 + (0x08*k) | | |
| Description | Define ConnID bit vectors for a protection group. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------|------|-------------|
| 31:0 | RESERVED | Read returns 0's | R | 0x0000 0000 |

Table 14-479. Register Call Summary for Register L4_AP_PROT_GROUP_MEMBERS_k_H

L4 interconnects

- [L4 Address Protection \(L4 AP\) Register Summary: \[0\]](#)

Table 14-480. L4_AP_PROT_GROUP_ROLES_k_L

| | | | |
|-------------------------|---|--------------|--|
| Address Offset | 0x200 + (0x08*k) | Index | k = 0 to 7 for PER_AP k = 0 to 7 for CFG_AP |
| Physical address | 0x4800 0280 + (0x08*k) 0x4A00 0280 + (0x08*k) | | |
| Description | Define MReqInfo bit vectors for a protection group. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ENABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|--------|
| 31:0 | ENABLE | Setting of type acces allowed for the group of initiators. | R | 0xFFFF |

Table 14-481. Register Call Summary for Register L4_AP_PROT_GROUP_ROLES_k_L

L4 interconnects

- [Protection Group: \[0\]](#)
- [L4 Firewall Address and Protection Register Settings: \[1\]](#)
- [Operational Modes Configuration: \[2\]](#)
- [L4 Address Protection \(L4 AP\) Register Summary: \[3\]](#)

Table 14-482. Reset Value for L4_AP_PROT_GROUP_ROLES_k

| k | L4_PER | | L4_CFG | |
|---|--------|----------------------------|--------|----------------------------|
| | Type | Reset Value | Type | Reset Value |
| 0 | R | 0xFFFF FFFF ⁽¹⁾ | R | 0xFFFF FFFF ⁽¹⁾ |
| 1 | R | 0xFFFF FFFF ⁽¹⁾ | R | 0xFFFF FFFF ⁽¹⁾ |
| 2 | R | 0xFFFF FFFF ⁽¹⁾ | R | 0x0000 0000 ⁽¹⁾ |
| 3 | RW | 0xFFFF FFFF | R | 0xFFFF FFFF ⁽¹⁾ |
| 4 | RW | 0xFFFF FFFF | R | 0xFFFF FFFF ⁽¹⁾ |
| 5 | RW | 0xFFFF FFFF | RW | 0xFFFF FFFF |
| 6 | RW | 0xFFFF FFFF | RW | 0xFFFF FFFF |
| 7 | RW | 0xFFFF FFFF | RW | 0xFFFF FFFF |

⁽¹⁾ Value exported from the SCM and valid for GP device only (see *System Control Module*). The values of the other protection registers can be modified during run time.

Table 14-483. L4_AP_PROT_GROUP_ROLES_k_H

| | | | | |
|------------------|---|-------|--|--|
| Address Offset | 0x204 + (0x08*k) | Index | k = 0 to 7 for PER_AP k = 0 to 7 for CFG_AP | |
| Physical address | 0x4800 0284 + (0x08*k) 0x4A00 0284 + (0x08*k) | | | |
| Description | Define ConnID bit vectors for a protection group. | | | |
| Type | R | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ENABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|--------|
| 31:0 | ENABLE | Setting of type acces allowed for the group of initiators. | R | 0xFFFF |

Table 14-484. Register Call Summary for Register L4_AP_PROT_GROUP_ROLES_k_H

L4 interconnects

- [L4 Address Protection \(L4 AP\) Register Summary: \[0\]](#)

Table 14-485. L4_AP_REGION_I_L

| | | | |
|-------------------------|--|--------------|---|
| Address Offset | 0x300 + (0x08*I) | Index | I = 0 to 96 for PER_AP I = 0 to 113 for CFG_AP |
| Physical address | 0x4800 0300 + (0x08*I) 0x4A00 0300 + (0x08*I) | | |
| Description | Define the base address of the region in respect to the segment it belongs to. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | BASE | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--|
| 31:21 | RESERVED | Read returns 0. | R | 0x00 |
| 20:0 | BASE | Sets the base address of the region relative to its segment base. | R | See Table 14-489 to Table 14-490 |

Table 14-486. Register Call Summary for Register L4_AP_REGION_I_L

L4 interconnects

- [L4 Firewall Address and Protection Register Settings: \[0\]](#)
- [Operational Modes Configuration: \[1\]](#)
- [L4 Address Protection \(L4 AP\) Register Summary: \[2\]](#)

Table 14-487. L4_AP_REGION_I_H

| | | | |
|-------------------------|--|--------------|-------------------------|
| Address Offset | 0x304 + (0x08*I) | Index | I = 0 to 99 for CORE_AP |
| Physical address | 0x4800 0304 + (0x08*I) 0x4A00 0304 + (0x08*I) | | |
| Description | Define the size, protection group and segment ID of the region | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------------|----|----|----|----------|---------------|----|----|----|----------|---------------------|----|----|----|----------|---------------|---|---|---|---|---|---|---|----------|------|--|--|--|--|--|--|--|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | |
| RESERVED | | | | | | | | SEGMENT_ID | | | | RESERVED | PROT_GROUP_ID | | | | RESERVED | BYTE_DATA_WIDTH_EXP | | | | RESERVED | PHY_TARGET_ID | | | | | | | | RESERVED | SIZE | | | | | | | | ENABLE |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|---|
| 31:28 | RESERVED | Read returns 0. | R | 0x0 |
| 27:24 | SEGMENT_ID | The segment associated to the region | R | See Table 14-489 and Table 14-490 . |
| 23 | RESERVED | Read returns 0. | R | 0 |
| 22:20 | PROT_GROUP_ID | The protection group associated to the region | RW | See Table 14-489 and Table 14-490 . |
| 19 | RESERVED | Read returns 0. | R | 0x0 |
| 18:17 | BYTE_DATA_WIDTH_EXP | The target data byte width is 2 ^(BYTE_DATA_WIDTH_EXP) bytes | R | See Table 14-489 and Table 14-490 . |
| 16:15 | RESERVED | Read returns 0. | R | 0x0 |
| 14:8 | PHY_TARGET_ID | Physical target ID | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|---|
| 7 | RESERVED | Read returns 0. | R | 0x0 |
| 6:1 | SIZE | Define the size of the region in bytes. 2 ^{SIZE} equals the region | R | See Table 14-489 and Table 14-490 . |
| 0 | ENABLE | 0x0: Disable the region, no access allowed 0x1: Enable the region, with access as define in registers | R | 0x1 |

Table 14-488. Register Call Summary for Register L4_AP_REGION_I_H

L4 interconnects

- [Protection Group: \[0\]](#)
- [L4 Firewall Address and Protection Register Settings: \[1\]](#)
- [L4 Address Protection \(L4 AP\) Register Summary: \[2\]](#)

Table 14-489. L4_AP_REGION_I Reset Value for L4_PER

| Region | MADDRSPACE | SEGMENT_ID | PROT_GROUP_ID | BYTE_DATA_WIDTH_EXP | SIZE | BASE |
|--------|------------|------------|---------------|---------------------|------|----------|
| 0 | 0x0 | 0x0 | 0x0 | 0x2 | 0x0B | 0x000000 |
| 1 | 0x1 | 0x0 | 0x7 | 0x2 | 0x0B | 0x000800 |
| 2 | 0x5 | 0x0 | 0x7 | 0x2 | 0x0C | 0x001000 |
| 3 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x020000 |
| 4 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x021000 |
| 5 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x032000 |
| 6 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x033000 |
| 7 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x034000 |
| 8 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x035000 |
| 9 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x036000 |
| 10 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x037000 |
| 11 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x03E000 |
| 12 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x03F000 |
| 13 | 0x0 | 0x0 | 0x2 | 0x2 | 0x10 | 0x040000 |
| 14 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x050000 |
| 15 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x055000 |
| 16 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x056000 |
| 17 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x057000 |
| 18 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x058000 |
| 19 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x059000 |
| 20 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x05A000 |
| 21 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x05B000 |
| 22 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x05C000 |
| 23 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x05D000 |
| 24 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x05E000 |
| 25 | 0x0 | 0x0 | 0x7 | 0x1 | 0x0C | 0x060000 |
| 26 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x06A000 |
| 27 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x06B000 |
| 28 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x06C000 |
| 29 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x06D000 |
| 30 | 0x1 | 0x0 | 0x7 | 0x2 | 0x0C | 0x06E000 |
| 31 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x06F000 |
| 32 | 0x0 | 0x0 | 0x7 | 0x1 | 0x0C | 0x070000 |
| 33 | 0x0 | 0x0 | 0x7 | 0x1 | 0x0C | 0x071000 |

Table 14-489. L4_AP_REGION_I Reset Value for L4_PER (continued)

| Region | MADDRSPACE | SEGMENT_ID | PROT_GROUP_ID | BYTE_DATA_WIDTH_EXP | SIZE | BASE |
|--------|------------|------------|---------------|---------------------|------|----------|
| 34 | 0x0 | 0x0 | 0x7 | 0x1 | 0x0C | 0x072000 |
| 35 | 0x0 | 0x0 | 0x7 | 0x1 | 0x0C | 0x073000 |
| 36 | 0x0 | 0x0 | 0x7 | 0x1 | 0x0C | 0x061000 |
| 37 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x074000 |
| 38 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x075000 |
| 39 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x076000 |
| 40 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x077000 |
| 41 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x078000 |
| 42 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x079000 |
| 43 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x086000 |
| 44 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x087000 |
| 45 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x088000 |
| 46 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x089000 |
| 47 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x096000 |
| 48 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x097000 |
| 49 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x098000 |
| 50 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x099000 |
| 51 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x09A000 |
| 52 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x09B000 |
| 53 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x09C000 |
| 54 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x09D000 |
| 55 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x09E000 |
| 56 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x09F000 |
| 57 | 0x0 | 0x0 | 0x1 | 0x2 | 0x0C | 0x0A0000 |
| 58 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0A1000 |
| 59 | 0x0 | 0x0 | 0x1 | 0x2 | 0x0C | 0x0A2000 |
| 60 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0A3000 |
| 61 | 0x0 | 0x0 | 0x1 | 0x2 | 0x0D | 0x0A8000 |
| 62 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0AA000 |
| 63 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0AD000 |
| 64 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0AE000 |
| 65 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0B2000 |
| 66 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0B3000 |
| 67 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0B4000 |
| 68 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0B5000 |
| 69 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0B8000 |
| 70 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0B9000 |
| 71 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0BA000 |
| 72 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0BB000 |
| 73 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x151000 |
| 74 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0D2000 |
| 75 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0D5000 |
| 76 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0D6000 |
| 77 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x150000 |
| 78 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x151000 |
| 79 | 0x0 | 0x0 | 0x7 | 0x1 | 0x0C | 0x0A2000 |
| 80 | 0x0 | 0x0 | 0x7 | 0x1 | 0x0C | 0x0A3000 |

Table 14-489. L4_AP_REGION_I Reset Value for L4_PER (continued)

| Region | MADDRSPACE | SEGMENT_ID | PROT_GROUP_ID | BYTE_DATA_WIDTH_EXP | SIZE | BASE |
|--------|------------|------------|---------------|---------------------|------|----------|
| 81 | 0x2 | 0x0 | 0x7 | 0x2 | 0x0A | 0x001400 |
| 82 | 0x3 | 0x0 | 0x7 | 0x2 | 0x0A | 0x001800 |
| 83 | 0x4 | 0x0 | 0x7 | 0x2 | 0x0A | 0x001C00 |
| 84 | 0x1 | 0x0 | 0x1 | 0x2 | 0x0C | 0x0A5000 |

Table 14-490. L4_AP_REGION_I Reset Value for L4_CFG

| Region | MADDRSPACE | SEGMENT_ID | PROT_GROUP_ID | BYTE_DATA_WIDTH_EXP | SIZE | BASE |
|--------|------------|------------|---------------|---------------------|------|---------|
| 0 | 0x0 | 0x0 | 0x0 | 0x2 | 0x0B | 0x00000 |
| 1 | 0x1 | 0x0 | 0x7 | 0x2 | 0x0B | 0x00800 |
| 2 | 0x5 | 0x0 | 0x7 | 0x2 | 0x0C | 0x01000 |
| 3 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x02000 |
| 4 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x03000 |
| 5 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x04000 |
| 6 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x05000 |
| 7 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x56000 |
| 8 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x57000 |
| 9 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x5C000 |
| 10 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0E | 0x58000 |
| 11 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x62000 |
| 12 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x63000 |
| 13 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x59000 |
| 14 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x5A000 |
| 15 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0E | 0x5B000 |
| 16 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x5C000 |
| 17 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0E | 0x5D000 |
| 18 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x5E000 |
| 19 | 0x0 | 0x1 | 0x5 | 0x2 | 0x0C | 0x60000 |
| 20 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x61000 |
| 21 | 0x0 | 0x2 | 0x7 | 0x2 | 0x0C | 0x00000 |
| 22 | 0x0 | 0x2 | 0x7 | 0x2 | 0x0C | 0x01000 |
| 23 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x08000 |
| 24 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0A000 |
| 25 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x66000 |
| 26 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x67000 |
| 27 | 0x0 | 0x1 | 0x1 | 0x2 | 0x0C | 0x74000 |
| 28 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x75000 |
| 29 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x76000 |
| 30 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x77000 |
| 31 | 0x0 | 0x4 | 0x1 | 0x2 | 0x0C | 0x1E000 |
| 32 | 0x0 | 0x4 | 0x7 | 0x2 | 0x0C | 0x1F000 |
| 33 | 0x0 | 0x4 | 0x1 | 0x2 | 0x0C | 0x6C000 |
| 34 | 0x0 | 0x4 | 0x7 | 0x2 | 0x0C | 0x0B000 |
| 35 | 0x0 | 0x4 | 0x1 | 0x2 | 0x0C | 0x04000 |
| 36 | 0x0 | 0x4 | 0x7 | 0x2 | 0x0C | 0x05000 |
| 37 | 0x0 | 0x4 | 0x1 | 0x2 | 0x0C | 0x06000 |

Table 14-490. L4_AP_REGION_I Reset Value for L4_CFG (continued)

| Region | MADDRSPACE | SEGMENT_ID | PROT_GROUP_ID | BYTE_DATA_WIDT H_EXP | SIZE | BASE |
|--------|------------|------------|---------------|-------------------------|------|---------|
| 38 | 0x0 | 0x4 | 0x7 | 0x2 | 0x0C | 0x07000 |
| 39 | 0x1 | 0x4 | 0x1 | 0x2 | 0x0D | 0x12000 |
| 40 | 0x2 | 0x1 | 0x7 | 0x2 | 0x0C | 0x13000 |
| 41 | 0x0 | 0x0 | 0x1 | 0x2 | 0x0D | 0x0C000 |
| 42 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x0D000 |
| 43 | 0x0 | 0x0 | 0x1 | 0x2 | 0x0C | 0x10000 |
| 44 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x11000 |
| 45 | 0x0 | 0x1 | 0x1 | 0x2 | 0x0C | 0x16000 |
| 46 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x17000 |
| 47 | 0x0 | 0x1 | 0x1 | 0x2 | 0x0C | 0x14000 |
| 48 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x15000 |
| 49 | 0x0 | 0x4 | 0x1 | 0x2 | 0x0C | 0x18000 |
| 50 | 0x0 | 0x4 | 0x7 | 0x2 | 0x0C | 0x19000 |
| 51 | 0x0 | 0x4 | 0x1 | 0x2 | 0x0C | 0x20000 |
| 52 | 0x0 | 0x4 | 0x7 | 0x2 | 0x0C | 0x21000 |
| 53 | 0x0 | 0x4 | 0x1 | 0x2 | 0x0C | 0x26000 |
| 54 | 0x0 | 0x4 | 0x7 | 0x2 | 0x0C | 0x27000 |
| 55 | 0x0 | 0x4 | 0x1 | 0x2 | 0x0C | 0x28000 |
| 56 | 0x0 | 0x4 | 0x7 | 0x2 | 0x0C | 0x29000 |
| 57 | 0x0 | 0x4 | 0x1 | 0x2 | 0x0C | 0x2A000 |
| 58 | 0x0 | 0x4 | 0x7 | 0x2 | 0x0C | 0x1D000 |
| 59 | 0x0 | 0x4 | 0x1 | 0x2 | 0x0C | 0x1C000 |
| 60 | 0x0 | 0x4 | 0x7 | 0x2 | 0x0C | 0x1D000 |
| 61 | 0x0 | 0x2 | 0x1 | 0x2 | 0x0C | 0x02000 |
| 62 | 0x0 | 0x2 | 0x7 | 0x2 | 0x0C | 0x03000 |
| 63 | 0x0 | 0x2 | 0x1 | 0x2 | 0x0C | 0x08000 |
| 64 | 0x0 | 0x2 | 0x7 | 0x2 | 0x0C | 0x09000 |
| 65 | 0x0 | 0x2 | 0x1 | 0x2 | 0x0C | 0x0A000 |
| 66 | 0x0 | 0x2 | 0x7 | 0x2 | 0x0C | 0x0B000 |
| 67 | 0x0 | 0x6 | 0x1 | 0x2 | 0x11 | 0x00000 |
| 68 | 0x0 | 0x6 | 0x7 | 0x2 | 0x0C | 0x40000 |
| 69 | 0x0 | 0x1 | 0x1 | 0x2 | 0x0C | 0x36000 |
| 70 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x37000 |
| 71 | 0x1 | 0x6 | 0x1 | 0x2 | 0x0E | 0x20000 |
| 72 | 0x2 | 0x6 | 0x2 | 0x2 | 0x0D | 0x24000 |
| 73 | 0x3 | 0x6 | 0x1 | 0x2 | 0x0C | 0x26000 |
| 74 | 0x4 | 0x6 | 0x7 | 0x2 | 0x0C | 0x27000 |
| 75 | 0x5 | 0x6 | 0x1 | 0x2 | 0x0C | 0x27000 |
| 76 | 0x6 | 0x4 | 0x4 | 0x2 | 0x0C | 0x29000 |
| 77 | 0x9 | 0x4 | 0x1 | 0x2 | 0x10 | 0x30000 |
| 78 | 0x0 | 0x4 | 0x7 | 0x2 | 0x0C | 0x4D000 |
| 79 | 0x0 | 0x2 | 0x7 | 0x2 | 0x0C | 0x4E000 |
| 80 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0D | 0x5E000 |
| 81 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x60000 |
| 82 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x29000 |
| 83 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x2A000 |
| 84 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x2B000 |

Table 14-490. L4_AP_REGION_I Reset Value for L4_CFG (continued)

| Region | MADDRSPACE | SEGMENT_ID | PROT_GROUP_ID | BYTE_DATA_WIDT H_EXP | SIZE | BASE |
|--------|------------|------------|---------------|-------------------------|------|---------|
| 85 | 0x0 | 0x1 | 0x7 | 0x2 | 0x0C | 0x2C000 |
| 86 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x64000 |
| 87 | 0x0 | 0x0 | 0x7 | 0x2 | 0x0C | 0x65000 |
| 88 | 0x0 | 0x2 | 0x7 | 0x2 | 0x0C | 0x2D000 |
| 89 | 0x0 | 0x4 | 0x1 | 0x2 | 0x0C | 0x2E000 |
| 90 | 0x7 | 0x6 | 0x7 | 0x2 | 0x0D | 0x2A000 |
| 91 | 0x8 | 0x6 | 0x1 | 0x2 | 0x0E | 0x2C000 |

Chip-to-Chip Interface (C2C)

This chapter describes the C2C interconnection of the device.

| Topic | Page |
|--|------|
| 15.1 C2C Overview | 2972 |
| 15.2 C2C Integration | 2974 |
| 15.3 C2C Power, Reset, and Clock Management | 2975 |
| 15.4 C2C L3 Interconnect | 3001 |
| 15.5 C2C SSCM | 3006 |
| 15.6 Intersystem Communication Register Module | 3008 |
| 15.7 C2C Register Manual | 3016 |

15.1 C2C Overview

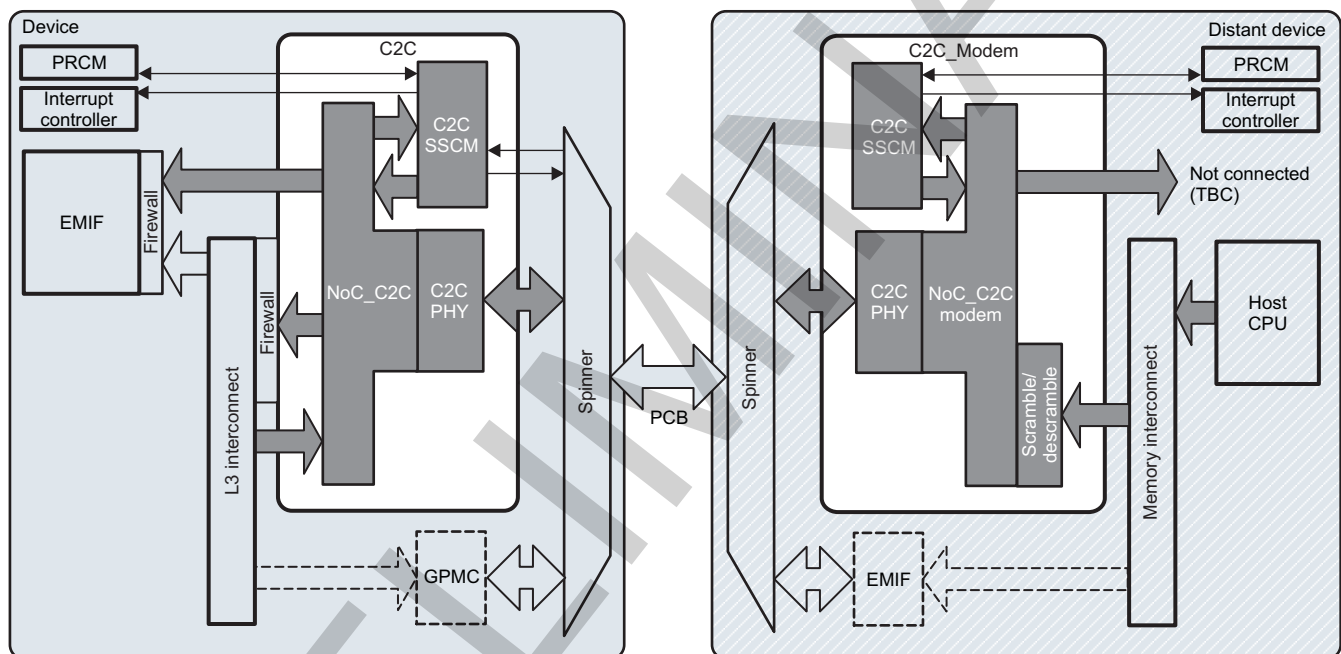
The chip-to-chip (C2C) is a serial, low-latency, peer-to-peer communication protocol that enables the extension of an internal protocol bus to one physical device over a printed circuit board (PCB). The C2C accomplishes this function by serializing local bus transactions in one device. The serialized transactions are transferred between devices through C2C ports, and the remote bus transactions are deserialized.

The C2C includes three main functional submodules:

- The Arteris® interconnect (NoC_C2C_Device), including the interface ports and the C2C port
- The physical interface (PHY_C2C_Device)
- The subsystem control module (SSCM), which supports the clock division during operating performance point (OPP) changes, wake-up and sleep sequences, and sideband signal protocol encapsulation

Figure 15-1 shows an example of the C2C implementation mirror mode.

Figure 15-1. C2C Implementation Mirror Mode Example



c2c-001

The C2C includes the following general features:

- Low-pin-count interface
- Scalability up to 16 inputs/16 outputs (The device supports up to 8 inputs/16 outputs or 16 inputs/8 outputs only.)
- No mandatory 3-state signals
- All signals driven using source synchronous clocking (two dual data rate [DDR] clock signals per direction for TX and RX paths)
- Supports two PHY voltages: 1.2 and 1.8 V
- Supports symmetric (peer-to-peer) and asymmetric (host/peripheral) communication operations
- Protocol support of in-band flow control
- No extra pins needed
- All request packets, response packets, and flow control information multiplexed and sent across the same physical pins
- Supports multiple outstanding transaction reads, writes, and interrupts
- Supports mirror mode to enable self-test with identical device

- Provides signals for system power management

PRELIMINARY

15.2 C2C Integration

This section describes module integration in the device, including information about clocks, resets, and hardware requests.

Table 15-1 through Table 15-3 summarize the integration of the module in the device.

Table 15-1. Integration Attributes

| Module Instance | Attributes |
|-----------------|--------------|
| | Power Domain |
| C2C | PD_CORE |

Table 15-2. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|------------------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| C2C | C2C_L3_ICLK | C2C_L3_ICLK | PRCM | L3 interconnect clock enable |
| C2C | C2C_L3X2_ICLK | C2C_L3X2_ICLK | PRCM | Functional clock |
| Resets | | | | |
| C2C | C2C_RST | CORE_RST | PRCM | Global warm |

Table 15-3. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-----------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| C2C | C2C_SSCM_IRQ0 | MA_IRQ_27 | Cortex™-A9 INTC | Interrupt request to the Cortex-A9 interrupt controller (INTC) |
| | C2C_SSCM_IRQ1 | MA_IRQ_88 | Cortex-A9 INTC | Interrupt request to the Cortex-A9 INTC |
| | C2C_SSCM_IRQ0 | MM_IRQ_46 | Cortex™-M3 INTC | Interrupt request to the Cortex-M3 INTC |
| | C2C_SSCM_IRQ1 | MM_IRQ_47 | Cortex-M3 INTC | Interrupt request to the Cortex-M3 INTC |
| | C2C_SSCM_IRQ0 | D_IRQ_85 | DSP INTC | Interrupt request to the digital signal processor (DSP) INTC |
| | C2C_SSCM_IRQ1 | D_IRQ_86 | DSP INTC | Interrupt request to the DSP INTC |
| DMA Requests | | | | |
| C2C | C2C_SSCM_GPO_0 | S_DMA_20 | sDMA | Destination is system DMA (sDMA) |
| | C2C_SSCM_GPO_1 | S_DMA_21 | sDMA | Destination is sDMA |
| | C2C_SSCM_GPO_2 | S_DMA_67 | sDMA | Destination is sDMA |
| | C2C_SSCM_GPO_3 | S_DMA_68 | sDMA | Destination is sDMA |

NOTE: The gpio_wk0 device pad can be used as a C2C pre-wakeup pin. The purpose of this pin is to start the APE wakeup before C2C is ready on the distant device to trigger the c2c_wakereqin pad. The signal from the C2C pre-wakeup pin goes only to the PRCM module, not to the C2C module.

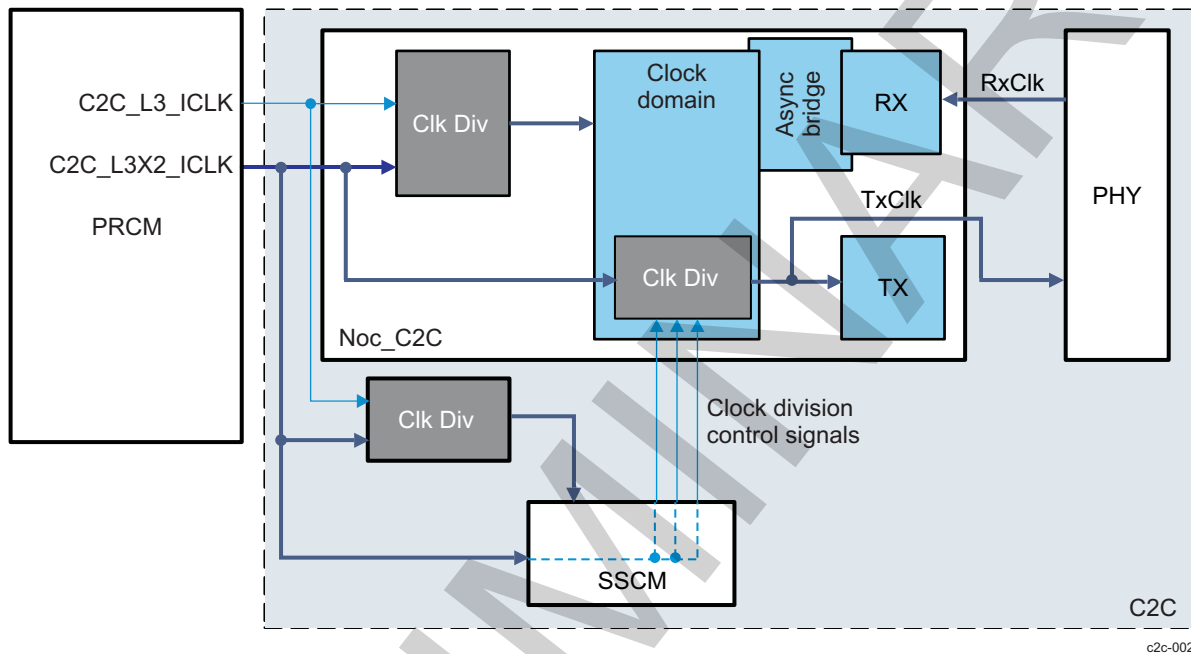
15.3 C2C Power, Reset, and Clock Management

15.3.1 PRCM Overview

The power, reset, and clock management (PRCM) module provides device-level clock, reset, and power control for other modules, as well as clock and reset signals to the C2C.

Figure 15-2 shows the C2C mode-specific overview of the PRCM.

Figure 15-2. PRCM Overview



15.3.2 Reset Manager Functional Description

15.3.2.1 Reset Sources

This section describes the reset sources triggering the reset managers in the power and reset manager (PRM).

15.3.2.1.1 Global Reset Sources

Table 15-4 lists the global reset sources of the device. The global reset source signals received by the reset manager trigger the reset of all device modules. For all hardware reset signals, the source of the reset is identified; for the software reset signals, the reset triggering bit is identified.

Table 15-4. Global Reset Sources

| Type | Name | Source/Control | Description |
|----------|--------------|----------------|----------------------------|
| Hardware | C2C_WARM_RST | C2C module | Global hardware warm reset |

15.3.2.2 Reset Domains

A power domain can receive power-on reset (PWRON_RST) and/or normal reset (RST) signals. These signals reset nonretention logic and behave as follows:

- RST and PWRON_RST are asserted on any global or local cold reset.
- Only RST is asserted on any global or local warm reset.

A power domain can receive two additional retention logic reset signals: power-on retention reset (PWRON_RET_RST) and/or retention reset (RET_RST). These signals behave as follows:

- RET_RST and PWRON_RET_RST are asserted on any global cold reset or wakeup from OFF state to ON-ACTIVE state.
- Only RET_RST is asserted on any global warm reset.
- These signals are not asserted on wakeup from RETENTION state.

This section presents the trigger sources and attributes for all reset domains of the device. See [Section 15.3.2.1, Reset Sources](#), for an explanation of each reset trigger source for the device.

[Table 15-5](#) identifies the associated power and reset domains for each module.

Table 15-5. C2C Power and Reset Domain Association

| Module | Power Domain | Reset Domains |
|--------|--------------|------------------------------|
| C2C | PD_CORE | CORE_RET_RST, CORE_RST |
| C2C_FW | PD_CORE | CORE_PWRON_RET_RST, CORE_RST |

[Table 15-6](#) lists the reset sources that trigger the reset domains of the device.

Table 15-6. Reset Sources For the Reset Domains

| Reset Domain | Reset Source | Reset Source Type |
|----------------|-----------------------|-------------------|
| AUDIO_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | | |
| ALWON_CM1_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | | |
| ALWON_CORE_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | | |
| ALWON_IVA_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | | |

Table 15-6. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|---------------|-----------------------|-------------------|
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| ALWON_MPU_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| CAM_RST | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| CM2_RET_RST | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| CORE_RET_RST | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |

Table 15-6. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|------------------|-----------------------|-------------------|
| CORE_RST | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| DLL_RST | DLL_FREQCHANGE_RST | Local warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| DSS_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| DSS_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| CORTEXM3_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |

Table 15-6. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|---------------|--------------------------|-------------------|
| | RM_CORTEXM3_RSTCTRL_RST3 | Local warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| CORTEXM3_RST1 | CORTEXM3_ICECRUSHER1_RST | Local warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_CORTEXM3_RSTCTRL_RST1 | Local warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | | |
| | | |
| CORTEXM3_RST2 | CORTEXM3_ICECRUSHER2_RST | Local warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_CORTEXM3_RSTCTRL_RST2 | Local warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | | |
| | | |
| CORTEXM3_RST3 | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_CORTEXM3_RSTCTRL_RST3 | Local warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | | |
| | | |
| | | |
| EMU_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |

Table 15-6. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|----------------|-----------------------|-------------------|
| SGX_RST | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| IVAHD_RST | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_IVAHD_RSTCTRL_RST3 | Local warm |
| IVAHD_SEQ1_RST | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | IVAHD_ICECRUSHER1_RST | Local warm |
| IVAHD_SEQ2_RST | CORTEXA9_WDT_RST | Global warm |
| | RM_IVAHD_RSTCTRL_RST1 | Local warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| IVAHD_SEQ2_RST | ICEPICKPOR_RST | Global cold |
| | IVAHD_ICECRUSHER2_RST | Local warm |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_IVAHD_RSTCTRL_RST2 | Local warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | | |

Table 15-6. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|-----------------|-------------------------|-------------------|
| L3_INIT_RET_RST | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| L3_INIT_RST | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| L4_PER_RET_RST | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| L4_PER_RST | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| CORTEXA9_RST | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | CORTEXA9_ICECRUSHER_RST | Local warm |

Table 15-6. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|--------------|-----------------------|-------------------|
| | CORTEXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| SDMA_RET_RST | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | SDMA_RESTORE_RST | Local warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| DSP_RST | CORTEXA9_WDT_RST | Global warm |
| | RM_DSP_RSTCTRL_RST1 | Local warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | DSP_EMU_RESET_REQ_TR | Local warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_DSP_RSTCTRL_RST2 | Local warm |
| DSP_RET_RST | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_DSP_RSTCTRL_RST2 | Local warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| DSP_SYS_RST | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTEXA9_WDT_RST | Global warm |
| | RM_DSP_RSTCTRL_RST2 | Local warm |
| | SYS_PWRON_RST | Global cold |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |

Table 15-6. Reset Sources For the Reset Domains (continued)

| Reset Domain | Reset Source | Reset Source Type |
|--------------|-----------------------|-------------------|
| WKUP_RST | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |
| | GLOBAL_COLD_SW_RST | Global cold |
| | GLOBAL_WARM_SW_RST | Global warm |
| | ICEPICKPOR_RST | Global cold |
| | CORTXA9_WDT_RST | Global warm |
| | SYS_PWRON_RST | Global cold |
| | SYS_WARMIN_RST | Global warm |
| | VDD_CORE_VOLT_MGR_RST | Global warm |
| | VDD_IVA_VOLT_MGR_RST | Global warm |
| | VDD_MPU_VOLT_MGR_RST | Global warm |
| | C2C_WARM_RST | Global warm |

15.3.3 Clock Manager Functional Description

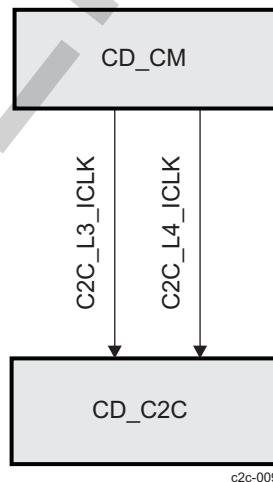
15.3.3.1 CD_C2C Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits, and their dependencies on other device clock domains.

15.3.3.1.1 Overview

Figure 15-3 shows an overview of the clock domain.

Figure 15-3. CD_C2C Overview



15.3.3.1.2 Clock Domain Modes

Table 15-7 lists the clock domain modes supported by the clock domain.

Table 15-7. CD_C2C Clock Domain Modes

| NO_SLEEP | SW_SLEEP | SW_WKUP | HW_AUTO |
|-----------|---------------|-----------|-----------|
| Available | Not available | Available | Available |

Table 15-8 lists the clock domain state transition control and status bits for the clock in this clock domain.

Table 15-8. CD_C2C Control and Status Parameters

| Parameter Name | Control/Status Bit Field |
|---------------------------------------|---|
| C2C_L3_ICLK clock status | CM_C2C_CLKSTCTRL[8] CLKACTIVITY_L3_C2C_ICLK |
| C2C_L4_ICLK clock status | CM_C2C_CLKSTCTRL[9] CLKACTIVITY_L4_C2C_ICLK |
| Clock domain state transition control | CM_C2C_CLKSTCTRL[1:0] CLKTRCTRL |

15.3.3.1.3 Clock Domain Dependency

CD_C2C has no module wake-up dependency on any other device clock domains.

15.3.3.1.3.1 Static Dependency

Table 15-9 lists the static dependency of the clock domain on other device clock domains.

Table 15-9. CD_C2C Static Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|------------------------------------|-------------|
| CD_ABE | Disabled | CM_C2C_STATICDEP[3] ABE_STATDEP | Read/write |
| CD_IVAHD | Disabled | CM_C2C_STATICDEP[2] IVAHD_STATDEP | Read/write |
| CD_L3_1 | Disabled | CM_C2C_STATICDEP[5] L3_1_STATDEP | Read/write |
| CD_L3_2 | Disabled | CM_C2C_STATICDEP[6] L3_2_STATDEP | Read/write |
| CD_L3_INIT | Disabled | CM_C2C_STATICDEP[7] L3INIT_STATDEP | Read/write |
| CD_L4_CFG | Disabled | CM_C2C_STATICDEP[12] L4CFG_STATDEP | Read/write |
| CD_L4_PER | Disabled | CM_C2C_STATICDEP[13] L4PER_STATDEP | Read/write |
| CD_EMIF | Enabled | CM_C2C_STATICDEP[4] MEMIF_STATDEP | Read/write |

15.3.3.1.3.2 Dynamic Dependency

Table 15-10 lists the dynamic dependency of the clock domain on other device clock domains.

Table 15-10. CD_C2C Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|-----------------------------------|-------------|
| CD_L3_2 | Always enabled | CM_C2C_DYNAMICDEP[6] L3_2_DYNDEP | Read only |
| CD_EMIF | Always enabled | CM_C2C_DYNAMICDEP[4] MEMIF_DYNDEP | Read only |

15.3.3.1.4 Clock Domain Module Attributes

Table 15-11 lists the clocks received by each module of the clock domain and their role (that is, as a functional or interface clock).

Table 15-11. CD_C2C Module Clocks Association

| Module | Clock | Clock Type |
|--------|-------------|------------|
| C2C | C2C_L3_ICLK | Interface |
| C2C_FW | C2C_L3_ICLK | Interface |
| | C2C_L4_ICLK | Interface |

Table 15-12 lists the supported wake-up request generation capability for each module of the clock domain.

Table 15-12. CD_C2C Module Wake-Up Request

| Module | Wake-Up Feature |
|--------|------------------------|
| C2C | Master wake-up request |
| C2C_FW | None |

Table 15-13 lists the supported clock management modes and associated software control bit fields for each module of the power domain.

Table 15-13. CD_C2C Module Clock Management Modes and Control

| Module | Clock Mgmt. Protocol | Status Bit Field | Role |
|--------|----------------------|--------------------------------------|----------------|
| C2C | Master/slave | CM_C2C_C2C_CLKCTRL[18] STBYST | Standby status |
| | | CM_C2C_C2C_CLKCTRL[17:16] IDLEST | Idle status |
| C2C_FW | Slave | CM_C2C_C2C_FW_CLKCTRL [17:16] IDLEST | Idle status |

Table 15-14 lists the supported clock management modes and associated software control bit fields for each module of the power domain.

Table 15-14. CD_C2C Modules Slave Clock Management Modes and Control

| Module | Disabled | Auto | Enabled | Control Bit Field | Access Type |
|--------|----------|-----------|---------|---------------------------------------|-------------|
| C2C | N/A | Available | N/A | CM_C2C_C2C_CLKCTRL[1:0] MODULEMODE | Read only |
| C2C_FW | N/A | Available | N/A | CM_C2C_C2C_FW_CLKCTRL[1:0] MODULEMODE | Read only |

15.3.3.2 CD_CORTEXA9 Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits, and their dependencies on other device clock domains.

15.3.3.2.1 Clock Domain Dependency

CD_CORTEXA9 has no module wake-up dependency on any other device clock domain.

15.3.3.2.1.1 Static Dependency

Table 15-15 lists the static dependency of the clock domain on other device clock domains.

Table 15-15. CD_CORTEXA9 Static Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|----------------------------------|-------------|
| CD_C2C | Always disabled | CM_MPU_STATICDEP[18] C2C_STATDEP | Read only |

15.3.3.3 CD_L4_CFG Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits, and their dependencies on other device clock domains.

15.3.3.3.1 Clock Domain Dependency

CD_L4_CFG has no static or module wake-up dependency on any other device clock domain.

15.3.3.3.1.1 Dynamic Dependency

Table 15-16 lists the dynamic dependency of the clock domain on other device clock domains.

Table 15-16. CD_L4_CFG Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|------------------------------------|-------------|
| CD_C2C | Always enabled | CM_L4CFG_DYNAMICDEP[18] C2C_DYNDEP | Read only |

15.3.3.4 CD_L3_2 Clock Domain

This section identifies the modes supported by the clock domain, the associated control and status bits, and their dependencies on other device clock domains.

15.3.3.4.1 Clock Domain Dependency

CD_L3_2 has no static or module wake-up dependency on any other device clock domain.

15.3.3.4.1.1 Dynamic Dependency

Table 15-17 identifies the dynamic dependency of the clock domain on other device clock domains.

Table 15-17. CD_L3_2 Dynamic Dependency Association Parameters

| Clock Domain Name | Default Setting | Control Bit Field | Access Type |
|-------------------|-----------------|-----------------------------------|-------------|
| CD_C2C | Always enabled | CM_L3_2_DYNAMICDEP[18] C2C_DYNDEP | Read only |

15.3.4 Power Management Functional Description

The section highlights the functional concepts of power-domain-level power management in the device.

The PD_CORE power domain supports the DPS with switching times of less than 5 μ s.

15.3.4.1 PD_CORE Description

PD_CORE contains the following clock domains:

- CD_C2C
- CD_DMA
- CD_CORTEXM3
- CD_EMIF
- CD_L3_1
- CD_L3_2
- CD_L3_INSTR
- CD_L4_CFG

Table 15-18 lists the logic retention capability for each module of the power domain.

Table 15-18. PD_CORE C2C Power Attributes

| Module | Logic Retention | DFF Context Status | RFF Context Status |
|--------|-----------------|---|---|
| C2C | Partial | RM_C2C_C2C_CONTEXT[0] LOSTCONTEXT_DFF | RM_C2C_C2C_CONTEXT[1] LOSTCONTEXT_RFF |
| C2C_FW | Partial | RM_C2C_C2C_FW_CONTEXT[0] LOSTCONTEXT_DFF | RM_C2C_C2C_FW_CONTEXT[1] LOSTCONTEXT_RFF |

15.3.5 PRCM Register Manual

15.3.5.1 PRM Instance Summary

Table 15-19 lists the PRCM registers and their addresses and sizes.

Table 15-19. PRM Instance Summary

| Module Name | L4 Base Address | Size |
|---------------------|-----------------|-----------|
| INTRCONN_SOCKET_PRM | 0x4A30 6000 | 256 bytes |
| CKGEN_PRM | 0x4A30 6100 | 256 bytes |
| MPU_PRM | 0x4A30 6300 | 256 bytes |
| DSP_PRM | 0x4A30 6400 | 256 bytes |
| ABE_PRM | 0x4A30 6500 | 256 bytes |
| ALWAYS_ON_PRM | 0x4A30 6600 | 256 bytes |
| CORE_PRM | 0x4A30 6700 | 2K bytes |
| IWAHD_PRM | 0x4A30 6F00 | 256 bytes |
| CAM_PRM | 0x4A30 7000 | 256 bytes |
| DSS_PRM | 0x4A30 7100 | 256 bytes |
| SGX_PRM | 0x4A30 7200 | 256 bytes |
| L3INIT_PRM | 0x4A30 7300 | 256 bytes |
| L4PER_PRM | 0x4A30 7400 | 512 bytes |
| WKUP_PRM | 0x4A30 7700 | 256 bytes |
| WKUP_CM | 0x4A30 7800 | 256 bytes |
| EMU_PRM | 0x4A30 7900 | 256 bytes |
| EMU_CM | 0x4A30 7A00 | 256 bytes |
| DEVICE_PRM | 0x4A30 7B00 | 256 bytes |
| INSTR_PRM | 0x4A30 7F00 | 256 bytes |

15.3.5.2 CORE_PRM Registers

15.3.5.2.1 CORE_PRM Register Summary

Table 15-20 summarizes the CORE_PRM registers.

Table 15-20. CORE_PRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CORE_PRM L4 Base Address |
|---------------------------------------|------|-----------------------|----------------|--------------------------|
| RM_C2C_C2C_CONTEXT | RW | 32 | 0x0000 0524 | 0x4A30 6C24 |
| RM_C2C_C2C_FW_CONTEXT | RW | 32 | 0x0000 0534 | 0x4A30 6C34 |

15.3.5.2.2 CORE_PRM Register Description

Table 15-21 through Table 15-23 describe the individual CORE_PRM registers in detail.

Table 15-21. RM_C2C_C2C_CONTEXT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0524 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 6C24 | | | | | | | | | | | | | | | | InstanceCORE_PRM | | | | | | | | | | | | | | | |
| Description | This register contains dedicated C2C context statuses. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|--|-----------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | | LOSTCONTEXT_DFF | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specifies whether RFF-based context has been lost due to a previous power transition or other reset source (set upon assertion of CORE_RST signal) 0x0: Context has been maintained. 0x1: Context has been lost. | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specifies whether DFF-based context has been lost due to a previous power transition or other reset source (set upon assertion of CORE_RST signal) 0x0: Context has been maintained. 0x1: Context has been lost. | RW W1toClr | 1 |

Table 15-22. Register Call Summary for Register RM_C2C_C2C_CONTEXT

C2C Power, Reset, and Clock Management

- [PD_CORE Description: \[0\] \[1\]](#)
- [CORE_PRM Registers: \[2\]](#)

Table 15-23. RM_C2C_C2C_FW_CONTEXT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0534 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 6C34 | | | | | | | | | | | | | | | | InstanceCORE_PRM | | | | | | | | | | | | | | | |
| Description | This register contains dedicated C2C_FW context statuses. [warm reset insensitive] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|--|-----------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOSTCONTEXT_RFF | | LOSTCONTEXT_DFF | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|---------------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | LOSTCONTEXT_RFF | Specifies whether RFF-based context has been lost due to a previous power transition or other reset source (set upon assertion of CORE_RET_RST signal) 0x0: Context has been maintained. 0x1: Context has been lost. | RW W1toClr | 1 |
| 0 | LOSTCONTEXT_DFF | Specifies whether DFF-based context has been lost due to a previous power transition or other reset source (set upon assertion of CORE_RST signal) 0x0: Context has been maintained. 0x1: Context has been lost. | RW W1toClr | 1 |

Table 15-24. Register Call Summary for Register RM_C2C_C2C_FW_CONTEXT

C2C Power, Reset, and Clock Management

- [PD_CORE Description: \[0\] \[1\]](#)
- [CORE_PRM Registers: \[2\]](#)

15.3.5.3 CORE_CM2 Registers

15.3.5.3.1 CORE_CM2 Register Summary

[Table 15-36](#) summarizes the CORE_CM2 registers.

Table 15-25. CORE_CM2 Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CORE_CM2 L4 Base Address |
|---------------------------------------|------|-----------------------|----------------|--------------------------|
| CM_C2C_CLKSTCTRL | RW | 32 | 0x0000 0500 | 0x4A00 8C00 |
| CM_C2C_STATICDEP | RW | 32 | 0x0000 0504 | 0x4A00 8C04 |
| CM_C2C_DYNAMICDEP | RW | 32 | 0x0000 0508 | 0x4A00 8C08 |
| CM_C2C_C2C_CLKCTRL | R | 32 | 0x0000 0520 | 0x4A00 8C20 |
| CM_C2C_C2C_FW_CLKCTRL | R | 32 | 0x0000 0530 | 0x4A00 8C30 |
| CM_L4CFG_DYNAMICDEP | RW | 32 | 0x0000 0608 | 0x4A00 8D08 |

15.3.5.3.2 CORE_CM2 Register Description

[Table 15-26](#) through [Table 15-36](#) describe the individual CORE_CM2 registers in detail.

Table 15-26. CM_C2C_CLKSTCTRL

| | | | |
|------------------|--|----------|----------|
| Address Offset | 0x0000 0500 | Instance | CORE_CM2 |
| Physical Address | See Table 15-25 . | | |
| Description | This register enables the domain power state transition. It controls the hardware-supervised domain power state transition between On-Active and On-Inactive states. It also holds 1 status bit per clock input of the domain. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------------------|----|----|----|----|----|-------------------------|---|-------------------------|---|----------|---|---|---|---|---|--|-----------|--|
| RESERVED | | | | | | | | | | | | | | | | CCLKACTIVITY_L3X2_C2C_ICLK | | | | | | CLKACTIVITY_L4_C2C_ICLK | | CLKACTIVITY_L3_C2C_ICLK | | RESERVED | | | | | | | CLKTRCTRL | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|---|------|----------|
| 31:11 | RESERVED | | R | 0x000000 |
| 10 | CCLKACTIVITY_L3X2_C2C_ICLK | This field indicates the state of the L3X2_C2C_ICLK clock in the domain. [warm reset insensitive] Read 0x0: Corresponding clock is definitely gated. Read 0x1: Corresponding clock is running or gating/ungating transition is ongoing. | R | 0 |
| 9 | CLKACTIVITY_L4_C2C_ICLK | This field indicates the state of the L4_C2C_ICLK clock in the domain. [warm reset insensitive] Read 0x0: On-Inactive is definitely gated. Read 0x1: On-Inactive is running or gating/ungating transition is ongoing. | R | 0 |
| 8 | CLKACTIVITY_L3_C2C_ICLK | This field indicates the state of the L3_C2C_ICLK clock in the domain. [warm reset insensitive] Read 0x0: On-Inactive is definitely gated. Read 0x1: On-Inactive is running or gating/ungating transition is ongoing. | R | 0 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | CLKTRCTRL | Controls the clock state transition of the C2C clock domain. 0x0: NO_SLEEP: Sleep transition cannot be initiated. Wakeup transition may occur. Read 0x1: Reserved 0x2: SW_WKUP: Start a software forced wake-up transition on the domain. 0x3: HW_AUTO: Automatic transition is enabled. Sleep and wakeup transitions are based upon hardware conditions. | RW | 0x3 |

Table 15-27. Register Call Summary for Register CM_C2C_CLKSTCTRL

C2C Power, Reset, and Clock Management

- [CD_C2C Clock Domain: \[0\] \[1\] \[2\]](#)
- [CORE_CM2 Registers: \[3\]](#)

Table 15-28. CM_C2C_STATICDEP

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0504 | Instance | CORE_CM2 |
| Physical Address | See Table 15-25 . | | |
| Description | This register controls the static domain dependencies from C2C domain toward target domains. It is relevant only for a domain having system initiator(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----------|----|---|---|----------------|--------------|--------------|---------------|-------------|---------------|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | RESERVED | | | | L3INIT_STATDEP | L3_2_STATDEP | L3_1_STATDEP | MEMIF_STATDEP | ABE_STATDEP | IWAHD_STATDEP | RESERVED | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13 | L4PER_STATDEP | Static dependency toward L4_PER clock domain 0x0: Dependency is disabled. 0x1: Dependency is enabled. | RW | 0 |
| 12 | L4CFG_STATDEP | Static dependency toward L4_CFG clock domain 0x0: Dependency is disabled. 0x1: Dependency is enabled. | RW | 0 |
| 11:8 | RESERVED | | R | 0x0 |
| 7 | L3INIT_STATDEP | Static dependency toward L3_INIT clock domain 0x0: Dependency is disabled. 0x1: Dependency is enabled. | RW | 0 |
| 6 | L3_2_STATDEP | Static dependency toward L3_2 clock domain 0x0: Dependency is disabled. 0x1: Dependency is enabled. | RW | 0 |
| 5 | L3_1_STATDEP | Static dependency toward L3_1 clock domain 0x0: Dependency is disabled. 0x1: Dependency is enabled. | RW | 0 |
| 4 | MEMIF_STATDEP | Static dependency toward MEMIF clock domain 0x0: Dependency is disabled. 0x1: Dependency is enabled. | RW | 1 |
| 3 | ABE_STATDEP | Static dependency toward ABE clock domain 0x0: Dependency is disabled. 0x1: Dependency is enabled. | RW | 0 |
| 2 | IWAHD_STATDEP | Static dependency toward IWAHD clock domain 0x0: Dependency is disabled. 0x1: Dependency is enabled. | RW | 0 |
| 1:0 | RESERVED | | R | 0x0 |

Table 15-29. Register Call Summary for Register CM_C2C_STATICDEP

- C2C Power, Reset, and Clock Management
- [CD_C2C Clock Domain: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
 - [CORE_CM2 Registers: \[8\]](#)

Table 15-30. CM_C2C_DYNAMICDEP

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0508 | Instance | CORE_CM2 |
| Physical Address | See Table 15-25 . | | |
| Description | This register controls the dynamic domain dependencies from C2C domain toward target domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|----|----|----|----|-------------|----|----------|----|--------------|----|----------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | | | | | L3_2_DYNDEP | | RESERVED | | MEMIF_DYNDEP | | RESERVED | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|--------------|---------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor INTRCONN interface activity for determination of autosleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:7 | RESERVED | | R | 0x00000 |
| 6 | L3_2_DYNDEP | Dynamic dependency toward L3_2 clock domain Read 0x1: Dependency is enabled. | R returns 1s | 1 |
| 5 | RESERVED | | R | 0 |
| 4 | MEMIF_DYNDEP | Dynamic dependency toward MEMIF clock domain Read 0x1: Dependency is enabled. | R returns 1s | 1 |
| 3:0 | RESERVED | | R | 0x0 |

Table 15-31. Register Call Summary for Register CM_C2C_DYNAMICDEP

C2C Power, Reset, and Clock Management

- [CD_C2C Clock Domain: \[0\] \[1\]](#)
- [CORE_CM2 Registers: \[2\]](#)

Table 15-32. CM_C2C_C2C_CLKCTRL

| | | | |
|-------------------------|---------------------------------------|-----------------|----------|
| Address Offset | 0x0000 0520 | Instance | CORE_CM2 |
| Physical Address | See Table 15-25 . | | |
| Description | This register manages the C2C clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|--------|--------|----------|----|----|----|----|----|----|---|---|---|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | STBYST | IDLEST | RESERVED | | | | | | | | | | | | MODULEMODE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|--------------|--------|
| 31:19 | RESERVED | | R | 0x0000 |
| 18 | STBYST | C2C module standby status [warm reset insensitive] Read 0x0: Module is functional (not in standby). Read 0x1: Module is in standby. | R | 1 |
| 17:16 | IDLEST | C2C interface idle status [warm reset insensitive] Read 0x0: C2C interface is in functional state. Read 0x1: C2C interface is in a transitory state. Read 0x2: C2C interface is in Idle state. | R | 0x2 |
| 15:2 | RESERVED | | R | 0x0000 |
| 1:0 | MODULEMODE | Controls the way mandatory clocks are managed. Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition put module into idle. A wakeup domain transition put it back into function. If CLKTRCTRL = 3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Returns | 0x1 |

Table 15-33. Register Call Summary for Register CM_C2C_C2C_CLKCTRL

C2C Power, Reset, and Clock Management

- [CD_C2C Clock Domain: \[0\] \[1\] \[2\]](#)
- [CORE_CM2 Registers: \[3\]](#)

Table 15-34. CM_C2C_C2C_FW_CLKCTRL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 0530 | Instance | CORE_CM2 |
| Physical Address | See Table 15-25 . | | |
| Description | This register manages the C2C_FW clocks. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------|----|----------|----|----|----|----|----|----|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | IDLEST | | RESERVED | | | | | | | | MODULEMODE | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17:16 | IDLEST | Module idle status [warm reset insensitive] Read 0x0: Module is fully functional, including INTRCONN. Read 0x1: Module is performing transition: wakeup, or sleep, or sleep abortion. Read 0x2: Module is in Idle mode (only INTRCONN part). It is functional if using separate functional clock. Read 0x3: Module is disabled and cannot be accessed. | R | 0x3 |
| 15:2 | RESERVED | | R | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 1:0 | MODULEMODE | Controls the way mandatory clocks are managed Read 0x1: Module is managed automatically by hardware according to clock domain transition. A clock domain sleep transition puts module into idle. A wakeup domain transition puts it back into function. If CLKTRCTRL = 3, any INTRCONN access to module is always granted. Module clocks may be gated according to the clock domain state. | R Rreturns | 0x1 |

Table 15-35. Register Call Summary for Register CM_C2C_C2C_FW_CLKCTRL

C2C Power, Reset, and Clock Management

- [CD_C2C Clock Domain: \[0\] \[1\]](#)
- [CORE_CM2 Registers: \[2\]](#)

Table 15-36. CM_L4CFG_DYNAMICDEP

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0608 | Instance | CORE_CM2 |
| Physical Address | See Table 15-25 . | | |
| Description | This register controls the dynamic domain dependancies from L4_CFG domain toward target domains. It is relevant only for domain having INTRCONN master port(s). | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|------------|----|----|----|----------|----|----|----|------------|----|----------|------------------|---------------|----------|----|----|----|-------------|----------|------------|------------|----------------|-------------|-------------|--------------|----------|------------|----------|
| RESERVED | | | | WINDOWSIZE | | | | RESERVED | | | | C2C_DYNDEP | | RESERVED | ALWONCORE_DYNDEP | L4WKUP_DYNDEP | RESERVED | | | | SDMA_DYNDEP | RESERVED | CAM_DYNDEP | DSS_DYNDEP | L3_INIT_DYNDEP | L3_2_DYNDEP | L3_1_DYNDEP | MEMIF_DYNDEP | RESERVED | DSP_DYNDEP | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|---------------------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:24 | WINDOWSIZE | Size of sliding window used to monitor INTRCONN interface activity for determination of autosleep feature. Time unit defined by CM_DYN_DEP_PRESCAL register. | RW | 0x4 |
| 23:19 | RESERVED | | R | 0x00 |
| 18 | C2C_DYNDEP | Dynamic dependency toward C2C clock domain Read 0x1: Dependency is enabled. | R Rreturns 1s | 1 |
| 17 | RESERVED | | R | 1 |
| 16 | ALWONCORE_DYNDEP | Dynamic dependency toward ALWONCORE clock domain Read 0x1: Dependency is enabled. | R Rreturns 1s | 1 |
| 15 | L4WKUP_DYNDEP | Dynamic dependency toward L4_WKUP clock domain Read 0x1: Dependency is enabled. | R Rreturns 1s | 1 |
| 14:12 | RESERVED | | R | 0x0 |
| 11 | SDMA_DYNDEP | Dynamic dependency toward sDMA clock domain Read 0x1: Dependency is enabled. | R Rreturns 1s | 1 |
| 10 | RESERVED | | R | 0 |
| 9 | CAM_DYNDEP | Dynamic dependency toward ISS clock domain Read 0x0: Dependency is disabled. | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|---------------------|-------|
| 8 | DSS_DYNDEP | Dynamic dependency toward DSS clock domain Read 0x1: Dependency is enabled. | R Rreturns 1s | 1 |
| 7 | L3_INIT_DYNDEP | Dynamic dependency toward L3_INIT clock domain Read 0x1: Dependency is enabled. | R Rreturns 1s | 1 |
| 6 | L3_2_DYNDEP | Dynamic dependency toward L3_2 clock domain Read 0x1: Dependency is enabled. | R Rreturns 1s | 1 |
| 5 | L3_1_DYNDEP | Dynamic dependency toward L3_1 clock domain Read 0x1: Dependency is enabled. | R Rreturns 1s | 1 |
| 4 | MEMIF_DYNDEP | Dynamic dependency toward MEMIF clock domain Read 0x1: Dependency is enabled. | R Rreturns 1s | 1 |
| 3:2 | RESERVED | | R | 0x0 |
| 1 | DSP_DYNDEP | Dynamic dependency toward DSP clock domain Read 0x1: Dependency is enabled. | R Rreturns 1s | 1 |
| 0 | RESERVED | | R | 0 |

Table 15-37. Register Call Summary for Register CM_L4CFG_DYNAMICDEP

C2C Power, Reset, and Clock Management

- [CD_L4_CFG Clock Domain: \[0\]](#)
- [CORE_CM2 Registers: \[1\]](#)

15.3.5.4 SCRM Instance Summary

[Table 15-38](#) lists the register instances for the system clock and reset manager (SCRM).

Table 15-38. SCRM Instance Summary

| Module Name | L4 Base Address | Size |
|-------------|-----------------|-----------|
| SCRM | 0x4A30 A000 | 256 bytes |

15.3.5.5 SCRM Registers

15.3.5.5.1 SCRM Register Summary

[Table 15-39](#) summarizes the SCRM registers.

Table 15-39. SCRM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | SCRM L4 Base Address |
|---------------------------------------|------|-----------------------|----------------|----------------------|
| C2CCLKM | RW | 32 | 0x0000 011C | 0x4A30 A11C |
| C2CCLKREQ | RW | 32 | 0x0000 0234 | 0x4A30 A234 |
| C2CRSTCTRL | RW | 32 | 0x0000 041C | 0x4A30 A41C |
| EXTWARMRSTCTRL | RW | 32 | 0x0000 0500 | 0x4A30 A500 |
| APEWARMRSTCTRL | RW | 32 | 0x0000 0504 | 0x4A30 A504 |
| RESERVED | RW | 32 | 0x0000 0508 | 0x4A30 A508 |
| C2CWARMRSTCTRL | RW | 32 | 0x0000 050C | 0x4A30 A50C |
| C2CWARMRSTST_RE G | RW | 32 | 0x0000 051C | 0x4A30 A51C |

15.3.5.5.2 SCRM Register Description

Table 15-40 through Table 15-52 describe the individual SCRM registers in detail.

Table 15-40. C2CCLKM

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 011C | Instance | SCRM |
| Physical Address | 0x4A30 A11C | | |
| Description | This register controls the clocks of the external C2C interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|--------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | SYSCLK | CLK_32KHZ |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:2 | RESERVED | Reads return 0. | R | 0x0000 0000 |
| 1 | SYSCLK | This bit allows to enable and disable the system clock version of the external C2C interface. 0x0: The system clock version for the external C2C interface is disabled. 0x1: The system clock version for the external C2C interface is enabled. | RW | 0 |
| 0 | CLK_32KHZ | This bit allows to enable and disable the 32-kHz clock version of the external C2C interface. 0x0: The 32-kHz clock version for the external C2C interface is disabled. 0x1: The 32-kHz clock version for the external C2C interface is enabled. | RW | 0 |

Table 15-41. Register Call Summary for Register C2CCLKM

C2C Power, Reset, and Clock Management

- [SCRM Registers: \[0\]](#)

Table 15-42. C2CCLKREQ

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0234 | Instance | SCRM |
| Physical Address | 0x4A30 A234 | | |
| Description | This register holds qualifiers for the external C2C interface clock request. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|----------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ACCURACY | POLARITY |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | Reads return 0. | R | 0x0000 0000 |
| 1 | ACCURACY | This bit qualifies the external C2C interface clock request as an accurate clock request. 0x0: An active external C2C interface clock request does not generate an accurate clock request. 0x1: An active external C2C interface clock request generates an accurate clock request. | RW | 0 |
| 0 | POLARITY | This bit defines the active level of the external C2C interface clock request. 0x0: The external C2C interface clock request is active low. 0x1: The external C2C interface clock request is active high. | RW | 1 |

Table 15-43. Register Call Summary for Register C2CCLKREQ

C2C Power, Reset, and Clock Management

- [SCRM Registers: \[0\]](#)

Table 15-44. C2CRSTCTRL

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 041C | Instance | SCRM |
| Physical Address | 0x4A30 A41C | | |
| Description | This register controls the release of the external C2C interface reset lines. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---------|---|---------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | WARMRST | | COLDRST | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:2 | RESERVED | Reads return 0. | R | 0x0000 0000 |
| 1 | WARMRST | This bit allows to release the warm reset line of the external C2C interface. [warm reset sensitive] 0x0: Clearing this bit releases the warm reset line of the external C2C interface. 0x1: Writing this bit asserts the warm reset line of the external C2C interface. | RW | 1 |
| 0 | COLDRST | This bit allows to release the cold reset line of the external C2C interface. 0x0: Clearing this bit releases the cold reset line of the external C2C interface. 0x1: Writing this bit asserts the cold reset line of the external C2C interface. | RW | 1 |

Table 15-45. Register Call Summary for Register C2CRSTCTRL

C2C Power, Reset, and Clock Management

- [SCRM Registers: \[0\]](#)

Table 15-46. EXTWARMRSTCTRL

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0500 | | |
| Physical Address | 0x4A30 A500 | Instance | SCRM |
| Description | This register allows selection of the external warm reset source as a global warm reset for the platform. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WARM_SRC_SELECT |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------------|
| 31:1 | RESERVED | Reads return 0. | R | 0x0000 0000 |
| 0 | WARMSRCSELECT | <p>Selects the external warm reset source as a global warm reset</p> <p>0x0: The external warm reset source does not reset (warm) the other functions (APE, modem, and external C2C interface).</p> <p>0x1: The external warm reset source resets (warm) the other functions (APE, modem, and external C2C interface).</p> | RW | 1 |

Table 15-47. Register Call Summary for Register EXTWARMRSTCTRL

C2C Power, Reset, and Clock Management

- SCRM Registers: [0]

Table 15-48. APEWARMRSTCTRL

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0504 | | |
| Physical Address | 0x4A30 A504 | Instance | SCRM |
| Description | This register allows selection of the APE warm reset source as a global warm reset for the platform. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WARMSRCSELECT |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------------|
| 31:1 | RESERVED | Reads return 0. | R | 0x0000 0000 |
| 0 | WARMSRCSELECT | Select the APE warm reset source as a global warm reset. 0x0: The APE warm reset source does not reset (warm) the other functions (external peripherals, modem, and external C2C interface). 0x1: The APE warm reset source resets (warm) the other functions (external peripherals, modem, and external C2C interface). | RW | 1 |

Table 15-49. Register Call Summary for Register APEWARMRSTCTRL

C2C Power, Reset, and Clock Management

- [SCRM Registers: \[0\]](#)

Table 15-50. C2CWARMRSTCTRL

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 050C | Instance | SCRM |
| Physical Address | 0x4A30 A50C | | |
| Description | This register allows selection of the external C2C interface warm reset source as a global warm reset for the platform. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WARMSRCSELECT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------------|
| 31:1 | RESERVED | Reads return 0. | R | 0x0000 0000 |
| 0 | WARMSRCSELECT | Select the external C2C interface warm reset source as a global warm reset. 0x0: The external C2C interface warm reset source does not reset (warm) the other functions (external peripherals, APE, and modem). 0x1: The external C2C interface warm reset source resets (warm) the other functions (external peripherals, APE, and modem). | RW | 0 |

Table 15-51. Register Call Summary for Register C2CWARMRSTCTRL

C2C Power, Reset, and Clock Management

- [SCRM Registers: \[0\]](#)

Table 15-52. C2CWARMRSTST_REG

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 051C | Instance | SCRM |
| Physical Address | 0x4A30 A51C | | |
| Description | This register logs the source of warm reset on the external C2C interface. Each bit is set upon release of the external C2C interface warm reset and must be cleared by software. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | C2CWARMRSTST | | | | Reserved | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|---------------|------------|
| 31:4 | RESERVED | Reads return 0. | R | 0x00000000 |
| 3 | C2CWARMRSTST | This bit logs the C2C warm reset source. 0x0: No C2C warm reset occurred. 0x1: A C2C warm reset occurred. | RW W1toClr | 0 |
| 2 : 0 | Reserved | Read returns 0 | R | 0x0 |

Table 15-53. Register Call Summary for Register C2CWARMRSTST_REG

C2C Power, Reset, and Clock Management

- [SCRM Registers: \[0\]](#)

15.4 C2C L3 Interconnect

NOTE: The L3 interconnect is an instantiation of the Arteris interconnect from Arteris, Inc.

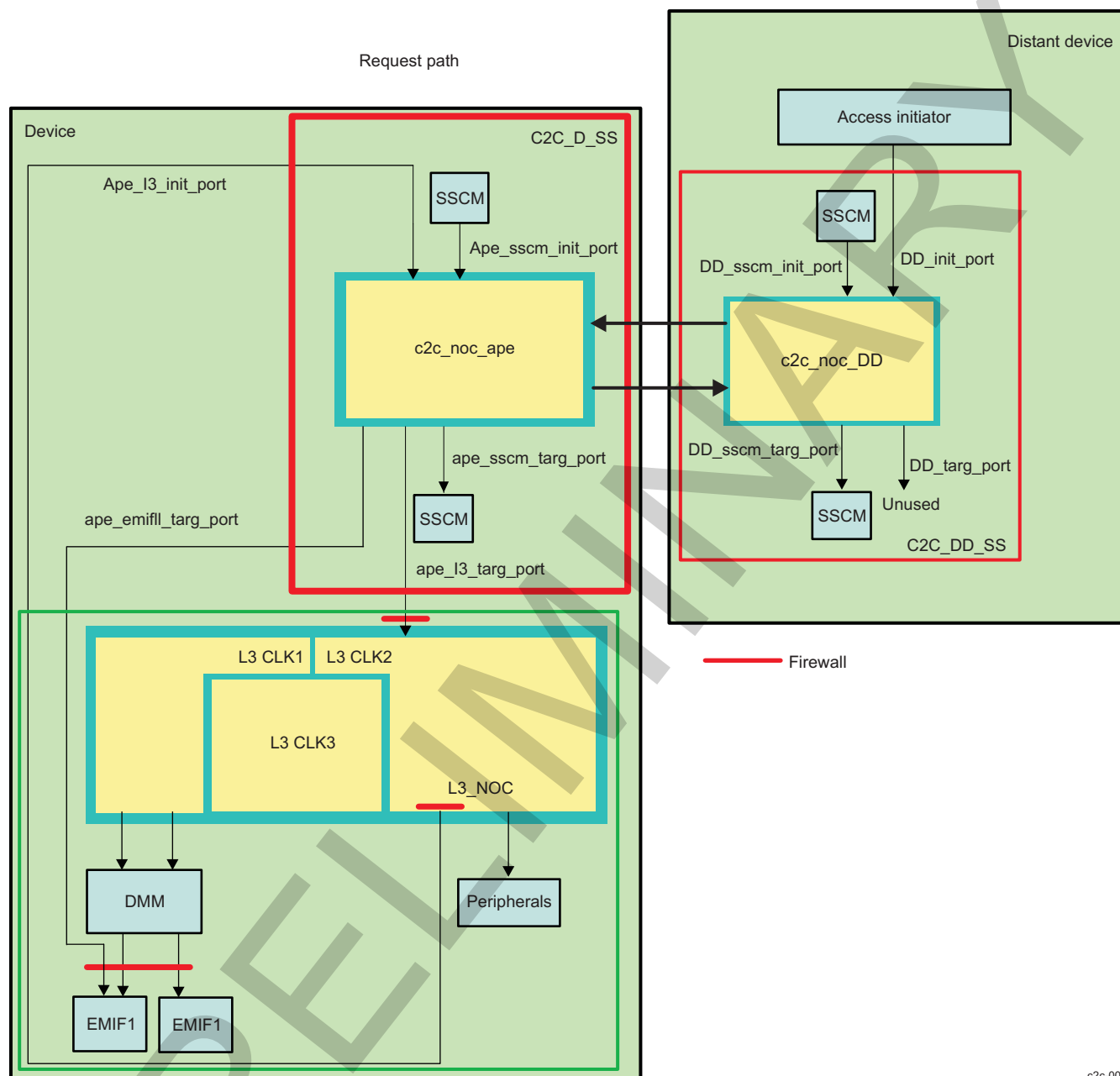
This document contains materials that are ©2003–2009 Arteris, Inc., and that constitute proprietary information of Arteris, Inc.

All materials and trademarks are used under license from Arteris, Inc. For additional information, see the Arteris reference manuals, or contact Arteris, Inc.

NoC is an abbreviation for network on chip.

15.4.1 C2C Interconnect Overview

[Figure 15-4](#) shows the L3 interconnect interface.

Figure 15-4. C2C L3 Interface

c2c-004

The C2C L3 interface includes the following main features:

- Network interface units (NIUs): Master NIUs for the initiator agents (IAs) and slave NIUs for the target agents (TAs)
- A partially depleted crossbar exchange network
- A special internal slave NIU to access L3 interconnect configuration registers
- True little-endian platform
- Transaction errors tracking and logging registers
- Provides all signaling support for the chip-level, power-management infrastructure

15.4.2 C2C Interconnect Integration

15.4.2.1 Clocking, Reset, and Power-Management Scheme

15.4.2.1.1 Clocks

Table 15-54 lists the C2C L3 interconnect clocks. For more information, see [Chapter 3, Power, Reset, and Clock Management](#).

Table 15-54. Clocks

| Module | Type | Name | Source | Description |
|--------|-----------|-------------|--------|--|
| C2C L3 | Interface | C2C_L3_ICLK | PRCM | Interface/functional clock for the C2C |

15.4.2.1.2 Resets

Table 15-55 lists the C2C L3 interconnect resets. For more information, see [Chapter 3, Power, Reset, and Clock Management](#).

Table 15-55. Resets

| Module | Name | Source | Description |
|--------|----------|--------|-------------------|
| C2C L3 | CORE_RST | PRCM | Global warm reset |

15.4.2.1.3 Power Management

The L3 interconnect ports belong to the CORE power domain. As part of the system-wide power-management scheme, the L3 ports go into IDLE state after receiving a request from the PRCM module and after all commands are serviced. For more information, see [Chapter 3, Power, Reset, and Clock Management](#).

15.4.3 C2C Interconnect Functional Description

15.4.3.1 Slave NIU Configuration

All external subsystem master NIUs can initiate transactions to the L3 applicative slave NIUs listed in [Table 15-56](#) through the C2C port link, as shown in [Table 15-56](#).

Table 15-56. C2C Connectivity

| Master NIUs | Slave NIUs | | | | |
|-------------|------------|---------------|------------------|------------------|------------------|
| | APE_L3_SN | APE_emifll_SN | APE_SSCM | DD_L3_SN | DD_SSCM |
| APE_L3_MN | | | 0 | 0 ⁽¹⁾ | 0 ⁽²⁾ |
| APE_SSCM_MN | | | | | 0 |
| DD_SSCM_MN | | | 0 | | |
| DD_L3_MN | 0 | 0 | 0 ⁽²⁾ | | 0 |

⁽¹⁾ This connection must be assessed according to system requirements on a case-by-case basis.

⁽²⁾ These connections are present only for debugging purposes.

[Table 15-57](#) lists the mapping of the C2C required information.

Table 15-57. C2C ReqInfo Mapping

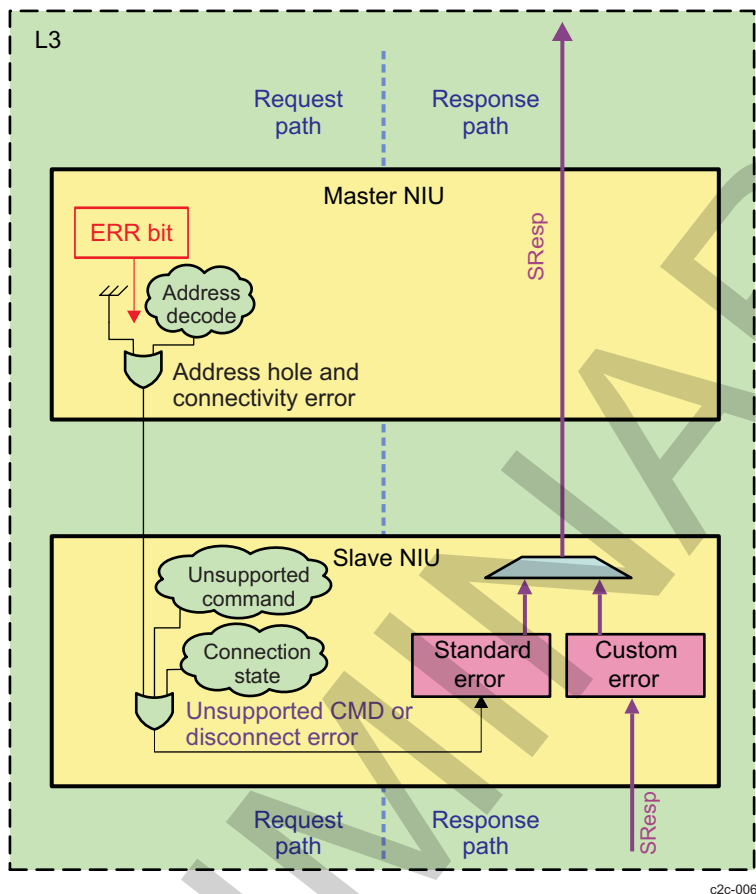
| | ReqInfo Name | MReqDebug | MReqType | MReqSupervisor |
|-----|--------------|-----------|----------|----------------|
| MNs | APE_L3 | x | 0 | x |
| | APE_SSCM | | | |
| | DD_L3 | x | 0 | x |
| SNs | APE_L3 | x | 0 | x |
| | APE_EMIF1 | x | 0 | x |
| | APE_SSCM | | | |
| | DD_SSCM | | | |
| | DD_MNs | x | 0 | x |

15.4.3.2 Global Error Routing Scheme

Error logging is not enabled on the C2C because it is already enabled in the L3 interconnect. The C2C L3 only reports in-band errors. For more information about L3 interconnect error logging, see [Section 14.2, L3 Interconnect](#).

[Figure 15-5](#) shows the C2C global error routing scheme.

Figure 15-5. C2C Global Error Routing Scheme

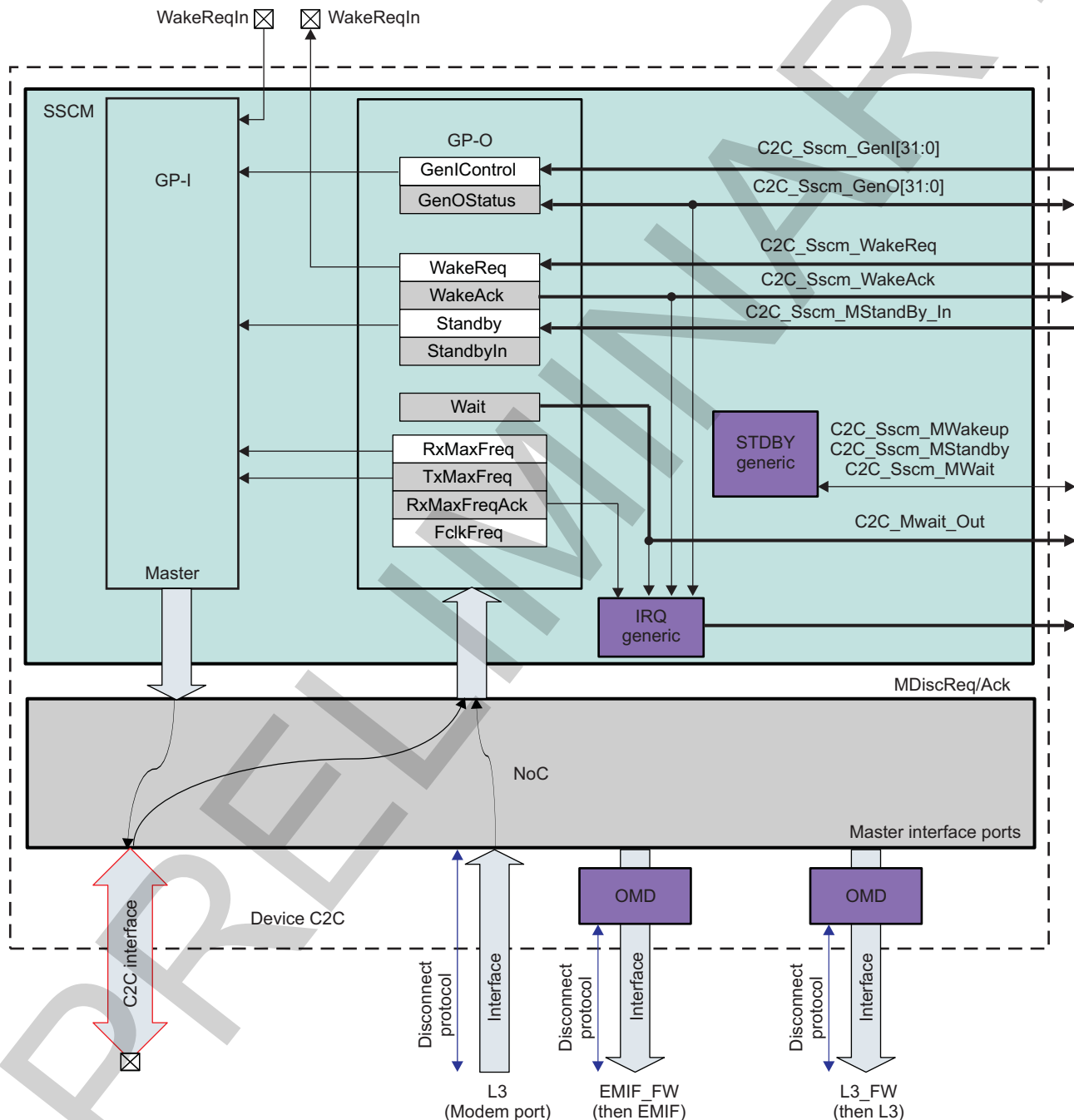


15.5 C2C SSCM

15.5.1 SSCM Overview

The SSCM supports clock division during OPP changes, the wake-up and sleep sequences, and interrupts signaling. Figure 15-7 shows the C2C SSCM block diagram.

Figure 15-6. C2C SSCM Block Diagram



c2c-003

The C2C SSCM supports:

- Different handshakes for local and distant OPP changes
- Sleep and wake-up sequences initiated locally or from a remote side

- TX clock automatic division
- Transport of general-purpose signals to and from distant C2C
- GPI and GPO submodules

15.5.2 SSCM Interrupts

15.5.2.1 SSCM GPI Interrupt Mapping

Table 15-58 lists the SSCM GPI interrupt mapping.

Table 15-58. SSCM GPI Interrupt Mapping

| C2C_SSCM_GPI | Source | Description |
|---------------------|----------------------------------|--|
| C2C_SSCM_GPI[0] | SYS_IRQ1n | External interrupt |
| C2C_SSCM_GPI[1] | MAIL_U3_C2C_IRQ | Device to DD mailbox interrupt |
| C2C_SSCM_GPI[2] | MODEM_ICR_IRQ | Distant (Modem) ICR Interrupt |
| C2C_SSCM_GPI[3] | UART1_IRQ | UART module 1 |
| C2C_SSCM_GPI[4] | UART2_IRQ | UART module 2 |
| C2C_SSCM_GPI[5] | UART3_IRQ | UART module 3 |
| C2C_SSCM_GPI[6] | GPT6_IRQ | General-purpose timer 6 |
| C2C_SSCM_GPI[7] | GPT7_IRQ | General-purpose timer 7 |
| C2C_SSCM_GPI[8] | GPT8_IRQ | General-purpose timer 8 |
| C2C_SSCM_GPI[9] | GPT9_IRQ | General-purpose timer 9 |
| C2C_SSCM_GPI[10] | GPIO1_MPU_IRQ | GPIO module 1 |
| C2C_SSCM_GPI[11] | GPIO2_MPU_IRQ | GPIO module 2 |
| C2C_SSCM_GPI[12] | GPIO3_MPU_IRQ | GPIO module 3 |
| C2C_SSCM_GPI[13] | GPIO4_MPU_IRQ | GPIO module 4 |
| C2C_SSCM_GPI[14] | HS_USB_MC_NINT | Module HS USB OTG |
| C2C_SSCM_GPI[15] | HS_USB_DMA_NINT | Module HS USB OTG DMA controller interrupt |
| C2C_SSCM_GPI[16] | FSUSB_IRQ | FS USB-HOST controller interrupt |
| C2C_SSCM_GPI[17] | FSUSB_SMI_IRQ | FS USB-HOST controller SMI |
| C2C_SSCM_GPI[18] | L3_APP_IRQ | Application errors on L3 |
| C2C_SSCM_GPI[19] | ONCHI_IRQ | HSUSB MP host interrupt |
| C2C_SSCM_GPI[20] | EHCI_IRQ | HSUSB MP host interrupt |
| C2C_SSCM_GPI[21] | TLL_IRQ | TLL interrupt |
| C2C_SSCM_GPI[22] | SYS_IRQ2n | External interrupt |
| C2C_SSCM_GPI[23:29] | Reserved | Reserved |
| C2C_SSCM_GPI[30] | Modem_shutdown_irqModem_wake_irq | PRCM Modem_shutdown_irq |
| C2C_SSCM_GPI[31] | Modem_wake_irq | PRCM Modem_wake_irq |

15.5.3 SSCM GPO

The interrupts described in [Section 15.1, C2C Overview](#), are active in GPO mode.

15.6 Intersystem Communication Register Module

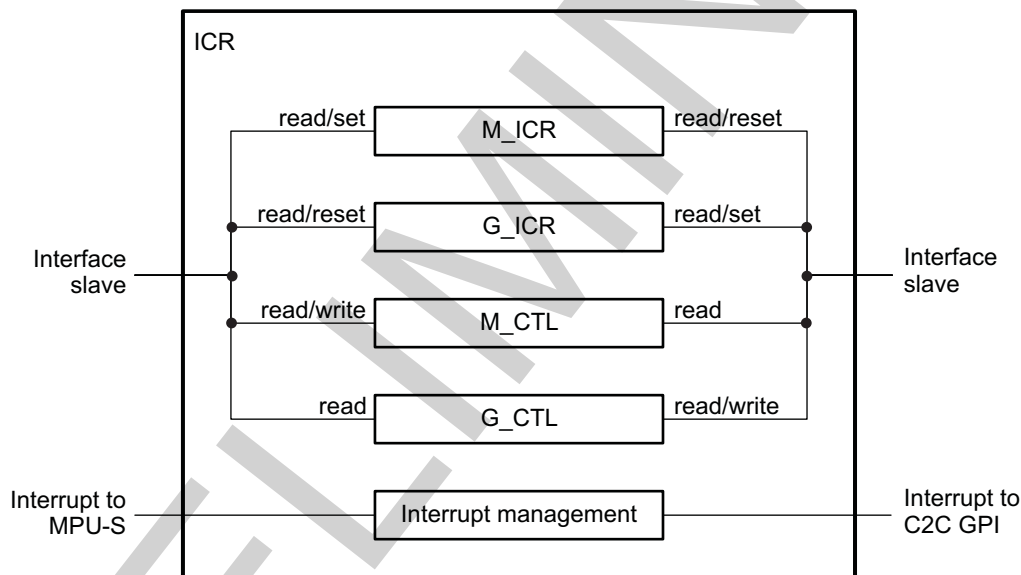
15.6.1 intersystem Communication Register Overview

The intersystem communication register (ICR) module synchronizes microprocessor unit (MPU) and modem activity, relying on flag mechanisms that are shared by both systems. Basically, the MPU sets a flag that is reset by the modem and vice versa. For a given direction, all flags are set by the source subsystem and are reset by the destination subsystem when it wants to. Each subsystem can read flags without resetting them. To avoid continuous polling on the ICRs, each subsystem can receive an interrupt when an operation that is related to it (set or reset) completes.

15.6.2 ICR Functional Description

The ICR is used when the device is connected to an external initiator device connected on the C2C port. Otherwise, the ICR is not used. The MPU and the external systems communicate with the help of two ICRs. One ICR (**G_ICR**) is used by the external system to inform the device MPU subsystem of an event and to send commands to the MPU-S. In the same way, the other ICR (**M_ICR**) is used by the device MPU subsystem to inform the external system of an event and to send commands to the MPU subsystem. The bits definition of the **G_ICR** and **M_ICR** registers are defined by software.

Figure 15-7. ICR Block Diagram



c2c-005

15.6.2.1 ICR Clocking Scheme

The ICR function operates from the L4-core interface clock.

15.6.2.2 Flag Management

Flags are used to notify the other subsystem of an event. Software determines the meaning of each flag. The following communication sequence from the MPU-S to the modem-S is typical:

- The MPU-S writes one or more flags in the **M_ICR** register.
- An interrupt is sent to the modem-S (if enabled).
- The modem-S reads the **M_ICR** register to check which flags are set.
- The modem-S resets one or more flags in the **M_ICR** register.
- An interrupt is sent to the MPU-S (if enabled).
- The MPU-S reads the **M_ICR** register to check which flags are reset.

15.6.2.3 Setting and Resetting a Flag

To set a flag, the MPU-S must set the desired bit of the **M_ICR** register to 1. Setting a bit of **M_ICR** to 0 does not change its content (that is, if previous value was 1, bit value remains 1 after the write access, [modem-S does the same thing with **G_ICR** register]).

To reset a flag, the MPU-S must set the desired bit of the **G_ICR** register to 1 (that is, if previous value of the bit was 1, then it becomes 0 else it remains 0, [modem-S does the same thing with **M_ICR** register]).

15.6.2.4 Interrupt Management

Interrupt behavior is the same on both sides (MPU and modem).

Two kinds of events can generate an interrupt to the MPU:

- The modem sets a flag in **G_ICR** register.
- The modem resets a flag in **M_ICR** register.

Interrupt generation is controlled by the **M_CTL** register.

Interrupt generation mechanism to the modem is exactly the same as on the MPU side:

- The MPU sets a flag in the **M_ICR** register.
- The MPU resets a flag in the **G_ICR** register.

Interrupt generation is controlled by the **G_CTL** register. To acknowledge an interrupt, the MPU must clear the **M_IRQ_STATUS** register by setting to 1 the bits that caused the interrupt. Acknowledgment on the modem side follows the same procedure with the **G_IRQ_STATUS** register.

15.6.3 ICR Register Manual

15.6.3.1 ICR Instance Summary

Table 15-59. C2C Instance Summary

| Module Name | Module Base Address | Size |
|-------------|---------------------|------|
| ICR_MPU | 0x4A0B 6000 | 4KB |
| ICR_MDM | 0x4A0C D000 | 4KB |

15.6.3.2.1 ICR Register Summary

Table 15-60 lists the mapping summary of the ICR registers.

Table 15-60. ICR Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ICR_MDM Base Address | ICR_MPU Base Address |
|---------------|------|-----------------------|----------------|----------------------|----------------------|
| ICR_REVISION | R | 32 | 0x0000 0000 | 0x4A0C D000 | 0x4A0B 6000 |
| SYS_CONFIG | RW | 32 | 0x0000 0010 | 0x4A0C D010 | 0x4A0B 6010 |
| SYS_STATUS | R | 32 | 0x0000 0014 | 0x4A0C D014 | 0x4A0B 6014 |
| M_IRQ_STATUS | RW | 32 | 0x0000 0018 | 0x4A0C D018 | 0x4A0B 6018 |
| G_IRQ_STATUS | RW | 32 | 0x0000 001C | 0x4A0C D01C | 0x4A0B 601C |
| M_ICR | RW | 32 | 0x0000 0020 | 0x4A0C D020 | 0x4A0B 6020 |
| G_ICR | RW | 32 | 0x0000 0024 | 0x4A0C D024 | 0x4A0B 6024 |
| M_CTL | R | 32 | 0x0000 0028 | 0x4A0C D028 | 0x4A0B 6028 |
| G_CTL | RW | 32 | 0x0000 002C | 0x4A0C D02C | 0x4A0B 602C |

15.6.3.2.2 ICR Register Description

Table 15-61 through Table 15-77 describe each ICR register.

Table 15-61. ICR_REVISION

| | | | |
|------------------|--|----------|--------------------|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4A0C D000 0x4A0B 6000 | Instance | ICR_MDM ICR_MPU |
| Description | This register contains the IP revision code. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP Revision | R | TI internal data |

Table 15-62. Register Call Summary for Register ICR_REVISION

- **ICR_MDM and ICR_MPU Registers:** [0]

Table 15-63. SYS CONFIG

| | | | |
|-------------------------|---|-----------------|--------------------|
| Address Offset | 0x0000 0010 | | |
| Physical Address | 0x4A0C D010 0x4A0B 6010 | Instance | ICR_MDM ICR_MPU |
| Description | This register allows controlling various parameters of the OCP interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|----------|-----------|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | IDLEMODE | | | | RESERVED | SOFTRESET | AUTOIDLE | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:5 | RESERVED | Read returns 0 | R | 0x00000000 |
| 4:3 | IDLEMODE | Slave interface power management, req/ack control 0x0: Force-idle 0x1: No-idle 0x3: Reserved 0x2: Smart-idle | RW | 0x0 |
| 2 | RESERVED | Read returns 0 | R | 0 |
| 1 | SOFTRESET | Software reset. Set this bit to 1 to trigger a module reset. The bit is automatically reset by the hardware. During reads, it always return 0. 0: Normal mode 1: The module is reset | RW | 0 |
| 0 | AUTOIDLE | Internal OCP clock gating 0: OCP clock is free running 1: Automatic OCP clock gating strategy is applied based on the OCP interface activity | RW | 0 |

Table 15-64. Register Call Summary for Register SYS_CONFIG

Intersystem Communication Register Module

- ICR_MDM and ICR_MPU Registers: [0]

Table 15-65. SYS_STATUS

| | | | |
|-------------------------|---|-----------------|--------------------|
| Address Offset | 0x0000 0014 | Instance | ICR_MDM ICR_MPU |
| Physical Address | 0x4A0C D014 0x4A0B 6014 | | |
| Description | This register provides status information about the module, excluding the interrupt status information. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESETDONE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | RESETDONE | Internal reset monitoring 0: Internal module reset ongoing 1: Reset completed Read 0x1: Reset completed Read 0x0: Internal module reset in ongoing | R | 0 |

Table 15-66. Register Call Summary for Register SYS_STATUS

Intersystem Communication Register Module

- [ICR_MDM and ICR_MPU Registers: \[0\]](#)

Table 15-67. M_IRQ_STATUS

| | | | |
|-------------------------|--|-----------------|--------------------|
| Address Offset | 0x0000 0018 | Instance | ICR_MDM ICR_MPU |
| Physical Address | 0x4A0C D018 0x4A0B 6018 | | |
| Description | The interrupt status register regroups all the status of the module internal events that can generate an interrupt - Write 1 to a given bit resets this bit. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|----------|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | FLAG_SET | FLAG_RESET |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | Reads returns 0 | R | 0x0000 0000 |
| 1 | FLAG_SET | Flag has been set in G_ICR register. Write 0x0: Received command (Rx path) status bit unchanged Write 0x1: Received command (Rx path) status bit is reset Read 0x1: Received command (Rx path) is true ("pending") Read 0x0: Received command (Rx path) false | RW | 0 |
| 0 | FLAG_RESET | Flag has been reset in M_ICR register. Write 0x0: Received command (Rx path) status bit unchanged Write 0x1: Received command (Rx path) status bit is reset Read 0x1: Received command (Rx path) is true ("pending") Read 0x0: Received command (Rx path) false | RW | 0 |

Table 15-68. Register Call Summary for Register M_IRQ_STATUS

Intersystem Communication Register Module

- [Interrupt Management: \[0\]](#)
- [ICR_MDM and ICR_MPU Registers: \[1\]](#)

Table 15-69. G_IRQ_STATUS

| | | | |
|-------------------------|--|-----------------|--------------------|
| Address Offset | 0x0000 001C | Instance | ICR_MDM ICR_MPU |
| Physical Address | 0x4A0C D01C 0x4A0B 601C | | |
| Description | The interrupt status register regroups all the status of the module internal events that can generate an interrupt - Write 1 to a given bit resets this bit. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|----------|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | FLAG_SET | FLAG_RESET |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------------|
| 31:2 | RESERVED | Reads returns 0 | R | 0x0000 0000 |
| 1 | FLAG_SET | Flag has been set in M_ICR register. Write 0x0: Received command (Rx path) status bit unchanged Write 0x1: Received command (Rx path) status bit is reset Read 0x1: Received command (Rx path) is true ("pending") Read 0x0: Received command (Rx path) false | RW W1toClr | 0 |
| 0 | FLAG_RESET | Flag has been reset in G_ICR register. Write 0x0: Received command (Rx path) status bit unchanged Write 0x1: Received command (Rx path) status bit is reset Read 0x1: Received command (Rx path) is true ("pending") Read 0x0: Received command (Rx path) false | RW W1toClr | 0 |

Table 15-70. Register Call Summary for Register G_IRQ_STATUS

Intersystem Communication Register Module

- [Interrupt Management: \[0\]](#)
- [ICR_MDM and ICR_MPU Registers: \[1\]](#)

Table 15-71. M_ICR

| | | | |
|-------------------------|---|-----------------|--------------------|
| Address Offset | 0x0000 0020 | Instance | ICR_MDM ICR_MPU |
| Physical Address | 0x4A0C D020 0x4A0B 6020 | | |
| Description | Flags are used to notify an event to the other subsystem. The meaning of each flag is software dependent. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FLAGS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------------|---------------|-------------|
| 31:0 | FLAGS | Meaning is software dependent. | RW W1toClr | 0x0000 0000 |

Table 15-72. Register Call Summary for Register M_ICR

Intersystem Communication Register Module

- [ICR Functional Description: \[0\] \[1\]](#)
- [Flag Management: \[2\] \[3\] \[4\] \[5\]](#)
- [Setting and Resetting a Flag: \[6\] \[7\] \[8\]](#)
- [Interrupt Management: \[9\] \[10\]](#)
- [ICR_MDM and ICR_MPU Registers: \[11\] \[12\] \[13\]](#)

Table 15-73. G_ICR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0024 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A0C D024 0x4A0B 6024 | | | | | | | | | | | | | | | | Instance ICR_MDM ICR_MPU | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Flags are used to notify an event to the other subsystem. The meaning of each flag is software dependent. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | |
| FLAGS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 15-74. Register Call Summary for Register G_ICR

Intersystem Communication Register Module

- [ICR Functional Description: \[0\] \[1\]](#)
- [Setting and Resetting a Flag: \[2\] \[3\]](#)
- [Interrupt Management: \[4\] \[5\]](#)
- [ICR_MDM and ICR_MPU Registers: \[6\] \[7\] \[8\]](#)

Table 15-75. M_CTL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0028 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A0C D028 0x4A0B 6028 | | | | | | | | | | | | | | | | Instance ICR_MDM ICR_MPU | | | | | | | | | | | | | | | |
| Description | Enables interrupts to subsystems. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | G_ICR_INTEN | M_ICR_INTEN |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | G_ICR_INTEN | Enable interrupt to MPU-S 0: No interrupt is generated 1: An interrupt is generated when Modem-S sets a flag to MPU-S | R | 0 |
| 0 | M_ICR_INTEN | Enable interrupt to MPU-S 0: No interrupt is generated 1: An interrupt is generated when Modem-S resets a flag set by MPU-S | R | 0 |

Table 15-76. Register Call Summary for Register M_CTL

Intersystem Communication Register Module

- [Interrupt Management: \[0\]](#)
- [ICR_MDM and ICR_MPU Registers: \[1\]](#)

Table 15-77. G_CTL

| | | | |
|-------------------------|-----------------------------------|-----------------|--------------------|
| Address Offset | 0x0000 002C | Instance | ICR_MDM ICR_MPU |
| Physical Address | 0x4A0C D02C 0x4A0B 602C | | |
| Description | Enables interrupts to subsystems. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|-------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | M_ICR_INTEN | | G_ICR_INTEN | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------------|
| 31:2 | RESERVED | | RW | 0x0000 0000 |
| 1 | M_ICR_INTEN | Enable interrupt to Modem-S 0: No interrupt is generated 1: An interrupt is generated when MPU-S sets a flag to Modem-S | RW | 0 |
| 0 | G_ICR_INTEN | Enable interrupt to Modem-S 0: No interrupt is generated 1: An interrupt is generated when MPU-S resets a flag set by Modem-S | RW | 0 |

Table 15-78. Register Call Summary for Register G_CTL

Intersystem Communication Register Module

- [Interrupt Management: \[0\]](#)
- [ICR_MDM and ICR_MPU Registers: \[1\]](#)

15.7 C2C Register Manual

15.7.1 C2C Instance Summary

Table 15-79. C2C Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|------|
| C2C | 0x5C000000 | 64MB |

15.7.2 C2C Registers

15.7.2.1 C2C Register Summary

Table 15-80 summarizes the C2C registers.

Table 15-80. C2C Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | C2C L3 Physical Address |
|-------------------------|------|-----------------------|----------------|-------------------------|
| C2C_REVISION | R | 32 | 0x0000 0000 | 0x5C000000 |
| C2C_SYSCONFIG | R | 32 | 0x0000 0004 | 0x5C000004 |
| C2C_SYSSTATUS | R | 32 | 0x0000 0008 | 0x5C000008 |
| C2C_PORTCONFIG | RW | 32 | 0x0000 000C | 0x5C00000C |
| C2C_MIRRORMODE | RW | 32 | 0x0000 0010 | 0x5C000010 |
| C2C_IRQ_RAW_STATUS_0 | RW | 32 | 0x0000 0014 | 0x5C000014 |
| C2C_IRQ_RAW_STATUS_1 | RW | 32 | 0x0000 0018 | 0x5C000018 |
| C2C_IRQ_ENABLE_STATUS_0 | RW | 32 | 0x0000 001C | 0x5C00001C |
| C2C_IRQ_ENABLE_STATUS_1 | RW | 32 | 0x0000 0020 | 0x5C000020 |
| C2C_IRQ_ENABLE_SET_0 | RW | 32 | 0x0000 0024 | 0x5C000024 |
| C2C_IRQ_ENABLE_SET_1 | RW | 32 | 0x0000 0028 | 0x5C000028 |
| C2C_IRQ_ENABLE_CLEAR_0 | RW | 32 | 0x0000 002C | 0x5C00002C |
| C2C_IRQ_ENABLE_CLEAR_1 | RW | 32 | 0x0000 0030 | 0x5C000030 |
| C2C_FCLK_FREQ | RW | 32 | 0x0000 0040 | 0x5C000040 |
| C2C_RX_MAX_FREQ | RW | 32 | 0x0000 0044 | 0x5C000044 |
| C2C_TX_MAX_FREQ | RW | 32 | 0x0000 0048 | 0x5C000048 |
| C2C_RX_MAX_FREQ_ACK | RW | 32 | 0x0000 004C | 0x5C00004C |
| C2C_WAKE_REQ | RW | 32 | 0x0000 0050 | 0x5C000050 |
| C2C_WAKE_ACK | RW | 32 | 0x0000 0054 | 0x5C000054 |
| C2C_STANDBY | RW | 32 | 0x0000 0060 | 0x5C000060 |
| C2C_STANDBY_IN | RW | 32 | 0x0000 0064 | 0x5C000064 |
| C2C_WAIT | RW | 32 | 0x0000 0068 | 0x5C000068 |
| C2C_GENI_CONTROL | RW | 32 | 0x0000 0070 | 0x5C000070 |
| C2C_GENI_MASK | RW | 32 | 0x0000 0074 | 0x5C000074 |
| C2C_GENO_STATUS | RW | 32 | 0x0000 0080 | 0x5C000080 |
| C2C_GENO_INTERRUPT | RW | 32 | 0x0000 0084 | 0x5C000084 |
| C2C_GENO_LEVEL | RW | 32 | 0x0000 0088 | 0x5C000088 |

15.7.2.2 C2C Register Description

Table 15-81 through Table 15-133 describe the individual C2C registers in detail.

Table 15-81. C2C_REVISION

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 0000 | Instance | C2C |
| Physical Address | 0x5C000000 | | |
| Description | IP Revision identifier (X.Y.R) Used by software to track features, bugs, and compatibility | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP Revision | R | TI internal data |

Table 15-82. Register Call Summary for Register C2C_REVISION

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-83. C2C_SYSCONFIG

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 0004 | Instance | C2C |
| Physical Address | 0x5C000004 | | |
| Description | System configuration register (not used) | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | RESERVED | Reserved | R | 0x0000 0000 |

Table 15-84. Register Call Summary for Register C2C_SYSCONFIG

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-85. C2C_SYSSTATUS

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0008 | Instance | C2C |
| Physical Address | 0x5C000008 | | |
| Description | Reserved | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | RESERVED | Reserved | R | 0x0000 0000 |

Table 15-86. Register Call Summary for Register C2C_SYSSTATUS

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-87. C2C_PORTCONFIG

| | | | |
|-------------------------|---|-----------------|-----|
| Address Offset | 0x0000 000C | Instance | C2C |
| Physical Address | 0x5C00000C | | |
| Description | This register defines the widths of the TX and RX buses on the C2C interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RX_WIDTH | | | | TX_WIDTH | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7:4 | RX_WIDTH | 0000: Bus width is set to 8 bits (default mode). 0001: Bus width is set to 10 bits (possible only if TX = 8). 0010: Bus width is set to 16 bits. Other values are reserved, and should not be used. | RW | 0x0 |
| 3:0 | TX_WIDTH | 0000: Bus width is set to 8 bits. 0001: Bus width is set to 10 bits (possible only if RX = 8). 0010: Bus width is set to 16 bits (default mode). Other values are reserved, and shall not be used. | RW | 0x2 |

Table 15-88. Register Call Summary for Register C2C_PORTCONFIG

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-89. C2C_MIRRORMODE

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 0010 | Instance | C2C |
| Physical Address | 0x5C000010 | | |
| Description | This register sets the C2C L3 in mirror mode. See debug section. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | MIRRORMODE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | MIRRORMODE | Mirror mode. 0x0: Functional default mode 0x1: Mirror mode for debug | RW | 0 |

Table 15-90. Register Call Summary for Register C2C_MIRRORMODE

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-91. C2C_IRQ_RAW_STATUS_0

| | | | |
|-------------------------|---|-----------------|-----|
| Address Offset | 0x0000 0014 | Instance | C2C |
| Physical Address | 0x5C000014 | | |
| Description | Interrupt status register (OCP-compliant IRQ line) for C2c_Sscm_Irq(0), regardless of enable settings | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|--------------|---|---------------------|---|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | WAIT_IRQ | | | WAKE_ACK_IRQ | | RX_MAX_FREQ_ACK_IRQ | | TX_FREQ_IRQ |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|---------------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | WAIT_IRQ | Reading 1 indicates WAIT value in WAIT register has been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0x0 |
| 2 | WAKE_ACK_IRQ | Reading 1 indicates WAKE_ACK value in the WAKE_ACK register has been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0x0 |
| 1 | RX_MAX_FREQ_ACK_IRQ | Reading 1 indicates GPI is not turned on OR RX_MAX_FREQ_ACK value in the RX_MAX_FREQ_ACK register equal RX_MAX_FREQ value in the RX_MAX_FREQ register. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0x0 |
| 0 | TX_FREQ_IRQ | Reading 1 indicates that the FCLK_FREQ value in the FCLK_FREQ register has been updated AND the SSCM has finished updating the new division for the TX clock. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0x0 |

Table 15-92. Register Call Summary for Register C2C_IRQ_RAW_STATUS_0

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-93. C2C_IRQ_RAW_STATUS_1

| | | | |
|-------------------------|--|-------------|---------------------|
| Address Offset | | 0x0000 0018 | |
| Physical Address | | 0x5C000018 | Instance C2C |
| Description | | | |
| Type | | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GENO_IRQ_31 | GENO_IRQ_30 | GENO_IRQ_29 | GENO_IRQ_28 | GENO_IRQ_27 | GENO_IRQ_26 | GENO_IRQ_25 | GENO_IRQ_24 | GENO_IRQ_23 | GENO_IRQ_22 | GENO_IRQ_21 | GENO_IRQ_20 | GENO_IRQ_19 | GENO_IRQ_18 | GENO_IRQ_17 | GENO_IRQ_16 | GENO_IRQ_15 | GENO_IRQ_14 | GENO_IRQ_13 | GENO_IRQ_12 | GENO_IRQ_11 | GENO_IRQ_10 | GENO_IRQ_9 | GENO_IRQ_8 | GENO_IRQ_7 | GENO_IRQ_6 | GENO_IRQ_5 | GENO_IRQ_4 | GENO_IRQ_3 | GENO_IRQ_2 | GENO_IRQ_1 | GENO_IRQ_0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|---------------|-------|
| 31 | GENO_IRQ_31 | Reading 1 indicates C2c_Sscm_GENO (31) signal and GENO_31 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 30 | GENO_IRQ_30 | Reading 1 indicates C2c_Sscm_GENO (30) signal and GENO_30 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 29 | GENO_IRQ_29 | Reading 1 indicates C2c_Sscm_GENO (29) signal and GENO_29 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 28 | GENO_IRQ_28 | Reading 1 indicates C2c_Sscm_GENO (28) signal and GENO_28 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 27 | GENO_IRQ_27 | Reading 1 indicates C2c_Sscm_GENO (27) signal and GENO_27 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 26 | GENO_IRQ_26 | Reading 1 indicates C2c_Sscm_GENO (26) signal and GENO_26 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 25 | GENO_IRQ_25 | Reading 1 indicates C2c_Sscm_GENO (25) signal and GENO_25 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 24 | GENO_IRQ_24 | Reading 1 indicates C2c_Sscm_GENO (24) signal and GENO_24 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|---------------|-------|
| 23 | GENO_IRQ_23 | Reading 1 indicates C2c_Sscm_GENO (23) signal and GENO_23 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 22 | GENO_IRQ_22 | Reading 1 indicates C2c_Sscm_GENO (22) signal and GENO_22 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 21 | GENO_IRQ_21 | Reading 1 indicates C2c_Sscm_GENO (21) signal and GENO_21 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 20 | GENO_IRQ_20 | Reading 1 indicates C2c_Sscm_GENO (20) signal and GENO_20 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 19 | GENO_IRQ_19 | Reading 1 indicates C2c_Sscm_GENO (19) signal and GENO_19 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 18 | GENO_IRQ_18 | Reading 1 indicates C2c_Sscm_GENO (18) signal and GENO_18 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 17 | GENO_IRQ_17 | Reading 1 indicates C2c_Sscm_GENO (17) signal and GENO_17 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 16 | GENO_IRQ_16 | Reading 1 indicates C2c_Sscm_GENO (16) signal and GENO_16 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 15 | GENO_IRQ_15 | Reading 1 indicates C2c_Sscm_GENO (15) signal and GENO_15 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 14 | GENO_IRQ_14 | Reading 1 indicates C2c_Sscm_GENO (14) signal and GENO_14 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 13 | GENO_IRQ_13 | Reading 1 indicates C2c_Sscm_GENO (13) signal and GENO_13 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|---------------|-------|
| 12 | GENO_IRQ_12 | Reading 1 indicates C2c_Sscm_GENO (12) signal and GENO_12 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 11 | GENO_IRQ_11 | Reading 1 indicates C2c_Sscm_GENO (11) signal and GENO_11 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 10 | GENO_IRQ_10 | Reading 1 indicates C2c_Sscm_GENO (10) signal and GENO_10 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 9 | GENO_IRQ_9 | Reading 1 indicates C2c_Sscm_GENO (9) signal and GENO_9 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 8 | GENO_IRQ_8 | Reading 1 indicates C2c_Sscm_GENO (8) signal and GENO_8 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 7 | GENO_IRQ_7 | Reading 1 indicates C2c_Sscm_GENO (7) signal and GENO_7 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 6 | GENO_IRQ_6 | Reading 1 indicates C2c_Sscm_GENO (6) signal and GENO_6 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 5 | GENO_IRQ_5 | Reading 1 indicates C2c_Sscm_GENO (5) signal and GENO_5 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 4 | GENO_IRQ_4 | Reading 1 indicates C2c_Sscm_GENO (4) signal and GENO_4 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 3 | GENO_IRQ_3 | Reading 1 indicates C2c_Sscm_GENO (3) signal and GENO_3 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 2 | GENO_IRQ_2 | Reading 1 indicates C2c_Sscm_GENO (2) signal and GENO_2 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 1 | GENO_IRQ_1 | Reading 1 indicates C2c_Sscm_GENO (1) signal and GENO_1 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 0 | GENO_IRQ_0 | Reading 1 indicates C2c_Sscm_GENO (0) signal and GENO_0 value in GENO_STATUS register have been modified by distant C2C. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |

Table 15-94. Register Call Summary for Register C2C_IRQ_RAW_STATUS_1

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-95. C2C_IRQ_ENABLE_STATUS_0

| | | | |
|------------------|-------------|----------|-----|
| Address Offset | 0x0000 001C | Instance | C2C |
| Physical Address | 0x5C00001C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------|--------------|---------------------|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | WAIT_IRQ | WAKE_ACK_IRQ | RX_MAX_FREQ_ACK_IRQ | TX_FREQ_IRQ |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|---------------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | WAIT_IRQ | Reading 1 indicates WAIT value in WAIT register has been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 2 | WAKE_ACK_IRQ | Reading 1 indicates WAKE_ACK value in the WAKE_ACK register has been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 1 | RX_MAX_FREQ_ACK_IRQ | Reading 1 indicates GPI is not turned on OR RX_MAX_FREQ_ACK value in the RX_MAX_FREQ_ACK register equal RX_MAX_FREQ value in the RX_MAX_FREQ register. | RW W1toClr | 0 |
| 0 | TX_FREQ_IRQ | Reading 1 indicates that the FCLK_FREQ value in the FCLK_FREQ register has been updated AND the SSCM has finished updating the new division for the Tx clock. | RW W1toClr | 0 |

Table 15-96. Register Call Summary for Register C2C_IRQ_ENABLE_STATUS_0

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-97. C2C_IRQ_ENABLE_STATUS_1

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0020 | Instance | C2C |
| Physical Address | 0x5C000020 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GENO_IRQ_31 | GENO_IRQ_30 | GENO_IRQ_29 | GENO_IRQ_28 | GENO_IRQ_27 | GENO_IRQ_26 | GENO_IRQ_25 | GENO_IRQ_24 | GENO_IRQ_23 | GENO_IRQ_22 | GENO_IRQ_21 | GENO_IRQ_20 | GENO_IRQ_19 | GENO_IRQ_18 | GENO_IRQ_17 | GENO_IRQ_16 | GENO_IRQ_15 | GENO_IRQ_14 | GENO_IRQ_13 | GENO_IRQ_12 | GENO_IRQ_11 | GENO_IRQ_10 | GENO_IRQ_9 | GENO_IRQ_8 | GENO_IRQ_7 | GENO_IRQ_6 | GENO_IRQ_5 | GENO_IRQ_4 | GENO_IRQ_3 | GENO_IRQ_2 | GENO_IRQ_1 | GENO_IRQ_0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|---------------|-------|
| 31 | GENO_IRQ_31 | Reading 1 indicates C2c_Sscm_GENO (31) signal and GENO_31 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 30 | GENO_IRQ_30 | Reading 1 indicates C2c_Sscm_GENO (30) signal and GENO_30 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 29 | GENO_IRQ_29 | Reading 1 indicates C2c_Sscm_GENO (29) signal and GENO_29 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 28 | GENO_IRQ_28 | Reading 1 indicates C2c_Sscm_GENO (28) signal and GENO_28 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 27 | GENO_IRQ_27 | Reading 1 indicates C2c_Sscm_GENO (27) signal and GENO_27 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 26 | GENO_IRQ_26 | Reading 1 indicates C2c_Sscm_GENO (26) signal and GENO_26 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 25 | GENO_IRQ_25 | Reading 1 indicates C2c_Sscm_GENO (25) signal and GENO_25 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 24 | GENO_IRQ_24 | Reading 1 indicates C2c_Sscm_GENO (24) signal and GENO_24 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 23 | GENO_IRQ_23 | Reading 1 indicates C2c_Sscm_GENO (23) signal and GENO_23 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|---------------|-------|
| 22 | GENO_IRQ_22 | Reading 1 indicates C2c_Sscm_GENO (22) signal and GENO_22 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 21 | GENO_IRQ_21 | Reading 1 indicates C2c_Sscm_GENO (21) signal and GENO_21 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 20 | GENO_IRQ_20 | Reading 1 indicates C2c_Sscm_GENO (20) signal and GENO_20 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 19 | GENO_IRQ_19 | Reading 1 indicates C2c_Sscm_GENO (19) signal and GENO_19 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 18 | GENO_IRQ_18 | Reading 1 indicates C2c_Sscm_GENO (18) signal and GENO_18 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 17 | GENO_IRQ_17 | Reading 1 indicates C2c_Sscm_GENO (17) signal and GENO_17 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 16 | GENO_IRQ_16 | Reading 1 indicates C2c_Sscm_GENO (16) signal and GENO_16 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 15 | GENO_IRQ_15 | Reading 1 indicates C2c_Sscm_GENO (15) signal and GENO_15 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 14 | GENO_IRQ_14 | Reading 1 indicates C2c_Sscm_GENO (14) signal and GENO_14 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 13 | GENO_IRQ_13 | Reading 1 indicates C2c_Sscm_GENO (13) signal and GENO_13 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 12 | GENO_IRQ_12 | Reading 1 indicates C2c_Sscm_GENO (12) signal and GENO_12 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 11 | GENO_IRQ_11 | Reading 1 indicates C2c_Sscm_GENO (11) signal and GENO_11 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 10 | GENO_IRQ_10 | Reading 1 indicates C2c_Sscm_GENO (10) signal and GENO_10 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------|
| 9 | GENO_IRQ_9 | Reading 1 indicates C2c_Sscm_GENO (9) signal and GENO_9 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 8 | GENO_IRQ_8 | Reading 1 indicates C2c_Sscm_GENO (8) signal and GENO_8 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 7 | GENO_IRQ_7 | Reading 1 indicates C2c_Sscm_GENO (7) signal and GENO_7 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 6 | GENO_IRQ_6 | Reading 1 indicates C2c_Sscm_GENO (6) signal and GENO_6 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 5 | GENO_IRQ_5 | Reading 1 indicates C2c_Sscm_GENO (5) signal and GENO_5 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 4 | GENO_IRQ_4 | Reading 1 indicates C2c_Sscm_GENO (4) signal and GENO_4 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 3 | GENO_IRQ_3 | Reading 1 indicates C2c_Sscm_GENO (3) signal and GENO_3 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 2 | GENO_IRQ_2 | Reading 1 indicates C2c_Sscm_GENO (2) signal and GENO_2 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 1 | GENO_IRQ_1 | Reading 1 indicates C2c_Sscm_GENO (1) signal and GENO_1 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 0 | GENO_IRQ_0 | Reading 1 indicates C2c_Sscm_GENO (0) signal and GENO_0 value in GENO_STATUS register have been modified by distant C2C and interrupt source is not masked. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |

Table 15-98. Register Call Summary for Register C2C_IRQ_ENABLE_STATUS_1

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-99. C2C_IRQ_ENABLE_SET_0

| | | | |
|------------------|-------------|----------|-----|
| Address Offset | 0x0000 0024 | Instance | C2C |
| Physical Address | 0x5C000024 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|-----------------|----|------------------------|---|----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WAIT_IRQ_EN | | | | WAKE_ACK_IRQ_EN | | RX_MAX_FREQ_ACK_IRQ_EN | | TX_FREQ_IRQ_EN | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--|---------------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | WAIT_IRQ_EN | Interrupt enable for WAIT IRQ. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 2 | WAKE_ACK_IRQ_EN | Interrupt enable for WAKE_ACK IRQ. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 1 | RX_MAX_FREQ_ACK_IRQ_EN | Interrupt enable for RX_MAX_FREQ_ACK IRQ. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |
| 0 | TX_FREQ_IRQ_EN | Interrupt enable for TX_FREQ IRQ. Writing 1 to this bit sets the bit. Writing 0 has no effect. | RW W1toSet | 0 |

Table 15-100. Register Call Summary for Register C2C_IRQ_ENABLE_SET_0

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-101. C2C_IRQ_ENABLE_SET_1

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0028 | Instance | C2C |
| Physical Address | 0x5C000028 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GENO_IRQ_31_EN | GENO_IRQ_30_EN | GENO_IRQ_29_EN | GENO_IRQ_28_EN | GENO_IRQ_27_EN | GENO_IRQ_26_EN | GENO_IRQ_25_EN | GENO_IRQ_24_EN | GENO_IRQ_23_EN | GENO_IRQ_22_EN | GENO_IRQ_21_EN | GENO_IRQ_20_EN | GENO_IRQ_19_EN | GENO_IRQ_18_EN | GENO_IRQ_17_EN | GENO_IRQ_16_EN | GENO_IRQ_15_EN | GENO_IRQ_14_EN | GENO_IRQ_13_EN | GENO_IRQ_12_EN | GENO_IRQ_11_EN | GENO_IRQ_10_EN | GENO_IRQ_9_EN | GENO_IRQ_8_EN | GENO_IRQ_7_EN | GENO_IRQ_6_EN | GENO_IRQ_5_EN | GENO_IRQ_4_EN | GENO_IRQ_3_EN | GENO_IRQ_2_EN | GENO_IRQ_1_EN | GENO_IRQ_0_EN |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---------------------------------------|---------------|-------|
| 31 | GENO_IRQ_31_EN | Interrupt enable for GENO_IRQ_31 IRQ. | RW W1toSet | 0 |
| 30 | GENO_IRQ_30_EN | Interrupt enable for GENO_IRQ_30 IRQ. | RW W1toSet | 0 |
| 29 | GENO_IRQ_29_EN | Interrupt enable for GENO_IRQ_29 IRQ. | RW W1toSet | 0 |
| 28 | GENO_IRQ_28_EN | Interrupt enable for GENO_IRQ_28 IRQ. | RW W1toSet | 0 |
| 27 | GENO_IRQ_27_EN | Interrupt enable for GENO_IRQ_27 IRQ. | RW W1toSet | 0 |
| 26 | GENO_IRQ_26_EN | Interrupt enable for GENO_IRQ_26 IRQ. | RW W1toSet | 0 |
| 25 | GENO_IRQ_25_EN | Interrupt enable for GENO_IRQ_25 IRQ. | RW W1toSet | 0 |
| 24 | GENO_IRQ_24_EN | Interrupt enable for GENO_IRQ_24 IRQ. | RW W1toSet | 0 |
| 23 | GENO_IRQ_23_EN | Interrupt enable for GENO_IRQ_23 IRQ. | RW W1toSet | 0 |
| 22 | GENO_IRQ_22_EN | Interrupt enable for GENO_IRQ_22 IRQ. | RW W1toSet | 0 |
| 21 | GENO_IRQ_21_EN | Interrupt enable for GENO_IRQ_21 IRQ. | RW W1toSet | 0 |
| 20 | GENO_IRQ_20_EN | Interrupt enable for GENO_IRQ_20 IRQ. | RW W1toSet | 0 |
| 19 | GENO_IRQ_19_EN | Interrupt enable for GENO_IRQ_19 IRQ. | RW W1toSet | 0 |
| 18 | GENO_IRQ_18_EN | Interrupt enable for GENO_IRQ_18 IRQ. | RW W1toSet | 0 |
| 17 | GENO_IRQ_17_EN | Interrupt enable for GENO_IRQ_17 IRQ. | RW W1toSet | 0 |
| 16 | GENO_IRQ_16_EN | Interrupt enable for GENO_IRQ_16 IRQ. | RW W1toSet | 0 |
| 15 | GENO_IRQ_15_EN | Interrupt enable for GENO_IRQ_15 IRQ. | RW W1toSet | 0 |
| 14 | GENO_IRQ_14_EN | Interrupt enable for GENO_IRQ_14 IRQ. | RW W1toSet | 0 |
| 13 | GENO_IRQ_13_EN | Interrupt enable for GENO_IRQ_13 IRQ. | RW W1toSet | 0 |
| 12 | GENO_IRQ_12_EN | Interrupt enable for GENO_IRQ_12 IRQ. | RW W1toSet | 0 |
| 11 | GENO_IRQ_11_EN | Interrupt enable for GENO_IRQ_11 IRQ. | RW W1toSet | 0 |
| 10 | GENO_IRQ_10_EN | Interrupt enable for GENO_IRQ_10 IRQ. | RW W1toSet | 0 |
| 9 | GENO_IRQ_9_EN | Interrupt enable for GENO_IRQ_9 IRQ. | RW W1toSet | 0 |
| 8 | GENO_IRQ_8_EN | Interrupt enable for GENO_IRQ_8 IRQ. | RW W1toSet | 0 |
| 7 | GENO_IRQ_7_EN | Interrupt enable for GENO_IRQ_7 IRQ. | RW W1toSet | 0 |
| 6 | GENO_IRQ_6_EN | Interrupt enable for GENO_IRQ_6 IRQ. | RW W1toSet | 0 |
| 5 | GENO_IRQ_5_EN | Interrupt enable for GENO_IRQ_5 IRQ. | RW W1toSet | 0 |
| 4 | GENO_IRQ_4_EN | Interrupt enable for GENO_IRQ_4 IRQ. | RW W1toSet | 0 |
| 3 | GENO_IRQ_3_EN | Interrupt enable for GENO_IRQ_3 IRQ. | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--------------------------------------|---------------|-------|
| 2 | GENO_IRQ_2_EN | Interrupt enable for GENO_IRQ_2 IRQ. | RW W1toSet | 0 |
| 1 | GENO_IRQ_1_EN | Interrupt enable for GENO_IRQ_1 IRQ. | RW W1toSet | 0 |
| 0 | GENO_IRQ_0_EN | Interrupt enable for GENO_IRQ_0 IRQ. | RW W1toSet | 0 |

Table 15-102. Register Call Summary for Register C2C_IRQ_ENABLE_SET_1

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-103. C2C_IRQ_ENABLE_CLEAR_0

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 002C | Instance | C2C |
| Physical Address | 0x5C00002C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-------------|-----------------|------------------------|----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | WAIT_IRQ_EN | WAKE_ACK_IRQ_EN | RX_MAX_FREQ_ACK_IRQ_EN | TX_FREQ_IRQ_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|---------------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | WAIT_IRQ_EN | Interrupt enable for WAIT IRQ. | RW W1toClr | 0 |
| 2 | WAKE_ACK_IRQ_EN | Interrupt enable for WAKE_ACK IRQ. | RW W1toClr | 0 |
| 1 | RX_MAX_FREQ_ACK_IRQ_EN | Interrupt enable for RX_MAX_FREQ_ACK IRQ. | RW W1toClr | 0 |
| 0 | TX_FREQ_IRQ_EN | Interrupt enable for TX_FREQ IRQ. | RW W1toClr | 0 |

Table 15-104. Register Call Summary for Register C2C_IRQ_ENABLE_CLEAR_0

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-105. C2C_IRQ_ENABLE_CLEAR_1

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0030 | Instance | C2C |
| Physical Address | 0x5C000030 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GENO_IRQ_31_EN | GENO_IRQ_30_EN | GENO_IRQ_29_EN | GENO_IRQ_28_EN | GENO_IRQ_27_EN | GENO_IRQ_26_EN | GENO_IRQ_25_EN | GENO_IRQ_24_EN | GENO_IRQ_23_EN | GENO_IRQ_22_EN | GENO_IRQ_21_EN | GENO_IRQ_20_EN | GENO_IRQ_19_EN | GENO_IRQ_18_EN | GENO_IRQ_17_EN | GENO_IRQ_16_EN | GENO_IRQ_15_EN | GENO_IRQ_14_EN | GENO_IRQ_13_EN | GENO_IRQ_12_EN | GENO_IRQ_11_EN | GENO_IRQ_10_EN | GENO_IRQ_9_EN | GENO_IRQ_8_EN | GENO_IRQ_7_EN | GENO_IRQ_6_EN | GENO_IRQ_5_EN | GENO_IRQ_4_EN | GENO_IRQ_3_EN | GENO_IRQ_2_EN | GENO_IRQ_1_EN | GENO_IRQ_0_EN |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|---------------|-------|
| 31 | GENO_IRQ_31_EN | Interrupt enable for GENO_IRQ_31 IRQ. Writing 1 to this bit clears the bit. Writing 0 has no effect. | RW W1toClr | 0 |
| 30 | GENO_IRQ_30_EN | Interrupt enable for GENO_IRQ_30 IRQ. | RW W1toClr | 0 |
| 29 | GENO_IRQ_29_EN | Interrupt enable for GENO_IRQ_29 IRQ. | RW W1toClr | 0 |
| 28 | GENO_IRQ_28_EN | Interrupt enable for GENO_IRQ_28 IRQ. | RW W1toClr | 0 |
| 27 | GENO_IRQ_27_EN | Interrupt enable for GENO_IRQ_27 IRQ. | RW W1toClr | 0 |
| 26 | GENO_IRQ_26_EN | Interrupt enable for GENO_IRQ_26 IRQ. | RW W1toClr | 0 |
| 25 | GENO_IRQ_25_EN | Interrupt enable for GENO_IRQ_25 IRQ. | RW W1toClr | 0 |
| 24 | GENO_IRQ_24_EN | Interrupt enable for GENO_IRQ_24 IRQ. | RW W1toClr | 0 |
| 23 | GENO_IRQ_23_EN | Interrupt enable for GENO_IRQ_23 IRQ. | RW W1toClr | 0 |
| 22 | GENO_IRQ_22_EN | Interrupt enable for GENO_IRQ_22 IRQ. | RW W1toClr | 0 |
| 21 | GENO_IRQ_21_EN | Interrupt enable for GENO_IRQ_21 IRQ. | RW W1toClr | 0 |
| 20 | GENO_IRQ_20_EN | Interrupt enable for GENO_IRQ_20 IRQ. | RW W1toClr | 0 |
| 19 | GENO_IRQ_19_EN | Interrupt enable for GENO_IRQ_19 IRQ. | RW W1toClr | 0 |
| 18 | GENO_IRQ_18_EN | Interrupt enable for GENO_IRQ_18 IRQ. | RW W1toClr | 0 |
| 17 | GENO_IRQ_17_EN | Interrupt enable for GENO_IRQ_17 IRQ. | RW W1toClr | 0 |
| 16 | GENO_IRQ_16_EN | Interrupt enable for GENO_IRQ_16 IRQ. | RW W1toClr | 0 |
| 15 | GENO_IRQ_15_EN | Interrupt enable for GENO_IRQ_15 IRQ. | RW W1toClr | 0 |
| 14 | GENO_IRQ_14_EN | Interrupt enable for GENO_IRQ_14 IRQ. | RW W1toClr | 0 |
| 13 | GENO_IRQ_13_EN | Interrupt enable for GENO_IRQ_13 IRQ. | RW W1toClr | 0 |
| 12 | GENO_IRQ_12_EN | Interrupt enable for GENO_IRQ_12 IRQ. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---------------------------------------|---------------|-------|
| 11 | GENO_IRQ_11_EN | Interrupt enable for GENO_IRQ_11 IRQ. | RW W1toClr | 0 |
| 10 | GENO_IRQ_10_EN | Interrupt enable for GENO_IRQ_10 IRQ. | RW W1toClr | 0 |
| 9 | GENO_IRQ_9_EN | Interrupt enable for GENO_IRQ_9 IRQ. | RW W1toClr | 0 |
| 8 | GENO_IRQ_8_EN | Interrupt enable for GENO_IRQ_8 IRQ. | RW W1toClr | 0 |
| 7 | GENO_IRQ_7_EN | Interrupt enable for GENO_IRQ_7 IRQ. | RW W1toClr | 0 |
| 6 | GENO_IRQ_6_EN | Interrupt enable for GENO_IRQ_6 IRQ. | RW W1toClr | 0 |
| 5 | GENO_IRQ_5_EN | Interrupt enable for GENO_IRQ_5 IRQ. | RW W1toClr | 0 |
| 4 | GENO_IRQ_4_EN | Interrupt enable for GENO_IRQ_4 IRQ. | RW W1toClr | 0 |
| 3 | GENO_IRQ_3_EN | Interrupt enable for GENO_IRQ_3 IRQ. | RW W1toClr | 0 |
| 2 | GENO_IRQ_2_EN | Interrupt enable for GENO_IRQ_2 IRQ. | RW W1toClr | 0 |
| 1 | GENO_IRQ_1_EN | Interrupt enable for GENO_IRQ_1 IRQ. | RW W1toClr | 0 |
| 0 | GENO_IRQ_0_EN | Interrupt enable for GENO_IRQ_0 IRQ. | RW W1toClr | 0 |

Table 15-106. Register Call Summary for Register C2C_IRQ_ENABLE_CLEAR_1

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-107. C2C_FCLK_FREQ

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|-----|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0040 | | | | | | | | | | | | | | | | Instance | | | | | | | | C2C | | | | | | | |
| Physical Address | | 0x5C000040 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| </ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 15-108. Register Call Summary for Register C2C_FCLK_FREQ

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-109. C2C_RX_MAX_FREQ

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0044 | Instance | C2C |
| Physical Address | 0x5C000044 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | RX_MAX_FREQ | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|----------|
| 31:10 | RESERVED | Reserved | R | 0x000000 |
| 9:0 | RX_MAX_FREQ | Value of the requested RX maximum clock frequency according to OPP written by software. Default value is 50 (MHz). | RW | 0x032 |

Table 15-110. Register Call Summary for Register C2C_RX_MAX_FREQ

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-111. C2C_TX_MAX_FREQ

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-------------|-------------|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----------|----|-----|----|-------------|---|------|----------|---|---|---|---|---|---|
| Address Offset | | 0x0000 0048 | | | | | | | | | | | | | | | | Instance | | C2C | | | | | | | | | | | |
| Physical Address | | 0x5C000048 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | TX_MAX_FREQ | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | Description | | | | | | | | | | | | | | | | Type | Reset | | | | | | |
| 31:10 | RESERVED | | | | | | | Reserved | | | | | | | | | | | | | | | | R | 0x000000 | | | | | | |
| 9:0 | TX_MAX_FREQ | | | | | | | Value of the requested TX maximum clock frequency set by distant C2C. Default value is 50 (MHz). | | | | | | | | | | | | | | | | RW | 0x032 | | | | | | |

Table 15-112. Register Call Summary for Register C2C_TX_MAX_FREQ

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-113. C2C_RX_MAX_FREQ_ACK

| | | | |
|------------------|-------------|----------|-----|
| Address Offset | 0x0000 004C | Instance | C2C |
| Physical Address | 0x5C00004C | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | RX MAX FREQ ACK | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|----------|
| 31:10 | RESERVED | Reserved | R | 0x000000 |
| 9:0 | RX_MAX_FREQ_ACK | Acknowledged maximum Rx clock frequency. Set by distant C2C. Default value is 50 (MHz). | RW | 0x032 |

Table 15-114. Register Call Summary for Register C2C_RX_MAX_FREQ_ACK

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-115. C2C_WAKE_REQ

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0050 | Instance | C2C |
| Physical Address | 0x5C000050 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | WAKE_REQ | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------------------|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | WAKE_REQ | Value of the WAKE_REQ set by software | RW | 0 |

Table 15-116. Register Call Summary for Register C2C_WAKE_REQ

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-117. C2C_WAKE_ACK

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0054 | Instance | C2C |
| Physical Address | 0x5C000054 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WAKE ACK |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | WAKE_ACK | Value of the WAKE_ACK set by distant C2C | RW | 0 |

Table 15-118. Register Call Summary for Register C2C_WAKE_ACK

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-119. C2C_STANDBY

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0060 | Instance | C2C |
| Physical Address | 0x5C000060 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | STANDBY |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------------------|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | STANDBY | Value of the STANDBY set by software | RW | 1 |

Table 15-120. Register Call Summary for Register C2C_STANDBY

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-121. C2C_STANDBY_IN

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0064 | Instance | C2C |
| Physical Address | 0x5C000064 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | STANDBY |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | STANDBY | Value of the STANDBY set by distant C2C | RW | 1 |

Table 15-122. Register Call Summary for Register C2C_STANDBY_IN

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-123. C2C_WAIT

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0068 | Instance | C2C |
| Physical Address | 0x5C000068 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | WAIT |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------------------|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | WAIT | Value of the WAIT set by distant C2C | RW | 1 |

Table 15-124. Register Call Summary for Register C2C_WAIT

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-125. C2C_GENI_CONTROL

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0070 | Instance | C2C |
| Physical Address | 0x5C000070 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GENI_31 | GENI_30 | GENI_29 | GENI_28 | GENI_27 | GENI_26 | GENI_25 | GENI_24 | GENI_23 | GENI_22 | GENI_21 | GENI_20 | GENI_19 | GENI_18 | GENI_17 | GENI_16 | GENI_15 | GENI_14 | GENI_13 | GENI_12 | GENI_11 | GENI_10 | GENI_9 | GENI_8 | GENI_7 | GENI_6 | GENI_5 | GENI_4 | GENI_3 | GENI_2 | GENI_1 | GENI_0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31 | GENI_31 | If GENI_MASK_31 in GENI_MASK register is reset, GENI_31 is the value of C2C_Sscm_Geni_31 and cannot be modified by software. (signal is not masked) If GENI_MASK_31 is set (signal is masked), GENI_31 can be modified by software. | RW | 0 |
| 30 | GENI_30 | f GENI_MASK_30 in GENI_MASK register is reset, GENI_30 is the value of C2C_Sscm_Geni_30 and cannot be modified by software. (signal is not masked) If GENI_MASK_30 is set (signal is masked), GENI_30 can be modified by software. | RW | 0 |
| 29 | GENI_29 | f GENI_MASK_29 in GENI_MASK register is reset, GENI_29 is the value of C2C_Sscm_Geni_29 and cannot be modified by software. (signal is not masked) If GENI_MASK_29 is set (signal is masked), GENI_29 can be modified by software. | RW | 0 |
| 28 | GENI_28 | f GENI_MASK_28 in GENI_MASK register is reset, GENI_28 is the value of C2C_Sscm_Geni_28 and cannot be modified by software. (signal is not masked) If GENI_MASK_28 is set (signal is masked), GENI_28 can be modified by software. | RW | 0 |
| 27 | GENI_27 | f GENI_MASK_27 in GENI_MASK register is reset, GENI_27 is the value of C2C_Sscm_Geni_27 and cannot be modified by software. (signal is not masked) If GENI_MASK_27 is set (signal is masked), GENI_27 can be modified by software. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 26 | GENI_26 | f GENI_MASK_26 in GENI_MASK register is reset, GENI_26 is the value of C2C_Sscm_Genl_26 and cannot be modified by software. (signal is not masked) If GENI_MASK_26 is set (signal is masked), GENI_26 can be modified by software. | RW | 0 |
| 25 | GENI_25 | f GENI_MASK_25 in GENI_MASK register is reset, GENI_25 is the value of C2C_Sscm_Genl_25 and cannot be modified by software. (signal is not masked) If GENI_MASK_25 is set (signal is masked), GENI_25 can be modified by software. | RW | 0 |
| 24 | GENI_24 | f GENI_MASK_24 in GENI_MASK register is reset, GENI_24 is the value of C2C_Sscm_Genl_24 and cannot be modified by software. (signal is not masked) If GENI_MASK_24 is set (signal is masked), GENI_24 can be modified by software. | RW | 0 |
| 23 | GENI_23 | f GENI_MASK_23 in GENI_MASK register is reset, GENI_23 is the value of C2C_Sscm_Genl_23 and cannot be modified by software. (signal is not masked) If GENI_MASK_23 is set (signal is masked), GENI_23 can be modified by software. | RW | 0 |
| 22 | GENI_22 | f GENI_MASK_22 in GENI_MASK register is reset, GENI_22 is the value of C2C_Sscm_Genl_22 and cannot be modified by software. (signal is not masked) If GENI_MASK_22 is set (signal is masked), GENI_22 can be modified by software. | RW | 0 |
| 21 | GENI_21 | f GENI_MASK_21 in GENI_MASK register is reset, GENI_21 is the value of C2C_Sscm_Genl_31 and cannot be modified by software. (signal is not masked) If GENI_MASK_21 is set (signal is masked), GENI_21 can be modified by software. | RW | 0 |
| 20 | GENI_20 | f GENI_MASK_20 in GENI_MASK register is reset, GENI_20 is the value of C2C_Sscm_Genl_20 and cannot be modified by software. (signal is not masked) If GENI_MASK_20 is set (signal is masked), GENI_20 can be modified by software. | RW | 0 |
| 19 | GENI_19 | f GENI_MASK_19 in GENI_MASK register is reset, GENI_19 is the value of C2C_Sscm_Genl_19 and cannot be modified by software. (signal is not masked) If GENI_MASK_19 is set (signal is masked), GENI_19 can be modified by software. | RW | 0 |
| 18 | GENI_18 | f GENI_MASK_18 in GENI_MASK register is reset, GENI_18 is the value of C2C_Sscm_Genl_31 and cannot be modified by software. (signal is not masked) If GENI_MASK_18 is set (signal is masked), GENI_18 can be modified by software. | RW | 0 |
| 17 | GENI_17 | f GENI_MASK_17 in GENI_MASK register is reset, GENI_17 is the value of C2C_Sscm_Genl_31 and cannot be modified by software. (signal is not masked) If GENI_MASK_17 is set (signal is masked), GENI_17 can be modified by software. | RW | 0 |
| 16 | GENI_16 | f GENI_MASK_16 in GENI_MASK register is reset, GENI_16 is the value of C2C_Sscm_Genl_16 and cannot be modified by software. (signal is not masked) If GENI_MASK_16 is set (signal is masked), GENI_16 can be modified by software. | RW | 0 |
| 15 | GENI_15 | f GENI_MASK_15 in GENI_MASK register is reset, GENI_15 is the value of C2C_Sscm_Genl_15 and cannot be modified by software. (signal is not masked) If GENI_MASK_15 is set (signal is masked), GENI_15 can be modified by software. | RW | 0 |
| 14 | GENI_14 | f GENI_MASK_14 in GENI_MASK register is reset, GENI_14 is the value of C2C_Sscm_Genl_14 and cannot be modified by software. (signal is not masked) If GENI_MASK_14 is set (signal is masked), GENI_14 can be modified by software. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 13 | GENI_13 | f GENI_MASK_13 in GENI_MASK register is reset, GENI_13 is the value of C2C_Sscm_Geni_13 and cannot be modified by software. (signal is not masked) If GENI_MASK_13 is set (signal is masked), GENI_13 can be modified by software. | RW | 0 |
| 12 | GENI_12 | f GENI_MASK_12 in GENI_MASK register is reset, GENI_12 is the value of C2C_Sscm_Geni_12 and cannot be modified by software. (signal is not masked) If GENI_MASK_12 is set (signal is masked), GENI_12 can be modified by software. | RW | 0 |
| 11 | GENI_11 | f GENI_MASK_11 in GENI_MASK register is reset, GENI_11 is the value of C2C_Sscm_Geni_11 and cannot be modified by software. (signal is not masked) If GENI_MASK_11 is set (signal is masked), GENI_11 can be modified by software. | RW | 0 |
| 10 | GENI_10 | f GENI_MASK_10 in GENI_MASK register is reset, GENI_10 is the value of C2C_Sscm_Geni_10 and cannot be modified by software. (signal is not masked) If GENI_MASK_10 is set (signal is masked), GENI_10 can be modified by software. | RW | 0 |
| 9 | GENI_9 | f GENI_MASK_9 in GENI_MASK register is reset, GENI_9 is the value of C2C_Sscm_Geni_9 and cannot be modified by software. (signal is not masked) If GENI_MASK_9 is set (signal is masked), GENI_9 can be modified by software. | RW | 0 |
| 8 | GENI_8 | f GENI_MASK_8 in GENI_MASK register is reset, GENI_8 is the value of C2C_Sscm_Geni_8 and cannot be modified by software. (signal is not masked) If GENI_MASK_8 is set (signal is masked), GENI_8 can be modified by software. | RW | 0 |
| 7 | GENI_7 | f GENI_MASK_7 in GENI_MASK register is reset, GENI_7 is the value of C2C_Sscm_Geni_7 and cannot be modified by software. (signal is not masked) If GENI_MASK_7 is set (signal is masked), GENI_7 can be modified by software. | RW | 0 |
| 6 | GENI_6 | f GENI_MASK_6 in GENI_MASK register is reset, GENI_6 is the value of C2C_Sscm_Geni_6 and cannot be modified by software. (signal is not masked) If GENI_MASK_6 is set (signal is masked), GENI_6 can be modified by software. | RW | 0 |
| 5 | GENI_5 | f GENI_MASK_5 in GENI_MASK register is reset, GENI_5 is the value of C2C_Sscm_Geni_5 and cannot be modified by software. (signal is not masked) If GENI_MASK_5 is set (signal is masked), GENI_5 can be modified by software. | RW | 0 |
| 4 | GENI_4 | f GENI_MASK_4 in GENI_MASK register is reset, GENI_4 is the value of C2C_Sscm_Geni_4 and cannot be modified by software. (signal is not masked) If GENI_MASK_4 is set (signal is masked), GENI_4 can be modified by software. | RW | 0 |
| 3 | GENI_3 | f GENI_MASK_3 in GENI_MASK register is reset, GENI_3 is the value of C2C_Sscm_Geni_3 and cannot be modified by software. (signal is not masked) If GENI_MASK_3 is set (signal is masked), GENI_3 can be modified by software. | RW | 0 |
| 2 | GENI_2 | f GENI_MASK_2 in GENI_MASK register is reset, GENI_2 is the value of C2C_Sscm_Geni_2 and cannot be modified by software. (signal is not masked) If GENI_MASK_2 is set (signal is masked), GENI_2 can be modified by software. | RW | 0 |
| 1 | GENI_1 | f GENI_MASK_1 in GENI_MASK register is reset, GENI_1 is the value of C2C_Sscm_Geni_1 and cannot be modified by software. (signal is not masked) If GENI_MASK_1 is set (signal is masked), GENI_1 can be modified by software. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | GENI_0 | f GENI_MASK_0 in GENI_MASK register is reset, GENI_0 is the value of C2C_Sscm_GenI_0 and cannot be modified by software. (signal is not masked) If GENI_MASK_0 is set (signal is masked), GENI_0 can be modified by software. | RW | 0 |

Table 15-126. Register Call Summary for Register C2C_GENI_CONTROL

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-127. C2C_GENI_MASK

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0074 | Instance | C2C |
| Physical Address | 0x5C000074 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GENI_MASK_31 | GENI_MASK_30 | GENI_MASK_29 | GENI_MASK_28 | GENI_MASK_27 | GENI_MASK_26 | GENI_MASK_25 | GENI_MASK_24 | GENI_MASK_23 | GENI_MASK_22 | GENI_MASK_21 | GENI_MASK_20 | GENI_MASK_19 | GENI_MASK_18 | GENI_MASK_17 | GENI_MASK_16 | GENI_MASK_15 | GENI_MASK_14 | GENI_MASK_13 | GENI_MASK_12 | GENI_MASK_11 | GENI_MASK_10 | GENI_MASK_9 | GENI_MASK_8 | GENI_MASK_7 | GENI_MASK_6 | GENI_MASK_5 | GENI_MASK_4 | GENI_MASK_3 | GENI_MASK_2 | GENI_MASK_1 | GENI_MASK_0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 31 | GENI_MASK_31 | If GENI_MASK_31 is reset, C2C_Sscm_GenI_31 signal is not masked If GENI_MASK_31 is set, signal is masked. | RW | 0 |
| 30 | GENI_MASK_30 | If GENI_MASK_30 is reset, C2C_Sscm_GenI_30 signal is not masked If GENI_MASK_30 is set, signal is masked. | RW | 0 |
| 29 | GENI_MASK_29 | If GENI_MASK_29 is reset, C2C_Sscm_GenI_29 signal is not masked If GENI_MASK_29 is set, signal is masked. | RW | 0 |
| 28 | GENI_MASK_28 | If GENI_MASK_28 is reset, C2C_Sscm_GenI_28 signal is not masked If GENI_MASK_28 is set, signal is masked. | RW | 0 |
| 27 | GENI_MASK_27 | If GENI_MASK_27 is reset, C2C_Sscm_GenI_27 signal is not masked If GENI_MASK_27 is set, signal is masked. | RW | 0 |
| 26 | GENI_MASK_26 | If GENI_MASK_26 is reset, C2C_Sscm_GenI_26 signal is not masked If GENI_MASK_26 is set, signal is masked. | RW | 0 |
| 25 | GENI_MASK_25 | If GENI_MASK_26 is reset, C2C_Sscm_GenI_25 signal is not masked If GENI_MASK_26 is set, signal is masked. | RW | 0 |
| 24 | GENI_MASK_24 | If GENI_MASK_24 is reset, C2C_Sscm_GenI_24 signal is not masked If GENI_MASK_24 is set, signal is masked. | RW | 0 |
| 23 | GENI_MASK_23 | If GENI_MASK_23 is reset, C2C_Sscm_GenI_23 signal is not masked If GENI_MASK_23 is set, signal is masked. | RW | 0 |
| 22 | GENI_MASK_22 | If GENI_MASK_22 is reset, C2C_Sscm_GenI_22 signal is not masked If GENI_MASK_22 is set, signal is masked. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 21 | GENI_MASK_21 | If GENI_MASK_21 is reset, C2C_Sscm_GenI_21 signal is not masked If GENI_MASK_21 is set, signal is masked. | RW | 0 |
| 20 | GENI_MASK_20 | If GENI_MASK_20 is reset, C2C_Sscm_GenI_20 signal is not masked If GENI_MASK_20 is set, signal is masked. | RW | 0 |
| 19 | GENI_MASK_19 | If GENI_MASK_19 is reset, C2C_Sscm_GenI_19 signal is not masked If GENI_MASK_19 is set, signal is masked. | RW | 0 |
| 18 | GENI_MASK_18 | If GENI_MASK_18 is reset, C2C_Sscm_GenI_18 signal is not masked If GENI_MASK_18 is set, signal is masked. | RW | 0 |
| 17 | GENI_MASK_17 | If GENI_MASK_17 is reset, C2C_Sscm_GenI_17 signal is not masked If GENI_MASK_17 is set, signal is masked. | RW | 0 |
| 16 | GENI_MASK_16 | If GENI_MASK_16 is reset, C2C_Sscm_GenI_16 signal is not masked If GENI_MASK_16 is set, signal is masked. | RW | 0 |
| 15 | GENI_MASK_15 | If GENI_MASK_15 is reset, C2C_Sscm_GenI_15 signal is not masked If GENI_MASK_15 is set, signal is masked. | RW | 0 |
| 14 | GENI_MASK_14 | If GENI_MASK_14 is reset, C2C_Sscm_GenI_14 signal is not masked If GENI_MASK_14 is set, signal is masked. | RW | 0 |
| 13 | GENI_MASK_13 | If GENI_MASK_13 is reset, C2C_Sscm_GenI_13 signal is not masked If GENI_MASK_13 is set, signal is masked. | RW | 0 |
| 12 | GENI_MASK_12 | If GENI_MASK_12 is reset, C2C_Sscm_GenI_12 signal is not masked If GENI_MASK_12 is set, signal is masked. | RW | 0 |
| 11 | GENI_MASK_11 | If GENI_MASK_11 is reset, C2C_Sscm_GenI_11 signal is not masked If GENI_MASK_11 is set, signal is masked. | RW | 0 |
| 10 | GENI_MASK_10 | If GENI_MASK_10 is reset, C2C_Sscm_GenI_10 signal is not masked If GENI_MASK_10 is set, signal is masked. | RW | 0 |
| 9 | GENI_MASK_9 | If GENI_MASK_9 is reset, C2C_Sscm_GenI_9 signal is not masked If GENI_MASK_9 is set, signal is masked. | RW | 0 |
| 8 | GENI_MASK_8 | If GENI_MASK_8 is reset, C2C_Sscm_GenI_8 signal is not masked If GENI_MASK_8 is set, signal is masked. | RW | 0 |
| 7 | GENI_MASK_7 | If GENI_MASK_7 is reset, C2C_Sscm_GenI_7 signal is not masked If GENI_MASK_7 is set, signal is masked. | RW | 0 |
| 6 | GENI_MASK_6 | If GENI_MASK_6 is reset, C2C_Sscm_GenI_6 signal is not masked If GENI_MASK_6 is set, signal is masked. | RW | 0 |
| 5 | GENI_MASK_5 | If GENI_MASK_5 is reset, C2C_Sscm_GenI_5 signal is not masked If GENI_MASK_5 is set, signal is masked. | RW | 0 |
| 4 | GENI_MASK_4 | If GENI_MASK_4 is reset, C2C_Sscm_GenI_4 signal is not masked If GENI_MASK_4 is set, signal is masked. | RW | 0 |
| 3 | GENI_MASK_3 | If GENI_MASK_3 is reset, C2C_Sscm_GenI_3 signal is not masked If GENI_MASK_3 is set, signal is masked. | RW | 0 |
| 2 | GENI_MASK_2 | If GENI_MASK_2 is reset, C2C_Sscm_GenI_2 signal is not masked If GENI_MASK_2 is set, signal is masked. | RW | 0 |
| 1 | GENI_MASK_1 | If GENI_MASK_1 is reset, C2C_Sscm_GenI_1 signal is not masked If GENI_MASK_1 is set, signal is masked. | RW | 0 |
| 0 | GENI_MASK_0 | If GENI_MASK_0 is reset, C2C_Sscm_GenI_0 signal is not masked If GENI_MASK_0 is set, signal is masked. | RW | 0 |

Table 15-128. Register Call Summary for Register C2C_GENI_MASK

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-129. C2C_GENO_STATUS

| | | | |
|-------------------------|-------------|-----------------|-----|
| Address Offset | 0x0000 0080 | Instance | C2C |
| Physical Address | 0x5C000080 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GENO_31 | GENO_30 | GENO_29 | GENO_28 | GENO_27 | GENO_26 | GENO_25 | GENO_24 | GENO_23 | GENO_22 | GENO_21 | GENO_20 | GENO_19 | GENO_18 | GENO_17 | GENO_16 | GENO_15 | GENO_14 | GENO_13 | GENO_12 | GENO_11 | GENO_10 | GENO_9 | GENO_8 | GENO_7 | GENO_6 | GENO_5 | GENO_4 | GENO_3 | GENO_2 | GENO_1 | GENO_0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31 | GENO_31 | GENO_31 is the value of C2C_Sscm_GenO_31 signal. | RW | 0 |
| 30 | GENO_30 | GENO_30 is the value of C2C_Sscm_GenO_30 signal. | RW | 0 |
| 29 | GENO_29 | GENO_29 is the value of C2C_Sscm_GenO_29 signal. | RW | 0 |
| 28 | GENO_28 | GENO_28 is the value of C2C_Sscm_GenO_28 signal. | RW | 0 |
| 27 | GENO_27 | GENO_27 is the value of C2C_Sscm_GenO_27 signal. | RW | 0 |
| 26 | GENO_26 | GENO_26 is the value of C2C_Sscm_GenO_26 signal. | RW | 0 |
| 25 | GENO_25 | GENO_25 is the value of C2C_Sscm_GenO_25 signal. | RW | 0 |
| 24 | GENO_24 | GENO_24 is the value of C2C_Sscm_GenO_24 signal. | RW | 0 |
| 23 | GENO_23 | GENO_23 is the value of C2C_Sscm_GenO_23 signal. | RW | 0 |
| 22 | GENO_22 | GENO_22 is the value of C2C_Sscm_GenO_22 signal. | RW | 0 |
| 21 | GENO_21 | GENO_21 is the value of C2C_Sscm_GenO_21 signal. | RW | 0 |
| 20 | GENO_20 | GENO_20 is the value of C2C_Sscm_GenO_20 signal. | RW | 0 |
| 19 | GENO_19 | GENO_19 is the value of C2C_Sscm_GenO_19 signal. | RW | 0 |
| 18 | GENO_18 | GENO_18 is the value of C2C_Sscm_GenO_18 signal. | RW | 0 |
| 17 | GENO_17 | GENO_17 is the value of C2C_Sscm_GenO_17 signal. | RW | 0 |
| 16 | GENO_16 | GENO_16 is the value of C2C_Sscm_GenO_16 signal. | RW | 0 |
| 15 | GENO_15 | GENO_15 is the value of C2C_Sscm_GenO_15 signal. | RW | 0 |
| 14 | GENO_14 | GENO_14 is the value of C2C_Sscm_GenO_14 signal. | RW | 0 |
| 13 | GENO_13 | GENO_13 is the value of C2C_Sscm_GenO_13 signal. | RW | 0 |
| 12 | GENO_12 | GENO_12 is the value of C2C_Sscm_GenO_12 signal. | RW | 0 |
| 11 | GENO_11 | GENO_11 is the value of C2C_Sscm_GenO_11 signal. | RW | 0 |
| 10 | GENO_10 | GENO_10 is the value of C2C_Sscm_GenO_10 signal. | RW | 0 |
| 9 | GENO_9 | GENO_9 is the value of C2C_Sscm_GenO_9 signal. | RW | 0 |
| 8 | GENO_8 | GENO_8 is the value of C2C_Sscm_GenO_8 signal. | RW | 0 |
| 7 | GENO_7 | GENO_7 is the value of C2C_Sscm_GenO_7 signal. | RW | 0 |
| 6 | GENO_6 | GENO_6 is the value of C2C_Sscm_GenO_6 signal. | RW | 0 |
| 5 | GENO_5 | GENO_5 is the value of C2C_Sscm_GenO_5 signal. | RW | 0 |
| 4 | GENO_4 | GENO_4 is the value of C2C_Sscm_GenO_4 signal. | RW | 0 |
| 3 | GENO_3 | GENO_3 is the value of C2C_Sscm_GenO_3 signal. | RW | 0 |
| 2 | GENO_2 | GENO_2 is the value of C2C_Sscm_GenO_2 signal. | RW | 0 |
| 1 | GENO_1 | GENO_1 is the value of C2C_Sscm_GenO_1 signal. | RW | 0 |
| 0 | GENO_0 | GENO_0 is the value of C2C_Sscm_GenO_0 signal. | RW | 0 |

Table 15-130. Register Call Summary for Register C2C_GENO_STATUS

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-131. C2C_GENO_INTERRUPT

| | | | |
|-------------------------|--|-------------|---------------------|
| Address Offset | | 0x0000 0084 | |
| Physical Address | | 0x5C000084 | Instance C2C |
| Description | | | |
| Type | | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GENO_INT_31 | GENO_INT_30 | GENO_INT_29 | GENO_INT_28 | GENO_INT_27 | GENO_INT_26 | GENO_INT_25 | GENO_INT_24 | GENO_INT_23 | GENO_INT_22 | GENO_INT_21 | GENO_INT_20 | GENO_INT_19 | GENO_INT_18 | GENO_INT_17 | GENO_INT_16 | GENO_INT_15 | GENO_INT_14 | GENO_INT_13 | GENO_INT_12 | GENO_INT_11 | GENO_INT_10 | GENO_INT_9 | GENO_INT_8 | GENO_INT_7 | GENO_INT_6 | GENO_INT_5 | GENO_INT_4 | GENO_INT_3 | GENO_INT_2 | GENO_INT_1 | GENO_INT_0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------|
| 31 | GENO_INT_31 | If GENO_INT_31=0, GENO_IRQ_31=1 when GENO_31 toggles; If GENO_INT_31=1: If GENO_LEVEL_31=0, GENO_IRQ_31 =1 when GENO_31 toggles to 0. If GENO_LEVEL_31=1, GENO_IRQ_31 =1 when GENO_31 toggles to 1. | RW | 0 |
| 30 | GENO_INT_30 | If GENO_INT_30=0, GENO_IRQ_30=1 when GENO_30 toggles; If GENO_INT_30=1: If GENO_LEVEL_30=0, GENO_IRQ_30 =1 when GENO_30 toggles to 0. If GENO_LEVEL_30=1, GENO_IRQ_30 =1 when GENO_30 toggles to 1. | RW | 0 |
| 29 | GENO_INT_29 | If GENO_INT_29=0, GENO_IRQ_29=1 when GENO_29 toggles; If GENO_INT_29=1: If GENO_LEVEL_29=0, GENO_IRQ_29 =1 when GENO_29 toggles to 0. If GENO_LEVEL_29=1, GENO_IRQ_29 =1 when GENO_29 toggles to 1. | RW | 0 |
| 28 | GENO_INT_28 | If GENO_INT_28=0, GENO_IRQ_28=1 when GENO_28 toggles; If GENO_INT_28=1: If GENO_LEVEL_28=0, GENO_IRQ_28 =1 when GENO_28 toggles to 0. If GENO_LEVEL_28=1, GENO_IRQ_28 =1 when GENO_28 toggles to 1. | RW | 0 |
| 27 | GENO_INT_27 | If GENO_INT_27=0, GENO_IRQ_27=1 when GENO_27 toggles; If GENO_INT_27=1: If GENO_LEVEL_27=0, GENO_IRQ_27 =1 when GENO_27 toggles to 0. If GENO_LEVEL_27=1, GENO_IRQ_27 =1 when GENO_27 toggles to 1. | RW | 0 |
| 26 | GENO_INT_26 | If GENO_INT_26=0, GENO_IRQ_26=1 when GENO_26 toggles; If GENO_INT_26=1: If GENO_LEVEL_26=0, GENO_IRQ_26 =1 when GENO_26 toggles to 0. If GENO_LEVEL_26=1, GENO_IRQ_26 =1 when GENO_26 toggles to 1. | RW | 0 |
| 25 | GENO_INT_25 | If GENO_INT_25=0, GENO_IRQ_25=1 when GENO_25 toggles; If GENO_INT_25=1: If GENO_LEVEL_25=0, GENO_IRQ_25 =1 when GENO_25 toggles to 0. If GENO_LEVEL_25=1, GENO_IRQ_25 =1 when GENO_25 toggles to 1. | RW | 0 |
| 24 | GENO_INT_24 | If GENO_INT_24=0, GENO_IRQ_24=1 when GENO_24 toggles; If GENO_INT_24=1: If GENO_LEVEL_24=0, GENO_IRQ_24 =1 when GENO_24 toggles to 0. If GENO_LEVEL_24=1, GENO_IRQ_24 =1 when GENO_24 toggles to 1. | RW | 0 |
| 23 | GENO_INT_23 | If GENO_INT_23=0, GENO_IRQ_23=1 when GENO_23 toggles; If GENO_INT_23=1: If GENO_LEVEL_23=0, GENO_IRQ_23 =1 when GENO_23 toggles to 0. If GENO_LEVEL_23=1, GENO_IRQ_23 =1 when GENO_23 toggles to 1. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------|
| 22 | GENO_INT_22 | If GENO_INT_22=0, GENO_IRQ_22=1 when GENO_22 toggles; If GENO_INT_22=1: If GENO_LEVEL_22=0, GENO_IRQ_22 =1 when GENO_22 toggles to 0. If GENO_LEVEL_22=1, GENO_IRQ_22 =1 when GENO_22 toggles to 1. | RW | 0 |
| 21 | GENO_INT_21 | If GENO_INT_21=0, GENO_IRQ_21=1 when GENO_21 toggles; If GENO_INT_21=1: If GENO_LEVEL_21=0, GENO_IRQ_21 =1 when GENO_21 toggles to 0. If GENO_LEVEL_21=1, GENO_IRQ_21 =1 when GENO_21 toggles to 1. | RW | 0 |
| 20 | GENO_INT_20 | If GENO_INT_20=0, GENO_IRQ_20=1 when GENO_20 toggles; If GENO_INT_20=1: If GENO_LEVEL_20=0, GENO_IRQ_20 =1 when GENO_20 toggles to 0. If GENO_LEVEL_20=1, GENO_IRQ_20 =1 when GENO_20 toggles to 1. | RW | 0 |
| 19 | GENO_INT_19 | If GENO_INT_19=0, GENO_IRQ_19=1 when GENO_19 toggles; If GENO_INT_19=1: If GENO_LEVEL_19=0, GENO_IRQ_19 =1 when GENO_19 toggles to 0. If GENO_LEVEL_19=1, GENO_IRQ_19 =1 when GENO_19 toggles to 1. | RW | 0 |
| 18 | GENO_INT_18 | If GENO_INT_18=0, GENO_IRQ_18=1 when GENO_18 toggles; If GENO_INT_18=1: If GENO_LEVEL_18=0, GENO_IRQ_18 =1 when GENO_18 toggles to 0. If GENO_LEVEL_18=1, GENO_IRQ_18 =1 when GENO_18 toggles to 1. | RW | 0 |
| 17 | GENO_INT_17 | If GENO_INT_17=0, GENO_IRQ_17=1 when GENO_17 toggles; If GENO_INT_17=1: If GENO_LEVEL_17=0, GENO_IRQ_17 =1 when GENO_17 toggles to 0. If GENO_LEVEL_17=1, GENO_IRQ_17 =1 when GENO_17 toggles to 1. | RW | 0 |
| 16 | GENO_INT_16 | If GENO_INT_16=0, GENO_IRQ_16=1 when GENO_16 toggles; If GENO_INT_16=1: If GENO_LEVEL_16=0, GENO_IRQ_16 =1 when GENO_16 toggles to 0. If GENO_LEVEL_16=1, GENO_IRQ_16 =1 when GENO_16 toggles to 1. | RW | 0 |
| 15 | GENO_INT_15 | If GENO_INT_15=0, GENO_IRQ_15=1 when GENO_15 toggles; If GENO_INT_15=1: If GENO_LEVEL_15=0, GENO_IRQ_15 =1 when GENO_15 toggles to 0. If GENO_LEVEL_15=1, GENO_IRQ_15 =1 when GENO_15 toggles to 1. | RW | 0 |
| 14 | GENO_INT_14 | If GENO_INT_14=0, GENO_IRQ_14=1 when GENO_14 toggles; If GENO_INT_14=1: If GENO_LEVEL_14=0, GENO_IRQ_14 =1 when GENO_14 toggles to 0. If GENO_LEVEL_14=1, GENO_IRQ_14 =1 when GENO_14 toggles to 1. | RW | 0 |
| 13 | GENO_INT_13 | If GENO_INT_13=0, GENO_IRQ_13=1 when GENO_13 toggles; If GENO_INT_13=1: If GENO_LEVEL_13=0, GENO_IRQ_13 =1 when GENO_13 toggles to 0. If GENO_LEVEL_13=1, GENO_IRQ_13 =1 when GENO_13 toggles to 1. | RW | 0 |
| 12 | GENO_INT_12 | If GENO_INT_12=0, GENO_IRQ_12=1 when GENO_12 toggles; If GENO_INT_12=1: If GENO_LEVEL_12=0, GENO_IRQ_12 =1 when GENO_12 toggles to 0. If GENO_LEVEL_12=1, GENO_IRQ_12 =1 when GENO_12 toggles to 1. | RW | 0 |
| 11 | GENO_INT_11 | If GENO_INT_11=0, GENO_IRQ_11=1 when GENO_11 toggles; If GENO_INT_11=1: If GENO_LEVEL_11=0, GENO_IRQ_11 =1 when GENO_11 toggles to 0. If GENO_LEVEL_11=1, GENO_IRQ_11 =1 when GENO_11 toggles to 1. | RW | 0 |
| 10 | GENO_INT_10 | If GENO_INT_10=0, GENO_IRQ_10=1 when GENO_10 toggles; If GENO_INT_10=1: If GENO_LEVEL_10=0, GENO_IRQ_10 =1 when GENO_10 toggles to 0. If GENO_LEVEL_10=1, GENO_IRQ_10 =1 when GENO_10 toggles to 1. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 9 | GENO_INT_9 | If GENO_INT_9=0, GENO_IRQ_9=1 when GENO_9 toggles; If GENO_INT_9=1: If GENO_LEVEL_9=0, GENO_IRQ_9 =1 when GENO_9 toggles to 0. If GENO_LEVEL_9=1, GENO_IRQ_9 =1 when GENO_9 toggles to 1. | RW | 0 |
| 8 | GENO_INT_8 | If GENO_INT_8=0, GENO_IRQ_8=1 when GENO_8 toggles; If GENO_INT_8=1: If GENO_LEVEL_8=0, GENO_IRQ_8 =1 when GENO_8 toggles to 0. If GENO_LEVEL_8=1, GENO_IRQ_8 =1 when GENO_8 toggles to 1. | RW | 0 |
| 7 | GENO_INT_7 | If GENO_INT_7=0, GENO_IRQ_7=1 when GENO_7 toggles; If GENO_INT_7=1: If GENO_LEVEL_7=0, GENO_IRQ_7 =1 when GENO_7 toggles to 0. If GENO_LEVEL_7=1, GENO_IRQ_7 =1 when GENO_7 toggles to 1. | RW | 0 |
| 6 | GENO_INT_6 | If GENO_INT_6=0, GENO_IRQ_6=1 when GENO_6 toggles; If GENO_INT_6=1: If GENO_LEVEL_6=0, GENO_IRQ_6 =1 when GENO_6 toggles to 0. If GENO_LEVEL_6=1, GENO_IRQ_6 =1 when GENO_6 toggles to 1. | RW | 0 |
| 5 | GENO_INT_5 | If GENO_INT_5=0, GENO_IRQ_5=1 when GENO_5 toggles; If GENO_INT_5=1: If GENO_LEVEL_5=0, GENO_IRQ_5 =1 when GENO_5 toggles to 0. If GENO_LEVEL_5=1, GENO_IRQ_5 =1 when GENO_5 toggles to 1. | RW | 0 |
| 4 | GENO_INT_4 | If GENO_INT_4=0, GENO_IRQ_4=1 when GENO_4 toggles; If GENO_INT_4=1: If GENO_LEVEL_4=0, GENO_IRQ_4 =1 when GENO_4 toggles to 0. If GENO_LEVEL_4=1, GENO_IRQ_4 =1 when GENO_4 toggles to 1. | RW | 0 |
| 3 | GENO_INT_3 | If GENO_INT_3=0, GENO_IRQ_3=1 when GENO_3 toggles; If GENO_INT_3=1: If GENO_LEVEL_3=0, GENO_IRQ_3 =1 when GENO_3 toggles to 0. If GENO_LEVEL_3=1, GENO_IRQ_3 =1 when GENO_3 toggles to 1. | RW | 0 |
| 2 | GENO_INT_2 | If GENO_INT_2=0, GENO_IRQ_2=1 when GENO_2 toggles; If GENO_INT_2=1: If GENO_LEVEL_2=0, GENO_IRQ_2 =1 when GENO_2 toggles to 0. If GENO_LEVEL_2=1, GENO_IRQ_2 =1 when GENO_2 toggles to 1. | RW | 0 |
| 1 | GENO_INT_1 | If GENO_INT_1=0, GENO_IRQ_1=1 when GENO_1 toggles; If GENO_INT_1=1: If GENO_LEVEL_1=0, GENO_IRQ_1 =1 when GENO_1 toggles to 0. If GENO_LEVEL_1=1, GENO_IRQ_1 =1 when GENO_1 toggles to 1. | RW | 0 |
| 0 | GENO_INT_0 | If GENO_INT_0=0, GENO_IRQ_0=1 when GENO_0 toggles; If GENO_INT_0=1: If GENO_LEVEL_0=0, GENO_IRQ_0 =1 when GENO_0 toggles to 0. If GENO_LEVEL_0=1, GENO_IRQ_0 =1 when GENO_0 toggles to 1. | RW | 0 |

Table 15-132. Register Call Summary for Register C2C_GENO_INTERRUPT

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

Table 15-133. C2C_GENO_LEVEL

| | | | |
|-------------------------|--|-------------|---------------------|
| Address Offset | | 0x0000 0088 | |
| Physical Address | | 0x5C000088 | Instance C2C |
| Description | | | |
| Type | | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GENO_LEVEL_31 | GENO_LEVEL_30 | GENO_LEVEL_29 | GENO_LEVEL_28 | GENO_LEVEL_27 | GENO_LEVEL_26 | GENO_LEVEL_25 | GENO_LEVEL_24 | GENO_LEVEL_23 | GENO_LEVEL_22 | GENO_LEVEL_21 | GENO_LEVEL_20 | GENO_LEVEL_19 | GENO_LEVEL_18 | GENO_LEVEL_17 | GENO_LEVEL_16 | GENO_LEVEL_15 | GENO_LEVEL_14 | GENO_LEVEL_13 | GENO_LEVEL_12 | GENO_LEVEL_11 | GENO_LEVEL_10 | GENO_LEVEL_9 | GENO_LEVEL_8 | GENO_LEVEL_7 | GENO_LEVEL_6 | GENO_LEVEL_5 | GENO_LEVEL_4 | GENO_LEVEL_3 | GENO_LEVEL_2 | GENO_LEVEL_1 | GENO_LEVEL_0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 31 | GENO_LEVEL_31 | IF GENO_LEVEL_31=0, GENO_IRQ_31 =1 when GENO_31 toggles to 0. IF GENO_LEVEL_31=1, GENO_IRQ_31 =1 when GENO_31 toggles to 1. | RW | 0 |
| 30 | GENO_LEVEL_30 | IF GENO_LEVEL_30=0, GENO_IRQ_30 =1 when GENO_30 toggles to 0. IF GENO_LEVEL_30=1, GENO_IRQ_30 =1 when GENO_30 toggles to 1. | RW | 0 |
| 29 | GENO_LEVEL_29 | IF GENO_LEVEL_29=0, GENO_IRQ_29 =1 when GENO_29 toggles to 0. IF GENO_LEVEL_29=1, GENO_IRQ_29 =1 when GENO_29 toggles to 1. | RW | 0 |
| 28 | GENO_LEVEL_28 | IF GENO_LEVEL_28=0, GENO_IRQ_28 =1 when GENO_28 toggles to 0. IF GENO_LEVEL_28=1, GENO_IRQ_28 =1 when GENO_28 toggles to 1. | RW | 0 |
| 27 | GENO_LEVEL_27 | IF GENO_LEVEL_27=0, GENO_IRQ_27 =1 when GENO_27 toggles to 0. IF GENO_LEVEL_27=1, GENO_IRQ_27 =1 when GENO_27 toggles to 1. | RW | 0 |
| 26 | GENO_LEVEL_26 | IF GENO_LEVEL_26=0, GENO_IRQ_26 =1 when GENO_26 toggles to 0. IF GENO_LEVEL_26=1, GENO_IRQ_26 =1 when GENO_26 toggles to 1. | RW | 0 |
| 25 | GENO_LEVEL_25 | IF GENO_LEVEL_25=0, GENO_IRQ_25 =1 when GENO_25 toggles to 0. IF GENO_LEVEL_25=1, GENO_IRQ_25 =1 when GENO_25 toggles to 1. | RW | 0 |
| 24 | GENO_LEVEL_24 | IF GENO_LEVEL_24=0, GENO_IRQ_24 =1 when GENO_24 toggles to 0. IF GENO_LEVEL_24=1, GENO_IRQ_24 =1 when GENO_24 toggles to 1. | RW | 0 |
| 23 | GENO_LEVEL_23 | IF GENO_LEVEL_23=0, GENO_IRQ_23 =1 when GENO_23 toggles to 0. IF GENO_LEVEL_23=1, GENO_IRQ_23 =1 when GENO_23 toggles to 1. | RW | 0 |
| 22 | GENO_LEVEL_22 | IF GENO_LEVEL_22=0, GENO_IRQ_22 =1 when GENO_22 toggles to 0. IF GENO_LEVEL_22=1, GENO_IRQ_22 =1 when GENO_22 toggles to 1. | RW | 0 |
| 21 | GENO_LEVEL_21 | IF GENO_LEVEL_21=0, GENO_IRQ_21 =1 when GENO_21 toggles to 0. IF GENO_LEVEL_21=1, GENO_IRQ_21 =1 when GENO_21 toggles to 1. | RW | 0 |
| 20 | GENO_LEVEL_20 | IF GENO_LEVEL_20=0, GENO_IRQ_20 =1 when GENO_20 toggles to 0. IF GENO_LEVEL_20=1, GENO_IRQ_20 =1 when GENO_20 toggles to 1. | RW | 0 |
| 19 | GENO_LEVEL_19 | IF GENO_LEVEL_19=0, GENO_IRQ_19 =1 when GENO_19 toggles to 0. IF GENO_LEVEL_19=1, GENO_IRQ_19 =1 when GENO_19 toggles to 1. | RW | 0 |
| 18 | GENO_LEVEL_18 | IF GENO_LEVEL_18=0, GENO_IRQ_18 =1 when GENO_18 toggles to 0. IF GENO_LEVEL_18=1, GENO_IRQ_18 =1 when GENO_18 toggles to 1. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 17 | GENO_LEVEL_17 | IF GENO_LEVEL_17=0, GENO_IRQ_17 =1 when GENO_17 toggles to 0. IF GENO_LEVEL_17=1, GENO_IRQ_17 =1 when GENO_17 toggles to 1. | RW | 0 |
| 16 | GENO_LEVEL_16 | IF GENO_LEVEL_16=0, GENO_IRQ_16 =1 when GENO_16 toggles to 0. IF GENO_LEVEL_16=1, GENO_IRQ_16 =1 when GENO_16 toggles to 1. | RW | 0 |
| 15 | GENO_LEVEL_15 | IF GENO_LEVEL_15=0, GENO_IRQ_15 =1 when GENO_15 toggles to 0. IF GENO_LEVEL_15=1, GENO_IRQ_15 =1 when GENO_15 toggles to 1. | RW | 0 |
| 14 | GENO_LEVEL_14 | IF GENO_LEVEL_14=0, GENO_IRQ_14 =1 when GENO_14 toggles to 0. IF GENO_LEVEL_14=1, GENO_IRQ_14 =1 when GENO_14 toggles to 1. | RW | 0 |
| 13 | GENO_LEVEL_13 | IF GENO_LEVEL_13=0, GENO_IRQ_13 =1 when GENO_13 toggles to 0. IF GENO_LEVEL_13=1, GENO_IRQ_13 =1 when GENO_13 toggles to 1. | RW | 0 |
| 12 | GENO_LEVEL_12 | IF GENO_LEVEL_12=0, GENO_IRQ_12 =1 when GENO_12 toggles to 0. IF GENO_LEVEL_12=1, GENO_IRQ_12 =1 when GENO_12 toggles to 1. | RW | 0 |
| 11 | GENO_LEVEL_11 | IF GENO_LEVEL_11=0, GENO_IRQ_11 =1 when GENO_11 toggles to 0. IF GENO_LEVEL_11=1, GENO_IRQ_11 =1 when GENO_11 toggles to 1. | RW | 0 |
| 10 | GENO_LEVEL_10 | IF GENO_LEVEL_10=0, GENO_IRQ_10 =1 when GENO_10 toggles to 0. IF GENO_LEVEL_10=1, GENO_IRQ_10 =1 when GENO_10 toggles to 1. | RW | 0 |
| 9 | GENO_LEVEL_9 | IF GENO_LEVEL_9=0, GENO_IRQ_9 =1 when GENO_9 toggles to 0. IF GENO_LEVEL_9=1, GENO_IRQ_9 =1 when GENO_9 toggles to 1. | RW | 0 |
| 8 | GENO_LEVEL_8 | IF GENO_LEVEL_8=0, GENO_IRQ_8 =1 when GENO_8 toggles to 0. IF GENO_LEVEL_8=1, GENO_IRQ_8 =1 when GENO_8 toggles to 1. | RW | 0 |
| 7 | GENO_LEVEL_7 | IF GENO_LEVEL_7=0, GENO_IRQ_7 =1 when GENO_7 toggles to 0. IF GENO_LEVEL_7=1, GENO_IRQ_7 =1 when GENO_7 toggles to 1. | RW | 0 |
| 6 | GENO_LEVEL_6 | IF GENO_LEVEL_6=0, GENO_IRQ_6 =1 when GENO_6 toggles to 0. IF GENO_LEVEL_6=1, GENO_IRQ_6 =1 when GENO_6 toggles to 1. | RW | 0 |
| 5 | GENO_LEVEL_5 | IF GENO_LEVEL_5=0, GENO_IRQ_5 =1 when GENO_5 toggles to 0. IF GENO_LEVEL_5=1, GENO_IRQ_5 =1 when GENO_5 toggles to 1. | RW | 0 |
| 4 | GENO_LEVEL_4 | IF GENO_LEVEL_4=0, GENO_IRQ_4 =1 when GENO_4 toggles to 0. IF GENO_LEVEL_4=1, GENO_IRQ_4 =1 when GENO_4 toggles to 1. | RW | 0 |
| 3 | GENO_LEVEL_3 | IF GENO_LEVEL_3=0, GENO_IRQ_3 =1 when GENO_3 toggles to 0. IF GENO_LEVEL_3=1, GENO_IRQ_3 =1 when GENO_3 toggles to 1. | RW | 0 |
| 2 | GENO_LEVEL_2 | IF GENO_LEVEL_2=0, GENO_IRQ_2 =1 when GENO_2 toggles to 0. IF GENO_LEVEL_2=1, GENO_IRQ_2 =1 when GENO_2 toggles to 1. | RW | 0 |
| 1 | GENO_LEVEL_1 | IF GENO_LEVEL_1=0, GENO_IRQ_1 =1 when GENO_1 toggles to 0. IF GENO_LEVEL_1=1, GENO_IRQ_1 =1 when GENO_1 toggles to 1. | RW | 0 |
| 0 | GENO_LEVEL_0 | IF GENO_LEVEL_0=0, GENO_IRQ_0 =1 when GENO_0 toggles to 0. IF GENO_LEVEL_0=1, GENO_IRQ_0 =1 when GENO_0 toggles to 1. | RW | 0 |

Table 15-134. Register Call Summary for Register C2C_GENO_LEVEL

C2C Register Manual

- [C2C Register Summary: \[0\]](#)

PRELIMINARY

Memory Subsystem

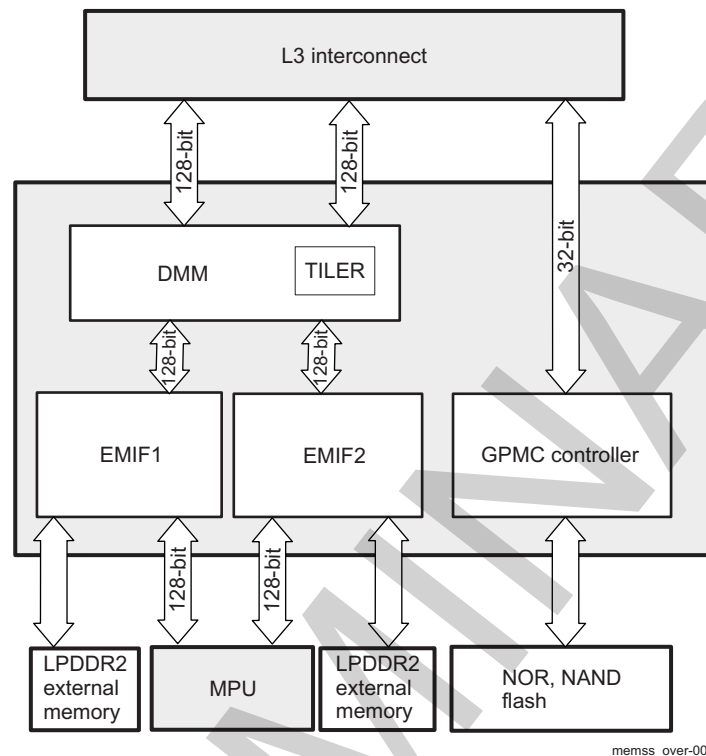
This chapter introduces the memory subsystem of the device.

| Topic | Page |
|---|-------------|
| 16.1 Memory Subsystem Overview | 3048 |
| 16.2 Dynamic Memory Manager | 3053 |
| 16.3 EMIF Controller | 3133 |
| 16.4 General-Purpose Memory Controller | 3206 |
| 16.5 Error Location Module | 3346 |
| 16.6 On-Chip Memory (OCM) Subsystem | 3373 |

16.1 Memory Subsystem Overview

Figure 16-1 shows a functional diagram of all memory subsystems in the device.

Figure 16-1. Memory Subsystem Functional Diagram



16.1.1 DMM Overview

The dynamic memory manager (DMM) module is typically located immediately in front of the synchronous dynamic random access memory (SDRAM) controller (SDRC), as shown in Figure 16-1.

In a broad sense, the DMM manages various aspects of memory accesses such as:

- Initiator-indexed priority generation
- Multizone SDRAM interleaving configuration
- Block object transfer optimization – tiling
- Centralized low-latency page translation – MMU-like feature

The dynamic qualifier for memory management highlights the software configurability, and hence the runtime nature, of the four aspects of memory management handled by the DMM.

16.1.1.1 DMM Features

From a functional perspective, the role of the DMM is to:

- Add initiator-based priority to any incoming requests
- Perform to/from tiling conversions of tiled requests
- Make on-the-fly basic transforms, such as quadrant rotations and mirroring
- Optionally, provide a low-latency page-based translation to handle memory fragmentation – MMU
- Distribute the traffic on all attached memory controllers according to the interleaving configuration

The main features of the DMM are:

- Programmable multizone DRAM mapping and interleaving configuration
- Programmable initiator-based request priority extension

- Multichannel memory transfer optimization
- Single SDRAM page request generation
- Low-latency interconnect port
- Page-grained address translation to manage memory fragmentation
- Automatic synchronized reloading of the address translation table

16.1.2 TILER Overview

The tiling and isometric lightweight engine for rotation (TILER) is a submodule of the DMM (see [Figure 16-1](#)) and is therefore described in [Section 16.2, Dynamic Memory Manager](#).

The TILER is intended to improve bidimensional (tiled) block transfer efficiency. It is, therefore, a module aimed at:

- Primarily, efficient handling of 2-dimension (2D) data mapped in tiles, such as video or graphics macroblocks
- Optionally, managing the memory fragmentation and zero-copy physical frame-buffer swapping through a page-grained translation
- Making isometric (distance preserving) transforms, such as 90-, 180-, or 270-degree rotations, with a horizontal or vertical reflection

The lightweight qualifier of this engine highlights its limited support of isometric transforms, as:

- Rotation performs only basic quadrant rotations by some multiple of 90 degrees.
- Reflection is limited to horizontal and vertical flip.
- Translation is restricted to a 4-KB page granularity.

Written differently, the functionality of the TILER is to map a 2D virtually addressed interconnect request into one or more physically addressed interconnect requests by:

- Transforming the virtual address, data, and byte-enable to match the requested 0-, 90-, 180-, or 270-degree orientation in a tiled 2D addressing space
- Optionally, translating the oriented tiled address by a page-specific vector to manage memory fragmentation and physical object aliasing

16.1.2.1 TILER Features

The main features of the TILER are:

- Efficiency improvement of 2D block access on SDRAMs
- Optimized interlaced access on tiled frames
- 2D virtual-to-physical address translation of SDRAM bidimensional objects to handle rotation
- Page-grained address translation to manage memory fragmentation and physical buffer aliasing
- Unlimited number of 2D tiled objects supported in any (0, 90, 180, or 270 degrees) orientation
- Full bandwidth use by minimizing the size of raster-based initiator buffers
- Optimization of multichannel memory transfers
- Interconnect request granularity balance (in X and Y directions)

16.1.3 EMIF Overview

The extended memory interface (EMIF) module is typically located near the DMM module, as shown in [Figure 16-1](#).

The EMIF provides connectivity between the device and LPDDR2-type memory. It manages data bus read/write accesses between external memories, the microprocessor unit (MPU), and the direct memory access (DMA) controller. It acts as the primary interface between SDRAM and all functional blocks, such as the ARM®, IVA-HD, imaging subsystem (ISS), GFX, and DMA controllers.

16.1.3.1 Main Features

The EMIF has the following capabilities:

- Supports JEDEC standard-compliant LPDDR2-SDRAM (S2 and S4) devices
- 2-GB SDRAM address range over two chip selects (CSs) (configurable with the DMM; see [Section 16.2, Dynamic Memory Manager](#), for more information)
- Supports two independent CSs, with their corresponding register sets, and independent page tracking
- Both CSs must have the same memory type and size.
- Flexible address muxing scheme that permits choosing different bank-mapping allocation by configuring the bank, column, and row-address decoding ordering
- 16- or 32-bit data path to external SDRAM
- Supports LPDDR2 devices with 1, 2, 4, or 8 internal banks
- Supports the following data bus widths:
 - 128-bit level 3 (L3) interconnect data bus width
 - 16- and 32-bit SDRAM data bus width
- Supports the following CAS latencies: 3, 4, 5, 6, 7, and 8
- Supports 256-, 512-, 1024-, and 2048-word page sizes
- Supports the following burst lengths: 8
- Supports sequential burst type
- SDRAM auto-initialization from reset or configuration change
- Supports bank interleaving across both CSs if same memory type
- Supports self-refresh and precharge power-down modes for low power (per CS, manual entry/exit self-refresh, and deep power-down modes)
- Supports deep power-down mode for low power
- Supports partial array self-refresh and temperature-controlled self-refresh modes for low power. Temperature-controlled self-refresh is supported only for mobile SDRAM having an on-chip temperature sensor.
- Supports prioritized refresh
- Programmable SDRAM refresh rate and backlog counter
- Supports ZQ calibration
- Supports temperature monitoring

16.1.4 GPMC Overview

The general-purpose memory controller (GPMC) is an unified memory controller dedicated to interfacing external memory devices:

- Asynchronous SRAM-like memories and application-specific integrated circuit (ASIC) devices
- Asynchronous, synchronous, and page mode (available only in nonmuxed mode) burst NOR flash devices
- NAND flash
- Pseudo-SRAM devices

16.1.4.1 GPMC Features

The GPMC is the external memory controller of the device. The GPMC data access engine provides a flexible programming model for communication with all standard memories. The GPMC supports various accesses:

- Asynchronous read/write access
- Asynchronous read page access (4, 8, and 16 Word16)
- Synchronous read/write access
- Synchronous read/write burst access without wrap capability (4, 8, and 16 Word16)

- Synchronous read/write burst access with wrap capability (4, 8, and 16 Word16)
- Address/data-multiplexed access
- Little- and big-endian access

The GPMC can communicate with a wide range of external devices:

- External asynchronous or synchronous 8-bit wide memory or device (nonburst device)
- External asynchronous or synchronous 16-bit wide memory or device
- External 16-bit nonmultiplexed device with limited address range (2KB)
- External 16-bit address/data-multiplexed NOR flash device
- External 8-bit and 16-bit NAND flash device
- External 16-bit pseudo-SRAM (pSRAM) device

The main features of the GPMC are:

- 8- or 16-bit-wide data path to external memory device
- Supports up to eight CS regions of programmable size and programmable base addresses in a total address space of 1GB
- Supports transactions controlled by a firewall
- On-the-fly error code detection using the Bose-Chaudhuri-Hocquenghem (BCH) ($t = 4, 8, \text{ or } 16$) or Hamming code to improve the reliability of NAND with a minimum effect on software (NAND flash with 512-byte page size or greater)
- Fully pipelined operation for optimal memory bandwidth use
- External device clock provided from the L3 clock divided by 1, 2, 3, or 4
- Supports programmable autoclock gating when no access is detected
- Independent and programmable control signal timing parameters for setup and hold time on a per-chip basis. Parameters are set according to the memory device timing parameters, with a timing granularity of one L3 clock cycle.
- Flexible internal access time control (WAIT state) and flexible handshake mode using external WAIT pin monitoring
- Support bus keeping
- Support bus turnaround
- Prefetch and write posting engine associated with system DMA (sDMA) to achieve full performance from the AND device with minimum effect on NOR/SRAM concurrent access

NOTE: Page mode is available only in nonmultiplexed mode.

16.1.5 ELM Overview

NAND flash memories are dense and nonvolatile, but error-prone. Whenever NAND flash memories are read from, some level of error correction is required. In the case of NAND modules with no internal correction capability, sometimes referred to as bare NAND, the correction process is delegated to the memory controller.

The error location module (ELM) must be used in conjunction with the GPMC. The GPMC probes data read from an external NAND flash and uses them to compute checksum-like information, called syndrome polynomials, on a per-block basis. Each syndrome polynomial gives a status of the read operations for a full block, including 512 bytes of data, parity bits, and an optional spare area data field, with a maximum block size of 1023 bytes. Computation is based on the BCH algorithm. The ELM extracts error addresses from these syndrome polynomials.

Based on the syndrome polynomial value, the ELM can detect errors, compute the number of errors, and give the location of each error bit. The actual data is not required to complete the error correction algorithm. Errors can be reported anywhere in the NAND flash block, including in the parity bits.

The maximum acceptable number of errors that can be corrected depends on a configuration parameter. Error correction levels of 4, 8, and 16 bits are supported. The ELM relies on a static definition of the generator polynomial for each error correction level that corresponds to the generator polynomials defined in the GPMC. A larger number of errors can be detected, but the ELM cannot correct them all. The offending block is then tagged as uncorrectable.

When the error location process completes, an interrupt is triggered to inform a central processing unit (CPU) that its status can be checked. The error locations for the NAND page can be retrieved from the module through register accesses.

16.1.5.1 ELM Features

The ELM features:

- 4, 8, and 16 bits per 512-byte block error location based on BCH algorithm
- Eight simultaneous processing contexts
- Page-based and continuous modes
- Interrupt generation when error location process completes:
 - When the full page has been processed in page mode
 - For each syndrome polynomial in continuous mode

16.1.6 OCM Overview

The on-chip memory (OCM) subsystem consists of the following OCM controllers: one connected to an on-chip ROM (SAR ROM), one connected to an on-chip RAM (SAR RAM), and one connected to an on-chip SRAM (L3 SRAM). Each memory controller has its own dedicated interface to the L3 interconnect.

16.1.6.1 SAR ROM

This on-chip ROM contains 4KB of memory and a linked list of descriptors used by sDMA during the restore context operation (when the device transitions from off to on mode).

The device-embedded SAR ROM has the following characteristics:

- 4-KB ROM
- 32-bit access per cycle
- Support for single- and burst-access transactions

16.1.6.2 SAR RAM

The on-chip SAR RAM contains 8KB and is mapped as four blocks with irregular region sizes. This memory content is preserved when the device goes into off mode (as long as the wake-up voltage domain remains supplied). It is used as context-saving memory to be written by software so that sDMA restores its saved content when the device transitions from off to on mode.

The device-embedded SAR RAM has the following characteristics:

- Support for single-access transactions
 - Operates at full L4-PER interconnect clock frequency
 - 32-bit access per cycle

16.1.6.3 L3 OCM_RAM

The on-chip L3 OCM_RAM contains 56KB of RAM, and partitioning is defined by the L3 firewall logic. The device-embedded L3 OCM_RAM has the following characteristics:

- Support for single and burst access transactions:
 - Operates at full L3 interconnect clock frequency
 - Fully pipelined, one 32-bit access per cycle
- Restricted access support

16.2 Dynamic Memory Manager

16.2.1 DMM Overview

This section describes the dynamic memory manager (DMM) and its tiling and isometric lightweight engine for rotation (TILER) submodule.

The DMM is introduced in [Section 16.1, Memory Subsystem Overview](#) in [Chapter 16, Memory Subsystem](#).

The function of the DMM is to:

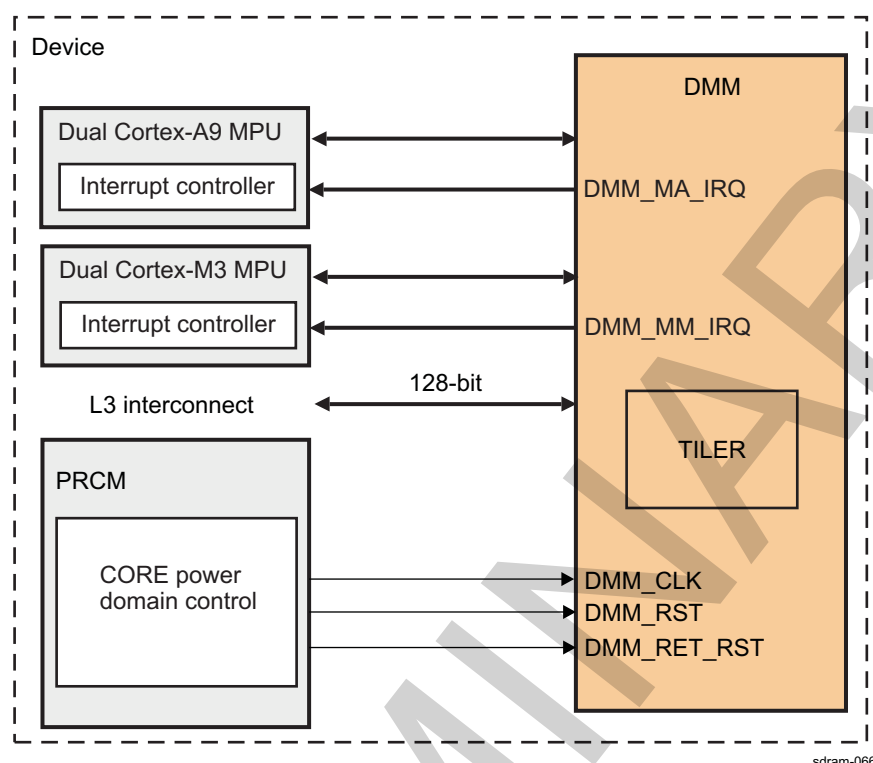
- Add initiator-based priority to any incoming requests
- Perform to-and-from tiling conversions of tiled requests
- Make on-the-fly basic transforms, such as quadrant rotations and mirroring
- Optionally provide a low-latency page-based translation to handle memory fragmentation – memory management unit (MMU)
- Distribute the traffic on all attached memory controllers according to the interleaving configuration

The TILER is also introduced in [Section 16.1, Memory Subsystem Overview](#) in [Chapter 16, Memory Subsystem](#).

The functions of the TILER are:

- Primary handling efficiently 2-dimensional (2D) data mapped in tiles, such as video or graphics macroblocks
- Optionally managing the memory fragmentation and zero-copy physical frame buffers swapping through a page-grained translation
- Allowing optimized interlaced accesses on tiled frames
- Making (distance preserving) transforms, such as 90-, 180-, or 270-degree rotations, with a horizontal or vertical reflection
- Interleaving the memory accesses among the two memory controllers (also called EMIF). For more information, see [Section 16.3, EMIF Controller](#).

[Figure 16-2](#) is an overview of the DMM and TILER in the device.

Figure 16-2. DMM and Tiler Overview

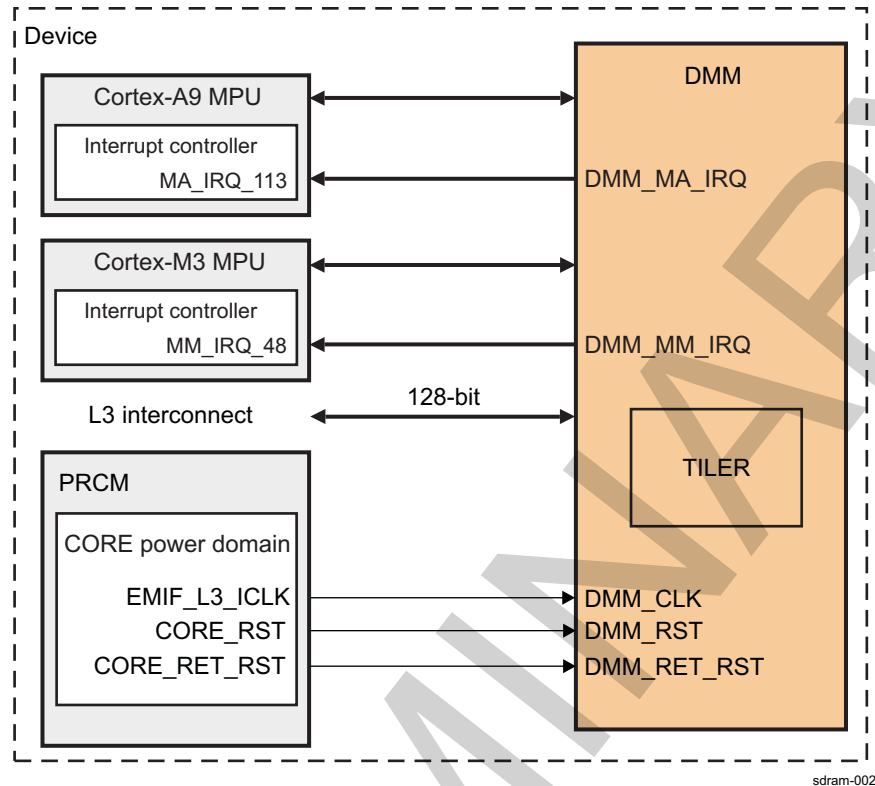
16.2.2 DMM Integration

This section describes module integration in the device, including information about clocks, resets, and hardware requests.

- IDLE hardware handshake (the DMM supports only smart-idle mode)
- No STANDBY hardware handshake
- No wake-up request
- No system direct memory access (sDMA) requests
- One interrupt line for interrupt request (IRQ)
- One functional clock

Figure 16-3 shows the integration of DMM in the device.

Figure 16-3. DMM Integration



NOTE: For more information about the IDLE hardware handshake, see [Chapter 3, Power, Reset, and Clock Management](#).

Table 16-1 through Table 16-3 summarize the integration of DMM in the device.

Table 16-1. DMM Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| DMM | PD_CORE | No | N/A |

Table 16-2. DMM Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|---|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| DMM | DMM_CLK | EMIF_L3_ICLK | PRCM | DMM interface and functional clock. For information about power, reset, and clock management (PRCM) module clock gating and management, see Chapter 3, Power, Reset, and Clock Management . |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| DMM | DMM_RST | CORE_RST | PRCM | Functional reset. For information about PRCM reset sources and distribution, see Chapter 3, Power, Reset, and Clock Management . |
| DMM | DMM_RET_RST | CORE_RET_RST | PRCM | Reset for retention flip-flop (RFF) registers, namely: DMM_SYSCONFIG |

Table 16-2. DMM Clocks and Resets (continued)

| |
|--|
| DMM_LISA_LOCK |
| DMM_LISA_MAP_i |
| DMM_TILER_OR0 |
| DMM_TILER_OR1 |
| DMM_PAT_VIEW0 |
| DMM_PAT_VIEW1 |
| DMM_PAT_VIEW_MAP_i |
| DMM_PAT_VIEW_MAP_BASE |
| DMM_PAT_DESCR_i |
| DMM_PAT_AREA_i |
| DMM_PAT_CTRL_i |
| DMM_PAT_DATA_i |
| DMM_PEG_PRIO_k |
| DMM_PEG_PRIO_PAT |
| For information about PRCM reset sources and distribution, see Chapter 3, Power, Reset, and Clock Management . |

Table 16-3. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|---------------------|---|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| DMM | DMM_MA_IRQ | MA_IRQ_113 | Dual Cortex™-A9 MPU | DMM interrupt to the dual Cortex-A9 MPU subsystem |
| DMM | DMM_MM_IRQ | MM_IRQ_48 | Dual Cortex™-M3 MPU | DMM interrupt to the dual Cortex-M3 MPU subsystem |
| No DMA Requests | | | | |

16.2.2.1 DMM Configuration

[Table 16-4](#) lists all configured parameters for the DMM. These parameters are read-only.

Table 16-4. DMM TILER Container Geometry

| Scope | Bit field | Configuration Value | Description |
|-------|---|---------------------|---|
| LISA | DMM_HWINFO[3:0] TILER_CNT | 0x2 | Two TILER instances in the DMM |
| | DMM_HWINFO[19:16] ROBIN_CNT | 0x2 | Two ROBIN instances in the DMM |
| | DMM_LISA_HWINFO[4:0] SECTION_CNT | 0x2 | Two DMM sections |
| | DMM_LISA_HWINFO[11:8] SDRG_CNT | 0x2 | Two SDRAM controllers (EMIF) attached |
| TILER | DMM_TILER_HWINFO[6:0] OR_CNT | 0x10 | 16 orientation entries |
| PAT | DMM_PAT_GEOMETRY[4:0] PAGE_SZ | 0x0C | 4-KB page granularity |
| | DMM_PAT_GEOMETRY[19:16] CONT_WDTH | 0x8 | Container width of 256 pages |
| | DMM_PAT_GEOMETRY[26:24] CONT_HGHT | 0x7 | Container height of 128 pages |
| | DMM_PAT_GEOMETRY[13:8] ADDR_RANGE | 0x10 | 2-GiB PAT output physical address range |
| | DMM_PAT_HWINFO[6:0] VIEW_CNT | 0x10 | 16 view entries |
| | DMM_PAT_HWINFO[11:8] VIEW_MAP_CNT | 0x4 | Four view maps |
| | DMM_PAT_HWINFO[20:16] LUT_CNT | 0x1 | One PAT LUT |
| | DMM_PAT_HWINFO[28:24] ENGINE_CNT | 0x2 | Two PAT refill engines |

Table 16-4. DMM TILER Container Geometry (continued)

| Scope | Bit field | Configurat ion Value | Description |
|-------|---|-------------------------|---------------------|
| PEG | DMM_PEG_HWINFO [6:0] PRIO_CNT | 0x10 | 16 priority entries |

16.2.3 DMM Functional Description

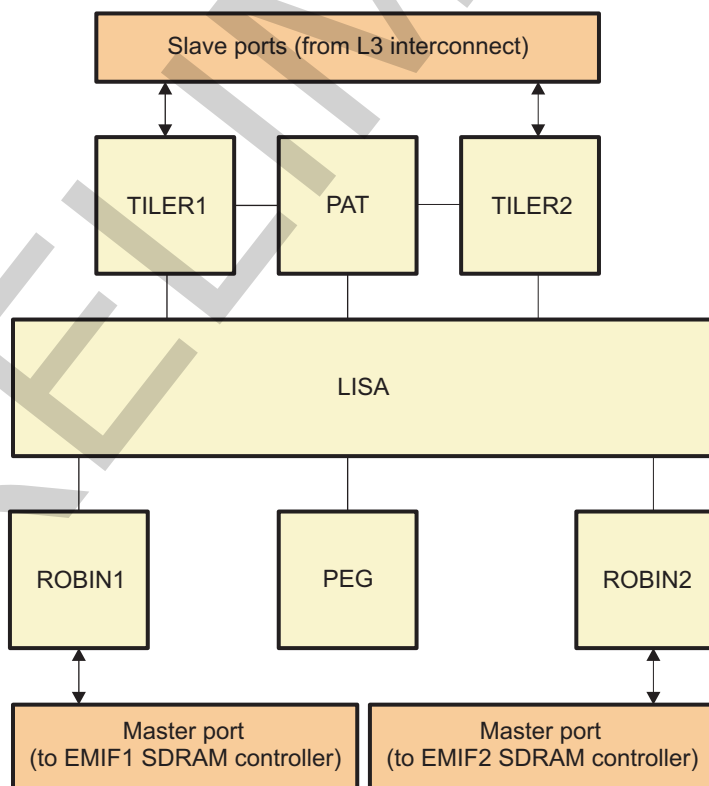
16.2.3.1 DMM Block Diagram

Figure 16-4 shows the DMM macro architecture. The DMM consists of six blocks:

- Two TILERS, each with its own interconnect slave port for converting requests back and forth between the input virtual addressing mode and the output physical tiled addressing mode. The tiling conversions of requests, write data, and responses is performed entirely in the TILER blocks.
- Two reordering buffer and initiator nodes (ROBINs), each with its own interconnect master port to initiate requests to the SDRC and allow tiled data, tiled response, and split response reconstruction. The ROBIN block manages only the reordering buffer and performs data reordering due to the orientation.
- A physical address translator (PAT) for managing the memory fragmentation
- A priority extension generator (PEG) to generate priorities required by the SDRC; these priorities are not used in the DMM.
- A local interconnect and synchronization agent (LISA) to synchronize all DMM subsystems and provide access to their configuration registers

Figure 16-4 is a block diagram of the DMM.

Figure 16-4. DMM Block Diagram



sdram-003

CAUTION

The interconnect must ensure that virtually addressed requests target only a TILER port.

16.2.3.2 DMM Clock Configuration

Table 16-5 describes the DMM clocks.

Table 16-5. DMM Clocks

| Signal | I/O ⁽¹⁾ | Description |
|---------|--------------------|--------------------------------|
| DMM_CLK | I | Functional and interface clock |

⁽¹⁾ I = Input; O = Output

The DMM is concerned with SDRC management and is in the MEMIF clock domain among the SDRCs. The DMM is a fully synchronous module, which uses the clock and clock-enable signals provided in the MEMIF clock domain to generate its interface and functional clocks.

To configure DMM_CLK control and settings, see Table 16-2.

16.2.3.3 DMM Power Management

DMM power is supplied by the CORE power domain, and DMM power management complies with system power-management guidelines.

Table 16-6 describes the power-management features available for the DMM module.

Table 16-6. DMM Local Power-Management Features

| Feature | Registers | Description |
|------------------------|---|--|
| Clock auto gating | N/A | Feature not available |
| Slave idle modes | DMM_SYSCONFIG[3:2] SIDLEMODE bit field | Only smart-idle wake-up mode is available. |
| Clock activity | N/A | Feature not available |
| Master standby modes | N/A | Feature not available |
| Global wake-up enable | N/A | Feature not available |
| Wake-up sources enable | N/A | Feature not available |

Some of the DMM module registers are affected by the save-and-restore (SAR) mechanism. For more information about SAR, see Chapter 3, *Power, Reset, and Clock Management*.

16.2.3.4 DMM Interrupt Requests

Errors in PAT area refill registers are reported through the DMM_PAT_STATUS_i[15:10] ERROR bit field (see Table 16-7).

Table 16-7. DMM Hardware Status Features

| Feature | Type | Register | Description |
|-----------------|-----------|---|--|
| PAT error flags | Read-only | DMM_PAT_STATUS_i[15:10] ERROR (i = 0 to 3) | Unexpected update of the PAT area refill registers |

Table 16-8 lists the event flags, and their masks, that can cause module interrupts.

Table 16-8. Events

| Interrupt | Event Flag | Event Mask |
|---------------|--|--|
| ERR_LUT_MISS3 | DMM_PAT_IRQSTATUS[31] EVENT0 DMM_PAT_IRQSTATUS_RAW[31] EVENT0 | DMM_PAT_IRQENABLE_SET[31] EVENT0 DMM_PAT_IRQENABLE_CLR[31] EVENT0 |
| ERR_UPD_DATA3 | DMM_PAT_IRQSTATUS[30] EVENT0 DMM_PAT_IRQSTATUS_RAW[30] EVENT0 | DMM_PAT_IRQENABLE_SET[30] EVENT0 DMM_PAT_IRQENABLE_CLR[30] EVENT0 |
| ERR_UPD_CTRL3 | DMM_PAT_IRQSTATUS[29] EVENT0 DMM_PAT_IRQSTATUS_RAW[29] EVENT0 | DMM_PAT_IRQENABLE_SET[29] EVENT0 DMM_PAT_IRQENABLE_CLR[29] EVENT0 |
| ERR_UPD_AREA3 | DMM_PAT_IRQSTATUS[28] EVENT0 DMM_PAT_IRQSTATUS_RAW[28] EVENT0 | DMM_PAT_IRQENABLE_SET[28] EVENT0 DMM_PAT_IRQENABLE_CLR[28] EVENT0 |
| ERR_INV_DATA3 | DMM_PAT_IRQSTATUS[27] EVENT0 DMM_PAT_IRQSTATUS_RAW[27] EVENT0 | DMM_PAT_IRQENABLE_SET[27] EVENT0 DMM_PAT_IRQENABLE_CLR[27] EVENT0 |
| ERR_INV_DSC3 | DMM_PAT_IRQSTATUS[26] EVENT0 DMM_PAT_IRQSTATUS_RAW[26] EVENT0 | DMM_PAT_IRQENABLE_SET[26] EVENT0 DMM_PAT_IRQENABLE_CLR[26] EVENT0 |
| FILL_LST3 | DMM_PAT_IRQSTATUS[25] EVENT0 DMM_PAT_IRQSTATUS_RAW[25] EVENT0 | DMM_PAT_IRQENABLE_SET[25] EVENT0 DMM_PAT_IRQENABLE_CLR[25] EVENT0 |
| FILL_DSC3 | DMM_PAT_IRQSTATUS[24] EVENT0 DMM_PAT_IRQSTATUS_RAW[24] EVENT0 | DMM_PAT_IRQENABLE_SET[24] EVENT0 DMM_PAT_IRQENABLE_CLR[24] EVENT0 |
| ERR_LUT_MISS2 | DMM_PAT_IRQSTATUS[23] EVENT0 DMM_PAT_IRQSTATUS_RAW[23] EVENT0 | DMM_PAT_IRQENABLE_SET[23] EVENT0 DMM_PAT_IRQENABLE_CLR[23] EVENT0 |
| ERR_UPD_DATA2 | DMM_PAT_IRQSTATUS[22] EVENT0 DMM_PAT_IRQSTATUS_RAW[22] EVENT0 | DMM_PAT_IRQENABLE_SET[22] EVENT0 DMM_PAT_IRQENABLE_CLR[22] EVENT0 |
| ERR_UPD_CTRL2 | DMM_PAT_IRQSTATUS[21] EVENT0 DMM_PAT_IRQSTATUS_RAW[21] EVENT0 | DMM_PAT_IRQENABLE_SET[21] EVENT0 DMM_PAT_IRQENABLE_CLR[21] EVENT0 |
| ERR_UPD_AREA2 | DMM_PAT_IRQSTATUS[20] EVENT0 DMM_PAT_IRQSTATUS_RAW[20] EVENT0 | DMM_PAT_IRQENABLE_SET[20] EVENT0 DMM_PAT_IRQENABLE_CLR[20] EVENT0 |
| ERR_INV_DATA2 | DMM_PAT_IRQSTATUS[19] EVENT0 DMM_PAT_IRQSTATUS_RAW[19] EVENT0 | DMM_PAT_IRQENABLE_SET[19] EVENT0 DMM_PAT_IRQENABLE_CLR[19] EVENT0 |
| ERR_INV_DSC2 | DMM_PAT_IRQSTATUS[18] EVENT0 DMM_PAT_IRQSTATUS_RAW[18] EVENT0 | DMM_PAT_IRQENABLE_SET[18] EVENT0 DMM_PAT_IRQENABLE_CLR[18] EVENT0 |
| FILL_LST2 | DMM_PAT_IRQSTATUS[17] EVENT0 DMM_PAT_IRQSTATUS_RAW[17] EVENT0 | DMM_PAT_IRQENABLE_SET[17] EVENT0 DMM_PAT_IRQENABLE_CLR[17] EVENT0 |
| FILL_DSC2 | DMM_PAT_IRQSTATUS[16] EVENT0 DMM_PAT_IRQSTATUS_RAW[16] EVENT0 | DMM_PAT_IRQENABLE_SET[16] EVENT0 DMM_PAT_IRQENABLE_CLR[16] EVENT0 |
| ERR_LUT_MISS1 | DMM_PAT_IRQSTATUS[15] EVENT0 DMM_PAT_IRQSTATUS_RAW[15] EVENT0 | DMM_PAT_IRQENABLE_SET[15] EVENT0 DMM_PAT_IRQENABLE_CLR[15] EVENT0 |
| ERR_UPD_DATA1 | DMM_PAT_IRQSTATUS[14] EVENT0 DMM_PAT_IRQSTATUS_RAW[14] EVENT0 | DMM_PAT_IRQENABLE_SET[14] EVENT0 DMM_PAT_IRQENABLE_CLR[14] EVENT0 |
| ERR_UPD_CTRL1 | DMM_PAT_IRQSTATUS[13] EVENT0 DMM_PAT_IRQSTATUS_RAW[13] EVENT0 | DMM_PAT_IRQENABLE_SET[13] EVENT0 DMM_PAT_IRQENABLE_CLR[13] EVENT0 |
| ERR_UPD_AREA1 | DMM_PAT_IRQSTATUS[12] EVENT0 DMM_PAT_IRQSTATUS_RAW[12] EVENT0 | DMM_PAT_IRQENABLE_SET[12] EVENT0 DMM_PAT_IRQENABLE_CLR[12] EVENT0 |
| ERR_INV_DATA1 | DMM_PAT_IRQSTATUS[11] EVENT0 DMM_PAT_IRQSTATUS_RAW[11] EVENT0 | DMM_PAT_IRQENABLE_SET[11] EVENT0 DMM_PAT_IRQENABLE_CLR[11] EVENT0 |
| ERR_INV_DSC1 | DMM_PAT_IRQSTATUS[10] EVENT0 DMM_PAT_IRQSTATUS_RAW[10] EVENT0 | DMM_PAT_IRQENABLE_SET[10] EVENT0 DMM_PAT_IRQENABLE_CLR[10] EVENT0 |
| FILL_LST1 | DMM_PAT_IRQSTATUS[9] EVENT0 DMM_PAT_IRQSTATUS_RAW[9] EVENT0 | DMM_PAT_IRQENABLE_SET[9] EVENT0 DMM_PAT_IRQENABLE_CLR[9] EVENT0 |
| FILL_DSC1 | DMM_PAT_IRQSTATUS[8] EVENT0 DMM_PAT_IRQSTATUS_RAW[8] EVENT0 | DMM_PAT_IRQENABLE_SET[8] EVENT0 DMM_PAT_IRQENABLE_CLR[8] EVENT0 |
| ERR_LUT_MISS0 | DMM_PAT_IRQSTATUS[7] EVENT0 DMM_PAT_IRQSTATUS_RAW[7] EVENT0 | DMM_PAT_IRQENABLE_SET[7] EVENT0 DMM_PAT_IRQENABLE_CLR[7] EVENT0 |
| ERR_UPD_DATA0 | DMM_PAT_IRQSTATUS[6] EVENT0 DMM_PAT_IRQSTATUS_RAW[6] EVENT0 | DMM_PAT_IRQENABLE_SET[6] EVENT0 DMM_PAT_IRQENABLE_CLR[6] EVENT0 |
| ERR_UPD_CTRL0 | DMM_PAT_IRQSTATUS[5] EVENT0 DMM_PAT_IRQSTATUS_RAW[5] EVENT0 | DMM_PAT_IRQENABLE_SET[5] EVENT0 DMM_PAT_IRQENABLE_CLR[5] EVENT0 |
| ERR_UPD_AREA0 | DMM_PAT_IRQSTATUS[4] EVENT0 DMM_PAT_IRQSTATUS_RAW[4] EVENT0 | DMM_PAT_IRQENABLE_SET[4] EVENT0 DMM_PAT_IRQENABLE_CLR[4] EVENT0 |

Table 16-8. Events (continued)

| Interrupt | Event Flag | Event Mask |
|---------------|--|--|
| ERR_INV_DATA0 | DMM_PAT_IRQSTATUS[3] EVENT0 DMM_PAT_IRQSTATUS_RAW[3] EVENT0 | DMM_PAT_IRQENABLE_SET[3] EVENT0 DMM_PAT_IRQENABLE_CLR[3] EVENT0 |
| ERR_INV_DSC0 | DMM_PAT_IRQSTATUS[2] EVENT0 DMM_PAT_IRQSTATUS_RAW[2] EVENT0 | DMM_PAT_IRQENABLE_SET[2] EVENT0 DMM_PAT_IRQENABLE_CLR[2] EVENT0 |
| FILL_LST0 | DMM_PAT_IRQSTATUS[1] EVENT0 DMM_PAT_IRQSTATUS_RAW[1] EVENT0 | DMM_PAT_IRQENABLE_SET[1] EVENT0 DMM_PAT_IRQENABLE_CLR[1] EVENT0 |
| FILL_DSC0 | DMM_PAT_IRQSTATUS[0] EVENT0 DMM_PAT_IRQSTATUS_RAW[0] EVENT0 | DMM_PAT_IRQENABLE_SET[0] EVENT0 DMM_PAT_IRQENABLE_CLR[0] EVENT0 |

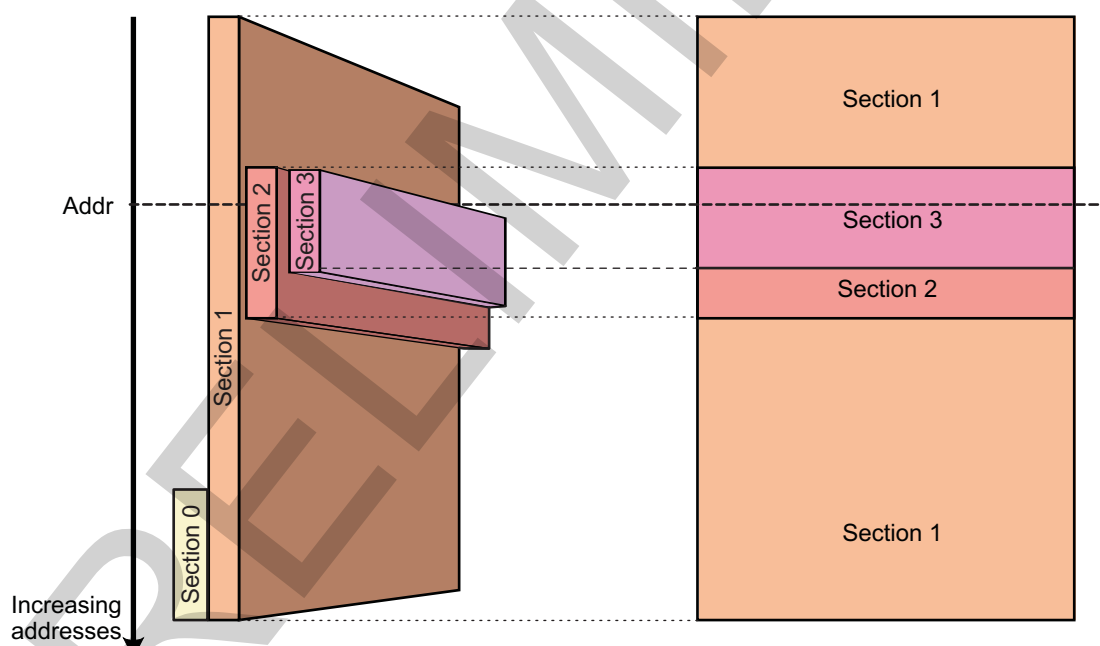
16.2.3.5 DMM

16.2.3.5.1 DMM Concepts

The DMM introduces the concepts of dynamic mapping and DMM atomic units.

16.2.3.5.1.1 Dynamic Mapping

The DMM manages its internal memory space as an ordered set of up to four sections. [Figure 16-5](#) shows the DMM sections and memory mapping.

Figure 16-5. DMM Sections and Memory Mapping

sdram_004

In the DMM, a section is:

- A segment of 16MiB to 2GiB, which is power-of-two in size and aligned to that size in the system map
- An area with a constant interleaving scheme: constant interleaving granularity on a constant set of SDR (EMIF) targets
- Given a priority equal to its index: the higher the index, the higher the priority

NOTE: Whenever a request hits more than one DMM section, it follows the interleaving scheme of the section having the highest index.

The interleaving configuration of the DMM, its section-based dynamic memory mapping, is shown on the right in [Figure 16-5](#). In this example, a request at the system address Addr follows the interleaving scheme of section 3, although it hits sections 1, 2, and 3. Similarly, the DMM configuration given in this example prevents any request from using the interleaving scheme of section 0, because section 0 is fully masked by section 1, which has a higher priority.

Each of the four sections is configured through a [DMM_LISA_MAP_i](#) register, where $i = 0$ to 3.

NOTE: The DMM and SDRC registers ([Table 16-88](#) and EMIF registers; see [EMIF Controller](#)) are declared in two extra static DMM sections of the highest priority so that they cannot be masked by any standard programmable DMM section.

NOTE: The DMM atomic size is:

- 1kiB in noninterleaved sections
- Equal to the interleaving granularity (128, 256, or 512 bytes) in interleaved sections

16.2.3.5.1.2 Address Mapping

The address mapping inside the DMM is configurable through up to four sections. A DMM section description fits in a single register ([DMM_LISA_MAP_i](#)). Each section is defined based on:

- Its system address: The base address of the decoding range for the section
- Its size: The encoding is the number of bits used in the upper 8 bits of the incoming system address
- Its physical address: The base address of the memory range access in the external memory controller
- Its address space: The address space used on the external (for the DMM) memory controller when hitting this section. For details, see [Section 16.3.4.1.1, L3 Interface](#).
- The target memory controller. A section may hit a single or pair of controllers.
- Its interleaving definition

The address decoding is priority-based. In case of overlapping sections, only the highest-order one is hit. Register memory spaces have priority over regular memory sections. In case of four sections, the priority order is therefore:

1. Registers
2. [DMM_LISA_MAP_3](#)
3. [DMM_LISA_MAP_2](#)
4. [DMM_LISA_MAP_1](#)
5. [DMM_LISA_MAP_0](#)

All register-related addresses are reserved and fixed in the overall address mapping:

- DMM registers: 0x4E00_0000 to 0x4FFF_FFFF
- EMIF1 registers: 0x4C00_0000 to 0x4CFF_FFFF
- EMIF2 registers: 0x4D00_0000 to 0x4DFF_FFFF

There is no overlapping between register sections.

NOTE: Section decoding happens after PAT address translation in the case of TILER. In non-bypass mode, the system address considered for TILER accesses is the virtual address computed based on the PAT translation tables.

The [DMM_LISA_LOCK](#) register is used to lock the configuration once set. If written to 1, the LOCK bit prevents further writes to all [DMM_LISA_MAP_i](#) registers. The LOCK bit cannot be written back to 0. A reset is required to reprogram the sections.

16.2.3.5.1.3 Address Translation

The PAT engine of the DMM is composed of a 32-k entry physical address translation vector table and one or two refill engines. The refill engine is a specialized DMA for refilling the content of the PAT table.

The address translation mechanism is available only when the incoming request hits a page mode or tiled mode container; that is, when the incoming address targets the TILER or its aliased view in the system addressing space. Otherwise, the PAT logic is bypassed so that the resulting physical address corresponds to the input address.

The PAT engine supports multiple address translation schemes, called views, which can be bound to one or more initiators through a view mapping mechanism.

16.2.3.5.1.3.1 PAT View Mappings

The PAT engine can have up to 16 groups of initiators that share a set of four PAT views. The connection from an initiator to a PAT view is made through the DMM_PAT_VIEW register. Given that each PAT view index is coded on 4 bits, the DMM_PAT_VIEW register is a 64-bit register split into two 32-bit registers ([DMM_PAT_VIEW0](#) for the first eight PAT view indexes and [DMM_PAT_VIEW1](#) for the last eight PAT view indexes).

The PAT view index that corresponds to the initiator having the value *i* as the 4 most-significant bits (MSBs) of its L3 ConnID uses the view referenced in entry *i* of the DMM_PAT_VIEW. For example, the initiator 0xC4 uses the thirteenth view index of the DMM_PAT_VIEW register, the fifth view index in the [DMM_PAT_VIEW1](#) register.

The PAT view index of the initiator *i* is found in the Vi field. The Wi field is aimed at writing the corresponding Vi. When writing to the DMM_PAT_VIEW registers, the only Vi view indexes that are updated are those having their corresponding Wi bit, and byte enable, set. The Wi bits are always read as 0. For instance, to set the PAT view indexes V3 and V7 to 2 and 1, respectively, the [DMM_PAT_VIEW0](#) register must be written with 5000 6000h.

16.2.3.5.1.3.2 PAT View Map Base Address

The PAT view map base address defines the base address of all PAT translated addresses.

Bit [31] of all PAT translated addresses is set to BASE_ADDR. For example, if the [DMM_PAT_VIEW_MAP_BASE](#) register is set to 8000 0000h, all PAT translated addresses will have bit [31] set to 1 so that the translated addresses range from 8000 0000h to FFFF FFFFh. All reserved bits of this DMM PAT base address register are read to 0.

16.2.3.5.1.3.3 PAT Views

A PAT view defines the kind of physical address translation to perform for each mode accesses (page, 8-bit, 16-bit and 32-bit). Each mode of each PAT view can be configured to use a container-grained translation or page-mode translation.

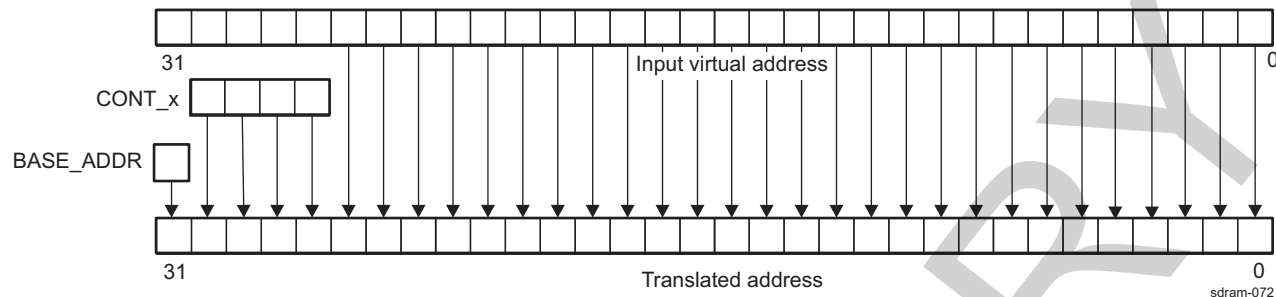
16.2.3.5.1.3.3.1 PAT Direct Access Translation

The container-grained translation is named the direct access. In this mode, the translation vector is given directly by the CONT_x bit field that corresponds to the accessed mode.

- A page mode access uses the vector contained in the [DMM_PAT_VIEW_MAP_i](#)[27:24] CONT_PAGE bit field.
- A 32-bit mode access uses the vector contained in the [DMM_PAT_VIEW_MAP_i](#)[19:16] CONT_32 bit field.
- A 16-bit mode access uses the vector contained in the [DMM_PAT_VIEW_MAP_i](#)[11:8] CONT_16 bit field.
- An 8-bit mode access uses the vector contained in the [DMM_PAT_VIEW_MAP_i](#)[3:0] CONT_8 bit field.

See [Figure 16-6](#).

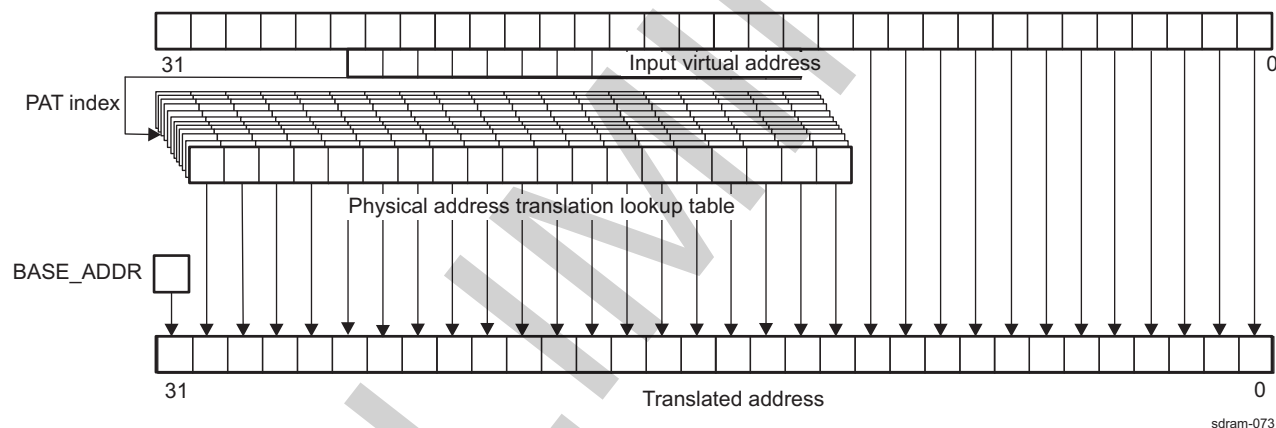
Figure 16-6. PAT Direct Access Translation



16.2.3.5.1.3.3.2 PAT Indirect Access Translation

The page-grained translation is named the indirect access. In this mode the translation vector is found in the internal 32-k entry physical address translation vector table at the index given by bits [26:12] of the input virtual address, and the [DMM_PAT_VIEW_MAP_i](#) CONT_x bit field references the internal physical address translation table to use. Because the DMM uses only one such table, in this mode the CONT_x bit field must be written as 0. See [Figure 16-7](#).

Figure 16-7. PAT Indirect Access Translation



Each entry of the PAT lookup table (LUT) is a 19-bit vector that replaces bits [30:12] of the input virtual address. The PAT index aimed at selecting the vector in the table consists of bits [26:12] of the input virtual address.

16.2.3.5.1.3.3.3 PAT View Configuration

There are four different views in a DMM, each with its own [DMM_PAT_VIEW_MAP_i](#) register for defining the kind of address translation to perform.

The PAT view type of each mode is selected by the ACCESS_x bit field in the [DMM_PAT_VIEW_MAP_i](#) register, i being the index of the considered view. When this field is set to 1, the indirect access scheme is used; otherwise, the PAT performs the address translation in a direct way with the corresponding CONT_x vector.

When configuring a mode in a view to use the indirect access, the corresponding CONT_x bit field must be filled with 0.

16.2.3.5.1.3.3.4 PAT Address Translation LUT

The PAT LUT has the same geometry as the DMM container. It has 128 lines of 256 entries of 19-bit each. See [Figure 16-8](#).

Figure 16-8. Physical Address Translation Table

| | | | | | | | | | |
|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|---------------|---------------|
| $E_{0,0}$ | $E_{1,0}$ | $E_{2,0}$ | $E_{3,0}$ | $E_{4,0}$ | $E_{251,0}$ | $E_{252,0}$ | $E_{253,0}$ | $E_{254,0}$ | $E_{255,0}$ |
| $E_{0,1}$ | $E_{1,1}$ | $E_{2,1}$ | $E_{3,1}$ | $E_{4,1}$ | $E_{251,1}$ | $E_{252,1}$ | $E_{253,1}$ | $E_{254,1}$ | $E_{255,1}$ |
| $E_{0,2}$ | $E_{1,2}$ | $E_{2,2}$ | $E_{3,2}$ | $E_{4,2}$ | $E_{251,2}$ | $E_{252,2}$ | $E_{253,2}$ | $E_{254,2}$ | $E_{255,2}$ |
| $E_{0,125}$ | $E_{1,125}$ | $E_{2,125}$ | $E_{3,125}$ | $E_{4,125}$ | $E_{251,125}$ | $E_{252,125}$ | $E_{253,125}$ | $E_{254,125}$ | $E_{255,125}$ |
| $E_{0,126}$ | $E_{1,126}$ | $E_{2,126}$ | $E_{3,126}$ | $E_{4,126}$ | $E_{251,126}$ | $E_{252,126}$ | $E_{253,126}$ | $E_{254,126}$ | $E_{255,126}$ |
| $E_{0,127}$ | $E_{1,127}$ | $E_{2,127}$ | $E_{3,127}$ | $E_{4,127}$ | $E_{251,127}$ | $E_{252,127}$ | $E_{253,127}$ | $E_{254,127}$ | $E_{255,127}$ |

$E_{x,y}$ 4-KB page entry

sdram-074

Each entry of the PAT address corresponds to the page in the DMM container that has the same location. The entry (74, 42) in the table corresponds to the page (74, 42) in any DMM container.

16.2.3.5.1.3.3.5 Direct Access to the PAT Table Vectors

The PAT table is typically refilled with specialized DMA called refill engines. Some direct read and write access to the content of this table is granted when disabling the use of one or the other refill engine by writing 1 in the MODE*i* field of the [DMM_PAT_CONFIG](#) register that corresponds to the refill engine *i* to disable.

In this mode, often called the debug mode, the data read in or written to the [DMM_PAT_DATA_i](#) register corresponds to the vector in the PAT table, whose index is in the X0 and Y0 fields of the [DMM_PAT_AREA_i](#) register.

16.2.3.5.1.3.3.6 Automatic Refill Through the Refill Engines

See [Section 16.2.4.1](#), PAT Use Cases.

16.2.3.5.2 DMM Transaction Flows

16.2.3.5.2.1 Nontiled Transaction Flow

Each nontiled interconnect transaction that reaches the DMM on a TILER port is subject to the same processing.

The TILER blocks consider separated request, data, and response paths. An overview of each path follows and more detailed information is in [Section 16.2.3.5.3](#), DMM Internal Macro-Architecture.

On the request path, the flow consists of:

- Allocating a TILER response context for the timely generation of the appropriate responses
- Splitting 2D requests in a collection of 1D requests – TILER ports
- Splitting requests at DMM unit boundaries; the split granularity is provided by the LISA mapping registers
- Allocating an available buffer in the appropriate ROBIN, for both read and write requests
- In case of a write request, allocating and updating a TILER write context to direct the incoming write data into the relevant reordering buffer

- Generating the initiator-indexed priority extension by use of the PEG block

On the write data path, the flow consists of forwarding incoming data to the relevant reordering buffer in accordance with the corresponding TILER write context.

On the response path, responses are returned when:

- At least one response has entered each related buffer, in case of read requests
- All related responses have returned from the SDRC, in case of write requests
- AND no other previous pending response with the same tag exists

16.2.3.5.2.2 Tiled Transaction Flow

Similarly, each tiled interconnect transaction that reaches the DMM is subject to the same processing.

The TILER blocks consider separated request, data, and response paths. An overview of each path follows, and more detailed information is in [Section 16.2.3.5.3, DMM Internal Macro-Architecture](#).

On the request path, the processing phase consists of:

- Decoding the address to qualify whether the request targets the TILER or the memory directly
- Transforming TILER-specific requests to their natural representation; the address, width, and height are modified accordingly

On the request path, the generation phase consists of:

- Allocating a TILER response context for the timely generation of the appropriate responses
- Splitting malformed: The request stride differs from the container stride and from the double of this container stride – tiled 2D requests in a collection of 1D requests
- Splitting tiled requests at tile boundaries
- Performing the page-based address translation by use of the PAT block
- Allocating an available buffer in the appropriate ROBIN, for read and write requests
- In case of a write request, allocating and updating a TILER write context to direct the incoming write data into the relevant reordering buffer
- Generating the initiator-indexed priority extension by use of the PEG block

On the data path, any incoming data is transformed in accordance with the corresponding TILER write context and sent to the appropriate reordering buffer.

On the response path, responses are returned when:

- A minimal number of responses have entered the corresponding buffers, in case of read requests
- All related responses have returned from the SDRCs, in case of write requests
- No other previous pending response with the same tag exists

16.2.3.5.3 DMM Internal Macro-Architecture

This section describes the DMM internal macro-architecture, specifically:

- Input request decoding
- PAT and synchronized translation table reloading
- Output request and response generation
- Memory mapping in the system addressing space, including interleaving
- Tag management
- Priority handling
- Contexts
- Maximum allowed burst size
- Reconstruction buffer dimensioning

16.2.3.5.3.1 LISA Description

The LISA is a full crossbar aimed at setting priorities, managing tag, and mapping memory.

The interconnect routes are:

- TILER requests on the ROBIN initiator nodes
- TILER write data on the ROBIN write buffers
- ROBIN read data to the relevant TILER initiators

The LISA block registers are [DMM_LISA_MAP_i](#) (where $i = 0$ to 3) and [DMM_LISA_LOCK](#).

When two ROBINS are in use, the two ports are interleaved at a programmable boundary from 128 bytes or more (configurable with the [DMM_LISA_MAP_i\[19:18\]](#) SDRG_INTL bit field).

16.2.3.5.3.2 PAT Description

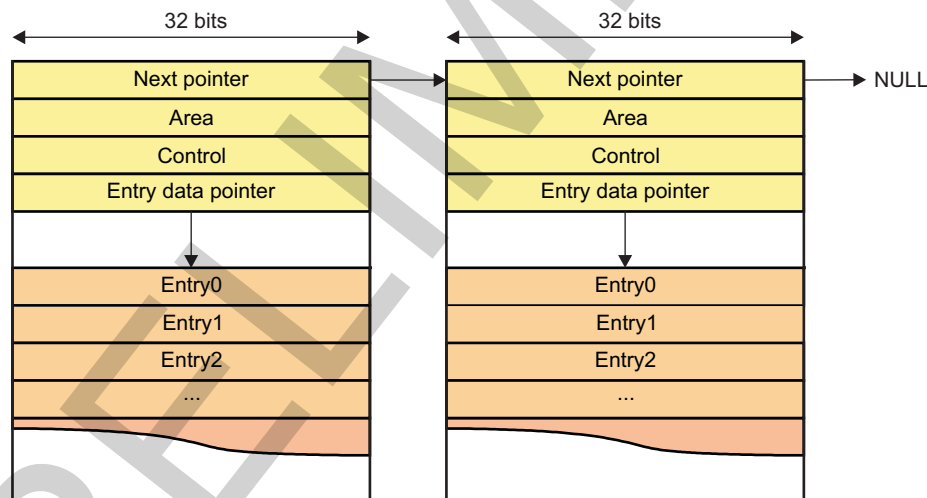
The PAT block maps physical pages to each TILER container page. The internal address translation memories used in the PAT block are designed with RFFs. It consists of:

- A memory-based LUT which has the same geometry as the container pages
- A refill engine for modifying entries in a given area of the internal LUT

A PAT descriptor is a singly-linked list node (see [Figure 16-9](#)) that contains:

- A description of the LUT area to reload
- A description of how to reload the defined LUT area
- A pointer to the location where the corresponding LUT entries are stored

Figure 16-9. PAT Descriptors



sdram-065

PAT descriptors are chained and processed until a NULL pointer is encountered. The PAT bank allocation scheme allows the updating of four consecutive entries of a line in a single cycle regardless of the refilling orientation.

The PAT descriptor structure directly maps the following registers (where $i = 0$ to 3):

- [DMM_PAT_DESCR_i](#)
- [DMM_PAT_AREA_i](#)
- [DMM_PAT_CTRL_i](#)
- [DMM_PAT_DATA_i](#)

The PAT refill engine can be started by:

- Filling manually all the necessary registers:
 - [DMM_PAT_AREA_i](#) with the $(x0, y0) (x1, y1)$ area definition

- [DMM_PAT_DATA_i](#) with the physical address of the corresponding area entry table
- [DMM_PAT_CTRL_i](#)[6:4] DIRECTION bit field with the relevant (S, Y, X) direction of the area refill
- [DMM_PAT_CTRL_i](#)[0] START bit with 1
- Writing the physical address of a memory-mapped PAT descriptor in [DMM_PAT_DESCR_i](#), which updates:
 - [DMM_PAT_AREA_i](#) with the area value of the descriptor
 - [DMM_PAT_DATA_i](#) with the data value of the descriptor
 - [DMM_PAT_CTRL_i](#) with the control value of the descriptor
 - [DMM_PAT_DESCR_i](#) with the next value of the descriptor
- The data part of the PAT refill starts only when the [DMM_PAT_CTRL_i](#)[0] START bit is asserted.

The [DMM_PAT_STATUS_i](#) register can be used to see whether the process has completed without errors.

16.2.3.5.3.3 PEG Description

The PEG is a dynamic software-programmable, initiator-ConnID-indexed table of priorities. Its role is to change on the fly the priority of an initiator, for initiators that do not generate their own per-transaction priority. The mapping of each initiator to the table (split into eight registers) is based on its 6-MSB group ConnID (see [Table 29-20](#), *ConnID Mapping (Debug View)*, in [Chapter 29](#), *On-Chip Debug Support*).

When an interconnect request enters the DMM, its priority is extracted from the PEG LUT and set in its MReqInfo field.

The 64 priority entries are software-programmable with eight [DMM_PEG_PRIO](#) registers ([DMM_PEG_PRIO_k](#)).

These eight registers are each split into eight 4-bit fields, each field mapping an entry of the LUT with:

- The 3-bit priority coded on the 3 least-significant bits (LSBs): Px field. A priority of 0 defines the highest priority and a priority of 7 defines the lowest priority. The priority of a request with ConnId equal to y is written in (8.n + x) P field, where n is the number of the priority register (n = 0 to 7) and x is the number of the P field in the corresponding register (x = 0 to 7). If the ConnId is 0x16, its priority is written in the third priority register (where n = 2), in the P4 bit field ([18:16]), because x = 4.
- A \overline{W} x field-specific active-low local write enable bit, always read as 0, on the most-significant bit (MSB). The role of the \overline{W} bit is to allow the modification of a single entry without requiring a read-modify-write sequence. Because its \overline{W} bits are always read as 0, writing back the modified register updates all priority fields of the register.

Although this priority information is generated before entering the LISA block, it is not used internally in the local interconnect arbitration but is forwarded to the SDRC as an MReqInfo, where it indicates the command priority.

It is also possible to give a priority for the internal PAT engine through the [DMM_PEG_PRIO_PAT](#) register.

16.2.3.5.3.4 ROBIN Description

The ROBIN is a block that provides some working buffering for converting data and responses to-and-from between raster and tiled organizations, and a master port to connect to the SDRC.

The ROBIN block:

- Forwards requests
- Writes data and buffers responses
- Keeps write data ordering
- Performs intraword tiling and orientation transforms
- Handles tags

16.2.3.5.3.5 TILER Description

The main function of the TILER is request conversion caused by tiling.

The TILER block:

- Decodes the address to qualify whether the request targets the TILER or the memory directly
- Converts TILER-specific requests to their natural representation; address, width, and height are modified accordingly
- Allocates an internal response context for the timely generation of appropriate responses
- Splits tiled requests at tile boundaries and not-tiled requests at DMM atomic section boundaries
- Requests the page-based address translation
- Requests buffer allocation in the appropriate ROBIN
- In case of a write request, allocates and updates an internal write context to direct the incoming write data into the relevant reordering buffer

The interdependent tiling and isometric transform concepts introduced in the TILER are described in the following section.

16.2.3.6 TILER

16.2.3.6.1 TILER Concepts

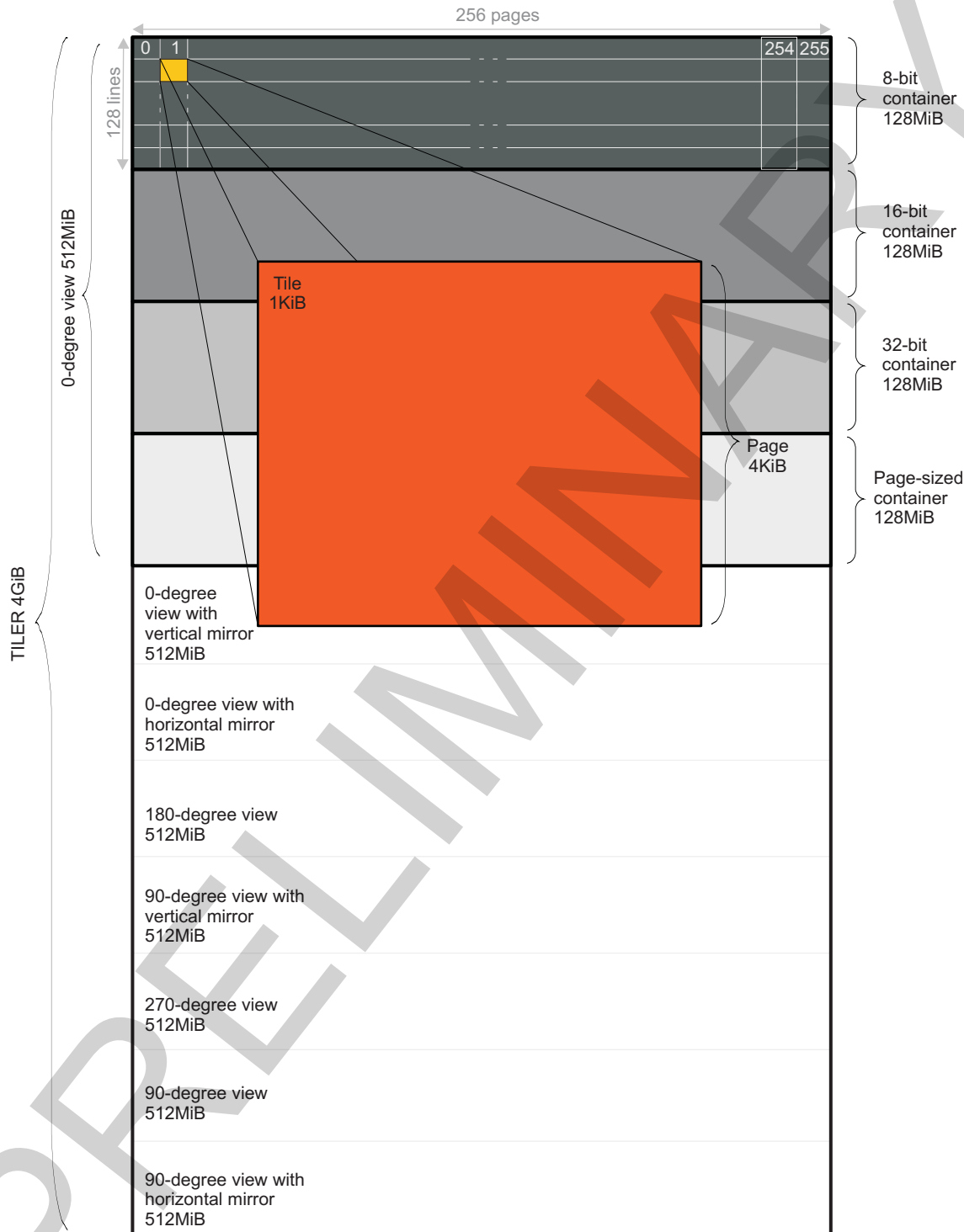
This section describes the concepts behind the TILER transforms, through a top-down approach starting from the main object container.

16.2.3.6.1.1 TILER Rationale

This section is a synthesis of all TILER concepts, giving one rule per TILER structure level.

[Figure 16-10](#) shows the TILER address space structure for tiled modes.

Figure 16-10. TILER Address Space Structure for Tiled Modes



sdram-005_public

16.2.3.6.1.1.1 The TILER is a 4-GB Virtual Address Space Composed of Eight Views

There is one view for each of the eight possible ways of scanning a frame-buffer:

- From left to right then from top to bottom

- From right to left then from top to bottom
- From left to right then from bottom to top
- From right to left then from bottom to top
- From top to bottom then from left to right
- From top to bottom then from right to left
- From bottom to top then from left to right
- From bottom to top then from right to left

16.2.3.6.1.1.2 A View is a 512-MB Virtual Address Space Composed of Four Containers

There is one container per element size to allow correct access patterns in any of the eight possible orientations. The container is the entity where all objects of a given element type are allocated.

The element is the entity of maximum size (8, 16, 32 bits or page-sized), which is invariant in any orientation.

16.2.3.6.1.1.3 A Container is a 128-MB Virtual Address Space

A container is composed of an array of 128 lines of 256 pages of 4 KB each.

The page defines the granularity of physical memory allocation through a PAT unit – MMU.

16.2.3.6.1.1.4 A Page is a 4-KB Virtual Address Space

A page is composed of two lines. Each line consists of two tiles.

16.2.3.6.1.1.5 A Tile is a 1-KB Address Space

The tile is designed to offer bidimensional data locality in a single SDRAM page. In this respect, it is sized to 1 KB; that is, to the size of the smallest SDRAM page.

16.2.3.6.1.2 TILER Modes

The TILER supports three major modes, bypass, page, and tiled. Each mode has a specific output request generation.

16.2.3.6.1.2.1 Bypass Mode

This mode is transparent from the TILER perspective. However, from the DMM perspective:

- 2D block bursts are broken down on a line basis in a set of incremental bursts.
- Incremental bursts, including those issued by a 2D block burst breakdown, are split at the DMM atomic unit of the section hit by the burst at:
 - The interleaving granularity of the section (128, 256, or 512 bytes) in interleaved sections
 - 1-KB boundary in noninterleaved sections

16.2.3.6.1.2.2 Page Mode

This mode uses the DMM address translation mechanism for nontiled accesses. In this respect it is similar to bypass mode:

- 2D block bursts are broken down on a line basis in a set of incremental bursts.
- Incremental bursts, including those issued by a 2D block burst breakdown, are split at:
 - The interleaving granularity of the section (128, 256, or 512 bytes) in interleaved sections
 - 1-KB boundary in noninterleaved sections

16.2.3.6.1.2.3 Tiled Mode

Tiled mode has two major breakdown algorithms:

- One for well-formed 2D block requests that conform to the orientation, mode, and stride listed in [Table 16-9](#)
- One for 1D incremental requests and ill-formed 2D block requests

Table 16-9. Well-Formed Tiled Mode 2D Block Requests

| Orientation | | | Mode | | Stride | Description |
|-------------|---|---|------|----|---------|---|
| S | Y | X | M1 | M0 | (bytes) | |
| 0 | x | x | 0 | 0 | 16,384 | Plain access to an 8-bit progressive frame in 0 or 180 degrees |
| | | | | | 32,768 | Field access to an 8-bit interlaced frame 0 or 180 degrees |
| | | | 0 | 1 | 32,768 | Plain access to a 16-bit progressive frame in 0 or 180 degrees |
| | | | | | 65,536 | Field access to a 16-bit interlaced frame 0 or 180 degrees |
| | | | 1 | 0 | 32,768 | Plain access to a 32-bit progressive frame in 0 or 180 degrees |
| | | | | | 65,536 | Field access to a 32-bit interlaced frame 0 or 180 degrees |
| 1 | x | x | 0 | 0 | 8192 | Plain access to an 8-bit progressive frame in 90 or 270 degrees |
| | | | | | 16,384 | Field access to an 8-bit interlaced frame 90 or 270 degrees |
| | | | 0 | 1 | 8192 | Plain access to a 16-bit progressive frame in 90 or 270 degrees |
| | | | | | 16,384 | Field access to a 16-bit interlaced frame 90 or 270 degrees |
| | | | 1 | 0 | 16,384 | Plain access to a 32-bit progressive frame in 90 or 270 degrees |
| | | | | | 32,768 | Field access to a 32-bit interlaced frame 90 or 270 degrees |

Similar to the bypass and page modes, ill-formed 2D block requests are broken down on a line basis in a set of incremental bursts. In tiled mode, however, these incremental virtual bursts do not translate to 1D physical burst requests.

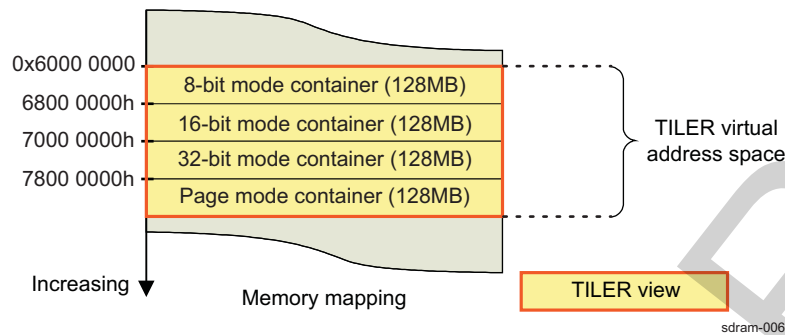
16.2.3.6.1.3 Object Container Definition

The object container is the unique addressable entry point of the TILER. It is a 128-MB virtual address space, where all objects of a same kind and orientation are allocated.

Four main types of containers are present in the TILER, each referred by a mode:

- 8-bit element mode, for efficiently accessing bidimensional arrays of 8-bit data
- 16-bit element mode, for efficiently accessing bidimensional arrays of 16-bit data
- 32-bit element mode, for efficiently accessing bidimensional arrays of 32-bit data
- Page mode, for efficient 1D accesses

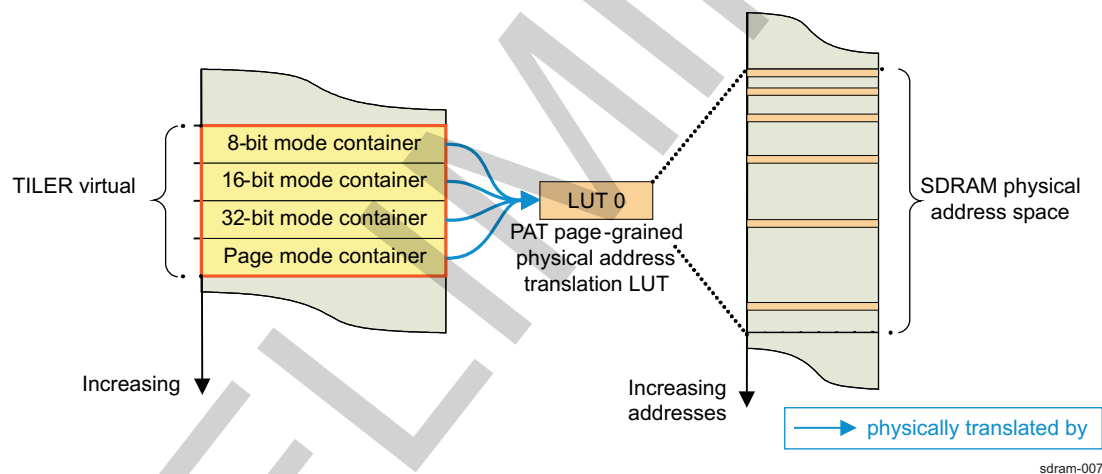
[Figure 16-11](#) shows the TILER object containers and views.

Figure 16-11. TILER Object Containers and Views

The 512-MB virtual address space composed of four 128-MB object containers of different modes is called a view. Because eight orientations are available per mode, the TILER actually manages 32 kinds of containers.

The physical memory footprint of a 512-MB TILER view is directly subject to the nature of the PAT unit.

A unique PAT LUT is instantiated in the DMM. This table is shared by all TILER modes. Hence, each of the four modes cannot be given its own private page-grained PAT LUT. A maximum of 128MB of objects among all TILER modes can be managed as shown in Figure 16-12.

Figure 16-12. TILER Memory Footprint With PAT and Shared Physical Address Translation LUT

Although each of the four modes has its own separate virtual 128-MB object container, these containers are all mapped to the same piecewise 128-MB physical address space, and are then not physically separated. Consequently, a memory-related system constraint is that no more than 128-MB of objects can be available simultaneously in a TILER view.

NOTE: Software must ensure that any object allocated in a mode does not physically overlap with any other object, even in another mode.

16.2.3.6.1.4 Page Definition

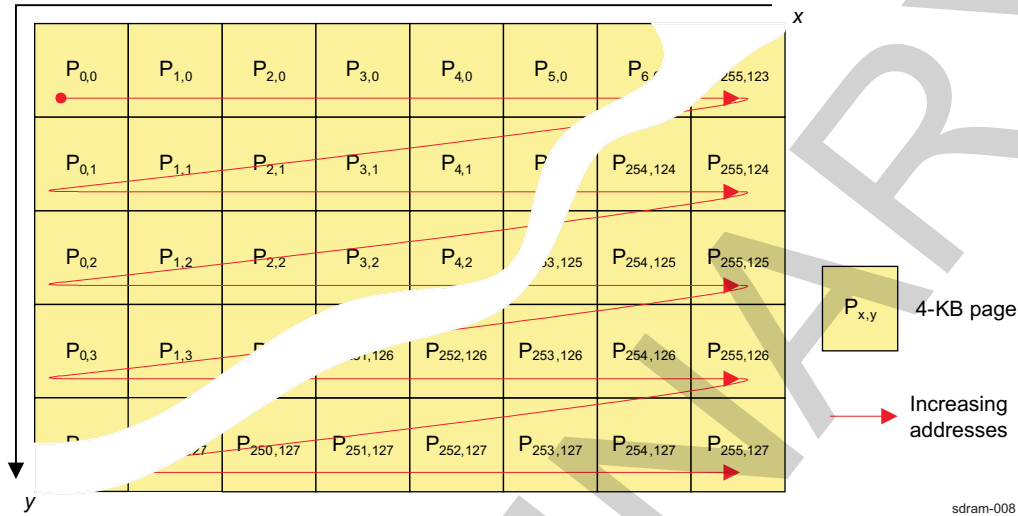
A TILER page defines the granularity of object allocation in virtual TILER containers.

Because the subpage structure is mode-specific, the page is the smallest granularity common to all modes, making it the granularity to consider in the TILER resource manager for object allocation.

16.2.3.6.1.4.1 Container Geometry With 4-KB Pages

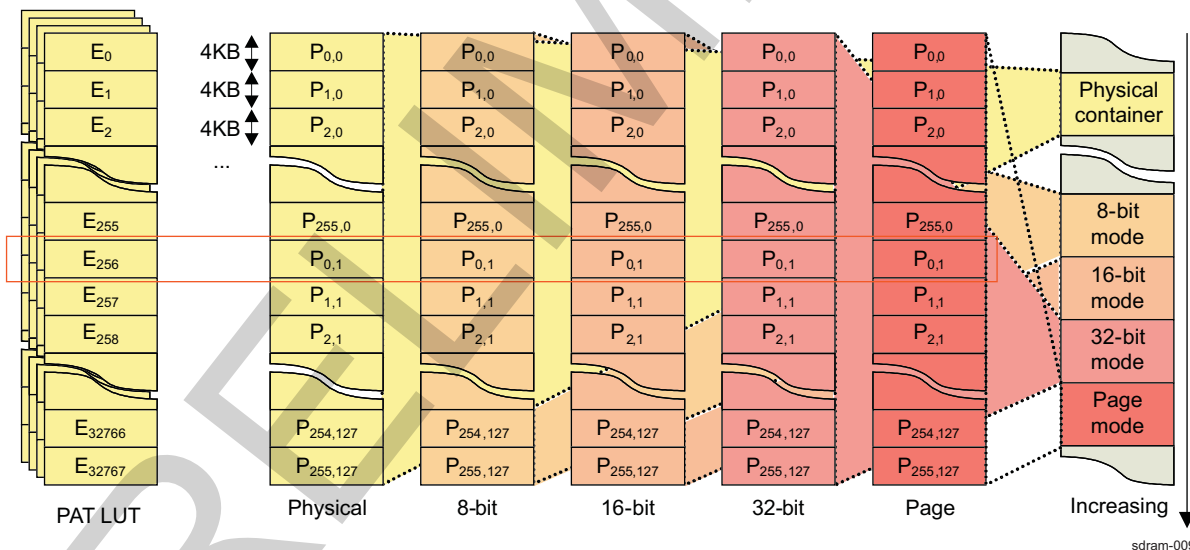
Because the size of the page is 4 KB, any 128-MB object container is a set of 32,768 pages, organized in an array of 256 columns and 128 rows, as shown in Figure 16-13.

Figure 16-13. Object Container Geometry With 4-KB Pages



This array of pages is mapped to the system address space, as shown in Figure 16-14.

Figure 16-14. TILER Page Mapping When Using 4-KB Pages



In any 128-MB object container, the 4-KB page $P_{x,y}$ at column x (where $0 = x \leq 255$) and row y (where $0 = y \leq 127$), is found at an offset of $4096 \cdot (x + 256 \cdot y)$ bytes from the base address of the related object container.

Similarly, the page $P_{x,y}$ at column x (where $0 = x \leq 255$) and row y (where $0 = y \leq 127$), is translated by the LUT entry $E_{x+256 \cdot y}$ found at the index $x + 256 \cdot y$.

16.2.3.6.1.4.2 Container Geometry and Page Mapping Summary

The TILER has a page size of 4096 bytes. The page $P_{x,y}$:

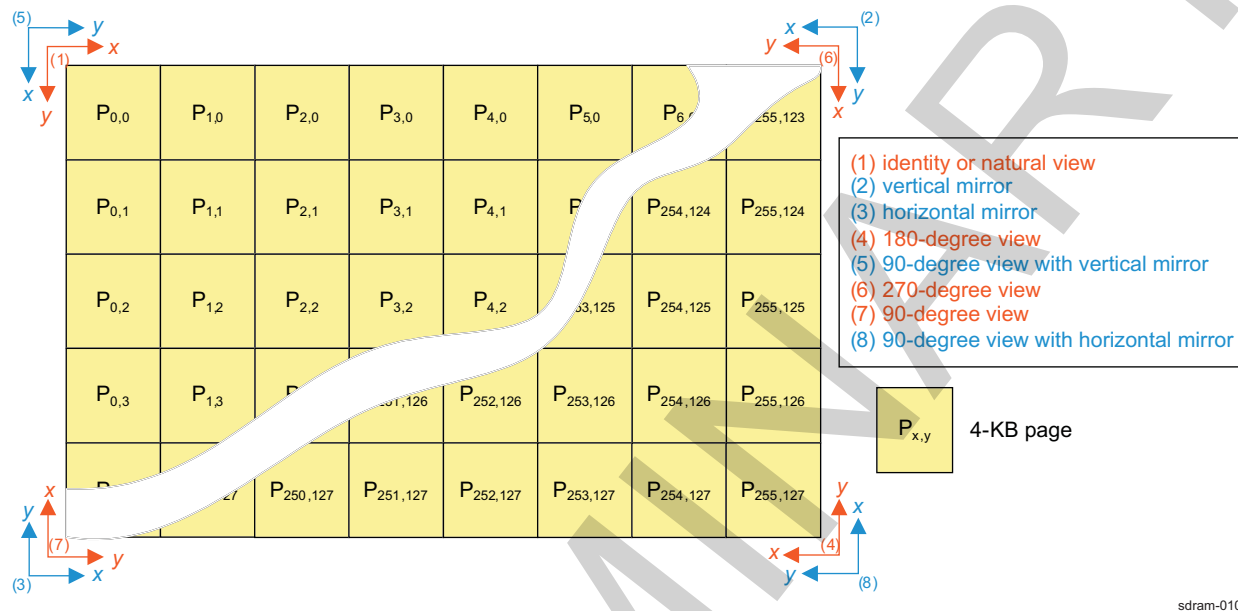
- Has $\max_x = 256$ and $\max_y = 128$
- Is found at an offset of $4096 \cdot (x + \max_x \cdot y)$ bytes from the base address of the related object container
- Is translated by the entry at the index $(x + \max_x \cdot y)$ of the LUT

16.2.3.6.1.5 Orientation

This section describes the eight on-the-fly orientation-related isometric transforms, which correspond to all available changes of orthonormal basis in the bidimensional space of the TILER container.

Figure 16-15 shows isometric transforms in the TILER container

Figure 16-15. Isometric Transforms in the TILER Container



Mathematically speaking, all these transforms correspond to the composition of a 0-, 90-, 180-, or 270-degree rotation with an optional reflection. The nature of this orientation is based on the three following binary parameters:

- X to change the direction of the x axis of the TILER container
- Y to change the direction of the y axis of the TILER container
- S to swap the modified x and y axis

Hereafter in this document the term orientation refers to any composition of a "quadrant" rotation with an optional horizontal (flip-flop) or vertical mirroring.

16.2.3.6.1.6 Tile Definition

A tile is a subdivision of a page that is aimed at:

- Representing a 2D block to better balance accesses in both directions
- Ensuring that any tiled access that fits within a tile is made atomic in the SDRG and fits in a single SDRAM memory page
- Minimizing the number of SDRAM page openings per 2D block transfer

The tile is defined as a 1-KB 2D block, and a 4-KB page as an array of two lines of two tiles each.

When the considered page is in an interleaved DMM section, it is necessary that:

- The DMM memory interleaving size of tiled accesses is set to 1 KB (a tile size) so that any tiled request that fits within a tile, fits in a single SDRAM memory page.
- Any request that spans two or four tiles is distributed on a maximum number of SDRGs.

16.2.3.6.1.7 TILER Virtual Addressing

The TILER can be virtually accessed in four different modes: 8-, 16-, 32-bit, and page modes. Each mode defines the element granularity to apply isometric transforms, as summarized in Table 16-10.

Table 16-10. Coding and Description of TILER Modes

| Mode | Name | Granularity (Element Size) |
|------|-------------------|----------------------------|
| 0 | 8-bit tiled mode | 8 bits |
| 1 | 16-bit tiled mode | 16 bits |
| 2 | 32-bit tiled mode | 32 bits |
| 3 | Page mode | 4096 bytes |

For instance, making a vertical mirror of a 16-byte horizontal line that contains the word 000102030405060708090A0B0C0D0E0Fh, leads to:

- 0F0E0D0C0B0A09080706050403020100h in 8-bit tiled mode
- 0E0F0C0D0A0B08090607040502030001h in 16-bit tiled mode
- 0C0D0E0F08090A0B0405060700010203h in 32-bit tiled mode
- 000102030405060708090A0B0C0D0E0Fh in page mode – unchanged because the element granularity is 4KB

Besides, because each of the eight orientations is available for any of the four modes, the TILER has 32 addressing possibilities (see [Table 16-11](#)).

Table 16-11. Coding and Description of TILER Orientations

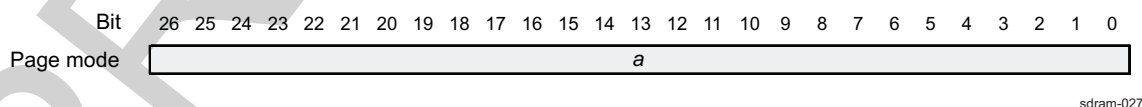
| S | Y | X | Description | Alternate description |
|---|---|---|---------------------------------------|--|
| 0 | 0 | 0 | 0-degree view | Natural view |
| 0 | 0 | 1 | 0-degree view with vertical mirror | 180-degree view with horizontal mirror |
| 0 | 1 | 0 | 0-degree view with horizontal mirror | 180-degree view with vertical mirror |
| 0 | 1 | 1 | 180-degree view | |
| 1 | 0 | 0 | 90-degree view with vertical mirror | 270-degree view with horizontal mirror |
| 1 | 0 | 1 | 270-degree view | |
| 1 | 1 | 0 | 90-degree view | |
| 1 | 1 | 1 | 90-degree view with horizontal mirror | 270-degree view with vertical mirror |

16.2.3.6.1.7.1 Page Mode Virtual Addressing and Characteristics

When used in page mode, the 128-MB TILER space is seen as an orientation-specific sequence of 32,768 pages of 4 KB each. The access sequence inside a page is left unchanged.

Therefore, in page mode, the TILER is accessed similarly to any 128-MB memory, with a 27-bit byte-based address.

NOTE: From here forward, the address is noted as *a* (see [Figure 16-16](#)).

Figure 16-16. Page Mode Virtual Addressing


sdram-027

16.2.3.6.1.7.2 Tiled Mode Virtual Addressing and Characteristics

When used in tiled mode, the 128-MB TILER space is seen as a giant frame-buffer, the container. The addressing and characteristics of this giant frame-buffer depend on:

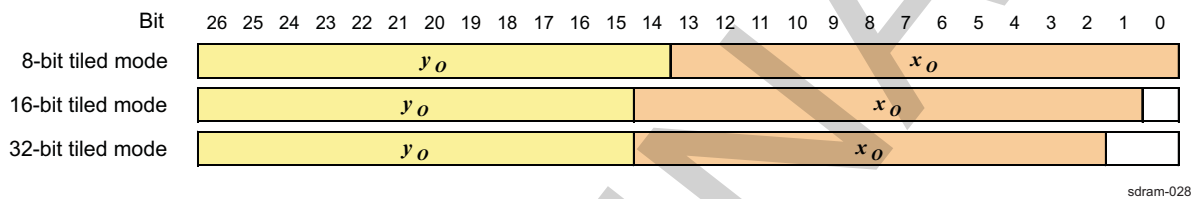
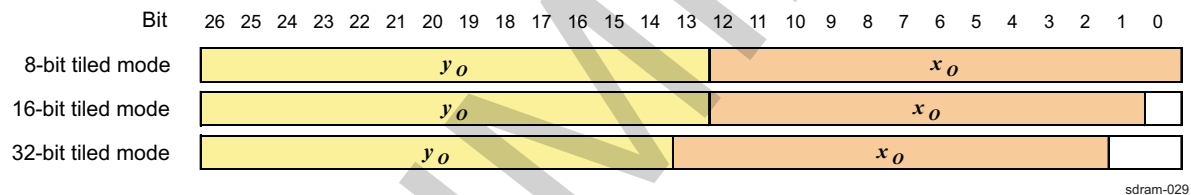
- The tiled mode, which defines the considered atomic element size
- The orientation, which potentially swaps its x and y axis, and hence the container geometry

[Table 16-12](#) summarizes the container characteristics in tiled mode.

Table 16-12. Tiled Mode Container Characteristics

| Orientation S | Υ | \bar{X} | Element Size (Bits) | Width (Elements) | Height (Elements) | Stride (Bytes) | |
|------------------|------------|-----------|------------------------|---------------------|----------------------|----------------|------------|
| | | | | | | Progressive | Interlaced |
| 0 | x | x | 8 | 16,384 | 8192 | 16,384 | 32,768 |
| | | | 16 | 16,384 | 4096 | 32,768 | 65,536 |
| | | | 32 | 8192 | 4096 | 32,768 | 65,536 |
| 1 | x | x | 8 | 8192 | 16,384 | 8192 | 16,384 |
| | | | 16 | 4096 | 16,384 | 8192 | 16,384 |
| | | | 32 | 4096 | 8192 | 16,384 | 32,768 |

As a result, the coordinate (x_0, y_0) of a pixel in an oriented view is translated in a virtual address, as shown in [Figure 16-17](#) and [Figure 16-18](#).

Figure 16-17. Tiled Mode Addressing in 0- or 180-Degree Orientation (S = 0)**Figure 16-18. Tiled Mode Addressing in 90- or 270-Degree Orientation (S = 1)**

16.2.3.6.1.7.3 Element Ordering in the TILER Container

This section describes how elements (8-, 16-, or 32-bit data or a 4-KB page) are ordered in the container. In other words, this section describes how the path of incrementing virtual addresses is mapped in the container.

Regardless of the mode, and hence the element size, the sequence for ordering the elements in their related container is strictly similar and depends only on the related orientation. In other words:

- Mode is concerned with element granularity.
- Orientation is concerned with change of orthonormal basis for ordering the elements in the mode-specific container.

A corollary to the previous statements is that in a given mode the internal structure of an element is unchanged regardless of the orientation. In page mode for instance, the offset of a word inside a page is invariant by orientation; the content of a page is always accessed in the same manner.

In the following sections, the natural container orthonormal basis is referenced as:

$$(\vec{x}_N, \vec{y}_N)$$

sdram-030

and the oriented orthonormal basis is referenced as:

$$(\vec{x}_O, \vec{y}_O)$$

sdram-031

16.2.3.6.1.7.3.1 Natural View or 0-Degree View (Orientation 0)

This orientation defined by $S = 0$, $\overline{Y} = 0$, and $\overline{X} = 0$ means that the operated change of basis is:

$$\begin{cases} \vec{x}_O = \vec{x}_N \\ \vec{y}_O = \vec{y}_N \end{cases}$$

sdram-032

In any TILER mode, the elements are ordered from left to right and then from top to bottom in their container, as shown in Figure 16-19 and Figure 16-20.

Figure 16-19. Tiled Mode Ordering of Elements in Natural View

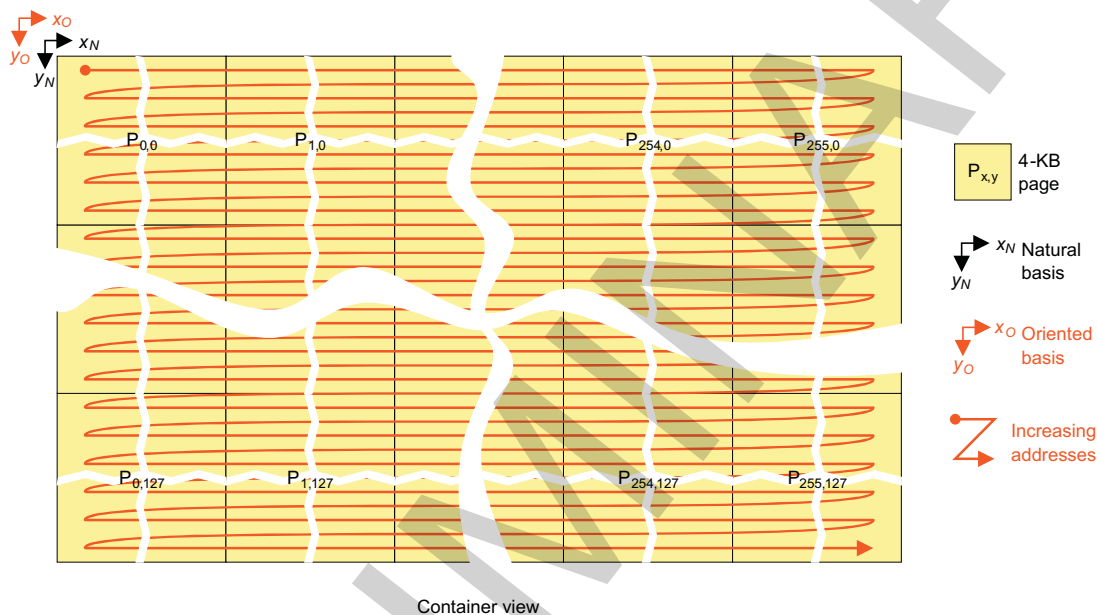
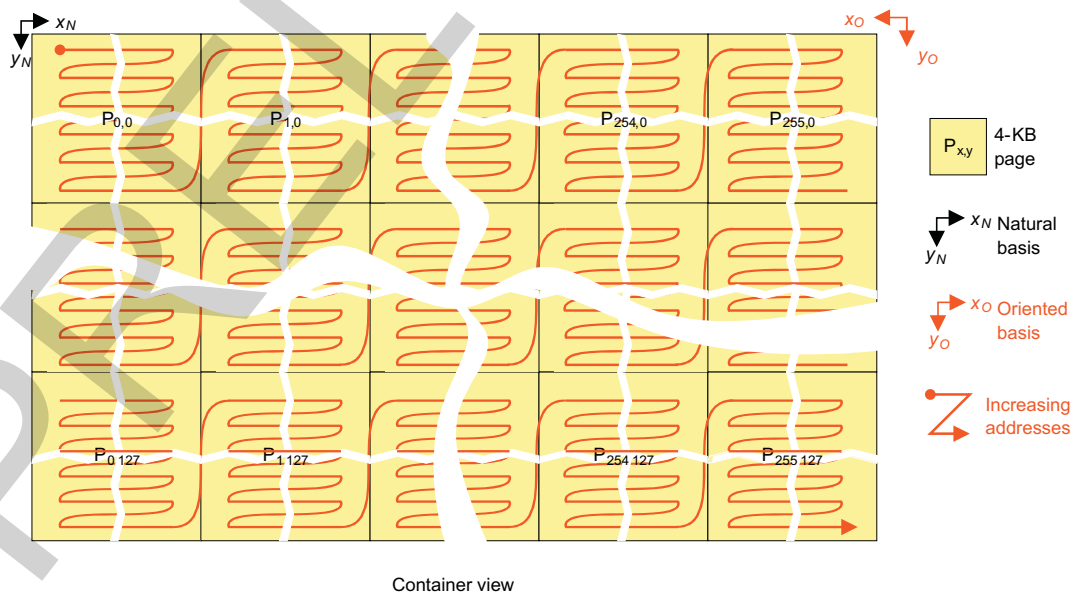


Figure 16-20. Page Mode Ordering of Elements in Natural View



16.2.3.6.1.7.3.2 0-Degree View With Vertical Mirror or 180-Degree View With Horizontal Mirror

(Orientation 1)

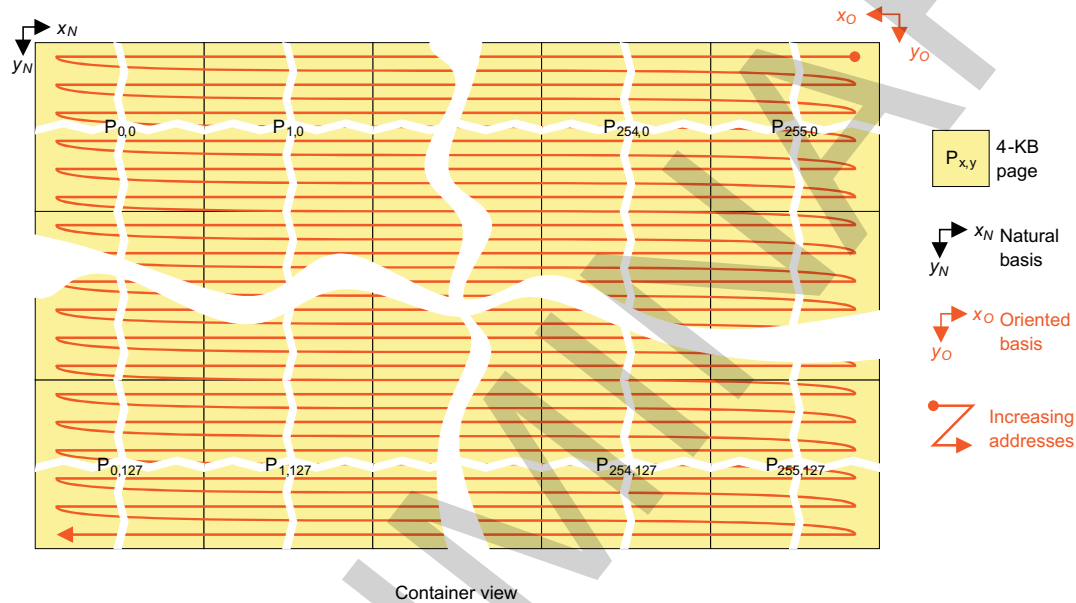
This orientation defined by $S = 0$, $\overline{Y} = 0$, and $\overline{X} = 1$ and means that the operated change of basis is:

$$\begin{cases} \vec{x}_O = -\vec{x}_N \\ \vec{y}_O = \vec{y}_N \end{cases}$$

sdram-035

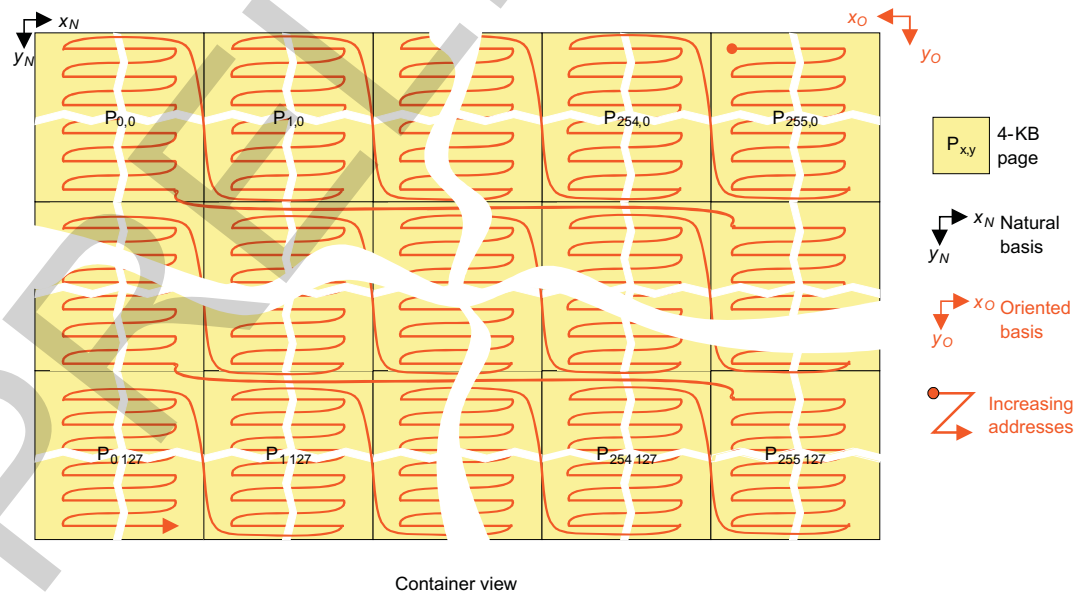
In any TILER mode, the elements are then ordered from right to left and then from top to bottom in their container, as shown in Figure 16-21 and Figure 16-22.

Figure 16-21. Tiled Mode Ordering of Elements in 0-Degree View With Vertical Mirror



sdram-036

Figure 16-22. Page Mode Ordering of Elements in 0-Degree View With Vertical Mirror



sdram-037

16.2.3.6.1.7.3.3 0-Degree View With Horizontal Mirror or 180-Degree View With Vertical Mirror

(Orientation 2)

This orientation defined by $S = 0$, $\overline{Y} = 1$, and $\overline{X} = 0$ and means that the operated change of basis is:

$$\begin{cases} \vec{x}_O = \vec{x}_N \\ \vec{y}_O = -\vec{y}_N \end{cases}$$

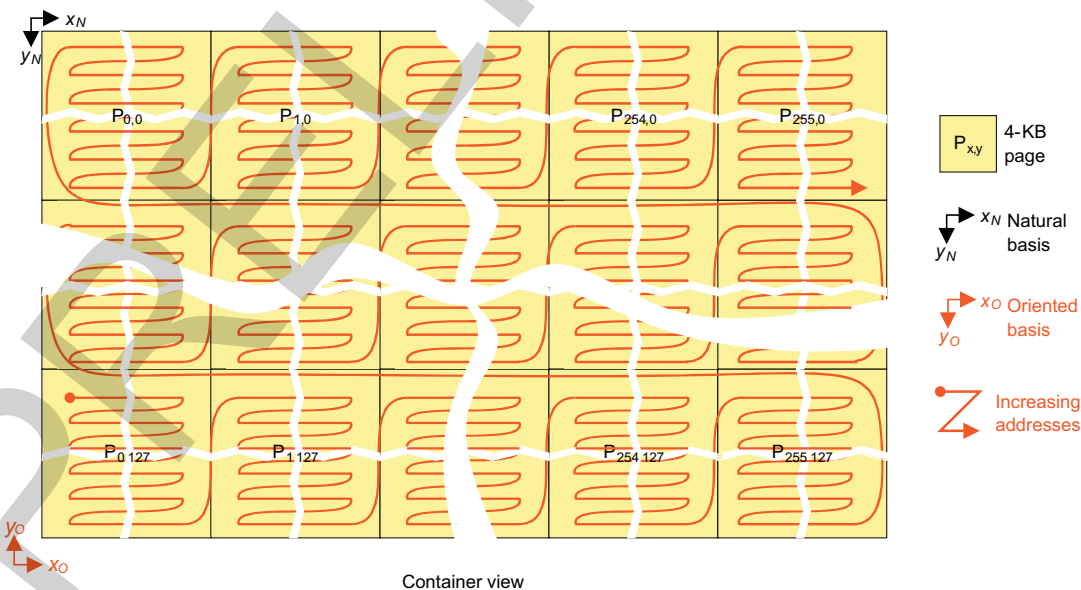
sdram-038

In any TILER mode, the elements are ordered from left to right and then from bottom to top in their container, as shown in Figure 16-23 and Figure 16-24.

Figure 16-23. Tiled Mode Ordering of Elements in 0-Degree View With Horizontal Mirror



Figure 16-24. Page Mode Ordering of Elements in 0-Degree View With Horizontal Mirror



16.2.3.6.1.7.3.4 180-Degree View (Orientation 3)

This orientation defined by $S = 0$, $\overline{Y} = 1$, and $\overline{X} = 1$ and means that the operated change of basis is:

$$\begin{cases} \vec{x}_O = -\vec{x}_N \\ \vec{y}_O = -\vec{y}_N \end{cases}$$

sdram-041

In any TILER mode, the elements are ordered from right to left and then from bottom to top in their container, as shown in Figure 16-25 and Figure 16-26.

Figure 16-25. Tiled Mode Ordering of Elements in 180-Degree View

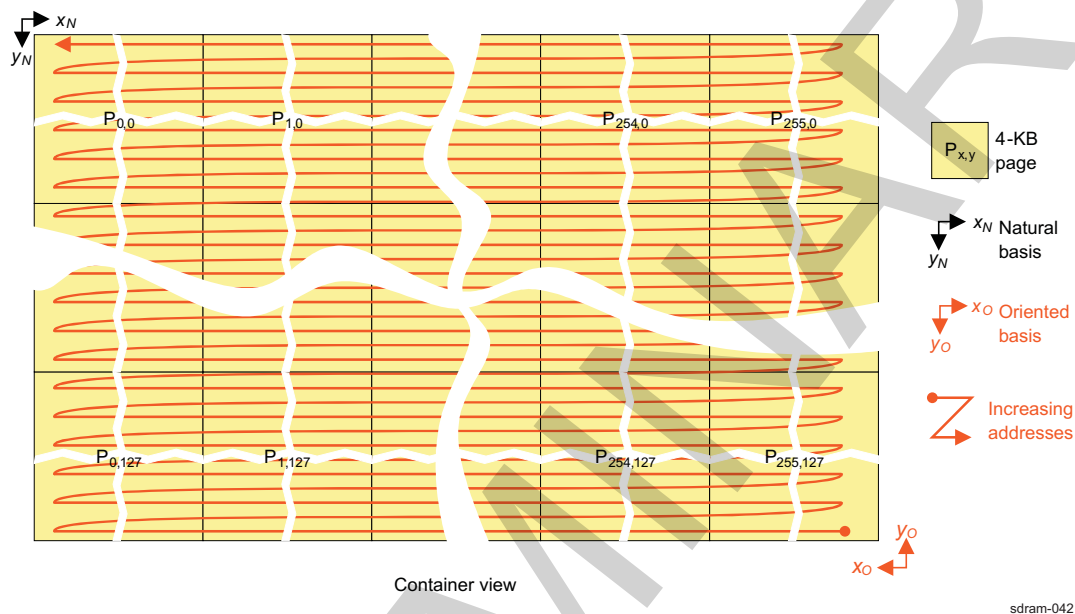
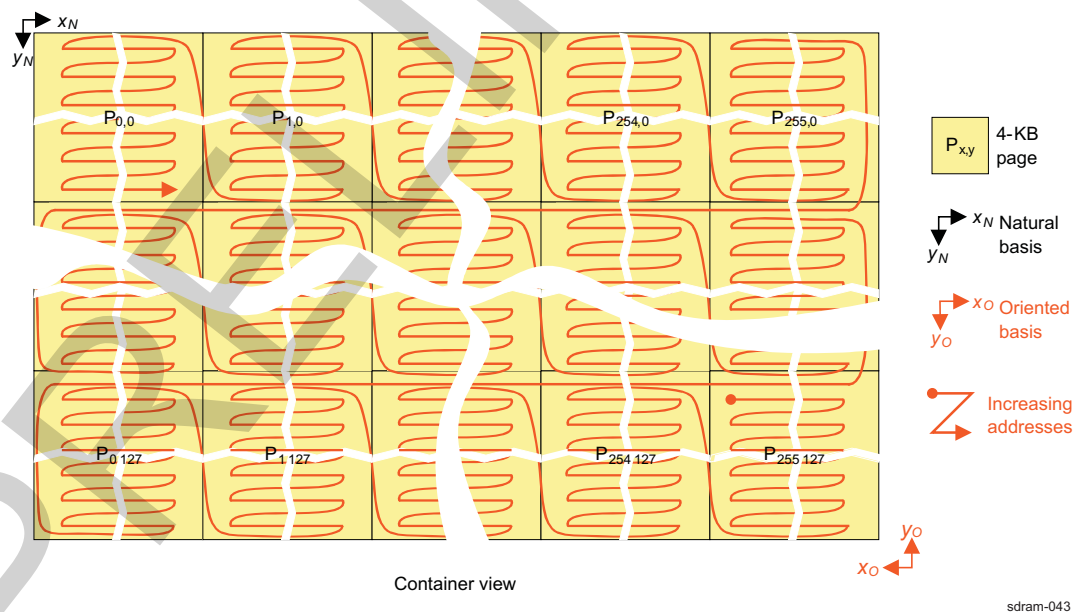


Figure 16-26. Page Mode Ordering of Elements in 180-Degree View



16.2.3.6.1.7.3.5 90-Degree View With Vertical Mirror or 270-Degree View With Horizontal Mirror (Orientation 4)

This orientation defined by $S = 1$, $\overline{Y} = 0$, and $\overline{X} = 0$ and means that the operated change of basis is:

$$\begin{cases} \vec{x}_O = \vec{y}_N \\ \vec{y}_O = \vec{x}_N \end{cases}$$

sdram-044

In any TILER mode, the elements are ordered from top to bottom and then from left to right in their container, as shown in Figure 16-27 and Figure 16-28.

Figure 16-27. Tiled Mode Ordering of Elements in 90-Degree View With Vertical Mirror

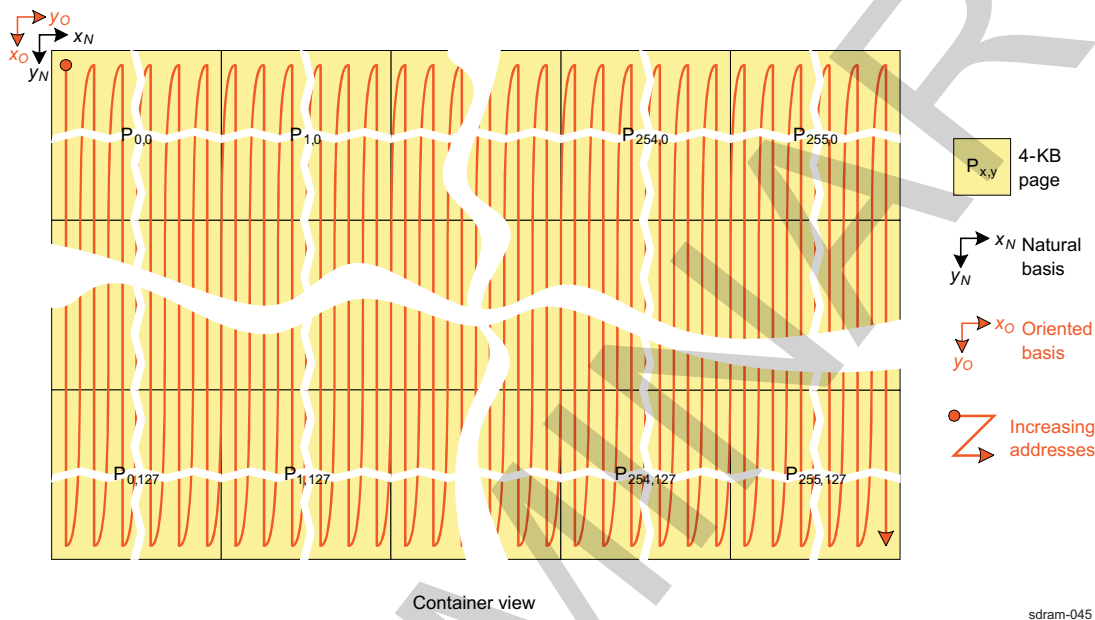
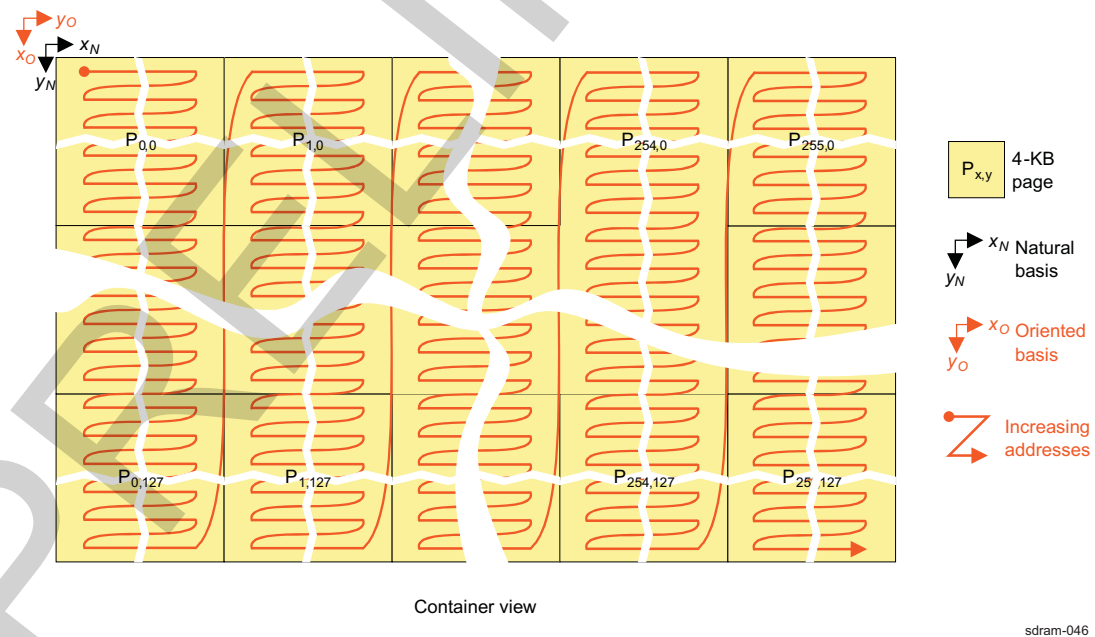


Figure 16-28. Page Mode Ordering of Elements in 90-Degree View With Vertical Mirror



16.2.3.6.1.7.3.6 270-Degree View (Orientation 5)

This orientation defined by $S = 1$, $\overline{Y} = 0$, and $\overline{X} = 1$ and means that the operated change of basis is:

$$\begin{cases} \vec{x}_O = \vec{y}_N \\ \vec{y}_O = -\vec{x}_N \end{cases}$$

sdram-047

In any TILER mode, the elements are ordered from top to bottom and then from right to left in their container, as shown in Figure 16-29 and Figure 16-30.

Figure 16-29. Tiled Mode Ordering of Elements in 270-Degree View

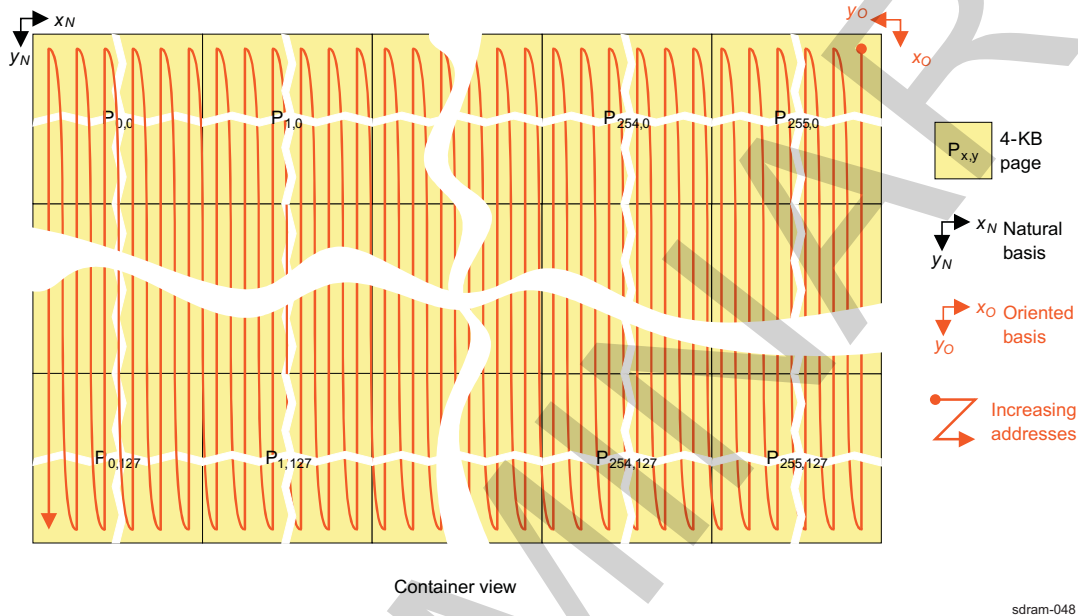
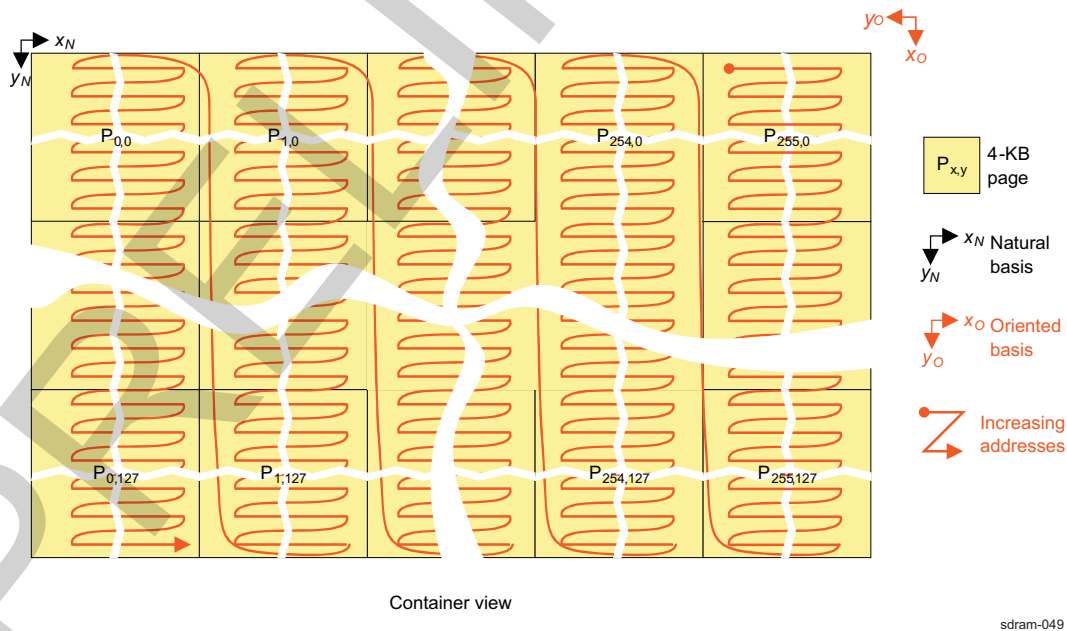


Figure 16-30. Page Mode Ordering of Elements in 270-Degree View



16.2.3.6.1.7.3.7 90-Degree View (Orientation 6)

This orientation defined by $S = 1$, $\overline{Y} = 1$, and $\overline{X} = 0$ and means that the operated change of basis is:

$$\begin{cases} \vec{x}_O = -\vec{y}_N \\ \vec{y}_O = \vec{x}_N \end{cases}$$

sdram-050

In any TILER mode, the elements are ordered from bottom to top and then from left to right in their container, as shown in Figure 16-31 and Figure 16-32.

Figure 16-31. Tiled Mode Ordering of Elements in 90-Degree View

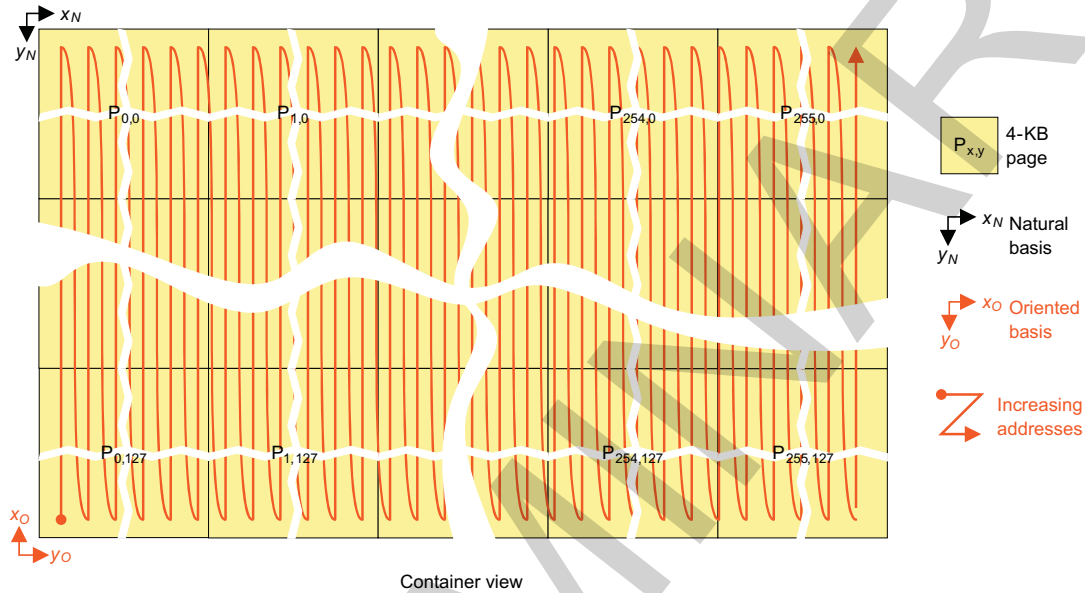
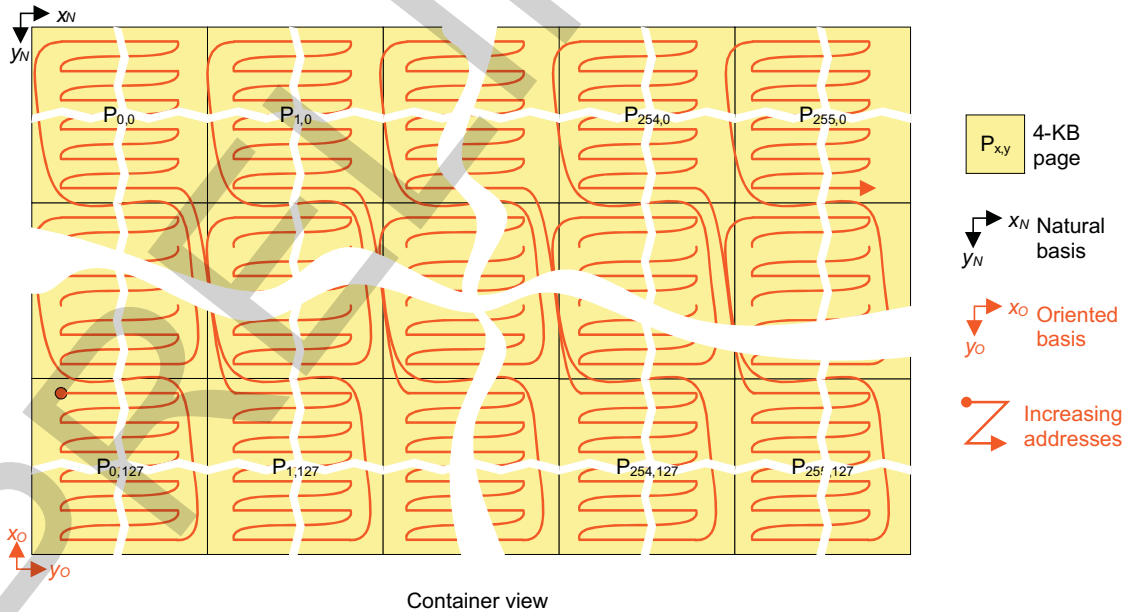


Figure 16-32. Page Mode Ordering of Elements in 90-Degree View



16.2.3.6.1.7.3.8 90-Degree View With Horizontal Mirror or 270-Degree View With Vertical Mirror (Orientation 7)

This orientation defined by $S = 1$, $\overline{Y} = 1$, and $\overline{X} = 1$ and means that the operated change of basis is:

$$\begin{cases} \vec{x}_O = -\vec{y}_N \\ \vec{y}_O = -\vec{x}_N \end{cases}$$

sdram-053

In any TILER mode, the elements are ordered from bottom to top and then from right to left in their container, as shown in Figure 16-33 and Figure 16-34.

Figure 16-33. Tiled Mode Ordering of Elements in 90-Degree View With Horizontal Mirror

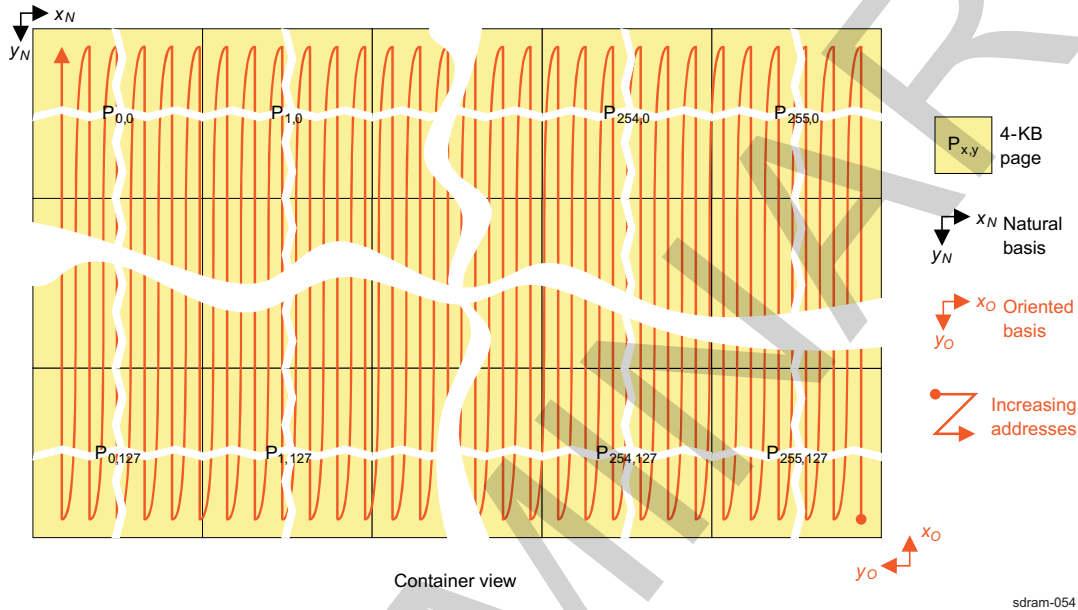
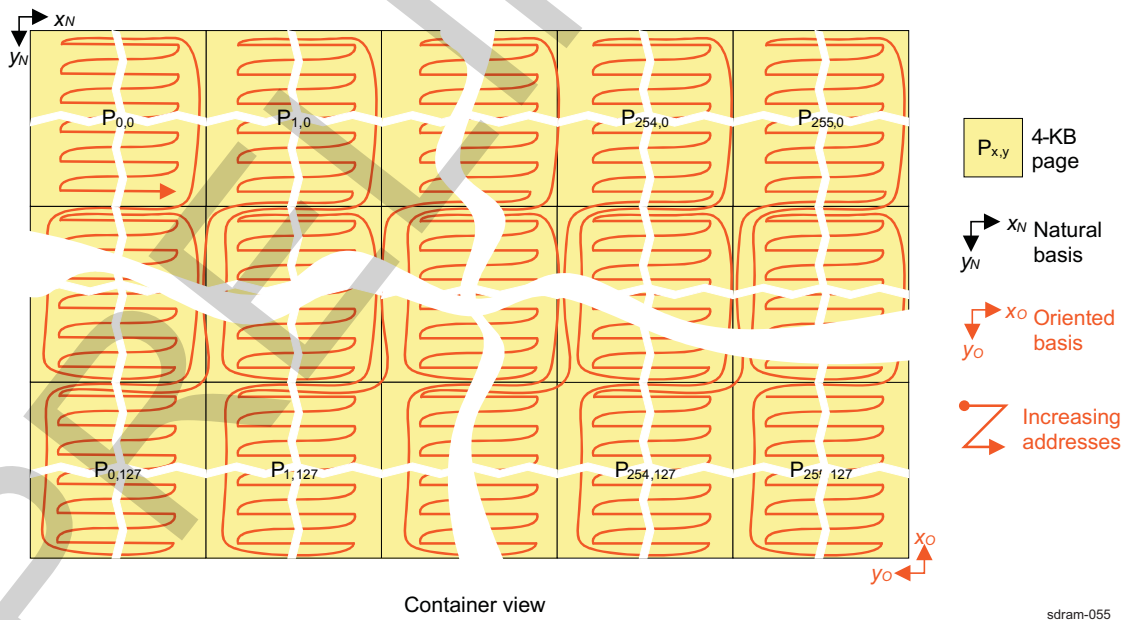


Figure 16-34. Page Mode Ordering of Elements in 90-Degree View With Horizontal Mirror



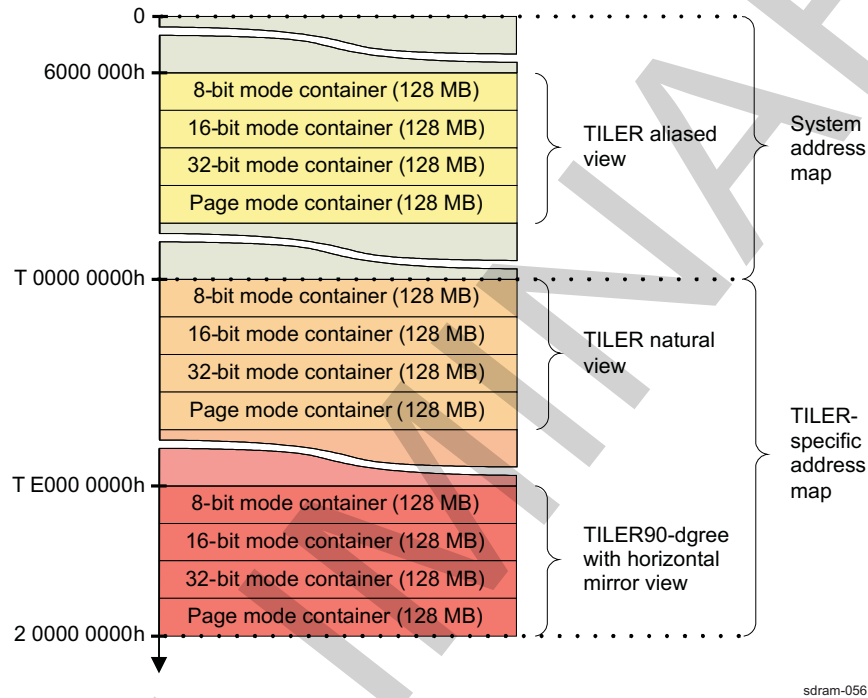
16.2.3.6.2 TILER Macro-Architecture

The TILER requires a 4-GB addressing space to map its 128-MB physical container in four modes and

eight orientations. Because its addressing space alone fills the 4-GB global system address map, the TILER addressing space cannot enter as-is into the system address map. Besides, putting in place a register-based mechanism per initiator to specify the orientation of the following accesses and then reducing the TILER addressing space to a single 512-MB view is not an option; this is because most of the bandwidth-hungry initiators require simultaneous accesses to the TILER container in different views.

As a result, 32 bits are not enough to address all these requests, because the TILER port must convey not only virtually addressed requests to the "oriented" TILER containers but also physically addressed requests to the attached SDRCs. A thirty-third address bit is necessary to distinguish the two separated address maps, as shown in Figure 16-35.

Figure 16-35. TILER Port Address Map



Still, having separated systems and TILER-specific address maps is not sufficient. In a system many existing and external IP blocks still rely on a 32-bit address and would then be limited to one or the other 4-GB addressing space. To overcome this limitation, one 512-MB view is aliased in the system address map as (see Table 16-13 and Figure 16-36).

Table 16-13. TILER Aliased View in the L3 Interconnect Mapping

| Start Address (hex) | End Address (hex) | Size |
|---------------------|-------------------|--------|
| 0x6000_0000 | 0x7FFF_FFFF | 512 MB |

From all incoming requests, TILER requests are filtered as having an address that fits one of the following:

- The address format in the TILER-specific address map given in Table 16-14, or
- The address format of the aliased view in the system address map given in Table 16-15; other requests are forwarded directly to the SDR in TILER bypass mode.

Table 16-14. Address Format in the TILER-Specific Address Map

| 32 | 31 | 30 | 29 | 28 | 27 | 26 ... 4 | 3 ... 0 |
|----|-------------|----|----|------|----|-----------------|---------|
| T | Orientation | | | Mode | | Virtual address | |
| 1 | S | Y | X | M1 | M0 | A26 ... A4 | 0 |

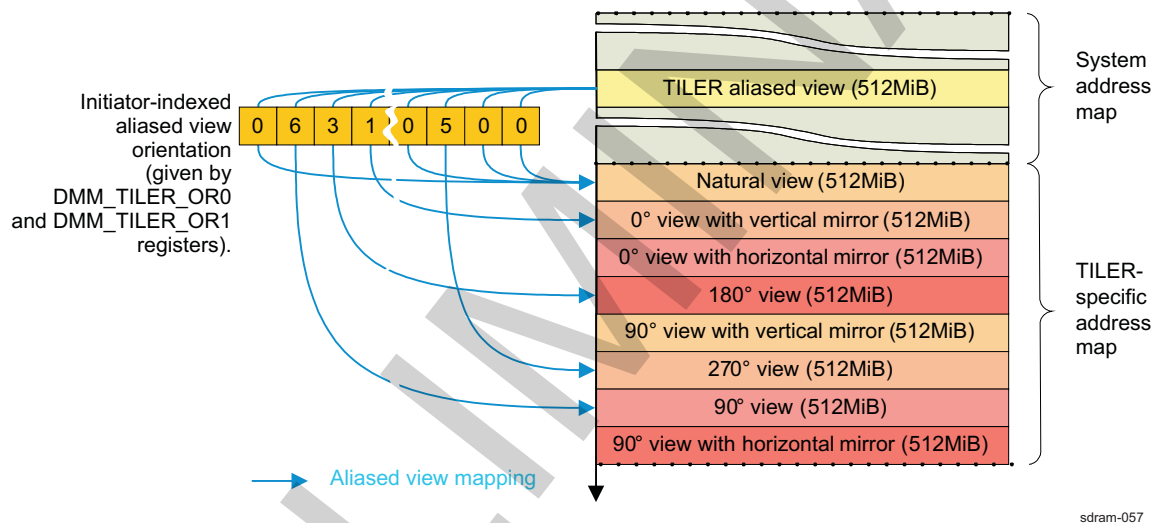
Table 16-15. Address Format of the TILER Aliased View in the System Address Map

| 32 | 31 | 30 | 29 | 28 | 27 | 26 ... 4 | 3 ... 0 |
|----|----------------|----|----|------|----|-----------------|---------|
| T | TILER aliasing | | | Mode | | Virtual address | |
| 0 | 0 | 1 | 1 | M1 | M0 | A26 ... A4 | 0 |

In these address formats:

- The thirty-third bit, noted T, is aimed at distinguishing the standard 4-GiB system address map from the 4-GiB TILER-specific address map.
- The orientation bits, noted S, \overline{Y} , and \overline{X} , define the request orientation, as specified in [Table 16-11](#).
- The mode bits, noted M1 and M0, define the request mode, as specified in [Table 16-10](#).
- The remaining 27 bits, noted A0 to A26, define the mode and orientation specific virtual address, as defined in [Figure 16-16](#), [Figure 16-17](#), and [Figure 16-18](#).

The orientation of the aliased TILER view is extracted from an initiator-indexed LUT, as shown in [Figure 16-36](#).

Figure 16-36. TILER Aliased View Orientation

As shown in [Figure 16-36](#), an internal initiator-indexed LUT stores the current orientation of the aliased view for each initiator.

When an interconnect request hits the TILER aliased view in the system address map, the request initiator orientation is extracted from the LUT and the request address is translated according to this orientation: the T bit is set and bits [31:29] are replaced with the orientation.

Regarding the dimensioning of this LUT, given that initiators simultaneously accessing multiple views use the TILER-specific address map, and many initiators do not need to access any view or can be restricted to accessing only the natural view, only a limited number of initiators are likely to dynamically modify the orientation of its aliased TILER view.

The orientation LUT is limited to 16 entries. These 16 orientation entries are mapped on the two 32-bit [DMM_TILER_OR0](#) and [DMM_TILER_OR1](#) registers.

The first eight entries of the LUT are mapped in the [DMM_TILER_OR0](#) register, and the last eight entries are mapped in the [DMM_TILER_OR1](#) register. Therefore, given an index x, the orientation related to this index is given in the ORx field.

Each of these registers is split into eight 4-bit fields, each field mapping an entry of the LUT with:

- An S, \overline{Y} , \overline{X} orientation code on the 3 LSBs
- An \overline{W} field-specific active-low local write-enable bit, always read as 0, on the MSB.

The registers fields that correspond to initiators that do not need any dynamic configuration of their aliased view orientation must be specified as reserved fields, and only written with zeros.

The \overline{W} bit allows the modification of a single entry without requiring a read-modify-write sequence. This approach is then more accommodating:

- In a system where multiple initiators can modify their own fields in the registers
- With initiators unable to make the read-modify-write sequence, such as DMA

Still, the \overline{W} bit is active-low to keep the compatibility with the usual read-modify-write sequence. When reading an aliased view orientation register, because all its \overline{W} bits are read as 0, if these bits are untouched by the modification—as they should be—writing back the modified register updates all orientation fields of the register.

16.2.3.6.3 TILER Guidelines for Initiators

16.2.3.6.3.1 Buffered Raster-Based Initiators

16.2.3.6.3.1.1 Buffer Size

The necessary minimum buffer size depends on the SDRAM prefetch size and on initiator support in terms of the following:

- Element size
- Orientation
- Maximum number of elements per line in all supported element sizes and orientations

Let N be the maximum number of elements per line for a given mode (element size) and orientation, P be the SDRAM memory prefetch size in bytes, and \max be the function returning the maximum of the two parameters. The minimum necessary line buffer size to handle all resolutions in a given mode and orientation is listed in [Table 16-16](#).

Table 16-16. Minimum Buffer Size to Efficiently Handle Lines of up to N Elements

| | 0- or 180- Degree Orientation ($S = 0$) | 90- or 270-Degree Orientation ($S = 1$) |
|-------------|--|---|
| 8-bit mode | $4 \times N$ bytes | $\max(4, P/4) \times N$ bytes |
| 16-bit mode | None | $\max(8, P/2) \times N$ bytes |
| 32-bit mode | None | $\max(8, P/2) \times N$ bytes |

This minimal buffer size can be reached only with an advanced FIFO management scheme. The standard ping-pong buffer requires twice this buffer size.

NOTE: Given their nature, field accesses to an interlaced frame-buffer require buffers twice as small as in the standard progressive case.

For instance, an initiator that must handle only a single progressive frame-buffer in any orientation of:

- Up to 1920×1080 in YUV4:2:0
- Up to 1600×1200 in 16-bit RGB565
- Up to 800×600 in 32-bit ARGB

requires a line buffer of at least 15,360 bytes because:

- $4 \times 1920 + 4 \times 2960 = 15,360$ bytes required for a 3-plane YUV4:2:0 frame of 1920×1080
- $4 \times 1920 + 8 \times 960 = 15,360$ bytes required for a 2-plane YUV4:2:0 frame of 1920×1080
- $8 \times 1600 = 12,800$ bytes required for a 16-bit RGB565 frame of 1600×1200
- $8 \times 800 = 6400$ bytes required for a 32-bit ARGB frame of 800×600

and a line buffer of at least 30,720 bytes when using a simple ping-pong buffer scheme.

16.2.3.6.3.1.2 Performance

[Table 16-17](#) gives the ratio of effective data to transferred data at the external memory interface for buffered raster-based initiators in each mode and orientation, when using an up-to-32-bit DDR, lpDDR, or lpDDR2 SDRAM, or an up-to-16-bit DDR2 memory.

Table 16-17. Memory Data Payload for Buffered Raster-Based Initiators on Up-to-32-Bit DDR, lpDDR, or lpDDR2

| | 0- or 180-Degree Orientation (S = 0) | | 90- or 270-Degree Orientation (S = 1) | |
|-------------|--------------------------------------|------------|---------------------------------------|------------|
| | Progressive | Interlaced | Progressive | Interlaced |
| 8-bit mode | 100% | 100% | 100% | 50% |
| 16-bit mode | 100% | 100% | 100% | 50% |
| 32-bit mode | 100% | 100% | 100% | 50% |
| Page mode | 100% | N/A | 100% | 100% |

When using 32-bit DDR, lpDDR, or lpDDR2 SDRAMs, or 16-bit DDR, DDR2, lpDDR, or lpDDR2 memories, whenever all previous guidelines are fulfilled, there is no penalty for these initiators to access a tiled object in any orientation, except for accesses to an interlaced frame in 90- or 270-degree orientation where the memory bandwidth is twice the requested bandwidth.

When using up-to-32-bit DDR, lpDDR, lpDDR2, or up-to-16-bit DDR2 SDRAMs, all accesses, except interlaced accesses in a 90- or 270-degree orientation, are equally efficient and offer the full possible memory bandwidth.

Because of its progressive nature, page mode does not introduce any performance hit.

[Table 16-18](#) lists the ratio of effective data-to-transferred data at the external memory interface for the buffered raster-based initiators in each mode and orientation when using a 32-bit DDR2 or DDR3 memory.

Table 16-18. Memory Data Payload for Buffered Raster-Based Initiators on 32-Bit DDR2 or DDR3

| | 0- or 180-Degree Orientation (S = 0) | | 90- or 270-Degree Orientation (S = 1) | |
|-------------|--------------------------------------|------------|---------------------------------------|------------|
| | Progressive | Interlaced | Progressive | Interlaced |
| 8-bit mode | 100% | 50% | 100% | 50% |
| 16-bit mode | 100% | 50% | 100% | 50% |
| 32-bit mode | 100% | 50% | 100% | 50% |
| Page mode | 100% | N/A | 100% | 100% |

When using 32-bit DDR2 or DDR3 SDRAMs, whenever all previous guidelines are fulfilled, there is no penalty for these initiators to access a tiled object in any orientation, except for accesses to an interlaced frame in any orientation where the memory bandwidth is twice the requested bandwidth.

When using DDR2 or DDR3 SDRAMs, all accesses, except interlaced accesses, are equally efficient and offer the full possible memory bandwidth.

Similarly, page mode does not introduce any performance hit.

16.2.4 DMM Use Cases and Tips

16.2.4.1 PAT Use Cases

Five ways to use PAT are:

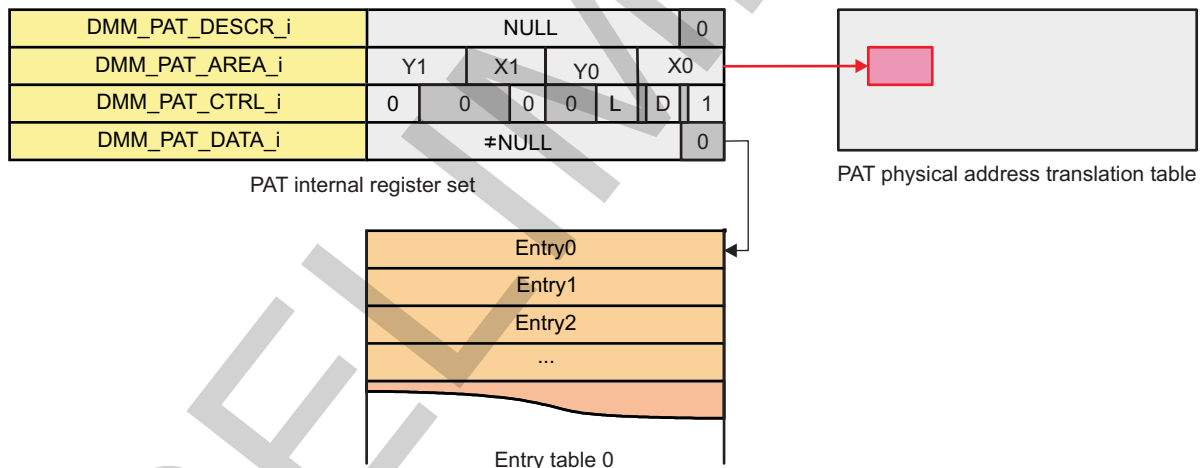
- Simple manual area refill
- Single auto-configured area refill
- Chained auto-configured area refill
- Synchronized auto-configured area refill
- Cyclic synchronized auto-configured area refill

16.2.4.1.1 Simple Manual Area Refill

The following must be performed to create a 16-byte aligned memory-mapped entry table containing all entries of the defined area (see [Figure 16-37](#)):

1. Write the [DMM_PAT_AREA_i](#) register with the relevant (x0, y0) (x1, y1) area definition.
2. Write the [DMM_PAT_DATA_i](#) register with the physical address of the created entry table.
3. Write the [DMM_PAT_CTRL_i](#) register with the requested refill direction and assert the [DMM_PAT_CTRL_i\[0\]](#) START bit with the requested refill direction D and with the LUT ID L if multiple LUTs are present in the system.
4. The refill is done when the [DMM_PAT_STATUS_i\[3\]](#) DONE bit is set.
5. A new refill can be initiated when the [DMM_PAT_STATUS_i\[0\]](#) READY bit is set.

Figure 16-37. Simple Manual Area Refill Scheme



sdram-067

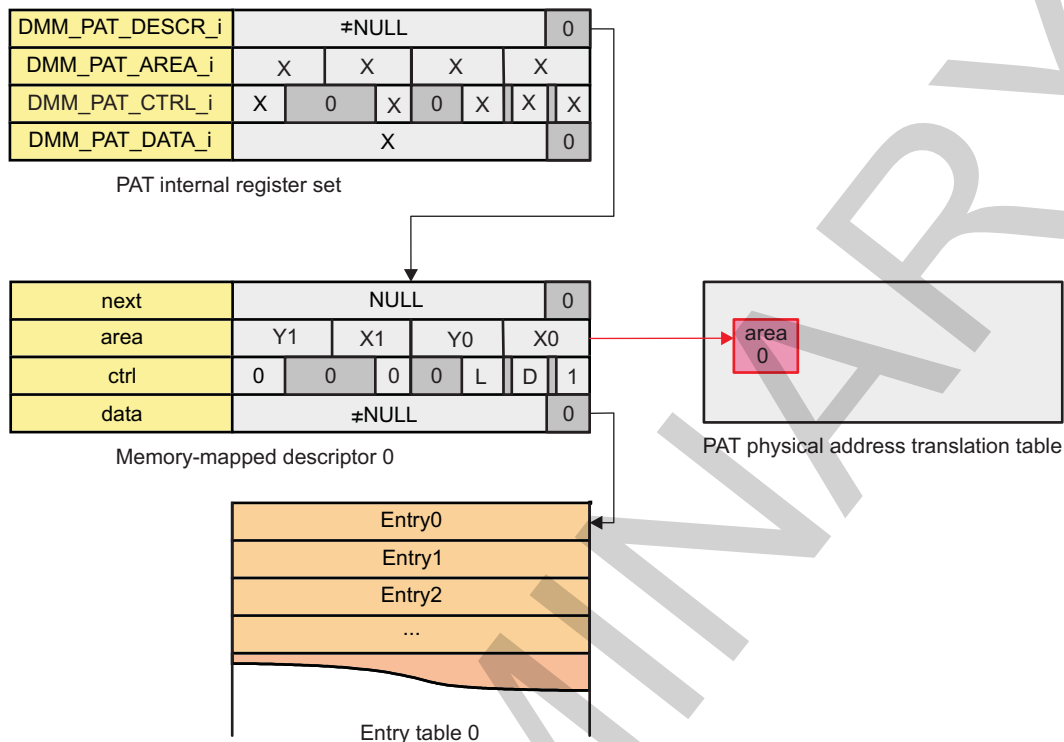
16.2.4.1.2 Single Auto-Configured Area Refill

The following must be performed to create a 16-byte aligned memory-mapped entry table containing all entries of the defined area (see [Figure 16-38](#)):

1. Create a 16-byte aligned memory-mapped descriptor structure where:
 - The next field is set to NULL.
 - The area field is set with the relevant (x0, y0) (x1, y1) area definition.
 - The ctrl field is set with the requested direction D, with the requested LUT ID L if multiple LUTs are present in the system, and the START bit is asserted to start refilling as soon as this descriptor enters the PAT refill engine.
 - The data field is set to the physical address of the created entry table.
2. Write the [DMM_PAT_DESCR_i](#) register with the physical address of the created descriptor.
3. The refill is done when the [DMM_PAT_STATUS_i\[3\]](#) DONE bit is set.

4. A new refill can be initiated when the [DMM_PAT_STATUS_i\[0\]](#) READY bit is set.

Figure 16-38. Single Auto-Configured Area Refill Scheme



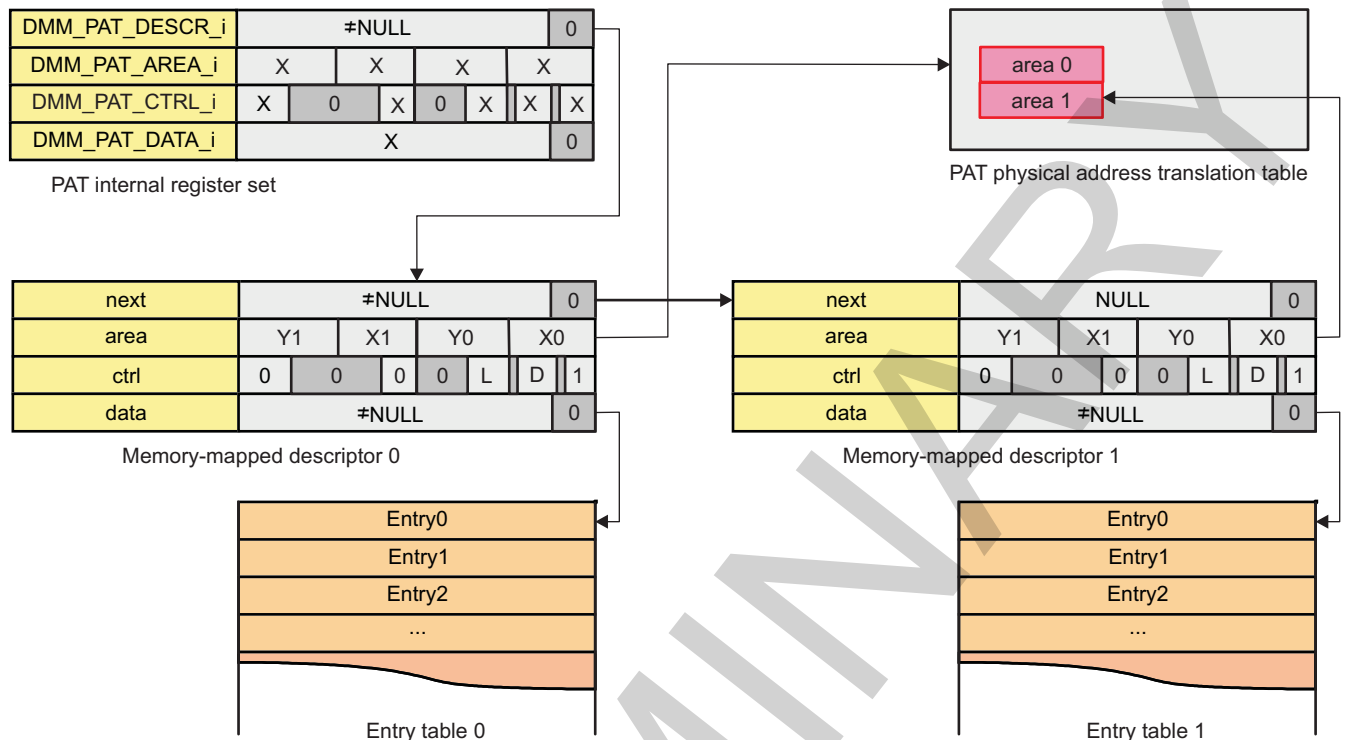
sdram-068

16.2.4.1.3 Chained Auto-Configured Area Refill

The following must be performed to create one 16-byte aligned memory-mapped entry table per area containing the entries for the corresponding area (see [Figure 16-39](#)):

- Create one 16-byte aligned memory-mapped descriptor structure per area where:
 - The next field is set to the physical address of the next descriptor or NULL for the last one.
 - The area field is set with the relevant (x0, y0) (x1, y1) area definition.
 - The ctrl field is set with the requested direction D, with the requested LUT ID L if multiple LUTs are present in the system, and the START bit is asserted to start refilling as soon as the previous area refill is done.
 - The data field is set to the physical address of the corresponding entry table.
- Write the [DMM_PAT_DESCR_i](#) register with the physical address of the first created descriptor.
- Each area refill is done when the [DMM_PAT_STATUS_i\[3\]](#) DONE bit is set.
- All area refills are done when the [DMM_PAT_STATUS_i\[0\]](#) READY bit is set.
- A new refill can be initiated when the [DMM_PAT_STATUS_i\[0\]](#) READY bit is set.

Figure 16-39. Chained Auto-Configured Area Refill Scheme

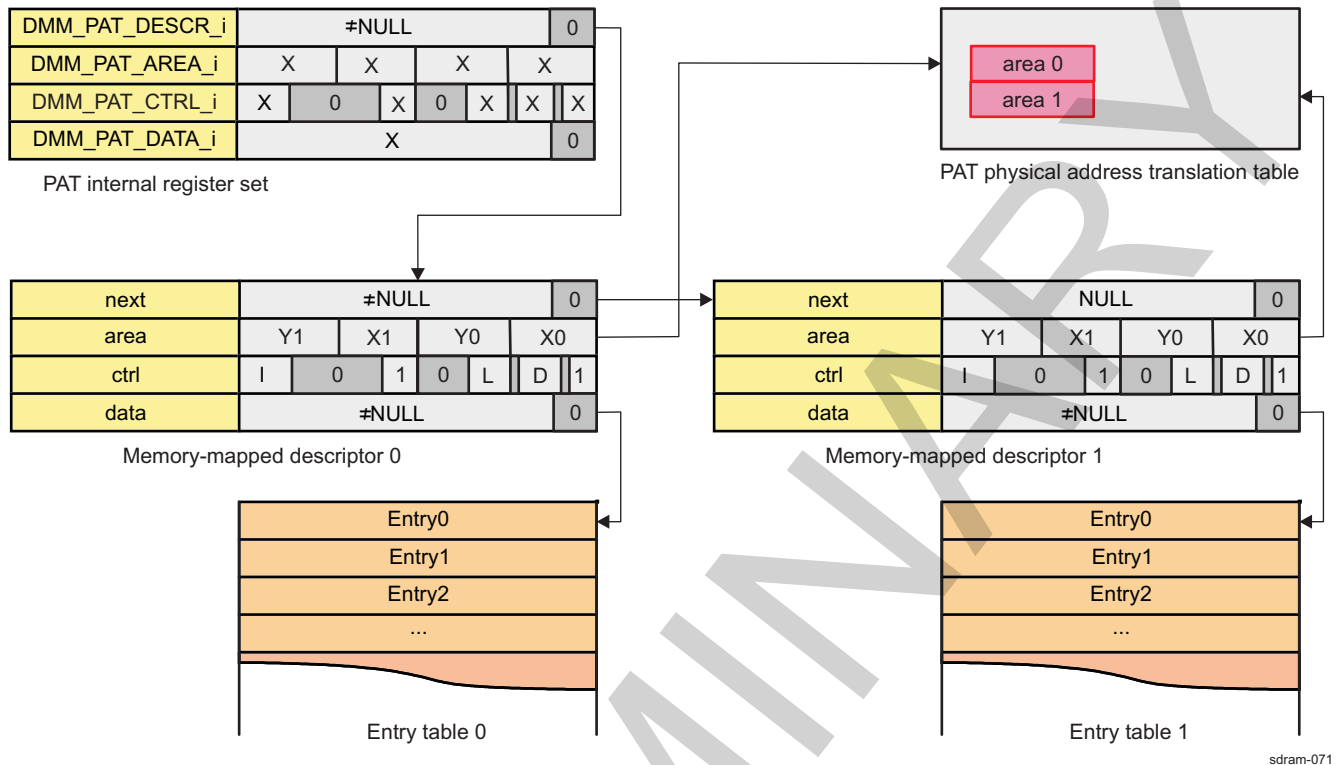


sdram-069

16.2.4.1.4 Synchronized Auto-Configured Area Refill

The following must be performed to create one 16-byte aligned memory-mapped entry table per area containing the entries for the corresponding area (see Figure 16-40):

1. Create one 16-byte aligned memory-mapped descriptor structure per area where:
 - The `next` field is set to the physical address of the next descriptor or NULL for the last one.
 - The `area` field is set with the relevant (x0, y0) (x1, y1) area definition.
 - The `ctrl` field is set with the synchronizing initiator identifier I, the SYNC bit is asserted, the requested direction D and the requested LUT ID L if multiple LUTs are present in the system, and the START bit is asserted to start refilling as soon as the previous area refill is done and initiator I has made one access in the previous area.
 - The `data` field is set to the physical address of the corresponding entry table.
2. Write the `DMM_PAT_DESCR_i` register with the physical address of the first created descriptor.
3. Each area refill is done when the `DMM_PAT_STATUS_i[3]` DONE bit is set.
4. All area refills are done when the `DMM_PAT_STATUS_i[0]` READY bit is set.
5. A new refill can be initiated when the `DMM_PAT_STATUS_i[0]` READY bit is set.

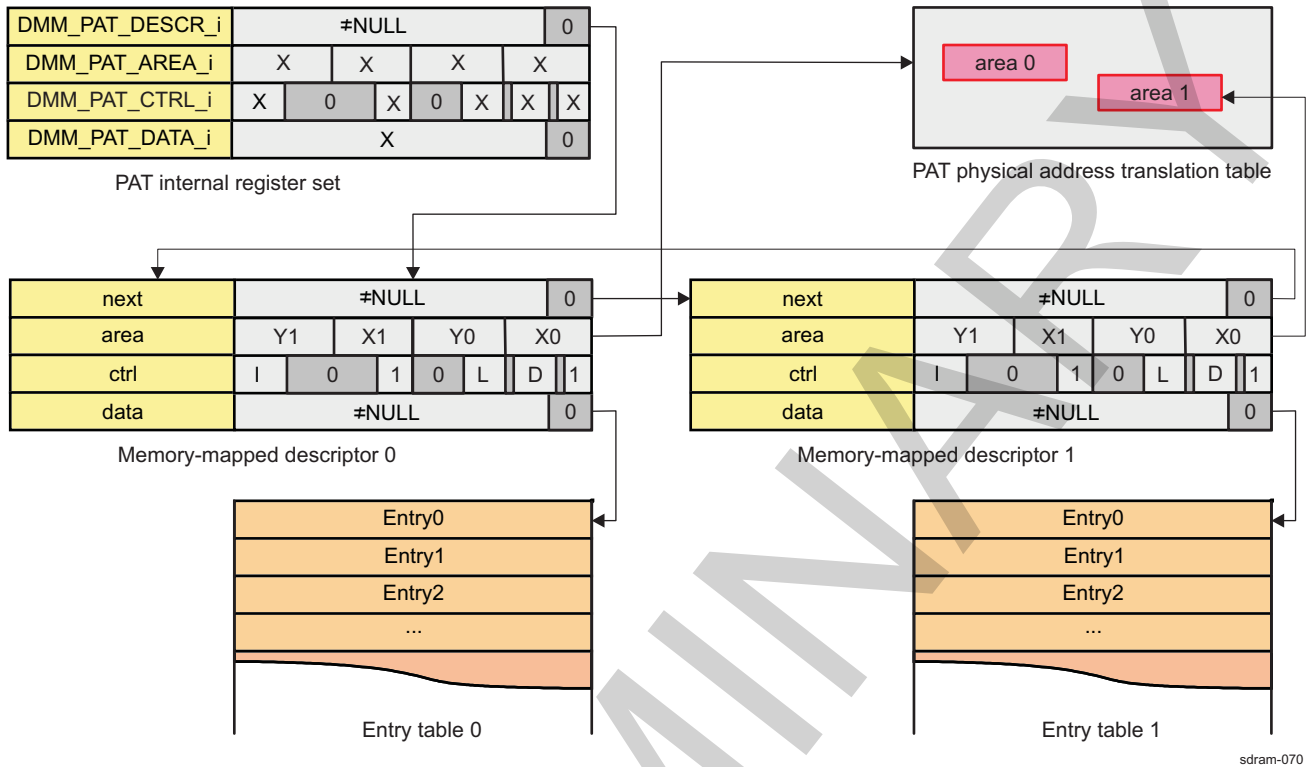
Figure 16-40. Synchronized Auto-Configured Area Refill Scheme

16.2.4.1.5 Cyclic Synchronized Auto-Configured Area Refill

The following must be performed to create one 16-byte aligned memory-mapped entry table per area containing the entries for the corresponding area (see [Figure 16-41](#)):

- Create one 16-byte aligned memory-mapped descriptor structure per area where:
 - The next field is set to the physical address of the next descriptor in the circular list.
 - The area field is set with the relevant (x0, y0) (x1, y1) area definition.
 - The control field is set with the synchronizing initiator identifier I, the SYNC bit asserted, the requested direction D and requested LUT ID L if multiple LUTs are present in the system, and the START bit is asserted to start refilling as soon as the previous area refill is done and initiator I has made one access in the previous area.
 - The data field is set to the physical address of the corresponding entry table.
- Write the [DMM_PAT_DESCR_i](#) register with the physical address of the initial descriptor.
- Each area refill is done when the [DMM_PAT_STATUS_i\[3\]](#) DONE bit is set.
- A new refill can be initiated by writing any value to the [DMM_PAT_DESCR_i](#) register to abort the current one.

Figure 16-41. Cyclic Synchronized Auto-Configured Area Refill Scheme



NOTE: Never use circular lists of descriptors where all descriptors have the `DMM_PAT_CTRL_i[0]` START bit set and there is no synchronization. This leads to an endless continuous refill.

16.2.4.2 Addressing Management with LISA

16.2.4.2.1 Case 1: Use of One Memory Controller

In this example, assume there is 1 GB of external memory evenly spread onto two address spaces. The address range for address space 0 must start at offset 0x2000_0000 (see Table 16-19).

Table 16-19. Address Definition

| Address Range | Memory Controller | Memory Controller Address Space ⁽¹⁾ | Memory Controller Address Range |
|----------------------------|-------------------|--|---------------------------------|
| 0x8000_0000 to 0x9FFF_FFFF | EMIF1 | 0x1 | 0x0000_0000 to 0x1FFF_FFFF |
| 0xA000_0000 to 0xBFFF_FFFF | EMIF1 | 0x0 | 0x2000_0000 to 0x3FFF_FFFF |

⁽¹⁾ For memory controller address spaces, see Section 16.3.4.1.1, L3 Interface.

This configuration requires two nonoverlapping sections to be set. They can be defined in any order because there is no concern with priority in this case (see Table 16-20):

Table 16-20. Configuration

| Bit Field | Section 0 (DMM_LISA_MAP_0) | Section 1 (DMM_LISA_MAP_1) |
|-------------------|----------------------------|----------------------------|
| [31:24] SYS_ADDR | 0x80 | 0xA0 |
| [22:20] SYS_SIZE | 0x5 | 0x5 |
| [19:18] SDRC_INTL | 0x0 (not applicable) | 0x0 (not applicable) |

Table 16-20. Configuration (continued)

| Bit Field | Section 0 (DMM_LISA_MAP_0) | Section 1 (DMM_LISA_MAP_1) |
|----------------------|----------------------------|----------------------------|
| [17:16] SDRC_ADDRSPC | 0x1 | 0x0 |
| [8] SDRC_MAP | 0x1 (only one controller) | 0x1 (only one controller) |
| [7:0] SDRC_ADDR | 0x00 | 0x20 |

To check whether an address hits a section, use the 8 upper address bits of the address and mask them with the hit mask: $2^8 - 2^{\text{SYS_SIZE}}$. If the result is equal to SYS_ADDR, the section is hit.

To define the physical address to be issued to the memory controller, use the 8 upper address bits of the system address, mask them with the address mask: $2^{\text{SYS_SIZE}} - 1$, and OR them with SDRC_ADDR. This gives the resulting 8 upper physical address bits. All lower address bits are forwarded unchanged.

Request to address 0x99AE_37F0:

- Upper address bits: 0x99
- Hit mask: $2^8 - 2^5 = 0xE0$
- Masked upper address bits: 0x80 – hits section 0
- Address mask: $2^5 - 1 = 0x1F$
- Masked upper address bits: 0x19
- OR with SDRC_ADDR: 0x19
- Physical address: 0x19AE_37F0

This request is forwarded to address 0x19AE_37F0, address space 1 of the memory controller.

Request to address 0xB7FF_0340:

- Upper address bits: 0xB7
- Hit mask: $2^8 - 2^5 = 0xE0$
- Masked upper address bits: 0xA0 – hits section 1
- Address mask: $2^5 - 1 = 0x1F$
- Masked upper address bits: 0x17
- OR with SDRC_ADDR: 0x57
- Physical address: 0x57FF_0340

This request is forwarded to address 0x57FF_0340, address space 0 of the memory controller.

16.2.4.2.2 Case 2: Use of Two Memory Controllers

In the case of 512 MB interleaved at 128-byte boundaries and 256 MB noninterleaved on the second memory controller, one address space per memory controller, the following results are achieved (see [Table 16-21](#)):

Table 16-21. Address Definition

| Address Range | Memory Controller | Memory Controller Address Space ⁽¹⁾ | Memory Controller Address Range |
|----------------------------|---|--|--|
| 0x8000_0000 to 0x9FFF_FFFF | EMIF1 and EMIF2, interleaved at 128-byte boundaries | 0x0 on both controllers | 0x0000_0000 to 0x0FFF_FFFF on both controllers |
| 0xA000_0000 to 0xAFFF_FFFF | EMIF2 only | 0x0 | 0x1000_0000 to 0x1FFF_FFFF |

⁽¹⁾ For memory controller address spaces, see [Section 16.3.4.1.1, L3 Interface](#).

Two sections are used to map such a configuration, see [Table 16-22](#):

Table 16-22. Configuration

| Bit Field | Section 0 (DMM_LISA_MAP_0) | Section 1 (DMM_LISA_MAP_1) |
|----------------------|----------------------------|----------------------------|
| [31:24] SYS_ADDR | 0x80 | 0xA0 |
| [22:20] SYS_SIZE | 0x5 | 0x4 |
| [19:18] SDRC_INTL | 0x1 | 0x0 (not applicable) |
| [17:16] SDRC_ADDRSPC | 0x0 | 0x0 |
| [8] SDRC_MAP | 0x3 | 0x2 |
| [7:0] SDRC_ADDR | 0x00 | 0x10 |

Detecting a section hit is the same for the interleaved case as for the single controller case: to check whether an address hits a section, use the 8 upper address bits of the address and mask them with the hit mask: $2^8 - 2^{\text{SYS_SIZE}}$. If the result is equal to SYS_ADDR, the section is hit.

The physical address generation is modified for the interleaved case. In case of 256-byte interleaving, the first chunk of 256 bytes is mapped to the first controller, the second chunk to the second controller, and so on. This results in system address bit 8 to be decoded as the controller indicator, 0 for the first controller, and 1 for the second controller (system address bit 7 is used for interleaving at the 128-byte boundary, and bit 9 for 512 bytes). This bit is not included in the computed physical address, meaning the upper system address bits [31:9] are shifted to bits [30:8] when generating the physical address.

The rest of the address generation is handled the same as for the single controller case: to define the physical address to be issued to the memory controller, use the 8 upper address bits of the system address, mask them with the address mask: $2^{\text{SYS_SIZE}} - 1$, and OR them with SDRC_ADDR. This gives the resulting 8 upper physical address bits. All lower address bits are forwarded unchanged.

Request to address 0x99AE_37F0:

- Upper address bits: 0x99
- Hit mask: $2^8 - 2^5 = 0xE0$
- Masked upper address bits: 0x80 – hits section 0
- Address mask: $2^5 - 1 = 0x1F$
- Masked upper address bits: 0x19
- Full masked address: 0x19AE_37F0
- Bit 7 is 1 – targets the second memory controller
- Full masked shifted address (suppressing bit 7): 0x0CD7_1BF0 (see [Section 16.2.4.2.2.1](#))
- OR upper physical address bits with SDRC_ADDR: 0x0CD7_1BF0
- Physical address: 0x0CD7_1BF0

This request is forwarded to address 0x0CD7_1BF0, address space 0, of the second memory controller.

16.2.4.2.2.1 Address Upper Bits Shifting

Table 16-23 describes shifting the address upper bits.

Table 16-23. Address Upper Bits Shifting

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Address Before Interleaving | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | |
| Address After Interleaving | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |

16.2.5 DMM Basic Programming Model

The programming model section:

- Describes how objects can be addressed in all TILER modes and orientations
- Explains how the physical containers and PAT LUT can be shared between different modes
- Does not give an exhaustive description of the TILER and DMM registers, because these are described in [Section 16.2.3.5, DMM](#), and [Section 16.2.3.6, TILER](#).

16.2.5.1 Global Initialization

This section identifies the requirements for initializing the surrounding modules when the DMM is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the DMM (see [Table 16-24](#)).

Table 16-24. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|--|---|
| PRCM | The module interface and functional clocks must be enabled. See Chapter 3, Power, Reset, and Clock Management . |
| Dual Cortex - M3 microprocessor unit (MPU) | Cortex-M3 interrupt controller (INTC) configuration must be done to enable the interrupts from the DMM. See Chapter 18, Interrupt Controllers . |
| Dual Cortex - A9 MPU | Cortex-A9 INTC configuration must be done to enable interrupts from the DMM. See Chapter 18, Interrupt Controllers . |
| L3 interconnect | Data interface |

16.2.5.2 DMM Module Global Initialization

This procedure in [Table 16-25](#) initializes the DMM after a power-on reset (POR).

Table 16-25. DMM Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Configure the DMM for smart-idle power management mode. | DMM_SYSCONFIG [3:2] IDLE_MODE | 0x2 |

16.2.5.3 DMM Operational Modes Configuration

16.2.5.3.1 Different Operational Modes

The TILER can be virtually accessed in four different modes: 8-, 16-, 32-bit, and page modes. Each mode defines the element granularity to apply isometric transforms (see [Table 16-26](#)).

Table 16-26. Coding and Description of TILER Modes

| Mode | Name | Granularity (Element Size) |
|------|-------------------|----------------------------|
| 0 | 8-bit tiled mode | 8 bits |
| 1 | 16-bit tiled mode | 16 bits |
| 2 | 32-bit tiled mode | 32 bits |
| 3 | Page mode | 4096 bytes |

16.2.5.3.2 Configuration Settings and LUT Refill

The procedure in [Table 16-27](#) provides the configuration settings and LUT refill.

Table 16-27. Configuration Settings and LUT Refill

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| PAT configuration refill Engine 0 | DMM_PAT_CONFIG[0] MODE0 | xxx |
| PAT configuration refill Engine 1 | DMM_PAT_CONFIG[1] MODE1 | xxx |
| Set DMM PAT view register value for each initiator. | DMM_PAT_VIEW0 Vx DMM_PAT_VIEW1 Vx | xxx |
| Set DMM PAT write enable for the initiators. | DMM_PAT_VIEW0 Wx DMM_PAT_VIEW1 Wx | xxx |
| Choosing container type and access method | DMM_PAT_VIEW_MAP_i | xxx |
| Define the base address of all view mappings. | DMM_PAT_VIEW_MAP_BASE[31] BASE_ADDR | xxx |
| Set area definition for DMM physical address translator. | DMM_PAT_AREA_i | xxx |
| Set physical address of the current table refill entry data or entry data when in manual mode. | DMM_PAT_DATA_i[31:4] ADDR | xxx |
| Define the direction of this PAT table refill (S Y X), different from 0x011. | DMM_PAT_CTRL_i[6:4] DIRECTION | xxx |
| Start a PAT table refill. | DMM_PAT_CTRL_i[0] START | 0x1 |

16.2.5.3.3 Interleaving Settings

The procedure in [Table 16-28](#) provides the interleaving settings.

Table 16-28. Interleaving Settings

| Step | Register/Bit Field/Programming Model | Value |
|---|--------------------------------------|-------|
| Set DMM system section address MSB. | DMM_LISA_MAP_i[31:24] SYS_ADDR | xxx |
| Set DMM system section size. | DMM_LISA_MAP_i[22:20] SYS_SIZE | xxx |
| Set SDRC interleaving mode. | DMM_LISA_MAP_i[19:18] SDRC_INTL | xxx |
| Set SDRC address space. | DMM_LISA_MAP_i[17:16] SDRC_ADDRSPC | xxx |
| Set SDRC mapping. | DMM_LISA_MAP_i[9:8] SDRC_MAP | xxx |
| Set SDRC address MSB. | DMM_LISA_MAP_i[7:0] SDRC_ADDR | xxx |
| Enable/disable DMM memory mapping lock. | DMM_LISA_LOCK[0] LOCK | xxx |

16.2.5.3.4 Aliased Tiled View Orientation Settings and LUT Refill

The procedure in [Table 16-29](#) provides the settings for aliased tiled view and LUT refill.

Table 16-29. Aliased Tiled View Orientation Settings and LUT Refill

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Set DMM TILER orientation for each initiator. | DMM_TILER_OR0 ORx DMM_TILER_OR1 ORx | xxx |
| Set DMM TILER write enable for the initiators. | DMM_TILER_OR0 Wx DMM_TILER_OR1 Wx | xxx |
| Define the base address of all view mappings. | DMM_PAT_VIEW_MAP_BASE[31] BASE_ADDR | xxx |
| DMM PAT initiator for synchronization | DMM_PAT_CTRL_i[31:28] INITIATOR | xxx |
| Set DMM PAT table reload synchronization. | DMM_PAT_CTRL_i[16] SYNC | xxx |
| Set DMM PAT LUT index. | DMM_PAT_CTRL_i[9:8] LUT_ID | xxx |
| Define the direction of this PAT table refill (S Y X). | DMM_PAT_CTRL_i[6:4] DIRECTION | xxx |
| Start a PAT table refill. | DMM_PAT_CTRL_i[0] START | 0x1 |

16.2.5.3.5 Priority Settings

The procedure in [Table 16-30](#) provides the sequence to set priorities.

Table 16-30. Priority Settings

| Step | Register/Bit Field/Programming Model | Value |
|-----------------------------------|--|-------|
| Set priority for each initiator. | DMM_PEG_PRIO_k Px | xxx |
| Set write enable for P_PAT field. | DMM_PEG_PRIO_PAT [4] W_PAT | xxx |
| Set priority for PAT engine. | DMM_PEG_PRIO_PAT [2:0] P_PAT | xxx |

16.2.5.3.6 Error Handling

The procedure in [Table 16-31](#) provides the sequence for error handling.

Table 16-31. Error Handling

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Enable interrupt for selected type of error. | DMM_PAT_IRQENABLE_SET [15:9] DMM_PAT_IRQENABLE_SET [7:0] | xxx |
| When interrupt occurs | | |
| Disable type of error to handle. | DMM_PAT_IRQENABLE_CLR [15:9] DMM_PAT_IRQENABLE_CLR [7:0] | xxx |
| Check error status. | DMM_PAT_IRQSTATUS [15:9] DMM_PAT_IRQSTATUS [7:0] | xxx |

16.2.5.3.7 PAT Programming Model

The PAT maps the tiled data anywhere in the 4-GB physical address range, with a PAGE granularity. (The TILER page is the granularity of physical memory allocation in the TILER container. Each page is 4kiB).

A PAT view defines the kind of PAT to perform for each page, 8-, 16-, and 32-bit mode access. Each mode in each PAT view can be programmed in two different modes: direct translation and indirect translation.

16.2.5.3.7.1 PAT in Direct Translation Mode

In this mode, the PAT performs a translation of the 128-MB virtual container as a whole in the physical address space (that is, in the SDRAM). This mode is used only for debug or in case of a DMM without a PAT.

16.2.5.3.7.2 PAT in Indirect Translation Mode

This is the most commonly used mode. In this mode, the PAT performs a translation of each 4-KB page individually. In this way the 128-MB virtual address space can be scattered in the whole 2GB of the physical address space. This is achieved by using a 32,678-word LUT that converts each page index (32,678 possible values) into 19 address bits that represent this page address in the physical memory. The main characteristic of this mode is there is no constraint on the use of the physical memory except that it is uses a multiple of 4-KB areas located at 4-KB boundaries in the physical memory. In this mode, the translation vector is in the internal 32-k entry PAT vector table at the index given by bits [26:12] of the input virtual address, and CONT_x = 0.

Programming sequence:

1. Set the [DMM_PAT_VIEW0](#) register (or [DMM_PAT_VIEW1](#), depending on the L3 CONN_ID of the initiator that is to perform the tiled accesses) with the appropriate value. For example, if the L3 CONN_ID equals 0, then the [DMM_PAT_VIEW0](#) register must be programmed with the value 0x0000_0001 (PAT view 1 selected for initiator 0).
2. Set [DMM_PAT_VIEW_MAP_BASE](#)[31] = 0x8000_0000 (must always be programmed at 1 to select the upper 2GB of the physical address space that corresponds to the external memory).

- Set all 16-bit tiled accesses in indirect translation mode by setting at least the field ACCESS_16 to 1 (DMM_PAT_VIEW_MAP_1 = 0x0000_8000), program DMM_PAT_VIEW_MAP_1 at 0x8080_8080.

16.2.5.4 Addressing an Object in Tiled Mode

This section describes how a frame-buffer with a top-left pixel at (x0,y0) in the natural view container and a bottom right pixel at (x1,y1) in the natural view container is addressed in any tiled mode and orientation.

16.2.5.4.1 Frame-Buffer Addressing

NOTE: In this section, the (x,y) coordinates are given in pixel units.

Given an (S, \bar{Y} , \bar{X}) orientation, the (x,y) coordinates of the first pixel of the frame in the oriented view (where W = the width and H = the height in pixels of the container in the considered frame mode) is:

(x,y) = (x_{or}, y_{or}) when S, (y_{or}, x_{or}) otherwise
with:

x_{or} = x₀ when \bar{X} , W-1-x₁ otherwise

y_{or} = y₀ when \bar{Y} , H-1-y₁ otherwise

Given a (M₁, M₀) TILER mode where M₁ ≠ 0 or M₀ ≠ 0, the size in bytes of a pixel is 2^{2M₁+M₀}.

Therefore, given an (S, \bar{Y} , \bar{X}) orientation and a n(M₁, M₀) TILER mode where M₁ ≠ 0 or M₀ ≠ 0, the byte offset of the base address of the considered oriented frame in its container is:

base_address((x₀, y₀), (x₁, y₁), (S, \bar{Y} , \bar{X}), (M₁, M₀)) = (y_{or}W + x_{or}) P₅ when S, (x_{or}H + y_{or}) P₅ otherwise

with:

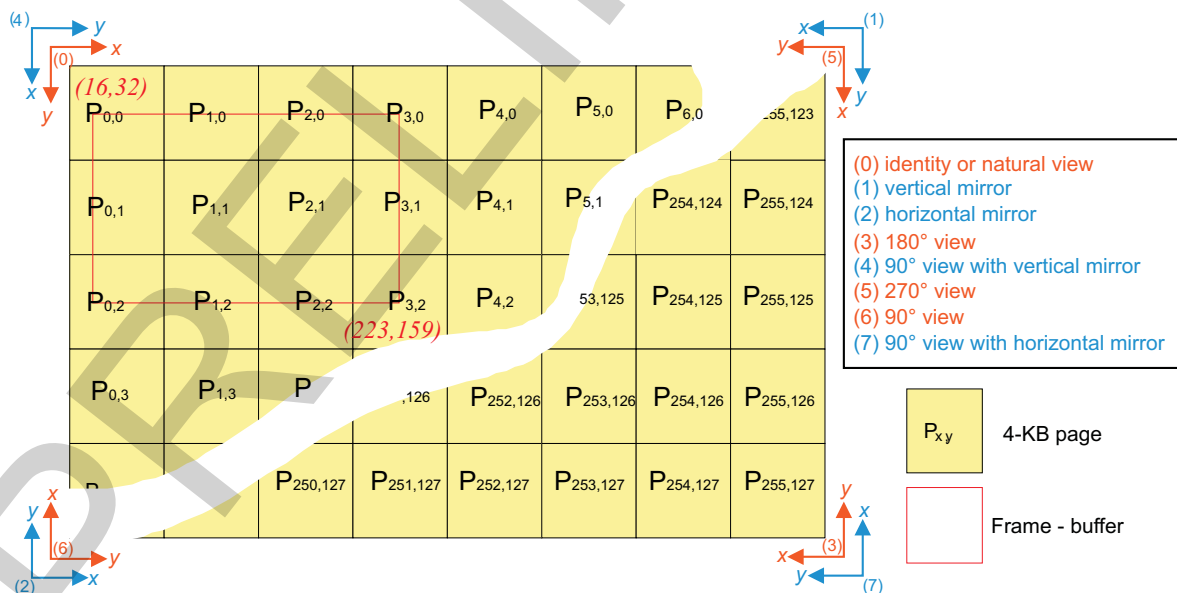
x_{or} = x₀ when \bar{X} , W-1-x₁ otherwise

y_{or} = y₀ when \bar{Y} , H-1-y₁ otherwise

P₅ = 2^{2M₁+M₀}

In its natural orientation, the TILER container consists of 8192 lines of 16,384 pixels of 8 bits, or 4096 lines of 16,384 pixels of 16 bits, or 4096 lines of 8192 pixels of 32 bits.

Figure 16-42. Example of 8-Bit Frame-Buffer Addressing in any Orientation



sdram-075

This frame-buffer address generation is independent from the page size. For instance, the 8-bit frame-buffer shown in Figure 16-42 that ranges from the top-left pixel at (16, 32) to the bottom-right pixel at (223, 159) in the natural orientation view, corresponds to the 29-bit view address offsets and full 33-bit TILER addresses given in Table 16-32.

Table 16-32. 29-Bit View Address Offset and 33-Bit Full TILER Address for an 8-Bit Frame-Buffer

| S | Y | X | x _{or} | y _{or} | 29-Bit Address Offset in View | Full 33-Bit TILER Address |
|---|---|---|-----------------|-----------------|-------------------------------|---------------------------|
| 0 | 0 | 0 | 16 | 32 | 00080010h | 100080010h |
| 0 | 0 | 1 | 16,160 | 32 | 00083F20h | 120083F20h |
| 0 | 1 | 0 | 16 | 8032 | 07D80010h | 147D80010h |
| 0 | 1 | 1 | 16,160 | 8032 | 07D83F20h | 167D83F20h |
| 1 | 0 | 0 | 16 | 32 | 00020020h | 180020020h |
| 1 | 0 | 1 | 16,160 | 32 | 07E40020h | 1A7E40020h |
| 1 | 1 | 0 | 16 | 8032 | 00021F60h | 1C0021F60h |
| 1 | 1 | 1 | 16,160 | 8032 | 07E41F60h | 1E7E41F60h |

In this example the TILER is addressed in 8-bit mode, which translates to addresses with all mode bits (bits 27 and 28) cleared in the 29-bit address offset in view and in the full 33-bit TILER address.

16.2.5.4.2 TILER Page Mapping

Let:

- c (c = 0, 1, or 2) be the TILER page configuration (0 for 4-KB pages, 1 for 16-KB pages, and 2 for 64-KB pages)
- (x₀, y₀) be the top-left pixel and (x₁, y₁) be the bottom-right pixel of a frame in its natural orientation
- W be the width and H the height in pixels of the container in the considered frame mode

The top-left page coordinates (P_{x0}, P_{y0}) and bottom-right page coordinates (P_{x1}, P_{y1}) that correspond to the frame are given by: P_{x0} = (64.x₀.2^{2-c}) / W, P_{y0} = (32.y₀.2^{2-c}) / H, P_{x1} = (64.x₁.2^{2-c}) / W and P_{y1} = (32.y₁.2^{2-c}) / H.

In its natural orientation, the TILER container consists of 8192 lines of 16,384 pixels of 8 bits, or 4096 lines of 16,384 pixels of 16 bits, or 4096 lines of 8192 pixels of 32 bits.

NOTE: The page area type has the same structure as the [DMM_PAT_AREA_i](#) registers. For instance, the 8-bit frame-buffer described in [Figure 16-42](#) and ranging from the top-left pixel at (16, 32) to the bottom-right pixel at (223, 159) in the natural orientation view, is mapped from the top-left page at P0,0 to the bottom-right page P3,2.

16.2.5.5 Addressing an Object in Page Mode

In page mode, the orientation modifies only the sequence of accessed pages, not their content. In this respect the orientation must be seen as a way to optimize the one-dimensional (1D) object allocation in a TILER container by allowing a 1D object spanning multiple pages to map a set of adjacent pages in any direction. For instance, a 1.25-MB object, mapped on 320 pages of 4-KB can be allocated in a TILER container in any of the eight orientations (see [Section 16.2.3.6.1.7.3, Element Ordering in the TILER Container](#)).

The initial page can be chosen freely among all pages. In this respect, the address offset of a page in a TILER container is expressed as:

Let:

- c (c = 0, 1 or 2) be the TILER page configuration (0 for 4-KB pages, 1 for 16-KB pages, and 2 for 64-KB pages)
- (S, Y, X) be the orientation of the considered 1D object in page mode
- (P_x, P_y) be the coordinate of the initial page in the natural orientation view

The byte offset of the base address of the considered initial page in its oriented container is:
base_address((P_x, P_y), (S, Y, X)) = 4096.(64.y_{or}.2^{2-c} + x_{or}).2^{2-c} when S, 4096.(32.x_{or}.2^{2-c} + y_{or}).2^{2-c} otherwise
with:

x_{or} = P_x when X, 64.2^{2-c}-1-P_x otherwise

y_{or} = P_y when Y, 32.2^{2-c}-1-P_y otherwise

For instance, a 1D object starting from the page P32,63 in the natural orientation view on a DMM using 4-KB pages, corresponds to the 29-bit view address offsets and full 33-bit TILER addresses given in [Table 16-33](#).

Table 16-33. 29-Bit View Address Offset and 33-Bit Full TILER Address for a 1D Object

| S | Y | X | x _{or} | y _{or} | 29-Bit Address Offset in View | Full 33-Bit TILER Address |
|---|---|---|-----------------|-----------------|-------------------------------|---------------------------|
| 0 | 0 | 0 | 32 | 63 | 1BF20000h | 11BF20000h |
| 0 | 0 | 1 | 223 | 63 | 1BFDF000h | 13BFDF000h |
| 0 | 1 | 0 | 32 | 64 | 1C020000h | 15C020000h |
| 0 | 1 | 1 | 223 | 64 | 1C0DF000h | 17C0DF000h |
| 1 | 0 | 0 | 32 | 63 | 1903F000h | 19903F000h |
| 1 | 0 | 1 | 223 | 63 | 1EFBF000h | 1BEFBF000h |
| 1 | 1 | 0 | 32 | 64 | 19040000h | 1D9040000h |
| 1 | 1 | 1 | 223 | 64 | 1EFC0000h | 1FEFC0000h |

In this example the TILER is addressed in page mode, which translates to addresses with mode bits (bits 27 and 28) set in the 29-bit address offset in view and full 33-bit TILER address.

16.2.5.6 Sharing Containers Between Different Modes

When allocating objects in TILER containers, take care to ensure that no two objects physically overlap.

In this respect, and to ease the object allocation and deallocation, it is strongly advised to share a TILER page only for different objects that do both of the following:

- Belong to the same mode
- Have the same lifetime (that is, are allocated and deallocated simultaneously)

Two objects of different modes can physically overlap if:

- One physical page is mapped twice in two different locations of the DMM LUT.
- The two objects share the DMM LUT and the intersection of their two page set is not empty.

These two issues can be easily avoided by allocating a physical page only once in the DMM LUT.

The second issue is a bit more difficult, especially if the allocation of objects in the various TILER containers must be dynamic. Managing the fragmentation within a flat memory model in a space-constrained system is not straightforward, and is the main reason for the existence of MMUs in most current processors, which adds yet another constraint to the problem (the y dimension, which makes it even more difficult).

Returning to the CPU-analogy, the memory fragmentation issue has been mostly solved by using a virtual memory space larger than the actual physical memory space and a virtual-to-physical translation system. This allows contiguous virtual memory allocation when sufficient physical memory is available and the larger contiguous physical buffer is smaller than the requested memory allocation.

Similarly, the DMM answer to this object allocation in the TILER containers is two-fold:

- The DMM must have sufficient virtual address space in all modes to permit a static allocation of a pool of virtual buffers in all TILER modes for all TILER-aware initiators.
- Each TILER-aware initiator must dynamically manage its own pool of virtual buffers.

16.2.6 DMM Register Manual

This section provides information about the DMM registers. [Table 16-34](#) describes the DMM instance.

16.2.6.1 DMM Instance Summary

Table 16-34. DMM Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|------|
| DMM | 0x4E00 0000 | 32MB |

16.2.6.2 DMM Registers

16.2.6.2.1 DMM Register Summary

[Table 16-35](#) provides a summary of the DMM registers.

Table 16-35. DMM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | DMM L3 Physical Address |
|--|------|-----------------------|--------------------------|--------------------------|
| DMM_REVISION | R | 32 | 0x0000 0000 | 0x4E00 0000 |
| DMM_HWINFO | R | 32 | 0x0000 0004 | 0x4E00 0004 |
| DMM_LISA_HWINFO | R | 32 | 0x0000 0008 | 0x4E00 0008 |
| DMM_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4E00 0010 |
| DMM_LISA_LOCK | RW | 32 | 0x0000 001C | 0x4E00 001C |
| DMM_LISA_MAP_i⁽¹⁾ | RW | 32 | 0x0000 0040 + (0x4 * i) | 0x4E00 0040 + (0x4 * i) |
| DMM_TILER_HWINFO | R | 32 | 0x0000 0208 | 0x4E00 0208 |
| DMM_TILER_OR0 | RW | 32 | 0x0000 0220 | 0x4E00 0220 |
| DMM_TILER_OR1 | RW | 32 | 0x0000 0224 | 0x4E00 0224 |
| DMM_PAT_HWINFO | R | 32 | 0x0000 0408 | 0x4E00 0408 |
| DMM_PAT_GEOMETRY | R | 32 | 0x0000 040C | 0x4E00 040C |
| DMM_PAT_CONFIG | RW | 32 | 0x0000 0410 | 0x4E00 0410 |
| DMM_PAT_VIEW0 | RW | 32 | 0x0000 0420 | 0x4E00 0420 |
| DMM_PAT_VIEW1 | RW | 32 | 0x0000 0424 | 0x4E00 0424 |
| DMM_PAT_VIEW_MAP_i⁽¹⁾ | RW | 32 | 0x0000 0440 + (0x4 * i) | 0x4E00 0440 + (0x4 * i) |
| DMM_PAT_VIEW_MAP_BASE | RW | 32 | 0x0000 0460 | 0x4E00 0460 |
| DMM_PAT_IRQSTATUS_RAW | RW | 32 | 0x0000 0480 | 0x4E00 0480 |
| DMM_PAT_IRQSTATUS | RW | 32 | 0x0000 0490 | 0x4E00 0490 |
| DMM_PAT_IRQENABLE_SET | RW | 32 | 0x0000 04A0 | 0x4E00 04A0 |
| DMM_PAT_IRQENABLE_CLR | RW | 32 | 0x0000 04B0 | 0x4E00 04B0 |
| DMM_PAT_STATUS_i⁽¹⁾ | R | 32 | 0x0000 04C0 + (0x4 * i) | 0x4E00 04C0 + (0x4 * i) |
| DMM_PAT_DESCR_i⁽¹⁾ | RW | 32 | 0x0000 0500 + (0x10 * i) | 0x4E00 0500 + (0x10 * i) |
| DMM_PAT_AREA_i⁽¹⁾ | RW | 32 | 0x0000 0504 + (0x10 * i) | 0x4E00 0504 + (0x10 * i) |
| DMM_PAT_CTRL_i⁽¹⁾ | RW | 32 | 0x0000 0508 + (0x10 * i) | 0x4E00 0508 + (0x10 * i) |
| DMM_PAT_DATA_i⁽¹⁾ | RW | 32 | 0x0000 050C + (0x10 * i) | 0x4E00 050C + (0x10 * i) |
| DMM_PEG_HWINFO | R | 32 | 0x0000 0608 | 0x4E00 0608 |
| DMM_PEG_PRIO_k⁽²⁾ | RW | 32 | 0x0000 0620 + (0x4 * k) | 0x4E00 0620 + (0x4 * k) |

⁽¹⁾ i = 0 to 3 for DMM

⁽²⁾ k = 0 to 7

Table 16-35. DMM Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | DMM L3 Physical Address |
|----------------------------------|------|-----------------------|----------------|-------------------------|
| DMM_PEG_PRIO_PAT | RW | 32 | 0x0000 0640 | 0x4E00 0640 |

16.2.6.2.2 DMM Register Description

[Table 16-36](#) through [Table 16-90](#) describe the DMM registers.

Table 16-36. DMM_REVISION

| | | | |
|-------------------------|-----------------------------|-----------------|-----|
| Address Offset | 0x0000 0000 | Instance | DMM |
| Physical Address | 0x4E00 0000 | | |
| Description | DMM Revision Number | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|------------|
| 31:0 | REVISION | Revision Number | R | 0x---- (1) |

(1) TI internal data

Table 16-37. Register Call Summary for Register DMM_REVISION

Dynamic Memory Manager

- [DMM Register Summary: \[0\]](#)

Table 16-38. DMM_HWINFO

| | | | |
|------------------|----------------------------|----------|-----|
| Address Offset | 0x0000 0004 | Instance | DMM |
| Physical Address | 0x4E00 0004 | | |
| Description | DMM hardware configuration | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------|----|----|----|----------|----|----|----|----------|----|----|----|----------|----|---|---|-----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | ROBIN CNT | | | | RESERVED | | | | ELLA CNT | | | | RESERVED | | | | TILER CNT | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|----------------------------|------|-------|
| 31:20 | RESERVED | Reserved | R | 0x000 |
| 19:16 | ROBIN_CNT | Number of ROBIN in the DMM | R | 0x2 |
| 15:12 | RESERVED | Reserved | R | 0x0 |
| 11:8 | ELLA_CNT | Number of ELLA in the DMM | R | 0x0 |
| 7:4 | RESERVED | Reserved | R | 0x0 |
| 3:0 | TILER_CNT | Number of TILER in the DMM | R | 0x2 |

Table 16-39. Register Call Summary for Register DMM_HWINFO

Dynamic Memory Manager

- [DMM Configuration: \[0\] \[1\]](#)
- [DMM Register Summary: \[2\]](#)

Table 16-40. DMM_LISA_HWINFO

| | | | |
|-------------------------|-------------------------------------|-----------------|-----|
| Address Offset | 0x0000 0008 | Instance | DMM |
| Physical Address | 0x4E00 0008 | | |
| Description | DMM hardware configuration for LISA | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|---|---|----------|---|---|-------------|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | SDRC_CNT | | | RESERVED | | | SECTION_CNT | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--------------------------------------|------|---------|
| 31:12 | RESERVED | Reserved | R | 0x00000 |
| 11:8 | SDRC_CNT | Number of attached SDRAM controllers | R | 0x2 |
| 7:5 | RESERVED | Reserved | R | 0x0 |
| 4:0 | SECTION_CNT | Number of DMM sections | R | 0x02 |

Table 16-41. Register Call Summary for Register DMM_LISA_HWINFO

Dynamic Memory Manager

- [DMM Configuration: \[0\] \[1\]](#)
- [DMM Register Summary: \[2\]](#)

Table 16-42. DMM_SYSCONFIG

| | | | |
|-------------------------|------------------------------------|-----------------|-----|
| Address Offset | 0x0000 0010 | Instance | DMM |
| Physical Address | 0x4E00 0010 | | |
| Description | DMM clock management configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|-----------|---|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | IDLE_MODE | | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:4 | RESERVED | Reserved | R | 0x0000000 |
| 3:2 | IDLE_MODE | Configuration of the local target state management mode. 0x0: Force-idle mode: local target's idle state follows (acknowledges) the system's idle requests unconditionally, that is, regardless of the IP module's internal requirements. Backup mode, for debug only. 0x1: No-idle mode: local target never enters idle state. Backup mode, for debug only 0x3: Reserved 0x2: Smart-idle mode: local target's idle state eventually follows (acknowledges) the system's idle requests, depending on the IP module's internal requirements. IP module shall not generate (IRQ- or DMA-request-related) wake-up events. | RW | 0x2 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|--------------|-------|
| 1:0 | RESERVED | Reserved | RW W0Only | 0x0 |

Table 16-43. Register Call Summary for Register DMM_SYSCONFIG

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [DMM Power Management: \[1\]](#)
- [DMM Module Global Initialization: \[2\]](#)
- [DMM Register Summary: \[3\]](#)

Table 16-44. DMM_LISA_LOCK

| | | | |
|-------------------------|-----------------------------|-----------------|-----|
| Address Offset | 0x0000 001C | Instance | DMM |
| Physical Address | 0x4E00 001C | | |
| Description | DMM memory mapping lock | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LOCK |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Should be written as 0 | R | 0x0000 0000 |
| 0 | LOCK | DMM lock map Write 0x0: No effect (clear on reset only) Read 0x0: DMM_LISA_MAP_i unlocked Read 0x1: DMM_LISA_MAP_i locked Write 0x1: Locking DMM_LISA_MAP_i registers | RW | 0 |

Table 16-45. Register Call Summary for Register DMM_LISA_LOCK

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [DMM Concepts: \[1\]](#)
- [DMM Internal Macro-Architecture: \[2\]](#)
- [Interleaving Settings: \[3\]](#)
- [DMM Register Summary: \[4\]](#)

Table 16-46. DMM_LISA_MAP_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0040 + (0x4 * i) | Index | i = 0 to 3 |
| Physical Address | 0x4E00 0040 + (0x4 * i) | Instance | DMM |
| Description | DMM memory mapping register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----------|----|----|----|-----------|--------------|----------|----|----|----|----|----|----|----------|-----------|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SYS_ADDR | | | | | | | | RESERVED | SYS_SIZE | | | | SDRC_INTL | SDRC_ADDRSPC | RESERVED | | | | | | | SDRC_MAP | SDRC_ADDR | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|--------------|-------|
| 31:24 | SYS_ADDR | DMM system section address MSB for view mapping i | RW | 0x00 |
| 23 | RESERVED | Reserved | RW W0Only | 0 |
| 22:20 | SYS_SIZE | DMM system section size for view mapping i 0x0: 16-MB section 0x1: 32-MB section 0x2: 64-MB section 0x3: 128-MB section 0x4: 256-MB section 0x5: 512-MB section 0x6: 1-GB section 0x7: 2-GB section | RW | 0x0 |
| 19:18 | SDRC_INTL | SDRAM controller interleaving mode 0x0: No interleaving 0x1: 128-byte interleaving 0x2: 256-byte interleaving 0x3: 512-byte interleaving The 128-/256-/512-byte interleaving applies only to nontiled regions. If accesses are made to tiled regions, interleaving is forced to 1kiB. SDRC_INTL is don't care if SDRC_MAP is not 0x3 (no interleaving). | RW | 0x0 |
| 17:16 | SDRC_ADDRSPC | SDRAM controller address space for view mapping i | RW | 0x0 |
| 15:10 | RESERVED | Reserved | RW W0Only | 0x00 |
| 9:8 | SDRC_MAP | SDRAM controller mapping for view mapping i 0x0: Unmapped 0x1: Mapped on EMIF1 only (not interleaved) 0x2: Mapped on EMIF2 only (not interleaved) 0x3: Mapped on EMIF1 and EMIF2 (interleaved) To enable interleaving, SDRC_MAP must be 0x3 and SDRC_INTL must be a nonzero value. | RW | 0 |
| 7:0 | SDRC_ADDR | SDRAM controller address MSB for view mapping i | RW | 0x00 |

Table 16-47. Register Call Summary for Register DMM_LISA_MAP_i

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [DMM Concepts: \[1\] \[2\]](#)
- [DMM Internal Macro-Architecture: \[3\] \[4\]](#)
- [Interleaving Settings: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [DMM Register Summary: \[11\]](#)
- [DMM Register Description: \[12\] \[13\] \[14\]](#)

Table 16-48. DMM_TILER_HWINFO

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--------------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|-----|----|----|----|---|---|---|---|---|---|--------|---|---|---|--|--|
| Address Offset | 0x0000 0208 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4E00 0208 | | | | | | | | | | | | | | | | Instance | DMM | | | | | | | | | | | | | | | |
| Description | DMM hardware configuration for TILER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | OR CNT | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4:0 | OR_CNT | Number of TILER orientation entries Read 0x1: One orientation entry Read 0x2: Two orientation entries Read 0x4: Four orientation entries Read 0x8: Eight orientation entries Read 0x10: Sixteen orientation entries | R | 0x10 |

Table 16-49. Register Call Summary for Register DMM_TILER_HWINFO

Dynamic Memory Manager

- [DMM Configuration: \[0\]](#)
- [DMM Register Summary: \[1\]](#)

Table 16-50. DMM_TILER_OR0

| | | | |
|-------------------------|---|-----------------|-----|
| Address Offset | 0x0000 02200 | Index | 0 |
| Physical Address | 0x4E00 0220 | Instance | DMM |
| Description | DMM TILER orientation (initiators 0 to 7) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|-----|----|----|----|-----|----|----|----|-----|----|----|----|-----|----|----|----|-----|----|----|----|-----|---|---|----|-----|---|---|----|-----|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| W7 | OR7 | | | W6 | OR6 | | | W5 | OR5 | | | W4 | OR4 | | | W3 | OR3 | | | W2 | OR2 | | | W1 | OR1 | | | W0 | OR0 | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31 | W7 | Write-enable for OR7 bit field Write 0x0: OR7 field is unchanged Write 0x1: OR7 field is updated | RW | 0 |
| 30:28 | OR7 | Orientation for initiator 7 | RW | 0x0 |
| 27 | W6 | Write-enable for OR6 bit field Write 0x0: OR6 field is unchanged Write 0x1: OR6 field is updated | RW | 0 |
| 26:24 | OR6 | Orientation for initiator 6 | RW | 0x0 |
| 23 | W5 | Write-enable for OR5 bit field Write 0x0: OR5 field is unchanged Write 0x1: OR5 field is updated | RW | 0 |
| 22:20 | OR5 | Orientation for initiator 5 | RW | 0x0 |
| 19 | W4 | Write-enable for OR4 bit field Write 0x0: OR4 field is unchanged Write 0x1: OR4 field is updated | RW | 0 |
| 18:16 | OR4 | Orientation for initiator 4 | RW | 0x0 |
| 15 | W3 | Write-enable for OR3 bit field Write 0x0: OR3 field is unchanged Write 0x1: OR3 field is updated | RW | 0 |
| 14:12 | OR3 | Orientation for initiator 3 | RW | 0x0 |
| 11 | W2 | Write-enable for OR2 bit field Write 0x0: OR2 field is unchanged Write 0x1: OR2 field is updated | RW | 0 |
| 10:8 | OR2 | Orientation for initiator 2 | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7 | W1 | Write-enable for OR1 bit field Write 0x0: OR1 field is unchanged Write 0x1: OR1 field is updated | RW | 0 |
| 6:4 | OR1 | Orientation for initiator 1 | RW | 0x0 |
| 3 | W0 | Write-enable for OR0 bit field Write 0x0: OR0 field is unchanged Write 0x1: OR0 field is updated | RW | 0 |
| 2:0 | OR0 | Orientation for initiator 0 | RW | 0x0 |

Table 16-51. Register Call Summary for Register DMM_TILER_OR0

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [TILER Macro-Architecture: \[1\] \[2\]](#)
- [Aliased Tiled View Orientation Settings and LUT Refill: \[3\] \[4\]](#)
- [DMM Register Summary: \[5\]](#)

Table 16-52. DMM_TILER_OR1

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 02204 | Index | 0 |
| Physical Address | 0x4E00 0224 | Instance | DMM |
| Description | DMM TILER orientation (initiators 8 to 15) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|------|----|----|----|-----|------|----|----|----|-----|------|----|----|----|-----|------|----|----|----|-----|------|---|---|---|-----|------|---|---|---|----|-----|--|--|--|----|-----|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
| W15 | OR15 | | | | W14 | OR14 | | | | W13 | OR13 | | | | W12 | OR12 | | | | W11 | OR11 | | | | W10 | OR10 | | | | W9 | OR9 | | | | W8 | OR8 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31 | W15 | Write-enable for OR15 bit field Write 0x0: OR15 field is unchanged Write 0x1: OR15 field is updated | RW | 0 |
| 30:28 | OR15 | Orientation for initiator 15 | RW | 0x0 |
| 27 | W14 | Write-enable for OR14 bit field Write 0x0: OR14 field is unchanged Write 0x1: OR14 field is updated | RW | 0 |
| 26:24 | OR14 | Orientation for initiator 14 | RW | 0x0 |
| 23 | W13 | Write-enable for OR13 bit field Write 0x0: OR13 field is unchanged Write 0x1: OR13 field is updated | RW | 0 |
| 22:20 | OR13 | Orientation for initiator 13 | RW | 0x0 |
| 19 | W12 | Write-enable for OR12 bit field Write 0x0: OR12 field is unchanged Write 0x1: OR12 field is updated | RW | 0 |
| 18:16 | OR12 | Orientation for initiator 12 | RW | 0x0 |
| 15 | W11 | Write-enable for OR11 bit field Write 0x0: OR11 field is unchanged Write 0x1: OR11 field is updated | RW | 0 |
| 14:12 | OR11 | Orientation for initiator 11 | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 11 | W10 | Write-enable for OR10 bit field Write 0x0: OR10 field is unchanged Write 0x1: OR10 field is updated | RW | 0 |
| 10:8 | OR10 | Orientation for initiator 10 | RW | 0x0 |
| 7 | W9 | Write-enable for OR9 bit field Write 0x0: OR9 field is unchanged Write 0x1: OR9 field is updated | RW | 0 |
| 6:4 | OR9 | Orientation for initiator 9 | RW | 0x0 |
| 3 | W8 | Write-enable for OR8 bit field Write 0x0: OR8 field is unchanged Write 0x1: OR8 field is updated | RW | 0 |
| 2:0 | OR8 | Orientation for initiator 8 | RW | 0x0 |

Table 16-53. Register Call Summary for Register DMM_TILER_OR1

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [TILER Macro-Architecture: \[1\] \[2\]](#)
- [Aliased Tiled View Orientation Settings and LUT Refill: \[3\] \[4\]](#)
- [DMM Register Summary: \[5\]](#)

Table 16-54. DMM_PAT_HWINFO

| | | | |
|-------------------------|------------------------------------|-----------------|-----|
| Address Offset | 0x0000 0408 | Instance | DMM |
| Physical Address | 0x4E00 0408 | | |
| Description | DMM hardware configuration for PAT | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|---------|----|----|----|----------|----|----|----|--------------|----|---|---|----------|---|----------|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | RESERVED | | | | LUT_CNT | | | | RESERVED | | | | VIEW_MAP_CNT | | | | RESERVED | | VIEW_CNT | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|-------|
| 31:29 | RESERVED | Reserved | R | 0x0 |
| 28:24 | ENGINE_CNT | Number of PAT refill engines | R | 0x04 |
| 23:21 | RESERVED | Reserved | R | 0x0 |
| 20:16 | LUT_CNT | Number of PAT LUT for page-grained physical address translation | R | 0x01 |
| 15:12 | RESERVED | Reserved | R | 0x0 |
| 11:8 | VIEW_MAP_CNT | Number of internal PAT view mappings. Read 0x1: One view map Read 0x2: Two view maps Read 0x4: Four view maps Read 0x8: Eight view maps | R | 0x4 |
| 7 | RESERVED | Reserved | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 6:0 | VIEW_CNT | Number of PAT view entries Read 0x1: One view entry Read 0x2: Two view entries Read 0x4: Four view entries Read 0x8: Eight view entries Read 0x10: Sixteen view entries Read 0x20: Thirty-two view entries Read 0x40: Sixty-four view entries | R | 0x10 |

Table 16-55. Register Call Summary for Register DMM_PAT_HWINFO

Dynamic Memory Manager

- [DMM Configuration: \[0\] \[1\] \[2\] \[3\]](#)
- [DMM Register Summary: \[4\]](#)

Table 16-56. DMM_PAT_GEOMETRY

| | | | |
|-------------------------|-------------------------------|-----------------|-----|
| Address Offset | 0x0000 040C | Instance | DMM |
| Physical Address | 0x4E00 040C | | |
| Description | PAT geometry-related settings | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|-----------|----|----|----------|----|----|----|-----------|----|----|----|----------|----|------------|----|----|----|---|---|----------|---|---|---------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | CONT_HGHT | | | RESERVED | | | | CONT_WDTH | | | | RESERVED | | ADDR_RANGE | | | | | | RESERVED | | | PAGE_SZ | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:27 | RESERVED | Reserved | R | 0x00 |
| 26:24 | CONT_HGHT | Container height in pages Read 0x1: Container height of 32 pages Read 0x2: Container height of 64 pages Read 0x4: Container height of 128 pages | R | 0x4 |
| 23:20 | RESERVED | Reserved | R | 0x0 |
| 19:16 | CONT_WDTH | Container width in pages Read 0x2: Container width of 64 pages Read 0x4: Container width of 128 pages Read 0x8: Container width of 256 pages | R | 0x8 |
| 15:14 | RESERVED | Reserved | R | 0x0 |
| 13:8 | ADDR_RANGE | PAT output physical address range Read 0x1: 128-MB range Read 0x2: 256-MB range Read 0x4: 512-MB range Read 0x8: 1-GB range Read 0x10: 2-GB range Read 0x20: 4-GB range | R | 0x10 |
| 7:5 | RESERVED | Reserved | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 4:0 | PAGE_SZ | Page size in 4-KB granularity Read 0x1: 4-KB page Read 0x4: 16-KB page Read 0x10: 64-KB page | R | 0x01 |

Table 16-57. Register Call Summary for Register DMM_PAT_GEOMETRY

Dynamic Memory Manager

- [DMM Configuration: \[0\] \[1\] \[2\] \[3\]](#)
- [DMM Register Summary: \[4\]](#)

Table 16-58. DMM_PAT_CONFIG

| | | | |
|-------------------------|---|-----------------|-----|
| Address Offset | 0x0000 0410 | Instance | DMM |
| Physical Address | 0x4E00 0410 | | |
| Description | This is the PAT configuration register aimed at defining the major PAT configuration of each refill engine. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-------|-------|-------|-------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | MODE3 | MODE2 | MODE1 | MODE0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | MODE3 | Mode of refill engine 3 0: Normal mode 1: Direct LUT access | RW | 0 |
| 2 | MODE2 | Mode of refill engine 2 0: Normal mode 1: Direct LUT access | RW | 0 |
| 1 | MODE1 | Mode of refill engine 1 0: Normal mode 1: Direct LUT access | RW | 0 |
| 0 | MODE0 | Mode of refill engine 0 0: Normal mode 1: Direct LUT access | RW | 0 |

Table 16-59. Register Call Summary for Register DMM_PAT_CONFIG

Dynamic Memory Manager

- [DMM Concepts: \[0\]](#)
- [Configuration Settings and LUT Refill: \[1\] \[2\]](#)
- [DMM Register Summary: \[3\]](#)

Table 16-60. DMM_PAT_VIEW0

| | | | |
|-------------------------|---|-----------------|-----|
| Address Offset | 0x0000 0420 | Index | |
| Physical Address | 0x4E00 0420 | Instance | DMM |
| Description | DMM PAT View register (initiators 0 to 7) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----------|----|----|----------|----|----|----------|----|----|----------|----|----|----------|----|----|----------|----|----|----------|----|----|----------|----|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| W7 | RESERVED | V7 | W6 | RESERVED | V6 | W5 | RESERVED | V5 | W4 | RESERVED | V4 | W3 | RESERVED | V3 | W2 | RESERVED | V2 | W1 | RESERVED | V1 | W0 | RESERVED | V0 | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|--------------|-------|
| 31 | W7 | Write-enable for V7 bit field Write 0x0: V7 field is unchanged Write 0x1: V7 field is updated | RW | 0 |
| 30 | RESERVED | Reserved | RW W0Only | 0 |
| 29:28 | V7 | PAT view for initiator 7 | RW | 0x0 |
| 27 | W6 | Write-enable for V6 bit field Write 0x0: V6 field is unchanged Write 0x1: V6 field is updated | RW | 0 |
| 26 | RESERVED | Reserved | RW W0Only | 0 |
| 25:24 | V6 | PAT view for initiator 6 | RW | 0x0 |
| 23 | W5 | Write-enable for V5 bit field Write 0x0: V5 field is unchanged Write 0x1: V5 field is updated | RW | 0 |
| 22 | RESERVED | Reserved | RW W0Only | 0 |
| 21:20 | V5 | PAT view for initiator 5 | RW | 0x0 |
| 19 | W4 | Write-enable for V4 bit field Write 0x0: V4 field is unchanged Write 0x1: V4 field is updated | RW | 0 |
| 18 | RESERVED | Reserved | RW W0Only | 0 |
| 17:16 | V4 | PAT view for initiator 4 | RW | 0x0 |
| 15 | W3 | Write-enable for V3 bit field Write 0x0: V3 field is unchanged Write 0x1: V3 field is updated | RW | 0 |
| 14 | RESERVED | Reserved | RW W0Only | 0 |
| 13:12 | V3 | PAT view for initiator 3 | RW | 0x0 |
| 11 | W2 | Write-enable for V2 bit field Write 0x0: V2 field is unchanged Write 0x1: V2 field is updated | RW | 0 |
| 10 | RESERVED | Reserved | RW W0Only | 0 |
| 9:8 | V2 | PAT view for initiator 2 | RW | 0x0 |
| 7 | W1 | Write-enable for V1 bit field Write 0x0: V1 field is unchanged Write 0x1: V1 field is updated | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|--------------|-------|
| 6 | RESERVED | Reserved | RW W0Only | 0 |
| 5:4 | V1 | PAT view for initiator 1 | RW | 0x0 |
| 3 | W0 | Write-enable for V0 bit field Write 0x0: V0 field is unchanged Write 0x1: V0 field is updated | RW | 0 |
| 2 | RESERVED | Reserved | RW W0Only | 0 |
| 1:0 | V0 | PAT view for initiator 0 | RW | 0x0 |

Table 16-61. Register Call Summary for Register DMM_PAT_VIEW0

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [DMM Concepts: \[1\] \[2\]](#)
- [Configuration Settings and LUT Refill: \[3\] \[4\]](#)
- [PAT Programming Model: \[5\] \[6\]](#)
- [DMM Register Summary: \[7\]](#)

Table 16-62. DMM_PAT_VIEW1

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 0424 | Index | |
| Physical Address | 0x4E00 0424 | Instance | DMM |
| Description | DMM PAT view register (initiators 8 to 15) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|-----|-----|----------|-----|----|----------|----|----|----------|----|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| W15 | RESERVED | V15 | W14 | RESERVED | V14 | W13 | RESERVED | V13 | W12 | RESERVED | V12 | W11 | RESERVED | V11 | W10 | RESERVED | V10 | W9 | RESERVED | V9 | W8 | RESERVED | V8 | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|--------------|-------|
| 31 | W15 | Write-enable for V15 bit field Write 0x0: V15 field is unchanged Write 0x1: V15 field is updated | RW | 0 |
| 30 | RESERVED | Reserved | RW W0Only | 0 |
| 29:28 | V15 | PAT view for initiator 15 | RW | 0x0 |
| 27 | W14 | Write-enable for V14 bit field Write 0x0: V14 field is unchanged Write 0x1: V14 field is updated | RW | 0 |
| 26 | RESERVED | Reserved | RW W0Only | 0 |
| 25:24 | V14 | PAT view for initiator 14 | RW | 0x0 |
| 23 | W13 | Write-enable for V13 bit field Write 0x0: V13 field is unchanged Write 0x1: V13 field is updated | RW | 0 |
| 22 | RESERVED | Reserved | RW W0Only | 0 |
| 21:20 | V13 | PAT view for initiator 13 | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|--------------|-------|
| 19 | W12 | Write-enable for V12 bit field Write 0x0: V12 field is unchanged Write 0x1: V12 field is updated | RW | 0 |
| 18 | RESERVED | Reserved | RW W0Only | 0 |
| 17:16 | V12 | PAT view for initiator 12 | RW | 0x0 |
| 15 | W11 | Write-enable for V11 bit field Write 0x0: V11 field is unchanged Write 0x1: V11 field is updated | RW | 0 |
| 14 | RESERVED | Reserved | RW W0Only | 0 |
| 13:12 | V11 | PAT view for initiator 11 | RW | 0x0 |
| 11 | W10 | Write-enable for V10 bit field Write 0x0: V10 field is unchanged Write 0x1: V10 field is updated | RW | 0 |
| 10 | RESERVED | Reserved | RW W0Only | 0 |
| 9:8 | V10 | PAT view for initiator 10 | RW | 0x0 |
| 7 | W9 | Write-enable for V9 bit field Write 0x0: V9 field is unchanged Write 0x1: V9 field is updated | RW | 0 |
| 6 | RESERVED | Reserved | RW W0Only | 0 |
| 5:4 | V9 | PAT view for initiator 9 | RW | 0x0 |
| 3 | W8 | Write-enable for V8 bit field Write 0x0: V8 field is unchanged Write 0x1: V8 field is updated | RW | 0 |
| 2 | RESERVED | Reserved | RW W0Only | 0 |
| 1:0 | V8 | PAT view for initiator 8 | RW | 0x0 |

Table 16-63. Register Call Summary for Register DMM_PAT_VIEW1

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [DMM Concepts: \[1\] \[2\]](#)
- [Configuration Settings and LUT Refill: \[3\] \[4\]](#)
- [PAT Programming Model: \[5\]](#)
- [DMM Register Summary: \[6\]](#)

Table 16-64. DMM_PAT_VIEW_MAP_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 0440 + (0x4 * i) | Index | i = 0 to 3 |
| Physical Address | 0x4E00 0440 + (0x4 * i) | Instance | DMM |
| Description | PAT view mapping register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----------|----|----|-----------|----|----|----|-----------|----------|----|----|---------|----|----|----|-----------|----------|----|----|---------|----|---|---|----------|----------|---|---|--------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ACCESS_PAGE | RESERVED | | | CONT_PAGE | | | | ACCESS_32 | RESERVED | | | CONT_32 | | | | ACCESS_16 | RESERVED | | | CONT_16 | | | | ACCESS_8 | RESERVED | | | CONT_8 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|--------------|-------|
| 31 | ACCESS_PAGE | Kind of access for this page mode container in view mapping i 0x0: Direct access, container base address given in CONT_PAGE 0x1: Indirect access through the LUT indexed by CONT_PAGE | RW | 0 |
| 30:28 | RESERVED | Reserved | RW W0Only | 0x0 |
| 27:24 | CONT_PAGE | Container for page mode in view mapping i | RW | 0x0 |
| 23 | ACCESS_32 | Kind of access for this 32-bit mode container in view mapping i 0x0: Direct access, container base address given in CONT_32 0x1: Indirect access through the LUT indexed by CONT_32 | RW | 0 |
| 22:20 | RESERVED | Reserved | RW W0Only | 0x0 |
| 19:16 | CONT_32 | Container for 32-bit mode in view mapping i | RW | 0x0 |
| 15 | ACCESS_16 | Kind of access for this 16-bit mode container in view mapping i 0x0: Direct access, container base address given in CONT_16 0x1: Indirect access through the LUT indexed by CONT_16 | RW | 0 |
| 14:12 | RESERVED | Reserved | RW W0Only | 0x0 |
| 11:8 | CONT_16 | Container for 16-bit mode in view mapping i | RW | 0x0 |
| 7 | ACCESS_8 | Kind of access for this 8-bit mode container in view mapping i 0x0: Direct access, container base address given in CONT_8 0x1: Indirect access through the LUT indexed by CONT_8 | RW | 0 |
| 6:4 | RESERVED | Reserved | RW W0Only | 0x0 |
| 3:0 | CONT_8 | Container for 8-bit mode in view mapping i | RW | 0x0 |

Table 16-65. Register Call Summary for Register DMM_PAT_VIEW_MAP_i

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [DMM Concepts: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [Configuration Settings and LUT Refill: \[8\]](#)
- [DMM Register Summary: \[9\]](#)

Table 16-66. DMM_PAT_VIEW_MAP_BASE

| | | | |
|-------------------------|-----------------------------------|-----------------|-----|
| Address Offset | 0x0000 0460 | Instance | DMM |
| Physical Address | 0x4E00 0460 | | |
| Description | Base address of all view mappings | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| BASE_ADDR | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|--------------|-------------|
| 31 | BASE_ADDR | MSB of the PAT view mapping base address | RW | 0 |
| 30:0 | RESERVED | Reserved | RW W0Only | 0x0000 0000 |

Table 16-67. Register Call Summary for Register DMM_PAT_VIEW_MAP_BASE

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [DMM Concepts: \[1\]](#)
- [Configuration Settings and LUT Refill: \[2\]](#)
- [Aliased Tiled View Orientation Settings and LUT Refill: \[3\]](#)
- [PAT Programming Model: \[4\]](#)
- [DMM Register Summary: \[5\]](#)

Table 16-68. DMM_PAT_IRQSTATUS_RAW

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 0480 | Instance | DMM |
| Physical Address | 0x4E00 0480 | | |
| Description | Per-event raw interrupt status vector. Raw status is set even if the related event is not enabled. Write 1 to set the (raw) status, mostly for debug. n = 0 for the first interrupt status raw register, n = 1 for the second interrupt status raw register. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|---------------|---------------|---------------|---------------|--------------|-----------|-----------|---------------|---------------|---------------|---------------|---------------|--------------|-----------|-----------|
| RESERVED | | | | | | | | | | | | | | | | ERR_LUT_MISS1 | ERR_UPD_DATA1 | ERR_UPD_CTRL1 | ERR_UPD_AREA1 | ERR_INV_DATA1 | ERR_INV_DSC1 | FILL_LST1 | FILL_DSC1 | ERR_LUT_MISS0 | ERR_UPD_DATA0 | ERR_UPD_CTRL0 | ERR_UPD_AREA0 | ERR_INV_DATA0 | ERR_INV_DSC0 | FILL_LST0 | FILL_DSC0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|---------------|--------|
| 31:16 | RESERVED | Reserved | RW W0Only | 0x0000 |
| 15 | ERR_LUT_MISS1 | Access to a yet-to-be-refilled area event in area 4.n+1 Write 0x0: Keep current error event Read 0x0: No such error event Read 0x1: Error event happened Write 0x1: Set error event | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|---------------|-------|
| 14 | ERR_UPD_DATA1 | Data register update while refilling error event in area 4.n+1 Write 0x0: Keep current error event Read 0x0: No such error event Read 0x1: Error event happened Write 0x1: Set error event | RW W1toSet | 0 |
| 13 | ERR_UPD_CTRL1 | Control register update while refilling error event in area 4.n+1 Write 0x0: Keep current error event Read 0x0: No such error event Read 0x1: Error event happened Write 0x1: Set error event | RW W1toSet | 0 |
| 12 | ERR_UPD_AREA1 | Area register update while refilling error event in area 4.n+1 Write 0x0: Keep current error event Read 0x0: No such error event Read 0x1: Error event happened Write 0x1: Set error event | RW W1toSet | 0 |
| 11 | ERR_INV_DATA1 | Invalid entry-table pointer error event in area 4.n+1 Write 0x0: Keep current error event Read 0x0: No such error event Read 0x1: Error event happened Write 0x1: Set error event | RW W1toSet | 0 |
| 10 | ERR_INV_DSC1 | Invalid descriptor pointer error event in area 4.n+1 Write 0x0: Keep current error event Read 0x0: No such error event Read 0x1: Error event happened Write 0x1: Set error event | RW W1toSet | 0 |
| 9 | FILL_LST1 | End of refill event for the last descriptor in area 4.n+1 Write 0x0: Keep area 1 refill done event Read 0x0: Area 1 is yet-to-be refilled Read 0x1: Area 1 is refilled Write 0x1: Set area 1 refill done event | RW W1toSet | 0 |
| 8 | FILL_DSC1 | End of refill event for any descriptor in area 4.n+1 Write 0x0: Keep area 1 refill done event Read 0x0: Area 1 is yet-to-be refilled Read 0x1: Area 1 is refilled Write 0x1: Set area 1 refill done event | RW W1toSet | 0 |
| 7 | ERR_LUT_MISS0 | Access to a yet-to-be-refilled area event in area 4.n Write 0x0: Keep current error event Read 0x0: No such error event Read 0x1: Error event happened Write 0x1: Set error event | RW W1toSet | 0 |
| 6 | ERR_UPD_DATA0 | Data register update while refilling error event in area 4.n Write 0x0: Keep current error event Read 0x0: No such error event Read 0x1: Error event happened Write 0x1: Set error event | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|---------------|-------|
| 5 | ERR_UPD_CTRL0 | Control register update while refilling error event in area 4.n Write 0x0: Keep current error event Read 0x0: No such error event Read 0x1: Error event happened Write 0x1: Set error event | RW W1toSet | 0 |
| 4 | ERR_UPD_AREA0 | Area register update while refilling error event in area 4.n Write 0x0: Keep current error event Read 0x0: No such error event Read 0x1: Error event happened Write 0x1: Set error event | RW W1toSet | 0 |
| 3 | ERR_INV_DATA0 | Invalid entry-table pointer error event in area 4.n Write 0x0: Keep current error event Read 0x0: No such error event Read 0x1: Error event happened Write 0x1: Set error event | RW W1toSet | 0 |
| 2 | ERR_INV_DSC0 | Invalid descriptor pointer error event in area 4.n Write 0x0: Keep current error event Read 0x0: No such error event Read 0x1: Error event happened Write 0x1: Set error event | RW W1toSet | 0 |
| 1 | FILL_LST0 | End of refill event for the last descriptor in area 4.n Write 0x0: Keep area 0 refill done event Read 0x0: Area 0 is yet-to-be refilled Read 0x1: Area 0 is refilled Write 0x1: Set area 0 refill done event | RW W1toSet | 0 |
| 0 | FILL_DSC0 | End of refill event for any descriptor in area 4.n Write 0x0: Keep area 0 refill done event Read 0x0: Area 0 is yet-to-be refilled Read 0x1: Area 0 is refilled Write 0x1: Set area 0 refill done event | RW W1toSet | 0 |

Table 16-69. Register Call Summary for Register DMM_PAT_IRQSTATUS_RAW

Dynamic Memory Manager

- [DMM Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\]](#)
- [DMM Register Summary: \[32\]](#)

Table 16-70. DMM_PAT_IRQSTATUS

| | | | |
|-------------------------|---|-----------------|-----|
| Address Offset | 0x0000 0490 | Instance | DMM |
| Physical Address | 0x4E00 0490 | | |
| Description | Per-event "enabled" interrupt status vector. Enabled status is not set unless the event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). n = 0 for the first interrupt status register, n = 1 for the second interrupt status register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|---------------|---------------|---------------|---------------|--------------|-----------|-----------|---------------|---------------|---------------|---------------|---------------|--------------|-----------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ERR_LUT_MISS1 | ERR_UPD_DATA1 | ERR_UPD_CTRL1 | ERR_UPD_AREA1 | ERR_INV_DATA1 | ERR_INV_DSC1 | FILL_LST1 | FILL_DSC1 | ERR_LUT_MISS0 | ERR_UPD_DATA0 | ERR_UPD_CTRL0 | ERR_UPD_AREA0 | ERR_INV_DATA0 | ERR_INV_DSC0 | FILL_LST0 | FILL_DSC0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|---------------|--------|
| 31:16 | RESERVED | Reserved | RW W0Only | 0x0000 |
| 15 | ERR_LUT_MISS1 | Access to a yet-to-be-refilled area event in area 4.n+1 Write 0x0: Keep current maskable error event Read 0x0: No such error event or this event is masked Read 0x1: Error event happened Write 0x1: Clear this maskable error event | RW W1toClr | 0 |
| 14 | ERR_UPD_DATA1 | Data register update while refilling error event in area 4.n+1 Write 0x0: Keep current maskable error event Read 0x0: No such error event or this event is masked Read 0x1: Error event happened Write 0x1: Clear this maskable error event | RW W1toClr | 0 |
| 13 | ERR_UPD_CTRL1 | Control register update while refilling error event in area 4.n+1 Write 0x0: Keep current maskable error event Read 0x0: No such error event or this event is masked Read 0x1: Error event happened Write 0x1: Clear this maskable error event | RW W1toClr | 0 |
| 12 | ERR_UPD_AREA1 | Area register update while refilling error event in area 4.n+1 Write 0x0: Keep current maskable error event Read 0x0: No such error event or this event is masked Read 0x1: Error event happened Write 0x1: Clear this maskable error event | RW W1toClr | 0 |
| 11 | ERR_INV_DATA1 | Invalid entry-table pointer error event in area 4.n+1 Write 0x0: Keep current maskable error event Read 0x0: No such error event or this event is masked Read 0x1: Error event happened Write 0x1: Clear this maskable error event | RW W1toClr | 0 |
| 10 | ERR_INV_DSC1 | Invalid descriptor pointer error event in area 4.n+1 Write 0x0: Keep current maskable error event Read 0x0: No such error event or this event is masked Read 0x1: Error event happened Write 0x1: Clear this maskable error event | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|---------------|-------|
| 9 | FILL_LST1 | End of refill event for the last descriptor in area 4.n+1 Write 0x0: Keep current area refill done maskable event Read 0x0: Current area is yet-to-be refilled or this event is masked Read 0x1: Current area is refilled Write 0x1: Clear current area refill done maskable event | RW W1toClr | 0 |
| 8 | FILL_DSC1 | End of refill event for any descriptor in area 4.n+1 Write 0x0: Keep current area refill done maskable event Read 0x0: Current area is yet-to-be refilled or this event is masked Read 0x1: Current area is refilled Write 0x1: Clear current area refill done maskable event | RW W1toClr | 0 |
| 7 | ERR_LUT_MISS0 | Access to a yet-to-be-refilled area event in area 4.n Write 0x0: Keep current maskable error event Read 0x0: No such error event or this event is masked Read 0x1: Error event happened Write 0x1: Clear this maskable error event | RW W1toClr | 0 |
| 6 | ERR_UPD_DATA0 | Data register update while refilling error event in area 4.n Write 0x0: Keep current maskable error event Read 0x0: No such error event or this event is masked Read 0x1: Error event happened Write 0x1: Clear this maskable error event | RW W1toClr | 0 |
| 5 | ERR_UPD_CTRL0 | Control register update while refilling error event in area 4.n Write 0x0: Keep current maskable error event Read 0x0: No such error event or this event is masked Read 0x1: Error event happened Write 0x1: Clear this maskable error event | RW W1toClr | 0 |
| 4 | ERR_UPD_AREA0 | Area register update while refilling error event in area 4.n Write 0x0: Keep current maskable error event Read 0x0: No such error event or this event is masked Read 0x1: Error event happened Write 0x1: Clear this maskable error event | RW W1toClr | 0 |
| 3 | ERR_INV_DATA0 | Invalid entry-table pointer error event in area 4.n Write 0x0: Keep current maskable error event Read 0x0: No such error event or this event is masked Read 0x1: Error event happened Write 0x1: Clear this maskable error event | RW W1toClr | 0 |
| 2 | ERR_INV_DSC0 | Invalid descriptor pointer error event in area 4.n Write 0x0: Keep current maskable error event Read 0x0: No such error event or this event is masked Read 0x1: Error event happened Write 0x1: Clear this maskable error event | RW W1toClr | 0 |
| 1 | FILL_LST0 | End of refill event for the last descriptor in area 4.n Write 0x0: Keep current area refill done maskable event Read 0x0: Current area is yet-to-be refilled or this event is masked Read 0x1: Current area is refilled Write 0x1: Clear current area refill done maskable event | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 0 | FILL_DSC0 | End of refill event for any descriptor in area 4.n Write 0x0: Keep current area refill done maskable event Read 0x0: Current area is yet-to-be refilled or this event is masked Read 0x1: Current area is refilled Write 0x1: Clear current area refill done maskable event | RW W1toClr | 0 |

Table 16-71. Register Call Summary for Register DMM_PAT_IRQSTATUS

Dynamic Memory Manager

- DMM Interrupt Requests: [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31]
- Error Handling: [32] [33]
- DMM Register Summary: [34]

Table 16-72. DMM_PAT_IRQENABLE_SET

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 04A0 | Instance | DMM |
| Physical Address | 0x4E00 04A0 | | |
| Description | Per-event interrupt enable bit vector. Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. n = 0 for the first interrupt enable set register, n = 1 for the second interrupt enable set register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|---------------|---------------|---------------|---------------|--------------|-----------|-----------|---------------|---------------|---------------|---------------|---------------|--------------|-----------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ERR_LUT_MISS1 | ERR_UPD_DATA1 | ERR_UPD_CTRL1 | ERR_UPD_AREA1 | ERR_INV_DATA1 | ERR_INV_DSC1 | FILL_LST1 | FILL_DSC1 | ERR_LUT_MISS0 | ERR_UPD_DATA0 | ERR_UPD_CTRL0 | ERR_UPD_AREA0 | ERR_INV_DATA0 | ERR_INV_DSC0 | FILL_LST0 | FILL_DSC0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|---------------|--------|
| 31:16 | RESERVED | Reserved | RW W0Only | 0x0000 |
| 15 | ERR_LUT_MISS1 | Unexpected access to a yet-to-be-refilled area interrupt source mask for area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 14 | ERR_UPD_DATA1 | Unexpected data register update while refilling interrupt source mask for area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 13 | ERR_UPD_CTRL1 | Unexpected control register update while refilling interrupt source mask for area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------|-------|
| 12 | ERR_UPD_AREA1 | Unexpected area register update while refilling interrupt source mask for area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 11 | ERR_INV_DATA1 | Invalid entry-table pointer interrupt source mask for area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 10 | ERR_INV_DSC1 | Invalid descriptor pointer interrupt source mask for area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 9 | FILL_LST1 | End of refill interrupt source mask for the last descriptor in area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 8 | FILL_DSC1 | End of refill interrupt source mask for any descriptor in area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 7 | ERR_LUT_MISS0 | Unexpected access to a yet-to-be-refilled area interrupt source mask for area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 6 | ERR_UPD_DATA0 | Unexpected data register update while refilling interrupt source mask for area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 5 | ERR_UPD_CTRL0 | Unexpected control register update while refilling interrupt source mask for area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|---------------|-------|
| 4 | ERR_UPD_AREA0 | Unexpected area register update while refilling interrupt source mask for area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 3 | ERR_INV_DATA0 | Invalid entry-table pointer interrupt source mask for area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 2 | ERR_INV_DSC0 | Invalid descriptor pointer interrupt source mask for area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 1 | FILL_LST0 | End of refill interrupt source mask for the last descriptor in area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |
| 0 | FILL_DSC0 | End of refill interrupt source mask for any descriptor in area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Enable (unmask) this interrupt source | RW W1toSet | 0 |

Table 16-73. Register Call Summary for Register DMM_PAT_IRQENABLE_SET

Dynamic Memory Manager

- [DMM Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\]](#)
- [Error Handling: \[32\] \[33\]](#)
- [DMM Register Summary: \[34\]](#)

Table 16-74. DMM_PAT_IRQENABLE_CLR

| | | | |
|------------------|---|----------|-----|
| Address Offset | 0x0000 04B0 | Instance | DMM |
| Physical Address | 0x4E00 04B0 | | |
| Description | Per-event interrupt enable bit vector. Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. n = 0 for the first interrupt enable clear register, n = 1 for the second interrupt enable clear register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|---------------|---------------|---------------|---------------|--------------|-----------|-----------|---------------|---------------|---------------|---------------|---------------|--------------|-----------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ERR_LUT_MISS1 | ERR_UPD_DATA1 | ERR_UPD_CTRL1 | ERR_UPD_AREA1 | ERR_INV_DATA1 | ERR_INV_DSC1 | FILL_LST1 | FILL_DSC1 | ERR_LUT_MISS0 | ERR_UPD_DATA0 | ERR_UPD_CTRL0 | ERR_UPD_AREA0 | ERR_INV_DATA0 | ERR_INV_DSC0 | FILL_LST0 | FILL_DSC0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|---------------|--------|
| 31:16 | RESERVED | Reserved | RW W0Only | 0x0000 |
| 15 | ERR_LUT_MISS1 | Unexpected access to a yet-to-be-refilled area interrupt source mask for area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 14 | ERR_UPD_DATA1 | Unexpected data register update while refilling interrupt source mask for area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 13 | ERR_UPD_CTRL1 | Unexpected control register update while refilling interrupt source mask for area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 12 | ERR_UPD_AREA1 | Unexpected area register update while refilling interrupt source mask for area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 11 | ERR_INV_DATA1 | Invalid entry-table pointer interrupt source mask for area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 10 | ERR_INV_DSC1 | Invalid descriptor pointer interrupt source mask for area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 9 | FILL_LST1 | End of refill interrupt source mask for the last descriptor in area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|---------------|-------|
| 8 | FILL_DSC1 | End of refill interrupt source mask for any descriptor in area 4.n+1 Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 7 | ERR_LUT_MISS0 | Unexpected access to a yet-to-be-refilled area interrupt source mask for area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 6 | ERR_UPD_DATA0 | Unexpected data register update while refilling interrupt source mask for area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 5 | ERR_UPD_CTRL0 | Unexpected control register update while refilling interrupt source mask for area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 4 | ERR_UPD_AREA0 | Unexpected area register update while refilling interrupt source mask for area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 3 | ERR_INV_DATA0 | Invalid entry-table pointer interrupt source mask for area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 2 | ERR_INV_DSC0 | Invalid descriptor pointer interrupt source mask for area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |
| 1 | FILL_LST0 | End of refill interrupt source mask for the last descriptor in area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 0 | FILL_DSC0 | End of refill interrupt source mask for any descriptor in area 4.n Write 0x0: Keep current mask of this interrupt source Read 0x0: This interrupt source is disabled (masked) Read 0x1: This interrupt source is enabled (unmasked) Write 0x1: Disable (mask) this interrupt source | RW W1toClr | 0 |

Table 16-75. Register Call Summary for Register DMM_PAT_IRQENABLE_CLR

Dynamic Memory Manager

- [DMM Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\]](#)
- [Error Handling: \[32\] \[33\]](#)
- [DMM Register Summary: \[34\]](#)

Table 16-76. DMM_PAT_STATUS_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 04C0 + (0x4 * i) | Index | i = 0 to 3 |
| Physical Address | 0x4E00 04C0 + (0x4 * i) | Instance | DMM |
| Description | Status register for each refill engine n = 0 for the first engine status register, n = 1 for the second engine status register. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|----------|----------|----------|--------|------|-----|-------|-------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CNT | | | | | | | | ERROR | | | | | | | | RESERVED | BYPASSED | RESERVED | LINKED | DONE | RUN | VALID | READY |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:25 | RESERVED | Reserved | R | 0x00 |
| 24:16 | CNT | Counter of remaining lines to reload for engine n | R | 0x000 |
| 15:10 | ERROR | Error happened in engine n Read 0x0: No error Read 0x1: Invalid descriptor provided Read 0x2: Invalid data pointer provided Read 0x4: Unexpected area register update while refilling Read 0x8: Unexpected control register update while refilling Read 0x10: Unexpected data register update while refilling Read 0x20: Unexpected access to a yet-to-be-refilled location | R | 0x00 |
| 9:8 | RESERVED | Reserved | R | 0x0 |
| 7 | BYPASSED | Engine n is bypassed. Direct access to the LUT is provided. | R | 0 |
| 6:5 | RESERVED | Reserved | R | 0x0 |
| 4 | LINKED | Area reconfiguration link asserted for engine n | R | 0 |
| 3 | DONE | Area reloading finished for engine n | R | 0 |
| 2 | RUN | Area currently reloading for engine n | R | 0 |
| 1 | VALID | Valid area description for engine n | R | 0 |
| 0 | READY | Area registers ready for engine n | R | 1 |

Table 16-77. Register Call Summary for Register DMM_PAT_STATUS_i

Dynamic Memory Manager

- [DMM Interrupt Requests](#): [0] [1]
- [DMM Internal Macro-Architecture](#): [2]
- [Simple Manual Area Refill](#): [3] [4]
- [Single Auto-Configured Area Refill](#): [5] [6]
- [Chained Auto-Configured Area Refill](#): [7] [8] [9]
- [Synchronized Auto-Configured Area Refill](#): [10] [11] [12]
- [Cyclic Synchronized Auto-Configured Area Refill](#): [13]
- [DMM Register Summary](#): [14]

Table 16-78. DMM_PAT_DESCR_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0500 + (0x10 * i) | Index | i = 0 to 3 |
| Physical Address | 0x4E00 0500 + (0x10 * i) | Instance | DMM |
| Description | Physical address of the next table refill descriptor n = 0 for the descriptor register of the first engine, n = 1 for the descriptor register of the second engine. Writing to this register aborts the current ongoing area reload and resets the corresponding DMM_PAT_AREA_x, DMM_PAT_CTRL_x and DMM_PAT_DATA_x registers. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|--------------|-----------|
| 31:4 | ADDR | Physical address of the next table refill descriptor of engine n | RW WtoClr | 0x0000000 |
| 3:0 | RESERVED | Reserved | RW W0Only | 0x0 |

Table 16-79. Register Call Summary for Register DMM_PAT_DESCR_i

Dynamic Memory Manager

- [DMM Integration](#): [0]
- [DMM Internal Macro-Architecture](#): [1] [2] [3]
- [Single Auto-Configured Area Refill](#): [4]
- [Chained Auto-Configured Area Refill](#): [5]
- [Synchronized Auto-Configured Area Refill](#): [6]
- [Cyclic Synchronized Auto-Configured Area Refill](#): [7] [8]
- [DMM Register Summary](#): [9]

Table 16-80. DMM_PAT_AREA_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0504 + (0x10 * i) | Index | i = 0 to 3 |
| Physical Address | 0x4E00 0504 + (0x10 * i) | Instance | DMM |
| Description | Area definition for DMM physical address translator n = 0 for the area register of the first engine, n = 1 for the area register of the second engine. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | Y1 | | | | | | | X1 | | | | | | | | RESERVED | Y0 | | | | | | | X0 | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|--------------|-------|
| 31 | RESERVED | Reserved | RW W0Only | 0 |
| 30:24 | Y1 | Y-coordinate of the bottom-right corner of the PAT area for engine n | RW | 0x00 |
| 23:16 | X1 | X-coordinate of the bottom-right corner of the PAT area for engine n | RW | 0x00 |
| 15 | RESERVED | Reserved | RW W0Only | 0 |
| 14:8 | Y0 | Y-coordinate of the top-left corner of the PAT area for engine n | RW | 0x00 |
| 7:0 | X0 | X-coordinate of the top-left corner of the PAT area for engine n | RW | 0x00 |

Table 16-81. Register Call Summary for Register DMM_PAT_AREA_i

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [DMM Concepts: \[1\]](#)
- [DMM Internal Macro-Architecture: \[2\] \[3\] \[4\]](#)
- [Simple Manual Area Refill: \[5\]](#)
- [Configuration Settings and LUT Refill: \[6\]](#)
- [TILER Page Mapping: \[7\]](#)
- [DMM Register Summary: \[8\]](#)

Table 16-82. DMM_PAT_CTRL_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0508 + (0x10 * i) | Index | i = 0 to 3 |
| Physical Address | 0x4E00 0508 + (0x10 * i) | Instance | DMM |
| Description | DMM physical address translator control register n = 0 for the control register of the first engine, n = 1 for the control register of the second engine. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|------|----------|----|----|----|----|---|---|---|-----------|---|----------|---|-------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INITIATOR | | | | RESERVED | | | | | | | | | | | | SYNC | RESERVED | | | | | | | | DIRECTION | | RESERVED | | START | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|--------------|-------|
| 31:28 | INITIATOR | DMM PAT initiator for synchronization in engine n | RW | 0x0 |
| 27:17 | RESERVED | Reserved | RW W0Only | 0x000 |
| 16 | SYNC | DMM PAT table reload synchronization for engine n 0x0: Not synchronized 0x1: Synchronized | RW | 0 |
| 15:7 | RESERVED | Reserved | RW W0Only | 0x000 |
| 6:4 | DIRECTION | Direction of this PAT table refill for engine n | RW | 0x0 |
| 3:1 | RESERVED | Reserved | RW W0Only | 0x0 |
| 0 | START | Starting a PAT table refill with engine n | RW | 0 |

Table 16-83. Register Call Summary for Register DMM_PAT_CTRL_i

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [DMM Internal Macro-Architecture: \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Simple Manual Area Refill: \[6\] \[7\]](#)
- [Cyclic Synchronized Auto-Configured Area Refill: \[8\]](#)
- [Configuration Settings and LUT Refill: \[9\] \[10\]](#)
- [Aliased Tiled View Orientation Settings and LUT Refill: \[11\] \[12\] \[13\] \[14\] \[15\]](#)
- [DMM Register Summary: \[16\]](#)

Table 16-84. DMM_PAT_DATA_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 050C + (0x10 * i) | Index | i = 0 to 3 |
| Physical Address | 0x4E00 050C + (0x10 * i) | Instance | DMM |
| Description | Physical address of the current table refill entry data n = 0 for the data register of the first engine, n = 1 for the data register of the second engine. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|--------------|------------|
| 31:4 | ADDR | Physical address of the current table refill entry data or single actual entry data when in manual mode for engine n | RW | 0x00000000 |
| 3:0 | RESERVED | Reserved | RW W0Only | 0x0 |

Table 16-85. Register Call Summary for Register DMM_PAT_DATA_i

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [DMM Concepts: \[1\]](#)
- [DMM Internal Macro-Architecture: \[2\] \[3\] \[4\]](#)
- [Simple Manual Area Refill: \[5\]](#)
- [Configuration Settings and LUT Refill: \[6\]](#)
- [DMM Register Summary: \[7\]](#)

Table 16-86. DMM_PEG_HWINFO

| | | | |
|------------------|------------------------------------|----------|-----|
| Address Offset | 0x0000 0608 | | |
| Physical Address | 0x4E00 0608 | Instance | DMM |
| Description | DMM hardware configuration for PEG | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PRIO_CNT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:7 | RESERVED | Reserved | R | 0x00000000 |
| 6:0 | PRIO_CNT | Number of PEG priority entries Read 0x1: One priority entry Read 0x2: Two priority entries Read 0x4: Four priority entries Read 0x8: Eight priority entries Read 0x10: Sixteen priority entries Read 0x20: Thirty-two priority entries Read 0x40: Sixty-four priority entries | R | 0x40 |

Table 16-87. Register Call Summary for Register DMM_PEG_HWINFO

Dynamic Memory Manager

- [DMM Configuration: \[0\]](#)
- [DMM Register Summary: \[1\]](#)

Table 16-88. DMM_PEG_PRIO_k

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 0620 + (0x4 * k) | Index | k = 0 to 7 |
| Physical Address | 0x4E00 0620 + (0x4 * k) | Instance | DMM |
| Description | DMM PEG Priority register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|----|---|----|---|----|---|----|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| W7 | | P7 | | W6 | | P6 | | W5 | | P5 | | W4 | | P4 | | W3 | | P3 | | W2 | | P2 | | W1 | | P1 | | W0 | | P0 | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31 | W7 | Write-enable for P7 bit field Write 0x0: P7 field is unchanged Write 0x1: P7 field is updated | RW | 0 |
| 30:28 | P7 | Priority for initiator 8.k+7 | RW | 0x4 |
| 27 | W6 | Write-enable for P6 bit field Write 0x0: P6 field is unchanged Write 0x1: P6 field is updated | RW | 0 |
| 26:24 | P6 | Priority for initiator 8.k+6 | RW | 0x4 |
| 23 | W5 | Write-enable for P5 bit field Write 0x0: P5 field is unchanged Write 0x1: P5 field is updated | RW | 0 |
| 22:20 | P5 | Priority for initiator 8.k+5 | RW | 0x4 |
| 19 | W4 | Write-enable for P4 bit field Write 0x0: P4 field is unchanged Write 0x1: P4 field is updated | RW | 0 |
| 18:16 | P4 | Priority for initiator 8.k+4 | RW | 0x4 |
| 15 | W3 | Write-enable for P3 bit field Write 0x0: P3 field is unchanged Write 0x1: P3 field is updated | RW | 0 |
| 14:12 | P3 | Priority for initiator 8.k+3 | RW | 0x4 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 11 | W2 | Write-enable for P2 bit field Write 0x0: P2 field is unchanged Write 0x1: P2 field is updated | RW | 0 |
| 10:8 | P2 | Priority for initiator 8.k+2 | RW | 0x4 |
| 7 | W1 | Write-enable for P1 bit field Write 0x0: P1 field is unchanged Write 0x1: P1 field is updated | RW | 0 |
| 6:4 | P1 | Priority for initiator 8.k+1 | RW | 0x4 |
| 3 | W0 | Write-enable for P0 bit field Write 0x0: P0 field is unchanged Write 0x1: P0 field is updated | RW | 0 |
| 2:0 | P0 | Priority for initiator 8.k | RW | 0x4 |

Table 16-89. Register Call Summary for Register DMM_PEG_PRIO_k

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [DMM Internal Macro-Architecture: \[1\]](#)
- [Priority Settings: \[2\]](#)
- [DMM Register Summary: \[3\]](#)

Table 16-90. DMM_PEG_PRIO_PAT

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 0640 | Instance | DMM |
| Physical Address | 0x4E00 0640 | | |
| Description | DMM PEG priority register for the internal PAT engine. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|-------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | W_PAT | | P_PAT | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|--------------|------------|
| 31:4 | RESERVED | Reserved | RW W0Only | 0x00000000 |
| 3 | W_PAT | Write-enable for P_PAT bit field Write 0x0: P_PAT field is updated Write 0x1: P_PAT field is unchanged | RW | 0 |
| 2:0 | P_PAT | Priority for PAT engine | RW | 0x4 |

Table 16-91. Register Call Summary for Register DMM_PEG_PRIO_PAT

Dynamic Memory Manager

- [DMM Integration: \[0\]](#)
- [DMM Internal Macro-Architecture: \[1\]](#)
- [Priority Settings: \[2\] \[3\]](#)
- [DMM Register Summary: \[4\]](#)

16.3 EMIF Controller

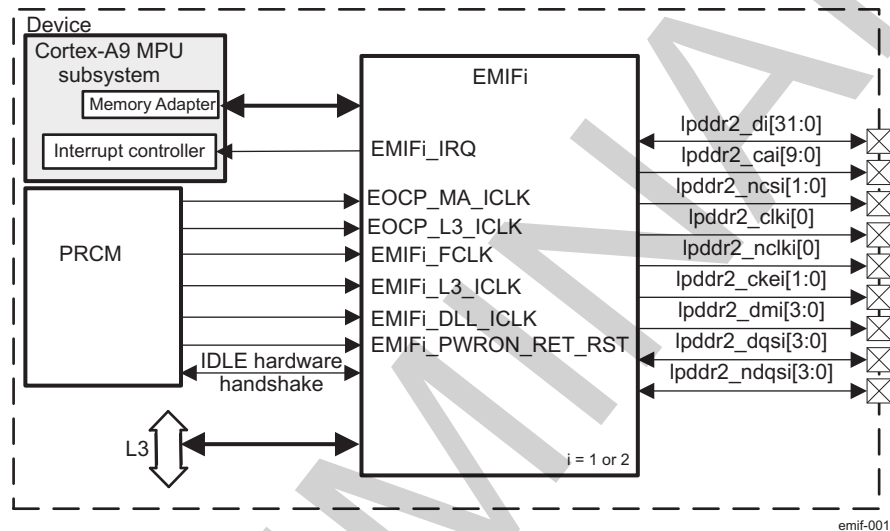
This section describes the features and functions of the external memory interface (EMIF) module of the device.

16.3.1 EMIF Module Overview

The EMIF module provides connectivity between the device and the LPDDR2-type memories and manages data bus read/write accesses between external memories, the microprocessor unit (MPU), and the direct memory access (DMA) controller.

The device includes two EMIF controllers. Figure 16-43 is an overview of the EMIF module.

Figure 16-43. EMIF Module Overview



16.3.1.1 EMIF Module Main Features

The EMIF module supports the following features:

- JEDEC standard-compliant LPDDR2-SDRAM (S2 and S4) devices
- 2-GB SDRAM address ranges over two chip-selects (CSs) (1GB per CS) (configurable with the dynamic memory manager (DMM) module; see Section 16.2, *Dynamic Memory Manager*, for more information)
- Two independent CSs with their corresponding register sets and independent page tracking
- Both CSs must have the same memory type and size.
- Flexible address muxing scheme, which permits the choosing of different bank mapping allocation by configuring the decoding order of the bank, column, and row address
- 16- or 32-bit data path to external SDRAM
- LPDDR2 devices with one, two, four, or eight internal banks
- Data bus widths:
 - 128-bit L3 interconnect data bus width
 - 16- and 32-bit SDRAM data bus widths
- CAS latencies: 3, 4, 5, 6, 7, and 8
- 256-, 512-, 1024-, and 2048-word page sizes
- Burst lengths: 8
- Sequential burst type
- SDRAM auto initialization from reset or configuration change
- Bank interleaving across both CSs if the same memory type

- Self-refresh and precharge power-down modes for low power (per CS, manual entry/exit self-refresh and deep power-down modes)
- Deep power-down mode for low power
- Partial array self-refresh and temperature-controlled self-refresh modes for low power. Temperature-controlled self-refresh is supported only for mobile SDRAM having on-chip temperature sensor.
- Prioritized refresh
- Programmable SDRAM refresh rate and backlog counter
- Output impedance (ZQ) calibration
- Active power-down
- Temperature monitoring

16.3.1.2 Not Supported Features

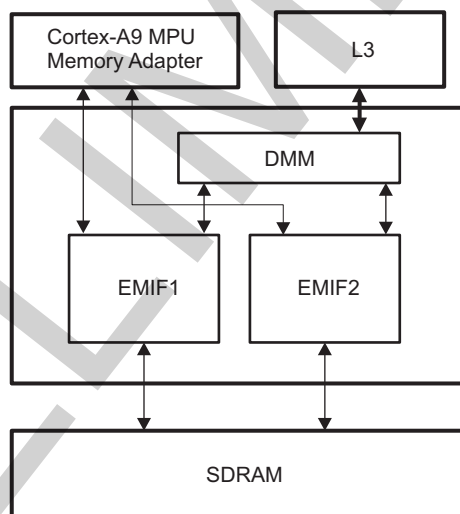
The EMIF module does not support:

- Interleave burst type
- Auto precharge
- Per-bank refreshes for LPDDR2-SDRAM

16.3.1.3 EMIF Overall Architecture

Figure 16-44 shows the EMIF connection with the surrounding modules.

Figure 16-44. EMIF Overall Architecture



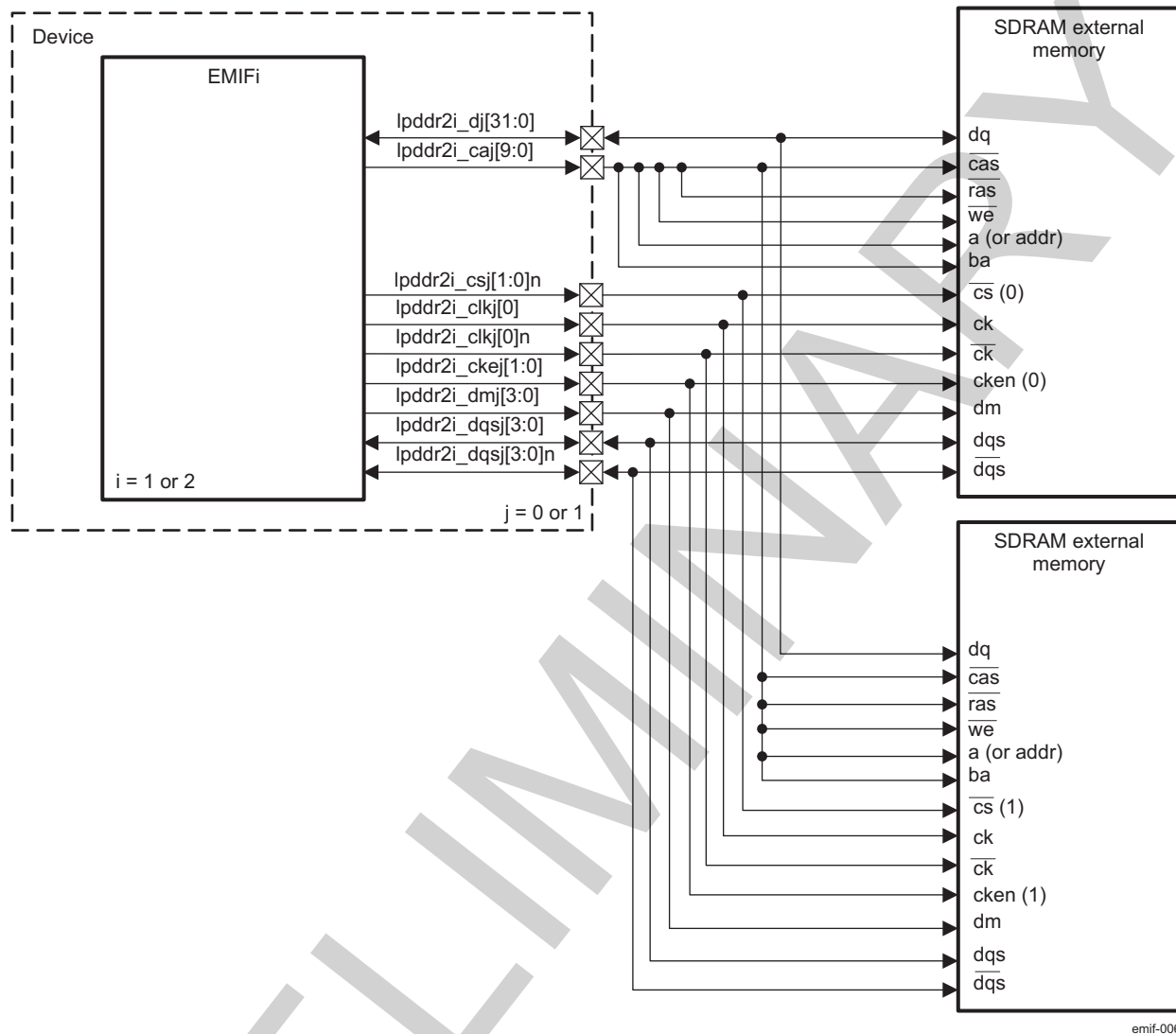
emif-007

16.3.2 EMIF Environment

This section describes the EMIF application fields from an environment point of view (external connections).

Figure 16-45 shows the EMIF generic configuration.

Figure 16-45. EMIF Generic Configuration



emif-006

16.3.2.1 EMIF Signals

Table 16-92 describes the module signals and specifies their links to functions.

Table 16-92. I/O Signals

| Signal | I/O ⁽¹⁾ | Description |
|--------------------------------|--------------------|--|
| EMIF1 | | |
| <code>lpddr21_dq[31:0]</code> | I/O | Data bus |
| <code>lpddr21_ca[9:0]</code> | O | Double-data rate (DDR) command/address |
| <code>lpddr21_ncs[1:0]</code> | O | Chip selects 1–0 (active low) |
| <code>lpddr21_clk</code> | O | Clock |
| <code>lpddr21_nclk</code> | O | Clock invert |
| <code>lpddr21_cke[1:0]</code> | O | Clock enables 1–0 |
| <code>lpddr21_dm[3:0]</code> | I/O | Data mask |
| <code>lpddr21_dqs[3:0]</code> | I/O | Data strobe |
| <code>lpddr21_ndqs[3:0]</code> | I/O | Data strobe invert |

⁽¹⁾ I = Input; O = Output

Table 16-92. I/O Signals (continued)

| Signal | I/O ⁽¹⁾ | Description |
|-------------------|--------------------|-------------------------------|
| EMIF2 | | |
| lpddr22_dq[31:0] | I/O | Data bus |
| lpddr22_ca[9:0] | O | DDR command/address |
| lpddr22_ncs[1:0] | O | Chip selects 1–0 (active low) |
| lpddr22_clk | O | Clock |
| lpddr22_nclk | O | Clock invert |
| lpddr22_cke[1:0] | O | Clock enables 1–0 |
| lpddr22_dm[3:0] | I/O | Data mask |
| lpddr22_dqs[3:0] | I/O | Data strobe |
| lpddr22_ndqs[3:0] | I/O | Data strobe invert |

The CKE memory pin is dynamically driven by the SDRAM controller (SDRC) according to the memory interface activity. Each CS has its own CKE pin so that each CS can be controlled independently in terms of power-down, deep power-down, and self-refresh modes.

Each LPDDR2 channel (that is, each EMIF controller) can be connected to two external LPDDR2 memories. For more information, see [Section 16.2](#), *Dynamic Memory Manager*.

16.3.3 EMIF Integration

This section describes the integration of the module in the device, and includes information about clocks, resets, and hardware requests.

Figure 16-46 shows the integration of the EMIF1 module in the device.

Figure 16-46. EMIF1 Integration

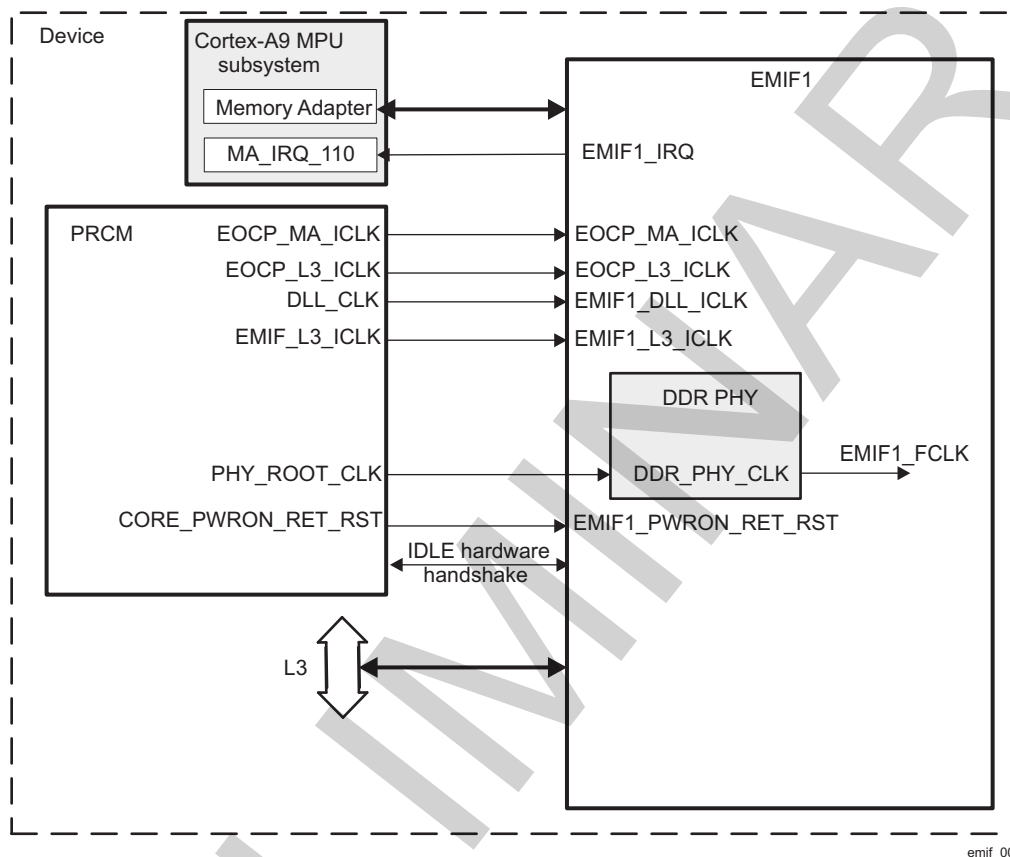
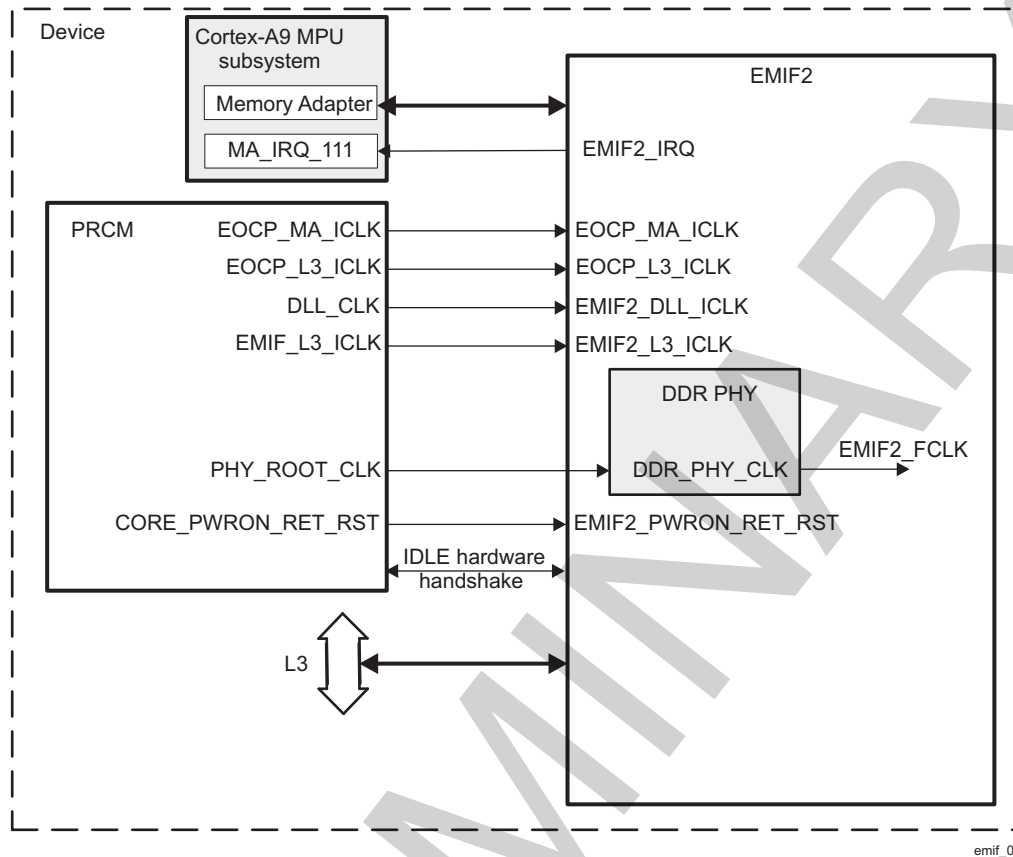


Figure 16-47 shows the integration of the EMIF2 module in the device.

Figure 16-47. EMIF2 Integration

NOTE: DDR_PHY_CLK is equal to PHY_ROOT_CLK divided by 2. EMIFi_FCLK is equal to DDR_PHY_CLK divided by 2.

For more information about the EMIF clocking scheme, see [Chapter 3, Power, Reset, and Clock Management](#).

NOTE: For more information about the IDLE hardware handshake, see [Chapter 3, Power, Reset, and Clock Management](#).

Table 16-93 through Table 16-95 summarize the integration of the module in the device.

Table 16-93. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| EMIF1 | PD_CORE | No | L3 |
| EMIF2 | PD_CORE | No | L3 |

Table 16-94. Clocks and Resets

| Module Instance | Destination Signal Name | Clocks | | |
|-----------------|-------------------------|--------------------|--------|-----------------------------|
| | | Source Signal Name | Source | Description |
| EMIF1 | EMIF1_FCLK | EMIF_FCLK | PRCM | EMIF1 core functional clock |
| | EMIF1_L3_ICLK | EMIF_L3_ICLK | PRCM | Interface clock |

Table 16-94. Clocks and Resets (continued)

| | | | | |
|------------------------|--------------------------------|---------------------------|---------------|-----------------------------|
| | EOCP_MA_ICLK | EOCP_MA_ICLK | PRCM | Interface clock |
| | EOCP_L3_ICLK | EOCP_L3_ICLK | PRCM | Interface clock |
| | EMIF1_DLL_ICLK | DLL_CLK | PRCM | Interface clock |
| EMIF2 | EMIF2_FCLK | EMIF_FCLK | PRCM | EMIF2 core functional clock |
| | EMIF2_L3_ICLK | EMIF_L3_ICLK | PRCM | Interface clock |
| | EOCP_MA_ICLK | EOCP_MA_ICLK | PRCM | Interface clock |
| | EOCP_L3_ICLK | EOCP_L3_ICLK | PRCM | Interface clock |
| | EMIF2_DLL_ICLK | DLL_CLK | PRCM | Interface clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| EMIF1 | EMIF1_PWRON_RET_RST | CORE_PWRON_RET_RST | PRCM | Retention reset |
| EMIF2 | EMIF2_PWRON_RET_RST | CORE_PWRON_RET_RST | PRCM | Retention reset |

NOTE: The two clocks EOCP_MA_ICLK and EOCP_L3_ICLK are exclusive. EMIF modules are clocked by EOCP_MA_ICLK when MPU is active, otherwise EOCP_L3_ICLK clock is used.

Table 16-95. Hardware Requests

| | | | | |
|---------------------------|---------------------------|--------------------------------|--|--------------------------------|
| Interrupt Requests | | | | |
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| EMIF1 | EMIF1_IRQ | MA_IRQ_110 | Cortex™-A9 interrupt controller (INTC) | Interrupt to the MPU subsystem |
| EMIF2 | EMIF2_IRQ | MA_IRQ_111 | Cortex™-A9 INTC | Interrupt to the MPU subsystem |
| No DMA Requests | | | | |

NOTE: For the description of the interrupt source, see [Section 16.3.4.5, Interrupt Requests](#).

16.3.4 EMIF Functional Description

16.3.4.1 Block Diagram

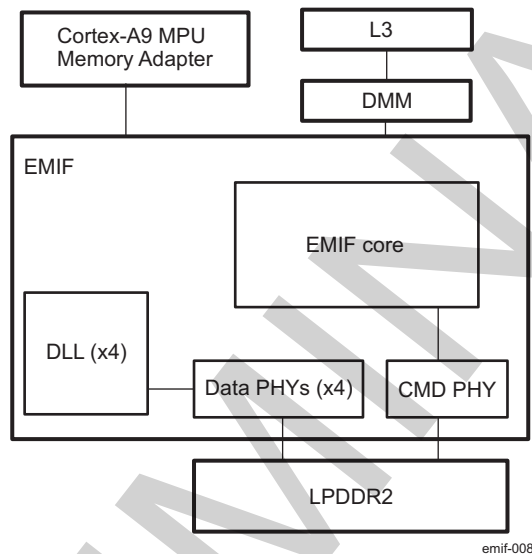
The EMIF is an L3 bus peripheral that provides an interface to the LPDDR2 memories.

Figure 16-48 shows the interconnection between the EMIF module and the other modules.

Digital locked loops (DLLs) are used to delay the input DQS signals during reads so that these strobe signals can be used to latch incoming data on the DQ pins, as required by the LPDDR2 standard.

Physical layers (PHYs) are hard macros that convert single-data rate (SDR) signals to DDR signals.

Figure 16-48. EMIF Block Diagram



16.3.4.1.1 L3 Interface

The EMIF supports three local interfaces: one connects to the system interconnect, one to a low-latency master, and one comes from the MPU half of the EMIF-to-MPU connection. These interfaces are used to request all external memory device accesses, to access the EMIF registers, and to transfer all data to and from the EMIF controller. Table 16-96 shows the MAddrSpace mapping to different chip-selects. A third interface arranges the connection between the EMIF and the MPU. It is separated to the MPU half of the EMIF-to-MPU L3 Interface and the EMIF half of the EMIF-to-MPU L3 Interface.

Table 16-96. MAddrSpace Mapping to Chip-Selects

| MAddrSpace ⁽¹⁾ | Chip-Select | Description | Exclusions |
|---------------------------|-------------|-------------------------|----------------------------|
| 0x0 | ICS[1:0] | SDRAM(s) | |
| 0x1 | CS1 | Reserved for LPDDR2-NVM | |
| 0x2 | N/A | Reserved | Not visible to the MA port |
| 0x3 | N/A | Internal registers | Not visible to the MA port |

⁽¹⁾ See DMM_LISA_MAP_i [17:16] SDR_C_ADDRSPC register in Section 16.2, *Dynamic Memory Manager*.

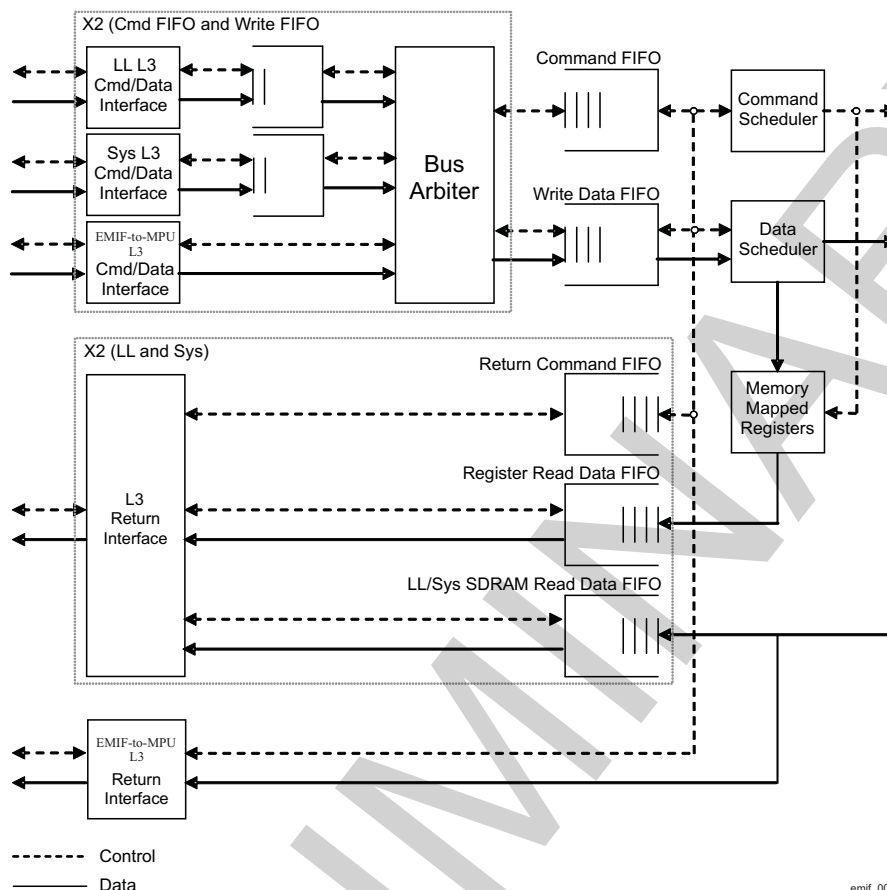
16.3.4.1.2 FIFO Description

The EMIF module contains the following FIFOs:

- Command FIFO
- Write data FIFO
- Return command FIFO
- Two read data FIFOs

Figure 16-49 shows the overall architecture of the EMIF module.

Figure 16-49. FIFO Block Diagram



Because the system (128-bit) L3 interface is the main interface, it has a higher allocation of FIFO slots than the low-latency (64-bit) L3 interface. Table 16-97 lists the allocation of the entries.

Table 16-97. FIFO Allocation

| Parameter | System L3 Interface Entries | Low-Latency L3 Interface Entries | MPU Half of the EMIF-to-MPU L3 Interface Entries |
|-------------------------|-----------------------------|----------------------------------|--|
| Pre Command FIFO | 5 | 5 | 3 |
| Command FIFO | Programmable ⁽¹⁾ | Programmable ⁽¹⁾ | Programmable ⁽¹⁾ |
| Pre Write FIFO | 8 | 8 | 8 |
| Write Data FIFO | Up to 19+8 | Up to 19 + 8 | Up to 19 + 8 |
| Return Command FIFO | 22 | 17 | 13 |
| SDRAM Read Data FIFO | 22 | 17 | 20 |
| Register Read Data FIFO | 2 | 2 | 0 |

⁽¹⁾ The total number of entries in the command FIFO is 10.

The command FIFO is shared between the three L3 interfaces, whereas there are three different FIFOs for every other type, one dedicated to each L3 interface.

The command FIFO stores all the commands coming in on the L3 command interface. The allocation of entries in the command FIFO is programmable per L3 interface using the [EMIF_L3_CONFIG\[27:24\]](#) REG_SYS_THRESH_MAX, [EMIF_L3_CONFIG\[19:16\]](#) REG_LL_THRESH_MAX, and [EMIF_L3_CONFIG\[23:20\]](#) REG_MPU_TRESH_MAX bit fields.

If the addition of the [EMIF_L3_CONFIG\[27:24\] REG_SYS_THRESH_MAX](#) and [EMIF_L3_CONFIG\[19:16\] REG_LL_THRESH_MAX](#) bit fields is greater than the number of entries in the command FIFO, the allocation depends on the traffic on the interfaces. For example, if both fields are programmed to 7, then either of the interfaces can use seven entries in the command FIFO if the other interface is idle. If both interfaces have traffic, then the EMIF starts to gradually allocate entries to both interfaces until it settles down to seven entries for the low-latency interface and three entries for the system interface, because the low-latency interface has higher priority. If the low-latency interface has no traffic, the system interface can use seven entries.

The allocation also depends on the traffic on the interfaces, if the [EMIF_L3_CONFIG\[27:24\] REG_SYS_THRESH_MAX](#) and [EMIF_L3_CONFIG\[19:16\] REG_LL_THRESH_MAX](#) bit fields are programmed to be equal to or greater than the number of entries in the command FIFO. For example, if both fields are programmed to 10, then the low-latency port can use all the entries if there is no traffic on the system interface. However, if there is no traffic on the low-latency interface, the system interface can use all but one entry. This is because the low-latency interface has higher priority than the system interface. The only way for the system interface to use all command FIFO entries is to set the [EMIF_L3_CONFIG\[19:16\] REG_LL_THRESH_MAX](#) bit field to 0. Writing 0 reserves no space for the associated interface. If the value is set to 0 and a request is seen for that interface, the command FIFO assumes a value of 1 for that interface.

The write data FIFO stores the write data for all the write transactions coming in on the L3 write data interface. The write FIFO is shared for all the ports. A similar token mechanism is used to allocate the write FIFO with the following exceptions. All ports are given a minimum of four tokens, which ensures that each has ensured access to three write FIFO locations. Any one port can only use up to 19 of the 25 write FIFO locations. Because there is an 8-word pre-FIFO, each port can have up to 27 backlogged writes.

The return command FIFO stores all the return transactions that are to be issued to the L3 return interface. These include the write status return and the read data return commands.

Two read data FIFOs store the read data to be sent to the L3 return interface. One read data FIFO stores read data from the memory mapped registers. The other read data FIFO stores read data from external memory.

A write command is executed only when four L3 words of the corresponding data is received in the write data FIFO, or when it is the last data, and if there is space in the return command FIFO. The EMIF schedules a read-only if the results can fit into the return command FIFO and the corresponding read data FIFOs.

16.3.4.1.3 MPU Port Restrictions

The EMIF MPU port is defined only to process memory requests. All register accesses are processed through the system or LL ports of the EMIF. The EMIF MPU port does not support 2D or register requests required or provided by the system and LL interfaces. The port priority is as follows:

1. LL port (highest priority)
2. System or MPU, depending on the MPriority field of the MReqInfo bus

The EMIF considers an address that matches and requires coherency if the arriving address rounded down to the nearest 1-K block matches any address in the FIFO rounded down to the nearest 1-K block plus or minus 1-K block. This ensures that any address within a burst will be coherent with any address within any other burst. This ensures that any address within 1024 bytes will be coherent. It is possible to be coherent up to 2048 bytes apart depending on the address. To maintain coherency two rules must be followed:

- Rule A: Any command arriving on any interface (MPU, system, or LL) that matches an address in the cFIFO is executed after the command in the cFIFO.
- Rule B: Any command arriving within a 10-cycle window of another, from the different interfaces that do not match any address in the cFIFO but may match command addresses arriving on a different interface, can be executed in any order.

16.3.4.1.4 Arbitration

The EMIF looks at all the commands stored in the command FIFO to schedule commands to the external memory. All commands with the same MConnID on a particular L3 interface complete in order. The EMIF does not ensure ordering between commands with different MConnIDs or between commands from two L3 interfaces. For more information about L3 interconnect terms (MConnID, MCMD, MADDR, etc.) see [Section 14.2, L3 Interconnect](#).

However, the EMIF does maintain data coherency. Therefore, the EMIF blocks a command, regardless of priority or the L3 interface, if that command is to the same block address (2048 bytes) as an older command that is not complete. Thus, the EMIF may have one pending read or write for each MConnID. Among all pending reads, the EMIF selects all reads that have their corresponding SDRAM banks already open. Similarly, among all pending writes, the EMIF selects all writes that have their corresponding SDRAM banks already open. Accesses to memory mapped registers are treated as accesses that have open banks.

As a result of this reordering, the EMIF may now have several pending reads and writes that have their corresponding banks open. The EMIF then selects the highest priority read from pending reads, and the highest priority write from pending writes. Commands from the low-latency L3 interface have a higher priority over the commands from the system L3 interface. If two or more commands have the highest priority, the EMIF selects the oldest command. As a result, the EMIF may now have the next read and a write command. If the return command FIFO and the read data FIFO have space and the external bus conflict is resolved, the EMIF performs the final read command before the final write command. If the return command FIFO has space but the read data FIFO is full, the EMIF performs the final write command before the final read command. Resolution of external bus conflict means all the SDRAM command-to-command counters are satisfied and the read-to-write or write-to-read turnaround time is met.

The EMIF does not support tag interleaving. In other words, for an L3 interface, the EMIF completes executing an L3 command before it switches to another command. The EMIF can, however, interleave execution between commands from two L3 interfaces.

The data coherency inside the EMIF is ensured only in a single level of L3 infrastructure. For example, if a write from a secondary L3 bus segment is blocked by a bridge element, the read from a tertiary bus can still beat the write to the EMIF. In such a case, to confirm that a write from master A has landed before a read from master B is performed, master A must wait for the write status from the EMIF before indicating to master B that the data is ready to be read. If master A does not use the L3 wait status, it must do the following:

1. Perform the required write.
2. Perform a dummy write to the [EMIF_MOD_ID_REV](#) register.
3. Perform a dummy read to the [EMIF_MOD_ID_REV](#) register.
4. Indicate to master B that the data is ready to be read after completion of read in Step 3. The completion of read in Step 3 ensures that the previous writes were done.

Apart from reads and writes, the EMIF must also open and close SDRAM banks and maintain the refresh counts for an SDRAM. The priority of SDRAM commands with respect to refresh levels are:

1. SDRAM refresh request when refresh-must level is reached (highest priority)
2. L3 request for a read without a higher priority write
3. SDRAM refresh request when refresh-need level is reached
4. L3 request for a write
5. SDRAM activate commands
6. SDRAM deactivate commands
7. SDRAM deep power-down request
8. SDRAM refresh request when refresh-may level is reached
9. SDRAM self-refresh or SDRAM power-down request (lowest priority)

While performing the previous scheduling algorithm, the EMIF may encounter two conditions:

- A continuous stream of high-priority commands can block lower priority commands.

- A continuous stream of SDRAM commands to a row in an open bank can block commands to another row in the same bank.

In addition to this scheduling, the highest priority condition is a reset command. If this condition occurs, the EMIF abandons what it is doing and begins its start-up sequence. In this case, commands and data stored in the FIFOs are lost. The EMIF also starts its start-up sequence whenever the [EMIF_SDRAM_CONFIG](#) register is written and the [EMIF_SDRAM_REF_CTRL\[31\] REG_INITREF_DIS](#) bit is set to 0. In this case, commands and data stored in the FIFOs are not lost. The EMIF ensures that in-flight read or write transactions to the SDRAM are complete before starting the initialization sequence.

All the accesses to an SDRAM are pipelined to maximize use of the external bus. All of these are done while fulfilling the access timing requirements of an SDRAM.

16.3.4.2 Clock Management

The EMIF can gate EMIF_FCLK. There is an internal mechanism that can stop EMIF_FCLK automatically.

EMIF_FCLK can be stopped only after the SDRAM is put into self-refresh mode and the power-idle protocol on the L3 bus completes.

The EMIF waits for the DLL lock before performing any memory access.

The EMIF_FCLK frequency can be changed only after putting the external SDRAM in self-refresh mode.

EMIFi_FCLK frequency is equal to half of the DDR_PHY_CLK frequency. DDR_PHY_CLK is equal to half of the PHY_ROOT_CLK frequency.

16.3.4.3 Software Reset

The EMIF does not support a software reset.

The EMIF supports global warm reset mode, during which the EMIF keeps the SDRAM content. Upon a request from the PRCM module indicating a need to enter global warm reset mode, the EMIF does the following:

1. Completes the ongoing access and then puts the SDRAM in self-refresh mode
2. Clears all its FIFO contents and deasserts the sys_SCmdAccept and sys_SDataAccept ports

When the global warm reset must terminate:

1. The PRCM block deasserts its request signal to the EMIF.
2. The EMIF exits self-refresh mode when it receives host accesses from the MPU to the external memory.

16.3.4.4 System Power Management

16.3.4.4.1 Read Idle Window

The [EMIF_READ_IDLE_CTRL](#) register can force idle time between consecutive reads to allow the DDR PHY to recalibrate the DLL delays during gradual voltage and frequency change.

The [EMIF_READ_IDLE_CTRL\[8:0\] REG_READ_IDLE_INTERVAL](#) bit field determines the maximum interval $((\text{REG_READ_IDLE_INTERVAL} + 1) * 64 \text{ EMIF_FCLK clock cycles})$ between read idle detections or force read idle time. A value of 0 disables the read idle function.

The [EMIF_READ_IDLE_CTRL\[19:16\] REG_READ_IDLE_LEN](#) bit field determines the minimum size of idle window for the read idle detection and the force read idle time. The EMIF introduces idle time only if it does not see at least $(\text{REG_READ_IDLE_LEN} + 1) * 2$ number of idle EMIF_FCLK cycles in [REG_READ_IDLE_INTERVAL](#). Any command other than a read command is considered idle for this purpose. Force read idle occurs when the data bus is busy transferring read data and the read idle interval expires without seeing a read idle length pause in the reads.

16.3.4.4.2 LPDDR2-SDRAM Power-Down Mode

The EMIF supports power-down mode for low power. The EMIF automatically puts the SDRAM into power-down mode after it is idle for [EMIF_PWR_MGMT_CTRL\[15:12\] REG_PD_TIM](#) number of EMIF_FCLK cycles and the [EMIF_PWR_MGMT_CTRL\[10:8\] REG_LP_MODE](#) bit field is set to 0x4. In power-down mode, the EMIF does not stop the clocks to the SDRAM. The EMIF maintains [lpddr2i_cke\[j\]\[1:0\]](#) (where i = 1 or 2 and j = 0 or 1) low to maintain the power-down mode.

When the SDRAM is in power-down mode, the EMIF services register accesses normally.

If the LPDDR2-SDRAM is in power-down mode and one of the following occurs, the EMIF brings SDRAM out of power-down mode:

1. [EMIF_PWR_MGMT_CTRL\[10:8\] REG_LP_MODE](#) bit field is changed from 0x4 to some other value.
2. An SDRAM access is requested.
3. The refresh-must level is reached.

For LPDDR2-SDRAM, the EMIF module:

1. Drives [lpddr2i_cke\[j\]\[1:0\]](#) (where i = 1 or 2 and j = 0 or 1) high
2. Waits for [EMIF_SDRAM_TIM_2\[30:28\] REG_T_XP + 1](#) cycles
3. Enters its idle mode and can issue any commands

16.3.4.4.3 LPDDR2-SDRAM Deep Power-Down Mode

For ultimate power savings, the EMIF supports deep power-down mode for LPDDR2-SDRAM.

The SDRAM can be forced into deep power-down mode through software by setting the [EMIF_PWR_MGMT_CTRL\[11\] REG_DPD_EN](#) bit to 0x1. In this case the EMIF continues normal operation until all SDRAM access requests are serviced. At this point the EMIF issues a deep power-down command. The EMIF then maintains [lpddr2i_cke\[j\]\[1:0\]](#) (where i = 1 or 2 and j = 0 or 1) low to maintain deep power-down mode. In deep power-down mode, the EMIF automatically stops the clocks to the SDRAM.

Setting the [EMIF_PWR_MGMT_CTRL\[11\] REG_DPD_EN](#) bit to 1 overrides the setting of the [EMIF_PWR_MGMT_CTRL\[10:8\] REG_LP_MODE](#) bit field. Therefore, if the SDRAM is in self-refresh or power-down mode, and the [EMIF_PWR_MGMT_CTRL\[11\] REG_DPD_EN](#) bit is set to 1, the EMIF exits those modes and goes into deep power-down mode.

When the SDRAM is in deep power-down mode, the EMIF services register accesses normally.

If the [EMIF_PWR_MGMT_CTRL\[11\] REG_DPD_EN](#) bit is set to 0x0, the EMIF brings the SDRAM out of deep power-down mode.

For LPDDR2-SDRAM, the EMIF controller:

1. Drives [lpddr2i_cke\[j\]\[1:0\]](#) (where i = 1 or 2 and j = 0 or 1) high
2. Issues a RESET command to LPDDR2 (MRW)
3. Enters its idle mode and can issue any commands
4. Software must perform initialization, as specified in [Section 16.3.4.12, LPDDR2-SDRAM Initialization](#).

16.3.4.4.4 LPDDR2-SDRAM Self-Refresh Mode

The EMIF supports self-refresh mode for low power. The EMIF automatically puts the SDRAM into self-refresh mode after the EMIF is idle for [EMIF_PWR_MGMT_CTRL\[3:0\] REG_CS_TIM](#) number of EMIF_FCLK cycles and the [EMIF_PWR_MGMT_CTRL\[10:8\] REG_LP_MODE](#) bit field is set to 0x2. In self-refresh mode, the EMIF automatically stops the clocks to the SDRAM. The EMIF maintains [lpddr2i_cke\[j\]\[1:0\]](#) (where i = 1 or 2 and j = 0 or 1) low to maintain self-refresh mode.

When the SDRAM is in self-refresh mode, the EMIF services register accesses normally.

If the LPDDR2-SDRAM is in self-refresh mode and one of the following occurs, the EMIF brings SDRAM out of self-refresh mode:

1. The [EMIF_PWR_MGMT_CTRL\[10:8\] REG_LP_MODE](#) bit field is changed from 0x2 to some other value.

2. An SDRAM access is requested.
3. [EMIF_SDRAM_TIM_2\[2:0\]](#) REG_T_CKE + 1 cycles have elapsed since the SELF-REFRESH command was issued.

For LPDDR2-SDRAM, the EMIF:

1. Enables clocks
2. Drives [lpddr2i_cke\[j\[1:0\]\]](#) (i = 1 or 2 and j = 0 or 1) high
3. Waits for [EMIF_SDRAM_TIM_2\[24:16\]](#) REG_T_XSNR + 1 cycles
4. Starts an auto-refresh cycle in the next cycle
5. Enters its idle mode and can issue any commands

16.3.4.4.5 Save and Restore

The EMIF supports the save-and-restore mechanism to switch off power to the EMIF.

For more information about the off-mode sequence and restoration of power to the EMIF sequence, see [Chapter 3, Power, Reset, and Clock Management](#).

16.3.4.4.6 Retention Mode

EMIF supports full-retention mode.

16.3.4.5 Interrupt Requests

The EMIF sources two interrupts: one for the system L3 interface and the other for the low-latency L3 interface. The pulse and level interrupt signals for a particular interface are sourced from the same raw interrupt internal to the module.

The EMIF sets the [EMIF_IRQSTATUS_RAW_SYS\[0\]](#) REG_RAW_SYS/[EMIF_IRQSTATUS_RAW_LL\[0\]](#) REG_RAW_LL bit (depending on which interface sent the command having an error) to 1, if an access request to an unsupported MAddrSpace is received. If such an error occurs, it is due to bad programming of the DMM. For more information about addressing, see [Section 16.2, Dynamic Memory Manager](#).

The interrupts can be cleared by writing 1 to the corresponding bits in the [EMIF_IRQSTATUS_RAW_SYS/EMIF_IRQSTATUS_RAW_LL](#) or the [EMIF_IRQSTATUS_SYS/EMIF_IRQSTATUS_LL](#) registers.

[Table 16-98](#) lists the event flags and their mask that can cause module interrupts.

Table 16-98. Events

| Event Flag | Event Mask | Description |
|---|--|---|
| EMIF_IRQSTATUS_RAW_SYS[1] REG_TA_SYS / EMIF_IRQSTATUS_SYS[1] REG_TA_SYS | EMIF_IRQENABLE_SET_SYS[1] REG_EN_TA_SYS / EMIF_IRQENABLE_CLR_SYS[1] REG_EN_TA_SYS | System L3 interrupt for SDRAM temperature alert |
| EMIF_IRQSTATUS_RAW_LL[1] REG_TA_LL / EMIF_IRQSTATUS_LL[1] REG_TA_LL | EMIF_IRQENABLE_SET_LL[1] REG_EN_TA_LL / EMIF_IRQENABLE_CLR_LL[1] REG_EN_TA_LL | Low-latency L3 interrupt for SDRAM temperature alert |
| EMIF_IRQSTATUS_RAW_SYS[0] REG_ERR_SYS / EMIF_IRQSTATUS_SYS[0] REG_ERR_SYS | EMIF_IRQENABLE_SET_SYS[0] REG_EN_ERR_SYS / EMIF_IRQENABLE_CLR_SYS[0] REG_EN_ERR_SYS | System L3 interrupt for command or address error |
| EMIF_IRQSTATUS_RAW_LL[0] REG_ERR_LL / EMIF_IRQSTATUS_LL[0] REG_ERR_LL | EMIF_IRQENABLE_SET_LL[0] REG_EN_ERR_LL / EMIF_IRQENABLE_CLR_LL[0] REG_EN_ERR_LL | Low-latency L3 interrupt for command or address error |

16.3.4.6 SDRAM Output Impedance Calibration

The EMIF supports automatic output impedance calibration. The ZQ calibration can be enabled per CS by setting the [EMIF_ZQ_CONFIG\[31\] REG_ZQ_CS1EN](#) and [EMIF_ZQ_CONFIG\[30\] REG_ZQ_CS0EN](#) bits. The EMIF supports three types of ZQ calibration commands:

- ZQINIT: ZQ calibration command during initialization
- ZQCS: ZQ calibration short command
- ZQCL: ZQ calibration long command

The EMIF issues a ZQCS command each time the [EMIF_ZQ_CONFIG\[15:0\] REG_ZQ_REFINTERVAL](#) bit field expires. In other words, the [REG_ZQ_REFINTERVAL](#) defines the interval between ZQCS commands. When a ZQCS command is issued, the EMIF waits and blocks any other command for ([EMIF_SDRAM_TIM_3\[20:15\] REG_ZQ_ZQCS](#) + 1) number of DDR clock cycles.

If the [EMIF_ZQ_CONFIG\[28\] REG_ZQ_SFEXITEN](#) bit field is set to 1, the EMIF issues a ZQCL command every time it exits self-refresh, active power-down, and precharge power-down modes. When a ZQCL command is issued, the EMIF waits and blocks any other command for ([EMIF_ZQ_CONFIG\[17:16\] REG_ZQ_ZQCL_MULT](#) + 1) × ([EMIF_SDRAM_TIM_3\[20:15\] REG_ZQ_ZQCS](#) + 1) number of DDR clock cycles.

If a separate calibration resistor is used per device, the ZQ calibration can be performed simultaneously over both CSs. To enable ZQ calibration to be performed simultaneously over both CSs, the [EMIF_ZQ_CONFIG\[27\] REG_ZQ_DUALCALEN](#) bit must be set to 1. If [REG_ZQ_DUALCALEN](#) is set to 0, the EMIF performs ZQ calibration per CS serially.

16.3.4.7 SDRAM Temperature Monitoring

The EMIF supports automatic temperature monitoring to facilitate the software update of the refresh rate according to the temperature changes of the LPDDR2. Temperature monitoring can be enabled per CS by setting the [EMIF_TEMP_ALERT_CONFIG\[31\] REG_TA_CS1EN](#) and [EMIF_TEMP_ALERT_CONFIG\[30\] REG_TA_CS0EN](#) bits.

The EMIF polls the temperature of the LPDDR2 (issues an MRR command to Mode Register 4) every time the [EMIF_TEMP_ALERT_CONFIG\[21:0\] REG_TA_REFINTERVAL](#) bit field expires. In other words, [REG_TA_REFINTERVAL](#) defines the interval between temperature alert polls. If the EMIF sees a 1 on bit 7 of the read data value from the MRR, which indicates the temperature has changed, the [EMIF_IRQSTATUS_SYS\[1\] REG_TA_SYS](#) bit (for L3 interconnect) or [EMIF_IRQSTATUS_LL\[1\] REG_TA_LL](#) bit (for low-latency L3) is set and the module sends an interrupt on the system and low-latency interrupt lines, respectively. When the interrupt is received, software updates the [EMIF_SDRAM_REF_CTRL\[15:0\] REG_REFRESH_RATE](#) bit field to the required value as per the temperature change.

If the [EMIF_TEMP_ALERT_CONFIG\[28\] REG_TA_SFEXITEN](#) bit is set to 1, the EMIF polls for temperature change every time it exits self-refresh, active power-down, and precharge power-down modes.

Because the EMIF is performing an MRR, it needs information about how the LPDDR2 is connected. The [EMIF_TEMP_ALERT_CONFIG\[27:26\] REG_TA_DEVWDT](#) and [EMIF_TEMP_ALERT_CONFIG\[25:24\] REG_TA_DEVCNT](#) bit fields provide the necessary information to the EMIF for MRR data compare. For example, if [REG_TA_DEVWDT](#) is set to 0, which indicates 8-bit devices are used, and if [REG_TA_DEVCNT](#) is set to 2, which indicates four devices are used to form a 32-bit bus, the mask used for checking is 4'b1111; that is, the EMIF expects data on each byte lane on a 32-bit bus.

16.3.4.8 SDRAM Refresh Scheduling

The EMIF uses two counters to schedule AUTO REFRESH commands: a 13-bit decrementing refresh interval counter and a 4-bit refresh backlog counter. The interval counter is used to define the rate at which connected SDRAM devices are refreshed. It is loaded with the value of the

[EMIF_SDRAM_REF_CTRL](#)[15:0] REG_REFRESH_RATE bit field at reset (only the 13 LSBs are taken). The interval counter decrements by 1 each cycle until it reaches 0, at which point it reloads from the [EMIF_SDRAM_REF_CTRL](#)[15:0] REG_REFRESH_RATE bit field and restarts decrementing. The counter also reloads and restarts decrementing whenever the [EMIF_SDRAM_REF_CTRL](#)[15:0] REG_REFRESH_RATE bit field is updated.

The refresh backlog counter records the number of outstanding AUTO REFRESH commands the EMIF has. The backlog counter increments by 1 each time the interval counter reloads (unless it has reached its maximum value of 15). The backlog counter decrements by 1 each time the EMIF issues an AUTO REFRESH command (unless it is already 0). For the range of values that the backlog counter can take, there are four levels of urgency with which the EMIF must perform an auto refresh cycle (in which it issues AUTO REFRESH commands):

1. Refresh-may level is reached when the backlog count is greater than 0, which indicates there is a refresh backlog; therefore, if the EMIF is not busy and none of the SDRAM banks are open, the EMIF must perform an auto refresh cycle.
2. Refresh-release level is reached when the backlog count is greater than 4, which indicates the refresh backlog is getting bigger; therefore, if the EMIF is not busy it must perform an auto refresh cycle even if any of the banks are open.
3. Refresh-need level is reached when the backlog count is greater than 5, which indicates the refresh backlog is getting bigger and the EMIF must raise the priority of performing an auto refresh cycle above that of servicing new memory write requests. The EMIF starts servicing new memory accesses after the refresh-release level is cleared.
4. Refresh-must level is reached when the backlog count is greater than 7, which indicates the refresh backlog is becoming excessive and the EMIF must perform an auto refresh cycle before servicing any new memory access requests. The EMIF starts servicing new memory accesses after the refresh-release level is cleared.

The refresh counters do not operate when SDRAM is in self-refresh mode.

The EMIF issues AUTO REFRESH commands within auto refresh cycles. An auto refresh cycle consists of issuing an AUTO REFRESH command and waiting T_{RFC} (see [EMIF_SDRAM_TIM_3](#)) cycles before rechecking the refresh levels. If the refresh-release level is not reached, the EMIF starts another auto refresh cycle; otherwise, it returns to idle mode where it can issue any command. The EMIF ensures that no more than eight AUTO REFRESH commands are issued in any rolling $tREFBW (= 4 * 8 * tRFC)$ window.

16.3.4.8.1 Performance Counters Description

The [EMIF_PERF_CNT_1](#) and [EMIF_PERF_CNT_2](#) registers can be used to monitor or calculate the EMIF bandwidth and efficiency. These counters can count events such as total SDRAM accesses, SDRAM activates, reads, writes, etc. Each counter counts events independent of the other counters. In addition to the ability to count events, the counters can also filter the events from a particular master or address space. The events to be counted and the filter enabling can be configured using the [EMIF_PERF_CNT_CFG](#) register. The filter value to be used can be configured using the [EMIF_PERF_CNT_SEL](#) register. Each counter can be configured independently.

[Table 16-99](#) lists all the events that can be counted and whether a filter can be applied to a particular event. A filter can be applied to an event if the following bits for Performance Counter 1 and Performance Counter 2 can be set equal to 0x1 for that event:

- Performance Counter 1: [EMIF_PERF_CNT_CFG](#)[15] REG_CNTR1_MCONNID_EN and [EMIF_PERF_CNT_CFG](#)[14] REG_CNTR1_REGION_EN
- Performance Counter 2: [EMIF_PERF_CNT_CFG](#)[31] REG_CNTR2_MCONNID_EN and [EMIF_PERF_CNT_CFG](#)[30] REG_CNTR2_REGION_EN

[Table 16-99](#) shows the possible filter configurations for the two performance counters. These filter configurations can be used in conjunction with a L3 master ID and/or external chip-select to obtain performance statistics for a particular L3 master and/or external chip-select.

Table 16-99. Performance Counter Filter Configuration

| CNTRn_CFG ⁽¹⁾ | CNTRn_REGION_EN ⁽¹⁾ | CNTRn_MCONNID_EN ⁽¹⁾ | Description |
|--------------------------|--------------------------------|---------------------------------|---|
| 0x0 ⁽²⁾ | 0x0 | 0x0 or 0x1 | Count total SDRAM accesses |
| 0x1 ⁽²⁾ | 0x0 | 0x0 or 0x1 | Count total SDRAM activates |
| 0x2 ⁽²⁾ | 0x0 or 0x1 | 0x0 or 0x1 | Count total L3 reads. CPU cache based operations are 32 bytes. DMA burst is 128 bytes. |
| 0x3 ⁽²⁾ | 0x0 or 0x1 | 0x0 or 0x1 | Count total L3 writes. CPU cache based operations are 32 bytes. DMA burst is 128 bytes. |
| 0x4 | 0x0 | 0x0 | Count number of EMIF FCLK clock cycles L3 Command FIFO is full |
| 0x5 | 0x0 | 0x0 | Count number of EMIF FCLK clock cycles L3 Write Data FIFO is full |
| 0x6 | 0x0 | 0x0 | Count number of EMIF FCLK clock cycles L3 Read Data FIFO is full |
| 0x7 | 0x0 | 0x0 | Count number of EMIF FCLK clock cycles L3 Return Command FIFO is full |
| 0x8 | 0x0 or 0x1 | 0x0 or 0x1 | Count number of priority elevations |
| 0x9 | 0x0 | 0x0 | Count number of EMIF FCLK clock cycles that a command was pending |
| 0xA ⁽²⁾ | 0x0 | 0x0 | Count number of EMIF FCLK clock cycles for which the memory data bus was transferring data. |
| 0xA ⁽²⁾ | 0x0 | 0x1 | Count number of L3 commands for which the memory data bus was transferring data. |
| 0xB to 0xF | 0x0 | 0x0 | Reserved for future use. |

⁽¹⁾ n = 1 or 2

⁽²⁾ When MReqDebug is set to a 1 for a particular L3 command, the performance counters will not be incremented for that command.

When CNTRn_CFG = 0xA and CNTRn_MCONNID_EN=0x1, the following guidelines must apply:

- Count of 1 implies OCP command up to 32 bytes for all the initiators except for Cortex-A9 MPU
- Count of 1 implies OCP command up to 16 bytes for Cortex-A9 MPU when all the other initiators are not generating traffic on SDRAM.
- If there are multiple initiators generating traffic, then Count for Cortex-A9 MPU doesn't indicate the bandwidth directly. The following formula must be used:

$$\text{Actual MPU Count} = \text{Count value} - \sum_{i=0}^{\text{all_initiators-MPU}} \text{Count}_i$$

where i is different initiators and Count_i is the Count value for each of those initiators. Then:

- Actual MPU count of 1 implies OCP command up to 16 bytes for Cortex-A9 MPU
- Bandwidth for all other initiators except MPU is Count × 32 bytes
- Bandwidth calculation for MPU is MPU Count × 16 bytes

16.3.4.8.2 Performance Counters General Examples

16.3.4.8.2.1 PERF_CNT_1 General Example for Counting Write Accesses

The Performance Counter 1 register must count all write accesses from the dual Cortex-M3 MPU subsystem:

- To enable counting writes, the [EMIF_PERF_CNT_CFG\[3:0\]](#) REG_CNTR1_CFG bit field must be set to 0x3.

- The [EMIF_PERF_CNT_SEL\[15:8\]](#) REG_MCONNID1 bit field must be set to 0x44. The values programmed into the REG_MCONNIDx bit fields are those in [Table 29-20](#), in [Chapter 29, On-Chip Debug Support](#), left-shifted by 2 bits.
- To enable filtering, the [EMIF_PERF_CNT_CFG\[15\]](#) REG_CNTR1_MCONNID_EN bit must be set to 0x1.

With this configuration, Counter 1 counts every write made to the EMIF from master 0x44 to any address space. This does not include accesses from other masters and does not include commands other than writes.

16.3.4.8.2.2 *PERF_CNT_2 General Example for Counting Total Access*

The Performance Counter 2 register must count total accesses to SDRAM regardless of the masters or address space.

- To enable counting all SDRAM accesses, the [EMIF_PERF_CNT_CFG\[19:16\]](#) REG_CNTR2_CFG bit field must be set to 0x0.
- To disable filtering, the [EMIF_PERF_CNT_CFG\[31\]](#) REG_CNTR2_MCONNID_EN and the [EMIF_PERF_CNT_CFG\[30\]](#) REG_CNTR2_REGION_EN bits must be set to 0x0.

With this configuration, Counter 2 counts every access made to the EMIF. This includes all accesses from all masters and to any address space.

16.3.4.8.2.3 *PERF_CNT_3 General Example for Counting all Read Accesses*

The Performance Counter 1 register must count all read accesses from the dual Cortex-M3 MPU subsystem to address space 0x0.

- To enable counting reads, the [EMIF_PERF_CNT_CFG\[3:0\]](#) REG_CNTR1_CFG bit field must be set to 0x2.
- The [EMIF_PERF_CNT_SEL\[15:8\]](#) REG_MCONNID1 and [EMIF_PERF_CNT_SEL\[1:0\]](#) REG_REGION_SEL1 bit fields must be set to 0x44 and 0x0, respectively.
- To enable filtering, the [EMIF_PERF_CNT_CFG\[15\]](#) REG_CNTR1_MCONNID_EN and [EMIF_PERF_CNT_CFG\[14\]](#) REG_CNTR1_REGION_EN bits must be set to 0x1.

With this configuration, Counter 1 counts every read made to the EMIF from master 0x44 to address space 0x0. This does not include accesses from other masters or accesses to other address space and does not include commands other than reads.

16.3.4.9 *EMIF Access Cycles*

By default, the EMIF keeps the SDRAM CSs active. To direct a command to one of the SDRAMs, the EMIF deasserts the CS to the other SDRAMs for the duration of the command. If the [EMIF_SDRAM_CONFIG\[3\]](#) REG_EBANK bit in the SDRAM configuration register is set to 0, CS1 is always driven high except during initialization and for REFRESH, POWER DOWN, SELF-REFRESH, and DEEP POWER-DOWN commands.

The EMIF always performs burst accesses to the SDRAM. Multiple SDRAM bursts may be needed to service a single L3 burst request. [Table 16-100](#) through [Table 16-104](#) show a few examples of how EMIF accesses SDRAM for a linear incrementing transaction type. T0, T1, etc. are clock cycles. R0 is read starting at column 0, R8 is read starting at column 8, and R16 is read starting at column 16. D0-1 is the data from column 0 and 1, D2-3 is the data from column 2 and 3, and so on.

Table 16-100. 64-Byte Linear Read Starting at Address 0x0

| T0 | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 | T11 |
|----|----|----|----|------|------|------|------|------|--------|--------|--------|
| R0 | | | | R8 | | | | | | | |
| | | | | D0-1 | D2-3 | D4-5 | D6-7 | D8-9 | D10-11 | D12-13 | D14-15 |

Table 16-101. 64-Byte Linear Read Starting at Address 0x8 (LPDDR2-S2)

| T0 | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 | T11 | T12 | T13 | T14 |
|----|----|----|----|------|------|------|------|--------|--------|--------|--------|--------|--------|--------|
| R2 | | | R8 | | | | R16 | | | | | | | |
| | | | | D2-3 | D4-5 | D6-7 | D8-9 | D10-11 | D12-13 | D14-15 | D16-17 | Unused | Unused | Unused |

Table 16-102. 64-Byte Linear Read Starting at Address 0x8 (LPDDR2-S4)

| T0 | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 | T11 | T12 | T13 | T14 | T15 |
|----|----|----|----|------|------|------|--------|------|--------|--------|--------|--------|--------|--------|--------|
| R2 | | | | R8 | | | | R16 | | | | | | | |
| | | | | D2-3 | D4-5 | D6-7 | Unused | D8-9 | D10-11 | D12-13 | D14-15 | D16-17 | Unused | Unused | Unused |

Table 16-103. 64-Byte Linear Read Starting at Address 0x10

| T0 | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 | T11 | T12 | T13 |
|----|----|----|----|------|------|------|--------|--------|--------|--------|--------|--------|--------|
| R4 | | R8 | | | | | R16 | | | | | | |
| | | | | D4-5 | D6-7 | D8-9 | D10-11 | D12-13 | D14-15 | D16-17 | D18-19 | Unused | Unused |

Table 16-104. 64-Byte Linear Read Starting at Address 0x18

| T0 | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 | T11 | T12 | T13 |
|----|----|----|----|------|--------|------|--------|--------|--------|--------|--------|--------|--------|
| R6 | | R8 | | | | | R16 | | | | | | |
| | | | | D6-7 | Unused | D8-9 | D10-11 | D12-13 | D14-15 | D16-17 | D18-19 | D20-21 | Unused |

The EMIF uses the unused data phases in the preceding figures by issuing successive read commands if there are reads to open banks pending in the command FIFO.

The write data conversion from SDR to DDR is done outside the EMIF.

16.3.4.9.1 SDRAM Read

A read access to an SDRAM is initiated with a READ command. The EMIF provides the internal bank address and the column address on pad_ca_o with the READ command. The EMIF registers the first read data from lpddr2i_dj (where i = 1 or 2 and j = 0 or 1) after (read_latency + 3) DDR clock cycles. Read latency is programmed in the [EMIF_DDR_PHY_CTRL_1](#) register.

16.3.4.9.2 SDRAM Write

A write access to an SDRAM is initiated with a WRITE command. The EMIF provides the internal bank address and the column address on pad_ca_o with the WRITE command.

The EMIF delays the write data by the appropriate write latency minus 1. Subsequent data words are provided on lpddr2i_dj (where i = 1 or 2 and j = 0 or 1) along with the appropriate data mask on lpddr2i_dmj (where i = 1 or 2 and j = 0 or 1) on each successive clock cycle. The DDR PHY then adds one more clock cycle delay to the write data to appropriately center the write data to the outgoing DQS.

16.3.4.10 Turnaround Time

[Table 16-105](#) lists the turnaround time the EMIF introduces on the data bus for various back-to-back accesses. The EMIF takes advantage of the CAS latencies and packs the commands as close as possible on the control bus to introduce the following turnaround time on the data bus.

Table 16-105. Turnaround Time

| Previous Access | Next Access | Turnaround Time (Number of DDR Clock Cycles) |
|-----------------|---------------------------|--|
| SDRAM read | SDRAM read to the same CS | 0 |

Table 16-105. Turnaround Time (continued)

| Previous Access | Next Access | Turnaround Time (Number of DDR Clock Cycles) |
|-----------------|------------------------------|--|
| SDRAM read | SDRAM read to a different CS | 2 |
| SDRAM read | SDRAM write | 2 |
| SDRAM write | SDRAM write | 0 |
| SDRAM write | SDRAM read | 2 |

16.3.4.11 SDRAM Address Mapping

The EMIF interleaves the internal banks for SDRAM connected to both CSs (see [Table 16-106](#) for the SDRAM addressing space), according to the DMM (for more information, see [Section 16.2, Dynamic Memory Manager](#)). From the system point of view, the external SDRAM is seen as one block of SDRAM. If two external 64-MB devices are used, a 128-MB memory block is observed. If two external 32-MB devices are used, a 64-MB block is observed.

Table 16-106. SDRAM Addressing Space

| Module Name | Base Address | Size |
|--|--------------|---|
| EMIF1 EMIF2-CS0-SDRAM ⁽¹⁾ | 0x8000 0000 | 0 to 1GB, programmable in DMM (see Section 16.2, Dynamic Memory Manager) |
| EMIF1 EMIF2-CS1-SDRAM ⁽²⁾ | 0xC000 0000 | 0 to 1GB, programmable in DMM (see Section 16.2, Dynamic Memory Manager) |

⁽¹⁾ The addressing space is interleaved on two LPDDR memory controllers (EMIF1, EMIF2), each activating their CS0 line. These CSs can address 64, 128, 256, 512, 1024, or 2048MBs. Interleaving occurs at 128-byte granularity. EMIF1-CS0 base address is always 0x8000 0000 at reset, and occupies a 1-GB address space at reset (interleaving disabled at reset).

⁽²⁾ The addressing space is interleaved on two LPDDR memory controllers (EMIF1, EMIF2), each activating its CS1 line. These CSs are programmable to 64, 128, 256, 512, or 1024MBs. Interleaving occurs at 128-byte granularity. EMIF1-CS1 and EMIF2-CS1 are disabled at reset. Their base address is programmable to achieve a continuous address space with the respective CS0, regardless of the programmed address range. EMIF1-CS1 is disabled if the EMIF1-CS0 memory density is set to 2048MB (2GB) when interleaving is disabled, or if the EMIF1-CS0 + EMIF2-CS0 memory density is set to 1024MB (1GB) when interleaving is enabled.

When addressing SDRAM, if the [EMIF_SDRAM_CONFIG\[28:27\] REG_IBANK_POS](#) bit field is set to 0, the EMIF uses the following three bit fields to determine the mapping from the source address to the SDRAM row, column, bank, and CS:

- [EMIF_SDRAM_CONFIG\[6:4\] REG_IBANK](#)
- [EMIF_SDRAM_CONFIG\[3\] REG_EBANK](#)
- [EMIF_SDRAM_CONFIG\[2:0\] REG_PAGESIZE](#)

If the [EMIF_SDRAM_CONFIG\[28:27\] REG_IBANK_POS](#) bit field is set to 1, 2, or 3, the EMIF uses the following four bit fields to determine the mapping from the source address to the SDRAM row, column, bank, and CS:

- [EMIF_SDRAM_CONFIG\[6:4\] REG_IBANK](#)
- [EMIF_SDRAM_CONFIG\[3\] REG_EBANK](#)
- [EMIF_SDRAM_CONFIG\[2:0\] REG_PAGESIZE](#)
- [EMIF_SDRAM_CONFIG\[9:7\] REG_ROWSIZE](#)

In all cases the EMIF considers its SDRAM address space to be a single logical block, regardless of the number of physical devices or whether the devices are mapped across one or two EMIF CSs.

For [EMIF_SDRAM_CONFIG\[28:27\] REG_IBANK_POS](#) = 0, [Table 16-107](#) and [Table 16-108](#) list which source address bits (MAddr) map to the SDRAM row, column, bank, and CS bits for all combinations of [REG_IBANK](#), [REG_EBANK](#), and [REG_PAGESIZE](#).

For [EMIF_SDRAM_CONFIG\[28:27\] REG_IBANK_POS](#) != 0, [Table 16-110](#) and [Table 16-111](#) show which source address bits (MAddr) map to the SDRAM row, column, bank, and CS bits for all combinations of [REG_IBANK](#), [REG_EBANK](#), [REG_PAGESIZE](#), and [REG_ROWSIZE](#).

The tables also list the maximum size of the resulting SDRAM space.

PRELIMINARY

Table 16-107. L3 Address to SDRAM Address Mapping for 16-Bit SDRAM (EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 0)

| Rea ch (M Byt es) | EMIF_S DRAM CONFI G [3] REG_ EBANK | EMIF_S DRAM CONFI G [6:4] REG_ IBANK | EMIF_S DRAM CONFI G [2:0] REG_ PAGES IZE | MAddr | | | | | | | | | | | | | | [8:1] | | |
|-------------------------------|---|---|--|-------|----|----|----|----|----|----|---------|----|----|----|----|----|----|-------|------|-----|
| | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | [24:16] | 15 | 14 | 13 | 12 | 11 | 10 | | 9 | |
| 32 | 0 | 0 | 0 | - | | | | | | | Row | | | | | | | Col | | |
| 64 | 1 | 0 | 0 | - | | | | | | | Row | | | | | | | CS | Col | |
| 64 | 0 | 1 | 0 | - | | | | | | | Row | | | | | | | Bank | Col | |
| 128 | 1 | 1 | 0 | - | | | | | | | Row | | | | | | | CS | Bank | Col |
| 128 | 0 | 2 | 0 | - | | | | | | | Row | | | | | | | Bank | Col | |
| 256 | 1 | 2 | 0 | - | | | | | | | Row | | | | | | | CS | Bank | Col |
| 256 | 0 | 3 | 0 | - | | | | | | | Row | | | | | | | Bank | Col | |
| 512 | 1 | 3 | 0 | - | | | | | | | Row | | | | | | | CS | Bank | Col |
| 64 | 0 | 0 | 1 | - | | | | | | | Row | | | | | | | | Col | |
| 128 | 1 | 0 | 1 | - | | | | | | | Row | | | | | | | CS | Col | |
| 128 | 0 | 1 | 1 | - | | | | | | | Row | | | | | | | Bank | Col | |
| 256 | 1 | 1 | 1 | - | | | | | | | Row | | | | | | | CS | Bank | Col |
| 256 | 0 | 2 | 1 | - | | | | | | | Row | | | | | | | Bank | Col | |
| 512 | 1 | 2 | 1 | - | | | | | | | Row | | | | | | | CS | Bank | Col |
| 512 | 0 | 3 | 1 | - | | | | | | | Row | | | | | | | Bank | Col | |
| 102 4 | 1 | 3 | 1 | - | | | | | | | Row | | | | | | | CS | Bank | Col |
| 128 | 0 | 0 | 2 | - | | | | | | | Row | | | | | | | | Col | |
| 256 | 1 | 0 | 2 | - | | | | | | | Row | | | | | | | CS | Col | |
| 256 | 0 | 1 | 2 | - | | | | | | | Row | | | | | | | Bank | Col | |
| 512 | 1 | 1 | 2 | - | | | | | | | Row | | | | | | | CS | Bank | Col |
| 512 | 0 | 2 | 2 | - | | | | | | | Row | | | | | | | Bank | Col | |
| 102 4 | 1 | 2 | 2 | - | | | | | | | Row | | | | | | | CS | Bank | Col |
| 102 4 | 0 | 3 | 2 | - | | | | | | | Row | | | | | | | Bank | Col | |
| 204 8 | 1 | 3 | 2 | - | | | | | | | Row | | | | | | | CS | Bank | Col |
| 256 | 0 | 0 | 3 | - | | | | | | | Row | | | | | | | | Col | |
| 512 | 1 | 0 | 3 | - | | | | | | | Row | | | | | | | CS | Col | |
| 512 | 0 | 1 | 3 | - | | | | | | | Row | | | | | | | Bank | Col | |

Table 16-107. L3 Address to SDRAM Address Mapping for 16-Bit SDRAM (EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 0) (continued)

| Rea ch (M Byt es) | EMIF_S DRAM_ CONFI G [3] REG_ EBANK | EMIF_S DRAM_ CONFI G [6:4] REG_ IBANK | EMIF_S DRAM_ CONFI G [2:0] REG_ PAGES IZE | MAddr | | | | | | | | | | | | | | |
|-------------------------------|--|--|---|-------|-----|-----|----|----|----|----|---------|------|------|------|-----|----|----|---|
| | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | [24:16] | 15 | 14 | 13 | 12 | 11 | 10 | 9 |
| 102 4 | 1 | 1 | 3 | — | | Row | | | | | | | CS | Bank | Col | | | |
| 102 4 | 0 | 2 | 3 | — | | Row | | | | | | | Bank | | Col | | | |
| 204 8 | 1 | 2 | 3 | — | Row | | | | | | | CS | Bank | | Col | | | |
| 204 8 | 0 | 3 | 3 | — | Row | | | | | | | Bank | | Col | | | | |

Table 16-108. L3 Address to SDRAM Address Mapping for 32-Bit SDRAM (EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 0)

| Reach (Mbyte s) | EMIF_S DRAM_ CONFI G[3] REG_E BANK | EMIF_S DRAM_ CONFI G[6:4] REG_IB ANK | EMIF_S DRAM_ CONFI G[2:0] REG_P AGESIZ E | MAddr | | | | | | | | | | | | | | | | | |
|-----------------------|---|---|--|-------|----|----|----|----|----|-------|----|----|----|----|----|----|----|------|------|-----|-----|
| | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25:17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9:2 | | | |
| 64 | 0 | 0 | 0 | - | | | | | | row | | | | | | | | col | | | |
| 128 | 1 | 0 | 0 | - | | | | | | row | | | | | | | | cs | col | | |
| 128 | 0 | 1 | 0 | - | | | | | | row | | | | | | | | bank | col | | |
| 256 | 1 | 1 | 0 | - | | | | | | row | | | | | | | | cs | bank | col | |
| 256 | 0 | 2 | 0 | - | | | | | | row | | | | | | | | bank | | col | |
| 512 | 1 | 2 | 0 | - | | | | | | row | | | | | | | | cs | bank | | col |
| 512 | 0 | 3 | 0 | - | | | | | | row | | | | | | | | bank | | col | |
| 1024 | 1 | 3 | 0 | - | | | | | | row | | | | | | | | cs | bank | | col |
| 128 | 0 | 0 | 1 | - | | | | | | row | | | | | | | | col | | | |
| 256 | 1 | 0 | 1 | - | | | | | | row | | | | | | | | cs | col | | |
| 256 | 0 | 1 | 1 | - | | | | | | row | | | | | | | | bank | | col | |
| 512 | 1 | 1 | 1 | - | | | | | | row | | | | | | | | cs | bank | col | |
| 512 | 0 | 2 | 1 | - | | | | | | row | | | | | | | | bank | | col | |
| 1024 | 1 | 2 | 1 | - | | | | | | row | | | | | | | | cs | bank | | col |
| 1024 | 0 | 3 | 1 | - | | | | | | row | | | | | | | | bank | | col | |

Table 16-108. L3 Address to SDRAM Address Mapping for 32-Bit SDRAM (EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 0) (continued)

| Reach (Mbyte s) | EMIF_S DRAM_ CONFI G[3] REG_E BANK | EMIF_S DRAM_ CONFI G[6:4] REG_IB ANK | EMIF_S DRAM_ CONFI G[2:0] REG_P AGESIZ E | MAddr | | | | | | | | | | | | | | |
|-----------------------|---|---|--|-------|-----|----|----|-----|----|-------|----|------|------|------|------|------|-----|-----|
| | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25:17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9:2 |
| 2048 | 1 | 3 | 1 | - | row | | | | | | | | cs | bank | | | col | |
| 256 | 0 | 0 | 2 | - | | | | row | | | | | | | | col | | |
| 512 | 1 | 0 | 2 | - | | | | row | | | | | | | cs | col | | |
| 512 | 0 | 1 | 2 | - | | | | row | | | | | | | bank | col | | |
| 1024 | 1 | 1 | 2 | - | | | | row | | | | | | | cs | bank | col | |
| 1024 | 0 | 2 | 2 | - | | | | row | | | | | | | bank | | col | |
| 2048 | 1 | 2 | 2 | - | row | | | | | | | | cs | bank | | col | | |
| 2048 | 0 | 3 | 2 | - | row | | | | | | | | bank | | | col | | |
| 4096 | 1 | 3 | 2 | row | | | | | | | | cs | bank | | | col | | |
| 512 | 0 | 0 | 3 | - | | | | row | | | | | | | | col | | |
| 1024 | 1 | 0 | 3 | - | | | | row | | | | | | | cs | col | | |
| 1024 | 0 | 1 | 3 | - | | | | row | | | | | | | bank | col | | |
| 2048 | 1 | 1 | 3 | - | row | | | | | | | | cs | bank | col | | | |
| 2048 | 0 | 2 | 3 | - | row | | | | | | | | bank | col | | | | |
| 4096 | 1 | 2 | 3 | row | | | | | | | | cs | bank | col | | | | |
| 4096 | 0 | 3 | 3 | row | | | | | | | | bank | col | | | | | |

For [EMIF_SDRAM_CONFIG\[28:27\]](#) REG_IBANK_POS = 0, the effect of the address-mapping scheme is that as the source address increments across SDRAM page boundaries, the EMIF moves onto the same page in the next bank in the current device (lpddr2i_cs1[0]n, where i = 1 or 2). This movement along the banks of the current device continues until the page is accessed in all banks in the current device. The EMIF then proceeds to the same page in the next device (if [EMIF_SDRAM_CONFIG\[3\]](#) REG_EBANK = 1, lpddr2i_cs1[1]n, where i = 1 or 2) and proceeds through the same page in all its banks before moving to the next page in the first device (lpddr2i_cs1[0]n, where i = 1 or 2). The EMIF exploits this movement across internal banks and CSs while remaining on the same page to maximize the number of open SDRAM banks within the overall SDRAM space.

Thus, the EMIF can keep a maximum of 16 banks (eight internal banks across two CSs) open at a time, and can interleave among all of them.

[Table 16-109](#) through [Table 16-111](#) list the L3 address to SDRAM address mapping. In each case, there are x bits for bank, followed by y bits for row, followed by z bits for CS, followed by s bits for bank, and t bits for col in MAddr[31:N] (x, y, z, s, and t are given depending on the value of the [EMIF_SDRAM_CONFIG](#) bit field).

Table 16-109. L3 Address to SDRAM Address Mapping for [EMIF_SDRAM_CONFIG\[28:27\]](#) REG_IBANK_POS = 1 and [EMIF_SDRAM_CONFIG_2\[27\]](#) REG_EBANK_POS = 0

| MAddr[31:N] | | | | |
|---|---|---|---|--|
| Bank Address | Row Address | Chip-Select | Bank Address | Column Address |
| Number of bits defined by EMIF_SDRAM_CONFIG [6] REG_IBANK | Number of bits defined by EMIF_SDRAM_CONFIG [9:7] REG_ROWSIZE | Number of bits defined by EMIF_SDRAM_CONFIG [3] REG_EBANK | Number of bits defined by EMIF_SDRAM_CONFIG [5:3] REG_IBANK | Number of bits defined by EMIF_SDRAM_CONFIG [2:0] REG_PAGESIZE |
| = 0: 0 bit | = 0: 9 bits | = 0: 0 bit | = 0: 0 bit | = 0: 8 bits |
| = 1: 0 bit | = 1: 10 bits | = 1: 1 bit | = 1: 1 bit | = 1: 9 bits |
| | = 2: 11 bits | | = 2: 2 bits | = 2: 10 bits |
| | = 3: 12 bits | | = 3: 2 bits | = 3: 11 bits |
| | = 4: 13 bits | | | |
| | = 5: 14 bits | | | |
| | = 6: 15 bits | | | |
| | = 7: 16 bits | | | |

NOTE: N = 1 for 16-bit SDRAM, and N = 2 for 32-bit SDRAM.

The REG_IBANK bit field is listed twice because it gives the number of bank bits depending on their place in the MAddr.

For EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 1, the EMIF interleaves banks the same as for EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 0, but the interleaving of banks within a device (per CS) is limited to four banks. Thus, the EMIF can keep a maximum of 16 banks (eight internal banks across two CSs) open at a time, but can interleave among only 8 of them.

Table 16-110. L3 Address to SDRAM Address Mapping for EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 2 and EMIF_SDRAM_CONFIG_2[27] REG_EBANK_POS = 0

| MAddr[31:N] | | | | |
|---|---|---|---|--|
| Bank Address | Row Address | Chip-Select | Bank Address | Column Address |
| Number of bits defined by EMIF_SDRAM_CONFIG [6:5] REG_IBANK | Number of bits defined by EMIF_SDRAM_CONFIG [9:7] REG_ROWSIZE | Number of bits defined by EMIF_SDRAM_CONFIG [3] REG_EBANK | Number of bits defined by EMIF_SDRAM_CONFIG [4] REG_IBANK | Number of bits defined by EMIF_SDRAM_CONFIG [2:0] REG_PAGESIZE |
| = 0: 0 bit | = 0: 9 bits | = 0: 0 bit | = 0: 0 bit | = 0: 8 bits |
| = 1: 0 bit | = 1: 10 bits | = 1: 1 bit | = 1: 1 bit | = 1: 9 bits |
| = 2: 1 bit | = 2: 11 bits | | | = 2: 10 bits |
| = 3: 2 bits | = 3: 12 bits | | | = 3: 11 bits |
| | = 4: 13 bits | | | |
| | = 5: 14 bits | | | |
| | = 6: 15 bits | | | |
| | = 7: 16 bits | | | |

NOTE: N = 1 for 16-bit SDRAM, and N = 2 for 32-bit SDRAM.

For [EMIF_SDRAM_CONFIG\[28:27\]](#) REG_IBANK_POS = 2, the EMIF interleaves banks the same as for [EMIF_SDRAM_CONFIG\[28:27\]](#) REG_IBANK_POS = 0, but the interleaving of banks within a device (per CS) is limited to two banks. Thus, the EMIF can keep a maximum of 16 banks (eight internal banks across two CSs) open at a time, but can interleave among only 4 of them.

Table 16-111. L3 Address to SDRAM Address Mapping for [EMIF_SDRAM_CONFIG\[28:27\]](#) REG_IBANK_POS = 3 and [EMIF_SDRAM_CONFIG_2\[27\]](#) REG_EBANK_POS = 0

| MAddr[31:N] | | | |
|--|--|--|---|
| Bank Address | Row Address | Chip-Select | Column Address |
| Number of bits defined by EMIF_SDRAM_CONFIG[6:4] REG_IBANK | Number of bits defined by EMIF_SDRAM_CONFIG[9:7] REG_ROWSIZE | Number of bits defined by EMIF_SDRAM_CONFIG[3] REG_EBANK | Number of bits defined by EMIF_SDRAM_CONFIG[2:0] REG_PAGESIZE |
| = 0: 0 bit | = 0: 9 bits | = 0: 0 bit | = 0: 8 bits |
| = 1: 1 bit | = 1: 10 bits | = 1: 1 bit | = 1: 9 bits |
| = 2: 2 bits | = 2: 11 bits | | = 2: 10 bits |
| = 3: 3 bits | = 3: 12 bits | | = 3: 11 bits |
| | = 4: 13 bits | | |
| | = 5: 14 bits | | |
| | = 6: 15 bits | | |
| | = 7: 16 bits | | |

NOTE: N = 1 for 16-bit SDRAM, and N = 2 for 32-bit SDRAM.

For [EMIF_SDRAM_CONFIG\[28:27\]](#) REG_IBANK_POS = 3, the EMIF cannot interleave banks within a device (per CS). However, it can interleave banks between the two CSs. Thus, the EMIF can keep a maximum of 16 banks (eight internal banks across two CSs) open at a time, but can interleave among only 2 of them.

Because the EMIF interleave among a fewer number of banks when [EMIF_SDRAM_CONFIG\[28:27\]](#) REG_IBANK_POS != 0, these cases are lower in performance than the [EMIF_SDRAM_CONFIG\[28:27\]](#) REG_IBANK_POS = 0 case. Thus, these cases are recommended to be used only with partial array self-refresh where performance can be traded off for power savings.

Table 16-112. L3 Address to SDRAM Address Mapping for EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 1 and EMIF_SDRAM_CONFIG_2[27] REG_EBANK_POS = 1

| MAddr[31:N] | | | | |
|---|---|---|---|--|
| Chip-Select | Bank Address | Row Address | Bank Address | Column Address |
| Number of bits defined by EMIF_SDRAM_CONFIG[3] REG_EBANK | Number of bits defined by EMIF_SDRAM_CONFIG[6:4] REG_IBANK | Number of bits defined by EMIF_SDRAM_CONFIG[9:7] REG_ROWSIZE | Number of bits defined by EMIF_SDRAM_CONFIG[6:4] REG_IBANK | Number of bits defined by EMIF_SDRAM_CONFIG[2:0] REG_PAGESIZE |
| = 0: 0 bit | = 0: 0 bit | = 0: 9 bits | = 0: 0 bit | = 0: 8 bits |
| = 1: 1 bit | = 1: 0 bit | = 1: 10 bits | = 1: 1 bit | = 1: 9 bits |
| | = 2: 0 bit | = 2: 11 bits | = 2: 2 bits | = 2: 10 bits |
| | = 3: 1 bit | = 3: 12 bits | = 3: 2 bits | = 3: 11 bits |
| | | = 4: 13 bits | | |
| | | = 5: 14 bits | | |
| | | = 6: 15 bits | | |
| | | = 7: 16 bits | | |

NOTE: N = 1 for 16-bit SDRAM, and N = 2 for 32-bit SDRAM.

The interleaving of banks within a device (per chip-select) is limited to four banks. The EMIF cannot interleave banks between the two chip-selects. Thus, the EMIF can keep a maximum of 16 banks (8 internal banks across two chip-selects) open at a time, but can interleave among only 4 of them.

Table 16-113. L3 Address to SDRAM Address Mapping for EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS = 2 and EMIF_SDRAM_CONFIG_2[27] REG_EBANK_POS = 1

| MAddr[31:N] | | | | |
|---|---|--|--|--|
| Chip-Select | Bank Address | Row Address | Bank Address | Column Address |
| Number of bits defined by EMIF_SDRAM_CONFIG[3] REG_EBANK | Number of bits defined by EMIF_SDRAM_CONFIG[6:4] REG_IBANK | Number of bits defined by EMIF_SDRAM_CONFIG [9:7] REG_ROWSIZE | Number of bits defined by EMIF_SDRAM_CONFIG [6:4] REG_IBANK | Number of bits defined by EMIF_SDRAM_CON FIG[2:0] REG_PAGESIZE |
| = 0: 0 bit | = 0: 0 bit | = 0: 9 bits | = 0: 0 bit | = 0: 8 bits |
| = 1: 1 bit | = 1: 0 bit | = 1: 10 bits | = 1: 1 bit | = 1: 9 bits |
| | = 2: 1 bit | = 2: 11 bits | = 2: 1 bit | = 2: 10 bits |
| | = 3: 2 bits | = 3: 12 bits | = 3: 1 bit | = 3: 11 bits |
| | | = 4: 13 bits | | |
| | | = 5: 14 bits | | |
| | | = 6: 15 bits | | |
| | | = 7: 16 bits | | |

NOTE: N = 1 for 16-bit SDRAM, and N = 2 for 32-bit SDRAM.

The interleaving of banks within a device (per chip-select) is limited to two banks. The EMIF cannot interleave banks between the two chip-selects. Thus, the EMIF can keep a maximum of 16 banks (8 internal banks across two chip-selects) open at a time, but can interleave among only 2 of them.

**Table 16-114. L3 Address to SDRAM Address Mapping for EMIF_SDRAM_CONFIG[28:27]
REG_IBANK_POS = 3 and EMIF_SDRAM_CONFIG_2[27] REG_EBANK_POS = 1**

| MAddr[31:N] | | | |
|--|--|--|---|
| Chip-Select | Bank Address | Row Address | Column Address |
| Number of bits defined by EMIF_SDRAM_CONFIG[3] REG_EBANK | Number of bits defined by EMIF_SDRAM_CONFIG[6:4] REG_IBANK | Number of bits defined by EMIF_SDRAM_CONFIG[9:7] REG_ROWSIZE | Number of bits defined by EMIF_SDRAM_CONFIG[2:0] REG_PAGESIZE |
| = 0: 0 bit | = 0: 0 bit | = 0: 9 bits | = 0: 8 bits |
| = 1: 1 bit | = 1: 1 bit | = 1: 10 bits | = 1: 9 bits |
| | = 2: 2 bits | = 2: 11 bits | = 2: 10 bits |
| | = 3: 3 bits | = 3: 12 bits | = 3: 11 bits |
| | | = 4: 13 bits | |
| | | = 5: 14 bits | |
| | | = 6: 15 bits | |
| | | = 7: 16 bits | |

NOTE: N = 1 for 16-bit SDRAM, and N = 2 for 32-bit SDRAM.

The EMIF cannot interleave banks within a device (per chip-select) or between the two chip-selects. Thus, the EMIF can keep a maximum of 16 banks (8 internal banks across two chip-selects) open at a time, but cannot interleave among them.

Because the EMIF interleaves among fewer banks when REG_IBANK_POS != 0 or REG_EBANK_POS = 1, these cases are lower in performance than the REG_IBANK_POS = 0 case. Thus, these cases are recommended to be used only along with partial array self-refresh, where performance can be traded for power savings.

16.3.4.12 LPDDR2 SDRAM Initialization

When coming out of reset if the [EMIF_SDRAM_CONFIG](#)[31:29] REG_SDRAM_TYPE bit field is equal to 4 or 5, the EMIF performs an LPDDR2 initialization sequence as follows:

1. Drives lpddr2i_cke[j[1:0] (where i = 1 or 2 and j = 0 or 1) high and starts to issue NOP commands continuously.
2. After 16 SDRAM refresh rate intervals, issues a PRECHARGE-ALL command. The SDRAM refresh rate is defined in the [EMIF_SDRAM_REF_CTRL](#)[15:0] REG_REFRESH_RATE bit field.
3. Issues a RESET command.
4. Software initializes LPDDR2 using the [EMIF_LPDDR2_MODE_REG_CFG](#) and [EMIF_LPDDR2_MODE_REG_DATA](#) registers. Software must enable refreshes by writing 1 in the [EMIF_LPDDR2_MODE_REG_CFG](#)[30] REG_REFRESH_EN bit during the last MRW command.

The EMIF also performs the initialization sequence whenever the [EMIF_SDRAM_CONFIG](#) register is written and the LPDDR2 initialization was not performed previously because the SDRAM_REF_CTRL[31] REG_INITREF_DIS bit was set to 0. Once the EMIF performs initialization, rewriting the SDRAM configuration register does not cause reinitialization.

NOTE: The values of the different bit fields in the [EMIF_SDRAM_CONFIG](#) and [EMIF_SDRAM_CONFIG_2](#) registers are set by the control module at reset. These values must be modified by the configuration header feature in the ROM code or by the initial boot image running from an external XIP booting memory or internal RAM (see [Section 28.4.8, Image Format](#)). They must not be modified during run time, because they reflect the used hardware LPDDR2 SDRAM configurations.

The EMIF does not perform any transactions until the LPDDR2 initialization sequence completes.

When the EMIF comes out of reset, the delay time in Step 2 resulting from the 16 refresh rate intervals + 8 cycles is approximately $16 \times \text{EMIF_SDRAM_REF_CTRL}[15:0] \text{ REG_REFRESH_RATE} / \text{input frequency}$.

16.3.5 EMIF Programming Guide

16.3.5.1 EMIF Low-Level Programming Models

This section describes the low-level hardware programming sequences for the configuration and use of the EMIF module.

The following programming sequences are double, because there are two EMIF modules (EMIF1 and EMIF2) with the same register mapping but different register addresses.

16.3.5.1.1 Global Initialization

Table 16-115. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|--------------------------------|---|
| PRCM | The module interface and functional clocks must be enabled. See Chapter 3, Power, Reset, and Clock Management . |
| Interrupt submodule of the MPU | The interrupt requests from the EMIF must be enabled (unmasked). See Chapter 18, Interrupt Controllers . |
| DMM | The EMIF is a slave to the DMM. The DMM must be enabled and configured for communication with LPDDR2 memories. See Section 16.2, Dynamic Memory Manager . |

16.3.5.1.1.1 EMIF Module Global Initialization

This procedure initializes the EMIF after a power-on reset (POR). The unused bits in all registers must be written with zeros. The values of the shadow registers are loaded in their corresponding registers when the signal SidleAck is asserted.

NOTE: The values of the different bit fields in the [EMIF_SDRAM_CONFIG](#) and [EMIF_SDRAM_CONFIG_2](#) registers are set by the control module at reset. These values must be modified by the configuration header feature in the ROM code or by the initial boot image running from an external XIP booting memory or internal RAM (see [Section 28.4.8, Image Format](#)). They must not be modified during run time, because they reflect the used hardware LPDDR2 SDRAM configurations.

Table 16-116. EMIF Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------------------------------------|
| Disable the automatic power management mode. | EMIF_PWR_MGMT_CTRL [10:8] REG_LP_MODE | 0x0 |
| Write the shadow register of the EMIF_PWR_MGMT_CTRL with the same value. | EMIF_PWR_MGMT_CTRL_SHDW | EMIF_PWR_MGMT_CTRL |
| Configure the DDR PHY physical layer to the SDRAM. (Read Latency for the read data from SDRAM in number of DDR clock cycles) | EMIF_DDR_PHY_CTRL_1 | 0x----- |
| Write the shadow register of the EMIF_DDR_PHY_CTRL_1 with the same value. | EMIF_DDR_PHY_CTRL_1_SHDW | EMIF_DDR_PHY_CTRL_1 |
| Configure the DDR PHY physical layer to the SDRAM parameters. | EMIF_DDR_PHY_CTRL_2 | 0x----- |
| Write the shadow register of the EMIF_SDRAM_REF_CTRL with the same value. | EMIF_SDRAM_REF_CTRL_SHDW | EMIF_SDRAM_REF_CTRL |
| Define the CS to be used and the mode register address. | EMIF_LPDDR2_MODE_REG_CFG | 0x-00000- |
| Configure the system and low-latency L3 threshold maxima and the priority counter of an old command. | EMIF_L3_CONFIG | 0x0-0-00- |
| Configure the performance counter configuration register. | EMIF_PERF_CNT_CFG | 0x-00--00- |

Table 16-116. EMIF Global Initialization (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|---|------------|
| Configure the performance counter master region select register. | EMIF_PERF_CNT_SEL | 0x--0---0- |
| Define timings and clock parameters. | EMIF Timing Initialization | |
| Configure the SDRAM output impedance calibration parameters. | EMIF Output Impedance Calibration Mode | |
| Configure the temperature alert parameters. | EMIF Temperature Monitoring Mode | |
| Enable system L3 interrupt for command or address error and/or for temperature alert. | EMIF_IRQENABLE_SET_SYS [1:0] | 0x3 |
| Enable low-latency L3 interrupt. | EMIF_IRQENABLE_SET_LL [1:0] | 0x3 |
| Specify the dummy-data to be written to the memory for refresh cycles. | EMIF_LPDDR2_MODE_REG_DATA | 0x000000-- |
| Clear all eventual previous indications of treated interrupts; write the four registers: | EMIF_IRQSTATUS_SYS , EMIF_IRQSTATUS_LL , EMIF_IRQSTATUS_RAW_SYS , EMIF_IRQSTATUS_RAW_LL | 0x00000003 |

Table 16-117. Subprocess Call Summary for Main Sequence – EMIF Global Initialization

| Subprocess Name | Cross-Reference |
|--|--|
| EMIF Timing Initialization | Table 16-118 <i>EMIF Timing Initialization</i> |
| EMIF Output Impedance Calibration Mode | Table 16-119 <i>EMIF Output Impedance Calibration Mode</i> |
| EMIF Temperature Monitoring Mode | Table 16-127 <i>EMIF Temperature Monitoring Mode</i> |

16.3.5.1.1.2 Subsequence – EMIF Timing Initialization

Table 16-118. Subsequence – EMIF Timing Initialization

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------------------------------------|
| Configure the time after which the EMIF being in Idle mode will put the SDRAM in power-saving mode. | EMIF_PWR_MGMT_CTRL [3:0] REG_CS_TIM | 0x- |
| Write the shadow register of the EMIF_PWR_MGMT_CTRL with the same value. | EMIF_PWR_MGMT_CTRL_SHDW | EMIF_PWR_MGMT_CTRL |
| Define the rate at which the connected SDRAM devices are refreshed. | EMIF_SDRAM_REF_CTRL [15:0] REG_REFRESH_RATE | 0x---- |
| Write the shadow register of the EMIF_SDRAM_REF_CTRL with the same value. | EMIF_SDRAM_REF_CTRL_SHDW | EMIF_SDRAM_REF_CTRL |
| Define the timings and clock parameters: 1) Minimum number of DDR clock cycles for which LPDDR2 must remain in self-refresh mode 2) Number of DDR clock cycles for a ZQCS command 3) Number of DDR clock that satisfies tDQSCKmax for LPDDR2 4) Minimum number of DDR clock cycles from refresh or load mode to refresh or activate 5) Maximum number of reg_refresh_rate intervals from activate to precharge command | EMIF_SDRAM_TIM_3 | 0x0000---- |
| Write the shadow register of the EMIF_SDRAM_TIM_3 . | EMIF_SDRAM_TIM_3_SHDW | EMIF_SDRAM_TIM_3 |
| Define minimum number of DDR clock cycles from power-down exit to any command other than a read command. | EMIF_SDRAM_TIM_2 [30:28]REG_T_XP | 0x- |
| Write the shadow register of the EMIF_SDRAM_TIM_2 . | EMIF_SDRAM_TIM_2_SHDW | EMIF_SDRAM_TIM_2 |

Table 16-118. Subsequence – EMIF Timing Initialization (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------------------------------------|
| Determine the minimum size of the read idle window for read idle detection and the force read idle time. | EMIF_READ_IDLE_CTRL [19:16] REG_READ_IDLE_LEN | 0x- |
| Determine the maximum interval between read idle detections or force. | EMIF_READ_IDLE_CTRL [8:0] REG_READ_IDLE_INTERVAL | 0x— |
| Write the shadow register of the EMIF_READ_IDLE_CTRL with the same value. | EMIF_READ_IDLE_CTRL_SHDW | EMIF_READ_IDLE_CTRL |
| Configure the temperature alert parameters. | EMIF_TEMP_ALERT_CONFIG | 0x----- |
| Specify the data to be written to the memory. | EMIF_LPDDR2_MODE_REG_DATA | 0x000000— |

16.3.5.1.2 Operational Modes Configuration

16.3.5.1.2.1 EMIF Output Impedance Calibration Mode

Table 16-119. EMIF Output Impedance Calibration Mode

| Step | Register/Bit Field/Programming Model | Value |
|---|--|--------|
| Determine whether CS1 or CS0 will be used for automatic output impedance calibration (Option 1). | EMIF_ZQ_CONFIG [31:30] REG_ZQ_CS1/0EN | 0x- |
| Determine whether CS1 and CS 0 will be used for automatic output impedance calibration simultaneously (Option 2). | EMIF_ZQ_CONFIG [29] REG_ZQ_DUALCALEN | 0x- |
| Define the interval (number of refresh periods) between ZQCS commands. | EMIF_ZQ_CONFIG [15:0] REG_ZQ_REFINTERVAL | 0x---- |
| Define the number of ZQCL intervals that build the ZQINIT interval. | EMIF_ZQ_CONFIG [19:18] REG_ZQ_ZQINIT_MULT | 0x- |
| Define the number of ZQCS intervals that build the ZQCL interval. | EMIF_ZQ_CONFIG [17:16] REG_ZQ_ZQCL_MULT | 0x- |
| Enable the issuing of ZQ-Long command on self-refresh, active power-down, and precharge power-down exit. | EMIF_ZQ_CONFIG [28] REG_ZQ_SFEXITEN | 0x1 |

16.3.5.1.2.2 EMIF Read

Table 16-120. EMIF Read

| Step | Register/Bit Field/Programming Model | Value |
|---|---|---|
| Define the read latency of the memory. | EMIF_DDR_PHY_CTRL_1 [3:0] REG_READ_LATENCY | 0x- |
| Choose CS0 or CS1 to issue the mode register command. | EMIF_LPDDR2_MODE_REG_CFG [31] REG_CS | 0x- |
| Write the memory address. | EMIF_LPDDR2_MODE_REG_CFG [7:0] REG_ADDRESS | 0x---- |
| Initiate read command by reading the register. | EMIF_LPDDR2_MODE_REG_DATA [7:0] | Configure the SDRAM output impedance calibration parameters 0x-00----- |

16.3.5.1.2.3 EMIF Write

Table 16-121. EMIF Write

| Step | Register/Bit Field/Programming Model | Value |
|--|---|--------|
| Choose CS0 or CS1 to issue mode register command. | EMIF_LPDDR2_MODE_REG_CFG[31] REG_CS | 0x- |
| Write the memory address. | EMIF_LPDDR2_MODE_REG_CFG[7:0] REG_ADDRESS | 0x---- |
| Define the minimum number of DDR clock cycles from last write transfer to precharge. | EMIF_SDRAM_TIM_1[20:17] REG_T_WR | 0x- |
| Supply the data byte to be written and initiate write command by writing the register. | EMIF_LPDDR2_MODE_REG_DATA[7:0] REG_VALUE_0 | 0x- |

16.3.5.1.2.4 EMIF SDRAM Refresh

Table 16-122. EMIF SDRAM Refresh

| Step | Register/Bit Field/Programming Model | Value |
|---|---|---------------------|
| Define the minimum number of DDR clock cycles from refresh or load mode to refresh or activate. | EMIF_SDRAM_TIM_3[12:4] REG_T_RFC | 0x---- |
| Write the shadow register of EMIF_SDRAM_TIM_3. | EMIF_SDRAM_TIM_3_SHDW | EMIF_SDRAM_TIM_3 |
| Define the rate at which the connected SDRAM devices are refreshed. | EMIF_SDRAM_REF_CTRL[15:0] REG_REFRESH_RATE | 0x---- |
| Disable the SDRAM-DDR1/2/3 refresh. | EMIF_SDRAM_REF_CTRL[31] REG_INITREF_DIS | 0x1 |
| Write the shadow register of EMIF_SDRAM_REF_CTRL. | EMIF_SDRAM_REF_CTRL_SHDW | EMIF_SDRAM_REF_CTRL |
| Choose CS0 or CS1 to issue mode register command. | EMIF_LPDDR2_MODE_REG_CFG[31] | 0x- |
| Enable refresh for SDRAM-LPDDR2 memory. | EMIF_LPDDR2_MODE_REG_CFG[30] | 0x1 |
| Dummy write to start the LPDDR2 refresh cycles. | EMIF_LPDDR2_MODE_REG_DATA | 0x00000000 |

16.3.5.1.2.5 EMIF SDRAM Self-Refresh

Table 16-123. EMIF SDRAM Self-Refresh

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|------------------|
| Define minimum number of DDR clock cycles from self-refresh exit to any command other than a read command. | EMIF_SDRAM_TIM_2[24:16] REG_T_XSNR | 0x— |
| Write the shadow register of EMIF_SDRAM_TIM_2. | EMIF_SDRAM_TIM_2_SHDW | EMIF_SDRAM_TIM_2 |
| Enable self-refresh mode. | EMIF_PWR_MGMT_CTRL[10:8] REG_LP_MODE | 0x2 |

16.3.5.1.2.6 EMIF LPDDR2 SDRAM Power-Down Mode

Table 16-124. EMIF SDRAM Power-Down Mode

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|------------------|
| Define minimum number of DDR clock cycles from power-down exit to any command other than a read command. | EMIF_SDRAM_TIM_2[30:28] REG_T_XP | 0x- |
| Write the shadow register of EMIF_SDRAM_TIM_2. | EMIF_SDRAM_TIM_2_SHDW | EMIF_SDRAM_TIM_2 |
| Define the number of DDR clock cycles after which the external memory will be put in power-saving mode when the EMIF enters idle mode. | EMIF_PWR_MGMT_CTRL[3:0] REG_CS_TIM | 0x- |

Table 16-124. EMIF SDRAM Power-Down Mode (continued)

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------------|---|-------|
| Enable (enter) power-down mode. | EMIF_PWR_MGMT_CTRL [10:8] REG_LP_MODE | 0x4 |

16.3.5.1.2.7 EMIF LPDDR2-SDRAM Deep Power-Down Mode

Table 16-125. EMIF LPDDR2-SDRAM Deep Power-Down Mode

| Step | Register/Bit Field/Programming Model | Value |
|--|---|----------------------------------|
| Define minimum number of DDR clock cycles from power-down exit to any command other than a read command. | EMIF_SDRAM_TIM_2 [30:28] REG_T_XP | 0x- |
| Write the shadow register of EMIF_SDRAM_TIM_2 . | EMIF_SDRAM_TIM_2_SHDW | EMIF_SDRAM_TIM_2 |
| Define the number of DDR clock cycles after which the external memory will be put in power-saving mode when the EMIF enters idle mode. | EMIF_PWR_MGMT_CTRL [3:0] REG_CS_TIM | 0x- |
| Enable (enter) deep power-down mode. | EMIF_PWR_MGMT_CTRL [11] REG_DPD_EN | 0x1 |

16.3.5.1.2.8 EMIF Global Warm Reset (Software Reset)

Table 16-126. EMIF Global Warm Reset (Software Reset)

| Step | Register/Bit Field/Programming Model | Value |
|--|---|--|
| IF: External request for reset | Input signal EMIFi_GLOBAL_RST | Asserted (see the programming model in the PRCM chapter) |
| Follow the sequence in Section 16.3.5.1.2.5 EMIF SDRAM Self-Refresh Sequence . | EMIF_PWR_MGMT_CTRL [10:8] REG_LP_MODE | 0x2 |
| ELSE: | Input signal EMIFi_GLOBAL_RST | Deasserted (see the programming model in the PRCM chapter) |
| Disable (exit) self-refresh mode when not needed. | EMIF_PWR_MGMT_CTRL [10:8] REG_LP_MODE | 0x0 |
| ENDIF | | |

16.3.5.1.2.9 EMIF Temperature Monitoring Mode

Table 16-127. EMIF Temperature Monitoring Mode

| Step | Register/Bit Field/Programming Model | Value |
|---|---|---------|
| Determine whether CS1 or CS0 will be used for temperature alert polling. | EMIF_TEMP_ALERT_CONFIG [31:30] REG_TA_CS1/0EN | 0x- |
| Define the interval (number of refresh periods) between temperature alert polls. | EMIF_TEMP_ALERT_CONFIG [21:0] REG_TA_REFINTERVAL | 0x----- |
| Define how wide the physical memory device will be. | EMIF_TEMP_ALERT_CONFIG [27:26] REG_TA_DEVWDT | 0x- |
| Define which external byte lanes will contain a device for temperature monitoring (which devices to be polled). | EMIF_TEMP_ALERT_CONFIG [25:24] REG_TA_DEVCNT | 0x- |
| Enable system L3 interrupt for SDRAM temperature alert. | EMIF_IRQENABLE_SET_SYS [1] REG_EN_TA_SYS | 0x1 |
| Enable low-latency L3 interrupt for SDRAM temperature alert. | EMIF_IRQENABLE_SET_LL [1] REG_EN_TA_LL | 0x1 |

Table 16-127. EMIF Temperature Monitoring Mode (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Enable the issuing of a temperature alert poll on self-refresh exit (poll for temperature change every time EMIF exits self-refresh, active power-down, and precharge power-down modes). | EMIF_TEMP_ALERT_CONFIG [28] REG_TA_SFEXITEN | 0x1 |

16.3.5.1.3 EMIF Events Servicing

16.3.5.1.3.1 Interrupt Servicing

This section describes event servicing (interrupt treatment) of the EMIF module.

The following Interrupt mechanism is double, because there are two EMIF modules with different register addresses and two Interrupt lines, EMIF1_IRQ and EMIF2_IRQ.

Table 16-128. EMIF Event Servicing

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-----------|
| Clear all eventual previous indications of treated interrupts, and write the four registers: | EMIF_IRQSTATUS_SYS , EMIF_IRQSTATUS_LL , EMIF_IRQSTATUS_RAW_SYS , EMIF_IRQSTATUS_RAW_LL | 0x0000003 |
| Enable the system L3 interrupts. | EMIF_IRQENABLE_SET_SYS | 0x0000003 |
| Enable the low-latency L3 interrupts. | EMIF_IRQENABLE_SET_LL | 0x0000003 |
| Wait until an event occurs. | | |
| Read the status registers: | EMIF_IRQSTATUS_SYS , EMIF_IRQSTATUS_LL , EMIF_IRQSTATUS_RAW_SYS , EMIF_IRQSTATUS_RAW_LL | |
| IF: the EMIF_IRQSTATUS_SYS [0] = 1 | | |
| Read the error log register and determine the addressing mode, command type, and connection ID of the first errored transaction: | EMIF_L3_ERR_LOG | |
| Start the interrupt handler for system L3 Command/address error. | – INTC of the MPU | |
| ELSE IF: the EMIF_IRQSTATUS_SYS [1] = 1 | | |
| Read the error log register and determine the addressing mode, command type, and connection ID of the first errored transaction: | EMIF_L3_ERR_LOG | |
| Start the interrupt handler for system L3 Temperature alert. | – INTC of the MPU | |
| Update the REFRESH_RATE to the required value as per the temperature change. | EMIF_SDRAM_REF_CTRL [15:0] REG_REFRESH_RATE | 0x---- |
| ELSE IF: the EMIF_IRQSTATUS_RAW_SYS [0] = 1 | | |
| Read the error log register and determine the addressing mode, command type, and connection ID of the first errored transaction: | EMIF_L3_ERR_LOG | |
| Start the interrupt handler for raw system L3 – Command/address error. | – INTC of the MPU | |
| ELSE IF: the EMIF_IRQSTATUS_RAW_SYS [1] = 1 | | |
| Read the error log register and determine the addressing mode, command type, and connection ID of the first errored transaction: | EMIF_L3_ERR_LOG | |
| Start the interrupt handler for raw system L3 – Temperature alert | – INTC of the MPU | |
| Update the REFRESH_RATE to the required value as per the temperature change. | EMIF_SDRAM_REF_CTRL [15:0] REG_REFRESH_RATE | 0x---- |
| ELSE IF: the EMIF_IRQSTATUS_LL [0] = 1 | | |

Table 16-128. EMIF Event Servicing (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|---|--------|
| Read the error log register and determine the addressing mode, command type, and connection ID of the first errored transaction: | EMIF_L3_ERR_LOG | |
| Start the interrupt handler for low-latency L3 – Command/address error. | INTC of the MPU | |
| ELSE IF: the EMIF_IRQSTATUS_LL[1] = 1 | | |
| Read the error log register and determine the addressing mode, command type, and connection ID of the first errored transaction: | EMIF_L3_ERR_LOG | |
| Start the interrupt handler for low-latency L3 – Temperature alert. | INTC of the MPU | |
| Update the REFRESH_RATE to the required value as per the temperature change. | EMIF_SDRAM_REF_CTRL[15:0] REG_REFRESH_RATE | 0x---- |
| ELSE IF: The EMIF_IRQSTATUS_RAW_LL[0] = 1 | | |
| Read the error log register and determine the addressing mode, command type, and connection ID of the first errored transaction: | EMIF_L3_ERR_LOG | |
| Start the interrupt handler for raw low-latency L3 – Command/address error | INTC of the MPU | |
| ELSE: The EMIF_IRQSTATUS_RAW_LL[1] = 1 | | |
| Read the error log register and determine the addressing mode, command type, and connection ID of the first errored transaction: | EMIF_L3_ERR_LOG | |
| Start the interrupt handler for raw low-latency L3 – Temperature alert. | INTC of the MPU | |
| Update the REFRESH_RATE to the required value as per the temperature change. | EMIF_SDRAM_REF_CTRL[15:0] REG_REFRESH_RATE | 0x---- |
| ENDIF | | |
| Wait until the termination of the corresponding interrupt handler. | IINTC of the MPU | |
| IF: Address/command error was treated | | |
| Clear the LSB in the relevant IRQ status registers, SYS or LL; write both registers: | EMIF_IRQSTATUS_SYS[0] REG_ERR_SYS and EMIF_IRQSTATUS_RAW_SYS[0] REG_ERR_SYS, or EMIF_IRQSTATUS_LL[0] REG_ERR_LL and EMIF_IRQSTATUS_RAW_LL[0] REG_ERR_LL | 0x1 |
| Disable the corresponding interrupt if needed; write: | EMIF_IRQENABLE_CLR_SYS[0] REG_EN_ERR_SYS or EMIF_IRQENABLE_CLR_LL[0] REG_EN_ERR_LL | 0x1 |
| ELSE: (Temperature alert proceeded) | | |
| Clear the corresponding bit in the relevant IRQ status registers, SYS or LL; write both registers: | EMIF_IRQSTATUS_SYS[1] REG_TA_SYS and EMIF_IRQSTATUS_RAW_SYS[1] REG_TA_SYS, or EMIF_IRQSTATUS_LL[1] REG_TA_LL and EMIF_IRQSTATUS_RAW_LL[1] REG_TA_LL | 0x1 |
| Disable the corresponding interrupt if needed; write: | EMIF_IRQENABLE_CLR_SYS[1] REG_EN_TA_SYS or EMIF_IRQENABLE_CLR_LL[1] REG_EN_TA_LL | 0x1 |
| ENDIF | | |

16.3.6 EMIF Register Manual

Table 16-129 lists the EMIF instance.

16.3.6.1 EMIF Instance Summary

Table 16-129. EMIF Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|------|
| EMIF1 | 0x4C00 0000 | 16MB |
| EMIF2 | 0x4D00 0000 | 16MB |

16.3.6.2 EMIF Registers

Table 16-130 summarizes the EMIF register mapping.

16.3.6.2.1 EMIF Register Summary

Table 16-130. EMIF Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | EMIF1 L3 Physical Address | EMIF2 L3 Physical Address |
|------------------------------|------|-----------------------|----------------|---------------------------|---------------------------|
| EMIF_MOD_ID_REV | R | 32 | 0x0000 0000 | 0x4C00 0000 | 0x4D00 0000 |
| EMIF_STATUS | R | 32 | 0x0000 0004 | 0x4C00 0004 | 0x4D00 0004 |
| EMIF_SDRAM_CONFIG | RW | 32 | 0x0000 0008 | 0x4C00 0008 | 0x4D00 0008 |
| EMIF_SDRAM_CONFIG_2 | RW | 32 | 0x0000 000C | 0x4C00 000C | 0x4D00 000C |
| EMIF_SDRAM_REFRESH_CTRL | RW | 32 | 0x0000 0010 | 0x4C00 0010 | 0x4D00 0010 |
| EMIF_SDRAM_REFRESH_CTRL_SHDW | RW | 32 | 0x0000 0014 | 0x4C00 0014 | 0x4D00 0014 |
| EMIF_SDRAM_TIM_1 | RW | 32 | 0x0000 0018 | 0x4C00 0018 | 0x4D00 0018 |
| EMIF_SDRAM_TIM_1_SHDW | RW | 32 | 0x0000 001C | 0x4C00 001C | 0x4D00 001C |
| EMIF_SDRAM_TIM_2 | RW | 32 | 0x0000 0020 | 0x4C00 0020 | 0x4D00 0020 |
| EMIF_SDRAM_TIM_2_SHDW | RW | 32 | 0x0000 0024 | 0x4C00 0024 | 0x4D00 0024 |
| EMIF_SDRAM_TIM_3 | RW | 32 | 0x0000 0028 | 0x4C00 0028 | 0x4D00 0028 |
| EMIF_SDRAM_TIM_3_SHDW | RW | 32 | 0x0000 002C | 0x4C00 002C | 0x4D00 002C |
| EMIF_LPDDR2_NVM_TIM | RW | 32 | 0x0000 0030 | 0x4C00 0030 | 0x4D00 0030 |
| EMIF_LPDDR2_NVM_TIM_SHDW | RW | 32 | 0x0000 0034 | 0x4C00 0034 | 0x4D00 0034 |
| EMIF_PWR_MGMT_CTRL | RW | 32 | 0x0000 0038 | 0x4C00 0038 | 0x4D00 0038 |
| EMIF_PWR_MGMT_CTRL_SHDW | RW | 32 | 0x0000 003C | 0x4C00 003C | 0x4D00 003C |
| EMIF_LPDDR2_MODE_REG_DATA | RW | 32 | 0x0000 0040 | 0x4C00 0040 | 0x4D00 0040 |
| EMIF_LPDDR2_MODE_REG_CFG | RW | 32 | 0x0000 0050 | 0x4C00 0050 | 0x4D00 0050 |
| EMIF_L3_CONFIG | RW | 32 | 0x0000 0054 | 0x4C00 0054 | 0x4D00 0054 |
| EMIF_L3_CFG_VAL_1 | R | 32 | 0x0000 0058 | 0x4C00 0058 | 0x4D00 0058 |
| EMIF_L3_CFG_VAL_2 | R | 32 | 0x0000 005C | 0x4C00 005C | 0x4D00 005C |
| EMIF_PERF_CNT_1 | R | 32 | 0x0000 0080 | 0x4C00 0080 | 0x4D00 0080 |

Table 16-130. EMIF Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | EMIF1 L3 Physical Address | EMIF2 L3 Physical Address |
|--------------------------|------|-----------------------|----------------|---------------------------|---------------------------|
| EMIF_PERF_CNT_2 | R | 32 | 0x0000 0084 | 0x4C00 0084 | 0x4D00 0084 |
| EMIF_PERF_CNT_CFG | RW | 32 | 0x0000 0088 | 0x4C00 0088 | 0x4D00 0088 |
| EMIF_PERF_CNT_SEL | RW | 32 | 0x0000 008C | 0x4C00 008C | 0x4D00 008C |
| EMIF_PERF_CNT_TIM | R | 32 | 0x0000 0090 | 0x4C00 0090 | 0x4D00 0090 |
| EMIF_READ_IDLE_CTRL | RW | 32 | 0x0000 0090 | 0x4C00 0098 | 0x4D00 0098 |
| EMIF_READ_IDLE_CTRL_SHDW | RW | 32 | 0x0000 0090 | 0x4C00 009C | 0x4D00 009C |
| EMIF_IRQSTATUS_RAW_SYS | RW | 32 | 0x0000 00A4 | 0x4C00 00A4 | 0x4D00 00A4 |
| EMIF_IRQSTATUS_RAW_LL | RW | 32 | 0x0000 00A8 | 0x4C00 00A8 | 0x4D00 00A8 |
| EMIF_IRQSTATUS_SYS | RW | 32 | 0x0000 00AC | 0x4C00 00AC | 0x4D00 00AC |
| EMIF_IRQSTATUS_LL | RW | 32 | 0x0000 00B0 | 0x4C00 00B0 | 0x4D00 00B0 |
| EMIF_IRQENABLE_SET_SYS | RW | 32 | 0x0000 00B4 | 0x4C00 00B4 | 0x4D00 00B4 |
| EMIF_IRQENABLE_SET_LL | RW | 32 | 0x0000 00B8 | 0x4C00 00B8 | 0x4D00 00B8 |
| EMIF_IRQENABLE_CLR_SYS | RW | 32 | 0x0000 00BC | 0x4C00 00BC | 0x4D00 00BC |
| EMIF_IRQENABLE_CLR_LL | RW | 32 | 0x0000 00C0 | 0x4C00 00C0 | 0x4D00 00C0 |
| EMIF_ZQ_CONFIG | RW | 32 | 0x0000 00C8 | 0x4C00 00C8 | 0x4D00 00C8 |
| EMIF_TEMP_ALERT_CONFIG | RW | 32 | 0x0000 00CC | 0x4C00 00CC | 0x4D00 00CC |
| EMIF_L3_ERR_LOG | R | 32 | 0x0000 00D0 | 0x4C00 00D0 | 0x4D00 00D0 |
| EMIF_DDR_PHY_CTRL_1 | RW | 32 | 0x0000 00E4 | 0x4C00 00E4 | 0x4D00 00E4 |
| EMIF_DDR_PHY_CTRL_1_SHDW | RW | 32 | 0x0000 00E8 | 0x4C00 00E8 | 0x4D00 00E8 |
| EMIF_DDR_PHY_CTRL_2 | RW | 32 | 0x0000 00EC | 0x4C00 00EC | 0x4D00 00EC |

NOTE: The values of the different bit fields in the [EMIF_SDRAM_CONFIG](#) and [EMIF_SDRAM_CONFIG2](#) registers are set by the control module at reset. These values must be modified by the configuration header feature in the ROM code or by the initial boot image running from an external XIP booting memory or internal RAM (see [Section 28.4.8, Image Format](#)). They must not be modified during run time, because they reflect the used hardware LPDDR2 SDRAM configurations.

16.3.6.2.2 EMIF Register Description

[Table 16-131](#) through [Table 16-213](#) describe the individual EMIF registers.

Table 16-131. EMIF_MOD_ID_REV

| | | | |
|-------------------------|----------------------------|-----------------|----------------|
| Address Offset | 0x0000 0000 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0000 0x4D00 0000 | | |
| Description | Revision number register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------------|------|------------|
| 31:0 | RESERVED | Reserved for future use | R | 0x---- (1) |

(1) TI internal data

Table 16-132. Register Call Summary for Register EMIF_MOD_ID_REV

EMIF Controller

- [Arbitration: \[0\] \[1\]](#)
- [EMIF Register Summary: \[2\]](#)

Table 16-133. EMIF_STATUS

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------|--|
| Address Offset | | 0x0000 0004 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | EMIF1 | |
| Physical Address | | 0x4C00 0004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EMIF2 | |
| | | 0x4D00 0004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | SDRAM Status Register (STATUS) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|-------------------|----|----|---------------|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|-------------------|--|--|----------|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | |
| REG_BE | | | REG_DUAL_CLK_MODE | | | REG_FAST_INIT | | | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | REG_PHY_DLL_READY | | | RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|------------|
| 31 | REG_BE | Big endian mode select for 8 and 16-bit devices, set to 1 for big endian or 0 for little endian operation. | R | 0 |
| 30 | REG_DUAL_CLK_MODE | Dual Clock mode. Defines whether the L3_clk and EMIF_FCLK clock are asynchronous. L3_clk and EMIF_FCLK clock are asynchronous, if set to 1. | R | 1 |
| 29 | REG_FAST_INIT | Fast Init. Defines whether the EMIF fast initialization mode has been enabled. Fast initialization is enabled if set to 1. | R | 0 |
| 28:3 | RESERVED | Reserved | R | 0x00000000 |
| 2 | REG_PHY_DLL_READY | DDR PHY Ready. Reflects the value on the phy_ready port (active high) that defines whether the DDR PHY is ready for normal operation. The DDR PHY is ready for normal operation, if set to 1. | R | 1 |
| 1:0 | RESERVED | Reserved | R | 0x0 |

Table 16-134. Register Call Summary for Register EMIF_STATUS

EMIF Controller

- [EMIF Register Summary: \[0\]](#)

Table 16-135. EMIF_SDRAM_CONFIG

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 0008 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0008 0x4D00 0008 | | |
| Description | SDRAM Config Register. A write to this register will cause the EMIF to start the SDRAM initialization sequence if it was not performed previously because EMIF_SDRAM_REF_CTRL [31] REG_INITREF_DIS was a zero. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | |
|----------------|----|----|----|---------------|----|----|----|----------|----|----|----|---------------------|----|----|----|----------|----|----|----|-----------------|----|---|---|--------|---|---|---|-------------|---|---|---|-----------|--|--|--|-----------|--|--|--|--------------|--|--|--|
| REG_SDRAM_TYPE | | | | REG_IBANK_POS | | | | RESERVED | | | | REG_DDR2_DDQS | | | | RESERVED | | | | REG_NARROW_MODE | | | | REG_CL | | | | REG_ROWSIZE | | | | REG_IBANK | | | | REG_EBANK | | | | REG_PAGESIZE | | | |
| | | | | | | | | | | | | REG_DDR_DISABLE_DLL | | | | | | | | REG_ROWSIZE | | | | | | | | REG_EBANK | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|--------------------|
| 31:29 | REG_SDRAM_TYPE | SDRAM Type selection. Set to 4 for LPDDR2-S4, Set to 5 for LPDDR2-S2 All other value are reserved. | RW | 0x- ⁽¹⁾ |
| 28:27 | REG_IBANK_POS | Internal bank position. Set to 0 to assign internal bank address bits from L3 address as shown in Table 16-107 and Table 16-108 . Set to 1, 2, or 3 to assign internal bank address bits from L3 address as shown in Table 16-109 , Table 16-110 , and Table 16-111 . | RW | 0x- ⁽¹⁾ |
| 26:24 | RESERVED | RESERVED | RW | 0x0 |
| 23 | REG_DDR2_DDQS | DDR2 differential DQS enable. Set to 0 for single-ended DQS. Set to 1 for differential DQS. This bit is only for DDR2 mode, because the device supports LPDDR2; this bit is don't care. | RW | 0x- ⁽¹⁾ |
| 22:21 | RESERVED | RESERVED | RW | 0x- ⁽¹⁾ |
| 20 | REG_DDR_DISABLE_DLL | Disable DLL select. Set to 1 to disable DLL inside SDRAM. | RW | 0x- ⁽¹⁾ |
| 19:16 | RESERVED | RESERVED | RW | 0x0 |
| 15:14 | REG_NARROW_MODE | SDRAM data bus width. Set to 0 for 32-bit and set to 1 for 16-bit. All other values are reserved. | RW | 0x- ⁽¹⁾ |
| 13:10 | REG_CL | CAS Latency (referred to as read latency (RL) in some SDRAM specs). The value of this field defines the CAS latency to be used when accessing connected SDRAM devices. Value of 3, 4, 5, 6, 7, and 8 (CAS latency of 3, 4, 5, 6, 7, and 8) are supported for LPDDR2-SDRAM. All other values are reserved. Also program the EMIF_DDR_PHY_CTRL_1 [3:0] REG_READ_LATENCY | RW | 0x- ⁽¹⁾ |

⁽¹⁾ Value loaded by the control module at reset (see [Section 19.6.4, SYSCTRL_GENERAL_WKUP Register Summary](#)).

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|--------------------|
| 9:7 | REG_ROWSIZE | Row Size. Defines the number of row address bits of connected SDRAM devices. Set to 0 for 9 row bits, Set to 1 for 10 row bits, Set to 2 for 11 row bits, Set to 3 for 12 row bits, Set to 4 for 13 row bits, Set to 5 for 14 row bits, Set to 6 for 15 row bits, Set to 7 for 16 row bits. This field is only used when EMIF_SDRAM_CONFIG[28:27] REG_IBANK_POS field is set to 1, 2, or 3 or REG_EBANK_POS field in EMIF_SDRAM_CONFIG_2 register is set to 1. | RW | 0x- ⁽²⁾ |
| 6:4 | REG_IBANK | Internal Bank setup. Defines number of banks inside connected SDRAM devices. Set to 0 for 1 bank, Set to 1 for 2 banks, Set to 2 for 4 banks, Set to 3 for 8 banks. All other values are reserved. | RW | 0x- ⁽²⁾ |
| 3 | REG_EBANK | External chip select setup. Defines whether SDRAM accesses will use 1 or 2 chip select lines. Set to 0 to use pad_cs_o_n[0] only. Set to 1 to use pad_cs_o_n[1:0]. This bit will automatically be set to 0 if EMIF_SDRAM_CONFIG_2[30] REG_CS1NVMEN field is set to 1. | RW | 0x- ⁽²⁾ |
| 2:0 | REG_PAGESIZE | Page Size. Defines the internal page size of connected SDRAM devices. Set to 0 for 256-word page (8 column bits), Set to 1 for 512-word page (9 column bits), Set to 2 for 1024-word page (10 column bits), Set to 3 for 2048-word page (11 column bits). All other values are reserved. | RW | 0x- ⁽²⁾ |

⁽²⁾ Value loaded by the control module at reset (see [Section 19.6.4, SYSCTRL_GENERAL_WKUP Register Summary](#)).

Table 16-136. Register Call Summary for Register EMIF_SDRAM_CONFIG

EMIF Controller

- [Arbitration: \[0\]](#)
- [EMIF Access Cycles: \[1\]](#)
- [SDRAM Address Mapping: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\] \[44\] \[45\] \[46\] \[47\] \[48\] \[49\] \[50\] \[51\] \[52\] \[53\] \[54\] \[55\] \[56\]](#)
- [LPDDR2 SDRAM Initialization: \[57\] \[58\] \[59\]](#)
- [Global Initialization: \[60\]](#)
- [EMIF Register Summary: \[61\] \[62\] \[63\]](#)
- [EMIF Register Description: \[64\]](#)

Table 16-137. EMIF_SDRAM_CONFIG_2

| | |
|------------------|--|
| Address Offset | 0x0000 000C |
| Physical Address | 0x4C00 000C 0x4D00 000C |
| Description | |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|--------------|----------|---------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----------|-------------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | REG_CS1NVMEN | RESERVED | REG_EBANK_POS | RESERVED | | | | | | | | | | | | | | | | REG_RDBNUM | RESERVED | REG_RDBSIZE | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|--------------------|
| 31 | RESERVED | | R | 0 |
| 30 | REG_CS1NVMEN | CS1 LPDDR2-NVM enable. Set to 1 if LPDDR2-NVM is connected to CS1. This bit will automatically be set to 0 if reg_sdram_type field in the SDRAM Config register is not set to LPDDR2. | RW | 0x- ⁽¹⁾ |
| 29:28 | RESERVED | | R | 0x0 |
| 27 | REG_EBANK_POS | External bank position. Set to 0 to assign external bank address bits from lower OCP address as shown in tables. Set to 1 to assign external bank address bits from higher OCP address bits as shown in tables. | RW | 0 |
| 26:6 | RESERVED | | R | 0x000000 |
| 5:4 | REG_RDBNUM | Row Buffer setup. Defines number of row buffers inside connected LPDDR2-NVM devices. Set to 0 for 1 row buffer, set to 1 for 2 row buffers, set to 2 for 4 row buffers, and set to 3 for 8 row buffers. All other values are reserved. | RW | 0x- ⁽¹⁾ |
| 3 | RESERVED | | R | 0 |
| 2:0 | REG_RDBSIZE | Row Data Buffer Size. Defines the row data buffer size of connected LPDDR2-NVM devices. Set to 0 for 32 bytes, set to 1 for 64 bytes, set to 2 for 128 bytes, set to 3 for 256 bytes, set to 4 for 512 bytes, set to 5 for 1024 bytes, set to 6 for 2048 bytes, and set to 7 for 4096 bytes. | RW | 0x- ⁽¹⁾ |

⁽¹⁾ Value fixed by the control module at reset

Table 16-138. Register Call Summary for Register EMIF_SDRAM_CONFIG_2

EMIF Controller

- [LPDDR2 SDRAM Initialization: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [EMIF Register Summary: \[2\]](#)
- [EMIF Register Description: \[3\] \[4\]](#)

Table 16-139. EMIF_SDRAM_REF_CTRL

| | | | |
|-------------------------|--------------------------------|-----------------|----------------|
| Address Offset | 0x0000 0010 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0010 0x4D00 0010 | | |
| Description | SDRAM Refresh Control Register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| REG_INITREF_DIS | RESERVED | | | | | | | | | | | | | | | REG_REFRESH_RATE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|--------|
| 31 | REG_INITREF_DIS | Initialization and Refresh disable. When set to 1, EMIF will disable SDRAM initialization and refreshes, but will carry out SDRAM write/read transactions. | RW | 0 |
| 30:16 | RESERVED | Reserved | R | 0 |
| 15:0 | REG_REFRESH_RATE | Refresh Rate. Value in this field is used to define the rate at which connected SDRAM devices will be refreshed. SDRAM refresh rate = $\text{DDR_PHY_CLK} / \text{REG_REFRESH_RATE}$. To avoid lock-up situations, the programmer must not program $\text{REG_REFRESH_RATE} < (6 \times \text{REG_T_RFC})$. For DDR_PHY_CLK description, see Section 16.3.3, EMIF Integration . | RW | 0x0000 |

Table 16-140. Register Call Summary for Register EMIF_SDRAM_REF_CTRL

EMIF Controller

- [Arbitration: \[0\]](#)
- [SDRAM Temperature Monitoring: \[1\]](#)
- [SDRAM Refresh Scheduling: \[2\] \[3\] \[4\]](#)
- [LPDDR2 SDRAM Initialization: \[5\] \[6\]](#)
- [Global Initialization: \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [Operational Modes Configuration: \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [EMIF Events Servicing: \[17\] \[18\] \[19\] \[20\]](#)
- [EMIF Register Summary: \[21\]](#)
- [EMIF Register Description: \[22\] \[23\] \[24\]](#)

Table 16-141. EMIF_SDRAM_REF_CTRL_SHDW

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0014 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0014 0x4D00 0014 | | |
| Description | SDRAM Refresh Control Shadow Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | REG_REFRESH_RATE_SHDW | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | REG_REFRESH_RATE_SHDW | Shadow field for REG_REFRESH_RATE. This field is loaded into EMIF_SDRAM_REF_CTRL[15:0] REG_REFRESH_RATE field when SIdleAck is asserted. This register is not auto corrected when the value is invalid. | RW | 0x0000 |

Table 16-142. Register Call Summary for Register EMIF_SDRAM_REF_CTRL_SHDW

EMIF Controller

- [Global Initialization: \[0\] \[1\]](#)
- [EMIF Register Summary: \[2\]](#)

Table 16-143. EMIF_SDRAM_TIM_1

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0018 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0018 0x4D00 0018 | | |
| Description | SDRAM Timing 1 Register. If this register is byte written, care must be taken that all the fields are written before performing any accesses to the SDRAM. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | REG_T_RP | | | | | | | | REG_T_RCD | | | | | | | | REG_T_WR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:29 | RESERVED | Reserved | R | 0x0 |
| 28:25 | REG_T_RP | Minimum number of DDR clock cycles from Precharge to Activate or Refresh, minus one. | RW | 0x0 |
| 24:21 | REG_T_RCD | Minimum number of DDR clock cycles from Activate to Read or Write, minus one. | RW | 0x0 |
| 20:17 | REG_T_WR | Minimum number of DDR clock cycles from last Write transfer to Precharge, minus one. | RW | 0x0 |
| 16:12 | REG_T_RAS | Minimum number of DDR clock cycles from Activate to Precharge, minus one. reg_t_ras value needs to be bigger than or equal to reg_t_rcd value. | RW | 0x0 |
| 11:6 | REG_T_RC | Minimum number of DDR clock cycles from Activate to Activate, minus one. | RW | 000010 |
| 5:3 | REG_T_RRD | Minimum number of DDR clock cycles from Activate to Activate for a different bank, minus one. For an 8-bank, this field must be equal to ((tFAW/(4*tCK))-1). | RW | 100 |
| 2:0 | REG_T_WTR | Minimum number of DDR clock cycles from last Write to Read, minus one. | RW | 11 |

Table 16-144. Register Call Summary for Register EMIF_SDRAM_TIM_1

EMIF Controller

- [Operational Modes Configuration: \[0\]](#)
- [EMIF Register Summary: \[1\]](#)
- [EMIF Register Description: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)

Table 16-145. EMIF_SDRAM_TIM_1_SHDW

| | | | |
|-------------------------|--------------------------------|-----------------|----------------|
| Address Offset | 0x0000 001C | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 001C 0x4D00 001C | | |
| Description | SDRAM Timing 1 Shadow Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|---------------|----|----|----|----------------|----|----|----|---------------|----|----|----|----------------|----|----|----|---------------|----|---|---|----------------|---|---|---|----------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | REG_T_RP_SHDW | | | | REG_T_RCD_SHDW | | | | REG_T_WR_SHDW | | | | REG_T_RAS_SHDW | | | | REG_T_RC_SHDW | | | | REG_T_RRD_SHDW | | | | REG_T_WTR_SHDW | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|--------|
| 31:29 | RESERVED | Reserved | R | 0x0 |
| 28:25 | REG_T_RP_SHDW | Shadow field for REG_T_RP. This field is loaded into EMIF_SDRAM_TIM_1 [28:25] REG_T_RP field when SldleAck is asserted. | RW | 0x0 |
| 24:21 | REG_T_RCD_SHDW | Shadow field for REG_T_RCD. This field is loaded into EMIF_SDRAM_TIM_1 [24:21] REG_T_RCD field when SldleAck is asserted. | RW | 0x0 |
| 20:17 | REG_T_WR_SHDW | Shadow field for REG_T_WR. This field is loaded into EMIF_SDRAM_TIM_1 [20:17] REG_T_WR field when SldleAck is asserted. | RW | 0x0 |
| 16:12 | REG_T_RAS_SHDW | Shadow field for REG_T_RAS. This field is loaded into EMIF_SDRAM_TIM_1 [16:12] REG_T_RAS field when SldleAck is asserted. | RW | 0x00 |
| 11:6 | REG_T_RC_SHDW | Shadow field for REG_T_RC. This field is loaded into EMIF_SDRAM_TIM_1 [11:6] REG_T_RC field when SldleAck is asserted. | RW | 000010 |
| 5:3 | REG_T_RRD_SHDW | Shadow field for REG_T_RRD. This field is loaded into EMIF_SDRAM_TIM_1 [5:3] REG_T_RRD field when SldleAck is asserted. | RW | 0x4 |
| 2:0 | REG_T_WTR_SHDW | Shadow field for REG_T_WTR. This field is loaded into EMIF_SDRAM_TIM_1 [2:0] REG_T_WTR field when SldleAck is asserted. | RW | 0x3 |

Table 16-146. Register Call Summary for Register EMIF_SDRAM_TIM_1_SHDW

EMIF Controller

- [EMIF Register Summary: \[0\]](#)

Table 16-147. EMIF_SDRAM_TIM_2

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0020 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0020 0x4D00 0020 | | |
| Description | SDRAM Timing 2 Register. If this register is byte written, care must be taken that all the fields are written before performing any accesses to the SDRAM. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----------|----|----|----|----------|------------|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|-----------|---|---|---|-----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | REG_T_XP | | | | RESERVED | REG_T_XSNR | | | | | | | | | | REG_T_XSRD | | | | | | | | REG_T_RTP | | | | REG_T_CKE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|------------|
| 31 | RESERVED | Reserved | R | 0 |
| 30:28 | REG_T_XP | Minimum number of DDR clock cycles from power-down exit to any command other than a read command, minus one. | RW | 0x2 |
| 27:25 | RESERVED | reserved | R | 0x0 |
| 24:16 | REG_T_XSNR | Minimum number of DDR clock cycles from Self-Refresh exit to any command other than a Read command, minus one. REG_T_XSNR and REG_T_XSRD must be programmed with the same value. | RW | 0x0A |
| 15:6 | REG_T_XSRD | Minimum number of DDR clock cycles from Self-Refresh exit to a Read command, minus one. REG_T_XSNR and REG_T_XSRD must be programmed with the same value. | RW | 0000001010 |
| 5:3 | REG_T_RTP | Minimum number of DDR clock cycles for the last read command to a Precharge command, minus one. | RW | 001 |
| 2:0 | REG_T_CKE | Minimum number of DDR clock cycles between pad_cke_o changes, minus one. | RW | 010 |

Table 16-148. Register Call Summary for Register EMIF_SDRAM_TIM_2

EMIF Controller

- [LPDDR2-SDRAM Power-Down Mode: \[0\]](#)
- [LPDDR2-SDRAM Self-Refresh Mode: \[1\] \[2\]](#)
- [Global Initialization: \[3\] \[4\] \[5\]](#)
- [Operational Modes Configuration: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [EMIF Register Summary: \[14\]](#)
- [EMIF Register Description: \[15\] \[16\] \[17\] \[18\] \[19\]](#)

Table 16-149. EMIF_SDRAM_TIM_2_SHDW

| | | | |
|------------------|--------------------------------|----------|-------|
| Address Offset | 0x0000 0024 | Instance | EMIF1 |
| Physical Address | 0x4C00 0024 0x4D00 0024 | | EMIF2 |
| Description | SDRAM Timing 2 Shadow Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|---------------|----|----|----|----------|----|-----------------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|----------------|---|----------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | REG_T_XP_SHDW | | | | RESERVED | | REG_T_XSNR_SHDW | | | | | | | | REG_T_XSRD_SHDW | | | | | | | | REG_T_RTP_SHDW | | REG_T_CKE_SHDW | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|------------|
| 31 | RESERVED | Reserved | R | 0 |
| 30:28 | REG_T_XP_SHDW | Shadow field for REG_T_XP. This field is loaded into EMIF_SDRAM_TIM_2 [30:28] REG_T_XP field when SldleAck is asserted. | RW | 0x2 |
| 27:25 | RESERVED | Reserved | RW | 0x0 |
| 24:16 | REG_T_XSNR_SHDW | Shadow field for REG_T_XSNR. This field is loaded into EMIF_SDRAM_TIM_2 [24:16] REG_T_XSNR field when SldleAck is asserted. | RW | 0x0A |
| 15:6 | REG_T_XSRD_SHDW | Shadow field for REG_T_XSRD. This field is loaded into EMIF_SDRAM_TIM_2 [15:6] REG_T_XSRD field when SldleAck is asserted. | RW | 0000001010 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------|
| 5:3 | REG_T_RTP_SHDW | Shadow field for REG_T_RTP. This field is loaded into EMIF_SDRAM_TIM_2 [5:3] REG_T_RTP field when SldleAck is asserted. | RW | 0x1 |
| 2:0 | REG_T_CKE_SHDW | Shadow field for REG_T_CKE. This field is loaded into EMIF_SDRAM_TIM_2 [2:0] REG_T_CKE field when SldleAck is asserted. | RW | 0x2 |

Table 16-150. Register Call Summary for Register EMIF_SDRAM_TIM_2_SHDW

EMIF Controller

- [Global Initialization: \[0\]](#)
- [Operational Modes Configuration: \[1\] \[2\] \[3\]](#)
- [EMIF Register Summary: \[4\]](#)

Table 16-151. EMIF_SDRAM_TIM_3

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0028 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0028 0x4D00 0028 | | |
| Description | SDRAM Timing 3 Register. If this register is byte written, care must be taken that all the fields are written before performing any accesses to the SDRAM. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|-------------|-------------|----|----|----|----|----|-----------------|-----------|----|----|----|----|----|---|---|---|---|---|---|---------------|---|---|---|
| RESERVED | | | | | | | | REG_T_CKESR | REG_ZQ_ZQCS | | | | | | REG_T_TDQSCKMAX | REG_T_RFC | | | | | | | | | | | | REG_T_RAS_MAX | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|-------|
| 31:24 | RESERVED | Reserved | R | 0x0 |
| 23:21 | REG_T_CKESR | Minimum number of DDR clock cycles for which LPDDR2 must remain in Self Refresh, minus one. | RW | 0x2 |
| 20:15 | REG_ZQ_ZQCS | Number of DDR clock cycles for a ZQCS command, minus one. | RW | 0x08 |
| 14:13 | REG_T_TDQSCKMAX | Number of DDR clock that satisfies tDQSCKmax for LPDDR2, minus one. | RW | 01 |
| 12:4 | REG_T_RFC | Minimum number of DDR clock cycles from Refresh or Load Mode to Refresh or Activate, minus one. | RW | 0x115 |
| 3:0 | REG_T_RAS_MAX | Maximum number of reg_refresh_rate intervals from Activate to Precharge command. This field must be equal to ((tRASmax / tREFI)-1) rounded down to the next lower integer. Value for REG_T_RAS_MAX can be calculated as follows: If tRASmax = 120 us and tREFI = 15.7 us, then REG_T_RAS_MAX = ((120/15.7)-1) = 6.64. Round down to the next lower integer. Therefore, the programmed value must be 6. | RW | 0x1 |

Table 16-152. Register Call Summary for Register EMIF_SDRAM_TIM_3

EMIF Controller

- [SDRAM Output Impedance Calibration](#): [0] [1]
- [SDRAM Refresh Scheduling](#): [2]
- [Global Initialization](#): [3] [4] [5]
- [Operational Modes Configuration](#): [6] [7] [8]
- [EMIF Register Summary](#): [9]
- [EMIF Register Description](#): [10] [11] [12] [13] [14] [15] [16]

Table 16-153. EMIF_SDRAM_TIM_3_SHDW

| | | | |
|-------------------------|--------------------------------|-----------------|----------------|
| Address Offset | 0x0000 002C | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 002C 0x4D00 002C | | |
| Description | SDRAM Timing 3 Shadow Register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|------------------|------------------|----|----|----|----|----|----|---------------------|----------------|----|----|----|----|---|---|---|--------------------|---|---|---|---|---|---|
| RESERVED | | | | | | | | REG_T_CKESR_SHDW | REG_ZQ_ZQCS_SHDW | | | | | | | REG_T_TDQCKMAX_SHDW | REG_T_RFC_SHDW | | | | | | | | REG_T_RAS_MAX_SHDW | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|-------|
| 31:24 | RESERVED | Reserved | R | 0x0 |
| 23:21 | REG_T_CKESR_SHDW | Shadow field for reg_t_ckesr. This field is loaded into reg_t_ckesr field in EMIF_SDRAM_TIM_3 register when SldleAck is asserted. | RW | 0x2 |
| 20:15 | REG_ZQ_ZQCS_SHDW | Shadow field for reg_zq_zqcs. This field is loaded into reg_zq_zqcs field in EMIF_SDRAM_TIM_3 register when SldleAck is asserted. | RW | 0x08 |
| 14:13 | REG_T_TDQCKMAX_SHDW | Shadow field for REG_T_TDQCKMAX. This field is loaded into EMIF_SDRAM_TIM_3 [14:13] REG_T_TDQCKMAX field when SldleAck is asserted. | RW | 0x1 |
| 12:4 | REG_T_RFC_SHDW | Shadow field for REG_T_RFC. This field is loaded into EMIF_SDRAM_TIM_3 [12:4] REG_T_RFC when SldleAck is asserted. | RW | 0x115 |
| 3:0 | REG_T_RAS_MAX_SHDW | Shadow field for REG_T_RAS_MAX. This field is loaded into EMIF_SDRAM_TIM_3 [3:0] REG_T_RAS_MAX field when SldleAck is asserted. | RW | 0x1 |

Table 16-154. Register Call Summary for Register EMIF_SDRAM_TIM_3_SHDW

EMIF Controller

- [Global Initialization](#): [0]
- [Operational Modes Configuration](#): [1]
- [EMIF Register Summary](#): [2]

Table 16-155. EMIF_LPDDR2_NVM_TIM

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0030 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0030 0x4D00 0030 | | |
| Description | LPDDR2-NVM Timing Register. If this register is byte written, care must be taken that all the fields are written before performing any accesses to the LPDDR2-NVM. NOT USED. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
|----------|----|----|----|--------------|----|----|----|----------|----|----|----|---------------|----|----|----|--------------|----|----|----|---------------|----|---|---|---------------|---|---|---|---|---|---|---|------------------|--|--|--|--|--|--|--|
| RESERVED | | | | REG_NVM_T_XP | | | | RESERVED | | | | REG_NVM_T_WTR | | | | REG_NVM_T_RP | | | | REG_NVM_T_WRA | | | | REG_NVM_T_RRD | | | | | | | | REG_NVM_T_RCDMIN | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 31 | RESERVED | Reserved | R | 0 |
| 30:28 | REG_NVM_T_XP | Minimum number of DDR clock cycles from power-down exit to any command minus one. | RW | 0x1 |
| 27 | RESERVED | Reserved | R | 0 |
| 26:24 | REG_NVM_T_WTR | Minimum number of DDR clock cycles from last Write to Read, minus one. | RW | 0x1 |
| 23:20 | REG_NVM_T_RP | Minimum number of DDR clock cycles from Preactive to Activate, minus one. | RW | 0x2 |
| 19:16 | REG_NVM_T_WRA | Minimum number of DDR clock cycles from last Write transfer to Activate, minus one. | RW | 0x2 |
| 15:8 | REG_NVM_T_RRD | Minimum number of DDR clock cycles from Activate to Activate for a different bank, minus one. | RW | 0x0C |
| 7:0 | REG_NVM_T_RCDMIN | Minimum number of DDR clock cycles from Activate to Read or Write, minus one. | RW | 0x0C |

Table 16-156. Register Call Summary for Register EMIF_LPDDR2_NVM_TIM

EMIF Controller

- [EMIF Register Summary: \[0\]](#)
- [EMIF Register Description: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

Table 16-157. EMIF_LPDDR2_NVM_TIM_SHDW

| | | | |
|-------------------------|-----------------------------------|-----------------|----------------|
| Address Offset | 0x0000 0034 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0034 0x4D00 0034 | | |
| Description | LPDDR2-NVM Timing Shadow Register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
|----------|----|----|----|-------------------|----|----|----|----------|----|----|----|--------------------|----|----|----|-------------------|----|----|----|--------------------|----|---|---|--------------------|---|---|---|---|---|---|---|-----------------------|--|--|--|--|--|--|--|
| RESERVED | | | | REG_NVM_T_XP_SHDW | | | | RESERVED | | | | REG_NVM_T_WTR_SHDW | | | | REG_NVM_T_RP_SHDW | | | | REG_NVM_T_WRA_SHDW | | | | REG_NVM_T_RRD_SHDW | | | | | | | | REG_NVM_T_RCDMIN_SHDW | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|------|-------|
| 31 | RESERVED | Reserved | R | 0 |
| 30:28 | REG_NVM_T_XP_SHDW | Shadow field for REG_NVM_T_XP. This field is loaded into EMIF_LPDDR2_NVM_TIM [30:28] REG_NVM_T_XP field when SldleAck is asserted. | RW | 0x0 |
| 27 | RESERVED | Reserved | R | 0 |
| 26:24 | REG_NVM_T_WTR_SHDW | Shadow field for REG_NVM_T_WTR. This field is loaded into EMIF_LPDDR2_NVM_TIM [26:24] REG_NVM_T_WTR field when SldleAck is asserted. | RW | 0x0 |
| 23:20 | REG_NVM_T_RP_SHDW | Shadow field for REG_NVM_T_RP. This field is loaded into EMIF_LPDDR2_NVM_TIM [23:20] REG_NVM_T_RP field when SldleAck is asserted. | RW | 0x0 |
| 19:16 | REG_NVM_T_WRA_SHDW | Shadow field for REG_NVM_T_WRA. This field is loaded into EMIF_LPDDR2_NVM_TIM [19:16] REG_NVM_T_WRA field when SldleAck is asserted. | RW | 0x0 |
| 15:8 | REG_NVM_T_RRD_SHDW | Shadow field for REG_NVM_T_RRD. This field is loaded into EMIF_LPDDR2_NVM_TIM [15:8] REG_NVM_T_RRD field when SldleAck is asserted. | RW | 0x00 |
| 7:0 | REG_NVM_T_RCDMIN_SHDW | Shadow field for . This field is loaded into EMIF_LPDDR2_NVM_TIM [7:0] REG_NVM_T_RCDMIN field when SldleAck is asserted. | RW | 0x00 |

Table 16-158. Register Call Summary for Register EMIF_LPDDR2_NVM_TIM_SHDW

EMIF Controller

- [EMIF Register Summary: \[0\]](#)

Table 16-159. EMIF_PWR_MGMT_CTRL

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0038 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0038 0x4D00 0038 | | |
| Description | Power Management Control Register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|------------|----|-------------|---|------------|---|---|---|------------|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | REG_PD_TIM | | | | REG_DPD_EN | | REG_LP_MODE | | REG_SR_TIM | | | | REG_CS_TIM | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:12 | REG_PD_TIM | Power Mangement timer for Power-Down. The EMIF will put the external SDRAM in Power-Down mode after the EMIF is idle for these number of DDR clock cycles and if reg_lp_mode field is set to 4. Set to 0 to immediately enter Power-Down mode. Set to 1 for 16 clocks, set to 2 for 32 clocks, set to 3 for 64 clocks, set to 4 for 128 clocks, set to 5 for 256 clocks, set to 6 for 512 clocks, set to 7 for 1024 clocks, set to 8 for 2048 clocks, set to 9 for 4096 clocks, set to 10 for 8192 clocks, set to 11 for 16384 clocks, set to 12 for 32768 clocks, set to 13 for 65536 clocks, set to 14 for 131072 clocks, and set to 15 for 262144 clocks. | RW | 0x0 |
| 11 | REG_DPD_EN | Deep Power Down enable. Set to 0 for normal operation. Set to 1 to enter deep power-down mode. This mode will override the reg_lp_mode field setting. | RW | 0 |
| 10:8 | REG_LP_MODE | Automatic Power Management enable Set to 1: Reserved Set to 2: Self-refresh mode Set to 4: Power-down mode All other values will disable automatic power management. | RW | 0x0 |
| 7:4 | REG_SR_TIM | Power Mangement timer for Self Refresh. The EMIF will put the external SDRAM in Self Refresh mode after the EMIF is idle for these number of DDR clock cycles and if reg_lp_mode field is set to 2. Set to 0 to immediately enter Self Refresh mode. Set to 1 for 16 clocks, set to 2 for 32 clocks, set to 3 for 64 clocks, set to 4 for 128 clocks, set to 5 for 256 clocks, set to 6 for 512 clocks, set to 7 for 1024 clocks, set to 8 for 2048 clocks, set to 9 for 4096 clocks, set to 10 for 8192 clocks, set to 11 for 16384 clocks, set to 12 for 32768 clocks, set to 13 for 65536 clocks, set to 14 for 131072 clocks, and set to 15 for 262144 clocks. | RW | 0x0 |
| 3:0 | REG_CS_TIM | Power Mangement timer for Clock Stop. The EMIF will put the external SDRAM in Clock Stop mode after the EMIF is idle for these number of DDR clock cycles and if reg_lp_mode field is set to 1. Set to 0 to immediately enter Clock Stop mode. Set to 1 for 16 clocks, set to 2 for 32 clocks, set to 3 for 64 clocks, set to 4 for 128 clocks, set to 5 for 256 clocks, set to 6 for 512 clocks, set to 7 for 1024 clocks, set to 8 for 2048 clocks, set to 9 for 4096 clocks, set to 10 for 8192 clocks, set to 11 for 16384 clocks, set to 12 for 32768 clocks, set to 13 for 65536 clocks, set to 14 for 131072 clocks, and set to 15 for 262144 clocks. | RW | 0x0 |

Table 16-160. Register Call Summary for Register EMIF_PWR_MGMT_CTRL

EMIF Controller

- [LPDDR2-SDRAM Power-Down Mode: \[0\] \[1\] \[2\]](#)
- [LPDDR2-SDRAM Deep Power-Down Mode: \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [LPDDR2-SDRAM Self-Refresh Mode: \[8\] \[9\] \[10\]](#)
- [Global Initialization: \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [Operational Modes Configuration: \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [EMIF Register Summary: \[24\]](#)

Table 16-161. EMIF_PWR_MGMT_CTRL_SHDW

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 003C | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 003C 0x4D00 003C | | |
| Description | Power Management Control Shadow Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----------|----|----|----|----|----|----|----|-----------------|----|-----------------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | REG_PD_TIM_SHDW | | RESERVED | | | | | | | | REG_SR_TIM_SHDW | | REG_CS_TIM_SHDW | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|-------|
| 31:16 | RESERVED | Reserved | RO | 0x0 |
| 15:12 | REG_PD_TIM_SHDW | Shadow field for reg_pd_tim. This field is loaded into reg_pd_tim field in Power Management Control register when SldleAck is asserted. | RW | 0x0 |
| 11:8 | RESERVED | Reserved | RO | 0x0 |
| 7:4 | REG_SR_TIM_SHDW | Shadow field for reg_sr_tim. This field is loaded into reg_sr_tim field in Power Management Control register when SldleAck is asserted. | RW | 0x0 |
| 3:0 | REG_CS_TIM_SHDW | Shadow field for reg_cs_tim. This field is loaded into reg_cs_tim field in Power Management Control register when SldleAck is asserted. | RW | 0x0 |

Table 16-162. Register Call Summary for Register EMIF_PWR_MGMT_CTRL_SHDW

EMIF Controller

- [Global Initialization: \[0\] \[1\]](#)
- [EMIF Register Summary: \[2\]](#)

Table 16-163. EMIF_LPDDR2_MODE_REG_DATA

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 0040 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0040 0x4D00 0040 | | |
| Description | LPDDR2 Mode Reg Data Register A write to this register will cause a Mode Register write command to be sent to the LPDDR2 device with write data as specified in the REG_VALUE_0 field. The address and chip select are taken from the LPDDR2_MODE_REG_CFG register. A read to this register will cause a Mode Register read command to be sent to the LPDDR2 device. The address and chip select are taken from the LPDDR2_MODE_REG_CFG register. The read data will appear in REG_VALUE_0 field. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | REG_VALUE_0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--------------------------|------|------------|
| 31:8 | RESERVED | Reserved for future use. | R | 0x00000000 |
| 7:0 | REG_VALUE_0 | Mode register value. | RW | 0x00 |

Table 16-164. Register Call Summary for Register EMIF_LPDDR2_MODE_REG_DATA

EMIF Controller

- [LPDDR2 SDRAM Initialization: \[0\]](#)
- [Global Initialization: \[1\] \[2\]](#)
- [Operational Modes Configuration: \[3\] \[4\] \[5\]](#)
- [EMIF Register Summary: \[6\]](#)

Table 16-165. EMIF_LPDDR2_MODE_REG_CFG

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0050 | | |
| Physical Address | 0x4C00 0050 0x4D00 0050 | Instance | EMIF1 EMIF2 |
| Description | LPDDR2 Mode Reg Config Register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------|----------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| REG_CS | REG_REFRESH_EN | RESERVED | | | | | | | | | | | | | | REG_ADDRESS | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|----------|
| 31 | REG_CS | Chip select to issue mode register command. Set to 0 for CS0 and set to 1 for CS1. | RW | 0 |
| 30 | REG_REFRESH_EN | Refresh Enable after MRW write. If a Mode Data register write occurs with this bit set to 1, the refresh operations will commence. | RW | 0x0 |
| 29:8 | RESERVED | Reserved | R | 0x000000 |
| 7:0 | REG_ADDRESS | Mode register address. | RW | 0x00 |

Table 16-166. Register Call Summary for Register EMIF_LPDDR2_MODE_REG_CFG

EMIF Controller

- [LPDDR2 SDRAM Initialization: \[0\] \[1\]](#)
- [Global Initialization: \[2\]](#)
- [Operational Modes Configuration: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [EMIF Register Summary: \[9\]](#)

Table 16-167. EMIF_L3_CONFIG

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0054 | | |
| Physical Address | 0x4C00 0054 0x4D00 0054 | Instance | EMIF1 EMIF2 |
| Description | Config Register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | RESERVED | | | | | | | | RESERVED | | | | | | | | REG_PR_OLD_COUNT | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|-------|
| 31:28 | RESERVED | Reserved for future use. | R | 0x0 |
| 27:24 | REG_SYS_THRESH_MAX | System L3 Threshold Maximum. The number of commands the system interface can consume in the command FIFO. The value is used to determine when to stop future request, writing a zero will reserve no space for the associated interface. In the event the value is set to zero and a request is seen for that interface, the command FIFO will assume a value of 1. Since the low-latency interface has effectively a higher priority, the only way for the system interface to use all command FIFO entries is to set the REG_LL_THRESH_MAX to zero. | RW | 0x7 |
| 23:20 | REG_MPU_THRESH_MAX | MPU Interface Threshold Maximum. The number of commands the MPU interface can consume in the command FIFO. The value is used to determine when to stop future request, writing a zero will reserve no space for the associated interface. In the event the value is set to zero and a request is seen for that interface, the command FIFO will assume a value of 1. | RW | 0x7 |
| 19:16 | REG_LL_THRESH_MAX | Low-latency L3 Threshold Maximum. The number of commands the low latency interface can consume in the command FIFO. The value is used to determine when to stop future request, writing a zero will reserve no space for the associated interface. In the event the value is set to zero and a request is seen for that interface, the command FIFO will assume a value of 1. | RW | 0x7 |
| 15:8 | RESERVED | Reserved for future use. | R | 0x0 |
| 7:0 | RESERVED | Although this field is reserved, it is still read writable. Values written have no effect on operation of the EMIF4D3. | RW | 0xFF |

Table 16-168. Register Call Summary for Register EMIF_L3_CONFIG

EMIF Controller

- [FIFO Description: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [Global Initialization: \[8\]](#)
- [EMIF Register Summary: \[9\]](#)

Table 16-169. EMIF_L3_CFG_VAL_1

| | | | |
|-------------------------|----------------------------|-----------------|----------------|
| Address Offset | 0x0000 0058 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0058 0x4D00 0058 | | |
| Description | Config Value 1 Register | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------------|----|------------------|----|----------|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|--------------------|---|---|---|---|---|---|---|
| REG_SYS_BUS_WIDTH | | REG_LL_BUS_WIDTH | | RESERVED | | | | | | | | | | | | REG_WR_FIFO_DEPTH | | | | | | | | REG_CMD_FIFO_DEPTH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|-------|
| 31:30 | REG_SYS_BUS_WIDTH | System L3 data bus width 0 = 32-bit wide, 1 = 64-bit wide, 2 = 128-bit wide, 3 = Reserved | R | 0x2 |
| 29:28 | REG_LL_BUS_WIDTH | Low-latency L3 data bus width 0 = 32-bit wide, 1 = 64-bit wide, 2 = 128-bit wide, 3 = Reserved | R | 0x1 |
| 27:16 | RESERVED | Reserved for future use. | R | 0x000 |
| 15:8 | REG_WR_FIFO_DEPTH | Write Data FIFO depth | R | 0x19 |
| 7:0 | REG_CMD_FIFO_DEPTH | Command FIFO depth | R | 0x0A |

Table 16-170. Register Call Summary for Register EMIF_L3_CFG_VAL_1

EMIF Controller

- [EMIF Register Summary: \[0\]](#)

Table 16-171. EMIF_L3_CFG_VAL_2

| | | | |
|-------------------------|----------------------------|-----------------|----------------|
| Address Offset | 0x0000 005C | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 005C 0x4D00 005C | | |
| Description | Config Value 2 Register | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---------------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | REG_RREG_FIFO_DEPTH | | | | | | | | REG_RSD_FIFO_DEPTH | | | | | | | | REG_RCMD_FIFO_DEPTH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|-------------------------------|------|-------|
| 31:24 | RESERVED | Reserved | R | 0x00 |
| 23:16 | REG_RREG_FIFO_DEPTH | Register Read Data FIFO depth | R | 0x04 |
| 15:8 | REG_RSD_FIFO_DEPTH | SDRAM Read Data FIFO depth | R | 0x27 |
| 7:0 | REG_RCMD_FIFO_DEPTH | Read Command FIFO depth | R | 0x27 |

Table 16-172. Register Call Summary for Register EMIF_L3_CFG_VAL_2

EMIF Controller

- [EMIF Register Summary: \[0\]](#)

Table 16-173. EMIF_PERF_CNT_1

| | | | |
|-------------------------|--------------------------------|-----------------|----------------|
| Address Offset | 0x0000 0080 | | |
| Physical Address | 0x4C00 0080 0x4D00 0080 | Instance | EMIF1 EMIF2 |
| Description | Performance Counter 1 Register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REG_COUNTER1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------------|
| 31:0 | REG_COUNTER1 | 32-bit counter that can be configured as specified in the Performance Counter Config Register and Performance Counter Master Region Select Register. | R | 0x0000 0000 |

Table 16-174. Register Call Summary for Register EMIF_PERF_CNT_1

EMIF Controller

- [Performance Counters Description: \[0\]](#)
- [EMIF Register Summary: \[1\]](#)

Table 16-175. EMIF_PERF_CNT_2

| | | | |
|-------------------------|--------------------------------|-----------------|----------------|
| Address Offset | 0x0000 0084 | | |
| Physical Address | 0x4C00 0084 0x4D00 0084 | Instance | EMIF1 EMIF2 |
| Description | Performance Counter 2 Register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REG_COUNTER2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------------|
| 31:0 | REG_COUNTER2 | 32-bit counter that can be configured as specified in the Performance Counter Config Register and Performance Counter Master Region Select Register. | R | 0x0000 0000 |

Table 16-176. Register Call Summary for Register EMIF_PERF_CNT_2

EMIF Controller

- [Performance Counters Description: \[0\]](#)
- [EMIF Register Summary: \[1\]](#)

Table 16-177. EMIF_PERF_CNT_CFG

| | | | |
|-------------------------|-------------------------------------|-----------------|----------------|
| Address Offset | 0x0000 0088 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0088 0x4D00 0088 | | |
| Description | Performance Counter Config Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|---------------------|----------|----|----|----|----|----|----|----|---------------|----|----|----|----------------------|---------------------|----------|----|----|----|----|----|---|---|---------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REG_CNTR2_MCONNID_EN | REG_CNTR2_REGION_EN | RESERVED | | | | | | | | REG_CNTR2_CFG | | | | REG_CNTR1_MCONNID_EN | REG_CNTR1_REGION_EN | RESERVED | | | | | | | | REG_CNTR1_CFG | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|-------|
| 31 | REG_CNTR2_MCONNID_EN | MConnID filter enable for Performance Counter 2 register. | RW | 0 |
| 30 | REG_CNTR2_REGION_EN | Chip Select filter enable for Performance Counter 2 register. | RW | 0 |
| 29:20 | RESERVED | Reserved for future use | R | 0x000 |
| 19:16 | REG_CNTR2_CFG | Filter configuration for Performance Counter 2. Refer to Table 16-99 for details. | RW | 0x1 |
| 15 | REG_CNTR1_MCONNID_EN | MConnID filter enable for Performance Counter 1 register. | RW | 0 |
| 14 | REG_CNTR1_REGION_EN | Chip Select filter enable for Performance Counter 1 register. | RW | 0 |
| 13:4 | RESERVED | Reserved for future use | R | 0x000 |
| 3:0 | REG_CNTR1_CFG | Filter configuration for Performance Counter 1. Refer to Table 16-99 for details. | RW | 0x0 |

Table 16-178. Register Call Summary for Register EMIF_PERF_CNT_CFG

EMIF Controller

- [Performance Counters Description: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [Performance Counters General Examples: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [Global Initialization: \[13\]](#)
- [EMIF Register Summary: \[14\]](#)

Table 16-179. EMIF_PERF_CNT_SEL

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 008C | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 008C 0x4D00 008C | | |
| Description | Performance Counter Master Region Select Register | | |
| Type | RW | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|-------|
| 31:24 | REG_MCONNID2 | MConnID for Performance Counter 2 register. The values programmed are those in Table 29-20, ConnID Mapping (Debug View) , in Chapter 29, On-Chip Debug Support , left-shifted by 2 bits. | RW | 0x00 |
| 23:18 | RESERVED | Reserved for future use. | R | 0x00 |
| 17:16 | REG_REGION_SEL2 | MAddrSpace for Performance Counter 2 register. | RW | 0x0 |
| 15:8 | REG_MCONNID1 | MConnID for Performance Counter 1 register. The values programmed are those in Table 29-20, ConnID Mapping (Debug View) , in Chapter 29, On-Chip Debug Support , left-shifted by 2 bits. | RW | 0x00 |
| 7:2 | RESERVED | Reserved for future use. | R | 0x00 |
| 1:0 | REG_REGION_SEL1 | MAddrSpace for Performance Counter 1 register. | RW | 0x0 |

EMIF Controller

- Performance Counters Description: [0]
- Performance Counters General Examples: [1] [2] [3]
- Global Initialization: [4]
- EMIF Register Summary: [5]

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------------|
| 31:0 | REG_TOTAL_TIME | 32-bit counter that continuously counts number for EMIF_FCLK clock cycles elapsed after EMIF is brought out of reset. | R | 0x0000 0000 |

EMIF Controller

- EMIF Register Summary: [0]

Table 16-183. EMIF_READ_IDLE_CTRL

| | | | |
|-------------------------|----------------------------|-----------------|----------------|
| Address Offset | 0x0000 0098 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 0098 0x4D00 0098 | | |
| Description | Read Idle Control Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|----|----|----|----------|----|----|----|----|----|----|----|------------------------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | REG_READ_IDLE_LEN | | | | RESERVED | | | | | | | | REG_READ_IDLE_INTERVAL | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|-------|
| 31:20 | RESERVED | Reserved for future use. | R | 0x0 |
| 19:16 | REG_READ_IDLE_LEN | The Read Idle Length field determines the minimum required size that a read idle window must be to be detected or generated. The actual read idle length will be (REG_READ_IDLE_LEN+1)*2 EMIF_FCLK clocks. The value programmed should be (the required read idle length minus one) divided by two. | RW | 0x5 |
| 15:9 | RESERVED | Reserved for future use. | R | 0x0 |
| 8:0 | REG_READ_IDLE_INTERVAL | The Read Idle Interval field determines the maximum interval between successive read idle events. The actual interval between read idle events is (REG_READ_IDLE_INTERVAL+1)*64 EMIF_FCLK clocks. The value programmed should be (the required max interval divided by sixty four) minus one. A value of 0 disables the read idle function. | RW | 0x0 |

Table 16-184. Register Call Summary for Register EMIF_READ_IDLE_CTRL

EMIF Controller

- [Read Idle Window: \[0\] \[1\] \[2\]](#)
- [Global Initialization: \[3\] \[4\] \[5\] \[6\]](#)
- [EMIF Register Summary: \[7\]](#)
- [EMIF Register Description: \[8\] \[9\]](#)

Table 16-185. EMIF_READ_IDLE_CTRL_SHDW

| | | | |
|-------------------------|-----------------------------------|-----------------|----------------|
| Address Offset | 0x0000 009C | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 009C 0x4D00 009C | | |
| Description | Read Idle Control Shadow Register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|------------------------|----|----|----|----------|----|----|----|----|----|----|----|-----------------------------|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | REG_READ_IDLE_LEN_SHDW | | | | RESERVED | | | | | | | | REG_READ_IDLE_INTERVAL_SHDW | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|--|------|-------|
| 31:20 | RESERVED | Reserved for future use. | R | 0x0 |
| 19:16 | REG_READ_IDLE_LEN_SHDW | Shadow field for REG_READ_IDLE_LEN. This field is loaded into EMIF_READ_IDLE_CTRL [19:16] REG_READ_IDLE_LEN field when SldleAck is asserted. | RW | 0x5 |
| 15:9 | RESERVED | Reserved for future use. | R | 0x0 |
| 8:0 | REG_READ_IDLE_INTERVAL_SHDW | Shadow field for REG_READ_IDLE_INTERVAL. This field is loaded into EMIF_READ_IDLE_CTRL [8:0] REG_READ_IDLE_INTERVAL field when SldleAck is asserted. | RW | 0x0 |

Table 16-186. Register Call Summary for Register EMIF_READ_IDLE_CTRL_SHDW

EMIF Controller

- [Global Initialization: \[0\]](#)
- [EMIF Register Summary: \[1\]](#)

Table 16-187. EMIF_IRQSTATUS_RAW_SYS

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 00A4 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 00A4 0x4D00 00A4 | | |
| Description | System L3 Interrupt Raw Status Register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-------------|---|------------|-------------|
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | REG_DNV_SYS | | REG_TA_SYS | REG_ERR_SYS |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------------|
| 31:3 | RESERVED | Reserved for future use. | R | 0x0000 0000 |
| 2 | REG_DNV_SYS | Raw status of system L3 interrupt for LPDDR2 NVM data not valid. Write 1 to set the (raw) status, typically for debug. Writing 0 has no effect. | RW | 0 |
| 1 | REG_TA_SYS | Raw status of system L3 interrupt for SDRAM temperature alert. Write 1 to set the (raw) status, mostly for debug. Writing a 0 has no effect. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------|
| 0 | REG_ERR_SYS | Raw status of system L3 interrupt for command or address error. Write 1 to set the (raw) status, mostly for debug. Writing a 0 has no effect. | RW | 0 |

Table 16-188. Register Call Summary for Register EMIF_IRQSTATUS_RAW_SYS

EMIF Controller

- [Interrupt Requests: \[0\] \[1\] \[2\] \[3\]](#)
- [Global Initialization: \[4\]](#)
- [EMIF Events Servicing: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [EMIF Register Summary: \[11\]](#)

Table 16-189. EMIF_IRQSTATUS_RAW_LL

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 00A8 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 00A8 0x4D00 00A8 | | |
| Description | Low-Latency L3 Interrupt Raw Status Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|------------|-----------|------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | REG_DNV_LL | REG_TA_LL | REG_ERR_LL | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | Reserved for future use. | R | 0x0000 0000 |
| 2 | REG_DNV_LL | Raw status of low-latency L3 interrupt for LPDDR2 NVM data not valid. Write 1 to set the (raw) status, typically for debug. Writing 0 has no effect. | RW | 0 |
| 1 | REG_TA_LL | Raw status of low-latency L3 interrupt or SDRAM temperature alert. Write 1 to set the (raw) status, mostly for debug. Writing 0 has no effect. | RW | 0 |
| 0 | REG_ERR_LL | Raw status of low-latency L3 interrupt for command or address error. Write 1 to set the (raw) status, mostly for debug. Writing a 0 has no effect. | RW | 0 |

Table 16-190. Register Call Summary for Register EMIF_IRQSTATUS_RAW_LL

EMIF Controller

- [Interrupt Requests: \[0\] \[1\] \[2\] \[3\]](#)
- [Global Initialization: \[4\]](#)
- [EMIF Events Servicing: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [EMIF Register Summary: \[11\]](#)

Table 16-191. EMIF_IRQSTATUS_SYS

| | | | |
|-------------------------|-------------------------------------|-----------------|----------------|
| Address Offset | 0x0000 00AC | | |
| Physical Address | 0x4C00 00AC 0x4D00 00AC | Instance | EMIF1 EMIF2 |
| Description | System L3 Interrupt Status Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|-------------|------------|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REG_DNV_SYS | REG_TA_SYS | REG_ERR_SYS |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------------|
| 31:3 | RESERVED | Reserved for future use. | R | 0x0000 0000 |
| 2 | REG_DNV_SYS | Enabled status of system L3 interrupt for LPDDR2 NVM data not valid. Write 1 to clear the status after interrupt is serviced (raw status is cleared; that is, even if not enabled). Writing 0 has no effect. | RW | 0 |
| 1 | REG_TA_SYS | Enabled status of system L3 interrupt for SDRAM temperature alert. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). Writing a 0 has no effect. | RW | 0 |
| 0 | REG_ERR_SYS | Enabled status of system L3 interrupt interrupt for command or address error. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). Writing a 0 has no effect. | RW | 0 |

Table 16-192. Register Call Summary for Register EMIF_IRQSTATUS_SYS

EMIF Controller

- [Interrupt Requests: \[0\] \[1\] \[2\]](#)
- [SDRAM Temperature Monitoring: \[3\]](#)
- [Global Initialization: \[4\]](#)
- [EMIF Events Servicing: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [EMIF Register Summary: \[11\]](#)

Table 16-193. EMIF_IRQSTATUS_LL

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 00B0 | | |
| Physical Address | 0x4C00 00B0 0x4D00 00B0 | Instance | EMIF1 EMIF2 |
| Description | Low-Latency L3 Interrupt Status Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|------------|-----------|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | REG_DNV_LL | REG_TA_LL | REG_ERR_LL |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------------|
| 31:3 | RESERVED | Reserved for future use. | R | 0x0000 0000 |
| 2 | REG_DNV_LL | Enabled status of low-latency L3 interrupt for LPDDR2 NVM data not valid. Write 1 to clear the status after interrupt is serviced (raw status is cleared; that is, even if not enabled). Writing 0 has no effect. | RW W1toClr | 0 |
| 1 | REG_TA_LL | Enabled status of low-latency L3 interrupt for SDRAM temperature alert. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). Writing a 0 has no effect. | RW W1toClr | 0 |
| 0 | REG_ERR_LL | Enabled status of low-latency L3 interrupt for command or address error. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). Writing a 0 has no effect. | RW W1toClr | 0 |

Table 16-194. Register Call Summary for Register EMIF_IRQSTATUS_LL

EMIF Controller

- [Interrupt Requests: \[0\] \[1\] \[2\]](#)
- [SDRAM Temperature Monitoring: \[3\]](#)
- [Global Initialization: \[4\]](#)
- [EMIF Events Servicing: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [EMIF Register Summary: \[11\]](#)

Table 16-195. EMIF_IRQENABLE_SET_SYS

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 00B4 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 00B4 0x4D00 00B4 | | |
| Description | System L3 Interrupt Enable Set Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------------|---|---------------|---|----------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | REG_EN_DNV_SYS | | REG_EN_TA_SYS | | REG_EN_ERR_SYS | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|---------------|-------------|
| 31:3 | RESERVED | Reserved for future use. | R | 0x0000 0000 |
| 2 | REG_EN_DNV_SYS | Enable set for system L3 interrupt for LPDDR2 NVM data not valid. Writing 1 enables the interrupt and sets this bit and the corresponding Interrupt-enable clear register. Writing 0 has no effect. | RW W1toSet | 0 |
| 1 | REG_EN_TA_SYS | Enable set for system L3 interrupt for SDRAM temperature alert. . Writing a 1 will enable the interrupt, and set this bit as well as the corresponding Interrupt Enable Clear Register. Writing a 0 has no effect. | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|---------------|-------|
| 0 | REG_EN_ERR_SYS | Enable set for system L3 interrupt for command or address error. Writing a 1 will enable the interrupt, and set this bit as well as the corresponding Interrupt Enable Clear Register. Writing a 0 has no effect. | RW W1toSet | 0 |

Table 16-196. Register Call Summary for Register EMIF_IRQENABLE_SET_SYS

EMIF Controller

- [Interrupt Requests: \[0\] \[1\]](#)
- [Global Initialization: \[2\]](#)
- [Operational Modes Configuration: \[3\]](#)
- [EMIF Events Servicing: \[4\]](#)
- [EMIF Register Summary: \[5\]](#)

Table 16-197. EMIF_IRQENABLE_SET_LL

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 00B8 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 00B8 0x4D00 00B8 | | |
| Description | Low-Latency L3 Interrupt Enable Set Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---------------|--------------|---------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | REG_EN_DNV_LL | REG_EN_TA_LL | REG_EN_ERR_LL | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|---------------|-------------|
| 31:3 | RESERVED | Reserved for future use. | R | 0x0000 0000 |
| 2 | REG_EN_DNV_LL | Enable set for low-latency L3 interrupt for LPDDR2 NVM data not valid. Writing 1 enables the interrupt and sets this bit and the corresponding Interrupt-enable clear register. Writing a 0 has no effect. | RW W1toSet | 0 |
| 1 | REG_EN_TA_LL | Enable set for low-latency L3 interrupt for SDRAM temperature alert. Writing a 1 will enable the interrupt, and set this bit as well as the corresponding Interrupt Enable Clear Register. Writing a 0 has no effect. | RW W1toSet | 0 |
| 0 | REG_EN_ERR_LL | Enable set for low-latency L3 interrupt for command or address error. Writing a 1 will enable the interrupt, and set this bit as well as the corresponding Interrupt Enable Clear Register. Writing a 0 has no effect. | RW W1toSet | 0 |

Table 16-198. Register Call Summary for Register EMIF_IRQENABLE_SET_LL

EMIF Controller

- [Interrupt Requests: \[0\] \[1\]](#)
- [Global Initialization: \[2\]](#)
- [Operational Modes Configuration: \[3\]](#)
- [EMIF Events Servicing: \[4\]](#)
- [EMIF Register Summary: \[5\]](#)

Table 16-199. EMIF_IRQENABLE_CLR_SYS

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 00BC | | |
| Physical Address | 0x4C00 00BC 0x4D00 00BC | Instance | EMIF1 EMIF2 |
| Description | System L3 Interrupt Enable Clear Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|---------------|----|----|----------------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | REG_EN_DNV_SYS | | | REG_EN_TA_SYS | | | REG_EN_ERR_SYS | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|---------------|-------------|
| 31:3 | RESERVED | Reserved for future use | R | 0x0000 0000 |
| 2 | REG_EN_DNV_SYS | Enable clear for system OCP interrupt for LPDDR2 NVM data not valid. Writing 1 disables the interrupt and clears this bit and the corresponding interrupt-enable set register. Writing 0 has no effect. | RW W1toClr | 0 |
| 1 | REG_EN_TA_SYS | Enable clear for system L3 interrupt for SDRAM temperature alert. Writing a 1 will disable the interrupt, and clear this bit as well as the corresponding Interrupt Enable Set Register. Writing a 0 has no effect. | RW W1toClr | 0 |
| 0 | REG_EN_ERR_SYS | Enable clear for system L3 interrupt for command or address error. Writing a 1 will disable the interrupt, and clear this bit as well as the corresponding Interrupt Enable Set Register. Writing a 0 has no effect. | RW W1toClr | 0 |

Table 16-200. Register Call Summary for Register EMIF_IRQENABLE_CLR_SYS

EMIF Controller

- [Interrupt Requests: \[0\] \[1\]](#)
- [EMIF Events Servicing: \[2\] \[3\]](#)
- [EMIF Register Summary: \[4\]](#)

Table 16-201. EMIF_IRQENABLE_CLR_LL

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 00C0 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 00C0 0x4D00 00C0 | | |
| Description | Low-Latency L3 Interrupt Enable Clear Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---------------|---|---|--------------|---|---|---------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | REG_EN_DNV_LL | | | REG_EN_TA_LL | | | REG_EN_ERR_LL | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------|-------------|
| 31:3 | RESERVED | Reserved for future use. | R | 0x0000 0000 |
| 2 | REG_EN_DNV_LL | Enable clear for low-latency OCP interrupt for LPDDR2 NVM data not valid. Writing 1 disables the interrupt and clears this bit and the corresponding interrupt enable set register. Writing 0 has no effect. | RW W1toClr | 0 |
| 1 | REG_EN_TA_LL | Enable clear for low-latency L3 interrupt for SDRAM temperature alert. Writing a 1 will disable the interrupt, and clear this bit as well as the corresponding Interrupt Enable Set Register. Writing a 0 has no effect. | RW W1toClr | 0 |
| 0 | REG_EN_ERR_LL | Enable clear for low-latency L3 interrupt for command or address error. Writing a 1 will disable the interrupt, and clear this bit as well as the corresponding Interrupt Enable Set Register. Writing a 0 has no effect. | RW W1toClr | 0 |

Table 16-202. Register Call Summary for Register EMIF_IRQENABLE_CLR_LL

EMIF Controller

- [Interrupt Requests: \[0\] \[1\]](#)
- [EMIF Events Servicing: \[2\] \[3\]](#)
- [EMIF Register Summary: \[4\]](#)

Table 16-203. EMIF_ZQ_CONFIG

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 00C8 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 00C8 0x4D00 00C8 | | |
| Description | SDRAM Output Impedance Calibration Config Register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
|--------------|----|----|----|--------------|----|----|----|------------------|----|----|----|-----------------|----|----|----|----------|----|----|----|----|----|---|---|--------------------|---|---|---|------------------|---|---|---|--------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| REG_ZQ_CS1EN | | | | REG_ZQ_CS0EN | | | | REG_ZQ_DUALCALEN | | | | REG_ZQ_SFEXITEN | | | | RESERVED | | | | | | | | REG_ZQ_ZQINIT_MULT | | | | REG_ZQ_ZQCL_MULT | | | | REG_ZQ_REFINTERVAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|--------|
| 31 | REG_ZQ_CS1EN | Writing a 1 enables ZQ calibration for CS1. | RW | 0x0 |
| 30 | REG_ZQ_CS0EN | Writing a 1 enables ZQ calibration for CS0. | RW | 0x0 |
| 29 | REG_ZQ_DUALCALEN | ZQ Dual Calibration enable. Allows both ranks to be ZQ calibrated simultaneously. Setting this bit requires both chip selects to have a separate calibration resistor per device. | RW | 0x0 |
| 28 | REG_ZQ_SFEXITEN | ZQCL on Self-Refresh, Active Power-Down, and Precharge Power-Down exit enable. Writing a 1 enables the issuing of ZQCL on Self-Refresh, Active Power-Down, and Precharge Power-Down exit. | RW | 0x0 |
| 27:20 | RESERVED | Reserved | R | 0x00 |
| 19:18 | REG_ZQ_ZQINIT_MULT | Indicates the number of ZQCL durations that make up a ZQINIT duration, minus one.. | RW | 0x0 |
| 17:16 | REG_ZQ_ZQCL_MULT | Indicates the number of ZQCS intervals that make up a ZQCL duration, minus one. ZQCS interval is defined by reg_zq_zqcs in EMIF_SDRAM_TIM_3 . | RW | 0x0 |
| 15:0 | REG_ZQ_REFINTERVAL | Number of refresh periods between ZQCS commands. This field supports between one refresh period to 256 ms between ZQCS calibration commands. Refresh period is defined by reg_refresh_rate in EMIF_SDRAM_REF_CTRL register. | RW | 0x0000 |

Table 16-204. Register Call Summary for Register EMIF_ZQ_CONFIG

EMIF Controller

- [SDRAM Output Impedance Calibration: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Operational Modes Configuration: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [EMIF Register Summary: \[12\]](#)

Table 16-205. EMIF_TEMP_ALERT_CONFIG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|-------|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00CC | | | | | | | | | | | | | | | | Instance | | | | | | | | EMIF1 | | | | | | | |
| Physical Address | 0x4C00 00CC 0x4D00 00CC | | | | | | | | | | | | | | | | | | | | | | | | EMIF2 | | | | | | | |
| Description | Temperature Alert Config Register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|--------------|----------|-----------------|---------------|---------------|----------|--------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REG_TA_CS1EN | REG_TA_CS0EN | RESERVED | REG_TA_SFEXITEN | REG_TA_DEVWDT | REG_TA_DEVCNT | RESERVED | REG_TA_REFINTERVAL | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|----------|
| 31 | REG_TA_CS1EN | Writing a 1 enables temperature alert polling for CS1. | RW | 0x0 |
| 30 | REG_TA_CS0EN | Writing a 1 enables temperature alert polling for CS0. | RW | 0x0 |
| 29 | RESERVED | Reserved | R | 0x0 |
| 28 | REG_TA_SFEXITEN | Temperature Alert Poll on Self-Refresh, Active Power-Down, and Precharge Power-Down exit enable. Writing a 1 enables the issuing of a temperature alert poll on Self-Refresh exit. | RW | 0x0 |
| 27:26 | REG_TA_DEVWDT | This field indicates how wide a physical device is. It is used in conjunction with the reg_ta_devcnt register to determine which byte lanes contain the temperature alert info. A value of 0 = eight bit wide, 1 = sixteen bit wide, 2 = thirty two bit wide. All others are reserved. If this field is set to 1 and the reg_ta_devcnt field is set to one the byte mask for checking will be 4'b0101. | RW | 0x0 |
| 25:24 | REG_TA_DEVCNT | This field indicates which external byte lanes contain a device for temperature monitoring. A value of 0 = one device, 1 = two devices, 2 = four devices. All other reserved. | RW | 0x0 |
| 23:22 | RESERVED | Reserved | R | 0x0 |
| 21:0 | REG_TA_REFINTERVAL | Number of refresh periods between temperature alert polls. This field supports between one refresh period to 10 seconds between temperature alert polls. Refresh period is defined by reg_refresh_rate in SDRAM Refresh Control register. | RW | 0x000000 |

Table 16-206. Register Call Summary for Register EMIF_TEMP_ALERT_CONFIG

EMIF Controller

- [SDRAM Temperature Monitoring: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Global Initialization: \[6\]](#)
- [Operational Modes Configuration: \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [EMIF Register Summary: \[12\]](#)

Table 16-207. EMIF_L3_ERR_LOG

| | | | |
|-------------------------|----------------------------|-----------------|----------------|
| Address Offset | 0x0000 00D0 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 00D0 0x4D00 00D0 | | |
| Description | Error Log Register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------------|----|----|----|----|----|----|----|---------------|----|----|----|----------|----|---|---|-------------|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
| RESERVED | | | | | | | | REG_MADDRSPACE | | | | | | | | REG_MBURSTSEQ | | | | REG_MCMD | | | | REG_MCONNID | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|--------|
| 31:16 | RESERVED | Reserved for future use. | R | 0x0000 |
| 15:14 | REG_MADDRSPACE | Address space of the first errored transaction. 0x0: SDRAM 0x1: LPDDR2-NVM 0x2: reserved 0x3: internal registers | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|-------|
| 13:11 | REG_MBURSTSEQ | Addressing mode of the first errored transaction. (see Chapter 14, Interconnect for more information) | R | 0x0 |
| 10:8 | REG_MCMD | Command type of the first errored transaction. (see Chapter 14, Interconnect for more information) | R | 0x0 |
| 7:0 | REG_MCONNID | Connection ID of the first errored transaction. | R | 0x00 |

Table 16-208. Register Call Summary for Register EMIF_L3_ERR_LOG

EMIF Controller

- [EMIF Events Servicing: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [EMIF Register Summary: \[8\]](#)

Table 16-209. EMIF_DDR_PHY_CTRL_1

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 00E4 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 00E4 0x4D00 00E4 | | |
| Description | DDR PHY Control 1 Register. This register is used to control the DDR PHY. The bit field definitions are DDR PHY specific. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------------|----|----|----|-------------------------------------|----|----|----|------------------------------------|----|----|----|-----------------------------|----|----|----|------------------------|----|----|----|------------------|----|---|---|---|---|---|---|---|---|---|---|
| DLL_MASTER_SENSITIVITY | | | | REG_PHY_FREEZE_DELAY_CODE_POSTAMBLE | | | | REG_PHY_FREEZE_DELAY_CODE_PREAMBLE | | | | REG_DLL_MASTER_SW_CODE_CTRL | | | | REG_DLL_SLAVE_DLY_CTRL | | | | REG_READ_LATENCY | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|---|------|-------|
| 31:30 | DLL_MASTER_SENSITIVITY | This field defines the level of sensitivity of the DLL master: the lower the value, the more sensitive the DLL is to PVT variation. The recommended setting is 0x2. | RW | 0x0 |
| 29:26 | REG_PHY_FREEZE_DELAY_CODE_POSTAMBLE | Postamble time respected by the DATA PHY freezing the DLL slave code after reads | RW | 0x0 |
| 25:22 | REG_PHY_FREEZE_DELAY_CODE_PREAMBLE | Preamble time respected by the DATA PHY before freezing the DLL slave code during reads | RW | 0x0 |
| 21:12 | REG_DLL_MASTER_SW_CODE_CTRL | DLL delay code when in software override mode | RW | 0x1FF |
| 11:4 | REG_DLL_SLAVE_DLY_CTRL | DLL slave delay ratio control | RW | 0xFF |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------|
| 3:0 | REG_READ_LATENCY | This field defines the read latency for the read data from SDRAM in number of DDR clock cycles. This field is used by the EMIF as well as the PHY. The EMIF will expect the first read data to arrive (reg_read_latency + 3) DDR clock cycles from the read command. The REG_READ_LATENCY must be set to RL + EMIF_SDRAM_TIM_3 [14:13] REG_T_TDQSCKMAX , where REG_T_TDQSCKMAX = ceiling(tDQSCKmax / tCKavg) - 1 The write latency (WL) is tied to the RL. See the LPDDR2 SDRAM standard. | RW | 0x0 |

Table 16-210. Register Call Summary for Register EMIF_DDR_PHY_CTRL_1

EMIF Controller

- [SDRAM Read: \[0\]](#)
- [Global Initialization: \[1\] \[2\]](#)
- [Operational Modes Configuration: \[3\]](#)
- [EMIF Register Summary: \[4\]](#)
- [EMIF Register Description: \[5\] \[6\] \[7\]](#)

Table 16-211. EMIF_DDR_PHY_CTRL_1_SHDW

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 00E8 | Instance | EMIF1 EMIF2 |
| Physical Address | 0x4C00 00E8 0x4D00 00E8 | | |
| Description | DDR PHY Control 1 Shadow Register. Shadow field for EMIF_DDR_PHY_CTRL_1 . | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|---|----|----|----|----|----|---|---|----------------------------------|---|---|---|---|---|---|---|-----------------------------|--|--|--|--|--|--|--|-----------------------|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | REG_PHY_FREEZE_DELAY_CODE_POSTAMBLE_SHDW | | | | | | | | REG_PHY_FREEZE_DELAY_CODE_PREAMBLE_SHDW | | | | | | | | REG_DLL_MASTER_SW_CODE_CTRL_SHDW | | | | | | | | REG_DLL_SLAVE_DLY_CTRL_SHDW | | | | | | | | REG_READ_LATENCY_SHDW | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--|--|------|-------|
| 31:30 | RESERVED | Reserved | RW | 0x0 |
| 29:26 | REG_PHY_FREEZE_DELAY_CODE_POSTAMBLE_SHDW | Shadow field for REG_PHY_FREEZE_DELAY_CODE_POSTAMBLE | RW | 0x0 |
| 25:22 | REG_PHY_FREEZE_DELAY_CODE_PREAMBLE_SHDW | Shadow field for REG_PHY_FREEZE_DELAY_CODE_PREAMBLE | RW | 0x0 |
| 21:12 | REG_DLL_MASTER_SW_CODE_CTRL_SHDW | Shadow field for REG_DLL_MASTER_SW_CODE_CTRL | RW | 0x1FF |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|--|------|-------|
| 11:4 | REG_DLL_SLAVE_DLY_CTRL_SHDW | Shadow field for REG_DLL_SLAVE_DLY_CTRL | RW | 0xFF |
| 3:0 | REG_READ_LATENCY_SHDW | Shadow field for REG_READ_LATENCY. This field is loaded into EMIF_DDR_PHY_CTRL_1[3:0] REG_READ_LATENCY field when SideAck is asserted. | RW | 0x0 |

Table 16-212. Register Call Summary for Register EMIF_DDR_PHY_CTRL_1_SHDW

EMIF Controller

- [Global Initialization: \[0\]](#)
- [EMIF Register Summary: \[1\]](#)

Table 16-213. EMIF_DDR_PHY_CTRL_2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------------------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00EC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4C00 00EC 0x4D00 00EC | | | | | | | | | | | | | | | | Instance EMIF1 EMIF2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | DDR PHY Control 2 Register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="17">REG_DDR_PHY_CTRL_2</td><td colspan="17"></td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | REG_DDR_PHY_CTRL_2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REG_DDR_PHY_CTRL_2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Field Name | REG_DDR_PHY_CTRL_2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | This register is used to control the DDR PHY. The bit field definitions are DDR PHY specific. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 16-214. Register Call Summary for Register EMIF_DDR_PHY_CTRL_2

EMIF Controller

- [Global Initialization: \[0\]](#)
- [EMIF Register Summary: \[1\]](#)

16.4 General-Purpose Memory Controller

16.4.1 GPMC Overview

The general-purpose memory controller (GPMC) is a unified memory controller dedicated to interfacing external memory devices:

- Asynchronous SRAM-like memories and application-specific integrated circuit (ASIC) devices
- Asynchronous, synchronous, and page mode (only available in non-muxed mode) burst NOR flash devices
- NAND Flash
- Pseudo-SRAM devices

16.4.2 GPMC Environment

This section describes the GPMC application fields from an environment point of view (external connections). It describes GPMC connectivity options, and gives three possible interfaces.

16.4.2.1 GPMC Modes

This section shows three GPMC external connections options:

- [Figure 16-50](#) shows a connection between the GPMC and a 16-bit synchronous address/data-multiplexed (or AAD-multiplexed, but this protocol use less address pins) external memory device ([Figure 16-50](#)).
- [Figure 16-50](#) shows a connection between the GPMC and a 16-bit synchronous nonmultiplexed external memory device ([Figure 16-51](#)).
- [Figure 16-52](#) shows a connection between the GPMC and a 16-bit NAND device ([Figure 16-52](#)).

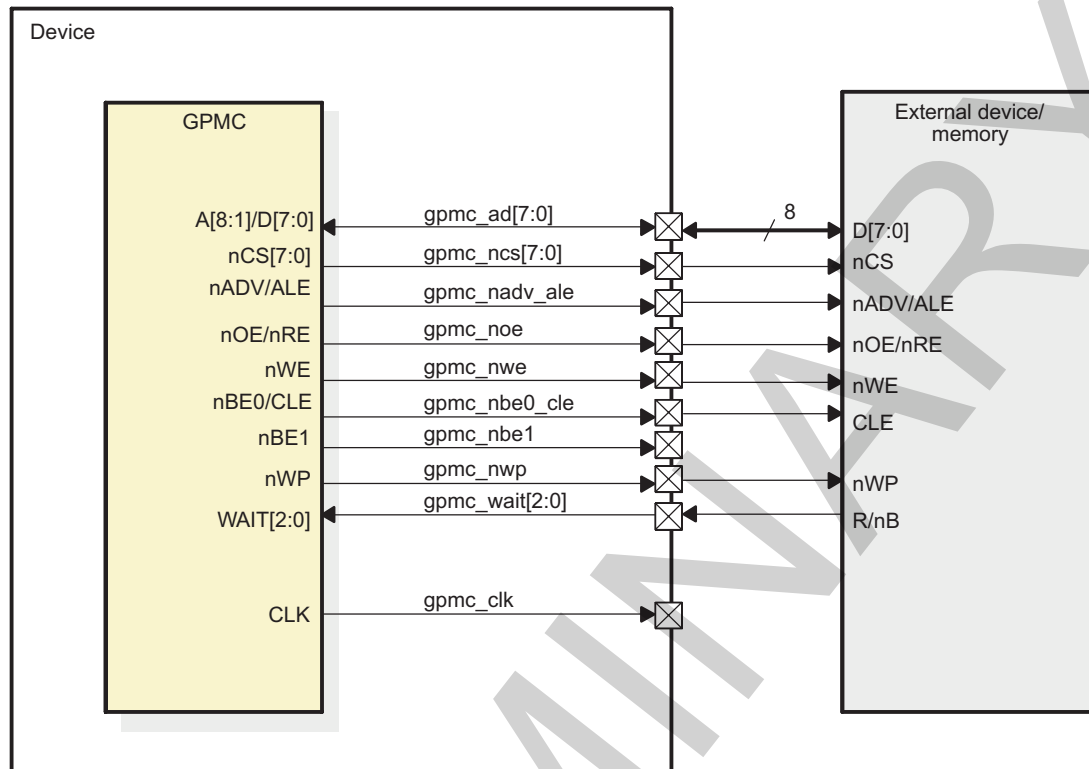
NOTE: The device does not provide the A0 byte address line required for random-byte addressable 8-bit wide device interfacing (for multiplexed and nonmultiplexed protocol). Hence, an 8-bit device must be connected to the D[7:0] / gpmc_ad[7:0] data bus (rather than D[15:8] / gpmc_ad[15:8]) of the GPMC controller. This limits the use of 8-bit wide device interfacing to byte-alias access.

Figure 16-50. GPMC to 16-Bit Address/Data-Multiplexed Memory



Figure 16-51. GPMC to 16-Bit Nonmultiplexed Memory



Figure 16-52. GPMC to 8-Bit NAND Device

gpmc-003

16.4.2.2 GPMC Signals

Table 16-215 lists the GPMC subsystem I/O pins.

Table 16-215. GPMC I/O Description

| Pin Name | I/O | Description |
|----------------|------------------|--|
| gpmc_a[25:16] | O | Address |
| gpmc_ad[15:0] | I/O | Data |
| gpmc_ncs[7:0] | O | Chip-selects (active low) |
| gpmc_clk | O ⁽¹⁾ | Clock generated for the external memory or device |
| gpmc_nadv_ale | O | Address valid (active low). Also used as address latch enable (active high) for NAND protocol memories. |
| gpmc_noe_nre | O | Output enable (active low). Also used as read enable (active low) for NAND protocol memories. |
| gpmc_nwe | O | Write enable (active low) |
| gpmc_nbe0_cle | O | Lower-byte enable (active low). Also used as command latch enable for NAND protocol memories. |
| gpmc_nbe1 | O | Upper-byte enable (active low). |
| gpmc_nwp | O | Write protect (active low) |
| gpmc_wait[2:0] | I | External wait signal for NOR and NAND protocol memories. The wait signals can be mapped on any of the chip-select. |
| gpmc_io_dir | O | gpmc_ad[15:0] signal direction control: Low during transmit (for write access: data OUT from GPMC to memory), High during receive (for read access: data IN from memory to GPMC) |

⁽¹⁾ This output signal is also used as retiming input (the INPUTENABLE bit in the corresponding pad configuration register must be set to 1).

Table 16-216 shows the use of address and data GPMC controller pins based on the type of external device.

Table 16-216. GPMC Pin Multiplexing Options

| GPMC Pin | Multiplexed Address Data 16-Bit Device | Nonmultiplexed Address Data 16-Bit Device With LIMITED- ADDRESS Bit Enabled | 16-Bit NAND Device | 8-Bit NAND Device |
|-------------|--|--|-----------------------|----------------------|
| gpmc_a[25] | A26 | A10 | Not used | Not used |
| gpmc_a[24] | A25 | A9 | Not used | Not used |
| gpmc_a[23] | A24 | A8 | Not used | Not used |
| gpmc_a[22] | A23 | A7 | Not used | Not used |
| gpmc_a[21] | A22 | A6 | Not used | Not used |
| gpmc_a[20] | A21 | A5 | Not used | Not used |
| gpmc_a[19] | A20 | A4 | Not used | Not used |
| gpmc_a[18] | A19 | A3 | Not used | Not used |
| gpmc_a[17] | A18 | A2 | Not used | Not used |
| gpmc_a[16] | A17 | A1 | Not used | Not used |
| gpmc_ad[15] | A16/D15 | D15 | D15 | Not used |
| gpmc_ad[14] | A15/D14 | D14 | D14 | Not used |
| gpmc_ad[13] | A14/D13 | D13 | D13 | Not used |
| gpmc_ad[12] | A13/D12 | D12 | D12 | Not used |
| gpmc_ad[11] | A12/D11 | D11 | D11 | Not used |
| gpmc_ad[10] | A11/D10 | D10 | D10 | Not used |
| gpmc_ad[9] | A10/D9 | D9 | D9 | Not used |
| gpmc_ad[8] | A9/D8 | D8 | D8 | Not used |
| gpmc_ad[7] | A8/D7 | D7 | D7 | D7 |
| gpmc_ad[6] | A7/D6 | D6 | D6 | D6 |
| gpmc_ad[5] | A6/D5 | D5 | D5 | D5 |
| gpmc_ad[4] | A5/D4 | D4 | D4 | D4 |
| gpmc_ad[3] | A4/D3 | D3 | D3 | D3 |
| gpmc_ad[2] | A3/D2 | D2 | D2 | D2 |
| gpmc_ad[1] | A2/D1 | D1 | D1 | D1 |
| gpmc_ad[0] | A1/D0 | D0 | D0 | D0 |

When using non-multiplexed memories, it is recommended to enable [GPMC_CONFIG\[1\] LIMITEDADDRESS](#). This bit forces A[26:11] to 1 on the GPMC I/O side. Thus, only 2Kbytes of memory address space is accessible regardless of the memory size.

With all device types, the GPMC does not drive unnecessary address lines. They stay at their reset value of 0x00.

Address mapping supports address/data-multiplexed 16-bit wide devices:

- The NOR flash memory controller still supports non-multiplexed address and data memory devices.
- Multiplexing mode can be selected through the [GPMC_CONFIG1_i\[9:8\] MUXADDDATA](#) bit field (i = 0 to 7).
- Asynchronous page mode is not supported for multiplexed address and data devices.

NOTE: The numbering for A (address) is starting from 1 instead of 0 such as D (data) because the A0 signal is handled within the GPMC but is not driven to any pad. The signal is only relevant to 8-bit accesses and this configuration is not recommended. If such a memory or device is connected, only every second word in the memory is accessible, that is, each 16-bit aligned 8-bit word is mapped but not the non-16-bit aligned ones. Any access to a non-aligned one will actually result in accessing the associated aligned one, at address A1 instead of address A.

16.4.3 GPMC Integration

This section describes module integration in the device, including information about clocks, resets, and hardware requests.

- No STANDBY hardware handshake
- No wake-up request
- One system direct memory access (sDMA) request
- One interrupt request to the Cortex-A9 MPU Interrupt Controller (MA_IRQ) and to DSP subsystem (D_IRQ)
- One clock for functional and interface domains

Figure 16-53 shows GPMC integration.

Figure 16-53. GPMC Integration

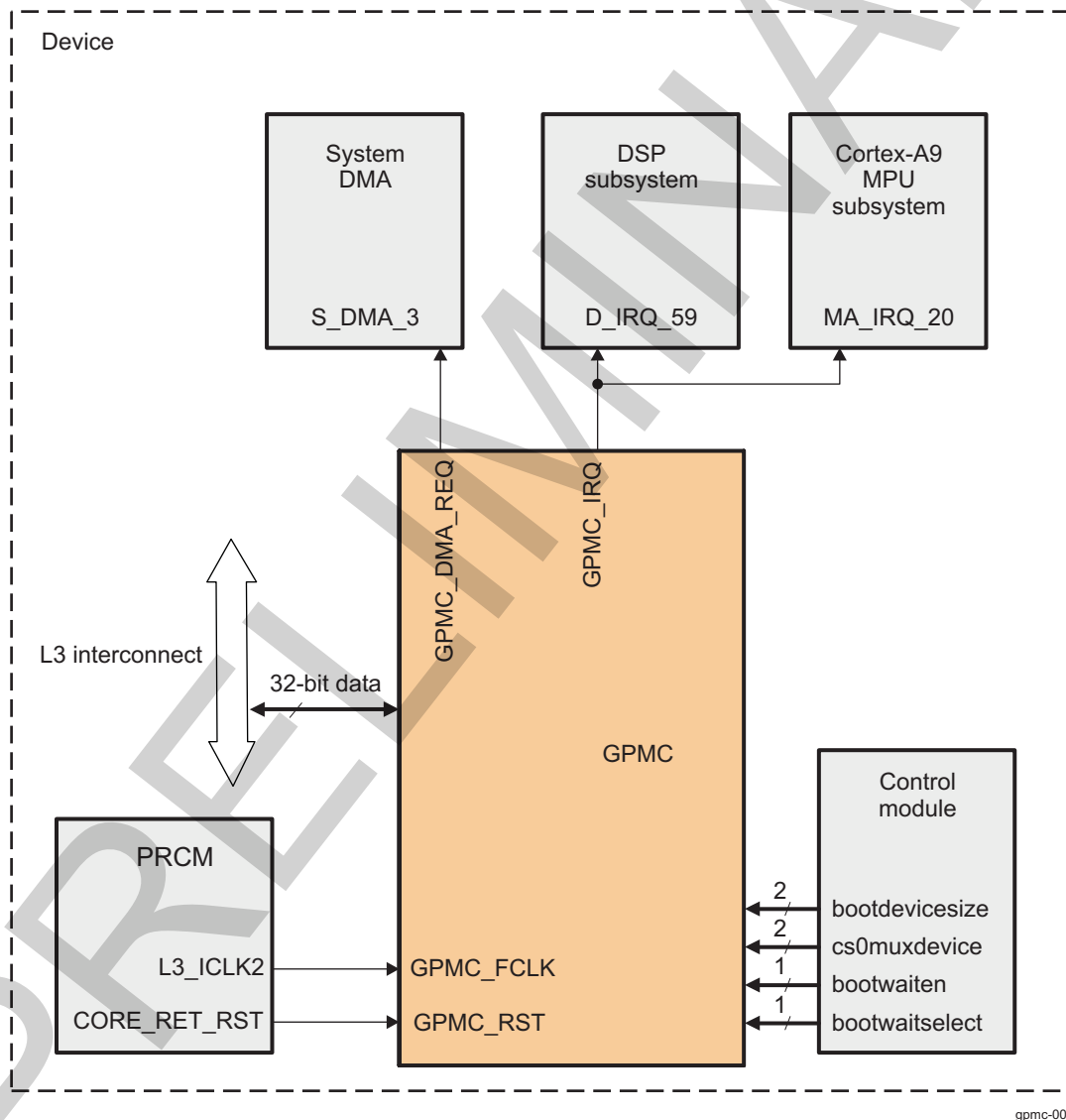


Table 16-217, Table 16-218 and Table 16-219 summarize the integration of the module in the device.

Table 16-217. GPMC Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-up Capability | Interconnect |
| GPMC | PD_CORE | No | L3 |

NOTE:

- For information about operation performance point (OPP) configuration description, see [Section 3.1.1.1.2, Module Level Clock Management](#) in [Chapter 3, Power, Reset, and Clock Management](#).

Table 16-218. GPMC Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| GPMC | GPMC_FCLK | L3_ICLK2 | PRCM | Functional clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| GPMC | GPMC_RST | CORE_RET_RST | PRCM | GPMC reset |

NOTE: For clock description, see [Section 16.4.4.2, GPMC Clock Configuration](#).

Table 16-219. GPMC Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------|---|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| GPMC | GPMC_IRQ | D_IRQ_59 | DSP | GPMC interrupt to DSP subsystem |
| | GPMC_IRQ | MA_IRQ_20 | Cortex-A9 | GPMC interrupt to Cortex-A9 MPU subsystem |
| DMA Requests | | | | |
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| GPMC | GPMC_DMA_REQ | S_DMA_3 | sDMA | GPMC request from Prefetch Engine to sDMA |

NOTE:

- For interrupt source description, see [Section 16.4.4.5, GPMC Interrupt Requests](#).
- For DMA source description, see [Section 16.4.4.6, GPMC DMA Requests](#).

16.4.4 GPMC Functional Description

The GPMC basic programming model offers maximum flexibility to support various access protocols for each of the eight configurable chip-selects. Use optimal chip-select settings, based on the characteristics of the external device:

- Different protocols can be selected to support generic asynchronous or synchronous random-access devices (NOR flash, SRAM) or to support specific NAND devices.
- The address and the data bus can be multiplexed on the same external bus.
- Read and write access can be independently defined as asynchronous or synchronous.
- System requests (byte, 16-bit word, burst) are performed through single or multiple accesses. External access profiles (single, multiple with optimized burst length, native- or emulated-wrap) are based on external device characteristics (supported protocol, bus width, data buffer size, native-wrap support).
- System burst read or write requests are synchronous-burst (multiple-read or multiple-write). When neither burst nor page mode is supported by external memory or ASIC devices, system burst read or write requests are translated to successive single synchronous or asynchronous accesses (single reads or single writes). 8-bit wide devices are supported only in single synchronous or single asynchronous read or write mode.
- To simulate a programmable internal-wait state, an external wait pin can be monitored to dynamically control external access at the beginning (initial access time) of and during a burst access.

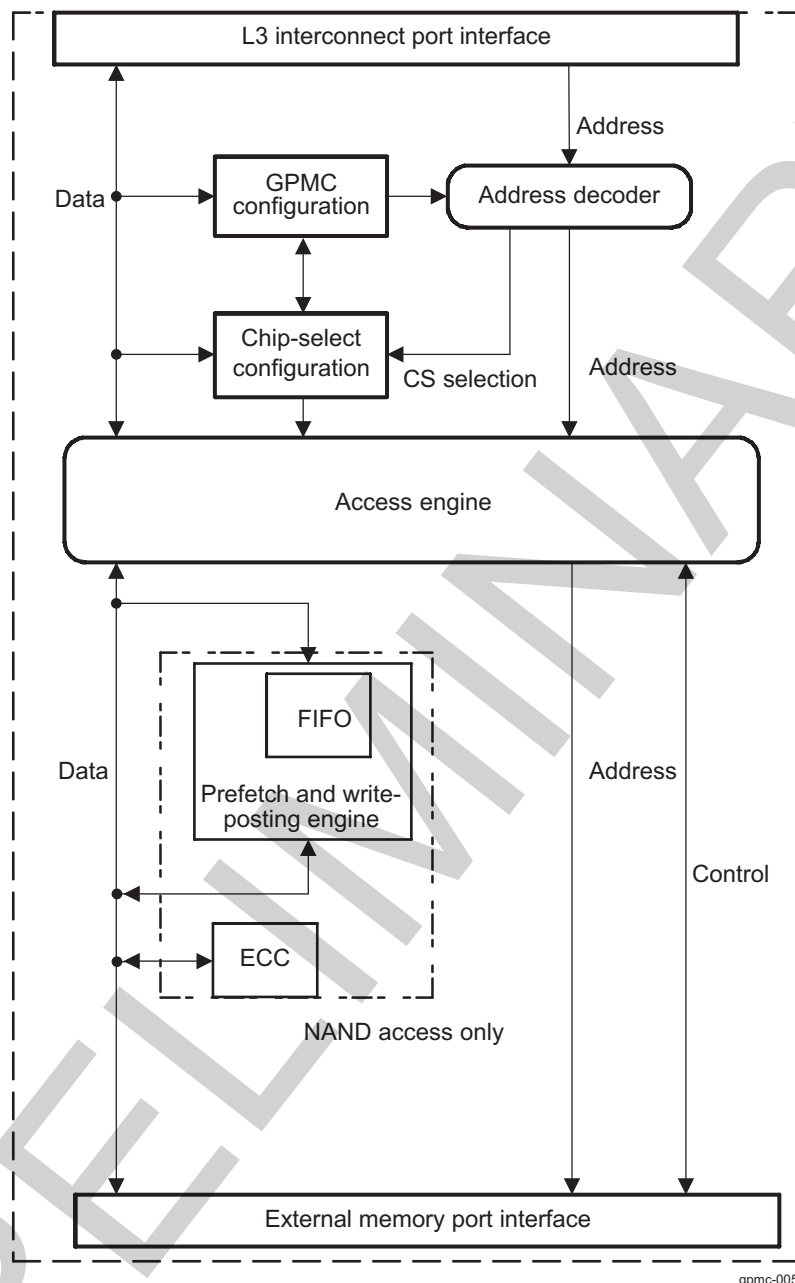
Each control signal is controlled independently for each chip-select. The internal functional clock of the GPMC (GPMC_FCLK) is used as a time reference to specify the following:

- Read- and write-access duration
- Most GPMC external interface control-signal assertion and deassertion times
- Data-capture time during read access
- External wait-pin monitoring time
- Duration of idle time between accesses, when required

16.4.4.1 GPMC Block Diagram

Figure 16-54 shows the GPMC functional block diagram. The GPMC consists of six blocks:

- L3 interconnect port interface
- Address decoder, GPMC configuration, and chip-select configuration register file
- Access engine
- Prefetch and write-posting engine
- Error correction code engine (ECC)
- External device/memory port interface

Figure 16-54. GPMC Block Diagram

The GPMC can access various external devices through the L3 Interconnect. The flexible programming model allows a wide range of attached device types and access schemes.

Based on the programmed configuration bit fields stored in the GPMC registers, the GPMC is able to generate all control signals timing depending on the attached device and access type.

Given the chip-select decoding and its associated configuration registers, the GPMC selects the appropriate device type control signals timing.

16.4.4.2 GPMC Clock Configuration

Table 16-220 describes the GPMC clocks.

Table 16-220. GPMC Clocks

| Signal | I/O ⁽¹⁾ | Description |
|-----------|--------------------|---|
| GPMC_FCLK | I | Functional and interface clock |
| gpmc_clk | O | External clock provided to synchronous external memory devices. |

⁽¹⁾ I = Input; O = Output

The gpmc_clk is generated by the GPMC from the internal GPMC_FCLK clock. The source of the GPMC_FCLK is described in [Table 16-218](#). The gpmc_clk is configured via the [GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER field (for i = 0 to 7) as shown in [Table 16-221](#).

Table 16-221. gpmc_clk Configuration

| Source Clock | GPMC_CONFIG1_i[1:0] GPMCFCLKDIVIDER | gpmc_clk Generated Clock Provided to External Memory Device |
|--------------|--|--|
| GPMC_FCLK | 00 | GPMC_FCLK |
| | 01 | GPMC_FCLK/2 |
| | 10 | GPMC_FCLK/3 |
| | 11 | GPMC_FCLK/4 |

16.4.4.3 GPMC Software Reset

The GPMC can be reset by software through the [GPMC_SYSCONFIG\[1\]](#) SOFTRESET bit. Setting the bit to 1 enables an active software reset that is functionally equivalent to a hardware reset. Hardware and software resets initialize all GPMC registers and the finite state-machine (FSM) immediately and unconditionally. The [GPMC_SYSSTATUS\[0\]](#) RESETDONE bit indicates that the software reset is complete when its value is 1. The software must ensure that the software reset completes before doing GPMC operations.

16.4.4.4 GPMC Power Management

GPMC power is supplied by the CORE power domain, and GPMC power management complies with system power-management guidelines.

[Table 16-222](#) describes power-management features available for the GPMC module.

NOTE:

- For information about source clock gating and sleep/wake-up transitions description, see [Section 3.1.1.1, Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).
- For descriptions of EnaWakeUp, IdleMode, ClockActivity, and StandbyMode features, see [Section 3.6, Clock Management Functional Description](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 16-222. GPMC Local Power Management Features

| Feature | Registers | Description |
|------------------------|---|---|
| Clock Auto Gating | GPMC_SYSCONFIG[0] AUTOIDLE bit | This bit allows a local power optimization inside the module, by gating the GPMC_FCLK clock upon the internal activity. |
| Slave Idle Modes | GPMC_SYSCONFIG[4:3] SIDLEMODE bit field | Force-idle, No-idle and Smart-idle wakeup modes are available |
| Clock Activity | N/A | Feature not available |
| Master Standby Modes | N/A | Feature not available |
| Global Wake-up Enable | N/A | Feature not available |
| Wake-up Sources Enable | N/A | Feature not available |

16.4.4.5 GPMC Interrupt Requests

The GPMC generates one interrupt event as shown in [Figure 16-53](#) :

- The interrupt request goes from GPMC (GPMC_IRQ) to the Cortex-A9 MPU subsystem : MA_IRQ_20 and to the DSP subsystem : D_IRQ_59.

[Table 16-223](#) lists the event flags, and their mask, that can cause module interrupts.

Table 16-223. GPMC Interrupt Events

| Event Flag | Event Mask | Sensitivity | Map to | Description |
|---|---|-------------|------------------------|---|
| GPMC_IRQSTATUS [10] WAIT2EDGE DETECTIONSTATUS | GPMC_IRQENABLE [10] WAIT2EDGE DETECTIONENABLE | Edge | D_IRQ_59 and MA_IRQ_20 | Wait2 edge detection interrupt: Triggered if a rising or falling edge is detected on the gpmc_wait2 signal. The rising or falling edge detection of Wait2 is selected through GPMC_CONFIG [10] WAIT2PINPOLARITY |
| GPMC_IRQSTATUS [9] WAIT1EDGE DETECTIONSTATUS | GPMC_IRQENABLE [9] WAIT1EDGE DETECTIONENABLE | Edge | D_IRQ_59 and MA_IRQ_20 | Wait1 edge detection interrupt: Triggered if a rising or falling edge is detected on the gpmc_wait1 signal. The rising or falling edge detection of Wait1 is selected through GPMC_CONFIG [9] WAIT1PINPOLARITY |
| GPMC_IRQSTATUS [8] WAIT0EDGE DETECTIONSTATUS | GPMC_IRQENABLE [8] WAIT0EDGE DETECTIONENABLE | Edge | D_IRQ_59 and MA_IRQ_20 | Wait0 edge detection interrupt: Triggered if a rising or falling edge is detected on the gpmc_wait0 signal. The rising or falling edge detection of Wait0 is selected through GPMC_CONFIG [8] WAIT0PINPOLARITY |
| GPMC_IRQSTATUS [1] TERMINAL COUNTSTATUS | GPMC_IRQENABLE [1] TERMINAL COUNTENABLE | Level | D_IRQ_59 and MA_IRQ_20 | Terminal count event: Triggered on prefetch process completion, that is when the number of currently remaining data to be requested reaches zero |
| GPMC_IRQSTATUS [0] FIFOEVENTSTATUS | GPMC_IRQENABLE [0] FIFOEVENTENABLE | Level | D_IRQ_59 and MA_IRQ_20 | FIFO event interrupt: Indicates FIFO levels availability for in Write-Posting mode and prefetch mode. GPMC_PREFETCH_CONFIG1 [2] DMAMODE shall be set to 0. |

16.4.4.6 GPMC DMA Requests

The GPMC generates one DMA event as shown in [Figure 16-53](#) :

- From GPMC (GPMC_DMA_REQ) to the system DMA (sDMA) : S_DMA_3.

16.4.4.7 L3 Interconnect Interface

The GPMC L3 interconnect interface is a pipelined interface including an 16 x 32-bit word write buffer.

Any system host can issue external access requests through the GPMC.

The device system can issue the following requests through this interface:

- One 8-bit / 16-bit / 32-bit interconnect access (read/write)
- Two incrementing 32-bit interconnect accesses (read/write)
- Two wrapped 32-bit interconnect accesses (read/write)
- Four incrementing 32-bit interconnect accesses (read/write)
- Four wrapped 32-bit interconnect accesses (read/write)
- Eight incrementing 32-bit interconnect accesses (read/write)
- Eight wrapped 32-bit interconnect accesses (read/write)

Only linear burst transactions are supported; interleaved burst transactions are not supported. Only power-of-two-length precise bursts 2 x 32, 4 x 32, 8 x 32 or 16 x 32 with the burst base address aligned on the total burst size are supported (this limitation applies to incrementing bursts only).

This interface also provides one interrupt and one DMA request line, for specific event control.

It is recommended to program the ATTACHEDDEVICEPAGELENGTH field ([GPMC_CONFIG1_i\[24:23\]](#)) according to the effective attached device page length and to enable WRAPBURST bit ([GPMC_CONFIG1_i\[31\]](#)) if the attached device supports wrapping burst.

However, it is possible to emulate wrapping burst on a non-wrapping memory by providing relevant addresses within the page or splitting transactions. Bursts larger than the memory page length are chopped into multiple bursts transactions. Due to the alignment requirements, a page boundary is never crossed.

16.4.4.8 GPMC Address and Data Bus

The current application supports GPMC connection to NAND devices and to address/data-multiplexed memories or devices. Connection to address/data-nonmultiplexed memories or devices is supported with a limited address range of 2 Kbytes.

Depending on the GPMC configuration of each chip-select, address and data bus lines that are not required for a particular access protocol are not updated (changed from current value) and are not sampled when input (input data bus).

- When the [GPMC_CONFIG\[1\]](#) LIMITEDADDRESS bit is set to 1, A26-A11 are not modified during an external memory access. This limits the memory address space to 2K-byte regardless of the memory size.
- For address/data-multiplexed and AAD-multiplexed NOR devices, the address is multiplexed on the data bus.
- 8-bit wide NOR devices do not use GPMC I/O: gpmc_ad[15:8] for data (they are used for address if needed).
- 16-bit wide NAND devices do not use GPMC I/O: gpmc_a[25:16].
- 8-bit wide NAND devices do not use GPMC I/O: gpmc_a[25:16] and GPMC I/O: gpmc_ad[15:8].

CAUTION

Before accessing a chip-select configured with a nonmultiplexed protocol, set the LIMITEDADDRESS bit control.

16.4.4.8.1 GPMC I/O Configuration Setting

NOTE: In this section and next sections, the *i* in GPMC_CONFIGx_i stands for the GPMC chip-select *i* where *i* = 0 to 7.

To select a NAND device, program the following register fields:

- [GPMC_CONFIG1_i\[11:10\]](#) DEVICETYPE field = 0b10
- [GPMC_CONFIG1_i\[9:8\]](#) MUXADDDATA bit = 0b00

To select an address/data-multiplexed device, program the following register fields:

- [GPMC_CONFIG1_i\[11:10\]](#) DEVICETYPE field = 0b00
- [GPMC_CONFIG1_i\[9:8\]](#) MUXADDDATA bit = 0b10

To select an address/address/data-multiplexed device, program the following register fields:

- [GPMC_CONFIG1_i\[11:10\]](#) DEVICETYPE field = 0b00
- [GPMC_CONFIG1_i\[9:8\]](#) MUXADDDATA bit = 0b01

To select an address/data-nonmultiplexed device (limited to a 2K-byte address range), program the following register fields:

- [GPMC_CONFIG1_i\[11:10\]](#) DEVICETYPE field = 0b00
- [GPMC_CONFIG1_i\[9:8\]](#) MUXADDDATA bit = 0b00
- [GPMC_CONFIG\[1\]](#) LIMITEDADDRESS bit = 1

NOTE: The [GPMC_CONFIG\[1\]](#) LIMITEDADDRESS bit only applies to address/data-nonmultiplexed devices; it has no effect on other device types (NAND, address/data-multiplexed).

16.4.4.8.2 GPMC CS0 Default Configuration at IC Reset

To ensure a correct external boot with a GPMC access from IC reset time on CS0, several external pins are sampled:

- The sys_boot[4:0] pins (device boundary) define the sequence of interfaces and devices to use for booting.
- The sys_boot[5] pin defines which group of booting sequences is preferred: memory booting (sys_boot[5] = 0) or peripheral booting (sys_boot[5] = 1).
- Additional pins are used to configure reset values in the [GPMC_CONFIG1_i](#) register (where i = 0) as detailed below and in [Table 16-224](#):
 - The *bootdevicesize* input pin (at the GPMC boundary) defines the size of the attached device on chip-select 0 and is used to configure the [GPMC_CONFIG1_i\[13:12\]](#) DEVICESIZE bits (where i = 0). The BOOT_DEVICE_TYPE signal is propagated from the system control module (SCM). Its value is fixed for the device at 0x1 at IC reset, which means that only 16-bit memories are supported for booting.
 - The *cs0muxdevice* input pin (at the GPMC boundary) selects whether the attached device to chip-select 0 is an address/data-multiplexed device or not. The input pin is used to configure the [GPMC_CONFIG1_i\[9:8\]](#) MUXADDDATA bit (where i = 0). The CS0_MUX_DEVICE signal is propagated from the SCM. Its value is fixed for the device at 0x2 at IC reset, which means that only address/data-multiplexed memories are supported for booting (that is, in a standalone way from memories connected to CS0).
 - The *bootwaiten* input pin (at the GPMC boundary) enables the monitoring on chip-select 0 of the WAIT pin at IC reset release time for read accesses. The input pin is used to configure the [GPMC_CONFIG1_i\[22\]](#) WAITREADMONITORING bit (where i = 0). The BOOT_WAIT_ENABLE signal is propagated from the system control module (SCM). When sys_boot[5:0] = 0b11 1111, the BOOT_WAIT_ENABLE signal is activated, causing the wait pin to be monitored for read accesses.
 - The *bootwaitselect* input pin selects the WAIT signal at IC reset release time between WAIT0 input pin, WAIT1 input pin or WAIT2 input pin. At IC reset release time, these three pins have different polarity.

Table 16-224. Boot Control Interface Input Signals Description

| Signal Name | Width | Description |
|-----------------------|-------|--|
| <i>bootdevicesize</i> | 2 | Size of the device attached on CS0 0b00: 8-bit 0b01: 16-bit 0b10: Reserved 0b11: Reserved |
| <i>cs0muxdevice</i> | 2 | Multiplexing mode of the device on CS0 0b00: Nonmultiplexed device on CS0 0b01: AAD-multiplexed device on CS0 (address-address-data) 0b10: Address/Data-multiplexed device on CS0 0b11: Reserved |
| <i>bootwaiten</i> | 1 | Wait monitoring on CS0 at IC reset release time for read accesses 0: Wait pin is not monitored 1: Wait pin is monitored |
| <i>bootwaitselect</i> | 1 | Selection of the wait pin 0: WAIT0 input pin 1: WAIT1 input pin 2: WAIT2 input pin |

CAUTION

Using the internal boot code, the entire CS0 configuration can be modified before the first CS0 access. This modification of internal boot code is necessary for two external devices:

- NAND device attached to CS0
- Nonmultiplexed 2 Kbytes address range device attached to CS0

At reset time, the IC may boot from the internal ROM.

Reset values of the timing control parameters are defined to cope with direct boot on address and data multiplexed NOR Flash device, on non-multiplexed NOR Flash device or on any asynchronous device with large timing margins assuming a low GPMC_FCLK frequency (for example, 19.2Mhz) at boot time.

For a multiplexed access, the address 16 low-order bits are presented onto gpmc_ad[15:0] while the high-order bits are presented both onto gpmc_a[26:16]. If the external chip interface to the memories uses a 16-bit data bus, the high-order address bits are sampled on the address bus.

The reset values of timing parameters used at boot time are:

- CSONTIME = 1
- CSRDOFFTIME = 16
- ADVONTIME = 4
- ADVRDOFFTIME = 5
- OEONTIME = 6
- OEOFFTIME = 16
- RDACCESSTIME = 15
- RDCYCLETIME = 17

For an AAD-multiplexed access, all address bits are passed onto the data bus using two nADV rising edge. The first rising edge latches the address MSB down to bit 17 while the second rising edge latches address bits 16 down to 1. This configuration is only used for 16-bit memories.

The reset values of these timing parameters used at boot time are:

- ADVAADMUXONTIME = 1
- ADVAADMUXRDOFFTIME = 2
- OEAADMUXONTIME = 1
- OEAADMUXRDOFFTIME = 3

16.4.4.9 Address Decoder and Chip-Select Configuration

Addresses are decoded accordingly with the address request of the chip-select and the content of the chip-select base address register file, which includes a set of global GPMC configuration registers and eight sets of chip-select configuration registers.

The GPMC configuration register file is memory-mapped and can be read or written with byte, 16-bit word, or 32-bit word accesses. The register file should be configured as a noncacheable, nonbufferable region to prevent any desynchronization between host execution (write request) and the completion of register configuration (write completed with register updated). [Section 16.4.7, GPMC Register Manual](#) provides the GPMC register locations. For the map of GPMC memory locations, see [Chapter 2, Memory Mapping](#).

After the chip-select is configured, the access engine accesses the external device, drives the external interface control signals, and applies the interface protocol based on user-defined timing parameters and settings.

16.4.4.9.1 Chip-Select Base Address and Region Size

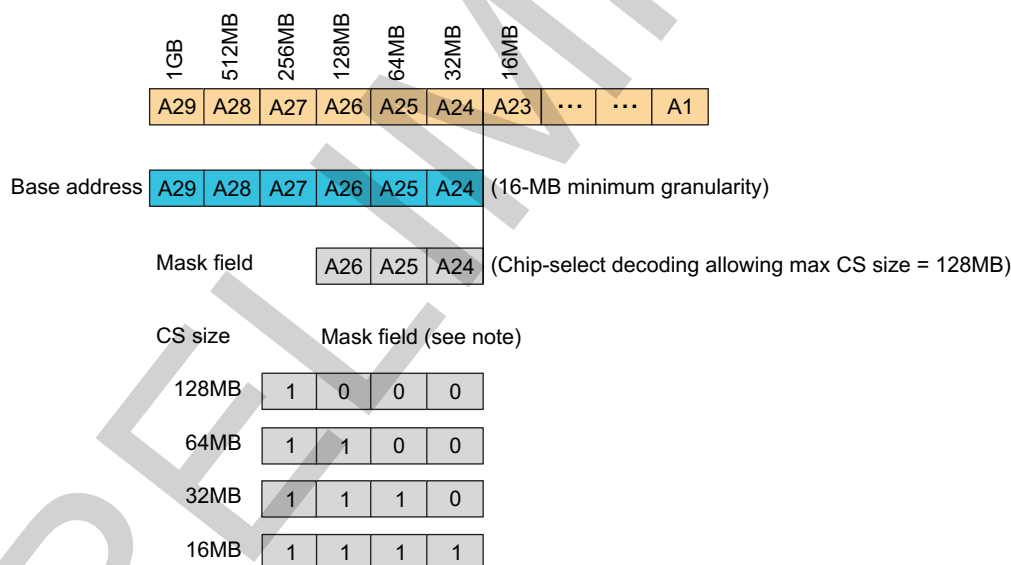
Any external memory or ASIC device attached to the GPMC external interface can be accessed by any device system host within the GPMC 1 Gbyte contiguous address space. For details, see [Chapter 2, Memory Mapping](#).

The GPMC 1G byte address space can be divided into a maximum of eight chip-select regions with programmable base address and programmable CS size. The CS size is programmable from 16M bytes to 128M bytes (must be a power-of-2) and is defined by the mask field. Attached memory smaller than the programmed CS region size is accessed through the entire CS region (aliasing).

Each chip-select has a 6-bit base address encoding and a 4-bit decoding mask, which must be programmed according to the following rules:

- The programmed chip-select region base address must be aligned on the chip-select region size address boundary and is limited to a power-of-2 address value. During access decoding, the register base address value is used for address comparison with the address-bit line mapping as described in [Figure 16-55](#) (with A0 as the device system byte-address line). Base address is programmed through the `GPMC_CONFIG7_i[5:0]` BASEADDRESS bit field
- The register mask is used to exclude some address lines from the decoding. A register mask bit field set to 0 suppresses the associated address line from the address comparison (incoming address bit line is don't care). The register mask value must be limited to the subsequent value, based on the desired chip-select region size. Any other value has an undefined result. When multiple chip-select regions with overlapping addresses are enabled concurrently, access to these chip-select regions is cancelled and a GPMC access error is posted. The mask field is programmed through the `GPMC_CONFIG7_i[11:8]` MASKADDRESS bit field.

Figure 16-55. Chip-Select Address Mapping and Decoding Mask



gpmc-006

Chip-select configuration (base and mask address or any protocol and timing settings) must be performed while the associated chip-select is disabled through the `GPMC_CONFIG7_i[6]` CSVALID bit (where *i* stands for the GPMC chip-select value, *i* = 0 to 7). In addition, a chip-select configuration can only be disabled if there is no ongoing access to that chip-select. This requires activity monitoring of the prefetch or write-posting engine if the engine is active on the chip-select. Also, the write buffer state must be monitored to wait for any posted write completion to the chip-select.

Any access attempted to a nonvalid GPMC address region (CSVALID disabled or address decoding outside a valid chip-select region) is not propagated to the external interface and a GPMC access error is posted. In case of chip-selects overlapping, an error is generated and no access will occur on either chip-select.

Chip-select 0 is the only chip-select region enabled after either a power-up or a GPMC reset.

CAUTION

Although the GPMC interface can drive up to 4 chip-selects, the frequency specified for this interface is for a specific load. If this load is exceeded, the maximum frequency cannot be reached. One solution is to implement a board with buffers, to allow the slowest device to maintain the total load on the lines.

16.4.4.9.2 Access Protocol

16.4.4.9.2.1 Supported Devices

The access protocol of each chip-select can be independently specified through the [GPMC_CONFIG1_i\[11:10\]](#) DEVICETYPE parameter (where i = 0 to 7) for:

- Random-access synchronous or asynchronous memory like NOR flash, SRAM
- NAND flash asynchronous devices

NOTE: For more information about the NAND flash GPMC basic programming model and NAND support, see [Section 16.4.4.13](#), *NAND Device Basic Programming Model*, and [Section 16.4.4.13.1](#), *NAND Memory Device in Byte or Word 16 Stream Mode*.

16.4.4.9.2.2 Access Size Adaptation and Device Width

Each chip-select can be independently configured through the [GPMC_CONFIG1_i\[13:12\]](#) DEVICESIZE field (i = 0 to 7) to interface with a 16-bit wide device or an 8-bit wide device. System requests with data width greater than the external device data bus width are split into successive accesses according to both the external device data-bus width and little-endian data organization.

NOTE: The device does not provide the A0 byte address line required for random-byte addressable 8-bit wide device interfacing (for both multiplexed and nonmultiplexed protocol). It limits the use of 8-bit wide device interfacing to byte-alias accesses. This limitation is not applicable to NAND device interfacing (8-bit wide or 16-bit wide devices).

16.4.4.9.2.3 Address/Data-Multiplexing Interface

For random synchronous or asynchronous memory interfacing (DEVICETYPE = 0b00), an address- and data-multiplexing protocol can be selected through the [GPMC_CONFIG1_i\[9:8\]](#) MUXADDDATA bit field (i = 0 to 7). The nADV signal must be used as the external device address latch control signal. For the associated chip-select configuration, nADV assertion and deassertion time and nOE assertion time must be set to the appropriate value to meet the address latch setup/hold time requirements of the external device. See [Section 16.4.3](#), *GPMC Integration*.

NOTE: This address/data-multiplexing interface is not applicable to NAND device interfacing. NAND devices require a specific address, command, and data multiplexing protocol. See [Section 16.4.4.13](#), *NAND Device Basic Programming Model*.

16.4.4.9.3 External Signals

16.4.4.9.3.1 WAIT Pin Monitoring Control

GPMC access time can be dynamically controlled using an external gpmc_wait pin when the external device access time is not deterministic and cannot be defined and controlled only using the GPMC internal RDACCESSTIME, WRACCESSTIME and PAGEBURSTACCESSTIME wait state generator.

The GPMC features three input wait pins: gpmc_wait2, gpmc_wait1 and gpmc_wait0. These pins allow control of external devices with different wait-pin polarity. They also allow the overlap of wait-pin assertion from different devices without affecting access to devices for which the wait pin is not asserted.

- The [GPMC_CONFIG1_i\[17:16\]](#) WAITPINSELECT field (i = 0 to 7) selects which input gpmc_wait pin is used for the device attached to the corresponding chip-select.
- The polarity of the wait pin is defined through the WAITxPINPOLARITY bit of the [GPMC_CONFIG](#) register. A wait pin configured to be active low means that low level on the WAIT signal indicates that the data is not ready and that the data bus is invalid. When WAIT is inactive, data is valid.

The GPMC access engine can be configured per CS to monitor the wait pin of the external memory device or not, based on the access type: read or write.

- The [GPMC_CONFIG1_i\[22\]](#) WAITREADMONITORING bit defines whether the wait pin should be monitored during read accesses or not.
- The [GPMC_CONFIG1_i\[21\]](#) WAITWRITEMONITORING bit defines whether the wait pin should be monitored during write accesses or not.

The GPMC access engine can be configured to monitor the wait pin of the external memory device asynchronously or synchronously with the GPMC_CLK clock, depending on the access type: synchronous or asynchronous (the [GPMC_CONFIG1_i\[29\]](#) READTYPE and [GPMC_CONFIG1_i\[27\]](#) WRITETYPE bits).

16.4.4.9.3.1.1 Wait Monitoring During an Asynchronous Read Access

When wait-pin monitoring is enabled for read accesses (WAITREADMONITORING), the effective access time is a logical AND combination of the RDACCESSTIME timing completion and the wait-deasserted state.

During asynchronous read accesses with wait-pin monitoring enabled, the wait pin must be at a valid level (asserted or deasserted) for at least two GPMC clock cycles before RDACCESSTIME completes, to ensure correct dynamic access-time control through wait-pin monitoring. The advance pipelining of the two GPMC clock cycles is the result of the internal synchronization requirements for the WAIT signal.

In this context, RDACCESSTIME is used as a WAIT invalid timing window and is set to such a value that the wait pin is at a valid state two GPMC clock cycles before RDACCESSTIME completes.

Similarly, during a multiple-access cycle (for example, asynchronous read page mode), the effective access time is a logical AND combination of PAGEBURSTACCESSTIME timing completion and the wait-deasserted state. Wait-monitoring pipelining is also applicable to multiple accesses (access within a page).

- WAIT monitored as active freezes the CYCLETIME counter. For an access within a page, when the CYCLETIME counter is by definition in a lock state, WAIT monitored as asserted extends the current access time in the page. Control signals are kept in their current state. The data bus is considered invalid, and no data are captured during this clock cycle.
- WAIT monitored as inactive unfreezes the CYCLETIME counter. For an access within a page, when the CYCLETIME counter is by definition in a lock state, WAIT monitored as inactive completes the current access time and starts the next access phase in the page. The data bus is considered valid, and data are captured during this clock cycle. In case of a single access or if this was the last access in a multiple-access cycle, all signals are controlled according to their related control timing value and according to the CYCLETIME counter status.

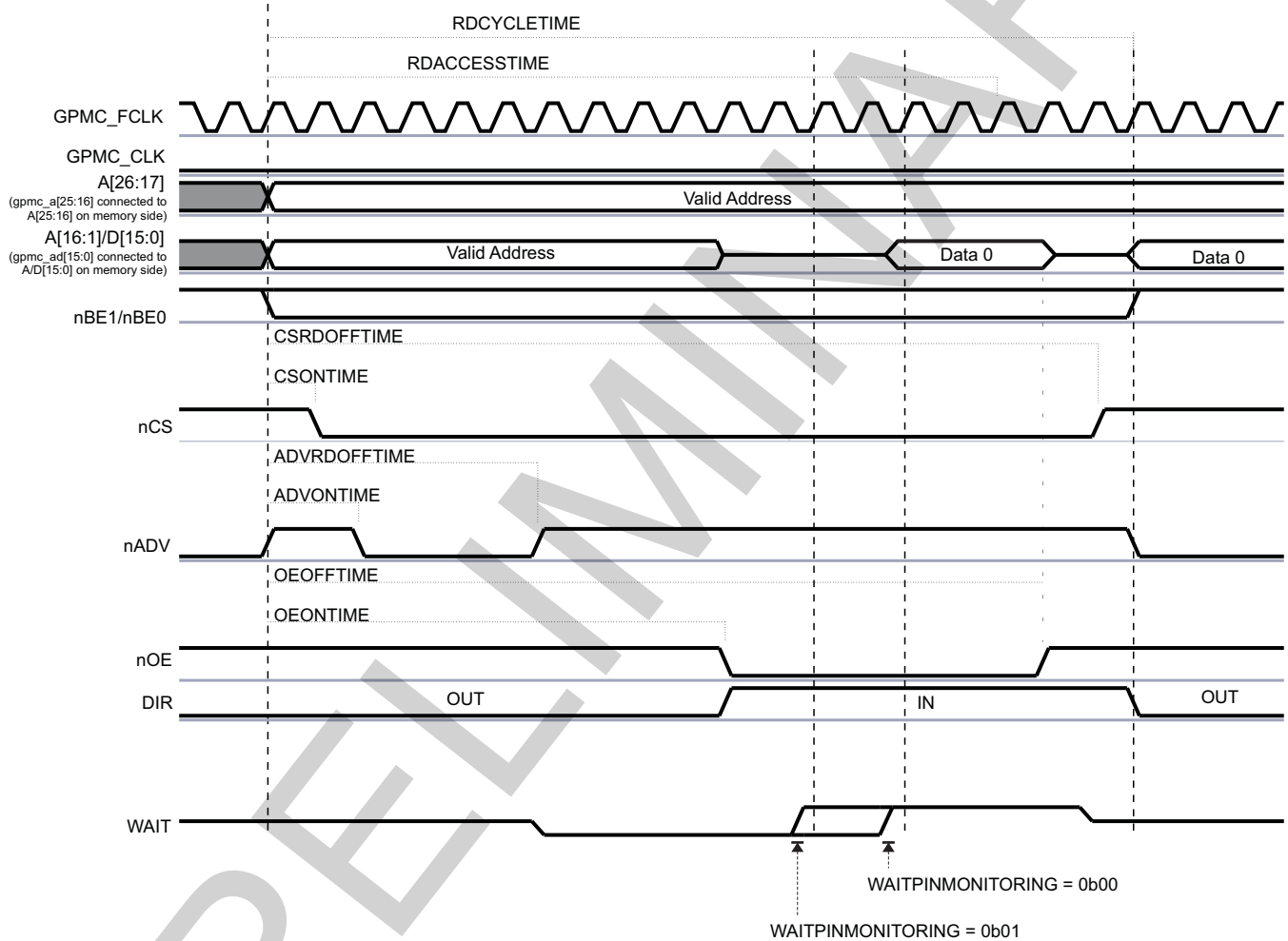
When a delay larger than two GPMC clocks must be observed between wait-pin deactivation time and data valid time (including the required GPMC and the device data setup time), an extra delay can be added between wait-pin deassertion time detection and effective data-capture time and the effective unlock of the CYCLETIME counter. This extra delay can be programmed in the [GPMC_CONFIG1_i\[19:18\]](#) WAITMONITORINGTIME field (i = 0 to 7).

NOTE:

- The WAITMONITORINGTIME parameter does not delay the wait-pin active or inactive detection, nor does it modify the two GPMC clocks pipelined detection delay.
- This extra delay is expressed as a number of GPMC_CLK clock cycles, even though the access is defined as asynchronous, and no GPMC_CLK clock is provided to the external device. Still, GPMCFCLKDIVIDER is used as a divider for the GPMC clock, so it must be programmed to define the correct WAITMONITORINGTIME delay.

Figure 16-56 shows wait behavior during an asynchronous single read access.

Figure 16-56. Wait Behavior During an Asynchronous Single Read Access (GPMCFCLKDivider = 1)



gpmc-008

NOTE: The WAIT signal is active low. [GPMC_CONFIG1_i\[19:18\]](#) WAITMONITORINGTIME = 0b00, or 0b01.

16.4.4.9.3.1.2 Wait Monitoring During an Asynchronous Write Access

When wait-pin monitoring is enabled for write accesses ([GPMC_CONFIG1_i\[21\]](#) WAITWRITEMONITORING bit = 0x1), the WAIT-invalid timing window is defined by the WRACCESSTIME field. WRACCESSTIME must be set so that the wait pin is at a valid state two GPMC clock cycles before WRACCESSTIME completes. The advance pipelining of the two GPMC clock cycles is the result of the internal synchronization requirements for the WAIT signal.

- WAIT monitored as active freezes the CYCLETIME counter. This informs the GPMC that the data bus is not captured by the external device. The control signals are kept in their current state. The data bus still drives the data.
- WAIT monitored as inactive unfreezes the CYCLETIME counter. This informs that the data bus is correctly captured by the external device. All signals, including the data bus, are controlled according to their related control timing value and to the CYCLETIME counter status.

When a delay larger than two GPMC clock cycles must be observed between wait-pin deassertion time and the effective data write into the external device (including the required GPMC data setup time and the device data setup time), an extra delay can be added between wait-pin deassertion time detection and effective data write time into the external device and the effective unfreezing of the CYCLETIME counter. This extra delay can be programmed in the [GPMC_CONFIG1_i\[19:18\]](#) WAITMONITORINGTIME fields ($i = 0$ to 7).

NOTE:

- The WAITMONITORINGTIME parameter does not delay the wait-pin assertion or deassertion detection, nor does it modify the two GPMC clock cycles pipelined detection delay.
- This extra delay is expressed as a number of GPMC_CLK clock cycles, even though the access is defined as asynchronous, and even though no clock is provided to the external device. Still, [GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER is used as a divider for the GPMC clock and so it must be programmed to define the correct WAITMONITORINGTIME delay.

16.4.4.9.3.1.3 Wait Monitoring During a Synchronous Read Access

During synchronous accesses with wait-pin monitoring enabled, the wait pin is captured synchronously with GPMC_CLK, using the rising edge of this clock.

The WAIT signal can be programmed to apply to the same clock cycle it is captured in. Alternatively, it can be sampled one or two GPMC_CLK cycles ahead of the clock cycle it applies to. This pipelining is applicable to the entire burst access, and to all data phase in the burst access. This WAIT pipelining depth is programmed in the [GPMC_CONFIG1_i\[19:18\]](#) WAITMONITORINGTIME field (where $i = 0$ to 7), and is expressed as a number of GPMC_CLK clock cycles.

In synchronous mode, when wait-pin monitoring is enabled ([GPMC_CONFIG1_i\[22\]](#) WAITREADMONITORING bit), the effective access time is a logical AND combination of the RDACCESSTIME timing completion and the WAIT deasserted-state detection.

Depending on the programmed WAITMONITORINGTIME value, the wait pin should be at a valid level, either asserted or deasserted:

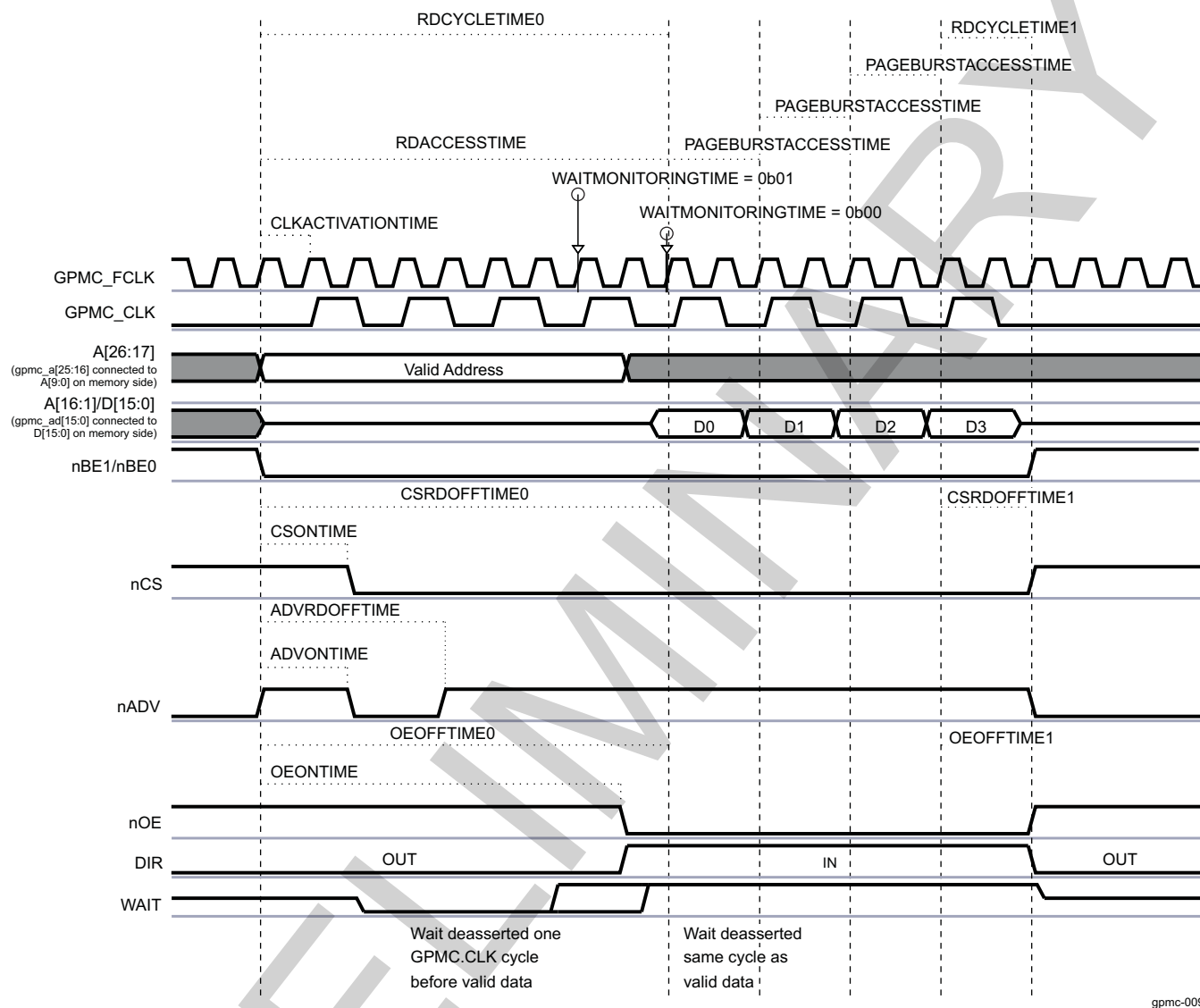
- In the same clock cycle the data is valid if WAITMONITORINGTIME = 0 (at RDACCESSTIME completion)
- In the WAITMONITORINGTIME x (GPMCFCLKDIVIDER + 1) GPMC_FCLK clock cycles before RDACCESSTIME completion if WAITMONITORINGTIME not equal to 0

Similarly, during a multiple-access cycle (burst mode), the effective access time is a logical AND combination of PAGEBURSTACCESSTIME timing completion and the wait-inactive state. The Wait pipelining depth programming applies to the whole burst access.

- WAIT monitored as active freezes the CYCLETIME counter. For an access within a burst (when the CYCLETIME counter is by definition in a lock state), WAIT monitored as active extends the current access time in the burst. Control signals are kept in their current state. The data bus is considered invalid, and no data are captured during this clock cycle.
- WAIT monitored as inactive unfreezes the CYCLETIME counter. For an access within a burst (when the CYCLETIME counter is by definition in lock state), WAIT monitored as inactive completes the current access time and starts the next access phase in the burst. The data bus is considered valid, and data are captured during this clock cycle. In a single access or if this was the last access in a multiple-access cycle, all signals are controlled according to their relative control timing value and the CYCLETIME counter status.

Figure 16-57 shows wait behavior during a synchronous read burst access.

Figure 16-57. Wait Behavior During a Synchronous Read Burst Access



NOTE: The WAIT signal is active low. WAITMONITORINGTIME = 00, 01.

16.4.4.9.3.1.4 Wait Monitoring During a Synchronous Write Access

During synchronous accesses with wait-pin monitoring enabled (the WAITWRITEMONITORING bit), the wait pin is captured synchronously with GPMC_CLK, using the rising edge of this clock.

If enabled, external wait-pin monitoring can be used in combination with WRACCESSTIME to delay the effective memory device GPMC_CLK capture edge.

Wait-monitoring pipelining depth is similar to synchronous read access:

- At WRACCESSTIME completion if WAITMONITORINGTIME = 0
- In the WAITMONITORINGTIME x (GPMCFCLKDIVIDER + 1) GPMC_FCLK cycles before WRACCESSTIME completion if WAITMONITORINGTIME not equal to 0.

Wait-monitoring pipelining definition applies to whole burst accesses:

- WAIT monitored as active freezes the CYCLETIME counter. For accesses within a burst, when the CYCLETIME counter is by definition in a lock state, WAIT monitored as active indicates that the data bus is not being captured by the external device. Control signals are kept in their current state. The data bus is kept in its current state.
- WAIT monitored as inactive unfreezes the CYCLETIME counter. For accesses within a burst, when the CYCLETIME counter is by definition in a lock state, WAIT monitored as inactive indicates the effective data capture of the bus by the external device and starts the next access of the burst. In case of a single access or if this was the last access in a multiple access cycle, all signals, including the data bus, are controlled according to their related control timing value and the CYCLETIME counter status.

NOTE: Wait monitoring is supported for all configurations except for [GPMC_CONFIG1_i\[19:18\]](#) WAITMONITORINGTIME = 0x0 (where i = 0 to 7) for write bursts with a clock divider of 1 or 2 ([GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER field equal to 0x0 or 0x1 respectively).

16.4.4.9.3.1.5 WAIT with NAND Device

For details about the use of the wait pin for communication with a NAND flash external device, see [Section 16.4.4.13.2, NAND Device-Ready Pin](#).

16.4.4.9.3.1.6 Idle Cycle Control Between Successive Accesses

16.4.4.9.3.1.6.1 Bus Turnaround (BUSTURNAROUND)

To prevent data-bus contention, an access that follows a read access to a slow memory/device must be delayed (in other words, control the nCS/nOE de-assertion to data bus in high-impedance delay).

The bus turnaround is a time-out counter starting after nCS or nOE de-assertion time, whichever occurs first, and delays the next access start-cycle time. The counter is programmed through the [GPMC_CONFIG6_i\[3:0\]](#) BUSTURNAROUND bit field (where i = 0 to 7).

After a read access to a chip-select with a non zero BUSTURNAROUND, the next access is delayed until the BUSTURNAROUND delay completes, if the next access is one of the following:

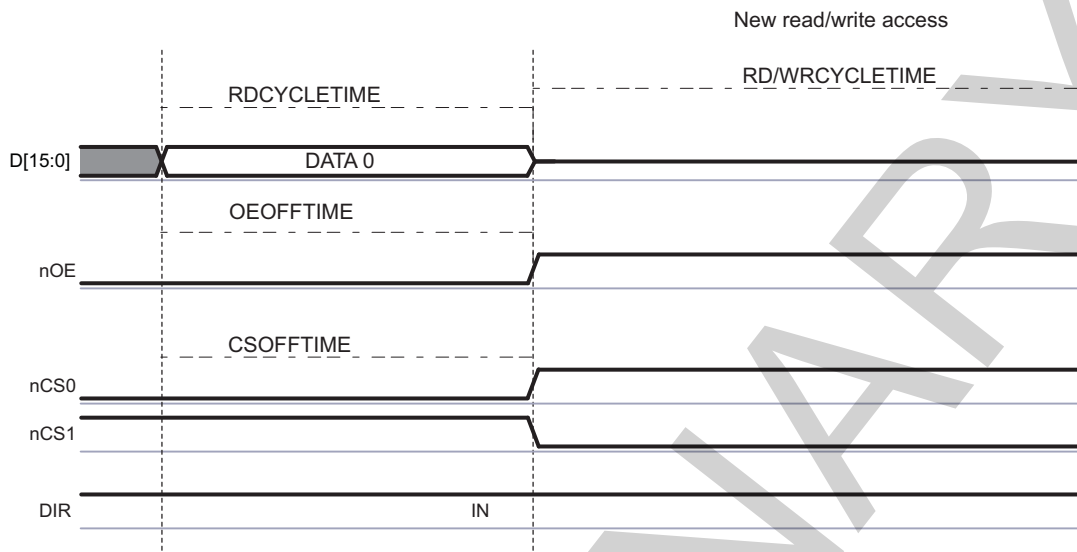
- A write access to any chip-select (same or different from the chip-select data was read from)
- A read access to a different chip-select from the chip-select data was read access from
- A read or write access to a chip-select associated with an address/data-multiplexed device

NOTE: Bus keeping starts after bus turnaround completion so that DIR changes from IN to OUT after bus turnaround. The bus will not have enough time to go into high-impedance even though it could be driven with the same value before bus turnaround timing.

BUSTURNAROUND delay runs in parallel with [GPMC_CONFIG6_i\[3:0\]](#) CYCLE2CYCLEDELAY delays. It should be noted that BUSTURNAROUND is a timing parameter for the ending chip-select access while CYCLE2CYCLEDELAY is a timing parameter for the following chip-select access. The effective minimum delay between successive accesses is driven by these delay timing parameters and by the access type of the following access. See [Figure 16-58](#) to [Figure 16-60](#).

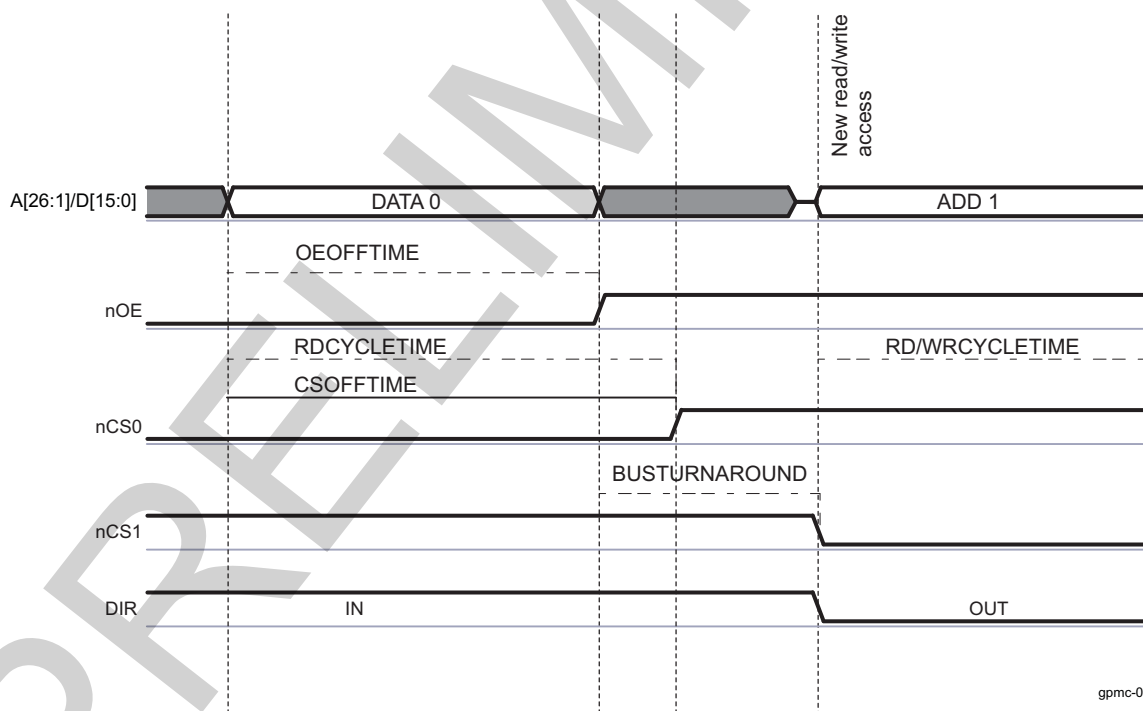
Another way to prevent bus contention is to define an earlier nCS or nOE deassertion time for slow devices or to extend the value of RDCYCLETIME. Doing this prevents bus contention, but affects all accesses of this specific chip-select.

Figure 16-58. Read to Read for an Address-Data Multiplexed Device, on Different CS, without Bus Turnaround (nCS0 attached to a fast device)



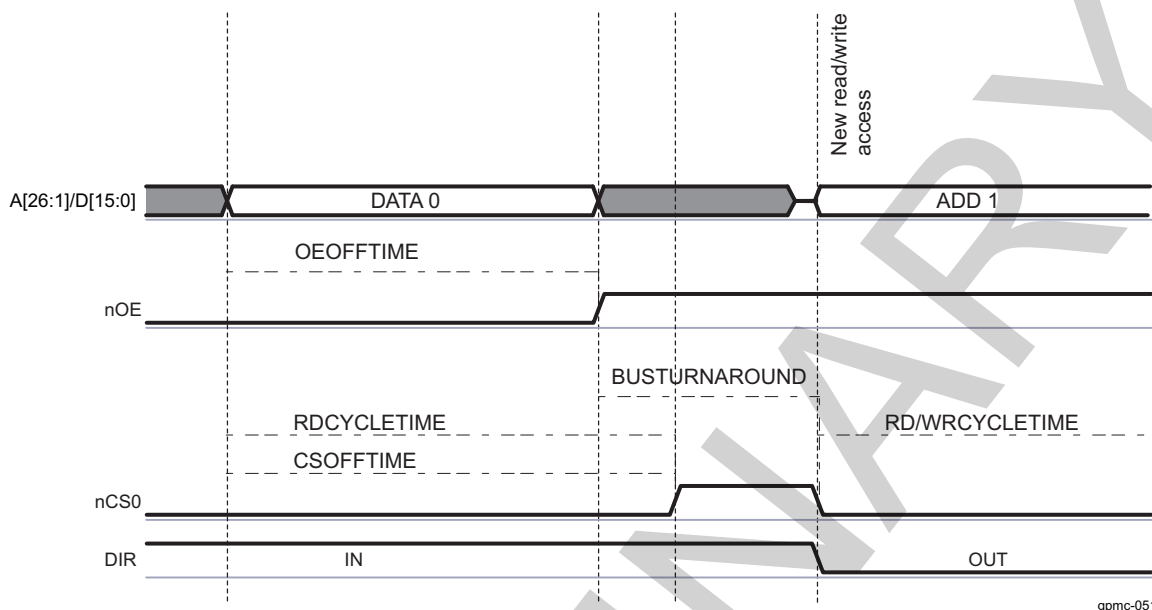
gpmc-049

Figure 16-59. Read to Read / Write for an Address-Data Multiplexed Device, on Different CS, with Bus Turnaround



gpmc-050

Figure 16-60. Read to Read / Write for a Address-Data or AAD-multiplexed device, on the Same CS, with Bus Turnaround



16.4.4.9.3.1.6.2 Idle Cycles Between Accesses to Same Chip-Select (CYCLE2CYCLESAMEECSEN, CYCLE2CYCLEDELAY)

Some devices require a minimum chip-select signal inactive time between accesses. The [GPMC_CONFIG6_i\[7\]](#) CYCLE2CYCLESAMEECSEN bit ($i = 0$ to 7) enables insertion of a minimum number of GPMC_FCLK cycles, defined by the [GPMC_CONFIG6_i\[11:8\]](#) CYCLE2CYCLEDELAY field, between successive accesses of any type (read or write) to the same chip-select.

If CYCLE2CYCLESAMEECSEN is enabled, any subsequent access to the same chip-select is delayed until its CYCLE2CYCLEDELAY completes. The CYCLE2CYCLEDELAY counter starts when CSRDOFFTIME/CSWROFFTIME completes.

The same applies to successive accesses occurring during 32-bit word or burst accesses split into successive single accesses when the single-access mode is used ([GPMC_CONFIG1_i\[30\]](#) READMULTIPLE = 0 or [GPMC_CONFIG1_i\[28\]](#) WRITEMULTIPLE = 0).

All control signals (CS, ADV#/ALE, BE0#/CLE, WE#, and GPMC.CLK) are kept inactive (ADV#/ALE, BE0#/CLE, and GPMC.CLK at low level; and CS, OE#/RE, and WE at high level) during the idle GPMC_FCLK cycles. This prevents back-to-back accesses to the same chip-select without idle cycles between accesses.

16.4.4.9.3.1.6.3 Idle Cycles Between Accesses to Different Chip-Select (CYCLE2CYCLEDIFFECSEN, CYCLE2CYCLEDELAY)

Because of the pipelined behavior of the system, successive accesses to different chip-selects can occur back-to-back with no idle cycles between accesses. Depending on the control signals (nCS , $nADV/ALE$, $nBE0/CLE$, nOE/RE , nWE) assertion and de-assertion timing parameters and on the IC timing parameters, some control signals assertion times may overlap between the successive accesses to different CS. Similarly, some control signals (WE, OE/RE) may not respect required transition times.

To work around the overlapping and to observe the required control-signal transitions, a minimum of CYCLE2CYCLEDELAY inactive cycles is inserted between the access being initiated to this chip-select and the previous access ending for a different chip-select. This applies to any type of access (read or write).

If [GPMC_CONFIG6_i\[6\]](#) CYCLE2CYCLEDIFFCSEN is enabled, the chip-select access is delayed until CYCLE2CYCLEDELAY cycles have expired since the end of a previous access to a different chip-select. CYCLE2CYCLEDELAY count starts at CSRDOFFTIME/CSWROFFTIME completion. All control signals are kept inactive during the idle GPMC_FCLK cycles.

NOTE: CYCLE2CYCLESAMECSEN and CYCLE2CYCLEDIFFCSEN should be set in [GPMC_CONFIG6_i](#) registers to respectively get idle cycles inserted between accesses on this chip-select and after accesses to a different chip-select.

The CYCLE2CYCLEDELAY delay runs in parallel with the BUSTURNAROUND delay. It should be noted that BUSTURNAROUND is a timing parameter defined for the ending chip-select access, whereas CYCLE2CYCLEDELAY is a timing parameter defined for the starting chip-select access. The effective minimum delay between successive accesses is based on the larger delay timing parameter and on access type combination, since bus turnaround does not apply to all access types. See [Section 16.4.4.9.3.1.6.1, Bus Turnaround \(BUSTURNAROUND\)](#) for more details on bus turnaround.

[Table 16-225](#) describes the configuration required for idle cycle insertion.

Table 16-225. Idle Cycle Insertion Configuration

| 1st Access Type | BUSTURN AROUND Timing Parameter | Second Access Type | Chip-Select | Add/Data Multiplexed | CYCLE2 CYCLE SAMECSEN Parameter | CYCLE2 CYCLE DIFFCSEN Parameter | Idle Cycle Insertion Between the Two Accesses |
|-----------------|---------------------------------|--------------------|-------------|----------------------|---------------------------------|---------------------------------|--|
| R/W | = 0 | R/W | Any | Any | 0 | x | No idle cycles are inserted if the two accesses are well pipelined. |
| R | 0 | R | Same | Nonmuxed | x | 0 | No idle cycles are inserted if the two accesses are well pipelined. |
| R | 0 | R | Different | Nonmuxed | 0 | 0 | BUSTURNAROUND cycles are inserted. |
| R | 0 | R/W | Any | Muxed | 0 | 0 | BUSTURNAROUND cycles are inserted. |
| R | 0 | W | Any | Any | 0 | 0 | BUSTURNAROUND cycles are inserted. |
| W | 0 | R/W | Any | Any | 0 | 0 | No idle cycles are inserted if the two accesses are well pipelined. |
| R/W | = 0 | R/W | Same | Any | 1 | x | CYCLE2CYCLEDELAY cycles are inserted. |
| R/W | = 0 | R/W | Different | Any | x | 1 | CYCLE2CYCLEDELAY cycles are inserted. |
| R/W | 0 | R/W | Same | Any | 1 | x | CYCLE2CYCLEDELAY cycles are inserted. If BTA idle cycles already apply on these two back-to-back accesses, the effective delay is max (BUSTURNAROUND, CYCLE2CYCLEDELAY). |
| R/W | 0 | R/W | Different | Any | x | 1 | CYCLE2CYCLEDELAY cycles are inserted. If BTA idle cycles already apply on these two back-to-back accesses, the effective delay is maximum (BUSTURNAROUND, CYCLE2CYCLEDELAY). |

16.4.4.9.3.1.7 Slow Device Support (TIMEPARAGRANULARITY Parameter)

All access-timing parameters can be multiplied by 2 by setting the [GPMC_CONFIG1_i\[4\]](#) TIMEPARAGRANULARITY bit (where i stands for the GPMC chip-select value, i = 0 to 7). Increasing all access timing parameters allows support of slow devices.

16.4.4.9.3.2 *gpmc_io_dir Pin*

The `gpmc_io_dir` pin is used to control I/O direction on the GPMC data bus `gpmc_ad[15:0]`. Depending on top-level pad multiplexing, this signal can be output and used externally to the device, if required.

The `gpmc_io_dir` pin is low during transmit (OUT) and high during receive (IN).

For write accesses, the `gpmc_io_dir` pin stays OUT from start-cycle time to end-cycle time.

For read accesses, the `gpmc_io_dir` pin goes from OUT to IN at `nOE` assertion time and stays IN until:

- BUSTURNAROUND is enabled:
 - The `gpmc_io_dir` pin goes from IN to OUT at end-cycle time plus programmable bus turnaround time.
- BUSTURNAROUND is disabled:
 - After an asynchronous read access, the `gpmc_io_dir` pin goes from IN to OUT at `RDACCESSTIME + 1 GPMC_FCLK` cycle or when `RDCYCLETIME` completes, whichever occurs last.
 - After a synchronous read access, the `gpmc_io_dir` pin goes from IN to OUT at `RDACCESSTIME + 2 GPMC_FCLK` cycles or when `RDCYCLETIME` completes, whichever occurs last.

Because of the bus-keeping feature of the GPMC, after a read or write access and with no other accesses pending, the default value of the `gpmc_io_dir` pin is OUT (see [Section 16.4.4.10.10, Bus Keeping Support](#)).

In nonmultiplexed devices, the `gpmc_io_dir` pin stays IN between two successive read accesses to prevent unnecessary toggling (nonmultiplexed 16-bit wide devices support is limited to 2 Kbytes).

16.4.4.9.3.3 *Reset*

No reset signal is sent to the external memory device by the GPMC. For more information about external-device reset, see [Chapter 3, Power, Reset, and Clock Management](#).

The PRCM module provides an input pin, `global_rst_n`, to the GPMC:

- The `global_rst_n` pin is activated during device warm reset and cold reset.
- The `global_rst_n` pin initializes the internal state-machine and the internal configuration registers.

16.4.4.9.3.4 *Write Protect Signal (nWP)*

When connected to the attached memory device, the write protect signal can enable or disable the lockdown function of the attached memory.

The `gpmc_nwp` output pin value is controlled through the `GPMC_CONFIG[4]` WRITEPROTECT bit, which is common to all CS.

16.4.4.9.3.5 *Byte Enable (nBE1/nBE0)*

Byte enable signals (`nBE1/nBE0`) are:

- Valid (asserted or nonasserted according to the incoming system request) from access start to access completion for asynchronous and synchronous single accesses
- Asserted low from access start to access completion for asynchronous and synchronous multiple read accesses
- Valid (asserted or nonasserted, according to the incoming system request) synchronously to each written data for synchronous multiple write accesses

16.4.4.9.4 *Error Handling*

When an error occurs in the GPMC, the error information is stored in the `GPMC_ERR_TYPE` register and the address of the illegal access is stored in the `GPMC_ERR_ADDRESS` register. The GPMC only keeps the first error abort information until the `GPMC_ERR_TYPE` register is reset. Subsequent accesses that cause errors are not logged until the error is cleared by hardware with the `GPMC_ERR_TYPE[0]` ERRORVALID bit.

- **ERRORNOTSUPPADD** occurs when an incoming system request address decoding does not match any valid chip-select region, or if two chip-select regions are defined as overlapped, or if a register file access is tried outside the valid address range of 1 Kbyte.
- **ERRORNOTSUPPMCMD** occurs when an unsupported command request is decoded at the L3 interconnect interface.
- **ERRORTIMEOUT**: A time-out mechanism prevents the system from hanging. The start value of the 9-bit time-out counter is defined in the [GPMC_TIMEOUT_CONTROL](#) register and enabled with the [GPMC_TIMEOUT_CONTROL\[0\] TIMEOUTENABLE](#) bit. When enabled, the counter starts at start-cycle time until it reaches 0 and data is not responded to from memory, then a time-out error occurs. When data are sent from memory, this counter is reset to its start value. With multiple accesses (asynchronous page mode or synchronous burst mode), the counter is reset to its start value for each data access within the burst.

The GPMC does not generate interrupts on these errors. True abort to the MPU or interrupt generation is handled at interconnect level.

16.4.4.10 Timing Setting

The GPMC offers the maximum flexibility to support various access protocols. Most of the timing parameters of the protocol access used by the GPMC to communicate with attached memories or devices are programmable on a chip-select basis. Assertion and deassertion times of control signals are defined to match the attached memory or device timing specifications and to get maximum performance during accesses. For more information on GPMC_CLK and GPMC_FCLK see [Section 16.4.4.10.6, GPMC_CLK](#).

NOTE: In the following sections, the start access time refer to the time at which the access begins.

16.4.4.10.1 Read Cycle Time and Write Cycle Time (RDCYCLETIME / WRCYCLETIME)

The [GPMC_CONFIG5_i\[4:0\] RDCYCLETIME](#) and [GPMC_CONFIG5_i\[12:8\] WRCYCLETIME](#) fields ($i = 0$ to 7) define the address bus and byte enables valid times for read and write accesses. To ensure a correct duty cycle of GPMC_CLK between accesses, RDCYCLETIME and WRCYCLETIME are expressed in GPMC_FCLK cycles and must be multiples of the GPMC_CLK cycle. RDCYCLETIME and WRCYCLETIME bit fields can be set with a granularity of 1 or 2 through [GPMC_CONFIG1_i\[4\] TIMEPARAGRANULARITY](#).

When either RDCYCLETIME or WRCYCLETIME completes, if they are not already deasserted, all control signals (nCS, nADV/ALE, nOE/RE, nWE, and BE0/CLE) are deasserted to their reset values, regardless of their deassertion time parameters.

An exception to this forced deassertion occurs when a pipelined request to the same chip-select or to a different chip-select is pending. In such a case, it is not necessary to deassert a control signal with deassertion time parameters equal to the cycle-time parameter. This exception to forced deassertion prevents any unnecessary glitches. This requirement also applies to BE signals, thus avoiding an unnecessary BE glitch transition when pipelining requests.

NOTE: All control signals (CS, ADV#/ALE, BE0#/CLE, WE#, and GPMC.CLK) are kept inactive (ADV#/ALE, BE0#/CLE, and GPMC.CLK at low level; and CS, OE#/RE, and WE at high level) during the idle GPMC.FCLK cycles.

If no inactive cycles are required between successive accesses to the same or to a different chip-select ([GPMC_CONFIG6_i\[7\] CYCLE2CYCLESAMECSSEN = 0](#) or [GPMC_CONFIG6_i\[6\] CYCLE2CYCLEDIFFCSSEN = 0](#), where $i = 0$ to 7), and if assertion-time parameters associated with the pipelined access are equal to 0, asserted control signals (nCS, nADV/ALE, nBE0/CLE, nWE, and nOE/RE) are kept asserted. This applies to any read/write to read/write access combination.

If inactive cycles are inserted between successive accesses, that is, [CYCLE2CYCLESAMECSSEN = 1](#) or [CYCLE2CYCLEDIFFCSSEN = 1](#), the control signals are forced to their respective default reset values for the number of GPMC_FCLK cycles defined in [CYCLE2CYCLEDELAY](#).

16.4.4.10.2 nCS: Chip-Select Signal Control Assertion/Deassertion Time (CSONTIME / CSRDOFFTIME / CSWROFFTIME / CSEXTRADELAY)

The [GPMC_CONFIG2_i\[3:0\]](#) CSONTIME field (where i = 0 to 7) defines the nCS signal-assertion time relative to the start access time. It is common for read and write accesses.

[GPMC_CONFIG2_i\[12:8\]](#) CSRDOFFTIME (read access) and [GPMC_CONFIG2_i\[20:16\]](#) CSWROFFTIME (write access) bit fields define the nCS signal deassertion time relative to start access time.

CSONTIME, CSRDOFFTIME and CSWROFFTIME parameters are applicable to synchronous and asynchronous modes. CSONTIME can be used to control an address and byte enable setup time before chip-select assertion. CSRDOFFTIME and CSWROFFTIME can be used to control an address and byte enable hold time after chip-select deassertion.

nCS signal transitions as controlled through CSONTIME, CSRDOFFTIME, and CSWROFFTIME can be delayed by half a GPMC_FCLK period by enabling the [GPMC_CONFIG2_i\[7\]](#) CSEXTRADELAY bit. This half of a GPMC_FCLK period provides more granularity on the nCS assertion and deassertion time to guarantee proper setup and hold time relative to GPMC_CLK. CSEXTRADELAY is especially useful in configurations where GPMC_CLK and GPMC_FCLK have the same frequency, but can be used for all GPMC configurations. If enabled, CSEXTRADELAY applies to all parameters controlling nCS transitions.

The CSEXTRADELAY bit must be used carefully to avoid control-signal overlap between successive accesses to different chip-selects. This implies the need to program the RDCYCLETIME and WRCYCLETIME bit fields to be greater than the nCS signal-deassertion time, including the extra half-GPMC_FCLK-period delay.

16.4.4.10.3 nADV/ALE: Address Valid/Address Latch Enable Signal Control Assertion/Deassertion Time (ADVONTIME / ADVRDOFFTIME / ADVWROFFTIME / ADVEXTRADELAY/ADVAADMUXONTIME/ADVAADMUXRDOFFTIME/ADVAADMUXWROFFTIME)

The [GPMC_CONFIG3_i\[3:0\]](#) ADVONTIME field (where i = 0 to 7) defines the nADV/ALE signal-assertion time relative to start access time. It is common to read and write accesses.

[GPMC_CONFIG3_i\[12:8\]](#) ADVRDOFFTIME (read access) and [GPMC_CONFIG3_i\[20:16\]](#) ADVWROFFTIME (write access) bit fields define the nADV/ALE signal-deassertion time relative to start access time.

ADVONTIME can be used to control an address and byte enable valid setup time control before nADV/ALE assertion. ADVRDOFFTIME and ADVWROFFTIME can be used to control an address and byte enable valid hold time control after nADV/ALE de-assertion. ADVRDOFFTIME and ADVWROFFTIME are applicable to both synchronous and asynchronous modes.

nADV/ALE signal transitions as controlled through ADVONTIME, ADVRDOFFTIME, and ADVWROFFTIME can be delayed by half a GPMC_FCLK period by enabling the [GPMC_CONFIG3_i\[7\]](#) ADVEXTRADELAY bit. This half of a GPMC_FCLK period provides more granularity on nADV/ALE assertion and deassertion time to guarantee proper setup and hold time relative to GPMC_CLK. The ADVEXTRADELAY configuration parameter is especially useful in configurations where GPMC_CLK and GPMC_FCLK have the same frequency, but can be used for all GPMC configurations. If enabled, ADVEXTRADELAY applies to all parameters controlling nADV/ALE transitions.

ADVEXTRADELAY must be used carefully to avoid control-signal overlap between successive accesses to different chip-selects. This implies the need to program the RDCYCLETIME and WRCYCLETIME bit fields to be greater than nADV/ALE signal-deassertion time, including the extra half-GPMC_FCLK-period delay.

[GPMC_CONFIG3_i\[6:4\]](#) ADVAADMUXONTIME, [GPMC_CONFIG3_i\[26:24\]](#) ADVAADMUXRDOFFTIME, and [GPMC_CONFIG3_i\[30:28\]](#) ADVAADMUXWROFFTIME parameters have the same functions as ADVONTIME, ADVRDOFFTIME, and ADVWROFFTIME, but apply to the first address phase in the AAD-multiplexed protocol. It is the user responsibility to make sure ADVAADMUXxxOFFTIME is programmed to a value lower than or equal to ADVxxOFFTIME. Functionality in AAD-mux mode is undefined if the settings do not comply with this requirement. ADVAADMUXxxOFFTIME can be programmed to the same value as ADVONTIME if no high nADV pulse is needed between the two AAD-mux address phases, which is the typical case in synchronous mode. In this configuration, nADV is kept low until it reaches the correct ADVxxOFFTIME.

See [Section 16.4.4.13](#), *NAND Access Description* for more details on ADVONTIME, ADVRDOffTIME, ADVWROffTIME, and ADVAADMUXRDOffTIME, ADVAADMUXWROffTIME usage for CLE and ALE (Command / Address Latch Enable) usage for a NAND Flash interface.

16.4.4.10.4 nOE/nRE: Output Enable / Read Enable Signal Control Assertion / Deassertion Time (OEONTIME / OEOFFTIME / OEEXTRADELAY / OEAADMUXONTIME / OEAADMUXOFFTIME)

The [GPMC_CONFIG4_i\[3:0\]](#) OEONTIME field (where i = 0 to 7) defines the nOE/nRE signal assertion time relative to start access time. It is applicable only to read accesses.

The [GPMC_CONFIG4_i\[12:8\]](#) OEOFFTIME field defines the nOE/nRE signal deassertion time relative to start access time. It is applicable only to read accesses. nOE/nRE is not asserted during a write cycle.

OEONTIME, OEOFFTIME, OEAADMUXONTIME and OEAADMUXOFFTIME parameters are applicable to synchronous and asynchronous modes. OEONTIME can be used to control an address and byte enable valid setup time control before nOE/nRE assertion. OEOFFTIME can be used to control an address and byte enable valid hold time control after nOE/nRE assertion.

OEAADMUXONTIME and OEAADMUXOFFTIME parameters have the same functions as OEONTIME and OEOFFTIME, but apply to the first OE assertion in the AAD-multiplexed protocol for a read phase, or to the only OE assertion for a write phase. It is the user responsibility to make sure OEAADMUXOFFTIME is programmed to a value lower than OEONTIME. Functionality in AAD-mux mode is undefined if the settings do not comply with this requirement. OEAADMUXOFFTIME shall never be equal to OEONTIME because the AAD-mux protocol requires a second address phase with the nOE signal deasserted before nOE can be asserted again to define a read command.

The nOE/RE signal transitions as controlled through OEONTIME, OEOFFTIME, OEAADMUXONTIME and OEAADMUXOFFTIME can be delayed by half a GPMC_FCLK period by enabling the [GPMC_CONFIG4_i\[7\]](#) OEEXTRADELAY bit. This half of a GPMC_FCLK period provides more granularity on nOE/RE assertion and deassertion time to guaranty proper setup and hold time relative to GPMC_CLK. If enabled, OEEXTRADELAY applies to all parameters controlling nOE/nRE transitions.

OEEXTRADELAY must be used carefully, to avoid control-signal overlap between successive accesses to different chip-selects. This implies the need to program RDCYCLETIME and WRCYCLETIME to be greater than nOE/RE signal-deassertion time, including the extra half-GPMC_FCLK-period delay.

NOTE: When the GPMC generates a read access to an address-/data-multiplexed device, it drives the address bus until nOE assertion time.

16.4.4.10.5 nWE: Write Enable Signal Control Assertion / Deassertion Time (WEONTIME / WEOFFTIME / WEEXTRADELAY)

The [GPMC_CONFIG4_i\[19:16\]](#) WEONTIME field (where i = 0 to 7) defines the nWE signal-assertion time relative to start access time. The [GPMC_CONFIG4_i\[28:24\]](#) WEOFFTIME field defines the nWE signal-deassertion time relative to start access time. These bit fields only apply to write accesses. nWE is not asserted during a read cycle.

WEONTIME can be used to control an address and byte enable valid setup time control before nWE assertion. WEOFFTIME can be used to control an address and byte enable valid hold time control after nWE assertion.

nWE signal transitions as controlled through WEONTIME, and WEOFFTIME can be delayed by half a GPMC_FCLK period by enabling the [GPMC_CONFIG4_i\[23\]](#) WEEXTRADELAY bit. This half of a GPMC_FCLK period provides more granularity on nWE assertion and deassertion time to guaranty proper setup and hold time relative to GPMC_CLK. If enabled, WEEXTRADELAY applies to all parameters controlling nWE transitions.

The WEEXTRADELAY bit must be used carefully to avoid control-signal overlap between successive accesses to different chip-selects. This implies the need to program the WRCYCLETIME bit field to be greater than the nWE signal-deassertion time, including the extra half-GPMC_FCLK-period delay.

16.4.4.10.6 GPMC_CLK

GPMC_CLK is the external clock provided to the attached synchronous memory or device.

- The GPMC_CLK clock frequency is the GPMC_FCLK functional clock frequency divided by 1, 2, 3, or 4, depending on the [GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER bit field (where $i = 0$ to 7), with a guaranteed 50-percent duty cycle.
- The GPMC_CLK clock is only activated when the access in progress is defined as synchronous (read or write access).
- The [GPMC_CONFIG1_i\[26:25\]](#) CLKACTIVATIONTIME field ($i = 0$ to 7) defines the number of GPMC_FCLK cycles from start access time to GPMC_CLK activation.
- The GPMC_CLK clock is stopped when cycle time completes and is asserted low between accesses.
- The GPMC_CLK clock is kept low when access is defined as asynchronous.

CAUTION

When cycle time completes, the GPMC_CLK may be high because of the GPMCFCLKDIVIDER bit field. To ensure correct stoppage of the GPMC_CLK clock within the 50-percent required duty cycle, it is the user's responsibility to extend the RDCYCLETIME or WRCYCLETIME value.

NOTE: To ensure a correct external clock cycle, the following rules must be applied:

- (RDCYCLETIME CLKACTIVATIONTIME) must be a multiple of (GPMCFCLKDIVIDER + 1).
- The PAGEBURSTACCESSTIME value must be a multiple of (GPMCFCLKDIVIDER + 1).

16.4.4.10.7 GPMC_CLK and Control Signals Setup and Hold

Control-signal transition (assertion and deassertion) setup and hold values with respect to the GPMC_CLK edge can be controlled in the following ways:

- For the GPMC_CLK signal, the [GPMC_CONFIG1_i\[26:25\]](#) CLKACTIVATIONTIME field ($i = 0$ to 7) allows setup and hold control of control-signal assertion time.
- The use of a divided GPMC_CLK allows setup and hold control of control-signal assertion and deassertion times.
- When GPMC_CLK runs at the GPMC_FCLK frequency so that GPMC_CLK edge and control-signal transitions refer to the same GPMC_FCLK edge, the control-signal transitions can be delayed by half of a GPMC_FCLK period to provide minimum setup and hold times. This half-GPMC_FCLK delay is enabled with the CSEXTRADELAY, ADVEXTRADELAY, OEEXTRADELAY, or WEEXTRADELAY parameter. This delay must be used carefully to prevent control-signal overlap between successive accesses to different chip-selects. This implies that the RDCYCLETIME and WRCYCLETIME are greater than the last control-signal deassertion time, including the extra half-GPMC_FCLK cycle.

16.4.4.10.8 Access Time (RDACCESSTIME / WRACCESSTIME)

The read access time and write access time durations can be programmed independently through [GPMC_CONFIG5_i\[20:16\]](#) RDACCESSTIME and [GPMC_CONFIG6_i\[28:24\]](#) WRACCESSTIME ($i = 0$ to 7). This allows nOE and GPMC data capture timing parameters to be independent of nWE and memory device data capture timing parameters. RDACCESSTIME and WRACCESSTIME bit fields can be set with a granularity of 1 or 2 through [GPMC_CONFIG1_i\[4\]](#) TIMEPARAGRANULARITY.

16.4.4.10.8.1 Access Time on Read Access

In asynchronous read mode, for single and paged accesses, [GPMC_CONFIG5_i\[20:16\]](#) RDACCESSTIME field ($i = 0$ to 7) defines the number of GPMC_FCLK cycles from start access time to the GPMC_FCLK rising edge used for the first data capture. RDACCESSTIME must be programmed to the rounded greater value (in GPMC_FCLK cycles) of the read access time of the attached memory device.

In synchronous read mode, for single or burst accesses, RDACCESSTIME defines the number of GPMC_FCLK cycles from start access time to the GPMC_FCLK rising edge corresponding to the GPMC_CLK rising edge used for the first data capture.

GPMC_CLK which is sent to the memory device for synchronization with the GPMC controller, is internally retimed to correctly latch the returned data. [GPMC_CONFIG5_i\[4:0\]](#) RDCYCLETIME must be greater than RDACCESSTIME in order to let the GPMC latch the last return data using the internally retimed GPMC_CLK.

The external WAIT signal can be used in conjunction with RDACCESSTIME to control the effective GPMC data-capture GPMC_FCLK edge on read access in both asynchronous mode and synchronous mode. For details about wait monitoring, see [Section 16.4.4.9.3.1, Chip-Select Base Address and Region Size](#).

16.4.4.10.8.2 Access Time on Write Access

In asynchronous write mode, the [GPMC_CONFIG6_i\[28:24\]](#) WRACCESSTIME timing parameter is not used to define the effective write access time. Instead, it is used as a WAIT invalid timing window, and must be set to a correct value so that the gpmc_wait pin is at a valid state two GPMC_CLK cycles before WRACCESSTIME completes. For details about wait monitoring, see [Section 16.4.4.9.3.1, Chip-Select Base Address and Region Size](#).

In synchronous write mode, for single or burst accesses, WRACCESSTIME defines the number of GPMC_FCLK cycles from start access time to the GPMC_CLK rising edge used by the memory device for the first data capture.

The external WAIT signal can be used in conjunction with WRACCESSTIME to control the effective memory device data capture GPMC_CLK edge for a synchronous write access. For details about wait monitoring, see [Section 16.4.4.9.3.1, Chip-Select Base Address and Region Size](#).

16.4.4.10.9 Page Burst Access Time (PAGEBURSTACCESSTIME)

[GPMC_CONFIG5_i\[27:24\]](#) PAGEBURSTACCESSTIME bit field ($i = 0$ to 7) can be set with a granularity of 1 or 2 through [GPMC_CONFIG1_i\[4\]](#) TIMEPARAGRANULARITY.

16.4.4.10.9.1 Page Burst Access Time on Read Access

In asynchronous page read mode, the delay between successive word captures in a page is controlled through the PAGEBURSTACCESSTIME bit field. The PAGEBURSTACCESSTIME parameter must be programmed to the rounded greater value (in GPMC_FCLK cycles) of the read access time of the attached device.

In synchronous burst read mode, the delay between successive word captures in a burst is controlled through the PAGEBURSTACCESSTIME field.

The external WAIT signal can be used in conjunction with PAGEBURSTACCESSTIME to control the effective GPMC data capture GPMC_FCLK edge on read access. For details about wait monitoring, see [Section 16.4.4.9.3.1, Chip-Select Base Address and Region Size](#).

16.4.4.10.9.2 Page Burst Access Time on Write Access

Asynchronous page write mode is not supported. PAGEBURSTACCESSTIME is irrelevant in this case.

In synchronous burst write mode, PAGEBURSTACCESSTIME controls the delay between successive memory device word captures in a burst.

The external WAIT signal can be used in conjunction with PAGEBURSTACCESSTIME to control the effective memory-device data capture GPMC_CLK edge in synchronous write mode. For details about wait monitoring, see [Section 16.4.4.9.3.1, Chip-Select Base Address and Region Size](#).

16.4.4.10.10 Bus Keeping Support

At the end-cycle time of a read access, if no other access is pending, the GPMC drives the bus with the last data read after RDCYCLETIME completion time to prevent bus floating and reduce power consumption.

After a write access, if no other access is pending, the GPMC keeps driving the data bus after WRCYCLETIME completes with the same data to prevent bus floating and power consumption.

16.4.4.11 NOR Access Description

For each chip-select configuration, the read access can be specified as either asynchronous or synchronous access through the [GPMC_CONFIG1_i\[29\]](#) READTYPE bit ($i = 0$ to 7). For each chip-select configuration, the write access can be specified as either synchronous or asynchronous access through the [GPMC_CONFIG1_i\[27\]](#) WRITETYPE bit ($i = 0$ to 7).

Asynchronous and synchronous read and write access time and related control signals are controlled through timing parameters that refer to GPMC_FCLK. The primary difference of synchronous mode is the availability of a configurable clock interface (GPMC_CLK) to control the external device. Synchronous mode also affects data-capture and wait-pin monitoring schemes in read access.

For details about asynchronous and synchronous access, see the descriptions of GPMC_CLK, RdAccessTime, WrAccessTime, and wait-pin monitoring.

For more information about timing-parameter settings, see the sample timing diagrams in this chapter.

NOTE: The address bus and nBE[1:0] are fixed for the duration of a synchronous burst read access, but they are updated for each beat of an asynchronous page-read access.

16.4.4.11.1 Asynchronous Access Description

This section describes:

- Asynchronous single-read operation on an address/data multiplexed device
- Asynchronous single write operation on an address/data-multiplexed device
- Asynchronous single read operation on an AAD-multiplexed device
- Asynchronous single write operation on an AAD-multiplexed device
- Asynchronous multiple (page) read operation on a non-multiplexed device

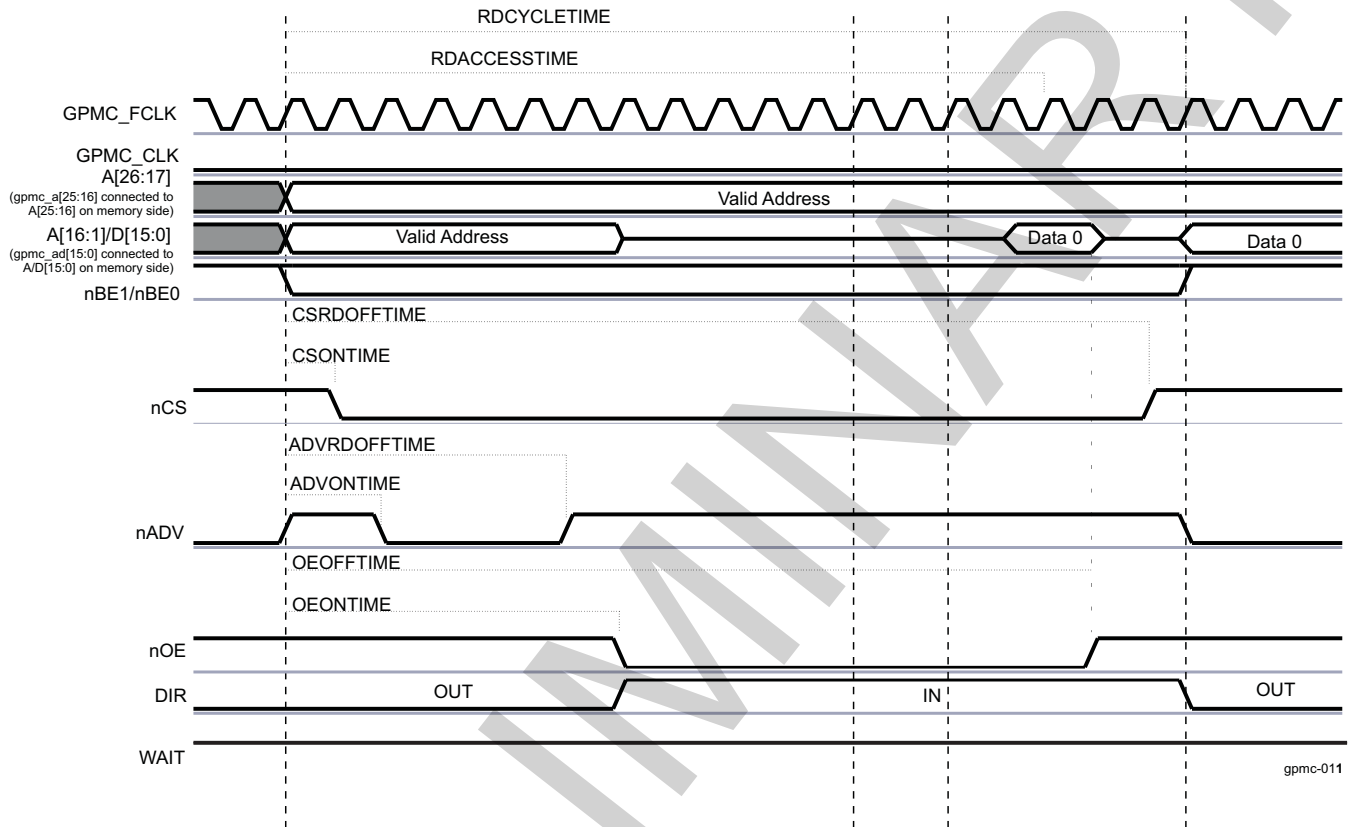
In asynchronous operations GPMC_CLK is not provided outside the GPMC and is kept low.

16.4.4.11.1.1 Access on Address/Data Multiplexed Devices

16.4.4.11.1.1.1 Asynchronous Single-Read Operation on an Address/Data Multiplexed Device

Figure 16-61 shows an asynchronous single read operation on an address/data-multiplexed device.

Figure 16-61. Asynchronous Single Read on an Address/Data-Multiplexed Device



See Section 16.4.5.6.1, *GPMC Timing Parameters Formulas* for formulas to calculate timing parameters.

Table 16-257 lists the timing bit fields to set up in order to configure the GPMC in asynchronous single read mode.

When the GPMC generates a read access to an address/data-multiplexed device, it drives the address bus until nOE assertion time. For details, see Section 16.4.4.9.2.3, *Address/Data-Multiplexing Interface*.

Address bits (A[16:1] from a GPMC perspective, A[15:0] from an external device perspective) are placed on the address/data bus, and the remaining address bits gpmc_a[25:16] are placed on the address bus. The address phase ends at nOE assertion, when the DIR signal goes from OUT to IN.

- Chip-select signal nCS:
 - nCS assertion time is controlled by the GPMC_CONFIG2_i[3:0] CS ONTIME field. It controls the address setup time to nCS assertion.
 - nCS deassertion time is controlled by the GPMC_CONFIG2_i[12:8] CSRD OFFTIME field. It controls the address hold time from nCS deassertion.
- Address valid signal nADV:
 - nADV assertion time is controlled by the GPMC_CONFIG3_i[3:0] ADV ONTIME field.
 - nADV deassertion time is controlled by the GPMC_CONFIG3_i[12:8] ADV RD OFFTIME field.
- Output enable signal nOE:
 - nOE assertion indicates a read cycle.
 - nOE assertion time is controlled by the GPMC_CONFIG4_i[3:0] OE ONTIME field.

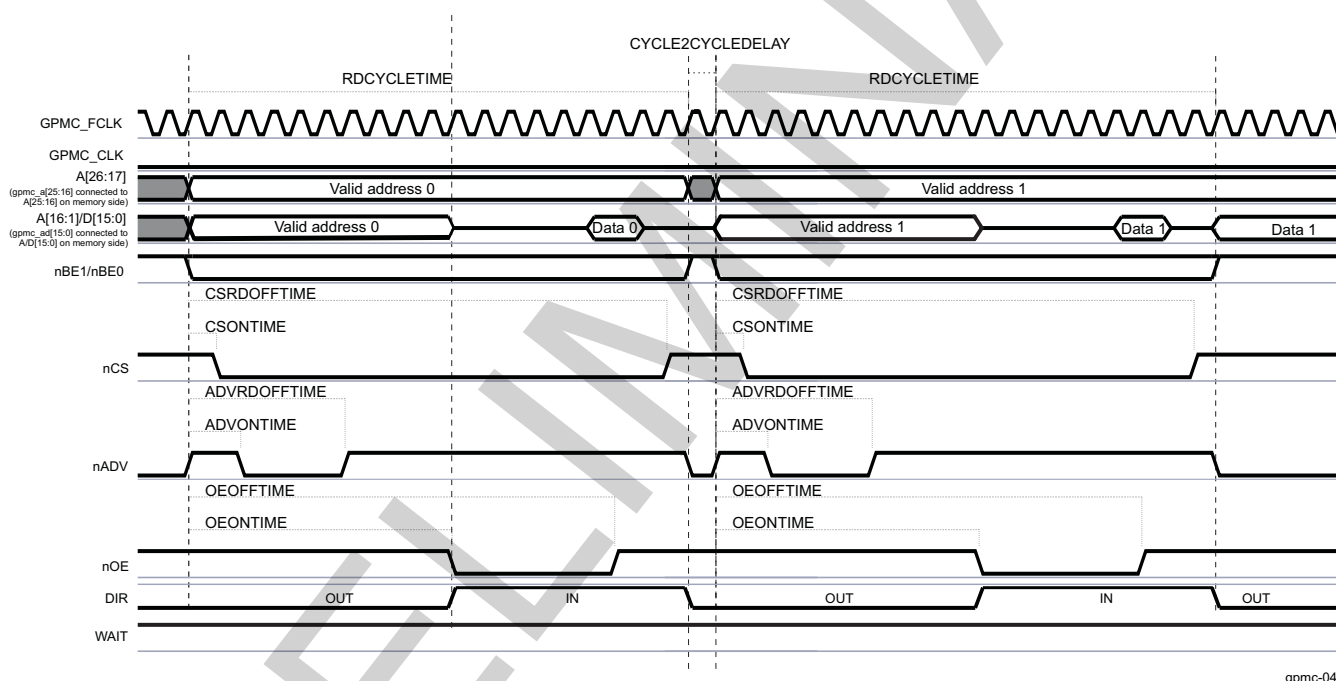
- nOE deassertion time is controlled by the [GPMC_CONFIG4_i\[12:8\] OEOFFTIME](#) field.
- Read data is latched when RDACCESSTIME completes. Access time is defined in the [GPMC_CONFIG5_i\[20:16\] RDACCESSTIME](#) field.
- Direction signal DIR: DIR goes from OUT to IN at the same time that nOE is asserted.
- The end of the access is defined by the [GPMC_CONFIG5_i\[4:0\] RDCYCLETIME](#) parameter.

In the GPMC, when a 16-bit wide device is attached to the controller, a 32-bit word write access is split into two 16-bit word write accesses. For more information about GPMC access size and type adaptation, see [Section 16.4.4.11.5, System Burst Versus External Device Burst Support](#).

Between two successive accesses, if an nCS pulse is needed:

- The [GPMC_CONFIG6_i\[11:8\] CYCLE2CYCLEDELAY](#) field can be programmed with [GPMC_CONFIG6_i\[7\] CYCLE2CYCLESAMECSEN](#) enabled.
- The CSWROFFTIME and CSONTIME parameters also allow a chip-select pulse, but this affects all other types of access.

Figure 16-62. Two Asynchronous Single Read Accesses on an Address/Data Multiplexed Device (32-bit read split into 2 x 16-bit read)

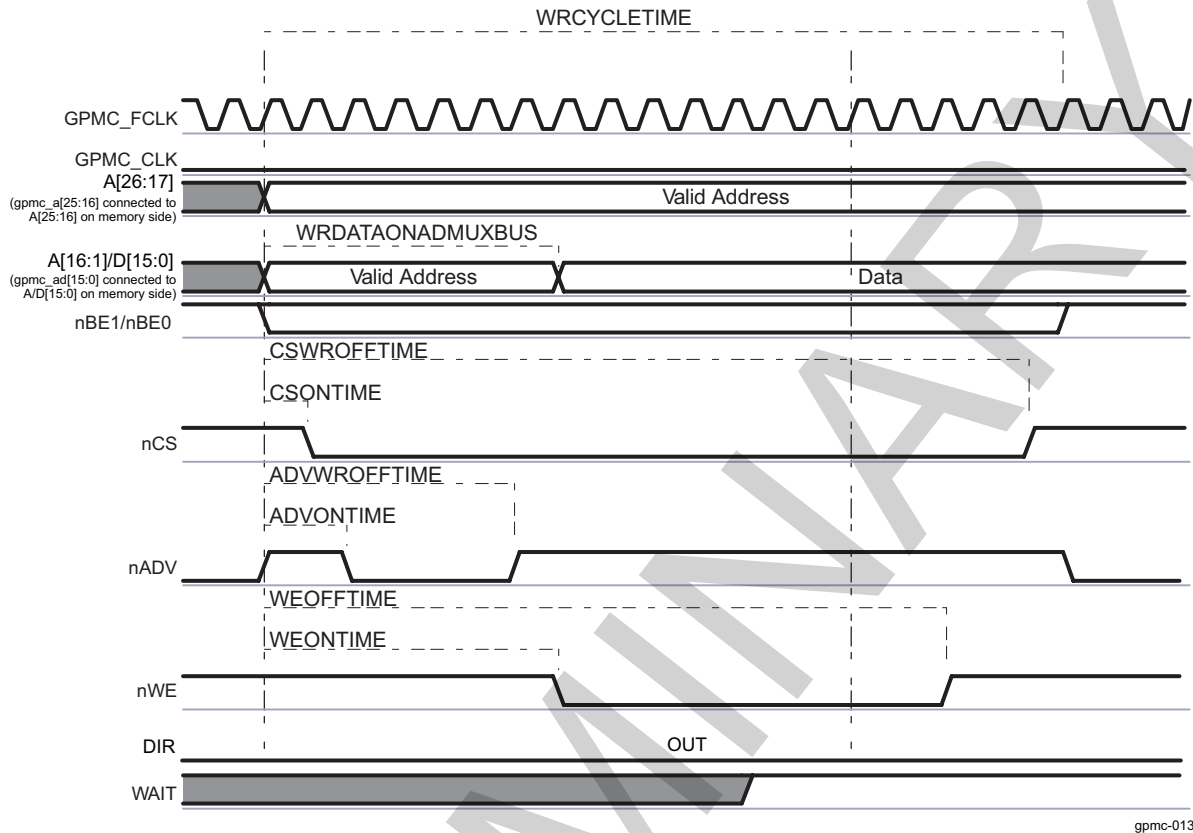


gpmc-044

16.4.4.11.1.2 Asynchronous Single Write Operation on an Address/Data-Multiplexed Device

Figure 16-63 shows an asynchronous single write operation on an address/data-multiplexed device.

Figure 16-63. Asynchronous Single Write on an Address/Data-Multiplexed Device



gpmc-013

See [Section 16.4.5.6.1, GPMC Timing Parameters Formulas](#) for formulas to calculate timing parameters.

[Table 16-257](#) lists the timing bit fields to set up in order to configure the GPMC in asynchronous single write mode.

When the GPMC generates a write access to an address/data-multiplexed device, it drives the address bus until nWE assertion time. For more information, see [Section 16.4.4.9.2.3, Address/Data-Multiplexing Interface](#).

The nCS, and nADV signals are controlled in the same way as for asynchronous single read operation on an address/data-multiplexed device.

- Write enable signal nWE:
 - nWE assertion indicates a write cycle.
 - nWE assertion time is controlled by the [GPMC_CONFIG4_i\[19:16\] WEONTIME](#) field.
 - nWE deassertion time is controlled by the [GPMC_CONFIG4_i\[28:24\] WEOFFTIME](#) field.
- Direction signal DIR: DIR signal is OUT during the entire access.
- The end of the access is defined by the [GPMC_CONFIG5_i\[12:8\] WRCYCLETIME](#) parameter.

Address bits A[16:1] (GPMC point of view) are placed on the address/data bus at the start of cycle time, and the remaining address bits A[26:17] are placed on the address bus.

Data is driven on the address/data bus at a [GPMC_CONFIG6_i\[19:16\] WRDATAONADMUXBUS](#) time.

NOTE: Write multiple access in asynchronous mode is not supported. If WRITEMULTIPLE is enabled with WRITETYPE as asynchronous, the GPMC processes single asynchronous accesses.

After a write operation, if no other access (read or write) is pending, the data bus keeps its previous value. See [Section 16.4.4.10.10](#), *Bus Keeping Support*.

16.4.4.11.1.1.3 Asynchronous Multiple (Page) Write Operation on an Address/Data-Multiplexed Device

Write multiple (page) access in asynchronous mode is not supported for address/data-multiplexed devices.

If [GPMC_CONFIG1_i\[28\]](#) WRITEMULTIPLE is enabled (0x1) with [GPMC_CONFIG1_i\[27\]](#) WRITETYPE as asynchronous (0x0), the GPMC processes single asynchronous accesses.

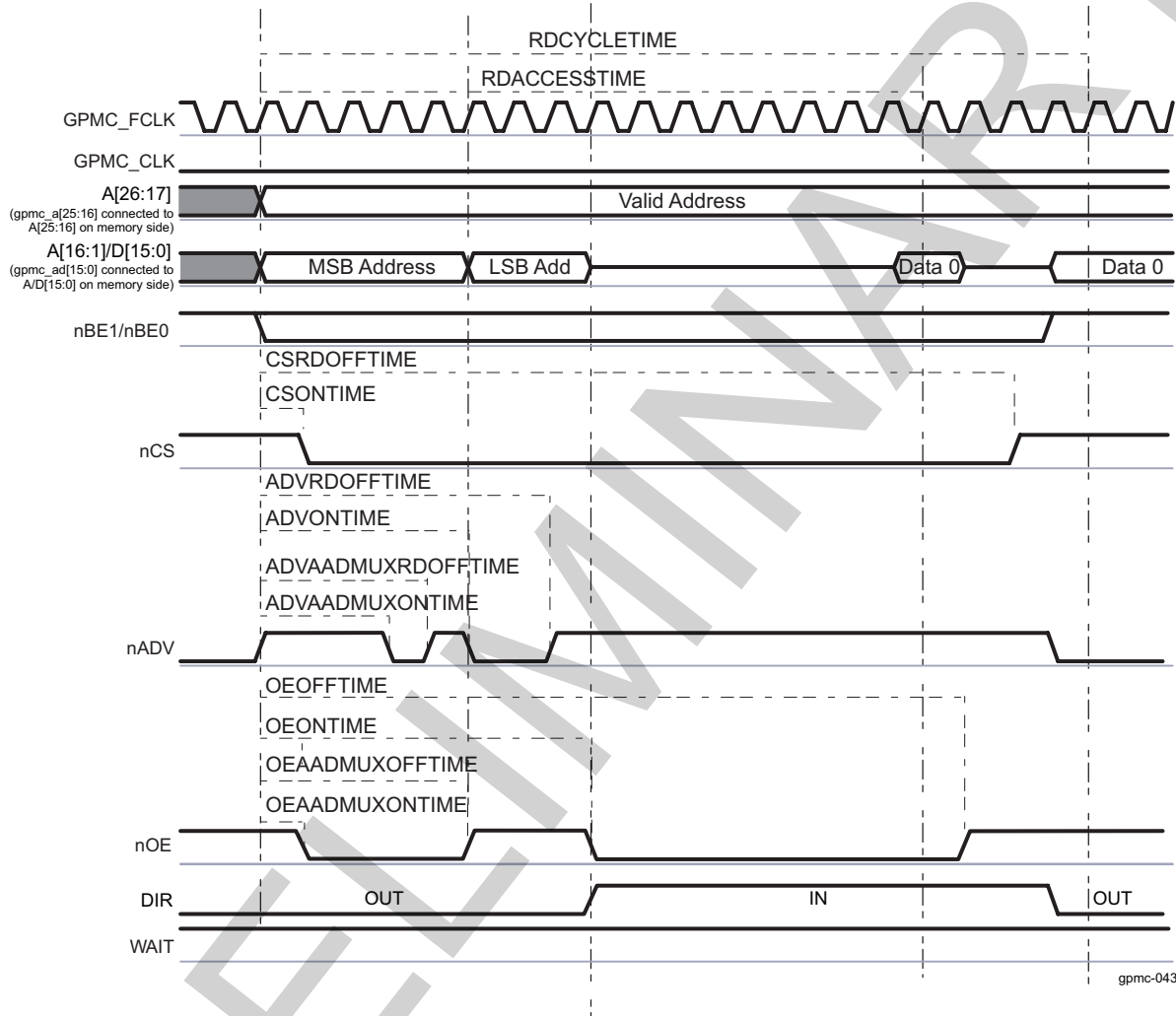
For accesses on non-multiplexed devices refer to [Section 16.4.4.11.3](#), *Asynchronous and Synchronous Accesses in Nonmultiplexed Mode*.

16.4.4.11.1.2 Access on Address/Address/Data Multiplexed Devices

16.4.4.11.1.2.1 Asynchronous Single Read Operation on an AAD-Multiplexed Device

Figure 16-64 shows an asynchronous single read operation on an AAD-multiplexed device.

Figure 16-64. Asynchronous Single Read on an AAD-Multiplexed Device



See [Section 16.4.5.6.1, GPMC Timing Parameters Formulas](#) for formulas to calculate timing parameters.

[Table 16-257](#) lists the timing bit fields to set up in order to configure the GPMC in asynchronous single write mode.

When the GPMC generates a read access to an AAD-multiplexed device, all address bits are driven onto the address/data bus in two separate phases. The first phase is used for the MSB address and is qualified with nOE driven low. The first address phase ends at the first nOE deassertion time. The second phase for LSB address is qualified with nOE driven high. The second address phase ends at the second nOE assertion time, when the DIR signal goes from OUT to IN.

The nCS, and DIR signals are controlled in the same way as for asynchronous single read operation on an address/data-multiplexed device.

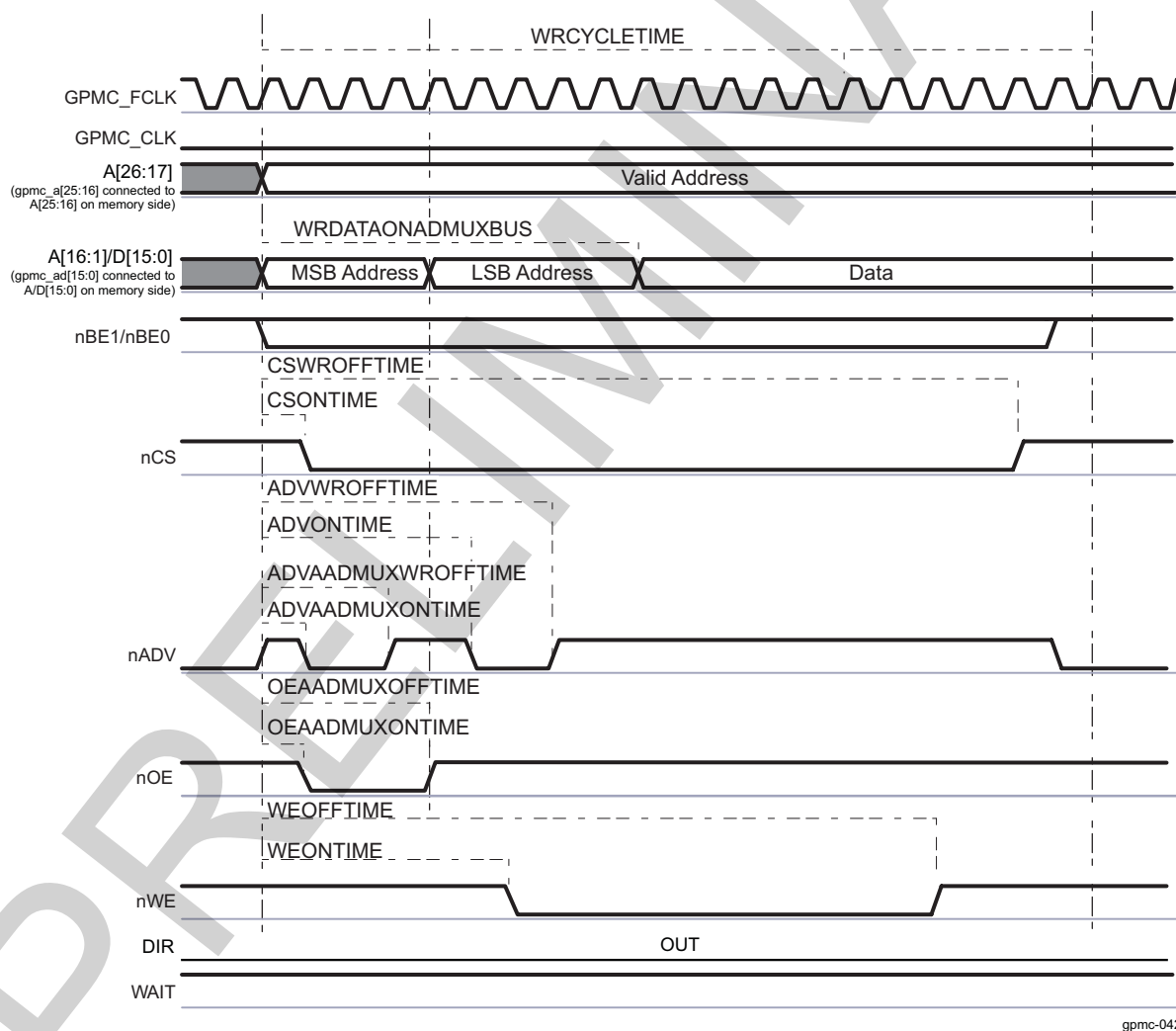
- Address valid signal nADV. nADV is asserted and deasserted twice during a read transaction:
 - nADV first assertion time is controlled by the [GPMC_CONFIG3_i\[6:4\] ADVAADMUXONTIME](#) field.
 - nADV first deassertion time is controlled by the [GPMC_CONFIG3_i\[26:24\] ADVAADMUXRD OFFTIME](#) field.

- nADV second assertion time is controlled by the [GPMC_CONFIG3_i\[3:0\]](#) ADVONTIME field.
- nADV second deassertion time is controlled by the [GPMC_CONFIG3_i\[12:8\]](#) ADVRDOFFTIME field.
- Output Enable signal nOE. nOE is asserted and deasserted twice during a read transaction (nOE second assertion indicates a read cycle):
 - nOE first assertion time is controlled by the [GPMC_CONFIG4_i\[6:4\]](#) OEAADMUXONTIME field.
 - nOE first deassertion time is controlled by the [GPMC_CONFIG3_i\[15:13\]](#) OEAADMUXOFFTIME field.
 - nOE second assertion time is controlled by the [GPMC_CONFIG4_i\[3:0\]](#) OEONTIME field.
 - nOE second deassertion time is controlled by the [GPMC_CONFIG4_i\[12:8\]](#) OEOFFTIME field.

16.4.4.11.1.2.2 Asynchronous Single Write Operation on an AAD-Multiplexed Device

Figure 16-65 shows an asynchronous single write operation on an AAD-multiplexed device.

Figure 16-65. Asynchronous Single Write on an AAD-Multiplexed Device



See [Section 16.4.5.6.1, GPMC Timing Parameters Formulas](#) for formulas to calculate timing parameters.

[Table 16-257](#) lists the timing bit fields to set up in order to configure the GPMC in asynchronous single write mode.

When the GPMC generates a write access to an AAD-multiplexed device, all address bits are driven onto the address/data bus in two separate phases. The first phase is used for the MSB address and is qualified with nOE driven low. The second phase for LSB address is qualified with nOE driven high. The address phase ends at nWE assertion time.

The nCS, nWE, and DIR signals are controlled in the same way as for asynchronous single write operation on an address/data-multiplexed device. See [Table 16-248](#).

- Address valid signal nADV is asserted and deasserted twice during a write transaction:
 - nADV first assertion time is controlled by the [GPMC_CONFIG3_i\[6:4\]](#) ADVAADMUXONTIME field.
 - nADV first deassertion time is controlled by the [GPMC_CONFIG3_i\[30:28\]](#) ADVAADMUXWROFFTIME field.
 - nADV second assertion time is controlled by the [GPMC_CONFIG3_i\[3:0\]](#) ADVONTIME field.
 - nADV second deassertion time is controlled by the [GPMC_CONFIG3_i\[20:16\]](#) ADVWROFFTIME field.
- Output Enable signal nOE is asserted during the address phase of a write transaction:
 - nOE assertion time is controlled by the [GPMC_CONFIG4_i\[6:4\]](#) OEAADMUXONTIME field.
 - nOE deassertion time is controlled by the [GPMC_CONFIG3_i\[15:13\]](#) OEAADMUXOFFTIME field.

The address bits for the first address phase are driven onto the data bus until nOE deassertion. Data is driven onto the address/data bus at the clock edge defined by the [GPMC_CONFIG6_i\[19:16\]](#) WRDATAONADMUXBUS parameter.

16.4.4.11.1.2.3 Asynchronous Multiple (Page) Read Operation on an AAD-Multiplexed Device

Write multiple (page) access in asynchronous mode is not supported for AAD-multiplexed devices.

If [GPMC_CONFIG1_i\[28\]](#) WRITEMULTIPLE is enabled (0x1) with [GPMC_CONFIG1_i\[27\]](#) WRITETYPE as asynchronous (0x0), the GPMC processes single asynchronous accesses.

For accesses on non-multiplexed devices refer to [Section 16.4.4.11.3, Asynchronous and Synchronous Accessed in Nonmultiplexed Mode](#).

16.4.4.11.2 Synchronous Access Description

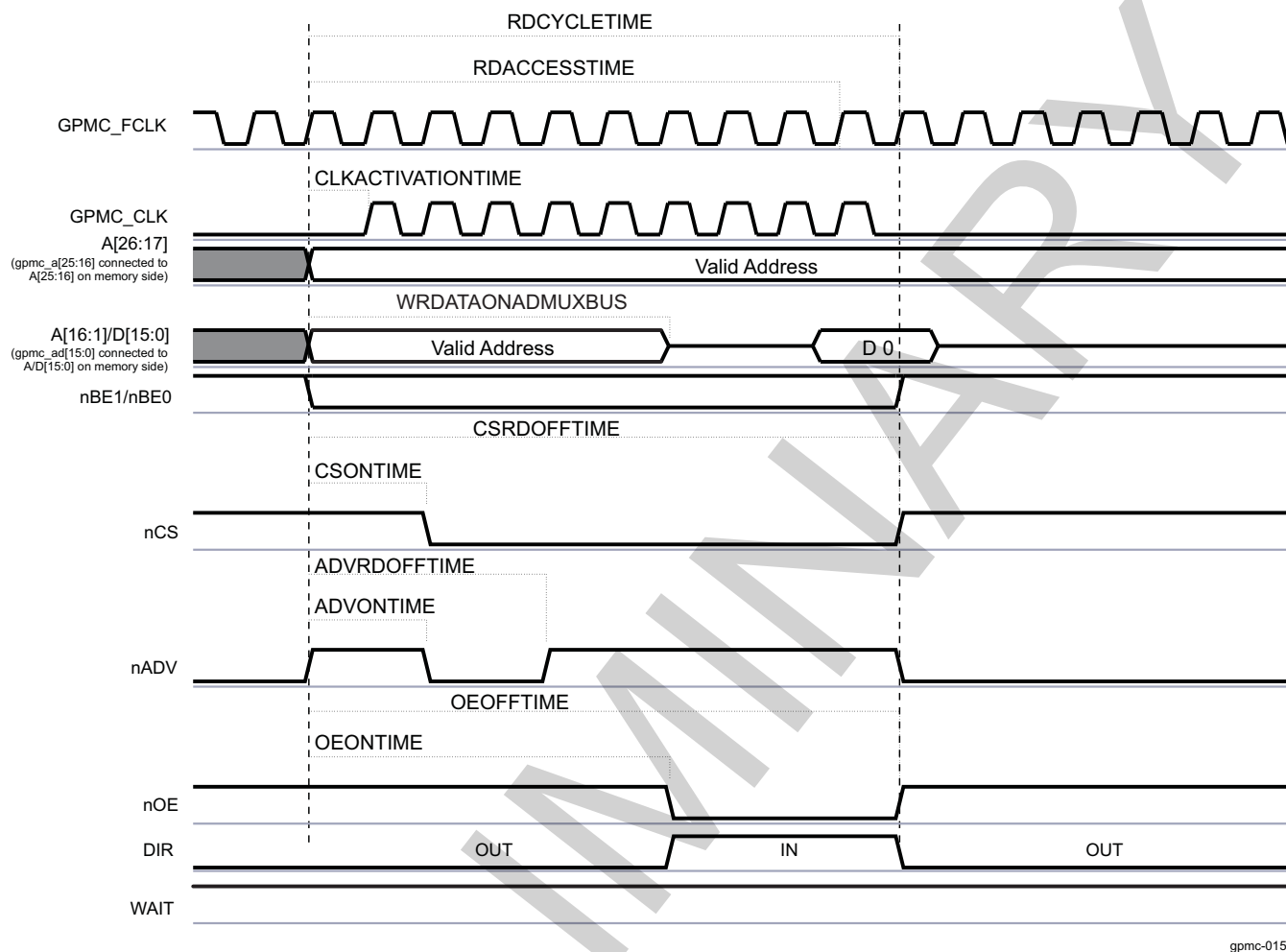
This section details read and write synchronous accesses on address/data multiplexed. All information in this section can be applied to any type of memory - non-multiplexed, address and data multiplexed or AAD-multiplexed - with a difference limited to the address phase. For accesses on non-multiplexed devices refer to [Section 16.4.4.11.3, Asynchronous and Synchronous Accessed in Nonmultiplexed Mode](#).

In synchronous operations:

- The GPMC_CLK clock is provided outside the GPMC when accessing the memory device.
- The GPMC_CLK clock is derived from the GPMC_FCLK clock using the [GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER field. In the following section i stands for the chip-select number, i = 0 to 7.
- The [GPMC_CONFIG1_i\[26:25\]](#) CLKACTIVATIONTIME field specifies that the GPMC_CLK is provided outside the GPMC 0, 1, or 2 GPMC_FCLK cycles after start access time until RDCYCLETIME or WRCYCLETIME completion.

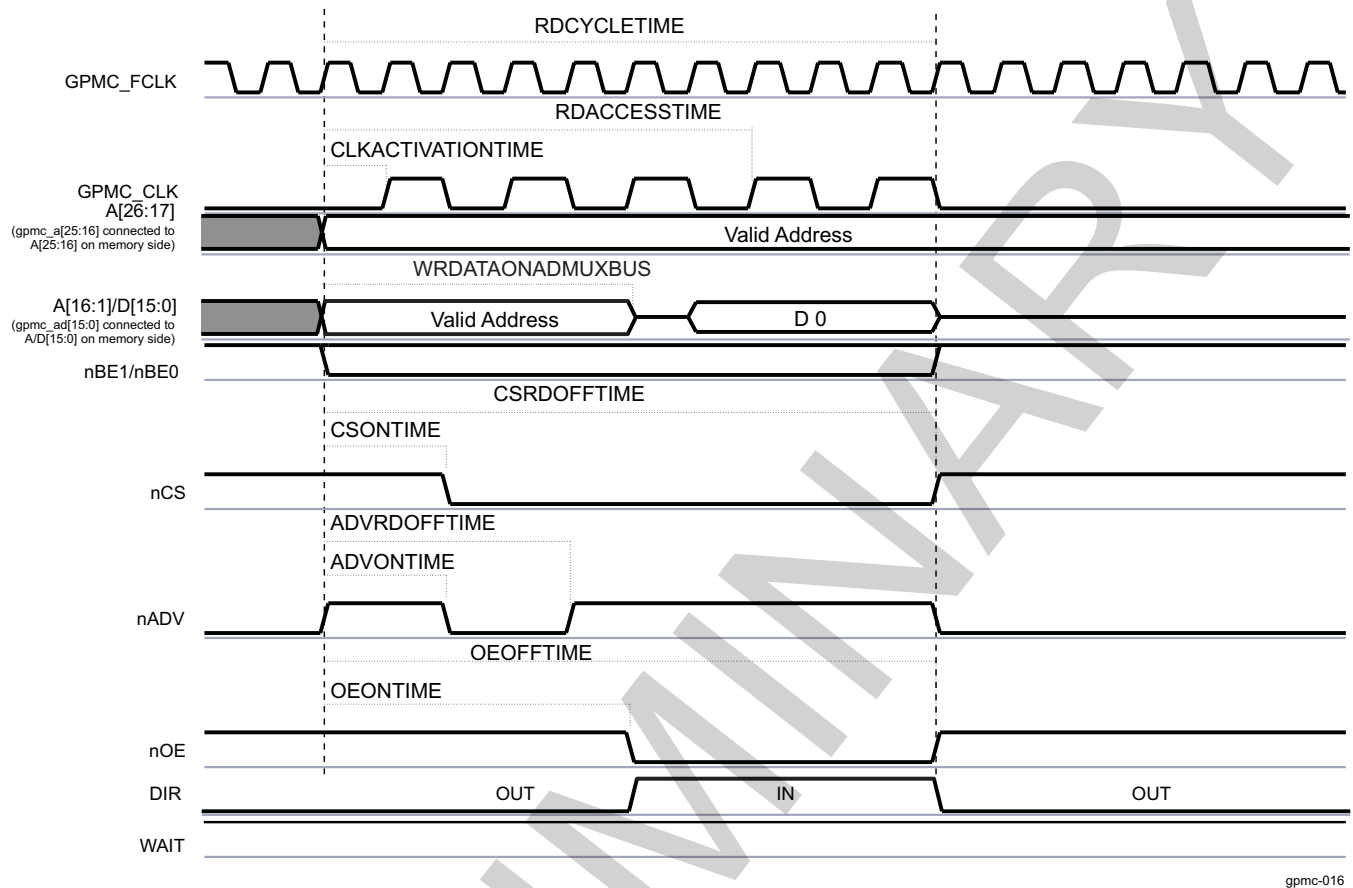
16.4.4.11.2.1 Synchronous Single Read

[Figure 16-66](#) and [Figure 16-67](#) show a synchronous single-read operation with GPMCFCLKDIVIDER equal to 0 and 1, respectively.

Figure 16-66. Synchronous Single Read (GPMCFCLKDIVIDER = 0)

gpmc-015

Figure 16-67. Synchronous Single Read (GPMCFCLKDIVIDER = 1)



See [Section 16.4.5.6.1, GPMC Timing Parameters Formulas](#) for formulas to calculate timing parameters.

[Table 16-257](#) lists the timing bit fields to set up in order to configure the GPMC in asynchronous single read mode.

When the GPMC generates a read access to an address/data-multiplexed device, it drives the address bus until nOE assertion time. For details, see [Section 16.4.4.9.2.3, Address/Data-Multiplexing Interface](#).

- Chip-select signal nCS:
 - nCS assertion time is controlled by the [GPMC_CONFIG2_i\[3:0\] CSONTIME](#) field and ensures address setup time to nCS assertion.
 - nCS deassertion time is controlled by the [GPMC_CONFIG2_i\[12:8\] CSRDOFFTIME](#) field and ensures address hold time to nCS deassertion.
- Address valid signal nADV:
 - nADV assertion time is controlled by the [GPMC_CONFIG3_i\[3:0\] ADVONTIME](#) field.
 - nADV deassertion time is controlled by the [GPMC_CONFIG3_i\[12:8\] ADVRDOFFTIME](#) field.
- Output enable signal nOE:
 - nOE assertion indicates a read cycle.
 - nOE assertion time is controlled by the [GPMC_CONFIG4_i\[3:0\] OEONTIME](#) field.
 - nOE deassertion time is controlled by the [GPMC_CONFIG4_i\[12:8\] OEOFFTIME](#) field.
- Initial latency for the first read data is controlled by [GPMC_CONFIG5_i\[20:16\] RDACCESSTIME](#) or by monitoring the WAIT signal.
- Total access time ([GPMC_CONFIG5_i\[4:0\] RDCYCLETIME](#)) corresponds to RDACCESSTIME plus the address hold time from nCS deassertion, plus time from RDACCESSTIME to CSRDOFFTIME.
- Direction signal DIR: DIR goes from OUT to IN at the same time as nOE assertion.

When the GPMC generates a write access to an AAD-multiplexed device, all address bits are driven onto the address/data bus in two separate phases. The first phase is used for the MSB address and is qualified with nOE driven low. The second phase for LSB address is qualified with nOE driven high. The address phase ends at nWE assertion time.

The nCS, and DIR signals are controlled in the same way as for synchronous single read operation on an address/data-multiplexed device.

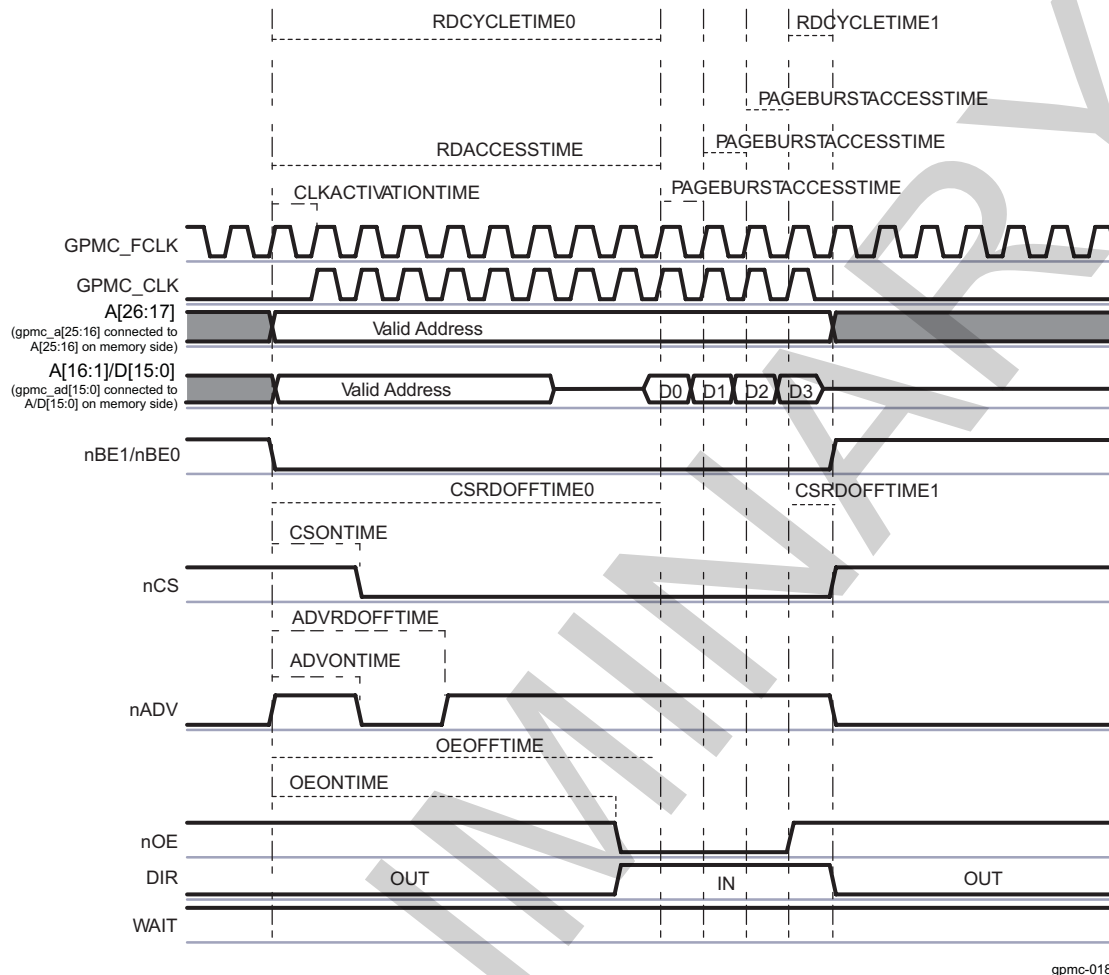
- Address valid signal nADV is asserted and deasserted twice during a read transaction:
 - nADV first assertion time is controlled by the [GPMC_CONFIG3_i\[6:4\]](#) ADVAADMUXONTIME field.
 - nADV first deassertion time is controlled by the [GPMC_CONFIG3_i\[26:24\]](#) ADVAADMUXRDOFFTIME field.
 - nADV second assertion time is controlled by the [GPMC_CONFIG3_i\[3:0\]](#) ADVONTIME field.
 - nADV second deassertion time is controlled by the [GPMC_CONFIG3_i\[12:8\]](#) ADVRDOFFTIME field.
- Output Enable signal nOE is asserted and deasserted twice during a read transaction (nOE second assertion indicates a read cycle):
 - nOE first assertion time is controlled by the [GPMC_CONFIG4_i\[6:4\]](#) OEAADMUXONTIME field.
 - nOE first deassertion time is controlled by the [GPMC_CONFIG3_i\[15:13\]](#) OEAADMUXOFFTIME field.
 - nOE second assertion time is controlled by the [GPMC_CONFIG4_i\[3:0\]](#) OEONTIME field.
 - nOE second deassertion time is controlled by the [GPMC_CONFIG4_i\[12:8\]](#) OEOFFTIME field.

After a read operation, if no other access (read or write) is pending, the data bus is driven with the previous read value. See [Section 16.4.4.10.10](#), *Bus Keeping Support*.

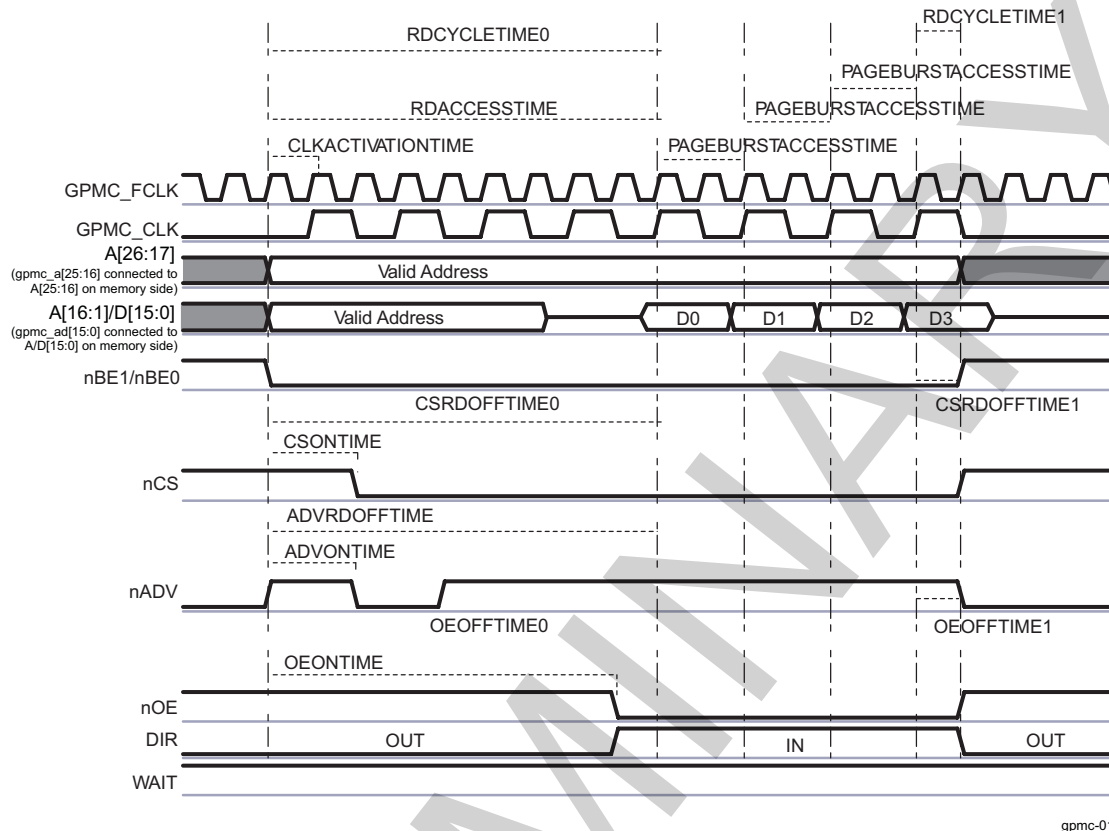
16.4.4.11.2.2 Synchronous Multiple (Burst) Read (4-, 8-, 16-Word16 Burst With Wraparound Capability)

[Figure 16-68](#) and [Figure 16-69](#) show a synchronous multiple read operation with GPMCFCLKDivider equal to 0 and 1, respectively.

Figure 16-68. Synchronous Multiple (Burst) Read (GPMC_FCLKDIVIDER = 0)



gpmc-018

Figure 16-69. Synchronous Multiple (Burst) Read (GPMCFCLKDIVIDER = 1)

gpmc-019

When [GPMC_CONFIG5_i\[20:16\]](#) RDACCESSTIME completes, control-signal timings are frozen during the multiple data transactions, corresponding to [GPMC_CONFIG5_i\[27:24\]](#) PAGEBURSTACCESSTIME multiplied by the number of remaining data transactions.

The nCS, nADV, nOE and DIR signals are controlled in the same way as for synchronous single read operation. See [Table 16-243](#).

Initial latency for the first read data is controlled by RDACCESSTIME or by monitoring the WAIT signal. Successive read data are provided by the memory device each one or two GPMC_CLK cycles. The PAGEBURSTACCESSTIME parameter must be set accordingly with [GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER and the memory-device internal configuration. Depending on the device page length, the GPMC checks device page crossing during a new burst request and purposely insert initial latency (of RDACCESSTIME) when required.

Total access time [GPMC_CONFIG5_i\[4:0\]](#) RDCYCLETIME corresponds to RDACCESSTIME plus the address hold time from nCS deassertion. In [Figure 16-69](#), RDCYCLETIME programmed value equals to RDCYCLETIME0 + RDCYCLETIME1.

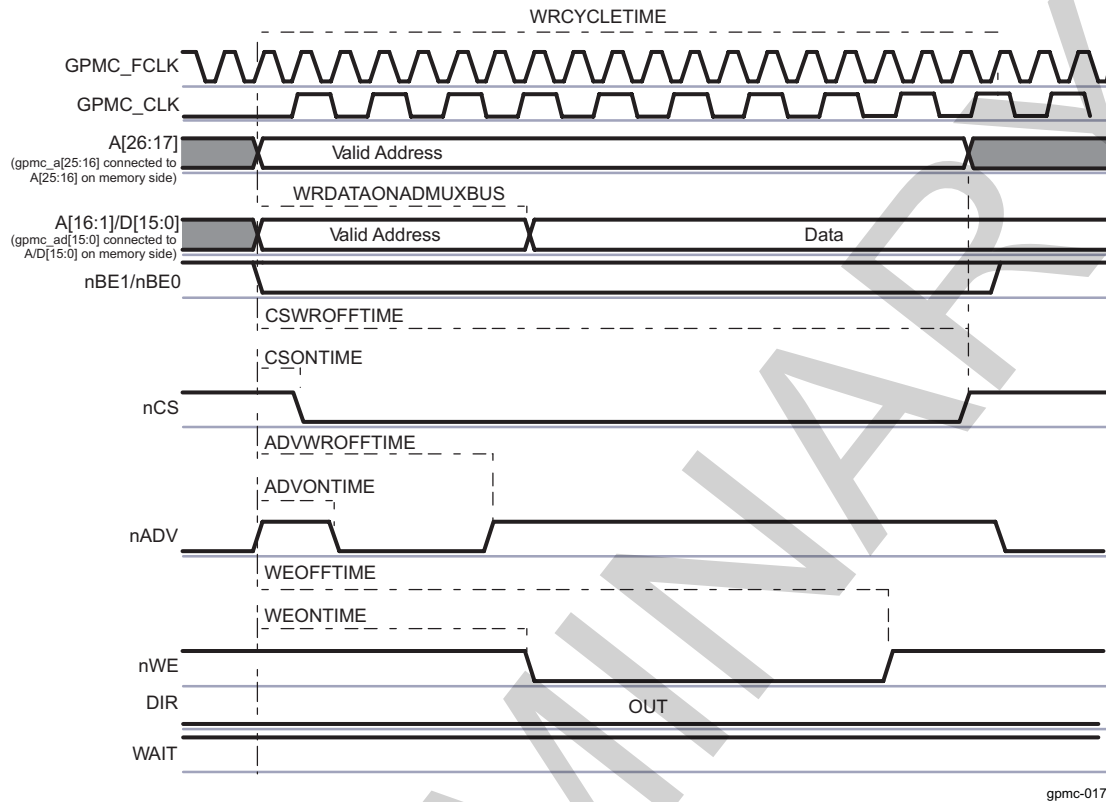
After a read operation, if no other access (read or write) is pending, the data bus is driven with the previous read value. See [Section 16.4.4.10.10, Bus Keeping Support](#).

Burst wraparound is enabled through the [GPMC_CONFIG1_i\[31\]](#) WRAPBURST bit and allows a 4-, 8-, or 16-Word16 linear burst access to wrap within its burst-length boundary through [GPMC_CONFIG1_i\[24:23\]](#) ATTACHEDDEVICEPAGELENGTH.

16.4.4.11.2.3 Synchronous Single Write

Burst write mode is used for synchronous single or burst accesses.

Figure 16-70. Synchronous Single Write on an Address/Data-Multiplexed Device



When the GPMC generates a write access to an address/data-multiplexed device, it drives the data bus (with address bits A[16:1]) until [GPMC_CONFIG6_i\[19:16\]](#) WRDATAONADMUXBUS time. First data of the burst is driven on the address/data bus at WRDATAONADMUXBUS time.

16.4.4.11.2.4 Synchronous Multiple (Burst) Write

Synchronous burst write mode provides synchronous single or consecutive accesses.

[Figure 16-71](#) shows a synchronous burst write access when the chip-select is configured in address/data-multiplexed mode.

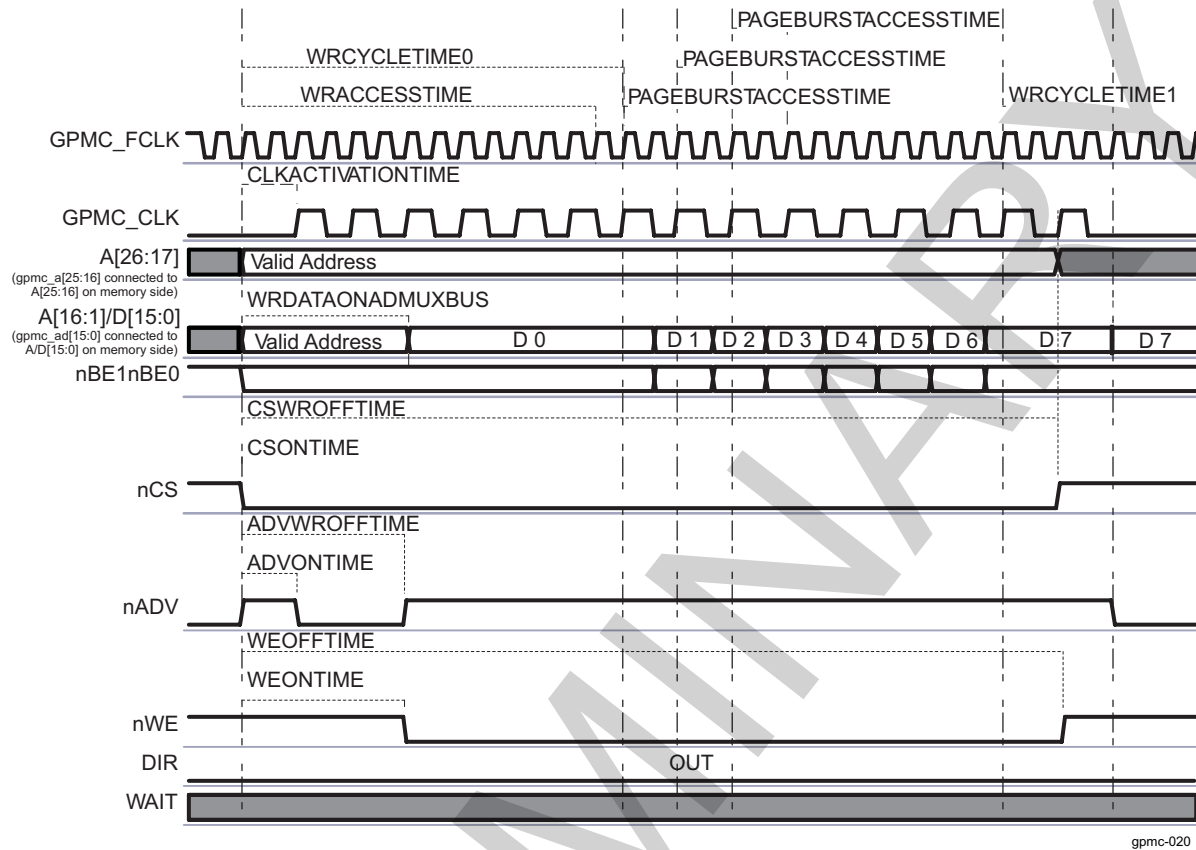
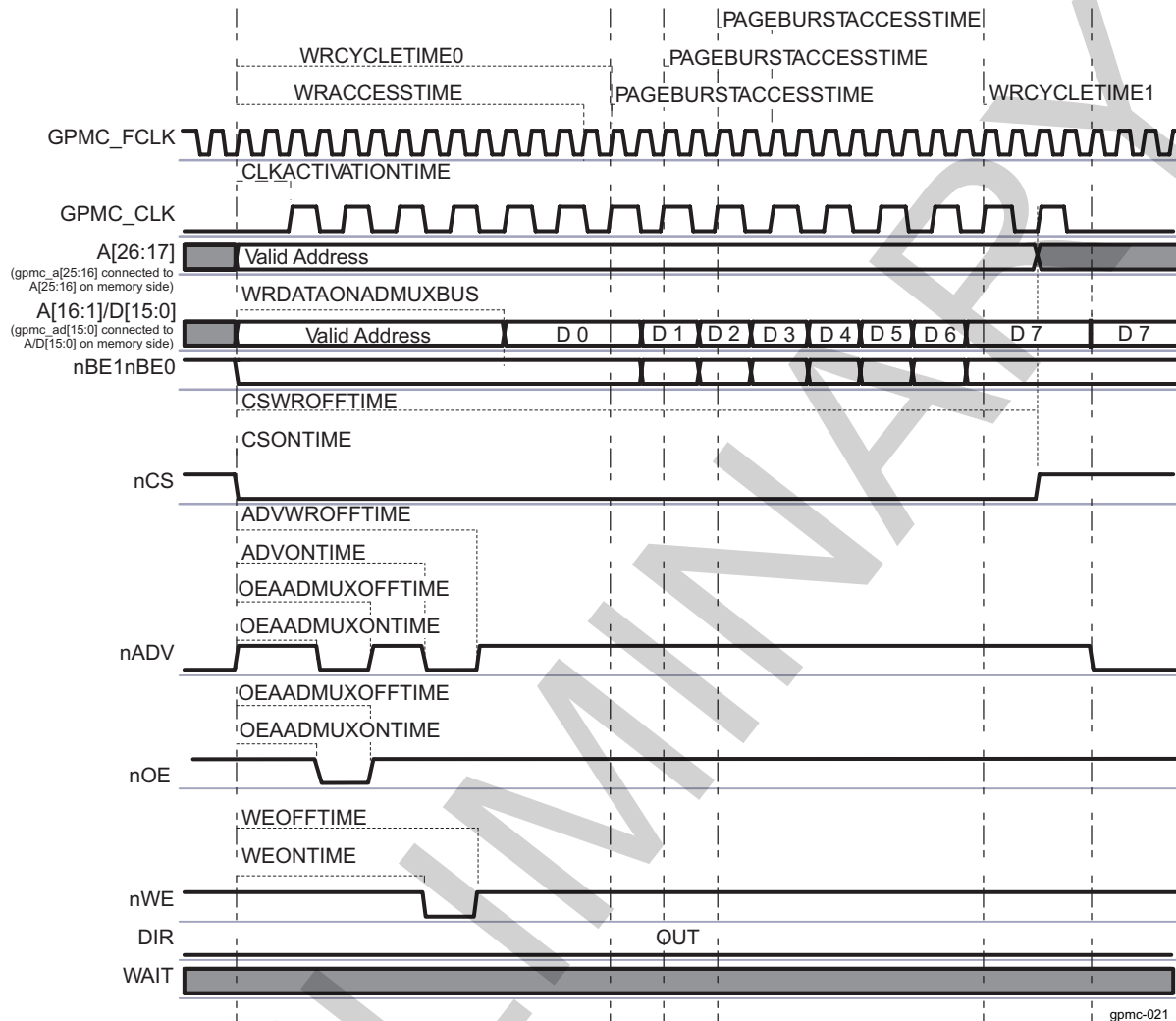
Figure 16-71. Synchronous Multiple Write (Burst Write) in Address/Data-Multiplexed Mode

Figure 16-72 shows the same synchronous burst write access when the chip-select is configured in address/address/data-multiplexed (AAD-multiplexed) mode.

Figure 16-72. Synchronous Multiple Write (Burst Write) in Address/Address/Data-Multiplexed Mode



The first data of the burst is driven on the A/D bus at [GPMC_CONFIG6_i\[19:16\]](#) WRDATAONADMUXBUS.

When WRACCESSTIME completes, control-signal timings are frozen during the multiple data transactions, corresponding to the [GPMC_CONFIG5_i\[27:24\]](#) PAGEBURSTACCESSTIME multiplied by the number of remaining data transactions.

When the GPMC generates a read access to an address/data-multiplexed device, it drives the address bus until nOE assertion time. For details, see [Section 16.4.4.9.2.3, Address/Data-Multiplexing Interface](#).

- Chip-select signal nCS:
 - nCS assertion time is controlled by the [GPMC_CONFIG2_i\[3:0\]](#) CSONTIME field ($i = 0$ to 7) and ensures address setup time to nCS assertion.
 - nCS deassertion time controlled by the [GPMC_CONFIG2_i\[20:16\]](#) CSWROFFTIME field and ensures address hold time to nCS deassertion.
- Address valid signal nADV:
 - nADV assertion time is controlled by the [GPMC_CONFIG3_i\[3:0\]](#) ADVONTIME field.
 - nADV deassertion time is controlled by the [GPMC_CONFIG3_i\[20:16\]](#) ADVWROFFTIME field.
- Write enable signal nWE:
 - nWE assertion indicates a read cycle.
 - nWE assertion time is controlled by the [GPMC_CONFIG4_i\[19:16\]](#) WEONTIME field.

- nWE deassertion time is controlled by the [GPMC_CONFIG4_i\[28:24\]](#) WEOFFTIME field.

NOTE: The nWE falling edge must not be used to control the time when the burst first data is driven in the address/data bus because some new devices require the nWE signal at low during the address phase.

- Direction signal DIR is OUT during the entire access.

When the GPMC generates a write access to an AAD-multiplexed device, all address bits are driven onto the address/data bus in two separate phases. The first phase is used for the MSB address and is qualified with nOE driven low. The second phase for LSB address is qualified with nOE driven high. The address phase ends at nWE assertion time.

The nCS, and DIR signals are controlled as detailed above.

- Address valid signal nADV is asserted and deasserted twice during a read transaction:
 - nADV first assertion time is controlled by the [GPMC_CONFIG3_i\[6:4\]](#) ADVAADMUXONTIME field.
 - nADV first deassertion time is controlled by the [GPMC_CONFIG3_i\[26:24\]](#) ADVAADMUXRDOFFTIME field.
 - nADV second assertion time is controlled by the [GPMC_CONFIG3_i\[3:0\]](#) ADVONTIME field.
 - nADV second deassertion time is controlled by the [GPMC_CONFIG3_i\[12:8\]](#) ADVRDOFFTIME field.
- Output Enable signal nOE is asserted and deasserted twice during a read transaction (nOE second assertion indicates a read cycle):
 - nOE first assertion time is controlled by the [GPMC_CONFIG4_i\[6:4\]](#) OEAADMUXONTIME field.
 - nOE first deassertion time is controlled by the [GPMC_CONFIG4_i\[15:13\]](#) OEAADMUXOFFTIME field.
 - nOE second assertion time is controlled by the [GPMC_CONFIG4_i\[3:0\]](#) OEONTIME field.
 - nOE second deassertion time is controlled by the [GPMC_CONFIG4_i\[12:8\]](#) OEOFFTIME field.

First write data is driven by the GPMC at [GPMC_CONFIG6_i\[19:16\]](#) WRDATAONADMUXBUS, when in address/data mux configuration. The next write data of the burst is driven on the bus at WRACCESSTIME + 1 during [GPMC_CONFIG5_i\[27:24\]](#) PAGEBURSTACCESSTIME GPMC_FCLK cycles. The last data of the synchronous burst write is driven until [GPMC_CONFIG5_i\[12:8\]](#) WRCYCLETIME completes.

- WRACCESSTIME is defined in the [GPMC_CONFIG6_i\[28:24\]](#) register.
- The PAGEBURSTACCESSTIME parameter must be set accordingly with GPMCFCLKDIVIDER and the memory-device internal configuration.

Total access time [GPMC_CONFIG5_i\[12:8\]](#) WRCYCLETIME corresponds to WRACCESSTIME plus the address hold time from nCS deassertion. In [Figure 16-71](#), the WRCYCLETIME programmed value equals WRCYCLETIME0 + WRCYCLETIME1. WRCYCLETIME0 and WRCYCLETIME1 delays are not actual parameters and are only a graphical representation of the full WRCYCLETIME value.

After a write operation, if no other access (read or write) is pending, the data bus keeps the previous value. See [Section 16.4.4.10.10, Bus Keeping Support](#).

16.4.4.11.3 Asynchronous and Synchronous Accesses in Nonmultiplexed Mode

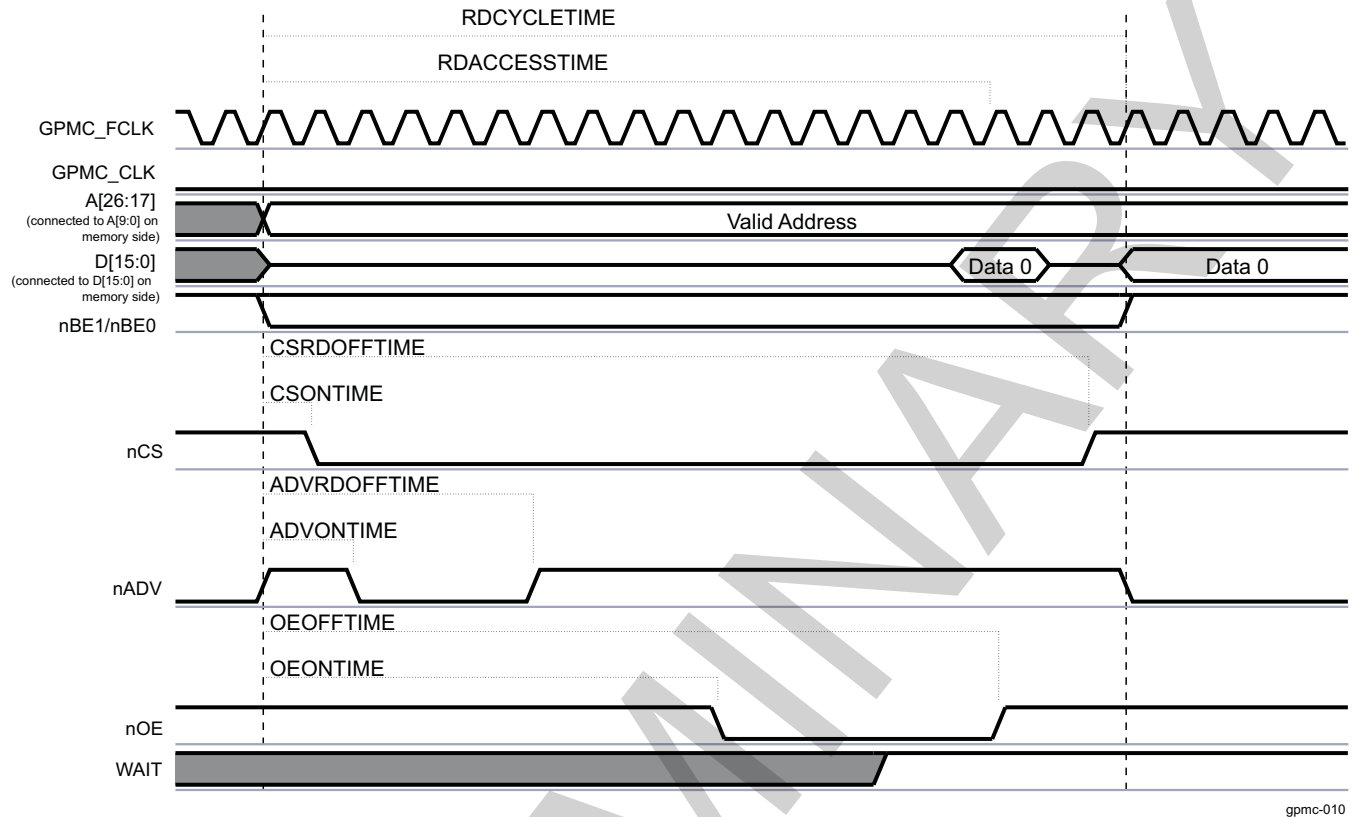
Page mode is only available in non-muxed mode. The non-muxed mode is described in this section even though its use is very limited (address space limited to 2 KBytes).

- Asynchronous single read operation on a nonmultiplexed device
- Asynchronous single write operation on a nonmultiplexed device
- Asynchronous multiple (page mode) read operation on a nonmultiplexed device
- Synchronous operations on a nonmultiplexed device

16.4.4.11.3.1 Asynchronous Single Read Operation on a Nonmultiplexed Device

[Figure 16-73](#) shows an asynchronous single read operation on a nonmultiplexed device.

Figure 16-73. Asynchronous Single Read on an Address/Data-Nonmultiplexed Device



The 10-bit address is driven onto the address bus A[10:1] and the 16-bit data is driven onto the data bus D[15:0].

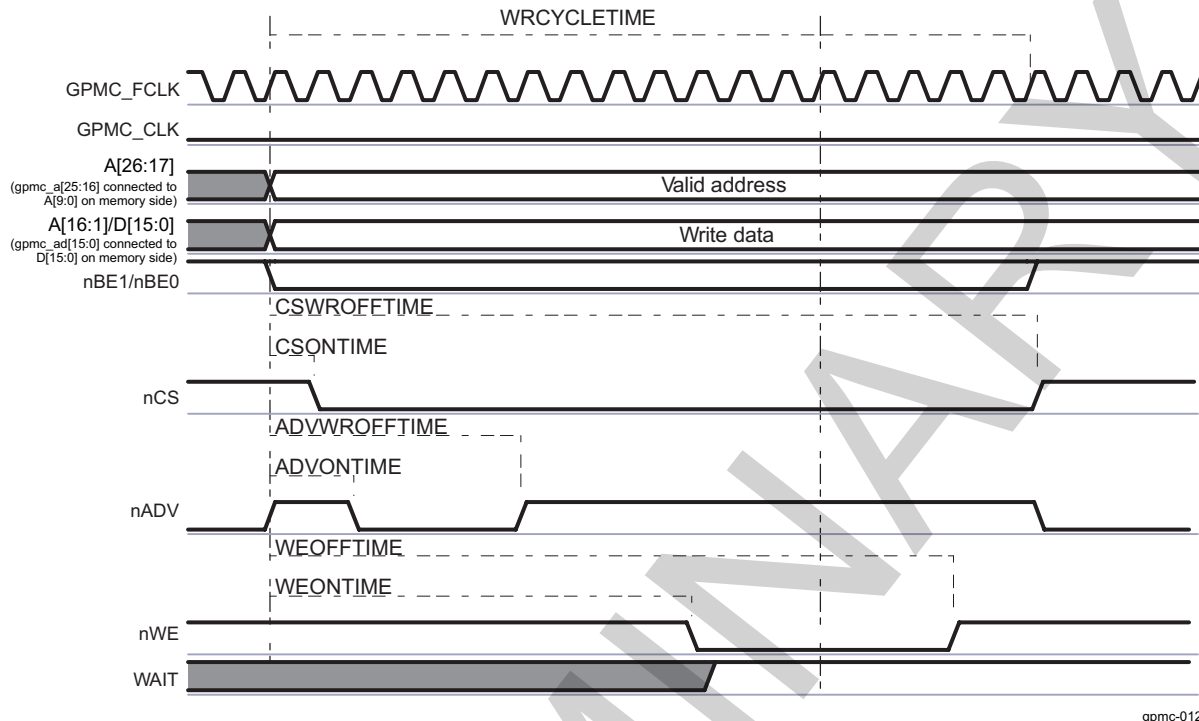
Read data is latched at [GPMC_CONFIG1_5\[20:16\]](#) RDACCESSTIME completion time. The end of the access is defined by the [GPMC_CONFIG1_5\[4:0\]](#) RDCYCLETIME parameter.

Set [GPMC_CONFIG\[1\] LIMITEDADDRESS](#) to 0x1 (A26-A11 are not modified during an external memory access).

nCS, nADV, nOE and DIR signals are controlled in the same way as address/data multiplexed accesses, see [Table 16-248](#).

16.4.4.11.3.2 Asynchronous Single Write Operation on a Nonmultiplexed Device

[Figure 16-74](#) shows an asynchronous single write operation on a nonmultiplexed device.

Figure 16-74. Asynchronous Single Write on an Address/Data-Nonmultiplexed Device

The 10-bit address is driven onto the address bus A[10:1] and the 16-bit data is driven onto the data bus D[15:0].

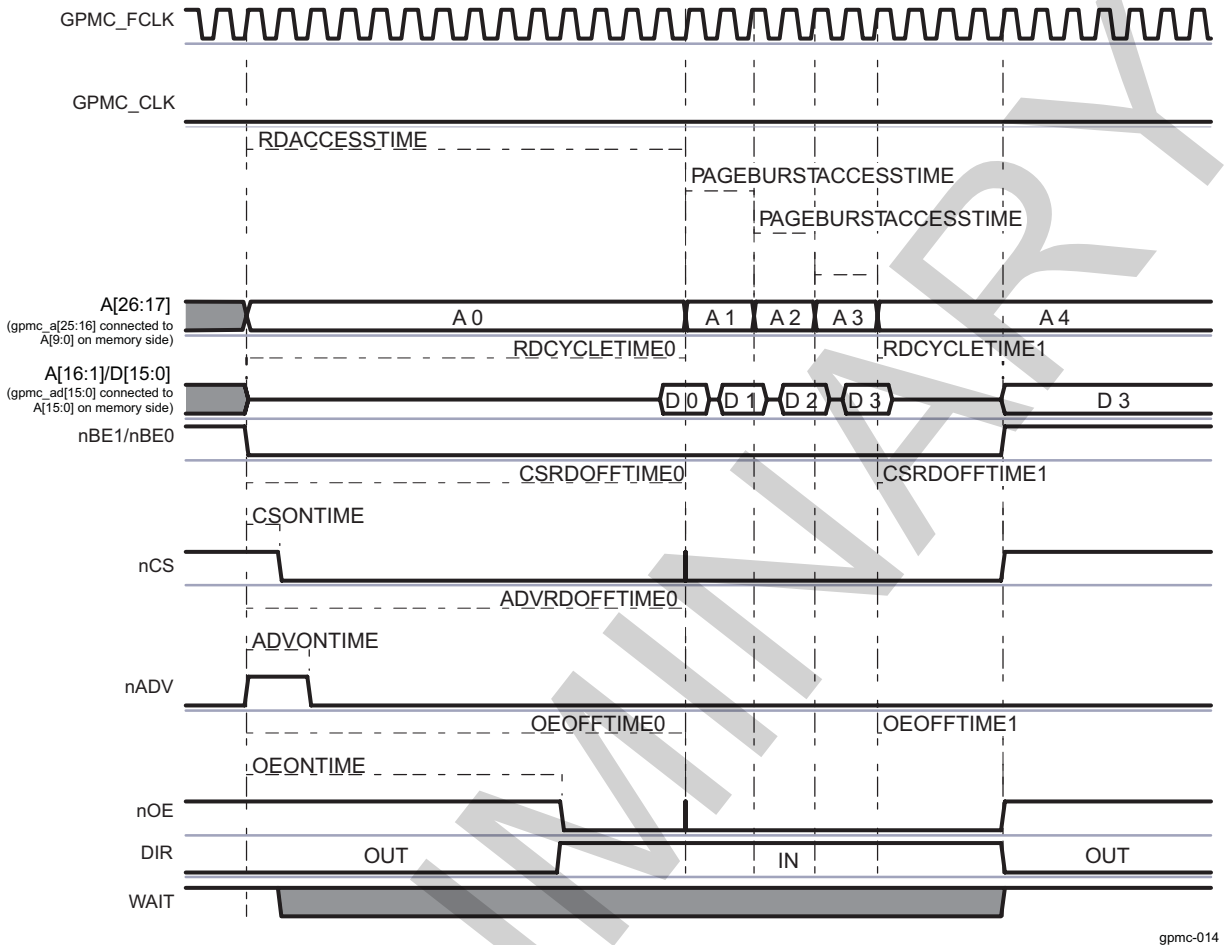
Set [GPMC_CONFIG\[1\] LIMITEDADDRESS](#) to 0x1 (A26-A11 are not modified during an external memory access).

nCS, nADV, nWE and DIR signals are controlled in the same way as address/data multiplexed accesses, see [Table 16-248](#).

16.4.4.11.3.3 Asynchronous Multiple (Page Mode) Read Operation on a Nonmultiplexed Device

[Figure 16-75](#) shows an asynchronous multiple read operation on a Nonmultiplexed Device, in which two word32 host read accesses to the GPMC are split into one multiple (page mode of 4 word16) read access to the attached device.

Figure 16-75. Asynchronous Multiple (Page Mode) Read



NOTE: The WAIT signal is active low.

nCS, nADV, nOE and DIR signals are controlled in the same way as address/data multiplexed accesses, see [Table 16-248](#).

When RDACCESSTIME completes, control-signal timings are frozen during the multiple data transactions, corresponding to PAGEBURSTACCESSTIME multiplied by the number of remaining data transactions.

Read data is latched at [GPMC_CONFIG5_i\[20:16\]](#) RDACCESSTIME completion time (i = 0 to 7). The end of the access is defined by the [GPMC_CONFIG5_i\[4:0\]](#) RDCYCLETIME parameter.

Set [GPMC_CONFIG\[1\]](#) LIMITEDADDRESS to 0x1 (A26-A11 are not modified during an external memory access).

During consecutive accesses, the GPMC increments the address after each data read completes.

Delay between successive read data in the page is controlled by the [GPMC_CONFIG5_i\[27:24\]](#) PAGEBURSTACCESSTIME parameter. Depending on the device page length, the GPMC can control device page crossing during a burst request and insert initial RDACCESSTIME latency. Note that page crossing is only possible with a new burst access, meaning a new initial access phase is initiated.

Total access time RDCYCLETIME corresponds to RDACCESSTIME plus the address hold time starting from the nCS deassertion.

- The read cycle time is defined in the [GPMC_CONFIG5_i\[4:0\]](#) RDCYCLETIME field.
- In [Figure 16-75](#), the RDCYCLETIME programmed value equals RDCYCLETIME0 (before paged accesses) + RDCYCLETIME1 (after paged accesses).

16.4.4.11.3.4 Synchronous Operations on a Nonmultiplexed Device

All information for this section is equivalent to similar operations for address/data- or AAD-multiplexed accesses. The only difference resides in the address phase. See [Section 16.4.5.3, GPMC Configuration in NOR Mode](#).

16.4.4.11.4 Page and Burst Support

Each chip-select can be configured to process system single or burst requests into successive single accesses or asynchronous page/synchronous burst accesses, with appropriate access size adaptation.

Depending on the external device page or burst capability, read and write accesses can be independently configured through the GPMC. The [GPMC_CONFIG1_i\[30\]](#) READMULTIPLE and [GPMC_CONFIG1_i\[28\]](#) WRITEMULTIPLE bits ($i = 0$ to 7) are associated with the READTYPE and WRITETYPE parameters.

NOTE:

- Asynchronous write page mode is not supported.
- 8-bit wide device support is limited to nonburstable devices (READMULTIPLE and WRITEMULTIPLE are ignored).
- Not applicable to NAND device interfacing.

16.4.4.11.5 System Burst Versus External Device Burst Support

The device system can issue the following requests to the GPMC:

- Byte, 16-bit word, 32-bit word requests (byte enable controlled). This is always a single request from the interconnect point of view.
- Incrementing fixed-length bursts of two words, four words, and eight words
- Wrapped (critical word access first) fixed-length burst of two, four, or eight words

To process a system request with the optimal protocol, the READMULTIPLE (and READTYPE) and WRITEMULTIPLE (and WRITETYPE) parameters must be set according to the burstable capability (synchronous or asynchronous) of the attached device.

The GPMC access engine issues only fixed-length burst. The maximum length that can be issued is defined per CS by the [GPMC_CONFIG1_i\[24:23\]](#) ATTACHEDDEVICEPAGELENGTH field ($i = 0$ to 7). When the ATTACHEDDEVICEPAGELENGTH value is less than the system burst request length (including the appropriate access size adaptation according to the device width), the GPMC splits the system burst request into multiple bursts. Within the specified 4-, 8-, or 16-word value, the ATTACHEDDEVICEPAGELENGTH field value must correspond to the maximum-length burst supported by the memory device configured in fixed-length burst mode (as opposed to continuous burst mode).

To get optimal performance from memory devices that natively support 16 Word16-length-wrapping burst capability (critical word access first), the ATTACHEDDEVICEPAGELENGTH parameter must be set to 16 words and the [GPMC_CONFIG1_i\[31\]](#) WRAPBURST bit ($i = 0$ to 7) must be set to 1. Similarly DEVICESPAGELENGTH is set to 4 and 8 for memories supporting respectively 4 and 8 Word16-length-wrapping burst.

When the memory device does not offer (or is not configured to offer) native 16 Word16-length-wrapping burst, the WRAPBURST parameter must be cleared, and the GPMC access engine emulates the wrapping burst by issuing the appropriate burst sequences according to the ATTACHEDDEVICEPAGELENGTH value.

When the memory device does not support native-wrapping burst, there is usually no difference in behavior between a fixed burst length mode and a continuous burst mode configuration (except for a potential power increase from a memory-speculative data prefetch in a continuous burst read). However, even though continuous burst mode is compatible with GPMC behavior, because the GPMC access engine issues only fixed-length burst and does not benefit from continuous burst mode, it is best to configure the memory device in fixed-length burst mode.

The memory device maximum-length burst (configured in fixed-length burst wrap or nonwrap mode) usually corresponds to the memory device data buffer size. Memory devices with a minimum of 16 half-word buffers are the most appropriate (especially with wrap support), but memory devices with smaller buffer size (4 or 8) are also supported, assuming that the [GPMC_CONFIG1_i\[24:23\]](#) ATTACHEDDEVICEPAGELENGTH field is set accordingly to 4 or 8 words.

The device system issues only requests with addresses or starting addresses for nonwrapping burst requests; that is, the request size boundary is aligned. In case of an eight-word-wrapping burst, the wrapping address always occurs on the eight-words boundary. As a consequence, all words requested must be available from the memory data buffer when the buffer size is equal to or greater than the ATTACHEDDEVICEPAGELENGTH value. This usually means that data can be read from or written to the buffer at a constant rate (number of cycles between data) without wait states between data accesses. If the memory does not behave this way (nonzero wait state burstable memory), wait-pin monitoring must be enabled to dynamically control data-access completion within the burst.

NOTE: When the system burst request length is less than the ATTACHEDDEVICEPAGELENGTH value, the GPMC proceeds with the required accesses.

16.4.4.12 pSRAM Access Specificities

pSRAM devices are SRAM-pin-compatible low-power memories that contain a self-refreshed DRAM memory array. The [GPMC_CONFIG1_i\[11:10\]](#) DEVICETYPE field (i = 0 to 7) must be set to 0b00.

The pSRAM devices uses the NOR protocol. It support the following operations:

- Asynchronous single read
- Asynchronous page read
- Asynchronous single write
- Synchronous single read and write
- Synchronous burst read
- Synchronous burst write (not supported by NOR Flash memory)

pSRAM devices must be powered up and initialized in a predefined manner according to the specifications of the attached device.

pSRAM devices can be programmed to use either mode: fixed or variable latency. pSRAM devices can either automatically schedule autorefresh operations, which force the GPMC to use its WAIT signal capability when read or write operations occur during an internal self-refresh operation, or pSRAM devices automatically include the autorefresh operation in the access time. These devices do not require additional WAIT signal capability or a minimum nCS high pulse width between consecutive accesses to ensure that the correct internal refresh operation is scheduled.

16.4.4.13 NAND Access Description

NAND (8-bit and 16-bit) memory devices using a standard NAND asynchronous address/data-multiplexing scheme can be supported on any chip-select with the appropriate asynchronous configuration settings.

As for any other type of memory compatible with the GPMC interface, accesses to a chip-select allocated to a NAND device can be interleaved with accesses to chip-selects allocated to other external devices.

This interleaved capability limits the system to *chip enable don't care* NAND devices since the chip-select allocated to the NAND device has to be deasserted if accesses to other chip-selects are requested.

16.4.4.13.1 NAND Memory Device in Byte or 16-bit Word Stream Mode

NAND devices require correct command and address programming before data array read or write accesses. The GPMC does not include specific hardware to translate a random address system request into a NAND-specific multiphase access. In that sense, GPMC NAND support, as opposed to random memory-map device support, is data-stream-oriented (byte or 16-bit word).

The GPMC NAND programming model relies on a software driver for address and command formatting with the correct data address pointer value according to the block and page structure. Because of NAND structure and protocol interface diversity, the GPMC does not support automatic command and address phase programming, and software drivers must access the NAND device ID to ensure that correct command and address formatting are used for the identified device.

NAND device data read and write accesses are achieved through an asynchronous read or write access. The associated chip-select signal timing control must be programmed according to the NAND device timing specification.

Any chip-select region can be qualified as a NAND region to constrain the nADV/ALE signal as Address Latch Enable (ALE active high, default state value at low) during address program access, and the nBE0/CLE signal as Command Latch Enable (CLE active high, default state value at low) during command program access. GPMC address lines are not used (the previous value is not changed) during NAND access.

16.4.4.13.1.1 Chip-Select Configuration for NAND Interfacing in Byte or Word Stream Mode

The [GPMC_CONFIG1_i](#) register (where $i = 0$ to 7) associated with a NAND device region interfaced in byte or word stream mode can be initialized with a minimum size of 16 Mbytes, because any address location in the chip-select memory region can be used to access a NAND data array. The NAND Flash protocol specifies an address sequence where address bits are passed through the data bus in a series of write accesses with the ALE pin asserted. After this address phase, all operations are streamed and the system requests address is irrelevant.

CAUTION

To allow correct command, address, and data-access controls, the [GPMC_CONFIG1_i](#) register associated with a NAND device region must be initialized in asynchronous read and write modes with the parameters shown in [Table 16-226](#). Failure to comply with these settings corrupts the NAND interface protocol.

Table 16-226. Chip-Select Configuration for NAND Interfacing

| Bit Field | Register | Value | Comments |
|--------------------------|---|--------------|--|
| WRAPBURST | GPMC_CONFIG1_i[31] ⁽¹⁾ | 0 | No wrap |
| READMULTIPLE | GPMC_CONFIG1_i[30] | 0 | Single access |
| READTYPE | GPMC_CONFIG1_i[29] | 0 | Asynchronous mode |
| WRITEMULTIPLE | GPMC_CONFIG1_i[28] | 0 | Single access |
| WRITETYPE | GPMC_CONFIG1_i[27] | 0 | Asynchronous mode |
| CLKACTIVATIONTIME | GPMC_CONFIG1_i[26:25] | 0b00 | |
| ATTACHEDDEVICEPAGELENGTH | GPMC_CONFIG1_i[24:23] | Don't care | Single-access mode |
| WAITREADMONITORING | GPMC_CONFIG1_i[22] | 0 | Wait not monitored by GPMC access engine |
| WAITWRITEMONITORING | GPMC_CONFIG1_i[21] | 0 | Wait not monitored by GPMC access engine |
| WAITMONITORINGTIME | GPMC_CONFIG1_i[19:18] | Don't care | Wait not monitored by GPMC access engine |
| WAITPINSELECT | GPMC_CONFIG1_i[17:16] | | Select which wait is monitored by edge detectors |
| DEVICESIZE | GPMC_CONFIG1_i[13:12] | 0b00 or 0b01 | 8- or 16-bit interface |
| DEVICETYPE | GPMC_CONFIG1_i[11:10] | 0b10 | NAND device in stream mode |
| MUXADDDATA | GPMC_CONFIG1_i[9:8] | 0b00 | Nonmultiplexed mode |

⁽¹⁾ $i = 0$ to 7

Table 16-226. Chip-Select Configuration for NAND Interfacing (continued)

| Bit Field | Register | Value | Comments |
|---------------------|-------------------------------------|------------|--|
| TIMEPARAGRANULARITY | GPMC_CONFIG1_i[4] | 0 | Timing achieved with best GPMC clock granularity |
| GPMCFCLKDIVIDER | GPMC_CONFIG1_i[1:0] | Don't care | Asynchronous mode |

The [GPMC_CONFIG1_i](#) to [GPMC_CONFIG4_i](#) register (where i = 0 to 7) associated with a NAND device region must be initialized with the correct control-signal timing value according to the NAND device timing parameters.

16.4.4.13.1.2 NAND Device Command and Address Phase Control

NAND devices require multiple address programming phases. The MPU software driver is responsible for issuing the correct number of command and address program accesses, according to the device command set and the device address-mapping scheme.

NAND device-command and address-phase programming is achieved through write requests to the [GPMC_NAND_COMMAND_i](#) and [GPMC_NAND_ADDRESS_i](#) register locations (i = 0 to 7) with the correct command and address values. These locations are mapped in the associated chip-select register region. The associated chip-select signal timing control must be programmed according to the NAND device timing specification.

Command and address values are not latched during the access and cannot be read back at the register location.

- Only write accesses must be issued to these locations, but the GPMC does not discard any read access. Accessing a NAND device with nOE and CLE or ALE asserted (read access) can produce undefined results.
- Write accesses to the [GPMC_NAND_COMMAND_i](#) register location and to the [GPMC_NAND_ADDRESS_i](#) register location must be posted for faster operations (i = 0 to 7). The [GPMC_CONFIG\[0\]](#) NANDFORCEPOSTEDWRITE bit enables write accesses to these locations as posted, even if they are defined as nonposted.

A write buffer is used to store write transaction information before the external device is accessed:

- Up to eight consecutive posted write accesses can be accepted and stored in the write buffer.
- For nonposted write, the pipeline is one deep.
- An [GPMC_STATUS\[0\]](#) EMPTYWRITEBUFFERSTATUS bit stores the empty status of the write buffer.

[GPMC_NAND_COMMAND_i](#) and [GPMC_NAND_ADDRESS_i](#) (i = 0 to 7) are 32-bit word locations, which means any 32-bit word or 16-bit word access is split into 4- or 2-byte accesses if an 8-bit wide NAND device is attached. For multiple-command phase or multiple-address phase, the software driver can use 32-bit word or 16-bit word access to these registers, but it must account for the splitting and little-endian ordering scheme. When only one byte command or address phase is required, only byte write access to [GPMC_NAND_COMMAND_i](#) and [GPMC_NAND_ADDRESS_i](#) can be used, and any of the four byte locations of the registers are valid.

The same applies to a [GPMC_NAND_COMMAND_i](#) and a [GPMC_NAND_ADDRESS_i](#) (i = 0 to 7) 32-bit word write access to a 16-bit wide NAND device (split into two 16-bit word accesses). In the case of a 16-bit word write access, the MSByte of the 16-bit word value must be set according to the NAND device requirement (usually 0). Either 16-bit word location or any one of the four byte locations of the registers is valid.

16.4.4.13.1.3 Command Latch Cycle

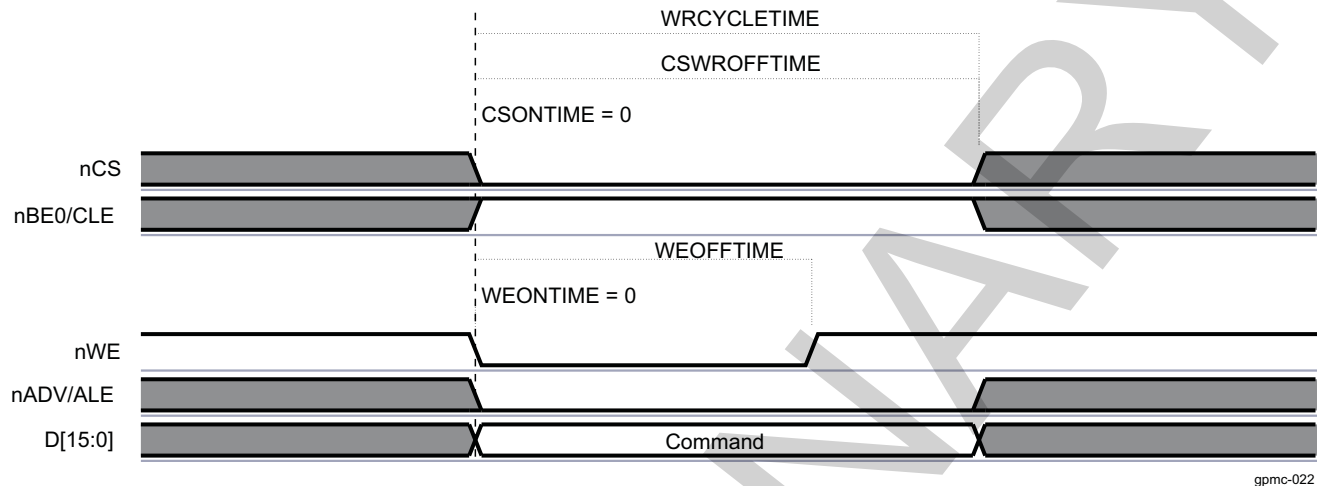
Writing data at the [GPMC_NAND_COMMAND_i](#) location (i = 0 to 7) places the data as the NAND command value on the bus, using a regular asynchronous write access.

- nCE is controlled by the CSONTIME and CSWROFFTIME timing parameters.
- CLE is controlled by the ADVONTIME and ADVWROFFTIME timing parameters.

- nWE is controlled by the WEONTIME and WEOFFTIME timing parameters.
- ALE and nRE (nOE) are maintained inactive.

Figure 16-76 shows the NAND command latch cycle.

Figure 16-76. NAND Command Latch Cycle



NOTE: CLE is shared with the nBE0 output signal and has an inverted polarity from BE0. The NAND qualifier deals with this. During the asynchronous NAND data access cycle, nBE0 (also nBE1) must not toggle, because it is shared with CLE.

NAND Flash memories do not use byte enable signals at all.

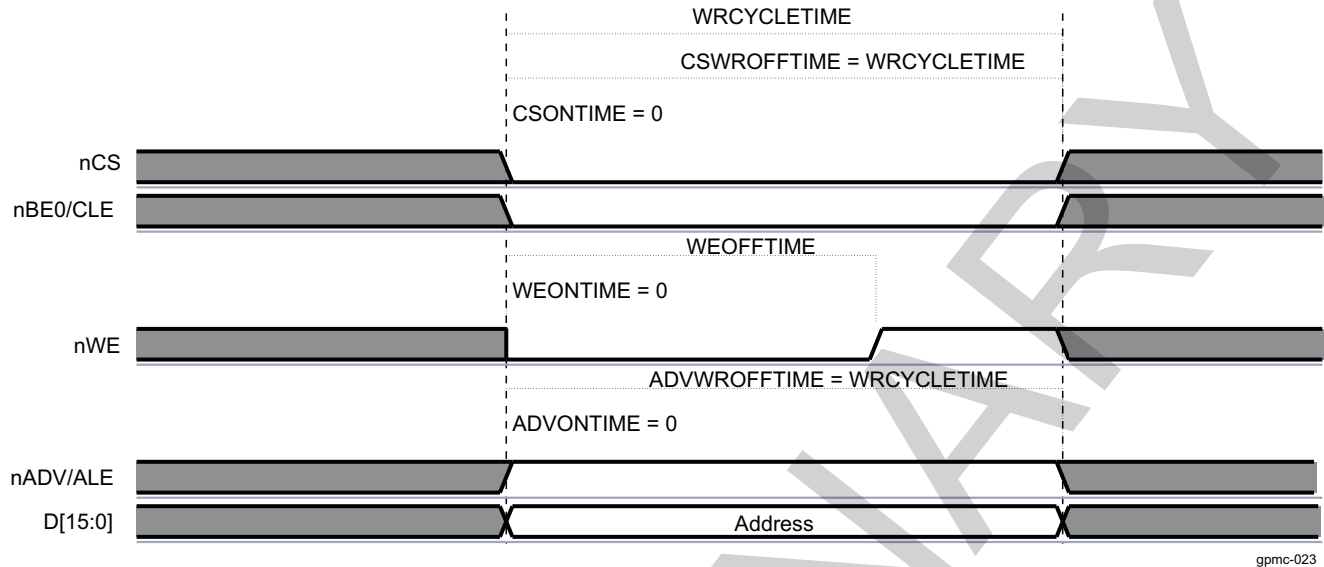
16.4.4.13.1.4 Address Latch Cycle

Writing data at the [GPMC_NAND_ADDRESS_i](#) location ($i = 0$ to 7) places the data as the NAND partial address value on the bus, using a regular asynchronous write access.

- nCS is controlled by the CSONTIME and CSWROFFTIME timing parameters.
- ALE is controlled by the ADVONTIME and ADVWROFFTIME timing parameters.
- nWE is controlled by the WEONTIME and WEOFFTIME timing parameters.
- CLE and nRE (nOE) are maintained inactive.

Figure 16-77 shows the NAND address latch cycle.

Figure 16-77. NAND Address Latch Cycle



NOTE: ALE is shared with the nADV output signal and has an inverted polarity from ADV. The NAND qualifier deals with this. During the asynchronous NAND data access cycle, ALE is kept stable.

16.4.4.13.1.5 NAND Device Data Read and Write Phase Control in Stream Mode

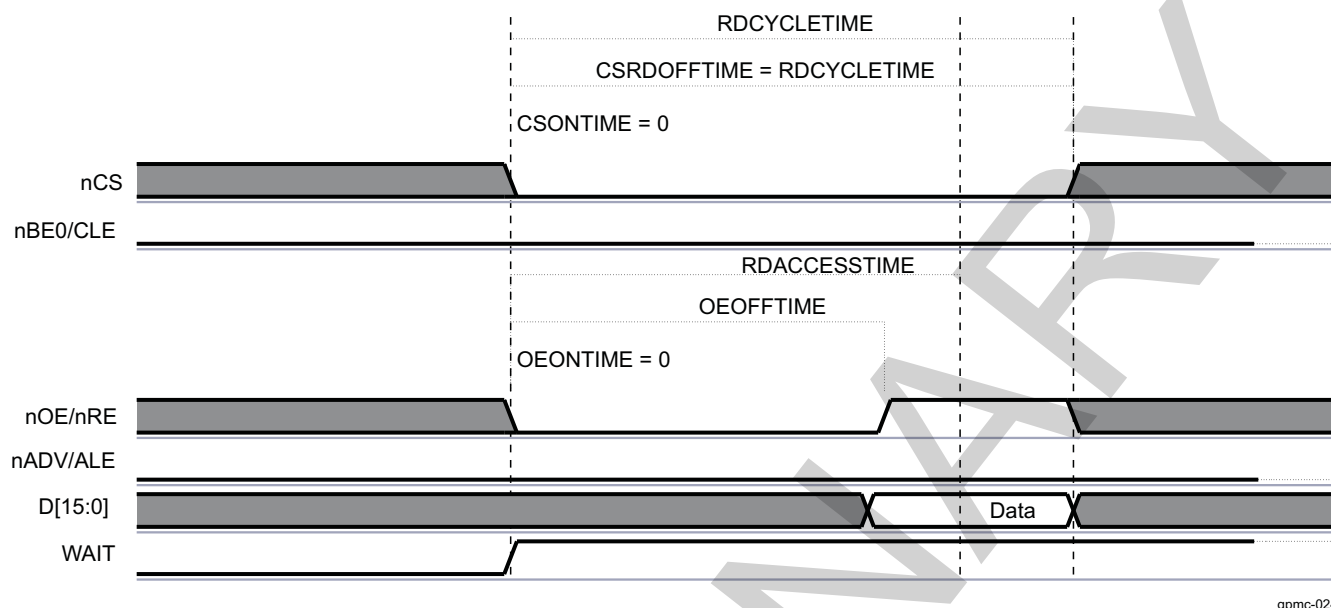
NAND device data read and write accesses are achieved through a read or write request to the chip-select-associated memory region at any address location in the region or through a read or write request to the [GPMC_NAND_DATA_i](#) location ($i = 0$ to 7) mapped in the chip-select-associated control register region. [GPMC_NAND_DATA_i](#) is not a true register, but an address location to enable **nRE** or **nWE** signal control. The associated chip-select signal timing control must be programmed according to the NAND device timing specification.

Reading data from the [GPMC_NAND_DATA_i](#) location or from any location in the associated chip-select memory region activates an asynchronous read access.

- **nCS** is controlled by the **CSONTIME** and **CSRDOFFTIME** timing parameters.
- **nRE** is controlled by the **OEONTIME** and **OEOFFTIME** timing parameters.
- To take advantage of **nRE** high-to-data invalid minimum timing value, the **RDACCESSTIME** can be set so that data are effectively captured after **nRE** deassertion. This allows optimization of NAND read access cycle time completion. For optimal timing parameter settings, see the NAND device and the device IC timing parameters.

ALE, CLE, and **nWE** are maintained inactive.

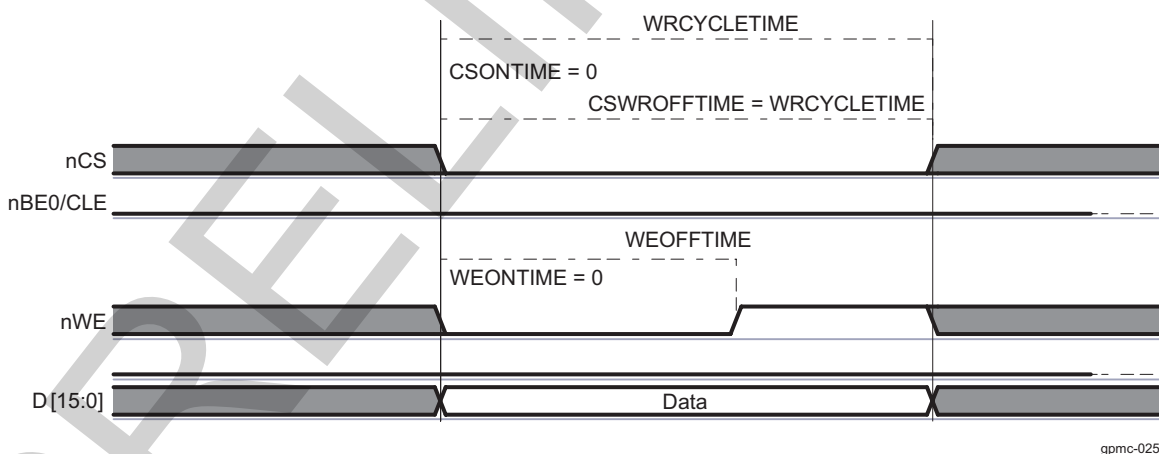
[Figure 16-78](#) shows the NAND data read cycle.

Figure 16-78. NAND Data Read Cycle

Writing data to the [GPMC_NAND_DATA_i](#) location or to any location in the associated chip-select memory region activates an asynchronous write access.

- nCS is controlled by the CSONTIME and CSWROFFTIME timing parameters.
- nWE is controlled by the WEONTIME and WEOFFTIME timing parameters.
- ALE, CLE, and nRE (nOE) are maintained inactive.

[Figure 16-79](#) shows the NAND data write cycle.

Figure 16-79. NAND Data Write Cycle

16.4.4.13.1.6 NAND Device General Chip-Select Timing Control Requirement

For most NAND devices, read data access time is dominated by nCS-to-data-valid timing and has faster nRE-to-data-valid timing. Successive accesses with nCS deassertions between accesses are affected by this timing constraint. Because accesses to a NAND device can be interleaved with other chip-select accesses, there is no certainty that nCS always stays low between two accesses to the same chip-select. Moreover, an nCS deassertion time between the same chip-select NAND accesses is likely to be required as follows: the nCS deassertion requires programming CYCLETIME and RDACCESSTIME according to the nCS-to-data-valid critical timing.

To get full performance from NAND read and write accesses, the prefetch engine can dynamically reduce

RDCYCLETIME, WRCYCLETIME, RDACCESSTIME, WRACCESSTIME, CSRDOFFTIME, CSWROFFTIME, ADVRDOFFTIME, ADVWROFFTIME, OEOFFTIME, and WEOFFTIME on back-to-back NAND accesses (to the same memory) and suppress the minimum nCS high pulse width between accesses. For more information about optimal prefetch engine access, see [Section 16.4.4.13.4, Prefetch and Write-Posting Engine](#).

Some NAND devices require minimum write-to-read idle time, especially for device-status read accesses following status-read command programming (write access). If such write-to-read transactions are used, a minimum nCS high pulse width must be set. For this, CYCLE2CYCLESAMECSSEN and CYCLE2CYCLEDELAY must be set according to the appropriate timing requirement to prevent any timing violation.

NAND devices usually have an important nRE high to data bus in tristate mode. This requires a bus turnaround setting (BUSTURNAROUND = 1), so that the next access to a different chip-select is delayed until the BUSTURNAROUND delay completes. Back-to-back NAND read accesses to the same NAND Flash are not affected by the programmed bus turnaround delay.

16.4.4.13.1.7 Read and Write Access Size Adaptation

16.4.4.13.1.7.1 8-bit wide NAND Device

Host 16-bit word and 32-bit word read and write access requests to a chip-select associated with an 8-bit wide NAND device are split into successive read and write byte accesses to the NAND memory device. Byte access is ordered according to little-endian organization. A NAND 8-bit wide device must be interfaced on the D0D7 interface bus lane. GPMC data accesses are justified on this bus lane when the chip-select is associated with an 8-bit wide NAND device.

16.4.4.13.1.7.2 16-bit wide NAND Device

Host 32-bit word read and write access requests to a chip-select associated with a 16-bit wide NAND device are split into successive read and write 16-bit word accesses to the NAND memory device. 16-bit word access is ordered according to little-endian organization.

Host byte read and write access requests to a 16-bit wide NAND device are completed as 16-bit accesses on the device itself, because there is no byte-addressing capability on 16-bit wide NAND devices. This means that the NAND device address pointer is incremented on a 16-bit word basis and not on a byte basis. For a read access, only the requested byte is given back to the host, but the remaining byte is not stored or saved by the GPMC, and the next byte or 16-bit word read access gets the next 16-bit word NAND location. For a write access, the invalid byte part of the 16-bit word is driven to FF, and the next byte or 16-bit word write access programs the next 16-bit word NAND location.

Generally, byte access to a 16-bit wide NAND device should be avoided, especially when ECC calculation is enabled. 8-bit or 16-bit ECC-based computations are corrupted by a byte read to a 16-bit wide NAND device, because the nonrequested byte is considered invalid on a read access (not captured on the external data bus; FF is fed to the ECC engine) and is set to FF on a write access.

Host requests (read/write) issued in the chip-select memory region are translated in successive single or split accesses (read/write) to the attached device. Therefore, incrementing 32-bit burst requests are translated in multiple 32-bit sequential accesses following the access adaptation of the 32-bit to 8- or 16-bit device.

16.4.4.13.2 NAND Device-Ready Pin

The NAND memory device provides a ready pin to indicate data availability after a block/page opening and to indicate that data programming is complete. The ready pin can be connected to one of the WAIT GPMC input pins; data read accesses must not be tried when the ready pin is sampled inactive (device is not ready) even if the associated chip-select WAITREADMONITORING bit field is set. The duration of the NAND device busy state after the block/page opening is so long (up to 50 micro second) that accesses occurring when the ready pin is sampled inactive can stall GPMC access and eventually cause a system time-out.

NOTE: If a read access to a NAND flash is done using the wait monitoring mode, the device is blocked during a page opening, and so is the GPMC. If the correct settings are used, other chip-selects can be used while the memory processes the page opening command.

To avoid a time-out caused by a block/page opening delay in NAND flash, disable the wait pin monitoring for read and write accesses (that is, set the [GPMC_CONFIG1_i\[21\]](#) WAITWRITEMONITORING and [GPMC_CONFIG1_i\[22\]](#) WAITREADMONITORING bits to 0, where $i = 0$ to 7), and use one of the following methods instead:

- Use software to poll the WAITnSTATUS bit ($n = 0$ to 3) of the [GPMC_STATUS](#) register.
- Configure an interrupt that is generated on the WAIT signal change (through the [GPMC_IRQENABLE](#) register bits[11:8]).

Even if the READWAITMONITORING bit is not set, the external memory nR/B pin status is captured in the programmed WAIT bit in the [GPMC_STATUS](#) register.

The READWAITMONITORING bit method must be used for other memories than NAND flash, if they require the use of a WAIT signal.

16.4.4.13.2.1 Ready Pin Monitored by Software Polling

The ready signal state can be monitored through the [GPMC_STATUS](#) WAITxSTATUS bit ($x = 0$ or 1). The software must monitor the ready pin only when the signal is declared valid. Refer to the NAND device timing parameters to set the correct software temporization to monitor ready only after the invalid window is complete from the last read command written to the NAND device.

16.4.4.13.2.2 Ready Pin Monitored by Hardware Interrupt

Each gpmc_wait input pin can generate an interrupt when a wait-to-no-wait transition is detected. Depending on whether the [GPMC_CONFIG](#) WAITxPINPOLARITY bits ($x = 0$ or 1) is active low or active high, the wait-to-no-wait transition is a low-to-high external WAIT signal transition or a high-to-low external WAIT signal transition, respectively.

The wait transition pin detector must be cleared before any transition detection. This is done by writing 1 to the WAITxEDGEDETECTIONSTATUS bit ($x = 0$ or 3) of the [GPMC_IRQSTATUS](#) register according to the gpmc_wait pin used for the NAND device-ready signal monitoring. To detect a wait-to-no-wait transition, the transition detector requires a wait active time detection of a minimum of two GPMC_FCLK cycles. Software must incorporate precautions to clear the wait transition pin detector before wait (busy) time completes.

A wait-to-no-wait transition detection can issue a GPMC interrupt if the WAITxEDGEDETECTIONENABLE bit in the [GPMC_IRQENABLE](#) register is set and if the WAITxEDGEDETECTIONSTATUS bit field in the [GPMC_IRQSTATUS](#) register is set.

The WAITMONITORINGTIME field does not affect wait-to-no-wait transition time detection.

It is also possible to poll the WAITxEDGEDETECTIONSTATUS bit field in the [GPMC_IRQSTATUS](#) register according to the gpmc_wait pin used for the NAND device ready signal monitoring.

16.4.4.13.3 ECC Calculator

The General Purpose Memory Controller includes an Error Code Correction (ECC) calculator circuitry that enables on the fly ECC calculation during data read or data program (that is, write) operations. The page size supported by the ECC calculator in one calculation/context is 512 bytes.

The user can choose from two different algorithms with different error correction capabilities through the [GPMC_ECC_CONFIG\[16\]](#) ECCALGORITHM bit:

1. Hamming code for 1-bit error code correction on 8- or 16-bit NAND Flash organized with page size greater than 512 bytes
2. BCH (Bose-Chaudhuri-Hocquenghem) code for 4- to 16-bit error correction

The GPMC does not directly handle the error code correction itself. During writes, the GPMC computes parity bits. During reads, the GPMC provides enough information for the processor to correct errors without reading the data buffer all over again.

The Hamming code ECC is based on a 2-dimensional (row and column) bit parity accumulation. This parity accumulation is either accomplished on the programmed number of bytes or 16-bit words read from the memory device, or written to the memory device in stream mode.

Because the ECC engine includes only one accumulation context, it can be allocated to only one chip-select at a time through the [GPMC_ECC_CONFIG\[3:1\]](#) ECCCS bit field. Even if two CS use different ECC algorithms, one the Hamming code and the other a BCH code, they must define separate ECC contexts because some of the ECC registers are common to all types of algorithms.

16.4.4.13.3.1 Hamming Code

All references to Error Code Correction (ECC) in this subsection refer to the 1-bit error correction Hamming code.

The ECC is based on a two-dimensional (row and column) bit parity accumulation known as Hamming Code. The parity accumulation is done for a programmed number of bytes or 16-bit word read from the memory device or written to the memory device in stream mode.

There is no automatic error detection or correction, and it is the software NAND driver responsibility to read the multiple ECC calculation results, compare them to the expected code value, and take the appropriate corrective actions according to the error handling strategy (ECC storage in spare byte, error correction on read, block invalidation).

The ECC engine includes a single accumulation context. It can be allocated to a single designated chip-select at a time and parallel computations on different chip-selects are not possible. Since it is allocated to a single chip-select, the ECC computation is not affected by interleaved GPMC accesses to other chip-selects and devices. The ECC accumulation is sequentially processed in the order of data read from or written to the memory on the designated chip-select. The ECC engine does not differentiate read accesses from write accesses and does not differentiate data from command or status information. It is the software responsibility to make sure only relevant data are passed to the NAND flash memory while the ECC computation engine is active.

The starting NAND page location must be programmed first, followed by an ECC accumulation context reset with an ECC enabling, if required. The NAND device accesses discussed in the following sections must be limited to data read or write until the specified number of ECC calculations is completed.

16.4.4.13.3.1.1 ECC Result Register and ECC Computation Accumulation Size

The GPMC includes up to nine ECC result registers ([GPMC_ECCj_RESULT](#), j = 1 to 9) to store ECC computation results when the specified number of bytes or 16-bit words has been computed.

The ECC result registers are used sequentially; one ECC result is stored in one ECC result register on the list, the next ECC result is stored in the next ECC result register on the list, and so forth, until the last ECC computation. The [GPMC_ECCj_RESULT](#) register value is valid only when the programmed number of bytes or 16-bit words has been accumulated, which means that the same number of bytes or 16-bit words has been read from or written to the NAND device in sequence.

The [GPMC_ECC_CONTROL\[3:0\]](#) ECCPOINTER field must be set to the correct value to select the ECC result register to be used first in the list for the incoming ECC computation process. The ECCPointer can be read to determine which ECC register is used in the next ECC result storage for the ongoing ECC computation. The [GPMC_ECCj_RESULT](#) register value (j = 1 to 9) can be considered valid when ECCPOINTER equals j + 1. When [GPMC_ECCj_RESULT](#) (where j = 9) is updated, ECCPOINTER is frozen at 10, and ECC computing is stopped (ECCENABLE = 0).

The ECC accumulator must be reset before any ECC computation accumulation process. The [GPMC_ECC_CONTROL\[8\]](#) ECCCLEAR bit must be set to 1 (nonpersistent bit) to clear the accumulator and all ECC result registers.

For each ECC result (each [GPMC_ECCj_RESULT](#) register, j = 1 to 9), the number of bytes or 16-bit words used for ECC computing accumulation can be selected from between two programmable values.

The ECCjRESULTSISE bits (j = 1 to 9) in the [GPMC_ECC_SIZE_CONFIG](#) register select which programmable size value (ECCSIZE0 or ECCSIZE1) must be used for this ECC result (stored in [GPMC_ECCj_RESULT](#)).

The ECCSIZE0 and ECCSIZE1 fields allow selection of the number of bytes or 16-bit words used for ECC computation accumulation. Any even values from 2 to 512 are allowed.

Flexibility in the number of ECCs computed and the number of bytes or 16-bit words used in the successive ECC computations enables different NAND page error-correction strategies. Usually based on 256 or 512 bytes and on 128 or 256 16-bit word, the number of ECC results required is a function of the NAND device page size. Specific ECC accumulation size can be used when computing the ECC on the NAND spare byte.

For example, with a 2 Kbyte data page 8-bit wide NAND device, eight ECCs accumulated on 256 bytes can be computed and added to one extra ECC computed on the 24 spare bytes area where the eight ECC results used for comparison and correction with the computed data page ECC are stored. The GPMC then provides nine [GPMC_ECCj_RESULT](#) registers (j= 1 to 9) to store the results. In this case, ECCSIZE0 is set to 256, and ECCSIZE1 is set to 24; the ECC[1:8]RESULTSISE bits are set to 0, and the ECC9RESULTSISE bit is set to 1.

16.4.4.13.3.1.2 ECC Enabling

The [GPMC_ECC_CONFIG](#)[3:1] ECCCS field selects the allocated chip-select. The [GPMC_ECC_CONFIG](#)[0] ECCENABLE bit enables ECC computation on the next detected read or write access to the selected chip-select.

The ECCPOINTER, ECCCLEAR, ECCSIZE, ECCjRESULTSISE (where j = 1 to 9), ECC16B, and ECCCS fields must not be changed or cleared while an ECC computation is in progress.

The ECC accumulator and ECC result register must not be changed or cleared while an ECC computation is in progress.

[Table 16-227](#) describes the ECC enable settings.

Table 16-227. ECC Enable Settings

| Bit Field | Register | Value | Comments |
|-----------------------------------|--------------------------------------|-----------|---|
| ECCCS | GPMC_ECC_CONFIG | 0-3 | Selects the chip-select where ECC is computed |
| ECC16B | GPMC_ECC_CONFIG | 0/1 | Selects column number for ECC calculation |
| ECCCLEAR | GPMC_ECC_CONTROL | 0-7 | Clears all ECC result registers |
| ECCPOINTER | GPMC_ECC_CONTROL | 0-7 | A write to this bit field selects the ECC result register where the first ECC computation is stored. Set to 1 by default. |
| ECCSIZE1 | GPMC_ECC_SIZE_CONFIG | 0x00-0xFF | Defines ECCSIZE1 |
| ECCSIZE0 | GPMC_ECC_SIZE_CONFIG | 0x00-0xFF | Defines ECCSIZE0 |
| ECCjRESULTSISE (j from 1 to 9) | GPMC_ECC_SIZE_CONFIG | 0/1 | Selects the size of ECCn result register |
| ECCENABLE | GPMC_ECC_CONFIG | 1 | Enables the ECC computation |

16.4.4.13.3.1.3 ECC Computation

The ECC algorithm is a multiple parity bit accumulation computed on the odd and even bit streams extracted from the byte or Word 16 streams. The parity accumulation is split into row and column accumulations, as shown in [Figure 16-80](#) and [Figure 16-81](#). The intermediate row and column parities are used to compute the upper level row and column parities. Only the final computation of each parity bit is used for ECC comparison and correction.

P1o = bit7 XOR bit5 XOR bit3 XOR bit1 on each byte of the data stream

P1e = bit6 XOR bit4 XOR bit2 XOR bit0 on each byte of the data stream

P2o = bit7 XOR bit6 XOR bit3 XOR bit2 on each byte of the data stream

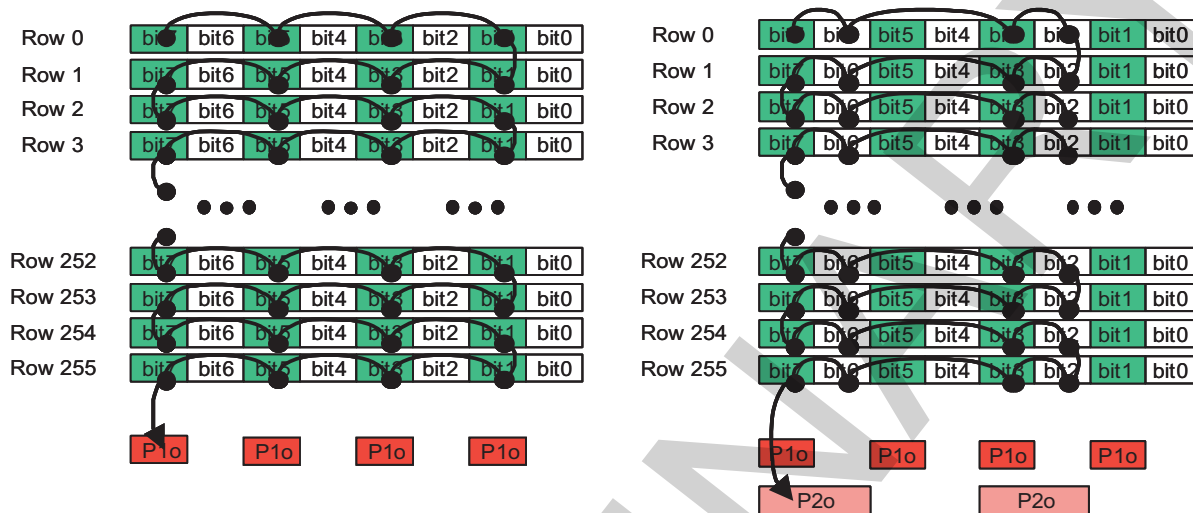
P2e = bit5 XOR bit4 XOR bit1 XOR bit0 on each byte of the data stream

$P4o = \text{bit7 XOR bit6 XOR bit5 XOR bit4}$ on each byte of the data stream

$P4e = \text{bit3 XOR bit2 XOR bit1 XOR bit0}$ on each byte of the data stream

Each column parity bit is XORed with the previous accumulated value.

Figure 16-80. Hamming Code Accumulation Algorithm (1/2)



gpmc-026

For line parities, the bits of each new data are XORed together, and line parity bits are computed as described below:

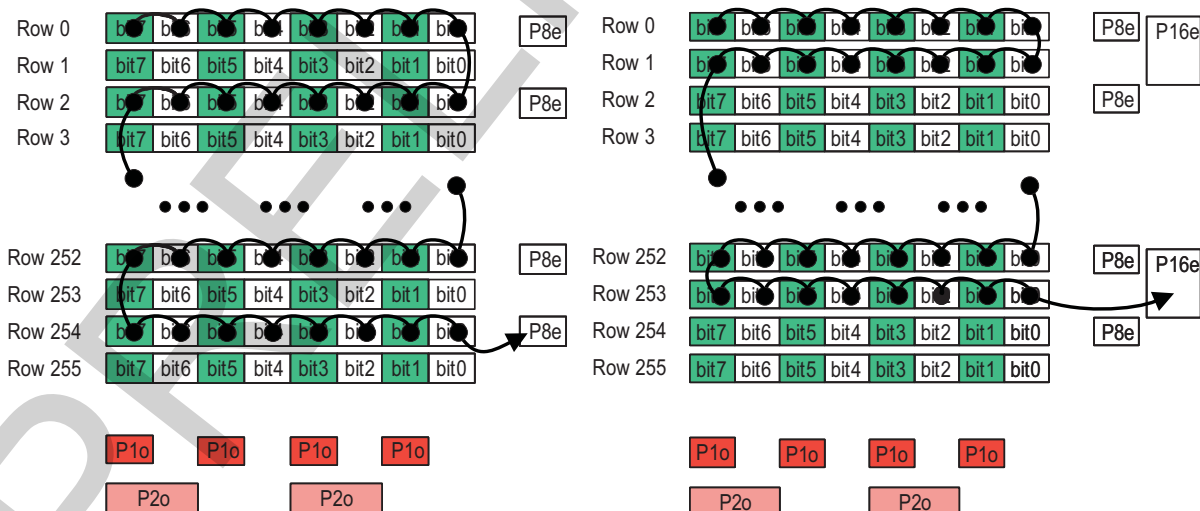
$P8e = \text{row0 XOR row2 XOR row4 XOR ... XOR row254}$

$P8o = \text{row1 XOR row3 XOR row5 XOR ... XOR row255}$

$P16e = \text{row0 XOR row1 XOR row4 XOR row5 XOR ... XOR row252 XOR row 253}$

$P16o = \text{row2 XOR row3 XOR row6 XOR row7 XOR ... XOR row254 XOR row 255}$

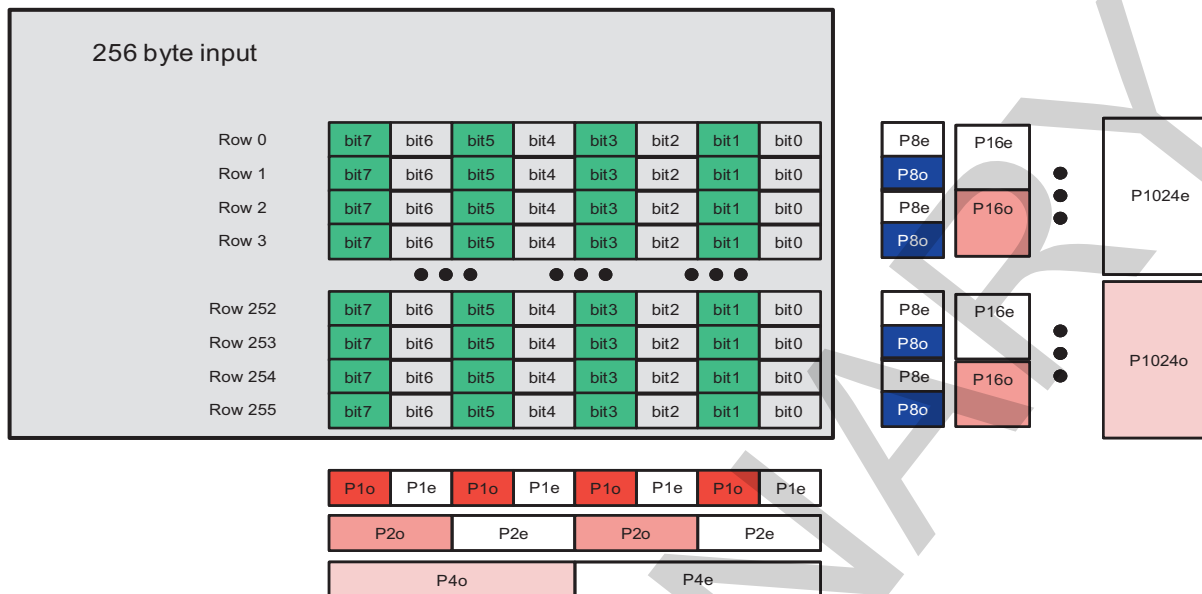
Figure 16-81. Hamming Code Accumulation Algorithm (2/2)



gpmc-027

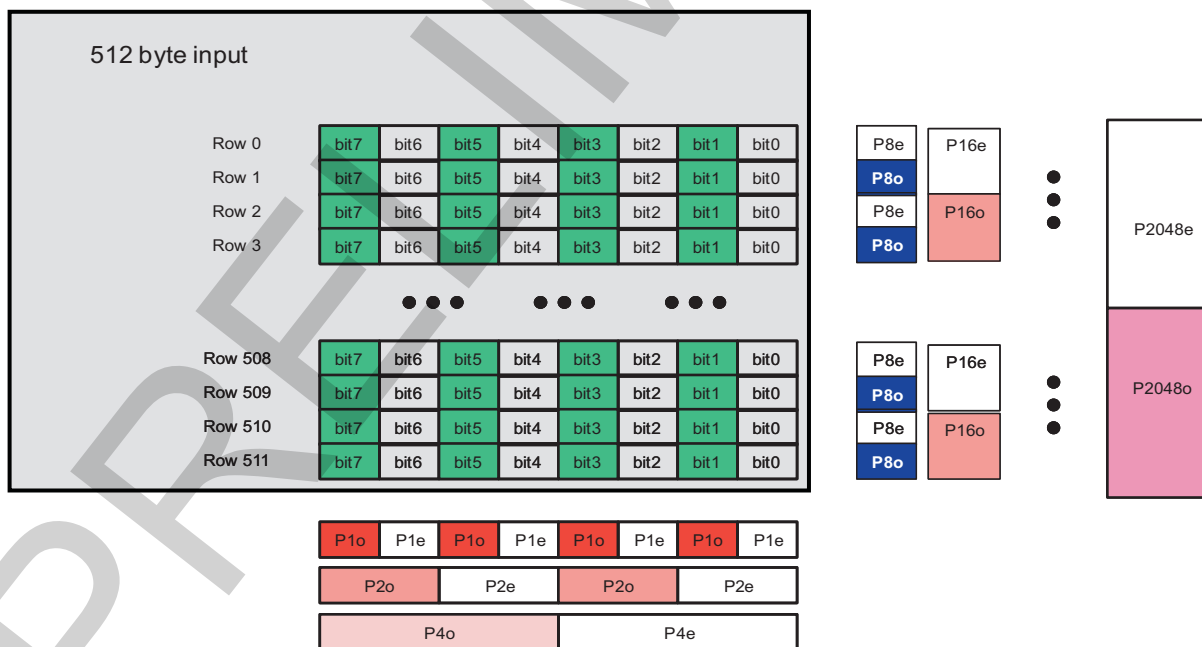
Unused parity bits in the result registers are set to 0.

Figure 16-82 shows ECC computation for a 256-byte data stream (read or write). The result includes six column parity bits ($P1o$ - $P2o$ - $P4o$ for odd parities, and $P1e$ - $P2e$ - $P4e$ for even parities) and sixteen row parity bits ($P8o$ - $P16o$ - $P32o$ - $P1024o$ for odd parities, and $P8e$ - $P16e$ - $P32e$ - $P1024e$ for even parities).

Figure 16-82. ECC Computation for a 256-Byte Data Stream (Read or Write)

gpmc-028

Figure 16-83 shows ECC computation for a 512-byte data stream (read or write). The result includes six column parity bits (P1o-P2o-P4o for odd parities, and P1e-P2e-P4e for even parities) and eighteen row parity bits (P8o-P16o-P32o-P1024o - P2048o for odd parities, and P8e-P16e-P32e-P1024e- P2048e for even parities).

Figure 16-83. ECC Computation for a 512-Byte Data Stream (Read or Write)

gpmc-029

For a 2 Kbytes page, four 512 bytes ECC calculations plus one for the spare area are required. Results are stored in the [GPMC_ECCj_RESULT](#) registers ($j = 1$ to 9).

16.4.4.13.3.1.4 ECC Comparison and Correction

To detect an error, the computed ECC result must be XORed with the parity value stored in the spare area of the accessed page.

- If the result of this logical XOR is all 0s, no error is detected and the read data is correct.
- If every second bit in the parity result is a 1, one bit is corrupted and is located at bit address (P2048o, P1024o, P512o, P256o, P128o, P64o, P32o, P16o, P8o, P4o, P2o, P1o). The software must correct the corresponding bit.
- If only one bit in the parity result is 1, it is an ECC error and the read data is correct.

16.4.4.13.3.1.5 ECC Calculation Based on 8-Bit Word

The 8-bit based ECC computation is used for 8-bit wide NAND device interfacing.

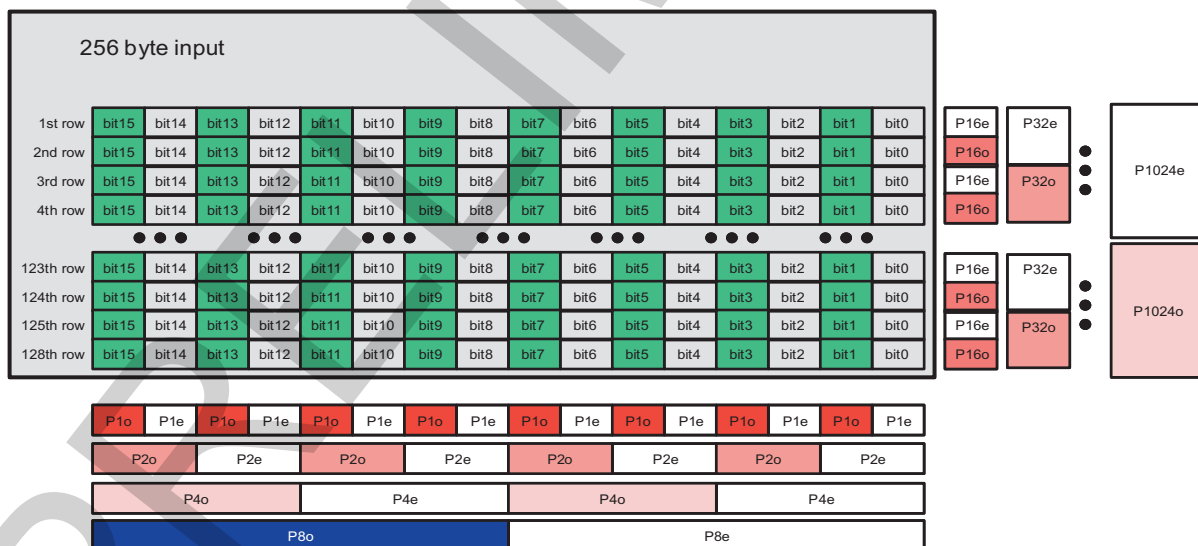
The 8-bit based ECC computation can be used for 16-bit wide NAND device interfacing to get backward compatibility on the error-handling strategy used with 8-bit wide NAND devices. In this case, the 16-bit wide data read from or written to the NAND device is fragmented into 2 bytes. According to little-endian access, the least significant bit (LSB) of the 16-bit wide data is ordered first in the byte stream used for 8-bit based ECC computation.

16.4.4.13.3.1.6 ECC Calculation Based on 16-Bit Word

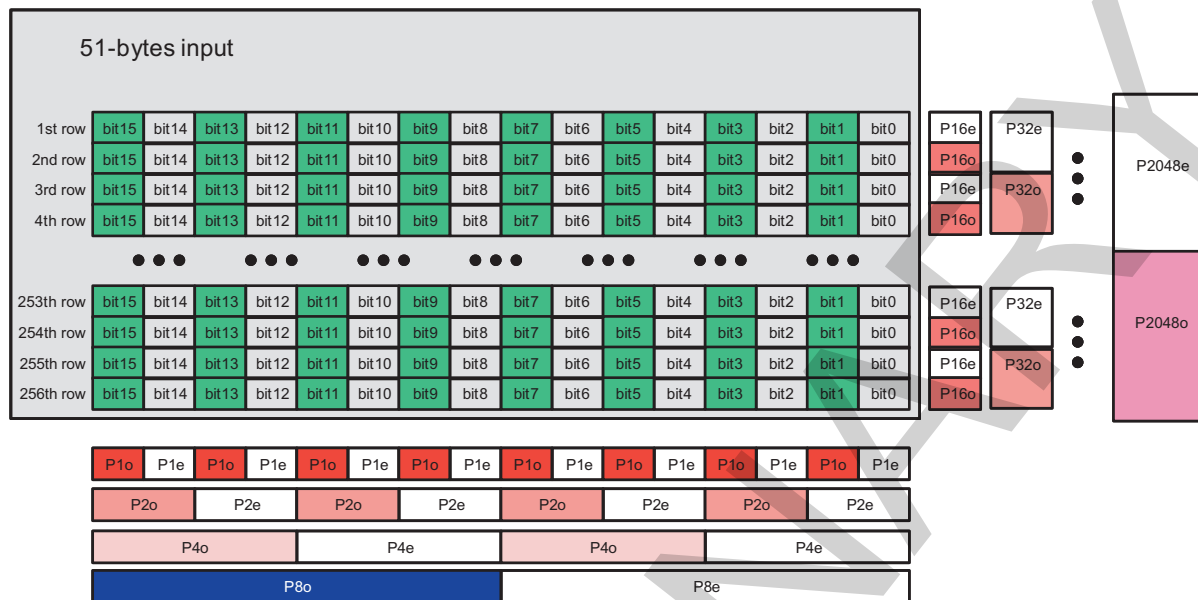
ECC computation based on a 16-bit word is used for 16-bit wide NAND device interfacing. This ECC computation is not supported when interfacing an 8-bit wide NAND device, and the [GPMC_ECC_CONFIG\[7\]](#) ECC16B bit must be set to 0 when interfacing an 8-bit wide NAND device.

The parity computation based on 16-bit words affects the row and column parity mapping. The main difference is that the odd and even parity bits P8o and P8e are computed on rows for an 8-bit based ECC while there are computed on columns for a 16-bit based ECC. [Figure 16-84](#) and [Figure 16-85](#) show a 128 Word 16 ECC computation scheme and a 256 16-bit word ECC computation scheme.

Figure 16-84. 128 Word16 ECC Computation



gpmc-030

Figure 16-85. 256 Word16 ECC Computation

gpmc-031

16.4.4.13.3.2 BCH Code (Bose-Chaudhuri-Hocquenghem)

All references to Error Code Correction (ECC) in this subsection refer to the 4- to 16-bit error correction BCH code.

16.4.4.13.3.2.1 Requirements

- Read and write accesses to a NAND flash take place by whole pages, in a predetermined sequence: first the data byte page itself, then some spare bytes, including the BCH ECC (and other information). The NAND IC can cache a full page, including spares, for read and write accesses.
Typical page write sequence:
 - Sequential write to NAND cache of main data + spare data, for a page. ECC is calculated on the fly. Calculated ECC may be inserted on the fly in the spares, or replaced by dummy accesses.
 - When the calculated ECC is replaced by dummy accesses, it must be written to the cache in a second, separate phase. The ECC module is disabled during that time.
 - NAND writes its cache line (page) to the array.
 Typical page read sequence:
 - Sequential read of a page. ECC is calculated on the fly.
 - ECC module buffers status determines the presence of errors.
- Accesses to several memories may be interleaved by the GPMC, but only one of those memories can be a NAND using the BCH engine at a time; in other words, only one BCH calculation (for example, for a single page) can be on-going at any time. Note also that the sequential nature of NAND accesses guarantees that the data is always written / read out in the same order. BCH-relevant accesses are selected by the GPMCs chip-select.
- Each page may hold up to 4 Kbytes of data, spare bytes not included. This means up to 8 x 512-byte BCH messages. Since all the data is written / read out first, followed by the BCH ECC, this means that the BCH engine must be able to hold 8 104-bit remainders or syndromes (or smaller, 52-bit ones) at the same time.
The BCH module has the capacity to store all remainders internally. After the page start, an internal counter is used to detect the 512-byte sector boundaries. On those boundaries, the current remainder is stored and the divider reset for the next calculation. At the end of the page, the BCH module contains all remainders.
- NAND access cycles hold 8 or 16 bits of data each (1 or 2 bytes); Each NAND cycle takes at least 4

cycles of the GPMCs internal clock. This means the NAND flash timing parameters must define a RDCYCLETIME and a WRCYCLETIME of at least 4 clock cycles after optimization when using the BCH calculator.

5. The spare area is assumed to be large enough to hold the BCH ECC, that is, to have at least a message of 13 bytes available per 512-byte sector of data. The zone of unused spare area by the ECC may or may not be protected by the same ECC scheme, by extending the BCH message beyond 512 bytes (maximum codeword is 1023-byte long, ECC included, which leaves a lot of space to cover some spares bytes).

16.4.4.13.3.2.2 Memory-Mapping of the BCH Codeword

BCH encoding considers a block of data to protect as a polynomial message $M(x)$. In our standard case, 512 bytes of data (that is, 2^{12} bits = 4096 bits) are seen as a polynomial of degree $2^{12} - 1 = 4095$, with parameters ranging from M0 to M4095. For 512 bytes of data, 52 bits are required for 4-bit error correction, and 104 bits are required for 8-bit error correction and 207 bits are required for 16-bit error correction. The ECC is a remainder polynomial $R(x)$ of degree 103 (or 51, depending on the selected mode). The complete codeword $C(x)$ is the concatenation of $M(x)$ and $R(x)$ as shown in Table 16-228.

Table 16-228. Flattened BCH Codeword Mapping (512 Bytes + 104 Bits)

| Bit number | Message $M(x)$ | | | ECC $R(x)$ | | |
|------------|----------------|-----|----|------------|-----|----|
| | M4095 | ... | M0 | R103 | ... | R0 |

If the message is extended by the addition of spare bytes to be protected by the same ECC, the principle is still valid. For example, a 3-byte extension of the message gives a polynomial message $M(x)$ of degree $((512 + 3) * 8) - 1 = 4119$, for a total of $3 + 13 = 16$ spare bytes of spare, all protected as part of the same codeword.

The message and the ECC bits are manipulated and mapped in the GPMC byte-oriented system. The ECC bits are stored in [GPMC_BCH_RESULT0_i](#), [GPMC_BCH_RESULT1_i](#), [GPMC_BCH_RESULT2_i](#), and [GPMC_BCH_RESULT3_i](#) (where $i = 0$ to 7).

16.4.4.13.3.2.2.1 Memory-Mapping of the Data Message

The data message mapping shall follow the following rules:

- Bit endianness within a byte is little-endian, that is, the bytes LS bit is also the lowest-degree polynomial parameter: a byte b7-b0 (with b0 the LS bit) represents a segment of polynomial $b7 * x^{(7+i)} + b6 * x^{(6+i)} + \dots + b0 * x^i$
- The message is mapped in the NAND starting with the highest-order parameters, that is, in the lowest addresses of a NAND page.
- Byte endianness within the NANDs 16-bit words is big endian. This means that the same message mapped in 8- and 16-bit memories has the same content at the same byte address.

NOTE: The BCH module has no visibility over actual addresses. The most important point is the sequence of data word the BCH sees. However, the NAND page is always scanned incrementally in read and write accesses, and this produces the mapping patterns described below.

The following tables represent the mapping of the same 512-byte vector (typically a BCH message) in the NANDs memory space. Note that the byte 'address' is only an offset modulo 512 (0x200), since the same page may contain several contiguous 512-byte sectors (BCH blocks). The LSB and MSB are respectively the bits M0 and $M(2^{12}-1)$ of the codeword mapping given above. In both cases the data vectors are aligned, that is, their boundaries coincide with the RAMs data word boundaries.

Table 16-229. Aligned Message Byte Mapping in 8-bit NAND

| Byte offset | 8-bit word |
|-------------|------------------------|
| 0x000 | (msb) Byte 511 (0x1FF) |
| 0x001 | Byte 510 (0x1FE) |
| ... | ... |
| 0x1FF | Byte 0 (0x0) (lsb) |

Table 16-230. Aligned Message Byte Mapping in 16-bit NAND

| Byte offset | 16-bit words MSB | 16-bit words LSB |
|-------------|------------------|------------------------|
| 0x000 | Byte 510 (0x1FE) | (msb) Byte 511 (0x1FF) |
| 0x002 | Byte 508 (0x1FC) | Byte 509 (0x1FD) |
| ... | ... | ... |
| 0x1FE | Byte 0 (0x0) | (lsb) Byte 1 (0x1) |

The following tables show the mapping in memory of arbitrarily-sized messages, starting on access (byte or 16-bit word) boundaries for more clarity. Note that message may actually start and stop on arbitrary nibbles. A nibble is a 4-bit entity. The unused nibbles are not discarded, and they can still be used by the BCH module, but as part of the next message section (for example, on another sectors ECC).

Table 16-231. Aligned Nibble Mapping of Message in 8-bit NAND

| Byte offset | 8-bit word | |
|-------------|-------------------------------|-------------------------------|
| | 4-bit most significant Nibble | 4-bit less significant Nibble |
| 1 | (msb) Nibble S-1 | Nibble S-2 |
| 2 | Nibble S-3 | Nibble S-4 |
| ... | ... | ... |
| S/2 - 2 | Nibble 3 | Nibble 2 |
| S/2 - 1 | Nibble 1 | Nibble 0 (lsb) |

Table 16-232. Misaligned Nibble Mapping of Message in 8-bit NAND

| Byte offset | 8-bit word | |
|---------------|-------------------------------|-------------------------------|
| | 4-bit most significant Nibble | 4-bit less significant Nibble |
| 1 | (msb) Nibble S-1 | Nibble S-2 |
| 2 | Nibble S-3 | Nibble S-4 |
| ... | ... | ... |
| $(S+1)/2 - 2$ | Nibble 2 | Nibble 1 |
| $(S+1)/2 - 1$ | Nibble 0 (lsb) | |

Table 16-233. Aligned Nibble Mapping of Message in 16-bit NAND

| Byte offset | 16-bit word | | | |
|-------------|-------------------------------|----------------|-------------------------------|------------|
| | 4-bit most significant Nibble | | 4-bit less significant Nibble | |
| 0 | Nibble S-3 | Nibble S-4 | (msb) Nibble S-1 | Nibble S-2 |
| 2 | Nibble S-7 | Nibble S-8 | Nibble S-5 | Nibble S-6 |
| ... | ... | ... | ... | ... |
| $S/2 - 4$ | Nibble 5 | Nibble 4 | Nibble 7 | Nibble 6 |
| $S/2 - 2$ | Nibble 1 | Nibble 0 (lsb) | Nibble 3 | Nibble 2 |

Table 16-234. Misaligned Nibble Mapping of Message in 16-bit NAND (1 Unused Nibble)

| Byte offset | 16-bit word | | | |
|---------------|-------------------------------|------------|-------------------------------|------------|
| | 4-bit most significant Nibble | | 4-bit less significant Nibble | |
| 0 | Nibble S-3 | Nibble S-4 | (msb) Nibble S-1 | Nibble S-2 |
| 2 | Nibble S-7 | Nibble S-8 | Nibble S-5 | Nibble S-6 |
| ... | ... | ... | ... | ... |
| $(S+1)/2 - 4$ | Nibble 4 | Nibble 3 | Nibble 6 | Nibble 5 |
| $(S+1)/2 - 2$ | Nibble 0 (lsb) | | Nibble 2 | Nibble 1 |

Table 16-235. Misaligned Nibble Mapping of Message in 16-bit NAND (2 Unused Nibbles)

| Byte offset | 16-bit word | | | |
|---------------|-------------------------------|------------|-------------------------------|----------------|
| | 4-bit most significant Nibble | | 4-bit less significant Nibble | |
| 0 | Nibble S-3 | Nibble S-4 | (msb) Nibble S-1 | Nibble S-2 |
| 2 | Nibble S-7 | Nibble S-8 | Nibble S-5 | Nibble S-6 |
| ... | ... | ... | ... | ... |
| $(S+2)/2 - 4$ | Nibble 3 | Nibble 2 | Nibble 5 | Nibble 4 |
| $(S+2)/2 - 2$ | | | Nibble 1 | Nibble 0 (lsb) |

Table 16-236. Misaligned Nibble Mapping of Message in 16-bit NAND (3 Unused Nibbles)

| Byte offset | 16-bit word | | | |
|---------------|-------------------------------|------------|-------------------------------|------------|
| | 4-bit most significant Nibble | | 4-bit less significant Nibble | |
| 0 | Nibble S-3 | Nibble S-4 | (msb) Nibble S-1 | Nibble S-2 |
| 2 | Nibble S-7 | Nibble S-8 | Nibble S-5 | Nibble S-6 |
| ... | ... | ... | ... | ... |
| $(S+3)/2 - 4$ | Nibble 2 | Nibble 1 | Nibble 4 | Nibble 3 |
| $(S+3)/2 - 2$ | | | Nibble 0 (lsb) | |

Note that many other cases exist than the ones represented above, for example, where the message does not start on a word boundary.

16.4.4.13.3.2.2.2 Memory-Mapping of the ECC

The ECC (or remainder) is presented by the BCH module as a single 104-bit (or 52-bit), little-endian vector. It is up to the software to fetch those 13 bytes (or 6 bytes) from the modules interface, then store them to the NANDs spare area (page write) or to an intermediate buffer for comparison with the stored ECC (page read). There are no constraints on the ECC mapping inside the spare area: it is a softwarecontrolled operation.

However, it is advised to maintain a coherence in the respective formats of the message or the ECC remainder once they have been read out of the NAND. The error correction algorithm works from the complete codeword (concatenated message and remainder) once an error as been detected. The creation of this codeword should be made as straightforward as possible.

There are cases where the same NAND access contains both data and the ECC protecting that data. This is the case when the data/ECC boundary (which can be on any nibble) does not coincide with an access boundary. The ECC is calculated on-the-fly following the write. In that case, the write must also contain part of the ECC because it is impossible to insert the ECC on-the-fly. Instead:

- During the initial page write (BCH encoding), the ECC is replaced by dummy bits. The BCH encoder is by definition turned OFF during the ECC section, so the BCH result is unmodified.
- During a second phase, the ECC is written to the correct location, next to the actual data.
- The completed line buffer is then written to the NAND array.

16.4.4.13.3.2.2.3 Wrapping Modes

For a given wrapping mode, the module automatically goes through a specific number of sections, as data is being fed into the module. For each section, the BCH core can be enabled (in which case the data is fed to the BCH divider) or not (in which case the BCH simply counts to the end of the section). When enabled, the data is added to the ongoing calculation for a given sector number (for example, number 0).

Wrapping modes are described below. To get a better understanding and see the real-life read and write sequences implemented with each mode, see [Section 16.4.4.13.3.2.3, Supported NAND Page Mappings and ECC Schemes](#).

For each mode:

- a sequence describes the mode in pseudo-language, with for each section the size and the buffer used for ECC processing (if ON). The programmable lengths are size, size0 and size1.
- a checksum condition is given. If the checksum condition is not respected for a given mode, the modules behavior is unpredictable. S is the number of sectors in the page; size0 and size1 are the section sizes programmed for the mode, in nibbles.

Note that wrapping modes 8, 9, 10, and 11 insert a 1-nibble padding where the BCH processing is OFF. This is intended for $t = 4$ ECC, where ECC is 6 bytes long and the ECC area is expected to include (at least) 1 unused nibble to remain byte-aligned.

16.4.4.13.3.2.4 Manual Mode (0x0)

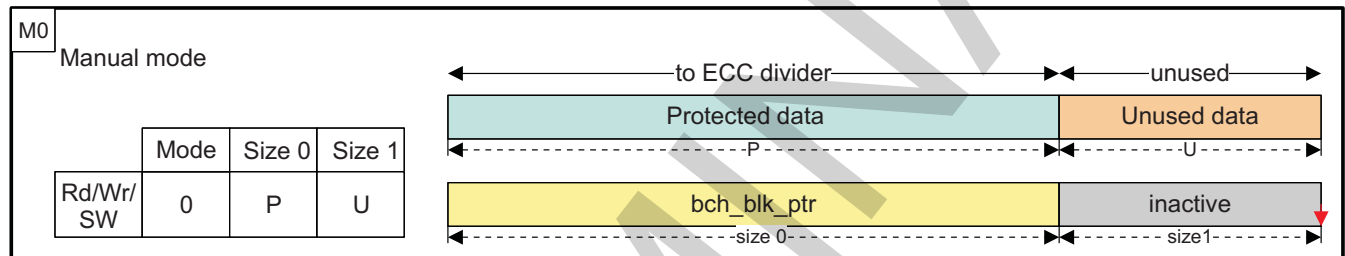
This mode is intended for short sequences, added manually to a given buffer through the software data port input. A complete page may be built out of several such sequences.

To process an arbitrary sequence of 4-bit nibbles, accesses to the software data port must be made, containing the appropriate data. If the sequence end does not coincide with an access boundary (for example, to process 5 nibbles = 20 bits in 16-bit access mode) and those nibbles need to be skipped, a number of unused nibbles must be programmed in [GPMC_ECC_SIZE_CONFIG\[29:22\] ECCSIZE1](#). (In the same example: 5 nibbles to process + 3 to discard = 8 nibbles = exactly 2 x 16-bit accesses. Software must set:

- [GPMC_ECC_SIZE_CONFIG\[19:12\] ECCSIZE0](#) = 0x5
- [GPMC_ECC_SIZE_CONFIG\[29:22\] ECCSIZE1](#) = 0x3

NOTE: In the following figures size and size0 are the same parameter.

Figure 16-86. Manual Mode Sequence and Mapping



gpmc-032

Section processing sequence:

- One time with buffer
 - size0 nibbles of data, processing ON
 - size1 nibbles of unused data, processing OFF

Checksum: size0 + size1 nibbles must fit in a whole number of accesses.

In the following sections, S is the number of sectors in the page.

16.4.4.13.3.2.5 Mode 0x1

Page processing sequence:

- Repeat with buffer 0 to S-1
 - 512-byte data, processing ON
- Repeat with buffer 0 to S-1
 - size0 nibbles spare, processing ON
 - size1 nibbles spare, processing OFF

Checksum: Spare area size (nibbles) = S × (size0 + size1)

16.4.4.13.3.2.6 Mode 0xA (10)

Page processing sequence:

- Repeat with buffer 0 to S-1
 - 512-byte data, processing ON
- Repeat with buffer 0 to S-1
 - size0 nibbles spare, processing ON
 - 1 nibble pad spare, processing OFF

- size1 nibbles spare, processing OFF

Checksum: Spare area size (nibbles) = $S \times (\text{size0} + 1 + \text{size1})$

16.4.4.13.3.2.2.7 Mode 0x2

Page processing sequence:

- Repeat with buffer 0 to S-1
 - 512-byte data, processing ON
- Repeat with buffer 0 to S-1
 - size0 nibbles spare, processing OFF
 - size1 nibbles spare, processing ON

Checksum: Spare area size (nibbles) = $S \times (\text{size0} + \text{size1})$

16.4.4.13.3.2.2.8 Mode 0x3

Page processing sequence:

- Repeat with buffer 0 to S-1
 - 512-byte data, processing ON
- One time with buffer 0
 - size0 nibbles spare, processing ON
- Repeat with buffer 0 to S-1
 - size1 nibbles spare, processing ON

Checksum: Spare area size (nibbles) = $\text{size0} + (S \times \text{size1})$

16.4.4.13.3.2.2.9 Mode 0x7

Page processing sequence:

- Repeat with buffer 0 to S-1
 - 512-byte data, processing ON
- One time with buffer 0
 - size0 nibbles spare, processing ON
- Repeat S times (no buffer used)
 - size1 nibbles spare, processing OFF

Checksum: Spare area size (nibbles) = $\text{size0} + (S \times \text{size1})$

16.4.4.13.3.2.2.10 Mode 0x8

Page processing sequence:

- Repeat with buffer 0 to S-1
 - 512-byte data, processing ON
- One time with buffer 0
 - size0 nibbles spare, processing ON
- Repeat with buffer 0 to S-1
 - 1 nibble padding spare, processing OFF
 - size1 nibbles spare, processing ON

Checksum: Spare area size (nibbles) = $\text{size0} + (S \times (1 + \text{size1}))$

16.4.4.13.3.2.2.11 Mode 0x4

Page processing sequence:

- Repeat with buffer 0 to S-1
 - 512-byte data, processing ON
 - One time (no buffer used)
 - size0 nibbles spare, processing OFF
 - Repeat with buffer 0 to S-1
 - size1 nibbles spare, processing ON
- Checksum: Spare area size (nibbles) = size0 + (S × size1)

16.4.4.13.3.2.2.12 Mode 0x9

Page processing sequence:

- Repeat with buffer 0 to S-1
 - 512-byte data, processing ON
- One time (no buffer used)
 - size0 nibbles spare, processing OFF
- Repeat with buffer 0 to S-1
 - 1 nibble padding spare, processing OFF
 - size1 nibbles spare, processing ON

Checksum: Spare area size (nibbles) = size0 + (S × (1+size1))

16.4.4.13.3.2.2.13 Mode 0x5

Page processing sequence:

- Repeat with buffer 0 to S-1
 - 512-byte data, processing ON
- Repeat with buffer 0 to S-1
 - size0 nibbles spare, processing ON
- Repeat with buffer 0 to S-1
 - size1 nibbles spare, processing ON

Checksum: Spare area size (nibbles) = S × (size0 + size1)

16.4.4.13.3.2.2.14 Mode 0xB (11)

Page processing sequence:

- Repeat with buffer 0 to S-1
 - 512-byte data, processing ON
- Repeat with buffer 0 to S-1
 - size0 nibbles spare, processing ON
- Repeat with buffer 0 to S-1
 - 1 nibble padding spare, processing OFF
 - size1 nibbles spare, processing ON

Checksum: Spare area size (nibbles) = S × (size0 + 1 + size1)

16.4.4.13.3.2.2.15 Mode 0x6

Page processing sequence:

- Repeat with buffer 0 to S-1
 - 512-byte data, processing ON
- Repeat with buffer 0 to S-1

- size0 nibbles spare, processing ON
- Repeat S times (no buffer used)
- size1 nibbles spare, processing OFF

Checksum: Spare area size (nibbles) = $S \times (\text{size0} + \text{size1})$

16.4.4.13.3.2.3 Supported NAND Page Mappings and ECC Schemes

The following rules apply throughout the entire mapping description:

- Main data area (sectors) size is hardcoded to 512 bytes.
- Spare area size is programmable.
- All page sections (of main area data bytes, protected spare bytes, unprotected spare bytes, and ECC) are defined as explained in [Section 16.4.4.13.3.2.1, Memory-Mapping of the Data Message](#).

Each one of the following sections shows a NAND page mapping example (per-sector spare mappings, pooled spare mapping, per-sector spare mapping, with ECC separated at the end of the page).

In the mapping diagrams, sections that belong to the same BCH codeword have the same color (blue or green); unprotected sections are not covered (orange) by the BCH scheme.

Below each mapping diagram, a write (encoding) and read (decoding: syndrome generation) sequence is given, with the number of the active buffers at each point in time (yellow). In the inactive zones (grey), no computing is taking place but the data counter is still active.

In [Figure 16-87](#) to [Figure 16-89](#), tables on the left summarize the mode, size0, size1 parameters to program for respectively write and read processing of a page, with the given mapping, where :

- P is the size of spare byte section Protected by the ECC (in nibbles)
- U is the size of spare byte section Unprotected by the ECC (in nibbles)
- E is the size of the ECC itself (in nibbles)
- S is the number of Sectors per page (2 in the current diagrams)

Each time the processing of a BCH block is complete (ECC calculation for write/encoding, syndrome generation for read/decoding, indicated by red arrows), the update pointer is pulsed. Note that the processing for block 0 can be the first or the last to complete, depending on the NAND page mapping and operation (read or write). All examples show a page size of 1kByte + spares, that is, $S = 2$ sectors of 512 bytes. The same principles can be extended to larger pages by adding more sectors.

The actual BCH codeword size is used during the error location work to restrict the search range: by definition, errors can only happen in the codeword that was actually written to the NAND, and not in the mathematical codeword of $n = 2^{13} - 1 = 8191$ bits. That codeword (higher-order bits) is all-zero and implicit during computations.

The actual BCH codeword size depends on the mode, on the programmed sizes and on the sector number (all sizes in nibbles):

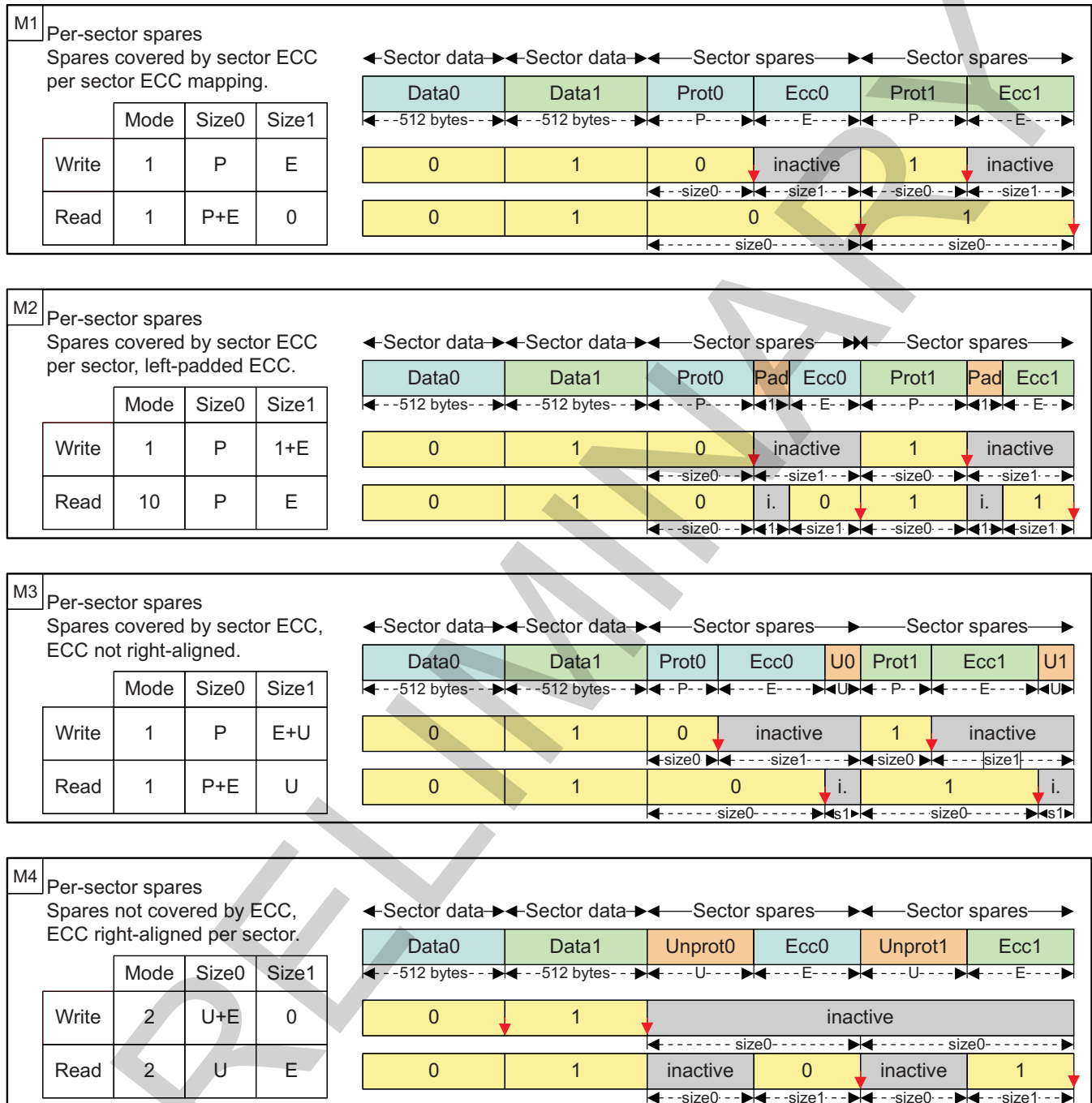
- Spares mapped and protected per sector (below: see M1-M2-M3-M9-M10):
 - all sectors: $(512) + P + E$
- Spares pooled and protected by sector 0 (below: see M5-M6):
 - sector 0 codeword: $(512) + P + E$
 - other sectors: $(512) + E$
- Unprotected spares (below: see M4-M7-M8-M11-M12):
 - all codewords $(512) + E$

16.4.4.13.3.2.3.1 Per-Sector Spare Mappings

In these schemes, each 512-byte sector of the main area has its own dedicated section of the spare area. The spare area of each sector is composed of :

- ECC, which must be located after the data it protects
- other data, which may or may not be protected by the sectors ECC

Figure 16-87. NAND Page Mapping and ECC: Per-Sector Schemes

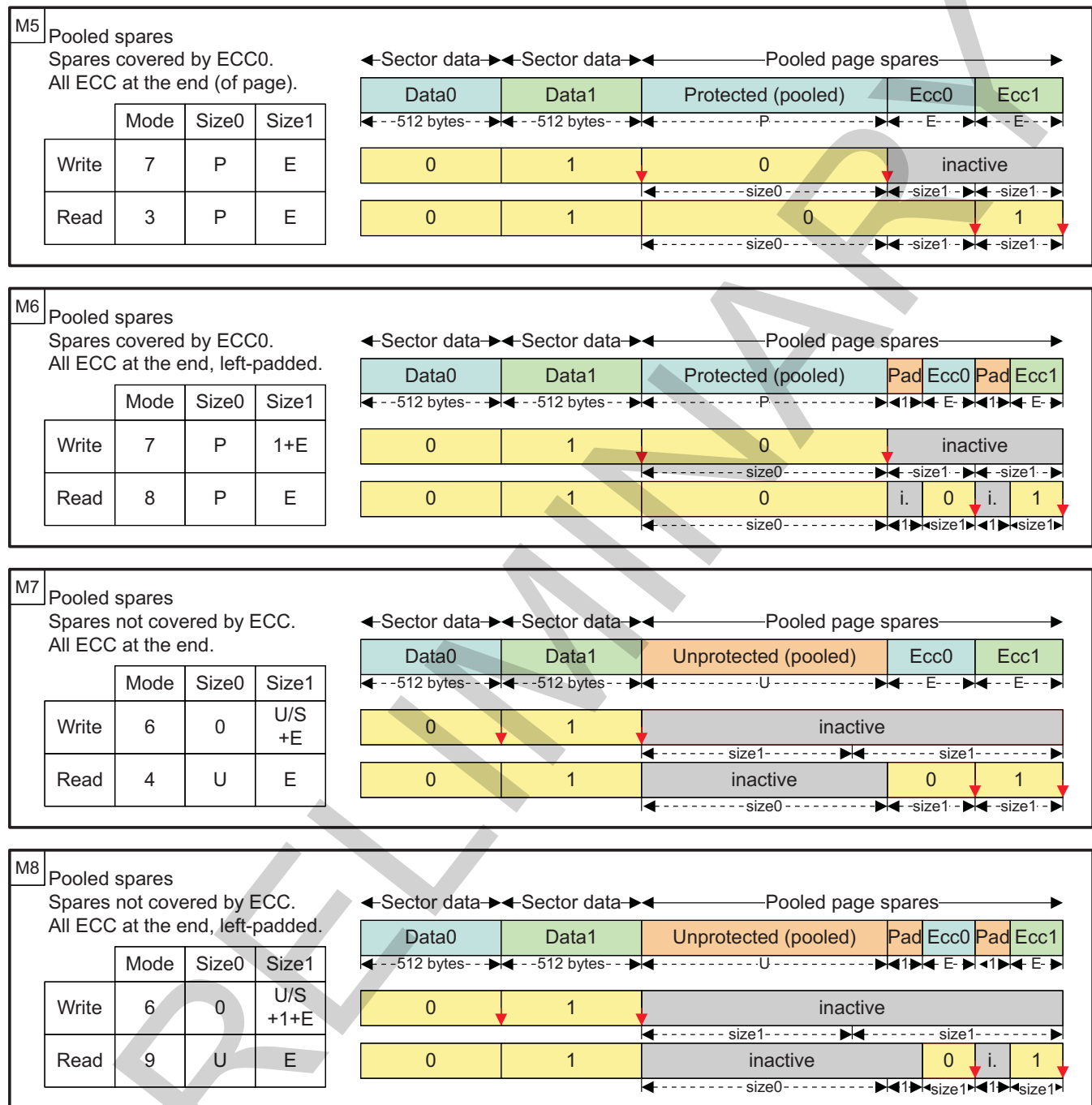


gpmc-033

16.4.4.13.3.2.3.2 Pooled Spare Mapping

In the schemes below, the spare area is pooled for the page.

- The ECC of each sector is aligned at the end of the spare area.
- The non-ECC spare data may or may not be covered by the ECC of sector 0

Figure 16-88. NAND Page Mapping and ECC: Pooled Spare Schemes

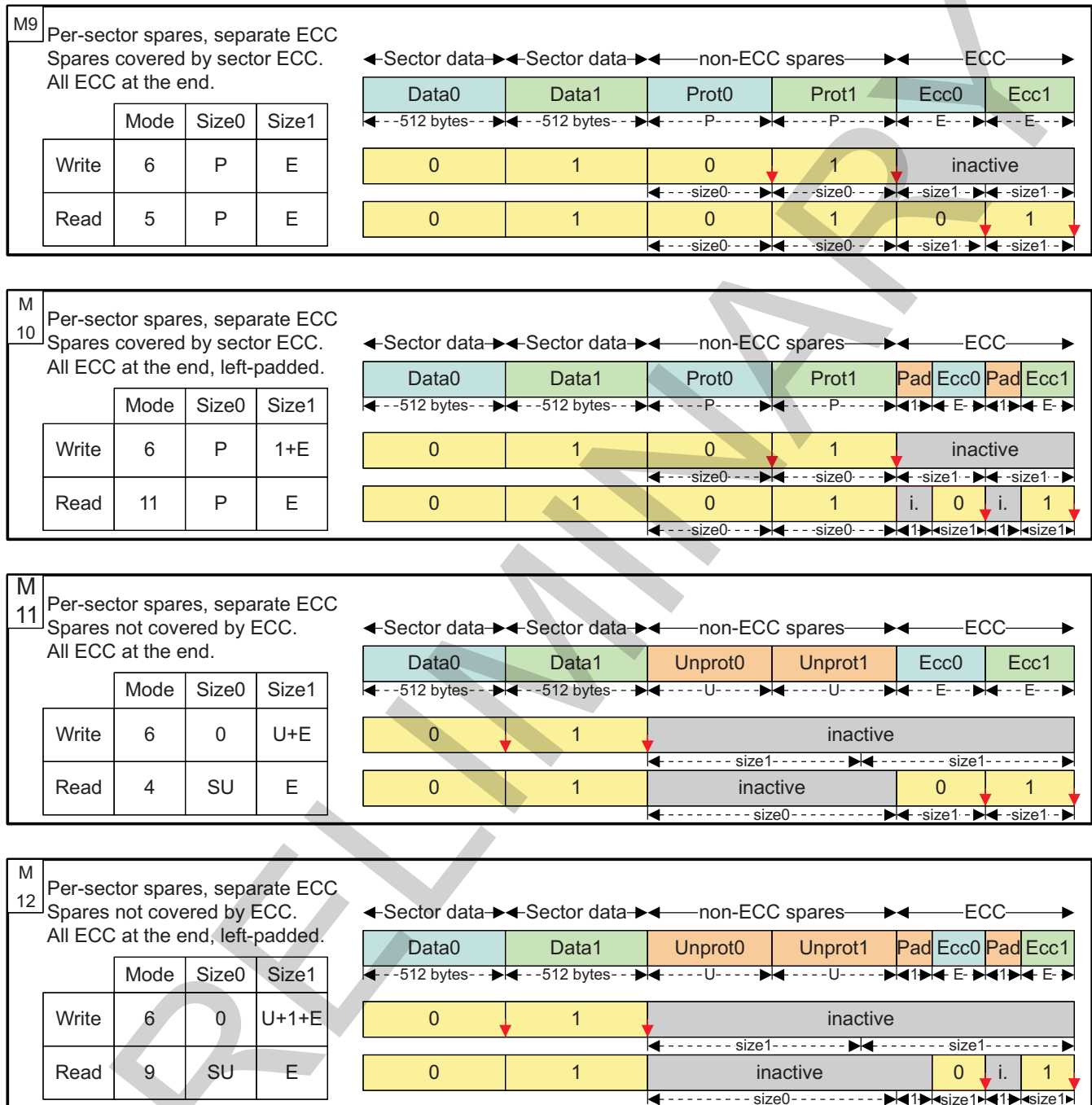
gpmc-034

16.4.4.13.3.2.3.3 Per-Sector Spare Mapping, with ECC Separated at the End of the Page

In these schemes, each 512-byte sector of the main area is associated with 2 sections of the spare area.

- ECC section, all aligned at the end of the page
- other data section, aligned before the ECCs, each of which may or may not be protected by its sectors ECC

Figure 16-89. NAND Page Mapping and ECC: Per-Sector Schemes, with Separate ECC



gpmc_035

16.4.4.13.4 Prefetch and Write-Posting Engine

NAND device data access cycles are usually much slower than the MPU system frequency; such NAND read or write accesses issued by the processor will impact the overall system performance, especially considering long read or write sequences required for NAND page loading or programming. To minimize this effect on system performance, the GPMC includes a prefetch and write-posting engine, which can be used to read from or write to any chip-select location in a buffered manner.

The prefetch and write-posting engine is a simplified embedded-access requester that presents requests to the access engine on a user-defined chip-select target. The access engine interleaves these requests with any request coming from the L3 interface; as a default the prefetch and write-posting engine has the lowest priority.

The prefetch and write-posting engine is dedicated to data-stream access (as opposed to random data access); thus, it is primarily dedicated to NAND support. The engine does not include an address generator; the request is limited to chip-select target identification. It includes a 64-byte FIFO associated with a DMA request synchronization line, for optimal DMA-based use.

The prefetch and write-posting engine uses an embedded 64 bytes (32 16-bit word) FIFO to prefetch data from the NAND device in read mode (prefetch mode) or to store host data to be programmed into the NAND device in write mode (write-posting mode). The FIFO draining and filling (read and write) can be controlled either by the MPU through interrupt synchronization (an interrupt is triggered whenever a programmable threshold is reached) or the sDMA through DMA request synchronization, with a programmable request byte size in both prefetch or posting mode.

The prefetch and write-posting engine includes a single memory pool. Therefore, only one mode, read or write, can be used at any given time. In other words, the prefetch and write-posting engine is a single-context engine that can be allocated to only one chip-select at a time for a read prefetch or a write-posting process.

The engine does not support atomic command and address phase programming and is limited to linear memory read or write access. In consequence, it is limited to NAND data-stream access. The engine relies on the MPU NAND software driver to control block and page opening with the correct data address pointer initialization, before the engine can read from or write to the NAND memory device.

Once started, the engine data reads and writes sequencing is solely based on FIFO location availability and until the total programmed number of bytes is read or written.

Any host-concurrent accesses to a different chip-select are correctly interleaved with ongoing engine accesses. The engine has the lowest priority access so that host accesses to a different chip-select do not suffer a large latency.

A round-robin arbitration scheme can be enabled to ensure minimum bandwidth to the prefetch and write-posting engine in the case of back-to-back direct memory requests to a different chip-select. If the [GPMC_PREFETCH_CONFIG1\[23\] PFPWENROUNDROBIN](#) bit is enabled, the arbitration grants the prefetch and write posting engine access to the GPMC bus for a number of requests programmed in the [GPMC_PREFETCH_CONFIG1\[19:16\] PFPWWEIGHTEDPRIO](#) field.

The prefetch/write-posting engine read or write request is routed to the access engine with the chip-select destination ID. After the required arbitration phase, the access engine processes the request as a single access with the data access size equal to the device size specified in the corresponding chip-select configuration.

NOTE: The destination chip-select configuration must be set to the NAND protocol-compatible configuration for which address lines are not used (the address bus is not changed from its current value). Selecting a different chip-select configuration can produce undefined behavior.

16.4.4.13.4.1 General Facts About the Engine Configuration

The engine can be configured only if the [GPMC_PREFETCH_CONTROL\[0\] STARTENGINE](#) bit is deasserted.

The engine must be correctly configured in prefetch or write-posting mode and must be linked to a NAND chip-select before it can be started. The chip-select is linked using the [GPMC_PREFETCH_CONFIG1\[26:24\] ENGINECSSELECTOR](#) field.

In both prefetch and write-posting modes, the engine respectively uses byte or 16-bit word access requests for an 8- or 16-bit-wide NAND device attached to the linked chip-select. The FIFOTHRESHOLD and TRANSFERCOUNT fields must be programmed accordingly as a number of bytes.

When the [GPMC_PREFETCH_CONFIG1\[7\]](#) ENABLEENGINE bit is set, the FIFO entry on the L3 interconnect port side is accessible at any address in the associated chip-select memory region. When the ENABLEENGINE bit is set, any host access to this chip-select is rerouted to the FIFO input. Directly accessing the NAND device linked to this chip-select from the host is still possible through the [GPMC_NAND_COMMAND_i](#), [GPMC_NAND_ADDRESS_i](#), and [GPMC_NAND_DATA_i](#) registers (where i = 0 to 7).

The FIFO entry on the L3 interconnect port can be accessed with byte, 16-bit word, or 32-bit word access size, according to little-endian format, even though the FIFO input is 32 bits wide.

The FIFO control is made easier through the use of interrupts or DMA requests associated with the FIFOTHRESHOLD bit field. The [GPMC_PREFETCH_STATUS\[30:24\]](#) FIFOPINTER field monitors the number of available bytes to be read in prefetch mode or the number of free empty slots which can be written in write-posting mode. The [GPMC_PREFETCH_STATUS\[13:0\]](#) COUNTVALUE field monitors the number of remaining bytes to be read or written by the engine according to the TRANSFERCOUNT value. The FIFOPINTER and COUNTVALUE bit fields are always expressed as a number of bytes even if a 16-bit wide NAND device is attached to the linked chip-select.

In prefetch mode, when the FIFOPINTER equals 0, that is, the FIFO is empty, a host read access receives the byte last read from the FIFO as its response. In case of 32-bit word or 16-bit word read accesses, the last byte read from the FIFO is copied the required number of times to fit the requested word size. In write-posting mode, when the FIFOPINTER equals 0, that is, the FIFO is full, a host write overwrites the last FIFO byte location. There is no underflow or overflow error reporting in the GPMC.

16.4.4.13.4.2 Prefetch Mode

The prefetch mode is selected when the [GPMC_PREFETCH_CONFIG1\[0\]](#) ACCESSMODE bit is cleared.

The MPU NAND software driver must issue the block and page opening (READ) command with the correct data address pointer initialization before the engine can be started to read from the NAND memory device. The engine is started by asserting the [GPMC_PREFETCH_CONTROL\[0\]](#) STARTENGINE bit. The STARTENGINE bit automatically clears when the prefetch process completes.

If required, the ECC calculator engine must be initialized (that is, reset, configured, and enabled) before the prefetch engine is started, so that the ECC is correctly computed on all data read by the prefetch engine.

When the [GPMC_PREFETCH_CONFIG1\[3\]](#) SYNCHROMODE bit is cleared, the prefetch engine starts requesting data as soon as the STARTENGINE bit is set. If using this configuration, the host must monitor the NAND device-ready pin so that it only sets the STARTENGINE bit when the NAND device is in a ready state, meaning data is valid for prefetching.

When the SYNCHROMODE bit is set, the prefetch engine starts requesting data when an active to inactive wait signal transition is detected. The transition detector must be cleared before any transition detection; see [Section 16.4.4.13.2.2, Ready Pin Monitored by Hardware Interrupt](#). The [GPMC_PREFETCH_CONFIG1\[5:4\]](#) WAITPINSELECTOR field selects which gpmc_wait pin edge detector triggers the prefetch engine in this synchronized mode.

If the STARTENGINE bit is set after the NAND address phase (page opening command), the engine is effectively started only after the actual NAND address phase completion. To prevent GPMC stall during this NAND address phase, set the STARTENGINE bit field before NAND address phase completion when in synchronized mode. The prefetch engine will start when an active to inactive wait signal transition is detected. The STARTENGINE bit is automatically cleared on prefetch process completion.

The prefetch engine issues a read request to fill the FIFO with the amount of data specified by [GPMC_PREFETCH_CONFIG2\[13:0\]](#) TRANSFERCOUNT field.

Table 16-237. Prefetch Mode Configuration

| Bit Field | Register | Value | Comments |
|------------------|--|--------|--|
| STARTENGINE | GPMC_PREFETCH_CONTROL[0] | 0 | Prefetch engine can be configured only if STARTENGINE is set to 0. |
| ENGINECSSELECTOR | GPMC_PREFETCH_CONFIG1[26:24] | 0 to 3 | Selects the chip-select associated with a NAND device where the prefetch engine is active. |

Table 16-237. Prefetch Mode Configuration (continued)

| Bit Field | Register | Value | Comments |
|-----------------------|---|--------|---|
| ACCESSMODE | GPMC_PREFETCH_CONFIG1 [0] | 0 | Selects prefetch mode |
| FIFOTHRESHOLD | GPMC_PREFETCH_CONFIG1 [14:8] | | Selects the maximum number of bytes read or written by the host on DMA or interrupt request |
| TRANSFERCOUNT | GPMC_PREFETCH_CONFIG2 [13:0] | | Selects the number of bytes to be read or written by the engine to the selected chip-select |
| SYNCHROMODE | GPMC_PREFETCH_CONFIG1 [3] | 0/1 | Selects when the engine starts the access to the chip-select |
| WAITPINSELECT | GPMC_PREFETCH_CONFIG1 [17:16] | 0 to 1 | Selects wait pin edge detector (if GPMC_PREFETCH_CONFIG1 [3] SYNCHROMODE = 0x1) |
| ENABLEOPTIMIZEDACCESS | GPMC_PREFETCH_CONFIG1 [27] | 0/1 | See Section 16.4.4.13.4.6, Optimizing NAND Access Using the Prefetch and Write-Posting Engine . |
| CYCLOOPTIMIZATION | GPMC_PREFETCH_CONFIG1 [30:28] | | Number of clock cycle removed to timing parameters |
| ENABLEENGINE | GPMC_PREFETCH_CONFIG1 [7] | 1 | Engine enabled |
| STARTENGINE | GPMC_PREFETCH_CONTROL [0] | 1 | Starts the prefetch engine |

16.4.4.13.4.3 FIFO Control in Prefetch Mode

The FIFO can be drained directly by the MPU or by an sDMA channel.

In MPU draining mode, the FIFO status can be monitored through the [GPMC_PREFETCH_STATUS](#)[30:24] FIFOPINTER field or through the [GPMC_PREFETCH_STATUS](#)[16] FIFOTHRESHOLDSTATUS bit. The FIFOPINTER indicates the current number of available data to be read; FIFOTHRESHOLDSTATUS set to 1 indicates that at least FIFOTHRESHOLD bytes are available from the FIFO.

An interrupt can be triggered by the GPMC if the [GPMC_IRQENABLE](#)[0] FIFOEVENTENABLE bit is set. The FIFO interrupt event is logged, and the [GPMC_IRQSTATUS](#)[0] FIFOEVENTSTATUS bit is set. To clear the interrupt, the MPU must read all the available bytes, or at least enough bytes to get below the programmed FIFO threshold, and the FIFOEVENTSTATUS bit must be cleared to enable further interrupt events. The FIFOEVENTSTATUS bit must always be reset prior to asserting the FIFOEVENTENABLE bit to clear any out-of-date logged interrupt event. This interrupt generation must be enabled after enabling the STARTENGINE bit.

Prefetch completion can be monitored through the [GPMC_PREFETCH_STATUS](#)[13:0] COUNTVALUE field. COUNTVALUE indicates the number of currently remaining data to be requested according to the TRANSFERCOUNT value. An interrupt can be triggered by the GPMC when the prefetch process is complete (that is, COUNTVALUE equals 0) if the [GPMC_IRQENABLE](#)[1] TERMINALCOUNTEVENTENABLE bit is set. At prefetch completion, the TERMINALCOUNT interrupt event is also logged, and the [GPMC_IRQSTATUS](#)[1] TERMINALCOUNTSTATUS bit is set. To clear the interrupt, the MPU must clear the TERMINALCOUNTSTATUS bit. The TERMINALCOUNTSTATUS bit must always be cleared prior to asserting the TERMINALCOUNTEVENTENABLE bit to clear any out-of-date logged interrupt event.

NOTE: The COUNTVALUE value is only valid when the prefetch engine is active (started), and an interrupt is only triggered when COUNTVALUE reaches 0, that is, when the prefetch engine automatically goes from an active to an inactive state.

The number of bytes to be prefetched (programmed in TRANSFERCOUNT) must be a multiple of the

programmed FIFOTHRESHOLD to trigger the correct number of interrupts allowing a deterministic and transparent FIFO control. If this guideline is respected, the number of ISR accesses is always required and the FIFO is always empty after the last interrupt is triggered. In other cases, the TERMINALCOUNT interrupt must be used to read the remaining bytes in the FIFO (the number of remaining bytes being lower than the FIFOTHRESHOLD value).

In DMA draining mode, the [GPMC_PREFETCH_CONFIG1\[2\]](#) DMAMODE bit must be set so that the GPMC issues a DMA hardware request when at least FIFOTHRESHOLD bytes are ready to be read from the FIFO. The DMA channel owning this DMA request must be programmed so that the number of bytes programmed in FIFOTHRESHOLD is read from the FIFO during the DMA request process. The DMA request is kept active until this number of bytes has effectively been read from the FIFO, and no other DMA request can be issued until the ongoing active request is complete.

In prefetch mode, the TERMINALCOUNT event is also a source of DMA requests if the number of bytes to be prefetched is not a multiple of FIFOTHRESHOLD, the remaining bytes in the FIFO can be read by the DMA channel using the last DMA request. This assumes that the number of remaining bytes to be read is known and controlled through the DMA channel programming model.

Any potentially active DMA request is cleared when the prefetch engine goes from inactive to active prefetch (the STARTENGINE bit is set to 1). The associated DMA channel must always be enabled by the MPU after setting the STARTENGINE bit so that the out-of-date active DMA request does not trigger spurious DMA transfers.

16.4.4.13.4.4 Write-Posting Mode

The write-posting mode is selected when the [GPMC_PREFETCH_CONFIG1\[0\]](#) ACCESSMODE bit is set.

The MPU NAND software driver must issue the correct address pointer initialization command (page program) before the engine can start writing data into the NAND memory device. The engine starts when the [GPMC_PREFETCH_CONFIG1\[0\]](#) STARTENGINE bit is set to 1. The STARTENGINE bit clears automatically when posting completes. When all data have been written to the NAND memory device, the MPU NAND software driver must issue the second cycle program command and monitor the status for programming process completion (adding ECC handling, if required).

If used, the ECC calculator engine must be started (configured, reset, and enabled) before the posting engine is started so that the ECC parities are properly calculated on all data written by the prefetch engine to the associated chip-select.

In write-posting mode, the [GPMC_PREFETCH_CONFIG1\[3\]](#) SYNCHROMODE bit must be cleared so that posting starts as soon as the STARTENGINE bit is set and the FIFO is not empty.

If the STARTENGINE bit is set after the NAND address phase (page program command), the STARTENGINE setting is effective only after the actual NAND command completion. To prevent GPMC stall during this NAND command phase, set the STARTENGINE bit field before the NAND address completion and ensure that the associated DMA channel is enabled after the NAND address phase.

The posting engine issues a write request when valid data are available from the FIFO and until the programmed [GPMC_PREFETCH_CONFIG2\[13:0\]](#) TRANSFERCOUNT accesses have been completed.

The STARTENGINE bit clears automatically when posting completes. When all data have been written to the NAND memory device, the MPU NAND software driver must issue the second cycle program command and monitor the status for programming process completion. The closing program command phase must only be issued when the full NAND page has been written into the NAND flash write buffer, including the spare area data and the ECC parities, if used.

Table 16-238. Write-Posting Mode Configuration

| Bit Field | Register | Value | Comments |
|------------------|--|--------|---|
| STARTENGINE | GPMC_PREFETCH_CONFIG1[0] | 0 | Write-posting engine can be configured only if STARTENGINE is set to 0. |
| ENGINECSSELECTOR | GPMC_PREFETCH_CONFIG1[26:24] | 0 to 3 | Selects the chip-select associated with a NAND device where the prefetch engine is active |
| ACCESSMODE | GPMC_PREFETCH_CONFIG1[0] | 1 | Selects write-posting mode |

Table 16-238. Write-Posting Mode Configuration (continued)

| Bit Field | Register | Value | Comments |
|-----------------------|---|-------|---|
| FIFOTHRESHOLD | GPMC_PREFETCH_CONFIG1 [14:8] | | Selects the maximum number of bytes read or written by the host on DMA or interrupt request |
| TRANSFERCOUNT | GPMC_PREFETCH_CONFIG2 [13:0] | | Selects the number of bytes to be read or written by the engine from/to the selected chip-select |
| SYNCHROMODE | GPMC_PREFETCH_CONFIG1 [3] | 0 | Engine starts the access to chip-select as soon as STARTENGINE is set. |
| ENABLEOPTIMIZEDACCESS | GPMC_PREFETCH_CONFIG1 [27] | 0/1 | See Section 16.4.4.13.4.6, Optimizing NAND Access Using the Prefetch and Write-Posting Engine . |
| CYCLOPTIMIZATION | GPMC_PREFETCH_CONFIG1 [30:28] | | |
| ENABLEENGINE | GPMC_PREFETCH_CONFIG1 [7] | 1 | Engine enabled |
| STARTENGINE | GPMC_PREFETCH_CONTROL [0] | 1 | Starts the prefetch engine |

16.4.4.13.4.5 FIFO Control in Write-Posting Mode

The FIFO can be filled directly by the MPU or by an sDMA channel.

In MPU filling mode, the FIFO status can be monitored through the [FIFOPOINTER](#) or through the [GPMC_PREFETCH_STATUS](#)[16] [FIFOTHRESHOLDSTATUS](#) bit. [FIFOPOINTER](#) indicates the current number of available free byte places in the FIFO, and the [FIFOTHRESHOLDSTATUS](#) bit, when set, indicates that at least [FIFOTHRESHOLD](#) free byte places are available in the FIFO.

An interrupt can be issued by the GPMC if the [GPMC_IRQENABLE](#)[0] [FIFOEVENTENABLE](#) bit is set. When the interrupt is fired, the [GPMC_IRQSTATUS](#)[0] [FIFOEVENTSTATUS](#) bit is set. To clear the interrupt, the MPU must write enough bytes to fill the FIFO, or enough bytes to get below the programmed threshold, and the [FIFOEVENTSTATUS](#) bit must be cleared to get further interrupt events. The [FIFOEVENTSTATUS](#) bit must always be cleared prior to asserting the [FIFOEVENTENABLE](#) bit to clear any out-of-date logged interrupt event. This interrupt must be enabled after enabling the [STARTENGINE](#) bit.

The posting completion can be monitored through the [GPMC_PREFETCH_STATUS](#)[13:0] [COUNTVALUE](#) field. [COUNTVALUE](#) indicates the current number of remaining data to be written based on the [TRANSFERCOUNT](#) value. An interrupt is issued by the GPMC when the write-posting process completes (that is, [COUNTVALUE](#) equal to 0) if the [GPMC_IRQENABLE](#)[1] [TERMINALCOUNTEVENTENABLE](#) bit is set. When the interrupt is fired, the [GPMC_IRQSTATUS](#)[1] [TERMINALCOUNTSTATUS](#) bit is set. To clear the interrupt, the MPU must clear the [TERMINALCOUNTSTATUS](#) bit. The [TERMINALCOUNTSTATUS](#) bit must always be cleared prior to asserting the [TERMINALCOUNTEVENTENABLE](#) bit to clear any out-of-date logged interrupt event.

NOTE: The [COUNTVALUE](#) value is only valid if the write-posting engine is active and started, and an interrupt is only issued when [COUNTVALUE](#) reaches 0, that is, when the posting engine automatically goes from active to inactive.

In DMA filling mode, the [DMAMode](#) bit field in the [GPMC_PREFETCH_CONFIG1](#)[2] [DMAMODE](#) bit must be set so that the GPMC issues a DMA hardware request when at least [FIFOTHRESHOLD](#) bytes-free places are available in the FIFO. The DMA channel owning this DMA request must be programmed so that a number of bytes equal to the value programmed in the [FIFOTHRESHOLD](#) bit field are written into the FIFO during the DMA access. The DMA request remains active until the associated number of bytes has effectively been written into the FIFO, and no other DMA request can be issued until the ongoing active request has been completed.

Any potentially active DMA request is cleared when the prefetch engine goes from inactive to active prefetch ([STARTENGINE](#) set to 1). The associated DMA channel must always be enabled by the MPU after setting the [STARTENGINE](#) bit so that an out-of-date active DMA request does not trigger spurious DMA transfers.

In write-posting mode, the DMA or the MPU fill the FIFO with no consideration to the associated byte enables. Any byte stored in the FIFO is written into the memory device.

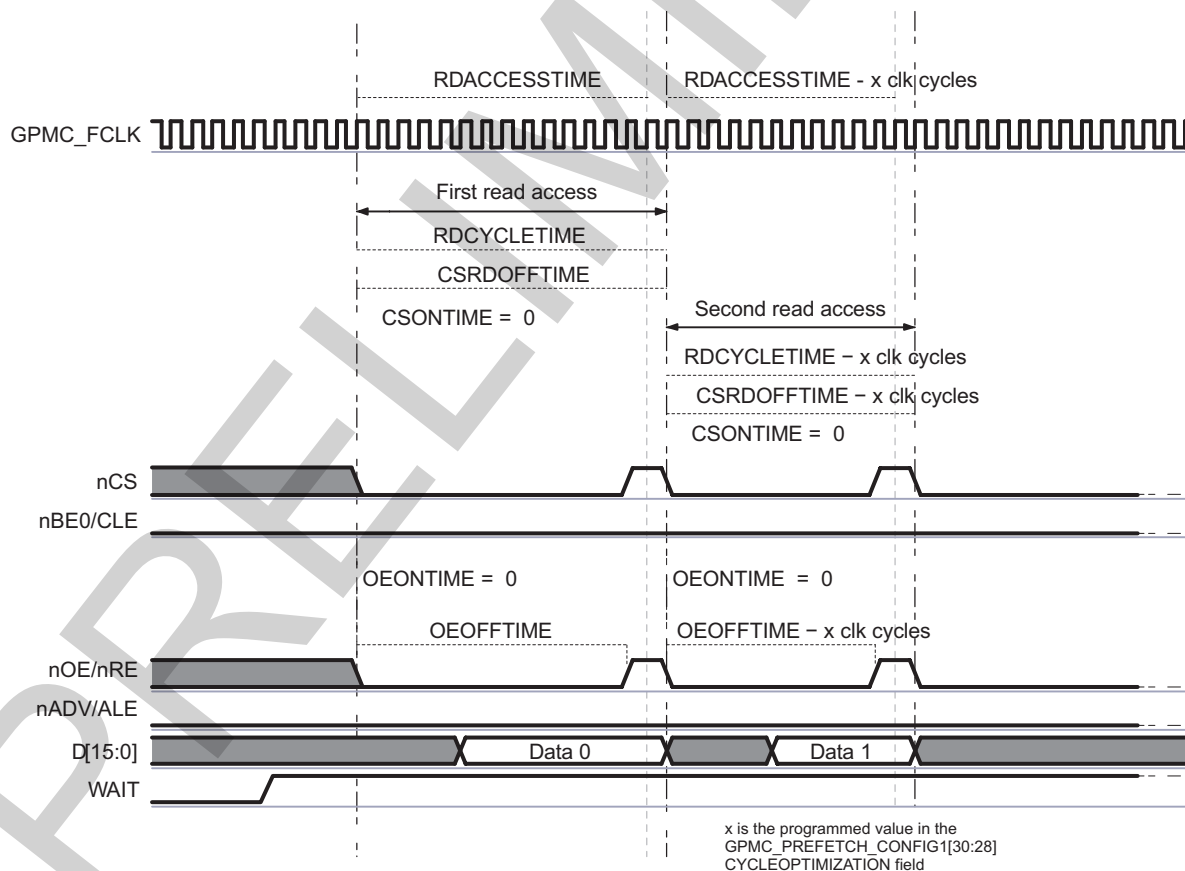
16.4.4.13.4.6 Optimizing NAND Access Using the Prefetch and Write-Posting Engine

Access time to a NAND memory device can be optimized for back-to-back accesses if the associated nCS signal is not deasserted between accesses. The GPMC access engine can track prefetch engine accesses to optimize the access timing parameter programmed for the allocated chip-select, if no accesses to other chip-selects (that is, interleaved accesses) occur. Similarly, the access engine also eliminates the CYCLE2CYCLEDELAY even if CYCLE2CYCLESAMECSN is set. This capability is limited to the prefetch and write-posting engine accesses, and MPU accesses to a NAND memory device (through the defined chip-select memory region or through the [GPMC_NAND_DATA_i](#) location, $i = 0$ to 7) are never optimized.

The [GPMC_PREFETCH_CONFIG1](#)[27] ENABLEOPTIMIZEDACCESS bit must be set to enable optimized accesses. To optimize access time, the [GPMC_PREFETCH_CONFIG1](#)[30:28] CYCLEOPTIMIZATION field defines the number of GPMC_FCLK cycles to be suppressed from the RDCYCLETIME, WRCYCLETIME, RDACCESSTIME, WRACCESSTIME, CSOFFTIME, ADVOFFTIME, OEOFFTIME, and WEOFFTIME timing parameters.

[Figure 16-90](#) highlights that, in the case of back-to-back accesses to the NAND flash through the prefetch engine, CYCLE2CYCLESAMECSN is forced to 0 when using optimized accesses. The first access uses the regular timing settings for this chip-select. All accesses after this one use settings reduced by x clock cycles, x being defined by the [GPMC_PREFETCH_CONFIG1](#)[30:28] CYCLEOPTIMIZATION field.

Figure 16-90. NAND Read Cycle Optimization Timing Description



gpmc-036

16.4.4.13.4.7 Interleaved Accesses Between Prefetch and Write-Posting Engine and Other Chip-Selects

Any on-going read or write access from the prefetch and write-posting engine is completed before an

access to any other chip-select can be initiated. As a default, the arbiter uses a fixed-priority algorithm, and the prefetch and write-posting engine has the lowest priority. The maximum latency added to access starting time in this case equals the RDCYCLETIME or WRCYCLETIME (optimized or not) plus the requested BUSTURNAROUND delay for bus turnaround completion programmed for the chip-select to which the NAND device is connected to.

Alternatively, a round-robin arbitration can be used to prioritize accesses to the external bus. This arbitration scheme is enabled by setting the [GPMC_PREFETCH_CONFIG1](#)[23] PFPWENROUNDROBIN bit. When a request to another chip-select is received while the prefetch and write-posting engine is active, priority is given to the new request. The request processed thereafter is the prefetch and write-posting engine request, even if another interconnect request is passed in the mean time. The engine keeps control of the bus for an additional number of requests programmed in the [GPMC_PREFETCH_CONFIG1](#)[19:16] PFPWWEIGHTEDPRIO bit field. Control is then passed to the direct interconnect request.

As an example, the round-robin arbitration scheme is selected with PFPWWEIGHTEDPRIO set to 0x2. Considering the prefetch and write-posting engine and the interconnect interface are always requesting access to the external interface, the GPMC grants priority to the direct interconnect access for one request. The GPMC then grants priority to the engine for three requests, and finally back to the direct interconnect access, until the arbiter is reset when one of the two initiators stops initiating requests.

16.4.5 GPMC Basic Programming Model

16.4.5.1 GPMC High-Level Programming Model Overview

The goal of the basic high-level programming model is to introduce a top down approach to users that need to configure the GPMC module.

[Figure 16-91](#), [Table 16-239](#), [Table 16-240](#) and [Table 16-241](#) show a programming model top level diagram for the GPMC, and the description of each step. Each block of the diagram is detailed in one of the following subsections through a set of registers to configure.

Figure 16-91. Programming Model Top Level Diagram

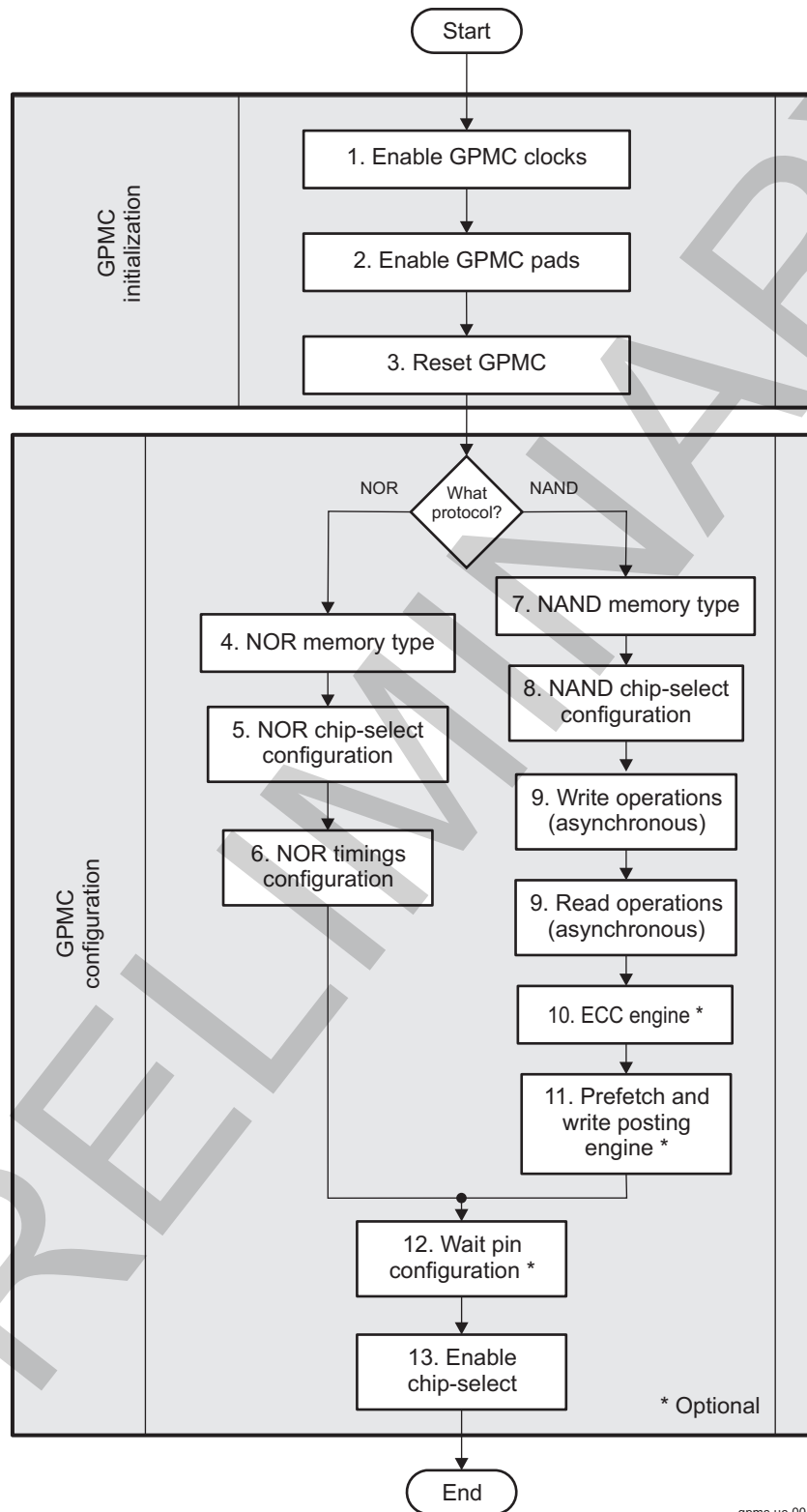


Table 16-239. GPMC Initialization

| Step | Description |
|--------------------|--|
| Enable GPMC clocks | Module interface and functional clocks must be enabled. See Chapter 3, Power, Reset, and Clock Management . |
| Enable GPMC pads | Module-specific pad muxing and configuration must be set in the control module. See Chapter 19, Control Module . |
| Reset GPMC | See Table 16-242 |

Table 16-240. GPMC Configuration in NOR Mode

| Step | Description |
|-------------------------------|----------------------------------|
| NOR Memory Type | See Table 16-243 |
| NOR Chip-Select Configuration | See Table 16-244 |
| NOR Timings Configuration | See Table 16-245 |
| Wait Pin Configuration | See Table 16-253 |
| Enable Chip-Select | See Table 16-254 |

Table 16-241. GPMC Configuration in NAND Mode

| Step | Description |
|-----------------------------------|----------------------------------|
| NAND Memory Type | See Table 16-248 |
| NAND Chip-Select Configuration | See Table 16-249 |
| Write Operations (Asynchronous) | See Table 16-250 |
| Read Operations (Asynchronous) | See Table 16-250 |
| ECC Engine | See Table 16-251 |
| Prefetch and Write-Posting Engine | See Table 16-252 |
| Wait Pin Configuration | See Table 16-253 |
| Enable Chip-Select | See Table 16-254 |

16.4.5.2 GPMC Initialization

[Table 16-270](#) describes the settings required to prepare the GPMC, that is enabling its clock, its pads, and proceeding to a GPMC reset.

Table 16-242. Reset GPMC

| Sub-process Name | Register / Bit Field | Value |
|------------------------|--|-------|
| Start a software reset | GPMC_SYSCONFIG [1] SOFTRESET | 0x1 |
| Wait until | GPMC_SYSSTATUS [0] RESETDONE = | 0x1 |

16.4.5.3 GPMC Configuration in NOR Mode

This section gives a generic configuration for parameters related to the NOR memory connected to the GPMC.

Table 16-243. NOR Memory Type

| Sub-process Name | Register / Bit Field | Value |
|--|---|-------|
| Set the NOR protocol | GPMC_CONFIG1 [11:10] DEVICETYPE | 0x0 |
| Set a device size | GPMC_CONFIG1 [13:12] DEVICESIZE | x |
| Select an address and data multiplexing protocol | GPMC_CONFIG1 [9] MUXADDDATA | x |
| Set the attached device page length | GPMC_CONFIG1 [24:23] ATTACHEDDEVICEPAGELENGTH | x |
| Set the wrapping burst capabilities | GPMC_CONFIG1 [31] WRAPBURST | x |

Table 16-243. NOR Memory Type (continued)

| Sub-process Name | Register / Bit Field | Value |
|--|---|-------|
| Select a timing signals latencies factor | GPMC_CONFIG1_i[4] TIMEPARAGRANULARITY | x |
| Select an output clock frequency ⁽¹⁾ | GPMC_CONFIG1_i[1:0] GPMCFCLKDIVIDER | x |
| Choose an output clock activation time ⁽¹⁾ | GPMC_CONFIG1_i[26:25] CLKACTIVATIONTIME | x |
| Set a single or multiple access for read operations ⁽¹⁾ | GPMC_CONFIG1_i[30] READMULTIPLE | x |
| Set a synchronous or asynchronous mode for read operations | GPMC_CONFIG1_i[29] READTYPE | x |
| Set a single or multiple access for write operations | GPMC_CONFIG1_i[28] WRITEMULTIPLE | x |
| Set a synchronous or asynchronous mode for write operations | GPMC_CONFIG1_i[27] WRITETYPE | x |

⁽¹⁾ Only applies to synchronous configurations (or non-multiplexed async for the multiple access one).

Table 16-244. NOR Chip-Select Configuration

| Sub-process Name | Register / Bit Field | Value |
|-------------------------------------|--|-------|
| Select the chip-select base address | GPMC_CONFIG7_i[5:0] BASEADDRESS | x |
| Select the chip-select mask address | GPMC_CONFIG7_i[11:8] MASKADDRESS | x |

Table 16-245. NOR Timings Configuration

| Sub-process Name | Register / Bit Field | Value |
|--|--|-------|
| Configure adequate timing parameters in various memory modes | See Section 16.4.5.6 , <i>GPMC Timing Parameters</i> | |

Table 16-246. Wait Pin Configuration

| Sub-process Name | Register / Bit Field | Value |
|--|--|-------|
| Enable or disable wait pin monitoring for read operations | GPMC_CONFIG1_i[22] WAITREADMONITORING | x |
| Enable or disable wait pin monitoring for write operations | GPMC_CONFIG1_i[21] WAITWRITEMONITORING | x |
| Select a wait pin monitoring time | GPMC_CONFIG1_i[19:18] WAITMONITORINGTIME | x |
| Choose the input wait pin for the chip-select | GPMC_CONFIG1_i[17:16] WAITPINSELECT | x |

Table 16-247. Enable Chip-Select

| Sub-process Name | Register / Bit Field | Value |
|--|---|-------|
| When all parameters are configured, enable the chip-select | GPMC_CONFIG7_i[6] CSVALID | x |

16.4.5.4 GPMC Configuration in NAND Mode

This section gives a generic configuration for parameters related to the NAND memory connected to the GPMC.

Table 16-248. NAND Memory Type

| Sub-process Name | Register / Bit Field | Value |
|--|---|-------|
| Set the NAND protocol | GPMC_CONFIG1_i[11:10] DEVICETYPE | 0x2 |
| Set a device size | GPMC_CONFIG1_i[13:12] DEVICESIZE | x |
| Set the address and data multiplexing protocol to non-multiplexed attached device | GPMC_CONFIG1_i[9] MUXADDDATA | 0x0 |
| Select a timing signals latencies factor | GPMC_CONFIG1_i[4] TIMEPARAGRANULARITY | x |
| Set a synchronous or asynchronous mode and a single or multiple access for read and write operations | See Section 16.4.5.5 , <i>Set Memory Access</i> | x |

Table 16-249. NAND Chip-Select Configuration

| Sub-process Name | Register / Bit Field | Value |
|--|--|-------|
| Select the chip-select base address | GPMC_CONFIG7_i[5:0] BASEADDRESS | x |
| Select the chip-select minimum granularity (16M bytes) | GPMC_CONFIG7_i[11:8] MASKADDRESS | x |

Table 16-250. Asynchronous Read and Write Operations

| Sub-process Name | Register / Bit Field | Value |
|--|--|-------|
| Configure adequate timing parameters in asynchronous modes | See Section 16.4.5.6 , <i>GPMC Timing Parameters</i> | |

Table 16-251. ECC Engine

| Sub-process Name | Register / Bit Field | Value |
|---|---|---------------------|
| Select the ECC result register where the first ECC computation is stored (Only applies to Hamming) | GPMC_ECC_CONTROL[3:0] ECCPOINTER | x ⁽¹⁾ |
| Clear all ECC result registers | GPMC_ECC_CONTROL[8] ECCCLEAR | Write '1' to clear. |
| Define ECCSIZE0 and ECCSIZE1 | GPMC_ECC_SIZE_CONFIG[19:12] ECCSIZE0 and [29:22] ECCSIZE1 | x ⁽²⁾ |
| Select the size of each of the 9 result registers (size specified by ECCSIZE0 or ECCSIZE1) | GPMC_ECC_SIZE_CONFIG[j-1] ECCjRESULTSIZ | x |
| Select the chip-select where ECC is computed | GPMC_ECC_CONFIG[3:1] ECCCS | x |
| Select the Hamming code or BCH code ECC algorithm in use | GPMC_ECC_CONFIG[16] ECCALGORITHM | x |
| Select word size for ECC calculation | GPMC_ECC_CONFIG[7] ECC16B | x |
| If the BCH code is used, Set an error correction capability and Select a number of sectors to process | GPMC_ECC_CONFIG[13:12] ECCBCHTSEL and GPMC_ECC_CONFIG[6:4] ECCTOPSECTOR | x |
| Enable the ECC computation | GPMC_ECC_CONFIG[0] ECCENABLE | 0x1 |

⁽¹⁾ This parameter depends on the numbers of sectors in a page.

⁽²⁾ Depends on the size of each sector in the NAND page.

Table 16-252. Prefetch and Write-Posting Engine

| Sub-process Name | Register / Bit Field | Value |
|--|---|-------|
| Disable the engine before configuration | GPMC_PREFETCH_CONTROL[0] STARTENGINE | 0x0 |
| Select the chip-select associated with a NAND device where the prefetch engine is active | GPMC_PREFETCH_CONFIG1[26:24] ENGINECSSELECTOR | x |
| Select access direction through prefetch engine, read or write. | GPMC_PREFETCH_CONFIG1[0] ACCESSMODE | x |
| Select the threshold used to issue a DMA request | GPMC_PREFETCH_CONFIG1[14:8] FIFOTHRESHOLD | x |
| Select either DMA synchronized mode or software manual mode. | GPMC_PREFETCH_CONFIG1[2] DMAMODE | x |
| Select if the engine immediately starts accessing the memory upon STARTENGINE assertion or if hardware synchronization based on a WAIT signal is used. | GPMC_PREFETCH_CONFIG1[3] SYNCHROMODE | x |
| Select which wait pin edge detector should start the engine in synchronized mode | GPMC_PREFETCH_CONFIG1[5:4] WAITPINSELECTOR | x |
| Enter a number of clock cycles removed to timing parameters (For all back-to-back accesses to the NAND flash but not the first one) | GPMC_PREFETCH_CONFIG1[30:28] CYCLOPTIMIZATION | x |
| Enable the prefetch postwrite engine | GPMC_PREFETCH_CONFIG1[7] ENABLEENGINE | 0x1 |
| Select the number of bytes to be read or written by the engine to the selected chip-select | GPMC_PREFETCH_CONFIG2[13:0] TRANSFERCOUNT | x |
| Start the prefetch engine | GPMC_PREFETCH_CONTROL[0] STARTENGINE | 0x1 |

Table 16-253. Wait Pin Configuration

| Sub-process Name | Register / Bit Field | Value |
|--|---|-------|
| Selects when the engine starts the access to CS | GPMC_PREFETCH_CONFIG1 [3] SYNCHROMODE | x |
| Select which wait pin edge detector should start the engine in synchronized mode | GPMC_PREFETCH_CONFIG1 [5:4] WAITPINSELECTOR | x |

Table 16-254. Enable Chip-Select

| Sub-process Name | Register / Bit Field | Value |
|--|---|-------|
| When all parameters are configured, enable the chip-select | GPMC_CONFIG7 _[6] CSVALID | x |

16.4.5.5 Set Memory Access

This section details the bit field to configure to set the GPMC in various memory modes.

Table 16-255. Mode Parameters Check List Table

| Register | Bit | Bit field name | Asynchronous | | | | Synchronous | | | |
|--------------------------------|-----|----------------|--------------------|---------------------|-----------------------------|------------------------------|--------------------|---------------------|------------------------------|-------------------------------|
| | | | Single Read Access | Single Write Access | Multiple Read (Page) Access | Multiple Write (Page) Access | Single Read Access | Single Write Access | Multiple Read (Burst) Access | Multiple Write (Burst) Access |
| GPMC_CONFIG1_i | 30 | READMULTIPLE | 0x0 | - | 0x1 ⁽¹⁾ | N/S | 0x0 | - | 0x1 | - |
| GPMC_CONFIG1_i | 29 | READTYPE | 0x0 | - | 0x0 ⁽¹⁾ | N/S | 0x1 | - | 0x1 | - |
| GPMC_CONFIG1_i | 28 | WRITEMULTIPLE | - | 0x0 | - ⁽¹⁾ | N/S | - | 0x0 | - | 0x1 |
| GPMC_CONFIG1_i | 27 | WRITETYPE | - | 0x0 | - ⁽¹⁾ | N/S | - | 0x1 | - | 0x1 |

⁽¹⁾ Multiple read is not supported in address/data- and AAD-multiplexed modes. Multiple read is supported in Nonmultiplexed mode.

Table 16-256. Access Type Parameters Check List Table

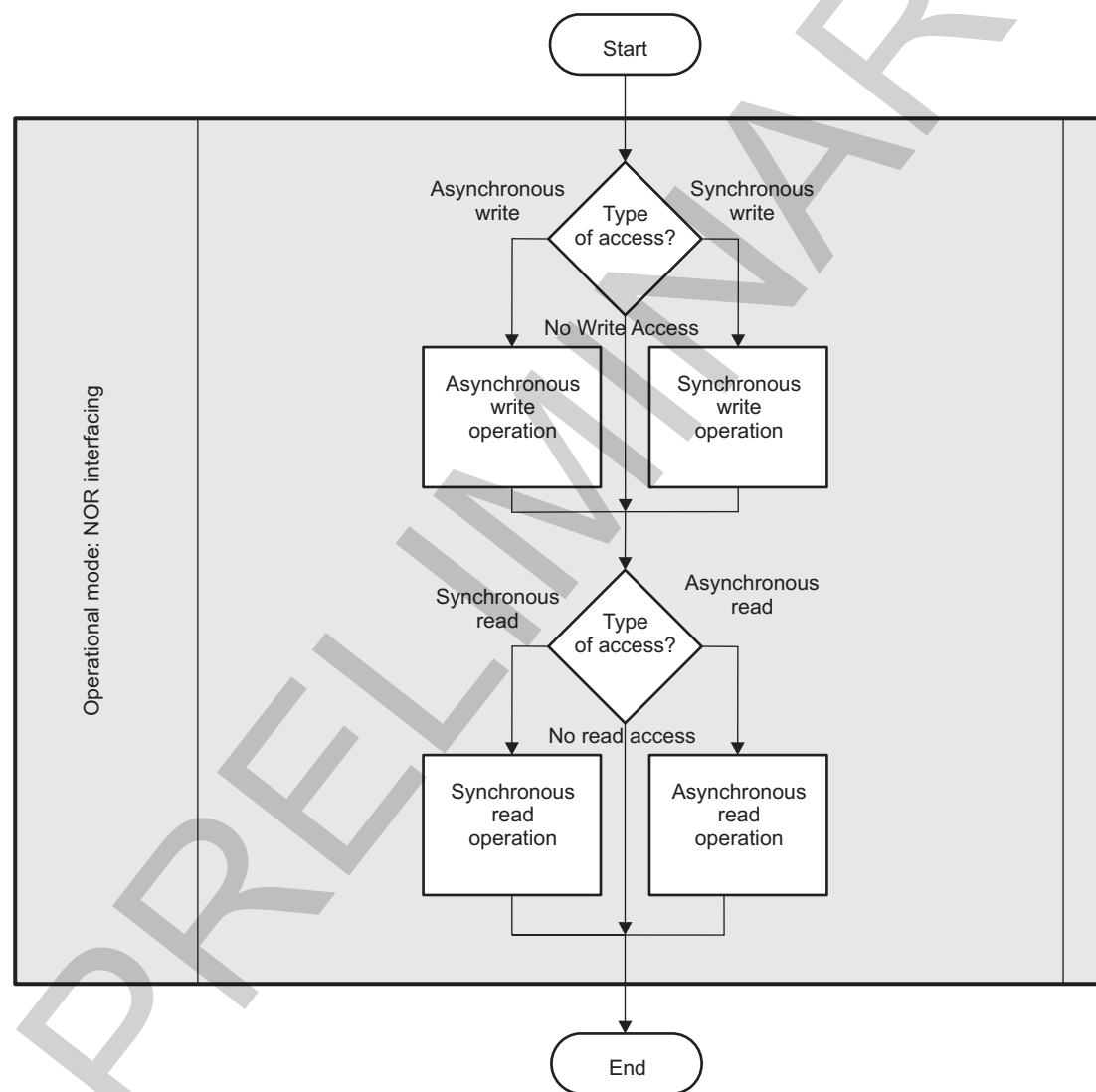
| Register | Bit | Bit field name | Access Type | | |
|--------------------------------|-----|-------------------------------|-------------|-------------------|---------|
| | | | Non-mux | Address /Data Mux | AAD-mux |
| GPMC_CONFIG1_i | 9:8 | MUXADDDATA | 0x0 | 0x2 | 0x1 |
| GPMC_CONFIG | 1 | LIMITEDADDRESS ⁽¹⁾ | 0x1 | 0x0 | 0x0 |

⁽¹⁾ This parameter applies to all chip-selects. There is no per-CS configuration for this parameter.

16.4.5.6 GPMC Timing Parameters

Figure 16-92 shows a programming model diagram for the NOR interfacing timing parameters.

Figure 16-92. NOR Interfacing Timing Parameters Diagram



gpmc-uc-002

Table 16-257 lists bit fields to configure adequate timing parameter in various memory modes.

Table 16-257. Timing Parameters

| Register | Bit | Bit field name | Asynchronous | | | Synchronous | | | | Access Type | | |
|----------------|-------|---------------------|--------------------|---------------------|-----------------------------|--------------------|---------------------|------------------------------|-------------------------------|-----------------|--------------------------|-----------------|
| | | | Single Read Access | Single Write Access | Multiple Read (Page) access | Single Read Access | Single Write Access | Multiple Read (Burst) Access | Multiple Write (Burst) Access | Non-multiplexed | Address/Data-multiplexed | AAD-multiplexed |
| GPMC_CONFIG1_i | 9 | MUXADDDATA | y | y | y | y | y | y | y | y | y | y |
| GPMC_CONFIG1_i | 29 | READTYPE | y | | y | y | | y | | y | y | y |
| GPMC_CONFIG1_i | 30 | READMULTIPLE | y | | y | y | | y | | y | y | y |
| GPMC_CONFIG1_i | 27 | WRITETYPE | | y | | | y | | y | y | y | y |
| GPMC_CONFIG1_i | 28 | WRITEMULTIPLE | | y | | | y | | y | y | y | y |
| GPMC_CONFIG1_i | 31 | WRAPBURST | | | | | | y | y | y | y | y |
| GPMC_CONFIG1_i | 26:25 | CLKACTIVATIONTIME | | | | y | y | y | y | y | y | y |
| GPMC_CONFIG1_i | 19:18 | WAITMONITORINGTIME | y | y | y | y | y | y | y | y | y | y |
| GPMC_CONFIG1_i | 4 | TIMEPARAGRANULARITY | y | y | y | y | y | y | y | y | y | y |
| GPMC_CONFIG2_i | 20:16 | CSWROFFTIME | | y | | | y | | y | y | y | y |
| GPMC_CONFIG2_i | 12:8 | CSRDOFFTIME | y | | y | y | | y | | y | y | y |
| GPMC_CONFIG2_i | 7 | CSEXTRADELAY | y | y | y | y | y | y | y | y | y | y |
| GPMC_CONFIG2_i | 3:0 | CSONTIME | y | y | y | y | y | y | y | y | y | y |
| GPMC_CONFIG3_i | 30:28 | ADVAADMUXWROFFTIME | | y | | | y | | y | | | y |
| GPMC_CONFIG3_i | 30:29 | ADVAADMUXRDOFFTIME | y | | y | y | | y | | | | y |
| GPMC_CONFIG3_i | 6:4 | ADVAADMUXONTIME | y | y | y | y | y | y | y | | | y |
| GPMC_CONFIG3_i | 20:16 | ADVWROFFTIME | | y | | | y | | y | y | y | y |
| GPMC_CONFIG3_i | 12:8 | ADVRDOFFTIME | y | | y | y | | y | | y | y | y |
| GPMC_CONFIG3_i | 7 | ADVEXTRADELAY | y | y | y | y | y | y | y | y | y | y |
| GPMC_CONFIG3_i | 3:0 | ADVONTIME | y | y | y | y | y | y | y | y | y | y |
| GPMC_CONFIG4_i | 15:13 | OEAADMUXOFFTIME | y | y | y | y | y | y | y | | | y |
| GPMC_CONFIG4_i | 6:4 | OEAADMUXONTIME | y | y | y | y | y | y | y | | | y |
| GPMC_CONFIG4_i | 28:24 | WEOFFTIME | | y | | | y | | y | y | y | y |
| GPMC_CONFIG4_i | 23 | WEEXTRADELAY | | y | | | y | | y | y | y | y |
| GPMC_CONFIG4_i | 19:16 | WEONTIME | | y | | | y | | y | y | y | y |
| GPMC_CONFIG4_i | 12:8 | OEOFFTIME | y | | y | y | | y | | y | y | y |
| GPMC_CONFIG4_i | 7 | OEEXTRADELAY | y | | y | y | | y | | y | y | y |
| GPMC_CONFIG4_i | 3:0 | OEONTIME | y | | y | y | | y | | y | y | y |
| GPMC_CONFIG5_i | 27:24 | PAGEBURSTACCESSTIME | | | y | | | y | y | y | y | y |

Table 16-257. Timing Parameters (continued)

| | | | Asynchronous | | | Synchronous | | | | Access Type | | |
|--------------------------------|-------|----------------------|--------------|---|---|-------------|---|---|---|-------------|---|---|
| GPMC_CONFIG5_i | 20:16 | RDACCESSTIME | y | | y | y | | y | | y | y | y |
| GPMC_CONFIG5_i | 12:8 | WRCYCLETIME | | y | | | y | | y | y | y | y |
| GPMC_CONFIG5_i | 4:0 | RDCYCLETIME | y | | y | y | | y | | y | y | y |
| GPMC_CONFIG6_i | 28:24 | WRACCESSTIME | | y | | | y | | y | y | y | y |
| GPMC_CONFIG6_i | 19:16 | WRDATAONADMUXBUS | | y | | | y | | y | | y | y |
| GPMC_CONFIG6_i | 11:8 | CYCLE2CYCLEDELAY | y | y | y | y | y | y | y | y | y | y |
| GPMC_CONFIG6_i | 7 | CYCLE2CYCLESAMECSSEN | y | y | y | y | y | y | y | y | y | y |
| GPMC_CONFIG6_i | 6 | CYCLE2CYCLEDIFFCSSEN | y | y | y | y | y | y | y | y | y | y |
| GPMC_CONFIG6_i | 3:0 | BUSTURNAROUND | y | y | y | y | y | y | y | y | y | y |
| GPMC_CONFIG7_i | 6 | CSVALID | y | y | y | y | y | y | y | y | y | y |

16.4.5.6.1 GPMC Timing Parameters Formulas

This section intends to help the user to calculate the GPMC timing bit fields values. Formulas are not listed exhaustively.

The section details:

- NAND Flash Interface Timing Parameters Formulas
- Synchronous NOR Flash Timing Parameters Formulas
- Asynchronous NOR Flash Timing Parameters Formulas

16.4.5.6.1.1 NAND Flash Interface Timing Parameters Formulas

This section lists formulas to use in order to calculate NAND timing parameters. This is the case when [GPMC_CONFIG1_i\[11:10\] DEVICETYPE = 0x2](#). [Table 16-258](#) details NAND timing parameters.

Table 16-258. NAND Formulas Description Table

| Configuration Parameter | Unit | Description |
|-------------------------|------|--|
| A | ns | Pulse duration - gpmc_nwe valid time |
| B | ns | Delay time - gpmc_ncs valid to gpmc_nwe valid |
| C | ns | Delay time - gpmc_nbe0_cle/gpmc_nadv_ale high to gpmc_nwe valid |
| D | ns | Delay time - gpmc_ad[15:0] valid to gpmc_nwe valid |
| E | ns | Delay time - gpmc_nwe invalid to gpmc_ad[15:0] invalid |
| F | ns | Delay time - gpmc_nwe invalid to gpmc_nbe0_cle/gpmc_nadv_ale invalid |
| G | ns | Delay time - gpmc_nwe invalid to gpmc_ncs invalid |
| H | ns | Cycle time - Write cycle time |
| I | ns | Delay time - gpmc_ncs valid to gpmc_noe valid |
| J | ns | Setup time - gpmc_ad[15:0] valid to gpmc_noe invalid |
| K | ns | Pulse duration - gpmc_noe valid time |
| L | ns | Cycle time - Read cycle time |
| M | ns | Delay time - gpmc_noe invalid to gpmc_ncs invalid |

The configuration parameters are calculated through the following formulas.

$$A = (WEOffTime - WEOnTime) * (TimeParaGranularity + 1) * GPMC_FCLK \text{ period}$$

$$B = ((WEOnTime - CSOnTime) * (TimeParaGranularity + 1) + 0.5 * (WEEExtraDelay - CSEExtraDelay)) * GPMC_FCLK \text{ period}$$

$$C = ((WEOnTime - ADVOnTime) * (TimeParaGranularity + 1) + 0.5 * (WEEExtraDelay - ADVExtraDelay)) * GPMC_FCLK \text{ period}$$

$$D = (WEOnTime * (TimeParaGranularity + 1) + 0.5 * WEEExtraDelay) * GPMC_FCLK \text{ period}$$

$$E = (WrCycleTime - WEOffTime * (TimeParaGranularity + 1) - 0.5 * WEEExtraDelay) * GPMC_FCLK \text{ period}$$

$$F = (ADVWrOffTime - WEOffTime * (TimeParaGranularity + 1) + 0.5 * (ADVExtraDelay - WEEExtraDelay)) * GPMC_FCLK \text{ period}$$

$$G = (CSWrOffTime - WEOffTime * (TimeParaGranularity + 1) + 0.5 * (CSEExtraDelay - WEEExtraDelay)) * GPMC_FCLK \text{ period}$$

$$H = WrCycleTime * (1 + TimeParaGranularity) * GPMC_FCLK \text{ period}$$

$$I = ((OEOnTime - CSOnTime) * (TimeParaGranularity + 1) + 0.5 * (OEEExtraDelay - CSEExtraDelay)) * GPMC_FCLK \text{ period}$$

$$J = ((AccessTime - OEOffTime) * (TimeParaGranularity + 1) - 0.5 * OEEExtraDelay) * GPMC_FCLK \text{ period}$$

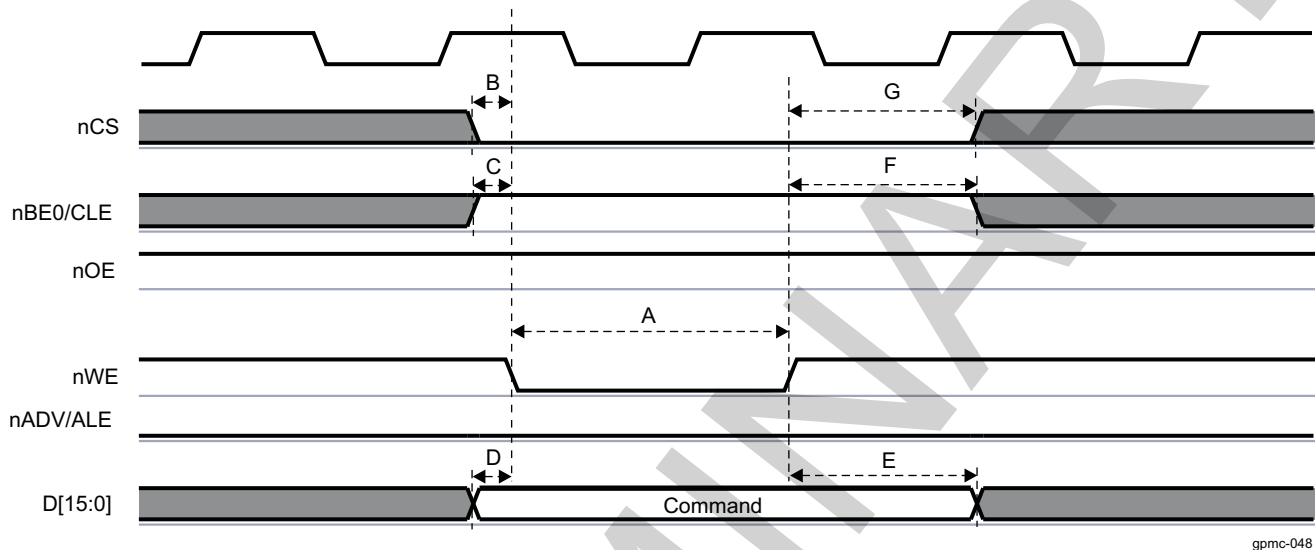
$$K = (OEOffTime - OEOnTime) * (1 + TimeParaGranularity) * GPMC_FCLK \text{ period}$$

$$L = RdCycleTime * (1 + TimeParaGranularity) * GPMC_FCLK \text{ period}$$

$$M = (CSRdOffTime - OEOffTime * (TimeParaGranularity + 1) + 0.5 * (CSEExtraDelay - OEEExtraDelay) * GPMC_FCLK \text{ period}$$

Figure 16-93 shows a command latch cycle timing simplified example where formulas are associated with signal waves.

Figure 16-93. NAND Command Latch Cycle Timing Simplified Example



16.4.5.6.1.2 Synchronous NOR Flash Timing Parameters Formulas

This section lists all formulas to use in order to calculate synchronous NOR timing parameters. This is the case when `GPMC_CONFIG1_[11:10] DEVICETYPE = 0x0` and when `READTYPE` or `WRITETYPE` are set to synchronous mode.

Table 16-259. Synchronous NOR Formulas Description Table

| Configuration Parameter | Unit | Description |
|-------------------------|------|---|
| A | ns | Pulse duration - gpmc_ncs low |
| B | ns | Delay time - address bus valid to gpmc_clk first edge Delay time - gpmc_nbe0_cle/gpmc_nbe1 valid to gpmc_clk first edge |
| C | ns | Pulse duration - gpmc_nbe0_cle/gpmc_nbe1 low |
| D | ns | Delay time - gpmc_clk rising edge to gpmc_nbe0_cle/gpmc_nbe1 invalid Delay time - gpmc_clk rising edge to gpmc_nadv_ale invalid |
| E | ns | Delay time - gpmc_clk rising edge to gpmc_ncs invalid Delay time - gpmc_clk rising edge to gpmc_noe invalid |
| F | ns | Delay time - gpmc_clk rising edge to gpmc_ncs transition |
| G | ns | Delay time - gpmc_clk rising edge to gpmc_nadv_ale transition |
| H | ns | Delay time - gpmc_clk rising edge to gpmc_noe transition |
| I | ns | Delay time - gpmc_clk rising edge to gpmc_nwe transition |
| J | ns | Delay time - gpmc_clk rising edge to gpmc_ad data bus transition Delay time - gpmc_clk rising edge to gpmc_nbe0_cle/gpmc_nbe1 transition |
| K | ns | Pulse duration - gpmc_nadv_ale low |
| L | ns | Delay time - gpmc_wait invalid to first data latching gpmc_clk edge |

The configuration parameters are calculated through the following formulas.

1. For single read accesses:
 $A = (\text{CSRDOFFTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$
 $C = \text{RDCYCLETIME} * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$
 $D = (\text{RDCYCLETIME} - \text{ACCESSTIME}) * \text{GPMC_FCLK period}$
 $E = (\text{CSRDOFFTIME} - \text{ACCESSTIME}) * \text{GPMC_FCLK period}$
2. For burst read accesses (where n is the page burst access number):
 $A = (\text{CSRDOFFTIME} - \text{CSONTIME} + (n - 1) * \text{PAGEBURSTACCESSTIME}) * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$
 $C = (\text{RDCYCLETIME} + (n - 1) * \text{PAGEBURSTACCESSTIME}) * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$
 $D = (\text{RDCYCLETIME} - (\text{ACCESSTIME} + (n - 1) * \text{PAGEBURSTACCESSTIME})) * \text{GPMC_FCLK period}$
 $E = (\text{CSRDOFFTIME} - (\text{ACCESSTIME} + (n - 1) * \text{PAGEBURSTACCESSTIME})) * \text{GPMC_FCLK period}$
3. For burst write accesses (where n is the page burst access number):
 $A = (\text{CSWROFFTIME} - \text{CSONTIME} + (n - 1) * \text{PAGEBURSTACCESSTIME}) * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$
 $C = (\text{WRCYCLETIME} + (n - 1) * \text{PAGEBURSTACCESSTIME}) * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$
 $D = (\text{WRCYCLETIME} - (\text{ACCESSTIME} + (n - 1) * \text{PAGEBURSTACCESSTIME})) * \text{GPMC_FCLK period}$
 $E = (\text{CSWROFFTIME} - (\text{ACCESSTIME} + (n - 1) * \text{PAGEBURSTACCESSTIME})) * \text{GPMC_FCLK period}$
4. For all accesses:
 For nCS falling edge (CS activated):
 - Case where [GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER = 0x0:
 $F = 0.5 * \text{CSEXTRADELAY} * \text{GPMC_FCLK period}$
 - Case where GPMCFCLKDIVIDER = 0x1:
 $F = 0.5 * \text{CSEXTRADELAY} * \text{GPMC_FCLK period}$, when (CLKACTIVATIONTIME and CSONTIME are odd) or (CLKACTIVATIONTIME and CSONTIME are even)
 $F = (1 + 0.5 * \text{CSEXTRADELAY}) * \text{GPMC_FCLK period}$ otherwise.
 - Case where GPMCFCLKDIVIDER = 0x2:
 $F = 0.5 * \text{CSEXTRADELAY} * \text{GPMC_FCLK period}$, when (CSONTIME - CLKACTIVATIONTIME) is a multiple of 3
 $F = (1 + 0.5 * \text{CSEXTRADELAY}) * \text{GPMC_FCLK period}$, when (CSONTIME - CLKACTIVATIONTIME - 1) is a multiple of 3
 $F = (2 + 0.5 * \text{CSEXTRADELAY}) * \text{GPMC_FCLK period}$, when (CSONTIME - CLKACTIVATIONTIME - 2) is a multiple of 3
 For nCS rising edge (CS deactivated) in reading mode:
 - Case where [GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER = 0x0:
 $F = 0.5 * \text{CSEXTRADELAY} * \text{GPMC_FCLK period}$
 - Case where GPMCFCLKDIVIDER = 0x1:
 $F = 0.5 * \text{CSEXTRADELAY} * \text{GPMC_FCLK period}$, when (CLKACTIVATIONTIME and CSRDOFFTIME are odd) or (CLKACTIVATIONTIME and CSRDOFFTIME are even)
 $F = (1 + 0.5 * \text{CSEXTRADELAY}) * \text{GPMC_FCLK period}$ otherwise.
 - Case where GPMCFCLKDIVIDER = 0x2:
 $F = 0.5 * \text{CSEXTRADELAY} * \text{GPMC_FCLK period}$, when (CSRDOFFTIME - CLKACTIVATIONTIME) is a multiple of 3
 $F = (1 + 0.5 * \text{CSEXTRADELAY}) * \text{GPMC_FCLK period}$, when (CSRDOFFTIME - CLKACTIVATIONTIME - 1) is a multiple of 3
 $F = (2 + 0.5 * \text{CSEXTRADELAY}) * \text{GPMC_FCLK period}$, when (CSRDOFFTIME - CLKACTIVATIONTIME - 2) is a multiple of 3
 For nCS rising edge (CS deactivated) in writing mode:
 - Case where [GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER = 0x0:
 $F = 0.5 * \text{CSEXTRADELAY} * \text{GPMC_FCLK period}$
 - Case where GPMCFCLKDIVIDER = 0x1:
 $F = 0.5 * \text{CSEXTRADELAY} * \text{GPMC_FCLK period}$, when (CLKACTIVATIONTIME and CSWROFFTIME are odd) or (CLKACTIVATIONTIME and CSWROFFTIME are even)
 $F = (1 + 0.5 * \text{CSEXTRADELAY}) * \text{GPMC_FCLK period}$ otherwise.

- Case where GPMCFCLKDIVIDER = 0x2:
 $F = 0.5 * CSEXTRADELAY * GPMC_FCLK \text{ period, when } (CSWROFFTIME - CLKACTIVATIONTIME) \text{ is a multiple of } 3$
 $F = (1 + 0.5 * CSEXTRADELAY) * GPMC_FCLK \text{ period, when } (CSWROFFTIME - CLKACTIVATIONTIME - 1) \text{ is a multiple of } 3$
 $F = (2 + 0.5 * CSEXTRADELAY) * GPMC_FCLK \text{ period, when } (CSWROFFTIME - CLKACTIVATIONTIME - 2) \text{ is a multiple of } 3$
- For nADV falling edge (nADV activated):
- Case where [GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER = 0x0:
 $G = 0.5 * ADVEXTRADELAY * GPMC_FCLK \text{ period}$
- Case where GPMCFCLKDIVIDER = 0x1:
 $G = 0.5 * ADVEXTRADELAY * GPMC_FCLK \text{ period, when } (CLKACTIVATIONTIME \text{ and } ADVONTIME \text{ are odd}) \text{ or } (CLKACTIVATIONTIME \text{ and } ADVONTIME \text{ are even})$
 $G = (1 + 0.5 * ADVEXTRADELAY) * GPMC_FCLK \text{ period otherwise.}$
- Case where GPMCFCLKDIVIDER = 0x2:
 $G = 0.5 * ADVEXTRADELAY * GPMC_FCLK \text{ period, when } (ADVONTIME - CLKACTIVATIONTIME) \text{ is a multiple of } 3$
 $G = (1 + 0.5 * ADVEXTRADELAY) * GPMC_FCLK \text{ period, when } (ADVONTIME - CLKACTIVATIONTIME - 1) \text{ is a multiple of } 3$
 $G = (2 + 0.5 * ADVEXTRADELAY) * GPMC_FCLK \text{ period, when } (ADVONTIME - CLKACTIVATIONTIME - 2) \text{ is a multiple of } 3$
- For nADV rising edge (nADV deactivated) in reading mode:
- Case where [GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER = 0x0:
 $G = 0.5 * ADVEXTRADELAY * GPMC_FCLK \text{ period}$
- Case where GPMCFCLKDIVIDER = 0x1:
 $G = 0.5 * ADVEXTRADELAY * GPMC_FCLK \text{ period, when } (CLKACTIVATIONTIME \text{ and } ADVRDOFFTIME \text{ are odd}) \text{ or } (CLKACTIVATIONTIME \text{ and } ADVRDOFFTIME \text{ are even})$
 $G = (1 + 0.5 * ADVEXTRADELAY) * GPMC_FCLK \text{ period otherwise.}$
- Case where GPMCFCLKDIVIDER = 0x2:
 $G = 0.5 * ADVEXTRADELAY * GPMC_FCLK \text{ period, when } (ADVRDOFFTIME - CLKACTIVATIONTIME) \text{ is a multiple of } 3$
 $G = (1 + 0.5 * ADVEXTRADELAY) * GPMC_FCLK \text{ period, when } (ADVRDOFFTIME - CLKACTIVATIONTIME - 1) \text{ is a multiple of } 3$
 $G = (2 + 0.5 * ADVEXTRADELAY) * GPMC_FCLK \text{ period, when } (ADVRDOFFTIME - CLKACTIVATIONTIME - 2) \text{ is a multiple of } 3$
- For nADV rising edge (nADV deactivated) in writing mode:
- Case where [GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER = 0x0:
 $G = 0.5 * ADVEXTRADELAY * GPMC_FCLK \text{ period}$
- Case where GPMCFCLKDIVIDER = 0x1:
 $G = 0.5 * ADVEXTRADELAY * GPMC_FCLK \text{ period, when } (CLKACTIVATIONTIME \text{ and } ADVWROFFTIME \text{ are odd}) \text{ or } (CLKACTIVATIONTIME \text{ and } ADVWROFFTIME \text{ are even})$
 $G = (1 + 0.5 * ADVEXTRADELAY) * GPMC_FCLK \text{ period otherwise.}$
- Case where GPMCFCLKDIVIDER = 0x2:
 $G = 0.5 * ADVEXTRADELAY * GPMC_FCLK \text{ period, when } (ADVWROFFTIME - CLKACTIVATIONTIME) \text{ is a multiple of } 3$
 $G = (1 + 0.5 * ADVEXTRADELAY) * GPMC_FCLK \text{ period, when } (ADVWROFFTIME - CLKACTIVATIONTIME - 1) \text{ is a multiple of } 3$
 $G = (2 + 0.5 * ADVEXTRADELAY) * GPMC_FCLK \text{ period, when } (ADVWROFFTIME - CLKACTIVATIONTIME - 2) \text{ is a multiple of } 3$
- For nOE falling edge (nOE activated):
- Case where [GPMC_CONFIG1_i\[1:0\]](#) GPMCFCLKDIVIDER = 0x0:
 $H = 0.5 * OEEXTRADELAY * GPMC_FCLK \text{ period}$
- Case where GPMCFCLKDIVIDER = 0x1:
 $H = 0.5 * OEEXTRADELAY * GPMC_FCLK \text{ period, when } (CLKACTIVATIONTIME \text{ and } OEONTIME \text{ are odd}) \text{ or } (CLKACTIVATIONTIME \text{ and } OEONTIME \text{ are even})$
 $H = (1 + 0.5 * OEEXTRADELAY) * GPMC_FCLK \text{ period otherwise.}$

- Case where GPMCFCLKDIVIDER = 0x2:
 $H = 0.5 * OEEXTRADELAY * GPMC_FCLK \text{ period, when } (OEONTIME - CLKACTIVATIONTIME) \text{ is a multiple of } 3$
 $H = (1 + 0.5 * OEEXTRADELAY) * GPMC_FCLK \text{ period, when } (OEONTIME - CLKACTIVATIONTIME - 1) \text{ is a multiple of } 3$
 $H = (2 + 0.5 * OEEXTRADELAY) * GPMC_FCLK \text{ period, when } (OEONTIME - CLKACTIVATIONTIME - 2) \text{ is a multiple of } 3$
- For nOE rising edge (nOE desactivated):
- Case where GPMC_CONFIG1_i[1:0] GPMCFCLKDIVIDER = 0x0:
 $H = 0.5 * OEEXTRADELAY * GPMC_FCLK \text{ period}$
- Case where GPMCFCLKDIVIDER = 0x1:
 $H = 0.5 * OEEXTRADELAY * GPMC_FCLK \text{ period, when } (CLKACTIVATIONTIME \text{ and } OEOFFTIME \text{ are odd}) \text{ or } (CLKACTIVATIONTIME \text{ and } OEOFFTIME \text{ are even})$
 $H = (1 + 0.5 * OEEXTRADELAY) * GPMC_FCLK \text{ period otherwise.}$
- Case where GPMCFCLKDIVIDER = 0x2:
 $H = 0.5 * OEEXTRADELAY * GPMC_FCLK \text{ period, when } (OEOFFTIME - CLKACTIVATIONTIME) \text{ is a multiple of } 3$
 $H = (1 + 0.5 * OEEXTRADELAY) * GPMC_FCLK \text{ period, when } (OEOFFTIME - CLKACTIVATIONTIME - 1) \text{ is a multiple of } 3$
 $H = (2 + 0.5 * OEEXTRADELAY) * GPMC_FCLK \text{ period, when } (OEOFFTIME - CLKACTIVATIONTIME - 2) \text{ is a multiple of } 3$
- For nWE falling edge (nWE activated):
- Case where GPMC_CONFIG1_i[1:0] GPMCFCLKDIVIDER = 0x0:
 $I = 0.5 * WEEXTRADELAY * GPMC_FCLK \text{ period}$
- Case where GPMCFCLKDIVIDER = 0x1:
 $I = 0.5 * WEEXTRADELAY * GPMC_FCLK \text{ period, when } (CLKACTIVATIONTIME \text{ and } WEONTIME \text{ are odd}) \text{ or } (CLKACTIVATIONTIME \text{ and } WEONTIME \text{ are even})$
 $I = (1 + 0.5 * WEEXTRADELAY) * GPMC_FCLK \text{ period otherwise.}$
- Case where GPMCFCLKDIVIDER = 0x2:
 $I = 0.5 * WEEXTRADELAY * GPMC_FCLK \text{ period, when } (WEONTIME - CLKACTIVATIONTIME) \text{ is a multiple of } 3$
 $I = (1 + 0.5 * WEEXTRADELAY) * GPMC_FCLK \text{ period, when } (WEONTIME - CLKACTIVATIONTIME - 1) \text{ is a multiple of } 3$
 $I = (2 + 0.5 * WEEXTRADELAY) * GPMC_FCLK \text{ period, when } (WEONTIME - CLKACTIVATIONTIME - 2) \text{ is a multiple of } 3$
- For nWE rising edge (nWE desactivated):
- Case where GPMC_CONFIG1_i[1:0] GPMCFCLKDIVIDER = 0x0:
 $I = 0.5 * WEEXTRADELAY * GPMC_FCLK \text{ period}$
- Case where GPMCFCLKDIVIDER = 0x1:
 $I = 0.5 * WEEXTRADELAY * GPMC_FCLK \text{ period, when } (CLKACTIVATIONTIME \text{ and } WEOFFTIME \text{ are odd}) \text{ or } (CLKACTIVATIONTIME \text{ and } WEOFFTIME \text{ are even})$
 $I = (1 + 0.5 * WEEXTRADELAY) * GPMC_FCLK \text{ period otherwise.}$
- Case where GPMCFCLKDIVIDER = 0x2:
 $I = 0.5 * WEEXTRADELAY * GPMC_FCLK \text{ period, when } (WEOFFTIME - CLKACTIVATIONTIME) \text{ is a multiple of } 3$
 $I = (1 + 0.5 * WEEXTRADELAY) * GPMC_FCLK \text{ period, when } (WEOFFTIME - CLKACTIVATIONTIME - 1) \text{ is a multiple of } 3$
 $I = (2 + 0.5 * WEEXTRADELAY) * GPMC_FCLK \text{ period, when } (WEOFFTIME - CLKACTIVATIONTIME - 2) \text{ is a multiple of } 3$
- For gpmc_nadv low pulse duration:
- Read operation:
 $K = (ADVROFFTIME - ADVONTIME) * (TIMEPARAGRANULARITY + 1) * GPMC_FCLK \text{ period}$
- Write operation:
 $K = (ADVWROFFTIME - ADVONTIME) * (TIMEPARAGRANULARITY + 1) * GPMC_FCLK \text{ period}$
- For gpmc_wait invalid to first data latching gpmc_clk edge:
- $L = WAITMONITORINGTIME * (GPMCFCLKDIVIDER + 1) * GPMC_FCLK \text{ period} + GPMC_CLK$

Figure 16-94 shows a synchronous NOR single read simplified example where formulas are associated with signal waves.

Figure 16-94. Synchronous NOR Single Read Simplified Example



16.4.5.6.1.3 Asynchronous NOR Flash Timing Parameters Formulas

This section lists all formulas to use in order to calculate asynchronous NOR timing parameters. This is the case when `GPMC_CONFIG1_[11:10] DEVICETYPE = 0x0` and when `READTYPE` or `WRITETYPE` are set to asynchronous mode.

Table 16-260. Asynchronous NOR Formulas Description Table

| Configuration Parameter | Unit | Description |
|-------------------------|------|--|
| A | ns | Pulse duration - gpmc_ncs low |
| B | ns | Delay time - gpmc_ncs valid to gpmc_nadv_ale invalid |
| C | ns | Delay time - gpmc_ncs valid to gpmc_noe invalid (single read) |
| D | ns | Pulse duration - address bus valid - 2nd, 3rd and 4th accesses |
| E | ns | Delay time - gpmc_ncs valid to gpmc_nwe valid |
| F | ns | Delay time - gpmc_ncs valid to gpmc_nwe invalid |
| G | ns | Address invalid duration between 2 successive R/W accesses |
| H | ns | Setup time - read data valid before gpmc_noe high |
| I | ns | Delay time - gpmc_ncs valid to gpmc_noe invalid (burst read) |
| J | ns | Delay time - address bus valid to gpmc_ncs valid |
| | | Delay time - data bus valid to gpmc_ncs valid |
| | | Delay time - gpmc_nbe0_cle/gpmc_nbe1 valid to gpmc_ncs valid |
| K | ns | Delay time - gpmc_ncs valid to gpmc_nadv_ale valid |

Table 16-260. Asynchronous NOR Formulas Description Table (continued)

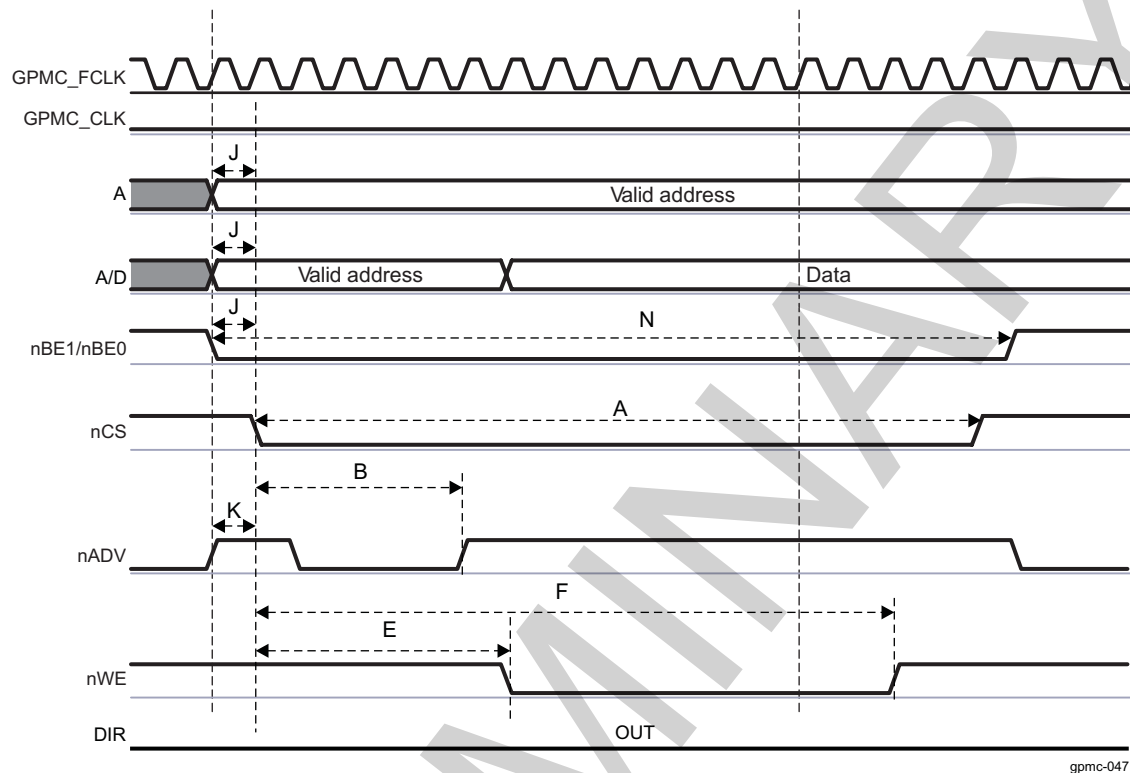
| Configuration Parameter | Unit | Description |
|-------------------------|------|---|
| L | ns | Delay time - gpmc_ncs valid to gpmc_noe valid |
| M | ns | Delay time - gpmc_ncs valid to first data latching edge |
| N | ns | Pulse duration - gpmc_nbe0_cle/gpmc_nbe1 valid time |
| O | ns | Delay time - gpmc_ncs valid to gpmc_nadv_ale valid |

The configuration parameters are calculated through the following formulas. Note that these formulas are not exhaustive.

- gpmc_ncs low pulse:
For single read: $A = (\text{CSRDOFFTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$
For burst read: $A = (\text{CSRDOFFTIME} - \text{CSONTIME} + (N - 1) * \text{PAGEBURSTACCESSTIME}) * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$, where N = page burst access number
For single write: $A = (\text{CSWROFFTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$
For burst write: $A = (\text{CSWROFFTIME} - \text{CSONTIME} + (N - 1) * \text{PAGEBURSTACCESSTIME}) * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$, where N = page burst access number
- gpmc_ncs valid to gpmc_nadv_ale invalid delay:
For reading: $B = ((\text{ADVRDOFFTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) + 0.5 * (\text{ADVEXTRADELAY} - \text{CSEXTRADELAY})) * \text{GPMC_FCLK period}$
For writing: $B = ((\text{ADVWROFFTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) + 0.5 * (\text{ADVEXTRADELAY} - \text{CSEXTRADELAY})) * \text{GPMC_FCLK period}$
- $C = ((\text{OE OFFTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) + 0.5 * (\text{OEEXTRADELAY} - \text{CSEXTRADELAY})) * \text{GPMC_FCLK period}$
- $D = \text{PAGEBURSTACCESSTIME} * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$
- $E = ((\text{WEONTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) + 0.5 * (\text{WEEXTRADELAY} - \text{CSEXTRADELAY})) * \text{GPMC_FCLK period}$
- $F = ((\text{WEOFFTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) + 0.5 * (\text{WEEXTRADELAY} - \text{CSEXTRADELAY})) * \text{GPMC_FCLK period}$
- $G = \text{CYCLE2CYCLEDELAY} * \text{GPMC_FCLK period}$
- $H = ((\text{OE OFFTIME} - \text{ACCESSTIME}) * (\text{TIMEPARAGRANULARITY} + 1) + 0.5 * \text{OEEXTRADELAY}) * \text{GPMC_FCLK period}$
- $I = ((\text{OE OFFTIME} + (N - 1) * \text{PAGEBURSTACCESSTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) + 0.5 * (\text{OEEXTRADELAY} - \text{CSEXTRADELAY})) * \text{GPMC_FCLK period}$, where N = page burst access number
- $J = (\text{CSONTIME} * (\text{TIMEPARAGRANULARITY} + 1) + 0.5 * \text{CSEXTRADELAY}) * \text{GPMC_FCLK period}$
- $K = ((\text{ADVONTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) + 0.5 * (\text{ADVEXTRADELAY} - \text{CSEXTRADELAY})) * \text{GPMC_FCLK period}$
- $L = ((\text{OEONTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) + 0.5 * (\text{OEEXTRADELAY} - \text{CSEXTRADELAY})) * \text{GPMC_FCLK period}$
- $M = ((\text{ACCESSTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) - 0.5 * \text{CSEXTRADELAY}) * \text{GPMC_FCLK period}$
- gpmc_nbe0_cle/gpmc_nbe1 pulse:
For single read: $N = \text{RDCYCLETIME} * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$
For burst read: $N = (\text{RDCYCLETIME} + (N - 1) * \text{PAGEBURSTACCESSTIME}) * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$, where N = page burst access number
For burst write: $N = (\text{WRCYCLETIME} + (N - 1) * \text{PAGEBURSTACCESSTIME}) * (\text{TIMEPARAGRANULARITY} + 1) * \text{GPMC_FCLK period}$, where N = page burst access number
- $O = ((\text{WRCYCLETIME} + (N - 1) * \text{PAGEBURSTACCESSTIME} - \text{CSONTIME}) * (\text{TIMEPARAGRANULARITY} + 1) + 0.5 * (\text{ADVEXTRADELAY} - \text{CSEXTRADELAY})) * \text{GPMC_FCLK period}$

Figure 16-95 shows an asynchronous NOR single write simplified example where formulas are associated with signal waves.

Figure 16-95. Asynchronous NOR Single Write Simplified Example



NOTE: Write multiple access is not supported in asynchronous mode. If WRITEMULTIPLE is enabled with WRITETYPE as asynchronous, the GPMC processes single asynchronous accesses.

16.4.6 GPMC Use Cases And Tips

16.4.6.1 How to Set GPMC Timing Parameters for Typical Accesses

16.4.6.1.1 External Memory Attached to the GPMC Module

As discussed in the introduction to this chapter, the GPMC module supports the following external memory types:

- Asynchronous or synchronous, 8-bit or 16-bit-width memory or device
- 16-bit address/data-multiplexed or not multiplexed NOR flash device
- 8- or 16-bit NAND flash device

The following examples show how to calculate GPMC timing parameters by showing a typical parameter setup for the access to be performed.

The example is based on a 512-Mb multiplexed NOR flash memory with the following characteristics:

- Type: NOR flash (address/data-multiplexed mode)
- Size: 512M bits
- Data Bus: 16 bits wide
- Speed: 104 MHz clock frequency
- Read access time: 80 ns

16.4.6.1.2 Typical GPMC Setup

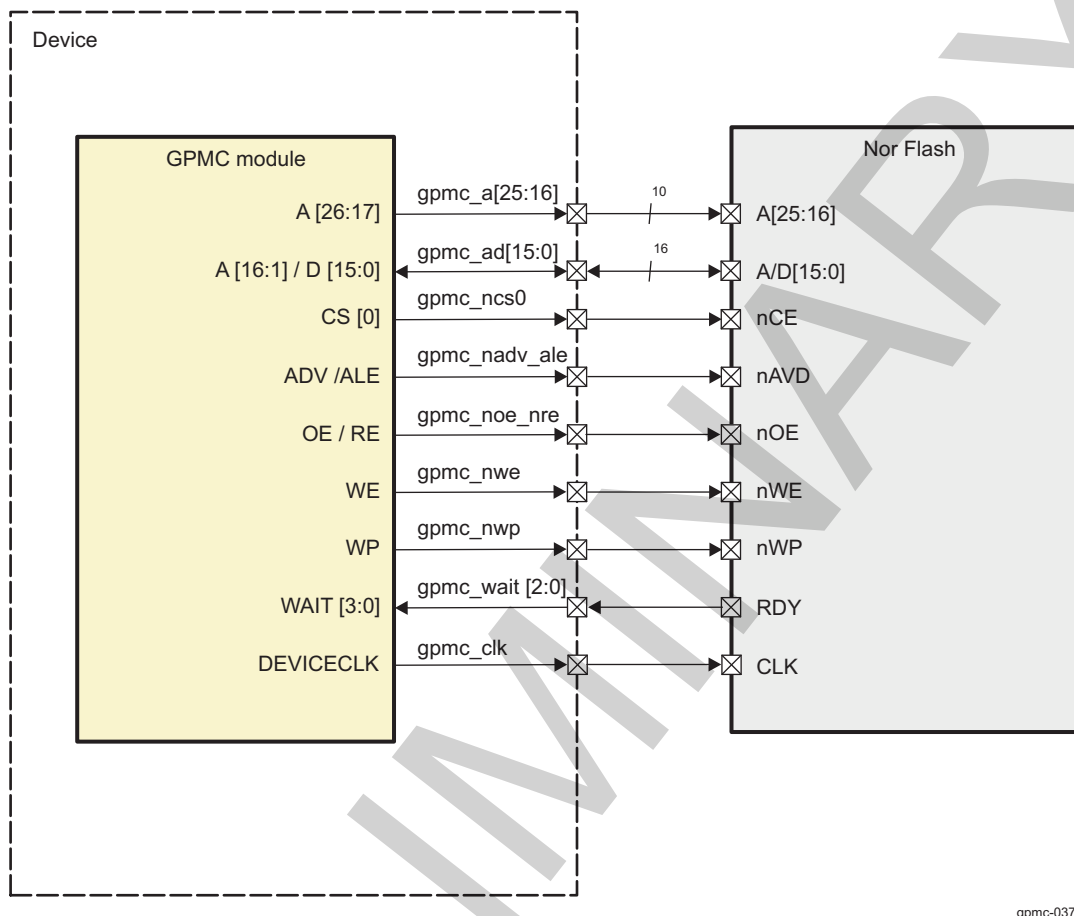
Table 16-261 lists some of the I/Os of the GPMC module.

Table 16-261. GPMC Signals

| Signal Name | I/O | Description |
|----------------|----------|--|
| GPMC_FCLK | Internal | Functional and interface clock. Acts as the time reference. |
| gpmc_clk | O | External clock provided to the external device for synchronous operations |
| gpmc_a[25:16] | O | Address |
| gpmc_ad[15: 0] | I/O | Data-multiplexed with addresses A[16:1] on memory side |
| gpmc_ncsx | O | Chip-select (where x = 0, or 1) |
| gpmc_nadv_ale | O | Address valid enable |
| gpmc_noe_nre | O | Output enable (read access only) |
| gpmc_nwe | O | Write enable (write access only) |
| gpmc_wait[2:0] | I | Ready signal from memory device. Indicates when valid burst data is ready to be read |

Figure 16-96 shows the typical connection between the GPMC module and an attached NOR Flash memory.

Figure 16-96. GPMC Connection to an External NOR Flash Memory



gpmc-037

The following sections demonstrate how to calculate GPMC parameters for three access types:

- Synchronous burst read
- Asynchronous read
- Asynchronous single write

16.4.6.1.2.1 GPMC Configuration for Synchronous Burst Read Access

The clock runs at 104 MHz ($f = 104 \text{ MHz}$; $T = 9,615 \text{ ns}$).

Table 16-262 shows the timing parameters (on the memory side) that determine the parameters on the GPMC side.

Table 16-263 shows how to calculate timings for the GPMC using the memory parameters.

Figure 16-97 shows the synchronous burst read access.

Table 16-262. Useful Timing Parameters on the Memory Side

| AC Read Characteristics on the Memory Side | Description | Duration (ns) |
|--|-----------------------------|---------------|
| tCES | nCS setup time to clock | 0 |
| tACS | Address setup time to clock | 3 |
| tIACC | Synchronous access time | 80 |

Table 16-262. Useful Timing Parameters on the Memory Side (continued)

| AC Read Characteristics on the Memory Side | Description | Duration (ns) |
|--|---|---------------|
| tBACC | Burst access time valid clock to output delay | 5,2 |
| tCEZ | Chip-select to High-Z | 7 |
| tOEZ | Output enable to High-Z | 7 |
| tAVC | nADV setup time | 6 |
| tAVD | nAVD pulse | 6 |
| tACH | Address hold time from clock | 3 |

The following terms, which describe the timing interface between the controller and its attached device, are used to calculate the timing parameters on the GPMC side:

- Read Access time (GPMC side): Time required to activate the clock + read access time requested on the memory side + data setup time required for optimal capture of a burst of data
- Data setup time (GPMC side): Ensures a good capture of a burst of data (as opposed to taking a burst of data out). One word of data is processed in one clock cycle ($T = 9,615$ ns). The read access time between 2 bursts of data is $tBACC = 5,2$ ns. Therefore, data setup time is a clock period - $tBACC = 4,415$ ns of data setup.
- Access completion (GPMC side): (Different from page burst access time) Time required between the last burst access and access completion: nCS/nOE hold time (nCS and nOE must be released at the end of an access. These signals are held to allow the access to complete).
- Read cycle time (GPMC side): Read Access time + access completion
- Write cycle time for burst access: Not supported for NOR flash memory

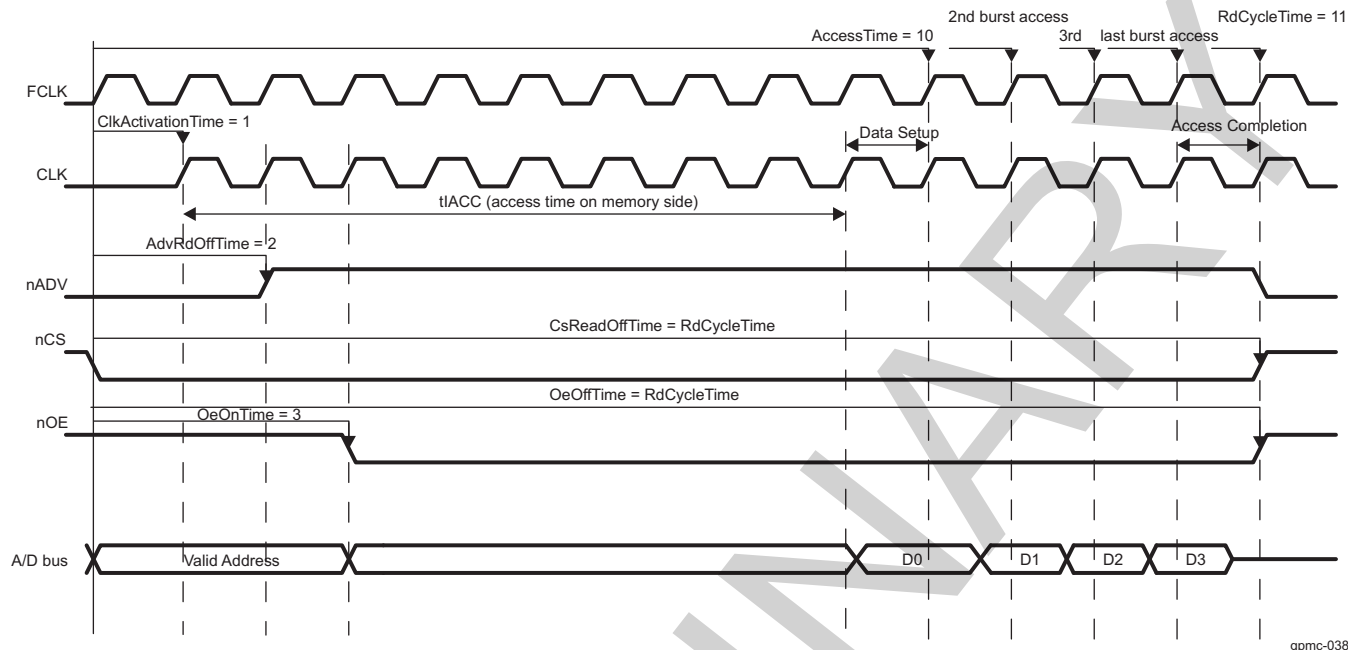
Table 16-263. Calculating GPMC Timing Parameters

| Parameter Name on GPMC Side | Formula | Duration (ns) | Number of Clock Cycles (F = 104 MHz) | GPMC Register Configurations |
|-----------------------------|--|-----------------------------|---------------------------------------|------------------------------|
| GPMC FCLK Divider | - | - | - | GPMCFCLKDIVIDER = 0x0 |
| ClkActivation Time | $\min(tCES, tACS)$ | 3 | 1 | CLKACTIVATIONTIME = 0x1 |
| RdAccessTime | $\text{roundmax}(\text{ClkActivationTime} + tIACC + \text{DataSetupTime})$ | 94,03: (9,615 + 80 + 4,415) | 10 : $\text{roundmax}(94,03 / 9,615)$ | ACCESSTIME = 0x0A |
| PageBurst AccessTime | $\text{roundmax}(tBACC)$ | $\text{roundmax}(5,2)$ | 1 | PAGEBURSTACCESSTIME = 0x1 |
| RdCycleTime | $\text{AccessTime} + \max(tCEZ, tOEZ)$ | 101, 03: (94, 03 + 7) | 11 | RDCYCLETIME = 0x0B |
| CsOnTime | tCES | 0 | 0 | CSONTIME = 0x0 |
| CsReadOffTime | RdCycleTime | - | 11 | CSRDOFFTIME = 0x0B |
| AdvOnTime | tAVC ⁽¹⁾ | 0 | 0 | ADVONTIME = 0x0 |
| AdvRdOffTime | tAVD + tAVC ⁽²⁾ | 12 | 2 | ADVRDOFFTIME = 0x02 |
| OeOnTime ⁽³⁾ | (ClkActivationTime + tACH) OeOnTime (ClkActivationTime + tIACC) | - | 3 for instance. | OEONTIME = 0x3 |
| OeOffTime | RdCycleTime | - | 11 | OEOFFTIME = 0x0B |

⁽¹⁾ The external clock provided to the NOR flash is not yet available.

⁽²⁾ $\text{AdvRdOffTime} - \text{AdvOnTime} = \text{tAVD}$; thus, $\text{AdvRdOffTime} = \text{tAVD} + \text{AdvOnTime} = \text{tAVD} + \text{tAVC}$.

⁽³⁾ OeOnTime must guarantee that addresses are available. It must not exceed the availability of the first burst of data.

Figure 16-97. Synchronous Burst Read Access (Timing Parameters in Clock Cycles)

gpmc-038

16.4.6.1.2.2 GPMC Configuration for Asynchronous Read Access

The clock runs at 104 MHz ($f = 104 \text{ MHz}$; $T = 9,615 \text{ ns}$).

Table 16-264 shows the timing parameters (on the memory side) that determine the parameters on the GPMC side.

Table 16-265 shows how to calculate timings for the GPMC using the memory parameters.

Figure 16-98 shows the asynchronous read access.

Table 16-264. AC Characteristics for Asynchronous Read Access

| AC Read Characteristics on the Memory Side | Description | Duration (ns) |
|--|---|---------------|
| tCE | Read Access time from nCS low | 80 |
| tAAVDS | Address setup time to rising edge of nADV | 3 |
| tAVDP | nADV low time | 6 |
| tCAS | nCS setup time to nADV | 0 |
| tOE | Output enable to output valid | 6 |
| tOEZ | Output enable to High-Z | 7 |

Use the following formula to calculate the RdCycleTime parameter for this typical access:

$$\text{RdCycleTime} = \text{RdAccessTime} + \text{AccessCompletion} = \text{RdAccessTime} + 1 \text{ clock cycle} + \text{tOEZ}$$

- First, on the memory side, the external memory makes the data available to the output bus. This is the memory-side read access time defined in Table 16-264: the number of clock cycles between the address capture (nADV rising edge) and the data valid on the output bus.

The GPMC requires some hold time to allow the data to be captured correctly and the access to be finished.

- To read the data correctly, the GPMC must be configured to meet the data setup time requirement of the memory; the GPMC module captures the data on the next rising edge. This is access time on the GPMC side.
- There must also be a data hold time for correctly reading the data (checking that there is no nOE/nCS

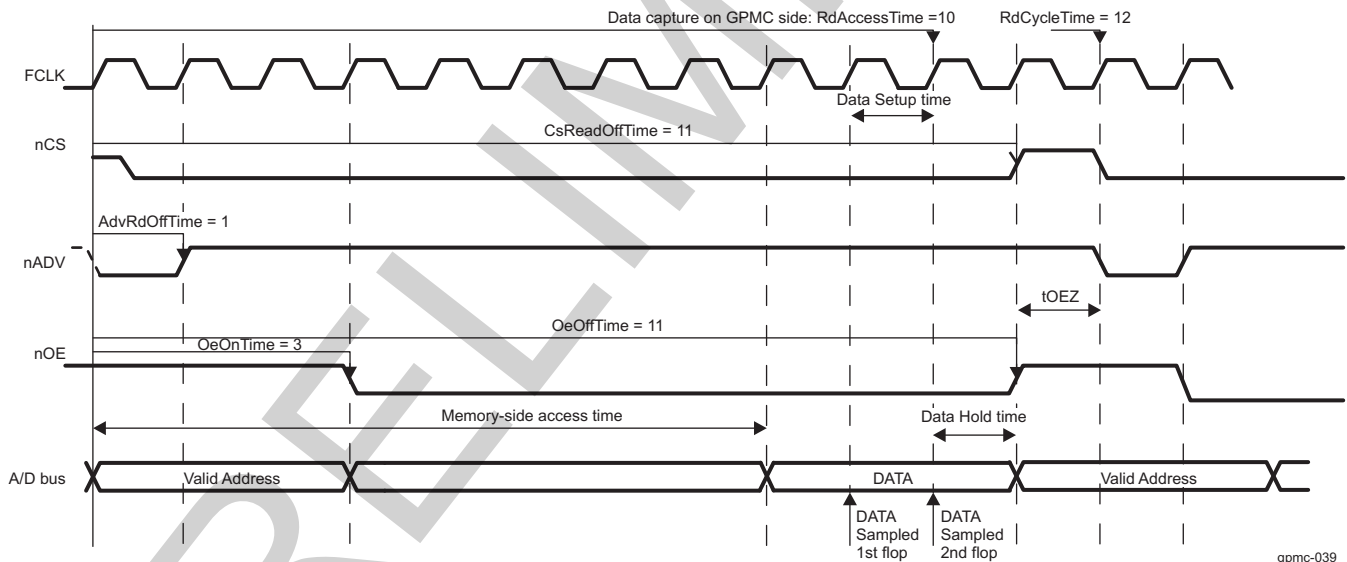
deassertion while reading the data). This data hold time is 1 clock cycle (that is, AccessTime + 1).

- To complete the access, nOE/nCS signals are driven to High-Z. AccessTime + 1 + tOEZ is the read cycle time.
- Addresses can now be relatched and a new read cycle begun.

Table 16-265. GPMC Timing Parameters for Asynchronous Read Access

| Parameter Name on GPMC side | Formula | Duration (ns) | Number of Clock Cycles (F = 104 MHz) | GPMC Register Configurations |
|--------------------------------|---|-------------------------|--|---------------------------------|
| ClkActivationTime | | n/a (asynchronous mode) | | |
| AccessTime | round max (tCE) | 80 | 10 | ACCESSTIME = 0x0A |
| PageBurstAccess Time | n/a (single access) | | | |
| RdCycleTime | AccessTime + 1cycle + tOEZ | 96, 615 | 12 | RDCYCLETIME = 0x0C |
| CsOnTime | tCAS | 0 | 0 | CSONTIME = 0x0 |
| CsReadOffTime | AccessTime + 1 cycle | 89, 615 | 11 | CSRDOFFTIME = 0x0B |
| AdvOnTime | tAAVDS | 3 | 1 | ADVONTIME = 0x1 |
| AdvRdOffTime | tAAVDS + tAVDP | 9 | 1 | ADVROFFTIME = 0x01 |
| OeOnTime | OeOnTime = AdvRdOffTime (multiplexed mode) | - | 3 for instance | OEONTIME = 0x3 |
| OeOffTime | AccessTime + 1cycle | 89, 615 | 11 | OEOFFTIME = 0x0B |

Figure 16-98. Asynchronous Single Read Access (Timing Parameters in Clock Cycles)



gpmc-039

16.4.6.1.2.3 GPMC Configuration for Asynchronous Single Write Access

The clock runs at 104 MHz: (f = 104 MHz; T = 9, 615 ns).

Table 16-267 shows how to calculate timings for the GPMC using the memory parameters.

Table 16-266 shows the timing parameters (on the memory side) that determine the parameters on the GPMC side.

Figure 16-99 shows the synchronous burst write access.

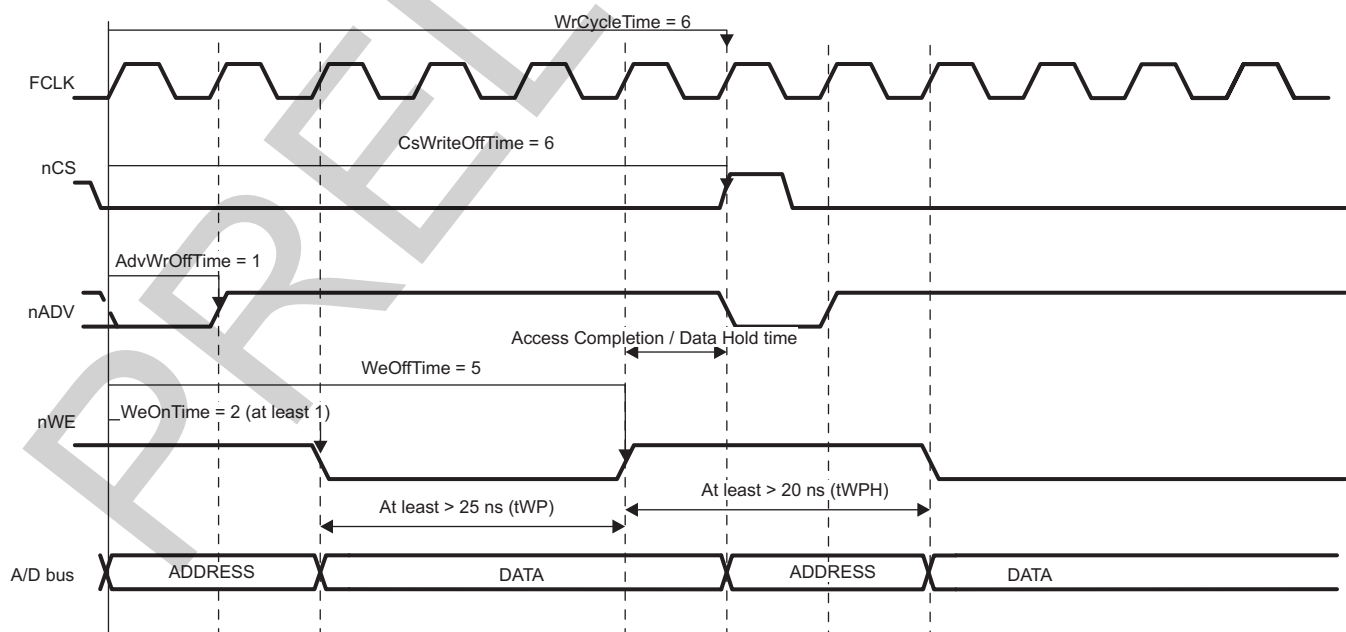
Table 16-266. AC Characteristics for Asynchronous Single Write (Memory Side)

| AC Characteristics on the Memory Side | Description | Duration (ns) |
|---------------------------------------|------------------------|---------------|
| tWC | Write cycle time | 60 |
| tAVDP | nADV low time | 6 |
| tWP | Write pulse width | 25 |
| tWPH | Write pulse width high | 20 |
| tCS | nCS setup time to nWE | 3 |
| tCAS | nCS setup time to nADV | 0 |
| tAVSC | nADV setup time | 3 |

For asynchronous single write access, write cycle time is $WrCycleTime = WeOffTime + AccessCompletion = WeOffTime + 1$. For the AccessCompletion, the GPMC requires 1 cycle of data hold time (nCS deassertion).

Table 16-267. GPMC Timing parameters for Asynchronous Single Write

| Parameter Name on GPMC side | Formula | Duration (ns) | Number of Clock Cycles (F = 104 MHz) | GPMC Registers Configuration |
|-----------------------------|--|-------------------------|--------------------------------------|------------------------------|
| ClkActivationTime | | n/a (asynchronous mode) | | |
| AccessTime | Applicable only to WAITMONITORING (the value is the same as for read access) | | | |
| PageBurstAccessTime | | n/a (single access) | | |
| WrCycleTime | WeOffTime + AccessCompletion | 57, 615 | 6 | WRCYCLETIME = 0x06 |
| CsOnTime | tCAS | 0 | 0 | CSONTIME = 0x0 |
| CsWrOffTime | WeOffTime + 1 | 57, 615 | 6 | CSWROFFTIME = 0x06 |
| AdvOnTime | tAVSC | 3 | 1 | ADVONTIME = 0x1 |
| AdvWrOffTime | tAVSC + tAVDP | 9 | 1 | ADVWROFFTIME = 0x01 |
| WeOnTime | tCS | 3 | 1 | WEONTIME = 0x1 |
| WeOffTime | tCS + tWP + tWPH | 48 | 5 | WEOFFTIME = 0x05 |

Figure 16-99. Asynchronous Single Write Access (Timing Parameters in Clock Cycles)

gpmc-040

16.4.6.2 How to choose a suitable memory to use with the GPMC

This section is intended to help the user select a suitable memory device to interface with the GPMC controller.

16.4.6.2.1 Supported Memories or Devices

NAND flash and NOR flash architectures are the two flash technologies. The GPMC supports various types of external memory or device, basically any one that supports NAND or NOR protocols:

- 8- and 16-bit width asynchronous or synchronous memory or device (8-bit: non burst device only)
- 16-bit address and data multiplexed NOR flash devices (pSRAM, OneNAND™, ...)
- 8- and 16-bit NAND flash device

NOTE: Non-multiplexed NOR flash devices are supported by the GPMC but their usage is highly limited. As only ten address pins are available on the GPMC interface, the maximum device size supported is 2KB.

16.4.6.2.1.1 Memory Pin Multiplexing

This section highlights the interfacing differences of the GPMC supported memories.

Table 16-268. Supported memories interfaces

| Function | 16-bit Address/Data muxed pSRAM or NOR Flash ⁽¹⁾ | OneNAND | 16-bit NAND | 8-bit NAND |
|-------------|--|---------|-------------|------------|
| gpmc_a[25] | A26 | | | |
| gpmc_a[24] | A25 | | | |
| gpmc_a[23] | A24 | | | |
| gpmc_a[22] | A23 | | | |
| gpmc_a[21] | A22 | | | |
| gpmc_a[20] | A21 | | | |
| gpmc_a[19] | A20 | | | |
| gpmc_a[18] | A19 | | | |
| gpmc_a[17] | A18 | | | |
| gpmc_a[16] | A17 | | | |
| gpmc_ad[15] | D15 or A16 | | IO15 | |
| gpmc_ad[14] | D14 or A15 | | IO14 | |
| gpmc_ad[13] | D13 or A14 | | IO13 | |
| gpmc_ad[12] | D12 or A13 | | IO12 | |
| gpmc_ad[11] | D11 or A12 | | IO11 | |
| gpmc_ad[10] | D10 or A11 | | IO10 | |
| gpmc_ad[9] | D9 or A10 | | IO9 | |
| gpmc_ad[8] | D8 or A9 | | IO8 | |
| gpmc_ad[7] | D7 or A8 | | IO7 | |
| gpmc_ad[6] | D6 or A7 | | IO6 | |
| gpmc_ad[5] | D5 or A6 | | IO5 | |
| gpmc_ad[4] | D4 or A5 | | IO4 | |
| gpmc_ad[3] | D3 or A4 | | IO3 | |
| gpmc_ad[2] | D2 or A3 | | IO2 | |
| gpmc_ad[1] | D1 or A2 | | IO1 | |
| gpmc_ad[0] | D0 or A1 | | IO0 | |
| gpmc_clk | CLK | | | |

⁽¹⁾ Addresses seen from the device side. When interfacing to the external IC, A1 is connected to the memory A0, A2 to the memory A1, and so on...

Table 16-268. Supported memories interfaces (continued)

| Function | 16-bit Address/Data muxed pSRAM or NOR Flash ⁽¹⁾ | OneNAND | 16-bit NAND | 8-bit NAND |
|---------------|--|---------|----------------------------|------------|
| gpmc_ncs0 | nCS0 (Chip Select) | | nCE0 (Chip Enable) | |
| gpmc_ncs1 | nCS1 | | nCE1 | |
| gpmc_ncs2 | nCS2 | | nCE2 | |
| gpmc_ncs3 | nCS3 | | nCE3 | |
| gpmc_ncs4 | nCS4 | | nCE4 | |
| gpmc_ncs5 | nCS5 | | nCE5 | |
| gpmc_ncs6 | nCS6 | | nCE6 | |
| gpmc_ncs7 | nCS7 | | nCE7 | |
| gpmc_nadv_ale | nADV (Address Valid) | | ALE (Address Latch Enable) | |
| gpmc_noe | nOE (Output Enable) | | nRE (Read Enable) | |
| gpmc_nwe | nWE (Write Enable) | | nWE (Write Enable) | |
| gpmc_nbe0_cle | nBE0 (Byte Enable) | | CLE (Command Latch Enable) | |
| gpmc_nbe1 | nBE1 | | | |
| gpmc_nwp | nWP (Write Protect) | | nWP (Write Protect) | |
| gpmc_wait0 | WAIT0 | | R/nB0 (Ready/Busy) | |
| gpmc_wait1 | WAIT1 | | R/nB1 | |
| gpmc_wait2 | WAIT2 | | R/nB2 | |

16.4.6.2.1.2 NAND Interface Protocol

NAND flash architecture, introduced in 1989, is a flash technology. NAND is a page-oriented memory device, that is, read and write accesses are done by pages. NAND achieves great density by sharing common areas of the storage transistor, which creates strings of serially connected transistors (in NOR devices, each transistor stands alone). Thanks to its high density NAND is best suited to devices requiring high capacity data storage, such as pictures, music, or data files. NAND non-volatility, makes of it a good storage solution for many applications where mobility, low power, and speed are key factors. Low pin count and simple interface are other advantages of NAND.

Table 16-269 summarizes the NAND interface signals level applied to external device or memories.

Table 16-269. NAND Interface Bus Operations Summary

| Bus operation | CLE | ALE | nCE | nWE ⁽¹⁾ | nRE ⁽¹⁾ | nWP |
|-----------------------|-----|-----|------------------|--------------------|--------------------|--------------------|
| Read (cmd input) | H | L | L | RE | H | x |
| Read (add input) | L | H | L | RE | H | x |
| Write (cmd input) | H | L | L | RE | H | H |
| Write (add input) | L | H | L | RE | H | H |
| Data input | L | L | L | RE | H | H |
| Data output | L | L | L | H | FE | x |
| Busy (during read) | x | x | H ⁽²⁾ | H ⁽²⁾ | H ⁽²⁾ | x |
| Busy (during program) | x | x | x | x | x | H |
| Busy (during erase) | x | x | x | x | x | H |
| Write protect | x | x | x | x | x | L |
| Stand-by | x | x | H | x | x | H/L ⁽³⁾ |

⁽¹⁾ RE stands for rising edge, FE stands for falling edge

⁽²⁾ Can be either nCE high, or WE and nRE high.

⁽³⁾ nWP should be biased to CMOS high or CMOS low for standby

16.4.6.2.1.3 NOR Interface Protocol

NOR flash architecture, introduced in 1988, is a flash technology. Unlike NAND which is a sequential access device, NOR is directly addressable, that is, is designed to be a random access device. NOR is best suited to devices used to store and run code or firmware, usually in small capacities. While NOR has fast read capabilities it has slow write and erase functions compared to NAND architecture.

Table 16-270 summarizes the NOR interface signals level applied to external device or memories.

Table 16-270. NOR Interface Bus Operations Summary

| Bus operation | CLK | nADV | nCS | nOE | nWE | WAIT | DQ[15:0] |
|----------------------|---------|------|-----|-----|-----|----------|----------|
| Read (asynchronous) | x | L | L | L | H | Asserted | Output |
| Read (synchronous) | Running | L | L | L | H | Driven | Output |
| Read (burst suspend) | Halted | x | L | H | H | Active | Output |
| Write | x | L | L | H | L | Asserted | Input |
| Output disable | x | x | L | H | H | Asserted | High-Z |
| Standby | x | x | H | x | x | High-Z | High-Z |

16.4.6.2.1.4 Other Technologies

Other supported device type interact with the GPMC through the NOR interface protocol.

OneNAND™ is a high density and low-power memory device. OneNAND™ is based on single- or multi-level-cell NAND core with SRAM and logic, and interfaces as a synchronous NOR Flash, plus has synchronous write capability. It reads faster than conventional NAND and write faster than conventional NOR flash. Hence, it is appropriate for both mass storage and code storage.

pSRAM stands for pseudo-static random access memory. pSRAM is a low-power memory device for mobile applications. pSRAM is based on the DRAM cell with internal refresh and address control features, and interfaces as a synchronous NOR Flash, plus has synchronous write capability.

16.4.6.2.1.5 Supported Protocols

The GPMC supports the following interface protocols when communicating with external memory or external devices:

- Asynchronous read/write access
- Asynchronous read page access (4-8-16 Word16)
- Synchronous read/write access
- Synchronous read burst access without wrap capability (4-8-16 Word16)
- Synchronous read burst access with wrap capability (4-8-16 Word16)

16.4.6.2.2 GPMC Features and Settings

This section lists GPMC features and settings:

- Supported device type: up to four NAND or NOR protocol external memories or devices
- Operating Voltage: 1.8V;
- Maximum GPMC addressing capability: 1 GByte divided into eight chip-selects
- Maximum supported memory size: 256 MBytes (must be a power-of-2)
- Minimum supported memory size: 16 MBytes (must be a power-of-2). Aliasing occurs when addressing smaller memories.
- Data path to external memory or device: 8- and 16-bit wide
- Burst and page access: burst of 4-8-16 Word16
- Supports bus keeping
- Supports bus turn around

16.4.7 GPMC Register Manual

This section provides information about the GPMC instance in this product. [Table 16-272](#) provides a summary of the GPMC registers. The remaining parts of this section describe the registers within the module instance.

16.4.7.1 GPMC Register Summary

Table 16-271. GPMC Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|-----------|
| GPMC | 0x5000 0000 | 32 Mbytes |

Table 16-272. GPMC Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | GPMC L3 Physical Address |
|--|------|-----------------------|---------------------------------|---------------------------------|
| GPMC_REVISION | R | 32 | 0x0000 0000 | 0x5000 0000 |
| GPMC_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5000 0010 |
| GPMC_SYSSTATUS | R | 32 | 0x0000 0014 | 0x5000 0014 |
| GPMC_IRQSTATUS | RW | 32 | 0x0000 0018 | 0x5000 0018 |
| GPMC_IRQENABLE | RW | 32 | 0x0000 001C | 0x5000 001C |
| GPMC_TIMEOUT_CONTROL | RW | 32 | 0x0000 0040 | 0x5000 0040 |
| GPMC_ERR_ADDRESS | RW | 32 | 0x0000 0044 | 0x5000 0044 |
| GPMC_ERR_TYPE | RW | 32 | 0x0000 0048 | 0x5000 0048 |
| GPMC_CONFIG | RW | 32 | 0x0000 0050 | 0x5000 0050 |
| GPMC_STATUS | RW | 32 | 0x0000 0054 | 0x5000 0054 |
| GPMC_CONFIG1_i ⁽¹⁾ | RW | 32 | 0x0000 0060 + (0x0000 0030 * i) | 0x5000 0060 + (0x0000 0030 * i) |
| GPMC_CONFIG2_i ⁽¹⁾ | RW | 32 | 0x0000 0064 + (0x0000 0030 * i) | 0x5000 0064 + (0x0000 0030 * i) |
| GPMC_CONFIG3_i ⁽¹⁾ | RW | 32 | 0x0000 0068 + (0x0000 0030 * i) | 0x5000 0068 + (0x0000 0030 * i) |
| GPMC_CONFIG4_i ⁽¹⁾ | RW | 32 | 0x0000 006C + (0x0000 0030 * i) | 0x5000 006C + (0x0000 0030 * i) |
| GPMC_CONFIG5_i ⁽¹⁾ | RW | 32 | 0x0000 0070 + (0x0000 0030 * i) | 0x5000 0070 + (0x0000 0030 * i) |
| GPMC_CONFIG6_i ⁽¹⁾ | RW | 32 | 0x0000 0074 + (0x0000 0030 * i) | 0x5000 0074 + (0x0000 0030 * i) |
| GPMC_CONFIG7_i ⁽¹⁾ | RW | 32 | 0x0000 0078 + (0x0000 0030 * i) | 0x5000 0078 + (0x0000 0030 * i) |
| GPMC_NAND_COMMAND_i ⁽¹⁾ | W | 32 | 0x0000 007C + (0x0000 0030 * i) | 0x5000 007C + (0x0000 0030 * i) |
| GPMC_NAND_ADDRESS_i ⁽¹⁾ | W | 32 | 0x0000 0080 + (0x0000 0030 * i) | 0x5000 0080 + (0x0000 0030 * i) |
| GPMC_NAND_DATA_i ⁽¹⁾ | RW | 32 | 0x0000 0084 + (0x0000 0030 * i) | 0x5000 0084 + (0x0000 0030 * i) |
| GPMC_PREFETCH_CONFIG1 | RW | 32 | 0x0000 01E0 | 0x5000 01E0 |
| GPMC_PREFETCH_CONFIG2 | RW | 32 | 0x0000 01E4 | 0x5000 01E4 |
| GPMC_PREFETCH_CONTROL | RW | 32 | 0x0000 01EC | 0x5000 01EC |
| GPMC_PREFETCH_STATUS | RW | 32 | 0x0000 01F0 | 0x5000 01F0 |
| GPMC_ECC_CONFIG | RW | 32 | 0x0000 01F4 | 0x5000 01F4 |
| GPMC_ECC_CONTROL | RW | 32 | 0x0000 01F8 | 0x5000 01F8 |
| GPMC_ECC_SIZE_CONFIG | RW | 32 | 0x0000 01FC | 0x5000 01FC |
| GPMC_ECCj_RESULT ⁽²⁾ | RW | 32 | 0x0000 0200 + (0x0000 0004 * j) | 0x5000 0200 + (0x0000 0004 * j) |
| GPMC_BCH_RESULT0_i ⁽¹⁾ | RW | 32 | 0x0000 0240 + (0x0000 0010 * i) | 0x5000 0240 + (0x0000 0010 * i) |
| GPMC_BCH_RESULT1_i ⁽¹⁾ | RW | 32 | 0x0000 0244 + (0x0000 0010 * i) | 0x5000 0244 + (0x0000 0010 * i) |
| GPMC_BCH_RESULT2_i ⁽¹⁾ | RW | 32 | 0x0000 0248 + (0x0000 0010 * i) | 0x5000 0248 + (0x0000 0010 * i) |
| GPMC_BCH_RESULT3_i ⁽¹⁾ | RW | 32 | 0x0000 024C + (0x0000 0010 * i) | 0x5000 024C + (0x0000 0010 * i) |
| GPMC_BCH_RESULT4_i ⁽¹⁾ | RW | 32 | 0x0000 0300 + (0x0000 0010 * i) | 0x5000 0300 + (0x0000 0010 * i) |
| GPMC_BCH_RESULT5_i ⁽¹⁾ | RW | 32 | 0x0000 0304 + (0x0000 0010 * i) | 0x5000 0304 + (0x0000 0010 * i) |
| GPMC_BCH_RESULT6_i ⁽¹⁾ | RW | 32 | 0x0000 0308 + (0x0000 0010 * i) | 0x5000 0308 + (0x0000 0010 * i) |
| GPMC_BCH_SWDATA | RW | 32 | 0x0000 02D0 | 0x5000 02D0 |

⁽¹⁾ i = 0 to 7 for GPMC

⁽²⁾ j = 0 to 8 for GPMC

16.4.7.2 GPMC Register Descriptions

NOTE: All GPMC registers are aligned to 32-bit address boundaries. All register file accesses, except to `GPMC_NAND_DATA_i` register, are little endian. If the `GPMC_NAND_DATA_i` register location is accessed, the endianness is access-dependent.

In the whole section i corresponds to the chip-select number, $i = 0$ to 7 .

Table 16-273. GPMC REVISION

| | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|-----------------|------|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | |
| Physical Address | 0x5000 0000 | | | | | | | | Instance | GPMC | | | | | | | |
| Description | This register contains the IP revision code. | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP revision | R | TI internal data |

Table 16-274. Register Call Summary for Register GPMC REVISION

General-Purpose Memory Controller

- GPMC Register Summary: [0]

Table 16-275. GPMC SYSCONFIG

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0010 | | |
| Physical Address | 0x5000 0010 | Instance | GPMC |
| Description | This register controls the various parameters of the Interconnect. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-----------|---|---|---|----------|-----------|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | SIDLEMODE | | | | RESERVED | SOFTRESET | AUTOIDLE | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:5 | RESERVED | Write 0s for future compatibility. Reads return 0s. | RW | 0x0000000 |
| 4:3 | SIDLEMODE | 0x0: Force-idle. An idle request is acknowledged unconditionally 0x1: No-idle. An idle request is never acknowledged 0x2: Smart-idle. Acknowledgment to an idle request is given based on the internal activity of the module 0x3: Do not use | RW | 0x0 |
| 2 | RESERVED | Write 0 for future compatibility Reads returns 0 | RW | 0x0 |
| 1 | SOFTRESET | Software reset. Set this bit to 1 triggers a module reset. This bit is automatically reset by hardware. During reads, it always returns 0. 0x0: Normal mode 0x1: The module is reset | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | AUTOIDLE | Internal Interface clock gating strategy 0x0: Interface clock is free-running 0x1: Automatic Interface clock gating strategy is applied, based on the Interconnect activity | RW | 0x0 |

Table 16-276. Register Call Summary for Register GPMC_SYSCONFIG

General-Purpose Memory Controller

- [GPMC Software Reset: \[0\]](#)
- [GPMC Power Management: \[1\] \[2\]](#)
- [GPMC Initialization: \[3\]](#)
- [GPMC Register Summary: \[4\]](#)

Table 16-277. GPMC_SYSSTATUS

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0014 | Instance | GPMC |
| Physical Address | 0x5000 0014 | | |
| Description | This register provides status information about the module, excluding the interrupt status information | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | RESETDONE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Reads returns 0 | R | 0x000000 |
| 7:1 | RESERVED | Reads returns 0 (reserved for Interconnect-socket status information) | R | 0x00 |
| 0 | RESETDONE | Internal reset monitoring 0x0: Internal module reset in ongoing 0x1: Reset completed | R | 0x- |

Table 16-278. Register Call Summary for Register GPMC_SYSSTATUS

General-Purpose Memory Controller

- [GPMC Software Reset: \[0\]](#)
- [GPMC Initialization: \[1\]](#)
- [GPMC Register Summary: \[2\]](#)

Table 16-279. GPMC_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0018 | Instance | GPMC |
| Physical Address | 0x5000 0018 | | |
| Description | This interrupt status register regroups all the status of the module internal events that can generate an interrupt. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|--------------------------|----|----|--------------------------|---|---|----------|---|---|---|---------------------|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WAIT2EDGEDETECTIONSTATUS | | | WAIT1EDGEDETECTIONSTATUS | | | WAIT0EDGEDETECTIONSTATUS | | | RESERVED | | | | TERMINALCOUNTSTATUS | | FIFOEVENTSTATUS |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|----------|
| 31:11 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x000000 |
| 10 | WAIT2EDGEDETECTIONSTATUS | <p>Status of the Wait2 Edge Detection interrupt</p> <p>Read 0x0: A transition on WAIT2 input pin has not been detected</p> <p>Write 0x0: WAIT2EDGEDETECTIONSTATUS bit unchanged</p> <p>Read 0x1: A transition on WAIT2 input pin has been detected</p> <p>Write 0x1: WAIT2EDGEDETECTIONSTATUS bit is reset</p> | RW | 0x0 |
| 9 | WAIT1EDGEDETECTIONSTATUS | <p>Status of the Wait1 Edge Detection interrupt</p> <p>Read 0x0: A transition on WAIT1 input pin has not been detected</p> <p>Write 0x0: WAIT1EDGEDETECTIONSTATUS bit unchanged</p> <p>Read 0x1: A transition on WAIT1 input pin has been detected</p> <p>Write 0x1: WAIT1EDGEDETECTIONSTATUS bit is reset</p> | RW | 0x0 |
| 8 | WAIT0EDGEDETECTIONSTATUS | <p>Status of the Wait0 Edge Detection interrupt</p> <p>Read 0x0: A transition on WAIT0 input pin has not been detected</p> <p>Write 0x0: WAIT0EDGEDETECTIONSTATUS bit unchanged</p> <p>Read 0x1: A transition on WAIT0 input pin has been detected</p> <p>Write 0x1: WAIT0EDGEDETECTIONSTATUS bit is reset</p> | RW | 0x0 |
| 7:2 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x00 |
| 1 | TERMINALCOUNTSTATUS | <p>Status of the TerminalCountEvent interrupt</p> <p>Read 0x0: Indicates that CountValue is greater than 0</p> <p>Write 0x0: TERMINALCOUNTSTATUS bit unchanged</p> <p>Read 0x1: Indicates that CountValue is equal to 0</p> <p>Write 0x1: TERMINALCOUNTSTATUS bit is reset</p> | RW | 0x0 |
| 0 | FIFOEVENTSTATUS | <p>Status of the FIFOEvent interrupt</p> <p>Read 0x0: Indicates than less than GPMC_PREFETCH_STATUS[16] FIFOTHRESHOLDSTATUS bytes are available in prefetch mode and less than FIFOTHRESHOLD bytes free places are available in write-posting mode.</p> <p>Write 0x0: FIFOEVENTSTATUS bit unchanged</p> <p>Read 0x1: Indicates than at least GPMC_PREFETCH_STATUS[16] FIFOTHRESHOLDSTATUS bytes are available in prefetch mode and at least FIFOTHRESHOLD bytes free places are available in write-posting mode.</p> <p>Write 0x1: FIFOEVENTSTATUS bit is reset</p> | RW | 0x0 |

Table 16-280. Register Call Summary for Register GPMC_IRQSTATUS

General-Purpose Memory Controller

- [GPMC Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [NAND Device-Ready Pin: \[5\] \[6\] \[7\]](#)
- [Prefetch and Write-Posting Engine: \[8\] \[9\] \[10\] \[11\]](#)
- [GPMC Register Summary: \[12\]](#)

Table 16-281. GPMC_IRQENABLE

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 001C | Instance | GPMC |
| Physical Address | 0x5000 001C | | |
| Description | The interrupt enable register allows to mask/unmask the module internal sources of interrupt, on a event-by-event basis. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|--------------------------|----|----|--------------------------|---|---|----------|---|---|---|--------------------------|---|-----------------|
| RESERVED | | | | | | | | | | | | | | | | WAIT2EDGEDETECTIONENABLE | | | WAIT1EDGEDETECTIONENABLE | | | WAIT0EDGEDETECTIONENABLE | | | RESERVED | | | | TERMINALCOUNTEVENTENABLE | | FIFOEVENTENABLE |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|----------|
| 31:11 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x000000 |
| 10 | WAIT2EDGEDETECTIONENABLE | Enables the Wait2 Edge Detection interrupt 0x0: Wait2EdgeDetection interrupt is masked 0x1: Wait2EdgeDetection event generates an interrupt if occurs | RW | 0 |
| 9 | WAIT1EDGEDETECTIONENABLE | Enables the Wait1 Edge Detection interrupt 0x0: Wait1EdgeDetection interrupt is masked 0x1: Wait1EdgeDetection event generates an interrupt if occurs | RW | 0x0 |
| 8 | WAIT0EDGEDETECTIONENABLE | Enables the Wait0 Edge Detection interrupt 0x0: Wait0EdgeDetection interrupt is masked 0x1: Wait0EdgeDetection event generates an interrupt if occurs | RW | 0x0 |
| 7:2 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x00 |
| 1 | TERMINALCOUNTEVENTENABLE | Enables TerminalCountEvent interrupt issuing in prefetch or write-posting mode 0x0: TerminalCountEvent interrupt is masked 0x1: TerminalCountEvent interrupt is not masked | RW | 0x0 |
| 0 | FIFOEVENTENABLE | Enables the FIFOEvent interrupt 0x0: FIFOEvent interrupt is masked 0x1: FIFOEvent interrupt is not masked | RW | 0x0 |

Table 16-282. Register Call Summary for Register GPMC_IRQENABLE

General-Purpose Memory Controller

- [GPMC Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [NAND Device-Ready Pin: \[5\] \[6\]](#)
- [Prefetch and Write-Posting Engine: \[7\] \[8\] \[9\] \[10\]](#)
- [GPMC Register Summary: \[11\]](#)

Table 16-283. GPMC_TIMEOUT_CONTROL

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0040 | Instance | GPMC |
| Physical Address | 0x5000 0040 | | |
| Description | The GPMC_TIMEOUT_CONTROL register allows the user to set the start value of the timeout counter | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|---|---|----------|---|---|---------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TIMEOUTSTARTVALUE | | | | | | | | | | RESERVED | | | TIMEOUTENABLE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|---------|
| 31:13 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x00000 |
| 12:4 | TIMEOUTSTARTVALUE | Start value of the time-out counter 0x000: Zero GPMC_FCLK cycle 0x001: One GPMC_FCLK cycle ... 0x1FF: 511 GPMC_FCLK cycles | RW | 0x1FF |
| 3:1 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 0 | TIMEOUTENABLE | Enable bit of the TimeOut feature 0x0: TimeOut feature is disabled 0x1: TimeOut feature is enabled | RW | 0x0 |

Table 16-284. Register Call Summary for Register GPMC_TIMEOUT_CONTROL

General-Purpose Memory Controller

- [Error Handling: \[0\] \[1\]](#)
- [GPMC Register Summary: \[2\]](#)
- [GPMC Register Descriptions: \[3\]](#)

Table 16-285. GPMC_ERR_ADDRESS

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0044 | Instance | GPMC |
| Physical Address | 0x5000 0044 | | |
| Description | The GPMC_ERR_ADDRESS register stores the address of the illegal access when an error occurs | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | ILLEGALADD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0x0 |
| 30:0 | ILLEGALADD | Address of illegal access A30: 0 for memory region, 1 for GPMC register region A29-A0: 1 GBytes max | R | 0x00000000 |

Table 16-286. Register Call Summary for Register GPMC_ERR_ADDRESS

General-Purpose Memory Controller

- [Error Handling: \[0\]](#)
- [GPMC Register Summary: \[1\]](#)
- [GPMC Register Descriptions: \[2\]](#)

Table 16-287. GPMC_ERR_TYPE

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0048 | Instance | GPMC |
| Physical Address | 0x5000 0048 | | |
| Description | The GPMC_ERR_TYPE register stores the type of error when an error occurs | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----------|----|-----------------|----|------------------|---|--------------|---|----------|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ILLEGALMCMD | | RESERVED | | ERRORNOTSUPPADD | | ERRORNOTSUPPMCMD | | ERRORTIMEOUT | | RESERVED | | ERRORVALID | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|----------|
| 31:11 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x000000 |
| 10:8 | ILLEGALMCMD | System Command of the transaction that caused the error | R | 0x0 |
| 7:5 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 4 | ERRORNOTSUPPADD | Not supported Address error 0x0: No error occurs 0x1: The error is due to a non supported Address | R | 0x0 |
| 3 | ERRORNOTSUPPMCMD | Not supported Command error 0x0: No error occurs 0x1: The error is due to a non supported Command | R | 0x0 |
| 2 | ERRORTIMEOUT | Time-out error 0x0: No error occurs 0x1: The error is due to a time out | R | 0x0 |
| 1 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0x0 |
| 0 | ERRORVALID | Error validity status - Must be explicitly cleared with a write 1 transaction 0x0: All error fields no longer valid 0x1: Error detected and logged in the other error fields | RW | 0x0 |

Table 16-288. Register Call Summary for Register GPMC_ERR_TYPE

General-Purpose Memory Controller

- [Error Handling: \[0\] \[1\] \[2\]](#)
- [GPMC Register Summary: \[3\]](#)
- [GPMC Register Descriptions: \[4\]](#)

Table 16-289. GPMC_CONFIG

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0050 | Instance | GPMC |
| Physical Address | 0x5000 0050 | | |
| Description | The configuration register allows global configuration of the GPMC | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|------------------|----|----|------------------|---|---|----------|---|---|--------------|---|---|----------|--|--|----------------|--|--|----------------------|--|--|
| RESERVED | | | | | | | | | | | | | | | | WAIT2PINPOLARITY | | | WAIT1PINPOLARITY | | | WAIT0PINPOLARITY | | | RESERVED | | | WRITEPROTECT | | | RESERVED | | | LIMITEDADDRESS | | | NANDFORCEPOSTEDWRITE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|-------|
| 31:11 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x1 |
| 10 | WAIT2PINPOLARITY | Selects the polarity of input pin WAIT2 0x0: WAIT2 active low 0x1: WAIT2 active high | RW | 0x0 |
| 9 | WAIT1PINPOLARITY | Selects the polarity of input pin WAIT1 0x0: WAIT1 active low 0x1: WAIT1 active high | RW | 0x1 |
| 8 | WAIT0PINPOLARITY | Selects the polarity of input pin WAIT0 0x0: WAIT0 active low 0x1: WAIT0 active high | RW | 0x0 |
| 7:5 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 4 | WRITEPROTECT | Controls the WP output pin level 0x0: WP output pin is low 0x1: WP output pin is high | RW | 0x0 |
| 3:2 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 1 | LIMITEDADDRESS | Limited Address device support 0x0: No effect 0x1: A26-A11 are not modified during an external memory access. | RW | 0x0 |
| 0 | NANDFORCEPOSTEDWRITE | Enables the Force Posted Write feature to NAND Cmd/Add/Data location 0x0: Disables Force Posted Write 0x1: Enables Force Posted Write | RW | 0x0 |

Table 16-290. Register Call Summary for Register GPMC_CONFIG

General-Purpose Memory Controller

- GPMC Signals: [0]
- GPMC Interrupt Requests: [1] [2] [3]
- GPMC Address and Data Bus: [4]
- GPMC I/O Configuration Setting: [5] [6]
- External Signals: [7] [8]
- Asynchronous and Synchronous Accesses in Nonmultiplexed Mode: [9] [10] [11] [12] [13]
- NAND Memory Device in Byte or 16-bit Word Stream Mode: [14]
- NAND Device-Ready Pin: [15]
- Set Memory Access: [16]
- GPMC Register Summary: [17]

Table 16-291. GPMC_STATUS

| | | | |
|-------------------------|---|-----------------|------|
| Address Offset | 0x0000 0054 | Instance | GPMC |
| Physical Address | 0x5000 0054 | | |
| Description | The status register provides global status bits of the GPMC | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|-------------|----|----|-------------|---|---|----------|---|---|---|---|---|---|------------------------|
| RESERVED | | | | | | | | | | | | | | | | WAIT2STATUS | | | WAIT1STATUS | | | WAIT0STATUS | | | RESERVED | | | | | | | EMPTYWRITEBUFFERSTATUS |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|----------|
| 31:11 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x000000 |
| 10 | WAIT2STATUS | Is a copy of input pin WAIT2. (Reset value is WAIT2 input pin sampled at IC reset) 0x0: WAIT2 asserted (inactive state) 0x1: WAIT2 deasserted | R | 0x- |
| 9 | WAIT1STATUS | Is a copy of input pin WAIT1. (Reset value is WAIT1 input pin sampled at IC reset) 0x0: WAIT1 asserted (inactive state) 0x1: WAIT1 deasserted | R | 0x- |
| 8 | WAIT0STATUS | Is a copy of input pin WAIT0. (Reset value is WAIT0 input pin sampled at IC reset) 0x0: WAIT0 asserted (inactive state) 0x1: WAIT0 deasserted | R | 0x- |
| 7:1 | RESERVED | Write 0s for future compatibility. Reads returns 0 | RW | 0x00 |
| 0 | EMPTYWRITEBUFFERSTATUS | Stores the empty status of the write buffer 0x0: Write Buffer is not empty 0x1: Write Buffer is empty | R | 0x1 |

Table 16-292. Register Call Summary for Register GPMC_STATUS

General-Purpose Memory Controller

- [NAND Memory Device in Byte or 16-bit Word Stream Mode: \[0\]](#)
- [NAND Device-Ready Pin: \[1\] \[2\] \[3\]](#)
- [GPMC Register Summary: \[4\]](#)

Table 16-293. GPMC_CONFIG1_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0060 + (0x0000 0030 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0060 + (0x0000 0030 * i) | Instance | GPMC |
| Description | The configuration register 1 sets signal control parameters per chip-select | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------|--------------|----------|---------------|-----------|-------------------|--------------------------|--------------------|---------------------|----------|--------------------|---------------|----------|-------------|------------|------------|----------|---------------------|----------|-----------------|----|----|---|---|---|---|---|---|---|---|---|---|
| WRAPBURST | READMULTIPLE | READTYPE | WRITEMULTIPLE | WRITETYPE | CLKACTIVATIONTIME | ATTACHEDDEVICEPAGELENGTH | WAITREADMONITORING | WAITWRITEMONITORING | RESERVED | WAITMONITORINGTIME | WAITPINSELECT | RESERVED | DEVICESTYPE | DEVICETYPE | MUXADDRESS | RESERVED | TIMEPARAGRANULARITY | RESERVED | GPMCFCLKDIVIDER | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31 | WRAPBURST | Enables the wrapping burst capability. Must be set if the attached device is configured in wrapping burst 0x0: Synchronous wrapping burst not supported 0x1: Synchronous wrapping burst supported | RW | 0x0 |
| 30 | READMULTIPLE | Selects the read single or multiple access 0x0: Single access 0x1: Multiple access (burst if synchronous, page if asynchronous) | RW | 0x0 |
| 29 | READTYPE | Selects the read mode operation 0x0: Read Asynchronous 0x1: Read Synchronous | RW | 0x0 |
| 28 | WRITEMULTIPLE | Selects the write single or multiple access 0x0: Single access 0x1: Multiple access (burst if synchronous, considered as single if asynchronous) | RW | 0x0 |
| 27 | WRITETYPE | Selects the write mode operation 0x0: Write Asynchronous 0x1: Write Synchronous | RW | 0x0 |
| 26:25 | CLKACTIVATIONTIME | Output GPMC_CLK activation time 0x0: First rising edge of GPMC_CLK at start access time 0x1: First rising edge of GPMC_CLK one GPMC_FCLK cycle after start access time 0x2: First rising edge of GPMC_CLK two GPMC_FCLK cycles after start access time 0x3: Reserved | RW | 0x0 |

General-Purpose Memory Controller

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|--|------|-------|
| 24:23 | ATTACHEDDEVICEPAGE LENGTH | Specifies the attached device page (burst) length 0x0: 4 Words 0x1: 8 Words 0x2: 16 Words 0x3: Reserved (1 Word = Interface size) | RW | 0x0 |
| 22 | WAITREADMONITORING | Selects the Wait monitoring configuration for Read accesses (Reset value is <i>bootwaiten</i> input pin sampled at IC reset) 0x0: Wait pin is not monitored for read accesses 0x1: Wait pin is monitored for read accesses | RW | 0x- |
| 21 | WAITWRITEMONITORING | Selects the Wait monitoring configuration for Write accesses 0x0: Wait pin is not monitored for write accesses 0x1: Wait pin is monitored for write accesses | RW | 0x0 |
| 20 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0x0 |
| 19:18 | WAITMONITORINGTIME | Selects input pin Wait monitoring time 0x0: Wait pin is monitored with valid data 0x1: Wait pin is monitored one GPMC_CLK cycle before valid data 0x2: Wait pin is monitored two GPMC_CLK cycle before valid data 0x3: Reserved | RW | 0x0 |
| 17:16 | WAITPINSELECT | Selects the input WAIT pin for this chip-select (Reset value is <i>bootwaitselect</i> input pin sampled at IC reset for CS0 and 0 for CS1-7) 0x0: Wait input pin is WAIT0 0x1: Wait input pin is WAIT1 0x2: Wait input pin is WAIT2 0x3: Reserved | RW | 0x- |
| 15:14 | RESERVED | Write 0s for future compatibility. Reads returns 0 | RW | 0x0 |
| 13:12 | DEVICESTYPE | Selects the device size attached (Reset value is <i>bootdevicesize</i> input pin sampled at IC reset for CS0 and 0x1 for CS1 to CS7) 0x0: 8 bit 0x1: 16 bit 0x2: Reserved 0x3: Reserved | RW | 0x- |
| 11:10 | DEVICETYPE | Selects the attached device type 0x0: NOR Flash like, asynchronous and synchronous devices 0x1: Reserved 0x2: NAND Flash like devices, stream mode 0x3: Reserved | RW | 0x0 |
| 9:8 | MUXADDDATA | Enables the address and data multiplexed protocol (Reset value is <i>cs0muxdevice</i> input pin sampled at IC reset for CS0 and 0 for CS1-CS7) 0x0: Non-multiplexed attached device 0x1: AAD-mux protocol device 0x2: Address and data multiplexed attached device 0x3: Reserved | RW | 0x- |
| 7:5 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|-------|
| 4 | TIMEPARAGRANULARITY | Signals timing latencies scalar factor (RD/WRCYCLETIME, RD/WRACCESSTIME, PAGEBURSTACCESSTIME, CSONTIME, CSRD/WROFFTIME, ADVONTIME, ADVRD/WROFFTIME, OEONTIME, OEOFFTIME, WEONTIME, WEOFFTIME, CYCLE2CYCLEDELAY, BUSTURNAROUND, TIMEOUTSTARTVALUE, WRDATAONADMUXBUS) 0x0: x1 latencies 0x1: x2 latencies | RW | 0x0 |
| 3:2 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 1:0 | GPMC_FCLKDIVIDER | Divides the GPMC_FCLK clock 0x0: GPMC_CLK frequency = GPMC_FCLK frequency 0x1: GPMC_CLK frequency = GPMC_FCLK frequency / 2 0x2: GPMC_CLK frequency = GPMC_FCLK frequency / 3 0x3: GPMC_CLK frequency = GPMC_FCLK frequency / 4 | RW | 0x0 |

Table 16-294. Register Call Summary for Register GPMC_CONFIG1_i

General-Purpose Memory Controller

- [GPMC Signals: \[0\]](#)
- [GPMC Clock Configuration: \[1\] \[2\]](#)
- [L3 Interconnect Interface: \[3\] \[4\]](#)
- [GPMC I/O Configuration Setting: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [GPMC CS0 Default Configuration at IC Reset: \[13\] \[14\] \[15\] \[16\]](#)
- [Access Protocol: \[17\] \[18\] \[19\]](#)
- [External Signals: \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\]](#)
- [Read Cycle Time and Write Cycle Time \(RDCYCLETIME / WRCYCLETIME\): \[37\]](#)
- [GPMC_CLK: \[38\] \[39\]](#)
- [GPMC_CLK and Control Signals Setup and Hold: \[40\]](#)
- [Access Time \(RDACCESSTIME / WRACCESSTIME\): \[41\]](#)
- [Page Burst Access Time \(PAGEBURSTACCESSTIME\): \[42\]](#)
- [NOR Access Description: \[43\] \[44\]](#)
- [Asynchronous Access Description: \[45\] \[46\] \[47\] \[48\]](#)
- [Synchronous Access Description: \[49\] \[50\] \[51\] \[52\] \[53\]](#)
- [Page and Burst Support: \[54\] \[55\]](#)
- [System Burst Versus External Device Burst Support: \[56\] \[57\] \[58\]](#)
- [pSRAM Access Specificities: \[59\]](#)
- [NAND Memory Device in Byte or 16-bit Word Stream Mode: \[60\] \[61\] \[62\] \[63\] \[64\] \[65\] \[66\] \[67\] \[68\] \[69\] \[70\] \[71\] \[72\] \[73\] \[74\] \[75\] \[76\] \[77\]](#)
- [NAND Device-Ready Pin: \[78\] \[79\]](#)
- [GPMC Configuration in NOR Mode: \[80\] \[81\] \[82\] \[83\] \[84\] \[85\] \[86\] \[87\] \[88\] \[89\] \[90\] \[91\] \[92\] \[93\] \[94\] \[95\]](#)
- [GPMC Configuration in NAND Mode: \[96\] \[97\] \[98\] \[99\]](#)
- [Set Memory Access: \[100\] \[101\] \[102\] \[103\] \[104\]](#)
- [GPMC Timing Parameters: \[105\] \[106\] \[107\] \[108\] \[109\] \[110\] \[111\] \[112\] \[113\]](#)
- [GPMC Timing Parameters Formulas: \[114\] \[115\] \[116\] \[117\] \[118\] \[119\] \[120\] \[121\] \[122\] \[123\] \[124\] \[125\] \[126\]](#)
- [GPMC Register Summary: \[127\]](#)

Table 16-295. GPMC_CONFIG2_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0064 + (0x0000 0030 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0064 + (0x0000 0030 * i) | Instance | GPMC |
| Description | CS signal timing parameter configuration | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|-------------|----|----|----|----------|----|-------------|----|----|----|--------------|----|----------|----|----------|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | CSWROFFTIME | | | | RESERVED | | CSRDOFFTIME | | | | CSEXTRADelay | | RESERVED | | CSONTIME | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|-------|
| 31:21 | RESERVED | Write 0s for future compatibility. Reads returns 0 | RW | 0x000 |
| 20:16 | CSWROFFTIME | CS i de-assertion time from start cycle time for write accesses 0x00: 0 GPMC_FCLK cycle 0x01: 1 GPMC_FCLK cycle ... 0x1F: 31 GPMC_FCLK cycles | RW | 0x10 |
| 15:13 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 12:8 | CSRDOFFTIME | CS i de-assertion time from start cycle time for read accesses 0x00: 0 GPMC_FCLK cycle 0x01: 1 GPMC_FCLK cycle ... 0x1F: 31 GPMC_FCLK cycles | RW | 0x10 |
| 7 | CSEXTRADelay | CS i Add Extra Half GPMC_FCLK cycle 0x0: CS i Timing control signal is not delayed 0x1: CS i Timing control signal is delayed of half GPMC_FCLK clock cycle | RW | 0x0 |
| 6:4 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 3:0 | CSONTIME | CS i assertion time from start cycle time 0x0: 0 GPMC_FCLK cycle 0x1: 1 GPMC_FCLK cycle ... 0xF: 15 GPMC_FCLK cycles | RW | 0x1 |

Table 16-296. Register Call Summary for Register GPMC_CONFIG2_i

General-Purpose Memory Controller

- [nCS: Chip-Select Signal Control Assertion/Deassertion Time \(CSONTIME / CSRDOFFTIME / CSWROFFTIME / CSEXTRADelay\): \[0\] \[1\] \[2\] \[3\]](#)
- [Asynchronous Access Description: \[4\] \[5\]](#)
- [Synchronous Access Description: \[6\] \[7\] \[8\] \[9\]](#)
- [GPMC Timing Parameters: \[10\] \[11\] \[12\] \[13\]](#)
- [GPMC Register Summary: \[14\]](#)

Table 16-297. GPMC_CONFIG3_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0068 + (0x0000 0030 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0068 + (0x0000 0030 * i) | Instance | GPMC |
| Description | nADV signal timing parameter configuration | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|----------|--------------------|
| RESERVED | ADVAADMUXWROFFTIME | RESERVED | ADVAADMUXRDOFFTIME | RESERVED | ADVAADMUXWROFFTIME | RESERVED | ADVAADMUXRDOFFTIME | RESERVED | ADVAADMUXWROFFTIME | RESERVED | ADVAADMUXRDOFFTIME | RESERVED | ADVAADMUXWROFFTIME | RESERVED | ADVAADMUXRDOFFTIME | RESERVED | ADVAADMUXWROFFTIME | RESERVED | ADVAADMUXRDOFFTIME | RESERVED | ADVAADMUXWROFFTIME | RESERVED | ADVAADMUXRDOFFTIME | RESERVED | ADVAADMUXWROFFTIME | RESERVED | ADVAADMUXRDOFFTIME | RESERVED | ADVAADMUXWROFFTIME | RESERVED | ADVAADMUXRDOFFTIME |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 30:28 | ADVAADMUXWROFFTIME | nADV de-assertion for first address phase when using the AAD-mux protocol 0x0: 0 GPMC_FCLK cycle 0x1: 1 GPMC_FCLK cycle ... 0x7: 7 GPMC_FCLK cycles | RW | 0x2 |
| 27 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 26:24 | ADVAADMUXRDOFFTIME | nADV assertion for first address phase when using the AAD-mux protocol 0x0: 0 GPMC_FCLK cycle 0x1: 1 GPMC_FCLK cycle ... 0x7: 7 GPMC_FCLK cycles | RW | 0x2 |
| 23:21 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 20:16 | ADVVWROFFTIME | nADV de-assertion time from start cycle time for write accesses 0x00: 0 GPMC_FCLK cycle 0x01: 1 GPMC_FCLK cycle ... 0x1F: 31 GPMC_FCLK cycles | RW | 0x02 |
| 15:13 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 12:8 | ADVRDOFFTIME | nADV de-assertion time from start cycle time for read accesses 0x00: 0 GPMC_FCLK cycle 0x01: 1 GPMC_FCLK cycle ... 0x1F: 31 GPMC_FCLK cycles | RW | 0x02 |
| 7 | ADVEXTRADELAY | nADV Add Extra Half GPMC_FCLK cycle 0x0: nADV Timing control signal is not delayed 0x1: nADV Timing control signal is delayed of half GPMC_FCLK clock cycle | RW | 0x0 |
| 6:4 | ADVAADMUXONTIME | nADV assertion for first address phase when using the AAD-mux protocol 0x0: 0 GPMC_FCLK cycle 0x1: 1 GPMC_FCLK cycle ... 0x7: 7 GPMC_FCLK cycles | RW | 0x1 |
| 3:0 | ADVONTIME | nADV assertion time from start cycle time 0x0: 0 GPMC_FCLK cycle 0x1: 1 GPMC_FCLK cycle ... 0xF: 15 GPMC_FCLK cycles | RW | 0x1 |

Table 16-298. Register Call Summary for Register GPMC_CONFIG3_i

General-Purpose Memory Controller

- [nADV/ALE: Address Valid/Address Latch Enable Signal Control Assertion/Deassertion Time \(ADVONTIME / ADVRD OFFTIME / ADVWROFFTIME / ADVEXTRADELAY/ADVAADMUXONTIME/ADVAADMUXROFFTIME/ADVAADMUXWROFFTIME\): \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [Asynchronous Access Description: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [Synchronous Access Description: \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\]](#)
- [GPMC Timing Parameters: \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\]](#)
- [GPMC Register Summary: \[39\]](#)

Table 16-299. GPMC_CONFIG4_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 006C + (0x0000 0030 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 006C + (0x0000 0030 * i) | Instance | GPMC |
| Description | nWE and nOE signals timing parameter configuration | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|-----------|----|----|----|--------------|----------|----|----|----|----------|----|----|----|----------------|----|----|----|------------|---|---|---|--------------|---------------|---|---|---|----------|---|--|--|
| RESERVED | | | | WEOFFTIME | | | | WEEXTRADELAY | RESERVED | | | | WEONTIME | | | | OEADMUXOFFTIME | | | | OEEOFFTIME | | | | OEEXTRADELAY | OEADMUXONTIME | | | | OEONTIME | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|-------|
| 31:29 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x3 |
| 28:24 | WEOFFTIME | nWE de-assertion time from start cycle time 0x00: 0 GPMC_FCLK cycle 0x01: 1 GPMC_FCLK cycle ... 0x1F: 31 GPMC_FCLK cycles | RW | 0x10 |
| 23 | WEEXTRADELAY | nWE Add Extra Half GPMC_FCLK cycle 0x0: nWE Timing control signal is not delayed 0x1: nWE Timing control signal is delayed of half GPMC_FCLK clock cycle | RW | 0x0 |
| 22:20 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 19:16 | WEONTIME | nWE assertion time from start cycle time 0x0: 0 GPMC_FCLK cycle 0x1: 1 GPMC_FCLK cycle ... 0xF: 15 GPMC_FCLK cycles | RW | 0x5 |
| 15:13 | OEAADMUX OFFTIME | nOE de-assertion time for the first address phase in an AAD-mux access 0x0: 0 GPMC_FCLK cycle 0x1: 1 GPMC_FCLK cycle ... 0x7: 7 GPMC_FCLK cycles | RW | 0x3 |
| 12:8 | OEOFFTIME | nOE de-assertion time from start cycle time 0x00: 0 GPMC_FCLK cycle 0x01: 1 GPMC_FCLK cycle ... 0x1F: 31 GPMC_FCLK cycles | RW | 0x10 |
| 7 | OEEXTRADELAY | nOE Add Extra Half GPMC_FCLK cycle 0x0: nOE Timing control signal is not delayed 0x1: nOE Timing control signal is delayed of half GPMC_FCLK clock cycle | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------|
| 6:4 | OEAADMUXONTIME | nOE assertion time for the first address phase in an AAD-mux access 0x0: 0 GPMC_FCLK cycle 0x1: 1 GPMC_FCLK cycle ... 0x7: 7 GPMC_FCLK cycles | RW | 0x1 |
| 3:0 | OEONTIME | nOE assertion time from start cycle time 0x0: 0 GPMC_FCLK cycle 0x1: 1 GPMC_FCLK cycle ... 0xF: 15 GPMC_FCLK cycles | RW | 0x6 |

Table 16-300. Register Call Summary for Register GPMC_CONFIG4_i

General-Purpose Memory Controller

- nOE/nRE: Output Enable / Read Enable Signal Control Assertion / Deassertion Time (OEONTIME / OEOFFTIME / OEEXTRADELAY / OEAADMUXONTIME / OEAADMUXOFFTIME): [0] [1] [2]
- nWE: Write Enable Signal Control Assertion / Deassertion Time (WEONTIME / WEOFFTIME / WEEXTRADELAY): [3] [4] [5]
- Asynchronous Access Description: [6] [7] [8] [9] [10] [11] [12] [13]
- Synchronous Access Description: [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24]
- NAND Memory Device in Byte or 16-bit Word Stream Mode: [25]
- GPMC Timing Parameters: [26] [27] [28] [29] [30] [31] [32] [33]
- GPMC Register Summary: [34]

Table 16-301. GPMC_CONFIG5_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0070 + (0x0000 0030 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0070 + (0x0000 0030 * i) | Instance | GPMC |
| Description | RdAccessTime and CycleTime timing parameters configuration | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|---------------------|----|----|----|----------|----|----|----|--------------|----|----|----|----------|----|----|----|-------------|----|---|---|----------|---|---|---|-------------|---|---|---|
| RESERVED | | | | PAGEBURSTACCESSTIME | | | | RESERVED | | | | RDACCESSTIME | | | | RESERVED | | | | WRCYCLETIME | | | | RESERVED | | | | RDCYCLETIME | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 12:8 | WRCYCLETIME | Total write cycle time 0x00: 0 GPMC_FCLK cycle 0x01: 1 GPMC_FCLK cycle ... 0x1F: 31 GPMC_FCLK cycles | RW | 0x11 |
| 7:5 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 4:0 | RDCYCLETIME | Total read cycle time 0x00: 0 GPMC_FCLK cycle 0x01: 1 GPMC_FCLK cycle ... 0x1F: 31 GPMC_FCLK cycles | RW | 0x11 |

Table 16-302. Register Call Summary for Register GPMC_CONFIG5_i

General-Purpose Memory Controller

- [Read Cycle Time and Write Cycle Time \(RDCYCLETIME / WRCYCLETIME\): \[0\] \[1\]](#)
- [Access Time \(RDACCESSTIME / WRACCESSTIME\): \[2\] \[3\] \[4\]](#)
- [Page Burst Access Time \(PAGEBURSTACCESSTIME\): \[5\]](#)
- [Asynchronous Access Description: \[6\] \[7\] \[8\]](#)
- [Synchronous Access Description: \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\]](#)
- [Asynchronous and Synchronous Accesses in Nonmultiplexed Mode: \[18\] \[19\] \[20\] \[21\]](#)
- [GPMC Timing Parameters: \[22\] \[23\] \[24\] \[25\]](#)
- [GPMC Register Summary: \[26\]](#)

Table 16-303. GPMC_CONFIG6_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0074 + (0x0000 0030 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0074 + (0x0000 0030 * i) | Instance | GPMC |
| Description | WrAccessTime, WrDataOnADmuxBus, Cycle2Cycle and BusTurnAround parameters configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----------|----|--------------|----|----|----|----------|----|----|----|------------------|----|----|----|----------|----|----|----|------------------|----|---|---|---------------------|---------------------|----------|---|---------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | RESERVED | | WRACCESSTIME | | | | RESERVED | | | | WRDATAONADMUXBUS | | | | RESERVED | | | | CYCLE2CYCLEDELAY | | | | CYCLE2CYCLESAMECSEN | CYCLE2CYCLEDIFFCSEN | RESERVED | | BUSTURNAROUND | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 31 | RESERVED | TI Internal use - Do not modify. | RW | 0x1 |
| 30:29 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 28:24 | WRACCESSTIME | Delay from start access time to the GPMC_FCLK rising edge corresponding the the GPMC_CLK rising edge used by the attached memory for the first data capture 0x00: 0 GPMC_FCLK cycle 0x01: 1 GPMC_FCLK cycle ... 0x1F: 31 GPMC_FCLK cycles | RW | 0x0F |
| 23:20 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 19:16 | WRDATAONADMUXBUS | Specifies on which GPMC_FCLK rising edge the first data of the synchronous burst write is driven in the add/data mux bus | RW | 0x7 |
| 15:12 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|-------|
| 11:8 | CYCLE2CYCLEDELAY | Chip-select high pulse delay between successive accesses 0x0: 0 GPMC_FCLK cycle 0x1: 1 GPMC_FCLK cycle ... 0xF: 15 GPMC_FCLK cycles | RW | 0x0 |
| 7 | CYCLE2CYCLESAMECSSEN | Add CYCLE2CYCLEDELAY between successive accesses to the same CS (any access type) 0x0: No delay between the two accesses 0x1: Add CYCLE2CYCLEDELAY | RW | 0x0 |
| 6 | CYCLE2CYCLEDIFFCSSEN | Add CYCLE2CYCLEDELAY between successive accesses to a different CS (any access type) 0x0: No delay between the two accesses 0x1: Add CYCLE2CYCLEDELAY | RW | 0x0 |
| 5:4 | RESERVED | Write 0s for future compatibility. Reads returns 0 | RW | 0x0 |
| 3:0 | BUSTURNAROUND | Bus turn around latency between successive accesses to the same CS (read to write) or to a different CS (read to read and read to write) 0x0: 0 GPMC_FCLK cycle 0x1: 1 GPMC_FCLK cycle ... 0xF: 15 GPMC_FCLK cycles | RW | 0x0 |

Table 16-304. Register Call Summary for Register GPMC_CONFIG6_i

General-Purpose Memory Controller

- [External Signals: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Read Cycle Time and Write Cycle Time \(RDCYCLETIME / WRCYCLETIME\): \[6\] \[7\]](#)
- [Access Time \(RDACCESSTIME / WRACCESSTIME\): \[8\] \[9\]](#)
- [Asynchronous Access Description: \[10\] \[11\] \[12\] \[13\]](#)
- [Synchronous Access Description: \[14\] \[15\] \[16\] \[17\]](#)
- [GPMC Timing Parameters: \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [GPMC Register Summary: \[24\]](#)

Table 16-305. GPMC_CONFIG7_i

| | | | |
|------------------|----------------------------------|----------|------------|
| Address Offset | 0x0000 0078 + (0x0000 0030 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0078 + (0x0000 0030 * i) | Instance | GPMC |
| Description | CS address mapping configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----------|---------|-------------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MASKADDRESS | | | | RESERVED | CSVALID | BASEADDRESS | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|---------|
| 31:12 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x00000 |
| 11:8 | MASKADDRESS | CS mask address. 0x1000: Chip-select size of 128 Mbytes 0x1100: Chip-select size of 64 Mbytes 0x1110: Chip-select size of 32 Mbytes 0x1111: Chip-select size of 16 Mbytes Other values must be avoided as they create holes in the chip-select address space. | RW | 0xF |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|--------------------|
| 7 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0x0 |
| 6 | CSVALID | CS enable 0x0: CS disabled 0x1: CS enabled | RW | See ⁽¹⁾ |
| 5:0 | BASEADDRESS | CSi base address where i = 0 to 7 (16M bytes minimum granularity) bits [5:0] corresponds to A29, A28, A27, A26, A25, and A24. See Figure 16-55 | RW | 0x00 |

⁽¹⁾ Reset value is 0x1 for CS0 and 0x0 for CS1 to CS7

Table 16-306. Register Call Summary for Register GPMC_CONFIG7_i

General-Purpose Memory Controller

- [Chip-Select Base Address and Region Size: \[0\] \[1\] \[2\]](#)
- [NAND Memory Device in Byte or 16-bit Word Stream Mode: \[3\]](#)
- [GPMC Configuration in NOR Mode: \[4\] \[5\] \[6\]](#)
- [GPMC Configuration in NAND Mode: \[7\] \[8\] \[9\]](#)
- [GPMC Timing Parameters: \[10\]](#)
- [GPMC Register Summary: \[11\]](#)

Table 16-307. GPMC_NAND_COMMAND_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 007C + (0x0000 0030 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 007C + (0x0000 0030 * i) | Instance | GPMC |
| Description | This register is not a true register, just an address location. | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GPMC_NAND_COMMAND | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|-------|
| 31:0 | GPMC_NAND_COMMAND | This register is not a true register, just an address location. Writing data at the GPMC_NAND_COMMAND_i location places the data as the NAND command value on the bus, using a regular asynchronous write access. | W | n/a |

Table 16-308. Register Call Summary for Register GPMC_NAND_COMMAND_i

General-Purpose Memory Controller

- [NAND Memory Device in Byte or 16-bit Word Stream Mode: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Prefetch and Write-Posting Engine: \[6\]](#)
- [GPMC Register Summary: \[7\]](#)
- [GPMC Register Descriptions: \[8\]](#)

Table 16-309. GPMC_NAND_ADDRESS_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0080 + (0x0000 0030 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0080 + (0x0000 0030 * i) | Instance | GPMC |
| Description | This register is not a true register, just an address location. | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GPMC_NAND_ADDRESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|-------|
| 31:0 | GPMC_NAND_ADDRESS | This register is not a true register, just an address location. Writing data at the GPMC_NAND_ADDRESS_i location places the data as the NAND partial address value on the bus, using a regular asynchronous write access. | W | n/a |

Table 16-310. Register Call Summary for Register GPMC_NAND_ADDRESS_i

General-Purpose Memory Controller

- [NAND Memory Device in Byte or 16-bit Word Stream Mode: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Prefetch and Write-Posting Engine: \[6\]](#)
- [GPMC Register Summary: \[7\]](#)
- [GPMC Register Descriptions: \[8\]](#)

Table 16-311. GPMC_NAND_DATA_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0084 + (0x0000 0030 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0084 + (0x0000 0030 * i) | Instance | GPMC |
| Description | This register is not a true register, just an address location. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GPMC_NAND_DATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------|
| 31:0 | GPMC_NAND_DATA | This register is not a true register, just an address location. Reading data from the GPMC_NAND_DATA_i location or from any location in the associated chip-select memory region activates an asynchronous read access. | W | n/a |

Table 16-312. Register Call Summary for Register GPMC_NAND_DATA_i

General-Purpose Memory Controller

- [NAND Memory Device in Byte or 16-bit Word Stream Mode: \[0\] \[1\] \[2\] \[3\]](#)
- [Prefetch and Write-Posting Engine: \[4\] \[5\]](#)
- [GPMC Register Summary: \[6\]](#)
- [GPMC Register Descriptions: \[7\] \[8\] \[9\]](#)

Table 16-313. GPMC_PREFETCH_CONFIG1

| | | | |
|-------------------------|---------------------------------|-----------------|------|
| Address Offset | 0x0000 01E0 | Instance | GPMC |
| Physical Address | 0x5000 01E0 | | |
| Description | Prefetch engine configuration 1 | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|----------|----|------------------|----|----|----|-----------------------|----|------------------|----------|----|----|----|------------------|----|----|----|----------|---------------|----|----|----|---|---|---|---|--------------|----------|-----------------|---|---|---|-------------|---------|----------|------------|
| RESERVED | | CYCLOPTIMIZATION | | | | ENABLEOPTIMIZEDACCESS | | PPFWENROUNDROBIN | RESERVED | | | | PPFWWEIGHTEDPRIO | | | | RESERVED | FIFOTHRESHOLD | | | | | | | | ENABLEENGINE | RESERVED | WAITPINSELECTOR | | | | SYNCHROMODE | DMAMODE | RESERVED | ACCESSMODE |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

General-Purpose Memory Controller

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|------|-------|
| 31 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0x0 |
| 30:28 | CYCLEOPTIMIZATION | Define the number of GPMC_FCLK cycles to be subtracted from RDCYCLETIME, WRCYCLETIME, ACCESTIME, CSRDOFFTIME, CSWROFFTIME, ADVRDOFFTIME, ADVWROFFTIME, OEOFFTIME, WEOFFTIME 0x0: 0 GPMC_FCLK cycle 0x1: 1 GPMC_FCLK cycle ... 0x7: 7 GPMC_FCLK cycles | RW | 0x0 |
| 27 | ENABLEOPTIMIZEDACCESS | Enables access cycle optimization 0x0: Access cycle optimization is disabled 0x1: Access cycle optimization is enabled | RW | 0x0 |
| 26:24 | ENGINECSSELECTOR | Selects the CS where Prefetch Postwrite engine is active 0x0: CS0 0x1: CS1 0x2: CS2 0x3: CS3 0x4: CS4 0x5: CS5 0x6: CS6 0x7: CS7 | RW | 0x0 |
| 23 | PFPWENROUNDROBIN | Enables the PFPW RoundRobin arbitration 0x0: Prefetch Postwrite engine round robin arbitration is disabled 0x1: Prefetch Postwrite engine round robin arbitration is enabled | RW | 0x0 |
| 22:20 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 19:16 | PFPWWEIGHTEDPRIO | When an arbitration occurs between a DMA and a PFPW engine access, the DMA is always serviced. If the PFPWEnRoundRobin is enabled, 0x0: the next access is granted to the PFPW engine, 0x1: the two next accesses are granted to the PFPW engine, ..., 0xF: the 16 next accesses are granted to the PFPW engine. | RW | 0x0 |
| 15 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0x0 |
| 14:8 | FIFOTHRESHOLD | Selects the maximum number of bytes read from the FIFO or written to the FIFO by the host on a DMA or interrupt request 0x00: 0 byte 0x01: 1 byte ... 0x40: 64 bytes | RW | 0x40 |
| 7 | ENABLEENGINE | Enables the Prefetch Postwrite engine 0x0: Prefetch Postwrite engine is disabled 0x1: Prefetch Postwrite engine is enabled | RW | 0x0 |
| 6 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0x0 |
| 5:4 | WAITPINSELECTOR | Select which wait pin edge detector should start the engine in synchronized mode 0x0: Selects Wait0 EdgeDetection 0x1: Selects Wait1 EdgeDetection 0x2: Selects Wait2 EdgeDetection 0x3: Reserved | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 3 | SYNCHROMODE | Selects when the engine starts the access to CS 0x0: Engine starts the access to CS as soon as STARTENGINE is set 0x1: Engine starts the access to CS as soon as STARTENGINE is set AND wait to non wait edge detection on the selected wait pin | RW | 0x0 |
| 2 | DMAMODE | Selects interrupt synchronization or DMA request synchronization 0x0: Interrupt synchronization is enabled. Only interrupt line will be activated on FIFO threshold crossing. 0x1: DMA request synchronization is enabled. A DMA request protocol is used. | RW | 0x0 |
| 1 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0x0 |
| 0 | ACCESSMODE | Selects prefetch read or write-posting accesses 0x0: Prefetch read mode 0x1: Write-posting mode | RW | 0x0 |

Table 16-314. Register Call Summary for Register GPMC_PREFETCH_CONFIG1

General-Purpose Memory Controller

- [GPMC Interrupt Requests: \[0\]](#)
- [Prefetch and Write-Posting Engine: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\]](#)
- [GPMC Configuration in NAND Mode: \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\]](#)
- [GPMC Register Summary: \[43\]](#)

Table 16-315. GPMC_PREFETCH_CONFIG2

| | | | |
|------------------|---------------------------------|----------|------|
| Address Offset | 0x0000 01E4 | Instance | GPMC |
| Physical Address | 0x5000 01E4 | | |
| Description | Prefetch engine configuration 2 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TRANSFERCOUNT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|---------|
| 31:14 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x00000 |
| 13:0 | TRANSFERCOUNT | Selects the number of bytes to be read or written by the engine to the selected CS 0x0000: 0 byte 0x0001: 1 byte ... 0x2000: 8 Kbytes | RW | 0x0000 |

Table 16-316. Register Call Summary for Register GPMC_PREFETCH_CONFIG2

General-Purpose Memory Controller

- [Prefetch and Write-Posting Engine: \[0\] \[1\] \[2\] \[3\]](#)
- [GPMC Configuration in NAND Mode: \[4\]](#)
- [GPMC Register Summary: \[5\]](#)

Table 16-317. GPMC_PREFETCH_CONTROL

| | | | |
|-------------------------|-------------------------|-----------------|------|
| Address Offset | 0x0000 01EC | Instance | GPMC |
| Physical Address | 0x5000 01EC | | |
| Description | Prefetch engine control | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STARTENGINE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|------------|
| 31:1 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x00000000 |
| 0 | STARTENGINE | Resets the FIFO pointer and starts the engine Read 0x0: Engine is stopped Write 0x0 stops the engine Read 0x1: Engine is running Write 0x1 resets the FIFO pointer to 0x0 in prefetch mode and 0x40 in postwrite mode and starts the engine | RW | 0x0 |

Table 16-318. Register Call Summary for Register GPMC_PREFETCH_CONTROL

General-Purpose Memory Controller

- [Prefetch and Write-Posting Engine: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [GPMC Configuration in NAND Mode: \[7\] \[8\]](#)
- [GPMC Register Summary: \[9\]](#)

Table 16-319. GPMC_PREFETCH_STATUS

| | | | |
|-------------------------|------------------------|-----------------|------|
| Address Offset | 0x0000 01F0 | Instance | GPMC |
| Physical Address | 0x5000 01F0 | | |
| Description | Prefetch engine status | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|--------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------------------|----------|----|-------------|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
| RESERVED | | FIFO POINTER | | | | | | | | RESERVED | | | | | | | | FIFOTHRESHOLD STATUS | RESERVED | | COUNT VALUE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|--------|
| 31 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0x0 |
| 30:24 | FIFOPOINTER | Number of available bytes to be read or number of free empty byte places to be written 0x00: 0 byte available to be read or 0 free empty place to be written ... 0x40: 64 bytes available to be read or 64 empty places to be written | R | 0x00 |
| 23:17 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x00 |
| 16 | FIFOTHRESHOLDSTATUS | Set when FIFOPointer exceeds FIFOThreshold value 0x0: FIFOPointer smaller or equal to FIFOThreshold. Writing to this bit has no effect 0x1: FIFOPointer greater than FIFOThreshold. Writing to this bit has no effect | R | 0x0 |
| 15:14 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 13:0 | COUNTVALUE | Number of remaining bytes to be read or to be written by the engine according to the TransferCount value 0x0000: 0 byte remaining to be read or to be written 0x0001: 1 byte remaining to be read or to be written ... 0x2000: 8 Kbytes remaining to be read or to be written | R | 0x0000 |

Table 16-320. Register Call Summary for Register GPMC_PREFETCH_STATUS

General-Purpose Memory Controller

- [Prefetch and Write-Posting Engine: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [GPMC Register Summary: \[7\]](#)
- [GPMC Register Descriptions: \[8\] \[9\]](#)

Table 16-321. GPMC_ECC_CONFIG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 01F4 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | GPMC | | | | | | | | | | | | | | | |
| Physical Address | | 0x5000 01F4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | ECC configuration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----------|------------|-------------|--------|--------------|-------|---|---|-----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECCALGORITHM | RESERVED | ECCBCHTSEL | ECCWRAPMODE | ECC16B | ECCTOPSECTOR | ECCCS | | | ECCENABLE | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|--------|
| 31:17 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0000 |
| 16 | ECCALGORITHM | ECC algorithm used 0x0: Hamming code 0x1: BCH code | RW | 0x0 |
| 15:14 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 13:12 | ECCBCHTSEL | Error correction capability used for BCH 0x0: Up to 4 bits error correction (t = 4) 0x1: Up to 8 bits error correction (t = 8) 0x2: Up to 16 bits error correction (t = 16) 0x3: Reserved | RW | 0x1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------|
| 11:8 | ECCWRAPMODE | Spare area organization definition for the BCH algorithm. See the BCH syndrome/parity calculator module functional specification for more details | RW | 0x0 |
| 7 | ECC16B | Selects an ECC calculated on 16 columns 0x0: ECC calculated on 8 columns 0x1: ECC calculated on 16 columns | RW | 0x0 |
| 6:4 | ECCTOPSECTOR | Number of sectors to process with the BCH algorithm 0x0: 1 sector (512kB page) 0x1: 2 sectors ... 0x3: 4 sectors (2kB page) ... 0x7: 8 sectors (4kB page) | RW | 0x3 |
| 3:1 | ECCCS | Selects the CS where ECC is computed 0x0: Chip-select 0 0x1: Chip-select 1 0x2: Chip-select 2 0x3: Chip-select 3 Other: Reserved | RW | 0x0 |
| 0 | ECCENABLE | Enables the ECC feature 0x0: ECC disabled 0x1: ECC enabled | RW | 0x0 |

Table 16-322. Register Call Summary for Register GPMC_ECC_CONFIG

General-Purpose Memory Controller

- [ECC Calculator: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [GPMC Configuration in NAND Mode: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [GPMC Register Summary: \[14\]](#)
- [GPMC Register Descriptions: \[15\] \[16\] \[17\]](#)

Table 16-323. GPMC_ECC_CONTROL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|---|---|----------|----------|------|---|---|------------|---|---|--|--|
| Address Offset | | 0x0000 01F8 | | | | | | | | | | | | | | | | Instance | | | | | | | | GPMC | | | | | | | |
| Physical Address | | 0x5000 01F8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | ECC control | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | ECCCLEAR | RESERVED | | | | ECCPOINTER | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:9 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x000000 |
| 8 | ECCCLEAR | Clear all ECC result registers Reads returns 0 Write 0x1 to this field clear all ECC result registers Write 0x0 is ignored | RW | 0x0 |
| 7:4 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 3:0 | ECCPOINTER | <p>Selects ECC result register (Reads to this field give the dynamic position of the ECC pointer - Writes to this field select the ECC result register where the first ECC computation will be stored); Other enums: writing other values disables the ECC engine (ECCENABLE bit of GPMC_ECC_CONFIG set to 0)</p> <p>0x0: Writing 0x0 disables the ECC engine (ECCENABLE bit of GPMC_ECC_CONFIG set to 0)</p> <p>0x1: ECC result register 1 selected</p> <p>0x2: ECC result register 2 selected</p> <p>0x3: ECC result register 3 selected</p> <p>0x4: ECC result register 4 selected</p> <p>0x5: ECC result register 5 selected</p> <p>0x6: ECC result register 6 selected</p> <p>0x7: ECC result register 7 selected</p> <p>0x8: ECC result register 8 selected</p> <p>0x9: ECC result register 9 selected</p> | RW | 0x0 |

Table 16-324. Register Call Summary for Register GPMC_ECC_CONTROL

General-Purpose Memory Controller

- [ECC Calculator: \[0\] \[1\] \[2\] \[3\]](#)
- [GPMC Configuration in NAND Mode: \[4\] \[5\]](#)
- [GPMC Register Summary: \[6\]](#)

Table 16-325. GPMC_ECC_SIZE_CONFIG

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 01FC | Instance | GPMC |
| Physical Address | 0x5000 01FC | | |
| Description | ECC size | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----------|----|----|----|----|----|----------|----|----|----|----|----------|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | ECCSIZE1 | | RESERVED | | | | | | ECCSIZE0 | | | | | RESERVED | | ECC9RESULTS | ECC8RESULTS | ECC7RESULTS | ECC6RESULTS | ECC5RESULTS | ECC4RESULTS | ECC3RESULTS | ECC2RESULTS | ECC1RESULTS |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:30 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 29:22 | ECCSIZE1 | <p>Defines Hamming code ECC size 1 in bytes</p> <p>0x00: 2 Bytes</p> <p>0x01: 4 Bytes</p> <p>0x02: 6 Bytes</p> <p>0x03: 8 Bytes</p> <p>...</p> <p>0xFF: 512 Bytes</p> <p>For BCH code ECC, the size 1 is programmed directly with the number of nibbles (see Section 16.4.4.13.3.2.2.3, Wrapping Modes).</p> | RW | 0xFF |
| 21:20 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|-------|
| 19:12 | ECCSIZE0 | Defines Hamming code ECC size 0 in bytes 0x00: 2 Bytes 0x01: 4 Bytes 0x02: 6 Bytes 0x03: 8 Bytes ... 0xFF: 512 Bytes For BCH code ECC, the size 0 is programmed directly with the number of nibbles (see Section 16.4.4.13.3.2.2.3, Wrapping Modes). | RW | 0xFF |
| 11:9 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 8 | ECC9RESULTSIZ | Selects ECC size for ECC 9 result register 0x0: ECCSIZE0 selected 0x1: ECCSIZE1 selected | RW | 0x0 |
| 7 | ECC8RESULTSIZ | Selects ECC size for ECC 8 result register 0x0: ECCSIZE0 selected 0x1: ECCSIZE1 selected | RW | 0x0 |
| 6 | ECC7RESULTSIZ | Selects ECC size for ECC 7 result register 0x0: ECCSIZE0 selected 0x1: ECCSIZE1 selected | RW | 0x0 |
| 5 | ECC6RESULTSIZ | Selects ECC size for ECC 6 result register 0x0: ECCSIZE0 selected 0x1: ECCSIZE1 selected | RW | 0x0 |
| 4 | ECC5RESULTSIZ | Selects ECC size for ECC 5 result register 0x0: ECCSIZE0 selected 0x1: ECCSIZE1 selected | RW | 0x0 |
| 3 | ECC4RESULTSIZ | Selects ECC size for ECC 4 result register 0x0: ECCSIZE0 selected 0x1: ECCSIZE1 selected | RW | 0x0 |
| 2 | ECC3RESULTSIZ | Selects ECC size for ECC 3 result register 0x0: ECCSIZE0 selected 0x1: ECCSIZE1 selected | RW | 0x0 |
| 1 | ECC2RESULTSIZ | Selects ECC size for ECC 2 result register 0x0: ECCSIZE0 selected 0x1: ECCSIZE1 selected | RW | 0x0 |
| 0 | ECC1RESULTSIZ | Selects ECC size for ECC 1 result register 0x0: ECCSIZE0 selected 0x1: ECCSIZE1 selected | RW | 0x0 |

Table 16-326. Register Call Summary for Register GPMC_ECC_SIZE_CONFIG

General-Purpose Memory Controller

- [ECC Calculator: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [GPMC Configuration in NAND Mode: \[7\] \[8\]](#)
- [GPMC Register Summary: \[9\]](#)

Table 16-327. GPMC_ECCj_RESULT

| | | | |
|-------------------------|---------------------------------------|-----------------|------------|
| Address Offset | 0x0000 0200 + (0x0000 0004 * (j - 1)) | Index | j = 1 to 9 |
| Physical Address | 0x5000 0200 + (0x0000 0004 * j) | Instance | GPMC |
| Description | ECC result register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|--------|--------|-------|-------|-------|------|------|------|-----|-----|-----|-----|----------|----|----|----|--------|--------|-------|-------|-------|------|------|------|-----|-----|-----|-----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | P2048o | P1024o | P512o | P256o | P128o | P64o | P32o | P16o | P8o | P4o | P2o | P1o | RESERVED | | | | P2048e | P1024e | P512e | P256e | P128e | P64e | P32e | P16e | P8e | P4e | P2e | P1e |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:28 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 27 | P2048o | Odd row parity bit 2048, only used for ECC computed on 512 Bytes | R | 0x0 |
| 26 | P1024o | Odd row parity bit 1024 | R | 0x0 |
| 25 | P512o | Odd row parity bit 512 | R | 0x0 |
| 24 | P256o | Odd row parity bit 256 | R | 0x0 |
| 23 | P128o | Odd row parity bit 128 | R | 0x0 |
| 22 | P64o | Odd row parity bit 64 | R | 0x0 |
| 21 | P32o | Odd row parity bit 32 | R | 0x0 |
| 20 | P16o | Odd row parity bit 16 | R | 0x0 |
| 19 | P8o | Odd row parity bit 8 | R | 0x0 |
| 18 | P4o | Odd Column Parity bit 4 | R | 0x0 |
| 17 | P2o | Odd Column Parity bit 2 | R | 0x0 |
| 16 | P1o | Odd Column Parity bit 1 | R | 0x0 |
| 15:12 | RESERVED | Write 0s for future compatibility. Read returns 0s. | RW | 0x0 |
| 11 | P2048e | Even row parity bit 2048, only used for ECC computed on 512 Bytes | R | 0x0 |
| 10 | P1024e | Even row parity bit 1024 | R | 0x0 |
| 9 | P512e | Even row parity bit 512 | R | 0x0 |
| 8 | P256e | Even row parity bit 256 | R | 0x0 |
| 7 | P128e | Even row parity bit 128 | R | 0x0 |
| 6 | P64e | Even row parity bit 64 | R | 0x0 |
| 5 | P32e | Even row parity bit 32 | R | 0x0 |
| 4 | P16e | Even row parity bit 16 | R | 0x0 |
| 3 | P8e | Even row parity bit 8 | R | 0x0 |
| 2 | P4e | Even column parity bit 4 | R | 0x0 |
| 1 | P2e | Even column parity bit 2 | R | 0x0 |
| 0 | P1e | Even column parity bit 1 | R | 0x0 |

Table 16-328. Register Call Summary for Register GPMC_ECCj_RESULT

General-Purpose Memory Controller

- [ECC Calculator: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [GPMC Register Summary: \[8\]](#)

Table 16-329. GPMC_BCH_RESULT0_i

| | | | |
|-------------------------|---------------------------------|-----------------|------------|
| Address Offset | 0x0000 0240 + (0x0000 0010 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0240 + (0x0000 0010 * i) | Instance | GPMC |
| Description | BCH ECC result (bits 0 to 31) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BCH_RESULT_0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|-------------------------------|------|------------|
| 31:0 | BCH_RESULT_0 | BCH ECC result (bits 0 to 31) | RW | 0x00000000 |

Table 16-330. Register Call Summary for Register GPMC_BCH_RESULT0_i

General-Purpose Memory Controller

- [ECC Calculator: \[0\]](#)
- [GPMC Register Summary: \[1\]](#)

Table 16-331. GPMC_BCH_RESULT1_i

| | | | |
|-------------------------|---------------------------------|-----------------|------------|
| Address Offset | 0x0000 0244 + (0x0000 0010 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0244 + (0x0000 0010 * i) | Instance | GPMC |
| Description | BCH ECC result (bits 32 to 63) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BCH_RESULT_1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--------------------------------|------|------------|
| 31:0 | BCH_RESULT_1 | BCH ECC result (bits 32 to 63) | RW | 0x00000000 |

Table 16-332. Register Call Summary for Register GPMC_BCH_RESULT1_i

General-Purpose Memory Controller

- [ECC Calculator: \[0\]](#)
- [GPMC Register Summary: \[1\]](#)

Table 16-333. GPMC_BCH_RESULT2_i

| | | | |
|-------------------------|---------------------------------|-----------------|------------|
| Address Offset | 0x0000 0248 + (0x0000 0010 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0248 + (0x0000 0010 * i) | Instance | GPMC |
| Description | BCH ECC result (bits 64 to 95) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BCH_RESULT_2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--------------------------------|------|------------|
| 31:0 | BCH_RESULT_2 | BCH ECC result (bits 64 to 95) | RW | 0x00000000 |

Table 16-334. Register Call Summary for Register GPMC_BCH_RESULT2_i

General-Purpose Memory Controller

- [ECC Calculator: \[0\]](#)
- [GPMC Register Summary: \[1\]](#)

Table 16-335. GPMC_BCH_RESULT3_i

| | | | |
|-------------------------|---------------------------------|-----------------|------------|
| Address Offset | 0x0000 024C + (0x0000 0010 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 024C + (0x0000 0010 * i) | Instance | GPMC |
| Description | BCH ECC result (bits 96 to 127) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BCH_RESULT_3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---------------------------------|------|------------|
| 31:0 | BCH_RESULT_3 | BCH ECC result (bits 96 to 127) | RW | 0x00000000 |

Table 16-336. Register Call Summary for Register GPMC_BCH_RESULT3_i

General-Purpose Memory Controller

- [ECC Calculator: \[0\]](#)
- [GPMC Register Summary: \[1\]](#)

Table 16-337. GPMC_BCH_RESULT4_i

| | | | |
|-------------------------|----------------------------------|-----------------|------------|
| Address Offset | 0x0000 0300 + (0x0000 0010 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0300 + (0x0000 0010 * i) | Instance | GPMC |
| Description | BCH ECC result (bits 128 to 159) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BCH_RESULT_4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|----------------------------------|------|------------|
| 31:0 | BCH_RESULT_4 | BCH ECC result (bits 128 to 159) | RW | 0x00000000 |

Table 16-338. Register Call Summary for Register GPMC_BCH_RESULT4_i

General-Purpose Memory Controller

- [GPMC Register Summary: \[0\]](#)

Table 16-339. GPMC_BCH_RESULT5_i

| | | | |
|-------------------------|----------------------------------|-----------------|------------|
| Address Offset | 0x0000 0304 + (0x0000 0010 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0304 + (0x0000 0010 * i) | Instance | GPMC |
| Description | BCH ECC result (bits 160 to 191) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BCH_RESULT_5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|----------------------------------|------|------------|
| 31:0 | BCH_RESULT_5 | BCH ECC result (bits 160 to 191) | RW | 0x00000000 |

Table 16-340. Register Call Summary for Register GPMC_BCH_RESULT5_i

General-Purpose Memory Controller

- [GPMC Register Summary: \[0\]](#)

Table 16-341. GPMC_BCH_RESULT6_i

| | | | |
|-------------------------|----------------------------------|-----------------|------------|
| Address Offset | 0x0000 0308 + (0x0000 0010 * i) | Index | i = 0 to 7 |
| Physical Address | 0x5000 0308 + (0x0000 0010 * i) | Instance | GPMC |
| Description | BCH ECC result (bits 192 to 207) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BCH_RESULT_6 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Read returns 0s. | R | 0x0000 |
| 15:0 | BCH_RESULT_6 | BCH ECC result (bits 192 to 207) | RW | 0x0000 |

Table 16-342. Register Call Summary for Register GPMC_BCH_RESULT6_i

General-Purpose Memory Controller

- [GPMC Register Summary: \[0\]](#)

Table 16-343. GPMC_BCH_SWDATA

Address Offset

0x0000 02D0

Physical Address

0x5000 02D0

Description

This register is used to directly pass data to the BCH ECC calculator without accessing the actual NAND flash interface.

Type

RW

31

30

29

28

27

26

25

24

23

22

21

20

19

18

17

16

15

14

13

12

11

10

9

8

7

6

5

4

3

2

1

0

RESERVED

BCH_DATA

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Write 0s for future compatibility. Read returns 0s. | R | 0x0000 |
| 15:0 | BCH_DATA | Data to be included in the BCH calculation. Only bits 0 to 7 are taken into account if the calculator is configured to use 8 bits data (GPMC ECC_CONFIG[7] ECC16B = 0) | RW | 0x0000 |

Table 16-344. Register Call Summary for Register GPMC_BCH_SWDATA

General-Purpose Memory Controller

- [GPMC Register Summary: \[0\]](#)

16.5 Error Location Module

16.5.1 Error Location Module Overview

Non-managed NAND flash memories can be dense and nonvolatile in their own nature, but error-prone. When reading from NAND flash memories, some level of error-correction is required. In the case of NAND modules with no internal correction capability, sometimes referred to as *bare NANDs*, the correction process is delegated to the memory controller.

The general-purpose memory controller (GPMC) probes data read from an external NAND flash and uses this to compute checksum-like information, called syndrome polynomials, on a per-block basis. Each syndrome polynomial gives a status of the read operations for a full block, including 512 bytes of data, parity bits, and an optional spare-area data field, with a maximum block size of 1023 bytes. Computation is based on a Bose-Chaudhuri-Hocquenghem (BCH) algorithm. The error-location module (ELM) extracts error addresses from these syndrome polynomials.

Based on the syndrome polynomial value, the ELM can detect errors, compute the number of errors, and give the location of each error bit. The actual data is not required to complete the error-correction algorithm. Errors can be reported anywhere in the NAND flash block, including in the parity bits.

The maximum acceptable number of errors that can be corrected depends on a programmable configuration parameter. 4-, 8-, and 16-bit error-correction levels are supported. The ELM relies on a static and fixed definition of the generator polynomial for each error-correction level that corresponds to the generator polynomials defined in the GPMC (there are three fixed polynomial for the three correction error levels). A larger number of errors than the programmed error-correction level may be detected, but the ELM cannot correct them all. The offending block is then tagged as *uncorrectable* in the associated computation exit status register. If the computation is successful, that is, if the number of errors detected does not exceed the maximum value authorized for the chosen correction capability, the exit status register contains the information on the number of detected errors.

When the error-location process completes, an interrupt is triggered to inform the central processing unit (CPU) that its status can be checked. The number of detected errors and their locations in the NAND block can be retrieved from the module through register accesses.

16.5.1.1 ELM Features

The ELM has the following features:

- 4, 8, and 16 bits per 512-byte block error-location based on BCH algorithms
- Eight simultaneous processing contexts
- Page-based and continuous modes
- Interrupt generation on error-location process completion:
 - When the full page has been processed in page mode
 - For each syndrome polynomial in continuous mode

16.5.2 ELM Integration

The ELM extracts error addresses from generated syndrome polynomials.

The ELM is used with the GPMC. Syndrome polynomials generated on-the-fly when reading a NAND flash page and stored in GPMC registers are passed to the ELM. The microprocessor unit (MPU) can then correct the data block by flipping the bits to which the ELM error-location outputs point.

Figure 16-100 shows the integration of the ELM subsystem in the device.

Figure 16-100. ELM Integration

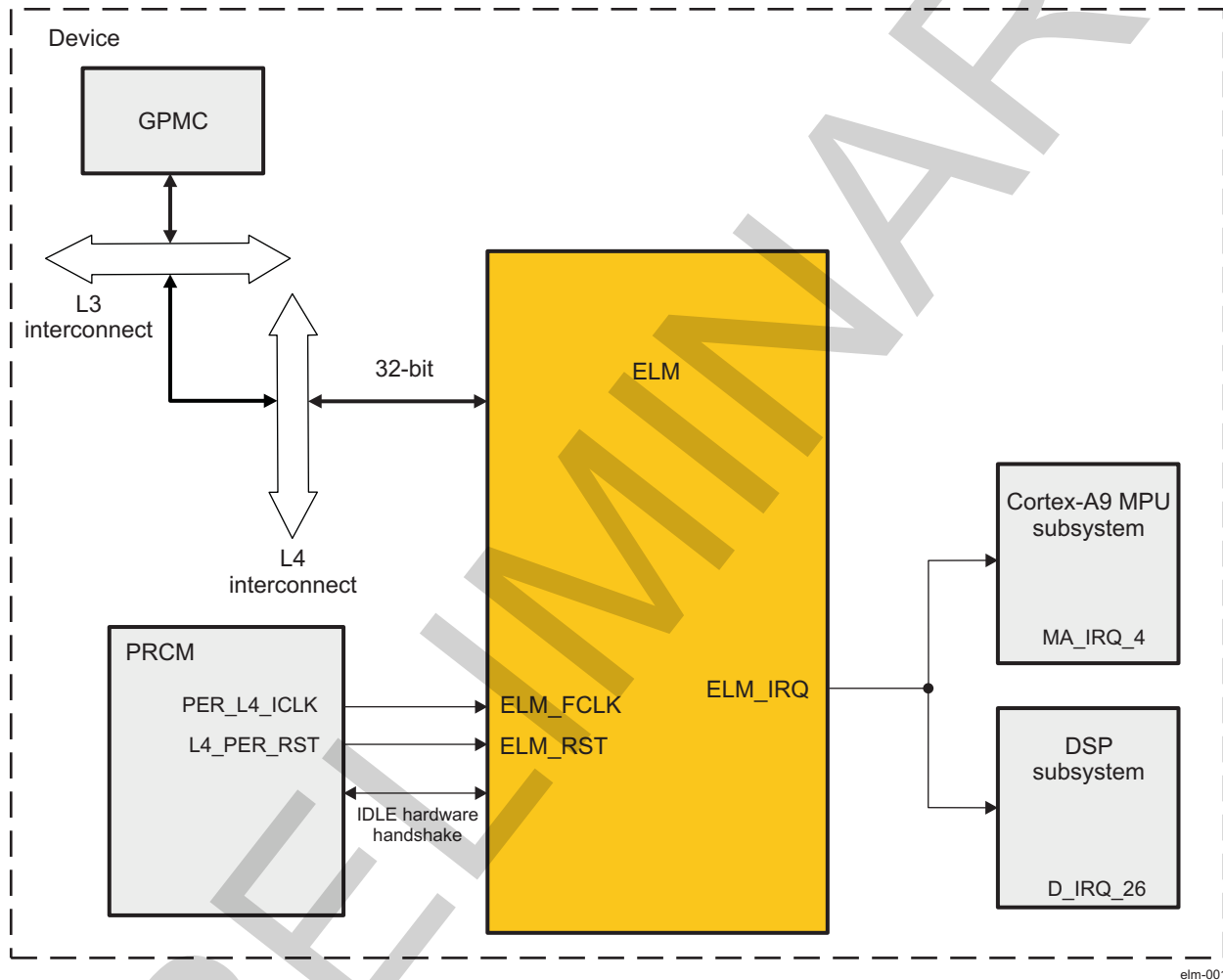


Table 16-345. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| ELM | PD_L4_PER | No | NA |

Table 16-346. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|---|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| ELM | ELM_FCLK | PER_L4_ICLK | PRCM | Functional clock For information about PRCM clock gating and management, see , <i>CD_L4_PER Clock Domain</i> in Chapter 3, Power, Reset, and Clock Management . |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| ELM | ELM_RST | L4_PER_RST | PRCM | Power domain hardware reset For information about PRCM reset sources and distribution, see , <i>Reset Domains</i> in Chapter 3, Power, Reset, and Clock Management . |

Table 16-347. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| ELM | ELM_IRQ | MA_IRQ_4 | Cortex-A9 | BCH error-location module interrupt For information about Cortex-A9 interrupt control, see Section 18.3.2, Interrupt Requests to Cortex-A9 MPU INTG . |
| | | D_IRQ_26 | DSP | BCH error-location module interrupt For information about DSP interrupt control, see , <i>Interrupts Requests</i> . |

16.5.3 ELM Functional Description

The ELM is designed around the error-location engine, which handles the computation based on the input syndrome polynomials.

The ELM maps the error-location engine to a standard interconnect interface by using a set of registers to control inputs and outputs.

16.5.3.1 ELM Software Reset

To perform a software reset, write a 1 to the [ELM_SYSCONFIG\[1\] SOFTRESET](#) bit. The [ELM_SYSSTATUS\[0\] RESETDONE](#) bit indicates that the software reset is complete when its value is 1. When the software reset completes, the [ELM_SYSCONFIG\[1\] SOFTRESET](#) bit is automatically reset.

16.5.3.2 ELM Power Management

[Table 16-348](#) describes the power-management features available to the ELM module.

NOTE:

- For information about source clock gating and sleep/wake-up transitions description, see the , *CD_L4_PER Clock Domain* in [Chapter 3, Power, Reset, and Clock Management](#).
- For a general description of EnaWakeUp, IdleMode, ClockActivity, and StandbyMode features, see [Section 3.6 Clock Management](#) in [Chapter 3, Power, Reset, and Clock Management](#)

Table 16-348. Local Power Management Features

| Feature | Registers | Description |
|------------------|---|--|
| Clock autogating | ELM_SYSCONFIG[0] AUTOGATING bit | This bit allows a local power optimization inside the module by gating the ELM_FCLK clock upon the interface activity. |

Table 16-348. Local Power Management Features (continued)

| Feature | Registers | Description |
|------------------------|--|--|
| Slave idle modes | ELM_SYSCONFIG [4:3] SIDLEMODE bit field | Force-idle, No-idle, and Smart-idle modes are available. |
| Clock activity | ELM_SYSCONFIG [8] CLOCKACTIVITY bit | The clock can be switched-off or maintained during the wake-up period. |
| Master Standby modes | N/A | |
| Global Wake-up Enable | N/A | |
| Wake-up Sources Enable | N/A | |

CAUTION

The PRCM module has no hardware means of reading [CLOCKACTIVITY](#) settings. Thus, software must ensure consistent programming between the [ELM CLOCKACTIVITY](#) and [ELM clock PRCM control bits](#). For a description of the ClockActivity feature, see [Chapter 3, Power, Reset, and Clock Management](#).

16.5.3.3 ELM Interrupt Requests

[Table 16-349](#) lists the event flags, and their masks, that can cause module interrupts.

Table 16-349. Events

| Event Flag | Event Mask | Map to | Description |
|--|--|---------|--|
| ELM_IRQSTATUS [8] PAGE_VALID | ELM_IRQENABLE [8] PAGE_MASK | ELM_IRQ | Page interrupt |
| ELM_IRQSTATUS [7] LOC_VALID_7 | ELM_IRQENABLE [7] LOCATION_MASK_7 | ELM_IRQ | Error-location interrupt for syndrome polynomial 7 |
| ELM_IRQSTATUS [6] LOC_VALID_6 | ELM_IRQENABLE [6] LOCATION_MASK_6 | ELM_IRQ | Error-location interrupt for syndrome polynomial 6 |
| ELM_IRQSTATUS [5] LOC_VALID_5 | ELM_IRQENABLE [5] LOCATION_MASK_5 | ELM_IRQ | Error-location interrupt for syndrome polynomial 5 |
| ELM_IRQSTATUS [4] LOC_VALID_4 | ELM_IRQENABLE [4] LOCATION_MASK_4 | ELM_IRQ | Error-location interrupt for syndrome polynomial 4 |
| ELM_IRQSTATUS [3] LOC_VALID_3 | ELM_IRQENABLE [3] LOCATION_MASK_3 | ELM_IRQ | Error-location interrupt for syndrome polynomial 3 |
| ELM_IRQSTATUS [2] LOC_VALID_2 | ELM_IRQENABLE [2] LOCATION_MASK_2 | ELM_IRQ | Error-location interrupt for syndrome polynomial 2 |
| ELM_IRQSTATUS [1] LOC_VALID_1 | ELM_IRQENABLE [1] LOCATION_MASK_1 | ELM_IRQ | Error-location interrupt for syndrome polynomial 1 |
| ELM_IRQSTATUS [0] LOC_VALID_0 | ELM_IRQENABLE [0] LOCATION_MASK_0 | ELM_IRQ | Error-location interrupt for syndrome polynomial 0 |

16.5.3.4 Processing Initialization

[ELM_LOCATION_CONFIG](#) global setting parameters must be set before using the error-location engine. The [ELM_LOCATION_CONFIG](#)[1:0] [ECC_BCH_LEVEL](#) bit defines the error-correction level used (4-, 8-, or 16-bit error-correction). The [ELM_LOCATION_CONFIG](#)[26:16] [ECC_SIZE](#) bit field defines the maximum buffer length beyond which the engine processing no longer looks for errors.

The CPU can choose to use the ELM in continuous mode or page mode. If all [ELM_PAGE_CTRL](#)[i] [SECTOR_i](#) bits are reset (i is the syndrome polynomial number, i = 0 to 7), continuous mode is used. In any other case, page mode is implicitly selected.

- Continuous mode: Each syndrome polynomial is processed independently – results for a syndrome can be retrieved and acknowledged at any time, whatever the status of the other seven processing contexts.
- Page mode: Syndrome polynomials are grouped into atomic entities – only one page can be processed at any given time, even if all eight contexts are not used for this page. Unused contexts are lost and cannot be affected to any other processing. The full page must be acknowledged and cleared before moving to the next page.

For completion interrupts to be generated correctly, all [ELM_IRQENABLE\[i\]](#) [LOCATION_MASK_i](#) bits ($i = 0$ to 7) must be forced to 0 when in page mode, and set to 1 in continuous mode. Additionally, the [ELM_IRQENABLE\[8\]](#) [PAGE_MASK](#) bit must be set to 1 when in page mode.

The CPU initiates error-location processing by writing a syndrome polynomial into one of the eight possible register sets. Each of these register sets includes seven registers: [ELM_SYNDROME_FRAGMENT_0_i](#) to [ELM_SYNDROME_FRAGMENT_6_i](#). The first six registers can be written in any order, but [ELM_SYNDROME_FRAGMENT_6_i](#) must be written last because it includes the validity bit, which instructs the ELM that this syndrome polynomial must be processed (the [ELM_SYNDROME_FRAGMENT_6_i\[16\]](#) [SYNDROME_VALID](#) bit).

As soon as one validity bit is asserted ([ELM_SYNDROME_FRAGMENT_6_i\[16\]](#) [SYNDROME_VALID](#) = $0x1$, with $i = 0$ to 7), error-location processing can start for the corresponding syndrome polynomial. The associated [ELM_LOCATION_STATUS_i](#) and [ELM_ERROR_LOCATION_0_i](#) to [ELM_ERROR_LOCATION_15_i](#) registers are not reset ($i = 0$ to 7). The software must not consider them until the corresponding [ELM_IRQSTATUS\[i\]](#) [LOC_VALID_i](#) bit is set.

16.5.3.5 Processing Sequence

While the error-location engine is busy processing one syndrome polynomial, further syndrome polynomials can be written. They are processed when the current processing completes.

The engine completes early when:

- No error is detected; that is, when the [ELM_LOCATION_STATUS_i\[8\]](#) [ECC_CORRECTABLE](#) bit is set to 1 and the [ELM_LOCATION_STATUS_i\[4:0\]](#) [ECC_NB_ERRORS](#) bit field is set to $0x0$.
- Too many errors are detected; that is, when the [ELM_LOCATION_STATUS_i\[8\]](#) [ECC_CORRECTABLE](#) bit is set to 0 while the [ELM_LOCATION_STATUS_i\[4:0\]](#) [ECC_NB_ERRORS](#) bit field is set with the value output by the error-location engine. The reported number of errors is not ensured if [ECC_CORRECTABLE](#) is 0.

If the engine completes early, the associated error-location registers [ELM_ERROR_LOCATION_0_i](#) to [ELM_ERROR_LOCATION_15_i](#) are not updated ($i = 0$ to 7).

In all other cases, the engine goes through the entire error-location process. Each time an error-location is found, it is logged in the associated [ECC_ERROR_LOCATION](#) bit field. The first error detected is logged in the [ELM_ERROR_LOCATION_0_i\[12:0\]](#) [ECC_ERROR_LOCATION](#) bit field; the second in the [ELM_ERROR_LOCATION_1_i\[12:0\]](#) [ECC_ERROR_LOCATION](#) bit field, and so on.

Table 16-350. ELM_LOCATION_STATUS_i Value Decoding Table

| ECC_CORRECTABLE Value | ECC_NB_ERRORS Value | Status | Number of Errors Detected | Action Required |
|---------------------------------------|-------------------------------------|--------|-------------------------------|--|
| 1 | 0 | OK | 0 | None |
| 1 | $\neq 0$ | OK | ECC_NB_ERRORS | Correct the data buffer read based on the ELM_ERROR_LOCATION_0_i to ELM_ERROR_LOCATION_15_i results. |
| 0 | Any | Failed | Unknown | Software-dependant |

16.5.3.6 Processing Completion

When the processing for a given syndrome polynomial completes, its [ELM_SYNDROME_FRAGMENT_6_i\[16\]](#) SYNDROME_VALID bit is reset. It must not be set again until the exit status registers, [ELM_LOCATION_STATUS_i](#) ($i = 0$ to 7), for this processing are checked. Failure to comply with this rule leads to potential loss of the first polynomial process data output.

The error-location engine signals the process completion to the ELM. When this event is detected, the corresponding [ELM_IRQSTATUS\[i\]](#) LOC_VALID_i bit is set ($i = 0$ to 7). The processing-exit status is available from the associated [ELM_LOCATION_STATUS_i](#) register, and error locations are stored in order in the ECC_ERROR_LOCATION fields. The software must only read valid error-location registers based on the number of errors detected and located.

Immediately after the error-location engine completes, a new syndrome polynomial can be processed, if any is available, as reported by the [ELM_SYNDROME_FRAGMENT_6_i\[16\]](#) SYNDROME_VALID validity bit, depending on the configured error-correction level. If several syndrome polynomials are available, a round-robin arbitration is used to select one for processing.

In continuous mode (that is, all bits in [ELM_PAGE_CTRL](#) are reset), an interrupt is triggered whenever a [ELM_IRQSTATUS\[i\]](#) LOC_VALID_i bit is asserted. The CPU must read the [ELM_IRQSTATUS](#) register to determine which polynomial is processed and retrieve the exit status and error locations ([ELM_LOCATION_STATUS_i](#) and [ELM_ERROR_LOCATION_0_i](#) to [ELM_ERROR_LOCATION_15_i](#)). When done, the CPU must clear the corresponding [ELM_IRQSTATUS\[i\]](#) LOC_VALID_i bit by writing it to 1. Other status bits must be written to 0 so that other interrupts are not unintentionally cleared. When using this mode, the [ELM_IRQSTATUS\[8\]](#) PAGE_VALID interrupt is never triggered.

In page mode, the module does not trigger interrupts for the processing completion of each polynomial because the [ELM_IRQENABLE\[i\]](#) LOCATION_MASK_i bits are cleared. A page is defined using the [ELM_PAGE_CTRL](#) register. Each SECTOR_i bit set means the corresponding polynomial i is part of the page processing. A page is fully processed when all tagged polynomials have been processed, as logged in the [ELM_IRQSTATUS\[i\]](#) LOC_VALID_i bit fields. The module triggers an [ELM_IRQSTATUS\[8\]](#) PAGE_VALID interrupt whenever it detects that the full page has been processed. To make sure the next page can be correctly processed, all status bits in the [ELM_IRQSTATUS](#) register must be cleared by using a single atomic-write access.

NOTE: Do not modify page setting parameters in the [ELM_PAGE_CTRL](#) register unless the engine is idle, no polynomial input is valid, and all interrupts have been cleared.

Because no polynomial-level interrupt is triggered in page mode, polynomials cleared in the [ELM_PAGE_CTRL\[i\]](#) SECTOR_i bit fields ($i = 0$ to 7) are processed as usual, but are essentially ignored. The CPU must manually poll the [ELM_IRQSTATUS](#) bits to check for their status.

16.5.4 ELM Basic Programming Model

16.5.4.1 ELM Low Level Programming Model

16.5.4.1.1 Processing Initialization

Table 16-351. ELM Processing Initialization

| Step | Register/ Bit Field / Programming Model | Value |
|---|---|-----------|
| Resets the module | ELM_SYSCONFIG[1] SOFTRESET | 0x1 |
| Wait until reset is done. | ELM_SYSSTATUS[0] RESETDONE | 0x1 |
| Configure the slave interface power management. | ELM_SYSCONFIG[4:3] SIDLEMODE | Set value |
| Defines the error-correction level used | ELM_LOCATION_CONFIG[1:0] ECC_BCH_LEVEL | Set value |
| Defines the maximum buffer length | ELM_LOCATION_CONFIG[26:16] ECC_SIZE | Set value |
| Sets the ELM in continuous mode or page mode | ELM_PAGE_CTRL | Set value |
| If continuous mode is used | All ELM_PAGE_CTRL[i] SECTOR_i ($i = 0$ to 7) | 0x0 |
| Enables interrupt for syndrome polynomial i | ELM_IRQENABLE[i] LOCATION_MASK_i | 0x1 |

Table 16-351. ELM Processing Initialization (continued)

| Step | Register/ Bit Field / Programming Model | Value |
|--|--|-----------|
| else (page mode is used) | One syndrome polynomial <i>i</i> is set ELM_PAGE_CTRL[i] SECTOR_ <i>i</i> (<i>i</i> = 0 to 7) | 0x1 |
| Disable all interrupts for syndrome polynomial and enable PAGE_MASK interrupt. | All ELM_IRQENABLE[i] LOCATION_MASK_ <i>i</i> = 0x0 and ELM_IRQENABLE[8] PAGE_MASK = 0x1 | Set value |
| endif | | Set value |
| Set the input syndrome polynomial <i>i</i> . | ELM_SYNDROME_FRAGMENT_0_i | Set value |
| | ELM_SYNDROME_FRAGMENT_1_i | Set value |
| | ELM_SYNDROME_FRAGMENT_5_i | Set value |
| | ELM_SYNDROME_FRAGMENT_6_i | Set value |
| Initiates the computation process | ELM_SYNDROME_FRAGMENT_6_i[16] SYNDROME_VALID | 0x1 |

16.5.4.1.2 Read Results

The engine goes through the entire error-location process and results can be read. [Table 16-352](#) and [Table 16-353](#) describe the processing completion for continuous and page modes, respectively.

Table 16-352. ELM Processing Completion for Continuous Mode

| Step | Register/ Bit Field / Programming Model | Value |
|---|---|-------|
| Wait until process is complete for syndrome polynomial <i>i</i> : Wait until the ELM_IRQ interrupt is generated, or poll the status register. | | |
| Read for which <i>i</i> the error-location process is complete. | ELM_IRQSTATUS[i] LOC_VALID_ <i>i</i> | 0x1 |
| if the process fails (too many errors) | ELM_LOCATION_STATUS_i[8] ECC_CORRECTABLE | 0x0 |
| It is software dependant. | | |
| else (process successful, the engine completes) | ELM_LOCATION_STATUS_i[8] ECC_CORRECTABLE | 0x1 |
| Read the number of errors. | ELM_LOCATION_STATUS_i[4:0] ECC_NB_ERRORS | |
| Read the error-location bit addresses for syndrome polynomial <i>i</i> of the ECC_NB_ERRORS first registers. It is the software responsibility to correct errors in the data buffer. | ELM_ERROR_LOCATION_0_i[12:0] ECC_ERROR_LOCATION | |
| | ELM_ERROR_LOCATION_1_i[12:0] ECC_ERROR_LOCATION | |
| | ... | |
| | ELM_ERROR_LOCATION_15_i[12:0] ECC_ERROR_LOCATION | |
| endif | | |
| Clear the corresponding <i>i</i> interrupt. | ELM_IRQSTATUS[i] LOC_VALID_ <i>i</i> | 0x1 |

A new syndrome polynomial can be processed after the end of processing ([ELM_SYNDROME_FRAGMENT_6_i\[16\]](#) SYNDROME_VALID = 0x0) and after the exit status register check ([ELM_LOCATION_STATUS_i](#)).

Table 16-353. ELM Processing Completion for Page Mode

| Step | Register/ Bit Field / Programming Model | Value |
|--|---|-------|
| Wait until process is complete for syndrome polynomial <i>i</i> : Wait until the ELM_IRQ interrupt is generated, or poll the status register. | | |
| Wait for page completed interrupt: All error locations are valid. | ELM_IRQSTATUS[8] PAGE_VALID | 0x1 |
| Repeat the following actions the necessary number of times. That is, once for each valid defined block in the page. | | |

Table 16-353. ELM Processing Completion for Page Mode (continued)

| Step | Register/ Bit Field / Programming Model | Value |
|---|--|-------|
| Read the process exit status. | ELM_LOCATION_STATUS_i [8] ECC_CORRECTABLE | |
| if the process fails (too many errors) | ELM_LOCATION_STATUS_i [8] ECC_CORRECTABLE | 0x0 |
| It is software dependant. | | |
| else (process successful, the engine completes) | ELM_LOCATION_STATUS_i [8] ECC_CORRECTABLE | 0x1 |
| Read the number of errors. | ELM_LOCATION_STATUS_i [4:0] ECC_NB_ERRORS | |
| Read the error-location bit addresses for syndrome polynomial i of the ECC_NB_ERRORS first registers. | ELM_ERROR_LOCATION_0_i [12:0] ECC_ERROR_LOCATION | |
| | ELM_ERROR_LOCATION_1_i [12:0] ECC_ERROR_LOCATION | |
| | ... | |
| | ELM_ERROR_LOCATION_15_i [12:0] ECC_ERROR_LOCATION | |
| | | |
| endif | | |
| End Repeat | | |
| Clear the ELM_IRQSTATUS register. | ELM_IRQSTATUS | 0x1FF |

Next page can be correctly processed after a page is fully processed, when all tagged polynomials have been processed ([ELM_IRQSTATUS](#)[i] LOC_VALID_i = 0x1 for all syndrome polynomials i used in the page).

16.5.4.2 Use Case: ELM Used in Continuous Mode

In this example, the ELM module is programmed for an 8-bit error-correction capability in continuous mode. After reading a 528-byte NAND flash sector (512B data plus 16B spare area) with a 16-bit interface, a non-zero polynomial syndrome is reported from the GPMC (Polynomial syndrome 0 is used in the ELM):

- P = 0x0A16ABE115E44F767BFB0D0980

Table 16-354. Use Case: Continuous Mode

| Step | Register/ Bit Field / Programming Model | Value |
|--|--|------------|
| Resets the module | ELM_SYSCONFIG [1] SOFTRESET | 0x1 |
| Wait until reset is done. | ELM_SYSSTATUS [0] RESETDONE | 0x1 |
| Configure the slave interface power management: Smart idle is used. | ELM_SYSCONFIG [4:3] SIDLEMODE | 0x2 |
| Defines the error-correction level used: 8 bits | ELM_LOCATION_CONFIG [1:0] ECC_BCH_LEVEL | 0x1 |
| Defines the maximum buffer length: 528 bytes (2x528 = 1056) | ELM_LOCATION_CONFIG [26:16] ECC_SIZE | 0x420 |
| Sets the ELM in continuous mode | ELM_PAGE_CTRL | 0 |
| Enables interrupt for syndrome polynomial 0 | ELM_IRQENABLE [0] LOCATION_MASK_0 | 0x1 |
| Set the input syndrome polynomial 0. | ELM_SYNDROME_FRAGMENT_0_i (i=0) | 0xFB0D0980 |
| | ELM_SYNDROME_FRAGMENT_1_i (i=0) | 0xE44F767B |
| | ELM_SYNDROME_FRAGMENT_2_i (i=0) | 0x16ABE115 |
| | ELM_SYNDROME_FRAGMENT_3_i (i=0) | 0x0000000A |
| Initiates the computation process | ELM_SYNDROME_FRAGMENT_6_i [16] SYNDROME_VALID (i=0) | 0x1 |
| Wait until process is complete for syndrome polynomial 0: IRQ_ELM is generated or poll the status register. | | |
| Read that error-location process is complete for syndrome polynomial 0. | ELM_IRQSTATUS [0] LOC_VALID_0 | 0x1 |
| Read the process exit status: All errors were successfully located. | ELM_LOCATION_STATUS_i [8] ECC_CORRECTABLE (i=0) | 0x1 |

Table 16-354. Use Case: Continuous Mode (continued)

| Step | Register/ Bit Field / Programming Model | Value |
|--|---|-------|
| Read the number of errors: Four errors detected. | ELM_LOCATION_STATUS_i [4:0] ECC_NB_ERRORS (i=0) | 0x4 |
| Read the error-location bit addresses for syndrome polynomial 0 of the 4 first registers: Errors are located in the data buffer at decimal addresses 431, 1062, 1909, 3452. | ELM_ERROR_LOCATION_0_i (i=0) | 0x1AF |
| | ELM_ERROR_LOCATION_1_i (i=0) | 0x426 |
| | ELM_ERROR_LOCATION_2_i (i=0) | 0x775 |
| | ELM_ERROR_LOCATION_3_i (i=0) | 0xD7C |
| Clear the corresponding interrupt for polynomial 0. | ELM_IRQSTATUS [0] LOC_VALID_0 | 0x1 |

The NAND flash data in the sector are seen as a polynomial of degree 4223 (number of bits in a 528 byte buffer minus 1), with each data bit being a coefficient in the polynomial. When reading from a NAND flash using the GPMC module, computation of the polynomial syndrome assumes that the first NAND word read at address 0x0 contains the highest-order coefficient in the message. Furthermore, in the 16-bit NAND word, bits are ordered from bit 7 to bit 0, then from bit 15 to bit 8. Based on this convention, an address table of the data buffer can be built. NAND memory addresses in [Table 16-355](#) are given in decimal format.

Table 16-355. 16-bit NAND Sector Buffer Address Map

| NAND Memory Address | Message bit addresses in the memory word | | | | | | | | | | | | | | | |
|---------------------------|--|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 0 | 4215 | 4214 | 4213 | 4212 | 4211 | 4210 | 4209 | 4208 | 4223 | 4222 | 4221 | 4220 | 4219 | 4218 | 4217 | 4216 |
| 1 | 4175 | 4174 | 4173 | 4172 | 4171 | 4170 | 4169 | 4168 | 4183 | 4182 | 4181 | 4180 | 4179 | 4178 | 4177 | 4176 |
| ... | | | | | | | | | | | | | | | | |
| 47 | 3463 | 3462 | 3461 | 3460 | 3459 | 3458 | 3457 | 3456 | 3471 | 3470 | 3469 | 3468 | 3467 | 3466 | 3465 | 3464 |
| 48 | 3447 | 3446 | 3445 | 3444 | 3443 | 3442 | 3441 | 3440 | 3455 | 3454 | 3453 | 3452 | 3451 | 3450 | 3449 | 3448 |
| 49 | 3431 | 3430 | 3429 | 3428 | 3427 | 3426 | 3425 | 3424 | 3439 | 3438 | 3437 | 3436 | 3435 | 3434 | 3433 | 3432 |
| 50 | 3415 | 3414 | 3413 | 3412 | 3411 | 3410 | 3409 | 3408 | 3423 | 3422 | 3421 | 3420 | 3419 | 3418 | 3417 | 3416 |
| ... | | | | | | | | | | | | | | | | |
| 255 | 135 | 134 | 133 | 132 | 131 | 130 | 129 | 128 | 143 | 142 | 141 | 140 | 139 | 138 | 137 | 136 |
| 256 | 119 | 118 | 117 | 116 | 115 | 114 | 113 | 112 | 127 | 126 | 125 | 124 | 123 | 122 | 121 | 120 |
| 257 | 103 | 102 | 101 | 100 | 99 | 98 | 97 | 96 | 111 | 110 | 109 | 108 | 107 | 106 | 105 | 104 |
| 258 | 87 | 86 | 85 | 84 | 83 | 82 | 81 | 80 | 95 | 94 | 93 | 92 | 91 | 90 | 89 | 88 |
| 259 | 71 | 70 | 69 | 68 | 67 | 66 | 65 | 64 | 79 | 78 | 77 | 76 | 75 | 74 | 73 | 72 |
| 260 | 55 | 54 | 53 | 52 | 51 | 50 | 49 | 48 | 63 | 62 | 61 | 60 | 59 | 58 | 57 | 56 |
| 261 | 39 | 38 | 37 | 36 | 35 | 34 | 33 | 32 | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |
| 262 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 |
| 263 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |

The table can now be used to determine which bits in the buffer were incorrect and must be flipped. In this example, the first bit to be flipped is bit 4 from the 49th byte read from memory. It is up to the processor to correctly map this word to the copied buffer and to flip this bit. The same process must be repeated for all detected errors.

16.5.4.3 Use Case: ELM Used in Page Mode

In this example, the ELM module is programmed for an 16-bit error-correction capability in page mode. After reading a 528-byte NAND flash sector (512B data plus 16B spare area) with a 16-bit interface, four non-zero polynomial syndromes are reported from the GPMC (Polynomial syndrome 0, 1, 2, and 3 are used in the ELM):

- P0 = 0xE8B0 12ADDB5A318E05BE B0693DB28330B5CC A329AA05E0B718EF
- P1 = 0xBAD0 49A0D932C22E6669 0948DF08BE093336 79C6BA10E5F935EB

- P2 = 0x69D9 B86ABCD5EC3697FA A6498FEE54556EA0 1579EF7D60BA3189
- P3 = 0x0

Table 16-356. Use Case: Page Mode

| Step | Register/ Bit Field / Programming Model | Value |
|--|--|------------|
| Resets the module | ELM_SYSCONFIG[1] SOFTRESET | 0x1 |
| Wait until reset is done. | ELM_SYSSTATUS[0] RESETDONE | 0x1 |
| Configure the slave interface power management: Smart idle is used. | ELM_SYSCONFIG[4:3] SIDLEMODE | 0x2 |
| Defines the error-correction level used: 16 bits | ELM_LOCATION_CONFIG[1:0] ECC_BCH_LEVEL | 0x2 |
| Defines the maximum buffer length: 528 bytes | ELM_LOCATION_CONFIG[26:16] ECC_SIZE | 0x420 |
| Sets the ELM in page mode (4 blocks in a page) | ELM_PAGE_CTRL[0] SECTOR_0 | 0x1 |
| | ELM_PAGE_CTRL[1] SECTOR_1 | 0x1 |
| | ELM_PAGE_CTRL[2] SECTOR_2 | 0x1 |
| | ELM_PAGE_CTRL[3] SECTOR_3 | 0x1 |
| Disable all interrupts for syndrome polynomial and enable PAGE_MASK interrupt. | ELM_IRQENABLE | 0x100 |
| Set the input syndrome polynomial 0. | ELM_SYNDROME_FRAGMENT_0_i (i=0) | 0xE0B718EF |
| | ELM_SYNDROME_FRAGMENT_1_i (i=0) | 0xA329AA05 |
| | ELM_SYNDROME_FRAGMENT_2_i (i=0) | 0x8330B5CC |
| | ELM_SYNDROME_FRAGMENT_3_i (i=0) | 0xB0693DB2 |
| | ELM_SYNDROME_FRAGMENT_4_i (i=0) | 0x318E05BE |
| | ELM_SYNDROME_FRAGMENT_5_i (i=0) | 0x12ADDB5A |
| Set the input syndrome polynomial 1. | ELM_SYNDROME_FRAGMENT_6_i (i=0) | 0xE8B0 |
| | ELM_SYNDROME_FRAGMENT_0_i (i=1) | 0xE5F935EB |
| | ELM_SYNDROME_FRAGMENT_1_i (i=1) | 0x79C6BA10 |
| | ELM_SYNDROME_FRAGMENT_2_i (i=1) | 0xBE093336 |
| | ELM_SYNDROME_FRAGMENT_3_i (i=1) | 0x0948DF08 |
| | ELM_SYNDROME_FRAGMENT_4_i (i=1) | 0xC22E6669 |
| Set the input syndrome polynomial 2. | ELM_SYNDROME_FRAGMENT_5_i (i=1) | 0x49A0D932 |
| | ELM_SYNDROME_FRAGMENT_6_i (i=1) | 0xBAD0 |
| | ELM_SYNDROME_FRAGMENT_0_i (i=2) | 0x60BA3189 |
| | ELM_SYNDROME_FRAGMENT_1_i (i=2) | 0x1579EF7D |
| | ELM_SYNDROME_FRAGMENT_2_i (i=2) | 0x54556EA0 |
| | ELM_SYNDROME_FRAGMENT_3_i (i=2) | 0xA6498FEE |
| Set the input syndrome polynomial 3. | ELM_SYNDROME_FRAGMENT_4_i (i=2) | 0xEC3697FA |
| | ELM_SYNDROME_FRAGMENT_5_i (i=2) | 0xB86ABCD5 |
| | ELM_SYNDROME_FRAGMENT_6_i (i=2) | 0x69D9 |
| | ELM_SYNDROME_FRAGMENT_0_i (i=3) | 0x0 |
| | ELM_SYNDROME_FRAGMENT_1_i (i=3) | 0x0 |
| | ELM_SYNDROME_FRAGMENT_2_i (i=3) | 0x0 |
| Initiates the computation process for syndrome polynomial 0 | ELM_SYNDROME_FRAGMENT_3_i (i=3) | 0x0 |
| | ELM_SYNDROME_FRAGMENT_4_i (i=3) | 0x0 |
| | ELM_SYNDROME_FRAGMENT_5_i (i=3) | 0x0 |
| | ELM_SYNDROME_FRAGMENT_6_i (i=3) | 0x0 |
| | ELM_SYNDROME_FRAGMENT_6_i[16] SYNDROME_VALID (i=0) | 0x1 |
| Initiates the computation process for syndrome polynomial 1 | ELM_SYNDROME_FRAGMENT_6_i[16] SYNDROME_VALID (i=1) | 0x1 |
| Initiates the computation process for syndrome polynomial 2 | ELM_SYNDROME_FRAGMENT_6_i[16] SYNDROME_VALID (i=2) | 0x1 |

Table 16-356. Use Case: Page Mode (continued)

| Step | Register/ Bit Field / Programming Model | Value |
|--|---|--------|
| Initiates the computation process for syndrome polynomial 3 | ELM_SYNDROME_FRAGMENT_6_i[16] SYNDROME_VALID (i=3) | 0x1 |
| Wait until process is complete for syndrome polynomial 0, 1, 2, and 3: Wait until the ELM_IRQ interrupt is generated or poll the status register. | | |
| Wait for page completed interrupt: All error locations are valid. | ELM_IRQSTATUS [8] PAGE_VALID | 0x1 |
| Read the process exit status for syndrome polynomial 0: All errors were successfully located. | ELM_LOCATION_STATUS_i [8] ECC_CORRECTABLE (i=0) | 0x1 |
| Read the process exit status for syndrome polynomial 1: All errors were successfully located. | ELM_LOCATION_STATUS_i [8] ECC_CORRECTABLE (i=1) | 0x1 |
| Read the process exit status for syndrome polynomial 2: All errors were successfully located. | ELM_LOCATION_STATUS_i [8] ECC_CORRECTABLE (i=2) | 0x1 |
| Read the process exit status for syndrome polynomial 3: All errors were successfully located. | ELM_LOCATION_STATUS_i [8] ECC_CORRECTABLE (i=3) | 0x1 |
| Read the number of errors for syndrome polynomial 0: 4 errors detected. | ELM_LOCATION_STATUS_i [4:0] ECC_NB_ERRORS (i=0) | 0x4 |
| Read the number of errors for syndrome polynomial 1: 2 errors detected. | ELM_LOCATION_STATUS_i [4:0] ECC_NB_ERRORS (i=1) | 0x2 |
| Read the number of errors for syndrome polynomial 2: 1 error detected. | ELM_LOCATION_STATUS_i [4:0] ECC_NB_ERRORS (i=2) | 0x1 |
| Read the number of errors for syndrome polynomial 3: 0 errors detected. | ELM_LOCATION_STATUS_i [4:0] ECC_NB_ERRORS (i=3) | 0x0 |
| Read the error-location bit addresses for syndrome polynomial 0 of the 4 first registers: | ELM_ERROR_LOCATION_0_i (i=0) | 0x1FE |
| | ELM_ERROR_LOCATION_1_i (i=0) | 0x617 |
| | ELM_ERROR_LOCATION_2_i (i=0) | 0x650 |
| | ELM_ERROR_LOCATION_3_i (i=0) | 0xA83 |
| Read the error-location bit addresses for syndrome polynomial 1 of the 2 first registers: | ELM_ERROR_LOCATION_0_i (i=1) | 0x4 |
| | ELM_ERROR_LOCATION_1_i (i=1) | 0x1036 |
| Read the errors location bit addresses for syndrome polynomial 2 of the first registers: | ELM_ERROR_LOCATION_0_i (i=1) | 0x3E8 |
| Clear the ELM_IRQSTATUS register. | ELM_IRQSTATUS | 0x1FF |

16.5.5 ELM Register Manual

16.5.5.1 ELM Instance Summary

Table 16-357. ELM Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|------|
| ELM | 0x4807 8000 | 4KB |

16.5.5.2 ELM Registers

16.5.5.2.1 ELM Register Summary

Table 16-358. ELM Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | ELM L3 Physical Address |
|--|------|-----------------------|---------------------------|---------------------------|
| ELM_REVISION | R | 32 | 0x0000 0000 | 0x4807 8000 |
| ELM_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4807 8010 |
| ELM_SYSSTATUS | R | 32 | 0x0000 0014 | 0x4807 8014 |
| ELM_IRQSTATUS | RW | 32 | 0x0000 0018 | 0x4807 8018 |
| ELM_IRQENABLE | RW | 32 | 0x0000 001C | 0x4807 801C |
| ELM_LOCATION_CONFIG | RW | 32 | 0x0000 0020 | 0x4807 8020 |
| ELM_PAGE_CTRL | RW | 32 | 0x0000 0080 | 0x4807 8080 |
| ELM_SYNDROME_FRAGMENT_0_i ⁽¹⁾ | RW | 32 | 0x0000 0400 + (0x40 * i) | 0x4807 8400 + (0x40 * i) |
| ELM_SYNDROME_FRAGMENT_1_i ⁽¹⁾ | RW | 32 | 0x0000 0404 + (0x40 * i) | 0x4807 8404 + (0x40 * i) |
| ELM_SYNDROME_FRAGMENT_2_i ⁽¹⁾ | RW | 32 | 0x0000 0408 + (0x40 * i) | 0x4807 8408 + (0x40 * i) |
| ELM_SYNDROME_FRAGMENT_3_i ⁽¹⁾ | RW | 32 | 0x0000 040C + (0x40 * i) | 0x4807 840C + (0x40 * i) |
| ELM_SYNDROME_FRAGMENT_4_i ⁽¹⁾ | RW | 32 | 0x0000 0410 + (0x40 * i) | 0x4807 8410 + (0x40 * i) |
| ELM_SYNDROME_FRAGMENT_5_i ⁽¹⁾ | RW | 32 | 0x0000 0414 + (0x40 * i) | 0x4807 8414 + (0x40 * i) |
| ELM_SYNDROME_FRAGMENT_6_i ⁽¹⁾ | RW | 32 | 0x0000 0418 + (0x40 * i) | 0x4807 8418 + (0x40 * i) |
| ELM_LOCATION_STATUS_i ⁽¹⁾ | R | 32 | 0x0000 0800 + (0x100 * i) | 0x4807 8800 + (0x100 * i) |
| ELM_ERROR_LOCATION_0_i ⁽¹⁾ | R | 32 | 0x0000 0880 + (0x100 * i) | 0x4807 8880 + (0x100 * i) |
| ELM_ERROR_LOCATION_1_i ⁽¹⁾ | R | 32 | 0x0000 0884 + (0x100 * i) | 0x4807 8884 + (0x100 * i) |
| ELM_ERROR_LOCATION_2_i ⁽¹⁾ | R | 32 | 0x0000 0888 + (0x100 * i) | 0x4807 8888 + (0x100 * i) |
| ELM_ERROR_LOCATION_3_i ⁽¹⁾ | R | 32 | 0x0000 088C + (0x100 * i) | 0x4807 888C + (0x100 * i) |
| ELM_ERROR_LOCATION_4_i ⁽¹⁾ | R | 32 | 0x0000 0890 + (0x100 * i) | 0x4807 8890 + (0x100 * i) |
| ELM_ERROR_LOCATION_5_i ⁽¹⁾ | R | 32 | 0x0000 0894 + (0x100 * i) | 0x4807 8894 + (0x100 * i) |
| ELM_ERROR_LOCATION_6_i ⁽¹⁾ | R | 32 | 0x0000 0898 + (0x100 * i) | 0x4807 8898 + (0x100 * i) |
| ELM_ERROR_LOCATION_7_i ⁽¹⁾ | R | 32 | 0x0000 089C + (0x100 * i) | 0x4807 889C + (0x100 * i) |
| ELM_ERROR_LOCATION_8_i ⁽¹⁾ | R | 32 | 0x0000 08A0 + (0x100 * i) | 0x4807 88A0 + (0x100 * i) |
| ELM_ERROR_LOCATION_9_i ⁽¹⁾ | R | 32 | 0x0000 08A4 + (0x100 * i) | 0x4807 88A4 + (0x100 * i) |
| ELM_ERROR_LOCATION_10_i ⁽¹⁾ | R | 32 | 0x0000 08A8 + (0x100 * i) | 0x4807 88A8 + (0x100 * i) |
| ELM_ERROR_LOCATION_11_i ⁽¹⁾ | R | 32 | 0x0000 08AC + (0x100 * i) | 0x4807 88AC + (0x100 * i) |
| ELM_ERROR_LOCATION_12_i ⁽¹⁾ | R | 32 | 0x0000 08B0 + (0x100 * i) | 0x4807 88B0 + (0x100 * i) |
| ELM_ERROR_LOCATION_13_i ⁽¹⁾ | R | 32 | 0x0000 08B4 + (0x100 * i) | 0x4807 88B4 + (0x100 * i) |
| ELM_ERROR_LOCATION_14_i ⁽¹⁾ | R | 32 | 0x0000 08B8 + (0x100 * i) | 0x4807 88B8 + (0x100 * i) |
| ELM_ERROR_LOCATION_15_i ⁽¹⁾ | R | 32 | 0x0000 08BC + (0x100 * i) | 0x4807 88BC + (0x100 * i) |

⁽¹⁾ i = 0 to 7 for ELM

16.5.5.2.2 ELM Register Description

Table 16-359. ELM_REVISION

| | | | |
|------------------|---|----------|-----|
| Address Offset | 0x0000 0000 | Instance | ELM |
| Physical Address | 0x4807 8000 | | |
| Description | This register contains the IP revision code. (A write or reset of to this register has no effect.) | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP Revision | R | TI internal data |

Table 16-360. Register Call Summary for Register ELM_REVISION

Error Location Module

- [ELM Register Summary: \[0\]](#)

Table 16-361. ELM_SYSCONFIG

| | | | |
|-------------------------|---|-----------------|-----|
| Address Offset | 0x0000 0010 | Instance | ELM |
| Physical Address | 0x4807 8010 | | |
| Description | This register allows controlling various parameters of the OCP interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----------|----|----|-----------|---|----------|---|-----------|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLOCKACTIVITYOCP | | RESERVED | | | SIDLEMODE | | RESERVED | | SOFTRESET | | AUTOGATING | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-----------|
| 31:9 | RESERVED | Reserved | R | 0x0000000 |
| 8 | CLOCKACTIVITYOCP | OCP Clock activity when module is in IDLE mode (during wake up mode period) 0x0: OCP Clock can be switch-off 0x1: OCP Clock is maintained during wake up period | RW | 0 |
| 7:5 | RESERVED | Reserved | R | 0x0 |
| 4:3 | SIDLEMODE | Slave interface power management (IDLE req/ack control) 0x0: FORCE Idle. IDLE request is acknowledged unconditionally and immediately (Default <i>Dumb</i> mode for safety) 0x1: NO idle. IDLE request is never acknowledged. 0x2: SMART Idle. The acknowledgment to an IDLE request is given based on the internal activity. 0x3: Reserved - do not use | RW | 0x2 |
| 2 | RESERVED | Reserved | R | 0 |
| 1 | SOFTRESET | Module software reset This bit is automatically reset by hardware (During reads, it always returns 0.) It has same effect as the OCP hardware reset. 0x0: Normal mode 0x1: Start soft reset sequence. | RW | 0 |
| 0 | AUTOGATING | Internal OCP clock gating strategy (no module visible impact other than saving power) 0x0: OCP clock is free-running 0x1: Automatic internal OCP clock gating strategy is applied based on the OCP interface activity. | RW | 1 |

Table 16-362. Register Call Summary for Register ELM_SYSCONFIG

Error Location Module

- ELM Software Reset: [0] [1]
- ELM Power Management: [2] [3] [4]
- Processing Initialization: [5] [6]
- Use Case: ELM Used in Continuous Mode: [7] [8]
- Use Case: ELM Used in Page Mode: [9] [10]
- ELM Register Summary: [11]

Table 16-363. ELM SYSSTATUS

| | |
|-------------------------|--|
| Address Offset | 0x0000 0014 |
| Physical Address | 0x4807 8014 |
| Description | Internal reset monitoring (OCP domain) Undefined since: From hardware perspective, the reset state is 0. From software user perspective, when the accessible module is 1. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | RESETDONE | <p>Internal reset monitoring (OCP domain)</p> <p>Undefined since: From hardware perspective, the reset state is 0. From software user perspective, when the accessible module is 1.</p> <p>Read 0x0: Reset is on-going</p> <p>Read 0x1: Reset is done (completed)</p> | R | 1 |

Table 16-364. Register Call Summary for Register ELM_SYSSTATUS

Error Location Module

- ELM Software Reset: [0]
- Processing Initialization: [1]
- Use Case: ELM Used in Continuous Mode: [2]
- Use Case: ELM Used in Page Mode: [3]
- ELM Register Summary: [4]

Table 16-365. ELM_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|-----|
| Address Offset | 0x0000 0018 | Instance | ELM |
| Physical Address | 0x4807 8018 | | |
| Description | Interrupt status. This register doubles as a status register for the error-location processes. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | PAGE_VALID | LOC_VALID_7 | LOC_VALID_6 | LOC_VALID_5 | LOC_VALID_4 | LOC_VALID_3 | LOC_VALID_2 | LOC_VALID_1 | LOC_VALID_0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|---------------|-----------|
| 31:9 | RESERVED | Reserved | R | 0x0000000 |
| 8 | PAGE_VALID | Error-location status for a full page, based on the mask definition Read 0x0: Error locations invalid for all polynomials enabled in the ECC_INTERRUPT_MASK register Read 0x1: All error locations valid Write 0x0: No effect Write 0x1: Clear interrupt | RW | 0 |
| 7 | LOC_VALID_7 | Error-location status for syndrome polynomial 7 Read 0x0: No syndrome processed or process in progress Read 0x1: Error-location process completed Write 0x0: No effect Write 0x1: Clear interrupt | RW W1toClr | 0 |
| 6 | LOC_VALID_6 | Error-location status for syndrome polynomial 6 | RW W1toClr | 0 |
| 5 | LOC_VALID_5 | Error-location status for syndrome polynomial 5 | RW W1toClr | 0 |
| 4 | LOC_VALID_4 | Error-location status for syndrome polynomial 4 | RW W1toClr | 0 |
| 3 | LOC_VALID_3 | Error-location status for syndrome polynomial 3 | RW W1toClr | 0 |
| 2 | LOC_VALID_2 | Error-location status for syndrome polynomial 2 | RW W1toClr | 0 |
| 1 | LOC_VALID_1 | Error-location status for syndrome polynomial 1 | RW W1toClr | 0 |
| 0 | LOC_VALID_0 | Error-location status for syndrome polynomial 0 | RW W1toClr | 0 |

Table 16-366. Register Call Summary for Register ELM_IRQSTATUS

Error Location Module

- [ELM Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [Processing Initialization: \[9\]](#)
- [Processing Completion: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [Read Results: \[19\] \[20\] \[21\] \[22\] \[23\] \[24\]](#)
- [Use Case: ELM Used in Continuous Mode: \[25\] \[26\]](#)
- [Use Case: ELM Used in Page Mode: \[27\] \[28\] \[29\]](#)
- [ELM Register Summary: \[30\]](#)

Table 16-367. ELM_IRQENABLE

| | | | |
|-------------------------|------------------|-----------------|-----|
| Address Offset | 0x0000 001C | Instance | ELM |
| Physical Address | 0x4807 801C | | |
| Description | Interrupt enable | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|-----------------|----|-----------------|----|-----------------|---|-----------------|---|-----------------|---|-----------------|---|-----------------|---|-----------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | PAGE_MASK | | LOCATION_MASK_7 | | LOCATION_MASK_6 | | LOCATION_MASK_5 | | LOCATION_MASK_4 | | LOCATION_MASK_3 | | LOCATION_MASK_2 | | LOCATION_MASK_1 | | LOCATION_MASK_0 | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-----------|
| 31:9 | RESERVED | Reserved | R | 0x0000000 |
| 8 | PAGE_MASK | Page interrupt mask bit 0: Disable interrupt 1: Enable interrupt | RW | 0 |
| 7 | LOCATION_MASK_7 | Error-location interrupt mask bit for syndrome polynomial 7 | RW | 0 |
| 6 | LOCATION_MASK_6 | Error-location interrupt mask bit for syndrome polynomial 6 | RW | 0 |
| 5 | LOCATION_MASK_5 | Error-location interrupt mask bit for syndrome polynomial 5 | RW | 0 |
| 4 | LOCATION_MASK_4 | Error-location interrupt mask bit for syndrome polynomial 4 | RW | 0 |
| 3 | LOCATION_MASK_3 | Error-location interrupt mask bit for syndrome polynomial 3 | RW | 0 |
| 2 | LOCATION_MASK_2 | Error-location interrupt mask bit for syndrome polynomial 2 | RW | 0 |
| 1 | LOCATION_MASK_1 | Error-location interrupt mask bit for syndrome polynomial 1 | RW | 0 |
| 0 | LOCATION_MASK_0 | Error-location interrupt mask bit for syndrome polynomial 0 0: Disable interrupt 1: Enable interrupt | RW | 0 |

Table 16-368. Register Call Summary for Register ELM_IRQENABLE

Error Location Module

- [ELM Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [Processing Initialization: \[9\] \[10\]](#)
- [Processing Completion: \[11\]](#)
- [Processing Initialization: \[12\] \[13\] \[14\]](#)
- [Use Case: ELM Used in Continuous Mode: \[15\]](#)
- [Use Case: ELM Used in Page Mode: \[16\]](#)
- [ELM Register Summary: \[17\]](#)

Table 16-369. ELM_LOCATION_CONFIG

| | | | |
|-------------------------|--------------------------|-----------------|-----|
| Address Offset | 0x0000 0020 | Instance | ELM |
| Physical Address | 0x4807 8020 | | |
| Description | ECC algorithm parameters | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | ECC_SIZE | | | | | | | | RESERVED | | | | | | | | | | | | | ECC_BCH_LEVEL | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|--------|
| 31:27 | RESERVED | Reserved | R | 0x00 |
| 26:16 | ECC_SIZE | Maximum size of the buffers for which the error-location engine is used, in number of nibbles (4-bits entities) | RW | 0x000 |
| 15:2 | RESERVED | Reserved | R | 0x0000 |
| 1:0 | ECC_BCH_LEVEL | Error correction level 0x0: 4 bits 0x1: 8 bits 0x2: 16 bits 0x3: Reserved | RW | 0x0 |

Table 16-370. Register Call Summary for Register ELM_LOCATION_CONFIG

Error Location Module

- [Processing Initialization: \[0\] \[1\] \[2\]](#)
- [Processing Initialization: \[3\] \[4\]](#)
- [Use Case: ELM Used in Continuous Mode: \[5\] \[6\]](#)
- [Use Case: ELM Used in Page Mode: \[7\] \[8\]](#)
- [ELM Register Summary: \[9\]](#)

Table 16-371. ELM_PAGE_CTRL

| | | | |
|-------------------------|-----------------|-----------------|-----|
| Address Offset | 0x0000 0080 | Instance | ELM |
| Physical Address | 0x4807 8080 | | |
| Description | Page definition | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----------|----|----------|----|----------|---|----------|---|----------|---|----------|---|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SECTOR_7 | | SECTOR_6 | | SECTOR_5 | | SECTOR_4 | | SECTOR_3 | | SECTOR_2 | | SECTOR_1 | | SECTOR_0 | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7 | SECTOR_7 | Set to 1 if syndrome polynomial 7 is part of the page in page mode. Must be 0 in continuous mode. | RW | 0 |
| 6 | SECTOR_6 | Set to 1 if syndrome polynomial 6 is part of the page in page mode. Must be 0 in continuous mode. | RW | 0 |
| 5 | SECTOR_5 | Set to 1 if syndrome polynomial 5 is part of the page in page mode. Must be 0 in continuous mode. | RW | 0 |
| 4 | SECTOR_4 | Set to 1 if syndrome polynomial 4 is part of the page in page mode. Must be 0 in continuous mode. | RW | 0 |
| 3 | SECTOR_3 | Set to 1 if syndrome polynomial 3 is part of the page in page mode. Must be 0 in continuous mode. | RW | 0 |
| 2 | SECTOR_2 | Set to 1 if syndrome polynomial 2 is part of the page in page mode. Must be 0 in continuous mode. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 1 | SECTOR_1 | Set to 1 if syndrome polynomial 1 is part of the page in page mode. Must be 0 in continuous mode. | RW | 0 |
| 0 | SECTOR_0 | Set to 1 if syndrome polynomial 0 is part of the page in page mode. Must be 0 in continuous mode. | RW | 0 |

Table 16-372. Register Call Summary for Register ELM_PAGE_CTRL

Error Location Module

- [Processing Initialization: \[0\]](#)
- [Processing Completion: \[1\] \[2\] \[3\] \[4\]](#)
- [Processing Initialization: \[5\] \[6\] \[7\]](#)
- [Use Case: ELM Used in Continuous Mode: \[8\]](#)
- [Use Case: ELM Used in Page Mode: \[9\] \[10\] \[11\] \[12\]](#)
- [ELM Register Summary: \[13\]](#)

Table 16-373. ELM_SYNDROME_FRAGMENT_0_i

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0400 + (0x40 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8400 + (0x40 * i) | Instance | ELM |
| Description | Input syndrome polynomial bits 0 to 31. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SYNDROME_0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------|------|-------------|
| 31:0 | SYNDROME_0 | Syndrome bits 0 to 31 | RW | 0x0000 0000 |

Table 16-374. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_0_i

Error Location Module

- [Processing Initialization: \[0\]](#)
- [Processing Initialization: \[1\]](#)
- [Use Case: ELM Used in Continuous Mode: \[2\]](#)
- [Use Case: ELM Used in Page Mode: \[3\] \[4\] \[5\] \[6\]](#)
- [ELM Register Summary: \[7\]](#)

Table 16-375. ELM_SYNDROME_FRAGMENT_1_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0404 + (0x40 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8404 + (0x40 * i) | Instance | ELM |
| Description | Input syndrome polynomial bits 32 to 63. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SYNDROME_1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------|------|-------------|
| 31:0 | SYNDROME_1 | Syndrome bits 32 to 63 | RW | 0x0000 0000 |

Table 16-376. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_1_i

Error Location Module

- [Processing Initialization: \[0\]](#)
- [Use Case: ELM Used in Continuous Mode: \[1\]](#)
- [Use Case: ELM Used in Page Mode: \[2\] \[3\] \[4\] \[5\]](#)
- [ELM Register Summary: \[6\]](#)

Table 16-377. ELM_SYNDROME_FRAGMENT_2_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0408 + (0x40 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8408 + (0x40 * i) | Instance | ELM |
| Description | Input syndrome polynomial bits 64 to 95. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SYNDROME_2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------|------|-------------|
| 31:0 | SYNDROME_2 | Syndrome bits 64 to 95 | RW | 0x0000 0000 |

Table 16-378. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_2_i

Error Location Module

- [Use Case: ELM Used in Continuous Mode: \[0\]](#)
- [Use Case: ELM Used in Page Mode: \[1\] \[2\] \[3\] \[4\]](#)
- [ELM Register Summary: \[5\]](#)

Table 16-379. ELM_SYNDROME_FRAGMENT_3_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 040C + (0x40 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 840C + (0x40 * i) | Instance | ELM |
| Description | Input syndrome polynomial bits 96 to 127 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SYNDROME_3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------------|------|-------------|
| 31:0 | SYNDROME_3 | Syndrome bits 96 to 127 | RW | 0x0000 0000 |

Table 16-380. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_3_i

Error Location Module

- [Use Case: ELM Used in Continuous Mode: \[0\]](#)
- [Use Case: ELM Used in Page Mode: \[1\] \[2\] \[3\] \[4\]](#)
- [ELM Register Summary: \[5\]](#)

Table 16-381. ELM_SYNDROME_FRAGMENT_4_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0410 + (0x40 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8410 + (0x40 * i) | Instance | ELM |
| Description | Input syndrome polynomial bits 128 to 159. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SYNDROME_4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------|------|-------------|
| 31:0 | SYNDROME_4 | Syndrome bits 128 to 159 | RW | 0x0000 0000 |

Table 16-382. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_4_i

Error Location Module

- Use Case: ELM Used in Page Mode: [0] [1] [2] [3]
- ELM Register Summary: [4]

Table 16-383. ELM_SYNDROME_FRAGMENT_5_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0414 + (0x40 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8414 + (0x40 * i) | Instance | ELM |
| Description | Input syndrome polynomial bits 160 to 191. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SYNDROME_5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------|------|-------------|
| 31:0 | SYNDROME_5 | Syndrome bits 160 to 191 | RW | 0x0000 0000 |

Table 16-384. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_5_i

Error Location Module

- Processing Initialization: [0]
- Use Case: ELM Used in Page Mode: [1] [2] [3] [4]
- ELM Register Summary: [5]

Table 16-385. ELM_SYNDROME_FRAGMENT_6_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0418 + (0x40 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8418 + (0x40 * i) | Instance | ELM |
| Description | Input syndrome polynomial bits 192 to 207. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | SYNDROME_VALID | SYNDROME_6 | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|--------|
| 31:17 | RESERVED | Reserved | R | 0x0000 |
| 16 | SYNDROME_VALID | Syndrome valid bit 0x0: This syndrome polynomial should not be processed. 0x1: This syndrome polynomial must be processed. | RW | 0 |
| 15:0 | SYNDROME_6 | Syndrome bits 192 to 207 | RW | 0x0000 |

Table 16-386. Register Call Summary for Register ELM_SYNDROME_FRAGMENT_6_i

Error Location Module

- [Processing Initialization: \[0\] \[1\] \[2\] \[3\]](#)
- [Processing Completion: \[4\] \[5\]](#)
- [Processing Initialization: \[6\] \[7\]](#)
- [Read Results: \[8\]](#)
- [Use Case: ELM Used in Continuous Mode: \[9\]](#)
- [Use Case: ELM Used in Page Mode: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\]](#)
- [ELM Register Summary: \[18\]](#)

Table 16-387. ELM_LOCATION_STATUS_i

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0800 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8800 + (0x100 * i) | Instance | ELM |
| Description | Exit status for the syndrome polynomial processing | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----------|----|----|---------------|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_CORRECTABLE | | RESERVED | | | ECC_NB_ERRORS | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|----------|
| 31:9 | RESERVED | Reserved | R | 0x000000 |
| 8 | ECC_CORRECTABLE | Error-location process exit status 0x0: ECC error-location process failed. Number of errors and error locations are invalid. 0x1: All errors were successfully located. Number of errors and error locations are valid. | R | 0 |
| 7:5 | RESERVED | Reserved | R | 0x0 |
| 4:0 | ECC_NB_ERRORS | Number of errors detected and located | R | 0x00 |

Table 16-388. Register Call Summary for Register ELM_LOCATION_STATUS_i

Error Location Module

- [Processing Initialization: \[0\]](#)
- [Processing Sequence: \[1\] \[2\] \[3\] \[4\]](#)
- [Processing Completion: \[5\] \[6\] \[7\]](#)
- [Read Results: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)
- [Use Case: ELM Used in Continuous Mode: \[16\] \[17\]](#)
- [Use Case: ELM Used in Page Mode: \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\]](#)
- [ELM Register Summary: \[26\]](#)

Table 16-389. ELM_ERROR_LOCATION_0_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 0880 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8880 + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-390. Register Call Summary for Register ELM_ERROR_LOCATION_0_i

Error Location Module

- [Processing Initialization: \[0\]](#)
- [Processing Sequence: \[1\] \[2\] \[3\]](#)
- [Processing Completion: \[4\]](#)
- [Read Results: \[5\] \[6\]](#)
- [Use Case: ELM Used in Continuous Mode: \[7\]](#)
- [Use Case: ELM Used in Page Mode: \[8\] \[9\] \[10\]](#)
- [ELM Register Summary: \[11\]](#)

Table 16-391. ELM_ERROR_LOCATION_1_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 0884 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8884 + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-392. Register Call Summary for Register ELM_ERROR_LOCATION_1_i

Error Location Module

- [Processing Sequence: \[0\]](#)
- [Read Results: \[1\] \[2\]](#)
- [Use Case: ELM Used in Continuous Mode: \[3\]](#)
- [Use Case: ELM Used in Page Mode: \[4\] \[5\]](#)
- [ELM Register Summary: \[6\]](#)

Table 16-393. ELM_ERROR_LOCATION_2_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 0888 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8888 + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-394. Register Call Summary for Register ELM_ERROR_LOCATION_2_i

Error Location Module

- [Use Case: ELM Used in Continuous Mode: \[0\]](#)
- [Use Case: ELM Used in Page Mode: \[1\]](#)
- [ELM Register Summary: \[2\]](#)

Table 16-395. ELM_ERROR_LOCATION_3_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 088C + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 888C + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-396. Register Call Summary for Register ELM_ERROR_LOCATION_3_i

Error Location Module

- [Use Case: ELM Used in Continuous Mode: \[0\]](#)
- [Use Case: ELM Used in Page Mode: \[1\]](#)
- [ELM Register Summary: \[2\]](#)

Table 16-397. ELM_ERROR_LOCATION_4_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 0890 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8890 + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-398. Register Call Summary for Register ELM_ERROR_LOCATION_4_i

Error Location Module

- [ELM Register Summary: \[0\]](#)

Table 16-399. ELM_ERROR_LOCATION_5_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 0894 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8894 + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-400. Register Call Summary for Register ELM_ERROR_LOCATION_5_i

Error Location Module

- [ELM Register Summary: \[0\]](#)

Table 16-401. ELM_ERROR_LOCATION_6_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 0898 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 8898 + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-402. Register Call Summary for Register ELM_ERROR_LOCATION_6_i

Error Location Module

- [ELM Register Summary: \[0\]](#)

Table 16-403. ELM_ERROR_LOCATION_7_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 089C + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 889C + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-404. Register Call Summary for Register ELM_ERROR_LOCATION_7_i

Error Location Module

- [ELM Register Summary: \[0\]](#)

Table 16-405. ELM_ERROR_LOCATION_8_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 08A0 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 88A0 + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-406. Register Call Summary for Register ELM_ERROR_LOCATION_8_i

Error Location Module

- [ELM Register Summary: \[0\]](#)

Table 16-407. ELM_ERROR_LOCATION_9_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 08A4 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 88A4 + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-408. Register Call Summary for Register ELM_ERROR_LOCATION_9_i

Error Location Module

- [ELM Register Summary: \[0\]](#)

Table 16-409. ELM_ERROR_LOCATION_10_i

| | | | |
|------------------|---------------------------|----------|------------|
| Address Offset | 0x0000 08A8 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 88A8 + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-410. Register Call Summary for Register ELM_ERROR_LOCATION_10_i

Error Location Module

- [ELM Register Summary: \[0\]](#)

Table 16-411. ELM_ERROR_LOCATION_11_i

| | | | |
|------------------|---------------------------|----------|------------|
| Address Offset | 0x0000 08AC + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 88AC + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-412. Register Call Summary for Register ELM_ERROR_LOCATION_11_i

Error Location Module

- [ELM Register Summary: \[0\]](#)

Table 16-413. ELM_ERROR_LOCATION_12_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 08B0 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 88B0 + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-414. Register Call Summary for Register ELM_ERROR_LOCATION_12_i

Error Location Module

- [ELM Register Summary: \[0\]](#)

Table 16-415. ELM_ERROR_LOCATION_13_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 08B4 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 88B4 + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-416. Register Call Summary for Register ELM_ERROR_LOCATION_13_i

Error Location Module

- [ELM Register Summary: \[0\]](#)

Table 16-417. ELM_ERROR_LOCATION_14_i

| | | | |
|-------------------------|---------------------------|-----------------|------------|
| Address Offset | 0x0000 08B8 + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 88B8 + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-418. Register Call Summary for Register ELM_ERROR_LOCATION_14_i

Error Location Module

- [ELM Register Summary: \[0\]](#)

Table 16-419. ELM_ERROR_LOCATION_15_i

| | | | |
|------------------|---------------------------|----------|------------|
| Address Offset | 0x0000 08BC + (0x100 * i) | Index | i = 0 to 7 |
| Physical Address | 0x4807 88BC + (0x100 * i) | Instance | ELM |
| Description | Error-location register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ECC_ERROR_LOCATION | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|----------------------------|------|---------|
| 31:13 | RESERVED | Reserved | R | 0x00000 |
| 12:0 | ECC_ERROR_LOCATION | Error-location bit address | R | 0x0000 |

Table 16-420. Register Call Summary for Register ELM_ERROR_LOCATION_15_i

Error Location Module

- [Processing Initialization: \[0\]](#)
- [Processing Sequence: \[1\] \[2\]](#)
- [Processing Completion: \[3\]](#)
- [Read Results: \[4\] \[5\]](#)
- [ELM Register Summary: \[6\]](#)

16.6 On-Chip Memory (OCM) Subsystem

16.6.1 OCM Subsystem Overview

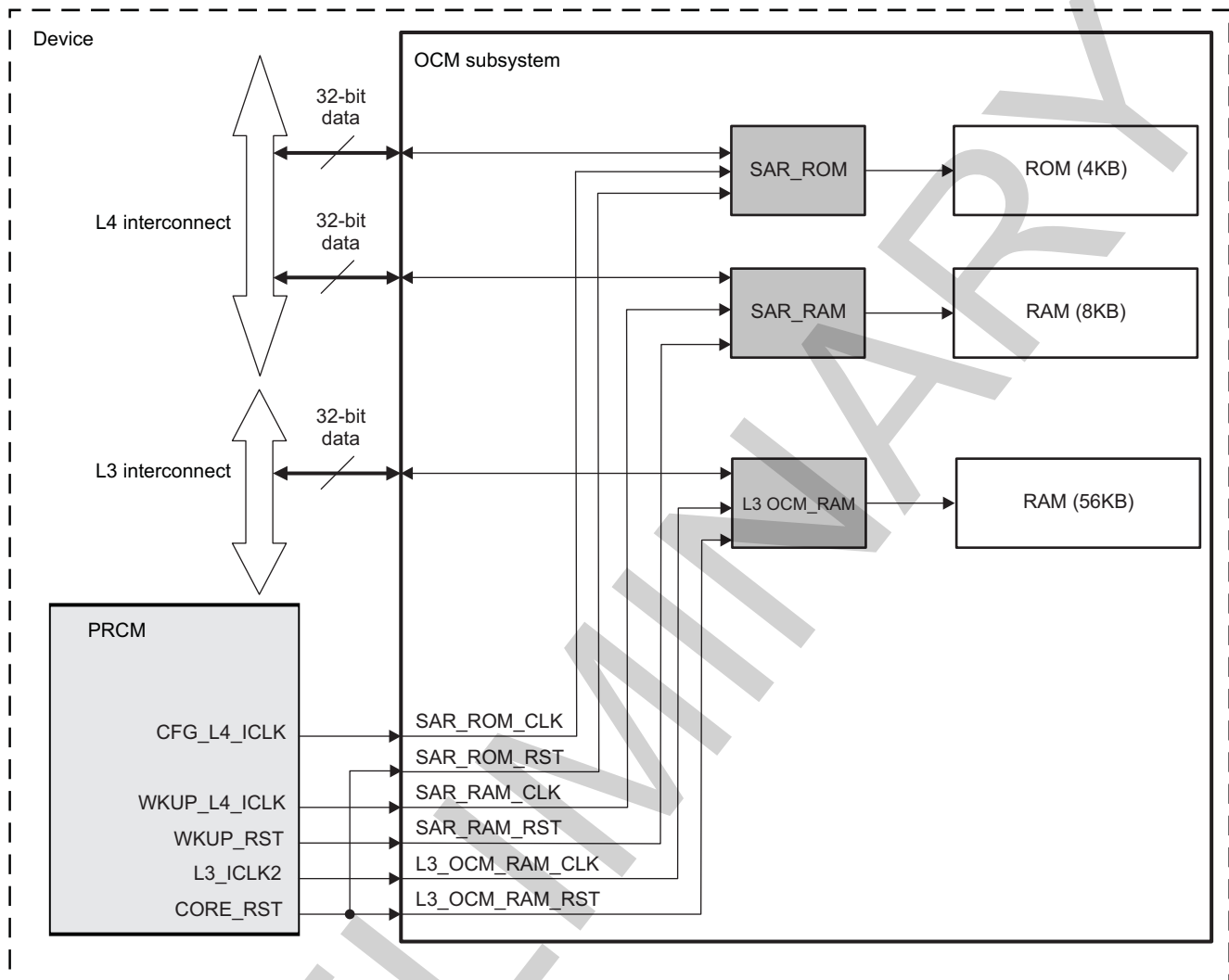
There are three on-chip memories in the device.

- A 4K-byte SAR read-only memory (ROM)
- A 8K-byte SAR random-access memory (RAM)
- A 56K-byte L3 static random-access memory (L3 OCM_RAM)

There are other on-chip memories located inside other subsystems (Cortex-A9 MPU, DSP IVA-HD, ABE, Cortex-M3 MPU) that are not described in the following sections. Refer to each subsystem chapter for more details.

16.6.2 OCM Subsystem Integration

[Figure 16-101](#) shows the integration of the OCM subsystem to the device.

Figure 16-101. OCM Subsystem Integration to the Device

Ocm-004

Table 16-421 through Table 16-422 summarize the integration of the module in the device.

Table 16-421. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| L3_OCM_RAM | PD_CORE | No | NA |
| SAR_RAM | PD_WKUP | No | NA |
| SAR_ROM | PD_CORE | No | NA |

Table 16-422. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|---|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| L3_OCM_RAM | L3_OCM_RAM_CLK | L3_ICLK2 | PRCM | L3_OCM_RAM Clock For information about PRCM clock gating and management, see the <i>CORE Power Domain Clocks Controls</i> section in Chapter 3, Power, Reset, and Clock Management . |

Table 16-422. Clocks and Resets (continued)

| SAR_RAM | SAR_RAM_CLK | WKUP_L4_ICLK | PRCM | SAR RAM clock For information about PRCM clock gating and management, see the <i>Wake-Up Power Domain Clocks Controls</i> section in Chapter 3, Power, Reset, and Clock Management . |
|-----------------|-------------------------|--------------------|--------|---|
| SAR_ROM | SAR_ROM_CLK | CFG_L4_ICLK | PRCM | SAR ROM clock For information about PRCM clock gating and management, see the <i>CORE Power Domain Clocks Controls</i> section in Chapter 3, Power, Reset, and Clock Management . |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| L3 OCM_RAM | L3 OCM_RAM_RST | CORE_RST | PRCM | L3 OCM_RAM reset signal For information about PRCM reset sources and distribution, see the <i>CORE Power Domain Reset Description</i> section in Chapter 3, Power, Reset, and Clock Management . |
| SAR_RAM | SAR_RAM_RST | WKUP_RST | PRCM | SAR RAM reset signal For information about PRCM reset sources and distribution, see the <i>WAKE-UP Power Domain Reset Description</i> section in Chapter 3, Power, Reset, and Clock Management . |
| SAR_ROM | SAR_ROM_RST | CORE_RST | PRCM | SAR ROM reset signal For information about PRCM reset sources and distribution, see the <i>CORE Power Domain Reset Description</i> section in Chapter 3, Power, Reset, and Clock Management . |

16.6.3 OCM Subsystem Functional Description

16.6.3.1 SAR ROM

This on-chip ROM contains 4K bytes of memory and a linked list of descriptors used by the system DMA (sDMA) during the restore context operation (when device transitions from OFF to ON modes).

The device-embedded SAR ROM has the following characteristics:

- 4K-bytes ROM
- 32-bit access per cycle
- Support for single and burst access transactions

The memory space of the embedded ROM starts at 0x4A05 E000 and ends at 0x4A05 FFFF (8K bytes are reserved, but only 4K bytes are used).

16.6.3.2 SAR RAM

The on-chip SAR RAM contains 8K bytes and is mapped as 4 blocks with irregular region sizes. This memory content is preserved when the device goes into OFF mode (as long as the wake-up voltage domain remains supplied). It is used as context-saving memory to be written by the software, so that the sDMA restores its saved content when the device transitions from OFF to ON mode. Locations not used by the sDMA can be used as a scratch-pad memory by the software. It is mapped on the wake-up voltage domain.

The device-embedded SAR RAM has the following characteristics:

- Support for single-access transactions
 - Operates at full L4-PER interconnect clock frequency
 - 32-bit access per cycle

The SAR RAM space is at the following location:

- SAR space 1 (4KB): Starts at 0x4A32 6000 and ends at 0x4A32 6FFF

- SAR space 2 (1KB): Starts at 0x4A32 7000 and ends at 0x4A32 73FF
- SAR space 3 (2KB): Starts at 0x4A32 8000 and ends at 0x4A32 87FF
- SAR space 4 (1KB): Starts at 0x4A32 9000 and ends at 0x4A32 93FF

16.6.3.3 L3 OCM_RAM

The on-chip L3 OCM_RAM contains 56K bytes of RAM, partitioning is defined by the L3 firewall logic. The device-embedded L3 OCM_RAM has the following characteristics:

- Support for single and burst access transactions:
 - Operates at full L3 interconnect clock frequency
 - Fully pipelined, one 32-bit access per cycle
- Restricted access support based on:
 - A region-based partitioning (refer to L3 firewall description)
 - The module owner of the access, with respect to its read and write permissions to that region
 - The transaction attributes of the access, with respect to the region permission properties. See [Section 14.2, L3 Interconnect](#) for details.

The memory space of the embedded RAM starts at 0x4030 0000 and ends at 0x4030 DFFF.

This chapter describes the system direct memory access (sDMA) module.

| Topic | Page |
|---|------|
| 17.1 sDMA Module Overview | 3378 |
| 17.2 sDMA Controller Environment | 3380 |
| 17.3 sDMA Module Integration | 3382 |
| 17.4 sDMA Functional Description | 3387 |
| 17.5 sDMA Basic Programming Model | 3422 |
| 17.6 sDMA Register Manual | 3431 |

17.1 sDMA Module Overview

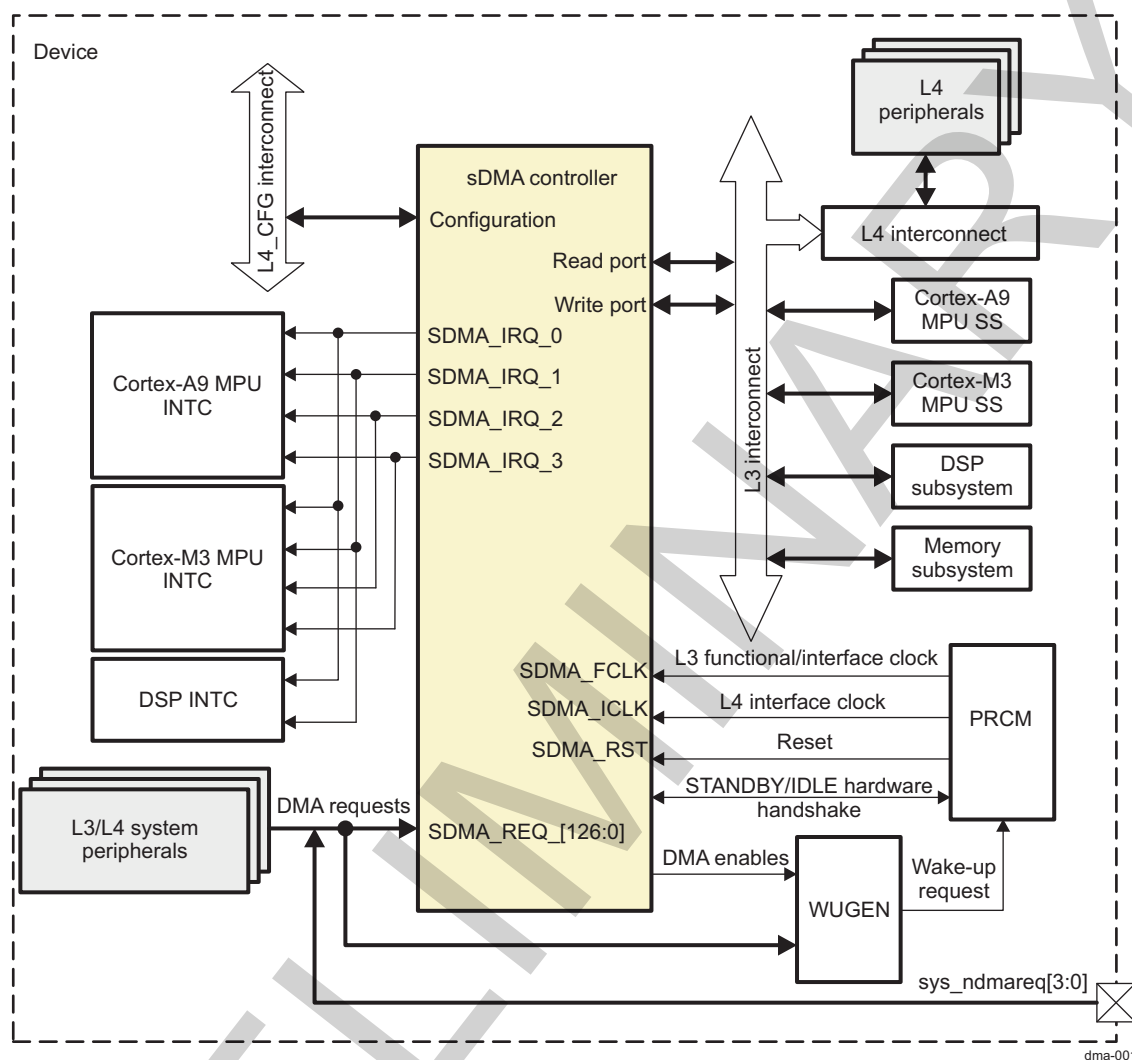
The system direct memory access (sDMA) module, also called DMA4, performs high-performance data transfers between memories and peripheral devices without microprocessor unit (MPU) or digital signal processor (DSP) support during transfer. A DMA transfer is programmed through a logical DMA channel, which allows the transfer to be optimally tailored to the requirements of the application.

The DMA controller includes the following main features:

- Data transfer support in either direction between:
 - Memory and memory
 - Memory and peripheral device
- 32 logical DMA channels supporting:
 - Multiple concurrent transfers
 - Independent transfer profile for each channel
 - 8-bit, 16-bit, or 32-bit data element transfer size
 - Software-triggered or hardware-synchronized transfers
 - Flexible source and destination address generation
 - Burst read and write
 - Chained multiple-channel transfers
 - Endianism conversion
 - Draining
 - Linked-list support for descriptor types 1, 2, and 3
- First-come, first-serve DMA scheduling with fixed priority
- Up to 127 DMA requests
- Constant fill
- Transparent copy
- Four programmable interrupt request output lines
- FIFO depth: 256 × 64-bit
- Data buffering
- FIFO budget allocation
- Power-management support
- Auto-idle power-saving support
- Implementation of retention flip-flops (RFFs) to support dynamic power switching (DPS) between system power modes without MPU involvement. For more information about DPS, see [Section 3.1.2.3, Dynamic Power Switching](#), in [Chapter 3, Power, Reset and Clock Management](#).

Figure 17-1 shows an overview of the sDMA module.

Figure 17-1. sDMA Overview



The sDMA module has three ports: one read, one write, and one configuration port, and provides multiple logical channel support. A dynamically allocated FIFO queue memory pool provides buffering between the read and write ports, which are multithreaded (two threads for the write port and four threads for the read port); this means that each transaction is flagged by a thread ID (0, 1, 2, or 3) in the request direction and in the response direction. This allows the read port to have four outstanding requests at a time. The write port has two threads available.

The MPU (or DSP) configures the sDMA through the L4_CFG interconnect.

17.2 sDMA Controller Environment

The sDMA controller supports external DMA requests through the sys_ndmareq[3:0] pins (see [Table 17-1](#)). A logical channel can be configured to respond to an external synchronization request.

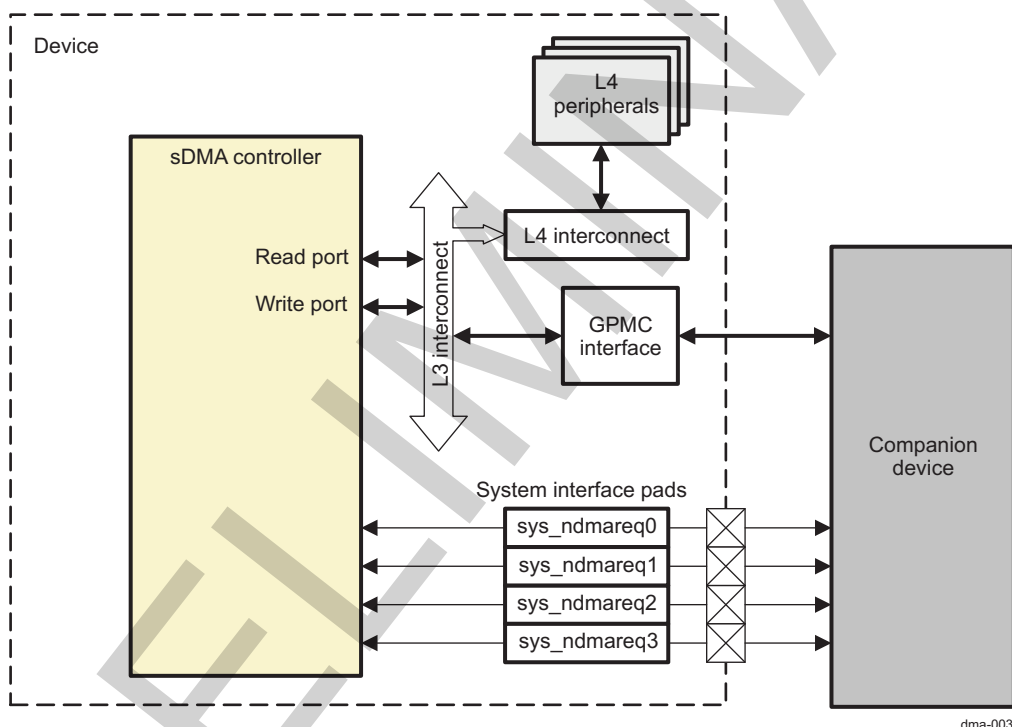
Table 17-1. External sDMA Request Signals

| Signal Name | I/O ⁽¹⁾ | Description | Reset Value |
|--------------|--------------------|---|-------------|
| sys_ndmareq0 | I | External DMA request 0 (system expansion) | Z |
| sys_ndmareq1 | I | External DMA request 1 (system expansion) | Z |
| sys_ndmareq2 | I | External DMA request 2 (system expansion) | Z |
| sys_ndmareq3 | I | External DMA request 3 (system expansion) | Z |

⁽¹⁾ I = Input, O = Output

[Figure 17-2](#) shows an example of how to use the external hardware DMA request pins in the sDMA environment.

Figure 17-2. Example of External DMA Requests Use



An external device can use the external DMA request pins to start a logical channel transfer over the general-purpose memory controller (GPMC) interface. The transfer can be a memory-to-memory transfer in which the source memory is in the external device.

By default, the external DMA request signals are not available on external pins after a cold reset. For more information about multiplexing out the four signal lines to pins, see [Chapter 19, Control Module](#).

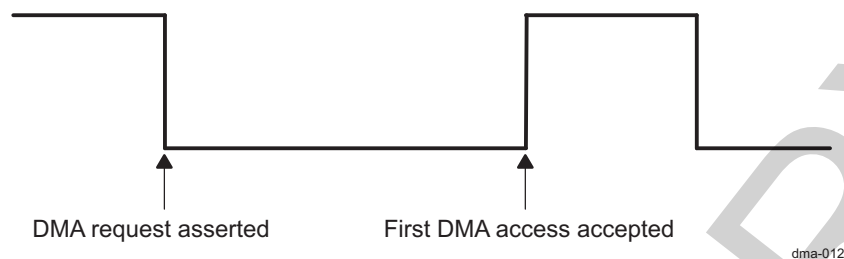
All 127 DMA request lines are transition-sensitive.

For a transition-sensitive DMA request (see [Figure 17-3](#)), the line must be maintained low (asserted) until the first DMA access is complete, after which the line must be maintained high (deasserted) for more than one clock cycle (DMA_L3_ICLK):

- When the deassertion time is less than one clock cycle, the sDMA may not detect the deassertion.
- When the channel is enabled one cycle after a DMA request is disabled, the channel detects the DMA request and starts the corresponding transfer.
- When the channel is enabled two cycles after the DMA request is disabled, the channel does not

detect the DMA request.

Figure 17-3. Transition-Sensitive DMA Request Scheme

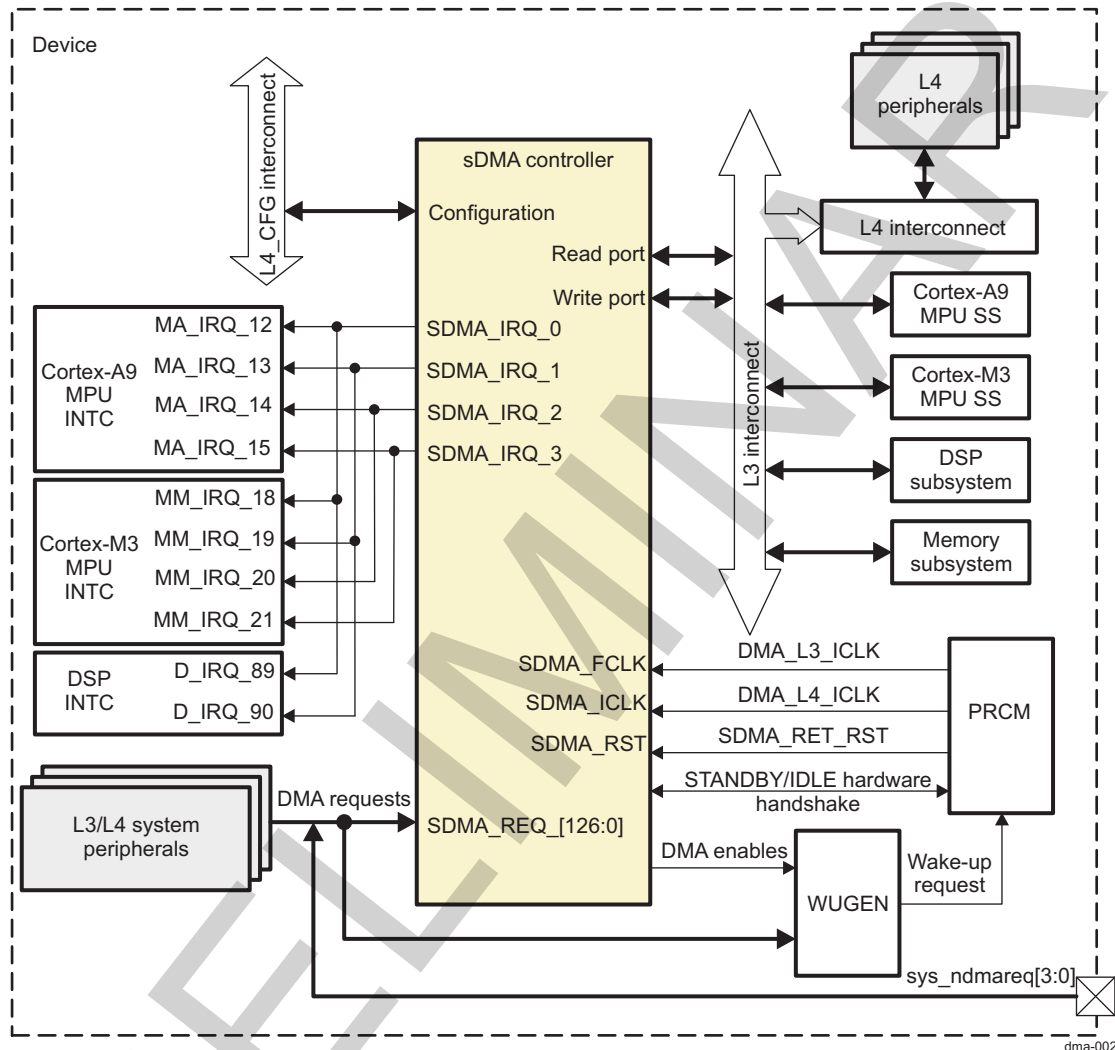


17.3 sDMA Module Integration

This section describes the integration of the module in the device, including information about clocks, resets, and hardware requests.

Figure 17-4 shows the sDMA controller integration.

Figure 17-4. sDMA Controller Integration



NOTE: For more information about the wake-up generator (WUGEN), the STANDBY/IDLE hardware handshake, and the wake-up request, see [Section 3.1.1.1, Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 17-2 through Table 17-4 summarize the integration of the module in the device.

Table 17-2. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|---------------|
| | Power Domain | Interconnect |
| sDMA | PD_CORE | L3 and L4_CFG |

Table 17-3. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| sDMA | SDMA_FCLK | DMA_L3_ICLK | PRCM | Functional clock for all internal logic and for the two master read and write ports. For information about the power, reset, and clock management (PRCM) clock gating and management, see Chapter 3, Power, Reset, and Clock Management . |
| | SDMA_ICLK | DMA_L4_ICLK | | Interface clock. It supports the configuration port. For information about PRCM clock gating and management, see Chapter 3, Power, Reset, and Clock Management . |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| sDMA | SDMA_RST | SDMA_RET_RST | PRCM | Hardware reset. It initializes all internal logic of the sDMA module, all global registers, and some of the per-channel registers, implemented in flip-flops. However, all remaining per-channel registers are memory-based, and, therefore, are not reset (have undefined values). Thus, when programming a channel for the first time, all bits that have undefined reset values must be configured before enabling the channel. For information about PRCM reset sources and distribution, see Chapter 3, Power, Reset, and Clock Management . |

Table 17-4. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|---------------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| sDMA | SDMA_IRQ_0 | MA_IRQ_12 | Cortex™-A9 MPU INTC | sDMA interrupt request 0. For information about the Cortex-A9 MPU INTC, see Section 18.3.2 . |
| | SDMA_IRQ_1 | MA_IRQ_13 | Cortex-A9 MPU INTC | sDMA interrupt request 1 |
| | SDMA_IRQ_2 | MA_IRQ_14 | Cortex-A9 MPU INTC | sDMA interrupt request 2 |
| | SDMA_IRQ_3 | MA_IRQ_15 | Cortex-A9 MPU INTC | sDMA interrupt request 3 |
| | SDMA_IRQ_0 | MM_IRQ_18 | Cortex™-M3 MPU INTC | sDMA interrupt request 0. For information about the Cortex-M3 MPU INTC, see Section 18.3.3 . |
| | SDMA_IRQ_1 | MM_IRQ_19 | Cortex-M3 MPU INTC | sDMA interrupt request 1 |
| | SDMA_IRQ_2 | MM_IRQ_20 | Cortex-M3 MPU INTC | sDMA interrupt request 2 |
| | SDMA_IRQ_3 | MM_IRQ_21 | Cortex-M3 MPU INTC | sDMA interrupt request 3 |
| | SDMA_IRQ_0 | D_IRQ_89 | DSP INTC | sDMA interrupt request 0. For information about the DSP INTC, see Section 18.3.4 . |
| | SDMA_IRQ_1 | D_IRQ_90 | DSP INTC | sDMA interrupt request 1 |

NOTE: For a description of the interrupt source, see [Section 17.4.2, sDMA Controller Interrupt Requests](#).

17.3.1 DMA Requests to the sDMA Controller

Table 17-5 lists the sDMA controller request mapping.

Table 17-5. sDMA Controller Request Mapping

| DMA Request Line | Source | Description |
|------------------|---------------|---|
| S_DMA_0 | Reserved | Reserved |
| S_DMA_1 | sys_dma_req0 | External DMA request 0 (system expansion) |
| S_DMA_2 | sys_dma_req1 | External DMA request 1 (system expansion) |
| S_DMA_3 | GPMC_DMA | GPMC data transmit request from prefetch engine |
| S_DMA_4 | Reserved | Reserved |
| S_DMA_5 | DSS_DISPC_DMA | Frame update request |
| S_DMA_6 | sys_dma_req2 | External DMA request 2 (system expansion) |
| S_DMA_7 | MCASP1_AXEVT | McASP1 transmit request |
| S_DMA_8 | ISS_DMA0 | Imaging subsystem request 0 |
| S_DMA_9 | ISS_DMA1 | Imaging subsystem request 1 |
| S_DMA_10 | Reserved | Reserved |
| S_DMA_11 | ISS_DMA2 | Imaging subsystem request 2 |
| S_DMA_12 | ISS_DMA3 | Imaging subsystem request 3 |
| S_DMA_13 | DSS_RFBI_DMA | Display subsystem RFBI request |
| S_DMA_14 | SPI3_DMA_TX0 | McSPI3 transmit request channel 0 |
| S_DMA_15 | SPI3_DMA_RX0 | McSPI3 receive request channel 0 |
| S_DMA_16 | MCBSP2_DMA_TX | McBSP2 transmit request |
| S_DMA_17 | MCBSP2_DMA_RX | McBSP2 receive request |
| S_DMA_18 | MCBSP3_DMA_TX | McBSP3 transmit request |
| S_DMA_19 | MCBSP3_DMA_RX | McBSP3 receive request |
| S_DMA_20 | C2C_SSCM_GPO0 | C2C GPO line 0 |
| S_DMA_21 | C2C_SSCM_GPO1 | C2C GPO line 1 |
| S_DMA_22 | SPI3_DMA_TX1 | McSPI3 transmit request channel 1 |
| S_DMA_23 | SPI3_DMA_RX1 | McSPI3 receive request channel 1 |
| S_DMA_24 | I2C3_DMA_TX | I2C3 transmit request |
| S_DMA_25 | I2C3_DMA_RX | I2C3 receive request |
| S_DMA_26 | I2C1_DMA_TX | I2C1 transmit request |
| S_DMA_27 | I2C1_DMA_RX | I2C1 receive request |
| S_DMA_28 | I2C2_DMA_TX | I2C2 transmit request |
| S_DMA_29 | I2C2_DMA_RX | I2C2 receive request |
| S_DMA_30 | MCBSP4_DMA_TX | McBSP4 transmit request |
| S_DMA_31 | MCBSP4_DMA_RX | McBSP4 receive request |
| S_DMA_32 | MCBSP1_DMA_TX | McBSP1 transmit request |
| S_DMA_33 | MCBSP1_DMA_RX | McBSP1 receive request |
| S_DMA_34 | SPI1_DMA_TX0 | McSPI1 transmit request channel 0 |
| S_DMA_35 | SPI1_DMA_RX0 | McSPI1 receive request channel 0 |
| S_DMA_36 | SPI1_DMA_TX1 | McSPI1 transmit request channel 1 |
| S_DMA_37 | SPI1_DMA_RX1 | McSPI1 receive request channel 1 |
| S_DMA_38 | SPI1_DMA_TX2 | McSPI1 transmit request channel 2 |
| S_DMA_39 | SPI1_DMA_RX2 | McSPI1 receive request channel 2 |

Table 17-5. sDMA Controller Request Mapping (continued)

| DMA Request Line | Source | Description |
|------------------|------------------|---|
| S_DMA_40 | SPI1_DMA_TX3 | McSPI1 transmit request channel 3 |
| S_DMA_41 | SPI1_DMA_RX3 | McSPI1 receive request channel 3 |
| S_DMA_42 | SPI2_DMA_TX0 | McSPI2 transmit request channel 0 |
| S_DMA_43 | SPI2_DMA_RX0 | McSPI2 receive request channel 0 |
| S_DMA_44 | SPI2_DMA_TX1 | McSPI2 transmit request channel 1 |
| S_DMA_45 | SPI2_DMA_RX1 | McSPI2 receive request channel 1 |
| S_DMA_46 | MMC2_DMA_TX | MMC2 transmit request |
| S_DMA_47 | MMC2_DMA_RX | MMC2 receive request |
| S_DMA_48 | UART1_DMA_TX | UART1 transmit request |
| S_DMA_49 | UART1_DMA_RX | UART1 receive request |
| S_DMA_50 | UART2_DMA_TX | UART2 transmit request |
| S_DMA_51 | UART2_DMA_RX | UART2 receive request |
| S_DMA_52 | UART3_DMA_TX | UART3 transmit request |
| S_DMA_53 | UART3_DMA_RX | UART3 receive request |
| S_DMA_54 | UART4_DMA_TX | UART4 transmit request |
| S_DMA_55 | UART4_DMA_RX | UART4 receive request |
| S_DMA_56 | MMC4_DMA_TX | MMC4 transmit request |
| S_DMA_57 | MMC4_DMA_RX | MMC4 receive request |
| S_DMA_58 | MMC5_DMA_TX | MMC5 transmit request |
| S_DMA_59 | MMC5_DMA_RX | MMC5 receive request |
| S_DMA_60 | MMC1_DMA_TX | MMC1 transmit request |
| S_DMA_61 | MMC1_DMA_RX | MMC1 receive request |
| S_DMA_62 | Reserved | Reserved |
| S_DMA_63 | sys_dma_req3 | External DMA request 3 (system expansion) |
| S_DMA_64 | MCPDM_DMA_UP | McPDM uplink request |
| S_DMA_65 | MCPDM_DMA_DOWN | McPDM downlink request |
| S_DMA_66 | DMIC_DMA | DMIC DMA request |
| S_DMA_67 | C2C_SSCM_GPO2 | C2C GPO line 2 |
| S_DMA_68 | C2C_SSCM_GPO3 | C2C GPO line 3 |
| S_DMA_69 | SPI4_DMA_TX0 | McSPI4 transmit request channel 0 |
| S_DMA_70 | SPI4_DMA_RX0 | McSPI4 receive request channel 0 |
| S_DMA_71 | DSS_DSI1_DMA0 | Display subsystem DSI1 request 0 |
| S_DMA_72 | DSS_DSI1_DMA1 | Display subsystem DSI1 request 1 |
| S_DMA_73 | DSS_DSI1_DMA2 | Display subsystem DSI1 request 2 |
| S_DMA_74 | DSS_DSI1_DMA3 | Display subsystem DSI1 request 3 |
| S_DMA_75 | DSS_HDMI_DMA | Display subsystem HDMI audio request |
| S_DMA_76 | MMC3_DMA_TX | MMC3 transmit request |
| S_DMA_77 | MMC3_DMA_RX | MMC3 receive request |
| S_DMA_78 | Reserved | Reserved |
| S_DMA_79 | Reserved | Reserved |
| S_DMA_80 | DSS_DSI2_DMA0 | Display subsystem DSI2 request 0 |
| S_DMA_81 | DSS_DSI2_DMA1 | Display subsystem DSI2 request 1 |
| S_DMA_82 | DSS_DSI2_DMA2 | Display subsystem DSI2 request 2 |
| S_DMA_83 | DSS_DSI2_DMA3 | Display subsystem DSI2 request 3 |
| S_DMA_84 | SLIMBUS1_DMA_TX0 | SLIMBUS1 transmit request channel 0 |
| S_DMA_85 | SLIMBUS1_DMA_TX1 | SLIMBUS1 transmit request channel 1 |
| S_DMA_86 | SLIMBUS1_DMA_TX2 | SLIMBUS1 transmit request channel 2 |

Table 17-5. sDMA Controller Request Mapping (continued)

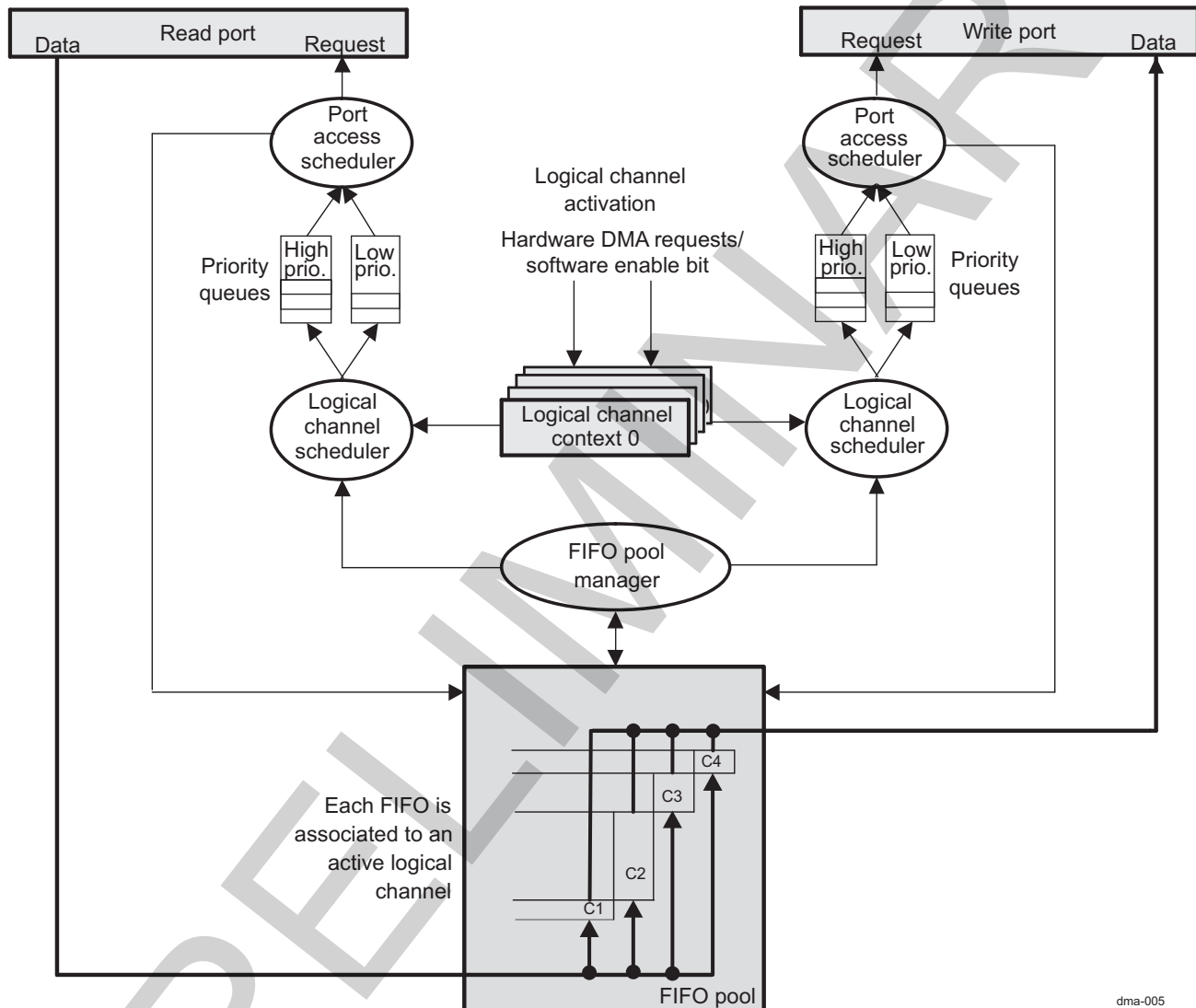
| DMA Request Line | Source | Description |
|------------------|------------------|-------------------------------------|
| S_DMA_87 | SLIMBUS1_DMA_TX3 | SLIMBUS1 transmit request channel 3 |
| S_DMA_88 | SLIMBUS1_DMA_RX0 | SLIMBUS1 receive request channel 0 |
| S_DMA_89 | SLIMBUS1_DMA_RX1 | SLIMBUS1 receive request channel 1 |
| S_DMA_90 | SLIMBUS1_DMA_RX2 | SLIMBUS1 receive request channel 2 |
| S_DMA_91 | SLIMBUS1_DMA_RX3 | SLIMBUS1 receive request channel 3 |
| S_DMA_92 | SLIMBUS2_DMA_TX0 | SLIMBUS2 transmit request channel 0 |
| S_DMA_93 | SLIMBUS2_DMA_TX1 | SLIMBUS2 transmit request channel 1 |
| S_DMA_94 | SLIMBUS2_DMA_TX2 | SLIMBUS2 transmit request channel 2 |
| S_DMA_95 | SLIMBUS2_DMA_TX3 | SLIMBUS2 transmit request channel 3 |
| S_DMA_96 | SLIMBUS2_DMA_RX0 | SLIMBUS2 receive request channel 0 |
| S_DMA_97 | SLIMBUS2_DMA_RX1 | SLIMBUS2 receive request channel 1 |
| S_DMA_98 | SLIMBUS2_DMA_RX2 | SLIMBUS2 receive request channel 2 |
| S_DMA_99 | SLIMBUS2_DMA_RX3 | SLIMBUS2 receive request channel 3 |
| S_DMA_100 | ABE_DMA0 | Audio back-end – request FIFO 0 |
| S_DMA_101 | ABE_DMA1 | Audio back-end – request FIFO 1 |
| S_DMA_102 | ABE_DMA2 | Audio back-end – request FIFO 2 |
| S_DMA_103 | ABE_DMA3 | Audio back-end – request FIFO 3 |
| S_DMA_104 | ABE_DMA4 | Audio back-end – request FIFO 4 |
| S_DMA_105 | ABE_DMA5 | Audio back-end – request FIFO 5 |
| S_DMA_106 | ABE_DMA6 | Audio back-end – request FIFO 6 |
| S_DMA_107 | ABE_DMA7 | Audio back-end – request FIFO 7 |
| S_DMA_108 | Reserved | Reserved |
| S_DMA_109 | Reserved | Reserved |
| S_DMA_110 | Reserved | Reserved |
| S_DMA_111 | Reserved | Reserved |
| S_DMA_112 | Reserved | Reserved |
| S_DMA_113 | Reserved | Reserved |
| S_DMA_114 | Reserved | Reserved |
| S_DMA_115 | Reserved | Reserved |
| S_DMA_116 | Reserved | Reserved |
| S_DMA_117 | Reserved | Reserved |
| S_DMA_118 | Reserved | Reserved |
| S_DMA_119 | Reserved | Reserved |
| S_DMA_120 | Reserved | Reserved |
| S_DMA_121 | Reserved | Reserved |
| S_DMA_122 | Reserved | Reserved |
| S_DMA_123 | I2C4_DMA_TX | I2C4 transmit request |
| S_DMA_124 | I2C4_DMA_RX | I2C4 receive request |
| S_DMA_125 | Reserved | Reserved |
| S_DMA_126 | Reserved | Reserved |

17.4 sDMA Functional Description

The sDMA module provides high-performance data transfers between memories and peripheral devices with low processor use. A DMA transfer is programmed through a logical DMA channel, which allows the transfer to be optimally tailored to the requirements of the application.

Figure 17-5 shows the sDMA controller top-level block diagram.

Figure 17-5. sDMA Controller Top-Level Block Diagram



dma-005

17.4.1 sDMA Controller Power Management

Table 17-6 describes power-management features available for the sDMA controller.

NOTE:

- For information about source clock gating and sleep/wake-up transitions, see [Section 3.1.1.1, Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).
- For a description of the EnaWakeUp, IdleMode, ClockActivity, and StandbyMode features, see [Section 3.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 17-6. Local Power-Management Features

| Feature | Registers | Description |
|------------------------|--|---|
| Clock auto gating | DMA4_OCP_SYSCONFIG [0] AUTOIDLE bit | This bit allows local power optimization inside the module by gating the SDMA_ICLK clock upon the interface activity. |
| Slave idle modes | DMA4_OCP_SYSCONFIG [4:3] SIDLEMODE bit field | Force-idle, no-idle, and smart-idle modes are available. |
| Clock activity | DMA4_OCP_SYSCONFIG [9:8] CLOCKACTIVITY bit field | For configuration details, see Table 17-7 . |
| Master standby modes | DMA4_OCP_SYSCONFIG [13:12] MIDLEMODE bit field | Force-standby, no-standby, and smart-standby modes are available. |
| Global wake-up enable | N/A | Feature not available |
| Wake-up sources enable | N/A | Feature not available |

[Table 17-7](#) lists the clock states in accordance with the state of the module.

Table 17-7. Clock Activity Settings

| SDMA_CLOCKACTIVITY Values | Clock State When Module is in IDLE State | |
|---------------------------|--|-----------|
| | SDMA_ICLK | SDMA_FCLK |
| 00 | Off | Off |
| 10 | Off | On |
| 01 | On | Off |
| 11 | On | On |

CAUTION

Because the PRCM module cannot read CLOCKACTIVITY settings through hardware, software must ensure consistent programming between the SDMA_CLOCKACTIVITY and sDMA clock PRCM control bits. For a description of the ClockActivity feature, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

17.4.2 sDMA Controller Interrupt Requests

DMA4 has four interrupt lines (L_j, where j = 0, 1, 2, 3). Each logical channel can request an interrupt over any line. The attachment of a channel interrupt event to one of these four external lines is programmable. Software determines whether it attaches a channel interrupt to a single interrupt request (IRQ) line or to multiple IRQ lines.

There are two different registers per interrupt line:

- The [DMA4_IRQSTATUS_Lj](#) CH_31_0_Lj field shows the status of the different sources of interrupt. If the [DMA4_IRQENABLE_Lj](#) bit is 1, channel *i* is the source of interrupt in line *j*. In contrast to the [DMA4_CSRi](#) registers, the [DMA4_IRQSTATUS_Lj](#) registers are updated regardless of the corresponding bits in the [DMA4_IRQENABLE_Lj](#) registers.
- The [DMA4_IRQENABLE_Lj](#) CH_31_0_Lj_EN field masks/unmasks the channel interrupt. If the [DMA4_IRQENABLE_Lj](#) bit is set to 0, channel interrupt *i* of the line *j* is masked.

Each logical channel can generate a number of different interrupt events when enabled (that is, set to 1) in the [DMA4_CICRi](#) register. Each status bit is updated in the [DMA4_CSRi](#) register only when the corresponding enable bit is enabled in the [DMA4_CICRi](#) register.

To determine an interrupt source when an interrupt rises on an interrupt line L_j:

- Identify the channel (LCH_i) generating the interrupt.
Read [DMA4_IRQSTATUS_Lj](#).LCH_i (LCH₀ to LCH₃₁). If LCH_i = 1, channel *i* is the originator of the interrupt.

- Identify the interrupt event.
Read the LCHi [DMA4_CSRi](#). For example, if the drop event (the [DMA4_CSRi\[1\]](#) DROP bit) is 1, a request collision occurs.
The interrupt event status bit in the [DMA4_CSRi](#) register is immediately reset after it is written to 1.
The interrupt status bit in the [DMA4_IRQSTATUS_Lj](#) register is cleared after it is written to 1.

17.4.2.1 Interrupt Generation

The sDMA module has four interrupt request output lines, SDMA_IRQ_0 to SDMA_IRQ_3. One or more logical channels can be programmed to generate an interrupt request on any of these lines when any one of the maskable DMA events listed in [Table 17-8](#) occurs.

Table 17-8. Logical DMA Channel Events

| Event | Description |
|------------------------------|---|
| End of packet | A packet transfer completed. |
| End of block | A block transfer completed. |
| End of frame | A frame transfer completed. |
| End of super block | A super block transfer completed. |
| Half of frame | Half of the current frame transferred. |
| Start of last frame | The first element of the last frame transferred. |
| Transaction error | A transaction error is returned by the interconnect in either the read or write port. |
| Address error | An attempt was made to perform a DMA access to an address not aligned on an ES boundary. Condition to occur: if DMA4_CEN[23:0] CHANNEL_ELMNT_NBR = 0x000000 or DMA4_CFN[15:0] CHANNEL_FRAME_NBR = 0x0000 or DMA4_CSDP[1:0] DATA_TYPE = 0x3. |
| Supervisor transaction error | An error occurred, for example, when an unauthorized initiator (that is, not a supervisor) tries to use a supervisor transfer. |
| Drain end | Drain is completed (DMA4_CCRi[10] WR_ACTIVE becomes 0). |
| Drop error | A drop event interrupt is generated when a DMA request is being serviced while a second one is asserted and a third one arrives before the second DMA request is serviced. |

The logical DMA channels that generate an interrupt on a particular IRQ output are specified through the [DMA4_IRQENABLE_Lj](#) register (where *j* is the IRQ number: 0, 1, 2, or 3). The events that generate an interrupt for a particular channel can be configured through the channel [DMA4_CICRi](#) register.

When an interrupt is detected, the logical DMA channel generating the event can first be identified by reading the [DMA4_IRQSTATUS_Lj](#) register. The event causing the interrupt then can be identified by reading the interrupt status through the relevant DMA channel [DMA4_CSRi](#) register.

17.4.3 Logical Channel Transfer Overview

As [Figure 17-5](#) shows, the sDMA module has one read port and one write port operating independently of one another. Buffering is provided between the read and write ports through a FIFO queue memory pool that is shared dynamically between the active logical channels.

- Logical channel synchronization
A logical channel is described as hardware-synchronized when the DMA transfers are triggered by DMA requests from a hardware device. Alternatively, a logical channel is described as nonsynchronized when the DMA transfer is triggered by software.
- Logical channel activation
A logical channel becomes active as follows:
 - For hardware-synchronized transfers, when the logical channel is enabled and the hardware DMA request line is asserted
 - For software-triggered (nonsynchronized) transfers, as soon as software enables the logical channel
- Logical channel transfer composition

A DMA transfer is divided automatically into a number of transactions. Depending on the logical channel context configured, the transfer size, start address alignment, addressing mode, and configured maximum burst size, each transaction can be a single access or a burst of accesses.

- Logical channel scheduling

When several logical channels are active at the same time, schedulers manage the read and write ports. The scheduling of logical channel transfers is similar for both read and write ports. When a logical channel becomes active, it is added to the end of a scheduling queue. If more than one logical channel becomes active at the same time, the one with the lower number is queued first. This mechanism provides a first-come, first-serve scheduling scheme between the concurrently active logical channels.

In addition, each read and write port has a high-priority queue and a low-priority queue. The priority bits (WRITE_PRIORITY and READ_PRIORITY) in the logical channel [DMA4_CCRi](#) register determine whether a logical channel is queued as high or low priority. A software-configurable 8-bit priority counter gives weighting to the priority write queue. For every N (1 to 255) schedules from the priority write queue, one is scheduled from the regular write queue. A channel that is scheduled goes to the end of the queue after it completes its turn on the port. The relative weighting of the scheduling of the high-priority queue to the low priority queue is programmable from 1:1 to 1:256 through the DMA global channel register using the [DMA4_GCR\[23:16\]](#) ARBITRATION_RATE bit field.

NOTE: The [DMA4_GCR\[23:16\]](#) ARBITRATION_RATE bit field does not depend on the [DMA4_GCR\[13:12\]](#) HI_THREAD_RESERVED bit field. The ARBITRATION_RATE bit field depends on the [DMA4_CCRi\[26\]](#) WRITE_PRIORITY bit and the [DMA4_CCRi\[6\]](#) READ_PRIORITY bit.

- Read/write port access scheduling policy

When either the read or write port becomes available, the port access scheduler selects the next logical channel for which to perform a DMA transaction from either the high- or low-priority queue.

When the current DMA transaction (single or burst access) is complete and the full DMA transfer is not finished, the logical channel returns to the end of the queue. Because the port access scheduling is on a per-transaction basis, a logical channel can be queued repeatedly this way several times during its block transfer.

The sDMA module can have up to four outstanding read transactions and two outstanding write transactions in the system interconnect; four read and two write thread IDs exist. For an arbitration cycle to occur, these two conditions must be met:

- At least one channel is requesting
- At least one free thread ID is available

On an arbitration cycle, the scheduler grants the highest priority channel that has an active request, allocates the thread ID, and tags this thread as busy. At a given time, a channel cannot be allocated for more than one thread ID.

NOTE: If more than one channel is active, each channel is given a thread ID for the current service only, not for the whole channel transfer.

When only one channel is enabled, only one thread is allocated for the channel. In such a situation the channel can have a maximum of four outstanding commands (without getting the responses) without rescheduling the channel at the end of each transaction. Each command can be either single access (8-bit, 16-bit, or 32-bit) or burst access ($2 \times M$, $4 \times M$, $8 \times M$, or $16 \times M$, where M can be 8, 16, or 32 bits).

When nonburst alignment is at the beginning of the transfer, the channel is rescheduled for each smaller access until burst-aligned. When the end of the transfer is not burst-aligned, the channel is rescheduled for each of the remaining smaller accesses.

For a logical channel transfer completion, when the last access is written to the destination, the logical channel becomes inactive. If enabled, an interrupt request is generated (see [Section 17.4.2.1, Interrupt Generation](#)).

17.4.4 FIFO Queue Memory Pool

A FIFO queue memory pool provides buffering between the read and write ports. The hardware allocates the space dynamically to a number of FIFO queues, and each queue is associated with an active logical channel.

To avoid a memory pool overflow, if there are fewer entries in the FIFO queue memory pool than are required for the maximum configured source burst size of the next logical channel to be scheduled, the logical channel is returned to the end of the queue, and the port access scheduler continues to search the queue until it finds a logical channel that can be scheduled.

The maximum FIFO depth that can be allocated to each individual logical channel can be limited globally through the [DMA4_GCR\[7:0\] MAX_CHANNEL_FIFO_DEPTH](#) bit field. This value should be configured to allow a fair allocation of the memory pool between the active channels.

A logical channel is scheduled if it has not yet reached its allocation limit, even if the access to be performed will exceed this limit. This means that the effective number of entries used by a particular logical channel is limited to the configured maximum entries per channel plus the channel maximum configured burst size (in words) 1.

17.4.5 Addressing Modes

A DMA transfer block consists of a number of frames (FN). Each frame consists of a number of elements (EN), and each element can have a size of 8, 16, or 32 bits (ES), as follows:

$$\text{transfer block size} = \text{FN} \times \text{EN} \times \text{ES}$$

The FN, EN, and ES are common for the source and destination. However, the way in which the data is represented (addressing profile/mode) is independently programmable for the source and destination devices, using one of these four addressing modes:

- Constant: The address remains the same for consecutive element accesses.
- Post-increment: The address increases by the ES, even across consecutive frames.
- Single-index: The address increases by the ES plus the element index (EI) value minus 1 (even across consecutive frames).
- Double-index: The address increases by the ES plus the EI value minus 1 within a frame. When a full frame is transferred, the address increases by the ES plus the frame index (FI) value minus 1.

The ES, EI, and FI values are expressed in bytes. The EI and FI values can be positive or negative.

When calculating the EI and FI values, it is critical to note that, after an element is accessed, the logical channel address pointer equals the address of the last byte (highest address) of the accessed element. The correct value for the EI or FI must be such that, when added to the logical channel address pointer, it results in the address of the first byte (lowest address) of the next element to be accessed.

The EI and FI values must be configured so that the address of each element in the transfer is aligned on an ES boundary.

Consequently, the single-index addressing mode with EI = 1 or double-index addressing mode with EI = 1 and FI = 1 is equivalent to post-increment addressing.

NOTE: The source and destination start addresses must also be aligned on an ES boundary.

When the address of an element to be accessed is not aligned on an ES boundary, the transfer is stopped and a misaligned address error interrupt occurs, if enabled (see [Section 17.4.2.1, Interrupt Generation](#)).

The [DMA4_CFNi](#) register configures the FN in a block.

The [DMA4_CENi](#) register configures the EN.

The [DMA4_CSDPi](#) register configures the ES.

The [DMA4_CSSAi](#) and [DMA4_CDSAi](#) registers configure the source and destination start addresses.

The [DMA4_CCRi](#) register configures the source and destination addressing modes.

The [DMA4_CSEIi](#), [DMA4_CSFIi](#), [DMA4_CDEIi](#), and [DMA4_CDFIi](#) registers configure the source EI, source FI, destination EI, and destination FI, respectively.

The addressing profiles are expressed as equations as follows:

Equation 1. Constant addressing:

$$A(n + 1) = A(n)$$

Note: Constant addressing mode with DMA4 to/from DDR memory is not supported on the OMAP4470 device.
To fill DDR memory with a single value, the constant fill feature of DMA4 must be used instead of a constant addressing mode transfer.

Equation 2. Post-increment addressing:

$$A(n + 1) = A(n) + ES$$

Equation 3. Single-indexed addressing:

$$A(n + 1) = A(n) + ES + (EI - 1)$$

Equation 4. Double-indexed addressing:

When not at the end of a frame or transfer (that is, when the element counter $\neq 0$):

$$A(n + 1) = A(n) + ES + (EI - 1)$$

When at the end of a frame but not at the end of the transfer (that is, when the element counter = 0 and the frame counter $\neq 0$):

$$A(n + 1) = A(n) + ES + (FI - 1)$$

Calculate the element and frame index as follows:

Equation 5. Element index

$$EI = [(Stride\ EI - 1) \times ES] + 1$$

Equation 6. Frame index

$$FI = [(Stride\ FI - 1) \times ES] + 1$$

where:

$A(n)$: Byte address of the element n within the transfer.

ES is in bytes, ES{1, 2, 4}.

EI is in bytes, specified in a configuration register, 32768 EI 32767.

Stride EI: The difference in the number of elements between the start of the current element n to the start of next element, $n + 1$.

Element counter: A counter that is (re)initiated with the number of elements per frame or per transfer. Decreased by 1 for each element transferred. The initial value is configured in the register DMA channel element number, [DMA4_CENi](#).

FI is in bytes, specified in a configuration register, 2147483648 FI 2147483647.

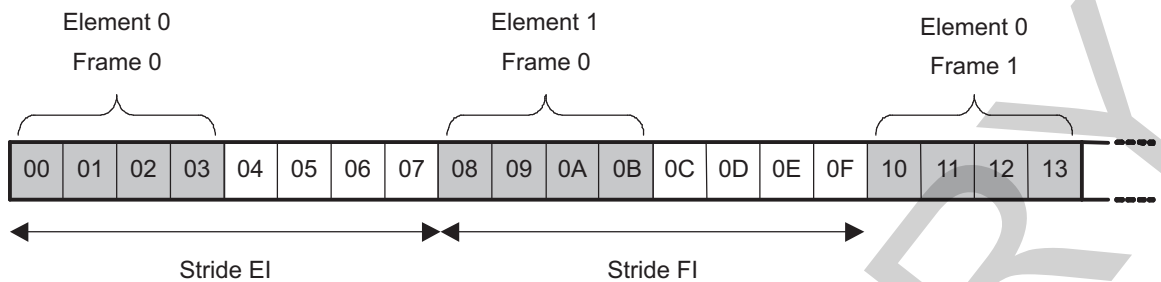
Stride FI: The difference in the number of elements between the start of the last element of the current frame and the beginning of the first element of the next frame.

Frame counter: A counter that is (re)initiated with the FN per transfer. Decreased by 1 for each frame transferred. The initial value is configured in the register DMA channel frame number, [DMA4_CFNi](#).

[Figure 17-6](#) shows how a stride EI and FI are defined. When handling complex configurations, using strides can make it easier to calculate EI and FI because you can calculate in elements instead of bytes. (This approach is used in the 90-degree clockwise image rotation example shown in [Figure 17-10](#).) The double-index addressing example shown in [Figure 17-6](#) uses ES = 4, EN = 2, EI = 5, FI = 5, and FN = 2.

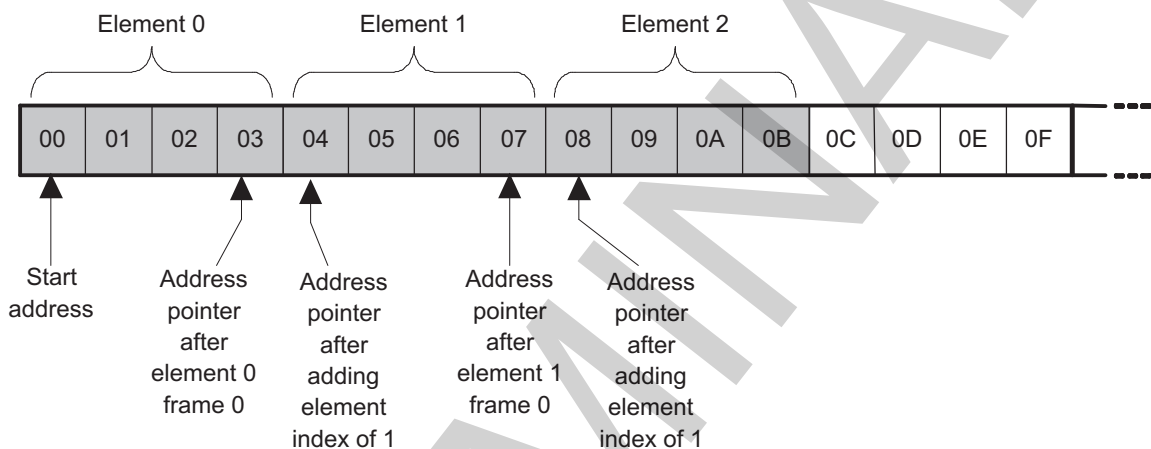
[Figure 17-6](#) through [Figure 17-9](#) show examples of addressing mode configurations. [Table 17-9](#) lists parameter values for the examples.

Figure 17-6. Example Showing Double-Index Addressing, Elements, Frames, and Strides



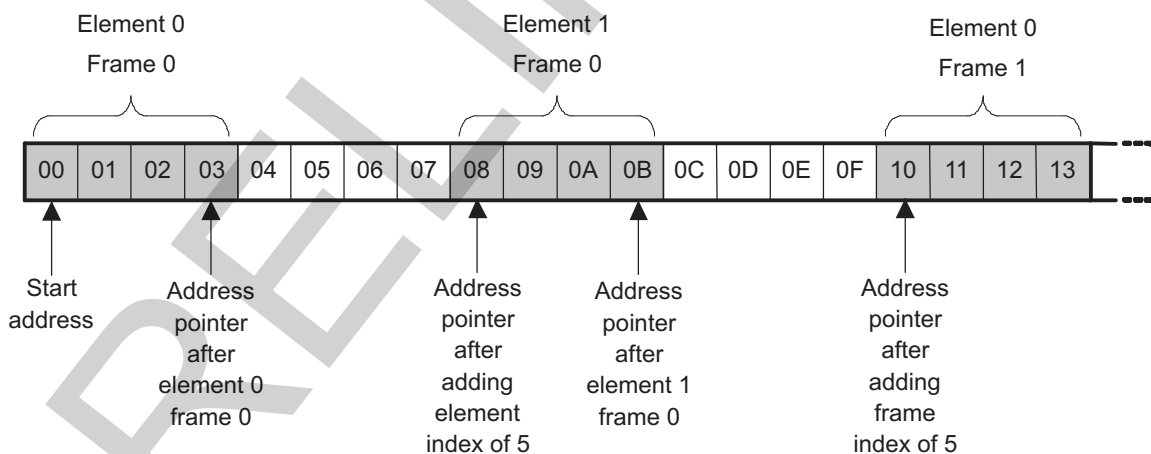
dma-011

Figure 17-7. Addressing Mode Example (a)

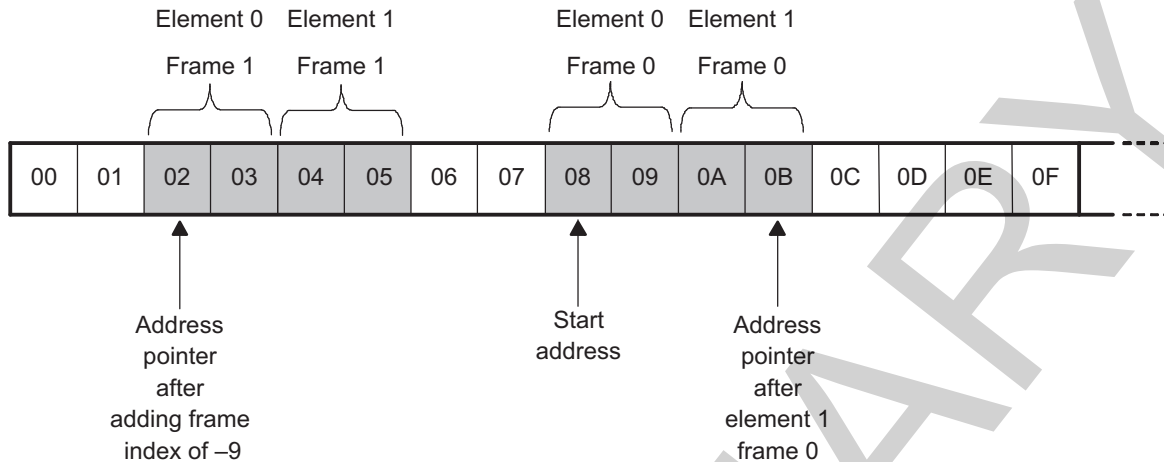


dma-010

Figure 17-8. Addressing Mode Example (b)



dma-009

Figure 17-9. Addressing Mode Example (c)

dma-008

Table 17-9. Parameter Values for Addressing Mode Examples (a), (b), and (c)

| Parameter | Example (a) | Example (b) | Example (c) |
|-----------------|-------------------------------------|--------------|--------------|
| Addressing mode | Single index (or post-increment) | Double index | Double index |
| Start address | 0 | 0 | 8 |
| ES | 4 (32-bit) | 4 (32-bit) | 2 (16-bit) |
| EN | 3 | 2 | 2 |
| EI | 1 | 5 | 1 |
| FN | 1 | 2 | 2 |
| Frame index | N/A | 5 | -9 |

Double indexing can occur on source (read) or destination (write). Equations for rotation of xx degrees on destination are obtained by taking equations for rotation of $(360 - xx)$ degrees on source, and swapping the width (x) and height (y) of the image in them. The opposite is also true. Table 17-10 lists the equations for 90-, 180-, and 270-degree rotations.

Table 17-10. Equations for Rotation

| | | 90-Degree Rotation | 180-Degree Rotation | 270-Degree Rotation |
|--|--------------|--------------------------------------|----------------------------|--------------------------------------|
| Double-indexing on destination (write) | Base address | $ES \cdot (y - 1)$ | $ES \cdot (x \cdot y - 1)$ | $ES \cdot y \cdot (x - 1)$ |
| | EI | $ES \cdot (y - 1) + 1$ | $1 - 2 \cdot ES$ | $1 - ES \cdot (y + 1)$ |
| | FI | $1 - ES \cdot [(x - 1) \cdot y + 2]$ | $1 - 2 \cdot ES$ | $1 + ES \cdot (x - 1) \cdot y$ |
| Double-indexing on source (read) | Base address | $ES \cdot x \cdot (y - 1)$ | $ES \cdot (x \cdot y - 1)$ | $ES \cdot (x - 1)$ |
| | EI | $1 - ES \cdot (x + 1)$ | $1 - 2 \cdot ES$ | $ES \cdot (x - 1) + 1$ |
| | FI | $1 + ES \cdot (y - 1) \cdot x$ | $1 - 2 \cdot ES$ | $1 - ES \cdot [(y - 1) \cdot x + 2]$ |

Table 17-11 and Figure 17-10 show the configuration required to perform a 90-degree clockwise rotation of a 240×160 pixel, 32-bit image. The EI, frame size, and FI values are configured so that the image is rotated line-by-line starting at the left end of the top line.

NOTE: The FI value for the destination is negative so that the first pixel of each subsequent line of the source image is written to the correct location at the destination.

Equation 5 and Equation 6 calculate the destination, EI and FI. The example assumes that the image lines are stored at consecutive addresses in memory, meaning that both EI and FI on the source side are 1.

Rotations:

[Section 17.5.7, 90-Degree Clockwise Image Rotation](#), describes how to program an example of a 90-degree clockwise image rotation.

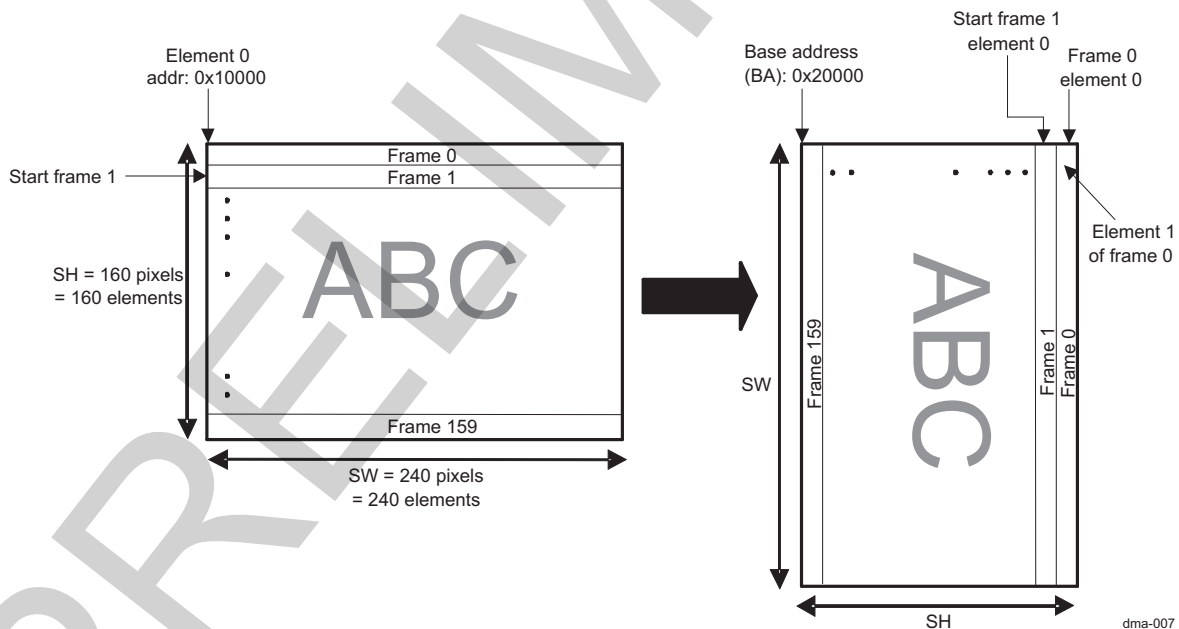
Observe that:

- One pixel = one element
- One line = one DMA frame
- Pixel size = element size = ES

Table 17-11. Example Parameter Values for a 90-Degree Clockwise Image Rotation

| Parameter | Source Value | Destination Value |
|-----------------------------|-------------------------------------|---|
| Bits per pixel | 32 | 32 |
| ES | 4 | 4 |
| Image width | SW | SH |
| Image height | SH | SW |
| Stride elements (stride EI) | 1 element | SH |
| Stride frames (stride FI) | 1 element | $-(SW-1) \times SH + 1 = 38,241$ elements |
| Start address | 0x100000 | $0x200000 + (SH-1) \times ES = 0x20027C$ |
| EN | SW | SW |
| EI | $[(Stride EI-1) \times ES] + 1 = 1$ | $[(Stride EI-1) \times ES] + 1 = 637$ |
| FN | SH | SH |
| FI | $[(Stride FI-1) \times ES] + 1 = 1$ | $[(Stride FI-1) \times ES] + 1 = 152,967$ |

Figure 17-10. Example of a 90-Degree Clockwise Image Rotation



17.4.6 Packed Accesses

To pack data means to group data to match the bus size, thus optimizing a transfer. When the logical channel ES is less than the DMA module read/write port size, and the addressing profile supports it (post-increment mode or single- or double-index mode with EI = 1), the number of elements to transfer in each read/write port access can be maximized by specifying that the source or destination is packed through the channel [DMA4_CSDPi](#) register. Thus:

- For a read/write port size of 32 bits, the source or destination can be configured as packed for transfer ESs of 8 bits (four elements per access) and 16 bits (two elements per access).

- For a read/write port size of 64 bits, the source or destination can be configured as packed for transfer ESs of 8 bits (eight elements per access), 16 bits (four elements per access), and 32 bits (two elements per access).

Depending on the start address and transfer length, the first or last packed access can be only partially filled. This is indicated to the source or destination using the byte-enable signals.

17.4.7 Burst Transactions

Transfer performance can be improved so that the source or destination and addressing profile supports it. This can be achieved by configuring the logical channel to perform burst transactions consisting of multiple instead of single accesses. The channel can be programmed to use burst sizes equal to 16, 32, or 64 bytes through the [DMA4_CSDPi](#) register, with the read burst size programmable independently of the write burst size. Typically, the optimal burst size is 64 bytes (16 accesses for a 32-bit read/write port size or 8 accesses for a 64-bit read/write port size).

To obtain the maximum benefit from burst transactions, the source and destination start addresses must be aligned with the burst size. If this is not the case, the start of the transfer can consist of a number of smaller (single or burst) transactions until the first burst size boundary is reached.

Similarly, if the end of the transfer is not aligned on a burst size boundary, the final part of the transfer can consist of a number of smaller transactions.

NOTE: If post-incrementing is used, data must be packed to DMA data-port width, to use burst.

17.4.8 Endianism Conversion

The source and destination are each specified as little-endian or big-endian through the [DMA4_CSDPi](#) register for the particular logical channel. If the endianism of the source and destination differ, and if the logical channel ES is less than the sDMA module read/write port size, an endianism conversion is applied to the data before it is written to the destination.

When transferring data between a source and a destination with different endianism, it is important to specify an ES that equals the type of data being transferred to preserve the correct data image at the destination.

In the system, endianism conversion can be performed in more than one place. It is possible to instruct the source and/or destination to lock the endianism (that is, to not perform a conversion) through the logical DMA channel [DMA4_CSDPi](#) register.

NOTE: Because the device is little-endian by construction, the sDMA endianism registers must never be set to big-endian.

If sDMA is used to execute endian conversion by the setting source and destination to different endianism values, it is important to consider that the L3 interconnect also executes endian conversion if the sDMA and the source or destination have a different data bus width.

17.4.9 Transfer Synchronization

A logical channel can be programmed for software-triggered or hardware-synchronized transfers.

17.4.9.1 Software Synchronization

A transfer is software-triggered when the logical channel is set up and started by software. To specify a software-triggered transfer, set the channel DMA [DMA4_CCRi\[4:0\]](#) and [DMA4_CCRi\[20:19\]](#) bit fields to 0. The transfer starts as soon as the DMA [DMA4_CCRi\[7\]](#) bit is set (when it enters the scheduling process).

17.4.9.2 Hardware Synchronization

A transfer is hardware-synchronized if the logical channel activation is driven by hardware requests from the source or destination target. A hardware-synchronized transfer is specified by configuring the DMA request line number in the channel `DMA4_CCRi` register to a value that corresponds to the DMA request line from the source or destination that generates the DMA requests. The DMA request numbers to be configured are specified in the DMA request mapping (see [Table 17-8](#)).

Specify the DMA request number in the `DMA4_CCRi[4:0]` SYNCHRO_CONTROL and `DMA4_CCRi[20:19]` SYNCHRO_CONTROL_UPPER bit fields. After the `DMA4_CCRi[7]` ENABLE bit is set, the logical channel becomes enabled but not activated (it does not enter the scheduling process), which means that channel registers are not updated until the first DMA request is received.

NOTE: The channel synchronization control registers are 1-based. For example, to enable the S_DMA_1 request, the `DMA4_CCRi[4:0]` SYNCHRO_CONTROL bit field must be set to 0x2 (DMA request number + 1).

NOTE: A DMA request line must not be shared between concurrently enabled DMA channels. However, a DMA request line can be shared among several chained logical channels.

For hardware synchronization, the amount of data to be transferred for each assertion of the DMA request line is configured through the frame synchronization (FS) and block synchronization (BS) bits in the logical channel `DMA4_CCRi` register and the `DMA4_CCRi[5]` FS and `DMA4_CCRi[18]` BS bits, respectively.

The amount of data can be any of the following:

- A single element transfer: A complete element defined by data type. For example, 8/16/32 bits are transferred in response to a DMA request.
- A full frame: A complete frame of several elements is transferred in response to a DMA request.
- A full block (a full channel transfer): A complete block of several frames is transferred in response to a DMA request.
- A full packet (a full channel transfer): A complete packet of several elements is transferred in response to a DMA request.

Packets allow the size of each part of the full DMA transfer to be configured independently of the organization of the data to be transferred (typically a number of elements). This can be useful when the source or destination has a buffer (such as a FIFO queue) with a size unrelated to the frame size of the transfer. The packet size then can be set to the size of the buffer.

Packet transfer must be used only where the source or destination is addressed in constant addressing mode, because FI registers are reused to specify the packet size.

To support the burst mode, the logical channel must also be configured in target-port packed access mode.

The packet size is configured based on the `DMA4_CCRi[24]` SEL_SRC_DST_SYNC bit through either the channel `DMA4_CDFli` register (source synchronized) or the `DMA4_CSFl` register (destination synchronized).

When the logical channel transfer block is not an exact multiple of the packet size, the final packet consists of the remaining elements in the transfer, using burst or single accesses to complete the block transfer.

The maximum transfer size, regardless of the packet size, is always as follows:

$$\text{Block_size} = \text{Number_of_Frame_in_Block} \times \text{Number_of_Element_in_Frame} \times \text{Element_Size}$$

- Synchronized at the source

The DMA module optimizes the transfer with respect to the number and size of burst transactions for the given source and destination addressing profiles and configured maximum burst sizes. When writing to the destination is slower than reading from the source, data is buffered in the channel FIFO queue. If the transfer is packet-synchronized at the source, the end-of-packet interrupt is disabled (see [Section 17.4.13, Reprogramming an Active Channel](#)).

For a source synchronized transfer, buffering can be enabled or disabled by setting the [DMA4_CCRi\[25\] BUFFERING_DISABLE](#) bit. For a packet source synchronization with buffering disabled and the packed/burst across the packet boundary, the last packed/burst write transaction is split in optimized smaller accesses to complete the packet transfer size. However, for a packet source synchronized transfer with buffering enabled and with the packed/burst across the packet boundary, the DMA module waits for the next DMA request(s) to read enough data to issue an atomic packed/burst write transaction (assuming that the address is packed/burst aligned).

NOTE: Buffering is not performed between frames, even if it is enabled. If the packed/burst is across the frame boundary, the last packed/burst write transaction is split in optimized smaller accesses to complete the frame transfer size.

- Synchronized at the destination

The performance of a hardware-synchronized transfer can be improved by using the prefetch mode, enabled through the channel [DMA4_CCRi\[23\] PREFETCH](#) bit. Data is prefetched on the read port side before the DMA request received and buffered in the FIFO queue. Up to a full transfer block can be prefetched, although this can be limited by the specified maximum channel FIFO queue depth (see [Section 17.4.4, FIFO Queue Memory Pool](#)).

Buffering disable is not allowed for a destination-synchronized transfer.

NOTE: Behavior is undefined when prefetch is enabled and a transfer is synchronized to the source.

Regardless of whether buffering is enabled, the last transaction in the frame or in the block is write nonposted (WNP) even if the write mode is specified as write last nonposted (WLNP; the [DMA4_CSDPi\[17:16\] WRITE_MODE](#) bit field = 0x2). However, in a packet synchronization mode, the last transaction of each packet in the transfer is WNP only if the buffering disable is on (even if the write mode is specified as WLNP).

Regardless of whether buffering is enabled, the packet interrupt is not generated in the packet source synchronized mode.

CAUTION

The [DMA4_CCRi\[25\] BUFFERING_DISABLE](#) bit must be filled with an allowed value, as specified in [Table 17-12](#).

Table 17-12. Buffering Disable

| | BUFFERING_DISABLE (0: Buffering enable, 1: Buffering disable) | |
|--------------------------|---|-------------|
| Destination synchronized | 0 | Allowed |
| | 1 | Not allowed |
| Source synchronized | 0 | Allowed |
| | 1 | Allowed |

- Synchronized transfer monitoring using CDAC ([DMA4_CDACi](#)):
Context is restored only when the channel becomes active on a DMA request (not at software enable). The channel is software-enabled first, and then a DMA request is asserted followed by the first context restore.
The CDAC register is writable; thus, the CDAC can be initialized to monitor the transfer and determine whether the transfer is started (for more information, see [Section 17.5.4, Synchronized Transfer Monitoring Using CDAC](#)).

NOTE: For 16-bit transactions, start reading from or writing to the least-significant byte (LSByte) first to enable the register update. This is not an issue for 32-bit read-write transactions.

17.4.10 Thread Budget Allocation

When several concurrent channels are latency critical and hardware synchronized, a specific latency cannot be ensured until the target is served. This situation occurs when the number of concurrent channels is greater than the number of available threads.

NOTE: Four threads are available on the read port, and two threads are available on the write port.

For a hardware-synchronized transfer (memory to peripheral), a minimum bandwidth for a latency-critical transfer must be ensured to avoid collisions between two hardware requests.

Because it is latency critical, the software user is responsible for the following:

- Programming the synchronized channel as a high-priority channel
- Reserving one or several threads for high-priority channels

The proposed implementation is as follows (see [Section 17.5.5, Concurrent Software and Hardware Synchronization](#)):

Prevent the regular channel queue from exceeding more than a programmable (3, 2, or 1) number of threads on the read port and no more than one thread on the write port. This number can be set in the global register [DMA4_GCR\[13:12\]](#).

The thread reservation is programmable for maximum use of thread resources for concurrent, low-priority channel transfer. Programmability can also allow a partial throughput control by limiting in software the number of concurrent outstanding requests that break the pipelining.

Depending on the [DMA4_GCR\[13:12\]](#) value, the following threadID on the read/write ports are allocated for a high-priority channel:

Read port priority thread reservation:

- [DMA4_GCR\[13:12\]](#) = 0x0 = No ThreadID is reserved for high-priority channels.
- [DMA4_GCR\[13:12\]](#) = 0x1 = Read ThreadID 0 is reserved for high-priority channels.
- [DMA4_GCR\[13:12\]](#) = 0x2 = Read ThreadID 0 and Read ThreadID 1 are reserved for high-priority channels.
- [DMA4_GCR\[13:12\]](#) = 0x3 = Read ThreadID 0, Read ThreadID 1, and Read ThreadID 2 are reserved for high-priority channels.

Write port priority thread reservation:

- [DMA4_GCR\[13:12\]](#) = 0x0 = No ThreadID is reserved for high-priority channels
- [DMA4_GCR\[13:12\]](#) = 0x1 = Write ThreadID 0 is reserved for high-priority channels.
- [DMA4_GCR\[13:12\]](#) = 0x2 = Write ThreadID 0 is reserved for high-priority channels.
- [DMA4_GCR\[13:12\]](#) = 0x3 = Write ThreadID 0 is reserved for high-priority channels.

Regardless of whether the enabled channels are high priority, only the value of the [DMA4_GCR\[13:12\]](#) setting forces the thread reservation to these values. Set the appropriate value to avoid losing threads using only regular channels.

To have an independent read and write priority context, a per-channel bit ([DMA4_CCRi\[26\]](#)) is added for write priority, and the previous priority bit becomes read priority bit ([DMA4_CCRi\[6\]](#)).

NOTE: The device has one priority bit per logical channel, not one priority bit per port.

17.4.11 FIFO Budget Allocation

To avoid fully occupying the FIFO with a high-priority transfer while low-priority channels wait in the

arbitration queue, two separate FIFO budgets are specified: one for high-priority channels and one for low-priority channels. This is defined in the [DMA4_GCR](#) register, allowing the user to share the FIFO budget between the low- and high-priority channels. The amount of the FIFO allocated by the low- and high-priority channels is fixed by the value set in the [DMA4_GCR\[15:14\] HI_LO_FIFO_BUDGET](#) bit field. The maximum channel FIFO depth is limited by the [HI_LO_FIFO_BUDGET](#) bit field as follows:

If the channel is low priority:

- When [HI_LO_FIFO_BUDGET](#) = 0x1, then low priority cannot exceed 75 percent of the total FIFO.
- When [HI_LO_FIFO_BUDGET](#) = 0x2, then low priority cannot exceed 25 percent of the total FIFO.
- When [HI_LO_FIFO_BUDGET](#) = 0x3, then low priority cannot exceed 50 percent of the total FIFO.

If channel is high priority

- When [HI_LO_FIFO_BUDGET](#) = 0x1, then high priority cannot exceed 25 percent of the total FIFO.
- When [HI_LO_FIFO_BUDGET](#) = 0x2, then high priority cannot exceed 75 percent of the total FIFO.
- When [HI_LO_FIFO_BUDGET](#) = 0x3, then high priority cannot exceed 50 percent of the total FIFO.

The user must perform the following equation:

- For a high-priority channel: $(\text{Per_Channel_Maximum FIFO Depth} + 1) \times \text{Number of High Channel} = \text{High Budget FIFO}$
- For a low-priority channel: $(\text{Per_Channel_Maximum FIFO Depth} + 1) \times \text{Number of Low Channel} = \text{Low Budget FIFO}$

NOTE: Ensure that *Number of High Channel* means *Number of Active High-Priority Channel* and that *Number of Low Channel* means *Number of Active Low-Priority Channel*.

17.4.12 Chained Logical Channel Transfers

Chaining multiple logical channels permits transfers consisting of multiple parts to be executed without repeated software intervention. This results in better performance than the alternative of software setting up and starting each transfer separately. Each part of a chained transfer can have the data addressed in a different manner that permits the programming of a variety of complex transfers. For example:

- Interlaced video data with one logical channel configured to transfer the even lines and another logical channel configured to transfer the odd lines
- Protocol headers with a separate DMA4 channel configured to transfer each field in the header

Channels can be chained through each channel [DMA4_CLNK_CTRLi](#) register. When the transfer for the first channel completes, the next channel in the chain is enabled. The number of channels in the chain that are configured for hardware-synchronized transfers is flexible (although typically it may be all, none, or simply the first one). The DMA request line number must be set to 0 to specify that any or all channels in a chain are software-triggered or nonsynchronized.

The last channel in a chain can be chained to the first channel to create a continuously looping chain. The continuously looping transfer can be stopped on the fly at a specific channel by disabling the [DMA4_CLNK_CTRLi\[15\] ENABLE_LNK](#) bit. The looping transfer stops after the specified channel transfer completes.

NOTE: A DMA request line must not be shared between concurrently enabled DMA channels. However, a DMA request line can be shared between several chained logical channels.

For more information about the programming model, see [Section 17.5, sDMA Basic Programming Model](#).

17.4.13 Reprogramming an Active Channel

A currently active logical DMA channel can be disabled through the [DMA4_CCRi\[7\] ENABLE](#) bit. When an ongoing transaction completes and the read-active and write-active bits in the [DMA4_CCRi](#) register ([DMA4_CCRi\[9\] RD_ACTIVE](#) and [DMA4_CCRi\[10\] WR_ACTIVE](#)) are reset, the channel can be reprogrammed for a new transfer.

17.4.14 Packet Synchronization

A packet transfer notion is related to the behavior of some peripherals, which have certain buffering capability and must transfer the buffer content once an element number threshold is reached (a hardware DMA request is generated). To associate a frame synchronization to each DMA request is possible, but this limits the maximum transfer size. The maximum transfer size is proportional to the FIFO depth of the peripheral:

$$\text{maximum_transfer_size} = \text{peripheral_FIFO_depth} \times \text{number_of_frame_in_block}$$

The packet synchronization allows to dissociate the transfer size from the FIFO depth of the peripheral. Only constant addressing mode is allowed on a read port or a write port if source target or destination target is packet synchronized, respectively.

Example:

Consider a camera interface with a FIFO_depth of 128 words and a FIFO_element_number_threshold of 128, and a picture to transfer with a size 320 lines by 240 columns. If frame synchronization is associated with each DMA request, then the maximum transfer size that can be performed is 128×2^{16} words. In this case, a frame is 128 words long, which does not fit the size of a line, and it is not possible to generate an interrupt at the end of line. However, by introducing the packet transfer notion, which is related to the peripheral FIFO behavior/structure, the maximum transfer size ($\text{maximum_transfer_size} = 2^{24} \times 2^{16}$ words) is independent of both peripheral_FIFO_depth and FIFO_element_number_threshold. This allows a long-enough transfer within one channel context and rotation operation on a large image format.

The main features of DMA packet transfer are as follows:

- DMA Packet_Data_Size for each DMA request: The Peripheral_element_number_threshold (the number of elements in a packet) shares the **DMA4_CSFI** and **DMA4_CDFI** configuration registers. If the peripheral is the source target, the addressing mode is constant, and the **DMA4_CSFI[15:0]** bit field is used to specify the packet data size in the **DMA4_CSFI** register. The user must set the **DMA4_CCRi[24] SEL_SRC_DST_SYNC** bit to 1. If the peripheral is the destination target, the addressing mode is constant, the **DMA4_CDFI[15:0]** bit field, is used to specify the packet data size (PKT_ELNT_NBR), and the bit field [31:16] is unused. To specify the packet data size in the **DMA4_CDFI** register, the user must set the **DMA4_CCRi[24] SEL_SRC_DST_SYNC** bit to 0.

NOTE: The packet size can be a submultiple or nonsubmultiple of a frame size. If DMA Packet_Data_Size is aligned on the DMA channel block data size boundary, then DMA transfers the last data in the channel block boundary and stops at the block boundary for the last packet DMA request. If the Packet_Data_Size is not aligned on the block boundary, the remaining data smaller than a packet size are transferred using burst or single accesses to complete the block.

- DMA Packet_Data_Transfer does not affect DMA channel capabilities in terms of packing and bursting. The packet synchronization mode is active when **DMA4_CCRi[5] FS = DMA4_CCRi[18] BS = 1**. Then:
 - If **DMA4_CCRi[24] SEL_SRC_DST_SYNC = 0**, the **DMA4_CDFI[15:0]** bit field gives the number of elements in the packet and the **DMA4_CDFI[31:16]** bit field is unused for the packet size.
 - If **DMA4_CCRi[24] SEL_SRC_DST_SYNC = 1**, the **DMA4_CSFI[15:0]** bit field gives the number of elements in the packet and the **DMA4_CSFI[31:16]** bit field is unused for the packet size.

NOTE: The maximum transfer size, regardless of the packet size, is always:

$$\text{Block_size} = \text{Number_of_Frame_in_Block} \times \text{Number_of_Element_in_Frame} \times \text{Element_Size}$$

If DMA channel packet/burst access is across the packet boundary, the DMA hardware automatically splits this packing/burst access into multiple smaller accesses that are aligned on the packet boundary. Otherwise, the DMA transfers data as a usual packing/burst access.

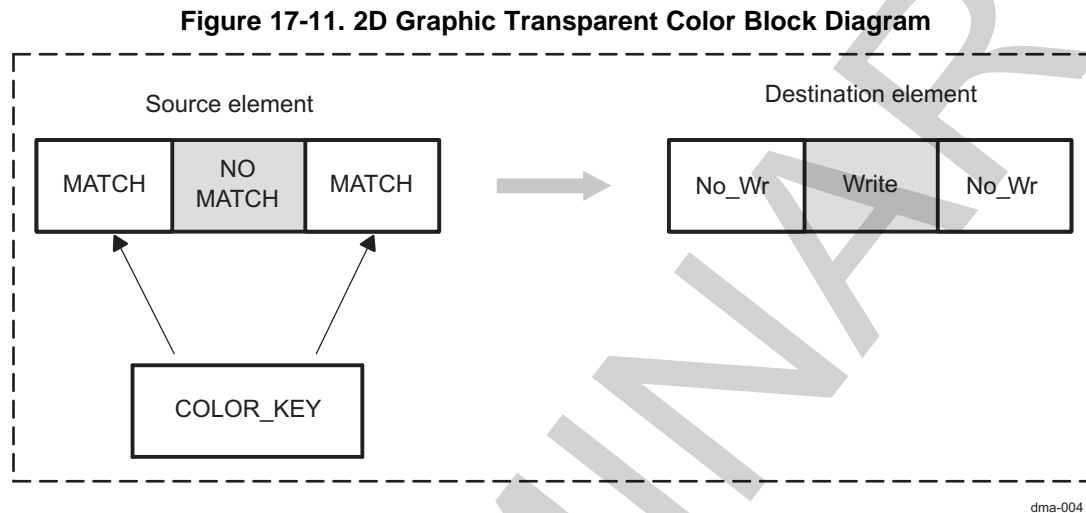
17.4.15 Graphics Acceleration Support

The sDMA supports two graphic acceleration features: transparent copy and constant fill.

Only one of these features at a time can be enabled through the [DMA4_CCRi](#) register for the particular logical DMA channel.

The transparent copy feature enables specification of a particular color through the [DMA4_COLORi](#) register so that when it is recognized in the data from the source, it is not copied to the corresponding location in the destination but instead leaves the data in the corresponding location in the destination as it is.

[Figure 17-11](#) shows the 2-dimensional (2D) graphic transparent color block diagram.



The constant fill feature provides the ability to specify a particular color through the [DMA4_COLORi](#) register for every specified location in the destination. In this case, the transfer consists only of writing to the destination without reading from a source.

Both features support 8, 16, and 24 bpp, depending on what is specified as the DMA transfer ES through the [DMA4_CSDPi](#) register. An ES of 32 bits corresponds to 24 bpp. During a 32-bit (24 bpp) transfer, the 8 most-significant bits (MSBs) ([31:24]) are 0. Both features are compatible with packed and burst transactions.

17.4.16 Supervisor Modes

A logical DMA channel can be configured to operate in supervisor mode through the [DMA4_CCRi](#)[22] SUPERVISOR bit. This must be done using supervisor access. Once a channel is configured in supervisor mode, the channel configuration is protected from nonsupervisor accesses. All DMA transactions on a supervisor channel are supervisor transactions.

17.4.17 Posted and Nonposted Writes

A logical channel can be configured in its [DMA4_CSDPi](#)[17:16] bits to use one of three write access handshake modes for the destination:

- Nonposted write: Each write must complete before transfer can continue or complete.
- Posted write: Transfer continues without waiting for each write to complete (may improve performance with slow devices).
- Posted with final write nonposted: Transfer continues without waiting for each write to complete, but final write completes before transfer can complete.

17.4.18 Disabling a Channel During Transfer

When a channel is disabled during a transfer, the channel undergoes an abort, unless it is hardware-source-synchronized with buffering enabled ([DMA4_CCRi](#)[25] BUFFERING_DISABLE = 0). If this is the case, the FIFO is drained to prevent the loss of data. For more information about this feature, see [Section 17.4.19, FIFO Draining Mechanism](#).

17.4.19 FIFO Draining Mechanism

When a source-synchronized channel is disabled during a transfer, the current hardware request (element/packet/frame/block) service completes and the channel `DMA4_CCRi[9]` `RD_ACTIVE` bit is set to 0, which means the channel is not active on the read port. The remaining data in the corresponding disabled channel FIFO is drained onto the write port and transferred to the programmed destination as in normal transfer.

At the end of the draining the `DMA4_CCRi[10]` `WR_ACTIVE` bit is set to 0 (the channel is no longer active on the write port) and if the `DMA4_CICRi[12]` `DRAIN_END_IE` is set to 1, the `DMA4_CSRI[12]` `DRAIN_END` status bit is updated and an interrupt is generated.

Once a channel is disabled during a transfer, it must wait for the `DMA4_CCRi[9]` `RD_ACTIVE` and `DMA4_CCRi[10]` `WR_ACTIVE` bits to become 0 before being reenabled for a new transfer. The FIFO drain for a channel occurs only in the following cases:

- If the channel is a source-synchronized channel and `DMA4_CCRi[25]` `BUFFERING_DISABLE` = 0 and
- If the channel is not a solid-fill channel and
- If the channel is not a transparent and copy channel and
- If the channel is a hardware, synchronized channel

NOTE: For a self-linked or chain-linked channel, the user must disable the `DMA4_CLNK_CTRLi[15]` `ENABLE_LINK` bit before disabling the channel.

In all other cases, the channel undergoes an abort.

17.4.20 Linked List

17.4.20.1 Overview

The sDMA supports the logical transfer-descriptor loader feature. A transfer descriptor represents a set of values that maps to a set of logical channel configuration registers.

A logical channel transfer descriptor can be loaded by DMA from memories, and then successive transfer descriptors can be autonomously loaded based on a linked-list scheme. This enables DMA4 scatter-gather transfers with minimum MPU support by removing successive channel configuration processing and associated interrupt handling overheads. It also optimizes DMA4 channel resources by enabling efficient transfer serialization on a single logical channel versus concurrent (multiple) logical channel use.

Different types of transfer descriptors are supported (full or partial logical channel configuration registers are set). This optimizes the memory size required for storing a long linked list, because parameter changes are limited to only a few logical channel configuration registers.

17.4.20.2 Link-List Transfer Profile

A linked-list transfer can be seen as a superblock transfer (where the block is composed of FN frames and each frame includes EN elements). The block size ($FN \times EN \times ES$) can be changed in the linked list by loading an updated transfer descriptor.

The end of the super block is signaled in the last descriptor associated with the last block. Generally, for a given link-list transfer, the logical channel is set at the beginning of the transfer and the logical channel configurations for the subsequent blocks are slightly changed. Thus, the descriptor can be limited to an update of only few parameters, such as FN or EN. This assumes that the content of unmodified registers is preserved when a new descriptor is loaded.

A transfer descriptor is composed of a set of channel configuration register values with the addition of the next-descriptor pointer register ([DMA4_CNDPi](#)) and a channel-descriptor parameter register ([DMA4_CDPi](#)). The next-descriptor pointer is the 32-bit address pointer from where the next transfer descriptor is to be loaded. The next-descriptor pointer is mapped depending on the descriptor type (1, 2, or 3).

17.4.20.3 Descriptors

A transfer descriptor is a set of values that maps to a set of logical channel configuration registers. The descriptor contains the parameters associated with a transfer profile (transfer size, source or destination addresses, etc). Four different types of transfer descriptors are supported to optimize the memory size required to store a long linked list and to minimize MPU use to create and maintain the descriptor list.

A transfer descriptor is a list of 32-bit values. A descriptor must be 32-bit aligned in memory. Only the 30 least-significant bits (LSBs) of the next-descriptor address pointer are updated from the descriptor, and the DMA4 forces the 2 LSBs to 0 when the pointer address is generated. The descriptor size is variable, depending on the descriptor type and the `Nxt_Dv` and `Nxt_Sv` bit fields.

Transfer descriptor bit mapping is the same as DMA4 logical-channel configuration register bit mapping, with the following exceptions:

- `Src_Element_index` and `Dst_Element_index` are concatenated in the same 32-bit location.
- [DMA4_CICRi](#) (interrupt event mask)
- CFN (frame number)
- Bit fields:
 - `P`: Corresponds to the `PAUSE_LINK_LIST` bit:
 - When set to 1 in the descriptor, the channel is suspended when the descriptor load completes.
 - The user must not set the `PAUSE_LINK_LIST` bit through the configuration port. Otherwise, behavior is undefined.
 - When set to 0 (through the configuration port) after pause, the linked-list channel resumes its transfer (descriptor load or data load).
 - `B`: Corresponds to the end-of-block enable bit (`BLOCK_IE`) of the [DMA4_CICRi](#) register; valid only for type 3. This value is don't care for descriptor types 1 and 2, where [DMA4_CICRi](#) is fully specified.
 - `Nxt_Dv`, `Nxt_Sv`: Mapped in the [DMA4_CDPi](#) register. They indicate one of the following possibilities:
 - Next descriptor contains an updated destination or source address.
 - Next descriptor does not update the source or destination address, but increments the last source or destination address (from the end of the last transfer).
 - The next source address and/or destination address are the last valid ones in the configuration memory. This means that the corresponding location in the configuration memory is not updated (assuming that they were initialized at least once in the past). This is also called wrapping addressing.
 - `Next_Descriptor_Type`: Specifies the next descriptor type that corresponds to the `NEXT_DESCRIPTOR_TYPE` bit field in the [DMA4_CDPi](#) register

17.4.20.3.1 Type 1

A type 1 descriptor includes the overall channel configuration register value to be loaded (global registers are not part of the type 1 descriptor). This descriptor is used primarily when major changes are required:

- Channel read or write access profiles must be modified; for example, bursting and packing (included in the [DMA4_CSDPi](#) register)
- Attach a new DMA request to the same channel or change the priority or access privilege (included in the [DMA4_CCRi](#) register)
- Enable solid or transparent color fill (included in the [DMA4_CCRi](#) and [DMA4_COLORi](#) registers)
- Enable a channel link (included in the [DMA4_CLNK_CTRLi](#) register)

Table 17-13 shows a type 1 descriptor.

Table 17-13. Type 1

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|---------------------------------|---|---|----|---|----|---|----------------|---|---|---|---|---|---|---|-------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-----|---|
| | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| Ptr+0x2C | CCR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+0x28 | CLNK_CTRL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+0x24 | CSDP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+0x20 | COLOR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+0x1C | Src_Frame_index/Src_Packet_size | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+0x18 | Dst_Frame_index/Dst_Packet_size | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+0x14 | Src_Element_index | | | | | | | | | | | | | | | Dst_Element_index | | | | | | | | | | | | | | | | |
| Ptr+0x10 | CICR (interrupt events mask) | | | | | | | | | | | | | | | CFN frame number | | | | | | | | | | | | | | | | |
| Ptr+0xC | Destination_Start_Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+0x8 | Source_Start_Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+0x4 | N_type | | B | Dv | | Sv | | Element_number | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr | Next_descriptor_address_pointer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Rsv | P |

17.4.20.3.2 Type 2

A type 2 descriptor includes the overall logical channel transfer address register and transfer format register to be loaded. This descriptor enables 2D addressing linked-list transfer (for example, a multimedia application where 2D objects are moved in a link). [Table 17-14](#) shows a type 2 descriptor with source and destination address updates. [Table 17-15](#) shows a type 2 descriptor with one source or destination address update.

Table 17-14. Type 2 With Source and Destination Address Updates

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|---------------------------------|--------|--------|--------|--------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------------------|--------|--------|--------|--------|--------|---|---|---|---|---|---|---|---|---------|---|
| | 3 1 | 3 0 | 2 9 | 2 8 | 2 7 | 2 6 | 2 5 | 2 4 | 2 3 | 2 2 | 2 1 | 2 0 | 1 9 | 1 8 | 1 7 | 1 6 | 1 5 | 1 4 | 1 3 | 1 2 | 1 1 | 1 0 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Ptr+ 0x1C | Src_Frame_index/Src_Packet_size | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+ 0x18 | Dst_Frame_index/Dst_Packet_size | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+ 0x14 | Src_Element_index | | | | | | | | | | | | | | | | Dst_Element_index | | | | | | | | | | | | | | | |
| Ptr+ 0x10 | CICR (interrupt events Mask) | | | | | | | | | | | | | | | | CFN frame number | | | | | | | | | | | | | | | |
| Ptr+ 0xC | Destination_Start_Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+ 0x8 | Source_Start_Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+ 0x4 | N_type | | B | Dv | Sv | Element_number | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr | Next_descriptor_address_pointer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | R sv | P |

Table 17-15. Type 2 With Source or Destination Address Update

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|---|--------|--------|--------|--------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------------------|--------|--------|--------|--------|--------|---|---|---|---|---|---|---|---|---------|---|
| | 3 1 | 3 0 | 2 9 | 2 8 | 2 7 | 2 6 | 2 5 | 2 4 | 2 3 | 2 2 | 2 1 | 2 0 | 1 9 | 1 8 | 1 7 | 1 6 | 1 5 | 1 4 | 1 3 | 1 2 | 1 1 | 1 0 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Ptr+ 0x18 | Src_Frame_index/Src_Packet_size | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+ 0x14 | Dst_Frame_index/Dst_Packet_size | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+ 0x10 | Src_Element_index | | | | | | | | | | | | | | | | Dst_Element_index | | | | | | | | | | | | | | | |
| Ptr+ 0xC | CICR (interrupt events Mask) | | | | | | | | | | | | | | | | CFN frame number | | | | | | | | | | | | | | | |
| Ptr+ 0x8 | Source_Start_Address or Destination_Start_Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+ 0x4 | N_type | | B | Dv | Sv | Element_number | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr | Next_descriptor_address_pointer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | R sv | P |

17.4.20.3.3 Type 3

A type 3 descriptor is limited to a few logical channel transfer address registers and transfer format registers to be loaded. This descriptor enables simple 1D addressing link transfer (for example, scatter-gather or ping-pong memory movement using a linked list). [Table 17-16](#) shows a type 3 descriptor with source and destination address updates. [Table 17-17](#) shows a type 3 descriptor with one source or address destination update.

Table 17-16. Type 3 With Source and Destination Address Updates

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|---------------------------------|--------|--------|--------|--------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|---|---|---|---|---|---|---|---------|---|
| | 3 1 | 3 0 | 2 9 | 2 8 | 2 7 | 2 6 | 2 5 | 2 4 | 2 3 | 2 2 | 2 1 | 2 0 | 1 9 | 1 8 | 1 7 | 1 6 | 1 5 | 1 4 | 1 3 | 1 2 | 1 1 | 1 0 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Ptr+ 0xC | Destination_Start_Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+ 0x8 | Source_Start_Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+ 0x4 | N_type | | B | Dv | Sv | Element_number | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr | Next_descriptor_address_pointer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | R sv | P |

Table 17-17. Type 3 With Source or Destination Address Update

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|---|--------|--------|--------|--------|--------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---|---|---|---|---|---|---------|---|---|---|
| | 3 1 | 3 0 | 2 9 | 2 8 | 2 7 | 2 6 | 2 5 | 2 4 | 2 3 | 2 2 | 2 1 | 2 0 | 1 9 | 1 8 | 1 7 | 1 6 | 1 5 | 1 4 | 1 3 | 1 2 | 1 1 | 1 0 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Ptr+ 0x8 | Source_Start_Address or Destination_Start_Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr+ 0x4 | N_type | | B | Dv | Sv | | Element_number | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ptr | Next_descriptor_address_pointer | | | | | | | | | | | | | | | | | | | | | | | | | | | | R sv | P | | |

17.4.20.4 Linked-List Control and Monitoring

17.4.20.4.1 Transfer Mode Setting

Four descriptor types are available in the DMA4_CDPi[9:8] TRANSFER_MODE bit field to distinguish the different transfer modes:

- [DMA4_CDPi](#)[9:8] TRANSFER_MODE = 00: The current channel is using normal mode.
- [DMA4_CDPi](#)[9:8] TRANSFER_MODE = 01: The current channel is using link-list channel mode for a type 1, 2, or 3 descriptor.

The reset value is normal mode (DMA4_CDPI[9:8] TRANSFER_MODE = 0).

17.4.20.4.2 Starting a Linked List

Like a nonlinked-list transfer, a link transfer starts under host control by enabling the associated logical channel (set the [DMA4_CCRi\[7\]](#) ENABLE bit to 1). The [DMA4_CDPi\[10\]](#) FAST bit sets the start mode of the link-list transfer:

In nonfast-start mode, the logical channel configuration is fully initialized so that the transfer can start without descriptor loading.

In fast-start mode, the descriptor pointer and other inputs are given. The channel starts by loading the descriptor and then starts the data transfer phase.

17.4.20.4.3 Monitoring a Linked-List Progression

In addition to the [DMA4_CCENi](#) (remaining elements) and [DMA4_CCFNi](#) (remaining frames) registers that are used to monitor the transfer progress, a per-channel register, [DMA4_CCDNi](#) (channel current active descriptor number), monitors which descriptor in the list is active. The user must initialize the [DMA4_CCDNi](#) register to 0 during the initial configuration. When the [DMA4_CCDNi](#) register is updated, the [DMA4_CCFNi](#) and [DMA4_CCENi](#) registers are updated. The user must also initialize the [DMA4_CCFNi](#) and [DMA4_CCENi](#) registers to 0xFFFF and to 0xFFFFFFFF, respectively, to track the effective transfer start of synchronized transfer.

17.4.20.4.4 Interrupt During Linked-List Execution

Any logical channel source of interrupt can be triggered during a linked-list execution, if the interrupt source is enabled during the initial configuration in [CICR](#). The [DMA4_CICRi](#) register can also be updated during the linked-list execution if descriptor types 1 and 2 are used.

The use of an interrupt event in a link execution can be difficult, because the link can progress in parallel with interrupt service routine (ISR) execution. This makes it difficult to synchronize them unless system assumptions are used. The most appropriate synchronization model is to get an interrupt-only on linked-list completion, when the last transfer block completes. This prevents the interrupt from occurring during the link execution. An end-of-superblock interrupt event available in the [DMA4_CICRi](#) and [DMA4_CSRi](#) registers can be enabled at initial configuration or when using descriptor types 1 and 2. To prevent the use of descriptor type 1 or 2 to update BLOCK_IE (full [DMA4_CICRi](#) update), a dedicated BLOCK_IE bit field is also available in a type 3 descriptor.

17.4.20.4.5 Pause a Linked List

When the channel is suspended, it remains enabled.

The pause behaves differently, depending on the transfer mode:

- Normal transfer mode: If the user sets the [DMA4_CDPi\[7\]](#) PAUSE_LINK_LIST bit to 1, the channel completes the current read and write transactions and then suspends the channel. The channel can be resumed by setting the channel [DMA4_CDPi\[7\]](#) PAUSE_LINK_LIST bit to 0.
- Linked-list type 1, 2, or 3 mode: The user must not set the [DMA4_CDPi\[7\]](#) PAUSE_LINK_LIST bit through the configuration port; otherwise, transfer behavior is undefined.

A PAUSE_LINK_LIST bit (P) is set to 1 in the descriptor.

- The channel is suspended after the descriptor load, translation, and configuration memory update are complete.
- The linked list can be resumed by resetting the [DMA4_CDPi\[7\]](#) PAUSE_LINK_LIST bit (through the configuration port).

17.4.20.4.6 Stop a Linked List (Abort or Drain)

The channel can be stopped for a drain or an abort. These cases are exclusive.

17.4.20.4.6.1 Drain

- Drain conditions:

A channel is a drain candidate if it is a hardware-source-synchronized transfer with [DMA4_CCRi\[25\]](#)

BUFFERING_DISABLE = 0 and should not be doing any of the graphics operation (transparent copy or solid-color fill).

- Drain trigger:
A drain candidate channel is drained if it is disabled ([DMA4_CCRi\[7\] ENABLE = 0](#)) or if it receives a transaction error on the read port.
- Drain behavior with a type 1, 2, or 3 descriptor. Drain trigger can occur in two situations:
 - During descriptor loading: Any ongoing current transaction is complete and the channel is aborted.
 - During data loading: The read is completed at the boundary of the request (element/frame/packet/block boundary), the FIFO is drained to the destination, and then a DRAIN_END interrupt can be asserted.

17.4.20.4.6.2 Abort

- Abort condition:
A channel is an abort candidate if it is software-synchronized, hardware-destination-synchronized, solid color-fill, transparent-color fill, or hardware-source-synchronized with [DMA4_CCRi\[25\] BUFFERING_DISABLE = 1](#).
- Abort trigger:
A channel is an abort candidate if it is disabled ([DMA4_CCRi\[7\] ENABLE = 0](#)), if it receives a transaction error on the read or write port, or if there is a MISALIGNMENT_ERROR.
- Abort behavior with a type 1, 2, or 3 descriptor:
If an abort trigger occurs, the channel aborts immediately after current read/write transactions completes, and then the FIFO is cleaned up.
In type 1, 2, or 3, if an abort trigger or drain trigger occurs during the descriptor load phase, the channel aborts.

17.4.20.4.7 Status Bit Behavior

This section describes the behavior of the [DMA4_CSRI\[6\] SYNC](#), [DMA4_CCRi\[9\] RD_ACTIVE](#), and [DMA4_CCRi\[10\] WR_ACTIVE](#) status bits:

- For a hardware-synchronized channel in linked-list mode, the [DMA4_CSRI\[6\] SYNC](#) bit becomes active ([DMA4_CSRI\[6\] SYNC = 1](#)) when the first data load transaction is scheduled and remains active until the last data load transaction in the block (not super block) is descheduled ([DMA4_CSRI\[6\] SYNC = 0](#)). The SYNC bit is not active during the descriptor load phase.
- The [DMA4_CCRi\[9\] RD_ACTIVE](#) bit is active during the data load phase and the descriptor load phase. It becomes active when the first read transaction is scheduled. It becomes inactive:
 - When (during the descriptor load phase) the last descriptor write request is descheduled
 - When (during the data load phase) the last read transaction in the block (not super block) is descheduled for software-synchronized transfer or destination-synchronized transfer with prefetch enabled
 - When (during the data load phase) the last read transaction in the request (element/frame/packet/block sync) is descheduled for hardware-source-synchronized transfer or hardware-destination-synchronized transfer without prefetch
- The [DMA4_CCRi\[10\] WR_ACTIVE](#) bit is active only during the data load phase. It becomes active when the first write transaction is scheduled and becomes inactive:
 - Until the last write transaction in the block (not super block) is descheduled and the FIFO is cleaned up for software-synchronized transfer
 - Until the last write transaction in the request (element/frame/packet/block sync) is descheduled and the FIFO is cleaned up for hardware-source-synchronized transfer (with [DMA4_CCRi\[25\] BUFFERING_DISABLE = 0](#)) or hardware-destination-synchronized transfer.

17.4.20.4.8 Linked-List Channel Linking

Channel linking for inter- and intra-super blocks is supported for type 1, 2, and 3 descriptors.

Assume that CHx and CHz are linked-list channels using generic descriptors. If CHx is composed of N descriptors and CHz is composed of M descriptors, then in nonfast mode:

CHx: CHx[Data1]- CHx[DES1] - . - CHx[DESN]-CHx[DataN + 1]

CHz: CHz[Data1]- CHz[DES1] - . - CHz[DESM]-CHz[DataM + 1]

It is possible to link CHx to CHz or CHx to itself after the completion of the CHx transfer (end of superblock). To do this, the user must set the [DMA4_CLNK_CTRLi\[15\] ENABLE_LNK](#) bit to 1 and the [DMA4_CLNK_CTRLi\[4:0\] NEXTLCH_ID](#) bit field to z (or to x for self-linking) through the last descriptor using a type 1 descriptor. The sequence is:

CHx: CHx[Data1]- CHx[DES1] - . - CHx[DESN]-CHx[DataN+1] - CHz: CHz[Data1]- CHz[DES1] - . - CHz[DESM]-CHz[DataM+1]

It is also possible to link CHx to CHz during the CHx transfer and before the end of super block. The user must set the [DMA4_CLNK_CTRLi\[15\] ENABLE_LNK](#) bit field to 1 and the [DMA4_CLNK_CTRLi\[4:0\] NEXTLCH_ID](#) bit field to z through descriptor p (CHx[DESp]) using a type 1 descriptor. The sequence is:

CHx: CHx[Data1]- CHx[DES1] -.- CHx[DESp]-CHx[Data(p + 1)] - CHz[Data1]- CHz[DES1] - .

The user must continue the linking until channels CHx and CHz complete their superblock transfers; otherwise, the channels remain enabled.

NOTE: In channel linking, the head of a chain can be in fast mode or nonfast mode. All channels that are not in the head of the chain can be in nonfast mode only. In self-linking, the channel cannot be in fast mode.

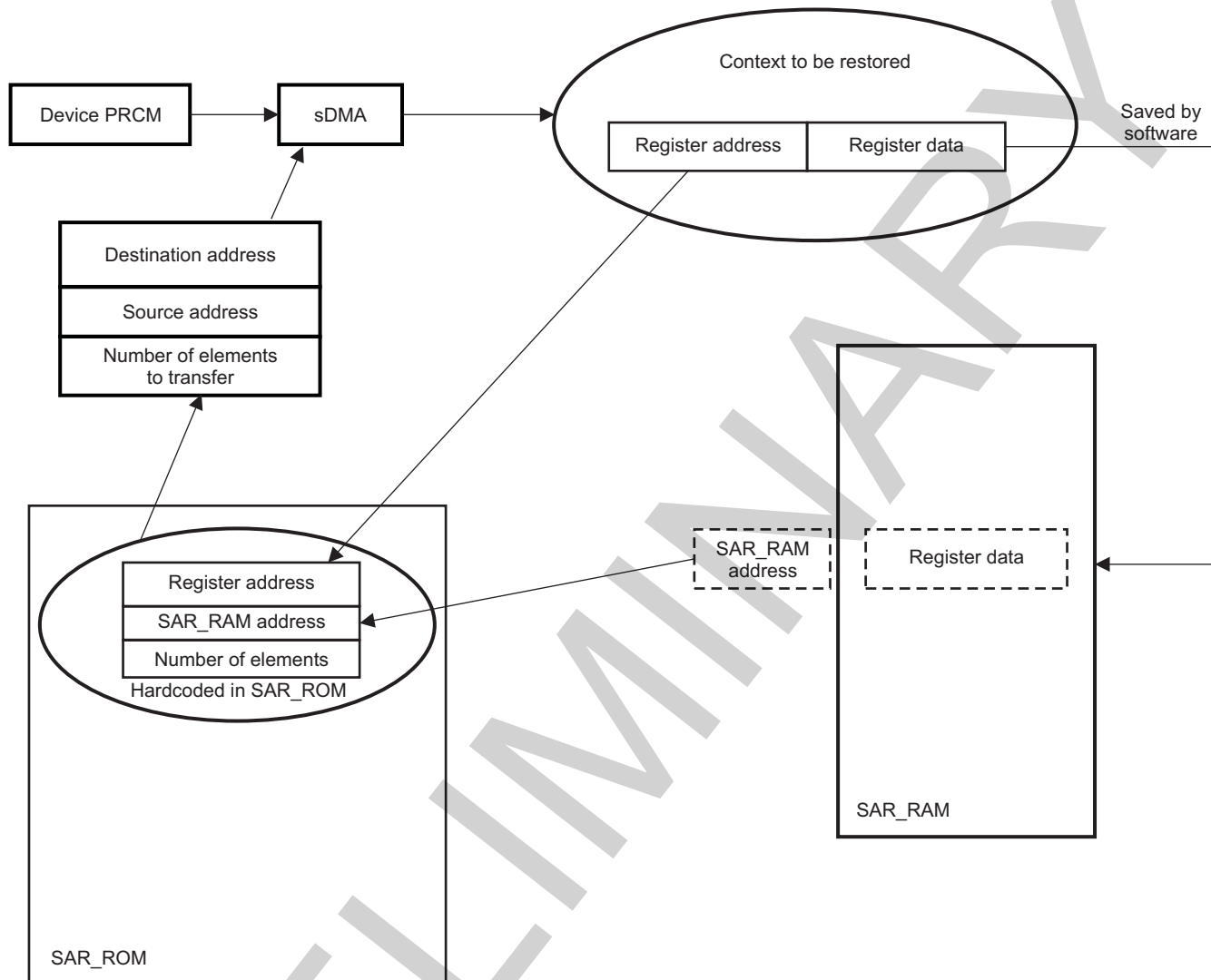
NOTE: If channel CHx links to CHz in the middle of the superblock transfer (remember link bit can be set through Type-1 descriptor load), CHx is disabled after the corresponding data load and enables the channel CHz.

17.4.21 Auto-Restore Feature

The auto-restore feature is introduced mainly to accelerate the restore process, which otherwise is complex and time and resource consuming. In many system applications, it is required that the modem wake up and use only a few modules to wake up, without the intervention of the main MPU (Cortex-A9 MPU). The MPU still may be in off mode; however, some modules may need to come out of off mode. The sDMA can be used to restore the register contents of these modules. The auto-restore feature consists in saving the register data into a memory (SAR RAM in the WKUP domain) that remains powered even during off mode, and then in automatically retrieving data when returning from off mode.

The restore feature is enabled by default and cannot be disabled.

[Figure 17-12](#) is an overview of the save-and-restore mechanism using SAR RAM and SAR ROM.

Figure 17-12. Overview of Save-and-Restore Mechanism Using SAR RAM and SAR ROM

dma-014

17.4.21.1 Save Process

The save process is done entirely by software; the sDMA module normally is not involved. Software must save the data to be restored in a dedicated location in SAR RAM. To reduce the save sequence execution time, the sDMA can be used with linked-list descriptors. These save descriptors are symmetrical with regards to descriptors in the SAR ROM.

The register content to be saved can be the register value before going into off mode or a value that is required on wake up. This means that the restored register value can differ from the last value of the register before going into off mode.

The following registers are affected:

- CM1 and CM2 configuration
Bits 0 of the CM_SHADOW_FREQ_CONFIG1 register and the CM_SHADOW_FREQ_CONFIG2 register are self-clearing and must be set at restore time. Thus, these data must always be overwritten in the SAR RAM.
- Because USBHOSTHS and USBTLL restore requires a particular sequencing, software must overwrite data read from the following registers implied in phase 2a and phase 2b:
 - CM_L3INIT_HSUSBHOST_CLKCTRL_RESTORE

- CM_L3INIT_HSUSBTLL_CLKCTRL_RESTORE
- CM_SDMA_STATICDEP_RESTORE

The USBHOSTHS and USBTLL modules must be put in a particular mode when saving (and restoring) their context. In the case of context saving, software must:

- Configure the L3INIT clock domain to SW_WKUP to ensure module transitions.
- Disable both modules.
- Assert the SAR_MODE pins.
- Enable back both modules. Optional clocks must be kept gated.
- Save both modules context.
- Disable both modules.
- Deassert SAR_MODE pins.
- At this point, software may enable back both modules and get the L3INIT clock domain out from SW_WKUP state.

17.4.21.2 Restore Process

As explained earlier, every time modem wakes up, the MPU must not necessarily wake up. This needs an automated way of restore. For example, when mobile is in roaming, and not in active use, it must change base stations. For this task, the MPU does not need to wake up, only a few peripherals/subsystems need to be in on mode. Before executing any task, we need to restore their register contents.

17.4.21.2.1 PRCM and sDMA interaction During Restore Phase

Restore is performed during three phases. At the end of each phase, the sDMA stops and waits for the PRCM to perform the next phase transfer. For more information, see [Section 3.9.3.2, Device Off Mode Wake-Up Sequences](#), in [Chapter 3, Power, Reset, and Clock Management](#).

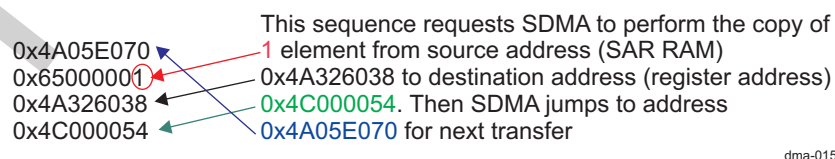
17.4.21.2.2 sDMA Descriptors Description

The restore phase is done automatically by the sDMA. The sDMA gets the register address (destination address), number of elements to transfer, and the address of the data to transfer (source address) from SAR ROM. As mentioned previously, the register data is stored in the SAR RAM.

The SAR ROM contains two types of descriptors the DMA-4 should use:

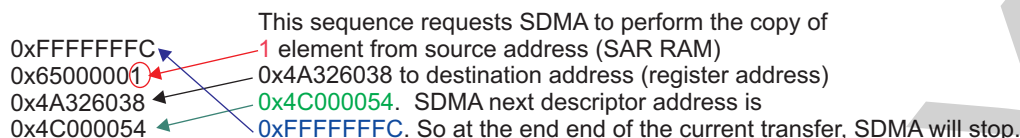
- Type-1 descriptors:
Type-1 descriptors (48 bytes) are used at the beginning of each phase. In addition to the source and destination address and number of elements, these descriptors contain the required data that initializes the sDMA. [Table 17-13](#) shows the type-1 descriptor structure.
- Type-3 descriptors with source and destination address update:
Type-3 descriptors (16 bytes) are used for subsequent sDMA transfers and mainly contain the source and destination address and number of elements. [Table 17-16](#) shows the type-3 descriptor structure. [Figure 17-13](#) is an example of SAR ROM code (type-3 descriptor).

Figure 17-13. Type-3 SAR ROM Code Example



dma-015

[Figure 17-14](#) is an example of last DMA transfer (Type-3 descriptor). To indicate to the DMA that this is the last transfer, the next descriptor address must be set to 0xFFFFF0FC, as shown in the figure.

Figure 17-14. Type-3 SAR ROM Last Transfer Example

dma-016

17.4.21.3 SAR RAM

The SAR RAM contains the data that must be maintained during off mode. The SAR RAM is split into three banks (see [Table 17-18](#)).

Table 17-18. SAR RAM Allocation

| Access Mode | Bank | Address Range |
|---------------------|---------------|-------------------------------|
| Public | 1 (SAR_RAM_1) | 0x4A32_6000–0x4A32_6FFF (4KB) |
| Public, for I/O pad | 2 (SAR_RAM_2) | 0x4A32_7000–0x4A32_73FF (1KB) |
| Public | 3 (SAR_RAM_3) | 0x4A32_8000–0x4A32_87FF (2KB) |

17.4.21.4 SAR ROM

The SAR ROM contains the list of registers that must be saved before off mode and then restored after off mode, and where the register data is stored in SAR RAM. The SAR ROM start address is 0x4A05_E000.

When exiting off mode, PRCM automatically redirects the sDMA to address:

- 0x4A05_E000 for phase 1 (in SAR ROM)
- 0x4A05_E030 for phase 2a (in SAR ROM)
- 0x4A05_E060 for phase 2b (in SAR ROM)

The SAR ROM is built so that the sDMA performs all the transfers for each phase. At the end of each phase, the sDMA stops. The PRCM module then requests to perform the next phase transfer, depending on the wake-up source.

Remarks:

- Phase 1 is always to happen; the restore mechanism is enabled by default and cannot be disabled.
- Phase 2 (2a and 2b) is to happen depending on the wake-up source from off mode. Phase 2 is not performed if C2C is the wake-up source, but it is performed for all other wake-up sources. Therefore, it is mandatory to fill the SAR RAM locations used for USB restore correctly, even if USB is not used, because the restore sequence will happen.
- The USB host restore is to be performed before the USB TLL restore.

NOTE: Some consecutive address registers cannot be saved/restored with burst. This is the case for:

- CLK2_XXX_BW_LIMITER_BANDWIDTH_FRACTIONAL and CLK2_XXX_BW_LIMITER_BANDWIDTH_INTEGER registers, where XXX = BB2D_M1 and BB2D_M2
- CLK2_XXX_BW_REGULATOR.L3_BW_R_BANDWIDTH and CLK2_XXX_BW_REGULATOR.L3_BW_R_WATERMARK registers, where XXX = IVAHD, SGX_M1, SGX_M2, BB2D_M1, and BB2D_M2
- CLK2_BB2D_M2_BW_LIMITER_WATERMARK_0

To avoid the failure of an sDMA transfer, the transfer of the previous registers is performed using a single sDMA transfer.

17.4.21.5 SAR RAM Memory Allocation Reserved for Save and Restore

The memory size of the SAR RAM reserved for the save-and-restore mechanism is:

- 58 percent (2376 bytes) reserved for the SAR mechanism from SAR_RAM_1. The whole SAR_RAM_1 size is 4KB.
- 40 percent (412 bytes) reserved for the SAR mechanism from SAR_RAM_2. The whole SAR_RAM_2 size is 1KB.
- 59 percent (1204 bytes) reserved for the SAR mechanism from SAR_RAM_3. The whole SAR_RAM_3 size is 2KB.

The free part of the SAR RAM can be used by the user software to store any data that must be in always-on memory.

17.4.21.6 Register Mapping in SAR RAM

Table 17-19 describes the SAR_RAM_1 memory mapping.

Table 17-19. SAR_RAM_1 Memory Mapping

| Order | Register Name | Register Start Address | Register End Address | Size | SAR_RAM_1 Address |
|-------|--------------------------------|------------------------|----------------------|------|-------------------|
| 1 | EMIF1.EMIF_LPDDR2_NVM_CONFIG | 0x4C00000C | | 4 | 0x4A326000 |
| 2 | EMIF1.EMIF_SDRAM_CONFIG | 0x4C000008 | | 4 | 0x4A326004 |
| 3 | EMIF1.EMIF_SDRAM_REF_CTRL | 0x4C000010 | | 4 | 0x4A326008 |
| 4 | EMIF1.EMIF_SDRAM_REF_CTRL_SHDW | 0x4C000014 | | 4 | 0x4A32600C |
| 5 | EMIF1.EMIF_SDRAM_TIM_1 | 0x4C000018 | | 4 | 0x4A326010 |
| 6 | EMIF1.EMIF_SDRAM_TIM_1_SHDW | 0x4C00001C | | 4 | 0x4A326014 |
| 7 | EMIF1.EMIF_SDRAM_TIM_2 | 0x4C000020 | | 4 | 0x4A326018 |
| 8 | EMIF1.EMIF_SDRAM_TIM_2_SHDW | 0x4C000024 | | 4 | 0x4A32601C |
| 9 | EMIF1.EMIF_SDRAM_TIM_3 | 0x4C000028 | | 4 | 0x4A326020 |
| 10 | EMIF1.EMIF_SDRAM_TIM_3_SHDW | 0x4C00002C | | 4 | 0x4A326024 |
| 11 | EMIF1.EMIF_LPDDR2_NVM_TIM | 0x4C000030 | | 4 | 0x4A326028 |
| 12 | EMIF1.EMIF_LPDDR2_NVM_TIM_SHDW | 0x4C000034 | | 4 | 0x4A32602C |
| 13 | EMIF1.EMIF_PWR_MGMT_CTRL | 0x4C000038 | | 4 | 0x4A326030 |
| 14 | EMIF1.EMIF_PWR_MGMT_CTRL_SHDW | 0x4C00003C | | 4 | 0x4A326034 |
| 15 | EMIF1.EMIF_L3_CONFIG | 0x4C000054 | | 4 | 0x4A326038 |
| 16 | EMIF1.EMIF_PERF_CNT_CFG | 0x4C000088 | | 4 | 0x4A32603C |
| 17 | EMIF1.EMIF_PERF_CNT_SEL | 0x4C00008C | | 4 | 0x4A326040 |
| 18 | EMIF1.EMIF_READ_IDLE_CTRL | 0x4C000098 | | 4 | 0x4A326044 |
| 19 | EMIF1.EMIF_READ_IDLE_CTRL_SHDW | 0x4C00009C | | 4 | 0x4A326048 |
| 20 | EMIF1.EMIF_IRQENABLE_SET_SYS | 0x4C0000B4 | | 4 | 0x4A32604C |
| 21 | EMIF1.EMIF_IRQENABLE_SET_LL | 0x4C0000B8 | | 4 | 0x4A326050 |
| 22 | EMIF1.EMIF_ZQ_CONFIG | 0x4C0000C8 | | 4 | 0x4A326054 |
| 23 | EMIF1.EMIF_TEMP_ALERT_CONFIG | 0x4C0000CC | | 4 | 0x4A326058 |
| 24 | EMIF1.EMIF_DDR_PHY_CTRL_1 | 0x4C0000E4 | | 4 | 0x4A32605C |
| 25 | EMIF1.EMIF_DDR_PHY_CTRL_1_SHDW | 0x4C0000E8 | | 4 | 0x4A326060 |
| 26 | EMIF1.EMIF_DDR_PHY_CTRL_2 | 0x4C0000EC | | 4 | 0x4A326064 |
| 27 | EMIF2.EMIF_LPDDR2_NVM_CONFIG | 0x4D00000C | | 4 | 0x4A326068 |
| 28 | EMIF2.EMIF_SDRAM_CONFIG | 0x4D000008 | | 4 | 0x4A32606C |
| 29 | EMIF2.EMIF_SDRAM_REF_CTRL | 0x4D000010 | | 4 | 0x4A326070 |
| 30 | EMIF2.EMIF_SDRAM_REF_CTRL_SHDW | 0x4D000014 | | 4 | 0x4A326074 |
| 31 | EMIF2.EMIF_SDRAM_TIM_1 | 0x4D000018 | | 4 | 0x4A326078 |
| 32 | EMIF2.EMIF_SDRAM_TIM_1_SHDW | 0x4D00001C | | 4 | 0x4A32607C |
| 33 | EMIF2.EMIF_SDRAM_TIM_2 | 0x4D000020 | | 4 | 0x4A326080 |

Table 17-19. SAR_RAM_1 Memory Mapping (continued)

| Order | Register Name | Register Start Address | Register End Address | Size | SAR_RAM_1 Address |
|-------|---|------------------------|----------------------|------|-------------------|
| 34 | EMIF2.EMIF_SDRAM_TIM_2_SHDW | 0x4D000024 | | 4 | 0x4A326084 |
| 35 | EMIF2.EMIF_SDRAM_TIM_3 | 0x4D000028 | | 4 | 0x4A326088 |
| 36 | EMIF2.EMIF_SDRAM_TIM_3_SHDW | 0x4D00002C | | 4 | 0x4A32608C |
| 37 | EMIF2.EMIF_LPDDR2_NVM_TIM | 0x4D000030 | | 4 | 0x4A326090 |
| 38 | EMIF2.EMIF_LPDDR2_NVM_TIM_SHDW | 0x4D000034 | | 4 | 0x4A326094 |
| 39 | EMIF2.EMIF_PWR_MGMT_CTRL | 0x4D000038 | | 4 | 0x4A326098 |
| 40 | EMIF2.EMIF_PWR_MGMT_CTRL_SHDW | 0x4D00003C | | 4 | 0x4A32609C |
| 41 | EMIF2.EMIF_L3_CONFIG | 0x4D000054 | | 4 | 0x4A3260A0 |
| 42 | EMIF2.EMIF_PERF_CNT_CFG | 0x4D000088 | | 4 | 0x4A3260A4 |
| 43 | EMIF2.EMIF_PERF_CNT_SEL | 0x4D00008C | | 4 | 0x4A3260A8 |
| 44 | EMIF2.EMIF_READ_IDLE_CTRL | 0x4D000098 | | 4 | 0x4A3260AC |
| 45 | EMIF2.EMIF_READ_IDLE_CTRL_SHDW | 0x4D00009C | | 4 | 0x4A3260B0 |
| 46 | EMIF2.EMIF_IRQENABLE_SET_SYS | 0x4D0000B4 | | 4 | 0x4A3260B4 |
| 47 | EMIF2.EMIF_IRQENABLE_SET_LL | 0x4D0000B8 | | 4 | 0x4A3260B8 |
| 48 | EMIF2.EMIF_ZQ_CONFIG | 0x4D0000C8 | | 4 | 0x4A3260BC |
| 49 | EMIF2.EMIF_TEMP_ALERT_CONFIG | 0x4D0000CC | | 4 | 0x4A3260C0 |
| 50 | EMIF2.EMIF_DDR_PHY_CTRL_1 | 0x4D0000E4 | | 4 | 0x4A3260C4 |
| 51 | EMIF2.EMIF_DDR_PHY_CTRL_1_SHDW | 0x4D0000E8 | | 4 | 0x4A3260C8 |
| 52 | EMIF2.EMIF_DDR_PHY_CTRL_2 | 0x4D0000EC | | 4 | 0x4A3260CC |
| 53 | RESTORE_CM2. CM_MEMIF_CLKSTCTRL_RESTORE | 0x4A009E0C | | 4 | 0x4A3260D0 |
| 54 | RESTORE_CM1. CM_CLKSEL_CORE_RESTORE | 0x4A004E00 | | 4 | 0x4A3260D4 |
| 55 | RESTORE_CM1. CM_DIV_M2_DPLL_CORE_RESTORE | 0x4A004E04 | | 4 | 0x4A3260D8 |
| 56 | RESTORE_CM1. CM_DIV_M3_DPLL_CORE_RESTORE | 0x4A004E08 | | 4 | 0x4A3260DC |
| 57 | RESTORE_CM1. CM_DIV_M4_DPLL_CORE_RESTORE | 0x4A004E0C | | 4 | 0x4A3260E0 |
| 58 | RESTORE_CM1. CM_DIV_M5_DPLL_CORE_RESTORE | 0x4A004E10 | | 4 | 0x4A3260E4 |
| 59 | RESTORE_CM1. CM_DIV_M6_DPLL_CORE_RESTORE | 0x4A004E14 | | 4 | 0x4A3260E8 |
| 60 | RESTORE_CM1. CM_DIV_M7_DPLL_CORE_RESTORE | 0x4A004E18 | | 4 | 0x4A3260EC |
| 61 | RESTORE_CM1. CM_CLKSEL_DPLL_CORE_RESTORE | 0x4A004E1C | | 4 | 0x4A3260F0 |
| 62 | RESTORE_CM1. CM_SSC_DELTAMSTEP_DPLL_CORE_RESTORE | 0x4A004E20 | | 4 | 0x4A3260F4 |
| 63 | RESTORE_CM1. CM_SSC_MODFREQDIV_DPLL_CORE_RESTORE | 0x4A004E24 | | 4 | 0x4A3260F8 |
| 64 | RESTORE_CM1. CM_CLKMODE_DPLL_CORE_RESTORE | 0x4A004E28 | | 4 | 0x4A3260FC |
| 65 | RESTORE_CM1. CM_SHADOW_FREQ_CONFIG2_RESTORE | 0x4A004E2C | | 4 | 0x4A326100 |
| 66 | RESTORE_CM1. CM_SHADOW_FREQ_CONFIG1_RESTORE | 0x4A004E30 | | 4 | 0x4A326104 |
| 67 | RESTORE_CM1. CM_AUTOIDLE_DPLL_CORE_RESTORE | 0x4A004E34 | | 4 | 0x4A326108 |

Table 17-19. SAR_RAM_1 Memory Mapping (continued)

| Order | Register Name | Register Start Address | Register End Address | Size | SAR_RAM_1 Address |
|-------|---|------------------------|----------------------|------|-------------------|
| 68 | RESTORE_CM1. CM_MPU_CLKSTCTRL_RESTORE | 0x4A004E38 | | 4 | 0x4A326010C |
| 69 | RESTORE_CM1. CM_CM1_PROFILING_CLKCTRL_RESTORE | 0x4A004E3C | | 4 | 0x4A3260110 |
| 70 | RESTORE_CM1. CM_DYN_DEP_PRESCAL_RESTORE | 0x4A004E40 | | 4 | 0x4A326114 |
| 71 | RESTORE_CM2. CM_L3_1_CLKSTCTRL_RESTORE | 0x4A009E00 | | 4 | 0x4A326118 |
| 72 | RESTORE_CM2. CM_L3_2_CLKSTCTRL_RESTORE | 0x4A009E04 | | 4 | 0x4A32611C |
| 73 | RESTORE_CM2. CM_L4CFG_CLKSTCTRL_RESTORE | 0x4A009E08 | | 4 | 0x4A326120 |
| 74 | RESTORE_CM2. CM_MEMIF_CLKSTCTRL_RESTORE | 0x4A009E0C | | 4 | 0x4A326124 |
| 75 | RESTORE_CM2. CM_L4PER_CLKSTCTRL_RESTORE | 0x4A009E10 | | 4 | 0x4A326128 |
| 76 | RESTORE_CM2. CM_L3INIT_CLKSTCTRL_RESTORE | 0x4A009E14 | | 4 | 0x4A32612C |
| 77 | RESTORE_CM2. CM_L3INSTR_L3_3_CLKCTRL_RESTORE | 0x4A009E18 | | 4 | 0x4A326130 |
| 78 | RESTORE_CM2. CM_L3INSTR_L3_INSTR_CLKCTRL_RESTORE | 0x4A009E1C | | 4 | 0x4A326134 |
| 79 | RESTORE_CM2. CM_L3INSTR_OCP_WP1_CLKCTRL_RESTORE | 0x4A009E20 | | 4 | 0x4A326138 |
| 80 | RESTORE_CM2. CM_CM2_PROFILING_CLKCTRL_RESTORE | 0x4A009E24 | | 4 | 0x4A32613C |
| 81 | RESTORE_CM2. CM_C2C_STATICDEP_RESTORE | 0x4A009E28 | | 4 | 0x4A326140 |
| 82 | RESTORE_CM2. CM_L3_1_DYNAMICDEP_RESTORE | 0x4A009E2C | | 4 | 0x4A326144 |
| 83 | RESTORE_CM2. CM_L3_2_DYNAMICDEP_RESTORE | 0x4A009E30 | | 4 | 0x4A326148 |
| 84 | RESTORE_CM2. CM_C2C_DYNAMICDEP_RESTORE | 0x4A009E34 | | 4 | 0x4A32614C |
| 85 | RESTORE_CM2. CM_L4CFG_DYNAMICDEP_RESTORE | 0x4A009E38 | | 4 | 0x4A326150 |
| 86 | RESTORE_CM2. CM_L4PER_DYNAMICDEP_RESTORE | 0x4A009E3C | | 4 | 0x4A326154 |
| 87 | C2C. C2C_PORTCONFIG | 0x5C00000C | | 4 | 0x4A326158 |
| 88 | C2C. C2C_MIRRORMODE | 0x5C000010 | | 4 | 0x4A32615C |
| 89 | C2C. C2C_IRQ_ENABLE_SET_1 | 0x5C000028 | | 4 | 0x4A326160 |
| 90 | C2C. C2C_FCLK_FREQ | 0x5C000040 | | 4 | 0x4A326164 |
| 91 | C2C. C2C_RX_MAX_FREQ | 0x5C000044 | | 4 | 0x4A326168 |
| 92 | C2C. C2C_GENI_CONTROL | 0x5C000070 | | 4 | 0x4A32616C |
| 93 | C2C. C2C_GENI_MASK | 0x5C000074 | | 4 | 0x4A326170 |
| 94 | C2C. C2C_GENO_INTERRUPT | 0x5C000084 | | 4 | 0x4A326174 |
| 95 | C2C. C2C_GENO_LEVEL | 0x5C000088 | | 4 | 0x4A326178 |
| 98 | SYSCTRL_PADCONF_CORE.CONTROL_PADCONF_GLOBAL | 0x4A1005A0 | 0x4A1005DB | 60 | 0x4A32617C |
| 99 | SYSCTRL_PADCONF_CORE.CONTROL_PBIASLITE | 0x4A100600 | 0x4A10060B | 12 | 0x4A3261B8 |

Table 17-19. SAR_RAM_1 Memory Mapping (continued)

| Order | Register Name | Register Start Address | Register End Address | Size | SAR_RAM_1 Address |
|-------|---|------------------------|----------------------|------|-------------------|
| 100 | SYSCTRL_PADCONF_CORE.CONTROL_H DMI_TX_PHY | 0x4A100610 | 0x4A100637 | 40 | 0x4A3261C4 |
| 101 | SYSCTRL_PADCONF_CORE.CONTROL_L PDDR2IO1_0 | 0x4A100638 | 0x4A100657 | 32 | 0x4A3261EC |
| 102 | SYSCTRL_PADCONF_CORE.CONTROL_B US_HOLD | 0x4A100658 | | 4 | 0x4A32620C |
| 103 | SYSCTRL_PADCONF_CORE.CONTROL_C 2C | 0x4A10065C | | 4 | 0x4A326210 |
| 104 | SYSCTRL_PADCONF_CORE.CONTROL_E FUSE_2 | 0x4A100704 | | 4 | 0x4A326214 |
| 105 | SYSCTRL_PADCONF_CORE.CONTROL_E FUSE_4 | 0x4A10070C | | 4 | 0x4A326218 |
| 106 | CONTROL_HWOBS_CONTROL | 0x4A002350 | | 4 | 0x4A32621C |
| 251 | DMM.DMM_LISA_MAP_0 | 0x4E000040 | | 4 | 0x4A326220 |
| 252 | DMM.DMM_LISA_MAP_1 | 0x4E000044 | | 4 | 0x4A326224 |
| 253 | DMM.DMM_LISA_MAP_2 | 0x4E000048 | | 4 | 0x4A326228 |
| 254 | DMM.DMM_LISA_MAP_3 | 0x4E00004C | | 4 | 0x4A32622C |
| 255 | DMM.DMM_LISA_LOCK | 0x4E00001C | | 4 | 0x4A326230 |
| 256 | DMM.DMM_TILER_OR0 | 0x4E000220 | | 4 | 0x4A326234 |
| 257 | DMM.DMM_TILER_OR1 | 0x4E000224 | | 4 | 0x4A326238 |
| 258 | DMM.DMM_PAT_VIEW0 | 0x4E000420 | | 4 | 0x4A32623C |
| 259 | DMM.DMM_PAT_VIEW1 | 0x4E000424 | | 4 | 0x4A326240 |
| 260 | DMM.DMM_PAT_VIEW_MAP_0 | 0x4E000440 | | 4 | 0x4A326244 |
| 261 | DMM.DMM_PAT_VIEW_MAP_1 | 0x4E000444 | | 4 | 0x4A326248 |
| 262 | DMM.DMM_PAT_VIEW_MAP_2 | 0x4E000448 | | 4 | 0x4A32624C |
| 263 | DMM.DMM_PAT_VIEW_MAP_3 | 0x4E00044C | | 4 | 0x4A326250 |
| 264 | DMM.DMM_PAT_VIEW_MAP_BASE | 0x4E000460 | | 4 | 0x4A326254 |
| 265 | DMM.DMM_PAT_IRQENABLE_SET | 0x4E0004A0 | | 4 | 0x4A326258 |
| 266 | DMM.DMM_PAT_DESCR_0 | 0x4E000500 | | 4 | 0x4A32625C |
| 267 | DMM.DMM_PAT_AREA_0 | 0x4E000504 | | 4 | 0x4A326260 |
| 268 | DMM.DMM_PAT_CTRL_0 | 0x4E000508 | | 4 | 0x4A326264 |
| 269 | DMM.DMM_PAT_DATA_0 | 0x4E00050C | | 4 | 0x4A326268 |
| 270 | DMM.DMM_PAT_DESCR_1 | 0x4E000510 | | 4 | 0x4A32626C |
| 271 | DMM.DMM_PAT_AREA_1 | 0x4E000514 | | 4 | 0x4A326270 |
| 272 | DMM.DMM_PAT_CTRL_1 | 0x4E000518 | | 4 | 0x4A326274 |
| 273 | DMM.DMM_PAT_DATA_1 | 0x4E00051C | | 4 | 0x4A326278 |
| 274 | DMM.DMM_PAT_DESCR_2 | 0x4E000520 | | 4 | 0x4A32627C |
| 275 | DMM.DMM_PAT_AREA_2 | 0x4E000524 | | 4 | 0x4A326280 |
| 276 | DMM.DMM_PAT_CTRL_2 | 0x4E000528 | | 4 | 0x4A326284 |
| 277 | DMM.DMM_PAT_DATA_2 | 0x4E00052C | | 4 | 0x4A326288 |
| 278 | DMM.DMM_PAT_DESCR_3 | 0x4E000530 | | 4 | 0x4A32628C |
| 279 | DMM.DMM_PAT_AREA_3 | 0x4E000534 | | 4 | 0x4A326290 |
| 280 | DMM.DMM_PAT_CTRL_3 | 0x4E000538 | | 4 | 0x4A326294 |
| 281 | DMM.DMM_PAT_DATA_3 | 0x4E00053C | | 4 | 0x4A326298 |
| 282 | DMM.DMM_PEG_PRIO0 | 0x4E000460 | | 4 | 0x4A32629C |
| 283 | DMM.DMM_PEG_PRIO1 | 0x4E000464 | | 4 | 0x4A3262A0 |
| 284 | DMM.DMM_PEG_PRIO_PAT | 0x4E000640 | | 4 | 0x4A3262A4 |
| 285 | CLK1_FLAGMUX_CLK1.L3_FLAGMUX_MA SK0 | 0x44000508 | | 4 | 0x4A3262A8 |

Table 17-19. SAR_RAM_1 Memory Mapping (continued)

| Order | Register Name | Register Start Address | Register End Address | Size | SAR_RAM_1 Address |
|-------|--|------------------------|----------------------|------|-------------------|
| 286 | CLK1_FLAGMUX_CLK1.L3_FLAGMUX_MA_SK1 | 0x44000510 | | 4 | 0x4A3262AC |
| 287 | CLK1_RATE_ADAPT_RESP_32TO128_CLK1.L3_RA_CNF | 0x44000808 | | 4 | 0x4A3262B0 |
| 288 | CLK2_FLAGMUX_CLK2.L3_FLAGMUX_MA_SK0 | 0x44801008 | | 4 | 0x4A3262B4 |
| 289 | CLK2_FLAGMUX_CLK2.L3_FLAGMUX_MA_SK1 | 0x44801010 | | 4 | 0x4A3262B8 |
| 290 | CLK2_RATE_ADAPT_RESP_32TO128_CLK2.L3_RA_CNF | 0x44801208 | | 4 | 0x4A3262BC |
| 291 | CLK2_IVAHD_BW_REGULATOR.L3_BW_R_BANDWIDTH | 0x44801408 | | 4 | 0x4A3262C0 |
| 292 | CLK2_IVAHD_BW_REGULATOR.L3_BW_R_WATERMARK | 0x4480140C | | 4 | 0x4A3262C4 |
| 293 | CLK2_SGX_M1_BW_REGULATOR.L3_BW_R_BANDWIDTH | 0x44801708 | | 4 | 0x4A3262C8 |
| 294 | CLK2_SGX_M1_BW_REGULATOR.L3_BW_R_WATERMARK | 0x4480170C | | 4 | 0x4A3262CC |
| 295 | CLK2_SGX_M2_BW_REGULATOR.L3_BW_R_BANDWIDTH | 0x44801808 | | 4 | 0x4A3262D0 |
| 296 | CLK2_SGX_M2_BW_REGULATOR.L3_BW_R_WATERMARK | 0x4480180C | | 4 | 0x4A3262D4 |
| 297 | CLK2_BB2D_M1_BW_REGULATOR.L3_BW_R_BANDWIDTH | 0x44801A08 | | 4 | 0x4A3262D8 |
| 298 | CLK2_BB2D_M1_BW_REGULATOR.L3_BW_R_WATERMARK | 0x44801A0C | | 4 | 0x4A3262DC |
| 299 | CLK2_BB2D_M2_BW_REGULATOR.L3_BW_R_BANDWIDTH | 0x44801B08 | | 4 | 0x4A3262E0 |
| 300 | CLK2_BB2D_M2_BW_REGULATOR.L3_BW_R_WATERMARK | 0x44801B0C | | 4 | 0x4A3262E4 |
| 301 | CLK2_BB2D_M1_BW_LIMITER.L3_BW_LIMITER_BANDWIDTH_FRACTIONAL | 0x44801C08 | | 4 | 0x4A3262E8 |
| 302 | CLK2_BB2D_M1_BW_LIMITER.L3_BW_LIMITER_BANDWIDTH_INTEGER | 0x44801C0C | | 4 | 0x4A3262EC |
| 303 | CLK2_BB2D_M1_BW_LIMITER.L3_BW_LIMITER_WATERMARK_0 | 0x44801C10 | | 4 | 0x4A3262F0 |
| 304 | CLK2_BB2D_M2_BW_LIMITER.L3_BW_LIMITER_BANDWIDTH_FRACTIONAL | 0x44801D08 | | 4 | 0x4A3262F4 |
| 305 | CLK2_BB2D_M2_BW_LIMITER.L3_BW_LIMITER_BANDWIDTH_INTEGER | 0x44801D0C | | 4 | 0x4A3262F8 |
| 306 | CLK2_BB2D_M2_BW_LIMITER.L3_BW_LIMITER_WATERMARK_0 | 0x44801D10 | | 4 | 0x4A3262FC |
| 307 | CLK3_FLAGMUX_CLK3.L3_FLAGMUX_MA_SK0 | 0x45000208 | | 4 | 0x4A326300 |
| 308 | CLK3_FLAGMUX_CLK3.L3_FLAGMUX_MA_SK1 | 0x45000210 | | 4 | 0x4A326304 |
| 309 | CLK3_FLAGMUX_CLK3.L3_STATCOLL_M_ASK0 | 0x45000308 | | 4 | 0x4A326308 |
| 313 | RESTORE_CM2.CM_L3INIT_USB_HOST_CLKCTRL_RESTORE | 0x4A009E54 | | 4 | 0x4A32630C |
| 314 | RESTORE_CM2.CM_L3INIT_USB_TLL_CLKCTRL_RESTORE | 0x4A009E58 | | 4 | 0x4A326310 |
| 315 | RESTORE_CM2.CM_SDMA_STATICDEP_RESTORE | 0x4A009E5C | | 4 | 0x4A326314 |
| 317 | USBTLLHS_config.USBTLL_SAR_CNTX_0 | 0x4A062400 | | 4 | 0x4A326318 |

Table 17-19. SAR_RAM_1 Memory Mapping (continued)

| Order | Register Name | Register Start Address | Register End Address | Size | SAR_RAM_1 Address |
|-------|---|------------------------|----------------------|------|-------------------|
| 318 | USBTLLHS_config.USBTLL_SAR_CNTX_1 | 0x4A062404 | | 4 | 0x4A32631C |
| 319 | USBTLLHS_config.USBTLL_SAR_CNTX_2 | 0x4A062408 | | 4 | 0x4A326320 |
| 320 | USBTLLHS_config.USBTLL_SAR_CNTX_3 | 0x4A06240C | | 4 | 0x4A326324 |
| 321 | USBTLLHS_config.USBTLL_SAR_CNTX_4 | 0x4A062410 | | 4 | 0x4A326328 |
| 322 | USBTLLHS_config.USBTLL_SAR_CNTX_5 | 0x4A062414 | | 4 | 0x4A32632C |
| 323 | USBTLLHS_config.USBTLL_SAR_CNTX_6 | 0x4A062418 | | 4 | 0x4A326330 |
| 324 | HSUSBHOST.UHH_SYSCONFIG | 0x4A064010 | | 4 | 0x4A326334 |
| 325 | HSUSBHOST.UHH_HOSTCONFIG | 0x4A064040 | | 4 | 0x4A326338 |
| 326 | HSUSBHOST.UHH_SAR_CNTX_0 | 0x4A064100 | 0x4A0646FF | 1536 | 0x4A32633C |
| 327 | RESTORE_CM2.CM_L3INIT_HSUSBHOST_CLKCTRL_RESTORE | 0x4A009E54 | | 4 | 0x4A32693C |
| 328 | RESTORE_CM2.CM_L3INIT_HSUSBTLL_C_LKCTRL_RESTORE | 0x4A009E58 | | 4 | 0x4A326940 |
| 329 | RESTORE_CM2.CM_SDMA_STATICDEP_RESTORE | 0x4A009E5C | | 4 | 0x4A326944 |

Table 17-20 describes the SAR_RAM_2 memory mapping.

Table 17-20. SAR_RAM_2 Memory Mapping

| Order | Register Name | Register Start Address | Register End Address | Size | SAR RAM Address |
|-------|---|------------------------|----------------------|------|-----------------|
| 96 | SYSCTRL_PADCONF_CORE. CONTROL_CORE_PAD0_GPMC_AD0_PAD1_GPMC_AD1 | 0x4A100040 | 0x4A1001D7 | 408 | 0x4A327000 |
| 97 | SYSCTRL_PADCONF_CORE. CONTROL_CORE_PAD0_CSI22_DY2 | 0x4A1001F4 | | 4 | 0x4A327198 |

Table 17-21 describes the SAR_RAM_3 memory mapping.

Table 17-21. SAR_RAM_3 Memory Mapping

| Order | Register Name | Register Start Address | Register End Address | Size | SAR RAM Address |
|-------|--------------------------------------|------------------------|----------------------|------|-----------------|
| 144 | MPUMA_FW.MRM_PERMISSION_REGION_LOW_0 | 0x4A20A088 | 0x4A20A0FF | 120 | 0x4A328278 |
| 145 | PER_AP.L4_AP_PROT_GROUP_MEMBER_S_3_L | 0x48000218 | | 4 | 0x4A3282F0 |
| 146 | PER_AP.L4_AP_PROT_GROUP_MEMBER_S_4_L | 0x48000220 | | 4 | 0x4A3282F4 |
| 147 | PER_AP.L4_AP_PROT_GROUP_MEMBER_S_5_L | 0x48000228 | | 4 | 0x4A3282F8 |
| 148 | PER_AP.L4_AP_PROT_GROUP_MEMBER_S_6_L | 0x48000230 | | 4 | 0x4A3282FC |
| 149 | PER_AP.L4_AP_PROT_GROUP_MEMBER_S_7_L | 0x48000238 | | 4 | 0x4A328300 |
| 150 | PER_AP.L4_AP_PROT_GROUP_ROLES_3 | 0x48000298 | 0x4800029F | 8 | 0x4A328304 |
| 151 | PER_AP.L4_AP_PROT_GROUP_ROLES_4 | 0x480002A0 | 0x480002A7 | 8 | 0x4A32830C |
| 152 | PER_AP.L4_AP_PROT_GROUP_ROLES_5 | 0x480002A8 | 0x480002AF | 8 | 0x4A328314 |
| 153 | PER_AP.L4_AP_PROT_GROUP_ROLES_6 | 0x480002B0 | 0x480002B7 | 8 | 0x4A32831C |
| 154 | PER_AP.L4_AP_PROT_GROUP_ROLES_7 | 0x480002B8 | 0x480002BF | 8 | 0x4A328324 |
| 155 | PER_AP.L4_AP_REGION_0_L | 0x48000304 | | 4 | 0x4A32832C |
| 156 | PER_AP.L4_AP_REGION_3_L | 0x4800031C | | 4 | 0x4A328330 |

Table 17-21. SAR_RAM_3 Memory Mapping (continued)

| Order | Register Name | Register Start Address | Register End Address | Size | SAR RAM Address |
|-------|---|------------------------|----------------------|------|-----------------|
| 157 | PER_AP.L4_AP_REGION_5_L | 0x4800032C | | 4 | 0x4A328334 |
| 158 | PER_AP.L4_AP_REGION_7_L | 0x4800033C | | 4 | 0x4A328338 |
| 159 | PER_AP.L4_AP_REGION_9_L | 0x4800034C | | 4 | 0x4A32833C |
| 160 | PER_AP.L4_AP_REGION_11_L | 0x4800035C | | 4 | 0x4A328340 |
| 161 | PER_AP.L4_AP_REGION_13_L | 0x4800036C | | 4 | 0x4A328344 |
| 162 | PER_AP.L4_AP_REGION_15_L | 0x4800037C | | 4 | 0x4A328348 |
| 163 | PER_AP.L4_AP_REGION_17_L | 0x4800038C | | 4 | 0x4A32834C |
| 164 | PER_AP.L4_AP_REGION_19_L | 0x4800039C | | 4 | 0x4A328350 |
| 165 | PER_AP.L4_AP_REGION_21_L | 0x480003AC | | 4 | 0x4A328354 |
| 166 | PER_AP.L4_AP_REGION_23_L | 0x480003BC | | 4 | 0x4A328358 |
| 167 | PER_AP.L4_AP_REGION_25_L | 0x480003CC | | 4 | 0x4A32835C |
| 168 | PER_AP.L4_AP_REGION_26_L | 0x480003D4 | | 4 | 0x4A328360 |
| 169 | PER_AP.L4_AP_REGION_28_L | 0x480003E4 | | 4 | 0x4A328364 |
| 170 | PER_AP.L4_AP_REGION_30_L | 0x480003F4 | | 4 | 0x4A328368 |
| 171 | PER_AP.L4_AP_REGION_32_L | 0x48000404 | | 4 | 0x4A32836C |
| 172 | PER_AP.L4_AP_REGION_34_L | 0x48000414 | | 4 | 0x4A328370 |
| 173 | PER_AP.L4_AP_REGION_37_L | 0x4800042C | | 4 | 0x4A328374 |
| 174 | PER_AP.L4_AP_REGION_39_L | 0x4800043C | | 4 | 0x4A328378 |
| 175 | PER_AP.L4_AP_REGION_41_L | 0x4800044C | | 4 | 0x4A32837C |
| 176 | PER_AP.L4_AP_REGION_43_L | 0x4800045C | | 4 | 0x4A328380 |
| 177 | PER_AP.L4_AP_REGION_45_L | 0x4800046C | | 4 | 0x4A328384 |
| 178 | PER_AP.L4_AP_REGION_47_L | 0x4800047C | | 4 | 0x4A328388 |
| 179 | PER_AP.L4_AP_REGION_49_L | 0x4800048C | | 4 | 0x4A32838C |
| 180 | PER_AP.L4_AP_REGION_51_L | 0x4800049C | | 4 | 0x4A328390 |
| 181 | PER_AP.L4_AP_REGION_53_L | 0x480004AC | | 4 | 0x4A328394 |
| 182 | PER_AP.L4_AP_REGION_55_L | 0x480004BC | | 4 | 0x4A328398 |
| 183 | PER_AP.L4_AP_REGION_57_L | 0x480004CC | | 4 | 0x4A32839C |
| 184 | PER_AP.L4_AP_REGION_59_L | 0x480004DC | | 4 | 0x4A3283A0 |
| 185 | PER_AP.L4_AP_REGION_61_L | 0x480004EC | | 4 | 0x4A3283A4 |
| 186 | PER_AP.L4_AP_REGION_63_L | 0x480004FC | | 4 | 0x4A3283A8 |
| 187 | PER_AP.L4_AP_REGION_65_L | 0x4800050C | | 4 | 0x4A3283AC |
| 188 | PER_AP.L4_AP_REGION_67_L | 0x4800051C | | 4 | 0x4A3283B0 |
| 189 | PER_AP.L4_AP_REGION_69_L | 0x4800052C | | 4 | 0x4A3283B4 |
| 190 | PER_AP.L4_AP_REGION_71_L | 0x4800053C | | 4 | 0x4A3283B8 |
| 191 | PER_AP.L4_AP_REGION_73_L | 0x4800054C | | 4 | 0x4A3283BC |
| 192 | PER_AP.L4_AP_REGION_75_L | 0x4800055C | | 4 | 0x4A3283C0 |
| 193 | PER_AP.L4_AP_REGION_77_L | 0x4800056C | | 4 | 0x4A3283C4 |
| 194 | PER_AP.L4_AP_REGION_79_L | 0x4800057C | | 4 | 0x4A3283C8 |
| 195 | PER_AP.L4_AP_REGION_84_L | 0x480005A4 | | 4 | 0x4A3283CC |
| 196 | CFG_AP.L4_AP_PROT_GROUP_MEMBER S_6_L | 0x4A000230 | | 4 | 0x4A3283D0 |
| 197 | CFG_AP.L4_AP_PROT_GROUP_MEMBER S_7_L | 0x4A000238 | | 4 | 0x4A3283D4 |
| 198 | CFG_AP.L4_AP_PROT_GROUP_ROLES_6 | 0x4A0002B0 | 0x4A0002B7 | 8 | 0x4A3283D8 |
| 199 | CFG_AP.L4_AP_PROT_GROUP_ROLES_7 | 0x4A0002B8 | 0x4A0002BF | 8 | 0x4A3283E0 |
| 200 | CFG_AP.L4_AP_REGION_0_L | 0x4A000304 | | 4 | 0x4A3283E8 |
| 201 | CFG_AP.L4_AP_REGION_3_L | 0x4A00031C | | 4 | 0x4A3283EC |

Table 17-21. SAR_RAM_3 Memory Mapping (continued)

| Order | Register Name | Register Start Address | Register End Address | Size | SAR RAM Address |
|-------|--------------------------|------------------------|----------------------|------|-----------------|
| 202 | CFG_AP.L4_AP_REGION_5_L | 0x4A00032C | | 4 | 0x4A3283F0 |
| 203 | CFG_AP.L4_AP_REGION_7_L | 0x4A00033C | | 4 | 0x4A3283F4 |
| 204 | CFG_AP.L4_AP_REGION_10_L | 0x4A000354 | | 4 | 0x4A3283F8 |
| 205 | CFG_AP.L4_AP_REGION_11_L | 0x4A00035C | | 4 | 0x4A3283FC |
| 206 | CFG_AP.L4_AP_REGION_13_L | 0x4A00036C | | 4 | 0x4A328400 |
| 207 | CFG_AP.L4_AP_REGION_15_L | 0x4A00037C | | 4 | 0x4A328404 |
| 208 | CFG_AP.L4_AP_REGION_17_L | 0x4A00038C | | 4 | 0x4A328408 |
| 209 | CFG_AP.L4_AP_REGION_21_L | 0x4A0003AC | | 4 | 0x4A32840C |
| 210 | CFG_AP.L4_AP_REGION_23_L | 0x4A0003BC | | 4 | 0x4A328410 |
| 211 | CFG_AP.L4_AP_REGION_25_L | 0x4A0003CC | | 4 | 0x4A328414 |
| 212 | CFG_AP.L4_AP_REGION_27_L | 0x4A0003DC | | 4 | 0x4A328418 |
| 213 | CFG_AP.L4_AP_REGION_29_L | 0x4A0003EC | | 4 | 0x4A32841C |
| 214 | CFG_AP.L4_AP_REGION_31_L | 0x4A0003FC | | 4 | 0x4A328420 |
| 215 | CFG_AP.L4_AP_REGION_33_L | 0x4A00040C | | 4 | 0x4A328424 |
| 216 | CFG_AP.L4_AP_REGION_35_L | 0x4A00041C | | 4 | 0x4A328428 |
| 217 | CFG_AP.L4_AP_REGION_37_L | 0x4A00042C | | 4 | 0x4A32842C |
| 218 | CFG_AP.L4_AP_REGION_39_L | 0x4A00043C | | 4 | 0x4A328430 |
| 219 | CFG_AP.L4_AP_REGION_41_L | 0x4A00044C | | 4 | 0x4A328434 |
| 220 | CFG_AP.L4_AP_REGION_43_L | 0x4A00045C | | 4 | 0x4A328438 |
| 221 | CFG_AP.L4_AP_REGION_45_L | 0x4A00046C | | 4 | 0x4A32843C |
| 222 | CFG_AP.L4_AP_REGION_47_L | 0x4A00047C | | 4 | 0x4A328440 |
| 223 | CFG_AP.L4_AP_REGION_49_L | 0x4A00048C | | 4 | 0x4A328444 |
| 224 | CFG_AP.L4_AP_REGION_51_L | 0x4A00049C | | 4 | 0x4A328448 |
| 225 | CFG_AP.L4_AP_REGION_53_L | 0x4A0004AC | | 4 | 0x4A32844C |
| 226 | CFG_AP.L4_AP_REGION_55_L | 0x4A0004BC | | 4 | 0x4A328450 |
| 227 | CFG_AP.L4_AP_REGION_57_L | 0x4A0004CC | | 4 | 0x4A328454 |
| 228 | CFG_AP.L4_AP_REGION_59_L | 0x4A0004DC | | 4 | 0x4A328458 |
| 229 | CFG_AP.L4_AP_REGION_61_L | 0x4A0004EC | | 4 | 0x4A32845C |
| 230 | CFG_AP.L4_AP_REGION_63_L | 0x4A0004FC | | 4 | 0x4A328460 |
| 231 | CFG_AP.L4_AP_REGION_65_L | 0x4A00050C | | 4 | 0x4A328464 |
| 232 | CFG_AP.L4_AP_REGION_67_L | 0x4A00051C | | 4 | 0x4A328468 |
| 233 | CFG_AP.L4_AP_REGION_69_L | 0x4A00052C | | 4 | 0x4A32846C |
| 234 | CFG_AP.L4_AP_REGION_71_L | 0x4A00053C | | 4 | 0x4A328470 |
| 235 | CFG_AP.L4_AP_REGION_73_L | 0x4A00054C | | 4 | 0x4A328474 |
| 236 | CFG_AP.L4_AP_REGION_75_L | 0x4A00055C | | 4 | 0x4A328478 |
| 237 | CFG_AP.L4_AP_REGION_77_L | 0x4A00056C | | 4 | 0x4A32847C |
| 238 | CFG_AP.L4_AP_REGION_78_L | 0x4A000574 | | 4 | 0x4A328480 |
| 239 | CFG_AP.L4_AP_REGION_80_L | 0x4A000584 | | 4 | 0x4A328484 |
| 240 | CFG_AP.L4_AP_REGION_82_L | 0x4A000594 | | 4 | 0x4A328488 |
| 241 | CFG_AP.L4_AP_REGION_84_L | 0x4A0005A4 | | 4 | 0x4A32848C |
| 242 | CFG_AP.L4_AP_REGION_86_L | 0x4A0005B4 | | 4 | 0x4A328490 |
| 243 | CFG_AP.L4_AP_REGION_88_L | 0x4A0005C4 | | 4 | 0x4A328494 |
| 244 | CFG_AP.L4_AP_REGION_90_L | 0x4A0005D4 | | 4 | 0x4A328498 |
| 245 | CFG_AP.L4_AP_REGION_91_L | 0x4A0005DC | | 4 | 0x4A32849C |
| 246 | CFG_AP.L4_AP_REGION_92_L | 0x4A0005E4 | | 4 | 0x4A3284A0 |
| 247 | CFG_AP.L4_AP_REGION_93_L | 0x4A0005EC | | 4 | 0x4A3284A4 |
| 248 | CFG_AP.L4_AP_REGION_94_L | 0x4A0005F4 | | 4 | 0x4A3284A8 |

Table 17-21. SAR_RAM_3 Memory Mapping (continued)

| Order | Register Name | Register Start Address | Register End Address | Size | SAR RAM Address |
|-------|--------------------------|------------------------|----------------------|------|-----------------|
| 249 | CFG_AP.L4_AP_REGION_95_L | 0x4A0005FC | | 4 | 0x4A3284AC |
| 250 | CFG_AP.L4_AP_REGION_96_L | 0x4A000604 | | 4 | 0x4A3284B0 |

17.5 sDMA Basic Programming Model

17.5.1 Setup Configuration

After a hardware reset, program all fields in the logical channel registers to default values for any channels used, because most fields are undefined following reset.

Before programming any DMA transfers, the priority arbitration rate and the maximum FIFO depth must be configured through the [DMA4_GCR](#) register, and any required interrupts must be enabled through the [DMA4_IRQENABLE_Lj](#) registers and the logical channel [DMA4_CICRi](#) registers.

Software clears the [DMA4_CSRi](#) register and the IRQSTATUS bit for the different interrupt lines before enabling the channel.

17.5.2 Software-Triggered (Nonsynchronized) Transfer

To program a software-triggered DMA transfer:

1. Configure the transfer parameters in the logical DMA channel registers:

- [DMA4_CSDPi](#):
 - Transfer ES (8, 16, or 32 bits) in the DMA [DMA4_CSDPi\[1:0\]](#) bit field.
 - Read and write port access types (single/burst), DMA [DMA4_CSDPi\[8:7\]](#) and [DMA4_CSDPi\[15:14\]](#) bit fields
 - Source and destination endianness, DMA [DMA4_CSDPi\[21\]](#) and [DMA4_CSDPi\[19\]](#) bits
 - Write mode (posted or nonposted) and DMA [DMA4_CSDPi\[17:16\]](#) bit field
 - Source or destination packed or nonpacked (if the ES is less than the read/write port size), DMA [DMA4_CSDPi\[6\]](#) and [DMA4_CSDPi\[13\]](#) bits
- [DMA4_CENi](#): EN
- [DMA4_CFNi](#): FN per transfer block
- [DMA4_CSSAi](#) and [DMA4_CDSAi](#): Source and destination start address (aligned with transfer ES)
- [DMA4_CCRi](#):
 - Read and write port addressing modes, DMA [DMA4_CCRi\[13:12\]](#) and [DMA4_CCRi\[15:14\]](#) bit field
 - Priority bit for both read and write ports, DMA [DMA4_CCRi\[6\]](#) and [DMA4_CCRi\[26\]](#) bits
 - DMA request number (set to 0 for a software-triggered transfer) and DMA register bit fields [DMA4_CCRi\[4:0\] = 0](#) and [DMA4_CCRi\[20:19\] = 0](#)
- [DMA4_CSEli](#), [DMA4_CSFli](#), [DMA4_CDEli](#), and [DMA4_CDFli](#): Source and destination element and frame indexes (depending on addressing mode)

2. Start the transfer through the enable bit in the channel [DMA4_CCRi](#) register and DMA [DMA4_CCRi\[7\]](#) bit.

The following example performs a DMA transfer on channel 10 of a 240 × 160 picture from RAM to RAM (0x80C00000 to 0x80F00000):

```
UWORD32 RegVal = 0;
DMA4_t *DMA4;
DMA4 = (DMA4_t
*)malloc(sizeof(DMA4_t));
/* Init. parameters
*/
DMA4->DataType = 0x2; //
DMA4->CSDPi[1:0]
DMA4->ReadPortAccessType = 0; //
DMA4->CSDPi[8:7]
DMA4->WritePortAccessType = 0; //
DMA4->CSDPi[15:14]
DMA4->SourceEndianness = 0; //
DMA4->CSDPi[21]
DMA4->DestinationEndianness = 0; //
```

```

        DMA4_CSDPi[19]
DMA4-WriteMode = 0; //
        DMA4_CSDPi[17:16]
DMA4-SourcePacked = 0; //
        DMA4_CSDPi[6]
DMA4-DestinationPacked = 0; //
        DMA4_CSDPi[13]
DMA4-NumberOfElementPerFrame = 240; //
        DMA4_CENi
DMA4-NumberOfFramePerTransferBlock = 160; //
        DMA4_CFNi
DMA4-SourceStartAddress = 0x80C00000; //
        DMA4_CSSAi
DMA4-DestinationStartAddress = 0x80F00000; //
        DMA4_CDSAi
DMA4-SourceElementIndex = 1; //
        DMA4_CSEIi
DMA4-SourceFrameIndex = 1; //
        DMA4_CSFii
DMA4-DestinationElementIndex = 1; //
        DMA4_CDEIi
DMA4-DestinationFrameIndex = 1; //
        DMA4_CDFii
DMA4-ReadPortAccessMode = 1; //
        DMA4_CCRi[13:12]
DMA4-WritePortAccessMode = 1; //
        DMA4_CCRi[15:14]
DMA4-ReadPriority = 0; //
        DMA4_CCRi[6]
DMA4-WritePriority = 0; //
        DMA4_CCRi[23]
DMA4-ReadRequestNumber = 0; //
        DMA4_CCRi[4:0]
DMA4-WriteRequestNumber = 0; //
        DMA4_CCRi[20:19]
/* 1) Configure the transfer
   parameters in the logical DMA registers
   */
/*-----*/
/*
    a) Set the data type CSDP[1:0], the Read/Write Port access type
    CSDP[8:7]/[15:14], the Source/dest endianism CSDP[21]/CSDP[19], write
    mode CSDP[17:16], source/dest packed or non-packed
    CSDP[6]/CSDP[13]*//

// Read CSDP
RegVal =
    DMA4_CSDP_CH10;
// Build reg
RegVal = ((RegVal ~ 0x3)
    | DMA4-DataType );
RegVal = ((RegVal ~(0x3 7)) |
    (DMA4-ReadPortAccessType 7));
RegVal = ((RegVal ~(0x3 14)) |
    (DMA4-WritePortAccessType 14));
RegVal = ((RegVal ~(0x1 21)) |
    (DMA4-SourceEndiansim 21));
RegVal = ((RegVal ~(0x1 19)) |
    (DMA4-DestinationEndianism 19));
RegVal = ((RegVal ~(0x3 16)) |
    (DMA4-WriteMode 16));
RegVal = ((RegVal ~(0x1 6)) |
    (DMA4-SourcePacked 6));
RegVal = ((RegVal ~(0x1 13)) |
    (DMA4-DestinationPacked 13));
// Write CSDP

```

```

DMA4_CSDP_CH10 = RegVal;
/* b) Set the number of
   element per frame CEN[23:0]*/
DMA4_CEN_CH10 =
    DMA4-NumberOfElementPerFrame;
/* c) Set the number of frame
   per block CFN[15:0]*/
DMA4_CFN_CH10 =
    DMA4-NumberOfFramePerTransferBlock;
/* d) Set the
   Source/dest start address index CSSA[31:0]/CDSA[31:0]*/

DMA4_CSSA_CH10 = DMA4-SourceStartAddress; // address start

DMA4_CDSA_CH10 = DMA4-DestinationStartAddress; // address dest

/* e) Set the Read Port addressing mode CCR[13:12], the
   Write Port addressing mode CCR[15:14], read/write priority
   CCR[6]/CCR[26], the current LCH CCR[20:19]=00 and CCR[4:0]=00000*/

// Read CCR
RegVal = DMA4_CCR_CH10;
//
    Build reg
RegVal = ((RegVal ~(0x3 12)) | (DMA4-ReadPortAccessMode
    12));
RegVal = ((RegVal ~(0x3 14)) | (DMA4-WritePortAccessMode
    14));
RegVal = ((RegVal ~(0x1 6)) | (DMA4-ReadPriority 6));
RegVal = ((RegVal ~(0x1 26)) | (DMA4-WritePriority 26));

RegVal= 0xFFCFFFE0 ;
// Write CCR
DMA4_CCR_CH10
    = RegVal;
/* f)- Set the source element index CSEI[15:0]*/

DMA4_CSEI_CH10 = DMA4-SourceElementIndex;
/* g)-
   Set the source frame index CSFI[15:0]*/
DMA4_CSFI_CH10 =
    DMA4-SourceFrameIndex ;
/* h)- Set the destination element
   index CDEI[15:0]*/
DMA4_CDEI_CH10 =
    DMA4-DestinationElementIndex;
/* i)- Set the destination
   frame index CDFI[31:0]*/
DMA4_CDFI_CH10 =
    DMA4-DestinationFrameIndex;
/* 2) Start the DMA transfer by
   Setting the enable bit CCR[7]=1 */

/*-----*/

//write enable bit
DMA4_CCR_CH10 |= 1 7; /* start */

```

17.5.3 Hardware-Synchronized Transfer

To monitor a hardware-synchronized DMA transfer, initialize the [DMA4_CDACi](#) register before the software enable.

To configure an LCh to synchronize by element, packet, frame, or block, the frame synchronization [DMA4_CCRi\[5\]](#) FS bit and the block synchronization [DMA4_CCRi\[18\]](#) BS bit must be programmed. For all the following synchronized transfers (element, packet, and frame or block-synchronized transfers), the user must first set the [DMA4_CCRi\[24\]](#) SEL_SRC_DST_SYNC bit to 1 when the source triggers on the DMA request and set it the [DMA4_CCRi\[24\]](#) SEL_SRC_DST_SYNC bit to 0 when the destination triggers on the DMA request.

NOTE: The user must take care when setting the [DMA4_CCRi\[23\]](#) PREFETCH bit in conjunction with the [DMA4_CCRi\[24\]](#) SEL_SRC_DST_SYNC bit.

- To configure an LCh to transfer one element per DMA request:
 1. Set the number of DMA request associated with the current LCH in the [DMA4_CCRi\[20:19\]](#) SYNCHRO_CONTROL_UPPER and [DMA4_CCRi\[4:0\]](#) SYNCHRO bit field.
 2. Set the data type, also referenced as element size (ES), in the [DMA4_CSDPi\[1:0\]](#) DATA_TYPE bit field.
 3. Set the Read Port access type (single or burst access) in the [DMA4_CSDPi\[8:7\]](#) SRC_BURST_EN bit field.
 4. Set the Write Port access type (single or burst access) in the [DMA4_CSDPi\[15:14\]](#) DST_BURST_EN bit field.
 5. Set the Read Port addressing mode in the [DMA4_CCRi\[13:12\]](#) SRC_AMODE bit field.
 6. Set the Write Port addressing mode in the [DMA4_CCRi\[15:14\]](#) DST_AMODE bit field.
 7. Set the Read start address in the [DMA4_CSSAi\[31:0\]](#) SRC_START_ADRS bit field.
 8. Set the Write start address in the [DMA4_CDSAi\[31:0\]](#) DST_START_ADRS bit field.
 9. Set both FS and BS to 0 in [DMA4_CCRi\[5\]](#) FS and [DMA4_CCRi\[18\]](#) BS.
 10. Set to 1 the channel enable bit [DMA4_CCRi\[7\]](#) EN.
- To configure an LCh to transfer one frame per DMA request:
 1. Set the number of DMA request associated to the current LCH in the [DMA4_CCRi\[20:19\]](#) SYNCHRO_CONTROL_UPPER and [DMA4_CCRi\[4:0\]](#) SYNCHRO bit field.
 2. Set the data type, also referenced as element size (ES), in the [DMA4_CSDPi\[1:0\]](#) DATA_TYPE bit field.
 3. Set the number of element per frame in the [DMA4_CENi\[23:0\]](#) CHANNEL_ELMNT_NBR bit field.
 4. Set the Read Port access type (single or burst access) in the [DMA4_CSDPi\[8:7\]](#) SRC_BURST_EN bit field.
 5. Set the Write Port access type (single or burst access) in the [DMA4_CSDPi\[15:14\]](#) DST_BURST_EN bit field.
 6. Set the Read Port addressing mode in the [DMA4_CCRi\[13:12\]](#) SRC_AMODE bit field.
 7. Set the Write Port addressing mode in the [DMA4_CCRi\[15:14\]](#) DST_AMODE bit field.
 8. Set the Read start address in the [DMA4_CSSAi\[31:0\]](#) SRC_START_ADRS bit field.
 9. Set the Write start address in the [DMA4_CDSAi\[31:0\]](#) DST_START_ADRS bit field.
 10. Set FS to 1 and BS to 0, respectively, in [DMA4_CCRi\[5\]](#) FS and [DMA4_CCRi\[18\]](#) BS.
 11. Set to 1 the channel enable bit [DMA4_CCRi\[7\]](#) EN.
- To configure an LCh to transfer one block per DMA request:
 1. Set the number of DMA request associated to the current LCH in the [DMA4_CCRi\[20:19\]](#) SYNCHRO_CONTROL_UPPER and [DMA4_CCRi\[4:0\]](#) SYNCHRO bit field.
 2. Set the data type, also referenced as element size (ES), in the [DMA4_CSDPi\[1:0\]](#) DATA_TYPE bit field.
 3. Set the number of elements per frame in the [DMA4_CENi\[23:0\]](#) CHANNEL_ELMNT_NBR bit field.
 4. Set in the [DMA4_CFNi\[15:0\]](#) CHANNEL_FRAME_NBR bit field the number of frame (transfers), to occur before the LCH gets disabled.
 5. Set the Read Port access type (single or burst access) in the [DMA4_CSDPi\[8:7\]](#) SRC_BURST_EN

bit field.

6. Set the Write Port access type (single or burst access) in the [DMA4_CSDPi\[15:14\]](#) DST_BURST_EN bit field.
 7. Set the Read Port addressing mode in the [DMA4_CCRi\[13:12\]](#) SRC_AMODE bit field.
 8. Set the Write Port addressing mode in the [DMA4_CCRi\[15:14\]](#) DST_AMODE bit field.
 9. Set the Read start address in the [DMA4_CSSAi\[31:0\]](#) SRC_START_ADRS bit field.
 10. Set the Write start address in the [DMA4_CDSAi\[31:0\]](#) DST_START_ADRS bit field.
 11. Set FS to 0 and BS to 1, respectively, in [DMA4_CCRi\[5\]](#) FS and [DMA4_CCRi\[18\]](#) BS.
 12. Set to 1 the channel enable bit [DMA4_CCRi\[7\]](#) EN.
- To configure an LCh to transfer one packet per DMA request:
 1. Set the number of DMA request associated to the current LCH in the [DMA4_CCRi\[20:19\]](#) SYNCHRO_CONTROL_UPPER and [DMA4_CCRi\[4:0\]](#) SYNCHRO bit field.
 2. Set the data type, also referenced as element size (ES), in the [DMA4_CSDPi\[1:0\]](#) DATA_TYPE bit field.
 3. Set the number of elements per packet to transfer: If the packet requestor is in the source, set the [DMA4_CCRi\[24\]](#) SEL_SRC_DST_SYNC bit to 1 and set the packet element number in the [DMA4_CSFli](#) register and set the addressing mode of source to constant addressing in [DMA4_CCRi\[13:12\]](#) SRC_AMODE bit field; else, if the packet requestor is in the destination, set the [DMA4_CCRi\[24\]](#) SEL_SRC_DST_SYNC bit to 0 and set the packet element number in the [DMA4_CDFli](#) register and set the addressing mode of destination to constant addressing in [DMA4_CCRi\[15:14\]](#) DST_AMODE bit field.
 4. Set the number of elements per frame in the [DMA4_CENi\[23:0\]](#) CHANNEL_ELMNT_NBR bit field.
 5. Set in the [DMA4_CFNi\[15:0\]](#) CHANNEL_FRAME_NBR bit field the number of frames (transfers), to occur before the LCH gets disabled.
 6. Set the element number in the packet in the [DMA4_CSFli\[15:0\]](#) PKT_ELNT_NBR bit field, if constant addressing or post-incremented addressing modes are used in the source side. However, the number of element in the packet is set in the [DMA4_CDFli\[15:0\]](#) PKT_ELNT_NBR bit field if constant addressing mode is used in the destination side.
 7. Set the Read Port access type (single or burst access) in the [DMA4_CSDPi\[8:7\]](#) SRC_BURST_EN bit field.
 8. Set the Write Port access type (single or burst access) in the [DMA4_CSDPi\[15:14\]](#) DST_BURST_EN bit field.
 9. Set the Read Port addressing mode in the [DMA4_CCRi\[13:12\]](#) SRC_AMODE bit field.
 10. Set the Write Port addressing mode in the [DMA4_CCRi\[15:14\]](#) DST_AMODE bit field.
 11. Set the Read start address in the [DMA4_CSSAi\[31:0\]](#) SRC_START_ADRS bit field.
 12. Set the Write start address in the [DMA4_CDSAi\[31:0\]](#) DST_START_ADRS bit field.
 13. Set FS to 1 and BS to 1, respectively, in [DMA4_CCRi\[5\]](#) FS and [DMA4_CCRi\[18\]](#) BS.
 14. Set to 1 the channel enable bit [DMA4_CCRi\[7\]](#) EN.

NOTE: It is possible to stop a transfer by disabling the channel by resetting the [DMA4_CCRi\[7\]](#) ENABLE bit.

17.5.4 Synchronized Transfer Monitoring Using CDAC

The [DMA4_CDACi](#) register is writable and noninitialized (value undefined). It can be initialized to monitor a transfer by applying the following programming model:

1. Write 0 in the [DMA4_CDACi](#) register.
2. Enable the channel.
3. If a time-out occurs, read the [DMA4_CDACi](#) register.
4. If [DMA4_CDACi](#) != 0 (it is the value configured in [DMA4_CDACi](#)):

This indicates that the corresponding transfer has started. The user can then rely on [DMA4_CCENi](#) and [DMA4_CCFNi](#) element and frame counters.

Otherwise, if [DMA4_CDACi](#) = 0 (it is the value configured in the [DMA4_CDACi](#)):

This indicates that the corresponding transfer did not start.

17.5.5 Concurrent Software and Hardware Synchronization

This section describes thread allocation only; it does not describe the entire transfer. Because synchronized transfers are latency critical, you must allocate a thread at least on the synchronized target side.

Even for multiple concurrent channels, thread reservation ensures that when a hardware DMA request arrives, the read/write scheduler finds available thread(s) to initiate a channel schedule and issue a read/write transaction.

Consider six concurrent channels:

- Channels 0-3 are dedicated to memory-memory transfer; they are software triggered and not synchronized.
- Channel 4 is dedicated to memory-peripheral transfer, hardware triggered, and synchronized on the write side.
- Channel 5 is dedicated to peripheral-memory transfer, hardware triggered, and synchronized on the read side.

To perform thread reservation:

1. Allow thread reservation for priority channel 4 and channel 5:

Reserve one thread (Read ThreadID 0) on the read port and one thread (Write ThreadID 0) on the write port: set the [DMA4_GCR\[13:12\]](#) HI_THREAD_RESERVED bit field to 0x1.

2. Specify channel priority:

Channel 4 is a write high-priority channel: set the [DMA4_CCRi\[26\]](#) WRITE_PRIORITY bit to 1.

Channel 5 is a read high-priority channel: set the [DMA4_CCRi\[6\]](#) READ_PRIORITY bit to 1.

17.5.6 Chained Transfer

A chained DMA transfer can be programmed as follows:

1. Configure the transfer parameters for each logical DMA channel in the chain as in step 1 for either the synchronized or nonsynchronized transfers describe in [Section 17.5.5, Concurrent Software and Hardware Synchronization](#).
2. For each channel in the chain, configure the [DMA4_CLNK_CTRLi](#) register as follows:
 - Next logical DMA channel number (for a looping chained transfer link last channel to first channel number), in the [DMA4_CLNK_CTRLi\[4:0\]](#) NEXTLCH_ID bit field.
 - Include the logical channel to the chain and enable link by setting the [DMA4_CLNK_CTRLi\[15\]](#) ENABLE_LNK bit.
 - For a nonlooping chain, the last logical channel in the chain must have the [DMA4_CLNK_CTRLi\[15\]](#) ENABLE_LNK bit set to 0 to indicate the end of the chain.
3. Enable the transfer through the enable bit in the first logical channel [DMA4_CCRi\[7\]](#) ENABLE bit. All other channels in the chain must be disabled. Each channel is enabled automatically in turn when the previous logical channel transfer completes. A nonsynchronized transfer starts immediately; a hardware-synchronized transfer starts when the DMA request line corresponding to the first DMA channel in the chain is asserted.

To stop a looping chained transfer, disable the [DMA4_CLNK_CTRLi\[15\]](#) ENABLE_LNK bit (by setting it to 0x0) of the final channel transfer.

In the RAM-to-RAM copy example, to copy in loop, it is possible to link channel 10 on itself. The following line can be added in the channel configuration:

```
/* g) Set link for loop */
DMA4_CLNK_CTRL_CH10 =
```

```
0x0000800A;
```

17.5.7 90-Degree Clockwise Image Rotation

The 90-degree clockwise image rotation example described in [Section 17.4.5, Addressing Modes](#), can be programmed as follows:

1. Configure the transfer parameters in the logical DMA channel registers:

- **DMA4_CSDPi:**
 - Transfer ES = 32-bit (32 bpp), **DMA4_CSDPi**[1:0] DATA_TYPE bit field
 - Read and write port access types = maximum burst size supported by memory device, **DMA4_CSDPi**[8:7] SRC_BURST_EN and **DMA4_CSDPi**[15:14] DST_BURST_EN bit fields
 - Source and destination endianness, **DMA4_CSDPi**[21] SRC_ENDIAN and **DMA4_CSDPi**[19] DST_ENDIAN bits
 - Write mode = posted with last element nonposted, **DMA4_CSDPi**[17:16] WRITE_MODE bit field
 - Source and destination packed = Yes (although destination writes do not benefit because EI1), **DMA4_CSDPi**[6] SRC_PACKED and **DMA4_CSDPi**[13] DST_PACKED bits
- **DMA4_CENi:** EN = 240
- **DMA4_CFNi:** FN per transfer block = 160
- **DMA4_CSSAi:** Source start address = 0x100000
- **DMA4_CDSAi:** destination start address = 0x20013E
- **DMA4_CCRi:**
 - Read and write port addressing modes = double-index addressing mode for both or post-increment addressing on source and double-index addressing on destination, **DMA4_CCRi**[13:12] SRC_AMODE and **DMA4_CCRi**[15:14] DST_AMODE bit fields
 - Low or high priority, **DMA4_CCRi**[6] READ_PRIORITY bit
 - DMA request number = 0 (for software-triggered transfer), **DMA4_CCRi**[4:0] SYNCHRO_CONTROL and **DMA4_CCRi**[20:19] SYNCHRO_CONTROL_UPPER bit fields
- **DMA4_CSEIi:** Source EI = 1
- **DMA4_CSFii:** Source frame index = 1
- **DMA4_CDEIi:** destination EI = 637
- **DMA4_CDFii:** destination frame index = 152967

2. Start the transfer through the enable bit in the channel **DMA4_CCRi** register.

The following parameters are used to perform this rotation from 0x80C00000 RAM address to 0x80F00000, with the same code used in [Section 17.5.2, Software-Triggered \(Nonsynchronized\) Transfer](#).

```
/* Init. parameters */
DMA4-DataType = 0x2; //
    DMA4_CSDPi[1:0]
DMA4-ReadPortAccessType = 0x3; // DMA4_CSDPi[8:7]

DMA4-WritePortAccessType = 0x3; // DMA4_CSDPi[15:14]

DMA4-SourceEndiansim = 0; // DMA4_CSDPi[21]

DMA4-DestinationEndianness = 0; // DMA4_CSDPi[19]

DMA4-WriteMode = 0x2; // DMA4_CSDPi[17:16]
DMA4-SourcePacked
    = 0x1; // DMA4_CSDPi[6]
DMA4-DestinationPacked = 0x1; //
    DMA4_CSDPi[13]
DMA4-NumberOfElementPerFrame = 240; // DMA4_CENi

DMA4-NumberOfFramePerTransferBlock = 160; // DMA4_CFNi
```

```

DMA4-SourceStartAddress = 0x80C00000; // DMA4_CSSAi

DMA4-DestinationStartAddress = 0x80F00000; // DMA4_CDSAi

DMA4-SourceElementIndex = 1; // DMA4_CSEIi

DMA4-SourceFrameIndex = 1; // DMA4_CSFii

DMA4-DestinationElementIndex = 637; // DMA4_CDEIi

DMA4-DestinationFrameIndex = -152967; // DMA4_CDFii

DMA4-ReadPortAccessMode = 0x3; // DMA4_CCRi[13:12]

DMA4-WritePortAccessMode = 0x3; // DMA4_CCRi[15:14]

DMA4-ReadPriority = 0; // DMA4_CCRi[6]
DMA4-WritePriority =
    0; // DMA4_CCRi[23]
DMA4-ReadRequestNumber = 0; // DMA4_CCRi[4:0]

DMA4-WriteRequestNumber = 0; // DMA4_CCRi[20:19]

```

17.5.8 Graphic Operations

- Transparent copy:
 1. Set the [DMA4_CCRi\[17\]](#) TRANSPARENT_COPY_ENABLE bit to 1.
 2. Set the [DMA4_CCRi\[16\]](#) CONST_FILL_ENABLE bit to 0.
 3. Set the value of the key color in the [DMA4_COLORi\[15:0\]](#) COLOR_KEY bit field.

To perform this graphic operation, the following lines can be added to the example of [Section 17.5.2, Software-Triggered \(Nonsynchronized\) Transfer](#).

```

DMA4_CCR_CH10 = ~(0x1 16);
DMA4_CCR_CH10 |= 0x1 17;

DMA4_COLOR_CH10 = 0x00000003;

```

- Solid Color fill:
 1. Set the [DMA4_CCRi\[16\]](#) CONST_FILL_ENABLE bit to 1
 2. Set the [DMA4_CCRi\[17\]](#) TRANSPARENT_COPY_ENABLE bit to 0
 3. Set the value of key the color in the [DMA4_COLORi\[15:0\]](#) SOLID_COLOR bit field

To perform this graphic operation, the following lines can be added to the example of [Section 17.5.2, Software-Triggered \(Nonsynchronized\) Transfer](#).

```

DMA4_CCR_CH10 = ~(0x1 17);
DMA4_CCR_CH10 |= 0x1 16;

DMA4_COLOR_CH10 = 0x00000003;

```

17.5.9 Linked-List Programming Guidelines

- With the exception of the [DMA4_CCRi\[7\]](#) ENABLE bit and the [DMA4_CDPi\[7\]](#) PAUSE_LINK_LIST bit during a linked-list transfer (descriptor load phase or data load phase), avoid programming any register through the configuration port.
- Before enabling any linked-list transfer, ensure that all global registers and all registers in the descriptor are initialized. Some static channel registers (registers that are not updated by the descriptor to be loaded) must also be initialized correctly:
 - For type 2, the following registers must be initialized with consistent values:
 - All global registers
 - [DMA4_CCRi](#)
 - [DMA4_CSDPi](#)

- [DMA4_CLNK_CTRLi](#)
- For type 3, the following registers must be initialized with consistent values:
 - All global registers
 - [DMA4_CCRi](#)
 - [DMA4_CSDPi](#)
 - [DMA4_CLNK_CTRLi](#)
 - [DMA4_CICRi](#)
 - [DMA4_CFNi](#)
- In case of a linked list with descriptor types 2 and 3, the content of the [DMA4_CCRi](#) register must not change during superblock life.
- The PAUSE_LINK_LIST bit must not be set in the initialization phase.

17.6 sDMA Register Manual

17.6.1 sDMA Instance Summary

Table 17-22. sDMA Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|------|
| sDMA | 0x4A05 6000 | 4 KB |

17.6.2 sDMA Registers

17.6.2.1 sDMA Register Summary

Index *i* represents the logical channel number (where *i* = 0 to 31). The offset address for some registers is calculated from the channel *c* number. For example, the DMA4_CCR10 (channel 10) register has an offset address of $10 \times 0x60 = 0x3C0$, and thus a physical address of $0x4A05\ 6080 + 0x3C0 = 0x4A05\ 6440$.

Index *j* represents the interrupt line number (where *j* = 0 to 3). The offset address for some registers is calculated from the channel *c* number. For example, the DMA4_IRQSTATUS_L3 (line 3) register has an offset address of $3 \times 0x4 = 0xC$, and thus a physical address of $0x4A05\ 6008 + 0xC = 0x4A05\ 6014$.

Table 17-23. sDMA Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | sDMA L3 Base Address |
|----------------------------------|------|-----------------------|-----------------------------|-----------------------------|
| DMA4_REVISION | R | 32 | 0x0000 0000 | 0x4A05 6000 |
| DMA4_IRQSTATUS_Lj ⁽¹⁾ | RW | 32 | $0x0000\ 0008 + (0x4 * j)$ | $0x4A05\ 6008 + (0x4 * j)$ |
| DMA4_IRQENABLE_Lj ⁽¹⁾ | RW | 32 | $0x0000\ 0018 + (0x4 * j)$ | $0x4A05\ 6018 + (0x4 * j)$ |
| DMA4_SYSSTATUS | R | 32 | 0x0000 0028 | 0x4A05 6028 |
| DMA4_OCP_SYSCONFIG | RW | 32 | 0x0000 002C | 0x4A05 602C |
| DMA4_CAPS_0 | RW | 32 | 0x0000 0064 | 0x4A05 6064 |
| DMA4_CAPS_2 | R | 32 | 0x0000 006C | 0x4A05 606C |
| DMA4_CAPS_3 | R | 32 | 0x0000 0070 | 0x4A05 6070 |
| DMA4_CAPS_4 | RW | 32 | 0x0000 0074 | 0x4A05 6074 |
| DMA4_GCR | RW | 32 | 0x0000 0078 | 0x4A05 6078 |
| DMA4_CCRi ⁽²⁾ | RW | 32 | $0x0000\ 0080 + (0x60 * i)$ | $0x4A05\ 6080 + (0x60 * i)$ |
| DMA4_CLNK_CTRLi ⁽²⁾ | RW | 32 | $0x0000\ 0084 + (0x60 * i)$ | $0x4A05\ 6084 + (0x60 * i)$ |
| DMA4_CICRi ⁽²⁾ | RW | 32 | $0x0000\ 0088 + (0x60 * i)$ | $0x4A05\ 6088 + (0x60 * i)$ |
| DMA4_CSRi ⁽²⁾ | RW | 32 | $0x0000\ 008C + (0x60 * i)$ | $0x4A05\ 608C + (0x60 * i)$ |
| DMA4_CSDPi ⁽²⁾ | RW | 32 | $0x0000\ 0090 + (0x60 * i)$ | $0x4A05\ 6090 + (0x60 * i)$ |
| DMA4_CENi ⁽²⁾ | RW | 32 | $0x0000\ 0094 + (0x60 * i)$ | $0x4A05\ 6094 + (0x60 * i)$ |
| DMA4_CFNi ⁽²⁾ | RW | 32 | $0x0000\ 0098 + (0x60 * i)$ | $0x4A05\ 6098 + (0x60 * i)$ |
| DMA4_CSSAi ⁽²⁾ | RW | 32 | $0x0000\ 009C + (0x60 * i)$ | $0x4A05\ 609C + (0x60 * i)$ |

⁽¹⁾ *j* = 0 to 3

⁽²⁾ *i* = 0 to 31

Table 17-23. sDMA Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | sDMA L3 Base Address |
|--|------|-----------------------|--------------------------|--------------------------|
| DMA4_CDSAi ⁽²⁾ | RW | 32 | 0x0000 00A0 + (0x60 * i) | 0x4A05 60A0 + (0x60 * i) |
| DMA4_CSEIi ⁽²⁾ | RW | 32 | 0x0000 00A4 + (0x60 * i) | 0x4A05 60A4 + (0x60 * i) |
| DMA4_CSFii ⁽²⁾ | RW | 32 | 0x0000 00A8 + (0x60 * i) | 0x4A05 60A8 + (0x60 * i) |
| DMA4_CDEIi ⁽²⁾ | RW | 32 | 0x0000 00AC + (0x60 * i) | 0x4A05 60AC + (0x60 * i) |
| DMA4_CDFii ⁽²⁾ | RW | 32 | 0x0000 00B0 + (0x60 * i) | 0x4A05 60B0 + (0x60 * i) |
| DMA4_CSACi ⁽²⁾ | R | 32 | 0x0000 00B4 + (0x60 * i) | 0x4A05 60B4 + (0x60 * i) |
| DMA4_CDACi ⁽²⁾ | RW | 32 | 0x0000 00B8 + (0x60 * i) | 0x4A05 60B8 + (0x60 * i) |
| DMA4_CCENi ⁽²⁾ | RW | 32 | 0x0000 00BC + (0x60 * i) | 0x4A05 60BC + (0x60 * i) |
| DMA4_CCFNi ⁽²⁾ | RW | 32 | 0x0000 00C0 + (0x60 * i) | 0x4A05 60C0 + (0x60 * i) |
| DMA4_COLORi ⁽³⁾ | RW | 32 | 0x0000 00C4 + (0x60 * i) | 0x4A05 60C4 + (0x60 * i) |
| DMA4_CDPi ⁽³⁾ | RW | 32 | 0x0000 00D0 + (0x60 * i) | 0x4A05 60D0 + (0x60 * i) |
| DMA4_CNDPi ⁽³⁾ | RW | 32 | 0x0000 00D4 + (0x60 * i) | 0x4A05 60D4 + (0x60 * i) |
| DMA4_CCDNi ⁽³⁾ | RW | 32 | 0x0000 00D8 + (0x60 * i) | 0x4A05 60D8 + (0x60 * i) |

⁽³⁾ i = 0 to 31**17.6.2.2 sDMA Register Description**

NOTE: Some registers have no reset value (marked with –) because of hardware implementation in memory. Software must ensure the correct programming of these registers, if needed.

Shadow registers are used to read run-time registers such as CCEN, CCFN, CDAC, and CSAC. Typically, when accessed in 8-bit or 16-bit access for two consecutive accesses, the value of the previous registers can change. A shadow register holds the entire value to let the next access recover the remaining 24 or 16 bits.

For non-32-bit transactions, start reading or writing from the LSByte first to enable the register update. There is no issue for 32-bit read-write transactions.

Table 17-24. DMA4_REVISION

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0000 | Instance | sDMA |
| Physical Address | 0x4A05 6000 | | |
| Description | This register contains the DMA revision code | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|--------------------|
| 31:0 | REVISION | Reserved, Write 0's for future compatibility. Read returns 0 | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 17-25. Register Call Summary for Register DMA4_REVISION

sDMA Register Manual

- [sDMA Register Summary: \[0\]](#)

Table 17-26. DMA4_IRQSTATUS_Lj

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0008 + (0x4 * j) | Index | j = 0 to 3 |
| Physical Address | 0x4A05 6008 + (0x4 * j) | Instance | sDMA |
| Description | The interrupt status register regroups all the status of the DMA4 channels that can generate an interrupt over line Lj. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CH_31_0_Lj | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | CH_31_0_Lj | Channel 31 Interrupt on Lj: When an interrupt is seen on the line Lj the status of a interrupting channel i is read in the bit field i. Read 0x0: Channel Interrupt Lj false Write 0x0: Channel Interrupt Lj status bit unchanged Write 0x1: Channel Interrupt Lj status bit is reset Read 0x1: Channel Interrupt Lj true (pending) | RW | 0x0000 0000 |

Table 17-27. Register Call Summary for Register DMA4_IRQSTATUS_Lj

sDMA Functional Description

- [sDMA Controller Interrupt Requests: \[0\] \[1\] \[2\] \[3\]](#)
- [Interrupt Generation: \[4\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[5\]](#)

Table 17-28. DMA4_IRQENABLE_Lj

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0018 + (0x4 * j) | Index | j = 0 to 3 |
| Physical Address | 0x4A05 6018 + (0x4 * j) | Instance | sDMA |
| Description | The interrupt enable register allows to mask/unmask the module internal sources of interrupt, on line Lj | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CH_31_0_Lj_EN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------------|
| 31:0 | CH_31_0_Lj_EN | Channel Interrupt on Lj mask/unmask: to Mask/Unmask a channel i interrupt on Lj the user writes 0/1 on the bit field i. 0x0: Channel Interrupt Lj is masked 0x1: Channel Interrupt Lj generates an interrupt when it occurs | RW | 0x0000 0000 |

Table 17-29. Register Call Summary for Register DMA4_IRQENABLE_Lj

sDMA Functional Description

- [sDMA Controller Interrupt Requests: \[0\] \[1\] \[2\] \[3\]](#)
- [Interrupt Generation: \[4\]](#)

sDMA Basic Programming Model

- [Setup Configuration: \[5\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[6\]](#)

Table 17-30. DMA4_SYSSTATUS

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 0028 | Instance | sDMA |
| Physical Address | 0x4A05 6028 | | |
| Description | The register provides status information about the module excluding the interrupt status information (see interrupt status register) | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESETDONE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Reserved for module-specific status information | R | 0x0000 0000 |
| 0 | RESETDONE | Internal reset monitoring Read 0x0: Internal module reset is ongoing Read 0x1: Reset completed | R | 1 |

Table 17-31. Register Call Summary for Register DMA4_SYSSTATUS

sDMA Register Manual

- [sDMA Register Summary: \[0\]](#)

Table 17-32. DMA4_OCP_SYSCONFIG

| | | | |
|------------------|-----------------------------------|----------|------|
| Address Offset | 0x0000 002C | Instance | sDMA |
| Physical Address | 0x4A05 602C | | |
| Description | DMA system configuration register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----------|----|---------------|----|----------|---|---------|---|-----------|---|----------|---|----------|---|----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | MIDLEMODE | | RESERVED | | CLOCKACTIVITY | | RESERVED | | EMUFREE | | SIDLEMODE | | RESERVED | | RESERVED | | AUTOIDLE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|---------|
| 31:14 | RESERVED | Write 0's for future compatibility, Reads return 0 | RW | 0x00000 |
| 13:12 | MIDLEMODE | Read write power management, standby/wait control 0x0: Force-standby: MStandby is asserted only when all the DMA channels are disabled 0x1: No-Standby: MStandby is never asserted 0x2: Smart-Standby: MStandby is asserted if at least one of the following two conditions is satisfied: 1. All the channels are disabled, OR 2. There is no nonsynchronized channel enabled AND [if hardware synchronized channel is enabled, then no DMA request input is asserted and no requests are pending to be serviced]. 0x3: Reserved | RW | 0x0 |
| 11:10 | RESERVED | Reserved for clocks activities extension | RW | 0x0 |
| 9:8 | CLOCKACTIVITY | Clocks activities during wake-up Bit 8: Interface clock 0x0: Interface clock can be switched-off Bit 9: Functional clock 0x0: Functional clock can be switched-off | R | 0x0 |
| 7:6 | RESERVED | Write 0's for future compatibility. Read returns 0 | RW | 0x0 |
| 5 | EMUFREE | Enable sensitivity to MSuspend 0x0: DMA4 freezes its internal logic upon MSuspend assertion 0x1: DMA4 ignores the MSuspend input | RW | 0 |
| 4:3 | SIDLEMODE | Configuration port power management, Idle req/ack control 0x0: Force-idle. An idle request is acknowledged unconditionally 0x1: No-idle. An idle request is never acknowledged 0x2: Smart-idle. Idle acknowledge is given by DMA4 if all of the conditions are true: 1. All the channels are disabled. 2. If hardware synchronized channel is enabled, then no DMA request input is asserted and no requests are pending to be serviced. 3. All transactions are completed on all the DMA ports. 4. No interrupts are pending to be serviced. 0x3: Reserved. Do not use | RW | 0x0 |
| 2 | RESERVED | Write 0's for future compatibility, Reads return 0 | RW | 0 |
| 1 | RESERVED | Reserved for non-GP devices | RW | 0 |
| 0 | AUTOIDLE | Internal interface clock gating strategy 0x0: Interface clock is free running 0x1: Automatic interface clock gating strategy is applied, based on the interface activity. | RW | 0 |

Table 17-33. Register Call Summary for Register DMA4_OCP_SYSCONFIG

sDMA Functional Description

- [sDMA Controller Power Management: \[0\] \[1\] \[2\] \[3\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[4\]](#)

Table 17-34. DMA4_CAPS_0

| | | | |
|-------------------------|---------------------------------|-----------------|------|
| Address Offset | 0x0000 0064 | Instance | sDMA |
| Physical Address | 0x4A05 6064 | | |
| Description | DMA Capabilities Register 0 LSW | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
|----------|----|----|----|----|----|----|----|------------------------|--------------------------|-------------------|------------------------|--------------------------|----|----|----|-------------------|----|----|----|----------|----|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | LINK_LIST_CPBLTY_TYPE4 | | | | LINK_LIST_CPBLTY_TYPE123 | | | | CONST_FILL_CPBLTY | | | | RESERVED | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | LINK_LIST_CPBLTY_TYPE4 | LINK_LIST_CPBLTY_TYPE123 | CONST_FILL_CPBLTY | TRANSPARENT_BLT_CPBLTY | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|---------|
| 31:22 | RESERVED | Write 0's for future compatibility. Read returns 0 | RW | 0x000 |
| 21 | LINK_LIST_CPBLTY_TYPE4 | Link List capability for type4 descriptor capability | R | 0 |
| 20 | LINK_LIST_CPBLTY_TYPE123 | Link List capability for type123 descriptor capability | R | 1 |
| 19 | CONST_FILL_CPBLTY | Constant_Fill_Capability Read 0x0: No LCH supports constant fill copy Read 0x1: any LCH supports constant fill copy | R | 1 |
| 18 | TRANSPARENT_BLT_CPBLTY | Transparent_BLT_Capability Read 0x0: No LCH supports transparent BLT copy Read 0x1: any LCH supports transparent BLT copy | R | 1 |
| 17:0 | RESERVED | Write 0's for future compatibility. Read returns 0 | RW | 0x00000 |

Table 17-35. Register Call Summary for Register DMA4_CAPS_0

sDMA Register Manual

- [sDMA Register Summary: \[0\]](#)

Table 17-36. DMA4_CAPS_2

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 006C | Instance | sDMA |
| Physical Address | 0x4A05 606C | | |
| Description | DMA Capabilities Register 2 | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------------------|----|------------------------------|----|------------------------------|----|------------------------------|---|-----------------------|---|------------------------------|---|------------------------------|---|--------------------------------|---|-----------------------|--|
| RESERVED | | | | | | | | | | | | | | | | SEPARATE_SRC_AND_DST_INDEX_CPBLTY | | DST_DOUBLE_INDEX_ADRS_CPBLTY | | DST_SINGLE_INDEX_ADRS_CPBLTY | | DST_POST_INCRMNT_ADRS_CPBLTY | | DST_CONST_ADRS_CPBLTY | | SRC_DOUBLE_INDEX_ADRS_CPBLTY | | SRC_SINGLE_INDEX_ADRS_CPBLTY | | SRC_POST_INCREMENT_ADRS_CPBLTY | | SRC_CONST_ADRS_CPBLTY | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------------|--|------|----------|
| 31:9 | RESERVED | Write 0's for future compatibility. Read returns 0 | R | 0x000000 |
| 8 | SEPARATE_SRC_AND_DST_IN DEX_CPBLTY | Separate_source/destination_index_capability Read 0x0: Does not support separate src/dst index for 2D addressing Read 0x1: Supports separate src/dst index for 2D addressing | R | 1 |
| 7 | DST_DOUBLE_INDEX_ADRS_C PBLTY | Destination_double_index_address_capability Read 0x0: Does not support double index address mode on the destination port Read 0x1: Supports double index address mode on the destination port | R | 1 |
| 6 | DST_SINGLE_INDEX_ADRS_C PBLTY | Destination_single_index_address_capability Read 0x0: Does not support single index address mode on the destination port Read 0x1: Supports single index address mode on the destination port | R | 1 |
| 5 | DST_POST_INCRMNT_ADRS_ CPBLTY | Destination_post_increment_address_capability Read 0x0: Does not supports post-increment address mode in the destination port Read 0x1: Supports post-increment address mode in the destination port | R | 1 |
| 4 | DST_CONST_ADRS_CPBLTY | Destination_constant_address_capability Read 0x0: Does not supports constant address mode in the destination port Read 0x1: Supports constant address mode in the destination port | R | 1 |
| 3 | SRC_DOUBLE_INDEX_ADRS_ CPBLTY | Source_double_index_address_capability Read 0x0: Does not support double index address mode on the source port Read 0x1: Supports double index address mode on the source port | R | 1 |
| 2 | SRC_SINGLE_INDEX_ADRS_C PBLTY | Source_single_index_address_capability Read 0x0: Does not support single index address mode on the source port Read 0x1: Supports single index address mode in the source port | R | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------------|---|------|-------|
| 1 | SRC_POST_INCREMENT_ADR S_CPBLTY | Source_post_increment_address_capability Read 0x0: Does not supports post-increment address mode in the source port Read 0x1: Supports post-increment address mode in the source port | R | 1 |
| 0 | SRC_CONST_ADRS_CPBLTY | Source_constant_address_capability Read 0x0: Does not supports constant address mode in the source port Read 0x1: Supports constant address mode in the source port | R | 1 |

Table 17-37. Register Call Summary for Register DMA4_CAPS_2

sDMA Register Manual

- [sDMA Register Summary: \[0\]](#)

Table 17-38. DMA4_CAPS_3

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0070 | Instance | sDMA |
| Physical Address | 0x4A05 6070 | | |
| Description | DMA Capabilities Register 3 | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|-------------------|----|-------------------------|----|---------------------------|---|----------|---|---------------------|---|---------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BLOCK_SYNCHR_CPBLTY | | PKT_SYNCHR_CPBLTY | | CHANNEL_CHANINIG_CPBLTY | | CHANNEL_INTERLEAVE_CPBLTY | | RESERVED | | FRAME_SYNCHR_CPBLTY | | ELMNT_SYNCHR_CPBLTY | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|----------|
| 31:8 | RESERVED | Write 0's for future compatibility. Read returns 0 | R | 0x000000 |
| 7 | BLOCK_SYNCHR_CPBLTY | Block_synchronization_capability Read 0x0: Does not support synchronization transfer on block boundary Read 0x1: Supports synchronization transfer on block boundary | R | 1 |
| 6 | PKT_SYNCHR_CPBLTY | Packet_synchronization_capability Read 0x0: Does not support synchronization transfer on packet boundary Read 0x1: Supports synchronization transfer on packet boundary | R | 1 |
| 5 | CHANNEL_CHANINIG_CPBLTY | Channel_Chaninig_capability Read 0x0: Does not support Channel Chaninig capability Read 0x1: Supports Channel Chaninig capability | R | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|--|------|-------|
| 4 | CHANNEL_INTERLEAVE_CPBLTY | Channel_interleave_capability Read 0x0: Does not support Channel interleave capability Read 0x1: Supports Channel_interleave capability | R | 1 |
| 3:2 | RESERVED | | R | 0x0 |
| 1 | FRAME_SYNCHR_CPBLTY | Frame_synchronization_capability Read 0x0: Does not support synchronization transfer on Frame boundary Read 0x1: Supports synchronization transfer on Frame boundary | R | 1 |
| 0 | ELMNT_SYNCHR_CPBLTY | Element_synchronization_capability Read 0x0: Does not support synchronization transfer on Element boundary Read 0x1: Supports synchronization transfer on Element boundary | R | 1 |

Table 17-39. Register Call Summary for Register DMA4_CAPS_3

sDMA Register Manual

- [sDMA Register Summary: \[0\]](#)

Table 17-40. DMA4_CAPS_4

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0074 | Instance | sDMA |
| Physical Address | 0x4A05 6074 | | |
| Description | DMA Capabilities Register 4 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----------|----------------------------|--------------------------------------|---------------------------------|----------|----------------------------|----------------------|--------------------|------------------------|-----------------------------|------------------------|-----------------------------|-----------------------------|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | EOSB_INTERRUPT_CPBLTY | RESERVED | DRAIN_END_INTERRUPT_CPBLTY | MISALIGNED_ADRS_ERR_INTERRUPT_CPBLTY | SUPERVISOR_ERR_INTERRUPT_CPBLTY | RESERVED | TRANS_ERR_INTERRUPT_CPBLTY | PKT_INTERRUPT_CPBLTY | SYNC_STATUS_CPBLTY | BLOCK_INTERRUPT_CPBLTY | LAST_FRAME_INTERRUPT_CPBLTY | FRAME_INTERRUPT_CPBLTY | HALF_FRAME_INTERRUPT_CPBLTY | EVENT_DROP_INTERRUPT_CPBLTY | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------------|---|------|---------|
| 31:15 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x00000 |
| 14 | EOSB_INTERRUPT_CPBLTY | End of Super Block detection capability. | R | 1 |
| 13 | RESERVED | Reserved for non-GP devices | R | 1 |
| 12 | DRAIN_END_INTERRUPT_CPBLTY | Drain End detection capability. | R | 1 |
| 11 | MISALIGNED_ADRS_ERR_INTERRUPT_CPBLTY | Misaligned error detection capability. | R | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|--|------|-------|
| 10 | SUPERVISOR_ERR_INTERRUPT_CPBLTY | Supervisor error detection capability. | R | 1 |
| 9 | RESERVED | Reserved for non-GP devices | R | 1 |
| 8 | TRANS_ERR_INTERRUPT_CPBLTY | Transaction error detection capability. | R | 1 |
| 7 | PKT_INTERRUPT_CPBLTY | End of Packet detection capability. Read 0x0: Does not support end of packet interrupt generation capability Read 0x1: Supports end of packet interrupt generation capability | R | 1 |
| 6 | SYNC_STATUS_CPBLTY | Sync_status_capability Read 0x0: Does not support synchronized transfer status bit generation Read 0x1: Supports synchronized transfer status bit generation | R | 1 |
| 5 | BLOCK_INTERRUPT_CPBLTY | End of block detection capability. Read 0x0: Does not support end of block interrupt generation capability Read 0x1: Supports end of block interrupt generation capability | R | 1 |
| 4 | LAST_FRAME_INTERRUPT_CPBLTY | Start of last frame detection capability. Read 0x0: Does not support last frame interrupt generation capability Read 0x1: Supports last frame interrupt generation capability | R | 1 |
| 3 | FRAME_INTERRUPT_CPBLTY | End of frame detection capability. Read 0x0: Does not support end of frame interrupt generation capability Read 0x1: Supports end of frame interrupt generation capability | R | 1 |
| 2 | HALF_FRAME_INTERRUPT_CPBLTY | Detection capability of the half of frame end. Read 0x0: Does not support half of frame interrupt generation capability Read 0x1: Supports half of frame interrupt generation capability | R | 1 |
| 1 | EVENT_DROP_INTERRUPT_CPBLTY | Request collision detection capability. Read 0x0: Does not support event drop interrupt generation capability Read 0x1: Supports event drop interrupt generation capability | R | 1 |
| 0 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0 |

Table 17-41. Register Call Summary for Register DMA4_CAPS_4

sDMA Register Manual

- [sDMA Register Summary: \[0\]](#)

Table 17-42. DMA4_GCR

| | | | |
|-------------------------|-------------|-----------------|------|
| Address Offset | 0x0000 0078 | Instance | sDMA |
| Physical Address | 0x4A05 6078 | | |
| Description | DMA4_GCR | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|------------------|----|----|----|----|----|----|----|-------------------|----|--------------------|----|----------|----|---|---|------------------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | ARBITRATION_RATE | | | | | | | | HI_LO_FIFO_BUDGET | | HI_THREAD_RESERVED | | RESERVED | | | | MAX_CHANNEL_FIFO_DEPTH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|-------|
| 31:25 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x00 |
| 24 | CHANNEL_ID_GATE | Gates the Channel ID bus monitoring on both Read and Write ports 0x0: Gates the Channel ID qualifiers on both Read and Write Ports 0x1: Does not gate the Channel ID qualifiers on both Read and Write Ports | RW | 0x0 |
| 23:16 | ARBITRATION_RATE | Arbitration switching rate between prioritized and regular channel queues | RW | 0x01 |
| 15:14 | HI_LO_FIFO_BUDGET | Allow to have a separate Global FIFO budget for high and low priority channels. For Hi priority Channel: (Per_channel_Maximum FIFO depth + 1) x Number of active High-priority Channel = High Budget FIFO For Low priority channel: (Per_channel_Maximum FIFO depth + 1) x Number of active Low priority Channel = Low Budget FIFO 0x0: no fixed budget for neither higher nor lower priority channel 0x1: 75% of FIFO for low priority and 25% for high-priority channels 0x2: 25% of FIFO for low priority and 75% for high-priority channels 0x3: 50% of FIFO for low priority and 50% for high-priority channels | RW | 0x0 |
| 13:12 | HI_THREAD_RESERVED | Allow thread reservation for high-priority channel on both read and write ports. 0x0: No ThreadID is reserved on the Read Port for high-priority channels. No ThreadID is reserved on the Write Port for high-priority channels. 0x1: Read Port ThreadID 0 is reserved for high-priority channels. Write Port ThreadID 0 is reserved for high-priority channels. 0x2: Read port ThreadID 0 and ThreadID 1 are reserved for high-priority channels. Write Port ThreadID 0 is reserved for high-priority channels. 0x3: Read Port ThreadID 0, ThreadID 1 and ThreadID 2 are reserved for high-priority channels. Write Port ThreadID 0 is reserved for high-priority channels. | RW | 0x0 |
| 11:8 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--|------|-------|
| 7:0 | MAX_CHANNEL_FIFO_DEPTH | Maximum FIFO depth allocated to one logical channel. Maximum FIFO depth can not be 0x0. It should be at least 0x1 or greater. Note that If channel limit is less than destination burst size enough data will not be accumulated in the data FIFO and it will never be sent out on the WR port. The burst size should be less than the FIFO limit specified in this bit field. | RW | 0x10 |

Table 17-43. Register Call Summary for Register DMA4_GCR

sDMA Functional Description

- [Logical Channel Transfer Overview](#): [0] [1] [2]
- [FIFO Queue Memory Pool](#): [3]
- [Thread Budget Allocation](#): [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14]
- [FIFO Budget Allocation](#): [15] [16]

sDMA Basic Programming Model

- [Setup Configuration](#): [17]
- [Concurrent Software and Hardware Synchronization](#): [18]

sDMA Register Manual

- [sDMA Register Summary](#): [19]
- [sDMA Register Description](#): [20]

Table 17-44. DMA4_CCRi

| | | | |
|-------------------------|--------------------------|-----------------|-------------|
| Address Offset | 0x0000 0080 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 6080 + (0x60 * i) | Instance | sDMA |
| Description | Channel Control Register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----------|----|----|----|----------------|-------------------|------------------|----------|------------|----------|-----------------------|----|-------------------------|-------------------|-----------|-----------|----------|-----------|-----------|-------------------|--------|---------------|----|-----------------|---|---|---|---|
| RESERVED | | | | RESERVED | | | | WRITE_PRIORITY | BUFFERING_DISABLE | SEL_SRC_DST_SYNC | PREFETCH | SUPERVISOR | RESERVED | SYNCHRO_CONTROL_UPPER | BS | TRANSPARENT_COPY_ENABLE | CONST_FILL_ENABLE | DST_AMODE | SRC_AMODE | RESERVED | WR_ACTIVE | RD_ACTIVE | SUSPEND_SENSITIVE | ENABLE | READ_PRIORITY | FS | SYNCHRO_CONTROL | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|-------|
| 31:30 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x0 |
| 29:27 | RESERVED | Reserved for non-GP devices | RW | 0x0 |
| 26 | WRITE_PRIORITY | Channel priority on the Write side 0x0: Channel has low priority on the write side during the arbitration process. 0x1: Channel has high-priority on write sided during the arbitration process. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|---|------|-------|
| 25 | BUFFERING_DISABLE | This bit allows to disable the default buffering functionality when transfer is source synchronized. 0x0: Buffering is enabled across element/packet when source is synchronized to element, packet, frame or blocks. 0x1: Buffering is disabled across element/packet when source is synchronized to element, packet, frame or blocks. | RW | – |
| 24 | SEL_SRC_DST_SYNC | Specifies that element, packet, frame or block transfer (depending on CCR.bs and CCR.fs) is triggered by the source or the destination on the DMA request 0x0: Transfer is triggered by the destination. If synch on packet the packet element number is specified in the CDFI register. 0x1: Transfer is triggered by the source. If synchronized on packet the packet element number is specified in the CSFI register. | RW | – |
| 23 | PREFETCH | Enables the prefetch mode 0x0: Prefetch mode is disabled. When Sel_Src_Dst_Sync=1 transfers are buffered and pipelined between DMA requests. 0x1: Prefetch mode is enabled. Prefetch mode is active only when destination is synchronized. It is software user responsibility not to have at the same time Prefetch=1 when Sel_Src_Dst_Sync=1. This mode is not supported. | RW | 0 |
| 22 | SUPERVISOR | Enables the supervisor mode 0x0: Supervisor mode is disabled. 0x1: Supervisor mode is enabled. | RW | 0 |
| 21 | RESERVED | Reserved for non-GP devices | RW | 0 |
| 20:19 | SYNCHRO_CONTROL_UPPER | Channel Synchronization control upper (used in conjunction with the 5 bits of synchro channel DMA4_CCRi[4:0]) Used in conjunction, as 2 MSB, with the 5 bits of the synchro channel bit field. | RW | 0b00 |
| 18 | BS | Block synchronization This bit used in conjunction with the fs to see how the DMA request is serviced in a synchronized transfer. | RW | – |
| 17 | TRANSPARENT_COPY_ENABLE | Transparent copy enable 0x0: Transparent copy mode is disabled. 0x1: Transparent copy mode is enabled. | RW | – |
| 16 | CONST_FILL_ENABLE | Constant fill enable 0x0: Constant fill mode is disabled. 0x1: Constant fill mode is enabled. | RW | 0 |
| 15:14 | DST_AMODE | Selects the addressing mode on the Write Port of a channel. 0x0: Constant address mode 0x1: Post-incremented address mode 0x2: Single index address mode 0x3: Double index address mode | RW | 0bxx |
| 13:12 | SRC_AMODE | Selects the addressing mode on the Read Port of a channel. 0x0: Constant address mode 0x1: Post-incremented address mode 0x2: Single index address mode 0x3: Double index address mode | RW | 0bxx |
| 11 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|---------|
| 10 | WR_ACTIVE | Indicates if the channel write context is active or not Read 0x0: Channel is not active on the write port. Read 0x1: Channel is currently active on the write port. | R | 0 |
| 9 | RD_ACTIVE | Indicates if the channel read context is active or not Read 0x0: Channel is not active on the read port. Read 0x1: Channel is currently active on the read port. | R | 0 |
| 8 | SUSPEND_SENSITIVE | Logical channel suspend enable bit 0x0: The channel ignores the MSuspend even if EMUFree is set to 0. 0x1: If EMUFree is set to 0 and MSuspend comes in then all current OCP services (single transaction or burst transaction as specified in the corresponding CSDP register) have to be completed before stopping processing any more transactions. | RW | 0 |
| 7 | ENABLE | Logical channel enable. It is SW responsibility to clear the CSR register and the IRQSTATUS bit for the different interrupt lines before enabling the channel. 0x0: The logical channel is disabled. 0x1: The logical channel is enabled. | RW | 0 |
| 6 | READ_PRIORITY | Channel priority on the read side 0x0: Channel has low priority on the read side during the arbitration process. 0x1: Channel has high-priority on read sided during the arbitration process. | RW | 0 |
| 5 | FS | Frame synchronization This bit used in conjunction with the BS to see how the DMA request is serviced in a synchronized transfer FS = 0 and BS = 0: An element is transferred once a DMA request is made. FS = 0 and BS = 1: An entire block is transferred once a DMA request is made. FS = 1 and BS = 0: An entire frame is transferred once a DMA request is made. FS = 1 and BS = 1: A packet is transferred once a DMA request is made. All these different transfers can be interleaved on the port with other DMA requests. | RW | – |
| 4:0 | SYNCHRO_CONTROL | Channel synchronization control This bit field used in conjunction with the second_level_synchro_control_upper (as 2 MSB) 0000000 : Is reserved for non synchronized LCH transfer xxxxxxx (from 1 to 127) There are 127 possible DMA request to assign to any LCH. Note: The channel synchronization control registers are 1-based. For example, to enable the S_DMA_1 request, DMA4_CCR[4:0] SYNCHRO_CONTROL must be set to 0x2 (DMA request number + 1). | RW | 0b00000 |

Table 17-45. Register Call Summary for Register DMA4_CCRi
sDMA Functional Description

- [Interrupt Generation: \[0\]](#)
- [Logical Channel Transfer Overview: \[1\] \[2\] \[3\]](#)
- [Addressing Modes: \[4\]](#)
- [Software Synchronization: \[5\] \[6\] \[7\]](#)
- [Hardware Synchronization: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\]](#)
- [Thread Budget Allocation: \[20\] \[21\]](#)
- [Reprogramming an Active Channel: \[22\] \[23\] \[24\] \[25\]](#)
- [Packet Synchronization: \[26\] \[27\] \[28\] \[29\] \[30\] \[31\]](#)
- [Graphics Acceleration Support: \[32\]](#)
- [Supervisor Modes: \[33\]](#)
- [Disabling a Channel During Transfer: \[34\]](#)
- [FIFO Draining Mechanism: \[35\] \[36\] \[37\] \[38\] \[39\]](#)
- [Type 1: \[40\] \[41\]](#)
- [Starting a Linked List: \[42\]](#)
- [Stop a Linked List \(Abort or Drain\): \[43\] \[44\] \[45\] \[46\]](#)
- [Status Bit Behavior: \[47\] \[48\] \[49\] \[50\] \[51\]](#)

sDMA Basic Programming Model

- [Software-Triggered \(Nonsynchronized\) Transfer: \[52\] \[53\] \[54\] \[55\] \[56\] \[57\] \[58\] \[59\] \[60\]](#)
- [Hardware-Synchronized Transfer: \[61\] \[62\] \[63\] \[64\] \[65\] \[66\] \[67\] \[68\] \[69\] \[70\] \[71\] \[72\] \[73\] \[74\] \[75\] \[76\] \[77\] \[78\] \[79\] \[80\] \[81\] \[82\] \[83\] \[84\] \[85\] \[86\] \[87\] \[88\] \[89\] \[90\] \[91\] \[92\] \[93\] \[94\] \[95\] \[96\] \[97\] \[98\] \[99\]](#)
- [Concurrent Software and Hardware Synchronization: \[100\] \[101\]](#)
- [Chained Transfer: \[102\]](#)
- [90-Degree Clockwise Image Rotation: \[103\] \[104\] \[105\] \[106\] \[107\] \[108\] \[109\]](#)
- [Graphic Operations: \[110\] \[111\] \[112\] \[113\]](#)
- [Linked-List Programming Guidelines: \[114\] \[115\] \[116\] \[117\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[118\]](#)
- [sDMA Register Description: \[119\]](#)

Table 17-46. DMA4_CLNK_CTRLi

| | | | |
|-------------------------|-------------------------------|-----------------|-------------|
| Address Offset | 0x0000 0084 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 6084 + (0x60 * i) | Instance | sDMA |
| Description | Channel Link Control Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----------|----|----|----|----|---|---|---|------------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ENABLE_LNK | RESERVED | | | | | | | | NEXTLCH_ID | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x0000 |
| 15 | ENABLE_LNK | Enables or disable the channel linking. 0x0: Channel linking mode is disabled When set on the fly to 0 the current channel will complete the transfer and stops the chain linking 0x1: Channel linking mode is enabled. The logical channel defined in the NextLCH_ID is enabled at the end of the current transfer | RW | 0 |
| 14:5 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|---------|
| 4:0 | NEXTLCH_ID | Defines the NextLCh_ID, which is used to build logical channel chaining queue. | RW | 0bxxxxx |

Table 17-47. Register Call Summary for Register DMA4_CLNK_CTRLi

sDMA Functional Description

- [Chained Logical Channel Transfers: \[0\] \[1\]](#)
- [FIFO Draining Mechanism: \[2\]](#)
- [Type 1: \[3\]](#)
- [Linked-List Channel Linking: \[4\] \[5\] \[6\] \[7\]](#)

sDMA Basic Programming Model

- [Chained Transfer: \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [Linked-List Programming Guidelines: \[13\] \[14\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[15\]](#)

Table 17-48. DMA4_CICRi

| | | | |
|-------------------------|------------------------------------|-----------------|-------------|
| Address Offset | 0x0000 0088 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 6088 + (0x60 * i) | Instance | sDMA |
| Description | Channel Interrupt Control Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----------|----------|-------------------|-------------------|----------|--------------|--------|----------|----------|---------|----------|---------|---------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SUPER_BLOCK_IE | | RESERVED | DRAIN_IE | MISALIGNED_ERR_IE | SUPERVISOR_ERR_IE | RESERVED | TRANS_ERR_IE | PKT_IE | RESERVED | BLOCK_IE | LAST_IE | FRAME_IE | HALF_IE | DROP_IE | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|---------|
| 31:15 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x00000 |
| 14 | SUPER_BLOCK_IE | Enables the end of super block interrupt | RW | – |
| 13 | RESERVED | Reserved for non-GP devices | RW | 1 |
| 12 | DRAIN_IE | Enables the end of draining interrupt | RW | 0 |
| 11 | MISALIGNED_ERR_IE | Enables the address misaligned error event interrupt 0x0: Disables the misaligned address error event interrupt 0x1: Enables the misaligned address error event interrupt | RW | – |
| 10 | SUPERVISOR_ERR_IE | Enables the supervisor transaction error event interrupt 0x0: Disables the supervisor transaction error event interrupt 0x1: Enables the supervisor transaction error event interrupt | RW | 1 |
| 9 | RESERVED | Reserved for non-GP devices | RW | 1 |
| 8 | TRANS_ERR_IE | Enables the transaction error event interrupt 0x0: Disables the transaction error event interrupt 0x1: Enables the transaction error event interrupt | RW | – |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7 | PKT_IE | Enables the end of Packet interrupt 0x0: Disables the end of Packet transfer interrupt 0x1: Enables the end of Packet transfer interrupt | RW | – |
| 6 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0 |
| 5 | BLOCK_IE | Enables the end of block interrupt 0x0: Disables the end of block interrupt 0x1: Disables the end of block interrupt | RW | – |
| 4 | LAST_IE | Last frame interrupt enable (start of last frame) 0x0: Disables the last frame interrupt 0x1: Enables the last frame interrupt | RW | – |
| 3 | FRAME_IE | Frame interrupt enable (end of frame) 0x0: Disables the end of frame interrupt 0x1: Enables the end of frame interrupt | RW | – |
| 2 | HALF_IE | Enables or disables the half frame interrupt. 0x0: Disables the half frame interrupt 0x1: Enables the half frame interrupt | RW | – |
| 1 | DROP_IE | Synchronization event drop interrupt enable (request collision) 0x0: Disables the event drop interrupt 0x1: Enables the event drop interrupt | RW | 0 |
| 0 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0 |

Table 17-49. Register Call Summary for Register DMA4_CICRi

sDMA Functional Description

- [sDMA Controller Interrupt Requests: \[0\] \[1\]](#)
- [Interrupt Generation: \[2\]](#)
- [FIFO Draining Mechanism: \[3\]](#)
- [Descriptors: \[4\] \[5\] \[6\]](#)
- [Interrupt During Linked-List Execution: \[7\] \[8\] \[9\]](#)

sDMA Basic Programming Model

- [Setup Configuration: \[10\]](#)
- [Linked-List Programming Guidelines: \[11\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[12\]](#)

Table 17-50. DMA4_CSRi

| | | | |
|-------------------------|--------------------------|-----------------|-------------|
| Address Offset | 0x0000 008C + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 608C + (0x60 * i) | Instance | sDMA |
| Description | Channel Status Register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|-------------|----------|-----------|---------------------|----------------|----------|-----------|-----|------|-------|------|-------|------|------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | SUPER_BLOCK | RESERVED | DRAIN_END | MISALIGNED_ADRS_ERR | SUPERVISOR_ERR | RESERVED | TRANS_ERR | PKT | SYNC | BLOCK | LAST | FRAME | HALF | DROP | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|--------|
| 31:17 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x0000 |
| 16:15 | RESERVED | Reserved for debug (Monitor descriptor/data load phase), Write 0's for future compatibility, Read returns 0 | RW | 0x0 |
| 14 | SUPER_BLOCK | End of Super block event | RW | 0 |
| 13 | RESERVED | Reserved for non-GP devices | RW | 0 |
| 12 | DRAIN_END | End of channel draining | RW | 0 |
| 11 | MISALIGNED_ADRS_ERR | Misaligned address error event Read 0x0: No address error Write 0x0: Status bit unchanged Write 0x1: Status bit is reset Read 0x1: An address error has been occurred | RW | 0 |
| 10 | SUPERVISOR_ERR | Supervisor transaction error event Read 0x0: No supervisor transaction error Write 0x0: Status bit unchanged Write 0x1: Status bit is reset Read 0x1: A supervisor transaction error has been occurred | RW | 0 |
| 9 | RESERVED | Reserved for non-GP devices | RW | 0 |
| 8 | TRANS_ERR | Transaction error event Read 0x0: No transaction error Write 0x0: Status bit unchanged Write 0x1: Status bit is reset Read 0x1: A transaction error has been occurred | RW | 0 |
| 7 | PKT | End of Packet transfer Read 0x0: The current packet transfer has not been finished Write 0x0: Status bit unchanged Write 0x1: Status bit is reset Read 0x1: The current packet has been transferred | RW | 0 |
| 6 | SYNC | Synchronization status of a channel. Read 0x0: Logical channel is not scheduled or servicing a non synchronized DMA request. Write 0x0: Status bit unchanged Write 0x1: Status bit is reset Read 0x1: Logical channel is servicing a synchronized DMA request | RW | 0 |
| 5 | BLOCK | End of block event Read 0x0: The current block transfer has not been finished Write 0x0: Status bit unchanged Write 0x1: Status bit is reset Read 0x1: The current block has been transferred | RW | 0 |
| 4 | LAST | Last frame (start of last frame) Read 0x0: The start of the last frame to transfer is not reached Write 0x0: Status bit unchanged Write 0x1: Status bit is reset Read 0x1: The start of the last frame to transfer is reached | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 3 | FRAME | End of frame event Read 0x0: The end of current transferred frame is not reached Write 0x0: Status bit unchanged Write 0x1: Status bit is reset Read 0x1: The end of current transferred frame is reached | RW | 0 |
| 2 | HALF | Half of frame event. Read 0x0: The half of current transferred frame is not reached Write 0x0: Status bit unchanged Write 0x1: Status bit is reset Read 0x1: The half of current transferred frame is reached | RW | 0 |
| 1 | DROP | Synchronization event drop occurred during the transfer Read 0x0: No synchronization collision Write 0x0: Status bit unchanged Write 0x1: Status bit is reset Read 0x1: A synchronization collision has been occurred | RW | 0 |
| 0 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0 |

Table 17-51. Register Call Summary for Register DMA4_CSRi

sDMA Functional Description

- [sDMA Controller Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [Interrupt Generation: \[5\]](#)
- [FIFO Draining Mechanism: \[6\]](#)
- [Interrupt During Linked-List Execution: \[7\]](#)
- [Status Bit Behavior: \[8\] \[9\] \[10\] \[11\]](#)

sDMA Basic Programming Model

- [Setup Configuration: \[12\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[13\]](#)

Table 17-52. DMA4_CSDPi

| | | | |
|-------------------------|---------------------------------------|-----------------|-------------|
| Address Offset | 0x0000 0090 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 6090 + (0x60 * i) | Instance | sDMA |
| Description | Channel Source Destination Parameters | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------------|-----------------|------------|-----------------|------------|--------------|------------|----------|--------------|------------|----------|-----------|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SRC_ENDIAN | SRC_ENDIAN_LOCK | DST_ENDIAN | DST_ENDIAN_LOCK | WRITE_MODE | DST_BURST_EN | DST_PACKED | RESERVED | SRC_BURST_EN | SRC_PACKED | RESERVED | DATA_TYPE | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|-------|
| 31:22 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x000 |
| 21 | SRC_ENDIAN | Channel source endianness control 0x0: Source has Little Endian type 0x1: Source has Big Endian type | RW | – |
| 20 | SRC_ENDIAN_LOCK | Endianness Lock 0x0: Endianness adapt 0x1: Endianness lock | RW | – |
| 19 | DST_ENDIAN | Channel Destination endianness control 0x0: Destination has Little Endian type 0x1: Destination has Big Endian type | RW | – |
| 18 | DST_ENDIAN_LOCK | Endianness Lock 0x0: Endianness adapt 0x1: Endianness lock | RW | – |
| 17:16 | WRITE_MODE | Used to enable writing mode without posting or with posting 0x0: Write None Posted (WRNP) 0x1: Write (Posted) 0x2: All transaction are mapped on the Write command as posted except for the last transaction in the transfer mapped on a Write None Posted 0x3: Undefined | RW | 0bxx |
| 15:14 | DST_BURST_EN | Used to enable bursting on the Write Port. Smaller burst size than the programmed burst size is also allowed 0x0: single access 0x1: 16 bytes or 4x32-bit / 2x64-bit burst access 0x2: 32 bytes or 8x32-bit / 4x64-bit burst access 0x3: 64 bytes or 16x32-bit / 8x64-bit burst access | RW | 0b00 |
| 13 | DST_PACKED | Destination receives packed data. 0x0: The destination target is non packed 0x1: The destination target is packed | RW | – |
| 12:9 | RESERVED | Write the reset value. Read returns reset value | RW | 0x- |
| 8:7 | SRC_BURST_EN | Used to enable bursting on the Read Port. Smaller burst size than the programmed burst size is also allowed 0x0: single access 0x1: 16 bytes or 4x32-bit / 2x64-bit burst access 0x2: 32 bytes or 8x32-bit / 4x64-bit burst access 0x3: 64 bytes or 16x32-bit / 8x64-bit burst access | RW | 0bxx |
| 6 | SRC_PACKED | Source provides packed data. 0x0: The source target is non packed 0x1: The source target is packed | RW | – |
| 5:2 | RESERVED | Write the reset value. Read returns reset value | RW | 0x- |
| 1:0 | DATA_TYPE | Defines the type of the data moved in the channel. 0x0: 8 bits scalar 0x1: 16 bits scalar 0x2: 32 bits scalar 0x3: Reserved | RW | 0bxx |

Table 17-53. Register Call Summary for Register DMA4_CSDPi

sDMA Functional Description

- [Addressing Modes: \[0\]](#)
- [Packed Accesses: \[1\]](#)
- [Burst Transactions: \[2\]](#)
- [Endianism Conversion: \[3\] \[4\]](#)
- [Hardware Synchronization: \[5\]](#)
- [Graphics Acceleration Support: \[6\]](#)
- [Posted and Nonposted Writes: \[7\]](#)
- [Type 1: \[8\]](#)

sDMA Basic Programming Model

- [Software-Triggered \(Nonsynchronized\) Transfer: \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\]](#)
- [Hardware-Synchronized Transfer: \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\]](#)
- [90-Degree Clockwise Image Rotation: \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\]](#)
- [Linked-List Programming Guidelines: \[39\] \[40\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[41\]](#)

Table 17-54. DMA4_CENi

| | | | |
|-------------------------|--------------------------|-----------------|-------------|
| Address Offset | 0x0000 0094 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 6094 + (0x60 * i) | Instance | sDMA |
| Description | Channel Element Number | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CHANNEL_ELMNT_NBR | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|---------|
| 31:24 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x00 |
| 23:0 | CHANNEL_ELMNT_NBR | Number of elements within a frame (unsigned) to transfer | RW | 0x----- |

Table 17-55. Register Call Summary for Register DMA4_CENi

sDMA Functional Description

- [Addressing Modes: \[0\] \[1\]](#)

sDMA Basic Programming Model

- [Software-Triggered \(Nonsynchronized\) Transfer: \[2\]](#)
- [Hardware-Synchronized Transfer: \[3\] \[4\] \[5\]](#)
- [90-Degree Clockwise Image Rotation: \[6\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[7\]](#)

Table 17-56. DMA4_CFNi

| | | | |
|-------------------------|--------------------------|-----------------|-------------|
| Address Offset | 0x0000 0098 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 6098 + (0x60 * i) | Instance | sDMA |
| Description | Channel Frame Number | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CHANNEL_FRAME_NBR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|--------|
| 31:16 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x0000 |
| 15:0 | CHANNEL_FRAME_NBR | Number of frames within the block to be transferred (unsigned) | RW | 0x---- |

Table 17-57. Register Call Summary for Register DMA4_CFNi

sDMA Functional Description

- [Addressing Modes: \[0\] \[1\]](#)

sDMA Basic Programming Model

- [Software-Triggered \(Nonsynchronized\) Transfer: \[2\]](#)
- [Hardware-Synchronized Transfer: \[3\] \[4\]](#)
- [90-Degree Clockwise Image Rotation: \[5\]](#)
- [Linked-List Programming Guidelines: \[6\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[7\]](#)

Table 17-58. DMA4_CSSAi

| | | | |
|-------------------------|------------------------------|-----------------|-------------|
| Address Offset | 0x0000 009C + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 609C + (0x60 * i) | Instance | sDMA |
| Description | Channel Source Start Address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SRC_START_ADRS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|-------------------------------------|------|---------|
| 31:0 | SRC_START_ADRS | 32 bits of the source start address | RW | 0x----- |

Table 17-59. Register Call Summary for Register DMA4_CSSAi

sDMA Functional Description

- [Addressing Modes: \[0\]](#)

sDMA Basic Programming Model

- [Software-Triggered \(Nonsynchronized\) Transfer: \[1\]](#)
- [Hardware-Synchronized Transfer: \[2\] \[3\] \[4\] \[5\]](#)
- [90-Degree Clockwise Image Rotation: \[6\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[7\]](#)

Table 17-60. DMA4_CDSAi

| | | | |
|-------------------------|-----------------------------------|-----------------|-------------|
| Address Offset | 0x0000 00A0 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60A0 + (0x60 * i) | Instance | sDMA |
| Description | Channel Destination Start Address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DST_START_ADRS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|---------|
| 31:0 | DST_START_ADRS | 32 bits of the destination start address | RW | 0x----- |

Table 17-61. Register Call Summary for Register DMA4_CDSAi

sDMA Functional Description

- [Addressing Modes: \[0\]](#)

sDMA Basic Programming Model

- [Software-Triggered \(Nonsynchronized\) Transfer: \[1\]](#)
- [Hardware-Synchronized Transfer: \[2\] \[3\] \[4\] \[5\]](#)
- [90-Degree Clockwise Image Rotation: \[6\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[7\]](#)

Table 17-62. DMA4_CSEIi

| | | | |
|-------------------------|---------------------------------------|-----------------|-------------|
| Address Offset | 0x0000 00A4 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60A4 + (0x60 * i) | Instance | sDMA |
| Description | Channel Source Element Index (Signed) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CHANNEL_SRC_ELMNT_INDEX | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|---|------|--------|
| 31:16 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x0000 |
| 15:0 | CHANNEL_SRC_ELMNT_INDEX | Channel source element index | RW | 0x---- |

Table 17-63. Register Call Summary for Register DMA4_CSEIi

sDMA Functional Description

- [Addressing Modes: \[0\]](#)

sDMA Basic Programming Model

- [Software-Triggered \(Nonsynchronized\) Transfer: \[1\]](#)
- [90-Degree Clockwise Image Rotation: \[2\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[3\]](#)

Table 17-64. DMA4_CSFIi

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 00A8 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60A8 + (0x60 * i) | Instance | sDMA |
| Description | Channel Source Frame Index (Signed) or 16-bit Packet size | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CH_SRC_FRM_INDEX_OR_16BIT_PKT_ELNT_NBR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--|---|------|---------|
| 31:0 | CH_SRC_FRM_INDEX_OR_16BIT_PKT_ELNT_NBR | Channel source frame index value if source address is in double index mode. Or if fs=bs=1 and DMA_CCR[SEL_SRC_DST_SYNC] = 1; the bit field [15:0] gives the number of element in packet. The field [31:16] is unused for the packet size. | RW | 0x----- |

Table 17-65. Register Call Summary for Register DMA4_CSFIi

sDMA Functional Description

- [Addressing Modes: \[0\]](#)
- [Hardware Synchronization: \[1\]](#)
- [Packet Synchronization: \[2\] \[3\] \[4\] \[5\] \[6\]](#)

sDMA Basic Programming Model

- [Software-Triggered \(Nonsynchronized\) Transfer: \[7\]](#)
- [Hardware-Synchronized Transfer: \[8\] \[9\]](#)
- [90-Degree Clockwise Image Rotation: \[10\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[11\]](#)

Table 17-66. DMA4_CDEIi

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 00AC + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60AC + (0x60 * i) | Instance | sDMA |
| Description | Channel Destination Element Index (Signed) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CHANNEL_DST_ELMNT_INDEX | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|---|------|--------|
| 31:16 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x0000 |
| 15:0 | CHANNEL_DST_ELMNT_INDEX | Channel destination element index | RW | 0x---- |

Table 17-67. Register Call Summary for Register DMA4_CDEIi

sDMA Functional Description

- [Addressing Modes: \[0\]](#)

sDMA Basic Programming Model

- [Software-Triggered \(Nonsynchronized\) Transfer: \[1\]](#)
- [90-Degree Clockwise Image Rotation: \[2\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[3\]](#)

Table 17-68. DMA4_CDFIi

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 00B0 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60B0 + (0x60 * i) | Instance | sDMA |
| Description | Channel Destination Frame Index (Signed) or 16-bit Packet size | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CH_DST_FRM_IDX_OR_16BIT_PKT_ELNT_NBR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------------|--|------|---------|
| 31:0 | CH_DST_FRM_IDX_OR_16BIT_PKT_ELNT_NBR | Channel destination frame index value if destination address is in double index mode. Or if fs=bs=1 and DMA_CCR[SEL_SRC_DST_SYNC]=0; the bit field [15:0] gives the number of element in packet. The field [31:16] is unused for the packet size.. | RW | 0x----- |

Table 17-69. Register Call Summary for Register DMA4_CDFIi

sDMA Functional Description

- [Addressing Modes: \[0\]](#)
- [Hardware Synchronization: \[1\]](#)
- [Packet Synchronization: \[2\] \[3\] \[4\] \[5\] \[6\]](#)

sDMA Basic Programming Model

- [Software-Triggered \(Nonsynchronized\) Transfer: \[7\]](#)
- [Hardware-Synchronized Transfer: \[8\] \[9\]](#)
- [90-Degree Clockwise Image Rotation: \[10\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[11\]](#)

Table 17-70. DMA4_CSACi

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 00B4 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60B4 + (0x60 * i) | Instance | sDMA |
| Description | Channel Source Address Value. User has to access this register only in 32-bit access. If accessed in 8-bit or 16bit data may be corrupted. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SRC_ELMNT_ADRS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--------------------------------------|------|---------|
| 31:0 | SRC_ELMNT_ADRS | Current source address counter value | R | 0x----- |

Table 17-71. Register Call Summary for Register DMA4_CSACi

sDMA Register Manual

- [sDMA Register Summary: \[0\]](#)

Table 17-72. DMA4_CDACi

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 00B8 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60B8 + (0x60 * i) | Instance | sDMA |
| Description | Channel Destination Address Value. User has to access this register only in 32-bit access. If accessed in 8-bit or 16-bit data may be corrupted. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DST_ELMNT_ADRS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|---------|
| 31:0 | DST_ELMNT_ADRS | Current destination address counter value | RW | 0x----- |

Table 17-73. Register Call Summary for Register DMA4_CDACi

sDMA Functional Description

- [Hardware Synchronization: \[0\]](#)

sDMA Basic Programming Model

- [Hardware-Synchronized Transfer: \[1\]](#)
- [Synchronized Transfer Monitoring Using CDAC: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[9\]](#)

Table 17-74. DMA4_CCENi

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 00BC + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60BC + (0x60 * i) | Instance | sDMA |
| Description | Channel Current Transferred Element Number in the current frame. User has to access this register only in 32-bit access. If accessed in 8-bit or 16bit data may be corrupted. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CURRENT_ELMNT_NBR | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|---------|
| 31:24 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x00 |
| 23:0 | CURRENT_ELMNT_NBR | Channel current transferred element number in the current frame | RW | 0x----- |

Table 17-75. Register Call Summary for Register DMA4_CCENi

sDMA Functional Description

- [Monitoring a Linked-List Progression: \[0\] \[1\] \[2\]](#)

sDMA Basic Programming Model

- [Synchronized Transfer Monitoring Using CDAC: \[3\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[4\]](#)

Table 17-76. DMA4_CCFNi

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 00C0 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60C0 + (0x60 * i) | Instance | sDMA |
| Description | Channel Current Transferred Frame Number in the current transfer. User has to access this register only in 32-bit access. If accessed in 8-bit or 16bit data may be corrupted. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CURRENT FRAME NBR | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|--------|
| 31:16 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x0000 |
| 15:0 | CURRENT_FRAME_NBR | Channel current transferred frame number in the current transfer | RW | 0x---- |

Table 17-77. Register Call Summary for Register DMA4_CCFNi

sDMA Functional Description

- [Monitoring a Linked-List Progression: \[0\] \[1\] \[2\]](#)

sDMA Basic Programming Model

- [Synchronized Transfer Monitoring Using CDAC: \[3\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[4\]](#)

Table 17-78. DMA4_COLORi

| | | | |
|-------------------------|------------------------------------|-----------------|-------------|
| Address Offset | 0x0000 00C4 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60C4 + (0x60 * i) | Instance | sDMA |
| Description | Channel DMA COLOR KEY /SOLID COLOR | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CH BLT FRGRND COLOR OR SOLID COLOR PTRN | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---|---|------|---------|
| 31:24 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0x– |
| 23:0 | CH_BLT_FRGRND_COLOR_OR_SOLID_COLOR_PTRN | Color key or solid color pattern: The pattern is replicated according to the data type. If the data-type is 8-bit the pattern is replicated 4 times to fill the register in order to enhance processing when data is packed at the graphic module input. The same reasoning for 16-bit data-type. | RW | 0x----- |

Table 17-79. Register Call Summary for Register DMA4_COLORi

sDMA Functional Description

- [Graphics Acceleration Support: \[0\] \[1\]](#)
- [Type 1: \[2\]](#)

sDMA Basic Programming Model

- [Graphic Operations: \[3\] \[4\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[5\]](#)

Table 17-80. DMA4_CDPi

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 00D0 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60D0 + (0x60 * i) | Instance | sDMA |
| Description | This register controls the various parameters of the link list mechanism | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|---------------|----|-----------------|----|----------------------|---|-----------|---|------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FAST | | TRANSFER_MODE | | PAUSE_LINK_LIST | | NEXT_DESCRIPTOR_TYPE | | SRC_VALID | | DEST_VALID | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|--|------|---------|
| 31:11 | RESERVED | Write 0's for future compatibility, Reads return 0 | RW | 0x00000 |
| 10 | FAST | Sets the fast-start mode for linked list descriptor types 1, 2 and 3 0x0: No fast-start mode 0x1: Fast-start mode is enabled. | RW | 0x0 |
| 9:8 | TRANSFER_MODE | Enable linked-list transfer mode 0x0: Normal transfer mode is used. 0x1: Linked-list channel mode for type 1, 2, or 3 descriptor is used. 0x2: Undefined 0x3: Undefined | RW | 0x0 |
| 7 | PAUSE_LINK_LIST | Suspend the linked-list transfer at completion of the current block transfer. 0x0: Linked list is active. 0x1: Linked list is suspended at the boundary of next descriptor loading. | RW | 0x0 |
| 6:4 | NEXT_DESCRIPTOR_TYPE | Next Descriptor Type 0x0: Undefined 0x1: Next descriptor is of type 1. 0x2: Next descriptor is of type 2. 0x3: Next descriptor is of type 3. 0x4: Undefined 0x5: Undefined 0x6: Undefined 0x7: Undefined | RW | 0x- |
| 3:2 | SRC_VALID | Source address valid 0x0: The source address is not present in the next descriptor and continuous incrementing is enabled. 0x1: The source address must be reloaded in the next descriptor transfer. 0x2: The source start address is not present in the next descriptor. But will reload the one from configuration memory which belongs to the previous descriptor. 0x3: Undefined addressing mode | RW | 0x- |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | DEST_VALID | Destination address valid 0x0: The destination address is not present in the next descriptor and continuous incrementing is enabled. 0x1: The destination address must be reloaded in the next descriptor transfer. 0x2: The destination start address is not present in the next descriptor. But will reload the one from configuration memory which belongs to the previous descriptor. 0x3: Undefined addressing mode | RW | 0x- |

Table 17-81. Register Call Summary for Register DMA4_CDPi

sDMA Functional Description

- [Link-List Transfer Profile: \[0\]](#)
- [Descriptors: \[1\] \[2\]](#)
- [Transfer Mode Setting: \[3\] \[4\] \[5\] \[6\]](#)
- [Starting a Linked List: \[7\]](#)
- [Pause a Linked List: \[8\] \[9\] \[10\] \[11\]](#)

sDMA Basic Programming Model

- [Linked-List Programming Guidelines: \[12\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[13\]](#)

Table 17-82. DMA4_CNDPi

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 00D4 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60D4 + (0x60 * i) | Instance | sDMA |
| Description | This register contains the Next descriptor Address Pointer for the link list Mechanism | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| NEXT_DESCRIPTOR_POINTER | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|--|
| 31:2 | NEXT_DESCRIPTOR_POINTER | This register contains the Next descriptor Address Pointer for the link list Mechanism | RW | 0bxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxx |
| 1:0 | RESERVED | Write 0's for future compatibility, Reads return 0 | RW | 0x0 |

Table 17-83. Register Call Summary for Register DMA4_CNDPi

sDMA Functional Description

- [Link-List Transfer Profile: \[0\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[1\]](#)

Table 17-84. DMA4_CCDNi

| | | | |
|-------------------------|--------------------------|-----------------|-------------|
| Address Offset | 0x0000 00D8 + (0x60 * i) | index: | i = 0 to 31 |
| Physical Address | 0x4A05 60D8 + (0x60 * i) | Instance | sDMA |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CURRENT_DESCRIPTOR_NBR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|--------|
| 31:16 | RESERVED | Write 0's for future compatibility, Reads return 0 | RW | 0x0000 |
| 15:0 | CURRENT_DESCRIPTOR_NBR | This register when read contains the current active descriptor number in the link list. This register is Read/write to allow user initialization. | RW | 0x---- |

Table 17-85. Register Call Summary for Register DMA4_CCDNi

sDMA Functional Description

- [Monitoring a Linked-List Progression: \[0\] \[1\] \[2\]](#)

sDMA Register Manual

- [sDMA Register Summary: \[3\]](#)

Interrupt Controllers

This chapter describes the interrupt controllers (INTCs) in the device.

| Topic | Page |
|--|------|
| 18.1 Interrupt Controller Overview | 3462 |
| 18.2 INTC Environment | 3464 |
| 18.3 INTC Integration | 3465 |
| 18.4 INTC Functional Description | 3471 |
| 18.5 INTC Register Manual | 3472 |

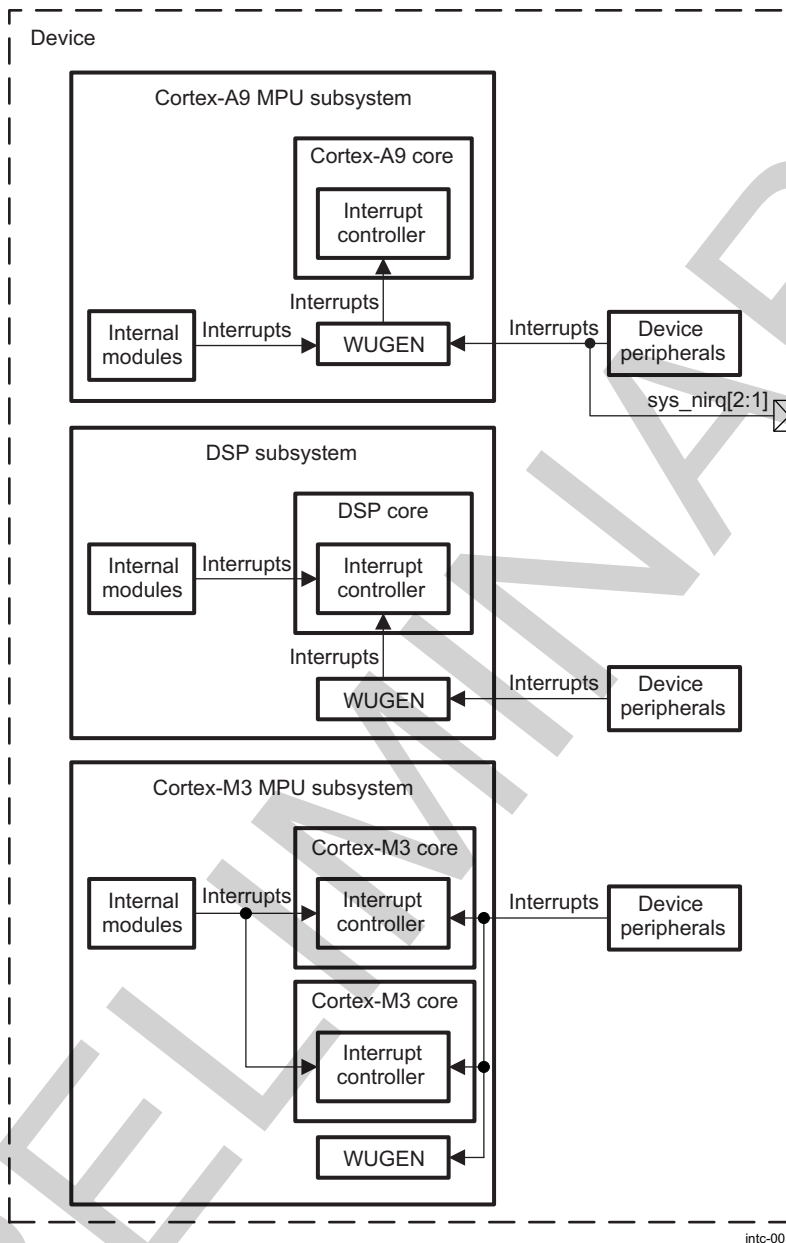
18.1 Interrupt Controller Overview

The device provides three interrupt controller (INTC) modules, which handle interrupts at the device level:

- Cortex™-A9 microprocessor unit (MPU) subsystem INTC: This INTC module is a single functional unit that is integrated in the Cortex-A9 multiprocessor core. It provides the following:
 - 128 hardware interrupt inputs
 - generation of interrupts by software
 - prioritization of interrupts
 - masking of any interrupts
 - distribution of the interrupts to the target Cortex-A9 processor(s)
 - tracking the status of interrupts
 - a wake-up generator (WUGEN) module on external and local interrupts
- Digital signal processor (DSP) subsystem INTC: This module is a specific combination of WUGEN and the C64x+™ DSP INTC. It is used in the device but is not described in detail in this chapter. For detailed information about this module, see [Chapter 5, DSP Subsystem](#).
- Cortex™-M3 MPU subsystem INTC: This module is also called nested vectored interrupt controller (NVIC) and is integrated within each Cortex-M3, so the different interrupt lines are directly connected to each core. To facilitate parallel processing, the interrupt mapping is the same for the two cores. The NVIC supports the following:
 - 64 external interrupts (in addition to 16 Cortex-M3 internal interrupts), which are dynamically prioritized with 16 levels of priority defined for each core
 - low-latency exception and interrupt handling
 - prioritization and handling of exceptions
 - control of the local power management
 - debug accesses to the processor core
 - a WUGEN module on external interrupts, coming from device peripherals

[Figure 18-1](#) shows the internal interrupt scheme of the device.

Figure 18-1. INTC Overview



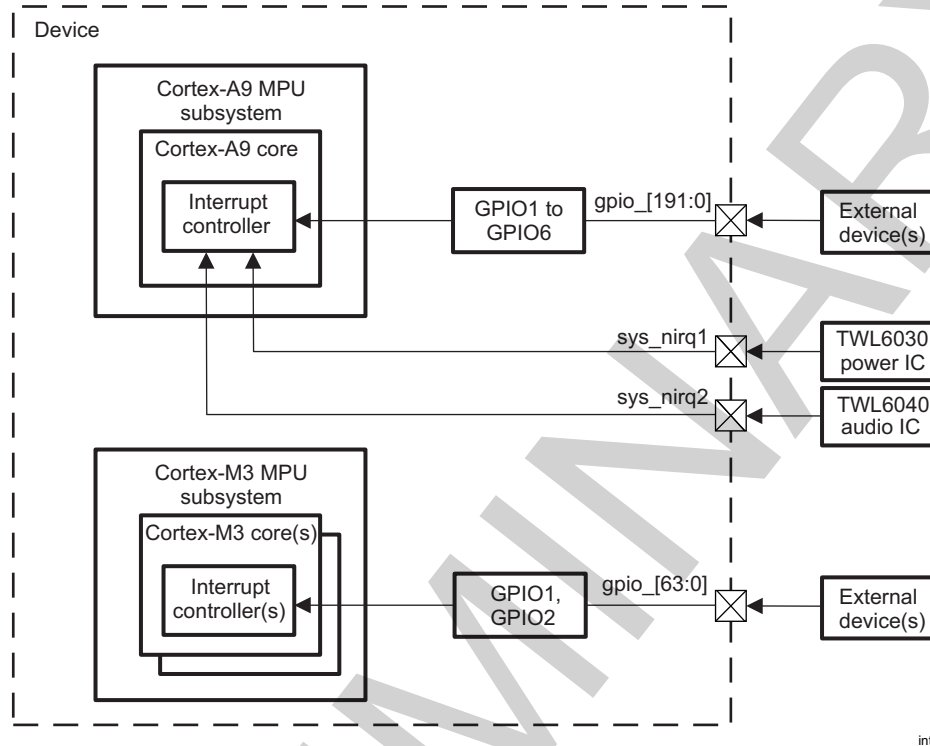
NOTE: For more information about the WUGEN module in the Cortex-A9 MPU subsystem (including integration, functional and register description), see [Chapter 4, Cortex-A9 MPU Subsystem](#).

For more information about the WUGEN module in the Cortex-M3 MPU subsystem (including integration, and functional and register descriptions), see [Chapter 7, Cortex-M3 MPU Subsystem](#).

18.2 INTC Environment

This section describes the INTC application fields from the environment point of view. [Figure 18-2](#) shows the relationship between the module and external interrupts.

Figure 18-2. Interrupts From External Devices



intc-002

[Table 18-1](#) describes the I/O signals that can be used by external devices to generate interrupts to the Cortex-A9 MPU INTC or Cortex-M3 MPU INTC.

Table 18-1. INTC I/O Signals

| Signal Name | I/O ⁽¹⁾ | Reset Value | Description | Cortex-A9 MPU INTC | Cortex-M3 MPU INTC |
|----------------|--------------------|-------------|---|--------------------|--------------------|
| sys_nirq1 | I | 1 | The TWL6030 power IC can use this pin to generate a system wake-up event for Cortex-A9 MPU INTC. | x | — |
| sys_nirq2 | I | 1 | The TWL6040 audio IC can use this pin to generate a system wake-up event for Cortex-A9 MPU INTC. | x | — |
| gpio_[31:0] | I/O | — | External devices can use GPIO modules to generate interrupts to the Cortex-A9 MPU or Cortex-M3 MPU. There are six dedicated interrupt lines (GPIO1 to GPIO6) to the Cortex-A9 MPU INTC, and two dedicated interrupt lines (GPIO1 and GPIO2) to the Cortex-M3 MPU INTC. Each GPIO module can generate a single interrupt whenever there is at least one event in any of the 32 configured GPIO inputs. For more information about GPIO interrupt generation, see Chapter 26, General-Purpose Interface . | x | x |
| gpio_[63:32] | I/O | — | | x | x |
| gpio_[95:64] | I/O | — | | x | — |
| gpio_[127:96] | I/O | — | | x | — |
| gpio_[159:128] | I/O | — | | x | — |
| gpio_[191:160] | I/O | — | | x | — |

⁽¹⁾ I = Input; O = Output; I/O = bidirectional

18.3 INTC Integration

The Cortex-A9 MPU INTC is integrated inside the Cortex-A9 MPU core. For more information about Cortex-A9 MPU INTC integration, see [Chapter 4, Cortex-A9 MPU Subsystem Integration](#).

The Cortex-M3 MPU INTC is integrated inside each Cortex-M3 MPU core. For more information about Cortex-M3 MPU INTC integration, see [Chapter 7, Dual Cortex-M3 MPU Subsystem Integration](#).

18.3.1 Interrupt Mapping

NOTE: All interrupts to device peripherals (external to the Cortex-A9 MPU, DSP, and Cortex-M3 MPU subsystems) are active-high, level-sensitive.

CAUTION

A single interrupt source can be physically mapped to multiple INTCs (Cortex-A9 MPU, DSP, and Cortex-M3 MPU subsystems). With multiple-mapped interrupts, it is strongly recommended to unmask each interrupt source in only one INTC at a time.

18.3.2 Interrupt Requests to Cortex-A9 MPU INTC

[Table 18-2](#) lists the Cortex-A9 MPU INTC interrupt mappings.

Table 18-2. Cortex-A9 MPU INTC Interrupt Mapping

| Interrupt Line (Destination) | Interrupt Line (Source) | Module Name | Description |
|------------------------------|-------------------------|-------------------|--|
| MA_IRQ_0 | L2_CACHE_IRQ | CORTEXA9 | L2 cache controller interrupt ⁽¹⁾ |
| MA_IRQ_1 | CTI_IRQ_0 | CORTEXA9 | Cross-trigger module 0 (CTI0) interrupt ⁽¹⁾ |
| MA_IRQ_2 | CTI_IRQ_1 | CORTEXA9 | Cross-trigger module 1 (CTI1) interrupt ⁽¹⁾ |
| MA_IRQ_3 | Reserved | Reserved | Reserved |
| MA_IRQ_4 | ELM_IRQ | ELM | Error location process completion ⁽²⁾ |
| MA_IRQ_5 | CMU_IRQ_P | CMU | Cache management unit interrupt |
| MA_IRQ_6 | Reserved | Reserved | Reserved |
| MA_IRQ_7 | sys_nirq1 | External | External interrupt 1 (active low) |
| MA_IRQ_8 | Reserved | Reserved | Reserved |
| MA_IRQ_9 | L3_DBG_IRQ | L3 | L3 interconnect debug error |
| MA_IRQ_10 | L3_APP_IRQ | L3 | L3 interconnect application error |
| MA_IRQ_11 | PRCM_MPU_IRQ | PRCM | PRCM interrupt |
| MA_IRQ_12 | SDMA_IRQ_0 | sDMA | sDMA interrupt 0 ⁽⁴⁾ |
| MA_IRQ_13 | SDMA_IRQ_1 | sDMA | sDMA interrupt 1 ⁽⁴⁾ |
| MA_IRQ_14 | SDMA_IRQ_2 | sDMA | sDMA interrupt 2 ⁽³⁾ |
| MA_IRQ_15 | SDMA_IRQ_3 | sDMA | sDMA interrupt 3 ⁽³⁾ |
| MA_IRQ_16 | MCBSP4_IRQ | MCBSP4 | MCBSP4 interrupt ⁽²⁾ |
| MA_IRQ_17 | MCBSP1_IRQ | MCBSP1 | MCBSP1 interrupt ⁽²⁾ |
| MA_IRQ_18 | SR_MPU_IRQ | SR_MPU | SmartReflex MPU interrupt |
| MA_IRQ_19 | SR_CORE_IRQ | SR_CORE | SmartReflex core interrupt |
| MA_IRQ_20 | GPMC_IRQ | GPMC | GPMC interrupt ⁽²⁾ |
| MA_IRQ_21 | SGX_IRQ | SGX | 2D/3D graphics module interrupt |
| MA_IRQ_22 | MCBSP2_IRQ | MCBSP2 | MCBSP2 interrupt ⁽²⁾ |
| MA_IRQ_23 | MCBSP3_IRQ | MCBSP3 | MCBSP3 interrupt ⁽²⁾ |
| MA_IRQ_24 | ISS_IRQ5 | Imaging subsystem | Imaging subsystem interrupt 5 ⁽³⁾ |

Table 18-2. Cortex-A9 MPU INTC Interrupt Mapping (continued)

| Interrupt Line (Destination) | Interrupt Line (Source) | Module Name | Description |
|------------------------------|-------------------------|-----------------------------|---|
| MA_IRQ_25 | DSS_DISPC_IRQ | Display controller | Display controller interrupt ⁽⁴⁾ |
| MA_IRQ_26 | MAIL_U0_MPU_IRQ | MAILBOX | Mailbox user 0 interrupt |
| MA_IRQ_27 | C2C_SSCM_IRQ0 | C2C | C2C status interrupt ⁽⁴⁾ |
| MA_IRQ_28 | DSP_MMU_IRQ | DSP | DSP MMU interrupt |
| MA_IRQ_29 | GPIO1_MPU_IRQ | GPIO1 | GPIO1 MPU interrupt ⁽³⁾ |
| MA_IRQ_30 | GPIO2_MPU_IRQ | GPIO2 | GPIO2 MPU interrupt ⁽³⁾ |
| MA_IRQ_31 | GPIO3_MPU_IRQ | GPIO3 | GPIO3 MPU interrupt |
| MA_IRQ_32 | GPIO4_MPU_IRQ | GPIO4 | GPIO4 MPU interrupt |
| MA_IRQ_33 | GPIO5_MPU_IRQ | GPIO5 | GPIO5 MPU interrupt |
| MA_IRQ_34 | GPIO6_MPU_IRQ | GPIO6 | GPIO6 MPU interrupt |
| MA_IRQ_35 | Reserved | Reserved | Reserved |
| MA_IRQ_36 | WDT3_IRQ | WDTIMER3 | WDTIMER3 overflow |
| MA_IRQ_37 | GPT1_IRQ | GPTIMER1 | GPTIMER1 interrupt |
| MA_IRQ_38 | GPT2_IRQ | GPTIMER2 | GPTIMER2 interrupt |
| MA_IRQ_39 | GPT3_IRQ | GPTIMER3 | GPTIMER3 interrupt ⁽³⁾ |
| MA_IRQ_40 | GPT4_IRQ | GPTIMER4 | GPTIMER4 interrupt ⁽³⁾ |
| MA_IRQ_41 | GPT5_IRQ | GPTIMER5 | GPTIMER5 interrupt ⁽²⁾ |
| MA_IRQ_42 | GPT6_IRQ | GPTIMER6 | GPTIMER6 interrupt ⁽²⁾ |
| MA_IRQ_43 | GPT7_IRQ | GPTIMER7 | GPTIMER7 interrupt ⁽²⁾ |
| MA_IRQ_44 | GPT8_IRQ | GPTIMER8 | GPTIMER8 interrupt ⁽²⁾ |
| MA_IRQ_45 | GPT9_IRQ | GPTIMER9 | GPTIMER9 interrupt ⁽³⁾ |
| MA_IRQ_46 | GPT10_IRQ | GPTIMER10 | GPTIMER10 interrupt |
| MA_IRQ_47 | GPT11_IRQ | GPTIMER11 | GPTIMER11 interrupt ⁽³⁾ |
| MA_IRQ_48 | MCSP14_IRQ | MCSP14 | MCSP14 interrupt |
| MA_IRQ_49 | Reserved | Reserved | Reserved |
| MA_IRQ_50 | Reserved | Reserved | Reserved |
| MA_IRQ_51 | Reserved | Reserved | Reserved |
| MA_IRQ_52 | Reserved | Reserved | Reserved |
| MA_IRQ_53 | DSS_DSI1_IRQ | MIPI DSI1 | Display subsystem DSI1 interrupt ⁽⁴⁾ |
| MA_IRQ_54 | CORTEXA9_CPU0_PMU_IRQ | CORTEXA9 CPU0 PMU | Cortex-A9 CPU0 PMU interrupt (PMUIRQ output) ⁽¹⁾ |
| MA_IRQ_55 | CORTEXA9_CPU1_PMU_IRQ | CORTEXA9 CPU1 PMU | Cortex-A9 CPU1 PMU interrupt (PMUIRQ output) ⁽¹⁾ |
| MA_IRQ_56 | I2C1_IRQ | I2C1 | I2C1 interrupt ⁽³⁾ |
| MA_IRQ_57 | I2C2_IRQ | I2C2 | I2C2 interrupt ⁽³⁾ |
| MA_IRQ_58 | HDQ_IRQ | HDQ | HDQ™/1-Wire® interrupt |
| MA_IRQ_59 | MMC5_IRQ | HSMMC5 | MMC5 interrupt ⁽³⁾ |
| MA_IRQ_60 | L3_STAT_ALARM_IRQ | L3 NoC Statistics Collector | L3 NoC statistics collector alarm interrupt |
| MA_IRQ_61 | I2C3_IRQ | I2C3 | I2C3 interrupt ⁽³⁾ |
| MA_IRQ_62 | I2C4_IRQ | I2C4 | I2C4 interrupt ⁽³⁾ |
| MA_IRQ_63 | Reserved | Reserved | Reserved |
| MA_IRQ_64 | Reserved | Reserved | Reserved |
| MA_IRQ_65 | MCSP11_IRQ | MCSP11 | MCSP11 interrupt ⁽⁴⁾ |
| MA_IRQ_66 | MCSP12_IRQ | MCSP12 | MCSP12 interrupt ⁽³⁾ |
| MA_IRQ_67 | HSI_P1_MPU_IRQ | HSI | HSI port 1 interrupt ⁽³⁾ |
| MA_IRQ_68 | HSI_P2_MPU_IRQ | HSI | HSI port 2 interrupt ⁽³⁾ |
| MA_IRQ_69 | FDIF_IRQ_3 | Face Detect | Face detect interrupt 3 |

Table 18-2. Cortex-A9 MPU INTC Interrupt Mapping (continued)

| Interrupt Line (Destination) | Interrupt Line (Source) | Module Name | Description |
|------------------------------|-------------------------|---------------|--|
| MA_IRQ_70 | UART4_IRQ | UART4 | UART module 4 interrupt |
| MA_IRQ_71 | HSI_DMA_MPU_IRQ | HSI | HSI DMA engine MPU request ⁽³⁾ |
| MA_IRQ_72 | UART1_IRQ | UART1 | UART1 interrupt |
| MA_IRQ_73 | UART2_IRQ | UART2 | UART2 interrupt |
| MA_IRQ_74 | UART3_IRQ | UART3 | UART3 interrupt ⁽⁴⁾ |
| MA_IRQ_75 | PBIAS_IRQ | PRCM | Merged interrupt for PBIASlite1 and 2 |
| MA_IRQ_76 | HSUSB_OHCI_IRQ | HSUSBHOST | HSUSB MP host interrupt OHCI controller |
| MA_IRQ_77 | HSUSB_EHCI_IRQ | HSUSBHOST | HSUSB MP host interrupt EHCI controller ⁽³⁾ |
| MA_IRQ_78 | HSUSB_TLL_IRQ | HSUSBTLL | HSUSB MP TLL interrupt ⁽³⁾ |
| MA_IRQ_79 | Reserved | Reserved | Reserved |
| MA_IRQ_80 | WDT2_IRQ | WDTIMER2 | WDTIMER2 interrupt |
| MA_IRQ_81 | Reserved | Reserved | Reserved |
| MA_IRQ_82 | Reserved | Reserved | Reserved |
| MA_IRQ_83 | MMC1_IRQ | HSMMC1 | MMC1 interrupt ⁽⁴⁾ |
| MA_IRQ_84 | DSS_DSI2_IRQ | MIPI DSI2 | Display subsystem DSI2 interrupt ⁽⁴⁾ |
| MA_IRQ_85 | Reserved | Reserved | Reserved |
| MA_IRQ_86 | MMC2_IRQ | HSMMC2 | MMC2 interrupt ⁽⁴⁾ |
| MA_IRQ_87 | MPU_ICR_IRQ | ICR | ICR interrupt |
| MA_IRQ_88 | C2C_SSCM_IRQ1 | C2C | C2C GPI interrupt ⁽⁴⁾ |
| MA_IRQ_89 | FSUSB_IRQ | FSUSB | FS-USB – host controller interrupt ⁽³⁾ |
| MA_IRQ_90 | FSUSB_SMI_IRQ | FSUSB | FS-USB – host controller SMI interrupt ⁽³⁾ |
| MA_IRQ_91 | MCSP13_IRQ | MCSP13 | MCSP13 interrupt |
| MA_IRQ_92 | HSUSB_OTG_IRQ | HSUSBOTG | HSUSB OTG controller interrupt ⁽³⁾ |
| MA_IRQ_93 | HSUSB_OTG_DMA_IRQ | HSUSBOTG | HSUSB OTG DMA interrupt ⁽³⁾ |
| MA_IRQ_94 | MMC3_IRQ | HSMMC3 | MMC3 interrupt ⁽³⁾ |
| MA_IRQ_95 | Reserved | Reserved | Reserved |
| MA_IRQ_96 | MMC4_IRQ | HSMMC4 | MMC4 interrupt ⁽³⁾ |
| MA_IRQ_97 | SLIMBUS1_IRQ | SLIMBUS1 | SLIMBUS1 interrupt ⁽²⁾ |
| MA_IRQ_98 | SLIMBUS2_IRQ | SLIMBUS2 | SLIMBUS2 interrupt ⁽²⁾ |
| MA_IRQ_99 | ABE_MPU_IRQ | ABE subsystem | Audio back-end interrupt |
| MA_IRQ_100 | CORTEXM3_MMU_IRQ | CORTEXM3 | Cortex-M3 MMU interrupt |
| MA_IRQ_101 | DSS_HDMI_IRQ | HDMI | Display subsystem HDMI interrupt ⁽⁴⁾ |
| MA_IRQ_102 | SR_IVA_IRQ | SR_IVA | SmartReflex IVA interrupt |
| MA_IRQ_103 | IVAHD_IRQ2 | IVAHD | Sync interrupt from ICONT2 (vDMA) ⁽⁴⁾ |
| MA_IRQ_104 | IVAHD_IRQ1 | IVAHD | Sync interrupt from ICONT1 ⁽⁴⁾ |
| MA_IRQ_105 | Reserved | Reserved | Reserved |
| MA_IRQ_106 | Reserved | Reserved | Reserved |
| MA_IRQ_107 | IVAHD_MAILBOX_IRQ_0 | IVAHD | IVAHD mailbox interrupt 0 |
| MA_IRQ_108 | Reserved | Reserved | Reserved |
| MA_IRQ_109 | MCASP1_AXINT | MCASP1 | McASP1 transmit interrupt ⁽²⁾ |
| MA_IRQ_110 | EMIF1_IRQ | EMIF1 | EMIF1 interrupt |
| MA_IRQ_111 | EMIF2_IRQ | EMIF2 | EMIF2 interrupt |
| MA_IRQ_112 | MCPDM_IRQ | MCPDM | MCPDM interrupt ⁽²⁾ |
| MA_IRQ_113 | DMM_IRQ | DMM | DMM interrupt ⁽³⁾ |
| MA_IRQ_114 | DMIC_IRQ | DMIC | DMIC interrupt ⁽²⁾ |
| MA_IRQ_115 | Reserved | Reserved | Reserved |
| MA_IRQ_116 | Reserved | Reserved | Reserved |

Table 18-2. Cortex-A9 MPU INTC Interrupt Mapping (continued)

| Interrupt Line (Destination) | Interrupt Line (Source) | Module Name | Description |
|------------------------------|-------------------------|--------------------------|--|
| MA_IRQ_117 | Reserved | Reserved | Reserved |
| MA_IRQ_118 | Reserved | Reserved | Reserved |
| MA_IRQ_119 | sys_nirq2 | External | External interrupt 2 (active low) |
| MA_IRQ_120 | KBD_CTL_IRQ | KEYBOARD | Keyboard controller interrupt |
| MA_IRQ_121 | Reserved | Reserved | Reserved |
| MA_IRQ_122 | Reserved | Reserved | Reserved |
| MA_IRQ_123 | Reserved | Reserved | Reserved |
| MA_IRQ_124 | Reserved | Reserved | Reserved |
| MA_IRQ_125 | BB2D_IRQ | BB2D | BB2D interrupt |
| MA_IRQ_126 | THERMAL_ALERT | SYSCRTL_GENERA L_CORE | General CORE control module thermal sensor alert interrupt |
| MA_IRQ_127 | Reserved | Reserved | Reserved |

(1) Internally generated within the Cortex-A9 MPU subsystem

(2) Shared with DSP INTC

(3) Shared with Cortex-M3 MPU INTC

(4) Shared with DSP INTC and Cortex-M3 MPU INTC

NOTE: All Cortex-A9 MPU subsystem internal interrupts are active-high, level-sensitive.

18.3.3 Interrupt Requests to Cortex-M3 MPU INTC

Table 18-3 lists the Cortex-M3 MPU INTC interrupt mappings.

Table 18-3. Cortex-M3 MPU INTC Interrupt Mapping

| Interrupt Line (Destination) | Interrupt Line (Source) | Module Name | Description |
|------------------------------|--------------------------|--------------------|--|
| MM_IRQ_0 | XLATE_MMU_FAULT | CORTEXM3 | L2 cache MMU interrupt ⁽¹⁾ |
| MM_IRQ_1 | SHARED_CACHE_MMU_CPU_INT | CORTEXM3 | Shared cache or MMU maintenance completed ⁽¹⁾ |
| MM_IRQ_2 | CTM_TIM_EVENT_1 | CORTEXM3 | CTM timer event (timer 1) ⁽¹⁾ |
| MM_IRQ_3 | HWSEM_M3_IRQ | CORTEXM3 | Semaphore interrupt ⁽¹⁾ |
| MM_IRQ_4 | IC_NEMUINTR | CORTEXM3 | ICECrusher™ (one to each core) ⁽¹⁾ |
| MM_IRQ_5 | IMP_FAULT | CORTEXM3 | Imprecise fault (from interconnect) ⁽¹⁾ |
| MM_IRQ_6 | CTM_TIM_EVENT_2 | CORTEXM3 | CTM timer event (timer 2) ⁽¹⁾ |
| MM_IRQ_7 | DSS_DISPC_IRQ | Display controller | Display controller interrupt ⁽⁴⁾ |
| MM_IRQ_8 | DSS_DSI1_IRQ | MIPI DSI1 | Display subsystem DSI1 interrupt ⁽⁴⁾ |
| MM_IRQ_9 | DSS_DSI2_IRQ | MIPI DSI2 | Display subsystem DSI2 interrupt ⁽⁴⁾ |
| MM_IRQ_10 | DSS_HDMI_IRQ | HDMI | Display subsystem HDMI interrupt ⁽⁴⁾ |
| MM_IRQ_11 | ISS_IRQ0 | Imaging subsystem | Imaging subsystem interrupt 0 |
| MM_IRQ_12 | ISS_IRQ1 | Imaging subsystem | Imaging subsystem interrupt 1 |
| MM_IRQ_13 | ISS_IRQ2 | Imaging subsystem | Imaging subsystem interrupt 2 |
| MM_IRQ_14 | ISS_IRQ3 | Imaging subsystem | Imaging subsystem interrupt 3 |
| MM_IRQ_15 | ISS_IRQ4 | Imaging subsystem | Imaging subsystem interrupt 4 ⁽²⁾ |
| MM_IRQ_16 | ISS_IRQ5 | Imaging subsystem | Imaging subsystem interrupt 5 ⁽³⁾ |
| MM_IRQ_17 | FDIF_IRQ_1 | Face detect | Face detect interrupt 1 |
| MM_IRQ_18 | SDMA_IRQ_0 | sDMA | sDMA interrupt 0 ⁽⁴⁾ |
| MM_IRQ_19 | SDMA_IRQ_1 | sDMA | sDMA interrupt 1 ⁽⁴⁾ |

Table 18-3. Cortex-M3 MPU INTC Interrupt Mapping (continued)

| Interrupt Line (Destination) | Interrupt Line (Source) | Module Name | Description |
|------------------------------|-------------------------|-------------|--|
| MM_IRQ_20 | SDMA_IRQ_2 | sDMA | sDMA interrupt 2 ⁽³⁾ |
| MM_IRQ_21 | SDMA_IRQ_3 | sDMA | sDMA interrupt 3 ⁽³⁾ |
| MM_IRQ_22 | IVAHD_MAILBOX_IRQ_2 | IVAHD | IVAHD mailbox interrupt 2 |
| MM_IRQ_23 | IVAHD_IRQ2 | IVAHD | Sync interrupt from ICONT2 (vDMA) ⁽⁴⁾ |
| MM_IRQ_24 | IVAHD_IRQ1 | IVAHD | Sync interrupt from ICONT1 ⁽⁴⁾ |
| MM_IRQ_25 | I2C1_IRQ | I2C1 | I2C1 interrupt ⁽³⁾ |
| MM_IRQ_26 | I2C2_IRQ | I2C2 | I2C2 interrupt ⁽³⁾ |
| MM_IRQ_27 | I2C3_IRQ | I2C3 | I2C3 interrupt ⁽³⁾ |
| MM_IRQ_28 | I2C4_IRQ | I2C4 | I2C4 interrupt ⁽³⁾ |
| MM_IRQ_29 | UART3_IRQ | UART3 | UART3 interrupt ⁽⁴⁾ |
| MM_IRQ_30 | Reserved | Reserved | Reserved |
| MM_IRQ_31 | PRCM_M3_IRQ | PRCM | PRCM interrupt |
| MM_IRQ_32 | Reserved | Reserved | Reserved |
| MM_IRQ_33 | Reserved | Reserved | Reserved |
| MM_IRQ_34 | MAIL_U2_M3_IRQ | MAILBOX | Mailbox user 2 interrupt |
| MM_IRQ_35 | GPIO1_MPU_IRQ | GPIO1 | GPIO1 MPU interrupt ⁽³⁾ |
| MM_IRQ_36 | GPIO2_MPU_IRQ | GPIO2 | GPIO2 MPU interrupt ⁽³⁾ |
| MM_IRQ_37 | GPT3_IRQ | GPTIMER3 | GPTIMER3 interrupt ⁽³⁾ |
| MM_IRQ_38 | GPT4_IRQ | GPTIMER4 | GPTIMER4 interrupt ⁽³⁾ |
| MM_IRQ_39 | GPT9_IRQ | GPTIMER9 | GPTIMER9 interrupt ⁽³⁾ |
| MM_IRQ_40 | GPT11_IRQ | GPTIMER11 | GPTIMER11 interrupt ⁽³⁾ |
| MM_IRQ_41 | MCSP11_IRQ | MCSP11 | MCSP11 interrupt ⁽⁴⁾ |
| MM_IRQ_42 | MCSP12_IRQ | MCSP12 | MCSP12 interrupt ⁽³⁾ |
| MM_IRQ_43 | Reserved | Reserved | Reserved |
| MM_IRQ_44 | Reserved | Reserved | Reserved |
| MM_IRQ_45 | Reserved | Reserved | Reserved |
| MM_IRQ_46 | C2C_SSCM_IRQ0 | C2C | C2C status interrupt ⁽⁴⁾ |
| MM_IRQ_47 | C2C_SSCM_IRQ1 | C2C | C2C GPI interrupt ⁽⁴⁾ |
| MM_IRQ_48 | DMM_IRQ | DMM | DMM interrupt ⁽³⁾ |
| MM_IRQ_49 | Reserved | Reserved | Reserved |
| MM_IRQ_50 | MMC1_IRQ | HSMMC1 | MMC1 interrupt ⁽⁴⁾ |
| MM_IRQ_51 | MMC2_IRQ | HSMMC2 | MMC2 interrupt ⁽⁴⁾ |
| MM_IRQ_52 | MMC3_IRQ | HSMMC3 | MMC3 interrupt ⁽³⁾ |
| MM_IRQ_53 | MMC4_IRQ | HSMMC4 | MMC4 interrupt ⁽³⁾ |
| MM_IRQ_54 | MMC5_IRQ | HSMMC5 | MMC5 interrupt ⁽³⁾ |
| MM_IRQ_55 | Reserved | Reserved | Reserved |
| MM_IRQ_56 | FSUSB_SMI_IRQ | FSUSB | FS-USB – host controller SMI interrupt ⁽³⁾ |
| MM_IRQ_57 | HSUSB_EHCI_IRQ | HSUSBHOST | HSUSB MP host interrupt EHCI controller ⁽³⁾ |
| MM_IRQ_58 | HSUSB_TLL_IRQ | HSUSBTLL | HSUSB MP TLL interrupt ⁽³⁾ |
| MM_IRQ_59 | FSUSB_IRQ | FSUSB | FS-USB – host controller Interrupt ⁽³⁾ |
| MM_IRQ_60 | HSUSB_OTG_IRQ | HSUSBOTG | HSUSB OTG controller interrupt ⁽³⁾ |
| MM_IRQ_61 | HSUSB_OTG_DMA_IRQ | HSUSBOTG | HSUSB OTG DMA interrupt ⁽³⁾ |
| MM_IRQ_62 | HSI_P1_MPU_IRQ | HSI | HSI port 1 interrupt ⁽³⁾ |
| MM_IRQ_63 | HSI_P2_MPU_IRQ | HSI | HSI port 2 interrupt ⁽³⁾ |

- (1) Internally generated within the Cortex-M3 MPU subsystem
- (2) Shared with DSP INTC
- (3) Shared with Cortex-A9 MPU INTC
- (4) Shared with DSP INTC and Cortex-A9 MPU INTC

NOTE: MM_IRQ_0 triggers exception 16 inside the Cortex-M3 core(s).

NOTE: All Cortex-M3 MPU subsystem internal interrupts are edge interrupts, except the one generated from the MMU (XLATE_MMU_FAULT), which is a level interrupt.

18.4 INTC Functional Description

18.4.1 Cortex-A9 MPU INTC Functional Description

The Cortex-A9 MPU INTC is configured to have the following interrupt sources:

- 16 interprocessor interrupts (IPIs): ID[15:0]
- Two private timer/watchdog interrupts: ID[30:29]
- Two legacy nFIQ nIRQ: one per CPU, bypasses the interrupt distributor logic and drives interrupt requests directly into the CPU, if used in legacy mode (otherwise, they are treated like other interrupts lines with ID28 and ID31, respectively)
- 128 hardware interrupts: ID[159:32] (rising-edge or high-level sensitive). The interrupt mapping of these interrupts is provided in [Table 18-2](#).

CAUTION

Although the hardware interrupts can be configured to be rising-edge or high-level sensitive in the INTC, the device supports only active-high, level-sensitive configuration.

For more information about the functionality of the Cortex-A9 MPU INTC, see the *ARM Cortex-A9 MP Core Technical Reference Manual*.

18.4.2 Cortex-M3 MPU INTC Functional Description

The Cortex-M3 MPU INTC has the following configuration in the device:

- 64 hardware interrupts/16 levels of priority for each Cortex-M3 core. The interrupt mapping of these interrupts is provided in [Table 18-3](#).
- The calibration register, which is used to reload the SYSTICK timer to generate a fixed interval, is not supported in the Cortex-M3 core within the Cortex-M3 MPU subsystem. The TENMS field is not available due to the different frequencies during voltage scaling.
- The SYSRESETREQ reset feature is not supported at the Cortex-M3 processor level. Writing to this bit has no effect.

For more information about the functionality of the Cortex-M3 MPU INTC, see *ARM Cortex-M3 Technical Reference Manual*.

18.5 INTC Register Manual

18.5.1 INTC Instance Summary

For information about the Cortex-A9 MPU INTC and Cortex-M3 MPU INTC instances, see [Chapter 4](#), *Cortex-A9 MPU Subsystem* and [Chapter 7](#), *Dual Cortex-M3 Subsystem*.

18.5.2 Cortex-A9 MPU INTC Registers

For information about the Cortex-A9 MPU INTC registers and their description, see the *ARM Cortex-A9 MP Core Technical Reference Manual*.

18.5.3 Cortex-M3 MPU INTC Registers

For information about the Cortex-M3 MPU INTC registers and their description, see the *ARM Cortex-M3 Technical Reference Manual*.

Control Module

This chapter describes the system control module for the device.

| Topic | Page |
|--|------|
| 19.1 Control Module Overview | 3474 |
| 19.2 Control Module Environment | 3476 |
| 19.3 Control Module Integration | 3477 |
| 19.4 Control Module Functional Description | 3481 |
| 19.5 Control Module Programming Guide | 3697 |
| 19.6 Control Module Register Manual | 3704 |

19.1 Control Module Overview

The control module allows software control of the various static modes supported by the device. It is composed of two control submodules: general control module and device (padconfiguration) control module.

The general control module has the following features:

- General status and control
- Hardware observability input/output (I/O) multiplexing
- Standard eFuse logic

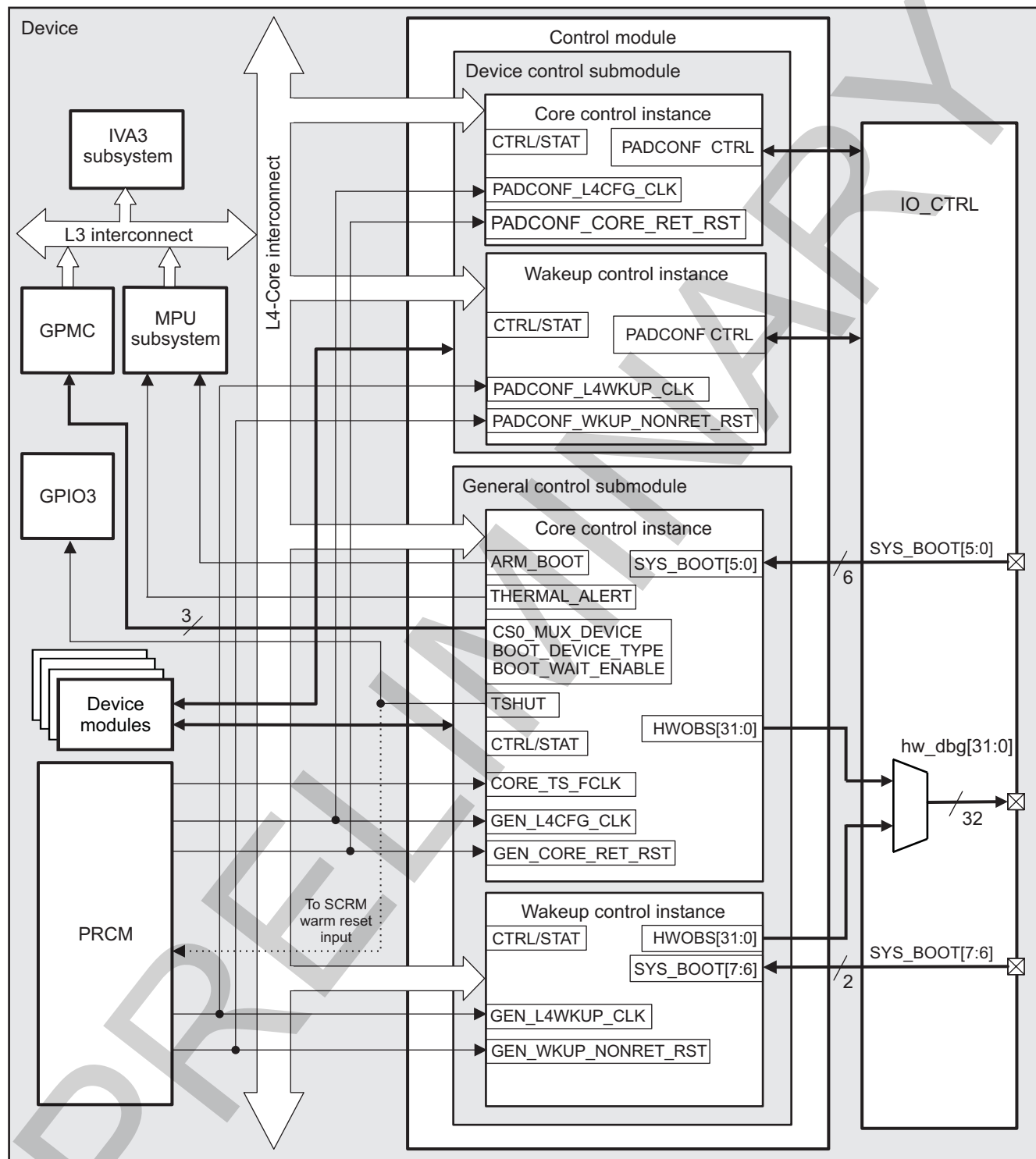
The device control module provides the following features:

- Pad functional I/O multiplexing
- Pad pullup/down configuration
- Pad groups associated signal integrity controls
- Complex I/O configuration
- Analog function control
- Device-specific eFuse registers

Both control submodules are split into two instances: the control core instance within the CORE power domain, and the control wake-up instance within the WKUP power domain. For more information about the four different control module instances, see [Section 19.3, Control Module Integration](#).

[Figure 19-1](#) is an overview of the control module.

Figure 19-1. Control Module Overview

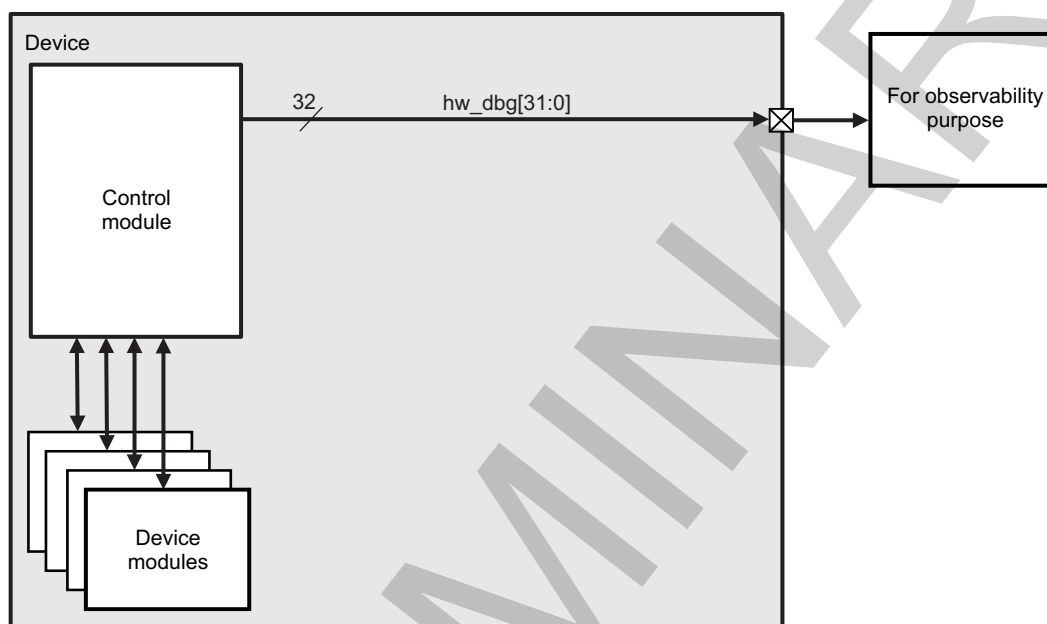


sysctrl-001

19.2 Control Module Environment

The control module controls the multiplexing of device internal module signals routed to the external pins (hw_dbg[31:0]) for hardware debug purposes. For more information, see [Section 19.4.11, Hardware Observability](#), and [Section 19.4.8, PAD Functional Multiplexing and Configuration](#). Using the correct pad configuration, the control module maps these pins at the device boundary to observe the internal signals from the power, reset, and clock management (PRCM) module, direct memory access (DMA) requests, and interrupts. [Figure 19-2](#) is an overview of the control module environment.

Figure 19-2. Control Module Environment



sysctrl-002

19.2.1 Control Module Signals

[Table 19-1](#) lists the control module hardware observability outputs configured to observe the debug signals of the device module. It describes the module signals and specifies their links to functions.

Table 19-1. Control Module I/O Description

| Signal | I/O ⁽¹⁾ | Description | Reset Value ⁽²⁾ |
|--------------|--------------------|---|----------------------------|
| hw_dbg[31:0] | O | Internal hardware observability signals 0 to 31 | hi-Z |

⁽¹⁾ I = Input; O = Output; I/O = Bidirectional

⁽²⁾ hi-Z = High impedance

19.3 Control Module Integration

The control module of the device is on the L4-Core interconnect. It consists of four module instances:

- General core control module (SYSCTRL_GENERAL_CORE)
- General wakeup control module (SYSCTRL_GENERAL_WKUP)
- Device core control module (SYSCTRL_PADCONF_CORE)
- Device wakeup control module (SYSCTRL_PADCONF_WKUP)

For more information about the different control module instances, see [Table 19-4](#).

Each of these four module instances has an associated register set and shares one functional clock and one reset signal with the PRCM module. The exception is general core control module (SYSCTRL_GENERAL_CORE) which also receives a secondary functional clock, CORE_TS_FCLK.

[Table 19-2](#) describes the signals.

Table 19-2. Clocks and Resets

| Clocks | | | | |
|----------------------|-------------------------|--------------------|--------|---|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| SYSCTRL_GENERAL_WKUP | GEN_L4WKUP_CLK | WKUP_L4_ICLK2 | PRCM | L4_WKUP interface/functional clock propagated to the general wakeup control module |
| SYSCTRL_GENERAL_CORE | GEN_L4CFG_CLK | CFG_L4_ICLK | PRCM | L4_CFG interface/functional clock propagated to the general core control module |
| | CORE_TS_FCLK | CORE_TS_FCLK | PRCM | Functional clock for the band gap state-machine instantiated in the general core control module |
| SYSCTRL_PADCONF_WKUP | PADCONF_L4WKUP_CLK | WKUP_L4_ICLK2 | PRCM | L4_WKUP interface/functional clock propagated to the device wakeup control module |
| SYSCTRL_PADCONF_CORE | PADCONF_L4CFG_CLK | CFG_L4_ICLK | PRCM | L4_CFG interface/functional clock propagated to the device core control module |
| Resets | | | | |
| SYSCTRL_GENERAL_WKUP | GEN_WKUP_NONRET_RST | WKUP_PWRON_RST | PRCM | Internal power-on reset (POR) affecting the general wakeup control module |
| SYSCTRL_GENERAL_CORE | GEN_CORE_RET_RST | CORE_PWRON_RET_RST | PRCM | Internal POR affecting the general core control module |
| SYSCTRL_PADCONF_WKUP | PADCONF_WKUP_NONRET_RST | WKUP_PWRON_RST | PRCM | Internal POR affecting the device wakeup control module |
| SYSCTRL_PADCONF_CORE | PADCONF_CORE_RET_RST | CORE_PWRON_RET_RST | PRCM | Internal POR affecting the device core control module |

Table 19-3. Hardware Requests

| Interrupt Requests | | | | |
|----------------------|--------------------|-------------------------|----------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| SYSCTRL_GENERAL_CORE | THERMAL_ALERT | MA_IRQ_126 | CORTEX-A9 INTC | Interrupt generated by general core control module to CORTEX™-A9 |

NOTE: For a description of the interrupt sources, see [Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller](#).

The control module is reset by the internal POR, which is active low. The PRCM module provides a

retention POR signal (CORE_PWRON_RET_RST) duplicated to both of the core control module instances, and a nonretention POR signal (WKUP_PWRON_RST) duplicated to each of the two wake-up control module instances in the control module. For more information, see [Section 3.5.4, Reset Domains](#), in [Chapter 3, Power, Reset, and Clock Management](#). The control module does not respond to a warm reset or to an L4-Core reset.

The main sequential logic within the control module is accessible in a register file through the L4-Core interconnect. The PRCM module provides the CFG_L4_ICLK functional clock signal (L4_CFG clock domain) separately to each of the two core control submodules. In addition, an instantiated inside the general core control, the band gap state-machine receives its functional clock (CORE_TS_FCLK) from the PRCM module. For more information about this signal, see [Section 3.6.3.2.4, CM2 Clock Generator](#) in [Chapter 3, Power, Reset, and Clock Management](#).

The PRCM module also supplies the WKUP_L4_ICLK2 functional clock signal (L4_WKUP clock domain) to each of the two wake-up control module instances. For more information about this signal, see [Section 3.6.3.1, PRM Clock Source](#) in [Chapter 3, Power, Reset, and Clock Management](#).

The PRCM module latches the sys_boot[7:0] pad signals at POR and exports them as vector to the SYSBOOT[7:0] input of the general core control module. It is scanned in the [CONTROL_STATUS\[7:0\]](#) SYS_BOOT bit field. For more information, see [Section 28.2.4.2, Booting Device Order Selection](#), and [Section 28.2.4.1, Clock Source Selection](#) of the chapter, *Initialization*.

The thermal management subsystem inside the general core control module delivers one interrupt request (THERMAL_ALERT) to line MA_IRQ_126 of the MPU subsystem interrupt controller (INTC) (Cortex-A9 INTC), and delivers a thermal shutdown protection output signal (TSHUT) to:

1. the GPIO3 controller instance
2. the device SCRM external warm reset mapping logic to optionally generate a device hardware warm reset upon a TSHUT event

For more information about the functional outputs of the thermal management control module, see [Section 19.4.10](#).

The signal integration of the control module features:

- No IDLE hardware handshake
- No STANDBY hardware handshake
- No SAVE and RESTORE hardware handshake
- No wake-up request generation
- No DMA request generation
- One interrupt request (IRQ) – THERMAL_ALERT to the MPU subsystem
- A thermal shutdown protection signal (TSHUT) delivered to a GPIO3 input and to the SCRM external warm reset mapping logic of the PRCM module
- Three functional clocks: two clocks in the CFG and one in the WKUP clock domains
- One retention and one nonretention internal power-on-based resets

[Figure 19-3](#) shows the integration of the module in the device.

Figure 19-3. Control Module Integration

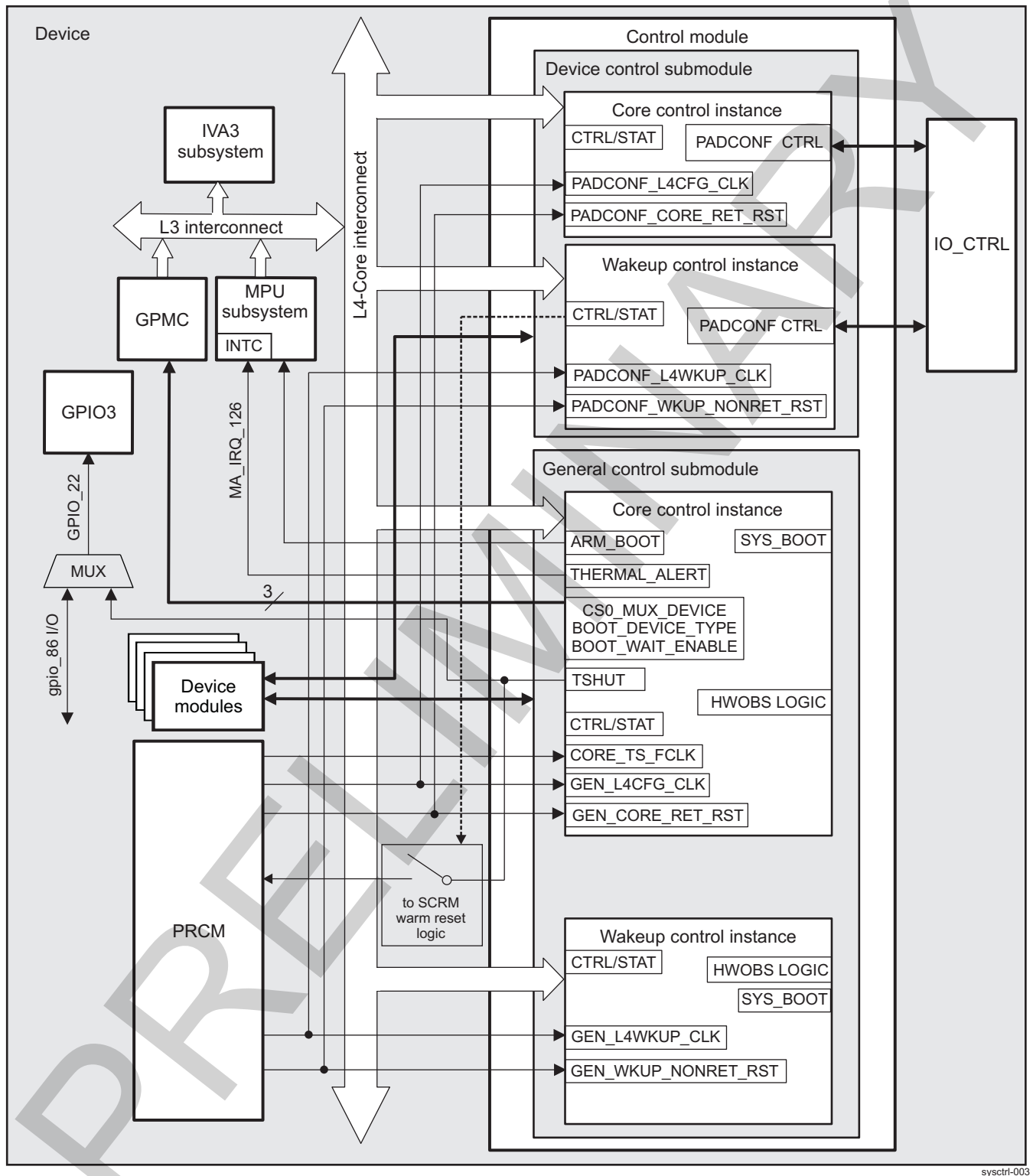


Table 19-4 lists the integration attributes.

Table 19-4. Integration Attributes

| Module Instance | Attributes | |
|----------------------|--------------|--------------|
| | Power Domain | Interconnect |
| SYSCTRL_GENERAL_WKUP | PD_WKUP | L4_WKUP |
| SYSCTRL_GENERAL_CORE | PD_CORE | L4_CFG |
| SYSCTRL_PADCONF_WKUP | PD_WKUP | L4_WKUP |
| SYSCTRL_PADCONF_CORE | PD_CORE | L4_CFG |

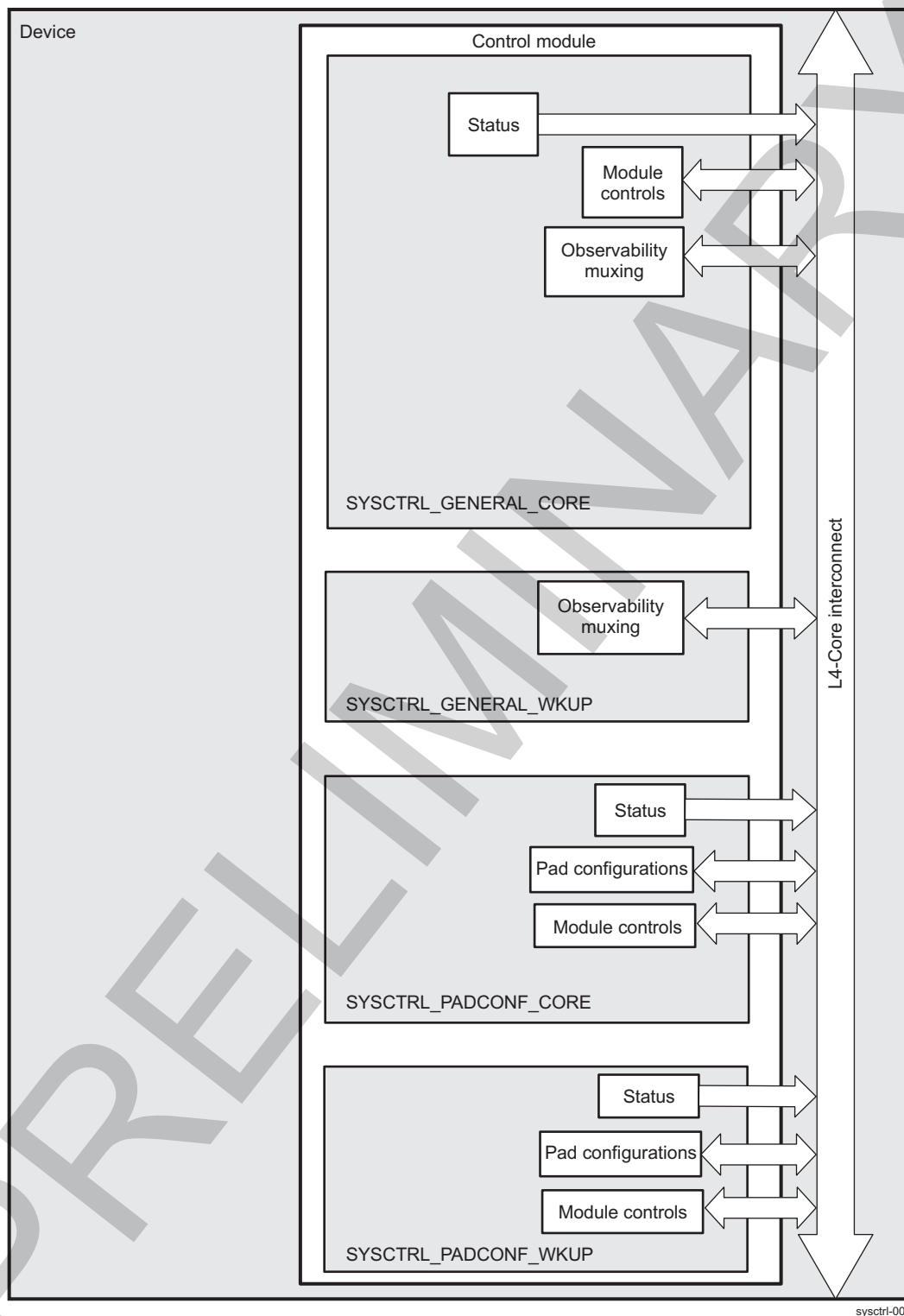
Software sets the configuration registers to the desired values depending on the configuration of the requested device. Static device configuration registers can be set by software any time and are effective immediately.

19.4 Control Module Functional Description

19.4.1 Control Module Block Diagram

The control module controls the settings of various device modules through the register configuration and internal signals. It also controls the pad configuration, pin functional multiplexing, and the routing of internal signals (such as PRCM signals or DMA requests) to output pins configured for hardware observability.

[Figure 19-4](#) is the control module block diagram.

Figure 19-4. Control Module Block Diagram

The control submodules primarily implement a bank of registers accessible (read/write) by software and some read-only registers that provide status information.

The read/write registers in the general control module can be divided into the following classes:

- Hardware observability registers (32-bit read/write registers)

- Status and configuration registers
- Boot registers
- eFuse ROM registers
- Miscellaneous functional registers

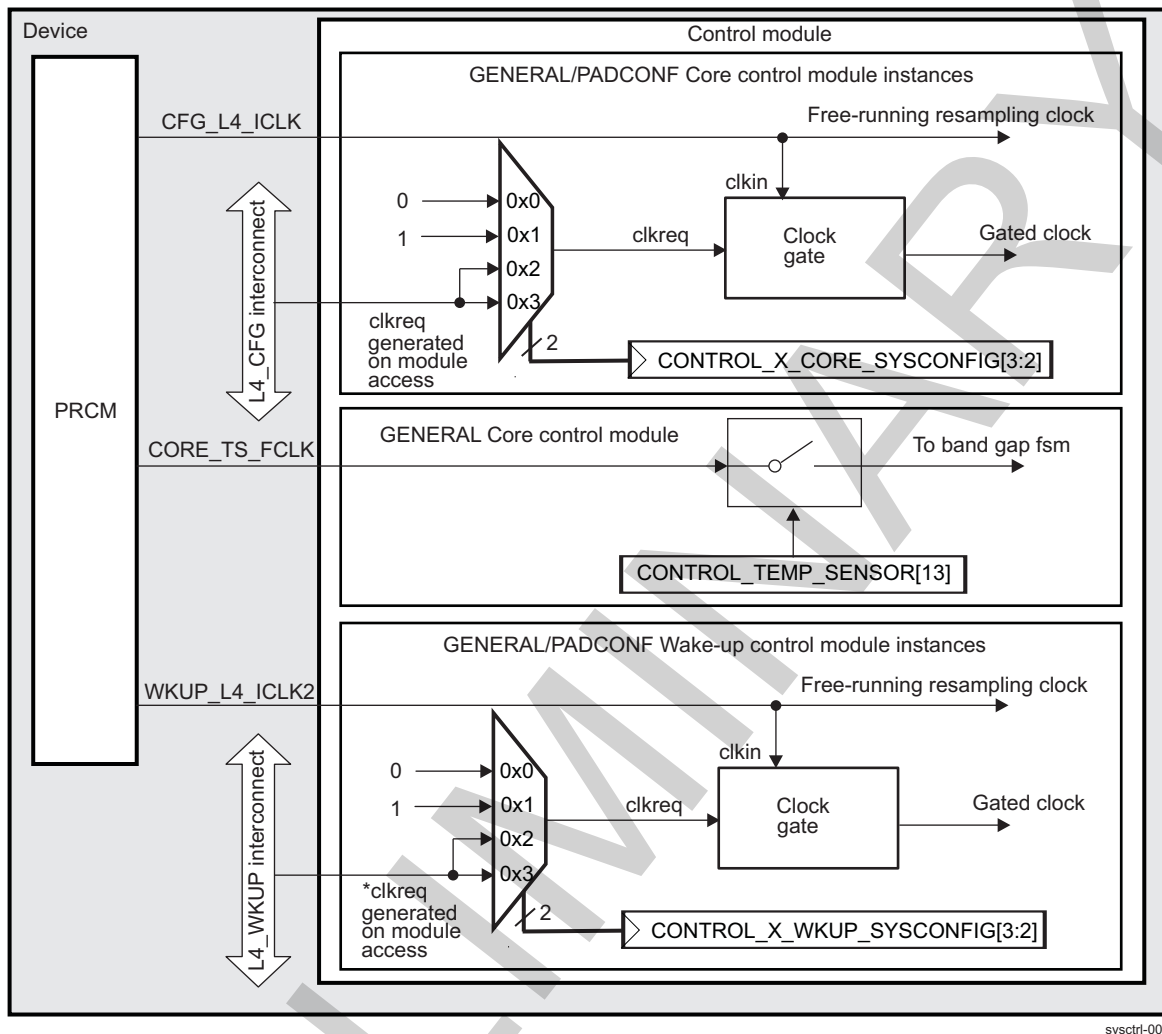
The read/write registers in the device(padconfiguration) control module can be divided into the following classes:

- Pad configuration registers (32-bit registers, one register for two pads)
- Pad groups (not individual per pad) associated registers for signal integrity parameters control (32-bit read/write registers)
- I/O cells associated specific control registers
- Device-specific status and configuration registers
- Miscellaneous functional registers

19.4.2 Control Module Clock Configuration

[Figure 19-5](#) shows the distribution schema of the control module internal clock . Each CFG_L4_ICLK and WKUP_L4_ICLK2 source clock is internally distributed into two clock paths: the first path directly mirrors the source clock and is an always-running clock. It is used to synchronize and resample some of the module inputs. The other clock path can be internally gated within the module.

The CORE_TS_FCLK clock, which drives the general core control band gap state-machine, can also be locally gated through a dedicated bit in the [CONTROL_TEMP_SENSOR](#) register. For more information about the temperature module off mode, see [Figure 19-5, Band Gap Voltage and Temperature Sensor](#).

Figure 19-5. Control Module Internal Clock Paths

sysctrl-005

The clock-gating strategy for L4 clocks is selected through the **CONTROL_SYSCONFIG[3:2]** **IP_SYSCONFIG_IDLEMODE** bit field available in each of the four control module instances. [Table 19-5](#) describes the different possibilities for clock management. There are no PRCM software controls for the **CFG_L4_ICLK** and **WKUP_L4_ICLK2** clocks in the control module. There are, however, clock activity status bits in the PRCM module.

The **CORE_TS_FCLK** has the following software controls: enable, status, and divider ratio, in the PRCM module. See [Section 3.6.4.2, Clock Domain Modes](#), and [Section 3.6.4, CD_WKUP Clock Domain](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 19-5. Internal Clock Gating Options

| Feature | CONTROL_SYSCONFIG[3:2] IP_SYSCONFIG_IDLEMODE Value | Description |
|------------------------|--|---|
| Local clock control | 0b00 | Clock is manually gated. |
| Local clock control | 0b01 | Clock is manually enabled. |
| Local clock autogating | 0b10, 0b11 | Clock is automatically gated when there is no access to the control module through the L4-interconnect. |

19.4.3 Control Module Software Reset

The control module is not sensitive to software reset.

19.4.4 Control Module Power Management

19.4.4.1 Retention

The general core module and device core control module instances are fully built with retention flip-flops (RFFs) and are powered in the CORE power domain; thus, they can be in active or retention mode. The core instances lose their content when the CORE power domain is in off mode. In contrast to the core control instances, the control wake-up instances are always powered and active. For more information about the device low-power states, see [Section 3.9, Device Low-Power States](#), in [Chapter 3, Power, Reset, and Clock Management](#).

19.4.4.2 Power Management Protocols

The control module, which is slave on the L4 interconnect, does not support standby or idle mode protocols.

19.4.4.3 Save-and-Restore Mechanism

The control core module instances lose their contents when the CORE power domain is in off mode. To prevent this, before going to off mode, the core register context is copied by software into a dedicated SAR_RAM in the WKUP voltage domain. The save-and-restore (SAR) mechanism, controlled by the PRCM module, allows restoring registers to the value present before going to off mode. Thus, core domain registers have a correct configuration/state immediately after the core power is on again without requesting a software operation to reconfigure them.

Because the SAR mechanism is managed by software-accessible registers, no hardware-specific requirements exist. For more information about SAR, see [Section 3.9.3, Device OFF State Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

19.4.5 Hardware Requests

The control module does not generate DMA or wake-up requests. The general core control module generates one IRQ (THERMAL_ALERT) to the Cortex-A9 INTC (MA_IRQ_126 line). For more information, see [Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller](#).

19.4.6 Control Module Initialization

The control module responds only to the internal POR and device type. At power-on, reset values for the registers define the *safe state* for the device. In the initialization mode, only modules to be used at boot time are associated with the pads. Other module inputs are internally tied and outputs pads are turned off. After POR, software must set the pad functional multiplexing and configuration registers to the desired values according to the requested device configuration. For more information, see [Chapter 28, Initialization](#).

General-purpose (GP) devices include features that are inaccessible or unavailable. These inaccessible registers define the default or fixed device configuration or behavior.

The [CONTROL_STATUS\[7:0\]](#) SYS_BOOT boot field reflects the state of the sys_boot pins captured at POR in the PRCM module.

19.4.7 General Control Module Instances

19.4.7.1 General Core Control Module Instance

The SYSCTRL_GENERAL_CORE instance contains most of the control logic that provides the hardware observability features for different digital phase-locked loop (DPLL) clockout and DPLL-specific signals, DMA requests, IRQs, and other internal hardware signals. The general core control provides the system boot decoding logic and has control over the standard eFuse settings. The system configuration registers, specific function controls, and some peripheral control and status registers are also mapped there.

The register sets available within the SYSCTRL_GENERAL_CORE are:

- Observability control registers:
 - [CONTROL_HWOBS_CONTROL](#)
 - [CONTROL_DEBOBS_FINAL_MUX_SEL](#)
 - [CONTROL_CONF_SDMA_REQ_SELx](#)
 - [CONTROL_CONF_CLK_SELx](#) (where x = 0 to 2)
 - [CONTROL_CONF_DPLL_X_SEL](#) (where X = FREQLOCK, TINITZ, PHASELOCK, TENABLE, TENABLEDIV, BYPASSACK, IDLE)
- Part of the debug view channel selection registers: [CONTROL_CORE_CONF_DEBUG_SEL_TST_X](#)
- MMU address translation-related registers: [CONTROL_CORTEX_M3_MMUADDRTRANSLTR](#) and [CONTROL_CORTEX_M3_MMUADDRLOGICTR](#)
- Standard fuse registers: [CONTROL_STD_FUSE_X](#)
- Clock gating configuration register: [CONTROL_GEN_CORE_SYSCONFIG](#)
- Control status register: [CONTROL_STATUS](#)
- Peripheral control registers:
 - [CONTROL_TEMP_SENSOR](#)
 - [CONTROL_BANDGAP_CTRL](#)
 - [CONTROL_BANDGAP_COUNTER](#)
 - [CONTROL_BANDGAP_THRESHOLD](#)
 - [CONTROL_TSHUT_THRESHOLD](#)
 - [CONTROL_BANDGAP_STATUS](#)
 - [CONTROL_DSS_CONTROL](#)
 - [CONTROL_USBOTGHS_CONTROL](#)
 - [CONTROL_LDOSRAM_MPU_VOLTAGE_CTRL](#)
 - Etc.

19.4.7.2 General Wakeup Control Module Instance

The registers associated with this module are:

- Clock gating configuration register: [CONTROL_GEN_WKUP_SYSCONFIG](#)
- Register with spare bits: [CONTROL_OCPREG_SPARE](#)
- Part of the debug view channel selection registers: [CONTROL_WKUP_CONF_DEBUG_SEL_TST_X](#)

19.4.7.3 Device Core Control Module Instance

The SYSCTRL_PADCONF_CORE instance provides the device-specific pad control features, such as pullup/down I/O configuration and pad functional multiplexing. Wake-up control/status features are also subjects of the device core control.

The registers associated with this module are:

- Clock gating configuration register: [CONTROL_PADCONF_CORE_SYSCONFIG](#)
- Different peripheral pad mode configuration and wake-up status/configuration registers:

- CONTROL_CORE_PAD0_X_PAD1_Y
- CONTROL_PADCONF_WAKEUPEVENTx
- [CONTROL_PADCONF_GLOBAL](#)
- CONTROL_SMARTxIO
- [CONTROL_C2CIO_PADCONF_0](#)
- Etc.
- Peripheral pad voltage-level control register: CONTROL_PADCONF_MODE
- Miscellaneous controls for different device interface modules: CONTROL_X registers, such as the [CONTROL_MMC1](#) register (including the CONTROL_EFUSE registers)

19.4.7.4 Device Wake-Up Control Module Instance

Configuration registers for all pads linked to the wake-up voltage domain are in the WKUP device control module. The registers instantiated are:

- Clock gating configuration register: [CONTROL_PADCONF_WKUP_SYSCONFIG](#)
- CONTROL_WKUP_PAD0_X_PAD1_Y registers for configuring FREF clock oscillator pads, reset signals, and power mode pad configurations

NOTE: SYSCTRL_PADCONF_X alias notifies a device control module instance.

[Table 19-111](#) shows the memory size and base addresses assigned to the different control module instances

19.4.8 Pad Functional Multiplexing and Configuration

After POR, software must set the pad functional multiplexing and configuration registers to the desired values according to the requested device configuration. The configuration is controlled by pads or a group of pads. Each configurable pin has its own configuration register for pullup/down control and for assignment to a given module.

Two sets of 32-bit registers provide the pad functional multiplexing and configuration feature of the control module. The first set of registers (CONTROL_CORE_PAD0_X_PAD1_Y) configures the pads in the CORE power domain. The second set of registers (CONTROL_WKUP_PAD0_X_PAD1_Y) configures the pads in the WKUP power domain.

The pad configuration as defined in this module is used in the IO_CTRL logic along with the gating and protection features. The gating feature is implemented for the output pads. The protection feature is implemented for input lines. These features implement additional control and multiplexing capabilities hard-wired in the IO_CTRL logic and driven by the state and/or logic of the internal device.

The gating feature allows forcing an output pad to a fixed value (Z, pullup, pulldown, 1, 0) or to a given internal signal. Each gating command is defined with a logic equation and the output state or value to be set on the pad when the logic equation is "True."

The protection feature provides control on each input line of the control module when no pad is assigned to this input (protected value). When POR is released, the value on the pad is driven by the default configuration of the control module. This configuration is usually aligned with the default value selected on the I/O cell. The protected value can be logical level (0 or 1) or a signal from a pad; it is selected when none of the pad_x.MuxMod selects a device input.

Each 32-bit pad configuration register controls two pads: the first pad is controlled by the 16 least-significant bits (LSBs), and the second pad is controlled by the 16 most-significant bits (MSBs); thus, one pad configuration register provides control for two different pins. After POR, software sets the pad functional multiplexing and configuration registers to the requested device pad configurations. Data written in these registers directly commands the multiplexing of the pad configuration logic. [Figure 19-6](#) shows the 16-bit-wide pad configuration register field associated with each pin.

Pad configuration register name = pad configuration register field @0xn name



The functional bits of a pad configuration register field are divided into the following five fields:

- MUXMODE (3 bits) defines the multiplexing mode applied to the pin. A mode corresponds to the selection of the function mapped on the pin with seven (0 to 6) possible functional modes for each pin.
- PULL (2 bits) for combinational pullup/down configuration:
 - PULLTYPESELECT: Pullup/down type selection for the pin
 - PULLUDENABLE: Enables pullup/down feature for the pin
- INPUTENABLE (1 bit) drives an input enable signal to the I/O CTRL.
 - INPUTENABLE = 0: Input disable. Pin is configured only in output mode.
 - INPUTENABLE = 1: Input enable. Pin is configured in bidirectional mode.
- Off mode values (1 bit) override the pin state when the OFFMODEENABLE bit in CONTROL_CORE_PAD0_X_PAD1_Y is set and off mode is active. This feature allows having separate configurations (5 bits) for the pins when in off mode:
 - OFFMODEENABLE: Off mode pin state override control. Set to 1 to enable the feature and set to 0 to disable it.
 - OFFMODEOUTENABLE: Off mode output enable value. Set to 0 to enable the feature and set to 1 to disable it.
 - OFFMODEOUTVALUE: Off mode output value.
 - OFFMODEPULLUDENABLE: Off mode pullup/down feature enable
 - OFFMODEPULLTYPESELECT: Off mode pullup/down type selection
- Wake-up bits (2 bits):
 - WAKEUPENABLE: Enable wake-up detection on input. It is also the off mode input enable value.
 - WAKEUPEVENT: Wake-up event status for the pin

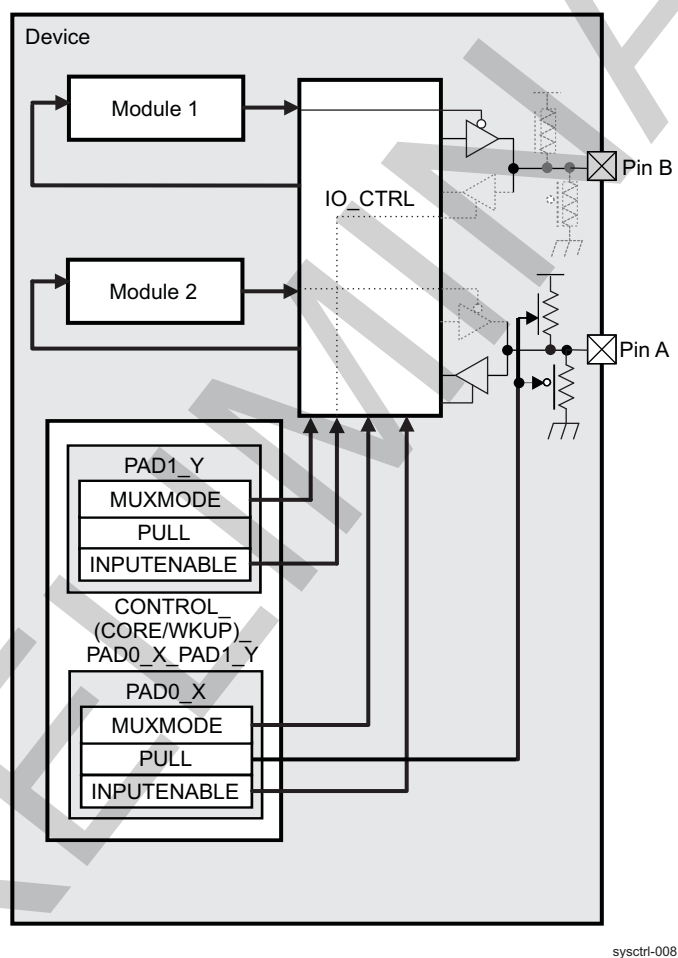
CAUTION

The OFFOUTENABLE and OFFOUTVALUE bits are functional only if the pad configuration supports output mode on at least one MUXMODE. For a pad that supports only the input feature, the OFFOUTENABLE and OFFOUTVALUE bits cannot be configured (they are don't care and read always returns 0).

NOTE: Because off-mode affects pads only in the CORE power domain, OFFMODE-related bits are not present in the pad configuration registers of the WKUP power domain.

Figure 19-7 shows the pad configuration functionality when off mode is inactive. For more information about off mode, see [Section 19.4.8.4, Off Mode PAD Control Overview](#).

Figure 19-7. Pad Configuration Diagram



sysctrl-008

The I/O pads are controlled by software by:

- Writing to the CONTROL_(CORE/WKUP)_PAD0_X_PAD1_Y registers in the device control module for I/O and pullup/down configuration
- Writing to the GPIOi.GPIO_OE registers in the GPIO module for I/O configuration

For more information about how to configure the I/O pads, see [Section 19.5.1.2.4, Pad Configuration Programming Points](#).

For more information about the GPIO module, see [Section 26.4.8, General-Purpose Interface Data Input/Output Capabilities](#).

NOTE: For the proper functioning of the following modules, the INPUTENABLE bit in the corresponding pad configuration register must be set to 1 for pads configured to drive output clocks:

- GPMC
- I2Ci
- MMCi
- HSUSB HOST
- McPDM

NOTE: For a correct configuration of each pin direction (input, output, bidirectional), the CONTROL_(CORE/WKUP)_PAD0_X_PAD1_Y and GPIOi.GPIO_OE registers must be written.

NOTE: Software INPUTENABLE controls are not available for the lpddr21_x, lpddr22_x, usbb1_hsic_x, and usbb2_hsic_x pads. Once their buffers are enabled they are always bidirectional. For more information, see [Section 19.4.12.8.2, High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings](#).

[Table 19-6](#) lists the bit directions of the CONTROL_(CORE/WKUP)_PAD0_X_PAD1_Y registers.

Table 19-6. Bit Meanings for CONTROL_(CORE/WKUP)_PAD0_X_PAD1_Y Registers

| Pad Configuration Bit | Bit Meaning | |
|-----------------------|--|--|
| | 0 | 1 |
| PULLUDENABLE | Not activated | Activated |
| PULLYPESELECT | Pulldown | Pullup |
| INPUTENABLE | Input enable signal is inactive. | Input enable signal is active. |
| OFFMODEENABLE | Off mode values are invalid. | Off mode values are valid. |
| OFFMODEOUTENABLE | Output | Input |
| OFFMODEOUTVALUE | Low | High |
| OFFMODEPULLUDENABLE | Not activated | Activated |
| OFFMODEPULLYPESELECT | Pulldown | Pullup |
| WAKEUPENABLE | Disable I/O wake-up function. | Enable I/O wake-up function. |
| WAKEUPEVENT | Wake-up event is not detected. | Wake-up event is detected. |
| MUXMODE bits | See Table 19-7, Mode Selection . | See Table 19-7, Mode Selection . |

19.4.8.1 Mode Selection

[Table 19-7](#) lists the multiplexing modes and settings.

Table 19-7. Mode Selection

| MUXMODE | Selected Mode |
|---------|-----------------------|
| 0b000 | Primary mode = Mode 0 |
| 0b001 | Mode 1 |
| 0b010 | Mode 2 |
| 0b011 | Mode 3 |
| 0b100 | Mode 4 |
| 0b101 | Mode 5 |
| 0b110 | Mode 6 |
| 0b111 | Safe mode = Mode 7 |

The MUXMODE field in the CONTROL_CORE_PAD0_X_PAD1_Y and CONTROL_WKUP_PAD0_X_PAD1_Y registers defines the multiplexing mode applied to the pad. Modes are referred to by their decimal (from 0 to 7) or binary (from 0b000 to 0b111) representation. Functional modes are defined from 0b000 to 0b110; mode 0b111 is referred to as the safe mode.

For most pads, the reset value for the MUXMODE field in the CONTROL_CORE_PAD0_X_PAD1_Y and CONTROL_WKUP_PAD0_X_PAD1_Y registers is 0b111. The exceptions are pads to be used at boot time to transfer data from selected peripherals to the external flash memory.

Mode 0 is the primary mode. When mode 0 is set, the function mapped to the pin corresponds to the name of the pin.

Modes 1–6 are possible modes for alternate functions. On each pin, some modes are used effectively for alternate functions, while other modes are unused and correspond to no functional configuration.

Safe mode (Mode 7) avoids any risk of electrical contention by configuring the pin as an input with no functional interface mapped to it. Safe mode is used mainly as the default mode for all pins containing no mandatory interface at the release of POR.

NOTE: When a pad is set into a mux mode that is not defined by pin multiplexing, the pad is actually set undriven (hi-Z) with potential pullup/down.

For more information about the configurable mode on each pin, see [Table 19-10](#) and [Table 19-9](#).

NOTE: Pad names are signal names available in mode 0.

19.4.8.2 Pull Selection

There is no automatic gating control to ensure that internal weak pulldown/pullup resistors on a pad are disconnected whenever pad is configured as output. If a pad is always configured in output mode, it is recommended for user software to disable any internal pull resistor tied to it, to avoid unnecessary consumption.

Table 19-8. Pull Selection

| PULL | | Pin Behavior |
|----------------|--------------|-------------------------------------|
| PULLTYPESELECT | PULLUDENABLE | |
| 0b0 | 0b0 | Pulldown selected but not activated |
| 0b0 | 0b1 | Pulldown selected and activated |
| 0b1 | 0b0 | Pullup selected but not activated |
| 0b1 | 0b1 | Pullup selected and activated |

For more information about the pull available on each pin, see [Table 19-10](#) and [Table 19-9](#).

NOTE: Software controls for internal active mode pullups and pulldowns on the lpddr21_x and lpddr22_x pads are available in the [CONTROL_LPDDR2IO1_0](#) through [CONTROL_LPDDR2IO1_2](#) and [CONTROL_LPDDR2IO2_0](#) through [CONTROL_LPDDR2IO2_2](#) registers, respectively.

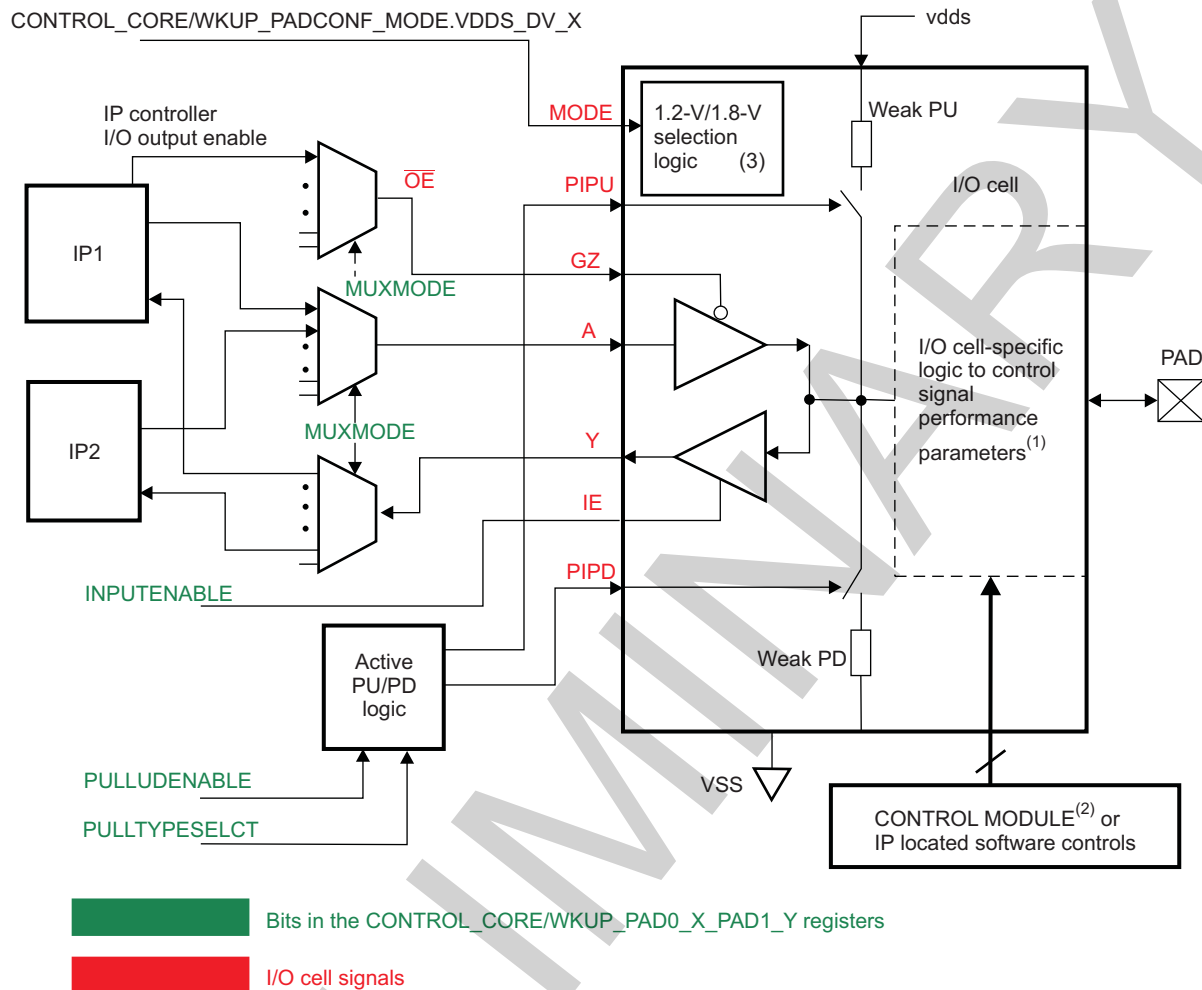
Software controls for internal active mode pullups and pulldowns on the usbb1_hsic_x and usbb2_hsic_x pads are available in the [CONTROL_USBB_HSIC](#) register.

For more information, see [Section 19.4.12.8.2, High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings](#).

19.4.8.2.1 Generic Pad Configuration Bit Fields vs I/O Cell Mapping

[Figure 19-8](#) provides a generic view of the relations between the pad configuration controls and I/O cell functions for a pad configured in active mode.

Figure 19-8. Active Mode Pad Configuration Bit Fields vs I/O Cell Mapping



sysctrl-028

- (1) [Section 19.4.12.8, Signal Integrity Parameter Control Registers With Pad Group Assignment](#), summarizes the I/O cell signal performance settings. For more information about the controlled I/O cell electrical parameters and interdependency considerations, see the device data manual.
- (2) For information about the mapping of software controls in the control module versus different device pads, see [Section 19.4.12.8.9, Device Interfaces Signal Group Controls Mapping](#). For more information about interface-specific signal parameter settings, see the device data manual.
- (3) The `CONTROL_CORE/WKUP_PADCONF_MODE.VDDS_DV_x` bit is available for each I/O that is part of the dual-voltage domain group x. For more information about 1.2-V/1.8-V dual-voltage domain I/Os, see the device data manual. For more information about peripheral dual-voltage software controls versus pad group mapping, see [Section 19.4.12.9, Dual-Voltage-Supplied Peripheral Controls](#).

NOTE: Dynamic switching between 1.2-V and 1.8-V voltage modes on dual-voltage peripheral I/Os is not allowed.

19.4.8.3 Pad Multiplexing Register Fields

Table 19-10 and Table 19-9 provide for each pad configuration register field the address offset and associated signal name for each multiplexing mode (as set by the MUXMODE bit field). Mode 0 is always defined. Modes with no signal name are undefined for the given pad. For more information about default padconfiguration settings (POR values) for pads in the CORE power domain, see Section 19.6.7, *SYSCTRL_PADCONF_CORE Register Description*; for pads in the WKUP power domain, see Section 19.6.9, *SYSCTRL_PADCONF_WKUP Register Description*.

NOTE:

- Table 19-9 lists the pad configuration registers instantiated in the WKUP power domain that drive the pads in the WKUP power domain. Table 19-10 lists the pad configuration registers instantiated in the CORE power domain that drive the pads in the CORE power domain.
- In Table 19-10 and Table 19-9, an empty cell indicates that the mode or pull is not available for this pin.

Table 19-9. Device Wake-Up Control Module Pad Configuration Register Fields

| SYSCTRL_PADCONF_WKUP P.[Register name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|-------------------|--------------|--------|--------|----------|---------------|--------|---------|-----------|
| CONTROL_WKUP_PAD0_GPIO_WK0_PAD1_GPIO_WK1[15:0] | 0x040 | gpio_wk0 | | | gpio_wk0 | c2c_pwkup | | hw_dbg1 | safe_mode |
| CONTROL_WKUP_PAD0_GPIO_WK0_PAD1_GPIO_WK1[31:16] | 0x040 | gpio_wk1 | | | gpio_wk1 | | | hw_dbg2 | safe_mode |
| CONTROL_WKUP_PAD0_GPIO_WK2_PAD1_GPIO_WK3[15:0] | 0x044 | gpio_wk2 | | | gpio_wk2 | | | hw_dbg3 | safe_mode |
| CONTROL_WKUP_PAD0_GPIO_WK2_PAD1_GPIO_WK3[31:16] | 0x044 | gpio_wk3 | | | gpio_wk3 | | | hw_dbg4 | safe_mode |
| CONTROL_WKUP_PAD0_GPIO_WK4_PAD1_SR_SCL[15:0] | 0x048 | gpio_wk4 | | | gpio_wk4 | | | hw_dbg5 | safe_mode |
| CONTROL_WKUP_PAD0_GPIO_WK4_PAD1_SR_SCL[31:16] | 0x048 | sr_scl | | | | | | | |
| CONTROL_WKUP_PAD0_SR_SDA_PAD1_FREF_XTAL_IN[15:0] | 0x04C | sr_sda | | | | | | | |
| CONTROL_WKUP_PAD0_SR_SDA_PAD1_FREF_XTAL_IN[31:16] | 0x04C | fref_xtal_in | | | | c2c_wakereqin | | | |

Table 19-9. Device Wake-Up Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_WKUP P.[Register name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|---------------------------------|---------------------|---------------|---------------|---------------|----------------|---------------|---------------|---------------|
| CONTROL_WKUP_PAD0_FREF_SLICER_IN_PAD1_FREF_CLK_IOREQ[15:0] | 0x050 | fref_slicer_in | | | gpi_wk5 | c2c_wakereqin | | | safe_mode |
| CONTROL_WKUP_PAD0_FREF_SLICER_IN_PAD1_FREF_CLK_IOREQ[31:16] | 0x050 | fref_clk_ioreq | | | | | | | |
| CONTROL_WKUP_PAD0_FREF_CLK0_OUT_PAD1_FREF_CLK3_REQ[15:0] | 0x054 | fref_clk0_out | fref_clk1_req | Reserved | gpio_wk6 | | sdmmc2_dat7 | hw_dbg6 | safe_mode |
| CONTROL_WKUP_PAD0_FREF_CLK0_OUT_PAD1_FREF_CLK3_REQ[31:16] | 0x054 | fref_clk3_req | fref_clk1_req | Reserved | gpio_wk30 | c2c_wakereqin | sdmmc2_dat4 | hw_dbg7 | safe_mode |
| CONTROL_WKUP_PAD0_FREF_CLK3_OUT_PAD1_FREF_CLK4_REQ[15:0] | 0x058 | fref_clk3_out | fref_clk2_req | Reserved | gpio_wk31 | c2c_wakereqout | sdmmc2_dat5 | hw_dbg8 | safe_mode |
| CONTROL_WKUP_PAD0_FREF_CLK3_OUT_PAD1_FREF_CLK4_REQ[31:16] | 0x058 | fref_clk4_req | fref_clk5_out | | gpio_wk7 | | sdmmc2_dat6 | hw_dbg9 | |
| CONTROL_WKUP_PAD0_FREF_CLK4_OUT_PAD1_SYSS_32K[15:0] | 0x05C | fref_clk4_out | | | gpio_wk8 | | | hw_dbg10 | |
| CONTROL_WKUP_PAD0_FREF_CLK4_OUT_PAD1_SYSS_32K[31:16] | 0x05C | sys_32k | | | | | | | |
| CONTROL_WKUP_PAD0_SYSNRESPWRON_PAD1_SYSNRESWARM[15:0] | 0x060 | sys_nrespwron | | | | | | | |
| CONTROL_WKUP_PAD0_SYSNRESPWRON_PAD1_SYSNRESWARM[31:16] | 0x060 | sys_nreswarm | | | | | | | |
| CONTROL_WKUP_PAD0_SYSPWR_REQ_PAD1_SYSPWRON_RESET_OUT[15:0] | 0x064 | sys_pwr_req | | | | | | | |
| CONTROL_WKUP_PAD0_SYSPWR_REQ_PAD1_SYSPWRON_RESET_OUT[31:16] | 0x064 | sys_pwron_reset_out | | | gpio_wk29 | | hw_dbg0 | hw_dbg11 | |
| CONTROL_WKUP_PAD0_SYSS_BOOT6_PAD1_SYSS_BOOT7[15:0] | 0x068 | sys_boot6 | dpm_emu18 | | gpio_wk9 | c2c_wakereqout | | hw_dbg12 | safe_mode |

Table 19-9. Device Wake-Up Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_WKU P.[Register name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|-------------------|---------------|-----------|--------|-----------|--------|--------|----------|-----------|
| CONTROL_WKUP_PAD0_SYS_BOOT6_PAD1_SYS_BOOT7[31:16] | 0x068 | sys_boot7 | dpm_emu19 | | gpio_wk10 | | | hw_dbg13 | safe_mode |
| CONTROL_WKUP_PAD0_JTAG_NTRST_PAD1_JTAG_TCK[15:0] | 0x06C | jtag_nrst | | | | | | | |
| CONTROL_WKUP_PAD0_JTAG_NTRST_PAD1_JTAG_TCK[31:16] | 0x06C | jtag_tck | | | | | | | safe_mode |
| CONTROL_WKUP_PAD0_JTAG_RTCK_PAD1_JTAG_TMS[15:0] | 0x070 | jtag_rtck | | | | | | | |
| CONTROL_WKUP_PAD0_JTAG_RTCK_PAD1_JTAG_TMS[31:16] | 0x070 | jtag_tms_tmsc | | | | | | | safe_mode |
| CONTROL_WKUP_PAD0_JTAG_TDI_PAD1_JTAG_TDO[15:0] | 0x074 | jtag_tdi | | | | | | | |
| CONTROL_WKUP_PAD0_JTAG_TDI_PAD1_JTAG_TDO[31:16] | 0x074 | jtag_tdo | | | | | | | |

Table 19-10. Device Core Control Module Pad Configuration Register Fields

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|-------------------|----------|-------------|-----------------|--------|--------|--------|--------|--------|
| CONTROL_CORE_PAD0_GPMC_AD0_PAD1_GPMC_AD1[15:0] | 0x040 | gpmc_ad0 | sdmmc2_dat0 | | | | | | |
| CONTROL_CORE_PAD0_GPMC_AD0_PAD1_GPMC_AD1[31:16] | 0x040 | gpmc_ad1 | sdmmc2_dat1 | | | | | | |
| CONTROL_CORE_PAD0_GPMC_AD2_PAD1_GPMC_AD3[15:0] | 0x044 | gpmc_ad2 | sdmmc2_dat2 | | | | | | |
| CONTROL_CORE_PAD0_GPMC_AD2_PAD1_GPMC_AD3[31:16] | 0x044 | gpmc_ad3 | sdmmc2_dat3 | | | | | | |
| CONTROL_CORE_PAD0_GPMC_AD4_PAD1_GPMC_AD5[15:0] | 0x048 | gpmc_ad4 | sdmmc2_dat4 | sdmmc2_dir_dat0 | | | | | |
| CONTROL_CORE_PAD0_GPMC_AD4_PAD1_GPMC_AD5[31:16] | 0x048 | gpmc_ad5 | sdmmc2_dat5 | sdmmc2_dir_dat1 | | | | | |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|-----------------------|---------------|---------------|-----------------|---------------|---------------|---------------|---------------|---------------|
| CONTROL_CORE_PAD0_GPMC_AD6_PAD1_GPMC_AD7[15:0] | 0x04C | gpmc_ad6 | sdmmc2_dat6 | sdmmc2_dir_cmd | | | | | |
| CONTROL_CORE_PAD0_GPMC_AD6_PAD1_GPMC_AD7[31:16] | 0x04C | gpmc_ad7 | sdmmc2_dat7 | sdmmc2_clk_fdbk | | | | | |
| CONTROL_CORE_PAD0_GPMC_AD8_PAD1_GPMC_AD9[15:0] | 0x050 | gpmc_ad8 | kpd_row0 | c2c_data15 | gpio_32 | | sdmmc1_dat0 | | |
| CONTROL_CORE_PAD0_GPMC_AD8_PAD1_GPMC_AD9[31:16] | 0x050 | gpmc_ad9 | kpd_row1 | c2c_data14 | gpio_33 | | sdmmc1_dat1 | | |
| CONTROL_CORE_PAD0_GPMC_AD10_PAD1_GPMC_AD11[15:0] | 0x054 | gpmc_ad10 | kpd_row2 | c2c_data13 | gpio_34 | | sdmmc1_dat2 | | |
| CONTROL_CORE_PAD0_GPMC_AD10_PAD1_GPMC_AD11[31:16] | 0x054 | gpmc_ad11 | kpd_row3 | c2c_data12 | gpio_35 | | sdmmc1_dat3 | | |
| CONTROL_CORE_PAD0_GPMC_AD12_PAD1_GPMC_AD13[15:0] | 0x058 | gpmc_ad12 | kpd_col0 | c2c_data11 | gpio_36 | | sdmmc1_dat4 | | |
| CONTROL_CORE_PAD0_GPMC_AD12_PAD1_GPMC_AD13[31:16] | 0x058 | gpmc_ad13 | kpd_col1 | c2c_data10 | gpio_37 | | sdmmc1_dat5 | | |
| CONTROL_CORE_PAD0_GPMC_AD14_PAD1_GPMC_AD15[15:0] | 0x05C | gpmc_ad14 | kpd_col2 | c2c_data9 | gpio_38 | | sdmmc1_dat6 | | |
| CONTROL_CORE_PAD0_GPMC_AD14_PAD1_GPMC_AD15[31:16] | 0x05C | gpmc_ad15 | kpd_col3 | c2c_data8 | gpio_39 | | sdmmc1_dat7 | | |
| CONTROL_CORE_PAD0_GPMC_A16_PAD1_GPMC_A17[15:0] | 0x060 | gpmc_a16 | kpd_row4 | c2c_datain0 | gpio_40 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_A16_PAD1_GPMC_A17[31:16] | 0x060 | gpmc_a17 | kpd_row5 | c2c_datain1 | gpio_41 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_A18_PAD1_GPMC_A19[15:0] | 0x064 | gpmc_a18 | kpd_row6 | c2c_datain2 | gpio_42 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_A18_PAD1_GPMC_A19[31:16] | 0x064 | gpmc_a19 | kpd_row7 | c2c_datain3 | gpio_43 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_A20_PAD1_GPMC_A21[15:0] | 0x068 | gpmc_a20 | kpd_col4 | c2c_datain4 | gpio_44 | | | | safe_mode |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|--|-----------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| CONTROL_CORE_PAD0_GPMC_A20_PAD1_GPMC_A21[31:16] | 0x068 | gpmc_a21 | kpd_col5 | c2c_datain5 | gpio_45 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_A22_PAD1_GPMC_A23[15:0] | 0x06C | gpmc_a22 | kpd_col6 | c2c_datain6 | gpio_46 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_A22_PAD1_GPMC_A23[31:16] | 0x06C | gpmc_a23 | kpd_col7 | c2c_datain7 | gpio_47 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_A24_PAD1_GPMC_A25[15:0] | 0x070 | gpmc_a24 | kpd_col8 | c2c_clkout0 | gpio_48 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_A24_PAD1_GPMC_A25[31:16] | 0x070 | gpmc_a25 | | c2c_clkout1 | gpio_49 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_NCS0_PAD1_GPMC_NCS1[15:0] | 0x074 | gpmc_ncs0 | | | gpio_50 | sys_ndmareq0 | | | |
| CONTROL_CORE_PAD0_GPMC_NCS0_PAD1_GPMC_NCS1[31:16] | 0x074 | gpmc_ncs1 | | c2c_dataout6 | gpio_51 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_NCS2_PAD1_GPMC_NCS3[15:0] | 0x078 | gpmc_ncs2 | kpd_row8 | c2c_dataout7 | gpio_52 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_NCS2_PAD1_GPMC_NCS3[31:16] | 0x078 | gpmc_ncs3 | gpmc_dir | c2c_dataout4 | gpio_53 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_NWP_PAD1_GPMC_CLK[15:0] | 0x07C | gpmc_nwp | dsi1_te0 | | gpio_54 | sys_ndmareq1 | | | |
| CONTROL_CORE_PAD0_GPMC_NWP_PAD1_GPMC_CLK[31:16] | 0x07C | gpmc_clk | | | gpio_55 | sys_ndmareq2 | sdmmc1_cmd | | |
| CONTROL_CORE_PAD0_GPMC_NADV_ALE_PAD1_GPMC_NOE[15:0] | 0x080 | gpmc_nadv_ale | dsi1_te1 | | gpio_56 | sys_ndmareq3 | sdmmc1_clk | | |
| CONTROL_CORE_PAD0_GPMC_NADV_ALE_PAD1_GPMC_NOE[31:16] | 0x080 | gpmc_noe | sdmmc2_clk | | | | | | |
| CONTROL_CORE_PAD0_GPMC_NWE_PAD1_GPMC_NBE0_CLE[15:0] | 0x084 | gpmc_nwe | sdmmc2_cmd | | | | | | |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|--|-----------------------|---------------|------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| CONTROL_CORE_PAD0_GPMC_NWE_PAD1_GPMC_NBE0_CLE[31:16] | 0x084 | gpmc_nbe0_cle | dsi2_te0 | | gpio_59 | | | | |
| CONTROL_CORE_PAD0_GPMC_NBE1_PAD1_GPMC_WAIT0[15:0] | 0x088 | gpmc_nbe1 | | c2c_dataout5 | gpio_60 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_NBE1_PAD1_GPMC_WAIT0[31:16] | 0x088 | gpmc_wait0 | dsi2_te1 | | gpio_61 | | | | |
| CONTROL_CORE_PAD0_GPMC_WAIT1_PAD1_GPMC_WAIT2[15:0] | 0x08C | gpmc_wait1 | | c2c_dataout2 | gpio_62 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_WAIT1_PAD1_GPMC_WAIT2[31:16] | 0x08C | gpmc_wait2 | usbc1_icusb_txen | c2c_dataout3 | gpio_100 | sys_ndmareq0 | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_NCS4_PAD1_GPMC_NCS5[15:0] | 0x090 | gpmc_ncs4 | dsi1_te0 | c2c_clkin0 | gpio_101 | sys_ndmareq1 | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_NCS4_PAD1_GPMC_NCS5[31:16] | 0x090 | gpmc_ncs5 | dsi1_te1 | c2c_clkin1 | gpio_102 | sys_ndmareq2 | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_NCS6_PAD1_GPMC_NCS7[15:0] | 0x094 | gpmc_ncs6 | dsi2_te0 | c2c_dataout0 | gpio_103 | sys_ndmareq3 | | | safe_mode |
| CONTROL_CORE_PAD0_GPMC_NCS6_PAD1_GPMC_NCS7[31:16] | 0x094 | gpmc_ncs7 | dsi2_te1 | c2c_dataout1 | gpio_104 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPIO63_PAD1_GPIO64[15:0] | 0x098 | Reserved | | | gpio_63 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPIO63_PAD1_GPIO64[31:16] | 0x098 | Reserved | | | gpio_64 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPIO65_PAD1_GPIO66[15:0] | 0x09C | Reserved | | | gpio_65 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPIO65_PAD1_GPIO66[31:16] | 0x09C | Reserved | | | gpio_66 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0[15:0] | 0x0A0 | csi21_dx0 | | | gpi_67 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0[31:16] | 0x0A0 | csi21_dy0 | | | gpi_68 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1[15:0] | 0x0A4 | csi21_dx1 | | | gpi_69 | | | | safe_mode |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|-----------------------|-------------------|---------------|---------------|---------------|-------------------|---------------|---------------|---------------|
| CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1[31:16] | 0x0A4 | csi21_dy1 | | | gpi_70 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2[15:0] | 0x0A8 | csi21_dx2 | | | gpi_71 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2[31:16] | 0x0A8 | csi21_dy2 | | | gpi_72 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3[15:0] | 0x0AC | csi21_dx3 | cam2_d7 | | gpi_73 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3[31:16] | 0x0AC | csi21_dy3 | cam2_d6 | | gpi_74 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4[15:0] | 0x0B0 | csi21_dx4 | cam2_d5 | | gpi_75 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4[31:16] | 0x0B0 | csi21_dy4 | cam2_d4 | | gpi_76 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0[15:0] | 0x0B4 | csi22_dx0 | cam2_d3 | cam2_d12 | gpi_77 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0[31:16] | 0x0B4 | csi22_dy0 | cam2_d2 | cam2_d13 | gpi_78 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1[15:0] | 0x0B8 | csi22_dx1 | cam2_d1 | cam2_d14 | gpi_79 | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1[31:16] | 0x0B8 | csi22_dy1 | cam2_d0 | cam2_d15 | gpi_80 | | | | safe_mode |
| CONTROL_CORE_PAD0_CAM_SHUTTER_PAD1_CAM_STROBE[15:0] | 0x0BC | cam_shutter | | cam2_hs | gpio_81 | | | | safe_mode |
| CONTROL_CORE_PAD0_CAM_SHUTTER_PAD1_CAM_STROBE[31:16] | 0x0BC | cam_strobe | | cam2_vs | gpio_82 | | | | safe_mode |
| CONTROL_CORE_PAD0_CAM_GLOBALRESET_PAD1_USBB1_ULPITLL_CLK[15:0] | 0x0C0 | cam_globalreset | | cam2_pclk | gpio_83 | | | | safe_mode |
| CONTROL_CORE_PAD0_CAM_GLOBALRESET_PAD1_USBB1_ULPITLL_CLK[31:16] | 0x0C0 | usbb1_ulpitll_clk | hsi1_cawake | | gpio_84 | usbb1_ulpiPHY_clk | | hw_dbg20 | safe_mode |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_STP_PAD1_USBB1_ULPITLL_DIR[15:0] | 0x0C4 | usbb1_ulpitll_stp | hsi1_cadata | mcbasp4_clkr | gpio_85 | usbb1_ulpiPHY_stp | usbb1_mm_rxdp | hw_dbg21 | safe_mode |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_STP_PAD1_USBB1_ULPITLL_DIR[31:16] | 0x0C4 | usbb1_ulpitll_dir | hsi1_caflag | mcbasp4_fsr | gpio_86 | usbb1_ulpiPHY_dir | | hw_dbg22 | safe_mode |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|-----------------------|--------------------|-------------------|------------------|---------------|--------------------|----------------|---------------|---------------|
| CONTROL_CORE_PAD0_USBB1_ULPITLL_NXT_PAD1_USBB1_ULPITLL_DAT0[15:0] | 0x0C8 | usbb1_ulpitll_nxt | hsi1_acready | mcbasp4_fsx | gpio_87 | usbb1_ulpiphy_nxt | usbb1_mm_rxdm | hw_dbg23 | safe_mode |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_NXT_PAD1_USBB1_ULPITLL_DAT0[31:16] | 0x0C8 | usbb1_ulpitll_dat0 | hsi1_acwake | mcbasp4_clkx | gpio_88 | usbb1_ulpiphy_dat0 | usbb1_mm_txen | hw_dbg24 | safe_mode |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT1_PAD1_USBB1_ULPITLL_DAT2[15:0] | 0x0CC | usbb1_ulpitll_dat1 | hsi1_acdata | mcbasp4_dx | gpio_89 | usbb1_ulpiphy_dat1 | usbb1_mm_txdat | hw_dbg25 | safe_mode |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT1_PAD1_USBB1_ULPITLL_DAT2[31:16] | 0x0CC | usbb1_ulpitll_dat2 | hsi1_acflag | mcbasp4_dr | gpio_90 | usbb1_ulpiphy_dat2 | usbb1_mm_txse0 | hw_dbg26 | safe_mode |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT3_PAD1_USBB1_ULPITLL_DAT4[15:0] | 0x0D0 | usbb1_ulpitll_dat3 | hsi1_caready | | gpio_91 | usbb1_ulpiphy_dat3 | usbb1_mm_rxcv | hw_dbg27 | safe_mode |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT3_PAD1_USBB1_ULPITLL_DAT4[31:16] | 0x0D0 | usbb1_ulpitll_dat4 | dmtimer8_pwm_evt | abe_mcbasp3_dr | gpio_92 | usbb1_ulpiphy_dat4 | | hw_dbg28 | safe_mode |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT5_PAD1_USBB1_ULPITLL_DAT6[15:0] | 0x0D4 | usbb1_ulpitll_dat5 | dmtimer9_pwm_evt | abe_mcbasp3_dx | gpio_93 | usbb1_ulpiphy_dat5 | | hw_dbg29 | safe_mode |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT5_PAD1_USBB1_ULPITLL_DAT6[31:16] | 0x0D4 | usbb1_ulpitll_dat6 | dmtimer10_pwm_evt | abe_mcbasp3_clkx | gpio_94 | usbb1_ulpiphy_dat6 | abe_dmic_din3 | hw_dbg30 | safe_mode |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT7_PAD1_USBB1_HSIC_DATA[15:0] | 0x0D8 | usbb1_ulpitll_dat7 | dmtimer11_pwm_evt | abe_mcbasp3_fsx | gpio_95 | usbb1_ulpiphy_dat7 | abe_dmic_clk3 | hw_dbg31 | safe_mode |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT7_PAD1_USBB1_HSIC_DATA[31:16] | 0x0D8 | usbb1_hsic_data | | | gpio_96 | | | | safe_mode |
| CONTROL_CORE_PAD0_USBB1_HSIC_STROBE_PAD1_GPIO_98[15:0] | 0x0DC | usbb1_hsic_strobe | | | gpio_97 | | | | safe_mode |
| CONTROL_CORE_PAD0_USBB1_HSIC_STROBE_PAD1_GPIO_98[31:16] | 0x0DC | gpio_98 | | | gpio_98 | | | | safe_mode |
| CONTROL_CORE_PAD0_GPIO_99_PAD1_SDMMC1_CLK[15:0] | 0x0E0 | gpio_99 | | | gpio_99 | | | | safe_mode |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|----------------|----------------------------|------------|----------------|----------|---------------|--------|--------|-----------|
| CONTROL_CORE_PAD0_GPIO_99_PAD1_SDMMC1_CLK[31:16] | 0x0E0 | sdmmc1_clk ⁽¹⁾ | | dpm_emu19 | gpio_100 | | | | safe_mode |
| CONTROL_CORE_PAD0_SDMC1_CMD_PAD1_SDMMC1_DAT0[15:0] | 0x0E4 | sdmmc1_cmd ⁽¹⁾ | | uart1_rx | gpio_101 | | | | safe_mode |
| CONTROL_CORE_PAD0_SDMC1_CMD_PAD1_SDMMC1_DAT0[31:16] | 0x0E4 | sdmmc1_dat0 ⁽¹⁾ | | dpm_emu18 | gpio_102 | | | | safe_mode |
| CONTROL_CORE_PAD0_SDMC1_DAT1_PAD1_SDMMC1_DAT2[15:0] | 0x0E8 | sdmmc1_dat1 ⁽¹⁾ | | dpm_emu17 | gpio_103 | | | | safe_mode |
| CONTROL_CORE_PAD0_SDMC1_DAT1_PAD1_SDMMC1_DAT2[31:16] | 0x0E8 | sdmmc1_dat2 ⁽¹⁾ | | dpm_emu16 | gpio_104 | jtag_tms_tmsc | | | safe_mode |
| CONTROL_CORE_PAD0_SDMC1_DAT3_PAD1_SDMMC1_DAT4[15:0] | 0x0EC | sdmmc1_dat3 ⁽¹⁾ | | dpm_emu15 | gpio_105 | jtag_tck | | | safe_mode |
| CONTROL_CORE_PAD0_SDMC1_DAT3_PAD1_SDMMC1_DAT4[31:16] | 0x0EC | sdmmc1_dat4 ⁽¹⁾ | | | gpio_106 | | | | safe_mode |
| CONTROL_CORE_PAD0_SDMC1_DAT5_PAD1_SDMMC1_DAT6[15:0] | 0x0F0 | sdmmc1_dat5 ⁽²⁾ | | | gpio_107 | | | | safe_mode |
| CONTROL_CORE_PAD0_SDMC1_DAT5_PAD1_SDMMC1_DAT6[31:16] | 0x0F0 | sdmmc1_dat6 ⁽²⁾ | | | gpio_108 | | | | safe_mode |
| CONTROL_CORE_PAD0_SDMC1_DAT7_PAD1_ABE_MCBS_P2_CLKX[15:0] | 0x0F4 | sdmmc1_dat7 ⁽²⁾ | | | gpio_109 | | | | safe_mode |
| CONTROL_CORE_PAD0_SDMC1_DAT7_PAD1_ABE_MCBS_P2_CLKX[31:16] | 0x0F4 | abe_mcbssp2_clkx | mcsip2_clk | abe_mcasphclkx | gpio_110 | usbb2_mm_rxdm | | | safe_mode |

- ⁽¹⁾ This pad is built on an I/O cell of the extended-drain type, which can be configured to operate within the 1.8-V (standard) or 3.0-V (high) I/O power supply voltage range. A PBIAS cell, which acts as a level shifter, is connected to the extended-drain I/O cell of this pad to appropriately bias its voltage according to the externally applied I/O power supply voltage. To ensure I/O safe operation at 1.8 V or 3.0 V and desired signal performance, the extended-drain I/O cell and its corresponding PBIAS cell must be appropriately configured by software prior to signal selection on the pad, regardless of the signal multiplexing mode. For more details on extended-drain I/O cell and PBIAS cell descriptions and settings, see [Section 19.4.9, Extended-Drain I/O and PBIAS Cell](#), and [Section 19.5.1.2.1, Extended-Drain I/Os and PBIAS Cells Programming Guide](#).
- ⁽²⁾ This pad is built on an I/O cell of the extended-drain type, which can be configured to operate within the 1.8-V (standard) or 3.0-V (high) I/O power supply voltage range. A PBIAS cell, which acts as a level shifter, is connected to the extended-drain I/O cell of this pad to appropriately bias its voltage according to the externally applied I/O power supply voltage. To ensure I/O safe operation at 1.8 V or 3.0 V and desired signal performance, the extended-drain I/O cell and its corresponding PBIAS cell must be appropriately configured by software prior to signal selection on the pad, regardless of the signal multiplexing mode. For more details on extended-drain I/O cell and PBIAS cell descriptions and settings, see [Section 19.4.9, Extended-Drain I/O and PBIAS Cell](#), and [Section 19.5.1.2.1, Extended-Drain I/Os and PBIAS Cells Programming Guide](#).

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|--|-----------------------|------------------|--------------------|--------------------|---------------|----------------|---------------|---------------|---------------|
| CONTROL_CORE_PAD0_ABE_MCBSP2_DR_PAD1_ABE_MCBSP2_DX[15:0] | 0x0F8 | abe_mcbbsp2_dr | mcspi2_somi | abe_mcaspi_axr | gpio_111 | usbb2_mm_rxdp | | | safe_mode |
| CONTROL_CORE_PAD0_ABE_MCBSP2_DR_PAD1_ABE_MCBSP2_DX[31:16] | 0x0F8 | abe_mcbbsp2_dx | mcspi2_simo | abe_mcaspi_amute | gpio_112 | usbb2_mm_rxrcv | | | safe_mode |
| CONTROL_CORE_PAD0_ABE_MCBSP2_FSX_PAD1_ABE_MCBSP1_CLKX[15:0] | 0x0FC | abe_mcbbsp2_fsx | mcspi2_cs0 | abe_mcaspi_afsx | gpio_113 | usbb2_mm_txen | | | safe_mode |
| CONTROL_CORE_PAD0_ABE_MCBSP2_FSX_PAD1_ABE_MCBSP1_CLKX[31:16] | 0x0FC | abe_mcbbsp1_clkx | abe_slimbus1_clock | | gpio_114 | | | | safe_mode |
| CONTROL_CORE_PAD0_ABE_MCBSP1_DR_PAD1_ABE_MCBSP1_DX[15:0] | 0x100 | abe_mcbbsp1_dr | abe_slimbus1_data | | gpio_115 | | | | safe_mode |
| CONTROL_CORE_PAD0_ABE_MCBSP1_DR_PAD1_ABE_MCBSP1_DX[31:16] | 0x100 | abe_mcbbsp1_dx | sdmmc3_dat2 | abe_mcaspi_aclkx | gpio_116 | | | | safe_mode |
| CONTROL_CORE_PAD0_ABE_MCBSP1_FSX_PAD1_ABE_PDM_UL_DATA[15:0] | 0x104 | abe_mcbbsp1_fsx | sdmmc3_dat3 | abe_mcaspi_amutein | gpio_117 | | | | safe_mode |
| CONTROL_CORE_PAD0_ABE_MCBSP1_FSX_PAD1_ABE_PDM_UL_DATA[31:16] | 0x104 | abe_pdm_ul_data | abe_mcbbsp3_dr | | | | | | safe_mode |
| CONTROL_CORE_PAD0_ABE_PDM_DL_DATA_PAD1_ABE_PDM_FRAME[15:0] | 0x108 | abe_pdm_dl_data | abe_mcbbsp3_dx | | | | | | safe_mode |
| CONTROL_CORE_PAD0_ABE_PDM_DL_DATA_PAD1_ABE_PDM_FRAME[31:16] | 0x108 | abe_pdm_frame | abe_mcbbsp3_clkx | | | | | | safe_mode |
| CONTROL_CORE_PAD0_ABE_PDM_LB_CLK_PAD1_ABE_PDM_CLKS[15:0] | 0x10C | abe_pdm_lb_clk | abe_mcbbsp3_fsx | | | | | | safe_mode |
| CONTROL_CORE_PAD0_ABE_PDM_LB_CLK_PAD1_ABE_PDM_CLKS[31:16] | 0x10C | abe_clks | | | gpio_118 | | | | safe_mode |
| CONTROL_CORE_PAD0_ABE_DMIC_CLK1_PAD1_ABE_DMIC_DIN1[15:0] | 0x110 | abe_dmic_clk1 | | | gpio_119 | usbb2_mm_txse0 | uart4_cts | | safe_mode |
| CONTROL_CORE_PAD0_ABE_DMIC_CLK1_PAD1_ABE_DMIC_DIN1[31:16] | 0x110 | abe_dmic_din1 | | | gpio_120 | usbb2_mm_txdat | uart4_rts | | safe_mode |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|-----------------------|---------------|----------------|---------------|---------------|---------------|-------------------|---------------|---------------|
| CONTROL_CORE_PAD0_ABE_DMIC_DIN2_PAD1_ABE_DMIC_DIN3[15:0] | 0x114 | abe_dmic_din2 | slimbus2_clock | abe_mcaspxr | gpio_121 | | dmtimer11_pwm_evt | | safe_mode |
| CONTROL_CORE_PAD0_ABE_DMIC_DIN2_PAD1_ABE_DMIC_DIN3[31:16] | 0x114 | abe_dmic_din3 | slimbus2_data | abe_dmic_clk2 | gpio_122 | | dmtimer9_pwm_evt | | safe_mode |
| CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS[15:0] | 0x118 | uart2_cts | sdmmc3_clk | | gpio_123 | | | | safe_mode |
| CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS[31:16] | 0x118 | uart2_rts | sdmmc3_cmd | | gpio_124 | | | | safe_mode |
| CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX[15:0] | 0x11C | uart2_rx | sdmmc3_dat0 | | gpio_125 | | | | safe_mode |
| CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX[31:16] | 0x11C | uart2_tx | sdmmc3_dat1 | | gpio_126 | | | | safe_mode |
| CONTROL_CORE_PAD0_HDQ_SIO_PAD1_I2C1_SCL[15:0] | 0x120 | hdq_sio | i2c3_sccb | i2c2_sccb | gpio_127 | | | | safe_mode |
| CONTROL_CORE_PAD0_HDQ_SIO_PAD1_I2C1_SCL[31:16] | 0x120 | i2c1_scl | | | | | | | |
| CONTROL_CORE_PAD0_I2C1_SDA_PAD1_I2C2_SCL[15:0] | 0x124 | i2c1_sda | | | | | | | |
| CONTROL_CORE_PAD0_I2C1_SDA_PAD1_I2C2_SCL[31:16] | 0x124 | i2c2_scl | uart1_rx | | gpio_128 | | | | safe_mode |
| CONTROL_CORE_PAD0_I2C2_SDA_PAD1_I2C3_SCL[15:0] | 0x128 | i2c2_sda | uart1_tx | | gpio_129 | | | | safe_mode |
| CONTROL_CORE_PAD0_I2C2_SDA_PAD1_I2C3_SCL[31:16] | 0x128 | i2c3_scl | | | gpio_130 | | | | safe_mode |
| CONTROL_CORE_PAD0_I2C3_SDA_PAD1_I2C4_SCL[15:0] | 0x12C | i2c3_sda | | | gpio_131 | | | | safe_mode |
| CONTROL_CORE_PAD0_I2C3_SDA_PAD1_I2C4_SCL[31:16] | 0x12C | i2c4_scl | | | gpio_132 | | | | safe_mode |
| CONTROL_CORE_PAD0_I2C4_SDA_PAD1_MCSP1_CLK[15:0] | 0x130 | i2c4_sda | | | gpio_133 | | | | safe_mode |
| CONTROL_CORE_PAD0_I2C4_SDA_PAD1_MCSP1_CLK[31:16] | 0x130 | mcspi1_clk | | | gpio_134 | | | | safe_mode |
| CONTROL_CORE_PAD0_MCSP1_I1_SOMI_PAD1_MCSP1_SIMO[15:0] | 0x134 | mcspi1_somi | | | gpio_135 | | | | safe_mode |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|-----------------------|----------------|------------------|------------------|---------------|---------------|---------------|---------------|---------------|
| CONTROL_CORE_PAD0_MCSP_I1_SOMI_PAD1_MCSP_I1_SIMO[31:16] | 0x134 | mcspi1_simo | | | gpio_136 | | | | safe_mode |
| CONTROL_CORE_PAD0_MCSP_I1_CS0_PAD1_MCSP_I1_CS1[15:0] | 0x138 | mcspi1_cs0 | | | gpio_137 | | | | safe_mode |
| CONTROL_CORE_PAD0_MCSP_I1_CS0_PAD1_MCSP_I1_CS1[31:16] | 0x138 | mcspi1_cs1 | uart1_rx | | gpio_138 | | | | safe_mode |
| CONTROL_CORE_PAD0_MCSP_I1_CS2_PAD1_MCSP_I1_CS3[15:0] | 0x13C | mcspi1_cs2 | uart1_cts | slimbus2_clock | gpio_139 | | | | safe_mode |
| CONTROL_CORE_PAD0_MCSP_I1_CS2_PAD1_MCSP_I1_CS3[31:16] | 0x13C | mcspi1_cs3 | uart1_rts | slimbus2_data | gpio_140 | | | | safe_mode |
| CONTROL_CORE_PAD0_UART3_CTS_RCTX_PAD1_UART3_RTS_SD[15:0] | 0x140 | uart3_cts_rctx | uart1_tx | | gpio_141 | | | | safe_mode |
| CONTROL_CORE_PAD0_UART3_CTS_RCTX_PAD1_UART3_RTS_SD[31:16] | 0x140 | uart3_rts_sd | | cam_globalreset | gpio_142 | | | | safe_mode |
| CONTROL_CORE_PAD0_UART3_RX_IRRX_PAD1_UART3_TX_IRTX[15:0] | 0x144 | uart3_rx_irrx | dmtimer8_pwm_evt | cam_shutter | gpio_143 | | | | safe_mode |
| CONTROL_CORE_PAD0_UART3_RX_IRRX_PAD1_UART3_TX_IRTX[31:16] | 0x144 | uart3_tx_irtx | dmtimer9_pwm_evt | cam_strobe | gpio_144 | | | | safe_mode |
| CONTROL_CORE_PAD0_SDM_MC5_CLK_PAD1_SDM_MC5_CMD[15:0] | 0x148 | sdmmc5_clk | mcspi2_clk | usbc1_icusb_dp | gpio_145 | | sdmmc2_clk | | safe_mode |
| CONTROL_CORE_PAD0_SDM_MC5_CLK_PAD1_SDM_MC5_CMD[31:16] | 0x148 | sdmmc5_cmd | mcspi2_simo | usbc1_icusb_dm | gpio_146 | | sdmmc2_cmd | | safe_mode |
| CONTROL_CORE_PAD0_SDM_MC5_DAT0_PAD1_SDM_MC5_DAT1[15:0] | 0x14C | sdmmc5_dat0 | mcspi2_somi | usbc1_icusb_rcv | gpio_147 | | sdmmc2_dat0 | | safe_mode |
| CONTROL_CORE_PAD0_SDM_MC5_DAT0_PAD1_SDM_MC5_DAT1[31:16] | 0x14C | sdmmc5_dat1 | | usbc1_icusb_txen | gpio_148 | | sdmmc2_dat1 | | safe_mode |
| CONTROL_CORE_PAD0_SDM_MC5_DAT2_PAD1_SDM_MC5_DAT3[15:0] | 0x150 | sdmmc5_dat2 | mcspi2_cs1 | | gpio_149 | | sdmmc2_dat2 | | safe_mode |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[R egister Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|---------------------------|------------------------|-----------------------|-----------------|---------------|------------------|-------------------|--------------------|---------------|
| CONTROL_CORE_PAD0_SDM MC5_DAT2_PAD1_SDMMC5_D AT3[31:16] | 0x150 | sdmmc5_ dat3 | mcspi2_ cs0 | | gpio_150 | | sdmmc2_ dat3 | | safe_mode |
| CONTROL_CORE_PAD0_MCSP I4_CLK_PAD1_MCSP4_SIMO[1 5:0] | 0x154 | mcspi4_clk | sdmmc4_ clk | kpd_col6 | gpio_151 | | | | safe_mode |
| CONTROL_CORE_PAD0_MCSP I4_CLK_PAD1_MCSP4_SIMO[3 1:16] | 0x154 | mcspi4_ simo | sdmmc4_ cmd | kpd_col7 | gpio_152 | | | | safe_mode |
| CONTROL_CORE_PAD0_MCSP I4_SOMI_PAD1_MCSP4_CS0[1 5:0] | 0x158 | mcspi4_ somi | sdmmc4_ dat0 | kpd_row6 | gpio_153 | | | | safe_mode |
| CONTROL_CORE_PAD0_MCSP I4_SOMI_PAD1_MCSP4_CS0[3 1:16] | 0x158 | mcspi4_ cs0 | sdmmc4_ dat3 | kpd_row7 | gpio_154 | | | | safe_mode |
| CONTROL_CORE_PAD0_UART 4_RX_PAD1_UART4_TX[15:0] | 0x15C | uart4_rx | sdmmc4_ dat2 | kpd_row8 | gpio_155 | | | | safe_mode |
| CONTROL_CORE_PAD0_UART 4_RX_PAD1_UART4_TX[31:16] | 0x15C | uart4_tx | sdmmc4_ dat1 | kpd_col8 | gpio_156 | | | | safe_mode |
| CONTROL_CORE_PAD0_USBB 2_ULPITLL_CLK_PAD1_USBB2 _ULPITLL_STP[15:0] | 0x160 | usbb2_ ulpitll_clk | usbb2_ ulpihy_clk | sdmmc4_ cmd | gpio_157 | hsi2_ cawake | | | safe_mode |
| CONTROL_CORE_PAD0_USBB 2_ULPITLL_CLK_PAD1_USBB2 _ULPITLL_STP[31:16] | 0x160 | usbb2_ ulpitll_stp | usbb2_ ulpihy_stp | sdmmc4_ clk | gpio_158 | hsi2_ cadata | dispc2_ data23 | | safe_mode |
| CONTROL_CORE_PAD0_USBB 2_ULPITLL_DIR_PAD1_USBB2_ ULPITLL_NXT[15:0] | 0x164 | usbb2_ ulpitll_dir | usbb2_ ulpihy_dir | sdmmc4_ dat0 | gpio_159 | hsi2_ caflag | dispc2_ data22 | | safe_mode |
| CONTROL_CORE_PAD0_USBB 2_ULPITLL_DIR_PAD1_USBB2_ ULPITLL_NXT[31:16] | 0x164 | usbb2_ ulpitll_nxt | usbb2_ ulpihy_nxt | sdmmc4_ dat1 | gpio_160 | hsi2_ acready | dispc2_ data21 | | safe_mode |
| CONTROL_CORE_PAD0_USBB 2_ULPITLL_DAT0_PAD1_USBB 2_ULPITLL_DAT1[15:0] | 0x168 | usbb2_ ulpitll_dat0 | usbb2_ ulpihy_dat0 | sdmmc4_ dat2 | gpio_161 | hsi2_ acwake | dispc2_ data20 | usbb2_ mm_txen | safe_mode |
| CONTROL_CORE_PAD0_USBB 2_ULPITLL_DAT0_PAD1_USBB 2_ULPITLL_DAT1[31:16] | 0x168 | usbb2_ ulpitll_dat1 | usbb2_ ulpihy_dat1 | sdmmc4_ dat3 | gpio_162 | hsi2_ acdata | dispc2_ data19 | usbb2_ mm_txdat | safe_mode |
| CONTROL_CORE_PAD0_USBB 2_ULPITLL_DAT2_PAD1_USBB 2_ULPITLL_DAT3[15:0] | 0x16C | usbb2_ ulpitll_dat2 | usbb2_ ulpihy_dat2 | sdmmc3_ dat2 | gpio_163 | hsi2_ acflag | dispc2_ data18 | usbb2_ mm_txse0 | safe_mode |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|-----------------------|--------------------|--------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT2_PAD1_USBB2_ULPITLL_DAT3[31:16] | 0x16C | usbb2_ulpitll_dat3 | usbb2_ulpiPHY_dat3 | sdmmc3_dat1 | gpio_164 | hsi2_caready | dispc2_data15 | rfbi_data15 | safe_mode |
| CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT4_PAD1_USBB2_ULPITLL_DAT5[15:0] | 0x170 | usbb2_ulpitll_dat4 | usbb2_ulpiPHY_dat4 | sdmmc3_dat0 | gpio_165 | mcspi3_somi | dispc2_data14 | rfbi_data14 | safe_mode |
| CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT4_PAD1_USBB2_ULPITLL_DAT5[31:16] | 0x170 | usbb2_ulpitll_dat5 | usbb2_ulpiPHY_dat5 | sdmmc3_dat3 | gpio_166 | mcspi3_cs0 | dispc2_data13 | rfbi_data13 | safe_mode |
| CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT6_PAD1_USBB2_ULPITLL_DAT7[15:0] | 0x174 | usbb2_ulpitll_dat6 | usbb2_ulpiPHY_dat6 | sdmmc3_cmd | gpio_167 | mcspi3_simo | dispc2_data12 | rfbi_data12 | safe_mode |
| CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT6_PAD1_USBB2_ULPITLL_DAT7[31:16] | 0x174 | usbb2_ulpitll_dat7 | usbb2_ulpiPHY_dat7 | sdmmc3_clk | gpio_168 | mcspi3_clk | dispc2_data11 | rfbi_data11 | safe_mode |
| CONTROL_CORE_PAD0_USBB2_HSIC_DATA_PAD1_USBB2_HSIC_STROBE[15:0] | 0x178 | usbb2_hsic_data | | | gpio_169 | | | | safe_mode |
| CONTROL_CORE_PAD0_USBB2_HSIC_DATA_PAD1_USBB2_HSIC_STROBE[31:16] | 0x178 | usbb2_hsic_strobe | | | gpio_170 | | | | safe_mode |
| CONTROL_CORE_PAD0_KPD_COL3_PAD1_KPD_COL4[15:0] | 0x17C | kpd_col3 | kpd_col0 | cam2_d0 | gpio_171 | | | | safe_mode |
| CONTROL_CORE_PAD0_KPD_COL3_PAD1_KPD_COL4[31:16] | 0x17C | kpd_col4 | kpd_col1 | cam2_d1 | gpio_172 | | | | safe_mode |
| CONTROL_CORE_PAD0_KPD_COL5_PAD1_KPD_COL0[15:0] | 0x180 | kpd_col5 | kpd_col2 | cam2_d2 | gpio_173 | | | | safe_mode |
| CONTROL_CORE_PAD0_KPD_COL5_PAD1_KPD_COL0[31:16] | 0x180 | kpd_col0 | kpd_col3 | cam2_d3 | gpio_174 | | | | safe_mode |
| CONTROL_CORE_PAD0_KPD_COL1_PAD1_KPD_COL2[15:0] | 0x184 | kpd_col1 | kpd_col4 | cam2_d8 | gpio_0 | | | | safe_mode |
| CONTROL_CORE_PAD0_KPD_COL1_PAD1_KPD_COL2[31:16] | 0x184 | kpd_col2 | kpd_col5 | cam2_d10 | gpio_1 | | | | safe_mode |
| CONTROL_CORE_PAD0_KPD_ROW3_PAD1_KPD_ROW4[15:0] | 0x188 | kpd_row3 | kpd_row0 | cam2_d4 | gpio_175 | | | | safe_mode |
| CONTROL_CORE_PAD0_KPD_ROW3_PAD1_KPD_ROW4[31:16] | 0x188 | kpd_row4 | kpd_row1 | cam2_d5 | gpio_176 | | | | safe_mode |
| CONTROL_CORE_PAD0_KPD_ROW5_PAD1_KPD_ROW0[15:0] | 0x18C | kpd_row5 | kpd_row2 | cam2_d6 | gpio_177 | | | | safe_mode |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|--|-----------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| CONTROL_CORE_PAD0_KPD_ROW5_PAD1_KPD_ROW0[31:16] | 0x18C | kpd_row0 | kpd_row3 | cam2_d7 | gpio_178 | | | | safe_mode |
| CONTROL_CORE_PAD0_KPD_ROW1_PAD1_KPD_ROW2[15:0] | 0x190 | kpd_row1 | kpd_row4 | cam2_d9 | gpio_2 | | | | safe_mode |
| CONTROL_CORE_PAD0_KPD_ROW1_PAD1_KPD_ROW2[31:16] | 0x190 | kpd_row2 | kpd_row5 | cam2_d11 | gpio_3 | | | | safe_mode |
| CONTROL_CORE_PAD0_USBA0_OTG_CE_PAD1_USBA0_OTG_DP[15:0] | 0x194 | usba0_otg_ce | | | | | | | |
| CONTROL_CORE_PAD0_USBA0_OTG_CE_PAD1_USBA0_OTG_DP[31:16] | 0x194 | usba0_otg_dp | uart3_rx_irrx | uart2_rx | | | | | safe_mode |
| CONTROL_CORE_PAD0_USBA0_OTG_DM_PAD1_FREF_CLK1_OUT[15:0] | 0x198 | usba0_otg_dm | uart3_tx_irtx | uart2_tx | | | | | safe_mode |
| CONTROL_CORE_PAD0_USBA0_OTG_DM_PAD1_FREF_CLK1_OUT[31:16] | 0x198 | fref_clk1_out | | | gpio_181 | | | | safe_mode |
| CONTROL_CORE_PAD0_FREF_CLK2_OUT_PAD1_SYS_NIRQ1[15:0] | 0x19C | fref_clk2_out | | | gpio_182 | | | | safe_mode |
| CONTROL_CORE_PAD0_FREF_CLK2_OUT_PAD1_SYS_NIRQ1[31:16] | 0x19C | sys_nirq1 | | | | | | | safe_mode |
| CONTROL_CORE_PAD0_SYS_NIRQ2_PAD1_SYS_BOOT0[15:0] | 0x1A0 | sys_nirq2 | | | gpio_183 | | | | safe_mode |
| CONTROL_CORE_PAD0_SYS_NIRQ2_PAD1_SYS_BOOT0[31:16] | 0x1A0 | sys_boot0 | | | gpio_184 | | | | safe_mode |
| CONTROL_CORE_PAD0_SYS_BOOT1_PAD1_SYS_BOOT2[15:0] | 0x1A4 | sys_boot1 | | | gpio_185 | | | | safe_mode |
| CONTROL_CORE_PAD0_SYS_BOOT1_PAD1_SYS_BOOT2[31:16] | 0x1A4 | sys_boot2 | | | gpio_186 | | | | safe_mode |
| CONTROL_CORE_PAD0_SYS_BOOT3_PAD1_SYS_BOOT4[15:0] | 0x1A8 | sys_boot3 | | | gpio_187 | | | | safe_mode |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|-----------------------|---------------|--------------------|----------------|---------------|----------------|---------------|---------------|---------------|
| CONTROL_CORE_PAD0_SYS_BOOT3_PAD1_SYS_BOOT4[31:16] | 0x1A8 | sys_boot4 | | | gpio_188 | | | | safe_mode |
| CONTROL_CORE_PAD0_SYS_BOOT5_PAD1_DPM_EMU0[15:0] | 0x1AC | sys_boot5 | | | gpio_189 | | | | safe_mode |
| CONTROL_CORE_PAD0_SYS_BOOT5_PAD1_DPM_EMU0[31:16] | 0x1AC | dpm_emu0 | | | gpio_11 | | | hw_dbg0 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU1_PAD1_DPM_EMU2[15:0] | 0x1B0 | dpm_emu1 | | | gpio_12 | | | hw_dbg1 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU1_PAD1_DPM_EMU2[31:16] | 0x1B0 | dpm_emu2 | usba0_ulpiphy_clk | | gpio_13 | | dispc2_fid | hw_dbg2 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU3_PAD1_DPM_EMU4[15:0] | 0x1B4 | dpm_emu3 | usba0_ulpiphy_stp | | gpio_14 | rfbi_data10 | dispc2_data10 | hw_dbg3 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU3_PAD1_DPM_EMU4[31:16] | 0x1B4 | dpm_emu4 | usba0_ulpiphy_dir | | gpio_15 | rfbi_data9 | dispc2_data9 | hw_dbg4 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU5_PAD1_DPM_EMU6[15:0] | 0x1B8 | dpm_emu5 | usba0_ulpiphy_nxt | | gpio_16 | rfbi_te_vsync0 | dispc2_data16 | hw_dbg5 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU5_PAD1_DPM_EMU6[31:16] | 0x1B8 | dpm_emu6 | usba0_ulpiphy_dat0 | uart3_tx_irtx | gpio_17 | rfbi_hsync0 | dispc2_data17 | hw_dbg6 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU7_PAD1_DPM_EMU8[15:0] | 0x1BC | dpm_emu7 | usba0_ulpiphy_dat1 | uart3_rx_irrx | gpio_18 | rfbi_cs0 | dispc2_hsync | hw_dbg7 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU7_PAD1_DPM_EMU8[31:16] | 0x1BC | dpm_emu8 | usba0_ulpiphy_dat2 | uart3_rts_sd | gpio_19 | rfbi_re | dispc2_pclk | hw_dbg8 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU9_PAD1_DPM_EMU10[15:0] | 0x1C0 | dpm_emu9 | usba0_ulpiphy_dat3 | uart3_cts_rctx | gpio_20 | rfbi_we | dispc2_vsync | hw_dbg9 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU9_PAD1_DPM_EMU10[31:16] | 0x1C0 | dpm_emu10 | usba0_ulpiphy_dat4 | | gpio_21 | rfbi_a0 | dispc2_de | hw_dbg10 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU11_PAD1_DPM_EMU12[15:0] | 0x1C4 | dpm_emu11 | usba0_ulpiphy_dat5 | | gpio_22 | rfbi_data8 | dispc2_data8 | hw_dbg11 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU11_PAD1_DPM_EMU12[31:16] | 0x1C4 | dpm_emu12 | usba0_ulpiphy_dat6 | | gpio_23 | rfbi_data7 | dispc2_data7 | hw_dbg12 | safe_mode |

Table 19-10. Device Core Control Module Pad Configuration Register Fields (continued)

| SYSCTRL_PADCONF_CORE.[Register Name] | Address Offset | Mode 0 | Mode 1 | Mode 2 | Mode 3 | Mode 4 | Mode 5 | Mode 6 | Mode 7 |
|---|-----------------------|---------------|--------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| CONTROL_CORE_PAD0_DPM_EMU13_PAD1_DPM_EMU14[15:0] | 0x1C8 | dpm_emu13 | usba0_ulpiphy_dat7 | | gpio_24 | rfbi_data6 | dispc2_data6 | hw_dbg13 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU13_PAD1_DPM_EMU14[31:16] | 0x1C8 | dpm_emu14 | Reserved | uart1_rx | gpio_25 | rfbi_data5 | dispc2_data5 | hw_dbg14 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU15_PAD1_DPM_EMU16[15:0] | 0x1CC | dpm_emu15 | Reserved | | gpio_26 | rfbi_data4 | dispc2_data4 | hw_dbg15 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU15_PAD1_DPM_EMU16[31:16] | 0x1CC | dpm_emu16 | dmtimer8_pwm_evt | dsi1_te0 | gpio_27 | rfbi_data3 | dispc2_data3 | hw_dbg16 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU17_PAD1_DPM_EMU18[15:0] | 0x1D0 | dpm_emu17 | dmtimer9_pwm_evt | dsi1_te1 | gpio_28 | rfbi_data2 | dispc2_data2 | hw_dbg17 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU17_PAD1_DPM_EMU18[31:16] | 0x1D0 | dpm_emu18 | dmtimer10_pwm_evt | dsi2_te0 | gpio_190 | rfbi_data1 | dispc2_data1 | hw_dbg18 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU19_PAD1_CSI22_DX2[15:0] | 0x1D4 | dpm_emu19 | dmtimer11_pwm_evt | dsi2_te1 | gpio_191 | rfbi_data0 | dispc2_data0 | hw_dbg19 | safe_mode |
| CONTROL_CORE_PAD0_DPM_EMU19_PAD1_CSI22_DX2[31:16] | 0x1D4 | csi22_dx2 | | cam2_fid | | | | | safe_mode |
| CONTROL_CORE_PAD0_CSI22_DY2[15:0] | 0x1F4 | csi22_dy2 | | cam2_wen | | | | | safe_mode |

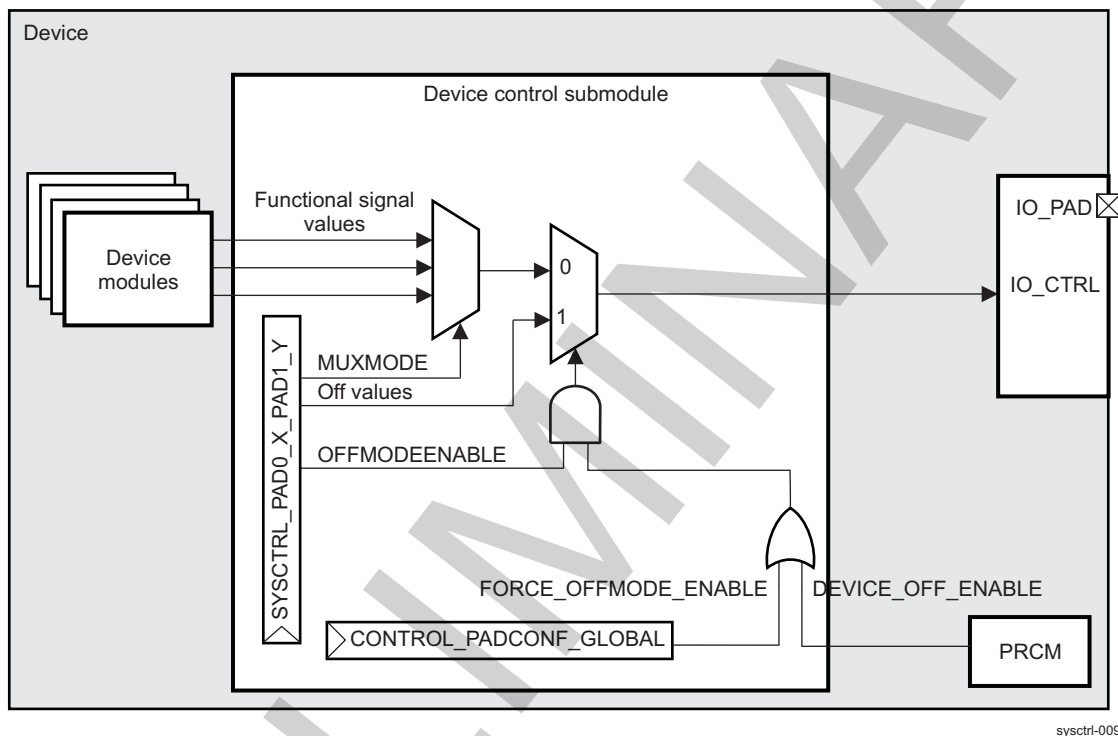
19.4.8.4 Off Mode Pad Control Overview

When off mode is selected, which is true when `PRM_DEVICE_OFF_CTRL[0] DEVICE_OFF_ENABLE` from the PRCM module = 0b1 or `CONTROL_PADCONF_GLOBAL[31] FORCE_OFFMODE_ENABLE = 0b1` (force bit to test the value of off mode), the off mode values field `CONTROL_CORE_PAD0_X_PAD1_Y[27,11] OFFMODEOUTVALUE` overrides the pad state when the `CONTROL_CORE_PAD0_X_PAD1_Y[25,9] OFFMODEENABLE` bit is set.

The `CONTROL_CORE_PAD0_X_PAD1_Y[26,10] OFFMODEOUTENABLE` bit is active low.

Figure 19-9 shows the off mode pad control.

Figure 19-9. Off Mode Pad Control Overview



If off mode is active and the `OFFMODEENABLE` bit field is set to 0 (disable the off mode override feature), the pad keeps the AND value of the configuration (input/output, pullup/down) it had before going into off mode:

- For an input, the pad is isolated and the pull remains active.
- For an output, the value is latched before going into off mode, to drive the same value in off mode.

NOTE: Software controls for internal off-mode pullups and pulldowns on the `usbb1_hsic_x` and `usbb2_hsic_x` pads are available in the `CONTROL_USBB_HSIC` register.

No internal off-mode pullups and pulldowns are available for the `lpddr21_x` and `lpddr22_x` pads of the device.

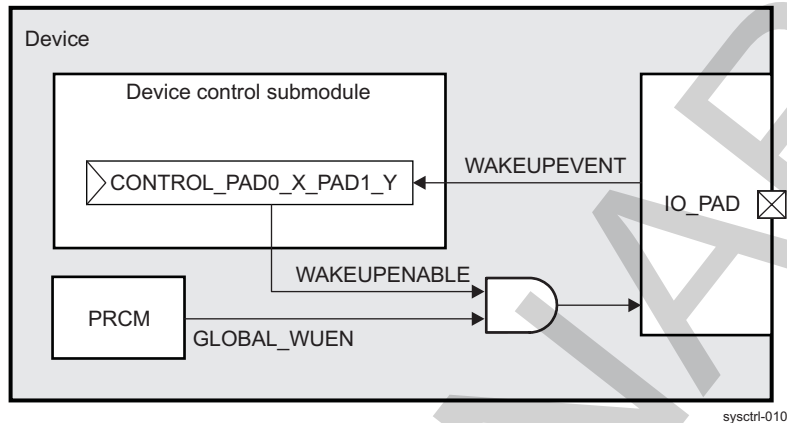
For more information, see [Section 19.4.12.8.2, High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings](#).

19.4.8.4.1 Wake-Up Event Detection

In off mode, wake-up event detection can also be enabled on an input pad. The pad wake-up event is latched in the `CONTROL_CORE_PAD0_X_PAD1_Y[31,15]` and `CONTROL_WKUP_PAD0_X_PAD1_Y[31,15] WAKEUPEVENT` bits.

The off mode I/O pads wake-up scheme is enabled by setting the PRM_IO_PMCTRL[16] GLOBAL_WUEN bit from the PRCM module. The wake-up scheme status is transmitted by the WKUP_ENABLE signal. The wake-up event detection capability of each I/O pad of the device is individually enabled or disabled by writing the CONTROL_CORE_PAD0_X_PAD1_Y[30,14] and CONTROL_WKUP_PAD0_X_PAD1_Y[30,14] WAKEUPENABLE bits.

Figure 19-10. Wake-Up Event Detection Overview



NOTE: When wake-up detection is enabled for a pad, the pad must be configured as input to avoid contention between the device output buffer and an external driver. If this pin is already configured as an input in active mode, hardware automatically retains the same input state; no software action is required.

If this pin is configured as an output in active mode, the off override function must be enabled to set the pin as an input during off mode: in the CONTROL_(CORE/WKUP)_PAD0_X_PAD1_Y register, set the OFFMODEENABLE bit to 0x1 to enable the off override function and set the OFFMODEOUTENABLE bit to 0x1 to switch this pin to input mode.

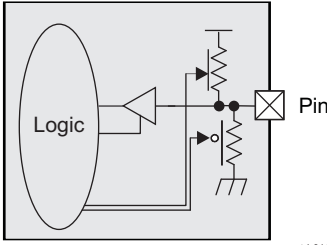
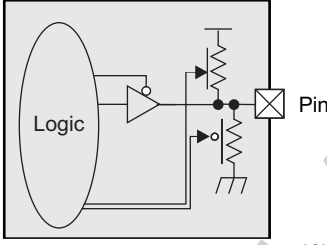
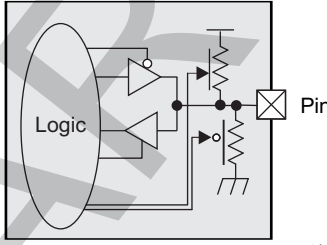
NOTE: Regardless of whether the INPUTENABLE bit is set high or low during active mode, to enable wake-up detection for a pad, user software must set the WAKEUPENABLE bit to 0x1. It is recommended to apply pullup/down resistors at the pad to avoid spurious wake-up detection. User software can optionally enable the pad off-mode internal pullup/down resistors through the appropriate setting of the OFFMODEPULLUDENABLE and OFFMODEPULLTYPESELECT bits in the corresponding pad configuration register.

The CONTROL_PADCONF_WAKEUPEVENT_0 through CONTROL_PADCONF_WAKEUPEVENT_6 registers are dedicated 32-bit registers for a separate capture of the WAKEUPEVENT from different pads. Duplication of the CONTROL_CORE_PAD0_X_PAD1_Y[31,15] and CONTROL_WKUP_PAD0_X_PAD1_Y[31,15] wake-up event bits inside these seven additional registers helps reduce the software latency in identifying which pad has triggered a wake-up event.

19.4.8.4.2 I/O Power Optimization

To optimize I/O power, it is important to avoid unconnected or incorrectly pulled pins. According to the type of pins, the way to reduce power consumption can differ. [Table 19-11](#) shows the three available pin (or ball) types.

Table 19-11. Pin Types

| Input | Output | Bidirectional |
|--|---|--|
|  sysctrl-011 |  sysctrl-012 |  sysctrl-013 |

The configuration differs according to the I/O cell types. The following advice can be useful to avoid extra current leakage:

- For input pins, use a pullup/down when possible.
- For output pins, check existing pulls to avoid conflicts.
- For bidirectional pins, reconfigure the pin as an output driving 0 when possible.

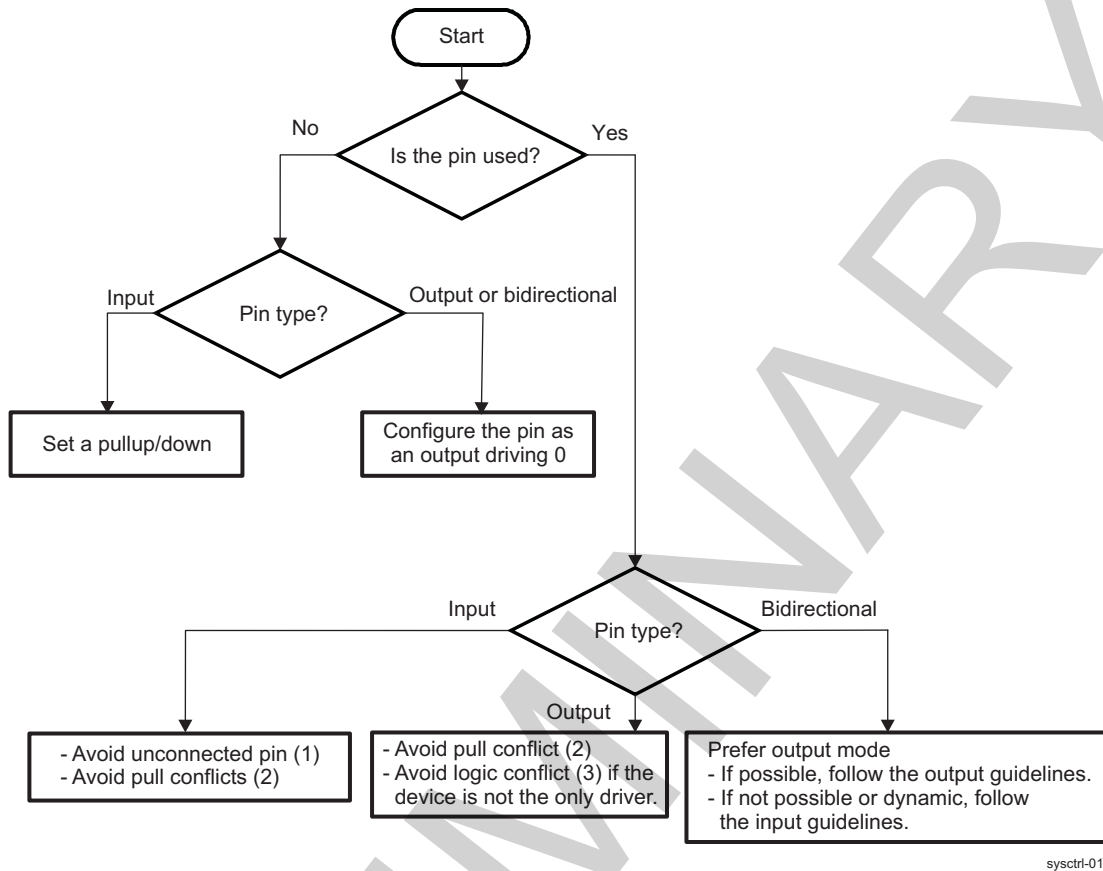
NOTE: If the pad is always configured in output mode, it is recommended for software to disable the internal pull by programming the I/O pad configuration register of the corresponding control module.

NOTE: If a device pad is left unconnected, but power is supplied to the I/O, or the pad is used only as an output during the lifetime of the application, it is recommended to keep its corresponding pad configuration bit `CONTROL_CORE /WKUP_PAD0_X_PAD1_Y.INPUTENABLE` set to 0b0. This keeps the input buffer disabled and reduces static current consumption.

Some I/O configurations involve modifications during the software setup of I/Os and sometimes require several hardware updates.

[Figure 19-11](#) shows how to optimize the power consumption of pads.

Figure 19-11. I/O Power Optimization Flow Chart



The following notes explain more about the pin configuration.

- To avoid unconnected pins, the configuration depends on its use:
 - If the pin is not driven externally, a pullup/down is required.
 - Otherwise, a pullup/down is not necessary.
- Pull conflicts occur when different pulls are on the same line. To configure the pin correctly, avoid having external and internal pulls together.
- Logic conflicts consist in different electrical levels at the same time on the same line. This can occur when several devices are connected to the same line. The two possible cases are:
 - If no external device drives the line, configure the pin to drive 0.
 - If another device drives the line, the same value must be driven or the pin must be disconnected (high-impedance state [Hi-Z]).

NOTE: It is advised to use Hi-Z logical state on the device or on the external component when the line is driven by both components.

For unconnected device pads, safe_mode pad configuration is recommended if available. [Table 19-12](#) summarizes recommendations for the configuration of unconnected pads (in terms of mux mode, input, and output buffer states) for all cases, including those where safe_mode configuration is not available

Table 19-12. Recommended Configuration For Unconnected Device Pads

| Pad MuxMode Set Features | | | Power-on reset default configuration | | Recommended Unconnected Device Pad Configuration | | | | |
|--------------------------|--------------------------|--|--------------------------------------|--------------------------|--|-----------|------------------------|-------------------------|------------------------------|
| Safe Mode Available? | GPIO Function Available? | More Than One (Non-GPIO) Function Available? | Multiplexed Signal Direction at Pad | Pad State ⁽¹⁾ | Multiplexed Signal Direction at Pad | Pad State | Input Buffer Disabled? | Output Buffer Disabled? | MUX Function Selected |
| Yes | N/A | N/A | Input | PU | Safe Mode | PU | Yes ⁽²⁾ | N/A | SAFE MODE ⁽³⁾ |
| Yes | N/A | N/A | Input | PD | Safe Mode | PD | Yes | N/A | SAFE MODE |
| Yes | N/A | N/A | Output | 1 | Safe Mode | PD | Yes | N/A | SAFE MODE |
| Yes | N/A | N/A | Output | 0 | Safe Mode | PD | Yes | N/A | SAFE MODE |
| Yes | N/A | N/A | - | Hi-Z | Safe Mode | PD | Yes | N/A | SAFE MODE |
| No | Yes | N/A | Input | PU | Input | PU | Yes | Yes ⁽⁴⁾ | GPIO_XX ⁽⁵⁾ |
| No | Yes | N/A | Input | PD | Input | PD | Yes | Yes | GPIO_XX |
| No | Yes | N/A | Output | 1 | Input | PD | Yes | Yes | GPIO_XX |
| No | Yes | N/A | Output | 0 | Input | PD | Yes | Yes | GPIO_XX |
| No | Yes | N/A | - | Hi-Z | Input | PD | Yes | Yes | GPIO_XX |
| No | No | Yes | Input | PU | Input | PU | Yes | N/A ⁽⁴⁾ | N/A (default) |
| No | No | Yes | Input | PD | Input | PD | Yes | N/A | N/A (default) |
| No | No | Yes | Output | 1 | Output | 1 | Yes | N/A | N/A (default) ⁽⁶⁾ |
| No | No | Yes | Output | 0 | Output | 0 | Yes | N/A | N/A (default) ⁽⁶⁾ |
| No | No | Yes | - | Hi-Z | Input | PD | Yes | N/A | N/A (default) |
| No | No | No | Input | PU | Input | PU | Yes | N/A ⁽⁴⁾ | N/A (default) |
| No | No | No | Input | PD | Input | PD | Yes | N/A | N/A (default) |
| No | No | No | Output | 1 | Output | 1 | Yes | N/A | N/A (default) |
| No | No | No | Output | 0 | Output | 0 | Yes | N/A | N/A (default) |
| No | No | No | - | Hi-Z | Input | PD | Yes | N/A | N/A (default) |

⁽¹⁾ PU = Pullup; PD = Pulldown; Hi-Z = High impedance

⁽²⁾ If a certain device pad is left unconnected, its associated padconfiguration register INPUTENABLE bit must be explicitly disabled in software (set to 0b0), regardless of pad MUXMODE bit field value.

⁽³⁾ If a certain pad has a defined safe_mode and is left unconnected in an application, it is recommended to keep its padconfiguration MuxMode value at 0x7 (that is, safe_mode).

⁽⁴⁾ There is no software control over the pad associated output buffer in the Control Module. In case of a GPIO function selection, the output buffer is hardware enabled once the user enables corresponding pin output direction in the GPIOx.GPIO_OE control register.

⁽⁵⁾ If a certain pad does not have a safe_mode but has an associated GPIO function, it is recommended to set its padconfiguration register MuxMode to select the GPIO mode.

⁽⁶⁾ If one of the other mux modes available is bidirectional or input-only, then the nondefault mux mode could be used and configured with input disabled.

19.4.9 Extended-Drain I/O and PBIAS Cell

The device primarily supports 1.8-V I/O voltage on its interfaces, with the exception of the MMC/SD/SDIO1 interface, which supports 1.8-V and 3.0-V voltages. The need for embedded extended-drain I/Os on the MMC/SD/SDIO1 interface imposes the use of embedded PBIAS cell - MMC1_PBIAS to provide a 1.8-V or 3.0-V reference.

NOTE: With the appropriate MMC1_PBIAS cell configuration, the different I/Os muxed on the sdmmc1 pads can operate at 1.8-V or 3.0-V power supply.

The MMC1_PBIAS cell and its associated MMC1 extended-drain I/O is software-controlled by bits in the [CONTROL_PBIASLITE](#) and [CONTROL_MMC1](#) registers of the device core control module.

Figure 19-12 shows the functional block diagram with the connections between the MMC1_PBIAS cell and the MMC1 extended-drain I/O cell.

Figure 19-12. Functional Block Diagram

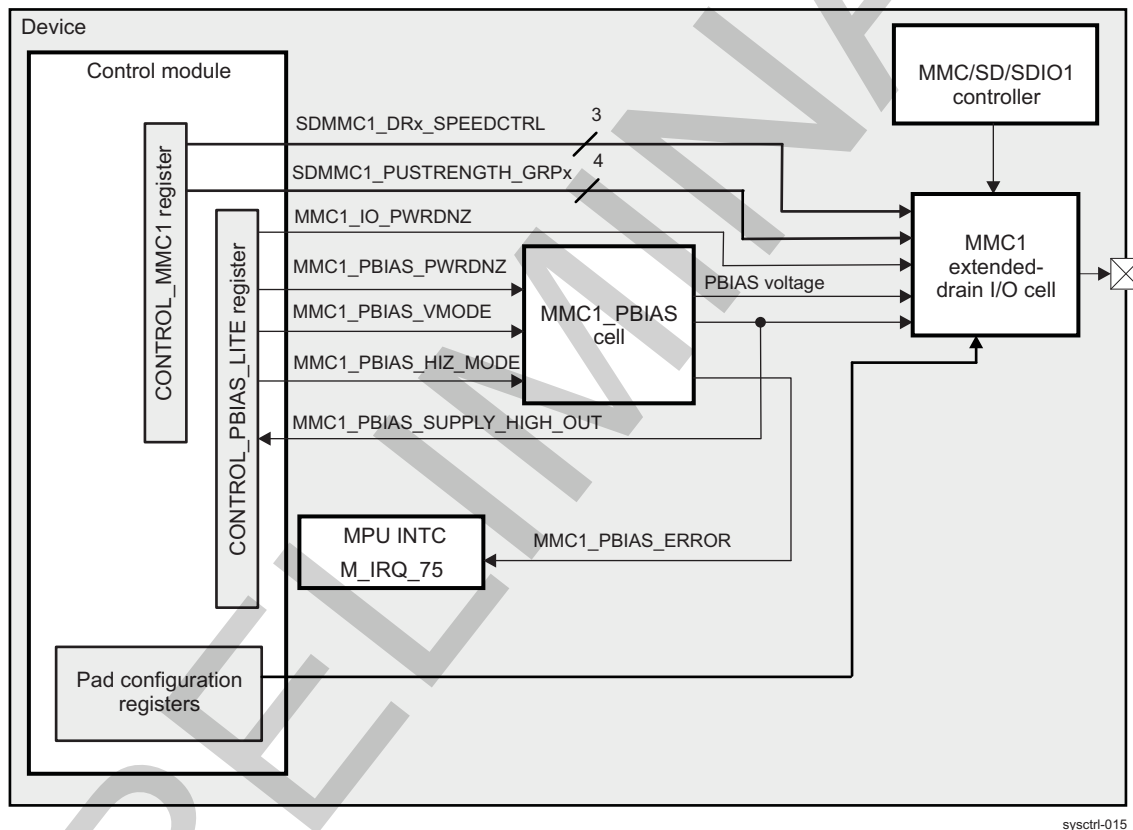


Table 19-13. PBIAS Cell and Extended-Drain I/O Pin CONTROL_PBIAS_LITE Bit Control

| Control Signals for Different PBIAS and Extended-Drain I/O Cells | Description |
|--|---|
| MMC1_PBIAS_PWRDNZ | Protects the MMC1_PBIAS cell when the SDMMC1_VDDS supply voltage is not stable. Software must keep this signal to 0b0 whenever this voltage ramps up/down or changes. When this bit is set to 0, the PBIAS output voltage is equal to SDMMC1_VDDS voltage and the PBIAS supply detector is disabled. |
| MMC1_PBIAS_VMODE | Sets the SDMMC1_VDDS voltage level (MMC1_PBIAS side) according to which MMC1_PBIAS cell generates appropriate biasing levels for the MMC1 extended-drain I/O. The default state of this bit is HIGH, indicating that the voltage level SDMMC1_VDDS is 3.0 V. |

Table 19-13. PBIAS Cell and Extended-Drain I/O Pin CONTROL_PBIAS_LITE Bit Control (continued)

| Control Signals for Different PBIAS and Extended-Drain I/O Cells | Description |
|--|---|
| MMC1_PBIAS_HIZ_MODE | When MMC1_PBIAS_HIZ_MODE is set to 1, the PBIAS output is in high impedance. MMC1_PBIAS_ERROR is automatically set to 1 when MMC1_PBIAS_HIZ_MODE = 1. When MMC1_PBIAS_HIZ_MODE = 0, MMC1_PBIAS cell is in normal operation mode. |
| MMC1_PBIAS_SUPPLY_HIGH_OUT | Output from the internal MMC1_PBIAS voltage supply detector, which indicates whether the SDMMC1_VDDS supply is 3.0 V or 1.8 V |
| MMC1_PBIAS_ERROR | Indicates whether the software-programmed MMC1_PBIAS_VMODE level matches the MMC1_PBIAS_SUPPLY_HI_OUT output signal during normal operation |
| MMC1_IO_PWRDNZ | Protects the MMC1 I/O extended-drain cell when the SDMMC1_VDDS voltage is not stable. Software must keep this signal to 0b0 whenever the SDMMC1_VDDS supply voltage ramps up/down or changes. When this bit is at 0, the pad is floating. |
| SDMMC1_DRx_SPEEDCTRL, x = (0...2) | Speed control signals for three different SDMMC1 pad groups identified within the MMC1 I/O cell |
| SDMMC1_PUSTRENGTH_GRPx, x = (0...3) | Pullup strength controls for four different SDMMC1 pad groups identified within the MMC1 I/O cell |

NOTE: When HIZ_MODE = 1, the PBIAS output (the pbias_mmc1 pin) must be tied to a defined external potential to avoid stress on transistors.

Table 19-14 lists the power supplies for PBIAS and the extended-drain I/O cell.

Table 19-14. Power Supplies

| Name | Description |
|-------------|--|
| VDD2 | Core voltage supply |
| SDMMC1_VDDS | MMC1 I/O cell supply voltage nominal 1.8 V/3.0 V |
| VDDS | 1.8-V supply for the input buffer |

19.4.9.1 PBIAS Cell

The MMC1_PBIAS cell provides a bias for the MMC/SD/SDIO1 extended-drain I/O cell used with high voltage for the MMC/SD/SDIO1 interface. This PBIAS cell provides a voltage reference (PBIAS voltage) for biasing extended-drain in the MMC/SD/SDIO1 cell. In addition to generating the bias voltage, the cell can detect the supply voltage (SDMMC1_VDDS) value (1.8 V or 3.0 V) and update, with its status, the [CONTROL_PBIASLITE](#)[24] MMC1_PBIASLITE_SUPPLY_HI_OUT bit. However, this is possible when the voltage reaches its steady state (the internal PBIAS voltage detector is enabled only when the MMC1_PBIAS_PWRDNZ signal is set to 0b1).

CAUTION

A PBIAS cell lets the peripheral associated with its corresponding extended-drain I/O cells support 1.8-V and 3.0-V voltages. A PBIAS cell is not part of a peripheral, but part of the device I/Os to which this peripheral is internally connected. These device I/Os are not exclusive to one peripheral; through I/O multiplexing they can be connected to other internal signals. It is necessary to configure the PBIAS cell to enable the I/Os, regardless of how I/O multiplexing is configured for these device I/Os. In other words, independently of which signal is internally connected to a device I/O powered by SDMMC1_VDDS, the MMC1_PBIAS cell must be configured.

19.4.9.2 Extended-Drain I/O

The following MMC/SD/SDIO1 interface signals (selected when MuxMode = 0) use the device I/Os associated with the MMC1 extended-drain I/O cell:

- sdmmc1_clk
- sdmmc1_cmd
- sdmmc1_dati (where i = 0 to 7)

The MMC1 I/O cell is powered externally through the vdds_sdmmc1 pad.

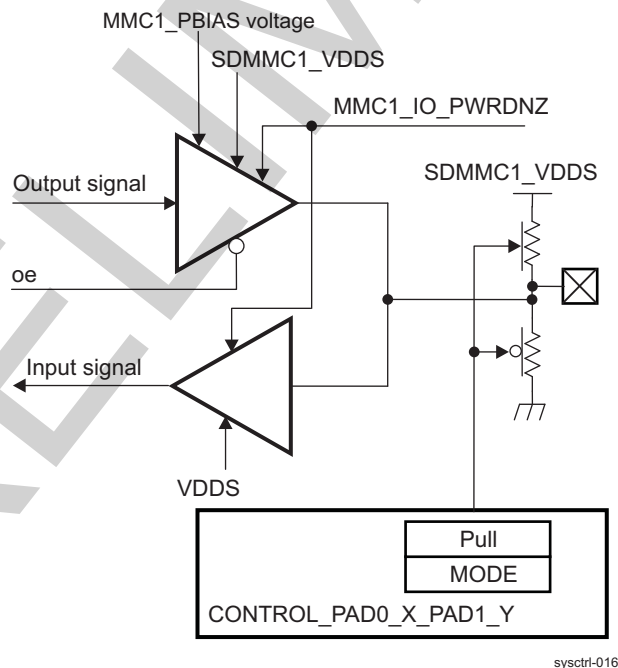
NOTE: The MMC1 I/O cell-associated device I/Os are also shared with other signals. gpio_100 - gpio_109, etc. are available when MuxMode is different than 0x0. If signals other than sdmmc1_x are selected, the MMC1 I/O cell must also be configured.

NOTE: For multiplexed gpio signals on the MMC1 I/O cell (gpio_100 through gpio_109), to function appropriately in standard 1.8-V mode, the [CONTROL_PBIASLITE\[21\]](#) MMC1_PBIASLITE_VMODE through [CONTROL_PBIASLITE\[26\]](#) MMC1_PWRDNZ bits must be set to 0b0. When these bits are set, and the externally-applied I/O cell power supply voltage (1.8 V) is stabilized, gpio signals can be enabled on the pads by setting the [CONTROL_PBIASLITE\[22\]](#) MMC1_PBIASLITE_PWRDNZ bit to 0b1 (power-up MMC1_PBIAS cell) and the [CONTROL_PBIASLITE\[26\]](#) MMC1_PWRDNZ bit to 0b1 (power-up MMC1 extended-drain I/O cell).

For more information about signal multiplexing, see [Table 19-10](#).

[Figure 19-13](#) shows the extended-drain I/O cells.

Figure 19-13. Extended-Drain I/O



The extended-drain I/O cells have the following I/O signals:

- The output signal, input signal, and oe, which comes from the selected I/O module with the correctly configured MUXMODE field within the corresponding CONTROL_CORE_PAD0_X_PAD1_Y or CONTROL_WKUP_PAD0_X_PAD1_Y register

NOTE: The MMC1 extended-drain I/O has associated muxed I/Os with mode and pullup/down configurations programmable in the control module.

- The MMC1_PBIAS voltage is a voltage reference for biasing the extended-drain in the MMC1 I/O cell.
- PWRDNZ signals are used on PBIAS cell and MMC1 I/O cell to protect them when the SDMMC1_VDDS voltage is not stable.

CAUTION

Software must keep the PWRDNZ-related signals to 0b0 whenever the SDMMC1_VDDS signal ramps up/down or changes. When it is set to 0, the pad is floating (the pad may not reflect the state of the output signal, and the input signal may not reflect the state of the pad).

- [CONTROL_PBIASLITE](#)[24] MMC1_PBIASLITE_SUPPLY_HI_OUT is a status bit on the SDMMC1_VDDS value and is used to inform the MMC1 I/O cell about the value of the SDMMC1_VDDS signal.

For more information about the software configurations of the MMC1 associated extended drain I/O and PBIAS cell, see [Section 19.5.1.2.1, Extended-Drain I/O and PBIAS Cell Programming Guide](#).

NOTE: The device can be supplied by an external power IC. TI provides such a global solution to its customers with the TWL60xx power IC.

If the device is associated with the TWL60xx power IC, before using an extended-drain I/O interface, software must program the TWL60xx to enable VMMC1 (for the MMC/SD/SDIO1 or muxed I/O modules) and the LDO to provide 1.8-V/3.0-V voltage. This is done by software through the inter-integrated circuit (I²C™) interface that links the device and the TWL60xx IC.

CAUTION

The power supply voltage generated from the companion power IC and applied on the vdds_sdmmc1 device pad must be programmed according to the recommendations for the currently selected I/O module power supply range.

If the application does not want the I/O interface to run at 3.0 V, software users must then assert the VMODE signal to low for 1.8-V activity: in this case, the PBIAS is connected to ground.

[Table 19-15](#) lists the control signal with the corresponding control bits from the [CONTROL_PBIASLITE](#) and [CONTROL_MMC1](#) registers to configure the MMC1_PBIAS and the MMC1 extended-drain I/O cells. These signals can be controlled by software.

Table 19-15. PBIAS/Extended-Drain I/O Cells Control Signals

| Control Signals for Different PBIAS and Extended-Drain I/O Cells | Bits Used for PBIAS Cell and I/O Cell Configurations for Different I/O Modules | Reset Value |
|--|--|-------------|
| MMC1_PBIAS_PWRDNZ | CONTROL_PBIASLITE [22] MMC1_PBIASLITE_PWRDNZ | 0 |
| MMC1_PBIAS_VMODE | CONTROL_PBIASLITE [21] MMC1_PBIASLITE_VMODE | 1 |
| MMC1_PBIAS_HIZ_MODE | CONTROL_PBIASLITE [25] MMC1_PBIASLITE_HIZ_MODE | 0 |
| MMC1_PBIAS_SUPPLY_HIGH_OUT | CONTROL_PBIASLITE [24] MMC1_PBIASLITE_SUPPLY_HI_OUT | 0 |
| MMC1_PBIAS_ERROR | CONTROL_PBIASLITE [23] MMC1_PBIASLITE_VMODE_ERROR | 0 |
| MMC1_IO_PWRDNZ | CONTROL_PBIASLITE [26] MMC1_PWRDNZ | 0 |
| SDMMC1_DRx_SPEEDCTRL, x = (0...2) | CONTROL_MMC1 [27] SDMMC1_DR0_SPEEDCTRL | 0 |

Table 19-15. PBIAS/Extended-Drain I/O Cells Control Signals (continued)

| Control Signals for Different PBIAS and Extended-Drain I/O Cells | Bits Used for PBIAS Cell and I/O Cell Configurations for Different I/O Modules | Reset Value |
|--|--|-------------|
| SDMMC1_PUSTRENGTH_GRPx, x = (0...3) | CONTROL_MMC1 [26] SDMMC1_DR1_SPEEDCTRL | 0 |
| | CONTROL_MMC1 [25] SDMMC1_DR2_SPEEDCTRL | 0 |
| | CONTROL_MMC1 [31] SDMMC1_PUSTRENGTH_GRP0 | 1 |
| | CONTROL_MMC1 [30] SDMMC1_PUSTRENGTH_GRP1 | 0 |
| | CONTROL_MMC1 [29] SDMMC1_PUSTRENGTH_GRP2 | 1 |
| | CONTROL_MMC1 [28] SDMMC1_PUSTRENGTH_GRP3 | 1 |

The PBIAS cell supports two ranges of SDMMC1_VDDS voltage: 1.8 V, typical for low-voltage applications, and 3.0 V, typical for high-voltage applications. For each supply voltage range, the cell generates suitable bias voltage (PBIAS) for extended-drain PMOS devices.

CAUTION

The PBIAS cell must be programmed according to peripheral power supply voltage. See [Table 19-16](#).

Table 19-16. Voltage Configuration⁽¹⁾

| PBIASLITEVMODE Configuration | SDMMC1_VDDS Voltage | Type of Operation |
|------------------------------|---------------------|---------------------------------------|
| 1.8 V | 1.8 V | Normal 1.8-V operation |
| 1.8 V | 3.0 V | Damaging configuration ⁽²⁾ |
| 3.0 V | 1.8 V | Degraded functionality ⁽²⁾ |
| 3.0 V | 3.0 V | Normal 3.0-V operation |

⁽¹⁾ For damaging configuration, hardware system protection is provided to prevent deterioration of the associated extended-drain I/Os.

⁽²⁾ These modes must not be used.

The MMC1_PBIAS output voltage is the same as SDMMC1_VDDS voltage when the [CONTROL_PBIASLITE](#)[22] MMC1_PBIASLITE_PWRDNZ bit is low. Once the SDMMC1_VDDS supply is stable, software can release the PWRNDZ (setting it high). This starts the PBIAS cell work to generate the PBIAS voltage. During the completion process the corresponding I/Os cannot be used to transmit data. If VMODE is set correctly (compared with supply detector output and found to be the same), then PBIAS output voltage is generated based on the value of VMODE.

NOTE: In the case of a damaging configuration, hardware system protection prevents deterioration of the associated extended-drain I/Os.

CAUTION

The following requirements are critical for an extended-drain I/O cell:

- The VMODE bit must be defined before the PWRNDZ bit is made high (cell is brought out of power-down mode).
- The default state of VMODE bit is high (indicates 3.0-V operation).
- The PWRNDZ bit must be kept low whenever the SDMMC1_VDDS supply ramps up/down or changes. This can be damaging.
- Supply detector is disabled when PWRDNZ = 0, and in this case, supply detector output (SUPPLY_HI_OUT) is initialized to 0.

19.4.9.3 PBIAS Error Generation

If VMODE and supply detector outputs are unequal, it takes 4 μ s for the comparator to process the inputs and generate the VMODE_ERROR flag.

Table 19-17 summarizes the generation of the PBIAS error signal (MMC1_PBIAS_ERROR of the MMC1_PBIAS cell), which depends on the various [CONTROL_PBIASLITE](#) bit combinations. The shaded row in the table indicates a condition that could cause a reliability issue if not detected. To prevent this reliability issue, the PBIAS voltage is tied to SDMMC1_VDDS when the PBIAS error signal is high. This disables the I/Os.

CAUTION

Although asserting VMODE_ERROR to 1 ensures that PBIAS voltage is equal to SDMMC1_VDDS, this does not completely protect the I/O cell. It is recommended that all the I/Os are powered down, setting the PWRDNZ mode bit of the corresponding I/O cell to 0b0 by software as soon as VMODE_ERROR = 0b1.

Table 19-17. PBIAS Error Signal Truth Table

| VMODE | PWRDNZ | HIZ_MODE | SUPPLY_HI_OUT | VMODE_ERROR |
|-------|--------|----------|---------------|-------------|
| 0 | 0 | X | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 |
| X | 1 | 1 | X | 1 |
| 1 | 0 | X | 0 | 0 |
| 1 | 1 | 0 | 0 | 1 |
| 1 | 1 | 0 | 1 | 0 |

NOTE: VMODE_ERROR = 0b1: VMODE level is not the same as SUPPLY_HI_OUT, or hi-Z mode is selected.

VMODE_ERROR = 0b0: VMODE level is the same as SUPPLY_HI_OUT, or VMODE is not considered (PWRDNZ = 0b0).

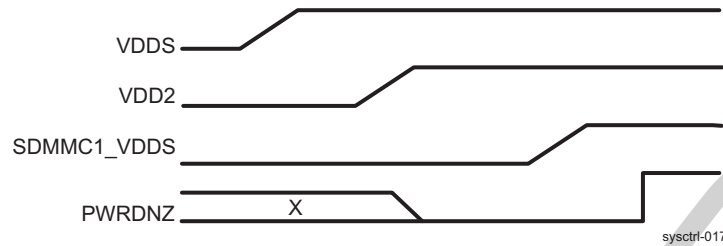
The MMC1_PBIAS_ERROR is mapped to the MPU subsystem interrupt controller. The interrupt line MA_IRQ_75 is activated upon error occurrence. For more information about the Cortex™-A9 MPU INTC registers and their description, see the *ARM Cortex-A9 Technical Reference Manual*.

The [CONTROL_PBIASLITE](#)[23] MMC1_PBIASLITE_VMODE_ERROR bit also indicates whether this kind of error occurs.

19.4.9.4 Critical Timing Requirements

It is critical that the PBIAS and I/O cell-related PWRDNZ bits are deasserted (made 1 from 0) only after SDMMC1_VDDS power supply voltage is stable in the device. The I/O cell supports only the case where the 1.8-V input buffer supply voltage VDDS ramps up before VDD2 (core voltage). This power-up sequence is automatically provided upon POR by hardware in the device. Take care to ensure that the externally provided SDMMC1_VDDS voltage (1.8 V/ 3 V) is powered up only after VDD2 and VDDS reach their steady state.

Figure 19-14 shows the only possible power-up sequence, as well as the expected behavior of PWRNDZ mode bit with regard to supplying voltage ramp-up.

Figure 19-14. VDDS Ramps Up Before VDD2


19.4.10 Band Gap Voltage and Temperature Sensor

The device supplies a voltage reference and a temperature sensor feature that are gathered in the band gap voltage and temperature sensor (VBGAPTS) module. The band gap provides current and voltage reference for its internal circuits and other analog IP blocks. The analog-to-digital converter (ADC) produces an output value that is proportional to the silicon temperature.

The main features of the VBGAPTS module are:

- A constant voltage reference output of 0.5 V
- Five constant current reference outputs of 1μA
- Analog supply is a nominal 1.8 V.
- Small ADC with 10-bit digital output
- Off mode compatible

A small finite state-machine (FSM) (band gap FSM) is instantiated inside the general core control module to help the VBGAPTS cell accomplish different measurement modes (see [Section 19.4.10.2, Temperature Sensor](#)). In addition, two programmable comparator blocks inside the general core control module post-process the converted data and provide the following outputs:

- Thermal alert programmable comparator output
- Thermal shutdown programmable comparator output

[Figure 19-15](#) shows the functional block diagram of the band gap and the temperature sensor module.

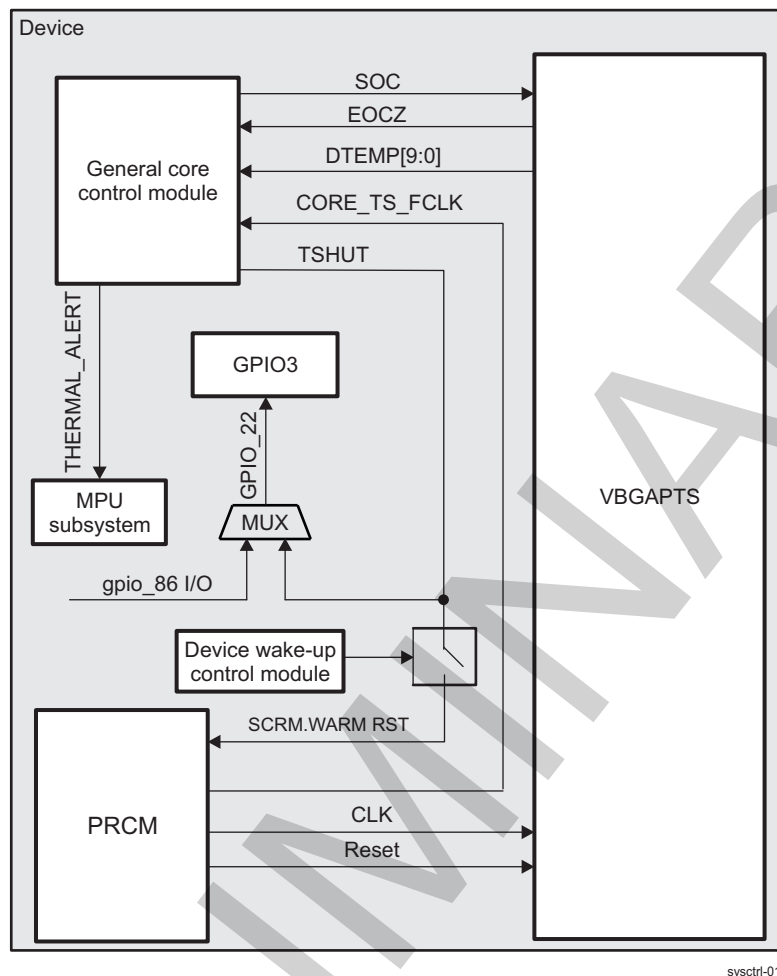
Figure 19-15. Functional Block Diagram

Table 19-18 describes the I/O signals, some of which (SOC, EOCZ, DTEMP[9:0]) build the interface between the VBGAPTS module and the bandgap state-machine of the general core control module.

Table 19-18. Band Gap Voltage and Temperature Sensor Signal Description

| Pin | I/O ⁽¹⁾ | Description |
|------------|--------------------|---|
| SOC | I | Start of Conversion signal. A transition to high starts a new ADC conversion cycle. |
| EOCZ | O | End of Conversion signal. When low, the signal indicates that the value of DTEMP[9:0] is valid. |
| DTEMP[9:0] | O | Temperature data from the temperature sensor. This value is valid when EOCZ is low. |
| CLRZ | I | When low, the temperature sensor is in reset mode. This signal must be low when OFFMODE is high. |
| CLK | I | Functional clock in the range (1–2 MHz) from the WKUP power domain used by the temperature sensor during temperature conversion |

⁽¹⁾ I = Input, O = Output

All the configuration signals of the VBGAPTS temperature conversion logic are available through the [CONTROL_TEMP_SENSOR](#) register.

The bandgap state-machine of the general core control module is driven by a dedicated clock (CORE_TS_FCLK) that shares a common PRCM clock source with the VBGAPTS CLK. For more information about the thermal management clocks, see [Chapter 3, Power, Reset, and Clock Management](#).

NOTE: The VBGAPTS functional clock delivered on CLK input is used only for the temperature sensor. When ADC is not converting, this clock can be switched off (CLK = 0). In this case, DTEMP[9:0] retains the temperature code obtained at the previous conversion.

NOTE: User software must ensure that the [CONTROL_BANDGAP_STATUS\[3\]](#) CLEAN_STOP bit read-only flag is high before switching off the VBGAPTS cell (CLK) and the bandgap state (CORE_TS_FCLK) clocks by programming the [CONTROL_TEMP_SENSOR\[13\]](#) BGAP_TEMPSOFF bit to 1. Status CLEAN_STOP = 1 indicates that the band gap state-machine is in IDLE state, and clocks can be safely switched off.

[Table 19-19](#) describes the functional outputs of the two post-processing comparator blocks integrated in the general core control module.

Table 19-19. General Core Control Thermal Logic Outputs Description

| Functional Output | Description |
|-------------------|--|
| THERMAL_ALERT | General core control module thermal alert output, mapped as an interrupt in the MPU subsystem. It is used by software to implement a thermal management policy of the device. |
| TSHUT | General core control module thermal shutdown comparator output is mapped on a GPIO input and can be configured as a source of SCRM external warm reset signal. This overheat protection signal is low during normal operation and goes high during a thermal shutdown event. |

The configuration bits of the thermal post-processing logic are in several registers of the general core control module. For more information, see [Section 19.4.10.2.3, Thermal Data Post-Processing](#).

19.4.10.1 Band Gap Voltage Reference

The band gap voltage reference feature provides several constant voltage and current references for its internal circuits and for other analog modules.

The voltage reference signal is a 0.5-V output. This output is used internally by the module and is exported for external modules or tests.

The current reference signals consist of five lines, each of which generates a 1-μA current with a 1.8-V voltage. These lines can be used to bias other modules.

19.4.10.2 Temperature Sensor

The temperature sensor feature is used to convert the temperature of the device into a decimal value coded on 10 bits. An internal ADC, which is part of the device embedded bandgap cell, is used for conversion.

For more information about the thermal sensor operating parameters (temperature range, accuracy, etc.), see the *Temperature Sensor* section in the device data manual.

For more information about the device operating junction temperature ranges under different conditions, see the *Recommended Operating Conditions* section in the device *Data Manual*.

NOTE: The temperature measured at the temperature sensor location is lower than the temperature of the hottest spot on the device die. This difference, defined also as the temperature offset between the on-die hottest spot temperature and the temperature registered by the on-die thermal sensor, depends on a number of factors, such as the current system power dissipation, device cooling conditions, etc.

CAUTION

User software must always take care to program thermal thresholds (thermal alert or TSHUT event points) at levels that do not exceed the device hottest spot maximal-allowed temperature minus the device temperature sensor offset estimated at current conditions.

The thermal alert interrupt events are described in [Section 19.4.10.2.4, Thermal Alert Functionality Comparators](#).

The TSHUT signal is connected internally to a GPIO controller pin. For more information, see [Chapter 26, General-Purpose Interface](#).

In addition, the TSHUT signal can be software configured from the device wakeup control module as a source of a hardware warm reset. For more details regarding warm reset description, see [Section 3.5, Reset Management Functional Description](#), in the chapter [Chapter 3, Power, Reset and Clock Management](#).

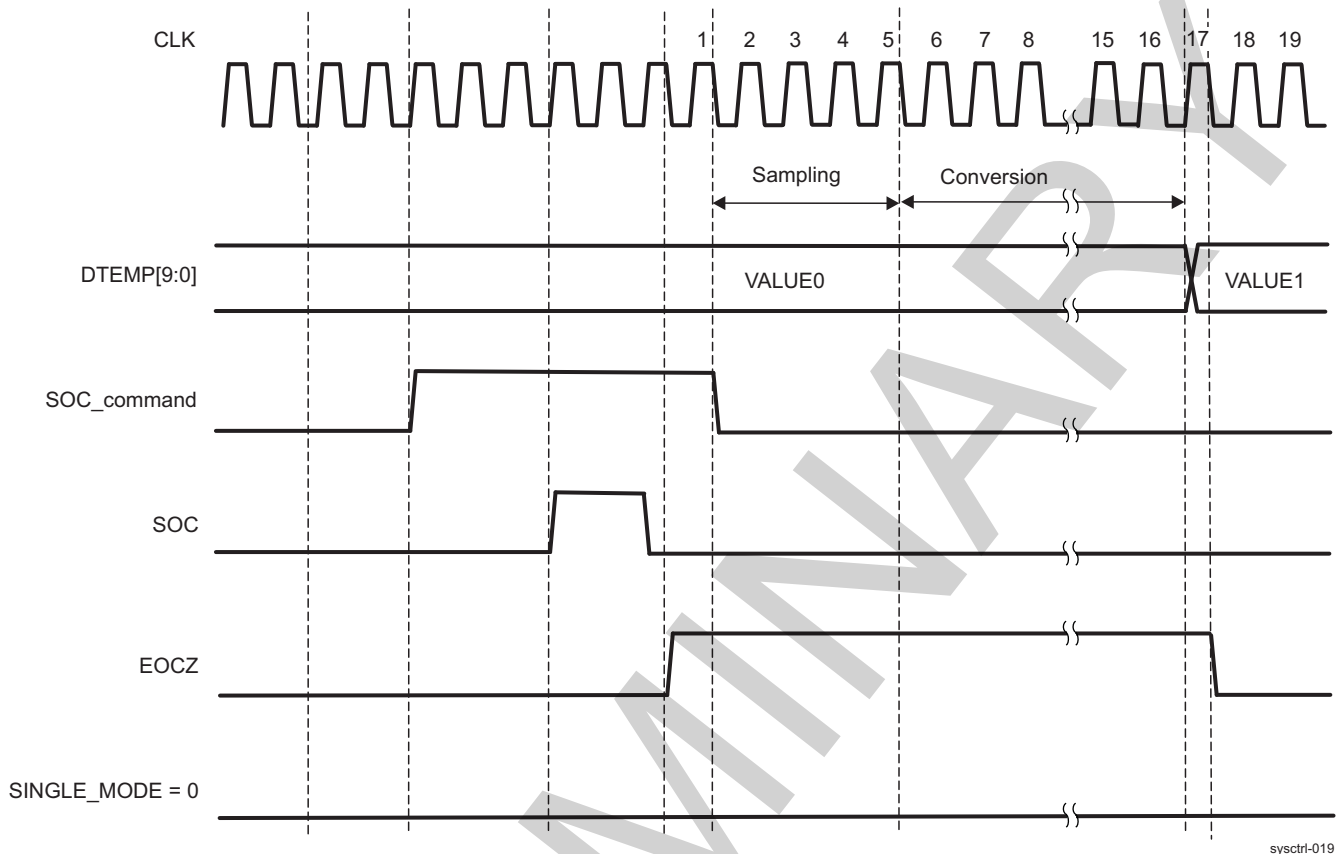
The bandgap state-machine offers two operating modes for the temperature sensor: single conversion mode and repeated single conversion mode.

19.4.10.2.1 Single Conversion Mode

When the ADC is idle ([CONTROL_TEMP_SENSOR\[10\] BGAP_TEMP_SENSOR_EOCZ](#) = 0) and the [CONTROL_BANDGAP_CTRL\[31\] SINGLE_MODE](#) bit is set to 0, it is possible to ask for a single temperature conversion. To initiate a new conversion, the start of conversion bit ([CONTROL_TEMP_SENSOR\[11\] BGAP_TEMP_SENSOR_SOC](#)) must be asserted and maintained high until the end of conversion flag ([CONTROL_TEMP_SENSOR\[10\] BGAP_TEMP_SENSOR_EOCZ](#)) goes high, after which the SOC signal must be made low by setting the [CONTROL_TEMP_SENSOR\[11\] BGAP_TEMP_SENSOR_SOC](#) bit to 0. Conversion completion is indicated by a negative edge of EOCZ (the [CONTROL_TEMP_SENSOR\[10\] BGAP_TEMP_SENSOR_EOCZ](#) bit).

[Figure 19-16](#) shows the timing sequence of a single temperature conversion. As can be seen in the figure, a single temperature conversion is performed by ADC for 17 band gap clock cycles.

Figure 19-16. Single Conversion Mode



19.4.10.2.2 Repeated Single Conversion Mode

A continuous temperature measurement on the device is performed as a sequence of single ADC conversions automatically initiated at regular intervals. A 24-bit counter inside the general core control module adds flexibility to program the delay between two consecutive SOC pulses generated from the band gap state-machine.

Two scenarios for ADC to work in a repeated single conversion mode are:

- Fixed-delay repeated single conversions
- Programmable-delay repeated single conversions

19.4.10.2.2.1 Fixed-Delay Repeated Single Conversions

The fixed-delay repeated single conversions scenario follows the sequence:

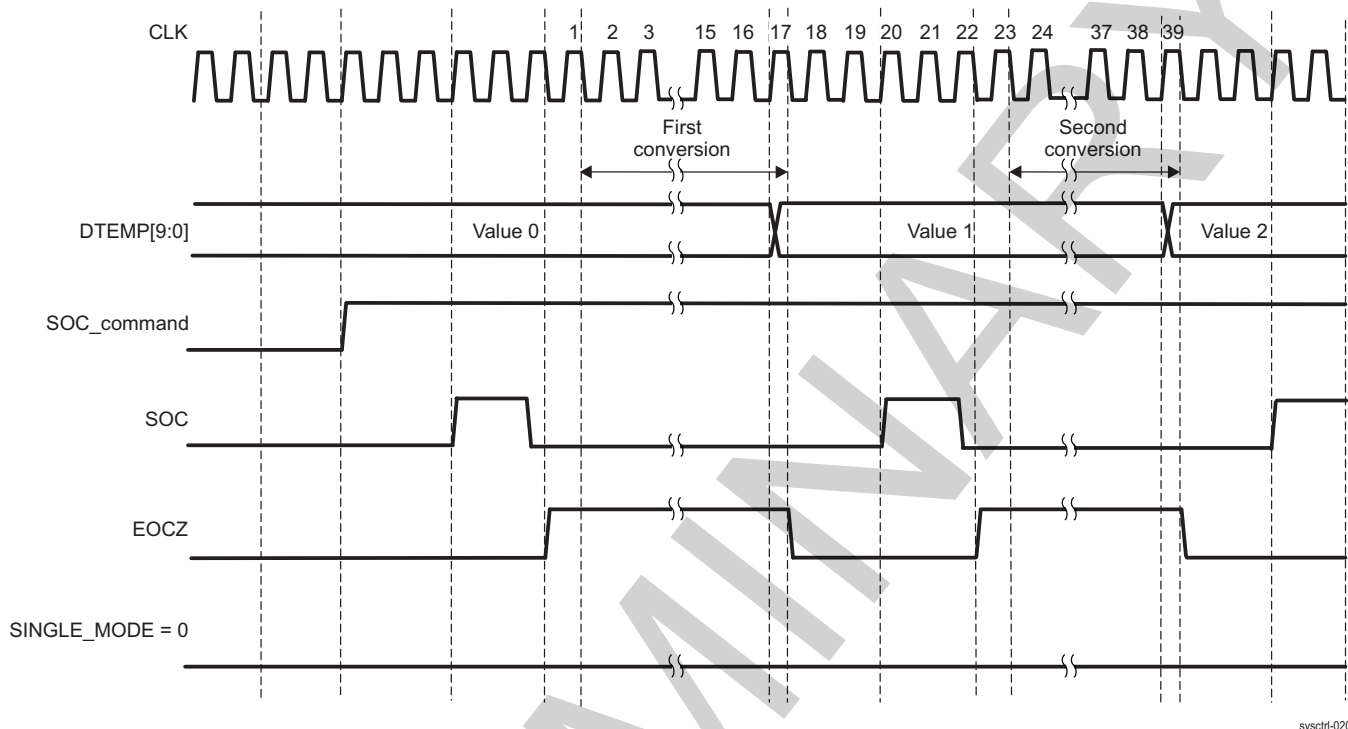
When the ADC is idle ([CONTROL_TEMP_SENSOR\[10\] BGAP_TEMP_SENSOR_EOCZ](#) = 0), and [CONTROL_BANDGAP_CTRL\[31\] SINGLE_MODE](#) = 0, the bandgap state-machine can be forced to generate a series of SOC pulses if the [CONTROL_TEMP_SENSOR\[11\] BGAP_TEMP_SENSOR_SOC](#) bit is asserted high and continuously maintained in this state during the required temperature monitoring period. The user software must deassert the [CONTROL_TEMP_SENSOR\[11\] BGAP_TEMP_SENSOR_SOC](#) bit to 0 when the [CONTROL_TEMP_SENSOR\[10\] BGAP_TEMP_SENSOR_EOCZ](#) status bit is set high for the last temperature measurement.

As described in [Section 19.4.10.2.1, Single Conversion Mode](#), valid data on the DTEMP[9:0] bus upon single conversion completion is indicated by a negative edge of the EOCZ signal. For the software, [CONTROL_TEMP_SENSOR\[10\] BGAP_TEMP_SENSOR_EOCZ](#) = 0 signals that the temperature data [CONTROL_TEMP_SENSOR\[7:0\] BGAP_TEMP_SENSOR_DTEMP](#) bit field is updated.

[Figure 19-17](#) shows the timing sequence for fixed-delay repeated single mode.

In this case, there is no flexibility to control delay between two consecutive SOC pulses, because with [CONTROL_BANDGAP_CTRL](#)[31] SINGLE_MODE = 0 band gap counter logic is disabled. The delay is fixed to 22 bandgap functional clock cycles.

Figure 19-17. Fixed-Delay Repeated Single Conversions



sysctrl-020

19.4.10.2.2.2 Programmable-Delay Repeated Single Conversions

In the programmable-delay repeated single conversions mode the bandgap state-machine uses a 24-bit incremental counter (part of the thermal post-processing logic of the general core control module) to generate a series of SOC pulses with a programmable delay between them.

The programmable-delay repeated single conversions scenario follows this sequence:

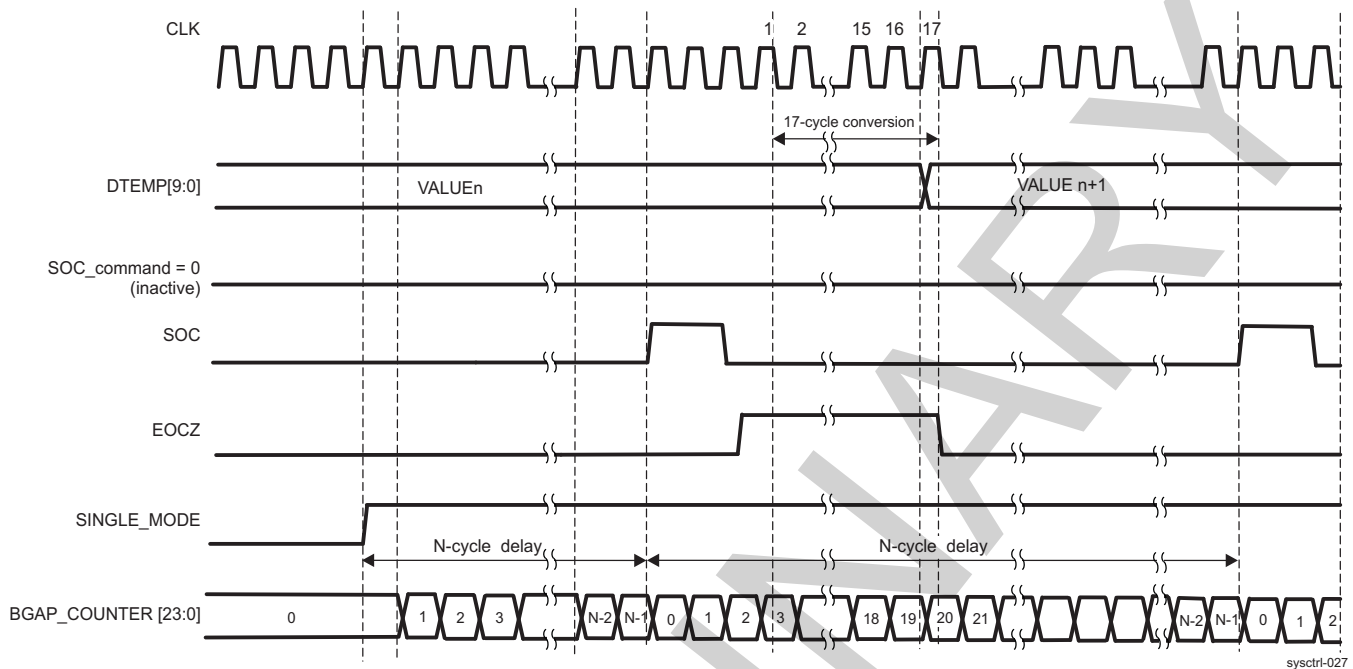
Before enabling this mode, the user must write the desired delay value as the number of bandgap CLK cycles in the [CONTROL_BGAP_COUNTER](#)[23:0] COUNTER bit field. When the ADC is idle ([CONTROL_TEMP_SENSOR](#)[10] BGAP_TEMP_SENSOR_EOCZ = 0) and [CONTROL_TEMP_SENSOR](#)[11] BGAP_TEMP_SENSOR_SOC = 0, the user must assert [CONTROL_BANDGAP_CTRL](#)[31] SINGLE_MODE = 1 to enable programmable-delay repeated single conversions.

Default value of the [CONTROL_BANDGAP_CTRL](#)[31] SINGLE_MODE is "1", which enables continuous conversion mode even during the device booting sequence.

NOTE: The programmable-delay repeated single conversions require that software keeps [CONTROL_TEMP_SENSOR](#)[11] BGAP_TEMP_SENSOR_SOC = 0 during the measurement sequence.

Figure 19-18 shows the timing sequence for a programmable-delay repeated single mode.

Figure 19-18. Programmable-Delay Repeated Single Conversions



As Figure 19-18 shows, the initial SOC pulse of a sequence is generated N-cycles after assertion of the SINGLE_MODE bit, when BGAP_COUNTER reaches N-1. The N-cycle period is repeated for consecutive SOC insertions until the sequence is stopped in software by deasserting the [CONTROL_BANDGAP_CTRL\[31\] SINGLE_MODE](#) bit to 0.

The signal synchronization described in [Section 19.4.10.2.1, Single Conversion Mode](#), applies to each single conversion in a measurement series. The general core control module sends the SOC pulses at regular programmable intervals defined through the value of the BGAP_COUNTER bit field and registers the temperature when EOCZ is asserted low. Software must populate the correct value based on the band gap frequency and monitoring frequency, knowing that the band gap, regardless of the clock frequency, delivers its temperature after 17 clock cycles.

[Table 19-20](#) provides examples for programming SOC pulse generation periods based on minimal (1 MHz) and maximal (2 MHz) band gap clock frequency.

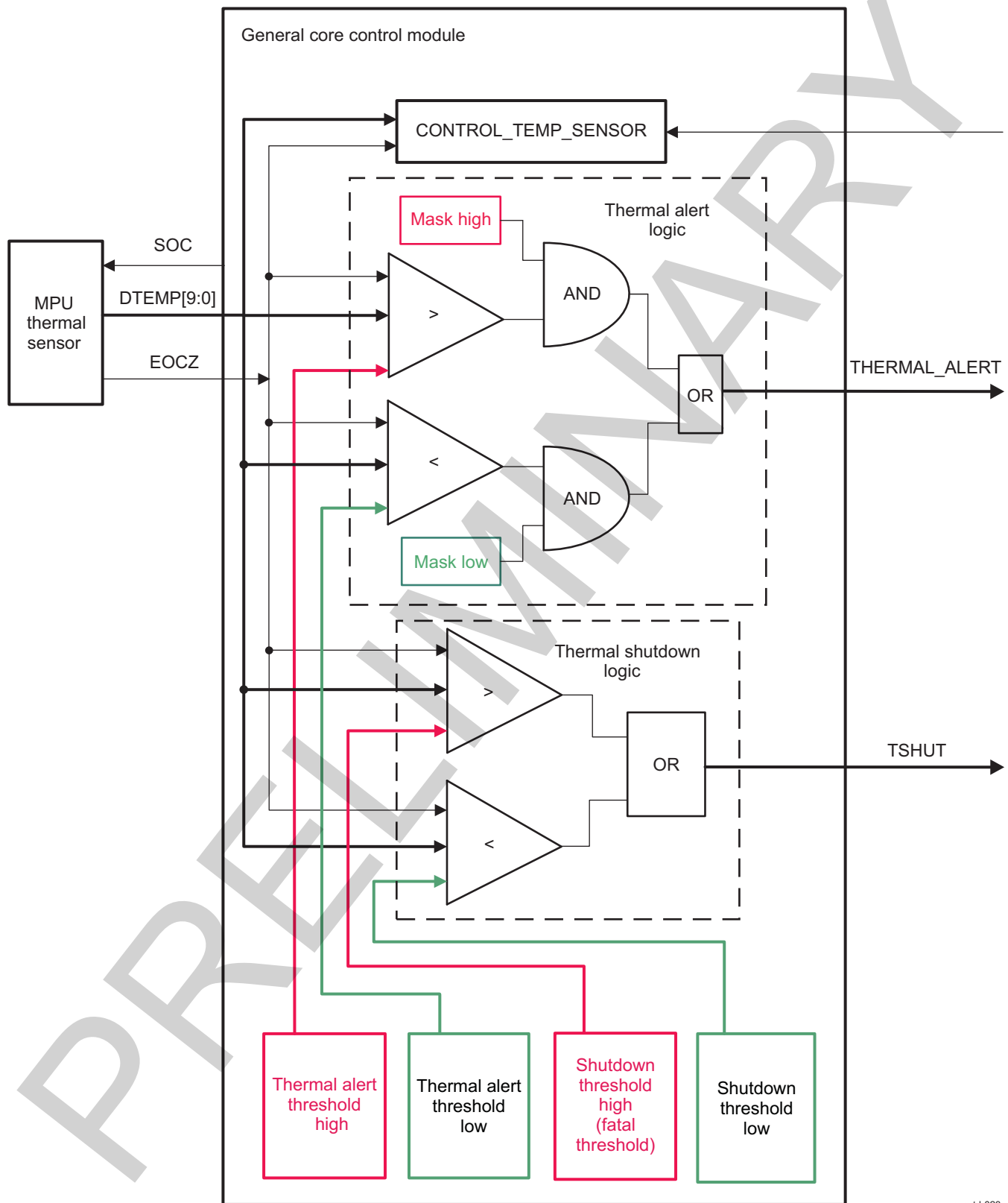
Table 19-20. Bandgap Counter Programming Examples

| Bandgap Clock | Monitoring Period | | | | |
|-----------------|-------------------|---------------|----------------|----------------|------------------|
| | 10 ms | 20 ms | 50 ms | 100 ms | 500 ms |
| 1 MHz – 1000 ns | 10,000 cycles | 20,000 cycles | 50,000 cycles | 100,000 cycles | 200,000 cycles |
| 2 MHz – 500 ns | 20,000 cycles | 40,000 cycles | 100,000 cycles | 200,000 cycles | 1,000,000 cycles |

19.4.10.2.3 Thermal Data Post-Processing Logic

A thermal data post-processing logic with dedicated registers is implemented in the general core control module. The registered ADC value is passed in parallel to the inputs of four comparators (two sets of two comparators). In each set, the temperature data is compared to high- and low-temperature thresholds defined in software, to handle the hysteresis effect when temperature decreases. The two comparator sets provide different thermal management functions.

[Figure 19-19](#) shows the thermal management schema in the device.

Figure 19-19. Thermal Management Schema

sysctrl-023

NOTE: The software settings of the comparator blocks must be applied before starting a single or repeated-single measurement sequence.

19.4.10.2.4 Thermal Alert Functionality Comparators

The first set of comparators provides a thermal alert function output. The high- and low-temperature thresholds for this function are configurable through the 10-bit [CONTROL_BANDGAP_THRESHOLD\[25:16\]](#) T_HOT and [CONTROL_BANDGAP_THRESHOLD\[9:0\]](#) T_COLD bit fields, respectively. Thermal alert logic in the general core control module provides the capability to mask (active low) comparator outputs for hot and cold events through the [CONTROL_BANDGAP_CTRL\[1\]](#) MASK_HOT and [CONTROL_BANDGAP_CTRL\[0\]](#) MASK_COLD bits. [Figure 19-20](#) shows the functional logic of these 2 bits to mask comparator outputs for hot and cold thermal alert events. The masked HOT and COLD point monitoring signals are then ORed in the THERMAL_ALERT signal, which delivers an interrupt to the MPU subsystem on the MA_IRQ_126 input (see [Section 19.3, Control Module Integration](#)). It can be used by software to implement a thermal management policy of the device. For more information about this interrupt, see [Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller](#).

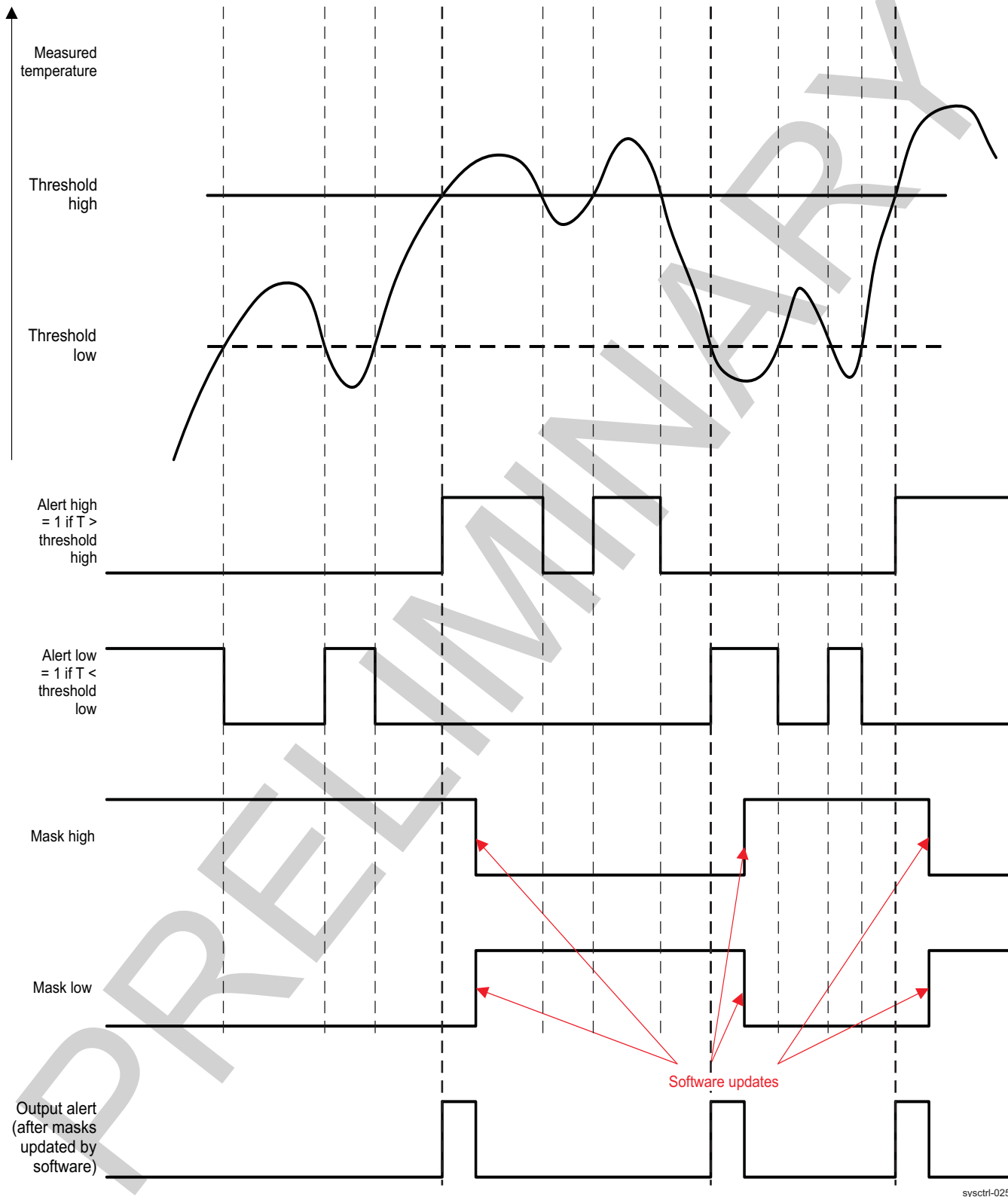
The nonmasked outputs of the thermal alert logic comparators are individually registered in the [CONTROL_BANDGAP_STATUS\[1\]](#) HOT_FLAG and [CONTROL_BANDGAP_STATUS\[0\]](#) COLD_FLAG read-only (RO) bits. The masked ORed event (that is, the THERMAL_ALERT signal) is mapped to the [CONTROL_BANDGAP_STATUS\[2\]](#) BGAP_ALERT RO bit. [Figure 19-20](#) shows the behavior of the thermal alert logic.

NOTE: The thermal processing logic of the general core control module generates an interrupt event to the MPU subsystem whenever the registered temperature of on-die thermal sensor crosses a software-configurable threshold.

CAUTION

Users must take care to program the value of the [CONTROL_BANDGAP_THRESHOLD\[25:16\]](#) T_HOT bit field such that its corresponding temperature value does not exceed the maximal-allowed on-die temperature minus the temperature sensor offset estimated for the current conditions. For more information about the sensed temperature value constraints, see [Section 19.4.10.2, Temperature Sensor](#).

Figure 19-20. Thermal Alert Generation Signals



sysctrl-025

19.4.10.2.5 Thermal Shutdown Functionality Comparators

The second set of two comparators in the general core control module is responsible for the thermal shutdown protection of the device. Two 10-bit fields ([CONTROL_TSHUT_THRESHOLD\[25:16\]](#) TSHUT_HOT and [CONTROL_TSHUT_THRESHOLD\[9:0\]](#) TSHUT_COLD) define the high- and low-threshold code values, respectively. These two bitfields can be programmed by the user ONLY once after device power-on reset. The default value of the TSHUT_HOT bit field corresponds to the maximum allowed on the device die temperature. The TSHUT output main purpose is to indicate that the maximum junction temperature of the die is reached, which is true when the temperature measured by the on-die sensor (at sensor location), satisfies the condition:

$$T_{\text{sensor_location_max_tshut}}, ^\circ\text{C} = T_{\text{max_allowed_hottest_spot}}, ^\circ\text{C} - \Delta T_{\text{estimated_temp_offset}}, ^\circ\text{C}$$

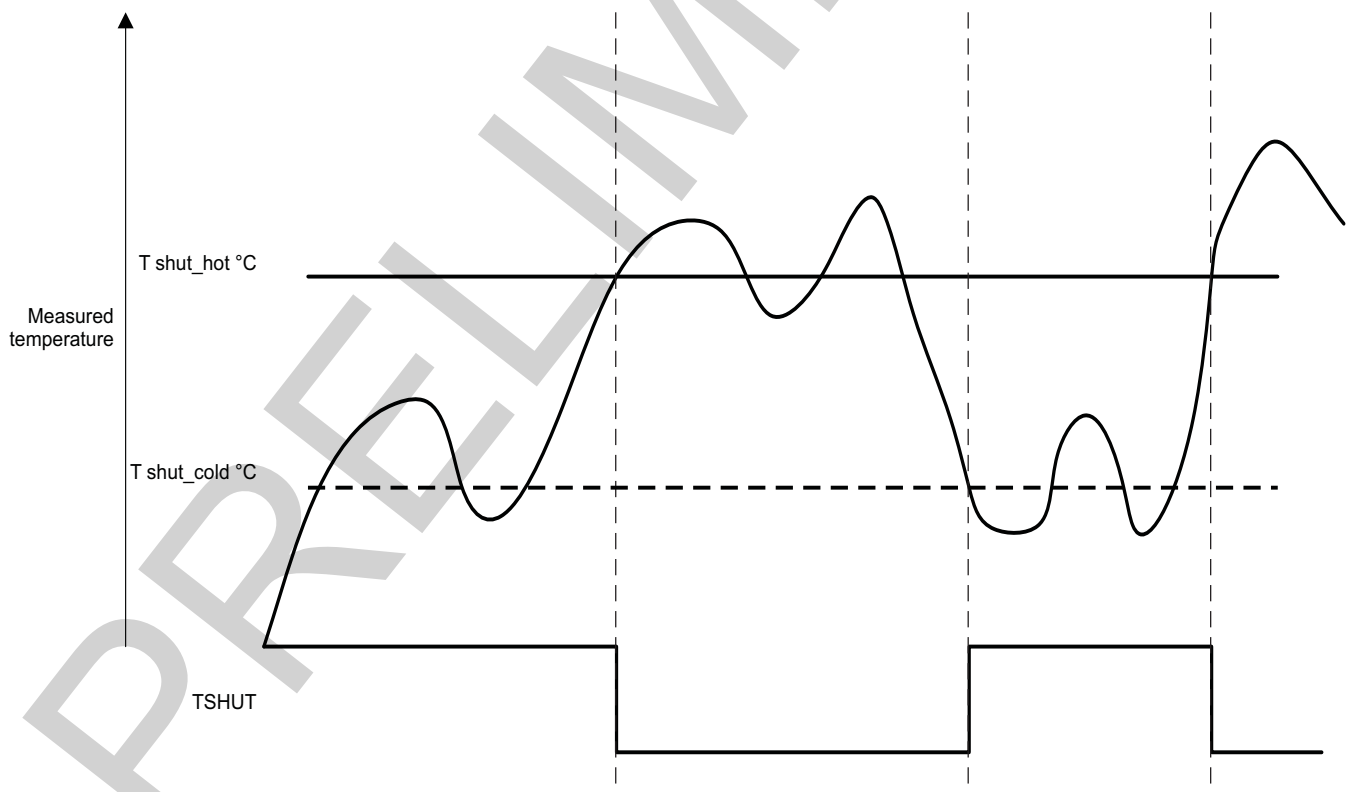
CAUTION

User software must always provide that the temperature corresponding to the programmed value of the [CONTROL_TSHUT_THRESHOLD\[25:16\]](#) TSHUT_HOT bit field does not exceed the described $T_{\text{sensor_location_max_tshut}}$ limit value. For more information about the sensed temperature value constraints, see [Section 19.4.10.2, Temperature Sensor](#).

To deactivate TSHUT output, the temperature ADC-encoded value must go below the value of TSHUT_COLD threshold.

[Figure 19-21](#) shows the behavior of the TSHUT logic.

Figure 19-21. Thermal Shutdown Generation Signals



sysctrl-026

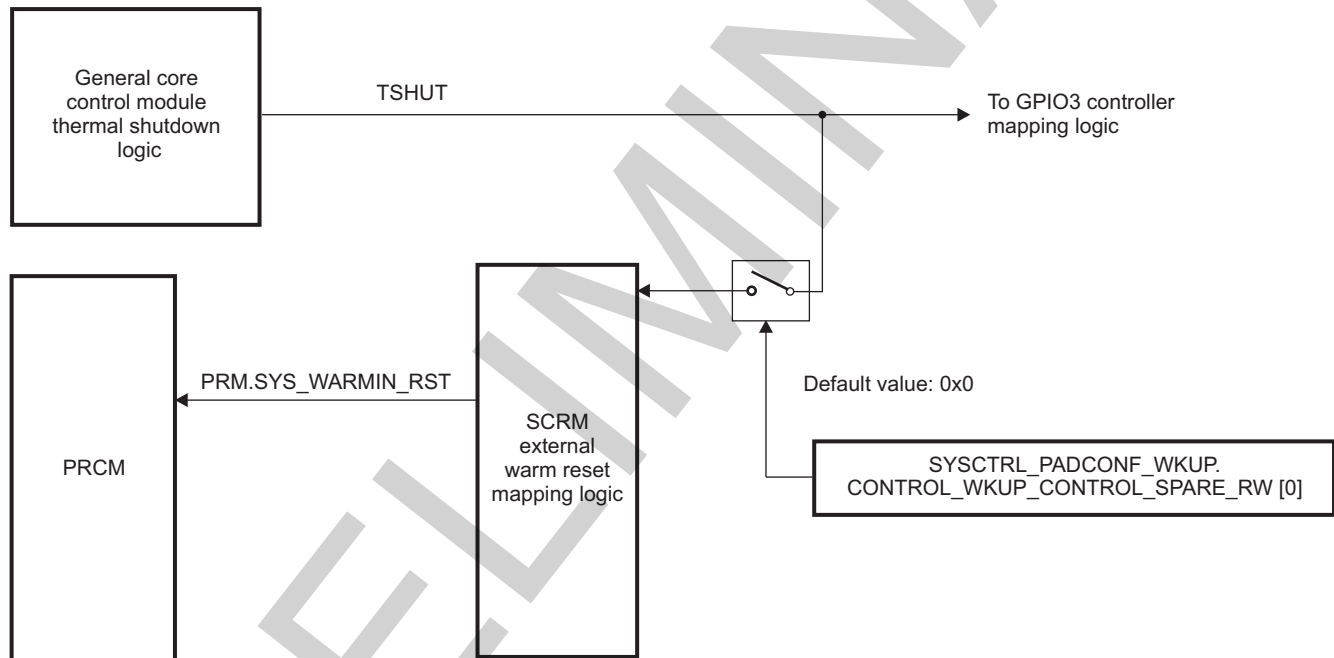
The TSHUT output of the general core control module is tied internally to a GPIO3 module input pin (see [Section 19.3, Control Module Integration](#)). For more information about thermal-related GPIO interrupt, see [Chapter 26, General-Purpose Interface](#). The software can use this GPIO interrupt to prevent device malfunction or permanent damage, by taking immediate action to reduce power dissipation by software warm-resetting the device or freezing most internal activities upon its detection.

Additionally, the TSHUT signal can be mapped to the device SCRM external warm reset logic to activate the PRM.SYS_WARMIN_RST input when a **fatal temperature threshold** (TSHUT_HOT) is exceeded. Hence, **a hardware warm reset** can be triggered directly on the device upon a fatal temperature threshold crossing event. For more details regarding external warm reset descriptions, see [Section 3.5, Reset Management Functional Description](#), in the chapter [Chapter 3, Power, Reset and Clock Management](#).

To enable the **fatal threshold hardware warm reset generation**, the user has to set bit SYSCTRL_PADCONF_WKUP.CONTROL_WKUP_CONTROL_SPARE_RW[0] to 0b1. The default (power-on-reset) bit value is 0b0, and TSHUT output is NOT able to generate a hardware warm reset in the device.

The mapping of general core control module TSHUT output inside the device is illustrated on [Figure 19-22](#).

Figure 19-22. TSHUT Output Mapping Diagram



sysctrl-030

NOTE: Besides interrupt generation capability via GPIO3 controller, the TSHUT output can be configured to generate **a hardware thermal-shutdown warm reset** upon device on-die hottest spot temperature crossing a user programmed fatal threshold (TSHUT_HOT value). This warm reset generation is enabled via setting the SYSCTRL_PADCONF_WKUP.CONTROL_WKUP_CONTROL_SPARE_RW[0] bit to 0b1.

NOTE: The [CONTROL_TSHUT_THRESHOLD\[25:16\]](#) TSHUT_HOT and [CONTROL_TSHUT_THRESHOLD\[9:0\]](#) TSHUT_COLD bitfields can be written only once after device power-on reset.

19.4.10.2.6 ADC Codes Versus Temperature

Table 19-21 gives the temperature range that corresponds to each value of the **CONTROL_TEMP_SENSOR[9:0]** BGAP_TEMP_SENSOR_DTEMP bit field.

Table 19-21. ADC Code Versus Temperature

| ADC Code | Temperature °C | | ADC Code | Temperature °C | | ADC Code | Temperature °C | | ADC Code | Temperature °C | |
|----------|----------------|-------|----------|----------------|------|----------|----------------|------|----------|----------------|-------|
| | From | To | | From | To | | From | To | | From | To |
| 530 | –40– | –40 | 631 | 1.4 | 1.8 | 732 | 44.2 | 44.6 | 833 | 86.2 | 86.6 |
| 531 | –40 | –40 | 632 | 1.8 | 2.4 | 733 | 44.6 | 45 | 834 | 86.6 | 87 |
| 532 | –40 | –40 | 633 | 2.4 | 2.8 | 734 | 45 | 45.6 | 835 | 87 | 87.6 |
| 533 | –40 | –40 | 634 | 2.8 | 3.2 | 735 | 45.6 | 46 | 836 | 87.6 | 88 |
| 534 | –40 | –39.6 | 635 | 3.2 | 3.6 | 736 | 46 | 46.4 | 837 | 88 | 88.4 |
| 535 | –39.6 | –39.2 | 636 | 3.6 | 4 | 737 | 46.4 | 46.8 | 838 | 88.4 | 88.8 |
| 536 | –39.2 | –38.8 | 637 | 4 | 4.4 | 738 | 46.8 | 47.2 | 839 | 88.8 | 89.2 |
| 537 | –38.8 | –38.4 | 638 | 4.4 | 4.8 | 739 | 47.2 | 47.6 | 840 | 89.2 | 89.6 |
| 538 | –38.4 | –38 | 639 | 4.8 | 5.4 | 740 | 47.6 | 48 | 841 | 89.6 | 90 |
| 539 | –38 | –37.6 | 640 | 5.4 | 5.8 | 741 | 48 | 48.4 | 842 | 90 | 90.4 |
| 540 | –37.6 | –37 | 641 | 5.8 | 6.2 | 742 | 48.4 | 48.8 | 843 | 90.4 | 90.8 |
| 541 | –37 | –36.6 | 642 | 6.2 | 6.6 | 743 | 48.8 | 49.2 | 844 | 90.8 | 91.2 |
| 542 | –36.6 | –36.2 | 643 | 6.6 | 7 | 744 | 49.2 | 49.8 | 845 | 91.2 | 91.6 |
| 543 | –36.2 | –35.8 | 644 | 7 | 7.4 | 745 | 49.8 | 50.2 | 846 | 91.6 | 92 |
| 544 | –35.8 | –35.4 | 645 | 7.4 | 7.8 | 746 | 50.2 | 50.6 | 847 | 92 | 92.4 |
| 545 | –35.4 | –35 | 646 | 7.8 | 8.2 | 747 | 50.6 | 51 | 848 | 92.4 | 92.8 |
| 546 | –35 | –34.6 | 647 | 8.2 | 8.8 | 748 | 51 | 51.4 | 849 | 92.8 | 93.2 |
| 547 | –34.6 | –34 | 648 | 8.8 | 9.2 | 749 | 51.4 | 51.8 | 850 | 93.2 | 93.6 |
| 548 | –34 | –33.6 | 649 | 9.2 | 9.6 | 750 | 51.8 | 52.2 | 851 | 93.6 | 94 |
| 549 | –33.6 | –33.2 | 650 | 9.6 | 10 | 751 | 52.2 | 52.6 | 852 | 94 | 94.4 |
| 550 | –33.2 | –32.8 | 651 | 10 | 10.4 | 752 | 52.6 | 53 | 853 | 94.4 | 94.8 |
| 551 | –32.8 | –32.4 | 652 | 10.4 | 10.8 | 753 | 53 | 53.4 | 854 | 94.8 | 95.2 |
| 552 | –32.4 | –32 | 653 | 10.8 | 11.2 | 754 | 53.4 | 54 | 855 | 95.2 | 95.8 |
| 553 | –32 | –31.6 | 654 | 11.2 | 11.6 | 755 | 54 | 54.4 | 856 | 95.8 | 96.2 |
| 554 | –31.6 | –31 | 655 | 11.6 | 12.2 | 756 | 54.4 | 54.8 | 857 | 96.2 | 96.6 |
| 555 | –31 | –30.6 | 656 | 12.2 | 12.6 | 757 | 54.8 | 55.2 | 858 | 96.6 | 97 |
| 556 | –30.6 | –30.2 | 657 | 12.6 | 13 | 758 | 55.2 | 55.6 | 859 | 97 | 97.4 |
| 557 | –30.2 | –29.8 | 658 | 13 | 13.4 | 759 | 55.6 | 56 | 860 | 97.4 | 97.8 |
| 558 | –29.8 | –29.4 | 659 | 13.4 | 13.8 | 760 | 56 | 56.4 | 861 | 97.8 | 98.2 |
| 559 | –29.4 | –29 | 660 | 13.8 | 14.2 | 761 | 56.4 | 56.8 | 862 | 98.2 | 98.6 |
| 560 | –29 | –28.4 | 661 | 14.2 | 14.6 | 762 | 56.8 | 57.2 | 863 | 98.6 | 99 |
| 561 | –28.4 | –28 | 662 | 14.6 | 15 | 763 | 57.2 | 57.6 | 864 | 99 | 99.4 |
| 562 | –28 | –27.6 | 663 | 15 | 15.6 | 764 | 57.6 | 58 | 865 | 99.4 | 99.8 |
| 563 | –27.6 | –27.2 | 664 | 15.6 | 16 | 765 | 58 | 58.4 | 866 | 99.8 | 100.2 |
| 564 | –27.2 | –26.8 | 665 | 16 | 16.4 | 766 | 58.4 | 59 | 867 | 100.2 | 100.6 |
| 565 | –26.8 | –26.4 | 666 | 16.4 | 16.8 | 767 | 59 | 59.4 | 868 | 100.6 | 101 |
| 566 | –26.4 | –26 | 667 | 16.8 | 17.2 | 768 | 59.4 | 59.8 | 869 | 101 | 101.4 |
| 567 | –26 | –25.4 | 668 | 17.2 | 17.6 | 769 | 59.8 | 60.2 | 870 | 101.4 | 101.8 |
| 568 | –25.4 | –25 | 669 | 17.6 | 18 | 770 | 60.2 | 60.6 | 871 | 101.8 | 102.2 |
| 569 | –25 | –24.6 | 670 | 18 | 18.4 | 771 | 60.6 | 61 | 872 | 102.2 | 102.6 |
| 570 | –24.6 | –24.2 | 671 | 18.4 | 19 | 772 | 61 | 61.4 | 873 | 102.6 | 103 |
| 571 | –24.2 | –23.8 | 672 | 19 | 19.4 | 773 | 61.4 | 61.8 | 874 | 103 | 103.4 |

Table 19-21. ADC Code Versus Temperature (continued)

| ADC Code | Temperature °C | | ADC Code | Temperature °C | | ADC Code | Temperature °C | | ADC Code | Temperature °C | |
|----------|----------------|-------|----------|----------------|------|----------|----------------|------|----------|----------------|-------|
| | From | To | | From | To | | From | To | | From | To |
| 572 | -23.8 | -23.4 | 673 | 19.4 | 19.8 | 774 | 61.8 | 62.2 | 875 | 103.4 | 103.8 |
| 573 | -23.4 | -23 | 674 | 19.8 | 20.2 | 775 | 62.2 | 62.6 | 876 | 103.8 | 104.2 |
| 574 | -23 | -22.4 | 675 | 20.2 | 20.6 | 776 | 62.6 | 63 | 877 | 104.2 | 104.6 |
| 575 | -22.4 | -22 | 676 | 20.6 | 21 | 777 | 63 | 63.6 | 878 | 104.6 | 105 |
| 576 | -22 | -21.6 | 677 | 21 | 21.4 | 778 | 63.6 | 64 | 879 | 105 | 105.4 |
| 577 | -21.6 | -21.2 | 678 | 21.4 | 21.8 | 779 | 64 | 64.4 | 880 | 105.4 | 105.8 |
| 578 | -21.2 | -20.8 | 679 | 21.8 | 22.4 | 780 | 64.4 | 64.8 | 881 | 105.8 | 106.4 |
| 579 | -20.8 | -20.4 | 680 | 22.4 | 22.8 | 781 | 64.8 | 65.2 | 882 | 106.4 | 106.8 |
| 580 | -20.4 | -20 | 681 | 22.8 | 23.2 | 782 | 65.2 | 65.6 | 883 | 106.8 | 107.2 |
| 581 | -20 | -19.4 | 682 | 23.2 | 23.6 | 783 | 65.6 | 66 | 884 | 107.2 | 107.6 |
| 582 | -19.4 | -19 | 683 | 23.6 | 24 | 784 | 66 | 66.4 | 885 | 107.6 | 108 |
| 583 | -19 | -18.6 | 684 | 24 | 24.4 | 785 | 66.4 | 66.8 | 886 | 108 | 108.4 |
| 584 | -18.6 | -18.2 | 685 | 24.4 | 24.8 | 786 | 66.8 | 67.2 | 887 | 108.4 | 108.8 |
| 585 | -18.2 | -17.8 | 686 | 24.8 | 25.2 | 787 | 67.2 | 67.6 | 888 | 108.8 | 109.2 |
| 586 | -17.8 | -17.4 | 687 | 25.2 | 25.6 | 788 | 67.6 | 68 | 889 | 109.2 | 109.6 |
| 587 | -17.4 | -17 | 688 | 25.6 | 26.2 | 789 | 68 | 68.4 | 890 | 109.6 | 110 |
| 588 | -17 | -16.4 | 689 | 26.2 | 26.6 | 790 | 68.4 | 69 | 891 | 110 | 110.4 |
| 589 | -16.4 | -16 | 690 | 26.6 | 27 | 791 | 69 | 69.4 | 892 | 110.4 | 110.8 |
| 590 | -16 | -15.6 | 691 | 27 | 27.4 | 792 | 69.4 | 69.8 | 893 | 110.8 | 111.2 |
| 591 | -15.6 | -15.2 | 692 | 27.4 | 27.8 | 793 | 69.8 | 70.2 | 894 | 111.2 | 111.6 |
| 592 | -15.2 | -14.8 | 693 | 27.8 | 28.2 | 794 | 70.2 | 70.6 | 895 | 111.6 | 112 |
| 593 | -14.8 | -14.4 | 694 | 28.2 | 28.6 | 795 | 70.6 | 71 | 896 | 112 | 112.4 |
| 594 | -14.4 | -14 | 695 | 28.6 | 29 | 796 | 71 | 71.4 | 897 | 112.4 | 112.8 |
| 595 | -14 | -13.4 | 696 | 29 | 29.6 | 797 | 71.4 | 71.8 | 898 | 112.8 | 113.2 |
| 596 | -13.4 | -13 | 697 | 29.6 | 30 | 798 | 71.8 | 72.2 | 899 | 113.2 | 113.6 |
| 597 | -13 | -12.6 | 698 | 30 | 30.4 | 799 | 72.2 | 72.6 | 900 | 113.6 | 114 |
| 598 | -12.6 | -12.2 | 699 | 30.4 | 30.8 | 800 | 72.6 | 73 | 901 | 114 | 114.4 |
| 599 | -12.2 | -11.8 | 700 | 30.8 | 31.2 | 801 | 73 | 73.4 | 902 | 114.4 | 114.8 |
| 600 | -11.8 | -11.4 | 701 | 31.2 | 31.6 | 802 | 73.4 | 73.8 | 903 | 114.8 | 115.2 |
| 601 | -11.4 | -11 | 702 | 31.6 | 32 | 803 | 73.8 | 74.4 | 904 | 115.2 | 115.6 |
| 602 | -11 | -10.4 | 703 | 32 | 32.4 | 804 | 74.4 | 74.8 | 905 | 115.6 | 116 |
| 603 | -10.4 | -10 | 704 | 32.4 | 32.8 | 805 | 74.8 | 75.2 | 906 | 116 | 116.4 |
| 604 | -10 | -9.6 | 705 | 32.8 | 33.4 | 806 | 75.2 | 75.6 | 907 | 116.4 | 116.8 |
| 605 | -9.6 | -9.2 | 706 | 33.4 | 33.8 | 807 | 75.6 | 76 | 908 | 116.8 | 117.2 |
| 606 | -9.2 | -8.8 | 707 | 33.8 | 34.2 | 808 | 76 | 76.4 | 909 | 117.2 | 117.6 |
| 607 | -8.8 | -8.4 | 708 | 34.2 | 34.6 | 809 | 76.4 | 76.8 | 910 | 117.6 | 118 |
| 608 | -8.4 | -8 | 709 | 34.6 | 35 | 810 | 76.8 | 77.2 | 911 | 118 | 118.4 |
| 609 | -8 | -7.4 | 710 | 35 | 35.4 | 811 | 77.2 | 77.6 | 912 | 118.4 | 118.8 |
| 610 | -7.4 | -7 | 711 | 35.4 | 35.8 | 812 | 77.6 | 78 | 913 | 118.8 | 119.2 |
| 611 | -7 | -6.6 | 712 | 35.8 | 36.2 | 813 | 78 | 78.4 | 914 | 119.2 | 119.6 |
| 612 | -6.6 | -6.2 | 713 | 36.2 | 36.6 | 814 | 78.4 | 78.8 | 915 | 119.6 | 120 |
| 613 | -6.2 | -5.8 | 714 | 36.6 | 37 | 815 | 78.8 | 79.2 | 916 | 120 | 120.4 |
| 614 | -5.8 | -5.4 | 715 | 37 | 37.6 | 816 | 79.2 | 79.6 | 917 | 120.4 | 120.8 |
| 615 | -5.4 | -5 | 716 | 37.6 | 38 | 817 | 79.6 | 80 | 918 | 120.8 | 121.2 |
| 616 | -5 | -4.6 | 717 | 38 | 38.4 | 818 | 80 | 80.6 | 919 | 121.2 | 121.6 |
| 617 | -4.6 | -4 | 718 | 38.4 | 38.8 | 819 | 80.6 | 81 | 920 | 121.6 | 122 |

Table 19-21. ADC Code Versus Temperature (continued)

| ADC Code | Temperature °C | | ADC Code | Temperature °C | | ADC Code | Temperature °C | | ADC Code | Temperature °C | |
|----------|----------------|------|----------|----------------|------|----------|----------------|------|----------|----------------------------|----------------------------|
| | From | To | | From | To | | From | To | | From | To |
| 618 | –4 | –3.6 | 719 | 38.8 | 39.2 | 820 | 81 | 81.4 | 921 | 122 | 122.4 |
| 619 | –3.6 | –3.2 | 720 | 39.2 | 39.6 | 821 | 81.4 | 81.8 | 922 | 122.4 | 122.8 |
| 620 | –3.2 | –2.8 | 721 | 39.6 | 40 | 822 | 81.8 | 82.2 | 923 | 122.8 | 123.2 |
| 621 | –2.8 | –2.4 | 722 | 40 | 40.4 | 823 | 82.2 | 82.6 | 924 | Outside range of operation | Outside range of operation |
| 622 | –2.4 | –2 | 723 | 40.4 | 40.8 | 824 | 82.6 | 83 | 925 | Outside range of operation | Outside range of operation |
| 623 | –2 | –1.6 | 724 | 40.8 | 41.4 | 825 | 83 | 83.4 | 926 | Outside range of operation | Outside range of operation |
| 624 | –1.6 | –1 | 725 | 41.4 | 41.8 | 826 | 83.4 | 83.8 | 927 | Outside range of operation | Outside range of operation |
| 625 | –1 | –0.6 | 726 | 41.8 | 42.2 | 827 | 83.8 | 84.2 | 928 | Outside range of operation | Outside range of operation |
| 626 | –0.6 | –0.2 | 727 | 42.2 | 42.6 | 828 | 84.2 | 84.6 | 929 | Outside range of operation | Outside range of operation |
| 627 | –0.2 | 0.2 | 728 | 42.6 | 43 | 829 | 84.6 | 85 | 930 | Outside range of operation | Outside range of operation |
| 628 | 0.2 | 0.6 | 729 | 43 | 43.4 | 830 | 85 | 85.4 | 931 | Outside range of operation | Outside range of operation |
| 629 | 0.6 | 1 | 730 | 43.4 | 43.8 | 831 | 85.4 | 85.8 | 932 | Outside range of operation | Outside range of operation |
| 630 | 1 | 1.4 | 731 | 43.8 | 44.2 | 832 | 85.8 | 86.2 | | Outside range of operation | |

NOTE: ADC code values in the subranges 0–529 and 933–1023 are reserved for future use.

19.4.11 Hardware Observability

19.4.11.1 Device Internal Signals Observability Overview

The general control module provides observability features covering different module internal signals related to:

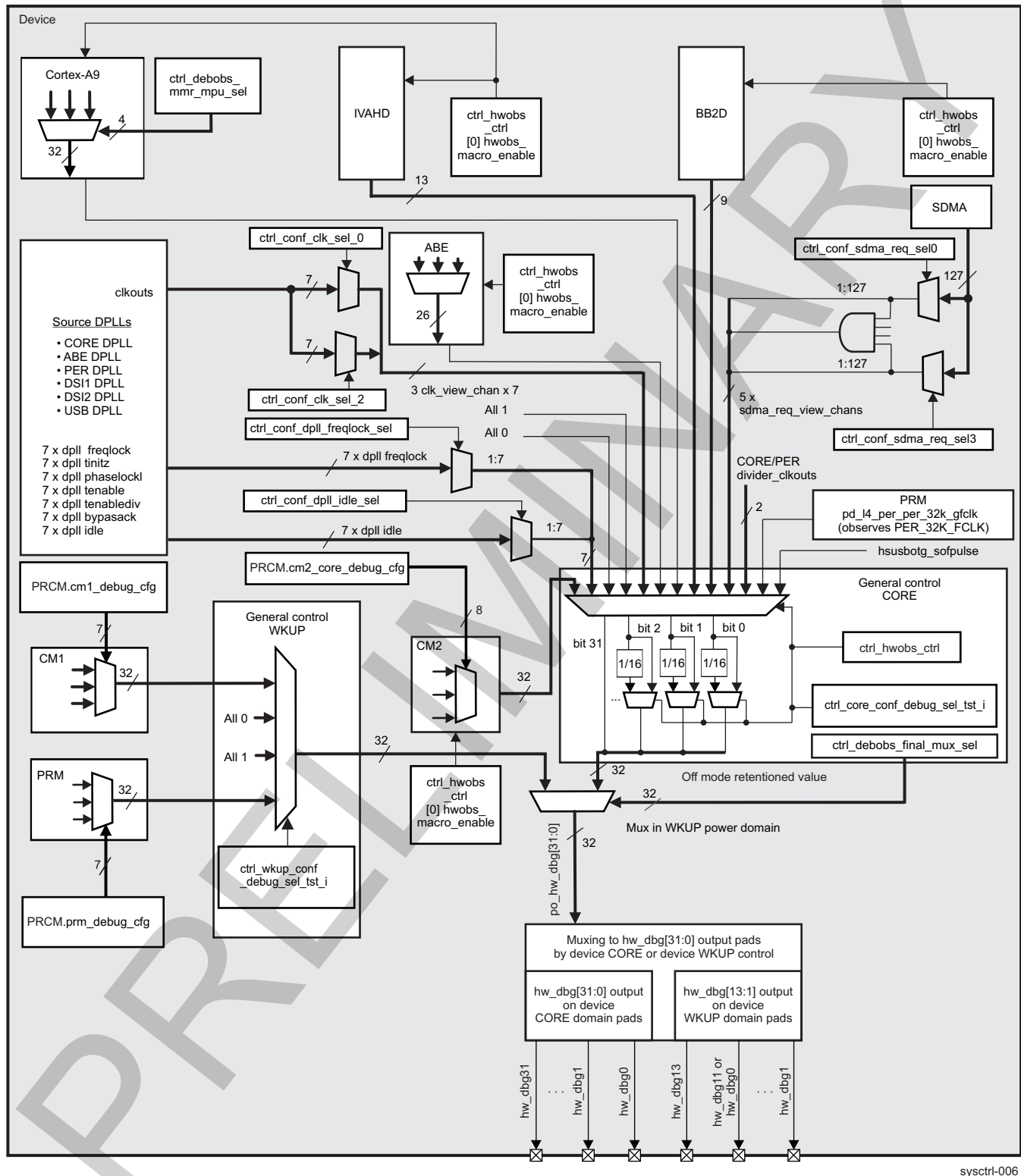
- Power and reset management protocol inside different power domains
- Power domain states/transition indication
- Interrupt requests by different modules
- DMA requests by different modules
- Clocks and clock management

The associated signal multiplexing function is controlled through the hardware observability I/O multiplexing registers (32-bit read/write registers). The selected observable signals are multiplexed between the general control module CORE and/or WKUP power domain and are output on the

po_hw_dbg[31:0] observability bus at the boundaries of the general wake-up control module. The po_hw_dbg[31:0] observability outputs are then exported to the device control module logic to be further multiplexed as their corresponding hw_dbg[31:0] signals on the different pads of the WKUP or CORE power domain of the device control module (see [Section 19.4.11.4, Observability Signals Multiplexing at Device Control Module Level](#)).

NOTE: Each signal po_hw_dbg_i (where i = 0 to 31) of the general control wakeup po_hw_dbg[31:0] bus is propagated by device control module-level logic as its corresponding hw_dbg_i output signal at the device boundary (where i = 0 to 31) for the device CORE power domain pads and where i = 0 to 13 for the device WKUP power domain pads (with the constraint that hw_dbg₀ and hw_dbg₁₁ are multiplexed on the same WKUP power domain pad) described in [Section 19.4.11.4, Observability Signals Multiplexing at Device Control Module Level](#).

[Figure 19-23](#) is an overview of observability multiplexing, which minimizes the number of signals exchanged at the device boundary.

Figure 19-23. Overview of the Hardware Observability Functionality

sysctrl-006

19.4.11.2 Observability Gating Capabilities

The programmer has the option to gate all 32 signals of the observability bus simultaneously at the

observability paths of the CORE and WKUP power domains, keeping them tied to 1 ([CONTROL_HWOBS_CONTROL](#)[1] HWOBS_ALL_ONE_MODE = 0b1) or keeping them tied to 0 ([CONTROL_HWOBS_CONTROL](#)[2] HWOBS_ALL_ZERO_MODE = 0b1). This can be useful to check the path from hardware observability to external pads. These two bits must be set to 0 to enable the observability feature for all observability pads.

Additionally, the [CONTROL_HWOBS_CONTROL](#)[0] HWOBS_MACRO_ENABLE bit provides the gating feature only to observability signals muxed in the CORE power domain that come from the following modules (identified in the so-called MACRO group):

- CORTEX-A9 MPU subsystem
-
- IVA-HD
- BB2D
- CM2
- ABE

When [CONTROL_HWOBS_CONTROL](#)[0] HWOBS_MACRO_ENABLE = 0b0, the observability outputs associated with the MACRO group are gated and forced to 0b0.

NOTE: Do not set the observability gating bits [CONTROL_HWOBS_CONTROL](#)[1] HWOBS_ALL_ONE_MODE and [CONTROL_HWOBS_CONTROL](#)[2] HWOBS_ALL_ZERO_MODE simultaneously to 1 to avoid undefined states of the observability bus.

The clock frequency of the hw_dbg0, hw_dbg1, and hw_dbg2 signals can be optionally divided by 1, 2, 4, 8, or 16 through programming dedicated bit fields in [CONTROL_HWOBS_CONTROL](#).

Assignment of dividers to the hw_dbg0, hw_dbg1, and hw_dbg2 signals applies only in the CORE power domain, as follows:

- [7:3] HWOBS_CLKDIV_SEL for hw_dbg0
- [13:9] HWOBS_CLKDIV_SEL_1 for hw_dbg1
- [18:14] HWOBS_CLKDIV_SEL_2 for hw_dbg2

NOTE: Only the CORE power domain signals hw_dbg0, hw_dbg1, and hw_dbg2 pass through the [CONTROL_HWOBS_CONTROL](#) programmable dividers. These dividers are not available to the corresponding po_hw_dbg(0), po_hw_dbg(1), and po_hw_dbg(2) lines in the WKUP power domain.

NOTE: To enable observability over the po_hw_dbg(0), po_hw_dbg(1), and po_hw_dbg(2) bus lines, the HWOBS_CLKDIV_SEL, HWOBS_CLKDIV_SEL_1, and HWOBS_CLKDIV_SEL_2 bit fields in the [CONTROL_HWOBS_CONTROL](#) register must be set different than 0. The default value (0) is not sufficient to see the observability value at the hw_dbg0, hw_dbg1, and hw_dbg2 pins.

NOTE: The hw_dbg0, hw_dbg1, and hw_dbg2 frequency division and ability to gate the MACRO group observability signals (hw_dbg i, configurable in the [CONTROL_HWOBS_CONTROL](#) register) are limited to the hardware observability signals hw_dbg i (where i = 0 to 31) multiplexed and propagated in the CORE power domain ([CONTROL_DEBOBS_FINAL_MUX_SEL](#)[i] SELECT = 0b1).

These options do not apply to the hardware observability signals, hw_dbg i (where i = 0 to 31), which are muxed in the WKUP power domain ([CONTROL_DEBOBS_FINAL_MUX_SEL](#)[i] SELECT = 0x0).

19.4.11.3 Observability Signals Multiplexing at General Core/Wake-Up Control Level

Most of the observability multiplexers (MACRO group modules/DPLLs/sDMA associated) are configurable in the General Core Control Module, which is part of the switchable CORE power domain. Signal multiplexers are also instantiated in the general wakeup control module (CM1/PRM dedicated), which is part of the WKUP power domain. The [CONTROL_DEBOBS_FINAL_MUX_SEL](#)[31:0] SELECT bit field, instantiated in the CORE power domain, selects a signal to be observed between the outputs at the CORE and WKUP multiplexing levels. A bit from this register set to 1 selects to route a signal from the CORE power domain to a certain po_hw_dbg_n (where n = 0...31) line, and when the bit is set to 0, selects to route a signal from the WKUP power domain to the same line. The output of this top-level multiplexing is further passed to the padconfiguration muxing I/O level within device control module boundaries.

NOTE: Although the [CONTROL_DEBOBS_FINAL_MUX_SEL](#) observability control register is in the CORE power domain, its value is retentioned before the device goes into off mode. Thus, the preserved value is used to control the final observability muxer in the WKUP power domain, even when the PD_CORE supply in the device is switched off. Because the hw_dbg_i signals, which are propagated in the CORE power domain, are not available in off mode, the value of [CONTROL_DEBOBS_FINAL_MUX_SEL](#)[i] SELECT = 0b1 (where i = 0 to 31) in this case means that the hw_dbg_i signal is not available at output.

The module and view-channel selection/reduction layer in the CORE domain is configured through the 4-bit field MODE in the 32 × 32-bit registers [CONTROL_CORE_CONF_DEBUG_SEL_TST_0](#) through [CONTROL_CORE_CONF_DEBUG_SEL_TST_31](#). The following modules can be selected as source of observability signals: Cortex-A9 MPU subsystem, IVA-HD, BB2D, CM2, and ABE (MACRO signal sources).

Some of the [CONTROL_CORE_CONF_DEBUG_SEL_TST](#) registers are responsible for selection of sDMA view channels, different DPLL clock view channels, and other signal view channels.

- 3 x DPLL clockout signal view channels
- 7 x DPLL (other than clkout signal) view channels
- 5 x sDMA signal view channels
- 3 x additional clockout view channels monitoring the hwobs_coredivider_clkout3, hwobs_perdivider_clkout4, and hwobs_pd_l4_per_per32k_gfclk signals.

[Table 19-22](#) summarizes the internal signals multiplexing schema for each of the 32 [CONTROL_CORE_CONF_DEBUG_SEL_TST](#) registers.

Table 19-22. CORE Power Domain Observability Signals Multiplexing

| REG_NAME | REG_ID | REG_OFFSET | REG_RESET | INPUT0 | INPUT1 | INPUT2 | INPUT3 | INPUT4 | INPUT5 | INPUT6 | INPUT7 | INPUT8 | INPUT9 | INPUT10 | INPUT11 | INPUT12 |
|---|--------|------------|---------------------|------------------|----------------|----------|----------|---|------------------|--------------------|----------|------------------|---|----------|----------|---|
| Reg Name | Reg | Reg | Mode value upon POR | Mode 0x0 | Mode 0x1 | Mode 0x2 | Mode 0x3 | Mode 0x4 | Mode 0x5 | Mode 0x6 | Mode 0x7 | Mode 0x8 | Mode 0x9 | Mode 0xA | Mode 0xB | Mode 0xC |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_0 | 0 | 0x0480 | 0x0 | hwobs_int_mpu(0) | clk_view_0 | Reserved | Reserved | This information is not available in the public domain. | hwobs_int_cm2(0) | hwobs_int_ivahd(0) | Reserved | hwobs_int_abe(0) | This information is not available in the public domain. | Reserved | Reserved | This information is not available in the public domain. |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_1 | 1 | 0x0484 | 0x0 | hwobs_int_mpu(1) | clk_view_1 | Reserved | Reserved | Reserved | hwobs_int_cm2(1) | hwobs_int_ivahd(1) | Reserved | hwobs_int_abe(1) | This information is not available in the public domain. | Reserved | Reserved | hwobs_bb2d_sys_interrupt_reqz |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_2 | 2 | 0x0488 | 0x0 | hwobs_int_mpu(2) | clk_view_2 | Reserved | Reserved | Reserved | hwobs_int_cm2(2) | hwobs_int_ivahd(2) | Reserved | hwobs_int_abe(2) | This information is not available in the public domain. | Reserved | Reserved | hwobs_bb2d_mconnect_1 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_3 | 3 | 0x048C | 0x0 | hwobs_int_mpu(3) | dppll_freqlock | Reserved | Reserved | Reserved | hwobs_int_cm2(3) | hwobs_int_ivahd(3) | Reserved | hwobs_int_abe(3) | This information is not available in the public domain. | Reserved | Reserved | hwobs_bb2d_mconnect_0 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_4 | 4 | 0x0490 | 0x0 | hwobs_int_mpu(4) | dppll_tinitz | Reserved | Reserved | Reserved | hwobs_int_cm2(4) | hwobs_int_ivahd(4) | Reserved | hwobs_int_abe(4) | This information is not available in the public domain. | Reserved | Reserved | hwobs_bb2d_sconnect_2 |

Table 19-22. CORE Power Domain Observability Signals Multiplexing (continued)

| REG_NAME | REG_ID | REG_OFFSET | REG_RESET | INPUT0 | INPUT1 | INPUT2 | INPUT3 | INPUT4 | INPUT5 | INPUT6 | INPUT7 | INPUT8 | INPUT9 | INPUT10 | INPUT11 | INPUT12 |
|--|--------|------------|-----------|-------------------|------------------|-----------------|----------|----------|-------------------|---------------------|----------|-------------------|---|----------|----------|----------------------|
| CONTROL_CORE_CONF_DEBUG_SEL_TST_5 | 5 | 0x0494 | 0x0 | hwobs_int_mpu(5) | dppll_phaselock | Reserved | Reserved | Reserved | hwobs_int_cm2(5) | hwobs_int_ivahd(5) | Reserved | hwobs_int_abe(5) | This information is not available in the public domain. | Reserved | Reserved | hwobs_bb2d_sconnet_1 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_6 | 6 | 0x0498 | 0x0 | hwobs_int_mpu(6) | Reserved | Reserved | Reserved | Reserved | hwobs_int_cm2(6) | hwobs_int_ivahd(6) | Reserved | hwobs_int_abe(6) | This information is not available in the public domain. | Reserved | Reserved | hwobs_bb2d_sconnet_0 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_7 | 7 | 0x049C | 0x0 | hwobs_int_mpu(7) | dppll_tenable | sdma_req_view_0 | Reserved | Reserved | hwobs_int_cm2(7) | hwobs_int_ivahd(7) | Reserved | hwobs_int_abe(7) | This information is not available in the public domain. | Reserved | Reserved | hwobs_bb2d_pggoodin |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_8 | 8 | 0x04A0 | 0x0 | hwobs_int_mpu(8) | dppll_tenablediv | sdma_req_view_1 | Reserved | Reserved | hwobs_int_cm2(8) | hwobs_int_ivahd(8) | Reserved | hwobs_int_abe(8) | This information is not available in the public domain. | Reserved | Reserved | hwobs_bb2d_ponin |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_9 | 9 | 0x04A4 | 0x0 | hwobs_int_mpu(9) | dppll_bypassack | sdma_req_view_2 | Reserved | Reserved | hwobs_int_cm2(9) | hwobs_int_ivahd(9) | Reserved | hwobs_int_abe(9) | This information is not available in the public domain. | Reserved | Reserved | hwobs_bb2d_ponout |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_10 | 10 | 0x04A8 | 0x0 | hwobs_int_mpu(10) | dppll_idle | sdma_req_view_3 | Reserved | Reserved | hwobs_int_cm2(10) | hwobs_int_ivahd(10) | Reserved | hwobs_int_abe(10) | This information is not available in the public domain. | Reserved | Reserved | N/A |

Table 19-22. CORE Power Domain Observability Signals Multiplexing (continued)

| REG_NAME | REG_ID | REG_OFFSET | REG_RESET | INPUT0 | INPUT1 | INPUT2 | INPUT3 | INPUT4 | INPUT5 | INPUT6 | INPUT7 | INPUT8 | INPUT9 | INPUT10 | INPUT11 | INPUT12 |
|--|--------|------------|-----------|-------------------|-------------------------|---------------------------|----------|----------|-------------------|---------------------|----------|-------------------|---|----------|----------|---------|
| CONTROL_CORE_CONF_DEBUG_SEL_TST_11 | 11 | 0x04AC | 0x0 | hwobs_int_mpu(11) | hwobs_hsusbotg_sofpulse | sdma_req_view_all | Reserved | Reserved | hwobs_int_cm2(11) | hwobs_int_ivahd(11) | Reserved | hwobs_int_abe(11) | This information is not available in the public domain. | Reserved | Reserved | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_12 | 12 | 0x04B0 | 0x0 | hwobs_int_mpu(12) | Reserved | hwobs_coredivider_clkout3 | Reserved | Reserved | hwobs_int_cm2(12) | hwobs_int_ivahd(12) | Reserved | hwobs_int_abe(12) | This information is not available in the public domain. | Reserved | Reserved | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_13 | 13 | 0x04B4 | 0x0 | hwobs_int_mpu(13) | Reserved | hwobs_perdivider_clkout4 | Reserved | Reserved | hwobs_int_cm2(13) | hwobs_int_ivahd(13) | Reserved | hwobs_int_abe(13) | This information is not available in the public domain. | Reserved | Reserved | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_14 | 14 | 0x04B8 | 0x0 | hwobs_int_mpu(14) | Reserved | hwobs_pd_l4_per32k_gfclk | Reserved | Reserved | hwobs_int_cm2(14) | hwobs_int_ivahd(14) | Reserved | hwobs_int_abe(14) | This information is not available in the public domain. | Reserved | Reserved | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_15 | 15 | 0x04BC | 0x0 | hwobs_int_mpu(15) | Reserved | 0 | Reserved | Reserved | hwobs_int_cm2(15) | hwobs_int_ivahd(15) | Reserved | hwobs_int_abe(15) | This information is not available in the public domain. | Reserved | Reserved | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_16 | 16 | 0x04C0 | 0x0 | hwobs_int_mpu(16) | Reserved | 0 | Reserved | Reserved | hwobs_int_cm2(16) | hwobs_int_ivahd(16) | Reserved | hwobs_int_abe(16) | This information is not available in the public domain. | Reserved | Reserved | N/A |

Table 19-22. CORE Power Domain Observability Signals Multiplexing (continued)

| REG_NAME | REG_ID | REG_OFFSET | REG_RESET | INPUT0 | INPUT1 | INPUT2 | INPUT3 | INPUT4 | INPUT5 | INPUT6 | INPUT7 | INPUT8 | INPUT9 | INPUT10 | INPUT11 | INPUT12 |
|--|--------|------------|-----------|-------------------|----------|--------|----------|----------|-------------------|---------------------|----------|-------------------|---|----------|----------|---------|
| CONTROL_CORE_CONF_DEBUG_SEL_TST_17 | 17 | 0x04C4 | 0x0 | hwobs_int_mpu(17) | Reserved | 0 | Reserved | Reserved | hwobs_int_cm2(17) | hwobs_int_ivahd(17) | Reserved | hwobs_int_abe(17) | This information is not available in the public domain. | Reserved | Reserved | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_18 | 18 | 0x04C8 | 0x0 | hwobs_int_mpu(18) | Reserved | 0 | Reserved | Reserved | hwobs_int_cm2(18) | hwobs_int_ivahd(18) | Reserved | hwobs_int_abe(18) | This information is not available in the public domain. | Reserved | Reserved | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_19 | 19 | 0x04CC | 0x0 | hwobs_int_mpu(19) | Reserved | 0 | Reserved | Reserved | hwobs_int_cm2(19) | hwobs_int_ivahd(19) | Reserved | hwobs_int_abe(19) | This information is not available in the public domain. | Reserved | Reserved | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_20 | 20 | 0x04D0 | 0x0 | hwobs_int_mpu(20) | Reserved | 0 | Reserved | Reserved | hwobs_int_cm2(20) | hwobs_int_ivahd(20) | Reserved | hwobs_int_abe(20) | This information is not available in the public domain. | Reserved | Reserved | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_21 | 21 | 0x04D4 | 0x0 | hwobs_int_mpu(21) | Reserved | 0 | Reserved | Reserved | hwobs_int_cm2(21) | hwobs_int_ivahd(21) | Reserved | hwobs_int_abe(21) | This information is not available in the public domain. | Reserved | N/A | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_22 | 22 | 0x04D8 | 0x0 | hwobs_int_mpu(22) | Reserved | 0 | Reserved | Reserved | hwobs_int_cm2(22) | hwobs_int_ivahd(22) | Reserved | hwobs_int_abe(22) | This information is not available in the public domain. | Reserved | N/A | N/A |

Table 19-22. CORE Power Domain Observability Signals Multiplexing (continued)

| REG_NAME | REG_ID | REG_OFFSET | REG_RESET | INPUT0 | INPUT1 | INPUT2 | INPUT3 | INPUT4 | INPUT5 | INPUT6 | INPUT7 | INPUT8 | INPUT9 | INPUT10 | INPUT11 | INPUT12 |
|--|--------|------------|-----------|-------------------|----------|--------|----------|----------|-------------------|---------------------|----------|-------------------|---|----------|---------|-----------------|
| CONTROL_CORE_CONF_DEBUG_SEL_TST_23 | 23 | 0x04DC | 0x0 | hwobs_int_mpu(23) | Reserved | 0 | Reserved | Reserved | hwobs_int_cm2(23) | hwobs_int_ivahd(23) | Reserved | hwobs_int_abe(23) | This information is not available in the public domain. | Reserved | N/A | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_24 | 24 | 0x04E0 | 0x0 | hwobs_int_mpu(24) | Reserved | 0 | Reserved | Reserved | hwobs_int_cm2(24) | hwobs_int_ivahd(24) | Reserved | hwobs_int_abe(24) | This information is not available in the public domain. | Reserved | N/A | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_25 | 25 | 0x04E4 | 0x0 | hwobs_int_mpu(25) | Reserved | 0 | Reserved | Reserved | hwobs_int_cm2(25) | hwobs_int_ivahd(25) | Reserved | hwobs_int_abe(25) | This information is not available in the public domain. | Reserved | N/A | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_26 | 26 | 0x04E8 | 0x0 | hwobs_int_mpu(26) | Reserved | 0 | Reserved | 0 | hwobs_int_cm2(26) | hwobs_int_ivahd(26) | Reserved | hwobs_int_abe(26) | This information is not available in the public domain. | Reserved | N/A | N/A |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_27 | 27 | 0x04EC | 0x0 | hwobs_int_mpu(27) | Reserved | 0 | Reserved | 0 | hwobs_int_cm2(27) | hwobs_int_ivahd(27) | Reserved | hwobs_int_abe(27) | This information is not available in the public domain. | Reserved | 0 | sdma_req_view_0 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_28 | 28 | 0x04F0 | 0x0 | hwobs_int_mpu(28) | Reserved | 0 | Reserved | 0 | hwobs_int_cm2(28) | hwobs_int_ivahd(28) | Reserved | hwobs_int_abe(28) | This information is not available in the public domain. | Reserved | 0 | sdma_req_view_1 |

Table 19-22. CORE Power Domain Observability Signals Multiplexing (continued)

| REG_NAME | REG_ID | REG_OFFSET | REG_RESET | INPUT0 | INPUT1 | INPUT2 | INPUT3 | INPUT4 | INPUT5 | INPUT6 | INPUT7 | INPUT8 | INPUT9 | INPUT10 | INPUT11 | INPUT12 |
|--|--------|------------|-----------|-------------------|----------|--------|----------|--------|-------------------|---------------------|----------|-------------------|---|----------|---------|-------------------|
| CONTROL_CORE_CONF_DEBUG_SEL_TST_29 | 29 | 0x04F4 | 0x0 | hwobs_int_mpu(29) | Reserved | 0 | Reserved | 0 | hwobs_int_cm2(29) | hwobs_int_ivahd(29) | Reserved | hwobs_int_abe(29) | This information is not available in the public domain. | Reserved | 0 | sdma_req_view_2 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_30 | 30 | 0x04F8 | 0x0 | hwobs_int_mpu(30) | Reserved | 0 | Reserved | 0 | hwobs_int_cm2(30) | hwobs_int_ivahd(30) | Reserved | hwobs_int_abe(30) | This information is not available in the public domain. | Reserved | 0 | sdma_req_view_3 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_31 | 31 | 0x04FC | 0x0 | hwobs_int_mpu(31) | Reserved | 0 | Reserved | 0 | hwobs_int_cm2(31) | hwobs_int_ivahd(31) | Reserved | hwobs_int_abe(31) | This information is not available in the public domain. | Reserved | 0 | sdma_req_view_all |

A third 1:N selection layer is applied over several signals to route them one-at-a-time to a certain view channel output:

- The [CONTROL_CONF_CLK_SEL0\[2:0\]](#) MULT through [CONTROL_CONF_CLK_SEL2\[2:0\]](#) MULT bit fields control the multiplexing of DPLL CLKOUT signals over three parallel DPLL clockout view channels. The signal source of a certain view channel can be selected to be one of six DPLLs in the device:
 - CORE DPLL
 - ABE DPLL
 - PER DPLL
 - DSI1 DPLL
 - DSI2 DPLL
 - USB DPLL
- The register bit fields associated with the seven different DPLL signal view channels are summarized in [Table 19-23](#). Again, the 3-bit MULT bit field in each of the seven registers makes it possible to choose the source of the DPLL signal to be one of the following device DPLLs:
 - CORE DPLL
 - ABE DPLL
 - PER DPLL
 - DSI1 DPLL

- DSI2 DPLL
- USB DPLL
- There are four independent sDMA request view channels, each of which has a dedicated register ([CONTROL_CONF_SDMA_REQ_SEL0](#) through [CONTROL_CONF_SDMA_REQ_SEL3](#)) with a 7-bit MULT bit field to select one from 127 possible sDMA request signals for observation purposes. For more information, see [Chapter 17, sDMA Controller](#). The fifth channel, sdma_req_view_all, is acquired by applying logical AND reduction over the four currently selected sDMA view channel output signals.
- The General Core observability logic input (hwobs_pd_l4_per_per32k_gfclk) is tied to the PRM output observability signal (pd_l4_per_per_32k_gfclk). The pd_l4_per_per_32k_gfclk signal corresponds to the hardware gated in the L4_PER clock domain clock (PER_32K_FCLK), which is directly sourced by the SCRM clock (32K_FCLK). For more information, see [Section 3.6.3.1, PRM Clock Source](#), in [Chapter 3, Power, Reset, and Clock Management](#). The PER_32K_FCLK and 32K_FCLK clocks are also multiplexed for observability in the WKUP domain when the PRCM.PRM_DEBUG_CFG[6:0] bit field is set to 0x6C. The observable signals are devfsm_I0.clk and gat_per_32k_gfclk_I0.clkGated, respectively. For more information, see [Table 19-42, PRM Observable Signals](#).
- The General Core observability logic input, hwobs_coredivider_clkout3, is tied to the Core DPLL observability output, CLK_FUNC_1_0_3, which is a direct (nongated, nondivided) version of the CORE DPLL clock output, CLKOUTX2_M3. For more information, see [Section 3.6.3.5, DPLL_CORE Description](#), in [Chapter 3, Power, Reset, and Clock Management](#).
- The General Core observability logic input, hwobs_perdivider_clkout4, is tied to the Core DPLL observability output, CLK_FUNC_1_0_4, which is a direct (nongated, nondivided) version of the PER DPLL clock output, CLKOUTX2_M4. For more information, see [Section 3.6.3.4, DPLL_PER Description](#), in [Chapter 3, Power, Reset, and Clock Management](#).

[Table 19-23](#) lists the DPLL signal observability controls.

Table 19-23. DPLL Signal Observability Controls

| Feature | Type | Register/Bit Field/Observability Control | Description |
|--|---------|---|--|
| Different domain DPLL freqlock observability | Control | CONTROL_CONF_DPLL_FREQLOCK_SEL [2:0] MULT | Selects DPLL freqlock view channel (1:8) |
| Different domain DPLL phaselock observability | Control | CONTROL_CONF_DPLL_PHASELOCK_SEL [2:0] MULT | Selects DPLL phaselock view channel (1:8) |
| Different domain DPLL tinitz observability | Control | CONTROL_CONF_DPLL_TINITZ_SEL [2:0] MULT | Selects to observe DPLL tinitzview channel (1:8) |
| Different domain DPLL tenable observability | Control | CONTROL_CONF_DPLL_TENABLE_SEL [2:0] MULT | Selects to observe DPLL tenableview channel (1:8) |
| Different domain DPLL tenablediv observability | Control | CONTROL_CONF_DPLL_TENABLEDIV_SEL [2:0] MULT | Selects to observe DPLL tenabledivview channel (1:8) |
| Different domain DPLL bypassack observability | Control | CONTROL_CONF_DPLL_BYPASSACK_SEL [2:0] MULT | Selects to observe DPLL bypassackview channel (1:8) |
| Different domain DPLL idle observability | Control | CONTROL_CONF_DPLL_IDLE_SEL [2:0] MULT | Selects to observe DPLL idleview channel (1:8) |

NOTE: Features configured in the following registers are limited to hardware observability signals, hw_dbg i (where i = 0 to 31), multiplexed and propagated in the CORE power domain ([CONTROL_DEBOBS_FINAL_MUX_SEL\[i\] SELECT = 0b1](#)):

- [CONTROL_CORE_CONF_DEBUG_SEL_TST_0](#) through [CONTROL_CORE_CONF_DEBUG_SEL_TST_31](#)
- [CONTROL_CONF_CLK_SEL0\[2:0\] MULT](#) through [CONTROL_CONF_CLK_SEL2\[2:0\] MULT](#)
- [CONTROL_CONF_SDMA_REQ_SEL0](#) through [CONTROL_CONF_SDMA_REQ_SEL3](#)
- [CONTROL_CONF_DPLL_FREQLOCK_SEL](#)
- [CONTROL_CONF_DPLL_TINITZ_SEL](#)
- [CONTROL_CONF_DPLL_PHASELOCK_SEL](#)
- [CONTROL_CONF_DPLL_TENABLE_SEL](#)
- [CONTROL_CONF_DPLL_TENABLEDIV_SEL](#)
- [CONTROL_CONF_DPLL_BYPASSACK_SEL](#)
- [CONTROL_CONF_DPLL_IDLE_SEL](#)

These options are not applicable to hardware observability signals, hw_dbg i (where i = 0 to 31), which at the general control module level are muxed in the WKUP power domain ([CONTROL_DEBOBS_FINAL_MUX_SEL\[i\] SELECT = 0b0](#)).

The [CONTROL_WKUP_CONF_DEBUG_SEL_TST_i\[0\] MODE](#) bit (where i = 0...31) provides the option to choose between observation of power and reset manager signals in the device or observation of signals related to CM1. If [CONTROL_WKUP_CONF_DEBUG_SEL_TST_i\[0\] = 0b1](#), the hwobs_int_prm_i signal is selected. Otherwise, the hwobs_int_cm1_i signal is output.

NOTE: The CM1 and PRM observable signals are multiplexed in the WKUP power domain.

19.4.11.4 Observability Signals Multiplexing at Device Control Module Level

The pads used for the hardware debug must be properly configured by selecting the hardware debug function (hw_dbgn) of the pad.

19.4.11.4.1 Observability Signals Muxed on Pads in Core Power Domain

To map the hw_dbg0 through hw_dbg19 signals to their associated external device pads in the CORE power domain, set the related MUXMODE bit fields within the [CONTROL_CORE_PAD0_SYS_BOOT5_PAD1_DPM_EMU0](#) through [CONTROL_CORE_PAD0_DPM_EMU19_PAD1_CSI22_DX2](#) padconfiguration registers to 0b110 (Mode 6). To make the remaining signals (hw_dbg20 through the hw_dbg31) available at their corresponding device pads in the CORE power domain, set the MUXMODE bit fields within the [CONTROL_CORE_PAD0_CAM_GLOBALRESET_PAD1_USBB1_ULPITLL_CLK](#) through [CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT7_PAD1_USBB1_HSIC_DATA](#) padconfiguration registers to 0b110 (Mode 6).

For more information, see [Table 19-10](#), *Device Core Control Module Pad Configuration Register Fields*.

For more information about hardware observability configuration, see [Table 19-110](#), *ACTIVE PADS Configuration Points*.

NOTE: The hw_dbg i signals (where i = 0 to 31), which are multiplexed and propagated in the CORE power domain, are not visible when the device is set in off mode (PD_CORE supply switched off).

19.4.11.4.2 Observability Signals Muxed on Pads in WKUP Power Domain

To have hw_dbg1 through hw_dbg13 signals multiplexed on the WKUP power domain pads, set MuxMode = 0x6 in the following SYSCTRL_PADCONF_WKUP registers:

- [CONTROL_WKUP_PAD0_GPIO_WK0_PAD1_GPIO_WK1](#) through [CONTROL_WKUP_PAD0_GPIO_WK2_PAD1_GPIO_WK3](#)[31:16] to have the hw_dbg1–hw_dbg4 signals output on the gpio_wk0–gpio_wk3 device pads, respectively
- [CONTROL_WKUP_PAD0_GPIO_WK4_PAD1_SR_SCL](#)[15:0] to have the hw_dbg5 signal output on the gpio_wk4 device pad
- [CONTROL_WKUP_PAD0_FREF_CLK0_OUT_PAD1_FREF_CLK3_REQ](#) through [CONTROL_WKUP_PAD0_FREF_CLK3_OUT_PAD1_FREF_CLK4_REQ](#) to have the hw_dbg6–hw_dbg9 signal output on the fref_clk0_out, fref_clk3_req, fref_clk3_out, and fref_clk4_req device pads, respectively
- [CONTROL_WKUP_PAD0_FREF_CLK4_OUT_PAD1_SYS_32K](#)[15:0] to have the hw_dbg10 signal output on the fref_clk4_out device pad
- [CONTROL_WKUP_PAD0_SYS_PWR_REQ_PAD1_SYS_PWRON_RESET_OUT](#)[31:16] to have the hw_dbg11 signal output on the sys_pwrn_reset_out device pad
- [CONTROL_WKUP_PAD0_SYS_BOOT6_PAD1_SYS_BOOT7](#) to have the hw_dbg12 and hw_dbg13 signals output on the sys_boot6 and sys_boot7 device pads, respectively

The hw_dbg0 signal is available on the sys_pwrn_reset_out pad in WKUP domain, through setting MuxMode=0x5 in

the [CONTROL_WKUP_PAD0_SYS_PWR_REQ_PAD1_SYS_PWRON_RESET_OUT](#)[31:16] register.

Because hw_dbg11 (MuxMode=0x6) and hw_dbg0 (MuxMode=0x5) are muxed on the same pad - sys_pwrn_reset_out, user should make choice between the two observable signals in WKUP domain

See [Table 19-9](#), *Device Wakeup Control Module Pad Configuration Register Fields* for more information.

See [Table 19-110](#), *ACTIVE PADS Configuration Points*, for more details on hardware observability configuration.

NOTE: If multiplexed on corresponding device pads in the WKUP power domain, the hw_dbg i signals (where i = 0 to 31), which are multiplexed and propagated in the WKUP power domain, can be observed even if the device goes into off mode.

19.4.11.5 Observability Signals Sourced at Module Level

Observable signals coming from within different device subsystems are mapped to general core control and general wakeup control observability inputs. Additional multiplexing is also implemented inside some of the observable modules (see [Figure 19-23, Overview of the Hardware Observability Functionality](#)).

19.4.11.5.1 Dual Cortex-A9 Subsystem Observable Signals

[Table 19-24](#) through [Table 19-32](#) list the Cortex-A9 MPU subsystem observable signals available in 12 functional multiplexing modes. The mode is selected at the general core control module level by programming the [CONTROL_DEBOBS_MMR_MPU\[3:0\]](#) SELECT bit field. The SELECT values in range (0xC–0xF) are reserved for future use.

Table 19-24. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 0

| CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b0000 | | | |
|--|--|--|--|
| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
| hwobs_int_mpu[31:24] | Intr[7:0] | hwobs_int_mpu(31) down to hwobs_int_mpu(24) correspond to Cortex-A9 MPU subsystem interrupt requests on lines MA_IRQ_7 down to MA_IRQ_0. For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | – |
| hwobs_int_mpu[23] | mpu_rstn | MPU warm reset | – |
| hwobs_int_mpu[22] | mpu_pwron_rstn | MPU power-on reset | – |
| hwobs_int_mpu[21:15] | Reserved | – | – |
| hwobs_int_mpu[14] | CPU0 Standby | Standby request asserted from CPU0 L1STBY ctrl to the local PRM wrapper | |
| hwobs_int_mpu[13] | CPU1 Standby | Standby request asserted from CPU1 L1STBY ctrl to the local PRM wrapper | |
| hwobs_int_mpu[12] | DPLLPhaseLock | Module in phase lock condition | Active high |
| hwobs_int_mpu[11] | DPLL Clock / 16 | MPU DPLL clock divided by 16 | |
| hwobs_int_mpu[10] | DPLLFreqLock | Module in freqlock condition | |
| hwobs_int_mpu[9] | PRESETN | Debug reset | |
| hwobs_int_mpu[8] | ATRESETN | Trace reset | |
| hwobs_int_mpu[7] | DPLLInitZ | – | |
| hwobs_int_mpu[6:5] | Reserved | – | |
| hwobs_int_mpu[4] | nCPURESET[0] | Cortex-A9 CPU reset (per CPU0) | |
| hwobs_int_mpu[3] | PIDPLLDLE | Observes PLL to Idle mode setting. Sets CLKOUT to the bypass mode clock as selected by ULOWCLKEN. | |
| hwobs_int_mpu[2] | PROFILING_EVENT2PRM[2:0] | Output to PRM for profiling local CPU0 power status | See Table 19-28 for signal descriptions. |
| hwobs_int_mpu[1] | | | |
| hwobs_int_mpu[0] | | | |

Table 19-25. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 1

| CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b0001 | | | |
|---|---|--|--|
| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
| hwobs_int_mpu[31:10] | Reserved | – | – |
| hwobs_int_mpu[9] | WDRESET | Watchdog status reset | – |
| hwobs_int_mpu[8] | ack_abe_final_phase | Last Ack pulse in period of the abe_clk generated at MPU subsystem level, used for ABE interface | – |
| hwobs_int_mpu[7] | ack_l3_final_phase | Last Ack pulse in period of the l3_clk generated at MPU subsystem level, used for L3 interface | – |
| hwobs_int_mpu[6:5] | Reserved | – | – |
| hwobs_int_mpu[4] | nCPURESET[1] | Cortex-A9 CPU Reset (per CPU1) | |
| hwobs_int_mpu[3] | ARM_FCLK / 16 | Cortex-A9 CPU0/CPU1 input clock divided by 16 | |
| hwobs_int_mpu[2] | PROFILING_EVENT2PRM[5:3] | Output to PRM for profiling local CPU0 power status | See Table 19-28 for signal descriptions. |
| hwobs_int_mpu[1] | | | |
| hwobs_int_mpu[0] | | | |

Table 19-26. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 2

| CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b0010 | | | |
|---|---|---|------------------------------|
| SYSCTRL_GENERAL_CORE Observability Inputs tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
| hwobs_int_mpu[27] | top_mstandby_0 | Standby handshake to local PRCM (CPU0) | – |
| hwobs_int_mpu[26] | top_mwait_0 | Standby wake-up handshake for CPU0 | |
| hwobs_int_mpu[25] | top_mwakeup_0 | Wake-up request from CPU0 | |
| hwobs_int_mpu[24] | top_mstandby_1 | Standby handshake to local PRCM (CPU1) | |
| hwobs_int_mpu[23] | top_mwait_1 | Standby wake-up handshake for CPU1 | – |
| hwobs_int_mpu[22] | top_mwakeup_1 | Wake-up request from CPU1 | |
| hwobs_int_mpu[21] | MSTANDBY | Global MStandby handshake to global PRCM | |
| hwobs_int_mpu[20] | MWAIT | Global MWait handshake to global PRCM | |
| hwobs_int_mpu[19] | MWAKEUP | Global Mwakeup handshake to global PRCM | |
| hwobs_int_mpu[18] | EMUASSERTNRESET[0] | Command for assertion of a local reset to CPU Core0 | |
| hwobs_int_mpu[17:8] | Reserved | – | – |
| hwobs_int_mpu[7] | DPLLInitZ | MPU subsystem DPLL initialization | |
| hwobs_int_mpu[6] | Ack / 8 | Ack is equal to ARM_FCLK / 2; thus, clock with frequency ARM_FCLK / 16 is observed. | |

Table 19-26. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 2 (continued)

CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b0010

| SYSCTRL_GENERAL_CORE Observability Inputs tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|---|---|--|--|
| hwobs_int_mpu[5] | Aclk / 8 | Aclk is equal to ARM_FCLK / 2; thus, clock with frequency ARM_FCLK / 16 is observed. | |
| hwobs_int_mpu[4] | L2_Cache_Ctrl_IDLE | IDLE state of L2-cache controller | |
| hwobs_int_mpu[3] | ARM_FCLK / 16 | Cortex-A9 CPU0/CPU1 input clock divided by 16 | |
| hwobs_int_mpu[2] | PROFILING_EVENT2PRM[8:6] | Output to PRM for profiling local CPU1 power status | See Table 19-28 for signal descriptions. |
| hwobs_int_mpu[1] | | | |
| hwobs_int_mpu[0] | | | |
| | | | |

Table 19-27. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level - Mode 3

CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b0011

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|---|---|--|--|
| hwobs_int_mpu[31:16] | Intr[31:16] | hwobs_int_mpu(31) down to hwobs_int_mpu(16) correspond to Cortex-A9 MPU subsystem interrupt requests on line :MA_IRQ_31 down to MA_IRQ_16. For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | – |
| hwobs_int_mpu[15:8] | Intr[15:8] | hwobs_int_mpu(15) down to hwobs_int_mpu(8) correspond to Cortex-A9 MPU subsystem interrupt requests on lines MA_IRQ_15 down to MA_IRQ_8. For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | – |
| hwobs_int_mpu[7] | DPLLInitZ | MPU subsystem DPLL Initialization | – |
| hwobs_int_mpu[6] | PODPLLBYPASSACK | Bypass status signal | 1 o/p clock in bypass |
| hwobs_int_mpu[5] | PIDPLLTENABLEDIV | Core RegM2/N2 load enable (L-H) | – |
| hwobs_int_mpu[4] | PIDPLLTENABLE | Core RegM2/N2 load enable (L-H) | – |
| hwobs_int_mpu[3] | ARM_FCLK / 16 | Cortex-A9 CPU0/CPU1 input clock divided by 16. | – |
| hwobs_int_mpu[2] | PROFILING_EVENT2PRM[11:9] | Output to PRM for profiling local CPU1 power status | See Table 19-28 for signal descriptions. |
| hwobs_int_mpu[1] | | | |
| hwobs_int_mpu[0] | | | |

The POPPROFILING_EVENT2PRM bus signals, observable in modes 0, 1, 2, and 3, monitor the power states of the CPU. There are 6 status bits per Cortex-A9 CPU0 and CPU1, respectively. [Table 19-28](#) describes the encoding of the status bits.

POPPROFILING_EVENT2PRM[5:0] are the status bits for CPU0, and POPPROFILING_EVENT2PRM[11:6] are the status bits for CPU1.

Table 19-28. CPU0/CPU1 PM Profiling Bus Observable Signals Description

| Bit Position (CPU0) | Bit Position (CPU1) | Descriptions |
|---------------------|---------------------|--|
| 5 | 11 | Memory in transition 1'b0 : Memory array power transition complete 1'b1 : Memory array power transition in progress |
| 4:3 | 10:9 | Memory (L1) State 2'b00 : OFF 2'b01 : RETENTION 2'b10: Reserved 2'b11: ON |
| 2 | 8 | Logic in transition 1'b0 : Power state transition complete 1'b1 : Power state transition in progress |
| 1:0 | 7:6 | Power State 2'b00 : Power Domain is OFF. 2'b01 : Power Domain is RETENTION. 2'b10: Power Domain is ON-INACTIVE. 2'b11: Power Domain is ON-ACTIVE. |

Table 19-29. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 4

CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b0100

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|--|--|--|-----------------------|
| hwobs_int_mpu[31:24] | Intr[55:48] | hwobs_int_mpu(31) down to hwobs_int_mpu(24) correspond to Cortex-A9 MPU subsystem interrupt requests on lines MA_IRQ_55 down to MA_IRQ_48. For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | — |
| hwobs_int_mpu[23:16] | Intr[47:40] | hwobs_int_mpu(23) down to hwobs_int_mpu(16) correspond to Cortex-A9 MPU subsystem interrupt requests on lines MA_IRQ_47 down to MA_IRQ_40. For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | — |
| hwobs_int_mpu[15:8] | Intr[39:32] | hwobs_int_mpu(15) down to hwobs_int_mpu(8) correspond to Cortex-A9 MPU subsystem interrupt requests on lines MA_IRQ_39 down to MA_IRQ_32. For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | — |

Table 19-29. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 4 (continued)

CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b0100

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|---|---|--|--|
| hwobs_int_mpu[7] | PIDPLLDLE | Observes PLL to Idle mode setting. Sets CLKOUT to the bypass mode clock as selected by ULOWCLKEN | 1: MPU subsystem DPLL is set to idle mode. |
| hwobs_int_mpu[6] | DPLLWRCK | – | – |
| hwobs_int_mpu[5] | DPLLCLKOUT | MPU subsystem DPLL clockout | – |
| hwobs_int_mpu[4] | EMUASSERTNRESET[1] | Command for assertion of a local reset to CPU Core1 | – |
| hwobs_int_mpu[3] | ARM_FCLK / 16 | Cortex-A9 CPU0 / CPU1 input clock divided by 16 | – |
| hwobs_int_mpu[2] | LPRM_EMU_i/f CPU0[2:0] | Latch Reset Bus Ack | – |
| hwobs_int_mpu[1] | | Force Active Ack | |
| hwobs_int_mpu[0] | | InhibitSleep Ack | |

Table 19-30. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 5

CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b0101

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|---|---|---|------------------------------|
| hwobs_int_mpu[31:16] | Intr[79:64] | hwobs_int_mpu(31) down to hwobs_int_mpu(16) correspond to Cortex-A9 MPU subsystem interrupt requests on lines MA_IRQ_79 down to MA_IRQ_64 For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | – |
| hwobs_int_mpu[15:8] | Intr[63:56] | hwobs_int_mpu(15) down to hwobs_int_mpu(8) correspond to Cortex-A9 MPU subsystem interrupt requests on lines MA_IRQ_63 down to MA_IRQ_56 For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | – |
| hwobs_int_mpu[7:4] | Reserved | – | – |
| hwobs_int_mpu[3] | ARM_FCLK / 16 | Cortex-A9 CPU0 / CPU1 input clock divided by 16 | – |
| hwobs_int_mpu[2] | LPRM_EMU_i/f CPU0[5:3] | CPU0 EMUWAITINRESET | – |
| hwobs_int_mpu[1] | | CPU0 EMURELEASEFROMWIR | – |
| hwobs_int_mpu[0] | | CPU0 EMUBLOCKRESET | – |

Table 19-31. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 6

| CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b0110 | | | |
|---|---|--|------------------------------|
| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
| hwobs_int_mpu[31:24] | Intr[103:96] | hwobs_int_mpu(31) down to hwobs_int_mpu(24) correspond to Cortex-A9 MPU subsystem interrupt requests on lines MA_IRQ_103 down to MA_IRQ_96 For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | – |
| hwobs_int_mpu[23:16] | Intr[95:88] | hwobs_int_mpu(23) down to hwobs_int_mpu(16) correspond to Cortex-A9 MPU subsystem interrupt requests on line :MA_IRQ_95 down to MA_IRQ_88 For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | – |
| hwobs_int_mpu[15:8] | Intr[87:80] | hwobs_int_mpu(15) down to hwobs_int_mpu(8) correspond to Cortex-A9 MPU subsystem interrupt requests on lines MA_IRQ_87 down to MA_IRQ_80 For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | – |
| hwobs_int_mpu[7:5] | Reserved | – | – |
| hwobs_int_mpu[4] | DPLLBYPASS | MPU DPLL bypass command | – |
| hwobs_int_mpu[3] | ARM_FCLK / 16 | Cortex-A9 CPU0 / CPU1 input clock divided by 16 | – |
| hwobs_int_mpu[2] | LPRM_EMU_i/f CPU1[2:0] | Latch Reset Bus Ack | – |
| hwobs_int_mpu[1] | | Force Active Ack | – |
| hwobs_int_mpu[0] | | InhibitSleep Ack | – |

Table 19-32. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 7

| CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b0111 | | | |
|---|---|---|------------------------------|
| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
| hwobs_int_mpu[31:16] | Intr[127: 112] | hwobs_int_mpu(31) down to hwobs_int_mpu(16) correspond to Cortex-A9 MPU subsystem interrupt requests on lines MA_IRQ_127 down to MA_IRQ_112 For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | – |

Table 19-32. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 7 (continued)

| CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b0111 | | | |
|---|---|--|------------------------------|
| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
| hwobs_int_mpu[15:8] | Intr[111: 104] | hwobs_int_mpu(15) down to hwobs_int_mpu(8) correspond to Cortex-A9 MPU subsystem interrupt requests on lines MA_IRQ_111 down to MA_IRQ_104 For more information, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller . | – |
| hwobs_int_mpu[7:4] | Reserved | – | – |
| hwobs_int_mpu[3] | ARM_FCLK / 16 | Cortex-A9 CPU0 / CPU1 input clock divided by 16 | – |
| hwobs_int_mpu[2] | LPRM_EMU_i/f CPU1[5:3] | CPU1 EMUWAITINRESET | – |
| hwobs_int_mpu[1] | | CPU1 EMURELEASEFROMWIR | – |
| hwobs_int_mpu[0] | | CPU1 EMUBLOCKRESET | – |

Table 19-33. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 8

| CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b1000 | | | |
|---|---|---|------------------------------|
| SYSCTRL_GENERAL_CORE observability inputs tied to signals inside Cortex-A9 MPU subsystem | Cortex-A9 MPU subsystem observable signals mapped to SYSCTRL_GENERAL_CORE observability inputs | Signal Description | Logical Value Meaning |
| hwobs_int_mpu[31:7] | Reserved | – | – |
| hwobs_int_mpu[6] | clkrst_emifclk_gated_hw | Copy of emifclk (ARM_FCLK / 2 or ARM_FCLK / 4 depending on EMIF_DIV_MODE input) which is gated by memory adapter hwdbgout. | – |
| hwobs_int_mpu[5:4] | Reserved | – | – |
| hwobs_int_mpu[3] | ARM_FCLK / 16 | Cortex-A9 CPU0 / CPU1 input clock divided by 16. | – |
| hwobs_int_mpu[2:0] | Reserved | – | – |

Table 19-34. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 9

| CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b1001 | | | |
|---|---|---|------------------------------|
| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
| hwobs_int_mpu[31:11] | Reserved | – | – |
| hwobs_int_mpu[10] | clkrst_emifclk_gated_hw | Copy of emifclk (ARM_FCLK / 2 or ARM_FCLK / 4, depending on EMIF_DIV_MODE input), which is gated by memory adapter hwdbgout | – |

Table 19-34. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 9 (continued)
CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b1001

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|--|--|---|-----------------------|
| hwobs_int_mpu[9:4] | Reserved | – | – |
| hwobs_int_mpu[3] | ARM_FCLK / 16 | Cortex-A9 CPU0/CPU1 input clock divided by 16 | – |
| hwobs_int_mpu[2:0] | Reserved | – | – |

Table 19-35. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 10
CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b1010

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|--|--|---|-----------------------|
| hwobs_int_mpu[31:12] | Reserved | – | – |
| hwobs_int_mpu[11] | clkst_emifclk_gated_hw | Copy of emifclk (ARM_FCLK / 2 or ARM_FCLK / 4, depending on EMIF_DIV_MODE input), which is gated by memory adapter hwdbgout | – |
| hwobs_int_mpu[10:4] | Reserved | – | – |
| hwobs_int_mpu[3] | ARM_FCLK / 16 | Cortex-A9 CPU0 / CPU1 input clock divided by 16 | – |
| hwobs_int_mpu[2:0] | Reserved | – | – |

Table 19-36. Observability Signals Multiplexing at Cortex-A9 MPU Subsystem Level – Mode 11
CONTROL_DEBOBS_MMR_MPU[3:0] SELECT = 0b1011

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Cortex-A9 MPU Subsystem | Cortex-A9 MPU Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|--|--|---|-----------------------|
| hwobs_int_mpu[31:4] | Reserved | – | – |
| hwobs_int_mpu[3] | ARM_FCLK / 16 | Cortex-A9 CPU0 / CPU1 input clock divided by 16 | – |
| hwobs_int_mpu[2:0] | Reserved | – | – |

19.4.11.5.2 IVA-HD Subsystem Observable Signals

Table 19-37 lists the full set of 13 IVA-HD observable signals from inside the IVA-HD subsystem. No observability signal multiplexing is implemented at the IVA-HD level.

Table 19-37. Observability Signals at IVA-HD Subsystem Level

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside IVA-HD Subsystem | IVA-HD Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|---|---|--|-----------------------|
| hwobs_int_ivahd[31:13] | unused | General control module IVA-HD inputs tied to low | Tied to low |

Table 19-37. Observability Signals at IVA-HD Subsystem Level (continued)

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside IVA-HD Subsystem | IVA-HD Subsystem Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|--|--|--|------------------------------|
| hwobs_int_iva hd[12] | MAILBOX_poidleack[1] | Mailbox idle acknowledge (idle domain 0) | – |
| hwobs_int_iva hd[11] | IVAHD_INTC_poidleack[1] | IVA-HD local interconnect idle acknowledge (idle domain 0) | – |
| hwobs_int_iva hd[10] | SMSET_poidleack[1] | SMSET idle acknowledge (idle domain 0) | – |
| hwobs_int_iva hd[9] | MSGIF_poidleack[1] | MSGIF idle acknowledge (idle domain 0) | – |
| hwobs_int_iva hd[8] | ECD3_poidleack[1] | ECD3 idle acknowledge (idle domain 0) | – |
| hwobs_int_iva hd[7] | MC3_poidleack[1] | MC3 idle acknowledge (idle domain 0) | – |
| hwobs_int_iva hd[6] | IPE3_poidleack[1] | iPE3 idle acknowledge (idle domain 0) | – |
| hwobs_int_iva hd[5] | CALC3_poidleack[1] | CALC3 idle acknowledge (idle domain 0) | – |
| hwobs_int_iva hd[4] | ILF3_poidleack[1] | iLF3 idle acknowledge s (idle domain 0) | – |
| hwobs_int_iva hd[3] | IME3_poidleack[1] | iME3 idle acknowledge (idle domain 0) | – |
| hwobs_int_iva hd[2] | VDMA_poidleack[1] | vDMA idle acknowledge (idle domain 0) | – |
| hwobs_int_iva hd[1] | ICONT2_poidleack[1] | ICONT2 idle acknowledge (idle domain 0) | – |
| hwobs_int_iva hd[0] | ICONT1_poidleack[1] | ICONT1 idle acknowledge (idle domain 0) | – |

19.4.11.5.3 BB2D Accelerator Observable Signals

The BB2D accelerator observable signals described in [Table 19-38](#) are directly mapped to the BB2D dedicated observability inputs of the SYSCTRL_GENERAL_CORE module, and NO additional multiplexing of observability signals is performed inside the BB2D module.

Table 19-38. Observability Signals at Display Subsystem Level

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to BB2D Signals | BB2D Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|---|--|--|-------------------------------------|
| hwobs_bb2d_sys_interrupt_reqz | BB2D_SYS_INTERRUPT_REQZ | a single aggregate active-low GPU interrupt | 0: interrupt pending 1: no event |
| hwobs_bb2d_mconnect_1 | BB2D_MCONNECT_1 | Not implemented in the BB2D subsystem | – |
| hwobs_bb2d_mconnect_0 | BB2D_MCONNECT_0 | Not implemented in the BB2D subsystem | – |
| hwobs_bb2d_sconnect_2 | BB2D_SCONNECT_2 | BB2D L3 slave (target port) connection bus [2] | – |
| hwobs_bb2d_sconnect_1 | BB2D_SCONNECT_1 | BB2D L3 slave (target port) connection bus [1] | – |
| hwobs_bb2d_sconnect_0 | BB2D_SCONNECT_0 | BB2D L3 slave (target port) connection bus [0] | – |

Table 19-38. Observability Signals at Display Subsystem Level (continued)

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to BB2D Signals | BB2D Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|---|--|--------------------------------------|------------------------------|
| hwobs_bb2d_pgoodin | BB2D_PGOODIN | PGOODIN control for the power switch | - |
| hwobs_bb2d_ponin | BB2D_PONIN | PONIN control for the power switch | - |
| hwobs_bb2d_ponout | BB2D_PONOUT | PONOUT control for the power switch | - |

19.4.11.5.4 DSP Subsystem Observable Signals

This information is not available in the public domain.

19.4.11.5.5 ABE Subsystem Observable Signals

The audio backend (ABE) observable signals described in [Table 19-39](#) are directly mapped to the ABE dedicated observability inputs, hwobs_int_abe[31:0] of the SYSCTRL_GENERAL_CORE module, and no additional multiplexing is performed inside the ABE.

Table 19-39. Observability Signals at ABE Subsystem Level

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside ABE subsystem | ABE Level Observability Signals | Signal Description | Logical Value Meaning |
|---|--|---|--|
| hwobs_int_abe[31:26] | — | — | — |
| hwobs_int_abe[25:24] | OPP_DIV | OPP DIVIDER bits [1:0] | — |
| hwobs_int_abe[23] | AESS_to_MPU_IRQ | IRQ sent from AESS to MCU. See Chapter 13, ABE . | — |
| hwobs_int_abe[22] | AESS_to_DSPSS_IRQ | IRQ sent from AESS to DSP. See , Interrupt Requests , and Chapter 13, ABE . | — |
| hwobs_int_abe[21] | Reserved | — | — |
| hwobs_int_abe[20] | GPT_WDT_PWM_INP | PWM received from the GPTIMER or watchdog (OR) | — |
| hwobs_int_abe[19] | AESS_DMAREQ_ALL | (Logical OR with all DMA requests out) | High while outgoing DMA requests from audio engine have not been acknowledged by the host |
| hwobs_int_abe[18] | AESS_DMAREQ_PER | (Logical OR with all DMA requests coming from the peripheral) | High when incoming DMA requests from audio engine are still to be served |
| hwobs_int_abe[17] | AESS_IDLEPO | PO_IDLE AESS output | High when the audio engine executes a wait until an activation of the PI_WAKEUP pin is done |
| hwobs_int_abe[16:0] | RESERVED | — | — |

19.4.11.5.6 USBOTGHS Subsystem Observable Signals

One of the General Wakeup Control observability inputs can be mapped to the USBOTGHS start-of-frame signal (hsusbogt_sofpulse) by setting [CONTROL_CORE_CONF_DEBUG_SEL_TST_11\[3:0\] MODE = 0x1](#).

19.4.11.5.7 CM2 Subsystem Observable Signals

The SYSCTRL_GENERAL_CORE observability inputs hwobs_int_cm2(i), (where i = 0...31) are mapped to the signals debugcm2(i), (where i = 0...31) coming out of the PRCM submodule, clock manager 2 (CM2).

Local multiplexing controls at the CM2 level are in the CM2_DEBUG_CFG register. The CM2 observability output signals are driven on the debugcm2(0) through debugcm2(7) lines. A certain mux set is selected by programming the CM2_DEBUG_CFG[7:0] SEL0 bit field. The remaining debugcm2(8) through debugcm2(31) lines are reserved for future use. For more information about the CM2 observability source select field, see [Section 3.11.30.1, INTRCONN_SOCKET_CM2 Register Summary](#), in [Chapter 3, Power, Reset, and Clock Management](#).

[Table 19-40](#) provides different details about the signals inside the CM 2 that can be monitored on device hw_dbg pins.

Table 19-40. CM2 Observable Signals

| Byte | 0x00 | Type | AutoPRCM Signal Identifier | B# | Info + | Info + | Info + | Comments |
|------|------|------|----------------------------|----|--------|--------|--------|----------|
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x01 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x02 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x03 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x04 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x5 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x6 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x7 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x8 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x9 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0xa | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0xb | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0xc | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0xd | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0xe | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0xf | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |

Table 19-40. CM2 Observable Signals (continued)

| Byte | 0x10 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 0 | Internal | ifsm_bb2d_stby_prot_I0.MStandby | | | | Input | |
| Bit | 1 | Internal | ifsm_bb2d_stby_prot_I0.init_Wait | | | | Output | |
| Bit | 2 | Internal | ifsm_bb2d_stby_prot_I0.module_mwakeup | 0 | | | Input | |
| Bit | 3 | | ifsm_ccptx_ccpt_stby_I0.MStandby | | | | Input | |
| Bit | 4 | | ifsm_ccptx_ccpt_stby_I0.init_Wait | | | | Output | |
| Bit | 5 | | ifsm_ccptx_ccpt_stby_I0.module_mwakeup | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x11 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 2:0 | Internal | Reserved | | | | | |
| Bit | 3 | Internal | ifsm_dss_dss_stby_pm_I0.MStandby | | | | Input | |
| Bit | 4 | Internal | ifsm_dss_dss_stby_pm_I0.init_Wait | | | | Output | |
| Bit | 5 | Internal | ifsm_dss_dss_stby_pm_I0.module_mwakeup | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x12 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ifsm_cortex_m3_pm_master_I0.MStandby | | | | Input | |
| Bit | 1 | Internal | ifsm_cortex_m3_pm_master_I0.init_Wait | | | | Output | |
| Bit | 2 | Internal | ifsm_cortex_m3_pm_master_I0.module_mwakeup | 0 | | | Input | |
| Bit | 3 | Internal | ifsm_emac_mstandbyp_I0.MStandby | | | | Input | |
| Bit | 4 | Internal | ifsm_emac_mstandbyp_I0.init_Wait | | | | Output | |
| Bit | 5 | Internal | ifsm_emac_mstandbyp_I0.module_mwakeup | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x13 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ifsm_fdif_standby_prot_I0.MStandby | | | | Input | |
| Bit | 1 | Internal | ifsm_fdif_standby_prot_I0.init_Wait | | | | Output | |
| Bit | 2 | Internal | ifsm_fdif_standby_prot_I0.module_mwakeup | 0 | | | Input | |
| Bit | 3 | Internal | ifsm_gfx_stby_prot_I0.MStandby | | | | Input | |
| Bit | 4 | Internal | ifsm_gfx_stby_prot_I0.init_Wait | | | | Output | |
| Bit | 5 | Internal | ifsm_gfx_stby_prot_I0.module_mwakeup | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x14 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ifsm_hsi_hsi_standby_I0.MStandby | | | | Input | |
| Bit | 1 | Internal | ifsm_hsi_hsi_standby_I0.init_Wait | | | | Output | |
| Bit | 2 | Internal | ifsm_hsi_hsi_standby_I0.module_mwakeup | 0 | | | Input | |
| Bit | 3 | Internal | ifsm_iss_standby_iss_I0.MStandby | | | | Input | |
| Bit | 4 | Internal | ifsm_iss_standby_iss_I0.init_Wait | | | | Output | |
| Bit | 5 | Internal | ifsm_iss_standby_iss_I0.module_mwakeup | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x15 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ifsm_ivahd_master_I0.MStandby | | | | Input | |
| Bit | 1 | Internal | ifsm_ivahd_master_I0.init_Wait | | | | Output | |
| Bit | 2 | Internal | ifsm_ivahd_master_I0.module_mwakeup | 0 | | | Input | |
| Bit | 3 | Internal | ifsm_mmc1_stby_prot_I0.MStandby | | | | Input | |
| Bit | 4 | Internal | ifsm_mmc1_stby_prot_I0.init_Wait | | | | Output | |
| Bit | 5 | Internal | ifsm_mmc1_stby_prot_I0.module_mwakeup | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x16 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ifsm_mmc2_stby_prot_I0.MStandby | | | | Input | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 1 | Internal | ifsm_mmc2_stby_prot_I0.init_Wait | | | | Output | |
| Bit | 2 | Internal | ifsm_mmc2_stby_prot_I0.module_mwakeup | 0 | | | Input | |
| Bit | 7:3 | | Reserved | | | | | |
| Byte | 0x17 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x18 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ifsm_sad2d_sad2d_stby_I0.MStandby | | | | Input | |
| Bit | 1 | Internal | ifsm_sad2d_sad2d_stby_I0.init_Wait | | | | Output | |
| Bit | 2 | Internal | ifsm_sad2d_sad2d_stby_I0.module_mwakeup | 0 | | | Input | |
| Bit | 7:3 | | Reserved | | | | | |
| Byte | 0x19 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ifsm_sdma_stby_prot_I0.MStandby | | | | Input | |
| Bit | 1 | Internal | ifsm_sdma_stby_prot_I0.init_Wait | | | | Output | |
| Bit | 2 | Internal | ifsm_sdma_stby_prot_I0.module_mwakeup | 0 | | | Input | |
| Bit | 3 | Internal | ifsm_tppss_cppidma_stby_prm_I0.MStandby | | | | Input | |
| Bit | 4 | Internal | ifsm_tppss_cppidma_stby_prm_I0.init_Wait | | | | Output | |
| Bit | 5 | Internal | ifsm_tppss_cppidma_stby_prm_I0.module_mwakeup | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x1a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 2:0 | | reserved | | | | | |
| Bit | 3 | Internal | ifsm_usb_host_fs_standby_prot_I0.MStandby | | | | Input | |
| Bit | 4 | Internal | ifsm_usb_host_fs_standby_prot_I0.init_Wait | | | | Output | |
| Bit | 5 | Internal | ifsm_usb_host_fs_standby_prot_I0.module_mwakeup | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x1b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ifsm_usb_host_usbhosths_intrconn_masterif_pwr_I0.MStandby | | | | Input | |
| Bit | 1 | Internal | ifsm_usb_host_usbhosths_intrconn_masterif_pwr_I0.init_Wait | | | | Output | |
| Bit | 2 | Internal | ifsm_usb_host_usbhosths_intrconn_masterif_pwr_I0.module_mwakeup | 0 | | | Input | |
| Bit | 3 | Internal | ifsm_usb_otg_usbotghs_intrconn_master_I0.MStandby | | | | Input | |
| Bit | 4 | Internal | ifsm_usb_otg_usbotghs_intrconn_master_I0.init_Wait | | | | Output | |
| Bit | 5 | Internal | ifsm_usb_otg_usbotghs_intrconn_master_I0.module_mwakeup | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x1c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ifsm_xhpi_hpi_stby_I0.MStandby | | | | Input | |
| Bit | 1 | Internal | ifsm_xhpi_hpi_stby_I0.init_Wait | | | | Output | |
| Bit | 2 | Internal | ifsm_xhpi_hpi_stby_I0.module_mwakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_adc_adc_idle_I0.idleReq | | | | Output | |
| Bit | 4 | Internal | tfsm_adc_adc_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 5 | Internal | tfsm_adc_adc_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 6 | Internal | tfsm_adc_adc_idle_I0.fclken_IP | | | | Output | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x1d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x1e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_bb2d_idle_prot_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsm_bb2d_idle_prot_I0.SidleAck | 1 | | | Input | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 2 | Internal | tfs_m_bb2d_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_bb2d_idle_prot_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfs_m_ccptx_ccpt_idle_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_m_ccptx_ccpt_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_m_ccptx_ccpt_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_m_ccptx_ccpt_idle_I0.fclken_IP | | | | Output | |
| Byte | 0x1f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | | tfs_m_cm2_profiling_I0.idleReq | | | | Output | |
| Bit | 1 | | tfs_m_cm2_profiling_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | | tfs_m_cm2_profiling_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | | tfs_m_cm2_profiling_I0.fclken_IP | | | | Output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x20 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x21 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_dmm_idle_prot_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_dmm_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_dmm_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_dmm_idle_prot_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfs_m_dmtimer10_dmtimer_dmc1ms_power_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_m_dmtimer10_dmtimer_dmc1ms_power_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_m_dmtimer10_dmtimer_dmc1ms_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_m_dmtimer10_dmtimer_dmc1ms_power_I0.fclken_IP | | | | Output | |
| Byte | 0x22 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_dmtimer11_dmtimer_dmc_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_dmtimer11_dmtimer_dmc_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_dmtimer11_dmtimer_dmc_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_dmtimer11_dmtimer_dmc_power_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfs_m_dmtimer2_dmtimer_dmc1ms_power_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_m_dmtimer2_dmtimer_dmc1ms_power_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_m_dmtimer2_dmtimer_dmc1ms_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_m_dmtimer2_dmtimer_dmc1ms_power_I0.fclken_IP | | | | Output | |
| Byte | 0x23 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_dmtimer3_dmtimer_dmc_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_dmtimer3_dmtimer_dmc_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_dmtimer3_dmtimer_dmc_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_dmtimer3_dmtimer_dmc_power_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfs_m_dmtimer4_dmtimer_dmc_power_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_m_dmtimer4_dmtimer_dmc_power_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_m_dmtimer4_dmtimer_dmc_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_m_dmtimer4_dmtimer_dmc_power_I0.fclken_IP | | | | Output | |
| Byte | 0x24 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_dmtimer9_dmtimer_dmc_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_dmtimer9_dmtimer_dmc_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_dmtimer9_dmtimer_dmc_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_dmtimer9_dmtimer_dmc_power_I0.fclken_IP | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x25 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsd_dss_dss_idle_pm_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsd_dss_dss_idle_pm_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsd_dss_dss_idle_pm_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsd_dss_dss_idle_pm_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsd_dss_dss_idle_pm_I0.module_swakeup | 2 | | | Input | |
| Bit | 5 | Internal | tfsd_dss_dss_idle_pm_I0.module_swakeup | 3 | | | Input | |
| Bit | 6 | Internal | tfsd_dss_dss_idle_pm_I0.module_swakeup | 4 | | | Input | |
| Bit | 7 | Internal | tfsd_dss_dss_idle_pm_I0.fclken_IP | | | | Output | |
| Byte | 0x26 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsd_cortex_m3_pm_slave_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsd_cortex_m3_pm_slave_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsd_cortex_m3_pm_slave_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsd_cortex_m3_pm_slave_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfsd_elm_idle_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsd_elm_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsd_elm_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsd_elm_idle_I0.fclken_IP | | | | Output | |
| Byte | 0x27 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsd_emac_slv0p_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsd_emac_slv0p_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsd_emac_slv0p_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsd_emac_slv0p_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfsd_emif1_I3idleprm_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsd_emif1_I3idleprm_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsd_emif1_I3idleprm_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsd_emif1_I3idleprm_I0.fclken_IP | | | | Output | |
| Byte | 0x28 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsd_emif2_I3idleprm_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsd_emif2_I3idleprm_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsd_emif2_I3idleprm_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsd_emif2_I3idleprm_I0.fclken_IP | | | | Output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x29 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsd_emif_h1_I3idleprm_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsd_emif_h1_I3idleprm_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsd_emif_h1_I3idleprm_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsd_emif_h1_I3idleprm_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfsd_emif_h2_I3idleprm_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsd_emif_h2_I3idleprm_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsd_emif_h2_I3idleprm_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsd_emif_h2_I3idleprm_I0.fclken_IP | | | | Output | |
| Byte | 0x2a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsd_fdif_idle_prot_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsd_fdif_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsd_fdif_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsd_fdif_idle_prot_I0.fclken_IP | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 4 | Internal | tfsf_gfx_idle_prot_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsf_gfx_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsf_gfx_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsf_gfx_idle_prot_I0.fclken_IP | | | | Output | |
| Byte | 0x2b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsf_gpio2_gpio_v2_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsf_gpio2_gpio_v2_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsf_gpio2_gpio_v2_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsf_gpio2_gpio_v2_power_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsf_gpio2_gpio_v2_power_I0.fclken_IP | | | | Output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x2c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsf_gpio3_gpio_v2_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsf_gpio3_gpio_v2_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsf_gpio3_gpio_v2_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsf_gpio3_gpio_v2_power_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsf_gpio3_gpio_v2_power_I0.fclken_IP | | | | Output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x2d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsf_gpio4_gpio_v2_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsf_gpio4_gpio_v2_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsf_gpio4_gpio_v2_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsf_gpio4_gpio_v2_power_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsf_gpio4_gpio_v2_power_I0.fclken_IP | | | | Output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x2e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsf_gpio5_gpio_v2_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsf_gpio5_gpio_v2_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsf_gpio5_gpio_v2_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsf_gpio5_gpio_v2_power_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsf_gpio5_gpio_v2_power_I0.fclken_IP | | | | Output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x2f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsf_gpio6_gpio_v2_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsf_gpio6_gpio_v2_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsf_gpio6_gpio_v2_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsf_gpio6_gpio_v2_power_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsf_gpio6_gpio_v2_power_I0.fclken_IP | | | | Output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x30 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsf_gpmc_idle_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsf_gpmc_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsf_gpmc_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsf_gpmc_idle_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfsf_hdq1w_hdq1w_idle_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsf_hdq1w_hdq1w_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsf_hdq1w_hdq1w_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsf_hdq1w_hdq1w_idle_I0.fclken_IP | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| Byte | 0x31 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 0 | Internal | tfsm_hecc1_hecc_cfg_idle_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsm_hecc1_hecc_cfg_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_hecc1_hecc_cfg_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_hecc1_hecc_cfg_idle_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfsm_hecc2_hecc_cfg_idle_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsm_hecc2_hecc_cfg_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsm_hecc2_hecc_cfg_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsm_hecc2_hecc_cfg_idle_I0.fclken_IP | | | | Output | |
| Byte | 0x32 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_hsi_hsi_idle_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsm_hsi_hsi_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_hsi_hsi_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_hsi_hsi_idle_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsm_hsi_hsi_idle_I0.module_swakeup | 2 | | | Input | |
| Bit | 5 | Internal | tfsm_hsi_hsi_idle_I0.fclken_IP | | | | Output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x33 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_hw_sem_hwsem_idle_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsm_hw_sem_hwsem_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_hw_sem_hwsem_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_hw_sem_hwsem_idle_I0.fclken_IP | | | | Output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x34 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_i2c1_mshsi2cintrconn_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsm_i2c1_mshsi2cintrconn_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_i2c1_mshsi2cintrconn_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_i2c1_mshsi2cintrconn_power_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsm_i2c1_mshsi2cintrconn_power_I0.fclken_IP | | | | Output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x35 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_i2c2_mshsi2cintrconn_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsm_i2c2_mshsi2cintrconn_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_i2c2_mshsi2cintrconn_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_i2c2_mshsi2cintrconn_power_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsm_i2c2_mshsi2cintrconn_power_I0.fclken_IP | | | | Output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x36 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_i2c3_mshsi2cintrconn_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsm_i2c3_mshsi2cintrconn_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_i2c3_mshsi2cintrconn_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_i2c3_mshsi2cintrconn_power_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsm_i2c3_mshsi2cintrconn_power_I0.fclken_IP | | | | Output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x37 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_i2c4_mshsi2cintrconn_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsm_i2c4_mshsi2cintrconn_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_i2c4_mshsi2cintrconn_power_I0.module_swakeup | 0 | | | Input | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 3 | Internal | tfs_m_i2c4_mshsi2cintrconn_power_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfs_m_i2c4_mshsi2cintrconn_power_I0.fclken_IP | | | | Output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x38 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_i2c5_mshsi2cintrconn_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_i2c5_mshsi2cintrconn_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_i2c5_mshsi2cintrconn_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_i2c5_mshsi2cintrconn_power_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfs_m_i2c5_mshsi2cintrconn_power_I0.fclken_IP | | | | Output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x39 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_iss_idle_iss_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_iss_idle_iss_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_iss_idle_iss_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_iss_idle_iss_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfs_m_ivahd_idle0_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_m_ivahd_idle0_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_m_ivahd_idle0_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_m_ivahd_idle0_I0.fclken_IP | | | | Output | |
| Byte | 0x3a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_I3_instr_interconnect_idle_prot_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_I3_instr_interconnect_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_I3_instr_interconnect_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_I3_instr_interconnect_idle_prot_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfs_m_I3_interconnect_1_idle_prot_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_m_I3_interconnect_1_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_m_I3_interconnect_1_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_m_I3_interconnect_1_idle_prot_I0.fclken_IP | | | | Output | |
| Byte | 0x3b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_I3_interconnect_2_idle_prot_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_I3_interconnect_2_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_I3_interconnect_2_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_I3_interconnect_2_idle_prot_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfs_m_I3_interconnect_3_idle_prot_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_m_I3_interconnect_3_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_m_I3_interconnect_3_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_m_I3_interconnect_3_idle_prot_I0.fclken_IP | | | | Output | |
| Byte | 0x3c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_I4_cfg_interconnect_idle_prot_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_I4_cfg_interconnect_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_I4_cfg_interconnect_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_I4_cfg_interconnect_idle_prot_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfs_m_I4_per_interconnect_idle_prot_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_m_I4_per_interconnect_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_m_I4_per_interconnect_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_m_I4_per_interconnect_idle_prot_I0.fclken_IP | | | | Output | |
| Byte | 0x3d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_mailbox_mbx_idle_I0.idleReq | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 1 | Internal | tfs_m_mailbox_mbx_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_mailbox_mbx_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_mailbox_mbx_idle_I0.fclken_IP | | | | Output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x3e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x3f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x40 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_mcbasp4_mcbasp4_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_mcbasp4_mcbasp4_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_mcbasp4_mcbasp4_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_mcbasp4_mcbasp4_power_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfs_m_mcspi1_spi_power_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_m_mcspi1_spi_power_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_m_mcspi1_spi_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_m_mcspi1_spi_power_I0.fclken_IP | | | | Output | |
| Byte | 0x41 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_mcspi2_spi_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_mcspi2_spi_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_mcspi2_spi_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_mcspi2_spi_power_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfs_m_mcspi3_spi_power_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_m_mcspi3_spi_power_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_m_mcspi3_spi_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_m_mcspi3_spi_power_I0.fclken_IP | | | | Output | |
| Byte | 0x42 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_mcspi4_spi_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_mcspi4_spi_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_mcspi4_spi_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_mcspi4_spi_power_I0.fclken_IP | | | | Output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x43 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_m_mmc1_idle_prot_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_m_mmc1_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_m_mmc1_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_m_mmc1_idle_prot_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfs_m_mmc2_idle_prot_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_m_mmc2_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_m_mmc2_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_m_mmc2_idle_prot_I0.fclken_IP | | | | Output | |
| Byte | 0x44 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 3:0 | | Reserved | | | | | |
| Bit | 4 | Internal | tfs_m_mmc_sd3_mmchs_idle_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_m_mmc_sd3_mmchs_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_m_mmc_sd3_mmchs_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_m_mmc_sd3_mmchs_idle_I0.fclken_IP | | | | Output | |
| Byte | 0x45 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 0 | Internal | tfsd_mmc_sd4_mmchs_idle_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsd_mmc_sd4_mmchs_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsd_mmc_sd4_mmchs_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsd_mmc_sd4_mmchs_idle_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfsd_mmc_sd5_mmchs_idle_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsd_mmc_sd5_mmchs_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsd_mmc_sd5_mmchs_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsd_mmc_sd5_mmchs_idle_I0.fclken_IP | | | | Output | |
| Byte | 0x46 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsd_modem_icr_idle_prot_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsd_modem_icr_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsd_modem_icr_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsd_modem_icr_idle_prot_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfsd_modem_intc_idle_prot_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsd_modem_intc_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsd_modem_intc_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsd_modem_intc_idle_prot_I0.fclken_IP | | | | Output | |
| Byte | 0x47 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 3:0 | | Reserved | | | | | |
| Bit | 4 | Internal | tfsd_ocmc_ram_ocmcram_idle_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsd_ocmc_ram_ocmcram_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsd_ocmc_ram_ocmcram_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsd_ocmc_ram_ocmcram_idle_I0.fclken_IP | | | | Output | |
| Byte | 0x48 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsd_ocp_wp1_idle_prot_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsd_ocp_wp1_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsd_ocp_wp1_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsd_ocp_wp1_idle_prot_I0.fclken_IP | | | | Output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x49 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x4a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 3:0 | | Reserved | | | | | |
| Bit | 4 | Internal | tfsd_sad2d_d2d_idle_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsd_sad2d_d2d_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsd_sad2d_d2d_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsd_sad2d_d2d_idle_I0.fclken_IP | | | | Output | |
| Byte | 0x4b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x4c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 3:0 | | Reserved | | | | | |
| Bit | 4 | Internal | tfsd_sdma_idle_prot_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsd_sdma_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsd_sdma_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsd_sdma_idle_prot_I0.fclken_IP | | | | Output | |
| Byte | 0x4d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 3:0 | | Reserved | | | | | |
| Bit | 4 | Internal | tfsd_sl2_idle1_I0.idleReq | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 5 | Internal | tfsmlsl2_idle1_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsmlsl2_idle1_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsmlsl2_idle1_I0.fclken_IP | | | | Output | |
| Byte | 0x4e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsmslimbus2_slimbus_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsmslimbus2_slimbus_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsmslimbus2_slimbus_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsmslimbus2_slimbus_power_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsmslimbus2_slimbus_power_I0.fclken_IP | | | | Output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x4f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsmsmartreflex_core_sr_idle_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsmsmartreflex_core_sr_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsmsmartreflex_core_sr_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsmsmartreflex_core_sr_idle_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfsmsmartreflex_iva_sr_idle_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsmsmartreflex_iva_sr_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsmsmartreflex_iva_sr_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsmsmartreflex_iva_sr_idle_I0.fclken_IP | | | | Output | |
| Byte | 0x50 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsmsmartreflex_mpu_sr_idle_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsmsmartreflex_mpu_sr_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsmsmartreflex_mpu_sr_idle_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsmsmartreflex_mpu_sr_idle_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfsmtppss_tppss_slave_prm_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsmtppss_tppss_slave_prm_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsmtppss_tppss_slave_prm_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsmtppss_tppss_slave_prm_I0.fclken_IP | | | | Output | |
| Byte | 0x51 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsmuart1_uartirdacirintrconn_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsmuart1_uartirdacirintrconn_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsmuart1_uartirdacirintrconn_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsmuart1_uartirdacirintrconn_power_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfsmuart2_uartirdacirintrconn_power_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsmuart2_uartirdacirintrconn_power_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsmuart2_uartirdacirintrconn_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsmuart2_uartirdacirintrconn_power_I0.fclken_IP | | | | Output | |
| Byte | 0x52 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsmuart3_uartirdacirintrconn_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfsmuart3_uartirdacirintrconn_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsmuart3_uartirdacirintrconn_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsmuart3_uartirdacirintrconn_power_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfsmuart4_uartirdacirintrconn_power_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfsmuart4_uartirdacirintrconn_power_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsmuart4_uartirdacirintrconn_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsmuart4_uartirdacirintrconn_power_I0.fclken_IP | | | | Output | |
| Byte | 0x53 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 3:0 | | Reserved | | | | | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 4 | Internal | tfs_usb_host_fs_idle_prot_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_usb_host_fs_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_usb_host_fs_idle_prot_I0.module_wakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_usb_host_fs_idle_prot_I0.fclken_IP | | | | Output | |
| Byte | 0x54 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_usb_host_usbhosths_intrconn_regif_pwr_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_usb_host_usbhosths_intrconn_regif_pwr_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_usb_host_usbhosths_intrconn_regif_pwr_I0.module_wakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_usb_host_usbhosths_intrconn_regif_pwr_I0.fclken_I P | | | | Output | |
| Bit | 4 | Internal | tfs_usb_otg_usbotghs_intrconn_slave_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_usb_otg_usbotghs_intrconn_slave_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_usb_otg_usbotghs_intrconn_slave_I0.module_wake up | 0 | | | Input | |
| Bit | 7 | Internal | tfs_usb_otg_usbotghs_intrconn_slave_I0.fclken_IP | | | | Output | |
| Byte | 0x55 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_usb_tll_usb_tll_power_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_usb_tll_usb_tll_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_usb_tll_usb_tll_power_I0.module_wakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_usb_tll_usb_tll_power_I0.fclken_IP | | | | Output | |
| Bit | 4 | Internal | tfs_usbphyintrconn2scp_idle_prot_I0.idleReq | | | | Output | |
| Bit | 5 | Internal | tfs_usbphyintrconn2scp_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfs_usbphyintrconn2scp_idle_prot_I0.module_wakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfs_usbphyintrconn2scp_idle_prot_I0.fclken_IP | | | | Output | |
| Byte | 0x56 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfs_xhpi_hpi_idle_I0.idleReq | | | | Output | |
| Bit | 1 | Internal | tfs_xhpi_hpi_idle_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfs_xhpi_hpi_idle_I0.module_wakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfs_xhpi_hpi_idle_I0.fclken_IP | | | | Output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x57 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpII_per_I0.DPLLCtrlState | 0 | LSB | | Output | |
| Bit | 1 | Internal | dpllsctrl_dpII_per_I0.DPLLCtrlState | 1 | | | Output | |
| Bit | 2 | Internal | dpllsctrl_dpII_per_I0.DPLLCtrlState | 2 | | | Output | |
| Bit | 3 | Internal | dpllsctrl_dpII_per_I0.DPLLCtrlState | 3 | | | Output | |
| Bit | 4 | Internal | dpllsctrl_dpII_per_I0.DPLLCtrlState | 4 | | | Output | |
| Bit | 5 | Internal | dpllsctrl_dpII_per_I0.DPLLCtrlState | 5 | | | Output | |
| Bit | 6 | Internal | dpllsctrl_dpII_per_I0.DPLLCtrlState | 6 | | | Output | |
| Bit | 7 | Internal | dpllsctrl_dpII_per_I0.DPLLCtrlState | 7 | MSB | | Output | |
| Byte | 0x58 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpII_per_I0.freqChgReqAck | | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dpII_per_I0.freqChgReq | | | | Output | |
| Bit | 2 | Internal | dpllsctrl_dpII_per_I0.freqChgReqAck2 | | | | Output | |
| Bit | 3 | Internal | dpllsctrl_dpII_per_I0.freqChgReq2 | | | | Input | |
| Bit | 4 | Internal | dpllsctrl_dpII_per_I0.bypass | | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpII_per_I0.freqlock | | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dpII_per_I0.lossref | | | | Input | |
| Bit | 7 | Internal | dpllsctrl_dpII_per_I0.tinitz | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| Byte | 0x59 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 0 | Internal | dpllsctrl_dpll_per_I0.tenable | | | | Output | |
| Bit | 1 | Internal | dpllsctrl_dpll_per_I0.tenablediv | | | | Output | |
| Bit | 2 | Internal | dpllsctrl_dpll_per_I0.idle | | | | Output | |
| Bit | 3 | Internal | dpllsctrl_dpll_per_I0.lowcurrstdby | | | | Output | |
| Bit | 4 | Internal | dpllsctrl_dpll_per_I0.dpll_ticopwdn | | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpll_per_I0.dpll_idopwdn | | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dpll_per_I0.ulowclken | 0 | | | Output | |
| Bit | 7 | Internal | dpllsctrl_dpll_per_I0.dpll_clkbypselacksel | 0 | | | Input | |
| Byte | 0x5a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_per_I0.clkinplsRunning | | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dpll_per_I0.clkinpToBeGated | | | | Output | |
| Bit | 2 | Internal | dpllsctrl_dpll_per_I0.clkinplowlsRunning | | | | Input | |
| Bit | 3 | Internal | dpllsctrl_dpll_per_I0.clkinplowToBeGated | | | | Output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x5b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x5c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x5d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x5e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_usb_I0.DPLLCtrlState | 0 | LSB | | Output | |
| Bit | 1 | Internal | dpllsctrl_dpll_usb_I0.DPLLCtrlState | 1 | | | Output | |
| Bit | 2 | Internal | dpllsctrl_dpll_usb_I0.DPLLCtrlState | 2 | | | Output | |
| Bit | 3 | Internal | dpllsctrl_dpll_usb_I0.DPLLCtrlState | 3 | | | Output | |
| Bit | 4 | Internal | dpllsctrl_dpll_usb_I0.DPLLCtrlState | 4 | | | Output | |
| Bit | 5 | Internal | dpllsctrl_dpll_usb_I0.DPLLCtrlState | 5 | | | Output | |
| Bit | 6 | Internal | dpllsctrl_dpll_usb_I0.DPLLCtrlState | 6 | | | Output | |
| Bit | 7 | Internal | dpllsctrl_dpll_usb_I0.DPLLCtrlState | 7 | MSB | | Output | |
| Byte | 0x5f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_usb_I0.freqChgReqAck | | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dpll_usb_I0.freqChgReq | | | | Output | |
| Bit | 2 | Internal | dpllsctrl_dpll_usb_I0.freqChgReqAck2 | | | | Output | |
| Bit | 3 | Internal | dpllsctrl_dpll_usb_I0.freqChgReq2 | | | | Input | |
| Bit | 4 | Internal | dpllsctrl_dpll_usb_I0.bypass | | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpll_usb_I0.freqlock | | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dpll_usb_I0.lossref | | | | Input | |
| Bit | 7 | Internal | dpllsctrl_dpll_usb_I0.tinitz | | | | Output | |
| Byte | 0x60 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_usb_I0.tenable | | | | Output | |
| Bit | 1 | Internal | dpllsctrl_dpll_usb_I0.tenablediv | | | | Output | |
| Bit | 2 | Internal | dpllsctrl_dpll_usb_I0.idle | | | | Output | |
| Bit | 3 | Internal | dpllsctrl_dpll_usb_I0.dpll_ticopwdn | | | | Input | |
| Bit | 4 | Internal | dpllsctrl_dpll_usb_I0.dpll_idopwdn | | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpll_usb_I0.ulowclken | 0 | | | Output | |
| Bit | 6 | Internal | dpllsctrl_dpll_usb_I0.dpll_clkbypselacksel | 0 | | | Input | |
| Bit | 7 | Internal | dpllsctrl_dpll_usb_I0.clkinplsRunning | | | | Input | |

Table 19-40. CM2 Observable Signals (continued)

| Byte | 0x61 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 0 | Internal | dpllsctrl_dpll_usb_I0.clkinpToBeGated | | | | Output | |
| Bit | 1 | Internal | dpllsctrl_dpll_usb_I0.clkinpIOWsRunning | | | | Input | |
| Bit | 2 | Internal | dpllsctrl_dpll_usb_I0.clkinpIOWToBeGated | | | | Output | |
| Bit | 3 | Internal | mutegen_bb2d_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_bb2d_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_bb2d_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x62 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_ccptx_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_ccptx_I0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_ccptx_I0.public_active | 0 | | | Input | |
| Bit | 7:3 | | Reserved | | | | | |
| Byte | 0x63 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 2:0 | | Reserved | | | | | |
| Bit | 3 | Internal | mutegen_dss_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_dss_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_dss_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x64 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_cortex_m3_to_I3_interconnect_2_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_cortex_m3_to_I3_interconnect_2_I0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_cortex_m3_to_I3_interconnect_2_I0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_emac_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_emac_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_emac_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x65 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_fdif_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_fdif_I0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_fdif_I0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_gfx_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_gfx_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_gfx_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x66 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_hsi_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_hsi_I0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_hsi_I0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_iss_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_iss_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_iss_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x67 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_ivahd_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_ivahd_I0.static_domain_mute | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 2 | Internal | mutegen_ivahd_I0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_I3_interconnect_1_all_ta_to_dmm_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_I3_interconnect_1_all_ta_to_dmm_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_I3_interconnect_1_all_ta_to_dmm_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x68 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_I3_interconnect_1_to_dmm_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_I3_interconnect_1_to_dmm_I0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_I3_interconnect_1_to_dmm_I0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_I3_interconnect_1_to_I3_interconnect_2_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_I3_interconnect_1_to_I3_interconnect_2_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_I3_interconnect_1_to_I3_interconnect_2_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x69 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_I3_interconnect_1_to_I4_audio_interconnect_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_I3_interconnect_1_to_I4_audio_interconnect_I0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_I3_interconnect_1_to_I4_audio_interconnect_I0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_I3_interconnect_1_to_I4_cfg_interconnect_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_I3_interconnect_1_to_I4_cfg_interconnect_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_I3_interconnect_1_to_I4_cfg_interconnect_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x6a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x6b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_I3_interconnect_2_to_bb2d_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_I3_interconnect_2_to_bb2d_I0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_I3_interconnect_2_to_bb2d_I0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_I3_interconnect_2_to_dss_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_I3_interconnect_2_to_dss_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_I3_interconnect_2_to_dss_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x6c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_I3_interconnect_2_to_cortex_m3_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_I3_interconnect_2_to_cortex_m3_I0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_I3_interconnect_2_to_cortex_m3_I0.public_active | 0 | | | Input | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 3 | Internal | mutegen_l3_interconnect_2_to_gfx_l0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_l3_interconnect_2_to_gfx_l0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_l3_interconnect_2_to_gfx_l0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x6d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_l3_interconnect_2_to_ivahd_l0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_l3_interconnect_2_to_ivahd_l0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_l3_interconnect_2_to_ivahd_l0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_l3_interconnect_2_to_l3_interconnect_1_l0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_l3_interconnect_2_to_l3_interconnect_1_l0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_l3_interconnect_2_to_l3_interconnect_1_l0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x6e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_l3_interconnect_2_to_l4_per_interconnect_l0.dyn_domain_mute | | | | | |
| Bit | 1 | Internal | mutegen_l3_interconnect_2_to_l4_per_interconnect_l0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_l3_interconnect_2_to_l4_per_interconnect_l0.public_active | | | | Output | |
| Bit | 3:7 | | Reserved | | | | | |
| Byte | 0x6f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_l3_interconnect_2_to_sad2d_l0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_l3_interconnect_2_to_sad2d_l0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_l3_interconnect_2_to_sad2d_l0.public_active | 0 | | | Input | |
| Bit | 7:3 | | Reserved | | | | | |
| Byte | 0x70 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 3 | Internal | mutegen_l3_interconnect_2_to_sl2_l0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_l3_interconnect_2_to_sl2_l0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_l3_interconnect_2_to_sl2_l0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_l3_interconnect_2_to_tppss_l0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_l3_interconnect_2_to_tppss_l0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_l3_interconnect_2_to_tppss_l0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x71 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_l4_cfg_interconnect_all_ta_to_l3_interconnect_2_l0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_l4_cfg_interconnect_all_ta_to_l3_interconnect_2_l0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_l4_cfg_interconnect_all_ta_to_l3_interconnect_2_l0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_l4_cfg_interconnect_all_ta_to_l3_interconnect_2_l1.dyn_domain_mute | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i1.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i1.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x72 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i2.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i2.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i2.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i3.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i3.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i3.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x73 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i4.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i4.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i4.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i5.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i5.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i5.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x74 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i6.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i6.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i6.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i7.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i7.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i7.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x75 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i8.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i8.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i8.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2 _i9.dyn_domain_mute | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2_i9.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_i3_interconnect_2_i9.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x76 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_modem_icr_i0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_modem_icr_i0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_all_ta_to_modem_icr_i0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_to_ccptx_i0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_to_ccptx_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_to_ccptx_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x77 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 2:0 | | | | | | | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_to_emac_i0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_to_emac_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_to_emac_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x78 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_to_emif_fw_i0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_to_emif_fw_i0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_to_emif_fw_i0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_to_hsi_i0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_to_hsi_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_to_hsi_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x79 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_to_i3_interconnect_1_i0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_to_i3_interconnect_1_i0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_to_i3_interconnect_1_i0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_to_i3_interconnect_2_i0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_to_i3_interconnect_2_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_to_i3_interconnect_2_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x7a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_to_modem_icr_i0.dyn_domain_mute | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_to_modem_icr_l0.static_do_main_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_to_modem_icr_l0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_to_modem_intc_l0.dyn_do_main_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_to_modem_intc_l0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_to_modem_intc_l0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x7b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x7c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_to_sad2d_fw_l0.dyn_domain_mute | | | | Output | |
| | 1 | Internal | mutegen_i4_cfg_interconnect_to_sad2d_fw_l0.static_domain_mute | | | | Output | |
| | 2 | Internal | mutegen_i4_cfg_interconnect_to_sad2d_fw_l0.public_active | | | | Input | |
| Bit | 7:3 | | Reserved | | | | | |
| Byte | 0x7d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_to_sdma_l0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_to_sdma_l0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_to_sdma_l0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_to_smartreflex_core_l0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_to_smartreflex_core_l0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_to_smartreflex_core_l0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x7e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_to_smartreflex_iva_l0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_to_smartreflex_iva_l0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_to_smartreflex_iva_l0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_to_smartreflex_mpu_l0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_to_smartreflex_mpu_l0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_to_smartreflex_mpu_l0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x7f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_to_dspss_l0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_to_dspss_l0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_to_dspss_l0.public_active | 0 | | | Input | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_to_tppss_i0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_to_tppss_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_to_tppss_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x80 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 2:0 | | Reserved | | | | | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_to_usb_host_i0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_to_usb_host_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_to_usb_host_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x81 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_to_usb_host_fs_i0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_to_usb_host_fs_i0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_to_usb_host_fs_i0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_to_usb_otg_i0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_to_usb_otg_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_to_usb_otg_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x82 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_to_usb_tll_i0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_to_usb_tll_i0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_to_usb_tll_i0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_to_usbphyintrconn2scp_i0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_to_usbphyintrconn2scp_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_to_usbphyintrconn2scp_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x83 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_i4_cfg_interconnect_to_wkup_i4_interconnect_i0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_i4_cfg_interconnect_to_wkup_i4_interconnect_i0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_i4_cfg_interconnect_to_wkup_i4_interconnect_i0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_i4_cfg_interconnect_to_xhpi_i0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_i4_cfg_interconnect_to_xhpi_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_i4_cfg_interconnect_to_xhpi_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x84 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x85 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_l4_per_interconnect_to_dss_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_l4_per_interconnect_to_dss_I0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_l4_per_interconnect_to_dss_I0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_l4_per_interconnect_to_mmc1_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_l4_per_interconnect_to_mmc1_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_l4_per_interconnect_to_mmc1_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x86 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_l4_per_interconnect_to_mmc2_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_l4_per_interconnect_to_mmc2_I0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_l4_per_interconnect_to_mmc2_I0.public_active | 0 | | | Input | |
| Bit | 7:3 | | Reserved | | | | | |
| Byte | 0x87 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x88 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_mmc1_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_mmc1_I0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_mmc1_I0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_mmc2_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_mmc2_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_mmc2_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x89 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x8a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 2:0 | | Reserved | | | | | |
| Bit | 3 | Internal | mutegen_sad2d_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_sad2d_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_sad2d_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x8b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_sad2d_fw_to_I3_interconnect_2_I0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_sad2d_fw_to_I3_interconnect_2_I0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_sad2d_fw_to_I3_interconnect_2_I0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_sad2d_to_emif_fw_I0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_sad2d_to_emif_fw_I0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_sad2d_to_emif_fw_I0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x8c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 2:0 | | reserved | | | | | |
| Bit | 3 | Internal | mutegen_sdma_I0.dyn_domain_mute | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|---|
| Bit | 4 | Internal | mutegen_sdma_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_sdma_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x8d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_sdma_write_port_i0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_sdma_write_port_i0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_sdma_write_port_i0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_tppss_i0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_tppss_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_tppss_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x8e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 2:0 | | reserved | | | | | |
| Bit | 3 | Internal | mutegen_usb_host_i0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_usb_host_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_usb_host_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x8f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_usb_host_fs_i0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_usb_host_fs_i0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_usb_host_fs_i0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_usb_otg_i0.dyn_domain_mute | | | | Output | |
| Bit | 4 | Internal | mutegen_usb_otg_i0.static_domain_mute | | | | Output | |
| Bit | 5 | Internal | mutegen_usb_otg_i0.public_active | 0 | | | Input | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x90 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_xhpi_i0.dyn_domain_mute | | | | Output | |
| Bit | 1 | Internal | mutegen_xhpi_i0.static_domain_mute | | | | Output | |
| Bit | 2 | Internal | mutegen_xhpi_i0.public_active | 0 | | | Input | |
| Bit | 7:3 | | Reserved | | | | | |
| Byte | 0x91 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cmfsm_always_on_core_i4_ao_i0.domain_is_on | | | | Input | |
| Bit | 1 | Internal | cmfsm_always_on_core_i4_ao_i0.domain_wakeup | | | | Input | |
| Bit | 2 | Internal | cmfsm_always_on_core_i4_ao_i0.domain_wkup_ack | | | | Output | |
| Bit | 3 | Internal | cmfsm_always_on_core_i4_ao_i0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = "101" |
| Bit | 4 | Internal | cmfsm_always_on_core_i4_ao_i0.fsm_state | 1 | | | Output | ACTIVE = "011", ACT2INACT1 = "111", |
| Bit | 5 | Internal | cmfsm_always_on_core_i4_ao_i0.fsm_state | 2 | MSB | | Output | INACTIVE = "000", INACT2ACT = "001", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x92 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cmfsm_cam_iss_i0.domain_is_on | | | | Input | |
| Bit | 1 | Internal | cmfsm_cam_iss_i0.domain_wakeup | | | | Input | |
| Bit | 2 | Internal | cmfsm_cam_iss_i0.domain_wkup_ack | | | | Output | |
| Bit | 3 | Internal | cmfsm_cam_iss_i0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = "101" |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|--|
| Bit | 4 | Internal | cmfsm_cam_iss_i0.fsm_state | 1 | | | Output | ACTIVE = "011", ACT2INACT1 = "111", |
| Bit | 5 | Internal | cmfsm_cam_iss_i0.fsm_state | 2 | MSB | | Output | INACTIVE = "000", INACT2ACT = "001", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x93 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cmfsm_core_cortex_m3_i0.domain_is_on | | | | input | |
| Bit | 1 | Internal | cmfsm_core_cortex_m3_i0.domain_wakeup | | | | Input | |
| Bit | 2 | Internal | cmfsm_core_cortex_m3_i0.domain_wkup_ack | | | | Output | |
| Bit | 3 | Internal | cmfsm_core_cortex_m3_i0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = "101" |
| Bit | 4 | Internal | cmfsm_core_cortex_m3_i0.fsm_state | 1 | | | Output | ACTIVE = "011", ACT2INACT1 = "111", |
| Bit | 5 | Internal | cmfsm_core_cortex_m3_i0.fsm_state | 2 | MSB | | Output | INACTIVE = "000", INACT2ACT = "001", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x94 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cmfsm_core_i3_1_i0.domain_is_on | | | | Input | |
| Bit | 1 | Internal | cmfsm_core_i3_1_i0.domain_wakeup | | | | Input | |
| Bit | 2 | Internal | cmfsm_core_i3_1_i0.domain_wkup_ack | | | | Output | |
| Bit | 3 | Internal | cmfsm_core_i3_1_i0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = 101 |
| Bit | 4 | Internal | cmfsm_core_i3_1_i0.fsm_state | 1 | | | Output | ACTIVE = 011, ACT2INACT1 = 111 |
| Bit | 5 | Internal | cmfsm_core_i3_1_i0.fsm_state | 2 | MSB | | Output | INACTIVE = 000, INACT2ACT = 001 |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x95 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cmfsm_core_i3_2_i0.domain_is_on | | | | Input | |
| Bit | 1 | Internal | cmfsm_core_i3_2_i0.domain_wakeup | | | | Input | |
| Bit | 2 | Internal | cmfsm_core_i3_2_i0.domain_wkup_ack | | | | Output | |
| Bit | 3 | Internal | cmfsm_core_i3_2_i0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = 101 |
| Bit | 4 | Internal | cmfsm_core_i3_2_i0.fsm_state | 1 | | | Output | ACTIVE = 011, ACT2INACT1 = 111 |
| Bit | 5 | Internal | cmfsm_core_i3_2_i0.fsm_state | 2 | MSB | | Output | INACTIVE = 000, INACT2ACT = 001 |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x96 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cmfsm_core_i3_dma_i0.domain_is_on | | | | Input | |
| Bit | 1 | Internal | cmfsm_core_i3_dma_i0.domain_wakeup | | | | Input | |
| Bit | 2 | Internal | cmfsm_core_i3_dma_i0.domain_wkup_ack | | | | Output | |
| Bit | 3 | Internal | cmfsm_core_i3_dma_i0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = 101 |
| Bit | 4 | Internal | cmfsm_core_i3_dma_i0.fsm_state | 1 | | | Output | ACTIVE = 011, ACT2INACT1 = 111 |
| Bit | 5 | Internal | cmfsm_core_i3_dma_i0.fsm_state | 2 | MSB | | Output | INACTIVE = 000, INACT2ACT = 001 |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x97 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cmfsm_core_i3_emif_i0.domain_is_on | | | | Input | |
| Bit | 1 | Internal | cmfsm_core_i3_emif_i0.domain_wakeup | | | | Input | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|---|
| Bit | 2 | Internal | cmfsm_core_l3_emif_l0.domain_wkup_ack | | | | Output | |
| Bit | 3 | Internal | cmfsm_core_l3_emif_l0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = 101 |
| Bit | 4 | Internal | cmfsm_core_l3_emif_l0.fsm_state | 1 | | | Output | ACTIVE = 011, ACT2INACT1 = 111 |
| Bit | 5 | Internal | cmfsm_core_l3_emif_l0.fsm_state | 2 | MSB | | Output | INACTIVE = 000, INACT2ACT = 001 |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x98 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ctsbuf_ff_cm2_per_abe_x1_gfclk_l0.y | | | clock | Output | PER_ABE_X1_GFC LK (dpll_abe_clkoutm2) |
| Bit | 1 | Internal | cmfsm_core_l3_instr_l0.domain_is_on | | | | Input | |
| Bit | 2 | Internal | cmfsm_core_l3_instr_l0.domain_wakeup | | | | Input | |
| Bit | 3 | Internal | cmfsm_core_l3_instr_l0.domain_wkup_ack | | | | Output | |
| Bit | 4 | Internal | cmfsm_core_l3_instr_l0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = 101 |
| Bit | 5 | Internal | cmfsm_core_l3_instr_l0.fsm_state | 1 | | | Output | ACTIVE = 011, ACT2INACT1 = 111 |
| Bit | 6 | Internal | cmfsm_core_l3_instr_l0.fsm_state | 2 | MSB | | Output | INACTIVE = 000, INACT2ACT = 001 |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x99 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cmfsm_core_l3x2_d2d_l0.domain_is_on | | | | Input | |
| Bit | 1 | Internal | cmfsm_core_l3x2_d2d_l0.domain_wakeup | | | | Input | |
| Bit | 2 | Internal | cmfsm_core_l3x2_d2d_l0.domain_wkup_ack | | | | Output | |
| Bit | 3 | Internal | cmfsm_core_l3x2_d2d_l0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = 101 |
| Bit | 4 | Internal | cmfsm_core_l3x2_d2d_l0.fsm_state | 1 | | | Output | ACTIVE = 011, ACT2INACT1 = 111 |
| Bit | 5 | Internal | cmfsm_core_l3x2_d2d_l0.fsm_state | 2 | MSB | | Output | INACTIVE = 000, INACT2ACT = 001 |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x9a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ctsbuf_ff_cm2_func_192m_clk_l0.y | | | clock | Output | FUNC_192M (dpll_per_clkoutm2x 2) |
| Bit | 1 | Internal | cmfsm_core_l4_cfg_l0.domain_is_on | | | | Input | |
| Bit | 2 | Internal | cmfsm_core_l4_cfg_l0.domain_wakeup | | | | Input | |
| Bit | 3 | Internal | cmfsm_core_l4_cfg_l0.domain_wkup_ack | | | | Output | |
| Bit | 4 | Internal | cmfsm_core_l4_cfg_l0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = 101 |
| Bit | 5 | Internal | cmfsm_core_l4_cfg_l0.fsm_state | 1 | | | Output | ACTIVE = 011, ACT2INACT1 = 111 |
| Bit | 6 | Internal | cmfsm_core_l4_cfg_l0.fsm_state | 2 | MSB | | Output | INACTIVE = 000, INACT2ACT = 001 |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x9b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x9c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ctsbuf_ff_cm2_func_128m_clk_l0.y | | | clock | Output | FUNC_128M (dpll_per_clkoutm4) |
| Bit | 1 | Internal | cmfsm_dss_l3_dss_l0.domain_is_on | | | | Input | |
| Bit | 2 | Internal | cmfsm_dss_l3_dss_l0.domain_wakeup | | | | Input | |
| Bit | 3 | Internal | cmfsm_dss_l3_dss_l0.domain_wkup_ack | | | | Output | |
| Bit | 4 | Internal | cmfsm_dss_l3_dss_l0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = 101 |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|--|
| Bit | 5 | Internal | cmfsm_dss_l3_dss_l0.fsm_state | 1 | | | Output | ACTIVE = 011, ACT2INACT1 = 111 |
| Bit | 6 | Internal | cmfsm_dss_l3_dss_l0.fsm_state | 2 | MSB | | Output | INACTIVE = 000, INACT2ACT = 001 |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x9d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | spare_cm2_l0.cm2_sgx_gfclk_in | | | clock | input | CORE_SGX_GFCLK (dpll_core_clkoutm7) |
| Bit | 1 | Internal | cmfsm_gfx_l3_gfx_l0.domain_is_on | | | | Input | |
| Bit | 2 | Internal | cmfsm_gfx_l3_gfx_l0.domain_wakeup | | | | Input | |
| Bit | 3 | Internal | cmfsm_gfx_l3_gfx_l0.domain_wkup_ack | | | | Output | |
| Bit | 4 | Internal | cmfsm_gfx_l3_gfx_l0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = 101 |
| Bit | 5 | Internal | cmfsm_gfx_l3_gfx_l0.fsm_state | 1 | | | Output | ACTIVE = 011, ACT2INACT1 = 111 |
| Bit | 6 | Internal | cmfsm_gfx_l3_gfx_l0.fsm_state | 2 | MSB | | Output | INACTIVE = 000, INACT2ACT = 001 |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x9e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cmfsm_ivahd_ivahd_root_l0.domain_is_on | | | | Input | |
| Bit | 1 | Internal | cmfsm_ivahd_ivahd_root_l0.domain_wakeup | | | | Input | |
| Bit | 2 | Internal | cmfsm_ivahd_ivahd_root_l0.domain_wkup_ack | | | | Output | |
| Bit | 3 | Internal | cmfsm_ivahd_ivahd_root_l0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = 101 |
| Bit | 4 | Internal | cmfsm_ivahd_ivahd_root_l0.fsm_state | 1 | | | Output | ACTIVE = 011, ACT2INACT1 = 111 |
| Bit | 5 | Internal | cmfsm_ivahd_ivahd_root_l0.fsm_state | 2 | MSB | | Output | INACTIVE = 000, INACT2ACT = 001 |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x9f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cmfsm_l3_init_l3_init_l0.domain_is_on | | | | Input | |
| Bit | 1 | Internal | cmfsm_l3_init_l3_init_l0.domain_wakeup | | | | Input | |
| Bit | 2 | Internal | cmfsm_l3_init_l3_init_l0.domain_wkup_ack | | | | Output | |
| Bit | 3 | Internal | cmfsm_l3_init_l3_init_l0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = 101 |
| Bit | 4 | Internal | cmfsm_l3_init_l3_init_l0.fsm_state | 1 | | | Output | ACTIVE = 011, ACT2INACT1 = 111 |
| Bit | 5 | Internal | cmfsm_l3_init_l3_init_l0.fsm_state | 2 | MSB | | Output | INACTIVE = 000, INACT2ACT = 001 |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0xa0 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ctsbuf_ff_cm2_l4_iclk_p2p_i_l0.y | | | clock | Output | L4_ICLK |
| Bit | 1 | Internal | cmfsm_l4_per_l4_per_l0.domain_is_on | | | | Input | |
| Bit | 2 | Internal | cmfsm_l4_per_l4_per_l0.domain_wakeup | | | | Input | |
| Bit | 3 | Internal | cmfsm_l4_per_l4_per_l0.domain_wkup_ack | | | | Output | |
| Bit | 4 | Internal | cmfsm_l4_per_l4_per_l0.fsm_state | 0 | LSB | | Output | ACT2INACT2 = 101 |
| Bit | 5 | Internal | cmfsm_l4_per_l4_per_l0.fsm_state | 1 | | | Output | ACTIVE = 011, ACT2INACT1 = 111 |
| Bit | 6 | Internal | cmfsm_l4_per_l4_per_l0.fsm_state | 2 | MSB | | Output | INACTIVE = 000, INACT2ACT = 001 |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0xa1 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 5:0 | | Reserved | | | | | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 6 | Internal | gcg_cam_phy_ctrl_gclk_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_cam_phy_ctrl_gclk_I0.clk_is_running | | | | Output | |
| Byte | 0xa2 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_cm2_profiling_I4_giclk_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_cm2_profiling_I4_giclk_I0.clk_is_running | | | | Output | |
| Bit | 2 | Internal | gcg_core_alwon_32k_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_core_alwon_32k_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 5:4 | | Reserved | | | | | |
| Bit | 6 | Internal | gcg_dss_fclk_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_dss_fclk_I0.clk_is_running | | | | Output | |
| Byte | 0xa3 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_cortex_m3_gclk_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_cortex_m3_gclk_I0.clk_is_running | | | | Output | |
| Bit | 2 | Internal | gcg_cortex_m3_iss_clk_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_cortex_m3_iss_clk_I0.clk_is_running | | | | Output | |
| Bit | 4 | Internal | gcg_fdif_fclk_pwadded_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_fdif_fclk_pwadded_I0.clk_is_running | | | | Output | |
| Bit | 6 | Internal | gcg_fdif_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_fdif_gfclk_I0.clk_is_running | | | | Output | |
| Byte | 0xa4 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_func_128m_clk_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_func_128m_clk_I0.clk_is_running | | | | Output | |
| Bit | 2 | Internal | gcg_func_12m_fclk_pwadded_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_func_12m_fclk_pwadded_I0.clk_is_running | | | | Output | |
| Bit | 4 | Internal | gcg_func_192m_clk_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_func_192m_clk_I0.clk_is_running | | | | Output | |
| Bit | 6 | Internal | gcg_func_24mc_fclk_pwadded_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_func_24mc_fclk_pwadded_I0.clk_is_running | | | | Output | |
| Byte | 0xa5 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_func_48m_fclk_pwadded_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_func_48m_fclk_pwadded_I0.clk_is_running | | | | Output | |
| Bit | 2 | Internal | gcg_func_48mc_fclk_pwadded_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_func_48mc_fclk_pwadded_I0.clk_is_running | | | | Output | |
| Bit | 4 | Internal | gcg_func_64m_fclk_pwadded_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_func_64m_fclk_pwadded_I0.clk_is_running | | | | Output | |
| Bit | 6 | Internal | gcg_func_96m_alwon_clk_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_func_96m_alwon_clk_I0.clk_is_running | | | | Output | |
| Byte | 0xa6 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_func_96m_fclk_pwadded_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_func_96m_fclk_pwadded_I0.clk_is_running | | | | Output | |
| Bit | 3:2 | | Reserved | | | | | |
| Bit | 4 | Internal | gcg_hsi_fclk_pwadded_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_hsi_fclk_pwadded_I0.clk_is_running | | | | Output | |
| Bit | 6 | Internal | gcg_hsic_p1_480m_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_hsic_p1_480m_gfclk_I0.clk_is_running | | | | Output | |
| Byte | 0xa7 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_hsic_p1_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_hsic_p1_gfclk_I0.clk_is_running | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 2 | Internal | gcg_hsic_p2_480m_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_hsic_p2_480m_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 4 | Internal | gcg_hsic_p2_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_hsic_p2_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 6 | Internal | gcg_init_480m_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_init_480m_gfclk_I0.clk_is_running | | | | Output | |
| Byte | 0xa8 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_init_48m_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_init_48m_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 2 | Internal | gcg_init_48mc_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_init_48mc_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 4 | Internal | gcg_init_60m_fclk_pwadded_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_init_60m_fclk_pwadded_I0.clk_is_running | | | | Output | |
| Bit | 6 | Internal | gcg_init_60m_p1_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_init_60m_p1_gfclk_I0.clk_is_running | | | | Output | |
| Byte | 0xa9 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_init_60m_p2_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_init_60m_p2_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 2 | Internal | gcg_init_960m_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_init_960m_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 4 | Internal | gcg_init_96m_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_init_96m_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 6 | Internal | gcg_init_hsi_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_init_hsi_gfclk_I0.clk_is_running | | | | Output | |
| Byte | 0xaa | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_iss_gclk_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_iss_gclk_I0.clk_is_running | | | | Output | |
| Bit | 2 | Internal | gcg_I3_gfx_giclk_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_I3_gfx_giclk_I0.clk_is_running | | | | Output | |
| Bit | 4 | Internal | gcg_I4_ao_iclk_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_I4_ao_iclk_I0.clk_is_running | | | | Output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0xab | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_I4_d2d_giclk_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_I4_d2d_giclk_I0.clk_is_running | | | | Output | |
| Bit | 2 | Internal | gcg_I4_d2d_giclk_I1.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_I4_d2d_giclk_I1.clk_is_running | | | | Output | |
| Bit | 4 | Internal | gcg_I4_dss_giclk_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_I4_dss_giclk_I0.clk_is_running | | | | Output | |
| Bit | 6 | Internal | gcg_per_32k_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_per_32k_gfclk_I0.clk_is_running | | | | Output | |
| Byte | 0xac | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_per_48m_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_per_48m_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 2 | Internal | gcg_per_96m_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_per_96m_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 4 | Internal | gcg_per_abe_24m_fclk_pwadded_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_per_abe_24m_fclk_pwadded_I0.clk_is_running | | | | Output | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 6 | Internal | gcg_per_abe_nc_fclk_pwadded_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_per_abe_nc_fclk_pwadded_I0.clk_is_running | | | | Output | |
| Byte | 0xad | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_per_bb2d_fclk_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_per_bb2d_fclk_I0.clk_is_running | | | | Output | |
| Bit | 2 | Internal | gcg_per_dpll_alwon_clk_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_per_dpll_alwon_clk_I0.clk_is_running | | | | Output | |
| Bit | 4 | Internal | gcg_per_dpll_scrm_clk_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_per_dpll_scrm_clk_I0.clk_is_running | | | | Output | |
| Bit | 6 | Internal | gcg_per_sys_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_per_sys_gfclk_I0.clk_is_running | | | | Output | |
| Byte | 0xae | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_sgx_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_sgx_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 2 | Internal | gcg_sr_core_sysclk_I0.clk_is_gatedgcg_sr_core_sysclk_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_sr_core_sysclk_I0.clk_is_running | | | | Output | |
| Bit | 4 | Internal | gcg_sr_iva_sysclk_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_sr_iva_sysclk_I0.clk_is_running | | | | Output | |
| Bit | 6 | Internal | gcg_sr_mpu_sysclk_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_sr_mpu_sysclk_I0.clk_is_running | | | | Output | |
| Byte | 0xaf | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_tll_ch0_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 1 | Internal | gcg_tll_ch0_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 2 | Internal | gcg_tll_ch1_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_tll_ch1_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0xb0 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 1:0 | | Reserved | | | | | |
| Bit | 2 | Internal | gcg_usb_dpll_clk_I0.clk_is_gated | | | | Output | |
| Bit | 3 | Internal | gcg_usb_dpll_clk_I0.clk_is_running | | | | Output | |
| Bit | 4 | Internal | gcg_utmi_p3_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 5 | Internal | gcg_utmi_p3_gfclk_I0.clk_is_running | | | | Output | |
| Bit | 6 | Internal | gcg_utmi_root_gfclk_I0.clk_is_gated | | | | Output | |
| Bit | 7 | Internal | gcg_utmi_root_gfclk_I0.clk_is_running | | | | Output | |
| Byte | 0xb1 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_bb2d_clk_mux_pwadded0_I0.clkCtrl | | | | Input | |
| Bit | 1 | Internal | gat_bb2d_clk_mux_pwadded1_I0.clkCtrl | | | | Input | |
| Bit | 2 | Internal | gat_cam_phy_ctrl_gclk_I0.clkCtrl | | | | Input | |
| Bit | 3 | Internal | gat_cm2_profiling_I4_giclk_I0.clkCtrl | | | | Input | |
| Bit | 4 | Internal | gat_fdif_fclk_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 5 | Internal | gat_fdif_gfclk_I0.clkCtrl | | | | Input | |
| Bit | 6 | Internal | gat_func_12m_fclk_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 7 | Internal | gat_func_24mc_fclk_pwadded_I0.clkCtrl | | | | Input | |
| Byte | 0xb2 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_func_48m_fclk_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 1 | Internal | gat_func_48mc_fclk_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 2 | Internal | gat_func_64m_fclk_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 3 | Internal | gat_func_96m_fclk_pwadded_I0.clkCtrl | | | | Input | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 4 | | Reserved | | | | | |
| Bit | 5 | Internal | gat_hsi_fclk_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 6 | Internal | gat_hsmmc1_fclk_pwadded0_I0.clkCtrl | | | | Input | |
| Bit | 7 | Internal | gat_hsmmc1_fclk_pwadded1_I0.clkCtrl | | | | Input | |
| Byte | 0xb3 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_hsmmc2_fclk_pwadded0_I0.clkCtrl | | | | Input | |
| Bit | 1 | Internal | gat_hsmmc2_fclk_pwadded1_I0.clkCtrl | | | | Input | |
| Bit | 3:2 | | Reserved | | | | | |
| Bit | 4 | Internal | gat_init_48m_gfclk_I0.clkCtrl | | | | Input | |
| Bit | 5 | Internal | gat_init_48mc_gfclk_I0.clkCtrl | | | | Input | |
| Bit | 6 | Internal | gat_init_96m_gfclk_I0.clkCtrl | | | | Input | |
| Bit | 7 | Internal | gat_init_hsi_gfclk_I0.clkCtrl | | | | Input | |
| Byte | 0xb4 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_l3_1_giclk_I0.clkCtrl | | | | Input | |
| Bit | 1 | Internal | gat_l3_2_giclk_I0.clkCtrl | | | | Input | |
| Bit | 2 | Internal | gat_l3_d2d_giclk_I0.clkCtrl | | | | Input | |
| Bit | 3 | Internal | gat_l3_dma_giclk_I0.clkCtrl | | | | Input | |
| Bit | 4 | Internal | gat_l3_dss_giclk_I0.clkCtrl | | | | Input | |
| Bit | 5 | Internal | gat_l3_emif_giclk_I0.clkCtrl | | | | Input | |
| Bit | 6 | Internal | gat_l3_eintrconn_giclk_I0.clkCtrl | | | | Input | |
| Bit | 7 | Internal | gat_l3_gfx_giclk_I0.clkCtrl | | | | Input | |
| Byte | 0xb5 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_l3_init_giclk_I0.clkCtrl | | | | Input | |
| Bit | 1 | Internal | gat_l3_instr_giclk_I0.clkCtrl | | | | Input | |
| Bit | 2 | | Reserved | | | | | |
| Bit | 3 | Internal | gat_l4_ao_iclk_I0.clkCtrl | | | | Input | |
| Bit | 4 | | Reserved | | | | | |
| Bit | 5 | Internal | gat_l4_cfg_giclk_I0.clkCtrl | | | | Input | |
| Bit | 6 | Internal | gat_l4_d2d_giclk_I0.clkCtrl | | | | Input | |
| Bit | 7 | Internal | gat_l4_init_giclk_I0.clkCtrl | | | | Input | |
| Byte | 0xb6 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_l4_per_giclk_I0.clkCtrl | | | | Input | |
| Bit | 5:1 | | Reserved | | | | | |
| Bit | 6 | Internal | gat_mcbasp4_sync_mux_pwadded0_I0.clkCtrl | | | | Input | |
| Bit | 7 | Internal | gat_mcbasp4_sync_mux_pwadded1_I0.clkCtrl | | | | Input | |
| Byte | 0xb7 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_per_48m_gfclk_I0.clkCtrl | | | | Input | |
| Bit | 1 | Internal | gat_per_96m_gfclk_I0.clkCtrl | | | | Input | |
| Bit | 2 | Internal | gat_per_abe_24m_fclk_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 3 | Internal | gat_per_abe_nc_fclk_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0xb8 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | dllready | 0 | | | input | |
| Bit | 1 | External | dllready | 1 | | | Input | |
| Bit | 2 | External | dllready | 2 | | | Input | |
| Bit | 3 | External | dllready | 3 | | | Input | |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|---|
| Bit | 4 | External | dllready | 4 | | | Input | |
| Bit | 5 | External | dllready | 5 | | | Input | |
| Bit | 6 | External | dllready | 6 | | | Input | |
| Bit | 7 | External | dllready | 7 | | | Input | |
| Byte | 0xb9 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | emiffsm_i0.state | 0 | LSB | | Output | |
| Bit | 1 | Internal | emiffsm_i0.state | 1 | | | Output | |
| Bit | 2 | Internal | emiffsm_i0.state | 2 | MSB | | Output | |
| Bit | 3 | Internal | emiffsm_i0.clockStable | | | | Output | |
| Bit | 4 | External | forceactive_cortex_m3_cpu1 | | | | Input | |
| Bit | 5 | External | forceactive_cortex_m3_cpu2 | | | | Input | |
| Bit | 6 | External | inhibitsleep_cortex_m3_cpu1 | | | | Input | |
| Bit | 7 | External | inhibitsleep_cortex_m3_cpu2 | | | | Input | |
| Byte | 0xba | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cortex_m3_emu_custom.emu_clkstate_cortex_m3 | | | | Output | |
| Bit | 1 | Internal | prcm_emu_ctrl_clk_cortex_m3_cpu1_st.ackfsm_state | 0 | LSB | | Output | FORCEACKSTATE = 11, BOTHACK = 10 |
| Bit | 2 | Internal | prcm_emu_ctrl_clk_cortex_m3_cpu1_st.ackfsm_state | 1 | MSB | | Output | ACKOFF = 01, INHIBACK = 00 |
| Bit | 3 | Internal | prcm_emu_ctrl_clk_cortex_m3_cpu1_st.fsm_state | 0 | LSB | | Output | FORCEON = 010 |
| Bit | 4 | Internal | prcm_emu_ctrl_clk_cortex_m3_cpu1_st.fsm_state | 1 | | | Output | SLEEPDESIREDSTATE = 111, SLEEP2NORMAL = 101 |
| Bit | 5 | Internal | prcm_emu_ctrl_clk_cortex_m3_cpu1_st.fsm_state | 2 | MSB | | Output | NORMAL = 000, TOSLEEPD = 001 |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0xbb | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | prcm_emu_ctrl_clk_cortex_m3_cpu2_st.ackfsm_state | 0 | LSB | | Output | FORCEACKSTATE = 11, BOTHACK = 10 |
| Bit | 1 | Internal | prcm_emu_ctrl_clk_cortex_m3_cpu2_st.ackfsm_state | 1 | MSB | | Output | ACKOFF = 01, INHIBACK = 00 |
| Bit | 2 | Internal | prcm_emu_ctrl_clk_cortex_m3_cpu2_st.fsm_state | 0 | LSB | | Output | FORCEON = 010 |
| Bit | 3 | Internal | prcm_emu_ctrl_clk_cortex_m3_cpu2_st.fsm_state | 1 | | | Output | SLEEPDESIREDSTATE = 111, SLEEP2NORMAL = 101 |
| Bit | 4 | Internal | prcm_emu_ctrl_clk_cortex_m3_cpu2_st.fsm_state | 2 | MSB | | Output | NORMAL = 000, TOSLEEPD = 001 |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0xbc | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | prcm_emu_ctrl_cortex_m3_clk_i0.ackfsm_state | 0 | LSB | | Output | FORCEACKSTATE = 11, BOTHACK = 10 |
| Bit | 1 | Internal | prcm_emu_ctrl_cortex_m3_clk_i0.ackfsm_state | 1 | MSB | | Output | ACKOFF = 01, INHIBACK = 00 |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|---|
| Bit | 2 | Internal | prcm_emu_ctrl_cortex_m3_clk_i0.fsm_state | 0 | LSB | | Output | FORCEON = 010 |
| Bit | 3 | Internal | prcm_emu_ctrl_cortex_m3_clk_i0.fsm_state | 1 | | | Output | SLEEPDESIREDSTATE = 111, SLEEP2NORMAL = 101 |
| Bit | 4 | Internal | prcm_emu_ctrl_cortex_m3_clk_i0.fsm_state | 2 | MSB | | Output | NORMAL = 000, TOSLEEPD = 001 |
| Bit | 5 | Internal | gat_l3_dss_giclk_i0.clkGated | | | clock | Output | L3_DSS_GICLK |
| Bit | 6 | Internal | gat_l3_init_giclk_i0.clkGated | | | clock | Output | L3_INIT_GICLK |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0xbd | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_l3_gfx_giclk_i0.clkGated | | | clock | Output | L3_GFX_GICLK |
| Bit | 1 | Internal | gat_l3_emif_giclk_i0.clkGated | | | clock | Output | L3_EMIF_GICLK |
| Bit | 2 | Internal | gat_l3_d2d_giclk_i0.clkGated | | | clock | Output | L3_D2D_GICLK |
| Bit | 3 | Internal | gat_l3_1_giclk_i0.clkGated | | | clock | Output | L3_1_GICLK |
| Bit | 4 | Internal | gat_l3_2_giclk_i0.clkGated | | | clock | Output | L3_2_GICLK |
| Bit | 5 | Internal | gat_l3_instr_giclk_i0.clkGated | | | clock | Output | L3_INSTR_GICLK |
| Bit | 6 | Internal | gat_l3_dma_giclk_i0.clkGated | | | clock | Output | L3_DMA_GICLK |
| Bit | 7 | Internal | gat_l4_init_giclk_i0.clkGated | | | clock | Output | L4_INIT_GICLK |
| Byte | 0xbe | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_l4_per_giclk_i0.clkGated | | | clock | Output | L4_PER_GICLK |
| Bit | 1 | | Reserved | | | | | |
| Bit | 2 | Internal | gat_l4_ao_iclk_i0.clkGated | | | clock | Output | L4_AO_ICLK |
| Bit | 3 | Internal | gat_l4_d2d_giclk_i0.clkGated | | | clock | Output | L4_D2D_GICLK |
| Bit | 4 | Internal | gat_l4_cfg_giclk_i0.clkGated | | | clock | Output | L4_CFG_GICLK |
| Bit | 5 | Internal | gat_cm2_profiling_l4_giclk_i0.clkGated | | | clock | Output | CM2_PROFILING_L4_GICLK |
| Bit | 6 | | Reserved | | | | | |
| Bit | 7 | Internal | gat_cam_phy_ctrl_giclk_i0.clkGated | | | clock | Output | CAM_PHY_CTRL_GICLK |
| Byte | 0xbf | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_init_96m_gfclk_i0.clkGated | | | clock | Output | INIT_96M_GFCLK |
| Bit | 1 | Internal | gat_per_96m_gfclk_i0.clkGated | | | clock | Output | PER_96M_GFCLK |
| Bit | 2 | Internal | gat_init_hsi_gfclk_i0.clkGated | | | clock | Output | INIT_HSI_GFCLK |
| Bit | 3 | Internal | gat_per_48m_gfclk_i0.clkGated | | | clock | Output | PER_48M_GFCLK |
| Bit | 4 | Internal | gat_init_48m_gfclk_i0.clkGated | | | clock | Output | INIT_48M_GFCLK |
| Bit | 5 | Internal | dg1_func_12m_fclk_i0.div_bus | | | clock | Output | FUNC_12M_GFCLK |
| Bit | 6 | Internal | dg1_func_24mc_fclk_i0.div_bus | | | clock | Output | PER_24MC_GFCLK |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0xc0 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_init_48mc_gfclk_i0.clkGated | | | clock | Output | INIT_48MC_GFCLK |
| Bit | 1 | Internal | gat_init_48mc_gfclk_i0.clkGated | | | clock | Output | HDMI_PHY_48MHZ_GFCLK |
| Bit | 2 | Internal | gat_fdif_gfclk_i0.clkGated | | | clock | Output | FDIF_GFCLK |
| Bit | 3 | Internal | mux_hsmmc2_fclk_i0.clk_out | | | clock | Output | INIT_HSMMC2_GFCLK |
| Bit | 4 | Internal | mux_hsmmc1_fclk_i0.clk_out | | | clock | Output | INIT_HSMMC1_GFCLK |
| Bit | 5 | | Reserved | | | | | |
| Bit | 6 | Internal | dg1_per_abe_24m_fclk_i0.div_bus | | | clock | Output | PER_ABE_24M_GFCLK |

Table 19-40. CM2 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|---------------------------------|
| Bit | 7 | Internal | mux_per_mcbbsp4_gfclk_i0.clk_out | | | clock | Output | PER_MCBSP4_GFCLK |
| Byte | 0xc1 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 1:0 | | Reserved | | | | | |
| Bit | 2 | External | pd_dss_i4_dss_giclk_ien | | | clock | Output | L4_DSS_GICLK_IEN |
| Bit | 3 | | Reserved | | | | | |
| Bit | 4 | External | pd_core_i4_d2d_giclk_ien | | | clock | Output | L4_D2D_GICLK_IEN |
| Bit | 5 | External | pd_core_i4_1_giclk_ien | | | clock | Output | L4_1_GICLK_IEN |
| Bit | 6 | External | pd_core_i4_2_giclk_ien | | | clock | Output | L4_2_GICLK_IEN |
| Bit | 7 | External | pd_core_i4_instr_giclk_ien | | | clock | Output | L4_INSTR_GICLK_IEN |
| Byte | 0xc2 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | pd_core_i4_dma_giclk_ien | | | clock | Output | L4_DMA_GICLK_IEN |
| Bit | 1 | External | pd_core_i4_emif_giclk_ien | | | clock | Output | L4_EMIF_GICLK_IEN |
| Bit | 2 | External | pd_i3_init_i4_init_giclk_ien | | | clock | Output | L4_INIT_GICLK_IEN |
| Bit | 3 | Internal | spare_cm2_i0.cm2_emac_50mh_clk_in | | | clock | Input | EMAC_50MHZ_CLK |
| Bit | 4 | Internal | ctsbuf_ff_cm2_per_bb2d_x2_fclk_i0.y | | | clock | Output | PER_BB2D_X2_FCLK(DPLL_PER.M6) |
| Bit | 5 | Internal | ctsbuf_ff_cm2_core_bb2d_x2_fclk_i0.y | | | clock | Output | CORE_BB2D_X2_FCLK(DPLL_CORE.M7) |
| Bit | 6 | Internal | spare_cm2_i0.cm2_sgx_gfclk_in | | | clock | Input | SGX_GFCLK(DPLL_PER.M7) |
| Bit | 7 | Internal | mux_bb2d_clk_mux_i0.clk_out | | | clock | Output | BB2D_X2_GFCLK |
| Byte | 0xc3 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | freezegen_cam_iss_i0.freeze_Public | | | | Output | |
| Bit | 1 | Internal | freezegen_core_cortex_m3_i0.freeze_Public | | | | Output | |
| Bit | 2 | Internal | freezegen_core_i3_dma_i0.freeze_Public | | | | Output | |
| Bit | 3 | Internal | freezegen_core_i3x2_d2d_i0.freeze_Public | | | | Output | |
| Bit | 4 | Internal | freezegen_dss_i3_dss_i0.freeze_Public | | | | Output | |
| Bit | 5 | Internal | freezegen_gfx_i3_gfx_i0.freeze_Public | | | | Output | |
| Bit | 6 | Internal | freezegen_ivahd_ivahd_root_i0.freeze_Public | | | | Output | |
| Bit | 7 | Internal | freezegen_i3_init_i3_init_i0.freeze_Public | | | | Output | |

19.4.11.5.8 CM1 Subsystem Observable Signals

The General Wakeup Control observability inputs hwobs_int_cm1(i) , (where i = 0...31) are mapped to the signals debugcm1(i), (where i = 0...31) coming out of the PRCM submodule clock manager 1 (CM1).

Local multiplexing controls at the CM1 level are in the CM1_DEBUG_CFG register. The CM1 observability output signals are driven on the debugcm1(0) through debugcm1(7) lines. A certain mux set is selected by programming the CM1_DEBUG_CFG[6:0] SEL0 bit field. The remaining debugcm1(8) through debugcm1(31) lines are reserved for future use. For more information about the CM1 observability source select field, see [Section 3.11.22.1, INTRCONN_SOCKET_CM1 Register Summary](#) in [Chapter 3, Power, Reset, and Clock Management](#).

[Table 19-41](#) provides different details about the signals inside CM1 that can be monitored on device hw_dbg pins.

Table 19-41. CM1 Observable Signals

| Byte | 0x00 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
|------|------|----------|-------------------------------|----|--------|--------|--------|---------------|
| Bit | 0 | External | cortex_a9_cm1_profiling_event | 0 | | | Input | CPU0_MStandby |
| Bit | 1 | External | cortex_a9_cm1_profiling_event | 2 | | | Input | CPU0_MWait |
| Bit | 2 | External | cortex_a9_cm1_profiling_event | 4 | | | Input | CPU1_MStandby |
| Bit | 3 | External | cortex_a9_cm1_profiling_event | 6 | | | Input | CPU1_MWait |
| Bit | 4 | External | cortex_a9_cm1_profiling_event | 1 | | | Input | CPU0_MWakeup |
| Bit | 5 | External | cortex_a9_cm1_profiling_event | 5 | | | Input | CPU1_MWakeup |
| Bit | 6 | External | cortex_a9_cm1_profiling_event | 3 | | | Input | |
| Bit | 7 | External | cortex_a9_cm1_profiling_event | 7 | | | Input | |
| Byte | 0x01 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ckctrl_emif_l0.ckctrl_mpudpll | | | | Input | |
| Bit | 1 | Internal | ckctrl_emif_l0.ckstat_mpudpll | | | | output | |
| Bit | 2 | Internal | ckctrl_emif_l0.ckctrl_icg1 | | | | output | |
| Bit | 3 | Internal | ckctrl_emif_l0.ckstat_icg1 | | | | Input | |
| Bit | 4 | Internal | ckctrl_emif_l0.ckctrl_icg2 | | | | output | |
| Bit | 5 | Internal | ckctrl_emif_l0.ckstat_icg2 | | | | Input | |
| Bit | 6 | Internal | ckctrl_emif_l0.emif_clk_sel | | | | output | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x02 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ckctrl_emif_l0.ckctrl_l3emif | | | | Input | |
| Bit | 1 | Internal | ckctrl_emif_l0.ckstat_l3emif | | | | output | |
| Bit | 2 | Internal | ckctrl_emif_l0.ckctrl_icg3 | | | | output | |
| Bit | 3 | Internal | ckctrl_emif_l0.ckstat_icg3 | | | | Input | |
| Bit | 4 | Internal | ckctrl_emif_l0.ckctrl_icg4 | | | | output | |
| Bit | 5 | Internal | ckctrl_emif_l0.ckstat_icg4 | | | | Input | |
| Bit | 6 | Internal | ckctrl_emif_l0.emif_clk_sel | | | | output | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x03 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mpu_dcc_fsm_l0.dbgstate | 0 | | | output | |
| Bit | 1 | Internal | mpu_dcc_fsm_l0.dbgstate | 1 | | | output | |
| Bit | 2 | Internal | mpu_dcc_fsm_l0.dbgstate | 2 | | | output | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 3 | Internal | mpu_dcc_fsm_I0.dbgstate | 3 | | | output | |
| Bit | 4 | Internal | ckctrl_emif_I0.ckctrl_icg1 | | | | output | |
| Bit | 5 | Internal | mpu_dcc_fsm_I0.mpu_clkoutenack | | | | Input | |
| Bit | 6 | Internal | mpu_dcc_fsm_I0.mpu_clkouthifenack | | | | Input | |
| Bit | 7 | Internal | mpu_dcc_fsm_I0.mpu_dcc_ckstat | | | | Input | |
| Byte | 0x04 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x5 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x6 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x7 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x8 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x9 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0xa | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0xb | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0xc | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0xd | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0xe | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0xf | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x10 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ifsm_aess_standby_prot_I0.MStandby | | | | Input | |
| Bit | 1 | Internal | ifsm_aess_standby_prot_I0.init_Wait | | | | output | |
| Bit | 2 | Internal | ifsm_aess_standby_prot_I0.module_mwakeup | 0 | | | Input | |
| Bit | 7:3 | | Reserved | | | | | |
| Byte | 0x11 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ifsm_dspss_stdby_prot_I0.MStandby | | | | Input | |
| Bit | 1 | Internal | ifsm_dspss_stdby_prot_I0.init_Wait | | | | output | |
| Bit | 2 | Internal | ifsm_dspss_stdby_prot_I0.module_mwakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsa_aess_idle_prot_I0.idleReq | | | | output | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 4 | Internal | tfsm_aess_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 5 | Internal | tfsm_aess_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 6 | Internal | tfsm_aess_idle_prot_I0.fclken_IP | | | | output | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x12 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_cm1_profiling_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_cm1_profiling_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_cm1_profiling_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_cm1_profiling_I0.fclken_IP | | | | output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x13 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_dmic_idle_prot_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_dmic_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_dmic_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_dmic_idle_prot_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsm_dmic_idle_prot_I0.fclken_IP | | | | output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x14 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_I4_audio_interconnect_idle_prot_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_I4_audio_interconnect_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_I4_audio_interconnect_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_I4_audio_interconnect_idle_prot_I0.fclken_IP | | | | output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x15 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_mcaspcfgidle_p_cfg_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_mcaspcfgidle_p_cfg_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_mcaspcfgidle_p_cfg_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_mcaspcfgidle_p_cfg_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsm_mcaspcfgidle_p_cfg_I0.fclken_IP | | | | output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x16 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_mcbbsp1_mcbbsp1p_power_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_mcbbsp1_mcbbsp1p_power_I0.SidleAck | 1 | | | Input | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 2 | Internal | tfsm_mcbasp1_mcbaspplp_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_mcbasp1_mcbaspplp_power_I0.fclken_IP | | | | output | |
| Bit | 4 | Internal | tfsm_mcbasp2_mcbaspplp_power_I0.idleReq | | | | output | |
| Bit | 5 | Internal | tfsm_mcbasp2_mcbaspplp_power_I0.SidleAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsm_mcbasp2_mcbaspplp_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsm_mcbasp2_mcbaspplp_power_I0.fclken_IP | | | | output | |
| Byte | 0x17 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_mcbasp3_mcbaspplp_power_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_mcbasp3_mcbaspplp_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_mcbasp3_mcbaspplp_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_mcbasp3_mcbaspplp_power_I0.fclken_IP | | | | output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x18 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_pdm_idle_prot_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_pdm_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_pdm_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_pdm_idle_prot_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsm_pdm_idle_prot_I0.fclken_IP | | | | output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x19 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_slimbus_slimbus_power_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_slimbus_slimbus_power_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_slimbus_slimbus_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_slimbus_slimbus_power_I0.module_swakeup | 1 | | | Input | |
| Bit | 4 | Internal | tfsm_slimbus_slimbus_power_I0.fclken_IP | | | | output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x1a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_dspss_idle_prot_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_dspss_idle_prot_I0.SidleAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_dspss_idle_prot_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_dspss_idle_prot_I0.fclken_IP | | | | output | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 4 | Internal | tfsm_timer5_dmtimer_dmc_power_I0.idleReq | | | | output | |
| Bit | 5 | Internal | tfsm_timer5_dmtimer_dmc_power_I0.SideAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsm_timer5_dmtimer_dmc_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsm_timer5_dmtimer_dmc_power_I0.fclken_IP | | | | output | |
| Byte | 0x1b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_timer6_dmtimer_dmc_power_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_timer6_dmtimer_dmc_power_I0.SideAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_timer6_dmtimer_dmc_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_timer6_dmtimer_dmc_power_I0.fclken_IP | | | | output | |
| Bit | 4 | Internal | tfsm_timer7_dmtimer_dmc_power_I0.idleReq | | | | output | |
| Bit | 5 | Internal | tfsm_timer7_dmtimer_dmc_power_I0.SideAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsm_timer7_dmtimer_dmc_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsm_timer7_dmtimer_dmc_power_I0.fclken_IP | | | | output | |
| Byte | 0x1c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_timer8_dmtimer_dmc_power_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_timer8_dmtimer_dmc_power_I0.SideAck | 1 | | | Input | |
| Bit | 2 | Internal | tfsm_timer8_dmtimer_dmc_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 3 | Internal | tfsm_timer8_dmtimer_dmc_power_I0.fclken_IP | | | | output | |
| Bit | 4 | Internal | tfsm_wdt3_watchdog_power_I0.idleReq | | | | output | |
| Bit | 5 | Internal | tfsm_wdt3_watchdog_power_I0.SideAck | 1 | | | Input | |
| Bit | 6 | Internal | tfsm_wdt3_watchdog_power_I0.module_swakeup | 0 | | | Input | |
| Bit | 7 | Internal | tfsm_wdt3_watchdog_power_I0.fclken_IP | | | | output | |
| Byte | 0x1d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_abe_I0.DPLLCtrlState | 0 | LSB | | output | |
| Bit | 1 | Internal | dpllsctrl_dpll_abe_I0.DPLLCtrlState | 1 | | | output | |
| Bit | 2 | Internal | dpllsctrl_dpll_abe_I0.DPLLCtrlState | 2 | | | output | |
| Bit | 3 | Internal | dpllsctrl_dpll_abe_I0.DPLLCtrlState | 3 | | | output | |
| Bit | 4 | Internal | dpllsctrl_dpll_abe_I0.DPLLCtrlState | 4 | | | output | |
| Bit | 5 | Internal | dpllsctrl_dpll_abe_I0.DPLLCtrlState | 5 | | | output | |
| Bit | 6 | Internal | dpllsctrl_dpll_abe_I0.DPLLCtrlState | 6 | | | output | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 7 | Internal | dpllsctrl_dpll_abe_i0.DPLLCtrlState | 7 | MSB | | output | |
| Byte | 0x1e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_abe_i0.freqChgReqAck | | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dpll_abe_i0.freqChgReq | | | | output | |
| Bit | 2 | Internal | dpllsctrl_dpll_abe_i0.freqChgReqAck2 | | | | output | |
| Bit | 3 | Internal | dpllsctrl_dpll_abe_i0.freqChgReq2 | | | | Input | |
| Bit | 4 | Internal | dpllsctrl_dpll_abe_i0.bypass | | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpll_abe_i0.freqlock | | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dpll_abe_i0.lossref | | | | Input | |
| Bit | 7 | Internal | dpllsctrl_dpll_abe_i0.tinitz | | | | output | |
| Byte | 0x1f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_abe_i0.tenable | | | | output | |
| Bit | 1 | Internal | dpllsctrl_dpll_abe_i0.tenablediv | | | | output | |
| Bit | 2 | Internal | dpllsctrl_dpll_abe_i0.idle | | | | output | |
| Bit | 3 | Internal | dpllsctrl_dpll_abe_i0.lowcurrstdby | | | | output | |
| Bit | 4 | Internal | dpllsctrl_dpll_abe_i0.dpll_ticopwdn | | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpll_abe_i0.dpll_idopwdn | | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dpll_abe_i0.clkinplsRunning | | | | Input | |
| Bit | 7 | Internal | dpllsctrl_dpll_abe_i0.clkinpToBeGated | | | | output | |
| Byte | 0x20 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_abe_i0.clkinplowIsRunning | | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dpll_abe_i0.clkinplowToBeGated | | | | output | |
| Bit | 7:2 | | Reserved | | | | | |
| Byte | 0x21 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_core_i0.DPLLCtrlState | 0 | LSB | | output | |
| Bit | 1 | Internal | dpllsctrl_dpll_core_i0.DPLLCtrlState | 1 | | | output | |
| Bit | 2 | Internal | dpllsctrl_dpll_core_i0.DPLLCtrlState | 2 | | | output | |
| Bit | 3 | Internal | dpllsctrl_dpll_core_i0.DPLLCtrlState | 3 | | | output | |
| Bit | 4 | Internal | dpllsctrl_dpll_core_i0.DPLLCtrlState | 4 | | | output | |
| Bit | 5 | Internal | dpllsctrl_dpll_core_i0.DPLLCtrlState | 5 | | | output | |
| Bit | 6 | Internal | dpllsctrl_dpll_core_i0.DPLLCtrlState | 6 | | | output | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---------------------------------------|----|--------|--------|--------|----------|
| Bit | 7 | Internal | dpllsctrl_dpll_core_I0.DPLLCtrlState | 7 | MSB | | output | |
| Byte | 0x22 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_core_I0.stopCondBus | 0 | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dpll_core_I0.stopCondBus | 1 | | | Input | |
| Bit | 2 | Internal | dpllsctrl_dpll_core_I0.stopCondBus | 2 | | | Input | |
| Bit | 3 | Internal | dpllsctrl_dpll_core_I0.stopCondBus | 3 | | | Input | |
| Bit | 4 | Internal | dpllsctrl_dpll_core_I0.stopCondBus | 4 | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpll_core_I0.stopCondBus | 5 | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dpll_core_I0.stopCondBus | 6 | | | Input | |
| Bit | 7 | Internal | dpllsctrl_dpll_core_I0.stopCondBus | 7 | | | Input | |
| Byte | 0x23 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_core_I0.bypassCondBus | 0 | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dpll_core_I0.bypassCondBus | 1 | | | Input | |
| Bit | 2 | Internal | dpllsctrl_dpll_core_I0.bypassCondBus | 2 | | | Input | |
| Bit | 3 | Internal | dpllsctrl_dpll_core_I0.bypassCondBus | 3 | | | Input | |
| Bit | 4 | Internal | dpllsctrl_dpll_core_I0.bypassCondBus | 4 | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpll_core_I0.bypassCondBus | 5 | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dpll_core_I0.bypassCondBus | 6 | | | Input | |
| Bit | 7 | Internal | dpllsctrl_dpll_core_I0.bypassCondBus | 7 | | | Input | |
| Byte | 0x24 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_core_I0.freqChgReqAck | | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dpll_core_I0.freqChgReq | | | | output | |
| Bit | 2 | Internal | dpllsctrl_dpll_core_I0.freqChgReqAck2 | | | | output | |
| Bit | 3 | Internal | dpllsctrl_dpll_core_I0.freqChgReq2 | | | | Input | |
| Bit | 4 | Internal | dpllsctrl_dpll_core_I0.bypass | | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpll_core_I0.freqlock | | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dpll_core_I0.lossref | | | | Input | |
| Bit | 7 | Internal | dpllsctrl_dpll_core_I0.tinitz | | | | output | |
| Byte | 0x25 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_core_I0.tenable | | | | output | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 1 | Internal | dpllsctrl_dpll_core_I0.tenablediv | | | | output | |
| Bit | 2 | Internal | dpllsctrl_dpll_core_I0.idle | | | | output | |
| Bit | 3 | Internal | dpllsctrl_dpll_core_I0.lowcurrstdby | | | | output | |
| Bit | 4 | Internal | dpllsctrl_dpll_core_I0.dpll_ticopwdn | | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpll_core_I0.dpll_ldopwdn | | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dpll_core_I0.ulowclken | 0 | | | output | |
| Bit | 7 | Internal | dpllsctrl_dpll_core_I0.dpll_clkbyselacksel | 0 | | | Input | |
| Byte | 0x26 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_core_I0.clkinplsRunning | | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dpll_core_I0.clkinpToBeGated | | | | output | |
| Bit | 2 | Internal | dpllsctrl_dpll_core_I0.clkinplowIsRunning | | | | Input | |
| Bit | 3 | Internal | dpllsctrl_dpll_core_I0.clkinplowToBeGated | | | | output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x27 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_iva_I0.DPLLCtrlState | 0 | LSB | | output | |
| Bit | 1 | Internal | dpllsctrl_dpll_iva_I0.DPLLCtrlState | 1 | | | output | |
| Bit | 2 | Internal | dpllsctrl_dpll_iva_I0.DPLLCtrlState | 2 | | | output | |
| Bit | 3 | Internal | dpllsctrl_dpll_iva_I0.DPLLCtrlState | 3 | | | output | |
| Bit | 4 | Internal | dpllsctrl_dpll_iva_I0.DPLLCtrlState | 4 | | | output | |
| Bit | 5 | Internal | dpllsctrl_dpll_iva_I0.DPLLCtrlState | 5 | | | output | |
| Bit | 6 | Internal | dpllsctrl_dpll_iva_I0.DPLLCtrlState | 6 | | | output | |
| Bit | 7 | Internal | dpllsctrl_dpll_iva_I0.DPLLCtrlState | 7 | MSB | | output | |
| Byte | 0x28 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_iva_I0.freqChgReqAck | | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dpll_iva_I0.freqChgReq | | | | output | |
| Bit | 2 | Internal | dpllsctrl_dpll_iva_I0.freqChgReqAck2 | | | | output | |
| Bit | 3 | Internal | dpllsctrl_dpll_iva_I0.freqChgReq2 | | | | Input | |
| Bit | 4 | Internal | dpllsctrl_dpll_iva_I0.bypass | | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpll_iva_I0.freqlock | | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dpll_iva_I0.lossref | | | | Input | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 7 | Internal | dpllsctrl_dpll_iva_i0.tinitz | | | | output | |
| Byte | 0x29 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_iva_i0.tenable | | | | output | |
| Bit | 1 | Internal | dpllsctrl_dpll_iva_i0.tenablediv | | | | output | |
| Bit | 2 | Internal | dpllsctrl_dpll_iva_i0.idle | | | | output | |
| Bit | 3 | Internal | dpllsctrl_dpll_iva_i0.lowcurrstdby | | | | output | |
| Bit | 4 | Internal | dpllsctrl_dpll_iva_i0.dpll_ticopwdn | | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpll_iva_i0.dpll_ldopwdn | | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dpll_iva_i0.clkinplsRunning | | | | Input | |
| Bit | 7 | Internal | dpllsctrl_dpll_iva_i0.clkinpToBeGated | | | | output | |
| Byte | 0x2a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_iva_i0.clkinplowlsRunning | | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dpll_iva_i0.clkinpToBeGated | | | | output | |
| Bit | 7:2 | | Reserved | | | | | |
| Byte | 0x2b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_mpu_i0.DPLLCtrlState | 0 | LSB | | output | |
| Bit | 1 | Internal | dpllsctrl_dpll_mpu_i0.DPLLCtrlState | 1 | | | output | |
| Bit | 2 | Internal | dpllsctrl_dpll_mpu_i0.DPLLCtrlState | 2 | | | output | |
| Bit | 3 | Internal | dpllsctrl_dpll_mpu_i0.DPLLCtrlState | 3 | | | output | |
| Bit | 4 | Internal | dpllsctrl_dpll_mpu_i0.DPLLCtrlState | 4 | | | output | |
| Bit | 5 | Internal | dpllsctrl_dpll_mpu_i0.DPLLCtrlState | 5 | | | output | |
| Bit | 6 | Internal | dpllsctrl_dpll_mpu_i0.DPLLCtrlState | 6 | | | output | |
| Bit | 7 | Internal | dpllsctrl_dpll_mpu_i0.DPLLCtrlState | 7 | MSB | | output | |
| Byte | 0x2c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dpll_mpu_i0.freqChgReqAck | | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dpll_mpu_i0.freqChgReq | | | | output | |
| Bit | 2 | Internal | dpllsctrl_dpll_mpu_i0.freqChgReqAck2 | | | | output | |
| Bit | 3 | Internal | dpllsctrl_dpll_mpu_i0.freqChgReq2 | | | | Input | |
| Bit | 4 | Internal | dpllsctrl_dpll_mpu_i0.bypass | | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dpll_mpu_i0.freqlock | | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dpll_mpu_i0.lossref | | | | Input | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|---|
| Bit | 7 | Internal | dpllsctrl_dppll_mpu_I0.tinitz | | | | output | |
| Byte | 0x2d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dppll_mpu_I0.tenable | | | | output | |
| Bit | 1 | Internal | dpllsctrl_dppll_mpu_I0.tenablediv | | | | output | |
| Bit | 2 | Internal | dpllsctrl_dppll_mpu_I0.idle | | | | output | |
| Bit | 3 | Internal | dpllsctrl_dppll_mpu_I0.lowcurrstdby | | | | output | |
| Bit | 4 | Internal | dpllsctrl_dppll_mpu_I0.dppll_ticopwdn | | | | Input | |
| Bit | 5 | Internal | dpllsctrl_dppll_mpu_I0.dppll_ldopwdn | | | | Input | |
| Bit | 6 | Internal | dpllsctrl_dppll_mpu_I0.clkinplsRunning | | | | Input | |
| Bit | 7 | Internal | dpllsctrl_dppll_mpu_I0.clkinpToBeGated | | | | output | |
| Byte | 0x2e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dpllsctrl_dppll_mpu_I0.clkinplowIsRunning | | | | Input | |
| Bit | 1 | Internal | dpllsctrl_dppll_mpu_I0.clkinplowToBeGated | | | | output | |
| Bit | 7:2 | | Reserved | | | | | |
| Byte | 0x2f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | |
| Byte | 0x30 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ctsbuf_ff_cm1_func_96m_alwon_clk_I0.y | | | clock | output | FUNC_96M_ALWON_CLK (dppll_per_clkoutm2) |
| Bit | 1 | Internal | mutegen_dspss_to_ivahd_I0.dyn_domain_mute | | | | output | |
| Bit | 2 | Internal | mutegen_dspss_to_ivahd_I0.static_domain_mute | | | | output | |
| Bit | 3 | Internal | mutegen_dspss_to_ivahd_I0.public_active | 0 | | | Input | |
| Bit | 4 | Internal | mutegen_dspss_to_I3_interconnect_1_I0.dyn_domain_mute | | | | output | |
| Bit | 5 | Internal | mutegen_dspss_to_I3_interconnect_1_I0.static_domain_mute | | | | output | |
| Bit | 6 | Internal | mutegen_dspss_to_I3_interconnect_1_I0.public_active | 0 | | | Input | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x31 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mutegen_dspss_to_I4_audio_interconnect_I0.dyn_domain_mute | | | | output | |
| Bit | 1 | Internal | mutegen_dspss_to_I4_audio_interconnect_I0.static_domain_mute | | | | output | |
| Bit | 2 | Internal | mutegen_dspss_to_I4_audio_interconnect_I0.public_active | 0 | | | Input | |
| Bit | 3 | Internal | mutegen_dspss_to_sl2_I0.dyn_domain_mute | | | | output | |
| Bit | 4 | Internal | mutegen_dspss_to_sl2_I0.static_domain_mute | | | | output | |
| Bit | 5 | Internal | mutegen_dspss_to_sl2_I0.public_active | 0 | | | Input | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|---|
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x32 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_l3_iclk_i0.clkGated | | | clock | output | L3_ICLK |
| Bit | 1 | Internal | cmfsm_audio_interconn_abe_i0.domain_is_on | | | | Input | |
| Bit | 2 | Internal | cmfsm_audio_interconn_abe_i0.domain_wakeup | | | | Input | |
| Bit | 3 | Internal | cmfsm_audio_interconn_abe_i0.domain_wkup_ack | | | | output | |
| Bit | 4 | Internal | cmfsm_audio_interconn_abe_i0.fsm_state | 0 | LSB | | output | ACT2INACT2 = "101" |
| Bit | 5 | Internal | cmfsm_audio_interconn_abe_i0.fsm_state | 1 | | | output | ACTIVE = "011", ACT2INACT1 = "111", |
| Bit | 6 | Internal | cmfsm_audio_interconn_abe_i0.fsm_state | 2 | MSB | | output | INACTIVE = "000", INACT2ACT = "001", |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x33 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ctsbuf_ff_cm1_core_dp1l_hs_clk_i0.y | | | clock | output | CORE_DPLL_HS_CLK (dp1l_abe_clkoutm3) |
| Bit | 1 | Internal | cmfsm_core_cm1_i0.domain_is_on | | | | Input | |
| Bit | 2 | Internal | cmfsm_core_cm1_i0.domain_wakeup | | | | Input | |
| Bit | 3 | Internal | cmfsm_core_cm1_i0.domain_wkup_ack | | | | output | |
| Bit | 4 | Internal | cmfsm_core_cm1_i0.fsm_state | 0 | LSB | | output | ACT2INACT2 = "101" |
| Bit | 5 | Internal | cmfsm_core_cm1_i0.fsm_state | 1 | | | output | ACTIVE = "011", ACT2INACT1 = "111", |
| Bit | 6 | Internal | cmfsm_core_cm1_i0.fsm_state | 2 | MSB | | output | INACTIVE = "000", INACT2ACT = "001", |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x34 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_l4_root_clk_i0.clkGated | | | clock | output | L4_ROOT_CLK |
| Bit | 1 | Internal | cmfsm_mpu_mpu_dp1l_i0.domain_is_on | | | | Input | |
| Bit | 2 | Internal | cmfsm_mpu_mpu_dp1l_i0.domain_wakeup | | | | Input | |
| Bit | 3 | Internal | cmfsm_mpu_mpu_dp1l_i0.domain_wkup_ack | | | | output | |
| Bit | 4 | Internal | cmfsm_mpu_mpu_dp1l_i0.fsm_state | 0 | LSB | | output | ACT2INACT2 = "101" |
| Bit | 5 | Internal | cmfsm_mpu_mpu_dp1l_i0.fsm_state | 1 | | | output | ACTIVE = "011", ACT2INACT1 = "111", |
| Bit | 6 | Internal | cmfsm_mpu_mpu_dp1l_i0.fsm_state | 2 | MSB | | output | INACTIVE = "000", INACT2ACT = "001", |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x35 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cmfsm_dspss_dspss_root_i0.domain_is_on | | | | Input | |
| Bit | 1 | Internal | cmfsm_dspss_dspss_root_i0.domain_wakeup | | | | Input | |
| Bit | 2 | Internal | cmfsm_dspss_dspss_root_i0.domain_wkup_ack | | | | output | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|---|
| Bit | 3 | Internal | cmfsm_dspss_dspss_root_I0.fsm_state | 0 | LSB | | output | ACT2INACT2 = "101" |
| Bit | 4 | Internal | cmfsm_dspss_dspss_root_I0.fsm_state | 1 | | | output | ACTIVE = "011", ACT2INACT1 = "111", |
| Bit | 5 | Internal | cmfsm_dspss_dspss_root_I0.fsm_state | 2 | MSB | | output | INACTIVE = "000", INACT2ACT = "001", |
| Bit | 6 | Internal | gcg_abe_24m_fclk_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_abe_24m_fclk_pwadded_I0.clk_is_running | | | | output | |
| Byte | 0x36 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_abe_alwon_32k_clk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_abe_alwon_32k_clk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_abe_clk_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_abe_clk_pwadded_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_abe_sysclk_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_abe_sysclk_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_adll_clk_div_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_adll_clk_div_pwadded_I0.clk_is_running | | | | output | |
| Byte | 0x37 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_aess_fclk_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_aess_fclk_pwadded_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_async_dll_x2_clk_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_async_dll_x2_clk_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_async_phy1_clk_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_async_phy1_clk_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_async_phy2_clk_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_async_phy2_clk_I0.clk_is_running | | | | output | |
| Byte | 0x38 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_cm1_profiling_I3_giclk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_cm1_profiling_I3_giclk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_cm1_profiling_I4_giclk_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_cm1_profiling_I4_giclk_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_core_bb2d_fclk_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_core_bb2d_fclk_I0.clk_is_running | | | | output | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 6 | Internal | gcg_core_clk_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_core_clk_I0.clk_is_running | | | | output | |
| Byte | 0x39 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_core_dpll_hs_clk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_core_dpll_hs_clk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_core_dpll_scrm_clk_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_core_dpll_scrm_clk_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_core_x2_clk_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_core_x2_clk_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_div_core_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_div_core_pwadded_I0.clk_is_running | | | | output | |
| Byte | 0x3a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_div_iva_hs_clk_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_div_iva_hs_clk_pwadded_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_div_mpu_hs_clk_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_div_mpu_hs_clk_pwadded_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_dll_clk_div_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_dll_clk_div_pwadded_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_dll_x2_clk_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_dll_x2_clk_I0.clk_is_running | | | | output | |
| Byte | 0x3b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_dpll_abe_x2_clk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_dpll_abe_x2_clk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_emac_50mhz_clk_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_emac_50mhz_clk_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_func_24m_clk_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_func_24m_clk_pwadded_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_iva_hd_root_clk_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_iva_hd_root_clk_I0.clk_is_running | | | | output | |
| Byte | 0x3c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--------------------------------------|----|--------|--------|--------|----------|
| Bit | 0 | Internal | gcg_l3_d2d_giclk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_l3_d2d_giclk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_l3_div_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_l3_div_pwadded_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_l3_iclk_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_l3_iclk_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_l4_1_giclk_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_l4_1_giclk_I0.clk_is_running | | | | output | |
| Byte | 0x3d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_l4_2_giclk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_l4_2_giclk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_l4_cfg_giclk_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_l4_cfg_giclk_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_l4_div_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_l4_div_pwadded_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_l4_dma_giclk_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_l4_dma_giclk_I0.clk_is_running | | | | output | |
| Byte | 0x3e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_l4_emif_giclk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_l4_emif_giclk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_l4_iclk_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_l4_iclk_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_l4_init_giclk_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_l4_init_giclk_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_l4_init_giclk_I1.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_l4_init_giclk_I1.clk_is_running | | | | output | |
| Byte | 0x3f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_l4_instr_giclk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_l4_instr_giclk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_l4_per_giclk_I0.clk_is_gated | | | | output | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 3 | Internal | gcg_l4_per_giclk_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_l4_root_clk_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_l4_root_clk_I0.clk_is_running | | | | output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x40 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 1:0 | | reserved | | | | | |
| Bit | 2 | Internal | gcg_lp_clk_div_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_lp_clk_div_pwadded_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_mpu_dpll_alwon_clk_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_mpu_dpll_alwon_clk_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_mpu_dpll_clk_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_mpu_dpll_clk_I0.clk_is_running | | | | output | |
| Byte | 0x41 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_mpu_dpll_hs_clk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_mpu_dpll_hs_clk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_interconn_abe_giclk_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_interconn_abe_giclk_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_interconn_abe_iclk_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_interconn_abe_iclk_pwadded_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_pad_gclks_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_pad_gclks_I0.clk_is_running | | | | output | |
| Byte | 0x42 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_per_abe_x1_gfclk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_per_abe_x1_gfclk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_per_hs_clk_div_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_per_hs_clk_div_pwadded_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_phy_root_clk_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_phy_root_clk_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_slimbus_gclks_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_slimbus_gclks_I0.clk_is_running | | | | output | |
| Byte | 0x43 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 0 | Internal | gcg_dspss_dp1l_alwon_clk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_dspss_dp1l_alwon_clk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_dspss_root_clk_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_dspss_root_clk_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_usb_hs_clk_div_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_usb_hs_clk_div_pwadded_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gat_adll_clk_div_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 7 | Internal | gat_cm1_profiling_l3_giclk_I0.clkCtrl | | | | Input | |
| Byte | 0x44 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_cm1_profiling_l4_giclk_I0.clkCtrl | | | | Input | |
| Bit | 1 | Internal | gat_core_clk_I0.clkCtrl | | | | Input | |
| Bit | 2 | Internal | gat_core_hsd_byp_clk_mux_pwadded0_I0.clkCtrl | | | | Input | |
| Bit | 3 | Internal | gat_core_hsd_byp_clk_mux_pwadded1_I0.clkCtrl | | | | Input | |
| Bit | 4 | Internal | gat_div_core_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 5 | Internal | gat_div_iva_hs_clk_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 6 | Internal | gat_div_mpu_hs_clk_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 7 | Internal | gat_dll_clk_div_pwadded_I0.clkCtrl | | | | Input | |
| Byte | 0x45 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_cortex_m3_iss_clk_I0.clkCtrl | | | | Input | |
| Bit | 1 | Internal | gat_func_24m_clk_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 2 | Internal | gat_iva_hsd_byp_clk_mux_pwadded0_I0.clkCtrl | | | | Input | |
| Bit | 3 | Internal | gat_iva_hsd_byp_clk_mux_pwadded1_I0.clkCtrl | | | | Input | |
| Bit | 4 | Internal | gat_l3_div_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 5 | Internal | gat_l3_iclk_I0.clkCtrl | | | | Input | |
| Bit | 6 | Internal | gat_l3x2_d2d_giclk_I0.clkCtrl | | | | Input | |
| Bit | 7 | Internal | gat_l4_div_pwadded_I0.clkCtrl | | | | Input | |
| Byte | 0x46 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_l4_iclk_I0.clkCtrl | | | | Input | |
| Bit | 1 | Internal | gat_l4_root_clk_I0.clkCtrl | | | | Input | |
| Bit | 2 | Internal | gat_mpu_dp1l_hs_clk_I0.clkCtrl | | | | Input | |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|--|
| Bit | 3 | Internal | gat_per_hs_clk_div_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 4 | Internal | gat_per_hsd_byp_clk_mux_pwadded0_I0.clkCtrl | | | | Input | |
| Bit | 5 | Internal | gat_per_hsd_byp_clk_mux_pwadded1_I0.clkCtrl | | | | Input | |
| Bit | 6 | Internal | gat_usb_hs_clk_div_pwadded_I0.clkCtrl | | | | Input | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x47 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | forceactive_cortex_m3_cpu1 | | | | Input | |
| Bit | 1 | External | forceactive_cortex_m3_cpu2 | | | | Input | |
| Bit | 2 | External | forceactive_ivahd_seq1 | | | | Input | |
| Bit | 3 | External | forceactive_ivahd_seq2 | | | | Input | |
| Bit | 4 | External | forceactive_mpu | | | | Input | |
| Bit | 5 | External | forceactive_dspss | | | | Input | |
| Bit | 6 | External | inhibitsleep_cortex_m3_cpu1 | | | | Input | |
| Bit | 7 | External | inhibitsleep_cortex_m3_cpu2 | | | | Input | |
| Byte | 0x48 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | inhibitsleep_ivahd_seq1 | | | | Input | |
| Bit | 1 | External | inhibitsleep_ivahd_seq2 | | | | Input | |
| Bit | 2 | External | inhibitsleep_mpu | | | | Input | |
| Bit | 3 | External | inhibitsleep_dspss | | | | Input | |
| Bit | 4 | Internal | ckctrl_emif_I0.ckstat_mpudpll | | | | output | emu_clkstate_mpu |
| Bit | 5 | Internal | ivahd_emu_custom.emu_clkstate_ivahd | | | | output | |
| Bit | 6 | Internal | dspss_emu_custom.emu_clkstate_dspss | | | | output | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x49 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | emu_ivahd_root_ctrl_clk_I0.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |
| Bit | 1 | Internal | emu_ivahd_root_ctrl_clk_I0.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | emu_ivahd_root_ctrl_clk_I0.fsm_state | 0 | LSB | | output | FORCEON = "010" |
| Bit | 3 | Internal | emu_ivahd_root_ctrl_clk_I0.fsm_state | 1 | | | output | SLEEPDESIREDSTATE = "111", SLEEP2NORMAL = "101", |
| Bit | 4 | Internal | emu_ivahd_root_ctrl_clk_I0.fsm_state | 2 | MSB | | output | NORMAL = "000", TOSLEEPD = "001", |
| Bit | 7:5 | | Reserved | | | | | |

Table 19-41. CM1 Observable Signals (continued)

| Byte | 0x4a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
|------|------|----------|--|----|--------|--------|--------|--|
| Bit | 0 | Internal | emu_mpu_ctrl_clk_i0.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |
| Bit | 1 | Internal | emu_mpu_ctrl_clk_i0.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | emu_mpu_ctrl_clk_i0.fsm_state | 0 | LSB | | output | FORCEON = "010" |
| Bit | 3 | Internal | emu_mpu_ctrl_clk_i0.fsm_state | 1 | | | output | SLEEPDESIREDSTATE = "111", SLEEP2NORMAL = "101", |
| Bit | 4 | Internal | emu_mpu_ctrl_clk_i0.fsm_state | 2 | MSB | | output | NORMAL = "000", TOSLEEPD = "001", |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x4b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | emu_dspss_root_ctrl_clk_i0.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |
| Bit | 1 | Internal | emu_dspss_root_ctrl_clk_i0.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | emu_dspss_root_ctrl_clk_i0.fsm_state | 0 | LSB | | output | FORCEON = "010" |
| Bit | 3 | Internal | emu_dspss_root_ctrl_clk_i0.fsm_state | 1 | | | output | SLEEPDESIREDSTATE = "111", SLEEP2NORMAL = "101", |
| Bit | 4 | Internal | emu_dspss_root_ctrl_clk_i0.fsm_state | 2 | MSB | | output | NORMAL = "000", TOSLEEPD = "001", |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x4c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | prcm_emu_ctrl_clk_ivahd_seq1_st.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |
| Bit | 1 | Internal | prcm_emu_ctrl_clk_ivahd_seq1_st.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | prcm_emu_ctrl_clk_ivahd_seq1_st.fsm_state | 0 | LSB | | output | FORCEON = "010" |
| Bit | 3 | Internal | prcm_emu_ctrl_clk_ivahd_seq1_st.fsm_state | 1 | | | output | SLEEPDESIREDSTATE = "111", SLEEP2NORMAL = "101", |
| Bit | 4 | Internal | prcm_emu_ctrl_clk_ivahd_seq1_st.fsm_state | 2 | MSB | | output | NORMAL = "000", TOSLEEPD = "001", |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x4d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | prcm_emu_ctrl_clk_ivahd_seq2_st.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |
| Bit | 1 | Internal | prcm_emu_ctrl_clk_ivahd_seq2_st.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | prcm_emu_ctrl_clk_ivahd_seq2_st.fsm_state | 0 | LSB | | output | FORCEON = "010" |
| Bit | 3 | Internal | prcm_emu_ctrl_clk_ivahd_seq2_st.fsm_state | 1 | | | output | SLEEPDESIREDSTATE = "111", SLEEP2NORMAL = "101", |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|--|
| Bit | 4 | Internal | prcm_emu_ctrl_clk_iva_hd_seq2_st.fsm_state | 2 | MSB | | output | NORMAL = "000", TOSLEEPD = "001", |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x4e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | prcm_emu_ctrl_clk_iva_hd_dspss_l0.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |
| Bit | 1 | Internal | prcm_emu_ctrl_clk_iva_hd_dspss_l0.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | prcm_emu_ctrl_clk_iva_hd_dspss_l0.fsm_state | 0 | LSB | | output | FORCEON = "010" |
| Bit | 3 | Internal | prcm_emu_ctrl_clk_iva_hd_dspss_l0.fsm_state | 1 | | | output | SLEEPDESIREDSTATE = "111", SLEEP2NORMAL = "101", |
| Bit | 4 | Internal | prcm_emu_ctrl_clk_iva_hd_dspss_l0.fsm_state | 2 | MSB | | output | NORMAL = "000", TOSLEEPD = "001", |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x4f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | prcm_emu_ctrl_l4_iclk_l0.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |
| Bit | 1 | Internal | prcm_emu_ctrl_l4_iclk_l0.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | prcm_emu_ctrl_l4_iclk_l0.fsm_state | 0 | LSB | | output | FORCEON = "010" |
| Bit | 3 | Internal | prcm_emu_ctrl_l4_iclk_l0.fsm_state | 1 | | | output | SLEEPDESIREDSTATE = "111", SLEEP2NORMAL = "101", |
| Bit | 4 | Internal | prcm_emu_ctrl_l4_iclk_l0.fsm_state | 2 | MSB | | output | NORMAL = "000", TOSLEEPD = "001", |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x50 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | prcm_emu_ctrl_l4_root_clk_l0.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |
| Bit | 1 | Internal | prcm_emu_ctrl_l4_root_clk_l0.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | prcm_emu_ctrl_l4_root_clk_l0.fsm_state | 0 | LSB | | output | FORCEON = "010" |
| Bit | 3 | Internal | prcm_emu_ctrl_l4_root_clk_l0.fsm_state | 1 | | | output | SLEEPDESIREDSTATE = "111", SLEEP2NORMAL = "101", |
| Bit | 4 | Internal | prcm_emu_ctrl_l4_root_clk_l0.fsm_state | 2 | MSB | | output | NORMAL = "000", TOSLEEPD = "001", |
| Bit | 5 | Internal | ctsbuf_ff_cm1_core_x2_clk_l0.y | | | clock | output | CORE_X2_CLK |
| Bit | 6 | Internal | gat_dll_clk_div_pwadded_l0.clkGated | | | clock | output | DLL_CLK |
| Bit | 7 | Internal | gat_mpu_dpll_hs_clk_l0.clkGated | | | clock | output | MPU_DPLL_HS_CLK |
| Byte | 0x51 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ctsbuf_ff_cm1_div_iva_hs_clk_l0.y | | | clock | output | IVA_DPLL_HS_CLK |

Table 19-41. CM1 Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|------------------------|
| Bit | 1 | Internal | gat_l3x2_d2d_giclk_I0.clkGated | | | clock | output | L3X2_D2D_GICLK |
| Bit | 2 | Internal | shp_l3_d2d_giclk_I0.clkEnabling | | | clock | output | L3_D2D_GICLK_IEN |
| Bit | 3 | Internal | gat_l3_iclk_I0.clkGated | | | clock | output | L3_ICLK |
| Bit | 4 | Internal | gat_cm1_profiling_l3_giclk_I0.clkGated | | | clock | output | CM1_PROFILING_L3_GICLK |
| Bit | 5 | Internal | gat_l4_root_clk_I0.clkGated | | | clock | output | L4_ROOT_CLK |
| Bit | 6 | Internal | gat_cm1_profiling_l4_giclk_I0.clkGated | | | clock | output | CM1_PROFILING_L4_GICLK |
| Bit | 7 | Internal | gat_l4_iclk_I0.clkGated | | | clock | output | L4_ICLK |
| Byte | 0x52 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | dg1_adll_clk_div_I0.div_bus | | | clock | output | ASYNC_DLL_CLK |
| Bit | 1 | Internal | dg1_func_24m_clk_I0.div_bus | | | clock | output | FUNC_24M_GFCLK |
| Bit | 2 | Internal | mux_per_hsd_byp_clk_mux_I0.clk_out | | | clock | output | PER_HSD_BYP_CLK |
| Bit | 3 | Internal | dg1_per_hs_clk_div_I0.div_bus | | | clock | output | PER_DPLL_HS_CLK |
| Bit | 4 | Internal | dg1_usb_hs_clk_div_I0.div_bus | | | clock | output | USB_DPLL_HS_CLK |
| Bit | 5 | Internal | mux_core_hsd_byp_clk_mux_I0.clk_out | | | clock | output | CORE_PHY_HSD_BYP_CLK |
| Bit | 6 | Internal | mux_iva_hsd_byp_clk_mux_I0.clk_out | | | clock | output | IVA_HSD_BYP_CLK |
| Bit | 7 | Internal | spare_cm1_I0.cm1_dss_fclk_in | | | clock | Input | DSS_FCLK |
| Byte | 0x53 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_cortex_m3_iss_clk_I0.clkGated | | | clock | output | CORTEX_M3_ISS_CLK |
| Bit | 1 | Internal | freezegen_mpu_mpu_dpll_I0.freeze_Public | | | | output | |
| Bit | 2 | Internal | freezegen_dspss_dspss_root_I0.freeze_Public | | | | output | |
| Bit | 7:3 | | Reserved | | | | | |

19.4.11.5.9 PRM Subsystem Observable Signals

The General Wakeup Control observability inputs hwobs_int_prm(i), (where i = 0...31) are mapped to the signals debugprm(i), (where i = 0...31) coming out from the power reset manager (PRM) submodule.

Local multiplexing controls at the PRM level are in the PRM_DEBUG_CFG register. The PRM observability output signals are driven on the debugprm(0) through debugprm(7) lines. A certain mux set is selected by programming the PRM_DEBUG_CFG[6:0] SEL0 bit field. The remaining debugprm(8) through debugprm(31) lines are reserved for future use. For more information about the PRM observability source select field, see [Section 3.11.2.1, INTRCONN_SOCKET_PRM Register Summary](#) in [Chapter 3, Power, Reset, and Clock Management](#).

[Table 19-42](#) provides different details about the signals inside the PRM that can be monitored on device hw_dbg pins.

Table 19-42. PRM Observable Signals

| Byte | 0x00 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
|------|------|----------|---|----|--------|--------|--------|------------------------|
| Bit | 0 | Internal | devfsm_I0.osc_clk_out | | | clock | input | |
| Bit | 1 | Internal | prcm_dev_sysclk_gcgc_I0.clk_activity_ctrl | | | | output | |
| Bit | 2 | Internal | bgap_stabilization_custom.bgap_is_on | | | | output | |
| Bit | 3 | Internal | prcm_dev_merger_I0.pmDomainIsIdle | | | | output | devfsm_I0.device_is_lp |
| Bit | 4 | Internal | vfsm_custom_I0.device_in_off_mode | | | | output | |
| Bit | 5 | Internal | ldo_custom_I0.bgap_aipoff | | | | output | |
| Bit | 6 | Internal | temporary_device_I1.ls_vddcore_off | | | | output | |
| Bit | 7 | Internal | temporary_device_I1.ls_vddcore_wkup_en | | | | output | |
| Byte | 0x01 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ldo_custom_I0.wkupldosleep | | | | output | |
| Bit | 1 | Internal | iocntl_I0.fsm_state | 0 | LSB | | output | |
| Bit | 2 | Internal | iocntl_I0.fsm_state | 1 | | | output | |
| Bit | 3 | Internal | iocntl_I0.fsm_state | 2 | | | output | |
| Bit | 4 | Internal | iocntl_I0.fsm_state | 3 | | | output | |
| Bit | 5 | Internal | iocntl_I0.fsm_state | 4 | MSB | | output | |
| Bit | 6 | Internal | vdd_status_custom_I0.device_is_on | | | | output | all_vdd_is_on |
| Bit | 7 | Internal | device_sar fsm_I0.sar_restore_start | | | | output | |
| Byte | 0x02 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | init_off_cond_custom_I0.init_off_cond | | | | output | |
| Bit | 1 | Internal | vfsm_iva_I0.go_off_mode | | | | output | |
| Bit | 2 | Internal | bgap_aipoff_custom.go_ls_off_mode | | | | output | |
| Bit | 3 | Internal | gpcon_vdd_I0.gp_is_on | | | | output | |
| Bit | 4 | Internal | gpcon_vdd_I0.gp_ack | | | | output | |
| Bit | 5 | Internal | device_in_off_transition_custom_I0.device_in_off_transition | | | | output | |
| Bit | 6 | Internal | vfsm_custom_I0.device_in_off_mode | | | | output | |
| Bit | 7 | Internal | bgap_stabilization_custom.bgap_is_on | | | | output | |
| Byte | 0x03 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vfsm_custom_I0.volt_mpu_domain_dep | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|-----------|--------|--------|----------|
| Bit | 1 | Internal | vfsn_custom_I0.volt_iva_domain_de p | | | | output | |
| Bit | 2 | Internal | vfsn_custom_I0.volt_core_domain_d ep | | | | output | |
| Bit | 3 | Internal | vfsn_custom_I0.volt_mpu_domain_w akeup | | | | output | |
| Bit | 4 | Internal | vfsn_custom_I0.volt_iva_domain_wa akeup | | | | output | |
| Bit | 5 | Internal | vfsn_custom_I0.volt_core_domain_w akeup | | | | output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x04 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vsldo_mpu_I0.sram_vok | | | | output | |
| Bit | 1 | Internal | vsldo_mpu_custom.all_sram_off_or_r et | | | | output | |
| Bit | 2 | Internal | vsldo_mpu_custom.all_sram_off_or_r et_req | | | | output | |
| Bit | 3 | Internal | pscon_override_custom_I0.pscon_m pu_sramvok | | | | output | |
| Bit | 4 | Internal | vdd_status_custom_I0.vdd_mpu_do main_is_on | | | | output | |
| Bit | 5 | Internal | vdd_status_custom_I0.vdd_iva_doma in_is_on | | | | output | |
| Bit | 6 | Internal | vdd_status_custom_I0.vdd_core_do main_is_on | | | | output | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x05 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vsldo_iva_I0.sram_vok | | | | output | |
| Bit | 1 | Internal | vsldo_iva_custom.all_sram_off_or_ret | | | | output | |
| Bit | 2 | Internal | vsldo_iva_custom.all_sram_off_or_ret _req | | | | output | |
| Bit | 3 | Internal | pscon_override_custom_I0.pscon_iva hd_sramvok | | | | output | |
| Bit | 4 | Internal | pscon_override_custom_I0.pscon_ds pss_sramvok | | | | output | |
| Bit | 5 | Internal | pscon_override_custom_I0.pscon_au dio_sramvok | | | | output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x06 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vsldo_core_I0.sram_vok | | | | output | |
| Bit | 1 | Internal | vsldo_core_custom.all_sram_off_or_r et | | | | output | |
| Bit | 2 | Internal | vsldo_core_custom.all_sram_off_or_r et_req | | | | output | |
| Bit | 3 | Internal | pscon_override_custom_I0.pscon_co re_sramvok | | | | output | |
| Bit | 4 | Internal | pscon_override_custom_I0.pscon_ds s_sramvok | | | | output | |
| Bit | 5 | Internal | pscon_override_custom_I0.pscon_gfx _sramvok | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------------------------|
| Bit | 6 | Internal | pscon_override_custom_l0.pscon_custom_sramvok | | | | output | |
| Bit | 7 | Internal | pscon_override_custom_l0.pscon_l4_per_sramvok | | | | output | |
| Byte | 0x07 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | device_sar fsm_l0.sar_override | | | | output | |
| Bit | 1 | Internal | device_sar fsm_l0.sar_inhibit_frequpdate | | | | output | |
| Bit | 2 | Internal | device_sar fsm_l0.sar_stall_reset | | | | output | |
| Bit | 3 | Internal | device_sar fsm_l0.sar_sdma_mwakeu p | | | | output | |
| Bit | 4 | Internal | device_sar fsm_l0.sar_deviceOffWkupActst | | | | output | |
| Bit | 5 | Internal | device_sar fsm_l0.sar_sdma_rst_n | | | | output | |
| Bit | 6 | Internal | device_sar fsm_l0.sdma_mstandby | | | | input | |
| Bit | 7 | Internal | device_sar fsm_l0.io_nready | | | | input | |
| Byte | 0x08 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | cortex_a9_prm_profiling_event | 0 | | | input | mpuss_cpu0_powerStateSt(0) |
| Bit | 1 | External | cortex_a9_prm_profiling_event | 1 | | | input | mpuss_cpu0_powerStateSt(1) |
| Bit | 2 | External | cortex_a9_prm_profiling_event | 2 | | | input | mpuss_cpu0_logicStateSt |
| Bit | 3 | External | cortex_a9_prm_profiling_event | 3 | | | input | mpuss_cpu0_l1_membankst(0) |
| Bit | 4 | External | cortex_a9_prm_profiling_event | 4 | | | input | mpuss_cpu0_l1_membankst(1) |
| Bit | 5 | External | cortex_a9_prm_profiling_event | 5 | | | input | mpuss_cpu0_inTransition |
| Bit | 7:6 | | Reserved | | | | | SPARE |
| Byte | 0x09 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | cortex_a9_prm_profiling_event | 6 | | | input | mpuss_cpu1_powerStateSt(0) |
| Bit | 1 | External | cortex_a9_prm_profiling_event | 7 | | | input | mpuss_cpu1_powerStateSt(1) |
| Bit | 2 | External | cortex_a9_prm_profiling_event | 8 | | | input | mpuss_cpu1_logicStateSt |
| Bit | 3 | External | cortex_a9_prm_profiling_event | 9 | | | input | mpuss_cpu1_l1_membankst(0) |
| Bit | 4 | External | cortex_a9_prm_profiling_event | 10 | | | input | mpuss_cpu1_l1_membankst(1) |
| Bit | 5 | External | cortex_a9_prm_profiling_event | 11 | | | input | mpuss_cpu1_inTransition |
| Bit | 7:6 | | Reserved | | | | | SPARE |
| Byte | 0x0a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x0b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|---|
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x0c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x0d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x0e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x0f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | | Reserved | | | | | SPARE |
| Byte | 0x10 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | emu_custom1.dbg_mstandby | | | | output | ifsm_debug_logic_debugss_stby_I0.MStandby |
| Bit | 1 | Internal | ifsm_debug_logic_debugss_stby_I0.init_Wait | | | | output | |
| Bit | 2 | Internal | ifsm_debug_logic_debugss_stby_I0.module_mwakeupp | 0 | | | input | |
| Bit | 3 | Internal | tfsm_debug_logic_debugss_idle_I0.idleReq | | | | output | |
| Bit | 4 | Internal | tfsm_debug_logic_debugss_idle_I0.SidleAck | 1 | | | input | |
| Bit | 5 | Internal | tfsm_debug_logic_debugss_idle_I0.module_swakeupp | 0 | | | input | |
| Bit | 6 | Internal | tfsm_debug_logic_debugss_idle_I0.fclken_IP | | | | output | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x11 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_gpio1_gpio_v2_power_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_gpio1_gpio_v2_power_I0.SidleAck | 1 | | | input | |
| Bit | 2 | Internal | tfsm_gpio1_gpio_v2_power_I0.module_swakeupp | 0 | | | input | |
| Bit | 3 | Internal | tfsm_gpio1_gpio_v2_power_I0.module_swakeupp | 1 | | | input | |
| Bit | 4 | Internal | tfsm_gpio1_gpio_v2_power_I0.fclken_IP | | | | output | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x12 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_keyboard_kbdinterconn_power_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_keyboard_kbdinterconn_power_I0.SidleAck | 1 | | | input | |
| Bit | 2 | Internal | tfsm_keyboard_kbdinterconn_power_I0.module_swakeupp | 0 | | | input | |
| Bit | 3 | Internal | tfsm_keyboard_kbdinterconn_power_I0.fclken_IP | | | | output | |
| Bit | 4 | Internal | tfsm_prm_profiling_I0.idleReq | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 5 | Internal | tfsm_prm_profiling_I0.SidleAck | 1 | | | input | |
| Bit | 6 | Internal | tfsm_prm_profiling_I0.module_swakeup | 0 | | | input | |
| Bit | 7 | Internal | tfsm_prm_profiling_I0.fclken_IP | | | | output | |
| Byte | 0x13 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_rtc_slvp_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_rtc_slvp_I0.SidleAck | 1 | | | input | |
| Bit | 2 | Internal | tfsm_rtc_slvp_I0.module_swakeup | 0 | | | input | |
| Bit | 3 | Internal | tfsm_rtc_slvp_I0.fclken_IP | | | | output | |
| Bit | 4 | Internal | tfsm_sar_ram_sar_ram_idle_I0.idleReq | | | | output | |
| Bit | 5 | Internal | tfsm_sar_ram_sar_ram_idle_I0.SidleAck | 1 | | | input | |
| Bit | 6 | Internal | tfsm_sar_ram_sar_ram_idle_I0.module_swakeup | 0 | | | input | |
| Bit | 7 | Internal | tfsm_sar_ram_sar_ram_idle_I0.fclken_IP | | | | output | |
| Byte | 0x14 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_synctimer_synctimer32k_power_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_synctimer_synctimer32k_power_I0.SidleAck | 1 | | | input | |
| Bit | 2 | Internal | tfsm_synctimer_synctimer32k_power_I0.module_swakeup | 0 | | | input | |
| Bit | 3 | Internal | tfsm_synctimer_synctimer32k_power_I0.fclken_IP | | | | output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x15 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | tfsm_timer1_dmtimer_dmc1ms_power_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_timer1_dmtimer_dmc1ms_power_I0.SidleAck | 1 | | | input | |
| Bit | 2 | Internal | tfsm_timer1_dmtimer_dmc1ms_power_I0.module_swakeup | 0 | | | input | |
| Bit | 3 | Internal | tfsm_timer1_dmtimer_dmc1ms_power_I0.fclken_IP | | | | output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x16 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 3:0 | | Reserved | | | | | |
| Bit | 4 | Internal | tfsm_wdt2_watchdoginterconn2_power_I0.idleReq | | | | output | |
| Bit | 5 | Internal | tfsm_wdt2_watchdoginterconn2_power_I0.SidleAck | 1 | | | input | |
| Bit | 6 | Internal | tfsm_wdt2_watchdoginterconn2_power_I0.module_swakeup | 0 | | | input | |
| Bit | 7 | Internal | tfsm_wdt2_watchdoginterconn2_power_I0.fclken_IP | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| Byte | 0x17 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
|------|------|----------|--|----|--------|--------|--------|--------------------------------------|
| Bit | 0 | Internal | tfsm_wkup_l4_interconnect_idle_prot_I0.idleReq | | | | output | |
| Bit | 1 | Internal | tfsm_wkup_l4_interconnect_idle_prot_I0.SidleAck | 1 | | | input | |
| Bit | 2 | Internal | tfsm_wkup_l4_interconnect_idle_prot_I0.module_swakeup | 0 | | | input | |
| Bit | 3 | Internal | tfsm_wkup_l4_interconnect_idle_prot_I0.fclken_IP | | | | output | |
| Bit | 4 | Internal | mutegen_debug_logic_to_l3_interconnect_2_I0.dyn_domain_mute | | | | output | |
| Bit | 5 | Internal | mutegen_debug_logic_to_l3_interconnect_2_I0.static_domain_mute | | | | output | |
| Bit | 6 | Internal | mutegen_debug_logic_to_l3_interconnect_2_I0.public_active | 0 | | | input | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x18 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | cmfsm_emu_emu_sys_I0.domain_is_on | | | | input | |
| Bit | 1 | Internal | cmfsm_emu_emu_sys_I0.domain_wakeup | | | | input | |
| Bit | 2 | Internal | cmfsm_emu_emu_sys_I0.domain_wkup_ack | | | | output | |
| Bit | 3 | Internal | cmfsm_emu_emu_sys_I0.fsm_state | 0 | LSB | | output | ACT2INACT2 = "101" |
| Bit | 4 | Internal | cmfsm_emu_emu_sys_I0.fsm_state | 1 | | | output | ACTIVE = "011", ACT2INACT1 = "111", |
| Bit | 5 | Internal | cmfsm_emu_emu_sys_I0.fsm_state | 2 | MSB | | output | INACTIVE = "000", INACT2ACT = "001", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x19 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mux_l4_wkup_clk_mux_I0.clk_out | | | clock | output | L4_WKUP_ICLK |
| Bit | 1 | Internal | cmfsm_wkup_l4_wkup_I0.domain_is_on | | | | input | |
| Bit | 2 | Internal | cmfsm_wkup_l4_wkup_I0.domain_wakeup | | | | input | |
| Bit | 3 | Internal | cmfsm_wkup_l4_wkup_I0.domain_wkup_ack | | | | output | |
| Bit | 4 | Internal | cmfsm_wkup_l4_wkup_I0.fsm_state | 0 | LSB | | output | ACT2INACT2 = "101" |
| Bit | 5 | Internal | cmfsm_wkup_l4_wkup_I0.fsm_state | 1 | | | output | ACTIVE = "011", ACT2INACT1 = "111", |
| Bit | 6 | Internal | cmfsm_wkup_l4_wkup_I0.fsm_state | 2 | MSB | | output | INACTIVE = "000", INACT2ACT = "001", |
| Bit | 7 | Internal | cm2prm_core_cm1_I0.pmDomainIdle | | | | output | |
| Byte | 0x1a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_cm1_sys_clk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_cm1_sys_clk_I0.clk_is_running | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 2 | Internal | gcg_core_dpll_alwon_clk_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_core_dpll_alwon_clk_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_core_dpll_emu_clk_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_core_dpll_emu_clk_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_core_ts_gfclk_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_core_ts_gfclk_I0.clk_is_running | | | | output | |
| Byte | 0x1b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_div_ts_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_div_ts_pwadded_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_dss_alwon_sys_clk_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_dss_alwon_sys_clk_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_emu_sys_clk_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_emu_sys_clk_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_emu_sys_clk_gate_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_emu_sys_clk_gate_I0.clk_is_running | | | | output | |
| Byte | 0x1c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_l4_wkup_gclk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_l4_wkup_gclk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | gcg_l4_wkup_gclk_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | gcg_l4_wkup_gclk_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gcg_l4_wkup_profiling_gclk_I0.clk_is_gated | | | | output | |
| Bit | 5 | Internal | gcg_l4_wkup_profiling_gclk_I0.clk_is_running | | | | output | |
| Bit | 6 | Internal | gcg_std_efuse_sys_clk_I0.clk_is_gated | | | | output | |
| Bit | 7 | Internal | gcg_std_efuse_sys_clk_I0.clk_is_running | | | | output | |
| Byte | 0x1d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_sync_clk_div_pwadded_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_sync_clk_div_pwadded_I0.clk_is_running | | | | output | |
| Bit | 5:2 | | Reserved | | | | | |
| Bit | 6 | Internal | gcg_wkup_32k_gfclk_I0.clk_is_gated | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 7 | Internal | gcg_wkup_32k_gfclk_I0.clk_is_running | | | | output | |
| Byte | 0x1e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gcg_wkup_ts_gfclk_I0.clk_is_gated | | | | output | |
| Bit | 1 | Internal | gcg_wkup_ts_gfclk_I0.clk_is_running | | | | output | |
| Bit | 2 | Internal | prcm_dev_sysclk_gcg_I0.clk_is_gated | | | | output | |
| Bit | 3 | Internal | prcm_dev_sysclk_gcg_I0.clk_is_running | | | | output | |
| Bit | 4 | Internal | gat_abe_alwon_32k_clk_I0.clkCtrl | | | | input | |
| Bit | 5 | Internal | gat_abe_dpll_bypass_clk_mux_pwadded0_I0.clkCtrl | | | | input | |
| Bit | 6 | Internal | gat_abe_dpll_bypass_clk_mux_pwadded1_I0.clkCtrl | | | | input | |
| Bit | 7 | Internal | gat_abe_dpll_refclk_mux_pwadded0_I0.clkCtrl | | | | input | |
| Byte | 0x1f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_abe_dpll_refclk_mux_pwadded1_I0.clkCtrl | | | | input | |
| Bit | 1 | Internal | gat_abe_sysclk_I0.clkCtrl | | | | input | |
| Bit | 2 | Internal | gat_cm1_sys_clk_I0.clkCtrl | | | | input | |
| Bit | 3 | Internal | gat_cm2_dm10_mux_pwadded0_I0.clkCtrl | | | | input | |
| Bit | 4 | Internal | gat_cm2_dm10_mux_pwadded1_I0.clkCtrl | | | | input | |
| Bit | 5 | Internal | gat_cm2_dm11_mux_pwadded0_I0.clkCtrl | | | | input | |
| Bit | 6 | Internal | gat_cm2_dm11_mux_pwadded1_I0.clkCtrl | | | | input | |
| Bit | 7 | Internal | gat_cm2_dm2_mux_pwadded0_I0.clkCtrl | | | | input | |
| Byte | 0x20 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_cm2_dm2_mux_pwadded1_I0.clkCtrl | | | | input | |
| Bit | 1 | Internal | gat_cm2_dm3_mux_pwadded0_I0.clkCtrl | | | | input | |
| Bit | 2 | Internal | gat_cm2_dm3_mux_pwadded1_I0.clkCtrl | | | | input | |
| Bit | 3 | Internal | gat_cm2_dm4_mux_pwadded0_I0.clkCtrl | | | | input | |
| Bit | 4 | Internal | gat_cm2_dm4_mux_pwadded1_I0.clkCtrl | | | | input | |
| Bit | 5 | Internal | gat_cm2_dm9_mux_pwadded0_I0.clkCtrl | | | | input | |
| Bit | 6 | Internal | gat_cm2_dm9_mux_pwadded1_I0.clkCtrl | | | | input | |
| Bit | 7 | Internal | gat_core_alwon_32k_gfclk_I0.clkCtrl | | | | input | |

Table 19-42. PRM Observable Signals (continued)

| Byte | 0x21 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 0 | Internal | gat_core_dpll_alwon_clk_I0.clkCtrl | | | | input | |
| Bit | 1 | Internal | gat_core_ts_gfclk_I0.clkCtrl | | | | input | |
| Bit | 2 | | Reserved | | | | | |
| Bit | 3 | Internal | gat_div_ts_pwadded_I0.clkCtrl | | | | input | |
| Bit | 4 | Internal | gat_dmt1_clk_mux_pwadded0_I0.clkCtrl | | | | input | |
| Bit | 5 | Internal | gat_dmt1_clk_mux_pwadded1_I0.clkCtrl | | | | input | |
| Bit | 6 | Internal | gat_dss_alwon_sys_clk_I0.clkCtrl | | | | input | |
| Bit | 7 | Internal | gat_emu_sys_clk_I0.clkCtrl | | | | input | |
| Byte | 0x22 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_l4_wkup_clk_mux_pwadded0_I0.clkCtrl | | | | input | |
| Bit | 1 | Internal | gat_l4_wkup_clk_mux_pwadded1_I0.clkCtrl | | | | input | |
| Bit | 2 | Internal | gat_l4_wkup_gclk_I0.clkCtrl | | | | input | |
| Bit | 3 | Internal | gat_l4_wkup_giclk_I0.clkCtrl | | | | input | |
| Bit | 4 | Internal | gat_l4_wkup_profiling_gclk_I0.clkCtrl | | | | input | |
| Bit | 5 | Internal | gat_mpu_dpll_alwon_clk_I0.clkCtrl | | | | input | |
| Bit | 6 | Internal | gat_per_32k_gfclk_I0.clkCtrl | | | | input | |
| Bit | 7 | Internal | gat_per_dpll_alwon_clk_I0.clkCtrl | | | | input | |
| Byte | 0x23 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_per_sys_gfclk_I0.clkCtrl | | | | input | |
| Bit | 1 | Internal | gat_sr_core_sysclk_I0.clkCtrl | | | | input | |
| Bit | 2 | Internal | gat_sr_iva_sysclk_I0.clkCtrl | | | | input | |
| Bit | 3 | Internal | gat_sr_mpu_sysclk_I0.clkCtrl | | | | input | |
| Bit | 4 | Internal | gat_std_efuse_sys_clk_I0.clkCtrl | | | | input | |
| Bit | 5 | Internal | gat_sys_clk_div_pwadded_I0.clkCtrl | | | | input | |
| Bit | 6 | Internal | gat_dspss_dpll_alwon_clk_I0.clkCtrl | | | | input | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x24 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_usb_dpll_clk_I0.clkCtrl | | | | input | |
| Bit | 2:1 | | Reserved | | | | | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|-------------------------------|----|--------|----------|--------|---|
| Bit | 3 | Internal | gat_wkup_32k_gfclk_I0.clkCtrl | | | | input | |
| Bit | 4 | Internal | gat_wkup_ts_gfclk_I0.clkCtrl | | | | input | |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x25 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pmfsm_audio_I0.done | | | act like | output | |
| Bit | 1 | Internal | pmfsm_audio_I0.fsm_state | 0 | LSB | | output | INACTIVE2ONISO = "11010", INACTIVE2ONNOISO = "11011", INACTIVE2ONRST = "11100", UPDATE2OFF = "11101", UPDATE2RETL = "11110", UPDATE2RETH = "11111" |
| Bit | 2 | Internal | pmfsm_audio_I0.fsm_state | 1 | | | output | RETL2ONNOISO = "10100", RETH2ONNOISO = "10101", OFF2ONRST = "10110", RETL2ONRST = "10111", RETH2ONRST = "11000", INACTIVE2ON = "11001", |
| Bit | 3 | Internal | pmfsm_audio_I0.fsm_state | 2 | | | output | RETL2ON = "01110", RETH2ON = "01111", OFF2ONISO = "10000", RETL2ONISO = "10001", RETH2ONISO = "10010", OFF2ONNOISO = "10011", |
| Bit | 4 | Internal | pmfsm_audio_I0.fsm_state | 3 | | | output | ON2OFF = "00111", ON2RETL = "01000", ON2RETH = "01001", OFFSTATE = "01010", RETL = "01011", RETH = "01100", OFF2ON = "01101", |
| Bit | 5 | Internal | pmfsm_audio_I0.fsm_state | 4 | MSB | | output | RESET = "00000", CHANGEMEM = "00001", ONSTATE = "00010", STATEUPDATE = "00011", INACTIVE = "00100", ON2INACT = "00101", INACT2ON = "00110", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x26 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pmfsm_cam_I0.done | | | act like | output | |
| Bit | 1 | Internal | pmfsm_cam_I0.fsm_state | 0 | LSB | | output | INACTIVE2ONISO = "11010", INACTIVE2ONNOISO = "11011", INACTIVE2ONRST = "11100", UPDATE2OFF = "11101", UPDATE2RETL = "11110", UPDATE2RETH = "11111" |
| Bit | 2 | Internal | pmfsm_cam_I0.fsm_state | 1 | | | output | RETL2ONNOISO = "10100", RETH2ONNOISO = "10101", OFF2ONRST = "10110", RETL2ONRST = "10111", RETH2ONRST = "11000", INACTIVE2ON = "11001", |
| Bit | 3 | Internal | pmfsm_cam_I0.fsm_state | 2 | | | output | RETL2ON = "01110", RETH2ON = "01111", OFF2ONISO = "10000", RETL2ONISO = "10001", RETH2ONISO = "10010", OFF2ONNOISO = "10011", |
| Bit | 4 | Internal | pmfsm_cam_I0.fsm_state | 3 | | | output | ON2OFF = "00111", ON2RETL = "01000", ON2RETH = "01001", OFFSTATE = "01010", RETL = "01011", RETH = "01100", OFF2ON = "01101", |
| Bit | 5 | Internal | pmfsm_cam_I0.fsm_state | 4 | MSB | | output | RESET = "00000", CHANGEMEM = "00001", ONSTATE = "00010", STATEUPDATE = "00011", INACTIVE = "00100", ON2INACT = "00101", INACT2ON = "00110", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x27 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pmfsm_core_I0.done | | | act like | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|----------------------------|----|--------|----------|--------|---|
| Bit | 1 | Internal | pmfsm_core_l0.fsm_state | 0 | LSB | | output | INACTIVE2ONISO = "11010", INACTIVE2ONNOISO = "11011", INACTIVE2ONRST = "11100", UPDATE2OFF = "11101", UPDATE2RETL = "11110", UPDATE2RETH = "11111" |
| Bit | 2 | Internal | pmfsm_core_l0.fsm_state | 1 | | | output | RETL2ONNOISO = "10100", RETH2ONNOISO = "10101", OFF2ONRST = "10110", RETL2ONRST = "10111", RETH2ONRST = "11000", INACTIVE2ON = "11001", |
| Bit | 3 | Internal | pmfsm_core_l0.fsm_state | 2 | | | output | RETL2ON = "01110", RETH2ON = "01111", OFF2ONISO = "10000", RETL2ONISO = "10001", RETH2ONISO = "10010", OFF2ONNOISO = "10011", |
| Bit | 4 | Internal | pmfsm_core_l0.fsm_state | 3 | | | output | ON2OFF = "00111", ON2RETL = "01000", ON2RETH = "01001", OFFSTATE = "01010", RETL = "01011", RETH = "01100", OFF2ON = "01101", |
| Bit | 5 | Internal | pmfsm_core_l0.fsm_state | 4 | MSB | | output | RESET = "00000", CHANGEMEM = "00001", ONSTATE = "00010", STATEUPDATE = "00011", INACTIVE = "00100", ON2INACT = "00101", INACT2ON = "00110", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x28 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 7:0 | Internal | Reserved | | | act like | output | |
| Byte | 0x29 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pmfsm_dss_l0.done | | | act like | output | |
| Bit | 1 | Internal | pmfsm_dss_l0.fsm_state | 0 | LSB | | output | INACTIVE2ONISO = "11010", INACTIVE2ONNOISO = "11011", INACTIVE2ONRST = "11100", UPDATE2OFF = "11101", UPDATE2RETL = "11110", UPDATE2RETH = "11111" |
| Bit | 2 | Internal | pmfsm_dss_l0.fsm_state | 1 | | | output | RETL2ONNOISO = "10100", RETH2ONNOISO = "10101", OFF2ONRST = "10110", RETL2ONRST = "10111", RETH2ONRST = "11000", INACTIVE2ON = "11001", |
| Bit | 3 | Internal | pmfsm_dss_l0.fsm_state | 2 | | | output | RETL2ON = "01110", RETH2ON = "01111", OFF2ONISO = "10000", RETL2ONISO = "10001", RETH2ONISO = "10010", OFF2ONNOISO = "10011", |
| Bit | 4 | Internal | pmfsm_dss_l0.fsm_state | 3 | | | output | ON2OFF = "00111", ON2RETL = "01000", ON2RETH = "01001", OFFSTATE = "01010", RETL = "01011", RETH = "01100", OFF2ON = "01101", |
| Bit | 5 | Internal | pmfsm_dss_l0.fsm_state | 4 | MSB | | output | RESET = "00000", CHANGEMEM = "00001", ONSTATE = "00010", STATEUPDATE = "00011", INACTIVE = "00100", ON2INACT = "00101", INACT2ON = "00110", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x2a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pmfsm_emu_l0.done | | | act like | output | |
| Bit | 1 | Internal | pmfsm_emu_l0.fsm_state | 0 | LSB | | output | INACTIVE2ONISO = "11010", INACTIVE2ONNOISO = "11011", INACTIVE2ONRST = "11100", UPDATE2OFF = "11101", UPDATE2RETL = "11110", UPDATE2RETH = "11111" |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|----------------------------|----|--------|----------|--------|--|
| Bit | 2 | Internal | pmfsm_emu_l0.fsm_state | 1 | | | output | RETL2ONNOISO = "10100", RETH2ONNOISO = "10101", OFF2ONRST = "10110", RETL2ONRST = "10111", RETH2ONRST = "11000", INACTIVE2ON = "11001", |
| Bit | 3 | Internal | pmfsm_emu_l0.fsm_state | 2 | | | output | RETL2ON = "01110", RETH2ON = "01111", OFF2ONISO = "10000", RETL2ONISO = "10001", RETH2ONISO = "10010", OFF2ONNOISO = "10011", |
| Bit | 4 | Internal | pmfsm_emu_l0.fsm_state | 3 | | | output | ON2OFF = "00111", ON2RETL = "01000", ON2RETH = "01001", OFFSTATE = "01010", RETL = "01011", RETH = "01100", OFF2ON = "01101", |
| Bit | 5 | Internal | pmfsm_emu_l0.fsm_state | 4 | MSB | | output | RESET = "00000", CHANGEMEM = "00001", ONSTATE = "00010", STATEUPDATE = "00011", INACTIVE = "00100", ON2INACT = "00101", INACT2ON = "00110", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x2b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pmfsm_gfx_l0.done | | | act like | output | |
| Bit | 1 | Internal | pmfsm_gfx_l0.fsm_state | 0 | LSB | | output | INACTIVE2ONISO = "11010", INACTIVE2ONNOISO = "11011", INACTIVE2ONRST = "11100", UPDATE2OFF = "11101", UPDATE2RETL = "11110", UPDATE2RETH = "11111" |
| Bit | 2 | Internal | pmfsm_gfx_l0.fsm_state | 1 | | | output | RETL2ONNOISO = "10100", RETH2ONNOISO = "10101", OFF2ONRST = "10110", RETL2ONRST = "10111", RETH2ONRST = "11000", INACTIVE2ON = "11001", |
| Bit | 3 | Internal | pmfsm_gfx_l0.fsm_state | 2 | | | output | RETL2ON = "01110", RETH2ON = "01111", OFF2ONISO = "10000", RETL2ONISO = "10001", RETH2ONISO = "10010", OFF2ONNOISO = "10011", |
| Bit | 4 | Internal | pmfsm_gfx_l0.fsm_state | 3 | | | output | ON2OFF = "00111", ON2RETL = "01000", ON2RETH = "01001", OFFSTATE = "01010", RETL = "01011", RETH = "01100", OFF2ON = "01101", |
| Bit | 5 | Internal | pmfsm_gfx_l0.fsm_state | 4 | MSB | | output | RESET = "00000", CHANGEMEM = "00001", ONSTATE = "00010", STATEUPDATE = "00011", INACTIVE = "00100", ON2INACT = "00101", INACT2ON = "00110", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x2c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pmfsm_ivahd_l0.done | | | act like | output | |
| Bit | 1 | Internal | pmfsm_ivahd_l0.fsm_state | 0 | LSB | | output | INACTIVE2ONISO = "11010", INACTIVE2ONNOISO = "11011", INACTIVE2ONRST = "11100", UPDATE2OFF = "11101", UPDATE2RETL = "11110", UPDATE2RETH = "11111" |
| Bit | 2 | Internal | pmfsm_ivahd_l0.fsm_state | 1 | | | output | RETL2ONNOISO = "10100", RETH2ONNOISO = "10101", OFF2ONRST = "10110", RETL2ONRST = "10111", RETH2ONRST = "11000", INACTIVE2ON = "11001", |
| Bit | 3 | Internal | pmfsm_ivahd_l0.fsm_state | 2 | | | output | RETL2ON = "01110", RETH2ON = "01111", OFF2ONISO = "10000", RETL2ONISO = "10001", RETH2ONISO = "10010", OFF2ONNOISO = "10011", |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|----------------------------|----|--------|----------|--------|--|
| Bit | 4 | Internal | pmfsm_ivahd_l0.fsm_state | 3 | | | output | ON2OFF = "00111", ON2RETL = "01000", ON2RETH = "01001", OFFSTATE = "01010", RETL = "01011", RETH = "01100", OFF2ON = "01101", |
| Bit | 5 | Internal | pmfsm_ivahd_l0.fsm_state | 4 | MSB | | output | RESET = "00000", CHANGEMEM = "00001", ONSTATE = "00010", STATEUPDATE = "00011", INACTIVE = "00100", ON2INACT = "00101", INACT2ON = "00110", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x2d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pmfsm_l3_init_l0.done | | | act like | output | |
| Bit | 1 | Internal | pmfsm_l3_init_l0.fsm_state | 0 | LSB | | output | INACTIVE2ONISO = "11010", INACTIVE2ONNOISO = "11011", INACTIVE2ONRST = "11100", UPDATE2OFF = "11101", UPDATE2RETL = "11110", UPDATE2RETH = "11111" |
| Bit | 2 | Internal | pmfsm_l3_init_l0.fsm_state | 1 | | | output | RETL2ONNOISO = "10100", RETH2ONNOISO = "10101", OFF2ONRST = "10110", RETL2ONRST = "10111", RETH2ONRST = "11000", INACTIVE2ON = "11001", |
| Bit | 3 | Internal | pmfsm_l3_init_l0.fsm_state | 2 | | | output | RETL2ON = "01110", RETH2ON = "01111", OFF2ONISO = "10000", RETL2ONISO = "10001", RETH2ONISO = "10010", OFF2ONNOISO = "10011", |
| Bit | 4 | Internal | pmfsm_l3_init_l0.fsm_state | 3 | | | output | ON2OFF = "00111", ON2RETL = "01000", ON2RETH = "01001", OFFSTATE = "01010", RETL = "01011", RETH = "01100", OFF2ON = "01101", |
| Bit | 5 | Internal | pmfsm_l3_init_l0.fsm_state | 4 | MSB | | output | RESET = "00000", CHANGEMEM = "00001", ONSTATE = "00010", STATEUPDATE = "00011", INACTIVE = "00100", ON2INACT = "00101", INACT2ON = "00110", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x2e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pmfsm_l4_per_l0.done | | | act like | output | |
| Bit | 1 | Internal | pmfsm_l4_per_l0.fsm_state | 0 | LSB | | output | INACTIVE2ONISO = "11010", INACTIVE2ONNOISO = "11011", INACTIVE2ONRST = "11100", UPDATE2OFF = "11101", UPDATE2RETL = "11110", UPDATE2RETH = "11111" |
| Bit | 2 | Internal | pmfsm_l4_per_l0.fsm_state | 1 | | | output | RETL2ONNOISO = "10100", RETH2ONNOISO = "10101", OFF2ONRST = "10110", RETL2ONRST = "10111", RETH2ONRST = "11000", INACTIVE2ON = "11001", |
| Bit | 3 | Internal | pmfsm_l4_per_l0.fsm_state | 2 | | | output | RETL2ON = "01110", RETH2ON = "01111", OFF2ONISO = "10000", RETL2ONISO = "10001", RETH2ONISO = "10010", OFF2ONNOISO = "10011", |
| Bit | 4 | Internal | pmfsm_l4_per_l0.fsm_state | 3 | | | output | ON2OFF = "00111", ON2RETL = "01000", ON2RETH = "01001", OFFSTATE = "01010", RETL = "01011", RETH = "01100", OFF2ON = "01101", |
| Bit | 5 | Internal | pmfsm_l4_per_l0.fsm_state | 4 | MSB | | output | RESET = "00000", CHANGEMEM = "00001", ONSTATE = "00010", STATEUPDATE = "00011", INACTIVE = "00100", ON2INACT = "00101", INACT2ON = "00110", |
| Bit | 7:6 | | Reserved | | | | | |

Table 19-42. PRM Observable Signals (continued)

| Byte | 0x2f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
|------|------|----------|----------------------------|----|--------|----------|--------|---|
| Bit | 0 | Internal | pmfsm_mpu_l0.done | | | act like | output | |
| Bit | 1 | Internal | pmfsm_mpu_l0.fsm_state | 0 | LSB | | output | INACTIVE2ONISO = "11010", INACTIVE2ONNOISO = "11011", INACTIVE2ONRST = "11100", UPDATE2OFF = "11101", UPDATE2RETL = "11110", UPDATE2RETH = "11111" |
| Bit | 2 | Internal | pmfsm_mpu_l0.fsm_state | 1 | | | output | RETL2ONNOISO = "10100", RETH2ONNOISO = "10101", OFF2ONRST = "10110", RETL2ONRST = "10111", RETH2ONRST = "11000", INACTIVE2ON = "11001", |
| Bit | 3 | Internal | pmfsm_mpu_l0.fsm_state | 2 | | | output | RETL2ON = "01110", RETH2ON = "01111", OFF2ONISO = "10000", RETL2ONISO = "10001", RETH2ONISO = "10010", OFF2ONNOISO = "10011", |
| Bit | 4 | Internal | pmfsm_mpu_l0.fsm_state | 3 | | | output | ON2OFF = "00111", ON2RETL = "01000", ON2RETH = "01001", OFFSTATE = "01010", RETL = "01011", RETH = "01100", OFF2ON = "01101", |
| Bit | 5 | Internal | pmfsm_mpu_l0.fsm_state | 4 | MSB | | output | RESET = "00000", CHANGEMEM = "00001", ONSTATE = "00010", STATEUPDATE = "00011", INACTIVE = "00100", ON2INACT = "00101", INACT2ON = "00110", |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x30 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pmfsm_dspss_l0.done | | | act like | output | |
| Bit | 1 | Internal | pmfsm_dspss_l0.fsm_state | 0 | LSB | | output | INACTIVE2ONISO = "11010", INACTIVE2ONNOISO = "11011", INACTIVE2ONRST = "11100", UPDATE2OFF = "11101", UPDATE2RETL = "11110", UPDATE2RETH = "11111" |
| Bit | 2 | Internal | pmfsm_dspss_l0.fsm_state | 1 | | | output | RETL2ONNOISO = "10100", RETH2ONNOISO = "10101", OFF2ONRST = "10110", RETL2ONRST = "10111", RETH2ONRST = "11000", INACTIVE2ON = "11001", |
| Bit | 3 | Internal | pmfsm_dspss_l0.fsm_state | 2 | | | output | RETL2ON = "01110", RETH2ON = "01111", OFF2ONISO = "10000", RETL2ONISO = "10001", RETH2ONISO = "10010", OFF2ONNOISO = "10011", |
| Bit | 4 | Internal | pmfsm_dspss_l0.fsm_state | 3 | | | output | ON2OFF = "00111", ON2RETL = "01000", ON2RETH = "01001", OFFSTATE = "01010", RETL = "01011", RETH = "01100", OFF2ON = "01101", |
| Bit | 5 | Internal | pmfsm_dspss_l0.fsm_state | 4 | MSB | | output | RESET = "00000", CHANGEMEM = "00001", ONSTATE = "00010", STATEUPDATE = "00011", INACTIVE = "00100", ON2INACT = "00101", INACT2ON = "00110", |
| Bit | 6 | Internal | pscon_audio_l0.pgoodout | 0 | | | input | |
| Bit | 7 | Internal | pscon_audio_l0.ret | | | | output | |
| Byte | 0x31 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pscon_cam_l0.pgoodout | 0 | | | input | |
| Bit | 1 | Internal | pscon_core_l0.pgoodout | 0 | | | input | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|----------|
| Bit | 2 | Internal | pscon_core_l0.ret | | | | output | |
| Bit | 3 | | Reserved | | | | | |
| Bit | 4 | Internal | pscon_dss_l0.pgoodout | 0 | | | input | |
| Bit | 5 | Internal | pscon_dss_l0.ret | | | | output | |
| Bit | 6 | Internal | pscon_emu_l0.pgoodout | 0 | | | input | |
| Bit | 7 | Internal | pscon_gfx_l0.pgoodout | 0 | | | input | |
| Byte | 0x32 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pscon_ivahd_l0.pgoodout | 0 | | | input | |
| Bit | 1 | Internal | pscon_ivahd_l0.ret | | | | output | |
| Bit | 2 | Internal | pscon_l3_init_l0.pgoodout | 0 | | | input | |
| Bit | 3 | Internal | pscon_l3_init_l0.ret | | | | output | |
| Bit | 4 | Internal | pscon_l4_per_l0.pgoodout | 0 | | | input | |
| Bit | 5 | Internal | pscon_l4_per_l0.ret | | | | output | |
| Bit | 6 | Internal | pscon_mpu_l0.pgoodout | 0 | | | input | |
| Bit | 7 | Internal | pscon_mpu_l0.ret | | | | output | |
| Byte | 0x33 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | pscon_std_efuse_l0.pgoodout | 0 | | | input | |
| Bit | 1 | Internal | pscon_dspss_l0.pgoodout | 0 | | | input | |
| Bit | 2 | Internal | pscon_dspss_l0.ret | | | | output | |
| Bit | 3 | Internal | wkupctrl_always_on_core_l4_ao_l0.dmain_wakeup | | | | output | |
| Bit | 4 | Internal | wkupctrl_always_on_core_l4_ao_l0.dmain_wkup_ack | | | | input | |
| Bit | 5 | Internal | wkupctrl_audio_interconn_abe_l0.dmain_wakeup | | | | output | |
| Bit | 6 | Internal | wkupctrl_audio_interconn_abe_l0.dmain_wkup_ack | | | | input | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x34 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | wkupctrl_cam_iss_l0.domain_wakeup | | | | output | |
| Bit | 1 | Internal | wkupctrl_cam_iss_l0.domain_wkup_ack | | | | input | |
| Bit | 2 | Internal | wkupctrl_core_cm1_l0.domain_wakeup | | | | output | |
| Bit | 3 | Internal | wkupctrl_core_cm1_l0.domain_wkup_ack | | | | input | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 4 | Internal | wkupctrl_core_cortex_m3_I0.domain_wakeup | | | | output | |
| Bit | 5 | Internal | wkupctrl_core_cortex_m3_I0.domain_wkup_ack | | | | input | |
| Bit | 6 | Internal | wkupctrl_core_I3_1_I0.domain_wakeup | | | | output | |
| Bit | 7 | Internal | wkupctrl_core_I3_1_I0.domain_wkup_ack | | | | input | |
| Byte | 0x35 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | wkupctrl_core_I3_2_I0.domain_wakeup | | | | output | |
| Bit | 1 | Internal | wkupctrl_core_I3_2_I0.domain_wkup_ack | | | | input | |
| Bit | 2 | Internal | wkupctrl_core_I3_dma_I0.domain_wakeup | | | | output | |
| Bit | 3 | Internal | wkupctrl_core_I3_dma_I0.domain_wkup_ack | | | | input | |
| Bit | 4 | Internal | wkupctrl_core_I3_emif_I0.domain_wakeup | | | | output | |
| Bit | 5 | Internal | wkupctrl_core_I3_emif_I0.domain_wkup_ack | | | | input | |
| Bit | 6 | Internal | wkupctrl_core_I3_instr_I0.domain_wakeup | | | | output | |
| Bit | 7 | Internal | wkupctrl_core_I3_instr_I0.domain_wkup_ack | | | | input | |
| Byte | 0x36 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | wkupctrl_core_I3x2_d2d_I0.domain_wakeup | | | | output | |
| Bit | 1 | Internal | wkupctrl_core_I3x2_d2d_I0.domain_wkup_ack | | | | input | |
| Bit | 2 | Internal | wkupctrl_core_I4_cfg_I0.domain_wakeup | | | | output | |
| Bit | 3 | Internal | wkupctrl_core_I4_cfg_I0.domain_wkup_ack | | | | input | |
| Bit | 5:4 | | Reserved | | | | | |
| Bit | 6 | Internal | wkupctrl_dss_I3_dss_I0.domain_wakeup | | | | output | |
| Bit | 7 | Internal | wkupctrl_dss_I3_dss_I0.domain_wkup_ack | | | | input | |
| Byte | 0x37 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | wkupctrl_emu_emu_sys_I0.domain_wakeup | | | | output | |
| Bit | 1 | Internal | wkupctrl_emu_emu_sys_I0.domain_wkup_ack | | | | input | |
| Bit | 2 | Internal | wkupctrl_gfx_I3_gfx_I0.domain_wakeup | | | | output | |
| Bit | 3 | Internal | wkupctrl_gfx_I3_gfx_I0.domain_wkup_ack | | | | input | |
| Bit | 4 | Internal | wkupctrl_iva_hd_iva_hd_root_I0.domain_wakeup | | | | output | |
| Bit | 5 | Internal | wkupctrl_iva_hd_iva_hd_root_I0.domain_wkup_ack | | | | input | |
| Bit | 6 | Internal | wkupctrl_I3_init_I3_init_I0.domain_wakeup | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 7 | Internal | wkupctrl_i3_init_i3_init_i0.domain_wkup_ack | | | | input | |
| Byte | 0x38 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | wkupctrl_i4_per_i4_per_i0.domain_wakeup | | | | output | |
| Bit | 1 | Internal | wkupctrl_i4_per_i4_per_i0.domain_wkup_ack | | | | input | |
| Bit | 3:2 | | Reserved | | | | | |
| Bit | 4 | Internal | wkupctrl_mpu_mpu_dpll_i0.domain_wakeup | | | | output | |
| Bit | 5 | Internal | wkupctrl_mpu_mpu_dpll_i0.domain_wkup_ack | | | | input | |
| Bit | 6 | Internal | wkupctrl_dspss_dspss_root_i0.domain_wakeup | | | | output | |
| Bit | 7 | Internal | wkupctrl_dspss_dspss_root_i0.domain_wkup_ack | | | | input | |
| Byte | 0x39 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | wkupctrl_wkup_i4_wkup_i0.domain_wakeup | | | | output | |
| Bit | 1 | Internal | wkupctrl_wkup_i4_wkup_i0.domain_wkup_ack | | | | input | |
| Bit | 2 | Internal | inv_glbl_sw_rst_custom.ro_rst_global_cold_sw_n | | | | output | |
| Bit | 3 | External | icepickpor_rst_n | | | | input | |
| Bit | 4 | External | sys_pwron_arst_n | | | | input | |
| Bit | 5 | Internal | inv_glbl_sw_rst_custom.ro_rst_global_warm_sw_n | | | | output | |
| Bit | 6 | External | icepick_rst_n | | | | input | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x3a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | mpu_wdt_rst_n | | | | input | |
| Bit | 1 | | Reserved | | | | | |
| Bit | 2 | External | sys_warmin_arst_n | | | | input | |
| Bit | 3 | External | c2c_warm_rst | | | | input | |
| Bit | 4 | External | audio_pwron_rst_n | | | | output | |
| Bit | 5 | External | audio_rst_n | | | | output | |
| Bit | 6 | External | always_on_cm1_pwron_rst_n | | | | output | |
| Bit | 7 | External | always_on_cm1_rst_n | | | | output | |
| Byte | 0x3b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | always_on_core_pwron_rst | | | | output | |
| Bit | 1 | External | always_on_core_rst_n | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|----------------------------|----|--------|--------|--------|----------|
| Bit | 2 | External | always_on_iva_rst_n | | | | output | |
| Bit | 3 | External | always_on_mpu_rst_n | | | | output | |
| Bit | 4 | External | cam_rst_n | | | | output | |
| Bit | 5 | External | cm2_pwron_ret_rst_n | | | | output | |
| Bit | 6 | External | cm2_ret_rst_n | | | | output | |
| Bit | 7 | External | core_pwron_ret_rst_n | | | | output | |
| Byte | 0x3c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | core_ret_rst_n | | | | output | |
| Bit | 1 | External | core_rst_n | | | | output | |
| Bit | 2 | | Reserved | | | | | |
| Bit | 3 | External | dll_rst_n | | | | output | |
| Bit | 4 | External | dpll_iva_pwron_rst | | | | output | |
| Bit | 5 | External | dpll_l3_init_pwron_ret_rst | | | | output | |
| Bit | 6 | External | dpll_mpu_pwron_rst | | | | output | |
| Bit | 7 | External | dss_ret_rst_n | | | | output | |
| Byte | 0x3d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | dss_rst_n | | | | output | |
| Bit | 1 | External | cortex_m3_pwron_rst_n | | | | output | |
| Bit | 2 | External | cortex_m3_ret_rst_n | | | | output | |
| Bit | 3 | External | cortex_m3_rst1_n | | | | output | |
| Bit | 4 | External | cortex_m3_rst2_n | | | | output | |
| Bit | 5 | External | cortex_m3_rst3_n | | | | output | |
| Bit | 6 | External | emif_ddr_phy_pwron_rst_n | | | | output | |
| Bit | 7 | External | emu_early_pwron_rst_n | | | | output | |
| Byte | 0x3e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | emu_pwron_rst_n | | | | output | |
| Bit | 1 | External | emu_rst_n | | | | output | |
| Bit | 2 | External | gfx_rst_n | | | | output | |
| Bit | 3 | External | ivahd_pwron_rst_n | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--------------------------------------|----|--------|--------|--------|----------|
| Bit | 4 | External | iva_hd_rst_n | | | | output | |
| Bit | 5 | External | iva_hd_seq1_rst_n | | | | output | |
| Bit | 6 | External | iva_hd_seq2_rst_n | | | | output | |
| Bit | 7 | External | l3_init_pwrn_rst_n | | | | output | |
| Byte | 0x3f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | l3_init_ret_rst_n | | | | output | |
| Bit | 1 | External | l3_init_rst_n | | | | output | |
| Bit | 2 | External | l4_per_pwrn_ret_rst_n | | | | output | |
| Bit | 3 | External | l4_per_ret_rst_n | | | | output | |
| Bit | 4 | External | l4_per_rst_n | | | | output | |
| Bit | 5 | External | mpu_pwrn_rst_n | | | | output | |
| Bit | 6 | External | mpu_rst_n | | | | output | |
| Bit | 7 | External | sdma_ret_rst_n | | | | output | |
| Byte | 0x40 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | std_efuse_pwrn_rst_n | | | | output | |
| Bit | 1 | External | dspss_dsp_rst_n | | | | output | |
| Bit | 2 | External | dspss_pwrn_rst_n | | | | output | |
| Bit | 3 | External | dspss_ret_rst_n | | | | output | |
| Bit | 4 | External | dspss_sys_rst_n | | | | output | |
| Bit | 5 | External | wkup_pwrn_rst_n | | | | output | |
| Bit | 6 | External | wkup_rst_n | | | | output | |
| Bit | 7 | External | wkup_sys_pwrn_rst_n | | | | output | |
| Byte | 0x41 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | cortex_m3_rstdone | | | | input | |
| Bit | 1 | External | mpu_pwrn_rstdone | | | | input | |
| Bit | 2 | External | dspss_rstdone | | | | input | |
| Bit | 4:3 | Internal | Reserved | | | | output | |
| Bit | 5 | Internal | memlog_mpu_l2_destroyed_l0.logStatus | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|--|
| Bit | 6 | Internal | memlog_mpu_l2_notaccessible_I0.logStatus | | | | output | |
| Bit | 7 | Internal | memlog_mpu_ram_destroyed_I0.logStatus | | | | output | |
| Byte | 0x42 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | memlog_mpu_ram_notaccessible_I0.logStatus | | | | output | |
| Bit | 1 | Internal | rstactst_audio_rstactst_I0.logStatus | | | | output | |
| Bit | 2 | Internal | rstactst_cam_rstactst_I0.logStatus | | | | output | |
| Bit | 3 | Internal | rstactst_core_rstactst_I0.logStatus | | | | output | |
| Bit | 4 | | Reserved | | | | | |
| Bit | 5 | Internal | rstactst_dss_rstactst_I0.logStatus | | | | output | |
| Bit | 6 | Internal | rstactst_emu_rstactst_I0.logStatus | | | | output | |
| Bit | 7 | Internal | rstactst_gfx_rstactst_I0.logStatus | | | | output | |
| Byte | 0x43 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | rstactst_ivahd_rstactst_I0.logStatus | | | | output | |
| Bit | 1 | Internal | rstactst_l3_init_rstactst_I0.logStatus | | | | output | |
| Bit | 2 | Internal | rstactst_l4_per_rstactst_I0.logStatus | | | | output | |
| Bit | 3 | Internal | rstactst_mpu_rstactst_I0.logStatus | | | | output | |
| Bit | 4 | Internal | rstactst_dspss_rstactst_I0.logStatus | | | | output | |
| Bit | 5 | Internal | rstactst_globalwarm_rstactst_I0.logStatus | | | | output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x44 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | rstactst_globalcold_rstactst_I0.logStatus | | | | output | |
| Bit | 1 | Internal | glblrstmgr_I0.warmrst_fsm_state | 0 | LSB | | output | WAITWARMIN = "101", WAITCLOCKSTABLE = "110", FREUPDATE = "111" |
| Bit | 2 | Internal | glblrstmgr_I0.warmrst_fsm_state | 1 | | | output | WAITEMIFIDLE = "011", WAITNOPENDINGRST = "100", |
| Bit | 3 | Internal | glblrstmgr_I0.warmrst_fsm_state | 2 | | | output | RESET = "000", INIT = "001", WAIT16CLK = "010", |
| Bit | 4 | Internal | glblrstmgr_I0.warmrst_fsm_state | 3 | MSB | | output | RESET = "000", INIT = "001", WAIT16CLK = "010", |
| Bit | 5 | External | debug_logic_debugss_stby_mstandby | | | | input | |
| Bit | 6 | External | forceactive_cortex_m3_cpu1 | | | | input | |
| Bit | 7 | External | forceactive_cortex_m3_cpu2 | | | | input | |
| Byte | 0x45 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|-----------------------------|----|--------|--------|--------|--|
| Bit | 0 | External | forceactive_ivahd_seq1 | | | | input | |
| Bit | 1 | External | forceactive_ivahd_seq2 | | | | input | |
| Bit | 2 | External | forceactive_mpu | | | | input | |
| Bit | 3 | External | forceactive_dspss | | | | input | |
| Bit | 4 | External | inhibitsleep_cortex_m3_cpu1 | | | | input | |
| Bit | 5 | External | inhibitsleep_cortex_m3_cpu2 | | | | input | |
| Bit | 6 | External | inhibitsleep_ivahd_seq1 | | | | input | |
| Bit | 7 | External | inhibitsleep_ivahd_seq2 | | | | input | |
| Byte | 0x46 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | External | inhibitsleep_mpu | | | | input | |
| Bit | 1 | External | inhibitsleep_dspss | | | | input | |
| Bit | 2 | External | waitinreset_cortex_m3_cpu1 | | | | input | |
| Bit | 3 | External | waitinreset_cortex_m3_cpu2 | | | | input | |
| Bit | 4 | External | waitinreset_ivahd_seq1 | | | | input | |
| Bit | 5 | External | waitinreset_ivahd_seq2 | | | | input | |
| Bit | 6 | External | waitinreset_mpu | | | | input | |
| Bit | 7 | External | waitinreset_dspss | | | | input | |
| Byte | 0x47 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | emupst_core_I0.powerState | | | | output | |
| Bit | 1 | Internal | emupst_ivahd_I0.powerState | | | | output | |
| Bit | 2 | Internal | emupst_mpu_I0.powerState | | | | output | |
| Bit | 3 | Internal | emupst_dspss_I0.powerState | | | | output | |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x48 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | emupwr_core_I0.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |
| Bit | 1 | Internal | emupwr_core_I0.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | emupwr_core_I0.fsm_state | 0 | LSB | | output | OFF2EMUONRST = "01111", RETL2EMUONRST = "10000", RETH2EMUONRST = "10001", EMUON2ONINACT = "10010" |
| Bit | 3 | Internal | emupwr_core_I0.fsm_state | 1 | | | output | OFF2EMUONNOISO = "01100", RETL2EMUONNOISO = "01101", RETH2EMUONNOISO = "01110", |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|------------------------------|----|--------|--------|--------|---|
| Bit | 4 | Internal | emupwr_core_i0.fsm_state | 2 | | | output | RETH2EMUONISO = "01000", EMUON2OFF = "01001", EMUON2RETL = "01010", EMUON2RETH = "01011", |
| Bit | 5 | Internal | emupwr_core_i0.fsm_state | 3 | | | output | RETL2EMUON = "00100", RETH2EMUON = "00101", OFF2EMUONISO = "00110", RETL2EMUONISO = "00111", |
| Bit | 6 | Internal | emupwr_core_i0.fsm_state | 4 | MSB | | output | NORMAL = "00000", SLEEPDESIREDSTATE = "00001", FORCEON = "00010", OFF2EMUON = "00011", |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x49 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | emupwr_ivahd_i0.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |
| Bit | 1 | Internal | emupwr_ivahd_i0.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | emupwr_ivahd_i0.fsm_state | 0 | LSB | | output | OFF2EMUONRST = "01111", RETL2EMUONRST = "10000", RETH2EMUONRST = "10001", EMUON2ONINACT = "10010" |
| Bit | 3 | Internal | emupwr_ivahd_i0.fsm_state | 1 | | | output | OFF2EMUONNOISO = "01100", RETL2EMUONNOISO = "01101", RETH2EMUONNOISO = "01110", |
| Bit | 4 | Internal | emupwr_ivahd_i0.fsm_state | 2 | | | output | RETH2EMUONISO = "01000", EMUON2OFF = "01001", EMUON2RETL = "01010", EMUON2RETH = "01011", |
| Bit | 5 | Internal | emupwr_ivahd_i0.fsm_state | 3 | | | output | RETL2EMUON = "00100", RETH2EMUON = "00101", OFF2EMUONISO = "00110", RETL2EMUONISO = "00111", |
| Bit | 6 | Internal | emupwr_ivahd_i0.fsm_state | 4 | MSB | | output | NORMAL = "00000", SLEEPDESIREDSTATE = "00001", FORCEON = "00010", OFF2EMUON = "00011", |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x4a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | emupwr_mpu_i0.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |
| Bit | 1 | Internal | emupwr_mpu_i0.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | emupwr_mpu_i0.fsm_state | 0 | LSB | | output | OFF2EMUONRST = "01111", RETL2EMUONRST = "10000", RETH2EMUONRST = "10001", EMUON2ONINACT = "10010" |
| Bit | 3 | Internal | emupwr_mpu_i0.fsm_state | 1 | | | output | OFF2EMUONNOISO = "01100", RETL2EMUONNOISO = "01101", RETH2EMUONNOISO = "01110", |
| Bit | 4 | Internal | emupwr_mpu_i0.fsm_state | 2 | | | output | RETH2EMUONISO = "01000", EMUON2OFF = "01001", EMUON2RETL = "01010", EMUON2RETH = "01011", |
| Bit | 5 | Internal | emupwr_mpu_i0.fsm_state | 3 | | | output | RETL2EMUON = "00100", RETH2EMUON = "00101", OFF2EMUONISO = "00110", RETL2EMUONISO = "00111", |
| Bit | 6 | Internal | emupwr_mpu_i0.fsm_state | 4 | MSB | | output | NORMAL = "00000", SLEEPDESIREDSTATE = "00001", FORCEON = "00010", OFF2EMUON = "00011", |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x4b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | emupwr_dspss_i0.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|--|
| Bit | 1 | Internal | emupwr_dspss_l0.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | emupwr_dspss_l0.fsm_state | 0 | LSB | | output | OFF2EMUONRST = "01111", RETL2EMUONRST = "10000", RETH2EMUONRST = "10001", EMUON2ONINACT = "10010" |
| Bit | 3 | Internal | emupwr_dspss_l0.fsm_state | 1 | | | output | OFF2EMUONNOISO = "01100", RETL2EMUONNOISO = "01101", RETH2EMUONNOISO = "01110", |
| Bit | 4 | Internal | emupwr_dspss_l0.fsm_state | 2 | | | output | RETH2EMUONISO = "01000", EMUON2OFF = "01001", EMUON2RETL = "01010", EMUON2RETH = "01011", |
| Bit | 5 | Internal | emupwr_dspss_l0.fsm_state | 3 | | | output | RETL2EMUON = "00100", RETH2EMUON = "00101", OFF2EMUONISO = "00110", RETL2EMUONISO = "00111", |
| Bit | 6 | Internal | emupwr_dspss_l0.fsm_state | 4 | MSB | | output | NORMAL = "00000", SLEEPDESIREDSTATE = "00001", FORCEON = "00010", OFF2EMUON = "00011", |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x4c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | prcm_emu_ctrl_cm1_sysclk_l0.ackfsm_state | 0 | LSB | | output | FORCEACKSTATE = "11", BOTHACK = "10" |
| Bit | 1 | Internal | prcm_emu_ctrl_cm1_sysclk_l0.ackfsm_state | 1 | MSB | | output | ACKOFF = "01", INHIBACK = "00", |
| Bit | 2 | Internal | prcm_emu_ctrl_cm1_sysclk_l0.fsm_state | 0 | LSB | | output | FORCEON = "010" |
| Bit | 3 | Internal | prcm_emu_ctrl_cm1_sysclk_l0.fsm_state | 1 | | | output | SLEEPDESIREDSTATE = "111", SLEEP2NORMAL = "101", |
| Bit | 4 | Internal | prcm_emu_ctrl_cm1_sysclk_l0.fsm_state | 2 | MSB | | output | NORMAL = "000", TOSLEEPD = "001", |
| Bit | 7:5 | | Reserved | | | | | |
| Byte | 0x4d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | emu_clkfsm_l0.dpll1_stop | | | | input | |
| Bit | 1 | Internal | emu_clkfsm_l0.dpll2_stop | | | | input | |
| Bit | 2 | Internal | emu_clkfsm_l0.stm_fsm_state | 0 | LSB | | output | DPLL1 = "11", DPLL2 = "10" |
| Bit | 3 | Internal | emu_clkfsm_l0.stm_fsm_state | 1 | MSB | | output | SLEEP = "00", SYS = "01", |
| Bit | 4 | Internal | emu_clkfsm_l0.trace_fsm_state | 0 | LSB | | output | DPLL1 = "11", DPLL2 = "10" |
| Bit | 5 | Internal | emu_clkfsm_l0.trace_fsm_state | 1 | MSB | | output | SLEEP = "00", SYS = "01", |
| Bit | 6 | Internal | emu_clkfsm_l0.dbg_fsm_state | 0 | LSB | | output | DPLL1 = "11", DPLL2 = "10" |
| Bit | 7 | Internal | emu_clkfsm_l0.dbg_fsm_state | 1 | MSB | | output | SLEEP = "00", SYS = "01", |
| Byte | 0x4e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | emu_clkfsm_l0.fsm_state | 0 | LSB | | output | CLKST = "110" |
| Bit | 1 | Internal | emu_clkfsm_l0.fsm_state | 1 | | | output | CLKCG = "011", CLKCR = "010", |
| Bit | 2 | Internal | emu_clkfsm_l0.fsm_state | 2 | MSB | | output | SLEEP = "000", MUX = "001", |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|------------------------|
| Bit | 3 | External | globalwkupen | | | | output | |
| Bit | 4 | External | ioswakeup | | | | input | |
| Bit | 5 | External | modern_sleep | | | | input | |
| Bit | 6 | Internal | sysclkreq_custom.emu_clkreq | | | | output | |
| Bit | 7 | Internal | prcm_dev_sysclk_gcq_I0.clk_activity_ctrl | | | | output | |
| Byte | 0x4f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | devfsm_I0.sys_clk_on | | | | output | |
| Bit | 1 | Internal | sysclkreq_custom.allsysclkisgated | | | | input | |
| Bit | 2 | Internal | devfsm_I0.power_req | | | | output | |
| Bit | 3 | Internal | devfsm_I0.power_req_ack | | | | input | |
| Bit | 4 | Internal | devfsm_I0.wkupldo_volt_ok | | | | output | |
| Bit | 5 | Internal | bgap_stabilization_custom.bgap_is_on | | | | output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x50 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | devfsm_I0.osc_clk_out | | | clock | input | |
| Bit | 1 | Internal | devfsm_I0.clk | | | clock | input | |
| Bit | 2 | Internal | devfsm_I0.device_is_on | | | | output | |
| Bit | 3 | Internal | prcm_dev_merger_I0.pmDomainIsIdle | | | | output | devfsm_I0.device_is_lp |
| Bit | 7:4 | | Reserved | | | | | |
| Byte | 0x51 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | ldo_custom_I0.wkupldosleep | | | | output | |
| Bit | 1 | Internal | ldo_custom_I0.wkupldoemuon | | | | output | |
| Bit | 2 | Internal | ldo_custom_I0.bgap_aipoff | | | | output | |
| Bit | 3 | Internal | ldo_custom_I0.vslldo_wkup_dfrtaon | | | | output | |
| Bit | 4 | Internal | ldo_custom_I0.vslldo_wkup_dfrtagood | | | | output | |
| Bit | 5 | Internal | vfsm_custom_I0.device_in_off_mode | | | | output | |
| Bit | 6 | Internal | vsldo_mpu_custom.global_aipoff | | | | input | |
| Bit | 7 | | Reserved | | | | | |
| Byte | 0x52 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vfsm_core_I0.volt_domain_is_on | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|------------------------------------|----|--------|--------|--------|----------|
| Bit | 1 | Internal | v fsm_core_I0.volt_domain_is_good | | | | output | |
| Bit | 2 | Internal | v fsm_core_I0.volt_domain_is_lp | | | | output | |
| Bit | 3 | Internal | v fsm_core_I0.volt_domain_is_sleep | | | | output | |
| Bit | 4 | Internal | v fsm_core_I0.volt_domain_is_ret | | | | output | |
| Bit | 5 | Internal | v fsm_core_I0.go_off_mode | | | | output | |
| Bit | 6 | Internal | v fsm_core_I0.err_rstn | | | | output | |
| Bit | 7 | Internal | v fsm_core_I0.volt_off_rst_n | | | | output | |
| Byte | 0x53 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | v fsm_core_I0.vcon_error | 0 | | | input | |
| Bit | 1 | Internal | v fsm_core_I0.vcon_error | 1 | | | input | |
| Bit | 2 | Internal | v fsm_core_I0.vcon_error | 2 | | | input | |
| Bit | 3 | Internal | v fsm_core_I0.vcon_com | 0 | LSB | | output | |
| Bit | 4 | Internal | v fsm_core_I0.vcon_com | 1 | MSB | | output | |
| Bit | 5 | Internal | v fsm_core_I0.vcon_req | | | | output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x54 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | v fsm_iva_I0.volt_domain_is_on | | | | output | |
| Bit | 1 | Internal | v fsm_iva_I0.volt_domain_is_good | | | | output | |
| Bit | 2 | Internal | v fsm_iva_I0.volt_domain_is_lp | | | | output | |
| Bit | 3 | Internal | v fsm_iva_I0.volt_domain_is_sleep | | | | output | |
| Bit | 4 | Internal | v fsm_iva_I0.volt_domain_is_ret | | | | output | |
| Bit | 5 | Internal | v fsm_iva_I0.go_off_mode | | | | output | |
| Bit | 6 | Internal | v fsm_iva_I0.err_rstn | | | | output | |
| Bit | 7 | Internal | v fsm_iva_I0.volt_off_rst_n | | | | output | |
| Byte | 0x55 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | v fsm_iva_I0.vcon_error | 0 | | | input | |
| Bit | 1 | Internal | v fsm_iva_I0.vcon_error | 1 | | | input | |
| Bit | 2 | Internal | v fsm_iva_I0.vcon_error | 2 | | | input | |
| Bit | 3 | Internal | v fsm_iva_I0.vcon_com | 0 | LSB | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|-----------------------------------|----|--------|--------|--------|----------|
| Bit | 4 | Internal | v fsm_iva_i0.vcon_com | 1 | MSB | | output | |
| Bit | 5 | Internal | v fsm_iva_i0.vcon_req | | | | output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x56 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | v fsm_mpu_i0.volt_domain_is_on | | | | output | |
| Bit | 1 | Internal | v fsm_mpu_i0.volt_domain_is_good | | | | output | |
| Bit | 2 | Internal | v fsm_mpu_i0.volt_domain_is_lp | | | | output | |
| Bit | 3 | Internal | v fsm_mpu_i0.volt_domain_is_sleep | | | | output | |
| Bit | 4 | Internal | v fsm_mpu_i0.volt_domain_is_ret | | | | output | |
| Bit | 5 | Internal | v fsm_mpu_i0.go_off_mode | | | | output | |
| Bit | 6 | Internal | v fsm_mpu_i0.err_rstn | | | | output | |
| Bit | 7 | Internal | v fsm_mpu_i0.volt_off_rst_n | | | | output | |
| Byte | 0x57 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | v fsm_mpu_i0.vcon_error | 0 | | | input | |
| Bit | 1 | Internal | v fsm_mpu_i0.vcon_error | 1 | | | input | |
| Bit | 2 | Internal | v fsm_mpu_i0.vcon_error | 2 | | | input | |
| Bit | 3 | Internal | v fsm_mpu_i0.vcon_com | 0 | LSB | | output | |
| Bit | 4 | Internal | v fsm_mpu_i0.vcon_com | 1 | MSB | | output | |
| Bit | 5 | Internal | v fsm_mpu_i0.vcon_req | | | | output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x58 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | v sldo_core_i0.AIPOFF | | | | output | |
| Bit | 1 | Internal | v sldo_core_i0.ABBOFF | | | | output | |
| Bit | 2 | Internal | v sldo_core_i0.SRAMALLRET | | | | output | |
| Bit | 3 | Internal | v sldo_core_i0.dfrtaon | | | | output | |
| Bit | 4 | Internal | v sldo_core_i0.dfrtagood | | | | output | |
| Bit | 5 | Internal | v sldo_core_i0.sram_vok | | | | output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x59 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | v sldo_iva_i0.AIPOFF | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--------------------------------------|----|--------|--------|--------|----------|
| Bit | 1 | Internal | vsldo_iva_I0.ABBOFF | | | | output | |
| Bit | 2 | Internal | vsldo_iva_I0.SRAMALLRET | | | | output | |
| Bit | 3 | Internal | vsldo_iva_I0.dfrtaon | | | | output | |
| Bit | 4 | Internal | vsldo_iva_I0.dfrtagood | | | | output | |
| Bit | 5 | Internal | vsldo_iva_I0.sram_vok | | | | output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x5a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vsldo_mpu_I0.AIPOFF | | | | output | |
| Bit | 1 | Internal | vsldo_mpu_I0.ABBOFF | | | | output | |
| Bit | 2 | Internal | vsldo_mpu_I0.SRAMALLRET | | | | output | |
| Bit | 3 | Internal | vsldo_mpu_I0.dfrtaon | | | | output | |
| Bit | 4 | Internal | vsldo_mpu_I0.dfrtagood | | | | output | |
| Bit | 5 | Internal | vsldo_mpu_I0.sram_vok | | | | output | |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x5b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vbbldo_iva_I0.AIPOFF | | | | output | |
| Bit | 1 | Internal | vbbldo_iva_I0.VBYPASSZ | | | | output | |
| Bit | 2 | Internal | vbbldo_iva_I0.BBSEL | | | | output | |
| Bit | 3 | Internal | vbbldo_iva_I0.sleep_and_vddc_settled | | | | input | |
| Bit | 4 | Internal | vbbldo_mpu_I0.AIPOFF | | | | output | |
| Bit | 5 | Internal | vbbldo_mpu_I0.VBYPASSZ | | | | output | |
| Bit | 6 | Internal | vbbldo_mpu_I0.BBSEL | | | | output | |
| Bit | 7 | Internal | vbbldo_mpu_I0.sleep_and_vddc_settled | | | | input | |
| Byte | 0x5c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | temporary_device_I1.ls_vddcore_en | | | | output | |
| Bit | 1 | Internal | temporary_device_I1.ls_vddcore_off | | | | output | |
| Bit | 2 | Internal | temporary_device_I1.ls_vddiva_en | | | | output | |
| Bit | 3 | Internal | temporary_device_I1.ls_vddiva_off | | | | output | |
| Bit | 4 | Internal | temporary_device_I1.ls_vddmpu_en | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--|----|--------|--------|--------|---|
| Bit | 5 | Internal | temporary_device_l1.ls_vddmpu_off | | | | output | |
| Bit | 6 | Internal | temporary_device_l1.ls_vddcore_wkup_en | | | | output | |
| Bit | 7 | Internal | temporary_device_l1.ls_vddcore_emu_en | | | | output | |
| Byte | 0x5d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | temporary_device_l1.ls_vddmodem_off | | | | output | |
| Bit | 7:1 | | Reserved | | | | | |
| Byte | 0x5e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | iocntl_I0.io_off_mode | | | | output | |
| Bit | 1 | Internal | iocntl_I0.io_isoovr | | | | output | |
| Bit | 2 | Internal | iocntl_I0.io_isobypass | | | | output | |
| Bit | 3 | Internal | iocntl_I0.io_iso_clk | | | | output | |
| Bit | 4 | Internal | iocntl_I0.io_iso_clk_ack | | | | input | |
| Bit | 5 | Internal | iocntl_I0.io_iso | | | | output | |
| Bit | 6 | Internal | iocntl_I0.io_iso_ack | | | | input | |
| Bit | 7 | Internal | iocntl_I0.io_wuclk | | | | output | |
| Byte | 0x5f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | iocntl_I0.io_wuclk_ack | | | | input | |
| Bit | 1 | Internal | iocntl_I0.io_nready | | | | output | |
| Bit | 2 | Internal | iocntl_I0.io_iso_active | | | | output | |
| Bit | 3 | Internal | iocntl_I0.fsm_state | 0 | LSB | | output | EMIF2ON_INIT2 = "11110", EMIF2ON_INIT3 = "11100", EMIF2ON_INIT4 = "11000" |
| Bit | 4 | Internal | iocntl_I0.fsm_state | 1 | | | output | ISOEMIF_INIT6 = "01010", ISOEMIF = "11010", ISOEMIF_EXTEND = "01111", EMIF2ON_INIT1 = "01110", |
| Bit | 5 | Internal | iocntl_I0.fsm_state | 2 | | | output | ISOEMIF_INIT2 = "01100", ISOEMIF_INIT3 = "01000", ISOEMIF_INIT4 = "01001", ISOEMIF_INIT5 = "01011", |
| Bit | 6 | Internal | iocntl_I0.fsm_state | 3 | | | output | ISOALL_INIT3 = "00110", ISOALL_INIT4 = "00111", ISOALL_ACTIVE = "00101", ISOEMIF_INIT1 = "00100", |
| Bit | 7 | Internal | iocntl_I0.fsm_state | 4 | MSB | | output | INIT = "00000", ONSTATE = "00001", ISOALL_INIT1 = "00011", ISOALL_INIT2 = "00010", |
| Byte | 0x60 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | device_sar fsm_I0.sar_restore_start | | | | output | |
| Bit | 1 | Internal | device_sar fsm_I0.sar_restore_io | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--------------------------------------|----|--------|--------|--------|---|
| Bit | 2 | Internal | device_sar fsm_i0.sar_restore_ioemif | | | | output | |
| Bit | 3 | Internal | device_sar fsm_i0.fsm_state | 0 | LSB | | output | SAR2B_RESTORE = "11010", SAR2B_RESET = "01111", SAR2B_IO = "01110" |
| Bit | 4 | Internal | device_sar fsm_i0.fsm_state | 1 | | | output | SAR2A_RESTORE = "01001", SAR2A_RESET = "01011", SAR2B_START = "01010", |
| Bit | 5 | Internal | device_sar fsm_i0.fsm_state | 2 | | | output | SAR1_IO = "00101", SAR1_RESET = "00100", SAR1_END = "01100", SAR2A_START = "01000", |
| Bit | 6 | Internal | device_sar fsm_i0.fsm_state | 3 | | | output | SAR1_BLOCKRST = "00010", SAR1_START = "00110", SAR1_RESTORE = "00111", |
| Bit | 7 | Internal | device_sar fsm_i0.fsm_state | 4 | MSB | | output | SAR_IDLE = "00000", INITOFF_MODE = "00001", OFF_MODE = "00011", |
| Byte | 0x61 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vproc_core_i0.srfreqerror | 0 | | | input | |
| Bit | 1 | Internal | vproc_core_i0.srfreqerror | 1 | | | input | |
| Bit | 2 | Internal | vproc_core_i0.srfreqerror | 2 | | | input | |
| Bit | 3 | Internal | vproc_core_i0.srfreqerror | 3 | | | input | |
| Bit | 4 | Internal | vproc_core_i0.srfreqerror | 4 | | | input | |
| Bit | 5 | Internal | vproc_core_i0.srfreqerror | 5 | | | input | |
| Bit | 6 | Internal | vproc_core_i0.srfreqerror | 6 | | | input | |
| Bit | 7 | Internal | vproc_core_i0.srfreqerror | 7 | | | input | |
| Byte | 0x62 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vproc_core_i0.vpvoltage | 0 | | | output | |
| Bit | 1 | Internal | vproc_core_i0.vpvoltage | 1 | | | output | |
| Bit | 2 | Internal | vproc_core_i0.vpvoltage | 2 | | | output | |
| Bit | 3 | Internal | vproc_core_i0.vpvoltage | 3 | | | output | |
| Bit | 4 | Internal | vproc_core_i0.vpvoltage | 4 | | | output | |
| Bit | 5 | Internal | vproc_core_i0.vpvoltage | 5 | | | output | |
| Bit | 6 | Internal | vproc_core_i0.vpvoltage | 6 | | | output | |
| Bit | 7 | Internal | vproc_core_i0.vpvoltage | 7 | | | output | |
| Byte | 0x63 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vproc_core_i0.srupdateclk | | | | input | |
| Bit | 1 | Internal | vproc_core_i0.srinterruptz | | | | input | |
| Bit | 2 | Internal | vproc_core_i0.vpirqlr | | | | output | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|------------------------------|----|--------|--------|--------|----------|
| Bit | 3 | Internal | vproc_core_l0.vpupdate | | | | output | |
| Bit | 4 | Internal | vproc_core_l0.vpopchangedone | | | | output | |
| Bit | 5 | Internal | vproc_core_l0.vpnosmpsack | | | | output | |
| Bit | 6 | Internal | vproc_core_l0.vpeqvalue | | | | output | |
| Bit | 7 | Internal | vproc_core_l0.vpmaxvdd | | | | output | |
| Byte | 0x64 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vproc_core_l0.vpminvdd | | | | output | |
| Bit | 7:1 | | Reserved | | | | | |
| Byte | 0x65 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vproc_iva_l0.srfreqerror | 0 | | | input | |
| Bit | 1 | Internal | vproc_iva_l0.srfreqerror | 1 | | | input | |
| Bit | 2 | Internal | vproc_iva_l0.srfreqerror | 2 | | | input | |
| Bit | 3 | Internal | vproc_iva_l0.srfreqerror | 3 | | | input | |
| Bit | 4 | Internal | vproc_iva_l0.srfreqerror | 4 | | | input | |
| Bit | 5 | Internal | vproc_iva_l0.srfreqerror | 5 | | | input | |
| Bit | 6 | Internal | vproc_iva_l0.srfreqerror | 6 | | | input | |
| Bit | 7 | Internal | vproc_iva_l0.srfreqerror | 7 | | | input | |
| Byte | 0x66 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vproc_iva_l0.vpvoltage | 0 | | | output | |
| Bit | 1 | Internal | vproc_iva_l0.vpvoltage | 1 | | | output | |
| Bit | 2 | Internal | vproc_iva_l0.vpvoltage | 2 | | | output | |
| Bit | 3 | Internal | vproc_iva_l0.vpvoltage | 3 | | | output | |
| Bit | 4 | Internal | vproc_iva_l0.vpvoltage | 4 | | | output | |
| Bit | 5 | Internal | vproc_iva_l0.vpvoltage | 5 | | | output | |
| Bit | 6 | Internal | vproc_iva_l0.vpvoltage | 6 | | | output | |
| Bit | 7 | Internal | vproc_iva_l0.vpvoltage | 7 | | | output | |
| Byte | 0x67 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vproc_iva_l0.srupdateclk | | | | input | |
| Bit | 1 | Internal | vproc_iva_l0.srinterruptz | | | | input | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|-----------------------------|----|--------|--------|--------|----------|
| Bit | 2 | Internal | vproc_iva_l0.vpirqlr | | | | output | |
| Bit | 3 | Internal | vproc_iva_l0.vpupdate | | | | output | |
| Bit | 4 | Internal | vproc_iva_l0.vpopchangedone | | | | output | |
| Bit | 5 | Internal | vproc_iva_l0.vpnosmpsack | | | | output | |
| Bit | 6 | Internal | vproc_iva_l0.vpeqvalue | | | | output | |
| Bit | 7 | Internal | vproc_iva_l0.vpmaxvdd | | | | output | |
| Byte | 0x68 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vproc_iva_l0.vpminvdd | | | | output | |
| Bit | 7:1 | | Reserved | | | | | |
| Byte | 0x69 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vproc_mpu_l0.srfreqerror | 0 | | | input | |
| Bit | 1 | Internal | vproc_mpu_l0.srfreqerror | 1 | | | input | |
| Bit | 2 | Internal | vproc_mpu_l0.srfreqerror | 2 | | | input | |
| Bit | 3 | Internal | vproc_mpu_l0.srfreqerror | 3 | | | input | |
| Bit | 4 | Internal | vproc_mpu_l0.srfreqerror | 4 | | | input | |
| Bit | 5 | Internal | vproc_mpu_l0.srfreqerror | 5 | | | input | |
| Bit | 6 | Internal | vproc_mpu_l0.srfreqerror | 6 | | | input | |
| Bit | 7 | Internal | vproc_mpu_l0.srfreqerror | 7 | | | input | |
| Byte | 0x6a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vproc_mpu_l0.vpvoltage | 0 | | | output | |
| Bit | 1 | Internal | vproc_mpu_l0.vpvoltage | 1 | | | output | |
| Bit | 2 | Internal | vproc_mpu_l0.vpvoltage | 2 | | | output | |
| Bit | 3 | Internal | vproc_mpu_l0.vpvoltage | 3 | | | output | |
| Bit | 4 | Internal | vproc_mpu_l0.vpvoltage | 4 | | | output | |
| Bit | 5 | Internal | vproc_mpu_l0.vpvoltage | 5 | | | output | |
| Bit | 6 | Internal | vproc_mpu_l0.vpvoltage | 6 | | | output | |
| Bit | 7 | Internal | vproc_mpu_l0.vpvoltage | 7 | | | output | |
| Byte | 0x6b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vproc_mpu_l0.srupdateclk | | | | input | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--------------------------------|----|--------|--------|--------|------------|
| Bit | 1 | Internal | vproc_mpu_i0.srinterruptz | | | | input | |
| Bit | 2 | Internal | vproc_mpu_i0.vpirqlr | | | | output | |
| Bit | 3 | Internal | vproc_mpu_i0.vpupdate | | | | output | |
| Bit | 4 | Internal | vproc_mpu_i0.vpopchangedone | | | | output | |
| Bit | 5 | Internal | vproc_mpu_i0.vpnosmpsack | | | | output | |
| Bit | 6 | Internal | vproc_mpu_i0.vpeqvalue | | | | output | |
| Bit | 7 | Internal | vproc_mpu_i0.vpmaxvdd | | | | output | |
| Byte | 0x6c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | vproc_mpu_i0.vpminvdd | | | | output | |
| Bit | 7:1 | | Reserved | | | | | |
| Byte | 0x6d | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | volcon_i0.pi_byps_request | | | | input | |
| Bit | 1 | Internal | volcon_i0.po_byps_ack | | | | output | |
| Bit | 2 | Internal | volcon_i0.po_byps_sa_err | | | | output | |
| Bit | 3 | Internal | volcon_i0.po_byps_ra_err | | | | output | |
| Bit | 4 | Internal | volcon_i0.po_byps_timeout_err | | | | output | |
| Bit | 5 | Internal | volcon_i0.po_i2c_sclout | | | | output | |
| Bit | 6 | Internal | volcon_i0.po_i2c_sdaout | | | | output | |
| Bit | 7 | Internal | volcon_i0.po_i2c_hsmode | | | | output | |
| Byte | 0x6e | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | volcon_i0.po_vfsm_ack | 0 | | | output | MPU |
| Bit | 1 | Internal | volcon_i0.po_vfsm_ack | 1 | | | output | IVA |
| Bit | 2 | Internal | volcon_i0.po_vfsm_ack | 2 | | | output | CORE |
| Bit | 3 | Internal | volcon_i0.po_smps_ack | 0 | | | output | MPU |
| Bit | 4 | Internal | volcon_i0.po_smps_ack | 1 | | | output | IVA |
| Bit | 5 | Internal | volcon_i0.po_smps_ack | 2 | | | output | CORE |
| Bit | 7:6 | | Reserved | | | | | |
| Byte | 0x6f | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | temporary_scrm_i0.scrm_2_prm_o | 32 | | | output | alt_sysclk |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--------------------------------|----|--------|--------|--------|-----------------------------------|
| Bit | 1 | Internal | temporary_scrm_l0.scrm_2_prm_o | 33 | | | output | ape_clk32k |
| Bit | 2 | Internal | temporary_scrm_l0.scrm_2_prm_o | 34 | | | output | ape_sysclk |
| Bit | 3 | Internal | temporary_scrm_l0.scrm_2_prm_o | 35 | | | output | mdm_clk32k |
| Bit | 4 | Internal | temporary_scrm_l0.scrm_2_prm_o | 36 | | | output | mdm_sysclk |
| Bit | 5 | Internal | temporary_scrm_l0.scrm_2_prm_o | 37 | | | output | d2d_clk32k |
| Bit | 6 | Internal | temporary_scrm_l0.scrm_2_prm_o | 38 | | | output | d2d_sysClk |
| Bit | 7 | Internal | temporary_scrm_l0.scrm_2_prm_o | 39 | | | output | ape_clkreq |
| Byte | 0x70 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | temporary_scrm_l0.scrm_2_prm_o | 40 | | | output | mdm_clkreq |
| Bit | 1 | Internal | temporary_scrm_l0.scrm_2_prm_o | 41 | | | output | d2d_clkreq |
| Bit | 2 | Internal | temporary_scrm_l0.scrm_2_prm_o | 42 | | | output | src_bypass |
| Bit | 3 | Internal | temporary_scrm_l0.scrm_2_prm_o | 43 | | | output | src_pwrdsn |
| Bit | 4 | Internal | temporary_scrm_l0.scrm_2_prm_o | 44 | | | output | src_sysclk_good |
| Bit | 5 | Internal | temporary_scrm_l0.scrm_2_prm_o | 45 | | | output | slicer_bypass |
| Bit | 6 | Internal | temporary_scrm_l0.scrm_2_prm_o | 46 | | | output | slicer_pwrdsn |
| Bit | 7 | Internal | temporary_scrm_l0.scrm_2_prm_o | 47 | | | output | scrm_dft_cnt_bypass |
| Byte | 0x71 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | temporary_scrm_l0.scrm_2_prm_o | 48 | | | output | aux_clk_muxout(4) |
| Bit | 1 | Internal | temporary_scrm_l0.scrm_2_prm_o | 49 | | | output | alt_sysclk |
| Bit | 2 | Internal | temporary_scrm_l0.scrm_2_prm_o | 50 | | | output | sysclk |
| Bit | 3 | Internal | temporary_scrm_l0.scrm_2_prm_o | 51 | | | output | state of pwr_req_sm state machine |
| Bit | 4 | Internal | temporary_scrm_l0.scrm_2_prm_o | 52 | | | output | state of pwr_req_sm state machine |
| Bit | 5 | Internal | temporary_scrm_l0.scrm_2_prm_o | 53 | | | output | state of pwr_req_sm state machine |
| Bit | 6 | Internal | temporary_scrm_l0.scrm_2_prm_o | 54 | | | output | mdm_pwr_req_ack |
| Bit | 7 | Internal | temporary_scrm_l0.scrm_2_prm_o | 55 | | | output | mdm_pwr_req |
| Byte | 0x72 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | temporary_scrm_l0.scrm_2_prm_o | 56 | | | output | ape_pwr_req_ack |
| Bit | 1 | Internal | temporary_scrm_l0.scrm_2_prm_o | 57 | | | output | ape_pwr_req |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--------------------------------|----|--------|--------|--------|-----------------------------|
| Bit | 2 | Internal | temporary_scrm_l0.scrm_2_prm_o | 58 | | | output | clk_is_gated_d2d_sysclk |
| Bit | 3 | Internal | temporary_scrm_l0.scrm_2_prm_o | 59 | | | output | clk_is_gated_mdm_sysclk |
| Bit | 4 | Internal | temporary_scrm_l0.scrm_2_prm_o | 60 | | | output | clk_is_gated_ape_sysclk |
| Bit | 5 | Internal | temporary_scrm_l0.scrm_2_prm_o | 61 | | | output | clk_is_running_sysclk |
| Bit | 6 | Internal | temporary_scrm_l0.scrm_2_prm_o | 62 | | | output | ape_allsysclkgated |
| Bit | 7 | Internal | temporary_scrm_l0.scrm_2_prm_o | 63 | | | output | sysclk_clkok |
| Byte | 0x73 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | temporary_scrm_l0.scrm_2_prm_o | 64 | | | output | warmrst_out_na |
| Bit | 1 | Internal | temporary_scrm_l0.scrm_2_prm_o | 65 | | | output | ape_por_na |
| Bit | 2 | Internal | temporary_scrm_l0.scrm_2_prm_o | 66 | | | output | ape_warmrst_out_na |
| Bit | 3 | Internal | temporary_scrm_l0.scrm_2_prm_o | 67 | | | output | mdm_por_na |
| Bit | 4 | Internal | temporary_scrm_l0.scrm_2_prm_o | 68 | | | output | mdm_warmrst_out_na |
| Bit | 5 | Internal | temporary_scrm_l0.scrm_2_prm_o | 69 | | | output | d2d_por_na |
| Bit | 6 | Internal | temporary_scrm_l0.scrm_2_prm_o | 70 | | | output | d2d_warmrst_out_na |
| Bit | 7 | Internal | temporary_scrm_l0.scrm_2_prm_o | 71 | | | output | por_out_na |
| Byte | 0x74 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | temporary_scrm_l0.scrm_2_prm_o | 72 | | | output | warmrst_in_na |
| Bit | 1 | Internal | temporary_scrm_l0.scrm_2_prm_o | 73 | | | output | ape_warmrst_in_na |
| Bit | 2 | Internal | temporary_scrm_l0.scrm_2_prm_o | 74 | | | output | mdm_warmrst_in_na |
| Bit | 3 | Internal | temporary_scrm_l0.scrm_2_prm_o | 75 | | | output | d2d_warmrst_in_na |
| Bit | 4 | Internal | temporary_scrm_l0.scrm_2_prm_o | 76 | | | output | d2d_clk32k_is_not_running |
| Bit | 5 | Internal | temporary_scrm_l0.scrm_2_prm_o | 77 | | | output | mdm_clk32k_is_not_running |
| Bit | 6 | Internal | temporary_scrm_l0.scrm_2_prm_o | 78 | | | output | ape_clk32k_is_not_running |
| Bit | 7 | Internal | temporary_scrm_l0.scrm_2_prm_o | 79 | | | output | aux_sysclk_4_is_not_running |
| Byte | 0x75 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | temporary_scrm_l0.scrm_2_prm_o | 80 | | | output | i_d2d_unnaturalreset |
| Bit | 1 | Internal | temporary_scrm_l0.scrm_2_prm_o | 81 | | | output | i_d2d_inreset |
| Bit | 2 | Internal | temporary_scrm_l0.scrm_2_prm_o | 82 | | | output | i_d2d_latchresetbusack |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|--------------------------------------|----|--------|--------|--------|------------------------|
| Bit | 3 | Internal | temporary_scrm_l0.scrm_2_prm_o | 83 | | | output | d2d_latchresetbus |
| Bit | 4 | Internal | temporary_scrm_l0.scrm_2_prm_o | 84 | | | output | d2d_assertnreset |
| Bit | 5 | Internal | temporary_scrm_l0.scrm_2_prm_o | 85 | | | output | d2d_blockreset |
| Bit | 6 | Internal | temporary_scrm_l0.scrm_2_prm_o | 86 | | | output | d2d_releasefromwir |
| Bit | 7 | Internal | temporary_scrm_l0.scrm_2_prm_o | 87 | | | output | d2d_waitinreset |
| Byte | 0x76 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | temporary_scrm_l0.scrm_2_prm_o | 88 | | | output | d2d_warminrstsrc_flttd |
| Bit | 1 | Internal | temporary_scrm_l0.scrm_2_prm_o | 89 | | | output | mdm_warminrstsrc_flttd |
| Bit | 2 | Internal | temporary_scrm_l0.scrm_2_prm_o | 90 | | | output | ape_warminrstsrc_flttd |
| Bit | 3 | Internal | temporary_scrm_l0.scrm_2_prm_o | 91 | | | output | ext_warminrstsrc_flttd |
| Bit | 4 | Internal | temporary_scrm_l0.scrm_2_prm_o | 92 | | | output | d2d_warmrst_in_na_s |
| Bit | 5 | Internal | temporary_scrm_l0.scrm_2_prm_o | 93 | | | output | mdm_warmrst_in_na_s |
| Bit | 6 | Internal | temporary_scrm_l0.scrm_2_prm_o | 94 | | | output | ape_warmrst_in_na_s |
| Bit | 7 | Internal | temporary_scrm_l0.scrm_2_prm_o | 95 | | | output | ext_warmrst_in_na_s |
| Byte | 0x77 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | devfsm_l0.osc_clk_out | | | clock | input | SYS_CLK |
| Bit | 1 | Internal | devfsm_l0.clk | | | clock | input | FUNC_32K_CLK |
| Bit | 2 | Internal | gat_per_32k_gfclk_l0.clkGated | | | clock | output | PER_32K_GFCLK |
| Bit | 3 | Internal | gat_wkup_32k_gfclk_l0.clkGated | | | clock | output | WKUP_32K_GFCLK |
| Bit | 4 | Internal | gat_abe_alwon_32k_clk_l0.clkGated | | | clock | output | ABE_ALWON_32K_CLK |
| Bit | 5 | Internal | gat_per_sys_gfclk_l0.clkGated | | | clock | output | PER_SYS_GFCLK |
| Bit | 6 | Internal | gat_std_efuse_sys_clk_l0.clkGated | | | clock | output | STD_EFUSE_SYS_CLK |
| Bit | 7 | Internal | gat_core_dppll_alwon_clk_l0.clkGated | | | clock | output | CORE_DPLL_ALWON_CLK |
| Byte | 0x78 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_per_dppll_alwon_clk_l0.clkGated | | | clock | output | PER_DPLL_ALWON_CLK |
| Bit | 1 | | Reserved | | | | | |
| Bit | 2 | Internal | gat_mpu_dppll_alwon_clk_l0.clkGated | | | clock | output | MPU_DPLL_ALWON_CLK |
| Bit | 3 | Internal | mux_abe_dppll_refclk_mux_l0.clk_out | | | clock | output | ABE_DPLL_ALWON_CLK |
| Bit | 4 | | Reserved | | | | | |

Table 19-42. PRM Observable Signals (continued)

| | | | | | | | | |
|------|------|----------|---|----|--------|--------|--------|------------------------|
| Bit | 5 | Internal | gat_l4_wkup_profiling_gclk_i0.clkGated | | | clock | output | L4_WKUP_PROFILING_GCLK |
| Bit | 6 | Internal | gat_l4_wkup_gclk_i0.clkGated | | | clock | output | L4_WKUP_GCLK |
| Bit | 7 | Internal | gat_cm1_sys_clk_i0.clkGated | | | clock | output | CM1_SYS_CLK |
| Byte | 0x79 | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_l4_wkup_giclk_i0.clkGated | | | clock | output | L4_WKUP_GICLK |
| Bit | 1 | Internal | gat_sr_core_sysclk_i0.clkGated | | | clock | output | SR_CORE_SYSCLK |
| Bit | 2 | Internal | gat_sr_mpu_sysclk_i0.clkGated | | | clock | output | SR_MPU_SYSCLK |
| Bit | 3 | Internal | gat_sr_iva_sysclk_i0.clkGated | | | clock | output | SR_IVA_SYSCLK |
| Bit | 4 | Internal | ctsbuf_ff_prm_l4_wkup_iclk_p2p_i0.y | | | clock | output | L4_WKUP_ICLK |
| Bit | 5 | | Reserved | | | | | |
| Bit | 6 | Internal | gat_dss_alwon_sys_clk_i0.clkGated | | | clock | output | DSS_ALWON_SYS_CLK |
| Bit | 7 | Internal | gat_abe_sysclk_i0.clkGated | | | clock | output | ABE_SYSCLK |
| Byte | 0x7a | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | gat_dspss_dppll_alwon_clk_i0.clkGated | | | clock | output | dspss_DPLL_ALWON_CLK |
| Bit | 1 | Internal | gat_emu_sys_clk_i0.clkGated | | | clock | output | EMU_SYS_CLK |
| Bit | 2 | Internal | gat_usb_dppll_clk_i0.clkGated | | | clock | output | USB_DPLL_CLK |
| Bit | 3 | Internal | gat_abe_dppll_bypass_clk_mux_pwded0_i0.clkGated | | | clock | output | ABE_DPLL_BYPASS_CLK |
| Bit | 4 | Internal | mux_cm2_dm2_mux_i0.clk_out | | | clock | output | DMT2_GFCLK |
| Bit | 5 | Internal | mux_cm2_dm3_mux_i0.clk_out | | | clock | output | DMT3_GFCLK |
| Bit | 6 | Internal | mux_cm2_dm4_mux_i0.clk_out | | | clock | output | DMT4_GFCLK |
| Bit | 7 | Internal | mux_cm2_dm9_mux_i0.clk_out | | | clock | output | DMT9_GFCLK |
| Byte | 0x7b | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
| Bit | 0 | Internal | mux_cm2_dm10_mux_i0.clk_out | | | clock | output | DMT10_GFCLK |
| Bit | 1 | Internal | mux_cm2_dm11_mux_i0.clk_out | | | clock | output | DMT11_GFCLK |
| Bit | 2 | Internal | mux_dmt1_clk_mux_i0.clk_out | | | clock | output | DMT1_GCLK |
| Bit | 3 | | Reserved | | | | | |
| Bit | 4 | Internal | cirq_cortex_m3_i0.prm2Irq | | | | output | |
| Bit | 5 | Internal | Reserved | | | | output | |
| Bit | 6 | Internal | cirq_dspss_i0.prm2Irq | | | | output | |
| Bit | 7 | | | | | | | |

Table 19-42. PRM Observable Signals (continued)

| Byte | 0x7c | Type | AutoPRCM signal identifier | B# | Info + | Info + | Info + | Comments |
|------|------|----------|--|----|--------|--------|--------|----------|
| Bit | 0 | Internal | rstbdvcn_I0.eFuseAutoLoad_done_pulse | | | | output | |
| Bit | 1 | Internal | rstbdvcn_I0.eFuseAutoLoad_done_one_pulse | | | | output | |
| Bit | 2 | Internal | rstbdvcn_I0.eFuseAutoLoad_n_s | | | | output | |
| Bit | 3 | Internal | rstbdvcn_I0.prmDeviceType | 0 | LSB | | output | |
| Bit | 4 | Internal | rstbdvcn_I0.prmDeviceType | 1 | | | output | |
| Bit | 5 | Internal | rstbdvcn_I0.prmDeviceType | 2 | MSB | | output | |
| Bit | 7:6 | | Reserved | | | | | |

19.4.11.5.10 PRCM FSM State Observable Signals Description

Some of the observable signals encode the different PRCM finite state-machine (FSM) states. Each state corresponds to a combination of FSM output signal values. The states of the different FSMs associated with the SAR RAM, DPLLs, EMIF, I/O controller, power manager, global reset manager warm reset generator, and clock managers, along with their corresponding output signal values (except for DPLL Ctrl outputs) are described in [Table 19-43](#) through [Table 19-49](#).

Table 19-43. SAR FSM State Description

| device_sar fsm_10. fsm_state | FSM State | | Output Values | | | | | | | | | |
|---------------------------------|---------------|-------|------------------------|----------------------|-------------------|--------------|-----------------------|-----------------|------------------|--------------------|----------------|----------------|
| | Name | Value | sar_deviceOffWkupActst | sar_restore_cndp | sar_restore_start | sar_override | sar_inhibit_frequency | sar_stall_reset | sar_sdma_mwakeup | sar_restore_ioemif | sar_restore_io | sar_sdma_rst_n |
| | SAR_IDLE | 00000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| | INITOFF_MODE | 00001 | 0 | Previous value | previous value | 0 | Previous value | Previous value | 0 | 0 | 0 | Previous value |
| | OFF_MODE | 00011 | 0 | restore_phase1_cndp | 0 | 0 | Previous value | 1 | 0 | 0 | 0 | 0 |
| | SAR1_BLOCKRST | 00010 | 0 | Previous value | 0 | 1 | Previous value | 1 | 0 | 0 | 0 | 0 |
| | SAR1_START | 00110 | 1 | Previous value | 1 | 1 | glblWarmRstActSt | 1 | 1 | 0 | 0 | 1 |
| | SAR1_RESTORE | 00111 | 1 | Previous value | 1 | 1 | Previous value | 1 | 0 | 0 | 0 | 1 |
| | SAR1_IO | 00101 | 1 | Previous value | 1 | 1 | Previous value | 1 | 0 | 1 | 0 | 1 |
| | SAR1_RESET | 00100 | 0 | Previous value | 1 | 0 | Previous value | 1 | 0 | 1 | 0 | 0 |
| | SAR1_END | 01100 | 0 | Previous value | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| | SAR2A_START | 01000 | 0 | restore_phase2a_cndp | 1 | 0 | Previous value | 1 | 1 | 1 | 0 | 1 |
| | SAR2A_RESTORE | 01001 | 0 | Previous value | 1 | 0 | Previous value | 1 | 0 | 1 | 0 | 1 |
| | SAR2A_RESET | 01011 | 0 | Previous value | 1 | 0 | Previous value | 1 | 0 | 1 | 0 | 0 |
| | SAR2B_START | 01010 | 0 | restore_phase2b_cndp | 1 | 0 | Previous value | 1 | 1 | 1 | 0 | 1 |
| | SAR2B_RESTORE | 11010 | 0 | Previous value | 1 | 0 | Previous value | 1 | 0 | 1 | 0 | 1 |
| | SAR2B_RESET | 01111 | 0 | Previous value | 0 | 0 | Previous value | 1 | 0 | 1 | 0 | 0 |
| | SAR2B_IO | 01110 | 0 | Previous value | 0 | 0 | Previous value | 1 | 0 | 1 | 1 | 1 |

Table 19-44. DPLLCtrl FSM State Description

| | Name | Value | | Mode |
|------------------------------|---------------|-------|----------|------|
| dpllctrl_dpll. DPLLCtrlState | | 0x00 | 00000000 | None |
| | MLPS0 | 0x11 | 00010001 | LPS |
| | MLPS1 | 0x12 | 00010010 | LPS |
| | MLPS2 | 0x13 | 00010011 | LPS |
| | GoToLPS | 0x14 | 00010100 | LPS |
| | setIdle | 0x15 | 00010101 | LPS |
| | LPStopCmd | 0x16 | 00010110 | LPS |
| | LPStopState | 0x1F | 00011111 | LPS |
| | MLPS0 | 0x91 | 10010001 | LPS |
| | MLPS1 | 0x92 | 10010010 | LPS |
| | MLPS2 | 0x93 | 10010011 | LPS |
| | GoToLPS | 0x94 | 10010100 | LPS |
| | setIdle | 0x95 | 10010101 | LPS |
| | LPStopCmd | 0x96 | 10010110 | LPS |
| | LPStopState | 0x9F | 10011111 | LPS |
| | MFRS0 | 0x21 | 00100001 | FRS |
| | MFRS1 | 0x22 | 00100010 | FRS |
| | MFRS2 | 0x23 | 00100011 | FRS |
| | GoToFRS | 0x24 | 00100100 | FRS |
| | FRStopCmd | 0x26 | 00100110 | FRS |
| | FRStopState | 0x2F | 00101111 | FRS |
| | MFRS0 | 0xA1 | 10100001 | FRS |
| | MFRS1 | 0xA2 | 10100010 | FRS |
| | MFRS2 | 0xA3 | 10100011 | FRS |
| | GoToFRS | 0xA4 | 10100100 | FRS |
| | setIdle | 0xA5 | 10100101 | FRS |
| | FRStopCmd | 0xA6 | 10100110 | FRS |
| | FRStopState | 0xAF | 10101111 | FRS |
| | waitM0 | 0x41 | 01000001 | MNB |
| | GoToMNB | 0x42 | 01000010 | MNB |
| | MNBypassState | 0x4F | 01001111 | MNB |
| | MLPB0 | 0x51 | 01010001 | LPB |
| | MLPB1 | 0x52 | 01010010 | LPB |
| | MLPB2 | 0x53 | 01010011 | LPB |

Table 19-44. DPLLCtrl FSM State Description (continued)

| | Name | Value | | Mode |
|------------------------------|---------------|-------|----------|------|
| dpllctrl_dpil. DPLLCtrlState | wait3clkinp | 0x54 | 01010100 | LPB |
| | GoToLPB | 0x55 | 01010101 | LPB |
| | LPBypassState | 0x5F | 01011111 | LPB |
| | MLPB0 | 0xD1 | 11010001 | LPB |
| | MLPB1 | 0xD2 | 11010010 | LPB |
| | MLPB2 | 0xD3 | 11010011 | LPB |
| | wait3clkinp | 0xD4 | 11010100 | LPB |
| | GoToLPB | 0xD5 | 11010101 | LPB |
| | LPBypassState | 0xDF | 11011111 | LPB |
| | MFRB0 | 0x61 | 01100001 | FRB |
| | MFRB1 | 0x62 | 01100010 | FRB |
| | MFRB2 | 0x63 | 01100011 | FRB |
| | wait3clkinp | 0x64 | 01100100 | FRB |
| | GoToFRB | 0x65 | 01100101 | FRB |
| | FRBypassState | 0x6F | 01101111 | FRB |
| | MFRB0 | 0xE1 | 11100001 | FRB |
| | MFRB1 | 0xE2 | 11100010 | FRB |
| | MFRB2 | 0xE3 | 11100011 | FRB |
| | wait3clkinp | 0xE4 | 11100100 | FRB |
| | GoToFRB | 0xE5 | 11100101 | FRB |
| | FRBypassState | 0xEF | 11101111 | FRB |
| | PL3.5 | 0x71 | 01110001 | Lock |
| | PL4 | 0x72 | 01110010 | Lock |
| | GoToLock | 0x73 | 01110011 | Lock |
| | LockState | 0x7F | 01111111 | Lock |

Table 19-45. EMIF FSM State Description

| emiffsm_l0.state | FSM State | | Output Values | | | | |
|------------------|----------------|-------|---------------|------------|---------------------|-------------------------------|------------------|
| | Name | Value | forceldleReq | copyShadow | dll_reset_enable | clear_frequpdate | freq_update_idle |
| | START | 000 | 0 | 0 | 0 | 0 | 1 |
| | REQIDLE | 001 | 1 | 0 | 0 | 0 | 0 |
| | UPLOADSHADOW1 | 010 | 1 | 1 | ro_shadow_dll_reset | 0 | 0 |
| | UPLOADSHADOW2 | 011 | 1 | 1 | ro_shadow_dll_reset | 0 | 0 |
| | SHADOWCOPIED | 100 | 1 | 1 | ro_shadow_dll_reset | 0 | 0 |
| | WAITDLLREADY | 101 | 1 | 0 | 0 | dllReady and warmrstdata_n | 0 |
| | CLEAR_EXITIDLE | 110 | 0 | 0 | 0 | 0 | 0 |

Table 19-46. I/O Controller FSM State Description

| iocntl_I0.fsm_state | FSM State | | Output Values | | | | | | | | | |
|---------------------|----------------|-------|----------------|---------------|----------|----------------|----------------|----------------|----------------|--------------|------------|---------------|
| | Name | Value | io_nready | io_iso_active | io_is_on | io_off_mode | io_iso_clk | io_iso | io_isoovr | io_isobypass | io_protect | wkup_chain_en |
| | INIT | 00000 | Previous value | 0 | 0 | Previous value | 0 | 0 | 0 | 0 | 0 | 0 |
| | ONSTATE | 00001 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ISOALL_INIT1 | 00011 | 1 | 0 | 0 | 1 | Previous value | Previous value | Previous value | 0 | 1 | 1 |
| | ISOALL_INIT2 | 00010 | 1 | 0 | 0 | Previous value | 1 | Previous value | Previous value | 0 | 1 | 1 |
| | ISOALL_INIT3 | 00110 | 1 | 0 | 0 | Previous value | Previous value | 1 | Previous value | 0 | 1 | 1 |
| | ISOALL_INIT4 | 00111 | 1 | 0 | 0 | Previous value | 0 | Previous value | Previous value | 0 | 1 | 1 |
| | ISOALL_ACTIVE | 00101 | 1 | 1 | 0 | Previous value | Previous value | Previous value | Previous value | 0 | 0 | 1 |
| | ISOEMIF_INIT1 | 00100 | 1 | 1 | 0 | 0 | Previous value | Previous value | Previous value | 0 | 0 | 1 |
| | ISOEMIF_INIT2 | 01100 | 1 | 1 | 0 | Previous value | Previous value | Previous value | 1 | 0 | 0 | 1 |
| | ISOEMIF_INIT3 | 01000 | 1 | 1 | 0 | Previous value | 1 | Previous value | Previous value | 0 | 0 | 1 |
| | ISOEMIF_INIT4 | 01001 | 1 | 1 | 0 | Previous value | Previous value | 0 | Previous value | 0 | 0 | 1 |
| | ISOEMIF_INIT5 | 01011 | 1 | 1 | 0 | Previous value | Previous value | Previous value | Previous value | 0 | 0 | 1 |
| | ISOEMIF_INIT6 | 01010 | 1 | 1 | 0 | Previous value | 0 | Previous value | Previous value | 0 | 0 | 1 |
| | ISOEMIF | 11010 | 1 | 0 | 0 | Previous value | Previous value | Previous value | Previous value | 0 | 0 | 0 |
| | ISOEMIF_EXTEND | 01111 | 0 | 0 | 0 | Previous value | Previous value | Previous value | Previous value | 0 | 0 | 0 |
| | EMIF2ON_INIT1 | 01110 | Previous value | 0 | 0 | Previous value | Previous value | Previous value | Previous value | 1 | 0 | 0 |
| | EMIF2ON_INIT2 | 11110 | Previous value | 0 | 0 | Previous value | 1 | Previous value | Previous value | 1 | 0 | 0 |
| | EMIF2ON_INIT3 | 11100 | Previous value | 0 | 0 | Previous value | Previous value | Previous value | 0 | 1 | 0 | 0 |
| | EMIF2ON_INIT4 | 11000 | Previous value | 0 | 0 | Previous value | 0 | Previous value | Previous value | 1 | 0 | 0 |

Table 19-47. PM FSM State Description

| pmfsm.fsm_state | FSM State | | Output Values | | | | | | | | | | | |
|-----------------|-------------|-------|---------------|------------------|--------------|--------------|-----------|--------------|--------------|---------------------|---------------|--------------------|----------------|----------------|
| | Name | Value | sleep | domain_isolation | PM_off_reset | PM_ret_reset | PM_reset | intransition | domain_is_on | domain_is_retention | domain_is_off | domain_is_inactive | powerrequest | powerok |
| | RESET | 00000 | 0 | 0 | PMRST_VAL | PMRST_VAL | PMRST_VAL | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| | CHANGEMEM | 00001 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | Previous value | Previous value |
| | ONSTATE | 00010 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | Previous value |
| | STATEUPDATE | 00011 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | Previous value | Previous value |
| | INACTIVE | 00100 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | Previous value | Previous value |
| | ON2INACT | 00101 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | Previous value | Previous value |
| | INACT2ON | 00110 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | Previous value | Previous value |
| | ON2OFF | 00111 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Previous value |
| | ON2RETL | 01000 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Previous value |
| | ON2RETH | 01001 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Previous value |
| | OFFSTATE | 01010 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Previous value | 0 |
| | RETL | 01011 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | Previous value | 0 |
| | RETH | 01100 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | Previous value | Previous value |
| | OFF2ON | 01101 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | Previous value | 0 |
| | RETL2ON | 01110 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | Previous value | 0 |
| | RETH2ON | 01111 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | Previous value | Previous value |
| | OFF2ONISO | 10000 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | Previous value | 1 |
| | RETL2ONISO | 10001 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | Previous value | 1 |
| | RETH2ONISO | 10010 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | Previous value | 1 |

Table 19-47. PM FSM State Description (continued)

| FSM State | | Output Values | | | | | | | | | | | | |
|-----------------|------------------|---------------|---|----------------|---|---|----------------|---|---|---|---|---|----------------|----------------|
| pmfsm.fsm_state | OFF2ONNOISO | 10011 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | Previous value | Previous value |
| | RETL2ONNOISO | 10100 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | Previous value | Previous value |
| | RETH2ONNOISO | 10101 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | Previous value | Previous value |
| | OFF2ONRST | 10110 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | Previous value | Previous value |
| | RETL2ONRST | 10111 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | Previous value | Previous value |
| | RETH2ONRST | 11000 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | Previous value | Previous value |
| | INACTIVE2ON | 11001 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | Previous value | Previous value |
| | INACTIVE2ONISO | 11010 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | Previous value | 1 |
| | INACTIVE2ONNOISO | 11011 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | Previous value | Previous value |
| | INACTIVE2ONRST | 11100 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | Previous value | Previous value |
| | UPDATE2OFF | 11101 | 1 | Previous value | 1 | 1 | Previous value | 1 | 0 | 0 | 0 | 0 | 0 | Previous value |
| | UPDATE2RETL | 11110 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Previous value |
| | UPDATE2RETH | 11111 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Previous value |

Table 19-48. Warm Reset FSM State Description

| glb1rstmgr_l0. warmrst_fsm_state | FSM State | | Output Values | | | | | |
|-------------------------------------|------------------|-------|--|----------|--------------------------|---------------------|------------------|-----------------|
| | Name | Value | glb1WarmRst_n | Reserved | glb1WarmRstNoWarmIn_n | glb1WarmRstActSrc_n | emifForceldleReq | warmRstBlockAck |
| | RESET | 000 | 0 | | 1 | 1 | 0 | 0 |
| | INIT | 001 | 1 | | 1 | 1 | 0 | 0 |
| | WAIT16CLK | 010 | 1 | | 1 | 0 | 1 | 0 |
| | WAITEMIFIDLE | 011 | 1 | | 1 | 0 | 1 | 0 |
| | WAITNOPENDINGRST | 100 | warm_in_s_n and not pending_warm _rst_log | | not pending_warm_rst_log | 0 | 1 | 0 |
| | WAITWARMIN | 101 | warm_in_s_n and not pending_warm _rst_log | | 1 | 0 | 1 | 0 |
| | WAITCLOCKSTABLE | 110 | 1 | | 1 | 1 | 1 | 0 |
| | FREQUPDATE | 111 | 1 | | 1 | 1 | 0 | 1 |

Table 19-49. CM FSM State Description

| cmfsm_fsm_state | FSM State | | Output Values | | | |
|-----------------|------------|-------|-----------------|---------------|----------------|---------------------|
| | Name | Value | domain_idle_req | domain_nReady | domain_is_idle | domain_is_noton_ack |
| | INACTIVE | 000 | 1 | 1 | 1 | 1 |
| | INACT2ACT | 001 | 0 | 1 | 0 | 0 |
| | ACTIVE | 011 | 0 | 0 | 0 | 0 |
| | ACT2INACT1 | 111 | 1 | 1 | 0 | 0 |
| | ACT2INACT2 | 101 | 1 | 1 | 1 | 0 |

19.4.11.5.11 DPLL Clockview Channel Observable Signals Multiplexing

Table 19-50 describes the multiplexing of the different DPLL clock outputs for each of the three available clk_view_0, clk_view_1, and clk_view_2 channels.

Table 19-50. Different DPLL Observable Clock Output Signals

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to Signals Inside Different Module DPLLs | Different DPLL Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | DPLL CLKOUT Selection Per clk_view channel i CONTROL_CONF_CLK_SELi [2:0] MULT Value (where i = 0...2) |
|---|---|--------------------|--|
| hwobs_coredpll_clkout | DPLL_TESTCLKOUT | CORE DPLL | 0x0 |
| hwobs_abedpll_clkout | PODPLLTESTCLKOUT | ABE DPLL | 0x1 |
| hwobs_perdpll_clkout | DPLL_TESTCLKOUT | PERIPH DPLL | 0x2 |
| hwobs_dsi1dpll_clkout | PODPLLTESTCLKOUT | DSI1 DPLL | 0x3 |
| hwobs_dsi2dpll_clkout | DPLL_TESTCLKOUT | DSI2 DPLL | 0x4 |
| reserved | Reserved | – | 0x5 |
| hwobs_usbdpll_clkout | PODPLLTESTCLKOUT | USB DPLL | 0x6 |
| reserved | Reserved | – | 0x7 |

19.4.11.5.12 Other CORE DPLL Observable Signals

Table 19-51 describes the mapping of CORE DPLL observability signals (other than CLKOUT) to the SYSCTRL_GENERAL_CORE DPLL observing inputs. The selection of CORE DPLL as the source of the additional DPLL signals is done at the SYSCTRL_GENERAL_CORE level by setting bit field MULT = 0x0 inside each of the eight registers (CONTROL_CONF_DPLL_FREQLOCK_SEL through CONTROL_CONF_DPLL_IDLE_SEL).

Table 19-51. Other CORE DPLL Observability Signals

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to CORE DPLL Observable Signals | Other CORE DPLL Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|--|--|---|-----------------------|
| hwobs_coredpll_freqlock | COREdpll_freqlock | CORE DPLL frequency lock check | – |
| hwobs_coredpll_tinitz | COREdpll_tinitz | Check CORE DPLL status, lock/relock time | – |
| hwobs_coredpll_phaselock | COREdpll_phaselock | CORE DPLL phase lock check | – |
| hwobs_coredpll_tenable | COREdpll_tenable | CORE DPLL core RegM/N load enable input | – |
| hwobs_coredpll_tenablediv | COREdpll_tenablediv | CORE DPLL core RegM2/N2 load enable input | – |
| hwobs_coredpll_bypassack | COREdpll_bypassack | CORE DPLL bypass status signal | – |
| hwobs_coredpll_idle | COREdpll_idle | CORE DPLL idle mode input | – |

19.4.11.5.13 Other ABE DPLL Observable Signals

Table 19-52 describes the mapping of CORE DPLL observability signals (other than CLKOUT) to the SYSCTRL_GENERAL_CORE DPLL observing inputs. The selection of ABE DPLL as the source of the additional DPLL signals is done at the SYSCTRL_GENERAL_CORE level by setting bit field MULT = 0x1 inside each of the eight registers (CONTROL_CONF_DPLL_FREQLOCK_SEL through CONTROL_CONF_DPLL_IDLE_SEL).

Table 19-52. Other ABE DPLL Observability Signals

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to ABE DPLL Observable Signals | Other ABE DPLL Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|--|--|--|------------------------------|
| hwobs_abedpll_freqlock | dsdpdll_freqlock | ABE DPLL frequency lock check | – |
| hwobs_abedpll_tinitz | dsdpdll_tinitz | Check ABE DPLL status, lock/relock time. | – |
| hwobs_abedpll_phaselock | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_abedpll_tenable | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_abedpll_tenablediv | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_abedpll_bypassack | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_abedpll_idle | dspDpllPhaseLock | dspDPLL phase lock check | – |

19.4.11.5.14 Other PERIPH DPLL Observable Signals

Table 19-53 describes the mapping of CORE DPLL observability signals (other than CLKOUT) to the SYSCTRL_GENERAL_CORE DPLL observing inputs. The selection of PERIPH DPLL as the source of the additional DPLL signals is done at the SYSCTRL_GENERAL_CORE level by setting bit field MULT = 0x2 inside each of the eight registers ([CONTROL_CONF_DPLL_FREQLOCK_SEL](#) through [CONTROL_CONF_DPLL_IDLE_SEL](#)).

Table 19-53. Other PERIPH DPLL Observability Signals

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to PERIPH DPLL Observable Signals | Other PERIPH DPLL Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|---|---|---|------------------------------|
| hwobs_perdppll_freqlock | PERIPHDpll_freqlock | PERIPH DPLL frequency lock check | – |
| hwobs_perdppll_tinitz | PERIPHDpll_tinitz | Check PERIPH DPLL status, lock/relock time. | – |
| hwobs_perdppll_phaselock | PERIPHDpllPhaseLock | PERIPH DPLL phase lock check | – |
| hwobs_perdppll_tenable | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_perdppll_tenablediv | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_perdppll_bypassack | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_perdppll_idle | PERIPHDpllPhaseLock | PERIPH DPLL phase lock check | – |

19.4.11.5.15 Other DSI1 DPLL Observable Signals

Table 19-54 describes the mapping of CORE DPLL observability signals (other than CLKOUT) to the SYSCTRL_GENERAL_CORE DPLL observing inputs. The selection of DSI1 DPLL as the source of the additional DPLL signals is done at the SYSCTRL_GENERAL_CORE level by setting bit field MULT = 0x3 inside each of the eight registers ([CONTROL_CONF_DPLL_FREQLOCK_SEL](#) through [CONTROL_CONF_DPLL_IDLE_SEL](#)).

Table 19-54. Other DSI1 DPLL Observability Signals

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to DSI1 DPLL Observable Signals | Other DSI1 DPLL Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|---|---|---|------------------------------|
| hwobs_dsi1dpll_freqlock | dsdpdll_freqlock | dspDPLL frequency lock check | – |
| hwobs_dsi1dpll_tinitz | dsdpdll_tinitz | Check dspDPLL status, lock/relock time. | – |

Table 19-54. Other DSI1 DPLL Observability Signals (continued)

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to DSI1 DPLL Observable Signals | Other DSI1 DPLL Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|---|---|---------------------------|------------------------------|
| hwobs_dsi1dpll_phaselock | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_dsi1dpll_tenable | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_dsi1dpll_tenablediv | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_dsi1dpll_bypassack | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_dsi1dpll_idle | dspDpllPhaseLock | dspDPLL phase lock check | – |

19.4.11.5.16 Other DSI2 DPLL Observable Signals

Table 19-55 describes the mapping of CORE DPLL observability signals (other than CLKOUT) to the SYSCTRL_GENERAL_CORE DPLL observing inputs. The selection of DSI2 DPLL as the source of the additional DPLL signals is done at the SYSCTRL_GENERAL_CORE level by setting bit field MULT = 0x4 inside each of the eight registers ([CONTROL_CONF_DPLL_FREQLOCK_SEL](#) through [CONTROL_CONF_DPLL_IDLE_SEL](#)).

Table 19-55. Other DSI2 DPLL Observability Signals

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to DSI2 DPLL Observable Signals | Other DSI2 DPLL Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability Inputs | Signal Description | Logical Value Meaning |
|---|---|---|------------------------------|
| hwobs_dsi2dpll_freqlock | PERIPHDpll_freqlock | PERIPH DPLL frequency lock check | – |
| hwobs_dsi2dpll_tinitz | PERIPHDpll_tinitz | Check PERIPH DPLL status, lock/relock time. | – |
| hwobs_dsi2dpll_phaselock | PERIPHDpllPhaseLock | PERIPH DPLL phase lock check | – |
| hwobs_dsi2dpll_tenable | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_dsi2dpll_tenablediv | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_dsi2dpll_bypassack | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_dsi2dpll_idle | PERIPHDpllPhaseLock | PERIPH DPLL phase lock check | – |

19.4.11.5.17 Other USB DPLL Observable Signals

Table 19-56 shows mapping of (other than CLKOUT) CORE dpll observability signals to the SYSCTRL_GENERAL_CORE dpll observing inputs. The selection of USB DPLL as the source of the additional DPLL signals is done at SYSCTRL_GENERAL_CORE level through setting bit field MULT=0x6 inside all of the eight registers - [CONTROL_CONF_DPLL_FREQLOCK_SEL](#) through [CONTROL_CONF_DPLL_IDLE_SEL](#).

Table 19-56. Other USB DPLL Observability Signals

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to USB DPLL Observable Signals | Other USB DPLL Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability inputs | Signal Description | Logical Value Meaning |
|--|--|---|------------------------------|
| hwobs_usbdpll_freqlock | dsdpdpll_freqlock | dspDPLL frequency lock check | – |
| hwobs_usbdpll_tinitz | dsdpdpll_tinitz | Check dspDPLL status, lock/relock time. | – |
| hwobs_usbdpll_phaselock | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_usbdpll_tenable | dspDpllPhaseLock | dspDPLL phase lock check | – |

Table 19-56. Other USB DPLL Observability Signals (continued)

| SYSCTRL_GENERAL_CORE Observability Inputs Tied to USB DPLL Observable Signals | Other USB DPLL Observable Signals Mapped to SYSCTRL_GENERAL_CORE Observability inputs | Signal Description | Logical Value Meaning |
|---|---|--------------------------|-----------------------|
| hwobs_usbdpll_tenablediv | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_usbdpll_bypassack | dspDpllPhaseLock | dspDPLL phase lock check | – |
| hwobs_usbdpll_idle | dspDpllPhaseLock | dspDPLL phase lock check | – |

19.4.12 Functional Register Description

19.4.12.1 DSP Boot Register

This information is not available in the public domain.

19.4.12.1.1 PBIASLITE Control Register

Table 19-57 describes the [CONTROL_PBIASLITE](#) register, which controls some settings of PBIASLITE cell for the MMC1 I/O interface.

Table 19-57. PBIAS Control Register

| Physical Address | Register Name | Description | Access |
|------------------|-----------------------------------|---------------------------------|--------|
| 0x4A10 0600 | CONTROL_PBIASLITE | Control settings for PBIAS cell | RW |

19.4.12.2 Temperature Sensor Control Registers

Table 19-58 describes the [CONTROL_TEMP_SENSOR](#) registers of the general core control module, which control the temperature sensor, band gap state-machine, and thermal post-processing logic.

Table 19-58. Temperature Sensor Register

| Physical Address | Register Name | Description | Access |
|------------------|---|--|--------|
| 0x4A00 232C | CONTROL_TEMP_SENSOR | Temperature sensor control register | R/W |
| 0x4A00 2378 | CONTROL_BANDGAP_CTRL | Mode selection and mask hot/cold event register | R/W |
| 0x4A00 237C | CONTROL_BANDGAP_COUNTER | Band gap delay counter register | R/W |
| 0x4A00 2380 | CONTROL_BANDGAP_THRESHOLD | Band gap thermal alert threshold register | R/W |
| 0x4A00 2384 | CONTROL_TSHUT_THRESHOLD | Tshut threshold register | R/W |
| 0x4A00 2388 | CONTROL_BANDGAP_STATUS | Thermal alert and band gap idle events status register | RO |

19.4.12.2.1 CSI Receiver Control Register

To enable the physical layer of the camera receiver, the programmer manipulates the bits within the [CONTROL_CAMERA_RX](#) register.

Table 19-59. CSI Receiver Control Register

| Physical Address | Register Name | Description | Access |
|------------------|-----------------------------------|---------------------------------|--------|
| 0x4A10 0608 | CONTROL_CAMERA_RX | Module dedicated configurations | RW |

19.4.12.3 Protection Status Registers

Table 19-60 lists the status registers.

Table 19-60. Protection Status Registers

| Physical Address | Register Name | Description | Access |
|------------------|--|---|-------------|
| 0x4A00 22D0 | CONTROL_SEC_ERR_STATUS_FUNC | Protection firewall error status register | Public (R) |
| 0x4A00 22D4 | CONTROL_SEC_ERR_STATUS_DEBUG | Protection firewall error status register debug | Public (RW) |

These registers do not depend on the device type.

The [CONTROL_PROT_ERR_STATUS_FUNC](#) can be read in public mode, but cannot be written.

The [CONTROL_PROT_ERR_STATUS_DEBUG](#) register is both read and write accessible in GP devices.

These bits are cleared when the L3 and L4 firewall embedded-error log registers are cleared. All bits in these registers reflect internal events in the device related to the device protection.

On a specific event (signal rising edge), the corresponding bit is set. On a rising edge, the input signal must stay high for at least two interface clock periods to be recognized. Software must clear each bit after reviewing the events.

When a protection violation occurs, the following bits are set:

- In application mode
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[01] = L3RAM protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[02] = GPMC protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[03] = EMIF protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[04] = IVA-HD protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[05] = Dual Cortex™-M3 protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[06] = SL2 protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[09] = BB2D protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[12] = C2C protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[13] = SGX protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[14] = DSS protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[15] = ISS protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[16] = L4_PER protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[17] = L4_CFG protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[18] = DEBUGSS protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[19] = L4 AudioBE protection violation
 - [CONTROL_SEC_ERR_STATUS_FUNC](#)[20] = C2C INIT protection violation
- In debug mode:
 - [CONTROL_SEC_ERR_STATUS_DEBUG](#)[01] = L3RAM protection violation
 - [CONTROL_SEC_ERR_STATUS_DEBUG](#)[02] = GPMC protection violation
 - [CONTROL_SEC_ERR_STATUS_DEBUG](#)[03] = EMIF protection violation
 - [CONTROL_SEC_ERR_STATUS_DEBUG](#)[04] = IVA-HD protection violation
 - [CONTROL_SEC_ERR_STATUS_DEBUG](#)[05] = Dual Cortex-M3 protection violation
 - [CONTROL_SEC_ERR_STATUS_DEBUG](#)[06] = SL2 protection violation
 - [CONTROL_SEC_ERR_STATUS_DEBUG](#)[09] = BB2D protection violation
 - [CONTROL_SEC_ERR_STATUS_DEBUG](#)[12] = C2C protection violation
 - [CONTROL_SEC_ERR_STATUS_DEBUG](#)[13] = SGX protection violation
 - [CONTROL_SEC_ERR_STATUS_DEBUG](#)[14] = DSS protection violation

- [CONTROL_SEC_ERR_STATUS_DEBUG\[15\]](#) = ISS protection violation
- [CONTROL_SEC_ERR_STATUS_DEBUG\[16\]](#) = L4_PER protection violation
- [CONTROL_SEC_ERR_STATUS_DEBUG\[17\]](#) = L4_CFG protection violation
- [CONTROL_SEC_ERR_STATUS_DEBUG\[18\]](#) = DEBUGSS protection violation
- [CONTROL_SEC_ERR_STATUS_DEBUG\[19\]](#) = L4 AudioBE protection violation
- [CONTROL_SEC_ERR_STATUS_DEBUG\[20\]](#) = C2C INIT protection violation

For more information about L4 firewall protection-violation report mechanisms, see [Firewall Error Logging in the Control Module](#). For more information about L3 firewall protection-violation report mechanisms, see [L3 Interconnect Error Analysis](#).

19.4.12.4 Protection SDRAM Configuration Registers

[Table 19-61](#), *Protection SDRAM Configuration Registers for EMIF1 and EMIF2*, lists the protection SDRAM configuration registers for EMIF1 and EMIF2 that are part of the general wakeup control module. Upon POR, their values are exported as reset values of the EMIF1 and EMIF2 registers (EMIF_SDRAM_CONFIG and EMIF_SDRAM_CONFIG_2, respectively).

Table 19-61. Protection SDRAM Configuration Registers for EMIF1 and EMIF2

| Physical Address | Register Name | Description | Access |
|------------------|---|--|--------|
| 0x4A30C110 | CONTROL_WKUP_PROT_EMIF1_SDRAM_CONFIG_REG | Protection SDRAM configuration register 1, defining bit field reset values of the EMIF1.EMIF_SDRAM_CONFIG register | RW |
| 0x4A30C114 | CONTROL_WKUP_PROT_EMIF1_SDRAM_CONFIG2_REG | Protection SDRAM configuration register 2, defining bit field reset values of the EMIF1.EMIF_SDRAM_CONFIG_2 register | RW |
| 0x4A30C118 | CONTROL_WKUP_PROT_EMIF2_SDRAM_CONFIG_REG | Protection SDRAM configuration register 1, defining bit field reset values of the EMIF2.EMIF_SDRAM_CONFIG register | RW |
| 0x4A30C11C | CONTROL_WKUP_PROT_EMIF2_SDRAM_CONFIG2_REG | Protection SDRAM configuration register 2, defining bit field reset values of the EMIF2.EMIF_SDRAM_CONFIG_2 register | RW |

19.4.12.5 Register Controls for the LPDDR2IO1/LPDDR2IO2 I/O Buffer Modes

Global LPDDR2IO1/LPDDR2IO2 (EMIF1 and EMIF2 associated) phycmd0 and phydata0–phydata3 I/O buffer controls are part of the SYSCTRL_GENERAL_CORE.CONTROL_GEN_CORE_OCPREG_SPARE register. Their functionality is as follows:

- Programming the OCPREG_SPARE[1] and OCPREG_SPARE[3] bits to high brings the PWRDN signal to the I/O buffers driven by the emif1/emif2phydata0 through emif/emif2phydata3 components, respectively, to low; as a consequence, power-down mode for these I/O buffers is activated. The PWRDN software controls do not affect the emif1/emif2phycmd0 components.
- Programming the OCPREG_SPARE[0] and OCPREG_SPARE[2] bits to high enables the low-voltage CMOS buffer logic for the emif1/emif2phydata0-emif1/emif2phydata3 and emif1/emif2phycmd0 components, respectively. Programming the OCPREG_SPARE[0] and OCPREG_SPARE[2] bits to low enables a true differential comparator.
- Upon POR, the value of the register is 0x0. The PWRDN signal is high (power-down mode is inactive) and CMOSEN is low at the pads (differential comparator enable).

CAUTION

The bits in [CONTROL_GEN_CORE_OCPREG_SPARE](#) must not be updated.

[Table 19-62](#) lists the register used to control the described EMIF1 and EMIF2 features.

Table 19-62. LPDDR2IO Buffer Control Register

| Physical Address | Register Name | Description | Access |
|------------------|---|---|--------|
| 0x4A0023FC | CONTROL_GEN_CORE_OCPREG_SPARE | The lower 4 bits of this register are assigned to control the power-down mode and enable the LVCMOS buffers associated with the EMIF1 and EMIF2 PHY components. | RW |

19.4.12.6 EMIF DLL Master/Slave Specific Registers

19.4.12.6.1 EMIF DLL Slaves Individual Offset Compensation

Delays used to time the DQS signals of the LPDDR2 interface vary for the different DDR PHY DLL slaves associated with an EMIF controller instance. An individual offset compensation is provided for each of the four DLL slaves to achieve symmetrical timings.

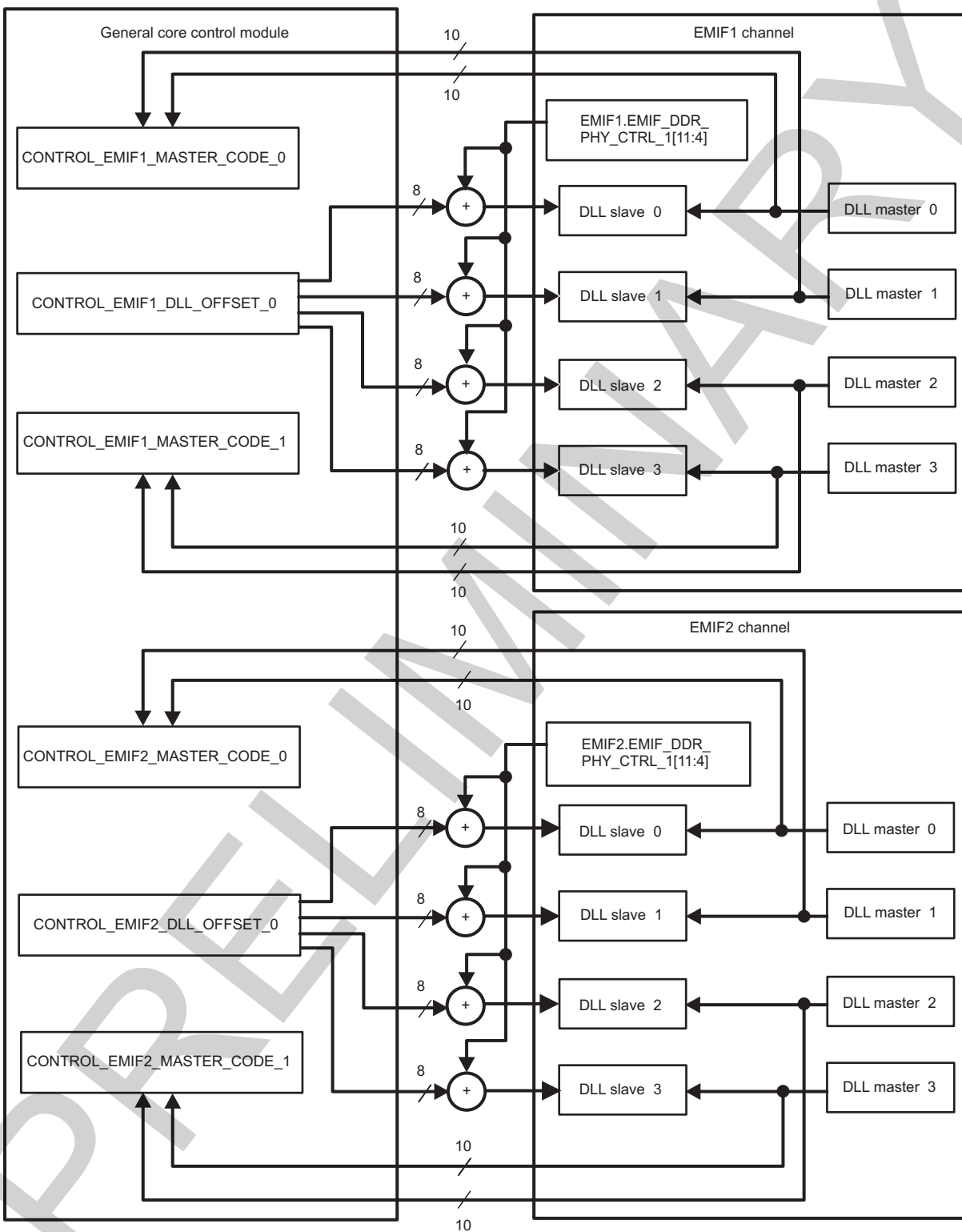
Two 32-bit registers ([CONTROL_EMIF1_OFFSET](#) and [CONTROL_EMIF2_OFFSET](#)) in the general core control module are dedicated to hold four signed-offset programmable values for the EMIF1 and EMIF2 PHY DLL slaves, respectively. The following programming points apply to these registers:

- Offset is stored as 2s complement 8-bit value, ranging from –128 to +127.
- Reset value is 0 (that is, by default, no offset is applied).
- The programmed values are saved and restored during an off mode transition.

The slave delay ratio value also has a single software control for all DLLs associated with an EMIF instance (the EMIF1.EMIF_DDR_PHY_CTRL_1[11:4] REG_DLL_SLAVE_DLY_CTRL bit field in the EMIF1 address space and EMIF2.EMIF_DDR_PHY_CTRL_1[11:4] REG_DLL_SLAVE_DLY_CTRL bit field in the EMIF2 address space). For more information, see [Chapter 16](#), *Memory Subsystem*.

The control sent to each DLL slave is the EMIF1/EMIF2 control (REG_DLL_SLAVE_DLY_CTRL) and the local signed offset, which is stored in the DLL slave corresponding bit field in the [CONTROL_EMIF1_OFFSET](#)/ [CONTROL_EMIF2_OFFSET](#) registers. [DLL Slave Delay Control Schema](#) shows the DLL slave delay control schema.

Figure 19-24. DLL Slave Delay Control Schema



sysctrl-022

Because the adders work in saturation mode, there is no wrap-around on either end of the spectrum:

- Any value higher than 0xFF saturates to 0xFF.
- Any value lower than 0x00 saturates to 0x00.

Table 19-63 describes the control registers in general core control module dedicated to store delay offsets individually for the four DDR PHY DLL slaves.

Table 19-63. EMIF DLL Slave Offset Compensation Registers

| Physical Address | Register Name | Description | Access |
|------------------|--------------------------------------|---|--------|
| 0x4A00 2360 | CONTROL_EMIF1_OFFSET | EMIF1 slaves individual DLL offset controls | R/W |
| 0x4A00 2364 | CONTROL_EMIF2_OFFSET | EMIF2 slaves individual DLL offset controls | R/W |

19.4.12.6.2 EMIF DLL Master Code Monitoring Registers

As can be seen in Figure 19-24, two read-only (RO) registers are provided in the general core control module to monitor DLL master codes for each of the EMIF1 and EMIF2 instances.

The 40 EMIF1 DLL master code monitoring signals are distributed as 20 read-only bits in the [CONTROL_EMIF1_MASTER_CODE_0](#) register and 20 read-only bits in the [CONTROL_EMIF1_MASTER_CODE_1](#) register, respectively.

Similarly, the 40 EMIF2 DLL master code monitoring signals are distributed as 20 read-only bits in the [CONTROL_EMIF2_MASTER_CODE_0](#) register and 20 read-only bits in the [CONTROL_EMIF2_MASTER_CODE_1](#) register, respectively.

Table 19-64 lists the control registers in general core control module dedicated to monitor the master code for the four DDR PHY DLLs.

Table 19-64. EMIF DLL Master Code-Monitoring Registers

| Physical Address | Register Name | Description | Access |
|------------------|---|------------------------|--------|
| 0x4A00 2368 | CONTROL_EMIF1_MASTER_CODE_0 | EMIF1 Master 0, 1 code | RO |
| 0x4A00 236C | CONTROL_EMIF1_MASTER_CODE_1 | EMIF1 Master 2, 3 code | RO |
| 0x4A00 2370 | CONTROL_EMIF2_MASTER_CODE_0 | EMIF2 Master 0, 1 code | RO |
| 0x4A00 2374 | CONTROL_EMIF2_MASTER_CODE_1 | EMIF2 Master 2, 3 code | RO |

19.4.12.7 Force MPU Write Nonposted Transactions Control Register

At the top level, software can force all writes from the MPU subsystem to the L3 interconnect to be nonposted, regardless of the attributes of the transactions coming from the Cortex-A9 CPU. When active-high bit FORCEWRNP = 1, only nonposted write commands are sent to the L3 interconnect. This bit must remain stable for the entire transfer and must not change in between the transfer.

Table 19-65 describes the general core control module register with FORCEWRNP control.

Table 19-65. Force MPU Write Nonposted Transactions Control Register

| Physical Address | Register Name | Description | Access |
|------------------|-----------------------------------|--|--------|
| 0x4A00 03C0 | CONTROL_FORCEWRNP | Forces only nonposted write commands from the MPU subsystem to the L3 interconnect | R/W |

19.4.12.8 Signal Integrity Parameter Control Registers With Pad Group Assignment

19.4.12.8.1 Signal Integrity Parameter Controls Overview

Most of the I/O cells associated with the device pads can be configured to deliver their carried signals to the targeted sink with maximum signal integrity. Configuration of these I/Os is done by pad group assignment and not individually per pad.

The different I/O-specific requirements determine the use of different types of I/O cells for the device I/Os. Software controls associated with the signal integrity parameters are implemented at the SYSCTRL_PADCONF_CORE and SYSCTRL_PADCONF_WKUP level.

The following types of I/O cells associated with pad groups can be identified:

- LPDDR2 high-speed I/O cells with impedance(I), slew rate(SR), and weak driver (WD) settings
- High-speed I/O cells with far-end load (LB) settings
- Low -speed I/O cells with combined slew rate (SC) and load versus transmission line (TL) length (LB) settings
- Two types of I/O cells with mode (MB) controls and load compensation (LB) settings
- I/O cells with control (DS0) of the impedance mode
- C2C I/O cells with LB0 control adjustable according to interface requirement/voltage mode
- I/O cells with pullup strength (PUSTRENGTH) and speed controls
- I2Cx I/O cells with pullup resistance vers capacitance load settings
- JTAG I/O cells with bus-holder enable control

NOTE: I/Os are non-failsafe, which means that voltage must never be applied at a pad before the internal I/O supply voltage VDDS is powered.

The pad group-assigned signal integrity controls are provided through the registers described in [Table 19-66](#).

Table 19-66. Signal Integrity Parameter Control Registers

| Physical Address | Register Name | Description | Access |
|------------------|--|--|--------|
| 0x4A10 05A8 | CONTROL_SMART1IO_PADCONF_0 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 05AC | CONTROL_SMART1IO_PADCONF_1 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 05B0 | CONTROL_SMART2IO_PADCONF_0 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 05B4 | CONTROL_SMART2IO_PADCONF_1 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 05B8 | CONTROL_SMART3IO_PADCONF_0 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 05BC | CONTROL_SMART3IO_PADCONF_1 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 05C0 | CONTROL_SMART3IO_PADCONF_2 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 05C4 | CONTROL_USBH_HSIC | Signal integrity pad group assignment control register | R/W |
| 0x4A10 05C8 | CONTROL_SMART3IO_PADCONF_3 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 05CC | CONTROL_SMART2IO_PADCONF_2 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 05D0 | CONTROL_SMART1IO_PADCONF_2 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 05D4 | CONTROL_SMART1IO_PADCONF_3 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 05D8 | CONTROL_C2CIO_PADCONF_0 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 0604 | CONTROL_I2C_0 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 0628 | CONTROL_MMC1 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 0638 | CONTROL_LPDDR2IO1_0 | Signal integrity pad group assignment control register | R/W |

Table 19-66. Signal Integrity Parameter Control Registers (continued)

| Physical Address | Register Name | Description | Access |
|------------------|--|--|--------|
| 0x4A10 063C | CONTROL_LPDDR2IO1_1 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 0640 | CONTROL_LPDDR2IO1_2 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 0644 | CONTROL_LPDDR2IO1_3 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 0648 | CONTROL_LPDDR2IO2_0 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 064C | CONTROL_LPDDR2IO2_1 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 0650 | CONTROL_LPDDR2IO2_2 | Signal integrity pad group assignment control register | R/W |
| 0x4A10 0654 | CONTROL_LPDDR2IO2_3 | Signal integrity pad group assignment control register | R/W |
| 0x4A31 E5A0 | CONTROL_SMART1NOPMIO_PADCONF_0 | Signal integrity pad group assignment control register | R/W |
| 0x4A31 E5A4 | CONTROL_SMART1NOPMIO_PADCONF_1 | Signal integrity pad group assignment control register | R/W |
| 0x4A31 E5B0 | CONTROL_SMART3NOPMIO_PADCONF_0 | Signal integrity pad group assignment control register | R/W |
| 0x4A31 E5B4 | CONTROL_SMART3NOPMIO_PADCONF_1 | Signal integrity pad group assignment control register | R/W |
| 0x4A31 E604 | CONTROL_I2C_2 | Signal integrity pad group assignment control register | R/W |
| 0x4A31 E608 | CONTROL_JTAG | Signal integrity pad group assignment control register | R/W |

19.4.12.8.2 High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings

The LPDDR2IO (EMIF) buffers are based on high-speed unterminated logic and require excellent driver impedance control to achieve optimal timing–EMI trade-offs. A specific type of device I/O cell with programmable features is used to meet this requirement. These I/O cells also support the high-speed interchip (HSIC) interface.

Three types of software-configurable I/O cells are integrated to support high-speed unterminated logic:

- Single-ended I/O cells
- Two-pad differential I/O cells
- Vref generation cell

Two-pad differential I/O cells are provided with a differential receiver and complementary transmitter. They are used to support the LPDDR2 clock pads (lpddr21_ck, lpddr21_nck, lpddr22_ck, lpddr22_nck) and LPDDR2 strobe pads (lpddr21_dqsi, lpddr21_ndqsi, lpddr22_dqsi, and lpddr22_ndqsi, where i = 0 to 3).

A Vref-generation cell is integrated in the device to supply a Vref-based receiver.

These I/O cells are integrated with the following controls in the SYSCTRL_PADCONF_CORE module:

- Driver output impedance (I) controls
- SR controls
- WD controls to support LPDDR2/HSIC interface and avoid floating pad
- Process-only impedance compensation using 5-bit binary coded schema separately for pullup p1:5 and pulldown n1:5 impedance
- Internal and external reference voltage source selection for the Vref generation cell
- Vref cell decoupling capacitor selection

Programmable bits for impedance and SR control are provided when the I/Os are set to operate in driver mode (outputs).

The bits I[2:0] are used to program the desired impedance value of the driver.

The drive strengths corresponding to the I[2:0] value are aliased as Drv i (where i = 5 to 12) in the CONTROL_LPDDR2IO1_x and CONTROL_LPDDR2IO2_x, (where x = 0 to 2) register tables in [Section 19.6.7, SYSCTRL_PADCONF_CORE Register Description](#).

CAUTION

To ensure the best performance of the LPDDR2 I/Os, it is strongly recommended for user software to always set the impedance controlling bits (I) in the CONTROL_LPDDR2IO1_x and CONTROL_LPDDR2IO2_x registers (where x = 0 to 2) to 0x7, which corresponds to Drv12 mode.

For more information about LPDDR2 I/O-specific driver output impedance (respectively, corresponding drive strength) parameter, see the *Electrical Characteristics/DC Electrical Characteristics/LPDDR2 DC Electrical Characteristics* section in the device data manual.

User software can program the slew rate (turn-on time) of the output signal using the control bits SR[1:0] in the CONTROL_LPDDR2IO1_x and CONTROL_LPDDR2IO2_x (where x = 0 to 2) registers.

For more information about the LPDDR2 I/O slew rate parameter control, SR[1:0], see the *Electrical Characteristics/DC Electrical Characteristics/LPDDR2 DC Electrical Characteristics* section in the device data manual.

Weak pullup/down or a keeper on pad is enabled through the wd0 and wd1 bits. The weak pullup/down option is used to define the pad state (high or low) when no signal is driving the pad. The weak keeper option is used to maintain the previous output value when nothing is driving the pad. [Table 19-67](#) describes the WD controls.

NOTE: The WD[1:0] bit field controls play the role of the PULLTYPESELECT and PULLUDENABLE bits within the standard pad configuration registers, and provides the keeper function to the I/Os with the state WD = 0b11. For LPDDR2 I/Os, the WD controls do not apply during off mode.

Similar to the lpddr1_x and lpddr2_x pads, the usbb1_hsic_data/strobe and usbb2_hsic_data/strobe pads also have weak driver software controls for active-mode internal weak pullups and pulldowns. They are in the [CONTROL_USBB_HSIC](#) register.

In contrast to the LPDDR2 I/Os, the usbb1_hsic and usbb2_hsic pads are also provided with bits in the same register to select weak pullup/down and keeper function during off mode. For a given usbbx_hsic_data/strobe pad (where x = 1, 2) the associated bit to allow an off mode-specific pullup/pulldown/keeper setting is OFFMODE_WD_ENABLE. The off mode option is defined through the OFFMODE_WD[1:0] bit field in the [CONTROL_USBB_HSIC](#) register..

Table 19-67. Weak Driver PUPD/Latch Mode

| WD1 | WD0 | Operation |
|-----|-----|-----------------------|
| 0 | 0 | Pull logic disabled |
| 0 | 1 | Weak pullup enabled |
| 1 | 0 | Weak pulldown enabled |
| 1 | 1 | Weak keeper enabled |

The following sequence is required to program the off-mode pullup/pulldown /latch (keeper) feature of the usbb1_hsic_data/usbb2_hsic_data and usbb1_hsic_strobe/usbb2_hsic_strobe pads:

1. Program the desired values for USBB1_HSIC_DATA_OFFMODE_WD/USBB2_HSIC_DATA_OFFMODE_WD and USBB1_HSIC_STROBE_OFFMODE_WD/USBB2_HSIC_STROBE_OFFMODE_WD in the [CONTROL_USBB_HSIC](#) register.

2. For an off-mode pullup/pulldown configuration different than the active-mode pullup/pulldown configuration, set the USBB1_HSIC_DATA_OFFMODE_WD_ENABLE/USBB2_HSIC_DATA_OFFMODE_WD_ENABLE and USBB1_HSIC_STROBE_OFFMODE_WD_ENABLE/USBB2_HSIC_STROBE_OFFMODE_WD_ENABLE bits to 1.

If USBB1_HSIC_DATA_OFFMODE_WD_ENABLE/USBB2_HSIC_DATA_OFFMODE_WD_ENABLE is set to 0, the applied value of the pullup/pulldown after the device goes to off mode will be same as the value of the active pullup/pulldown (that is, in this case, the value of the OFFMODE PU/PD bit field is disregarded).

If, for example, USBB1_HSIC_DATA_OFFMODE_WD/USBB2_HSIC_DATA_OFFMODE_WD is programmed with the same setting as USBB1_HSIC_DATA_WD/USBB2_HSIC_DATA_WD, then the value of USBB1_HSIC_DATA_OFFMODE_WD_ENABLE/USBB2_HSIC_DATA_OFFMODE_WD_ENABLE does not matter.

Therefore, USBB1_HSIC_DATA_OFFMODE_WD_ENABLE/USBB2_HSIC_DATA_OFFMODE_WD_ENABLE and USBB1_HSIC_STROBE_OFFMODE_WD_ENABLE/USBB2_HSIC_STROBE_OFFMODE_WD_ENABLE apply only to off-mode pullup/pulldown selection.

The eFuse impedance compensation settings are exported upon POR to 10 bits in the [CONTROL_EFUSE_2](#) register of the device control module as follows:

[CONTROL_EFUSE_2](#)[23] LPDDR2_PTV_N1 through [CONTROL_EFUSE_2](#)[19] LPDDR2_PTV_N5 (pulldown impedance trimming)

[CONTROL_EFUSE_2](#)[18] LPDDR2_PTV_P1 through [CONTROL_EFUSE_2](#)[14] LPDDR2_PTV_P5 (pullup impedance trimming)

CAUTION

Do not override the eFuse impedance compensation settings in the [CONTROL_EFUSE_2](#) register.

NOTE: There is no software control (INPUTENABLE) for the input buffer of the high-speed unterminated logic I/Os associated with the lpddr21_x, lpddr22_x, usbb1_hsic_data/strobe, and usbb2_hsic_data/strobe pads. If the CMOS buffer is enabled, it is always bidirectional (that is, the input buffer is always enabled).

Internal LPDDR2IO Vref-based receivers use the output voltage of LPDDR2-associated voltage reference cells. The voltage drive selection bit fields of the LPDDR2 voltage reference cells are in the [CONTROL_LPDDR2IO1_3](#) and [CONTROL_LPDDR2IO2_3](#) registers. Individual VREF_TAP[1:0] control bits set the output drive capability for each of the pads (where x = 1, 2):

- lpddr2x_vref_ca_int
- lpddr2x_vref_ca
- lpddr2x_vref_dq0_int–lpddr2x_vref_dq3_int
- lpddr2x_vref_dq

[Table 19-68](#), *LPDDR2 Internal Reference Configuration*, lists the possible options for internal reference voltage drive selection.

Table 19-68. LPDDR2 Internal Reference Configuration

| VREF_TAP1 | VREF_TAP0 | Description |
|-----------|-----------|---|
| 0 | 0 | Pad/bias2 Connected to internal reference VDDS/2, for 2-μA current load |
| 0 | 1 | Pad/bias2 Connected to internal reference VDDS/2, for 4-μA current load |
| 1 | 0 | Pad/bias2 Connected to internal reference VDDS/2, for 6-μA current load |

Table 19-68. LPDDR2 Internal Reference Configuration (continued)

| VREF_TAP1 | VREF_TAP0 | Description |
|-----------|-----------|---|
| 1 | 1 | Pad/bias2 Connected to internal reference VDDS/2, for 8-μA current load |

When the internal Vref generator is turned on, it supplies voltage reference to the Vref-based receivers associated with the LPDDR2IO DQ and CA interface lines.

In Vref-based receiver mode, the LPDDR2 I/O cell receiver is a true differential comparator with pad connected to the positive terminal and VREF tied to the negative terminal. The Vref-based receiver allows the improvement of speed performance at VDDS = 1.2-V I/O voltage supply.

Setting bit CONTROL_LPDDR2IOx_3[0] LPDDR2x_INT_VREF_AUTO_EN_DQ = 0b1 or CONTROL_LPDDR2IOx_3[1] LPDDR2x_INT_VREF_AUTO_EN_CA = 0b1 (where x = 1, 2) enables the automatic shut off or switch-on of the internal Vref cell generators associated with the LPDDR2x interface, the DQ and CA lines, respectively.

If user software sets the manual control bit CONTROL_LPDDR2IOx_3[2] LPDDR2x_INT_VREF_EN_DQ = 0b1 or CONTROL_LPDDR2IOx_3[3] LPDDR2x_INT_VREF_EN_CA = 0b1, internal Vref cell generators are enabled, regardless of the state of the LPDDR2x_INT_VREF_AUTO_EN_DQ/LPDDR2x_INT_VREF_AUTO_EN_CA bits. Thus, automatic control over LPDDR2 Vref cell generators can always be overridden in the context of enabling the Vref generator.

If the Vref cell generator is enabled, the following pads (where x = 1, 2) act as outputs and can be used to supply reference voltage to external devices:

- lpddr2x_vref_ca_int
- lpddr2x_vref_ca
- lpddr2x_vref_dq0_int–lpddr2x_vref_dq3_int
- lpddr2x_vref_dq (where x = 1, 2)

CAUTION

While using the Vref cell in internal reference mode, nothing else must drive the pad externally, although the pad can be connected to supply a Vref signal to other devices.

When the internal Vref cell generators are disabled and bypassed, which is provided when the bits LPDDR2x_INT_VREF_EN_DQ/CA = 0b0 and LPDDR2x_INT_VREF_AUTO_EN_DQ/CA = 0b0, the following pads (where x = 1, 2) act as inputs that can supply voltage reference to Vref-based receivers from external sources:

- lpddr2x_vref_ca_int
- lpddr2x_vref_ca
- lpddr2x_vref_dq0_int–lpddr2x_vref_dq3_int
- lpddr2x_vref_dq

NOTE: The LPDDR2x_INT_VREF_EN_DQ and LPDDR2x_INT_VREF_AUTO_EN_DQ controls determine the direction of the lpddr2x_vref_dq0_int–lpddr2x_vref_dq3_int and lpddr2x_vref_dq pads. Similarly, the LPDDR2x_INT_VREF_EN_CA and LPDDR2x_INT_VREF_AUTO_EN_CA controls determine the direction of the lpddr2x_vref_ca_int and lpddr2x_vref_ca pads.

Table 19-69 provides different combinations of Vref cell control types, the state of the Vref cell, and the associated voltage reference pad direction.

Table 19-69. LPDDR2 Vref Cells State Description

| LPDDR2x_INT_VREF_EN DQ/CA (Manual Control Bits) | LPDDR2x_INT_VREF_AUTO_ EN_DQ/CA (AUTO Control Bits) | Type of Control | Vref Cell State | Voltage Reference Pad Direction |
|---|---|-----------------|-----------------------------------|------------------------------------|
| 1 | x | Manual | Enabled | O |
| 0 | 1 | AUTO | Automatically enabled/disabled | O |
| 0 | 0 | – | Disabled and bypassed | I |

According to the noise environment, the user can choose to filter the reference voltage, which is supplied at the internal VREF node (receiver comparators Vref input), by the Vref cell generator or by an external source. Two coupling capacitors, internal to the LPDDR2 Vref cell, are available at the internal VREF node, and are configurable as specified in [Table 19-70](#).

Table 19-70. LPDDR2 Vref Cell Decoupling Cap Selection

| VREF_CCAP0 | VREF_CCAP1 | Capacitor |
|------------|------------|---|
| 0 | 0 | No capacitor connected |
| 0 | 1 | Capacitor between internal reference node and VDD5 |
| 1 | 0 | Capacitor between internal reference node and VSS |
| 1 | 1 | Capacitor between internal reference node and VDD5 as well as internal reference node and VSS |

Individual VREF_CCAP0 and VREF_CCAP1 control bits in the [CONTROL_LPDDR2IO1_3](#) and [CONTROL_LPDDR2IO2_3](#) registers set the internal coupling capacitor connection at the internal VREF node for each of the following pads (where x = 1, 2):

- lpddr2x_vref_ca_int
- lpddr2x_vref_ca
- lpddr2x_vref_dq0_int–lpddr2x_vref_dq3_int
- lpddr2x_vref_dq

19.4.12.8.3 Low-Speed I/Os Combined Slew Rate vs TL Length and Load Settings

The low-speed I/O cells slew modes are selectable through the slew mode control SC[1:0] bit field. These settings act like coarse settings for the signal performance behavior of the low-speed I/Os. The slew rate settings determine three target maximal frequencies of I/O operation at maximum load (see [Table 19-71](#)).

The low-speed I/O cells far-end capacitance load can be selected according to the transmission line (TL) length settings by modifying load bits LB[1] and LB[0] appropriately. The four possible load bit settings described in [Table 19-72](#) are fully applicable and have maximum effect only when slew control mode 0 is selected. These settings fine-tune the signal performance.

The pads featuring low-speed I/O cells require different SC[1:0] and LB[1:0] bit field settings to achieve optimal electrical performance for the multiplexed interface. This behavior may depend on various factors:

- [Section 19.4.12.8.9, Device Interfaces Signal Group Controls Mapping](#), describes the different interfaces that have SC[1:0] and LB[1:0] controls and their pad corresponding software control registers.
- The *Electrical Characteristics/DC Electrical Characteristics* section of the device data manual provides more information about the specific SC[1:0] and LB[1:0] bit field settings applicable to these interfaces multiplexed to low-speed I/O pads.
- The *Timing Parameters* section of the device data manual provides the exact system conditions (far end load, trace length, etc.) at which pad-multiplexed interface I/O timing parameters reach their boundary values.

Table 19-71. Slew Control Mode (Coarse) Settings

| SC[1] bit | SC[0] bit | Slew Rate Control Mode | Maximum Frequency Achieved at Maximum Load |
|-----------|-----------|------------------------|--|
| 0 | 0 | 0 | 20 MHz |
| 0 | 1 | 1 | 60 MHz |
| 1 | 0 | 2 | 40 MHz |

Table 19-72. Load Bit (Fine) Settings

| LB[1] (CLoad Capacitance Control) | LB[0] (TL-Length Control) | Effective TL Length (cm) | CLoad Capacitance (pF) (per TL) |
|-----------------------------------|---------------------------|--------------------------|---------------------------------|
| 0 | 0 | 2–20 | 1–10 |
| 0 | 1 | 20–40 (dual TL) | 1–10 |
| 1 | 0 | 2–20 | 10–20 |
| 1 | 1 | 20–40 (dual TL) | 10–20 |

NOTE: The load bit modes in [Table 19-72](#) are fully applicable and have maximum effect only in the case of slew control mode 0 (SC[1:0] = 00). For slew control modes 1 and 2, LB[1:0] = 0b11 is recommended.

19.4.12.8.4 I/Os With Combined Mode and Load Settings

There are two subtypes (conditionally described as type 1 and type 2 throughout this chapter) of device I/Os, with combined mode and load settings, that differ primarily in typical output impedance and mode-specific performance. Type 1 I/Os feature a lower typical output impedance than type 2.

Both I/Os have an output buffer with an internal pad voltage SR control mechanism. Each of the type 1 and type 2 corresponding I/O cells is controlled from two mode bits (MB0 and MB1) and a dedicated bit (LB0) for load compensation. LB0 programs the $C_{far\ end\ load}$ for the I/O cell associated pads. [Table 19-73](#) describes the mode bit settings for each mode and lists the load bit settings.

Table 19-73. Software Controls for I/Os With Combined Mode and Load Settings

| Mode | MB1 | MB0 | LB0 |
|--------------------|-----|-----|---|
| Mode 1 – SDMCC/SPI | 0 | 1 | 0 |
| Mode 2 - DMIC/GPIO | 1 | 0 | 0: ($C_{far\ end\ load}^{(1)} < 15\text{pf}$) 1: ($C_{far\ end\ load} \geq 15\text{pf}$) |
| Mode 3 – HIS | 1 | 1 | 0: ($C_{far\ end\ load} < 5\text{pf}$) 1: ($C_{far\ end\ load} \geq 5\text{pf}$) |
| Mode 4 - ULPI | 1 | 1 | 0: ($C_{far\ end\ load} < 4\text{pf}$) 1: ($C_{far\ end\ load} \geq 4\text{pf}$) |

⁽¹⁾ The $C_{far\ end\ load}$ is the external capacitance load applied at the far end of the pad signal transmission line.

The *Electrical Characteristics* / *DC Electrical Characteristics* section of the device data manual provides more information on the specific MB[1:0] and LB[1:0] bit field settings applicable to different interfaces multiplexed to I/O pads with combined mode and load settings. The *Timing Parameters* section of the device data manual provides the exact system conditions (far end load, trace length, etc.) at which pad-multiplexed interface I/O timing parameters reach their boundary values.

The pads featuring type 1 and type 2 I/O cells with combined mode and load settings require different MB[1:0] and LB0 bit field settings to achieve optimal electrical performance for the multiplexed interface. This behavior may depend on various factors:

- [Section 19.4.12.8.9, Device Interfaces Signal Group Controls Mapping](#), describes the different interfaces that have type 1 and type 2 MB and LB0 controls and the type 1 and type 2 I/O cell pad corresponding software control registers.

- The *Electrical Characteristics/DC Electrical Characteristics* section the device data manual provides more information about the specific MB[1:0] and LB0 bit field settings applicable to these interfaces multiplexed to type 1 and type 2 I/O pads with combined mode and load controls.

A process-only compensation using a 4-bit binary-coded schema is used separately for pullup/down output parameter variations.

For type 1 I/Os, only mode 2 does not use such compensation.

For type 2 I/Os, only mode 1 and mode 2 use eFuse process-only compensation to reduce the spread in timing parameters.

The I/Os with combined mode and load controls share the same compensation settings with the I/Os with driver output impedance (DS) settings and with the C2CI/O buffers. They are exported from eFuse upon POR to the following bits in the [CONTROL_EFUSE_2](#) register:

[CONTROL_EFUSE_2\[31\]](#) EFUSE_SMART2TEST_P0 through [CONTROL_EFUSE_2\[28\]](#) EFUSE_SMART2TEST_P3 (pullup output parameters trimming)
[CONTROL_EFUSE_2\[27\]](#) EFUSE_SMART2TEST_N0 through [CONTROL_EFUSE_2\[24\]](#) EFUSE_SMART2TEST_N3 (pulldown output parameters trimming)

CAUTION

Do not override the SMART2TEST_P/SMART2TEST_N eFuse compensation settings in the [CONTROL_EFUSE_2](#) register.

19.4.12.8.5 I/O Cells With Configurable Impedance Mode

The impedance mode at which this type of I/O cell operates is selected by setting a single bit drive strength control, DS0, as follows:

- DS0 = 1 selects mode 1, corresponding to 25-Ω impedance mode
- DS0 = 0 selects mode 2, corresponding to 50-Ω impedance mode

The pads featuring I/O cell with configurable impedance mode require different DS0 bit settings to achieve optimal electrical performance for the multiplexed interface. This behavior may depend on various factors:

- [Section 19.4.12.8.9, Device Interfaces Signal Group Controls Mapping](#), describes the different interfaces that have DS0 impedance mode control and the pad corresponding software control registers.
- The *Electrical Characteristics/DC Electrical Characteristics* section of the device data manual provides more information about the specific DS0 bit settings applicable to these interfaces multiplexed to I/O pads with configurable impedance mode.

A process-only compensation using 4-bit binary coded schema is used separately for pullup/down output parameter variations. Only MODE1 and MODE2 use eFuse process-only compensation to reduce spread in timing parameters. The I/Os with DS0 impedance mode control share the same compensation settings with the I/Os with combined mode and load controls (both type 1 and type 2) and with the C2CI/O buffers. They are exported from eFuse upon POR to the following bits in the [CONTROL_EFUSE_2](#) register:

[CONTROL_EFUSE_2\[31\]](#) EFUSE_SMART2TEST_P0 through [CONTROL_EFUSE_2\[28\]](#) EFUSE_SMART2TEST_P3 (pullup output parameters trimming)
[CONTROL_EFUSE_2\[27\]](#) EFUSE_SMART2TEST_N0 through [CONTROL_EFUSE_2\[24\]](#) EFUSE_SMART2TEST_N3 (pulldown output parameters trimming)

19.4.12.8.6 C2C/I/O Cells With Load Setting Adjustable According to Interface Requirement Voltage Mode

To configure this type of I/O cell for different interfaces multiplexed on it, the user must manipulate in software a single bit, LB0, depending on type of multiplexed interface (C2C, GPMC, or SDMMC2) of the pad and the selected I/O voltage supply mode. Like LPDDR2IO, this I/O cell is provided with selectable LVCMOS and Vref-based receiver option. A vref pad is provided to supply reference voltage to the receiver in the 1.2-V mode. To save power at lower frequency operation, the LVCMOS receiver can be selected, and 2 bits, for each of the two C2C pad groups, are used to enable/disable the LVCMOS receiver (CMOSEN_C2C_FRM_CTRL) manually in the [CONTROL_C2CIO_PADCONF_0](#) register.

The pads featuring C2C I/O cells with load setting adjustable according to interface requirement/voltage mode require different LB0 bit settings to achieve optimal electrical performance for the multiplexed interface. This behavior may depend on various factors:

- [Section 19.4.12.8.9, Device Interfaces Signal Group Controls Mapping](#), describes the different interfaces that have the interface type versus voltage mode control (LB0) and the pad corresponding software control registers.
- The *Electrical Characteristics/DC Electrical Characteristics* section of the device data manual provides more information about the specific LB0 bit settings applicable to these interfaces multiplexed to I/O pads with configurable impedance mode.

NOTE: No bits are assigned to control the output drive capability of the internal C2C Vref generator (at the c2c_vref pad). It is fixed to a 2-μA current load.

If 1.2-V voltage mode is selected, the user can choose to have the LVCMOS receiver or Vref-based receiver on the C2C I/O cell pads. For the description of the dual-voltage mode settings of the C2C I/O cell pads, see [Section 19.4.12.9, Dual Voltage-Supplied Peripheral Controls](#).

In Vref-based receiver mode, the C2C I/O cell receiver is a true differential comparator with pad connected to the positive terminal and VREF tied to the negative terminal. The Vref-based receiver allows the improvement of speed performance at VDD5 = 1.2-V I/O voltage supply.

NOTE: The Vref-based receiver is not supported in 1.8-V mode. In this mode, the LVCMOS receiver is the only option.

NOTE: While at VDD5 = 1.2 V, the LVCMOS receiver is supported for all C2C I/O cell pads. The Vref-based receiver is supported on only some of these pads.

The [CONTROL_C2CIO_PADCONF_0](#)[12] CMOSEN_C2C_0_FRM_CTRL and [CONTROL_C2CIO_PADCONF_0](#)[11] CMOSEN_C2C_1_FRM_CTRL bits, each related to a separate group of pads, are dedicated to select Vref-based receiver mode or LVCMOS receiver mode when VDD5 = 1.2 V is selected in the [CONTROL_CORE_PADCONF_MODE](#) register.

CMOSEN_C2C_0_FRM_CTRL = 1 enables the 1.2-V mode LVCMOS receiver, and CMOSEN_C2C_0_FRM_CTRL = 0 enables the 1.2-V Vref-based receiver for the following pads:

- gpmc_ad8–gpmc_ad15
- gpmc_ncs4
- gpmc_ncs5

CMOSEN_C2C_1_FRM_CTRL = 1 enables the 1.2-V mode LVCMOS receiver and CMOSEN_C2C_1_FRM_CTRL = 0 enables the 1.2-V Vref-based receiver for the following pads:

- gpmc_a16–gpmc_a23

NOTE: The Vref-based receiver in 1.2-V mode is not supported for the following C2C I/O cell pads:

- gpmc_ad0–gpmc_ad7
- gpmc_a24
- gpmc_a25
- gpmc_ncs0–gpmc_ncs3
- gpmc_clk
- gpmc_nadv_ale
- gpmc_noe
- gpmc_nwe
- gpmc_nbe0_cle
- gpmc_nbe1
- gpmc_wait1
- gpmc_wait2
- gpmc_ncs6
- gpmc_ncs7

When the internal Vref generator is turned on, it supplies voltage reference to the Vref-based receivers supported for some C2C I/O cell pads and can also be used to drive external modules with 1.2-V reference. In this case, the c2c_vref device pad outputs voltage of the internal C2C Vref cell.

Setting bit [CONTROL_C2CIO_PADCONF_0\[7\] C2C_INT_VREF_AUTO_EN](#) = 0b1 enables the automatic shut off or switch-on of the internal Vref cell generator.

If user software sets the manual control bit [CONTROL_C2CIO_PADCONF_0\[8\] C2C_INT_VREF_EN](#) = 0b1, the internal Vref cell generator is enabled, regardless of the state of the [CONTROL_C2CIO_PADCONF_0\[7\] C2C_INT_VREF_AUTO_EN](#) bit. Thus, automatic control over the C2C Vref cell generator can always be overridden in the context of enabling the Vref generator.

If the Vref cell generator is enabled, the c2c_vref pad acts as output and can be used to supply reference voltage to external devices.

NOTE: At VDDS = 1.8-V voltage mode, the internal reference generator is shut off and the internal Vref cell reference node is connected to 0.

For the description of the dual-voltage mode settings of the C2C I/O cell pads, see [Section 19.4.12.9, Dual Voltage-Supplied Peripheral Controls](#).

CAUTION

While using the Vref cell in internal reference mode, nothing else must drive the pad externally, although the pad can be connected to supply the Vref signal to other devices.

When the internal Vref cell generator is disabled and bypassed, which is provided when bits [CONTROL_C2CIO_PADCONF_0\[8\] C2C_INT_VREF_EN](#) = 0b0 and [CONTROL_C2CIO_PADCONF_0\[7\] C2C_INT_VREF_AUTO_EN](#) = 0b0, the c2c_vref pad acts as input that can supply voltage reference to the Vref-based receivers from external sources.

[Table 19-74](#) provides different combinations of Vref cell control types, the state of the Vref cell, and the associated voltage reference pad direction.

Table 19-74. C2C Vref Cell State Description

| C2C_INT_VREF_EN (Manual Control Bits) | C2C_INT_VREF_AUTO_EN (AUTO Control Bits) | Type of Control | Vref Cell State | Voltage Reference Pad Direction |
|--|---|-----------------|--------------------------------|---------------------------------|
| 1 | x | Manual | Enabled | O |
| 0 | 1 | AUTO | Automatically enabled/disabled | O |

Table 19-74. C2C Vref Cell State Description (continued)

| C2C_INT_VREF_EN (Manual Control Bits) | C2C_INT_VREF_AUTO_EN (AUTO Control Bits) | Type of Control | Vref Cell State | Voltage Reference Pad Direction |
|--|---|-----------------|-----------------------|---------------------------------|
| 0 | 0 | – | Disabled and bypassed | I |

CAUTION

The c2c_vref pad must be externally driven only in 1.2-V voltage mode.

According to the noise environment, the user can select to filter the reference voltage, which is supplied at the internal VREF node (receiver comparators Vref input) by the Vref cell generator or by an external source. Two coupling capacitors, internal to the C2C Vref cell, are available at the internal VREF node, which is configurable as specified in [Table 19-75](#).

Table 19-75. C2C Vref Cell Decoupling Cap Selection

| VREF_CCAP0 | VREF_CCAP1 | Capacitor |
|------------|------------|---|
| 0 | 0 | No capacitor connected |
| 0 | 1 | Capacitor between internal reference node and VDD5 |
| 1 | 0 | Capacitor between internal reference node and VSS |
| 1 | 1 | Capacitor between internal reference node and VDD5 as well as internal reference node and VSS |

A process-only compensation using a 4-bit binary-coded schema is used separately for pullup/down output parameter variations. The C2C I/O buffers share the same compensation settings with the I/Os with combined mode and load controls (both with 25- and 50-Ω output) and I/Os with driver output impedance (DS) settings. They are exported from eFuse upon POR to the following bits in the [CONTROL_EFUSE_2](#) register:

[CONTROL_EFUSE_2\[31\]](#) EFUSE_SMART2TEST_P0 through [CONTROL_EFUSE_2\[28\]](#) EFUSE_SMART2TEST_P3 (pullup output parameters trimming)
[CONTROL_EFUSE_2\[27\]](#) EFUSE_SMART2TEST_N0 through [CONTROL_EFUSE_2\[24\]](#) EFUSE_SMART2TEST_N3 (pulldown output parameters trimming)

19.4.12.8.7 SDMMC1 Pullup Strength Control

The SDMMC1_PUSTRENGTH_GRPi (where i = 1 to 3) control bits are added in the [CONTROL_MMC1](#) register to program the pullup strength for the MMC/SD/SDIO1 I/Os group.

- [Section 19.4.12.8.9, Device Interfaces Signal Group Controls Mapping](#), describes the different interfaces that have the pullup strength control and the pad corresponding software control registers.
- The *Electrical Characteristics/DC Electrical Characteristics* section of the device data manual provides more information about the specific pullup strength settings applicable to these interfaces multiplexed to I/O pads with configurable pullup strength.

19.4.12.8.8 I2Cx I/Os Group Pullupresx Controls and Load Range Settings

The I2Cx buffer contains internal pullup resistors for F/S and HS modes. LB[1:0] bits are used to select an appropriate pullup resistor for a given load range.

The active high GLFENB[0] bit is implemented for I²C receivers to enable glitch-free operation.

NOTE: The pullup versus load settings applicable to I2Cx FS mode also apply to I2Cx standard speed mode.

The type of the pullup resistor (external or internal) for a certain I2Cx I/O group (where x = 1 to 4) is selected through the I2Cx_SCL_PULLUPRESX and I2Cx_SDA_PULLUPRESX bits, which reside in the [CONTROL_I2C_0](#) register. The SR_SCL_PULLUPRESX and SR_SDA_PULLUPRESX bits reside in the [CONTROL_I2C_2](#) register, which is part of the wakeup voltage domain. .

Internal pullups are activated when I2Cx_SCL_PULLUPRESX / I2Cx_SDA_PULLUPRESX = 0b0 or SR_SCL_PULLUPRESX/SR_SDA_PULLUPRESX = 0b0.

I²C functionality is not ensured if the weak internal pullup or pulldown is activated on any of the I/Os connected to the bus.

NOTE: The user must set PULLUDENABLE = 0b0 in the I2Cx padconf registers (disable internal weak pullup resistors on i2cx pads) to ensure the full I/O cell performance capabilities of the I²C.

The I²C pads require different LB[1:0] and GLFENB[0] bit field settings to achieve optimal electrical performance for the multiplexed (in MuxMode = 0x0) I²C signals. This behavior may depend on various factors:

- [Section 19.4.12.8.9, Device Interfaces Signal Group Controls Mapping](#), describes the I²C pads and their corresponding software control registers.
- The *Electrical Characteristics/DC Electrical Characteristics/I²C DC Electrical Characteristics* section of the device data manual provides more information about the specific LB[1:0] and GLFENB[0] bit settings applicable to I²C I/O pads.

19.4.12.8.9 Device Interfaces Signal Group Controls Mapping

[Table 19-76](#) through [Table 19-103](#) describe the mapping of the signal integrity control bit fields in the different signal integrity control registers described in [Table 19-66](#).

NOTE: The same I/O cell and I/O cell controls assigned to a pad signal available when Muxmode = 0 are shared between signals available on the same pad when Muxmode is selected different than 0. For more information, see [Section 19.4.8.3, Pad Multiplexing Register Fields](#).

Table 19-76. EMIF (LPDDR2IO) Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| EMIF (LPDDR2IO) Interface I/O Controls | | |
|---|---|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_LPDDR2IO1_0[31:30] LPDDR2IO1_GR4_SR CONTROL_LPDDR2IO1_0[29:27] LPDDR2IO1_GR4_I CONTROL_LPDDR2IO1_0[26:25] LPDDR2IO1_GR4_WD | lpddr21_dq24–lpddr21_dq31; lpddr21_dm3 | HS I/O buffers with impedance (I), slew rate(SR), and weak driver settings (WD) (See Section 19.4.12.8.2 for more information.) |
| CONTROL_LPDDR2IO1_0[23:22] LPDDR2IO1_GR3_SR CONTROL_LPDDR2IO1_0[21:19] LPDDR2IO1_GR3_I CONTROL_LPDDR2IO1_0[18:17] LPDDR2IO1_GR3_WD | lpddr21_dq16–lpddr21_dq23; lpddr21_dm2 | |
| CONTROL_LPDDR2IO1_0[15:14] LPDDR2IO1_GR2_SR | lpddr21_dq8–lpddr21_dq15; lpddr21_dm1 | |

Table 19-76. EMIF (LPDDR2IO) Signal Group Parameter Controls to Different Interface I/O Pads Mapping (continued)

| EMIF (LPDDR2IO) Interface I/O Controls | | |
|--|---|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_LPDDR2IO1_0[13:11] LPDDR2IO1_GR2_I CONTROL_LPDDR2IO1_0[10:9] LPDDR2IO1_GR2_WD | | HS I/O buffers with impedance (I), slew rate(SR), and weak driver settings (WD) (See Section 19.4.12.8.2 for more information.) |
| CONTROL_LPDDR2IO1_0[7:6] LPDDR2IO1_GR1_SR CONTROL_LPDDR2IO1_0[5:3] LPDDR2IO1_GR1_I CONTROL_LPDDR2IO1_0[2:1] LPDDR2IO1_GR1_WD | lpddr21_dq0–lpddr21_dq7; lpddr21_dm0 | |
| CONTROL_LPDDR2IO1_1[31:30] LPDDR2IO1_GR8_SR CONTROL_LPDDR2IO1_1[29:27] LPDDR2IO1_GR8_I CONTROL_LPDDR2IO1_1[26:25] LPDDR2IO1_GR8_WD | lpddr21_dqs2; lpddr21_ndqs2 | |
| CONTROL_LPDDR2IO1_1[23:22] LPDDR2IO1_GR7_SR CONTROL_LPDDR2IO1_1[21:19] LPDDR2IO1_GR7_I CONTROL_LPDDR2IO1_1[18:17] LPDDR2IO1_GR7_WD | lpddr21_dqs1; lpddr21_ndqs1 | |
| CONTROL_LPDDR2IO1_1[15:14] LPDDR2IO1_GR6_SR CONTROL_LPDDR2IO1_1[13:11] LPDDR2IO1_GR6_I CONTROL_LPDDR2IO1_1[10:9] LPDDR2IO1_GR6_WD | lpddr21_dqs0; lpddr21_ndqs0 | |
| CONTROL_LPDDR2IO1_1[7:6] LPDDR2IO1_GR5_SR CONTROL_LPDDR2IO1_1[5:3] LPDDR2IO1_GR5_I CONTROL_LPDDR2IO1_1[2:1] LPDDR2IO1_GR5_WD | lpddr21_ca0–lpddr21_ca9 | |
| CONTROL_LPDDR2IO1_2[31:30] LPDDR2IO1_GR11_SR CONTROL_LPDDR2IO1_2[29:27] LPDDR2IO1_GR11_I CONTROL_LPDDR2IO1_2[26:25] LPDDR2IO1_GR11_WD | lpddr21_ncs0; lpddr21_ncs1; lpddr21_cke0; lpddr21_cke1 | |
| CONTROL_LPDDR2IO1_2[23:22] LPDDR2IO1_GR10_SR CONTROL_LPDDR2IO1_2[21:19] LPDDR2IO1_GR10_I CONTROL_LPDDR2IO1_2[18:17] LPDDR2IO1_GR10_WD | lpddr21_ck; lpddr21_nck | |
| CONTROL_LPDDR2IO1_2[15:14] LPDDR2IO1_GR9_SR CONTROL_LPDDR2IO1_2[13:11] LPDDR2IO1_GR9_I CONTROL_LPDDR2IO1_2[10:9] LPDDR2IO1_GR9_WD | lpddr21_dqs3; lpddr21_ndqs3 | |
| | | |
| | | |
| | | |
| | | |

Table 19-76. EMIF (LPDDR2IO) Signal Group Parameter Controls to Different Interface I/O Pads Mapping (continued)

| EMIF (LPDDR2IO) Interface I/O Controls | | |
|--|---|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_LPDDR2IO2_0 [31:30] LPDDR2IO2_GR4_SR CONTROL_LPDDR2IO2_0 [29:27] LPDDR2IO2_GR4_I CONTROL_LPDDR2IO2_0 [26:25] LPDDR2IO2_GR4_WD | lpddr22_dq24–lpddr22_dq31; lpddr22_dm3 | HS I/O buffers with impedance (I), slew rate(SR), and weak driver settings (WD) (See Section 19.4.12.8.2 for more information.) |
| CONTROL_LPDDR2IO2_0 [23:22] LPDDR2IO2_GR3_SR CONTROL_LPDDR2IO2_0 [21:19] LPDDR2IO2_GR3_I CONTROL_LPDDR2IO2_0 [18:17] LPDDR2IO2_GR3_WD | lpddr22_dq16–lpddr22_dq23; lpddr22_dm2 | |
| CONTROL_LPDDR2IO2_0 [15:14] LPDDR2IO2_GR2_SR CONTROL_LPDDR2IO2_0 [13:11] LPDDR2IO2_GR2_I CONTROL_LPDDR2IO2_0 [10:9] LPDDR2IO2_GR2_WD | lpddr22_dq8–lpddr22_dq15; lpddr22_dm1 | |
| CONTROL_LPDDR2IO2_0 [7:6] LPDDR2IO2_GR1_SR CONTROL_LPDDR2IO2_0 [5:3] LPDDR2IO2_GR1_I CONTROL_LPDDR2IO2_0 [2:1] LPDDR2IO2_GR1_WD | lpddr22_dq0–lpddr22_dq7; lpddr22_dm0 | |
| CONTROL_LPDDR2IO2_1 [31:30] LPDDR2IO2_GR8_SR CONTROL_LPDDR2IO2_1 [29:27] LPDDR2IO2_GR8_I CONTROL_LPDDR2IO2_1 [26:25] LPDDR2IO2_GR8_WD | lpddr22_dqs2; lpddr22_ndqs2 | |
| CONTROL_LPDDR2IO2_1 [23:22] LPDDR2IO2_GR7_SR CONTROL_LPDDR2IO2_1 [21:19] LPDDR2IO2_GR7_I CONTROL_LPDDR2IO2_1 [18:17] LPDDR2IO2_GR7_WD | lpddr22_dqs1; lpddr22_ndqs1 | |
| CONTROL_LPDDR2IO2_1 [15:14] LPDDR2IO2_GR6_SR CONTROL_LPDDR2IO2_1 [13:11] LPDDR2IO2_GR6_I CONTROL_LPDDR2IO2_1 [10:9] LPDDR2IO2_GR6_WD | lpddr22_dqs0; lpddr22_ndqs0 | |
| CONTROL_LPDDR2IO2_1 [7:6] LPDDR2IO2_GR5_SR CONTROL_LPDDR2IO2_1 [5:3] LPDDR2IO2_GR5_I CONTROL_LPDDR2IO2_1 [2:1] LPDDR2IO2_GR5_WD | lpddr22_ca0–lpddr22_ca9 | |
| CONTROL_LPDDR2IO2_2 [31:30] LPDDR2IO2_GR11_SR CONTROL_LPDDR2IO2_2 [29:27] LPDDR2IO2_GR11_I | lpddr22_ncs0; lpddr22_ncs1; lpddr22_cke0; lpddr22_cke1 | |

Table 19-76. EMIF (LPDDR2IO) Signal Group Parameter Controls to Different Interface I/O Pads Mapping (continued)

| EMIF (LPDDR2IO) Interface I/O Controls | | |
|---|--------------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_LPDDR2IO2_2[26:25] LPDDR2IO2_GR11_WD | lpddr22_ck; lpddr22_nck | |
| CONTROL_LPDDR2IO2_2[23:22] LPDDR2IO2_GR10_SR | | |
| CONTROL_LPDDR2IO2_2[21:19] LPDDR2IO2_GR10_I | | |
| CONTROL_LPDDR2IO2_2[18:17] LPDDR2IO2_GR10_WD | | |
| CONTROL_LPDDR2IO2_2[15:14] LPDDR2IO2_GR9_SR | lpddr22_dqs3; lpddr22_ndqs3 | |
| CONTROL_LPDDR2IO2_2[13:11] LPDDR2IO2_GR9_I | | |
| CONTROL_LPDDR2IO2_2[10:9] LPDDR2IO2_GR9_WD | | |

Table 19-77. GPMC I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| GPMC interface I/O Controls | | | |
|---|---|--|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields | |
| CONTROL_C2CIO_PADCONF_0[13] SDMMC2_DR0_LB0 | gpmc_ad0–gpmc_ad7; gpmc_noe; gpmc_nwe | C2CIO cell I/Os with single-LB0 control (See Section 19.4.12.8.6 for more information.) | |
| CONTROL_C2CIO_PADCONF_0[28] GPIO_DR0_LB0 | gpmc_ad8–gpmc_ad11 | | |
| CONTROL_C2CIO_PADCONF_0[15] KPD_DR4_LB0 | gpmc_ad12–gpmc_ad15 | | |
| CONTROL_C2CIO_PADCONF_0[27] GPIO_DR1_LB0 | gpmc_a16–gpmc_a19 | | |
| CONTROL_C2CIO_PADCONF_0[14] KPD_DR5_LB0 | gpmc_a20–gpmc_a23 | | |
| CONTROL_C2CIO_PADCONF_0[26] GPIO_DR2_LB0 | gpmc_a24 ; gpmc_nbe0_cle | C2CIO cell I/Os with single-LB0 control (See Section 19.4.12.8.6 for more information.) | |
| CONTROL_C2CIO_PADCONF_0[17] GPMC_DR8_LB0 | gpmc_a25 | | |
| CONTROL_C2CIO_PADCONF_0[25] GPMC_DR0_LB0 | gpmc_ncs0 | | |
| CONTROL_C2CIO_PADCONF_0[31] C2C_DR0_LB0 | gpmc_ncs1 | | |
| CONTROL_C2CIO_PADCONF_0[16] GPMC_DR9_LB0 | gpmc_ncs2 | | |
| CONTROL_C2CIO_PADCONF_0[23] GPMC_DR10_LB0 | gpmc_ncs3 | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) | |
| CONTROL_SMART3IO_PADCONF_1[13:12] GPMC_DR1_MB; | gpmc_nwp | | |
| CONTROL_SMART3IO_PADCONF_2[8] GPMC_DR1_LB | | | |

Table 19-77. GPMC I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping (continued)

| GPMC interface I/O Controls | | |
|--|-----------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_C2CIO_PADCONF_0 [24] GPMC_DR11_LB0 | gpmc_nadv_ale | C2CIO cell I/Os with single-LB0 control (See Section 19.4.12.8.6 for more information.) |
| CONTROL_C2CIO_PADCONF_0 [20] GPMC_DR5_LB0 | gpmc_clk | |
| CONTROL_C2CIO_PADCONF_0 [21] GPMC_DR4_LB0 | gpmc_nbe1 | |
| CONTROL_SMART1IO_PADCONF_0 [17:16] GPMC_DR3_SC CONTROL_SMART1IO_PADCONF_1 [17:16] GPMC_DR3_LB | gpmc_wait0 | Low speed I/Os LB[1:0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |
| CONTROL_C2CIO_PADCONF_0 [22] GPMC_DR2_LB0 | gpmc_wait1 | |
| CONTROL_C2CIO_PADCONF_0 [19] GPMC_DR6_LB0 | gpmc_wait2 | |
| CONTROL_C2CIO_PADCONF_0 [18] GPMC_DR7_LB0 | gpmc_ncs4, gpmc_ncs5 | C2CIO cell I/Os with single-LB0 control (See Section 19.4.12.8.6 for more information.) |
| CONTROL_C2CIO_PADCONF_0 [30] C2C_DR1_LB0 | gpmc_ncs6 | |
| CONTROL_C2CIO_PADCONF_0 [29] C2C_DR2_LB0 | gpmc_ncs7 | |

Table 19-78. CAMERA I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| CAMERA Interface I/O Controls | | |
|--|--|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART1IO_PADCONF_0 [29:28] CAM_DR0_SC CONTROL_SMART1IO_PADCONF_1 [29:28] CAM_DR0_LB | cam_shutter; cam_strobe; cam_globalreset | Low speed I/Os LB[1:0]+SC[1:0] controls, (See Section 19.4.12.8.3 for more information.) |

Table 19-79. USBB1 I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| USB B1 Interface I/O Controls | | |
|---|--|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART2IO_PADCONF_2 [11] USB1_DR0_DS | usbb1_ulpitll_clk | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |
| CONTROL_SMART3IO_PADCONF_1 [21:20] HSI_DR0_MB CONTROL_SMART3IO_PADCONF_2 [10] HSI_DR0_LB | usbb1_ulpitll_stp | Type 1 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3IO_PADCONF_1 [1:0] USB1_DR2_MB CONTROL_SMART3IO_PADCONF_2 [4] USB1_DR2_LB | usbb1_ulpitll_dir | |
| CONTROL_SMART3IO_PADCONF_0 [21:20] HSI_DR1_MB CONTROL_SMART3IO_PADCONF_2 [26] HSI_DR1_LB | usbb1_ulpitll_nxt; usbb1_ulpitll_dat0 | |

**Table 19-79. USBB1 I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping
(continued)**

| USB B1 Interface I/O Controls | | |
|---|---|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART3IO_PADCONF_0 [19:18] HSI_DR2_MB CONTROL_SMART3IO_PADCONF_2 [25] HSI_DR2_LB | usbb1_ulpitll_dat1; usbb1_ulpitll_dat2 | |
| CONTROL_SMART3IO_PADCONF_0 [17:16] HSI_DR3_MB CONTROL_SMART3IO_PADCONF_2 [24] HSI_DR3_LB | usbb1_ulpitll_dat3 | |
| CONTROL_SMART3IO_PADCONF_0 [29:28] GPIO_DR3_MB CONTROL_SMART3IO_PADCONF_2 [30] GPIO_DR3_LB | usbb1_ulpitll_dat4; usbb1_ulpitll_dat5 | |
| CONTROL_SMART3IO_PADCONF_0 [27:26] GPIO_DR4_MB CONTROL_SMART3IO_PADCONF_2 [29] GPIO_DR4_LB | usbb1_ulpitll_dat6; usbb1_ulpitll_dat7 | |
| CONTROL_USBB_HSIC [26:25] USBB1_DR1_SR CONTROL_USBB_HSIC [24:22] USBB1_DR1_I CONTROL_USBB_HSIC [21:20] USBB1_HSIC_DATA_WD CONTROL_USBB_HSIC [13] USBB1_HSIC_DATA_OFFMODE_WD_ENA BLE CONTROL_USBB_HSIC [12:11] USBB1_HSIC_DATA_OFFMODE_WD CONTROL_USBB_HSIC [19:18] USBB1_HSIC_STROBE_WD CONTROL_USBB_HSIC [10] USBB1_HSIC_STROBE_OFFMODE_WD_E NABLE CONTROL_USBB_HSIC [9:8] USBB1_HSIC_STROBE_OFFMODE_WD | usbb1_hsic_data; usbb1_hsic_strobe | HS I/O buffers with impedance (I), slew rate(SR), and weak driver (WD) settings (See Section 19.4.12.8.2 for more information.) |

Table 19-80. USB2 I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| USB2 Interface I/O Controls | | |
|--|---|--|
| Bit Fields for Pad Group Controls | Pads(Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART2IO_PADCONF_2 [12] USBB2_DR0_DS | usbb2_ulpitll_clk | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |
| CONTROL_SMART2IO_PADCONF_2 [23] SDMMC4_DR0_DS | usbb2_ulpitll_stp; usbb2_ulpitll_dir | |
| CONTROL_SMART2IO_PADCONF_2 [27] HSI2_DR0_DS | usbb2_ulpitll_nxt; usbb2_ulpitll_dat0 | |
| CONTROL_SMART2IO_PADCONF_2 [22] SDMMC4_DR1_DS | usbb2_ulpitll_dat1 | |
| CONTROL_SMART2IO_PADCONF_2 [26] HSI2_DR1_DS | usbb2_ulpitll_dat2 | |
| CONTROL_SMART2IO_PADCONF_2 [25] HSI2_DR2_DS | usbb2_ulpitll_dat3 | |
| CONTROL_SMART2IO_PADCONF_2 [24] SDMMC3_DR0_DS | usbb2_ulpitll_dat4 | |
| CONTROL_SMART2IO_PADCONF_2 [20] SPI3_DR1_DS | usbb2_ulpitll_dat5 | |
| CONTROL_SMART2IO_PADCONF_2 [21] SPI3_DR0_DS | usbb2_ulpitll_dat6; usbb2_ulpitll_dat7 | HS I/O buffers with impedance (I), slew rate(SR), and weak driver (WD) settings (See Section 19.4.12.8.2 for more information.) |
| CONTROL_USBB_HSIC [31:30] USBB2_DR1_SR | usbb2_hsic_data; usbb2_hsic_strobe | |
| CONTROL_USBB_HSIC [29:27] USBB2_DR1_I | | |
| CONTROL_USBB_HSIC [17:16] USBB2_HSIC_DATA_WD | | |
| CONTROL_USBB_HSIC [7] USBB2_HSIC_DATA_OFFMODE_WD_ENA BLE | | |
| CONTROL_USBB_HSIC [6:5] USBB2_HSIC_DATA_OFFMODE_WD | | |
| CONTROL_USBB_HSIC [15:14] USBB2_HSIC_STROBE_WD | | |
| CONTROL_USBB_HSIC [4] USBB2_HSIC_STROBE_OFFMODE_WD_E NABLE | | |
| CONTROL_USBB_HSIC [3:2] USBB2_HSIC_STROBE_OFFMODE_WD | | |

Table 19-81. Core Domain GPIO I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| Core Domain GPIO pads I/O Controls | | |
|--|-----------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART1IO_PADCONF_2 [21:20] GPIO_DR12_SC CONTROL_SMART1IO_PADCONF_3 [21:20] GPIO_DR12_LB | gpio_98 ; gpio_99 | Low speed I/Os LB[1: 0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |
| CONTROL_SMART1IO_PADCONF_0 [13:12] GPIO_63_64_DR0_SC CONTROL_SMART1IO_PADCONF_1 [13:12] GPIO_63_64_DR0_LB | gpio_63 - gpio_64 | Low speed I/Os LB[1: 0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |

Table 19-82. KEYPAD I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| KEYPAD Interface I/O Controls | | |
|--|------------------------------------|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART1IO_PADCONF_2 [31:30] KPD_DR0_SC CONTROL_SMART1IO_PADCONF_3 [31:30] KPD_DR0_LB | kpd_col3; kpd_col4; kpd_col5 | Low speed I/Os LB[1: 0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |
| CONTROL_SMART1IO_PADCONF_2 [29:28] KPD_DR1_SC CONTROL_SMART1IO_PADCONF_3 [29:28] KPD_DR1_LB | kpd_col0; kpd_col1; kpd_col2 | |
| CONTROL_SMART1IO_PADCONF_2 [27:26] KPD_DR2_SC CONTROL_SMART1IO_PADCONF_3 [27:26] KPD_DR2_LB | kpd_row3; kpd_row4; kpd_row5 | |
| CONTROL_SMART1IO_PADCONF_2 [25:24] KPD_DR3_SC CONTROL_SMART1IO_PADCONF_3 [25:24] KPD_DR3_LB | kpd_row0; kpd_row1; kpd_row2 | |

Table 19-83. HDQ I/O Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| HDQ Interface I/O Controls | | |
|--|-----------------------------|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART1IO_PADCONF_2 [23:22] HDQ_DR0_SC CONTROL_SMART1IO_PADCONF_3 [23:22] HDQ_DR0_LB | hdq_sio | Low speed I/Os LB[1: 0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |

Table 19-84. Wake-Up Domain GPIO Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| Wakeup Domain GPIO pads I/O Controls | | |
|--|--------------------------------|--|
| Bit Fields for Pad Group Controls | Signals (Muxmode = 3) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART1NOPMIO_PADCONF_0 [11:10] GPIO_DR11_SC CONTROL_SMART1NOPMIO_PADCONF_1 [11:10] GPIO_DR11_LB | gpio_wk0 - gpio_wk4 | Low speed I/Os LB[1: 0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |

Table 19-85. SDMMC1 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| SDMMC1 Interface I/O Controls | | |
|---|-----------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_MMC1 [31] SDMMC1_PUSTRENGTH_GRP0 | sdmmc1_clk | Pad pullup strength control. See Section 19.4.12.8.7 , Section 19.4.9.2 and Section 19.5.1.2.1 for more details. |
| CONTROL_MMC1 [27] SDMMC1_DR0_SPEEDCTRL | | Pad speed control. See Section 19.4.9.2 and Section 19.5.1.2.1 for more details. |

**Table 19-85. SDMMC1 Signal Group Parameter Controls to Different Interface I/O Pads Mapping
(continued)**

| SDMMC1 Interface I/O Controls | | |
|---|-----------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_MMC1 [30] SDMMC1_PUSTRENGTH_GRP1 | sdmmc1_cmd | Pad pullup strength control. For more information, see Section 19.4.12.8.7 , Section 19.4.9.2 , and Section 19.5.1.2.1 . |
| CONTROL_MMC1 [27] SDMMC1_DR0_SPEEDCTRL | | Pad speed control. For more information, see Section 19.4.9.2 and Section 19.5.1.2.1 . |
| CONTROL_MMC1 [29] SDMMC1_PUSTRENGTH_GRP2 | sdmmc1_dat0; sdmmc1_dat1 | Pad pullup strength control. For more information, see Section 19.4.12.8.7 , Section 19.4.9.2 , and Section 19.5.1.2.1 . |
| CONTROL_MMC1 [27] SDMMC1_DR0_SPEEDCTRL | | Pad speed control. For more information, see Section 19.4.9.2 and Section 19.5.1.2.1 . |
| CONTROL_MMC1 [29] SDMMC1_PUSTRENGTH_GRP2 | sdmmc1_dat2; sdmmc1_dat3 | Pad pullup strength control. For more information, see Section 19.4.12.8.7 , Section 19.4.9.2 , and Section 19.5.1.2.1 . |
| CONTROL_MMC1 [25] SDMMC1_DR2_SPEEDCTRL | | Pad speed control. For more information, see Section 19.4.9.2 and Section 19.5.1.2.1 . |
| CONTROL_MMC1 [28] SDMMC1_PUSTRENGTH_GRP3 | sdmmc1_dat4 - sdmmc1_dat7 | Pad pullup strength control. For more information, see Section 19.4.12.8.7 , Section 19.4.9.2 , and Section 19.5.1.2.1 . |
| CONTROL_MMC1 [26] SDMMC1_DR1_SPEEDCTRL | | Pad speed control. For more information, see Section 19.4.9.2 and Section 19.5.1.2.1 . |

Table 19-86. SDMMC5 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| SDMMC5 Interface I/O Controls | | |
|---|---|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode=0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART3IO_PADCONF_1 [31:30] SPI2_DR1_MB CONTROL_SMART3IO_PADCONF_2 [15] SPI2_DR1_LB | sdmmc5_clk; sdmmc5_cmd; sdmmc5_dat0 | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4 , <i>I/Os With Combined Mode and Load Settings</i>) |
| CONTROL_SMART3IO_PADCONF_1 [29:28] SPI2_DR2_MB CONTROL_SMART3IO_PADCONF_2 [14] SPI2_DR2_LB | sdmmc5_dat1 | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4 , <i>I/Os With Combined Mode and Load Settings</i>) |
| CONTROL_SMART3IO_PADCONF_0 [25:24] GPIO_DR5_MB CONTROL_SMART3IO_PADCONF_2 [28] GPIO_DR5_LB | sdmmc5_dat2 | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4 , <i>I/Os With Combined Mode and Load Settings</i>) |
| CONTROL_SMART3IO_PADCONF_0 [23:22] GPIO_DR6_MB CONTROL_SMART3IO_PADCONF_2 [27] GPIO_DR6_LB | sdmmc5_dat3 | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4 , <i>I/Os With Combined Mode and Load Settings</i>) |

Table 19-87. ABE McBSP1 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| McBSP1 Interface I/O Controls | | |
|---|------------------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART3IO_PADCONF_3 [31:30] SLIMBUS1_DR0_MB CONTROL_SMART3IO_PADCONF_3 [19] SLIMBUS1_DR0_LB | abe_mcbbsp1_clkx | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3IO_PADCONF_3 [29:28] SLIMBUS1_DR1_MB CONTROL_SMART3IO_PADCONF_3 [15] SLIMBUS1_DR1_LB | abe_mcbbsp1_dr | |
| CONTROL_SMART3IO_PADCONF_0 [9:8] SDMMC3_DR0_MB CONTROL_SMART3IO_PADCONF_2 [5] SDMMC3_DR0_LB | abe_mcbbsp1_dx; abe_mcbbsp1_fsx | |

Table 19-88. ABE McBSP2 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| McBSP2 Interface I/O Controls | | |
|--|--|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART3IO_PADCONF_0 [15:14] MCBSP2_DR0_MB; CONTROL_SMART3IO_PADCONF_2 [23] MCBSP2_DR0_LB | abe_mcbbsp2_clkx; abe_mcbbsp2_dr; abe_mcbbsp2_dx | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3IO_PADCONF_0 [1:0] SPI2_DR0_MB CONTROL_SMART3IO_PADCONF_2 [16] SPI2_DR0_LB | abe_mcbbsp2_fsx | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |

Table 19-89. ABE McPDM Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| McPDM Interface I/O Controls | | |
|--|--|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART3IO_PADCONF_1 [7:6] PDM_DR0_MB CONTROL_SMART3IO_PADCONF_2 [7] PDM_DR0_LB | abe_pdm_ul_data; abe_pdm_dl_data; abe_pdm_frame; abe_pdm_lb_clk | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |

Table 19-90. ABE DMIC Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| DMIC Interface I/O Controls | | |
|---|---------------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART3IO_PADCONF_0 [31:30] DMIC_DR0_MB CONTROL_SMART3IO_PADCONF_2 [31] DMIC_DR0_LB | abe_dmic_clk1; abe_dmic_din1 | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3IO_PADCONF_3 [27:26] SLIMBUS2_DR0_MB CONTROL_SMART3IO_PADCONF_3 [14] SLIMBUS2_DR0_LB | abe_dmic_din2 | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3IO_PADCONF_3 [23:22] SLIMBUS2_DR2_MB CONTROL_SMART3IO_PADCONF_3 [17] SLIMBUS2_DR2_LB | abe_dmic_din3 | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |

Table 19-91. ABE Shared Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| ABE Modules Shared I/O Controls | | |
|--|-----------------------------|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART1IO_PADCONF_0 [31:30] ABE_DR0_SC CONTROL_SMART1IO_PADCONF_1 [31:30] ABE_DR0_LB | abe_clks | Low-speed I/Os LB[1:0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |

Table 19-92. UART2 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| UART2 Interface I/O Controls | | |
|---|--------------------------------------|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART3IO_PADCONF_1 [27:26] UART2_DR0_MB CONTROL_SMART3IO_PADCONF_2 [13] UART2_DR0_LB | uart2_cts; uart2_rts; uart2_rx | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3IO_PADCONF_1 [25:24] UART2_DR1_MB CONTROL_SMART3IO_PADCONF_2 [12] UART2_DR1_LB | uart2_tx | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |

Table 19-93. UART3 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| UART3 Interface I/O Controls | | |
|--|--|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART1IO_PADCONF_0 [7:6] UART3_DR0_SC CONTROL_SMART1IO_PADCONF_1 [7:6] UART3_DR0_LB | uart3_cts_rctx; | Low-speed I/Os LB[1:0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |
| CONTROL_SMART1IO_PADCONF_0 [5:4] UART3_DR1_SC CONTROL_SMART1IO_PADCONF_1 [5:4] UART3_DR1_LB | uart3_rts_sd; uart3_rx_irrx; uart3_tx_irtx | Low-speed I/Os LB[1:0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |

Table 19-94. UART4 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| UART4 Interface I/O Controls | | |
|---|-----------------------------|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART3IO_PADCONF_1 [23:22] UART4_DR0_MB CONTROL_SMART3IO_PADCONF_2 [11] UART4_DR0_LB | uart4_rx; uart4_tx; | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |

Table 19-95. McSPI1 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| McSPI1 Interface I/O Controls | | |
|--|---|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART1IO_PADCONF_0 [11:10] MCSPI1_DR0_SC CONTROL_SMART1IO_PADCONF_1 [11:10] MCSPI1_DR0_LB | mcspi1_clk; mcspi1_somi; mcspi1_simo; mcspi1_cs0 | Low-speed I/Os LB[1:0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |
| CONTROL_SMART1IO_PADCONF_0 [9:8] UART1_DR0_SC CONTROL_SMART1IO_PADCONF_1 [9:8] UART1_DR0_LB | mcspi1_cs1 | Low-speed I/Os LB[1:0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |

**Table 19-95. McSPI1 Signal Group Parameter Controls to Different Interface I/O Pads Mapping
(continued)**

| McSPI1 Interface I/O Controls | | |
|---|-----------------------------|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART3IO_PADCONF_3 [25:24] SLIMBUS2_DR1_MB CONTROL_SMART3IO_PADCONF_3 [18] SLIMBUS2_DR1_LB | mcspi1_cs2 | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3IO_PADCONF_3 [21:20] SLIMBUS2_DR3_MB CONTROL_SMART3IO_PADCONF_3 [16] SLIMBUS2_DR3_LB | mcspi1_cs3 | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |

Table 19-96. McSPI4 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| McSPI4 Interface I/O Controls | | |
|---|---|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART3IO_PADCONF_0 [13:12] MCSPI4_DR0_MB CONTROL_SMART3IO_PADCONF_2 [22] MCSPI4_DR0_LB | mcspi4_clk; mcspi4_simo; mcspi4_somi; | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3IO_PADCONF_0 [11:10] MCSPI4_DR1_MB CONTROL_SMART3IO_PADCONF_2 [21] MCSPI4_DR1_LB | mcspi4_cs0 | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |

Table 19-97. I2C1 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| I2C1 Interface I/O Controls | | |
|---|-----------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_I2C_0 [3] I2C1_SCL_GLFENB | i2c1_scl | Enable glitch-free operation for I ² C receiver. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0 [2:1] I2C1_SCL_LOAD_BITS | | LB[1:0] – load bit controls to select internal pullup resistor value . (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0 [0] I2C1_SCL_PULLUPRESX | | Bit to enable internal pullup resistor option. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0 [19] I2C1_SDA_GLFENB | i2c1_sda | Enable glitch-free operation for I ² C receiver. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0 [18:17] I2C1_SDA_LOAD_BITS | | LB[1:0] – load bit controls to select internal pullup resistor value . (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0 [16] I2C1_SDA_PULLUPRESX | | Bit to enable internal pullup resistor option. (See Section 19.4.12.8.8 for more information.) |

Table 19-98. I2C2 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| I2C2 Interface I/O Controls | | |
|--|-----------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_I2C_0[7] I2C2_SCL_GLFENB | i2c2_scl | Enable glitch-free operation for I ² C receiver. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[6:5] I2C2_SCL_LOAD_BITS | | LB[1:0] – load bit controls to select internal pullup resistor value . (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[4] I2C2_SCL_PULLUPRESX | | Bit to enable internal pullup resistor option. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[23] I2C2_SDA_GLFENB | i2c2_sda | Enable glitch-free operation for I ² C receiver. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[22:21] I2C2_SDA_LOAD_BITS | | LB[1:0] – load bit controls to select internal pullup resistor value . (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[20] I2C2_SDA_PULLUPRESX | | Bit to enable internal pullup resistor option. (See Section 19.4.12.8.8 for more information.) |

Table 19-99. I2C3 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| I2C3 Interface I/O Controls | | |
|--|-----------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_I2C_0[11] I2C3_SCL_GLFENB | i2c3_scl | Enable glitch-free operation for I ² C receiver. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[10:9] I2C3_SCL_LOAD_BITS | | LB[1:0] - load bit controls to select internal pullup resistor value . (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[8] I2C3_SCL_PULLUPRESX | | Bit to enable internal pullup resistor option. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[27] I2C3_SDA_GLFENB | i2c3_sda | Enable glitch-free operation for I ² C receiver. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[26:25] I2C3_SDA_LOAD_BITS | | LB[1:0] – load bit controls to select internal pullup resistor value. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[24] I2C3_SDA_PULLUPRESX | | Bit to enable internal pullup resistor option. (See Section 19.4.12.8.8 for more information.) |

Table 19-100. I2C4 Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| I2C4 Interface I/O Controls | | |
|--|-----------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_I2C_0[15] I2C4_SCL_GLFENB | i2c4_scl | Enable glitch-free operation for I ² C receiver. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[14:13] I2C4_SCL_LOAD_BITS | | LB[1:0] – load bit controls to select internal pullup resistor value . (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[12] I2C4_SCL_PULLUPRESX | | Bit to enable internal pullup resistor option. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[31] I2C4_SDA_GLFENB | i2c4_sda | Enable glitch-free operation for I ² C receiver. (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[30:29] I2C4_SDA_LOAD_BITS | | LB[1:0] – load bit controls to select internal pullup resistor value . (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_0[28] I2C4_SDA_PULLUPRESX | | Bit to enable internal pullup resistor option. (See Section 19.4.12.8.8 for more information.) |

Table 19-101. SR Signal Group Parameter Controls to Different Interface I/O Pads Mapping

| SR Interface I/O Controls | | |
|--|-----------------------------|--|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_I2C_2[31] SR_SCL_GLFENB | sr_scl | Enable glitch-free operation for SmartReflex™ I ² C receiver (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_2[30:29] SR_SCL_LOAD_BITS | | LB[1:0] – load bit controls to select internal pullup resistor value (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_2[28] SR_SCL_PULLUPRESX | | Bit to enable internal pullup resistor option (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_2[27] SR_SDA_GLFENB | sr_sda | Enable glitch-free operation for SmartReflex I ² C receiver (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_2[26:25] SR_SDA_LOAD_BITS | | LB[1:0] – load bit controls to select internal pullup resistor value (See Section 19.4.12.8.8 for more information.) |
| CONTROL_I2C_2[24] SR_SDA_PULLUPRESX | | Bit to enable internal pullup resistor option (See Section 19.4.12.8.8 for more information.) |

Table 19-102. System Signals Group Parameter Controls to Different Interface I/O Pads Mapping

| System Interface I/O Controls | | |
|--|-----------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART1NOPMIO_PADCONF_0 [31:30] FREF_DR0_SC CONTROL_SMART1NOPMIO_PADCONF_1 [31:30] FREF_DR0_LB | fref_clk_ioreq | Low-speed I/Os LB[1:0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |
| CONTROL_SMART3NOPMIO_PADCONF_0 [31:30] FREF_DR1_MB CONTROL_SMART3NOPMIO_PADCONF_1 [31] FREF_DR1_LB0 | fref_clk0_out | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3IO_PADCONF_1 [5:4] FREF_DR2_MB CONTROL_SMART3IO_PADCONF_2 [6] FREF_DR2_LB | fref_clk1_out | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3IO_PADCONF_1 [3:2] FREF_DR3_MB CONTROL_SMART3IO_PADCONF_2 [9] FREF_DR3_LB | fref_clk2_out | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3NOPMIO_PADCONF_0 [23:22] FREF_DR4_MB CONTROL_SMART3NOPMIO_PADCONF_1 [27] FREF_DR4_LB0 | fref_clk3_req | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3NOPMIO_PADCONF_0 [29:28] FREF_DR5_MB CONTROL_SMART3NOPMIO_PADCONF_1 [30] FREF_DR5_LB0 | fref_clk3_out | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3NOPMIO_PADCONF_0 [27:26] FREF_DR6_MB CONTROL_SMART3NOPMIO_PADCONF_1 [29] FREF_DR6_LB0 | fref_clk4_req | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART3NOPMIO_PADCONF_0 [25:24] FREF_DR7_MB CONTROL_SMART3NOPMIO_PADCONF_1 [28] FREF_DR7_LB0 | fref_clk4_out | Type 2 I/Os with MB[1:0] + LB[0] settings (for more information, see Section 19.4.12.8.4, I/Os With Combined Mode and Load Settings) |
| CONTROL_SMART1NOPMIO_PADCONF_0 [19:18] GPIO_DR7_SC CONTROL_SMART1NOPMIO_PADCONF_1 [19:18] GPIO_DR7_LB | sys_pwron_reset_out | Low-speed I/Os LB[1:0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |
| CONTROL_SMART1IO_PADCONF_0 [23:22] GPIO_DR8_SC CONTROL_SMART1IO_PADCONF_1 [23:22] GPIO_DR8_LB | sys_nirq2 | Low-speed I/Os LB[1:0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |
| CONTROL_SMART1IO_PADCONF_0 [21:20] GPIO_DR9_SC CONTROL_SMART1IO_PADCONF_1 [21:20] GPIO_DR9_LB | sys_boot0 -sys_boot5 | Low-speed I/Os LB[1:0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |

Table 19-102. System Signals Group Parameter Controls to Different Interface I/O Pads Mapping (continued)

| System Interface I/O Controls | | |
|--|-----------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode = 0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART1NOPMIO_PADCONF_0 [15:14] DPM_DR0_SC CONTROL_SMART1NOPMIO_PADCONF_1 [15:14] DPM_DR0_LB | sys_boot6; sys_boot7 | Low-speed I/Os LB[1: 0] + SC[1:0] controls (See Section 19.4.12.8.3 for more information.) |

Table 19-103. DPM Signals Group Parameter Controls to Different Interface I/O Pads Mapping

| System Interface I/O Controls | | |
|---|---------------------------|---|
| Bit Fields for Pad Group Controls | Pads (Muxmode=0) in Group | Type of I/O Group-Associated Control Bit Fields |
| CONTROL_SMART2IO_PADCONF_2 [31] DPM_DR1_DS | dpm_emu0; dpm_emu1 | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |
| CONTROL_SMART2IO_PADCONF_2 [15] USBA0_DR0_DS | dpm_emu2 | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |
| CONTROL_SMART2IO_PADCONF_2 [14] USBA0_DR1_DS | dpm_emu3–dpm_emu5 | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |
| CONTROL_SMART2IO_PADCONF_2 [19] UART3_DR2_DS | dpm_emu6 | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |
| CONTROL_SMART2IO_PADCONF_2 [18] UART3_DR3_DS | dpm_emu7 | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |
| CONTROL_SMART2IO_PADCONF_2 [17] UART3_DR4_DS | dpm_emu8 | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |
| CONTROL_SMART2IO_PADCONF_2 [16] UART3_DR5_DS | dpm_emu9 | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |
| CONTROL_SMART2IO_PADCONF_2 [13] USBA_DR2_DS | dpm_emu10– dpm_emu13 | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |
| CONTROL_SMART2IO_PADCONF_2 [28] GPIO_DR10_DS | dpm_emu14 ; dpm_emu15 | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |
| CONTROL_SMART2IO_PADCONF_2 [30] DPM_DR2_DS | dpm_emu16; dpm_emu17 | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |
| CONTROL_SMART2IO_PADCONF_2 [29] DPM_DR3_DS | dpm_emu18; dpm_emu19 | I/O cell with single-bit drive strength (DS) control for driver output impedance (See Section 19.4.12.8.5 for more information.) |

19.4.12.9 Dual Voltage-Supplied Peripheral Controls

Some of the peripheral I/Os have the option to be supplied with a 1.2-V or 1.8-V power supply (VDDS through device external pads). The power supply level to the dual-voltage I/Os of different peripherals is configurable through bit fields in the [CONTROL_CORE_PADCONF_MODE](#) register in the CORE domain (EMIF, GPMC, C2C, CAMERA, and SDMMC2 I/Os) and the [CONTROL_WKUP_PADCONF_MODE](#) register in the WKUP domain (EMIF and FREF generator). One control bit in these registers is dedicated to set dual-voltage per group of pads.

NOTE: Dynamic switching between 1.2-V and 1.8-V voltage modes on dual-voltage peripheral I/Os is not allowed.

Table 19-104 describes dual-voltage controls versus the mapping of different pads.

Table 19-104. Dual-Voltage Peripheral Control Bits vs Pad Mapping

| Dual-Voltage VDDS = 1.2-V/1.8-V Control Bits | Pads With Dual-Voltage Settings |
|---|--|
| CONTROL_CORE_PADCONF_MODE [22] VDDS_DV_SDMMC2 | gpmc_ad0–gpmc_ad7 gpmc_noe gpmc_nwe |
| CONTROL_CORE_PADCONF_MODE [25] VDDS_DV_C2C | gpmc_ad8–gpmc_ad15 gpmc_a16–gpmc_a25 gpmc_ncs1–gpmc_ncs3 gpmc_nbe1 gpmc_wait1 gpmc_wait2 gpmc_ncs4–gpmc_ncs7 c2c_vref |
| CONTROL_CORE_PADCONF_MODE [23] VDDS_DV_GPMC0 | gpmc_clk gpmc_nbe0_cle |
| CONTROL_CORE_PADCONF_MODE [20] VDDS_DV_GPMC1 | gpmc_ncs0 gpmc_nwp gpmc_nadv_ale gpmc_wait0 |
| CONTROL_CORE_PADCONF_MODE [24] VDDS_DV_CAM | cam_globalreset cam_shutter cam_strobe i2c3_scl i2c3_sda fref_clk1_out fref_clk2_out |
| CONTROL_CORE_PADCONF_MODE [31] VDDS_DV_BANK0 | usbb1_ulpitll_clk usbb1_ulpitll_stp usbb1_ulpitll_dir usbb1_ulpitll_nxt usbb1_ulpitll_dat0–usbb1_ulpitll_dat7 |
| CONTROL_CORE_PADCONF_MODE [30] VDDS_DV_BANK1 | abe_mcbbsp2_clkx abe_mcbbsp2_dr abe_mcbbsp2_dx abe_mcbbsp2_fsx abe_mcbbsp1_clkx abe_mcbbsp1_dr |

Table 19-104. Dual-Voltage Peripheral Control Bits vs Pad Mapping (continued)

| Dual-Voltage VDDS = 1.2-V/1.8-V Control Bits | Pads With Dual-Voltage Settings |
|--|---|
| | abe_mcbasp1_dx abe_mcbasp1_fsx uart2_cts uart2_rts uart2_rx uart2_tx |
| CONTROL_CORE_PADCONF_MODE[19] VDDS_DV_BANK2_SHARED0 | abe_pdm_ul_data abe_pdm_dl_data abe_pdm_frame abe_pdm_lb_clk abe_clks abe_dmic_clk1 abe_dmic_din1 abe_dmic_din2 abe_dmic_din3 i2c1_scl i2c1_sda |
| CONTROL_WKUP_PADCONF_MODE[30] VDDS_DV_BANK2_SHARED1 | sr_scl sr_sda |
| CONTROL_CORE_PADCONF_MODE[29] VDDS_DV_BANK3 | mcspi1_clk mcspi1_somi mcspi1_simo mcspi1_cs0–mcspi1_cs3 |
| CONTROL_CORE_PADCONF_MODE[28] VDDS_DV_BANK4 | sdmmc5_clk sdmmc5_cmd sdmmc5_dat0–sdmmc5_dat3 |
| CONTROL_CORE_PADCONF_MODE[27] VDDS_DV_BANK5 | mcspi4_clk mcspi4_simo mcspi_somi mcspi_cs0 uart4_rx uart4_tx i2c4_scl i2c4_sda |
| CONTROL_CORE_PADCONF_MODE[26] VDDS_DV_BANK6 | usbb2_ulpitll_clk usbb2_ulpitll_stp usbb2_ulpitll_dir usbb2_ulpitll_nxt usbb2_ulpitll_dat0–usbb2_ulpitll_dat7 |
| CONTROL_CORE_PADCONF_MODE[21] VDDS_DV_BANK7 | kpd_col0–kpd_col5 kpd_row0–kpd_row5 |
| CONTROL_WKUP_PADCONF_MODE[31] VDDS_DV_FREF | fref_clk3_req fref_clk3_out fref_clk4_req fref_clk4_out |

PRELIMINARY

19.5 Control Module Programming Guide

19.5.1 Control Module Low-Level Programming Models

This section describes the low-level programming sequences for the configuration and use of the control module.

19.5.1.1 Global Initialization

19.5.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the control module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the environment and integration of the control module. For more information, see [Section 19.2, Control Module Environment](#), and [Section 19.3, Control Module Integration](#).

Table 19-105. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|---|
| PRCM | The three clocks coming from the PRCM module (CFG_L4_ICLK , WKUP_L4_ICLK2 , and CORE_TS_FCLK) are not software-controlled by PRCM. For more information about the three clocks, see Section 3.6.3.2.4, CM2 Clock Generator , and Section 3.6.3.1, PRM Clock Source , in Chapter 3, Power, Reset, and Clock Management . |
| L4 interconnect | For information about the L4-CFG interconnect configuration, see Section 14.3, L4 Interconnects , in Chapter 14, Interconnects . |

19.5.1.1.2 Control Module Global Initialization

19.5.1.1.2.1 Software Reset

The control module is not sensitive to a software reset.

19.5.1.1.2.2 Clock Gating Configuration

As described in [Section 19.4.2, Control Module Clock Configuration](#), the programmer can choose a clock-gating strategy individually for each of the four control module instances. [Table 19-106](#) explains the necessary steps.

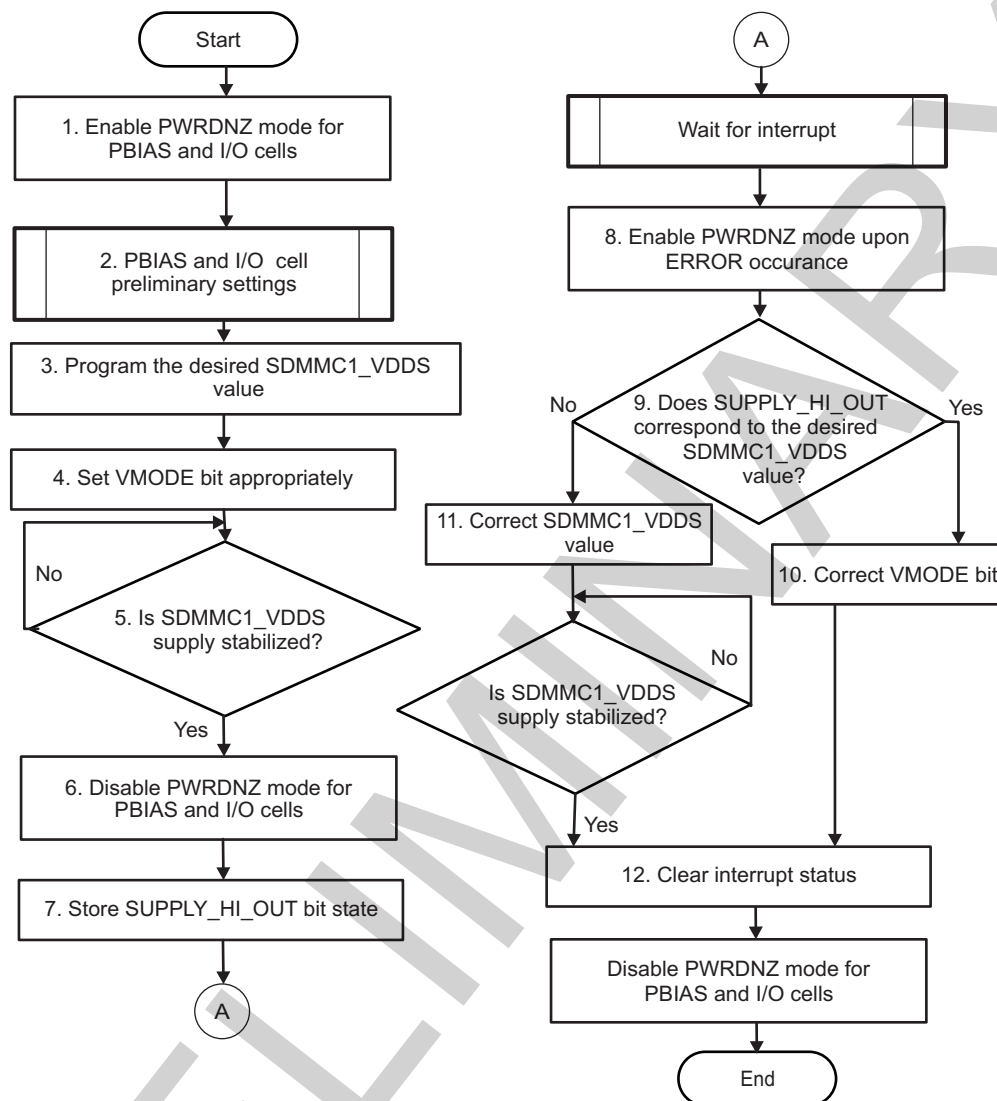
Table 19-106. Configure Clock Gating for Different Control Module Instances

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Set clock gating for SYSCTRL_PADCONF_CORE. | CONTROL_PADCONF_CORE_SYSCONFIG[3:2] | 0x- |
| Set clock gating for SYSCTRL_PADCONF_WKUP. | CONTROL_PADCONF_WKUP_SYSCONFIG[3:2] | 0x- |
| Set clock gating for SYSCTRL_GENERAL_CORE. | CONTROL_GEN_CORE_SYSCONFIG[3:2] CONTROL_TEMP_SENSOR[13] | 0x- |
| Set clock gating for SYSCTRL_GENERAL_WKUP. | CONTROL_GEN_WKUP_SYSCONFIG[3:2] | 0x- |

19.5.1.2 Operational Modes Configuration

19.5.1.2.1 Extended-Drain I/Os and PBIAS Cells Programming Guide

This section describes the programming flow from 3.0 V to 1.8 V, and vice versa, when operating with the MMC1 extended-drain I/Os and MMC1_PBIAS cell.

Figure 19-25. Configuring PBIAS Cell to Operate in Different Modes, Interrupt Method

sysctrl-021

Table 19-107. Register Settings for Configuring the MMC1_PBIAS and MMC1 I/O Cells

| Procedure Name | Description | Register Settings |
|--|---|--|
| 1. Enable PWRDNZ mode for MMC1_PBIAS cell and MMC/SD/SDIO1 I/O cell. | Software must keep MMC1_PBIAS cell and MMC1_IO cell PWRDNZ signals low whenever SDMMC1_VDDS ramps up/down or changes. This is for cell protection purposes. | 1. Set CONTROL_PBIASLITE [22] MMC1_PBIASLITE_PWRDNZ = 0b0. 2. Set CONTROL_PBIASLITE [26] MMC1_PWRDNZ = 0b0. |

Table 19-107. Register Settings for Configuring the MMC1_PBIAS and MMC1 I/O Cells (continued)

| Procedure Name | Description | Register Settings |
|--|---|---|
| 2. Preliminary MMC1_PBIAS and MMC1 IO cell settings | Enable MMC1_PBIAS cell output and MMC1_PBIAS error associated interrupt. Select desired I/Os within the MMC1 I/O cell and set the corresponding pad configuration fields appropriately. Set the group speed and pullup strength controls for the MMC/SD/SDIO1 pads. | <ol style="list-style-type: none"> 1. Set CONTROL_PBIASLITE[25]MMC1_PBIASLITE_HIZ_MODE = 0b0. 2. For information about setting the MA_IRQ_75 line associated interrupt request PBIAS_IRQ, see Chapter 18, Interrupt Controller. 3. For I/O multiplexing and pad configuration settings, see Section 19.5.1.2.4, Pad Configuration Programming Points. 4. Set the speed control bits for the MMC1 I/O cell pads: <ul style="list-style-type: none"> • CONTROL_MMC1[27] SDMMC1_DR0_SPEEDCTRL = 0b- • CONTROL_MMC1[26] SDMMC1_DR1_SPEEDCTRL = 0b- • CONTROL_MMC1[28] SDMMC1_DR2_SPEEDCTRL = 0b- 5. Set the pullup strength control bits for the MMC1 I/O cell pad groups: <ul style="list-style-type: none"> • CONTROL_MMC1[31] SDMMC1_PUSTRENGTH_GRP0=0b- • CONTROL_MMC1[30] SDMMC1_PUSTRENGTH_GRP1=0b- • CONTROL_MMC1[29] SDMMC1_PUSTRENGTH_GRP2=0b- • CONTROL_MMC1[28] SDMMC1_PUSTRENGTH_GRP3=0b- |
| 3. Program the desired SDMMC1_VDDS voltage for MMC/SD/SDIO1 I/Os. | Program external power supply IC to generate appropriate SDMMC1_VDDS voltage:(3.0 V/ 1.8 V). | For more information about I ² C interface operation, see Section 24.1, Multimaster High-Speed I²C . |
| 4. Set VMODE bit appropriately. | PBIAS voltage generation is based on the value of VMODE, set according to externally applied SDMMC1_VDDS voltage. | Set CONTROL_PBIASLITE [21] MMC1_PBIASLITE_VMODE = 0b ⁽¹⁾ . |
| 5. Check whether the SDMMC1_VDDS supply is stabilized. | Check the state of the externally generated SDMMC1_VDDS voltage, which is provided through communication between the device and external power supply device over the I ² C interface. | For more information about I ² C interface settings, see Section 24.1, Multimaster High-Speed I²C . |
| 6. Disable PWRDNZ mode for MMC1_PBIAS and associated extended-drain MMC1 I/O cell. | This starts the MMC1_PBIAS cell work to generate the PBIAS voltage. | <ol style="list-style-type: none"> 1. Set CONTROL_PBIASLITE[22] MMC1_PBIASLITE_PWRDNZ = 0b1. 2. Set CONTROL_PBIASLITE[26] MMC1_PWRDNZ = 0b1. |
| 7. Store the state of the SUPPLY_HI_OUT bit. | Done as a preliminary step for error handling analysis. (Whenever PWRDNZ = 0b0 , SUPPLY_HI_OUT is unconditionally set to 0b0.) | Store CONTROL_PBIASLITE [24] MMC1_PBIASLITE_SUPPLY_HI_OUT bit in memory. |
| 8.Enable PWRDNZ mode upon error occurrence. | It is recommended that all the I/Os are powered down (PWRDNZ = 0) as soon as VMODE_ERROR is high. | <ol style="list-style-type: none"> 1. Set CONTROL_PBIASLITE[26] MMC1_PWRDNZ = 0b0 . 2. Set CONTROL_PBIASLITE[22]MMC1_PBIASLITE_PWRDNZ = 0b0. |
| 9. Does SUPPLY_HI_OUT correspond to the desired SDMMC1_VDDS? | Test whether the error comes from incorrectly set value of SDMMC1_VDDS or incorrectly set VMODE bit. | Check the SUPPLY_HI_OUT bit stored in memory. |
| 10. Correct VMODE bit. | If the level of SUPPLY_HI_OUT corresponds to the desired value of SDMMC1_VDDS, the correct the value of the VMODE bit | Modify the value of the CONTROL_PBIASLITE [21] MMC1_PBIASLITE_VMODE bit. |
| 11. Correct SDMMC1_VDDS value. | If SUPPLY_HI_OUT is different from expected, correct and set SDMMC1_VDDS value over I ² C again. | For more information about I ² C interface settings, see Section 24.1, Multimaster High-Speed I²C , |
| 12. Clear Interrupt status. | Clear the IRQ_MA_75 interrupt status flag. | For more information about setting the MA_IRQ_75 line associated interrupt request PBIAS_IRQ, see Chapter 18, Interrupt Controller . |

⁽¹⁾ Must be set high when external MMC1_VDDS source is programmed to be 3.0 V, or low when the external MMC1_VDDS source is programmed to be 1.8 V. The reset default value corresponds to 3.0 V.

19.5.1.2.2 Hardware Observability Settings

This section describes the procedures to control the hardware observability features of the device. To configure these features, the programmer must perform the steps listed in [Table 19-108](#).

Table 19-108. Configure Hardware Observability Features

| Step | Register/Bit Field/Programming Model | Value |
|--|--|---|
| 1. Select the hwoobs(0)/hwoobs(1)/hwoobs(2) signal frequency divider value (applies only to po_hw_dbg0, po_hw_dbg1, and po_hw_dbg2 bus signals propagated in the CORE power domain). | CONTROL_HWOBS_CONTROL [7:3] HWOBS_CLKDIV_SEL CONTROL_HWOBS_CONTROL [13:9] HWOBS_CLKDIV_SEL_1 CONTROL_HWOBS_CONTROL [18:14] HWOBS_CLKDIV_SEL_2 | 0x- ⁽¹⁾ |
| 2. Enable/disable gating of hwoobs and alternatively set all hwoobs ports to 0 or 1. | CONTROL_HWOBS_CONTROL [2] HWOBS_ALL_ZERO_MODE CONTROL_HWOBS_CONTROL [1] HWOBS_ALL_ONE_MODE | 0x- ⁽²⁾ |
| 3. Enable/disable hwoobs port gating only for signals coming from IPs identified in the MACRO group (applies only to po_hw_dbg bus signals propagated in the CORE power domain). | CONTROL_HWOBS_CONTROL [0] HWOBS_MACRO_ENABLE | 0x- ⁽³⁾ |
| 4. Associate a certain hwoobs channel to the CORE or WKUP power domain. | Configure each bit from the CONTROL_DEBOBS_FINAL_MUX_SEL [31:0] SELECT bit field appropriately for its corresponding hw_dbg channel. | 0x- |
| 5. Choose the source of a signal or signal view channel in the CORE power domain. | Configure each CONTROL_CORE_CONF_DEBUG_SEL_TST_0 [3:0] MODE through CONTROL_CORE_CONF_DEBUG_SEL_TST_31 [3:0] MODE bit field appropriately for its corresponding hw_dbg channel. | 0x- |
| 6. Choose the source of a signal within the WKUP power domain. | Configure each CONTROL_WKUP_CONF_DEBUG_SEL_TST_i [0] MODE bit, (where i = 0 to 31) appropriately for its corresponding hw_dbg channel i (where i = 0 to 31). | 0x- |
| 7. Choose to associate a certain DPLL signal to a given DPLL signal view channel (applies only to po_hw_dbg bus signals propagated in the CORE power domain). | CONTROL_CONF_DPLL_FREQLOCK_SEL [2:0] MULT CONTROL_CONF_DPLL_TINITZ_SEL [2:0] MULT CONTROL_CONF_DPLL_PHASELOCK_SEL [2:0] MULT CONTROL_CONF_DPLL_TENABLE_SEL [2:0] MULT CONTROL_CONF_DPLL_TENABLEDIV_SEL [2:0] MULT CONTROL_CONF_DPLL_BYPASSACK_SEL [2:0] MULT CONTROL_CONF_DPLL_IDLE_SEL [2:0] MULT | 0x- |
| 8. Choose to associate a certain clockout signal to a given clockview channel (applies only to po_hw_dbg bus signals propagated in the CORE power domain). | CONTROL_CONF_CLK_SEL0 [2:0] MULT through CONTROL_CONF_CLK_SEL2 [2:0] MULT | 0x- |
| 9. Choose to associate an sDMA signal to a given sDMA view channel (applies only to po_hw_dbg bus signals propagated in the CORE power domain). | CONTROL_CONF_SDMA_REQ_SEL0 [6:0] MULT through CONTROL_CONF_SDMA_REQ_SEL3 [6:0] MULT | 0x- |
| 10. Set the appropriate pad configuration bit fields to associate the hw_dbg pad function to output pins and configure additional output pad features. | For more information, see Section 19.4.11, Hardware Observability , and Section 19.4.8, Pad Functional Multiplexing and Configuration . | For more information, see Section 19.4.8, PAD Functional Multiplexing and Configuration . |

⁽¹⁾ To configure the hwoobs(0) channel to operate normally, the value of the HWOBS_CLKDIV_SEL, HWOBS_CLKDIV_SEL_1, or HWOBS_CLKDIV_SEL_2 bit must be set different than 0.

⁽²⁾ Set both bits to 0 to enable hardware observability. Set only one bit to 1 to gate hwoobs ports according to the output state required.

⁽³⁾ The modules that belong to this group are: Cortex-A9 MPU subsystem, IVA-HD, BB2D subsystem, CM2, and ABE.

For more information about the different functions and registers associated with the hardware observability features, see [Section 19.4.11, Hardware Observability](#).

19.5.1.2.3 Off Mode Preliminary Settings

This section describes configurations of pads to work in off mode. The following actions must be performed once, and remain valid for all device off - on transitions.

Table 19-109. Setting Pad Off Mode Through Padconfiguration Registers

| Step | Register/Bit Field/Programming Model | Value |
|---|---|---------|
| Set OFFMODEPULLTYPESELECT bit. | CONTROL_CORE_PAD0_X_PAD1_Y[29,13] – Select pullup/down type when pad in off mode. | 0b- |
| Set OFFMODEPULLUDENABLE bit. | CONTROL_CORE_PAD0_X_PAD1_Y[28,12] – Enable/disable pullup/down feature when pad in off mode. | 0b- |
| Set OFFMODEOUTVALUE bit. | CONTROL_CORE_PAD0_X_PAD1_Y[27,11] – Set off mode pad override value. | 0b- |
| Set OFFMODEENABLE bit (enable/disable pad overriding capability in off mode). | CONTROL_CORE_PAD0_X_PAD1_Y[25,9] – Set pad to keep its previous state (it had before going to off mode) or force pad output to a certain override value (OFFMODEOUTVALUE) when pad in off mode. | 0b- |
| Set OFFMODEOUTENABLE bit. | CONTROL_CORE_PAD0_X_PAD1_Y[26,10] – Enable/disable output in off mode. | 0b- |
| Program a valid device ACTIVE pad configuration. | For more information about ACTIVE pad configuration, see Table 19-110 . | |
| Set clock gating strategy. | . CONTROL_PADCONF_CORE_SYSCONFIG[3:2] IP_SYSCONFIG CONTROL_PADCONF_WKUP_SYSCONFIG[3:2] IP_SYSCONFIG | 0x2,0x3 |
| Enable/disable the wake-up detection capability ⁽¹⁾ . | CONTROL_CORE_PAD0_X_PAD1_Y[30,14] | 0b- |

⁽¹⁾ When the wake-up detection is enabled for a pad, this pad is configured as input. Therefore, be sure to write 0b1 in the OFFOUTENABLE bit to disable the output capability.

19.5.1.2.4 Pad Configuration Programming Points

This section describes through an example the configurations of pads necessary for working in active mode.

To configure the pad, ensure that the following steps are done:

1. Identify signals required on the interface based on the target application.

Example: To configure the UART2 interface on balls, the required signals are uart2_tx, uart2_rts, uart2_cts, and uart2_rx.

2. Choose the pads used for those signals. Some signals may be available on several pads and/or may be multiplexed with other signals needed for another application. See [Section 19.4.8.3, Pad Multiplexing Register Fields](#).

Example: Unlike the UART2 interface signals, uart2_rx and uart2_tx, each of which is available on two pads, the uart2_cts and uart2_rts signals are available only on one pad each (MUXMODE = 0b000). The uart2_cts signal, however, is multiplexed with the MMC I/O signal sdmmc3_clk, and the uart2_rts signal is multiplexed with the MMC I/O signal sdmmc3_cmd on the same pad. Assume that the MMC I/O 3 interface is also required in the system. Therefore, for the MMC I/O interface signals, pads must be used where those signals are not multiplexed with a UART2 signal, if possible. In this case, the solution is to use sdmmc3_clk and sdmmc3_cmd on another two pads of the device (usbb2_ulpitll_dat7 and usbb2_ulpitll_dat6) configuring (MUXMODE = 0b010).

3. Identify the signal integrity parameter settings (drive strength, impedance, slew rate, pullup/pulldown strength, etc.) necessary for the pads associated I/O cells, listed in [Section 19.4.12.8.9, Device Interfaces Signal Group Controls Mapping](#).

For the register settings of the signal integrity parameters for the uart2_rx, uart2_tx, uart2_cts, and urat2_rts pads (this is the variant when the desired uart2 signals appear in MuxMode = 0x0), see [Table 19-92](#).

For the `uart2_cts`, `uart2_rts`, and `uart2_rx` pads, the following bit fields (Mode and Load bit group settings) must be set:

- [CONTROL_SMART3IO_PADCONF_1](#)[27:26] UART2_DR0_MB
- [CONTROL_SMART3IO_PADCONF_2](#)[13] UART2_DR0_LB

For the `uart2_tx` pad, the following bit fields (Mode and Load bit group settings) must be set:

- [CONTROL_SMART3IO_PADCONF_1](#)[25:24] UART2_DR1_MB
- [CONTROL_SMART3IO_PADCONF_2](#)[12] UART2_DR1_LB

For recommendations about the signal integrity parameter settings of the mentioned pad group, see the device data manual.

NOTE: To identify the signal-associated I/O cell signal parameter settings in [Section 19.4.12.8.9, Device Interfaces Signal Group Controls Mapping](#), the user must search for the device pad name on which the desired signal is muxed, because the I/O cell settings are designated and listed on a per pad basis. This means that a signal name does not appear (unless MuxMode = 0x0) in [Section 19.4.12.8.9, Device Interfaces Signal Group Controls Mapping](#), but only the pad on which the signal is muxed.

Pads that do not have software I/O cell signal integrity parameter controls are not listed in [Section 19.4.12.8.9, Device Interfaces Signal Group Controls Mapping](#).

Assume the user application configures the `sdmmc3_clk` and `sdmmc3_cmd` signals on the `usbb2_ulpitll_dat7` and `usbb2_ulpitll_dat6` pads (MuxMode = 0x2). The I/O cell setting (single-bit group control – SPI3_DR0_DS of driver output impedance) listed in [Table 19-80](#) also applies to the `sdmmc3_clk` and `sdmmc3_cmd` signals, which appear on the same pads, when MuxMode = 0x2.

In this case, the [CONTROL_SMART2IO_PADCONF_2](#)[21] SPI3_DR0_DS bit must be set to configure the I/O cell performance of `sdmmc3_clk` and `sdmmc3_cmd`.

For recommendations about the mentioned pad group signal integrity parameter settings, see the device data manual.

4. Identify and program the peripheral dual-voltage settings, if they apply to the chosen pads:

[Table 19-104](#) lists the corresponding control bits of the pads in the [CONTROL_CORE_PADCONF_MODE](#) and [CONTROL_WKUP_PADCONF_MODE](#) registers. The identification of the I/O dual voltage domains/control bits for a signal must be made on a per-pad basis.

All pads (`uart2_cts`, `uart2_rts`, `uart2_rx`, and `uart2_tx`) fall within the same dual-voltage domain (VDDS_DV_BANK1) and the I/O supply voltage (1.2 V/1.8 V) is configured by setting the [CONTROL_CORE_PADCONF_MODE](#)[30] VDDS_DV_BANK1 bit.

As previously explained, the `sdmmc3_clk` and `sdmmc3_cmd` signals are muxed on the `usbb2_ulpitll_dat7` and `usbb2_ulpitll_dat6` pads. The dual-voltage control bit corresponding to these two pads is [CONTROL_CORE_PADCONF_MODE](#)[26] VDDS_DV_BANK6 (see [Table 19-104](#)).

For more information about pad performance dependencies from I/O dual-voltage supply settings, see the device data manual.

5. Identify the pad configuration registers associated with the pads to be used in the application. See [Section 19.4.8.3, Pad Multiplexing Register Fields](#).

Example: Under the previous hypothesis, the pad configuration registers to program are:

- `uart2_rts`: [CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS](#)[31:16]
- `uart2_cts`: [CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS](#)[15:0]
- `uart2_tx`: [CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX](#)[31:16]
- `uart2_rx`: [CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX](#)[15:0]
- `sdmmc3_clk` (MuxMode = 0x2):
[CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT6_PAD1_USBB2_ULPITLL_DAT7](#)[31:16]
- `sdmmc3_cmd` (MuxMode = 0x2):
[CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT6_PAD1_USBB2_ULPITLL_DAT7](#)[15:0]

Table 19-110. ACTIVE PADS Configuration Points

| Step | Register/Bit Field/Programming Model | Value |
|---|---|--|
| 1. Identify the interface signals and map them to the appropriate pads according to the application requirements and the device-specific pad I/O muxing capabilities. See Section 19.4.8.3, Pad Multiplexing Register Fields . | Define the list of I/O signal names: uart2_cts, uart2_rts, uart2_rx, uart2_tx, sdmmc3_clk, and sdmmc3_cmd Define the list of corresponding pads: uart2_cts, uart2_rts, uart2_rx, uart2_tx, usbb2_ulpitll_dat7, and usbb2_ulpitll_dat6 | – |
| 2. Identify the corresponding I/O cell signal integrity parameter controls for the pad (on a per-pad basis). See Section 19.4.12.8.9, Device Interfaces Signal Group Controls Mapping . | (uart2_cts, uart2_rts, uart2_rx pads) CONTROL_SMART3IO_PADCONF_1 [27:26] UART2_DR0_MB CONTROL_SMART3IO_PADCONF_2 [13] UART2_DR0_LB (uart2_tx pad) CONTROL_SMART3IO_PADCONF_1 [25:24] UART2_DR1_MB CONTROL_SMART3IO_PADCONF_2 [12] UART2_DR1_LB (usbb2_ulpitll_dat7, usbb2_ulpitll_dat6) CONTROL_SMART2IO_PADCONF_2 [21] SPI3_DR0_DS | For more information about the recommended I/O settings, see the device data manual |
| 3. Determine whether the pad is associated with a peripheral dual-voltage domain (see the device data manual). Identify its corresponding 1.2-V/1.8-V dual-voltage control bit in the CONTROL_CORE_PADCONF_MO DE or CONTROL_WKUP_PADCONF_MO DE register. See Table 19-104 . | (uart2_cts, uart2_rts, uart2_rx, uart2_tx) CONTROL_CORE_PADCONF_MODE [30] VDDS_DV_BANK1 (usbb2_ulpitll_dat7, usbb2_ulpitll_dat6) CONTROL_CORE_PADCONF_MODE [26] VDDS_DV_BANK6 | For more information about the I/O performance dependency on dual-voltage settings, see the device data manual. |
| 4. Configure MUXMODE field in pad configuration registers associated with the pads used. | CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS [18:16] UART2_RTS_MUXMODE CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS [2:0] UART2_CTS_MUXMODE CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX [18:16] UART2_TX_MUXMODE CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX [2:0] UART2_RX_MUXMODE CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT6_PAD1_USBB2_ULPITLL_DAT7 [18:16] USBB2_ULPITLL_DAT7_MUXMODE CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT6_PAD1_USBB2_ULPITLL_DAT7 [2:0] USBB2_ULPITLL_DAT6_MUXMODE | 0b000 0b000 0b000 0b000 0b010 0b010 |
| 5. Select the type of the internal pullup/down resistor ⁽¹⁾ . | CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX [4] UART2_RX_PULLTYPESELECT CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS [2:0] UART2_CTS_PULLTYPESELECT | 0b1 (pullup selected) 0b1 (pullup selected) |
| 6. Enable/disable pullup/down feature of the pad ⁽²⁾ . | CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX [3] UART2_RX_PULLUDENABLE CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS [3] UART2_CTS_PULLUDENABLE | 0b1 (pull feature enabled) 0b1 (pull feature enabled) |
| 7. Set the direction of the pin signal. ⁽²⁾ | CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX [8] UART2_RX_INPUTENABLE CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS [8] UART2_CTS_INPUTENABLE CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX [24] UART2_TX_INPUTENABLE CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS [24] UART2_RTS_INPUTENABLE CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT6_PAD1_USBB2_ULPITLL_DAT7 [24] USBB2_ULPITLL_DAT7_INPUTENABLE (sdmmc3_clk) CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT6_PAD1_USBB2_ULPITLL_DAT7 [8] USBB2_ULPITLL_DAT6_INPUTENABLE (sdmmc3_cmd) | 0b1 (input pin) 0b1 (input pin) 0b0 (output pin) 0b0 (output pin) 0b1 (input pin) 0b1 (input pin) |

⁽¹⁾ It is recommended to use internal pullup/down resistor if pad is used as input and external pullup/down is not used.

⁽²⁾ If the pad is configured in output mode, it is recommended for software to disable the internal pullup/pulldown associated with it.

NOTE: The order for setting the previous pad configuration bits is not important.

NOTE: If a device pad is left unconnected, but power is supplied to the I/O, or the pad is used only as an output during the lifetime of the application, it is recommended to keep its corresponding pad configuration bit CONTROL_CORE /WKUP_PAD0_X_PAD1_Y.INPUTENABLE set to 0b0. This keeps the input buffer disabled and reduces static current consumption.

NOTE: I/Os are non-failsafe, which means that voltage must never be applied at a pad before the internal I/O supply voltage VDD5 is powered.

19.6 Control Module Register Manual

19.6.1 Control Module Instance Summary

Table 19-111 lists the base address and address space for the control module instances.

Table 19-111. Control Module Instance Summary

| Module Instance | Base Address | Size | Description |
|--------------------------------------|--------------|------|-------------|
| SYSCTRL_GENERAL_CORE | 0x4A00 2000 | 4KB | Module |
| SYSCTRL_GENERAL_WKUP | 0x4A30 C000 | 4KB | Module |
| SYSCTRL_PADCONF_CORE | 0x4A10 0000 | 4KB | Module |
| SYSCTRL_PADCONF_WKUP | 0x4A31 E000 | 4KB | Module |

NOTE: All module registers are 8-, 16-, or 32-bit accessible through the L4 interconnect (little-endian encoding).

19.6.2 SYSCTRL_GENERAL_CORE Register Summary

Table 19-112. SYSCTRL_GENERAL_CORE Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_GENERAL_CORE Physical Address |
|--|------|-----------------------|----------------|---------------------------------------|
| CONTROL_GEN_CORE_REVISION | R | 32 | 0x00000000 | 0x4A002000 |
| CONTROL_GEN_CORE_HWINFO | R | 32 | 0x00000004 | 0x4A002004 |
| CONTROL_GEN_CORE_SYSCONFIG | RW | 32 | 0x00000010 | 0x4A002010 |
| CONTROL_STD_FUSE_DIE_ID_0 | R | 32 | 0x0000 0200 | 0x4A00 2200 |
| CONTROL_ID_CODE | R | 32 | 0x0000 0204 | 0x4A00 2204 |
| CONTROL_STD_FUSE_DIE_ID_1 | R | 32 | 0x0000 0208 | 0x4A00 2208 |
| CONTROL_STD_FUSE_DIE_ID_2 | R | 32 | 0x0000 020C | 0x4A00 220C |
| CONTROL_STD_FUSE_DIE_ID_3 | R | 32 | 0x0000 0210 | 0x4A00 2210 |
| CONTROL_STD_FUSE_PROD_ID_0 | R | 32 | 0x0000 0214 | 0x4A00 2214 |
| CONTROL_STD_FUSE_PROD_ID_1 | R | 32 | 0x0000 0218 | 0x4A00 2218 |
| CONTROL_STD_FUSE_USB_CONF | R | 32 | 0x0000 021C | 0x4A00 221C |
| CONTROL_STD_FUSE_CONF | R | 32 | 0x0000 0220 | 0x4A00 2220 |
| CONTROL_STD_FUSE_OPP_VDD_WKUP | R | 32 | 0x0000 0228 | 0x4A00 2228 |
| CONTROL_STD_FUSE_OPP_VDD_IVA_0 | R | 32 | 0x0000 022C | 0x4A00 222C |
| CONTROL_STD_FUSE_OPP_VDD_IVA_1 | R | 32 | 0x0000 0230 | 0x4A00 2230 |

Table 19-112. SYSCTRL_GENERAL_CORE Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_GENERAL_CORE Physical Address |
|-----------------------------------|------|-----------------------|----------------|---------------------------------------|
| CONTROL_STD_FUSE_OPP_VDD_IVA_2 | R | 32 | 0x0000 0234 | 0x4A00 2234 |
| CONTROL_STD_FUSE_OPP_VDD_IVA_3 | R | 32 | 0x0000 0238 | 0x4A00 2238 |
| RESERVED | R | 32 | 0x0000 023C | 0x4A00 223C |
| CONTROL_STD_FUSE_OPP_VDD_MPU_0 | R | 32 | 0x0000 0240 | 0x4A00 2240 |
| CONTROL_STD_FUSE_OPP_VDD_MPU_1 | R | 32 | 0x0000 0244 | 0x4A00 2244 |
| CONTROL_STD_FUSE_OPP_VDD_MPU_2 | R | 32 | 0x0000 0248 | 0x4A00 2248 |
| CONTROL_STD_FUSE_OPP_VDD_MPU_3 | R | 32 | 0x0000 024C | 0x4A00 224C |
| RESERVED | R | 32 | 0x0000 0250 | 0x4A00 2250 |
| CONTROL_STD_FUSE_OPP_VDD_CORE_0 | R | 32 | 0x0000 0254 | 0x4A00 2254 |
| CONTROL_STD_FUSE_OPP_VDD_CORE_1 | R | 32 | 0x0000 0258 | 0x4A00 2258 |
| CONTROL_STD_FUSE_OPP_VDD_CORE_2 | R | 32 | 0x0000 025C | 0x4A00 225C |
| CONTROL_STD_FUSE_OPP_BGAP | R | 32 | 0x0000 0260 | 0x4A00 2260 |
| CONTROL_STD_FUSE_OPP_DPLL_0 | R | 32 | 0x0000 0264 | 0x4A00 2264 |
| CONTROL_STD_FUSE_OPP_DPLL_1 | R | 32 | 0x0000 0268 | 0x4A00 2268 |
| CONTROL_STATUS | R | 32 | 0x0000 02C4 | 0x4A00 22C4 |
| CONTROL_SEC_ERR_STATUS_FUNC | RW | 32 | 0x0000 02D0 | 0x4A00 22D0 |
| CONTROL_SEC_ERR_STATUS_DEBUG | RW | 32 | 0x0000 02D4 | 0x4A00 22D4 |
| RESERVED | R | 32 | 0x0000 02D8 | 0x4A00 22D8 |
| RESERVED | R | 32 | 0x0000 02DC | 0x4A00 22DC |
| CONTROL_DEV_CONF | RW | 32 | 0x0000 0300 | 0x4A00 2300 |
| RESERVED | RW | 32 | 0x0000 0304 | 0x4A00 2304 |
| CONTROL_LDOVBB_IVA_VOLTAGE_CTRL | RW | 32 | 0x0000 0314 | 0x4A00 2314 |
| CONTROL_LDOVBB_MPU_VOLTAGE_CTRL | RW | 32 | 0x0000 0318 | 0x4A00 2318 |
| CONTROL_LDOSRAM_IVA_VOLTAGE_CTRL | RW | 32 | 0x0000 0320 | 0x4A00 2320 |
| CONTROL_LDOSRAM_MPU_VOLTAGE_CTRL | RW | 32 | 0x0000 0324 | 0x4A00 2324 |
| CONTROL_LDOSRAM_CORE_VOLTAGE_CTRL | RW | 32 | 0x0000 0328 | 0x4A00 2328 |
| CONTROL_TEMP_SENSOR | RW | 32 | 0x0000 032C | 0x4A00 232C |
| CONTROL_DPLL_NWELL_TRIM_0 | RW | 32 | 0x0000 0330 | 0x4A00 2330 |
| CONTROL_DPLL_NWELL_TRIM_1 | RW | 32 | 0x0000 0334 | 0x4A00 2334 |
| RESERVED | RW | 32 | 0x0000 0338 | 0x4A00 2338 |
| CONTROL_USBOTGHS_CONTROL | RW | 32 | 0x0000 033C | 0x4A00 233C |
| CONTROL_DSS_CONTROL | RW | 32 | 0x0000 0340 | 0x4A00 2340 |
| RESERVED | RO | 32 | 0x0000 0344 | 0x4A00 2344 |
| CONTROL_CORTX_M3_MMUADDRTRANSLTR | RW | 32 | 0x0000 0348 | 0x4A00 2348 |
| CONTROL_CORTX_M3_MMUADDRLOGICTR | RW | 32 | 0x0000 034C | 0x4A00 234C |
| CONTROL_HWOBS_CONTROL | RW | 32 | 0x0000 0350 | 0x4A00 2350 |
| CONTROL_EMIF1_OFFSET | RW | 32 | 0x0000 0360 | 0x4A00 2360 |
| CONTROL_EMIF2_OFFSET | RW | 32 | 0x0000 0364 | 0x4A00 2364 |
| CONTROL_EMIF1_MASTER_CODE_0 | RO | 32 | 0x0000 0368 | 0x4A00 2368 |
| CONTROL_EMIF1_MASTER_CODE_1 | RO | 32 | 0x0000 036C | 0x4A00 236C |
| CONTROL_EMIF2_MASTER_CODE_0 | RO | 32 | 0x0000 0370 | 0x4A00 2370 |
| CONTROL_EMIF2_MASTER_CODE_1 | RO | 32 | 0x0000 0374 | 0x4A00 2374 |
| CONTROL_BANDGAP_CTRL | RW | 32 | 0x0000 0378 | 0x4A00 2378 |
| CONTROL_BANDGAP_COUNTER | RW | 32 | 0x0000 037C | 0x4A00 237C |

Table 19-112. SYSCTRL_GENERAL_CORE Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_GENERAL_CORE Physical Address |
|-----------------------------------|------|-----------------------|----------------|---------------------------------------|
| CONTROL_BANDGAP_THRESHOLD | RW | 32 | 0x0000 0380 | 0x4A00 2380 |
| CONTROL_TSHUT_THRESHOLD | RW | 32 | 0x0000 0384 | 0x4A00 2384 |
| CONTROL_BANDGAP_STATUS | RO | 32 | 0x0000 0388 | 0x4A00 2388 |
| CONTROL_FORCEWRNP | RW | 32 | 0x0000 03C0 | 0x4A00 23C0 |
| CONTROL_GEN_CORE_OCPREG_SPARE | RW | 32 | 0x0000 03FC | 0x4A00 23FC |
| CONTROL_DEBOBS_FINAL_MUX_SEL | RW | 32 | 0x0000 0400 | 0x4A00 2400 |
| RESERVED | RO | 32 | 0x0000 0404 | 0x4A00 2404 |
| CONTROL_DEBOBS_MMR_MPU | RW | 32 | 0x0000 0408 | 0x4A00 2408 |
| RESERVED | RO | 32 | 0x0000 0410 | 0x4A00 2410 |
| RESERVED | RO | 32 | 0x0000 0414 | 0x4A00 2414 |
| RESERVED | RO | 32 | 0x0000 0418 | 0x4A00 2418 |
| RESERVED | RO | 32 | 0x0000 041C | 0x4A00 241C |
| RESERVED | RO | 32 | 0x0000 0420 | 0x4A00 2420 |
| RESERVED | RO | 32 | 0x0000 0424 | 0x4A00 2424 |
| CONTROL_CONF_SDMA_REQ_SEL0 | RW | 32 | 0x0000 042C | 0x4A00 242C |
| CONTROL_CONF_SDMA_REQ_SEL1 | RW | 32 | 0x0000 0430 | 0x4A00 2430 |
| CONTROL_CONF_SDMA_REQ_SEL2 | RW | 32 | 0x0000 0434 | 0x4A00 2434 |
| CONTROL_CONF_SDMA_REQ_SEL3 | RW | 32 | 0x0000 0438 | 0x4A00 2438 |
| CONTROL_CONF_CLK_SEL0 | RW | 32 | 0x0000 0440 | 0x4A00 2440 |
| CONTROL_CONF_CLK_SEL1 | RW | 32 | 0x0000 0444 | 0x4A00 2444 |
| CONTROL_CONF_CLK_SEL2 | RW | 32 | 0x0000 0448 | 0x4A00 2448 |
| CONTROL_CONF_DPLL_FREQLOCK_SEL | RW | 32 | 0x0000 044C | 0x4A00 244C |
| CONTROL_CONF_DPLL_TINITZ_SEL | RW | 32 | 0x0000 0450 | 0x4A00 2450 |
| CONTROL_CONF_DPLL_PHASELOCK_SEL | RW | 32 | 0x0000 0454 | 0x4A00 2454 |
| RESERVED | RW | 32 | 0x0000 0458 | 0x4A00 2458 |
| CONTROL_CONF_DPLL_TENABLE_SEL | RW | 32 | 0x0000 045C | 0x4A00 245C |
| CONTROL_CONF_DPLL_TENABLEDIV_SEL | RW | 32 | 0x0000 0460 | 0x4A00 2460 |
| CONTROL_CONF_DPLL_BYPASSACK_SEL | RW | 32 | 0x0000 0464 | 0x4A00 2464 |
| CONTROL_CONF_DPLL_IDLE_SEL | RW | 32 | 0x0000 0468 | 0x4A00 2468 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_0 | RW | 32 | 0x0000 0480 | 0x4A00 2480 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_1 | RW | 32 | 0x0000 0484 | 0x4A00 2484 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_2 | RW | 32 | 0x0000 0488 | 0x4A00 2488 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_3 | RW | 32 | 0x0000 048C | 0x4A00 248C |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_4 | RW | 32 | 0x0000 0490 | 0x4A00 2490 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_5 | RW | 32 | 0x0000 0494 | 0x4A00 2494 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_6 | RW | 32 | 0x0000 0498 | 0x4A00 2498 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_7 | RW | 32 | 0x0000 049C | 0x4A00 249C |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_8 | RW | 32 | 0x0000 04A0 | 0x4A00 24A0 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_9 | RW | 32 | 0x0000 04A4 | 0x4A00 24A4 |

Table 19-112. SYSCTRL_GENERAL_CORE Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_GENERAL_CORE Physical Address |
|------------------------------------|------|-----------------------|----------------|---------------------------------------|
| CONTROL_CORE_CONF_DEBUG_SEL_TST_10 | RW | 32 | 0x0000 04A8 | 0x4A00 24A8 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_11 | RW | 32 | 0x0000 04AC | 0x4A00 24AC |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_12 | RW | 32 | 0x0000 04B0 | 0x4A00 24B0 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_13 | RW | 32 | 0x0000 04B4 | 0x4A00 24B4 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_14 | RW | 32 | 0x0000 04B8 | 0x4A00 24B8 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_15 | RW | 32 | 0x0000 04BC | 0x4A00 24BC |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_16 | RW | 32 | 0x0000 04C0 | 0x4A00 24C0 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_17 | RW | 32 | 0x0000 04C4 | 0x4A00 24C4 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_18 | RW | 32 | 0x0000 04C8 | 0x4A00 24C8 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_19 | RW | 32 | 0x0000 04CC | 0x4A00 24CC |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_20 | RW | 32 | 0x0000 04D0 | 0x4A00 24D0 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_21 | RW | 32 | 0x0000 04D4 | 0x4A00 24D4 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_22 | RW | 32 | 0x0000 04D8 | 0x4A00 24D8 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_23 | RW | 32 | 0x0000 04DC | 0x4A00 24DC |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_24 | RW | 32 | 0x0000 04E0 | 0x4A00 24E0 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_25 | RW | 32 | 0x0000 04E4 | 0x4A00 24E4 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_26 | RW | 32 | 0x0000 04E8 | 0x4A00 24E8 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_27 | RW | 32 | 0x0000 04EC | 0x4A00 24EC |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_28 | RW | 32 | 0x0000 04F0 | 0x4A00 24F0 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_29 | RW | 32 | 0x0000 04F4 | 0x4A00 24F4 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_30 | RW | 32 | 0x0000 04F8 | 0x4A00 24F8 |
| CONTROL_CORE_CONF_DEBUG_SEL_TST_31 | RW | 32 | 0x0000 04FC | 0x4A00 24FC |

19.6.3 SYSCTRL_GENERAL_CORE Register Description

Table 19-113. CONTROL_GEN_CORE_REVISION

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4A002000 | Instance | SYSCTRL_GENERAL_CORE |
| Description | Control module instance revision identifier | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP Revision | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 19-114. Register Call Summary for Register CONTROL_GEN_CORE_REVISION

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-115. CONTROL_GEN_CORE_HWINFO

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0004 | | |
| Physical Address | 0x4A002004 | Instance | SYSCTRL_GENERAL_CORE |
| Description | Information about the IP module hardware configuration | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| IP_HWINFO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------|------|-------------|
| 31:0 | IP_HWINFO | IP-module dependent | R | 0x0000 0000 |

Table 19-116. Register Call Summary for Register CONTROL_GEN_CORE_HWINFO

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-117. CONTROL_GEN_CORE_SYSCONFIG

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0010 | | |
| Physical Address | 0x4A002010 | Instance | SYSCTRL_GENERAL_CORE |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|----|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | IP_SYSCONFIG_IDLEMODE | | | | RESERVED | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:2 | IP_SYSCONFIG_IDLEMODE | Select the local clock-gating strategy 0x0: Clock is manually gated 0x1: Clock is manually enabled 0x2,0x3: Clock is automatically gated when there is no access to the Control Module through L4-interconnect | RW | 0x2 |
| 1:0 | RESERVED | | R | 0x0 |

Table 19-118. Register Call Summary for Register CONTROL_GEN_CORE_SYSCONFIG

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)

Control Module Programming Guide

- [Control Module Global Initialization: \[1\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[2\]](#)

Table 19-119. CONTROL_STD_FUSE_DIE_ID_0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0200 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2200 | | |
| Description | Die ID Register - Part 0. Access conditions. Read: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------------|
| 31:0 | RESERVED | Reserved | R | Single identifier |

Table 19-120. Register Call Summary for Register CONTROL_STD_FUSE_DIE_ID_0

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-121. CONTROL_ID_CODE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0204 | | | | | | | | | | | | | | | | Instance | SYSCTRL_GENERAL_CORE | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 2204 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | ID_CODE Key Register Access conditions. Read: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| VERSION | | | | | | | | RAMP_SYSTEM | | | | | | | | | | | | | | | | TI_IDM | | | | | | | | - |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---------------------------|------|--------------------|
| 31:28 | VERSION | Revision number | R | 0x- ⁽¹⁾ |
| 27:12 | RAMP_SYSTEM | Ramp system number | R | 0x- ⁽¹⁾ |
| 11:1 | TI_IDM | Manufacturer identity(TI) | R | 0x17 |
| 0 | - | Always set to 1 | R | 0x1 |

⁽¹⁾ See [Section 1.5, Device Identification](#).

Table 19-122. Register Call Summary for Register CONTROL_ID_CODE

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-123. CONTROL_STD_FUSE_DIE_ID_1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0208 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2208 | | |
| Description | Die ID Register - Part 1. Access conditions. Read: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------------|
| 31:0 | RESERVED | Reserved | R | Single identifier |

Table 19-124. Register Call Summary for Register CONTROL_STD_FUSE_DIE_ID_1

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-125. CONTROL_STD_FUSE_DIE_ID_2

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 020C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 220C | | |
| Description | Die ID Register - Part 2. Access conditions. Read: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------------|
| 31:0 | RESERVED | Reserved | R | Single identifier |

Table 19-126. Register Call Summary for Register CONTROL_STD_FUSE_DIE_ID_2

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-127. CONTROL_STD_FUSE_DIE_ID_3

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0210 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2210 | | |
| Description | Die ID Register - Part 3. Access conditions. Read: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------------|
| 31:0 | RESERVED | Reserved | R | Single identifier |

Table 19-128. Register Call Summary for Register CONTROL_STD_FUSE_DIE_ID_3

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-129. CONTROL_STD_FUSE_PROD_ID_0

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0214 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2214 | | |
| Description | Prod ID Register - Part 0. This register shows the device type. Access conditions. Read: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DEVICE_TYPE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------|
| 31:8 | RESERVED | Reserved | R | 0x- |
| 7:0 | DEVICE_TYPE | Define the device type 0xF0 = GP device Other values = Reserved | R | 0x- |

Table 19-130. Register Call Summary for Register CONTROL_STD_FUSE_PROD_ID_0

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-131. CONTROL_STD_FUSE_PROD_ID_1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0218 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2218 | | |
| Description | Prod ID Register - Part 1. This register shows the device type. Access conditions. Read: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----|----------|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SILICON_TYPE | | RESERVED | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|-------|
| 31:18 | RESERVED | Reserved | R | 0x- |
| 17:16 | SILICON_TYPE | Define the silicon performance type ⁽¹⁾ | R | 0x- |
| 15:0 | RESERVED | Reserved | R | 0x- |

⁽¹⁾ For all available values, see [Section 1.5, OMAP4460 Family and Device Identification](#), in [Chapter 1, Introduction](#).

Table 19-132. Register Call Summary for Register CONTROL_STD_FUSE_PROD_ID_1

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-133. CONTROL_STD_FUSE_USB_CONF

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 021C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 221C | | |
| Description | Standard Fuse conf [31:0]. Register shows part of the chip standard eFuse configuration. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|----|----|----|----|----|----|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| USB_PROD_ID | | | | | | | | USB_VENDOR_ID | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|----------------------------|------|--------|
| 31:16 | USB_PROD_ID | USB Product Identification | R | 0x0000 |
| 15:0 | USB_VENDOR_ID | USB Vendor Identification | R | 0x0000 |

Table 19-134. Register Call Summary for Register CONTROL_STD_FUSE_USB_CONF

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-135. CONTROL_STD_FUSE_CONF

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0220 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2220 | | |
| Description | Standard fuse configuration register. The register shows part of the chip eFuse configuration on the L4 interface. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read only | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------------|------------------------|--------------------------|-----------------------------|-------------------|------------------------------------|----------|------------------------|------------------------|------------------------|------------------------|---------------------------------|----------------------------|-------------------------------|--------------------|-----------------------|
| RESERVED | | | | | | | | | | | | | | | | STD_FUSE_FACE_DETECT_DISABLE | STD_FUSE_CRYPT_DISABLE | STD_FUSE_MODEM3G_DISABLE | STD_FUSE_CH_SPEEDUP_DISABLE | STD_FUSE_ROM_HIDE | STD_FUSE_DPLL_CLK_TRIMMING_DISABLE | RESERVED | STD_FUSE_ISS_EFUSE1_EN | STD_FUSE_ISS_EFUSE2_EN | STD_FUSE_ISS_EFUSE3_EN | STD_FUSE_ISS_EFUSE4_EN | STD_FUSE_SGX544_3D_CLOCK_SOURCE | STD_FUSE_SGX544_3D_DISABLE | STD_FUSE_CORTEXA9_MPU_DISABLE | BSC_ACCESS_PROTECT | CUST_IEEE1500_DISABLE |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------------|---|------|-------------------|
| 31:17 | RESERVED | Reserved | R | 0x0000000 |
| 16 | STD_FUSE_FACE_DETECT_DISABLE | Disables face detect Read 0x0: Enables face detect Read 0x1: Disables face detect | R | 0x ⁽¹⁾ |
| 15 | STD_FUSE_CRYPT_DISABLE | Disables cryptographic modules Read 0x0: Enables cryptographic modules Read 0x1: Disables cryptographic modules | R | 0x- |
| 14 | STD_FUSE_MODEM3G_DISABLE | Disables the 3G modem Read 0x0: Enables 3G modem Read 0x1: Disables 3G modem | R | 0x- |
| 13 | STD_FUSE_CH_SPEEDUP_DISABLE | ROM code settings for configuration header block and speedup block. Only software access (no hardware access). Read 0x0: Enables CH and speedup Read 0x1: Disables CH and speedup | R | 0x- |
| 12 | STD_FUSE_ROM_HIDE | MPU BOOT ROM space (4-KB ROM code protection) Read 0x0: BOOT ROM space is 128KB. Read 0x1: BOOT ROM upper 4-KB region becomes reserved. | R | 0x- |
| 11 | STD_FUSE_DPLL_CLK_TRIMMING_DISABLE | Controls DPLLs Read 0x0: Enables DPLL trimming Read 0x1: Disables DPLL trimming | R | 0x- |

⁽¹⁾ The POR value is exported from Fuse-ROM locations, which are programmed during the manufacturing process.

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|---|------|-------|
| 10:9 | RESERVED | Reserved | R | 0x- |
| 8 | STD_FUSE_ISS_EFUSE1_EN | Enables implementation-specific features. Controls ISS.EFUSE1_EN. Sets to 1. Read 0x0: Disables ISS EFUSE1 Read 0x1: Enables ISS EFUSE1 | R | 0x1 |
| 7 | STD_FUSE_ISS_EFUSE2_EN | Enables implementation-specific features. Controls ISS.EFUSE2_EN. Sets to 0. Read 0x0: Disables ISS EFUSE2 Read 0x1: Enables ISS EFUSE2 | R | 0x0 |
| 6 | STD_FUSE_ISS_EFUSE3_EN | Enables implementation specific features. Controls ISS.EFUSE3_EN. Sets to 0. Read 0x0: Disables ISS EFUSE3 Read 0x1: Enables ISS EFUSE3 | R | 0x0 |
| 5 | STD_FUSE_ISS_EFUSE4_EN | Enables implementation-specific features. Controls ISS.EFUSE4_EN. Sets to 0. Read 0x0: Disables ISS EFUSE4 Read 0x1: Enables ISS EFUSE4 | R | 0x0 |
| 4 | STD_FUSE_SGX544_3D_CLOCK_SOURCE | Force 3D graphic engine clock source | R | 0x- |
| 3 | STD_FUSE_SGX544_3D_DISABLE | Disable the 3D Gx engine (SGX544) Read 0x0: Enables SGX Read 0x1: Disables SGX | R | 0x- |
| 2 | STD_FUSE_CORTEXA9_MPU_DISABLE | Configures Cortex-A9 MPU boot mode. It disables one Cortex-A9 core. Read 0x0: Boot SMP mode Read 0x1: Boot IP mode | R | 0x- |
| 1 | BSC_ACCESS_PROTECT | Reserved for bsc_access protect | R | 0x- |
| 0 | CUST_IEEE1500_DISABLE | Customer eFuse control/IEEE1500 access path disable | R | 0x- |

Table 19-136. Register Call Summary for Register CONTROL_STD_FUSE_CONF

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-137. CONTROL_STD_FUSE_OPP_VDD_WKUP

| Address Offset | 0x0000 0228 | Instance | SYSCTRL_GENERAL_CORE | |
|--|--|-------------|----------------------|-------------|
| Physical Address | 0x4A00 2228 | | | |
| Description | Standard Fuse OPP VDD_WKUP [31:0]. Register shows part of the chip standard eFuse configuration. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | | |
| Type | R | | | |
| <div><div><div>3130292827262524</div><div>2322212019181716</div><div>15141312111098</div><div>76543210</div></div><div>STD_FUSE_OPP_VDD_WKUP</div></div> | | | | |
| Bits | Field Name | Description | Type | Reset |
| 31:0 | STD_FUSE_OPP_VDD_WKUP | | R | 0x0000 0000 |

Table 19-138. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_WKUP

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-139. CONTROL_STD_FUSE_OPP_VDD_IVA_0

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 022C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 222C | | |
| Description | Standard Fuse OPP VDD_IVA_0. Register shows part of the chip eFuse configuration on the L4 interface. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------------------|----|----|----|----|----|----|----|-------------------------|----|----|----|-------------------------|----|----|----|------------------------|----|----|----|----|----|---|---|------------------------|---|---|---|---|---|---|---|
| VDD_IVA_OPP100_SENN_REC | | | | | | | | VDD_IVA_OPP50_SENP_GAIN | | | | VDD_IVA_OPP50_SENN_GAIN | | | | VDD_IVA_OPP50_SENP_REC | | | | | | | | VDD_IVA_OPP50_SENN_REC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|---|------|-------|
| 31:24 | VDD_IVA_OPP100_SENN_REC | Voltage domain VDD_IVA OPP100 [7:0] from Standard Fuse | R | 0x00 |
| 23:20 | VDD_IVA_OPP50_SENP_GAIN | Voltage domain VDD_IVA OPP50 [23:20] from Standard Fuse | R | 0x0 |
| 19:16 | VDD_IVA_OPP50_SENN_GAIN | Voltage domain VDD_IVA OPP50 [19:16] from Standard Fuse | R | 0x0 |
| 15:8 | VDD_IVA_OPP50_SENP_REC | Voltage domain VDD_IVA OPP50 [15:8] from Standard Fuse | R | 0x00 |
| 7:0 | VDD_IVA_OPP50_SENN_REC | Voltage domain VDD_IVA OPP50 [7:0] from Standard Fuse | R | 0x00 |

Table 19-140. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_IVA_0

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-141. CONTROL_STD_FUSE_OPP_VDD_IVA_1

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0230 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2230 | | |
| Description | Standard Fuse OPP VDD_IVA_1. Register shows part of the chip eFuse configuration on the L4 interface. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------------|----|----|----|----|----|----|----|----------------------------|----|----|----|----|----|----|----|--------------------------|----|----|----|--------------------------|----|---|---|-------------------------|---|---|---|---|---|---|---|
| VDD_IVA_OPP_TURBO_SENP_REC | | | | | | | | VDD_IVA_OPP_TURBO_SENN_REC | | | | | | | | VDD_IVA_OPP100_SENP_GAIN | | | | VDD_IVA_OPP100_SENN_GAIN | | | | VDD_IVA_OPP100_SENP_REC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|--|------|-------|
| 31:24 | VDD_IVA_OPP_TURBO_SENP_REC | Voltage domain VDD_IVA OPP_TURBO [15:8] from Standard Fuse | R | 0x00 |
| 23:16 | VDD_IVA_OPP_TURBO_SENN_REC | Voltage domain VDD_IVA OPP_TURBO [7:0] from Standard Fuse | R | 0x00 |
| 15:12 | VDD_IVA_OPP100_SENP_GAIN | Voltage domain VDD_IVA OPP100 [23:20] from Standard Fuse | R | 0x0 |
| 11:8 | VDD_IVA_OPP100_SENN_GAIN | Voltage domain VDD_IVA OPP100 [19:16] from Standard Fuse | R | 0x0 |
| 7:0 | VDD_IVA_OPP100_SENP_REC | Voltage domain VDD_IVA OPP100 [15:8] from Standard Fuse | R | 0x00 |

Table 19-142. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_IVA_1

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-143. CONTROL_STD_FUSE_OPP_VDD_IVA_2

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0234 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2234 | | |
| Description | Standard Fuse OPP VDD_IVA_2. Register shows part of the chip eFuse configuration on the L4 interface. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------------|----|----|----|-----------------------------|----|----|----|----------------------------|----|----|----|----------------------------|----|----|----|-----------------------------|----|----|----|-----------------------------|----|---|---|---|---|---|---|---|---|---|---|
| VDD_IVA_OPP_NITRO_SENP_GAIN | | | | VDD_IVA_OPP_NITRO_SENN_GAIN | | | | VDD_IVA_OPP_NITRO_SENP_REC | | | | VDD_IVA_OPP_NITRO_SENN_REC | | | | VDD_IVA_OPP_TURBO_SENP_GAIN | | | | VDD_IVA_OPP_TURBO_SENN_GAIN | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|--|------|-------|
| 31:28 | VDD_IVA_OPP_NITRO_SENP_GAIN | Voltage domain VDD_IVA OPP_NITRO[23:20] from Standard Fuse | R | 0x0 |
| 27:24 | VDD_IVA_OPP_NITRO_SENN_GAIN | Voltage domain VDD_IVA OPP_NITRO[19:16] from Standard Fuse | R | 0x0 |
| 23:16 | VDD_IVA_OPP_NITRO_SENP_REC | Voltage domain VDD_IVA OPP_NITRO[15:8] from Standard Fuse | R | 0x00 |
| 15:8 | VDD_IVA_OPP_NITRO_SENN_REC | Voltage domain VDD_IVA OPP_NITRO[7:0] from Standard Fuse | R | 0x00 |
| 7:4 | VDD_IVA_OPP_TURBO_SENP_GAIN | Voltage domain VDD_IVA OPP_TURBO[23:20] from Standard Fuse | R | 0x0 |
| 3:0 | VDD_IVA_OPP_TURBO_SENN_GAIN | Voltage domain VDD_IVA OPP_TURBO[19:16] from Standard Fuse | R | 0x0 |

Table 19-144. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_IVA_2

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-145. CONTROL_STD_FUSE_OPP_VDD_IVA_3

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0238 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2238 | | |
| Description | Standard Fuse OPP VDD_IVA_3. Register shows part of the chip eFuse configuration on the L4 interface. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|-----------------|----|----|----|-----------------|----|----|----|----------------------------|----|----|----|----------------------------|----|----|----|---------------------------|----|---|---|---------------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | VDD_IVA_SR_SENN | | | | VDD_IVA_SR_SENP | | | | VDD_IVA_OPP_NTSB_SENP_GAIN | | | | VDD_IVA_OPP_NTSB_SENN_GAIN | | | | VDD_IVA_OPP_NTSB_SENP_REC | | | | VDD_IVA_OPP_NTSB_SENN_REC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|---|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:26 | VDD_IVA_SR_SENN | VDD_IVA SmartReflex from Standard Fuse | R | 0x0 |
| 25:24 | VDD_IVA_SR_SENP | VDD_IVA SmartReflex from Standard Fuse | R | 0x0 |
| 23:20 | VDD_IVA_OPP_NTSB_SENP_G AIN | Voltage domain VDD_IVA OPP_NTSB[23:20] from Standard Fuse | R | 0x0 |
| 19:16 | VDD_IVA_OPP_NTSB_SENN_G AIN | Voltage domain VDD_IVA OPP_NTSB[19:16] from Standard Fuse | R | 0x0 |
| 15:8 | VDD_IVA_OPP_NTSB_SENP_R EC | Voltage domain VDD_IVA OPP_NTSB[15:8] from Standard Fuse | R | 0x00 |
| 7:0 | VDD_IVA_OPP_NTSB_SENN_R EC | Voltage domain VDD_IVA OPP_NTSB[7:0] from Standard Fuse | R | 0x00 |

Table 19-146. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_IVA_3

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-147. CONTROL_STD_FUSE_OPP_VDD_MPU_0

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0240 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2240 | | |
| Description | Standard Fuse OPP VDD_MPU_0. Register shows part of the chip eFuse configuration on the L4 interface. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|----|----|----|----|----|----|----|-------------------------|----|----|----|-------------------------|----|----|----|------------------------|----|----|----|----|----|---|---|------------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VDD_MPU_OPP100_SENN_REC | | | | | | | | VDD_MPU_OPP50_SENP_GAIN | | | | VDD_MPU_OPP50_SENN_GAIN | | | | VDD_MPU_OPP50_SENP_REC | | | | | | | | VDD_MPU_OPP50_SENN_REC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|-------|
| 31:24 | VDD_MPU_OPP100_SENN_REC | Voltage domain VDD_MPU OPP100[7:0] from Standard Fuse | R | 0x00 |
| 23:20 | VDD_MPU_OPP50_SENP_GAIN | Voltage domain VDD_MPU OPP50[23:20] from Standard Fuse | R | 0x0 |
| 19:16 | VDD_MPU_OPP50_SENN_GAI N | Voltage domain VDD_MPU OPP50[19:16] from Standard Fuse | R | 0x0 |
| 15:8 | VDD_MPU_OPP50_SENP_REC | Voltage domain VDD_MPU OPP50[15:8] from Standard Fuse | R | 0x00 |
| 7:0 | VDD_MPU_OPP50_SENN_REC | Voltage domain VDD_MPU OPP50[7:0] from Standard Fuse | R | 0x00 |

Table 19-148. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_MPU_0

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-149. CONTROL_STD_FUSE_OPP_VDD_MPU_1

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0244 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2244 | | |
| Description | Standard Fuse OPP VDD_MPU_1. Register shows part of the chip eFuse configuration on the L4 interface. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------|----|----|----|----|----|----|----|----------------------------|----|----|----|----|----|----|----|--------------------------|----|----|----|--------------------------|----|---|---|-------------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VDD_MPU_OPP_TURBO_SENP_REC | | | | | | | | VDD_MPU_OPP_TURBO_SENN_REC | | | | | | | | VDD_MPU_OPP100_SENP_GAIN | | | | VDD_MPU_OPP100_SENN_GAIN | | | | VDD_MPU_OPP100_SENP_REC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|---|------|-------|
| 31:24 | VDD_MPU_OPP_TURBO_SENP_REC | Voltage domain VDD_MPU OPP_TURBO[15:8] from Standard Fuse | R | 0x00 |
| 23:16 | VDD_MPU_OPP_TURBO_SENN_REC | Voltage domain VDD_MPU OPP_TURBO[7:0] from Standard Fuse | R | 0x00 |
| 15:12 | VDD_MPU_OPP100_SENP_GAIN | Voltage domain VDD_MPU OPP100[23:20] from Standard Fuse | R | 0x0 |
| 11:8 | VDD_MPU_OPP100_SENN_GAIN | Voltage domain VDD_MPU OPP100[19:16] from Standard Fuse | R | 0x0 |
| 7:0 | VDD_MPU_OPP100_SENP_REC | Voltage domain VDD_MPU OPP100[15:8] from Standard Fuse | R | 0x00 |

Table 19-150. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_MPU_1

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-151. CONTROL_STD_FUSE_OPP_VDD_MPU_2

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0248 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2248 | | |
| Description | Standard Fuse OPP VDD_MPU_2. Register shows part of the chip eFuse configuration on the L4 interface. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------------|----|----|----|-----------------------------|----|----|----|----------------------------|----|----|----|----------------------------|----|----|----|-----------------------------|----|----|----|-----------------------------|----|---|---|---|---|---|---|---|---|---|---|
| VDD_MPU_OPP_NITRO_SENP_GAIN | | | | VDD_MPU_OPP_NITRO_SENN_GAIN | | | | VDD_MPU_OPP_NITRO_SENP_REC | | | | VDD_MPU_OPP_NITRO_SENN_REC | | | | VDD_MPU_OPP_TURBO_SENP_GAIN | | | | VDD_MPU_OPP_TURBO_SENN_GAIN | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|--|------|-------|
| 31:28 | VDD_MPU_OPP_NITRO_SENP_GAIN | Voltage domain VDD_MPU OPP_NITRO[23:20] from Standard Fuse | R | 0x0 |
| 27:24 | VDD_MPU_OPP_NITRO_SENN_GAIN | Voltage domain VDD_MPU OPP_NITRO[19:16] from Standard Fuse | R | 0x0 |
| 23:16 | VDD_MPU_OPP_NITRO_SENP_REC | Voltage domain VDD_MPU OPP_NITRO[15:8] from Standard Fuse | R | 0x00 |
| 15:8 | VDD_MPU_OPP_NITRO_SENN_REC | Voltage domain VDD_MPU OPP_NITRO[7:0] from Standard Fuse | R | 0x00 |
| 7:4 | VDD_MPU_OPP_TURBO_SENP_GAIN | Voltage domain VDD_MPU OPP_TURBO[23:20] from Standard Fuse | R | 0x0 |
| 3:0 | VDD_MPU_OPP_TURBO_SENN_GAIN | Voltage domain VDD_MPU OPP_TURBO[19:16] from Standard Fuse | R | 0x0 |

Table 19-152. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_MPU_2

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-153. CONTROL_STD_FUSE_OPP_VDD_MPU_3

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 024C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 224C | | |
| Description | Standard Fuse OPP VDD_MPU_3. Register shows part of the chip eFuse configuration on the L4 interface. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|-----------------------------|----|----|----|-----------------------------|----|----|----|----------------------------|----|----|----|----|----|---|---|----------------------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | VDD_MPU_OPP_NTSPB_SENP_GAIN | | | | VDD_MPU_OPP_NTSPB_SENN_GAIN | | | | VDD_MPU_OPP_NTSPB_SENP_REC | | | | | | | | VDD_MPU_OPP_NTSPB_SENN_REC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|--|------|-------|
| 31:28 | RESERVED | | R | 0x0 |
| 27:26 | VDD_MPU_SR_SENN | VDD_MPU SmartReflex from Standard Fuse | R | 0x0 |
| 25:24 | VDD_MPU_SR_SENP | VDD_MPU SmartReflex from Standard Fuse | R | 0x0 |
| 23:20 | VDD_MPU_OPP_NTSPB_SENP_GAIN | Voltage domain VDD_MPU OPP_NTSPB[23:20] from Standard Fuse | R | 0x0 |
| 19:16 | VDD_MPU_OPP_NTSPB_SENN_GAIN | Voltage domain VDD_MPU OPP_NTSPB[19:16] from Standard Fuse | R | 0x0 |
| 15:8 | VDD_MPU_OPP_NTSPB_SENP_REC | Voltage domain VDD_MPU OPP_NTSPB[15:8] from Standard Fuse | R | 0x00 |
| 7:0 | VDD_MPU_OPP_NTSPB_SENN_REC | Voltage domain VDD_MPU OPP_NTSPB[7:0] from Standard Fuse | R | 0x00 |

Table 19-154. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_MPU_3

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-155. CONTROL_STD_FUSE_OPP_VDD_CORE_0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0254 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2254 | | |
| Description | Standard Fuse OPP VDD_CORE_0. Register shows part of the chip eFuse configuration on the L4 interface. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------------|----|----|----|----|----|----|----|--------------------------|----|----|----|--------------------------|----|----|----|-------------------------|----|----|----|----|----|---|---|-------------------------|---|---|---|---|---|---|---|
| VDD_CORE_OPP100_SENN_REC | | | | | | | | VDD_CORE_OPP50_SENP_GAIN | | | | VDD_CORE_OPP50_SENN_GAIN | | | | VDD_CORE_OPP50_SENP_REC | | | | | | | | VDD_CORE_OPP50_SENN_REC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|-------|
| 31:24 | VDD_CORE_OPP100_SENN_REC | Voltage domain VDD_CORE OPP100[7:0] from Standard Fuse | R | 0x00 |
| 23:20 | VDD_CORE_OPP50_SENP_GAIN | Voltage domain VDD_CORE OPP50 23:20] from Standard Fuse | R | 0x0 |
| 19:16 | VDD_CORE_OPP50_SENN_GAIN | Voltage domain VDD_CORE OPP50[19:16] from Standard Fuse | R | 0x0 |
| 15:8 | VDD_CORE_OPP50_SENP_REC | Voltage domain VDD_CORE OPP50[15:8] from Standard Fuse | R | 0x00 |
| 7:0 | VDD_CORE_OPP50_SENN_REC | Voltage domain VDD_CORE OPP50[7:0] from Standard Fuse | R | 0x00 |

Table 19-156. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_CORE_0

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-157. CONTROL_STD_FUSE_OPP_VDD_CORE_1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0258 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2258 | | |
| Description | Standard Fuse OPP VDD_CORE_1. Register shows part of the chip eFuse configuration on the L4 interface. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------------|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|----|----|---------------------------|----|----|----|---------------------------|----|---|---|--------------------------|---|---|---|---|---|---|---|
| VDD_CORE_OPP119_SENP_REC | | | | | | | | VDD_CORE_OPP119_SENN_REC | | | | | | | | VDD_CORE_OPP100_SENP_GAIN | | | | VDD_CORE_OPP100_SENN_GAIN | | | | VDD_CORE_OPP100_SENP_REC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|--|------|-------|
| 31:24 | VDD_CORE_OPP119_SENP_R EC | Voltage domain VDD_CORE OPP119[15:8] from Standard Fuse (overdrive mode) | R | 0x00 |
| 23:16 | VDD_CORE_OPP119_SENN_R EC | Voltage domain VDD_CORE OPP119[7:0] from Standard Fuse (overdrive mode) | R | 0x00 |
| 15:12 | VDD_CORE_OPP100_SENP_G AIN | Voltage domain VDD_CORE OPP100[23:20] from Standard Fuse | R | 0x0 |
| 11:8 | VDD_CORE_OPP100_SENN_G AIN | Voltage domain VDD_CORE OPP100[19:16] from Standard Fuse | R | 0x0 |
| 7:0 | VDD_CORE_OPP100_SENP_R EC | Voltage domain VDD_CORE OPP100[15:8] from Standard Fuse | R | 0x00 |

Table 19-158. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_CORE_1

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-159. CONTROL_STD_FUSE_OPP_VDD_CORE_2

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 025C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 225C | | |
| Description | Standard Fuse OPP VDD_CORE_2. Register shows part of the chip eFuse configuration on the L4 interface. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|------------------|----|---------------------------|----|---|---|---------------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | VDD_CORE_SR_SENN | | VDD_CORE_SR_SENP | | VDD_CORE_OPP119_SENP_GAIN | | | | VDD_CORE_OPP119_SENN_GAIN | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:10 | VDD_CORE_SR_SENN | VDD_CORE SmartReflex from Standard Fuse | R | 0x0 |
| 9:8 | VDD_CORE_SR_SENP | VDD_CORE SmartReflex from Standard Fuse | R | 0x0 |
| 7:4 | VDD_CORE_OPP119_SENP_G AIN | Voltage domain VDD_CORE OPP119[23:20] from Standard Fuse (overdrive mode) | R | 0x0 |
| 3:0 | VDD_CORE_OPP119_SENN_G AIN | Voltage domain VDD_CORE OPP119[19:16] from Standard Fuse (overdrive mode) | R | 0x0 |

Table 19-160. Register Call Summary for Register CONTROL_STD_FUSE_OPP_VDD_CORE_2

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-161. CONTROL_STD_FUSE_OPP_BGAP

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 0260 | | |
| Physical Address | 0x4A00 2260 | Instance | SYSCTRL_GENERAL_CORE |
| Description | Standard Fuse OPP BGAP. Register shows part of the chip standard eFuse configuration. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STD_FUSE_OPP_BGAP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|-------------|------|-------------|
| 31:0 | STD_FUSE_OPP_BGAP | | R | 0x0000 0000 |

Table 19-162. Register Call Summary for Register CONTROL_STD_FUSE_OPP_BGAP

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-163. CONTROL_STD_FUSE_OPP_DPLL_0

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0264 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2264 | | |
| Description | Standard Fuse OPP DPLL. Register shows part of the chip standard eFuse configuration. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STD_FUSE_OPP_DPLL_0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|-------------|------|-------------|
| 31:0 | STD_FUSE_OPP_DPLL_0 | | R | 0x0000 0000 |

Table 19-164. Register Call Summary for Register CONTROL_STD_FUSE_OPP_DPLL_0

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-165. CONTROL_STD_FUSE_OPP_DPLL_1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0268 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2268 | | |
| Description | Standard Fuse OPP DPLL. Register shows part of the chip standard eFuse configuration. Reading at the address of one of these registers provides a direct view into a part of the eFuse chain. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|---------------|----|---------------|----|----------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | IVA_RBB_TURBO | | MPU_RBB_TURBO | | RESERVED | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|--------------------|
| 31:22 | RESERVED | | R | 0x000 |
| 21 | IVA_RBB_TURBO | If trimmed, ABB (Adaptive Body Bias) set2 mode can be enabled at OPP TURBO on IVA 0x0: IVA ABB set2 voltage is NOT trimmed 0x1: IVA ABB set2 voltage is trimmed | R | 0x- ⁽¹⁾ |
| 20 | MPU_RBB_TURBO | If trimmed, ABB set2 mode can be enabled at OPP TURBO on MPU. 0x0: MPU ABB set2 voltage is NOT trimmed 0x1: MPU ABB set2 voltage is trimmed | R | 0x- ⁽¹⁾ |
| 19:0 | RESERVED | | R | 0x00000 |

⁽¹⁾ The default value is the value fused during device production.

Table 19-166. Register Call Summary for Register CONTROL_STD_FUSE_OPP_DPLL_1

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-167. CONTROL_STATUS

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 02C4 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 22C4 | | |
| Description | Control Module Status Register Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----------------------|----|----|----|-------------|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | SYSCTRL_GENERAL_CONF | | | | DEVICE_TYPE | | | | SYS_BOOT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:11 | SYSCTRL_GENERAL_CONF | Sysctrl_General_ IP configuration Read 0x1: SMP configuration | R | 0x0 |
| 10:8 | DEVICE_TYPE | Device type captured at reset time Device type value sampled at power-on reset. Read 0x3: General Purpose (GP) | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7:0 | SYS_BOOT | Sys.Boot pins state captured at reset time Sys.Boot pin values sampled at power-on reset | R | 0x00 |

Table 19-168. Register Call Summary for Register CONTROL_STATUS

Control Module Integration

- [Control Module Integration: \[0\]](#)

Control Module Functional Description

- [Control Module Initialization: \[1\]](#)
- [General Core Control Module Instance: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[3\]](#)

Table 19-169. CONTROL_SEC_ERR_STATUS_FUNC

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 02D0 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 22D0 | | |
| Description | Firewall Error Status functional Register Access conditions. Read Only | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|----|----|----|----|---------------------|----|----|----|----|------------------|----|----|----|---|--------------------|---|---|---|---|--------------------|---|---|---|--|--------------|--|--|--|--|--------------|--|--|--|--|--------------|--|--|--|--|--------------|--|--|--|--|----------|--|--|--|--|---------------|--|--|--|--|----------|--|--|--|--|--------------|--|--|--|--|-------------------------|--|--|--|--|----------------|--|--|--|--|---------------|--|--|--|--|---------------|--|--|--|--|----------------|--|--|--|--|----------|--|--|--|--|
| RESERVED | | | | | | | | C2C_INIT_FW_ERROR | | | | | L4_AUDIOBE_FW_ERROR | | | | | DEBUGSS_FW_ERROR | | | | | L4_CONFIG_FW_ERROR | | | | | L4_PERIPH_FW_ERROR | | | | | ISS_FW_ERROR | | | | | DSS_FW_ERROR | | | | | SGX_FW_ERROR | | | | | C2C_FW_ERROR | | | | | RESERVED | | | | | BB2D_FW_ERROR | | | | | RESERVED | | | | | SL2_FW_ERROR | | | | | DUAL_CORTEX_M3_FW_ERROR | | | | | IVAHD_FW_ERROR | | | | | EMIF_FW_ERROR | | | | | GPMC_FW_ERROR | | | | | L3RAM_FW_ERROR | | | | | RESERVED | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|-------|
| 31:21 | RESERVED | | R | 0x000 |
| 20 | C2C_INIT_FW_ERROR | C2C init firewall. MID config: unused (reserved) 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 19 | L4_AUDIOBE_FW_ERROR | L4 AudioBE firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 18 | DEBUGSS_FW_ERROR | DebugSS firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 17 | L4_CONFIG_FW_ERROR | L4 Config firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 16 | L4_PERIPH_FW_ERROR | L4 PER firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|---------|-------------------------|---|------|-------|
| 15 | ISS_FW_ERROR | ISS firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 14 | DSS_FW_ERROR | DSS firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 13 | SGX_FW_ERROR | SGX firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 12 | C2C_FW_ERROR | C2C firewall. MID config: unused (reserved). 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 11 : 10 | RESERVED | Reserved | R | 0 |
| 9 | BB2D_FW_ERROR | BB2D firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 8 : 7 | RESERVED | Reserved | R | 0 |
| 6 | SL2_FW_ERROR | SL2 firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 5 | DUAL_CORTEX_M3_FW_ERROR | Dual Cortex M3 firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 4 | IVAHD_FW_ERROR | IVAHD firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 3 | EMIF_FW_ERROR | EMIF firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 2 | GPMC_FW_ERROR | GPMC firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 1 | L3RAM_FW_ERROR | L3RAM firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 0 | RESERVED | Reserved | R | 0 |

Table 19-170. Register Call Summary for Register CONTROL_SEC_ERR_STATUS_FUNC

Control Module Functional Description

- [Protection Status Registers: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[17\]](#)

Table 19-171. CONTROL_SEC_ERR_STATUS_DEBUG

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 02D4 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 22D4 | | |
| Description | Error Status debug Register. Read All / Write All. Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------------------|----|----|----|----|----|----|----|------------------------|----|----|----|----|----|---|---|---------------------|---|---|---|---|---|---|---|-----------------------|--|--|--|--|--|--|--|-----------------------|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|---------------------------|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | C2C_INIT_DBGFW_ERROR | | | | | | | | L4_AUDIOBE_DBGFW_ERROR | | | | | | | | DEBUGSS_DBGFW_ERROR | | | | | | | | L4_CONFIG_DBGFW_ERROR | | | | | | | | L4_PERIPH_DBGFW_ERROR | | | | | | | | ISS_DBGFW_ERROR | | | | | | | | DSS_DBGFW_ERROR | | | | | | | | SGX_DBGFW_ERROR | | | | | | | | C2C_DBGFW_ERROR | | | | | | | | RESERVED | | | | | | | | BB2D_DBGFW_ERROR | | | | | | | | RESERVED | | | | | | | | SL2_DBGFW_ERROR | | | | | | | | DUAL_CORTX_M3_DBGFW_ERROR | | | | | | | | IVAHD_DBGFW_ERROR | | | | | | | | EMIF_DBGFW_ERROR | | | | | | | | GPMC_DBGFW_ERROR | | | | | | | | L3RAM_DBGFW_ERROR | | | | | | | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|-------|
| 31:21 | RESERVED | | R | 0x000 |
| 20 | C2C_INIT_DBGFW_ERROR | C2C init debug firewall. MID config: unused (reserved) 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 19 | L4_AUDIOBE_DBGFW_ERROR | L4 AudioBE debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 18 | DEBUGSS_DBGFW_ERROR | DebugSS debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 17 | L4_CONFIG_DBGFW_ERROR | L4 Config debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 16 | L4_PERIPH_DBGFW_ERROR | L4 PER debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 15 | ISS_DBGFW_ERROR | ISS debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 14 | DSS_DBGFW_ERROR | DSS debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 13 | SGX_DBGFW_ERROR | SGX debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 12 | C2C_DBGFW_ERROR | C2C debug firewall. MID config: unused (reserved). 0x0: No error from firewall 0x1: Error from firewall | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|---------|---------------------------|--|------|-------|
| 11 : 10 | RESERVED | Reserved | R | 0 |
| 9 | BB2D_DBGFW_ERROR | BB2D debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 8 : 7 | RESERVED | Reserved | R | 0 |
| 6 | SL2_DBGFW_ERROR | SL2 debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 5 | DUAL_CORTX_M3_DBGFW_ERROR | Dual Cortex M3 debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 4 | IVAHD_DBGFW_ERROR | IVAHD debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 3 | EMIF_DBGFW_ERROR | EMIF debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 2 | GPMC_DBGFW_ERROR | GPMC debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 1 | L3RAM_DBGFW_ERROR | L3RAM debug firewall 0x0: No error from firewall 0x1: Error from firewall | R | 0 |
| 0 | RESERVED | Reserved | R | 0 |

Table 19-172. Register Call Summary for Register CONTROL_SEC_ERR_STATUS_DEBUG

Control Module Functional Description

- [Protection Status Registers: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[17\]](#)

Table 19-173. CONTROL_DEV_CONF

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0300 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SYSCTRL_GENERAL_CORE | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 2300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Device configuration register. Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| DEV_CONF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | USBPHY_PD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | DEV_CONF | Spare bits for device configuration. | RW | 0x0000 0000 |
| 0 | USBPHY_PD | Power down entire USB phy (data, common module and UTMI). controls USB2PHYCORE.PD pin. ⁽¹⁾ 0x0: Normal operation 0x1: Power down the USB PHY | RW | 0 |

⁽¹⁾ Ensure that the USBPHY_PD bit is set to 1 before the 3.3-V power supply (vdda_usba0otg_3p3v) to USB PHY is shut down. If this bit remains at 0 after the 3.3-V power supply is shut down and the 1.8-V supply to USB is ON, there might be some leakage seen on the 3.3-V supply

Table 19-174. Register Call Summary for Register CONTROL_DEV_CONF

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-175. CONTROL_LDOVBB_IVA_VOLTAGE_CTRL

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0314 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2314 | | |
| Description | IVA Voltage Body Bias LDO control register Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|------------------------|----|-----------------------|----|----|----|------------------------|----|----|----|----------|----|----|----|----|----|------------------------|---|-----------------------|---|---|---|------------------------|---|---|---|
| RESERVED | | | | | | LDOVBBIVA_RBB_MUX_CTRL | | LDOVBBIVA_RBB_VSET_IN | | | | LDOVBBIVA_RBB_VSET_OUT | | | | RESERVED | | | | | | LDOVBBIVA_FBB_MUX_CTRL | | LDOVBBIVA_FBB_VSET_IN | | | | LDOVBBIVA_FBB_VSET_OUT | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|--|------|-------|
| 31:27 | RESERVED | Reserved | R | 0x00 |
| 26 | LDOVBBIVA_RBB_MUX_CTRL | Override control of EFUSE Adaptive Body Bias set2 voltage value 0x0: EFUSE value is used 0x1: Override value is used | RW | 0 |
| 25:21 | LDOVBBIVA_RBB_VSET_IN | EFUSE Adaptive Body Bias Set2 voltage value | R | 0x00 |
| 20:16 | LDOVBBIVA_RBB_VSET_OUT | Override value for Adaptive Body Bias Set2 voltage | RW | 0x00 |
| 15:11 | RESERVED | Reserved | R | 0x00 |
| 10 | LDOVBBIVA_FBB_MUX_CTRL | Override control of EFUSE Adaptive Body Bias Set1 voltage value 0x0: EFUSE value is used 0x1: Override value is used | RW | 0 |
| 9:5 | LDOVBBIVA_FBB_VSET_IN | EFUSE Adaptive Body Bias Set1 voltage value | R | 0x00 |
| 4:0 | LDOVBBIVA_FBB_VSET_OUT | Override value for Adaptive Body Bias Set1 voltage | RW | 0x00 |

Table 19-176. Register Call Summary for Register CONTROL_LDOVBB_IVA_VOLTAGE_CTRL

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-177. CONTROL_LDOVBB_MPU_VOLTAGE_CTRL

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0318 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2318 | | |
| Description | MPU Voltage Body Bias LDO control register Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
|----------|----|----|----|----|----|----|----|------------------------|----|----|----|-----------------------|----|----|----|------------------------|----|----|----|----------|----|---|---|---|---|---|---|------------------------|---|---|---|-----------------------|--|--|--|------------------------|--|--|--|
| RESERVED | | | | | | | | LDOVBBMPU_RBB_MUX_CTRL | | | | LDOVBBMPU_RBB_VSET_IN | | | | LDOVBBMPU_RBB_VSET_OUT | | | | RESERVED | | | | | | | | LDOVBBMPU_FBB_MUX_CTRL | | | | LDOVBBMPU_FBB_VSET_IN | | | | LDOVBBMPU_FBB_VSET_OUT | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|--|------|-------|
| 31:27 | RESERVED | Reserved | R | 0x00 |
| 26 | LDOVBBMPU_RBB_MUX_CTRL | Override control of EFUSE Adaptive Body Bias set2 voltage value 0x0: EFUSE value is used 0x1: Override value is used | RW | 0 |
| 25:21 | LDOVBBMPU_RBB_VSET_IN | EFUSE Adaptive Body Bias Set2 voltage value | R | 0x00 |
| 20:16 | LDOVBBMPU_RBB_VSET_OUT | Override value for Adaptive Body Bias Set2 voltage | RW | 0x00 |
| 15:11 | RESERVED | Reserved | R | 0x00 |
| 10 | LDOVBBMPU_FBB_MUX_CTRL | Override control of EFUSE Adaptive Body Bias Set1 voltage value 0x0: EFUSE value is used 0x1: Override value is used | RW | 0 |
| 9:5 | LDOVBBMPU_FBB_VSET_IN | EFUSE Adaptive Body Bias Set1 voltage value | R | 0x00 |
| 4:0 | LDOVBBMPU_FBB_VSET_OUT | Override value for Adaptive Body Bias Set1 voltage | RW | 0x00 |

Table 19-178. Register Call Summary for Register CONTROL_LDOVBB_MPU_VOLTAGE_CTRL

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-179. CONTROL_LDOSRAM_IVA_VOLTAGE_CTRL

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0320 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2320 | | |
| Description | IVA SRAM LDO control register Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|-----------------------------|----------------------------|----|----|----|-----------------------------|----|----|----|----------|----|----|----|----|-----------------------------|----------------------------|----|---|---|-----------------------------|---|---|---|---|---|---|---|
| RESERVED | | | | | LDOSRAMIVA_RETMODE_MUX_CTRL | LDOSRAMIVA_RETMODE_VSET_IN | | | | LDOSRAMIVA_RETMODE_VSET_OUT | | | | RESERVED | | | | | LDOSRAMIVA_ACTMODE_MUX_CTRL | LDOSRAMIVA_ACTMODE_VSET_IN | | | | LDOSRAMIVA_ACTMODE_VSET_OUT | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|---|------|-------|
| 31:27 | RESERVED | | R | 0x00 |
| 26 | LDOSRAMIVA_RETMODE_MUX_CTRL | Override control of EFUSE Retention Mode Voltage value 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 25:21 | LDOSRAMIVA_RETMODE_VSET_IN | EFUSE Retention Mode Voltage value (vset[9:5]) | R | 0x00 |
| 20:16 | LDOSRAMIVA_RETMODE_VSET_OUT | Override value for Retention Mode Voltage | RW | 0x00 |
| 15:11 | RESERVED | | R | 0x00 |
| 10 | LDOSRAMIVA_ACTMODE_MUX_CTRL | Override control of EFUSE Active Mode Voltage value 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 9:5 | LDOSRAMIVA_ACTMODE_VSET_IN | EFUSE Active Mode Voltage value (vset[4:0]) | R | 0x00 |
| 4:0 | LDOSRAMIVA_ACTMODE_VSET_OUT | Override value for Active Mode Voltage value | RW | 0x00 |

Table 19-180. Register Call Summary for Register CONTROL_LDOSRAM_IVA_VOLTAGE_CTRL

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-181. CONTROL_LDOSRAM_MPU_VOLTAGE_CTRL

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0324 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2324 | | |
| Description | MPU SRAM LDO control register Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|----|----|----------------------------|----|----|----|----|----|---|---|-----------------------------|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|----------------------------|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | LDOSRAMMPU_RETMODE_MUX_CTRL | | | | | | | | LDOSRAMMPU_RETMODE_VSET_IN | | | | | | | | LDOSRAMMPU_RETMODE_VSET_OUT | | | | | | | | RESERVED | | | | | | | | LDOSRAMMPU_ACTMODE_MUX_CTRL | | | | | | | | LDOSRAMMPU_ACTMODE_VSET_IN | | | | | | | | LDOSRAMMPU_ACTMODE_VSET_OUT | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|---|------|-------|
| 31:27 | RESERVED | | R | 0x00 |
| 26 | LDOSRAMMPU_RETMODE_MUX_CTRL | Override control of EFUSE Retention Mode Voltage value 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 25:21 | LDOSRAMMPU_RETMODE_VSET_IN | EFUSE Retention Mode Voltage value (vset[9:5]) | R | 0x00 |
| 20:16 | LDOSRAMMPU_RETMODE_VSET_OUT | Override value for Retention Mode Voltage | RW | 0x00 |
| 15:11 | RESERVED | | R | 0x00 |
| 10 | LDOSRAMMPU_ACTMODE_MUX_CTRL | Override control of EFUSE Active Mode Voltage value 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 9:5 | LDOSRAMMPU_ACTMODE_VSET_IN | EFUSE Active Mode Voltage value (vset[4:0]) | R | 0x00 |
| 4:0 | LDOSRAMMPU_ACTMODE_VSET_OUT | Override value for Active Mode Voltage value | RW | 0x00 |

Table 19-182. Register Call Summary for Register CONTROL_LDOSRAM_MPU_VOLTAGE_CTRL

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-183. CONTROL_LDOSRAM_CORE_VOLTAGE_CTRL

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 0328 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2328 | | |
| Description | Core SRAM LDO control register Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------------------|----|----|----|----|----|----|----|----------------------------|----|----|----|----|----|---|---|-----------------------------|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|----------------------------|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | LDSRAMCORE_RETMODE_MUX_CTRL | | | | | | | | LDSRAMCORE_RETMODE_VSET_IN | | | | | | | | LDSRAMCORE_RETMODE_VSET_OUT | | | | | | | | RESERVED | | | | | | | | LDSRAMCORE_ACTMODE_MUX_CTRL | | | | | | | | LDSRAMCORE_ACTMODE_VSET_IN | | | | | | | | LDSRAMCORE_ACTMODE_VSET_OUT | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|---|------|-------|
| 31:27 | RESERVED | | R | 0x00 |
| 26 | LDSRAMCORE_RETMODE_MUX_CTRL | Override control of EFUSE Retention Mode Voltage value 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 25:21 | LDSRAMCORE_RETMODE_VSET_IN | EFUSE Retention Mode Voltage value (vset[9:5]) | R | 0x00 |
| 20:16 | LDSRAMCORE_RETMODE_VSET_OUT | Override value for Retention Mode Voltage | RW | 0x00 |
| 15:11 | RESERVED | | R | 0x00 |
| 10 | LDSRAMCORE_ACTMODE_MUX_CTRL | Override control of EFUSE Active Mode Voltage value 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 9:5 | LDSRAMCORE_ACTMODE_VSET_IN | EFUSE Active Mode Voltage value (vset[4:0]) | R | 0x00 |
| 4:0 | LDSRAMCORE_ACTMODE_VSET_OUT | Override value for Active Mode Voltage value | RW | 0x00 |

Table 19-184. Register Call Summary for Register CONTROL_LDOSRAM_CORE_VOLTAGE_CTRL

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-185. CONTROL_TEMP_SENSOR

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 032C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 232C | | |
| Description | Control VBGAPTS temperature sensor and thermal comparator shutdown register Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----------|----|----------------------|----|-----------------------|---|------------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BGAP_TEMPSOFF | | RESERVED | | BGAP_TEMP_SENSOR_SOC | | BGAP_TEMP_SENSOR_EOCZ | | BGAP_TEMP_SENSOR_DTEMP | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13 | BGAP_TEMPSOFF | Temperature sensor and thermal shutdown mode. 0x0: Temperature sensor and thermal shutdown is active 0x1: Temperature sensor and thermal shutdown set in OFF mode | RW | 0 |
| 12 | RESERVED | Reserved | RW | 0 |
| 11 | BGAP_TEMP_SENSOR_SOC | ADC Start of Conversion. A transition to high starts a new ADC conversion cycle | RW | 0 |
| 10 | BGAP_TEMP_SENSOR_EOCZ | ADC End of Conversion. Active low, when CTRL_TEMP(5:0) is valid. | R | 0 |
| 9:0 | BGAP_TEMP_SENSOR_DTEMP | Temperature data from the ADC. Valid if EOCZ is low. | R | 0x000 |

Table 19-186. Register Call Summary for Register CONTROL_TEMP_SENSOR

Control Module Functional Description

- [Control Module Clock Configuration: \[0\]](#)
- [General Core Control Module Instance: \[1\]](#)
- [Band Gap Voltage and Temperature Sensor: \[2\] \[3\]](#)
- [Single Conversion Mode: \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [Repeated Single Conversion Mode: \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\]](#)
- [ADC Codes Versus Temperature: \[18\]](#)
- [Temperature Sensor Control Registers: \[19\] \[20\]](#)

Control Module Programming Guide

- [Control Module Global Initialization: \[21\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[22\]](#)

Table 19-187. CONTROL_DPLL_NWELL_TRIM_0

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 0330 | | |
| Physical Address | 0x4A00 2330 | Instance | SYSCTRL_GENERAL_CORE |
| Description | Dpll trim (SW override) - Part 0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------------------------------|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|---|---|------------------------------|---|---|---|---|---|---|---|---------------------|--|--|--|--|--|--|--|-------------------------------|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|------------------------------|--|--|--|--|--|--|--|---------------------|--|--|--|--|--|--|--|------------------------------|--|--|--|--|--|--|--|---------------------|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | DPLL_ABE_NWELL_TRIM_MUX_CTRL | | | | | | | | DPLL_ABE_NWELL_TRIM | | | | | | | | DPLL_PER_NWELL_TRIM_MUX_CTRL | | | | | | | | DPLL_PER_NWELL_TRIM | | | | | | | | DPLL_CORE_NWELL_TRIM_MUX_CTRL | | | | | | | | DPLL_CORE_NWELL_TRIM | | | | | | | | DPLL_IVA_NWELL_TRIM_MUX_CTRL | | | | | | | | DPLL_IVA_NWELL_TRIM | | | | | | | | DPLL_MPU_NWELL_TRIM_MUX_CTRL | | | | | | | | DPLL_MPU_NWELL_TRIM | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|---|------|-------|
| 31:30 | RESERVED | | R | 0x0 |
| 29 | DPLL_ABE_NWELL_TRIM_MUX_CTRL | Software override selection over efuse values. 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 28:24 | DPLL_ABE_NWELL_TRIM | Software override value. | RW | 0x00 |
| 23 | DPLL_PER_NWELL_TRIM_MUX_CTRL | Software override selection over efuse values. 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 22:18 | DPLL_PER_NWELL_TRIM | Software override value. | RW | 0x00 |
| 17 | DPLL_CORE_NWELL_TRIM_MUX_CTRL | Software override selection over efuse values. 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 16:12 | DPLL_CORE_NWELL_TRIM | Software override value. | RW | 0x00 |
| 11 | DPLL_IVA_NWELL_TRIM_MUX_CTRL | Software override selection over efuse values. 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 10:6 | DPLL_IVA_NWELL_TRIM | Software override value. | RW | 0x00 |
| 5 | DPLL_MPU_NWELL_TRIM_MUX_CTRL | Software override selection over efuse values. 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 4:0 | DPLL_MPU_NWELL_TRIM | Software override value. | RW | 0x00 |

Table 19-188. Register Call Summary for Register CONTROL_DPLL_NWELL_TRIM_0

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-189. CONTROL_DPLL_NWELL_TRIM_1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0334 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2334 | | |
| Description | Dpll trim (SW override) - Part 1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | |
|----------|----|----|----|----------|----|----|----|------------------------------|---------------------|----|----|----|----|----|----|----------|----|----|----|----|----|---|-------------------------------|----------------------|---|---|---|---|---|---|-------------------------------|----------------------|--|--|--|--|--|--|
| RESERVED | | | | RESERVED | | | | DPLL_USB_NWELL_TRIM_MUX_CTRL | DPLL_USB_NWELL_TRIM | | | | | | | RESERVED | | | | | | | DPLL_DS12_NWELL_TRIM_MUX_CTRL | DPLL_DS12_NWELL_TRIM | | | | | | | DPLL_DS11_NWELL_TRIM_MUX_CTRL | DPLL_DS11_NWELL_TRIM | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|---|------|-------|
| 31:30 | RESERVED | | R | 0x0 |
| 29:24 | RESERVED | Reserved | RW | 0x00 |
| 23 | DPLL_USB_NWELL_TRIM_MUX_CTRL | Software override selection over efuse values. 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 22:18 | DPLL_USB_NWELL_TRIM | Software override value. | RW | 0x00 |
| 17:12 | RESERVED | Reserved | RW | 0 |
| 11 | DPLL_DS12_NWELL_TRIM_MUX_CTRL | Software override selection over efuse values. 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 10:6 | DPLL_DS12_NWELL_TRIM | Software override value. | RW | 0x00 |
| 5 | DPLL_DS11_NWELL_TRIM_MUX_CTRL | Software override selection over efuse values. 0x0: efuse value is used 0x1: override value is used | RW | 0 |
| 4:0 | DPLL_DS11_NWELL_TRIM | Software override value. | RW | 0x00 |

Table 19-190. Register Call Summary for Register CONTROL_DPLL_NWELL_TRIM_1

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-191. CONTROL_USBOTGHS_CONTROL

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 033C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 233C | | |
| Description | USBOTGHS software control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----------|---------|----------|-------|---------|-----------|--------|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DISCHRGVBUS | CHRGVBUS | DRVVBUS | IDPULLUP | IDDIG | SESSEND | VBUSVALID | BVALID | AVALID | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | DISCHRGVBUS | USBOTGHS value for signal dischrgvbus (OTG_PD_VBUS). controls discharging of VBUS for completing SRP. Read 0x0: OTG transceiver does not discharge VBUS Read 0x1: OTG transceiver discharges VBUS | R | 0 |
| 7 | CHRGVBUS | USBOTGHS value for signal chrgvbus (OTG_PU_VBUS). controls charging of VBUS for initiating SRP. Read 0x0: OTG transceiver does not charge VBUS Read 0x1: OTG transceiver charges VBUS | R | 0 |
| 6 | DRVVBUS | USBOTGHS value for signal drvbus (OTG_DRV_VBUS). controls the driving of 5V power on VBUS. Read 0x0: OTG transceiver does not drive VBUS Read 0x1: OTG transceiver drives VBUS | R | 0 |
| 5 | IDPULLUP | USBOTGHS value for signal Idpullup (OTG_PU_ID). Enables sampling of the ID pin of the USB connector. Read 0x0: OTG transceiver does not apply a pullup to ID Read 0x1: OTG transceiver applies a pullup to ID | R | 0 |
| 4 | IDDIG | Sets the USBOTGHS signal iddig (ID). Indicates the value of the ID pin of the USB connector. 0x0: ID pin is grounded 0x1: ID pin is high-impedance | RW | 1 |
| 3 | SESSEND | Sets the USBOTGHS signal sessend (BSESSEND). Indicates if VBUS is above the threshold for normal operation. The threshold Vth is between 0.2V and 0.8V. 0x0: VBUS voltage is above VB_SESS_END 0x1: VBUS voltage is below VB_SESS_END | RW | 1 |
| 2 | VBUSVALID | Sets the USBOTGHS signal vbvalid (VBUSVLD). Indicates if VBUS is above the threshold for normal operation. The threshold Vth is between 4.4V and 4.75V. | RW | 0 |
| 1 | BVALID | Sets the USBOTGHS signal bvalid (BSESSVLD). Signal is currently unconnected (reserved for future use). 0x0: VBUS voltage is below VB_SESS_VLD 0x1: VBUS voltage is above VB_SESS_VLD | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | AVALID | Sets the USBOTGHS signal avalid (ASESSVLD). Indicates if VBUS is above the A-Device session valid threshold. The threshold Vth is between 0.8V and 2.0V. 0x0: VBUS voltage is below VA_SESS_VLD 0x1: VBUS voltage is above VA_SESS_VLD | RW | 0 |

Table 19-192. Register Call Summary for Register CONTROL_USBOTGHS_CONTROL

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-193. CONTROL_DSS_CONTROL

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0340 | | |
| Physical Address | 0x4A00 2340 | Instance | SYSCTRL_GENERAL_CORE |
| Description | DSS software control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DSS_MUX6_SELECT |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | DSS_MUX6_SELECT | Mux6 select value for DSS. 0x0: enables DSS_CLK as functional clock input for the DSI2 PHY bypass clock 0x1: enables PLL1_CLK4 as functional clock input for the DSI2 PHY bypass clock | RW | 0 |

Table 19-194. Register Call Summary for Register CONTROL_DSS_CONTROL

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-195. CONTROL_CORTEX_M3_MMUADDRTRANSLTR

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0348 | | |
| Physical Address | 0x4A00 2348 | Instance | SYSCTRL_GENERAL_CORE |
| Description | CORTEX_M3 reg Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|---------------------------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | CORTEX_M3_MMUADDRTRANSLTR | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|--|------|---------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:0 | CORTEX_M3_MMUADDRTRANSLTR | Used to save the mmu address boot SLTR | RW | 0x00000 |

Table 19-196. Register Call Summary for Register CONTROL_CORTEX_M3_MMUADDRTRANSLTR

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-197. CONTROL_CORTEX_M3_MMUADDRLOGICTR

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 034C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 234C | | |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|--------------------------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | CORTEX_M3_MMUADDRLOGICTR | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|-------------|------|---------|
| 31:20 | RESERVED | | R | 0x000 |
| 19:0 | CORTEX_M3_MMUADDRLOGICTR | | RW | 0x00000 |

Table 19-198. Register Call Summary for Register CONTROL_CORTEX_M3_MMUADDRLOGICTR

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-199. CONTROL_HWOBS_CONTROL

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0350 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2350 | | |
| Description | Hardware observability control. This register enables or disables hardware observability outputs (to save power primarily) Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------------|----|----|----|--------------------|----|----|----|----------|----|------------------|----|----|----|---------------------|---|--------------------|---|--------------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | HWOBS_CLKDIV_SEL_2 | | | | HWOBS_CLKDIV_SEL_1 | | | | RESERVED | | HWOBS_CLKDIV_SEL | | | | HWOBS_ALL_ZERO_MODE | | HWOBS_ALL_ONE_MODE | | HWOBS_MACRO_ENABLE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|----------|
| 31:19 | RESERVED | | R | 0x000000 |
| 18:14 | HWOBS_CLKDIV_SEL_2 | Clock divider selection on po_hwoobs(2). 0x1: output is not divided 0x2: output is divided by 2 0x4: output is divided by 4 0x8: output is divided by 8 0x10: output is divided by 16 ⁽¹⁾ | RW | 0x00 |
| 13:9 | HWOBS_CLKDIV_SEL_1 | Clock divider selection on po_hwoobs(1). 0x1: output is not divided 0x2: output is divided by 2 0x4: output is divided by 4 0x8: output is divided by 8 0x10: output is divided by 16 ⁽¹⁾ | RW | 0x00 |
| 8 | RESERVED | | R | 0x0 |
| 7:3 | HWOBS_CLKDIV_SEL | Clock divider selection on po_hwoobs(0). 0x1: output is not divided 0x2: output is divided by 2 0x4: output is divided by 4 0x8: output is divided by 8 0x10: output is divided by 16 ⁽¹⁾ | RW | 0x00 |
| 2 | HWOBS_ALL_ZERO_MODE | Used to gate observable signals. When set all outputs are set to zero (can be used to check the path from hardware observability to external pads). 0x0: Hardware observability ports are not gated 0x1: Hardware observability ports are all set to 0 | RW | 0 |
| 1 | HWOBS_ALL_ONE_MODE | Used to gate observable signals. When set all outputs are set to one (can be used to check the path from hardware observability to external pads). 0x0: Hardware observability ports are not gated 0x1: Hardware observability ports are all set to 1 | RW | 0 |
| 0 | HWOBS_MACRO_ENABLE | Used to gate observable signals coming from macros using the 32-bit HWOBS bus definition. When deasserted all outputs of the HWOBS busdef are set to zero. 0x0: Hardware observability ports from macros are gated and set to zero 0x1: Hardware observability ports from macros are not gated | RW | 0 |

⁽¹⁾ The values different than 1, 2, 4, 8, and 16 are reserved.

Table 19-200. Register Call Summary for Register CONTROL_HWOBS_CONTROL

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)
- [Observability Gating Capabilities: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[17\]](#)

Table 19-201. CONTROL_EMIF1_OFFSET

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0360 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2360 | | |
| Description | emif1 offset Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|--------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| EMIF1_DLL_OFFSET_3 | | | | | | | | EMIF1_DLL_OFFSET_2 | | | | | | | | EMIF1_DLL_OFFSET_1 | | | | | | | | EMIF1_DLL_OFFSET_0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|-------|
| 31:24 | EMIF1_DLL_OFFSET_3 | 8-bit signed offset value (-128 ... +127) for EMIF1 DLL Slave3 delay correction. | RW | 0x00 |
| 23:16 | EMIF1_DLL_OFFSET_2 | 8-bit signed offset value (-128 ... +127) for EMIF1 DLL Slave2 delay correction. | RW | 0x00 |
| 15:8 | EMIF1_DLL_OFFSET_1 | 8-bit signed offset value (-128 ... +127) for EMIF1 DLL Slave1 delay correction. | RW | 0x00 |
| 7:0 | EMIF1_DLL_OFFSET_0 | 8-bit signed offset value (-128 ... +127) for EMIF1 DLL Slave0 delay correction. | RW | 0x00 |

Table 19-202. Register Call Summary for Register CONTROL_EMIF1_OFFSET

Control Module Functional Description

- [EMIF DLL Slaves Individual Offset Compensation: \[0\] \[1\] \[2\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[3\]](#)

Table 19-203. CONTROL_EMIF2_OFFSET

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0364 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2364 | | |
| Description | emif2 offset Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|---|---|--------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| EMIF2_DLL_OFFSET_3 | | | | | | | | EMIF2_DLL_OFFSET_2 | | | | | | | | EMIF2_DLL_OFFSET_1 | | | | | | | | EMIF2_DLL_OFFSET_0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|-------|
| 31:24 | EMIF2_DLL_OFFSET_3 | 8-bit signed offset value (-128 ... +127) for EMIF2 DLL Slave3 delay correction. | RW | 0x00 |
| 23:16 | EMIF2_DLL_OFFSET_2 | 8-bit signed offset value (-128 ... +127) for EMIF2 DLL Slave2 delay correction. | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|------|-------|
| 15:8 | EMIF2_DLL_OFFSET_1 | 8-bit signed offset value (-128 ... +127) for EMIF2 DLL Slave1 delay correction. | RW | 0x00 |
| 7:0 | EMIF2_DLL_OFFSET_0 | 8-bit signed offset value (-128 ... +127) for EMIF2 DLL Slave0 delay correction. | RW | 0x00 |

Table 19-204. Register Call Summary for Register CONTROL_EMIF2_OFFSET

Control Module Functional Description

- [EMIF DLL Slaves Individual Offset Compensation: \[0\] \[1\] \[2\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[3\]](#)

Table 19-205. CONTROL_EMIF1_MASTER_CODE_0

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0368 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2368 | | |
| Description | emif1 master code Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | EMIF1_MASTER_CODE_1 | | | | | | | | RESERVED | | | | | | | | EMIF1_MASTER_CODE_0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|------------------------|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:16 | EMIF1_MASTER_CODE_1 | EMIF1 DLL Master1 code | R | 0x000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | EMIF1_MASTER_CODE_0 | EMIF1 DLL Master0 code | R | 0x000 |

Table 19-206. Register Call Summary for Register CONTROL_EMIF1_MASTER_CODE_0

Control Module Functional Description

- [EMIF DLL Master Code Monitoring Registers: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[2\]](#)

Table 19-207. CONTROL_EMIF1_MASTER_CODE_1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 036C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 236C | | |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | EMIF1_MASTER_CODE_3 | | | | | | | | RESERVED | | | | | | | | EMIF1_MASTER_CODE_2 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|------------------------|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:16 | EMIF1_MASTER_CODE_3 | EMIF1 DLL Master3 code | R | 0x000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | EMIF1_MASTER_CODE_2 | EMIF1 DLL Master2 code | R | 0x000 |

Table 19-208. Register Call Summary for Register CONTROL_EMIF1_MASTER_CODE_1

Control Module Functional Description

- [EMIF DLL Master Code Monitoring Registers: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[2\]](#)

Table 19-209. CONTROL_EMIF2_MASTER_CODE_0

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0370 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2370 | | |
| Description | emif2 master code Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | EMIF2_MASTER_CODE_1 | | | | | | | | RESERVED | | | | | | | | EMIF2_MASTER_CODE_0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|------------------------|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:16 | EMIF2_MASTER_CODE_1 | EMIF2 DLL Master1 code | R | 0x000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | EMIF2_MASTER_CODE_0 | EMIF2 DLL Master0 code | R | 0x000 |

Table 19-210. Register Call Summary for Register CONTROL_EMIF2_MASTER_CODE_0

Control Module Functional Description

- [EMIF DLL Master Code Monitoring Registers: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[2\]](#)

Table 19-211. CONTROL_EMIF2_MASTER_CODE_1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0374 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2374 | | |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | EMIF2_MASTER_CODE_3 | | | | | | | | RESERVED | | | | | | | | EMIF2_MASTER_CODE_2 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|------------------------|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:16 | EMIF2_MASTER_CODE_3 | EMIF2 DLL Master3 code | R | 0x000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | EMIF2_MASTER_CODE_2 | EMIF2 DLL Master2 code | R | 0x000 |

Table 19-212. Register Call Summary for Register CONTROL_EMIF2_MASTER_CODE_1

Control Module Functional Description

- [EMIF DLL Master Code Monitoring Registers: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[2\]](#)

Table 19-213. CONTROL_BANDGAP_CTRL

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0378 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2378 | | |
| Description | bandgap control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|-------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----------|-----------|
| SINGLE_MODE | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | MASK_HOT | MASK_COLD |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------------|
| 31 | SINGLE_MODE | Toggles between single mode or continuous mode (repeated single mode) 0x0: Single mode selected 0x1: Continuous mode selected | RW | 1 |
| 30:2 | RESERVED | | R | 0x0000 0000 |
| 1 | MASK_HOT | Mask for hot events 0x0: hot event is masked 0x1: hot event is enabled | RW | 0 |
| 0 | MASK_COLD | Mask for cold events 0x0: cold event is masked 0x1: cold event is enabled | RW | 0 |

Table 19-214. Register Call Summary for Register CONTROL_BANDGAP_CTRL

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)
- [Single Conversion Mode: \[1\]](#)
- [Repeated Single Conversion Mode: \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [Thermal Alert Functionality Comparators: \[7\] \[8\]](#)
- [Temperature Sensor Control Registers: \[9\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[10\]](#)

Table 19-215. CONTROL_BANDGAP_COUNTER

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 037C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 237C | | |
| Description | bandgap counter Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | COUNTER | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-----------------------------|------|----------|
| 31:24 | RESERVED | | R | 0x00 |
| 23:0 | COUNTER | Counter for continuous mode | RW | 0x000000 |

Table 19-216. Register Call Summary for Register CONTROL_BANDGAP_COUNTER

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)
- [Temperature Sensor Control Registers: \[1\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[2\]](#)

Table 19-217. CONTROL_BANDGAP_THRESHOLD

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0380 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2380 | | |
| Description | bandgap threshold Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | T_HOT | | | | | | | | RESERVED | | | | | | | | T_COLD | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------------|------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:16 | T_HOT | Threshold for hot temperature | RW | 0x000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | T_COLD | Threshold for cold temperature | RW | 0x000 |

Table 19-218. Register Call Summary for Register CONTROL_BANDGAP_THRESHOLD

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)
- [Thermal Alert Functionality Comparators: \[1\] \[2\] \[3\]](#)
- [Temperature Sensor Control Registers: \[4\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[5\]](#)

Table 19-219. CONTROL_TSHUT_THRESHOLD

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0384 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2384 | | |
| Description | bandgap tshut threshold Access conditions. Read: unrestricted, Write: unrestricted One time writable only (after device power-on reset) register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | TSHUT_HOT | | | | | | | | RESERVED | | | | | | | | TSHUT_COLD | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|-------------------|-------|
| 31:26 | RESERVED | | R | 0x00 |
| 25:16 | TSHUT_HOT | Tshut Threshold for hot temperature. Code value must not exceed the device junction (hottest spot) maximal-allowed temperature minus the device temperature sensor offset estimated at current conditions. For more information, see Section 19.4.10.2, Temperature Sensor . | RW ⁽¹⁾ | 0x000 |
| 15:10 | RESERVED | | R | 0x00 |
| 9:0 | TSHUT_COLD | Tshut Threshold for cold temperature | RW ⁽¹⁾ | 0x000 |

⁽¹⁾ One time writable only (after device power-on reset) bitfield

Table 19-220. Register Call Summary for Register CONTROL_TSHUT_THRESHOLD

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)
- [Thermal Shutdown Functionality Comparators: \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Temperature Sensor Control Registers: \[6\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[7\]](#)

Table 19-221. CONTROL_BANDGAP_STATUS

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0388 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2388 | | |
| Description | bandgap status Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|------------|----|----------|---|-----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLEAN_STOP | | | | BGAP_ALERT | | HOT_FLAG | | COLD_FLAG | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------------|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | CLEAN_STOP | Show when clean stop | R | 1 |
| 2 | BGAP_ALERT | Show when hot or cold event | R | 0 |
| 1 | HOT_FLAG | Show when hot event | R | 0 |
| 0 | COLD_FLAG | Show when cold event | R | 0 |

Table 19-222. Register Call Summary for Register CONTROL_BANDGAP_STATUS

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)
- [Band Gap Voltage and Temperature Sensor: \[1\]](#)
- [Thermal Alert Functionality Comparators: \[2\] \[3\] \[4\]](#)
- [Temperature Sensor Control Registers: \[5\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[6\]](#)

Table 19-223. CONTROL_FORCEWRNP

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 03C0 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 23C0 | | |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|--------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | MPUFORCEWRNP |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | MPUFORCEWRNP | 0x0: Non-posted write attribute is defined by Cortex-A9 CPU 0x1: Forces only non-posted write commands from MPUSS to the L3 interconnect | RW | 0 |

Table 19-224. Register Call Summary for Register CONTROL_FORCEWRNP

Control Module Functional Description

- [Force MPU Write Nonposted Transactions Control Register: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-225. CONTROL_GEN_CORE_OCPREG_SPARE

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 03FC | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 23FC | | |
| Description | The lower 4-bits of this register are assigned to control PWRDN mode globally, and the LVC MOS buffers enable control of the EMIF1 and EMIF2 PHYs. Read: Unrestricted; Write: Unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---------------|---------------|---------------|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| OCPREG_SPARE | | | | | | | | | | | | | | | | | | | | | | | | | | | | OCPREG_SPARE3 | OCPREG_SPARE2 | OCPREG_SPARE1 | OCPREG_SPARE0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|------------|
| 31:4 | OCPREG_SPARE | Reserved | R | 0x00000000 |
| 3 | OCPREG_SPARE3 | emif2phydata0–emif2phydata3 power-down mode control 0x0: Normal mode selected 0x1: Power-down mode selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------|
| 2 | OCPPREG_SPARE2 | emif2phycmd0, emif2phydata0–emif2phydata3 I/O LVCMOS buffers enable 0x0: Differential comparator is enabled. 0x1: Differential comparator is disabled. | RW | 0 |
| 1 | OCPPREG_SPARE1 | emif1phydata0–emif1phydata3 power-down mode control 0x0: Normal mode is selected. 0x1: Power-down mode is selected. | RW | 0 |
| 0 | OCPPREG_SPARE0 | emif1phycmd0, emif1phydata0–emif1phydata3 I/O LVCMOS buffers enable 0x0: LVCMOS buffers are enabled. 0x1: LVCMOS buffers are disabled. | RW | 0 |

Table 19-226. Register Call Summary for Register CONTROL_GEN_CORE_OCPREG_SPARE

Control Module Functional Description

- [Register Controls for the LPDDR2IO1/LPDDR2IO2 I/O Buffer Modes: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[2\]](#)

Table 19-227. CONTROL_DEBOBS_FINAL_MUX_SEL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0400 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SYSCTRL_GENERAL_CORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 2400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Final mux select signal. It selects between core and wkup signal (controls external observability logic). Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16">SELECT</td><td colspan="48"></td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | SELECT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SELECT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | SELECT | The i-th (i=0..31) bit from this bit field controls the multiplexing between the core and the wake-up signals to be observed at i-th hw_dbg line. 0b0: Selects a signal from the WAKEUP domain 0b1: Select a signal from the CORE domain | RW | 0x0000 0000 |

Table 19-228. Register Call Summary for Register CONTROL_DEBOBS_FINAL_MUX_SEL

Control Module Functional Description

- [General Core Control Module Instance: \[0\]](#)
- [Observability Gating Capabilities: \[1\] \[2\]](#)
- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[3\] \[4\] \[5\] \[6\] \[7\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[8\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[9\]](#)

Table 19-229. CONTROL_DEBOBS_MMR_MPU

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0408 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2408 | | |
| Description | Dual Cortex-A9 register to control hardware observability muxing inside dual Cortex-A9 (controls external observability logic). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SELECT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------------------|------|-------------|
| 31:4 | RESERVED | Reserved. Read returns reset value. | R | 0x0000 0000 |
| 3:0 | SELECT | Control external observability logic | RW | 0x0 |

Table 19-230. Register Call Summary for Register CONTROL_DEBOBS_MMR_MPU

Control Module Functional Description

- [Dual Cortex-A9 Subsystem Observable Signals: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[13\]](#)

Table 19-231. CONTROL_CONF_SDMA_REQ_SEL0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 042C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 242C | | |
| Description | System DMA requests view channel 0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MULT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6:0 | MULT | Select one of the following signals: 0x0: hwobs_sdma_dma_req_0 0x1: hwobs_sdma_dma_req_1 0x2: hwobs_sdma_dma_req_2 0x3: hwobs_sdma_dma_req_3 0x4: hwobs_sdma_dma_req_4 0x5: hwobs_sdma_dma_req_5 0x6: hwobs_sdma_dma_req_6 0x7: hwobs_sdma_dma_req_7 0x8: hwobs_sdma_dma_req_8 0x9: hwobs_sdma_dma_req_9 0xA: hwobs_sdma_dma_req_10 0xB: hwobs_sdma_dma_req_11 0xC: hwobs_sdma_dma_req_12 0xD: hwobs_sdma_dma_req_13 0xE: hwobs_sdma_dma_req_14 0xF: hwobs_sdma_dma_req_15 | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------------|------|-------|
| | | 0x10: hwobs_sdma_dma_req_16 | | |
| | | 0x11: hwobs_sdma_dma_req_17 | | |
| | | 0x12: hwobs_sdma_dma_req_18 | | |
| | | 0x13: hwobs_sdma_dma_req_19 | | |
| | | 0x14: hwobs_sdma_dma_req_20 | | |
| | | 0x15: hwobs_sdma_dma_req_21 | | |
| | | 0x16: hwobs_sdma_dma_req_22 | | |
| | | 0x17: hwobs_sdma_dma_req_23 | | |
| | | 0x18: hwobs_sdma_dma_req_24 | | |
| | | 0x19: hwobs_sdma_dma_req_25 | | |
| | | 0x1A: hwobs_sdma_dma_req_26 | | |
| | | 0x1B: hwobs_sdma_dma_req_27 | | |
| | | 0x1C: hwobs_sdma_dma_req_28 | | |
| | | 0x1D: hwobs_sdma_dma_req_29 | | |
| | | 0x1E: hwobs_sdma_dma_req_30 | | |
| | | 0x1F: hwobs_sdma_dma_req_31 | | |
| | | 0x20: hwobs_sdma_dma_req_32 | | |
| | | 0x21: hwobs_sdma_dma_req_33 | | |
| | | 0x22: hwobs_sdma_dma_req_34 | | |
| | | 0x23: hwobs_sdma_dma_req_35 | | |
| | | 0x24: hwobs_sdma_dma_req_36 | | |
| | | 0x25: hwobs_sdma_dma_req_37 | | |
| | | 0x26: hwobs_sdma_dma_req_38 | | |
| | | 0x27: hwobs_sdma_dma_req_39 | | |
| | | 0x28: hwobs_sdma_dma_req_40 | | |
| | | 0x29: hwobs_sdma_dma_req_41 | | |
| | | 0x2A: hwobs_sdma_dma_req_42 | | |
| | | 0x2B: hwobs_sdma_dma_req_43 | | |
| | | 0x2C: hwobs_sdma_dma_req_44 | | |
| | | 0x2D: hwobs_sdma_dma_req_45 | | |
| | | 0x2E: hwobs_sdma_dma_req_46 | | |
| | | 0x2F: hwobs_sdma_dma_req_47 | | |
| | | 0x30: hwobs_sdma_dma_req_48 | | |
| | | 0x31: hwobs_sdma_dma_req_49 | | |
| | | 0x32: hwobs_sdma_dma_req_50 | | |
| | | 0x33: hwobs_sdma_dma_req_51 | | |
| | | 0x34: hwobs_sdma_dma_req_52 | | |
| | | 0x35: hwobs_sdma_dma_req_53 | | |
| | | 0x36: hwobs_sdma_dma_req_54 | | |
| | | 0x37: hwobs_sdma_dma_req_55 | | |
| | | 0x38: hwobs_sdma_dma_req_56 | | |
| | | 0x39: hwobs_sdma_dma_req_57 | | |
| | | 0x3A: hwobs_sdma_dma_req_58 | | |
| | | 0x3B: hwobs_sdma_dma_req_59 | | |
| | | 0x3C: hwobs_sdma_dma_req_60 | | |
| | | 0x3D: hwobs_sdma_dma_req_61 | | |
| | | 0x3E: hwobs_sdma_dma_req_62 | | |
| | | 0x3F: hwobs_sdma_dma_req_63 | | |
| | | 0x40: hwobs_sdma_dma_req_64 | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-------|
| | | 0x41: hwobs_sdma_dma_req_65 | | |
| | | 0x42: hwobs_sdma_dma_req_66 | | |
| | | 0x43: hwobs_sdma_dma_req_67 | | |
| | | 0x44: hwobs_sdma_dma_req_68 | | |
| | | 0x45: hwobs_sdma_dma_req_69 | | |
| | | 0x46: hwobs_sdma_dma_req_70 | | |
| | | 0x47: hwobs_sdma_dma_req_71 | | |
| | | 0x48: hwobs_sdma_dma_req_72 | | |
| | | 0x49: hwobs_sdma_dma_req_73 | | |
| | | 0x4A: hwobs_sdma_dma_req_74 | | |
| | | 0x4B: hwobs_sdma_dma_req_75 | | |
| | | 0x4C: hwobs_sdma_dma_req_76 | | |
| | | 0x4D: hwobs_sdma_dma_req_77 | | |
| | | 0x4E: hwobs_sdma_dma_req_78 | | |
| | | 0x4F: hwobs_sdma_dma_req_79 | | |
| | | 0x50: hwobs_sdma_dma_req_80 | | |
| | | 0x51: hwobs_sdma_dma_req_81 | | |
| | | 0x52: hwobs_sdma_dma_req_82 | | |
| | | 0x53: hwobs_sdma_dma_req_83 | | |
| | | 0x54: hwobs_sdma_dma_req_84 | | |
| | | 0x55: hwobs_sdma_dma_req_85 | | |
| | | 0x56: hwobs_sdma_dma_req_86 | | |
| | | 0x57: hwobs_sdma_dma_req_87 | | |
| | | 0x58: hwobs_sdma_dma_req_88 | | |
| | | 0x59: hwobs_sdma_dma_req_89 | | |
| | | 0x5A: hwobs_sdma_dma_req_90 | | |
| | | 0x5B: hwobs_sdma_dma_req_91 | | |
| | | 0x5C: hwobs_sdma_dma_req_92 | | |
| | | 0x5D: hwobs_sdma_dma_req_93 | | |
| | | 0x5E: hwobs_sdma_dma_req_94 | | |
| | | 0x5F: hwobs_sdma_dma_req_95 | | |
| | | 0x60: hwobs_sdma_dma_req_96 | | |
| | | 0x61: hwobs_sdma_dma_req_97 | | |
| | | 0x62: hwobs_sdma_dma_req_98 | | |
| | | 0x63: hwobs_sdma_dma_req_99 | | |
| | | 0x64: hwobs_sdma_dma_req_100 | | |
| | | 0x65: hwobs_sdma_dma_req_101 | | |
| | | 0x66: hwobs_sdma_dma_req_102 | | |
| | | 0x67: hwobs_sdma_dma_req_103 | | |
| | | 0x68: hwobs_sdma_dma_req_104 | | |
| | | 0x69: hwobs_sdma_dma_req_105 | | |
| | | 0x6A: hwobs_sdma_dma_req_106 | | |
| | | 0x6B: hwobs_sdma_dma_req_107 | | |
| | | 0x6C: hwobs_sdma_dma_req_108 | | |
| | | 0x6D: hwobs_sdma_dma_req_109 | | |
| | | 0x6E: hwobs_sdma_dma_req_110 | | |
| | | 0x6F: hwobs_sdma_dma_req_111 | | |
| | | 0x70: hwobs_sdma_dma_req_112 | | |
| | | 0x71: hwobs_sdma_dma_req_113 | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-------|
| | | 0x72: hwobs_sdma_dma_req_114 | | |
| | | 0x73: hwobs_sdma_dma_req_115 | | |
| | | 0x74: hwobs_sdma_dma_req_116 | | |
| | | 0x75: hwobs_sdma_dma_req_117 | | |
| | | 0x76: hwobs_sdma_dma_req_118 | | |
| | | 0x77: hwobs_sdma_dma_req_119 | | |
| | | 0x78: hwobs_sdma_dma_req_120 | | |
| | | 0x79: hwobs_sdma_dma_req_121 | | |
| | | 0x7A: hwobs_sdma_dma_req_122 | | |
| | | 0x7B: hwobs_sdma_dma_req_123 | | |
| | | 0x7C: hwobs_sdma_dma_req_124 | | |
| | | 0x7D: hwobs_sdma_dma_req_125 | | |
| | | 0x7E: hwobs_sdma_dma_req_126 | | |

Table 19-232. Register Call Summary for Register CONTROL_CONF_SDMA_REQ_SEL0

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[3\]](#)

Table 19-233. CONTROL_CONF_SDMA_REQ_SEL1

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|----|--------------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|------|----|------------|---|---|------|---|---|---|---|---|---|---|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0430 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SYSCTRL_GENERAL_CORE | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 2430 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | System DMA requests view channel 1 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MULT | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:7 | RESERVED | | | | | | | | | | | | | | | | | | R | | 0x00000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6:0 | MULT | | Select one of the following signals: | | | | | | | | | | | | | | | | RW | | 0x01 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0x0: hwobs_sdma_dma_req_0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0x1: hwobs_sdma_dma_req_1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0x2: hwobs_sdma_dma_req_2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0x3: hwobs_sdma_dma_req_3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0x4: hwobs_sdma_dma_req_4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0x5: hwobs_sdma_dma_req_5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0x6: hwobs_sdma_dma_req_6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0x7: hwobs_sdma_dma_req_7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0x8: hwobs_sdma_dma_req_8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0x9: hwobs_sdma_dma_req_9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0xA: hwobs_sdma_dma_req_10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0xB: hwobs_sdma_dma_req_11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0xC: hwobs_sdma_dma_req_12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 0xD: hwobs sdma dma req 13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------------|------|-------|
| | | 0xE: hwobs_sdma_dma_req_14 | | |
| | | 0xF: hwobs_sdma_dma_req_15 | | |
| | | 0x10: hwobs_sdma_dma_req_16 | | |
| | | 0x11: hwobs_sdma_dma_req_17 | | |
| | | 0x12: hwobs_sdma_dma_req_18 | | |
| | | 0x13: hwobs_sdma_dma_req_19 | | |
| | | 0x14: hwobs_sdma_dma_req_20 | | |
| | | 0x15: hwobs_sdma_dma_req_21 | | |
| | | 0x16: hwobs_sdma_dma_req_22 | | |
| | | 0x17: hwobs_sdma_dma_req_23 | | |
| | | 0x18: hwobs_sdma_dma_req_24 | | |
| | | 0x19: hwobs_sdma_dma_req_25 | | |
| | | 0x1A: hwobs_sdma_dma_req_26 | | |
| | | 0x1B: hwobs_sdma_dma_req_27 | | |
| | | 0x1C: hwobs_sdma_dma_req_28 | | |
| | | 0x1D: hwobs_sdma_dma_req_29 | | |
| | | 0x1E: hwobs_sdma_dma_req_30 | | |
| | | 0x1F: hwobs_sdma_dma_req_31 | | |
| | | 0x20: hwobs_sdma_dma_req_32 | | |
| | | 0x21: hwobs_sdma_dma_req_33 | | |
| | | 0x22: hwobs_sdma_dma_req_34 | | |
| | | 0x23: hwobs_sdma_dma_req_35 | | |
| | | 0x24: hwobs_sdma_dma_req_36 | | |
| | | 0x25: hwobs_sdma_dma_req_37 | | |
| | | 0x26: hwobs_sdma_dma_req_38 | | |
| | | 0x27: hwobs_sdma_dma_req_39 | | |
| | | 0x28: hwobs_sdma_dma_req_40 | | |
| | | 0x29: hwobs_sdma_dma_req_41 | | |
| | | 0x2A: hwobs_sdma_dma_req_42 | | |
| | | 0x2B: hwobs_sdma_dma_req_43 | | |
| | | 0x2C: hwobs_sdma_dma_req_44 | | |
| | | 0x2D: hwobs_sdma_dma_req_45 | | |
| | | 0x2E: hwobs_sdma_dma_req_46 | | |
| | | 0x2F: hwobs_sdma_dma_req_47 | | |
| | | 0x30: hwobs_sdma_dma_req_48 | | |
| | | 0x31: hwobs_sdma_dma_req_49 | | |
| | | 0x32: hwobs_sdma_dma_req_50 | | |
| | | 0x33: hwobs_sdma_dma_req_51 | | |
| | | 0x34: hwobs_sdma_dma_req_52 | | |
| | | 0x35: hwobs_sdma_dma_req_53 | | |
| | | 0x36: hwobs_sdma_dma_req_54 | | |
| | | 0x37: hwobs_sdma_dma_req_55 | | |
| | | 0x38: hwobs_sdma_dma_req_56 | | |
| | | 0x39: hwobs_sdma_dma_req_57 | | |
| | | 0x3A: hwobs_sdma_dma_req_58 | | |
| | | 0x3B: hwobs_sdma_dma_req_59 | | |
| | | 0x3C: hwobs_sdma_dma_req_60 | | |
| | | 0x3D: hwobs_sdma_dma_req_61 | | |
| | | 0x3E: hwobs_sdma_dma_req_62 | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-------|
| | | 0x3F: hwobs_sdma_dma_req_63 | | |
| | | 0x40: hwobs_sdma_dma_req_64 | | |
| | | 0x41: hwobs_sdma_dma_req_65 | | |
| | | 0x42: hwobs_sdma_dma_req_66 | | |
| | | 0x43: hwobs_sdma_dma_req_67 | | |
| | | 0x44: hwobs_sdma_dma_req_68 | | |
| | | 0x45: hwobs_sdma_dma_req_69 | | |
| | | 0x46: hwobs_sdma_dma_req_70 | | |
| | | 0x47: hwobs_sdma_dma_req_71 | | |
| | | 0x48: hwobs_sdma_dma_req_72 | | |
| | | 0x49: hwobs_sdma_dma_req_73 | | |
| | | 0x4A: hwobs_sdma_dma_req_74 | | |
| | | 0x4B: hwobs_sdma_dma_req_75 | | |
| | | 0x4C: hwobs_sdma_dma_req_76 | | |
| | | 0x4D: hwobs_sdma_dma_req_77 | | |
| | | 0x4E: hwobs_sdma_dma_req_78 | | |
| | | 0x4F: hwobs_sdma_dma_req_79 | | |
| | | 0x50: hwobs_sdma_dma_req_80 | | |
| | | 0x51: hwobs_sdma_dma_req_81 | | |
| | | 0x52: hwobs_sdma_dma_req_82 | | |
| | | 0x53: hwobs_sdma_dma_req_83 | | |
| | | 0x54: hwobs_sdma_dma_req_84 | | |
| | | 0x55: hwobs_sdma_dma_req_85 | | |
| | | 0x56: hwobs_sdma_dma_req_86 | | |
| | | 0x57: hwobs_sdma_dma_req_87 | | |
| | | 0x58: hwobs_sdma_dma_req_88 | | |
| | | 0x59: hwobs_sdma_dma_req_89 | | |
| | | 0x5A: hwobs_sdma_dma_req_90 | | |
| | | 0x5B: hwobs_sdma_dma_req_91 | | |
| | | 0x5C: hwobs_sdma_dma_req_92 | | |
| | | 0x5D: hwobs_sdma_dma_req_93 | | |
| | | 0x5E: hwobs_sdma_dma_req_94 | | |
| | | 0x5F: hwobs_sdma_dma_req_95 | | |
| | | 0x60: hwobs_sdma_dma_req_96 | | |
| | | 0x61: hwobs_sdma_dma_req_97 | | |
| | | 0x62: hwobs_sdma_dma_req_98 | | |
| | | 0x63: hwobs_sdma_dma_req_99 | | |
| | | 0x64: hwobs_sdma_dma_req_100 | | |
| | | 0x65: hwobs_sdma_dma_req_101 | | |
| | | 0x66: hwobs_sdma_dma_req_102 | | |
| | | 0x67: hwobs_sdma_dma_req_103 | | |
| | | 0x68: hwobs_sdma_dma_req_104 | | |
| | | 0x69: hwobs_sdma_dma_req_105 | | |
| | | 0x6A: hwobs_sdma_dma_req_106 | | |
| | | 0x6B: hwobs_sdma_dma_req_107 | | |
| | | 0x6C: hwobs_sdma_dma_req_108 | | |
| | | 0x6D: hwobs_sdma_dma_req_109 | | |
| | | 0x6E: hwobs_sdma_dma_req_110 | | |
| | | 0x6F: hwobs_sdma_dma_req_111 | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-------|
| | | 0x70: hwobs_sdma_dma_req_112 | | |
| | | 0x71: hwobs_sdma_dma_req_113 | | |
| | | 0x72: hwobs_sdma_dma_req_114 | | |
| | | 0x73: hwobs_sdma_dma_req_115 | | |
| | | 0x74: hwobs_sdma_dma_req_116 | | |
| | | 0x75: hwobs_sdma_dma_req_117 | | |
| | | 0x76: hwobs_sdma_dma_req_118 | | |
| | | 0x77: hwobs_sdma_dma_req_119 | | |
| | | 0x78: hwobs_sdma_dma_req_120 | | |
| | | 0x79: hwobs_sdma_dma_req_121 | | |
| | | 0x7A: hwobs_sdma_dma_req_122 | | |
| | | 0x7B: hwobs_sdma_dma_req_123 | | |
| | | 0x7C: hwobs_sdma_dma_req_124 | | |
| | | 0x7D: hwobs_sdma_dma_req_125 | | |
| | | 0x7E: hwobs_sdma_dma_req_126 | | |

Table 19-234. Register Call Summary for Register CONTROL_CONF_SDMA_REQ_SEL1

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-235. CONTROL_CONF_SDMA_REQ_SEL2

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0434 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2434 | | |
| Description | System DMA requests view channel 2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MULT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6:0 | MULT | Select one of the following signals: 0x0: hwobs_sdma_dma_req_0 0x1: hwobs_sdma_dma_req_1 0x2: hwobs_sdma_dma_req_2 0x3: hwobs_sdma_dma_req_3 0x4: hwobs_sdma_dma_req_4 0x5: hwobs_sdma_dma_req_5 0x6: hwobs_sdma_dma_req_6 0x7: hwobs_sdma_dma_req_7 0x8: hwobs_sdma_dma_req_8 0x9: hwobs_sdma_dma_req_9 0xA: hwobs_sdma_dma_req_10 0xB: hwobs_sdma_dma_req_11 0xC: hwobs_sdma_dma_req_12 0xD: hwobs_sdma_dma_req_13 0xE: hwobs_sdma_dma_req_14 | RW | 0x02 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------------|------|-------|
| | | 0xF: hwobs_sdma_dma_req_15 | | |
| | | 0x10: hwobs_sdma_dma_req_16 | | |
| | | 0x11: hwobs_sdma_dma_req_17 | | |
| | | 0x12: hwobs_sdma_dma_req_18 | | |
| | | 0x13: hwobs_sdma_dma_req_19 | | |
| | | 0x14: hwobs_sdma_dma_req_20 | | |
| | | 0x15: hwobs_sdma_dma_req_21 | | |
| | | 0x16: hwobs_sdma_dma_req_22 | | |
| | | 0x17: hwobs_sdma_dma_req_23 | | |
| | | 0x18: hwobs_sdma_dma_req_24 | | |
| | | 0x19: hwobs_sdma_dma_req_25 | | |
| | | 0x1A: hwobs_sdma_dma_req_26 | | |
| | | 0x1B: hwobs_sdma_dma_req_27 | | |
| | | 0x1C: hwobs_sdma_dma_req_28 | | |
| | | 0x1D: hwobs_sdma_dma_req_29 | | |
| | | 0x1E: hwobs_sdma_dma_req_30 | | |
| | | 0x1F: hwobs_sdma_dma_req_31 | | |
| | | 0x20: hwobs_sdma_dma_req_32 | | |
| | | 0x21: hwobs_sdma_dma_req_33 | | |
| | | 0x22: hwobs_sdma_dma_req_34 | | |
| | | 0x23: hwobs_sdma_dma_req_35 | | |
| | | 0x24: hwobs_sdma_dma_req_36 | | |
| | | 0x25: hwobs_sdma_dma_req_37 | | |
| | | 0x26: hwobs_sdma_dma_req_38 | | |
| | | 0x27: hwobs_sdma_dma_req_39 | | |
| | | 0x28: hwobs_sdma_dma_req_40 | | |
| | | 0x29: hwobs_sdma_dma_req_41 | | |
| | | 0x2A: hwobs_sdma_dma_req_42 | | |
| | | 0x2B: hwobs_sdma_dma_req_43 | | |
| | | 0x2C: hwobs_sdma_dma_req_44 | | |
| | | 0x2D: hwobs_sdma_dma_req_45 | | |
| | | 0x2E: hwobs_sdma_dma_req_46 | | |
| | | 0x2F: hwobs_sdma_dma_req_47 | | |
| | | 0x30: hwobs_sdma_dma_req_48 | | |
| | | 0x31: hwobs_sdma_dma_req_49 | | |
| | | 0x32: hwobs_sdma_dma_req_50 | | |
| | | 0x33: hwobs_sdma_dma_req_51 | | |
| | | 0x34: hwobs_sdma_dma_req_52 | | |
| | | 0x35: hwobs_sdma_dma_req_53 | | |
| | | 0x36: hwobs_sdma_dma_req_54 | | |
| | | 0x37: hwobs_sdma_dma_req_55 | | |
| | | 0x38: hwobs_sdma_dma_req_56 | | |
| | | 0x39: hwobs_sdma_dma_req_57 | | |
| | | 0x3A: hwobs_sdma_dma_req_58 | | |
| | | 0x3B: hwobs_sdma_dma_req_59 | | |
| | | 0x3C: hwobs_sdma_dma_req_60 | | |
| | | 0x3D: hwobs_sdma_dma_req_61 | | |
| | | 0x3E: hwobs_sdma_dma_req_62 | | |
| | | 0x3F: hwobs_sdma_dma_req_63 | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-------|
| | | 0x40: hwobs_sdma_dma_req_64 | | |
| | | 0x41: hwobs_sdma_dma_req_65 | | |
| | | 0x42: hwobs_sdma_dma_req_66 | | |
| | | 0x43: hwobs_sdma_dma_req_67 | | |
| | | 0x44: hwobs_sdma_dma_req_68 | | |
| | | 0x45: hwobs_sdma_dma_req_69 | | |
| | | 0x46: hwobs_sdma_dma_req_70 | | |
| | | 0x47: hwobs_sdma_dma_req_71 | | |
| | | 0x48: hwobs_sdma_dma_req_72 | | |
| | | 0x49: hwobs_sdma_dma_req_73 | | |
| | | 0x4A: hwobs_sdma_dma_req_74 | | |
| | | 0x4B: hwobs_sdma_dma_req_75 | | |
| | | 0x4C: hwobs_sdma_dma_req_76 | | |
| | | 0x4D: hwobs_sdma_dma_req_77 | | |
| | | 0x4E: hwobs_sdma_dma_req_78 | | |
| | | 0x4F: hwobs_sdma_dma_req_79 | | |
| | | 0x50: hwobs_sdma_dma_req_80 | | |
| | | 0x51: hwobs_sdma_dma_req_81 | | |
| | | 0x52: hwobs_sdma_dma_req_82 | | |
| | | 0x53: hwobs_sdma_dma_req_83 | | |
| | | 0x54: hwobs_sdma_dma_req_84 | | |
| | | 0x55: hwobs_sdma_dma_req_85 | | |
| | | 0x56: hwobs_sdma_dma_req_86 | | |
| | | 0x57: hwobs_sdma_dma_req_87 | | |
| | | 0x58: hwobs_sdma_dma_req_88 | | |
| | | 0x59: hwobs_sdma_dma_req_89 | | |
| | | 0x5A: hwobs_sdma_dma_req_90 | | |
| | | 0x5B: hwobs_sdma_dma_req_91 | | |
| | | 0x5C: hwobs_sdma_dma_req_92 | | |
| | | 0x5D: hwobs_sdma_dma_req_93 | | |
| | | 0x5E: hwobs_sdma_dma_req_94 | | |
| | | 0x5F: hwobs_sdma_dma_req_95 | | |
| | | 0x60: hwobs_sdma_dma_req_96 | | |
| | | 0x61: hwobs_sdma_dma_req_97 | | |
| | | 0x62: hwobs_sdma_dma_req_98 | | |
| | | 0x63: hwobs_sdma_dma_req_99 | | |
| | | 0x64: hwobs_sdma_dma_req_100 | | |
| | | 0x65: hwobs_sdma_dma_req_101 | | |
| | | 0x66: hwobs_sdma_dma_req_102 | | |
| | | 0x67: hwobs_sdma_dma_req_103 | | |
| | | 0x68: hwobs_sdma_dma_req_104 | | |
| | | 0x69: hwobs_sdma_dma_req_105 | | |
| | | 0x6A: hwobs_sdma_dma_req_106 | | |
| | | 0x6B: hwobs_sdma_dma_req_107 | | |
| | | 0x6C: hwobs_sdma_dma_req_108 | | |
| | | 0x6D: hwobs_sdma_dma_req_109 | | |
| | | 0x6E: hwobs_sdma_dma_req_110 | | |
| | | 0x6F: hwobs_sdma_dma_req_111 | | |
| | | 0x70: hwobs_sdma_dma_req_112 | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-------|
| | | 0x71: hwobs_sdma_dma_req_113 | | |
| | | 0x72: hwobs_sdma_dma_req_114 | | |
| | | 0x73: hwobs_sdma_dma_req_115 | | |
| | | 0x74: hwobs_sdma_dma_req_116 | | |
| | | 0x75: hwobs_sdma_dma_req_117 | | |
| | | 0x76: hwobs_sdma_dma_req_118 | | |
| | | 0x77: hwobs_sdma_dma_req_119 | | |
| | | 0x78: hwobs_sdma_dma_req_120 | | |
| | | 0x79: hwobs_sdma_dma_req_121 | | |
| | | 0x7A: hwobs_sdma_dma_req_122 | | |
| | | 0x7B: hwobs_sdma_dma_req_123 | | |
| | | 0x7C: hwobs_sdma_dma_req_124 | | |
| | | 0x7D: hwobs_sdma_dma_req_125 | | |
| | | 0x7E: hwobs_sdma_dma_req_126 | | |

Table 19-236. Register Call Summary for Register CONTROL_CONF_SDMA_REQ_SEL2

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[0\]](#)

Table 19-237. CONTROL_CONF_SDMA_REQ_SEL3

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0438 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2438 | | |
| Description | System DMA requests view channel 3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MULT | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6:0 | MULT | Select one of the following signals: 0x0: hwobs_sdma_dma_req_0 0x1: hwobs_sdma_dma_req_1 0x2: hwobs_sdma_dma_req_2 0x3: hwobs_sdma_dma_req_3 0x4: hwobs_sdma_dma_req_4 0x5: hwobs_sdma_dma_req_5 0x6: hwobs_sdma_dma_req_6 0x7: hwobs_sdma_dma_req_7 0x8: hwobs_sdma_dma_req_8 0x9: hwobs_sdma_dma_req_9 0xA: hwobs_sdma_dma_req_10 0xB: hwobs_sdma_dma_req_11 0xC: hwobs_sdma_dma_req_12 0xD: hwobs_sdma_dma_req_13 0xE: hwobs_sdma_dma_req_14 0xF: hwobs_sdma_dma_req_15 | RW | 0x03 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------------|------|-------|
| | | 0x10: hwobs_sdma_dma_req_16 | | |
| | | 0x11: hwobs_sdma_dma_req_17 | | |
| | | 0x12: hwobs_sdma_dma_req_18 | | |
| | | 0x13: hwobs_sdma_dma_req_19 | | |
| | | 0x14: hwobs_sdma_dma_req_20 | | |
| | | 0x15: hwobs_sdma_dma_req_21 | | |
| | | 0x16: hwobs_sdma_dma_req_22 | | |
| | | 0x17: hwobs_sdma_dma_req_23 | | |
| | | 0x18: hwobs_sdma_dma_req_24 | | |
| | | 0x19: hwobs_sdma_dma_req_25 | | |
| | | 0x1A: hwobs_sdma_dma_req_26 | | |
| | | 0x1B: hwobs_sdma_dma_req_27 | | |
| | | 0x1C: hwobs_sdma_dma_req_28 | | |
| | | 0x1D: hwobs_sdma_dma_req_29 | | |
| | | 0x1E: hwobs_sdma_dma_req_30 | | |
| | | 0x1F: hwobs_sdma_dma_req_31 | | |
| | | 0x20: hwobs_sdma_dma_req_32 | | |
| | | 0x21: hwobs_sdma_dma_req_33 | | |
| | | 0x22: hwobs_sdma_dma_req_34 | | |
| | | 0x23: hwobs_sdma_dma_req_35 | | |
| | | 0x24: hwobs_sdma_dma_req_36 | | |
| | | 0x25: hwobs_sdma_dma_req_37 | | |
| | | 0x26: hwobs_sdma_dma_req_38 | | |
| | | 0x27: hwobs_sdma_dma_req_39 | | |
| | | 0x28: hwobs_sdma_dma_req_40 | | |
| | | 0x29: hwobs_sdma_dma_req_41 | | |
| | | 0x2A: hwobs_sdma_dma_req_42 | | |
| | | 0x2B: hwobs_sdma_dma_req_43 | | |
| | | 0x2C: hwobs_sdma_dma_req_44 | | |
| | | 0x2D: hwobs_sdma_dma_req_45 | | |
| | | 0x2E: hwobs_sdma_dma_req_46 | | |
| | | 0x2F: hwobs_sdma_dma_req_47 | | |
| | | 0x30: hwobs_sdma_dma_req_48 | | |
| | | 0x31: hwobs_sdma_dma_req_49 | | |
| | | 0x32: hwobs_sdma_dma_req_50 | | |
| | | 0x33: hwobs_sdma_dma_req_51 | | |
| | | 0x34: hwobs_sdma_dma_req_52 | | |
| | | 0x35: hwobs_sdma_dma_req_53 | | |
| | | 0x36: hwobs_sdma_dma_req_54 | | |
| | | 0x37: hwobs_sdma_dma_req_55 | | |
| | | 0x38: hwobs_sdma_dma_req_56 | | |
| | | 0x39: hwobs_sdma_dma_req_57 | | |
| | | 0x3A: hwobs_sdma_dma_req_58 | | |
| | | 0x3B: hwobs_sdma_dma_req_59 | | |
| | | 0x3C: hwobs_sdma_dma_req_60 | | |
| | | 0x3D: hwobs_sdma_dma_req_61 | | |
| | | 0x3E: hwobs_sdma_dma_req_62 | | |
| | | 0x3F: hwobs_sdma_dma_req_63 | | |
| | | 0x40: hwobs_sdma_dma_req_64 | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-------|
| | | 0x41: hwobs_sdma_dma_req_65 | | |
| | | 0x42: hwobs_sdma_dma_req_66 | | |
| | | 0x43: hwobs_sdma_dma_req_67 | | |
| | | 0x44: hwobs_sdma_dma_req_68 | | |
| | | 0x45: hwobs_sdma_dma_req_69 | | |
| | | 0x46: hwobs_sdma_dma_req_70 | | |
| | | 0x47: hwobs_sdma_dma_req_71 | | |
| | | 0x48: hwobs_sdma_dma_req_72 | | |
| | | 0x49: hwobs_sdma_dma_req_73 | | |
| | | 0x4A: hwobs_sdma_dma_req_74 | | |
| | | 0x4B: hwobs_sdma_dma_req_75 | | |
| | | 0x4C: hwobs_sdma_dma_req_76 | | |
| | | 0x4D: hwobs_sdma_dma_req_77 | | |
| | | 0x4E: hwobs_sdma_dma_req_78 | | |
| | | 0x4F: hwobs_sdma_dma_req_79 | | |
| | | 0x50: hwobs_sdma_dma_req_80 | | |
| | | 0x51: hwobs_sdma_dma_req_81 | | |
| | | 0x52: hwobs_sdma_dma_req_82 | | |
| | | 0x53: hwobs_sdma_dma_req_83 | | |
| | | 0x54: hwobs_sdma_dma_req_84 | | |
| | | 0x55: hwobs_sdma_dma_req_85 | | |
| | | 0x56: hwobs_sdma_dma_req_86 | | |
| | | 0x57: hwobs_sdma_dma_req_87 | | |
| | | 0x58: hwobs_sdma_dma_req_88 | | |
| | | 0x59: hwobs_sdma_dma_req_89 | | |
| | | 0x5A: hwobs_sdma_dma_req_90 | | |
| | | 0x5B: hwobs_sdma_dma_req_91 | | |
| | | 0x5C: hwobs_sdma_dma_req_92 | | |
| | | 0x5D: hwobs_sdma_dma_req_93 | | |
| | | 0x5E: hwobs_sdma_dma_req_94 | | |
| | | 0x5F: hwobs_sdma_dma_req_95 | | |
| | | 0x60: hwobs_sdma_dma_req_96 | | |
| | | 0x61: hwobs_sdma_dma_req_97 | | |
| | | 0x62: hwobs_sdma_dma_req_98 | | |
| | | 0x63: hwobs_sdma_dma_req_99 | | |
| | | 0x64: hwobs_sdma_dma_req_100 | | |
| | | 0x65: hwobs_sdma_dma_req_101 | | |
| | | 0x66: hwobs_sdma_dma_req_102 | | |
| | | 0x67: hwobs_sdma_dma_req_103 | | |
| | | 0x68: hwobs_sdma_dma_req_104 | | |
| | | 0x69: hwobs_sdma_dma_req_105 | | |
| | | 0x6A: hwobs_sdma_dma_req_106 | | |
| | | 0x6B: hwobs_sdma_dma_req_107 | | |
| | | 0x6C: hwobs_sdma_dma_req_108 | | |
| | | 0x6D: hwobs_sdma_dma_req_109 | | |
| | | 0x6E: hwobs_sdma_dma_req_110 | | |
| | | 0x6F: hwobs_sdma_dma_req_111 | | |
| | | 0x70: hwobs_sdma_dma_req_112 | | |
| | | 0x71: hwobs_sdma_dma_req_113 | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-------|
| | | 0x72: hwobs_sdma_dma_req_114 | | |
| | | 0x73: hwobs_sdma_dma_req_115 | | |
| | | 0x74: hwobs_sdma_dma_req_116 | | |
| | | 0x75: hwobs_sdma_dma_req_117 | | |
| | | 0x76: hwobs_sdma_dma_req_118 | | |
| | | 0x77: hwobs_sdma_dma_req_119 | | |
| | | 0x78: hwobs_sdma_dma_req_120 | | |
| | | 0x79: hwobs_sdma_dma_req_121 | | |
| | | 0x7A: hwobs_sdma_dma_req_122 | | |
| | | 0x7B: hwobs_sdma_dma_req_123 | | |
| | | 0x7C: hwobs_sdma_dma_req_124 | | |
| | | 0x7D: hwobs_sdma_dma_req_125 | | |
| | | 0x7E: hwobs_sdma_dma_req_126 | | |

Table 19-238. Register Call Summary for Register CONTROL_CONF_SDMA_REQ_SEL3

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[3\]](#)

Table 19-239. CONTROL_CONF_CLK_SEL0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0440 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2440 | | |
| Description | clk view channel 0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | MULT | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | MULT | Select one of the following signals: 0x0: hwobs_coredpll_clkout 0x1: hwobs_abedpll_clkout 0x2: hwobs_perdpll_clkout 0x3: hwobs_dsi1dpll_clkout 0x4: hwobs_dsi2dpll_clkout 0x5: reserved 0x6: hwobs_usbdpll_clkout 0x7: reserved | RW | 0x0 |

Table 19-240. Register Call Summary for Register CONTROL_CONF_CLK_SEL0

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[2\]](#)

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | MULT | Select one of the following signals: 0x0: hwobs_coredpll_clkout 0x1: hwobs_abedpll_clkout 0x2: hwobs_perdpll_clkout 0x3: hwobs_dsi1dpll_clkout 0x4: hwobs_dsi2dpll_clkout 0x5: reserved 0x6: hwobs_usbdpll_clkout 0x7: reserved | RW | 0x2 |

Table 19-244. Register Call Summary for Register CONTROL_CONF_CLK_SEL2

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[3\]](#)

Table 19-245. CONTROL_CONF_DPLL_FREQLOCK_SEL

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 044C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 244C | | |
| Description | dpll_freqlock view Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MULT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | MULT | Select one of the following signals: 0x0: hwobs_coredpll_freqlock 0x1: hwobs_abedpll_freqlock 0x2: hwobs_perdpll_freqlock 0x3: hwobs_dsi1dpll_freqlock 0x4: hwobs_dsi2dpll_freqlock 0x5: reserved 0x6: hwobs_usbdpll_freqlock 0x7: reserved | RW | 0x0 |

Table 19-246. Register Call Summary for Register CONTROL_CONF_DPLL_FREQLOCK_SEL

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\]](#)
- [Other CORE DPLL Observable Signals: \[2\]](#)
- [Other ABE DPLL Observable Signals: \[3\]](#)
- [Other PERIPH DPLL Observable Signals: \[4\]](#)
- [Other DSI1 DPLL Observable Signals: \[5\]](#)
- [Other DSI2 DPLL Observable Signals: \[6\]](#)
- [Other USB DPLL Observable Signals: \[7\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[8\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[9\]](#)

Table 19-247. CONTROL_CONF_DPLL_TINITZ_SEL

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0450 | | |
| Physical Address | 0x4A00 2450 | Instance | SYSCTRL_GENERAL_CORE |
| Description | dpll_tinitz view Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | MULT | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | MULT | Select one of the following signals: 0x0: hwobs_coredpll_tinitz | RW | 0x0 |

Table 19-248. Register Call Summary for Register CONTROL_CONF_DPLL_TINITZ_SEL

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[3\]](#)

Table 19-249. CONTROL_CONF_DPLL_PHASELOCK_SEL

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0454 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2454 | | |
| Description | dpll_phaselock view Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MULT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | MULT | Select one of the following signals: 0x0: hwobs_coredpll_phaselock 0x1: hwobs_abedpll_phaselock 0x2: hwobs_perdpll_phaselock 0x3: hwobs_dsi1dpll_phaselock 0x4: hwobs_dsi2dpll_phaselock 0x5: reserved 0x6: hwobs_usbdpll_phaselock 0x7: reserved | RW | 0x0 |

Table 19-250. Register Call Summary for Register CONTROL_CONF_DPLL_PHASELOCK_SEL

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[3\]](#)

Table 19-251. CONTROL_CONF_DPLL_TENABLE_SEL

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 045C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 245C | | |
| Description | dpll_tenable view Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MULT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | MULT | Select one of the following signals: 0x0: hwobs_coredpll_tenable 0x1: hwobs_abedpll_tenable 0x2: hwobs_perdpll_tenable 0x3: hwobs_dsi1dpll_tenable 0x4: hwobs_dsi2dpll_tenable 0x5: reserved 0x6: hwobs_usbdpll_tenable 0x7: reserved | RW | 0x0 |

Table 19-252. Register Call Summary for Register CONTROL_CONF_DPLL_TENABLE_SEL

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[3\]](#)

Table 19-253. CONTROL_CONF_DPLL_TENABLEDIV_SEL

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 0460 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2460 | | |
| Description | dpll_tenablediv view Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MULT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | MULT | Select one of the following signals: 0x0: hwobs_coredpll_tenablediv 0x1: hwobs_abedpll_tenablediv 0x2: hwobs_perdpll_tenablediv 0x3: hwobs_dsi1dpll_tenablediv 0x4: hwobs_dsi2dpll_tenablediv 0x5: reserved 0x6: hwobs_usbdpll_tenablediv 0x7: reserved | RW | 0x0 |

Table 19-254. Register Call Summary for Register CONTROL_CONF_DPLL_TENABLEDIV_SEL

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[3\]](#)

Table 19-255. CONTROL_CONF_DPLL_BYPASSACK_SEL

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0464 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2464 | | |
| Description | dpll_bypassack view Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MULT | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | MULT | Select one of the following signals: 0x0: hwobs_coredpll_bypassack 0x1: hwobs_abedpll_bypassack 0x2: hwobs_perdppll_bypassack 0x3: hwobs_dsi1dppll_bypassack 0x4: hwobs_dsi2dppll_bypassack 0x5: reserved 0x6: hwobs_usbdpll_bypassack 0x7: reserved | RW | 0x0 |

Table 19-256. Register Call Summary for Register CONTROL_CONF_DPLL_BYPASSACK_SEL

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[3\]](#)

Table 19-257. CONTROL_CONF_DPLL_IDLE_SEL

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0468 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2468 | | |
| Description | dpL_idle view Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MULT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2:0 | MULT | Select one of the following signals: 0x0: hwobs_coredpll_idle 0x1: hwobs_abedpll_idle 0x2: hwobs_perdppll_idle 0x3: hwobs_dsi1dppll_idle 0x4: hwobs_dsi2dppll_idle 0x5: reserved 0x6: hwobs_usbdpll_idle 0x7: reserved | RW | 0x0 |

Table 19-258. Register Call Summary for Register CONTROL_CONF_DPLL_IDLE_SEL

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\]](#)
- [Other CORE DPLL Observable Signals: \[2\]](#)
- [Other ABE DPLL Observable Signals: \[3\]](#)
- [Other PERIPH DPLL Observable Signals: \[4\]](#)
- [Other DSI1 DPLL Observable Signals: \[5\]](#)
- [Other DSI2 DPLL Observable Signals: \[6\]](#)
- [Other USB DPLL Observable Signals: \[7\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[8\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[9\]](#)

Table 19-259. CONTROL_CORE_CONF_DEBUG_SEL_TST_0

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 0480 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 2480 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_0 0x1: clk_view_0 0x2: reserved 0x3: reserved 0x4: This information is not available in the public domain. 0x5: hwobs_int_cm2_0 0x6: hwobs_int_ivahd_0 0x7: reserved 0x8: hwobs_int_abe_0 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved 0xC: This information is not available in the public domain. | RW | 0x0 |

Table 19-260. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_0

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\] \[2\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[3\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[4\]](#)

Table 19-261. CONTROL_CORE_CONF_DEBUG_SEL_TST_1

| | | | | | |
|------------------|--|--|----------|----------------------|--|
| Address Offset | 0x0000 0484 | | Instance | SYSCTRL_GENERAL_CORE | |
| Physical Address | 0x4A00 2484 | | | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | | | |
| Type | RW | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_1 0x1: clk_view_1 0x2: reserved 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_1 0x6: hwobs_int_ivahd_1 0x7: reserved 0x8: hwobs_int_abe_1 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved 0xC: hwobs_bb2d_sys_interrupt_reqz | RW | 0x0 |

Table 19-262. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_1

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-263. CONTROL_CORE_CONF_DEBUG_SEL_TST_2

Address Offset

0x0000 0488

Physical Address

0x4A00 2488

Description

Select mode for debug port
Access conditions. Read: unrestricted, Write: unrestricted

Type

RW

Instance

SYSCTRL_GENERAL_CORE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_2 0x1: clk_view_2 0x2: reserved | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| | | 0x3: reserved | | |
| | | 0x4: reserved | | |
| | | 0x5: hwobs_int_cm2_2 | | |
| | | 0x6: hwobs_int_ivahd_2 | | |
| | | 0x7: reserved | | |
| | | 0x8: hwobs_int_abe_2 | | |
| | | 0x9: This information is not available in the public domain. | | |
| | | 0xA: reserved | | |
| | | 0xB: reserved | | |
| | | 0xC: hwobs_bb2d_mconnect_1 | | |

Table 19-264. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_2

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-265. CONTROL_CORE_CONF_DEBUG_SEL_TST_3

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 048C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 248C | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_3 0x1: dpll_freqlock 0x2: reserved 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_3 0x6: hwobs_int_ivahd_3 0x7: reserved 0x8: hwobs_int_abe_3 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved 0xC: hwobs_bb2d_mconnect_0 | RW | 0x0 |

Table 19-266. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_3

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-267. CONTROL_CORE_CONF_DEBUG_SEL_TST_4

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0490 | | | | | | | | | | | | | | | | Instance | SYSCTRL_GENERAL_CORE | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 2490 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_4 0x1: dpll_tinitz 0x2: reserved 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_4 0x6: hwobs_int_ivahd_4 0x7: reserved 0x8: hwobs_int_abe_4 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved 0xC: hwobs_bb2d_sconnect_2 | RW | 0x0 |

Table 19-268. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_4

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| | | 0x3: reserved | | |
| | | 0x4: reserved | | |
| | | 0x5: hwobs_int_cm2_6 | | |
| | | 0x6: hwobs_int_ivahd_6 | | |
| | | 0x7: reserved | | |
| | | 0x8: hwobs_int_abe_6 | | |
| | | 0x9: This information is not available in the public domain. | | |
| | | 0xA: reserved | | |
| | | 0xB: reserved | | |
| | | 0xC: hwobs_bb2d_sconnect_0 | | |

Table 19-272. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_6

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-273. CONTROL_CORE_CONF_DEBUG_SEL_TST_7

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 049C | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 249C | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_7 0x1: dpll_tenable 0x2: sdma_req_view_0 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_7 0x6: hwobs_int_ivahd_7 0x7: reserved 0x8: hwobs_int_abe_7 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved 0xC: hwobs_bb2d_pgoodin | RW | 0x0 |

Table 19-274. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_7

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-275. CONTROL_CORE_CONF_DEBUG_SEL_TST_8

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04A0 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24A0 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_8 0x1: dpll_tenablediv 0x2: sdma_req_view_1 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_8 0x6: hwobs_int_ivahd_8 0x7: reserved 0x8: hwobs_int_abe_8 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved 0xC: hwobs_bb2d_ponin | RW | 0x0 |

Table 19-276. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_8

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-277. CONTROL_CORE_CONF_DEBUG_SEL_TST_9

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04A4 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24A4 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_9 0x1: dpll_bypassack 0x2: sdma_req_view_2 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_9 0x6: hwobs_int_iva9d_9 0x7: reserved 0x8: hwobs_int_abe_9 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved 0xC: hwobs_bb2d_ponout | RW | 0x0 |

Table 19-278. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_9

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-279. CONTROL_CORE_CONF_DEBUG_SEL_TST_10

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04A8 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24A8 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_10 0x1: dpil_idle 0x2: sdma_req_view_3 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_10 0x6: hwobs_int_ivahd_10 0x7: reserved 0x8: hwobs_int_abe_10 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved | RW | 0x0 |

Table 19-280. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_10

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-281. CONTROL_CORE_CONF_DEBUG_SEL_TST_11

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04AC | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24AC | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_11 0x1: hwobs_hsusbotg_sofpulse 0x2: sdma_req_view_all 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_11 0x6: hwobs_int_ivahd_11 0x7: reserved 0x8: hwobs_int_abe_11 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved | RW | 0x0 |

Table 19-282. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_11

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)
- [USBOTGHS Subsystem Observable Signals: \[1\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[2\]](#)

Table 19-283. CONTROL_CORE_CONF_DEBUG_SEL_TST_12

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 04B0 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24B0 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_12 0x1: reserved 0x2: hwobs_coredivider_clkout3 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_12 0x6: hwobs_int_ivahd_12 0x7: reserved 0x8: hwobs_int_abe_12 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved | RW | 0x0 |

Table 19-284. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_12

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-285. CONTROL_CORE_CONF_DEBUG_SEL_TST_13

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04B4 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24B4 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_13 0x1: reserved 0x2: hwobs_perdivider_clkout4 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_13 0x6: hwobs_int_ivahd_13 0x7: reserved 0x8: hwobs_int_abe_13 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved | RW | 0x0 |

Table 19-286. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_13

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-287. CONTROL_CORE_CONF_DEBUG_SEL_TST_14

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 04B8 | | | | | | | | | | | | | | | | Instance | SYSCTRL_GENERAL_CORE | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 24B8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_14 0x1: reserved 0x2: hwobs_pd_l4_per_per32k_gfclk 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_14 0x6: hwobs_int_ivahd_14 0x7: reserved 0x8: hwobs_int_abe_14 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved | RW | 0x0 |

Table 19-288. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_14

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-289. CONTROL_CORE_CONF_DEBUG_SEL_TST_15

Address Offset

Physical Address

Description

Type

0x0000 04BC

0x4A00 24BC

Select mode for debug port
Access conditions. Read: unrestricted, Write: unrestricted

RW

Instance

SYSCTRL_GENERAL_CORE

313029282726252423222120191817161514131211109876543210

RESERVED

MODE

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_15 0x1: reserved 0x2: 0 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_15 0x6: hwobs_int_ivahd_15 0x7: reserved 0x8: hwobs_int_abe_15 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved | RW | 0x0 |

Table 19-290. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_15

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-291. CONTROL_CORE_CONF_DEBUG_SEL_TST_16

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04C0 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24C0 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:4 | RESERVED | | R | 0x0000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_16 0x1: reserved 0x2: 0 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_16 0x6: hwobs_int_ivahd_16 0x7: reserved 0x8: hwobs_int_abe_16 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved | RW | 0x0 |

Table 19-292. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_16

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-293. CONTROL_CORE_CONF_DEBUG_SEL_TST_17

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 04C4 | | | | | | | | | | | | | | | | Instance | SYSCTRL_GENERAL_CORE | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 24C4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------|---|---|---|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_17 0x1: reserved 0x2: 0 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_17 0x6: hwobs_int_ivahd_17 0x7: reserved 0x8: hwobs_int_abe_17 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved | RW | 0x0 |

Table 19-294. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_17

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-295. CONTROL_CORE_CONF_DEBUG_SEL_TST_18

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 04C8 | | | | | | | | | | | | | | | | Instance | SYSCTRL_GENERAL_CORE | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 24C8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_18 0x1: reserved 0x2: 0 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_18 0x6: hwobs_int_ivahd_18 0x7: reserved 0x8: hwobs_int_abe_18 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved | RW | 0x0 |

Table 19-296. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_18

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-297. CONTROL_CORE_CONF_DEBUG_SEL_TST_19

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04CC | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24CC | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_19 0x1: reserved 0x2: 0 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_19 0x6: hwobs_int_ivahd_19 0x7: reserved 0x8: hwobs_int_abe_19 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved | RW | 0x0 |

Table 19-298. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_19

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-299. CONTROL_CORE_CONF_DEBUG_SEL_TST_20

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04D0 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24D0 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_20 0x1: reserved 0x2: 0 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_20 0x6: hwobs_int_ivahd_20 0x7: reserved 0x8: hwobs_int_abe_20 0x9: This information is not available in the public domain. 0xA: reserved 0xB: reserved | RW | 0x0 |

Table 19-300. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_20

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-301. CONTROL_CORE_CONF_DEBUG_SEL_TST_21

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 04D4 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24D4 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:4 | RESERVED | | R | 0x0000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_21 0x1: reserved 0x2: 0 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_21 0x6: hwobs_int_ivahd_21 0x7: reserved 0x8: hwobs_int_abe_21 0x9: This information is not available in the public domain. 0xA: reserved | RW | 0x0 |

Table 19-302. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_21

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-303. CONTROL_CORE_CONF_DEBUG_SEL_TST_22

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 04D8 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24D8 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_22 0x1: reserved 0x2: 0 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_22 0x6: hwobs_int_ivahd_22 0x7: reserved 0x8: hwobs_int_abe_22 0x9: This information is not available in the public domain. 0xA: reserved | RW | 0x0 |

Table 19-304. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_22

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-305. CONTROL_CORE_CONF_DEBUG_SEL_TST_23

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 04DC | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24DC | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_23 0x1: reserved 0x2: 0 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_23 0x6: hwobs_int_ivahd_23 0x7: reserved 0x8: hwobs_int_abe_23 0x9: This information is not available in the public domain. 0xA: reserved | RW | 0x0 |

Table 19-306. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_23

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-307. CONTROL_CORE_CONF_DEBUG_SEL_TST_24

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04E0 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24E0 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:4 | RESERVED | | R | 0x0000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_24 0x1: reserved 0x2: 0 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_24 0x6: hwobs_int_ivaht_24 0x7: reserved 0x8: hwobs_int_abe_24 0x9: This information is not available in the public domain. 0xA: reserved | RW | 0x0 |

Table 19-308. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_24

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-309. CONTROL_CORE_CONF_DEBUG_SEL_TST_25

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 04E4 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SYSCTRL_GENERAL_CORE | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 24E4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_25 0x1: reserved 0x2: 0 0x3: reserved 0x4: reserved 0x5: hwobs_int_cm2_25 0x6: hwobs_int_ivahd_25 0x7: reserved 0x8: hwobs_int_abe_25 0x9: This information is not available in the public domain. 0xA: reserved | RW | 0x0 |

Table 19-310. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_25

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-311. CONTROL_CORE_CONF_DEBUG_SEL_TST_26

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 04E8 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24E8 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_26 0x1: reserved 0x2: 0 0x3: reserved 0x4: 0 0x5: hwobs_int_cm2_26 0x6: hwobs_int_ivahd_26 0x7: reserved 0x8: hwobs_int_abe_26 0x9: This information is not available in the public domain. 0xA: reserved | RW | 0x0 |

Table 19-312. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_26

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-313. CONTROL_CORE_CONF_DEBUG_SEL_TST_27

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04EC | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24EC | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:4 | RESERVED | | R | 0x0000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_27 0x1: reserved 0x2: 0 0x3: reserved 0x4: 0 0x5: hwobs_int_cm2_27 0x6: hwobs_int_ivahd_27 0x7: reserved 0x8: hwobs_int_abe_27 0x9: This information is not available in the public domain. 0xA: reserved 0xB: 0 0xC: sdma_req_view_0 | RW | 0x0 |

Table 19-314. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_27

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-315. CONTROL_CORE_CONF_DEBUG_SEL_TST_28

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04F0 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24F0 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_28 0x1: reserved 0x2: 0 0x3: reserved 0x4: 0 0x5: hwobs_int_cm2_28 0x6: hwobs_int_ivahd_28 0x7: reserved 0x8: hwobs_int_abe_28 0x9: This information is not available in the public domain. 0xA: reserved 0xB: 0 0xC: sdma_req_view_1 | RW | 0x0 |

Table 19-316. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_28

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-317. CONTROL_CORE_CONF_DEBUG_SEL_TST_29

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 04F4 | | | | | | | | | | | | | | | | Instance | SYSCTRL_GENERAL_CORE | | | | | | | | | | | | | | | |
| Physical Address | 0x4A00 24F4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | MODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_29 0x1: reserved 0x2: 0 0x3: reserved 0x4: 0 0x5: hwobs_int_cm2_29 0x6: hwobs_int_ivahd_29 0x7: reserved 0x8: hwobs_int_abe_29 0x9: This information is not available in the public domain. 0xA: reserved 0xB: 0 0xC: sdma_req_view_2 | RW | 0x0 |

Table 19-318. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_29

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-319. CONTROL_CORE_CONF_DEBUG_SEL_TST_30

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04F8 | Instance | SYSCTRL_GENERAL_CORE |
| Physical Address | 0x4A00 24F8 | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_30 0x1: reserved 0x2: 0 0x3: reserved 0x4: 0 0x5: hwobs_int_cm2_30 0x6: hwobs_int_ivahd_30 0x7: reserved 0x8: hwobs_int_abe_30 0x9: This information is not available in the public domain. 0xA: reserved 0xB: 0 0xC: sdma_req_view_3 | RW | 0x0 |

Table 19-320. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_30

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[1\]](#)

Table 19-321. CONTROL_CORE_CONF_DEBUG_SEL_TST_31

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 04FC | | |
| Physical Address | 0x4A00 24FC | Instance | SYSCTRL_GENERAL_CORE |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MODE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | MODE | Select one of the following signals: 0x0: hwobs_int_mpu_31 0x1: reserved 0x2: 0 0x3: reserved 0x4: 0 0x5: hwobs_int_cm2_31 0x6: hwobs_int_ivahd_31 0x7: reserved 0x8: hwobs_int_abe_31 0x9: This information is not available in the public domain. 0xA: reserved 0xB: 0 0xC: sdma_req_view_all | RW | 0x0 |

Table 19-322. Register Call Summary for Register CONTROL_CORE_CONF_DEBUG_SEL_TST_31

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\] \[2\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[3\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_CORE Register Summary: \[4\]](#)

19.6.4 SYSCTRL_GENERAL_WKUP Register Summary

Table 19-323. SYSCTRL_GENERAL_WKUP Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_GENERAL_WKUP Physical Address |
|--|------|-----------------------|-------------------------|---------------------------------------|
| CONTROL_GEN_WKUP_REVISION | R | 32 | 0x0000 0000 | 0x4A30 C000 |
| CONTROL_GEN_WKUP_HWINFO | R | 32 | 0x0000 0004 | 0x4A30 C004 |
| CONTROL_GEN_WKUP_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4A30 C010 |
| RESERVED | RW | 32 | 0x0000 0104 | 0x4A30 C104 |
| RESERVED | RW | 32 | 0x0000 0108 | 0x4A30 C108 |
| CONTROL_OCPREG_SPARE | RW | 32 | 0x0000 010C | 0x4A30 C10C |
| CONTROL_WKUP_PROT_EMIF1_SDR AM_CONFIG_REG | RW | 32 | 0x0000 0110 | 0x4A30 C110 |
| CONTROL_WKUP_PROT_EMIF1_SDR AM_CONFIG2_REG | RW | 32 | 0x0000 0114 | 0x4A30 C114 |
| CONTROL_WKUP_PROT_EMIF2_SDR AM_CONFIG_REG | RW | 32 | 0x0000 0118 | 0x4A30 C118 |
| CONTROL_WKUP_PROT_EMIF2_SDR AM_CONFIG2_REG | RW | 32 | 0x0000 011C | 0x4A30 C11C |
| CONTROL_WKUP_CONF_DEBUG_SE L_TST_i⁽¹⁾ | RW | 32 | 0x0000 0460 + (i*0x004) | 0x4A30 C460 + (i*0x004) |

⁽¹⁾ i = 0 to 31

19.6.5 SYSCTRL_GENERAL_WKUP Register Description

Table 19-324. CONTROL_GEN_WKUP_REVISION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----------|----------------------|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 C000 | | | | | | | | | | | | | | | | Instance | SYSCTRL_GENERAL_WKUP | | | | | | | | | | | | | | | |
| Description | Control module revision identifier Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| | | | | | | | | | | | | | | | | REVISION | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP Revision | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 19-325. Register Call Summary for Register CONTROL_GEN_WKUP_REVISION

Control Module Register Manual

- [SYSCTRL_GENERAL_WKUP Register Summary: \[0\]](#)

Table 19-326. CONTROL_GEN_WKUP_HWINFO

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A30 C004 | | | | | | | | | | | | | | | | Instance | SYSCTRL_GENERAL_WKUP | | | | | | | | | | | | | | | |
| Description | Information about the IP module hardware configuration that is, typically the module HDL generics (if any). Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| | | | | | | | | | | | | | | | | IP_HWINFO | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------|------|-------------|
| 31:0 | IP_HWINFO | IP-module dependent | R | 0x0000 0000 |

Table 19-327. Register Call Summary for Register CONTROL_GEN_WKUP_HWINFO

Control Module Register Manual

- [SYSCTRL_GENERAL_WKUP Register Summary: \[0\]](#)

Table 19-328. CONTROL_GEN_WKUP_SYSCONFIG

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0010 | Instance | SYSCTRL_GENERAL_WKUP |
| Physical Address | 0x4A30 C010 | | |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|-----------------------|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | IP_SYSCONFIG_IDLEMODE | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-----------|
| 31:4 | RESERVED | | R | 0x0000000 |
| 3:2 | IP_SYSCONFIG_IDLEMODE | <p>Select the local clock-gating strategy</p> <p>0x0: Clock is manually gated</p> <p>0x1: Clock is manually enabled</p> <p>0x2,0x3: Clock is automatically gated when there is no access to the Control Module through L4-interconnect</p> | RW | 0x2 |
| 1:0 | RESERVED | | R | 0x0 |

Table 19-329. Register Call Summary for Register CONTROL_GEN_WKUP_SYSCONFIG

Control Module Functional Description

- General Wakeup Control Module Instance: [0]

Control Module Programming Guide

- Control Module Global Initialization: [1]

Control Module Register Manual

- [SYSCTRL_GENERAL_WKUP Register Summary: \[2\]](#)

Table 19-330. CONTROL_OCPREG_SPARE

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 010C | | |
| Physical Address | 0x4A30 C10C | Instance | SYSCTRL_GENERAL_WKUP |
| Description | Spare Register Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| OCPREG_SPARE31 | OCPREG_SPARE30 | OCPREG_SPARE29 | OCPREG_SPARE28 | OCPREG_SPARE27 | OCPREG_SPARE26 | OCPREG_SPARE25 | OCPREG_SPARE24 | OCPREG_SPARE23 | OCPREG_SPARE22 | OCPREG_SPARE21 | OCPREG_SPARE20 | OCPREG_SPARE19 | OCPREG_SPARE18 | OCPREG_SPARE17 | OCPREG_SPARE16 | OCPREG_SPARE15 | OCPREG_SPARE14 | OCPREG_SPARE13 | OCPREG_SPARE12 | OCPREG_SPARE11 | OCPREG_SPARE10 | OCPREG_SPARE9 | OCPREG_SPARE8 | OCPREG_SPARE7 | OCPREG_SPARE6 | OCPREG_SPARE5 | OCPREG_SPARE4 | OCPREG_SPARE3 | OCPREG_SPARE2 | OCPREG_SPARE1 | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|-------------------|------|-------|
| 31 | OCPREG_SPARE31 | Spare register 31 | RW | 0 |
| 30 | OCPREG_SPARE30 | Spare register 30 | RW | 0 |
| 29 | OCPREG_SPARE29 | Spare register 29 | RW | 0 |
| 28 | OCPREG_SPARE28 | Spare register 28 | RW | 0 |
| 27 | OCPREG_SPARE27 | Spare register 27 | RW | 0 |
| 26 | OCPREG_SPARE26 | Spare register 26 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|-------------------|------|-------|
| 25 | OCPREG_SPARE25 | Spare register 25 | RW | 0 |
| 24 | OCPREG_SPARE24 | Spare register 24 | RW | 0 |
| 23 | OCPREG_SPARE23 | Spare register 23 | RW | 0 |
| 22 | OCPREG_SPARE22 | Spare register 22 | RW | 0 |
| 21 | OCPREG_SPARE21 | Spare register 21 | RW | 0 |
| 20 | OCPREG_SPARE20 | Spare register 20 | RW | 0 |
| 19 | OCPREG_SPARE19 | Spare register 19 | RW | 0 |
| 18 | OCPREG_SPARE18 | Spare register 18 | RW | 0 |
| 17 | OCPREG_SPARE17 | Spare register 17 | RW | 0 |
| 16 | OCPREG_SPARE16 | Spare register 16 | RW | 0 |
| 15 | OCPREG_SPARE15 | Spare register 15 | RW | 0 |
| 14 | OCPREG_SPARE14 | Spare register 14 | RW | 0 |
| 13 | OCPREG_SPARE13 | Spare register 13 | RW | 0 |
| 12 | OCPREG_SPARE12 | Spare register 12 | RW | 0 |
| 11 | OCPREG_SPARE11 | Spare register 11 | RW | 0 |
| 10 | OCPREG_SPARE10 | Spare register 10 | RW | 0 |
| 9 | OCPREG_SPARE9 | Spare register 9 | RW | 0 |
| 8 | OCPREG_SPARE8 | Spare register 8 | RW | 0 |
| 7 | OCPREG_SPARE7 | Spare register 7 | RW | 0 |
| 6 | OCPREG_SPARE6 | Spare register 6 | RW | 0 |
| 5 | OCPREG_SPARE5 | Spare register 5 | RW | 0 |
| 4 | OCPREG_SPARE4 | Spare register 4 | RW | 0 |
| 3 | OCPREG_SPARE3 | Spare register 3 | RW | 0 |
| 2 | OCPREG_SPARE2 | Spare register 2 | RW | 0 |
| 1 | OCPREG_SPARE1 | Spare register 1 | RW | 0 |
| 0 | RESERVED | Reserved | RW | 0 |

Table 19-331. Register Call Summary for Register CONTROL_OCPREG_SPARE

Control Module Functional Description

- [General Wakeup Control Module Instance: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_WKUP Register Summary: \[1\]](#)

Table 19-332. CONTROL_WKUP_PROT_EMIF1_SDRAM_CONFIG_REG

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0100 | Instance | SYSCTRL_GENERAL_WKUP |
| Physical Address | 0x4A30 C110 | | |
| Description | Protection EMIF1 SDRAM configuration register 1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|----|----|-----------------------|----|----------|----|----|-----------------------|----|----------|----|-----------------------------|----|----|----------|----|----|-------------------------|----|----------------|---|---|---------------------|---|-------------------|---|-------------------|---|----------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| EMIF1_SDRAM_TYPE | | | | EMIF1_SDRAM_IBANK_POS | | RESERVED | | | EMIF1_SDRAM_DDR2_DDQS | | RESERVED | | EMIF1_SDRAM_DDR_DISABLE_DLL | | | RESERVED | | | EMIF1_SDRAM_NARROW_MODE | | EMIF1_SDRAM_CL | | | EMIF1_SDRAM_ROWSIZE | | EMIF1_SDRAM_IBANK | | EMIF1_SDRAM_EBANK | | EMIF1_SDRAM_PAGESIZE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|--|------|-------|
| 31:29 | EMIF1_SDRAM_TYPE | SDRAM type selection: Set to 0x4 for LPDDR2-S4. Set to 0x5 for LPDDR2-S2. All other values are reserved. | RW | 0x4 |
| 28:27 | EMIF1_SDRAM_IBANK_POS | Internal bank position: Set to 0x0 to assign internal bank address bits from the L3 address as shown in Table 16-100 , <i>64-Byte Linear Read Starting at Address 0x0</i> , and Table 16-101 , <i>64-Byte Linear Read Starting at Address 0x8 (LPDDR2-S2)</i> , in Chapter 16 , <i>Memory Subsystem</i> . Set to 0x1, 0x2, or 0x3 to assign internal bank address bits from the L3 address as shown in Table 16-102 , <i>64-Byte Linear Read Starting at Address 0x8 (LPDDR2-S4)</i> , Table 16-103 , <i>64-Byte Linear Read Starting at Address 0x10</i> , and Table 16-104 , <i>64-Byte Linear Read Starting at Address 0x18</i> , in Chapter 16 , <i>Memory Subsystem</i> . | RW | 0x0 |
| 26:24 | RESERVED | | R | 0x0 |
| 23 | EMIF1_SDRAM_DDR2_DDQS | DDR2 differential DQS enable: Set to 0 for single ended DQS. Set to 1 for differential DQS. This bit is only for DDR2 mode; because the device supports LPDDR2, this bit is don't care. | RW | 0x1 |
| 22:21 | RESERVED | | R | 0x0 |
| 20 | EMIF1_SDRAM_DDR_DISABLE_DLL | Disable DLL select: Set to 0x0 to enable DLL inside SDRAM. Set to 0x1 to disable DLL inside SDRAM. | RW | 0x0 |
| 19:16 | RESERVED | | R | 0x0 |
| 15:14 | EMIF1_SDRAM_NARROW_MODE | SDRAM data bus width: Set to 0x0 for 64-bit width. Set to 0x1 for 32-bit width. Set to 0x2 for 16-bit width. All other values are reserved. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|--|------|-------|
| 13:10 | EMIF1_SDRAM_CL | CAS latency (RL latency). The value of this field defines the CAS latency to be used when accessing connected SDRAM devices: Supported for LPDDR2-SDRAM: 0x3: CAS latency of 3 cycles 0x4: CAS latency of 4 cycles 0x5: CAS latency of 5 cycles 0x6: CAS latency of 6 cycles 0x7: CAS latency of 7 cycles 0x8: CAS latency of 8 cycles All other values are reserved. | RW | 0x3 |
| 9:7 | EMIF1_SDRAM_ROWSIZE | Row size. Defines the number of row address bits of connected SDRAM devices: Set to 0x0 for 9 row bits. Set to 0x1 for 10 row bits. Set to 0x2 for 11 row bits. Set to 0x3 for 12 row bits. Set to 0x4 for 13 row bits. Set to 0x5 for 14 row bits. Set to 0x6 for 15 row bits. Set to 0x7 for 16 row bits. This field is used only when the ibank_pos field in the SDRAM Config register is set to 0x1, 0x2, or 0x3. | RW | 0x4 |
| 6:4 | EMIF1_SDRAM_IBANK | Internal bank setup. Defines number of banks inside connected SDRAM devices: Set to 0x0 for 1 bank. Set to 0x1 for 2 banks. Set to 0x2 for 4 banks. Set to 0x3 for 8 banks. All other values are reserved. | RW | 0x3 |
| 3 | EMIF1_SDRAM_EBANK | External CS setup. Defines whether SDRAM accesses will use 1 or 2 CS lines. Set to 0 to use pad_cs_o_n[0] only: Set to 0x0 to use only pad_cs_o_n[0]. Set to 0x1 to use pad_cs_o_n[1:0]. This bit is automatically set to 0 if either the cs0nvmen or cs1nvmen field in the LPDDR2-NVM is set to 1. | RW | 0x0 |
| 2:0 | EMIF1_SDRAM_PAGESIZE | Page size. Defines the internal page size of the connected SDRAM devices: Set to 0x0 for 256-word page (8 column bits). Set to 0x1 for 512-word page (9 column bits). Set to 0x2 for 1024-word page (10 column bits). Set to 0x3 for 2048-word page (11 column bits). All other values are reserved. | RW | 0x0 |

**Table 19-333. Register Call Summary for Register
CONTROL_WKUP_PROT_EMIF1_SDRAM_CONFIG_REG**

Control Module Functional Description

- [Protection SDRAM Configuration Registers: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_WKUP Register Summary: \[1\]](#)

Table 19-334. CONTROL_WKUP_PROT_EMIF1_SDRAM_CONFIG2_REG

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0114 | Instance | SYSCTRL_GENERAL_WKUP |
| Physical Address | 0x4A30 C114 | | |
| Description | Protection EMIF1 SDRAM configuration register 2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----------------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----------|----|---------------------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | EMIF1_SDRAM_CS1NVMEN | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | EMIF1_SDRAM_RDBNUM | | RESERVED | | EMIF1_SDRAM_RDBSIZE | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|----------|
| 31 | RESERVED | | R | 0x0 |
| 30 | EMIF1_SDRAM_CS1NVMEN | CS1 LPDDR2-NVM enable: Set to 0x1 if LPDDR2-NVM is connected to CS1. This bit is automatically set to 0x0 if the sdram_type field in the SDRAM Config register is not set to LPDDR2. | RW | 0x1 |
| 29:6 | RESERVED | | R | 0x000000 |
| 5:4 | EMIF1_SDRAM_RDBNUM | Row buffer setup. Defines the number of row buffers inside the connected LPDDR2-NVM devices: Set to 0x0 for 1 row buffer. Set to 0x1 for 2 row buffers. Set to 0x2 for 4 row buffers. Set to 0x3 for 8 row buffers. All other values are reserved. | RW | 0x1 |
| 3 | RESERVED | | R | 0x0 |
| 2:0 | EMIF1_SDRAM_RDBSIZE | Row data buffer size. Defines the row data buffer size of connected LPDDR2-NVM devices: Set to 0x0 for 32 bytes. Set to 0x1 for 64 bytes. Set to 0x2 for 128 bytes. Set to 0x3 for 256 bytes. Set to 0x4 for 512 bytes. Set to 0x5 for 1024 bytes. Set to 0x6 for 2048 bytes. Set to 0x7 for 4096 bytes. | RW | 0x0 |

**Table 19-335. Register Call Summary for Register
CONTROL_WKUP_PROT_EMIF1_SDRAM_CONFIG2_REG**

Control Module Functional Description

- [Protection SDRAM Configuration Registers: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_WKUP Register Summary: \[1\]](#)

Table 19-336. CONTROL_WKUP_PROT_EMIF2_SDRAM_CONFIG_REG

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0118 | Instance | SYSCTRL_GENERAL_WKUP |
| Physical Address | 0x4A30 C118 | | |
| Description | Protection EMIF2 SDRAM configuration register 1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|----|----|----|----|----|----|-----------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------------------------|---|---|---|---|---|---|---|----------------|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|
| EMIF2_SDRAM_TYPE | | | | | | | | EMIF2_SDRAM_DDR2_DDQS | | | | | | | | RESERVED | | | | | | | | EMIF2_SDRAM_NARROW_MODE | | | | | | | | EMIF2_SDRAM_CL | | | | | | | | EMIF2_SDRAM_ROW_SIZE | | | | | | | | EMIF2_SDRAM_IBANK | | | | | | | | EMIF2_SDRAM_EBANK | | | | | | | | EMIF2_SDRAM_PAGESIZE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|--|------|-------|
| 31:29 | EMIF2_SDRAM_TYPE | SDRAM type selection: Set to 0x4 for LPDDR2-S4. Set to 0x5 for LPDDR2-S2. All other values are reserved. | RW | 0x4 |
| 28:27 | EMIF2_SDRAM_IBANK_POS | Internal bank position: Set to 0x0 to assign internal bank address bits from the L3 address as shown in Table 16-100 , <i>64-Byte Linear Read Starting at Address 0x0</i> , and Table 16-101 , <i>64-Byte Linear Read Starting at Address 0x8 (LPDDR2-S2)</i> , in Chapter 16 , <i>Memory Subsystem</i> . Set to 0x1, 0x2, or 0x3 to assign internal bank address bits from the L3 address as shown in Table 16-102 , <i>64-Byte Linear Read Starting at Address 0x8 (LPDDR2-S4)</i> , Table 16-103 , <i>64-Byte Linear Read Starting at Address 0x10</i> , and Table 16-104 , <i>64-Byte Linear Read Starting at Address 0x18</i> , in Chapter 16 , <i>Memory Subsystem</i> . | RW | 0x0 |
| 26:24 | RESERVED | | R | 0x0 |
| 23 | EMIF2_SDRAM_DDR2_DDQS | DDR2 differential DQS enable: Set to 0 for single ended DQS. Set to 1 for differential DQS. This bit is only for DDR2 mode; because the device supports LPDDR2, this bit is don't care. | RW | 0x1 |
| 22:21 | RESERVED | | R | 0x0 |
| 20 | EMIF2_SDRAM_DDR_DISABLE_DLL | Disable DLL select: Set to 0x0 to enable DLL inside SDRAM. Set to 0x1 to disable DLL inside SDRAM. | RW | 0x0 |
| 19:16 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|--|------|-------|
| 15:14 | EMIF2_SDRAM_NARROW_MODE | SDRAM data bus width: Set to 0x0 for 64-bit width. Set to 0x1 for 32-bit width. Set to 0x2 for 16-bit width. All other values are reserved. | RW | 0x0 |
| 13:10 | EMIF2_SDRAM_CL | CAS latency (RL latency). The value of this field defines the CAS latency to be used when accessing connected SDRAM devices: Supported for LPDDR2-SDRAM: 0x3: CAS latency of 3 cycles 0x4: CAS latency of 4 cycles 0x5: CAS latency of 5 cycles 0x6: CAS latency of 6 cycles 0x7: CAS latency of 7 cycles 0x8: CAS latency of 8 cycles All other values are reserved. | RW | 0x3 |
| 9:7 | EMIF2_SDRAM_ROWSIZE | Row size. Defines the number of row address bits of connected SDRAM devices: Set to 0x0 for 9 row bits. Set to 0x1 for 10 row bits. Set to 0x2 for 11 row bits. Set to 0x3 for 12 row bits. Set to 0x4 for 13 row bits. Set to 0x5 for 14 row bits. Set to 0x6 for 15 row bits. Set to 0x7 for 16 row bits. This field is used only when the ibank_pos field in the SDRAM Config register is set to 0x1, 0x2, or 0x3. | RW | 0x4 |
| 6:4 | EMIF2_SDRAM_IBANK | Internal bank setup. Defines number of banks inside connected SDRAM devices: Set to 0x0 for 1 bank. Set to 0x1 for 2 banks. Set to 0x2 for 4 banks. Set to 0x3 for 8 banks. All other values are reserved. | RW | 0x3 |
| 3 | EMIF2_SDRAM_EBANK | External CS setup. Defines whether SDRAM accesses will use 1 or 2 CS lines. Set to 0 to use pad_cs_o_n[0] only: Set to 0x0 to use only pad_cs_o_n[0]. Set to 0x1 to use pad_cs_o_n[1:0]. This bit is automatically set to 0 if either the cs0nvmen or cs1nvmen field in the LPDDR2-NVM is set to 1. | RW | 0x0 |
| 2:0 | EMIF2_SDRAM_PAGESIZE | Page size. Defines the internal page size of the connected SDRAM devices: Set to 0x0 for 256-word page (8 column bits). Set to 0x1 for 512-word page (9 column bits). Set to 0x2 for 1024-word page (10 column bits). Set to 0x3 for 2048-word page (11 column bits). All other values are reserved. | RW | 0x0 |

**Table 19-337. Register Call Summary for Register
CONTROL_WKUP_PROT_EMIF2_SDRAM_CONFIG_REG**

Control Module Functional Description

- [Protection SDRAM Configuration Registers: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_WKUP Register Summary: \[1\]](#)

Table 19-338. CONTROL_WKUP_PROT_EMIF2_SDRAM_CONFIG2_REG

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0114 | Instance | SYSCTRL_GENERAL_WKUP |
| Physical Address | 0x4A30 C11C | | |
| Description | Protection EMIF1 SDRAM configuration register 2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----------------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|--------------------|---|----------|---------------------|---|---|---|---|
| RESERVED | EMIF2_SDRAM_CS1NVMEN | RESERVED | | | | | | | | | | | | | | | | | | | | | | EMIF2_SDRAM_RDBNUM | | RESERVED | EMIF2_SDRAM_RDBSIZE | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|----------|
| 31 | RESERVED | | R | 0x0 |
| 30 | EMIF2_SDRAM_CS1NVMEN | CS1 LPDDR2-NVM enable: Set to 0x1 if LPDDR2-NVM is connected to CS1. This bit is automatically set to 0x0 if the sdram_type field in the SDRAM Config register is not set to LPDDR2. | RW | 0x1 |
| 29:6 | RESERVED | | R | 0x000000 |
| 5:4 | EMIF2_SDRAM_RDBNUM | Row buffer setup. Defines the number of row buffers inside the connected LPDDR2-NVM devices: Set to 0x0 for 1 row buffer. Set to 0x1 for 2 row buffers. Set to 0x2 for 4 row buffers. Set to 0x3 for 8 row buffers. All other values are reserved. | RW | 0x1 |
| 3 | RESERVED | | R | 0x0 |
| 2:0 | EMIF2_SDRAM_RDBSIZE | Row data buffer size. Defines the row data buffer size of connected LPDDR2-NVM devices: Set to 0x0 for 32 bytes. Set to 0x1 for 64 bytes. Set to 0x2 for 128 bytes. Set to 0x3 for 256 bytes. Set to 0x4 for 512 bytes. Set to 0x5 for 1024 bytes. Set to 0x6 for 2048 bytes. Set to 0x7 for 4096 bytes. | RW | 0x0 |

**Table 19-339. Register Call Summary for Register
CONTROL_WKUP_PROT_EMIF2_SDRAM_CONFIG2_REG**

Control Module Functional Description

- [Protection SDRAM Configuration Registers: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_WKUP Register Summary: \[1\]](#)

Table 19-340. CONTROL_WKUP_CONF_DEBUG_SEL_TST_i

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0460 | Instance | SYSCTRL_GENERAL_WKUP |
| Physical Address | 0x4A30 C460 + (i*0x004) | | |
| Description | Select mode for debug port Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | MODE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | MODE | Select one of the following signals: 0x0: hwobs_int_prm_i ⁽¹⁾ 0x1: hwobs_int_cm1_i | RW | 0 |

⁽¹⁾ i = 0 to 31

Table 19-341. Register Call Summary for Register CONTROL_WKUP_CONF_DEBUG_SEL_TST_i

Control Module Functional Description

- [Observability Signals Multiplexing at General Core/Wake-Up Control Level: \[0\] \[1\]](#)

Control Module Programming Guide

- [Hardware Observability Settings: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_GENERAL_WKUP Register Summary: \[3\]](#)

19.6.6 SYSCTRL_PADCONF_CORE Register Summary

Table 19-342. SYSCTRL_PADCONF_CORE Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_PADCONF_C ORE Physical Address |
|--|------|-----------------------|----------------|---|
| CONTROL_PADCONF_CORE_REVISION | R | 32 | 0x00000000 | 0x4A10 0000 |
| CONTROL_PADCONF_CORE_HWINFO | R | 32 | 0x00000004 | 0x4A10 0004 |
| CONTROL_PADCONF_CORE_SYSCONFIG | RW | 32 | 0x00000010 | 0x4A10 0010 |
| CONTROL_CORE_PAD0_GPMC_AD0_PAD1_GPMC_AD1 | RW | 32 | 0x00000040 | 0x4A10 0040 |
| CONTROL_CORE_PAD0_GPMC_AD2_PAD1_GPMC_AD3 | RW | 32 | 0x00000044 | 0x4A10 0044 |
| CONTROL_CORE_PAD0_GPMC_AD4_PAD1_GPMC_AD5 | RW | 32 | 0x00000048 | 0x4A10 0048 |

Table 19-342. SYSCTRL_PADCONF_CORE Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_PADCONF_CORE Physical Address |
|---|------|-----------------------|----------------|---------------------------------------|
| CONTROL_CORE_PAD0_GPMC_AD6_PAD1_GPMC_AD7 | RW | 32 | 0x0000004C | 0x4A10 004C |
| CONTROL_CORE_PAD0_GPMC_AD8_PAD1_GPMC_AD9 | RW | 32 | 0x00000050 | 0x4A10 0050 |
| CONTROL_CORE_PAD0_GPMC_AD10_PAD1_GPMC_AD11 | RW | 32 | 0x00000054 | 0x4A10 0054 |
| CONTROL_CORE_PAD0_GPMC_AD12_PAD1_GPMC_AD13 | RW | 32 | 0x00000058 | 0x4A10 0058 |
| CONTROL_CORE_PAD0_GPMC_AD14_PAD1_GPMC_AD15 | RW | 32 | 0x0000005C | 0x4A10 005C |
| CONTROL_CORE_PAD0_GPMC_A16_PAD1_GPMC_A17 | RW | 32 | 0x00000060 | 0x4A10 0060 |
| CONTROL_CORE_PAD0_GPMC_A18_PAD1_GPMC_A19 | RW | 32 | 0x00000064 | 0x4A10 0064 |
| CONTROL_CORE_PAD0_GPMC_A20_PAD1_GPMC_A21 | RW | 32 | 0x00000068 | 0x4A10 0068 |
| CONTROL_CORE_PAD0_GPMC_A22_PAD1_GPMC_A23 | RW | 32 | 0x0000006C | 0x4A10 006C |
| CONTROL_CORE_PAD0_GPMC_A24_PAD1_GPMC_A25 | RW | 32 | 0x00000070 | 0x4A10 0070 |
| CONTROL_CORE_PAD0_GPMC_NCS0_PAD1_GPMC_NCS1 | RW | 32 | 0x00000074 | 0x4A10 0074 |
| CONTROL_CORE_PAD0_GPMC_NCS2_PAD1_GPMC_NCS3 | RW | 32 | 0x00000078 | 0x4A10 0078 |
| CONTROL_CORE_PAD0_GPMC_NWP_PAD1_GPMC_CLK | RW | 32 | 0x0000007C | 0x4A10 007C |
| CONTROL_CORE_PAD0_GPMC_NADV_ALE_PAD1_GPMC_NOE | RW | 32 | 0x00000080 | 0x4A10 0080 |
| CONTROL_CORE_PAD0_GPMC_NWE_PAD1_GPMC_NBE0_CLE | RW | 32 | 0x00000084 | 0x4A10 0084 |
| CONTROL_CORE_PAD0_GPMC_NBE1_PAD1_GPMC_WAIT0 | RW | 32 | 0x00000088 | 0x4A10 0088 |
| CONTROL_CORE_PAD0_GPMC_WAIT1_PAD1_GPMC_WAIT2 | RW | 32 | 0x0000008C | 0x4A10 008C |
| CONTROL_CORE_PAD0_GPMC_NCS4_PAD1_GPMC_NCS5 | RW | 32 | 0x00000090 | 0x4A10 0090 |
| CONTROL_CORE_PAD0_GPMC_NCS6_PAD1_GPMC_NCS7 | RW | 32 | 0x00000094 | 0x4A10 0094 |
| CONTROL_CORE_PAD0_GPIO63_PAD1_GPIO64 | RW | 32 | 0x00000098 | 0x4A10 0098 |
| CONTROL_CORE_PAD0_GPIO65_PAD1_GPIO66 | RW | 32 | 0x0000009C | 0x4A10 009C |
| CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0 | RW | 32 | 0x000000A0 | 0x4A10 00A0 |
| CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1 | RW | 32 | 0x000000A4 | 0x4A10 00A4 |
| CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2 | RW | 32 | 0x000000A8 | 0x4A10 00A8 |
| CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3 | RW | 32 | 0x000000AC | 0x4A10 00AC |
| CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4 | RW | 32 | 0x000000B0 | 0x4A10 00B0 |
| CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0 | RW | 32 | 0x000000B4 | 0x4A10 00B4 |

Table 19-342. SYSCTRL_PADCONF_CORE Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_PADCONF_CORE Physical Address |
|--|------|-----------------------|----------------|---------------------------------------|
| CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1 | RW | 32 | 0x000000B8 | 0x4A10 00B8 |
| CONTROL_CORE_PAD0_CAM_SHUTTER_PAD1_CAM_STROBE | RW | 32 | 0x000000BC | 0x4A10 00BC |
| CONTROL_CORE_PAD0_CAM_GLOBALRESET_PAD1_USBB1_ULPITLL_CLK | RW | 32 | 0x000000C0 | 0x4A10 00C0 |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_STP_PAD1_USBB1_ULPITLL_DIR | RW | 32 | 0x000000C4 | 0x4A10 00C4 |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_NXT_PAD1_USBB1_ULPITLL_DATA0 | RW | 32 | 0x000000C8 | 0x4A10 00C8 |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_DATA1_PAD1_USBB1_ULPITLL_DATA2 | RW | 32 | 0x000000CC | 0x4A10 00CC |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_DATA3_PAD1_USBB1_ULPITLL_DATA4 | RW | 32 | 0x000000D0 | 0x4A10 00D0 |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_DATA5_PAD1_USBB1_ULPITLL_DATA6 | RW | 32 | 0x000000D4 | 0x4A10 00D4 |
| CONTROL_CORE_PAD0_USBB1_ULPITLL_DATA7_PAD1_USBB1_HSIC_DATA | RW | 32 | 0x000000D8 | 0x4A10 00D8 |
| CONTROL_CORE_PAD0_USBB1_HSIC_STROBE_PAD1_GPIO_98 | RW | 32 | 0x000000DC | 0x4A10 00DC |
| CONTROL_CORE_PAD0_GPIO_99_PAD1_SDMMC1_CLK | RW | 32 | 0x000000E0 | 0x4A10 00E0 |
| CONTROL_CORE_PAD0_SDMMC1_CMD_PAD1_SDMMC1_DATA0 | RW | 32 | 0x000000E4 | 0x4A10 00E4 |
| CONTROL_CORE_PAD0_SDMMC1_DATA1_PAD1_SDMMC1_DATA2 | RW | 32 | 0x000000E8 | 0x4A10 00E8 |
| CONTROL_CORE_PAD0_SDMMC1_DATA3_PAD1_SDMMC1_DATA4 | RW | 32 | 0x000000EC | 0x4A10 00EC |
| CONTROL_CORE_PAD0_SDMMC1_DATA5_PAD1_SDMMC1_DATA6 | RW | 32 | 0x000000F0 | 0x4A10 00F0 |
| CONTROL_CORE_PAD0_SDMMC1_DATA7_PAD1_ABE_MCBSP2_CLKX | RW | 32 | 0x000000F4 | 0x4A10 00F4 |
| CONTROL_CORE_PAD0_ABE_MCBSP2_DR_PAD1_ABE_MCBSP2_DX | RW | 32 | 0x000000F8 | 0x4A10 00F8 |
| CONTROL_CORE_PAD0_ABE_MCBSP2_FSX_PAD1_ABE_MCBSP1_CLKX | RW | 32 | 0x000000FC | 0x4A10 00FC |
| CONTROL_CORE_PAD0_ABE_MCBSP1_DR_PAD1_ABE_MCBSP1_DX | RW | 32 | 0x00000100 | 0x4A10 0100 |
| CONTROL_CORE_PAD0_ABE_MCBSP1_FSX_PAD1_ABE_PDM_UL_DATA | RW | 32 | 0x00000104 | 0x4A10 0104 |
| CONTROL_CORE_PAD0_ABE_PDM_DATA_L_PAD1_ABE_PDM_FRAME | RW | 32 | 0x00000108 | 0x4A10 0108 |
| CONTROL_CORE_PAD0_ABE_PDM_DATA_B_CLK_PAD1_ABE_CLKS | RW | 32 | 0x0000010C | 0x4A10 010C |
| CONTROL_CORE_PAD0_ABE_DMIC_CLK1_PAD1_ABE_DMIC_DIN1 | RW | 32 | 0x00000110 | 0x4A10 0110 |
| CONTROL_CORE_PAD0_ABE_DMIC_CLK2_PAD1_ABE_DMIC_DIN3 | RW | 32 | 0x00000114 | 0x4A10 0114 |
| CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS | RW | 32 | 0x00000118 | 0x4A10 0118 |

Table 19-342. SYSCTRL_PADCONF_CORE Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_PADCONF_CORE Physical Address |
|--|------|-----------------------|----------------|---------------------------------------|
| CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX | RW | 32 | 0x0000011C | 0x4A10 011C |
| CONTROL_CORE_PAD0_HDQ_SIO_PAD1_I2C1_SCL | RW | 32 | 0x00000120 | 0x4A10 0120 |
| CONTROL_CORE_PAD0_I2C1_SDA_PAD1_I2C2_SCL | RW | 32 | 0x00000124 | 0x4A10 0124 |
| CONTROL_CORE_PAD0_I2C2_SDA_PAD1_I2C3_SCL | RW | 32 | 0x00000128 | 0x4A10 0128 |
| CONTROL_CORE_PAD0_I2C3_SDA_PAD1_I2C4_SCL | RW | 32 | 0x0000012C | 0x4A10 012C |
| CONTROL_CORE_PAD0_I2C4_SDA_PAD1_MCSP1_CLK | RW | 32 | 0x00000130 | 0x4A10 0130 |
| CONTROL_CORE_PAD0_MCSP1_SO_MI_PAD1_MCSP1_SIMO | RW | 32 | 0x00000134 | 0x4A10 0134 |
| CONTROL_CORE_PAD0_MCSP1_CS0_PAD1_MCSP1_CS1 | RW | 32 | 0x00000138 | 0x4A10 0138 |
| CONTROL_CORE_PAD0_MCSP1_CS2_PAD1_MCSP1_CS3 | RW | 32 | 0x0000013C | 0x4A10 013C |
| CONTROL_CORE_PAD0_UART3_CTS_RCTX_PAD1_UART3_RTS_SD | RW | 32 | 0x00000140 | 0x4A10 0140 |
| CONTROL_CORE_PAD0_UART3_RX_IRRX_PAD1_UART3_TX_IRTX | RW | 32 | 0x00000144 | 0x4A10 0144 |
| CONTROL_CORE_PAD0_SDMMC5_CLK_PAD1_SDMMC5_CMD | RW | 32 | 0x00000148 | 0x4A10 0148 |
| CONTROL_CORE_PAD0_SDMMC5_DAT0_PAD1_SDMMC5_DAT1 | RW | 32 | 0x0000014C | 0x4A10 014C |
| CONTROL_CORE_PAD0_SDMMC5_DAT2_PAD1_SDMMC5_DAT3 | RW | 32 | 0x00000150 | 0x4A10 0150 |
| CONTROL_CORE_PAD0_MCSP14_CLK_PAD1_MCSP14_SIMO | RW | 32 | 0x00000154 | 0x4A10 0154 |
| CONTROL_CORE_PAD0_MCSP14_SO_MI_PAD1_MCSP14_CS0 | RW | 32 | 0x00000158 | 0x4A10 0158 |
| CONTROL_CORE_PAD0_UART4_RX_PAD1_UART4_TX | RW | 32 | 0x0000015C | 0x4A10 015C |
| CONTROL_CORE_PAD0_USBB2_ULPI_TLL_CLK_PAD1_USBB2_ULPI_TLL_STP | RW | 32 | 0x00000160 | 0x4A10 0160 |
| CONTROL_CORE_PAD0_USBB2_ULPI_TLL_DIR_PAD1_USBB2_ULPI_TLL_NEXT | RW | 32 | 0x00000164 | 0x4A10 0164 |
| CONTROL_CORE_PAD0_USBB2_ULPI_TLL_DAT0_PAD1_USBB2_ULPI_TLL_DAT1 | RW | 32 | 0x00000168 | 0x4A10 0168 |
| CONTROL_CORE_PAD0_USBB2_ULPI_TLL_DAT2_PAD1_USBB2_ULPI_TLL_DAT3 | RW | 32 | 0x0000016C | 0x4A10 016C |
| CONTROL_CORE_PAD0_USBB2_ULPI_TLL_DAT4_PAD1_USBB2_ULPI_TLL_DAT5 | RW | 32 | 0x00000170 | 0x4A10 0170 |
| CONTROL_CORE_PAD0_USBB2_ULPI_TLL_DAT6_PAD1_USBB2_ULPI_TLL_DAT7 | RW | 32 | 0x00000174 | 0x4A10 0174 |
| CONTROL_CORE_PAD0_USBB2_HSI_C_DATA_PAD1_USBB2_HSI_C_STROBE | RW | 32 | 0x00000178 | 0x4A10 0178 |
| CONTROL_CORE_PAD0_KPD_COL3_PAD1_KPD_COL4 | RW | 32 | 0x0000017C | 0x4A10 017C |

Table 19-342. SYSCTRL_PADCONF_CORE Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_PADCONF_CORE Physical Address |
|---|------|-----------------------|----------------|---------------------------------------|
| CONTROL_CORE_PAD0_KPD_COL5_PAD1_KPD_COL0 | RW | 32 | 0x00000180 | 0x4A10 0180 |
| CONTROL_CORE_PAD0_KPD_COL1_PAD1_KPD_COL2 | RW | 32 | 0x00000184 | 0x4A10 0184 |
| CONTROL_CORE_PAD0_KPD_ROW3_PAD1_KPD_ROW4 | RW | 32 | 0x00000188 | 0x4A10 0188 |
| CONTROL_CORE_PAD0_KPD_ROW5_PAD1_KPD_ROW0 | RW | 32 | 0x0000018C | 0x4A10 018C |
| CONTROL_CORE_PAD0_KPD_ROW1_PAD1_KPD_ROW2 | RW | 32 | 0x00000190 | 0x4A10 0190 |
| CONTROL_CORE_PAD0_USBA0_OTG_CE_PAD1_USBA0_OTG_DP | RW | 32 | 0x00000194 | 0x4A10 0194 |
| CONTROL_CORE_PAD0_USBA0_OTG_DM_PAD1_FREF_CLK1_OUT | RW | 32 | 0x00000198 | 0x4A10 0198 |
| CONTROL_CORE_PAD0_FREF_CLK2_OUT_PAD1_SYS_NIRQ1 | RW | 32 | 0x0000019C | 0x4A10 019C |
| CONTROL_CORE_PAD0_SYS_NIRQ2_PAD1_SYS_BOOT0 | RW | 32 | 0x000001A0 | 0x4A10 01A0 |
| CONTROL_CORE_PAD0_SYS_BOOT1_PAD1_SYS_BOOT2 | RW | 32 | 0x000001A4 | 0x4A10 01A4 |
| CONTROL_CORE_PAD0_SYS_BOOT3_PAD1_SYS_BOOT4 | RW | 32 | 0x000001A8 | 0x4A10 01A8 |
| CONTROL_CORE_PAD0_SYS_BOOT5_PAD1_DPM_EMU0 | RW | 32 | 0x000001AC | 0x4A10 01AC |
| CONTROL_CORE_PAD0_DPM_EMU1_PAD1_DPM_EMU2 | RW | 32 | 0x000001B0 | 0x4A10 01B0 |
| CONTROL_CORE_PAD0_DPM_EMU3_PAD1_DPM_EMU4 | RW | 32 | 0x000001B4 | 0x4A10 01B4 |
| CONTROL_CORE_PAD0_DPM_EMU5_PAD1_DPM_EMU6 | RW | 32 | 0x000001B8 | 0x4A10 01B8 |
| CONTROL_CORE_PAD0_DPM_EMU7_PAD1_DPM_EMU8 | RW | 32 | 0x000001BC | 0x4A10 01BC |
| CONTROL_CORE_PAD0_DPM_EMU9_PAD1_DPM_EMU10 | RW | 32 | 0x000001C0 | 0x4A10 01C0 |
| CONTROL_CORE_PAD0_DPM_EMU11_PAD1_DPM_EMU12 | RW | 32 | 0x000001C4 | 0x4A10 01C4 |
| CONTROL_CORE_PAD0_DPM_EMU13_PAD1_DPM_EMU14 | RW | 32 | 0x000001C8 | 0x4A10 01C8 |
| CONTROL_CORE_PAD0_DPM_EMU15_PAD1_DPM_EMU16 | RW | 32 | 0x000001CC | 0x4A10 01CC |
| CONTROL_CORE_PAD0_DPM_EMU17_PAD1_DPM_EMU18 | RW | 32 | 0x000001D0 | 0x4A10 01D0 |
| CONTROL_CORE_PAD0_DPM_EMU19_PAD1_CSI22_DX2 | RW | 32 | 0x000001D4 | 0x4A10 01D4 |
| CONTROL_PADCONF_WAKEUPEVENT_0 | R | 32 | 0x000001D8 | 0x4A10 01D8 |
| CONTROL_PADCONF_WAKEUPEVENT_1 | R | 32 | 0x000001DC | 0x4A10 01DC |
| CONTROL_PADCONF_WAKEUPEVENT_2 | R | 32 | 0x000001E0 | 0x4A10 01E0 |
| CONTROL_PADCONF_WAKEUPEVENT_3 | R | 32 | 0x000001E4 | 0x4A10 01E4 |
| CONTROL_PADCONF_WAKEUPEVENT_4 | R | 32 | 0x000001E8 | 0x4A10 01E8 |

Table 19-342. SYSCTRL_PADCONF_CORE Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_PADCONF_CORE Physical Address |
|-------------------------------|------|-----------------------|----------------|---------------------------------------|
| CONTROL_PADCONF_WAKEUPEVENT_5 | R | 32 | 0x000001EC | 0x4A10 01EC |
| CONTROL_PADCONF_WAKEUPEVENT_6 | R | 32 | 0x000001F0 | 0x4A10 01F0 |
| CONTROL_CORE_PAD0_CSI22_DY2 | RW | 32 | 0x0000 01F4 | 0x4A10 01F4 |
| CONTROL_PADCONF_GLOBAL | RW | 32 | 0x000005A0 | 0x4A10 05A0 |
| CONTROL_CORE_PADCONF_MODE | RW | 32 | 0x000005A4 | 0x4A10 05A4 |
| CONTROL_SMART1IO_PADCONF_0 | RW | 32 | 0x000005A8 | 0x4A10 05A8 |
| CONTROL_SMART1IO_PADCONF_1 | RW | 32 | 0x000005AC | 0x4A10 05AC |
| CONTROL_SMART2IO_PADCONF_0 | RW | 32 | 0x000005B0 | 0x4A10 05B0 |
| CONTROL_SMART2IO_PADCONF_1 | RW | 32 | 0x000005B4 | 0x4A10 05B4 |
| CONTROL_SMART3IO_PADCONF_0 | RW | 32 | 0x000005B8 | 0x4A10 05B8 |
| CONTROL_SMART3IO_PADCONF_1 | RW | 32 | 0x000005BC | 0x4A10 05BC |
| CONTROL_SMART3IO_PADCONF_2 | RW | 32 | 0x000005C0 | 0x4A10 05C0 |
| CONTROL_USBB_HSIC | RW | 32 | 0x000005C4 | 0x4A10 05C4 |
| CONTROL_SMART3IO_PADCONF_3 | RW | 32 | 0x000005C8 | 0x4A10 05C8 |
| CONTROL_SMART2IO_PADCONF_2 | RW | 32 | 0x000005CC | 0x4A10 05CC |
| CONTROL_SMART1IO_PADCONF_2 | RW | 32 | 0x000005D0 | 0x4A10 05D0 |
| CONTROL_SMART1IO_PADCONF_3 | RW | 32 | 0x000005D4 | 0x4A10 05D4 |
| CONTROL_C2CIO_PADCONF_0 | RW | 32 | 0x000005D8 | 0x4A10 05D8 |
| CONTROL_PBIASLITE | RW | 32 | 0x00000600 | 0x4A10 0600 |
| CONTROL_I2C_0 | RW | 32 | 0x00000604 | 0x4A10 0604 |
| CONTROL_CAMERA_RX | RW | 32 | 0x00000608 | 0x4A10 0608 |
| RESERVED | RW | 32 | 0x0000060C | 0x4A10 060C |
| RESERVED | RW | 32 | 0x00000610 | 0x4A10 0610 |
| CONTROL_MMC2 | RW | 32 | 0x00000614 | 0x4A10 0614 |
| CONTROL_DSIPHY | RW | 32 | 0x00000618 | 0x4A10 0618 |
| CONTROL_MCBSPLP | RW | 32 | 0x0000061C | 0x4A10 061C |
| CONTROL_USB2PHYCORE | RW | 32 | 0x00000620 | 0x4A10 0620 |
| CONTROL_I2C_1 | RW | 32 | 0x00000624 | 0x4A10 0624 |
| CONTROL_MMC1 | RW | 32 | 0x00000628 | 0x4A10 0628 |
| CONTROL_HSI | RW | 32 | 0x0000062C | 0x4A10 062C |
| CONTROL_USB | RW | 32 | 0x00000630 | 0x4A10 0630 |
| CONTROL_HDQ | RW | 32 | 0x00000634 | 0x4A10 0634 |
| CONTROL_LPDDR2IO1_0 | RW | 32 | 0x00000638 | 0x4A10 0638 |
| CONTROL_LPDDR2IO1_1 | RW | 32 | 0x0000063C | 0x4A10 063C |
| CONTROL_LPDDR2IO1_2 | RW | 32 | 0x00000640 | 0x4A10 0640 |
| CONTROL_LPDDR2IO1_3 | RW | 32 | 0x00000644 | 0x4A10 0644 |
| CONTROL_LPDDR2IO2_0 | RW | 32 | 0x00000648 | 0x4A10 0648 |
| CONTROL_LPDDR2IO2_1 | RW | 32 | 0x0000064C | 0x4A10 064C |
| CONTROL_LPDDR2IO2_2 | RW | 32 | 0x00000650 | 0x4A10 0650 |
| CONTROL_LPDDR2IO2_3 | RW | 32 | 0x00000654 | 0x4A10 0654 |
| CONTROL_BUS_HOLD | RW | 32 | 0x00000658 | 0x4A10 0658 |
| CONTROL_C2C | RW | 32 | 0x0000065C | 0x4A10 065C |
| CONTROL_CORE_CONTROL_SPARE_RW | RW | 32 | 0x00000660 | 0x4A10 0660 |
| CONTROL_CORE_CONTROL_SPARE_R | R | 32 | 0x00000664 | 0x4A10 0664 |

Table 19-342. SYSCTRL_PADCONF_CORE Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_PADCONF_C ORE Physical Address |
|---|------|-----------------------|----------------|---|
| CONTROL_CORE_CONTROL_SPARE_R_C0 | RW | 32 | 0x00000668 | 0x4A10 0668 |
| CONTROL_CORE_CONTROL_SPARE_RW1 | RW | 32 | 0x0000066C | 0x4A10 066C |
| CONTROL_CORE_CONTROL_SPARE_RW2 | RW | 32 | 0x00000670 | 0x4A10 0670 |
| CONTROL_CORE_CONTROL_SPARE_RW3 | RW | 32 | 0x00000674 | 0x4A10 0674 |
| CONTROL_CORE_CONTROL_SPARE_RW4 | RW | 32 | 0x00000678 | 0x4A10 0678 |
| CONTROL_CORE_CONTROL_SPARE_RW5 | RW | 32 | 0x0000067C | 0x4A10 067C |
| CONTROL_CORE_CONTROL_SPARE_RW6 | RW | 32 | 0x00000680 | 0x4A10 0680 |
| CONTROL_CORE_CONTROL_SPARE_RW7 | RW | 32 | 0x00000684 | 0x4A10 0684 |
| CONTROL_CORE_CONTROL_SPARE_RW8 | RW | 32 | 0x00000688 | 0x4A10 0688 |
| CONTROL_CORE_CONTROL_SPARE_RW9 | RW | 32 | 0x0000068C | 0x4A10 068C |
| CONTROL_CORE_CONTROL_SPARE_R1 | R | 32 | 0x00000690 | 0x4A10 0690 |
| RESERVED | RW | 32 | 0x0000 0694 | 0x4A10 0694 |
| RESERVED | RW | 32 | 0x00000700 | 0x4A10 0700 |
| CONTROL_EFUSE_2 | RW | 32 | 0x00000704 | 0x4A10 0704 |
| CONTROL_EFUSE_3 | R | 32 | 0x00000708 | 0x4A10 0708 |
| CONTROL_EFUSE_4 | RW | 32 | 0x0000070C | 0x4A10 070C |

19.6.7 SYSCTRL_PADCONF_CORE Register Description

Table 19-343. CONTROL_PADCONF_CORE_REVISION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|-------------|--|--|--|--|--|--|--|--|----------|----------------------|--|--|--|--|--|------|--------------------|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 0000 | | | | | | | | | | | | | | | | Instance | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Description | Control module revision identifier Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div><div><div>313029282726252423222120191817161514131211109876543210</div></div></div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | Description | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | |
| 31:0 | REVISION | | | | | | | IP Revision | | | | | | | | | | | | | | | | R | See ⁽¹⁾ | | | | | | | | |

⁽¹⁾ TI internal data

Table 19-344. Register Call Summary for Register CONTROL_PADCONF_CORE_REVISION

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-345. CONTROL_PADCONF_CORE_HWINFO

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0004 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0004 | | |
| Description | Information about the IP module hardware configuration that is, typically the module HDL generics (if any). Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| IP_HWINFO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------|------|-------------|
| 31:0 | IP_HWINFO | IP-module dependent | R | 0x0000 0000 |

Table 19-346. Register Call Summary for Register CONTROL_PADCONF_CORE_HWINFO

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-347. CONTROL_PADCONF_CORE_SYSCONFIG

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0010 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0010 | | |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------------|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | IP_SYSCONFIG_IDLEMODE | RESERVED | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:2 | IP_SYSCONFIG_IDLEMODE | Select the local clock-gating strategy 0x0: Clock is manually gated 0x1: Clock is manually enabled 0x2,0x3: Clock is automatically gated when there is no access to the Control Module through L4-interconnect | RW | 0x2 |
| 1:0 | RESERVED | | R | 0x0 |

Table 19-348. Register Call Summary for Register CONTROL_PADCONF_CORE_SYSCONFIG

Control Module Functional Description

- [Device Core Control Module Instance: \[0\]](#)

Control Module Programming Guide

- [Control Module Global Initialization: \[1\]](#)
- [Off Mode Preliminary Settings: \[2\]](#)

**Table 19-348. Register Call Summary for Register CONTROL_PADCONF_CORE_SYSCONFIG
(continued)**

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[3\]](#)

Table 19-349. CONTROL_CORE_PAD0_GPMC_AD0_PAD1_GPMC_AD1

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0040 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A10 0040 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Register control for Pads gpmc_ad0 and gpmc_ad1 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|-----------------------|----|------------------|----|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|-------------------------|-----------------------|---|------------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GPMC_AD1_WAKEUPEVENT | GPMC_AD1_WAKEUPENABLE | GPMC_AD1_OFFMODEPULLTYPESELECT | GPMC_AD1_OFFMODEPULLUDENABLE | GPMC_AD1_OFFMODEOUTVALUE | GPMC_AD1_OFFMODEOUTENABLE | GPMC_AD1_OFFMODEEENABLE | GPMC_AD1_INPUTENABLE | RESERVED | | | GPMC_AD1_PULLTYPESELECT | GPMC_AD1_PULLUDENABLE | | GPMC_AD1_MUXMODE | | GPMC_AD0_WAKEUPEVENT | GPMC_AD0_WAKEUPENABLE | GPMC_AD0_OFFMODEPULLTYPESELECT | GPMC_AD0_OFFMODEPULLUDENABLE | GPMC_AD0_OFFMODEOUTVALUE | GPMC_AD0_OFFMODEOUTENABLE | GPMC_AD0_OFFMODEEENABLE | GPMC_AD0_INPUTENABLE | RESERVED | | GPMC_AD0_PULLTYPESELECT | GPMC_AD0_PULLUDENABLE | | GPMC_AD0_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | GPMC_AD1_WAKEUPEVENT | Pad_x wake-up event status latched in the I/O Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_AD1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_AD1_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_AD1_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ad1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_AD1_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ad1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_AD1_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ad1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 25 | GPMC_AD1_OFFMODEENABLE | OffMode mode override control for pad gpmc_ad1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_AD1_INPUTENABLE | Input enable value for pad gpmc_ad1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_AD1_PULLTYPESELECT | pullup/down selection for pad gpmc_ad1 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | GPMC_AD1_PULLUDENABLE | pullup/down enable for pad gpmc_ad1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_AD1_MUXMODE | Functional multiplexing selection for pad gpmc_ad1 0x0: Select gpmc_ad1 0x1: Select sdmmc2_dat1 | RW | 0x0 |
| 15 | GPMC_AD0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_AD0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_AD0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_AD0_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ad0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_AD0_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ad0 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_AD0_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ad0. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_AD0_OFFMODEENABLE | OffMode mode override control for pad gpmc_ad0 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_AD0_INPUTENABLE | Input enable value for pad gpmc_ad0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_AD0_PULLTYPESELECT | pullup/down selection for pad gpmc_ad0 0x0: pulldown selected 0x1: pullup selected | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|-------|
| 3 | GPMC_AD0_PULLUDENABLE | pullup/down enable for pad gpmc_ad0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_AD0_MUXMODE | Functional multiplexing selection for pad gpmc_ad0 0x0: Select gpmc_ad0 0x1: Select sdmmc2_dat0 | RW | 0x0 |

**Table 19-350. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_AD0_PAD1_GPMC_AD1**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-351. CONTROL_CORE_PAD0_GPMC_AD2_PAD1_GPMC_AD3

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0044 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0044 | | |
| Description | Register control for Pads gpmc_ad2 and gpmc_ad3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|-----------------------|------------------|----|----|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|-------------------------|-----------------------|------------------|---|---|
| GPMC_AD3_WAKEUPEVENT | GPMC_AD3_WAKEUPENABLE | GPMC_AD3_OFFMODEPULLTYPESELECT | GPMC_AD3_OFFMODEPULLUDENABLE | GPMC_AD3_OFFMODEOUTVALUE | GPMC_AD3_OFFMODEOUTENABLE | GPMC_AD3_OFFMODEEENABLE | GPMC_AD3_INPUTENABLE | RESERVED | | | GPMC_AD3_PULLTYPESELECT | GPMC_AD3_PULLUDENABLE | GPMC_AD3_MUXMODE | | | GPMC_AD2_WAKEUPEVENT | GPMC_AD2_WAKEUPENABLE | GPMC_AD2_OFFMODEPULLTYPESELECT | GPMC_AD2_OFFMODEPULLUDENABLE | GPMC_AD2_OFFMODEOUTVALUE | GPMC_AD2_OFFMODEOUTENABLE | GPMC_AD2_OFFMODEEENABLE | GPMC_AD2_INPUTENABLE | RESERVED | | | GPMC_AD2_PULLTYPESELECT | GPMC_AD2_PULLUDENABLE | GPMC_AD2_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | GPMC_AD3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_AD3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_AD3_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad3 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 28 | GPMC_AD3_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ad3 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_AD3_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ad3 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_AD3_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ad3. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_AD3_OFFMODEENABLE | OffMode mode override control for pad gpmc_ad3 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_AD3_INPUTENABLE | Input enable value for pad gpmc_ad3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_AD3_PULLTYPESELECT | pullup/down selection for pad gpmc_ad3 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | GPMC_AD3_PULLUDENABLE | pullup/down enable for pad gpmc_ad3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_AD3_MUXMODE | Functional multiplexing selection for pad gpmc_ad3 0x0: Select gpmc_ad3 0x1: Select sdmmc2_dat3 | RW | 0x0 |
| 15 | GPMC_AD2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_AD2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_AD2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_AD2_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ad2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_AD2_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ad2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_AD2_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ad2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-------|
| 9 | GPMC_AD2_OFFMODEENABLE | OffMode mode override control for pad gpmc_ad2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_AD2_INPUTENABLE | Input enable value for pad gpmc_ad2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_AD2_PULLTYPESELECT | pullup/down selection for pad gpmc_ad2 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | GPMC_AD2_PULLUDENABLE | pullup/down enable for pad gpmc_ad2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_AD2_MUXMODE | Functional multiplexing selection for pad gpmc_ad2 0x0: Select gpmc_ad2 0x1: Select sdmmc2_dat2 | RW | 0x0 |

**Table 19-352. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_AD2_PAD1_GPMC_AD3**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-353. CONTROL_CORE_PAD0_GPMC_AD4_PAD1_GPMC_AD5

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----|---|----|--------------------------------|----|------------------------------|----|--------------------------|----|---------------------------|----|------------------------|----|----------------------|----|----------|----|----|----|----|----|----------------------|---|---|---|-------------------------|---|-----------------------|---|------------------|---|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0048 | | | | | | | | | | Instance | | | | | | | | | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A10 0048 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Register control for Pads gpmc_ad4 and gpmc_ad5 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
| GPMC_AD5_WAKEUPEVENT | | GPMC_AD5_WAKEUPENABLE | | GPMC_AD5_OFFMODEPULLTYPESELECT | | GPMC_AD5_OFFMODEPULLUDENABLE | | GPMC_AD5_OFFMODEOUTVALUE | | GPMC_AD5_OFFMODEOUTENABLE | | GPMC_AD5_OFFMODEENABLE | | GPMC_AD5_INPUTENABLE | | RESERVED | | | | | | | | | | GPMC_AD5_PULLTYPESELECT | | GPMC_AD5_PULLUDENABLE | | GPMC_AD5_MUXMODE | | | | | | | | | |
| GPMC_AD4_WAKEUPEVENT | | GPMC_AD4_WAKEUPENABLE | | GPMC_AD4_OFFMODEPULLTYPESELECT | | GPMC_AD4_OFFMODEPULLUDENABLE | | GPMC_AD4_OFFMODEOUTVALUE | | GPMC_AD4_OFFMODEOUTENABLE | | GPMC_AD4_OFFMODEENABLE | | GPMC_AD4_INPUTENABLE | | RESERVED | | | | | | | | | | GPMC_AD4_PULLTYPESELECT | | GPMC_AD4_PULLUDENABLE | | GPMC_AD4_MUXMODE | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 31 | GPMC_AD5_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_AD5_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_AD5_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad5 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_AD5_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ad5 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_AD5_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ad5 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_AD5_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ad5. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_AD5_OFFMODEENABLE | OffMode mode override control for pad gpmc_ad5 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_AD5_INPUTENABLE | Input enable value for pad gpmc_ad5 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_AD5_PULLTYPESELECT | pullup/down selection for pad gpmc_ad5 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | GPMC_AD5_PULLUDENABLE | pullup/down enable for pad gpmc_ad5 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_AD5_MUXMODE | Functional multiplexing selection for pad gpmc_ad5 0x0: Select gpmc_ad5 0x1: Select sdmmc2_dat5 0x2: Select sdmmc2_dir_dat1 | RW | 0x0 |
| 15 | GPMC_AD4_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_AD4_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_AD4_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad4 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|---|------|-------|
| 12 | GPMC_AD4_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ad4 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_AD4_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ad4 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_AD4_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ad4. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_AD4_OFFMODEENABLE | OffMode mode override control for pad gpmc_ad4 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_AD4_INPUTENABLE | Input enable value for pad gpmc_ad4 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_AD4_PULLTYPESELECT | pullup/down selection for pad gpmc_ad4 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | GPMC_AD4_PULLUDENABLE | pullup/down enable for pad gpmc_ad4 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_AD4_MUXMODE | Functional multiplexing selection for pad gpmc_ad4 0x0: Select gpmc_ad4 0x1: Select sdmmc2_dat4 0x2: Select sdmmc2_dir_dat0 | RW | 0x0 |

**Table 19-354. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_AD4_PAD1_GPMC_AD5**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-355. CONTROL_CORE_PAD0_GPMC_AD6_PAD1_GPMC_AD7

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 004C | | |
| Physical Address | 0x4A10 004C | Instance | SYSCTRL_PADCONF_CORE |
| Description | Register control for Pads gpmc_ad6 and gpmc_ad7 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|----------------------|----|------------------|----|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|-------------------------|----------------------|---|------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GPMC_AD7_WAKEUPEVENT | GPMC_AD7_WAKEUPENABLE | GPMC_AD7_OFFMODEPULLTYPESELECT | GPMC_AD7_OFFMODEPULLUDENABE | GPMC_AD7_OFFMODEOUTVALUE | GPMC_AD7_OFFMODEOUTENABLE | GPMC_AD7_OFFMODEEENABLE | GPMC_AD7_INPUTENABLE | RESERVED | | | GPMC_AD7_PULLTYPESELECT | GPMC_AD7_PULLUDENABE | | GPMC_AD7_MUXMODE | | GPMC_AD6_WAKEUPEVENT | GPMC_AD6_WAKEUPENABLE | GPMC_AD6_OFFMODEPULLTYPESELECT | GPMC_AD6_OFFMODEPULLUDENABE | GPMC_AD6_OFFMODEOUTVALUE | GPMC_AD6_OFFMODEOUTENABLE | GPMC_AD6_OFFMODEEENABLE | GPMC_AD6_INPUTENABLE | RESERVED | | | GPMC_AD6_PULLTYPESELECT | GPMC_AD6_PULLUDENABE | | GPMC_AD6_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 31 | GPMC_AD7_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_AD7_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_AD7_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad7 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_AD7_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad gpmc_ad7 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_AD7_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ad7 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_AD7_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ad7. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_AD7_OFFMODEEENABLE | OffMode mode override control for pad gpmc_ad7 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_AD7_INPUTENABLE | Input enable value for pad gpmc_ad7 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_AD7_PULLTYPESELECT | pullup/down selection for pad gpmc_ad7 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | GPMC_AD7_PULLUDENABE | pullup/down enable for pad gpmc_ad7 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 18:16 | GPMC_AD7_MUXMODE | Functional multiplexing selection for pad gpmc_ad7 0x0: Select gpmc_ad7 0x1: Select sdmmc2_dat7 0x2: Select sdmmc2_clk_fdbk | RW | 0x0 |
| 15 | GPMC_AD6_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_AD6_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_AD6_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad6 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_AD6_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ad6 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_AD6_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ad6 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_AD6_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ad6. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_AD6_OFFMODEENABLE | OffMode mode override control for pad gpmc_ad6 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_AD6_INPUTENABLE | Input enable value for pad gpmc_ad6 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_AD6_PULLTYPESELECT | pullup/down selection for pad gpmc_ad6 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | GPMC_AD6_PULLUDENABLE | pullup/down enable for pad gpmc_ad6 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_AD6_MUXMODE | Functional multiplexing selection for pad gpmc_ad6 0x0: Select gpmc_ad6 0x1: Select sdmmc2_dat6 0x2: Select sdmmc2_dir_cmd | RW | 0x0 |

**Table 19-356. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_AD6_PAD1_GPMC_AD7**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-357. CONTROL_CORE_PAD0_GPMC_AD8_PAD1_GPMC_AD9

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0050 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0050 | | |
| Description | Register control for Pads gpmc_ad8 and gpmc_ad9 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|----------------------|----|----|------------------|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|-------------------------|----------------------|---|---|------------------|
| GPMC_AD9_WAKEUPEVENT | GPMC_AD9_WAKEUPENABLE | GPMC_AD9_OFFMODEPULLTYPESELECT | GPMC_AD9_OFFMODEPULLUDENABE | GPMC_AD9_OFFMODEOUTVALUE | GPMC_AD9_OFFMODEOUTENABLE | GPMC_AD9_OFFMODEEENABLE | GPMC_AD9_INPUTENABLE | RESERVED | | | GPMC_AD9_PULLTYPESELECT | GPMC_AD9_PULLUDENABE | | | GPMC_AD9_MUXMODE | GPMC_AD8_WAKEUPEVENT | GPMC_AD8_WAKEUPENABLE | GPMC_AD8_OFFMODEPULLTYPESELECT | GPMC_AD8_OFFMODEPULLUDENABE | GPMC_AD8_OFFMODEOUTVALUE | GPMC_AD8_OFFMODEOUTENABLE | GPMC_AD8_OFFMODEEENABLE | GPMC_AD8_INPUTENABLE | RESERVED | | | GPMC_AD8_PULLTYPESELECT | GPMC_AD8_PULLUDENABE | | | GPMC_AD8_MUXMODE |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | GPMC_AD9_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_AD9_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_AD9_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad9 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_AD9_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad gpmc_ad9 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_AD9_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ad9 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_AD9_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ad9. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_AD9_OFFMODEEENABLE | OffMode mode override control for pad gpmc_ad9 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_AD9_INPUTENABLE | Input enable value for pad gpmc_ad9 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_AD9_PULLTYPESELECTION | pullup/down selection for pad gpmc_ad9 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | GPMC_AD9_PULLUDENABLE | pullup/down enable for pad gpmc_ad9 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_AD9_MUXMODE | Functional multiplexing selection for pad gpmc_ad9 0x0: Select gpmc_ad9 0x1: Select kpd_row1 0x2: Select c2c_data14 0x3: Select gpio_33 0x5: Select sdmmc1_dat1 | RW | 0x0 |
| 15 | GPMC_AD8_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_AD8_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_AD8_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad8 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_AD8_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ad8 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_AD8_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ad8 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_AD8_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ad8. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_AD8_OFFMODEENABLE | OffMode mode override control for pad gpmc_ad8 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_AD8_INPUTENABLE | Input enable value for pad gpmc_ad8 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_AD8_PULLTYPESELECTION | pullup/down selection for pad gpmc_ad8 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | GPMC_AD8_PULLUDENABLE | pullup/down enable for pad gpmc_ad8 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-------|
| 2:0 | GPMC_AD8_MUXMODE | Functional multiplexing selection for pad gpmc_ad8 0x0: Select gpmc_ad8 0x1: Select kpd_row0 0x2: Select c2c_data15 0x3: Select gpio_32 0x5: Select sdmmc1_dat0 | RW | 0x0 |

**Table 19-358. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_AD8_PAD1_GPMC_AD9**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-359. CONTROL_CORE_PAD0_GPMC_AD10_PAD1_GPMC_AD11

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0054 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0054 | | |
| Description | Register control for Pads gpmc_ad10 and gpmc_ad11 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|----------------------------|-------------------------|-----------------------|----------|----|----|----|--------------------------|-----------------------|-------------------|----|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|----------------------------|-------------------------|-----------------------|----------|---|---|---|--------------------------|-----------------------|-------------------|---|
| GPMC_AD11_WAKEUPEVENT | GPMC_AD11_WAKEUPENABLE | GPMC_AD11_OFFMODEPULLTYPESELECT | GPMC_AD11_OFFMODEPULLUDENABE | GPMC_AD11_OFFMODEOUTVALUE | GPMC_AD11_OFFMODEOUTENABLE | GPMC_AD11_OFFMODEEENABE | GPMC_AD11_INPUTENABLE | RESERVED | | | | GPMC_AD11_PULLTYPESELECT | GPMC_AD11_PULLUDENABE | GPMC_AD11_MUXMODE | | GPMC_AD10_WAKEUPEVENT | GPMC_AD10_WAKEUPENABLE | GPMC_AD10_OFFMODEPULLTYPESELECT | GPMC_AD10_OFFMODEPULLUDENABE | GPMC_AD10_OFFMODEOUTVALUE | GPMC_AD10_OFFMODEOUTENABLE | GPMC_AD10_OFFMODEEENABE | GPMC_AD10_INPUTENABLE | RESERVED | | | | GPMC_AD10_PULLTYPESELECT | GPMC_AD10_PULLUDENABE | GPMC_AD10_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|---|------|-------|
| 31 | GPMC_AD11_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_AD11_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_AD11_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad11 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|--|------|-------|
| 28 | GPMC_AD11_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ad11 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_AD11_OFFMODEOUTV ALUE | OffMode mode output value for pad gpmc_ad11 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_AD11_OFFMODEOUTE NABLE | OffMode mode output enable value for pad gpmc_ad11. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_AD11_OFFMODEENABL E | OffMode mode override control for pad gpmc_ad11 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_AD11_INPUTENABLE | Input enable value for pad gpmc_ad11 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_AD11_PULLTYPESELE CT | pullup/down selection for pad gpmc_ad11 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | GPMC_AD11_PULLUDENABLE | pullup/down enable for pad gpmc_ad11 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_AD11_MUXMODE | Functional multiplexing selection for pad gpmc_ad11 0x0: Select gpmc_ad11 0x1: Select kpd_row3 0x2: Select c2c_data12 0x3: Select gpio_35 0x5: Select sdmmc1_dat3 | RW | 0x0 |
| 15 | GPMC_AD10_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_AD10_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_AD10_OFFMODEPULLTYPESE LECT | OffMode mode pullup/down selection for pad gpmc_ad10 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_AD10_OFFMODEPULLUDENABL E | OffMode mode pullup/down enable for pad gpmc_ad10 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_AD10_OFFMODEOUTV ALUE | OffMode mode output value for pad gpmc_ad10 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_AD10_OFFMODEOUTE NABLE | OffMode mode output enable value for pad gpmc_ad10. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|------|-------|
| 9 | GPMC_AD10_OFFMODEENABLE | OffMode mode override control for pad gpmc_ad10 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_AD10_INPUTENABLE | Input enable value for pad gpmc_ad10 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_AD10_PULLTYPESELECT | pullup/down selection for pad gpmc_ad10 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | GPMC_AD10_PULLUDENABLE | pullup/down enable for pad gpmc_ad10 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_AD10_MUXMODE | Functional multiplexing selection for pad gpmc_ad10 0x0: Select gpmc_ad10 0x1: Select kpd_row2 0x2: Select c2c_data13 0x3: Select gpio_34 0x5: Select sdmmc1_dat2 | RW | 0x0 |

**Table 19-360. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_AD10_PAD1_GPMC_AD11**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-361. CONTROL_CORE_PAD0_GPMC_AD12_PAD1_GPMC_AD13

| | | | | | | | |
|------------------|--|---|----------|----------------------|--|--|--|
| Address Offset | | 0x0000 0058 | | | | | |
| Physical Address | | 0x4A10 0058 | Instance | SYSCTRL_PADCONF_CORE | | | |
| Description | | Register control for Pads gpmc_ad12 and gpmc_ad13 Access conditions. Read: unrestricted, Write: unrestricted | | | | | |
| Type | | RW | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|----|------------------------|----|---------------------------------|----|-------------------------------|----|---------------------------|----|----------------------------|----|-------------------------|----|-----------------------|----|----------|----|--------------------------|----|------------------------|----|-------------------|---|-----------------------|---|------------------------|---|---------------------------------|---|-------------------------------|---|---------------------------|--|----------------------------|--|-------------------------|--|-----------------------|--|----------|--|--------------------------|--|------------------------|--|-------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| GPMC_AD13_WAKEUPEVENT | | GPMC_AD13_WAKEUPENABLE | | GPMC_AD13_OFFMODEPULLTYPESELECT | | GPMC_AD13_OFFMODEPULLUDENABLE | | GPMC_AD13_OFFMODEOUTVALUE | | GPMC_AD13_OFFMODEOUTENABLE | | GPMC_AD13_OFFMODEENABLE | | GPMC_AD13_INPUTENABLE | | RESERVED | | GPMC_AD13_PULLTYPESELECT | | GPMC_AD13_PULLUDENABLE | | GPMC_AD13_MUXMODE | | GPMC_AD12_WAKEUPEVENT | | GPMC_AD12_WAKEUPENABLE | | GPMC_AD12_OFFMODEPULLTYPESELECT | | GPMC_AD12_OFFMODEPULLUDENABLE | | GPMC_AD12_OFFMODEOUTVALUE | | GPMC_AD12_OFFMODEOUTENABLE | | GPMC_AD12_OFFMODEENABLE | | GPMC_AD12_INPUTENABLE | | RESERVED | | GPMC_AD12_PULLTYPESELECT | | GPMC_AD12_PULLUDENABLE | | GPMC_AD12_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 31 | GPMC_AD13_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_AD13_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_AD13_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad13 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_AD13_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ad13 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_AD13_OFFMODEOUTV ALUE | OffMode mode output value for pad gpmc_ad13 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_AD13_OFFMODEOUTE NABLE | OffMode mode output enable value for pad gpmc_ad13. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_AD13_OFFMODEENABL E | OffMode mode override control for pad gpmc_ad13 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_AD13_INPUTENABLE | Input enable value for pad gpmc_ad13 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_AD13_PULLTYPESELE CT | pullup/down selection for pad gpmc_ad13 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPMC_AD13_PULLUDENABLE | pullup/down enable for pad gpmc_ad13 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_AD13_MUXMODE | Functional multiplexing selection for pad gpmc_ad13 0x0: Select gpmc_ad13 0x1: Select kpd_col1 0x2: Select c2c_data10 0x3: Select gpio_37 0x5: Select sdmmc1_dat5 | RW | 0x0 |
| 15 | GPMC_AD12_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_AD12_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_AD12_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad12 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|--|------|-------|
| 12 | GPMC_AD12_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ad12 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_AD12_OFFMODEOUTV ALUE | OffMode mode output value for pad gpmc_ad12 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_AD12_OFFMODEOUTE NABLE | OffMode mode output enable value for pad gpmc_ad12. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_AD12_OFFMODEENABL E | OffMode mode override control for pad gpmc_ad12 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_AD12_INPUTENABLE | Input enable value for pad gpmc_ad12 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_AD12_PULLTYPESELE CT | pullup/down selection for pad gpmc_ad12 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPMC_AD12_PULLUDENABLE | pullup/down enable for pad gpmc_ad12 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_AD12_MUXMODE | Functional multiplexing selection for pad gpmc_ad12 0x0: Select gpmc_ad12 0x1: Select kpd_col0 0x2: Select c2c_data11 0x3: Select gpio_36 0x5: Select sdmmc1_dat4 | RW | 0x0 |

**Table 19-362. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_AD12_PAD1_GPMC_AD13**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-363. CONTROL_CORE_PAD0_GPMC_AD14_PAD1_GPMC_AD15

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 005C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 005C | | |
| Description | Register control for Pads gpmc_ad14 and gpmc_ad15 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|----------------------------|-------------------------|-----------------------|----------|----|----|--------------------------|-----------------------|----|-------------------|----|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|----------------------------|-------------------------|-----------------------|----------|---|---|--------------------------|-----------------------|---|-------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GPMC_AD15_WAKEUPEVENT | GPMC_AD15_WAKEUPENABLE | GPMC_AD15_OFFMODEPULLTYPESELECT | GPMC_AD15_OFFMODEPULLUDENABE | GPMC_AD15_OFFMODEOUTVALUE | GPMC_AD15_OFFMODEOUTENABLE | GPMC_AD15_OFFMODEEENABE | GPMC_AD15_INPUTENABLE | RESERVED | | | GPMC_AD15_PULLTYPESELECT | GPMC_AD15_PULLUDENABE | | GPMC_AD15_MUXMODE | | GPMC_AD14_WAKEUPEVENT | GPMC_AD14_WAKEUPENABLE | GPMC_AD14_OFFMODEPULLTYPESELECT | GPMC_AD14_OFFMODEPULLUDENABE | GPMC_AD14_OFFMODEOUTVALUE | GPMC_AD14_OFFMODEOUTENABLE | GPMC_AD14_OFFMODEEENABE | GPMC_AD14_INPUTENABLE | RESERVED | | | GPMC_AD14_PULLTYPESELECT | GPMC_AD14_PULLUDENABE | | GPMC_AD14_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 31 | GPMC_AD15_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_AD15_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_AD15_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad15 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_AD15_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad gpmc_ad15 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_AD15_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ad15 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_AD15_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ad15. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_AD15_OFFMODEEENABE | OffMode mode override control for pad gpmc_ad15 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_AD15_INPUTENABLE | Input enable value for pad gpmc_ad15 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_AD15_PULLTYPESELECT | pullup/down selection for pad gpmc_ad15 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPMC_AD15_PULLUDENABE | pullup/down enable for pad gpmc_ad15 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 18:16 | GPMC_AD15_MUXMODE | Functional multiplexing selection for pad gpmc_ad15 0x0: Select gpmc_ad15 0x1: Select kpd_col3 0x2: Select c2c_data8 0x3: Select gpio_39 0x5: Select sdmmc1_dat7 | RW | 0x0 |
| 15 | GPMC_AD14_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_AD14_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_AD14_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ad14 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_AD14_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ad14 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_AD14_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ad14 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_AD14_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ad14. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_AD14_OFFMODEENABLER | OffMode mode override control for pad gpmc_ad14 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_AD14_INPUTENABLE | Input enable value for pad gpmc_ad14 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_AD14_PULLTYPESELECT | pullup/down selection for pad gpmc_ad14 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPMC_AD14_PULLUDENABLE | pullup/down enable for pad gpmc_ad14 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_AD14_MUXMODE | Functional multiplexing selection for pad gpmc_ad14 0x0: Select gpmc_ad14 0x1: Select kpd_col2 0x2: Select c2c_data9 0x3: Select gpio_38 0x5: Select sdmmc1_dat6 | RW | 0x0 |

**Table 19-364. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_AD14_PAD1_GPMC_AD15**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-365. CONTROL_CORE_PAD0_GPMC_A16_PAD1_GPMC_A17

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0060 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0060 | | |
| Description | Register control for Pads gpmc_a16 and gpmc_a17 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|----------------------|----|------------------|----|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|-------------------------|----------------------|---|------------------|---|
| GPMC_A17_WAKEUPEVENT | GPMC_A17_WAKEUPENABLE | GPMC_A17_OFFMODEPULLTYPESELECT | GPMC_A17_OFFMODEPULLUDENABE | GPMC_A17_OFFMODEOUTVALUE | GPMC_A17_OFFMODEOUTENABLE | GPMC_A17_OFFMODEEENABLE | GPMC_A17_INPUTENABLE | RESERVED | | | GPMC_A17_PULLTYPESELECT | GPMC_A17_PULLUDENABE | | GPMC_A17_MUXMODE | | GPMC_A16_WAKEUPEVENT | GPMC_A16_WAKEUPENABLE | GPMC_A16_OFFMODEPULLTYPESELECT | GPMC_A16_OFFMODEPULLUDENABE | GPMC_A16_OFFMODEOUTVALUE | GPMC_A16_OFFMODEOUTENABLE | GPMC_A16_OFFMODEEENABLE | GPMC_A16_INPUTENABLE | RESERVED | | | GPMC_A16_PULLTYPESELECT | GPMC_A16_PULLUDENABE | | GPMC_A16_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | GPMC_A17_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_A17_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_A17_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_a17 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_A17_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad gpmc_a17 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_A17_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_a17 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_A17_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_a17. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 25 | GPMC_A17_OFFMODEENABLE | OffMode mode override control for pad gpmc_a17 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_A17_INPUTENABLE | Input enable value for pad gpmc_a17 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_A17_PULLTYPESELECT | pullup/down selection for pad gpmc_a17 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPMC_A17_PULLUDENABLE | pullup/down enable for pad gpmc_a17 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_A17_MUXMODE | Functional multiplexing selection for pad gpmc_a17 0x0: Select gpmc_a17 0x1: Select kpd_row5 0x2: Select c2c_datain1 0x3: Select gpio_41 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPMC_A16_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_A16_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_A16_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_a16 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_A16_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_a16 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_A16_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_a16 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_A16_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_a16. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_A16_OFFMODEENABLE | OffMode mode override control for pad gpmc_a16 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_A16_INPUTENABLE | Input enable value for pad gpmc_a16 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-------|
| 4 | GPMC_A16_PULLTYPESELECT | pullup/down selection for pad gpmc_a16 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPMC_A16_PULLUDENABLE | pullup/down enable for pad gpmc_a16 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_A16_MUXMODE | Functional multiplexing selection for pad gpmc_a16 0x0: Select gpmc_a16 0x1: Select kpd_row4 0x2: Select c2c_datain0 0x3: Select gpio_40 0x7: Select safe_mode | RW | 0x7 |

**Table 19-366. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_A16_PAD1_GPMC_A17**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-367. CONTROL_CORE_PAD0_GPMC_A18_PAD1_GPMC_A19

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|----------|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0064 | | | | | | | | | | Instance | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A10 0064 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Register control for Pads gpmc_a18 and gpmc_a19 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----|-----------------------|----|--------------------------------|----|------------------------------|----|--------------------------|----|---------------------------|----|-------------------------|----|----------------------|----|----------|----|----|----|-------------------------|----|-----------------------|---|------------------|---|---|---|----------------------|---|-----------------------|---|--------------------------------|--|------------------------------|--|--------------------------|--|---------------------------|--|-------------------------|--|----------------------|--|----------|--|--|--|-------------------------|--|-----------------------|--|------------------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| GPMC_A19_WAKEUPEVENT | | GPMC_A19_WAKEUPENABLE | | GPMC_A19_OFFMODEPULLTYPESELECT | | GPMC_A19_OFFMODEPULLUDENABLE | | GPMC_A19_OFFMODEOUTVALUE | | GPMC_A19_OFFMODEOUTENABLE | | GPMC_A19_OFFMODEEENABLE | | GPMC_A19_INPUTENABLE | | RESERVED | | | | GPMC_A19_PULLTYPESELECT | | GPMC_A19_PULLUDENABLE | | GPMC_A19_MUXMODE | | | | GPMC_A18_WAKEUPEVENT | | GPMC_A18_WAKEUPENABLE | | GPMC_A18_OFFMODEPULLTYPESELECT | | GPMC_A18_OFFMODEPULLUDENABLE | | GPMC_A18_OFFMODEOUTVALUE | | GPMC_A18_OFFMODEOUTENABLE | | GPMC_A18_OFFMODEEENABLE | | GPMC_A18_INPUTENABLE | | RESERVED | | | | GPMC_A18_PULLTYPESELECT | | GPMC_A18_PULLUDENABLE | | GPMC_A18_MUXMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|-------|
| 31 | GPMC_A19_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_A19_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 29 | GPMC_A19_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_a19 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_A19_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_a19 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_A19_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_a19 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_A19_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_a19. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_A19_OFFMODEENABLE | OffMode mode override control for pad gpmc_a19 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_A19_INPUTENABLE | Input enable value for pad gpmc_a19 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_A19_PULLTYPESELECT | pullup/down selection for pad gpmc_a19 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPMC_A19_PULLUDENABLE | pullup/down enable for pad gpmc_a19 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_A19_MUXMODE | Functional multiplexing selection for pad gpmc_a19 0x0: Select gpmc_a19 0x1: Select kpd_row7 0x2: Select c2c_datain3 0x3: Select gpio_43 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPMC_A18_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_A18_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_A18_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_a18 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_A18_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_a18 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_A18_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_a18 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------|---|------|-------|
| 10 | GPMC_A18_OFFMODEOUTEN ABLE | OffMode mode output enable value for pad gpmc_a18. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_A18_OFFMODEENABLE | OffMode mode override control for pad gpmc_a18 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_A18_INPUTENABLE | Input enable value for pad gpmc_a18 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_A18_PULLTYPESELECT | pullup/down selection for pad gpmc_a18 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPMC_A18_PULLUDENABLE | pullup/down enable for pad gpmc_a18 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_A18_MUXMODE | Functional multiplexing selection for pad gpmc_a18 0x0: Select gpmc_a18 0x1: Select kpd_row6 0x2: Select c2c_datain2 0x3: Select gpio_42 0x7: Select safe_mode | RW | 0x7 |

**Table 19-368. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_A18_PAD1_GPMC_A19**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-369. CONTROL_CORE_PAD0_GPMC_A20_PAD1_GPMC_A21

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0068 | | |
| Physical Address | 0x4A10 0068 | Instance | SYSCTRL_PADCONF_CORE |
| Description | Register control for Pads gpmc_a20 and gpmc_a21 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|------------------------|----------------------|----------|----|----|-------------------------|-----------------------|----|------------------|----|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|------------------------|----------------------|----------|---|---|-------------------------|-----------------------|---|------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GPMC_A21_WAKEUPEVENT | GPMC_A21_WAKEUPENABLE | GPMC_A21_OFFMODEPULLTYPESELECT | GPMC_A21_OFFMODEPULLUDENABLE | GPMC_A21_OFFMODEOUTVALUE | GPMC_A21_OFFMODEOUTENABLE | GPMC_A21_OFFMODEENABLE | GPMC_A21_INPUTENABLE | RESERVED | | | GPMC_A21_PULLTYPESELECT | GPMC_A21_PULLUDENABLE | | GPMC_A21_MUXMODE | | GPMC_A20_WAKEUPEVENT | GPMC_A20_WAKEUPENABLE | GPMC_A20_OFFMODEPULLTYPESELECT | GPMC_A20_OFFMODEPULLUDENABLE | GPMC_A20_OFFMODEOUTVALUE | GPMC_A20_OFFMODEOUTENABLE | GPMC_A20_OFFMODEENABLE | GPMC_A20_INPUTENABLE | RESERVED | | | GPMC_A20_PULLTYPESELECT | GPMC_A20_PULLUDENABLE | | GPMC_A20_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 31 | GPMC_A21_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_A21_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_A21_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_a21 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_A21_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_a21 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_A21_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_a21 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_A21_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_a21. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_A21_OFFMODEENABLE | OffMode mode override control for pad gpmc_a21 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_A21_INPUTENABLE | Input enable value for pad gpmc_a21 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_A21_PULLTYPESELECT | pullup/down selection for pad gpmc_a21 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPMC_A21_PULLUDENABLE | pullup/down enable for pad gpmc_a21 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 18:16 | GPMC_A21_MUXMODE | Functional multiplexing selection for pad gpmc_a21 0x0: Select gpmc_a21 0x1: Select kpd_col5 0x2: Select c2c_datain5 0x3: Select gpio_45 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPMC_A20_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_A20_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_A20_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_a20 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_A20_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_a20 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_A20_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_a20 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_A20_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_a20. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_A20_OFFMODEENABLE | OffMode mode override control for pad gpmc_a20 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_A20_INPUTENABLE | Input enable value for pad gpmc_a20 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_A20_PULLTYPESELECT | pullup/down selection for pad gpmc_a20 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPMC_A20_PULLUDENABLE | pullup/down enable for pad gpmc_a20 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_A20_MUXMODE | Functional multiplexing selection for pad gpmc_a20 0x0: Select gpmc_a20 0x1: Select kpd_col4 0x2: Select c2c_datain4 0x3: Select gpio_44 0x7: Select safe_mode | RW | 0x7 |

**Table 19-370. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_A20_PAD1_GPMC_A21**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-371. CONTROL_CORE_PAD0_GPMC_A22_PAD1_GPMC_A23

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 006C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 006C | | |
| Description | Register control for Pads gpmc_a22 and gpmc_a23 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|----------------------|------------------|----|----|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|-------------------------|----------------------|------------------|---|---|
| GPMC_A23_WAKEUPEVENT | GPMC_A23_WAKEUPENABLE | GPMC_A23_OFFMODEPULLTYPESELECT | GPMC_A23_OFFMODEPULLUDENABE | GPMC_A23_OFFMODEOUTVALUE | GPMC_A23_OFFMODEOUTENABLE | GPMC_A23_OFFMODEEENABLE | GPMC_A23_INPUTENABLE | RESERVED | | | GPMC_A23_PULLTYPESELECT | GPMC_A23_PULLUDENABE | GPMC_A23_MUXMODE | | | GPMC_A22_WAKEUPEVENT | GPMC_A22_WAKEUPENABLE | GPMC_A22_OFFMODEPULLTYPESELECT | GPMC_A22_OFFMODEPULLUDENABE | GPMC_A22_OFFMODEOUTVALUE | GPMC_A22_OFFMODEOUTENABLE | GPMC_A22_OFFMODEEENABLE | GPMC_A22_INPUTENABLE | RESERVED | | | GPMC_A22_PULLTYPESELECT | GPMC_A22_PULLUDENABE | GPMC_A22_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | GPMC_A23_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_A23_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_A23_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_a23 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_A23_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad gpmc_a23 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_A23_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_a23 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_A23_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_a23. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 25 | GPMC_A23_OFFMODEENABLE | OffMode mode override control for pad gpmc_a23 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_A23_INPUTENABLE | Input enable value for pad gpmc_a23 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_A23_PULLTYPESELECT | pullup/down selection for pad gpmc_a23 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPMC_A23_PULLUDENABLE | pullup/down enable for pad gpmc_a23 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_A23_MUXMODE | Functional multiplexing selection for pad gpmc_a23 0x0: Select gpmc_a23 0x1: Select kpd_col7 0x2: Select c2c_datain7 0x3: Select gpio_47 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPMC_A22_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_A22_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_A22_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_a22 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_A22_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_a22 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_A22_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_a22 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_A22_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_a22. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_A22_OFFMODEENABLE | OffMode mode override control for pad gpmc_a22 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_A22_INPUTENABLE | Input enable value for pad gpmc_a22 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-------|
| 4 | GPMC_A22_PULLTYPESELECT | pullup/down selection for pad gpmc_a22 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPMC_A22_PULLUDENABLE | pullup/down enable for pad gpmc_a22 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_A22_MUXMODE | Functional multiplexing selection for pad gpmc_a22 0x0: Select gpmc_a22 0x1: Select kpd_col6 0x2: Select c2c_datain6 0x3: Select gpio_46 0x7: Select safe_mode | RW | 0x7 |

**Table 19-372. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_A22_PAD1_GPMC_A23**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-373. CONTROL_CORE_PAD0_GPMC_A24_PAD1_GPMC_A25

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|----------|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0070 | | | | | | | | | | Instance | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A10 0070 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Register control for Pads gpmc_a24 and gpmc_a25 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----|-----------------------|----|--------------------------------|----|------------------------------|----|--------------------------|----|---------------------------|----|------------------------|----|----------------------|----|----------|----|----|----|-------------------------|----|-----------------------|---|------------------|---|---|---|----------------------|---|-----------------------|---|--------------------------------|--|------------------------------|--|--------------------------|--|---------------------------|--|------------------------|--|----------------------|--|----------|--|--|--|-------------------------|--|-----------------------|--|------------------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| GPMC_A25_WAKEUPEVENT | | GPMC_A25_WAKEUPENABLE | | GPMC_A25_OFFMODEPULLTYPESELECT | | GPMC_A25_OFFMODEPULLUDENABLE | | GPMC_A25_OFFMODEOUTVALUE | | GPMC_A25_OFFMODEOUTENABLE | | GPMC_A25_OFFMODEENABLE | | GPMC_A25_INPUTENABLE | | RESERVED | | | | GPMC_A25_PULLTYPESELECT | | GPMC_A25_PULLUDENABLE | | GPMC_A25_MUXMODE | | | | GPMC_A24_WAKEUPEVENT | | GPMC_A24_WAKEUPENABLE | | GPMC_A24_OFFMODEPULLTYPESELECT | | GPMC_A24_OFFMODEPULLUDENABLE | | GPMC_A24_OFFMODEOUTVALUE | | GPMC_A24_OFFMODEOUTENABLE | | GPMC_A24_OFFMODEENABLE | | GPMC_A24_INPUTENABLE | | RESERVED | | | | GPMC_A24_PULLTYPESELECT | | GPMC_A24_PULLUDENABLE | | GPMC_A24_MUXMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|-------|
| 31 | GPMC_A25_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_A25_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 29 | GPMC_A25_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_a25 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_A25_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_a25 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_A25_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_a25 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_A25_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_a25. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_A25_OFFMODEENABLE | OffMode mode override control for pad gpmc_a25 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_A25_INPUTENABLE | Input enable value for pad gpmc_a25 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_A25_PULLTYPESELECT | pullup/down selection for pad gpmc_a25 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPMC_A25_PULLUDENABLE | pullup/down enable for pad gpmc_a25 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_A25_MUXMODE | Functional multiplexing selection for pad gpmc_a25 0x0: Select gpmc_a25 0x2: Select c2c_clkout1 0x3: Select gpio_49 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPMC_A24_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_A24_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_A24_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_a24 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_A24_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_a24 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_A24_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_a24 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------|---|------|-------|
| 10 | GPMC_A24_OFFMODEOUTEN ABLE | OffMode mode output enable value for pad gpmc_a24. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_A24_OFFMODEENABLE | OffMode mode override control for pad gpmc_a24 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_A24_INPUTENABLE | Input enable value for pad gpmc_a24 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_A24_PULLTYPESELECT | pullup/down selection for pad gpmc_a24 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPMC_A24_PULLUDENABLE | pullup/down enable for pad gpmc_a24 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_A24_MUXMODE | Functional multiplexing selection for pad gpmc_a24 0x0: Select gpmc_a24 0x1: Select kpd_col8 0x2: Select c2c_clkout0 0x3: Select gpio_48 0x7: Select safe_mode | RW | 0x7 |

**Table 19-374. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_A24_PAD1_GPMC_A25**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-375. CONTROL_CORE_PAD0_GPMC_NCS0_PAD1_GPMC_NCS1

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0074 | | |
| Physical Address | 0x4A10 0074 | Instance | SYSCTRL_PADCONF_CORE |
| Description | Register control for Pads gpmc_ncs0 and gpmc_ncs1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------------|---------------------------------|---------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|----|----|--------------------------|--------------------------|----|-------------------|----|-----------------------|------------------------|---------------------------------|---------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|---|---|--------------------------|--------------------------|---|-------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GPMC_NCS1_WAKEUPEVENT | GPMC_NCS1_WAKEUPENABLE | GPMC_NCS1_OFFMODEPULLTYPESELECT | GPMC_NCS1_OFFMODEPULLUDENENABLE | GPMC_NCS1_OFFMODEOUTVALUE | GPMC_NCS1_OFFMODEOUTENABLE | GPMC_NCS1_OFFMODEEENABLE | GPMC_NCS1_INPUTENABLE | RESERVED | | | GPMC_NCS1_PULLTYPESELECT | GPMC_NCS1_PULLUDENENABLE | | GPMC_NCS1_MUXMODE | | GPMC_NCS0_WAKEUPEVENT | GPMC_NCS0_WAKEUPENABLE | GPMC_NCS0_OFFMODEPULLTYPESELECT | GPMC_NCS0_OFFMODEPULLUDENENABLE | GPMC_NCS0_OFFMODEOUTVALUE | GPMC_NCS0_OFFMODEOUTENABLE | GPMC_NCS0_OFFMODEEENABLE | GPMC_NCS0_INPUTENABLE | RESERVED | | | GPMC_NCS0_PULLTYPESELECT | GPMC_NCS0_PULLUDENENABLE | | GPMC_NCS0_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 31 | GPMC_NCS1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_NCS1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_NCS1_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ncs1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_NCS1_OFFMODEPULLUDENENABLE | OffMode mode pullup/down enable for pad gpmc_ncs1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_NCS1_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ncs1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_NCS1_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ncs1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_NCS1_OFFMODEEENABLE | OffMode mode override control for pad gpmc_ncs1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_NCS1_INPUTENABLE | Input enable value for pad gpmc_ncs1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_NCS1_PULLTYPESELECT | pullup/down selection for pad gpmc_ncs1 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | GPMC_NCS1_PULLUDENENABLE | pullup/down enable for pad gpmc_ncs1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 18:16 | GPMC_NCS1_MUXMODE | Functional multiplexing selection for pad gpmc_ncs1 0x0: Select gpmc_ncs1 0x2: Select c2c_dataout6 0x3: Select gpio_51 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPMC_NCS0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_NCS0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_NCS0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ncs0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_NCS0_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ncs0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_NCS0_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ncs0 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_NCS0_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ncs0. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_NCS0_OFFMODEENABLE | OffMode mode override control for pad gpmc_ncs0 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_NCS0_INPUTENABLE | Input enable value for pad gpmc_ncs0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_NCS0_PULLTYPESELECT | pullup/down selection for pad gpmc_ncs0 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | GPMC_NCS0_PULLUDENABLE | pullup/down enable for pad gpmc_ncs0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_NCS0_MUXMODE | Functional multiplexing selection for pad gpmc_ncs0 0x0: Select gpmc_ncs0 0x3: Select gpio_50 0x4: Select sys_ndmareq0 | RW | 0x0 |

**Table 19-376. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_NCS0_PAD1_GPMC_NCS1**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-377. CONTROL_CORE_PAD0_GPMC_NCS2_PAD1_GPMC_NCS3

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0078 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0078 | | |
| Description | Register control for Pads gpmc_ncs2 and gpmc_ncs3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|-------------------------|-----------------------|----------|----|----|--------------------------|------------------------|----|-------------------|----|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|-------------------------|-----------------------|----------|---|---|--------------------------|------------------------|---|-------------------|---|--|--|
| GPMC_NCS3_WAKEUPEVENT | GPMC_NCS3_WAKEUPENABLE | GPMC_NCS3_OFFMODEPULLTYPESELECT | GPMC_NCS3_OFFMODEPULLUDENABLE | GPMC_NCS3_OFFMODEOUTVALUE | GPMC_NCS3_OFFMODEOUTENABLE | GPMC_NCS3_OFFMODEENABLE | GPMC_NCS3_INPUTENABLE | RESERVED | | | GPMC_NCS3_PULLTYPESELECT | GPMC_NCS3_PULLUDENABLE | | GPMC_NCS3_MUXMODE | | GPMC_NCS2_WAKEUPEVENT | GPMC_NCS2_WAKEUPENABLE | GPMC_NCS2_OFFMODEPULLTYPESELECT | GPMC_NCS2_OFFMODEPULLUDENABLE | GPMC_NCS2_OFFMODEOUTVALUE | GPMC_NCS2_OFFMODEOUTENABLE | GPMC_NCS2_OFFMODEENABLE | GPMC_NCS2_INPUTENABLE | RESERVED | | | GPMC_NCS2_PULLTYPESELECT | GPMC_NCS2_PULLUDENABLE | | GPMC_NCS2_MUXMODE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|--|------|-------|
| 31 | GPMC_NCS3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_NCS3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_NCS3_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ncs3 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_NCS3_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ncs3 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_NCS3_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ncs3 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_NCS3_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ncs3. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_NCS3_OFFMODEENABLE | OffMode mode override control for pad gpmc_ncs3 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_NCS3_INPUTENABLE | Input enable value for pad gpmc_ncs3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|--|------|-------|
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_NCS3_PULLTYPESELE CT | pullup/down selection for pad gpmc_ncs3 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | GPMC_NCS3_PULLUDENABLE | pullup/down enable for pad gpmc_ncs3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_NCS3_MUXMODE | Functional multiplexing selection for pad gpmc_ncs3 0x0: Select gpmc_ncs3 0x1: Select gpmc_dir 0x2: Select c2c_dataout4 0x3: Select gpio_53 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPMC_NCS2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_NCS2_WAKEUPENABL E | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_NCS2_ OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ncs2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_NCS2_ OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ncs2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_NCS2_OFFMODEOUTV ALUE | OffMode mode output value for pad gpmc_ncs2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_NCS2_OFFMODEOUTE NABLE | OffMode mode output enable value for pad gpmc_ncs2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_NCS2_OFFMODEENAB LE | OffMode mode override control for pad gpmc_ncs2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_NCS2_INPUTENABLE | Input enable value for pad gpmc_ncs2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_NCS2_PULLTYPESELE CT | pullup/down selection for pad gpmc_ncs2 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | GPMC_NCS2_PULLUDENABLE | pullup/down enable for pad gpmc_ncs2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|-------|
| 2:0 | GPMC_NCS2_MUXMODE | Functional multiplexing selection for pad gpmc_ncs2 0x0: Select gpmc_ncs2 0x1: Select kpd_row8 0x2: Select c2c_dataout7 0x3: Select gpio_52 0x7: Select safe_mode | RW | 0x7 |

**Table 19-378. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_NCS2_PAD1_GPMC_NCS3**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-379. CONTROL_CORE_PAD0_GPMC_NWP_PAD1_GPMC_CLK

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 007C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 007C | | |
| Description | Register control for Pads gpmc_nwp and gpmc_clk Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|-----------------------|------------------|----|----|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|-------------------------|-----------------------|------------------|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|
| GPMC_CLK_WAKEUPEVENT | GPMC_CLK_WAKEUPENABLE | GPMC_CLK_OFFMODEPULLTYPESELECT | GPMC_CLK_OFFMODEPULLUDENABLE | GPMC_CLK_OFFMODEOUTVALUE | GPMC_CLK_OFFMODEOUTENABLE | GPMC_CLK_OFFMODEEENABLE | GPMC_CLK_INPUTENABLE | RESERVED | | | GPMC_CLK_PULLTYPESELECT | GPMC_CLK_PULLUDENABLE | GPMC_CLK_MUXMODE | | | GPMC_NWP_WAKEUPEVENT | GPMC_NWP_WAKEUPENABLE | GPMC_NWP_OFFMODEPULLTYPESELECT | GPMC_NWP_OFFMODEPULLUDENABLE | GPMC_NWP_OFFMODEOUTVALUE | GPMC_NWP_OFFMODEOUTENABLE | GPMC_NWP_OFFMODEEENABLE | GPMC_NWP_INPUTENABLE | RESERVED | | | GPMC_NWP_PULLTYPESELECT | GPMC_NWP_PULLUDENABLE | GPMC_NWP_MUXMODE | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | GPMC_CLK_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_CLK_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_CLK_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_clk 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 28 | GPMC_CLK_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_clk 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_CLK_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_clk 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_CLK_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_clk. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_CLK_OFFMODEENABLE | OffMode mode override control for pad gpmc_clk 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_CLK_INPUTENABLE | Input enable value for pad gpmc_clk 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_CLK_PULLTYPESELECT | pullup/down selection for pad gpmc_clk 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPMC_CLK_PULLUDENABLE | pullup/down enable for pad gpmc_clk 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_CLK_MUXMODE | Functional multiplexing selection for pad gpmc_clk 0x0: Select gpmc_clk 0x3: Select gpio_55 0x4: Select sys_ndmareq2 0x5: Select sdmmc1_cmd | RW | 0x0 |
| 15 | GPMC_NWP_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_NWP_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_NWP_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_nwp 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_NWP_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_nwp 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_NWP_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_nwp 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_NWP_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_nwp. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-------|
| 9 | GPMC_NWP_OFFMODEENABLE | OffMode mode override control for pad gpmc_nwp 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_NWP_INPUTENABLE | Input enable value for pad gpmc_nwp 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_NWP_PULLTYPESELECT | pullup/down selection for pad gpmc_nwp 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPMC_NWP_PULLUDENABLE | pullup/down enable for pad gpmc_nwp 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_NWP_MUXMODE | Functional multiplexing selection for pad gpmc_nwp 0x0: Select gpmc_nwp 0x1: Select dsi1_te0 0x3: Select gpio_54 0x4: Select sys_ndmareq1 | RW | 0x0 |

**Table 19-380. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_NWP_PAD1_GPMC_CLK**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-381. CONTROL_CORE_PAD0_GPMC_NADV_ALE_PAD1_GPMC_NOE

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 0080 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0080 | | |
| Description | Register control for Pads gpmc_nadv_ale and gpmc_noe Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----|-----------------------|----|--------------------------------|----|-----------------------------|----|--------------------------|----|---------------------------|----|-------------------------|----|----------------------|----|----------|----|-------------------------|----|----------------------|----|------------------|---|---------------------------|---|----------------------------|---|-------------------------------------|---|----------------------------------|---|-------------------------------|--|--------------------------------|--|------------------------------|--|---------------------------|--|----------|--|------------------------------|--|---------------------------|--|-----------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| GPMC_NOE_WAKEUPEVENT | | GPMC_NOE_WAKEUPENABLE | | GPMC_NOE_OFFMODEPULLTYPESELECT | | GPMC_NOE_OFFMODEPULLUDENABE | | GPMC_NOE_OFFMODEOUTVALUE | | GPMC_NOE_OFFMODEOUTENABLE | | GPMC_NOE_OFFMODEEENABLE | | GPMC_NOE_INPUTENABLE | | RESERVED | | GPMC_NOE_PULLTYPESELECT | | GPMC_NOE_PULLUDENABE | | GPMC_NOE_MUXMODE | | GPMC_NADV_ALE_WAKEUPEVENT | | GPMC_NADV_ALE_WAKEUPENABLE | | GPMC_NADV_ALE_OFFMODEPULLTYPESELECT | | GPMC_NADV_ALE_OFFMODEPULLUDENABE | | GPMC_NADV_ALE_OFFMODEOUTVALUE | | GPMC_NADV_ALE_OFFMODEOUTENABLE | | GPMC_NADV_ALE_OFFMODEEENABLE | | GPMC_NADV_ALE_INPUTENABLE | | RESERVED | | GPMC_NADV_ALE_PULLTYPESELECT | | GPMC_NADV_ALE_PULLUDENABE | | GPMC_NADV_ALE_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 31 | GPMC_NOE_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_NOE_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_NOE_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_noe 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_NOE_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad gpmc_noe 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_NOE_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_noe 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_NOE_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_noe. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_NOE_OFFMODEEENABLE | OffMode mode override control for pad gpmc_noe 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_NOE_INPUTENABLE | Input enable value for pad gpmc_noe 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_NOE_PULLTYPESELECT | pullup/down selection for pad gpmc_noe 0x0: pulldown selected 0x1: pullup selected | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|--|------|-------|
| 19 | GPMC_NOE_PULLUDENABLE | pullup/down enable for pad gpmc_noe 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_NOE_MUXMODE | Functional multiplexing selection for pad gpmc_noe 0x0: Select gpmc_noe 0x1: Select sdmmc2_clk | RW | 0x0 |
| 15 | GPMC_NADV_ALE_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_NADV_ALE_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_NADV_ALE_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_nadv_ale 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_NADV_ALE_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_nadv_ale 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_NADV_ALE_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_nadv_ale 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_NADV_ALE_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_nadv_ale. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_NADV_ALE_OFFMODEENABLE | OffMode mode override control for pad gpmc_nadv_ale 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_NADV_ALE_INPUTENABLE | Input enable value for pad gpmc_nadv_ale 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_NADV_ALE_PULLTYPESELECT | pullup/down selection for pad gpmc_nadv_ale 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPMC_NADV_ALE_PULLUDENABLE | pullup/down enable for pad gpmc_nadv_ale 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_NADV_ALE_MUXMODE | Functional multiplexing selection for pad gpmc_nadv_ale 0x0: Select gpmc_nadv_ale 0x1: Select dsi1_te1 0x3: Select gpio_56 0x4: Select sys_ndmareq3 0x5: Select sdmmc1_clk | RW | 0x0 |

**Table 19-382. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_NADV_ALE_PAD1_GPMC_NOE**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-383. CONTROL_CORE_PAD0_GPMC_NWE_PAD1_GPMC_NBE0_CLE

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0084 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0084 | | |
| Description | Register control for Pads gpmc_nwe and gpmc_nbe0_cle Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------------------|----------------------------|-------------------------------------|-----------------------------------|-------------------------------|--------------------------------|------------------------------|---------------------------|----------|----|----|------------------------------|----------------------------|-----------------------|----|----|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|-------------------------|-----------------------|------------------|---|---|
| GPMC_NBE0_CLE_WAKEUPEVENT | GPMC_NBE0_CLE_WAKEUPENABLE | GPMC_NBE0_CLE_OFFMODEPULLTYPESELECT | GPMC_NBE0_CLE_OFFMODEPULLUDENABLE | GPMC_NBE0_CLE_OFFMODEOUTVALUE | GPMC_NBE0_CLE_OFFMODEOUTENABLE | GPMC_NBE0_CLE_OFFMODEEENABLE | GPMC_NBE0_CLE_INPUTENABLE | RESERVED | | | GPMC_NBE0_CLE_PULLTYPESELECT | GPMC_NBE0_CLE_PULLUDENABLE | GPMC_NBE0_CLE_MUXMODE | | | GPMC_NWE_WAKEUPEVENT | GPMC_NWE_WAKEUPENABLE | GPMC_NWE_OFFMODEPULLTYPESELECT | GPMC_NWE_OFFMODEPULLUDENABLE | GPMC_NWE_OFFMODEOUTVALUE | GPMC_NWE_OFFMODEOUTENABLE | GPMC_NWE_OFFMODEEENABLE | GPMC_NWE_INPUTENABLE | RESERVED | | | GPMC_NWE_PULLTYPESELECT | GPMC_NWE_PULLUDENABLE | GPMC_NWE_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------------|---|------|-------|
| 31 | GPMC_NBE0_CLE_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_NBE0_CLE_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_NBE0_CLE_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_nbe0_cle 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_NBE0_CLE_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_nbe0_cle 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_NBE0_CLE_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_nbe0_cle 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------------|--|------|-------|
| 26 | GPMC_NBE0_CLE_OFFMODE OUTENABLE | OffMode mode output enable value for pad gpmc_nbe0_cle. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_NBE0_CLE_OFFMODEE NABLE | OffMode mode override control for pad gpmc_nbe0_cle 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_NBE0_CLE_INPUTENAB LE | Input enable value for pad gpmc_nbe0_cle 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_NBE0_CLE_PULLTYPE SELECT | pullup/down selection for pad gpmc_nbe0_cle 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPMC_NBE0_CLE_PULLUDEN ABLE | pullup/down enable for pad gpmc_nbe0_cle 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_NBE0_CLE_MUXMODE | Functional multiplexing selection for pad gpmc_nbe0_cle 0x0: Select gpmc_nbe0_cle 0x1: Select dsi2_te0 0x3: Select gpio_59 | RW | 0x0 |
| 15 | GPMC_NWE_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_NWE_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_NWE_ OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_nwe 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_NWE_ OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_nwe 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_NWE_OFFMODEOUTVA LUE | OffMode mode output value for pad gpmc_nwe 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_NWE_OFFMODEOUTEN ABLE | OffMode mode output enable value for pad gpmc_nwe. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_NWE_OFFMODEENABL E | OffMode mode override control for pad gpmc_nwe 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_NWE_INPUTENABLE | Input enable value for pad gpmc_nwe 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------|
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_NWE_PULLTYPESELECT | pullup/down selection for pad gpmc_nwe 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | GPMC_NWE_PULLUDENABLE | pullup/down enable for pad gpmc_nwe 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_NWE_MUXMODE | Functional multiplexing selection for pad gpmc_nwe 0x0: Select gpmc_nwe 0x1: Select sdmmc2_cmd | RW | 0x0 |

**Table 19-384. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_NWE_PAD1_GPMC_NBE0_CLE**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-385. CONTROL_CORE_PAD0_GPMC_NBE1_PAD1_GPMC_WAIT0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0088 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0088 | | |
| Description | Register control for Pads gpmc_nbe1 and gpmc_wait0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|-------------------------|----------------------------------|--------------------------------|----------------------------|-----------------------------|---------------------------|------------------------|----------|----|----|---------------------------|-------------------------|----|----|--------------------|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|---|---|--------------------------|------------------------|---|---|-------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GPMC_WAIT0_WAKEUPEVENT | GPMC_WAIT0_WAKEUPENABLE | GPMC_WAIT0_OFFMODEPULLTYPESELECT | GPMC_WAIT0_OFFMODEPULLUDENABLE | GPMC_WAIT0_OFFMODEOUTVALUE | GPMC_WAIT0_OFFMODEOUTENABLE | GPMC_WAIT0_OFFMODEEENABLE | GPMC_WAIT0_INPUTENABLE | RESERVED | | | GPMC_WAIT0_PULLTYPESELECT | GPMC_WAIT0_PULLUDENABLE | | | GPMC_WAIT0_MUXMODE | GPMC_NBE1_WAKEUPEVENT | GPMC_NBE1_WAKEUPENABLE | GPMC_NBE1_OFFMODEPULLTYPESELECT | GPMC_NBE1_OFFMODEPULLUDENABLE | GPMC_NBE1_OFFMODEOUTVALUE | GPMC_NBE1_OFFMODEOUTENABLE | GPMC_NBE1_OFFMODEEENABLE | GPMC_NBE1_INPUTENABLE | RESERVED | | | GPMC_NBE1_PULLTYPESELECT | GPMC_NBE1_PULLUDENABLE | | | GPMC_NBE1_MUXMODE |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-------|
| 31 | GPMC_WAIT0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_WAIT0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------------|---|------|-------|
| 29 | GPMC_WAIT0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_wait0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_WAIT0_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_wait0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_WAIT0_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_wait0 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_WAIT0_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_wait0. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_WAIT0_OFFMODEENABLE | OffMode mode override control for pad gpmc_wait0 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_WAIT0_INPUTENABLE | Input enable value for pad gpmc_wait0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_WAIT0_PULLTYPESELECT | pullup/down selection for pad gpmc_wait0 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | GPMC_WAIT0_PULLUDENABLE | pullup/down enable for pad gpmc_wait0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_WAIT0_MUXMODE | Functional multiplexing selection for pad gpmc_wait0 0x0: Select gpmc_wait0 0x1: Select dsi2_te1 0x3: Select gpio_61 | RW | 0x0 |
| 15 | GPMC_NBE1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_NBE1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_NBE1_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_nbe1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_NBE1_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_nbe1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_NBE1_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_nbe1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------|--|------|-------|
| 10 | GPMC_NBE1_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_nbe1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_NBE1_OFFMODEENABLE | OffMode mode override control for pad gpmc_nbe1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_NBE1_INPUTENABLE | Input enable value for pad gpmc_nbe1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_NBE1_PULLTYPESELECT | pullup/down selection for pad gpmc_nbe1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPMC_NBE1_PULLUDENABLE | pullup/down enable for pad gpmc_nbe1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_NBE1_MUXMODE | Functional multiplexing selection for pad gpmc_nbe1 0x0: Select gpmc_nbe1 0x2: Select c2c_dataout5 0x3: Select gpio_60 0x7: Select safe_mode | RW | 0x7 |

**Table 19-386. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_NBE1_PAD1_GPMC_WAIT0**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-387. CONTROL_CORE_PAD0_GPMC_WAIT1_PAD1_GPMC_WAIT2

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 008C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 008C | | |
| Description | Register control for Pads gpmc_wait1 and gpmc_wait2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|-------------------------|----------------------------------|----------------------------------|----------------------------|-----------------------------|---------------------------|------------------------|----------|----|----|---------------------------|---------------------------|----|--------------------|----|------------------------|-------------------------|----------------------------------|----------------------------------|----------------------------|-----------------------------|---------------------------|------------------------|----------|---|---|---------------------------|---------------------------|---|--------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GPMC_WAIT2_WAKEUPEVENT | GPMC_WAIT2_WAKEUPENABLE | GPMC_WAIT2_OFFMODEPULLTYPESELECT | GPMC_WAIT2_OFFMODEPULLUDENENABLE | GPMC_WAIT2_OFFMODEOUTVALUE | GPMC_WAIT2_OFFMODEOUTENABLE | GPMC_WAIT2_OFFMODEEENABLE | GPMC_WAIT2_INPUTENABLE | RESERVED | | | GPMC_WAIT2_PULLTYPESELECT | GPMC_WAIT2_PULLUDENENABLE | | GPMC_WAIT2_MUXMODE | | GPMC_WAIT1_WAKEUPEVENT | GPMC_WAIT1_WAKEUPENABLE | GPMC_WAIT1_OFFMODEPULLTYPESELECT | GPMC_WAIT1_OFFMODEPULLUDENENABLE | GPMC_WAIT1_OFFMODEOUTVALUE | GPMC_WAIT1_OFFMODEOUTENABLE | GPMC_WAIT1_OFFMODEEENABLE | GPMC_WAIT1_INPUTENABLE | RESERVED | | | GPMC_WAIT1_PULLTYPESELECT | GPMC_WAIT1_PULLUDENENABLE | | GPMC_WAIT1_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------------|---|------|-------|
| 31 | GPMC_WAIT2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_WAIT2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_WAIT2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_wait2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_WAIT2_OFFMODEPULLUDENENABLE | OffMode mode pullup/down enable for pad gpmc_wait2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_WAIT2_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_wait2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_WAIT2_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_wait2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_WAIT2_OFFMODEEENABLE | OffMode mode override control for pad gpmc_wait2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_WAIT2_INPUTENABLE | Input enable value for pad gpmc_wait2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------------|--|------|-------|
| 20 | GPMC_WAIT2_PULLTYPESELE CT | pullup/down selection for pad gpmc_wait2 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPMC_WAIT2_PULLUDENABL E | pullup/down enable for pad gpmc_wait2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_WAIT2_MUXMODE | Functional multiplexing selection for pad gpmc_wait2 0x0: Select gpmc_wait2 0x1: Select usbc1_icusb_txen 0x2: Select c2c_dataout3 0x3: Select gpio_100 0x4: Select sys_ndmareq0 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPMC_WAIT1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_WAIT1_WAKEUPENABL E | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_WAIT1_ OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_wait1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_WAIT1_ OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_wait1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_WAIT1_OFFMODEOUTV ALUE | OffMode mode output value for pad gpmc_wait1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_WAIT1_OFFMODEOUTE NABLE | OffMode mode output enable value for pad gpmc_wait1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_WAIT1_OFFMODEENAB LE | OffMode mode override control for pad gpmc_wait1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_WAIT1_INPUTENABLE | Input enable value for pad gpmc_wait1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_WAIT1_PULLTYPESELE CT | pullup/down selection for pad gpmc_wait1 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | GPMC_WAIT1_PULLUDENABL E | pullup/down enable for pad gpmc_wait1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|------|-------|
| 2:0 | GPMC_WAIT1_MUXMODE | Functional multiplexing selection for pad gpmc_wait1 0x0: Select gpmc_wait1 0x2: Select c2c_dataout2 0x3: Select gpio_62 0x7: Select safe_mode | RW | 0x7 |

**Table 19-388. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_WAIT1_PAD1_GPMC_WAIT2**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-389. CONTROL_CORE_PAD0_GPMC_NCS4_PAD1_GPMC_NCS5

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0090 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0090 | | |
| Description | Register control for Pads gpmc_ncs4 and gpmc_ncs5 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|----|----|----|--------------------------|-----------------------|-------------------|----|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|---|---|---|--------------------------|-----------------------|-------------------|---|
| GPMC_NCS5_WAKEUPEVENT | GPMC_NCS5_WAKEUPENABLE | GPMC_NCS5_OFFMODEPULLTYPESELECT | GPMC_NCS5_OFFMODEPULLUDENABE | GPMC_NCS5_OFFMODEOUTVALUE | GPMC_NCS5_OFFMODEOUTENABLE | GPMC_NCS5_OFFMODEEENABLE | GPMC_NCS5_INPUTENABLE | RESERVED | | | | GPMC_NCS5_PULLTYPESELECT | GPMC_NCS5_PULLUDENABE | GPMC_NCS5_MUXMODE | | GPMC_NCS4_WAKEUPEVENT | GPMC_NCS4_WAKEUPENABLE | GPMC_NCS4_OFFMODEPULLTYPESELECT | GPMC_NCS4_OFFMODEPULLUDENABE | GPMC_NCS4_OFFMODEOUTVALUE | GPMC_NCS4_OFFMODEOUTENABLE | GPMC_NCS4_OFFMODEEENABLE | GPMC_NCS4_INPUTENABLE | RESERVED | | | | GPMC_NCS4_PULLTYPESELECT | GPMC_NCS4_PULLUDENABE | GPMC_NCS4_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|---|------|-------|
| 31 | GPMC_NCS5_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_NCS5_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_NCS5_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ncs5 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|---|------|-------|
| 28 | GPMC_NCS5_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ncs5 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_NCS5_OFFMODEOUTV ALUE | OffMode mode output value for pad gpmc_ncs5 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_NCS5_OFFMODEOUTE NABLE | OffMode mode output enable value for pad gpmc_ncs5 . This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_NCS5_OFFMODEENAB LE | OffMode mode override control for pad gpmc_ncs5 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPMC_NCS5_INPUTENABLE | Input enable value for pad gpmc_ncs5 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_NCS5_PULLTYPESELE CT | pullup/down selection for pad gpmc_ncs5 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPMC_NCS5_PULLUDENABLE | pullup/down enable for pad gpmc_ncs5 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_NCS5_MUXMODE | Functional multiplexing selection for pad gpmc_ncs5 0x0: Select gpmc_ncs5 0x1: Select dsi1_te1 0x2: Select c2c_clkin1 0x3: Select gpio_102 0x4: Select sys_ndmareq2 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPMC_NCS4_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_NCS4_WAKEUPENABL E | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_NCS4_ OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ncs4 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 12 | GPMC_NCS4_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ncs4 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_NCS4_OFFMODEOUTV ALUE | OffMode mode output value for pad gpmc_ncs4 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_NCS4_OFFMODEOUTE NABLE | OffMode mode output enable value for pad gpmc_ncs4. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_NCS4_OFFMODEENAB LE | OffMode mode override control for pad gpmc_ncs4 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_NCS4_INPUTENABLE | Input enable value for pad gpmc_ncs4 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_NCS4_PULLTYPESELE CT | pullup/down selection for pad gpmc_ncs4 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPMC_NCS4_PULLUDENABLE | pullup/down enable for pad gpmc_cs4 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_NCS4_MUXMODE | Functional multiplexing selection for pad gpmc_ncs4 0x0: Select gpmc_ncs4 0x1: Select dsi1_te0 0x2: Select c2c_clkin0 0x3: Select gpio_101 0x4: Select sys_ndmareq1 0x7: Select safe_mode | RW | 0x7 |

**Table 19-390. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_NCS4_PAD1_GPMC_NCS5**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-391. CONTROL_CORE_PAD0_GPMC_NCS6_PAD1_GPMC_NCS7

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0094 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A10 0094 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Description | | Register control for Pads gpmc_ncs6 and gpmc_ncs7 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|----|------------------------|----|---------------------------------|----|-------------------------------|----|---------------------------|----|----------------------------|----|-------------------------|----|-----------------------|----|----------|----|--------------------------|----|------------------------|----|-------------------|---|-----------------------|---|------------------------|---|---------------------------------|---|-------------------------------|---|---------------------------|--|----------------------------|--|-------------------------|--|-----------------------|--|----------|--|--------------------------|--|------------------------|--|-------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| GPMC_NCS7_WAKEUPEVENT | | GPMC_NCS7_WAKEUPENABLE | | GPMC_NCS7_OFFMODEPULLTYPESELECT | | GPMC_NCS7_OFFMODEPULLUDENABLE | | GPMC_NCS7_OFFMODEOUTVALUE | | GPMC_NCS7_OFFMODEOUTENABLE | | GPMC_NCS7_OFFMODEENABLE | | GPMC_NCS7_INPUTENABLE | | RESERVED | | GPMC_NCS7_PULLTYPESELECT | | GPMC_NCS7_PULLUDENABLE | | GPMC_NCS7_MUXMODE | | GPMC_NCS6_WAKEUPEVENT | | GPMC_NCS6_WAKEUPENABLE | | GPMC_NCS6_OFFMODEPULLTYPESELECT | | GPMC_NCS6_OFFMODEPULLUDENABLE | | GPMC_NCS6_OFFMODEOUTVALUE | | GPMC_NCS6_OFFMODEOUTENABLE | | GPMC_NCS6_OFFMODEENABLE | | GPMC_NCS6_INPUTENABLE | | RESERVED | | GPMC_NCS6_PULLTYPESELECT | | GPMC_NCS6_PULLUDENABLE | | GPMC_NCS6_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|--|------|-------|
| 31 | GPMC_NCS7_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_NCS7_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPMC_NCS7_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ncs7 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPMC_NCS7_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ncs7 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPMC_NCS7_OFFMODEOUTVALUE | OffMode mode output value for pad gpmc_ncs7 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPMC_NCS7_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpmc_ncs7. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPMC_NCS7_OFFMODEENABLE | OffMode mode override control for pad gpmc_ncs7 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|--|------|-------|
| 24 | GPMC_NCS7_INPUTENABLE | Input enable value for pad gpmc_ncs7 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPMC_NCS7_PULLTYPESELE CT | pullup/down selection for pad gpmc_ncs7 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPMC_NCS7_PULLUDENABLE | pullup/down enable for pad gpmc_ncs7 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPMC_NCS7_MUXMODE | Functional multiplexing selection for pad gpmc_ncs7 0x0: Select gpmc_ncs7 0x1: Select dsi2_te1 0x2: Select c2c_dataout1 0x3: Select gpio_104 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPMC_NCS6_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_NCS6_WAKEUPENABL E | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPMC_NCS6_ OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpmc_ncs6 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPMC_NCS6_ OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpmc_ncs6 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPMC_NCS6_OFFMODEOUTV ALUE | OffMode mode output value for pad gpmc_ncs6 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPMC_NCS6_OFFMODEOUTE NABLE | OffMode mode output enable value for pad gpmc_ncs6. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPMC_NCS6_OFFMODEENAB LE | OffMode mode override control for pad gpmc_ncs6 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPMC_NCS6_INPUTENABLE | Input enable value for pad gpmc_ncs6 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------|
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPMC_NCS6_PULLTYPESELECT | pullup/down selection for pad gpmc_ncs6 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPMC_NCS6_PULLUDENABLE | pullup/down enable for pad gpmc_ncs6 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPMC_NCS6_MUXMODE | Functional multiplexing selection for pad gpmc_ncs6 0x0: Select gpmc_ncs6 0x1: Select dsi2_te0 0x2: Select c2c_dataout0 0x3: Select gpio_103 0x4: Select sys_ndmareq3 0x7: Select safe_mode | RW | 0x7 |

**Table 19-392. Register Call Summary for Register
CONTROL_CORE_PAD0_GPMC_NCS6_PAD1_GPMC_NCS7**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-393. CONTROL_CORE_PAD0_GPIO63_PAD1_GPIO64

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0098 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0098 | | |
| Description | Register control for Pads gpio63 and gpio64 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|---------------------|------------------------------|----------------------------|------------------------|-------------------------|-----------------------|--------------------|----------|----|----|-----------------------|---------------------|----------------|----|----|--------------------|---------------------|------------------------------|----------------------------|------------------------|-------------------------|-----------------------|--------------------|----------|---|---|-----------------------|---------------------|----------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GPIO64_WAKEUPEVENT | GPIO64_WAKEUPENABLE | GPIO64_OFFMODEPULLTYPESELECT | GPIO64_OFFMODEPULLUDENABLE | GPIO64_OFFMODEOUTVALUE | GPIO64_OFFMODEOUTENABLE | GPIO64_OFFMODEEENABLE | GPIO64_INPUTENABLE | RESERVED | | | GPIO64_PULLTYPESELECT | GPIO64_PULLUDENABLE | GPIO64_MUXMODE | | | GPIO63_WAKEUPEVENT | GPIO63_WAKEUPENABLE | GPIO63_OFFMODEPULLTYPESELECT | GPIO63_OFFMODEPULLUDENABLE | GPIO63_OFFMODEOUTVALUE | GPIO63_OFFMODEOUTENABLE | GPIO63_OFFMODEEENABLE | GPIO63_INPUTENABLE | RESERVED | | | GPIO63_PULLTYPESELECT | GPIO63_PULLUDENABLE | GPIO63_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------|
| 31 | GPIO64_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|---|------|-------|
| 30 | GPIO64_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPIO64_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpio64 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPIO64_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpio64 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPIO64_OFFMODEOUTVALUE | OffMode mode output value for pad gpio64 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPIO64_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpio64. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPIO64_OFFMODEENABLE | OffMode mode override control for pad gpio64 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPIO64_INPUTENABLE | Input enable value for pad gpio64 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPIO64_PULLTYPESELECT | pullup/down selection for pad gpio64 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | GPIO64_PULLUDENABLE | pullup/down enable for pad gpio64 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPIO64_MUXMODE | Functional multiplexing selection for pad gpio64 0x0: Reserved 0x3: Select gpio_64 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPIO63_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPIO63_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPIO63_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpio63 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPIO63_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpio63 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-------|
| 11 | GPIO63_OFFMODEOUTVALUE | OffMode mode output value for pad gpio63 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPIO63_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpio63. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPIO63_OFFMODEENABLE | OffMode mode override control for pad gpio63 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPIO63_INPUTENABLE | Input enable value for pad gpio63 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPIO63_PULLTYPESELECT | pullup/down selection for pad gpio63 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPIO63_PULLUDENABLE | pullup/down enable for pad gpio63 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPIO63_MUXMODE | Functional multiplexing selection for pad gpio63 0x0: Reserved 0x3: Select gpio_63 0x7: Select safe_mode | RW | 0x7 |

Table 19-394. Register Call Summary for Register CONTROL_CORE_PAD0_GPIO63_PAD1_GPIO64

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-395. CONTROL_CORE_PAD0_GPIO65_PAD1_GPIO66

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 009C | | |
| Physical Address | 0x4A10 009C | Instance | SYSCTRL_PADCONF_CORE |
| Description | Register control for Pads gpio65 and gpio66 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
|--------------------|----|---------------------|----|------------------------------|----|------------------------------|----|------------------------|----|-------------------------|----|-----------------------|----|--------------------|----|----------|----|-----------------------|----|-----------------------|----|----------------|---|--------------------|---|---------------------|---|------------------------------|---|------------------------------|---|------------------------|--|-------------------------|--|-----------------------|--|--------------------|--|----------|--|-----------------------|--|-----------------------|--|----------------|--|
| GPIO66_WAKEUPEVENT | | GPIO66_WAKEUPENABLE | | GPIO66_OFFMODEPULLTYPESELECT | | GPIO66_OFFMODEPULLUDENENABLE | | GPIO66_OFFMODEOUTVALUE | | GPIO66_OFFMODEOUTENABLE | | GPIO66_OFFMODEEENABLE | | GPIO66_INPUTENABLE | | RESERVED | | GPIO66_PULLTYPESELECT | | GPIO66_PULLUDENENABLE | | GPIO66_MUXMODE | | GPIO65_WAKEUPEVENT | | GPIO65_WAKEUPENABLE | | GPIO65_OFFMODEPULLTYPESELECT | | GPIO65_OFFMODEPULLUDENENABLE | | GPIO65_OFFMODEOUTVALUE | | GPIO65_OFFMODEOUTENABLE | | GPIO65_OFFMODEEENABLE | | GPIO65_INPUTENABLE | | RESERVED | | GPIO65_PULLTYPESELECT | | GPIO65_PULLUDENENABLE | | GPIO65_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------------|---|------|-------|
| 31 | GPIO66_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPIO66_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPIO66_OFFMODEPULLTYPES ELECT | OffMode mode pullup/down selection for pad gpio66 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPIO66_OFFMODEPULLUDEN ABLE | OffMode mode pullup/down enable for pad gpio66 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPIO66_OFFMODEOUTVALUE | OffMode mode output value for pad gpio66 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPIO66_OFFMODEOUTENABL E | OffMode mode output enable value for pad gpio66. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPIO66_OFFMODEEENABLE | OffMode mode override control for pad gpio66 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | GPIO66_INPUTENABLE | Input enable value for pad gpio66 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPIO66_PULLTYPESELECT | pullup/down selection for pad gpio66 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | GPIO66_PULLUDENENABLE | pullup/down enable for pad gpio66 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|---|------|-------|
| 18:16 | GPIO66_MUXMODE | Functional multiplexing selection for pad gpio66 0x0: Reserved 0x3: Select gpio_66 ⁽¹⁾ 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPIO65_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPIO65_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPIO65_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpio65 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPIO65_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpio65 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPIO65_OFFMODEOUTVALUE | OffMode mode output value for pad GPIO65 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPIO65_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpio65. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPIO65_OFFMODEENABLE | OffMode mode override control for pad gpio65 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPIO65_INPUTENABLE | Input enable value for pad gpio65 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPIO65_PULLTYPESELECT | pullup/down selection for pad gpio65 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | GPIO65_PULLUDENABLE | pullup/down enable for pad gpio65 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPIO65_MUXMODE | Functional multiplexing selection for pad gpio65 0x0: Reserved 0x3: Select gpio_65 ⁽²⁾ 0x7: Select safe_mode | RW | 0x7 |

⁽¹⁾ To configure gpio_66 pad in GPIO mode, user must set CONTROL_I2C_1[22] GPIO66_NMODE to 0x1.

⁽²⁾ To configure gpio_65 pad in GPIO mode, user must set CONTROL_I2C_1[20] GPIO65_NMODE to 0x1.

Table 19-396. Register Call Summary for Register CONTROL_CORE_PAD0_GPIO65_PAD1_GPIO66

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-397. CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 00A0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00A0 | | |
| Description | Register control for Pads csi21_dx0 and csi21_dy0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
|-----------------------|------------------------|----------|----|----|----|----|----|-----------------------|----------|----|----|----|----|----|--------------------------|----|------------------------|-------------------|----|----|-----------------------|---|---|------------------------|----------|---|---|---|-----------------------|---|----------|--|--|--------------------------|--|------------------------|-------------------|--|--|
| CSI21_DY0_WAKEUPEVENT | CSI21_DY0_WAKEUPENABLE | RESERVED | | | | | | CSI21_DY0_INPUTENABLE | RESERVED | | | | | | CSI21_DY0_PULLTYPESELECT | | CSI21_DY0_PULLUDENABLE | CSI21_DY0_MUXMODE | | | CSI21_DX0_WAKEUPEVENT | | | CSI21_DX0_WAKEUPENABLE | RESERVED | | | | CSI21_DX0_INPUTENABLE | | RESERVED | | | CSI21_DX0_PULLTYPESELECT | | CSI21_DX0_PULLUDENABLE | CSI21_DX0_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|-------|
| 31 | CSI21_DY0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | CSI21_DY0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | CSI21_DY0_INPUTENABLE | Input enable value for pad csi21_dy0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | CSI21_DY0_PULLTYPESELECT | pullup/down selection for pad csi21_dy0 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | CSI21_DY0_PULLUDENABLE | pullup/down enable for pad csi21_dy0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | CSI21_DY0_MUXMODE | Functional multiplexing selection for pad csi21_dy0 0x0: Select csi21_dy0 0x3: Select gpi_68 0x7: Select safe_mode | RW | 0x7 |
| 15 | CSI21_DX0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | CSI21_DX0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------|
| 8 | CSI21_DX0_INPUTENABLE | Input enable value for pad csi21_dx0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CSI21_DX0_PULLTYPESELECT | pullup/down selection for pad csi21_dx0 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | CSI21_DX0_PULLUDENABLE | pullup/down enable for pad csi21_dx0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | CSI21_DX0_MUXMODE | Functional multiplexing selection for pad csi21_dx0 0x0: Select csi21_dx0 0x3: Select gpi_67 0x7: Select safe_mode | RW | 0x7 |

**Table 19-398. Register Call Summary for Register
CONTROL_CORE_PAD0_CSI21_DX0_PAD1_CSI21_DY0**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-399. CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 00A4 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00A4 | | |
| Description | Register control for Pads csi21_dx1 and csi21_dy1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------------|----------|----|----|----|----|----|-----------------------|----------|----|----|----|----|----|--------------------------|----|------------------------|----|-------------------|----|----------|---|---|---|---|---|-----------------------|---|----------|---|---|--|--|--|--------------------------|--|------------------------|--|-------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | |
| CSI21_DY1_WAKEUPEVENT | CSI21_DY1_WAKEUPENABLE | RESERVED | | | | | | CSI21_DY1_INPUTENABLE | RESERVED | | | | | | CSI21_DY1_PULLTYPESELECT | | CSI21_DY1_PULLUDENABLE | | CSI21_DY1_MUXMODE | | RESERVED | | | | | | CSI21_DX1_INPUTENABLE | | RESERVED | | | | | | CSI21_DX1_PULLTYPESELECT | | CSI21_DX1_PULLUDENABLE | | CSI21_DX1_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|-------|
| 31 | CSI21_DY1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | CSI21_DY1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|-------|
| 24 | CSI21_DY1_INPUTENABLE | Input enable value for pad csi21_dy1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | CSI21_DY1_PULLTYPESELECT | pullup/down selection for pad csi21_dy1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | CSI21_DY1_PULLUDENABLE | pullup/down enable for pad csi21_dy1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | CSI21_DY1_MUXMODE | Functional multiplexing selection for pad csi21_dy1 0x0: Select csi21_dy1 0x3: Select gpi_70 0x7: Select safe_mode | RW | 0x7 |
| 15 | CSI21_DX1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | CSI21_DX1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | CSI21_DX1_INPUTENABLE | Input enable value for pad csi21_dx1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CSI21_DX1_PULLTYPESELECT | pullup/down selection for pad csi21_dx1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | CSI21_DX1_PULLUDENABLE | pullup/down enable for pad csi21_dx1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | CSI21_DX1_MUXMODE | Functional multiplexing selection for pad csi21_dx1 0x0: Select csi21_dx1 0x3: Select gpi_69 0x7: Select safe_mode | RW | 0x7 |

**Table 19-400. Register Call Summary for Register
CONTROL_CORE_PAD0_CSI21_DX1_PAD1_CSI21_DY1**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-401. CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 00A8 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00A8 | | |
| Description | Register control for Pads csi21_dx2 and csi21_dy2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------------|----------|----|----|----|----|----|-----------------------|----------|----|--------------------------|------------------------|-------------------|----|----|-----------------------|------------------------|----------|----|----|----|---|---|-----------------------|----------|---|--------------------------|------------------------|-------------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CSI21_DY2_WAKEUPEVENT | CSI21_DY2_WAKEUPENABLE | RESERVED | | | | | | CSI21_DY2_INPUTENABLE | RESERVED | | CSI21_DY2_PULLTYPESELECT | CSI21_DY2_PULLUDENABLE | CSI21_DY2_MUXMODE | | | CSI21_DX2_WAKEUPEVENT | CSI21_DX2_WAKEUPENABLE | RESERVED | | | | | | CSI21_DX2_INPUTENABLE | RESERVED | | CSI21_DX2_PULLTYPESELECT | CSI21_DX2_PULLUDENABLE | CSI21_DX2_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|-------|
| 31 | CSI21_DY2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | CSI21_DY2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | CSI21_DY2_INPUTENABLE | Input enable value for pad csi21_dy2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | CSI21_DY2_PULLTYPESELECT | pullup/down selection for pad csi21_dy2 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | CSI21_DY2_PULLUDENABLE | pullup/down enable for pad csi21_dy2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | CSI21_DY2_MUXMODE | Functional multiplexing selection for pad csi21_dy2 0x0: Select csi21_dy2 0x3: Select gpi_72 0x7: Select safe_mode | RW | 0x7 |
| 15 | CSI21_DX2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | CSI21_DX2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------|
| 8 | CSI21_DX2_INPUTENABLE | Input enable value for pad csi21_dx2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CSI21_DX2_PULLTYPESELECT | pullup/down selection for pad csi21_dx2 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | CSI21_DX2_PULLUDENABLE | pullup/down enable for pad csi21_dx2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | CSI21_DX2_MUXMODE | Functional multiplexing selection for pad csi21_dx2 0x0: Select csi21_dx2 0x3: Select gpi_71 0x7: Select safe_mode | RW | 0x7 |

**Table 19-402. Register Call Summary for Register
CONTROL_CORE_PAD0_CSI21_DX2_PAD1_CSI21_DY2**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-403. CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 00AC | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00AC | | |
| Description | Register control for Pads csi21_dx3 and csi21_dy3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------------|----------|----|----|----|-----------------------|----------|--------------------------|------------------------|-------------------|----|----|----|-----------------------|------------------------|----------|----|----|----|-----------------------|----------|--------------------------|------------------------|-------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CSI21_DY3_WAKEUPEVENT | CSI21_DY3_WAKEUPENABLE | RESERVED | | | | CSI21_DY3_INPUTENABLE | RESERVED | CSI21_DY3_PULLTYPESELECT | CSI21_DY3_PULLUDENABLE | CSI21_DY3_MUXMODE | | | | CSI21_DX3_WAKEUPEVENT | CSI21_DX3_WAKEUPENABLE | RESERVED | | | | CSI21_DX3_INPUTENABLE | RESERVED | CSI21_DX3_PULLTYPESELECT | CSI21_DX3_PULLUDENABLE | CSI21_DX3_MUXMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------|---|------|-------|
| 31 | CSI21_DY3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | CSI21_DY3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|-------|
| 24 | CSI21_DY3_INPUTENABLE | Input enable value for pad csi21_dy3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | CSI21_DY3_PULLTYPESELECT | pullup/down selection for pad csi21_dy3 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | CSI21_DY3_PULLUDENABLE | pullup/down enable for pad csi21_dy3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | CSI21_DY3_MUXMODE | Functional multiplexing selection for pad csi21_dy3 0x0: Select csi21_dy3 0x1: Select cam2_d6 0x3: Select gpi_74 0x7: Select safe_mode | RW | 0x7 |
| 15 | CSI21_DX3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | CSI21_DX3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | CSI21_DX3_INPUTENABLE | Input enable value for pad csi21_dx3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CSI21_DX3_PULLTYPESELECT | pullup/down selection for pad csi21_dx3 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | CSI21_DX3_PULLUDENABLE | pullup/down enable for pad csi21_dx3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | CSI21_DX3_MUXMODE | Functional multiplexing selection for pad csi21_dx3 0x0: Select csi21_dx3 0x1: Select cam2_d7 0x3: Select gpi_73 0x7: Select safe_mode | RW | 0x7 |

**Table 19-404. Register Call Summary for Register
CONTROL_CORE_PAD0_CSI21_DX3_PAD1_CSI21_DY3**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-405. CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 00B0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00B0 | | |
| Description | Register control for Pads csi21_dx4 and csi21_dy4 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
|-----------------------|------------------------|----------|----|----|----|----|----|-----------------------|----------|----|----|----|----|----|--------------------------|------------------------|-------------------|----|-----------------------|------------------------|----------|---|---|---|---|---|-----------------------|----------|---|---|---|--|--|--------------------------|------------------------|-------------------|--|
| CSI21_DY4_WAKEUPEVENT | CSI21_DY4_WAKEUPENABLE | RESERVED | | | | | | CSI21_DY4_INPUTENABLE | RESERVED | | | | | | CSI21_DY4_PULLTYPESELECT | CSI21_DY4_PULLUDENABLE | CSI21_DY4_MUXMODE | | CSI21_DX4_WAKEUPEVENT | CSI21_DX4_WAKEUPENABLE | RESERVED | | | | | | CSI21_DX4_INPUTENABLE | RESERVED | | | | | | CSI21_DX4_PULLTYPESELECT | CSI21_DX4_PULLUDENABLE | CSI21_DX4_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|-------|
| 31 | CSI21_DY4_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | CSI21_DY4_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | CSI21_DY4_INPUTENABLE | Input enable value for pad csi21_dy4 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | CSI21_DY4_PULLTYPESELECT | pullup/down selection for pad csi21_dy4 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | CSI21_DY4_PULLUDENABLE | pullup/down enable for pad csi21_dy4 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | CSI21_DY4_MUXMODE | Functional multiplexing selection for pad csi21_dy4 0x0: Select csi21_dy4 0x1: Select cam2_d4 0x3: Select gpi_76 0x7: Select safe_mode | RW | 0x7 |
| 15 | CSI21_DX4_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | CSI21_DX4_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|------|-------|
| 8 | CSI21_DX4_INPUTENABLE | Input enable value for pad csi21_dx4 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CSI21_DX4_PULLTYPESELECT | pullup/down selection for pad csi21_dx4 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | CSI21_DX4_PULLUDENABLE | pullup/down enable for pad csi21_dx4 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | CSI21_DX4_MUXMODE | Functional multiplexing selection for pad csi21_dx4 0x0: Select csi21_dx4 0x1: Select cam2_d5 0x3: Select gpi_75 0x7: Select safe_mode | RW | 0x7 |

**Table 19-406. Register Call Summary for Register
CONTROL_CORE_PAD0_CSI21_DX4_PAD1_CSI21_DY4**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-407. CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0

| | | | | | | | |
|------------------|--|---|----------|----------------------|--|--|--|
| Address Offset | | 0x0000 00B4 | | | | | |
| Physical Address | | 0x4A10 00B4 | Instance | SYSCTRL_PADCONF_CORE | | | |
| Description | | Register control for Pads csi22_dx0 and csi22_dy0 Access conditions. Read: unrestricted, Write: unrestricted | | | | | |
| Type | | RW | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|----|------------------------|----|----------|----|----|----|-----------------------|----|----------|----|--------------------------|----|------------------------|----|-------------------|----|-----------------------|----|------------------------|----|----------|---|---|---|-----------------------|---|----------|---|--------------------------|---|------------------------|--|-------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| CSI22_DY0_WAKEUPEVENT | | CSI22_DY0_WAKEUPENABLE | | RESERVED | | | | CSI22_DY0_INPUTENABLE | | RESERVED | | CSI22_DY0_PULLTYPESELECT | | CSI22_DY0_PULLUDENABLE | | CSI22_DY0_MUXMODE | | CSI22_DX0_WAKEUPEVENT | | CSI22_DX0_WAKEUPENABLE | | RESERVED | | | | CSI22_DX0_INPUTENABLE | | RESERVED | | CSI22_DX0_PULLTYPESELECT | | CSI22_DX0_PULLUDENABLE | | CSI22_DX0_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------|
| 31 | CSI22_DY0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | CSI22_DY0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|-------|
| 29:25 | RESERVED | | R | 0x00 |
| 24 | CSI22_DY0_INPUTENABLE | Input enable value for pad csi22_dy0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | CSI22_DY0_PULLTYPESELECT | pullup/down selection for pad csi22_dy0 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | CSI22_DY0_PULLUDENABLE | pullup/down enable for pad csi22_dy0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | CSI22_DY0_MUXMODE | Functional multiplexing selection for pad csi22_dy0 0x0: Select csi22_dy0 0x1: Select cam2_d2 0x2: Select cam2_d13 0x3: Select gpi_78 0x7: Select safe_mode | RW | 0x7 |
| 15 | CSI22_DX0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | CSI22_DX0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | CSI22_DX0_INPUTENABLE | Input enable value for pad csi22_dx0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CSI22_DX0_PULLTYPESELECT | pullup/down selection for pad csi22_dx0 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | CSI22_DX0_PULLUDENABLE | pullup/down enable for pad csi22_dx0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | CSI22_DX0_MUXMODE | Functional multiplexing selection for pad csi22_dx0 0x0: Select csi22_dx0 0x1: Select cam2_d3 0x2: Select cam2_d12 0x3: Select gpi_77 0x7: Select safe_mode | RW | 0x7 |

**Table 19-408. Register Call Summary for Register
CONTROL_CORE_PAD0_CSI22_DX0_PAD1_CSI22_DY0**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-409. CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|----------------------|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 00B8 | | | | | | | | | | | | | | | | Instance | | SYSCTRL_PADCONF_CORE | | | | | | | | | |
| Physical Address | | 0x4A10 00B8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Register control for Pads csi22_dx1 and csi22_dy1 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------------|----------|----|----|----|-----------------------|----------|--------------------------|------------------------|-------------------|----|-----------------------|------------------------|----------|----|----|----|-----------------------|----------|--------------------------|------------------------|-------------------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CSI22_DY1_WAKEUPEVENT | CSI22_DY1_WAKEUPENABLE | RESERVED | | | | CSI22_DY1_INPUTENABLE | RESERVED | CSI22_DY1_PULLTYPESELECT | CSI22_DY1_PULLUDENABLE | CSI22_DY1_MUXMODE | | CSI22_DX1_WAKEUPEVENT | CSI22_DX1_WAKEUPENABLE | RESERVED | | | | CSI22_DX1_INPUTENABLE | RESERVED | CSI22_DX1_PULLTYPESELECT | CSI22_DX1_PULLUDENABLE | CSI22_DX1_MUXMODE | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|-------|
| 31 | CSI22_DY1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | CSI22_DY1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | CSI22_DY1_INPUTENABLE | Input enable value for pad csi22_dy1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | CSI22_DY1_PULLTYPESELECT | pullup/down selection for pad csi22_dy1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | CSI22_DY1_PULLUDENABLE | pullup/down enable for pad csi22_dy1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | CSI22_DY1_MUXMODE | Functional multiplexing selection for pad csi22_dy1 0x0: Select csi22_dy1 0x1: Select cam2_d0 0x2: Select cam2_d15 0x3: Select gpi_80 0x7: Select safe_mode | RW | 0x7 |
| 15 | CSI22_DX1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | CSI22_DX1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------|
| 13:9 | RESERVED | | R | 0x00 |
| 8 | CSI22_DX1_INPUTENABLE | Input enable value for pad csi22_dx1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CSI22_DX1_PULLTYPESELECT | pullup/down selection for pad csi22_dx1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | CSI22_DX1_PULLUDENABLE | pullup/down enable for pad csi22_dx1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | CSI22_DX1_MUXMODE | Functional multiplexing selection for pad csi22_dx1 0x0: Select csi22_dx1 0x1: Select cam2_d1 0x2: Select cam2_14 0x3: Select gpi_79 0x7: Select safe_mode | RW | 0x7 |

**Table 19-410. Register Call Summary for Register
CONTROL_CORE_PAD0_CSI22_DX1_PAD1_CSI22_DY1**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-411. CONTROL_CORE_PAD0_CAM_SHUTTER_PAD1_CAM_STROBE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|----|--|----|-----------------------------------|----|---------------------------------|----|-----------------------------|----|------------------------------|----|----------------------------|----|-------------------------|----|----------|----|----------|----|----------------------|----|---|---|----------------------------|---|--------------------------|---|---------------------|---|---|---|--|--|--|--|
| Address Offset | | 0x0000 00BC | | | | | | | | | | | | | | | | Instance | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A10 00BC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Register control for Pads cam_shutter and cam_strobe Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| CAM_STROBE_WAKEUPEVENT | | CAM_STROBE_WAKEUPENABLE | | CAM_STROBE_OFFMODEPULLTYPESELECT | | CAM_STROBE_OFFMODEPULLUDENABLE | | CAM_STROBE_OFFMODEOUTVALUE | | CAM_STROBE_OFFMODEOUTENABLE | | CAM_STROBE_OFFMODEEENABLE | | CAM_STROBE_INPUTENABLE | | RESERVED | | | | | | | | CAM_STROBE_PULLTYPESELECT | | CAM_STROBE_PULLUDENABLE | | CAM_STROBE_MUXMODE | | | | | | | |
| CAM_SHUTTER_WAKEUPEVENT | | CAM_SHUTTER_WAKEUPENABLE | | CAM_SHUTTER_OFFMODEPULLTYPESELECT | | CAM_SHUTTER_OFFMODEPULLUDENABLE | | CAM_SHUTTER_OFFMODEOUTVALUE | | CAM_SHUTTER_OFFMODEOUTENABLE | | CAM_SHUTTER_OFFMODEEENABLE | | CAM_SHUTTER_INPUTENABLE | | RESERVED | | | | | | | | CAM_SHUTTER_PULLTYPESELECT | | CAM_SHUTTER_PULLUDENABLE | | CAM_SHUTTER_MUXMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|---|------|-------|
| 31 | CAM_STROBE_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | CAM_STROBE_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | CAM_STROBE_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad cam_strobe 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | CAM_STROBE_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad cam_strobe 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | CAM_STROBE_OFFMODEOUTVALUE | OffMode mode output value for pad cam_strobe 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | CAM_STROBE_OFFMODEOUTENABLE | OffMode mode output enable value for pad cam_strobe. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | CAM_STROBE_OFFMODEENABLE | OffMode mode override control for pad cam_strobe 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | CAM_STROBE_INPUTENABLE | Input enable value for pad cam_strobe 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | CAM_STROBE_PULLTYPESELECT | pullup/down selection for pad cam_strobe 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | CAM_STROBE_PULLUDENABLE | pullup/down enable for pad cam_strobe 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | CAM_STROBE_MUXMODE | Functional multiplexing selection for pad cam_strobe 0x0: Select cam_strobe 0x2: Select cam2_vs 0x3: Select gpio_82 0x7: Select safe_mode | RW | 0x7 |
| 15 | CAM_SHUTTER_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | CAM_SHUTTER_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | CAM_SHUTTER_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad cam_shutter 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|--|------|-------|
| 12 | CAM_SHUTTER_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad cam_shutter 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | CAM_SHUTTER_OFFMODEOUTVALUE | OffMode mode output value for pad cam_shutter 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | CAM_SHUTTER_OFFMODEOUTENABLE | OffMode mode output enable value for pad cam_shutter. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | CAM_SHUTTER_OFFMODEENABLE | OffMode mode override control for pad cam_shutter 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | CAM_SHUTTER_INPUTENABLE | Input enable value for pad cam_shutter 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CAM_SHUTTER_PULLTYPESELECT | pullup/down selection for pad cam_shutter 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | CAM_SHUTTER_PULLUDENABLE | pullup/down enable for pad cam_shutter 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | CAM_SHUTTER_MUXMODE | Functional multiplexing selection for pad cam_shutter 0x0: Select cam_shutter 0x2: Select cam2_hs 0x3: Select gpio_81 0x7: Select safe_mode | RW | 0x7 |

**Table 19-412. Register Call Summary for Register
CONTROL_CORE_PAD0_CAM_SHUTTER_PAD1_CAM_STROBE**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-413. CONTROL_CORE_PAD0_CAM_GLOBALRESET_PAD1_USBB1_ULPITLL_CLK

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 00C0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00C0 | | |
| Description | Register control for Pads cam_globalreset and usbb1_ulpitll_clk Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------|--------------------------------|---|---------------------------------------|-----------------------------------|------------------------------------|----------------------------------|-------------------------------|----------|----|----|----|----------------------------------|--------------------------------|---------------------------|----|-----------------------------|------------------------------|---------------------------------------|-------------------------------------|---------------------------------|----------------------------------|--------------------------------|-----------------------------|----------|---|---|---|--------------------------------|------------------------------|-------------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| USBB1_ULPITLL_CLK_WAKEUPEVENT | USBB1_ULPITLL_CLK_WAKEUPENABLE | USBB1_ULPITLL_CLK_OFFMODEPULLTYPESELECT | USBB1_ULPITLL_CLK_OFFMODEPULLUDENABLE | USBB1_ULPITLL_CLK_OFFMODEOUTVALUE | USBB1_ULPITLL_CLK_OFFMODEOUTENABLE | USBB1_ULPITLL_CLK_OFFMODEEENABLE | USBB1_ULPITLL_CLK_INPUTENABLE | RESERVED | | | | USBB1_ULPITLL_CLK_PULLTYPESELECT | USBB1_ULPITLL_CLK_PULLUDENABLE | USBB1_ULPITLL_CLK_MUXMODE | | CAM_GLOBALRESET_WAKEUPEVENT | CAM_GLOBALRESET_WAKEUPENABLE | CAM_GLOBALRESET_OFFMODEPULLTYPESELECT | CAM_GLOBALRESET_OFFMODEPULLUDENABLE | CAM_GLOBALRESET_OFFMODEOUTVALUE | CAM_GLOBALRESET_OFFMODEOUTENABLE | CAM_GLOBALRESET_OFFMODEEENABLE | CAM_GLOBALRESET_INPUTENABLE | RESERVED | | | | CAM_GLOBALRESET_PULLTYPESELECT | CAM_GLOBALRESET_PULLUDENABLE | CAM_GLOBALRESET_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---|--|------|-------|
| 31 | USBB1_ULPITLL_CLK_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB1_ULPITLL_CLK_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | USBB1_ULPITLL_CLK_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb1_ulpitll_clk 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | USBB1_ULPITLL_CLK_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb1_ulpitll_clk 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | USBB1_ULPITLL_CLK_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_ulpitll_clk 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB1_ULPITLL_CLK_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_ulpitll_clk. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | USBB1_ULPITLL_CLK_OFFMODEEENABLE | OffMode mode override control for pad usbb1_ulpitll_clk 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | USBB1_ULPITLL_CLK_INPUTENABLE | Input enable value for pad usbb1_ulpitll_clk 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------------|---|------|-------|
| 20 | USBB1_ULPITLL_CLK_PULLTYPESELECT | pullup/down selection for pad usbb1_ulpitll_clk 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | USBB1_ULPITLL_CLK_PULLUDENABLE | pullup/down enable for pad usbb1_ulpitll_clk 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | USBB1_ULPITLL_CLK_MUXMODE | Functional multiplexing selection for pad usbb1_ulpitll_clk 0x0: Select usbb1_ulpitll_clk 0x1: Select hsi1_cawake 0x3: Select gpio_84 0x4: Select usbb1_ulpiiphy_clk 0x6: Select hw_dbg20 0x7: Select safe_mode | RW | 0x7 |
| 15 | CAM_GLOBALRESET_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | CAM_GLOBALRESET_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | CAM_GLOBALRESET_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad cam_globalreset 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | CAM_GLOBALRESET_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad cam_globalreset 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | CAM_GLOBALRESET_OFFMODEOUTVALUE | OffMode mode output value for pad cam_globalreset 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | CAM_GLOBALRESET_OFFMODEOUTENABLE | OffMode mode output enable value for pad cam_globalreset. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | CAM_GLOBALRESET_OFFMODEENABLE | OffMode mode override control for pad cam_globalreset 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | CAM_GLOBALRESET_INPUTENABLE | Input enable value for pad cam_globalreset 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CAM_GLOBALRESET_PULLTYPESELECT | pullup/down selection for pad cam_globalreset 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | CAM_GLOBALRESET_PULLUDENABLE | pullup/down enable for pad cam_globalreset 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-------|
| 2:0 | CAM_GLOBALRESET_MUXMODE | Functional multiplexing selection for pad cam_globalreset 0x0: Select cam_globalreset 0x2: Select cam2_pclk 0x3: Select gpio_83 0x7: Select safe_mode | RW | 0x7 |

**Table 19-414. Register Call Summary for Register
CONTROL_CORE_PAD0_CAM_GLOBALRESET_PAD1_USBB1_ULPITLL_CLK**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)
- [Observability Signals Muxed on Pads in Core Power Domain: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[3\]](#)

Table 19-415. CONTROL_CORE_PAD0_USBB1_ULPITLL_STP_PAD1_USBB1_ULPITLL_DIR

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 00C4 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00C4 | | |
| Description | Register control for Pads usbb1_ulpitll_stp and usbb1_ulpitll_dir Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------|--------------------------------|---|---------------------------------------|-----------------------------------|------------------------------------|----------------------------------|-------------------------------|----------|----|----|----------------------------------|--------------------------------|---------------------------|----|----|-------------------------------|--------------------------------|---|---------------------------------------|-----------------------------------|------------------------------------|----------------------------------|-------------------------------|----------|---|---|----------------------------------|--------------------------------|---------------------------|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | |
| USBB1_ULPITLL_DIR_WAKEUPEVENT | USBB1_ULPITLL_DIR_WAKEUPENABLE | USBB1_ULPITLL_DIR_OFFMODEPULLTYPESELECT | USBB1_ULPITLL_DIR_OFFMODEPULLUDENABLE | USBB1_ULPITLL_DIR_OFFMODEOUTVALUE | USBB1_ULPITLL_DIR_OFFMODEOUTENABLE | USBB1_ULPITLL_DIR_OFFMODEEENABLE | USBB1_ULPITLL_DIR_INPUTENABLE | RESERVED | | | USBB1_ULPITLL_DIR_PULLTYPESELECT | USBB1_ULPITLL_DIR_PULLUDENABLE | USBB1_ULPITLL_DIR_MUXMODE | | | USBB1_ULPITLL_STP_WAKEUPEVENT | USBB1_ULPITLL_STP_WAKEUPENABLE | USBB1_ULPITLL_STP_OFFMODEPULLTYPESELECT | USBB1_ULPITLL_STP_OFFMODEPULLUDENABLE | USBB1_ULPITLL_STP_OFFMODEOUTVALUE | USBB1_ULPITLL_STP_OFFMODEOUTENABLE | USBB1_ULPITLL_STP_OFFMODEEENABLE | USBB1_ULPITLL_STP_INPUTENABLE | RESERVED | | | USBB1_ULPITLL_STP_PULLTYPESELECT | USBB1_ULPITLL_STP_PULLUDENABLE | USBB1_ULPITLL_STP_MUXMODE | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | USBB1_ULPITLL_DIR_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB1_ULPITLL_DIR_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---|---|------|-------|
| 29 | USBB1_ULPITLL_DIR_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb1_ulpitll_dir 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | USBB1_ULPITLL_DIR_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb1_ulpitll_dir 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | USBB1_ULPITLL_DIR_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_ulpitll_dir 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB1_ULPITLL_DIR_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_ulpitll_dir. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | USBB1_ULPITLL_DIR_OFFMODEEENABLE | OffMode mode override control for pad usbb1_ulpitll_dir 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | USBB1_ULPITLL_DIR_INPUTENABLE | Input enable value for pad usbb1_ulpitll_dir 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | USBB1_ULPITLL_DIR_PULLTYPESELECT | pullup/down selection for pad usbb1_ulpitll_dir 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | USBB1_ULPITLL_DIR_PULLUDENABLE | pullup/down enable for pad usbb1_ulpitll_dir 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | USBB1_ULPITLL_DIR_MUXMODE | Functional multiplexing selection for pad usbb1_ulpitll_dir 0x0: Select usbb1_ulpitll_dir 0x1: Select hsi1_caflag 0x2: Select mcbasp4_fsr 0x3: Select gpio_86 0x4: Select usbb1_ulpiphy_dir 0x6: Select hw_dbg22 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB1_ULPITLL_STP_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | USBB1_ULPITLL_STP_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | USBB1_ULPITLL_STP_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb1_ulpitll_stp 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------------|---|------|-------|
| 12 | USBB1_ULPITLL_STP_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb1_ulpitll_stp 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | USBB1_ULPITLL_STP_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_ulpitll_stp 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB1_ULPITLL_STP_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_ulpitll_stp. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB1_ULPITLL_STP_OFFMODEENABLE | OffMode mode override control for pad usbb1_ulpitll_stp 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | USBB1_ULPITLL_STP_INPUTENABLE | Input enable value for pad usbb1_ulpitll_stp 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | USBB1_ULPITLL_STP_PULLTYPESELECT | pullup/down selection for pad usbb1_ulpitll_stp 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | USBB1_ULPITLL_STP_PULLUDENABLE | pullup/down enable for pad usbb1_ulpitll_stp 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | USBB1_ULPITLL_STP_MUXMODE | Functional multiplexing selection for pad usbb1_ulpitll_stp 0x0: Select usbb1_ulpitll_stp 0x1: Select hsi1_cadata 0x2: Select mcbasp4_clkr 0x3: Select gpio_85 0x4: Select usbb1_ulpiphy_stp 0x5: Select usbb1_mm_rxdp 0x6: Select hw_dbg21 0x7: Select safe_mode | RW | 0x7 |

**Table 19-416. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB1_ULPITLL_STP_PAD1_USBB1_ULPITLL_DIR**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-417. CONTROL_CORE_PAD0_USBB1_ULPITLL_NXT_PAD1_USBB1_ULPITLL_DAT0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 00C8 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00C8 | | |
| Description | Register control for Pads usbb1_ulpitll_nxt and usbb1_ulpitll_dat0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------------------|---------------------------------|--|--|------------------------------------|-------------------------------------|-----------------------------------|--------------------------------|----------|----|----|----|-----------------------------------|---------------------------------|----------------------------|----|-------------------------------|--------------------------------|---|---------------------------------------|-----------------------------------|------------------------------------|----------------------------------|-------------------------------|----------|---|---|---|----------------------------------|--------------------------------|---------------------------|---|
| USBB1_ULPITLL_DAT0_WAKEUPEVENT | USBB1_ULPITLL_DAT0_WAKEUPENABLE | USBB1_ULPITLL_DAT0_OFFMODEPULLTYPESELECT | USBB1_ULPITLL_DAT0_OFFMODEPULLUDENABLE | USBB1_ULPITLL_DAT0_OFFMODEOUTVALUE | USBB1_ULPITLL_DAT0_OFFMODEOUTENABLE | USBB1_ULPITLL_DAT0_OFFMODEEENABLE | USBB1_ULPITLL_DAT0_INPUTENABLE | RESERVED | | | | USBB1_ULPITLL_DAT0_PULLTYPESELECT | USBB1_ULPITLL_DAT0_PULLUDENABLE | USBB1_ULPITLL_DAT0_MUXMODE | | USBB1_ULPITLL_NXT_WAKEUPEVENT | USBB1_ULPITLL_NXT_WAKEUPENABLE | USBB1_ULPITLL_NXT_OFFMODEPULLTYPESELECT | USBB1_ULPITLL_NXT_OFFMODEPULLUDENABLE | USBB1_ULPITLL_NXT_OFFMODEOUTVALUE | USBB1_ULPITLL_NXT_OFFMODEOUTENABLE | USBB1_ULPITLL_NXT_OFFMODEEENABLE | USBB1_ULPITLL_NXT_INPUTENABLE | RESERVED | | | | USBB1_ULPITLL_NXT_PULLTYPESELECT | USBB1_ULPITLL_NXT_PULLUDENABLE | USBB1_ULPITLL_NXT_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|--|--|------|-------|
| 31 | USBB1_ULPITLL_DAT0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB1_ULPITLL_DAT0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | USBB1_ULPITLL_DAT0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb1_ulpitll_dat0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | USBB1_ULPITLL_DAT0_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb1_ulpitll_dat0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | USBB1_ULPITLL_DAT0_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_ulpitll_dat0 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB1_ULPITLL_DAT0_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_ulpitll_dat0. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---|--|------|-------|
| 25 | USBB1_ULPITLL_DAT0_OFFMODEENABLE | OffMode mode override control for pad usbb1_ulpitll_dat0 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | USBB1_ULPITLL_DAT0_INPUTENABLE | Input enable value for pad usbb1_ulpitll_dat0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | USBB1_ULPITLL_DAT0_PULLTYPESELECT | pullup/down selection for pad usbb1_ulpitll_dat0 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | USBB1_ULPITLL_DAT0_PULLUDENABLE | pullup/down enable for pad usbb1_ulpitll_dat0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | USBB1_ULPITLL_DAT0_MUXMODE | Functional multiplexing selection for pad usbb1_ulpitll_dat0 0x0: Select usbb1_ulpitll_dat0 0x1: Select hsi1_acwake 0x2: Select mcbasp4_clkx 0x3: Select gpio_88 0x4: Select usbb1_ulpiphy_dat0 0x5: Select usbb1_mm_txen 0x6: Select hw_dbg24 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB1_ULPITLL_NXT_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | USBB1_ULPITLL_NXT_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | USBB1_ULPITLL_NXT_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb1_ulpitll_nxt 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | USBB1_ULPITLL_NXT_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb1_ulpitll_nxt 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | USBB1_ULPITLL_NXT_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_ulpitll_nxt 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB1_ULPITLL_NXT_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_ulpitll_nxt. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB1_ULPITLL_NXT_OFFMODEENABLE | OffMode mode override control for pad usbb1_ulpitll_nxt 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------------|---|------|-------|
| 8 | USBB1_ULPITLL_NXT_INPUTENABLE | Input enable value for pad usbb1_ulpitll_nxt 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | USBB1_ULPITLL_NXT_PULLTYPESELECT | pullup/down selection for pad usbb1_ulpitll_nxt 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | USBB1_ULPITLL_NXT_PULLUDENABLE | pullup/down enable for pad usbb1_ulpitll_nxt 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | USBB1_ULPITLL_NXT_MUXMODE | Functional multiplexing selection for pad usbb1_ulpitll_nxt 0x0: Select usbb1_ulpitll_nxt 0x1: Select hsi1_acready 0x2: Select mcbasp4_fsx 0x3: Select gpio_87 0x4: Select usbb1_ulpiphy_nxt 0x5: Select usbb1_mm_rxdm 0x6: Select hw_dbg23 0x7: Select safe_mode | RW | 0x7 |

**Table 19-418. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB1_ULPITLL_NXT_PAD1_USBB1_ULPITLL_DAT0**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-419. CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT1_PAD1_USBB1_ULPITLL_DAT2

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 00CC | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00CC | | |
| Description | Register control for Pads usbb1_ulpitll_dat1 and usbb1_ulpitll_dat2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------|---------------------------------|--|---------------------------------------|------------------------------------|-------------------------------------|-----------------------------------|--------------------------------|----------|----|----|----|-----------------------------------|--------------------------------|----------------------------|----|--------------------------------|---------------------------------|--|---------------------------------------|------------------------------------|-------------------------------------|-----------------------------------|--------------------------------|----------|---|---|---|-----------------------------------|--------------------------------|----------------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| USBB1_ULPITLL_DAT2_WAKEUPEVENT | USBB1_ULPITLL_DAT2_WAKEUPENABLE | USBB1_ULPITLL_DAT2_OFFMODEPULLTYPESELECT | USBB1_ULPITLL_DAT2_OFFMODEPULLUDENABE | USBB1_ULPITLL_DAT2_OFFMODEOUTVALUE | USBB1_ULPITLL_DAT2_OFFMODEOUTENABLE | USBB1_ULPITLL_DAT2_OFFMODEEENABLE | USBB1_ULPITLL_DAT2_INPUTENABLE | RESERVED | | | | USBB1_ULPITLL_DAT2_PULLTYPESELECT | USBB1_ULPITLL_DAT2_PULLUDENABE | USBB1_ULPITLL_DAT2_MUXMODE | | USBB1_ULPITLL_DAT1_WAKEUPEVENT | USBB1_ULPITLL_DAT1_WAKEUPENABLE | USBB1_ULPITLL_DAT1_OFFMODEPULLTYPESELECT | USBB1_ULPITLL_DAT1_OFFMODEPULLUDENABE | USBB1_ULPITLL_DAT1_OFFMODEOUTVALUE | USBB1_ULPITLL_DAT1_OFFMODEOUTENABLE | USBB1_ULPITLL_DAT1_OFFMODEEENABLE | USBB1_ULPITLL_DAT1_INPUTENABLE | RESERVED | | | | USBB1_ULPITLL_DAT1_PULLTYPESELECT | USBB1_ULPITLL_DAT1_PULLUDENABE | USBB1_ULPITLL_DAT1_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|--|---|------|-------|
| 31 | USBB1_ULPITLL_DAT2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB1_ULPITLL_DAT2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | USBB1_ULPITLL_DAT2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb1_ulpitll_dat2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | USBB1_ULPITLL_DAT2_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad usbb1_ulpitll_dat2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | USBB1_ULPITLL_DAT2_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_ulpitll_dat2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB1_ULPITLL_DAT2_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_ulpitll_dat2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | USBB1_ULPITLL_DAT2_OFFMODEEENABLE | OffMode mode override control for pad usbb1_ulpitll_dat2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | USBB1_ULPITLL_DAT2_INPUTENABLE | Input enable value for pad usbb1_ulpitll_dat2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--|---|------|-------|
| 20 | USBB1_ULPITLL_DAT2_PULLTYPESELECT | pullup/down selection for pad usbb1_ulpitll_dat2 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | USBB1_ULPITLL_DAT2_PULLUDENABLE | pullup/down enable for pad usbb1_ulpitll_dat2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | USBB1_ULPITLL_DAT2_MUXMODE | Functional multiplexing selection for pad usbb1_ulpitll_dat2 0x0: Select usbb1_ulpitll_dat2 0x1: Select hsi1_acflag 0x2: Select mcbasp4_dr 0x3: Select gpio_90 0x4: Select usbb1_ulpipiphy_dat2 0x5: Select usbb1_mm_txse0 0x6: Select hw_dbg26 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB1_ULPITLL_DAT1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | USBB1_ULPITLL_DAT1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | USBB1_ULPITLL_DAT1_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb1_ulpitll_dat1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | USBB1_ULPITLL_DAT1_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb1_ulpitll_dat1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | USBB1_ULPITLL_DAT1_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_ulpitll_dat1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB1_ULPITLL_DAT1_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_ulpitll_dat1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB1_ULPITLL_DAT1_OFFMODEENABLE | OffMode mode override control for pad usbb1_ulpitll_dat1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | USBB1_ULPITLL_DAT1_INPUTENABLE | Input enable value for pad usbb1_ulpitll_dat1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | USBB1_ULPITLL_DAT1_PULLTYPESELECT | pullup/down selection for pad usbb1_ulpitll_dat1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|---|------|-------|
| 3 | USBB1_ULPITLL_DAT1_PULLUDENABLE | pullup/down enable for pad usbb1_ulpitll_dat1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | USBB1_ULPITLL_DAT1_MUXMODE | Functional multiplexing selection for pad usbb1_ulpitll_dat1 0x0: Select usbb1_ulpitll_dat1 0x1: Select hsi1_acdata 0x2: Select mcbasp4_dx 0x3: Select gpio_89 0x4: Select usbb1_ulpihy_dat1 0x5: Select usbb1_mm_txdm 0x6: Select hw_dbg25 0x7: Select safe_mode | RW | 0x7 |

**Table 19-420. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT1_PAD1_USBB1_ULPITLL_DAT2**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-421. CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT3_PAD1_USBB1_ULPITLL_DAT4

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 00D0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00D0 | | |
| Description | Register control for Pads usbb1_ulpitll_dat3 and usbb1_ulpitll_dat4 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|--------------------------------|---------------------------------|--|--|------------------------------------|-------------------------------------|------------------------------------|--------------------------------|----------|----|----|----|-----------------------------------|---------------------------------|----------------------------|----|----|----|--------------------------------|---------------------------------|--|--|------------------------------------|-------------------------------------|------------------------------------|--------------------------------|----------|---|---|---|-----------------------------------|---------------------------------|----------------------------|--|--|--|
| USBB1_ULPITLL_DAT4_WAKEUPEVENT | USBB1_ULPITLL_DAT4_WAKEUPENABLE | USBB1_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | USBB1_ULPITLL_DAT4_OFFMODEPULLUDENABLE | USBB1_ULPITLL_DAT4_OFFMODEOUTVALUE | USBB1_ULPITLL_DAT4_OFFMODEOUTENABLE | USBB1_ULPITLL_DAT4_OFFMODEDEENABLE | USBB1_ULPITLL_DAT4_INPUTENABLE | RESERVED | | | | USBB1_ULPITLL_DAT4_PULLTYPESELECT | USBB1_ULPITLL_DAT4_PULLUDENABLE | USBB1_ULPITLL_DAT4_MUXMODE | | | | USBB1_ULPITLL_DAT3_WAKEUPEVENT | USBB1_ULPITLL_DAT3_WAKEUPENABLE | USBB1_ULPITLL_DAT3_OFFMODEPULLTYPESELECT | USBB1_ULPITLL_DAT3_OFFMODEPULLUDENABLE | USBB1_ULPITLL_DAT3_OFFMODEOUTVALUE | USBB1_ULPITLL_DAT3_OFFMODEOUTENABLE | USBB1_ULPITLL_DAT3_OFFMODEDEENABLE | USBB1_ULPITLL_DAT3_INPUTENABLE | RESERVED | | | | USBB1_ULPITLL_DAT3_PULLTYPESELECT | USBB1_ULPITLL_DAT3_PULLUDENABLE | USBB1_ULPITLL_DAT3_MUXMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--|--|------|-------|
| 31 | USBB1_ULPITLL_DAT4_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB1_ULPITLL_DAT4_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | USBB1_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb1_ulpitll_dat4 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | USBB1_ULPITLL_DAT4_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb1_ulpitll_dat4 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | USBB1_ULPITLL_DAT4_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_ulpitll_dat4 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB1_ULPITLL_DAT4_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_ulpitll_dat4. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | USBB1_ULPITLL_DAT4_OFFMODEENABLE | OffMode mode override control for pad usbb1_ulpitll_dat4 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | USBB1_ULPITLL_DAT4_INPUTENABLE | Input enable value for pad usbb1_ulpitll_dat4 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | USBB1_ULPITLL_DAT4_PULLTYPESELECT | pullup/down selection for pad usbb1_ulpitll_dat4 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | USBB1_ULPITLL_DAT4_PULLUDENABLE | pullup/down enable for pad usbb1_ulpitll_dat4 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | USBB1_ULPITLL_DAT4_MUXMODE | Functional multiplexing selection for pad usbb1_ulpitll_dat4 0x0: Select usbb1_ulpitll_dat4 0x1: Select dmtimer8_pwm_evt 0x2: Select abe_mcbasp3_dr 0x3: Select gpio_92 0x4: Select usbb1_ulpiphy_dat4 0x6: Select hw_dbg28 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB1_ULPITLL_DAT3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--|---|------|-------|
| 14 | USBB1_ULPITLL_DAT3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | USBB1_ULPITLL_DAT3_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb1_ulpitll_dat3 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | USBB1_ULPITLL_DAT3_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb1_ulpitll_dat3 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | USBB1_ULPITLL_DAT3_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_ulpitll_dat3 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB1_ULPITLL_DAT3_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_ulpitll_dat3. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB1_ULPITLL_DAT3_OFFMODEENABLE | OffMode mode override control for pad usbb1_ulpitll_dat3 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | USBB1_ULPITLL_DAT3_INPUTENABLE | Input enable value for pad usbb1_ulpitll_dat3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | USBB1_ULPITLL_DAT3_PULLTYPESELECT | pullup/down selection for pad usbb1_ulpitll_dat3 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | USBB1_ULPITLL_DAT3_PULLUDENABLE | pullup/down enable for pad usbb1_ulpitll_dat3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | USBB1_ULPITLL_DAT3_MUXMODE | Functional multiplexing selection for pad usbb1_ulpitll_dat3 0x0: Select usbb1_ulpitll_dat3 0x1: Select hsi1_caready 0x3: Select gpio_91 0x4: Select usbb1_ulpiphy_dat3 0x5: Select usbb1_mm_rxcv 0x6: Select hw_dbg27 0x7: Select safe_mode | RW | 0x7 |

**Table 19-422. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT3_PAD1_USBB1_ULPITLL_DAT4**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-423. CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT5_PAD1_USBB1_ULPITLL_DAT6

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 00D4 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00D4 | | |
| Description | Register control for Pads usbb1_ulpitll_dat5 and usbb1_ulpitll_dat6 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--|----|----|----|----|----|----|----|----------------------------|----|----|----|----|----|----|----|--|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| USBB1_ULPITLL_DAT6_WAKEUPEVENT | | | | | | | | RESERVED | | | | | | | | USBB1_ULPITLL_DAT6_WAKEUPENABLE | | | | | | | | RESERVED | | | | | | | |
| USBB1_ULPITLL_DAT6_OFFMODEPULLTYPESELECT | | | | | | | | | | | | | | | | USBB1_ULPITLL_DAT6_PULLTYPESELECT | | | | | | | | | | | | | | | |
| USBB1_ULPITLL_DAT6_OFFMODEPULLUDENABE | | | | | | | | | | | | | | | | USBB1_ULPITLL_DAT6_PULLUDENABE | | | | | | | | | | | | | | | |
| USBB1_ULPITLL_DAT6_OFFMODEOUTVALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB1_ULPITLL_DAT6_OFFMODEOUTENABE | | | | | | | | USBB1_ULPITLL_DAT6_MUXMODE | | | | | | | | USBB1_ULPITLL_DAT5_WAKEUPEVENT | | | | | | | | RESERVED | | | | | | | |
| USBB1_ULPITLL_DAT6_OFFMODEEENABE | | | | | | | | | | | | | | | | USBB1_ULPITLL_DAT5_WAKEUPENABLE | | | | | | | | | | | | | | | |
| USBB1_ULPITLL_DAT6_INPUTENABE | | | | | | | | | | | | | | | | USBB1_ULPITLL_DAT5_OFFMODEPULLTYPESELECT | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | USBB1_ULPITLL_DAT5_OFFMODEPULLUDENABE | | | | | | | | | | | | | | | |
| | | | | | | | | USBB1_ULPITLL_DAT5_MUXMODE | | | | | | | | USBB1_ULPITLL_DAT5_OFFMODEOUTVALUE | | | | | | | | RESERVED | | | | | | | |
| | | | | | | | | | | | | | | | | USBB1_ULPITLL_DAT5_OFFMODEOUTENABE | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | USBB1_ULPITLL_DAT5_OFFMODEENABE | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | USBB1_ULPITLL_DAT5_INPUTENABE | | | | | | | | | | | | | | | |
| | | | | | | | | USBB1_ULPITLL_DAT5_MUXMODE | | | | | | | | USBB1_ULPITLL_DAT5_PULLTYPESELECT | | | | | | | | RESERVED | | | | | | | |
| | | | | | | | | | | | | | | | | USBB1_ULPITLL_DAT5_PULLUDENABE | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--|--|------|-------|
| 31 | USBB1_ULPITLL_DAT6_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB1_ULPITLL_DAT6_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | USBB1_ULPITLL_DAT6_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb1_ulpitll_dat6 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | USBB1_ULPITLL_DAT6_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb1_ulpitll_dat6 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | USBB1_ULPITLL_DAT6_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_ulpitll_dat6 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB1_ULPITLL_DAT6_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_ulpitll_dat6. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--|--|------|-------|
| 25 | USBB1_ULPITLL_DAT6_OFFMODEENABLE | OffMode mode override control for pad usbb1_ulpitll_dat6 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | USBB1_ULPITLL_DAT6_INPUTENABLE | Input enable value for pad usbb1_ulpitll_dat6 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | USBB1_ULPITLL_DAT6_PULLTYPESELECT | pullup/down selection for pad usbb1_ulpitll_dat6 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | USBB1_ULPITLL_DAT6_PULLUDENABLE | pullup/down enable for pad usbb1_ulpitll_dat6 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | USBB1_ULPITLL_DAT6_MUXMODE | Functional multiplexing selection for pad usbb1_ulpitll_dat6 0x0: Select usbb1_ulpitll_dat6 0x1: Select dmtimer10_pwm_evt 0x2: Select abe_mcbasp3_clkx 0x3: Select gpio_94 0x4: Select usbb1_ulpipiphy_dat6 0x5: Select abe_dmic_din3 0x6: Select hw_dbg30 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB1_ULPITLL_DAT5_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | USBB1_ULPITLL_DAT5_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | USBB1_ULPITLL_DAT5_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb1_ulpitll_dat5 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | USBB1_ULPITLL_DAT5_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb1_ulpitll_dat5 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | USBB1_ULPITLL_DAT5_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_ulpitll_dat5 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB1_ULPITLL_DAT5_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_ulpitll_dat5. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB1_ULPITLL_DAT5_OFFMODEENABLE | OffMode mode override control for pad usbb1_ulpitll_dat5 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------------|--|------|-------|
| 8 | USBB1_ULPITLL_DAT5_INPUTENABLE | Input enable value for pad usbb1_ulpitll_dat5 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | USBB1_ULPITLL_DAT5_PULLTYPESELECT | pullup/down selection for pad usbb1_ulpitll_dat5 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | USBB1_ULPITLL_DAT5_PULLUDENABLE | pullup/down enable for pad usbb1_ulpitll_dat5 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | USBB1_ULPITLL_DAT5_MUXMODE | Functional multiplexing selection for pad usbb1_ulpitll_dat5 0x0: Select usbb1_ulpitll_dat5 0x1: Select dmtimer9_pwm_evt 0x2: Select abe_mcbasp3_dx 0x3: Select gpio_93 0x4: Select usbb1_ulpiphy_dat5 0x6: Select hw_dbg29 0x7: Select safe_mode | RW | 0x7 |

**Table 19-424. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT5_PAD1_USBB1_ULPITLL_DAT6**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-425. CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT7_PAD1_USBB1_HSIC_DATA

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 00D8 | | |
| Physical Address | 0x4A10 00D8 | Instance | SYSCTRL_PADCONF_CORE |
| Description | Register control for Pads usbb1_ulpitll_dat7 and usbb1_hsic_data Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------|------------------------------|----------|----|---------------------------------|----------------------------------|--------------------------------|----------|----|----|----|----|----|----|-------------------------|----|----|--------------------------------|---------------------------------|--|--|------------------------------------|-------------------------------------|-----------------------------------|--------------------------------|----------|---|---|-----------------------------------|-----------------------------------|----------------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| USBB1_HSIC_DATA_WAKEUPEVENT | USBB1_HSIC_DATA_WAKEUPENABLE | RESERVED | | USBB1_HSIC_DATA_OFFMODEOUTVALUE | USBB1_HSIC_DATA_OFFMODEOUTENABLE | USBB1_HSIC_DATA_OFFMODEEENABLE | RESERVED | | | | | | | USBB1_HSIC_DATA_MUXMODE | | | USBB1_ULPITLL_DAT7_WAKEUPEVENT | USBB1_ULPITLL_DAT7_WAKEUPENABLE | USBB1_ULPITLL_DAT7_OFFMODEPULLTYPESELECT | USBB1_ULPITLL_DAT7_OFFMODEPULLUDENENABLE | USBB1_ULPITLL_DAT7_OFFMODEOUTVALUE | USBB1_ULPITLL_DAT7_OFFMODEOUTENABLE | USBB1_ULPITLL_DAT7_OFFMODEEENABLE | USBB1_ULPITLL_DAT7_INPUTENABLE | RESERVED | | | USBB1_ULPITLL_DAT7_PULLTYPESELECT | USBB1_ULPITLL_DAT7_PULLUDENENABLE | USBB1_ULPITLL_DAT7_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------------|--|------|-------|
| 31 | USBB1_HSIC_DATA_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB1_HSIC_DATA_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:28 | RESERVED | | R | 0x0 |
| 27 | USBB1_HSIC_DATA_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_hsic_data 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB1_HSIC_DATA_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_hsic_data. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | USBB1_HSIC_DATA_OFFMODEEENABLE | OffMode mode override control for pad usbb1_hsic_data 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24:19 | RESERVED | | R | 0x00 |
| 18:16 | USBB1_HSIC_DATA_MUXMODE | Functional multiplexing selection for pad usbb1_hsic_data 0x0: Select usbb1_hsic_data 0x3: Select gpio_96 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB1_ULPITLL_DAT7_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | USBB1_ULPITLL_DAT7_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--|---|------|-------|
| 13 | USBB1_ULPITLL_DAT7_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb1_ulpitll_dat7 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | USBB1_ULPITLL_DAT7_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb1_ulpitll_dat7 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | USBB1_ULPITLL_DAT7_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_ulpitll_dat7 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB1_ULPITLL_DAT7_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_ulpitll_dat7. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB1_ULPITLL_DAT7_OFFMODEENABLE | OffMode mode override control for pad usbb1_ulpitll_dat7 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | USBB1_ULPITLL_DAT7_INPUTENABLE | Input enable value for pad usbb1_ulpitll_dat7 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | USBB1_ULPITLL_DAT7_PULLTYPESELECT | pullup/down selection for pad usbb1_ulpitll_dat7 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | USBB1_ULPITLL_DAT7_PULLUDENABLE | pullup/down enable for pad usbb1_ulpitll_dat7 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | USBB1_ULPITLL_DAT7_MUXMODE | Functional multiplexing selection for pad usbb1_ulpitll_dat7 0x0: Select usbb1_ulpitll_dat7 0x1: Select dmtimer11_pwm_evt 0x2: Select abe_mcbasp3_fsx 0x3: Select gpio_95 0x4: Select usbb1_ulpiPHY_dat7 0x5: Select abe_dmic_clk3 0x6: Select hw_dbg31 0x7: Select safe_mode | RW | 0x7 |

**Table 19-426. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB1_ULPITLL_DAT7_PAD1_USBB1_HSIC_DATA**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)
- [Observability Signals Muxed on Pads in Core Power Domain: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[3\]](#)

Table 19-427. CONTROL_CORE_PAD0_USBB1_HSIC_STROBE_PAD1_GPIO_98

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 00DC | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00DC | | |
| Description | Register control for Pads usbb1_hsic_strobe and gpio_98 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------------|----------------------|-------------------------------|-----------------------------|-------------------------|--------------------------|-----------------------|---------------------|----------|----|----|------------------------|----------------------|----|-----------------|----|-------------------------------|--------------------------------|----------|----|-----------------------------------|------------------------------------|---------------------------------|---|----------|---|---|---|---|---|---|---------------------------|
| GPIO_98_WAKEUPEVENT | GPIO_98_WAKEUPENABLE | GPIO_98_OFFMODEPULLTYPESELECT | GPIO_98_OFFMODEPULLUDENABLE | GPIO_98_OFFMODEOUTVALUE | GPIO_98_OFFMODEOUTENABLE | GPIO_98_OFFMODEENABLE | GPIO_98_INPUTENABLE | RESERVED | | | GPIO_98_PULLTYPESELECT | GPIO_98_PULLUDENABLE | | GPIO_98_MUXMODE | | USBB1_HSIC_STROBE_WAKEUPEVENT | USBB1_HSIC_STROBE_WAKEUPENABLE | RESERVED | | USBB1_HSIC_STROBE_OFFMODEOUTVALUE | USBB1_HSIC_STROBE_OFFMODEOUTENABLE | USBB1_HSIC_STROBE_OFFMODEENABLE | | RESERVED | | | | | | | USBB1_HSIC_STROBE_MUXMODE |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------|--|------|-------|
| 31 | GPIO_98_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPIO_98_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | GPIO_98_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad gpio_98 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | GPIO_98_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad gpio_98 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | GPIO_98_OFFMODEOUTVALUE | OffMode mode output value for pad gpio_98 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | GPIO_98_OFFMODEOUTENABLE | OffMode mode output enable value for pad gpio_98. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | GPIO_98_OFFMODEENABLE | OffMode mode override control for pad gpio_98 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------------|--|------|-------|
| 24 | GPIO_98_INPUTENABLE | Input enable value for pad gpio_98 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPIO_98_PULLTYPESELECT | pullup/down selection for pad gpio_98 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPIO_98_PULLUDENABLE | pullup/down enable for pad gpio_98 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPIO_98_MUXMODE | Functional multiplexing selection for pad gpio_98 0x0, 0x3: Select gpio_98 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB1_HSIC_STROBE_WAKE_UPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | USBB1_HSIC_STROBE_WAKE_UPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:12 | RESERVED | | R | 0x0 |
| 11 | USBB1_HSIC_STROBE_OFFMODEOUTVALUE | OffMode mode output value for pad usbb1_hsic_strobe 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB1_HSIC_STROBE_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb1_hsic_strobe. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB1_HSIC_STROBE_OFFMODEENABLE | OffMode mode override control for pad usbb1_hsic_strobe 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8:3 | RESERVED | | R | 0x00 |
| 2:0 | USBB1_HSIC_STROBE_MUXMODE | Functional multiplexing selection for pad usbb1_hsic_strobe 0x0: Select usbb1_hsic_strobe 0x3: Select gpio_97 0x7: Select safe_mode | RW | 0x7 |

**Table 19-428. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB1_HSIC_STROBE_PAD1_GPIO_98**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-429. CONTROL_CORE_PAD0_GPIO_99_PAD1_SDMMC1_CLK

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 00E0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00E0 | | |
| Description | Register control for Pads gpio_99 and sdmmc1_clk Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------------|-------------------------|----------------------------------|-------------------------------|----------------------------|-----------------------------|---------------------------|------------------------|----------|----|----|---------------------------|------------------------|----|----|--------------------|----|---------------------|----------------------|-------------------------------|----------------------------|-------------------------|--------------------------|------------------------|---------------------|----------|---|------------------------|---------------------|---|---|-----------------|
| SDMMC1_CLK_WAKEUPEVENT | SDMMC1_CLK_WAKEUPENABLE | SDMMC1_CLK_OFFMODEPULLTYPESELECT | SDMMC1_CLK_OFFMODEPULLUDENABE | SDMMC1_CLK_OFFMODEOUTVALUE | SDMMC1_CLK_OFFMODEOUTENABLE | SDMMC1_CLK_OFFMODEEENABLE | SDMMC1_CLK_INPUTENABLE | RESERVED | | | SDMMC1_CLK_PULLTYPESELECT | SDMMC1_CLK_PULLUDENABE | | | SDMMC1_CLK_MUXMODE | | GPIO_99_WAKEUPEVENT | GPIO_99_WAKEUPENABLE | GPIO_99_OFFMODEPULLTYPESELECT | GPIO_99_OFFMODEPULLUDENABE | GPIO_99_OFFMODEOUTVALUE | GPIO_99_OFFMODEOUTENABLE | GPIO_99_OFFMODEEENABLE | GPIO_99_INPUTENABLE | RESERVED | | GPIO_99_PULLTYPESELECT | GPIO_99_PULLUDENABE | | | GPIO_99_MUXMODE |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------------|---|------|-------|
| 31 | SDMMC1_CLK_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SDMMC1_CLK_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | SDMMC1_CLK_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc1_clk 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | SDMMC1_CLK_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad sdmmc1_clk 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | SDMMC1_CLK_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc1_clk 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | SDMMC1_CLK_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc1_clk. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | SDMMC1_CLK_OFFMODEEENABLE | OffMode mode override control for pad sdmmc1_clk 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|--|------|-------|
| 24 | SDMMC1_CLK_INPUTENABLE | Input enable value for pad sdmmc1_clk 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SDMMC1_CLK_PULLTYPESELECT | pullup/down selection for pad sdmmc1_clk 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | SDMMC1_CLK_PULLUDENAB LE | pullup/down enable for pad sdmmc1_clk 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | SDMMC1_CLK_MUXMODE | Functional multiplexing selection for pad sdmmc1_clk ⁽¹⁾ 0x0: Select sdmmc1_clk 0x2: Select dpm_emu19 0x3: Select gpio_100 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPIO_99_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPIO_99_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | GPIO_99_OFFMODEPULLTYPE SELECT | OffMode mode pullup/down selection for pad gpio_99 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | GPIO_99_OFFMODEPULLUDE NABLE | OffMode mode pullup/down enable for pad gpio_99 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | GPIO_99_OFFMODEOUTVALU E | OffMode mode output value for pad gpio_99 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | GPIO_99_OFFMODEOUTENAB LE | OffMode mode output enable value for pad gpio_99. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | GPIO_99_OFFMODEENABLE | OffMode mode override control for pad gpio_99 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | GPIO_99_INPUTENABLE | Input enable value for pad gpio_99 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPIO_99_PULLTYPESELECT | pullup/down selection for pad gpio_99 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

⁽¹⁾ To ensure pad safe operation at 1.8 V or 3.0 V and desired signal performance, the corresponding extended-drain I/O cell and PBIAS cell must be appropriately configured by software prior to signal selection on the pad, regardless of the signal multiplexing mode. For more details on extended-drain I/O cells and PBIAS cell descriptions and settings, see [Section 19.4.9, Extended-Drain I/O and PBIAS Cell](#), and [Section 19.5.1.2.1, Extended-Drain I/Os and PBIAS Cells Programming Guide](#).

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|-------|
| 3 | GPIO_99_PULLUDENABLE | pullup/down enable for pad gpio_99 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPIO_99_MUXMODE | Functional multiplexing selection for pad gpio_99 0x0, 0x3: Select gpio_99 0x7: Select safe_mode | RW | 0x7 |

**Table 19-430. Register Call Summary for Register
CONTROL_CORE_PAD0_GPIO_99_PAD1_SDMMC1_CLK**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-431. CONTROL_CORE_PAD0_SDMMC1_CMD_PAD1_SDMMC1_DAT0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 00E4 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00E4 | | |
| Description | Register control for Pads sdmmc1_cmd and sdmmc1_dat0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | |
|-------------------------|--------------------------|-----------------------------------|---------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|----|----|----------------------------|--------------------------|---------------------|----|----|------------------------|-------------------------|----------------------------------|--------------------------------|----------------------------|-----------------------------|---------------------------|------------------------|----------|---|---|---------------------------|-------------------------|--------------------|---|---|--|--|--|--|--|--|--|--|--|--|--|--|
| SDMMC1_DAT0_WAKEUPEVENT | SDMMC1_DAT0_WAKEUPENABLE | SDMMC1_DAT0_OFFMODEPULLTYPESELECT | SDMMC1_DAT0_OFFMODEPULLUDENABLE | SDMMC1_DAT0_OFFMODEOUTVALUE | SDMMC1_DAT0_OFFMODEOUTENABLE | SDMMC1_DAT0_OFFMODEEENABLE | SDMMC1_DAT0_INPUTENABLE | RESERVED | | | SDMMC1_DAT0_PULLTYPESELECT | SDMMC1_DAT0_PULLUDENABLE | SDMMC1_DAT0_MUXMODE | | | SDMMC1_CMD_WAKEUPEVENT | SDMMC1_CMD_WAKEUPENABLE | SDMMC1_CMD_OFFMODEPULLTYPESELECT | SDMMC1_CMD_OFFMODEPULLUDENABLE | SDMMC1_CMD_OFFMODEOUTVALUE | SDMMC1_CMD_OFFMODEOUTENABLE | SDMMC1_CMD_OFFMODEEENABLE | SDMMC1_CMD_INPUTENABLE | RESERVED | | | SDMMC1_CMD_PULLTYPESELECT | SDMMC1_CMD_PULLUDENABLE | SDMMC1_CMD_MUXMODE | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------------|---|------|-------|
| 31 | SDMMC1_DAT0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SDMMC1_DAT0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | SDMMC1_DAT0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc1_dat0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------------|--|------|-------|
| 28 | SDMMC1_DAT0_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc1_dat0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | SDMMC1_DAT0_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc1_dat0 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | SDMMC1_DAT0_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc1_dat0. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | SDMMC1_DAT0_OFFMODEENABLE | OffMode mode override control for pad sdmmc1_dat0 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | SDMMC1_DAT0_INPUTENABLE | Input enable value for pad sdmmc1_dat0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SDMMC1_DAT0_PULLTYPESELECT | pullup/down selection for pad sdmmc1_dat0 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | SDMMC1_DAT0_PULLUDENABLE | pullup/down enable for pad sdmmc1_dat0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | SDMMC1_DAT0_MUXMODE | Functional multiplexing selection for pad sdmmc1_dat0 ⁽¹⁾ 0x0: Select sdmmc1_dat0 0x2: Select dpm_emu18 0x3: Select gpio_102 0x7: Select safe_mode | RW | 0x7 |
| 15 | SDMMC1_CMD_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SDMMC1_CMD_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | SDMMC1_CMD_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc1_cmd 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | SDMMC1_CMD_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc1_cmd 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | SDMMC1_CMD_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc1_cmd 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |

⁽¹⁾ To ensure pad safe operation at 1.8 V or 3.0 V and desired signal performance, the corresponding extended-drain I/O cell and PBIAS cell must be appropriately configured by software prior to signal selection on the pad, regardless of the signal multiplexing mode. For more details on extended-drain I/O cells and PBIAS cell descriptions and settings, see [Section 19.4.9, Extended-Drain I/O and PBIAS Cell](#), and [Section 19.5.1.2.1, Extended-Drain I/Os and PBIAS Cells Programming Guide](#).

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|------|-------|
| 10 | SDMMC1_CMD_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc1_cmd. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | SDMMC1_CMD_OFFMODEENABLE | OffMode mode override control for pad sdmmc1_cmd 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | SDMMC1_CMD_INPUTENABLE | Input enable value for pad sdmmc1_cmd 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SDMMC1_CMD_PULLTYPESELECT | pullup/down selection for pad sdmmc1_cmd 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | SDMMC1_CMD_PULLUDENABLE | pullup/down enable for pad sdmmc1_cmd 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | SDMMC1_CMD_MUXMODE | Functional multiplexing selection for pad sdmmc1_cmd ⁽²⁾ 0x0: Select sdmmc1_cmd 0x2: Select uart1_rx 0x3: Select gpio_101 0x7: Select safe_mode | RW | 0x7 |

⁽²⁾ To ensure pad safe operation at 1.8 V or 3.0 V and desired signal performance, the corresponding extended-drain I/O cell and PBIAS cell must be appropriately configured by software prior to signal selection on the pad, regardless of the signal multiplexing mode. For more details on extended-drain I/O cells and PBIAS cell descriptions and settings, see [Section 19.4.9, Extended-Drain I/O and PBIAS Cell](#), and [Section 19.5.1.2.1, Extended-Drain I/Os and PBIAS Cells Programming Guide](#).

**Table 19-432. Register Call Summary for Register
CONTROL_CORE_PAD0_SDMMC1_CMD_PAD1_SDMMC1_DAT0**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-433. CONTROL_CORE_PAD0_SDMMC1_DAT1_PAD1_SDMMC1_DAT2

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 00E8 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00E8 | | |
| Description | Register control for Pads sdmmc1_dat1 and sdmmc1_dat2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------------|-----------------------------------|---------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|----|----|----------------------------|--------------------------|----|---------------------|----|-------------------------|--------------------------|-----------------------------------|---------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|---|---|----------------------------|--------------------------|---|---------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SDMMC1_DAT2_WAKEUPEVENT | SDMMC1_DAT2_WAKEUPENABLE | SDMMC1_DAT2_OFFMODEPULLTYPESELECT | SDMMC1_DAT2_OFFMODEPULLUDENABLE | SDMMC1_DAT2_OFFMODEOUTVALUE | SDMMC1_DAT2_OFFMODEOUTENABLE | SDMMC1_DAT2_OFFMODEEENABLE | SDMMC1_DAT2_INPUTENABLE | RESERVED | | | SDMMC1_DAT2_PULLTYPESELECT | SDMMC1_DAT2_PULLUDENABLE | | SDMMC1_DAT2_MUXMODE | | SDMMC1_DAT1_WAKEUPEVENT | SDMMC1_DAT1_WAKEUPENABLE | SDMMC1_DAT1_OFFMODEPULLTYPESELECT | SDMMC1_DAT1_OFFMODEPULLUDENABLE | SDMMC1_DAT1_OFFMODEOUTVALUE | SDMMC1_DAT1_OFFMODEOUTENABLE | SDMMC1_DAT1_OFFMODEEENABLE | SDMMC1_DAT1_INPUTENABLE | RESERVED | | | SDMMC1_DAT1_PULLTYPESELECT | SDMMC1_DAT1_PULLUDENABLE | | SDMMC1_DAT1_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|--|------|-------|
| 31 | SDMMC1_DAT2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SDMMC1_DAT2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | SDMMC1_DAT2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc1_dat2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | SDMMC1_DAT2_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc1_dat2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | SDMMC1_DAT2_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc1_dat2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | SDMMC1_DAT2_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc1_dat2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | SDMMC1_DAT2_OFFMODEEENABLE | OffMode mode override control for pad sdmmc1_dat2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | SDMMC1_DAT2_INPUTENABLE | Input enable value for pad sdmmc1_dat2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SDMMC1_DAT2_PULLTYPESELECT | pullup/down selection for pad sdmmc1_dat2 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|--|------|-------|
| 19 | SDMMC1_DAT2_PULLUDENABLE | pullup/down enable for pad sdmmc1_dat2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | SDMMC1_DAT2_MUXMODE | Functional multiplexing selection for pad sdmmc1_dat2 ⁽¹⁾ 0x0: Select sdmmc1_dat2 0x2: Select dpm_emu16 0x3: Select gpio_104 0x4: Select jtag_tms_tmsc 0x7: Select safe_mode | RW | 0x7 |
| 15 | SDMMC1_DAT1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SDMMC1_DAT1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | SDMMC1_DAT1_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc1_dat1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | SDMMC1_DAT1_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc1_dat1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | SDMMC1_DAT1_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc1_dat1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | SDMMC1_DAT1_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc1_dat1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | SDMMC1_DAT1_OFFMODEENABLE | OffMode mode override control for pad sdmmc1_dat1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | SDMMC1_DAT1_INPUTENABLE | Input enable value for pad sdmmc1_dat1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SDMMC1_DAT1_PULLTYPESELECT | pullup/down selection for pad sdmmc1_dat1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | SDMMC1_DAT1_PULLUDENABLE | pullup/down enable for pad sdmmc1_dat1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

⁽¹⁾ To ensure pad safe operation at 1.8 V or 3.0 V and desired signal performance, the corresponding extended-drain I/O cell and PBIAS cell must be appropriately configured by software prior to signal selection on the pad, regardless of the signal multiplexing mode. For more details on extended-drain I/O cells and PBIAS cell descriptions and settings, see [Section 19.4.9, Extended-Drain I/O and PBIAS Cell](#), and [Section 19.5.1.2.1, Extended-Drain I/Os and PBIAS Cells Programming Guide](#).

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|-------|
| 2:0 | SDMMC1_DAT1_MUXMODE | Functional multiplexing selection for pad sdmmc1_dat1 ⁽²⁾ 0x0: Select sdmmc1_dat1 0x2: Select dpm_emu17 0x3: Select gpio_103 0x7: Select safe_mode | RW | 0x7 |

⁽²⁾ To ensure pad safe operation at 1.8 V or 3.0 V and desired signal performance, the corresponding extended-drain I/O cell and PBIAS cell must be appropriately configured by software prior to signal selection on the pad, regardless of the signal multiplexing mode. For more details on extended-drain I/O cells and PBIAS cell descriptions and settings, see [Section 19.4.9, Extended-Drain I/O and PBIAS Cell](#), and [Section 19.5.1.2.1, Extended-Drain I/Os and PBIAS Cells Programming Guide](#).

**Table 19-434. Register Call Summary for Register
CONTROL_CORE_PAD0_SDMMC1_DAT1_PAD1_SDMMC1_DAT2**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-435. CONTROL_CORE_PAD0_SDMMC1_DAT3_PAD1_SDMMC1_DAT4

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 00EC | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00EC | | |
| Description | Register control for Pads sdmmc1_dat3 and sdmmc1_dat4 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|----|--------------------------|----|-----------------------------------|----|---------------------------------|----|-----------------------------|----|------------------------------|----|----------------------------|----|-------------------------|----|----------|----|----|----|----|----|---|---|-------------------------|---|--------------------------|---|-----------------------------------|---|---------------------------------|---|-----------------------------|--|------------------------------|--|----------------------------|--|-------------------------|--|----------|--|--|--|--|--|--|--|----------------------------|--|--------------------------|--|---------------------|--|--|--|--|--|--|--|
| SDMMC1_DAT4_WAKEUPEVENT | | SDMMC1_DAT4_WAKEUPENABLE | | SDMMC1_DAT4_OFFMODEPULLTYPESELECT | | SDMMC1_DAT4_OFFMODEPULLUDENABLE | | SDMMC1_DAT4_OFFMODEOUTVALUE | | SDMMC1_DAT4_OFFMODEOUTENABLE | | SDMMC1_DAT4_OFFMODEEENABLE | | SDMMC1_DAT4_INPUTENABLE | | RESERVED | | | | | | | | SDMMC1_DAT3_WAKEUPEVENT | | SDMMC1_DAT3_WAKEUPENABLE | | SDMMC1_DAT3_OFFMODEPULLTYPESELECT | | SDMMC1_DAT3_OFFMODEPULLUDENABLE | | SDMMC1_DAT3_OFFMODEOUTVALUE | | SDMMC1_DAT3_OFFMODEOUTENABLE | | SDMMC1_DAT3_OFFMODEEENABLE | | SDMMC1_DAT3_INPUTENABLE | | RESERVED | | | | | | | | SDMMC1_DAT3_PULLTYPESELECT | | SDMMC1_DAT3_PULLUDENABLE | | SDMMC1_DAT3_MUXMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------|
| 31 | SDMMC1_DAT4_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SDMMC1_DAT4_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|--|------|-------|
| 29 | SDMMC1_DAT4_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc1_dat4 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | SDMMC1_DAT4_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc1_dat4 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | SDMMC1_DAT4_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc1_dat4 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | SDMMC1_DAT4_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc1_dat4. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | SDMMC1_DAT4_OFFMODEENABLE | OffMode mode override control for pad sdmmc1_dat4 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | SDMMC1_DAT4_INPUTENABLE | Input enable value for pad sdmmc1_dat4 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SDMMC1_DAT4_PULLTYPESELECT | pullup/down selection for pad sdmmc1_dat4 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | SDMMC1_DAT4_PULLUDENABLE | pullup/down enable for pad sdmmc1_dat4 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | SDMMC1_DAT4_MUXMODE | Functional multiplexing selection for pad sdmmc1_dat4 ⁽¹⁾ 0x0: Select sdmmc1_dat4 0x3: Select gpio_106 0x7: Select safe_mode | RW | 0x7 |
| 15 | SDMMC1_DAT3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SDMMC1_DAT3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | SDMMC1_DAT3_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc1_dat3 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | SDMMC1_DAT3_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc1_dat3 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |

⁽¹⁾ To ensure pad safe operation at 1.8 V or 3.0 V and desired signal performance, the corresponding extended-drain I/O cell and PBIAS cell must be appropriately configured by software prior to signal selection on the pad, regardless of the signal multiplexing mode. For more details on extended-drain I/O cells and PBIAS cell descriptions and settings, see [Section 19.4.9, Extended-Drain I/O and PBIAS Cell](#), and [Section 19.5.1.2.1, Extended-Drain I/Os and PBIAS Cells Programming Guide](#).

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|---|------|-------|
| 11 | SDMMC1_DAT3_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc1_dat3 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | SDMMC1_DAT3_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc1_dat3. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | SDMMC1_DAT3_OFFMODEENABLE | OffMode mode override control for pad sdmmc1_dat3 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | SDMMC1_DAT3_INPUTENABLE | Input enable value for pad sdmmc1_dat3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SDMMC1_DAT3_PULLTYPESELECT | pullup/down selection for pad sdmmc1_dat3 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | SDMMC1_DAT3_PULLUDENABLE | pullup/down enable for pad sdmmc1_dat3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | SDMMC1_DAT3_MUXMODE | Functional multiplexing selection for pad sdmmc1_dat3 ⁽²⁾ 0x0: Select sdmmc1_dat3 0x2: Select dpm_emu15 0x3: Select gpio_105 0x4: Select jtag_tck 0x7: Select safe_mode | RW | 0x7 |

⁽²⁾ To ensure pad safe operation at 1.8 V or 3.0 V and desired signal performance, the corresponding extended-drain I/O cell and PBIAS cell must be appropriately configured by software prior to signal selection on the pad, regardless of the signal multiplexing mode. For more details on extended-drain I/O cells and PBIAS cell descriptions and settings, see [Section 19.4.9, Extended-Drain I/O and PBIAS Cell](#), and [Section 19.5.1.2.1, Extended-Drain I/Os and PBIAS Cells Programming Guide](#).

**Table 19-436. Register Call Summary for Register
CONTROL_CORE_PAD0_SDMMC1_DAT3_PAD1_SDMMC1_DAT4**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-437. CONTROL_CORE_PAD0_SDMMC1_DAT5_PAD1_SDMMC1_DAT6

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 00F0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00F0 | | |
| Description | Register control for Pads sdmmc1_dat5 and sdmmc1_dat6 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------------|-----------------------------------|--------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|----|----|----|----------------------------|-------------------------|---------------------|----|-------------------------|--------------------------|-----------------------------------|--------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|---|---|---|----------------------------|-------------------------|---------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SDMMC1_DAT6_WAKEUPEVENT | SDMMC1_DAT6_WAKEUPENABLE | SDMMC1_DAT6_OFFMODEPULLTYPESELECT | SDMMC1_DAT6_OFFMODEPULLUDENABE | SDMMC1_DAT6_OFFMODEOUTVALUE | SDMMC1_DAT6_OFFMODEOUTENABLE | SDMMC1_DAT6_OFFMODEEENABLE | SDMMC1_DAT6_INPUTENABLE | RESERVED | | | | SDMMC1_DAT6_PULLTYPESELECT | SDMMC1_DAT6_PULLUDENABE | SDMMC1_DAT6_MUXMODE | | SDMMC1_DAT5_WAKEUPEVENT | SDMMC1_DAT5_WAKEUPENABLE | SDMMC1_DAT5_OFFMODEPULLTYPESELECT | SDMMC1_DAT5_OFFMODEPULLUDENABE | SDMMC1_DAT5_OFFMODEOUTVALUE | SDMMC1_DAT5_OFFMODEOUTENABLE | SDMMC1_DAT5_OFFMODEEENABLE | SDMMC1_DAT5_INPUTENABLE | RESERVED | | | | SDMMC1_DAT5_PULLTYPESELECT | SDMMC1_DAT5_PULLUDENABE | SDMMC1_DAT5_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|--|------|-------|
| 31 | SDMMC1_DAT6_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SDMMC1_DAT6_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | SDMMC1_DAT6_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc1_dat6 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | SDMMC1_DAT6_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad sdmmc1_dat6 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | SDMMC1_DAT6_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc1_dat6 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | SDMMC1_DAT6_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc1_dat6. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | SDMMC1_DAT6_OFFMODEEENABLE | OffMode mode override control for pad sdmmc1_dat6 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | SDMMC1_DAT6_INPUTENABLE | Input enable value for pad sdmmc1_dat6 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SDMMC1_DAT6_PULLTYPESELECT | pullup/down selection for pad sdmmc1_dat6 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|--|------|-------|
| 19 | SDMMC1_DAT6_PULLUDENABLE | pullup/down enable for pad sdmmc1_dat6 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | SDMMC1_DAT6_MUXMODE | Functional multiplexing selection for pad sdmmc1_dat6 ⁽¹⁾ 0x0: Select sdmmc1_dat6 0x3: Select gpio_108 0x7: Select safe_mode | RW | 0x7 |
| 15 | SDMMC1_DAT5_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SDMMC1_DAT5_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | SDMMC1_DAT5_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc1_dat5 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | SDMMC1_DAT5_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc1_dat5 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | SDMMC1_DAT5_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc1_dat5 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | SDMMC1_DAT5_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc1_dat5. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | SDMMC1_DAT5_OFFMODEENABLE | OffMode mode override control for pad sdmmc1_dat5 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | SDMMC1_DAT5_INPUTENABLE | Input enable value for pad sdmmc1_dat5 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SDMMC1_DAT5_PULLTYPESELECT | pullup/down selection for pad sdmmc1_dat5 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | SDMMC1_DAT5_PULLUDENABLE | pullup/down enable for pad sdmmc1_dat5 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

⁽¹⁾ To ensure pad safe operation at 1.8 V or 3.0 V and desired signal performance, the corresponding extended-drain I/O cell and PBIAS cell must be appropriately configured by software prior to signal selection on the pad, regardless of the signal multiplexing mode. For more details on extended-drain I/O cells and PBIAS cell descriptions and settings, see [Section 19.4.9, Extended-Drain I/O and PBIAS Cell](#), and [Section 19.5.1.2.1, Extended-Drain I/Os and PBIAS Cells Programming Guide](#).

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|-------|
| 2:0 | SDMMC1_DAT5_MUXMODE | Functional multiplexing selection for pad sdmmc1_dat5 ⁽²⁾ 0x0: Select sdmmc1_dat5 0x3: Select gpio_107 0x7: Select safe_mode | RW | 0x7 |

⁽²⁾ To ensure pad safe operation at 1.8 V or 3.0 V and desired signal performance, the corresponding extended-drain I/O cell and PBIAS cell must be appropriately configured by software prior to signal selection on the pad, regardless of the signal multiplexing mode. For more details on extended-drain I/O cells and PBIAS cell descriptions and settings, see [Section 19.4.9, Extended-Drain I/O and PBIAS Cell](#), and [Section 19.5.1.2.1, Extended-Drain I/Os and PBIAS Cells Programming Guide](#).

**Table 19-438. Register Call Summary for Register
CONTROL_CORE_PAD0_SDMMC1_DAT5_PAD1_SDMMC1_DAT6**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-439. CONTROL_CORE_PAD0_SDMMC1_DAT7_PAD1_ABE_MCBSP2_CLKX

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 00F4 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00F4 | | |
| Description | Register control for Pads sdmmc1_dat7 and abe_mcbasp2_clkx Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------|----|------------------------------|----|---------------------------------------|----|---------------------------------------|----|---------------------------------|----|----------------------------------|----|--------------------------------|----|-----------------------------|----|--------------------------|----|----|----|----|----|---|---|-----------------------------------|---|--------------------------------|---|-------------------------|---|---|---|-----------------------------------|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|------------------------------|--|--|--|--|--|--|--|----------------------------|--|--|--|--|--|--|--|-------------------------|--|--|--|--|--|--|--|
| ABE_MCBSP2_CLKX_WAKEUPEVENT | | ABE_MCBSP2_CLKX_WAKEUPENABLE | | ABE_MCBSP2_CLKX_OFFMODEPULLTYPESELECT | | ABE_MCBSP2_CLKX_OFFMODEPULLUDENENABLE | | ABE_MCBSP2_CLKX_OFFMODEOUTVALUE | | ABE_MCBSP2_CLKX_OFFMODEOUTENABLE | | ABE_MCBSP2_CLKX_OFFMODEEENABLE | | ABE_MCBSP2_CLKX_INPUTENABLE | | RESERVED | | | | | | | | ABE_MCBSP2_CLKX_PULLTYPESELECT | | ABE_MCBSP2_CLKX_PULLUDENENABLE | | ABE_MCBSP2_CLKX_MUXMODE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFFMODEPULLUDENENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTVALUE | | | | | | | | SDMMC1_DAT7_OFFMODEOUTENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEEENABLE | | | | | | | | SDMMC1_DAT7_INPUTENABLE | | | | | | | |
| RESERVED | | | | | | | | SDMMC1_DAT7_WAKEUPEVENT | | | | | | | | SDMMC1_DAT7_WAKEUPENABLE | | | | | | | | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | | | | | | | | SDMMC1_DAT7_OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|---|------|-------|
| 31 | ABE_MCBSP2_CLKX_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | ABE_MCBSP2_CLKX_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------------|---|------|-------|
| 29 | ABE_MCBSP2_CLKX_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_mcbbsp2_clkx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | ABE_MCBSP2_CLKX_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad abe_mcbbsp2_clkx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | ABE_MCBSP2_CLKX_OFFMODEOUTVALUE | OffMode mode output value for pad abe_mcbbsp2_clkx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | ABE_MCBSP2_CLKX_OFFMODEOUTENABLE | OffMode mode output enable value for pad abe_mcbbsp2_clkx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | ABE_MCBSP2_CLKX_OFFMODEENABLE | OffMode mode override control for pad abe_mcbbsp2_clkx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | ABE_MCBSP2_CLKX_INPUTENABLE | Input enable value for pad abe_mcbbsp2_clkx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | ABE_MCBSP2_CLKX_PULLTYPESELECT | pullup/down selection for pad abe_mcbbsp2_clkx 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | ABE_MCBSP2_CLKX_PULLUDENABLE | pullup/down enable for pad abe_mcbbsp2_clkx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | ABE_MCBSP2_CLKX_MUXMODE | Functional multiplexing selection for pad abe_mcbbsp2_clkx 0x0: Select abe_mcbbsp2_clkx 0x1: Select mcspi2_clk 0x2: Select abe_mcaspi_ahclkx 0x3: Select gpio_110 0x4: Select usbb2_mm_rxdm 0x7: Select safe_mode | RW | 0x7 |
| 15 | SDMMC1_DAT7_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SDMMC1_DAT7_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | SDMMC1_DAT7_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc1_dat7 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | SDMMC1_DAT7_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc1_dat7 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------------|--|------|-------|
| 11 | SDMMC1_DAT7_ OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc1_dat7 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | SDMMC1_DAT7_ OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc1_dat7. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | SDMMC1_DAT7_ OFFMODEENABLE | OffMode mode override control for pad sdmmc1_dat7 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | SDMMC1_DAT7_ INPUTENABLE | Input enable value for pad sdmmc1_dat7 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SDMMC1_DAT7_ PULLTYPESELECT | pullup/down selection for pad sdmmc1_dat7 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | SDMMC1_DAT7_ PULLUDENABLE | pullup/down enable for pad sdmmc1_dat7 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | SDMMC1_DAT7_ MUXMODE | Functional multiplexing selection for pad sdmmc1_dat7 ⁽¹⁾ 0x0: Select sdmmc1_dat7 0x3: Select gpio_109 0x7: Select safe_mode | RW | 0x7 |

⁽¹⁾ To ensure pad safe operation at 1.8 V or 3.0 V and desired signal performance, the corresponding extended-drain I/O cell and PBIAS cell must be appropriately configured by software prior to signal selection on the pad, regardless of the signal multiplexing mode. For more details on extended-drain I/O cells and PBIAS cell descriptions and settings, see [Section 19.4.9, Extended-Drain I/O and PBIAS Cell](#), and [Section 19.5.1.2.1, Extended-Drain I/Os and PBIAS Cells Programming Guide](#).

**Table 19-440. Register Call Summary for Register
CONTROL_CORE_PAD0_SDMMC1_DAT7_PAD1_ABE_MCBSP2_CLKX**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-441. CONTROL_CORE_PAD0_ABE_MCBSP2_DR_PAD1_ABE_MCBSP2_DX

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 00F8 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00F8 | | |
| Description | Register control for Pads abe_mcbasp2_dr and abe_mcbasp2_dx Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|----------------------------|-------------------------------------|-----------------------------------|-------------------------------|--------------------------------|------------------------------|---------------------------|----------|----|----|----|------------------------------|----------------------------|-----------------------|----|---------------------------|----------------------------|-------------------------------------|-----------------------------------|-------------------------------|--------------------------------|------------------------------|---------------------------|----------|---|---|---|------------------------------|----------------------------|-----------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ABE_MCBSP2_DX_WAKEUPEVENT | ABE_MCBSP2_DX_WAKEUPENABLE | ABE_MCBSP2_DX_OFFMODEPULLTYPESELECT | ABE_MCBSP2_DX_OFFMODEPULLUDENABLE | ABE_MCBSP2_DX_OFFMODEOUTVALUE | ABE_MCBSP2_DX_OFFMODEOUTENABLE | ABE_MCBSP2_DX_OFFMODEEENABLE | ABE_MCBSP2_DX_INPUTENABLE | RESERVED | | | | ABE_MCBSP2_DX_PULLTYPESELECT | ABE_MCBSP2_DX_PULLUDENABLE | ABE_MCBSP2_DX_MUXMODE | | ABE_MCBSP2_DR_WAKEUPEVENT | ABE_MCBSP2_DR_WAKEUPENABLE | ABE_MCBSP2_DR_OFFMODEPULLTYPESELECT | ABE_MCBSP2_DR_OFFMODEPULLUDENABLE | ABE_MCBSP2_DR_OFFMODEOUTVALUE | ABE_MCBSP2_DR_OFFMODEOUTENABLE | ABE_MCBSP2_DR_OFFMODEEENABLE | ABE_MCBSP2_DR_INPUTENABLE | RESERVED | | | | ABE_MCBSP2_DR_PULLTYPESELECT | ABE_MCBSP2_DR_PULLUDENABLE | ABE_MCBSP2_DR_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|---|------|-------|
| 31 | ABE_MCBSP2_DX_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | ABE_MCBSP2_DX_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | ABE_MCBSP2_DX_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_mcbasp2_dx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | ABE_MCBSP2_DX_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad abe_mcbasp2_dx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | ABE_MCBSP2_DX_OFFMODEOUTVALUE | OffMode mode output value for pad abe_mcbasp2_dx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | ABE_MCBSP2_DX_OFFMODEOUTENABLE | OffMode mode output enable value for pad abe_mcbasp2_dx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | ABE_MCBSP2_DX_OFFMODEEENABLE | OffMode mode override control for pad abe_mcbasp2_dx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | ABE_MCBSP2_DX_INPUTENABLE | Input enable value for pad abe_mcbasp2_dx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | ABE_MCBSP2_DX_PULLTYPESELECT | pullup/down selection for pad abe_mcbasp2_dx 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|--|------|-------|
| 19 | ABE_MCBSP2_DX_PULLUDENABLE | pullup/down enable for pad abe_mcbasp2_dx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | ABE_MCBSP2_DX_MUXMODE | Functional multiplexing selection for pad abe_mcbasp2_dx 0x0: Select abe_mcbasp2_dx 0x1: Select mcspi2_simo 0x2: Select abe_mcaspi2_amute 0x3: Select gpio_112 0x4: Select usbb2_mm_rxcv 0x7: Select safe_mode | RW | 0x7 |
| 15 | ABE_MCBSP2_DR_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | ABE_MCBSP2_DR_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | ABE_MCBSP2_DR_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_mcbasp2_dr 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | ABE_MCBSP2_DR_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad abe_mcbasp2_dr 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | ABE_MCBSP2_DR_OFFMODEOUTVALUE | OffMode mode output value for pad abe_mcbasp2_dr 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | ABE_MCBSP2_DR_OFFMODEOUTENABLE | OffMode mode output enable value for pad abe_mcbasp2_dr. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | ABE_MCBSP2_DR_OFFMODEENABLE | OffMode mode override control for pad abe_mcbasp2_dr 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | ABE_MCBSP2_DR_INPUTENABLE | Input enable value for pad abe_mcbasp2_dr 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | ABE_MCBSP2_DR_PULLTYPESELECT | pullup/down selection for pad abe_mcbasp2_dr 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | ABE_MCBSP2_DR_PULLUDENABLE | pullup/down enable for pad abe_mcbasp2_dr 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|-------|
| 2:0 | ABE_MCBSP2_DR_MUXMODE | Functional multiplexing selection for pad abe_mcbbsp2_dr 0x0: Select abe_mcbbsp2_dr 0x1: Select mcspi2_somi 0x2: Select abe_mcaspx_axr 0x3: Select gpio_111 0x4: Select usbb2_mm_rxdp 0x7: Select safe_mode | RW | 0x7 |

**Table 19-442. Register Call Summary for Register
CONTROL_CORE_PAD0_ABE_MCBSP2_DR_PAD1_ABE_MCBSP2_DX**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-443. CONTROL_CORE_PAD0_ABE_MCBSP2_FSX_PAD1_ABE_MCBSP1_CLKX

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 00FC | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 00FC | | |
| Description | Register control for Pads abe_mcbbsp2_fsx and abe_mcbbsp1_clkx Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------------|------------------------------|---------------------------------------|-------------------------------------|---------------------------------|----------------------------------|--------------------------------|-----------------------------|----------|----|----|--------------------------------|------------------------------|----|----|----|----------------------------|-----------------------------|--------------------------------------|------------------------------------|--------------------------------|---------------------------------|-------------------------------|----------------------------|----------|---|---|---|---|---|---|---|
| ABE_MCBSP1_CLKX_WAKEUPEVENT | ABE_MCBSP1_CLKX_WAKEUPENABLE | ABE_MCBSP1_CLKX_OFFMODEPULLTYPESELECT | ABE_MCBSP1_CLKX_OFFMODEPULLUDENABLE | ABE_MCBSP1_CLKX_OFFMODEOUTVALUE | ABE_MCBSP1_CLKX_OFFMODEOUTENABLE | ABE_MCBSP1_CLKX_OFFMODEEENABLE | ABE_MCBSP1_CLKX_INPUTENABLE | RESERVED | | | ABE_MCBSP1_CLKX_PULLTYPESELECT | ABE_MCBSP1_CLKX_PULLUDENABLE | | | | ABE_MCBSP2_FSX_WAKEUPEVENT | ABE_MCBSP2_FSX_WAKEUPENABLE | ABE_MCBSP2_FSX_OFFMODEPULLTYPESELECT | ABE_MCBSP2_FSX_OFFMODEPULLUDENABLE | ABE_MCBSP2_FSX_OFFMODEOUTVALUE | ABE_MCBSP2_FSX_OFFMODEOUTENABLE | ABE_MCBSP2_FSX_OFFMODEEENABLE | ABE_MCBSP2_FSX_INPUTENABLE | RESERVED | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------|---|------|-------|
| 31 | ABE_MCBSP1_CLKX_WAKEUP EVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | ABE_MCBSP1_CLKX_WAKEUP ENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------------|---|------|-------|
| 29 | ABE_MCBSP1_CLKX_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_mcbbsp1_clkx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | ABE_MCBSP1_CLKX_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad abe_mcbbsp1_clkx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | ABE_MCBSP1_CLKX_OFFMODEOUTVALUE | OffMode mode output value for pad abe_mcbbsp1_clkx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | ABE_MCBSP1_CLKX_OFFMODEOUTENABLE | OffMode mode output enable value for pad abe_mcbbsp1_clkx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | ABE_MCBSP1_CLKX_OFFMODEENABLE | OffMode mode override control for pad abe_mcbbsp1_clkx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | ABE_MCBSP1_CLKX_INPUTENABLE | Input enable value for pad abe_mcbbsp1_clkx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | ABE_MCBSP1_CLKX_PULLTYPESELECT | pullup/down selection for pad abe_mcbbsp1_clkx 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | ABE_MCBSP1_CLKX_PULLUDENABLE | pullup/down enable for pad abe_mcbbsp1_clkx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | ABE_MCBSP1_CLKX_MUXMODE | Functional multiplexing selection for pad abe_mcbbsp1_clkx 0x0: Select abe_mcbbsp1_clkx 0x1: Select abe_slimbus1_clock 0x3: Select gpio_114 0x7: Select safe_mode | RW | 0x7 |
| 15 | ABE_MCBSP2_FSX_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | ABE_MCBSP2_FSX_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | ABE_MCBSP2_FSX_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_mcbbsp2_fsx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | ABE_MCBSP2_FSX_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad abe_mcbbsp2_fsx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|--|------|-------|
| 11 | ABE_MCBSP2_FSX_OFFMODEOUTVALUE | OffMode mode output value for pad abe_mcbbsp2_fsx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | ABE_MCBSP2_FSX_OFFMODEOUTENABLE | OffMode mode output enable value for pad abe_mcbbsp2_fsx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | ABE_MCBSP2_FSX_OFFMODEENABLE | OffMode mode override control for pad abe_mcbbsp2_fsx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | ABE_MCBSP2_FSX_INPUTENABLE | Input enable value for pad abe_mcbbsp2_fsx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | ABE_MCBSP2_FSX_PULLTYPESELECT | pullup/down selection for pad abe_mcbbsp2_fsx 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | ABE_MCBSP2_FSX_PULLUDENABLE | pullup/down enable for pad abe_mcbbsp2_fsx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | ABE_MCBSP2_FSX_MUXMODE | Functional multiplexing selection for pad abe_mcbbsp2_fsx 0x0: Select abe_mcbbsp2_fsx 0x1: Select mcspi2_cs0 0x2: Select abe_mcaspi2_afsx 0x3: Select gpio_113 0x4: Select usbb2_mm_txen 0x7: Select safe_mode | RW | 0x7 |

**Table 19-444. Register Call Summary for Register
CONTROL_CORE_PAD0_ABE_MCBSP2_FSX_PAD1_ABE_MCBSP1_CLKX**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-445. CONTROL_CORE_PAD0_ABE_MCBSP1_DR_PAD1_ABE_MCBSP1_DX

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0100 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0100 | | |
| Description | Register control for Pads abe_mcbbsp1_dr and abe_mcbbsp1_dx Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|----------------------------|-------------------------------------|----------------------------------|-------------------------------|--------------------------------|------------------------------|---------------------------|----------|----|----|----|------------------------------|---------------------------|-----------------------|----|---------------------------|----------------------------|-------------------------------------|----------------------------------|-------------------------------|--------------------------------|------------------------------|---------------------------|----------|---|---|---|------------------------------|---------------------------|-----------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ABE_MCBSP1_DX_WAKEUPEVENT | ABE_MCBSP1_DX_WAKEUPENABLE | ABE_MCBSP1_DX_OFFMODEPULLTYPESELECT | ABE_MCBSP1_DX_OFFMODEPULLUDENABE | ABE_MCBSP1_DX_OFFMODEOUTVALUE | ABE_MCBSP1_DX_OFFMODEOUTENABLE | ABE_MCBSP1_DX_OFFMODEEENABLE | ABE_MCBSP1_DX_INPUTENABLE | RESERVED | | | | ABE_MCBSP1_DX_PULLTYPESELECT | ABE_MCBSP1_DX_PULLUDENABE | ABE_MCBSP1_DX_MUXMODE | | ABE_MCBSP1_DR_WAKEUPEVENT | ABE_MCBSP1_DR_WAKEUPENABLE | ABE_MCBSP1_DR_OFFMODEPULLTYPESELECT | ABE_MCBSP1_DR_OFFMODEPULLUDENABE | ABE_MCBSP1_DR_OFFMODEOUTVALUE | ABE_MCBSP1_DR_OFFMODEOUTENABLE | ABE_MCBSP1_DR_OFFMODEEENABLE | ABE_MCBSP1_DR_INPUTENABLE | RESERVED | | | | ABE_MCBSP1_DR_PULLTYPESELECT | ABE_MCBSP1_DR_PULLUDENABE | ABE_MCBSP1_DR_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|---|------|-------|
| 31 | ABE_MCBSP1_DX_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | ABE_MCBSP1_DX_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | ABE_MCBSP1_DX_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_mcbbsp1_dx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | ABE_MCBSP1_DX_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad abe_mcbbsp1_dx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | ABE_MCBSP1_DX_OFFMODEOUTVALUE | OffMode mode output value for pad abe_mcbbsp1_dx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | ABE_MCBSP1_DX_OFFMODEOUTENABLE | OffMode mode output enable value for pad abe_mcbbsp1_dx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | ABE_MCBSP1_DX_OFFMODEEENABLE | OffMode mode override control for pad abe_mcbbsp1_dx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | ABE_MCBSP1_DX_INPUTENABLE | Input enable value for pad abe_mcbbsp1_dx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | ABE_MCBSP1_DX_PULLTYPESELECT | pullup/down selection for pad abe_mcbbsp1_dx 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---|--|------|-------|
| 19 | ABE_MCBSP1_ DX_PULLUDENABLE | pullup/down enable for pad abe_mcbbsp1_dx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | ABE_MCBSP1_ DX_MUXMODE | Functional multiplexing selection for pad abe_mcbbsp1_dx 0x0: Select abe_mcbbsp1_dx 0x1: Select sdmmc3_dat2 0x2: Select abe_mcaspl_aclkx 0x3: Select gpio_116 0x7: Select safe_mode | RW | 0x7 |
| 15 | ABE_MCBSP1_ DR_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | ABE_MCBSP1_ DR_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | ABE_MCBSP1_ DR_OFFMODEPULLTYPESELE CT | OffMode mode pullup/down selection for pad abe_mcbbsp1_dr 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | ABE_MCBSP1_ DR_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad abe_mcbbsp1_dr 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | ABE_MCBSP1_ DR_OFFMODEOUTVALUE | OffMode mode output value for pad abe_mcbbsp1_dr 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | ABE_MCBSP1_ DR_OFFMODEOUTENABLE | OffMode mode output enable value for pad abe_mcbbsp1_dr. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | ABE_MCBSP1_ DR_OFFMODEENABLE | OffMode mode override control for pad abe_mcbbsp1_dr 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | ABE_MCBSP1_ DR_INPUTENABLE | Input enable value for pad abe_mcbbsp1_dr 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | ABE_MCBSP1_ DR_PULLTYPESELECT | pullup/down selection for pad abe_mcbbsp1_dr 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | ABE_MCBSP1_ DR_PULLUDENABLE | pullup/down enable for pad abe_mcbbsp1_dr 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | ABE_MCBSP1_ DR_MUXMODE | Functional multiplexing selection for pad abe_mcbbsp1_dr 0x0: Select abe_mcbbsp1_dr 0x1: Select abe_slimbus1_data 0x3: Select gpio_115 0x7: Select safe_mode | RW | 0x7 |

**Table 19-446. Register Call Summary for Register
CONTROL_CORE_PAD0_ABE_MCBSP1_DR_PAD1_ABE_MCBSP1_DX**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-447. CONTROL_CORE_PAD0_ABE_MCBSP1_FSX_PAD1_ABE_PDM_UL_DATA

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0104 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0104 | | |
| Description | Register control for Pads abe_mcbbsp1_fsx and abe_pdm_ul_data Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------|----|------------------------------|----|----------|----|----|----|----|----|-----------------------------|----|----------|----|----|----|-------------------------------|----|------------------------------|----|-------------------------|----|----------------------------|---|-----------------------------|---|-------------------------------------|---|------------------------------------|---|--------------------------------|---|---------------------------------|--|-------------------------------|--|----------------------------|--|----------|--|--|--|------------------------------|--|-----------------------------|--|------------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| ABE_PDM_UL_DATA_WAKEUPEVENT | | ABE_PDM_UL_DATA_WAKEUPENABLE | | RESERVED | | | | | | ABE_PDM_UL_DATA_INPUTENABLE | | RESERVED | | | | ABE_PDM_UL_DATA_PULLYPESELECT | | ABE_PDM_UL_DATA_PULLUDENABLE | | ABE_PDM_UL_DATA_MUXMODE | | ABE_MCBSP1_FSX_WAKEUPEVENT | | ABE_MCBSP1_FSX_WAKEUPENABLE | | ABE_MCBSP1_FSX_OFFMODEPULLYPESELECT | | ABE_MCBSP1_FSX_OFFMODEPULLUDENABLE | | ABE_MCBSP1_FSX_OFFMODEOUTVALUE | | ABE_MCBSP1_FSX_OFFMODEOUTENABLE | | ABE_MCBSP1_FSX_OFFMODEEENABLE | | ABE_MCBSP1_FSX_INPUTENABLE | | RESERVED | | | | ABE_MCBSP1_FSX_PULLYPESELECT | | ABE_MCBSP1_FSX_PULLUDENABLE | | ABE_MCBSP1_FSX_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|---|------|-------|
| 31 | ABE_PDM_UL_DATA_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | ABE_PDM_UL_DATA_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | ABE_PDM_UL_DATA_INPUTENABLE | Input enable value for pad abe_pdm_ul_data 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | ABE_PDM_UL_DATA_PULLYPESELECT | pullup/down selection for pad abe_pdm_ul_data 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | ABE_PDM_UL_DATA_PULLUDENABLE | pullup/down enable for pad abe_pdm_ul_data 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------------|---|------|-------|
| 18:16 | ABE_PDM_UL_DATA_MUXMODE | Functional multiplexing selection for pad abe_pdm_ul_data 0x0: Select abe_pdm_ul_data 0x1: Select abe_mcbasp3_dr 0x7: Select safe_mode | RW | 0x7 |
| 15 | ABE_MCBSP1_FSX_WAKEUPVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | ABE_MCBSP1_FSX_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | ABE_MCBSP1_FSX_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_mcbasp1_fsx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | ABE_MCBSP1_FSX_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad abe_mcbasp1_fsx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | ABE_MCBSP1_FSX_OFFMODEOUTVALUE | OffMode mode output value for pad abe_mcbasp1_fsx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | ABE_MCBSP1_FSX_OFFMODEOUTENABLE | OffMode mode output enable value for pad abe_mcbasp1_fsx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | ABE_MCBSP1_FSX_OFFMODEENABLE | OffMode mode override control for pad abe_mcbasp1_fsx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | ABE_MCBSP1_FSX_INPUTENABLE | Input enable value for pad abe_mcbasp1_fsx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | ABE_MCBSP1_FSX_PULLTYPESELECT | pullup/down selection for pad abe_mcbasp1_fsx 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | ABE_MCBSP1_FSX_PULLUDENABLE | pullup/down enable for pad abe_mcbasp1_fsx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | ABE_MCBSP1_FSX_MUXMODE | Functional multiplexing selection for pad abe_mcbasp1_fsx 0x0: Select abe_mcbasp1_fsx 0x1: Select sdmmc3_dat3 0x2: Select abe_mcasg_amutein 0x3: Select gpio_117 0x7: Select safe_mode | RW | 0x7 |

**Table 19-448. Register Call Summary for Register
CONTROL_CORE_PAD0_ABE_MCBSP1_FSX_PAD1_ABE_PDM_UL_DATA**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-449. CONTROL_CORE_PAD0_ABE_PDM_DL_DATA_PAD1_ABE_PDM_FRAME

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0108 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0108 | | |
| Description | Register control for Pads abe_pdm_dl_data and abe_pdm_frame Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------------------|----------------------------|-------------------------------------|-------------------------------------|-------------------------------|--------------------------------|-------------------------------|---------------------------|----------|----|----|----|------------------------------|------------------------------|-----------------------|----|-----------------------------|------------------------------|---------------------------------------|---------------------------------------|---------------------------------|----------------------------------|---------------------------------|-----------------------------|----------|---|---|---|--------------------------------|--------------------------------|-------------------------|---|
| ABE_PDM_FRAME_WAKEUPEVENT | ABE_PDM_FRAME_WAKEUPENABLE | ABE_PDM_FRAME_OFFMODEPULLTYPESELECT | ABE_PDM_FRAME_OFFMODEPULLUDENENABLE | ABE_PDM_FRAME_OFFMODEOUTVALUE | ABE_PDM_FRAME_OFFMODEOUTENABLE | ABE_PDM_FRAME_OFFMODEENENABLE | ABE_PDM_FRAME_INPUTENABLE | RESERVED | | | | ABE_PDM_FRAME_PULLTYPESELECT | ABE_PDM_FRAME_PULLUDENENABLE | ABE_PDM_FRAME_MUXMODE | | ABE_PDM_DL_DATA_WAKEUPEVENT | ABE_PDM_DL_DATA_WAKEUPENABLE | ABE_PDM_DL_DATA_OFFMODEPULLTYPESELECT | ABE_PDM_DL_DATA_OFFMODEPULLUDENENABLE | ABE_PDM_DL_DATA_OFFMODEOUTVALUE | ABE_PDM_DL_DATA_OFFMODEOUTENABLE | ABE_PDM_DL_DATA_OFFMODEENENABLE | ABE_PDM_DL_DATA_INPUTENABLE | RESERVED | | | | ABE_PDM_DL_DATA_PULLTYPESELECT | ABE_PDM_DL_DATA_PULLUDENENABLE | ABE_PDM_DL_DATA_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------------|---|------|-------|
| 31 | ABE_PDM_FRAME_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | ABE_PDM_FRAME_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | ABE_PDM_FRAME_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_pdm_frame 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | ABE_PDM_FRAME_OFFMODEPULLUDENENABLE | OffMode mode pullup/down enable for pad abe_pdm_frame 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | ABE_PDM_FRAME_OFFMODEOUTVALUE | OffMode mode output value for pad abe_pdm_frame 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------------|--|------|-------|
| 26 | ABE_PDM_FRAME_OFFMODEOUTENABLE | OffMode mode output enable value for pad abe_pdm_frame. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | ABE_PDM_FRAME_OFFMODEENABLE | OffMode mode override control for pad abe_pdm_frame 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | ABE_PDM_FRAME_INPUTENABLE | Input enable value for pad abe_pdm_frame 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | ABE_PDM_FRAME_PULLTYPESELECT | pullup/down selection for pad abe_pdm_frame 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | ABE_PDM_FRAME_PULLUDENABLE | pullup/down enable for pad abe_pdm_frame 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | ABE_PDM_FRAME_MUXMODE | Functional multiplexing selection for pad abe_pdm_frame 0x0: Select abe_pdm_frame 0x1: Select abe_mcbasp3_clkx 0x7: Select safe_mode | RW | 0x7 |
| 15 | ABE_PDM_DL_DATA_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | ABE_PDM_DL_DATA_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | ABE_PDM_DL_DATA_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_pdm_dl_data 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | ABE_PDM_DL_DATA_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad abe_pdm_dl_data 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | ABE_PDM_DL_DATA_OFFMODEOUTVALUE | OffMode mode output value for pad abe_pdm_dl_data 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | ABE_PDM_DL_DATA_OFFMODEOUTENABLE | OffMode mode output enable value for pad abe_pdm_dl_data. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | ABE_PDM_DL_DATA_OFFMODEENABLE | OffMode mode override control for pad abe_pdm_dl_data 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 8 | ABE_PDM_DL_DATA_INPUTENABLE | Input enable value for pad abe_pdm_dl_data 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | ABE_PDM_DL_DATA_PULLTYPESELECT | pullup/down selection for pad abe_pdm_dl_data 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | ABE_PDM_DL_DATA_PULLUDENABLE | pullup/down enable for pad abe_pdm_dl_data 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | ABE_PDM_DL_DATA_MUXMODE | Functional multiplexing selection for pad abe_pdm_dl_data 0x0: Select abe_pdm_dl_data 0x1: Select abe_mcbasp3_dx 0x7: Select safe_mode | RW | 0x7 |

**Table 19-450. Register Call Summary for Register
CONTROL_CORE_PAD0_ABE_PDM_DL_DATA_PAD1_ABE_PDM_FRAME**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-451. CONTROL_CORE_PAD0_ABE_PDM_LB_CLK_PAD1_ABE_CLKS

| | | | | | | | | | |
|------------------|--|---|--|--|--|----------|--|----------------------|--|
| Address Offset | | 0x0000 010C | | | | Instance | | SYSCTRL_PADCONF_CORE | |
| Physical Address | | 0x4A10 010C | | | | | | | |
| Description | | Register control for Pads abe_pdm_lb_clk and abe_clks Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | |
| Type | | RW | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----|-----------------------|----|--------------------------------|----|------------------------------|----|--------------------------|----|---------------------------|----|-------------------------|----|----------------------|----|----------|----|-------------------------|----|-----------------------|----|------------------|---|----------------------------|---|-----------------------------|---|--------------------------------------|---|------------------------------------|---|--------------------------------|--|---------------------------------|--|-------------------------------|--|----------------------------|--|----------|--|-------------------------------|--|-----------------------------|--|------------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| ABE_CLKS_WAKEUPEVENT | | ABE_CLKS_WAKEUPENABLE | | ABE_CLKS_OFFMODEPULLTYPESELECT | | ABE_CLKS_OFFMODEPULLUDENABLE | | ABE_CLKS_OFFMODEOUTVALUE | | ABE_CLKS_OFFMODEOUTENABLE | | ABE_CLKS_OFFMODEEENABLE | | ABE_CLKS_INPUTENABLE | | RESERVED | | ABE_CLKS_PULLTYPESELECT | | ABE_CLKS_PULLUDENABLE | | ABE_CLKS_MUXMODE | | ABE_PDM_LB_CLK_WAKEUPEVENT | | ABE_PDM_LB_CLK_WAKEUPENABLE | | ABE_PDM_LB_CLK_OFFMODEPULLTYPESELECT | | ABE_PDM_LB_CLK_OFFMODEPULLUDENABLE | | ABE_PDM_LB_CLK_OFFMODEOUTVALUE | | ABE_PDM_LB_CLK_OFFMODEOUTENABLE | | ABE_PDM_LB_CLK_OFFMODEEENABLE | | ABE_PDM_LB_CLK_INPUTENABLE | | RESERVED | | ABE_PDM_LB_CLK_PULLTYPESELECT | | ABE_PDM_LB_CLK_PULLUDENABLE | | ABE_PDM_LB_CLK_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------------|---|------|-------|
| 31 | ABE_CLKS_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | ABE_CLKS_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | ABE_CLKS_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_clks 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | ABE_CLKS_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad abe_clks 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | ABE_CLKS_OFFMODEOUTVALUE | OffMode mode output value for pad abe_clks 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | ABE_CLKS_OFFMODEOUTENABLE | OffMode mode output enable value for pad abe_clks. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | ABE_CLKS_OFFMODEENABLE | OffMode mode override control for pad abe_clks 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | ABE_CLKS_INPUTENABLE | Input enable value for pad abe_clks 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | ABE_CLKS_PULLTYPESELECT | pullup/down selection for pad abe_clks 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | ABE_CLKS_PULLUDENABLE | pullup/down enable for pad abe_clks 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | ABE_CLKS_MUXMODE | Functional multiplexing selection for pad abe_clks 0x0: Select abe_clks 0x3: Select gpio_118 0x7: Select safe_mode | RW | 0x7 |
| 15 | ABE_PDM_LB_CLK_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | ABE_PDM_LB_CLK_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | ABE_PDM_LB_CLK_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_pdm_lb_clk 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--|---|------|-------|
| 12 | ABE_PDM_LB_CLK_OFFMODE PULLUDENABLE | OffMode mode pullup/down enable for pad abe_pdm_lb_clk 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | ABE_PDM_LB_CLK_OFFMODE OUTVALUE | OffMode mode output value for pad abe_pdm_lb_clk 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | ABE_PDM_LB_CLK_OFFMODE OUTENABLE | OffMode mode output enable value for pad abe_pdm_lb_clk. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | ABE_PDM_LB_CLK_OFFMODE ENABLE | OffMode mode override control for pad abe_pdm_lb_clk 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | ABE_PDM_LB_CLK_INPUTENA BLE | Input enable value for pad abe_pdm_lb_clk 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | ABE_PDM_LB_CLK_PULLTYPE SELECT | pullup/down selection for pad abe_pdm_lb_clk 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | ABE_PDM_LB_CLK_PULLUDEN ABLE | pullup/down enable for pad abe_pdm_lb_clk 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | ABE_PDM_LB_CLK_MUXMODE | Functional multiplexing selection for pad abe_pdm_lb_clk 0x0: Select abe_pdm_lb_clk 0x1: Select abe_mcbasp3_fsx 0x7: Select safe_mode | RW | 0x7 |

**Table 19-452. Register Call Summary for Register
CONTROL_CORE_PAD0_ABE_PDM_LB_CLK_PAD1_ABE_CLKS**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-453. CONTROL_CORE_PAD0_ABE_DMIC_CLK1_PAD1_ABE_DMIC_DIN1

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0110 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0110 | | |
| Description | Register control for Pads abe_dmic_clk1 and abe_dmic_din1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|----|----------------------------|----|-------------------------------------|----|----------------------------------|----|-------------------------------|----|--------------------------------|----|------------------------------|----|---------------------------|----|----------|----|----|----|----|----|---|---|---------------------------|---|----------------------------|---|-------------------------------------|---|----------------------------------|---|-------------------------------|--|--------------------------------|--|------------------------------|--|---------------------------|--|----------|--|--|--|--|--|--|--|------------------------------|--|---------------------------|--|----------|--|--|--|--|--|--|--|-----------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ABE_DMIC_DIN1_WAKEUPEVENT | | ABE_DMIC_DIN1_WAKEUPENABLE | | ABE_DMIC_DIN1_OFFMODEPULLTYPESELECT | | ABE_DMIC_DIN1_OFFMODEPULLUDENABE | | ABE_DMIC_DIN1_OFFMODEOUTVALUE | | ABE_DMIC_DIN1_OFFMODEOUTENABLE | | ABE_DMIC_DIN1_OFFMODEEENABLE | | ABE_DMIC_DIN1_INPUTENABLE | | RESERVED | | | | | | | | ABE_DMIC_CLK1_WAKEUPEVENT | | ABE_DMIC_CLK1_WAKEUPENABLE | | ABE_DMIC_CLK1_OFFMODEPULLTYPESELECT | | ABE_DMIC_CLK1_OFFMODEPULLUDENABE | | ABE_DMIC_CLK1_OFFMODEOUTVALUE | | ABE_DMIC_CLK1_OFFMODEOUTENABLE | | ABE_DMIC_CLK1_OFFMODEEENABLE | | ABE_DMIC_CLK1_INPUTENABLE | | RESERVED | | | | | | | | ABE_DMIC_CLK1_PULLTYPESELECT | | ABE_DMIC_CLK1_PULLUDENABE | | RESERVED | | | | | | | | ABE_DMIC_CLK1_MUXMODE | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|--|------|-------|
| 31 | ABE_DMIC_DIN1_WAKEUPEVENT | Pad_x wake-up event status latched in the I/O Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | ABE_DMIC_DIN1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | ABE_DMIC_DIN1_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_dmic_din1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | ABE_DMIC_DIN1_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad abe_dmic_din1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | ABE_DMIC_DIN1_OFFMODEOUTVALUE | OffMode mode output value for pad abe_dmic_din1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | ABE_DMIC_DIN1_OFFMODEOUTENABLE | OffMode mode output enable value for pad abe_dmic_din1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | ABE_DMIC_DIN1_OFFMODEEENABLE | OffMode mode override control for pad abe_dmic_din1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | ABE_DMIC_DIN1_INPUTENABLE | Input enable value for pad abe_dmic_din1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | ABE_DMIC_DIN1_PULLTYPESELECT | pullup/down selection for pad abe_dmic_din1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|--|------|-------|
| 19 | ABE_DMIC_DIN1_PULLUDENABLE | pullup/down enable for pad abe_dmic_din1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | ABE_DMIC_DIN1_MUXMODE | Functional multiplexing selection for pad abe_dmic_din1 0x0: Select abe_dmic_din1 0x3: Select gpio_120 0x4: Select usbb2_mm_txdat 0x5: Select uart4_rts 0x7: Select safe_mode | RW | 0x7 |
| 15 | ABE_DMIC_CLK1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | ABE_DMIC_CLK1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | ABE_DMIC_CLK1_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_dmic_clk1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | ABE_DMIC_CLK1_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad abe_dmic_clk1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | ABE_DMIC_CLK1_OFFMODEOUTPUTVALUE | OffMode mode output value for pad abe_dmic_clk1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | ABE_DMIC_CLK1_OFFMODEOUTPUTENABLE | OffMode mode output enable value for pad abe_dmic_clk1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | ABE_DMIC_CLK1_OFFMODEENABLE | OffMode mode override control for pad abe_dmic_clk1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | ABE_DMIC_CLK1_INPUTENABLE | Input enable value for pad abe_dmic_clk1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | ABE_DMIC_CLK1_PULLTYPESSELECT | pullup/down selection for pad abe_dmic_clk1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | ABE_DMIC_CLK1_PULLUDENABLE | pullup/down enable for pad abe_dmic_clk1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------|
| 2:0 | ABE_DMIC_CLK1_MUXMODE | Functional multiplexing selection for pad abe_dmic_clk1 0x0: Select abe_dmic_clk1 0x3: Select gpio_119 0x4: Select usbb2_mm_txse0 0x5: Select uart4_cts 0x7: Select safe_mode | RW | 0x7 |

**Table 19-454. Register Call Summary for Register
CONTROL_CORE_PAD0_ABE_DMIC_CLK1_PAD1_ABE_DMIC_DIN1**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-455. CONTROL_CORE_PAD0_ABE_DMIC_DIN2_PAD1_ABE_DMIC_DIN3

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0114 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0114 | | |
| Description | Register control for Pads abe_dmic_din2 and abe_dmic_din3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|---------------------------|----|----------------------------|----|-------------------------------------|----|-----------------------------------|----|-------------------------------|----|--------------------------------|----|------------------------------|----|---------------------------|----|----------|--|--|--|----|------------------------------|----|----------------------------|----|-----------------------|--|--|----|----|---------------------------|----|----------------------------|----|-------------------------------------|----|-----------------------------------|----|-------------------------------|----|--------------------------------|---|------------------------------|---|---------------------------|---|----------|--|--|--|---|------------------------------|---|----------------------------|---|-----------------------|--|--|---|
| 31 | ABE_DMIC_DIN3_WAKEUPEVENT | 30 | ABE_DMIC_DIN3_WAKEUPENABLE | 29 | ABE_DMIC_DIN3_OFFMODEPULLTYPESELECT | 28 | ABE_DMIC_DIN3_OFFMODEPULLUDENABLE | 27 | ABE_DMIC_DIN3_OFFMODEOUTVALUE | 26 | ABE_DMIC_DIN3_OFFMODEOUTENABLE | 25 | ABE_DMIC_DIN3_OFFMODEEENABLE | 24 | ABE_DMIC_DIN3_INPUTENABLE | 23 | RESERVED | | | | 20 | ABE_DMIC_DIN3_PULLTYPESELECT | 19 | ABE_DMIC_DIN3_PULLUDENABLE | 18 | ABE_DMIC_DIN3_MUXMODE | | | 16 | 15 | ABE_DMIC_DIN2_WAKEUPEVENT | 14 | ABE_DMIC_DIN2_WAKEUPENABLE | 13 | ABE_DMIC_DIN2_OFFMODEPULLTYPESELECT | 12 | ABE_DMIC_DIN2_OFFMODEPULLUDENABLE | 11 | ABE_DMIC_DIN2_OFFMODEOUTVALUE | 10 | ABE_DMIC_DIN2_OFFMODEOUTENABLE | 9 | ABE_DMIC_DIN2_OFFMODEEENABLE | 8 | ABE_DMIC_DIN2_INPUTENABLE | 7 | RESERVED | | | | 4 | ABE_DMIC_DIN2_PULLTYPESELECT | 3 | ABE_DMIC_DIN2_PULLUDENABLE | 2 | ABE_DMIC_DIN2_MUXMODE | | | 0 |
|----|---------------------------|----|----------------------------|----|-------------------------------------|----|-----------------------------------|----|-------------------------------|----|--------------------------------|----|------------------------------|----|---------------------------|----|----------|--|--|--|----|------------------------------|----|----------------------------|----|-----------------------|--|--|----|----|---------------------------|----|----------------------------|----|-------------------------------------|----|-----------------------------------|----|-------------------------------|----|--------------------------------|---|------------------------------|---|---------------------------|---|----------|--|--|--|---|------------------------------|---|----------------------------|---|-----------------------|--|--|---|

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------------|---|------|-------|
| 31 | ABE_DMIC_DIN3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | ABE_DMIC_DIN3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | ABE_DMIC_DIN3_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_dmic_din3 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|---|------|-------|
| 28 | ABE_DMIC_DIN3_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad abe_dmic_din3 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | ABE_DMIC_DIN3_OFFMODEOUTPUTVALUE | OffMode mode output value for pad abe_dmic_din3 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | ABE_DMIC_DIN3_OFFMODEOUTPUTENABLE | OffMode mode output enable value for pad abe_dmic_din3. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | ABE_DMIC_DIN3_OFFMODEENABLE | OffMode mode override control for pad abe_dmic_din3 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | ABE_DMIC_DIN3_INPUTENABLE | Input enable value for pad abe_dmic_din3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | ABE_DMIC_DIN3_PULLTYPESELECT | pullup/down selection for pad abe_dmic_din3 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | ABE_DMIC_DIN3_PULLUDENABLE | pullup/down enable for pad abe_dmic_din3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | ABE_DMIC_DIN3_MUXMODE | Functional multiplexing selection for pad abe_dmic_din3 0x0: Select abe_dmic_din3 0x1: Select slimbus2_data 0x2: Select abe_dmic_clk2 0x3: Select gpio_122 0x5: Select dmtimer9_pwm_evt 0x7: Select safe_mode | RW | 0x7 |
| 15 | ABE_DMIC_DIN2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | ABE_DMIC_DIN2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | ABE_DMIC_DIN2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad abe_dmic_din2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | ABE_DMIC_DIN2_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad abe_dmic_din2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | ABE_DMIC_DIN2_OFFMODEOUTPUTVALUE | OffMode mode output value for pad abe_dmic_din2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------------|--|------|-------|
| 10 | ABE_DMIC_DIN2_OFFMODEO UTENABLE | OffMode mode output enable value for pad abe_dmic_din2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | ABE_DMIC_DIN2_OFFMODEEN ABLE | OffMode mode override control for pad abe_dmic_din2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | ABE_DMIC_DIN2_INPUTENABL E | Input enable value for pad abe_dmic_din2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | ABE_DMIC_DIN2_PULLTYPESE LECT | pullup/down selection for pad abe_dmic_din2 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | ABE_DMIC_DIN2_PULLUDENA BLE | pullup/down enable for pad abe_dmic_din2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | ABE_DMIC_DIN2_MUXMODE | Functional multiplexing selection for pad abe_dmic_din2 0x0: Select abe_dmic_din2 0x1: Select slimbus2_clock 0x2: Select abe_mcaspx_axr 0x3: Select gpio_121 0x5: Select dmtimer11_pwm_evt 0x7: Select safe_mode | RW | 0x7 |

**Table 19-456. Register Call Summary for Register
CONTROL_CORE_PAD0_ABE_DMIC_DIN2_PAD1_ABE_DMIC_DIN3**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-457. CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0118 | | |
| Physical Address | 0x4A10 0118 | Instance | SYSCTRL_PADCONF_CORE |
| Description | Register control for Pads uart2_cts and uart2_rts Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|----|----|----|--------------------------|------------------------|-------------------|----|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|---|---|---|--------------------------|------------------------|-------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| UART2_RTS_WAKEUPEVENT | UART2_RTS_WAKEUPENABLE | UART2_RTS_OFFMODEPULLTYPESELECT | UART2_RTS_OFFMODEPULLUDENABLE | UART2_RTS_OFFMODEOUTVALUE | UART2_RTS_OFFMODEOUTENABLE | UART2_RTS_OFFMODEEENABLE | UART2_RTS_INPUTENABLE | RESERVED | | | | UART2_RTS_PULLTYPESELECT | UART2_RTS_PULLUDENABLE | UART2_RTS_MUXMODE | | UART2_CTS_WAKEUPEVENT | UART2_CTS_WAKEUPENABLE | UART2_CTS_OFFMODEPULLTYPESELECT | UART2_CTS_OFFMODEPULLUDENABLE | UART2_CTS_OFFMODEOUTVALUE | UART2_CTS_OFFMODEOUTENABLE | UART2_CTS_OFFMODEEENABLE | UART2_CTS_INPUTENABLE | RESERVED | | | | UART2_CTS_PULLTYPESELECT | UART2_CTS_PULLUDENABLE | UART2_CTS_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 31 | UART2_RTS_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | UART2_RTS_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | UART2_RTS_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad uart2_rts 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | UART2_RTS_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad uart2_rts 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | UART2_RTS_OFFMODEOUTVALUE | OffMode mode output value for pad uart2_rts 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | UART2_RTS_OFFMODEOUTENABLE | OffMode mode output enable value for pad uart2_rts. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | UART2_RTS_OFFMODEEENABLE | OffMode mode override control for pad uart2_rts 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | UART2_RTS_INPUTENABLE | Input enable value for pad uart2_rts 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | UART2_RTS_PULLTYPESELECT | pullup/down selection for pad uart2_rts 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | UART2_RTS_PULLUDENABLE | pullup/down enable for pad uart2_rts 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 18:16 | UART2_RTS_MUXMODE | Functional multiplexing selection for pad uart2_rts 0x0: Select uart2_rts 0x1: Select sdmmc3_cmd 0x3: Select gpio_124 0x7: Select safe_mode | RW | 0x7 |
| 15 | UART2_CTS_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | UART2_CTS_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | UART2_CTS_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad uart2_cts 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | UART2_CTS_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad uart2_cts 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | UART2_CTS_OFFMODEOUTVALUE | OffMode mode output value for pad uart2_cts 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | UART2_CTS_OFFMODEOUTENABLE | OffMode mode output enable value for pad uart2_cts. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | UART2_CTS_OFFMODEENABLE | OffMode mode override control for pad uart2_cts 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | UART2_CTS_INPUTENABLE | Input enable value for pad uart2_cts 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | UART2_CTS_PULLTYPESELECT | pullup/down selection for pad uart2_cts 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | UART2_CTS_PULLUDENABLE | pullup/down enable for pad uart2_cts 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | UART2_CTS_MUXMODE | Functional multiplexing selection for pad uart2_cts 0x0: Select uart2_cts 0x1: Select sdmmc3_clk 0x3: Select gpio_123 0x7: Select safe_mode | RW | 0x7 |

**Table 19-458. Register Call Summary for Register
CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

**Table 19-458. Register Call Summary for Register
CONTROL_CORE_PAD0_UART2_CTS_PAD1_UART2_RTS (continued)**

Control Module Programming Guide

- [Pad Configuration Programming Points: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[10\]](#)

Table 19-459. CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX

| | | | | | | | |
|------------------|--|---|----------|----------------------|--|--|--|
| Address Offset | | 0x0000 011C | | | | | |
| Physical Address | | 0x4A10 011C | Instance | SYSCTRL_PADCONF_CORE | | | |
| Description | | Register control for Pads uart2_rx and uart2_tx Access conditions. Read: unrestricted, Write: unrestricted | | | | | |
| Type | | RW | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----|-----------------------|----|--------------------------------|----|------------------------------|----|--------------------------|----|---------------------------|----|-------------------------|----|----------------------|----|----------|----|-------------------------|----|-----------------------|----|------------------|---|----------------------|---|-----------------------|---|--------------------------------|---|------------------------------|---|--------------------------|--|---------------------------|--|-------------------------|--|----------------------|--|----------|--|-------------------------|--|-----------------------|--|------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| UART2_TX_WAKEUPEVENT | | UART2_TX_WAKEUPENABLE | | UART2_TX_OFFMODEPULLTYPESELECT | | UART2_TX_OFFMODEPULLUDENABLE | | UART2_TX_OFFMODEOUTVALUE | | UART2_TX_OFFMODEOUTENABLE | | UART2_TX_OFFMODEEENABLE | | UART2_TX_INPUTENABLE | | RESERVED | | UART2_TX_PULLTYPESELECT | | UART2_TX_PULLUDENABLE | | UART2_TX_MUXMODE | | UART2_RX_WAKEUPEVENT | | UART2_RX_WAKEUPENABLE | | UART2_RX_OFFMODEPULLTYPESELECT | | UART2_RX_OFFMODEPULLUDENABLE | | UART2_RX_OFFMODEOUTVALUE | | UART2_RX_OFFMODEOUTENABLE | | UART2_RX_OFFMODEEENABLE | | UART2_RX_INPUTENABLE | | RESERVED | | UART2_RX_PULLTYPESELECT | | UART2_RX_PULLUDENABLE | | UART2_RX_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | UART2_TX_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | UART2_TX_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | UART2_TX_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad uart2_tx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | UART2_TX_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad uart2_tx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | UART2_TX_OFFMODEOUTVALUE | OffMode mode output value for pad uart2_tx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | UART2_TX_OFFMODEOUTENABLE | OffMode mode output enable value for pad uart2_tx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 25 | UART2_TX_OFFMODEENABLE | OffMode mode override control for pad uart2_tx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | UART2_TX_INPUTENABLE | Input enable value for pad uart2_tx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | UART2_TX_PULLTYPESELECT | pullup/down selection for pad uart2_tx 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | UART2_TX_PULLUDENABLE | pullup/down enable for pad uart2_tx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | UART2_TX_MUXMODE | Functional multiplexing selection for pad uart2_tx 0x0: Select uart2_tx 0x1: Select sdmmc3_dat1 0x3: Select gpio_126 0x7: Select safe_mode | RW | 0x7 |
| 15 | UART2_RX_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | UART2_RX_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | UART2_RX_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad uart2_rx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | UART2_RX_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad uart2_rx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | UART2_RX_OFFMODEOUTVALUE | OffMode mode output value for pad uart2_rx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | UART2_RX_OFFMODEOUTENABLE | OffMode mode output enable value for pad uart2_rx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | UART2_RX_OFFMODEENABLE | OffMode mode override control for pad uart2_rx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | UART2_RX_INPUTENABLE | Input enable value for pad uart2_rx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------|
| 4 | UART2_RX_PULLTYPESELECT | pullup/down selection for pad uart2_rx 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | UART2_RX_PULLUDENABLE | pullup/down enable for pad uart2_rx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | UART2_RX_MUXMODE | Functional multiplexing selection for pad uart2_rx 0x0: Select uart2_rx 0x1: Select sdmmc3_dat0 0x3: Select gpio_125 0x7: Select safe_mode | RW | 0x7 |

**Table 19-460. Register Call Summary for Register
CONTROL_CORE_PAD0_UART2_RX_PAD1_UART2_TX**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Programming Guide

- [Pad Configuration Programming Points: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[10\]](#)

Table 19-461. CONTROL_CORE_PAD0_HDQ_SIO_PAD1_I2C1_SCL

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0120 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0120 | | |
| Description | Register control for Pads hdq_sio and i2c1_scl Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | |
|----------------------|-----------------------|----------|----|----|----|----|----|----------------------|----------|----|----|----|----|----|----------|----|----|----|---------------------|----------------------|-------------------------------|-----------------------------|-------------------------|--------------------------|-----------------------|---------------------|----------|---|---|---|---|--|------------------------|----------------------|-----------------|--|--|--|
| I2C1_SCL_WAKEUPEVENT | I2C1_SCL_WAKEUPENABLE | RESERVED | | | | | | I2C1_SCL_INPUTENABLE | RESERVED | | | | | | RESERVED | | | | HDQ_SIO_WAKEUPEVENT | HDQ_SIO_WAKEUPENABLE | HDQ_SIO_OFFMODEPULLTYPESELECT | HDQ_SIO_OFFMODEPULLUDENABLE | HDQ_SIO_OFFMODEOUTVALUE | HDQ_SIO_OFFMODEOUTENABLE | HDQ_SIO_OFFMODEENABLE | HDQ_SIO_INPUTENABLE | RESERVED | | | | | | HDQ_SIO_PULLTYPESELECT | HDQ_SIO_PULLUDENABLE | HDQ_SIO_MUXMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|-------|
| 31 | I2C1_SCL_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|--|------|-------|
| 30 | I2C1_SCL_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | I2C1_SCL_INPUTENABLE | Input enable value for pad i2c1_scl 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | I2C1_SCL_PULLTYPESELECT | pullup/down selection for pad i2c1_scl 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | I2C1_SCL_PULLUDENABLE | pullup/down enable for pad i2c1_scl 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 0 |
| 18:16 | RESERVED | | R | 0x0 |
| 15 | HDQ_SIO_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | HDQ_SIO_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | HDQ_SIO_OFFMODEPULLTYPESELECT | OffMode mode Pull-Up/Down selection for pad hdq_sio 0x0: Offmode Pull-Down selected 0x1: Offmode Pull-Up selected | RW | 0x0 |
| 12 | HDQ_SIO_OFFMODEPULLUDENABLE | OffMode mode Pull-Up/Down enable for pad hdq_sio 0x0: Offmode Pull-Up/Down disabled 0x1: Offmode Pull-Up/Down enabled | RW | 0x0 |
| 11 | HDQ_SIO_OFFMODEOUTVALUE | OffMode mode output value for pad hdq_sio 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | HDQ_SIO_OFFMODEOUTENABLE | OffMode mode output enable value for pad hdq_sio. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | HDQ_SIO_OFFMODEENABLE | OffMode mode override control for pad hdq_sio 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | HDQ_SIO_INPUTENABLE | Input enable value for pad hdq_sio 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | HDQ_SIO_PULLTYPESELECT | Pull-Up/Down selection for pad hdq_sio 0x0: Pull-Down selected 0x1: Pull-Up selected | RW | 0x0 |
| 3 | HDQ_SIO_PULLUDENABLE | Pull-Up/Down enable for pad hdq_sio 0x0: Pull-Up/Down disabled 0x1: Pull-Up/Down enabled | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------|
| 2:0 | HDQ_SIO_MUXMODE | Functional multiplexing selection for pad hdq_sio 0x0: Select hdq_sio 0x1: Select i2c3_sccb 0x2: Select i2c2_sccb 0x3: Select gpio_127 0x7: Select safe_mode | RW | 0x7 |

**Table 19-462. Register Call Summary for Register
CONTROL_CORE_PAD0_HDQ_SIO_PAD1_I2C1_SCL**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-463. CONTROL_CORE_PAD0_I2C1_SDA_PAD1_I2C2_SCL

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0124 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0124 | | |
| Description | Register control for Pads i2c1_sda and i2c2_scl Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|-------------------------|-----------------------|------------------|----|----------------------|-----------------------|----------|----|----------------------|----|----------|----|-------------------------|-----------------------|----------|---|---|---|---|---|---|---|
| I2C2_SCL_WAKEUPEVENT | I2C2_SCL_WAKEUPENABLE | I2C2_SCL_OFFMODEPULLTYPESELECT | I2C2_SCL_OFFMODEPULLUDENABLE | I2C2_SCL_OFFMODEOUTVALUE | I2C2_SCL_OFFMODEOUTENABLE | I2C2_SCL_OFFMODEEENABLE | I2C2_SCL_INPUTENABLE | RESERVED | | I2C2_SCL_PULLTYPESELECT | I2C2_SCL_PULLUDENABLE | I2C2_SCL_MUXMODE | | I2C1_SDA_WAKEUPEVENT | I2C1_SDA_WAKEUPENABLE | RESERVED | | I2C1_SDA_INPUTENABLE | | RESERVED | | I2C1_SDA_PULLTYPESELECT | I2C1_SDA_PULLUDENABLE | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | I2C2_SCL_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | I2C2_SCL_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | I2C2_SCL_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad i2c2_scl 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | I2C2_SCL_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad i2c2_scl 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|---|------|-------|
| 27 | I2C2_SCL_OFFMODEOUTVALUE | OffMode mode output value for pad i2c2_scl 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | I2C2_SCL_OFFMODEOUTENABLE | OffMode mode output enable value for pad i2c2_scl. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | I2C2_SCL_OFFMODEENABLE | OffMode mode override control for pad i2c2_scl 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | I2C2_SCL_INPUTENABLE | Input enable value for pad i2c2_scl 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | I2C2_SCL_PULLTYPESELECT | pullup/down selection for pad i2c2_scl 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | I2C2_SCL_PULLUDENABLE | pullup/down enable for pad i2c2_scl 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | I2C2_SCL_MUXMODE | Functional multiplexing selection for pad i2c2_scl 0x0: Select i2c2_scl 0x1: Select uart1_rx 0x3: Select gpio_128 0x7: Select safe_mode | RW | 0x7 |
| 15 | I2C1_SDA_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | I2C1_SDA_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | I2C1_SDA_INPUTENABLE | Input enable value for pad i2c1_sda 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | I2C1_SDA_PULLTYPESELECT | pullup/down selection for pad i2c1_sda 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | I2C1_SDA_PULLUDENABLE | pullup/down enable for pad i2c1_sda 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 0 |
| 2:0 | RESERVED | | R | 0x0 |

**Table 19-464. Register Call Summary for Register
CONTROL_CORE_PAD0_I2C1_SDA_PAD1_I2C2_SCL**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-465. CONTROL_CORE_PAD0_I2C2_SDA_PAD1_I2C3_SCL

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0128 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0128 | | |
| Description | Register control for Pads i2c2_sda and i2c3_scl Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|--------------------------|------------------------|---------------------|----------|----|----|-------------------------|----------------------|----|------------------|----|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|--------------------------|------------------------|---------------------|----------|---|---|-------------------------|----------------------|---|------------------|---|--|--|--|
| I2C3_SCL_WAKEUPEVENT | I2C3_SCL_WAKEUPENABLE | I2C3_SCL_OFFMODEPULLTYPESELECT | I2C3_SCL_OFFMODEPULLUDENABE | I2C3_SCL_OFFMODEOUTVALUE | I2C3_SCL_OFFMODEOUTENABE | I2C3_SCL_OFFMODEEENABE | I2C3_SCL_INPUTENABE | RESERVED | | | I2C3_SCL_PULLTYPESELECT | I2C3_SCL_PULLUDENABE | | I2C3_SCL_MUXMODE | | I2C2_SDA_WAKEUPEVENT | I2C2_SDA_WAKEUPENABLE | I2C2_SDA_OFFMODEPULLTYPESELECT | I2C2_SDA_OFFMODEPULLUDENABE | I2C2_SDA_OFFMODEOUTVALUE | I2C2_SDA_OFFMODEOUTENABE | I2C2_SDA_OFFMODEEENABE | I2C2_SDA_INPUTENABE | RESERVED | | | I2C2_SDA_PULLTYPESELECT | I2C2_SDA_PULLUDENABE | | I2C2_SDA_MUXMODE | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | I2C3_SCL_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | I2C3_SCL_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | I2C3_SCL_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad i2c3_scl 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | I2C3_SCL_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad i2c3_scl 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | I2C3_SCL_OFFMODEOUTVALUE | OffMode mode output value for pad i2c3_scl 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | I2C3_SCL_OFFMODEOUTENABE | OffMode mode output enable value for pad i2c3_scl. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 25 | I2C3_SCL_OFFMODEENABLE | OffMode mode override control for pad i2c3_scl 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | I2C3_SCL_INPUTENABLE | Input enable value for pad i2c3_scl 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | I2C3_SCL_PULLTYPESELECT | pullup/down selection for pad i2c3_scl 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | I2C3_SCL_PULLUDENABLE | pullup/down enable for pad i2c3_scl 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | I2C3_SCL_MUXMODE | Functional multiplexing selection for pad i2c3_scl 0x0: Select i2c3_scl 0x3: Select gpio_130 0x7: Select safe_mode | RW | 0x7 |
| 15 | I2C2_SDA_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | I2C2_SDA_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | I2C2_SDA_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad i2c2_sda 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | I2C2_SDA_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad i2c2_sda 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | I2C2_SDA_OFFMODEOUTVALUE | OffMode mode output value for pad i2c2_sda 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | I2C2_SDA_OFFMODEOUTENABLE | OffMode mode output enable value for pad i2c2_sda. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | I2C2_SDA_OFFMODEENABLE | OffMode mode override control for pad i2c2_sda 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | I2C2_SDA_INPUTENABLE | Input enable value for pad i2c2_sda 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | I2C2_SDA_PULLTYPESELECT | pullup/down selection for pad i2c2_sda 0x0: pulldown selected 0x1: pullup selected | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|-------|
| 3 | I2C2_SDA_PULLUDENABLE | pullup/down enable for pad i2c2_sda 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | I2C2_SDA_MUXMODE | Functional multiplexing selection for pad i2c2_sda 0x0: Select i2c2_sda 0x1: Select uart1_tx 0x3: Select gpio_129 0x7: Select safe_mode | RW | 0x7 |

**Table 19-466. Register Call Summary for Register
CONTROL_CORE_PAD0_I2C2_SDA_PAD1_I2C3_SCL**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-467. CONTROL_CORE_PAD0_I2C3_SDA_PAD1_I2C4_SCL

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 012C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 012C | | |
| Description | Register control for Pads i2c3_sda and i2c4_scl Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|----|-----------------------|-----------------------|------------------|----|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|---|-----------------------|-----------------------|------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| I2C4_SCL_WAKEUPEVENT | I2C4_SCL_WAKEUPENABLE | I2C4_SCL_OFFMODEPULLTYPESELECT | I2C4_SCL_OFFMODEPULLUDENABLE | I2C4_SCL_OFFMODEOUTVALUE | I2C4_SCL_OFFMODEOUTENABLE | I2C4_SCL_OFFMODEEENABLE | I2C4_SCL_INPUTENABLE | RESERVED | | | | I2C4_SCL_PULLEYSELECT | I2C4_SCL_PULLUDENABLE | I2C4_SCL_MUXMODE | | I2C3_SDA_WAKEUPEVENT | I2C3_SDA_WAKEUPENABLE | I2C3_SDA_OFFMODEPULLTYPESELECT | I2C3_SDA_OFFMODEPULLUDENABLE | I2C3_SDA_OFFMODEOUTVALUE | I2C3_SDA_OFFMODEOUTENABLE | I2C3_SDA_OFFMODEEENABLE | I2C3_SDA_INPUTENABLE | RESERVED | | | | I2C3_SDA_PULLEYSELECT | I2C3_SDA_PULLUDENABLE | I2C3_SDA_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | I2C4_SCL_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | I2C4_SCL_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | I2C4_SCL_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad i2c4_scl 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 28 | I2C4_SCL_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad i2c4_scl 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | I2C4_SCL_OFFMODEOUTVALUE | OffMode mode output value for pad i2c4_scl 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | I2C4_SCL_OFFMODEOUTENABLE | OffMode mode output enable value for pad i2c4_scl. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | I2C4_SCL_OFFMODEENABLE | OffMode mode override control for pad i2c4_scl 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | I2C4_SCL_INPUTENABLE | Input enable value for pad i2c4_scl 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | I2C4_SCL_PULLTYPESELECT | pullup/down selection for pad i2c4_scl 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | I2C4_SCL_PULLUDENABLE | pullup/down enable for pad i2c4_scl 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | I2C4_SCL_MUXMODE | Functional multiplexing selection for pad i2c4_scl 0x0: Select i2c4_scl 0x3: Select gpio_132 0x7: Select safe_mode | RW | 0x7 |
| 15 | I2C3_SDA_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | I2C3_SDA_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | I2C3_SDA_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad i2c3_sda 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | I2C3_SDA_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad i2c3_sda 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | I2C3_SDA_OFFMODEOUTVALUE | OffMode mode output value for pad i2c3_sda 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | I2C3_SDA_OFFMODEOUTENABLE | OffMode mode output enable value for pad i2c3_sda. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

Table 19-468. Register Call Summary for Register
CONTROL CORE PAD0 I2C3 SDA PAD1 I2C4 SCL

- Pad Multiplexing Register Fields: [0] [1]

- **SYSCTRL_PADCONF_CORE Register Summary:** [2]

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0130 | | |
| Physical Address | 0x4A10 0130 | Instance | SYSCTRL_PADCONF_CORE |
| Description | Register control for Pads i2c4_sda and mcspi1_clk Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

Copyright © 2011, Texas Instruments Incorporated

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------------|---|------|-------|
| 31 | MCSP11_CLK_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | MCSP11_CLK_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | MCSP11_CLK_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad mcspi1_clk 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | MCSP11_CLK_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad mcspi1_clk 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | MCSP11_CLK_OFFMODEOUTVALUE | OffMode mode output value for pad mcspi1_clk 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | MCSP11_CLK_OFFMODEOUTENABLE | OffMode mode output enable value for pad mcspi1_clk. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | MCSP11_CLK_OFFMODEENABLE | OffMode mode override control for pad mcspi1_clk 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | MCSP11_CLK_INPUTENABLE | Input enable value for pad mcspi1_clk 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | MCSP11_CLK_PULLTYPESELECT | pullup/down selection for pad mcspi1_clk 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | MCSP11_CLK_PULLUDENABLE | pullup/down enable for pad mcspi1_clk 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | MCSP11_CLK_MUXMODE | Functional multiplexing selection for pad mcspi1_clk 0x0: Select mcspi1_clk 0x3: Select gpio_134 0x7: Select safe_mode | RW | 0x7 |
| 15 | I2C4_SDA_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | I2C4_SDA_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | I2C4_SDA_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad i2c4_sda 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|---|------|-------|
| 12 | I2C4_SDA_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad i2c4_sda 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | I2C4_SDA_OFFMODEOUTVALUE | OffMode mode output value for pad i2c4_sda 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | I2C4_SDA_OFFMODEOUTENABLE | OffMode mode output enable value for pad i2c4_sda. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | I2C4_SDA_OFFMODEENABLE | OffMode mode override control for pad i2c4_sda 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | I2C4_SDA_INPUTENABLE | Input enable value for pad i2c4_sda 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | I2C4_SDA_PULLTYPESELECT | pullup/down selection for pad i2c4_sda 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | I2C4_SDA_PULLUDENABLE | pullup/down enable for pad i2c4_sda 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | I2C4_SDA_MUXMODE | Functional multiplexing selection for pad i2c4_sda 0x0: Select i2c4_sda 0x3: Select gpio_133 0x7: Select safe_mode | RW | 0x7 |

**Table 19-470. Register Call Summary for Register
CONTROL_CORE_PAD0_I2C4_SDA_PAD1_MCSP1_CLK**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-471. CONTROL_CORE_PAD0_MCSP1_SOMI_PAD1_MCSP1_SIMO

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0134 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0134 | | |
| Description | Register control for Pads mcspi1_somi and mcspi1_simo Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------------|-----------------------------------|--------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|----|----|----|----------------------------|-------------------------|---------------------|----|-------------------------|--------------------------|-----------------------------------|--------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|---|---|---|----------------------------|-------------------------|---------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| MCSP11_SIMO_WAKEUPEVENT | MCSP11_SIMO_WAKEUPENABLE | MCSP11_SIMO_OFFMODEPULLTYPESELECT | MCSP11_SIMO_OFFMODEPULLUDENABE | MCSP11_SIMO_OFFMODEOUTVALUE | MCSP11_SIMO_OFFMODEOUTENABLE | MCSP11_SIMO_OFFMODEEENABLE | MCSP11_SIMO_INPUTENABLE | RESERVED | | | | MCSP11_SIMO_PULLTYPESELECT | MCSP11_SIMO_PULLUDENABE | MCSP11_SIMO_MUXMODE | | MCSP11_SIMI_WAKEUPEVENT | MCSP11_SIMI_WAKEUPENABLE | MCSP11_SIMI_OFFMODEPULLTYPESELECT | MCSP11_SIMI_OFFMODEPULLUDENABE | MCSP11_SIMI_OFFMODEOUTVALUE | MCSP11_SIMI_OFFMODEOUTENABLE | MCSP11_SIMI_OFFMODEEENABLE | MCSP11_SIMI_INPUTENABLE | RESERVED | | | | MCSP11_SIMI_PULLTYPESELECT | MCSP11_SIMI_PULLUDENABE | MCSP11_SIMI_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|--|------|-------|
| 31 | MCSP11_SIMO_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | MCSP11_SIMO_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | MCSP11_SIMO_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad mcspi1_simo 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | MCSP11_SIMO_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad mcspi1_simo 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | MCSP11_SIMO_OFFMODEOUTVALUE | OffMode mode output value for pad mcspi1_simo 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | MCSP11_SIMO_OFFMODEOUTENABLE | OffMode mode output enable value for pad mcspi1_simo. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | MCSP11_SIMO_OFFMODEEENABLE | OffMode mode override control for pad mcspi1_simo 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | MCSP11_SIMO_INPUTENABLE | Input enable value for pad mcspi1_simo 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | MCSP11_SIMO_PULLTYPESELECT | pullup/down selection for pad mcspi1_simo 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|--|------|-------|
| 19 | MCSP11_SIMO_PULLUDENABLE | pullup/down enable for pad mcspi1_simo 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | MCSP11_SIMO_MUXMODE | Functional multiplexing selection for pad mcspi1_simo 0x0: Select mcspi1_simo 0x3: Select gpio_136 0x7: Select safe_mode | RW | 0x7 |
| 15 | MCSP11_SOMI_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | MCSP11_SOMI_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | MCSP11_SOMI_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad mcspi1_somi 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | MCSP11_SOMI_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad mcspi1_somi 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | MCSP11_SOMI_OFFMODEOUTVALUE | OffMode mode output value for pad mcspi1_somi 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | MCSP11_SOMI_OFFMODEOUTENABLE | OffMode mode output enable value for pad mcspi1_somi. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | MCSP11_SOMI_OFFMODEENABLE | OffMode mode override control for pad mcspi1_somi 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | MCSP11_SOMI_INPUTENABLE | Input enable value for pad mcspi1_somi 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | MCSP11_SOMI_PULLTYPESELECT | pullup/down selection for pad mcspi1_somi 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | MCSP11_SOMI_PULLUDENABLE | pullup/down enable for pad mcspi1_somi 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | MCSP11_SOMI_MUXMODE | Functional multiplexing selection for pad mcspi1_somi 0x0: Select mcspi1_somi 0x3: Select gpio_135 0x7: Select safe_mode | RW | 0x7 |

**Table 19-472. Register Call Summary for Register
CONTROL_CORE_PAD0_MCSP11_SOMI_PAD1_MCSP11_SIMO**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-473. CONTROL_CORE_PAD0_MCSP11_CS0_PAD1_MCSP11_CS1

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0138 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0138 | | |
| Description | Register control for Pads mcspi1_cs0 and mcspi1_cs1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------------|-----------------------|----------------------------------|------------------------------|----------------------------|---------------------------|-------------------------|----------------------|----------|----|----|----|---------------------------|-----------------------|--------------------|----|------------------------|-----------------------|----------------------------------|------------------------------|----------------------------|---------------------------|-------------------------|----------------------|----------|---|---|---|---------------------------|-----------------------|--------------------|---|
| MCSP11_CS1_WAKEUPEVENT | MCSP11_CS1_WAKEUPENAB | MCSP11_CS1_OFFMODEPULLTYPESELECT | MCSP11_CS1_OFFMODEPULLUDENAB | MCSP11_CS1_OFFMODEOUTVALUE | MCSP11_CS1_OFFMODEOUTENAB | MCSP11_CS1_OFFMODEEENAB | MCSP11_CS1_INPUTENAB | RESERVED | | | | MCSP11_CS1_PULLTYPESELECT | MCSP11_CS1_PULLUDENAB | MCSP11_CS1_MUXMODE | | MCSP11_CS0_WAKEUPEVENT | MCSP11_CS0_WAKEUPENAB | MCSP11_CS0_OFFMODEPULLTYPESELECT | MCSP11_CS0_OFFMODEPULLUDENAB | MCSP11_CS0_OFFMODEOUTVALUE | MCSP11_CS0_OFFMODEOUTENAB | MCSP11_CS0_OFFMODEEENAB | MCSP11_CS0_INPUTENAB | RESERVED | | | | MCSP11_CS0_PULLTYPESELECT | MCSP11_CS0_PULLUDENAB | MCSP11_CS0_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------------|---|------|-------|
| 31 | MCSP11_CS1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | MCSP11_CS1_WAKEUPENAB E | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | MCSP11_CS1_OFFMODEPULL YPESELECT | OffMode mode pullup/down selection for pad mcspi1_cs1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | MCSP11_CS1_OFFMODEPULL UDENAB | OffMode mode pullup/down enable for pad mcspi1_cs1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | MCSP11_CS1_OFFMODEOUTV ALUE | OffMode mode output value for pad mcspi1_cs1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | MCSP11_CS1_OFFMODEOUTE NAB | OffMode mode output enable value for pad mcspi1_cs1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------------|---|------|-------|
| 25 | MCSP11_CS1_OFFMODEENABLE | OffMode mode override control for pad mcspi1_cs1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | MCSP11_CS1_INPUTENABLE | Input enable value for pad mcspi1_cs1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | MCSP11_CS1_PULLTYPESELECT | pullup/down selection for pad mcspi1_cs1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | MCSP11_CS1_PULLUDENABLE | pullup/down enable for pad mcspi1_cs1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | MCSP11_CS1_MUXMODE | Functional multiplexing selection for pad mcspi1_cs1 0x0: Select mcspi1_cs1 0x1: Select uart1_rx 0x3: Select gpio_138 0x7: Select safe_mode | RW | 0x7 |
| 15 | MCSP11_CS0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | MCSP11_CS0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | MCSP11_CS0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad mcspi1_cs0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | MCSP11_CS0_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad mcspi1_cs0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | MCSP11_CS0_OFFMODEOUTVALUE | OffMode mode output value for pad mcspi1_cs0 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | MCSP11_CS0_OFFMODEOUTENABLE | OffMode mode output enable value for pad mcspi1_cs0. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | MCSP11_CS0_OFFMODEENABLE | OffMode mode override control for pad mcspi1_cs0 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | MCSP11_CS0_INPUTENABLE | Input enable value for pad mcspi1_cs0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|-------|
| 4 | MCSP11_CS0_PULLTYPESELECT | pullup/down selection for pad mcspi1_cs0 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | MCSP11_CS0_PULLUDENABLE | pullup/down enable for pad mcspi1_cs0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | MCSP11_CS0_MUXMODE | Functional multiplexing selection for pad mcspi1_cs0 0x0: Select mcspi1_cs0 0x3: Select gpio_137 0x7: Select safe_mode | RW | 0x7 |

**Table 19-474. Register Call Summary for Register
CONTROL_CORE_PAD0_MCSP11_CS0_PAD1_MCSP11_CS1**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-475. CONTROL_CORE_PAD0_MCSP11_CS2_PAD1_MCSP11_CS3

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 013C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 013C | | |
| Description | Register control for Pads mcspi1_cs2 and mcspi1_cs3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|-------------------------|----------------------------------|--------------------------------|----------------------------|-----------------------------|---------------------------|------------------------|----------|----|----|---------------------------|-------------------------|--------------------|----|----|------------------------|-------------------------|----------------------------------|--------------------------------|----------------------------|-----------------------------|---------------------------|------------------------|----------|---|---|---------------------------|-------------------------|--------------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| MCSP11_CS3_WAKEUPEVENT | MCSP11_CS3_WAKEUPENABLE | MCSP11_CS3_OFFMODEPULLTYPESELECT | MCSP11_CS3_OFFMODEPULLUDENABLE | MCSP11_CS3_OFFMODEOUTVALUE | MCSP11_CS3_OFFMODEOUTENABLE | MCSP11_CS3_OFFMODEEENABLE | MCSP11_CS3_INPUTENABLE | RESERVED | | | MCSP11_CS3_PULLTYPESELECT | MCSP11_CS3_PULLUDENABLE | MCSP11_CS3_MUXMODE | | | MCSP11_CS2_WAKEUPEVENT | MCSP11_CS2_WAKEUPENABLE | MCSP11_CS2_OFFMODEPULLTYPESELECT | MCSP11_CS2_OFFMODEPULLUDENABLE | MCSP11_CS2_OFFMODEOUTVALUE | MCSP11_CS2_OFFMODEOUTENABLE | MCSP11_CS2_OFFMODEEENABLE | MCSP11_CS2_INPUTENABLE | RESERVED | | | MCSP11_CS2_PULLTYPESELECT | MCSP11_CS2_PULLUDENABLE | MCSP11_CS2_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-------|
| 31 | MCSP11_CS3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | MCSP11_CS3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------------|---|------|-------|
| 29 | MCSP11_CS3_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad mcspi1_cs3 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | MCSP11_CS3_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad mcspi1_cs3 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | MCSP11_CS3_OFFMODEOUTVALUE | OffMode mode output value for pad mcspi1_cs3 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | MCSP11_CS3_OFFMODEOUTENABLE | OffMode mode output enable value for pad mcspi1_cs3. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | MCSP11_CS3_OFFMODEENABLE | OffMode mode override control for pad mcspi1_cs3 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | MCSP11_CS3_INPUTENABLE | Input enable value for pad mcspi1_cs3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | MCSP11_CS3_PULLTYPESELECT | pullup/down selection for pad mcspi1_cs3 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | MCSP11_CS3_PULLUDENABLE | pullup/down enable for pad mcspi1_cs3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | MCSP11_CS3_MUXMODE | Functional multiplexing selection for pad mcspi1_cs3 0x0: Select mcspi1_cs3 0x1: Select uart1_rts 0x2: Select slimbus2_data 0x3: Select gpio_140 0x7: Select safe_mode | RW | 0x7 |
| 15 | MCSP11_CS2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | MCSP11_CS2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | MCSP11_CS2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad mcspi1_cs2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | MCSP11_CS2_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad mcspi1_cs2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | MCSP11_CS2_OFFMODEOUTVALUE | OffMode mode output value for pad mcspi1_cs2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|---|------|-------|
| 10 | MCSP11_CS2_OFFMODEOUTE NABLE | OffMode mode output enable value for pad mcspi1_cs2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | MCSP11_CS2_OFFMODEENAB LE | OffMode mode override control for pad mcspi1_cs2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | MCSP11_CS2_INPUTENABLE | Input enable value for pad mcspi1_cs2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | MCSP11_ CS2_PULLTYPESELECT | pullup/down selection for pad mcspi1_cs2 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | MCSP11_CS2_PULLUDENABLE | pullup/down enable for pad mcspi1_cs2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | MCSP11_CS2_MUXMODE | Functional multiplexing selection for pad mcspi1_cs2 0x0: Select mcspi1_cs2 0x1: Select uart1_cts 0x2: Select slimbus2_clock 0x3: Select gpio_139 0x7: Select safe_mode | RW | 0x7 |

**Table 19-476. Register Call Summary for Register
CONTROL_CORE_PAD0_MCSP11_CS2_PAD1_MCSP11_CS3**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-477. CONTROL_CORE_PAD0_UART3_CTS_RCTX_PAD1_UART3_RTS_SD

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0140 | | |
| Physical Address | 0x4A10 0140 | Instance | SYSCTRL_PADCONF_CORE |
| Description | Register control for Pads uart3_cts_rctx and uart3_rts_sd Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------|---------------------------|------------------------------------|----------------------------------|------------------------------|-------------------------------|-----------------------------|--------------------------|----------|----|----|----|-----------------------------|---------------------------|----------------------|----|----------------------------|-----------------------------|--------------------------------------|------------------------------------|--------------------------------|---------------------------------|-------------------------------|----------------------------|----------|---|---|---|-------------------------------|-----------------------------|------------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| UART3_RTS_SD_WAKEUPEVENT | UART3_RTS_SD_WAKEUPENABLE | UART3_RTS_SD_OFFMODEPULLTYPESELECT | UART3_RTS_SD_OFFMODEPULLUDENABLE | UART3_RTS_SD_OFFMODEOUTVALUE | UART3_RTS_SD_OFFMODEOUTENABLE | UART3_RTS_SD_OFFMODEEENABLE | UART3_RTS_SD_INPUTENABLE | RESERVED | | | | UART3_RTS_SD_PULLTYPESELECT | UART3_RTS_SD_PULLUDENABLE | UART3_RTS_SD_MUXMODE | | UART3_CTS_RCTX_WAKEUPEVENT | UART3_CTS_RCTX_WAKEUPENABLE | UART3_CTS_RCTX_OFFMODEPULLTYPESELECT | UART3_CTS_RCTX_OFFMODEPULLUDENABLE | UART3_CTS_RCTX_OFFMODEOUTVALUE | UART3_CTS_RCTX_OFFMODEOUTENABLE | UART3_CTS_RCTX_OFFMODEEENABLE | UART3_CTS_RCTX_INPUTENABLE | RESERVED | | | | UART3_CTS_RCTX_PULLTYPESELECT | UART3_CTS_RCTX_PULLUDENABLE | UART3_CTS_RCTX_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------------|---|------|-------|
| 31 | UART3_RTS_SD_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | UART3_RTS_SD_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | UART3_RTS_SD_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad uart3_rts_sd 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | UART3_RTS_SD_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad uart3_rts_sd 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | UART3_RTS_SD_OFFMODEOUTVALUE | OffMode mode output value for pad uart3_rts_sd 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | UART3_RTS_SD_OFFMODEOUTENABLE | OffMode mode output enable value for pad uart3_rts_sd. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | UART3_RTS_SD_OFFMODEEENABLE | OffMode mode override control for pad uart3_rts_sd 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | UART3_RTS_SD_INPUTENABLE | Input enable value for pad uart3_rts_sd 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | UART3_RTS_SD_PULLTYPESELECT | pullup/down selection for pad uart3_rts_sd 0x0: pulldown selected 0x1: pullup selected | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------------|---|------|-------|
| 19 | UART3_RTS_SD_PULLUDENABLE | pullup/down enable for pad uart3_rts_sd 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | UART3_RTS_SD_MUXMODE | Functional multiplexing selection for pad uart3_rts_sd 0x0: Select uart3_rts_sd 0x2: Select cam_globalreset 0x3: Select gpio_142 0x7: Select safe_mode | RW | 0x7 |
| 15 | UART3_CTS_RCTX_WAKEUPVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | UART3_CTS_RCTX_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | UART3_CTS_RCTX_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad uart3_cts_rctx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | UART3_CTS_RCTX_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad uart3_cts_rctx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | UART3_CTS_RCTX_OFFMODEOUTVALUE | OffMode mode output value for pad uart3_cts_rctx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | UART3_CTS_RCTX_OFFMODEOUTENABLE | OffMode mode output enable value for pad uart3_cts_rctx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | UART3_CTS_RCTX_OFFMODEENABLE | OffMode mode override control for pad uart3_cts_rctx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | UART3_CTS_RCTX_INPUTENABLE | Input enable value for pad uart3_cts_rctx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | UART3_CTS_RCTX_PULLTYPESELECT | pullup/down selection for pad uart3_cts_rctx 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | UART3_CTS_RCTX_PULLUDENABLE | pullup/down enable for pad uart3_cts_rctx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | UART3_CTS_RCTX_MUXMODE | Functional multiplexing selection for pad uart3_cts_rctx 0x0: Select uart3_cts_rctx 0x1: Select uart1_tx 0x3: Select gpio_141 0x7: Select safe_mode | RW | 0x7 |

**Table 19-478. Register Call Summary for Register
CONTROL_CORE_PAD0_UART3_CTS_RCTX_PAD1_UART3_RTS_SD**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-479. CONTROL_CORE_PAD0_UART3_RX_IRRX_PAD1_UART3_TX_IRTX

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0144 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0144 | | |
| Description | Register control for Pads uart3_rx_irrx and uart3_tx_irtx Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------------------|----------------------------|-------------------------------------|----------------------------------|-------------------------------|-------------------------------|-----------------------------|--------------------------|----------|----|----|------------------------------|---------------------------|-----------------------|----|----|---------------------------|----------------------------|-------------------------------------|----------------------------------|-------------------------------|-------------------------------|-----------------------------|--------------------------|----------|---|---|------------------------------|---------------------------|-----------------------|---|---|
| UART3_TX_IRTX_WAKEUPEVENT | UART3_TX_IRTX_WAKEUPENABLE | UART3_TX_IRTX_OFFMODEPULLTYPESELECT | UART3_TX_IRTX_OFFMODEPULLUDENABE | UART3_TX_IRTX_OFFMODEOUTVALUE | UART3_TX_IRTX_OFFMODEOUTENABE | UART3_TX_IRTX_OFFMODEEENABE | UART3_TX_IRTX_INPUTENABE | RESERVED | | | UART3_TX_IRTX_PULLTYPESELECT | UART3_TX_IRTX_PULLUDENABE | UART3_TX_IRTX_MUXMODE | | | UART3_RX_IRRX_WAKEUPEVENT | UART3_RX_IRRX_WAKEUPENABLE | UART3_RX_IRRX_OFFMODEPULLTYPESELECT | UART3_RX_IRRX_OFFMODEPULLUDENABE | UART3_RX_IRRX_OFFMODEOUTVALUE | UART3_RX_IRRX_OFFMODEOUTENABE | UART3_RX_IRRX_OFFMODEEENABE | UART3_RX_IRRX_INPUTENABE | RESERVED | | | UART3_RX_IRRX_PULLTYPESELECT | UART3_RX_IRRX_PULLUDENABE | UART3_RX_IRRX_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------------|---|------|-------|
| 31 | UART3_TX_IRTX_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | UART3_TX_IRTX_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | UART3_TX_IRTX_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad uart3_tx_irtx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | UART3_TX_IRTX_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad uart3_tx_irtx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | UART3_TX_IRTX_OFFMODEOUTVALUE | OffMode mode output value for pad uart3_tx_irtx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|---|------|-------|
| 26 | UART3_TX_IRTX_OFFMODEOUTENABLE | OffMode mode output enable value for pad uart3_tx_irtx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | UART3_TX_IRTX_OFFMODEENABLE | OffMode mode override control for pad uart3_tx_irtx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | UART3_TX_IRTX_INPUTENABLE | Input enable value for pad uart3_tx_irtx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | UART3_TX_IRTX_PULLTYPESELECT | pullup/down selection for pad uart3_tx_irtx 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | UART3_TX_IRTX_PULLDOWNENABLE | pullup/down enable for pad uart3_tx_irtx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | UART3_TX_IRTX_MUXMODE | Functional multiplexing selection for pad uart3_tx_irtx 0x0: Select uart3_tx_irtx 0x1: Select dmtimer9_pwm_evt 0x2: Select cam_strobe 0x3: Select gpio_144 0x7: Select safe_mode | RW | 0x7 |
| 15 | UART3_RX_IRRX_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | UART3_RX_IRRX_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | UART3_RX_IRRX_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad uart3_rx_irrx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | UART3_RX_IRRX_OFFMODEPULLDOWNENABLE | OffMode mode pullup/down enable for pad uart3_rx_irrx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | UART3_RX_IRRX_OFFMODEOUTVALUE | OffMode mode output value for pad uart3_rx_irrx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | UART3_RX_IRRX_OFFMODEOUTENABLE | OffMode mode output enable value for pad uart3_rx_irrx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | UART3_RX_IRRX_OFFMODEENABLE | OffMode mode override control for pad uart3_rx_irrx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|--|------|-------|
| 8 | UART3_RX_IRRX_INPUTENABLE | Input enable value for pad uart3_rx_irrx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | UART3_RX_IRRX_PULLTYPESELECT | pullup/down selection for pad uart3_rx_irrx 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | UART3_RX_IRRX_PULLUDENABLE | pullup/down enable for pad uart3_rx_irrx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | UART3_RX_IRRX_MUXMODE | Functional multiplexing selection for pad uart3_rx_irrx 0x0: Select uart3_rx_irrx 0x1: Select dmtimer8_pwm_evt 0x2: Select cam_shutter 0x3: Select gpio_143 0x7: Select safe_mode | RW | 0x7 |

**Table 19-480. Register Call Summary for Register
CONTROL_CORE_PAD0_UART3_RX_IRRX_PAD1_UART3_TX_IRTX**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-481. CONTROL_CORE_PAD0_SDMMC5_CLK_PAD1_SDMMC5_CMD

| | | | | | | | |
|------------------|--|---|--|----------|--|----------------------|--|
| Address Offset | | 0x0000 0148 | | Instance | | SYSCTRL_PADCONF_CORE | |
| Physical Address | | 0x4A10 0148 | | | | | |
| Description | | Register control for Pads sdmmc5_clk and sdmmc5_cmd Access conditions. Read: unrestricted, Write: unrestricted | | | | | |
| Type | | RW | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|-------------------------|----|----------------------------------|----|--------------------------------|----|----------------------------|----|-----------------------------|----|---------------------------|----|------------------------|----|----------|----|---------------------------|----|-------------------------|----|--------------------|---|------------------------|---|-------------------------|---|----------------------------------|---|--------------------------------|---|----------------------------|--|-----------------------------|--|---------------------------|--|------------------------|--|----------|--|---------------------------|--|-------------------------|--|--------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| SDMMC5_CMD_WAKEUPEVENT | | SDMMC5_CMD_WAKEUPENABLE | | SDMMC5_CMD_OFFMODEPULLTYPESELECT | | SDMMC5_CMD_OFFMODEPULLUDENABLE | | SDMMC5_CMD_OFFMODEOUTVALUE | | SDMMC5_CMD_OFFMODEOUTENABLE | | SDMMC5_CMD_OFFMODEEENABLE | | SDMMC5_CMD_INPUTENABLE | | RESERVED | | SDMMC5_CMD_PULLTYPESELECT | | SDMMC5_CMD_PULLUDENABLE | | SDMMC5_CMD_MUXMODE | | SDMMC5_CLK_WAKEUPEVENT | | SDMMC5_CLK_WAKEUPENABLE | | SDMMC5_CLK_OFFMODEPULLTYPESELECT | | SDMMC5_CLK_OFFMODEPULLUDENABLE | | SDMMC5_CLK_OFFMODEOUTVALUE | | SDMMC5_CLK_OFFMODEOUTENABLE | | SDMMC5_CLK_OFFMODEEENABLE | | SDMMC5_CLK_INPUTENABLE | | RESERVED | | SDMMC5_CLK_PULLTYPESELECT | | SDMMC5_CLK_PULLUDENABLE | | SDMMC5_CLK_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------------|--|------|-------|
| 31 | SDMMC5_CMD_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SDMMC5_CMD_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | SDMMC5_CMD_OFFMODEPUL LTYPESELECT | OffMode mode pullup/down selection for pad sdmmc5_cmd 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | SDMMC5_CMD_OFFMODEPUL LUDENABLE | OffMode mode pullup/down enable for pad sdmmc5_cmd 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | SDMMC5_CMD_OFFMODEOUT VALUE | OffMode mode output value for pad sdmmc5_cmd 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | SDMMC5_CMD_OFFMODEOUT ENABLE | OffMode mode output enable value for pad sdmmc5_cmd. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | SDMMC5_CMD_OFFMODEENA BLE | OffMode mode override control for pad sdmmc5_cmd 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | SDMMC5_CMD_INPUTENABLE | Input enable value for pad sdmmc5_cmd 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SDMMC5_CMD_PULLTYPESELECT | pullup/down selection for pad sdmmc5_cmd 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | SDMMC5_CMD_PULLUDENABLE | pullup/down enable for pad sdmmc5_cmd 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | SDMMC5_CMD_MUXMODE | Functional multiplexing selection for pad sdmmc5_cmd 0x0: Select sdmmc5_cmd 0x1: Select mcspi2_simo 0x2: Select usbc1_ibusb_dm 0x3: Select gpio_146 0x5: Select sdmmc2_cmd 0x7: Select safe_mode | RW | 0x7 |
| 15 | SDMMC5_CLK_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SDMMC5_CLK_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------------|---|------|-------|
| 13 | SDMMC5_CLK_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc5_clk 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | SDMMC5_CLK_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc5_clk 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | SDMMC5_CLK_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc5_clk 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | SDMMC5_CLK_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc5_clk. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | SDMMC5_CLK_OFFMODEENABLE | OffMode mode override control for pad sdmmc5_clk 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | SDMMC5_CLK_INPUTENABLE | Input enable value for pad sdmmc5_clk 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SDMMC5_CLK_PULLTYPESELECT | pullup/down selection for pad sdmmc5_clk 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | SDMMC5_CLK_PULLUDENABLE | pullup/down enable for pad sdmmc5_clk 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | SDMMC5_CLK_MUXMODE | Functional multiplexing selection for pad sdmmc5_clk 0x0: Select sdmmc5_clk 0x1: Select mcspi2_clk 0x2: Select usbc1_icusb_dp 0x3: Select gpio_145 0x5: Select sdmmc2_clk 0x7: Select safe_mode | RW | 0x7 |

**Table 19-482. Register Call Summary for Register
CONTROL_CORE_PAD0_SDMMC5_CLK_PAD1_SDMMC5_CMD**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-483. CONTROL_CORE_PAD0_SDMMC5_DAT0_PAD1_SDMMC5_DAT1

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 014C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 014C | | |
| Description | Register control for Pads sdmmc5_dat0 and sdmmc5_dat1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------------------|--------------------------|-----------------------------------|---------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|----|----|----------------------------|--------------------------|----|----|---------------------|----|-------------------------|--------------------------|-----------------------------------|---------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|---|---|----------------------------|--------------------------|---|---------------------|
| SDMMC5_DAT1_WAKEUPEVENT | SDMMC5_DAT1_WAKEUPENABLE | SDMMC5_DAT1_OFFMODEPULLTYPESELECT | SDMMC5_DAT1_OFFMODEPULLUDENABLE | SDMMC5_DAT1_OFFMODEOUTVALUE | SDMMC5_DAT1_OFFMODEOUTENABLE | SDMMC5_DAT1_OFFMODEEENABLE | SDMMC5_DAT1_INPUTENABLE | RESERVED | | | SDMMC5_DAT1_PULLTYPESELECT | SDMMC5_DAT1_PULLUDENABLE | | | SDMMC5_DAT1_MUXMODE | | SDMMC5_DAT0_WAKEUPEVENT | SDMMC5_DAT0_WAKEUPENABLE | SDMMC5_DAT0_OFFMODEPULLTYPESELECT | SDMMC5_DAT0_OFFMODEPULLUDENABLE | SDMMC5_DAT0_OFFMODEOUTVALUE | SDMMC5_DAT0_OFFMODEOUTENABLE | SDMMC5_DAT0_OFFMODEEENABLE | SDMMC5_DAT0_INPUTENABLE | RESERVED | | | SDMMC5_DAT0_PULLTYPESELECT | SDMMC5_DAT0_PULLUDENABLE | | SDMMC5_DAT0_MUXMODE |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------------|--|------|-------|
| 31 | SDMMC5_DAT1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SDMMC5_DAT1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | SDMMC5_DAT1_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc5_dat1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | SDMMC5_DAT1_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc5_dat1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | SDMMC5_DAT1_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc5_dat1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | SDMMC5_DAT1_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc5_dat1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | SDMMC5_DAT1_OFFMODEEENABLE | OffMode mode override control for pad sdmmc5_dat1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|--|------|-------|
| 24 | SDMMC5_DAT1_INPUTENABLE | Input enable value for pad sdmmc5_dat1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SDMMC5_DAT1_PULLTYPESELECT | pullup/down selection for pad sdmmc5_dat1 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | SDMMC5_DAT1_PULLUDENABLE | pullup/down enable for pad sdmmc5_dat1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | SDMMC5_DAT1_MUXMODE | Functional multiplexing selection for pad sdmmc5_dat1 0x0: Select sdmmc5_dat1 0x2: Select usbc1_icusb_txen 0x3: Select gpio_148 0x5: Select sdmmc2_dat1 0x7: Select safe_mode | RW | 0x7 |
| 15 | SDMMC5_DAT0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SDMMC5_DAT0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | SDMMC5_DAT0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc5_dat0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | SDMMC5_DAT0_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc5_dat0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | SDMMC5_DAT0_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc5_dat0 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | SDMMC5_DAT0_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc5_dat0. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | SDMMC5_DAT0_OFFMODEENABLE | OffMode mode override control for pad sdmmc5_dat0 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | SDMMC5_DAT0_INPUTENABLE | Input enable value for pad sdmmc5_dat0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SDMMC5_DAT0_PULLTYPESELECT | pullup/down selection for pad sdmmc5_dat0 0x0: pulldown selected 0x1: pullup selected | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|------|-------|
| 3 | SDMMC5_DAT0_PULLUDENABLE | pullup/down enable for pad sdmmc5_dat0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | SDMMC5_DAT0_MUXMODE | Functional multiplexing selection for pad sdmmc5_dat0 0x0: Select sdmmc5_dat0 0x1: Select mcspi2_somi 0x2: Select usb1_icusb_rcv 0x3: Select gpio_147 0x5: sdmmc2_dat0 0x7: Select safe_mode | RW | 0x7 |

**Table 19-484. Register Call Summary for Register
CONTROL_CORE_PAD0_SDMMC5_DAT0_PAD1_SDMMC5_DAT1**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-485. CONTROL_CORE_PAD0_SDMMC5_DAT2_PAD1_SDMMC5_DAT3

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0150 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0150 | | |
| Description | Register control for Pads sdmmc5_dat2 and sdmmc5_dat3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------------|-----------------------------------|---------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|----|----|----------------------------|--------------------------|---------------------|----|----|-------------------------|--------------------------|-----------------------------------|---------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|---|---|----------------------------|--------------------------|---------------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SDMMC5_DAT3_WAKEUPEVENT | SDMMC5_DAT3_WAKEUPENABLE | SDMMC5_DAT3_OFFMODEPULLTYPESELECT | SDMMC5_DAT3_OFFMODEPULLUDENABLE | SDMMC5_DAT3_OFFMODEOUTVALUE | SDMMC5_DAT3_OFFMODEOUTENABLE | SDMMC5_DAT3_OFFMODEEENABLE | SDMMC5_DAT3_INPUTENABLE | RESERVED | | | SDMMC5_DAT3_PULLTYPESELECT | SDMMC5_DAT3_PULLUDENABLE | SDMMC5_DAT3_MUXMODE | | | SDMMC5_DAT2_WAKEUPEVENT | SDMMC5_DAT2_WAKEUPENABLE | SDMMC5_DAT2_OFFMODEPULLTYPESELECT | SDMMC5_DAT2_OFFMODEPULLUDENABLE | SDMMC5_DAT2_OFFMODEOUTVALUE | SDMMC5_DAT2_OFFMODEOUTENABLE | SDMMC5_DAT2_OFFMODEEENABLE | SDMMC5_DAT2_INPUTENABLE | RESERVED | | | SDMMC5_DAT2_PULLTYPESELECT | SDMMC5_DAT2_PULLUDENABLE | SDMMC5_DAT2_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------|
| 31 | SDMMC5_DAT3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SDMMC5_DAT3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|--|------|-------|
| 29 | SDMMC5_DAT3_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc5_dat3 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | SDMMC5_DAT3_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc5_dat3 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | SDMMC5_DAT3_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc5_dat3 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | SDMMC5_DAT3_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc5_dat3. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | SDMMC5_DAT3_OFFMODEENABLE | OffMode mode override control for pad sdmmc5_dat3 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | SDMMC5_DAT3_INPUTENABLE | Input enable value for pad sdmmc5_dat3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SDMMC5_DAT3_PULLTYPESELECT | pullup/down selection for pad sdmmc5_dat3 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | SDMMC5_DAT3_PULLUDENABLE | pullup/down enable for pad sdmmc5_dat3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | SDMMC5_DAT3_MUXMODE | Functional multiplexing selection for pad sdmmc5_dat3 0x0: Select sdmmc5_dat3 0x1: Select mcspi2_cs0 0x3: Select gpio_150 0x5: Select sdmmc2_dat3 0x7: Select safe_mode | RW | 0x7 |
| 15 | SDMMC5_DAT2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SDMMC5_DAT2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | SDMMC5_DAT2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sdmmc5_dat2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | SDMMC5_DAT2_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sdmmc5_dat2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|--|------|-------|
| 11 | SDMMC5_DAT2_OFFMODEOUTVALUE | OffMode mode output value for pad sdmmc5_dat2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | SDMMC5_DAT2_OFFMODEOUTENABLE | OffMode mode output enable value for pad sdmmc5_dat2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | SDMMC5_DAT2_OFFMODEENABLE | OffMode mode override control for pad sdmmc5_dat2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | SDMMC5_DAT2_INPUTENABLE | Input enable value for pad sdmmc5_dat2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SDMMC5_DAT2_PULLTYPESELECT | pullup/down selection for pad sdmmc5_dat2 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | SDMMC5_DAT2_PULLUDENABLE | pullup/down enable for pad sdmmc5_dat2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | SDMMC5_DAT2_MUXMODE | Functional multiplexing selection for pad sdmmc5_dat2 0x0: Select sdmmc5_dat2 0x1: Select mcspi2_cs1 0x3: Select gpio_149 0x5: Select sdmmc2_dat2 0x7: Select safe_mode | RW | 0x7 |

**Table 19-486. Register Call Summary for Register
CONTROL_CORE_PAD0_SDMMC5_DAT2_PAD1_SDMMC5_DAT3**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-487. CONTROL_CORE_PAD0_MCSPi4_CLK_PAD1_MCSPi4_SIMO

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000_0154 | | |
| Physical Address | 0x4A10_0154 | Instance | SYSCTRL_PADCONF_CORE |
| Description | Register control for Pads mcspi4_clk and mcspi4_simo Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--------------------------|-----------------------------------|--------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|----|----|----|----------------------------|-------------------------|---------------------|----|------------------------|-------------------------|----------------------------------|-------------------------------|----------------------------|-----------------------------|---------------------------|------------------------|----------|---|---|---|---------------------------|------------------------|--------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| MCSP14_SIMO_WAKEUPEVENT | MCSP14_SIMO_WAKEUPENABLE | MCSP14_SIMO_OFFMODEPULLTYPESELECT | MCSP14_SIMO_OFFMODEPULLUDENABE | MCSP14_SIMO_OFFMODEOUTVALUE | MCSP14_SIMO_OFFMODEOUTENABLE | MCSP14_SIMO_OFFMODEEENABLE | MCSP14_SIMO_INPUTENABLE | RESERVED | | | | MCSP14_SIMO_PULLTYPESELECT | MCSP14_SIMO_PULLUDENABE | MCSP14_SIMO_MUXMODE | | MCSP14_CLK_WAKEUPEVENT | MCSP14_CLK_WAKEUPENABLE | MCSP14_CLK_OFFMODEPULLTYPESELECT | MCSP14_CLK_OFFMODEPULLUDENABE | MCSP14_CLK_OFFMODEOUTVALUE | MCSP14_CLK_OFFMODEOUTENABLE | MCSP14_CLK_OFFMODEEENABLE | MCSP14_CLK_INPUTENABLE | RESERVED | | | | MCSP14_CLK_PULLTYPESELECT | MCSP14_CLK_PULLUDENABE | MCSP14_CLK_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|--|------|-------|
| 31 | MCSP14_SIMO_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | MCSP14_SIMO_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | MCSP14_SIMO_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad mcspi4_simo 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | MCSP14_SIMO_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad mcspi4_simo 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | MCSP14_SIMO_OFFMODEOUTVALUE | OffMode mode output value for pad mcspi4_simo 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | MCSP14_SIMO_OFFMODEOUTENABLE | OffMode mode output enable value for pad mcspi4_simo. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | MCSP14_SIMO_OFFMODEEENABLE | OffMode mode override control for pad mcspi4_simo 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | MCSP14_SIMO_INPUTENABLE | Input enable value for pad mcspi4_simo 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | MCSP14_SIMO_PULLTYPESELECT | pullup/down selection for pad mcspi4_simo 0x0: pulldown selected 0x1: pullup selected | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------------|---|------|-------|
| 19 | MCSPi4_SIMO_PULLUDENABLE | pullup/down enable for pad mcspi4_simo 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | MCSPi4_SIMO_MUXMODE | Functional multiplexing selection for pad mcspi4_simo 0x0: Select mcspi4_simo 0x1: Select sdmmc4_cmd 0x2: Select kpd_col7 0x3: Select gpio_152 0x7: Select safe_mode | RW | 0x7 |
| 15 | MCSPi4_CLK_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | MCSPi4_CLK_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | MCSPi4_CLK_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad mcspi4_clk 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | MCSPi4_CLK_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad mcspi4_clk 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | MCSPi4_CLK_OFFMODEOUTVALUE | OffMode mode output value for pad mcspi4_clk 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | MCSPi4_CLK_OFFMODEOUTENABLE | OffMode mode output enable value for pad mcspi4_clk. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | MCSPi4_CLK_OFFMODEENABLE | OffMode mode override control for pad mcspi4_clk 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | MCSPi4_CLK_INPUTENABLE | Input enable value for pad mcspi4_clk 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | MCSPi4_CLK_PULLTYPESELECT | pullup/down selection for pad mcspi4_clk 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | MCSPi4_CLK_PULLUDENABLE | pullup/down enable for pad mcspi4_clk 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | MCSPi4_CLK_MUXMODE | Functional multiplexing selection for pad mcspi4_clk 0x0: Select mcspi4_clk 0x1: Select sdmmc4_clk 0x2: Select kpd_col6 0x3: Select gpio_151 0x7: Select safe_mode | RW | 0x7 |

**Table 19-488. Register Call Summary for Register
CONTROL_CORE_PAD0_MCSPI4_CLK_PAD1_MCSPI4_SIMO**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-489. CONTROL_CORE_PAD0_MCSPI4_SOMI_PAD1_MCSPI4_CS0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0158 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0158 | | |
| Description | Register control for Pads mcspi4_somi and mcspi4_cs0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
|------------------------|-------------------------|----------------------------------|-------------------------------|----------------------------|-----------------------------|---------------------------|------------------------|----------|----|----|---------------------------|------------------------|--------------------|----|----|-------------------------|--------------------------|-----------------------------------|--------------------------------|-----------------------------|------------------------------|----------------------------|-------------------------|----------|---|---|----------------------------|-------------------------|---------------------|---|---|--|--|--|
| MCSP14_CS0_WAKEUPEVENT | MCSP14_CS0_WAKEUPENABLE | MCSP14_CS0_OFFMODEPULLTYPESELECT | MCSP14_CS0_OFFMODEPULLUDENABE | MCSP14_CS0_OFFMODEOUTVALUE | MCSP14_CS0_OFFMODEOUTENABLE | MCSP14_CS0_OFFMODEEENABLE | MCSP14_CS0_INPUTENABLE | RESERVED | | | MCSP14_CS0_PULLTYPESELECT | MCSP14_CS0_PULLUDENABE | MCSP14_CS0_MUXMODE | | | MCSP14_SOMI_WAKEUPEVENT | MCSP14_SOMI_WAKEUPENABLE | MCSP14_SOMI_OFFMODEPULLTYPESELECT | MCSP14_SOMI_OFFMODEPULLUDENABE | MCSP14_SOMI_OFFMODEOUTVALUE | MCSP14_SOMI_OFFMODEOUTENABLE | MCSP14_SOMI_OFFMODEEENABLE | MCSP14_SOMI_INPUTENABLE | RESERVED | | | MCSP14_SOMI_PULLTYPESELECT | MCSP14_SOMI_PULLUDENABE | MCSP14_SOMI_MUXMODE | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------------|---|------|-------|
| 31 | MCSP14_CS0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | MCSP14_CS0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | MCSP14_CS0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad mcspi4_cs0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | MCSP14_CS0_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad mcspi4_cs0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | MCSP14_CS0_OFFMODEOUTVALUE | OffMode mode output value for pad mcspi4_cs0 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | MCSP14_CS0_OFFMODEOUTENABLE | OffMode mode output enable value for pad mcspi4_cs0. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------------|--|------|-------|
| 25 | MCSPi4_CS0_OFFMODEENABLE | OffMode mode override control for pad mcspi4_cs0 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | MCSPi4_CS0_INPUTENABLE | Input enable value for pad mcspi4_cs0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | MCSPi4_CS0_PULLTYPESELECT | pullup/down selection for pad mcspi4_cs0 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | MCSPi4_CS0_PULLUDENABLE | pullup/down enable for pad mcspi4_cs0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | MCSPi4_CS0_MUXMODE | Functional multiplexing selection for pad mcspi4_cs0 0x0: Select mcspi4_cs0 0x1: Select sdmmc4_dat3 0x2: Select kpd_row7 0x3: Select gpio_154 0x7: Select safe_mode | RW | 0x7 |
| 15 | MCSPi4_SOMI_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | MCSPi4_SOMI_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | MCSPi4_SOMI_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad mcspi4_somi 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | MCSPi4_SOMI_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad mcspi4_somi 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | MCSPi4_SOMI_OFFMODEOUTVALUE | OffMode mode output value for pad mcspi4_somi 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | MCSPi4_SOMI_OFFMODEOUTENABLE | OffMode mode output enable value for pad mcspi4_somi. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | MCSPi4_SOMI_OFFMODEENABLE | OffMode mode override control for pad mcspi4_somi 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | MCSPi4_SOMI_INPUTENABLE | Input enable value for pad mcspi4_somi 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------|--|------|-------|
| 4 | MCSPi4_SOMI_PULLTYPESELECT | pullup/down selection for pad mcspi4_somi 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | MCSPi4_SOMI_PULLUDENABLE | pullup/down enable for pad mcspi4_somi 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | MCSPi4_SOMI_MUXMODE | Functional multiplexing selection for pad mcspi4_somi 0x0: Select mcspi4_somi 0x1: Select sdmmc4_dat0 0x2: Select kpd_row6 0x3: Select gpio_153 0x7: Select safe_mode | RW | 0x7 |

**Table 19-490. Register Call Summary for Register
CONTROL_CORE_PAD0_MCSPi4_SOMI_PAD1_MCSPi4_CS0**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-491. CONTROL_CORE_PAD0_UART4_RX_PAD1_UART4_TX

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 015C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 015C | | |
| Description | Register control for Pads uart4_rx and uart4_tx Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|------------------------|----------------------|----------|----|----|-------------------------|-----------------------|------------------|----|----|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|------------------------|----------------------|----------|---|---|-------------------------|-----------------------|------------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| UART4_TX_WAKEUPEVENT | UART4_TX_WAKEUPENABLE | UART4_TX_OFFMODEPULLTYPESELECT | UART4_TX_OFFMODEPULLUDENABLE | UART4_TX_OFFMODEOUTVALUE | UART4_TX_OFFMODEOUTENABLE | UART4_TX_OFFMODEENABLE | UART4_TX_INPUTENABLE | RESERVED | | | UART4_TX_PULLTYPESELECT | UART4_TX_PULLUDENABLE | UART4_TX_MUXMODE | | | UART4_RX_WAKEUPEVENT | UART4_RX_WAKEUPENABLE | UART4_RX_OFFMODEPULLTYPESELECT | UART4_RX_OFFMODEPULLUDENABLE | UART4_RX_OFFMODEOUTVALUE | UART4_RX_OFFMODEOUTENABLE | UART4_RX_OFFMODEENABLE | UART4_RX_INPUTENABLE | RESERVED | | | UART4_RX_PULLTYPESELECT | UART4_RX_PULLUDENABLE | UART4_RX_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|-------|
| 31 | UART4_TX_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | UART4_TX_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------------|---|------|-------|
| 29 | UART4_TX_ OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad uart4_tx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | UART4_TX_ OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad uart4_tx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | UART4_TX_ OFFMODEOUTVALUE | OffMode mode output value for pad uart4_tx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | UART4_TX_ OFFMODEOUTENABLE | OffMode mode output enable value for pad uart4_tx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | UART4_TX_ OFFMODEENABLE | OffMode mode override control for pad uart4_tx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | UART4_TX_ INPUTENABLE | Input enable value for pad uart4_tx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | UART4_TX_ PULLTYPESELECT | pullup/down selection for pad uart4_tx 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | UART4_TX_ PULLUDENABLE | pullup/down enable for pad uart4_tx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | UART4_TX_ MUXMODE | Functional multiplexing selection for pad uart4_tx 0x0: Select uart4_tx 0x1: Select sdmmc4_dat1 0x2: Select kpd_col8 0x3: Select gpio_156 0x7: Select safe_mode | RW | 0x7 |
| 15 | UART4_RX_ WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | UART4_RX_ WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | UART4_RX_ OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad uart4_rx 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | UART4_RX_ OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad uart4_rx 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | UART4_RX_ OFFMODEOUTVALUE | OffMode mode output value for pad uart4_rx 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|-------|
| 10 | UART4_RX_OFFMODEOUTENABLE | OffMode mode output enable value for pad uart4_rx. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | UART4_RX_OFFMODEENABLE | OffMode mode override control for pad uart4_rx 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | UART4_RX_INPUTENABLE | Input enable value for pad uart4_rx 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | UART4_RX_PULLTYPESELECT | pullup/down selection for pad uart4_rx 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | UART4_RX_PULLUDENABLE | pullup/down enable for pad uart4_rx 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | UART4_RX_MUXMODE | Functional multiplexing selection for pad uart4_rx 0x0: Select uart4_rx 0x1: Select sdmmc4_dat2 0x2: Select kpd_row8 0x3: Select gpio_155 0x7: Select safe_mode | RW | 0x7 |

**Table 19-492. Register Call Summary for Register
CONTROL_CORE_PAD0_UART4_RX_PAD1_UART4_TX**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-493. CONTROL_CORE_PAD0_USBB2_ULPITLL_CLK_PAD1_USBB2_ULPITLL_STP

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0160 | | |
| Physical Address | 0x4A10 0160 | Instance | SYSCTRL_PADCONF_CORE |
| Description | Register control for Pads usbb2_ulpitll_clk and usbb2_ulpitll_stp Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------|----|--------------------------------|----|---|----|---------------------------------------|----|-----------------------------------|----|------------------------------------|----|----------------------------------|----|-------------------------------|----|----------|----|----|----|----|----|---|---|----------------------------------|---|--------------------------------|---|---------------------------|---|---|---|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| USBB2_ULPITLL_STP_WAKEUPEVENT | | USBB2_ULPITLL_STP_WAKEUPENABLE | | USBB2_ULPITLL_STP_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_STP_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_STP_OFFMODEOUTVALUE | | USBB2_ULPITLL_STP_OFFMODEOUTENABLE | | USBB2_ULPITLL_STP_OFFMODEEENABLE | | USBB2_ULPITLL_STP_INPUTENABLE | | RESERVED | | | | | | | | USBB2_ULPITLL_STP_PULLTYPESELECT | | USBB2_ULPITLL_STP_PULLUDENABLE | | USBB2_ULPITLL_STP_MUXMODE | | | | | | | |
| USBB2_ULPITLL_CLK_WAKEUPEVENT | | USBB2_ULPITLL_CLK_WAKEUPENABLE | | USBB2_ULPITLL_CLK_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_CLK_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_CLK_OFFMODEOUTVALUE | | USBB2_ULPITLL_CLK_OFFMODEOUTENABLE | | USBB2_ULPITLL_CLK_OFFMODEEENABLE | | USBB2_ULPITLL_CLK_INPUTENABLE | | RESERVED | | | | | | | | USBB2_ULPITLL_CLK_PULLTYPESELECT | | USBB2_ULPITLL_CLK_PULLUDENABLE | | USBB2_ULPITLL_CLK_MUXMODE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---|--|------|-------|
| 31 | USBB2_ULPITLL_STP_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB2_ULPITLL_STP_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | USBB2_ULPITLL_STP_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb2_ulpitll_stp 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | USBB2_ULPITLL_STP_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb2_ulpitll_stp 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | USBB2_ULPITLL_STP_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_ulpitll_stp 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB2_ULPITLL_STP_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_ulpitll_stp. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | USBB2_ULPITLL_STP_OFFMODEEENABLE | OffMode mode override control for pad usbb2_ulpitll_stp 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | USBB2_ULPITLL_STP_INPUTENABLE | Input enable value for pad usbb2_ulpitll_stp 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---|---|------|-------|
| 20 | USBB2_ULPITLL_STP_PULLTYPESELECT | pullup/down selection for pad usbb2_ulpitll_stp 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | USBB2_ULPITLL_STP_PULLUDENABLE | pullup/down enable for pad usbb2_ulpitll_stp 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | USBB2_ULPITLL_STP_MUXMODE | Functional multiplexing selection for pad usbb2_ulpitll_stp 0x0: Select usbb2_ulpitll_stp 0x1: Select usbb2_ulpiphy_stp 0x2: Select sdmmc4_clk 0x3: Select gpio_158 0x4: Select hsi2_cadata 0x5: Select disp2_data23 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB2_ULPITLL_CLK_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | USBB2_ULPITLL_CLK_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | USBB2_ULPITLL_CLK_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb2_ulpitll_clk 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | USBB2_ULPITLL_CLK_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb2_ulpitll_clk 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | USBB2_ULPITLL_CLK_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_ulpitll_clk 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB2_ULPITLL_CLK_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_ulpitll_clk. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB2_ULPITLL_CLK_OFFMODEENABLE | OffMode mode override control for pad usbb2_ulpitll_clk 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | USBB2_ULPITLL_CLK_INPUTENABLE | Input enable value for pad usbb2_ulpitll_clk 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | USBB2_ULPITLL_CLK_PULLTYPESELECT | pullup/down selection for pad usbb2_ulpitll_clk 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | USBB2_ULPITLL_CLK_PULLUDENABLE | pullup/down enable for pad usbb2_ulpitll_clk 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|--|------|-------|
| 2:0 | USBB2_ULPITLL_CLK_MUXMODE | Functional multiplexing selection for pad usbb2_ulpitll_clk 0x0: Select usbb2_ulpitll_clk 0x1: Select usbb2_ulpiiphy_clk 0x2: Select sdmmc4_cmd 0x3: Select gpio_157 0x4: Select hsi2_cawake 0x7: Select safe_mode | RW | 0x7 |

**Table 19-494. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB2_ULPITLL_CLK_PAD1_USBB2_ULPITLL_STP**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-495. CONTROL_CORE_PAD0_USBB2_ULPITLL_DIR_PAD1_USBB2_ULPITLL_NXT

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0164 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0164 | | |
| Description | Register control for Pads usbb2_ulpitll_dir and usbb2_ulpitll_nxt Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------------------------|--------------------------------|---|---------------------------------------|-----------------------------------|------------------------------------|----------------------------------|-------------------------------|----------|----|----|----------------------------------|--------------------------------|---------------------------|----|----|-------------------------------|--------------------------------|---|---------------------------------------|-----------------------------------|------------------------------------|----------------------------------|-------------------------------|----------|---|---|----------------------------------|--------------------------------|---------------------------|---|---|
| USBB2_ULPITLL_NXT_WAKEUPEVENT | USBB2_ULPITLL_NXT_WAKEUPENABLE | USBB2_ULPITLL_NXT_OFFMODEPULLTYPESELECT | USBB2_ULPITLL_NXT_OFFMODEPULLUDENABLE | USBB2_ULPITLL_NXT_OFFMODEOUTVALUE | USBB2_ULPITLL_NXT_OFFMODEOUTENABLE | USBB2_ULPITLL_NXT_OFFMODEEENABLE | USBB2_ULPITLL_NXT_INPUTENABLE | RESERVED | | | USBB2_ULPITLL_NXT_PULLTYPESELECT | USBB2_ULPITLL_NXT_PULLUDENABLE | USBB2_ULPITLL_NXT_MUXMODE | | | USBB2_ULPITLL_DIR_WAKEUPEVENT | USBB2_ULPITLL_DIR_WAKEUPENABLE | USBB2_ULPITLL_DIR_OFFMODEPULLTYPESELECT | USBB2_ULPITLL_DIR_OFFMODEPULLUDENABLE | USBB2_ULPITLL_DIR_OFFMODEOUTVALUE | USBB2_ULPITLL_DIR_OFFMODEOUTENABLE | USBB2_ULPITLL_DIR_OFFMODEEENABLE | USBB2_ULPITLL_DIR_INPUTENABLE | RESERVED | | | USBB2_ULPITLL_DIR_PULLTYPESELECT | USBB2_ULPITLL_DIR_PULLUDENABLE | USBB2_ULPITLL_DIR_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | USBB2_ULPITLL_NXT_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB2_ULPITLL_NXT_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---|--|------|-------|
| 29 | USBB2_ULPITLL_NXT_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb2_ulpitll_nxt 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | USBB2_ULPITLL_NXT_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb2_ulpitll_nxt 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | USBB2_ULPITLL_NXT_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_ulpitll_nxt 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB2_ULPITLL_NXT_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_ulpitll_nxt. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | USBB2_ULPITLL_NXT_OFFMODEENABLE | OffMode mode override control for pad usbb2_ulpitll_nxt 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | USBB2_ULPITLL_NXT_INPUTENABLE | Input enable value for pad usbb2_ulpitll_nxt 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | USBB2_ULPITLL_NXT_PULLTYPESELECT | pullup/down selection for pad usbb2_ulpitll_nxt 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | USBB2_ULPITLL_NXT_PULLUDENABLE | pullup/down enable for pad usbb2_ulpitll_nxt 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | USBB2_ULPITLL_NXT_MUXMODE | Functional multiplexing selection for pad usbb2_ulpitll_nxt 0x0: Select usbb2_ulpitll_nxt 0x1: Select usbb2_ulpiiphy_nxt 0x2: Select sdmmc4_dat1 0x3: Select gpio_160 0x4: Select hsi2_acready 0x5: Select disp2_data21 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB2_ULPITLL_DIR_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | USBB2_ULPITLL_DIR_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | USBB2_ULPITLL_DIR_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb2_ulpitll_dir 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------------|---|------|-------|
| 12 | USBB2_ULPITLL_DIR_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb2_ulpitll_dir 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | USBB2_ULPITLL_DIR_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_ulpitll_dir 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB2_ULPITLL_DIR_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_ulpitll_dir. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB2_ULPITLL_DIR_OFFMODEENABLE | OffMode mode override control for pad usbb2_ulpitll_dir 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | USBB2_ULPITLL_DIR_INPUTENABLE | Input enable value for pad usbb2_ulpitll_dir 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | USBB2_ULPITLL_DIR_PULLTYPESELECT | pullup/down selection for pad usbb2_ulpitll_dir 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | USBB2_ULPITLL_DIR_PULLUDENABLE | pullup/down enable for pad usbb2_ulpitll_dir 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | USBB2_ULPITLL_DIR_MUXMODE | Functional multiplexing selection for pad usbb2_ulpitll_dir 0x0: Select usbb2_ulpitll_dir 0x1: Select usbb2_ulpiphy_dir 0x2: Select sdmmc4_dat0 0x3: Select gpio_159 0x4: Select hsi2_caflag 0x5: Select dispc2_data22 0x7: Select safe_mode | RW | 0x7 |

**Table 19-496. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB2_ULPITLL_DIR_PAD1_USBB2_ULPITLL_NXT**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-497. CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT0_PAD1_USBB2_ULPITLL_DAT1

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0168 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0168 | | |
| Description | Register control for Pads usbb2_ulpitll_dat0 and usbb2_ulpitll_dat1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------------------|---------------------------------|--|--|------------------------------------|-------------------------------------|-----------------------------------|--------------------------------|----------|----|----|----|-----------------------------------|---------------------------------|----------------------------|----|--------------------------------|---------------------------------|--|--|------------------------------------|-------------------------------------|-----------------------------------|--------------------------------|----------|---|---|---|-----------------------------------|---------------------------------|----------------------------|---|
| USBB2_ULPITLL_DAT1_WAKEUPEVENT | USBB2_ULPITLL_DAT1_WAKEUPENABLE | USBB2_ULPITLL_DAT1_OFFMODEPULLTYPESELECT | USBB2_ULPITLL_DAT1_OFFMODEPULLUDENABLE | USBB2_ULPITLL_DAT1_OFFMODEOUTVALUE | USBB2_ULPITLL_DAT1_OFFMODEOUTENABLE | USBB2_ULPITLL_DAT1_OFFMODEEENABLE | USBB2_ULPITLL_DAT1_INPUTENABLE | RESERVED | | | | USBB2_ULPITLL_DAT1_PULLTYPESELECT | USBB2_ULPITLL_DAT1_PULLUDENABLE | USBB2_ULPITLL_DAT1_MUXMODE | | USBB2_ULPITLL_DAT0_WAKEUPEVENT | USBB2_ULPITLL_DAT0_WAKEUPENABLE | USBB2_ULPITLL_DAT0_OFFMODEPULLTYPESELECT | USBB2_ULPITLL_DAT0_OFFMODEPULLUDENABLE | USBB2_ULPITLL_DAT0_OFFMODEOUTVALUE | USBB2_ULPITLL_DAT0_OFFMODEOUTENABLE | USBB2_ULPITLL_DAT0_OFFMODEEENABLE | USBB2_ULPITLL_DAT0_INPUTENABLE | RESERVED | | | | USBB2_ULPITLL_DAT0_PULLTYPESELECT | USBB2_ULPITLL_DAT0_PULLUDENABLE | USBB2_ULPITLL_DAT0_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|--|--|------|-------|
| 31 | USBB2_ULPITLL_DAT1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB2_ULPITLL_DAT1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | USBB2_ULPITLL_DAT1_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb2_ulpitll_dat1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | USBB2_ULPITLL_DAT1_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb2_ulpitll_dat1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | USBB2_ULPITLL_DAT1_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_ulpitll_dat1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB2_ULPITLL_DAT1_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_ulpitll_dat1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--|--|------|-------|
| 25 | USBB2_ULPITLL_DAT1_OFFMODEENABLE | OffMode mode override control for pad usbb2_ulpitll_dat1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | USBB2_ULPITLL_DAT1_INPUTENABLE | Input enable value for pad usbb2_ulpitll_dat1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | USBB2_ULPITLL_DAT1_PULLTYPESELECT | pullup/down selection for pad usbb2_ulpitll_dat1 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | USBB2_ULPITLL_DAT1_PULLUDENABLE | pullup/down enable for pad usbb2_ulpitll_dat1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | USBB2_ULPITLL_DAT1_MUXMODE | Functional multiplexing selection for pad usbb2_ulpitll_dat1 0x0: Select usbb2_ulpitll_dat1 0x1: Select usbb2_ulpiphy_dat1 0x2: Select sdmmc4_dat3 0x3: Select gpio_162 0x4: Select hsi2_acdata 0x5: Select dispc2_data19 0x6: Select usbb2_mm_txdat 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB2_ULPITLL_DAT0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | USBB2_ULPITLL_DAT0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | USBB2_ULPITLL_DAT0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb2_ulpitll_dat0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | USBB2_ULPITLL_DAT0_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb2_ulpitll_dat0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | USBB2_ULPITLL_DAT0_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_ulpitll_dat0 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB2_ULPITLL_DAT0_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_ulpitll_dat0. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB2_ULPITLL_DAT0_OFFMODEENABLE | OffMode mode override control for pad usbb2_ulpitll_dat0 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------------|--|------|-------|
| 8 | USBB2_ULPITLL_DAT0_INPUTENABLE | Input enable value for pad usbb2_ulpitll_dat0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | USBB2_ULPITLL_DAT0_PULLTYPESELECT | pullup/down selection for pad usbb2_ulpitll_dat0 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | USBB2_ULPITLL_DAT0_PULLUDENABLE | pullup/down enable for pad usbb2_ulpitll_dat0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | USBB2_ULPITLL_DAT0_MUXMODE | Functional multiplexing selection for pad usbb2_ulpitll_dat0 0x0: Select usbb2_ulpitll_dat0 0x1: Select usbb2_ulpiPHY_dat0 0x2: Select sdmmc4_dat2 0x3: Select gpio_161 0x4: Select hsi2_acwake 0x5: Select disp2_data20 0x6: Select usbb2_mm_txen 0x7: Select safe_mode | RW | 0x7 |

**Table 19-498. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT0_PAD1_USBB2_ULPITLL_DAT1**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-499. CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT2_PAD1_USBB2_ULPITLL_DAT3

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 016C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 016C | | |
| Description | Register control for Pads usbb2_ulpitll_dat2 and usbb2_ulpitll_dat3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------|---------------------------------|--|---------------------------------------|------------------------------------|-------------------------------------|----------------------------------|--------------------------------|----------|----|----|----|-----------------------------------|--------------------------------|----------------------------|----|--------------------------------|---------------------------------|--|---------------------------------------|------------------------------------|-------------------------------------|----------------------------------|--------------------------------|----------|---|---|---|-----------------------------------|--------------------------------|----------------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| USBB2_ULPITLL_DAT3_WAKEUPEVENT | USBB2_ULPITLL_DAT3_WAKEUPENABLE | USBB2_ULPITLL_DAT3_OFFMODEPULLTYPESELECT | USBB2_ULPITLL_DAT3_OFFMODEPULLUDENABE | USBB2_ULPITLL_DAT3_OFFMODEOUTVALUE | USBB2_ULPITLL_DAT3_OFFMODEOUTENABLE | USBB2_ULPITLL_DAT3_OFFMODEEENABE | USBB2_ULPITLL_DAT3_INPUTENABLE | RESERVED | | | | USBB2_ULPITLL_DAT3_PULLTYPESELECT | USBB2_ULPITLL_DAT3_PULLUDENABE | USBB2_ULPITLL_DAT3_MUXMODE | | USBB2_ULPITLL_DAT2_WAKEUPEVENT | USBB2_ULPITLL_DAT2_WAKEUPENABLE | USBB2_ULPITLL_DAT2_OFFMODEPULLTYPESELECT | USBB2_ULPITLL_DAT2_OFFMODEPULLUDENABE | USBB2_ULPITLL_DAT2_OFFMODEOUTVALUE | USBB2_ULPITLL_DAT2_OFFMODEOUTENABLE | USBB2_ULPITLL_DAT2_OFFMODEEENABE | USBB2_ULPITLL_DAT2_INPUTENABLE | RESERVED | | | | USBB2_ULPITLL_DAT2_PULLTYPESELECT | USBB2_ULPITLL_DAT2_PULLUDENABE | USBB2_ULPITLL_DAT2_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|--|---|------|-------|
| 31 | USBB2_ULPITLL_DAT3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB2_ULPITLL_DAT3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | USBB2_ULPITLL_DAT3_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb2_ulpitll_dat3 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | USBB2_ULPITLL_DAT3_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad usbb2_ulpitll_dat3 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | USBB2_ULPITLL_DAT3_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_ulpitll_dat3 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB2_ULPITLL_DAT3_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_ulpitll_dat3. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | USBB2_ULPITLL_DAT3_OFFMODEEENABE | OffMode mode override control for pad usbb2_ulpitll_dat3 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | USBB2_ULPITLL_DAT3_INPUTENABLE | Input enable value for pad usbb2_ulpitll_dat3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--|--|------|-------|
| 20 | USBB2_ULPITLL_DAT3_PULLTYPESELECT | pullup/down selection for pad usbb2_ulpitll_dat3 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | USBB2_ULPITLL_DAT3_PULLUDENABLE | pullup/down enable for pad usbb2_ulpitll_dat3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | USBB2_ULPITLL_DAT3_MUXMODE | Functional multiplexing selection for pad usbb2_ulpitll_dat3 0x0: Select usbb2_ulpitll_dat3 0x1: Select usbb2_ulpihy_dat3 0x2: Select sdmmc3_dat1 0x3: Select gpio_164 0x4: Select hsi2_caready 0x5: Select dispc2_data15 0x6: Select rfb_data15 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB2_ULPITLL_DAT2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | USBB2_ULPITLL_DAT2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | USBB2_ULPITLL_DAT2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb2_ulpitll_dat2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | USBB2_ULPITLL_DAT2_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb2_ulpitll_dat2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | USBB2_ULPITLL_DAT2_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_ulpitll_dat2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB2_ULPITLL_DAT2_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_ulpitll_dat2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB2_ULPITLL_DAT2_OFFMODEENABLE | OffMode mode override control for pad usbb2_ulpitll_dat2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | USBB2_ULPITLL_DAT2_INPUTENABLE | Input enable value for pad usbb2_ulpitll_dat2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | USBB2_ULPITLL_DAT2_PULLTYPESELECT | pullup/down selection for pad usbb2_ulpitll_dat2 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|---|------|-------|
| 3 | USBB2_ULPITLL_DAT2_PULLUDENABLE | pullup/down enable for pad usbb2_ulpitll_dat2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | USBB2_ULPITLL_DAT2_MUXMODE | Functional multiplexing selection for pad usbb2_ulpitll_dat2 0x0: Select usbb2_ulpitll_dat2 0x1: Select usbb2_ulpihy_dat2 0x2: Select sdmmc3_dat2 0x3: Select gpio_163 0x4: Select hsi2_acflag 0x5: Select dispc2_data18 0x6: Select usbb2_mm_txse0 0x7: Select safe_mode | RW | 0x7 |

**Table 19-500. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT2_PAD1_USBB2_ULPITLL_DAT3**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-501. CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT4_PAD1_USBB2_ULPITLL_DAT5

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0170 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0170 | | |
| Description | Register control for Pads usbb2_ulpitll_dat4 and usbb2_ulpitll_dat5 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
|--------------------------------|----|---------------------------------|----|--|----|--|----|------------------------------------|----|-------------------------------------|----|-----------------------------------|----|--------------------------------|----|----------------------------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|----------------------------|--|--|--|--|--|--|--|
| USBB2_ULPITLL_DAT5_WAKEUPEVENT | | USBB2_ULPITLL_DAT5_WAKEUPENABLE | | USBB2_ULPITLL_DAT5_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT5_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT5_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT5_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT5_OFFMODEEENABLE | | USBB2_ULPITLL_DAT5_INPUTENABLE | | USBB2_ULPITLL_DAT5_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT5_WAKEUPEVENT | | USBB2_ULPITLL_DAT5_WAKEUPENABLE | | USBB2_ULPITLL_DAT5_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT5_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT5_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT5_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT5_OFFMODEEENABLE | | USBB2_ULPITLL_DAT5_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | | | | | | | | | | | | | | | | | | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | USBB2_ULPITLL_DAT4_INPUTENABLE | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | | RESERVED | | | | | | | | USBB2_ULPITLL_DAT4_MUXMODE | | | | | | | |
| USBB2_ULPITLL_DAT4_WAKEUPEVENT | | USBB2_ULPITLL_DAT4_WAKEUPENABLE | | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | | USBB2_ULPITLL_DAT4_OFFMODEEENABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---|---|------|-------|
| 31 | USBB2_ULPITLL_DAT5_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB2_ULPITLL_DAT5_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | USBB2_ULPITLL_DAT5_OFFM_ODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb2_ulpitll_dat5 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | USBB2_ULPITLL_DAT5_OFFM_ODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb2_ulpitll_dat5 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | USBB2_ULPITLL_DAT5_OFFM_ODEOUTVALUE | OffMode mode output value for pad usbb2_ulpitll_dat5 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB2_ULPITLL_DAT5_OFFM_ODEOUTENABLE | OffMode mode output enable value for pad usbb2_ulpitll_dat5. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | USBB2_ULPITLL_DAT5_OFFM_ODEENABLE | OffMode mode override control for pad usbb2_ulpitll_dat5 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | USBB2_ULPITLL_DAT5_INPUTENABLE | Input enable value for pad usbb2_ulpitll_dat5 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | USBB2_ULPITLL_DAT5_PULLTYPESELECT | pullup/down selection for pad usbb2_ulpitll_dat5 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | USBB2_ULPITLL_DAT5_PULLUDENABLE | pullup/down enable for pad usbb2_ulpitll_dat5 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | USBB2_ULPITLL_DAT5_MUXMODE | Functional multiplexing selection for pad usbb2_ulpitll_dat5 0x0: Select usbb2_ulpitll_dat5 0x1: Select usbb2_ulpiphy_dat5 0x2: Select sdmmc3_dat3 0x3: Select gpio_166 0x4: Select mcspi3_cs0 0x5: Select disp2_data13 0x6: Select rfbi_data13 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB2_ULPITLL_DAT4_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--|--|------|-------|
| 14 | USBB2_ULPITLL_DAT4_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | USBB2_ULPITLL_DAT4_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb2_ulpitll_dat4 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | USBB2_ULPITLL_DAT4_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb2_ulpitll_dat4 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | USBB2_ULPITLL_DAT4_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_ulpitll_dat4 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB2_ULPITLL_DAT4_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_ulpitll_dat4. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB2_ULPITLL_DAT4_OFFMODEENABLE | OffMode mode override control for pad usbb2_ulpitll_dat4 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | USBB2_ULPITLL_DAT4_INPUTENABLE | Input enable value for pad usbb2_ulpitll_dat4 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | USBB2_ULPITLL_DAT4_PULLTYPESELECT | pullup/down selection for pad usbb2_ulpitll_dat4 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | USBB2_ULPITLL_DAT4_PULLUDENABLE | pullup/down enable for pad usbb2_ulpitll_dat4 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | USBB2_ULPITLL_DAT4_MUXMODE | Functional multiplexing selection for pad usbb2_ulpitll_dat4 0x0: Select usbb2_ulpitll_dat4 0x1: Select usbb2_ulpiiphy_dat4 0x2: Select sdmmc3_dat0 0x3: Select gpio_165 0x4: Select mcspi3_somi 0x5: Select dispc2_data14 0x6: Select rfbi_data14 0x7: Select safe_mode | RW | 0x7 |

**Table 19-502. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT4_PAD1_USBB2_ULPITLL_DAT5**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-503. CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT6_PAD1_USBB2_ULPITLL_DAT7

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0174 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0174 | | |
| Description | Register control for Pads usbb2_ulpitll_dat6 and usbb2_ulpitll_dat7 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------------------|---------------------------------|--|--|------------------------------------|-------------------------------------|-----------------------------------|--------------------------------|----------|----|----|----|-----------------------------------|---------------------------------|----------------------------|----|--------------------------------|---------------------------------|--|--|------------------------------------|-------------------------------------|-----------------------------------|--------------------------------|----------|---|---|---|-----------------------------------|---------------------------------|----------------------------|---|
| USBB2_ULPITLL_DAT7_WAKEUPEVENT | USBB2_ULPITLL_DAT7_WAKEUPENABLE | USBB2_ULPITLL_DAT7_OFFMODEPULLTYPESELECT | USBB2_ULPITLL_DAT7_OFFMODEPULLUDENABLE | USBB2_ULPITLL_DAT7_OFFMODEOUTVALUE | USBB2_ULPITLL_DAT7_OFFMODEOUTENABLE | USBB2_ULPITLL_DAT7_OFFMODEEENABLE | USBB2_ULPITLL_DAT7_INPUTENABLE | RESERVED | | | | USBB2_ULPITLL_DAT7_PULLTYPESELECT | USBB2_ULPITLL_DAT7_PULLUDENABLE | USBB2_ULPITLL_DAT7_MUXMODE | | USBB2_ULPITLL_DAT6_WAKEUPEVENT | USBB2_ULPITLL_DAT6_WAKEUPENABLE | USBB2_ULPITLL_DAT6_OFFMODEPULLTYPESELECT | USBB2_ULPITLL_DAT6_OFFMODEPULLUDENABLE | USBB2_ULPITLL_DAT6_OFFMODEOUTVALUE | USBB2_ULPITLL_DAT6_OFFMODEOUTENABLE | USBB2_ULPITLL_DAT6_OFFMODEEENABLE | USBB2_ULPITLL_DAT6_INPUTENABLE | RESERVED | | | | USBB2_ULPITLL_DAT6_PULLTYPESELECT | USBB2_ULPITLL_DAT6_PULLUDENABLE | USBB2_ULPITLL_DAT6_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|--|--|------|-------|
| 31 | USBB2_ULPITLL_DAT7_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB2_ULPITLL_DAT7_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | USBB2_ULPITLL_DAT7_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb2_ulpitll_dat7 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | USBB2_ULPITLL_DAT7_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb2_ulpitll_dat7 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | USBB2_ULPITLL_DAT7_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_ulpitll_dat7 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB2_ULPITLL_DAT7_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_ulpitll_dat7. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--|--|------|-------|
| 25 | USBB2_ULPITLL_DAT7_OFFMODEENABLE | OffMode mode override control for pad usbb2_ulpitll_dat7 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | USBB2_ULPITLL_DAT7_INPUTENABLE | Input enable value for pad usbb2_ulpitll_dat7 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | USBB2_ULPITLL_DAT7_PULLTYPESELECT | pullup/down selection for pad usbb2_ulpitll_dat7 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | USBB2_ULPITLL_DAT7_PULLUDENABLE | pullup/down enable for pad usbb2_ulpitll_dat7 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | USBB2_ULPITLL_DAT7_MUXMODE | Functional multiplexing selection for pad usbb2_ulpitll_dat7 0x0: Select usbb2_ulpitll_dat7 0x1: Select usbb2_ulpiphy_dat7 0x2: Select sdmmc3_clk 0x3: Select gpio_168 0x4: Select mcspi3_clk 0x5: Select dispc2_data11 0x6: Select rfb_data11 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB2_ULPITLL_DAT6_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | USBB2_ULPITLL_DAT6_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | USBB2_ULPITLL_DAT6_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad usbb2_ulpitll_dat6 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | USBB2_ULPITLL_DAT6_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad usbb2_ulpitll_dat6 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | USBB2_ULPITLL_DAT6_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_ulpitll_dat6 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB2_ULPITLL_DAT6_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_ulpitll_dat6. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB2_ULPITLL_DAT6_OFFMODEENABLE | OffMode mode override control for pad usbb2_ulpitll_dat6 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------------|---|------|-------|
| 8 | USBB2_ULPITLL_DAT6_INPUTENABLE | Input enable value for pad usbb2_ulpitll_dat6 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | USBB2_ULPITLL_DAT6_PULLTYPESELECT | pullup/down selection for pad usbb2_ulpitll_dat6 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | USBB2_ULPITLL_DAT6_PULLUDENABLE | pullup/down enable for pad usbb2_ulpitll_dat6 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | USBB2_ULPITLL_DAT6_MUXMODE | Functional multiplexing selection for pad usbb2_ulpitll_dat6 0x0: Select usbb2_ulpitll_dat6 0x1: Select usbb2_ulpiiphy_dat6 0x2: Select sdmmc3_cmd 0x3: Select gpio_167 0x4: Select mcspi3_simo 0x5: Select disp2_data12 0x6: Select rfi_data12 0x7: Select safe_mode | RW | 0x7 |

**Table 19-504. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB2_ULPITLL_DAT6_PAD1_USBB2_ULPITLL_DAT7**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Programming Guide

- [Pad Configuration Programming Points: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[8\]](#)

Table 19-505. CONTROL_CORE_PAD0_USBB2_HSIC_DATA_PAD1_USBB2_HSIC_STROBE

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0178 | | |
| Physical Address | 0x4A10 0178 | Instance | SYSCTRL_PADCONF_CORE |
| Description | Register control for Pads usbb2_hsic_data and usbb2_hsic_strobe Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------|----|--------------------------------|----|----------|----|-----------------------------------|----|------------------------------------|----|----------------------------------|----|----------|----|----|----|----|----|----|---------------------------|----|----|-----------------------------|---|------------------------------|---|----------|---|---------------------------------|---|----------------------------------|---|--------------------------------|--|----------|--|--|--|--|--|--|-------------------------|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | |
| USBB2_HSIC_STROBE_WAKEUPEVENT | | USBB2_HSIC_STROBE_WAKEUPENABLE | | RESERVED | | USBB2_HSIC_STROBE_OFFMODEOUTVALUE | | USBB2_HSIC_STROBE_OFFMODEOUTENABLE | | USBB2_HSIC_STROBE_OFFMODEEENABLE | | RESERVED | | | | | | | USBB2_HSIC_STROBE_MUXMODE | | | USBB2_HSIC_DATA_WAKEUPEVENT | | USBB2_HSIC_DATA_WAKEUPENABLE | | RESERVED | | USBB2_HSIC_DATA_OFFMODEOUTVALUE | | USBB2_HSIC_DATA_OFFMODEOUTENABLE | | USBB2_HSIC_DATA_OFFMODEEENABLE | | RESERVED | | | | | | | USBB2_HSIC_DATA_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------------|--|------|-------|
| 31 | USBB2_HSIC_STROBE_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | USBB2_HSIC_STROBE_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:28 | RESERVED | | R | 0x0 |
| 27 | USBB2_HSIC_STROBE_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_hsic_strobe 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | USBB2_HSIC_STROBE_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_hsic_strobe. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | USBB2_HSIC_STROBE_OFFMODEENABLE | OffMode mode override control for pad usbb2_hsic_strobe 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24:19 | RESERVED | | R | 0x00 |
| 18:16 | USBB2_HSIC_STROBE_MUXMODE | Functional multiplexing selection for pad usbb2_hsic_strobe 0x0: Select usbb2_hsic_strobe 0x3: Select gpio_170 0x7: Select safe_mode | RW | 0x7 |
| 15 | USBB2_HSIC_DATA_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | USBB2_HSIC_DATA_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:12 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------------|--|------|-------|
| 11 | USBB2_HSIC_DATA_OFFMODEOUTVALUE | OffMode mode output value for pad usbb2_hsic_data 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | USBB2_HSIC_DATA_OFFMODEOUTENABLE | OffMode mode output enable value for pad usbb2_hsic_data. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | USBB2_HSIC_DATA_OFFMODEENABLE | OffMode mode override control for pad usbb2_hsic_data 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8:3 | RESERVED | | R | 0x00 |
| 2:0 | USBB2_HSIC_DATA_MUXMODE | Functional multiplexing selection for pad usbb2_hsic_data 0x0: Select usbb2_hsic_data 0x3: Select gpio_169 0x7: Select safe_mode | RW | 0x7 |

**Table 19-506. Register Call Summary for Register
CONTROL_CORE_PAD0_USBB2_HSIC_DATA_PAD1_USBB2_HSIC_STROBE**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-507. CONTROL_CORE_PAD0_KPD_COL3_PAD1_KPD_COL4

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 017C | | | | | | | | | | | | | | | | Instance | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A10 017C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Register control for Pads kpd_col3 and kpd_col4 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|------------------------|----------------------|----------|----|----|-------------------------|----------------------|----|----|------------------|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|------------------------|----------------------|----------|---|-------------------------|----------------------|---|------------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| KPD_COL4_WAKEUPEVENT | KPD_COL4_WAKEUPENABLE | KPD_COL4_OFFMODEPULLTYPESELECT | KPD_COL4_OFFMODEPULLUDENABE | KPD_COL4_OFFMODEOUTVALUE | KPD_COL4_OFFMODEOUTENABLE | KPD_COL4_OFFMODEENABLE | KPD_COL4_INPUTENABLE | RESERVED | | | KPD_COL4_PULLTYPESELECT | KPD_COL4_PULLUDENABE | | | KPD_COL4_MUXMODE | KPD_COL3_WAKEUPEVENT | KPD_COL3_WAKEUPENABLE | KPD_COL3_OFFMODEPULLTYPESELECT | KPD_COL3_OFFMODEPULLUDENABE | KPD_COL3_OFFMODEOUTVALUE | KPD_COL3_OFFMODEOUTENABLE | KPD_COL3_OFFMODEENABLE | KPD_COL3_INPUTENABLE | RESERVED | | KPD_COL3_PULLTYPESELECT | KPD_COL3_PULLUDENABE | | KPD_COL3_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 31 | KPD_COL4_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | KPD_COL4_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | KPD_COL4_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad kpd_col4 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | KPD_COL4_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad kpd_col4 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | KPD_COL4_OFFMODEOUTVAL UE | OffMode mode output value for pad kpd_col4 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | KPD_COL4_OFFMODEOUTENABLE | OffMode mode output enable value for pad kpd_col4. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | KPD_COL4_OFFMODEENABLE | OffMode mode override control for pad kpd_col4 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | KPD_COL4_INPUTENABLE | Input enable value for pad kpd_col4 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | KPD_COL4_PULLTYPESELECT | pullup/down selection for pad kpd_col4 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | KPD_COL4_PULLUDENABLE | pullup/down enable for pad kpd_col4 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | KPD_COL4_MUXMODE | Functional multiplexing selection for pad kpd_col4 0x0: Select kpd_col4 0x1: Select kpd_col1 0x2: Select cam2_d1 0x3: Select gpio_172 0x7: Select safe_mode | RW | 0x7 |
| 15 | KPD_COL3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 14 | KPD_COL3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | KPD_COL3_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad kpd_col3 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | KPD_COL3_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad kpd_col3 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | KPD_COL3_OFFMODEOUTVALUE | OffMode mode output value for pad kpd_col3 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | KPD_COL3_OFFMODEOUTENABLE | OffMode mode output enable value for pad kpd_col3. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | KPD_COL3_OFFMODEENABLE | OffMode mode override control for pad kpd_col3 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | KPD_COL3_INPUTENABLE | Input enable value for pad kpd_col3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | KPD_COL3_PULLTYPESELECT | pullup/down selection for pad kpd_col3 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | KPD_COL3_PULLUDENABLE | pullup/down enable for pad kpd_col3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | KPD_COL3_MUXMODE | Functional multiplexing selection for pad kpd_col3 0x0: Select kpd_col3 0x1: Select kpd_col0 0x2: Select cam2_d0 0x3: Select gpio_171 0x7: Select safe_mode | RW | 0x7 |

**Table 19-508. Register Call Summary for Register
CONTROL_CORE_PAD0_KPD_COL3_PAD1_KPD_COL4**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-509. CONTROL_CORE_PAD0_KPD_COL5_PAD1_KPD_COL0

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0180 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0180 | | |
| Description | Register control for Pads kpd_col5 and kpd_col0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-----------------------|----------------------|----------|----|----|-------------------------|----------------------|----|------------------|----|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-----------------------|----------------------|----------|---|---|---|-------------------------|----------------------|---|---|------------------|--|--|--|--|--|--|--|--|--|--|--|--|
| KPD_COL0_WAKEUPEVENT | KPD_COL0_WAKEUPENABLE | KPD_COL0_OFFMODEPULLTYPESELECT | KPD_COL0_OFFMODEPULLUDENABE | KPD_COL0_OFFMODEOUTVALUE | KPD_COL0_OFFMODEOUTENABLE | KPD_COL0_OFFMODEENABE | KPD_COL0_INPUTENABLE | RESERVED | | | KPD_COL0_PULLTYPESELECT | KPD_COL0_PULLUDENABE | | KPD_COL0_MUXMODE | | KPD_COL5_WAKEUPEVENT | KPD_COL5_WAKEUPENABLE | KPD_COL5_OFFMODEPULLTYPESELECT | KPD_COL5_OFFMODEPULLUDENABE | KPD_COL5_OFFMODEOUTVALUE | KPD_COL5_OFFMODEOUTENABLE | KPD_COL5_OFFMODEENABE | KPD_COL5_INPUTENABLE | RESERVED | | | | KPD_COL5_PULLTYPESELECT | KPD_COL5_PULLUDENABE | | | KPD_COL5_MUXMODE | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | KPD_COL0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | KPD_COL0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | KPD_COL0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad kpd_col0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | KPD_COL0_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad kpd_col0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | KPD_COL0_OFFMODEOUTVALUE | OffMode mode output value for pad kpd_col0 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | KPD_COL0_OFFMODEOUTENABLE | OffMode mode output enable value for pad kpd_col0. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | KPD_COL0_OFFMODEENABE | OffMode mode override control for pad kpd_col0 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 24 | KPD_COL0_INPUTENABLE | Input enable value for pad kpd_col0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | KPD_COL0_PULLTYPESELECT | pullup/down selection for pad kpd_col0 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | KPD_COL0_PULLUDENABLE | pullup/down enable for pad kpd_col0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | KPD_COL0_MUXMODE | Functional multiplexing selection for pad kpd_col0 0x0: Select kpd_col0 0x1: Select kpd_col3 0x2: Select cam2_d3 0x3: Select gpio_174 0x7: Select safe_mode | RW | 0x7 |
| 15 | KPD_COL5_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | KPD_COL5_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | KPD_COL5_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad kpd_col5 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | KPD_COL5_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad kpd_col5 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | KPD_COL5_OFFMODEOUTVALUE | OffMode mode output value for pad kpd_col5 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | KPD_COL5_OFFMODEOUTENABLE | OffMode mode output enable value for pad kpd_col5. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | KPD_COL5_OFFMODEENABLE | OffMode mode override control for pad kpd_col5 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | KPD_COL5_INPUTENABLE | Input enable value for pad kpd_col5 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------|
| 4 | KPD_COL5_PULLTYPESELECT | pullup/down selection for pad kpd_col5 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | KPD_COL5_PULLUDENABLE | pullup/down enable for pad kpd_col5 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | KPD_COL5_MUXMODE | Functional multiplexing selection for pad kpd_col5 0x0: Select kpd_col5 0x1: Select kpd_col2 0x2: Select cam2_d2 0x3: Select gpio_173 0x7: Select safe_mode | RW | 0x7 |

**Table 19-510. Register Call Summary for Register
CONTROL_CORE_PAD0_KPD_COL5_PAD1_KPD_COLO**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-511. CONTROL_CORE_PAD0_KPD_COL1_PAD1_KPD_COL2

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0184 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0184 | | |
| Description | Register control for Pads kpd_col1 and kpd_col2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|-------------------------|-----------------------|----|----|----|------------------|----|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|-------------------------|-----------------------|---|---|------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| KPD_COL2_WAKEUPEVENT | KPD_COL2_WAKEUPENABLE | KPD_COL2_OFFMODEPULLTYPESELECT | KPD_COL2_OFFMODEPULLUDENABLE | KPD_COL2_OFFMODEOUTVALUE | KPD_COL2_OFFMODEOUTENABLE | KPD_COL2_OFFMODEEENABLE | KPD_COL2_INPUTENABLE | RESERVED | | KPD_COL2_PULLTYPESELECT | KPD_COL2_PULLUDENABLE | | | | KPD_COL2_MUXMODE | | KPD_COL1_WAKEUPEVENT | KPD_COL1_WAKEUPENABLE | KPD_COL1_OFFMODEPULLTYPESELECT | KPD_COL1_OFFMODEPULLUDENABLE | KPD_COL1_OFFMODEOUTVALUE | KPD_COL1_OFFMODEOUTENABLE | KPD_COL1_OFFMODEEENABLE | KPD_COL1_INPUTENABLE | RESERVED | | KPD_COL1_PULLTYPESELECT | KPD_COL1_PULLUDENABLE | | | KPD_COL1_MUXMODE |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|-------|
| 31 | KPD_COL2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 30 | KPD_COL2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | KPD_COL2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad kpd_col2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | KPD_COL2_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad kpd_col2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | KPD_COL2_OFFMODEOUTVALUE | OffMode mode output value for pad kpd_col2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | KPD_COL2_OFFMODEOUTENABLE | OffMode mode output enable value for pad kpd_col2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | KPD_COL2_OFFMODEENABLE | OffMode mode override control for pad kpd_col2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | KPD_COL2_INPUTENABLE | Input enable value for pad kpd_col2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | KPD_COL2_PULLTYPESELECT | pullup/down selection for pad kpd_col2 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | KPD_COL2_PULLUDENABLE | pullup/down enable for pad kpd_col2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | KPD_COL2_MUXMODE | Functional multiplexing selection for pad kpd_col2 0x0: Select kpd_col2 0x1: Select kpd_col5 0x2: Select cam2_d10 0x3: Select gpio_1 0x7: Select safe_mode | RW | 0x7 |
| 15 | KPD_COL1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | KPD_COL1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------------|--|------|-------|
| 13 | KPD_COL1_ OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad kpd_col1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | KPD_COL1_ OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad kpd_col1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | KPD_COL1_ OFFMODEOUTVALUE | OffMode mode output value for pad kpd_col1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | KPD_COL1_ OFFMODEOUTENABLE | OffMode mode output enable value for pad kpd_col1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | KPD_COL1_ OFFMODEENABLE | OffMode mode override control for pad kpd_col1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | KPD_COL1_ INPUTENABLE | Input enable value for pad kpd_col1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | KPD_COL1_ PULLTYPESELECT | pullup/down selection for pad kpd_col1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | KPD_COL1_ PULLUDENABLE | pullup/down enable for pad kpd_col1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | KPD_COL1_ MUXMODE | Functional multiplexing selection for pad kpd_col1 0x0: Select kpd_col1 0x1: Select kpd_col4 0x2: Select cam2_d8 0x3: Select gpio_0 0x7: Select safe_mode | RW | 0x7 |

**Table 19-512. Register Call Summary for Register
CONTROL_CORE_PAD0_KPD_COL1_PAD1_KPD_COL2**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-513. CONTROL_CORE_PAD0_KPD_ROW3_PAD1_KPD_ROW4

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0188 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0188 | | |
| Description | Register control for Pads kpd_row3 and kpd_row4 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|----------------------|----|------------------|----|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|-------------------------|----------------------|---|------------------|---|
| KPD_ROW4_WAKEUPEVENT | KPD_ROW4_WAKEUPENABLE | KPD_ROW4_OFFMODEPULLTYPESELECT | KPD_ROW4_OFFMODEPULLUDENABE | KPD_ROW4_OFFMODEOUTVALUE | KPD_ROW4_OFFMODEOUTENABLE | KPD_ROW4_OFFMODEEENABLE | KPD_ROW4_INPUTENABLE | RESERVED | | | KPD_ROW4_PULLTYPESELECT | KPD_ROW4_PULLUDENABE | | KPD_ROW4_MUXMODE | | KPD_ROW3_WAKEUPEVENT | KPD_ROW3_WAKEUPENABLE | KPD_ROW3_OFFMODEPULLTYPESELECT | KPD_ROW3_OFFMODEPULLUDENABE | KPD_ROW3_OFFMODEOUTVALUE | KPD_ROW3_OFFMODEOUTENABLE | KPD_ROW3_OFFMODEEENABLE | KPD_ROW3_INPUTENABLE | RESERVED | | | KPD_ROW3_PULLTYPESELECT | KPD_ROW3_PULLUDENABE | | KPD_ROW3_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | KPD_ROW4_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | KPD_ROW4_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | KPD_ROW4_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad kpd_row4 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | KPD_ROW4_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad kpd_row4 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | KPD_ROW4_OFFMODEOUTVALUE | OffMode mode output value for pad kpd_row4 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | KPD_ROW4_OFFMODEOUTENABLE | OffMode mode output enable value for pad kpd_row4. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | KPD_ROW4_OFFMODEEENABLE | OffMode mode override control for pad kpd_row4 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|--|------|-------|
| 24 | KPD_ROW4_INPUTENABLE | Input enable value for pad kpd_row4 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | KPD_ROW4_PULLTYPESELECTION | pullup/down selection for pad kpd_row4 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | KPD_ROW4_PULLUDENABLE | pullup/down enable for pad kpd_row4 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | KPD_ROW4_MUXMODE | Functional multiplexing selection for pad kpd_row4 0x0: Select kpd_row4 0x1: Select kpd_row1 0x2: Select cam2_d5 0x3: Select gpio_176 0x7: Select safe_mode | RW | 0x7 |
| 15 | KPD_ROW3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | KPD_ROW3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | KPD_ROW3_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad kpd_row3 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | KPD_ROW3_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad kpd_row3 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | KPD_ROW3_OFFMODEOUTVALUE | OffMode mode output value for pad kpd_row3 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | KPD_ROW3_OFFMODEOUTENABLE | OffMode mode output enable value for pad kpd_row3. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | KPD_ROW3_OFFMODEENABLE | OffMode mode override control for pad kpd_row3 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | KPD_ROW3_INPUTENABLE | Input enable value for pad kpd_row3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------|
| 7:5 | RESERVED | | R | 0x0 |
| 4 | KPD_ROW3_PULLTYPESELECT | pullup/down selection for pad kpd_row3 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | KPD_ROW3_PULLUDENABLE | pullup/down enable for pad kpd_row3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | KPD_ROW3_MUXMODE | Functional multiplexing selection for pad kpd_row3 0x0: Select kpd_row3 0x1: Select kpd_row0 0x2: Select cam2_d4 0x3: Select gpio_175 0x7: Select safe_mode | RW | 0x7 |

**Table 19-514. Register Call Summary for Register
CONTROL_CORE_PAD0_KPD_ROW3_PAD1_KPD_ROW4**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-515. CONTROL_CORE_PAD0_KPD_ROW5_PAD1_KPD_ROW0

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------|--|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|-----------------------|----|------------------|----|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|-------------------------|-----------------------|---|------------------|---|
| Address Offset | | 0x0000 018C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A10 018C | | Instance | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Register control for Pads kpd_row5 and kpd_row0 | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| KPD_ROW0_WAKEUPEVENT | KPD_ROW0_WAKEUPENABLE | KPD_ROW0_OFFMODEPULLTYPESELECT | KPD_ROW0_OFFMODEPULLUDENABLE | KPD_ROW0_OFFMODEOUTVALUE | KPD_ROW0_OFFMODEOUTENABLE | KPD_ROW0_OFFMODEEENABLE | KPD_ROW0_INPUTENABLE | RESERVED | | | KPD_ROW0_PULLTYPESELECT | KPD_ROW0_PULLUDENABLE | | KPD_ROW0_MUXMODE | | KPD_ROW5_WAKEUPEVENT | KPD_ROW5_WAKEUPENABLE | KPD_ROW5_OFFMODEPULLTYPESELECT | KPD_ROW5_OFFMODEPULLUDENABLE | KPD_ROW5_OFFMODEOUTVALUE | KPD_ROW5_OFFMODEOUTENABLE | KPD_ROW5_OFFMODEEENABLE | KPD_ROW5_INPUTENABLE | RESERVED | | | KPD_ROW5_PULLTYPESELECT | KPD_ROW5_PULLUDENABLE | | KPD_ROW5_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|-------|
| 31 | KPD_ROW0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 30 | KPD_ROW0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | KPD_ROW0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad kpd_row0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | KPD_ROW0_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad kpd_row0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | KPD_ROW0_OFFMODEOUTVALUE | OffMode mode output value for pad kpd_row0 0x0: Set value at 0. 0x1: Set value at 1. | RW | 0 |
| 26 | KPD_ROW0_OFFMODEOUTENABLE | OffMode mode output enable value for pad kpd_row0. This is an active low signal. 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | KPD_ROW0_OFFMODEENABLE | OffMode mode override control for pad kpd_row0 0x0: I/O state keeps its previous state when off mode is active. 0x1: I/O state is forced to off mode value when off mode is active. | RW | 0 |
| 24 | KPD_ROW0_INPUTENABLE | Input enable value for pad kpd_row0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | KPD_ROW0_PULLTYPESELECTION | pullup/down selection for pad kpd_row0 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | KPD_ROW0_PULLUDENABLE | pullup/down enable for pad kpd_row0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | KPD_ROW0_MUXMODE | Functional multiplexing selection for pad kpd_row0 0x0: Select kpd_row0 0x1: Select kpd_row3 0x2: Select cam2_d7 0x3: Select gpio_178 0x7: Select safe_mode | RW | 0x7 |
| 15 | KPD_ROW5_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | KPD_ROW5_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 13 | KPD_ROW5_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad kpd_row5 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | KPD_ROW5_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad kpd_row5 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | KPD_ROW5_OFFMODEOUTVALUE | OffMode mode output value for pad kpd_row5 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | KPD_ROW5_OFFMODEOUTENABLE | OffMode mode output enable value for pad kpd_row5. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | KPD_ROW5_OFFMODEENABLE | OffMode mode override control for pad kpd_row5 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | KPD_ROW5_INPUTENABLE | Input enable value for pad kpd_row5 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | KPD_ROW5_PULLTYPESELECT | pullup/down selection for pad kpd_row5 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | KPD_ROW5_PULLUDENABLE | pullup/down enable for pad kpd_row5 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | KPD_ROW5_MUXMODE | Functional multiplexing selection for pad kpd_row5 0x0: Select kpd_row5 0x1: Select kpd_row2 0x2: Select cam2_d6 0x3: Select gpio_177 0x7: Select safe_mode | RW | 0x7 |

**Table 19-516. Register Call Summary for Register
CONTROL_CORE_PAD0_KPD_ROW5_PAD1_KPD_ROW0**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-517. CONTROL_CORE_PAD0_KPD_ROW1_PAD1_KPD_ROW2

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0190 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0190 | | |
| Description | Register control for Pads kpd_row1 and kpd_row2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|----------------------|----|------------------|----|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|-------------------------|----------------------|---|------------------|---|
| KPD_ROW2_WAKEUPEVENT | KPD_ROW2_WAKEUPENABLE | KPD_ROW2_OFFMODEPULLTYPESELECT | KPD_ROW2_OFFMODEPULLUDENABE | KPD_ROW2_OFFMODEOUTVALUE | KPD_ROW2_OFFMODEOUTENABLE | KPD_ROW2_OFFMODEEENABLE | KPD_ROW2_INPUTENABLE | RESERVED | | | KPD_ROW2_PULLTYPESELECT | KPD_ROW2_PULLUDENABE | | KPD_ROW2_MUXMODE | | KPD_ROW1_WAKEUPEVENT | KPD_ROW1_WAKEUPENABLE | KPD_ROW1_OFFMODEPULLTYPESELECT | KPD_ROW1_OFFMODEPULLUDENABE | KPD_ROW1_OFFMODEOUTVALUE | KPD_ROW1_OFFMODEOUTENABLE | KPD_ROW1_OFFMODEEENABLE | KPD_ROW1_INPUTENABLE | RESERVED | | | KPD_ROW1_PULLTYPESELECT | KPD_ROW1_PULLUDENABE | | KPD_ROW1_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | KPD_ROW2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | KPD_ROW2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | KPD_ROW2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad kpd_row2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | KPD_ROW2_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad kpd_row2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | KPD_ROW2_OFFMODEOUTVALUE | OffMode mode output value for pad kpd_row2 0x0: Set value at 0. 0x1: Set value at 1. | RW | 0 |
| 26 | KPD_ROW2_OFFMODEOUTENABLE | OffMode mode output enable value for pad kpd_row2. This is an active low signal. 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | KPD_ROW2_OFFMODEENABLE | OffMode mode override control for pad kpd_row2 0x0: I/O state keeps its previous state when off mode is active. 0x1: I/O state is forced to off mode value when off mode is active. | RW | 0 |
| 24 | KPD_ROW2_INPUTENABLE | Input enable value for pad kpd_row2 0x0: Input buffee of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 23:21 | RESERVED | | R | 0x0 |
| 20 | KPD_ROW2_PULLTYPESELECTION | pullup/down selection for pad kpd_row2 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | KPD_ROW2_PULLUDENABLE | pullup/down enable for pad kpd_row2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | KPD_ROW2_MUXMODE | Functional multiplexing selection for pad kpd_row2 0x0: Select kpd_row2 0x1: Select kpd_row5 0x2: Select cam2_d11 0x3: Select gpio_3 0x7: Select safe_mode | RW | 0x7 |
| 15 | KPD_ROW1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | KPD_ROW1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | KPD_ROW1_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad kpd_row1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | KPD_ROW1_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad kpd_row1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | KPD_ROW1_OFFMODEOUTVALUE | OffMode mode output value for pad kpd_row1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | KPD_ROW1_OFFMODEOUTENABLE | OffMode mode output enable value for pad kpd_row1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | KPD_ROW1_OFFMODEENABLE | OffMode mode override control for pad kpd_row1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | KPD_ROW1_INPUTENABLE | Input enable value for pad kpd_row1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------|
| 4 | KPD_ROW1_PULLTYPESELECT | pullup/down selection for pad kpd_row1 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | KPD_ROW1_PULLUDENABLE | pullup/down enable for pad kpd_row1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | KPD_ROW1_MUXMODE | Functional multiplexing selection for pad kpd_row1 0x0: Select kpd_row1 0x1: Select kpd_row4 0x2: Select cam2_d9 0x3: Select gpio_2 0x7: Select safe_mode | RW | 0x7 |

**Table 19-518. Register Call Summary for Register
CONTROL_CORE_PAD0_KPD_ROW1_PAD1_KPD_ROW2**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-519. CONTROL_CORE_PAD0_USBA0_OTG_CE_PAD1_USBA0_OTG_DP

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0194 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0194 | | |
| Description | Register control for Pads usba0_otg_ce and usba0_otg_dp Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------------|---------------------------|----------|----|----|----|----|----|-----------------------------|---------------------------|----------------------|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|-----------------------------|---------------------------|----------|---|
| USBA0_OTG_DP_WAKEUPEVENT | USBA0_OTG_DP_WAKEUPENABLE | RESERVED | | | | | | USBA0_OTG_DP_PULLTYPESELECT | USBA0_OTG_DP_PULLUDENABLE | USBA0_OTG_DP_MUXMODE | | | | | | RESERVED | | | | | | | | | | | | USBA0_OTG_CE_PULLTYPESELECT | USBA0_OTG_CE_PULLUDENABLE | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------|
| 31 | USBA0_OTG_DP_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x1: A wake-up event occurred Read 0x0: No wake-up event occurred | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|--|------|-------|
| 30 | USBA0_OTG_DP_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: Wake-up detection on low level 0x1: Wake-up detection on high level | RW | 0x0 |
| 29:21 | RESERVED | | R | 0x000 |
| 20 | USBA0_OTG_DP_PULLTYPESELECT | Pullup/down selection for pad usba0_otg_dp 0x0: Pulldown selected 0x1: Pullup selected | RW | 0 |
| 19 | USBA0_OTG_DP_PULLUDENABLE | Pullup/down enable for pad usba0_otg_dp 0x0: Pullup/down disabled 0x1: Pullup/down enabled | RW | 1 |
| 18:16 | USBA0_OTG_DP_MUXMODE ⁽¹⁾ | Functional multiplexing selection for pad usba0_otg_dp 0x0: Select usba0_otg_dp 0x1: Select uart3_rx_irrx 0x2: Select uart2_rx 0x7: Select safe_mode | RW | 0x0 |
| 15:5 | RESERVED | | R | 0x000 |
| 4 | USBA0_OTG_CE_PULLTYPESELECT | Pullup/down selection for pad usba0_otg_ce 0x0: Pulldown selected 0x1: Pullup selected | RW | 0 |
| 3 | USBA0_OTG_CE_PULLUDENABLE | Pullup/down enable for pad usba0_otg_ce 0x0: Pullup/down disabled 0x1: Pullup/down enabled | RW | 1 |
| 2:0 | RESERVED | | R | 0x0 |

⁽¹⁾ When USBA0_OTG_DP_MUXMODE = 0, user software must ensure that CONTROL_USB2PHYCORE[29] USB2PHY_GPIOMODE = 0. When USBA0_OTG_DP_MUXMODE is different than 0, user software must ensure that CONTROL_USB2PHYCORE[29] USB2PHY_GPIOMODE = 1.

**Table 19-520. Register Call Summary for Register
CONTROL_CORE_PAD0_USBA0_OTG_CE_PAD1_USBA0_OTG_DP**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-521. CONTROL_CORE_PAD0_USBA0_OTG_DM_PAD1_FREF_CLK1_OUT

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 0198 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0198 | | |
| Description | Register control for Pads usba0_otg_dm and fref_clk1_out Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|----|----------------------------|----|-------------------------------------|----|-------------------------------------|----|-------------------------------|----|--------------------------------|----|------------------------------|----|---------------------------|----|----------|----|----|----|----------|----|---|---|-----------------------------|---|---|---|-----------------------------|---|---|---|----------------------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| FREF_CLK1_OUT_WAKEUPEVENT | | FREF_CLK1_OUT_WAKEUPENABLE | | FREF_CLK1_OUT_OFFMODEPULLTYPESELECT | | FREF_CLK1_OUT_OFFMODEPULLUDENENABLE | | FREF_CLK1_OUT_OFFMODEOUTVALUE | | FREF_CLK1_OUT_OFFMODEOUTENABLE | | FREF_CLK1_OUT_OFFMODEEENABLE | | FREF_CLK1_OUT_INPUTENABLE | | RESERVED | | | | RESERVED | | | | USBA0_OTG_DM_PULLTYPESELECT | | | | USBA0_OTG_DM_PULLUDENENABLE | | | | USBA0_OTG_DM_MUXMODE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|--|------|-------|
| 31 | FREF_CLK1_OUT_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | FREF_CLK1_OUT_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | FREF_CLK1_OUT_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad fref_clk1_out 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | FREF_CLK1_OUT_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad fref_clk1_out 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | FREF_CLK1_OUT_OFFMODEOUTVALUE | OffMode mode output value for pad fref_clk1_out 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | FREF_CLK1_OUT_OFFMODEOUTENABLE | OffMode mode output enable value for pad fref_clk1_out. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | FREF_CLK1_OUT_OFFMODEEENABLE | OffMode mode override control for pad fref_clk1_out 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | FREF_CLK1_OUT_INPUTENABLE | Input enable value for pad fref_clk1_out 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | FREF_CLK1_OUT_PULLTYPESELECT | pullup/down selection for pad fref_clk1_out 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|--|------|-------|
| 19 | FREF_CLK1_OUT_PULLUDENABLE | pullup/down enable for pad fref_clk1_out 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | FREF_CLK1_OUT_MUXMODE | Functional multiplexing selection for pad fref_clk1_out 0x0: Select fref_clk1_out 0x3: Select gpio_181 0x7: Select safe_mode | RW | 0x7 |
| 15:5 | RESERVED | | R | 0x000 |
| 4 | USBA0_OTG_DM_PULLTYPESELECT | pullup/down selection for pad usba0_otg_dm 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | USBA0_OTG_DM_PULLUDENABLE | pullup/down enable for pad usba0_otg_dm 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | USBA0_OTG_DM_MUXMODE ⁽¹⁾ | Functional multiplexing selection for pad usba0_otg_dm 0x0: Select usba0_otg_dm 0x1: Select uart3_tx_irtx 0x2: Select uart2_tx 0x7: Select safe_mode | RW | 0x0 |

⁽¹⁾ When USBA0_OTG_DM_MUXMODE = 0, user software must ensure that CONTROL_USB2PHYCORE[29] USB2PHY_GPIOMODE = 0. When USBA0_OTG_DM_MUXMODE is different than 0, user software must ensure that CONTROL_USB2PHYCORE[29] USB2PHY_GPIOMODE = 1.

**Table 19-522. Register Call Summary for Register
CONTROL_CORE_PAD0_USBA0_OTG_DM_PAD1_FREF_CLK1_OUT**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-523. CONTROL_CORE_PAD0_FREF_CLK2_OUT_PAD1_SYS_NIRQ1

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 019C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 019C | | |
| Description | Register control for Pads fref_clk2_out and sys_nirq1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------------|----------|----|----|----|----|----|-----------------------|----------|----|----|----|--------------------------|------------------------|-------------------|---------------------------|----------------------------|-------------------------------------|-----------------------------------|-------------------------------|--------------------------------|-------------------------------|---------------------------|----------|---|---|---|------------------------------|----------------------------|-----------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SYS_NIRQ1_WAKEUPEVENT | SYS_NIRQ1_WAKEUPENABLE | RESERVED | | | | | | SYS_NIRQ1_INPUTENABLE | RESERVED | | | | SYS_NIRQ1_PULLTYPESELECT | SYS_NIRQ1_PULLUDENABLE | SYS_NIRQ1_MUXMODE | FREF_CLK2_OUT_WAKEUPEVENT | FREF_CLK2_OUT_WAKEUPENABLE | FREF_CLK2_OUT_OFFMODEPULLTYPESELECT | FREF_CLK2_OUT_OFFMODEPULLUDENABLE | FREF_CLK2_OUT_OFFMODEOUTVALUE | FREF_CLK2_OUT_OFFMODEOUTENABLE | FREF_CLK2_OUT_OFFMODEDEENABLE | FREF_CLK2_OUT_INPUTENABLE | RESERVED | | | | FREF_CLK2_OUT_PULLTYPESELECT | FREF_CLK2_OUT_PULLUDENABLE | FREF_CLK2_OUT_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|---|------|-------|
| 31 | SYS_NIRQ1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SYS_NIRQ1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | SYS_NIRQ1_INPUTENABLE | Input enable value for pad sys_nirq1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SYS_NIRQ1_PULLTYPESELECT | pullup/down selection for pad sys_nirq1 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | SYS_NIRQ1_PULLUDENABLE | pullup/down enable for pad sys_nirq1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | SYS_NIRQ1_MUXMODE | Functional multiplexing selection for pad sys_nirq1 0x0: Select sys_nirq1 0x7: Select safe_mode | RW | 0x7 |
| 15 | FREF_CLK2_OUT_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | FREF_CLK2_OUT_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | FREF_CLK2_OUT_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad fref_clk2_out 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------------|--|------|-------|
| 12 | FREF_CLK2_OUT_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad fref_clk2_out 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | FREF_CLK2_OUT_OFFMODEOUTVALUE | OffMode mode output value for pad fref_clk2_out 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | FREF_CLK2_OUT_OFFMODEOUTENABLE | OffMode mode output enable value for pad fref_clk2_out. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | FREF_CLK2_OUT_OFFMODEENABLE | OffMode mode override control for pad fref_clk2_out 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | FREF_CLK2_OUT_INPUTENABLE | Input enable value for pad fref_clk2_out 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | FREF_CLK2_OUT_PULLTYPESELECT | pullup/down selection for pad fref_clk2_out 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | FREF_CLK2_OUT_PULLUDENABLE | pullup/down enable for pad fref_clk2_out 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | FREF_CLK2_OUT_MUXMODE | Functional multiplexing selection for pad fref_clk2_out 0x0: Select fref_clk2_out 0x3: Select gpio_182 0x7: Select safe_mode | RW | 0x7 |

**Table 19-524. Register Call Summary for Register
CONTROL_CORE_PAD0_FREF_CLK2_OUT_PAD1_SYS_NIRQ1**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-525. CONTROL_CORE_PAD0_SYS_NIRQ2_PAD1_SYS_BOOT0

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 01A0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01A0 | | |
| Description | Register control for Pads sys_nirq2 and sys_boot0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|----|----|--------------------------|------------------------|----|-------------------|----|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|---|---|--------------------------|------------------------|---|-------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SYS_BOOT0_WAKEUPEVENT | SYS_BOOT0_WAKEUPENABLE | SYS_BOOT0_OFFMODEPULLTYPESELECT | SYS_BOOT0_OFFMODEPULLUDENABLE | SYS_BOOT0_OFFMODEOUTVALUE | SYS_BOOT0_OFFMODEOUTENABLE | SYS_BOOT0_OFFMODEEENABLE | SYS_BOOT0_INPUTENABLE | RESERVED | | | SYS_BOOT0_PULLTYPESELECT | SYS_BOOT0_PULLUDENABLE | | SYS_BOOT0_MUXMODE | | SYS_NIRQ2_WAKEUPEVENT | SYS_NIRQ2_WAKEUPENABLE | SYS_NIRQ2_OFFMODEPULLTYPESELECT | SYS_NIRQ2_OFFMODEPULLUDENABLE | SYS_NIRQ2_OFFMODEOUTVALUE | SYS_NIRQ2_OFFMODEOUTENABLE | SYS_NIRQ2_OFFMODEEENABLE | SYS_NIRQ2_INPUTENABLE | RESERVED | | | SYS_NIRQ2_PULLTYPESELECT | SYS_NIRQ2_PULLUDENABLE | | SYS_NIRQ2_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 31 | SYS_BOOT0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SYS_BOOT0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | SYS_BOOT0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sys_boot0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | SYS_BOOT0_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sys_boot0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | SYS_BOOT0_OFFMODEOUTVALUE | OffMode mode output value for pad sys_boot0 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | SYS_BOOT0_OFFMODEOUTENABLE | OffMode mode output enable value for pad sys_boot0. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | SYS_BOOT0_OFFMODEEENABLE | OffMode mode override control for pad sys_boot0 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | SYS_BOOT0_INPUTENABLE | Input enable value for pad sys_boot0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SYS_BOOT0_PULLTYPESELECT | pullup/down selection for pad sys_boot0 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | SYS_BOOT0_PULLUDENABLE | pullup/down enable for pad sys_boot0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 18:16 | SYS_BOOT0_MUXMODE | Functional multiplexing selection for pad sys_boot0 0x0: Select sys_boot0 0x3: Select gpio_184 0x7: Select safe_mode | RW | 0x0 |
| 15 | SYS_NIRQ2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SYS_NIRQ2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | SYS_NIRQ2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sys_nirq2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | SYS_NIRQ2_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sys_nirq2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | SYS_NIRQ2_OFFMODEOUTVALUE | OffMode mode output value for pad sys_nirq2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | SYS_NIRQ2_OFFMODEOUTENABLE | OffMode mode output enable value for pad sys_nirq2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | SYS_NIRQ2_OFFMODEENABLER | OffMode mode override control for pad sys_nirq2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | SYS_NIRQ2_INPUTENABLE | Input enable value for pad sys_nirq2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SYS_NIRQ2_PULLTYPESELECT | pullup/down selection for pad sys_nirq2 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | SYS_NIRQ2_PULLUDENABLE | pullup/down enable for pad sys_nirq2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | SYS_NIRQ2_MUXMODE | Functional multiplexing selection for pad sys_nirq2 0x0: Select sys_nirq2 0x3: Select gpio_183 0x7: Select safe_mode | RW | 0x7 |

**Table 19-526. Register Call Summary for Register
CONTROL_CORE_PAD0_SYS_NIRQ2_PAD1_SYS_BOOT0**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-527. CONTROL_CORE_PAD0_SYS_BOOT1_PAD1_SYS_BOOT2

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 01A4 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01A4 | | |
| Description | Register control for Pads sys_boot1 and sys_boot2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|----|----|--------------------------|------------------------|----|----|-------------------|----|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|---|---|--------------------------|------------------------|---|-------------------|
| SYS_BOOT2_WAKEUPEVENT | SYS_BOOT2_WAKEUPENABLE | SYS_BOOT2_OFFMODEPULLTYPESELECT | SYS_BOOT2_OFFMODEPULLUDENABLE | SYS_BOOT2_OFFMODEOUTVALUE | SYS_BOOT2_OFFMODEOUTENABLE | SYS_BOOT2_OFFMODEEENABLE | SYS_BOOT2_INPUTENABLE | RESERVED | | | SYS_BOOT2_PULLTYPESELECT | SYS_BOOT2_PULLUDENABLE | | | SYS_BOOT2_MUXMODE | | SYS_BOOT1_WAKEUPEVENT | SYS_BOOT1_WAKEUPENABLE | SYS_BOOT1_OFFMODEPULLTYPESELECT | SYS_BOOT1_OFFMODEPULLUDENABLE | SYS_BOOT1_OFFMODEOUTVALUE | SYS_BOOT1_OFFMODEOUTENABLE | SYS_BOOT1_OFFMODEEENABLE | SYS_BOOT1_INPUTENABLE | RESERVED | | | SYS_BOOT1_PULLTYPESELECT | SYS_BOOT1_PULLUDENABLE | | SYS_BOOT1_MUXMODE |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|--|------|-------|
| 31 | SYS_BOOT2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SYS_BOOT2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | SYS_BOOT2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sys_boot2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | SYS_BOOT2_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sys_boot2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | SYS_BOOT2_OFFMODEOUTVALUE | OffMode mode output value for pad sys_boot2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | SYS_BOOT2_OFFMODEOUTENABLE | OffMode mode output enable value for pad sys_boot2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | SYS_BOOT2_OFFMODEEENABLE | OffMode mode override control for pad sys_boot2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | SYS_BOOT2_INPUTENABLE | Input enable value for pad sys_boot2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SYS_BOOT2_PULLTYPESELECTION | pullup/down selection for pad sys_boot2 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | SYS_BOOT2_PULLUDENABLE | pullup/down enable for pad sys_boot2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | SYS_BOOT2_MUXMODE | Functional multiplexing selection for pad sys_boot2 0x0: Select sys_boot2 0x3: Select gpio_186 0x7: Select safe_mode | RW | 0x0 |
| 15 | SYS_BOOT1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SYS_BOOT1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | SYS_BOOT1_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sys_boot1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | SYS_BOOT1_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sys_boot1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | SYS_BOOT1_OFFMODEOUTVALUE | OffMode mode output value for pad sys_boot1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | SYS_BOOT1_OFFMODEOUTENABLE | OffMode mode output enable value for pad sys_boot1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | SYS_BOOT1_OFFMODEENABLE | OffMode mode override control for pad sys_boot1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | SYS_BOOT1_INPUTENABLE | Input enable value for pad sys_boot1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SYS_BOOT1_PULLTYPESELECTION | pullup/down selection for pad sys_boot1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | SYS_BOOT1_PULLUDENABLE | pullup/down enable for pad sys_boot1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | SYS_BOOT1_MUXMODE | Functional multiplexing selection for pad sys_boot1 0x0: Select sys_boot1 0x3: Select gpio_185 0x7: Select safe_mode | RW | 0x0 |

**Table 19-528. Register Call Summary for Register
CONTROL_CORE_PAD0_SYS_BOOT1_PAD1_SYS_BOOT2**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-529. CONTROL_CORE_PAD0_SYS_BOOT3_PAD1_SYS_BOOT4

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 01A8 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01A8 | | |
| Description | Register control for Pads sys_boot3 and sys_boot4 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|---------------------------|-------------------------|----------------------|----------|----|----|--------------------------|-----------------------|----|----|-------------------|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|---------------------------|-------------------------|----------------------|----------|---|---|---|--------------------------|-----------------------|---|---|-------------------|
| SYS_BOOT4_WAKEUPEVENT | SYS_BOOT4_WAKEUPENABLE | SYS_BOOT4_OFFMODEPULLTYPESELECT | SYS_BOOT4_OFFMODEPULLUDENABE | SYS_BOOT4_OFFMODEOUTVALUE | SYS_BOOT4_OFFMODEOUTENABE | SYS_BOOT4_OFFMODEEENABE | SYS_BOOT4_INPUTENABE | RESERVED | | | SYS_BOOT4_PULLTYPESELECT | SYS_BOOT4_PULLUDENABE | | | SYS_BOOT4_MUXMODE | SYS_BOOT3_WAKEUPEVENT | SYS_BOOT3_WAKEUPENABLE | SYS_BOOT3_OFFMODEPULLTYPESELECT | SYS_BOOT3_OFFMODEPULLUDENABE | SYS_BOOT3_OFFMODEOUTVALUE | SYS_BOOT3_OFFMODEOUTENABE | SYS_BOOT3_OFFMODEEENABE | SYS_BOOT3_INPUTENABE | RESERVED | | | | SYS_BOOT3_PULLTYPESELECT | SYS_BOOT3_PULLUDENABE | | | SYS_BOOT3_MUXMODE |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|---|------|-------|
| 31 | SYS_BOOT4_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SYS_BOOT4_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | SYS_BOOT4_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sys_boot4 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | SYS_BOOT4_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad sys_boot4 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | SYS_BOOT4_OFFMODEOUTVALUE | OffMode mode output value for pad sys_boot4 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | SYS_BOOT4_OFFMODEOUTENABE | OffMode mode output enable value for pad sys_boot4. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 25 | SYS_BOOT4_OFFMODEENABLE | OffMode mode override control for pad sys_boot4 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | SYS_BOOT4_INPUTENABLE | Input enable value for pad sys_boot4 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SYS_BOOT4_PULLTYPESELECT | pullup/down selection for pad sys_boot4 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | SYS_BOOT4_PULLUDENABLE | pullup/down enable for pad sys_boot4 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | SYS_BOOT4_MUXMODE | Functional multiplexing selection for pad sys_boot4 0x0: Select sys_boot4 0x3: Select gpio_188 0x7: Select safe_mode | RW | 0x0 |
| 15 | SYS_BOOT3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SYS_BOOT3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | SYS_BOOT3_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sys_boot3 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | SYS_BOOT3_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sys_boot3 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | SYS_BOOT3_OFFMODEOUTVALUE | OffMode mode output value for pad sys_boot3 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | SYS_BOOT3_OFFMODEOUTENABLE | OffMode mode output enable value for pad sys_boot3. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | SYS_BOOT3_OFFMODEENABLE | OffMode mode override control for pad sys_boot3 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | SYS_BOOT3_INPUTENABLE | Input enable value for pad sys_boot3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SYS_BOOT3_PULLTYPESELECT | pullup/down selection for pad sys_boot3 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------|
| 3 | SYS_BOOT3_PULLUDENABLE | pullup/down enable for pad sys_boot3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | SYS_BOOT3_MUXMODE | Functional multiplexing selection for pad sys_boot3 0x0: Select sys_boot3 0x3: Select gpio_187 0x7: Select safe_mode | RW | 0x0 |

**Table 19-530. Register Call Summary for Register
CONTROL_CORE_PAD0_SYS_BOOT3_PAD1_SYS_BOOT4**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-531. CONTROL_CORE_PAD0_SYS_BOOT5_PAD1_DPM_EMU0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 01AC | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01AC | | |
| Description | Register control for Pads sys_boot5 and dpm_emu0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|-----------------------|------------------|----|----|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|---|---|---|--------------------------|------------------------|-------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| DPM_EMU0_WAKEUPEVENT | DPM_EMU0_WAKEUPENABLE | DPM_EMU0_OFFMODEPULLTYPESELECT | DPM_EMU0_OFFMODEPULLUDENABLE | DPM_EMU0_OFFMODEOUTVALUE | DPM_EMU0_OFFMODEOUTENABLE | DPM_EMU0_OFFMODEEENABLE | DPM_EMU0_INPUTENABLE | RESERVED | | | DPM_EMU0_PULLTYPESELECT | DPM_EMU0_PULLUDENABLE | DPM_EMU0_MUXMODE | | | SYS_BOOT5_WAKEUPEVENT | SYS_BOOT5_WAKEUPENABLE | SYS_BOOT5_OFFMODEPULLTYPESELECT | SYS_BOOT5_OFFMODEPULLUDENABLE | SYS_BOOT5_OFFMODEOUTVALUE | SYS_BOOT5_OFFMODEOUTENABLE | SYS_BOOT5_OFFMODEEENABLE | SYS_BOOT5_INPUTENABLE | RESERVED | | | | SYS_BOOT5_PULLTYPESELECT | SYS_BOOT5_PULLUDENABLE | SYS_BOOT5_MUXMODE | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | DPM_EMU0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | DPM_EMU0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | DPM_EMU0_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu0 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|---|------|-------|
| 28 | DPM_EMU0_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu0 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | DPM_EMU0_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu0 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | DPM_EMU0_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu0. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | DPM_EMU0_OFFMODEENABLE | OffMode mode override control for pad dpm_emu0 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | DPM_EMU0_INPUTENABLE | Input enable value for pad dpm_emu0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | DPM_EMU0_PULLTYPESELECTION | pullup/down selection for pad dpm_emu0 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | DPM_EMU0_PULLUDENABLE | pullup/down enable for pad dpm_emu0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | DPM_EMU0_MUXMODE | Functional multiplexing selection for pad dpm_emu0 0x0: Select dpm_emu0 0x3: Select gpio_11 0x6: Select hw_dbg0 0x7: Select safe_mode | RW | 0x0 |
| 15 | SYS_BOOT5_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SYS_BOOT5_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | SYS_BOOT5_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad sys_boot5 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | SYS_BOOT5_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad sys_boot5 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | SYS_BOOT5_OFFMODEOUTVALUE | OffMode mode output value for pad sys_boot5 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | SYS_BOOT5_OFFMODEOUTENABLE | OffMode mode output enable value for pad sys_boot5. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|--|------|-------|
| 9 | SYS_BOOT5_OFFMODEENABLE | OffMode mode override control for pad sys_boot5 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | SYS_BOOT5_INPUTENABLE | Input enable value for pad sys_boot5 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SYS_BOOT5_PULLTYPESELECT | pullup/down selection for pad sys_boot5 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | SYS_BOOT5_PULLUDENABLE | pullup/down enable for pad sys_boot5 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | SYS_BOOT5_MUXMODE | Functional multiplexing selection for pad sys_boot5 0x0: Select sys_boot5 0x3: Select gpio_189 0x7: Select safe_mode | RW | 0x0 |

**Table 19-532. Register Call Summary for Register
CONTROL_CORE_PAD0_SYS_BOOT5_PAD1_DPM_EMU0**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)
- [Observability Signals Muxed on Pads in Core Power Domain: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[3\]](#)

Table 19-533. CONTROL_CORE_PAD0_DPM_EMU1_PAD1_DPM_EMU2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 01B0 | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | |
| Physical Address | | 0x4A10 01B0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Register control for Pads dpm_emu1 and dpm_emu2 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|------------------------|----------------------|----------|----|----|----|-------------------------|-----------------------|------------------|----|----|----|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|------------------------|----------------------|----------|---|---|---|-------------------------|-----------------------|------------------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| DPM_EMU2_WAKEUPEVENT | DPM_EMU2_WAKEUPENABLE | DPM_EMU2_OFFMODEPULLTYPESELECT | DPM_EMU2_OFFMODEPULLUDENABLE | DPM_EMU2_OFFMODEOUTVALUE | DPM_EMU2_OFFMODEOUTENABLE | DPM_EMU2_OFFMODEENABLE | DPM_EMU2_INPUTENABLE | RESERVED | | | | DPM_EMU2_PULLTYPESELECT | DPM_EMU2_PULLUDENABLE | DPM_EMU2_MUXMODE | | | | DPM_EMU1_WAKEUPEVENT | DPM_EMU1_WAKEUPENABLE | DPM_EMU1_OFFMODEPULLTYPESELECT | DPM_EMU1_OFFMODEPULLUDENABLE | DPM_EMU1_OFFMODEOUTVALUE | DPM_EMU1_OFFMODEOUTENABLE | DPM_EMU1_OFFMODEENABLE | DPM_EMU1_INPUTENABLE | RESERVED | | | | DPM_EMU1_PULLTYPESELECT | DPM_EMU1_PULLUDENABLE | DPM_EMU1_MUXMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 31 | DPM_EMU2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | DPM_EMU2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | DPM_EMU2_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu2 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | DPM_EMU2_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu2 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | DPM_EMU2_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu2 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | DPM_EMU2_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu2. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | DPM_EMU2_OFFMODEENABLE | OffMode mode override control for pad dpm_emu2 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | DPM_EMU2_INPUTENABLE | Input enable value for pad dpm_emu2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | DPM_EMU2_PULLTYPESELECTION | pullup/down selection for pad dpm_emu2 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | DPM_EMU2_PULLUDENABLE | pullup/down enable for pad dpm_emu2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | DPM_EMU2_MUXMODE | Functional multiplexing selection for pad dpm_emu2 0x0: Select dpm_emu2 0x1: Select usba0_ulpiphy_clk 0x3: Select gpio_13 0x5: Select disp2_fid 0x6: Select hw_dbg2 0x7: Select safe_mode | RW | 0x7 |
| 15 | DPM_EMU1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | DPM_EMU1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 13 | DPM_EMU1_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu1 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | DPM_EMU1_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu1 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | DPM_EMU1_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu1 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | DPM_EMU1_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu1. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | DPM_EMU1_OFFMODEENABLE | OffMode mode override control for pad dpm_emu1 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | DPM_EMU1_INPUTENABLE | Input enable value for pad dpm_emu1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPM_EMU1_PULLTYPESELECT | pullup/down selection for pad dpm_emu1 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | DPM_EMU1_PULLUDENABLE | pullup/down enable for pad dpm_emu1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | DPM_EMU1_MUXMODE | Functional multiplexing selection for pad dpm_emu1 0x0: Select dpm_emu1 0x3: Select gpio_12 0x6: Select hw_dbg1 0x7: Select safe_mode | RW | 0x0 |

**Table 19-534. Register Call Summary for Register
CONTROL_CORE_PAD0_DPM_EMU1_PAD1_DPM_EMU2**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-535. CONTROL_CORE_PAD0_DPM_EMU3_PAD1_DPM_EMU4

| | | | |
|-------------------------|--|---|--------------------------------------|
| Address Offset | | 0x0000 01B4 | |
| Physical Address | | 0x4A10 01B4 | Instance SYSCTRL_PADCONF_CORE |
| Description | | Register control for Pads dpm_emu3 and dpm_emu4 Access conditions. Read: unrestricted, Write: unrestricted | |
| Type | | RW | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|-----------------------|----|----|------------------|----|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|-------------------------|-----------------------|---|------------------|
| DPM_EMU4_WAKEUPEVENT | DPM_EMU4_WAKEUPENABLE | DPM_EMU4_OFFMODEPULLTYPESELECT | DPM_EMU4_OFFMODEPULLUDENABLE | DPM_EMU4_OFFMODEOUTVALUE | DPM_EMU4_OFFMODEOUTENABLE | DPM_EMU4_OFFMODEEENABLE | DPM_EMU4_INPUTENABLE | RESERVED | | | DPM_EMU4_PULLTYPESELECT | DPM_EMU4_PULLUDENABLE | | | DPM_EMU4_MUXMODE | | DPM_EMU3_WAKEUPEVENT | DPM_EMU3_WAKEUPENABLE | DPM_EMU3_OFFMODEPULLTYPESELECT | DPM_EMU3_OFFMODEPULLUDENABLE | DPM_EMU3_OFFMODEOUTVALUE | DPM_EMU3_OFFMODEOUTENABLE | DPM_EMU3_OFFMODEEENABLE | DPM_EMU3_INPUTENABLE | RESERVED | | | DPM_EMU3_PULLTYPESELECT | DPM_EMU3_PULLUDENABLE | | DPM_EMU3_MUXMODE |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | DPM_EMU4_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | DPM_EMU4_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | DPM_EMU4_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu4 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | DPM_EMU4_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu4 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | DPM_EMU4_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu4 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | DPM_EMU4_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu4. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | DPM_EMU4_OFFMODEEENABLE | OffMode mode override control for pad dpm_emu4 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | DPM_EMU4_INPUTENABLE | Input enable value for pad dpm_emu4 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 23:21 | RESERVED | | R | 0x0 |
| 20 | DPM_EMU4_PULLTYPESELECTION | pullup/down selection for pad dpm_emu4 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | DPM_EMU4_PULLUDENABLE | pullup/down enable for pad dpm_emu4 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | DPM_EMU4_MUXMODE | Functional multiplexing selection for pad dpm_emu4 0x0: Select dpm_emu4 0x1: Select usba0_ulpiPHY_dir 0x3: Select gpio_15 0x4: Select rfb1_data9 0x5: Select disp2_data9 0x6: Select hw_dbg4 0x7: Select safe_mode | RW | 0x7 |
| 15 | DPM_EMU3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | DPM_EMU3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | DPM_EMU3_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu3 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | DPM_EMU3_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu3 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | DPM_EMU3_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu3 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | DPM_EMU3_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu3. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | DPM_EMU3_OFFMODEENABLE | OffMode mode override control for pad dpm_emu3 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | DPM_EMU3_INPUTENABLE | Input enable value for pad dpm_emu3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPM_EMU3_PULLTYPESELECTION | pullup/down selection for pad dpm_emu3 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | DPM_EMU3_PULLUDENABLE | pullup/down enable for pad dpm_emu3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-------|
| 2:0 | DPM_EMU3_MUXMODE | Functional multiplexing selection for pad dpm_emu3 0x0: Select dpm_emu3 0x1: Select usba0_ulpiiphy_stp 0x3: Select gpio_14 0x4: Select rfb_data10 0x5: Select dispc2_data10 0x6: Select hw_dbg3 0x7: Select safe_mode | RW | 0x7 |

**Table 19-536. Register Call Summary for Register
CONTROL_CORE_PAD0_DPM_EMU3_PAD1_DPM_EMU4**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-537. CONTROL_CORE_PAD0_DPM_EMU5_PAD1_DPM_EMU6

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 01B8 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01B8 | | |
| Description | Register control for Pads dpm_emu5 and dpm_emu6 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|--------------------------|------------------------|---------------------|----------|----|----|-------------------------|----------------------|------------------|----|----|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|--------------------------|------------------------|---------------------|----------|---|---|-------------------------|----------------------|------------------|---|---|
| DPM_EMU6_WAKEUPEVENT | DPM_EMU6_WAKEUPENABLE | DPM_EMU6_OFFMODEPULLTYPESELECT | DPM_EMU6_OFFMODEPULLUDENABE | DPM_EMU6_OFFMODEOUTVALUE | DPM_EMU6_OFFMODEOUTENABE | DPM_EMU6_OFFMODEEENABE | DPM_EMU6_INPUTENABE | RESERVED | | | DPM_EMU6_PULLTYPESELECT | DPM_EMU6_PULLUDENABE | DPM_EMU6_MUXMODE | | | DPM_EMU5_WAKEUPEVENT | DPM_EMU5_WAKEUPENABLE | DPM_EMU5_OFFMODEPULLTYPESELECT | DPM_EMU5_OFFMODEPULLUDENABE | DPM_EMU5_OFFMODEOUTVALUE | DPM_EMU5_OFFMODEOUTENABE | DPM_EMU5_OFFMODEEENABE | DPM_EMU5_INPUTENABE | RESERVED | | | DPM_EMU5_PULLTYPESELECT | DPM_EMU5_PULLUDENABE | DPM_EMU5_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | DPM_EMU6_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | DPM_EMU6_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | DPM_EMU6_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu6 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 28 | DPM_EMU6_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu6 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | DPM_EMU6_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu6 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | DPM_EMU6_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu6. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | DPM_EMU6_OFFMODEENABLE | OffMode mode override control for pad dpm_emu6 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | DPM_EMU6_INPUTENABLE | Input enable value for pad dpm_emu6 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | DPM_EMU6_PULLTYPESELECTION | pullup/down selection for pad dpm_emu6 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | DPM_EMU6_PULLUDENABLE | pullup/down enable for pad dpm_emu6 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | DPM_EMU6_MUXMODE | Functional multiplexing selection for pad dpm_emu6 0x0: Select dpm_emu6 0x1: Select usba0_ulpiphy_dat0 0x2: Select uart3_tx_irtx 0x3: Select gpio_17 0x4: Select rfb_i_hsync0 0x5: Select dispc2_data17 0x6: Select hw_dbg6 0x7: Select safe_mode | RW | 0x7 |
| 15 | DPM_EMU5_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | DPM_EMU5_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | DPM_EMU5_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu5 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | DPM_EMU5_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu5 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | DPM_EMU5_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu5 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------|--|------|-------|
| 10 | DPM_EMU5_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu5. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | DPM_EMU5_OFFMODEENABLE | OffMode mode override control for pad dpm_emu5 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | DPM_EMU5_INPUTENABLE | Input enable value for pad dpm_emu5 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPM_EMU5_PULLTYPESELECTION | pullup/down selection for pad dpm_emu5 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | DPM_EMU5_PULLUDENABLE | pullup/down enable for pad dpm_emu5 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | DPM_EMU5_MUXMODE | Functional multiplexing selection for pad dpm_emu5 0x0: Select dpm_emu5 0x1: Select usba0_ulpiphy_nxt 0x3: Select gpio_16 0x4: Select rfbi_te_vsync0 0x5: Select disp2_data16 0x6: Select hw_dbg5 0x7: Select safe_mode | RW | 0x7 |

**Table 19-538. Register Call Summary for Register
CONTROL_CORE_PAD0_DPM_EMU5_PAD1_DPM_EMU6**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-539. CONTROL_CORE_PAD0_DPM_EMU7_PAD1_DPM_EMU8

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 01BC | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01BC | | |
| Description | Register control for Pads dpm_emu7 and dpm_emu8 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|----|----|-------------------------|-----------------------|------------------|----|----|----------------------|-----------------------|--------------------------------|------------------------------|--------------------------|---------------------------|-------------------------|----------------------|----------|---|---|-------------------------|-----------------------|------------------|---|---|
| DPM_EMU8_WAKEUPEVENT | DPM_EMU8_WAKEUPENABLE | DPM_EMU8_OFFMODEPULLTYPESELECT | DPM_EMU8_OFFMODEPULLUDENABE | DPM_EMU8_OFFMODEOUTVALUE | DPM_EMU8_OFFMODEOUTENABLE | DPM_EMU8_OFFMODEEENABLE | DPM_EMU8_INPUTENABLE | RESERVED | | | DPM_EMU8_PULLTYPESELECT | DPM_EMU8_PULLUDENABLE | DPM_EMU8_MUXMODE | | | DPM_EMU7_WAKEUPEVENT | DPM_EMU7_WAKEUPENABLE | DPM_EMU7_OFFMODEPULLTYPESELECT | DPM_EMU7_OFFMODEPULLUDENABLE | DPM_EMU7_OFFMODEOUTVALUE | DPM_EMU7_OFFMODEOUTENABLE | DPM_EMU7_OFFMODEEENABLE | DPM_EMU7_INPUTENABLE | RESERVED | | | DPM_EMU7_PULLTYPESELECT | DPM_EMU7_PULLUDENABLE | DPM_EMU7_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|---|------|-------|
| 31 | DPM_EMU8_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | DPM_EMU8_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | DPM_EMU8_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu8 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | DPM_EMU8_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad dpm_emu8 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | DPM_EMU8_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu8 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | DPM_EMU8_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu8. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | DPM_EMU8_OFFMODEEENABE | OffMode mode override control for pad dpm_emu8 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | DPM_EMU8_INPUTENABLE | Input enable value for pad dpm_emu8 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | DPM_EMU8_PULLTYPESELECT | pullup/down selection for pad dpm_emu8 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | DPM_EMU8_PULLUDENABE | pullup/down enable for pad dpm_emu8 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|--|------|-------|
| 18:16 | DPM_EMU8_MUXMODE | Functional multiplexing selection for pad dpm_emu8 0x0: Select dpm_emu8 0x1: Select usba0_ulpihy_dat2 0x2: Select uart3_rts_sd 0x3: Select gpio_19 0x4: Select rfbi_re 0x5: Select dispc2_pclk 0x6: Select hw_dbg8 0x7: Select safe_mode | RW | 0x7 |
| 15 | DPM_EMU7_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | DPM_EMU7_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | DPM_EMU7_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu7 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | DPM_EMU7_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu7 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | DPM_EMU7_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu7 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | DPM_EMU7_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu7. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | DPM_EMU7_OFFMODEENABLER | OffMode mode override control for pad dpm_emu7 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | DPM_EMU7_INPUTENABLE | Input enable value for pad dpm_emu7 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPM_EMU7_PULLTYPESELECT | pullup/down selection for pad dpm_emu7 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | DPM_EMU7_PULLUDENABLE | pullup/down enable for pad dpm_emu7 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------|
| 2:0 | DPM_EMU7_MUXMODE | Functional multiplexing selection for pad dpm_emu7 0x0: Select dpm_emu7 0x1: Select usba0_ulpiiphy_dat1 0x2: Select uart3_rx_irrx 0x3: Select gpio_18 0x4: Select rfbi_cs0 0x5: Select dispc2_hsync 0x6: Select hw_dbg7 0x7: Select safe_mode | RW | 0x7 |

**Table 19-540. Register Call Summary for Register
CONTROL_CORE_PAD0_DPM_EMU7_PAD1_DPM_EMU8**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-541. CONTROL_CORE_PAD0_DPM_EMU9_PAD1_DPM_EMU10

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 01C0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01C0 | | |
| Description | Register control for Pads dpm_emu9 and dpm_emu10 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|---------------------------|-------------------------|----------------------|----------|----|----|----|--------------------------|-----------------------|-------------------|----|----------------------|-----------------------|--------------------------------|-----------------------------|--------------------------|--------------------------|------------------------|---------------------|----------|---|---|---|-------------------------|----------------------|------------------|---|
| DPM_EMU10_WAKEUPEVENT | DPM_EMU10_WAKEUPENABLE | DPM_EMU10_OFFMODEPULLTYPESELECT | DPM_EMU10_OFFMODEPULLUDENABE | DPM_EMU10_OFFMODEOUTVALUE | DPM_EMU10_OFFMODEOUTENABE | DPM_EMU10_OFFMODEEENABE | DPM_EMU10_INPUTENABE | RESERVED | | | | DPM_EMU10_PULLTYPESELECT | DPM_EMU10_PULLUDENABE | DPM_EMU10_MUXMODE | | DPM_EMU9_WAKEUPEVENT | DPM_EMU9_WAKEUPENABLE | DPM_EMU9_OFFMODEPULLTYPESELECT | DPM_EMU9_OFFMODEPULLUDENABE | DPM_EMU9_OFFMODEOUTVALUE | DPM_EMU9_OFFMODEOUTENABE | DPM_EMU9_OFFMODEEENABE | DPM_EMU9_INPUTENABE | RESERVED | | | | DPM_EMU9_PULLTYPESELECT | DPM_EMU9_PULLUDENABE | DPM_EMU9_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------|
| 31 | DPM_EMU10_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | DPM_EMU10_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 29 | DPM_EMU10_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu10 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | DPM_EMU10_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu10 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | DPM_EMU10_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu10 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | DPM_EMU10_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu10. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | DPM_EMU10_OFFMODEENABLE | OffMode mode override control for pad dpm_emu10 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | DPM_EMU10_INPUTENABLE | Input enable value for pad dpm_emu10 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | DPM_EMU10_PULLTYPESELECTION | pullup/down selection for pad dpm_emu10 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | DPM_EMU10_PULLUDENABLE | pullup/down enable for pad dpm_emu10 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | DPM_EMU10_MUXMODE | Functional multiplexing selection for pad dpm_emu10 0x0: Select dpm_emu10 0x1: Select usba0_ulpiphy_dat4 0x3: Select gpio_21 0x4: Select rfb_i_a0 0x5: Select disp2_de 0x6: Select hw_dbg10 0x7: Select safe_mode | RW | 0x7 |
| 15 | DPM_EMU9_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | DPM_EMU9_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | DPM_EMU9_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu9 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | DPM_EMU9_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu9 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------|--|------|-------|
| 11 | DPM_EMU9_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu9 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | DPM_EMU9_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu9. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | DPM_EMU9_OFFMODEENABLE | OffMode mode override control for pad dpm_emu9 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | DPM_EMU9_INPUTENABLE | Input enable value for pad dpm_emu9 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPM_EMU9_PULLTYPESELECTION | pullup/down selection for pad dpm_emu9 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | DPM_EMU9_PULLUDENABLE | pullup/down enable for pad dpm_emu9 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | DPM_EMU9_MUXMODE | Functional multiplexing selection for pad dpm_emu9 0x0: Select dpm_emu9 0x1: Select usba0_ulpiphy_dat3 0x2: Select uart3_cts_rctx 0x3: Select gpio_20 0x4: Select rfbi_we 0x5: Select dispc2_vsync 0x6: Select hw_dbg9 0x7: Select safe_mode | RW | 0x7 |

**Table 19-542. Register Call Summary for Register
CONTROL_CORE_PAD0_DPM_EMU9_PAD1_DPM_EMU10**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-543. CONTROL_CORE_PAD0_DPM_EMU11_PAD1_DPM_EMU12

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 01C4 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01C4 | | |
| Description | Register control for Pads dpm_emu11 and dpm_emu12 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|----|----|--------------------------|-----------------------|-------------------|----|----|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|---|---|--------------------------|-----------------------|-------------------|---|---|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| DPM_EMU12_WAKEUPEVENT | DPM_EMU12_WAKEUPENABLE | DPM_EMU12_OFFMODEPULLTYPESELECT | DPM_EMU12_OFFMODEPULLUDENABE | DPM_EMU12_OFFMODEOUTVALUE | DPM_EMU12_OFFMODEOUTENABLE | DPM_EMU12_OFFMODEEENABLE | DPM_EMU12_INPUTENABLE | RESERVED | | | DPM_EMU12_PULLTYPESELECT | DPM_EMU12_PULLUDENABE | DPM_EMU12_MUXMODE | | | DPM_EMU11_WAKEUPEVENT | DPM_EMU11_WAKEUPENABLE | DPM_EMU11_OFFMODEPULLTYPESELECT | DPM_EMU11_OFFMODEPULLUDENABE | DPM_EMU11_OFFMODEOUTVALUE | DPM_EMU11_OFFMODEOUTENABLE | DPM_EMU11_OFFMODEEENABLE | DPM_EMU11_INPUTENABLE | RESERVED | | | DPM_EMU11_PULLTYPESELECT | DPM_EMU11_PULLUDENABE | DPM_EMU11_MUXMODE | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 31 | DPM_EMU12_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | DPM_EMU12_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | DPM_EMU12_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu12 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | DPM_EMU12_OFFMODEPULLUDENABE | OffMode mode pullup/down enable for pad dpm_emu12 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | DPM_EMU12_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu12 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | DPM_EMU12_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu12. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | DPM_EMU12_OFFMODEEENABLE | OffMode mode override control for pad dpm_emu12 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | DPM_EMU12_INPUTENABLE | Input enable value for pad dpm_emu12 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | DPM_EMU12_PULLTYPESELE CT | pullup/down selection for pad dpm_emu12 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|---|------|-------|
| 19 | DPM_EMU12_PULLUDENABLE | pullup/down enable for pad dpm_emu12 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | DPM_EMU12_MUXMODE | Functional multiplexing selection for pad dpm_emu12 0x0: Select dpm_emu12 0x1: Select usba0_ulpihy_dat6 0x3: Select gpio_23 0x4: Select rfb_data7 0x5: Select disp2_data7 0x6: Select hw_dbg12 0x7: Select safe_mode | RW | 0x7 |
| 15 | DPM_EMU11_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | DPM_EMU11_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | DPM_EMU11_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu11 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | DPM_EMU11_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu11 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | DPM_EMU11_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu11 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | DPM_EMU11_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu11. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | DPM_EMU11_OFFMODEENABLE | OffMode mode override control for pad dpm_emu11 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | DPM_EMU11_INPUTENABLE | Input enable value for pad dpm_emu11 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPM_EMU11_PULLTYPESELE CT | pullup/down selection for pad dpm_emu11 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | DPM_EMU11_PULLUDENABLE | pullup/down enable for pad dpm_emu11 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|-------|
| 2:0 | DPM_EMU11_MUXMODE | Functional multiplexing selection for pad dpm_emu11 0x0: Select dpm_emu11 0x1: Select usba0_ulpiphy_dat5 0x3: Select gpio_22 0x4: Select rfb_data8 0x5: Select disp2_data8 0x6: Select hw_dbg11 0x7: Select safe_mode | RW | 0x7 |

**Table 19-544. Register Call Summary for Register
CONTROL_CORE_PAD0_DPM_EMU11_PAD1_DPM_EMU12**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-545. CONTROL_CORE_PAD0_DPM_EMU13_PAD1_DPM_EMU14

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 01C8 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01C8 | | |
| Description | Register control for Pads dpm_emu13 and dpm_emu14 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | |
|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|---------------------------|-------------------------|----------------------|----------|----|----|--------------------------|-----------------------|-------------------|----|----|-----------------------|------------------------|---------------------------------|------------------------------|---------------------------|---------------------------|-------------------------|----------------------|----------|---|---|--------------------------|-----------------------|-------------------|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|
| DPM_EMU14_WAKEUPEVENT | DPM_EMU14_WAKEUPENABLE | DPM_EMU14_OFFMODEPULLTYPESELECT | DPM_EMU14_OFFMODEPULLUDENABE | DPM_EMU14_OFFMODEOUTVALUE | DPM_EMU14_OFFMODEOUTENABE | DPM_EMU14_OFFMODEEENABE | DPM_EMU14_INPUTENABE | RESERVED | | | DPM_EMU14_PULLTYPESELECT | DPM_EMU14_PULLUDENABE | DPM_EMU14_MUXMODE | | | DPM_EMU13_WAKEUPEVENT | DPM_EMU13_WAKEUPENABLE | DPM_EMU13_OFFMODEPULLTYPESELECT | DPM_EMU13_OFFMODEPULLUDENABE | DPM_EMU13_OFFMODEOUTVALUE | DPM_EMU13_OFFMODEOUTENABE | DPM_EMU13_OFFMODEEENABE | DPM_EMU13_INPUTENABE | RESERVED | | | DPM_EMU13_PULLTYPESELECT | DPM_EMU13_PULLUDENABE | DPM_EMU13_MUXMODE | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------|
| 31 | DPM_EMU14_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | DPM_EMU14_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 29 | DPM_EMU14_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu14 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | DPM_EMU14_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu14 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | DPM_EMU14_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu14 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | DPM_EMU14_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu14. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | DPM_EMU14_OFFMODEENABLE | OffMode mode override control for pad dpm_emu14 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | DPM_EMU14_INPUTENABLE | Input enable value for pad dpm_emu14 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | DPM_EMU14_PULLTYPESELE CT | pullup/down selection for pad dpm_emu14 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | DPM_EMU14_PULLUDENABLE | pullup/down enable for pad dpm_emu14 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | DPM_EMU14_MUXMODE | Functional multiplexing selection for pad dpm_emu14 0x0: Select dpm_emu14 0x1: Reserved 0x2: Select uart1_rx 0x3: Select gpio_25 0x4: Select rfb_data5 0x5: Select dispc2_data5 0x6: Select hw_dbg14 0x7: Select safe_mode | RW | 0x7 |
| 15 | DPM_EMU13_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | DPM_EMU13_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | DPM_EMU13_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu13 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------|--|------|-------|
| 12 | DPM_EMU13_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu13 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | DPM_EMU13_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu13 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | DPM_EMU13_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu13. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | DPM_EMU13_OFFMODEENABLE | OffMode mode override control for pad dpm_emu13 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | DPM_EMU13_INPUTENABLE | Input enable value for pad dpm_emu13 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPM_EMU13_PULLTYPESELECTION | pullup/down selection for pad dpm_emu13 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | DPM_EMU13_PULLUDENABLE | pullup/down enable for pad dpm_emu13 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | DPM_EMU13_MUXMODE | Functional multiplexing selection for pad dpm_emu13 0x0: Select dpm_emu13 0x1: Select usba0_ulpiiphy_dat7 0x3: Select gpio_24 0x4: Select rfb_data6 0x5: Select dispc2_data6 0x6: Select hw_dbg13 0x7: Select safe_mode | RW | 0x7 |

**Table 19-546. Register Call Summary for Register
CONTROL_CORE_PAD0_DPM_EMU13_PAD1_DPM_EMU14**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-547. CONTROL_CORE_PAD0_DPM_EMU15_PAD1_DPM_EMU16

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 01CC | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01CC | | |
| Description | Register control for Pads dpm_emu15 and dpm_emu16 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|-------------------------|-----------------------|----------|----|----|--------------------------|------------------------|----|----|-------------------|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|-------------------------|-----------------------|----------|---|---|--------------------------|------------------------|---|---|-------------------|
| DPM_EMU16_WAKEUPEVENT | DPM_EMU16_WAKEUPENABLE | DPM_EMU16_OFFMODEPULLTYPESELECT | DPM_EMU16_OFFMODEPULLUDENABLE | DPM_EMU16_OFFMODEOUTVALUE | DPM_EMU16_OFFMODEOUTENABLE | DPM_EMU16_OFFMODEENABLE | DPM_EMU16_INPUTENABLE | RESERVED | | | DPM_EMU16_PULLTYPESELECT | DPM_EMU16_PULLUDENABLE | | | DPM_EMU16_MUXMODE | DPM_EMU15_WAKEUPEVENT | DPM_EMU15_WAKEUPENABLE | DPM_EMU15_OFFMODEPULLTYPESELECT | DPM_EMU15_OFFMODEPULLUDENABLE | DPM_EMU15_OFFMODEOUTVALUE | DPM_EMU15_OFFMODEOUTENABLE | DPM_EMU15_OFFMODEENABLE | DPM_EMU15_INPUTENABLE | RESERVED | | | DPM_EMU15_PULLTYPESELECT | DPM_EMU15_PULLUDENABLE | | | DPM_EMU15_MUXMODE |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|--|------|-------|
| 31 | DPM_EMU16_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | DPM_EMU16_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | DPM_EMU16_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu16 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | DPM_EMU16_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu16 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | DPM_EMU16_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu16 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | DPM_EMU16_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu16. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | DPM_EMU16_OFFMODEENABLE | OffMode mode override control for pad dpm_emu16 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|---|------|-------|
| 24 | DPM_EMU16_INPUTENABLE | Input enable value for pad dpm_emu16 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | DPM_EMU16_PULLTYPESELECTION | pullup/down selection for pad dpm_emu16 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | DPM_EMU16_PULLUDENABLE | pullup/down enable for pad dpm_emu16 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | DPM_EMU16_MUXMODE | Functional multiplexing selection for pad dpm_emu16 0x0: Select dpm_emu16 0x1: Select dmtimer8_pwm_evt 0x2: Select dsi1_te0 0x3: Select gpio_27 0x4: Select rfbi_data3 0x5: Select disp2_data3 0x6: Select hw_dbg16 0x7: Select safe_mode | RW | 0x7 |
| 15 | DPM_EMU15_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | DPM_EMU15_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13 | DPM_EMU15_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu15 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | DPM_EMU15_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu15 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | DPM_EMU15_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu15 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | DPM_EMU15_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu15. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | DPM_EMU15_OFFMODEENABLE | OffMode mode override control for pad dpm_emu15 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | DPM_EMU15_INPUTENABLE | Input enable value for pad dpm_emu15 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|---|------|-------|
| 4 | DPM_EMU15_PULLTYPESELE CT | pullup/down selection for pad dpm_emu15 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | DPM_EMU15_PULLUDENABLE | pullup/down enable for pad dpm_emu15 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | DPM_EMU15_MUXMODE | Functional multiplexing selection for pad dpm_emu15 0x0: Select dpm_emu15 0x1: Reserved 0x3: Select gpio_26 0x4: Select rfb_data4 0x5: Select disp2_data4 0x6: Select hw_dbg15 0x7: Select safe_mode | RW | 0x7 |

**Table 19-548. Register Call Summary for Register
CONTROL_CORE_PAD0_DPM_EMU15_PAD1_DPM_EMU16**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-549. CONTROL_CORE_PAD0_DPM_EMU17_PAD1_DPM_EMU18

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 01D0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01D0 | | |
| Description | Register control for Pads dpm_emu17 and dpm_emu18 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------------|-------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|----|----|------------------------|------------------------|----|----|-------------------|-----------------------|------------------------|-------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|---|---|------------------------|------------------------|---|---|-------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DPM_EMU18_WAKEUPEVENT | DPM_EMU18_WAKEUPENABLE | DPM_EMU18_OFFMODEPULLTYPESELE | DPM_EMU18_OFFMODEPULLUDENABLE | DPM_EMU18_OFFMODEOUTVALUE | DPM_EMU18_OFFMODEOUTENABLE | DPM_EMU18_OFFMODEEENABLE | DPM_EMU18_INPUTENABLE | RESERVED | | | DPM_EMU18_PULLTYPESELE | DPM_EMU18_PULLUDENABLE | | | DPM_EMU18_MUXMODE | DPM_EMU17_WAKEUPEVENT | DPM_EMU17_WAKEUPENABLE | DPM_EMU17_OFFMODEPULLTYPESELE | DPM_EMU17_OFFMODEPULLUDENABLE | DPM_EMU17_OFFMODEOUTVALUE | DPM_EMU17_OFFMODEOUTENABLE | DPM_EMU17_OFFMODEEENABLE | DPM_EMU17_INPUTENABLE | RESERVED | | | DPM_EMU17_PULLTYPESELE | DPM_EMU17_PULLUDENABLE | | | DPM_EMU17_MUXMODE |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|-------|
| 31 | DPM_EMU18_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------------|--|------|-------|
| 30 | DPM_EMU18_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29 | DPM_EMU18_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu18 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 28 | DPM_EMU18_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu18 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 27 | DPM_EMU18_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu18 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 26 | DPM_EMU18_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu18. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 25 | DPM_EMU18_OFFMODEENABLE | OffMode mode override control for pad dpm_emu18 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 24 | DPM_EMU18_INPUTENABLE | Input enable value for pad dpm_emu18 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | DPM_EMU18_PULLTYPESELECT | pullup/down selection for pad dpm_emu18 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | DPM_EMU18_PULLUDENABLE | pullup/down enable for pad dpm_emu18 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | DPM_EMU18_MUXMODE | Functional multiplexing selection for pad dpm_emu18 0x0: Select dpm_emu18 0x1: Select dmtimer10_pwm_evt 0x2: Select dsi2_te0 0x3: Select gpio_190 0x4: Select rfbi_data1 0x5: Select dispc2_data1 0x6: Select hw_dbg18 0x7: Select safe_mode | RW | 0x7 |
| 15 | DPM_EMU17_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | DPM_EMU17_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|--|------|-------|
| 13 | DPM_EMU17_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu17 0x0: Offmode pulldown selected 0x1: Offmode pullup selected | RW | 0 |
| 12 | DPM_EMU17_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu17 0x0: Offmode pullup/down disabled 0x1: Offmode pullup/down enabled | RW | 0 |
| 11 | DPM_EMU17_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu17 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | DPM_EMU17_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu17. This is an active low signal 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | DPM_EMU17_OFFMODEENABLE | OffMode mode override control for pad dpm_emu17 0x0: I/O state keeps its previous state when OFF mode is active 0x1: I/O state is forced to OFF mode value when OFF mode is active | RW | 0 |
| 8 | DPM_EMU17_INPUTENABLE | Input enable value for pad dpm_emu17 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPM_EMU17_PULLTYPESELE CT | pullup/down selection for pad dpm_emu17 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | DPM_EMU17_PULLUDENABLE | pullup/down enable for pad dpm_emu17 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | DPM_EMU17_MUXMODE | Functional multiplexing selection for pad dpm_emu17 0x0: Select dpm_emu17 0x1: Select dmtimer9_pwm_evt 0x2: Select dsi1_te1 0x3: Select gpio_28 0x4: Select rfbi_data2 0x5: Select dispc2_data2 0x6: Select hw_dbg17 0x7: Select safe_mode | RW | 0x7 |

**Table 19-550. Register Call Summary for Register
CONTROL_CORE_PAD0_DPM_EMU17_PAD1_DPM_EMU18**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-551. CONTROL_CORE_PAD0_DPM_EMU19_PAD1_CSI22_DX2

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 01D4 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01D4 | | |
| Description | Register control for Pads dpm_emu19 and csi22_dx2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | |
|-----------------------|------------------------|----------|----|----|----|----|----|-----------------------|----------|----|----|----|----|----|--------------------------|------------------------|-------------------|----|----|-----------------------|------------------------|---------------------------------|-------------------------------|---------------------------|----------------------------|--------------------------|-----------------------|----------|---|---|---|--|--|--------------------------|------------------------|-------------------|--|--|
| CSI22_DX2_WAKEUPEVENT | CSI22_DX2_WAKEUPENABLE | RESERVED | | | | | | CSI22_DX2_INPUTENABLE | RESERVED | | | | | | CSI22_DX2_PULLTYPESELECT | CSI22_DX2_PULLUDENABLE | CSI22_DX2_MUXMODE | | | DPM_EMU19_WAKEUPEVENT | DPM_EMU19_WAKEUPENABLE | DPM_EMU19_OFFMODEPULLTYPESELECT | DPM_EMU19_OFFMODEPULLUDENABLE | DPM_EMU19_OFFMODEOUTVALUE | DPM_EMU19_OFFMODEOUTENABLE | DPM_EMU19_OFFMODEEENABLE | DPM_EMU19_INPUTENABLE | RESERVED | | | | | | DPM_EMU19_PULLTYPESELECT | DPM_EMU19_PULLUDENABLE | DPM_EMU19_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|-------|
| 31 | CSI22_DX2_WAKEUPEVENT | Pad_x wake-up event status latched in the I/O Read 0x1: A wake-up event occurred. Read 0x0: No wake-up event occurred. | R | 0 |
| 30 | CSI22_DX2_WAKEUPENABLE | Input pad wake-up enable (and off mode input enable value) 0x0: Wake-up detection on low level 0x1: Wake-up detection on high level | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | CSI22_DX2_INPUTENABLE | Input enable value for pad csi22_dx2 0x0: Input buffer of IO cell is disabled. 0x1: Input buffer of IO cell is enabled. | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | CSI22_DX2_PULLTYPESELECT | Pullup/down selection for pad csi22_dx2 0x0: Pulldown selected 0x1: Pullup selected | RW | 0 |
| 19 | CSI22_DX2_PULLUDENABLE | Pullup/down enable for pad csi22_dx2 0x0: Pullup/down disabled 0x1: Pullup/down enabled | RW | 1 |
| 18:16 | CSI22_DX2_MUXMODE | Functional multiplexing selection for pad csi22_dx2 0x0: Select csi22_dx2 0x2: Select cam2_fid 0x7: Select safe_mode | R | 0x7 |
| 15 | DPM_EMU19_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred. Read 0x1: A wake-up event occurred. | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|--|------|-------|
| 14 | DPM_EMU19_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: Wake-up detection is disabled. 0x1: Wake-up detection is enabled. | RW | 0 |
| 13 | DPM_EMU19_OFFMODEPULLTYPESELECT | OffMode mode pullup/down selection for pad dpm_emu19 0x0: Off mode pulldown selected 0x1: Off mode pullup selected | RW | 0 |
| 12 | DPM_EMU19_OFFMODEPULLUDENABLE | OffMode mode pullup/down enable for pad dpm_emu19 0x0: Off mode pullup/down disabled 0x1: Off mode pullup/down enabled | RW | 0 |
| 11 | DPM_EMU19_OFFMODEOUTVALUE | OffMode mode output value for pad dpm_emu19 0x0: Set value at 0 0x1: Set value at 1 | RW | 0 |
| 10 | DPM_EMU19_OFFMODEOUTENABLE | OffMode mode output enable value for pad dpm_emu19. This is an active low signal. 0x0: Output enable 0x1: Output disable | RW | 0 |
| 9 | DPM_EMU19_OFFMODEENABLER | OffMode mode override control for pad dpm_emu19 0x0: I/O state keeps its previous state when off mode is active. 0x1: I/O state is forced to off mode value when off mode is active. | RW | 0 |
| 8 | DPM_EMU19_INPUTENABLE | Input enable value for pad dpm_emu19 0x0: Input buffer of I/O cell is disabled. 0x1: Input buffer of I/O cell is enabled. | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | DPM_EMU19_PULLTYPESELECT | Pullup/down selection for pad dpm_emu19 0x0: Pulldown selected 0x1: Pullup selected | RW | 0 |
| 3 | DPM_EMU19_PULLUDENABLE | Pullup/down enable for pad dpm_emu19 0x0: Pullup/down disabled 0x1: Pullup/down enabled | RW | 1 |
| 2:0 | DPM_EMU19_MUXMODE | Functional multiplexing selection for pad dpm_emu19 0x0: Select dpm_emu19 0x1: Select dmtimer11_pwm_evt 0x2: Select dsi2_te1 0x3: Select gpio_191 0x4: Select rfbi_data0 0x5: Select dispc2_data0 0x6: Select hw_dbg19 0x7: Select safe_mode | RW | 0x7 |

**Table 19-552. Register Call Summary for Register
CONTROL_CORE_PAD0_DPM_EMU19_PAD1_CSI22_DX2**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)
- [Observability Signals Muxed on Pads in Core Power Domain: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[3\]](#)

Table 19-553. CONTROL_PADCONF_WAKEUPEVENT_0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 01D8 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01D8 | | |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------|-------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| GPMC_CLK_DUPLICATEWAKEUPEVENT | GPMC_NWP_DUPLICATEWAKEUPEVENT | GPMC_NCS3_DUPLICATEWAKEUPEVENT | GPMC_NCS2_DUPLICATEWAKEUPEVENT | GPMC_NCS1_DUPLICATEWAKEUPEVENT | GPMC_NCS0_DUPLICATEWAKEUPEVENT | GPMC_A25_DUPLICATEWAKEUPEVENT | GPMC_A24_DUPLICATEWAKEUPEVENT | GPMC_A23_DUPLICATEWAKEUPEVENT | GPMC_A22_DUPLICATEWAKEUPEVENT | GPMC_A21_DUPLICATEWAKEUPEVENT | GPMC_A20_DUPLICATEWAKEUPEVENT | GPMC_A19_DUPLICATEWAKEUPEVENT | GPMC_A18_DUPLICATEWAKEUPEVENT | GPMC_A17_DUPLICATEWAKEUPEVENT | GPMC_A16_DUPLICATEWAKEUPEVENT | GPMC_AD15_DUPLICATEWAKEUPEVENT | GPMC_AD14_DUPLICATEWAKEUPEVENT | GPMC_AD13_DUPLICATEWAKEUPEVENT | GPMC_AD12_DUPLICATEWAKEUPEVENT | GPMC_AD11_DUPLICATEWAKEUPEVENT | GPMC_AD10_DUPLICATEWAKEUPEVENT | GPMC_AD9_DUPLICATEWAKEUPEVENT | GPMC_AD8_DUPLICATEWAKEUPEVENT | GPMC_AD7_DUPLICATEWAKEUPEVENT | GPMC_AD6_DUPLICATEWAKEUPEVENT | GPMC_AD5_DUPLICATEWAKEUPEVENT | GPMC_AD4_DUPLICATEWAKEUPEVENT | GPMC_AD3_DUPLICATEWAKEUPEVENT | GPMC_AD2_DUPLICATEWAKEUPEVENT | GPMC_AD1_DUPLICATEWAKEUPEVENT | GPMC_AD0_DUPLICATEWAKEUPEVENT |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|--|------|-------|
| 31 | GPMC_CLK_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_clk Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPMC_NWP_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_nwp Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 29 | GPMC_NCS3_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ncs3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 28 | GPMC_NCS2_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ncs2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 27 | GPMC_NCS1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ncs1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 26 | GPMC_NCS0_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ncs0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 25 | GPMC_A25_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_a25 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------------|--|------|-------|
| 24 | GPMC_A24_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpmc_a24 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 23 | GPMC_A23_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpmc_a23 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 22 | GPMC_A22_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpmc_a22 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 21 | GPMC_A21_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpmc_a21 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 20 | GPMC_A20_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpmc_a20 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 19 | GPMC_A19_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpmc_a19 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 18 | GPMC_A18_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpmc_a18 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 17 | GPMC_A17_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpmc_a17 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 16 | GPMC_A16_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpmc_a16 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 15 | GPMC_AD15_DUPLICATEWAKE EUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad15 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPMC_AD14_DUPLICATEWAKE EUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad14 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 13 | GPMC_AD13_DUPLICATEWAKE EUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad13 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 12 | GPMC_AD12_DUPLICATEWAKE EUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad12 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|--|------|-------|
| 11 | GPMC_AD11_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad11 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 10 | GPMC_AD10_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad10 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 9 | GPMC_AD9_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad9 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 8 | GPMC_AD8_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad8 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 7 | GPMC_AD7_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad7 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 6 | GPMC_AD6_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad6 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 5 | GPMC_AD5_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad5 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 4 | GPMC_AD4_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad4 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 3 | GPMC_AD3_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 2 | GPMC_AD2_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 1 | GPMC_AD1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 0 | GPMC_AD0_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ad0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

Table 19-554. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_0

Control Module Functional Description

- [Wake-Up Event Detection: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[1\]](#)

Table 19-555. CONTROL_PADCONF_WAKEUPEVENT_1

| | | | |
|-------------------------|--|--|--------------------------------------|
| Address Offset | | 0x0000 01DC | |
| Physical Address | | 0x4A10 01DC | Instance SYSCTRL_PADCONF_CORE |
| Description | | Access conditions. Read: unrestricted, Write: unrestricted | |
| Type | | R | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------|----------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|---------------------------------|---------------------------------|---------------------------------|--------------------------------|------------------------------------|-------------------------------|-------------------------------|------------------------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CAM_STROBE_DUPLICATEWAKEUPEVENT | CAM_SHUTTER_DUPLICATEWAKEUPEVENT | CSI22_DY1_DUPLICATEWAKEUPEVENT | CSI22_DX1_DUPLICATEWAKEUPEVENT | CSI22_DY0_DUPLICATEWAKEUPEVENT | CSI22_DX0_DUPLICATEWAKEUPEVENT | CSI21_DY4_DUPLICATEWAKEUPEVENT | CSI21_DX4_DUPLICATEWAKEUPEVENT | CSI21_DY3_DUPLICATEWAKEUPEVENT | CSI21_DX3_DUPLICATEWAKEUPEVENT | CSI21_DY2_DUPLICATEWAKEUPEVENT | CSI21_DX2_DUPLICATEWAKEUPEVENT | CSI21_DY1_DUPLICATEWAKEUPEVENT | CSI21_DX1_DUPLICATEWAKEUPEVENT | CSI21_DY0_DUPLICATEWAKEUPEVENT | CSI21_DX0_DUPLICATEWAKEUPEVENT | GPI066_DUPLICATEWAKEUPEVENT | GPI065_DUPLICATEWAKEUPEVENT | GPI064_DUPLICATEWAKEUPEVENT | GPI063_DUPLICATEWAKEUPEVENT | GPMC_NCS7_DUPLICATEWAKEUPEVENT | GPMC_NCS6_DUPLICATEWAKEUPEVENT | GPMC_NCS5_DUPLICATEWAKEUPEVENT | GPMC_NCS4_DUPLICATEWAKEUPEVENT | GPMC_WAIT2_DUPLICATEWAKEUPEVENT | GPMC_WAIT1_DUPLICATEWAKEUPEVENT | GPMC_WAIT0_DUPLICATEWAKEUPEVENT | GPMC_NBE1_DUPLICATEWAKEUPEVENT | GPMC_NBE0_CLE_DUPLICATEWAKEUPEVENT | GPMC_NWE_DUPLICATEWAKEUPEVENT | GPMC_NOE_DUPLICATEWAKEUPEVENT | GPMC_NADV_ALE_DUPLICATEWAKEUPEVENT |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------------|--|------|-------|
| 31 | CAM_STROBE_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad cam_strobe Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | CAM_SHUTTER_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad cam_shutter Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 29 | CSI22_DY1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi22_dy1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 28 | CSI22_DX1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi22_dx1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 27 | CSI22_DY0_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi22_dy0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|--|------|-------|
| 26 | CSI22_DX0_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi22_dx0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 25 | CSI21_DY4_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi21_dy4 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 24 | CSI21_DX4_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi21_dx4 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 23 | CSI21_DY3_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi21_dy3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 22 | CSI21_DX3_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi21_dx3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 21 | CSI21_DY2_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi21_dy2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 20 | CSI21_DX2_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi21_dx2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 19 | CSI21_DY1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi21_dy1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 18 | CSI21_DX1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi21_dx1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 17 | CSI21_DY0_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi21_dy0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 16 | CSI21_DX0_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad csi21_dx0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 15 | GPIO66_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpio66 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPIO65_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpio65 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--|---|------|-------|
| 13 | GPIO64_DUPLICATEWAKEUP VENT | Wake-up event status latched in the I/O for pad gpio64 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 12 | GPIO63_DUPLICATEWAKEUP VENT | Wake-up event status latched in the I/O for pad gpio63 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 11 | GPMC_NCS7_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ncs7 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 10 | GPMC_NCS6_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ncs6 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 9 | GPMC_NCS5_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ncs5 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 8 | GPMC_NCS4_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad gpmc_ncs4 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 7 | GPMC_WAIT2_DUPLICATEWA KEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_wait2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 6 | GPMC_WAIT1_DUPLICATEWA KEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_wait1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 5 | GPMC_WAIT0_DUPLICATEWA KEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_wait0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 4 | GPMC_NBE1_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad gpmc_nbe1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 3 | GPMC_NBE0_CLE_DUPLICATE WAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_nbe0_cle Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 2 | GPMC_NWE_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad gpmc_nwe Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 1 | GPMC_NOE_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpmc_noe Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------------|--|------|-------|
| 0 | GPMC_NADV_ALE_DUPLICATE_WAKEUPEVENT | Wake-up event status latched in the I/O for pad gpmc_nadv_ale Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

Table 19-556. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_1

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-557. CONTROL_PADCONF_WAKEUPEVENT_2

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 01E0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01E0 | | |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|----------------------------------|----------------------------------|-------------------------------|-------------------------------|--|--------------------------------------|---|---|---|---|---|---|---|---|--|--|--|--|---------------------------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ABE_MCBSP1_CLKX_DUPLICATE_WAKEUPEVENT | ABE_MCBSP2_FSX_DUPLICATE_WAKEUPEVENT | ABE_MCBSP2_DX_DUPLICATE_WAKEUPEVENT | ABE_MCBSP2_DR_DUPLICATE_WAKEUPEVENT | ABE_MCBSP2_CLKX_DUPLICATE_WAKEUPEVENT | SDMMC1_DAT7_DUPLICATE_WAKEUPEVENT | SDMMC1_DAT6_DUPLICATE_WAKEUPEVENT | SDMMC1_DAT5_DUPLICATE_WAKEUPEVENT | SDMMC1_DAT4_DUPLICATE_WAKEUPEVENT | SDMMC1_DAT3_DUPLICATE_WAKEUPEVENT | SDMMC1_DAT2_DUPLICATE_WAKEUPEVENT | SDMMC1_DAT1_DUPLICATE_WAKEUPEVENT | SDMMC1_DAT0_DUPLICATE_WAKEUPEVENT | SDMMC1_CMD_DUPLICATE_WAKEUPEVENT | SDMMC1_CLK_DUPLICATE_WAKEUPEVENT | GPIO_99_DUPLICATE_WAKEUPEVENT | GPIO_98_DUPLICATE_WAKEUPEVENT | USB1_HSIC_STROBE_DUPLICATE_WAKEUPEVENT | USB1_HSIC_DATA_DUPLICATE_WAKEUPEVENT | USB1_ULPITLL_DAT7_DUPLICATE_WAKEUPEVENT | USB1_ULPITLL_DAT6_DUPLICATE_WAKEUPEVENT | USB1_ULPITLL_DAT5_DUPLICATE_WAKEUPEVENT | USB1_ULPITLL_DAT4_DUPLICATE_WAKEUPEVENT | USB1_ULPITLL_DAT3_DUPLICATE_WAKEUPEVENT | USB1_ULPITLL_DAT2_DUPLICATE_WAKEUPEVENT | USB1_ULPITLL_DAT1_DUPLICATE_WAKEUPEVENT | USB1_ULPITLL_DAT0_DUPLICATE_WAKEUPEVENT | USB1_ULPITLL_NXT_DUPLICATE_WAKEUPEVENT | USB1_ULPITLL_DIR_DUPLICATE_WAKEUPEVENT | USB1_ULPITLL_STP_DUPLICATE_WAKEUPEVENT | USB1_ULPITLL_CLK_DUPLICATE_WAKEUPEVENT | CAM_GLOBALRESET_DUPLICATE_WAKEUPEVENT |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------------|---|------|-------|
| 31 | ABE_MCBSP1_CLKX_DUPLICATE_WAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_mcbbsp1_clkx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | ABE_MCBSP2_FSX_DUPLICATE_WAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_mcbbsp2_fsx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 29 | ABE_MCBSP2_DX_DUPLICATE_WAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_mcbbsp2_dx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 28 | ABE_MCBSP2_DR_DUPLICATE_WAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_mcbbsp2_dr Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------------|---|------|-------|
| 27 | ABE_MCBSP2_CLKX_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_mcbbsp2_clkx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 26 | SDMMC1_DAT7_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc1_dat7 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 25 | SDMMC1_DAT6_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc1_dat6 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 24 | SDMMC1_DAT5_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc1_dat5 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 23 | SDMMC1_DAT4_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc1_dat4 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 22 | SDMMC1_DAT3_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc1_dat3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 21 | SDMMC1_DAT2_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc1_dat2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 20 | SDMMC1_DAT1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc1_dat1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 19 | SDMMC1_DAT0_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc1_dat0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 18 | SDMMC1_CMD_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc1_cmd Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 17 | SDMMC1_CLK_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc1_clk Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 16 | GPIO_99_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpio_99 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 15 | GPIO_98_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpio_98 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--|---|------|-------|
| 14 | USBB1_HSIC_STROBE_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_hsic_strobe Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 13 | USBB1_HSIC_DATA_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_hsic_data Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 12 | USBB1_ULPITLL_DAT7_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_ulpitll_dat7 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 11 | USBB1_ULPITLL_DAT6_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_ulpitll_dat6 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 10 | USBB1_ULPITLL_DAT5_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_ulpitll_dat5 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 9 | USBB1_ULPITLL_DAT4_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_ulpitll_dat4 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 8 | USBB1_ULPITLL_DAT3_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_ulpitll_dat3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 7 | USBB1_ULPITLL_DAT2_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_ulpitll_dat2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 6 | USBB1_ULPITLL_DAT1_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_ulpitll_dat1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 5 | USBB1_ULPITLL_DAT0_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_ulpitll_dat0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 4 | USBB1_ULPITLL_NXT_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_ulpitll_nxt Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 3 | USBB1_ULPITLL_DIR_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_ulpitll_dir Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 2 | USBB1_ULPITLL_STP_DUPLICATEDWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_ulpitll_stp Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--|---|------|-------|
| 1 | USBB1_ULPITLL_CLK_DUPLIC ATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb1_ulpitll_clk Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 0 | CAM_GLOBALRESET_DUPLIC ATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad cam_globalreset Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

Table 19-558. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_2

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-559. CONTROL_PADCONF_WAKEUPEVENT_3

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 01E4 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A10 01E4 | | | | | | | | | | | | | | | | Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------|----|---------------------------------|----|---------------------------------|----|---------------------------------|----|----------------------------------|----|----------------------------------|----|---------------------------------|----|-------------------------------|----|-------------------------------|----|-------------------------------|----|-------------------------------|----|-------------------------------|---|-------------------------------|---|-------------------------------|---|-------------------------------|---|------------------------------|---|-------------------------------|--|-------------------------------|--|--------------------------------|--|--------------------------------|--|------------------------------------|--|------------------------------------|--|------------------------------------|--|------------------------------------|--|-------------------------------|--|-------------------------------------|--|------------------------------------|--|--------------------------------------|--|--------------------------------------|--|-------------------------------------|--|------------------------------------|--|------------------------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MCSP11_CS3_DUPLICATEWAKEUPEVENT | | MCSP11_CS2_DUPLICATEWAKEUPEVENT | | MCSP11_CS1_DUPLICATEWAKEUPEVENT | | MCSP11_CS0_DUPLICATEWAKEUPEVENT | | MCSP11_SIMO_DUPLICATEWAKEUPEVENT | | MCSP11_SOMI_DUPLICATEWAKEUPEVENT | | MCSP11_CLK_DUPLICATEWAKEUPEVENT | | I2C4_SDA_DUPLICATEWAKEUPEVENT | | I2C4_SCL_DUPLICATEWAKEUPEVENT | | I2C3_SDA_DUPLICATEWAKEUPEVENT | | I2C3_SCL_DUPLICATEWAKEUPEVENT | | I2C2_SDA_DUPLICATEWAKEUPEVENT | | I2C2_SCL_DUPLICATEWAKEUPEVENT | | I2C1_SDA_DUPLICATEWAKEUPEVENT | | I2C1_SCL_DUPLICATEWAKEUPEVENT | | HDQ_SIO_DUPLICATEWAKEUPEVENT | | UART2_TX_DUPLICATEWAKEUPEVENT | | UART2_RX_DUPLICATEWAKEUPEVENT | | UART2_RTS_DUPLICATEWAKEUPEVENT | | UART2_CTS_DUPLICATEWAKEUPEVENT | | ABE_DMIC_DIN3_DUPLICATEWAKEUPEVENT | | ABE_DMIC_DIN2_DUPLICATEWAKEUPEVENT | | ABE_DMIC_DIN1_DUPLICATEWAKEUPEVENT | | ABE_DMIC_CLK1_DUPLICATEWAKEUPEVENT | | ABE_CLKS_DUPLICATEWAKEUPEVENT | | ABE_PDM_LB_CLK_DUPLICATEWAKEUPEVENT | | ABE_PDM_FRAME_DUPLICATEWAKEUPEVENT | | ABE_PDM_DL_DATA_DUPLICATEWAKEUPEVENT | | ABE_PDM_UL_DATA_DUPLICATEWAKEUPEVENT | | ABE_MCBSP1_FSX_DUPLICATEWAKEUPEVENT | | ABE_MCBSP1_DX_DUPLICATEWAKEUPEVENT | | ABE_MCBSP1_DR_DUPLICATEWAKEUPEVENT | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------------|--|------|-------|
| 31 | MCSP11_CS3_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad mcspi1_cs3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | MCSP11_CS2_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad mcspi1_cs2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 29 | MCSP11_CS1_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad mcspi1_cs1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------------|--|------|-------|
| 28 | MCSP11_CS0_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad mcspi1_cs0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 27 | MCSP11_SIMO_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad mcspi1_simo Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 26 | MCSP11_SOMI_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad mcspi1_somi Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 25 | MCSP11_CLK_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad mcspi1_clk Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 24 | I2C4_SDA_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad i2c4_sda Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 23 | I2C4_SCL_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad i2c4_scl Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 22 | I2C3_SDA_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad i2c3_sda Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 21 | I2C3_SCL_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad i2c3_scl Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 20 | I2C2_SDA_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad i2c2_sda Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 19 | I2C2_SCL_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad i2c2_scl Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 18 | I2C1_SDA_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad i2c1_sda Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 17 | I2C1_SCL_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad i2c1_scl Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 16 | HDQ_SIO_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad hdq_sio Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 15 | UART2_TX_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad uart2_tx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | UART2_RX_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad uart2_rx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--|--|------|-------|
| 13 | UART2_RTS_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad uart2_rts Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 12 | UART2_CTS_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad uart2_cts Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 11 | ABE_DMIC_DIN3_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_dmic_din3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 10 | ABE_DMIC_DIN2_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_dmic_din2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 9 | ABE_DMIC_DIN1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_dmic_din1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 8 | ABE_DMIC_CLK1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_dmic_clk1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 7 | ABE_CLKS_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_clks Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 6 | ABE_PDM_LB_CLK_DUPLICAT EWAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_pdm_lb_clk Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 5 | ABE_PDM_FRAME_DUPLICAT EWAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_pdm_frame Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 4 | ABE_PDM_DL_DATA_DUPLICA TEWAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_pdm_dl_data Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 3 | ABE_PDM_UL_DATA_DUPLICA TEWAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_pdm_ul_data Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 2 | ABE_MCBSP1_FSX_DUPLICAT EWAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_mcbbsp1_fsx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 1 | ABE_MCBSP1_DX_DUPLICATE WAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_mcbbsp1_dx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------------|---|------|-------|
| 0 | ABE_MCBSP1_DR_DUPLICATE_WAKEUPEVENT | Wake-up event status latched in the I/O for pad abe_mcbbsp1_dr Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

Table 19-560. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_3

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-561. CONTROL_PADCONF_WAKEUPEVENT_4

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 01E8 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01E8 | | |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------|-------------------------------|--|--------------------------------------|---|---|---|---|---|---|---|---|--|--|--|--|-------------------------------|-------------------------------|---------------------------------|----------------------------------|----------------------------------|---------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|---------------------------------|---------------------------------|------------------------------------|------------------------------------|-----------------------------------|-------------------------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| KPD_COL4_DUPLICATEWAKEUPEVENT | KPD_COL3_DUPLICATEWAKEUPEVENT | USBB2_HSIC_STROBE_DUPLICATEWAKEUPEVENT | USBB2_HSIC_DATA_DUPLICATEWAKEUPEVENT | USBB2_ULPITLL_DAT7_DUPLICATEWAKEUPEVENT | USBB2_ULPITLL_DAT6_DUPLICATEWAKEUPEVENT | USBB2_ULPITLL_DAT5_DUPLICATEWAKEUPEVENT | USBB2_ULPITLL_DAT4_DUPLICATEWAKEUPEVENT | USBB2_ULPITLL_DAT3_DUPLICATEWAKEUPEVENT | USBB2_ULPITLL_DAT2_DUPLICATEWAKEUPEVENT | USBB2_ULPITLL_DAT1_DUPLICATEWAKEUPEVENT | USBB2_ULPITLL_DAT0_DUPLICATEWAKEUPEVENT | USBB2_ULPITLL_NXT_DUPLICATEWAKEUPEVENT | USBB2_ULPITLL_DIR_DUPLICATEWAKEUPEVENT | USBB2_ULPITLL_STP_DUPLICATEWAKEUPEVENT | USBB2_ULPITLL_CLK_DUPLICATEWAKEUPEVENT | UART4_TX_DUPLICATEWAKEUPEVENT | UART4_RX_DUPLICATEWAKEUPEVENT | MCSP14_CS0_DUPLICATEWAKEUPEVENT | MCSP14_SOMI_DUPLICATEWAKEUPEVENT | MCSP14_SIMO_DUPLICATEWAKEUPEVENT | MCSP14_CLK_DUPLICATEWAKEUPEVENT | SDMMC5_DAT3_DUPLICATEWAKEUPEVENT | SDMMC5_DAT2_DUPLICATEWAKEUPEVENT | SDMMC5_DAT1_DUPLICATEWAKEUPEVENT | SDMMC5_DAT0_DUPLICATEWAKEUPEVENT | SDMMC5_CMD_DUPLICATEWAKEUPEVENT | SDMMC5_CLK_DUPLICATEWAKEUPEVENT | UART3_TX_IRTX_DUPLICATEWAKEUPEVENT | UART3_RX_IRRX_DUPLICATEWAKEUPEVENT | UART3_RTS_SD_DUPLICATEWAKEUPEVENT | UART3_CTS_RCTX_DUPLICATEWAKEUPEVENT |

| Bits | Field Name | Description | Type | Reset |
|------|--|--|------|-------|
| 31 | KPD_COL4_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad kpd_col4 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | KPD_COL3_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad kpd_col3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 29 | USBB2_HSIC_STROBE_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_hsic_strobe Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 28 | USBB2_HSIC_DATA_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_hsic_data Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---|---|------|-------|
| 27 | USBB2_ULPITLL_DAT7_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_ulpitll_dat7 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 26 | USBB2_ULPITLL_DAT6_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_ulpitll_dat6 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 25 | USBB2_ULPITLL_DAT5_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_ulpitll_dat5 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 24 | USBB2_ULPITLL_DAT4_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_ulpitll_dat4 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 23 | USBB2_ULPITLL_DAT3_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_ulpitll_dat3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 22 | USBB2_ULPITLL_DAT2_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_ulpitll_dat2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 21 | USBB2_ULPITLL_DAT1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_ulpitll_dat1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 20 | USBB2_ULPITLL_DAT0_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_ulpitll_dat0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 19 | USBB2_ULPITLL_NXT_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_ulpitll_nxt Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 18 | USBB2_ULPITLL_DIR_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_ulpitll_dir Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 17 | USBB2_ULPITLL_STP_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_ulpitll_stp Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 16 | USBB2_ULPITLL_CLK_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usbb2_ulpitll_clk Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 15 | UART4_TX_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad uart4_tx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--|--|------|-------|
| 14 | UART4_RX_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad uart4_rx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 13 | MCSPi4_CS0_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad mcspi4_cs0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 12 | MCSPi4_SOMI_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad mcspi4_somi Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 11 | MCSPi4_SIMO_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad mcspi4_simo Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 10 | MCSPi4_CLK_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad mcspi4_clk Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 9 | SDMMC5_DAT3_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc5_dat3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 8 | SDMMC5_DAT2_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc5_dat2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 7 | SDMMC5_DAT1_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc5_dat1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 6 | SDMMC5_DAT0_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc5_dat0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 5 | SDMMC5_CMD_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc5_cmd Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 4 | SDMMC5_CLK_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sdmmc5_clk Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 3 | UART3_TX_IRTX_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad uart3_tx_irtx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 2 | UART3_RX_IRRX_ DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad uart3_rx_irrx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------------|--|------|-------|
| 1 | UART3_RTS_SD_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad uart3_rts_sd Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 0 | UART3_CTS_RCTX_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad uart3_cts_rctx Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

Table 19-562. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_4

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-563. CONTROL_PADCONF_WAKEUPEVENT_5

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------|----|--|----|-------------------------------|----|-------------------------------|----|-------------------------------|----|-------------------------------|----|-------------------------------|----|-------------------------------|----|-------------------------------|----|-------------------------------|----|-------------------------------|----|--------------------------------|---|--------------------------------|---|--------------------------------|---|--------------------------------|---|--------------------------------|---|--------------------------------|--|--------------------------------|--|--------------------------------|--|------------------------------------|--|------------------------------------|--|-----------------------------------|--|-------------------------------|--|-------------------------------|--|-------------------------------|--|-------------------------------|--|-------------------------------|--|-------------------------------|--|-------------------------------|--|-------------------------------|--|-------------------------------|--|-------------------------------|--|
| Address Offset | | 0x0000 01EC | | | | | | | | | | | | | | | | Instance | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A10 01EC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DPM_EMU10_DUPLICATEWAKEUPEVENT | | DPM_EMU9_DUPLICATEWAKEUPEVENT | | DPM_EMU8_DUPLICATEWAKEUPEVENT | | DPM_EMU7_DUPLICATEWAKEUPEVENT | | DPM_EMU6_DUPLICATEWAKEUPEVENT | | DPM_EMU5_DUPLICATEWAKEUPEVENT | | DPM_EMU4_DUPLICATEWAKEUPEVENT | | DPM_EMU3_DUPLICATEWAKEUPEVENT | | DPM_EMU2_DUPLICATEWAKEUPEVENT | | DPM_EMU1_DUPLICATEWAKEUPEVENT | | DPM_EMU0_DUPLICATEWAKEUPEVENT | | SYS_BOOT5_DUPLICATEWAKEUPEVENT | | SYS_BOOT4_DUPLICATEWAKEUPEVENT | | SYS_BOOT3_DUPLICATEWAKEUPEVENT | | SYS_BOOT2_DUPLICATEWAKEUPEVENT | | SYS_BOOT1_DUPLICATEWAKEUPEVENT | | SYS_BOOT0_DUPLICATEWAKEUPEVENT | | SYS_NIRQ2_DUPLICATEWAKEUPEVENT | | SYS_NIRQ1_DUPLICATEWAKEUPEVENT | | FREF_CLK2_OUT_DUPLICATEWAKEUPEVENT | | FREF_CLK1_OUT_DUPLICATEWAKEUPEVENT | | USBA0_OTG_DP_DUPLICATEWAKEUPEVENT | | KPD_ROW2_DUPLICATEWAKEUPEVENT | | KPD_ROW1_DUPLICATEWAKEUPEVENT | | KPD_ROW0_DUPLICATEWAKEUPEVENT | | KPD_ROW5_DUPLICATEWAKEUPEVENT | | KPD_ROW4_DUPLICATEWAKEUPEVENT | | KPD_ROW3_DUPLICATEWAKEUPEVENT | | KPD_COL2_DUPLICATEWAKEUPEVENT | | KPD_COL1_DUPLICATEWAKEUPEVENT | | KPD_COL0_DUPLICATEWAKEUPEVENT | | KPD_COL5_DUPLICATEWAKEUPEVENT | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 31 | DPM_EMU10_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad dpm_emu10 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | DPM_EMU9_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad dpm_emu9 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 29 | DPM_EMU8_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad dpm_emu8 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------------|---|------|-------|
| 28 | DPM_EMU7_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad dpm_emu7 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 27 | DPM_EMU6_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad dpm_emu6 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 26 | DPM_EMU5_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad dpm_emu5 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 25 | DPM_EMU4_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad dpm_emu4 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 24 | DPM_EMU3_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad dpm_emu3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 23 | DPM_EMU2_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad dpm_emu2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 22 | DPM_EMU1_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad dpm_emu1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 21 | DPM_EMU0_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad dpm_emu0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 20 | SYS_BOOT5_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad sys_boot5 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 19 | SYS_BOOT4_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad sys_boot4 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 18 | SYS_BOOT3_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad sys_boot3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 17 | SYS_BOOT2_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad sys_boot2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 16 | SYS_BOOT1_DUPLICATEWAK EUPEVENT | Wake-up event status latched in the I/O for pad sys_boot1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------------|--|------|-------|
| 15 | SYS_BOOT0_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sys_boot0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SYS_NIRQ2_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sys_nirq2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 13 | SYS_NIRQ1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sys_nirq1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 12 | FREF_CLK2_OUT_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad fref_clk2_out Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 11 | FREF_CLK1_OUT_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad fref_clk1_out Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 10 | USBA0_OTG_DP_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad usba0_otg_dp Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 9 | KPD_ROW2_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad kpd_row2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 8 | KPD_ROW1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad kpd_row1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 7 | KPD_ROW0_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad kpd_row0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 6 | KPD_ROW5_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad kpd_row5 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 5 | KPD_ROW4_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad kpd_row4 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 4 | KPD_ROW3_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad kpd_row3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 3 | KPD_COL2_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad kpd_col2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 2 | KPD_COL1_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad kpd_col1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 1 | KPD_COL0_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad kpd_col0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 0 | KPD_COL5_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad kpd_col5 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

Table 19-564. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_5

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-565. CONTROL_PADCONF_WAKEUPEVENT_6

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 01F0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01F0 | | |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------------|----|--------------------------------|----|--------------------------------|----|--------------------------------|---|--------------------------------|---|--------------------------------|---|--------------------------------|---|--------------------------------|---|--------------------------------|--|--------------------------------|--|--------------------------------|--|
| RESERVED | | | | | | | | | | | | | | | | CSI22_DY2_DUPLICATEWAKEUPEVENT | | CSI22_DX2_DUPLICATEWAKEUPEVENT | | DPM_EMU19_DUPLICATEWAKEUPEVENT | | DPM_EMU18_DUPLICATEWAKEUPEVENT | | DPM_EMU17_DUPLICATEWAKEUPEVENT | | DPM_EMU16_DUPLICATEWAKEUPEVENT | | DPM_EMU15_DUPLICATEWAKEUPEVENT | | DPM_EMU14_DUPLICATEWAKEUPEVENT | | DPM_EMU13_DUPLICATEWAKEUPEVENT | | DPM_EMU12_DUPLICATEWAKEUPEVENT | | DPM_EMU11_DUPLICATEWAKEUPEVENT | |

| Bits | Field Name | Description | Type | Reset |
|--------|---------------------------------|---|------|-----------|
| 31: 11 | RESERVED | | R | 0x0000000 |
| 10 | CSI22_DY2_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the IO for pad csi22_dy2 Read 0x1: A wakeup event occurred Read 0x0: No wakeup event occurred | R | 0 |
| 9 | CSI22_DX2_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the IO for pad csi22_dx2 Read 0x1: A wakeup event occurred Read 0x0: No wakeup event occurred | R | 0 |
| 8 | DPM_EMU19_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the IO for pad dpm_emu19 Read 0x1: A wakeup event occurred Read 0x0: No wakeup event occurred | R | 0x0000000 |
| 7 | DPM_EMU18_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the IO for pad dpm_emu18 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|--|------|-------|
| 6 | DPM_EMU17_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad dpm_emu17 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 5 | DPM_EMU16_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad dpm_emu16 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 4 | DPM_EMU15_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad dpm_emu15 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 3 | DPM_EMU14_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad dpm_emu14 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 2 | DPM_EMU13_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad dpm_emu13 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 1 | DPM_EMU12_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad dpm_emu12 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 0 | DPM_EMU11_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad dpm_emu11 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

Table 19-566. Register Call Summary for Register CONTROL_PADCONF_WAKEUPEVENT_6

Control Module Functional Description

- [Wake-Up Event Detection: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[1\]](#)

Table 19-567. CONTROL_CORE_PAD0_CSI22_DY2

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 01F4 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 01F4 | | |
| Description | Register control for Pad csi22_dy2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------------|----|------------------------|----|----------|----|---|---|---|-----------------------|---|----------|---|---|--------------------------|---|------------------------|--|-------------------|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
| RESERVED | | | | | | | | | | | | | | | | CSI22_DY2_WAKEUPEVENT | | CSI22_DY2_WAKEUPENABLE | | RESERVED | | | | | CSI22_DY2_INPUTENABLE | | RESERVED | | | CSI22_DY2_PULLTYPESELECT | | CSI22_DY2_PULLUDENABLE | | CSI22_DY2_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15 | CSI22_DY2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x1: A wake-up event occurred Read 0x0: No wake-up event occurred | R | 0 |
| 14 | CSI22_DY2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection on low level 0x1: wake-up detection on high level | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | CSI22_DY2_INPUTENABLE | Input enable value for pad csi22_dy2 0x0: Input buffer of IO cell is disabled 0x1: Input buffer of IO cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | CSI22_DY2_PULLTYPESELECT | Pull-Up/Down selection for pad csi22_dy2 0x0: Pull-Down selected 0x1: Pull-Up selected | RW | 0 |
| 3 | CSI22_DY2_PULLUDENABLE | Pull-Up/Down enable for pad csi22_dy2 0x0: Pull-Up/Down disabled 0x1: Pull-Up/Down enabled | RW | 1 |
| 2:0 | CSI22_DY2_MUXMODE | Functional multiplexing selection for pad csi22_dy2 0x0: Select csi22_dy2 0x2: Select cam2_wen 0x7: Select safe_mode | RW | 0x7 |

Table 19-568. Register Call Summary for Register CONTROL_CORE_PAD0_CSI22_DY2

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[1\]](#)

Table 19-569. CONTROL_PADCONF_GLOBAL

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 05A0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 05A0 | | |
| Description | Global PAD control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| FORCE_OFFMODE_EN | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------------|
| 31 | FORCE_OFFMODE_EN | Force offmode enable for PADS 0x0: Offmode is not forced active 0x1: Offmode is forced active | RW | 0 |
| 30:0 | RESERVED | | R | 0x0000 0000 |

Table 19-570. Register Call Summary for Register CONTROL_PADCONF_GLOBAL

Control Module Functional Description

- [Device Core Control Module Instance: \[0\]](#)
- [Off Mode Pad Control Overview: \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-571. CONTROL_CORE_PADCONF_MODE

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 05A4 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 05A4 | | |
| Description | PAD Voltage Mode control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | |
|---------------|---------------|---------------|---------------|---------------|---------------|-------------|-------------|---------------|----------------|---------------|---------------|-----------------------|----------|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|--|
| VDDS_DV_BANK0 | VDDS_DV_BANK1 | VDDS_DV_BANK3 | VDDS_DV_BANK4 | VDDS_DV_BANK5 | VDDS_DV_BANK6 | VDDS_DV_C2C | VDDS_DV_CAM | VDDS_DV_GPMC0 | VDDS_DV_SDMMC2 | VDDS_DV_BANK7 | VDDS_DV_GPMC1 | VDDS_DV_BANK2_SHARED0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|----------|
| 31 | VDDS_DV_BANK0 | PAD Voltage level control for vdds_dv_bank0 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 30 | VDDS_DV_BANK1 | PAD Voltage level control for vdds_dv_bank1 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 29 | VDDS_DV_BANK3 | PAD Voltage level control for vdds_dv_bank3 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 28 | VDDS_DV_BANK4 | PAD Voltage level control for vdds_dv_bank4 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 27 | VDDS_DV_BANK5 | PAD Voltage level control for vdds_dv_bank5 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 26 | VDDS_DV_BANK6 | PAD Voltage level control for vdds_dv_bank6 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 25 | VDDS_DV_C2C | PAD Voltage level control for vdds_dv_c2c 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 24 | VDDS_DV_CAM | PAD Voltage level control for vdds_dv_cam 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 23 | VDDS_DV_GPMC0 | PAD Voltage level control for vdds_dv_gpmc0 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 22 | VDDS_DV_SDMMC2 | PAD Voltage level control for vdds_dv_sdmmc2 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 21 | VDDS_DV_BANK7 | PAD Voltage level control for vdds_dv_bank7 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 20 | VDDS_DV_GPMC1 | PAD Voltage level control for vdds_dv_gpmc1 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 19 | VDDS_DV_BANK2_SHARED0 | PAD Voltage level control for vdds_dv_bank2_shared0 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 18:0 | RESERVED | | R | 0x000000 |

Table 19-572. Register Call Summary for Register CONTROL_CORE_PADCONF_MODE

Control Module Functional Description

- [C2CI/O Cells With Load Setting Adjustable According to Interface Requirement Voltage Mode: \[0\]](#)
- [Dual Voltage-Supplied Peripheral Controls: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)

Control Module Programming Guide

- [Pad Configuration Programming Points: \[15\] \[16\] \[17\] \[18\] \[19\] \[20\]](#)

Table 19-572. Register Call Summary for Register CONTROL_CORE_PADCONF_MODE (continued)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[21\]](#)

Table 19-573. CONTROL_SMART1IO_PADCONF_0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 05A8 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 05A8 | | |
| Description | SMART1 I/O control 0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------|----|------------|----|----------|----|----|----|-------------|----|-------------|----|----------|----|-------------|----|----------|----|-------------------|----|---------------|----|--------------|---|--------------|---|--------------|---|----------|---|---|---|
| ABE_DR0_SC | | CAM_DR0_SC | | RESERVED | | | | GPIO_DR8_SC | | GPIO_DR9_SC | | RESERVED | | GPMC_DR3_SC | | RESERVED | | GPIO_63_64_DR0_SC | | MCSP11_DR0_SC | | UART1_DR0_SC | | UART3_DR0_SC | | UART3_DR1_SC | | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:30 | ABE_DR0_SC | Slew rate control for group abe_dr0. Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 29:28 | CAM_DR0_SC | Slew rate control for group cam_dr0. Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 27:24 | RESERVED | Reserved | RW | 0x0 |
| 23:22 | GPIO_DR8_SC | Slew rate control for group gpio_dr8. Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 21:20 | GPIO_DR9_SC | Slew rate control for group gpio_dr9. Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 19:18 | RESERVED | Reserved | RW | 0x0 |
| 17:16 | GPMC_DR3_SC | Slew rate control for group gpmc_dr3. Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x1 |
| 15:14 | RESERVED | Reserved | RW | 0x0 |
| 13:12 | GPIO_63_64_DR0_SC | Slew rate control for group gpio_63_64_dr0. Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|-------|
| 11:10 | MCSP1_DR0_SC | Slew rate control for group mcspi1_dr0 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 9:8 | UART1_DR0_SC | Slew rate control for group uart1_dr0 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 7:6 | UART3_DR0_SC | Slew rate control for group uart3_dr0 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 5:4 | UART3_DR1_SC | Slew rate control for group uart3_dr1 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 3:0 | RESERVED | Reserved | RW | 0x0 |

Table 19-574. Register Call Summary for Register CONTROL_SMART1IO_PADCONF_0

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[11\]](#)

Table 19-575. CONTROL_SMART1IO_PADCONF_1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 05AC | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 05AC | | |
| Description | SMART1 I/O control 1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------|----|------------|----|----------|----|----|----|-------------|----|-------------|----|----------|----|-------------|----|----------|----|-------------------|----|--------------|----|--------------|---|--------------|---|--------------|---|----------|---|---|---|
| ABE_DR0_LB | | CAM_DR0_LB | | RESERVED | | | | GPIO_DR8_LB | | GPIO_DR9_LB | | RESERVED | | GPMC_DR3_LB | | RESERVED | | GPIO_63_64_DR0_LB | | MCSP1_DR0_LB | | UART1_DR0_LB | | UART3_DR0_LB | | UART3_DR1_LB | | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:30 | ABE_DR0_LB | Load control for group abe_dr0 0x0: TL Length= [2cm-20cm] / Far-end ⁽¹⁾ cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Far-end cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Far-end cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Far-end cap per TL= [10pF-20pF] | RW | 0x0 |

⁽¹⁾ Far-end load is equivalent to CLoad, where CLoad is the total capacitance seen at the far end of the transmission line.

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 29:28 | CAM_DR0_LB | Load control for group cam_dr0 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 27:24 | RESERVED | Reserved | RW | 0x0 |
| 23:22 | GPIO_DR8_LB | Load control for group gpio_dr8 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 21:20 | GPIO_DR9_LB | Load control for group gpio_dr9 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 19:18 | RESERVED | Reserved | RW | 0x0 |
| 17:16 | GPMC_DR3_LB | Load control for group gpmc_dr3 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 15:14 | RESERVED | Reserved | RW | 0x0 |
| 13:12 | GPIO_63_64_DR0_LB | Load control for group gpio_63_64_dr0 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 11:10 | MCSP1_DR0_LB | Load control for group mcspi1_dr0 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------|
| 9:8 | UART1_DR0_LB | Load control for group uart1_dr0 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 7:6 | UART3_DR0_LB | Load control for group uart3_dr0 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 5:4 | UART3_DR1_LB | Load control for group uart3_dr1 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 3:0 | RESERVED | Reserved | RW | 0x0 |

Table 19-576. Register Call Summary for Register CONTROL_SMART1IO_PADCONF_1

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[11\]](#)

Table 19-577. CONTROL_SMART2IO_PADCONF_0

| | | | | | | | | | | | | | | | | | |
|--|--|--|-------------|--|--|--|--|--|----------|----------------------|--|--|------|-------|--|--|--|
| Address Offset | 0x0000 05B0 | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 05B0 | | | | | | | | Instance | SYSCTRL_PADCONF_CORE | | | | | | | |
| Description | SMART2 I/O control 0 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | |
| <div><div><div>3130292827262524</div><div>2322212019181716</div><div>15141312111098</div><div>76543210</div></div></div> | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | Type | Reset | | | |
| 31:0 | RESERVED | | | | | | | | | | | | RW | 0 | | | |

Table 19-578. Register Call Summary for Register CONTROL_SMART2IO_PADCONF_0

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[1\]](#)

Table 19-579. CONTROL_SMART2IO_PADCONF_1

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 05B4 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 05B4 | | |
| Description | SMART2 I/O control 1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | RESERVED | | R | 0x0000 0000 |

Table 19-580. Register Call Summary for Register CONTROL_SMART2IO_PADCONF_1

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[1\]](#)

Table 19-581. CONTROL_SMART3IO_PADCONF_0

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|----|----|-------------|----|----|----|-------------|----|----|----|-------------|----|----|----|-------------|----|----|----|------------|----|---|---|------------|---|---|---|------------|---|---|---|---------------|----------|----------------------|--|---------------|--|--|--|---------------|--|--|--|---------------|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|-------------|--|--|--|
| Address Offset | 0x0000 05B8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Instance | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 05B8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | SMART3 I/O control 0 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DMIC_DR0_MB | | | | GPIO_DR3_MB | | | | GPIO_DR4_MB | | | | GPIO_DR5_MB | | | | GPIO_DR6_MB | | | | HSI_DR1_MB | | | | HSI_DR2_MB | | | | HSI_DR3_MB | | | | MCBSP2_DR0_MB | | | | MCSP14_DR0_MB | | | | MCSP14_DR1_MB | | | | SDMMC3_DR0_MB | | | | RESERVED | | | | | | | | | | | | SPI2_DR0_MB | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|-------|
| 31:30 | DMIC_DR0_MB | 50-Ω output buffer mode control for group dmic_dr0. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x2 |
| 29:28 | GPIO_DR3_MB | 25-Ω output buffer mode control for group gpio_dr3. Refer to I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x3 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|-------|
| 27:26 | GPIO_DR4_MB | 25-Ω output buffer mode control for group gpio_dr4. Refer to I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x3 |
| 25:24 | GPIO_DR5_MB | 50-Ω output buffer mode control for group gpio_dr5. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 23:22 | GPIO_DR6_MB | 50-Ω output buffer mode control for group gpio_dr6. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 21:20 | HSI_DR1_MB | 25-Ω output buffer mode control for group hsi_dr1. Refer to the I/Os with combined Mode and Load Settings for more information about mode settings. | RW | 0x3 |
| 19:18 | HSI_DR2_MB | 25-Ω output buffer mode control for group hsi_dr2. Refer to the I/Os with combined Mode and Load Settings for more information about mode settings. | RW | 0x3 |
| 17:16 | HSI_DR3_MB | 25-Ω output buffer mode control for group hsi_dr3. Refer to I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x3 |
| 15:14 | MCBSP2_DR0_MB | 50-Ω output buffer mode control for group mcbbsp2_dr0. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 13:12 | MCSPi4_DR0_MB | 50-Ω output buffer mode control for group mcspi4_dr0. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 11:10 | MCSPi4_DR1_MB | 50-Ω output buffer mode control for group mcspi4_dr1. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 9:8 | SDMMC3_DR0_MB | 50-Ω output buffer mode control for group sdmmc3_dr0. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | SPI2_DR0_MB | 50-Ω output buffer mode control for group spi2_dr0. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |

Table 19-582. Register Call Summary for Register CONTROL_SMART3IO_PADCONF_0

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[14\]](#)

Table 19-583. CONTROL_SMART3IO_PADCONF_1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 05BC | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 05BC | | |
| Description | SMART3 I/O control 1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|-------------|----|--------------|----|--------------|----|--------------|----|------------|----|----------|----|----|----|-------------|----|----------|----|----|----|------------|---|-------------|---|-------------|---|--------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SPI2_DR1_MB | | SPI2_DR2_MB | | UART2_DR0_MB | | UART2_DR1_MB | | UART4_DR0_MB | | HSI_DR0_MB | | RESERVED | | | | GPMC_DR1_MB | | RESERVED | | | | PDM_DR0_MB | | FREF_DR2_MB | | FREF_DR3_MB | | USBB1_DR2_MB | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|-------|
| 31:30 | SPI2_DR1_MB | 50-Ω output buffer mode control for group spi2_dr1. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 29:28 | SPI2_DR2_MB | 50-Ω output buffer mode control for group spi2_dr1. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 27:26 | UART2_DR0_MB | 50-Ω output buffer mode control for group spi2_dr1. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 25:24 | UART2_DR1_MB | 50-Ω output buffer mode control for group spi2_dr1. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 23:22 | UART4_DR0_MB | 50-Ω output buffer mode control for group spi2_dr1. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 21:20 | HSI_DR0_MB | 25-Ω output buffer mode control for group hsi_dr0. Refer to I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x3 |
| 19:14 | RESERVED | | R | 0x00 |
| 13:12 | GPMC_DR1_MB | 50-Ω output buffer mode control for group gpmc_dr1. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x3 |
| 11:8 | RESERVED | | RW | 0x0 |
| 7:6 | PDM_DR0_MB | 50-Ω output buffer mode control for group pdm_dr0. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 5:4 | FREF_DR2_MB | 50-Ω output buffer mode control for group freq_dr2. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 3:2 | FREF_DR3_MB | 50-Ω output buffer mode control for group freq_dr3. Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 1:0 | USBB1_DR2_MB | 25-Ω output buffer mode control for group usbb1_dr2. Refer to I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x3 |

Table 19-584. Register Call Summary for Register CONTROL_SMART3IO_PADCONF_1

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)

Control Module Programming Guide

- [Pad Configuration Programming Points: \[12\] \[13\] \[14\] \[15\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[16\]](#)

Table 19-585. CONTROL_SMART3IO_PADCONF_2

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 05C0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 05C0 | | |
| Description | SMART3 I/O control 2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|-------------|-------------|-------------|------------|------------|------------|---------------|---------------|---------------|----------|----|----|----|-------------|-------------|-------------|--------------|--------------|--------------|------------|-------------|-------------|------------|-------------|---------------|--------------|----------|---|---|---|
| DMIC_DR0_LB | GPIO_DR3_LB | GPIO_DR4_LB | GPIO_DR5_LB | GPIO_DR6_LB | HSI_DR1_LB | HSI_DR2_LB | HSI_DR3_LB | MCBSP2_DR0_LB | MCSP14_DR0_LB | MCSP14_DR1_LB | RESERVED | | | | SPI2_DR0_LB | SPI2_DR1_LB | SPI2_DR2_LB | UART2_DR0_LB | UART2_DR1_LB | UART4_DR0_LB | HSI_DR0_LB | FREF_DR3_LB | GPMC_DR1_LB | PDM_DR0_LB | FREF_DR2_LB | SDMMC3_DR0_LB | USBB1_DR2_LB | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------|
| 31 | DMIC_DR0_LB | 50-Ω output buffer load control dmec_dr0_lb Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 30 | GPIO_DR3_LB | 25-Ω output buffer load control gpio_dr3_lb Refer to I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 1 |
| 29 | GPIO_DR4_LB | 25-Ω output buffer load control gpio_dr4_lb Refer to I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 1 |
| 28 | GPIO_DR5_LB | 50-Ω output buffer load control gpio_dr5_lb Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 27 | GPIO_DR6_LB | 50-Ω output buffer load control gpio_dr6_lb Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 26 | HSI_DR1_LB | 25-Ω output buffer load control hsi_dr1_lb Refer to I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|--------|---------------|--|------|-------|
| 25 | HSI_DR2_LB | 25-Ω output buffer load control hsi_dr2_lb Refer to I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 1 |
| 24 | HSI_DR3_LB | 25-Ω output buffer load control hsi_dr3_lb Refer to I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 1 |
| 23 | MCBSP2_DR0_LB | 50-Ω output buffer load control mcbasp2_dr0_lb Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 22 | MCSPi4_DR0_LB | 50-Ω output buffer load control mcspi4_dr0_lb Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 21 | MCSPi4_DR1_LB | 50-Ω output buffer load control mcspi4_dr1_lb Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 20: 17 | RESERVED | | R | 0x0 |
| 16 | SPI2_DR0_LB | 50-Ω output buffer load control spi2_dr0_lb Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 15 | SPI2_DR1_LB | 50-Ω output buffer load control spi2_dr1_lb Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 14 | SPI2_DR2_LB | 50-Ω output buffer load control spi2_dr2_lb Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 13 | UART2_DR0_LB | 50-Ω output buffer load control uart2_dr0_lb Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 12 | UART2_DR1_LB | 50-Ω output buffer load control uart2_dr1_lb Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 11 | UART4_DR0_LB | 50-Ω output buffer load control uart4_dr0_lb Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 10 | HSI_DR0_LB | 25-Ω output buffer load control hsi_dr0 Refer to I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 1 |
| 9 | FREF_DR3_LB | 50-Ω output buffer load control pref_dr3 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 8 | GPMC_DR1_LB | 50-Ω output buffer load control gpmc_dr1 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 1 |
| 7 | PDM_DR0_LB | 50-Ω output buffer load control pdm_dr0 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |

Table 19-586. Register Call Summary for Register CONTROL_SMART3IO_PADCONF_2

- Signal Integrity Parameter Controls Overview: [0]
- Device Interfaces Signal Group Controls Mapping: [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24]

- Pad Configuration Programming Points: [25] [26] [27] [28]

- [SYSCTRL_PADCONF_CORE Register Summary: \[29\]](#)

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 05C4 | | |
| Physical Address | 0x4A10 05C4 | Instance | SYSCTRL_PADCONF_CORE |
| Description | USBB HSIC control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| USB2_DR1_SR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB2_DR1_I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB1_DR1_SR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB1_DR1_I | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB1_HSIC_DATA_WD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB1_HSIC_STROBE_WD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB2_HSIC_DATA_WD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB2_HSIC_STROBE_WD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB1_HSIC_DATA_OFFMODE_WD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB1_HSIC_STROBE_OFFMODE_WD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB2_HSIC_DATA_OFFMODE_WD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB2_HSIC_STROBE_OFFMODE_WD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB2_HSIC_DATA_OFFMODE_WD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USB2_HSIC_STROBE_OFFMODE_WD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|-------|
| 31:30 | USBB2_DR1_SR | usbb2 Slew Rate control sr1:sr0 0x0: Turn_on time 125ps for Drv8 0x1: Turn_on time 500ps for Drv8 0x2: Turn_on time 325ps for Drv8 0x3: Turn_on time 750ps for Drv8 | RW | 0x0 |
| 29:27 | USBB2_DR1_I | usbb2 Impedence control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 | RW | 0x6 |
| 26:25 | USBB1_DR1_SR | usbb1 Slew Rate control sr1:sr0 0x0: Turn_on time 125ps for Drv8 0x1: Turn_on time 500ps for Drv8 0x2: Turn_on time 325ps for Drv8 0x3: Turn_on time 750ps for Drv8 | RW | 0x0 |
| 24:22 | USBB1_DR1_I | usbb1 Impedence control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 | RW | 0x6 |
| 21:20 | USBB1_HSIC_DATA_WD | usbb1_hsic_data wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 19:18 | USBB1_HSIC_STROBE_WD | usbb1_hsic_strobe wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 17:16 | USBB2_HSIC_DATA_WD | usbb2_hsic_data wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 15:14 | USBB2_HSIC_STROBE_WD | usbb2_hsic_strobe wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|--|------|-------|
| 13 | USBB1_HSIC_DATA_OFFMODE_WD_ENABLE | usbb1_hsic_data_offmode_wd enable 0x0: offmode_wd1 0x1: offmode_wd1 | RW | 0 |
| 12:11 | USBB1_HSIC_DATA_OFFMODE_WD | usbb1_hsic_data_offmode_wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x0 |
| 10 | USBB1_HSIC_STROBE_OFFMODE_WD_ENABLE | usbb1_hsic_strobe_offmode_wd enable 0x0: offmode_wd1 0x1: offmode_wd1 | RW | 0 |
| 9:8 | USBB1_HSIC_STROBE_OFFMODE_WD | usbb1_hsic_strobe_offmode_wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x0 |
| 7 | USBB2_HSIC_DATA_OFFMODE_WD_ENABLE | usbb2_hsic_data_offmode_wd enable 0x0: offmode_wd1 0x1: offmode_wd1 | RW | 0 |
| 6:5 | USBB2_HSIC_DATA_OFFMODE_WD | usbb2_hsic_data_offmode_wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x0 |
| 4 | USBB2_HSIC_STROBE_OFFMODE_WD_ENABLE | usbb2_hsic_strobe_offmode_wd enable 0x0: offmode_wd1 0x1: offmode_wd1 | RW | 0 |
| 3:2 | USBB2_HSIC_STROBE_OFFMODE_WD | usbb2_hsic_strobe_offmode_wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x0 |
| 1:0 | RESERVED | | R | 0x0 |

Table 19-588. Register Call Summary for Register CONTROL_USBB_HSIC

Control Module Functional Description

- [Pull Selection: \[0\]](#)
- [Off Mode Pad Control Overview: \[1\]](#)
- [Signal Integrity Parameter Controls Overview: \[2\]](#)
- [High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings: \[3\] \[4\] \[5\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[22\]](#)

Table 19-589. CONTROL_SMART3IO_PADCONF_3

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 05C8 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 05C8 | | |
| Description | SMART3 IO control 3 Access conditions. Read: unrestricted, Write: unrestricted | | |

Table 19-589. CONTROL SMART3IO PADCONF_3 (continued)

| Type | | | | | | | | | | | | | | | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----|----|----|-----------------|----|----|----|-----------------|----|----|----|-----------------|----|----|----|-----------------|----|----|----|-----------------|----|---|---|-----------------|---|---|---|-----------------|---|---|---|-----------------|--|--|--|-----------------|--|--|--|-----------------|--|--|--|-----------------|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLIMBUS1_DR0_MB | | | | SLIMBUS1_DR1_MB | | | | SLIMBUS2_DR0_MB | | | | SLIMBUS2_DR1_MB | | | | SLIMBUS2_DR2_MB | | | | SLIMBUS2_DR3_MB | | | | SLIMBUS1_DR0_LB | | | | SLIMBUS2_DR1_LB | | | | SLIMBUS2_DR2_LB | | | | SLIMBUS2_DR3_LB | | | | SLIMBUS1_DR1_LB | | | | SLIMBUS2_DR0_LB | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|-------|
| 31:30 | SLIMBUS1_DR0_MB | 50-Ω output buffer mode control for group slimbus1_dr0 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 29:28 | SLIMBUS1_DR1_MB | 50-Ω output buffer mode control for group slimbus1_dr1 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 27:26 | SLIMBUS2_DR0_MB | 50-Ω output buffer mode control for group slimbus2_dr0 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 25:24 | SLIMBUS2_DR1_MB | 50-Ω output buffer mode control for group slimbus2_dr1 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 23:22 | SLIMBUS2_DR2_MB | 50-Ω output buffer mode control for group slimbus2_dr2 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 21:20 | SLIMBUS2_DR3_MB | 50-Ω output buffer mode control for group slimbus2_dr3 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 19 | SLIMBUS1_DR0_LB | 50-Ω output buffer load control for group slimbus1_dr0 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 18 | SLIMBUS2_DR1_LB | 50-Ω output buffer load control for group slimbus2_dr1 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 17 | SLIMBUS2_DR2_LB | 50-Ω output buffer load control for group slimbus2_dr2 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 16 | SLIMBUS2_DR3_LB | 50-Ω output buffer load control for group slimbus2_dr3 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 15 | SLIMBUS1_DR1_LB | 50-Ω output buffer load control for group slimbus1_dr1 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 14 | SLIMBUS2_DR0_LB | 50-Ω output buffer load control for group slimbus2_dr0 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------|
| 13:0 | RESERVED | | R | 0x0000 |

Table 19-590. Register Call Summary for Register CONTROL_SMART3IO_PADCONF_3

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[13\]](#)

Table 19-591. CONTROL_SMART2IO_PADCONF_2

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 05CC | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 05CC | | |
| Description | SMART2 IO control 2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|------------|------------|--------------|-------------|-------------|-------------|---------------|---------------|---------------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|--------------|----------|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DPM_DR1_DS | DPM_DR2_DS | DPM_DR3_DS | GPIO_DR10_DS | HSI2_DR0_DS | HSI2_DR1_DS | HSI2_DR2_DS | SDMMC3_DR0_DS | SDMMC4_DR0_DS | SDMMC4_DR1_DS | SPI3_DR0_DS | SPI3_DR1_DS | UART3_DR2_DS | UART3_DR3_DS | UART3_DR4_DS | UART3_DR5_DS | USBA0_DR0_DS | USBA0_DR1_DS | USBA_DR2_DS | USBB2_DR0_DS | USBB1_DR0_DS | RESERVED | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------|
| 31 | DPM_DR1_DS | Drive strength control bit for group dpm_dr1 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 30 | DPM_DR2_DS | Drive strength control bit for group dpm_dr2 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 29 | DPM_DR3_DS | Drive strength control bit for group dpm_dr3 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 28 | GPIO_DR10_DS | Drive strength control bit for group gpio_dr10 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 27 | HSI2_DR0_DS | Drive strength control bit for group hsi2_dr0 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 26 | HSI2_DR1_DS | Drive strength control bit for group hsi2_dr1 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 25 | HSI2_DR2_DS | Drive strength control bit for group hsi2_dr2 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 24 | SDMMC3_DR0_DS | Drive strength control bit for group sdmmc3_dr0 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 23 | SDMMC4_DR0_DS | Drive strength control bit for group sdmmc4_dr0 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 22 | SDMMC4_DR1_DS | Drive strength control bit for group sdmmc4_dr1 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 21 | SPI3_DR0_DS | Drive strength control bit for group spi3_dr0 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 20 | SPI3_DR1_DS | Drive strength control bit for group spi3_dr1 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 19 | UART3_DR2_DS | Drive strength control bit for group uart3_dr2 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 18 | UART3_DR3_DS | Drive strength control bit for group uart3_dr3 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 17 | UART3_DR4_DS | Drive strength control bit for group uart3_dr4 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 16 | UART3_DR5_DS | Drive strength control bit for group uart3_dr5 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 15 | USBA0_DR0_DS | Drive strength control bit for group usba0_dr0 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 14 | USBA0_DR1_DS | Drive strength control bit for group usba0_dr1 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 13 | USBA_DR2_DS | Drive strength control bit for group usba_dr2 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 12 | USBB2_DR0_DS | Drive strength control bit for group usbb2_dr0 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 11 | USBB1_DR0_DS | Drive strength control bit for group usbb1_dr0 0x0: 50 Ω 0x1: 25 Ω | RW | 0 |
| 10:0 | RESERVED | | R | 0x000 |

Table 19-592. Register Call Summary for Register CONTROL_SMART2IO_PADCONF_2

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\]](#)

Table 19-592. Register Call Summary for Register CONTROL_SMART2IO_PADCONF_2 (continued)

Control Module Programming Guide

- [Pad Configuration Programming Points: \[22\] \[23\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[24\]](#)

Table 19-593. CONTROL_SMART1IO_PADCONF_2

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 05D0 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 05D0 | | |
| Description | SMART1 IO control 2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|------------|------------|------------|------------|-------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| KPD_DR0_SC | KPD_DR1_SC | KPD_DR2_SC | KPD_DR3_SC | HDQ_DR0_SC | GPIODR12_SC | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|----------|
| 31:30 | KPD_DR0_SC | Slew rate control for group kpd_dr0 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 29:28 | KPD_DR1_SC | Slew rate control for group kpd_dr1 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 27:26 | KPD_DR2_SC | Slew rate control for group kpd_dr2 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 25:24 | KPD_DR3_SC | Slew rate control for group kpd_dr3 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 23:22 | HDQ_DR0_SC | Slew rate control for group hdq_dr0 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 21:20 | GPIODR12_SC | Slew rate control for group gpio_dr12 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 19:0 | RESERVED | | R | 0x000000 |

Table 19-594. Register Call Summary for Register CONTROL_SMART1IO_PADCONF_2

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[7\]](#)

Table 19-595. CONTROL_SMART1IO_PADCONF_3

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 05D4 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 05D4 | | |
| Description | SMART1 IO control 3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------|----|------------|----|------------|----|------------|----|------------|----|--------------|----|----------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| KPD_DR0_LB | | KPD_DR1_LB | | KPD_DR2_LB | | KPD_DR3_LB | | HDQ_DR0_LB | | GPIO_DR12_LB | | RESERVED | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:30 | KPD_DR0_LB | Load control for group kpd_dr0 0x0: TL Length= [2cm-20cm] / Far ⁽¹⁾ end cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Far ⁽¹⁾ end cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Far ⁽¹⁾ end cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Far ⁽¹⁾ end cap per TL= [10pF-20pF] | RW | 0x0 |
| 29:28 | KPD_DR1_LB | Load control for group kpd_dr1 0x0: TL Length= [2cm-20cm] / Far ⁽¹⁾ end cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Far ⁽¹⁾ end cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Far ⁽¹⁾ end cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Far ⁽¹⁾ end cap per TL= [10pF-20pF] | RW | 0x0 |
| 27:26 | KPD_DR2_LB | Load control for group kpd_dr2 0x0: TL Length= [2cm-20cm] / Far ⁽¹⁾ end cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Far ⁽¹⁾ end cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Far ⁽¹⁾ end cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Far ⁽¹⁾ end cap per TL= [10pF-20pF] | RW | 0x0 |

⁽¹⁾ Far-end load is equivalent to CLoad, where CLoad is the total capacitance seen at the far end of the transmission line.

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|----------|
| 25:24 | KPD_DR3_LB | Load control for group kpd_dr3 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 23:22 | HDQ_DR0_LB | Load control for group hdq_dr0 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 21:20 | GPIO_DR12_LB | Load control for group gpio_dr12 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 19:0 | RESERVED | | R | 0x000000 |

Table 19-596. Register Call Summary for Register CONTROL_SMART1IO_PADCONF_3

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[7\]](#)

Table 19-597. CONTROL_C2CIO_PADCONF_0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 05D8 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 05D8 | | |
| Description | C2C IO control 0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|-------------|--------------|--------------|--------------|--------------|---------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|-------------|----------------|-----------------------|-----------------------|---------------|-----------------|----------------------|----------|---|---|---|---|---|---|---|
| C2C_DR0_LB0 | C2C_DR1_LB0 | C2C_DR2_LB0 | GPIO_DR0_LB0 | GPIO_DR1_LB0 | GPIO_DR2_LB0 | GPMC_DR0_LB0 | GPMC_DR11_LB0 | GPMC_DR10_LB0 | GPMC_DR2_LB0 | GPMC_DR4_LB0 | GPMC_DR5_LB0 | GPMC_DR6_LB0 | GPMC_DR7_LB0 | GPMC_DR8_LB0 | GPMC_DR9_LB0 | KPD_DR4_LB0 | KPD_DR5_LB0 | SDMMC2_DR0_LB0 | CMOSEN_C2C_0_FRM_CTRL | CMOSEN_C2C_1_FRM_CTRL | C2C_VREF_CCAP | C2C_INT_VREF_EN | C2C_INT_VREF_AUTO_EN | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 31 | C2C_DR0_LB0 | Mode selection bit for group c2c_dr0_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 30 | C2C_DR1_LB0 | Mode selection bit for group c2c_dr1_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 29 | C2C_DR2_LB0 | Mode selection bit for group c2c_dr2_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 28 | GPIO_DR0_LB0 | Mode selection bit for group gpio_dr0_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 27 | GPIO_DR1_LB0 | Mode selection bit for group gpio_dr1_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 26 | GPIO_DR2_LB0 | Mode selection bit for group gpio_dr2_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 25 | GPMC_DR0_LB0 | Mode selection bit for group gpmc_dr0_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 24 | GPMC_DR11_LB0 | Mode selection bit for group gpmc_dr11_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 23 | GPMC_DR10_LB0 | Mode selection bit for group gpmc_dr10_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 22 | GPMC_DR2_LB0 | Mode selection bit for group gpmc_dr2_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 21 | GPMC_DR4_LB0 | Mode selection bit for group gpmc_dr4_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 20 | GPMC_DR5_LB0 | Mode selection bit for group gpmc_dr5_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------|
| 19 | GPMC_DR6_LB0 | Mode selection bit for group gpmc_dr6_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 18 | GPMC_DR7_LB0 | Mode selection bit for group gpmc_dr7_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 17 | GPMC_DR8_LB0 | Mode selection bit for group gpmc_dr8_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 16 | GPMC_DR9_LB0 | Mode selection bit for group gpmc_dr9_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 15 | KPD_DR4_LB0 | Mode selection bit for group kpd_dr4_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 14 | KPD_DR5_LB0 | Mode selection bit for group kpd_dr5_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 13 | SDMMC2_DR0_LB0 | Mode selection bit for group sdmmc2_dr0_LB0 0x0: sdmmc2 1.2V and 1.8V / gpmc 1.2V 0x1: c2c 1.2V and 1.8V / gpmc 1.8V | RW | 0 |
| 12 | CMOSEN_C2C_0_FRM_CTRL | Ivcmos receiver enable in 1.2V mode for group c2c_0 0x0: Ivcmos rx disable 0x1: Ivcmos rx enable | RW | 1 |
| 11 | CMOSEN_C2C_1_FRM_CTRL | Ivcmos receiver enable in 1.2V mode for group c2c_1 0x0: Ivcmos rx disable 0x1: Ivcmos rx enable | RW | 1 |
| 10:9 | C2C_VREF_CCAP | Selection for coupling cap connection on ivref pad 0x0: No capacitor connected 0x1: Capacitor between BIAS2 and VSS 0x3: Capacitor between BIAS2 and VDDS as well as BIAS2 and VSS 0x2: Capacitor between BIAS2 and VDDS | RW | 0x1 |
| 8 | C2C_INT_VREF_EN | Internal VREF enable for C2C pads in manual mode (if both manual and auto mode is enabled then manual mode takes the priority) 0x0: Disabled 0x1: Enabled | RW | 1 |
| 7 | C2C_INT_VREF_AUTO_EN | Internal VREF enable for C2C pads in auto mode (if both manual and auto mode is enabled then manual mode takes the priority) 0x0: Disabled 0x1: Enabled | RW | 1 |
| 6:0 | RESERVED | | R | 0x00 |

Table 19-598. Register Call Summary for Register CONTROL_C2CIO_PADCONF_0

Control Module Functional Description

- [Device Core Control Module Instance: \[0\]](#)
- [Signal Integrity Parameter Controls Overview: \[1\]](#)
- [C2C/O Cells With Load Setting Adjustable According to Interface Requirement Voltage Mode: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[29\]](#)

Table 19-599. CONTROL_PBIASLITE

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0600 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0600 | | |
| Description | PBIASLITE control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|-------------|-------------------------|------------------------------|----------------------------|-----------------------|----------------------|----------|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | MMC1_PWRDNZ | MMC1_PBIASLITE_HIZ_MODE | MMC1_PBIASLITE_SUPPLY_HI_OUT | MMC1_PBIASLITE_VMODE_ERROR | MMC1_PBIASLITE_PWRDNZ | MMC1_PBIASLITE_VMODE | RESERVED | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|---|------|-------|
| 31:27 | RESERVED | | R | 0x00 |
| 26 | MMC1_PWRDNZ | PWRDNZ control to MMC1 IO This bit is used to protect the MMC1 I/O cell when SDMMC1_VDDS is not stable. 0x0: Software must clear this bit when SDMMC1_VDDS changes. 0x1: Software must set this bit only when SDMMC1_VDDS is stable. | RW | 0 |
| 25 | MMC1_PBIASLITE_HIZ_MODE | HIZ_MODE from MMC1 PBIASLITE 0x0: PBIAS in normal operation mode 0x1: PBIAS output is in high impedance state | RW | 0 |
| 24 | MMC1_PBIASLITE_SUPPLY_HI_OUT | SUPPLY_HI_OUT from MMC1 PBIASLITE Read 0x0: SDMMC1_VDDS = 1.8V Read 0x1: SDMMC1_VDDS = 3V | R | 0 |
| 23 | MMC1_PBIASLITE_VMODE_ERROR | VMODE ERROR from MMC1 PBIASLITE Read 0x0: VMODE level is same as SUPPLY_HI_OUT Read 0x1: VMODE level is not same as SUPPLY_HI_OUT | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|-----------|
| 22 | MMC1_PBIASLITE_PWRDNZ | PWRDNZ control to MMC1 PBIASLITE This bit is used to protect the MMC1_PBIAS cell (MMC1 I/O cell associated) when SDMMC1_VDDS is not stable. 0x0: Software must clear this bit when SDMMC1_VDDS changes. 0x1: Software must set this bit only when SDMMC1_VDDS is stable. | RW | 0 |
| 21 | MMC1_PBIASLITE_VMODE | VMODE control to MMC1 PBIASLITE 0x0: SDMMC1_VDDS = 1.8V 0x1: SDMMC1_VDDS = 3V | RW | 1 |
| 20:0 | RESERVED | | R | 0x00 0000 |

Table 19-600. Register Call Summary for Register CONTROL_PBIASLITE

Control Module Functional Description

- [Extended-Drain I/O and PBIAS Cell: \[0\]](#)
- [PBIAS Cell: \[1\]](#)
- [Extended-Drain I/O: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [PBIAS Error Generation: \[15\] \[16\]](#)
- [PBIASLITE Control Register: \[17\] \[18\]](#)

Control Module Programming Guide

- [Extended-Drain I/Os and PBIAS Cells Programming Guide: \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[29\]](#)

Table 19-601. CONTROL_I2C_0

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0604 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 0604 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | I2C pads control 0 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|--------------------|---------------------|-----------------|--------------------|---------------------|-----------------|--------------------|---------------------|-----------------|--------------------|---------------------|-----------------|--------------------|---------------------|-----------------|--------------------|---------------------|-----------------|--------------------|---------------------|-----------------|--------------------|---------------------|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| I2C4_SDA_GLFENB | I2C4_SDA_LOAD_BITS | I2C4_SDA_PULLUPRESX | I2C3_SDA_GLFENB | I2C3_SDA_LOAD_BITS | I2C3_SDA_PULLUPRESX | I2C2_SDA_GLFENB | I2C2_SDA_LOAD_BITS | I2C2_SDA_PULLUPRESX | I2C1_SDA_GLFENB | I2C1_SDA_LOAD_BITS | I2C1_SDA_PULLUPRESX | I2C4_SCL_GLFENB | I2C4_SCL_LOAD_BITS | I2C4_SCL_PULLUPRESX | I2C3_SCL_GLFENB | I2C3_SCL_LOAD_BITS | I2C3_SCL_PULLUPRESX | I2C2_SCL_GLFENB | I2C2_SCL_LOAD_BITS | I2C2_SCL_PULLUPRESX | I2C1_SCL_GLFENB | I2C1_SCL_LOAD_BITS | I2C1_SCL_PULLUPRESX | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------|
| 31 | I2C4_SDA_GLFENB | Active_high glitch free operation enable pin for i2c4 receiver 0x0: Disable i2c4 glitch free operation 0x1: Enable i2c4 glitch free operation | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|-------|
| 30:29 | I2C4_SDA_LOAD_BITS | Internal Pull up resistor in Fast or Standard mode / High_speed mode for i2c4 0x0: 4.5 k Ω (5-15 pF) / 1.66 k Ω (5-12 pF) 0x1: 2.1 k Ω (15-50 pF) / 920 Ω (12-25 pF) 0x2: 860 Ω (50-150 pF) / 500 Ω (25-50 pF) 0x3: N.A / 300 Ω (50-80 pF) | RW | 0x1 |
| 28 | I2C4_SDA_PULLUPRESX | Active_low internal pull_up resistor enabled for i2c4 0x0: Enable Internal Pull up resistor 0x1: Disable Internal Pull up resistor | RW | 0 |
| 27 | I2C3_SDA_GLFENB | Active_high glitch free operation enable pin for i2c3 receiver 0x0: Disable i2c4 glitch free operation 0x1: Enable i2c4 glitch free operation | RW | 0 |
| 26:25 | I2C3_SDA_LOAD_BITS | Internal Pull up resistor in Fast or Standard mode / High_speed mode for i2c3 0x0: 4.5 k Ω (5-15 pF) / 1.66 k Ω (5-12 pF) 0x1: 2.1 k Ω (15-50 pF) / 920 Ω (12-25 pF) 0x2: 860 Ω (50-150 pF) / 500 Ω (25-50 pF) 0x3: N.A / 300 Ω (50-80 pF) | RW | 0x1 |
| 24 | I2C3_SDA_PULLUPRESX | Active_low internal pull_up resistor enabled for i2c3 0x0: Enable Internal Pull up resistor 0x1: Disable Internal Pull up resistor | RW | 0 |
| 23 | I2C2_SDA_GLFENB | Active_high glitch free operation enable pin for i2c2 receiver 0x0: Disable i2c4 glitch free operation 0x1: Enable i2c4 glitch free operation | RW | 0 |
| 22:21 | I2C2_SDA_LOAD_BITS | Internal Pull up resistor in Fast or Standard mode / High_speed mode for i2c2 0x0: 4.5 k Ω (5-15 pF) / 1.66 k Ω (5-12 pF) 0x1: 2.1 k Ω (15-50 pF) / 920 Ω (12-25 pF) 0x2: 860 Ω (50-150 pF) / 500 Ω (25-50 pF) 0x3: N.A / 300 Ω (50-80 pF) | RW | 0x1 |
| 20 | I2C2_SDA_PULLUPRESX | Active_low internal pull_up resistor enabled for i2c2 0x0: Enable Internal Pull up resistor 0x1: Disable Internal Pull up resistor | RW | 0 |
| 19 | I2C1_SDA_GLFENB | Active_high glitch free operation enable pin for i2c1 receiver 0x0: Disable i2c4 glitch free operation 0x1: Enable i2c4 glitch free operation | RW | 0 |
| 18:17 | I2C1_SDA_LOAD_BITS | Internal Pull up resistor in Fast or Standard mode / High_speed mode for i2c1 0x0: 4.5 k Ω (5-15 pF) / 1.66 k Ω (5-12 pF) 0x1: 2.1 k Ω (15-50 pF) / 920 Ω (12-25 pF) 0x2: 860 Ω (50-150 pF) / 500 Ω (25-50 pF) 0x3: N.A / 300 Ω (50-80 pF) | RW | 0x1 |
| 16 | I2C1_SDA_PULLUPRESX | Active_low internal pull_up resistor enabled for i2c1 0x0: Enable Internal Pull up resistor 0x1: Disable Internal Pull up resistor | RW | 0 |
| 15 | I2C4_SCL_GLFENB | Active_high glitch free operation enable pin for i2c4 receiver 0x0: Disable i2c4 glitch free operation 0x1: Enable i2c4 glitch free operation | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|---|------|-------|
| 14:13 | I2C4_SCL_LOAD_BITS | Internal Pull up resistor in Fast or Standard mode / High_speed mode for i2c4 0x0: 4.5 k Ω (5-15 pF) / 1.66 k Ω (5-12 pF) 0x1: 2.1 k Ω (15-50 pF) / 920 Ω (12-25 pF) 0x2: 860 Ω (50-150 pF) / 500 Ω (25-50 pF) 0x3: N.A / 300 Ω (50-80 pF) | RW | 0x1 |
| 12 | I2C4_SCL_PULLUPRESX | Active_low internal pull_up resistor enabled for i2c4 0x0: Enable Internal Pull up resistor 0x1: Disable Internal Pull up resistor | RW | 0 |
| 11 | I2C3_SCL_GLFENB | Active_high glitch free operation enable pin for i2c3 receiver 0x0: Disable i2c4 glitch free operation 0x1: Enable i2c4 glitch free operation | RW | 0 |
| 10:9 | I2C3_SCL_LOAD_BITS | Internal Pull up resistor in Fast or Standard mode / High_speed mode for i2c3 0x0: 4.5 k Ω (5-15 pF) / 1.66 k Ω (5-12 pF) 0x1: 2.1 k Ω (15-50 pF) / 920 Ω (12-25 pF) 0x2: 860 Ω (50-150 pF) / 500 Ω (25-50 pF) 0x3: N.A / 300 Ω (50-80 pF) | RW | 0x1 |
| 8 | I2C3_SCL_PULLUPRESX | Active_low internal pull_up resistor enabled for i2c3 0x0: Enable Internal Pull up resistor 0x1: Disable Internal Pull up resistor | RW | 0 |
| 7 | I2C2_SCL_GLFENB | Active_high glitch free operation enable pin for i2c2 receiver 0x0: Disable i2c4 glitch free operation 0x1: Enable i2c4 glitch free operation | RW | 0 |
| 6:5 | I2C2_SCL_LOAD_BITS | Internal Pull up resistor in Fast or Standard mode / High_speed mode for i2c2 0x0: 4.5 k Ω (5-15 pF) / 1.66 k Ω (5-12 pF) 0x1: 2.1 k Ω (15-50 pF) / 920 Ω (12-25 pF) 0x2: 860 Ω (50-150 pF) / 500 Ω (25-50 pF) 0x3: N.A / 300 Ω (50-80 pF) | RW | 0x1 |
| 4 | I2C2_SCL_PULLUPRESX | Active_low internal pull_up resistor enabled for i2c2 0x0: Enable Internal Pull up resistor 0x1: Disable Internal Pull up resistor | RW | 0 |
| 3 | I2C1_SCL_GLFENB | Active_high glitch free operation enable pin for i2c1 receiver 0x0: Disable i2c4 glitch free operation 0x1: Enable i2c4 glitch free operation | RW | 0 |
| 2:1 | I2C1_SCL_LOAD_BITS | Internal Pull up resistor in Fast or Standard mode / High_speed mode for i2c1 0x0: 4.5 k Ω (5-15 pF) / 1.66 k Ω (5-12 pF) 0x1: 2.1 k Ω (15-50 pF) / 920 Ω (12-25 pF) 0x2: 860 Ω (50-150 pF) / 500 Ω (25-50 pF) 0x3: N.A / 300 Ω (50-80 pF) | RW | 0x1 |
| 0 | I2C1_SCL_PULLUPRESX | Active_low internal pull_up resistor enabled for i2c1 0x0: Enable Internal Pull up resistor 0x1: Disable Internal Pull up resistor | RW | 0 |

Table 19-602. Register Call Summary for Register CONTROL_I2C_0

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [I2Cx I/Os Group Pullupresx Controls and Load Range Settings: \[1\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[26\]](#)

Table 19-603. CONTROL_CAMERA_RX

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0608 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A10 0608 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | CAMERA RX control Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------|----|----|----|--------------------------|------------------------|----|--------------------------|------------------------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| CAMERARX_CSI22_LANEENABLE2 | CAMERARX_CSI22_LANEENABLE1 | CAMERARX_CSI22_LANEENABLE0 | CAMERARX_CSI21_LANEENABLE4 | CAMERARX_CSI21_LANEENABLE3 | CAMERARX_CSI21_LANEENABLE2 | CAMERARX_CSI21_LANEENABLE1 | CAMERARX_CSI21_LANEENABLE0 | RESERVED | | | | CAMERARX_CSI22_CTRLCLKEN | CAMERARX_CSI22_CAMMODE | | CAMERARX_CSI21_CTRLCLKEN | CAMERARX_CSI21_CAMMODE | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|--|------|-------|
| 31 | CAMERARX_CSI22_LANEENAB LE2 | CSI22 CAMERARX lane 2 enable (CSI22_DX2, CSI22_DY2) 0x0: Lane module disabled 0x1: Lane module enabled | RW | 0x0 |
| 30 | CAMERARX_CSI22_LANEENAB LE1 | CSI22 CAMERARX lane 1 enable (CSI22_DX1, CSI22_DY1) 0x0: Lane module disabled 0x1: Lane module enabled | RW | 0x0 |
| 29 | CAMERARX_CSI22_LANEENAB LE0 | CSI22 CAMERARX lane 0 enable (CSI22_DX0, CSI22_DY0) 0x0: Lane module disabled 0x1: Lane module enabled | RW | 0x0 |
| 28 | CAMERARX_CSI21_LANEENAB LE4 | CSI21 CAMERARX lane 4 enable (CSI21_DX4, CSI21_DY4) 0x0: Lane module disabled 0x1: Lane module enabled | RW | 0x0 |
| 27 | CAMERARX_CSI21_LANEENAB LE3 | CSI21 CAMERARX lane 3 enable (CSI21_DX3, CSI21_DY3) 0x0: Lane module disabled 0x1: Lane module enabled | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------------|--|------|--------|
| 26 | CAMERARX_CSI21_LANEENAB LE2 | CSI21 CAMERARX lane 2 enable (CSI21_DX2, CSI21_DY2) 0x0: Lane module disabled 0x1: Lane module enabled | RW | 0x0 |
| 25 | CAMERARX_CSI21_LANEENAB LE1 | CSI21 CAMERARX lane 1 enable (CSI21_DX1, CSI21_DY1) 0x0: Lane module disabled 0x1: Lane module enabled | RW | 0x0 |
| 24 | CAMERARX_CSI21_LANEENAB LE0 | CSI21 CAMERARX lane 0 enable (CSI21_DX0, CSI21_DY0) 0x0: Lane module disabled 0x1: Lane module enabled | RW | 0x0 |
| 23:22 | RESERVED | | R | 0x0 |
| 21 | CAMERARX_CSI22_CTRLCLKE N | CSI22 CAMERARX clock enable control 0x0: Disable for CTRLCLK 0x1: Active high enable for CTRLCLK | RW | 0 |
| 20:19 | CAMERARX_CSI22_CAMMODE | CSI22 CAMERARX CAMMODE control 0x0: DPHY mode (CSI2 mode) 0x1: Data/Strobe Transmission Format (CCP2 mode) 0x2: Data/Clock Transmission Format (CCP2/CSI1 mode) 0x3: GPI mode (Parallel interface mode) | RW | 0x3 |
| 18 | CAMERARX_CSI21_CTRLCLKE N | CSI21 CAMERARX clock enable control 0x0: Disable for CTRLCLK 0x1: Active high enable for CTRLCLK | RW | 0 |
| 17:16 | CAMERARX_CSI21_CAMMODE | CSI21 CAMERARX CAMMODE control 0x0: DPHY mode (CSI2 mode) 0x1: Data/Strobe Transmission Format (CCP2 mode) 0x2: Data/Clock Transmission Format (CCP2/CSI1 mode) 0x3: GPI mode (Parallel interface mode) | RW | 0x3 |
| 15:0 | RESERVED | | R | 0x0000 |

Table 19-604. Register Call Summary for Register CONTROL_CAMERA_RX

Control Module Functional Description

- [CSI Receiver Control Register: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[2\]](#)

Table 19-605. CONTROL_MMC2

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 0614 | | |
| Physical Address | 0x4A10 0614 | Instance | SYSCTRL_PADCONF_CORE |
| Description | MMC2 control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| MMC2_FEEDBACK_CLK_SEL | | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------------|
| 31 | MMC2_FEEDBACK_CLK_SEL | Feed_back clock select 0x0: Clock feed_back at PAD level 0x1: Clock feed_back at board level | RW | 0 |
| 30:0 | RESERVED | | R | 0x0000 0000 |

Table 19-606. Register Call Summary for Register CONTROL_MMC2

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-607. CONTROL_DSIPHY

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0618 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0618 | | |
| Description | DSIPHY control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------|----|----|-----------------|----|----|----|-----------|----|----|----|-----------|----|----|----|----------|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| DSI2_LANEENABLE | | | DSI1_LANEENABLE | | | | DSI1_PIPD | | | | DSI2_PIPD | | | | RESERVED | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|-------|
| 31:29 | DSI2_LANEENABLE | DSI2 Lane Enable For each bit, the following settings are valid: 0x0: Lane module disabled 0x1: Lane module enabled [31] DSI2 lane 2 enable [30] DSI2 lane 1 enable [29] DSI2 lane 0 enable | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|--------|
| 28:24 | DSI1_LANEENABLE | DSI1 Lane Enable For each bit, the following settings are valid: 0x0: Lane module disabled 0x1: Lane module enabled [28] DSI1 lane 4 enable [27] DSI1 lane 3 enable [26] DSI1 lane 2 enable [25] DSI1 lane 1 enable [24] DSI1 lane 0 enable | RW | 0x00 |
| 23:19 | DSI1_PIPD | DSI1 PD Enable For each bit, the following settings are valid: 0x0: Pull down enabled 0x1: Pull down disabled [23] DSI1 lane 4 PD enable [22] DSI1 lane 3 PD enable [21] DSI1 lane 0 PD enable [20] DSI1 lane 2 PD enable [19] DSI1 lane 1 PD enable | RW | 0x00 |
| 18:14 | DSI2_PIPD | DSI2 PD Enable For each bit, the following settings are valid: 0x0: Pull down enabled 0x1: Pull down disabled [18]] RESERVED (Unused) [17]] RESERVED (Unused) [16]] DSI2 lane 0 PD enable [15]] DSI2 lane 2 PD enable [14]] DSI2 lane 1 PD enable | RW | 0x00 |
| 13:0 | RESERVED | | R | 0x0000 |

Table 19-608. Register Call Summary for Register CONTROL_DSIPHY

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-609. CONTROL_MCBSPLP

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 061C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 061C | | |
| Description | McBSPLP control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ALBCTRLRX_FSX | ALBCTRLRX_CLKX | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------------|
| 31 | ALBCTRLRX_FSX | Analog loop_back control for FSX. This bit is programmable only for McBSP4 instance, for rest three McBSP instances, this bit is hardwired to '1'. 0x0: PIFSR is used 0x1: PIFSX is used instead of PIFSR 4pin mode | RW | 0 |
| 30 | ALBCTRLRX_CLKX | Analog loop_back control for CLKX. This bit is programmable only for McBSP4 instance, for rest three McBSP instances, this bit is hardwired to '1'. 0x0: PCLKR is used 0x1: PCLKX is used instead of PCLKR 4pin mode | RW | 0 |
| 29:0 | RESERVED | | R | 0x0000 0000 |

Table 19-610. Register Call Summary for Register CONTROL_MCBSPLP

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-611. CONTROL_USB2PHYCORE

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0620 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0620 | | |
| Description | USB2PHYCORE control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | |
|-----------------------|-------------------|------------------|-------------------------|--------------------------|--------------------------|---------------------|----------------------|------------------------|----|----|-------------------------|-------------------------|-----------------|------------------|-----------------|-----------------------|--------------------|---------------------|------------------|--------------------|----------|-----------------------|--------------------------|-----------------------|------------------|-----------------------|----------|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|
| USB2PHY_AUTORESUME_EN | USB2PHY_DISCHGDET | USB2PHY_GPIOMODE | USB2PHY_CHG_DET_EXT_CTL | USB2PHY_RDM_PD_CHGDET_EN | USB2PHY_RDP_PU_CHGDET_EN | USB2PHY_CHG_VSRC_EN | USB2PHY_CHG_ISINK_EN | USB2PHY_CHG_DET_STATUS | | | USB2PHY_CHG_DET_DM_COMP | USB2PHY_CHG_DET_DP_COMP | USB2PHY_DATADET | USB2PHY_SINKONDP | USB2PHY_SRCONDM | USB2PHY_RESTARTCHGDET | USB2PHY_CHGDETDONE | USB2PHY_CHGDETECTED | USB2PHY_MCPCPUEN | USB2PHY_MCPCMODEEN | RESERVED | USB2PHY_UTMIRESETDONE | USB2PHY_TXBITSTUFFENABLE | USB2PHY_DATAPOLARITYN | USB2PHY_FREQLOCK | USB2PHY_RESETDONETCLK | RESERVED | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|---|------|-------|
| 31 | USB2PHY_AUTORESUME_EN | Auto resume enable 0x0: Disable autoresume 0x1: Enable autoresume | RW | 0 |
| 30 | USB2PHY_DISCHGDET | Disable charger detect 0x0: Charger detect function enabled 0x1: Charger detect function disabled | RW | 0x0 |
| 29 | USB2PHY_GPIOMODE ⁽¹⁾ | GPIO mode 0x0: USB mode enabled 0x1: GPIO mode enabled | RW | 0 |

⁽¹⁾ When USB_A0_OTG_DP_MUXMODE = 0 and USB_A0_OTG_DM_MUXMODE = 0, user software must ensure that CONTROL_USB2PHYCORE[29] USB2PHY_GPIOMODE = 0. When USB_A0_OTG_DP_MUXMODE is different than 0 and USB_A0_OTG_DM_MUXMODE is different than 0, user software must ensure that CONTROL_USB2PHYCORE[29] USB2PHY_GPIOMODE = 1.

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|--|------|-------|
| 28 | USB2PHY_CHG_DET_EXT_CTL | Charge detect external control 0x0: Charger detect internal state-machine used 0x1: Charge detect state-machine is bypassed | RW | 0 |
| 27 | USB2PHY_RDM_PD_CHGDET_EN | DM Pull down control 0x0: PD disabled 0x1: PD enabled | RW | 0 |
| 26 | USB2PHY_RDP_PU_CHGDET_EN | DP Pull up control 0x0: PU disabled 0x1: PU enabled | RW | 0 |
| 25 | USB2PHY_CHG_VSRC_EN | VSRC enable on DP line-Host charger case 0x0: Disable VSRC drive on DP 0x1: Drives VSRC 600 mV on DP line | RW | 0 |
| 24 | USB2PHY_CHG_ISINK_EN | ISINK enable on DM line-Host charger case 0x0: Disable the ISINK on DM 0x1: Enables the ISINK (100 A) on DM line | RW | 0 |
| 23:21 | USB2PHY_CHG_DET_STATUS | Status of charger detection Read 0x0: Wait state Read 0x1: No contact Read 0x2: PS/2 Read 0x3: Unknown error Read 0x4: Dedicated charger Read 0x5: HOST charger Read 0x6: PC Read 0x7: Interrupt | R | 0x1 |
| 20 | USB2PHY_CHG_DET_DM_COMP | Output of the comparator on DM during the resistor host detect protocol Read 0x0: DM line is below 0.75V to 0.95V Read 0x1: DM line is above 0.75V to 0.95V | R | 0 |
| 19 | USB2PHY_CHG_DET_DP_COMP | Output of the comparator on DP during the resistor host detect protocol Read 0x0: DP line is below 0.75V to 0.95V Read 0x1: DP line is above 0.75V to 0.95V | R | 0x1 |
| 18 | USB2PHY_DATADET | Output of the charger detect comparator Read 0x0: DM line is below 0.25V to 0.4V Read 0x1: DM line is above 0.25V to 0.4V | R | 0 |
| 17 | USB2PHY_SINKONDP | When 1 current sink is connected to DP instead of DM 0x0: Default value 0x1: Enables the ISINK on DP instead of DM | RW | 0 |
| 16 | USB2PHY_SRCONDM | When 1 voltage source is connected to DP instead of DM 0x0: Default value 0x1: Enable the VSRC on DM instead of DP | RW | 0 |
| 15 | USB2PHY_RESTARTCHGDET | restartchgdet = 1 for 1 msec cause the CD_START to reset 0x0: Default value 0x1: A high pulse of 1 msec causes the charger detect to restart on negative edge of restartchgdet | RW | 0 |
| 14 | USB2PHY_CHGDETDONE | Status indicates that charger detection protocol is over Read 0x0: Charger detection protocol is not over Read 0x1: Charger detection protocol is over | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|--|------|-------|
| 13 | USB2PHY_CHGDETECTED | Output of the charger detection protocol Read 0x0: Charger not detected Read 0x1: Charger detected | R | 0 |
| 12 | USB2PHY_MCPCPUEN | MCPC Pull up enable 0x0: Disable the MCPC pull up 0x1: Enable the 4.7K to10K pull up on receive line DP when datapolarityn is 0 and DM when datapolarityn is 1 | RW | 0 |
| 11 | USB2PHY_MCPCMODEEN | MCPC Mode enable 0x0: Disable MCPC mode 0x1: Enable MCPC mode | RW | 0 |
| 10 | RESERVED | Read returns reset value | R | 0 |
| 9 | USB2PHY_UTMIRESETDONE | UTMI FSM reset status Read 0x0: UTMI FSMs are in reset Read 0x1: UTMI FSMs are out of reset | R | 0 |
| 8 | USB2PHY_TXBITSTUFFENAB LE | TX data bit stuff enable 0x0: DATAOUT [7 0x1: DATAOUT [7 | RW | 0 |
| 7 | USB2PHY_DATAPOLARITYN | Data polarity 0x0: DP functionality is on DP and DM functionality is on DM 0x1: DP functionality is on DM and DM functionality is on DP | RW | 0 |
| 6 | USBDPLL_FREQLOCK | Status from USB DPLL | R | 0 |
| 5 | USB2PHY_RESETDONETCLK | resetdonetclk status from USB2PHY | R | 0 |
| 4:0 | RESERVED | | R | 0x00 |

Table 19-612. Register Call Summary for Register CONTROL_USB2PHYCORE

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-613. CONTROL_I2C_1

| | | | |
|------------------|---|----------|----------------------|
| Address Offset | 0x0000 0624 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0624 | | |
| Description | I ² C pads control 1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------|----------|--------------|----------|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | GPIO66_NMODE | RESERVED | GPIO65_NMODE | RESERVED | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|-------|
| 31:23 | RESERVED | Reserved | R | 0x000 |
| 22 | GPIO66_NMODE | Active-high selection for GPIO mode 0x0: Reserved 0x1: Normal (GPIO) mode | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 21 | RESERVED | Reserved | R | 0 |
| 20 | GPIO65_NMODE | Active-high selection for GPIO mode 0x0: Reserved 0x1: Normal (GPIO) mode | RW | 0 |
| 19:0 | RESERVED | Reserved | R | 0 |

Table 19-614. Register Call Summary for Register CONTROL_I2C_1

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-615. CONTROL_MMC1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0628 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0628 | | |
| Description | MMC1 control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|------------------------|------------------------|------------------------|----------------------|----------------------|----------------------|----------|-------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SDMMC1_PUSTRENGTH_GRP0 | SDMMC1_PUSTRENGTH_GRP1 | SDMMC1_PUSTRENGTH_GRP2 | SDMMC1_PUSTRENGTH_GRP3 | SDMMC1_DR0_SPEEDCTRL | SDMMC1_DR1_SPEEDCTRL | SDMMC1_DR2_SPEEDCTRL | RESERVED | USB_FD_CDEN | RESERVED | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--|------|-------|
| 31 | SDMMC1_PUSTRENGTH_GRP0 | Pullstrength control for sdmmc1_pustrength_grp0 0x0: Pull up with 50 to 110 kΩ on MMC1 data pins 0x1: Pull up with 10 to 50 kΩ on MMC1 data pins | RW | 1 |
| 30 | SDMMC1_PUSTRENGTH_GRP1 | Pullstrength control for sdmmc1_pustrength_grp1 0x0: Pull up with 50 to 110 kΩ on MMC1 data pins 0x1: Pull up with 10 to 50 kΩ on MMC1 data pins | RW | 0 |
| 29 | SDMMC1_PUSTRENGTH_GRP2 | Pullstrength control for sdmmc1_pustrength_grp2 0x0: Pull up with 50 to 110 kΩ on MMC1 data pins 0x1: Pull up with 10 to 50 kΩ on MMC1 data pins | RW | 1 |
| 28 | SDMMC1_PUSTRENGTH_GRP3 | Pullstrength control for sdmmc1_pustrength_grp3 0x0: Pull up with 50 to 110 kΩ on MMC1 data pins 0x1: Pull up with 10 to 50 kΩ on MMC1 data pins | RW | 1 |
| 27 | SDMMC1_DR0_SPEEDCTRL | Speed control for group sdmmc1_dr0 0x0: FMAX = 26 MHz at 30 pF 0x1: FMAX = 65 MHz at 30 pF | RW | 0 |
| 26 | SDMMC1_DR1_SPEEDCTRL | Speed control for group sdmmc1_dr1 0x0: FMAX = 26 MHz at 30 pF 0x1: FMAX = 65 MHz at 30 pF | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|-----------|
| 25 | SDMMC1_DR2_SPEEDCTRL | Speed control for group sdmmc1_dr2 0x0: FMAX = 26 MHz at 30 pF 0x1: FMAX = 65 MHz at 30 pF | RW | 0 |
| 24 | RESERVED | | R | 0 |
| 23 | USB_FD_CDEN | USB FD pull down select 0x0: select pull down from USB FD logic 0x1: select pull down from device control modules registers | RW | 0 |
| 22:0 | RESERVED | | R | 0x00 0000 |

Table 19-616. Register Call Summary for Register CONTROL_MMC1

Control Module Functional Description

- [Device Core Control Module Instance: \[0\]](#)
- [Extended-Drain I/O and PBIAS Cell: \[1\]](#)
- [Extended-Drain I/O: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [Signal Integrity Parameter Controls Overview: \[10\]](#)
- [SDMMC1 Pullup Strength Control: \[11\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\]](#)

Control Module Programming Guide

- [Extended-Drain I/Os and PBIAS Cells Programming Guide: \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[29\]](#)

Table 19-617. CONTROL_HSI

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 062C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 062C | | |
| Description | HSI control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------|------------------|-----------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| HSI1_CALLOOP_SEL | HSI1_CALMUX_SEL | HSI2_CALLOOP_SEL | HSI2_CALMUX_SEL | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------|
| 31 | HSI1_CALLOOP_SEL | hsi1 calibration loop select 0x0: Calibration mode 0x1: Enable Calibration mode | RW | 0 |
| 30 | HSI1_CALMUX_SEL | hsi1 calibration mux select 0x0: Calibration mode 0x1: Enable Calibration mode | RW | 0 |
| 29 | HSI2_CALLOOP_SEL | hsi2 calibration loop select 0x0: Calibration mode 0x1: Enable Calibration mode | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-----------|
| 28 | HSI2_CALMUX_SEL | hsi2 calibration mux select 0x0: Calibration mode 0x1: Enable Calibration mode | RW | 0 |
| 27:0 | RESERVED | | R | 0x0000000 |

Table 19-618. Register Call Summary for Register CONTROL_HSI

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-619. CONTROL_USB

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0630 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0630 | | |
| Description | USB control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------------------|-----------------------------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| CARKIT_USBA0_ULPIPHY_DAT0_AUTO_EN | CARKIT_USBA0_ULPIPHY_DAT1_AUTO_EN | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------------|--|------|-------------|
| 31 | CARKIT_USBA0_ULPIPHY_DAT0_AUTO_EN | carkit usba0 ulpiphy dat0 auto enable 0x0: Carkit Auto mode disabled 0x1: Carkit Auto mode enabled | RW | 0 |
| 30 | CARKIT_USBA0_ULPIPHY_DAT1_AUTO_EN | carkit usba0 ulpiphy dat1 auto enable 0x0: Carkit Auto mode disabled 0x1: Carkit Auto mode enabled | RW | 0 |
| 29:0 | RESERVED | | R | 0x0000 0000 |

Table 19-620. Register Call Summary for Register CONTROL_USB

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-621. CONTROL_HDQ

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0634 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0634 | | |
| Description | HDQ control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | RESERVED | | R | 0x0000 0000 |

Table 19-622. Register Call Summary for Register CONTROL_HDQ

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-623. CONTROL_LPDDR2IO1_0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0638 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0638 | | |
| Description | LPDDR2 1 I/O control 0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|-----------------|----|------------------|----|----------|----|------------------|----|-----------------|----|------------------|----|----------|----|------------------|----|-----------------|----|------------------|----|----------|---|------------------|---|-----------------|---|------------------|---|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| LPDDR2IO1_GR4_SR | | LPDDR2IO1_GR4_I | | LPDDR2IO1_GR4_WD | | RESERVED | | LPDDR2IO1_GR3_SR | | LPDDR2IO1_GR3_I | | LPDDR2IO1_GR3_WD | | RESERVED | | LPDDR2IO1_GR2_SR | | LPDDR2IO1_GR2_I | | LPDDR2IO1_GR2_WD | | RESERVED | | LPDDR2IO1_GR1_SR | | LPDDR2IO1_GR1_I | | LPDDR2IO1_GR1_WD | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 31:30 | LPDDR2IO1_GR4_SR | Group 4 Slew Rate control sr1:sr0 | RW | 0x2 |
| 29:27 | LPDDR2IO1_GR4_I | Group 4 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽¹⁾ | RW | 0x3 |
| 26:25 | LPDDR2IO1_GR4_WD | Group 4 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |

⁽¹⁾ To achieve the best LPDDR2IO performance, software must keep the impedance bit field at this value.

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 24 | RESERVED | | R | 0 |
| 23:22 | LPDDR2IO1_GR3_SR | Group 3 Slew Rate control sr1:sr0 | RW | 0x2 |
| 21:19 | LPDDR2IO1_GR3_I | Group 3 Impedence control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽²⁾ | RW | 0x3 |
| 18:17 | LPDDR2IO1_GR3_WD | Group 3 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 16 | RESERVED | | R | 0 |
| 15:14 | LPDDR2IO1_GR2_SR | Group 2 Slew Rate control sr1:sr0 | RW | 0x2 |
| 13:11 | LPDDR2IO1_GR2_I | Group 2 Impedence control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽²⁾ | RW | 0x3 |
| 10:9 | LPDDR2IO1_GR2_WD | Group 2 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 8 | RESERVED | | R | 0 |
| 7:6 | LPDDR2IO1_GR1_SR | Group 1 Slew Rate control sr1:sr0 | RW | 0x2 |
| 5:3 | LPDDR2IO1_GR1_I | Group 1 Impedence control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽²⁾ | RW | 0x3 |
| 2:1 | LPDDR2IO1_GR1_WD | Group 1 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |

⁽²⁾ To achieve the best LPDDR2IO performance, software must keep the impedance bit field at this value.

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------|
| 0 | RESERVED | | R | 0 |

Table 19-624. Register Call Summary for Register CONTROL_LPDDR2IO1_0

Control Module Functional Description

- [Pull Selection: \[0\]](#)
- [Signal Integrity Parameter Controls Overview: \[1\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[14\]](#)

For more information about slew rate (turn-on time) settings, see [Section 19.4.12.8.2, High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings](#).

Table 19-625. CONTROL_LPDDR2IO1_1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 063C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 063C | | |
| Description | LPDDR2 1 I/O control 1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------|----|-----------------|----|------------------|----|----------|----|------------------|----|-----------------|----|------------------|----|----------|----|------------------|----|-----------------|----|------------------|----|----------|---|------------------|---|-----------------|---|------------------|---|----------|---|
| LPDDR2IO1_GR8_SR | | LPDDR2IO1_GR8_I | | LPDDR2IO1_GR8_WD | | RESERVED | | LPDDR2IO1_GR7_SR | | LPDDR2IO1_GR7_I | | LPDDR2IO1_GR7_WD | | RESERVED | | LPDDR2IO1_GR6_SR | | LPDDR2IO1_GR6_I | | LPDDR2IO1_GR6_WD | | RESERVED | | LPDDR2IO1_GR5_SR | | LPDDR2IO1_GR5_I | | LPDDR2IO1_GR5_WD | | RESERVED | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 31:30 | LPDDR2IO1_GR8_SR | Group 8 Slew Rate control sr1:sr0 | RW | 0x2 |
| 29:27 | LPDDR2IO1_GR8_I | Group 8 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽¹⁾ | RW | 0x3 |
| 26:25 | LPDDR2IO1_GR8_WD | Group 8 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 24 | RESERVED | | R | 0 |
| 23:22 | LPDDR2IO1_GR7_SR | Group 7 Slew Rate control sr1:sr0 | RW | 0x2 |

⁽¹⁾ To achieve the best LPDDR2IO performance, software must keep the impedance bit field at this value.

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 21:19 | LPDDR2IO1_GR7_I | Group 7 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽²⁾ | RW | 0x3 |
| 18:17 | LPDDR2IO1_GR7_WD | Group 7 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 16 | RESERVED | | R | 0 |
| 15:14 | LPDDR2IO1_GR6_SR | Group 6 Slew Rate control sr1:sr0 | RW | 0x2 |
| 13:11 | LPDDR2IO1_GR6_I | Group 6 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽²⁾ | RW | 0x3 |
| 10:9 | LPDDR2IO1_GR6_WD | Group 6 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 8 | RESERVED | | R | 0 |
| 7:6 | LPDDR2IO1_GR5_SR | Group 5 Slew Rate control sr1:sr0 | RW | 0x2 |
| 5:3 | LPDDR2IO1_GR5_I | Group 5 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽²⁾ | RW | 0x3 |
| 2:1 | LPDDR2IO1_GR5_WD | Group 5 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 0 | RESERVED | | R | 0 |

⁽²⁾ To achieve the best LPDDR2IO performance, software must keep the impedance bit field at this value.

Table 19-626. Register Call Summary for Register CONTROL_LPDDR2IO1_1

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[13\]](#)

For more information about slew rate (turn-on time) settings, see [Section 19.4.12.8.2, High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings](#).

Table 19-627. CONTROL_LPDDR2IO1_2

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0640 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0640 | | |
| Description | LPDDR2 1 I/O control 2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
|-------------------|----|------------------|----|-------------------|----|----------|----|-------------------|----|------------------|----|-------------------|----|----------|----|------------------|----|-----------------|----|------------------|----|----------|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|
| LPDDR2IO1_GR11_SR | | LPDDR2IO1_GR11_I | | LPDDR2IO1_GR11_WD | | RESERVED | | LPDDR2IO1_GR10_SR | | LPDDR2IO1_GR10_I | | LPDDR2IO1_GR10_WD | | RESERVED | | LPDDR2IO1_GR9_SR | | LPDDR2IO1_GR9_I | | LPDDR2IO1_GR9_WD | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:30 | LPDDR2IO1_GR11_SR | Group 11 Slew Rate control sr1:sr0 | RW | 0x2 |
| 29:27 | LPDDR2IO1_GR11_I | Group 11 Impedence control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽¹⁾ | RW | 0x3 |
| 26:25 | LPDDR2IO1_GR11_WD | Group 11 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 24 | RESERVED | | R | 0 |
| 23:22 | LPDDR2IO1_GR10_SR | Group 10 Slew Rate control sr1:sr0 | RW | 0x2 |

⁽¹⁾ To achieve the best LPDDR2IO performance, software must keep the impedance bit field at this value.

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 21:19 | LPDDR2IO1_GR10_I | Group 10 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽²⁾ | RW | 0x3 |
| 18:17 | LPDDR2IO1_GR10_WD | Group 10 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 16 | RESERVED | | R | 0 |
| 15:14 | LPDDR2IO1_GR9_SR | Group 9 Slew Rate control sr1:sr0 | RW | 0x2 |
| 13:11 | LPDDR2IO1_GR9_I | Group 9 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽²⁾ | RW | 0x3 |
| 10:9 | LPDDR2IO1_GR9_WD | Group 9 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 8:0 | RESERVED | | R | 0x000 |

⁽²⁾ To achieve the best LPDDR2IO performance, software must keep the impedance bit field at this value.

Table 19-628. Register Call Summary for Register CONTROL_LPDDR2IO1_2

Control Module Functional Description

- [Pull Selection: \[0\]](#)
- [Signal Integrity Parameter Controls Overview: \[1\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[11\]](#)

For more information about slew rate (turn-on time) settings, see [Section 19.4.12.8.2, High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings](#).

Table 19-629. CONTROL_LPDDR2IO1_3

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0644 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0644 | | |
| Description | LPDDR2 1 I/O control 3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------|-----------------------|---------------------------|---------------------------|--------------------------|--------------------------|----------------------|----------------------|----------------------------|----------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|---------------------------|-----------------------|-----------------------|----------------------|----------------------|----------------------------|----------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|---------------------------|------------------------|------------------------|-----------------------------|-----------------------------|
| LPDDR21_VREF_CA_CCAPO | LPDDR21_VREF_CA_CCAP1 | LPDDR21_VREF_CA_INT_CCAPO | LPDDR21_VREF_CA_INT_CCAP1 | LPDDR21_VREF_CA_INT_TAP0 | LPDDR21_VREF_CA_INT_TAP1 | LPDDR21_VREF_CA_TAP0 | LPDDR21_VREF_CA_TAP1 | LPDDR21_VREF_DQ_INT0_CCAPO | LPDDR21_VREF_DQ_INT0_CCAP1 | LPDDR21_VREF_DQ_INT0_TAP0 | LPDDR21_VREF_DQ_INT0_TAP1 | LPDDR21_VREF_DQ_INT1_CCAPO | LPDDR21_VREF_DQ_INT1_CCAP1 | LPDDR21_VREF_DQ_INT1_TAP0 | LPDDR21_VREF_DQ_INT1_TAP1 | LPDDR21_VREF_DQ_CCAPO | LPDDR21_VREF_DQ_CCAP1 | LPDDR21_VREF_DQ_TAP0 | LPDDR21_VREF_DQ_TAP1 | LPDDR21_VREF_DQ_INT2_CCAPO | LPDDR21_VREF_DQ_INT2_CCAP1 | LPDDR21_VREF_DQ_INT2_TAP0 | LPDDR21_VREF_DQ_INT2_TAP1 | LPDDR21_VREF_DQ_INT3_CCAPO | LPDDR21_VREF_DQ_INT3_CCAP1 | LPDDR21_VREF_DQ_INT3_TAP0 | LPDDR21_VREF_DQ_INT3_TAP1 | LPDDR21_INT_VREF_EN_CA | LPDDR21_INT_VREF_EN_DQ | LPDDR21_INT_VREF_AUTO_EN_CA | LPDDR21_INT_VREF_AUTO_EN_DQ |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------|---|------|-------|
| 31 | LPDDR21_VREF_CA_CCAPO | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |
| 30 | LPDDR21_VREF_CA_CCAP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 29 | LPDDR21_VREF_CA_INT_CCAPO | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |
| 28 | LPDDR21_VREF_CA_INT_CCAP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 27 | LPDDR21_VREF_CA_INT_TAP0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 26 | LPDDR21_VREF_CA_INT_TAP1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 25 | LPDDR21_VREF_CA_TAP0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 24 | LPDDR21_VREF_CA_TAP1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 23 | LPDDR21_VREF_DQ_INT0_CCAPO | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 22 | LPDDR21_VREF_DQ_INT0_CC AP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 21 | LPDDR21_VREF_DQ_INT0_TA P0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 20 | LPDDR21_VREF_DQ_INT0_TA P1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 19 | LPDDR21_VREF_DQ_INT1_CC AP0 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |
| 18 | LPDDR21_VREF_DQ_INT1_CC AP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 17 | LPDDR21_VREF_DQ_INT1_TA P0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 16 | LPDDR21_VREF_DQ_INT1_TA P1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 15 | LPDDR21_VREF_DQ_CCAP0 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |
| 14 | LPDDR21_VREF_DQ_CCAP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 13 | LPDDR21_VREF_DQ_TAP0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 12 | LPDDR21_VREF_DQ_TAP1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 11 | LPDDR21_VREF_DQ_INT2_CC AP0 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |
| 10 | LPDDR21_VREF_DQ_INT3_CC AP0 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |
| 9 | LPDDR21_VREF_DQ_INT2_CC AP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 8 | LPDDR21_VREF_DQ_INT3_CC AP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 7 | LPDDR21_VREF_DQ_INT2_TA P0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|---|------|-------|
| 6 | LPDDR21_VREF_DQ_INT3_TA P0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 5 | LPDDR21_VREF_DQ_INT2_TA P1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 4 | LPDDR21_VREF_DQ_INT3_TA P1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 3 | LPDDR21_INT_VREF_EN_CA | Internal vref enable for CA in manual mode (if both manual and auto mode is enabled then manual mode takes the priority) 0x0: Disabled 0x1: Enabled | RW | 1 |
| 2 | LPDDR21_INT_VREF_EN_DQ | Internal vref enable for DQ in manual mode (if both manual and auto mode is enabled then manual mode takes the priority) 0x0: Disabled 0x1: Enabled | RW | 1 |
| 1 | LPDDR21_INT_VREF_AUTO_E N_CA | Internal vref enable for CA in auto mode (if both manual and auto mode is enabled then manual mode takes the priority) 0x0: Disabled 0x1: Enabled | RW | 1 |
| 0 | LPDDR21_INT_VREF_AUTO_E N_DQ | Internal vref enable for DQ in auto mode (if both manual and auto mode is enabled then manual mode takes the priority) 0x0: Disabled 0x1: Enabled | RW | 1 |

Table 19-630. Register Call Summary for Register CONTROL_LPDDR2IO1_3

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings: \[1\] \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[3\]](#)

Table 19-631. CONTROL_LPDDR2IO2_0

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0648 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 0648 | | | | | | | | | | | | | | | | Instance | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Description | LPDDR2 2 I/O control 0 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|----|----|-----------------|----|----|----|----------|----|----|----|------------------|----|----|----|-----------------|----|----|----|------------------|----|---|---|----------|---|---|---|------------------|---|---|---|-----------------|--|--|--|------------------|--|--|--|----------|--|--|--|------------------|--|--|--|-----------------|--|--|--|------------------|--|--|--|----------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LPDDR2IO2_GR4_SR | | | | LPDDR2IO2_GR4_I | | | | RESERVED | | | | LPDDR2IO2_GR3_SR | | | | LPDDR2IO2_GR3_I | | | | LPDDR2IO2_GR3_WD | | | | RESERVED | | | | LPDDR2IO2_GR2_SR | | | | LPDDR2IO2_GR2_I | | | | LPDDR2IO2_GR2_WD | | | | RESERVED | | | | LPDDR2IO2_GR1_SR | | | | LPDDR2IO2_GR1_I | | | | LPDDR2IO2_GR1_WD | | | | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 31:30 | LPDDR2IO2_GR4_SR | Group 4 Slew Rate control sr1:sr0 | RW | 0x2 |
| 29:27 | LPDDR2IO2_GR4_I | Group 4 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽¹⁾ | RW | 0x3 |
| 26:25 | LPDDR2IO2_GR4_WD | Group 4 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 24 | RESERVED | | R | 0 |
| 23:22 | LPDDR2IO2_GR3_SR | Group 3 Slew Rate control sr1:sr0 | RW | 0x2 |
| 21:19 | LPDDR2IO2_GR3_I | Group 3 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽¹⁾ | RW | 0x3 |
| 18:17 | LPDDR2IO2_GR3_WD | Group 3 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 16 | RESERVED | | R | 0 |
| 15:14 | LPDDR2IO2_GR2_SR | Group 2 Slew Rate control sr1:sr0 | RW | 0x2 |
| 13:11 | LPDDR2IO2_GR2_I | Group 2 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽¹⁾ | RW | 0x3 |
| 10:9 | LPDDR2IO2_GR2_WD | Group 2 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |

⁽¹⁾ To achieve the best LPDDR2IO performance, software must keep the impedance bit field at this value.

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------|
| 8 | RESERVED | | R | 0 |
| 7:6 | LPDDR2IO2_GR1_SR | Group 1 Slew Rate control sr1:sr0 | RW | 0x2 |
| 5:3 | LPDDR2IO2_GR1_I | Group 1 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽²⁾ | RW | 0x3 |
| 2:1 | LPDDR2IO2_GR1_WD | Group 1 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 0 | RESERVED | | R | 0 |

⁽²⁾ To achieve the best LPDDR2IO performance, software must keep the impedance bit field at this value.

Table 19-632. Register Call Summary for Register CONTROL_LPDDR2IO2_0

Control Module Functional Description

- [Pull Selection: \[0\]](#)
- [Signal Integrity Parameter Controls Overview: \[1\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[14\]](#)

For more information about slew rate (turn-on time) settings, see [Section 19.4.12.8.2, High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings](#).

Table 19-633. CONTROL_LPDDR2IO2_1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 064C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 064C | | |
| Description | LPDDR2 2 I/O control 1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|-----------------|----|------------------|----|----------|----|------------------|----|-----------------|----|------------------|----|----------|----|------------------|----|-----------------|----|------------------|----|----------|---|------------------|---|-----------------|---|------------------|---|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| LPDDR2IO2_GR8_SR | | LPDDR2IO2_GR8_I | | LPDDR2IO2_GR8_WD | | RESERVED | | LPDDR2IO2_GR7_SR | | LPDDR2IO2_GR7_I | | LPDDR2IO2_GR7_WD | | RESERVED | | LPDDR2IO2_GR6_SR | | LPDDR2IO2_GR6_I | | LPDDR2IO2_GR6_WD | | RESERVED | | LPDDR2IO2_GR5_SR | | LPDDR2IO2_GR5_I | | LPDDR2IO2_GR5_WD | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 31:30 | LPDDR2IO2_GR8_SR | Group 8 Slew Rate control sr1:sr0 | RW | 0x2 |
| 29:27 | LPDDR2IO2_GR8_I | Group 8 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽¹⁾ | RW | 0x3 |
| 26:25 | LPDDR2IO2_GR8_WD | Group 8 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 24 | RESERVED | | R | 0 |
| 23:22 | LPDDR2IO2_GR7_SR | Group 7 Slew Rate control sr1:sr0 | RW | 0x2 |
| 21:19 | LPDDR2IO2_GR7_I | Group 7 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽¹⁾ | RW | 0x3 |
| 18:17 | LPDDR2IO2_GR7_WD | Group 7 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 16 | RESERVED | | R | 0 |
| 15:14 | LPDDR2IO2_GR6_SR | Group 6 Slew Rate control sr1:sr0 | RW | 0x2 |
| 13:11 | LPDDR2IO2_GR6_I | Group 6 Impedance control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽¹⁾ | RW | 0x3 |
| 10:9 | LPDDR2IO2_GR6_WD | Group 6 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |

⁽¹⁾ To achieve the best LPDDR2IO performance, software must keep the impedance bit field at this value.

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------|
| 8 | RESERVED | | R | 0 |
| 7:6 | LPDDR2IO2_GR5_SR | Group 5 Slew Rate control sr1:sr0 | RW | 0x2 |
| 5:3 | LPDDR2IO2_GR5_I | Group 5 Impedence control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽²⁾ | RW | 0x3 |
| 2:1 | LPDDR2IO2_GR5_WD | Group 5 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 0 | RESERVED | | R | 0 |

⁽²⁾ To achieve the best LPDDR2IO performance, software must keep the impedance bit field at this value.

Table 19-634. Register Call Summary for Register CONTROL_LPDDR2IO2_1

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[13\]](#)

For more information about slew rate (turn-on time) settings, see [Section 19.4.12.8.2, High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings](#).

Table 19-635. CONTROL_LPDDR2IO2_2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0650 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 0650 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Description | LPDDR2 2 I/O control 2 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|----|----|----|------------------|----|----|----|-------------------|----|----|----|----------|----|----|----|-------------------|----|----|----|------------------|----|---|---|-------------------|---|---|---|----------|---|---|---|------------------|--|--|--|-----------------|--|--|--|------------------|--|--|--|----------|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | |
| LPDDR2IO2_GR11_SR | | | | LPDDR2IO2_GR11_I | | | | LPDDR2IO2_GR11_WD | | | | RESERVED | | | | LPDDR2IO2_GR10_SR | | | | LPDDR2IO2_GR10_I | | | | LPDDR2IO2_GR10_WD | | | | RESERVED | | | | LPDDR2IO2_GR9_SR | | | | LPDDR2IO2_GR9_I | | | | LPDDR2IO2_GR9_WD | | | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:30 | LPDDR2IO2_GR11_SR | Group 11 Slew Rate control sr1:sr0 | RW | 0x2 |
| 29:27 | LPDDR2IO2_GR11_I | Group 11 Impedence control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽¹⁾ | RW | 0x3 |
| 26:25 | LPDDR2IO2_GR11_WD | Group 11 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 24 | RESERVED | | R | 0 |
| 23:22 | LPDDR2IO2_GR10_SR | Group 10 Slew Rate control sr1:sr0 | RW | 0x2 |
| 21:19 | LPDDR2IO2_GR10_I | Group 10 Impedence control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽¹⁾ | RW | 0x3 |
| 18:17 | LPDDR2IO2_GR10_WD | Group 10 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 16 | RESERVED | | R | 0 |
| 15:14 | LPDDR2IO2_GR9_SR | Group 9 Slew Rate control sr1:sr0 | RW | 0x2 |
| 13:11 | LPDDR2IO2_GR9_I | Group 9 Impedence control i2:i0 0x0: for Drv5 0x1: for Drv6 0x2: for Drv7 0x3: for Drv8 0x4: for Drv9 0x5: for Drv10 0x6: for Drv11 0x7: Drv12 ⁽¹⁾ | RW | 0x3 |
| 10:9 | LPDDR2IO2_GR9_WD | Group 9 Weak driver control wd1:wd0 0x0: Pull logic disabled 0x1: pull up 0x2: pull down 0x3: Maintain the previous output value | RW | 0x2 |
| 8:0 | RESERVED | | R | 0x000 |

⁽¹⁾ To achieve the best LPDDR2IO performance, software must keep the impedance bit field at this value.

Table 19-636. Register Call Summary for Register CONTROL_LPDDR2IO2_2

Control Module Functional Description

- [Pull Selection: \[0\]](#)
- [Signal Integrity Parameter Controls Overview: \[1\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[11\]](#)

For more information about slew rate (turn-on time) settings, see [Section 19.4.12.8.2, High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings](#).

Table 19-637. CONTROL_LPDDR2IO2_3

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0654 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0654 | | |
| Description | LPDDR2 2 I/O control 3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------|-----------------------|---------------------------|---------------------------|--------------------------|--------------------------|----------------------|----------------------|----------------------------|----------------------------|---------------------------|---------------------------|----------------------------|----------------------------|---------------------------|---------------------------|-----------------------|-----------------------|----------------------|----------------------|----------------------------|----------------------------|----------------------------|----------------------------|---------------------------|---------------------------|---------------------------|---------------------------|------------------------|------------------------|-----------------------------|-----------------------------|
| LPDDR22_VREF_CA_CCAPO | LPDDR22_VREF_CA_CCAP1 | LPDDR22_VREF_CA_INT_CCAPO | LPDDR22_VREF_CA_INT_CCAP1 | LPDDR22_VREF_CA_INT_TAP0 | LPDDR22_VREF_CA_INT_TAP1 | LPDDR22_VREF_CA_TAP0 | LPDDR22_VREF_CA_TAP1 | LPDDR22_VREF_DQ_INT0_CCAPO | LPDDR22_VREF_DQ_INT0_CCAP1 | LPDDR22_VREF_DQ_INT0_TAP0 | LPDDR22_VREF_DQ_INT0_TAP1 | LPDDR22_VREF_DQ_INT1_CCAPO | LPDDR22_VREF_DQ_INT1_CCAP1 | LPDDR22_VREF_DQ_INT1_TAP0 | LPDDR22_VREF_DQ_INT1_TAP1 | LPDDR22_VREF_DQ_CCAPO | LPDDR22_VREF_DQ_CCAP1 | LPDDR22_VREF_DQ_TAP0 | LPDDR22_VREF_DQ_TAP1 | LPDDR22_VREF_DQ_INT2_CCAPO | LPDDR22_VREF_DQ_INT3_CCAPO | LPDDR22_VREF_DQ_INT2_CCAP1 | LPDDR22_VREF_DQ_INT3_CCAP1 | LPDDR22_VREF_DQ_INT2_TAP0 | LPDDR22_VREF_DQ_INT3_TAP0 | LPDDR22_VREF_DQ_INT2_TAP1 | LPDDR22_VREF_DQ_INT3_TAP1 | LPDDR22_INT_VREF_EN_CA | LPDDR22_INT_VREF_EN_DQ | LPDDR22_INT_VREF_AUTO_EN_CA | LPDDR22_INT_VREF_AUTO_EN_DQ |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|-------|
| 31 | LPDDR22_VREF_CA_CCAPO | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |
| 30 | LPDDR22_VREF_CA_CCAP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 29 | LPDDR22_VREF_CA_INT_CCAPO | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |
| 28 | LPDDR22_VREF_CA_INT_CCAP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 27 | LPDDR22_VREF_CA_INT_TAP0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 26 | LPDDR22_VREF_CA_INT_TAP1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 25 | LPDDR22_VREF_CA_TAP0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 24 | LPDDR22_VREF_CA_TAP1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 23 | LPDDR22_VREF_DQ_INT0_CC AP0 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |
| 22 | LPDDR22_VREF_DQ_INT0_CC AP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 21 | LPDDR22_VREF_DQ_INT0_TA P0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 20 | LPDDR22_VREF_DQ_INT0_TA P1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 19 | LPDDR22_VREF_DQ_INT1_CC AP0 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |
| 18 | LPDDR22_VREF_DQ_INT1_CC AP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 17 | LPDDR22_VREF_DQ_INT1_TA P0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 16 | LPDDR22_VREF_DQ_INT1_TA P1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 15 | LPDDR22_VREF_DQ_CCAPO | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |
| 14 | LPDDR22_VREF_DQ_CCAP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 13 | LPDDR22_VREF_DQ_TAP0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 12 | LPDDR22_VREF_DQ_TAP1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 11 | LPDDR22_VREF_DQ_INT2_CC AP0 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |
| 10 | LPDDR22_VREF_DQ_INT3_CC AP0 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|------|-------|
| 9 | LPDDR22_VREF_DQ_INT2_CC AP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 8 | LPDDR22_VREF_DQ_INT3_CC AP1 | Selection for coupling cap connection 0x0: Disabled 0x1: Enabled | RW | 0 |
| 7 | LPDDR22_VREF_DQ_INT2_TA P0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 6 | LPDDR22_VREF_DQ_INT3_TA P0 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 5 | LPDDR22_VREF_DQ_INT2_TA P1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 4 | LPDDR22_VREF_DQ_INT3_TA P1 | Selection for internal reference voltage drive 0x0: Disabled 0x1: Enabled | RW | 1 |
| 3 | LPDDR22_INT_VREF_EN_CA | Internal vref enable for CA in manual mode (if both manual and auto mode is enabled then manual mode takes the priority) 0x0: Disabled 0x1: Enabled | RW | 1 |
| 2 | LPDDR22_INT_VREF_EN_DQ | Internal vref enable for DQ in manual mode (if both manual and auto mode is enabled then manual mode takes the priority) 0x0: Disabled 0x1: Enabled | RW | 1 |
| 1 | LPDDR22_INT_VREF_AUTO_EN_CA | Internal vref enable for CA in auto mode (if both manual and auto mode is enabled then manual mode takes the priority) 0x0: Disabled 0x1: Enabled | RW | 1 |
| 0 | LPDDR22_INT_VREF_AUTO_EN_DQ | Internal vref enable for DQ in auto mode (if both manual and auto mode is enabled then manual mode takes the priority) 0x0: Disabled 0x1: Enabled | RW | 1 |

Table 19-638. Register Call Summary for Register CONTROL_LPDDR2IO2_3

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings: \[1\] \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[3\]](#)

Table 19-639. CONTROL_BUS_HOLD

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0658 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 0658 | | | | | | | | | | | | | | | InstanceSYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Description | BUS HOLD I/O controls Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------------|
| 31:0 | RESERVED | | R | 0x0000 0000 |

Table 19-640. Register Call Summary for Register CONTROL_BUS_HOLD

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-641. CONTROL_C2C

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 065C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 065C | | | | | | | | | | | | | | | | InstanceSYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | C2C controls Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| C2C_SPARE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------------|------|-------------|
| 31:0 | C2C_SPARE | C2C spare register bits | RW | 0x0000 0000 |

Table 19-642. Register Call Summary for Register CONTROL_C2C

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-643. CONTROL_CORE_CONTROL_SPARE_RW

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0660 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 0660 | | | | | | | | | | | | | | | | InstanceSYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Description | CORE control spare RW Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| CORE_CONTROL_SPARE_RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|-------------------------------------|------|-------------|
| 31:0 | CORE_CONTROL_SPARE_RW | Core control spare register bits RW | RW | 0x0000 0000 |

Table 19-644. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-645. CONTROL_CORE_CONTROL_SPARE_R

| | | |
|------------------|--|----------|
| Address Offset | 0x0000 0664 | |
| Physical Address | 0x4A10 0664 | Instance |
| Description | CORE control spare R Access conditions. Read: unrestricted, Write: unrestricted | |
| Type | R | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CONTROL_SPARE_R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|------------------------------------|------|-------------|
| 31:0 | CORE_CONTROL_SPARE_R | Core control spare register bits R | R | 0x0000 0000 |

Table 19-646. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_R

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-647. CONTROL_CORE_CONTROL_SPARE_R_C0

| | | | | | | | | | |
|------------------|---|--|--|----------|----------------------|--|--|--|--|
| Address Offset | 0x0000 0668 | | | Instance | SYSCTRL_PADCONF_CORE | | | | |
| Physical Address | 0x4A10 0668 | | | | | | | | |
| Description | CORE control spare RC Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | |
| Type | RW | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CONTROL_SPARE_R_C0 | CORE_CONTROL_SPARE_R_C1 | CORE_CONTROL_SPARE_R_C2 | CORE_CONTROL_SPARE_R_C3 | CORE_CONTROL_SPARE_R_C4 | CORE_CONTROL_SPARE_R_C5 | CORE_CONTROL_SPARE_R_C6 | CORE_CONTROL_SPARE_R_C7 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|---------|------------------------|-------------------------------------|--------------------------|-------|
| 31 0 | CORE_CONTROL_SPARE_R_C | Core control spare register bits RC | RW (Write 1 to Clear) | 0 |
| 30 1 | CORE_CONTROL_SPARE_R_C | Core control spare register bits RC | RW (Write 1 to Clear) | 0 |
| 29 2 | CORE_CONTROL_SPARE_R_C | Core control spare register bits RC | RW (Write 1 to Clear) | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|-------------------------------------|--------------------------|----------|
| 28 | CORE_CONTROL_SPARE_R_C 3 | Core control spare register bits RC | RW (Write 1 to Clear) | 0 |
| 27 | CORE_CONTROL_SPARE_R_C 4 | Core control spare register bits RC | RW (Write 1 to Clear) | 0 |
| 26 | CORE_CONTROL_SPARE_R_C 5 | Core control spare register bits RC | RW (Write 1 to Clear) | 0 |
| 25 | CORE_CONTROL_SPARE_R_C 6 | Core control spare register bits RC | RW (Write 1 to Clear) | 0 |
| 24 | CORE_CONTROL_SPARE_R_C 7 | Core control spare register bits RC | RW (Write 1 to Clear) | 0 |
| 23:0 | RESERVED | | R | 0x000000 |

Table 19-648. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_R_C0

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-649. CONTROL_CORE_CONTROL_SPARE_RW1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 066C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 066C | | |
| Description | CORE control spare RW1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CONTROL_SPARE_RW1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------------|--------------------------------------|------|-------------|
| 31:0 | CORE_CONTROL_SPARE_RW 1 | Core control spare register bits RW1 | RW | 0x0000 0000 |

Table 19-650. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW1

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-651. CONTROL_CORE_CONTROL_SPARE_RW2

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0670 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0670 | | |
| Description | CORE control spare RW2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CONTROL_SPARE_RW2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-----------|-----------------------|--------------------------------------|------|-------------|
| 31:0 2 | CORE_CONTROL_SPARE_RW | Core control spare register bits RW2 | RW | 0x0000 0000 |

Table 19-652. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW2

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-653. CONTROL_CORE_CONTROL_SPARE_RW3

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0674 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0674 | | |
| Description | CORE control spare RW3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CONTROL_SPARE_RW3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-----------|-----------------------|--------------------------------------|------|-------------|
| 31:0 3 | CORE_CONTROL_SPARE_RW | Core control spare register bits RW3 | RW | 0x0000 0000 |

Table 19-654. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW3

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-655. CONTROL_CORE_CONTROL_SPARE_RW4

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0678 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0678 | | |
| Description | CORE control spare RW4 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CONTROL_SPARE_RW4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-----------|-----------------------|--------------------------------------|------|-------------|
| 31:0 4 | CORE_CONTROL_SPARE_RW | Core control spare register bits RW4 | RW | 0x0000 0000 |

Table 19-656. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW4

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-657. CONTROL_CORE_CONTROL_SPARE_RW5

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 067C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 067C | | |
| Description | CORE control spare RW5 Access conditions. Read: unrestricted, Write: unrestricted | | |

Table 19-657. CONTROL_CORE_CONTROL_SPARE_RW5 (continued)

| Type | | | | | | | | | | | | | | | | RW | | | | | | | | | | | | | | | | |
|------------------------|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| CORE_CONTROL_SPARE_RW5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | | | | | | | | | Description | | | | | | | | | | | | | | | Type | Reset |
| 31:0 | CORE_CONTROL_SPARE_RW5 | | | | | | | | | | | | | | | Core control spare register bits RW5 | | | | | | | | | | | | | | | RW | 0x0000 0000 |

Table 19-658. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW5

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-659. CONTROL_CORE_CONTROL_SPARE_RW6

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0680 | | |
| Physical Address | 0x4A10 0680 | Instance | SYSCTRL_PADCONF_CORE |
| Description | CORE control spare RW6 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CONTROL_SPARE_RW6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--------------------------------------|------|-------------|
| 31:0 | CORE_CONTROL_SPARE_RW6 | Core control spare register bits RW6 | RW | 0x0000 0000 |

Table 19-660. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW6

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-661. CONTROL_CORE_CONTROL_SPARE_RW7

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0684 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A10 0684 | | | | | | | | | | | | | | | | Instance | SYSCTRL_PADCONF_CORE | | | | | | | | | | | | | | | |
| Description | CORE control spare RW7 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CONTROL_SPARE_RW7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--------------------------------------|------|-------------|
| 31:0 | CORE_CONTROL_SPARE_RW7 | Core control spare register bits RW7 | RW | 0x0000 0000 |

Table 19-662. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW7

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-663. CONTROL_CORE_CONTROL_SPARE_RW8

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0688 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0688 | | |
| Description | CORE control spare RW8 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CONTROL_SPARE_RW8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--------------------------------------|------|-------------|
| 31:0 | CORE_CONTROL_SPARE_RW8 | Core control spare register bits RW8 | RW | 0x0000 0000 |

Table 19-664. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW8

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-665. CONTROL_CORE_CONTROL_SPARE_RW9

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 068C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 068C | | |
| Description | CORE control spare RW9 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CONTROL_SPARE_RW9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--------------------------------------|------|-------------|
| 31:0 | CORE_CONTROL_SPARE_RW9 | Core control spare register bits RW9 | RW | 0xFFFF FFFF |

Table 19-666. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_RW9

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-667. CONTROL_CORE_CONTROL_SPARE_R1

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0690 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0690 | | |
| Description | CORE control spare R1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CORE_CONTROL_SPARE_R1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|-------------------------------------|------|-------------|
| 31:0 | CORE_CONTROL_SPARE_R1 | Core control spare register bits R1 | R | 0x0000 0000 |

Table 19-668. Register Call Summary for Register CONTROL_CORE_CONTROL_SPARE_R1

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-669. CONTROL_EFUSE_2

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0704 | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 0704 | | |
| Description | EFUSE control 2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| EFUSE_SMART2TEST_P0 | EFUSE_SMART2TEST_P1 | EFUSE_SMART2TEST_P2 | EFUSE_SMART2TEST_P3 | EFUSE_SMART2TEST_N0 | EFUSE_SMART2TEST_N1 | EFUSE_SMART2TEST_N2 | EFUSE_SMART2TEST_N3 | LPDDR2_PTV_N1 | LPDDR2_PTV_N2 | LPDDR2_PTV_N3 | LPDDR2_PTV_N4 | LPDDR2_PTV_N5 | LPDDR2_PTV_P1 | LPDDR2_PTV_P2 | LPDDR2_PTV_P3 | LPDDR2_PTV_P4 | LPDDR2_PTV_P5 | RESERVED | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|-------|
| 31 | EFUSE_SMART2TEST_P0 | Smart2/3/C2C I/O PMOS process compensation bit 0 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_sr_p0 | RW | 0 |
| 30 | EFUSE_SMART2TEST_P1 | Smart2/3/C2C I/O PMOS process compensation bit 1 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_sr_p1 | RW | 0 |
| 29 | EFUSE_SMART2TEST_P2 | Smart2/3/C2C I/O PMOS process compensation bit 2 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_sr_p2 | RW | 0 |
| 28 | EFUSE_SMART2TEST_P3 | Smart2/3/C2C I/O PMOS process compensation bit 3 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_sr_p3 | RW | 0 |
| 27 | EFUSE_SMART2TEST_N0 | Smart2/3/C2C I/O NMOS process compensation bit 0 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_sr_n0 | RW | 0 |
| 26 | EFUSE_SMART2TEST_N1 | Smart2/3/C2C I/O NMOS process compensation bit 1 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_sr_n1 | RW | 0 |
| 25 | EFUSE_SMART2TEST_N2 | Smart2/3/C2C I/O NMOS process compensation bit 2 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_sr_n2 | RW | 0 |
| 24 | EFUSE_SMART2TEST_N3 | Smart2/3/C2C I/O NMOS process compensation bit 3 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_sr_n3 | RW | 0 |
| 23 | LPDDR2_PTV_N1 | LPDDR2IO NMOS PTV code bit 1 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_lpddr2_n1 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|--------|
| 22 | LPDDR2_PTV_N2 | LPDDR2IO NMOS PTV code bit 2 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_lpddr2_n2 | RW | 0 |
| 21 | LPDDR2_PTV_N3 | LPDDR2IO NMOS PTV code bit 3 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_lpddr2_n3 | RW | 0 |
| 20 | LPDDR2_PTV_N4 | LPDDR2IO NMOS PTV code bit 4 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_lpddr2_n4 | RW | 0 |
| 19 | LPDDR2_PTV_N5 | LPDDR2IO NMOS PTV code bit 5 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_lpddr2_n5 | RW | 0 |
| 18 | LPDDR2_PTV_P1 | LPDDR2IO PMOS PTV code bit 1 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_lpddr2_p1 | RW | 0 |
| 17 | LPDDR2_PTV_P2 | LPDDR2IO PMOS PTV code bit 2 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_lpddr2_p2 | RW | 0 |
| 16 | LPDDR2_PTV_P3 | LPDDR2IO PMOS PTV code bit 3 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_lpddr2_p3 | RW | 0 |
| 15 | LPDDR2_PTV_P4 | LPDDR2IO PMOS PTV code bit 4 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_lpddr2_p4 | RW | 0 |
| 14 | LPDDR2_PTV_P5 | LPDDR2IO PMOS PTV code bit 5 (Reset value exported from efuse) Note that reset is exported. Its value is = pi_lpddr2_p5 | RW | 0 |
| 13:0 | RESERVED | | R | 0x0000 |

Table 19-670. Register Call Summary for Register CONTROL EFUSE 2

| | |
|---|--|
| Control Module Functional Description | |
| • High-Speed I/O Buffers With Impedance, Slew Rate, and Weak Driver Settings: [0] [1] [2] [3] [4] [5] | |
| • I/Os With Combined Mode and Load Settings: [6] [7] [8] [9] [10] [11] | |
| • I/O Cells With Configurable Impedance Mode: [12] [13] [14] [15] [16] | |
| • C2CI/O Cells With Load Setting Adjustable According to Interface Requirement Voltage Mode: [17] [18] [19] [20] [21] | |
| Control Module Register Manual | |
| • SYSCTRL_PADCONF_CORE Register Summary: [22] | |

Table 19-671. CONTROL EFUSE 3

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0708 | | |
| Physical Address | 0x4A10 0708 | Instance | SYSCTRL_PADCONF_CORE |
| Description | EFUSE control 3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|----|----|----|----|----|----|------------------|----|----|----|----|----|----|----|------------------|----|----|----|----|----|---|---|------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STD_FUSE_SPARE_1 | | | | | | | | STD_FUSE_SPARE_2 | | | | | | | | STD_FUSE_SPARE_3 | | | | | | | | STD_FUSE_SPARE_4 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|----------------------------------|------|-------|
| 31:24 | STD_FUSE_SPARE_1 | std efuse spare bits (Read Only) | R | 0x00 |
| 23:16 | STD_FUSE_SPARE_2 | std efuse spare bits (Read Only) | R | 0x00 |
| 15:8 | STD_FUSE_SPARE_3 | std efuse spare bits (Read Only) | R | 0x00 |
| 7:0 | STD_FUSE_SPARE_4 | std efuse spare bits (Read Only) | R | 0x00 |

Table 19-672. Register Call Summary for Register CONTROL_EFUSE_3

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

Table 19-673. CONTROL_EFUSE_4

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 070C | Instance | SYSCTRL_PADCONF_CORE |
| Physical Address | 0x4A10 070C | | |
| Description | EFUSE control 4 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|----|----|----|----|----|----|----|------------------|----|----|----|----|----|----|----|------------------|----|----|----|----|----|---|---|------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| STD_FUSE_SPARE_5 | | | | | | | | STD_FUSE_SPARE_6 | | | | | | | | STD_FUSE_SPARE_7 | | | | | | | | STD_FUSE_SPARE_8 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 31:24 | STD_FUSE_SPARE_5 | std efuse spare bits (RW) Note that reset is exported. Its value is = pi_std_fuse_spare5 | RW | 0x00 |
| 23:16 | STD_FUSE_SPARE_6 | std efuse spare bits (RW) Note that reset is exported. Its value is = pi_std_fuse_spare6 | RW | 0x00 |
| 15:8 | STD_FUSE_SPARE_7 | std efuse spare bits (RW) Note that reset is exported. Its value is = pi_std_fuse_spare7 | RW | 0x00 |
| 7:0 | STD_FUSE_SPARE_8 | std efuse spare bits (RW) Note that reset is exported. Its value is = pi_std_fuse_spare8 | RW | 0x00 |

Table 19-674. Register Call Summary for Register CONTROL_EFUSE_4

Control Module Register Manual

- [SYSCTRL_PADCONF_CORE Register Summary: \[0\]](#)

19.6.8 SYSCTRL_PADCONF_WKUP Register Summary

Table 19-675. SYSCTRL_PADCONF_WKUP Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_PADCONF_WKUP Physical Address |
|--|------|-----------------------|----------------|---------------------------------------|
| CONTROL_PADCONF_WKUP_REVISION | R | 32 | 0x0000 0000 | 0x4A31 E000 |
| CONTROL_PADCONF_WKUP_HWINFO | R | 32 | 0x0000 0004 | 0x4A31 E004 |
| CONTROL_PADCONF_WKUP_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4A31 E010 |
| CONTROL_WKUP_PAD0_GPIO_WK0_PAD1_GPIO_WK1 | RW | 32 | 0x0000 0040 | 0x4A31 E040 |
| CONTROL_WKUP_PAD0_GPIO_WK2_PAD1_GPIO_WK3 | RW | 32 | 0x0000 0044 | 0x4A31 E044 |
| CONTROL_WKUP_PAD0_GPIO_WK4_PAD1_SR_SCL | RW | 32 | 0x0000 0048 | 0x4A31 E048 |
| CONTROL_WKUP_PAD0_SR_SDA_PAD1_FREF_XTAL_IN | RW | 32 | 0x0000 004C | 0x4A31 E04C |
| CONTROL_WKUP_PAD0_FREF_SLICER_IN_PAD1_FREF_CLK_IOREQ | RW | 32 | 0x0000 0050 | 0x4A31 E050 |

Table 19-675. SYSCTRL_PADCONF_WKUP Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_PADCONF_WKUP Physical Address |
|--|------|-----------------------|----------------|---------------------------------------|
| CONTROL_WKUP_PAD0_FREF_CLK0_OUT_PAD1_FREF_CLK3_REQ | RW | 32 | 0x0000 0054 | 0x4A31 E054 |
| CONTROL_WKUP_PAD0_FREF_CLK3_OUT_PAD1_FREF_CLK4_REQ | RW | 32 | 0x0000 0058 | 0x4A31 E058 |
| CONTROL_WKUP_PAD0_FREF_CLK4_OUT_PAD1_SYS_32K | RW | 32 | 0x0000 005C | 0x4A31 E05C |
| CONTROL_WKUP_PAD0_SYS_NRESPWRON_PAD1_SYS_NRESWARM | RW | 32 | 0x0000 0060 | 0x4A31 E060 |
| CONTROL_WKUP_PAD0_SYS_PWR_REQ_PAD1_SYS_PWRON_RESET_OUT | RW | 32 | 0x0000 0064 | 0x4A31 E064 |
| CONTROL_WKUP_PAD0_SYS_BOOT6_PAD1_SYS_BOOT7 | RW | 32 | 0x0000 0068 | 0x4A31 E068 |
| CONTROL_WKUP_PAD0_JTAG_NTRST_PAD1_JTAG_TCK | RW | 32 | 0x0000 006C | 0x4A31 E06C |
| CONTROL_WKUP_PAD0_JTAG_RTC_PAD1_JTAG_TMS_TMSC | RW | 32 | 0x0000 0070 | 0x4A31 E070 |
| CONTROL_WKUP_PAD0_JTAG_TDI_PAD1_JTAG_TDO | RW | 32 | 0x0000 0074 | 0x4A31 E074 |
| CONTROL_WKUP_PADCONF_WAKEUPEVENT_0 | R | 32 | 0x0000 007C | 0x4A31 E07C |
| CONTROL_SMART1NOPMIO_PADC_ONF_0 | RW | 32 | 0x0000 05A0 | 0x4A31 E5A0 |
| CONTROL_SMART1NOPMIO_PADC_ONF_1 | RW | 32 | 0x0000 05A4 | 0x4A31 E5A4 |
| CONTROL_WKUP_PADCONF_MODE | RW | 32 | 0x0000 05A8 | 0x4A31 E5A8 |
| CONTROL_XTAL_OSCILLATOR | RW | 32 | 0x0000 05AC | 0x4A31 E5AC |
| CONTROL_SMART3NOPMIO_PADC_ONF_0 | RW | 32 | 0x0000 05B0 | 0x4A31 E5B0 |
| CONTROL_SMART3NOPMIO_PADC_ONF_1 | RW | 32 | 0x0000 05B4 | 0x4A31 E5B4 |
| RESERVED | RW | 32 | 0x0000 0600 | 0x4A31 E600 |
| CONTROL_I2C_2 | RW | 32 | 0x0000 0604 | 0x4A31 E604 |
| CONTROL_JTAG | RW | 32 | 0x0000 0608 | 0x4A31 E608 |
| CONTROL_SYS | RW | 32 | 0x0000 060C | 0x4A31 E60C |
| CONTROL_WKUP_CONTROL_SPARE_RW | RW | 32 | 0x0000 0614 | 0x4A31 E614 |
| CONTROL_WKUP_CONTROL_SPARE_R | R | 32 | 0x0000 0618 | 0x4A31 E618 |
| CONTROL_WKUP_CONTROL_SPARE_R_C0 | RW | 32 | 0x0000 061C | 0x4A31 E61C |
| CONTROL_WKUP_CONTROL_SPARE_RW1 | RW | 32 | 0x0000 0620 | 0x4A31 E620 |
| CONTROL_WKUP_CONTROL_SPARE_RW2 | RW | 32 | 0x0000 0624 | 0x4A31 E624 |
| CONTROL_WKUP_CONTROL_SPARE_RW3 | RW | 32 | 0x0000 0628 | 0x4A31 E628 |
| CONTROL_WKUP_CONTROL_SPARE_RW4 | RW | 32 | 0x0000 062C | 0x4A31 E62C |
| CONTROL_WKUP_CONTROL_SPARE_RW5 | RW | 32 | 0x0000 0630 | 0x4A31 E630 |
| CONTROL_WKUP_CONTROL_SPARE_RW6 | RW | 32 | 0x0000 0634 | 0x4A31 E634 |

Table 19-675. SYSCTRL_PADCONF_WKUP Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | SYSCTRL_PADCONF_WKUP Physical Address |
|--|------|-----------------------|----------------|---------------------------------------|
| CONTROL_WKUP_CONTROL_SPARE_RW7 | RW | 32 | 0x0000 0638 | 0x4A31 E638 |
| CONTROL_WKUP_CONTROL_SPARE_RW8 | RW | 32 | 0x0000 063C | 0x4A31 E63C |
| CONTROL_WKUP_CONTROL_SPARE_RW9 | RW | 32 | 0x0000 0640 | 0x4A31 E640 |
| CONTROL_WKUP_CONTROL_SPARE_R1 | R | 32 | 0x0000 064C | 0x4A31 E64C |

19.6.9 SYSCTRL_PADCONF_WKUP Register Description**Table 19-676. CONTROL_PADCONF_WKUP_REVISION**

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0000 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E000 | | |
| Description | Control module revision identifier Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP Revision | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data**Table 19-677. Register Call Summary for Register CONTROL_PADCONF_WKUP_REVISION**

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-678. CONTROL_PADCONF_WKUP_HWINFO

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0004 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E004 | | |
| Description | Information about the IP module hardware configuration that is, typically the module HDL generics (if any). Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| IP_HWINFO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------|------|-------------|
| 31:0 | IP_HWINFO | IP-module dependent | R | 0x0000 0000 |

Table 19-679. Register Call Summary for Register CONTROL_PADCONF_WKUP_HWINFO

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-680. CONTROL_PADCONF_WKUP_SYSCONFIG

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0010 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E010 | | |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------------------|---|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | IP_SYSCONFIG_IDLEMODE | | RESERVED | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:2 | IP_SYSCONFIG_IDLEMODE | Select the local clock-gating strategy 0x0: Clock is manually gated 0x1: Clock is manually enabled 0x2,0x3: Clock is automatically gated when there is no access to the Control Module through L4-interconnect | RW | 0x2 |
| 1:0 | RESERVED | | R | 0x0 |

Table 19-681. Register Call Summary for Register CONTROL_PADCONF_WKUP_SYSCONFIG

Control Module Functional Description

- [Device Wake-Up Control Module Instance: \[0\]](#)

Control Module Programming Guide

- [Control Module Global Initialization: \[1\]](#)
- [Off Mode Preliminary Settings: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[3\]](#)

Table 19-682. CONTROL_WKUP_PAD0_GPIO_WK0_PAD1_GPIO_WK1

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0040 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E040 | | |
| Description | Register control for Pads gpio_wk0 and gpio_wk1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----|-----------------------|----|----------|----|----|----|----------------------|----|----------|----|----|----|-------------------------|----|-----------------------|----|------------------|----|----|----|----------------------|---|-----------------------|---|----------|---|---|---|----------------------|---|----------|--|--|--|-------------------------|--|-----------------------|--|------------------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | |
| GPIO_WK1_WAKEUPEVENT | | GPIO_WK1_WAKEUPENABLE | | RESERVED | | | | GPIO_WK1_INPUTENABLE | | RESERVED | | | | GPIO_WK1_PULLTYPESELECT | | GPIO_WK1_PULLUDENABLE | | GPIO_WK1_MUXMODE | | | | GPIO_WK0_WAKEUPEVENT | | GPIO_WK0_WAKEUPENABLE | | RESERVED | | | | GPIO_WK0_INPUTENABLE | | RESERVED | | | | GPIO_WK0_PULLTYPESELECT | | GPIO_WK0_PULLUDENABLE | | GPIO_WK0_MUXMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|---|------|-------|
| 31 | GPIO_WK1_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPIO_WK1_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | GPIO_WK1_INPUTENABLE | Input enable value for pad gpio_wk1 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | GPIO_WK1_PULLTYPESELECT | pullup/down selection for pad gpio_wk1 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | GPIO_WK1_PULLUDENABLE | pullup/down enable for pad gpio_wk1 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPIO_WK1_MUXMODE | Functional multiplexing selection for pad gpio_wk1 0x0, 0x3: Select gpio_wk1 0x6: Select hw_dbg2 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPIO_WK0_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPIO_WK0_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | GPIO_WK0_INPUTENABLE | Input enable value for pad gpio_wk0 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPIO_WK0_PULLTYPESELECT | pullup/down selection for pad gpio_wk0 0x0: pulldown selected 0x1: pullup selected | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------|
| 3 | GPIO_WK0_PULLUDENABLE | pullup/down enable for pad gpio_wk0 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPIO_WK0_MUXMODE | Functional multiplexing selection for pad gpio_wk0 0x0, 0x3: Select gpio_wk0 0x4: Select c2c_pwkup 0x6: Select hw_dbg1 0x7: Select safe_mode | RW | 0x7 |

**Table 19-683. Register Call Summary for Register
CONTROL_WKUP_PAD0_GPIO_WK0_PAD1_GPIO_WK1**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)
- [Observability Signals Muxed on Pads in WKUP Power Domain: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[3\]](#)

Table 19-684. CONTROL_WKUP_PAD0_GPIO_WK2_PAD1_GPIO_WK3

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0044 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E044 | | |
| Description | Register control for Pads gpio_wk2 and gpio_wk3 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------------|-----------------------|----------|----|----|----|----|----|----------------------|----------|----|-------------------------|-----------------------|------------------|----|----------------------|-----------------------|----------|----|----|----|----|---|----------------------|----------|---|-------------------------|-----------------------|------------------|---|---|---|
| GPIO_WK3_WAKEUPEVENT | GPIO_WK3_WAKEUPENABLE | RESERVED | | | | | | GPIO_WK3_INPUTENABLE | RESERVED | | GPIO_WK3_PULLTYPESELECT | GPIO_WK3_PULLUDENABLE | GPIO_WK3_MUXMODE | | GPIO_WK2_WAKEUPEVENT | GPIO_WK2_WAKEUPENABLE | RESERVED | | | | | | GPIO_WK2_INPUTENABLE | RESERVED | | GPIO_WK2_PULLTYPESELECT | GPIO_WK2_PULLUDENABLE | GPIO_WK2_MUXMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|-------|
| 31 | GPIO_WK3_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | GPIO_WK3_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | GPIO_WK3_INPUTENABLE | Input enable value for pad gpio_wk3 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|---|------|-------|
| 20 | GPIO_WK3_PULLTYPESELECT | pullup/down selection for pad gpio_wk3 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | GPIO_WK3_PULLUDENABLE | pullup/down enable for pad gpio_wk3 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | GPIO_WK3_MUXMODE | Functional multiplexing selection for pad gpio_wk3 0x0, 0x3: Select gpio_wk3 0x6: Select hw_dbg4 0x7: Select safe_mode | RW | 0x7 |
| 15 | GPIO_WK2_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPIO_WK2_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | GPIO_WK2_INPUTENABLE | Input enable value for pad gpio_wk2 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | GPIO_WK2_PULLTYPESELECT | pullup/down selection for pad gpio_wk2 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPIO_WK2_PULLUDENABLE | pullup/down enable for pad gpio_wk2 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPIO_WK2_MUXMODE | Functional multiplexing selection for pad gpio_wk2 0x0, 0x3: Select gpio_wk2 0x6: Select hw_dbg3 0x7: Select safe_mode | RW | 0x7 |

**Table 19-685. Register Call Summary for Register
CONTROL_WKUP_PAD0_GPIO_WK2_PAD1_GPIO_WK3**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)
- [Observability Signals Muxed on Pads in WKUP Power Domain: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[3\]](#)

Table 19-686. CONTROL_WKUP_PAD0_GPIO_WK4_PAD1_SR_SCL

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0048 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E048 | | |
| Description | Register control for Pads gpio_wk4 and sr_scl Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------|---------------------|----------|----|----|----|--------------------|----|----------|----|-----------------------|---------------------|----------|----|----------------------|-----------------------|----------|----|----|----|----------------------|----------|---|-------------------------|-----------------------|------------------|---|---|---|---|---|---|
| SR_SCL_WAKEUPEVENT | SR_SCL_WAKEUPENABLE | RESERVED | | | | SR_SCL_INPUTENABLE | | RESERVED | | SR_SCL_PULLTYPESELECT | SR_SCL_PULLUDENABLE | RESERVED | | GPIO_WK4_WAKEUPEVENT | GPIO_WK4_WAKEUPENABLE | RESERVED | | | | GPIO_WK4_INPUTENABLE | RESERVED | | GPIO_WK4_PULLTYPESELECT | GPIO_WK4_PULLUDENABLE | GPIO_WK4_MUXMODE | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|-------|
| 31 | SR_SCL_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SR_SCL_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | SR_SCL_INPUTENABLE | Input enable value for pad sr_scl 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SR_SCL_PULLTYPESELECT | pullup/down selection for pad sr_scl 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | SR_SCL_PULLUDENABLE | pullup/down enable for pad sr_scl 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 0 |
| 18:16 | RESERVED | | R | 0x0 |
| 15 | GPIO_WK4_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | GPIO_WK4_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | GPIO_WK4_INPUTENABLE | Input enable value for pad gpio_wk4 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-------|
| 4 | GPIO_WK4_PULLTYPESELECT | pullup/down selection for pad gpio_wk4 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | GPIO_WK4_PULLUDENABLE | pullup/down enable for pad gpio_wk4 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | GPIO_WK4_MUXMODE | Functional multiplexing selection for pad gpio_wk4 0x0, 0x3: Select gpio_wk4 0x6: Select hw_dbg5 0x7: Select safe_mode | RW | 0x7 |

**Table 19-687. Register Call Summary for Register
CONTROL_WKUP_PAD0_GPIO_WK4_PAD1_SR_SCL**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)
- [Observability Signals Muxed on Pads in WKUP Power Domain: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[3\]](#)

Table 19-688. CONTROL_WKUP_PAD0_SR_SDA_PAD1_FREF_XTAL_IN

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 004C | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E04C | | |
| Description | Register control for Pads sr_sda and fref_xtal_in Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----------------------|----|----|----|--------------------|----|---------------------|----|----------|---|---|---|---|---|--------------------|---|----------|---|-----------------------|--|---------------------|--|----------|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | FREF_XTAL_IN_MUXMODE | | | | SR_SDA_WAKEUPEVENT | | SR_SDA_WAKEUPENABLE | | RESERVED | | | | | | SR_SDA_INPUTENABLE | | RESERVED | | SR_SDA_PULLTYPESELECT | | SR_SDA_PULLUDENABLE | | RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|--------|
| 31:19 | RESERVED | | R | 0x0000 |
| 18:16 | FREF_XTAL_IN_MUXMODE | Functional multiplexing selection for pad fref_xtal_in 0x0: Select fref_xtal_in 0x4: Select c2c_wakereqin | RW | 0x0 |
| 15 | SR_SDA_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SR_SDA_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------|
| 13:9 | RESERVED | | R | 0x00 |
| 8 | SR_SDA_INPUTENABLE | Input enable value for pad sr_sda 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SR_SDA_PULLTYPESELECT | pullup/down selection for pad sr_sda 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | SR_SDA_PULLUDENABLE | pullup/down enable for pad sr_sda 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 0 |
| 2:0 | RESERVED | | R | 0x0 |

**Table 19-689. Register Call Summary for Register
CONTROL_WKUP_PAD0_SR_SDA_PAD1_FREF_XTAL_IN**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[2\]](#)

Table 19-690. CONTROL_WKUP_PAD0_FREF_SLICER_IN_PAD1_FREF_CLK_IOREQ

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0050 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E050 | | |
| Description | Register control for Pads fref_slicer_in and fref_clk_ioreq Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------|-----------------------------|----------|----|----|----|----|----|----------------------------|----------|----|-------------------------------|-----------------------------|----------|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|------------------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FREF_CLK_IOREQ_WAKEUPEVENT | FREF_CLK_IOREQ_WAKEUPENABLE | RESERVED | | | | | | FREF_CLK_IOREQ_INPUTENABLE | RESERVED | | FREF_CLK_IOREQ_PULLTYPESELECT | FREF_CLK_IOREQ_PULLUDENABLE | RESERVED | | | | | | | | | | | | | | | | FREF_SLICER_IN_MUXMODE | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|------|-------|
| 31 | FREF_CLK_IOREQ_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | FREF_CLK_IOREQ_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------|---|------|--------|
| 29:25 | RESERVED | | R | 0x00 |
| 24 | FREF_CLK_IOREQ_INPUTENABLE | Input enable value for pad fref_clk_ioreq 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | FREF_CLK_IOREQ_PULLTYPESELECT | pullup/down selection for pad fref_clk_ioreq 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | FREF_CLK_IOREQ_PULLUDENABLE | pullup/down enable for pad fref_clk_ioreq 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:3 | RESERVED | | R | 0x0000 |
| 2:0 | FREF_SLICER_IN_MUXMODE | Functional multiplexing selection for pad fref_slicer_in 0x0: Select fref_slicer_in 0x3: Select gpi_wk5 0x4: Select c2c_wakereqin 0x7: Select safe_mode | RW | 0x0 |

**Table 19-691. Register Call Summary for Register
CONTROL_WKUP_PAD0_FREF_SLICER_IN_PAD1_FREF_CLK_IOREQ**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[2\]](#)

Table 19-692. CONTROL_WKUP_PAD0_FREF_CLK0_OUT_PAD1_FREF_CLK3_REQ

| | | | | | |
|------------------|--|---|----------|----------------------|--|
| Address Offset | | 0x0000 0054 | | | |
| Physical Address | | 0x4A31 E054 | Instance | SYSCTRL_PADCONF_WKUP | |
| Description | | Register control for Pads fref_clk0_out and fref_clk3_req Access conditions. Read: unrestricted, Write: unrestricted | | | |
| Type | | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|----|----------------------------|----|----------|----|----|----|---------------------------|----|----------|----|------------------------------|----|----------------------------|----|-----------------------|----|---------------------------|----|----------------------------|----|----------|---|---|---|---------------------------|---|----------|---|------------------------------|---|----------------------------|--|-----------------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| FREF_CLK3_REQ_WAKEUPEVENT | | FREF_CLK3_REQ_WAKEUPENABLE | | RESERVED | | | | FREF_CLK3_REQ_INPUTENABLE | | RESERVED | | FREF_CLK3_REQ_PULLTYPESELECT | | FREF_CLK3_REQ_PULLUDENABLE | | FREF_CLK3_REQ_MUXMODE | | FREF_CLK0_OUT_WAKEUPEVENT | | FREF_CLK0_OUT_WAKEUPENABLE | | RESERVED | | | | FREF_CLK0_OUT_INPUTENABLE | | RESERVED | | FREF_CLK0_OUT_PULLTYPESELECT | | FREF_CLK0_OUT_PULLUDENABLE | | FREF_CLK0_OUT_MUXMODE | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|---|------|-------|
| 31 | FREF_CLK3_REQ_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | FREF_CLK3_REQ_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | FREF_CLK3_REQ_INPUTENABLE | Input enable value for pad fref_clk3_req 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | FREF_CLK3_REQ_PULLTYPESELECT | pullup/down selection for pad fref_clk3_req 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | FREF_CLK3_REQ_PULLUDENABLE | pullup/down enable for pad fref_clk3_req 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | FREF_CLK3_REQ_MUXMODE | Functional multiplexing selection for pad fref_clk3_req 0x0: Select fref_clk3_req 0x1: Select fref_clk1_req 0x2: Reserved 0x3: Select gpio_wk30 0x4: Select c2c_wakereqin 0x5: Select sdmmc2_dat4 0x6: Select hw_dbg7 0x7: Select safe_mode | RW | 0x7 |
| 15 | FREF_CLK0_OUT_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | FREF_CLK0_OUT_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | FREF_CLK0_OUT_INPUTENABLE | Input enable value for pad fref_clk0_out 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | FREF_CLK0_OUT_PULLTYPESELECT | pullup/down selection for pad fref_clk0_out 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | FREF_CLK0_OUT_PULLUDENABLE | pullup/down enable for pad fref_clk0_out 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|-------|
| 2:0 | FREF_CLK0_OUT_MUXMODE | Functional multiplexing selection for pad fref_clk0_out 0x0: Select fref_clk0_out 0x1: Select fref_clk1_req 0x2: Reserved 0x3: Select gpio_wk6 0x5: Select sdmmc2_dat7 0x6: Select hw_dbg6 0x7: Select safe_mode | RW | 0x7 |

**Table 19-693. Register Call Summary for Register
CONTROL_WKUP_PAD0_FREF_CLK0_OUT_PAD1_FREF_CLK3_REQ**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)
- [Observability Signals Muxed on Pads in WKUP Power Domain: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[3\]](#)

Table 19-694. CONTROL_WKUP_PAD0_FREF_CLK3_OUT_PAD1_FREF_CLK4_REQ

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0058 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E058 | | |
| Description | Register control for Pads fref_clk3_out and fref_clk4_req Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------------------|----------------------------|----------|----|----|----|----|----|---------------------------|----------|----|-----------------------------|----------------------------|-----------------------|----|---------------------------|----------------------------|----------|----|----|----|----|---|---------------------------|----------|---|-----------------------------|----------------------------|-----------------------|---|---|---|
| FREF_CLK4_REQ_WAKEUPEVENT | FREF_CLK4_REQ_WAKEUPENABLE | RESERVED | | | | | | FREF_CLK4_REQ_INPUTENABLE | RESERVED | | FREF_CLK4_REQ_PULTYPESELECT | FREF_CLK4_REQ_PULLUDENABLE | FREF_CLK4_REQ_MUXMODE | | FREF_CLK3_OUT_WAKEUPEVENT | FREF_CLK3_OUT_WAKEUPENABLE | RESERVED | | | | | | FREF_CLK3_OUT_INPUTENABLE | RESERVED | | FREF_CLK3_OUT_PULTYPESELECT | FREF_CLK3_OUT_PULLUDENABLE | FREF_CLK3_OUT_MUXMODE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|---|------|-------|
| 31 | FREF_CLK4_REQ_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | FREF_CLK4_REQ_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | FREF_CLK4_REQ_INPUTENABLE | Input enable value for pad fref_clk4_req 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------------|--|------|-------|
| 23:21 | RESERVED | | R | 0x0 |
| 20 | FREF_CLK4_REQ_PULLTYPES ELECT | pullup/down selection for pad fref_clk4_req 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | FREF_CLK4_REQ_PULLUDENA BLE | pullup/down enable for pad fref_clk4_req 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | FREF_CLK4_REQ_MUXMODE | Functional multiplexing selection for pad fref_clk4_req 0x0: Select fref_clk4_req 0x1: Select fref_clk5_out 0x3: Select gpio_wk7 0x5: Select sdmmc2_dat6 0x6: Select hw_dbg9 | RW | 0x0 |
| 15 | FREF_CLK3_OUT_WAKEUPEV ENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | FREF_CLK3_OUT_WAKEUPEN ABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | FREF_CLK3_OUT_INPUTENAB LE | Input enable value for pad fref_clk3_out 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | FREF_CLK3_OUT_PULLTYPES ELECT | pullup/down selection for pad fref_clk3_out 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | FREF_CLK3_OUT_PULLUDENA BLE | pullup/down enable for pad fref_clk3_out 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | FREF_CLK3_OUT_MUXMODE | Functional multiplexing selection for pad fref_clk3_out 0x0: Select fref_clk3_out 0x1: Select fref_clk2_req 0x2: Reserved 0x3: Select gpio_wk31 0x4: Select c2c_wakereqout 0x5: Select sdmmc2_dat5 0x6: Select hw_dbg8 0x7: Select safe_mode | RW | 0x7 |

**Table 19-695. Register Call Summary for Register
CONTROL_WKUP_PAD0_FREF_CLK3_OUT_PAD1_FREF_CLK4_REQ**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)
- [Observability Signals Muxed on Pads in WKUP Power Domain: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[3\]](#)

Table 19-696. CONTROL_WKUP_PAD0_FREF_CLK4_OUT_PAD1_SYS_32K

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 005C | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E05C | | |
| Description | Register control for Pads fref_clk4_out and sys_32k Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | |
|---------------------|----------------------|----------|----|----|----|----|----|---------------------|----------|----|----|----|----|----|------------------------|----------------------|----------|----|----|----|----|---|---------------------------|----------------------------|----------|---|---|---|---|---|---------------------------|----------|--|--|--|--|--|------------------------------|----------------------------|-----------------------|--|--|--|--|--|
| SYS_32K_WAKEUPEVENT | SYS_32K_WAKEUPENABLE | RESERVED | | | | | | SYS_32K_INPUTENABLE | RESERVED | | | | | | SYS_32K_PULLTYPESELECT | SYS_32K_PULLUDENABLE | RESERVED | | | | | | FREF_CLK4_OUT_WAKEUPEVENT | FREF_CLK4_OUT_WAKEUPENABLE | RESERVED | | | | | | FREF_CLK4_OUT_INPUTENABLE | RESERVED | | | | | | FREF_CLK4_OUT_PULLTYPESELECT | FREF_CLK4_OUT_PULLUDENABLE | FREF_CLK4_OUT_MUXMODE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|---|------|-------|
| 31 | SYS_32K_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SYS_32K_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | SYS_32K_INPUTENABLE | Input enable value for pad sys_32k 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SYS_32K_PULLTYPESELECT | pullup/down selection for pad sys_32k 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | SYS_32K_PULLUDENABLE | pullup/down enable for pad sys_32k 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 0 |
| 18:16 | RESERVED | | R | 0x0 |
| 15 | FREF_CLK4_OUT_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | FREF_CLK4_OUT_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|--|------|-------|
| 8 | FREF_CLK4_OUT_INPUTENABLE | Input enable value for pad fref_clk4_out 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | FREF_CLK4_OUT_PULLTYPESELECT | pullup/down selection for pad fref_clk4_out 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | FREF_CLK4_OUT_PULLUDENABLE | pullup/down enable for pad fref_clk4_out 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 0 |
| 2:0 | FREF_CLK4_OUT_MUXMODE | Functional multiplexing selection for pad fref_clk4_out 0x0: Select fref_clk4_out 0x3: Select gpio_wk8 0x6: Select hw_dbg10 | RW | 0x0 |

**Table 19-697. Register Call Summary for Register
CONTROL_WKUP_PAD0_FREF_CLK4_OUT_PAD1_SYS_32K**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)
- [Observability Signals Muxed on Pads in WKUP Power Domain: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[3\]](#)

Table 19-698. CONTROL_WKUP_PAD0_SYS_NRESPWRON_PAD1_SYS_NRESWARM

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0060 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SYSCTRL_PADCONF_WKUP | | | | | | | | | | | | | | | |
| Physical Address | 0x4A31 E060 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Register control for Pads sys_nrespwron and sys_nreswarm Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------|---------------------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------------|----|----|----|----------------------------|----|----------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SYS_NRESWARM_WAKEUPEVENT | SYS_NRESWARM_WAKEUPENABLE | RESERVED | | | | | | | | | | | | | | SYS_NRESPWRON_PULLTYPESELECT | | | | SYS_NRESPWRON_PULLUDENABLE | | RESERVED | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------|---|------|-------|
| 31 | SYS_NRESWARM_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|---|------|------------|
| 30 | SYS_NRESWARM_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:5 | RESERVED | | R | 0x000 0000 |
| 4 | SYS_NRESPWRON_PULLTYPESELECT | Pull-Up/Down selection for pad sys_nrespwrn 0x0: Pull-Down selected 0x1: Pull-Up selected | RW | 0 |
| 3 | SYS_NRESPWRON_PULLUDEENABLE | Pull-Up/Down enable for pad sys_nrespwrn 0x0: Pull-Up/Down disabled 0x1: Pull-Up/Down enabled | RW | 0 |
| 2:0 | RESERVED | | R | 0x0000000 |

**Table 19-699. Register Call Summary for Register
CONTROL_WKUP_PAD0_SYS_NRESPWRON_PAD1_SYS_NRESWARM**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[2\]](#)

Table 19-700. CONTROL_WKUP_PAD0_SYS_PWR_REQ_PAD1_SYS_PWRON_RESET_OUT

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0064 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E064 | | |
| Description | Register control for Pads sys_pwr_req and sys_pwrn_reset_out Access conditions: Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------|----------------------------------|----------|----|----|----|----|----|---------------------------------|----------|----|------------------------------------|---------------------------------|-----------------------------|----|----|-------------------------|--------------------------|----------|----|----|----|---|-------------------------|----------|---|----------------------------|-------------------------|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SYS_PWRON_RESET_OUT_WAKEUPEVENT | SYS_PWRON_RESET_OUT_WAKEUPENABLE | RESERVED | | | | | | SYS_PWRON_RESET_OUT_INPUTENABLE | RESERVED | | SYS_PWRON_RESET_OUT_PULLTYPESELECT | SYS_PWRON_RESET_OUT_PULLUDENABE | SYS_PWRON_RESET_OUT_MUXMODE | | | SYS_PWR_REQ_WAKEUPEVENT | SYS_PWR_REQ_WAKEUPENABLE | RESERVED | | | | | SYS_PWR_REQ_INPUTENABLE | RESERVED | | SYS_PWR_REQ_PULLTYPESELECT | SYS_PWR_REQ_PULLUDENABE | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------------|---|------|-------|
| 31 | SYS_PWRON_RESET_OUT_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------------|--|------|-------|
| 30 | SYS_PWRON_RESET_OUT_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | SYS_PWRON_RESET_OUT_INPUTENABLE | Input enable value for pad sys_pwrn_reset_out 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SYS_PWRON_RESET_OUT_PULLTYPESELECT | pullup/down selection for pad sys_pwrn_reset_out 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | SYS_PWRON_RESET_OUT_PULLUDENABLE | pullup/down enable for pad sys_pwrn_reset_out 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | SYS_PWRON_RESET_OUT_MUXMODE | Functional multiplexing selection for pad sys_pwrn_reset_out 0x0: Select sys_pwrn_reset_out 0x3: Select gpio_wk29 0x5: Select hw_dbg0 0x6: Select hw_dbg11 | RW | 0x0 |
| 15 | SYS_PWR_REQ_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SYS_PWR_REQ_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | SYS_PWR_REQ_INPUTENABLE | Input enable value for pad sys_pwr_req 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SYS_PWR_REQ_PULLTYPESELECT | pullup/down selection for pad sys_pwr_req 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | SYS_PWR_REQ_PULLUDENABLE | pullup/down enable for pad sys_pwr_req 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | RESERVED | | R | 0x0 |

**Table 19-701. Register Call Summary for Register
CONTROL_WKUP_PAD0_SYS_PWR_REQ_PAD1_SYS_PWRON_RESET_OUT**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)
- [Observability Signals Muxed on Pads in WKUP Power Domain: \[2\] \[3\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[4\]](#)

Table 19-702. CONTROL_WKUP_PAD0_SYS_BOOT6_PAD1_SYS_BOOT7

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0068 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E068 | | |
| Description | Register control for Pads sys_boot6 and sys_boot7 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------------------|------------------------|----------|----|----|----|-----------------------|----|----------|----|--------------------------|------------------------|-------------------|----|----|-----------------------|------------------------|----------|----|----|----|-----------------------|----------|---|--------------------------|------------------------|-------------------|---|---|---|---|---|
| SYS_BOOT7_WAKEUPEVENT | SYS_BOOT7_WAKEUPENABLE | RESERVED | | | | SYS_BOOT7_INPUTENABLE | | RESERVED | | SYS_BOOT7_PULLTYPESELECT | SYS_BOOT7_PULLUDENABLE | SYS_BOOT7_MUXMODE | | | SYS_BOOT6_WAKEUPEVENT | SYS_BOOT6_WAKEUPENABLE | RESERVED | | | | SYS_BOOT6_INPUTENABLE | RESERVED | | SYS_BOOT6_PULLTYPESELECT | SYS_BOOT6_PULLUDENABLE | SYS_BOOT6_MUXMODE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------------|---|------|-------|
| 31 | SYS_BOOT7_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | SYS_BOOT7_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | SYS_BOOT7_INPUTENABLE | Input enable value for pad sys_boot7 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | SYS_BOOT7_PULLTYPESELECT | pullup/down selection for pad sys_boot7 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | SYS_BOOT7_PULLUDENABLE | pullup/down enable for pad sys_boot7 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 0 |
| 18:16 | SYS_BOOT7_MUXMODE | Functional multiplexing selection for pad sys_boot7 0x0: Select sys_boot7 0x1: Select dpm_emu19 0x3: Select gpio_wk10 0x6: Select hw_dbg13 0x7: Select safe_mode | RW | 0x0 |
| 15 | SYS_BOOT6_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SYS_BOOT6_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|--|------|-------|
| 13:9 | RESERVED | | R | 0x00 |
| 8 | SYS_BOOT6_INPUTENABLE | Input enable value for pad sys_boot6 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | SYS_BOOT6_PULLTYPESELECTION | pullup/down selection for pad sys_boot6 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | SYS_BOOT6_PULLUDENABLE | pullup/down enable for pad sys_boot6 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 0 |
| 2:0 | SYS_BOOT6_MUXMODE | Functional multiplexing selection for pad sys_boot6 0x0: Select sys_boot6 0x1: Select dpm_emu18 0x3: Select gpio_wk9 0x4: Select c2c_wakereqout 0x6: Select hw_dbg12 0x7: Select safe_mode | RW | 0x0 |

**Table 19-703. Register Call Summary for Register
CONTROL_WKUP_PAD0_SYS_BOOT6_PAD1_SYS_BOOT7**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)
- [Observability Signals Muxed on Pads in WKUP Power Domain: \[2\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[3\]](#)

Table 19-704. CONTROL_WKUP_PAD0_JTAG_NTRST_PAD1_JTAG_TCK

| | | | | | |
|------------------|--|---|----------|----------------------|--|
| Address Offset | | 0x0000 006C | | | |
| Physical Address | | 0x4A31 E06C | Instance | SYSCTRL_PADCONF_WKUP | |
| Description | | Register control for Pads jtag_ntrst and jtag_tck Access conditions. Read: unrestricted, Write: unrestricted | | | |
| Type | | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------|----------|----|----|----|----------------------|----------|-------------------------|-----------------------|------------------|------------------------|-------------------------|----------|----|----|----|------------------------|----------|---------------------------|-------------------------|----------|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| JTAG_TCK_WAKEUPEVENT | JTAG_TCK_WAKEUPENABLE | RESERVED | | | | JTAG_TCK_INPUTENABLE | RESERVED | JTAG_TCK_PULLTYPESELECT | JTAG_TCK_PULLUDENABLE | JTAG_TCK_MUXMODE | JTAG_NTRST_WAKEUPEVENT | JTAG_NTRST_WAKEUPENABLE | RESERVED | | | | JTAG_NTRST_INPUTENABLE | RESERVED | JTAG_NTRST_PULLTYPESELECT | JTAG_NTRST_PULLUDENABLE | RESERVED | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|---|------|-------|
| 31 | JTAG_TCK_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | JTAG_TCK_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | JTAG_TCK_INPUTENABLE | Input enable value for pad jtag_tck 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | JTAG_TCK_PULLTYPESELECT | pullup/down selection for pad jtag_tck 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 19 | JTAG_TCK_PULLUDENABLE | pullup/down enable for pad jtag_tck 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | JTAG_TCK_MUXMODE | Functional multiplexing selection for pad jtag_tck 0x0: Select jtag_tck 0x7: Select safe_mode | RW | 0x0 |
| 15 | JTAG_NTRST_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | JTAG_NTRST_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | JTAG_NTRST_INPUTENABLE | Input enable value for pad jtag_nrst 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | JTAG_NTRST_PULLTYPESELECT | pullup/down selection for pad jtag_nrst 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | JTAG_NTRST_PULLUDENABLE | pullup/down enable for pad jtag_nrst 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | RESERVED | | R | 0x0 |

**Table 19-705. Register Call Summary for Register
CONTROL_WKUP_PAD0_JTAG_NTRST_PAD1_JTAG_TCK**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[2\]](#)

Table 19-706. CONTROL_WKUP_PAD0_JTAG_RTCK_PAD1_JTAG_TMS_TMSC

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0070 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E070 | | |
| Description | Register control for Pads jtag_rtck and jtag_tms_tmsc Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|---------------------------|----------------------------|----------|----|----|----|----|----|---------------------------|----------|----|----|----|----|----|-----------------------|-----------------------|------------------------|----------|----|----|----|---|---|---|---|--------------------------|------------------------|----------|---|---|---|--|--|
| JTAG_TMS_TMSC_WAKEUPEVENT | JTAG_TMS_TMSC_WAKEUPENABLE | RESERVED | | | | | | JTAG_TMS_TMSC_INPUTENABLE | RESERVED | | | | | | JTAG_TMS_TMSC_MUXMODE | JTAG_RTCK_WAKEUPEVENT | JTAG_RTCK_WAKEUPENABLE | RESERVED | | | | | | | | JTAG_RTCK_PULLTYPESELECT | JTAG_RTCK_PULLUDENABLE | RESERVED | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------------|---|------|-------|
| 31 | JTAG_TMS_TMSC_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | JTAG_TMS_TMSC_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x00 |
| 24 | JTAG_TMS_TMSC_INPUTENABLE | Input enable value for pad jtag_tms_tmsc 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 23:19 | RESERVED | | R | 0x00 |
| 18:16 | JTAG_TMS_TMSC_MUXMODE | Functional multiplexing selection for pad jtag_tms_tmsc 0x0: Select jtag_tms_tmsc 0x7: Select safe_mode | RW | 0x0 |
| 15 | JTAG_RTCK_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | JTAG_RTCK_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:5 | RESERVED | | R | 0x000 |
| 4 | JTAG_RTCK_PULLTYPESELECT | pullup/down selection for pad jtag_rtck 0x0: pulldown selected 0x1: pullup selected | RW | 0 |
| 3 | JTAG_RTCK_PULLUDENABLE | pullup/down enable for pad jtag_rtck 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|-------|
| 2:0 | RESERVED | | R | 0x0 |

**Table 19-707. Register Call Summary for Register
CONTROL_WKUP_PAD0_JTAG_RTCK_PAD1_JTAG_TMS_TMSC**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[2\]](#)

Table 19-708. CONTROL_WKUP_PAD0_JTAG_TDI_PAD1_JTAG_TDO

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0074 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E074 | | |
| Description | Register control for Pads jtag_tdi and jtag_tdo Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|-----------------------|----------|----|----|----|----|----|----------------------|----------|----|----|----|-------------------------|-----------------------|----------|----|----|----------------------|-----------------------|----------|----|---|---|----------------------|----------|---|---|---|-------------------------|-----------------------|----------|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| JTAG_TDO_WAKEUPEVENT | JTAG_TDO_WAKEUPENABLE | RESERVED | | | | | | JTAG_TDO_INPUTENABLE | RESERVED | | | | JTAG_TDO_PULLTYPESELECT | JTAG_TDO_PULLUDENABLE | RESERVED | | | JTAG_TDI_WAKEUPEVENT | JTAG_TDI_WAKEUPENABLE | RESERVED | | | | JTAG_TDI_INPUTENABLE | RESERVED | | | | JTAG_TDI_PULLTYPESELECT | JTAG_TDI_PULLUDENABLE | RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|---|------|-------|
| 31 | JTAG_TDO_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 30 | JTAG_TDO_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 29:25 | RESERVED | | R | 0x000 |
| 24 | JTAG_TDO_INPUTENABLE | Input enable value for pad jtag_tdo 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 0x1 |
| 23:21 | RESERVED | | R | 0x000 |
| 20 | JTAG_TDO_PULLTYPESELECT | pullup/down selection for pad jtag_tdo 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 19 | JTAG_TDO_PULLUDENABLE | pullup/down enable for pad jtag_tdo 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 18:16 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|------|-------|
| 15 | JTAG_TDI_WAKEUPEVENT | Pad_x wake-up event status latched in the IO Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | JTAG_TDI_WAKEUPENABLE | Input pad wake-up enable (and OFF mode input enable value) 0x0: wake-up detection is disabled 0x1: wake-up detection is enabled | RW | 0 |
| 13:9 | RESERVED | | R | 0x00 |
| 8 | JTAG_TDI_INPUTENABLE | Input enable value for pad jtag_tdi 0x0: Input buffer of I/O cell is disabled 0x1: Input buffer of I/O cell is enabled | RW | 1 |
| 7:5 | RESERVED | | R | 0x0 |
| 4 | JTAG_TDI_PULLTYPESELECT | pullup/down selection for pad jtag_tdi 0x0: pulldown selected 0x1: pullup selected | RW | 1 |
| 3 | JTAG_TDI_PULLUDENABLE | pullup/down enable for pad jtag_tdi 0x0: pullup/down disabled 0x1: pullup/down enabled | RW | 1 |
| 2:0 | RESERVED | | R | 0x0 |

**Table 19-709. Register Call Summary for Register
CONTROL_WKUP_PAD0_JTAG_TDI_PAD1_JTAG_TDO**

Control Module Functional Description

- [Pad Multiplexing Register Fields: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[2\]](#)

Table 19-710. CONTROL_WKUP_PADCONF_WAKEUPEVENT_0

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 007C | | |
| Physical Address | 0x4A31 E07C | Instance | SYSCTRL_PADCONF_WKUP |
| Description | Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|----|----|----|----|-------------------------------|-------------------------------|------------------------------------|--------------------------------|-------------------------------|---------------------------------|--------------------------------|--------------------------------|--|----------------------------------|-----------------------------------|------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|-------------------------------------|-----------------------------|-----------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| RESERVED | | | | | | | | JTAG_TDO_DUPLICATEWAKEUPEVENT | JTAG_TDI_DUPLICATEWAKEUPEVENT | JTAG_TMS_TMSC_DUPLICATEWAKEUPEVENT | JTAG_RTCK_DUPLICATEWAKEUPEVENT | JTAG_TCK_DUPLICATEWAKEUPEVENT | JTAG_NTRST_DUPLICATEWAKEUPEVENT | SYS_BOOT7_DUPLICATEWAKEUPEVENT | SYS_BOOT6_DUPLICATEWAKEUPEVENT | SYS_PWRON_RESET_OUT_DUPLICATEWAKEUPEVENT | SYS_PWR_REQ_DUPLICATEWAKEUPEVENT | SYS_NRESWARM_DUPLICATEWAKEUPEVENT | SYS_32K_DUPLICATEWAKEUPEVENT | FREF_CLK4_OUT_DUPLICATEWAKEUPEVENT | FREF_CLK4_REQ_DUPLICATEWAKEUPEVENT | FREF_CLK3_OUT_DUPLICATEWAKEUPEVENT | FREF_CLK3_REQ_DUPLICATEWAKEUPEVENT | FREF_CLK0_OUT_DUPLICATEWAKEUPEVENT | FREF_CLK_IOREQ_DUPLICATEWAKEUPEVENT | SR_SDA_DUPLICATEWAKEUPEVENT | SR_SCL_DUPLICATEWAKEUPEVENT | GPIO_WK4_DUPLICATEWAKEUPEVENT | GPIO_WK3_DUPLICATEWAKEUPEVENT | GPIO_WK2_DUPLICATEWAKEUPEVENT | GPIO_WK1_DUPLICATEWAKEUPEVENT | GPIO_WK0_DUPLICATEWAKEUPEVENT |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------------------|---|------|-------|
| 31:25 | RESERVED | | R | 0x00 |
| 24 | JTAG_TDO_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad jtag_tdo Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 23 | JTAG_TDI_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad jtag_tdi Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 22 | JTAG_TMS_TMISC_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad jtag_tms_tmisc Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 21 | JTAG_RTCK_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad jtag_rtck Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 20 | JTAG_TCK_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad jtag_tck Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 19 | JTAG_NTRST_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad jtag_ntrst Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 18 | SYS_BOOT7_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sys_boot7 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 17 | SYS_BOOT6_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sys_boot6 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--|--|------|-------|
| 16 | SYS_PWRON_RESET_OUT_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sys_pwron_reset_out Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 15 | SYS_PWR_REQ_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sys_pwr_req Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 14 | SYS_NRESWARM_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sys_nreswarm Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 13 | SYS_32K_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sys_32k Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 12 | FREF_CLK4_OUT_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad fref_clk4_out Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 11 | FREF_CLK4_REQ_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad fref_clk4_req Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 10 | FREF_CLK3_OUT_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad fref_clk3_out Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 9 | FREF_CLK3_REQ_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad fref_clk3_req Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 8 | FREF_CLK0_OUT_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad fref_clk0_out Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 7 | FREF_CLK_IOREQ_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad fref_clk_ioreq Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 6 | SR_SDA_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sr_sda Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 5 | SR_SCL_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad sr_scl Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 4 | GPIO_WK4_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpio_wk4 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 3 | GPIO_WK3_DUPLICATEWAKEUPEVENT | Wake-up event status latched in the I/O for pad gpio_wk3 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------------------|---|------|-------|
| 2 | GPIO_WK2_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpio_wk2 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 1 | GPIO_WK1_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpio_wk1 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |
| 0 | GPIO_WK0_DUPLICATEWAKE UPEVENT | Wake-up event status latched in the I/O for pad gpio_wk0 Read 0x0: No wake-up event occurred Read 0x1: A wake-up event occurred | R | 0 |

Table 19-711. Register Call Summary for Register CONTROL_WKUP_PADCONF_WAKEUPEVENT_0

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-712. CONTROL_SMART1NOPMIO_PADCONF_0

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 05A0 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E5A0 | | |
| Description | SMART1 NOPM I/O control 0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----------|----|------------|----|----------|----|--------------|----|---|---|---|---|---|---|---|---|---|---|
| FREF_DR0_SC | | | | | | | | | | | | GPIO_DR7_SC | | RESERVED | | DPM_DR0_SC | | RESERVED | | GPIO_DR11_SC | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|-------|
| 31:30 | FREF_DR0_SC | Slew rate control for group fref_dr0 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 29:20 | RESERVED | | R | 0x000 |
| 19:18 | GPIO_DR7_SC | Slew rate control for group gpio_dr7 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 17:16 | RESERVED | | R | 0x0 |
| 15:14 | DPM_DR0_SC | Slew rate control for group dpm_dr0 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 13:12 | RESERVED | | R | 0x0 |
| 11:10 | GPIO_DR11_SC | Slew rate control for group gpio_dr11 Refer to Section 19.4.12.8.3 , section Low Speed I/Os Combined Slew Rate vs TL Length and Load Settings for more details on SR settings. | RW | 0x0 |
| 9:0 | RESERVED | | R | 0x000 |

Table 19-713. Register Call Summary for Register CONTROL_SMART1NOPMIO_PADCONF_0

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[5\]](#)

Table 19-714. CONTROL_SMART1NOPMIO_PADCONF_1

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 05A4 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E5A4 | | |
| Description | SMART1 NOPM I/O control 1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|----------|----|----|----|----|----|----|----|-------------|----|----------|----|------------|----|----------|----|--------------|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FREF_DR0_LB | | RESERVED | | | | | | | | GPIO_DR7_LB | | RESERVED | | DPM_DR0_LB | | RESERVED | | GPIO_DR11_LB | | RESERVED | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|-------|
| 31:30 | FREF_DR0_LB | Load control for group fref_dr0 0x0: TL Length= [2cm-20cm] / Farend ⁽¹⁾ cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 29:20 | RESERVED | | R | 0x000 |
| 19:18 | GPIO_DR7_LB | Load control for group gpio_dr7 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 17:16 | RESERVED | | R | 0x0 |
| 15:14 | DPM_DR0_LB | Load control for group dpm_dr0 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 13:12 | RESERVED | | R | 0x0 |

⁽¹⁾ Far-end load is equivalent to CLoad, where CLoad is the total capacitance seen at the far end of the transmission line.

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|-------|
| 11:10 | GPIO_DR11_LB | Load control for group gpio_dr11 0x0: TL Length= [2cm-20cm] / Farend cap per TL= [1pF-10pF] 0x1: Dual TL Length= [20cm-40cm] / Farend cap per TL= [1pF-10pF] 0x2: TL Length = [2cm-20cm] / Farend cap per TL= [10pF-20pF] 0x3: Dual TL Length = [20cm-40cm] / Farend cap per TL= [10pF-20pF] | RW | 0x0 |
| 9:0 | RESERVED | | R | 0x000 |

Table 19-715. Register Call Summary for Register CONTROL_SMART1NOPMIO_PADCONF_1

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[5\]](#)

Table 19-716. CONTROL_WKUP_PADCONF_MODE

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 05A8 | | |
| Physical Address | 0x4A31 E5A8 | Instance | SYSCTRL_PADCONF_WKUP |
| Description | PAD Voltage Mode control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|-----------------------|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VDDS_DV_FREF | | VDDS_DV_BANK2_SHARED1 | | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|---|------|-------------|
| 31 | VDDS_DV_FREF | PAD Voltage level control for vdds_dv_fref 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 30 | VDDS_DV_BANK2_SHARED1 | PAD Voltage level control for vdds_dv_bank2_shared1 0x0: VDDS = 1.8V 0x1: VDDS = 1.2V | RW | 0 |
| 29:0 | RESERVED | | R | 0x0000 0000 |

Table 19-717. Register Call Summary for Register CONTROL_WKUP_PADCONF_MODE

Control Module Functional Description

- [Dual Voltage-Supplied Peripheral Controls: \[0\] \[1\] \[2\]](#)

Control Module Programming Guide

- [Pad Configuration Programming Points: \[3\] \[4\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[5\]](#)

Table 19-718. CONTROL_XTAL_OSCILLATOR

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 05AC | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E5AC | | |
| Description | XTAL OSCILLATOR control Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------|----|-------------------|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| OSCILLATOR_BOOST | | OSCILLATOR_OS_OUT | | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|-------------|
| 31 | OSCILLATOR_BOOST | Fast startup control 0x0: Fast startup is disabled 0x1: Fast startup is enabled | RW | 1 |
| 30 | OSCILLATOR_OS_OUT | Oscillator output Read 0x0: low to high transition in BOOST mode Read 0x1: BOOST is disabled | R | 0 |
| 29:0 | RESERVED | | R | 0x0000 0000 |

Table 19-719. Register Call Summary for Register CONTROL_XTAL_OSCILLATOR

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-720. CONTROL_SMART3NOPMIO_PADCONF_0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 05B0 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E5B0 | | |
| Description | SMART3 NOPM IO control 0 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|-------------|----|-------------|----|-------------|----|-------------|----|----------|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FREF_DR1_MB | | FREF_DR5_MB | | FREF_DR6_MB | | FREF_DR7_MB | | FREF_DR4_MB | | RESERVED | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|----------|
| 31:30 | FREF_DR1_MB | 50-Ω output buffer mode control for group freq_dr1 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 29:28 | FREF_DR5_MB | 50-Ω output buffer mode control for group freq_dr5 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 27:26 | FREF_DR6_MB | 50-Ω output buffer mode control for group freq_dr6 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 25:24 | FREF_DR7_MB | 50-Ω output buffer mode control for group Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 23:22 | FREF_DR4_MB | 50-Ω output buffer mode control for group freq_dr4 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0x1 |
| 21:0 | RESERVED | | R | 0x000000 |

Table 19-721. Register Call Summary for Register CONTROL_SMART3NOPMIO_PADCONF_0

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\] \[5\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[6\]](#)

Table 19-722. CONTROL_SMART3NOPMIO_PADCONF_1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 05B4 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E5B4 | | |
| Description | SMART3 NOPM IO control 1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|--------------|--------------|--------------|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FREF_DR1_LB0 | FREF_DR5_LB0 | FREF_DR6_LB0 | FREF_DR7_LB0 | FREF_DR4_LB0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|------------|
| 31 | FREF_DR1_LB0 | 50-Ω output buffer load control for group fref_dr1 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 30 | FREF_DR5_LB0 | 50-Ω output buffer load control for group fref_dr5 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 29 | FREF_DR6_LB0 | 50-Ω output buffer load control for group fref_dr6 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 28 | FREF_DR7_LB0 | 50-Ω output buffer load control for group fref_dr7 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 27 | FREF_DR4_LB0 | 50-Ω output buffer load control for group fref_dr4 Refer to 50-Ω output buffer I/Os with combined Mode and Load Settings for more details on mode settings. | RW | 0 |
| 26:0 | RESERVED | | R | 0x00000000 |

Table 19-723. Register Call Summary for Register CONTROL_SMART3NOPMIO_PADCONF_1

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[1\] \[2\] \[3\] \[4\] \[5\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[6\]](#)

Table 19-724. CONTROL_I2C_2

| | | | | | |
|------------------|--|--|----------|----------------------|--|
| Address Offset | | 0x0000 0604 | | | |
| Physical Address | | 0x4A31 E604 | Instance | SYSCTRL_PADCONF_WKUP | |
| Description | | I2C pads control 2 Access conditions. Read: unrestricted, Write: unrestricted | | | |
| Type | | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|------------------|----|----|----|-------------------|----|----|----|---------------|----|----|----|------------------|----|----|----|-------------------|----|---|---|----------|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
| SR_SDA_GLFENB | | | | SR_SDA_LOAD_BITS | | | | SR_SDA_PULLUPRESX | | | | SR_SCL_GLFENB | | | | SR_SCL_LOAD_BITS | | | | SR_SCL_PULLUPRESX | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 31 | SR_SDA_GLFENB | Active_high glitch free operation enable pin for sr i2c receiver 0x0: Disable i2c4 glitch free operation 0x1: Enable i2c4 glitch free operation | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|----------|
| 30:29 | SR_SDA_LOAD_BITS | Internal Pull up resistor in Fast or Standard mode / High_speed mode for sr i2c 0x0: 4.5 kΩ (5-15 pF) / 1.66 kΩ (5-12 pF) 0x1: 2.1 kΩ (15-50 pF) / 920 Ω (12-25 pF) 0x2: 860 Ω (50-150 pF) / 500 Ω (25-50 pF) 0x3: N.A / 300 Ω (50-80 pF) | RW | 0x0 |
| 28 | SR_SDA_PULLUPRESX | Active_low internal pull_up resistor enabled for sr i2c 0x0: Enable Internal Pull up resistor 0x1: Disable Internal Pull up resistor | RW | 0 |
| 27 | SR_SCL_GLFENB | Active_high glitch free operation enable pin for sr i2c receiver 0x0: Disable i2c4 glitch free operation 0x1: Enable i2c4 glitch free operation | RW | 0 |
| 26:25 | SR_SCL_LOAD_BITS | Internal Pull up resistor in Fast or Standard mode / High_speed mode for sr i2c 0x0: 4.5 kΩ (5-15 pF) / 1.66 kΩ (5-12 pF) 0x1: 2.1 kΩ (15-50 pF) / 920 Ω (12-25 pF) 0x2: 860 Ω (50-150 pF) / 500 Ω (25-50 pF) 0x3: N.A / 300 Ω (50-80 pF) | RW | 0x0 |
| 24 | SR_SCL_PULLUPRESX | Active_low internal pull_up resistor enabled for sr i2c 0x0: Enable Internal Pull up resistor 0x1: Disable Internal Pull up resistor | RW | 0 |
| 23:0 | RESERVED | | R | 0x000000 |

Table 19-725. Register Call Summary for Register CONTROL_I2C_2

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)
- [I2Cx I/Os Group Pullupresx Controls and Load Range Settings: \[1\]](#)
- [Device Interfaces Signal Group Controls Mapping: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[8\]](#)

Table 19-726. CONTROL_JTAG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0608 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A31 E608 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | SYSCTRL_PADCONF_WKUP | | | | | | | | | | | | | | | |
| Description | | JTAG pads control Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|-------------|--------------|-------------|-------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| JTAG_NTRST_EN | JTAG_TCK_EN | JTAG_RTCK_EN | JTAG_TDI_EN | JTAG_TDO_EN | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-----------|
| 31 | JTAG_NTRST_EN | bus holder enable for jtag_ntrst PAD 0x0: Disable bus holder functionality 0x1: Enable bus holder functionality | RW | 0 |
| 30 | JTAG_TCK_EN | bus holder enable for jtag_tck PAD 0x0: Disable bus holder functionality 0x1: Enable bus holder functionality | RW | 0 |
| 29 | JTAG_RTCK_EN | bus holder enable for jtag_rtck PAD 0x0: Disable bus holder functionality 0x1: Enable bus holder functionality | RW | 0 |
| 28 | JTAG_TDI_EN | bus holder enable for jtag_tdi PAD 0x0: Disable bus holder functionality 0x1: Enable bus holder functionality | RW | 0 |
| 27 | JTAG_TDO_EN | bus holder enable for jtag_tdo PAD 0x0: Disable bus holder functionality 0x1: Enable bus holder functionality | RW | 0 |
| 26:0 | RESERVED | | R | 0x0000000 |

Table 19-727. Register Call Summary for Register CONTROL_JTAG

Control Module Functional Description

- [Signal Integrity Parameter Controls Overview: \[0\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[1\]](#)

Table 19-728. CONTROL_SYS

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 060C | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E60C | | |
| Description | SYS controls Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|-------------|
| 31 | SYS_NRESWARM_PIPU | Pull up enable for sys_nreswarm PAD 0x0: Enable pull up 0x1: Disable pull up | RW | 0 |
| 30:0 | RESERVED | | R | 0x0000 0000 |

Table 19-729. Register Call Summary for Register CONTROL_SYS

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-730. CONTROL_WKUP_CONTROL_SPARE_RW

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0614 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E614 | | |
| Description | Wake-up control spare RW Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WKUP_CONTROL_SPARE_RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------------|
| 31:0 | WKUP_CONTROL_SPARE_RW | Wake-up control spare register bits RW | RW | 0x0000 0000 |

Table 19-731. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW

Control Module Functional Description

- [Thermal Shutdown Functionality Comparators: \[0\] \[1\]](#)

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[2\]](#)

Table 19-732. CONTROL_WKUP_CONTROL_SPARE_R

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 0618 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E618 | | |
| Description | Wake-up control spare R Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WKUP_CONTROL_SPARE_R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---------------------------------------|------|-------------|
| 31:0 | WKUP_CONTROL_SPARE_R | Wake-up control spare register bits R | R | 0x0000 0000 |

Table 19-733. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_R

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-734. CONTROL_WKUP_CONTROL_SPARE_R_C0

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 061C | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E61C | | |
| Description | Wake-up control spare RC Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|
| WKUP_CONTROL_SPARE_R_C0 | WKUP_CONTROL_SPARE_R_C1 | WKUP_CONTROL_SPARE_R_C2 | WKUP_CONTROL_SPARE_R_C3 | WKUP_CONTROL_SPARE_R_C4 | WKUP_CONTROL_SPARE_R_C5 | WKUP_CONTROL_SPARE_R_C6 | WKUP_CONTROL_SPARE_R_C7 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|--------------------------|----------|
| 31 | WKUP_CONTROL_SPARE_R_C0 | Wake-up control spare register bits RC 0 | RW (Write 1 to Clear) | 0 |
| 30 | WKUP_CONTROL_SPARE_R_C1 | Wake-up control spare register bits RC 1 | RW (Write 1 to Clear) | 0 |
| 29 | WKUP_CONTROL_SPARE_R_C2 | Wake-up control spare register bits RC 2 | RW (Write 1 to Clear) | 0 |
| 28 | WKUP_CONTROL_SPARE_R_C3 | Wake-up control spare register bits RC 3 | RW (Write 1 to Clear) | 0 |
| 27 | WKUP_CONTROL_SPARE_R_C4 | Wake-up control spare register bits RC 4 | RW (Write 1 to Clear) | 0 |
| 26 | WKUP_CONTROL_SPARE_R_C5 | Wake-up control spare register bits RC 5 | RW (Write 1 to Clear) | 0 |
| 25 | WKUP_CONTROL_SPARE_R_C6 | Wake-up control spare register bits RC 6 | RW (Write 1 to Clear) | 0 |
| 24 | WKUP_CONTROL_SPARE_R_C7 | Wake-up control spare register bits RC 7 | RW (Write 1 to Clear) | 0 |
| 23:0 | RESERVED | | R | 0x000000 |

Table 19-735. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_R_C0

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-736. CONTROL_WKUP_CONTROL_SPARE_RW1

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0620 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E620 | | |
| Description | WKUP control spare RW1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| WKUP_CONTROL_SPARE_RW1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-----------|-----------------------|--------------------------------------|------|-------------|
| 31:0 1 | WKUP_CONTROL_SPARE_RW | wkup control spare register bits RW1 | RW | 0x0000 0000 |

Table 19-737. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW1

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-738. CONTROL_WKUP_CONTROL_SPARE_RW2

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 0624 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E624 | | |
| Description | WKUP control spare RW2 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WKUP_CONTROL_SPARE_RW2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-----------|-----------------------|--------------------------------------|------|-------------|
| 31:0 2 | WKUP_CONTROL_SPARE_RW | wkup control spare register bits RW2 | RW | 0x0000 0000 |

Table 19-739. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW2

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-740. CONTROL_WKUP_CONTROL_SPARE_RW3

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|
| Address Offset | 0x0000 0628 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A31 E628 | | | | | | | | | | | | | | | | InstanceSYSCTRL_PADCONF_WKUP | | | | | | | | | | | | | | | |
| Description | WKUP control spare RW3 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| WKUP CONTROL SPARE RW3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-----------|-----------------------|--------------------------------------|------|-------------|
| 31:0 3 | WKUP_CONTROL_SPARE_RW | wkup control spare register bits RW3 | RW | 0x0000 0000 |

Table 19-741. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW3

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-742. CONTROL_WKUP_CONTROL_SPARE_RW4

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 062C | | |
| Physical Address | 0x4A31 E62C | Instance | SYSCTRL_PADCONF_WKUP |
| Description | WKUP control spare RW4 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WKUP_CONTROL_SPARE_RW4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--------------------------------------|------|-------------|
| 31:0 | WKUP_CONTROL_SPARE_RW4 | wkup control spare register bits RW4 | RW | 0x0000 0000 |

Table 19-743. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW4

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-744. CONTROL_WKUP_CONTROL_SPARE_RW5

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0630 | | |
| Physical Address | 0x4A31 E630 | Instance | SYSCTRL_PADCONF_WKUP |
| Description | WKUP control spare RW5 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WKUP_CONTROL_SPARE_RW5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--------------------------------------|------|-------------|
| 31:0 | WKUP_CONTROL_SPARE_RW5 | wkup control spare register bits RW5 | RW | 0x0000 0000 |

Table 19-745. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW5

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-746. CONTROL_WKUP_CONTROL_SPARE_RW6

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0634 | | |
| Physical Address | 0x4A31 E634 | Instance | SYSCTRL_PADCONF_WKUP |
| Description | WKUP control spare RW6 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WKUP_CONTROL_SPARE_RW6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--------------------------------------|------|-------------|
| 31:0 | WKUP_CONTROL_SPARE_RW6 | wkup control spare register bits RW6 | RW | 0x0000 0000 |

Table 19-747. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW6

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-748. CONTROL_WKUP_CONTROL_SPARE_RW7

| | | | |
|------------------|--|----------|----------------------|
| Address Offset | 0x0000 0638 | Instance | SYSCTRL_PADCONF_WKUP |
| Physical Address | 0x4A31 E638 | | |
| Description | WKUP control spare RW7 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WKUP_CONTROL_SPARE_RW7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--------------------------------------|------|-------------|
| 31:0 | WKUP_CONTROL_SPARE_RW7 | wkup control spare register bits RW7 | RW | 0x0000 0000 |

Table 19-749. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW7

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-750. CONTROL_WKUP_CONTROL_SPARE_RW8

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|----------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 063C | | | | | | | | | | | | | | | | Instance | SYSCTRL_PADCONF_WKUP | | | | | | | | | | | | | | | |
| Physical Address | 0x4A31 E63C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | WKUP control spare RW8 Access conditions. Read: unrestricted, Write: unrestricted | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WKUP CONTROL SPARE RW8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--------------------------------------|------|-------------|
| 31:0 | WKUP_CONTROL_SPARE_RW8 | wkup control spare register bits RW8 | RW | 0x0000 0000 |

Table 19-751. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW8

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-752. CONTROL_WKUP_CONTROL_SPARE_RW9

| | | | |
|-------------------------|--|-----------------|----------------------|
| Address Offset | 0x0000 0640 | | |
| Physical Address | 0x4A31 E640 | Instance | SYSCTRL_PADCONF_WKUP |
| Description | WKUP control spare RW9 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WKUP_CONTROL_SPARE_RW9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--------------------------------------|------|-------------|
| 31:0 | WKUP_CONTROL_SPARE_RW9 | wkup control spare register bits RW9 | RW | 0xFFFF FFFF |

Table 19-753. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_RW9

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

Table 19-754. CONTROL_WKUP_CONTROL_SPARE_R1

| | | | |
|-------------------------|---|-----------------|----------------------|
| Address Offset | 0x0000 064C | | |
| Physical Address | 0x4A31 E64C | Instance | SYSCTRL_PADCONF_WKUP |
| Description | WKUP control spare R1 Access conditions. Read: unrestricted, Write: unrestricted | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WKUP_CONTROL_SPARE_R1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|-------------------------------------|------|-------------|
| 31:0 | WKUP_CONTROL_SPARE_R1 | wkup control spare register bits R1 | R | 0x0000 0000 |

Table 19-755. Register Call Summary for Register CONTROL_WKUP_CONTROL_SPARE_R1

Control Module Register Manual

- [SYSCTRL_PADCONF_WKUP Register Summary: \[0\]](#)

PRELIMINARY

Mailbox

This chapter describes the Mailbox module in the device.

| Topic | Page |
|--|-------------|
| 20.1 Mailbox Overview | 4170 |
| 20.2 Mailbox Integration | 4172 |
| 20.3 Mailbox Functional Description | 4176 |
| 20.4 Mailbox Programming Guide | 4182 |
| 20.5 Mailbox Register Manual | 4185 |

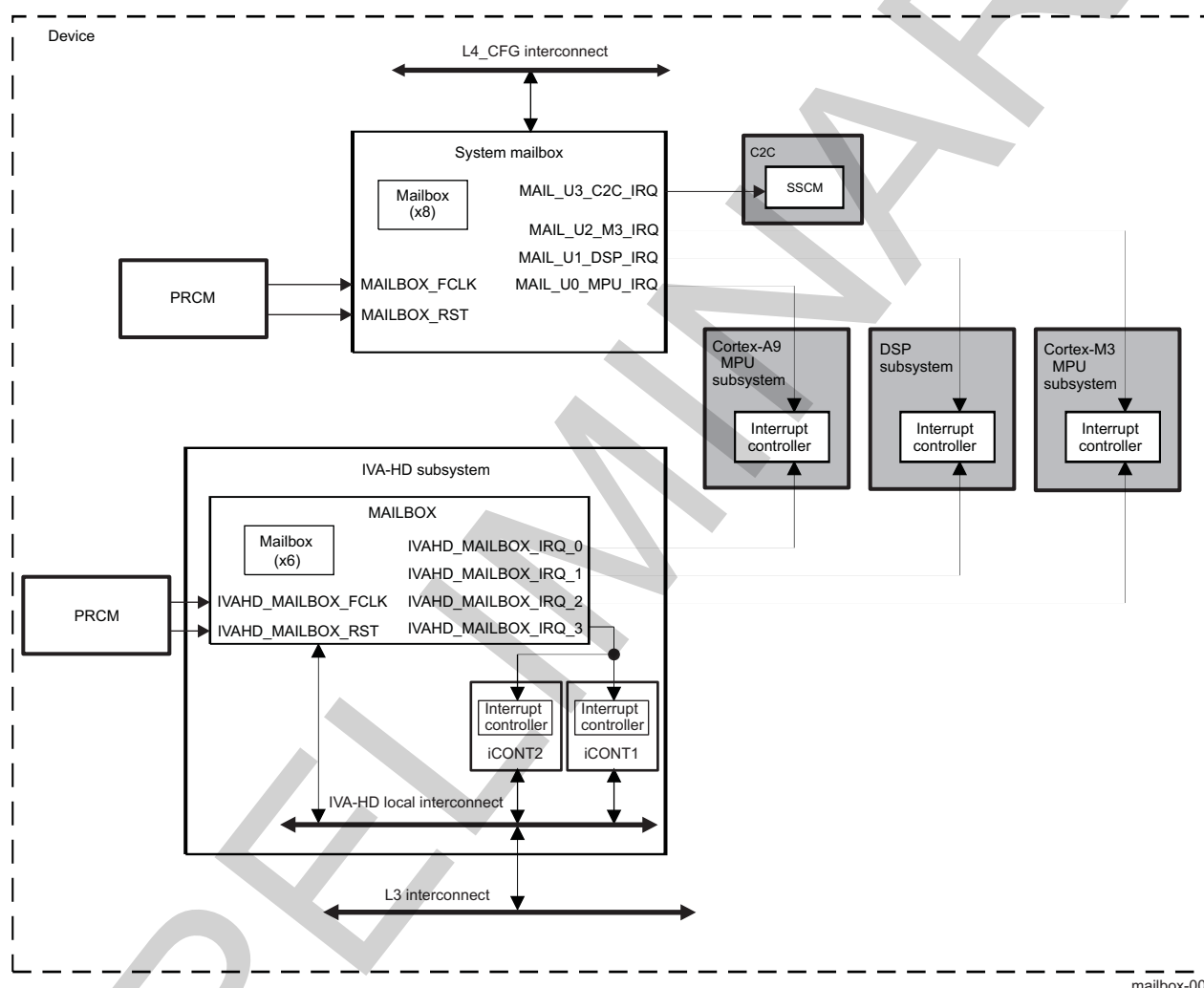
20.1 Mailbox Overview

Communication between the on-chip processors of the device uses a queued mailbox-interrupt mechanism.

The queued mailbox-interrupt mechanism allows the software to establish a communication channel between two processors through a set of registers and associated interrupt signals by sending and receiving messages (mailboxes).

Figure 20-1 shows an overview of the mailbox module.

Figure 20-1. Mailbox Overview



There are two mailbox module instances in the device:

- System mailbox - used for Cortex-A9 microprocessor unit (Cortex-A9 MPU), digital signal processor (DSP) and Cortex-M3 microprocessor unit (Cortex-M3 MPU) communications.
- IVA-HD mailbox - used for communication between one internal to the IVA-HD subsystem user (imaging controller 1 - iCONT1, or imaging controller 2 - iCONT2) and three external to the IVA-HD subsystem users (Cortex-A9 MPU, DSP and Cortex-M3 MPU). This communication is insured through three pairs of mailboxes.

The mailbox module includes the following features:

- Three users for the system mailbox instance (Cortex-A9 MPU, DSP and Cortex-M3 MPU)/four users for the IVA-HD mailbox instance (iCONT1/iCONT2, Cortex-A9 MPU, DSP and Cortex-M3 MPU)

- Eight mailbox message queues for the system mailbox instance/six mailbox message queues for the IVA-HD mailbox instance
- Flexible assignment of receiver and sender for each mailbox through interrupt configuration
- Three interrupts (one per user) for the system mailbox instance/four interrupts (one per user) for the IVA-HD mailbox instance
- 32-bit message width
- Four-message FIFO depth for each message queue
- Message reception and queue-not-full notification using interrupts
- Support of 16-/32-bit addressing scheme
- Power management support

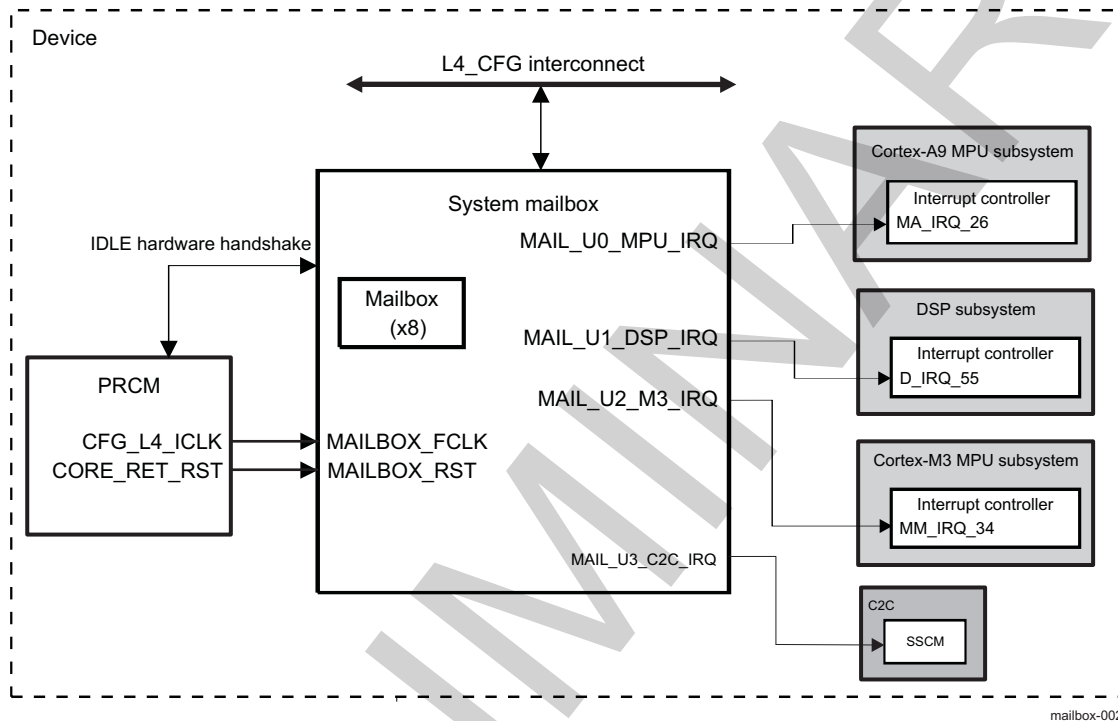
20.2 Mailbox Integration

This section describes the mailbox integration in the device, including information about clocks, resets, and hardware requests.

20.2.1 System Mailbox Integration

Figure 20-2 shows the system mailbox integration.

Figure 20-2. System Mailbox Integration



NOTE: For more information about the IDLE hardware handshake, see [Section 3.1.1.1.2, Module Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 20-1 through Table 20-3 summarize the system mailbox integration in the device.

Table 20-1. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| SYSTEM_MAILBOX | PD_CORE | NA | L4_CFG |

Table 20-2. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|---|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| SYSTEM_MAILBOX | MAILBOX_FCLK | CFG_L4_ICLK | PRCM | System mailbox functional/interface clock. For information about PRCM clock gating and management, see Section 3.6.14, CD_L4_CFG Clock Management , in Chapter 3, Power, Reset, and Clock Management . |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| SYSTEM_MAILBOX | MAILBOX_RST | CORE_RET_RST | PRCM | System mailbox hardware reset. For information about PRCM reset sources and distribution, see Section 3.5.4, Reset Domains , in Chapter 3, Power, Reset, and Clock Management . |

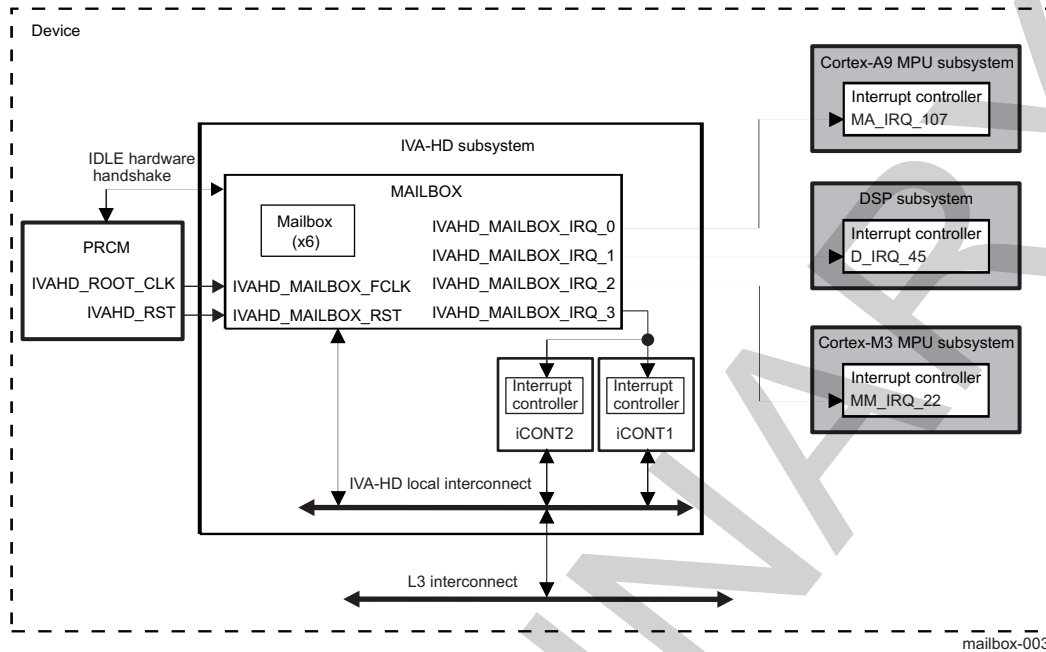
Table 20-3. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| SYSTEM_MAILBOX | MAIL_U0_MPU_IRQ | MA_IRQ_26 | Cortex-A9 | System mailbox user 0 interrupt request. For information about Cortex-A9 MPU interrupt mapping, see Section 18.3.2, Interrupt Requests to the Cortex-A9 MPU Interrupt Controller , in Chapter 18, Interrupt Controllers . |
| | MAIL_U1_DSP_IRQ | D_IRQ_55 | DSP | System mailbox user 1 interrupt request. For information about DSP interrupt mapping, see Section 18.3.3, Interrupt Requests to the Cortex-M3 MPU Interrupt Controller , in Chapter 18, Interrupt Controllers . |
| | MAIL_U2_M3_IRQ | MM_IRQ_34 | Cortex-M3 | System mailbox user 2 interrupt request. For information about Cortex-M3 MPU interrupt mapping, see Section 18.3.3, Interrupt Requests to the Cortex-M3 MPU Interrupt Controller , in Chapter 18, Interrupt Controllers . |
| | MAIL_U3_C2C_IRQ | C2C_SSCM_GPI_1 | C2C INTC | Interrupt to the SSCM of C2C |
| No DMA Requests | | | | |

NOTE: For information about interrupt source description, see [Section 20.3.4, Interrupt Requests](#).

20.2.2 IVA-HD Mailbox Integration

Figure 20-3 shows the IVA-HD mailbox integration.

Figure 20-3. IVA-HD Mailbox Integration

NOTE: For more information about the IDLE hardware handshake, see [Section 3.1.1.1.2, Module Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

NOTE: The two imaging controllers - iCONT1 and iCONT2, are mapped on a shared interrupt line. The choice between them is done by masking mailbox interrupt on iCONT1 or iCONT2. For more information, see [IVA-HD Imaging Controller](#) in [Chapter 6, IVA-HD Subsystem](#).

[Table 20-4](#) through [Table 20-6](#) summarize the IVA-HD mailbox integration in the device.

Table 20-4. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|---------------------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| IVAHD_MAILBOX | PD_IVAHD | NA | IVA-HD local interconnect |

Table 20-5. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| IVAHD_MAILBOX | IVAHD_MAILBOX_FCLK | IVAHD_CLK | PRCM | IVA-HD mailbox functional/interface clock. |

| Resets | | | | |
|-----------------|-------------------------|--------------------|--------|--------------------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| IVAHD_MAILBOX | IVAHD_MAILBOX_RST | IVAHD_RST | PRCM | IVA-HD mailbox hardware reset. |

Table 20-6. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------|-------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |

Table 20-6. Hardware Requests (continued)

| | | | | |
|------------------------|---------------------|------------|---------------|---|
| IVAHD_MAILBOX | IVAHD_MAILBOX_IRQ_0 | MA_IRQ_107 | Cortex-A9 | IVA-HD mailbox user 0 interrupt request |
| | IVAHD_MAILBOX_IRQ_1 | D_IRQ_45 | DSP | IVA-HD mailbox user 1 interrupt request |
| | IVAHD_MAILBOX_IRQ_2 | MM_IRQ_22 | Cortex-M3 | IVA-HD mailbox user 2 interrupt request |
| | IVAHD_MAILBOX_IRQ_3 | IRQ#11 | iCONT1/iCONT2 | IVA-HD mailbox user 3 interrupt request. For information about iCONT1/iCONT2 interrupt mapping, see , iCONT. |
| No DMA Requests | | | | |

NOTE: For information about interrupt source description, see [Section 20.3.4, Interrupt Requests](#).

20.3 Mailbox Functional Description

NOTE: In the mailbox functional description, u is the user number and m is the mailbox number as follows:

- for the system mailbox module instance, $u=0$ to 2 and $m=0$ to 7
- for the IVA-HD mailbox module instance, $u=0$ to 3 and $m=0$ to 5

The mailbox module provides a means of communication through message queues among the users (depending on the mailbox module instance). The individual mailbox modules (8 for the system mailbox instance, 6 for the IVA-HD mailbox instance), or FIFOs, can associate (or de-associate) with any of the processors using the [MAILBOX_IRQENABLE_SET_u](#) (or [MAILBOX_IRQENABLE_CLR_u](#)) register.

CAUTION

For the IVA-HD mailbox instance, communication is possible only if one of the users is iCONT1 or iCONT2.

The mailbox module includes the following user subsystems:

- User 0: Cortex-A9 MPU subsystem ($u = 0$)
- User 1: DSP subsystem ($u = 1$)
- User 2: Cortex-M3 MPU subsystem ($u = 2$)
- User 3:
 - IVA-HD subsystem ($u = 3$) - only available to the IVA-HD mailbox instance
 - Mailbox subsystem - only available to SSCM module of C2C interface

Each user has a dedicated interrupt signal from the corresponding mailbox module instance and dedicated interrupt enabling and status registers.

Each [MAILBOX_IRQSTATUS_RAW_u](#)/[MAILBOX_IRQSTATUS_CLR_u](#) interrupt status register corresponds to a particular user.

For the system mailbox instance, a user can query its interrupt status register through the L4_CFG interconnect.

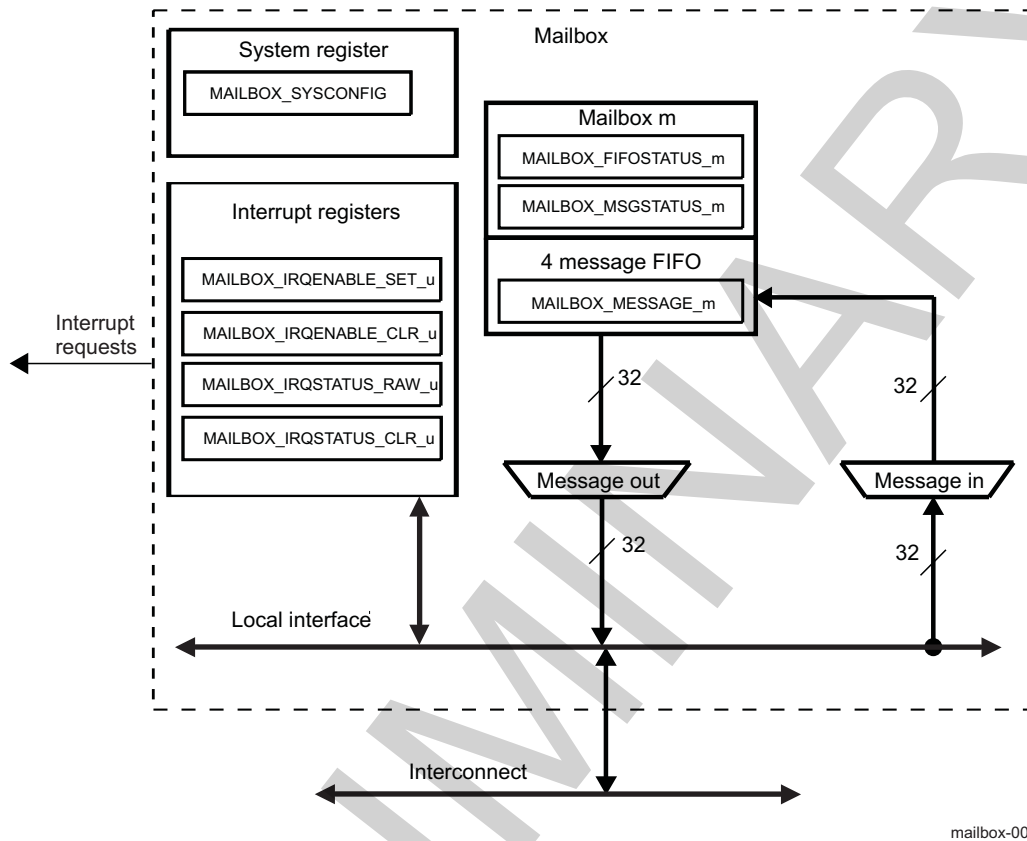
For the IVA-HD mailbox instance, a user can query its interrupt status register as follows:

- Cortex-A9 MPU and Cortex-M3 MPU - through the L3 interconnect
- iCONT1/iCONT2 and DSP - private access (directly through the IVA-HD local interconnect)

20.3.1 Mailbox Block Diagram

Figure 20-4 shows the mailbox block diagram.

Figure 20-4. Mailbox Block Diagram



NOTE: The interrupt requests and the interconnect depend on the mailbox module instance. For more information, see [Section 20.2, Mailbox Integration](#).

20.3.2 Mailbox Software Reset

The mailbox module supports a software reset through the [MAILBOX_SYSCONFIG\[0\]](#) SOFTRESET bit. Setting this bit to 1 enables an active software reset that is functionally equivalent to a hardware reset. Reading the [MAILBOX_SYSCONFIG\[0\]](#) SOFTRESET bit gives the status of the software reset:

- Read 1: the software reset is on-going.
- Read 0: the software reset is complete.

The software must ensure that the software reset completes before doing mailbox operations.

20.3.3 Mailbox Power Management

[Table 20-7](#) describes power-management features available for the mailbox module.

NOTE:

- For information about source clock gating and sleep/wake-up transitions description, see [Section 3.1.1.1.4, Clock-Domain Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).
- For descriptions of EnaWakeUp, IdleMode, ClockActivity, and StandbyMode features, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 20-7. Local Power Management Features

| Feature | Registers | Description |
|------------------------|---|--|
| Clock autogating | NA | Feature not available |
| Slave idle modes | MAILBOX_SYSCONFIG [3:2] SIDLEMODE bit field | Force-idle, no-idle and smart-idle modes are available |
| Clock activity | NA | Feature not available |
| Master standby modes | NA | Feature not available |
| Global wake-up enable | NA | Feature not available |
| Wake-up sources enable | NA | Feature not available |

The mailbox module can be configured using the [MAILBOX_SYSCONFIG](#)[3:2] SIDLEMODE bit field to one of the following acknowledgment modes:

- Force-idle mode (SIDLEMODE = 0x0): The mailbox module immediately enters the idle state on receiving a low-power-mode request from the PRCM module. In this mode, the software must ensure that there are no asserted output interrupts before requesting this mode to go into the idle state.
- No-idle mode (SIDLEMODE = 0x1): The mailbox module never enters the idle state.
- Smart-idle mode (SIDLEMODE = 0x2): After receiving a low-power-mode request from the PRCM module, the mailbox module enters the idle state only after all asserted output interrupts are acknowledged.

20.3.4 Mailbox Interrupt Requests

An interrupt request allows the user of the mailbox to be notified when a message is received or when the message queue is not full. There is one interrupt per user.

NOTE: For more information about interrupt requests, see [Section 20.2, Mailbox Integration](#).

[Table 20-8](#) lists the event flags, and their mask, that can cause module interrupts.

Table 20-8. Interrupt Events

| Non-Maskable Event Flag ⁽¹⁾ | Maskable Event Flag | Event Mask Bit | Event Unmask Bit | Description |
|---|---|---|---|---|
| MAILBOX_IRQSTATUS_RAW_u [0+m*2] NEWMSGSTATUSUUM Bm | MAILBOX_IRQSTATUS_CLR_u [0+m*2] NEWMSGSTATUSUUM Bm | MAILBOX_IRQENABLE_CLR_u [0+m*2] NEWMSGSTATUSUUM Bm | MAILBOX_IRQENABLE_SET_u [0+m*2] NEWMSGSTATUSUUM Bm | Mailbox <i>m</i> receives a new message. |
| MAILBOX_IRQSTATUS_RAW_u [1+m*2] NOTFULLSTATUSUUM Bm | MAILBOX_IRQSTATUS_CLR_u [1+m*2] NOTFULLSTATUSUUM Bm | MAILBOX_IRQENABLE_CLR_u [1+m*2] NOTFULLSTATUSUUM Bm | MAILBOX_IRQENABLE_SET_u [1+m*2] NOTFULLSTATUSUUM Bm | Mailbox <i>m</i> message queue is not full. |

⁽¹⁾ MAILBOX.MAILBOX_IRQSTATUS_RAW_u register is mostly used for debug purposes.

CAUTION

Once an event generating the interrupt request has been processed by the software, it must be cleared by writing a logical 1 in the corresponding bit of the [MAILBOX_IRQSTATUS_CLR_u](#) register.

Writing a logical 1 in a bit of the [MAILBOX_IRQSTATUS_CLR_u](#) register will also clear to 0 the corresponding bit in the appropriate [MAILBOX_IRQSTATUS_RAW_u](#) register.

An event can generate an interrupt request when a logical 1 is written to the corresponding unmask bit in the [MAILBOX_IRQENABLE_SET_u](#) register. Events are reported in the appropriate [MAILBOX_IRQSTATUS_CLR_u](#) and [MAILBOX_IRQSTATUS_RAW_u](#) registers.

An event stops generating interrupt requests when a logical 1 is written to the corresponding mask bit in the [MAILBOX_IRQENABLE_CLR_u](#) register. Events are only reported in the appropriate [MAILBOX_IRQSTATUS_RAW_u](#) register.

In case of the [MAILBOX_IRQSTATUS_RAW_u](#) register, the event is reported in the corresponding bit even if the interrupt request generation is disabled for this event.

20.3.5 Mailbox Assignment

20.3.5.1 Description

To assign a receiver to a mailbox, set the new message interrupt enable bit corresponding to the desired mailbox in the [MAILBOX_IRQENABLE_SET_u](#) register. The receiver reads the [MAILBOX_MESSAGE_m](#) register to retrieve a message from the mailbox.

An alternate method for the receiver that does not use the interrupts is to poll the [MAILBOX_FIFOSTATUS_m](#) and/or [MAILBOX_MSGSTATUS_m](#) registers to know when to send or retrieve a message to or from the mailbox. This method does not require assigning a receiver to a mailbox. Because this method does not include the explicit assignment of the mailbox, the software must avoid having multiple receivers use the same mailbox, which can result in incoherency.

To assign a sender to a mailbox, set the queue-not-full interrupt enable bit of the desired mailbox in the [MAILBOX_IRQENABLE_SET_u](#) register, where *u* is the number of the sending user. However, direct allocation of a mailbox to a sender is not recommended because it can cause the sending processor to be constantly interrupted.

It is recommended that register polling be used to:

- Check the status of either the [MAILBOX_FIFOSTATUS_m](#) or [MAILBOX_MSGSTATUS_m](#) registers
- Write the message to the corresponding [MAILBOX_MESSAGE_m](#) register, if space is available.

The sender might use the queue-not-full interrupt when the initial mailbox status check indicates the mailbox is full. In this case, the sender can enable the queue-not-full interrupt for its mailbox in the appropriate [MAILBOX_IRQENABLE_SET_u](#) register. This allows the sender to be notified by interrupt only when a FIFO queue has at least one available entry.

Reading the [MAILBOX_IRQSTATUS_CLR_u](#) register determines the status of the new message and the queue-not-full interrupts for a particular user. Writing 1 to the corresponding bit in the [MAILBOX_IRQSTATUS_CLR_u](#) register acknowledges, and subsequently clears, an interrupt.

CAUTION

Assigning multiple senders or multiple receivers to the same mailbox is not recommended.

20.3.6 Sending and Receiving Messages

20.3.6.1 Description

When a 32-bit message is written to the [MAILBOX_MESSAGE_m](#) register, the message is appended into the FIFO queue. This queue holds four messages. If the queue is full, the message is discarded.

Queue overflow can be avoided by first reading the [MAILBOX_FIFOSTATUS_m](#) register to check that the mailbox message queue is not full before writing a new message to it.

Reading the [MAILBOX_MESSAGE_m](#) register returns the message at the beginning of the FIFO queue and removes it from the queue. If the FIFO queue is empty when the [MAILBOX_MESSAGE_m](#) register is read, the value 0 is returned.

The new message interrupt is asserted when at least one message is in the mailbox message FIFO queue. To determine the number of messages in the mailbox message FIFO queue, read the [MAILBOX_MSGSTATUS_m](#) register.

20.3.7 16-Bit Register Access

20.3.7.1 Description

So that 16-bit processors can access the mailbox module, the module allows 16-bit register read and write access, with restrictions for the [MAILBOX_MESSAGE_m](#) registers. The 16-bit half-words are organized in little endian fashion; that is, the least-significant 16 bits are at the low address and the most-significant 16 bits are at the high address (low address + 0x02).

All mailbox module registers can be read or written to directly using individual 16-bit accesses with no restriction on interleaving, except the [MAILBOX_MESSAGE_m](#) registers, which must always be accessed by either single 32-bit accesses or two consecutive 16-bit accesses.

CAUTION

When using 16-bit accesses, it is critical to ensure that the mailbox used has only one assigned receiver and only one assigned sender.

When using 16-bit accesses to the [MAILBOX_MESSAGE_m](#) registers, the order of access must be the least-significant half-word first (low address) and the most-significant half-word last (high address). This requirement is because of the update operation by the message FIFO of the [MAILBOX_MSGSTATUS_m](#) registers. The update of the FIFO queue contents and the associated status registers and possible interrupt generation occurs only when the most-significant 16 bits of a [MAILBOX_MESSAGE_m](#) are accessed.

Figure 20-5 shows an example of communication between Cortex-A9 MPU and DSP subsystems.

Figure 20-5. Example of Communication



20.4 Mailbox Programming Guide

20.4.1 Mailbox Low-level Programming Models

This section covers the low-level hardware programming sequences for configuration and usage of the mailbox module.

20.4.1.1 Global Initialization

20.4.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements of initializing the surrounding modules when the mailbox module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration of the mailbox.

See [Section 20.2, Mailbox Integration](#), for further information.

Table 20-9. Global Initialization of Surrounding Modules for System Mailbox

| Surrounding Modules | Comments |
|-----------------------|--|
| PRCM | Mailbox functional/interface clock must be enabled. For more information, see Section 3.6.14, CD_L4_CFG Clock Domain , in Chapter 3, Power, Reset, and Clock Management . |
| Interrupt Controllers | Cortex-A9 MPU, or Cortex-M3 MPU, or DSP interrupt controller must be configured to enable the interrupt request generation to the Cortex-A9 MPU, or Cortex-M3 MPU, or DSP subsystem. For information about enabling interrupts in Cortex-A9 MPU INTC, see the <i>ARM Cortex™-A9 MPCore Technical Reference Manual</i> . For information about enabling interrupts in Cortex-M3 MPU INTC, see the <i>ARM Cortex™-M3 Technical Reference Manual</i> . For information about enabling interrupts in DSP INTC, see Chapter 5, DSP Subsystem . |
| Interconnect | For information about L4-CFG interconnect configuration, see Section 14.3, L4 Interconnects , in Chapter 14, Interconnect . |

Table 20-10. Global Initialization of Surrounding Modules for IVA-HD Mailbox

| Surrounding Modules | Comments |
|-----------------------|--|
| PRCM | Mailbox functional/interface clock must be enabled. For more information, see Chapter 3, Power, Reset, and Clock Management . |
| Interrupt Controllers | Cortex-A9 MPU, or Cortex-M3 MPU, or DSP, or iCONT1/iCONT2 interrupt controller must be configured to enable the interrupt request generation to the Cortex-A9 MPU, or Cortex-M3 MPU, or DSP, or IVA-HD subsystem. For information about enabling interrupts in Cortex-A9 MPU INTC, or Cortex-M3 MPU INTC, or DSP INTC, see Table 20-9, Global Initialization of Surrounding Modules for System Mailbox . For information about enabling interrupts in iCONT1/iCONT2, see <i>iCONT</i> in Chapter 6, IVA-HD Subsystem . |
| Interconnect | For information about L3 interconnect configuration, see Section 14.2, L3 Interconnects , in Chapter 14, Interconnect . |

20.4.1.1.2 Mailbox Global Initialization

20.4.1.1.2.1 Main Sequence - Mailbox Global Initialization

This procedure initializes the mailbox module after a power-on or software reset.

Table 20-11. Mailbox Global Initialization

| Step | Register/ Bit Field / Programming Model | Value |
|------------------------------|--|-------|
| Perform a software reset | MAILBOX_SYSCONFIG[0] SOFTRESET | 0x1 |
| Wait until reset is complete | MAILBOX_SYSCONFIG[0] SOFTRESET | = 0x0 |
| Set idle mode configuration | MAILBOX_SYSCONFIG[3:2] SIDLEMODE | 0x- |

20.4.1.2 Mailbox Operational Modes Configuration

20.4.1.2.1 Mailbox Processing modes

20.4.1.2.1.1 Main Sequence - Sending a Message (Polling Method)

Table 20-12. Sending a Message (Polling Method)

| Step | Register/ Bit Field / Programming Model | Value |
|---|--|--------|
| IF : Is FIFO full ? | MAILBOX_FIFOSTATUS_m[0] FIFOFULLMB | = 0x1 |
| Wait until at least one message slot is available | MAILBOX_FIFOSTATUS_m[0] FIFOFULLMB | = 0x0 |
| ELSE | | |
| Write message | MAILBOX_MESSAGE_m[31:0] MESSAGEVALUEMBM | 0x---- |
| ENDIF | | |

20.4.1.2.1.2 Main Sequence - Sending a Message (Interrupt Method)

Table 20-13. Sending a Message (Interrupt Method)

| Step | Register/ Bit Field / Programming Model | Value |
|---|--|--------|
| IF : Is FIFO full ? | MAILBOX_FIFOSTATUS_m[0] FIFOFULLMB | = 0x1 |
| Enable interrupt event | MAILBOX_IRQENABLE_SET_u[1+ m*2] | 0x1 |
| User (processor) can perform another task until interrupt occurs See Section 20.4.1.3.1 for interrupt handling in sending mode | | |
| ELSE | | |
| Write message | MAILBOX_MESSAGE_m[31:0] MESSAGEVALUEMBM | 0x---- |
| ENDIF | | |

20.4.1.2.1.3 Main Sequence - Receiving a Message (Polling Method)

Table 20-14. Receiving a Message (Polling Method)

| Step | Register/ Bit Field / Programming Model | Value |
|---|--|--------|
| IF : Number of messages is not equal to 0 | MAILBOX_MSGSTATUS_m[2:0] NBOFMSGMB | != 0x0 |
| Read message | MAILBOX_MESSAGE_m[31:0] MESSAGEVALUEMBM | 0x---- |
| ENDIF | | |

20.4.1.2.1.4 Main Sequence - Receiving a Message (Interrupt Method)

Table 20-15. Receiving a Message (Interrupt Method)

| Step | Register/ Bit Field / Programming Model | Value |
|---|--|-------|
| Enable interrupt event | MAILBOX_IRQENABLE_SET_u[0 + m*2] | 0x1 |
| User (processor) can perform another task until interrupt occurs See Section 20.4.1.3.2 for interrupt handling in receiving mode | | |

20.4.1.3 Mailbox Events Servicing

20.4.1.3.1 Events Servicing in Sending Mode

Table 20-16 describes the events servicing in sending mode.

Table 20-16. Events Servicing in Sending Mode

| Step | Register/ Bit Field / Programming Model | Value |
|----------------------------------|---|--------|
| Read interrupt status bit | MAILBOX_IRQSTATUS_CLR_u [1 + m*2] | 0x1 |
| Write message | MAILBOX_MESSAGE_m [31:0] MESSAGEVALUEMBM | 0x---- |
| Write 1 to acknowledge interrupt | MAILBOX_IRQSTATUS_CLR_u [1 + m*2] | 0x1 |

20.4.1.3.2 Events Servicing in Receiving Mode

Table 20-17 describes the events servicing in receiving mode.

Table 20-17. Events Servicing in Receiving Mode

| Step | Register/ Bit Field / Programming Model | Value |
|--|---|--------|
| Read interrupt status bit | MAILBOX_IRQSTATUS_CLR_u [0 + m*2] | 0x1 |
| IF : Number of messages is not equal to 0 ? | MAILBOX_MSGSTATUS_m [2:0] NBOFMSGMB | != 0x0 |
| Read message | MAILBOX_MESSAGE_m [31:0] MESSAGEVALUEMBM | 0x---- |
| ELSE | | |
| Write 1 to acknowledge interrupt | MAILBOX_IRQSTATUS_CLR_u [0 + m*2] | 0x1 |
| ENDIF | | |

20.5 Mailbox Register Manual

20.5.1 Mailbox Instance Summary

Table 20-18. System Mailbox Instance Summary

| Module Name | Base Address L4_CFG Interconnect | Size |
|----------------|-------------------------------------|------|
| System Mailbox | 0x4A0F 4000 | 4KB |

Table 20-19. IVAHD Mailbox Instance Summary

| Module Name | Base Address L3 Interconnect | Base Address DSP Subsystem Private Access | Base Address Private Access | Size |
|---------------|---------------------------------|---|--------------------------------|------|
| IVAHD Mailbox | 0x5A05 A800 | 0x01E5 A800 | 0x008D A800 | 4KB |

NOTE: Private access is an access that does not use the L3/L4 interconnects.

20.5.2 Mailbox Registers

20.5.2.1 Mailbox Register Summary

Table 20-20. System Mailbox Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L4_CFG Interconnect |
|---|------|-----------------------------|--------------------------|---|
| MAILBOX_REVISION | R | 32 | 0x0000 0000 | 0x4A0F 4000 |
| MAILBOX_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4A0F 4010 |
| MAILBOX_MESSAGE_m⁽¹⁾ | RW | 32 | 0x0000 0040 + (0x4 * m) | 0x4A0F 4040 + (0x4 * m) |
| MAILBOX_FIFOSTATUS_m⁽¹⁾ | R | 32 | 0x0000 0080 + (0x4 * m) | 0x4A0F 4080 + (0x4 * m) |
| MAILBOX_MSGSTATUS_m⁽¹⁾ | R | 32 | 0x0000 00C0 + (0x4 * m) | 0x4A0F 40C0 + (0x4 * m) |
| MAILBOX_IRQSTATUS_RAW_u⁽²⁾ | RW | 32 | 0x0000 0100 + (0x10 * u) | 0x4A0F 4100 + (0x10 * u) |
| MAILBOX_IRQSTATUS_CLR_u⁽²⁾ | RW | 32 | 0x0000 0104 + (0x10 * u) | 0x4A0F 4104 + (0x10 * u) |
| MAILBOX_IRQENABLE_SET_u⁽²⁾ | RW | 32 | 0x0000 0108 + (0x10 * u) | 0x4A0F 4108 + (0x10 * u) |
| MAILBOX_IRQENABLE_CLR_u⁽²⁾ | RW | 32 | 0x0000 010C + (0x10 * u) | 0x4A0F 410C + (0x10 * u) |
| RESERVED | | | 0x0000 0140 | 0x4A0F 4140 |

⁽¹⁾ m = 0 to 7

⁽²⁾ u = 0 to 2

Table 20-21. IVAHD Mailbox Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address DSP Private Access | Physical Address iCONT Private Access |
|--|------|-----------------------------|----------------------------|-------------------------------------|--|---|
| MAILBOX_REVISION | R | 32 | 0x0000 0000 | 0x5A05 A800 | 0x01E5 A800 | 0x008D A800 |
| MAILBOX_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5A05 A810 | 0x01E5 A810 | 0x008D A810 |
| MAILBOX_MESSAGE_m⁽¹⁾ | RW | 32 | 0x0000 0040 + (0x4 * m) | 0x5A05 A840 + (0x4 * m) | 0x01E5 A840 + (0x4 * m) | 0x008D A840 + (0x4 * m) |
| MAILBOX_FIFOSTATUS_m⁽¹⁾ | R | 32 | 0x0000 0080 + (0x4 * m) | 0x5A05 A880 + (0x4 * m) | 0x01E5 A880 + (0x4 * m) | 0x008D A880 + (0x4 * m) |

⁽¹⁾ m = 0 to 5

Table 20-21. IVAHD Mailbox Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address DSP Private Access | Physical Address iCONT Private Access |
|--|------|-----------------------|--------------------------|----------------------------------|-------------------------------------|---------------------------------------|
| MAILBOX_MSGSTATUS_m ⁽¹⁾ | R | 32 | 0x0000 00C0 + (0x4 * m) | 0x5A05 A8C0 + (0x4 * m) | 0x01E5 A8C0 + (0x4 * m) | 0x008D A8C0 + (0x4 * m) |
| MAILBOX_IRQSTATUS_RAW_u ⁽²⁾ | RW | 32 | 0x0000 0100 + (0x10 * u) | 0x5A05 A900 + (0x10 * u) | 0x01E5 A900 + (0x10 * u) | 0x008D A900 + (0x10 * u) |
| MAILBOX_IRQSTATUS_CLR_u ⁽²⁾ | RW | 32 | 0x0000 0104 + (0x10 * u) | 0x5A05 A904 + (0x10 * u) | 0x01E5 A904 + (0x10 * u) | 0x008D A904 + (0x10 * u) |
| MAILBOX_IRQENABLE_SET_u ⁽²⁾ | RW | 32 | 0x0000 0108 + (0x10 * u) | 0x5A05 A908 + (0x10 * u) | 0x01E5 A908 + (0x10 * u) | 0x008D A908 + (0x10 * u) |
| MAILBOX_IRQENABLE_CLR_u ⁽²⁾ | RW | 32 | 0x0000 010C + (0x10 * u) | 0x5A05 A90C + (0x10 * u) | 0x01E5 A90C + (0x10 * u) | 0x008D A90C + (0x10 * u) |
| RESERVED | | | 0x0000 0140 | 0x5A05 A940 | 0x01E5 A940 | 0x008D A940 |

⁽²⁾ u = 0 to 3**20.5.2.2 Mailbox Register Description****Table 20-22. MAILBOX_REVISION**

| | |
|-------------------------|---|
| Address Offset | 0x0000 0000 |
| Physical Address | See Table 20-20 |
| | Instance System Mailbox |
| | See Table 20-21 |
| | Instance IVA-HD Mailbox |
| Description | This register contains the IP revision code |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP Revision | R | TI internal data |

Table 20-23. Register Call Summary for Register MAILBOX_REVISION

Mailbox Register Manual

- [Mailbox Register Summary: \[0\] \[1\]](#)

Table 20-24. MAILBOX_SYSCONFIG

| | |
|-------------------------|--|
| Address Offset | 0x0000 0010 |
| Physical Address | See Table 20-20 |
| | Instance System Mailbox |
| | See Table 20-21 |
| | Instance IVA-HD Mailbox |
| Description | This register controls the various parameters of the communication interface |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------|---|----------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | SIDLEMODE | | RESERVED | SOFTRESET |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | Reserved | RW | 0x00000000 |
| 3:2 | SIDLEMODE | Idle Mode 0x0: Force-idle. An idle request is acknowledged unconditionally 0x1: No-idle. An idle request is never acknowledged 0x2: Smart-idle. Acknowledgement to an idle request is given based on the internal activity of the module based on the internal activity of the module 0x3: reserved do not use | RW | 0x2 |
| 1 | RESERVED | Reserved | RW | 0 |
| 0 | SOFTRESET | Softreset Read 0x0: Soft/Hard reset done Write 0x0: No action Read 0x1: Reset is ongoing Write 0x1: Start the soft reset sequence | RW | 0 |

Table 20-25. Register Call Summary for Register MAILBOX_SYSCONFIG

Mailbox Functional Description

- [Mailbox Software Reset: \[0\] \[1\]](#)
- [Mailbox Power Management: \[2\] \[3\]](#)

Mailbox Programming Guide

- [Mailbox Global Initialization: \[4\] \[5\] \[6\]](#)

Mailbox Register Manual

- [Mailbox Register Summary: \[7\] \[8\]](#)

Table 20-26. MAILBOX_MESSAGE_m

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | 0x0000 0040 + (0x4 * m) | index: | m = 0 to 7 (System Mailbox) or m = 0 to 5 (IVAHD Mailbox) |
| Physical Address | See Table 20-20 | Instance | System Mailbox |
| | See Table 20-21 | Instance | IVA-HD Mailbox |
| Description | The message register stores the next to be read message of the mailbox. Reads remove the message from the FIFO queue. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| MESSAGEVALUEMBM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--------------------|------|-------------|
| 31:0 | MESSAGEVALUEMBM | Message in Mailbox | RW | 0x0000 0000 |

Table 20-27. Register Call Summary for Register MAILBOX_MESSAGE_m

Mailbox Functional Description

- [Description: \[0\] \[1\]](#)
- [Description: \[2\] \[3\] \[4\]](#)
- [Description: \[5\] \[6\] \[7\] \[8\]](#)

Mailbox Programming Guide

- [Mailbox Processing modes: \[9\] \[10\] \[11\]](#)
- [Events Servicing in Sending Mode: \[12\]](#)
- [Events Servicing in Receiving Mode: \[13\]](#)

Table 20-27. Register Call Summary for Register MAILBOX_MESSAGE_m (continued)

Mailbox Register Manual

- [Mailbox Register Summary: \[14\] \[15\]](#)

Table 20-28. MAILBOX_FIFOSTATUS_m

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0080 + (0x4 * m) | index: | m = 0 to 7 (System Mailbox) or m = 0 to 5 (IVAHD Mailbox) |
| Physical Address | See Table 20-20 | Instance | System Mailbox |
| | See Table 20-21 | Instance | IVA-HD Mailbox |
| Description | The FIFO status register has the status related to the mailbox internal FIFO | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | FIFOFULLMBM |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------------|
| 31:1 | RESERVED | Reads returns 0 | R | 0x0000 0000 |
| 0 | FIFOFULLMBM | Full flag for Mailbox Read 0x0: Mailbox FIFO is not full Read 0x1: Mailbox FIFO is full | R | 0 |

Table 20-29. Register Call Summary for Register MAILBOX_FIFOSTATUS_m

Mailbox Functional Description

- [Description: \[0\] \[1\]](#)
- [Description: \[2\]](#)

Mailbox Programming Guide

- [Mailbox Processing modes: \[3\] \[4\] \[5\]](#)

Mailbox Register Manual

- [Mailbox Register Summary: \[6\] \[7\]](#)

Table 20-30. MAILBOX_MSGSTATUS_m

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 00C0 + (0x4 * m) | index: | m = 0 to 7 (System Mailbox) or m = 0 to 5 (IVAHD Mailbox) |
| Physical Address | See Table 20-20 | Instance | System Mailbox |
| | See Table 20-21 | Instance | IVA-HD Mailbox |
| Description | The message status register has the status of the messages in the mailbox. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | NBOFMSGMBM |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | Reserved. Read returns 0 | R | 0x0000 0000 |
| 2:0 | NBOFMSGMBM | Number of unread messages in Mailbox Note: Limited to four messages per mailbox. | R | 0x00 |

Table 20-31. Register Call Summary for Register MAILBOX_MSGSTATUS_m

Mailbox Functional Description

- [Description: \[0\] \[1\]](#)
- [Description: \[2\]](#)
- [Description: \[3\]](#)

Mailbox Programming Guide

- [Mailbox Processing modes: \[4\]](#)
- [Events Servicing in Receiving Mode: \[5\]](#)

Mailbox Register Manual

- [Mailbox Register Summary: \[6\] \[7\]](#)

Table 20-32. MAILBOX_IRQSTATUS_RAW_u

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0100 + (0x10 * u) | index: | u = 0 to 2 (System Mailbox) or u = 0 to 3 (IVA-HD Mailbox) |
| Physical Address | See Table 20-20 | Instance | System Mailbox |
| | See Table 20-21 | Instance | IVA-HD Mailbox |
| Description | The interrupt status register has the raw status for each event that may be responsible for the generation of an interrupt to the corresponding user - write 1 to a given bit sets this bit. This register is mainly used for debug purpose. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | NOTFULLSTATUSUUMB7 | NEWMSGSTATUSUUMB7 | NOTFULLSTATUSUUMB6 | NEWMSGSTATUSUUMB6 | NOTFULLSTATUSUUMB5 | NEWMSGSTATUSUUMB5 | NOTFULLSTATUSUUMB4 | NEWMSGSTATUSUUMB4 | NOTFULLSTATUSUUMB3 | NEWMSGSTATUSUUMB3 | NOTFULLSTATUSUUMB2 | NEWMSGSTATUSUUMB2 | NOTFULLSTATUSUUMB1 | NEWMSGSTATUSUUMB1 | NOTFULLSTATUSUUMB0 | NEWMSGSTATUSUUMB0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31:16 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0 |
| 15 | NOTFULLSTATUSUUMB7 | NotFull Status bit for User u, Mailbox 7 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Set the event (for debug) | RW | 1 |
| 14 | NEWMSGSTATUSUUMB7 | NewMessage Status bit for User u, Mailbox 7 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Set the event (for debug) | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------|
| 13 | NOTFULLSTATUSUUMB6 | NotFull Status bit for User u, Mailbox 6 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Set the event (for debug) | RW | 1 |
| 12 | NEWMSGSTATUSUUMB6 | NewMessage Status bit for User u, Mailbox 6 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Set the event (for debug) | RW | 0 |
| 11 | NOTFULLSTATUSUUMB5 | NotFull Status bit for User u, Mailbox 5 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Set the event (for debug) | RW | 1 |
| 10 | NEWMSGSTATUSUUMB5 | NewMessage Status bit for User u, Mailbox 5 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Set the event (for debug) | RW | 0 |
| 9 | NOTFULLSTATUSUUMB4 | NotFull Status bit for User u, Mailbox 4 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Set the event (for debug) | RW | 1 |
| 8 | NEWMSGSTATUSUUMB4 | NewMessage Status bit for User u, Mailbox 4 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Set the event (for debug) | RW | 0 |
| 7 | NOTFULLSTATUSUUMB3 | NotFull Status bit for User u, Mailbox 3 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Set the event (for debug) | RW | 1 |
| 6 | NEWMSGSTATUSUUMB3 | NewMessage Status bit for User u, Mailbox 3 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Set the event (for debug) | RW | 0 |
| 5 | NOTFULLSTATUSUUMB2 | NotFull Status bit for User u, Mailbox 2 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Set the event (for debug) | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------|
| 4 | NEWMSGSTATUSUUMB2 | NewMessage Status bit for User u, Mailbox 2 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Set the event (for debug) | RW | 0 |
| 3 | NOTFULLSTATUSUUMB1 | NotFull Status bit for User u, Mailbox 1 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Set the event (for debug) | RW | 1 |
| 2 | NEWMSGSTATUSUUMB1 | NewMessage Status bit for User u, Mailbox 1 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Set the event (for debug) | RW | 0 |
| 1 | NOTFULLSTATUSUUMB0 | NotFull Status bit for User u, Mailbox 0 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Set the event (for debug) | RW | 1 |
| 0 | NEWMSGSTATUSUUMB0 | NewMessage Status bit for User u, Mailbox 0 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Set the event (for debug) | RW | 0 |

Table 20-33. Register Call Summary for Register MAILBOX_IRQSTATUS_RAW_u

Mailbox Functional Description

- [Mailbox Functional Description: \[0\]](#)
- [Mailbox Interrupt Requests: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

Mailbox Register Manual

- [Mailbox Register Summary: \[7\] \[8\]](#)
- [Mailbox Register Description: \[9\]](#)

Table 20-34. MAILBOX_IRQSTATUS_CLR_u

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0104 + (0x10 * u) | index: | u = 0 to 2 (System Mailbox) or u = 0 to 3 (IVA-HD Mailbox) |
| Physical Address | See Table 20-20 | Instance | System Mailbox |
| | See Table 20-21 | Instance | IVA-HD Mailbox |
| Description | The interrupt status register has the status combined with irq-enable for each event that may be responsible for the generation of an interrupt to the corresponding user - write 1 to a given bit resets this bit | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | NOTFULLSTATUSUUMB7 | NEWMSGSTATUSUUMB7 | NOTFULLSTATUSUUMB6 | NEWMSGSTATUSUUMB6 | NOTFULLSTATUSUUMB5 | NEWMSGSTATUSUUMB5 | NOTFULLSTATUSUUMB4 | NEWMSGSTATUSUUMB4 | NOTFULLSTATUSUUMB3 | NEWMSGSTATUSUUMB3 | NOTFULLSTATUSUUMB2 | NEWMSGSTATUSUUMB2 | NOTFULLSTATUSUUMB1 | NEWMSGSTATUSUUMB1 | NOTFULLSTATUSUUMB0 | NEWMSGSTATUSUUMB0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31:16 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0 |
| 15 | NOTFULLSTATUSUUMB7 | NotFull Status bit for User u, Mailbox 7 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Clear pending event, if any | RW | 0 |
| 14 | NEWMSGSTATUSUUMB7 | NewMessage Status bit for User u, Mailbox 7 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Clear pending event, if any | RW | 0 |
| 13 | NOTFULLSTATUSUUMB6 | NotFull Status bit for User u, Mailbox 6 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Clear pending event, if any | RW | 0 |
| 12 | NEWMSGSTATUSUUMB6 | NewMessage Status bit for User u, Mailbox 6 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Clear pending event, if any | RW | 0 |
| 11 | NOTFULLSTATUSUUMB5 | NotFull Status bit for User u, Mailbox 5 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Clear pending event, if any | RW | 0 |
| 10 | NEWMSGSTATUSUUMB5 | NewMessage Status bit for User u, Mailbox 5 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Clear pending event, if any | RW | 0 |
| 9 | NOTFULLSTATUSUUMB4 | NotFull Status bit for User u, Mailbox 4 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Clear pending event, if any | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|-------|
| 8 | NEWMSGSTATUSENUUMB4 | NewMessage Status bit for User u, Mailbox 4 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Clear pending event, if any | RW | 0 |
| 7 | NOTFULLSTATUSENUUMB3 | NotFull Status bit for User u, Mailbox 3 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Clear pending event, if any | RW | 0 |
| 6 | NEWMSGSTATUSENUUMB3 | NewMessage Status bit for User u, Mailbox 3 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Clear pending event, if any | RW | 0 |
| 5 | NOTFULLSTATUSENUUMB2 | NotFull Status bit for User u, Mailbox 2 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Clear pending event, if any | RW | 0 |
| 4 | NEWMSGSTATUSENUUMB2 | NewMessage Status bit for User u, Mailbox 2 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Clear pending event, if any | RW | 0 |
| 3 | NOTFULLSTATUSENUUMB1 | NotFull Status bit for User u, Mailbox 1 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Clear pending event, if any | RW | 0 |
| 2 | NEWMSGSTATUSENUUMB1 | NewMessage Status bit for User u, Mailbox 1 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Clear pending event, if any | RW | 0 |
| 1 | NOTFULLSTATUSENUUMB0 | NotFull Status bit for User u, Mailbox 0 Read 0x0: No event pending (message queue full) Write 0x0: No action Read 0x1: Event pending (message queue not full) Write 0x1: Clear pending event, if any | RW | 0 |
| 0 | NEWMSGSTATUSENUUMB0 | NewMessage Status bit for User u, Mailbox 0 Read 0x0: No event (message) pending Write 0x0: No action Read 0x1: Event (message) pending Write 0x1: Clear pending event, if any | RW | 0 |

Table 20-35. Register Call Summary for Register MAILBOX_IRQSTATUS_CLR_u

Mailbox Functional Description

- [Mailbox Functional Description: \[0\]](#)
- [Mailbox Interrupt Requests: \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Description: \[6\] \[7\]](#)

Mailbox Programming Guide

- [Events Servicing in Sending Mode: \[8\] \[9\]](#)
- [Events Servicing in Receiving Mode: \[10\] \[11\]](#)

Mailbox Register Manual

- [Mailbox Register Summary: \[12\] \[13\]](#)
- [Mailbox Register Description: \[14\]](#)

Table 20-36. MAILBOX_IRQENABLE_SET_u

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0108 + (0x10 * u) | index: | u = 0 to 2 (System Mailbox) or u = 0 to 3 (IVA-HD Mailbox) |
| Physical Address | See Table 20-20 | Instance | System Mailbox |
| | See Table 20-21 | Instance | IVA-HD Mailbox |
| Description | The interrupt enable register enables to unmask the module internal source of interrupt to the corresponding user. This register is write 1 to set. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|
| RESERVED | | | | | | | | | | | | | | | | NOTFULLENABLEUUMB7 | NEWMSGENABLEUUMB7 | NOTFULLENABLEUUMB6 | NEWMSGENABLEUUMB6 | NOTFULLENABLEUUMB5 | NEWMSGENABLEUUMB5 | NOTFULLENABLEUUMB4 | NEWMSGENABLEUUMB4 | NOTFULLENABLEUUMB3 | NEWMSGENABLEUUMB3 | NOTFULLENABLEUUMB2 | NEWMSGENABLEUUMB2 | NOTFULLENABLEUUMB1 | NEWMSGENABLEUUMB1 | NOTFULLENABLEUUMB0 | NEWMSGENABLEUUMB0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|-------|
| 31:16 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0 |
| 15 | NOTFULLENABLEUUMB7 | NotFull Enable bit for User u, Mailbox 7 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 14 | NEWMSGENABLEUUMB7 | NewMessage Enable bit for User u, Mailbox 7 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 13 | NOTFULLENABLEUUMB6 | NotFull Enable bit for User u, Mailbox 6 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------|
| 12 | NEWMSGENABLEUUMB6 | NewMessage Enable bit for User u, Mailbox 6 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 11 | NOTFULLENABLEUUMB5 | NotFull Enable bit for User u, Mailbox 5 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 10 | NEWMSGENABLEUUMB5 | NewMessage Enable bit for User u, Mailbox 5 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 9 | NOTFULLENABLEUUMB4 | NotFull Enable bit for User u, Mailbox 4 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 8 | NEWMSGENABLEUUMB4 | NewMessage Enable bit for User u, Mailbox 4 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 7 | NOTFULLENABLEUUMB3 | NotFull Enable bit for User u, Mailbox 3 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 6 | NEWMSGENABLEUUMB3 | NewMessage Enable bit for User u, Mailbox 3 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 5 | NOTFULLENABLEUUMB2 | NotFull Enable bit for User u, Mailbox 2 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 4 | NEWMSGENABLEUUMB2 | NewMessage Enable bit for User u, Mailbox 2 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|------|-------|
| 3 | NOTFULLENABLEUUMB1 | NotFull Enable bit for User u, Mailbox 1 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 2 | NEWMSGENABLEUUMB1 | NewMessage Enable bit for User u, Mailbox 1 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 1 | NOTFULLENABLEUUMB0 | NotFull Enable bit for User u, Mailbox 0 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |
| 0 | NEWMSGENABLEUUMB0 | NewMessage Enable bit for User u, Mailbox 0 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Enable interrupt | RW | 0 |

Table 20-37. Register Call Summary for Register MAILBOX_IRQENABLE_SET_u

Mailbox Functional Description

- [Mailbox Functional Description: \[0\]](#)
- [Mailbox Interrupt Requests: \[1\] \[2\] \[3\]](#)
- [Description: \[4\] \[5\] \[6\]](#)

Mailbox Programming Guide

- [Mailbox Processing modes: \[7\] \[8\]](#)

Mailbox Register Manual

- [Mailbox Register Summary: \[9\] \[10\]](#)
- [Mailbox Register Description: \[11\]](#)

Table 20-38. MAILBOX_IRQENABLE_CLR_u

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 010C + (0x10 * u) | index: | u = 0 to 2 (System Mailbox) or u = 0 to 3 (IVA-HD Mailbox) |
| Physical Address | See Table 20-20 | Instance | System Mailbox |
| | See Table 20-21 | Instance | IVA-HD Mailbox |
| Description | The interrupt enable register enables to mask the module internal source of interrupt to the corresponding user. This register is write 1 to clear. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|
| RESERVED | | | | | | | | | | | | | | | | NOTFULLENABLEUUMB7 | NEWMSGENABLEUUMB7 | NOTFULLENABLEUUMB6 | NEWMSGENABLEUUMB6 | NOTFULLENABLEUUMB5 | NEWMSGENABLEUUMB5 | NOTFULLENABLEUUMB4 | NEWMSGENABLEUUMB4 | NOTFULLENABLEUUMB3 | NEWMSGENABLEUUMB3 | NOTFULLENABLEUUMB2 | NEWMSGENABLEUUMB2 | NOTFULLENABLEUUMB1 | NEWMSGENABLEUUMB1 | NOTFULLENABLEUUMB0 | NEWMSGENABLEUUMB0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|-------|
| 31:16 | RESERVED | Write 0's for future compatibility. Read returns 0. | RW | 0 |
| 15 | NOTFULLENABLEUUMB7 | NotFull Enable bit for User u, Mailbox 7 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 14 | NEWMSGENABLEUUMB7 | NewMessage Enable bit for User u, Mailbox 7 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 13 | NOTFULLENABLEUUMB6 | NotFull Enable bit for User u, Mailbox 6 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 12 | NEWMSGENABLEUUMB6 | NewMessage Enable bit for User u, Mailbox 6 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 11 | NOTFULLENABLEUUMB5 | NotFull Enable bit for User u, Mailbox 5 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 10 | NEWMSGENABLEUUMB5 | NewMessage Enable bit for User u, Mailbox 5 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 9 | NOTFULLENABLEUUMB4 | NotFull Enable bit for User u, Mailbox 4 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|------|-------|
| 8 | NEWMSGENABLEUUMB4 | NewMessage Enable bit for User u, Mailbox 4 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 7 | NOTFULLENABLEUUMB3 | NotFull Enable bit for User u, Mailbox 3 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 6 | NEWMSGENABLEUUMB3 | NewMessage Enable bit for User u, Mailbox 3 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 5 | NOTFULLENABLEUUMB2 | NotFull Enable bit for User u, Mailbox 2 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 4 | NEWMSGENABLEUUMB2 | NewMessage Enable bit for User u, Mailbox 2 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 3 | NOTFULLENABLEUUMB1 | NotFull Enable bit for User u, Mailbox 1 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 2 | NEWMSGENABLEUUMB1 | NewMessage Enable bit for User u, Mailbox 1 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 1 | NOTFULLENABLEUUMB0 | NotFull Enable bit for User u, Mailbox 0 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |
| 0 | NEWMSGENABLEUUMB0 | NewMessage Enable bit for User u, Mailbox 0 Read 0x0: Interrupt disabled Write 0x0: No action Read 0x1: Interrupt enabled Write 0x1: Disable interrupt | RW | 0 |

Table 20-39. Register Call Summary for Register MAILBOX_IRQENABLE_CLR_u

Mailbox Functional Description

- [Mailbox Functional Description: \[0\]](#)
 - [Mailbox Interrupt Requests: \[1\] \[2\] \[3\]](#)
-

Mailbox Register Manual

- [Mailbox Register Summary: \[4\] \[5\]](#)
 - [Mailbox Register Description: \[6\]](#)
-

NOTE: For each interrupt status and enable register ([MAILBOX_IRQSTATUS_RAW_u](#), [MAILBOX_IRQSTATUS_CLR_u](#), [MAILBOX_IRQENABLE_SET_u](#) and [MAILBOX_IRQENABLE_CLR_u](#)), bits [15:12] have the given meaning only for the System Mailbox instance. For the IVA-HD Mailbox instance, these bits are considered as Reserved.

PRELIMINARY

Memory Management Units

This chapter describes the memory management units (MMUs).

| Topic | Page |
|---|------|
| 21.1 MMU Overview | 4202 |
| 21.2 MMU Integration | 4203 |
| 21.3 MMU Functional Description | 4206 |
| 21.4 MMU Low-level Programming Models | 4219 |
| 21.5 MMU Register Manual | 4223 |

21.1 MMU Overview

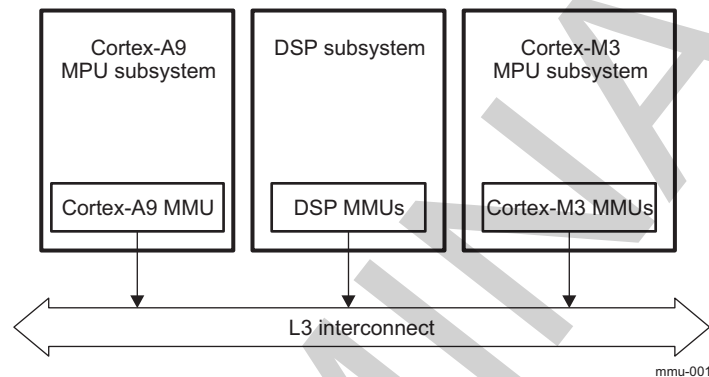
A memory management unit (MMU) is a hardware component responsible for handling accesses to memory requested by a processing unit. MMU functions include translation of virtual addresses to physical addresses (that is, virtual memory management) and cache control.

The device contains the following MMUs:

- In DSP - L1 Shared cache MMU and attribute MMU.
- In Dual Cortex-M3 MPU Subsystem - L1 Shared cache MMU and L2 MMU
- Cortex-A9 MMU

Figure 21-1 shows the MMU instances in the device.

Figure 21-1. Device MMU Instances



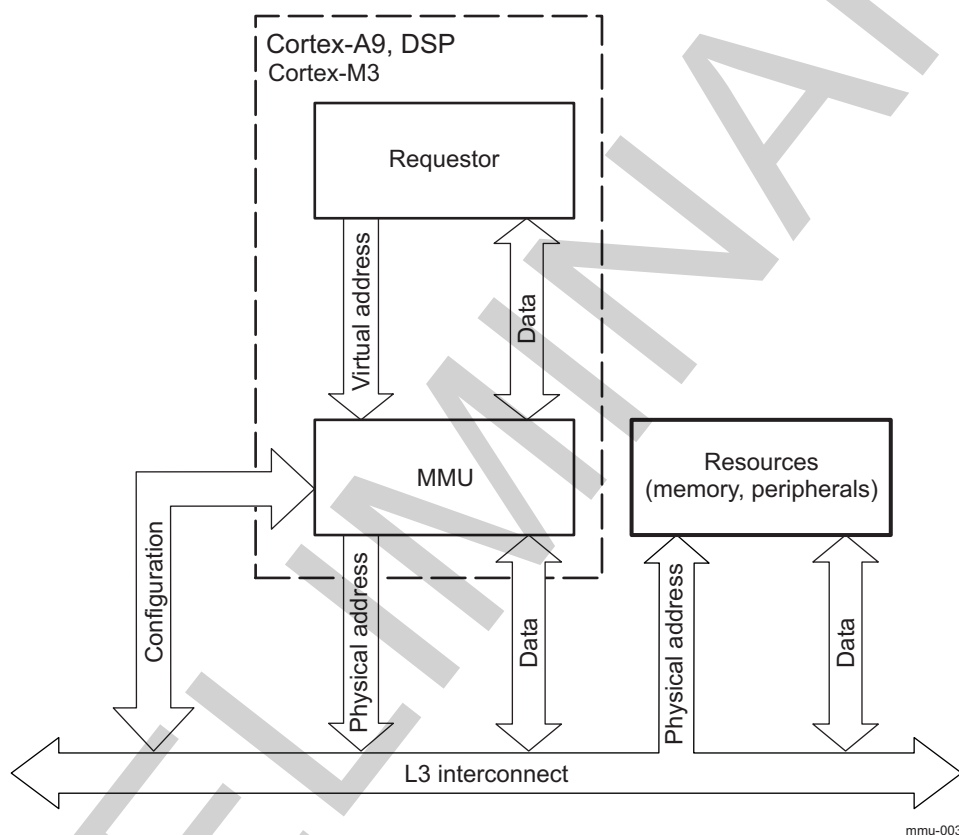
21.2 MMU Integration

This section describes module integration in the device, including information about clocks, resets, and hardware requests.

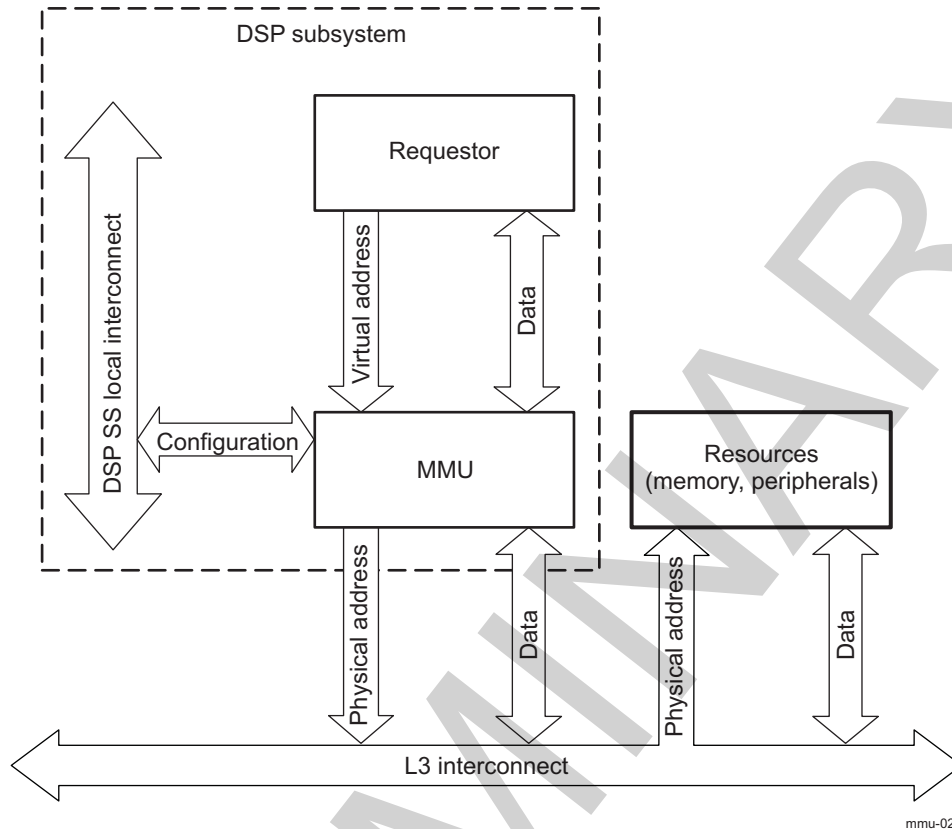
The MMU communicates accesses from the requestor (DSP, Cortex-M3 microprocessor unit (MPU), or Cortex-A9 MPU) to the L3 main interconnect, performing virtual to physical address translation. Although all MMUs are programmed (configured) through the L3 interconnect, the DSP MMU can be programmed both through the L3 interconnect or through the DSP local interconnect. DSP MMU and Cortex-M3 MMU error conditions are signaled as interrupts to the system main processor Cortex-A9 MPU.

Figure 21-2 shows typical MMU integration.

Figure 21-2. MMU Integration



NOTE: All MMUs are programmed through the L3 interconnect.

Figure 21-3. DSP MMU Integration

NOTE: The DSP MMU can be programmed from both the DSP local interconnect and from the L3 interconnect.

Table 21-1 through Table 21-3 summarize the MMU integration in the various modules of the device.

Table 21-1. Integration Attributes

| Module Instance | Power Domain |
|--|--------------|
| CORTEXM3_L2MMU and CORTEXM3_SCACHE_MMU | PD_CORE |
| CORTEXA9_MMU | PD_MPU |

Table 21-2. Clocks and Resets

| Clocks | | | | |
|--|-------------------------|--------------------|----------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| CORTEXA9_MMU | ARM_FCLK | MPU_DPLL_CLK | MPU DPLL | Internal clock in the Cortex-A9 MPU subsystem; supplies the MMU in Cortex-A9. |
| CORTEXM3_L2MMU and CORTEXM3_SCACHE_MMU | MPU_M3_CLK | MPU_M3_CLK | PRCM | External clock from the power, reset, and clock management (PRCM) module; supplies the shared cache MMU and L2 MMU in Cortex-M3. |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| CORTEXM3_L2MMU | CORTEXM3_PWRON_RST | CORTEXM3_PWRON_RST | PRCM | Power-on reset signal for the Cortex-M3 MPU subsystem |
| | CORTEXM3_RST3 | CORTEXM3_RST3 | PRCM | Reset signal to the L2 MMU |

Table 21-2. Clocks and Resets (continued)

| | | | | |
|---------------------|------------------|------------------|------|--|
| CORTEXM3_SCACHE_MMU | CORTEXM3_RST3 | CORTEXM3_RST3 | PRCM | Reset signal for the shared cache MMU |
| | CORTEXM3_RET_RST | CORTEXM3_RET_RST | PRCM | Retention reset signal for the Cortex-M3 MPU subsystem |
| CORTEXA9_MMU | MPU_PWRON_RST | MPU_PWRON_RST | PRCM | Power-on reset signal to the MMU and the rest of the Cortex-A9 MPU subsystem |
| | MPU_RST | MPU_RST | PRCM | Reset signal to the MMU and the rest of the Cortex-A9 MPU subsystem |

Table 21-3. Hardware Requests

| Interrupt Requests | | | | |
|---------------------|------------------------------|-------------------------|----------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| CORTEXM3_L2MMU | CORTEXM3_MMU_IRQ | MA_IRQ_100 | MPU_INT_C | Cortex-M3 MPU L2MMU interrupt to the main MPU subsystem |
| | XLATE_MMU_FAULT | MM_IRQ_0 | CortexM3_INT_C | Internal interrupt from the L2MMU to the Cortex-M3 interrupt controller (INTC) |
| CORTEXM3_SCACHE_MMU | SHARED_CACHE_MMU_C PU_INT | MM_IRQ_1 | CortexM3_INT_C | Internal interrupt from the shared cache MMU to the CortexM3 INTC |

NOTE:

- For a description of the interrupt source, see [Section 21.3.5, Interrupt Requests](#).

There are 5 MMU modules in the device:

- Shared cache MMU – there are two Share cache MMUs, one in the Cortex-M3 MPU and other in DSP subsystem. Refer to the corresponding chapters for more information.
- L2 MMUs – there are two L2 MMUs, one in the Cortex-M3 MPU and other in DSP subsystem. The L2 MMUs are directly operating with the L3 interconnect (shared device memory space). These L2 MMUs are described in this chapter.
- Cortex-A9 MMU – this MMU is located in the ARM Cortex-A9 processor. For information about this MMU, see the ARM® Cortex™-A9 MPCore Technical Reference Manual.

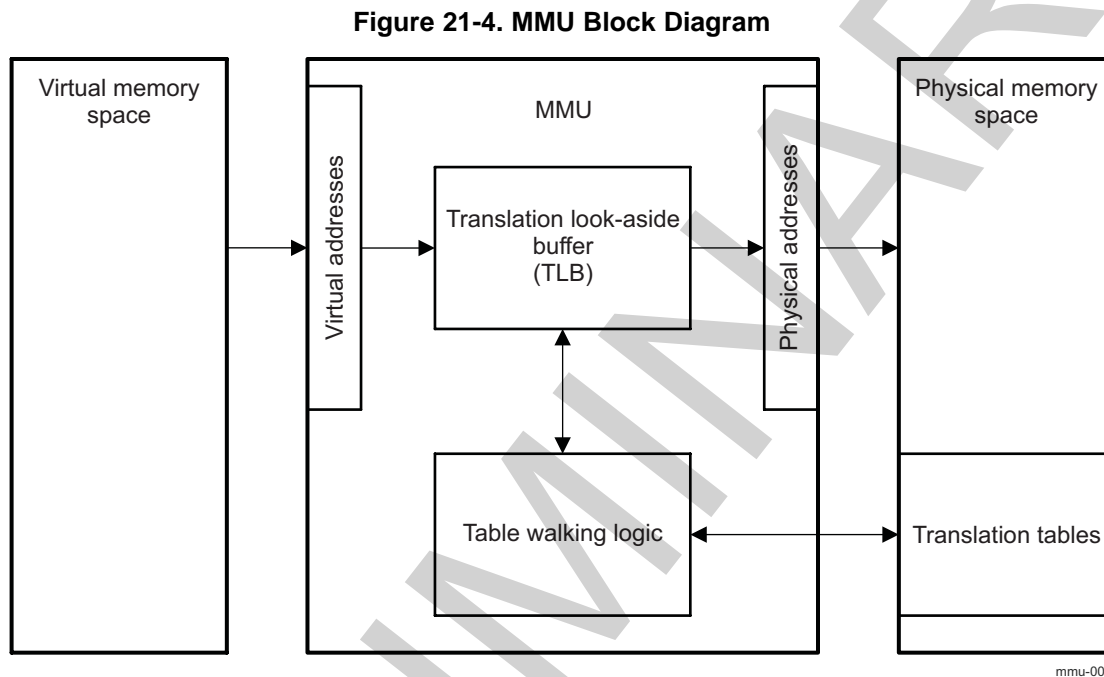
NOTE: There is PAT module in the Dynamic Memory Manager, which has similar to the MMU functionality. Refer to the DMM chapter, for more information.

21.3 MMU Functional Description

21.3.1 MMU Block Diagram

The MMU manages the virtual to physical address translation for external addresses, as well as endianness conversion. The MMU can be programmed through the L3 interconnect. MMU programming is expected to be accomplished by the Cortex-A9 MPU, except for the DSP MMU, of which the configuration can be accomplished through the DSP local interconnect.

Figure 21-4 is the MMU block diagram.



Each table entry describes the translation of one contiguous memory region. For a description of the structure of these tables, see [Section 21.3.1.2, Translation Tables](#).

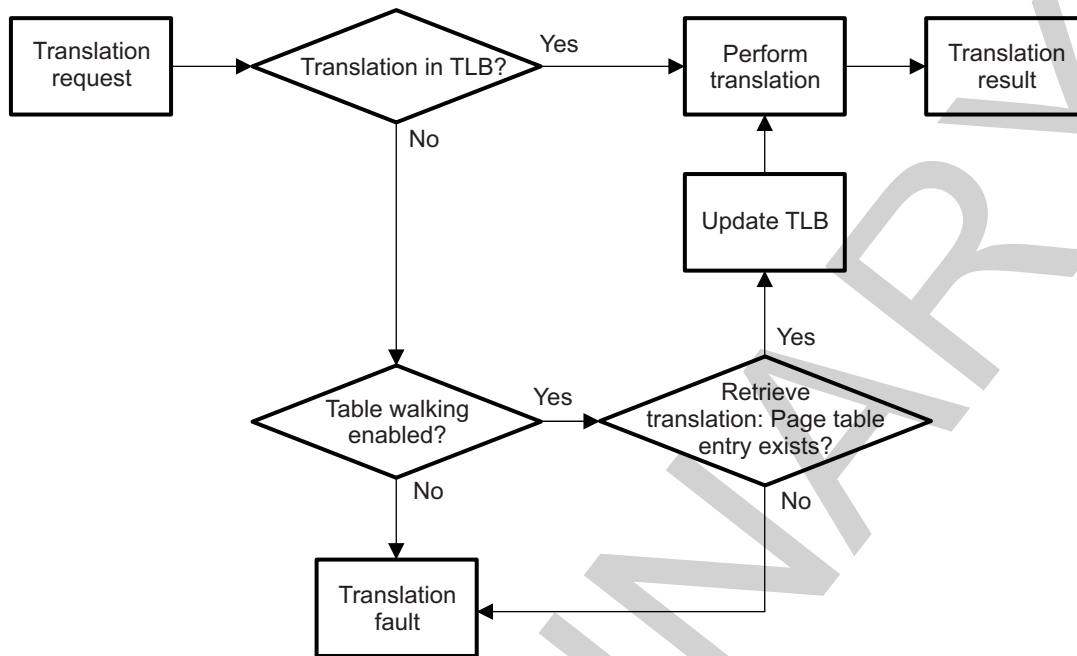
Two major functional units exist in the MMU to provide address translation automatically based on the table entries:

- The table walker automatically retrieves the correct translation table entry for a requested translation. If two-level translation is used (for the translation of small memory pages), the table walker also automatically reads the required second-level translation table entry. The two-level translation is described later in the chapter.
- The translation look-aside buffer (TLB) stores recently used translation entries, acting like a cache of the translation table.

21.3.1.1 MMU Address Translation Process

Whenever an address translation is requested (that is, for every access with the MMU enabled), the MMU first checks whether the translation is contained in the TLB, which acts like a cache storing recent translations. The TLB can also be programmed manually to ensure that time-critical data can be translated without delay.

If the requested translation is not in the TLB, the table-walking logic retrieves this translation from the translation table(s), and then updates the TLB. The address translation is then performed. [Figure 21-5](#) summarizes the process.

Figure 21-5. Translation Process


mmu-007

21.3.1.2 Translation Tables

The translation of virtual to physical addresses is based on entries in translation tables that define the following properties:

- Address translation, that is, the correspondence between virtual and physical addresses
- Size of the memory region the entry translates
- Endianness, data access size, and the mixed property of this memory region

The virtual addresses index the translation tables. Each virtual address corresponds to exactly one entry in the translation table.

21.3.1.2.1 Translation Table Hierarchy

When developing a table-based address translation scheme, one of the most important design parameters is the memory page size described by each translation table entry. MMU instances support 4KB and 64KB pages, a 1MB section, and a 16MB supersection. Using bigger page sizes means a smaller translation table.

Using a smaller page size greatly increases the efficiency of dynamic memory allocation and defragmentation. That is why many operating systems (OSs) can operate on memory blocks as small as 4KB; however, the smaller size implies a more complex table structure.

A quick calculation shows that using 4KB memory pages with one translation table would require one million entries to span the entire 4GB address range. The table itself would be 32MB, a size that is not feasible.

However, using bigger pages greatly reduces the functionality of the OS memory management. Implementing a two-level hierarchy reconciles these two requirements. Within this hierarchy, one first-level translation table describes the translation properties based on 1MB memory regions.

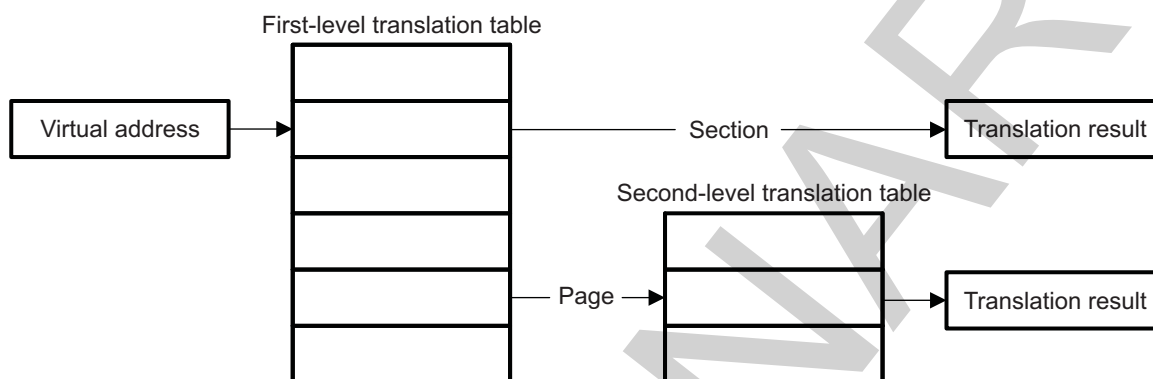
Each of the entries in this first-level translation table can specify the following:

- The translation properties for a big memory section. This memory section can be either 1MB (section) or 16MB (supersection). In this case, all translation parameters are specified in the first-level translation table entry.

- A pointer to a second-level translation table that specifies individual translation properties based on smaller pages within the 1MB page of memory. These pages can be either 64KB (large page) or 4KB (small page). In this case, the actual translation parameters are specified in the second-level translation table entry. The first-level translation table entry specifies only the base address of the second-level translation table.

This hierarchical approach means that additional translation information for smaller pages must be provided only when the pages are actually used. [Figure 21-6](#) shows the hierarchy.

Figure 21-6. Translation Hierarchy



mmu-008

The structure of the first and second-level translation tables and their entries are described in more detail in [Section 21.3.1.2.2, First-Level Translation Table](#), and [Section 21.3.1.2.3, Two-Level Translation](#).

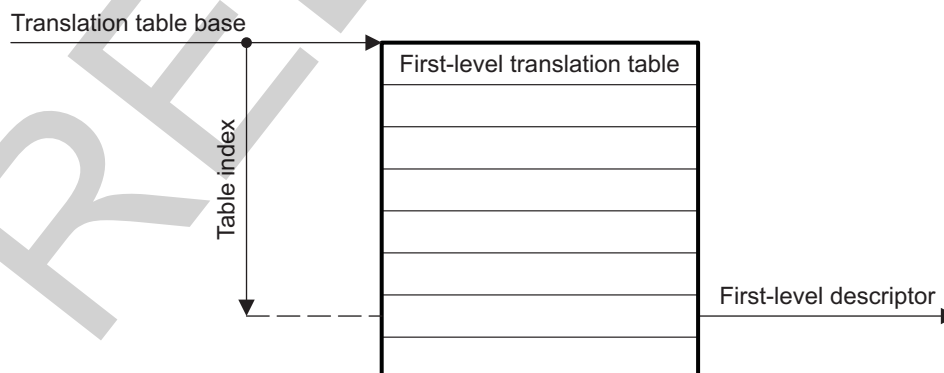
21.3.1.2.2 First-Level Translation Table

The first-level translation table describes the translation properties for 1MB sections. To describe a 4GB address range requires 4096 32-bit entries (so-called first-level descriptors).

The first-level translation table start address must be aligned on a multiple of the table size with a 128-byte minimum. Consequently, an alignment of at least 16K bytes is required for a complete 4096-entry table; that is, at least the last fourteen address bits must be zero.

The start address of the first-level translation table is specified by the so-called translation table base. The table is indexed by the upper 12-bits of the virtual address. [Figure 21-7](#) shows this mechanism.

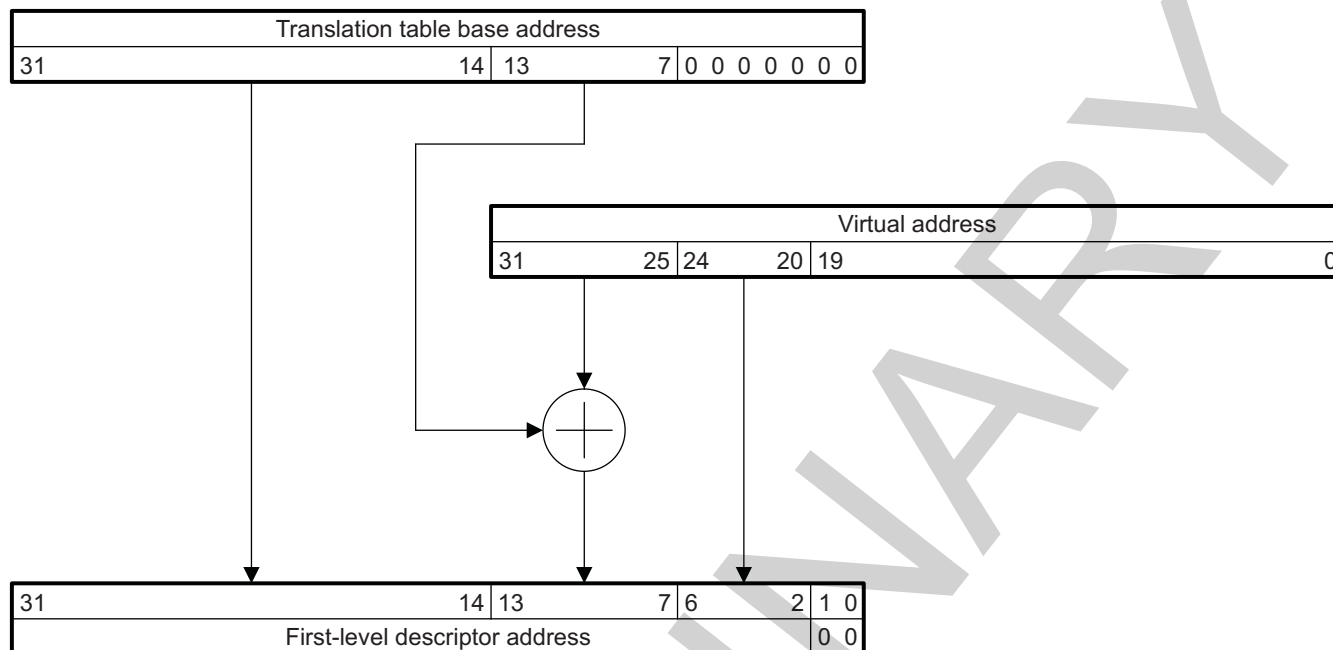
Figure 21-7. First-level Descriptor Address Calculation



mmu-009

To summarize, the translation table base and the translation table index together define the first-level descriptor address. [Figure 21-8](#) outlines the precise mechanism used to calculate this address.

Figure 21-8. Detailed First-Level Descriptor Address Calculation



mmu-010

As an example of this mechanism, consider a translation table base address of 0x8000:0000 and a virtual address of 0x1234:5678. In this case, the first-level descriptor address is 0x8000:0000 + (0x123 2) = 0x8000:048C.

21.3.1.2.2.1 First-Level Descriptor Format

Each first-level descriptor provides either the complete address translation for 1MB or 16MB sections or provides a pointer to a second-level translation table for 4KB or 64KB pages. Table 21-4 shows the first-level descriptor format.

Table 21-4. First-Level Descriptor Format

| First-Level Descriptor Format | | | | | | | | | | | | | |
|---|-------|----|----|----|----|------------------|-------|-------|-----|---|---|---------|--------------|
| 31:24 | 23:20 | 19 | 18 | 17 | 16 | 15 | 14:12 | 11:10 | 9:2 | 1 | 0 | | |
| X | | | | | | | | | | 0 | 0 | Fault | |
| Second-Level Translation Table Base Address | | | | | | | | | X | 0 | 1 | Page | |
| Section Base Address | | X | 0 | M | X | E ⁽¹⁾ | X | ES | X | 1 | 0 | Section | |
| Supersection Base Address | | X | | 1 | M | X | E | X | ES | X | 1 | 0 | Supersection |
| X | | | | | | | | | | 1 | 1 | Fault | |

⁽¹⁾ See for endianness limitations.

M = Mixed region: 0 = Page-based endianness, 1 = Access-based endianness

E = Endianness: 0 = Little endian, 1 = Big endian (endianness is locked on little endian)

ES = Element Size: 00 = 8-bit, 01 = 16-bit, 10 = 32-bit, 11 = No endianness conversion

X = Don't care

21.3.1.2.2.2 First-Level Page Descriptor Format

If a translation granularity smaller than 1MB is required, a two-level translation process is used. In this case, the first-level block descriptor specifies only the start address of a second-level translation table. The second-level translation table entries specify the actual translation properties.

21.3.1.2.2.3 First-Level Section Descriptor Format

Each section descriptor in the first-level translation table specifies the complete translation properties for a 1MB section or a 16MB supersection.

NOTE: Supersection descriptors must be repeated 16 times, because each descriptor in the first-level translation table describes 1MB of memory. If an access points to a descriptor that is not initialized, the MMU will behave in an unpredictable way.

In addition to the address translation itself, three parameters are specified in the section descriptors:

- Endianness

The *endianness* parameter specifies whether the memory section uses a big- or little-endian data format. This parameter is locked to little endian. See for more information.

- Element size

The *element size* parameter can optionally specify the data access size (8, 16, or 32 bits) for all data items in the defined section.

- Mixed region

The *mixed region* parameter specifies whether the information about the data access size is detected from the access itself (access-based detection) or if the specified element size parameter is used (page-based detection). For example, the specified element size parameter can be used when several smaller sized accesses are packed into a bigger sized access, such as two 16-bit accesses packed into one 32-bit access. In this case, with no specified data access size, 32 bits would be the access size detected, leading to an incorrect result. To avoid this problem, specify the data access size for the memory section.

21.3.1.2.2.4 Section Translation Summary

Sections and supersections can be translated based solely on the information in the first-level translation table. [Figure 21-9](#) summarizes the address translation process for a section.

Figure 21-9. Section Translation Summary



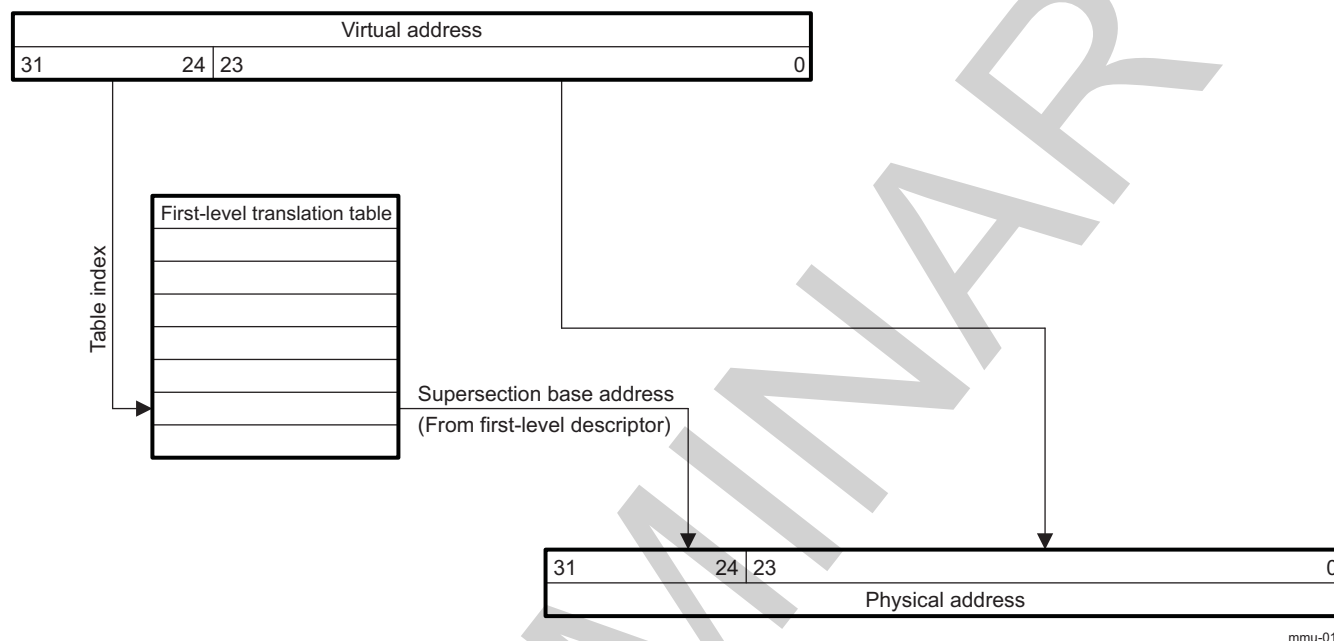
mmu-011

21.3.1.2.2.5 Supersection Translation Summary

The translation of a supersection is similar to the translation of a section. The difference is that for a supersection only bits 31 to 24 index into the first-level translation table. The last four bits of the table index are implicitly assumed to be zero as there are 16 identical consecutive entries for a supersection.

Figure 21-10 shows the translation mechanism for a supersection.

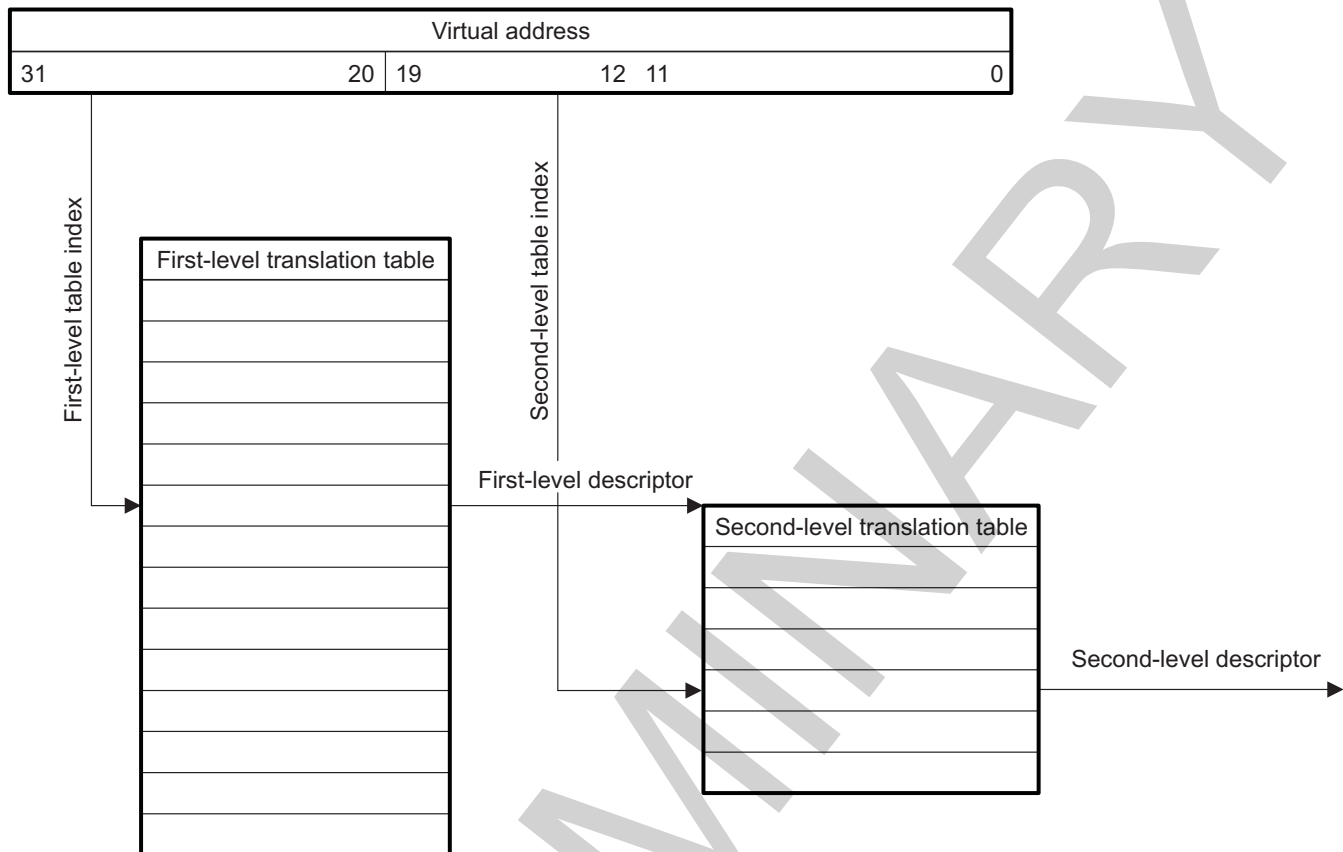
Figure 21-10. Supersection Translation Summary



mmu-012

21.3.1.2.3 Two-Level Translation

Two-level translation is used when fine-grain granularity is required, that is, when memory sections smaller than 1MB are needed. In this case, the first-level descriptor provides a pointer to the base address of a second-level translation table. This second-level table is indexed by bits 19 to 12 of the virtual address. Figure 21-11 shows this indexing mechanism.

Figure 21-11. Two-Level Translation

mmu-013

Each second-level translation table describes the translation of 1MB of address space in pages of 64KB (large page) or 4KB (small page). It consists of 256 second-level descriptors describing 4KB each.

NOTE: In the case of a large page, the same descriptor must be repeated 16 times. If an access points to a descriptor that is not initialized, the MMU will behave in an unpredictable way.

21.3.1.2.3.1 Second-Level Descriptor Format

Similar to first-level section descriptors, second-level descriptors provide all of the necessary information for the translation of a large or small page. Table 21-5 shows the format of second-level descriptors. The translation parameters (endianness, element size, and mixed region) have the same meaning as those for sections.

Table 21-5. Second-Level Descriptor Format

| Second-Level Descriptor Format | | | | | | | | | | |
|--------------------------------|-------|----|----|------------------|-----|-----|-----|---|---|------------|
| 31:16 | 15:12 | 11 | 10 | 9 | 8:6 | 5:4 | 3:2 | 1 | 0 | |
| X | | | | | | | | 0 | 0 | Fault |
| Large Page Base Address | X | M | X | E ⁽¹⁾ | X | ES | X | 0 | 1 | Large Page |
| Small Page Base Address | | M | X | E | X | ES | X | 1 | X | Small Page |

⁽¹⁾ See for endianness limitations.

M = Mixed region: 0 = Page-based endianness, 1 = Access-based endianness

E = Endianness: 0 = Little-endian, 1 = Big-endian (endianness is locked on little endian)

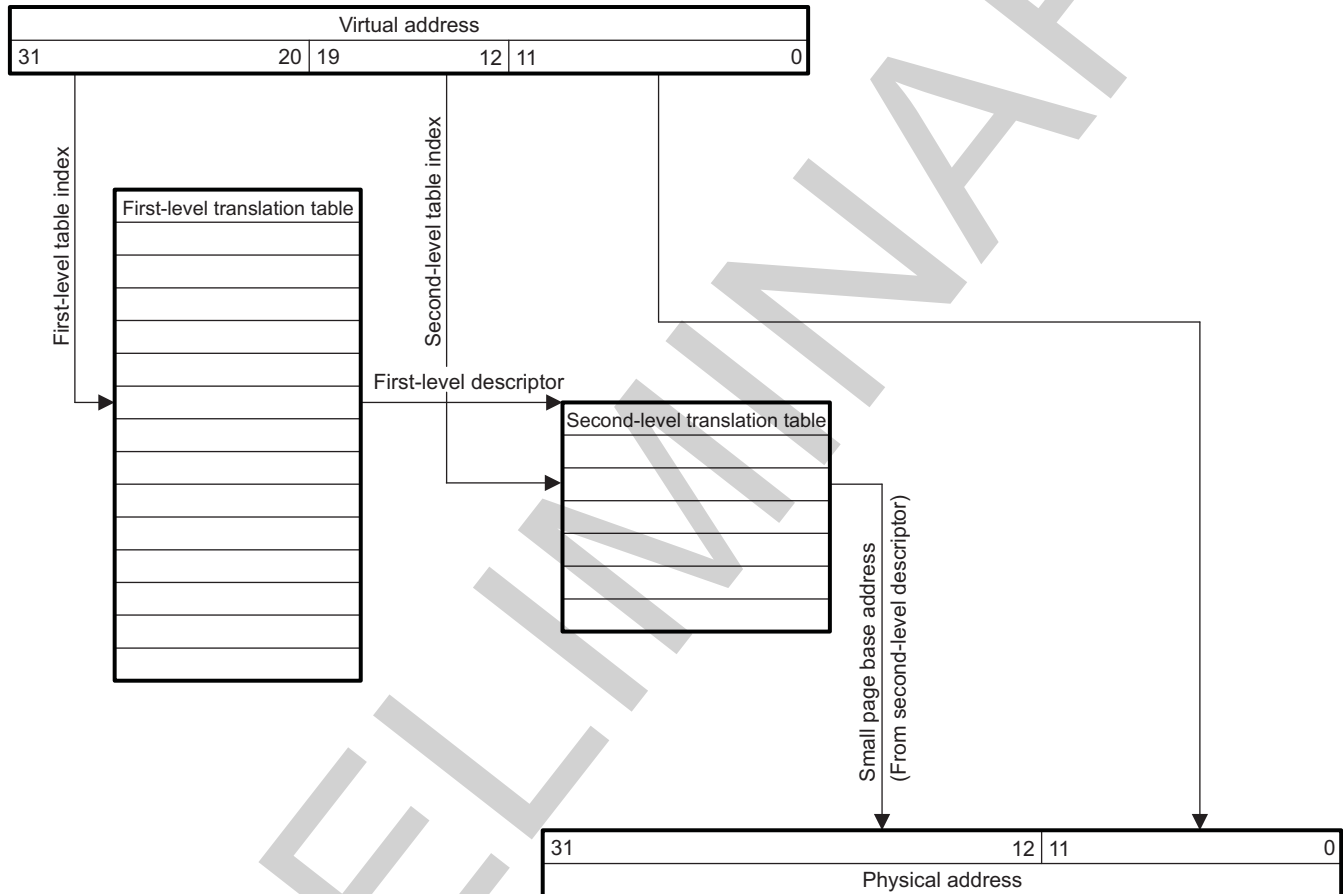
ES = Element Size: 00 = 8-bit, 01 = 16-bit, 10 = 32-bit, 11 = No endianness conversion

X = Don't care

21.3.1.2.3.2 Small Page Translation Summary

Figure 21-12 summarizes the translation process for small pages.

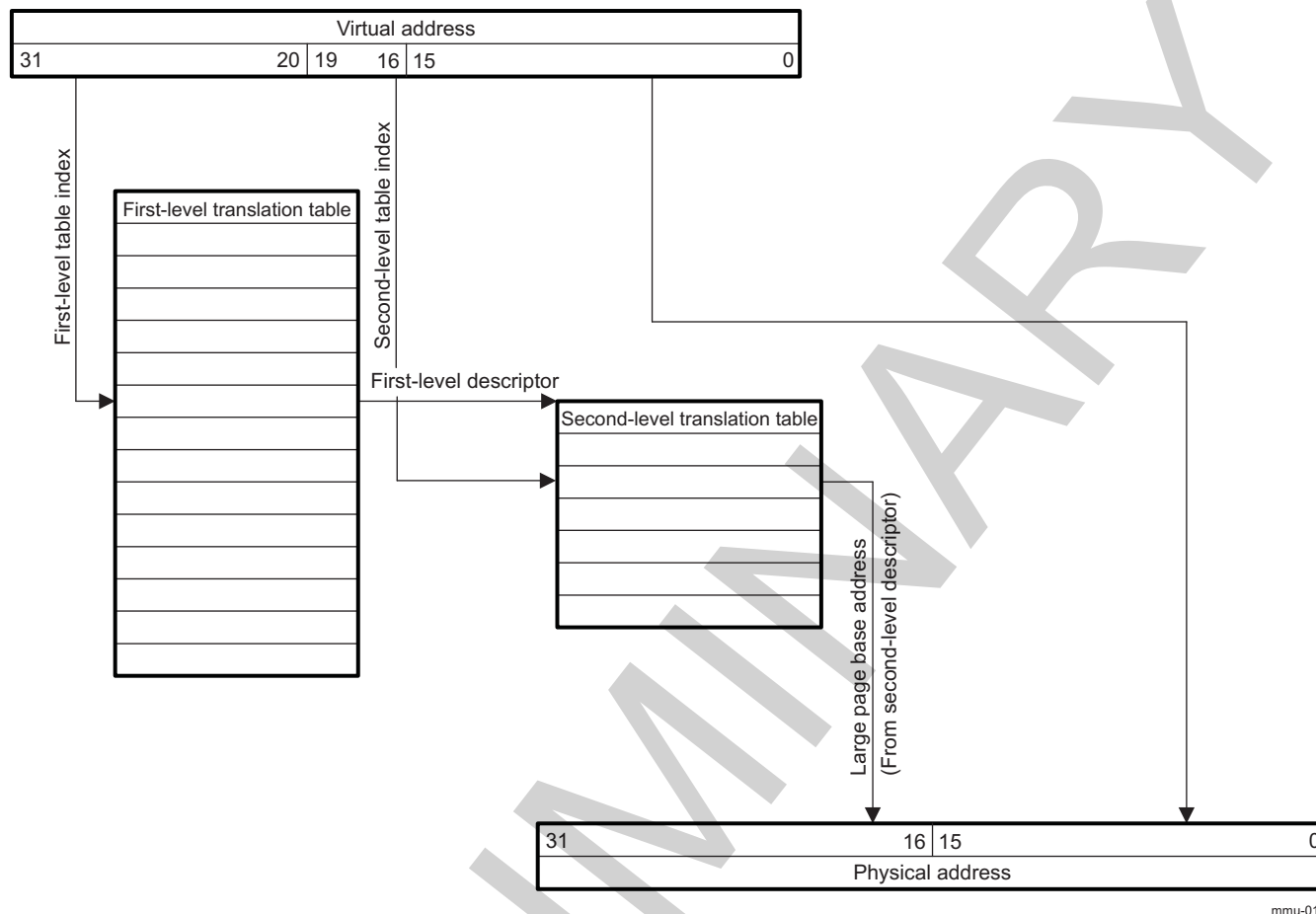
Figure 21-12. Small Page Translation Summary



mmu-014

21.3.1.2.3.3 Large Page Translation Summary

The translation of a large page is similar to the translation of a small page. The difference is that, for a large page, only bits 19 to 16 index into the second-level translation table. The last four bits of the table index are implicitly assumed to be zero as there are 16 identical consecutive entries for a large page. This is shown in Figure 21-13.

Figure 21-13. Large Page Translation Summary

mmu-015

21.3.1.3 Translation Lookaside Buffer

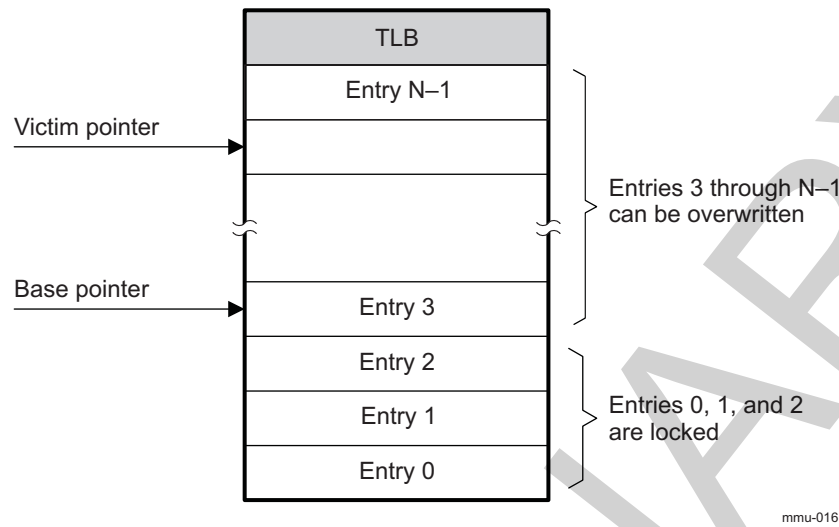
Translating virtual addresses to physical addresses is required for each memory access in systems using an MMU. To accelerate this translation process, a cache, or TLB, holds the result of recent translations.

For every translation, the MMU internal logic first checks whether the requested translation is already cached in the TLB. If the translation is cached, this translation is used; otherwise the translation is retrieved from the translation tables and the TLB is updated. If the TLB is full, one of its entries must be replaced. This entry is selected on a random basis.

The first n TLB entries, where n Total Number N of TLB Entries, can be protected (locked) against being overwritten by setting the TLB base pointer to n . When this mechanism is used, only unprotected entries can be overwritten. The victim pointer indicates the next TLB entry to be written. [Figure 21-14](#) shows an example of the TLB with N TLB entries (ranging from 0 to $N-1$). The base pointer contains the value "3" protecting Entry 0, Entry 1, and Entry 2 and the victim pointer points to the next TLB entry to be updated.

NOTE: The last TLB entry (Entry $N-1$) always remains unprotected.

Figure 21-14. TLB Entry Lock Mechanism



The table walking logic automatically writes the TLB entries. The entries can also be manually written, which is done typically to ensure that the translation of time-critical data accesses is already present in the TLB so that they execute as fast as possible. The entries must be locked to prevent them from being overwritten.

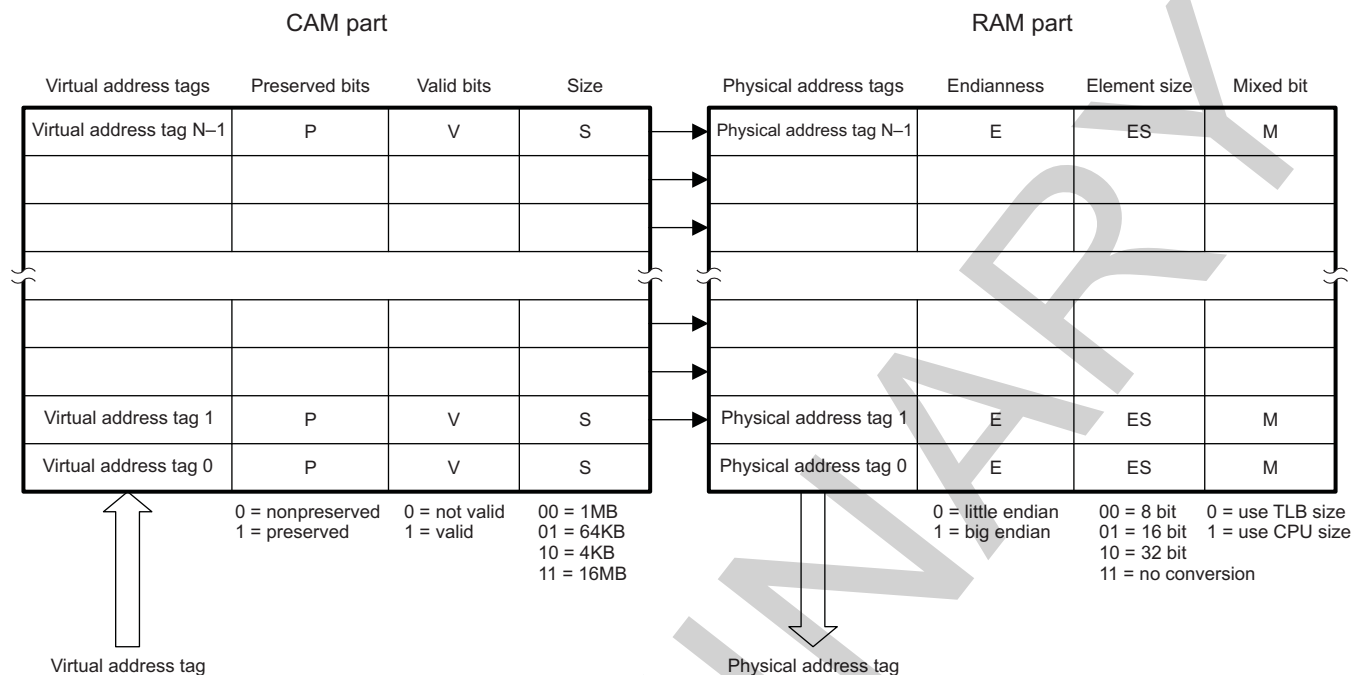
21.3.1.3.1 TLB Entry Format

TLB entries consist of two parts:

- The CAM part contains the virtual address tag used to determine if a virtual address translation is in the TLB. The TLB acts like a fully associative cache addressed by the virtual address tag. The CAM part also contains the section/page size, as well as the preserved and the valid parameters. See the [MMU_CAM](#) register table for more details.
- The RAM part contains the address translation that belongs to the virtual address tag as well as the endianness, element size, and mixed parameters described in [Section 21.3.1.2.2, First-Level Translation Table](#). See the [MMU_RAM](#) register table for more details.

The valid parameter specifies whether an entry is valid or not. The preserved parameter determines the behavior of an entry in the event of a TLB flush. If an entry is set as preserved, it is not deleted when a TLB is flushed, that is, when [MMU_GFLUSH\[0\] GLOBALFLUSH](#) is set to 1. Preserved entries must be deleted manually. [Section 21.3.1.2.2](#) describes the procedure to delete TLB entries.

[Figure 21-16](#) shows the TLB entry structure.

Figure 21-15. TLB Entry Structure

mmu-017

21.3.2 MMU Clock Configuration

There are two clock domains: The functional clock domain for the MMU, which is synchronous to the clock for the interconnect slave and master access ports; and the clock domain for the interconnect slave configuration port. As these clocks are matched, there is a single input clock with enables for each of the clock domains. If a clock domain should run at the same frequency as the input clock, that enable can be tied high.

Two clock enable signals exist, one to enable the interconnect data master and slave ports, and the other to enable the clock on the configuration L3 interconnect port. The clock signals are configured through the [MMU_SYSCONFIG](#) register. This is a system configuration register that controls the various parameters of the L3 interface.

21.3.3 MMU Software Reset

This section describes the software reset feature of the module. The MMU instances are reset together with their respective reset domains. See [Table 21-2](#) for information about the reset domains of the different MMU instances.

To perform a software reset, write 1 in the [MMU_SYSCONFIG](#)[1] SOFTRESET bit. The [MMU_SYSSTATUS](#)[0] RESETDONE bit indicates that the software reset is complete when its value is 1. When the software reset completes, the [MMU_SYSCONFIG](#)[1] SOFTRESET bit is automatically reset. The software must ensure that the software reset completes before doing MMU operations. When an MMU instance is released from reset, its TLB is empty and the MMU is disabled.

21.3.4 MMU Power Management

As part of the device system-wide power management scheme, each MMU instance supports a communication protocol with the PRCM module that allows the PRCM module to request an MMU instance to enter a low-power state. When the MMU instance acknowledges a low-power mode request from the PRCM module, the clock to the instance is gated off at the PRCM clock generator. Because the clock is disabled at the source, the low-power mode offers lower power consumption than the internal clock gating method in the local power management.

[Table 21-6](#) describes the power-management features available for the MMU modules.

NOTE:

- For information about source clock gating and sleep/wake-up transitions description, see [Section 3.1.1.1, Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).
- For descriptions of EnaWakeUp, IdleMode, ClockActivity, and StandbyMode features, see [Section 3.1.1.2, Module Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 21-6. MMU Local Power Management Features

| Feature | Register |
|------------------|---|
| Idle modes | MMU_SYSCONFIG [4:3] IDLEMODE |
| Clock activity | MMU_SYSCONFIG [9:8] CLOCKACTIVITY |
| Clock autogating | MMU_SYSCONFIG [0] AUTOIDLE |

NOTE: The [MMU_SYSCONFIG](#)[9:8] CLOCKACTIVITY bits are read only.

21.3.5 MMU Interrupt Requests

[Table 21-7](#) lists the event flags and their masks that can cause module interrupts.

Table 21-7. Events

| Event Flag | Event Mask | Synchrono us | Sensitivit y | Map to | Description |
|---|---|-----------------|-----------------|----------|--|
| MMU_IRQSTATUS [4] MULTIHITFAULT | MMU_IRQENABLE [4] MULTIHITFAULT | Yes | Level | M3_IRQ_0 | Error in the L2 MMU due to multiple matches in the TLB |
| MMU_IRQSTATUS [3] TABLEWALKFAULT | MMU_IRQENABLE [3] TABLEWALKFAULT | Yes | Level | M3_IRQ_0 | Error in the L2 MMU due to error response received during a Table Walk |
| MMU_IRQSTATUS [2] EMUMISS | MMU_IRQENABLE [2] EMUMISS | | | | For more information about emulation and debug features, see Chapter 29, On-Chip Debug Support . |
| MMU_IRQSTATUS [1] TRANSLATIONFAULT | MMU_IRQENABLE [1] TRANSLATIONFAULT | Yes | Level | M3_IRQ_0 | Error in the L2 MMU due to invalid descriptor in the translation tables (translation fault) |
| MMU_IRQSTATUS [0] TLBMISS | MMU_IRQENABLE [0] TLBMISS | Yes | Level | M3_IRQ_0 | Error in L2 MMU due to unrecoverable TLB miss (hardware TWL disabled) |

21.3.6 MMU Error Handling

[Table 21-8](#) summarizes the intended operation for real and potential error conditions.

Table 21-8. Error Handling

| Item | Condition | Action |
|------|--|---|
| 1 | Table-walk read has an error response. | Treat generally the same as a translation fault, but set the TableWalkFault interrupt status bit to aid in diagnosis |
| 2 | MMU is disabled during table-walk. | Not permitted; can result in loss of the current transaction but must not deadlock the MMU. Avoid this condition by first disabling the table-walk logic and then polling the TWLRunning bit to ensure that no table walk is pending |
| 3 | MMU is disabled during an address translation. | Not permitted; can result in access to an unintended location, but must not deadlock MMU. This condition should be avoided by ensuring that no accesses are pending. |

Table 21-8. Error Handling (continued)

| Item | Condition | Action |
|------|--|--|
| 4 | TLB is accessed during an address translation or a table walk. | Reading permitted; write should be done with care to ensure that the TLB is self-consistent at all times that a translation can occur. |
| 5 | TLB is flushed during address translation or a table walk. | Permitted; the flush is processed first, followed by the TWL update. |
| 6 | MMU is disabled while an interrupt is pending. | Not permitted; all pending interrupts should be processed before disabling the MMU. |

L3 Interconnect configuration port: Accesses to undecoded register addresses must not give an error response.

To protect against changes to the address translation between a READEX and the corresponding write or during a burst the following configuration operations are protected against writes during these processes:

- TLB update
- Global flush
- Flush entry
- MMU disable

The protection is implemented by stalling the configuration interconnect transaction until the write can proceed safely.

21.4 MMU Low-level Programming Models

This section covers the low-level hardware programming sequences for configuration and usage of the module.

21.4.1 Global Initialization

21.4.1.1 Surrounding Modules Global Initialization

This section identifies the requirements of initializing the surrounding modules when the MMU module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the MMU. For more information, see [Section 21.2, MMU Module Integration](#).

Table 21-9. Global Initialization of Surrounding Modules

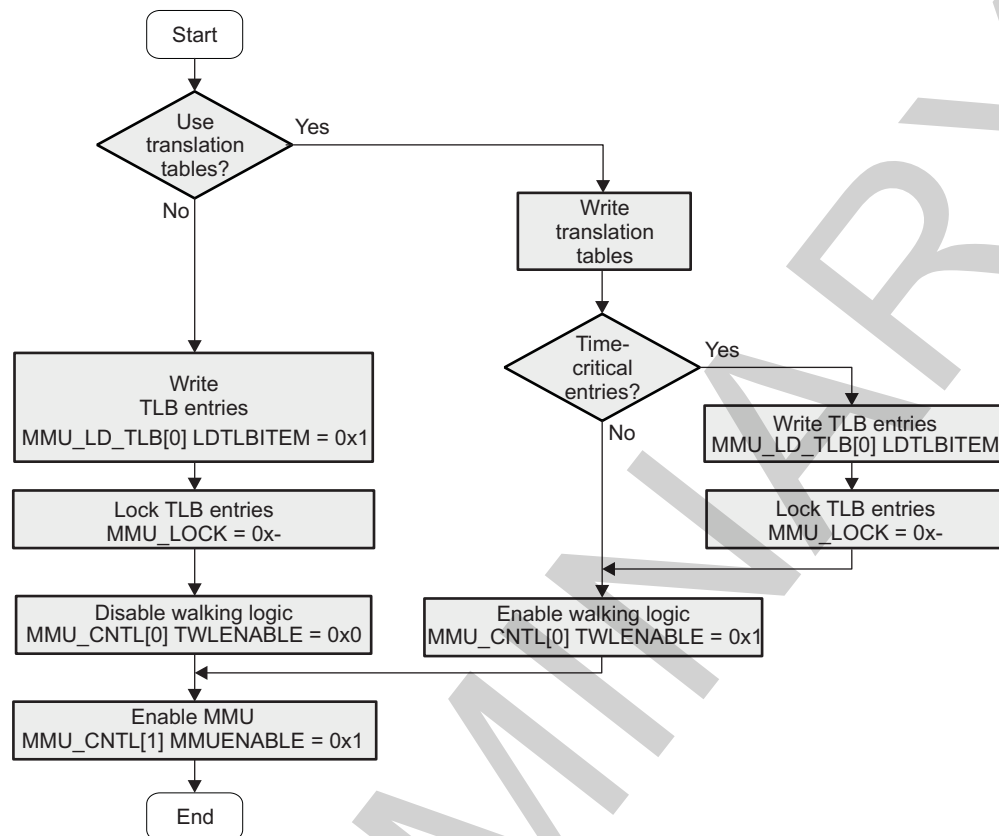
| Surrounding Modules | Comments |
|---|---|
| PRCM | Module interface and functional clocks must be enabled. For more information, see Chapter 3, Power, Reset, and Clock Management . |
| (optional) MPU INTC or DSP INTC or Cortex-M3 INTC | MPU, DSP, and Cortex-M3 interrupt controller configuration must be done to enable the interrupts from module. |
| Interconnect | For more information about the L3 interconnect configuration, see Section 14.2, L3 Interconnect . |

NOTE: If the interrupt-based communication mode is used, the MPU, DSP, and Cortex-M3 interrupt controllers configurations are required.

21.4.1.2 MMU Global Initialization

21.4.1.2.1 Main Sequence—MMU Global Initialization

[Figure 21-16](#) shows the procedure to initialize the MMU after a power-on or software reset.

Figure 21-16. MMU Global Initialization

mmu-018

Table 21-10. Register Call Summary for Main Sequence—MMU Global Initialization

| Register Name | Register Name | Register Name |
|---------------|---------------|---------------|
| MMU_LD_TLB | MMU_LOCK | MMU_CNTL |

21.4.1.2.2 Subsequence—Configure a TLB entry

Table 21-11. Configure a TLB Entry

| Step | Register / Bit Field / Programming Model | Value |
|-------------------------------------|--|-------|
| Load the Virtual Address Tag | MMU_CAM[31:12] VATAG | 0x- |
| Protect the TLB entry against flush | MMU_CAM[3] P | 0x1 |
| Validate the TLB entry | MMU_CAM[2] V | 0x1 |
| Define the page size | MMU_CAM[1:0] PAGESIZE | 0x- |

21.4.1.3 Operational Modes Configuration

21.4.1.3.1 Main Sequence—Writing TLB Entries Statically

Writing TLB entries statically avoids the need to write translation tables in memory and is commonly used for relatively small address spaces. This method ensures that the translation of time-critical data accesses execute as fast as possible with entries already present in the TLB. These entries must be locked to prevent them from being overwritten.

Table 21-12. MMU Writing TLB Entries Statically

| Step | Register/ Bit Field / Programming Model | Value |
|---|--|-------|
| Execute software reset | MMU_SYSCONFIG[1] SOFTRESET | 0x1 |
| Wait for reset to complete | MMU_SYSSTATUS[0] RESETDONE | =0x1 |
| Enable power saving via automatic interface clock gating | MMU_SYSCONFIG[0] AUTOIDLE | 0x1 |
| Configure TLB entries | See Table 21-11 | |
| Load the physical Address of the page | MMU_RAM[31:12] PHYSICALADDRESS | 0x- |
| Define the endianness of the page (little endian or big endian) | MMU_RAM[9] ENDIANNESS | 0x- |
| Select the element size | MMU_RAM[8:7] ELEMENTSIZE | 0x- |
| Define mixed page attribute | MMU_RAM[6] MIXED | 0x- |
| Specify the TLB entry you want to write | MMU_LOCK[8:4] CURRENTVICTIM | 0x- |
| Load the specified entry in the TLB | MMU_LD_TLB[0] LDTLBITEM | 0x1 |
| Enable multihit fault and TLB miss | MMU_IRQENABLE[4] MULTIHITFAULT | 0x1 |
| | MMU_IRQENABLE[0] TLBMISS | 0x1 |
| Enable memory translations | MMU_CNTL[1] MMUENABLE | 0x1 |

21.4.1.3.2 Main Sequence—Protecting TLB Entries

The first n TLB entries (with n total number of TLB entries) can be protected from being overwritten with new translations. This is useful to ensure that certain commonly used or time-critical translations are always in the TLB and do not require retrieval using the table walking process.

Table 21-13. Protecting TLB Entries

| Step | Register/Bit Field/Programming Model | Value |
|-----------------------|---|-------|
| Locks the TLB entries | MMU_LOCK[14:10] BASEVALUE | 0x- |

21.4.1.3.3 Main Sequence—Deleting TLB Entries

Two mechanisms exist to delete TLB entries. All unpreserved TLB entries, that is, TLB entries written with the preserved bit set to zero, can be deleted by invoking a TLB flush. The preserved bit should only be used on protected TLB entries, as it does not prevent replacement by the table walking logic.

Table 21-14. Deleting TLB Entries

| Step | Register / Bit Field / Programming Model | Value |
|---|---|-------|
| Flush all nonprotected TLB entries | MMU_GFLUSH[0] GLOBALFLUSH | 0x1 |
| Flush all TLB entries specified by the CAM register | MMU_FLUSH_ENTRY[0] FLUSHENTRY | 0x1 |

21.4.1.3.4 Main Sequence—Read TLB Entries

TLB entries can be read by the programmer to determine the TLB content at runtime.

Table 21-15. Read TLB Entries

| Step | Register / Bit Field / Programming Model | Value |
|---------------------------------|---|-------|
| Set the current victim pointer | MMU_LOCK[8:4] CURRENTVICTIM | 0x- |
| Read RAM parts of the TLB entry | MMU_READ_RAM | |
| Read CAM parts of the TLB entry | MMU_READ_CAM | |

PRELIMINARY

21.5 MMU Register Manual

21.5.1 MMU Instance Summary

Table 21-16. MMU Instance Summary

| Module Name | Base Address | Size |
|----------------|--------------|------|
| CORTEXM3_L2MMU | 0x5508 2000 | 4KB |
| DSP_MMU | 0x4A06 6000 | 4KB |

21.5.2 MMU Registers

21.5.2.1 MMU Register Summary

Table 21-17. MMU Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | CORTEXM3_L2M MU Base Address | DSP_MMU Base Address |
|----------------------------------|------|-----------------------|----------------|------------------------------|----------------------|
| MMU_REVISION | R | 32 | 0x0000 0000 | 0x5508 2000 | 0x4A06 6000 |
| MMU_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x5508 2010 | 0x4A06 6010 |
| MMU_SYSSTATUS | R | 32 | 0x0000 0014 | 0x5508 2014 | 0x4A06 6014 |
| MMU_IRQSTATUS | RW | 32 | 0x0000 0018 | 0x5508 2018 | 0x4A06 6018 |
| MMU_IRQENABLE | RW | 32 | 0x0000 001C | 0x5508 201C | 0x4A06 601C |
| MMU_WALKING_ST | R | 32 | 0x0000 0040 | 0x5508 2040 | 0x4A06 6040 |
| MMU_CNTL | RW | 32 | 0x0000 0044 | 0x5508 2044 | 0x4A06 6044 |
| MMU_FAULT_AD | R | 32 | 0x0000 0048 | 0x5508 2048 | 0x4A06 6048 |
| MMU_TTB | RW | 32 | 0x0000 004C | 0x5508 204C | 0x4A06 604C |
| MMU_LOCK | RW | 32 | 0x0000 0050 | 0x5508 2050 | 0x4A06 6050 |
| MMU_LD_TLB | RW | 32 | 0x0000 0054 | 0x5508 2054 | 0x4A06 6054 |
| MMU_CAM | RW | 32 | 0x0000 0058 | 0x5508 2058 | 0x4A06 6058 |
| MMU_RAM | RW | 32 | 0x0000 005C | 0x5508 205C | 0x4A06 605C |
| MMU_GFLUSH | RW | 32 | 0x0000 0060 | 0x5508 2060 | 0x4A06 6060 |
| MMU_FLUSH_ENTRY | RW | 32 | 0x0000 0064 | 0x5508 2064 | 0x4A06 6064 |
| MMU_READ_CAM | R | 32 | 0x0000 0068 | 0x5508 2068 | 0x4A06 6068 |
| MMU_READ_RAM | R | 32 | 0x0000 006C | 0x5508 206C | 0x4A06 606C |
| MMU_EMU_FAULT_AD | R | 32 | 0x0000 0070 | 0x5508 2070 | 0x4A06 6070 |
| MMU_FAULT_PC | R | 32 | 0x0000 0080 | 0x5508 2080 | 0x4A06 6080 |
| MMU_FAULT_STATUS | RW | 32 | 0x0000 0084 | 0x5508 2084 | 0x4A06 6084 |
| MMU_GP_REG | RW | 32 | 0x0000 0088 | 0x5508 2088 | N/A |
| DSPSS_MMU_GPR | RW | 32 | 0x0000 0088 | N/A | 0x4A06 6088 |

NOTE: [MMU_IRQENABLE](#), [MMU_CNTL](#) and [MMU_TTB](#) registers have retention capabilities. For more information about the device retention state management, see the PRCM chapter.

21.5.2.2 MMU Register Description

Table 21-18. MMU_REVISION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5508 2000 | | | | | | | | | | | | | | | | InstanceCORTEXM3_L2MMU | | | | | | | | | | | | | | | |
| Description | This register contains the IP revision code | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP Revision | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data**Table 21-19. Register Call Summary for Register MMU_REVISION**

MMU Register Manual

- [MMU Register Summary: \[0\]](#)

Table 21-20. MMU_SYSCONFIG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0010 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5508 2010 | | | | | | | | | | | | | | | | InstanceCORTEXM3_L2MMU | | | | | | | | | | | | | | | |
| Description | This register controls the various parameters of the L3 interconnect interface | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----------|----------|----------|-----------|----------|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLOCKACTIVITY | RESERVED | IDLEMODE | RESERVED | SOFTRESET | AUTOIDLE | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|----------|
| 31:10 | RESERVED | Write 0's for future compatibility Reads returns 0 | R | 0x000000 |
| 9:8 | CLOCKACTIVITY | Clock activity during wake-up mode 00 Functional and Interconnect clocks can be switched off | R | 0x0 |
| 7:5 | RESERVED | Write 0's for future compatibility Reads returns 0 | R | 0x0 |
| 4:3 | IDLEMODE | IdleMode 0x0: Force-idle. An idle request is acknowledged unconditionally 0x1: No-idle. An idle request is never acknowledged 0x2: Smart-idle. Acknowledgement to an idle request is given based on the internal activity of the module 0x3: reserved do not use | RW | 0x0 |
| 2 | RESERVED | Write 0's for future compatibility Reads returns 0 | R | 0 |
| 1 | SOFTRESET | Software reset. This bit is automatically reset by the hardware. During reads, it always return 0 Read 0x0: always return 0 Write 0x0: no functional effect Write 0x1: The module is reset Read 0x1: never happens | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | AUTOIDLE | Internal interconnect clock gating strategy 0x0: interconnect clock is free-running 0x1: Automatic interconnect clock gating strategy is applied, based on the interconnect interface activity | RW | 0 |

Table 21-21. Register Call Summary for Register MMU_SYSCONFIG

MMU Functional Description

- [MMU Clock Configuration: \[0\]](#)
- [MMU Software Reset: \[1\] \[2\]](#)
- [MMU Power Management: \[3\] \[4\] \[5\] \[6\]](#)

MMU Low-level Programming Models

- [Main Sequence—Writing TLB Entries Staticly: \[7\] \[8\]](#)

MMU Register Manual

- [MMU Register Summary: \[9\]](#)

Table 21-22. MMU_SYSSTATUS

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 0014 | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 2014 | | |
| Description | This register provides status information about the module, excluding the interrupt status information | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESETDONE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:1 | RESERVED | Reads returns 0 | R | 0x000000 |
| 0 | RESETDONE | Internal reset monitoring Read 0x0: Internal module reset in on-going Read 0x1: Reset completed | R | - |

Table 21-23. Register Call Summary for Register MMU_SYSSTATUS

MMU Functional Description

- [MMU Software Reset: \[0\]](#)

MMU Low-level Programming Models

- [Main Sequence—Writing TLB Entries Staticly: \[1\]](#)

MMU Register Manual

- [MMU Register Summary: \[2\]](#)

Table 21-24. MMU_IRQSTATUS

| | | | |
|------------------|--|----------|----------------|
| Address Offset | 0x0000 0018 | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 2018 | | |
| Description | This interrupt status register regroups all the status of the module internal events that can generate an interrupt. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----|----|----------------|----|---|---|---------|---|---|---|------------------|---|---|---|---------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | MULTIHITFAULT | | | | TABLEWALKFAULT | | | | EMUMISS | | | | TRANSLATIONFAULT | | | | TLBMISS | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|---------------|------------|
| 31:5 | RESERVED | Write 0's for future compatibility read returns 0 | R | 0x00000000 |
| 4 | MULTIHITFAULT | Error due to multiple matches in the TLB Read 0x0: MultiHitFault false Write 0x0: MultiHitFault status bit unchanged Write 0x1: MultiHitFault status bit is reset Read 0x1: MultiHitFault is true ("pending") | RW W1toClr | 0 |
| 3 | TABLEWALKFAULT | Error response received during a Table Walk Read 0x0: TableWalkFault false Write 0x0: TableWalkFault status bit unchanged Write 0x1: TableWalkFault status bit is reset Read 0x1: TableWalkFault is true ("pending") | RW W1toClr | 0 |
| 2 | EMUMISS | Unrecoverable TLB miss during debug (hardware TWL disabled) Read 0x0: EMUMiss false Write 0x0: EMUMiss status bit unchanged Write 0x1: EMUMiss status bit is reset Read 0x1: EMUMiss is true ("pending") | RW W1toClr | 0 |
| 1 | TRANSLATIONFAULT | Invalid descriptor in translation tables (translation fault) Read 0x0: TranslationFault false Write 0x0: TranslationFault status bit unchanged Write 0x1: TranslationFault status bit is reset Read 0x1: TranslationFault is true ("pending") | RW W1toClr | 0 |
| 0 | TLBMISS | Unrecoverable TLB miss (hardware TWL disabled) Read 0x0: TLBMiss false Write 0x0: TLBMiss status bit unchanged Write 0x1: TLBMiss status bit is reset Read 0x1: TLBMiss is true ("pending") | RW W1toClr | 0 |

Table 21-25. Register Call Summary for Register MMU_IRQSTATUS

MMU Functional Description

- [MMU Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

MMU Register Manual

- [MMU Register Summary: \[5\]](#)

Table 21-26. MMU_IRQENABLE

| | | | |
|-------------------------|--|-----------------|----------------|
| Address Offset | 0x0000 001C | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 201C | | |
| Description | The interrupt enable register allows to mask/unmask the module internal sources of interrupt, on a event-by-event basis. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----------------|----|---------|----|------------------|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MULTIHITFAULT | | TABLEWALKFAULT | | EMUMISS | | TRANSLATIONFAULT | | TLBMISS | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|------------|
| 31:5 | RESERVED | Write 0's for future compatibility Read returns 0 | R | 0x00000000 |
| 4 | MULTIHITFAULT | Error due to multiple matches in the TLB 0x0: MultiHitFault is masked 0x1: MultiHitFault event generates an interrupt if occurs | RW | 0 |
| 3 | TABLEWALKFAULT | Error response received during a Table Walk 0x0: TableWalkFault is masked 0x1: TableWalkFault event generates an interrupt if occurs | RW | 0 |
| 2 | EMUMISS | Unrecoverable TLB miss during debug (hardware TWL disabled) 0x0: EMUMiss interrupt is masked 0x1: EMUMiss event generates an interrupt when it occurs | RW | 0 |
| 1 | TRANSLATIONFAULT | Invalid descriptor in translation tables (translation fault) 0x0: TranslationFault is masked 0x1: TranslationFault event generates an interrupt if occurs | RW | 0 |
| 0 | TLBMISS | Unrecoverable TLB miss (hardware TWL disabled) 0x0: TLBMiss interrupt is masked 0x1: TLBMiss event generates an interrupt when if occurs | RW | 0 |

Table 21-27. Register Call Summary for Register MMU_IRQENABLE

MMU Functional Description

- [MMU Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

MMU Low-level Programming Models

- [Main Sequence—Writing TLB Entries Staticly: \[5\] \[6\]](#)

MMU Register Manual

- [MMU Register Summary: \[7\] \[8\]](#)

Table 21-28. MMU_WALKING_ST

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 0040 | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 2040 | | |
| Description | This register provides status information about the table walking logic | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TWLRUNNING | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Reads return 0 | R | 0x0000 0000 |
| 0 | TWLRUNNING | Table Walking Logic is running Read 0x0: TWL Completed Read 0x1: TWL Running | R | 0 |

Table 21-29. Register Call Summary for Register MMU_WALKING_ST

MMU Register Manual

- [MMU Register Summary: \[0\]](#)

Table 21-30. MMU_CNTL

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 0044 | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 2044 | | |
| Description | This register programs the MMU features | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|-----------|----|-----------|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | EMUTLBUPDATE | | | | TWLENABLE | | MMUENABLE | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|------------|
| 31:4 | RESERVED | Write 0's for future compatibility Reads return 0 | R | 0x00000000 |
| 3 | EMUTLBUPDATE | Enable TLB update on emulator table walk 0x0: Emulator TLB update disabled 0x1: Emulator TLB update enabled | RW | 0 |
| 2 | TWLENABLE | Table Walking Logic enable 0x0: TWL disabled 0x1: TWL enabled | RW | 0 |
| 1 | MMUENABLE | MMU enable 0x0: MMU disabled 0x1: MMU enabled | RW | 0 |
| 0 | RESERVED | Write 0's for future compatibility Reads return 0 | R | 0 |

Table 21-31. Register Call Summary for Register MMU_CNTL

MMU Low-level Programming Models

- [Main Sequence—MMU Global Initialization: \[0\]](#)
- [Main Sequence—Writing TLB Entries Statically: \[1\]](#)

MMU Register Manual

- [MMU Register Summary: \[2\] \[3\]](#)

Table 21-32. MMU_FAULT_AD

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 0048 | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 2048 | | |
| Description | This register contains the virtual address that generated the interrupt | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FAULTADDRESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------------|
| 31:0 | FAULTADDRESS | Virtual address of the access that generated a fault | R | 0x0000 0000 |

Table 21-33. Register Call Summary for Register MMU_FAULT_AD

MMU Register Manual

- [MMU Register Summary: \[0\]](#)

Table 21-34. MMU_TTB

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 004C | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 204C | | |
| Description | This register contains the Translation Table Base address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|----------|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TTBADDRESS | | | | | | | | | | | | | | | | | | | | | | | RESERVED | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:7 | TTBADDRESS | Translation Table Base Address | RW | 0x00000000 |
| 6:0 | RESERVED | Write 0's for future compatibility Reads return 0 | R | 0x00 |

Table 21-35. Register Call Summary for Register MMU_TTB

MMU Register Manual

- [MMU Register Summary: \[0\] \[1\]](#)

Table 21-36. MMU_LOCK

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 0050 | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 2050 | | |
| Description | This register locks some of the TLB entries | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----------|---------------|---|---|---|----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BASEVALUE | | | | RESERVED | CURRENTVICTIM | | | | RESERVED | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|---------|
| 31:15 | RESERVED | Write 0's for future compatibility Reads return 0 | R | 0x00000 |
| 14:10 | BASEVALUE | Locked entries base value | RW | 0x00 |
| 9 | RESERVED | Write 0's for future compatibility Read returns 0 | R | 0 |
| 8:4 | CURRENTVICTIM | Current entry to be updated either by the TWL or by the software Write value : TLB entry to be updated by software, Read value : TLB entry that will be updated by table walk logic | RW | 0x00 |
| 3:0 | RESERVED | Write 0's for future compatibility Reads return 0 | R | 0x0 |

Table 21-37. Register Call Summary for Register MMU_LOCK

MMU Low-level Programming Models

- [Main Sequence—MMU Global Initialization: \[0\]](#)
- [Main Sequence—Writing TLB Entries Statically: \[1\]](#)
- [Main Sequence—Protecting TLB Entries: \[2\]](#)
- [Main Sequence—Read TLB Entries: \[3\]](#)

MMU Register Manual

- [MMU Register Summary: \[4\]](#)

Table 21-38. MMU_LD_TLB

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 0054 | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 2054 | | |
| Description | This register loads a TLB entry (CAM+RAM) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LDTLBITEM |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Write 0's for future compatibility Reads return 0 | RW | 0x0000 0000 |
| 0 | LDTLBITEM | Write (load) data in the TLB Read 0x0: always return 0 Write 0x0: no functional effect Write 0x1: load TLB data Read 0x1: never happens | RW | 0 |

Table 21-39. Register Call Summary for Register MMU_LD_TLB

MMU Low-level Programming Models

- [Main Sequence—MMU Global Initialization: \[0\]](#)
- [Main Sequence—Writing TLB Entries Statically: \[1\]](#)

MMU Register Manual

- [MMU Register Summary: \[2\]](#)

Table 21-40. MMU_CAM

| | | | |
|------------------|---------------------------------|----------|----------------|
| Address Offset | 0x0000 0058 | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 2058 | | |
| Description | This register holds a CAM entry | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VATAG | | | | | | | | | | | | | | | | RESERVED | | | | | | | | P | V | PAGESIZE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | VATAG | Virtual address tag | RW | 0x00000 |
| 11:4 | RESERVED | Write 0's for future compatibility Reads return 0 | R | 0x00 |
| 3 | P | Preserved bit 0x0: TLB entry may be flushed 0x1: TLB entry is protected against flush | RW | 0 |
| 2 | V | Valid bit 0x0: TLB entry is invalid 0x1: TLB entry is valid | RW | 0 |
| 1:0 | PAGESIZE | Page size 0x0: Section (1MB) 0x1: Large page (64KB) 0x2: Small page (4KB) 0x3: Supersection (16MB) | RW | 0x0 |

Table 21-41. Register Call Summary for Register MMU_CAM

MMU Functional Description

- [TLB Entry Format: \[0\]](#)

MMU Low-level Programming Models

- [Subsequence—Configure a TLB entry: \[1\] \[2\] \[3\] \[4\]](#)

MMU Register Manual

- [MMU Register Summary: \[5\]](#)
- [MMU Register Description: \[6\]](#)

Table 21-42. MMU_RAM

| | | | |
|-------------------------|---------------------------------|-----------------|----------------|
| Address Offset | 0x0000 005C | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 205C | | |
| Description | This register holds a RAM entry | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|------------|----|-------------|----|-------|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PHYSICALADDRESS | | | | | | | | | | | | | | | | RESERVED | | ENDIANNESS | | ELEMENTSIZE | | MIXED | | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|---------|
| 31:12 | PHYSICALADDRESS | Physical address of the page | RW | 0x00000 |
| 11:10 | RESERVED | Write 0's for future compatibility Reads return 0 | R | 0x0 |
| 9 | ENDIANNESS | Endianness of the page 0x0: Little Endian 0x1: Big endian | RW | 0 |
| 8:7 | ELEMENTSIZE | Element size of the page (8, 16, 32, no translation) 0x0: 8-bits 0x1: 16-bits 0x2: 32-bits 0x3: No translation | RW | 0x0 |
| 6 | MIXED | Mixed page attribute (use CPU element size) 0x0: Use TLB element size 0x1: Use CPU element size | RW | 0 |
| 5:0 | RESERVED | Write 0's for future compatibility Reads return 0 | R | 0x00 |

Table 21-43. Register Call Summary for Register MMU_RAM

MMU Functional Description

- [TLB Entry Format: \[0\]](#)

MMU Low-level Programming Models

- [Main Sequence—Writing TLB Entries Statically: \[1\] \[2\] \[3\] \[4\]](#)

MMU Register Manual

- [MMU Register Summary: \[5\]](#)

Table 21-44. MMU_GFLUSH

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 0060 | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 2060 | | |
| Description | This register flushes all the non-protected TLB entries | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | GLOBALFLUSH | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------------|
| 31:1 | RESERVED | Write 0's for future compatibility Reads return 0 | RW | 0x0000 0000 |
| 0 | GLOBALFLUSH | Flush all the non-protected TLB entries when set Read 0x0: always return 0 Write 0x0: no functional effect Write 0x1: flush all the non-protected TLB entries Read 0x1: never happens | RW | 0 |

Table 21-45. Register Call Summary for Register MMU_GFLUSH

MMU Functional Description

- [TLB Entry Format: \[0\]](#)

MMU Low-level Programming Models

- [Main Sequence—Deleting TLB Entries: \[1\]](#)

MMU Register Manual

- [MMU Register Summary: \[2\]](#)

Table 21-46. MMU_FLUSH_ENTRY

| | | | |
|------------------|---|----------|----------------|
| Address Offset | 0x0000 0064 | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 2064 | | |
| Description | This register flushes the entry pointed to by the CAM virtual address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | FLUSHENTRY |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Write 0's for future compatibility Reads return 0 | RW | 0x0000 0000 |
| 0 | FLUSHENTRY | Flush the TLB entry pointed by the virtual address (VATag) in MMU_CAM register, even if this entry is set protected Read 0x0: always return 0 Write 0x0: no functional effect Write 0x1: flush all the TLB entries specified by the CAM register Read 0x1: never happens | RW | 0 |

Table 21-47. Register Call Summary for Register MMU_FLUSH_ENTRY

MMU Low-level Programming Models

- [Main Sequence—Deleting TLB Entries: \[0\]](#)

MMU Register Manual

- [MMU Register Summary: \[1\]](#)

Table 21-48. MMU_READ_CAM

| | | | | | |
|------------------|---|--|----------|----------------|--|
| Address Offset | 0x0000 0068 | | Instance | CORTEXM3_L2MMU | |
| Physical Address | 0x5508 2068 | | | | |
| Description | This register reads CAM data from a CAM entry | | | | |
| Type | R | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VATAG | | | | | | | | | | | | | | | | RESERVED | | | | | | | | P | V | PAGESIZE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | VATAG | Virtual address tag | R | 0x00000 |
| 11:4 | RESERVED | Reads return 0 | R | 0x00 |
| 3 | P | Preserved bit Read 0x0: TLB entry may be flushed Read 0x1: TLB entry is protected against flush | R | 0 |
| 2 | V | Valid bit Read 0x0: TLB entry is invalid Read 0x1: TLB entry is valid | R | 0 |
| 1:0 | PAGESIZE | Page size Read 0x0: Section (1MB) Read 0x1: Large page (64KB) Read 0x2: Small page (4KB) Read 0x3: Supersection (16MB) | R | 0x0 |

Table 21-49. Register Call Summary for Register MMU_READ_CAM

MMU Low-level Programming Models

- [Main Sequence—Read TLB Entries: \[0\]](#)

MMU Register Manual

- [MMU Register Summary: \[1\]](#)

Table 21-50. MMU_READ_RAM

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 006C | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | CORTEXM3_L2MMU | | | | | | | | | | | | | | | |
| Physical Address | 0x5508 206C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | This register reads RAM data from a RAM entry | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|------------|----|-------------|----|-------|---|----------|---|---|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| PHYSICALADDRESS | | | | | | | | | | | | | | | | RESERVED | | ENDIANNESS | | ELEMENTSIZE | | MIXED | | RESERVED | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|--|------|---------|
| 31:12 | PHYSICALADDRESS | Physical address of the page | R | 0x00000 |
| 11:10 | RESERVED | Reads return 0 | R | 0x0 |
| 9 | ENDIANNESS | Endianness of the page Read 0x0: Little Endian Read 0x1: Big endian | R | 0 |
| 8:7 | ELEMENTSIZE | Element size of the page (8, 16, 32, no translation) Read 0x0: 8-bits Read 0x1: 16-bits Read 0x2: 32-bits Read 0x3: No translation | R | 0x0 |
| 6 | MIXED | Mixed page attribute (use CPU element size) Read 0x0: Use TLB element size Read 0x1: Use CPU element size | R | 0 |
| 5:0 | RESERVED | Reads return 0 | R | 0x00 |

Table 21-51. Register Call Summary for Register MMU_READ_RAM

MMU Low-level Programming Models

- [Main Sequence—Read TLB Entries: \[0\]](#)

MMU Register Manual

- [MMU Register Summary: \[1\]](#)

Table 21-52. MMU_EMU_FAULT_AD

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|----------------|----|----|----|---|---|---|---|---|---|---|---|---|---|--|-------------|--------------|
| Address Offset | 0x0000 0070 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x5508 2070 | | | | | | | | | | | | | | | | Instance | CORTEXM3_L2MMU | | | | | | | | | | | | | | | | |
| Description | This register contains the last virtual address of a fault caused by the debugger | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| EMUFAULTADDRESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | | | | | | | | | | Description | | | | | | | | | | | | | | | | Type | Reset |
| 31:0 | EMUFAULTADDRESS | | | | | | | | | | | | | | | | Virtual address of the last emulator access that generated a fault | | | | | | | | | | | | | | | | R | 0x0000 0000 |

Table 21-53. Register Call Summary for Register MMU_EMU_FAULT_AD

MMU Register Manual

- [MMU Register Summary: \[0\]](#)
- [MMU Register Description: \[1\]](#)

Table 21-54. MMU_FAULT_PC

| | | | |
|-------------------------|---|-----------------|---------------------------|
| Address Offset | 0x0000 0080 | Instance | CORTEXM3_L2MMU DSP MMU |
| Physical Address | 0x5508 2080 | | |
| Description | Capture first fault PC value, controlled by MMU_FAULT_STATUS [0] FAULTINDICATION. Notes: The address value is captured at MMU_EMU_FAULT_AD [31:0] EMUFAULTADDRESS. Data-Read-access : corresponding PC. Data-write-access : not perfect accuracy due to Posted-write. All this description is valid only for the DSP MMU. The Cortex-M3 L2 MMU always reads zero from this register. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | PC | CPU program counter value where cause MMU fault | R | 0x0000 0000 |

Table 21-55. Register Call Summary for Register MMU_FAULT_PC

MMU Register Manual

- [MMU Register Summary: \[0\]](#)

Table 21-56. MMU_FAULT_STATUS

| | | | |
|-------------------------|-------------|-----------------|---------------------------|
| Address Offset | 0x0000 0084 | Instance | CORTEXM3_L2MMU DSP MMU |
| Physical Address | 0x5508 2084 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|-------|----|----------------|---|-----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MMU_FAULT_TRANS_ID | | | | RD_WR | | MMU_FAULT_TYPE | | FAULTINDICATION | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|---------------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:4 | MMU_FAULT_TRANS_ID | <p>Master ID who cause a fault</p> <p>Read 0x0: posted writes out of shared cache for Cortex-M3 MMU / eDMA read port 1 for DSP MMU</p> <p>Read 0x1: Cortex-M3 video and display control processor I/D bus access for Cortex-M3 MMU / eDMA read port 2 for DSP MMU</p> <p>Read 0x2: Cortex-M3 video and display control processor S bus access for Cortex-M3 MMU / eDMA write port 1 for DSP MMU</p> <p>Read 0x3: Cortex-M3 SIMCOP control processor I/D bus access for Cortex-M3 MMU / eDMA write port 2 for DSP MMU</p> <p>Read 0x4: Cortex-M3 SIMCOP control processor S bus access for Cortex-M3 MMU / shared cache Evictions/stores/Non-cacheable for DSP MMU</p> <p>Read 0x5: reserved for Cortex-M3 MMU / shared cache request for Program/Data for DSP MMU</p> <p>Read 0x6: reserved for Cortex-M3 MMU / shared cache request for DMA for DSP MMU</p> <p>Read 0x7: reserved (for both Cortex-M3 MMU and DSP MMU)</p> <p>Read 0x8: MMU hardware table walk (for both Cortex-M3 MMU and DSP MMU)</p> <p>Read 0x9 to 0xF: reserved (for both Cortex-M3 MMU and DSP MMU)</p> | R | 0x0 |
| 3 | RD_WR | indicates read or write | R | 0 |
| 2:1 | MMU_FAULT_TYPE | <p>MReq Type[1:0]</p> <p>Read 0x2: reserved for Cortex-M3 MMU / DMA address for DSP MMU</p> <p>Read 0x1: Fetch address</p> <p>Read 0x0: Data Load/Store</p> | R | 0x0 |
| 0 | FAULTINDICATION | indicates a MMU fault | RW W1toClr | 0 |

Table 21-57. Register Call Summary for Register MMU_FAULT_STATUS

MMU Register Manual

- [MMU Register Summary: \[0\]](#)
- [MMU Register Description: \[1\]](#)

Table 21-58. MMU_GP_REG

| | | | |
|-------------------------|---|-----------------|----------------|
| Address Offset | 0x0000 0088 | Instance | CORTEXM3_L2MMU |
| Physical Address | 0x5508 2088 | | |
| Description | Bus-error back response enable register. For more information about the register usage, see section L2 MMU, part of the Dual Cortex-M3 MPU chapter. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BUS_ERR_BACK_EN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-------|
| 31:1 | RESERVED | Reserved | R | 0x0 |
| 0 | BUS_ERR_BACK_EN | Bus-error back response enable bit 0x0: Default behaviour for MMU page Faults 0x1: All MMU faults return bus-error back | RW | 0x0 |

Table 21-59. Register Call Summary for Register MMU_GP_REG

MMU Register Manual

- [MMU Register Summary: \[0\]](#)

Table 21-60. DSPSS_MMU_GPR

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0088 | Instance | DSP_MMU |
| Physical Address | | | |
| Description | This register controls the DSP MMU hardware debug output multiplexer. It also controls force-idle request generation. For more information about the use of this register, see Chapter 19, Control Module . | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----------|----|----|----|----|---|---|---|---|---|-------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FORCE_IDLE_REQ | RESERVED | | | | | | | | | | HWDEBUG_MUX | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15 | FORCE_IDLE_REQ | Force-idle request to see existence of pending bus request. This bit must be used only for debug purposes, not in functional mode. | RW | 0x0 |
| 14:4 | RESERVED | Reserved | R | 0x0 |
| 3:0 | HWDEBUG_MUX | Control HWDEBUG output MUX | RW | 0x0 |

Table 21-61. Register Call Summary for Register DSPSS_MMU_GPR

MMU Register Manual

- [MMU Register Summary: \[0\]](#)

Spinlock

This chapter describes the Spinlock module of the device.

| Topic | Page |
|--|------|
| 22.1 Spinlock Overview | 4240 |
| 22.2 Spinlock Integration | 4241 |
| 22.3 Spinlock Functional Description | 4242 |
| 22.4 Spinlock Programming Guide | 4245 |
| 22.5 Spinlock Register Manual | 4248 |

22.1 Spinlock Overview

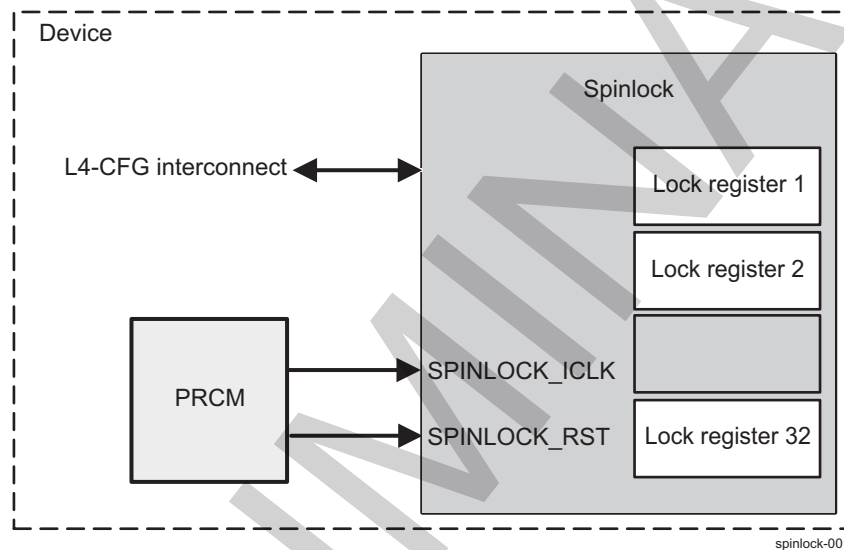
The Spinlock module provides hardware assistance for synchronizing the processes running on multiple processors in the device:

- Cortex-A9 microprocessor unit (MPU) subsystem
- Digital signal processor (DSP) subsystem
- Cortex-M3 MPU subsystem

The Spinlock module implements 32 spinlocks (or hardware semaphores), which provide an efficient way to perform a lock operation of a device resource using a single read-access, avoiding the need of a read-modify-write bus transfer that the programmable cores are not capable of.

Figure 22-1 shows the Spinlock module.

Figure 22-1. Spinlock Module

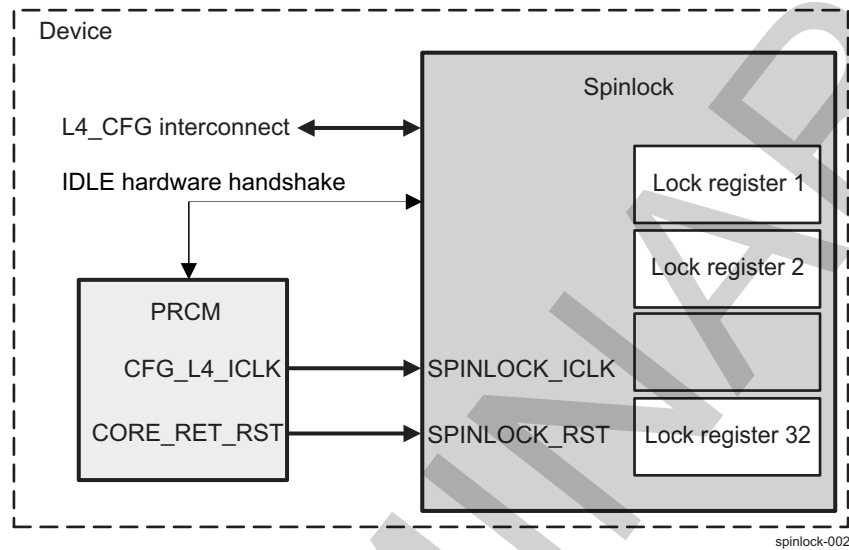


22.2 Spinlock Integration

This section describes module integration in the device, including information about clocks, resets, and hardware requests.

Figure 22-2 shows the Spinlock integration.

Figure 22-2. Spinlock Integration



NOTE: For more information about the IDLE hardware handshake and the wake-up request, see [Section 3.1.1.1.2, Module Level Clock Management](#), [Chapter 3, Power, Reset, and Clock Management](#).

Table 22-1 and Table 22-2 summarize the integration of the module in the device.

Table 22-1. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| SPINLOCK | PD_CORE | L4_CFG |

Table 22-2. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|---|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| SPINLOCK | SPINLOCK_ICLK | CFG_L4_ICLK | PRCM | Spinlock interface clock. This clock is used for all interface and functional operations. |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| SPINLOCK | SPINLOCK_RST | CORE_RET_RST | PRCM | Spinlock hardware reset. This reset is asynchronously applied to the Spinlock internal registers. |

The Spinlock module does not support any interrupt and DMA requests.

22.3 Spinlock Functional Description

22.3.1 Spinlock Software Reset

The Spinlock module can be reset by software through the [SPINLOCK_SYSCONFIG\[1\]](#) SOFTRESET bit. Setting this bit to 1 enables an active software reset that is functionally equivalent to a hardware reset. The [SPINLOCK_SYSTATUS\[0\]](#) RESETDONE bit can be polled to check the reset status (reading 1 indicates that reset sequence is done; reading 0 indicates that reset sequence is in progress). The software must ensure that the software reset completes before doing Spinlock operations.

22.3.2 Spinlock Power Management

[Table 22-3](#) describes power-management features available to the Spinlock module.

NOTE:

- For information about source clock gating and sleep/wake-up transitions description, see [Section 3.1.1.1.4, Clock Domain Level Clock Management, Chapter 3, Power, Reset, and Clock Management](#).
- For descriptions of EnaWakeUp, IdleMode, ClockActivity, and StandbyMode features, see [Section 3.1.1.1.2, Module Level Clock Management, Chapter 3, Power, Reset, and Clock Management](#).

Table 22-3. Local Power Management Features

| Feature | Registers | Description |
|-----------------------|--|---|
| Clock auto gating | SPINLOCK_SYSCONFIG[0] AUTOGATING bit | This bit indicates that the module uses an automatic internal interface clock gating strategy, based on interface activity. |
| Slave idle modes | SPINLOCK_SYSCONFIG[4:3] SIDLEMODE bit field | This bit field indicates that the module uses smart-idle mode. |
| Clock activity | SPINLOCK_SYSCONFIG[8] CLOCKACTIVITY bit | This bit indicates that the interface clock is not required by the module during idle mode and may be switched off. |
| Global wake-up enable | SPINLOCK_SYSCONFIG[2] ENAWAKEUP bit | This bit indicates that the wake-up generation feature (at module level) is disabled. |

NOTE: All the local power management features are non-configurable (that is, their respective bits or bit fields are read-only).

CAUTION

The PRCM module has no hardware means of reading CLOCKACTIVITY settings. Thus, software must ensure consistent programming between the CLOCKACTIVITY bit and Spinlock clock PRCM control bits.

The Spinlock module is normally idle, except when processing a request from its slave interface port. The smart-idle mode acknowledges idle requests from the PRCM only when the module is prepared to go idle. The Spinlock module is always ready to go idle if it does not have any request that it is processing.

The Spinlock module uses retention flops to retain state including the Taken state of each lock register. This means that the module can be placed in retention at any time when it is not processing a request and it is known that the system will not need to access the module.

Software must ensure to only power off the Spinlock module when no locks would be lost. In general, the steps to powering down the Spinlock module are:

- Check that all masters which might use the Spinlock module are either:
 - Already powered off, or
 - Notified that Spinlock is not available and the notification is acknowledged.

- If desired, check that no locks are currently held in the Spinlock module. The status of each bank of 32 locks can be read from the [SPINLOCK_SYSTATUS](#) register. If any locks are held, they are orphaned because they are not held by any master that is still active. Alternatively, you may decide to wait a timeout period to allow any active master to clean up its locks before powering down.
- The Spinlock module can now be powered off by writing the appropriate status to the PRCM.

In the case of powering off the whole system, these steps are unnecessary.

22.3.3 About Spinlocks

Spinlocks are present to solve the need for synchronization and mutual exclusion between heterogeneous processors and those not operating under a single, shared operating system. There is no alternative mechanism to accomplish these operations between processors in separate subsystems.

Spinlocks are not the best way to synchronize between tasks or threads on one CPU. Instead, spinlocks are for use in synchronization between different subsystems in the device that don't have any other means of hardware-based synchronization.

Spinlocks do not solve all system synchronization issues. They have limited applicability and should be used with care to implement higher level synchronization protocols.

A spinlock is appropriate for mutual exclusion for access to a shared data structure. It should be used only when:

1. The time to hold the lock is predictable and small (for example, a maximum hold time of less than 200 CPU cycles may be acceptable).
2. The locking task cannot be preempted, suspended, or interrupted while holding the lock (this would make the hold time large and unpredictable).
3. The lock is lightly contended, that is the chance of any other process (or processor) trying to acquire the lock while it is held is small.

If these conditions are met, then the locking code can retry a failed attempt to acquire the lock until success.

If the conditions are not met, then a spinlock is not a good candidate. One alternative is to use a spinlock for critical section control (engineered to meet the conditions) to implement a higher level semaphore that can support preemption, notification, timeout or other higher level properties.

22.3.4 Spinlock Functional Operation

The Spinlock module supports 32 spinlocks. It accepts only a single command at a time and processes the command fully before accepting the next command. A lock is requested by reading the [SPINLOCK_LOCK_REG_i\[0\]](#) TAKEN bit. There are two states: Taken ([SPINLOCK_LOCK_REG_i\[0\]](#) TAKEN = 1) or Not Taken ([SPINLOCK_LOCK_REG_i\[0\]](#) TAKEN = 0).

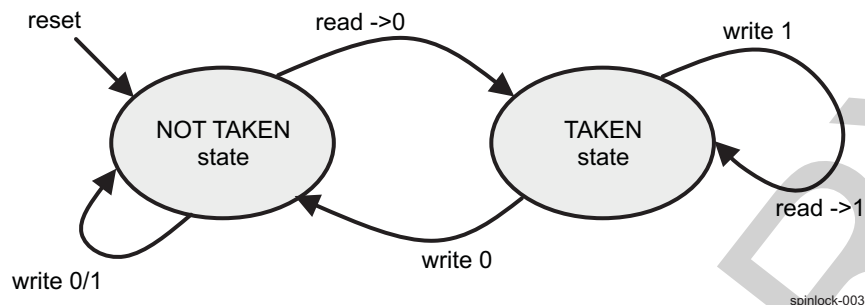
When the status of lock *i* (where *i* = 0 to 31) is Not Taken (free), a read from the [SPINLOCK_LOCK_REG_i](#) register returns 0 and sets the lock to Taken (locked). When the status of lock *i* is Taken, a read returns 1 and does not change the state of the lock.

A write to the [SPINLOCK_LOCK_REG_i](#) register does not change the state of lock, unless when writing 0 when the lock is in Taken state. By doing this, the requester frees the lock.

CAUTION

Only 32-bit reads and writes are supported.

Figure 22-3 shows the [SPINLOCK_LOCK_REG_i](#) register state diagram.

Figure 22-3. Lock Register State Diagram**NOTE:**

- There is no support to ensure that a lock register is locked and unlocked by the same process. This must be ensured in software.
- There is no support to check that the same initiator that acquired the lock is the one that is freeing the lock.

22.4 Spinlock Programming Guide

22.4.1 Spinlock Low-level Programming Models

This section covers the low-level hardware programming sequences for configuration and usage of the module.

22.4.1.1 Surrounding Modules Global Initialization

This procedure initializes the surrounding modules when the Spinlock module is used for the first time after a device reset.

Table 22-4. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|---|
| PRCM | Spinlock interface clock must be enabled. For more information, see Section 3.6.14 , CD_L4_CFG Clock Domain , Chapter 3, Power, Reset, and Clock Management . |
| Interconnect | For more information about the L4-CFG interconnect configuration, see Section 14.3, L4 Interconnects . |

22.4.1.2 Basic Spinlock Operations

The main spinlock operations are:

- Clear all the Taken spinlocks (only after a system bug recovery)
- Take a spinlock
- Release spinlock

22.4.1.2.1 Spinlocks Clearing After a System Bug Recovery

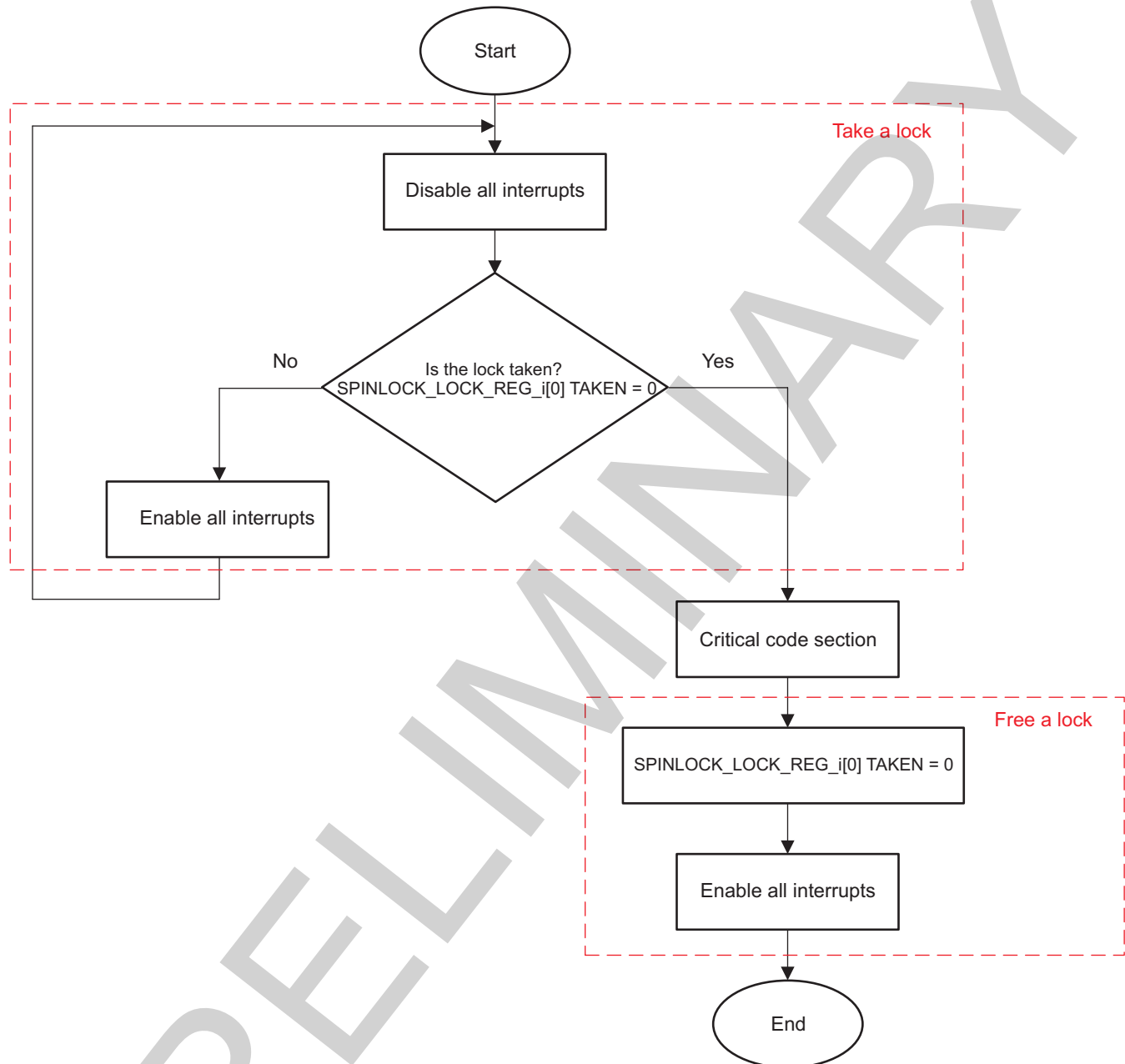
Module initialization (after reset) is not needed, except after system bug recovery. The following table presents the Spinlock initialization after a system bug recovery. Software should store 0 into each of the [SPINLOCK_LOCK_REG_i](#) registers at system startup to insure that all locks are initialized to Not Taken.

Table 22-5. Spinlock System Bug Recovery

| Step | Register | Value |
|---|---|-------|
| IF: SPINLOCK_SYSTATUS [0] IU0 == 1? | SPINLOCK_SYSTATUS [0] IU0 | |
| Free the 32 locks | SPINLOCK_LOCK_REG_i [0] TAKEN (i=0 to 31) | 0x0 |
| END | | |

22.4.1.2.2 Take and Release Spinlock

This procedure configures the take and release (free) operations for the Spinlock module. A spinlock should only be held with interrupts disabled. So, before attempting to obtain the spinlock, software should disable interrupts. Then it should read the [SPINLOCK_LOCK_REG_i](#)[0] TAKEN bit to attempt to obtain the lock. If it succeeds, it should proceed directly through the critical section then unlock and re-enable interrupts. If the acquisition attempt fails, the acquisition should be reattempted. To prevent unknown interrupt disabled time, interrupts should be re-enabled and then disabled before reattempting to acquire the lock. [Figure 22-4](#) shows the described above procedure.

Figure 22-4. Take and Release Spinlock

spinlock-004

Table 22-6. Register Call Summary

| Register Name |
|------------------------------|
| SPINLOCK_LOCK_REG_i[0] TAKEN |

Table 22-7. Subprocess Call Summary

| Subprocess Name | Cross Reference |
|--------------------|---|
| Disable Interrupts | For information about disabling interrupts in Cortex-A9 MPU INTC, see the <i>ARMCortex-A9 MPCore Technical Reference Manual</i> For information about disabling interrupts in Cortex-M3 MPU INTC, see the <i>ARMCortex-M3 Technical Reference Manual</i> For information about disabling interrupts in DSP INTC, see Chapter 5, DSP Subsystem |

Table 22-7. Subprocess Call Summary (continued)

| Subprocess Name | Cross Reference |
|-------------------|---|
| Enable Interrupts | <p>For information about enabling interrupts in Cortex-A9 MPU INTC, see the <i>ARM Cortex-A9 MPCore Technical Reference Manual</i></p> <p>For information about enabling interrupts in Cortex-M3 MPU INTC, see the <i>ARM Cortex-M3 Technical Reference Manual</i></p> <p>For information about enabling interrupts in DSP INTC, see Chapter 5, DSP Subsystem</p> |

22.5 Spinlock Register Manual

22.5.1 Spinlock Instance Summary

Table 22-8. Spinlock Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|----------|
| Spinlock | 0x4A0F 6000 | 4K bytes |

22.5.2 Spinlock Registers

22.5.2.1 Spinlock Register Summary

Table 22-9. Spinlock Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Spinlock L4-CFG Base Address |
|---|------|-----------------------|-------------------------|------------------------------|
| SPINLOCK_REVISION | R | 32 | 0x0000 0000 | 0x4A0F 6000 |
| SPINLOCK_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4A0F 6010 |
| SPINLOCK_SYSTATUS | R | 32 | 0x0000 0014 | 0x4A0F 6014 |
| SPINLOCK_LOCK_REG_i⁽¹⁾ | RW | 32 | 0x0000 0800 + (0x4 * i) | 0x4A0F 6800 + (0x4 * i) |

⁽¹⁾ i = 0 to 31

22.5.2.2 Spinlock Register Description

Table 22-10. SPINLOCK_REVISION

| | | | |
|------------------|---|----------|----------|
| Address Offset | 0x0000 0000 | Instance | Spinlock |
| Physical Address | 0x4A0F 6000 | | |
| Description | This register contains the IP revision code | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP revision | R | TI internal data |

Table 22-11. Register Call Summary for Register SPINLOCK_REVISION

Spinlock Register Manual

- [Spinlock Register Summary: \[0\]](#)

Table 22-12. SPINLOCK_SYSCONFIG

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0010 | Instance | Spinlock |
| Physical Address | 0x4A0F 6010 | | |
| Description | This register controls the various parameters of the L4-CFG interface. Note that most fields are read-only. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----------|----|-----------|----|----------|---|-----------|---|------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLOCKACTIVITY | | RESERVED | | SIDLEMODE | | ENWAKEUP | | SOFTRESET | | AUTOGATING | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-----------|
| 31:9 | RESERVED | Reserved. Reads return 0. | R | 0x0000000 |
| 8 | CLOCKACTIVITY | Indicates whether the module requires the interface clock when in IDLE mode. Read 0x0: Interface clock is not required by the module during IDLE mode and may be switched off. Read 0x1: Interface clock is required by the module, even during idle mode. | R | 0 |
| 7:5 | RESERVED | Reserved. Reads return 0. | R | 0x0 |
| 4:3 | SIDLEMODE | Slave interface power management (IDLE request/acknowledgement control). Read 0x0: Force-idle. IDLE request is acknowledged unconditionally and immediately. Read 0x1: No-idle. IDLE request is never acknowledged. Read 0x2: Smart-idle. IDLE request acknowledgement is based on the internal module activity. Read 0x3: Reserved. Do not use. | R | 0x2 |
| 2 | ENWAKEUP | Asynchronous wakeup generation. Read 0x0: Wakeup generation is disabled. Read 0x1: Wakeup generation is enabled. | R | 0 |
| 1 | SOFTRESET | Module software reset. Write 0x0: No action Write 0x1: Start soft reset sequence | W | 0 |
| 0 | AUTOGATING | Internal interface clock gating strategy. Read 0x0: Interface clock is not gated when the L4-CFG interface is idle. Read 0x1: Automatic internal interface clock gating strategy is applied, based on the L4-CFG interface activity. | R | 1 |

Table 22-13. Register Call Summary for Register SPINLOCK_SYSCONFIG

Spinlock Functional Description

- [Spinlock Software Reset: \[0\]](#)
- [Spinlock Power Management: \[1\] \[2\] \[3\] \[4\]](#)

Spinlock Register Manual

- [Spinlock Register Summary: \[5\]](#)

Table 22-14. SPINLOCK_SYSTATUS

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0014 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A0F 6014 | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | Spinlock | | | | | | | | | | | | | | | |
| Description | This register provides status information about this instance of the Spinlock module. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|----------|---|---|---|---|---|---|---|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| NUMLOCKS | | | | | | | | RESERVED | | | | | | | | IU7 | IU6 | IU5 | IU4 | IU3 | IU2 | IU1 | IU0 | RESERVED | | | | | | | | RESETDONE |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:24 | NUMLOCKS | Number of lock registers implemeted. Read 0x1: This instance has 32 lock registers. Read 0x2: This instance has 64 lock registers. Read 0x4: This instance has 128 lock registers. Read 0x8: This instance has 256 lock registers. | R | 0x01 |
| 23:16 | RESERVED | Reserved. Reads return 0. | R | 0x00 |
| 15 | IU7 | In-Use flag 7. Reads always return 0. | R | 0 |
| 14 | IU6 | In-Use flag 6. Reads always return 0. | R | 0 |
| 13 | IU5 | In-Use flag 5. Reads always return 0. | R | 0 |
| 12 | IU4 | In-Use flag 4. Reads always return 0. | R | 0 |
| 11 | IU3 | In-Use flag 3. Reads always return 0. | R | 0 |
| 10 | IU2 | In-Use flag 2. Reads always return 0. | R | 0 |
| 9 | IU1 | In-Use flag 1. Reads always return 0. | R | 0 |
| 8 | IU0 | In-Use flag 0, covering lock registers 0 - 31. Read 0x0: All lock registers 0 31 are in the Not Taken state. Read 0x1: At least one of the lock registers 0 31 is in the Taken state. | R | 0 |
| 7:1 | RESERVED | Reserved. Reads return 0. | R | 0x00 |
| 0 | RESETDONE | Reset done status. Read 0x0: Reset in progress. Read 0x1: Reset is completed. | R | 1 |

Table 22-15. Register Call Summary for Register SPINLOCK_SYSTATUS

Spinlock Functional Description

- [Spinlock Software Reset: \[0\]](#)
- [Spinlock Power Management: \[1\]](#)

Spinlock Programming Guide

- [Spinlocks Clearing After a System Bug Recovery: \[2\] \[3\]](#)

Spinlock Register Manual

- [Spinlock Register Summary: \[4\]](#)

Table 22-16. SPINLOCK_LOCK_REG_i

| | | | |
|-------------------------|---|-----------------|-------------|
| Address Offset | 0x0000 0800 | index | i = 0 to 31 |
| Physical Address | 0x4A0F 6800 + (0x4 * i) | Instance | Spinlock |
| Description | This register contains the state of one lock. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | TAKEN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved. Reads return 0. Writes are ignored. | R | 0x0000 0000 |
| 0 | TAKEN | Lock State Read 0x0: Lock was previously Not Taken (free). The requester is granted the lock. Write 0x0: Set the lock to Not Taken (free). Read 0x1: Lock was previously Taken. The requester is not granted the lock and must retry. Write 0x1: No update to the lock value. | RW | 0 |

Table 22-17. Register Call Summary for Register SPINLOCK_LOCK_REG_i

Spinlock Functional Description

- [Spinlock Functional Operation: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)

Spinlock Programming Guide

- [Spinlocks Clearing After a System Bug Recovery: \[6\] \[7\]](#)
- [Take and Release Spinlock: \[8\] \[9\]](#)

Spinlock Register Manual

- [Spinlock Register Summary: \[10\]](#)

PRELIMINARY

Timers

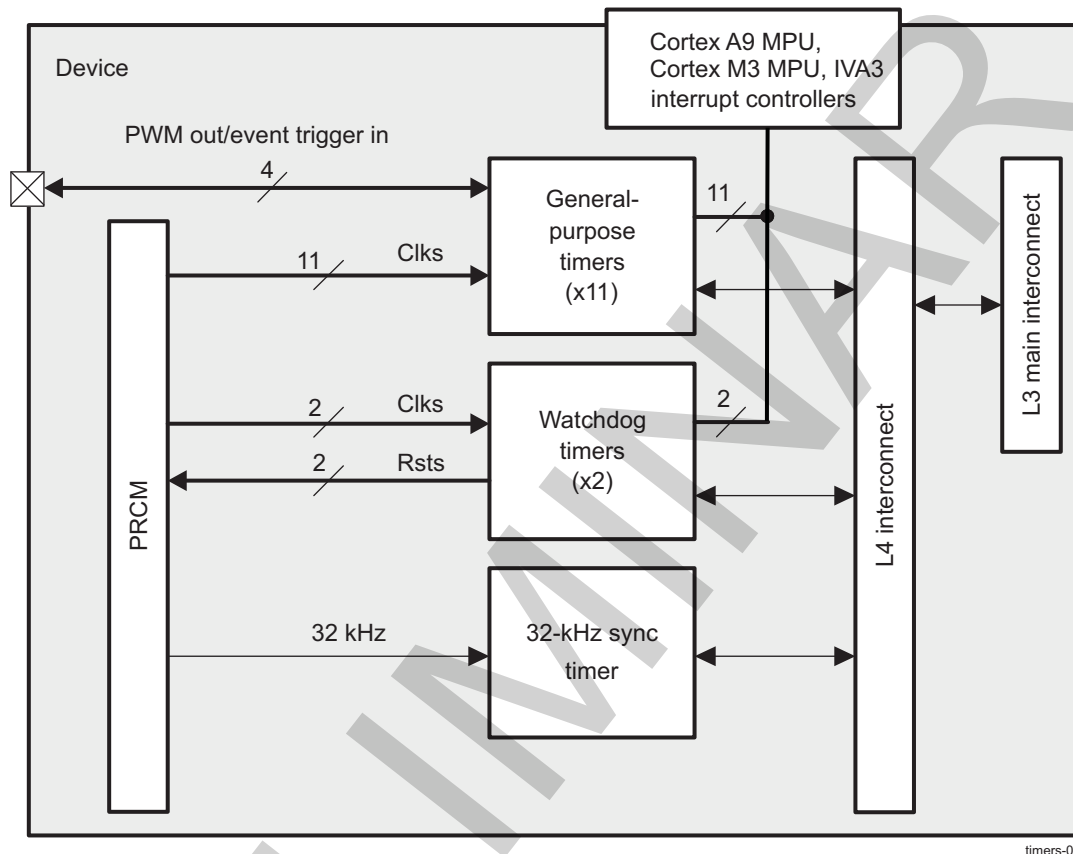
This chapter describes the timer modules for the device.

| Topic | Page |
|---|-------------|
| 23.1 Timers Overview | 4254 |
| 23.2 General-Purpose Timers | 4255 |
| 23.3 Watchdog Timers | 4311 |
| 23.4 32-kHz Synchronized Timer | 4339 |

23.1 Timers Overview

The device includes several types of timers used by the system software, including 11 general-purpose (GP) timers, two watchdog timers, and a 32-kHz synchronized timer (sync timer). Figure 23-1 is a high-level block diagram of the device timers.

Figure 23-1. Timers



The two watchdog timers are clocked with 32-kHz clocks. The 32-kHz sync timer, which is reset only at power up, provides the operating system (OS) with a stable timing source that stores the relative time since the last power cycle of the product. Finally, 11 GP timers, which are useful simply as basic timers, are included to generate time-stamp-based interrupts to the system software or to use as a source of pulse-width modulation (PWM) signals.

23.2 General-Purpose Timers

23.2.1 General-Purpose Timers Overview

The device has 11 general-purpose (GP) timers: GPTIMER1 through GPTIMER11.

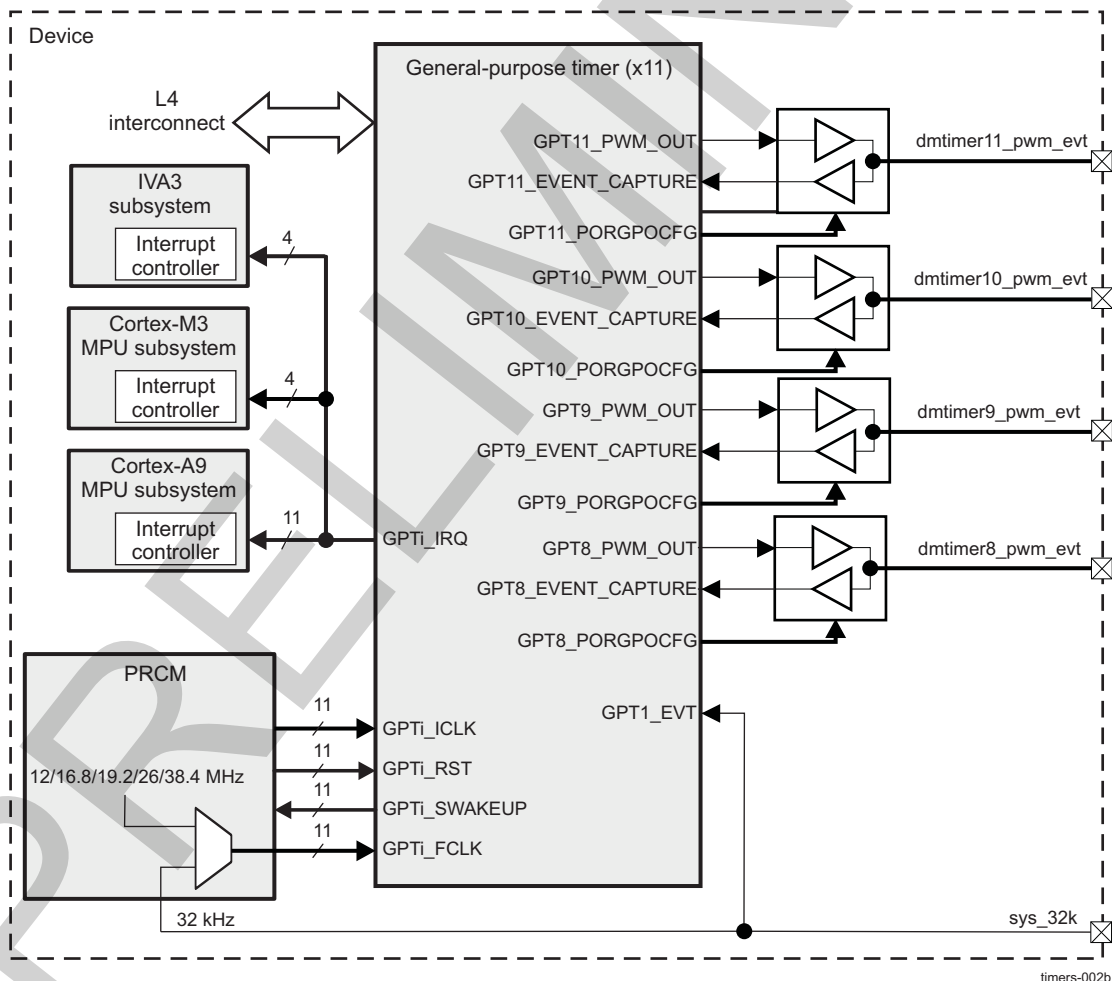
Each timer can be clocked from either the system clock (12, 16.8, 19.2, 26, or 38.4 MHz) or the 32-kHz clock. The selection of clock source is made at the power, reset, and clock management (PRCM) module level. For more information, see [Section 3.6.3.1, PRM Clock Source](#) in [Chapter 3, Power, Reset, and Clock Management](#).

GPTIMER1 has its GPT1_EVENT_CAPTURE pin tied to the 32-kHz clock and can be used to gauge the system clock input; it detects its frequency among 12, 16.8, 19.2, 26, or 38.4 MHz.

Each timer can provide an interrupt to the microprocessor unit (MPU) subsystem. In addition, GPTIMER5 through GPTIMER8 also have interrupts connected to the IVA3 subsystem.

GPTIMER1, GPTIMER2, and GPTIMER10 include specific functions to generate accurate tick interrupts to the operating system. GPTIMER8 through GPTIMER11 are connected to external pins by their PWM output or their event capture input pin (for external timer triggering). [Figure 23-2](#) is an overview of the GP timers.

Figure 23-2. GP Timers Overview



23.2.1.1 GP Timer Features

The following are the main features of the GP timer controllers:

- L4 slave interface support:

- 32-bit data bus width
- 32-/16-bit access supported
- 8-bit access not supported
- 10-bit address bus width
- Burst mode not supported
- Software-selectable nonposted or posted write/read internal resynchronization modes
- Interrupts generated on overflow, compare, and capture
- Free-running 32-bit upward counter
- Compare and capture modes
- Autoreload mode
- Start/stop mode
- Programmable divider clock source (2^n where $n = [0:8]$)
- Dedicated input trigger for capture mode and dedicated output trigger/PWM signal
- Dedicated GP output signal for using the GPTi_GPOCFG signal
- On-the-fly read/write register (while counting)
- 1-ms tick with 32,768-Hz functional clock generated (only GPTIMER1, GPTIMER2, and GPTIMER10)

23.2.2 GP Timer Environment

23.2.2.1 GP Timer External System Interface

Four of the 11 GP timers can send or receive stimulus to/from the external (off-chip) system. In the device; however, only GPTIMER8 through GPTIMER11 are configured to output a pulse-width modulation (PWM) pulse or receive an external event signal used as a trigger to capture the current timer count. GPTIMER1 is also configured to receive an event trigger input (GPT1_EVENT_CAPTURE) tied to the internal 32-kHz clock. This event signal gauges the system clock input; detecting its frequency among 12, 16.8, 19.2, 26, or 38.4 MHz.

Figure 23-3 shows the external system interface for the GP timers, and Table 23-1 describes the GP timer inputs and outputs.

NOTE: Software control must ensure that MUX mode is configured to select the dmtimerx_pwm_evt (where x = 8 to 11) signal on only one pad. Other pads on which the same signal is multiplexed must be configured in safe mode or non-dmtimer mode to avoid two different pads driving the same signal.

For more information about the configuration of the dmtimer8_pwm_evt through dmtimer11_pwm_evt I/O pads, see Section 19.4.8, *PAD Functional Multiplexing and Configuration*.

Figure 23-3. GP Timers External System Interface

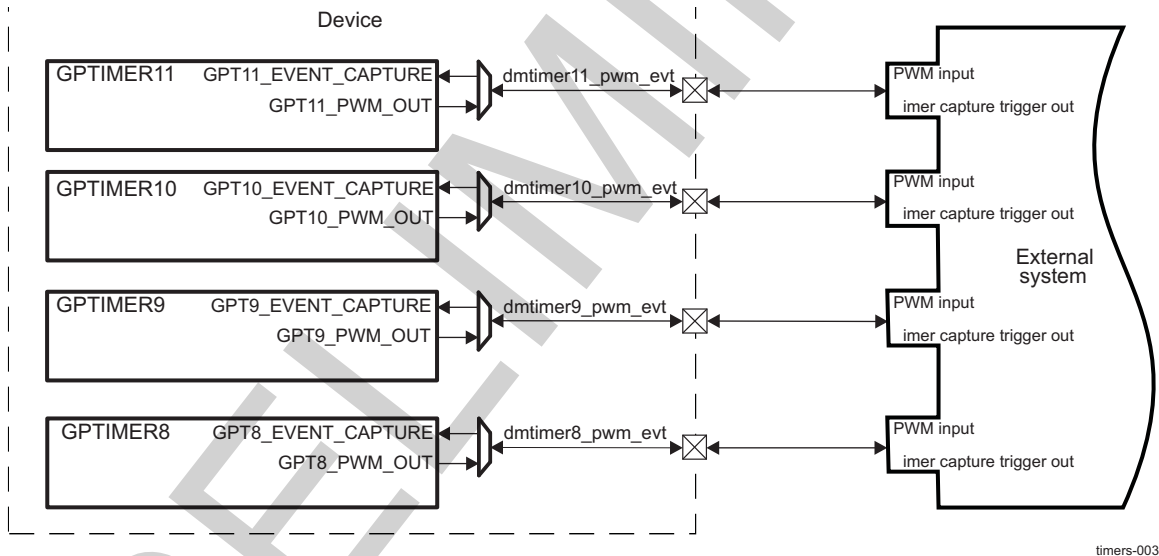


Table 23-1. Input/Output Description

| Pin Name | Type ⁽¹⁾ | Reset Value | Signal Name | Description |
|-------------------|---------------------|-------------|--------------------------------------|--|
| dmtimer8_pwm_evt | I/O | 0 | GPT8_EVENT_CAPTURE GPT8_PWM_OUT | GPTIMER8 trigger input/ PWM output |
| dmtimer9_pwm_evt | I/O | 0 | GPT9_EVENT_CAPTURE GPT9_PWM_OUT | GPTIMER9 trigger input/ PWM output |
| dmtimer10_pwm_evt | I/O | 0 | GPT10_EVENT_CAPTURE GPT10_PWM_OUT | GPTIMER10 trigger input/ PWM output |
| dmtimer11_pwm_evt | I/O | 0 | GPT11_EVENT_CAPTURE GPT11_PWM_OUT | GPTIMER11 trigger input/ PWM output |

⁽¹⁾ When configured for that function; I = input, O = output

NOTE: The event trigger input (GPTi_EVENT_CAPTURE) for GPTIMER2 through GPTIMER7 is internally tied low, and the PWM output (GPTi_PWM_OUT) is not connected.

NOTE: For GPTIMER8 through GPTIMER11, the GPTi_PORGPOCFG signal selects to connect the GPT pwm output or the GPT capture input to the dmtimerx_pwm_evt (where x = 8 to 11) pad at the top level. When the TCLR[14] GPO_CFG bit = 0b1, the dmtimerx_pwm_evt functions as a capture input. When the TCLR[14] GPO_CFG bit = 0b0, the dmtimerx_pwm_evt functions as a pwm output (GPO_CFG = 0b0).

23.2.3 GP Timer Integration

Figure 23-4 shows the integration of the GP timer in the device.

Figure 23-4. GP Timer Integration

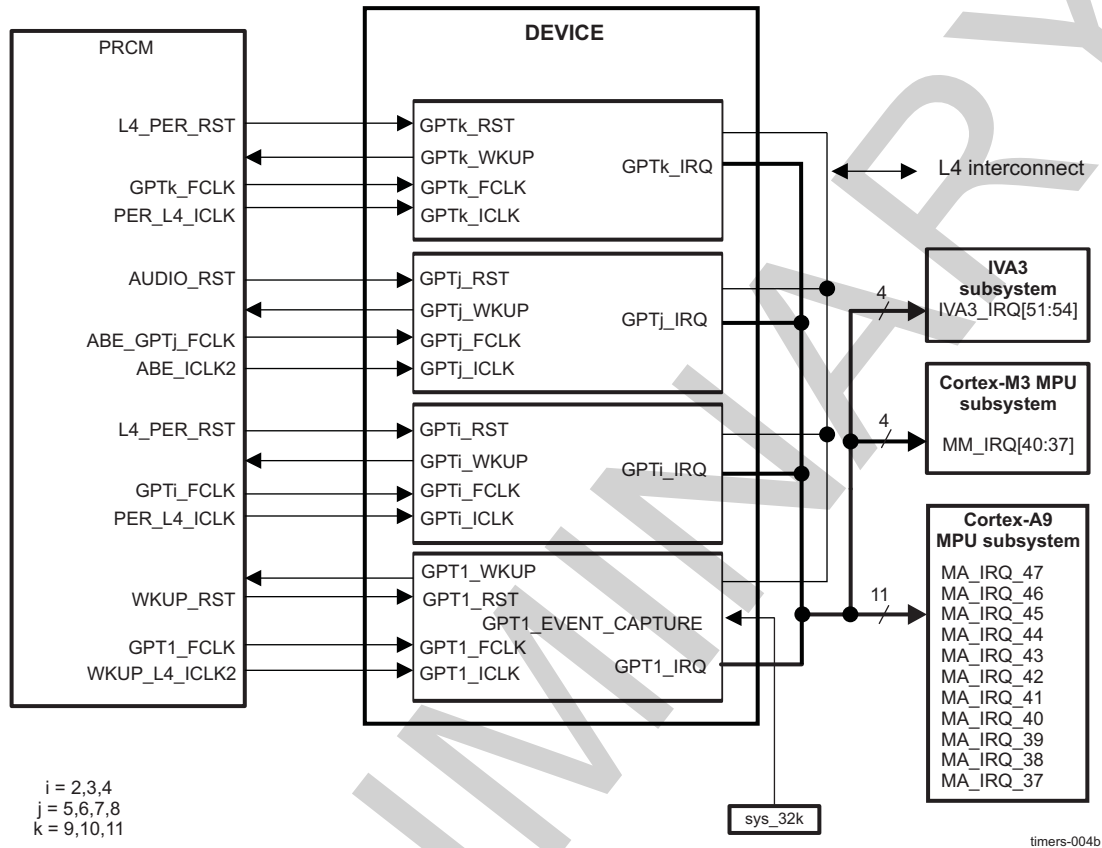


Table 23-2 through Table 23-4 summarize the integration of the module in the device.

Table 23-2. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| GPTIMER1 | PD_WKUP | Yes | L4_WKUP |
| GPTIMER2 | PD_L4_PER | Yes | L4_PER |
| GPTIMER3 | PD_L4_PER | Yes | L4_PER |
| GPTIMER4 | PD_L4_PER | Yes | L4_PER |
| GPTIMER5 | PD_AUDIO | Yes | L4_ABE |
| GPTIMER6 | PD_AUDIO | Yes | L4_ABE |
| GPTIMER7 | PD_AUDIO | Yes | L4_ABE |
| GPTIMER8 | PD_AUDIO | Yes | L4_ABE |
| GPTIMER9 | PD_L4_PER | Yes | L4_PER |
| GPTIMER10 | PD_L4_PER | Yes | L4_PER |
| GPTIMER11 | PD_L4_PER | Yes | L4_PER |

Table 23-3. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|-------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |

Table 23-3. Clocks and Resets (continued)

| | | | | |
|---------------|------------|---------------|------|----------------------------|
| GPTIMER1 | GPT1_FCLK | GPT1_FCLK | PRCM | GPTIMER1 functional clock |
| GPTIMER1 | GPT1_ICLK | WKUP_L4_ICLK2 | PRCM | GPTIMER1 interface Clock |
| GPTIMER2 | GPT2_FCLK | GPT2_FCLK | PRCM | GPTIMER2 functional clock |
| GPTIMER2 | GPT2_ICLK | PER_L4_ICLK | PRCM | GPTIMER2 interface Clock |
| GPTIMER3 | GPT3_FCLK | GPT3_FCLK | PRCM | GPTIMER3 functional clock |
| GPTIMER3 | GPT3_ICLK | PER_L4_ICLK | PRCM | GPTIMER3 interface Clock |
| GPTIMER4 | GPT4_FCLK | GPT4_FCLK | PRCM | GPTIMER4 functional clock |
| GPTIMER4 | GPT4_ICLK | PER_L4_ICLK | PRCM | GPTIMER4 interface Clock |
| GPTIMER5 | GPT5_FCLK | ABE_GPT5_FCLK | PRCM | GPTIMER5 functional clock |
| GPTIMER5 | GPT5_ICLK | ABE_ICLK2 | PRCM | GPTIMER5 interface Clock |
| GPTIMER6 | GPT6_FCLK | ABE_GPT6_FCLK | PRCM | GPTIMER6 functional clock |
| GPTIMER6 | GPT6_ICLK | ABE_ICLK2 | PRCM | GPTIMER6 interface Clock |
| GPTIMER7 | GPT7_FCLK | ABE_GPT7_FCLK | PRCM | GPTIMER7 functional clock |
| GPTIMER7 | GPT7_ICLK | ABE_ICLK2 | PRCM | GPTIMER7 interface Clock |
| GPTIMER8 | GPT8_FCLK | ABE_GPT8_FCLK | PRCM | GPTIMER8 functional clock |
| GPTIMER8 | GPT8_ICLK | ABE_ICLK2 | PRCM | GPTIMER8 interface Clock |
| GPTIMER9 | GPT9_FCLK | GPT9_FCLK | PRCM | GPTIMER9 functional clock |
| GPTIMER9 | GPT9_ICLK | PER_L4_ICLK | PRCM | GPTIMER9 interface Clock |
| GPTIMER10 | GPT10_FCLK | GPT10_FCLK | PRCM | GPTIMER10 functional clock |
| GPTIMER10 | GPT10_ICLK | PER_L4_ICLK | PRCM | GPTIMER10 interface Clock |
| GPTIMER11 | GPT11_FCLK | GPT11_FCLK | PRCM | GPTIMER11 functional clock |
| GPTIMER11 | GPT11_ICLK | PER_L4_ICLK | PRCM | GPTIMER11 interface Clock |
| Resets | | | | |
| GPTIMER1 | GPT1_RST | WKUP_RST | PRM | Reset to GPTIMER1 |
| GPTIMER2 | GPT2_RST | L4_PER_RST | PRM | Reset to GPTIMER2 |
| GPTIMER3 | GPT3_RST | L4_PER_RST | PRM | Reset to GPTIMER3 |
| GPTIMER4 | GPT4_RST | L4_PER_RST | PRM | Reset to GPTIMER4 |
| GPTIMER5 | GPT5_RST | AUDIO_RST | PRM | Reset to GPTIMER5 |
| GPTIMER6 | GPT6_RST | AUDIO_RST | PRM | Reset to GPTIMER6 |
| GPTIMER7 | GPT7_RST | AUDIO_RST | PRM | Reset to GPTIMER7 |
| GPTIMER8 | GPT8_RST | AUDIO_RST | PRM | Reset to GPTIMER8 |
| GPTIMER9 | GPT9_RST | L4_PER_RST | PRM | Reset to GPTIMER9 |
| GPTIMER10 | GPT10_RST | L4_PER_RST | PRM | Reset to GPTIMER10 |
| GPTIMER11 | GPT11_RST | L4_PER_RST | PRM | Reset to GPTIMER11 |

Table 23-4. Hardware Requests

| Module Instance | Source Signal Name | Destination Signal Name | Interrupt Requests | |
|-----------------|--------------------|-------------------------|--------------------|-------------------------------------|
| | | | Destination | Description |
| GPTIMER1 | GPT1_IRQ | MA_IRQ_37 | Cortex™-A9 MPU | GPTIMER1 interrupt to Cortex-A9 MPU |
| GPTIMER2 | GPT2_IRQ | MA_IRQ_38 | Cortex-A9™ MPU | GPTIMER2 interrupt to Cortex-A9 MPU |
| GPTIMER3 | GPT3_IRQ | MA_IRQ_39 | Cortex-A9 MPU | GPTIMER3 interrupt to Cortex-A9 MPU |
| | GPT3_IRQ | MM_IRQ_37 | Cortex-M3™ MPU | GPTIMER3 interrupt to Cortex-M3 MPU |
| GPTIMER4 | GPT4_IRQ | MA_IRQ_40 | Cortex-A9 MPU | GPTIMER3 interrupt to Cortex-A9 MPU |
| | GPT4_IRQ | MM_IRQ_38 | Cortex-M3 MPU | GPTIMER4 interrupt to Cortex-M3 MPU |
| GPTIMER5 | GPT5_IRQ | D_IRQ_51 | DSP | GPTIMER5 interrupt to DSP |
| | GPT5_IRQ | MA_IRQ_41 | Cortex-A9 MPU | GPTIMER5 interrupt to Cortex-A9 MPU |
| GPTIMER6 | GPT6_IRQ | D_IRQ_52 | DSP | GPTIMER6 interrupt to DSP |

Table 23-4. Hardware Requests (continued)

| | | | | |
|------------------------|-----------|-----------|---------------|--------------------------------------|
| | GPT6_IRQ | MA_IRQ_42 | Cortex-A9 MPU | GPTIMER6 interrupt to Cortex-A9 MPU |
| GPTIMER7 | GPT7_IRQ | D_IRQ_53 | DSP | GPTIMER7 interrupt to DSP |
| | GPT7_IRQ | MA_IRQ_43 | Cortex-A9 MPU | GPTIMER7 interrupt to Cortex-A9 MPU |
| GPTIMER8 | GPT8_IRQ | D_IRQ_54 | DSP | GPTIMER8 interrupt to DSP |
| | GPT8_IRQ | MA_IRQ_44 | Cortex-A9 MPU | GPTIMER8 interrupt to Cortex-A9 MPU |
| GPTIMER9 | GPT9_IRQ | MA_IRQ_45 | Cortex-A9 MPU | GPTIMER3 interrupt to Cortex-A9 MPU |
| | GPT9_IRQ | MM_IRQ_39 | Cortex-M3 MPU | GPTIMER9 interrupt to Cortex-M3 MPU |
| GPTIMER10 | GPT10_IRQ | MA_IRQ_46 | Cortex-A9 MPU | GPTIMER10 interrupt to Cortex-A9 MPU |
| GPTIMER11 | GPT11_IRQ | MA_IRQ_47 | Cortex-A9 MPU | GPTIMER3 interrupt to Cortex-A9 MPU |
| | GPT11_IRQ | MM_IRQ_40 | Cortex-M3 MPU | GPTIMER11 interrupt to Cortex-M3 MPU |
| No DMA Requests | | | | |

NOTE: For the description of the interrupt source description, see [Section 23.2.4.5, GP Timer Interrupts](#).

23.2.4 GP Timer Functional Description

Each GP timer contains a free-running upward counter with autoreload capability on overflow. The timer counter can be read and written on-the-fly (while counting). Each GP timer includes compare logic to allow an interrupt event on a programmable counter matching value. A dedicated output signal can be pulsed or toggled on either an overflow or a match event. This offers time-stamp trigger signaling or PWM signal sources. A dedicated input signal can be used to trigger an automatic timer counter capture or an interrupt event on a programmable input signal transition. A programmable clock divider (prescaler) allows reduction of the timer input clock frequency. All internal timer interrupt sources are merged into one module interrupt line and one wake-up line.

Each internal interrupt source can be independently enabled/disabled with a dedicated bit of the [GPT_TIER](#) register for the interrupt features, and a dedicated bit of the [GPT_TWER](#) register for the wake-up of GPTIMER1, GPTIMER2, and GPTIMER10. In addition, these timers have a mechanism implemented to generate an accurate tick interrupt.

For the other GP Timers, each internal interrupt source can be independently enabled/disabled through the [GPT_IRQENABLE_SET](#) and [GPT_IRQENABLE_CLR](#) register bit fields.

For each GP timer implemented in the device, there are two possible clock sources:

- 32-kHz clock
- System clock

Selection of the input clock source is done in the registers in the PRCM configuration (see [Section 23.2.1, GP Timer Overview](#)).

Each GP timer supports three functional modes:

- Timer mode
- Capture mode
- Compare mode

The capture and compare modes are disabled by default after core reset.

23.2.4.1 GP Timer Block Diagram

[Figure 23-5](#) is a block diagram of the common GP timers, and [Figure 23-6](#) is a block diagram of the GP timers with 1-ms tick generation module.

Figure 23-5. Block Diagram of GPTIMER3 Through GPTIMER9, and GPTIMER11

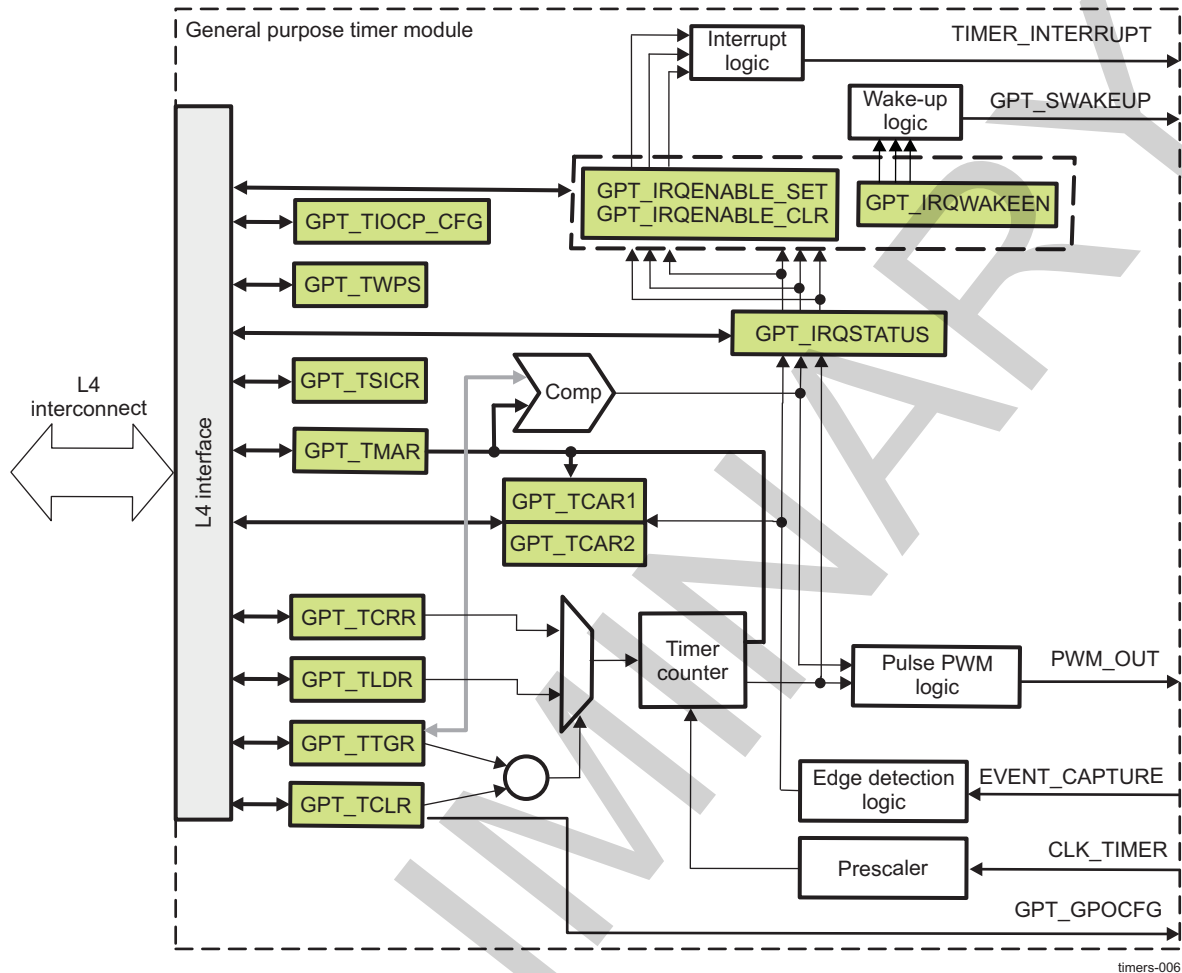
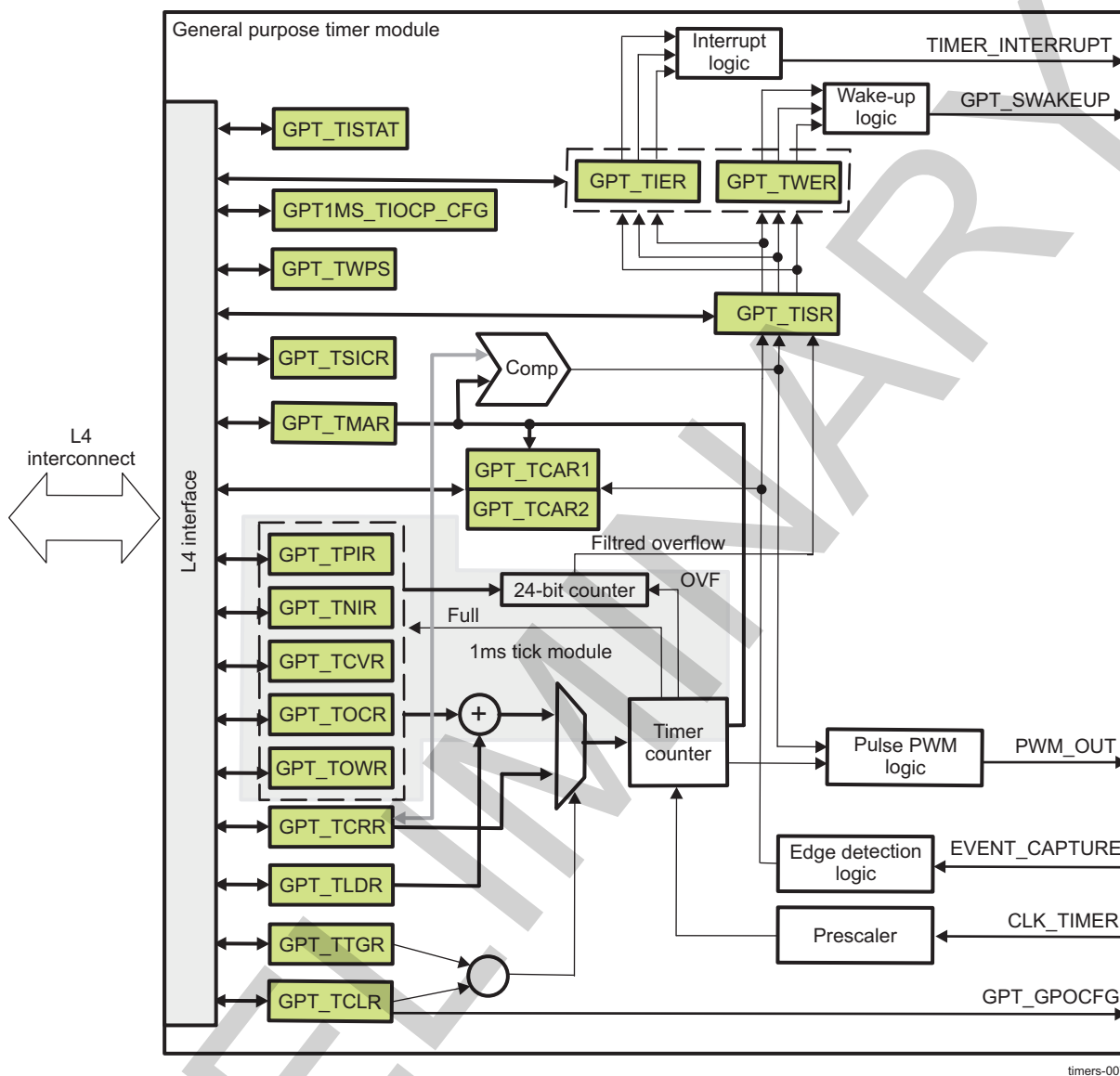


Figure 23-6. Block Diagram of GPTIMER1, GPTIMER2, and GPTIMER10

23.2.4.2 GPTIMER1, GPTIMER2, and GPTIMER10 Power Management

The GP timer modules have an internal bit, [GPT1MS_TIOCP_CFG\[0\]](#) AUTOIDLE, that is used to apply an internal interface clock gating strategy.

At the PRCM module level, when all conditions to shut off the PRCM module functional or interface output clocks are met (see [Section 3.1.1.1.4, Clock Domain-Level Clock Management](#)), the PRCM module automatically launches a hardware handshake protocol to ensure the GP timer is ready to have its clocks switched off. Namely, the PRCM module asserts an IDLE request to the GP timer.

Although this handshake is a hardware function and is out of software control, the way the GP timer acknowledges the PRCM IDLE request is configurable through the [GPT1MS_TIOCP_CFG\[4:3\]](#) IDLEMODE bit field.

[Table 23-7](#) lists the IDLEMODE settings and the related acknowledgment modes.

Table 23-5. IDLEMODE Settings

| IDLEMODE Value | Selected Mode | Description |
|----------------|---------------|--|
| 00 | Force-idle | The GP timer unconditionally acknowledges the IDLE request from the PRCM module, regardless of its internal operations. This mode must be used carefully, because it does not prevent the loss of data when the clock is switched off. |
| 01 | No-idle | The GP timer never acknowledges an IDLE request from the PRCM module. This mode is safe from a module point of view, because it ensures that the clocks remain active. It is not efficient from a power-saving perspective, because it does not allow the PRCM output clock to be shut off and thus the power domain to be set to a lower power state. |
| 10 | Smart-idle | The GP timer acknowledges the IDLE request, basing its decision on its internal activity. The acknowledge signal is asserted only when all pending transactions and IRQ requests are treated. This is the best approach to efficient system power management. |
| 11 | Reserved | |

When configured in smart-idle mode, the GP timer also offers an additional granularity on GPTi_FCLK and GPTi_ICLK gating. The [GPT1MS_TIOCP_CFG\[9:8\]](#) CLOCKACTIVITY bit field is used to determine which clock is shut down (GPTi_FCLK, GPTi_ICLK, neither, or both clocks).

The CLOCKACTIVITY setting is used internally to the GP timer to determine the part of the module on which the conditions to acknowledge the PRCM IDLE request are tested. For example, if GPTi_FCLK is not to be shut down on a PRCM IDLE request, the GP timer considers only GPTi_ICLK and associated pending activities before acknowledging the request.

Some GP timer features are associated with GPTi_ICLK and others are associated with GPTi_FCLK. Using the CLOCKACTIVITY setting along with the smart-idle mode ensures that the features associated with the clock that remains active are always enabled, even if the GP timer acknowledges an IDLE request.

[Table 23-6](#) lists the CLOCKACTIVITY settings and associated features.

Table 23-6. CLOCKACTIVITY Settings

| CLOCKACTIVITY Value | GPTi_ICLK Effects | GPTi_FCLK Effects | Description | Associated Features |
|---------------------|-------------------|-------------------|---|--|
| 00 | OFF | OFF | GPTi_ICLK and GPTi_FCLK are considered for generating the acknowledge. This setting also means GPTi_FCLK and GPTi_ICLK are likely to be shut down on PRCM IDLE request. | The idle acknowledge signal is asserted when there are no pending activities on the functional clock domain (improved latency in assertion of idle acknowledge). The wake-up capability of the GP timer is disabled. |
| 01 | ON | OFF | GPTi_ICLK is not shut down on PRCM IDLE request; only GPTi_FCLK is affected. | |

Table 23-6. CLOCKACTIVITY Settings (continued)

| CLOCKACTIVITY Value | GPTi_ICLK Effects | GPTi_FCLK Effects | Description | Associated Features |
|---------------------|-------------------|-------------------|--|--|
| 10 | OFF | ON | GPTi_FCLK is not shut down on PRCM IDLE request; only GPTi_ICLK is affected. | The idle acknowledge signal is asserted when there are no pending activities on the interface clock domain, without evaluating the pending activities on the functional clock domain (the GP timer enters into sleep mode, and if a pending interrupt event is completed during idle mode, the wake-up signal is asserted). The wake-up signal is enabled. |
| 11 | ON | ON | None of the clocks are shut down. Therefore, the GP timer can potentially acknowledge the IDLE request without checking the internal functionalities linked to its clocks. | |

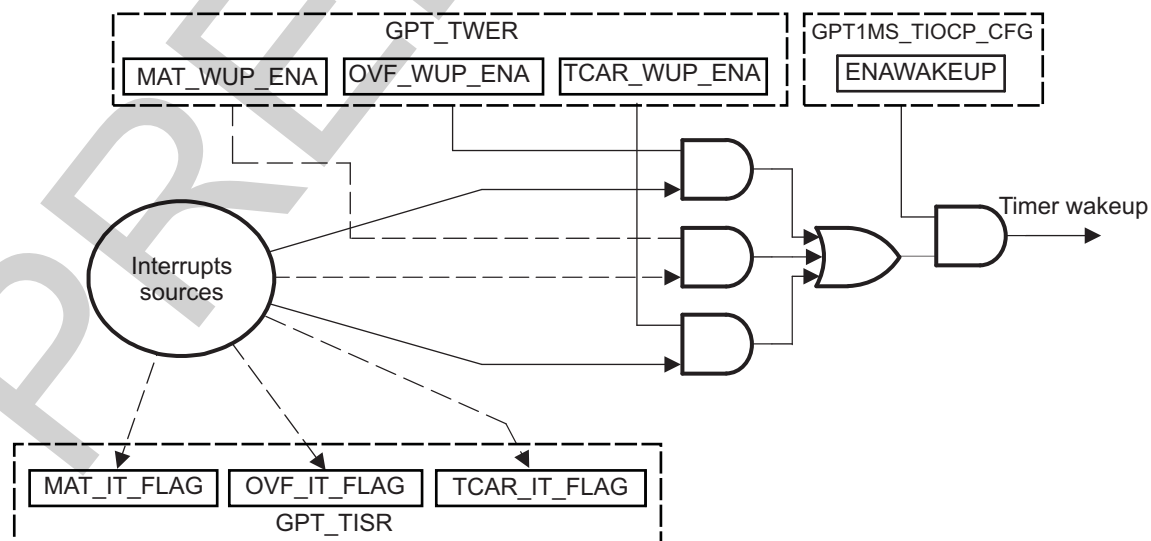
CAUTION

The PRCM module does not have any hardware means to read the CLOCKACTIVITY settings. The software must ensure consistent programming between the GP timer CLOCKACTIVITY and the PRCM module functional clock and interface clock control bits. If the GP timer is disabled in the CM_FCLKEN and CM_ICLKEN PRCM registers while CLOCKACTIVITY is set to 11, nothing prevents the PRCM module from asserting its IDLE request, which is acknowledged regardless of the features associated with the GP timer clocks. This can lead to unpredictable behavior.

23.2.4.2.1 Wake-Up Capability

If the [GPT1MS_TIOCP_CFG\[4:3\]](#) IDLEMODE bit field sets the smart-idle mode, the timer evaluates its internal capability to have the interface clock switched off. When there is no further internal activity (no pending interrupt sources: match, overflow, or timer capture events), the idle acknowledge signal is asserted and the timer enters sleep mode, ready to issue a wake-up request. This wake-up request is sent only if the [GPT1MS_TIOCP_CFG\[2\]](#) ENAWAKEUP bit enables the timer wake-up capability.

[Figure 23-7](#) shows the wake-up request generation. For more information on the GP timer clock control, see [Section 3.6, Clock Management Functional Description](#) in [Chapter 3, Power, Reset and Clock Management](#).

Figure 23-7. Wake-Up Request Generation

timers-005

For GPTIMER1, GPTIMER2, and GPTIMER10, the timer wake-up enable-register (**GPT_TWER**) allows masking the expected source of the wake-up event that generates a wake-up request. The **GPT_TWER** register is synchronously programmed with the interface clock before the PRCM module sends an idle mode request. The expected source of the wake-up event is an overflow (**GPT_TCRR**), a timer match (the compare result of **GPT_TCRR** and **GPT_TMAR** matches the counter value), and a timer capture (detection of an external pulse transition of the correct polarity on the **GPT_EVENT_CAPTURE**).

When the wake-up event is issued, the associated interrupt status bit is set in the timer status register (**GPT_TISR**). The pending wake-up event is reset when the set status bit is overwritten with 1.

NOTE: The status bit must be reset to re-enter idle mode.

23.2.4.3 Power Management of Other GP Timers

At the PRCM module level, when all conditions to shut off the PRCM module functional or interface output clocks are met (see [Section 3.1.1.1.4, Clock Domain Level Clock Management](#)), the PRCM module automatically launches a hardware handshake protocol to ensure the GP timer is ready to have its clocks switched off. Namely, the PRCM module asserts an IDLE request to the GP timer.

Although this handshake is a hardware function and is out of software control, the way the GP timer acknowledges the PRCM IDLE request is configurable through the **GPT_TIOCP_CFG**[3:2] IDLEMODE bit field.

[Table 23-7](#) lists the IDLEMODE settings and the related acknowledgment modes.

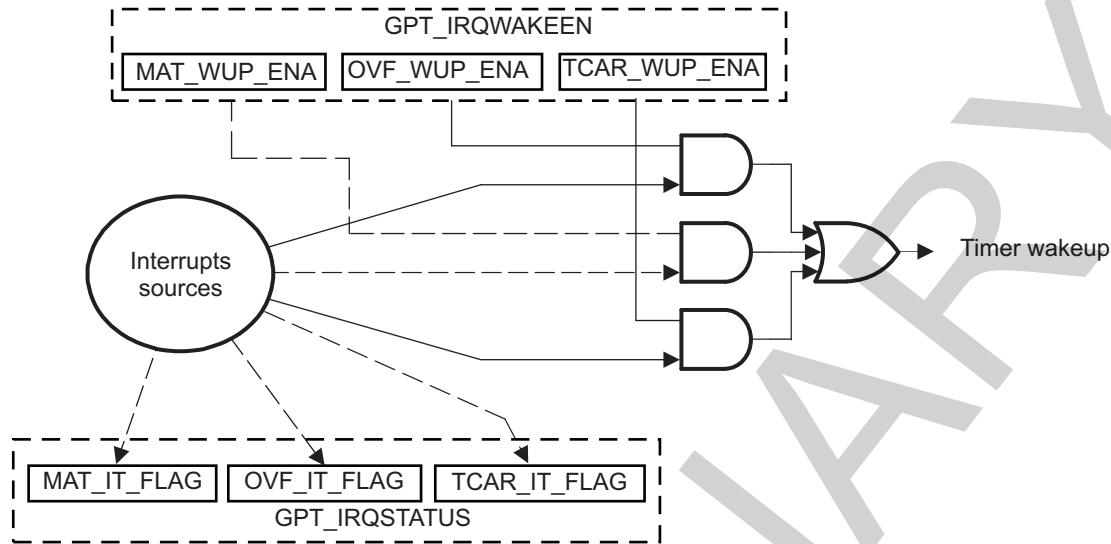
Table 23-7. IDLEMODE Settings

| IDLEMODE Value | Selected Mode | Description |
|----------------|---------------|---|
| 00 | Force-idle | The GP timer unconditionally acknowledges the IDLE request from the PRCM module, regardless of its internal operations. This mode must be used carefully, because it does not prevent the loss of data when the clock is switched off. |
| 01 | No-idle | The GP timer never acknowledges an IDLE request from the PRCM module. This mode is safe from a module point of view, because it ensures that the clocks remain active. It is not efficient from a power-saving perspective, however, because it does not allow the PRCM output clock to be shut off and thus the power domain to be set to a lower power state. |
| 10 | Smart-idle | The GP timer acknowledges the IDLE request, basing its decision on its internal activity. The acknowledge signal is asserted only when all pending transactions and IRQ requests are treated. This is the best approach to efficient system power management. |
| 11 | Reserved | |

23.2.4.3.1 Wake-Up Capability

If the **GPT_TIOCP_CFG**[3:2] IDLEMODE bit field sets the smart-idle mode, the timer evaluates its internal capability to have the interface clock switched off. When there is no further internal activity (no pending interrupt sources: match, overflow, or timer capture events), the idle acknowledge signal is asserted and the timer enters sleep mode, ready to issue a wake-up request. This wake-up request is sent only if the **GPT_IRQWAKEEN**[2:0] bit field enables the timer wake-up capability.

[Figure 23-8](#) shows the wake-up request generation. For more information on the GP timer clock control, see [Section 3.6, Clock Management Functional Description](#) in [Chapter 3, Power, Reset and Clock Management](#).

Figure 23-8. Wake-Up Request Generation

timers-014

When the wake-up event is issued, the associated interrupt status bit is set in the timer status register ([GPT_IRQSTATUS](#)). The pending wake-up event is reset when the set status bit is overwritten with 1.

NOTE: The status bit must be reset to re-enter idle mode.

23.2.4.4 Software Reset

Two bit fields can generate a software reset of the GP timer:

- [GPT1MS_TIOCP_CFG\[1\]](#) SOFTRESET for GPTIMER1, GPTIMER2, and GPTIMER10, and [GPT_TIOCP_CFG\[0\]](#) SOFTRESET for other timers
- [GPT_TSICR\[1\]](#) SFT for all timers

For both bits, all read accesses return 0.

The [GPT1MS_TIOCP_CFG\[1\]](#) SOFTRESET/[GPT_TIOCP_CFG\[0\]](#) SOFTRESET bit allows resetting the functional and interface domains. The [GPT_TSICR\[1\]](#) SFT bit allows resetting the functional part of the GP timer.

Before accessing or using the GP timer, the local host must ensure that both internal resets are released by reading the [GPT_TISTAT\[0\]](#) RESETDONE (for GPTIMER1, GPTIMER2, and GPTIMER10), or the [GPT_TIOCP_CFG\[0\]](#) SOFTRESET bit (for other timers). This bit monitors the internal reset status.

23.2.4.5 GP Timer Interrupts

The timer can issue an overflow interrupt, a timer match interrupt, and a timer capture interrupt. Each internal interrupt source can be independently enabled/disabled in the interrupt-enable register ([GPT_TIER](#) for GPTIMER1, GPTIMER2, and GPTIMER10), or, for other timers, enable in the interrupt-enable register ([GPT_IRQENABLE_SET](#)) and disable in the interrupt disable register ([GPT_IRQENABLE_CLR](#)). When the interrupt event is issued, the associated interrupt status bit is set in the timer status register ([GPT_TISR](#) for GPTIMER1, GPTIMER2, and GPTIMER10, and [GPT_IRQSTATUS](#) for other timers).

23.2.4.6 Timer Mode Functionality

The timer is an upward counter that can be started and stopped at any time through the timer control register ([GPT_TCLR\[0\]](#) ST bit). The timer counter register ([GPT_TCR](#)) can be loaded when stopped or on-the-fly (while counting). [GPT_TCR](#) can be loaded directly by a [GPT_TCR](#) write access with a new

timer value. The `GPT_TCR` register can also be loaded with the value held in the timer-load register `GPT_TLDR` by a trigger register (`GPT_TTGR`) write access. Loading of `GPT_TCR` is done regardless of the `GPT_TTGR` written value. The timer counter register `GPT_TCR` value can be read when stopped, or captured on-the-fly by a `GPT_TCR` read access. The timer is stopped and the counter value is set to 0 when the module reset is asserted. The timer is maintained at stop after the reset is released.

In one-shot mode (the `GPT_TCLR[1]` AR bit set to 0), the counter is stopped after counting overflow occurs (the counter value remains at 0).

When the autoreload mode is enabled (the `GPT_TCLR[1]` AR bit set to 1), the `GPT_TCR` register is reloaded with the timer-load register (`GPT_TLDR`) value after a counting overflow occurs.

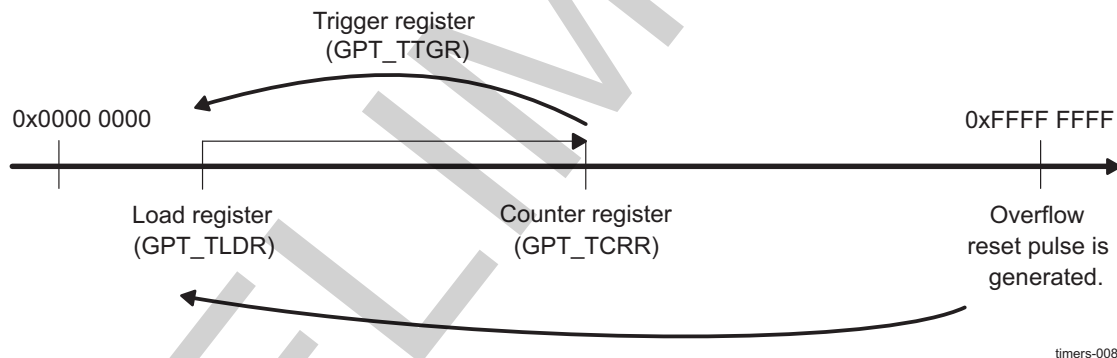
CAUTION

Do not put the overflow value (0xFFFF FFFF) in the `GPT_TLDR` register because it can lead to undesirable results.

An interrupt can be issued on overflow if the overflow interrupt-enable bit is set in the timer interrupt-enable register (`GPT_TIER[1]` OVF_IT_ENA bit set to 1 for GPTIMER1, GPTIMER2, and GPTIMER10, or `GPT_IRQENABLE_SET[1]` OVF_IT_FLAG bit set to 1 for other timers). A dedicated output pin (timer PWM) can be programmed in `GPT_TCLR[12]` through `GPT_TCLR[11:10]` (PT and TRG bits) to generate one positive pulse (prescaler duration) or to invert the current value (toggle mode) when an overflow occurs. The `GPT_TCLR[12]` PT bit selects pulse/toggle modulation (`GPT_TCLR[11:10]` TRG bit field selects trigger mode).

Figure 23-9 shows the `GPT_TCR` timing value.

Figure 23-9. GPT_TCR Timing Value

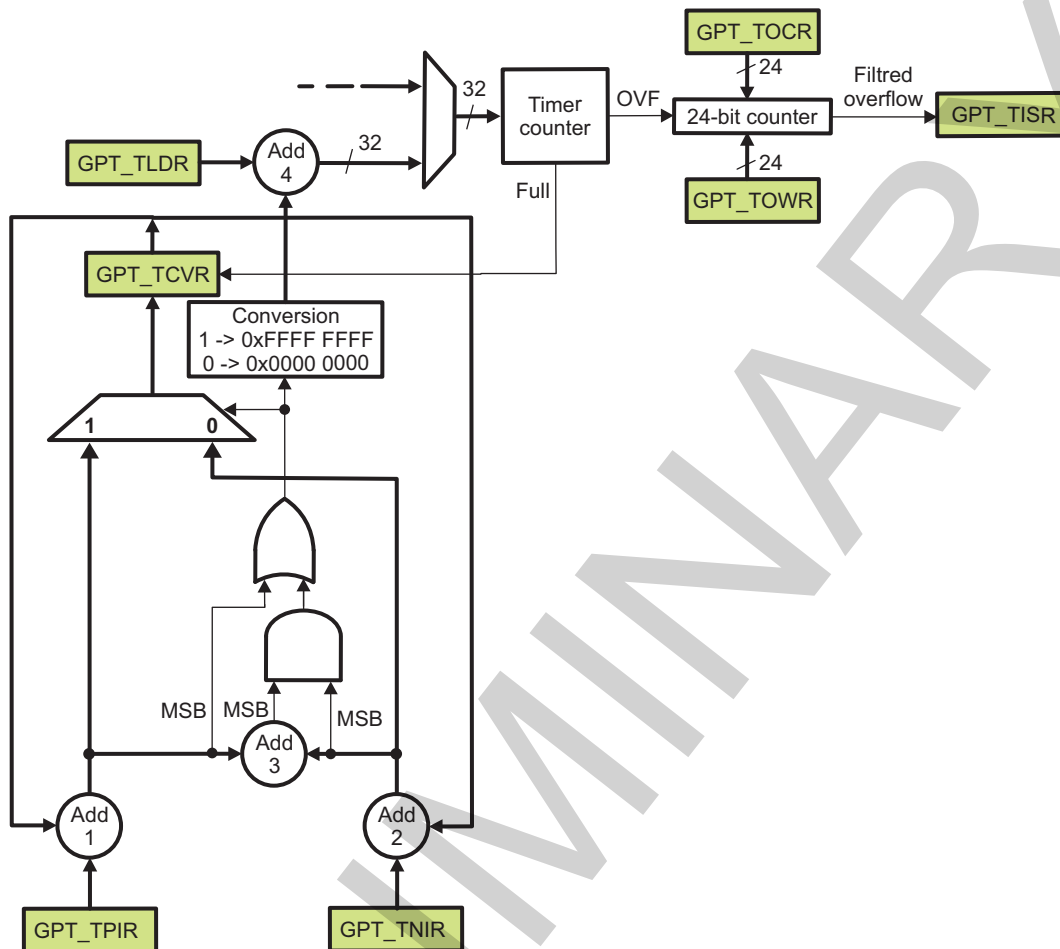


23.2.4.6.1 1-ms Tick Generation (Only GPTIMER1, GPTIMER2, and GPTIMER10)

The interrupt period is not exactly 1 ms because the timer input clock is 32,768 Hz. If the clock counts up to 32, it obtains a 0.977-ms period; if it counts up to 33, it obtains a 1.007-ms period. For large granularity, the error is cumulative and can generate important deviations from the standard value.

To minimize the error between a true 1-ms tick and the tick generated by the 32,768 Hz timer, the sequencing of periods less than 1 ms and periods greater than 1 ms must be shuffled. An additional 1-ms block is used to correct this error. See Figure 23-10.

In this implementation, the increment sequencing is automatically managed by the timer to minimize the error. The user must define only the value of the timer positive increment register (`GPT_TPIR[31:0]` POSITIVE_INC_VALUE bit field) and the timer negative increment register (`GPT_TNIR[31:0]` NEGATIVE_INC_VALUE bit field). An automatic adaptation mechanism is used to simplify the programming model.

Figure 23-10. Block Diagram of the 1-ms Tick Module

timers-009

The **GPT_TPIR**, **GPT_TNIR**, and **GPT_TCVR** registers and adders Add1, Add2, and Add3 are used to define whether the next value loaded in the timer counter register (**GPT_TCCR**[31:0] **TIMER_COUNTER** bit field) is the value of the **GPT_TLDR**[31:0] **LOAD_VALUE** bit field (period less than 1 ms) or the value of **GPT_TLDR**[31:0] **LOAD_VALUE** – 1 (period greater than 1 ms).

Table 23-8 lists the value loaded in the **GPT_TCCR** register according to the sign of the result of Add1, Add2, and Add3.

MSB = 0: Positive value, MSB = 1: Negative value

Table 23-8. Value Loaded in GPT_TCCR to Generate 1-ms Tick

| Add1 MSB | Add2 MSB | Add3 MSB | Value of GPT_TCCR Register |
|----------|----------|----------|--|
| 0 | 0 | 0 | GPT_TLDR [31:0] LOAD_VALUE bit field |
| 0 | 0 | 1 | GPT_TLDR [31:0] LOAD_VALUE bit field |
| 0 | 1 | 0 | GPT_TLDR [31:0] LOAD_VALUE bit field |
| 0 | 1 | 1 | GPT_TLDR [31:0] LOAD_VALUE – 1 |
| 1 | 0 | 0 | N/A |
| 1 | 0 | 1 | N/A |
| 1 | 1 | 0 | GPT_TLDR [31:0] LOAD_VALUE – 1 |
| 1 | 1 | 1 | GPT_TLDR [31:0] LOAD_VALUE – 1 |

The values of the [GPT_TPIR](#) and [GPT_TNIR](#) registers are calculated using the following formula:

- Positive increment value = $(\text{INTEGER}[F_{\text{clk}} * T_{\text{tick}}] + 1) * 1\text{e6} - (F_{\text{clk}} * T_{\text{tick}} * 1\text{e6})$
- Negative increment value = $(\text{INTEGER}[F_{\text{clk}} * T_{\text{tick}}] * 1\text{e6}) - (F_{\text{clk}} * T_{\text{tick}} * 1\text{e6})$

NOTE: Fclk clock frequency (kHz)

Ttick tick period (ms)

The timer overflow counter register ([GPT_TOCR](#)) and the timer overflow wrapping register [GPT_TOWR](#) are used to filter interrupts. When the timer overflows, it increments the 24-bit [GPT_TOCR](#) register. When the 24-bit [GPT_TOCR](#) register values match the value in the 24-bit [GPT_TOWR](#) register and the timer overflow is asserted, the [GPT_TOCR](#) register is reset and an interrupt is generated to the [GPT_TISR](#) register.

With the conversion block in reset state (the positive increment register, negative increment register, and counter value register are zeroed), the programming model and the behavior of GPTIMER1, GPTIMER2, and GPTIMER10 remain unchanged.

For 1-ms tick with a 32,768-Hz clock:

- [GPT_TPIR](#)[31:0] POSITIVE_INC_VALUE = 232000
- [GPT_TNIR](#)[31:0] NEGATIVE_INC_VALUE = -768000
- [GPT_TLDR](#)[31:0] LOAD_VALUE = 0xFFFF FFE0

NOTE: Any value of the tick period can be generated with the appropriate value of the [GPT_TPIR](#), [GPT_TNIR](#), and [GPT_TLDR](#) registers.

By default, the [GPT_TPIR](#), [GPT_TNIR](#), [GPT_TCVR](#), [GPT_TOCR](#), and [GPT_TOWR](#) registers and the associated logic are in reset mode (all 0s) and have no action on the programming model.

23.2.4.7 Capture Mode Functionality

When a transition is detected on the module input pin (EVENT_CAPTURE), the timer value in the [GPT_TCRR](#) register can be captured and saved in the [GPT_TCAR1](#) or TCAR2 register function of the mode selected in the [GPT_TCLR](#)[13] CAPT_MODE bit. The edge detection circuitry monitors transitions on the input pin (EVENT_CAPTURE).

The rising edge, falling edge, or both, can be selected in the [GPT_TCLR](#)[9:8] TCM bit field to trigger the timer counter capture. The module sets the [GPT_TISR](#)[2] TCAR_IT_FLAG bit for GPTIMER1, GPTIMER2, or GPTIMER10, and the [GPT_IRQSTATUS](#)[2] TCAR_IT_FLAG bit for other timers, when an active edge is detected, and at the same time, the counter value [GPT_TCRR](#) is stored in timer capture register [GPT_TCAR1](#) or [GPT_TCAR2](#), as follows:

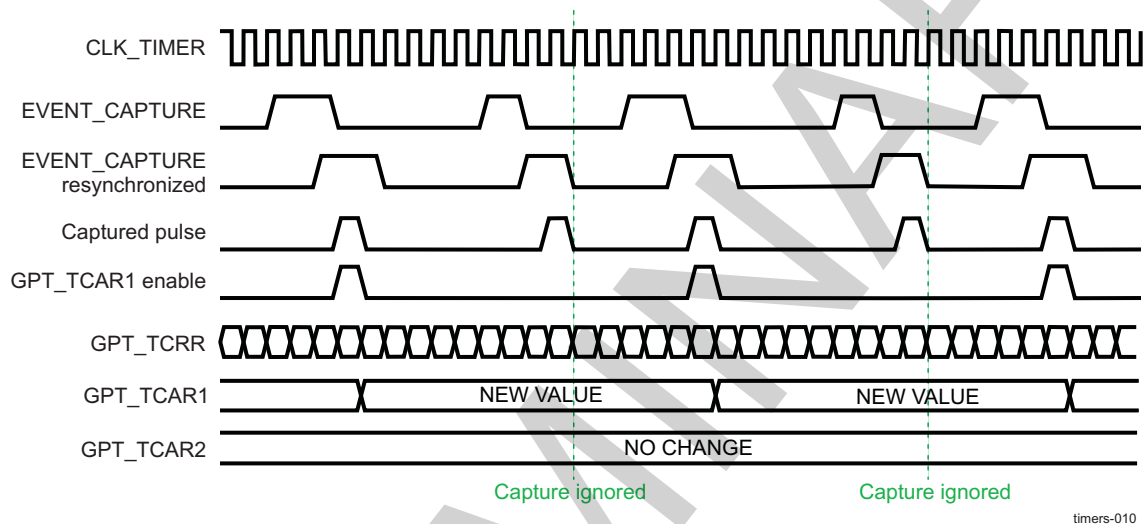
- If the [GPT_TCLR](#)[13] CAPT_MODE bit is 0, on the first enabled capture event, the value of the counter register is saved in the [GPT_TCAR1](#) register, and all the next events are ignored (no update on the [GPT_TCAR1](#) register and no interrupt triggering) until the detection logic is reset or the [GPT_TISR](#)[2] TCAR_IT_FLAG bit (or [GPT_IRQSTATUS](#)[2] TCAR_IT_FLAG, depending on the timer) is cleared by writing 1 to it.
- If the [GPT_TCLR](#)[13] CAPT_MODE bit is 1, on the first enabled capture event, the value of the counter register is saved in the [GPT_TCAR1](#) register, and on the second enabled capture event, the value of the counter register is saved in the [GPT_TCAR2](#) register. If a capture interrupt is enabled, the interrupt triggers on the second event capture. All other events are ignored (no update on [GPT_TCAR1](#)/[GPT_TCAR2](#) and no interrupt triggering) until the detection logic is reset or [GPT_TISR](#)[2] TCAR_IT_FLAG bit (or [GPT_IRQSTATUS](#)[2] TCAR_IT_FLAG, depending on the timer) is cleared by writing 1 to it. This mechanism is useful for period calculation of a clock, if that clock is connected to the EVENT_CAPTURE input pin.

The edge detection logic is reset (a new capture is enabled) when the active capture interrupt is served. The [GPT_TISR](#)[2] TCAR_IT_FLAG bit or the [GPT_IRQSTATUS](#)[2] TCAR_IT_FLAG (previously 1) is cleared by writing 1 to it or when the edge detection mode bits (the [GPT_TCLR](#)[9:8] TCM bit field) are

changed from no-capture mode detection to any other mode. The timer functional clock (input to prescaler) is used to sample the input pin (EVENT_CAPTURE). A negative or positive pulse input can be detected when the pulse time is greater than the functional clock period. An interrupt is issued on edge detection if the capture interrupt-enable bit is set in the [GPT_TIER\[2\]](#) TCAR_IT_ENA bit (for GPTIMER1, GPTIMER2, or GPTIMER10), or in the [GPT_IRQENABLE_SET\[2\]](#) TCAR_EN_FLAG bit (for other timers). See the examples in [Figure 23-11](#) and [Figure 23-12](#).

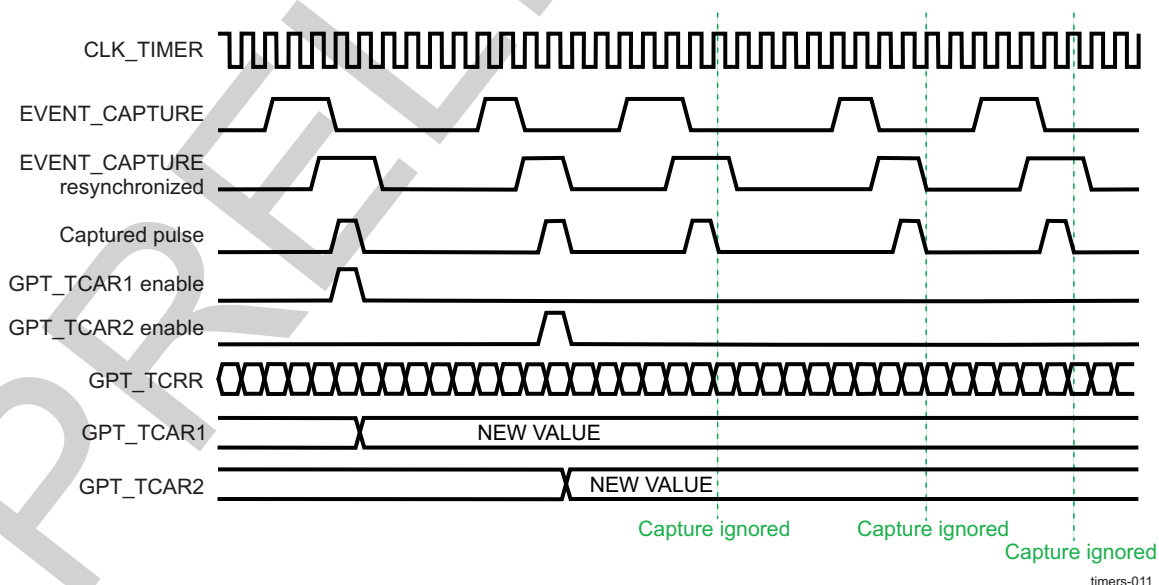
In [Figure 23-11](#), the [GPT_TCLR\[9:8\]](#) TCM bit field value is 0b01, and [GPT_TCLR\[13\]](#) CAPT_MODE bit is 0. Only the rising edge of EVENT_CAPTURE triggers a capture in the [GPT_TCARR1](#) and [GPT_TCARR2](#) registers, and only the [GPT_TCARR1](#) register updates.

Figure 23-11. Capture Wave Example for GPT_TCLR[13] CAPT_MODE = 0



In [Figure 23-12](#), the value of the [GPT_TCLR\[9:8\]](#) TCM bit field is 0b01, and the [GPT_TCLR\[13\]](#) CAPT_MODE bit is 1. Only the rising edge of EVENT_CAPTURE triggers a capture in the [GPT_TCARR1](#) register on the first enabled event, and the [GPT_TCARR2](#) register updates on the second enabled event.

Figure 23-12. Capture Wave Example for GPT_TCLR[13] CAPT_MODE = 1



23.2.4.8 Compare Mode Functionality

When compare enable-register [GPT_TCLR\[6\]](#) CE bit is set to 1, the timer value ([GPT_TCRR\[31:0\]](#))

TIMER_COUNTER bit field) is continuously compared to the value held in the timer match register (**GPT_TMAR**). The **GPT_TMAR**[31:0] COMPARE_VALUE bit field value can be loaded at any time (timer counting or stopped). When the **GPT_TCRR** and the **GPT_TMAR** values match, an interrupt is issued, if the **GPT_TIER**[0] MAT_IT_ENA (for GPTIMER1, GPTIMER2, and GPTIMER10), or **GPT_IRQSTATUS_SET**[0] MAT_EN_FLAG bit (for other timers) is set.

The right programming way is to write a compare value to the **GPT_TMAR** register before setting the **GPT_TCLR**[6] CE bit to prevent any unwanted interrupts due to a reset value matching effect.

The dedicated output pin (timer PWM) can be programmed in the **GPT_TCLR**[12] PT bit through the **GPT_TCLR**[11:10] TRG bit field to generate one positive pulse (timer clock duration) or to invert the current value (toggle mode) when an overflow or a match occurs.

23.2.4.9 Prescaler Functionality

A prescaler can be used to divide the timer counter input clock frequency. The prescaler is enabled when the **GPT_TCLR**[5] PRE bit is set. The **GPT_TCLR**[4:2] PTV bit field sets the second prescaler ratio. The prescaler counter is reset when the timer counter is stopped or reloaded on-the-fly.

Table 23-9 lists the prescaler/timer reload values versus contexts.

Table 23-9. Prescaler/Timer Reload Values Versus Contexts

| Context | Prescaler | Timer Counter |
|----------------------------------|-----------|------------------------|
| Overflow (when autoreload is on) | Reset | GPT_TLDR [31:0] |
| GPT_TCRR write | Reset | GPT_TCRR [31:0] |
| GPT_TTGR write | Reset | GPT_TLDR [31:0] |
| Stop | Reset | Frozen |

23.2.4.10 Pulse-Width Modulation

The timer can be configured to provide a programmable PWM output. The timer PWM output pin can be configured to toggle on an event. The **GPT_TCLR**[11:10] TRG bit field determines on which register value the PWM pin toggles. Either overflow alone or both overflow and match can be selected to toggle the timer PWM pin when a compare condition occurs.

CAUTION

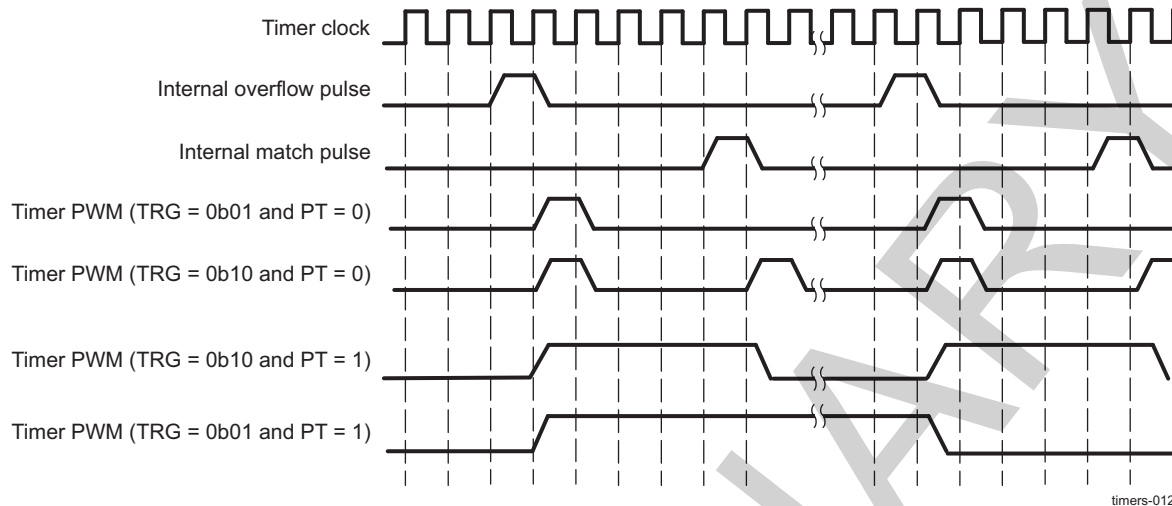
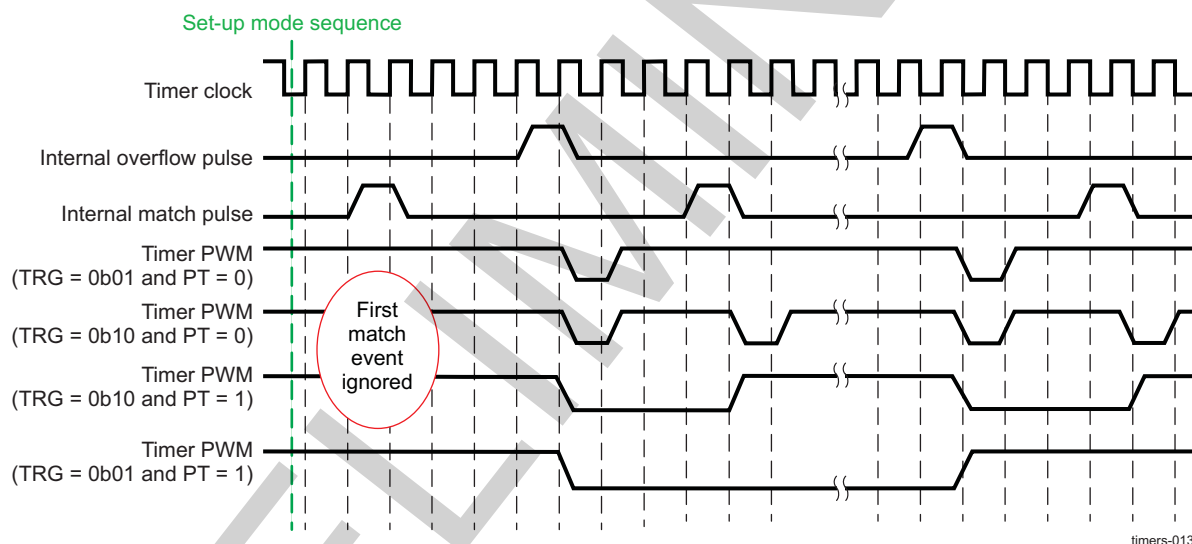
In toggle mode, when **GPT_TCLR**[11:10] TRG = 0x2 (overflow and match), the first event that toggles the PWM line is an overflow event. If a match event occurs first; it does not toggle the PWM line (see Figure 23-14).

The **GPT_TCLR**[7] SCPWM bit can be programmed to set or clear the timer PWM output signal only while the counter is stopped or the trigger is off. This allows setting the output pin to a known state before modulation starts. Modulation synchronously stops when the **GPT_TCLR**[11:10] TRG bit field is cleared and overflow occurs. This allows fixing a deterministic state of the output pin when modulation stops.

In Figure 23-13, the internal overflow pulse is set each time (0xFFFF FFFF - **GPT_TLDR**[31:0] LOAD_VALUE + 1) the value is reached, and the internal match pulse is set when the counter reaches the **GPT_TMAR** register value. Depending on the value of the **GPT_TCLR**[12] PT bit and **GPT_TCLR**[11:10] TRG bit field, the timer provides pulse or PWM event on the output pin (timer PWM).

The **GPT_TLDR** and **GPT_TMAR** registers must keep values below the overflow value (0xFFFF FFFF) by at least two units. In case the PWM trigger events are both overflow and match, the difference between the values kept in the **GPT_TMAR** register and the value in the **GPT_TLDR** register must be at least two units. When match event is used, the compare mode **GPT_TCLR**[6] CE bit must be set.

In Figure 23-13, the **GPT_TCLR**[7] SCPWM bit is set to 0. In Figure 23-14, the **GPT_TCLR**[7] SCPWM bit is set to 1. To obtain the desired wave form, start the counter at 0xFFFF FFFE value (to ensure an overflow first) or adjust the line polarity (**GPT_TCLR**[7] SCPWM bit).

Figure 23-13. Timing Diagram of PWM With GPT_TCLR[7] SCPWM Bit = 0**Figure 23-14. Timing Diagram of PWM With GPT_TCLR[7] SCPWM Bit = 1****23.2.4.11 Timer Counting Rate**

The timer rate is defined by the following values:

- Value of the prescaler fields (the [GPT_TCLR\[5\]](#) PRE bit and the [GPT_TCLR\[4:2\]](#) PTV bit field)
- Value loaded into the timer-load register ([GPT_TLDR](#))

[Table 23-10](#) lists the prescaler clock ratio values.

Table 23-10. Prescaler Clock Ratio Values

| GPT_TCLR[5] PRE | GPT_TCLR[4:2] PTV | Divisor (PS) |
|---------------------------------|-----------------------------------|--------------|
| 0 | X | 1 |
| 1 | 0 | 2 |
| 1 | 1 | 4 |
| 1 | 2 | 8 |
| 1 | 3 | 16 |
| 1 | 4 | 32 |

Table 23-10. Prescaler Clock Ratio Values (continued)

| GPT_TCLR[5] PRE | GPT_TCLR[4:2] PTV | Divisor (PS) |
|------------------------|--------------------------|---------------------|
| 1 | 5 | 64 |
| 1 | 6 | 128 |
| 1 | 7 | 256 |

Thus, the timer overflow rate is expressed as:

$$\text{OVF_Rate} = (0xFFFF FFFF - \text{GPT_TLDR} + 1) * (\text{timer-functional clock period}) * \text{PS}$$

With (timer-functional clock period) = 1/(timer-functional clock frequency) and PS = $2^{(\text{PTV} + 1)}$ if prescaler is enabled, or PS = 1 if prescaler is disabled.

CAUTION

Internal resynchronization causes any write to the **GPT_TCLR[1]** ST bit to have some latency before the register is updated:

2.5 * functional clock cycles write_GPT_TCLR_latency 3.5 * functional clock cycles

Remember to consider this latency whenever the timer must be started or stopped by a software change to the **GPT_TCLR[1]** ST bit.

CAUTION

- In the non-PWM mode, **GPT_TLDR** must be maintained at less than or equal to 0xFFFF FFFE.
- In the PWM mode, **GPT_TLDR** must be maintained at less than or equal to 0xFFFF FFED.

For example, with a timer clock input of 32 kHz and the **GPT_TCLR[5]** PRE bit set to 0, the timer output period is as listed in [Table 23-11](#).

Table 23-11. Value and Corresponding Interrupt Period

| GPT_TLDR[31:0] LOAD_VALUE | Interrupt Period |
|----------------------------------|-------------------------|
| 0x0000 0000 | 39 h |
| 0xFFFF 0000 | 2.1 s |
| 0xFFFF FFF0 | 524 μ s |
| 0xFFFF FFFE | 65.5 μ s |

23.2.4.12 Timer Under Emulation

During emulation mode, the timer continues to run according to the value of the **GPT1MS_TIOCP_CFG[5]/GPT_TIOCP_CFG[1]** EMUFREE bit.

If the **GPT1MS_TIOCP_CFG[5]/GPT_TIOCP_CFG[1]** EMUFREE bit is set to 1, timer execution is not stopped in emulation mode and the interrupt is still generated when overflow or match is reached.

If the **GPT1MS_TIOCP_CFG[5]/GPT_TIOCP_CFG[1]** EMUFREE bit is set to 0, the prescaler and timer are frozen and both resume on exit from emulation mode. The asynchronous external input pin (dmtimer_i_pwm_evt, with i=[8:11]) is internally synchronized on two timer-clock rising edges.

23.2.4.13 Accessing GP Timer Registers

All accesses are nonposted until software reconfiguration. All registers are 32 bits wide, accessible through the L4 interface with 16-bit or 32-bit access (read/write).

Any 16-bit write access must be least-significant bit (LSB) first, and the second write access must be most-significant bit (MSB) first. Write operations to the following GP timer registers can skip the MSB access if it is not necessary to update the 16 MSBs of the register:

- [GPT_TIDR](#)
- [GPT_TIOCP_CFG](#)
- [GPT1MS_TIOCP_CFG](#)
- [GPT_IRQSTATUS_RAW](#)
- [GPT_IRQSTATUS](#)
- [GPT_IRQENABLE_SET](#)
- [GPT_IRQENABLE_CLR](#)
- [GPT_IRQWAKEEN](#)
- [GPT_TISR](#)
- [GPT_TIER](#)
- [GPT_TWER](#)
- [GPT_TSICR](#)

Write operations to the following functional registers must be complete (the MSB must be written even if the MSB data is not used):

- [GPT_TCLR](#)
- [GPT_TCRR](#)
- [GPT_TLDR](#)
- [GPT_TTGR](#)
- [GPT_TMAR](#)
- [GPT_TPIR](#)
- [GPT_TNIR](#)
- [GPT_TCVR](#)
- [GPT_TOCR](#)
- [GPT_TOWR](#)

The following L4 synchronous registers are not affected by the posted/nonposted mode selection; the write/read operation is effective and acknowledged (command accepted) after one L4 clock cycle from command assertion:

- [GPT_TIDR](#)
- [GPT_TIOCP_CFG](#)
- [GPT1MS_TIOCP_CFG](#)
- [GPT_TISTAT](#)
- [GPT_IRQSTATUS](#)
- [GPT_IRQSTATUS_RAW](#)
- [GPT_IRQENABLE_SET](#)
- [GPT_IRQENABLE_CLR](#)
- [GPT_IRQWAKEEN](#)
- [GPT_TWPS](#)
- [GPT_TSICR](#)

23.2.4.13.1 Writing to Timer Registers

The host uses the L4 interface to write to the following registers synchronously with the timer interface clock:

- [GPT_TLDR](#)
- [GPT_TCRR](#)
- [GPT_TCLR](#)
- [GPT_TIOCP_CFG](#)
- [GPT1MS_TIOCP_CFG](#)
- [GPT_IRQSTATUS](#)
- [GPT_IRQENABLE_SET](#)
- [GPT_IRQENABLE_CLR](#)
- [GPT_IRQWAKEEN](#)
- [GPT_TTGR](#)
- [GPT_TSICR](#)
- [GPT_TMAR](#)

GPTIMER1, GPTIMER2, and GPTIMER10 also have the following registers:

- [GPT_TPIR](#)
- [GPT_TNIR](#)
- [GPT_TCVR](#)
- [GPT_TOCR](#)
- [GPT_TOWR](#)
- [GPT_TIER](#)
- [GPT_TISR](#)
- [GPT_TWER](#)

In 16-bit access mode, the 16 LSBs must be written before writing to the 16 MSBs.

23.2.4.13.1.1 Write Posting Synchronization Mode

This mode is used if the [GPT_TSICR](#)[2] POSTED bit is set to 1.

This mode uses a posted write scheme to update any internal register ([GPT_TCLR](#), [GPT_TCRR](#), [GPT_TLDR](#), [GPT_TTGR](#), [GPT_TMAR](#), and [GPT_TPIR](#), [GPT_TNIR](#), [GPT_TCVR](#), [GPT_TOCR](#), and [GPT_TOWR](#) for GPTIMER1, GPTIMER2, and GPTIMER10). Therefore, the write transaction is immediately acknowledged on the L4 interface, although the effective write operation occurs later due to a resynchronization in the timer clock domain. The advantage is that neither the interconnect nor the device that requested the write transaction are stalled.

For each register, a status bit is provided in the timer write-posted status register [GPT_TWPS](#). In this mode, it is mandatory that the software checks this status bit prior to any write access. In case a write is attempted to a register with a previous access pending, the previous access is discarded without notice.

The timer module updates the timer counter register value synchronously with the L4 clock. Consequently, any read access to the timer counter register [GPT_TCRR](#) does not add any resynchronization latency; the current value is always available.

NOTE: Since the overflow IRQ is generated, when the TCRR value reaches 0xFFFF FFFF, and not when it changes its value to the value after overflow, one must wait a delay of (1 * PS * timer-functional clock period) before any read access to the timer counter register [GPT_TCRR](#) to ensure a correct reading of its content.

If a write access is pending for a register, reading from this register does not yield a correct result. Software synchronization must be used to avoid incorrect results.

The drawback of this automatic update mechanism is that it assumes a given relationship between the timer interface frequency and the timer clock frequency.

Functional frequency range: $\text{freq}(\text{timer clock}) < \text{freq}(\text{L4 interface clock})/4$.

23.2.4.13.1.2 Write Nonposting Synchronization Mode

This mode is used if the [GPT_TSICR\[2\]](#) POSTED bit is set to 0. It uses a nonposted write scheme to update any internal register. Therefore, the write transaction is not acknowledged on the L4 interface until the effective write operation occurs after the resynchronization in the timer functional clock domain. The drawback is that both the interconnect and the device that requested the write transaction are stalled during this period.

The same full resynchronization scheme is used for a read transaction, and the same stall period applies. A register read following a write to the same register is always coherent.

This mode is functional regardless of the ratio between the L4 interface frequency and the timer clock frequency.

23.2.4.13.2 Reading From Timer Counter Registers

In 16-bit access mode, reading the 16 LSBs from the timer counter registers ([GPT_TCRR](#), [GPT_TCAR1](#), and [GPT_TCAR2](#)) captures the current timer counter value. This must be followed by reading the 16 MSBs.

IVA3 subsystem 16-bit accesses can be interleaved with MPU subsystem 32-bit accesses.

NOTE: LSB/MSB accesses cannot be interleaved (that is, the sequence LSB register 1, LSB register 2, MSB register 1, MSB register 2 is not supported).

23.2.5 GP Timer Low-Level Programming Models

This section covers the low-level hardware programming sequences for configuration and usage of the module.

23.2.5.1 Global Initialization

23.2.5.1.1 Global Initialization of Surrounding Modules

This section identifies the requirements for initializing the surrounding modules when the GP timer module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the GP timer. For more information, see [Section 23.2.3 GP Timers Integration](#) and [Section 23.2.2, GP Timers Environment](#).

Table 23-12. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|--|
| PRCM | The module interface and functional clocks must be enabled. For more information about the module configuration, see Section 3.1.1.1.2, Module Level Clock Management , in Chapter 3, Power, Reset, and Clock Management . |
| Control Module | The module specific pad muxing must be set in the control module. For more information about the module configuration, see Section 19.4.8 PAD Functional Multiplexing and Configuration , in Chapter 19, Control Module . |
| MPU INTC | The MPU INTC configuration must be done to enable the interrupts from the GP timer module. See Section 4.4.3, Interrupt Controller Registers , in Section 4.4.3, Cortex-A9 MPU Subsystem . |
| DSP INTC | The DSP INTC configuration must be done to enable the interrupts from GP timer module. See , INTC , in Chapter 5, DSP Subsystem . |

23.2.5.1.2 GP Timer Module Global Initialization

23.2.5.1.2.1 Main Sequence – GP Timer Module Global Initialization

This section identifies the main steps for initializing the GP timer module when the module is to be used for the first time.

Table 23-13. GP Timer Module Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|----------------------------------|---|-------|
| Execute software reset. | GPT_TIOCP_CFG[0] SOFTRESET⁽¹⁾ or GPT1MS_TIOCP_CFG[0] SOFTRESET⁽²⁾ | 0x1 |
| Wait until reset release? | GPT_TIOCP_CFG[0] SOFTRESET⁽¹⁾ or GPT1MS_TIOCP_CFG[0] SOFTRESET⁽²⁾ | 0x0 |
| Configure Idle mode. | GPT_TIOCP_CFG[3:2] IDLEMODE⁽¹⁾ or GPT1MS_TIOCP_CFG[4:3] IDLEMODE⁽²⁾ | xx |
| Configure clock activity. | GPT1MS_TIOCP_CFG[9:8] CLOCKACTIVITY⁽²⁾ | xx |
| Configure wake-up feature. | GPT1MS_TIOCP_CFG[2] ENAWAKEUP⁽²⁾ | x |
| Enable wake-up interrupt events. | GPT_IRQWAKEEN[2:0]⁽¹⁾ or GPT_TWER[2:0]⁽²⁾ | x |
| Select posted mode. | GPT_TSICR[2] POSTED | x |

⁽¹⁾ Applies only to GPTIMER3 through GPTIMER9, and GPTIMER11

⁽²⁾ Applies only to GPTIMER1, GPTIMER2, and GPTIMER10

23.2.5.2 Operational Mode Configuration

23.2.5.2.1 GP Timer Mode

23.2.5.2.1.1 Main Sequence – GP Timer Mode Configuration

Table 23-14. GP Timer Mode Configuration

| Step | Register/Bit Field/Programming Model | Value |
|----------------------------|--|-------|
| Select autoreload mode | GPT_TCLR[1] AR | x |
| Set prescale timer value. | GPT_TCLR[4:2] PTV | xxx |
| Enable prescaler. | GPT_TCLR[5] PRE | 0x1 |
| Enable overflow interrupt. | GPT_TIER[1] OVF_IT_ENA⁽¹⁾ or GPT_IRQENABLE_SET[1] OVF_EN_FLAG⁽²⁾ | 0x1 |
| Load timer counter value. | GPT_TCRR | xxx |
| Load timer load value. | GPT_TLDR | xxx |
| Start the timer. | GPT_TCLR[0] ST | 0x1 |

⁽¹⁾ Applies only to GPTIMER1, GPTIMER2, and GPTIMER10.

⁽²⁾ Applies only to GPTIMER3 through GPTIMER 9, and GPTIMER11.

23.2.5.2.2 GP Timer Compare Mode

23.2.5.2.2.1 Main Sequence – GP Timer Compare Mode Configuration

Table 23-15. GP Timer Compare Mode Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------|--------------------------------------|-------|
| Select autoreload mode. | GPT_TCLR[1] AR | x |
| Set prescale timer value. | GPT_TCLR[4:2] PTV | xxx |
| Enable prescaler. | GPT_TCLR[5] PRE | 0x1 |

Table 23-15. GP Timer Compare Mode Configuration (continued)

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------|--|-------|
| Enable match interrupt. | GPT_TIER[0] MAT_IT_ENA⁽¹⁾ or GPT_IRQENABLE_SET[0] MAT_EN_FLAG⁽²⁾ | 0x1 |
| Load timer counter value. | GPT_TCR | xxx |
| Load timer compare value. | GPT_TMAR | xxx |
| Enable Compare mode. | GPT_TCLR[6] CE | 0x1 |
| Start the timer. | GPT_TCLR[0] ST | 0x1 |

⁽¹⁾ Applies only to GPTIMER1, GPTIMER2, and GPTIMER10.

⁽²⁾ Applies only to GPTIMER3 through GPTIMER9, and GPTIMER11.

23.2.5.2.3 GP Timer Capture Mode

23.2.5.2.3.1 Main Sequence – GP Timer Capture Mode Configuration

Table 23-16. GP Timer Capture Mode Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------|--|-------|
| Initialize capture mode. | See Section 23.2.5.2.3.2 . | |
| Enable capture interrupt. | GPT_TIER[2] TCAR_IT_ENA⁽¹⁾ or GPT_IRQENABLE_SET[2] TCAR_EN_FLAG⁽²⁾ | 0x1 |
| Start the timer. | GPT_TCLR[0] ST | 0x1 |
| Detect event. | See Section 23.2.5.2.3.3 . | |

⁽¹⁾ Applies only to GPTIMER1, GPTIMER2, and GPTIMER10.

⁽²⁾ Applies only to GPTIMER3 through GPTIMER9, and GPTIMER11.

23.2.5.2.3.2 Subsequence – Initialize Capture Mode

Table 23-17. Initialize Capture Mode

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Select autoreload mode. | GPT_TCLR[1] AR | x |
| Set prescale timer value. | GPT_TCLR[4:2] PTV | xxx |
| Enable prescaler. | GPT_TCLR[5] PRE | 0x1 |
| Select GPTx (where x = 8 to 11). Capture input at device pin dmtimerx_pwm_evt. | GPT_TCLR[14] GPO_CFG⁽¹⁾ | 0x1 |
| Select single or second event capture. | GPT_TCLR[13] CAPT_MODE | x |
| Select transition capture mode. | GPT_TCLR[9:8] TCM | xx |

⁽¹⁾ Applies only to GPTIMER8 through GPTIMER11

23.2.5.2.3.3 Subsequence – Detect Event

Table 23-18. Detect Event

| Step | Register/Bit Field/Programming Model | Value |
|----------------------------|---|-------|
| Wait until event detected? | GPT_TISR[2] TCAR_IT_FLAG⁽¹⁾ or GPT_IRQSTATUS[2] TCAR_IT_FLAG⁽²⁾ | = 0x1 |
| Read Timer capture value. | GPT_TCAR1 and/or GPT_TCAR2 | |

⁽¹⁾ Applies only to GPTIMER1, GPTIMER2, and GPTIMER10.

⁽²⁾ Applies only to GPTIMER3 through GPTIMER9, and GPTIMER11.

Table 23-18. Detect Event (continued)

| Step | Register/Bit Field/Programming Model | Value |
|----------------------------------|--|-------|
| Clear capture interrupt request. | GPT_TISR [2] TCAR_IT_FLAG ⁽¹⁾ or GPT_IRQSTATUS [2] TCAR_IT_FLAG ⁽²⁾ | 0x1 |

23.2.5.2.4 GP Timer PWM Mode

23.2.5.2.4.1 Main Sequence – GP Timer PWM Mode Configuration

Table 23-19. GP Timer PWM Mode Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Select autoreload mode. | GPT_TCLR [1] AR | x |
| Set prescale timer value. | GPT_TCLR [4:2] PTV | xxx |
| Enable prescaler. | GPT_TCLR [5] PRE | 0x1 |
| Select trigger output mode. | GPT_TCLR [11:10] TRG | xx |
| Select pulse or toggle modulation PWM mode. | GPT_TCLR [12] PT | x |
| Select GPTx (where x = 8 to 11) pwm output at device pin dmtimerx_pwm_evt. | GPT_TCLR [14] GPO_CFG ⁽¹⁾ | 0x0 |
| Configure PWM output pin default value. | GPT_TCLR [7] SCPWM | x |
| Load timer load value. | GPT_TLDR | xxx |
| Load timer compare value. | GPT_TMAR | xxx |
| Enable compare. | GPT_TCLR [6] CE | 0x1 |
| Start the timer. | GPT_TCLR [0] ST | 0x1 |

⁽¹⁾ Applies only to GPTIMER8 through GPTIMER11

23.2.6 GP Timer Register Manual

23.2.6.1 GP Timer Instance Summary

Table 23-20 lists the base address and block size for the GP timer module instances.

Table 23-20. GP Timer Instance Summary

| Module Name | Base Address L4 Interconnect | Base Address L3 Interconnect | Base Address Cortex-A9 Private Access | Base Address DSP Private Access | Size |
|-------------|---------------------------------|---------------------------------|---|---------------------------------------|------|
| GPTIMER2 | 0x4803 2000 | - | - | - | 4 KB |
| GPTIMER3 | 0x4803 4000 | - | - | - | 4 KB |
| GPTIMER4 | 0x4803 6000 | - | - | - | 4 KB |
| GPTIMER9 | 0x4803 E000 | - | - | - | 4 KB |
| GPTIMER10 | 0x4808 6000 | - | - | - | 4 KB |
| GPTIMER11 | 0x4808 8000 | - | - | - | 4 KB |
| GPTIMER5 | - | 0x4903 8000 | 0x4013 8000 | 0x01D3 8000 | 4 KB |
| GPTIMER6 | - | 0x4903 A000 | 0x4013 A000 | 0x01D3 A000 | 4 KB |
| GPTIMER7 | - | 0x4903 C000 | 0x4013 C000 | 0x01D3 C000 | 4 KB |
| GPTIMER8 | - | 0x4903 E000 | 0x4013 E000 | 0x01D3 E000 | 4 KB |
| GPTIMER1 | 0x4A31 8000 | - | - | - | 4 KB |

NOTE: Private Access is an access which is not using the L3/L4 interconnects.

23.2.6.2 GP Timer Registers

23.2.6.2.1 GP Timer Register Summary

CAUTION

The GP timer registers are limited to 32-bit and 16-bit data accesses; 8-bit access is not allowed and can corrupt the register content.

Table 23-21 through Table 23-27 provide the register summary and associated offset addresses for the 11 GP timer internal registers.

Table 23-21. GPTIMER1, GPTIMER2, and GPTIMER10 Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | GPTIMER1 Physical Address L4 Interconnect | GPTIMER2 Physical Address L4 Interconnect | GPTIMER10 Physical Address L4 Interconnect |
|------------------|------|-----------------------|----------------|---|---|--|
| GPT_TIDR | R | 32 | 0x0000 0000 | 0x4A31 8000 | 0x4803 2000 | 0x4808 6000 |
| GPT1MS_TIOCP_CFG | RW | 32 | 0x0000 0010 | 0x4A31 8010 | 0x4803 2010 | 0x4808 6010 |
| GPT_TISTAT | R | 32 | 0x0000 0014 | 0x4A31 8014 | 0x4803 2014 | 0x4808 6014 |
| GPT_TISR | RW | 32 | 0x0000 0018 | 0x4A31 8018 | 0x4803 2018 | 0x4808 6018 |
| GPT_TIER | RW | 32 | 0x0000 001C | 0x4A31 801C | 0x4803 201C | 0x4808 601C |
| GPT_TWER | RW | 32 | 0x0000 0020 | 0x4A31 8020 | 0x4803 2020 | 0x4808 6020 |
| GPT_TCLR | RW | 32 | 0x0000 0024 | 0x4A31 8024 | 0x4803 2024 | 0x4808 6024 |
| GPT_TCRR | RW | 32 | 0x0000 0028 | 0x4A31 8028 | 0x4803 2028 | 0x4808 6028 |
| GPT_TLDR | RW | 32 | 0x0000 002C | 0x4A31 802C | 0x4803 202C | 0x4808 602C |
| GPT_TTGR | RW | 32 | 0x0000 0030 | 0x4A31 8030 | 0x4803 2030 | 0x4808 6030 |
| GPT_TWPS | R | 32 | 0x0000 0034 | 0x4A31 8034 | 0x4803 2034 | 0x4808 6034 |
| GPT_TMAR | RW | 32 | 0x0000 0038 | 0x4A31 8038 | 0x4803 2038 | 0x4808 6038 |
| GPT_TCAR1 | R | 32 | 0x0000 003C | 0x4A31 803C | 0x4803 203C | 0x4808 603C |
| GPT_TSICR | RW | 32 | 0x0000 0040 | 0x4A31 8040 | 0x4803 2040 | 0x4808 6040 |
| GPT_TCAR2 | R | 32 | 0x0000 0044 | 0x4A31 8044 | 0x4803 2044 | 0x4808 6044 |
| GPT_TPIR | RW | 32 | 0x0000 0048 | 0x4A31 8048 | 0x4803 2048 | 0x4808 6048 |
| GPT_TNIR | RW | 32 | 0x0000 004C | 0x4A31 804C | 0x4803 204C | 0x4808 604C |
| GPT_TCVR | RW | 32 | 0x0000 0050 | 0x4A31 8050 | 0x4803 2050 | 0x4808 6050 |
| GPT_TOCR | RW | 32 | 0x0000 0054 | 0x4A31 8054 | 0x4803 2054 | 0x4808 6054 |
| GPT_TOWR | RW | 32 | 0x0000 0058 | 0x4A31 8058 | 0x4803 2058 | 0x4808 6058 |

Table 23-22. GPTIMER3 and GPTIMER4 Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | GPTIMER3 Physical Address L4 Interconnect | GPTIMER4 Physical Address L4 Interconnect |
|-------------------|------|-----------------------|----------------|---|---|
| GPT_TIDR | R | 32 | 0x0000 0000 | 0x4803 4000 | 0x4803 6000 |
| GPT_TIOCP_CFG | RW | 32 | 0x0000 0010 | 0x4803 4010 | 0x4803 6010 |
| RESERVED | | | 0x0000 0020 | 0x4803 4020 | 0x4803 6020 |
| GPT_IRQSTATUS_RAW | RW | 32 | 0x0000 0024 | 0x4803 4024 | 0x4803 6024 |
| GPT_IRQSTATUS | RW | 32 | 0x0000 0028 | 0x4803 4028 | 0x4803 6028 |
| GPT_IRQENABLE_SET | RW | 32 | 0x0000 002C | 0x4803 402C | 0x4803 602C |
| GPT_IRQENABLE_CLR | RW | 32 | 0x0000 0030 | 0x4803 4030 | 0x4803 6030 |
| GPT_IRQWAKEEN | RW | 32 | 0x0000 0034 | 0x4803 4034 | 0x4803 6034 |
| GPT_TCLR | RW | 32 | 0x0000 0038 | 0x4803 4038 | 0x4803 6038 |
| GPT_TCRR | RW | 32 | 0x0000 003C | 0x4803 403C | 0x4803 603C |
| GPT_TLDR | RW | 32 | 0x0000 0040 | 0x4803 4040 | 0x4803 6040 |
| GPT_TTGR | RW | 32 | 0x0000 0044 | 0x4803 4044 | 0x4803 6044 |
| GPT_TWPS | R | 32 | 0x0000 0048 | 0x4803 4048 | 0x4803 6048 |
| GPT_TMAR | RW | 32 | 0x0000 004C | 0x4803 404C | 0x4803 604C |
| GPT_TCAR1 | R | 32 | 0x0000 0050 | 0x4803 4050 | 0x4803 6050 |
| GPT_TSICR | RW | 32 | 0x0000 0054 | 0x4803 4054 | 0x4803 6054 |
| GPT_TCAR2 | R | 32 | 0x0000 0058 | 0x4803 4058 | 0x4803 6058 |

Table 23-23. GPTIMER5 Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | GPTIMER5 Physical Address L3 Interconnect | GPTIMER5 Physical Address Cortex-A9 Private Access | GPTIMER5 Physical Address DSP Private Access |
|-------------------|------|-----------------------|----------------|--|---|---|
| GPT_TIDR | R | 32 | 0x0000 0000 | 0x4903 8000 | 0x4013 8000 | 0x01D3 8000 |
| GPT_TIOCP_CFG | RW | 32 | 0x0000 0010 | 0x4903 8010 | 0x4013 8010 | 0x01D3 8010 |
| RESERVED | | | 0x0000 0020 | 0x4903 8020 | 0x4013 8020 | 0x01D3 8020 |
| GPT_IRQSTATUS_RAW | RW | 32 | 0x0000 0024 | 0x4903 8024 | 0x4013 8024 | 0x01D3 8024 |
| GPT_IRQSTATUS | RW | 32 | 0x0000 0028 | 0x4903 8028 | 0x4013 8028 | 0x01D3 8028 |
| GPT_IRQENABLE_SET | RW | 32 | 0x0000 002C | 0x4903 802C | 0x4013 802C | 0x01D3 802C |
| GPT_IRQENABLE_CLR | RW | 32 | 0x0000 0030 | 0x4903 8030 | 0x4013 8030 | 0x01D3 8030 |
| GPT_IRQWAKEEN | RW | 32 | 0x0000 0034 | 0x4903 8034 | 0x4013 8034 | 0x01D3 8034 |
| GPT_TCLR | RW | 32 | 0x0000 0038 | 0x4903 8038 | 0x4013 8038 | 0x01D3 8038 |
| GPT_TCRR | RW | 32 | 0x0000 003C | 0x4903 803C | 0x4013 803C | 0x01D3 803C |
| GPT_TLDR | RW | 32 | 0x0000 0040 | 0x4903 8040 | 0x4013 8040 | 0x01D3 8040 |
| GPT_TTGR | RW | 32 | 0x0000 0044 | 0x4903 8044 | 0x4013 8044 | 0x01D3 8044 |
| GPT_TWPS | R | 32 | 0x0000 0048 | 0x4903 8048 | 0x4013 8048 | 0x01D3 8048 |
| GPT_TMAR | RW | 32 | 0x0000 004C | 0x4903 804C | 0x4013 804C | 0x01D3 804C |
| GPT_TCAR1 | R | 32 | 0x0000 0050 | 0x4903 8050 | 0x4013 8050 | 0x01D3 8050 |
| GPT_TSICR | RW | 32 | 0x0000 0054 | 0x4903 8054 | 0x4013 8054 | 0x01D3 8054 |
| GPT_TCAR2 | R | 32 | 0x0000 0058 | 0x4903 8058 | 0x4013 8058 | 0x01D3 8058 |

Table 23-24. GPTIMER6 Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | GPTIMER6 Physical Address L3 Interconnect | GPTIMER6 Physical Address Cortex-A9 Private Access | GPTIMER6 Physical Address DSP Private Access |
|-------------------|------|-----------------------|----------------|--|---|---|
| GPT_TIDR | R | 32 | 0x0000 0000 | 0x4903 A000 | 0x4013 A000 | 0x01D3 A000 |
| GPT_TIOCP_CFG | RW | 32 | 0x0000 0010 | 0x4903 A010 | 0x4013 A010 | 0x01D3 A010 |
| RESERVED | | | 0x0000 0020 | 0x4903 A020 | 0x4013 A020 | 0x01D3 A020 |
| GPT_IRQSTATUS_RAW | RW | 32 | 0x0000 0024 | 0x4903 A024 | 0x4013 A024 | 0x01D3 A024 |
| GPT_IRQSTATUS | RW | 32 | 0x0000 0028 | 0x4903 A028 | 0x4013 A028 | 0x01D3 A028 |
| GPT_IRQENABLE_SET | RW | 32 | 0x0000 002C | 0x4903 A02C | 0x4013 A02C | 0x01D3 A02C |
| GPT_IRQENABLE_CLR | RW | 32 | 0x0000 0030 | 0x4903 A030 | 0x4013 A030 | 0x01D3 A030 |
| GPT_IRQWAKEEN | RW | 32 | 0x0000 0034 | 0x4903 A034 | 0x4013 A034 | 0x01D3 A034 |
| GPT_TCLR | RW | 32 | 0x0000 0038 | 0x4903 A038 | 0x4013 A038 | 0x01D3 A038 |
| GPT_TCRR | RW | 32 | 0x0000 003C | 0x4903 A03C | 0x4013 A03C | 0x01D3 A03C |
| GPT_TLDR | RW | 32 | 0x0000 0040 | 0x4903 A040 | 0x4013 A040 | 0x01D3 A040 |
| GPT_TTGR | RW | 32 | 0x0000 0044 | 0x4903 A044 | 0x4013 A044 | 0x01D3 A044 |
| GPT_TWPS | R | 32 | 0x0000 0048 | 0x4903 A048 | 0x4013 A048 | 0x01D3 A048 |
| GPT_TMAR | RW | 32 | 0x0000 004C | 0x4903 A04C | 0x4013 A04C | 0x01D3 A04C |
| GPT_TCAR1 | R | 32 | 0x0000 0050 | 0x4903 A050 | 0x4013 A050 | 0x01D3 A050 |
| GPT_TSICR | RW | 32 | 0x0000 0054 | 0x4903 A054 | 0x4013 A054 | 0x01D3 A054 |
| GPT_TCAR2 | R | 32 | 0x0000 0058 | 0x4903 A058 | 0x4013 A058 | 0x01D3 A058 |

Table 23-25. GPTIMER7 Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | GPTIMER7 Physical Address L3 Interconnect | GPTIMER7 Physical Address Cortex-A9 Private Access | GPTIMER7 Physical Address DSP Private Access |
|-------------------|------|-----------------------|----------------|---|--|--|
| GPT_TIDR | R | 32 | 0x0000 0000 | 0x4903 C000 | 0x4013 C000 | 0x01D3 C000 |
| GPT_TIOCP_CFG | RW | 32 | 0x0000 0010 | 0x4903 C010 | 0x4013 C010 | 0x01D3 C010 |
| RESERVED | | | 0x0000 0020 | 0x4903 C020 | 0x4013 C020 | 0x01D3 C020 |
| GPT_IRQSTATUS_RAW | RW | 32 | 0x0000 0024 | 0x4903 C024 | 0x4013 C024 | 0x01D3 C024 |
| GPT_IRQSTATUS | RW | 32 | 0x0000 0028 | 0x4903 C028 | 0x4013 C028 | 0x01D3 C028 |
| GPT_IRQENABLE_SET | RW | 32 | 0x0000 002C | 0x4903 C02C | 0x4013 C02C | 0x01D3 C02C |
| GPT_IRQENABLE_CLR | RW | 32 | 0x0000 0030 | 0x4903 C030 | 0x4013 C030 | 0x01D3 C030 |
| GPT_IRQWAKEEN | RW | 32 | 0x0000 0034 | 0x4903 C034 | 0x4013 C034 | 0x01D3 C034 |
| GPT_TCLR | RW | 32 | 0x0000 0038 | 0x4903 C038 | 0x4013 C038 | 0x01D3 C038 |
| GPT_TCRR | RW | 32 | 0x0000 003C | 0x4903 C03C | 0x4013 C03C | 0x01D3 C03C |
| GPT_TLDR | RW | 32 | 0x0000 0040 | 0x4903 C040 | 0x4013 C040 | 0x01D3 C040 |
| GPT_TTGR | RW | 32 | 0x0000 0044 | 0x4903 C044 | 0x4013 C044 | 0x01D3 C044 |
| GPT_TWPS | R | 32 | 0x0000 0048 | 0x4903 C048 | 0x4013 C048 | 0x01D3 C048 |
| GPT_TMAR | RW | 32 | 0x0000 004C | 0x4903 C04C | 0x4013 C04C | 0x01D3 C04C |
| GPT_TCAR1 | R | 32 | 0x0000 0050 | 0x4903 C050 | 0x4013 C050 | 0x01D3 C050 |
| GPT_TSICR | RW | 32 | 0x0000 0054 | 0x4903 C054 | 0x4013 C054 | 0x01D3 C054 |
| GPT_TCAR2 | R | 32 | 0x0000 0058 | 0x4903 C058 | 0x4013 C058 | 0x01D3 C058 |

Table 23-26. GPTIMER8 Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | GPTIMER8 Physical Address L3 Interconnect | GPTIMER8 Physical Address Cortex-A9 Private Access | GPTIMER8 Physical Address DSP Private Access |
|-------------------|------|-----------------------|----------------|---|--|--|
| GPT_TIDR | R | 32 | 0x0000 0000 | 0x4903 E000 | 0x4013 E000 | 0x01D3 E000 |
| GPT_TIOCP_CFG | RW | 32 | 0x0000 0010 | 0x4903 E010 | 0x4013 E010 | 0x01D3 E010 |
| RESERVED | | | 0x0000 0020 | 0x4903 E020 | 0x4013 E020 | 0x01D3 E020 |
| GPT_IRQSTATUS_RAW | RW | 32 | 0x0000 0024 | 0x4903 E024 | 0x4013 E024 | 0x01D3 E024 |
| GPT_IRQSTATUS | RW | 32 | 0x0000 0028 | 0x4903 E028 | 0x4013 E028 | 0x01D3 E028 |
| GPT_IRQENABLE_SET | RW | 32 | 0x0000 002C | 0x4903 E02C | 0x4013 E02C | 0x01D3 E02C |
| GPT_IRQENABLE_CLR | RW | 32 | 0x0000 0030 | 0x4903 E030 | 0x4013 E030 | 0x01D3 E030 |
| GPT_IRQWAKEEN | RW | 32 | 0x0000 0034 | 0x4903 E034 | 0x4013 E034 | 0x01D3 E034 |
| GPT_TCLR | RW | 32 | 0x0000 0038 | 0x4903 E038 | 0x4013 E038 | 0x01D3 E038 |
| GPT_TCRR | RW | 32 | 0x0000 003C | 0x4903 E03C | 0x4013 E03C | 0x01D3 E03C |
| GPT_TLDR | RW | 32 | 0x0000 0040 | 0x4903 E040 | 0x4013 E040 | 0x01D3 E040 |
| GPT_TTGR | RW | 32 | 0x0000 0044 | 0x4903 E044 | 0x4013 E044 | 0x01D3 E044 |
| GPT_TWPS | R | 32 | 0x0000 0048 | 0x4903 E048 | 0x4013 E048 | 0x01D3 E048 |
| GPT_TMAR | RW | 32 | 0x0000 004C | 0x4903 E04C | 0x4013 E04C | 0x01D3 E04C |
| GPT_TCAR1 | R | 32 | 0x0000 0050 | 0x4903 E050 | 0x4013 E050 | 0x01D3 E050 |
| GPT_TSICR | RW | 32 | 0x0000 0054 | 0x4903 E054 | 0x4013 E054 | 0x01D3 E054 |
| GPT_TCAR2 | R | 32 | 0x0000 0058 | 0x4903 E058 | 0x4013 E058 | 0x01D3 E058 |

Table 23-27. GPTIMER9 and GPTIMER11 Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | GPTIMER9 Physical Address L4 Interconnect | GPTIMER11 Physical Address L4 Interconnect |
|-------------------|------|-----------------------|----------------|---|--|
| GPT_TIDR | R | 32 | 0x0000 0000 | 0x4803 E000 | 0x4808 8000 |
| GPT_TIOCP_CFG | RW | 32 | 0x0000 0010 | 0x4803 E010 | 0x4808 8010 |
| RESERVED | | | 0x0000 0020 | 0x4803 E020 | 0x4808 8020 |
| GPT_IRQSTATUS_RAW | RW | 32 | 0x0000 0024 | 0x4803 E024 | 0x4808 8024 |
| GPT_IRQSTATUS | RW | 32 | 0x0000 0028 | 0x4803 E028 | 0x4808 8028 |
| GPT_IRQENABLE_SET | RW | 32 | 0x0000 002C | 0x4803 E02C | 0x4808 802C |
| GPT_IRQENABLE_CLR | RW | 32 | 0x0000 0030 | 0x4803 E030 | 0x4808 8030 |
| GPT_IRQWAKEEN | RW | 32 | 0x0000 0034 | 0x4803 E034 | 0x4808 8034 |
| GPT_TCLR | RW | 32 | 0x0000 0038 | 0x4803 E038 | 0x4808 8038 |
| GPT_TCRR | RW | 32 | 0x0000 003C | 0x4803 E03C | 0x4808 803C |
| GPT_TLDR | RW | 32 | 0x0000 0040 | 0x4803 E040 | 0x4808 8040 |
| GPT_TTGR | RW | 32 | 0x0000 0044 | 0x4803 E044 | 0x4808 8044 |
| GPT_TWPS | R | 32 | 0x0000 0048 | 0x4803 E048 | 0x4808 8048 |
| GPT_TMAR | RW | 32 | 0x0000 004C | 0x4803 E04C | 0x4808 804C |
| GPT_TCAR1 | R | 32 | 0x0000 0050 | 0x4803 E050 | 0x4808 8050 |
| GPT_TSICR | RW | 32 | 0x0000 0054 | 0x4803 E054 | 0x4808 8054 |
| GPT_TCAR2 | R | 32 | 0x0000 0058 | 0x4803 E058 | 0x4808 8058 |

23.2.6.2.2 GP Timer Register Description

Table 23-28. GPT TIDR

| Address Offset | Physical Address | Instance |
|----------------|------------------|--------------------|
| 0x0000 0000 | | |
| | 0x4A31 8000 | GPTIMER1_L4 |
| | 0x4803 2000 | GPTIMER2_L4 |
| | 0x4808 6000 | GPTIMER10_L4 |
| | 0x4803 4000 | GPTIMER3_L4 |
| | 0x4803 6000 | GPTIMER4_L4 |
| | 0x4903 8000 | GPTIMER5_L3 |
| | 0x4013 8000 | GPTIMER5_CORTEX-A9 |
| | 0x01D3 8000 | GPTIMER5_DSP |
| | 0x4903 A000 | GPTIMER6_L3 |
| | 0x4013 A000 | GPTIMER6_CORTEX-A9 |
| | 0x01D3 A000 | GPTIMER6_DSP |
| | 0x4903 C000 | GPTIMER7_L3 |
| | 0x4013 C000 | GPTIMER7_CORTEX-A9 |
| | 0x01D3 C000 | GPTIMER7_DSP |
| | 0x4903 E000 | GPTIMER8_L3 |
| | 0x4013 E000 | GPTIMER8_CORTEX-A9 |
| | 0x01D3 E000 | GPTIMER8_DSP |
| | 0x4803 E000 | GPTIMER9_L4 |
| | 0x4808 8000 | GPTIMER11_L4 |

| Description |
|---|
| This read-only register contains the revision number of the module. A write to this register has no effect. This register is used by software to track features, bugs, and compatibility. |

| Type |
|------|
| R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|--------------------|
| 31: 0 | REVISION | IP Revision | R | 0x- ⁽¹⁾ |

(1) TI internal data

Table 23-29. Register Call Summary for Register GPT_TIDR

General-Purpose Timers

- [Accessing GP Timer Registers: \[0\] \[1\]](#)
- [GP Timer Register Summary: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)

Table 23-30. GPT_TIOCP_CFG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0010 | | |
| Physical Address | 0x4803 4010 0x4803 6010 0x4903 8010 0x4013 8010 0x01D3 8010 0x4903 A010 0x4013 A010 0x01D3 A010 0x4903 C010 0x4013 C010 0x01D3 C010 0x4903 E010 0x4013 E010 0x01D3 E010 0x4803 E010 0x4808 8010 | Instance | GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | This register controls the various parameters of the L4 interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------|---|---------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | IDLEMODE | | EMUFREE | SOFTRESET |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3:2 | IDLEMODE | Power management, req/ack control 0x0: Force-idle mode: local target idle state follows (acknowledges) the system idle requests unconditionally, that is, regardless of the IP module internal requirements. Back-up mode, for debug only. 0x1: No-idle mode: local target never enters idle state. Back-up mode, for debug only. 0x2: Smart-idle mode: local target idle state eventually follows (acknowledges) the system idle requests, depending on the IP module internal requirements. IP module should not generate (IRQ- or DMA-request-related) wake-up events. 0x3: Smart-idle wake-up-capable mode: local target idle state eventually follows (acknowledges) the system idle requests, depending on the IP module internal requirements. IP module may generate (IRQ- or DMA-request-related) wake-up events when in idle state. Mode is only relevant if the appropriate IP module <i>wake-up</i> output(s) is (are) implemented. | RW | 0x0 |
| 1 | EMUFREE | Emulation mode 0x0: The timer is frozen in emulation mode (PINSUSPENDN signal active). 0x1: The timer runs free, regardless of PINSUSPENDN value. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | SOFTRESET | Software reset 0x0: Read 0: reset done, no pending action Write 0: No action 0x1: Read 1: initiate software reset Write 1: Reset ongoing | RW | 0 |

Table 23-31. Register Call Summary for Register GPT_TIOCP_CFG

General-Purpose Timers

- [Power Management of Other GP Timers: \[0\]](#)
- [Wake-Up Capability: \[1\]](#)
- [Software Reset: \[2\] \[3\] \[4\]](#)
- [Timer Under Emulation: \[5\] \[6\] \[7\]](#)
- [Accessing GP Timer Registers: \[8\] \[9\]](#)
- [Writing to Timer Registers: \[10\]](#)
- [GP Timer Module Global Initialization: \[11\] \[12\] \[13\]](#)
- [GP Timer Register Summary: \[14\] \[15\] \[16\] \[17\] \[18\] \[19\]](#)

Table 23-32. GPT1MS_TIOCP_CFG

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0010 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 |
| Physical Address | 0x4A31 8010 0x4803 2010 0x4808 6010 | | |
| Description | This register controls the various parameters of the OCP interface. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----------|----|---------|----|----------|---|-----------|---|-----------|---|----------|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | CLOCKACTIVITY | | RESERVED | | EMUFREE | | IDLEMODE | | ENAWAKEUP | | SOFTRESET | | AUTOIDLE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|----------|
| 31:10 | RESERVED | Reserved | R | 0x000000 |
| 9:8 | CLOCKACTIVITY | Clock activity 0x0: Functional clock can be switched-off ; L4 clock can be switched-off. 0x1: Functional clock can be switched-off ; L4 clock is maintained during wake-up period. 0x2: Functional clock is maintained during wake-up period; L4 clock can be switched-off. 0x3: Functional clock is maintained during wake-up period; L4 clock is maintained during wake-up period. | RW | 0x0 |
| 7:6 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |
| 5 | EMUFREE | Emulation mode 0x0: Timer counter frozen in emulation 0x1: Timer counter free-running in emulation | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 4:3 | IDLEMODE | Power management, req/ack control 0x0: Force-idle. An idle request is acknowledged unconditionally. 0x1: No-idle. An idle request is never acknowledged. 0x2: Smart-idle. Acknowledgment to an idle request is given based on the internal activity of the module. 0x3: Reserved, do not use. | RW | 0x0 |
| 2 | ENAWAKEUP | Wake-up feature global control 0x0: No wake-up line assertion in idle mode 0x1: Wake-up line assertion enabled in smart-idle mode. | RW | 0 |
| 1 | SOFTRESET | Software reset. This bit is automatically reset by the hardware. During reads, it always returns 0. 0x0: Normal mode 0x1: The module is reset. | RW | 0 |
| 0 | AUTOIDLE | Internal L4 clock gating strategy 0x0: L4 clock is free-running. 0x1: Automatic L4 clock gating strategy is applied, based on the L4 interface activity. | RW | 0 |

Table 23-33. Register Call Summary for Register GPT1MS_TIOCP_CFG

General-Purpose Timers

- [GPTIMER1, GPTIMER2, and GPTIMER10 Power Management: \[0\] \[1\] \[2\]](#)
- [Wake-Up Capability: \[3\] \[4\]](#)
- [Software Reset: \[5\] \[6\]](#)
- [Timer Under Emulation: \[7\] \[8\] \[9\]](#)
- [Accessing GP Timer Registers: \[10\] \[11\]](#)
- [Writing to Timer Registers: \[12\]](#)
- [GP Timer Module Global Initialization: \[13\] \[14\] \[15\] \[16\] \[17\]](#)
- [GP Timer Register Summary: \[18\]](#)

Table 23-34. GPT_IRQSTATUS_RAW

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0024 | | |
| Physical Address | 0x4803 4024 0x4803 6024 0x4903 8024 0x4013 8024 0x01D3 8024 0x4903 A024 0x4013 A024 0x01D3 A024 0x4903 C024 0x4013 C024 0x01D3 C024 0x4903 E024 0x4013 E024 0x01D3 E024 0x4803 E024 0x4808 8024 | Instance | GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | Component interrupt-request status. Check the corresponding secondary status register. Raw status is set even if event is not enabled. Write 1 to set the (raw) status, mostly for debug. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|--------------|-------------|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | TCAR_IT_FLAG | OVF_IT_FLAG | MAT_IT_FLAG |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2 | TCAR_IT_FLAG | IRQ status for Capture Read 0: No event pending Write 0: No action Read 1: IRQ event pending Write 1: Trigger IRQ event by software. | RW | 0 |
| 1 | OVF_IT_FLAG | IRQ status for Overflow Read 0: No event pending Write 0: No action Read 1: IRQ event pending Write 1: Trigger IRQ event by software. | RW | 0 |
| 0 | MAT_IT_FLAG | IRQ status for Match Read 0: No event pending Write 0: No action Read 1: IRQ event pending Write 1: Trigger IRQ event by software | RW | 0 |

Table 23-35. Register Call Summary for Register GPT_IRQSTATUS_RAW

General-Purpose Timers

- [Accessing GP Timer Registers: \[0\] \[1\]](#)
- [GP Timer Register Summary: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)

Table 23-36. GPT_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0028 | | |
| Physical Address | 0x4803 4028 0x4803 6028 0x4903 8028 0x4013 8028 0x01D3 8028 0x4903 A028 0x4013 A028 0x01D3 A028 0x4903 C028 0x4013 C028 0x01D3 C028 0x4903 E028 0x4013 E028 0x01D3 E028 0x4803 E028 0x4808 8028 | Instance | GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | Component interrupt-request status. Check the corresponding secondary status register. Enabled status is not set unless event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|--------------|-------------|-------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | TCAR_IT_FLAG | OVF_IT_FLAG | MAT_IT_FLAG | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2 | TCAR_IT_FLAG | IRQ status for capture Read 0: No event pending Write 0: No action Read 1: IRQ event pending Write 1: Clear any pending event. | RW | 0 |
| 1 | OVF_IT_FLAG | IRQ status for Overflow Read 0: No event pending Write 0: No action Read 1: IRQ event pending Write 1: Clear any pending event. | RW | 0 |
| 0 | MAT_IT_FLAG | IRQ status for Match Read 0: No event pending Write 0: No action Read 1: IRQ event pending Write 1: Clear any pending event. | RW | 0 |

Table 23-37. Register Call Summary for Register GPT_IRQSTATUS

General-Purpose Timers

- [Wake-Up Capability: \[0\]](#)
- [GP Timer Interrupts: \[1\]](#)
- [Capture Mode Functionality: \[2\] \[3\] \[4\] \[5\]](#)
- [Accessing GP Timer Registers: \[6\] \[7\]](#)
- [Writing to Timer Registers: \[8\]](#)
- [GP Timer Capture Mode: \[9\] \[10\]](#)
- [GP Timer Register Summary: \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)

Table 23-38. GPT_IRQENABLE_SET

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 002C | | |
| Physical Address | 0x4803 402C 0x4803 602C 0x4903 802C 0x4013 802C 0x01D3 802C 0x4903 A02C 0x4013 A02C 0x01D3 A02C 0x4903 C02C 0x4013 C02C 0x01D3 C02C 0x4903 E02C 0x4013 E02C 0x01D3 E02C 0x4803 E02C 0x4808 802C | Instance | GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | Component interrupt-request enable. Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|--------------|-------------|-------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | TCAR_EN_FLAG | OVF_EN_FLAG | MAT_EN_FLAG | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2 | TCAR_EN_FLAG | IRQ enable for Compare Read 0: IRQ event is disabled. Write 0: No action Read 1: IRQ event is enabled Write 1: Set IRQ enable. | RW | 0 |
| 1 | OVF_EN_FLAG | IRQ enable for Overflow Read 0: IRQ event is disabled. Write 0: No action Read 1: IRQ event is enabled. Write 1: Set IRQ enable. | RW | 0 |
| 0 | MAT_EN_FLAG | IRQ enable for Match Read 0: IRQ event is disabled. Write 0: No action Read 1: IRQ event is enabled. Write 1: Set IRQ enable. | RW | 0 |

Table 23-39. Register Call Summary for Register GPT_IRQENABLE_SET

General-Purpose Timers

- [GP Timer Functional Description: \[0\]](#)
- [GP Timer Interrupts: \[1\]](#)
- [Timer Mode Functionality: \[2\]](#)
- [Capture Mode Functionality: \[3\]](#)
- [Accessing GP Timer Registers: \[4\] \[5\]](#)
- [Writing to Timer Registers: \[6\]](#)
- [GP Timer Mode: \[7\]](#)
- [GP Timer Compare Mode: \[8\]](#)
- [GP Timer Capture Mode: \[9\]](#)
- [GP Timer Register Summary: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)

Table 23-40. GPT_IRQENABLE_CLR

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0030 | | |
| Physical Address | 0x4803 4030 0x4803 6030 0x4903 8030 0x4013 8030 0x01D3 8030 0x4903 A030 0x4013 A030 0x01D3 A030 0x4903 C030 0x4013 C030 0x01D3 C030 0x4903 E030 0x4013 E030 0x01D3 E030 0x4803 E030 0x4808 8030 | Instance | GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | Component interrupt-request enable. Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|--------------|-------------|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | TCAR_EN_FLAG | OVF_EN_FLAG | MAT_EN_FLAG |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2 | TCAR_EN_FLAG | IRQ enable for Compare Read 0: IRQ event is disabled. Write 0: No action Read 1: IRQ event is enabled. Write 1: Clear IRQ enable. | RW | 0 |
| 1 | OVF_EN_FLAG | IRQ enable for Overflow Read 0: IRQ event is disabled. Write 0: No action Read 1: IRQ event is enabled. Write 1: Clear IRQ enable. | RW | 0 |
| 0 | MAT_EN_FLAG | IRQ enable for Match Read 0: IRQ event is disabled. Write 0: No action Read 1: IRQ event is enabled. Write 1: Clear IRQ enable. | RW | 0 |

Table 23-41. Register Call Summary for Register GPT_IRQENABLE_CLR

General-Purpose Timers

- [GP Timer Functional Description: \[0\]](#)
- [GP Timer Interrupts: \[1\]](#)
- [Accessing GP Timer Registers: \[2\] \[3\]](#)
- [Writing to Timer Registers: \[4\]](#)
- [GP Timer Register Summary: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)

Table 23-42. GPT_IRQWAKEEN

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0034 | | |
| Physical Address | 0x4803 4034 0x4803 6034 0x4903 8034 0x4013 8034 0x01D3 8034 0x4903 A034 0x4013 A034 0x01D3 A034 0x4903 C034 0x4013 C034 0x01D3 C034 0x4903 E034 0x4013 E034 0x01D3 E034 0x4803 E034 0x4808 8034 | Instance | GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | Wake-up-enabled events taking place when module is idle should generate an asynchronous wake-up. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--------------|-------------|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | TCAR_WUP_ENA | OVF_WUP_ENA | MAT_WUP_ENA |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2 | TCAR_WUP_ENA | Wake-up generation for Compare 0x0: Wake-up disabled 0x1: Wake-up enabled | RW | 0 |
| 1 | OVF_WUP_ENA | Wake-up generation for Overflow 0x0: Wake-up disabled 0x1: Wake-up enabled | RW | 0 |
| 0 | MAT_WUP_ENA | Wake-up generation for Match 0x0: Wake-up disabled 0x1: Wake-up enabled | RW | 0 |

Table 23-43. Register Call Summary for Register GPT_IRQWAKEEN

General-Purpose Timers

- [Wake-Up Capability: \[0\]](#)
- [Accessing GP Timer Registers: \[1\] \[2\]](#)
- [Writing to Timer Registers: \[3\]](#)
- [GP Timer Module Global Initialization: \[4\]](#)
- [GP Timer Register Summary: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)

Table 23-44. GPT_TCLR

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | 0x0000 0038 | | |
| Physical Address | 0x4A31 8024 0x4803 2024 0x4808 6024 0x4803 4038 0x4803 6038 0x4903 8038 0x4013 8038 0x01D3 8038 0x4903 A038 0x4013 A038 0x01D3 A038 0x4903 C038 0x4013 C038 0x01D3 C038 0x4903 E038 0x4013 E038 0x01D3 E038 0x4803 E038 0x4808 8038 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | This register controls optional features specific to the timer functionality. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|-----------|----|-----|-----|-------|----|-----|-----|----|----|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | GPO_CFG | CAPT_MODE | PT | TRG | TCM | SCPWM | CE | PRE | PTV | AR | ST | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | Reserved | R | 0x00000 |
| 14 | GPO_CFG | General-purpose output - this register directly drives the GPTi_PORGPOCFG output pin. For specific use of the GPO_CFG bit, see Section 23.2.2.1 , <i>GP Timer External System Interface</i> . 0x0: GPTi_PORGPOCFG drives 0. 0x1: GPTi_PORGPOCFG drives 1. | RW | 0 |
| 13 | CAPT_MODE | Capture mode select bit (first/second) 0x0: Single capture: Capture the first enabled capture event in TCAR1. 0x1: Capture on second event: Capture the second enabled capture event in TCAR2. | RW | 0 |
| 12 | PT | Pulse or toggle mode on GPTi_PWM_out output pin 0x0: Pulse modulation 0x1: Toggle modulation | RW | 0 |
| 11:10 | TRG | Trigger output mode on GPTi_PWM_out output pin 0x0: No trigger 0x1: Trigger on overflow. 0x2: Trigger on overflow and match. 0x3: Reserved | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 9:8 | TCM | Transition capture mode on GPTi_EVENT_CAPTURE input pin (When the TCM field passed from (00) to any other combination, the TCAR_IT_FLAG and the edge detection logic are cleared.) 0x0: No capture 0x1: Capture on rising edges of GPTi_EVENT_CAPTURE pin 0x2: Capture on falling edges of GPTi_EVENT_CAPTURE pin 0x3: Capture on both edges of GPTi_EVENT_CAPTURE pin | RW | 0x0 |
| 7 | SCPWM | Pulse width modulation output pin default setting This bit must be set or clear while the timer is stopped or the trigger is off. 0x0: Clear the GPTi_PWM_out output pin and select positive pulse for pulse mode. 0x1: Set the GPTi_PWM_out output pin and select negative pulse for pulse mode. | RW | 0 |
| 6 | CE | Compare enable 0x0: Compare mode is disable. 0x1: Compare mode is enable. | RW | 0 |
| 5 | PRE | Prescaler enable 0x0: The TIMER clock input pin clocks the counter. 0x1: The divided input pin clocks the counter. | RW | 0 |
| 4:2 | PTV | Prescale clock timer value The timer counter is prescaled with the value $2^{(PTV+1)}$. Example: PTV = 3, counter increases value (if started) after 16 functional clock periods. | RW | 0x0 |
| 1 | AR | Autoreload mode 0x0: One shot timer 0x1: Autoreload timer | RW | 0 |
| 0 | ST | Start/stop timer control 0x0: Stop timer: Only the counter is frozen. If one-shot mode selected (AR = 0), this bit is automatically reset by internal logic when the counter is overflowed. 0x1: Start timer | RW | 0 |

Table 23-45. Register Call Summary for Register GPT_TCLR

General-Purpose Timers

- [Timer Mode Functionality: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [Capture Mode Functionality: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)
- [Compare Mode Functionality: \[16\] \[17\] \[18\] \[19\]](#)
- [Prescaler Functionality: \[20\] \[21\]](#)
- [Pulse-Width Modulation: \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\]](#)
- [Timer Counting Rate: \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\]](#)
- [Accessing GP Timer Registers: \[39\]](#)
- [Writing to Timer Registers: \[40\] \[41\]](#)
- [GP Timer Mode: \[42\] \[43\] \[44\] \[45\]](#)
- [GP Timer Compare Mode: \[46\] \[47\] \[48\] \[49\] \[50\]](#)
- [GP Timer Capture Mode: \[51\] \[52\] \[53\] \[54\] \[55\] \[56\] \[57\]](#)
- [GP Timer PWM Mode: \[58\] \[59\] \[60\] \[61\] \[62\] \[63\] \[64\] \[65\] \[66\]](#)
- [GP Timer Register Summary: \[67\] \[68\] \[69\] \[70\] \[71\] \[72\] \[73\]](#)
- [GP Timer Register Description: \[74\] \[75\]](#)

Table 23-46. GPT_TCR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|------------------------|---|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 003C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A31 8028 0x4803 2028 0x4808 6028 0x4803 403C 0x4803 603C 0x4903 803C 0x4013 803C 0x01D3 803C 0x4903 A03C 0x4013 A03C 0x01D3 A03C 0x4903 C03C 0x4013 C03C 0x01D3 C03C 0x4903 E03C 0x4013 E03C 0x01D3 E03C 0x4803 E03C 0x4808 803C | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | This register holds the value of the internal counter. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="32">TIMER_COUNTER</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | TIMER_COUNTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TIMER_COUNTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:0 | TIMER_COUNTER | Value of TIMER counter | RW | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 23-47. Register Call Summary for Register GPT_TCR

General-Purpose Timers

- Wake-Up Capability: [0] [1]
- Timer Mode Functionality: [2] [3] [4] [5] [6] [7] [8] [9] [10]
- 1-ms Tick Generation (Only GPTIMER1, GPTIMER2, and GPTIMER10): [11] [12] [13]
- Capture Mode Functionality: [14] [15]
- Compare Mode Functionality: [16] [17]
- Prescaler Functionality: [18] [19]
- Accessing GP Timer Registers: [20]
- Writing to Timer Registers: [21] [22] [23] [24]
- Reading From Timer Counter Registers: [25]
- GP Timer Mode: [26]
- GP Timer Compare Mode: [27]
- GP Timer Register Summary: [28] [29] [30] [31] [32] [33] [34]
- GP Timer Register Description: [35] [36]

Table 23-48. GPT_TLDR

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | 0x0000 0040 | | |
| Physical Address | 0x4A31 802C 0x4803 202C 0x4808 602C 0x4803 4040 0x4803 6040 0x4903 8040 0x4013 8040 0x01D3 8040 0x4903 A040 0x4013 A040 0x01D3 A040 0x4903 C040 0x4013 C040 0x01D3 C040 0x4903 E040 0x4013 E040 0x01D3 E040 0x4803 E040 0x4808 8040 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | This register holds the timer load value. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| LOAD_VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | LOAD_VALUE | Timer counter value loaded on overflow in autoreload mode or on GPT_TTGR write access. LOAD_VALUE must be different than the timer overflow value (0xFFFF FFFF). | RW | 0x0000 0000 |

Table 23-49. Register Call Summary for Register GPT_TLDR

General-Purpose Timers

- [Timer Mode Functionality](#): [0] [1] [2]
- [1-ms Tick Generation \(Only GPTIMER1, GPTIMER2, and GPTIMER10\)](#): [3] [4] [5] [6] [7] [8] [9] [10] [11] [12]
- [Prescaler Functionality](#): [13] [14]
- [Pulse-Width Modulation](#): [15] [16] [17]
- [Timer Counting Rate](#): [18] [19] [20] [21] [22]
- [Accessing GP Timer Registers](#): [23]
- [Writing to Timer Registers](#): [24] [25]
- [GP Timer Mode](#): [26]
- [GP Timer PWM Mode](#): [27]
- [GP Timer Register Summary](#): [28] [29] [30] [31] [32] [33] [34]
- [GP Timer Register Description](#): [35] [36]

Table 23-50. GPT_TTGR

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | 0x0000 0044 | | |
| Physical Address | 0x4A31 8030 0x4803 2030 0x4808 6030 0x4803 4044 0x4803 6044 0x4903 8044 0x4013 8044 0x01D3 8044 0x4903 A044 0x4013 A044 0x01D3 A044 0x4903 C044 0x4013 C044 0x01D3 C044 0x4903 E044 0x4013 E044 0x01D3 E044 0x4803 E044 0x4808 8044 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | The read value of this register is always 0xFFFF FFFF. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TTGR_VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------------------|-------------|
| 31:0 | TTGR_VALUE | Writing to the TTGR register causes the GPT_TCR to be loaded from GPT_TLDR and the prescaler counter to be cleared. Reload is done regardless of the AR field value of the GPT_TCLR register. | RW Returns 1s | 0xFFFF FFFF |

Table 23-51. Register Call Summary for Register GPT_TTGR

General-Purpose Timers

- [Timer Mode Functionality](#): [0] [1]
- [Prescaler Functionality](#): [2]
- [Accessing GP Timer Registers](#): [3]
- [Writing to Timer Registers](#): [4] [5]
- [GP Timer Register Summary](#): [6] [7] [8] [9] [10] [11] [12]
- [GP Timer Register Description](#): [13] [14]

Table 23-52. GPT_TWPS

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | 0x0000 0048 | | |
| Physical Address | 0x4A31 8034 0x4803 2034 0x4808 6034 0x4803 4048 0x4803 6048 0x4903 8048 0x4013 8048 0x01D3 8048 0x4903 A048 0x4013 A048 0x01D3 A048 0x4903 C048 0x4013 C048 0x01D3 C048 0x4903 E048 0x4013 E048 0x01D3 E048 0x4803 E048 0x4808 8048 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | This register contains the write posting bits for all writable functional registers. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|-------------|----|-------------|----|-------------|---|-------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | W_PEND_TMAR | | W_PEND_TTGR | | W_PEND_TLDR | | W_PEND_TCRR | | W_PEND_TCLR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4 | W_PEND_TMAR | When equal to 1, a write is pending to the GPT_TMAR register. | R | 0 |
| 3 | W_PEND_TTGR | When equal to 1, a write is pending to the GPT_TTGR register. | R | 0 |
| 2 | W_PEND_TLDR | When equal to 1, a write is pending to the GPT_TLDR register. | R | 0 |
| 1 | W_PEND_TCRR | When equal to 1, a write is pending to the GPT_TCRR register. | R | 0 |
| 0 | W_PEND_TCLR | When equal to 1, a write is pending to the GPT_TCLR register. | R | 0 |

Table 23-53. Register Call Summary for Register GPT_TWPS

General-Purpose Timers

- [Accessing GP Timer Registers: \[0\]](#)
- [Writing to Timer Registers: \[1\]](#)
- [GP Timer Register Summary: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)

Table 23-54. GPT TMAR

| | | | | |
|--|---|---|---|--------------|
| Address Offset | 0x0000 004C | Instance | | |
| Physical Address | 0x4A31 8038 0x4803 2038 0x4808 6038 0x4803 404C 0x4803 604C 0x4903 804C 0x4013 804C 0x01D3 804C 0x4903 A04C 0x4013 A04C 0x01D3 A04C 0x4903 C04C 0x4013 C04C 0x01D3 C04C 0x4903 E04C 0x4013 E04C 0x01D3 E04C 0x4803 E04C 0x4808 804C | | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 | |
| Description | The compare logic consists of a 32-bit-wide, read/write data TMAR register and logic to compare counter. | | | |
| Type | RW | | | |
| <div><div>313029282726252423222120191817161514131211109876543210</div><div>COMPARE_VALUE</div></div> | | | | |
| Bits | Field Name | Description | Type | Reset |
| 31:0 | COMPARE_VALUE | Value to be compared to the timer counter | RW | 0x0000 0000 |

Table 23-55. Register Call Summary for Register GPT_TMAR

General-Purpose Timers

- [Wake-Up Capability: \[0\]](#)
- [Compare Mode Functionality: \[1\] \[2\] \[3\] \[4\]](#)
- [Pulse-Width Modulation: \[5\] \[6\] \[7\]](#)
- [Accessing GP Timer Registers: \[8\]](#)
- [Writing to Timer Registers: \[9\] \[10\]](#)
- [GP Timer Compare Mode: \[11\]](#)
- [GP Timer PWM Mode: \[12\]](#)
- [GP Timer Register Summary: \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\]](#)
- [GP Timer Register Description: \[20\]](#)

Table 23-56. GPT_TCAR1

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | 0x0000 0050 | | |
| Physical Address | 0x4A31 803C 0x4803 203C 0x4808 603C 0x4803 4050 0x4803 6050 0x4903 8050 0x4013 8050 0x01D3 8050 0x4903 A050 0x4013 A050 0x01D3 A050 0x4903 C050 0x4013 C050 0x01D3 C050 0x4903 E050 0x4013 E050 0x01D3 E050 0x4803 E050 0x4808 8050 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | This register holds the first captured value of the counter register. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CAPTURE_VALUE1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------------|
| 31:0 | CAPTURE_VALUE1 | First timer counter value captured on an external event trigger | R | 0x0000 0000 |

Table 23-57. Register Call Summary for Register GPT_TCAR1

General-Purpose Timers

- [Capture Mode Functionality: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [Reading From Timer Counter Registers: \[9\]](#)
- [GP Timer Capture Mode: \[10\]](#)
- [GP Timer Register Summary: \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\]](#)

Table 23-58. GPT_TSICR

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | 0x0000 0054 | | |
| Physical Address | 0x4A31 8040 0x4803 2040 0x4808 6040 0x4803 4054 0x4803 6054 0x4903 8054 0x4013 8054 0x01D3 8054 0x4903 A054 0x4013 A054 0x01D3 A054 0x4903 C054 0x4013 C054 0x01D3 C054 0x4903 E054 0x4013 E054 0x01D3 E054 0x4803 E054 0x4808 8054 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | Timer synchronous interface control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|--------|-----|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | POSTED | SFT | RESERVED | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2 | POSTED | Posted mode selection 0x0: Posted mode inactive: Delay the command accept output signal. 0x1: Posted mode active | RW | - |
| 1 | SFT | This bit resets all the functional part of the module. 0x0: Software reset is disabled. 0x1: Software reset is enabled. | RW | 0 |
| 0 | RESERVED | Reserved | R | 0 |

Table 23-59. Register Call Summary for Register GPT_TSICR

General-Purpose Timers

- [Software Reset: \[0\] \[1\]](#)
- [Accessing GP Timer Registers: \[2\] \[3\]](#)
- [Writing to Timer Registers: \[4\] \[5\] \[6\]](#)
- [GP Timer Module Global Initialization: \[7\]](#)
- [GP Timer Register Summary: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)

Table 23-60. GPT_TCAR2

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | 0x0000 0058 | | |
| Physical Address | 0x4A31 8044 0x4803 2044 0x4808 6044 0x4803 4058 0x4803 6058 0x4903 8058 0x4013 8058 0x01D3 8058 0x4903 A058 0x4013 A058 0x01D3 A058 0x4903 C058 0x4013 C058 0x01D3 C058 0x4903 E058 0x4013 E058 0x01D3 E058 0x4803 E058 0x4808 8058 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 GPTIMER3_L4 GPTIMER4_L4 GPTIMER5_L3 GPTIMER5_CORTEX-A9 GPTIMER5_DSP GPTIMER6_L3 GPTIMER6_CORTEX-A9 GPTIMER6_DSP GPTIMER7_L3 GPTIMER7_CORTEX-A9 GPTIMER7_DSP GPTIMER8_L3 GPTIMER8_CORTEX-A9 GPTIMER8_DSP GPTIMER9_L4 GPTIMER11_L4 |
| Description | This register holds the second captured value of the counter register. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CAPTURE_VALUE2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------------|
| 31:0 | CAPTURE_VALUE2 | Second timer counter value captured on an external event trigger | R | 0x0000 0000 |

Table 23-61. Register Call Summary for Register GPT_TCAR2

General-Purpose Timers

- [Capture Mode Functionality: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [Reading From Timer Counter Registers: \[5\]](#)
- [GP Timer Capture Mode: \[6\]](#)
- [GP Timer Register Summary: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)

23.2.6.2.3 GPTIMER1, GPTIMER2 , and GPTIMER10 Register Description**Table 23-62. GPT_TISTAT**

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0014 | | |
| Physical Address | 0x4A31 8014 0x4803 2014 0x4808 6014 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 |
| Description | This register provides status information about the module, excluding interrupt status information. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESETDONE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Reads return 0. | R | 0x0000 0000 |
| 0 | RESETDONE | Internal reset monitoring Read 0x0: Internal module reset in ongoing. Read 0x1: Reset complete | R | - |

Table 23-63. Register Call Summary for Register GPT_TISTAT

General-Purpose Timers

- [Software Reset: \[0\]](#)
- [Accessing GP Timer Registers: \[1\]](#)
- [GP Timer Register Summary: \[2\]](#)

Table 23-64. GPT_TISR

| | | | |
|------------------|--|----------|-----------------------------|
| Address Offset | 0x0000 0018 | Instance | GPTIMER1_L4 |
| Physical Address | 0x4A31 8018 0x4803 2018 0x4808 6018 | | GPTIMER2_L4 GPTIMER10_L4 |
| Description | The timer status register is used to determine which of the timer events requested an interrupt. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|-------------|----|----|-------------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TCAR_IT_FLAG | | | OVF_IT_FLAG | | | MAT_IT_FLAG | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:3 | RESERVED | Reads return 0. | R | 0x0000 0000 |
| 2 | TCAR_IT_FLAG | Indicates when an external pulse transition of the correct polarity is detected on external pin GPTi_EVENT_CAPTURE 0x0: No capture interrupt request 0x1: Capture interrupt request | RW | 0 |
| 1 | OVF_IT_FLAG | TCRR overflow 0x0: No overflow interrupt request 0x1: Overflow interrupt pending | RW | 0 |
| 0 | MAT_IT_FLAG | The compare result of TCRR and TMAR 0x0: No compare interrupt request 0x1: Compare interrupt pending | RW | 0 |

Table 23-65. Register Call Summary for Register GPT_TISR

General-Purpose Timers

- [Wake-Up Capability: \[0\]](#)
- [GP Timer Interrupts: \[1\]](#)
- [1-ms Tick Generation \(Only GPTIMER1, GPTIMER2, and GPTIMER10\): \[2\]](#)
- [Capture Mode Functionality: \[3\] \[4\] \[5\] \[6\]](#)
- [Accessing GP Timer Registers: \[7\]](#)
- [Writing to Timer Registers: \[8\]](#)
- [GP Timer Capture Mode: \[9\] \[10\]](#)
- [GP Timer Register Summary: \[11\]](#)

Table 23-66. GPT_TIER

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 001C | | |
| Physical Address | 0x4A31 801C 0x4803 201C 0x4808 601C | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 |
| Description | This register controls (enable/disable) the interrupt events. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|------------|----|------------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TCAR_IT_ENA | | OVF_IT_ENA | | MAT_IT_ENA | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------------|
| 31:3 | RESERVED | Reads return 0. | R | 0x0000 0000 |
| 2 | TCAR_IT_ENA | Capture interrupt enable 0x0: Disable capture interrupt. 0x1: Enable capture interrupt. | RW | 0 |
| 1 | OVF_IT_ENA | Overflow interrupt enable 0x0: Disable overflow interrupt. 0x1: Enable overflow interrupt. | RW | 0 |
| 0 | MAT_IT_ENA | Match interrupt enable 0x0: Disable match interrupt. 0x1: Enable match interrupt. | RW | 0 |

Table 23-67. Register Call Summary for Register GPT_TIER

General-Purpose Timers

- [GP Timer Functional Description: \[0\]](#)
- [GP Timer Interrupts: \[1\]](#)
- [Timer Mode Functionality: \[2\]](#)
- [Capture Mode Functionality: \[3\]](#)
- [Compare Mode Functionality: \[4\]](#)
- [Accessing GP Timer Registers: \[5\]](#)
- [Writing to Timer Registers: \[6\]](#)
- [GP Timer Mode: \[7\]](#)
- [GP Timer Compare Mode: \[8\]](#)
- [GP Timer Capture Mode: \[9\]](#)
- [GP Timer Register Summary: \[10\]](#)

Table 23-68. GPT_TWER

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0020 | | |
| Physical Address | 0x4A31 8020 0x4803 2020 0x4808 6020 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 |
| Description | This register controls (enable/disable) the wake-up feature on specific interrupt events. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|--------------|-------------|-------------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | TCAR_WUP_ENA | OVF_WUP_ENA | MAT_WUP_ENA | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------------|
| 31:3 | RESERVED | Reads return 0 | R | 0x0000 0000 |
| 2 | TCAR_WUP_ENA | Capture wake-up enable 0x0: Disable capture wake-up. 0x1: Enable capture wake-up. | RW | 0 |
| 1 | OVF_WUP_ENA | Overflow wake-up enable 0x0: Disable overflow wake-up. 0x1: Enable overflow wake-up. | RW | 0 |
| 0 | MAT_WUP_ENA | Match wake-up enable 0x0: Disable match wake-up. 0x1: Enable match wake-up. | RW | 0 |

Table 23-69. Register Call Summary for Register GPT_TWER

General-Purpose Timers

- [GP Timer Functional Description: \[0\]](#)
- [Wake-Up Capability: \[1\] \[2\]](#)
- [Accessing GP Timer Registers: \[3\]](#)
- [Writing to Timer Registers: \[4\]](#)
- [GP Timer Module Global Initialization: \[5\]](#)
- [GP Timer Register Summary: \[6\]](#)

Table 23-70. GPT_TPIR

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0048 | | |
| Physical Address | 0x4A31 8048 0x4803 2048 0x4808 6048 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 |
| Description | This register is used for 1-ms tick generation. The TPIR register holds the value of the positive increment. The value of this register is added to the value of TCVR to determine whether next value loaded in TCRR is the subperiod value or the overperiod value. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| POSITIVE_INC_VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---------------------------------|------|-------------|
| 31:0 | POSITIVE_INC_VALUE | Value of the positive increment | RW | 0x0000 0000 |

Table 23-71. Register Call Summary for Register GPT_TPIR

General-Purpose Timers

- [1-ms Tick Generation \(Only GPTIMER1, GPTIMER2, and GPTIMER10\): \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Accessing GP Timer Registers: \[6\]](#)
- [Writing to Timer Registers: \[7\] \[8\]](#)
- [GP Timer Register Summary: \[9\]](#)

Table 23-72. GPT_TNIR

| | | | |
|-------------------------|--|-----------------------|--|
| Address Offset | 0x0000 004C | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 |
| Physical Address | 0x4A31 804C 0x4803 204C 0x4808 604C | | |
| Description | This register is used for 1-ms tick generation. The TNIR register holds the value of the negative increment. The value of this register is added to the value of the TCVR to determine whether next value loaded in TCRR is the subperiod value or the overperiod value. | | |
| Type | RW | | |
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| NEGATIVE_INV_VALUE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---------------------------------|------|-------------|
| 31:0 | NEGATIVE_INV_VALUE | Value of the negative increment | RW | 0x0000 0000 |

Table 23-73. Register Call Summary for Register GPT_TNIR

General-Purpose Timers

- [1-ms Tick Generation \(Only GPTIMER1, GPTIMER2, and GPTIMER10\): \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Accessing GP Timer Registers: \[6\]](#)
- [Writing to Timer Registers: \[7\] \[8\]](#)
- [GP Timer Register Summary: \[9\]](#)

Table 23-74. GPT_TCVR

| | | | |
|-------------------------|--|-----------------------|--|
| Address Offset | 0x0000 0050 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 |
| Physical Address | 0x4A31 8050 0x4803 2050 0x4808 6050 | | |
| Description | This register is used for 1-ms tick generation. The TCVR register determines whether next value loaded in TCRR is the subperiod value or the overperiod value. | | |
| Type | RW | | |
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| COUNTER_VALUE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|----------------------|------|-------------|
| 31:0 | COUNTER_VALUE | Value of CVR counter | RW | 0x0000 0000 |

Table 23-75. Register Call Summary for Register GPT_TCVR

General-Purpose Timers

- [1-ms Tick Generation \(Only GPTIMER1, GPTIMER2, and GPTIMER10\): \[0\] \[1\]](#)
- [Accessing GP Timer Registers: \[2\]](#)
- [Writing to Timer Registers: \[3\] \[4\]](#)
- [GP Timer Register Summary: \[5\]](#)

Table 23-76. GPT_TOCR

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0054 | | |
| Physical Address | 0x4A31 8054 0x4803 2054 0x4808 6054 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 |
| Description | This register is used to mask the tick interrupt for a selected number of ticks. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | OVF COUNTER VALUE | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---------------------------|------|----------|
| 31:24 | RESERVED | Reads return 0. | R | 0x00 |
| 23:0 | OVF_COUNTER_VALUE | Number of overflow events | RW | 0x000000 |

Table 23-77. Register Call Summary for Register GPT_TOCR

General-Purpose Timers

- [1-ms Tick Generation \(Only GPTIMER1, GPTIMER2, and GPTIMER10\): \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [Accessing GP Timer Registers: \[5\]](#)
- [Writing to Timer Registers: \[6\] \[7\]](#)
- [GP Timer Register Summary: \[8\]](#)

Table 23-78. GPT_TOWR

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0058 | | |
| Physical Address | 0x4A31 8058 0x4803 2058 0x4808 6058 | Instance | GPTIMER1_L4 GPTIMER2_L4 GPTIMER10_L4 |
| Description | This register holds the number of masked overflow interrupts. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|--------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | OVF WRAPPING VALUE | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|-----------------------------|------|----------|
| 31:24 | RESERVED | Reads return 0. | R | 0x00 |
| 23:0 | OVF_WRAPPING_VALUE | Number of masked interrupts | RW | 0x000000 |

Table 23-79. Register Call Summary for Register GPT_TOWR

General-Purpose Timers

- [1-ms Tick Generation \(Only GPTIMER1, GPTIMER2, and GPTIMER10\): \[0\] \[1\] \[2\]](#)
- [Accessing GP Timer Registers: \[3\]](#)
- [Writing to Timer Registers: \[4\] \[5\]](#)
- [GP Timer Register Summary: \[6\]](#)

PRELIMINARY

23.3 Watchdog Timers

23.3.1 Watchdog Timers Overview

The device includes two instances of the 32-bit watchdog timer: WDT2 and WDT3. Figure 23-15 shows how each timer is connected in the device.

NOTE: WDTi (where i is the watchdog timer instance: i = 2 or 3) stands for the following:

- WDT2: Watchdog timer 2, also called MPU watchdog timer
- WDT3: Watchdog timer 3, also called IVA3 watchdog timer

Each watchdog timer is an upward counter capable of generating a pulse on the reset pin and an interrupt to the device system modules following an overflow condition. The MPU watchdog timer serves resets to the PRCM module (its interrupt outputs are unused), and the IVA3 watchdog timer serves watchdog interrupts to the MPU (its reset outputs are unused).

The watchdog timers can be accessed, loaded, and cleared by registers through the L4 interface. The MPU and IVA3 watchdog timers have the 32-kHz clock for their timer clock input.

The MPU watchdog timer directly generates a warm reset condition on overflow. The IVA3 watchdog timer generates an MPU interrupt condition on overflow, which can be used by the application software through the PRCM module to indirectly trigger a reset condition (that is, to the IVA3 subsystem).

The MPU watchdog timer connects to a single target agent port on the L4 interconnect.

Figure 23-15. Watchdog Timers Block Diagram

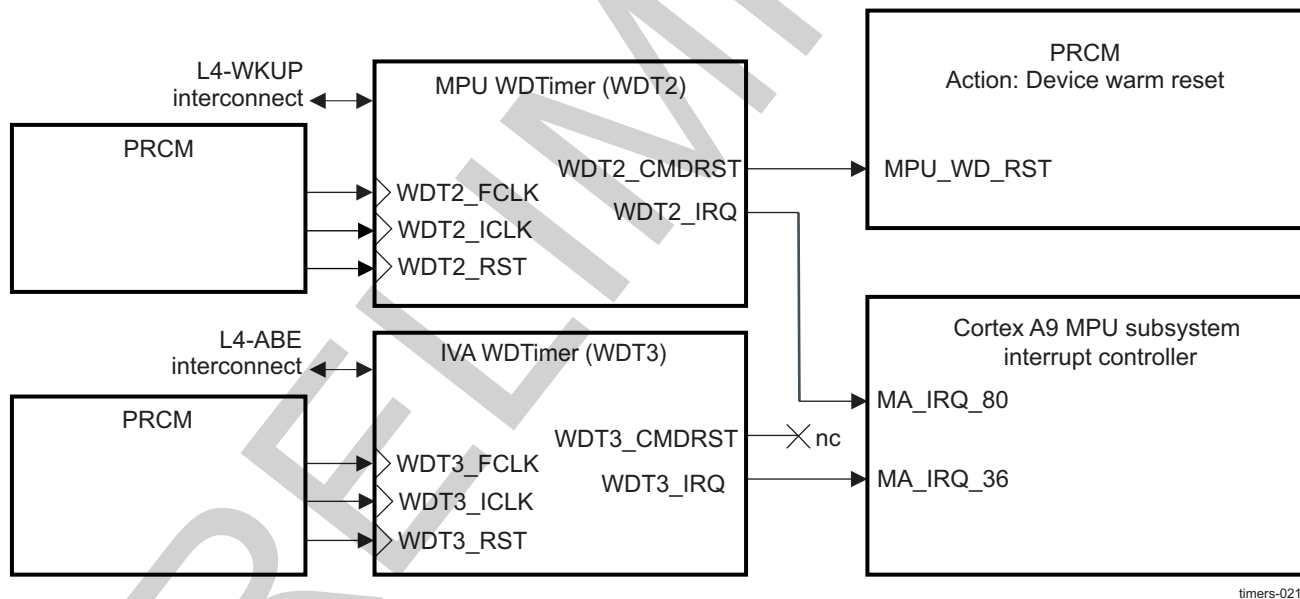


Table 23-80 lists the default state of the watchdog timers in the device.

Table 23-80. Watchdog Timers Default State

| Timer | Default State | | |
|-----------|---------------|-------------|--|
| MPU WDT2 | Enabled | Not running | |
| IVA3 WDT3 | Enabled | Not running | |

NOTE: The default state of the watchdog timers described in [Table 23-80](#) is considered to be their state immediately after ROM code execution. For more information, see [Chapter 28, Initialization](#).

23.3.1.1 Watchdog Timers Features

The main features of the watchdog timer controllers are:

- L4 slave interface support:
 - 32-bit data bus width
 - 32-/16-bit access supported
 - 8-bit access not supported
 - 11-bit address bus width
 - Burst mode not supported
 - Only posted write/read internal resynchronization mode supported
- Free-running 32-bit upward counter
- Programmable divider clock source (2^n where $n = [0:7]$)
- On-the-fly read/write register (while counting)
- Subset programming model of the GP timer
- The watchdog timers are reset either on power-on or after a warm reset before they start counting.
- Reset or interrupt actions when a timer overflow condition occurs
- The watchdog timer generates a reset or an interrupt in its hardware integration (WDT2 or WDT3).

23.3.2 Watchdog Timer Environment

The watchdog timers are accessible through the L4 interface.

23.3.3 Watchdog Timer Integration

Figure 23-16 shows the integration of the watchdog timers in the device.

Figure 23-16. Watchdog Timers Integration

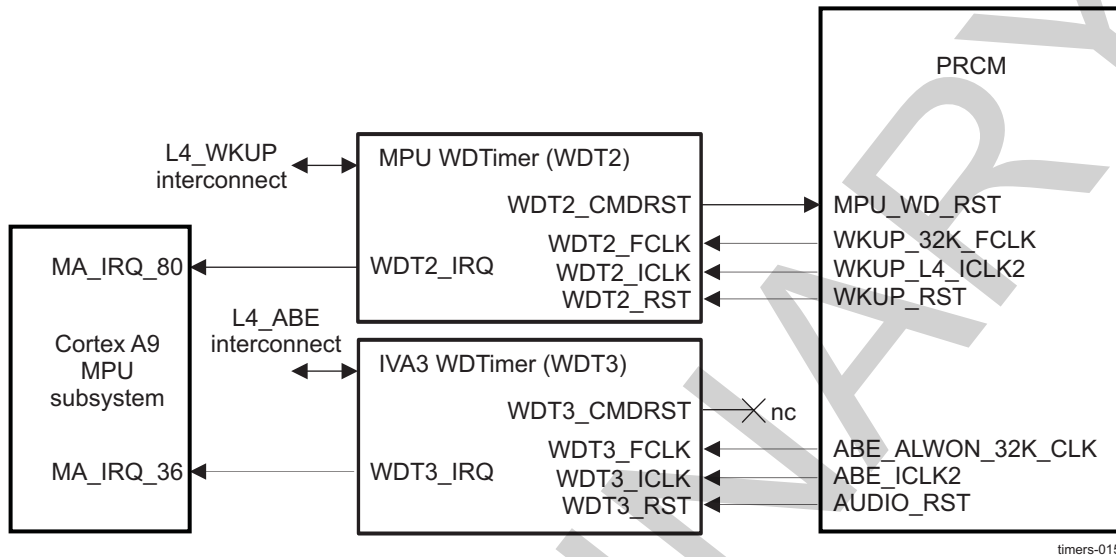


Table 23-81 through Table 23-83 summarize the integration of the module in the device.

Table 23-81. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| WDT2 | PD_WKUP | Yes | L4_WKUP |
| WDT3 | PD_AUDIO | Yes | L4_ABE |

Table 23-82. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|-----------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| WDT2 | WDT2_FCLK | WKUP_32K_FCLK | PRCM | WDT2 functional clock |
| WDT2 | WDT2_ICLK | WKUP_L4_ICLK2 | PRCM | WDT2 interface clock |
| WDT3 | WDT3_FCLK | ABE_ALWON_32K_CLK | PRCM | WDT3 functional clock |
| WDT3 | WDT3_ICLK | ABE_ICLK2 | PRCM | WDT3 interface clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| WDT2 | WDT2_RST | WKUP_RST | PRM | Reset to WDT2 |
| WDT2 | MPU_WDT_RST | WDT2_CMDRST | WDT2 | Reset to PRCM |
| WDT3 | WDT3_RST | AUDIO_RST | PRM | Reset to WDT3 |

NOTE: WDT2 is reset on power on or after a warm reset before it starts counting.

WDT3 is reset on power on or after a warm reset, and then it does not start counting.

Table 23-83. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|---------------|---------------------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| WDT2 | WDT2_IRQ | MA_IRQ_80 | Cortex-A9 MPU | WDT2 interrupt to Cortex-A9 MPU |
| WDT3 | WDT3_IRQ | MA_IRQ_36 | Cortex-A9 MPU | IVA3 watchdog overflow |
| No DMA Requests | | | | |

NOTE:

- See [Section 23.3.4.2, Interrupts](#), for interrupt source description.

23.3.4 Watchdog Timers Functional Description

23.3.4.1 Power Management

There are two clock domains in the watchdog timers:

- Functional clock domain: WDTi_FCLK is the watchdog timer functional clock. It is used to clock the watchdog timer internal logic.
- Interface clock domain: WDTi_ICLK is the watchdog timer interface clock. It is used to synchronize the watchdog timer L4 port to the L4 interconnect. All accesses from the interconnect are synchronous to WDTi_ICLK.

Table 23-82 lists the source clocks for each watchdog timer in the device. For more information about clock control and domains, see Section 3.1.1.1, *Clock Management* in Chapter 3, *Power, Reset, and Clock Management*.

From a global system power-management perspective, when one or both of the watchdog timer clocks is no longer required, the watchdog timers can be deactivated at the PRCM module level in the corresponding registers.

At the PRCM module level, when the conditions to shut off the PRCM module functional or interface output clocks are met (for more information, see the , *Clock Domain Level Clock Management*), the PRCM module automatically launches a hardware handshake protocol to ensure the watchdog timer is ready to have its clocks switched off. Namely, the PRCM module asserts an IDLE request to the watchdog timer.

Although this handshake is a hardware function and out of software control, the way the watchdog timer acknowledges the PRCM IDLE request is configurable through the WDT_WDSC[4:3] IDLEMODE bit field. Table 23-84 lists the settings and related acknowledgment modes of the IDLEMODE bit field.

Table 23-84. IDLEMODE Settings

| IDLEMODE Value | Selected Mode | Description |
|----------------|--------------------------------|--|
| 00 | Force-idle | The watchdog timer unconditionally acknowledges the IDLE request from the PRCM module, regardless of its internal operations. This mode must be used carefully, because it does not prevent loss of data when the clock is switched off. |
| 01 | No-idle | The watchdog timer never acknowledges an IDLE request from the PRCM module. This mode is safe from a module point of view, because it ensures that the clocks remain active. It is not efficient from a power-saving perspective, however, because it does not allow the PRCM module output clock to be shut off and thus the power domain to be set to a lower power state. |
| 10 | Smart-idle | The watchdog timer acknowledges the IDLE request, basing its decision on its internal activity. The acknowledge signal is asserted only when all pending transactions and IRQ requests are treated. This is the best approach for efficient system power management. |
| 11 | Smart-idle wakeup-capable mode | The watchdog timer acknowledges the IDLE request, basing its decision on its internal activity. The timer generates (IRQ-request-related) wake-up events when in IDLE state if the WDT_WIRQWAKEEN[1:0] bits are set to 1. |

23.3.4.1.1 Wake-Up Capability

If the WDT_WDSC[4:3] IDLEMODE bit field sets smart-idle wakeup-capable mode ($= 0 \times 3$), the timer evaluates its internal capability to have the interface clock switched off. When there is no more internal activity (no pending interrupt sources: match, overflow, or timer capture events), the idle acknowledge signal is asserted and the timer enters into sleep mode, ready to issue a wake-up request. This wake-up request is sent only if the WDT_WIRQWAKEEN[0] OVF_WK_ENA and/or the WDT_WIRQWAKEEN[1] DLY_WK_ENA bits enable the overflow and/or the delay wake-up capability.

23.3.4.2 Interrupts

Table 23-85 list the event flags, and their masks, that cause module interrupts.

Table 23-85. Watchdog Timer Events

| Event Flag | Event Mask | Mapping | Comments |
|---------------------------|---|----------|------------------------------|
| WDT_WIRQSTAT[0] EVENT_OVF | WDT_WIRQENSET/WDT_WIRQENCLR[0] OVF_IT_ENA | WDTi_IRQ | Watchdog timer overflow |
| WDT_WIRQSTAT[1] EVENT_DLY | WDT_WIRQENSET/WDT_WIRQENCLR[1] DLY_IT_ENA | WDTi_IRQ | Watchdog delay value reached |

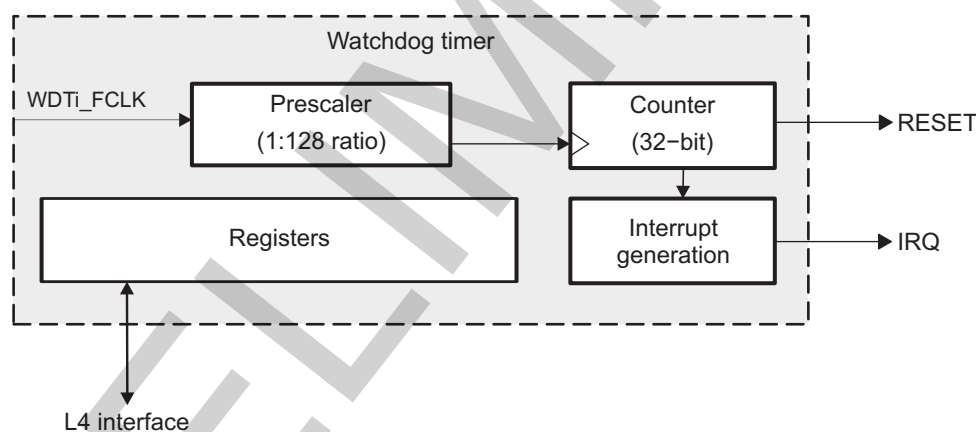
23.3.4.3 General Watchdog Timer Operation

The watchdog timers are based on an upward 32-bit counter coupled with a prescaler. The counter overflow is signaled through two independent signals: a simple reset signal and an interrupt signal, both active low. The use of these signals depends on whether they are connected or not. For this information, see [Figure 23-15](#). The interrupt generation mechanism is controlled through the [WDT_WIRQENSET/WDT_WIRQENCLR](#) and [WDT_WIRQSTAT](#) registers.

The prescaler ratio can be set from 1 to 128 by accessing the [WDT_WCLR\[4:2\]](#) PTV bit field and the [WDT_WCLR\[5\]](#) PRE bit of the watchdog control register ([WDT_WCLR](#)).

The current timer value can be accessed on-the-fly by reading the watchdog timer counter register ([WDT_WCRR](#)), modified by accessing the watchdog timer load register ([WDT_WLDR](#)) (no on-the-fly update), or reloaded by following a specific reload sequence on the watchdog timer trigger register ([WDT_WTGR](#)). A start/stop sequence applied to the watchdog timer start/stop register ([WDT_WSPR](#)) can start and stop the watchdog timers.

[Figure 23-17](#) is a functional block diagram of the watchdog timer.

Figure 23-17. 32-Bit Watchdog Timer Functional Block Diagram

timers-016

23.3.4.4 Reset Context

The watchdog timers are enabled after reset. [Table 23-86](#) lists the default reset values of the two watchdog timer load registers (the [WDT_WLDR](#)) and prescaler ratios (the [WDT_WCLR\[4:2\]](#) PTV bit field). To get these values, software must read the corresponding [WDT_WCLR\[4:2\]](#) PTV bit field and the 32-bit register to retrieve the static configuration of the module.

Table 23-86. Count and Prescaler Default Reset Values

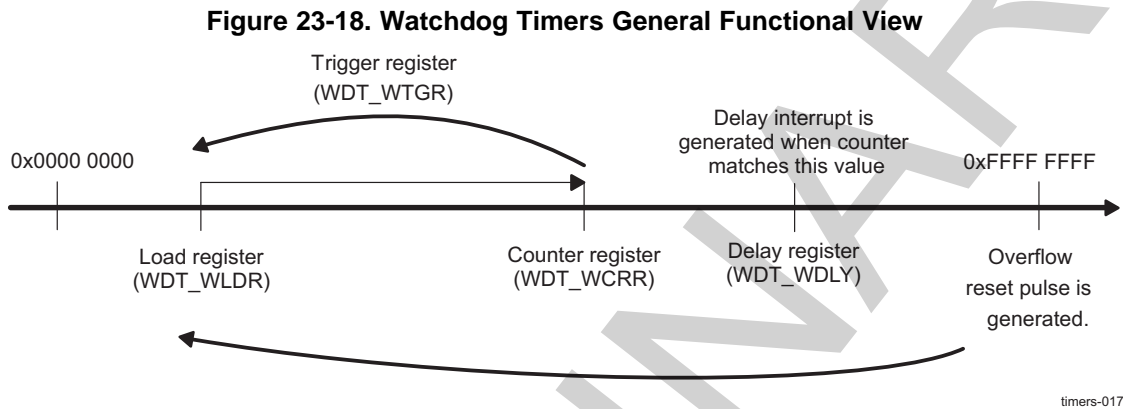
| Timer | WDT_WLDR Reset Value | PTV Reset Value |
|-----------------|----------------------|-----------------|
| MPU WDT (WDT2) | 0xFFFB 0000 | 0 |
| IVA3 WDT (WDT3) | 0xFFFB 0000 | 0 |

23.3.4.5 Overflow/Reset Generation

When the watchdog timer counter register ([WDT_WCRR](#)) overflows, an active-low reset pulse is generated to the PRCM module. This pulse is one prescaled timer clock cycle wide and occurs at the same time as the timer counter overflow.

After reset generation, the counter is automatically reloaded with the value stored in the watchdog load register ([WDT_WLDR](#)) and the prescaler is reset (the prescaler ratio remains unchanged). When the reset pulse output is generated, the timer counter begins incrementing again.

Figure 23-18 shows a general functional view of the watchdog timers.



23.3.4.6 Prescaler Value/Timer Reset Frequency

Each watchdog timer is composed of a prescaler stage and a timer counter.

The timer rate is defined by the following values:

- Value of the prescaler fields (the [WDT_WCLR\[5\]](#) PRE bit and the [WDT_WCLR\[4:2\]](#) PTV bit field)
- Value loaded into the timer load register ([WDT_WLDR](#))

The prescaler stage is clocked with the timer clock and acts as a clock divider for the timer counter stage. The ratio is managed by accessing the ratio definition field (the [WDT_WCLR\[4:2\]](#) PTV bit field) and is enabled with the [WDT_WCLR\[5\]](#) PRE bit.

Table 23-87 lists the prescaler clock ratio values.

Table 23-87. Prescaler Clock Ratio Values

| WDT_WCLR[5] PRE | WDT_WCLR[4:2] PTV | Clock Divider (PS) |
|---------------------------------|-----------------------------------|--------------------|
| 0 | X | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 2 |
| 1 | 2 | 4 |
| 1 | 3 | 8 |
| 1 | 4 | 16 |
| 1 | 5 | 32 |
| 1 | 6 | 64 |
| 1 | 7 | 128 |

Thus the watchdog timer overflow rate is expressed as:

$$\text{OVF_Rate} = (0\text{x}\text{FFFF FFFF} - \text{WDT_WLDR} + 1) \times (\text{wd-functional clock period}) \times \text{PS}$$

where wd-functional clock period = $1/(\text{wd-functional clock frequency})$ and $\text{PS} = 2^{(\text{PTV})}$

CAUTION

Internal resynchronization causes some latency in any software write to **WDT_WSPR** before **WDT_WSPR** is updated with the programmed value:

$$1.5 \times \text{functional clock cycles} \leq \text{write_WDT_WSPR_latency} \leq 2.5 \times \text{functional clock cycles}$$

Remember to consider this latency whenever the watchdog timer must be started or stopped.

For example, for a timer clock input of 32 kHz with a prescaler ratio value of 0x1 (clock divided by 2) and **WDT_WCLR**[5] PRE = 1 (clock divider enabled), the reset period is as listed in [Table 23-88](#).

Table 23-88. Reset Period Examples

| WDT_WLDR Value | Reset Period |
|-----------------------|---------------------|
| 0x0000 0000 | 74 h 56 min |
| 0xFFFF 0000 | 4 s |
| 0xFFFF FFF0 | 1 ms |
| 0xFFFF FFFF | 62.5 us |

CAUTION

- Ensure that the reloaded value allows the correct operation of the application. When a watchdog timer is enabled, software must periodically trigger a reload before the counter overflows. Hence, the value of the **WDT_WLDR**[31:0] bit field must be chosen according to the ongoing activity preceding the watchdog reload.
- Due to design reasons, **WDT_WLDR**[31:0] = 0xFFFF FFFF is a special case, although such a value of **WDT_WLDR** is meaningless. When **WDT_WLDR** is programmed with the overflow value, a triggering event generates a reset/interrupt one functional clock cycle later, even if the watchdog timer is stopped.

[Table 23-89](#) lists the default reset periods for the watchdog timers.

Table 23-89. Default Watchdog Timer Reset Periods

| Watchdog Timers | Clock Source | Default Reset Period |
|------------------------|---------------------|-----------------------------|
| MPU/IVA3 WDTs | 32 kHz | 10 s |

23.3.4.7 Triggering a Timer Reload

To reload the timer counter and reset the prescaler before reaching overflow, a reload command is executed by accessing the watchdog timer trigger register (**WDT_WTGR**) using a specific reload sequence.

The specific reload sequence is performed whenever the written value on the **WDT_WTGR** register differs from its previous value. In this case, reload is executed in the same way as an overflow autoreload, but without the generation of a reset pulse.

The timer counter is loaded with the value of the watchdog timer load register (the [WDT_WLDR](#)[31:0] [TIMER_LOAD](#) bit field), and the prescaler is reset.

23.3.4.8 Start/Stop Sequence for Watchdog Timers (Using the WDT_WSPR Register)

To start and stop a watchdog timer, access must be made through the start/stop register ([WDT_WSPR](#)) using a specific sequence.

To disable the timer, follow this sequence:

1. Write 0xFFFF AAAA in [WDT_WSPR](#).
2. Write 0xFFFF 5555 in [WDT_WSPR](#).

To enable the timer, follow this sequence:

1. Write 0xFFFF BBBB in [WDT_WSPR](#).
2. Write 0xFFFF 4444 in [WDT_WSPR](#).

All other write sequences on the [WDT_WSPR](#) register have no effect on the start/stop feature of the module.

23.3.4.9 Modifying Timer Count/Load Values and Prescaler Setting

To modify the timer counter value (the [WDT_WCRR](#) register), prescaler ratio (the [WDT_WCLR](#)[4:2] [PTV](#) bit field), delay configuration value (the [WDT_WDLY](#)[31:0] [DLY_VALUE](#) bit field), or the load value (the [WDT_WLDR](#)[31:0] [TIMER_LOAD](#) bit field), the watchdog timer must be disabled by using the start/stop sequence (the [WDT_WSPR](#) register).

After a write access, the load register value and prescaler ratio registers are updated immediately, but new values are considered only after the next consecutive counter overflow or after a new trigger command (the [WDT_WTGR](#) register).

23.3.4.10 Watchdog Counter Register Access Restriction (WDT_WCRR Register)

A 32-bit shadow register is implemented to read a coherent value of the [WDT_WCRR](#) register because the [WDT_WCRR](#) register is directly related to the timer counter value and is updated on the timer clock ([WDT_FCLK](#)). The shadow register is updated by a 16-bit LSB read command.

NOTE: Although the L4 clock ([WDT_ICLK](#)) is completely asynchronous with the timer clock ([WDT_FCLK](#)), some synchronization is performed to ensure that the value of the [WDT_WCRR](#) register is not read while it is being incremented.

When 32-bit read access is performed, the shadow register is not updated. Read access is performed directly from the accessed register.

To ensure that a coherent value is read inside [WDT_WCRR](#), the first read access is to the lower 16 bits (offset = 0x08), followed by read access to the upper 16 bits (offset = 0x0A).

23.3.4.11 Watchdog Timer Interrupt Generation

When an interrupt source occurs, the interrupt status bit (the [WDT_WIRQSTAT](#)[0] [EVENT_OVF](#) or [WDT_WIRQSTAT](#)[1] [EVENT_DLY](#) bit) is set to 1. The output interrupt line ([WDTi_IRQ](#)) is asserted (active low) when status (the [EVENT_xxx](#) bit) and enable (the [xxx_IT_ENA](#) bit) flags are set to 1; the order is not relevant. Writing 1 to the enable bit (the status is already set at 1) also triggers the interrupt in the normal order (enable first, status next). The pending interrupt event is cleared when the set status bit is overwritten by a value of 1 by a write command in the [WDT_WIRQSTAT](#) register. Reading the [WDT_WIRQSTAT](#) register and writing the value back allows a fast interrupt acknowledge process.

The watchdog timer issues an overflow interrupt if this interrupt is enabled in the watchdog interrupt enable register ([WDT_WIRQENSET](#)[0] [OVF_IT_ENA](#) = 1). When the overflow occurs, the interrupt status bit (the [WDT_WIRQSTAT](#)[0] [EVENT_OVF](#) bit) is set to 1. The output interrupt line ([WDT_IRQ](#)) is asserted (active low) when status ([EVENT_OVF](#)) and enable ([OVF_IT_ENA](#)) flags are set to 1; the order is not relevant. This interrupt can be disabled by setting the [WDT_WIRQENCLR](#)[0] [OVF_IT_ENA](#) bit to 1.

The watchdog can issue the delay interrupt if this interrupt is enabled in the interrupt enable register ([WDT_WIRQENSET](#)[1] DLY_IT_ENA = 1). When the counter is running and the counter value matches the value stored in the delay configuration register ([WDT_WDLY](#)), the corresponding interrupt status bit is set in the watchdog status register ([WDT_WIRQSTAT](#)) and the output interrupt line is asserted (active low) when the flag (EVENT_DLY) and enable (DLY_IT_ENA) bits are 1 in the [WDT_WIRQSTAT](#) and [WDT_WIRQENSET](#) registers, respectively; the order (normally enable, then flag), is not relevant. This interrupt can be disabled by setting the [WDT_WIRQENCLR](#)[1] DLY_IT_ENA bit to 1.

NOTE: Writing 0 to the [WDT_WIRQSTAT](#)[0] EVENT_OVF bit or the [WDT_WIRQSTAT](#)[1] EVENT_DLY bit has no effect.

The two clock domains are resynchronized because the interrupt event is generated on the functional clock domain (WDTi_FCLK) during the updating of the interrupt status register ([WDT_WIRQSTAT](#)).

The [WDT_WDLY](#) register is used to specify the value of the delay configuration register. The delay time to interrupt is the difference between the reload value stored in the counter load register ([WDT_WLDR](#)) and the programmed value in this register ([WDT_WDLY](#)).

Use the following formula to estimate the delay time:

Delay time period = ([WDT_WDLY](#) – [WDT_WLDR](#) + 1) × Timer clock period × Clock divider

Where:

- Timer clock period = 1/(Timer clock frequency)
- Clock divider = 2PTV

If the counter value ([WDT_WCRR](#)) reaches the programmed value ([WDT_WDLY](#)), the status bit (EVENT_DLY) gets set in the interrupt status register ([WDT_WIRQSTAT](#)), and an interrupt occurs if the corresponding enable bit is set in the interrupt enable register ([WDT_WIRQENSET](#)).

CAUTION

If the reload event occurs (after a triggering sequence or after a reset sequence) before reaching the programmed value ([WDT_WDLY](#)[31:0] WDLY_VALUE), no interrupt is generated.

Also, no interrupt is generated if the value programmed in the delay configuration register ([WDT_WDLY](#)) is less than the value stored in the counter load register ([WDT_WLDR](#)).

23.3.4.12 Watchdog Timers Under Emulation

During emulation mode, the watchdog timer can/cannot continue running, according to the value of the [WDT_WDSC](#)[5] EMUFREE bit of the system configuration register ([WDT_WDSC](#)).

- When EMUFREE is 1, watchdog timer execution is not stopped and a reset pulse is still generated when overflow is reached.
- When EMUFREE is 0, the counters (prescaler/timer) are frozen and incrementation restarts after exiting from emulation mode.

23.3.4.13 Accessing Watchdog Timer Registers

Posted/nonposted selection applies only to functional registers that require synchronization on/from the timer functional clock domain (WDTi_FCLK). For write/read operation, the following registers are affected:

- [WDT_WCLR](#)
- [WDT_WCRR](#)
- [WDT_WLDR](#)
- [WDT_WTGR](#)
- [WDT_WDLY](#)

- [WDT_WSPR](#)

NOTE: To ensure completion of successive writes in a WDT2 or WDT3 functional clock domain register, user software must poll the appropriate WDT_WWPS status bit.

NOTE: To ensure coherent reading when a read transaction immediately follows a write access to a WDT2 or WDT3 functional clock domain register, user software must check the appropriate WDT_WWPS status bit.

The timer interface clock domain synchronous registers are not affected by the posted mode mechanism; the write/read operation is effective and acknowledged (command accepted) after one WDT_ICLK cycle from the command assertion. The timer interface clock domain synchronous registers are:

- [WDT_WIDR](#)
- [WDT_WDSC](#)
- [WDT_WDST](#)
- [WDT_WIRQSTATRAW](#)
- [WDT_WIRQSTAT](#)
- [WDT_WIRQENSET](#)
- [WDT_WIRQENCLR](#)
- [WDT_WIRQWAKEEN](#)
- [WDT_WWPS](#)

NOTE: Accesses to WDT2 and WDT3 functional clock domain synchronous registers are posted.

23.3.5 Watchdog Timer Low-Level Programming Model

This section covers the low-level hardware programming sequences for configuration and use of the module.

23.3.5.1 Global Initialization

23.3.5.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the watchdog timer is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the watchdog timer (see [Table 23-90](#)). For more information, see [Section 23.3.2](#), *Watchdog Timer Environment*, and [Section 23.3.3](#), *Watchdog Timer Integration*.

Table 23-90. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|---|
| PRCM | The module interface and functional clocks must be enabled. for more information about the module configuration. For more information about the module configuration, see Section 3.1.1.1.2 , <i>Module Level Clock Management</i> , in Chapter 3 , <i>Power, Reset, and Clock Management</i> . |
| Control module | Module-specific pad muxing must be set in the control module. For more information about the module configuration, see Section 19.4.8 , <i>PAD Functional Multiplexing and Configuration</i> in Chapter 19 , <i>Control Module</i> . |
| MPU INTC | The MPU INTC configuration must be performed to enable the interrupts from the watchdog timer. See Section 4.4.3 , <i>Interrupt Controller Registers</i> in Chapter 4 , <i>Cortex-A9 MPU Subsystem</i> . |

PRELIMINARY

23.3.5.1.2 Watchdog Timer Module Global Initialization

23.3.5.1.2.1 Main Sequence – Watchdog Timer Module Global Initialization

Table 23-91 lists the steps for initializing the watchdog timer module when the module is to be used for the first time.

Table 23-91. Watchdog Timer Module Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|----------------------------|--------------------------------------|-------|
| Execute software reset. | WDT_WDSC[1] SOFTRESET | 0x1 |
| Wait until reset release? | WDT_WDSC[1] SOFTRESET | 0x0 |
| Configure idle mode. | WDT_WDSC[4:3] IDLEMODE | xx |
| Enable delay wakeup. | WDT_WIRQWAKEEN[1] DLY_WK_ENA | 0x1 |
| Enable overflow wakeup. | WDT_WIRQWAKEEN[0] OVF_WK_ENA | 0x1 |
| Enable delay interrupt. | WDT_WIRQENSET[1] ENABLE_DLY | 0x1 |
| Enable overflow interrupt. | WDT_WIRQENSET[0] ENABLE_OVF | 0x1 |

23.3.5.2 Operational Mode Configuration

23.3.5.2.1 Watchdog Timer Basic Configuration

23.3.5.2.1.1 Main Sequence – Watchdog Timer Basic Configuration

Table 23-92 lists the steps for the basic configuration of the watchdog timer.

Table 23-92. Watchdog Timer Basic Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------------|--------------------------------------|-------|
| Disable the watchdog timer. | See Section 23.3.5.2.1.2. | |
| Set prescaler value. | WDT_WCLR[4:2] PTV | xxx |
| Enable prescaler. | WDT_WCLR[5] PRE | 0x1 |
| Load delay configuration value. | WDT_WDLY | xxx |
| Load timer counter value. | WDT_WCRR | xxx |
| Enable the watchdog timer. | See Section 23.3.5.2.1.3. | |

23.3.5.2.1.2 Subsequence – Disable the Watchdog Timer

Table 23-93 lists the steps to disable the watchdog timer.

Table 23-93. Disable the Watchdog Timer

| Step | Register/Bit Field/Programming Model | Value |
|-------------------------------|--------------------------------------|-------------|
| Write disable sequence Data1. | WDT_WSPR | 0xFFFF AAAA |
| Write disable sequence Data2. | WDT_WSPR | 0xFFFF 5555 |

23.3.5.2.1.3 Subsequence – Enable the Watchdog Timer

Table 23-94 lists the steps to enable the watchdog timer.

Table 23-94. Enable the Watchdog Timer

| Step | Register/Bit Field/Programming Model | Value |
|------------------------------|--------------------------------------|-------------|
| Write enable sequence Data1. | WDT_WSPR | 0xFFFF BBBB |
| Write enable sequence Data2. | WDT_WSPR | 0xFFFF 4444 |

23.3.6 Watchdog Timer Register Manual

23.3.6.1 Watchdog Timer Instance Summary

Table 23-95 lists the base address and address space for the watchdog timer module instances.

Table 23-95. Watchdog Timer Instance Summary

| Module Name | Base Address L4 Interconnect | Base Address L3 Interconnect | Base Address Cortex-A9 Private Access | Base Address DSP Private Access | Size |
|-------------|---------------------------------|---------------------------------|---|---------------------------------------|------|
| WDTIMER2 | 0x4A31 4000 | - | - | - | 4KB |
| WDTIMER3 | - | 0x4903 0000 | 0x4013 0000 | 0x01D3 0000 | 4KB |

NOTE: Private access is an access which is not using the L3/L4 interconnects.

23.3.6.2 Watchdog Timer Registers

23.3.6.2.1 Watchdog Timer Register Summary

CAUTION

The watchdog timers registers are limited to 32-bit and 16-bit data accesses; 8-bit access is not allowed and can corrupt register content.

Table 23-96 lists the WDTIMER2 registers.

Table 23-96. WDTIMER2 Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L4 Interconnect |
|-----------------|------|--------------------------|----------------|-------------------------------------|
| WDT_WIDR | R | 32 | 0x0000 0000 | 0x4A31 4000 |
| WDT_WDSC | RW | 32 | 0x0000 0010 | 0x4A31 4010 |
| WDT_WDST | R | 32 | 0x0000 0014 | 0x4A31 4014 |
| WDT_WISR | RW | 32 | 0x0000 0018 | 0x4A31 4018 |
| WDT_WIER | RW | 32 | 0x0000 001C | 0x4A31 401C |
| WDT_WWER | RW | 32 | 0x0000 0020 | 0x4A31 4020 |
| WDT_WCLR | RW | 32 | 0x0000 0024 | 0x4A31 4024 |
| WDT_WCRR | RW | 32 | 0x0000 0028 | 0x4A31 4028 |
| WDT_WLDR | RW | 32 | 0x0000 002C | 0x4A31 402C |
| WDT_WTGR | RW | 32 | 0x0000 0030 | 0x4A31 4030 |
| WDT_WWPS | R | 32 | 0x0000 0034 | 0x4A31 4034 |
| WDT_WDLV | RW | 32 | 0x0000 0044 | 0x4A31 4044 |
| WDT_WSPR | RW | 32 | 0x0000 0048 | 0x4A31 4048 |
| RESERVED | | | 0x0000 0050 | 0x4A31 4050 |
| WDT_WIRQSTATRAW | RW | 32 | 0x0000 0054 | 0x4A31 4054 |
| WDT_WIRQSTAT | RW | 32 | 0x0000 0058 | 0x4A31 4058 |
| WDT_WIRQENSET | RW | 32 | 0x0000 005C | 0x4A31 405C |
| WDT_WIRQENCLR | RW | 32 | 0x0000 0060 | 0x4A31 4060 |
| WDT_WIRQWAKEEN | RW | 32 | 0x0000 0064 | 0x4A31 4064 |

Table 23-97 lists the WDTIMER3 registers.

Table 23-97. WDTIMER3 Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|-----------------|------|-----------------------|----------------|----------------------------------|---|-------------------------------------|
| WDT_WIDR | R | 32 | 0x0000 0000 | 0x4903 0000 | 0x4013 0000 | 0x01D3 0000 |
| WDT_WDSC | RW | 32 | 0x0000 0010 | 0x4903 0010 | 0x4013 0010 | 0x01D3 0010 |
| WDT_WDST | R | 32 | 0x0000 0014 | 0x4903 0014 | 0x4013 0014 | 0x01D3 0014 |
| WDT_WISR | RW | 32 | 0x0000 0018 | 0x4903 0018 | 0x4013 0018 | 0x01D3 0018 |
| WDT_WIER | RW | 32 | 0x0000 001C | 0x4903 001C | 0x4013 001C | 0x01D3 001C |
| WDT_WWER | RW | 32 | 0x0000 0020 | 0x4903 0020 | 0x4013 0020 | 0x01D3 0020 |
| WDT_WCLR | RW | 32 | 0x0000 0024 | 0x4903 0024 | 0x4013 0024 | 0x01D3 0024 |
| WDT_WCRR | RW | 32 | 0x0000 0028 | 0x4903 0028 | 0x4013 0028 | 0x01D3 0028 |
| WDT_WLDR | RW | 32 | 0x0000 002C | 0x4903 002C | 0x4013 002C | 0x01D3 002C |
| WDT_WTGR | RW | 32 | 0x0000 0030 | 0x4903 0030 | 0x4013 0030 | 0x01D3 0030 |
| WDT_WWPS | R | 32 | 0x0000 0034 | 0x4903 0034 | 0x4013 0034 | 0x01D3 0034 |
| WDT_WDLY | RW | 32 | 0x0000 0044 | 0x4903 0044 | 0x4013 0044 | 0x01D3 0044 |
| WDT_WSPR | RW | 32 | 0x0000 0048 | 0x4903 0048 | 0x4013 0048 | 0x01D3 0048 |
| RESERVED | | | 0x0000 0050 | 0x4903 0050 | 0x4013 0050 | 0x01D3 0050 |
| WDT_WIRQSTATRAW | RW | 32 | 0x0000 0054 | 0x4903 0054 | 0x4013 0054 | 0x01D3 0054 |
| WDT_WIRQSTAT | RW | 32 | 0x0000 0058 | 0x4903 0058 | 0x4013 0058 | 0x01D3 0058 |
| WDT_WIRQENSET | RW | 32 | 0x0000 005C | 0x4903 005C | 0x4013 005C | 0x01D3 005C |
| WDT_WIRQENCLR | RW | 32 | 0x0000 0060 | 0x4903 0060 | 0x4013 0060 | 0x01D3 0060 |
| WDT_WIRQWAKEEN | RW | 32 | 0x0000 0064 | 0x4903 0064 | 0x4013 0064 | 0x01D3 0064 |

NOTE:

- The [WDT_WISR](#) and [WDT_WIRQSTATRAW](#) registers have the same functionality. The [WDT_WISR](#) register is used for software backward compatibility.
- The [WDT_WIER](#) and [WDT_WIRQENSET](#)/[WDT_WIRQENCLR](#) registers have the same functionality. The [WDT_WIER](#) register is used for software backward compatibility.
- The [WDT_WWER](#) and [WDT_WIRQWAKEEN](#) registers have the same functionality. The [WDT_WWER](#) is used for software backward compatibility.
- The [WDT_WIRQSTATRAW](#) and [WDT_WIRQSTAT](#) registers give the same information when read. The [WDT_WIRQSTATRAW](#) register is used for debug.

23.3.6.2.2 Watchdog Timer Register Description

through describe the watchdog timer registers.

Table 23-98. WDT_WIDR

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4A31 4000 0x4903 0000 0x4013 0000 0x01D3 0000 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | IP revision identifier | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP Revision | R | 0x– ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 23-99. Register Call Summary for Register WDT_WIDR

Watchdog Timers

- [Accessing Watchdog Timer Registers: \[0\]](#)
- [Watchdog Timer Register Summary: \[1\] \[2\]](#)

Table 23-100. WDT_WDSC

| | | | |
|------------------|--|----------|--|
| Address Offset | 0x0000 0010 | | |
| Physical Address | 0x4A31 4010 0x4903 0010 0x4013 0010 0x01D3 0010 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | This register controls the various parameters of the L4 interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---------|---|----------|---|----------|-----------|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | EMUFREE | | IDLEMODE | | RESERVED | SOFTRESET | RESERVED | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:6 | RESERVED | Write os for future compatibility. Reads return 0. | R | 0x0000000 |
| 5 | EMUFREE | Emulation mode | RW | 0 |
| | | 0x0: Timer counter frozen in emulation | | |
| | | 0x1: Timer counter free-running in emulation | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 4:3 | IDLEMODE | Configuration of the local target state management mode. By definition, target can handle read/write transaction as long as it is out of IDLE state. 0x0: Force-idle mode: local target IDLE state follows (acknowledges) the system idle requests unconditionally, that is, regardless of the IP module internal requirements. Backup mode, for debug only. 0x1: No-idle mode: local target never enters IDLE state. Backup mode, for debug only. 0x2: Smart-idle mode: local target IDLE state eventually follows (acknowledges) the system idle requests, depending on the IP module internal requirements. IP module should not generate (IRQ- or DMA-request-related) wake-up events. 0x3: Smart-idle wake-up-capable mode: local target IDLE state eventually follows (acknowledges) the system idle requests, depending on the IP module internal requirements. IP module may generate (IRQ- or DMA-request-related) wake-up events when in IDLE state. Mode is relevant only if the appropriate IP module <i>swake-up</i> output(s) is (are) implemented. | RW | 0x2 |
| 2 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |
| 1 | SOFTRESET | Software reset. (Optional) Read 0x0: Reset done, no pending action Write 0x0: No action Write 0x1: Initiate software reset. Read 0x1: Reset (software or other) ongoing | RW | 0 |
| 0 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0 |

Table 23-101. Register Call Summary for Register WDT_WDSC

Watchdog Timers

- [Power Management: \[0\]](#)
- [Wake-Up Capability: \[1\]](#)
- [Watchdog Timers Under Emulation: \[2\] \[3\]](#)
- [Accessing Watchdog Timer Registers: \[4\]](#)
- [Watchdog Timer Module Global Initialization: \[5\] \[6\] \[7\]](#)
- [Watchdog Timer Register Summary: \[8\] \[9\]](#)

Table 23-102. WDT_WDST

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0014 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Physical Address | 0x4A31 4014 0x4903 0014 0x4013 0014 0x01D3 0014 | | |
| Description | This register provides status information about the module. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESETDONE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Reads return 0. | R | 0x0000 0000 |
| 0 | RESETDONE | Internal module reset monitoring Read 0x0: Internal module reset is ongoing. Read 0x1: Reset completed | R | 1 |

Table 23-103. Register Call Summary for Register WDT_WDST

Watchdog Timers

- [Accessing Watchdog Timer Registers: \[0\]](#)
- [Watchdog Timer Register Summary: \[1\] \[2\]](#)

Table 23-104. WDT_WISR

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0018 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Physical Address | 0x4A31 4018 0x4903 0018 0x4013 0018 0x01D3 0018 | | |
| Description | This register shows which interrupt events are pending inside the module. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|-------------|-------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DLY_IT_FLAG | OVF_IT_FLAG | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|---------------|-------------|
| 31:2 | RESERVED | Reads return 0. | R | 0x0000 0000 |
| 1 | DLY_IT_FLAG | Pending delay interrupt status. Read 0x0: No delay interrupt pending Write 0x0: Status unchanged Write 0x1: Status bit cleared Read 0x1: Delay interrupt pending | RW W1toClr | 0 |
| 0 | OVF_IT_FLAG | Pending overflow interrupt status. Read 0x0: No overflow interrupt pending Write 0x0: Status unchanged Write 0x1: Status bit cleared Read 0x1: Overflow interrupt pending | RW W1toClr | 0 |

Table 23-105. Register Call Summary for Register WDT_WISR

Watchdog Timers

- [Watchdog Timer Register Summary: \[0\] \[1\] \[2\] \[3\]](#)

Table 23-106. WDT_WIER

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 001C | | |
| Physical Address | 0x4A31 401C 0x4903 001C 0x4013 001C 0x01D3 001C | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | This register controls (enable/disable) the interrupt events. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DLY_IT_ENA | | OVF_IT_ENA | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:2 | RESERVED | Reads return 0. | R | 0x0000 0000 |
| 1 | DLY_IT_ENA | Delay interrupt enable/disable 0x0: Disable delay interrupt. 0x1: Enable delay interrupt. | RW | 0 |
| 0 | OVF_IT_ENA | Overflow interrupt enable/disable 0x0: Disable overflow interrupt. 0x1: Enable overflow interrupt. | RW | 0 |

Table 23-107. Register Call Summary for Register WDT_WIER

Watchdog Timers

- [Watchdog Timer Register Summary: \[0\] \[1\] \[2\] \[3\]](#)

Table 23-108. WDT_WWER

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0020 | | |
| Physical Address | 0x4A31 4020 0x4903 0020 0x4013 0020 0x01D3 0020 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | This register controls (enable/disable) the wake-up events. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DLY_WK_ENA | | OVF_WK_ENA | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 0000 |
| 1 | DLY_WK_ENA | Delay wake-up enable 0x0: Disable delay wakeup. 0x1: Enable delay wakeup. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | OVF_WK_ENA | Overflow wake-up enable 0x0: Disable overflow wakeup. 0x1: Enable overflow wakeup. | RW | 0 |

Table 23-109. Register Call Summary for Register WDT_WWER

Watchdog Timers

- [Watchdog Timer Register Summary: \[0\] \[1\] \[2\] \[3\]](#)

Table 23-110. WDT_WCLR

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0024 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Physical Address | 0x4A31 4024 0x4903 0024 0x4013 0024 0x01D3 0024 | | |
| Description | This register controls the prescaler stage of the counter. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-----|-----|---|---|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | PRE | PTV | | | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:6 | RESERVED | Reads return 0. | R | 0x0000000 |
| 5 | PRE | Prescaler enable/disable configuration 0x0: Prescaler disabled 0x1: Prescaler enabled | RW | 1 |
| 4:2 | PTV | Prescaler value The timer counter is prescaled with the value: 2**PTV. Example: PTV = 3 - counter increases value if started after 8 functional clock periods. On reset, it is loaded from PI_PTV_RESET_VALUE input port. | RW | 0x0 |
| 1:0 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0 |

Table 23-111. Register Call Summary for Register WDT_WCLR

Watchdog Timers

- [General Watchdog Timer Operation: \[0\] \[1\] \[2\]](#)
- [Reset Context: \[3\] \[4\]](#)
- [Prescaler Value/Timer Reset Frequency: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [Modifying Timer Count/Load Values and Prescaler Setting: \[12\]](#)
- [Accessing Watchdog Timer Registers: \[13\]](#)
- [Watchdog Timer Basic Configuration: \[14\] \[15\]](#)
- [Watchdog Timer Register Summary: \[16\] \[17\]](#)

Table 23-112. WDT_WCRR

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0028 | | |
| Physical Address | 0x4A31 4028 0x4903 0028 0x4013 0028 0x01D3 0028 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | This register holds the value of the internal counter. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TIMER_COUNTER | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|-------------------------------------|------|-------------|
| 31:0 | TIMER_COUNTER | Value of the timer counter register | RW | 0x0000 0000 |

Table 23-113. Register Call Summary for Register WDT_WCRR

Watchdog Timers

- [General Watchdog Timer Operation: \[0\]](#)
- [Overflow/Reset Generation: \[1\]](#)
- [Modifying Timer Count/Load Values and Prescaler Setting: \[2\]](#)
- [Watchdog Counter Register Access Restriction \(WDT_WCRR Register\): \[3\] \[4\] \[5\] \[6\]](#)
- [Watchdog Timer Interrupt Generation: \[7\]](#)
- [Accessing Watchdog Timer Registers: \[8\]](#)
- [Watchdog Timer Basic Configuration: \[9\]](#)
- [Watchdog Timer Register Summary: \[10\] \[11\]](#)

Table 23-114. WDT_WLDR

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 002C | | |
| Physical Address | 0x4A31 402C 0x4903 002C 0x4013 002C 0x01D3 002C | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | This register holds the timer load value. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TIMER_LOAD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------------------------|------|-------------|
| 31:0 | TIMER_LOAD | Value of the timer load register | RW | 0x0000 0000 |

Table 23-115. Register Call Summary for Register WDT_WLDR

Watchdog Timers

- [General Watchdog Timer Operation: \[0\]](#)
- [Reset Context: \[1\] \[2\]](#)
- [Overflow/Reset Generation: \[3\]](#)
- [Prescaler Value/Timer Reset Frequency: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [Triggering a Timer Reload: \[11\]](#)
- [Modifying Timer Count/Load Values and Prescaler Setting: \[12\]](#)
- [Watchdog Timer Interrupt Generation: \[13\] \[14\] \[15\]](#)
- [Accessing Watchdog Timer Registers: \[16\]](#)
- [Watchdog Timer Register Summary: \[17\] \[18\]](#)

Table 23-116. WDT_WTGR

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0030 | | |
| Physical Address | 0x4A31 4030 0x4903 0030 0x4013 0030 0x01D3 0030 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | Writing a different value than the one already written in this register does a watchdog counter reload. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TTGR_VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------------------|------|-------------|
| 31:0 | TTGR_VALUE | Value of the trigger register | RW | 0x0000 0000 |

Table 23-117. Register Call Summary for Register WDT_WTGR

Watchdog Timers

- [General Watchdog Timer Operation: \[0\]](#)
- [Triggering a Timer Reload: \[1\] \[2\]](#)
- [Modifying Timer Count/Load Values and Prescaler Setting: \[3\]](#)
- [Accessing Watchdog Timer Registers: \[4\]](#)
- [Watchdog Timer Register Summary: \[5\] \[6\]](#)

Table 23-118. WDT_WWPS

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0034 | | |
| Physical Address | 0x4A31 4034 0x4903 0034 0x4013 0034 0x01D3 0034 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | This register contains the write posting bits for all writeable functional registers. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------------|---|---|---|---|-------------|---|---|--|--|-------------|--|--|--|--|-------------|--|--|--|--|-------------|--|--|--|--|-------------|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | W_PEND_WDLY | | | | | W_PEND_WSPR | | | | | W_PEND_WTGR | | | | | W_PEND_WLDR | | | | | W_PEND_WCRR | | | | | W_PEND_WCLR | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|------------|
| 31:6 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x00000000 |
| 5 | W_PEND_WDLY | Write pending for register WDLY Read 0x0: No register write pending Read 0x1: Register write pending | R | 0 |
| 4 | W_PEND_WSPR | Write pending for register WSPR Read 0x0: No register write pending Read 0x1: Register write pending | R | 0 |
| 3 | W_PEND_WTGR | Write pending for register WTGR Read 0x0: No register write pending Read 0x1: Register write pending | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 2 | W_PEND_WLDR | Write pending for register WLDR Read 0x0: No register write pending Read 0x1: Register write pending | R | 0 |
| 1 | W_PEND_WCRR | Write pending for register WCRR Read 0x0: No register write pending Read 0x1: Register write pending | R | 0 |
| 0 | W_PEND_WCLR | Write pending for register WCLR Read 0x0: No register write pending Read 0x1: Register write pending | R | 0 |

Table 23-119. Register Call Summary for Register WDT_WWPS

Watchdog Timers

- [Accessing Watchdog Timer Registers: \[0\]](#)
- [Watchdog Timer Register Summary: \[1\] \[2\]](#)

Table 23-120. WDT_WDLY

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0044 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Physical Address | 0x4A31 4044 0x4903 0044 0x4013 0044 0x01D3 0044 | | |
| Description | This register holds the delay value that controls the internal pre-overflow event detection. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WDLY_VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------------|------|-------------|
| 31:0 | WDLY_VALUE | Value of the delay register | RW | 0x0000 0000 |

Table 23-121. Register Call Summary for Register WDT_WDLY

Watchdog Timers

- [Modifying Timer Count/Load Values and Prescaler Setting: \[0\]](#)
- [Watchdog Timer Interrupt Generation: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [Accessing Watchdog Timer Registers: \[8\]](#)
- [Watchdog Timer Basic Configuration: \[9\]](#)
- [Watchdog Timer Register Summary: \[10\] \[11\]](#)

Table 23-122. WDT_WSPR

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0048 | | |
| Physical Address | 0x4A31 4048 0x4903 0048 0x4013 0048 0x01D3 0048 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | This register holds the start-stop value that controls the internal start-stop FSM. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WSPR_VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------------------------|------|-------------|
| 31:0 | WSPR_VALUE | Value of the start-stop register | RW | 0x0000 0000 |

Table 23-123. Register Call Summary for Register WDT_WSPR

Watchdog Timers

- [General Watchdog Timer Operation: \[0\]](#)
- [Prescaler Value/Timer Reset Frequency: \[1\] \[2\]](#)
- [Start/Stop Sequence for Watchdog Timers \(Using the WDT_WSPR Register\): \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [Modifying Timer Count/Load Values and Prescaler Setting: \[9\]](#)
- [Accessing Watchdog Timer Registers: \[10\]](#)
- [Watchdog Timer Basic Configuration: \[11\] \[12\] \[13\] \[14\]](#)
- [Watchdog Timer Register Summary: \[15\] \[16\]](#)

Table 23-124. WDT_WIRQSTATRAW

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0054 | | |
| Physical Address | 0x4A31 4054 0x4903 0054 0x4013 0054 0x01D3 0054 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | IRQ unmasked status, status set per-event raw interrupt status vector, line 0. Raw status is set even if event is not enabled. Write 1 to set the (raw) status, mostly for debug. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|-----------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | EVENT_DLY | EVENT_OVF |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------------|
| 31:2 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 0000 |
| 1 | EVENT_DLY | Settable raw status for delay event Read 0x0: No event pending Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 0 | EVENT_OVF | Settable raw status for overflow event Read 0x0: No event pending Write 0x0: No action Write 0x1: Set event (debug) Read 0x1: Event pending | RW W1toSet | 0 |

Table 23-125. Register Call Summary for Register WDT_WIRQSTATRAW

Watchdog Timers

- [Accessing Watchdog Timer Registers: \[0\]](#)
- [Watchdog Timer Register Summary: \[1\] \[2\] \[3\] \[4\] \[5\]](#)

Table 23-126. WDT_WIRQSTAT

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0058 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Physical Address | 0x4A31 4058 0x4903 0058 0x4013 0058 0x01D3 0058 | | |
| Description | IRQ masked status, status clear per-event enabled interrupt status vector, line 0. Enabled status is not set unless event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|-----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | EVENT_DLY | | EVENT_OVF | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------------|
| 31:2 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 0000 |
| 1 | EVENT_DLY | Clearable, enabled status for delay event Read 0x0: No (enabled) event pending Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending | RW W1toClr | 0 |
| 0 | EVENT_OVF | Clearable, enabled status for overflow event Read 0x0: No (enabled) event pending Write 0x0: No action Write 0x1: Clear (raw) event Read 0x1: Event pending | RW W1toClr | 0 |

Table 23-127. Register Call Summary for Register WDT_WIRQSTAT

Watchdog Timers

- [Interrupts: \[0\] \[1\]](#)
- [General Watchdog Timer Operation: \[2\]](#)
- [Watchdog Timer Interrupt Generation: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [Accessing Watchdog Timer Registers: \[14\]](#)
- [Watchdog Timer Register Summary: \[15\] \[16\] \[17\]](#)

Table 23-128. WDT_WIRQENSET

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 005C | | |
| Physical Address | 0x4A31 405C 0x4903 005C 0x4013 005C 0x01D3 005C | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | IRQ enable set per-event interrupt enable bit vector, line 0. Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ENABLE_DLY | | ENABLE_OVF | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------------|
| 31:2 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 0000 |
| 1 | ENABLE_DLY | Enable for delay event Read 0x0: Interrupt disabled (masked) Write 0x0: No action Write 0x1: Enable interrupt. Read 0x1: Interrupt enabled | RW W1toSet | 0 |
| 0 | ENABLE_OVF | Enable for overflow event Read 0x0: Interrupt disabled (masked) Write 0x0: No action Write 0x1: Enable interrupt. Read 0x1: Interrupt enabled | RW W1toSet | 0 |

Table 23-129. Register Call Summary for Register WDT_WIRQENSET

Watchdog Timers

- [Interrupts: \[0\] \[1\]](#)
- [General Watchdog Timer Operation: \[2\]](#)
- [Watchdog Timer Interrupt Generation: \[3\] \[4\] \[5\] \[6\]](#)
- [Accessing Watchdog Timer Registers: \[7\]](#)
- [Watchdog Timer Module Global Initialization: \[8\] \[9\]](#)
- [Watchdog Timer Register Summary: \[10\] \[11\] \[12\]](#)

Table 23-130. WDT_WIRQENCLR

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0060 | | |
| Physical Address | 0x4A31 4060 0x4903 0060 0x4013 0060 0x01D3 0060 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | IRQ enable clear per-event interrupt enable bit vector, line 0. Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ENABLE_DLY | | ENABLE_OVF | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------------|
| 31:2 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 0000 |
| 1 | ENABLE_DLY | Enable for delay event Read 0x0: Interrupt disabled (masked) Write 0x0: No action Write 0x1: Disable interrupt. Read 0x1: Interrupt enabled | RW W1toClr | 0 |
| 0 | ENABLE_OVF | Enable for overflow event Read 0x0: Interrupt disabled (masked) Write 0x0: No action Write 0x1: Disable interrupt. Read 0x1: Interrupt enabled | RW W1toClr | 0 |

Table 23-131. Register Call Summary for Register WDT_WIRQENCLR
Watchdog Timers

- [Interrupts: \[0\] \[1\]](#)
- [General Watchdog Timer Operation: \[2\]](#)
- [Watchdog Timer Interrupt Generation: \[3\] \[4\]](#)
- [Accessing Watchdog Timer Registers: \[5\]](#)
- [Watchdog Timer Register Summary: \[6\] \[7\] \[8\]](#)

Table 23-132. WDT_WIRQWAKEEN

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0064 | | |
| Physical Address | 0x4A31 4064 0x4903 0064 0x4013 0064 0x01D3 0064 | Instance | WDTIMER2_L4 WDTIMER3_L3 WDTIMER3_CORTEX-A9 WDTIMER3_DSP |
| Description | This register controls (enable/disable) the wake-up events. | | |
| Type | RW | | |

Watchdog Timers

www.ti.com

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DLY_WK_ENA | | OVF_WK_ENA | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:2 | RESERVED | Write 0s for future compatibility. Reads return 0. | R | 0x0000 0000 |
| 1 | DLY_WK_ENA | Enable delay wake-up 0x0: Disable delay wakeup 0x1: Enable delay wakeup | RW | 0 |
| 0 | OVF_WK_ENA | Enable overflow wakeup 0x0: Disable overflow wakeup 0x1: Enable overflow wakeup | RW | 0 |

Table 23-133. Register Call Summary for Register WDT_WIRQWAKEEN

Watchdog Timers

- [Power Management: \[0\]](#)
- [Wake-Up Capability: \[1\] \[2\]](#)
- [Accessing Watchdog Timer Registers: \[3\]](#)
- [Watchdog Timer Module Global Initialization: \[4\] \[5\]](#)
- [Watchdog Timer Register Summary: \[6\] \[7\] \[8\]](#)

23.4 32-kHz Synchronized Timer

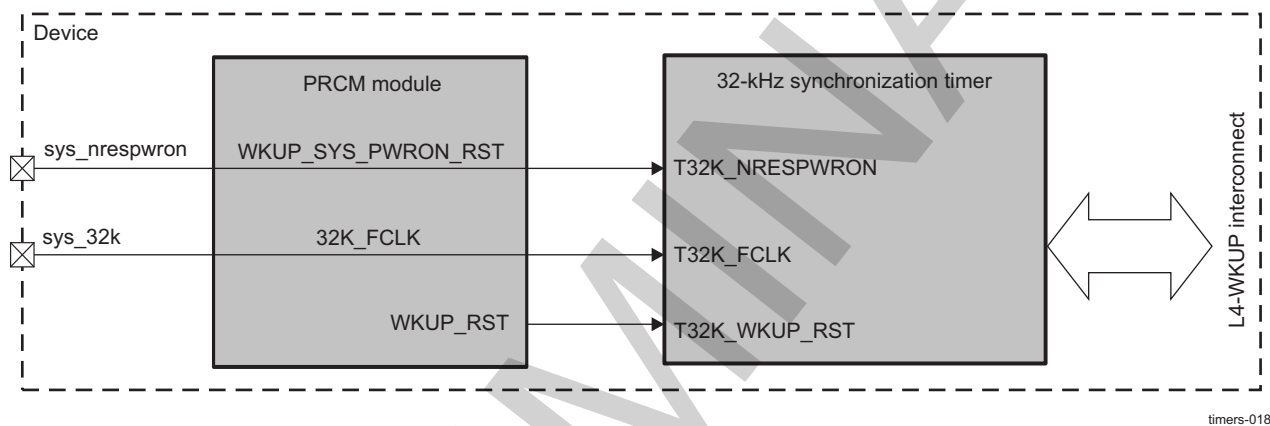
23.4.1 32-kHz Synchronized Timer Overview

The 32-kHz synchronized timer is a 32-bit counter clocked by the falling edge of the 32-kHz system clock. It is reset while the external asynchronous power-up reset (sys_nrespwron) primary input/output (I/O) is active (main device reset). When sys_nrespwron is released (on the rising edge of sys_nrespwron), after three 32-kHz clock periods, the counter starts counting up from the reset value of the counter register on the falling edge of the 32-kHz system clock. After reaching its highest value, the counter wraps back to 0 and starts counting again.

Figure 23-19 is the block diagram of the 32-kHz synchronized timer.

NOTE: sys_nrespwron is an active-low I/O.

Figure 23-19. 32-kHz Synchronized Timer Block Diagram



23.4.1.1 32-kHz Synchronized Timer Features

The main features of the 32-kHz synchronized timer controller are:

- L4 slave interface support:
 - 32-bit data bus width
 - 32-/16-bit access supported
 - 8-bit access not supported
 - 5-bit address bus width
 - Burst mode not supported
- Only read operations are supported on the module registers; no write operation is supported (no error/no action on write).
- Free-running 32-bit upward counter
- Start and keep counting after power-on reset
- Automatic roll over to 0; highest value reached: 0xFFFF FFFF
- On-the-fly read (while counting)

23.4.2 32-kHz Synchronized Timer Environment

The synchronized timer is accessible only through the L4 interface.

23.4.3 32-kHz Synchronized Timer Integration

Table 23-134 through Table 23-136 summarize the integration of the module in the device.

Table 23-134. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| 32KTIMER | PD_WKUP | No | L4_WKUP |

Table 23-135. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|---------------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| 32KTIMER | T32K_FCLK | 32K_FCLK | PRCM | 32KTIMER functional clock |
| 32KTIMER | T32K_ICLK | WKUP_L4_ICLK2 | PRCM | 32KTIMER interface clock |
| Resets | | | | |
| 32KTIMER | T32K_NRESPWRON | WKUP_SYS_PWRON_RST | PRM | Reset to 32KTIMER |
| 32KTIMER | T32K_WKUP_RST | WKUP_RST | PRM | Reset to 32KTIMER |

Table 23-136. Hardware Requests

| |
|-----------------------|
| No Interrupt Requests |
| No DMA Requests |

23.4.4 32-kHz Synchronized Timer Functional Description

The synchronized timer is a counter that starts on the rising edge of an external asynchronous signal (sys_nrespwron). When sys_nrespwron is released (on the rising edge of sys_nrespwron), the counter starts counting up from the reset value of the counter register on the falling edge of the 32-kHz system clock after three inverted 32-kHz clock periods. After reaching its highest value, the counter wraps back to 0 and starts counting again with no additional delay. When sys_nrespwron is released (on the rising edge of sys_nrespwron), after three inverted 32-kHz clock periods, the counter starts counting up from the reset value of the counter register on the falling edge of the 32-kHz system clock.

Figure 23-20 shows the reset synchronization timing diagram. After reaching its highest value, the counter wraps back to 0 and starts counting again without any extra delay.

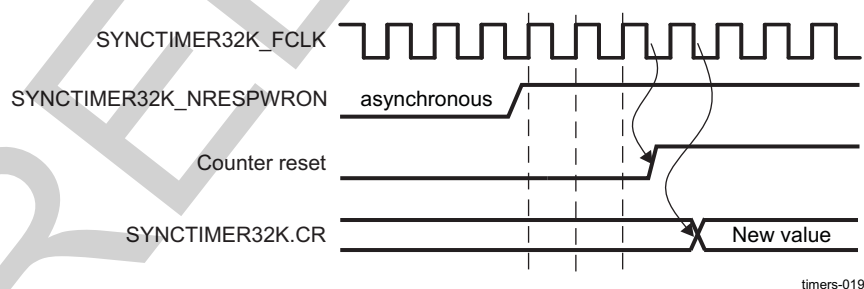
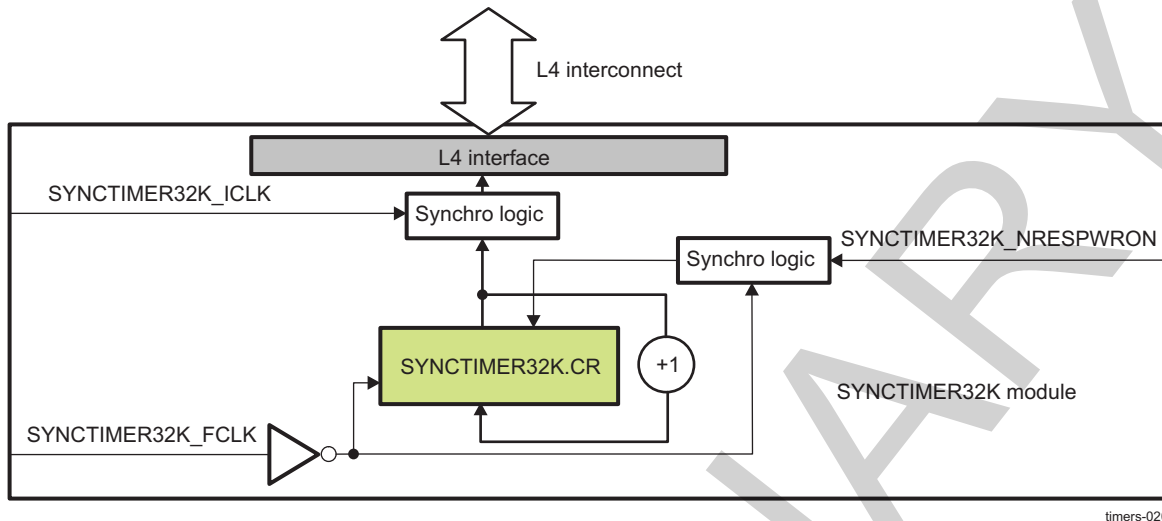
Figure 23-20. Reset Resynchronization Timing Diagram

Figure 23-21 is the block diagram of the synchronized timer.

NOTE: sys_nrespwron is an active-low input.

Figure 23-21. SYNCTIMER32K Block Diagram



The sync logic ensures the read transaction correctness by synchronizing the counter register read access on 32KSYNCNT_ICLK because the 32KSYNCNT_ICLK clock signal is completely asynchronous with S32KSYNCNT_FCLK. The sys_nrespwron input resets the counter register (32KSYNCNT_CR). The inverted 32KSYNCNT_FCLK clocks the sys_nrespwron reset signal.

23.4.4.1 Reading the 32-kHz Synchronized Timer

The counter register (32KSYNCNT_CR) is 32 bits wide. For correct count capture, it must be accessed as 16-bit LSB access first and 16-bit MSB access next. Internal synchronization logic allows reading of the counter value with 32KSYNCNT_ICLK while the counter is running. The time latency to read the synchronized counter register is one 32KSYNCNT_ICLK clock period.

23.4.5 32KTimer Register Manual

Table 23-137 lists the base address and block size for the 32-kHz synchronized timer. It is memory mapped to the L4 peripheral bus memory space.

Table 23-137. 32KTimer Instance Summary

| Module Name | Base Address L4 Interconnect | Size |
|-------------|---------------------------------|------|
| 32KTimer | 0x4A30 4000 | 4KB |

23.4.5.1 32KTimer Register Mapping Summary

CAUTION

The 32-kHz synchronized timer registers are limited to 32-bit and 16-bit data accesses; 8-bit access is not allowed and can corrupt the register content.

Table 23-138 lists the 32-kHz synchronized timer registers. through describe the register bits.

Table 23-138. 32KTimer Register Summary

| Register Name | Type | Register Width (Bits) | Offset Address | Physical Address L4 Interconnect |
|-------------------------------------|------|-----------------------|----------------|-------------------------------------|
| 32KSYNCNT_REV | R | 32 | 0x0000 | 0x4A30 4000 |
| 32KSYNCNT_SYSCONFIG | R/W | 32 | 0x0004 | 0x4A30 4004 |
| 32KSYNCNT_CR | R | 32 | 0x0010 | 0x4A30 4010 |

23.4.5.2 32KTimer Register Description

Table 23-139. 32KSYNCNT_REV

| | |
|------------------|---|
| Address Offset | 0x0000 |
| Physical Address | 0x4A30 4000 |
| Description | This register contains the sync counter IP revision code. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP Revision | R | 0x- ⁽¹⁾ |

⁽¹⁾ TI internal data

Table 23-140. Register Call Summary for Register 32KSYNCNT_REV

32-kHz Synchronized Timer

- [32KTimer Register Mapping Summary: \[0\]](#)

Table 23-141. 32KSYNCNT_SYSCONFIG

| | |
|-------------------------|--|
| Address Offset | 0x0004 |
| Physical Address | 0x4A30 4004 |
| Description | This register is used for IDLE modes only. |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Reserved | | | | | | | | | | | | | | | | IDLEMODE | | | | Reserved | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 31:5 | Reserved | Reads return 0. | R | 0x0 |
| 4:3 | IDLEMODE | Power management REQ/ACK control 0x0: Force idle. An idle request is acknowledged unconditionally. 0x1: No-idle. An idle request is never acknowledged. 0x2: Reserved 0x3: Reserved | RW | 0x0 |
| 2:0 | Reserved | Reads return 0. | R | 0x0 |

Table 23-142. Register Call Summary for Register 32KSYNCNT_SYSCONFIG

32-kHz Synchronized Timer

- [32KTimer Register Mapping Summary: \[0\]](#)

Table 23-143. 32KSYNCNT_CR

| | |
|-------------------------|---|
| Address Offset | 0x0010 |
| Physical Address | 0x4A30 4010 |
| Description | This register contains the 32-kHz sync counter value. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COUNTER_VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|------------------------|------|------------|
| 31:0 | COUNTER_VALUE | Counter register value | R | 0x00000003 |

Table 23-144. Register Call Summary for Register 32KSYNCNT_CR

32-kHz Synchronized Timer

- [32-kHz Synchronized Timer Functional Description: \[0\]](#)
- [Reading the 32-kHz Synchronized Timer: \[1\]](#)
- [32KTimer Register Mapping Summary: \[2\]](#)

PRELIMINARY

Serial Communication Interface

This chapter describes the features and operation of the device serial communication interface (SCI).

| Topic | Page |
|---|------|
| 24.1 Multimaster High-Speed I ² C Controller | 4346 |
| 24.2 HDQ/1-Wire | 4438 |
| 24.3 UART/IrDA/CIR | 4459 |
| 24.4 Multichannel Serial Port Interface | 4567 |
| 24.5 Multichannel Buffered Serial Port (McBSP) | 4632 |
| 24.6 Multichannel PDM Controller | 4747 |
| 24.7 Digital Microphone Module | 4793 |
| 24.8 Multichannel Audio Serial Port | 4826 |
| 24.9 Serial Low-Power Inter-Chip Media Bus Controller | 4885 |
| 24.10 MIPI-HSI | 5010 |
| 24.11 High-Speed Multiport USB Host Subsystem | 5086 |
| 24.12 High-Speed USB OTG Controller | 5209 |

24.1 Multimaster High-Speed I²C Controller

24.1.1 HS I²C Overview

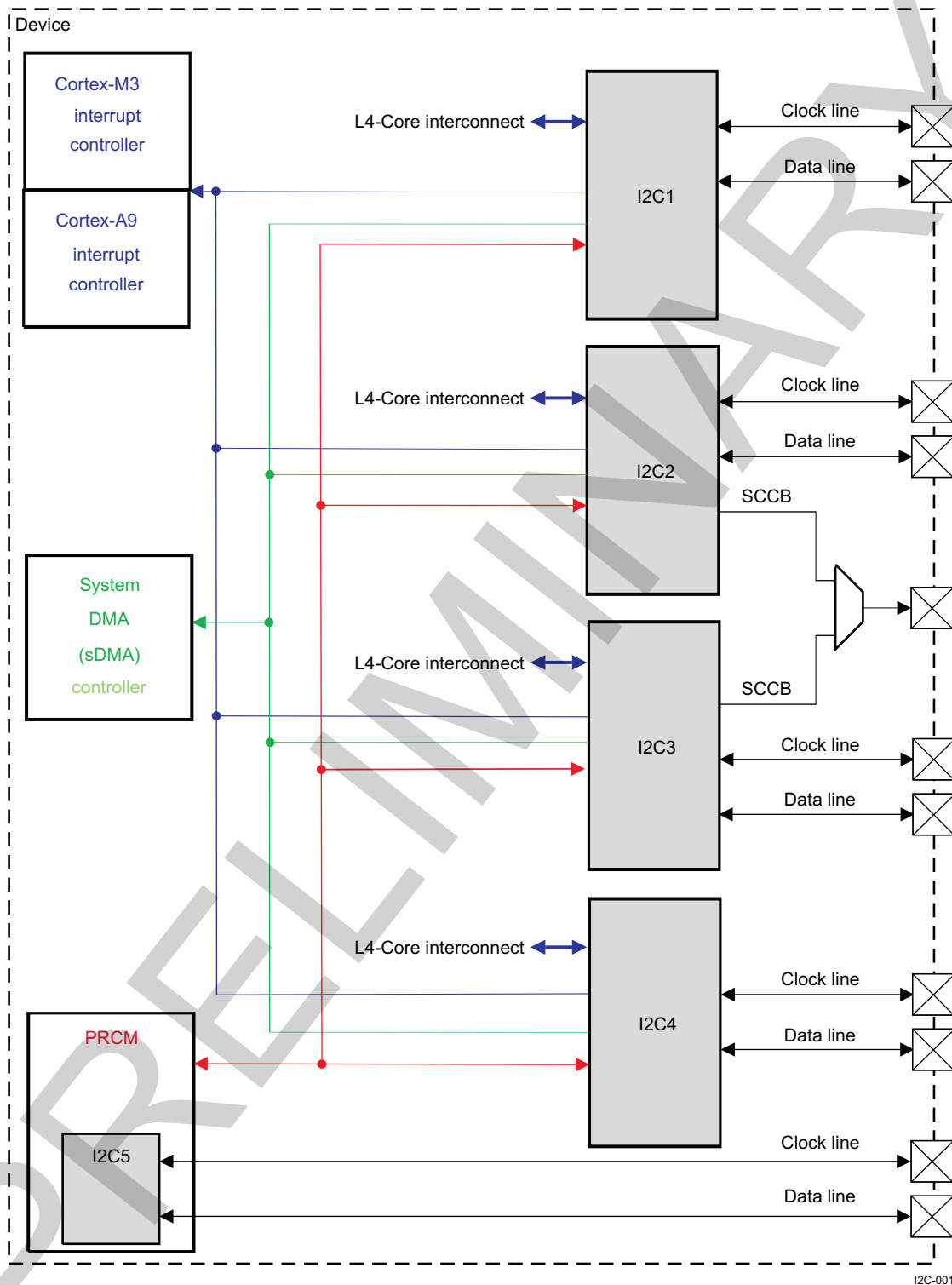
The device contains four multimaster high-speed (HS) inter-integrated circuit (I²C™) controllers (I2Ci modules, where i = 1, 2, 3, 4), each of which provides an interface between a local host (LH), such as a digital signal processor (DSP), and any I²C-bus-compatible device that connects through the I²C serial bus. External components attached to the I²C bus can serially transmit and receive up to 8 bits of data to and from the LH device through the 2-wire I²C interface.

Each multimaster HS I²C controller can be configured to act like a slave or master I²C-compatible device. Moreover, each multimaster HS I²C controller can be configured in serial camera control bus (SCCB) mode (the SCCB is a serial bus developed by Omnivision Technologies, Inc.) to act as a master on a 2-wire SCCB bus. Only multimaster HS I²C controllers I2C2 and I2C3 can be configured in SCCB mode to act as a master device on a 3-wire SCCB bus.

The device contains a fifth master transmitter HS I²C interface (I2C5) in the power, reset, and clock management (PRCM) module to perform dynamic voltage control and power sequencing with an external power integrated circuit (IC).

[Figure 24-1](#) shows the HS I²C controllers.

Figure 24-1. HS I²C Controllers



The four multimaster HS I²C controllers have the following features:

- Compliant with Philips I²C specification version 2.1
- Supports standard mode (up to 100 Kbps) and fast mode (up to 400 Kbps)
- Supports HS mode for transfer up to 3.4 Mbps

- Support for 3-wire/2-wire SCCB master mode for I2C2 and I2C3 modules, 2-wire SCCB master mode for I2C1 and I2C4 modules, up to 100 Kbps
- 7-bit and 10-bit device addressing modes
- General call
- Start/restart/stop
- Multimaster transmitter/slave receiver mode
- Multimaster receiver/slave transmitter mode
- Combined master transmit/receive and receive/transmit mode
- Built-in configurable FIFOs (8, 16, 32, 64 bytes) for buffered read or write
- Module enable/disable capability
- Programmable multislave channel (responds to four separate addresses)
- Programmable clock generation
- 8-bit-wide data access
- Open-core protocol (OCP) interface with LH application (OCP-IP 2.0 compliant)
- Designed for low power consumption
- Implement Auto Idle mechanism
- Implement Idle Request/Idle Acknowledge handshake mechanism
- Support for asynchronous wake-up mechanism
- Two direct memory access (DMA) channels
- Wide interrupt capability
- Supports OmniVision SCCB protocol
- Compliant with Highlander 0.8

The master transmitter HS I²C controller I2C5 has the following features:

- Support of HS and fast modes
- 7-bit addressing mode only
- Master transmitter mode only
- Start/restart/stop

NOTE: Before using HS I²C mode, determine that the target device supports this mode.

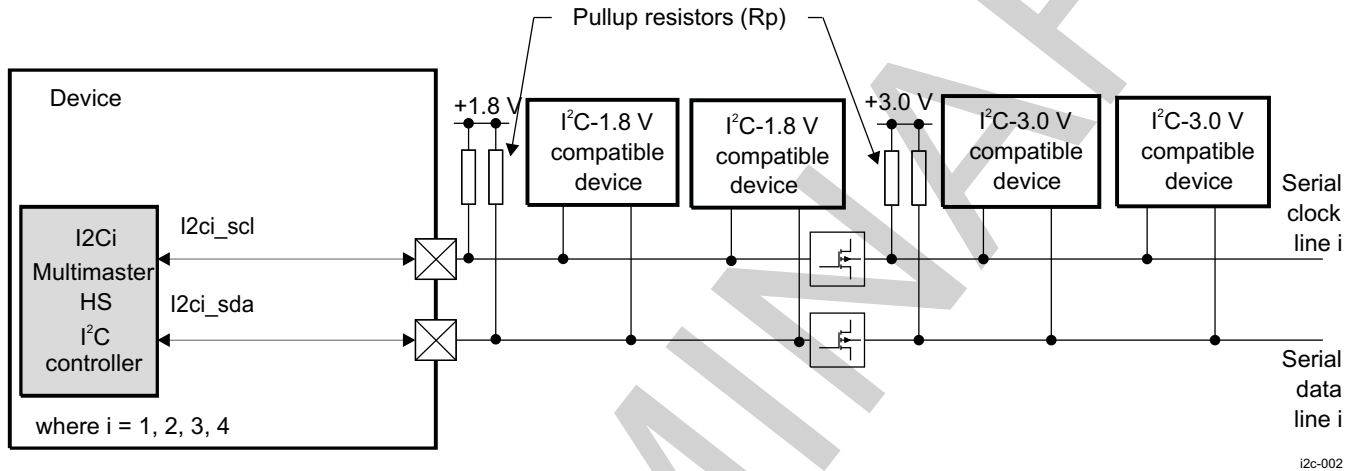
24.1.2 HS I²C Environment

This section describes the HS I²C application fields from an environment point of view (external connections). It describes HS I²C connectivity options, lists all possible interfaces, and describes the protocol and data format used in each case.

24.1.2.1 HS I²C in I²C Mode

Figure 24-2 shows the multimaster HS I²C controllers and their related connections with I²C-compliant devices in I²C mode.

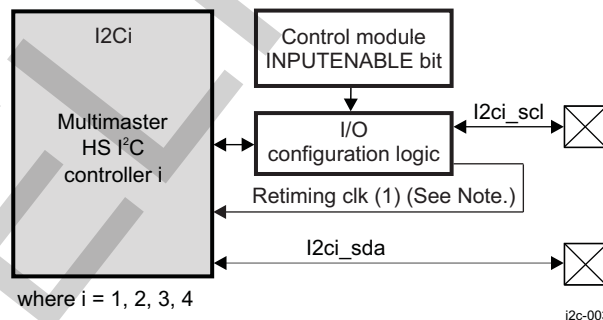
Figure 24-2. HS I²C and Typical Connections to I²C Devices



24.1.2.1.1 HS I²C Pins for Typical Connections in I²C Mode

Figure 24-3 shows the multimaster HS I²C controller pins used for typical connections with I²C devices.

Figure 24-3. HS I²C Interface Signals in I²C Mode



NOTE: In master mode, the clock signal (IP clk configured as output) is also used as retiming input (the INPUTENABLE bit in the corresponding pad configuration register must be set to 1).

24.1.2.1.2 HS I²C Interface Typical Connections

Table 24-1 lists the pins associated with the I²C interface.

Table 24-1. HS I²C Input/Output

| Signal | I/O ⁽¹⁾ | Description | Reset Value |
|----------|--------------------|---|-------------|
| i2ci_scl | I/O | I ² C serial clock line ⁽²⁾ . Open-drain output buffer. Requires external pullup resistor (Rp). | 1 |

⁽¹⁾ I = Input; O = Output

⁽²⁾ This output signal is also used as retiming input (the INPUTENABLE bit in the corresponding pad configuration register must be set to 1).

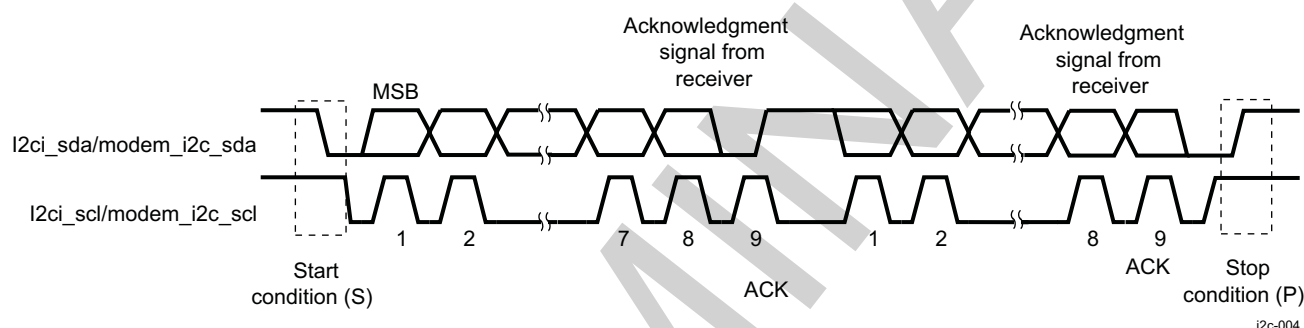
Table 24-1. HS I²C Input/Output (continued)

| Signal | I/O ⁽¹⁾ | Description | Reset Value |
|----------|--------------------|--|-------------|
| i2ci_sda | I/O | I ² C serial data line. Open-drain output buffer. Requires external Rp. | 1 |

24.1.2.1.3 HS I²C Typical Connection Protocol and Data Format

24.1.2.1.3.1 HS I²C Serial Data Format

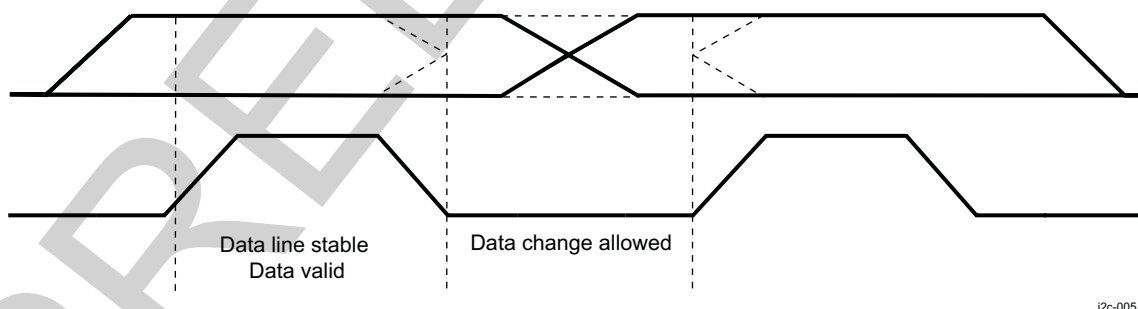
The I²C controller operates in 8-bit word data format (byte write access supported for the last access). Each byte transmitted or received on the serial data line is 8 bits long. The number of bytes that can be transmitted or received is not restricted. The data is transferred with the most-significant bit (MSB) first. In receiver mode, each byte is followed by an acknowledge bit from the I²C. Figure 24-4 shows a typical I²C communication format.

Figure 24-4. HS I²C Data Transfer

24.1.2.1.3.2 HS I²C Data Validity

The data on the serial data line (SDA) must be stable during the high period of the serial clock line. The high and low states of the data line can change only when the clock signal on the serial clock line (SCL) is low.

Figure 24-5 is an example of data validity requirements.

Figure 24-5. HS I²C Bit Transfer on the I²C Bus

24.1.2.1.3.3 HS I²C Start and Stop Conditions

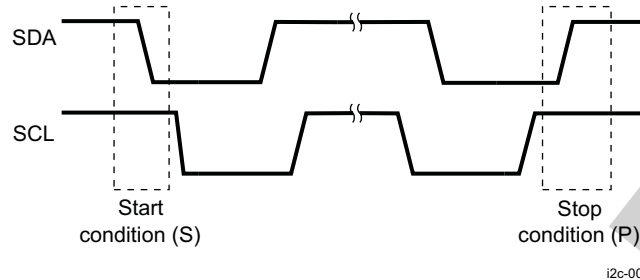
The I²C module generates start (S) and stop (P) conditions when it is configured as a master.

- An S condition is a high-to-low transition on the serial data line while serial clock line is high.
- A P condition is a low-to-high transition on the serial data line while serial clock line is high.

The bus is considered busy after the S condition (the I2Ci.I2C_STAT[12] BB bit is 1 to indicate that the bus is busy) and free after the P condition (the I2Ci.I2C_STAT[12] BB bit is 0 to indicate that the bus is free).

Figure 24-6 shows the waveforms that occur during an S and a P condition.

Figure 24-6. HS I²C S and P Condition Events



24.1.2.1.3.4 HS I²C Addressing

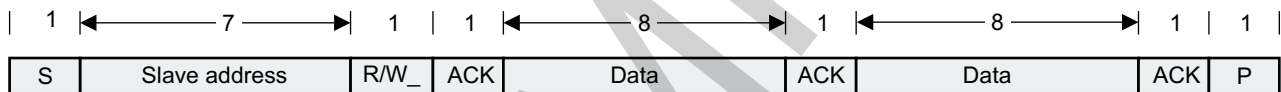
The I²C module supports two data formats in fast/standard (F/S) and HS modes:

- 7-bit/10-bit addressing format
- 7-bit/10-bit addressing format with repeated start (Sr) condition

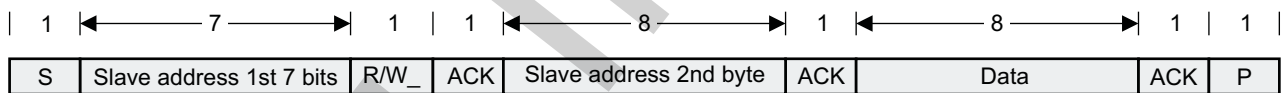
24.1.2.1.3.4.1 Data Transfer Formats in F/S Mode

Figure 24-7 shows the I²C data transfer formats in F/S mode.

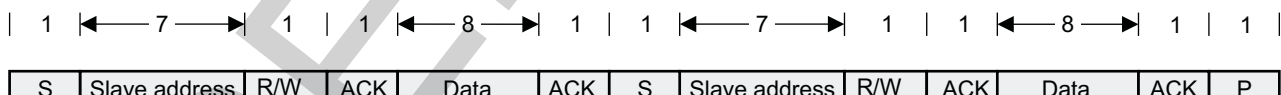
Figure 24-7. HS I²C Data Transfer Formats in F/S Mode



(a) 7-bit addressing format



(b) 10-bit addressing format



(c) Addressing format with repeated start condition

i2c-007

The first word after an S condition consists of 8 bits. In acknowledge mode, an extra dedicated acknowledgment bit is inserted after each byte.

In addressing formats with 7-bit addresses, the first byte is composed of 7 MSB slave address bits and 1 least-significant bit (LSB) R/W_ bit.

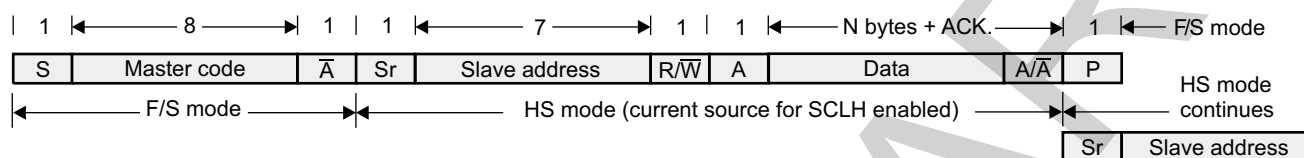
The LSB R/W_ bit of the address byte indicates the transmission direction of the data bytes that follow it. If R/W_ is 0, the master writes data to the selected slave; if it is 1, the master reads data from the slave.

In addressing formats with 10-bit addresses, the structure of the first byte is 11110XXY, where XX is the 2 MSBs of the 10-bit addresses, and Y is the R/W_ bit. If the R/W_ bit is 0, the next byte contains the last 8 bits of the slave address. If the R/W_ bit is 1, the next byte contains data transmitted from the slave to the master.

24.1.2.1.3.4.2 Data Transfer Format in HS Mode

Figure 24-8 shows the I²C data transfer format in HS mode.

Figure 24-8. HS I²C Data Transfer in HS Mode



S = Start; Sr = repeated start; P = Stop; F/S = Fast/standard mode; HS = High-speed mode

i2c-008

Each multimaster HS I²C controller can also operate in HS mode. In this case, after the S condition, the module, which is in F/S mode, writes the master code address (000001XXX, where XXX is the variable portion of the master code) on the bus. No device connected on the same bus acknowledges this address. The module switches the clock to the HS clock and after an Sr condition, and sends the slave address and the data, as shown in Figure 24-8.

24.1.2.1.3.5 HS I²C Master Transmitter

In master transmitter mode, data assembled in one of the previously described data formats is shifted out on the serial data line SDA in sync with the self-generated clock pulses on the serial clock line SCL. The clock pulses are inhibited and SCL is held low when the intervention of the processor is required (XUDF) after a byte is transmitted.

24.1.2.1.3.6 HS I²C Master Receiver

Master receiver mode can be entered only from master transmitter mode. With any of the address formats (a), (b), or (c) (see Figure 24-7), if R/W_ is high, the module enters master receiver mode after the slave address byte and bit R/W_ are transmitted. Serial data bits received on bus line SDA are shifted in synchronization with the self-generated clock pulses on SCL.

24.1.2.1.3.7 HS I²C Slave Transmitter

Slave transmitter mode can be entered only from slave receiver mode. With any of the address formats (a), (b), or (c) (see Figure 24-7), the slave transmitter is entered if the slave address byte is the same as its own address and bit R/W_ is transmitted, if R/W_ is high. The slave transmitter shifts the serial data out on the data line SDA in sync with the clock pulses that are generated by the master device. It does not generate the clock but it can hold clock line SCL low while intervention of the LH is required (XUDF).

24.1.2.1.3.8 HS I²C Slave Receiver

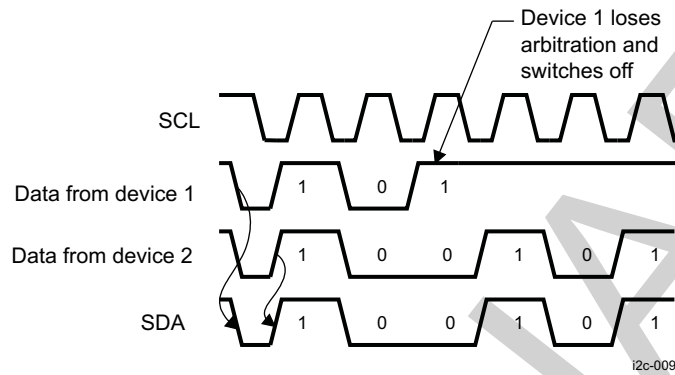
In this mode, serial data bits received on the bus line SDA are shifted-in in sync with the clock pulses on SCL that are generated by the master device. It does not generate the clock but it can hold clock line SCL low while intervention of the LH is required (ROVR) after a byte is received.

24.1.2.1.3.9 HS I²C Bus Arbitration

If two or more master transmitters start a transmission on the same bus almost simultaneously, an arbitration procedure is invoked. The arbitration procedure uses the data presented on the serial bus by the competing transmitters. When a transmitter senses that a high signal it has presented on the bus has

been overruled by a low signal, it switches to the slave receiver mode, sets the arbitration lost (AL) flag, and generates the arbitration lost interrupt. Figure 24-9 shows the arbitration procedure between two devices. The arbitration procedure gives priority to the device that transmits the serial data stream with the lowest binary value. If two or more devices send identical first bytes, arbitration continues on the subsequent bytes.

Figure 24-9. HS I²C Arbitration Between Master Transmitters



24.1.2.1.3.10 HS I²C Clock Generation and Synchronization

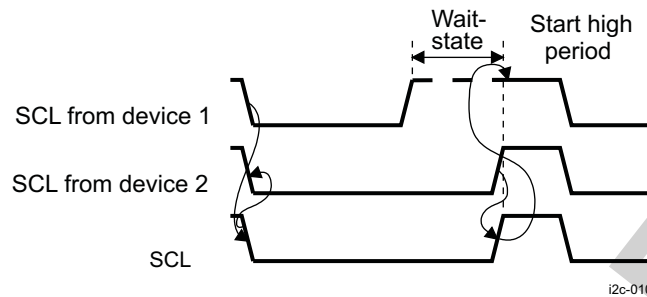
Under normal conditions, only one master device generates the clock signal, SCL. During the arbitration procedure, however, there are two or more master devices and the clock must be synchronized so that the data output can be compared. The wired-AND property of the clock line means that a device that first generates a low period of the clock line overrules the other devices. At this high/low transition, the clock generators of the other devices are forced to start generating their own low period. The clock line is then held low by the device with the longest low period, while the other devices that finish their low periods must wait for the clock line to be released before starting their high periods. A synchronized signal on the clock line is thus obtained, where the slowest device determines the length of the low period and the fastest device determines the length of the high period. If a device pulls down the clock line for a longer time, the result is that all clock generators must enter the WAIT-state. In this way a slave can slow down a fast master and the slow device can create enough time to store a received byte or prepare a byte to be transmitted (Clock Stretching).

NOTE: In case the SCL or SDA lines are stuck low, the Bus Clear operation is supported.

If the clock line (SCL) is stuck low, the preferred procedure is to reset the bus using the hardware reset signal if your I²C devices have hardware reset inputs. If the I²C devices do not have hardware reset inputs, cycle power to the devices to activate the mandatory internal power-on reset (POR) circuit.

If the data line (SDA) is stuck low, the master should send nine clock pulses. The device that held the bus low should release it sometime within those nine clocks. If not, then use the hardware reset or cycle power to clear the bus.

Figure 24-10 shows clock synchronization.

Figure 24-10. HS I²C Clock Generators Synchronization**24.1.2.1.3.11 HS I²C External Clock Configuration**

Each multimaster HS I²C controller is clocked with an independent functional clock (I2Ci_FCLK) and an interface clock (I2Ci_ICLK) for interfacing with the L4_PER interconnect. These clocks are provided by the APE PRCM module for I2Ci (where i = 1, 2, 3, 4).

The SYS_CLK clock provided by the clock generator of the PRCM module is connected to the functional and interface clocks of the HS I²C controller I2C5. For detailed information about the module clocking, see [Chapter 3, Power, Reset, and Clock Management](#).

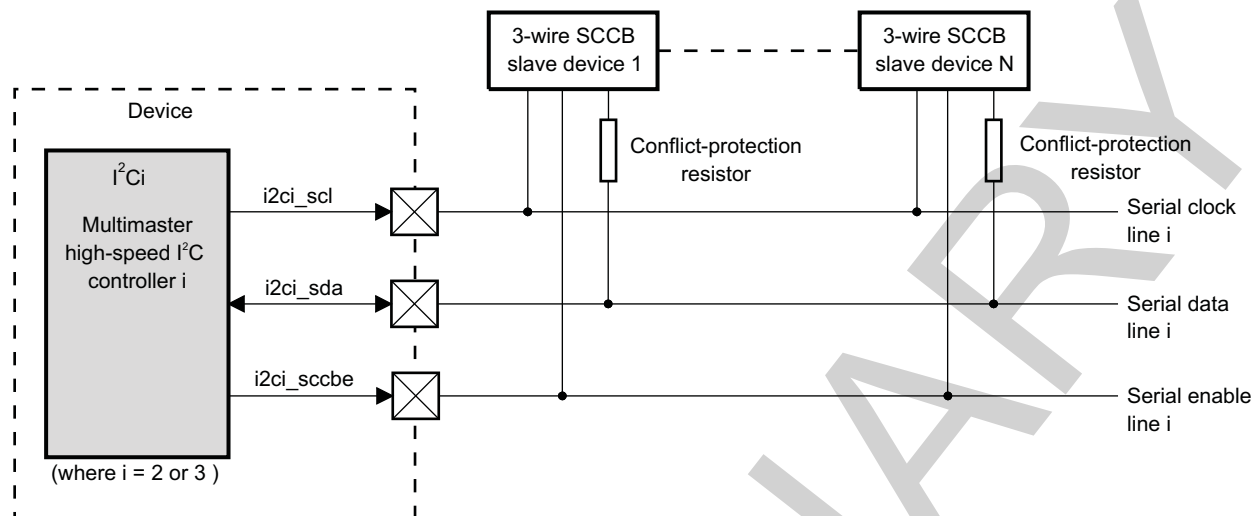
The functional clock is processed by a prescaler block to produce the internal sampling clock. This clock is generated by the I²C prescaler block. The prescaler block consists of the I2Ci.I2C_PSC[7:0] PSC bit field (where i = 1, 2, 3, 4) that is used to divide down the functional clock to obtain an internal sampling clock with a frequency value of I2Ci_FCLK/(I2Ci.I2C_PSC[7:0] PSC bit field value + 1, where i = 1, 2, 3, 4).

NOTE: The I2Ci.I2C_PSC[7:0] PSC bit field (where i = 5) of I2C5 is not accessible by software.

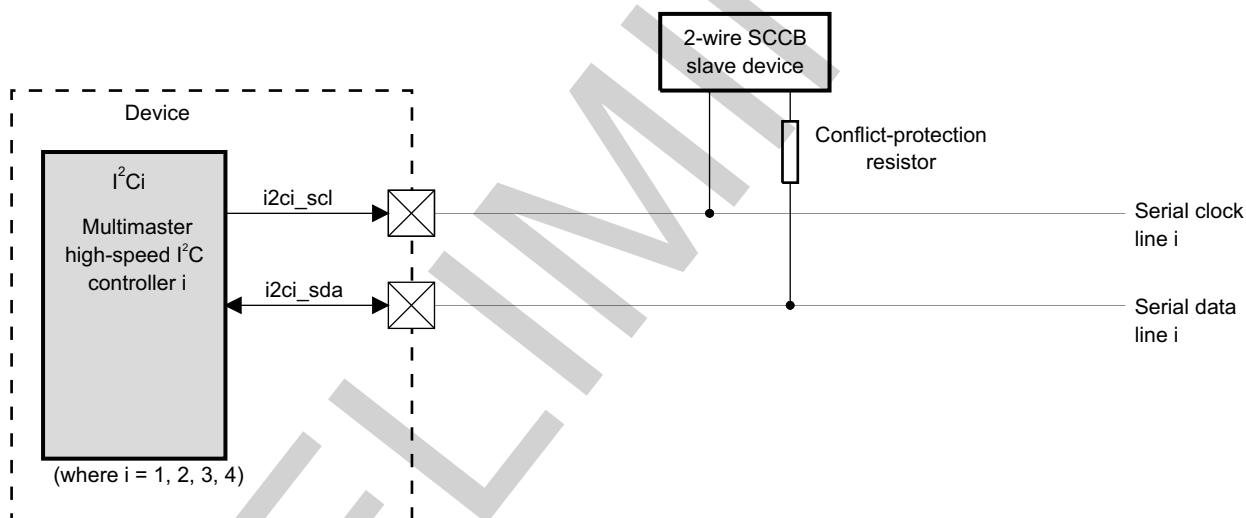
24.1.2.2 HS I²C in SCCB Mode

The multimaster HS I²C controllers support the 2-wire SCCB protocol in master mode as listed in [Figure 24-11](#). Only I2C2 and I2C3 support the 3-wire SCCB protocol in master mode.

Figure 24-11. HS I²C and Typical Connections to SCCB Devices



(a) Typical connection with 3-wire SCCB devices



(b) Typical connection with 2-wire SCCB devices

I2C-011

NOTE: Only one 2-wire SCCB slave device can be connected to the 2-wire SCCB bus.

24.1.2.2.1 HS I²C Pins for Typical Connections in SCCB Mode

Figure 24-12 shows the multimaster HS I²C controller pins used for typical connections with 3-wire or 2-wire SCCB devices.

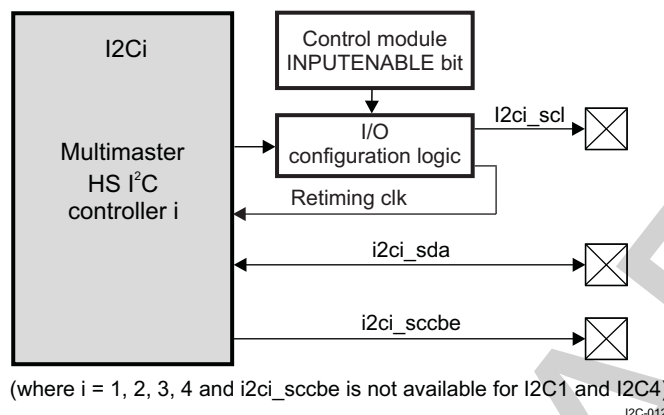
Figure 24-12. HS I²C Interface Signals in SCCB Mode**24.1.2.2.2 HS I²C SCCB Interface Typical Connections**

Table 24-2 lists the pins associated with the SCCB interface.

Table 24-2. HS I²C Input/Output

| Signal | I/O ⁽¹⁾ | Description | Reset Value ⁽²⁾ | I2Ci.I2C_CON[15] I2C_EN bit = 0 |
|--------------------------|--------------------|--|----------------------------|------------------------------------|
| i2ci_scl | O | SCCB serial clock line ⁽³⁾ . Standard CMOS output buffer. | Hi-Z | High |
| i2ci_sda | I/O(OD) | SCCB serial data line. Standard CMOS 3-state output buffer. Requires external conflict-protection resistor for each slave device connected to the bus. | Hi-Z | Hi-Z |
| i2ci_sccb ⁽⁴⁾ | O | SCCB enable line. Standard CMOS output buffer. | High | High |

⁽¹⁾ I = Input; O = Output; OD = Open Drain

⁽²⁾ Hi-Z = High Impedance

⁽³⁾ This output signal is also used as retiming input (the INPUTENABLE bit in the corresponding pad configuration register must be set to 1).

⁽⁴⁾ This signal is used for the 3-wire SCCB protocol only.

NOTE: Because they share the same ball, the i2c2_sccb and i2c3_sccb signals are not available at the same time. For detailed information about pin configuration, see [Chapter 19, Control Module](#).

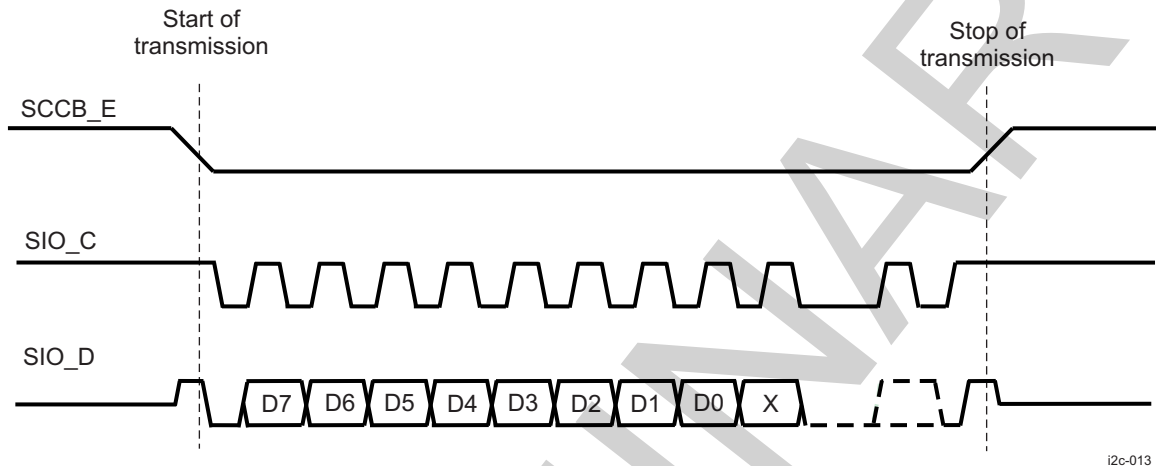
I2C1 and I2C4 do not provide any i2c1_sccb signal at the chip boundary of the device; thus, these modules do not support the 3-wire SCCB protocol.

24.1.2.2.3 HS I²C SCCB Typical Connection Protocol and Data Format

24.1.2.2.3.1 HS I²C SCCB Data Format

If the module is configured in SCCB mode of operation, the data format of transmissions appears as shown in Figure 24-13. For SCCB protocol compatibility I²C provides one more signal, SCCB_E, which acts like a transaction enable signal.

Figure 24-13. HS I²C 3-wire SCCB Transmission Timing Diagram

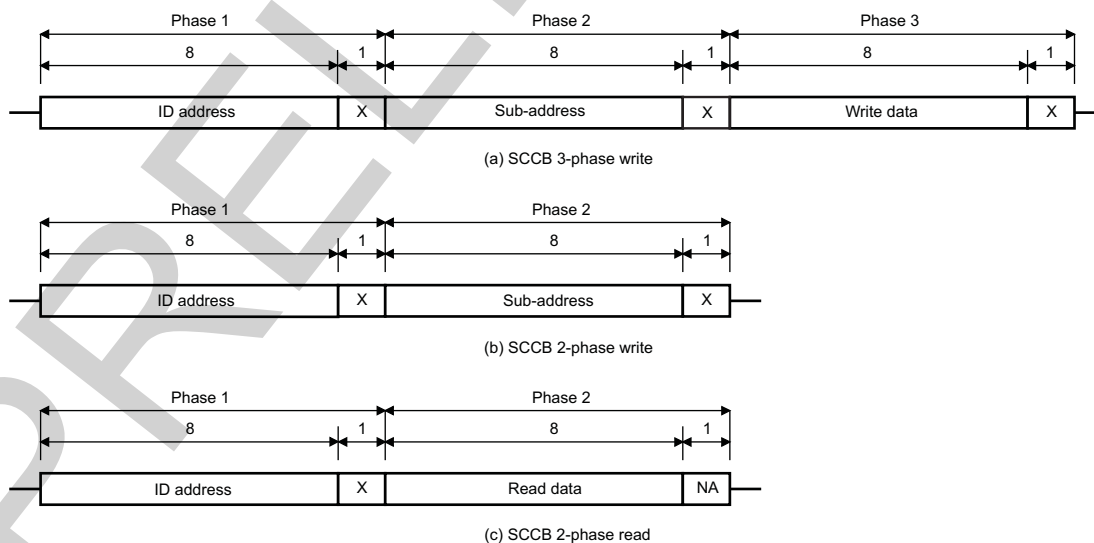


NOTE: When operating in 2-wire SCCB mode, the i2ci_sccb_e signal is not used by the 2-wire SCCB-compliant slave device attached to the 2-wire SCCB bus.

24.1.2.2.3.2 HS I²C SCCB Transmission Data Formats

Figure 24-14 describes the data format of the three kinds of transmission.

Figure 24-14. HS I²C SCCB Transmission Data Formats



R/W: 0 = Write, 1 = Read

X: don't care

NA: ninth bit of a read phase. This bit must be set to 1 by the master device.

I2C-014

The basic element of a data transmission is a phase. A phase contains 9 bits, which consist of an 8-bit sequential data transmission followed by a ninth bit. The ninth bit is a don't-care bit (X) or an NA bit, depending on whether the data transmission is a write or a read. The maximum number of phases that can be included in a transmission is three. The MSB is always asserted first for each phase.

A data transmission is one of three types:

- 3-phase write transmission:

The 3-phase write transmission cycle (see (a) of [Figure 24-14](#)) is a full write operation in which the master can write 1 byte of data to a specific slave(s). The 7-bit slave address in the ID value identifies the specific slave that the master intends to access. The subaddress identifies the register location of the specified slave. The write data contains 8-bit data that the master intends to write over the content of this specific address. The ninth bit of each of the three phases is a don't-care bit (X bit).

- 2-phase write transmission:

The 2-phase write transmission cycle is followed by a 2-phase read transmission cycle (see the following bullet). The purpose of issuing a 2-phase write transmission cycle (see (b) of [Figure 24-14](#)) is to identify the subaddress of some specific slave from which the master intends to read data for the following 2-phase read transmission cycle. The ninth bit of each phase is a don't-care bit (X bit).

- 2-phase read transmission:

Either a 3-phase or a 2-phase write transmission cycle must be asserted ahead of a 2-phase read transmission cycle. The 2-phase read transmission cycle (see (c) of [Figure 24-14](#)) cannot identify the subaddress. The 2-phase write transmission cycle contains read data of 8 bits and a ninth don't-care bit or NA bit. The master must drive the NA bit at logical 1.

In each transmission type, phase 1 (the 7-bit slave address of the ID value) is asserted by the master to identify the selected slave to which the data is read or written. Each slave has a unique 7-bit slave address. The 7-bit slave address of the ID value comprises 7 bits, from bit 7 to bit 1, that can identify up to 128 slaves. The eighth bit, bit 0, is the read/write selector bit that specifies the transmission direction of the current cycle. A logical 0 represents a write cycle and a logical 1 represents a read cycle. The ninth bit of phase 1 is a don't-care bit (X bit).

Phase 2 (subaddress/read data) is asserted by the master (subaddress) or the slave(s) (read data). A phase 2 transmission asserted by the master identifies the subaddress of the slave(s) the master intends to access. A phase 2 transmission asserted by the slave(s) indicates the read data that the master will receive. The slave(s) recognize the subaddress of this read data according to the previous 3-phase or 2-phase write transmission cycle. The ninth bit is defined as a don't-care bit (X bit) when the master asserts phase 2. The ninth bit is defined as an NA bit when the slave(s) asserts the phase 2 transmission. The master is responsible for a logical 1 during the period of the NA bit.

Phase 3 (write data) is asserted only by the master. This phase contains the data the master intends to write to the slave(s). Because the master asserts the transmission, the ninth bit of the phase 3 transmission is defined as a don't-care bit (X bit).

NOTE: A multimaster HS I²C controller configured in SCCB mode can perform two operations:

- Write a single byte to an SCCB slave device by using the 3-phase write transmission cycle
 - Read a single byte from an SCCB slave device by using the 2-phase write transmission cycle followed by the 2-phase read transmission cycle
-

24.1.2.2.3.3 HS I²C Data Validity

The data validity is the same as described in [Section 24.1.2.1.3.2, HS I²C Data Validity](#).

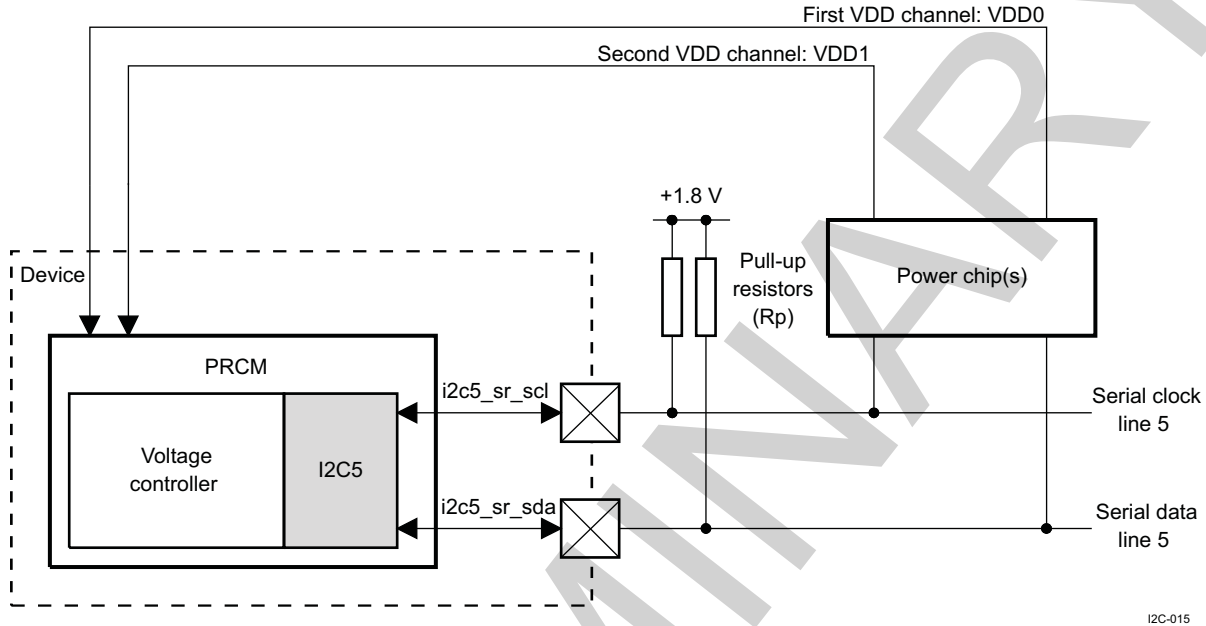
24.1.2.2.3.4 HS I²C S and P Conditions

The S and P conditions are the same as described in [Section 24.1.2.1.3.3, HS I²C Start and Stop Conditions](#).

24.1.2.3 HS I²C for Communication With Power Chip(s)

Figure 24-15 shows a typical connection between the master transmitter HS I²C controller I2C5 of the device and external power chip(s).

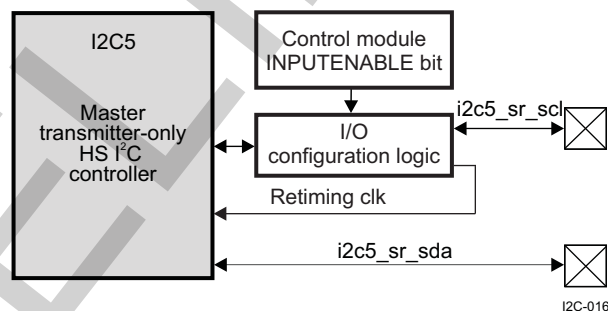
Figure 24-15. HS I²C and Typical Connection Between the HS I²C and Power Chip(s)



24.1.2.3.1 HS I²C I2C5 Pins for Typical Connections

Figure 24-16 shows the HS I²C controller I2C5 pins used for typical connections with power chips.

Figure 24-16. HS I²C I2C5 Interface Signals



24.1.2.3.2 HS I²C I2C5 Interface Typical Connections

The master transmitter HS I²C controller I2C5 interfaces between the device and external power chip(s) for voltage control. This module is always configured as an I²C master transmitter; it does not support the SCCB protocol.

Table 24-3 lists the pins associated with the I²C interface of the HS I²C controller I2C5 of the device.

Table 24-3. HS I²C Input/Output Description

| Signal | I/O ⁽¹⁾ | Description | Reset Value |
|-------------|--------------------|---|-------------|
| i2c5_sr_scl | I/O(OD) | I ² C serial clock line ⁽²⁾ . Open-drain output buffer. Requires external Rp. | 1 |

⁽¹⁾ I = Input; O = Output; OD = Open Drain

⁽²⁾ This signal is also used as retiming input (the INPUTENABLE bit in the corresponding pad configuration register must be set to 1).

Table 24-3. HS I²C Input/Output Description (continued)

| Signal | I/O ⁽¹⁾ | Description | Reset Value |
|-------------|--------------------|--|-------------|
| i2c5_sr_sda | I/O(OD) | I ² C serial data line. Open-drain output buffer. Requires external Rp. | 1 |

24.1.2.3.3 HS I²C Typical Connections Protocol and Data Format for I2C5

24.1.2.3.3.1 HS I²C Serial Data Format for I2C5

The serial data format is the same as described in [Section 24.1.2.1.3.1](#), *HS I²C Serial Data Format*.

24.1.2.3.3.2 HS I²C Data Validity for I2C5

The data validity is the same as described in [Section 24.1.2.1.3.2](#), *HS I²C Data Validity*.

24.1.2.3.3.3 HS I²C S and P Conditions for I2C5

The S and P conditions are the same as described in [Section 24.1.2.1.3.3](#), *HS I²C Start and Stop Conditions*.

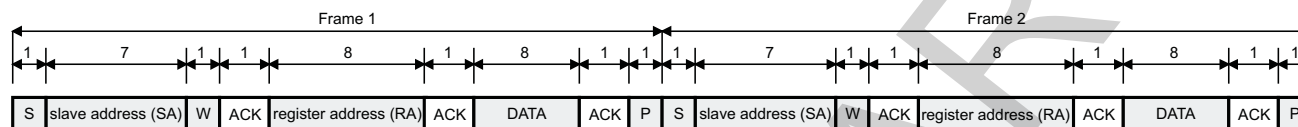
24.1.2.3.3.4 HS I²C Addressing for I2C5

The master transmitter HS I²C controller I2C5 supports only the 7-bit addressing mode. For each frame, the master writes the 8-bit value (DATA) in the register specified by the 8-bit register address (RA) of the slave addressed by the slave address (SA).

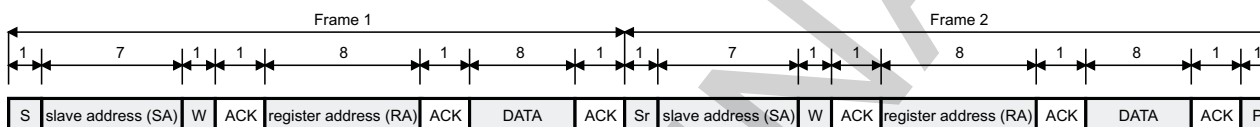
24.1.2.3.3.4.1 HS I²C Data Transfer Format in F/S Mode

Figure 24-17 shows the I²C data transfer format in F/S mode for I2C5.

Figure 24-17. HS I²C Data Transfer Format in F/S Mode for I2C5



(a) 7-bit slave address F/S mode without repeated start



(b) 7-bit address F/S mode with repeated start

W: write = 0

S: start condition

Sr: repeated start condition

P: stop condition

Master to slave

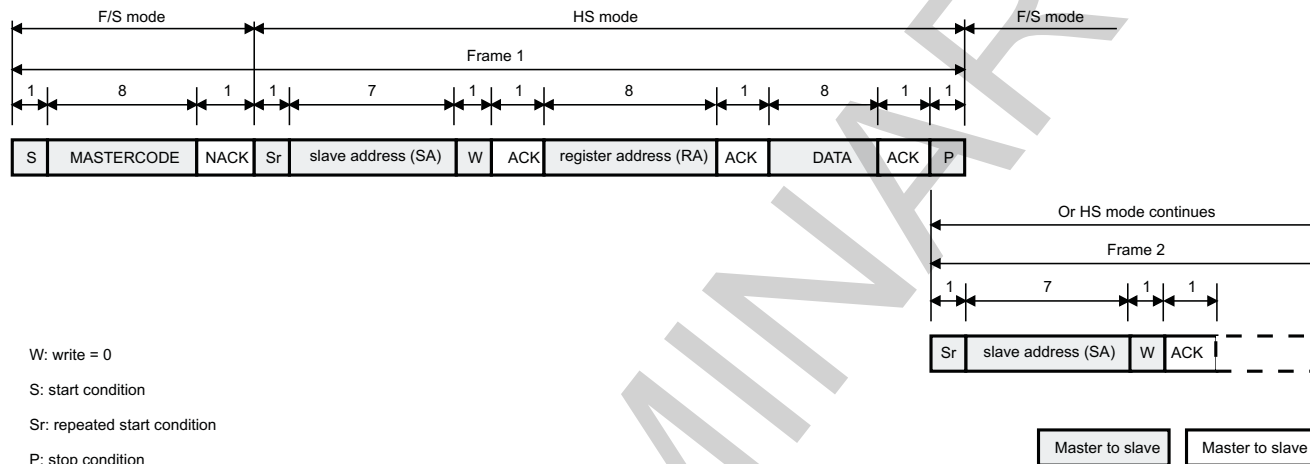
Slave to master

I2C-017

24.1.2.3.3.4.2 Data Transfer Format in HS Mode

Figure 24-18 shows the I²C data transfer format in HS mode for I2C5.

Figure 24-18. HS I²C Data Transfer Format in HS Mode for I2C5



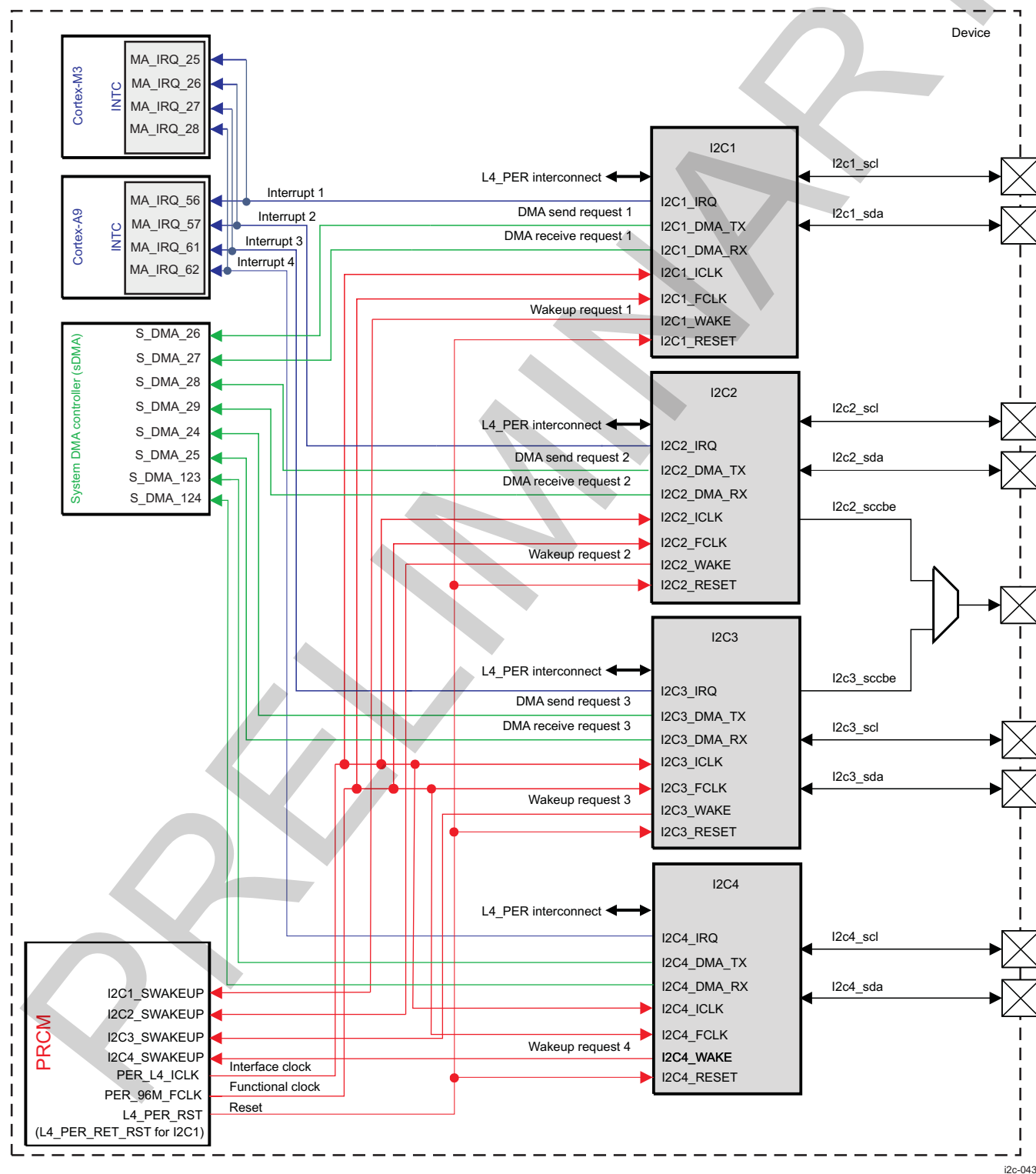
I2C-018

24.1.3 HS I²C Integration

This section describes module integration in the device, including information about clocks, resets, and hardware requests.

Figure 24-19 shows the integration of the four HS I²C controllers in the device.

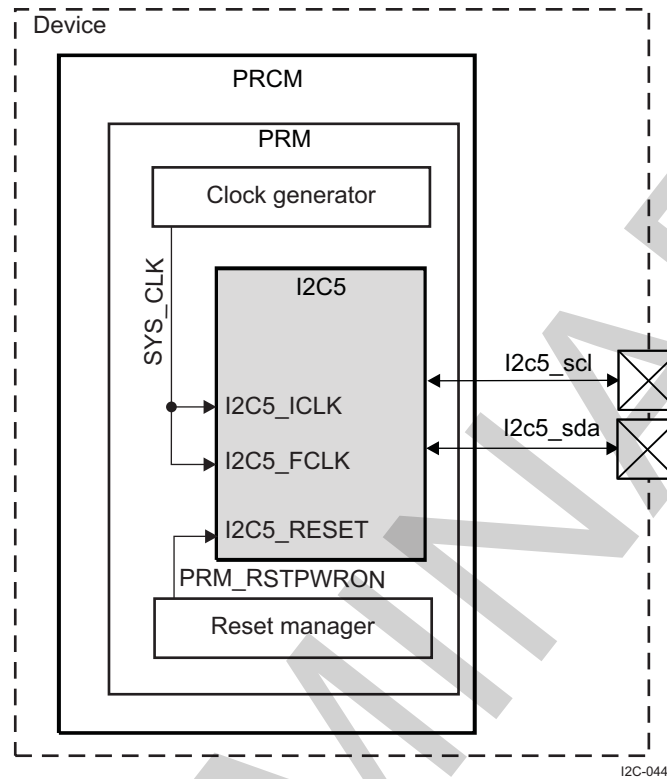
Figure 24-19. HS I²C Integration



i2c-043

Figure 24-20 shows HS I²C integration of I2C5 inside the PRCM module.

Figure 24-20. HS I²C I2C5 Integration



NOTE: For more information about the IDLE hardware handshake and the wake-up request, see [Power Management Functional Description](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 24-4 through Table 24-6 summarize the integration of the module in the device.

Table 24-4. HS I²C Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| I2C1 | PD_L4_PER | L4_PER |
| I2C2 | PD_L4_PER | L4_PER |
| I2C3 | PD_L4_PER | L4_PER |
| I2C4 | PD_L4_PER | L4_PER |

Table 24-5. HS I²C Clocks and Resets

| Module Instance | Destination Signal Name | Clocks | | | Description |
|-----------------|-------------------------|--------------------|--------|--|-----------------------|
| | | Source Signal Name | Source | | |
| I2C1 | I2C1_ICLK | PER_L4_ICLK | PRCM | | I2C1 interface clock |
| | I2C1_FCLK | PER_96M_FCLK | PRCM | | I2C1 functional clock |
| I2C2 | I2C2_ICLK | PER_L4_ICLK | PRCM | | I2C2 interface clock |
| | I2C2_FCLK | PER_96M_FCLK | PRCM | | I2C2 functional clock |
| I2C3 | I2C3_ICLK | PER_L4_ICLK | PRCM | | I2C3 interface clock |
| | I2C3_FCLK | PER_96M_FCLK | PRCM | | I2C3 functional clock |

Table 24-5. HS I²C Clocks and Resets (continued)

| I2C4 | I2C4_ICLK | PER_L4_ICLK | PRCM | I2C4 interface clock |
|-----------------|-------------------------|--------------------|--------|-----------------------|
| | I2C4_FCLK | PER_96M_FCLK | PRCM | I2C4 functional clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| I2C1 | I2C1_RESET | L4_PER_RET_RST | PRCM | I2C1 reset |
| I2C2 | I2C2_RESET | L4_PER_RST | PRCM | I2C2 reset |
| I2C3 | I2C3_RESET | L4_PER_RST | PRCM | I2C3 reset |
| I2C4 | I2C4_RESET | L4_PER_RST | PRCM | I2C4 reset |

Table 24-6. HS I²C Hardware Requests

| Interrupt Requests | | | | |
|---------------------------|--------------------|-------------------------|-----------------|---------------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| I2C1 | I2C1_IRQ | MA_IRQ_56 | Cortex™-A9 INTC | I2C1 interrupt request |
| | I2C1_IRQ | MM_IRQ_25 | Cortex™-M3 INTC | I2C1 interrupt request |
| I2C2 | I2C2_IRQ | MA_IRQ_57 | Cortex-A9 INTC | I2C2 interrupt request |
| | I2C2_IRQ | MM_IRQ_26 | Cortex-M3 INTC | I2C2 interrupt request |
| I2C3 | I2C3_IRQ | MA_IRQ_61 | Cortex-A9 INTC | I2C3 interrupt request |
| | I2C3_IRQ | MM_IRQ_27 | Cortex-M3 INTC | I2C3 interrupt request |
| I2C4 | I2C4_IRQ | MA_IRQ_62 | Cortex-A9 INTC | I2C4 interrupt request |
| | I2C4_IRQ | MM_IRQ_28 | Cortex-M3 INTC | I2C4 interrupt request |
| DMA Requests | | | | |
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| I2C1 | I2C1_DMA_TX | S_DMA_26 | sDMA | I2C1 DMA transmit request |
| | I2C1_DMA_RX | S_DMA_27 | sDMA | I2C1 DMA receive request |
| I2C2 | I2C2_DMA_TX | S_DMA_28 | sDMA | I2C2 DMA transmit request |
| | I2C2_DMA_RX | S_DMA_29 | sDMA | I2C2 DMA receive request |
| I2C3 | I2C3_DMA_TX | S_DMA_24 | sDMA | I2C3 DMA transmit request |
| | I2C3_DMA_RX | S_DMA_25 | sDMA | I2C3 DMA receive request |
| I2C4 | I2C4_DMA_TX | S_DMA_123 | sDMA | I2C4 DMA transmit request |
| | I2C4_DMA_RX | S_DMA_124 | sDMA | I2C4 DMA receive request |

NOTE:

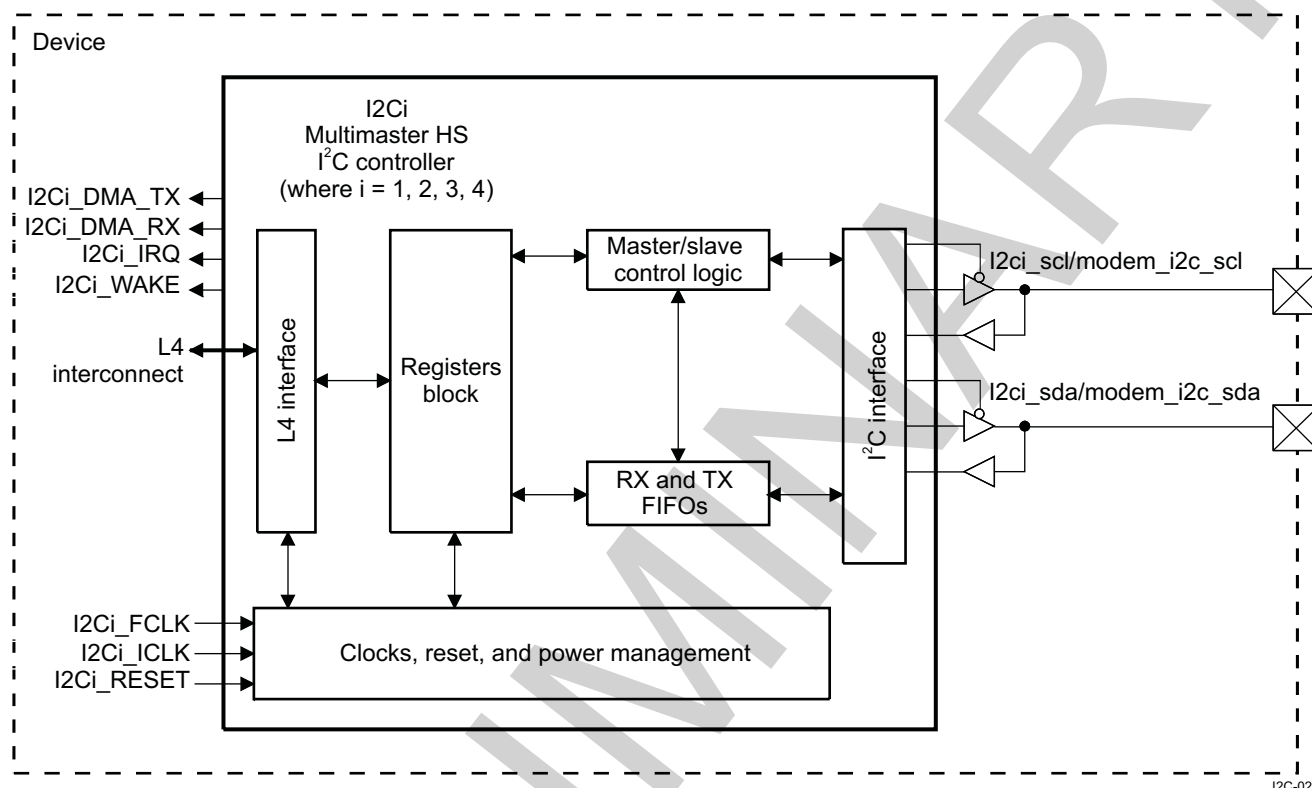
- For a description of interrupt source, see [Table 24-12](#).
- For a description of DMA source, see [Table 24-13](#).

24.1.4 HS I²C Functional Description

24.1.4.1 HS I²C Block Diagram

Figure 24-21 is the multimaster I²C HS controller block diagram.

Figure 24-21. HS I²C Block Diagram



The five multimaster HS I²C controllers can be configured in F/S I²C mode, HS I²C mode, or SCCB mode. The operation mode is selected by configuring the I2Ci.I2C_CON[13:12] OPMODE bit field. Table 24-7 lists the available operation modes.

NOTE: The fifth master transmitter HS I²C interface (I2C5) in the PRCM module can also be configured in HS mode.

Table 24-7. HS I²C Operation Mode Selection

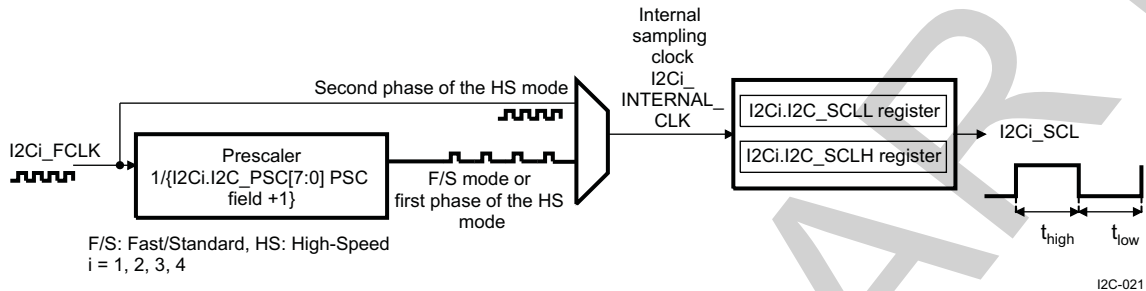
| Operation Mode | Value of I2Ci.I2C_CON[13:12] OPMODE Bit Field |
|----------------------|---|
| F/S I ² C | 0x0 |
| HS I ² C | 0x1 |
| SCCB | 0x2 |
| Reserved (not used) | 0x3 |

24.1.4.2 HS I²C Clocks

24.1.4.2.1 HS I²C Clocking

Figure 24-22 shows the I²C clock generation of the HS I²C controllers.

Figure 24-22. HS I²C Clock Generation



Each multimaster HS I²C controller uses the I2Ci_FCLK functional clock in the PRCM module. The internal sampling clock I2Ci_INTERNAL_CLK is generated by dividing the functional clock by the I2Ci.I2C_PSC[7:0] PSC bit field value + 1 in F/S mode, in SCCB mode, or in the first phase of HS mode; or by directly using the functional clock in the second phase of HS mode (prescaler is bypassed).

The low time of the I2Ci_SCL signal is determined by the I2Ci.I2C_SCLL[7:0] SCLL bit field in F/S mode, in SCCB mode, or in the first phase of HS mode; or by the I2Ci.I2C_SCLL[15:8] HSSCLL bit field in the second phase of HS mode.

The high time of the I2Ci_SCL signal is determined by the I2Ci.I2C_SCLH[7:0] SCLH bit field in F/S mode, in SCCB mode, or in the first phase of HS mode; or by the I2Ci.I2C_SCLH[15:8] HSSCLH bit field in the second phase of HS mode.

The low time of the I2C5 signal is determined by the PRM_VC_CFG_I2C_CLK[15:8] SCLL bit field in F/S mode or in the first phase of HS mode, or by the PRM_VC_CFG_I2C_CLK[31:24] HSSCLL bit field in the second phase of HS mode.

The high time of the I2C5 signal is determined by the PRM_VC_CFG_I2C_CLK[7:0] SCLH bit field in F/S mode or in the first phase of HS mode, or by the PRM_VC_CFG_I2C_CLK[23:16] HSSCLH bit field in the second phase of HS mode.

Table 24-8 lists the T_{LOW} and T_{HIGH} values in master mode only (in slave mode, the I²C controller does not generate the I²C clock).

Table 24-8. HS I²C T_{LOW} and T_{HIGH} Values of the I²C Clock

| Mode | I ² C Clock | t_{LOW} | t_{HIGH} | |
|--------------------------------|---|--|---|---|
| | | | DFILTEREN bit = 0 | DFILTEREN bit = 1 |
| F/S, SCCB, or HS first phase | $I2Ci_INTERNAL_CLK = I2Ci_FCLK / (I2Ci.I2C_PSC[7:0] \text{ PSC bit field} + 1)$ | $(I2Ci.I2C_SCLL[7:0] \text{ SCLL bit field value} + 7) \times I2Ci_INTERNAL_CLK \text{ period}$ | $(I2Ci.I2C_SCLH[7:0] \text{ SCLH bit field value} + 5 + PROP_DELAY0) \times I2Ci_INTERNAL_CLK \text{ period}$ | $(I2Ci.I2C_SCLH[7:0] \text{ SCLH bit field value} + 5 + PROP_DELAY1) \times I2Ci_INTERNAL_CLK \text{ period}$ |
| HS second phase | I2Ci_FCLK | $(I2Ci.I2C_SCLL[15:8] \text{ HSSCLL bit field value} + 7) \times I2Ci_FCLK \text{ period}$ | $(I2Ci.I2C_SCLH[15:8] \text{ HSSCLH bit field value} + 5 + PROP_DELAY0) \times I2Ci_FCLK \text{ period}$ | $(I2Ci.I2C_SCLH[15:8] \text{ HSSCLH bit field value} + 5 + PROP_DELAY1) \times I2Ci_FCLK \text{ period}$ |
| F/S or HS first phase for I2C5 | I2C5_FCLK | $(PRM_VC_CFG_I2C_CLK[15:8] \text{ SCLL} + 1) \times I2C5_FCLK \text{ period}$ | $(PRM_VC_CFG_I2C_CLK[7:0] \text{ SCLH} + 5 + PROP_DELAY0) \times I2C5_FCLK \text{ period}$ | $(PRM_VC_CFG_I2C_CLK[7:0] \text{ SCLH} + 5 + PROP_DELAY1) \times I2C5_FCLK \text{ period}$ |

Table 24-8. HS I²C T_{LOW} and T_{HIGH} Values of the I²C Clock (continued)

| Mode | I ² C Clock | t _{LOW} | t _{HIGH} | |
|--------------------------|------------------------|---|---|---|
| | | | DFILTEREN bit = 0 | DFILTEREN bit = 1 |
| HS second phase for I2C5 | I2C5_FCLK | (PRM_VC_CFG_I2C_CLK[31:24] HSSCLL + 1) x I2C5_FCLK period | (PRM_VC_CFG_I2C_CLK[23:16] HSSCLH + 5 + PROP_DELAY0) x I2C5_FCLK period | (PRM_VC_CFG_I2C_CLK[23:16] HSSCLH + 5 + PROP_DELAY1) x I2C5_FCLK period |

NOTE: For HS mode, the I2Ci.I2C_SCLL[15:8] HSSCLL and I2Ci.I2C_SCLL[7:0] SCLL bit fields must be programmed (the first phase of an HS transaction is performed at F/S speed).

For HS mode, the I2Ci.I2C_SCLH[15:8] HSSCLH and I2Ci.I2C_SCLH[7:0] SCLH bit fields must be programmed (the first phase of an HS transaction is performed at F/S speed).

NOTE: The equations in Table 24-8 give the SCL timing values for SCLL/SCLH/HSSCLL/HSSCLH at HS I²C controller outputs. Actual T_{LOW} and T_{HIGH} periods may vary depending on the board (the load capacitance on the SCL signal). If necessary, any adjustments to the SCLL/SCLH/HSSCLL/HSSCLH values must be determined by measurements of actual SCL signal on the board

CAUTION

During active mode (the I2Ci.I2C_CON[15] I2C_EN bit is set to 1), make no changes to the I2Ci.I2C_SCLL and I2Ci.I2C_SCLH registers. Changes can result in unpredictable behavior.

NOTE: Each multimaster HS I²C controller can be used with an internal secondary pullup. This pullup is mandatory when the I²C controller is configured in HS mode for a bit rate of 3.4 Mbps, and the bus line capacitance exceeds 45 pF. Pullups can be programmed through:

- CONTROL_I2C_0[0] I2C1_SCL_PULLUPRESX bit or CONTROL_I2C_0[16] I2C1_SDA_PULLUPRESX bit for I2C1
- CONTROL_I2C_0[4] I2C2_SCL_PULLUPRESX bit or CONTROL_I2C_0[20] I2C2_SDA_PULLUPRESX bit for I2C2
- CONTROL_I2C_0[8] I2C3_SCL_PULLUPRESX bit or CONTROL_I2C_0[24] I2C3_SDA_PULLUPRESX bit for I2C3
- CONTROL_I2C_0[12] I2C4_SCL_PULLUPRESX bit or CONTROL_I2C_0[28] I2C4_SDA_PULLUPRESX bit for I2C4

The maximum bit rate specified by the SCCB specifications is 100 Kbps.

For more information see Section 19.4.12.8.8, I2Cx I/Os Group Pullupresx Controls and Load Range Settings.

Table 24-9 lists the register values for obtaining the maximum I²C bit rates and the maximum period of the filtered spikes in F/S mode and HS mode.

Table 24-9. HS I²C Register Values for Maximum I²C Bit Rates in I²C F/S, I²C HS, and SCCB Modes⁽¹⁾

| | I ² C Mode for I2Ci, where i = 1, 2, 3, 4 | | | Description | SCCB Mode for I2Ci, where i = 2, 3 | | I ² C Mode for I2C5 Fast and High-Speed Mode | | |
|---|---|--------------|--------------------|--|---------------------------------------|-------------------------------|---|-----|---|
| | Standard Mode | Fast Mode | High-Speed Mode | | | | | | |
| I2Ci_FCLK frequency (MHz) | 96 | | | | 96 | | 38.4 | | SYS_CLK clock frequency |
| I2Ci.I2C_PSC[7:0] PSC bit field value | 23 | 9 | 1 | Prescaler value for F/S and HS modes | 4 | Prescaler value for SCCB mode | Not accessible by software | | |
| I2Ci_INTERNAL_CLK frequency (MHz) | 4 | 9.6 | 96 | 19.2 | | | | | |
| I2Ci.I2C_SCLL[7:0] SCLL bit field value | 13 | 7 | 113 | Value for F/S mode and first phase of HS mode | 89 | Value for SCCB mode | PRM_VC_CFG_I2C_CLK[15:8] SCLL (see Chapter 3, Power, Reset, and Clock Management) | 43 | Value for F/S mode and first phase of HS mode |
| I2Ci.I2C_SCLH[7:0] SCLH bit field value | 15 | 5 | 115 | Value for F/S mode and first phase of HS mode | 91 | Value for SCCB mode | PRM_VC_CFG_I2C_CLK[7:0] SCLH (see Chapter 3, Power, Reset, and Clock Management) | 41 | Value for F/S mode and first phase of HS mode |
| Maximum bit rate (Mbps) | 0.1 | 0.4 | 0.4 | F/S mode and first phase in HS mode maximum bit rate | 0.1 | SCCB mode maximum bit rate | Maximum bit rate (Mbps) | 0.4 | F/S mode and first phase in HS mode maximum bit rate |
| Maximum filter period (ns) | 250 | 104 | 10 | | 50 | | Maximum filter period (ns) | 50 | |
| I2Ci.I2C_SCLL[15:8] HSSCLL bit field value | 12 | | | Values for second phase of HS mode | | | PRM_VC_CFG_I2C_CLK[31:24] HSSCLL (see Chapter 3, Power, Reset, and Clock Management) | 14 | Values for second phase of HS mode |
| I2Ci.I2C_SCLH[15:8] HSSCLH bit field value | 5 | | | Values for second phase of HS mode | | | PRM_VC_CFG_I2C_CLK[23:16] HSSCLH (see Chapter 3, Power, Reset, and Clock Management) | 0 | Values for second phase of HS mode |
| HS mode maximum bit rate (Mbps) | 3.31 | | | HS mode maximum bit rate | | | HS mode maximum bit rate (Mbps) | 3.2 | HS mode maximum bit rate according to the corresponding SYS_CLK clock frequency |
| Maximum filter period (ns) | 10 | | | | | | | 10 | |

⁽¹⁾ Programmable fields are in bold.

NOTE: This table presents informative values only for the configuration parameters and the I²C bus performance obtained according to these values. The delays added by the analog pads are not considered in these figures.

NOTE: For I2Ci (where i = 1, 2, 3, 4)

$I2Ci_INTERNAL_CLK \text{ freq} = I2Ci_FCLK / (PSC + 1)$

$FS \text{ filter period} = 1 / I2Ci_INTERNAL_CLK$

$HS \text{ filter period} = 1 / I2Ci_FCLK \text{ freq}$

- If the DFILTEREN bit = 0:

$HS \text{ bit rate} = I2Ci_FCLK \text{ freq} / (HSSCLL + 7 + HSSCLH + 5 + PROP_DELAY0)$

$FS \text{ bit rate} = I2Ci_INTERNAL_CLK / (SCLL + 7 + SCLH + 5 + PROP_DELAY0)$

- If the DFILTEREN bit = 1:

$HS \text{ bit rate} = I2Ci_FCLK \text{ freq} / (HSSCLL + 7 + HSSCLH + 5 + PROP_DELAY1)$

$FS \text{ bit rate} = I2Ci_INTERNAL_CLK / (SCLL + 7 + SCLH + 5 + PROP_DELAY1)$

For I2C5 (SR):

$I2C5_FCLK \text{ freq} = SYS_CLK \text{ freq}$

$HS/FS \text{ filter period} = 1 / I2C5_FCLK \text{ freq}$

- If the DFILTEREN bit = 0:

$HS \text{ bit rate} = I2C5_FCLK \text{ freq} / (HSSCLL + 1 + HSSCLH + 5 + PROP_DELAY0)$

$FS \text{ bit rate} = I2C5_FCLK \text{ freq} / (SCLL + 1 + SCLH + 5 + PROP_DELAY0)$

- If the DFILTEREN bit = 1:

$HS \text{ bit rate} = I2C5_FCLK \text{ freq} / (HSSCLL + 1 + HSSCLH + 5 + PROP_DELAY1)$

$FS \text{ bit rate} = I2C5_FCLK \text{ freq} / (SCLL + 1 + SCLH + 5 + PROP_DELAY1)$

DFILTEREN refers to the VC_CFG_I2C_MODE[6] DFILTEREN bit. PROP_DELAYx (where x = 0 or 1) represents frequency-normalized I/O low-to-high propagation delay.

PROP_DELAY0 = 0 or 3 (values for bit rate maximum/minimum range)

PROP_DELAY1 = 1 or 4 (values for bit rate maximum/minimum range)

24.1.4.2.2 HS I²C Automatic Blocking of the I²C Clock Feature (I²C Mode Only)

This feature offers the possibility for the LH to command the blocking of the I²C clock after the slave addressing phase, when the I²C controller is addressed by an external master device using a certain Own Address.

The release of the I²C clock can be performed independently for each Own Address (I2Ci.I2C_OA , where i = 1, 2, 3, 4 and I2Ci.I2C_OAx registers, where x = 1, 2, 3) by deasserting the corresponding bit in the I2Ci.I2C_SBLOCK register.

24.1.4.3 HS I²C Software Reset

Each multimaster HS I²C controller supports the software reset by accessing the I2Ci.I2C_SYSC[1] SRST bit (1: reset; 0: normal mode).

The software reset status can be checked by accessing the I2Ci.I2C_SYSS[0] RDONE bit (1: reset is done; 0: reset is ongoing).

To perform a software reset:

1. Ensure that the module is disabled (clear the I2Ci.I2C_CON[15] I2C_EN bit to 0).
2. Set the I2Ci.I2C_SYSC[1] SRST bit to 1.
3. Enable the module by setting I2Ci.I2C_CON[15] I2C_EN bit to 1.
4. Check the I2Ci.I2C_SYSS[0] RDONE bit until it is set to 1 to indicate the software reset is complete.

NOTE: The I2Ci.I2C_CON[15] I2C_EN bit can hold the functional clock domain of the multimaster HS I²C controller in reset after the device reset has been released. When the system bus reset is removed, this bit remains cleared. The functional part of the I²C controller is held in reset state while this bit is 0, and all configuration registers can be accessed.

The I2Ci.I2C_CON[15] I2C_EN bit must be set to 1 to enable the functional part of the I²C controller.

The I2Ci.I2C_SYSS[0] RDONE bit is asserted only after the module is enabled by setting the I2Ci.I2C_CON[15] I2C_EN bit to 1.

24.1.4.4 HS I²C Power Management

Table 24-10 describes power-management features available for the multimaster HS I²C controllers.

NOTE:

- For information about source clock gating and sleep/wake-up transitions description, see [Section 3.1.1.1.2, Module Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).
- For descriptions of EnaWakeUp, IdleMode, ClockActivity, and StandbyMode features, see [Section 3.1.1.1.2, Module Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 24-10. HS I²C Local Power-Management Features

| Feature | Registers | Description |
|-----------------------|----------------------------------|--|
| Clock auto gating | I2Ci.I2C_SYSC[0] AUTOIDLE | This bit allows a local power optimization inside the module |
| Slave idle modes | I2Ci.I2C_SYSC[4:3] IDLEMODE | Force-idle, no-idle, smart-idle, and smart-idle wake-up-capable modes are available. |
| Clock activity | I2Ci.I2C_SYSC[9:8] CLOCKACTIVITY | For configuration details, see Table 24-11 . |
| Global wake-up enable | I2Ci.I2C_SYSC[2] ENAWAKEUP | This bit enables the wake-up feature at module level. |

NOTE: The voltage controllers, in which the HS I²C controller I2C5 are implemented, have no idle request/acknowledge mechanism. The idle modes for the voltage controllers are directly managed by the PRCM module.

Table 24-11. HS I²C Clock Activity Settings

| I2Ci.I2C_SYSC[9:8] CLOCKACTIVITY | Clock State When Module is in IDLE State | | Features Available/Unavailable When Module is in IDLE State |
|-------------------------------------|--|----------|---|
| | I2Ci_ICLK | I2C_FCLK | |
| 00 | OFF | OFF | Both clocks are disabled |
| 10 | OFF | ON | Interface clock is disabled; functional clock is enabled |
| 01 | ON | OFF | Functional clock is disabled; interface clock is enabled |
| 11 | ON | ON | Both clocks are enabled |

CAUTION

The PRCM module has no hardware means of reading the settings of CLOCKACTIVITY. Thus, software must ensure consistent programming between the I2C CLOCKACTIVITY and I2C clock PRCM control bits. For a description of the ClockActivity feature, see [Section 3.1.1.1.2, Module Level Clock Management](#) in [Chapter 3, Power, Reset, and Clock Management](#).

24.1.4.5 HS I²C Interrupt Requests

[Table 24-12](#) lists the event flags, and their mask, that can cause module interrupts.

Table 24-12. HS I²C Events

| Event Flag | Event Mask | Event Unmask | Map to | Description |
|----------------------------|-----------------------------------|------------------------------------|----------|---|
| I2Ci.I2C_IRQSTATUS[0] AL | I2Ci.I2C_IRQENABLE_SET[0] AL_IE | I2Ci.I2C_IRQENABLE_C LR[0] AL_IE | I2Ci_IRQ | Arbitration lost IRQ enabled status. This bit is automatically set by the hardware when it loses the Arbitration in master transmit mode, an interrupt is signaled to the MPU subsystem. During reads, it always returns 0. |
| I2Ci.I2C_IRQSTATUS[1] NACK | I2Ci.I2C_IRQENABLE_SET[1] NACK_IE | I2Ci.I2C_IRQENABLE_C LR[1] NACK_IE | I2Ci_IRQ | No acknowledgment IRQ enabled status. Bit is set when No Acknowledge has been received, an interrupt is signaled to MPU subsystem. Write 1 to clear this bit. |
| I2Ci.I2C_IRQSTATUS[2] ARDY | I2Ci.I2C_IRQENABLE_SET[2] ARDY_IE | I2Ci.I2C_IRQENABLE_C LR[2] ARDY_IE | I2Ci_IRQ | Register access ready IRQ enabled status. When set to 1 it indicates that previous access has been performed and registers are ready to be accessed again. An interrupt is signaled to MPU subsystem. Write 1 to clear. |
| I2Ci.I2C_IRQSTATUS[3] RRDY | I2Ci.I2C_IRQENABLE_SET[3] RRDY_IE | I2Ci.I2C_IRQENABLE_C LR[3] RRDY_IE | I2Ci_IRQ | Receive data ready IRQ enabled status. Set to 1 by core when receiver mode, a new data is able to be read. When set to 1 by core, an interrupt is signaled to MPU subsystem. Write 1 to clear. |

Table 24-12. HS I²C Events (continued)

| Event Flag | Event Mask | Event Unmask | Map to | Description |
|--------------------------------|---|---|----------|---|
| I2Ci.I2C_IRQSTATUS[4] XRDY | I2Ci.I2C_IRQENABLE_SET[4] XRDY_IE | I2Ci.I2C_IRQENABLE_C LR[4] XRDY_IE | I2Ci_IRQ | Transmit data ready IRQ enabled status. Set to 1 by core when transmitter and when new data is requested. When set to 1 by core, an interrupt is signaled to MPU subsystem. Write 1 to clear. |
| I2Ci.I2C_IRQSTATUS[5] GC | I2Ci.I2C_IRQENABLE_SET[5] GC_IE | I2Ci.I2C_IRQENABLE_C LR[5] GC_IE | I2Ci_IRQ | General call IRQ enabled status. Set to 1 by core when General call address detected and interrupt signaled to MPU subsystem. Write 1 to clear. |
| I2Ci.I2C_IRQSTATUS[6] STC | I2Ci.I2C_IRQENABLE_SET[6] STC_IE | I2Ci.I2C_IRQENABLE_C LR[6] STC_IE | I2Ci_IRQ | Start Condition IRQ enabled status. |
| I2Ci.I2C_IRQSTATUS[7] AERR | I2Ci.I2C_IRQENABLE_SET[7] AERR_IE | I2Ci.I2C_IRQENABLE_C LR[7] AERR_IE | I2Ci_IRQ | Access Error IRQ enabled status. |
| I2Ci.I2C_IRQSTATUS[8] BF | I2Ci.I2C_IRQENABLE_SET[8] BF_IE | I2Ci.I2C_IRQENABLE_C LR[8] BF_IE | I2Ci_IRQ | Access Error IRQ enabled status. |
| I2Ci.I2C_IRQSTATUS[9] AAS | I2Ci.I2C_IRQENABLE_SET[9] AAS_IE | I2Ci.I2C_IRQENABLE_C LR[9] AAS_IE | I2Ci_IRQ | Address recognized as slave IRQ enabled status. |
| I2Ci.I2C_IRQSTATUS[10] XUDF | I2Ci.I2C_IRQENABLE_SET[1 0] XUDF_IE | I2Ci.I2C_IRQENABLE_C LR[10] XUDF_IE | I2Ci_IRQ | Transmit underflow enabled status. Writing into this bit has no effect. |
| I2Ci.I2C_IRQSTATUS[11] ROVR | I2Ci.I2C_IRQENABLE_SET[1 1] ROVR_IE | I2Ci.I2C_IRQENABLE_C LR[11] ROVR_IE | I2Ci_IRQ | Receive overrun enabled status. Writing into this bit has no effect. |
| I2Ci.I2C_IRQSTATUS[12] BB | I2Ci.I2C_IRQENABLE_SET[1 2] BB_IE | I2Ci.I2C_IRQENABLE_C LR[12] BB_IE | I2Ci_IRQ | Bus busy enabled status. Writing into this bit has no effect. |
| I2Ci.I2C_IRQSTATUS[13] RDR | I2Ci.I2C_IRQENABLE_SET[1 3] RDR_IE | I2Ci.I2C_IRQENABLE_C LR[13] RDR_IE | I2Ci_IRQ | Receive draining IRQ enabled status. |
| I2Ci.I2C_IRQSTATUS[14] XDR | I2Ci.I2C_IRQENABLE_SET[1 4] XDR_IE | I2Ci.I2C_IRQENABLE_C LR[14] XDR_IE | I2Ci_IRQ | Transmit draining IRQ enabled status. |

24.1.4.6 HS I²C DMA Requests

Each multimaster HS I²C controller can generate two DMA requests to the system DMA (sDMA) controller. [Table 24-13](#) lists the DMA requests with mapping on the sDMA controller. For information about DMA generation, see [Section 24.1.4.8.3, HS I²C FIFO DMA Mode \(I²C Mode Only\)](#).

Table 24-13. HS I²C DMA Requests

| Name | Source | Destination | Description |
|-------------|--------|-------------|--|
| I2C1_DMA_TX | I2C1 | S_DMA_26 | I2C1 DMA write request to inform the sDMA to write new data in the I2C1.I2C_DATA[7:0] register |
| I2C1_DMA_RX | I2C1 | S_DMA_27 | I2C1 DMA read request to inform the sDMA to read the data in the I2C1.I2C_DATA[7:0] register |
| I2C2_DMA_TX | I2C2 | S_DMA_28 | I2C2 DMA write request to inform the sDMA to write new data in the I2C2.I2C_DATA[7:0] register |
| I2C2_DMA_RX | I2C2 | S_DMA_29 | I2C2 DMA read request to inform the sDMA to read the data in the I2C2.I2C_DATA[7:0] register |
| I2C3_DMA_TX | I2C3 | S_DMA_24 | I2C3 DMA write request to inform the sDMA to write new data in the I2C3.I2C_DATA[7:0] register |

Table 24-13. HS I²C DMA Requests (continued)

| Name | Source | Destination | Description |
|-------------|--------|-------------|--|
| I2C3_DMA_RX | I2C3 | S_DMA_25 | I2C3 DMA read request to inform the sDMA to read the data in the I2C3.I2C_DATA[7:0] register |
| I2C4_DMA_TX | I2C4 | S_DMA_123 | I2C4 DMA write request to inform the sDMA to write new data in the I2C4.I2C_DATA[7:0] register |
| I2C4_DMA_RX | I2C4 | S_DMA_124 | I2C4 DMA read request to inform the sDMA to read the data in the I2C4.I2C_DATA[7:0] register |

NOTE: The HS I²C controller I2C5 does not generate any DMA requests.

24.1.4.7 HS I²C Programmable Multislave Channel Feature (I²C Mode Only)

This feature allows each multimaster HS I²C controller to be addressed using four separate Own Addresses configured in the I2Ci.I2C_OA and I2Ci.I2C_OAx registers (where x = 1, 2, 3). An additional register (I2Ci.I2C_ACTOA) is used to indicate to the LH which address is used by the external master to communicate with the I²C controller.

Each Own Address can be independently configured in 7-bit or 10-bit mode by setting the corresponding bit (I2Ci.I2C_CON[7] XOA, I2Ci.I2C_CON[6] XOA1, I2Ci.I2C_CON[5] XOA2, or I2Ci.I2C_CON[4] XOA3).

24.1.4.8 HS I²C FIFO Management

Each multimaster HS I²C controller implements two internal 8-bit FIFOs, the RX and TX FIFOs.

The depth of the RX and TX FIFOs is fixed at 16 bytes and can be checked by reading the I2Ci.I2C_BUFSTAT[15:14] FIFODEPTH bit field (0x0: 8 bytes, 0x1: 16 bytes, 0x2: 32 bytes, and 0x3: 64 bytes).

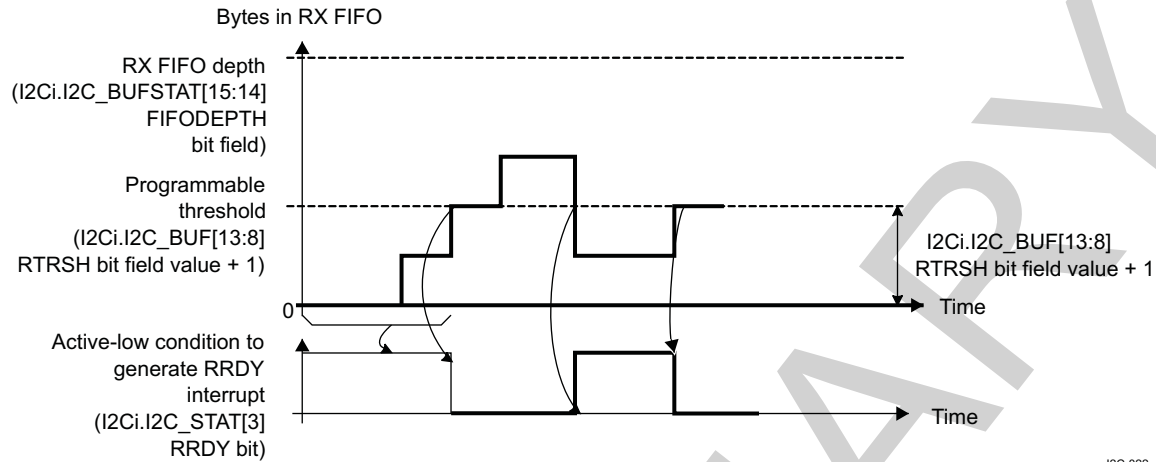
NOTE: FIFO depth is configured at design time and cannot be modified by software. FIFO thresholds must not exceed configured FIFO depth.

24.1.4.8.1 HS I²C FIFO Interrupt Mode

In first in first out (FIFO) interrupt mode (relevant interrupts enabled by the I2Ci.I2C_IE register), an interrupt signal informs the processor of the receiver and transmitter status. These interrupts are raised when the RX/TX FIFO thresholds (defined by the I2Ci.I2C_BUF[13:8] RTRSH bit field value + 1 for the RX FIFO or the I2Ci.I2C_BUF[5:0] TXTRSH bit field value + 1 for the TX FIFO) are reached; the interrupt signals instruct the LH to transfer data to the destination (from the I²C controller in receive mode and/or from any source to the I²C controller FIFO in transmit mode).

Figure 24-23 and Figure 24-24 show receive and transmit operations, respectively, from a FIFO management point of view.

Figure 24-23. HS I²C Receive FIFO Interrupt Request Generation

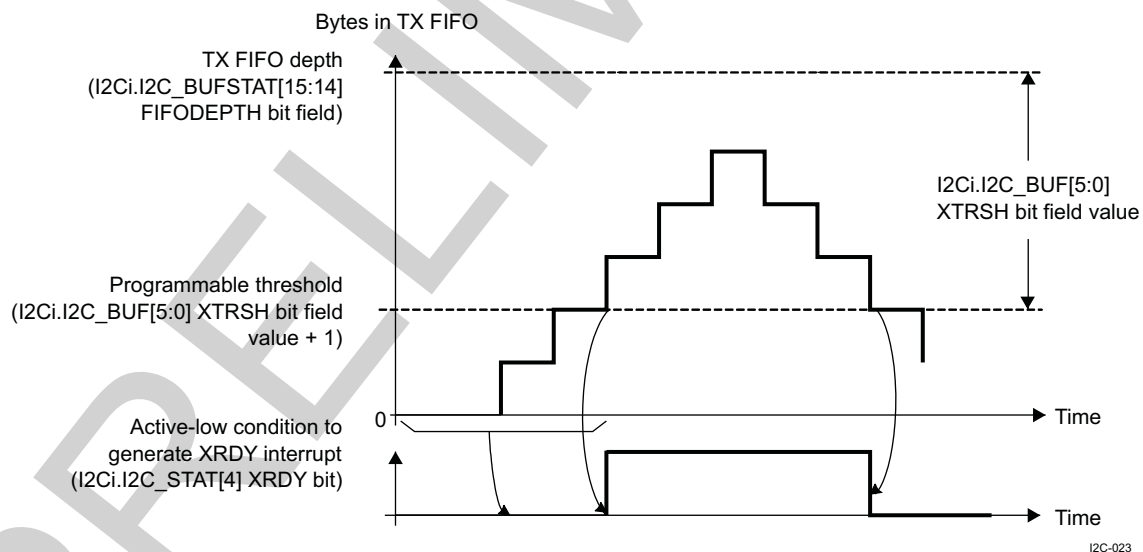


I2C-022

In Figure 24-23, the RRDY interrupt condition shows that the condition for generating an RRDY interrupt is achieved. The interrupt request is generated when this signal is active, and it can be cleared only by the LH by writing 1 in the I2Ci.I2C_STAT[3] RRDY bit. If the condition is still present after clearing the previous interrupt, another interrupt request is generated.

In receive mode, an RRDY interrupt is generated as soon as the FIFO reaches its receive threshold (I2Ci.I2C_BUF[13:8] RTRSH bit field value + 1). The interrupt can be deasserted only when the LH has handled enough bytes to make the number of bytes in the RX FIFO lower than the programmed threshold. For each interrupt, the LH can be configured to read a number of bytes equal to the value of the RX FIFO threshold.

Figure 24-24. HS I²C Transmit FIFO Interrupt Request Generation



I2C-023

In Figure 24-24, the XRDY interrupt condition shows that the condition for generating an XRDY interrupt is achieved. The interrupt request is generated when TX FIFO is empty or when the TX FIFO threshold is not reached, and the LH can clear the XRDY status bit by setting the I2Ci.I2C_STAT[4] XRDY bit to 1 after transmitting the configured number of bytes. If the condition is still present after clearing the previous interrupt, another interrupt request is generated.

In interrupt mode, the module offers two options for the LH application to handle the interrupts:

- When detecting an interrupt request (XRDY or RRDY type), the LH can write/read 1 data byte to/from the TX/RX FIFO and then clear the interrupt. The module reasserts the interrupt until the interrupt condition is not met.

- When detecting an interrupt request (XRDY or RRDY type), the LH can be programmed to write/read the amount of data bytes specified by the corresponding FIFO threshold (I2C_BUF[5:0] TXTRSH + 1 or I2C_BUF[5:0] RXTRSH + 1). In this case, the interrupt condition is cleared and the next interrupt is asserted again when the XRDY or RRDY condition is met again.

If the second-interrupt-serving approach is used, an additional mechanism (draining feature) is implemented for cases where the transfer length is not a multiple of the FIFO threshold value (see [Section 24.1.4.8.4, Draining Feature \[I²C Mode Only\]](#)).

NOTE: In slave transmit mode (the I2Ci.I2C_CON[10] MST bit is cleared and the I2Ci.I2C_CON[9] TRX bit is set to 1), the draining feature must not be used, because the transfer length is not known at configuration time, and the external master can end the transfer at any point by not acknowledging 1 data byte. If the draining feature is used in slave transmit mode, data can remain in the TX FIFO without being transmitted over the I²C bus. In this case, the TX FIFO must be cleared by setting the I2Ci.I2C_BUF[6] TXFIFO_CLR bit.

NOTE: In SCCB mode, the RX and TX threshold values must be set to 1 by setting the I2Ci.I2C_BUF[13:8]RTRSH and I2Ci.I2C_BUF[5:0] TXTRSH fields to 0x0.

24.1.4.8.2 HS I²C FIFO Polling Mode

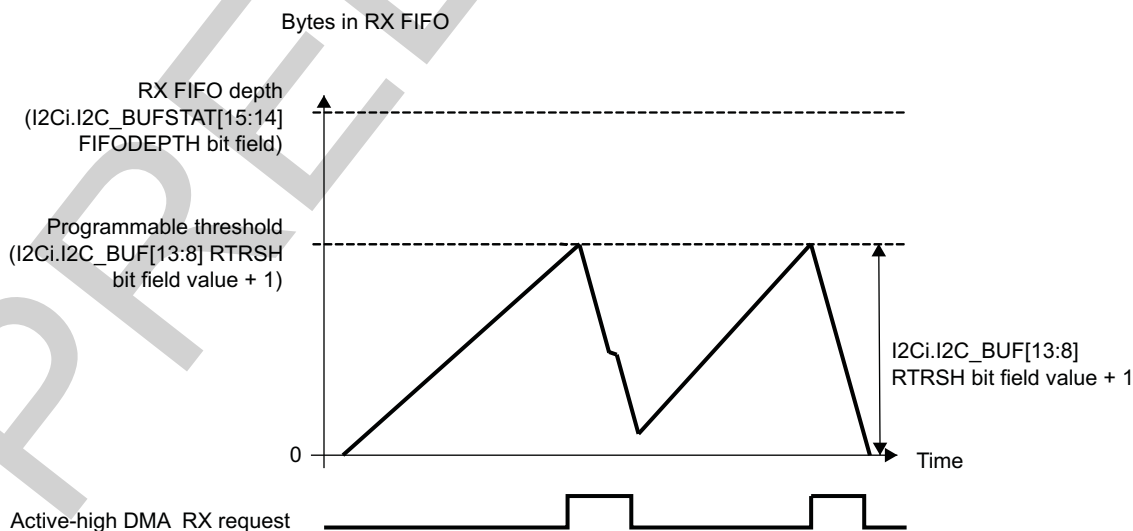
In FIFO polling mode (the I2Ci.I2C_IE[4] XRDY_IE and I2Ci.I2C_IE[3] RRDY_IE bits are disabled, and the I2Ci.I2C_BUF[15] RDMA_EN and I2Ci.I2C_BUF[7] XDMA_EN bits are disabled), the status of the module (receiver or transmitter) can be checked by polling the I2Ci.I2C_STAT[4] XRDY and the I2Ci.I2C_STAT[3] RRDY bits (the I2Ci.I2C_STAT[13] RDR and I2Ci.I2C_STAT[14] XDR bits can also be polled if the draining feature is enabled). The I2Ci.I2C_STAT[4] XRDY and I2Ci.I2C_STAT[3] RRDY bits accurately reflect the interrupt conditions described in the discussion of FIFO interrupt mode.

24.1.4.8.3 HS I²C FIFO DMA Mode (I²C Mode Only)

In receive mode, a DMA request is generated by the I2Ci_DMA_RX signal as soon as the RX FIFO exceeds its threshold level (the I2Ci.I2C_BUF[13:8] RTRSH bit field value + 1). This request is deasserted when the number of bytes defined by the threshold level is read by the DMA controller.

[Figure 24-25](#) shows the DMA request generation in receive mode.

Figure 24-25. HS I²C Receive FIFO DMA Request Generation



I2C-024

In transmit mode, a DMA request is automatically asserted by the I2Ci_DMA_TX signal when the TX FIFO is empty. This request is deasserted when the number of bytes (the 2Ci.I2C_BUF[5:0] TXTRSH bit field value + 1) is written in the FIFO by the DMA controller. If an insufficient number of bytes is written, the sDMA request remains active. Figure 24-26 and Figure 24-27 show the DMA TX transfers with different values for the I2Ci.I2C_BUF[5:0] TXTRSH bit field.

Figure 24-26. HS I²C Transmit FIFO Request Generation (High Threshold)

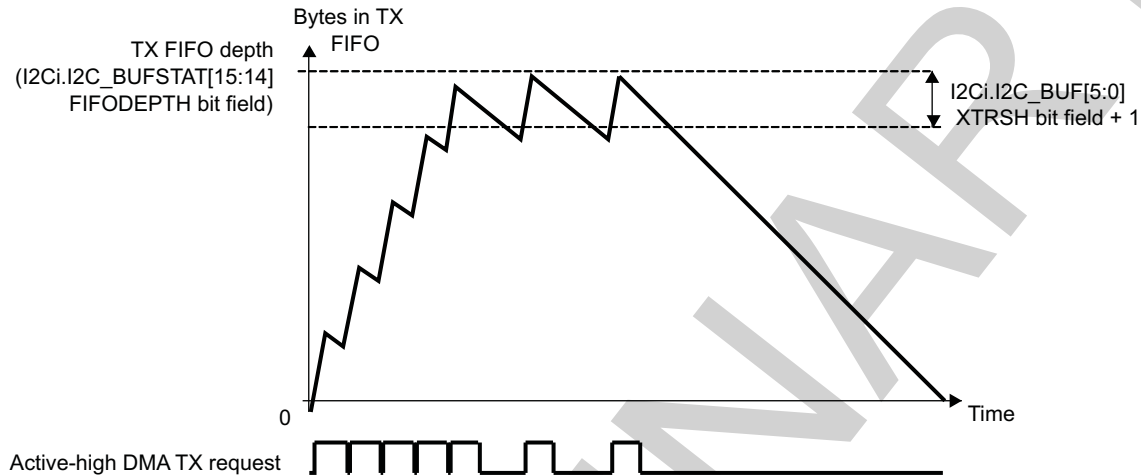
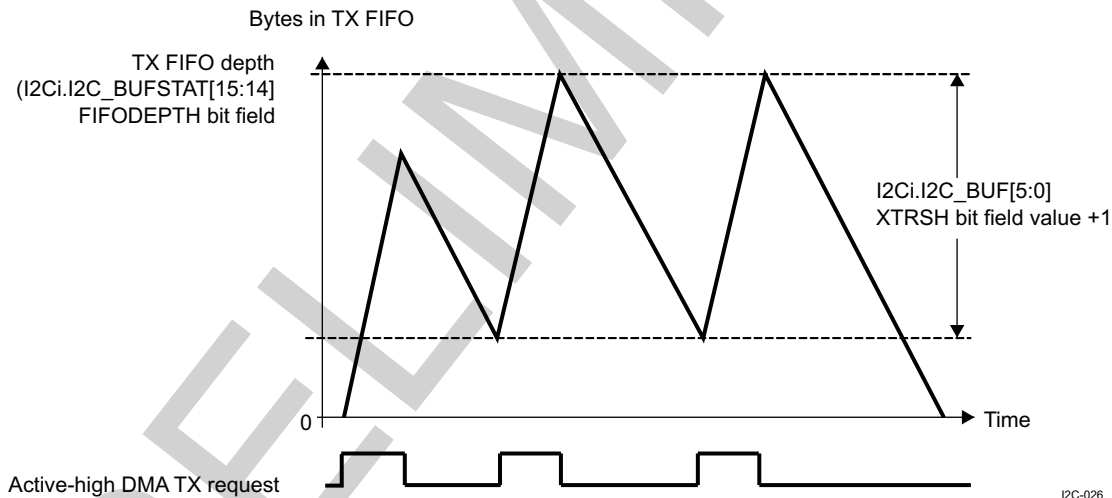


Figure 24-27. HS I²C Transmit FIFO Request Generation (Low Threshold)



NOTE: In SCCB mode, the RX and TX threshold values must be set to 1 by setting the I2Ci.I2C_BUF[13:8] RTRSH and I2Ci.I2C_BUF[5:0] XTRSH bit fields to 0x0.

The I²C module allows the user to clear the RX or TX FIFO by setting the I2Ci.I2C_BUF[14] RXFIFO_CLR and I2Ci.I2C_BUF[6] TXFIFO_CLR registers, respectively, which act like software reset for the FIFOs. In DMA mode, these bits also reset the DMA state-machines. The FIFO clearing feature can be used when the following conditions are met:

- The module is configured as a transmitter.
- The external receiver responds with a NACK in the middle of the transfer.
- Data in the TX FIFO is waiting to be transferred.

24.1.4.8.4 HS I²C Draining Feature (I²C Mode Only)

The draining feature is implemented to handle the end of a transfer whose length is not a multiple of the FIFO threshold values (the I2Ci.I2C_BUF[13:8] RTRSH bit field value + 1 for the RX threshold and I2Ci.I2C_BUF[5:0] TXTRSH field value + 1 for the TX threshold). It can also transfer the remaining number of bytes (because the threshold is not reached).

This feature prevents the LH or the DMA controller from trying more FIFO accesses than necessary (for example, to generate at the end of a transfer a DMA RX request having fewer bytes in the FIFO than the configured DMA transfer length). Otherwise, an AERR interrupt is generated by the I2Ci.I2C_STAT[7] AERR bit.

The draining mechanism generates an interrupt using the I2Ci.I2C_STAT[13] RDR or I2Ci.I2C_STAT[14] XDR bit at the end of the transfer, informing the LH that it must check the amount of data left to be transferred (the I2Ci.I2C_BUFSTAT[13:8] RXSTAT or I2Ci.I2C_BUFSTAT[5:0] TXSTAT bit fields) and enable the draining feature of the DMA controller by reconfiguring the DMA transfer length according to this value (when the DMA mode is enabled) or perform only the required number of data accesses (when the DMA mode is disabled).

In receive mode (master or slave), if the RX FIFO threshold (the I2Ci.I2C_BUF[13:8] RTRSH bit field value + 1) is not reached, but the transfer ends on the I²C bus and data remains in the RX FIFO (less than the threshold), the receive draining interrupt (the I2Ci.I2C_STAT[13] RDR bit) is asserted to inform the LH that it can read the amount of data in the RX FIFO (the I2Ci.I2C_BUFSTAT[13:8] RXSTAT bit field). The LH performs a number of data read accesses equal to the I2Ci.I2C_BUFSTAT[13:8] RXSTAT bit field (interrupt or polling mode), or reconfigures the sDMA controller with the required value to drain the FIFO.

In master transmit mode, if the TX FIFO threshold (I2Ci.I2C_BUF[5:0] TXTRSH bit field value + 1) is not reached, but the amount of data remaining to be written in the TX FIFO is less than the threshold, the transmit draining interrupt (the I2Ci.I2C_STAT[14] XDR bit) is asserted to inform the LH that it can read the amount of data remaining to be written in the TX FIFO (the I2Ci.I2C_BUFSTAT[5:0] TXSTAT bit field). The LH must write the required number of data bytes specified by the I2Ci.I2C_BUFSTAT[5:0] TXSTAT bit field value or reconfigure the sDMA controller with the value required to transfer the last bytes to the FIFO.

In master mode, the LH can alternately not check the values of the I2Ci.I2C_BUFSTAT[5:0] TXSTAT and I2Ci.I2C_BUFSTAT[13:8] RXSTAT bit fields, the LH can obtain this information internally (by computing the I2Ci.I2C_CNT[15:0] DATACOUNT bit field value modulo I2Ci.I2C_BUF[13:8] RTRSH or I2Ci.I2C_BUF[5:0] TXTRSH).

By default, the draining feature is disabled; it can be enabled using the I2Ci.I2C_IE[14] XDR_IE or I2Ci.I2C_IE[13] RDR_IE bits (default disabled) only for transfers with lengths not equal to the threshold values (I2Ci.I2C_BUF[5:0] TXTRSH bit field value + 1 for the TX threshold or I2Ci.I2C_BUF[13:8] RTRSH bit field value + 1 for the RX threshold).

24.1.4.9 HS I²C Noise Filter

The noise filter is used to suppress any noise that is 50 ns or less in case of F/S operation modes and SCCB modes, and any noise that is 10 ns or less in case of HS mode operation. The noise filter is always one period of the I2Ci_INTERNAL_CLK clock. This way, for HS mode operation (prescaler bypassed), the filter suppresses spikes of less than 10.4 ns.

For SCCB modes (for example, I2Ci.I2C_PSC[7:0] PSC bit field = 4), the maximum width of suppressed spikes is 52 ns.

To ensure correct filtering, the prescaler must be programmed accordingly by the I2Ci.I2C_PSC[7:0] PSC bit field.

24.1.4.10 HS I²C Write and Read Operations in SCCB Mode

In SCCB mode, the multimaster HS I²C controller can write or read a single byte to or from the external SCCB device.

To write a single byte to the external SCCB device, the multimaster HS I²C controller must be configured in multimaster transmitter mode by setting the I2Ci.I2C_CON[10] MST and I2Ci.I2C_CON[9] TRX bits to 1. The external device slave address (7-bit address of the ID value) is set in the I2Ci.I2C_SA register; the register address (8-bit subaddress in the external SCCB device) is set in the I2Ci.I2C_OA0 register. The 8-bit data to be transmitted is written by the LH in the I2Ci.I2C_DATA register.

To read a single byte from the external SCCB device, the multimaster HS I²C controller must be configured in multimaster receiver mode by setting the I2Ci.I2C_CON[10] MST bit to 1 and by clearing the I2Ci.I2C_CON[9] TRX bit to 0. The external device slave address (7-bit address of the ID value) is set in the I2Ci.I2C_SA register; the register address (8-bit subaddress in the external SCCB device) is set in the I2Ci.I2C_OA0 register. The 8-bit data received from the external SCCB device is read by the LH from the I2Ci.I2C_DATA register.

NOTE: In SCCB mode, the RX and TX thresholds must be set to 1 by configuring the I2Ci.I2C_BUF[13:8] RTRSH and I2Ci.I2C_BUF[5:0] XTRSH fields to 0x0.

24.1.4.11 HS I²C System Test Mode

A system test mode is available for multimaster HS I²C controller module testing. This mode is enabled by setting the I2Ci.I2C_SYSTEST[15] ST_EN bit to 1. When this bit is cleared to 0, the I²C controller is configured in normal operation mode.

In system test mode, the I2Ci_SYSTEST[13:12] TMODE bit field selects the type of test. Table 24-14 lists the tests available for the multimaster HS I²C controllers.

Table 24-14. HS I²C List of Tests

| I2Ci.I2C_SYSTEST[13:12] TMODE | Test | Description |
|-------------------------------|--|--|
| 00 | Functional mode | Normal operation mode |
| 01 | Reserved (not used) | |
| 10 | Test of i2ci_scl serial clock line | The i2ci_scl line is driven with a permanent clock as if mastered with the parameters set in the I2Ci.I2C_PSC, I2Ci.I2C_SCLL, and I2Ci.I2C_SCLH registers. |
| 11 | Loop-back mode + i2ci_scl/ i2ci_sda input/output | In master transmit mode only, data transmitted out of the I2Ci.I2C_DATA register (write action) is received in the same I2Ci.I2C_DATA register through an internal path through the FIFO buffers. The DMA and interrupt requests are normally generated if they are enabled. Moreover, the i2ci_scl, i2ci_sda, and i2ci_sccbe lines are controlled with the I2Ci.I2C_SYSTEST[4:0] bits.. |

NOTE: When the I2Ci.I2C_SYSTEST[13:12] TMODE bit field is set to 11, the I²C controller must be configured in I²C F/S (the I2Ci.I2C_CON[13:12] OPMODE set to 00) or I²C HS mode (the I2Ci.I2C_CON[13:12] OPMODE set to 01). The loop-back mode is not available in SCCB mode (the I2Ci.I2C_CON[13:12] OPMODE = b10).

NOTE: In normal operation mode (I2Ci.I2C_SYSTEST[15] ST_EN clear to 0), the I2Ci.I2C_SYSTEST[4:0] bits that control the i2ci_scl, i2ci_sda, and i2ci_sccbe lines in system test mode are read-only bits.

In system test mode (I2Ci.I2C_SYSTEST[15] ST_EN set to 1), the I2Ci.I2C_STAT[5:0] status bits can be set to 1 when the I2Ci.I2C_SYSTEST[11] SSB bit is set to 1. Clearing the I2Ci.I2C_SYSTEST[11] SSB bit to 0 does not clear the I2Ci.I2C_STAT[5:0] bits to 0. The I2Ci.I2C_STAT[5:0] bit field can be cleared to 0 only by writing 1 in the corresponding bits.

24.1.5 HS I²C Programming Guide

24.1.5.1 HS I²C Low-Level Programming Models

24.1.5.1.1 HS I²C Programming Model in I²C Mode

This section describes the programming model of the multimaster HS I²C controllers configured in I²C mode.

24.1.5.1.1.1 Main Program

24.1.5.1.1.1.1 Configure the Module Before Enabling the I²C Controller

Before enabling the I²C controller, perform the following:

1. Enable the functional and interface clocks.
2. Program the prescaler to obtain an approximately 12-MHz internal sampling clock by programming the corresponding value in the I2Ci.I2C_PSC[7:0] PSC field. This value depends on the frequency of the functional clock (I2Ci_FCLK).
3. Program the I2Ci.I2C_SCLL[7:0] SCLL and I2Ci.I2C_SCLH[7:0] SCLH bit fields to obtain a bit rate of 100 Kbps, 400 Kbps or 1Mbps. These values depend on the internal sampling clock frequency (see [Table 24-8](#)).
4. (Optional) Program the I2Ci.I2C_SCLL[15:8] HSSCLL and I2Ci.I2C_SCLH[15:8] HSSCLH bit fields to obtain a bit rate of 400 Kbps or 3.4 Mbps (for the second phase of HS mode). These values depend on the internal sampling clock frequency (see [Table 24-8](#)).
5. (Optional) If a bit rate of 3.4 Mbps is used and the bus line capacitance exceeds 45 pF, see [Section 19.4.8, PAD Functional Multiplexing and Configuration](#).
6. Configure the Own Address of the I2C controller by storing it in the I2Ci.I2C_OA register. Up to four Own Addresses can be programmed in the I2Ci.I2C_OAx registers (where x = 0, 1, 2, 3) for each I²C controller.

NOTE: For a 10-bit address, set the corresponding expand Own Address bit in the I2Ci.I2C_CON register.

7. Set the TX threshold (in transmitter mode) and the RX threshold (in receiver mode) by setting the I2Ci.I2C_BUF[5:0] TXTRSH bit field to (TX threshold to 1) and the I2Ci.I2C_BUF[13:8] RTRSH bit field to (RX threshold to 1), where the TX and RX thresholds are greater than or equal to 1.
8. Take the I²C controller out of reset by setting the I2Ci.I2C_CON[15] I2C_EN bit to 1.

24.1.5.1.1.1.2 Initialize the I²C Controller

To initialize the I²C controller, perform the following steps:

1. Configure the I2Ci.I2C_CON register:
 - For master or slave mode, set the I2Ci.I2C_CON[10] MST bit (0: slave; 1: master).
 - For transmitter or receiver mode, set the I2Ci.I2C_CON[9] TRX bit (0: receiver; 1: transmitter).
2. If using an interrupt to transmit and receive data, set the corresponding bit in the I2Ci.I2C_IE register to 1 (the I2Ci.I2C_IE[4] XRDY_IE bit for the transmit interrupt, the I2Ci.I2C_IE[3] RRDY bit for the receive interrupt).
3. If using DMA to receive and transmit data, set the corresponding bit in the I2Ci.I2C_BUF register to 1 (the I2Ci.I2C_BUF[15] RDMA_EN bit for the receive DMA channel, the I2Ci.I2C_BUF[7] XDMA_EN bit for the transmit DMA channel).

24.1.5.1.1.1.3 Configure Slave Address and the Data Control Register

In master mode, configure the slave address register by programming the I2Ci.I2C_SA[9:0] SA bit field and the number of data bytes (I²C data payload) associated with the transfer by programming the I2Ci.I2C_CNT[15:0] DCOUNT bit field.

NOTE: For a 10-bit address, set the I2Ci.I2C_CON[8] XSA bit to 1.

24.1.5.1.1.1.4 Initiate a Transfer

Poll the I2Ci.I2C_STAT[12] BB bit. If it is cleared to 0 (bus not busy), configure the I2Ci.I2C_CON[0] STT and I2Ci.I2C_CON[1] STP bits. To initiate a transfer, the I2Ci.I2C_CON[0] STT bit must be set to 1, and it is not mandatory to set the I2Ci.I2C_CON[1] STP bit to 1.

24.1.5.1.1.1.5 Receive Data

Poll the I2Ci.I2C_STAT[3] RRDY bit, or use the RRDY interrupt (the I2Ci.I2C_IE[3] RRDY_IE bit must be set to 1) or the DMA RX channel (the I2Ci.I2C_BUF[15] RDMA_EN bit must be set to 1) to read the receive data in the I2Ci.I2C_DATA register.

If the transfer length does not equal the RX FIFO threshold (I2Ci.I2C_BUF[13:8] RTRSH field + 1), use the draining feature (enable the RDR interrupt by setting the I2Ci.I2C_IE[13] RDR_IE bit to 1).

NOTE: In receive mode only, the I2Ci.I2C_STAT[11] ROVR (receive overrun) bit indicates whether the receiver has experienced overrun. An overrun condition occurs when the shift register and the RX FIFO are full. An overrun condition does not result in data loss; the I²C controller simply holds i2ci_scl to low to prevent other bytes from being received.

The I2Ci.I2C_STAT[7] AERR bit is set to 1 when a read access is performed in the I2Ci.I2C_DATA register while the RX FIFO is empty. The corresponding interrupt can be enabled by setting the I2Ci.I2C_IE[7] AERR_IE bit to 1.

24.1.5.1.1.1.6 Transmit Data

Poll the I2Ci.I2C_STAT[4] XRDY bit, or use the XRDY interrupt (the I2Ci.I2C_IE[4] XRDY_IE bit must be set to 1) or the DMA TX channel (the I2Ci.I2C_BUF[7] XDMA_EN bit must be set to 1) to write data to the I2Ci.I2C_DATA register.

If the transfer length does not equal the TX FIFO threshold (I2Ci.I2C_BUF[5:0] TXTRSH field + 1), use the draining feature (enable the XDR interrupt by setting the I2Ci.I2C_IE[14] XDR_IE bit to 1).

NOTE: In transmit mode only, the I2Ci.I2C_STAT[10] XUDF bit indicates whether the transmitter has experienced underflow.

In master transmit mode, underflow occurs when the shift register and the TX FIFO are empty and there are still some bytes to transmit (the value of the I2Ci.I2C_CNT[15:0] DCOUNT bit field is not 0).

In slave transmit mode, underflow occurs when the shift register and the TX FIFO are empty and the external I²C master device still requests data bytes to be read.

The I2Ci.I2C_STAT[7] AERR bit is set to 1 when a write access is performed in the I2Ci.I2C_DATA register while the TX FIFO is full. The corresponding interrupt can be enabled by setting the I2Ci.I2C_IE[7] AERR_IE bit to 1.

24.1.5.1.1.2 Interrupt Subroutine Sequence

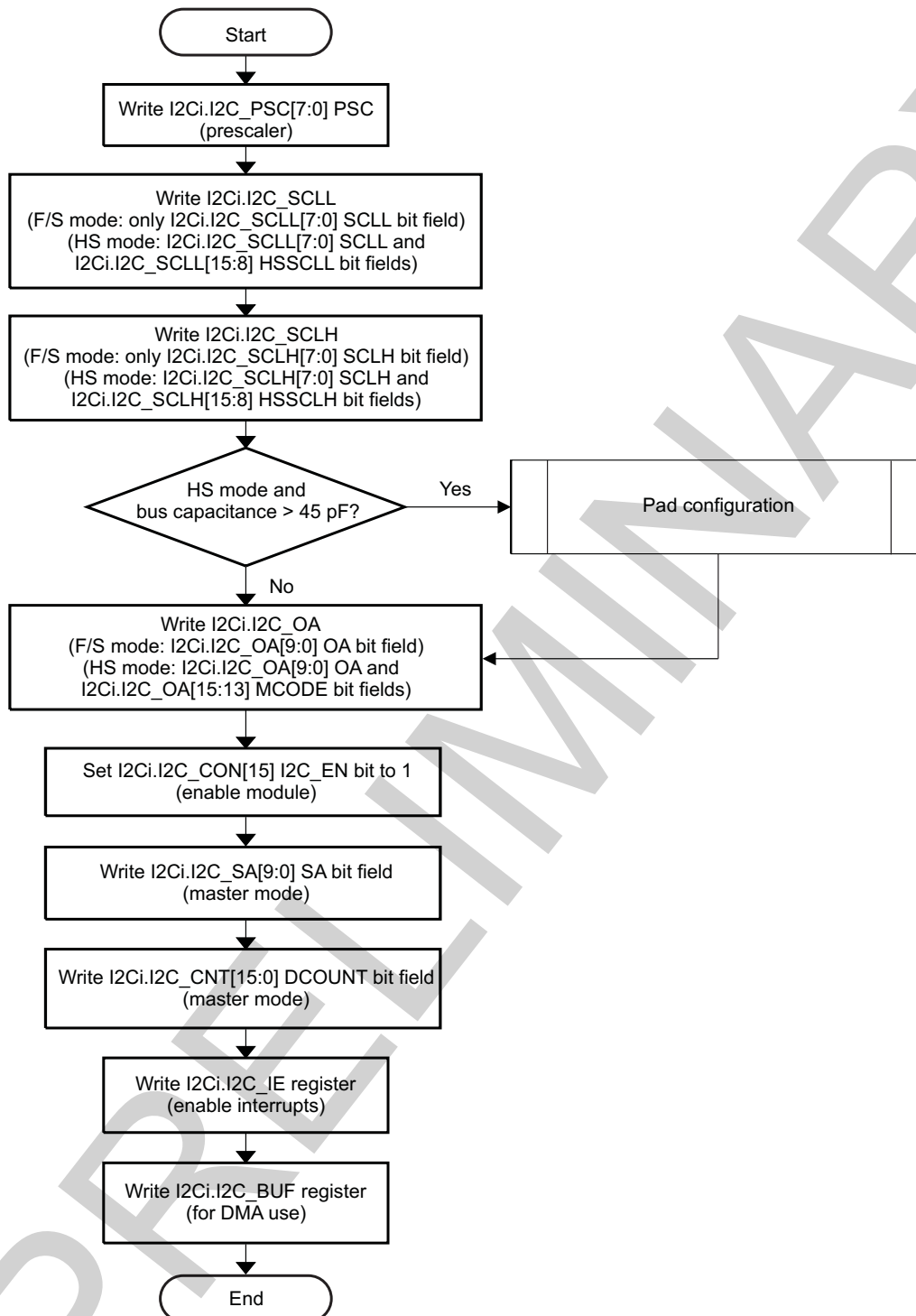
1. Test for arbitration lost (the I2Ci.I2C_STAT[0] AL bit) and resolve accordingly.
2. Test for no acknowledgment (the I2Ci.I2C_STAT[1] NACK bit) and resolve accordingly.
3. Test for register access ready (the I2Ci.I2C_STAT[2] ARDY bit) and resolve accordingly.

4. Test for receive data ready (the I2Ci.I2C_STAT[3] RRDY bit) and resolve accordingly.
5. Test for transmit data ready (the I2Ci.I2C_STAT[4] XRDY bit) and resolve accordingly.
6. Test for general call (the I2Ci.I2C_STAT[5] GC bit) and resolve accordingly.
7. Test for start (S) condition (the I2Ci.I2C_STAT[6] STC bit) and resolve accordingly. For this test, the functional clock must be inactive.
8. Test for access error (the I2Ci.I2C_STAT[7] AERR bit) and resolve accordingly.
9. Test for bus free (the I2Ci.I2C_STAT[8] BF bit) and resolve accordingly.

24.1.5.1.1.3 Programming Flow Diagrams

Figure 24-28 through Figure 24-36 are procedure flow charts for programming the F/S and HS I²C modes.

Figure 24-28. HS I²C Setup Procedure



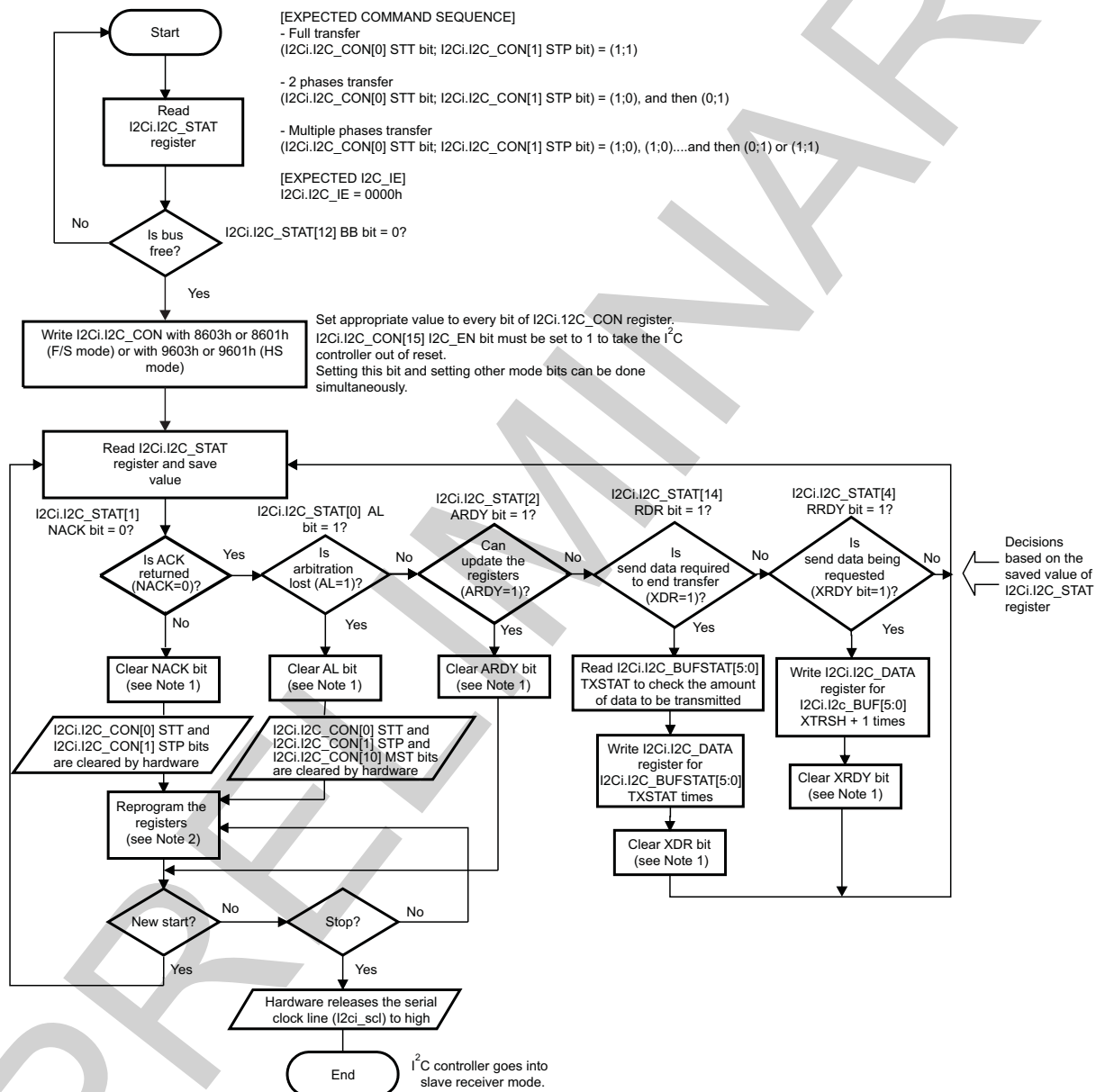
I2C-027

Table 24-15. HS I²C Subprocess call summary for Sequence - Setup Procedure

| Register Name | Register Name |
|-------------------|---|
| Pad configuration | Refer to Section 19.4.8 PAD Functional Multiplexing and Configuration . |

Table 24-16. HS I²C Register call summary for Sequence - Setup Procedure

| Register Name | Register Name | Register Name |
|------------------------------|-----------------------------|-----------------------------|
| I2Ci.I2C_PSC ⁽¹⁾ | I2Ci.I2C_CON ⁽¹⁾ | I2Ci.I2C_BUF ⁽¹⁾ |
| I2Ci.I2C_SCLL ⁽¹⁾ | I2Ci.I2C_SA ⁽¹⁾ | I2Ci.I2C_IE ⁽¹⁾ |
| I2Ci.I2C_SCLH ⁽¹⁾ | I2Ci.I2C_CNT ⁽¹⁾ | I2Ci.I2C_OA ⁽¹⁾ |

⁽¹⁾ i = 1 to 4**Figure 24-29. HS I²C Master Transmitter Mode, Polling Method, in F/S and HS Modes**

I2C-028

- (1) The NACK, AL, ARDY, XDR, and XRDY bits are cleared by writing 1 to each corresponding bit in the I2Ci.I2C_STAT register.
- (2) Reprogram the registers means: I2Ci.I2C_CON[11] STB and/or I2Ci.I2C_CON[10] MST bit and/or I2Ci.I2C_SA[9:0] SA register and/or I2Ci.I2C_CNT[15:0] DCOUNT register and/or I2Ci.I2C_CON[0] STT bit and/or I2Ci.I2C_CON[1] STP bit.

NOTE: The FIFO clearing can be made when the module is configured as transmitter and the receiver sends a NACK in the middle of the transfer and data still exists in the FIFO.

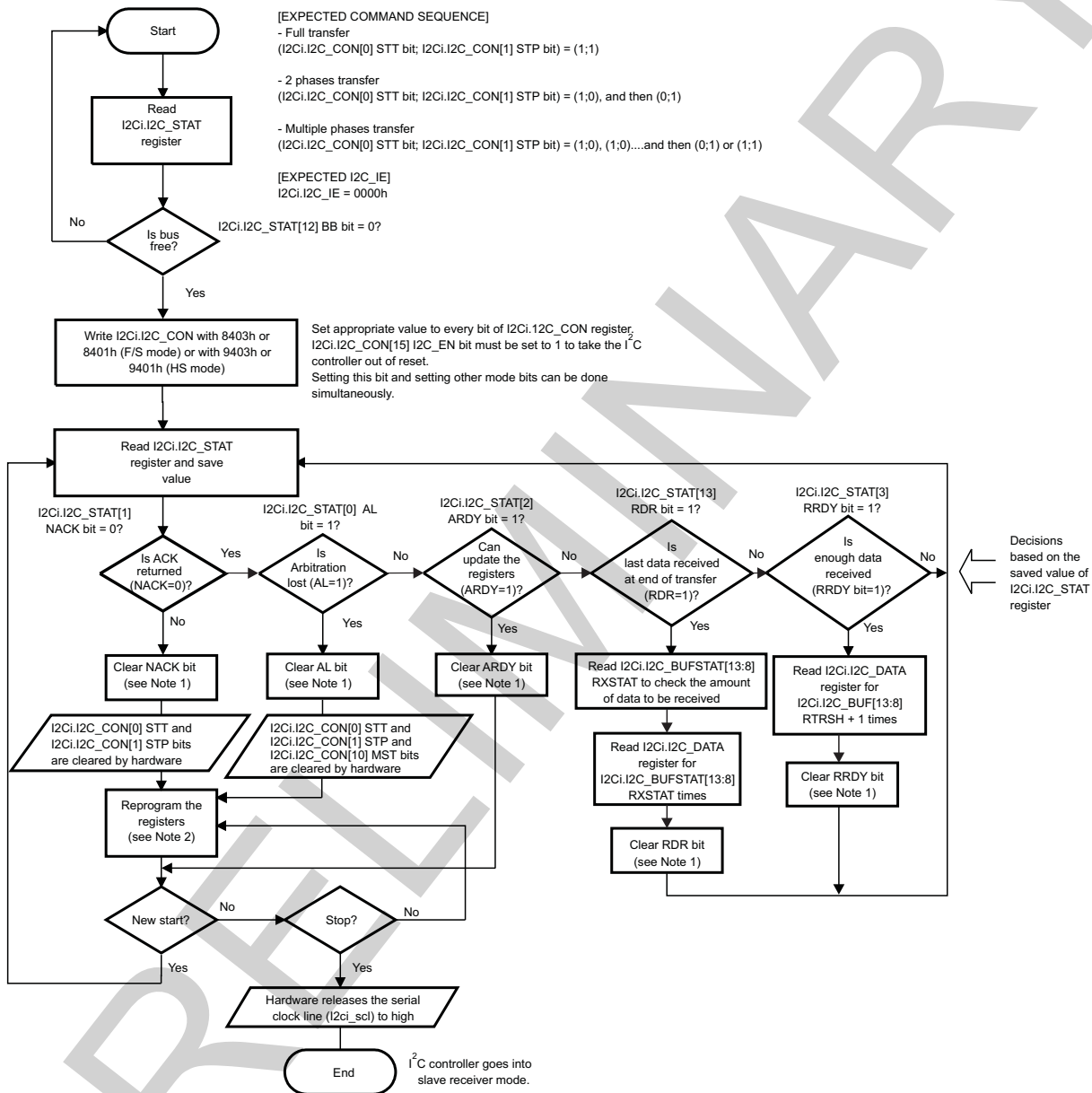
Table 24-17. HS I²C Register call summary for Sequence - Master Transmitter Mode, Polling Method, in F/S and HS Modes

| Register Name | Register Name | Register Name |
|---------------------------------|------------------------------|-----------------------------|
| I2Ci.I2C_STAT ⁽¹⁾ | I2Ci.I2C_DATA ⁽¹⁾ | I2Ci.I2C_CON ⁽¹⁾ |
| I2Ci.I2C_BUFSTAT ⁽¹⁾ | I2Ci.I2C_CON ⁽¹⁾ | I2Ci.I2C_BUF ⁽¹⁾ |

⁽¹⁾ i = 1 to 4

NOTE: In HS mode, the Sr condition and clock frequency switching are automatically generated by the multimaster HS I²C controller.

Figure 24-30. HS I²C Master Receiver Mode, Polling Method, in F/S and HS Modes



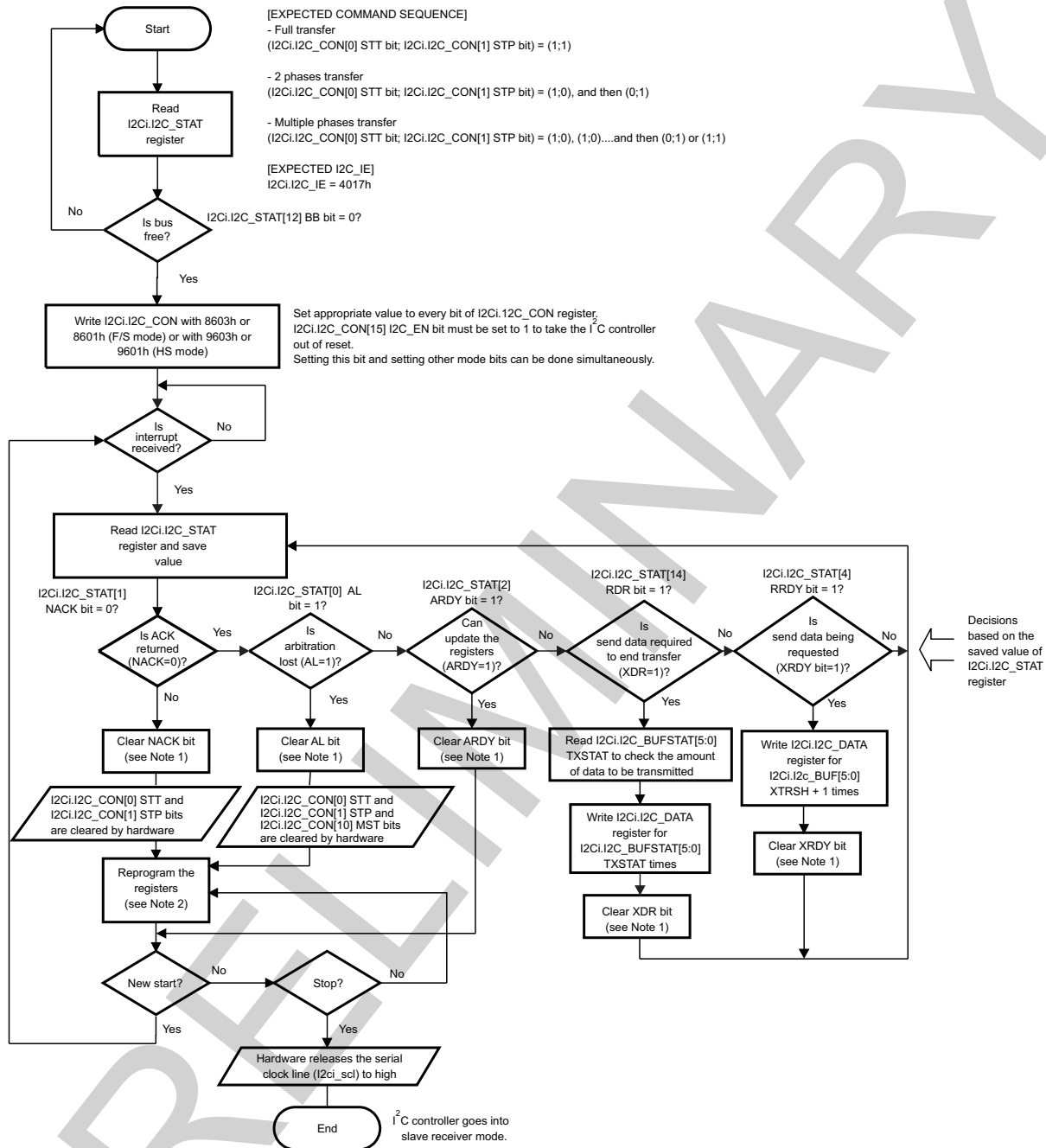
- (1) The NACK, AL, ARDY, RDR, and RRDY bits are cleared by writing 1 to each corresponding bit in the I2Ci.I2C_STAT register.
- (2) Reprogram registers means: I2Ci.I2C_CON[11] STB and/or I2Ci.I2C_CON[10] MST bit and/or I2Ci.I2C_SA[9:0] SA register and/or I2Ci.I2C_CNT[15:0] DCOUNT register and/or I2Ci.I2C_CON[0] STT bit and/or I2Ci.I2C_CON[1] STP bit.

I2C-029

Table 24-18. HS I²C Register call summary for Sequence - Master Receiver Mode, Polling Method, in F/S and HS Modes

| Register Name | Register Name | Register Name |
|------------------------------|---------------------------------|-----------------------------|
| I2Ci.I2C_STAT ⁽¹⁾ | I2Ci.I2C_BUFSTAT ⁽¹⁾ | I2Ci.I2C_BUF ⁽¹⁾ |
| I2Ci.I2C_CON ⁽¹⁾ | I2Ci.I2C_DATA ⁽¹⁾ | |

⁽¹⁾ i = 1 to 4

Figure 24-31. HS I²C Master Transmitter Mode, Interrupt Method, in F/S and HS Modes

- (1) The NACK, AL, ARDY, XDR, and XRDY bits are cleared by writing 1 to each corresponding bit in the I2Ci.I2C_STAT register.
- (2) Reprogram registers means: I2Ci.I2C_CON[11] STB and/or I2Ci.I2C_CON[10] MST bit and/or I2Ci.I2C_SA[9:0] SA register and/or I2Ci.I2C_CNT[15:0] DCOUNT register and/or I2Ci.I2C_CON[0] STT bit and/or I2Ci.I2C_CON[1] STP bit.

NOTE: The FIFO clearing can be made when the module is configured as transmitter and the receiver sends a NACK in the middle of the transfer and data still exists in the FIFO.

I2C-030

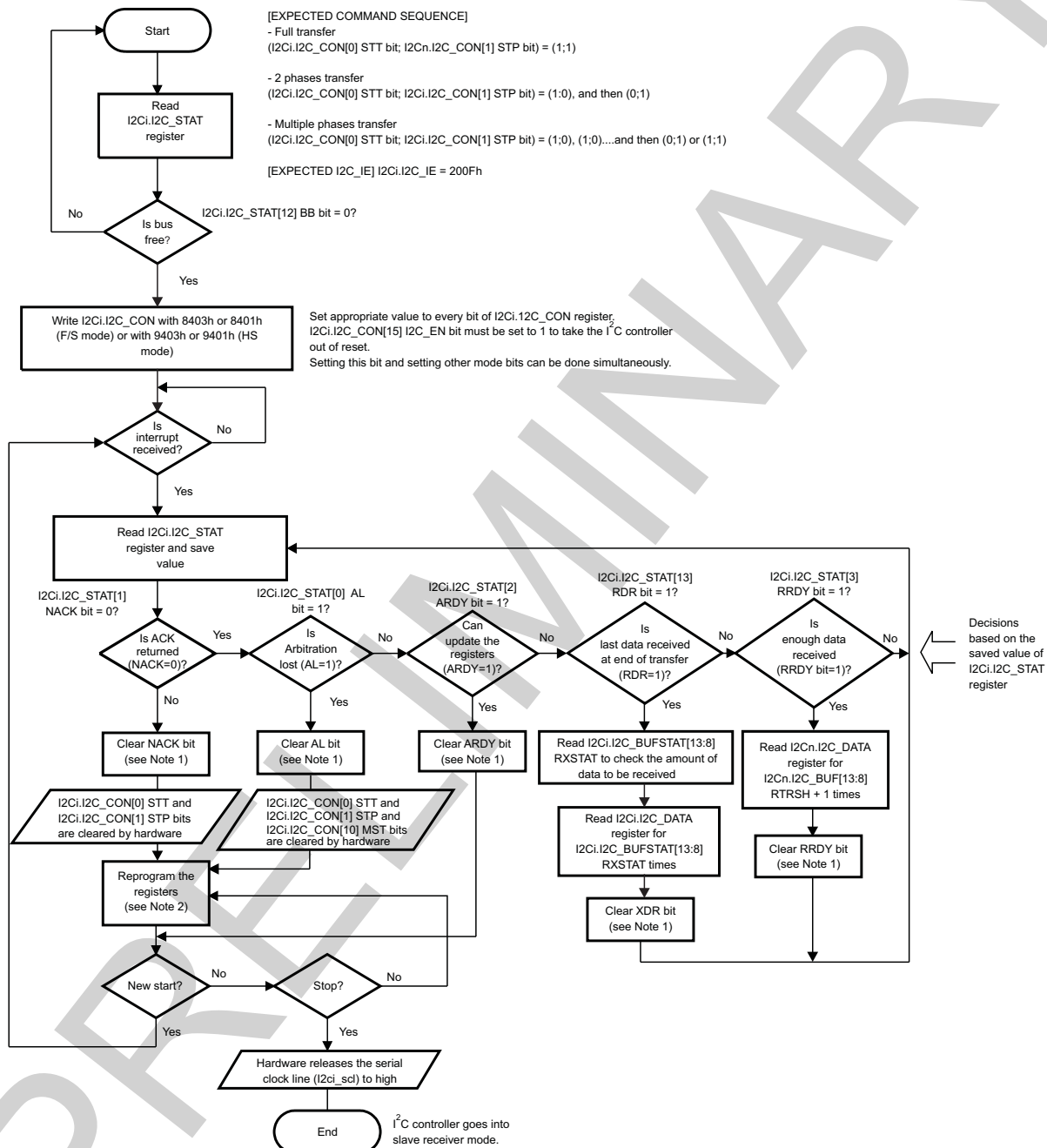
Table 24-19. HS I²C Register call summary for Sequence - Master Transmitter Mode, Interrupt Method, in F/S and HS Modes

| Register Name | Register Name | Register Name |
|------------------------------|---------------------------------|-----------------------------|
| I2Ci.I2C_STAT ⁽¹⁾ | I2Ci.I2C_BUFSTAT ⁽¹⁾ | I2Ci.I2C_BUF ⁽¹⁾ |
| I2Ci.I2C_CON ⁽¹⁾ | I2Ci.I2C_DATA ⁽¹⁾ | |

⁽¹⁾ i = 1 to 4

NOTE: In HS mode, the Sr condition and clock frequency switching are automatically generated by the multimaster HS I²C controller.

Figure 24-32. HS I²C Master Receiver Mode, Interrupt Method, in F/S and HS Modes



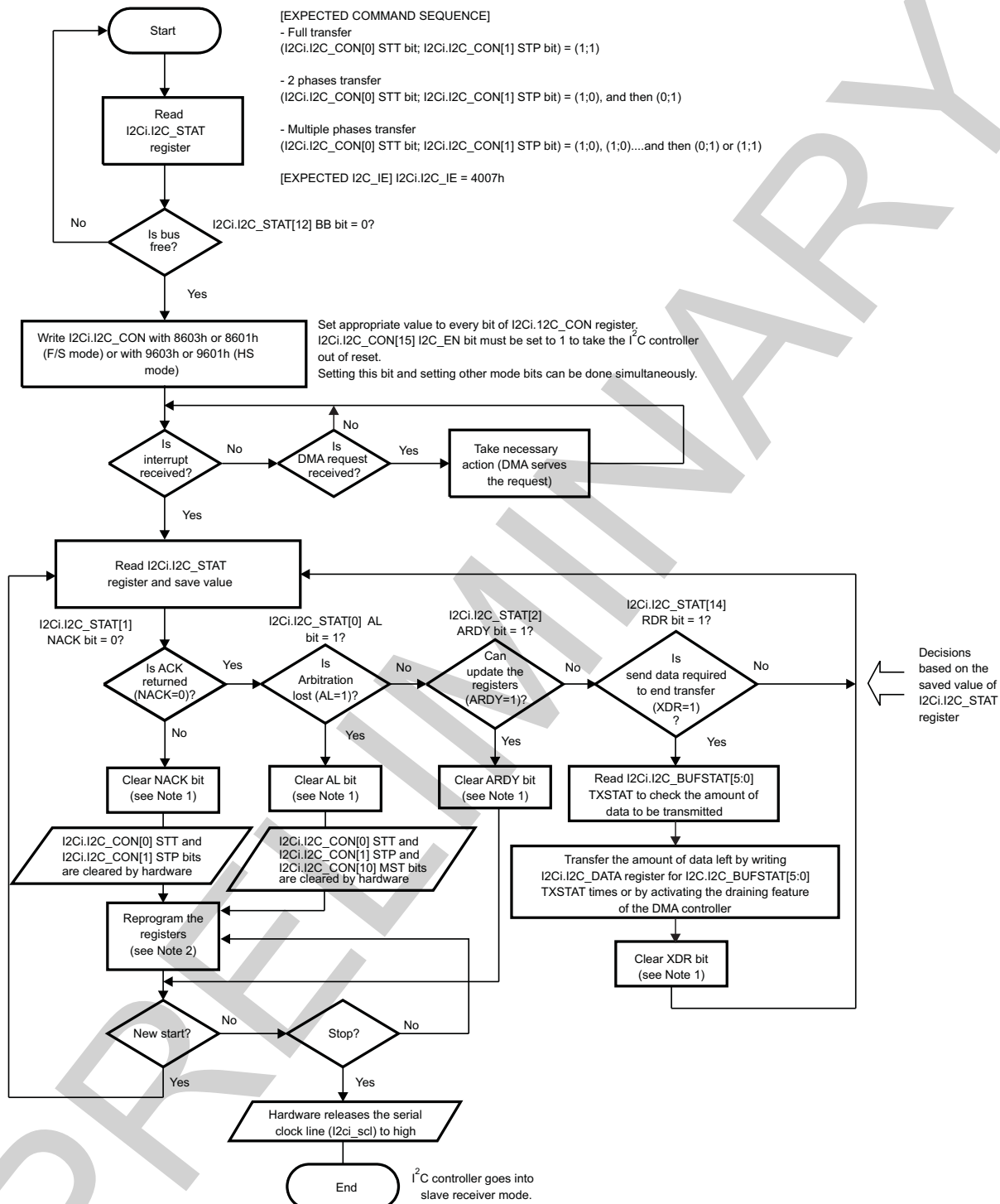
I2C-031

- (1) The NACK, AL, ARDY, RDR, and RRDY bits are cleared by writing 1 to each corresponding bit in the I2Ci.I2C_STAT register.
- (2) Reprogram registers means: I2Ci.I2C_CON[11] STB and/or I2Ci.I2C_CON[10] MST bit and/or I2Ci.I2C_SA[9:0] SA register and/or I2Ci.I2C_CNT[15:0] DCOUNT register and/or I2Ci.I2C_CON[0] STT bit and/or I2Ci.I2C_CON[1] STP bit.

Table 24-20. HS I²C Register call summary for Sequence - Master Receiver Mode, Interrupt Method, in F/S and HS Modes

| Register Name | Register Name | Register Name |
|------------------------------|---------------------------------|-----------------------------|
| I2Ci.I2C_STAT ⁽¹⁾ | I2Ci.I2C_BUFSTAT ⁽¹⁾ | I2Ci.I2C_BUF ⁽¹⁾ |
| I2Ci.I2C_CON ⁽¹⁾ | I2Ci.I2C_DATA ⁽¹⁾ | |

⁽¹⁾ i = 1 to 4

Figure 24-33. HS I²C Master Transmitter Mode, DMA Method in F/S and HS Modes

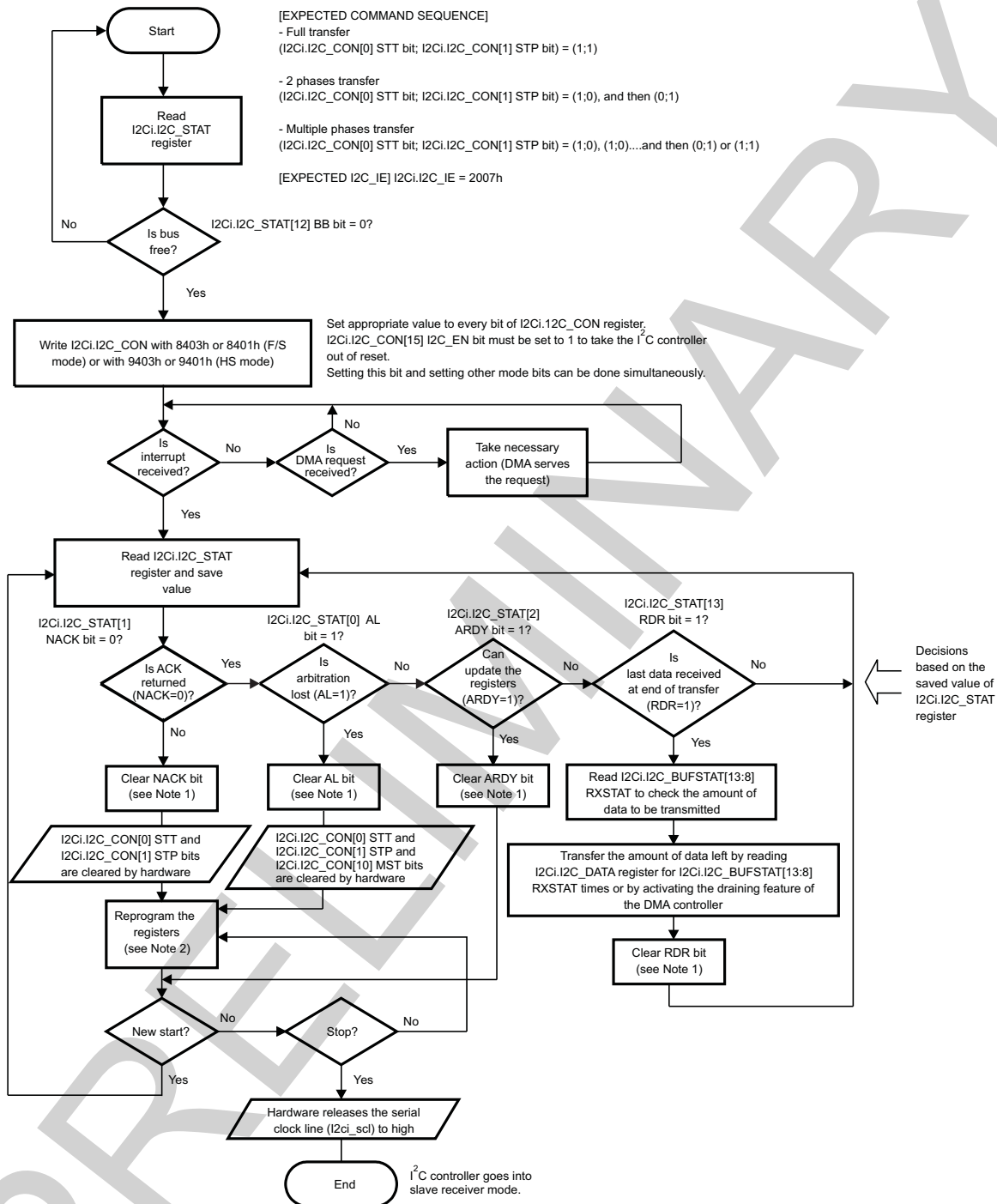
I2C-032

NOTE: The FIFO clearing can be made when the module is configured as transmitter and the receiver sends a NACK in the middle of the transfer and data still exists in the FIFO.

Table 24-21. HS I²C Register call summary for Sequence - Master Transmitter Mode, DMA Method in F/S and HS Modes

| Register Name | Register Name |
|------------------------------|---------------------------------|
| I2Ci.I2C_STAT ⁽¹⁾ | I2Ci.I2C_BUFSTAT ⁽¹⁾ |
| I2Ci.I2C_CON ⁽¹⁾ | I2Ci.I2C_DATA ⁽¹⁾ |

⁽¹⁾ i = 1 to 4

Figure 24-34. HS I²C Master Receiver Mode, DMA Method in F/S and HS Modes

I2C-033

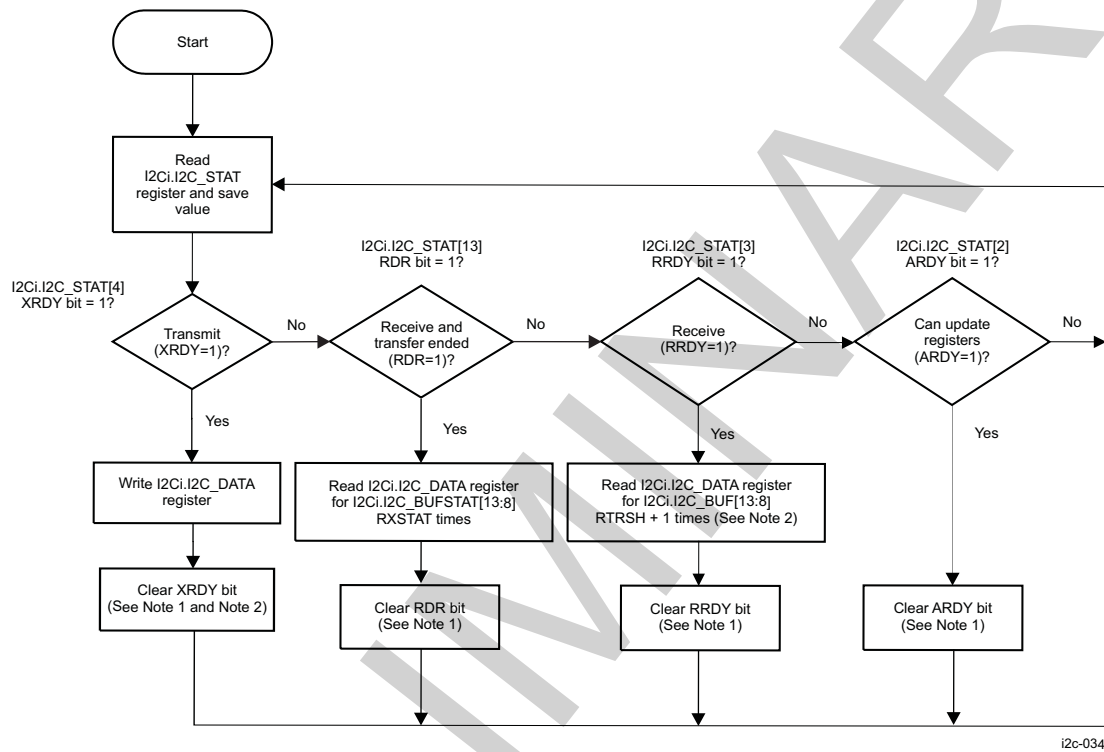
- (1) In HS mode, the Sr condition and clock frequency switching are automatically generated by the multimaster HS I²C controller.
- (2) The NACK, AL, ARDY, and RDR bits are cleared by writing 1 to each corresponding bit in the I2Ci.I2C_STAT register.
- (3) Reprogram registers means: I2Ci.I2C_CON[11] STB and/or I2Ci.I2C_CON[10] MST bit and/or I2Ci.I2C_SA[9:0] SA register and/or I2Ci.I2C_CNT[15:0] DCOUNT register and/or I2Ci.I2C_CON[0] STT bit and/or I2Ci.I2C_CON[1] STP bit.

Table 24-22. HS I²C Register call summary for Sequence - Master Receiver Mode, DMA Method in F/S and HS Modes

| Register Name | Register Name |
|------------------------------|---------------------------------|
| I2Ci.I2C_STAT ⁽¹⁾ | I2Ci.I2C_BUFSTAT ⁽¹⁾ |
| I2Ci.I2C_CON ⁽¹⁾ | I2Ci.I2C_DATA ⁽¹⁾ |

⁽¹⁾ i = 1 to 4

Figure 24-35. HS I²C Slave Transmitter/Receiver Mode, Polling

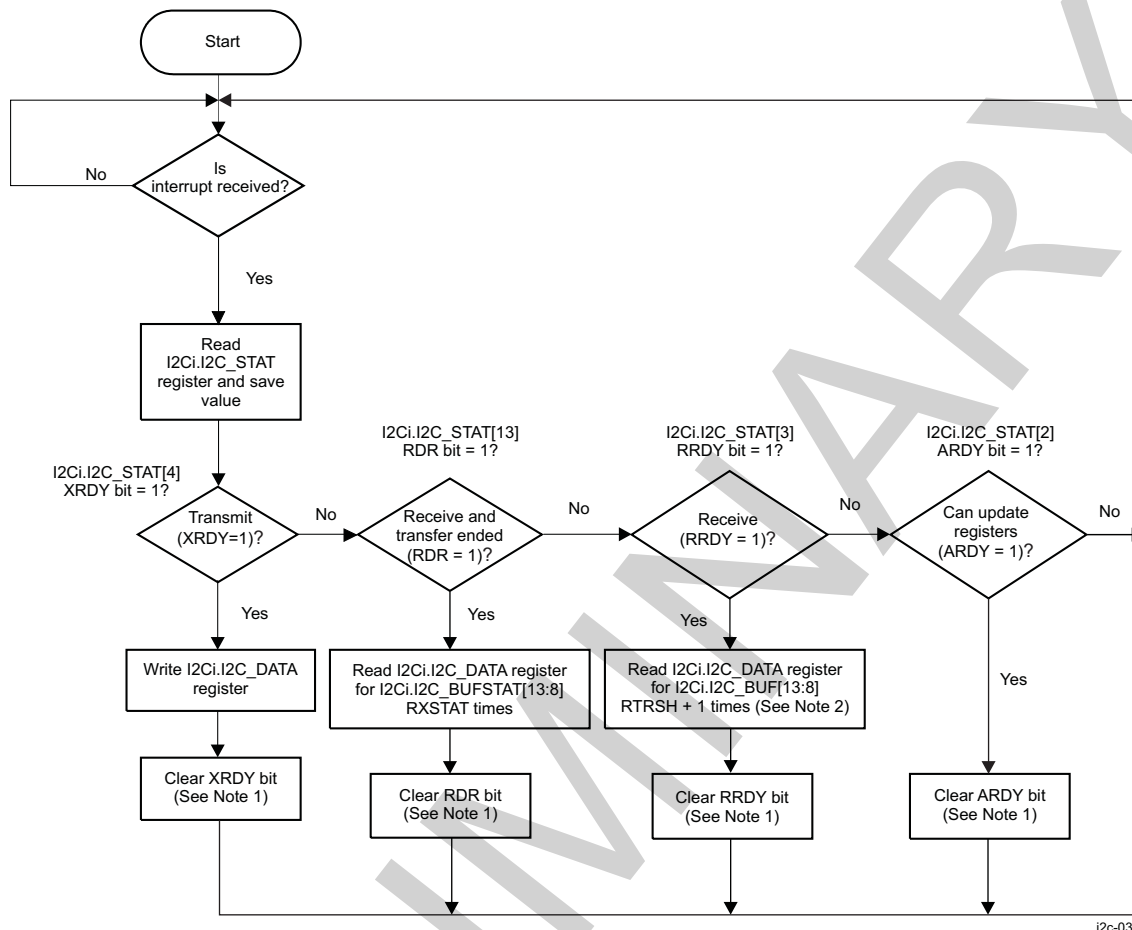


- (1) The XRDY, RDR, RRDY, and ARDY bits are cleared by writing 1 to each corresponding bit in the I2Ci.I2C_STAT register.
- (2) In slave transmitter mode, the amount of data requested by the external master I²C device is unknown; thus, the I2Ci.I2C_BUF[5:0] TXTRSH bit field must be configured to 0x0 (TX threshold = 1).

Table 24-23. HS I²C Register call summary for Sequence - Slave Transmitter/Receiver Mode, Polling

| Register Name | Register Name |
|------------------------------|---------------------------------|
| I2Ci.I2C_STAT ⁽¹⁾ | I2Ci.I2C_BUFSTAT ⁽¹⁾ |
| I2Ci.I2C_DATA ⁽¹⁾ | I2Ci.I2C_BUF ⁽¹⁾ |

⁽¹⁾ i = 1 to 4

Figure 24-36. HS I²C Slave Transmitter/Receiver Mode, Interrupt

i2c-035

- (1) The XRDY, RDR, RRDY, and ARDY bits are cleared by writing 1 to each corresponding bit in the I2Ci.I2C_STAT register.
- (2) In slave transmitter mode, the amount of data requested by the external master I²C device is unknown; thus, the I2Ci.I2C_BUF[5:0] TXTRSH bit field must be configured to 0x0 (TX threshold = 1).

Table 24-24. HS I²C Register call summary for Sequence - Slave Transmitter/Receiver Mode, Interrupt

| Register Name | Register Name |
|------------------------------|---------------------------------|
| I2Ci.I2C_STAT ⁽¹⁾ | I2Ci.I2C_BUFSTAT ⁽¹⁾ |
| I2Ci.I2C_DATA ⁽¹⁾ | I2Ci.I2C_BUF ⁽¹⁾ |

⁽¹⁾ i = 1 to 4

24.1.5.1.2 HS I²C (I2C5) Programming Model for Communication With Power Chips

This section describes the programming model of the master transmitter HS I²C controller (I2C5) for communication with one or more power chips. The HS I²C controller (I2C5) allows the two voltage Finite State Machines (FSMs) in the PRCM module of the device to be interfaced to external power chips through the I²C bus for dynamic voltage control of two power supplies and power sequencing. The primary programming tasks are to set up the configuration registers according to the external power supply chip(s) being used.

24.1.5.1.2.1 Configure the Voltage Controller Registers

To use the voltage control function, the LH must configure the following registers in the voltage controller of the APE and 3G modem SS PRCM modules:

- The voltage configuration register address for each VDD channel in the PRCM.PRM_VC_VAL_SMPS_RA_VOL register
- The ON/ON-low-power-Retention/OFF command configuration register address for each VDD channel in the PRCM.PRM_VC_VAL_SMPS_RA_CMD register
- The set of ON/ON-low-power/Retention/OFF voltage/mode values in the APE PRCM.PRM_VC_VAL_CMD_VDD_CORE_L, APE PRCM.PRM_VC_VAL_CMD_VDD_IVA_L, and APE PRCM.PRM_VC_VAL_CMD_VDD_MPU_L registers, and 3G modem SS PRCM.PRM_VC_VAL_CMD_VDD_WGM_L register.
- The VDD channels configuration selection in the PRCM.PRM_VC_CFG_CHANNEL register

For more information about the voltage controller register configuration, see [Chapter 3, Power, Reset, and Clock Management](#).

24.1.5.1.2.2 Configure the HS I²C Controller I2C5

At POR, the I2C5 is in HS mode (PRCM.PRM_VC_CFG_I2C_MODE[3] HSMODEEN bit). In HS mode, the LH must configure the master code value for the preamble I²C high-speed transmission by configuring the PRCM.PRM_VC_CFG_I2C_MODE[2:0] HSMCODE bit field. If the external power chips do not support the I²C HS mode, HS mode can be disabled and F/S mode enabled by clearing the PRCM.PRM_VC_CFG_I2C_MODE[3] HSMODEEN bit to 0.

By default, the Sr operation is enabled (PRCM.PRM_VC_CFG_I2C_MODE[4] SRMODEEN bit set to 1 at POR). In F/S mode, the Sr operation can be disabled by clearing the PRCM.PRM_VC_CFG_I2C_MODE[4] SRMODEEN bit to 0.

24.1.5.1.3 HS I²C Basic Programming Model in SCCB Mode

This section describes the programming model of the multimaster HS I²C controllers configured in SCCB mode.

24.1.5.1.3.1 Main Program

24.1.5.1.3.1.1 Configure the Module Before Enabling the I²C Controller

Before enabling the I²C controller, perform the following steps:

1. Enable the functional and interface clocks (see [Table 24-7](#)).
2. Program the prescaler to obtain an approximately 12-MHz internal sampling clock (I2Ci_INTERNAL_CLK) by programming the corresponding value in the I2Ci.I2C_PSC[7:0] PSC field. This value depends on the frequency of the functional clock (I2Ci_FCLK). Because this frequency is 96MHz, the I2Ci.I2C_PSC[7:0] PSC field value is 0x7.
3. Program the I2Ci.I2C_SCLL[7:0] SCLL and I2Ci.I2C_SCLH[7:0] SCLH fields to obtain a bit rate of 100K bps (maximum authorized bit rate in SCCB mode). This value depends on the internal sampling clock frequency (see [Table 24-8](#)).
4. Configure the 7-bit slave address (ID value) by storing it in the I2Ci.I2C_SA register.
5. Configure the 8-bit register address (subaddress) by storing it in the I2Ci.I2C_OA0 register.
6. Configure the I2Ci.I2C_BUF[13:8]RTRSH field to 0x0 (RX threshold to 1) and the I2Ci.I2C_BUF[5:0]XTRSH field to 0x0 (TX threshold to 1).
7. Take the I²C controller out of reset by setting the I2Ci.I2C_CON[15] I2C_EN bit to 1.

24.1.5.1.3.1.2 Initialize the I²C Controller

To initialize the I²C controller, perform the following steps:

1. Configure the I2Ci.I2C_CON register:

- In SCCB mode, only the master mode is supported; set the I2Ci.I2C_CON[10] MST bit to 1.
 - For transmitter mode (write to the external SCCB device register) or receiver mode (read from the external SCCB device register), set the I2Ci.I2C_CON[9] TRX bit (0: receiver, 1: transmitter).
2. If using an interrupt to transmit/receive data, set to 1 the corresponding bit in the I2Ci.I2C_IE register (the I2Ci.I2C_IE[4] XRDY_IE bit for the transmit interrupt, the I2Ci.I2C_IE[3] RRDY bit for the receive interrupt).

24.1.5.1.3.1.3 Initiate a Transfer

Poll the I2Ci.I2C_STAT[12] BB bit. If it is cleared to 0 (bus not busy), set the I2Ci.I2C_CON[0] STT bit to 1. Because a transfer allows the LH to write or read only a single byte to or from the external SCCB device, the transmission automatically stops at the end of the transfer. When the transfer is complete, the I2Ci.I2C_STAT[2] ARDY bit is set to 1. In SCCB mode, the I2Ci.I2C_CON[1] STP bit is not used.

24.1.5.1.3.1.4 Receive Data

Poll the I2Ci.I2C_STAT[3] RRDY bit, or use the RRDY interrupt (the I2Ci.I2C_IE[3] RRDY_IE bit must be set to 1) to read the receive data in the I2Ci.I2C_DATA register.

NOTE: In SCCB mode, the I2Ci.I2C_BUF[13:8] RTRSH field (RX threshold) must be set to a value of 0x0 (RX threshold = 1).

24.1.5.1.3.1.5 Transmit Data

Poll the I2Ci.I2C_STAT[4] XRDY bit, or use the XRDY interrupt (the I2Ci.I2C_IE[4] XRDY_IE bit must be set to 1) to write the data to the I2Ci.I2C_DATA register.

NOTE: In SCCB mode, the I2Ci.I2C_BUF[5:0] TXTRSH field (TX threshold) must be set to a value of 0x0 (TX threshold = 1).

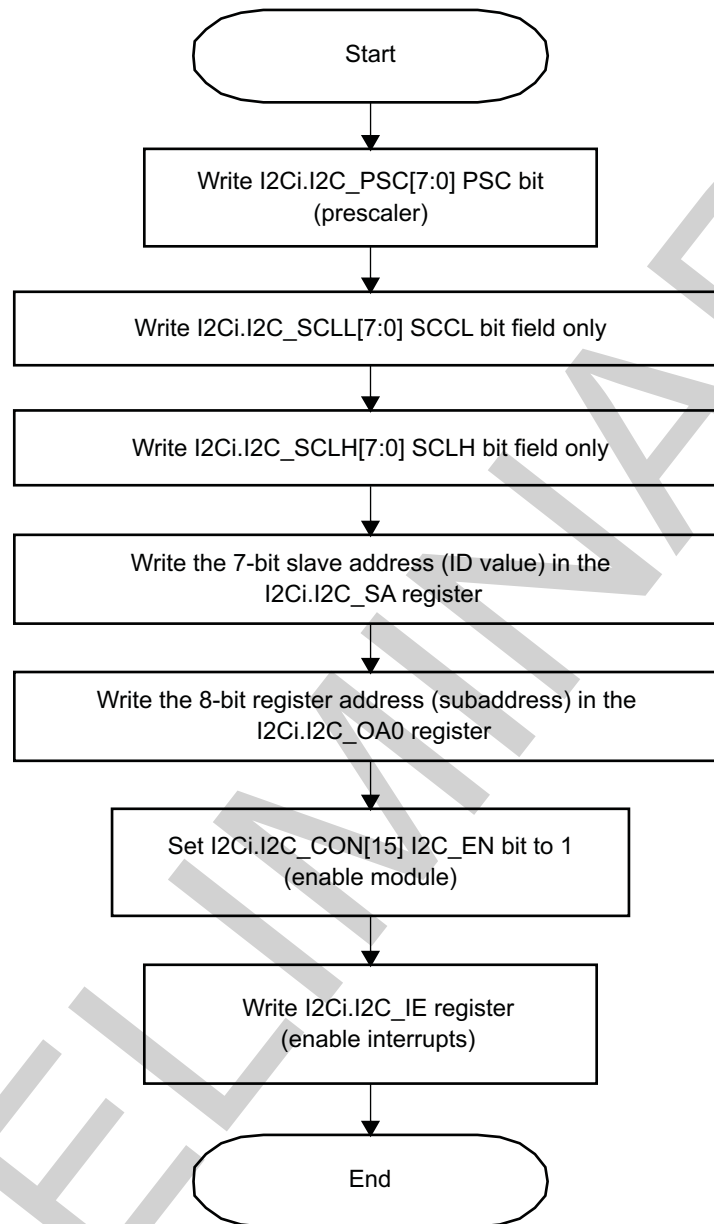
24.1.5.1.3.2 Interrupt Subroutine Sequence

1. Test for register access ready (I2Ci.I2C_STAT[2] ARDY status bit) and resolve accordingly.
2. Test for receive data ready (I2Ci.I2C_STAT[3] RRDY status bit) and resolve accordingly.
3. Test for transmit data ready (I2Ci.I2C_STAT[4] XRDY status bit) and resolve accordingly.

24.1.5.1.3.3 Programming Flow Diagrams

Figure 24-37 through Figure 24-41 are procedure flowcharts for programming the SCCB mode.

Figure 24-37. HS I²C SCCB Setup Procedure

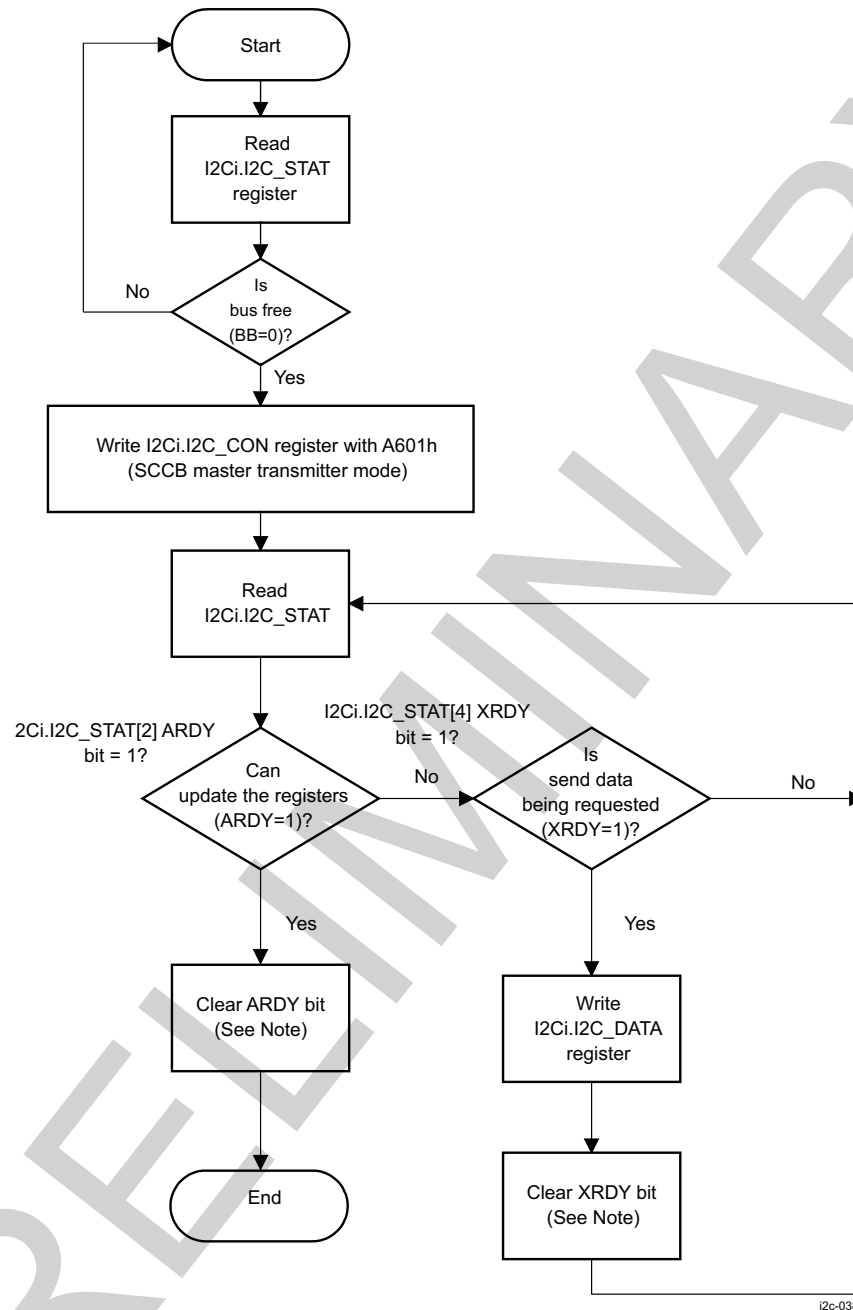


I2c-037

Table 24-25. HS I²C Register call summary for Sequence - SCCB Setup Procedure

| Register Name | Register Name | Register Name |
|-----------------------------|------------------------------|------------------------------|
| I2Ci.I2C_PSC ⁽¹⁾ | I2Ci.I2C_SCLL ⁽¹⁾ | I2Ci.I2C_SCLH ⁽¹⁾ |
| I2Ci.I2C_SA ⁽¹⁾ | I2Ci.I2C_OA0 ⁽¹⁾ | I2Ci.I2C_CON ⁽¹⁾ |
| I2Ci.I2C_IE ⁽¹⁾ | | |

⁽¹⁾ i = 1 to 4

Figure 24-38. HS I²C SCCB Master Transmitter Mode, Polling**Table 24-26. HS I²C Register call summary for Sequence - SCCB Master Transmitter Mode, Polling**

| Register Name | Register Name |
|------------------------------|------------------------------|
| I2Ci.I2C_STAT ⁽¹⁾ | I2Ci.I2C_SCLL ⁽¹⁾ |
| I2Ci.I2C_CON ⁽¹⁾ | I2Ci.I2C_DATA ⁽¹⁾ |

⁽¹⁾ i = 1 to 4

NOTE: The XRDY and ARDY bits are cleared by writing 1 to the corresponding bit in the I2Ci.I2C_STAT register.

Figure 24-39. HS I²C SCCB Master Receiver Mode, Polling

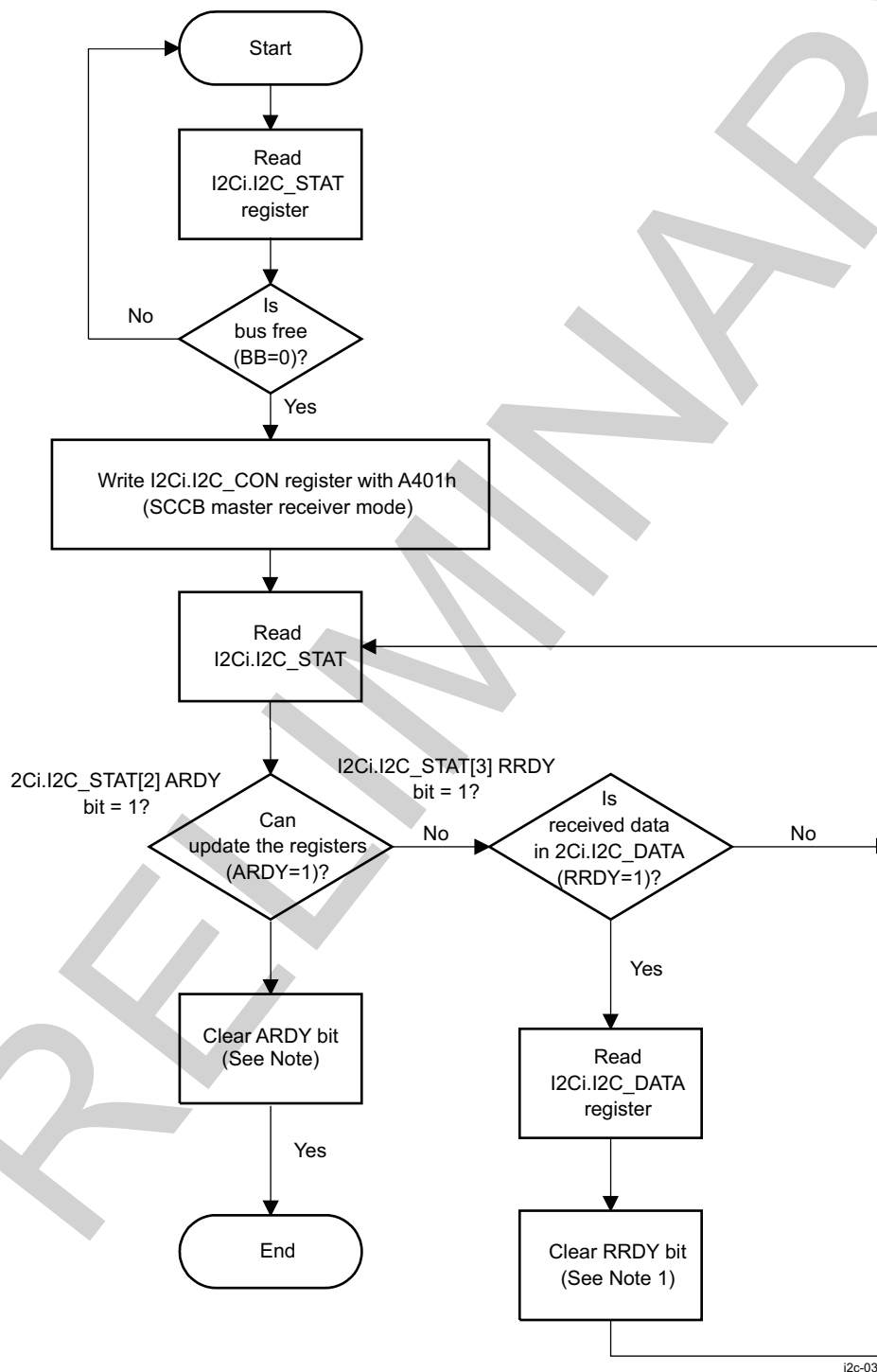


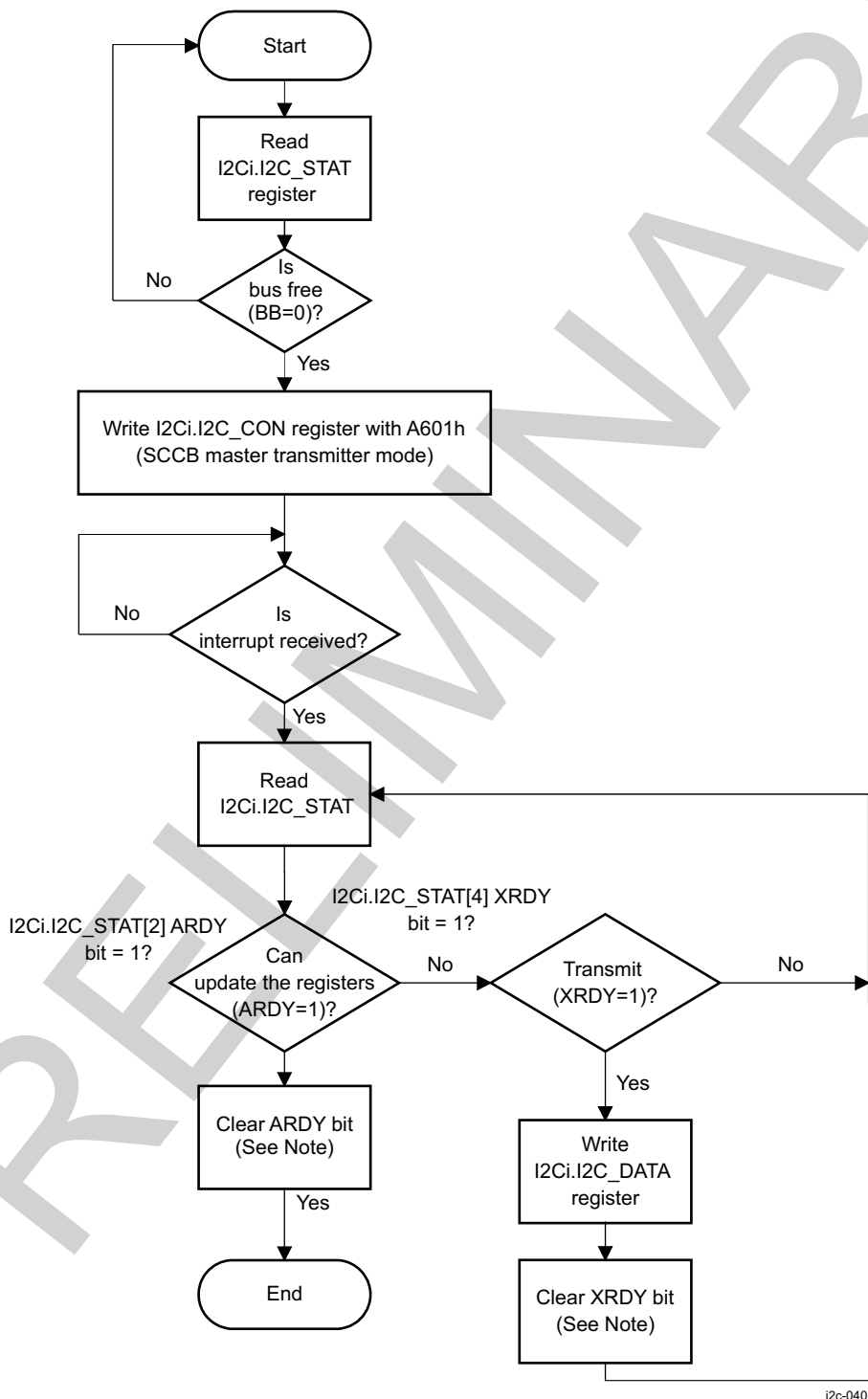
Table 24-27. HS I²C Register call summary for Sequence - SCCB Master Receiver Mode, Polling

| Register Name | Register Name |
|------------------------------|------------------------------|
| I2Ci.I2C_STAT ⁽¹⁾ | I2Ci.I2C_SCLL ⁽¹⁾ |
| I2Ci.I2C_CON ⁽¹⁾ | I2Ci.I2C_DATA ⁽¹⁾ |

⁽¹⁾ i = 1 to 4

NOTE: The RRDY and ARDY bits are cleared by writing 1 in the corresponding bit in the I2Ci.I2C_STAT register.

Figure 24-40. HS I²C SCCB Master Transmitter Mode, Interrupt



i2c-040

Table 24-28. HS I²C Register call summary for Sequence - SCCB Master Transmitter Mode, Interrupt

| Register Name | Register Name | Register Name |
|------------------------------|------------------------------|-----------------------------|
| I2Ci.I2C_STAT ⁽¹⁾ | I2Ci.I2C_DATA ⁽¹⁾ | I2Ci.I2C_CON ⁽¹⁾ |

⁽¹⁾ i = 1 to 4

NOTE: The XRDY and ARDY bits are cleared by writing 1 in the corresponding bit in the I2Ci.I2C_STAT register.

Figure 24-41. HS I²C SCCB Master Receiver Mode, Interrupt

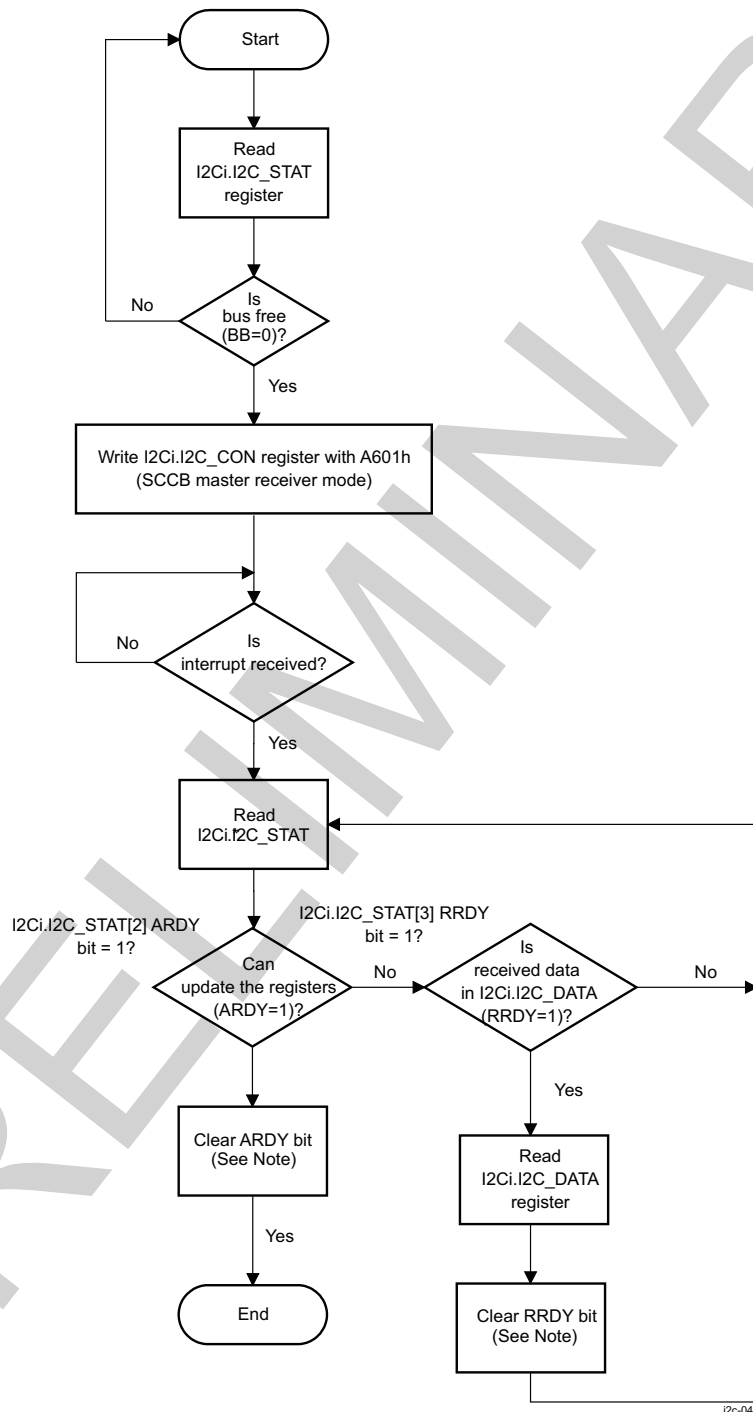


Table 24-29. HS I²C Register call summary for Sequence - SCCB Master Receiver Mode, Interrupt

| Register Name | Register Name | Register Name |
|------------------------------|------------------------------|-----------------------------|
| I2Ci.I2C_STAT ⁽¹⁾ | I2Ci.I2C_DATA ⁽¹⁾ | I2Ci.I2C_CON ⁽¹⁾ |

⁽¹⁾ i = 1 to 4

NOTE: The RRDY and ARDY bits are cleared by writing 1 in the corresponding bit in the I2Ci.I2C_STAT register.

24.1.6 HS I²C Register Manual

24.1.6.1 HS I²C Instance Summary

Table 24-30. HS I²C Instance Summary

| Module Name | Module Base Address | Size |
|-------------|---------------------|-----------|
| I2C3 | 0x4806 0000 | 256 bytes |
| I2C1 | 0x4807 0000 | 256 bytes |
| I2C2 | 0x4807 2000 | 256 bytes |
| I2C4 | 0x4835 0000 | 256 bytes |

24.1.6.2 HS I²C Registers

CAUTION

The HS I2Ci registers are limited to 16 bit and 8 bit data accesses; 32-bit data access is not allowed and can corrupt register content.

NOTE: For register details about the master transmitter HS I2C controller I2C5, see [Chapter 3, Power, Reset, and Clock Management](#).

24.1.6.2.1 HS I²C Register Summary

Table 24-31. HS I²C Registers Mapping Summary 1

| Register Name | Type | Register Width (Bits) | Address Offset | I2C3 Physical Address | I2C1 Physical Address |
|---------------------|------|-----------------------|----------------|-----------------------|-----------------------|
| I2C_REVNB_LO | R | 16 | 0x0000 0000 | 0x4806 0000 | 0x4807 0000 |
| I2C_REVNB_HI | R | 16 | 0x0000 0004 | 0x4806 0004 | 0x4807 0004 |
| I2C_SYSC | RW | 16 | 0x0000 0010 | 0x4806 0010 | 0x4807 0010 |
| RESERVED | W | 16 | 0x0000 0020 | 0x4806 0020 | 0x4807 0020 |
| I2C_IRQSTATUS_RAW | RW | 16 | 0x0000 0024 | 0x4806 0024 | 0x4807 0024 |
| I2C_IRQSTATUS | RW | 16 | 0x0000 0028 | 0x4806 0028 | 0x4807 0028 |
| I2C_IRQENABLE_SET | RW | 16 | 0x0000 002C | 0x4806 002C | 0x4807 002C |
| I2C_IRQENABLE_CLR | RW | 16 | 0x0000 0030 | 0x4806 0030 | 0x4807 0030 |
| I2C_WE | RW | 16 | 0x0000 0034 | 0x4806 0034 | 0x4807 0034 |
| I2C_DMARXENABLE_SET | RW | 16 | 0x0000 0038 | 0x4806 0038 | 0x4807 0038 |
| I2C_DMATXENABLE_SET | RW | 16 | 0x0000 003C | 0x4806 003C | 0x4807 003C |
| I2C_DMARXENABLE_CLR | RW | 16 | 0x0000 0040 | 0x4806 0040 | 0x4807 0040 |
| I2C_DMATXENABLE_CLR | RW | 16 | 0x0000 0044 | 0x4806 0044 | 0x4807 0044 |

Table 24-31. HS I²C Registers Mapping Summary 1 (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | I2C3 Physical Address | I2C1 Physical Address |
|----------------------------------|------|-----------------------|----------------|-----------------------|-----------------------|
| I2C_DMARXWAKE_EN | RW | 16 | 0x0000 0048 | 0x4806 0048 | 0x4807 0048 |
| I2C_DMATXWAKE_EN | RW | 16 | 0x0000 004C | 0x4806 004C | 0x4807 004C |
| I2C_IE | RW | 16 | 0x0000 0084 | 0x4806 0084 | 0x4807 0084 |
| I2C_STAT | RW | 16 | 0x0000 0088 | 0x4806 0088 | 0x4807 0088 |
| I2C_SYSS | RW | 16 | 0x0000 0090 | 0x4806 0090 | 0x4807 0090 |
| I2C_BUF | RW | 16 | 0x0000 0094 | 0x4806 0094 | 0x4807 0094 |
| I2C_CNT | RW | 16 | 0x0000 0098 | 0x4806 0098 | 0x4807 0098 |
| I2C_DATA | RW | 16 | 0x0000 009C | 0x4806 009C | 0x4807 009C |
| I2C_CON | RW | 16 | 0x0000 00A4 | 0x4806 00A4 | 0x4807 00A4 |
| I2C_OA | RW | 16 | 0x0000 00A8 | 0x4806 00A8 | 0x4807 00A8 |
| I2C_SA | RW | 16 | 0x0000 00AC | 0x4806 00AC | 0x4807 00AC |
| I2C_PSC | RW | 16 | 0x0000 00B0 | 0x4806 00B0 | 0x4807 00B0 |
| I2C_SCLL | RW | 16 | 0x0000 00B4 | 0x4806 00B4 | 0x4807 00B4 |
| I2C_SCLH | RW | 16 | 0x0000 00B8 | 0x4806 00B8 | 0x4807 00B8 |
| I2C_SYSTEST | RW | 16 | 0x0000 00BC | 0x4806 00BC | 0x4807 00BC |
| I2C_BUFSTAT | R | 16 | 0x0000 00C0 | 0x4806 00C0 | 0x4807 00C0 |
| I2C_OA1 | RW | 16 | 0x0000 00C4 | 0x4806 00C4 | 0x4807 00C4 |
| I2C_OA2 | RW | 16 | 0x0000 00C8 | 0x4806 00C8 | 0x4807 00C8 |
| I2C_OA3 | RW | 16 | 0x0000 00CC | 0x4806 00CC | 0x4807 00CC |
| I2C_ACTOA | R | 16 | 0x0000 00D0 | 0x4806 00D0 | 0x4807 00D0 |
| I2C_SBLOCK | RW | 16 | 0x0000 00D4 | 0x4806 00D4 | 0x4807 00D4 |

Table 24-32. HS I²C Registers Mapping Summary 2

| Register Name | Type | Register Width (Bits) | Address Offset | I2C2 Physical Address | I2C4 Physical Address |
|-------------------------------------|------|-----------------------|----------------|-----------------------|-----------------------|
| I2C_REVNB_LO | R | 16 | 0x0000 0000 | 0x4807 2000 | 0x4835 0000 |
| I2C_REVNB_HI | R | 16 | 0x0000 0004 | 0x4807 2004 | 0x4835 0004 |
| I2C_SYSC | RW | 16 | 0x0000 0010 | 0x4807 2010 | 0x4835 0010 |
| RESERVED | W | 16 | 0x0000 0020 | 0x4807 2020 | 0x4835 0020 |
| I2C_IRQSTATUS_RAW | RW | 16 | 0x0000 0024 | 0x4807 2024 | 0x4835 0024 |
| I2C_IRQSTATUS | RW | 16 | 0x0000 0028 | 0x4807 2028 | 0x4835 0028 |
| I2C_IRQENABLE_SET | RW | 16 | 0x0000 002C | 0x4807 202C | 0x4835 002C |
| I2C_IRQENABLE_CLR | RW | 16 | 0x0000 0030 | 0x4807 2030 | 0x4835 0030 |
| I2C_WE | RW | 16 | 0x0000 0034 | 0x4807 2034 | 0x4835 0034 |
| I2C_DMARXENABLE_SET | RW | 16 | 0x0000 0038 | 0x4807 2038 | 0x4835 0038 |
| I2C_DMATXENABLE_SET | RW | 16 | 0x0000 003C | 0x4807 203C | 0x4835 003C |
| I2C_DMARXENABLE_CLR | RW | 16 | 0x0000 0040 | 0x4807 2040 | 0x4835 0040 |
| I2C_DMATXENABLE_CLR | RW | 16 | 0x0000 0044 | 0x4807 2044 | 0x4835 0044 |
| I2C_DMARXWAKE_EN | RW | 16 | 0x0000 0048 | 0x4807 2048 | 0x4835 0048 |
| I2C_DMATXWAKE_EN | RW | 16 | 0x0000 004C | 0x4807 204C | 0x4835 004C |
| I2C_IE | RW | 16 | 0x0000 0084 | 0x4807 2084 | 0x4835 0084 |
| I2C_STAT | RW | 16 | 0x0000 0088 | 0x4807 2088 | 0x4835 0088 |
| I2C_SYSS | RW | 16 | 0x0000 0090 | 0x4807 2090 | 0x4835 0090 |
| I2C_BUF | RW | 16 | 0x0000 0094 | 0x4807 2094 | 0x4835 0094 |
| I2C_CNT | RW | 16 | 0x0000 0098 | 0x4807 2098 | 0x4835 0098 |

Table 24-32. HS I²C Registers Mapping Summary 2 (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | I2C2 Physical Address | I2C4 Physical Address |
|-----------------------------|------|-----------------------|----------------|-----------------------|-----------------------|
| I2C_DATA | RW | 16 | 0x0000 009C | 0x4807 209C | 0x4835 009C |
| I2C_CON | RW | 16 | 0x0000 00A4 | 0x4807 20A4 | 0x4835 00A4 |
| I2C_OA | RW | 16 | 0x0000 00A8 | 0x4807 20A8 | 0x4835 00A8 |
| I2C_SA | RW | 16 | 0x0000 00AC | 0x4807 20AC | 0x4835 00AC |
| I2C_PSC | RW | 16 | 0x0000 00B0 | 0x4807 20B0 | 0x4835 00B0 |
| I2C_SCLL | RW | 16 | 0x0000 00B4 | 0x4807 20B4 | 0x4835 00B4 |
| I2C_SCLH | RW | 16 | 0x0000 00B8 | 0x4807 20B8 | 0x4835 00B8 |
| I2C_SYSTEST | RW | 16 | 0x0000 00BC | 0x4807 20BC | 0x4835 00BC |
| I2C_BUFSTAT | R | 16 | 0x0000 00C0 | 0x4807 20C0 | 0x4835 00C0 |
| I2C_OA1 | RW | 16 | 0x0000 00C4 | 0x4807 20C4 | 0x4835 00C4 |
| I2C_OA2 | RW | 16 | 0x0000 00C8 | 0x4807 20C8 | 0x4835 00C8 |
| I2C_OA3 | RW | 16 | 0x0000 00CC | 0x4807 20CC | 0x4835 00CC |
| I2C_ACTOA | R | 16 | 0x0000 00D0 | 0x4807 20D0 | 0x4835 00D0 |
| I2C_SBLOCK | RW | 16 | 0x0000 00D4 | 0x4807 20D4 | 0x4835 00D4 |

24.1.6.2.2 HS I²C Register Description**Table 24-33. I2C_REVNB_LO**

| | |
|------------------|---|
| Address Offset | 0x0000 0000 |
| Physical Address | 0x4806 0000 0x4807 0000 0x4807 2000 0x4835 0000 |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP Revision | R | TI internal data |

Table 24-34. Register Call Summary for Register I2C_REVNB_LO

Multimaster High-Speed I2C Controller

- [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-35. I2C_REVNB_HI

| | |
|-------------------------|---|
| Address Offset | 0x0000 0004 |
| Physical Address | 0x4806 0004 0x4807 0004 0x4807 2004 0x4835 0004 |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP Revision | R | TI internal data |

Table 24-36. Register Call Summary for Register I2C_REVNB_HI

Multimaster High-Speed I2C Controller

- [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-37. I2C_SYSC

| | |
|-------------------------|--|
| Address Offset | 0x0000 0010 |
| Physical Address | 0x4806 0010 0x4807 0010 0x4807 2010 0x4835 0010 |
| Description | System Configuration register |
| Type | RW |

| | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|-------------|---|----------|---|---|----------|---|-----------|------|----------|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | CLKACTIVITY | | RESERVED | | | IDLEMODE | | ENAWAKEUP | SRST | AUTOIDLE |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|-------|
| 15:10 | RESERVED | Reserved. | R | 0x00 |
| 9:8 | CLKACTIVITY | Clock Activity selection bits 0x0: Both clocks can be cut off 0x1: Only OCP clock must be kept active; system clock can be cut off 0x3: Both clocks must be kept active 0x2: Only system clock must be kept active; OCP clock can be cut off | RW | 0x0 |
| 7:5 | RESERVED | Reads return 0. | R | 0x0 |
| 4:3 | IDLEMODE | Idle Mode selection bits 0x0: Force Idle mode 0x1: No Idle mode 0x3: smartidle_wakeup 0x2: Smart Idle mode | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 2 | ENAWAKEUP | Enable Wakeup control bit 0x0: Wakeup mechanism is disabled 0x1: Wakeup mechanism is enabled | RW | 0 |
| 1 | SRST | SoftReset bit 0x0: Normal mode 0x1: The module is reset | RW | 0 |
| 0 | AUTOIDLE | Autoidle bit 0x0: Auto Idle mechanism is disabled 0x1: Auto Idle mechanism is enabled | RW | 1 |

Table 24-38. Register Call Summary for Register I2C_SYSC

Multimaster High-Speed I2C Controller

- [HS I2C Software Reset: \[0\] \[1\]](#)
- [HS I2C Power Management: \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [HS I2C Register Summary: \[7\] \[8\]](#)

Table 24-39. I2C_IRQSTATUS_RAW

| | |
|-------------------------|--|
| Address Offset | 0x0000 0024 |
| Physical Address | 0x4806 0024 0x4807 0024 0x4807 2024 0x4835 0024 |
| Description | Per-event raw interrupt status vector |
| Type | RW |

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|-----|-----|----|------|------|-----|----|------|-----|----|------|------|------|------|----|
| RESERVED | XDR | RDR | BB | ROVR | XUDF | AAS | BF | AERR | STC | GC | XRDY | RRDY | ARDY | NACK | AL |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 15 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0 |
| 14 | XDR | Transmit draining IRQ status. 0x0: Transmit draining inactive. 0x1: Transmit draining enabled. | RW | 0 |
| 13 | RDR | Receive draining IRQ status. 0x0: Receive draining inactive. 0x1: Receive draining enabled. | RW | 0 |
| 12 | BB | Bus busy status. Writing into this bit has no effect. Read 0x1: Bus is occupied. Read 0x0: Bus is free. | R | 0 |
| 11 | ROVR | Receive overrun status. Writing into this bit has no effect. Read 0x1: Receiver overrun. Read 0x0: Normal operation. | RW | 0 |
| 10 | XUDF | Transmit underflow status. Writing into this bit has no effect. Read 0x1: Transmit underflow. Read 0x0: Normal operation. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 9 | AAS | Address recognized as slave IRQ status. 0x0: No action. 0x1: Address recognized. | RW | 0 |
| 8 | BF | Bus Free IRQ status. 0x0: No action. 0x1: Bus Free. | RW | 0 |
| 7 | AERR | Access Error IRQ status. 0x0: No action. 0x1: Access Error. | RW | 0 |
| 6 | STC | Start Condition IRQ status. 0x0: No action. 0x1: Start Condition detected. | RW | 0 |
| 5 | GC | General call IRQ status. Set to 1 by core when General call address detected and interrupt signaled to MPUSS. (1) 0x0: No general call detected. 0x1: General call address detected. | RW | 0 |
| 4 | XRDY | Transmit data ready IRQ status. Set to 1 by core when transmitter and when new data is requested. When set to 1 by core, an interrupt is signaled to MPUSS. (1) 0x0: Transmission ongoing. 0x1: Transmit data ready. | RW | 0 |
| 3 | RRDY | Receive data ready IRQ status. Set to 1 by core when receiver mode, a new data is able to be read. When set to 1 by core, an interrupt is signaled to MPUSS. (1) 0x0: No data available. 0x1: Receive data available. | RW | 0 |
| 2 | ARDY | Register access ready IRQ status. When set to 1 it indicates that previous access has been performed and registers are ready to be accessed again. An interrupt is signaled to MPUSS. (1) 0x0: Module busy. 0x1: Access ready. | RW | 0 |
| 1 | NACK | No acknowledgement IRQ status. Bit is set when No Acknowledge has been received, an interrupt is signaled to MPUSS. (1) 0x0: Normal operation. 0x1: Not Acknowledge detected. | RW | 0 |
| 0 | AL | Arbitration lost IRQ status. This bit is automatically set by the hardware when it loses the Arbitration in master transmit mode, an interrupt is signaled to MPUSS. During reads, it always returns 0. 0x0: Normal operation. 0x1: Arbitration lost detected. | RW | 0 |

1. Writing 1 in the bit field only sets the respective field to 1, used mainly for debug.

Table 24-40. Register Call Summary for Register I2C_IRQSTATUS_RAW

Multimaster High-Speed I2C Controller

- [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-41. I2C_IRQSTATUS

| | |
|-------------------------|--|
| Address Offset | 0x0000 0028 |
| Physical Address | 0x4806 0028 0x4807 0028 0x4807 2028 0x4835 0028 |
| Description | Per-event enabled interrupt status vector |
| Type | RW |

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|-----|-----|----|------|------|-----|----|------|-----|----|------|------|------|------|----|
| RESERVED | XDR | RDR | BB | ROVR | XUDF | AAS | BF | AERR | STC | GC | XRDY | RRDY | ARDY | NACK | AL |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------|
| 15 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0 |
| 14 | XDR | Transmit draining IRQ enabled status. 0x0: Transmit draining inactive. 0x1: Transmit draining enabled. | RW W1toClr | 0 |
| 13 | RDR | Receive draining IRQ enabled status. 0x0: Receive draining inactive. 0x1: Receive draining enabled. | RW W1toClr | 0 |
| 12 | BB | Bus busy enabled status. Writing into this bit has no effect. Read 0x1: Bus is occupied. Read 0x0: Bus is free. | R | 0 |
| 11 | ROVR | Receive overrun enabled status. Writing into this bit has no effect. Read 0x1: Receiver overrun. Read 0x0: Normal operation. | RW W1toClr | 0 |
| 10 | XUDF | Transmit underflow enabled status. Writing into this bit has no effect. Read 0x1: Transmit underflow. Read 0x0: Normal operation. | RW W1toClr | 0 |
| 9 | AAS | Address recognized as slave IRQ enabled status. 0x0: No action. 0x1: Address recognized. | RW W1toClr | 0 |
| 8 | BF | Bus Free IRQ enabled status. 0x0: No action. 0x1: Bus Free. | RW W1toClr | 0 |
| 7 | AERR | Access Error IRQ enabled status. 0x0: No action. 0x1: Access Error. | RW W1toClr | 0 |
| 6 | STC | Start Condition IRQ enabled status. 0x0: No action. 0x1: Start Condition detected. | RW W1toClr | 0 |
| 5 | GC | General call IRQ enabled status. Set to 1 by core when General call address detected and interrupt signaled to MPUSS. Write 1 to clear. 0x0: No general call detected. 0x1: General call address detected. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------|
| 4 | XRDY | Transmit data ready IRQ enabled status. Set to 1 by core when transmitter and when new data is requested. When set to 1 by core, an interrupt is signaled to MPUSS. Write 1 to clear. 0x0: Transmission ongoing. 0x1: Transmit data ready. | RW W1toClr | 0 |
| 3 | RRDY | Receive data ready IRQ enabled status. Set to 1 by core when receiver mode, a new data is able to be read. When set to 1 by core, an interrupt is signaled to MPUSS. Write 1 to clear. 0x0: No data available. 0x1: Receive data available. | RW W1toClr | 0 |
| 2 | ARDY | Register access ready IRQ enabled status. When set to 1 it indicates that previous access has been performed and registers are ready to be accessed again. An interrupt is signaled to MPUSS. Write 1 to clear. 0x0: Module busy. 0x1: Access ready. | RW W1toClr | 0 |
| 1 | NACK | No acknowledgement IRQ enabled status. Bit is set when No Acknowledge has been received, an interrupt is signaled to MPUSS. Write 1 to clear this bit. 0x0: Normal operation. 0x1: Not Acknowledge detected. | RW W1toClr | 0 |
| 0 | AL | Arbitration lost IRQ enabled status. This bit is automatically set by the hardware when it loses the Arbitration in master transmit mode, an interrupt is signaled to MPUSS. During reads, it always returns 0. 0x0: Normal operation. 0x1: Arbitration lost detected. | RW W1toClr | 0 |

Table 24-42. Register Call Summary for Register I2C_IRQSTATUS

Multimaster High-Speed I2C Controller

- [HS I2C Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [HS I2C Register Summary: \[15\] \[16\]](#)

Table 24-43. I2C_IRQENABLE_SET

| | |
|-------------------------|--|
| Address Offset | 0x0000 002C |
| Physical Address | 0x4806 002C 0x4807 002C 0x4807 202C 0x4835 002C |
| Description | Per-event interrupt enable bit vector. |
| Type | RW |

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|--------|--------|----------|------|------|--------|-------|---------|--------|-------|---------|---------|---------|---------|-------|
| RESERVED | XDR_IE | RDR_IE | RESERVED | ROVR | XUDF | ASS_IE | BF_IE | AERR_IE | STC_IE | GC_IE | XRDY_IE | RRDY_IE | ARDY_IE | NACK_IE | AL_IE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 15 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0 |
| 14 | XDR_IE | Transmit Draining interrupt enable set. Mask or unmask the interrupt signaled by bit in I2C_STAT[XDR] . 0x0: Transmit Draining interrupt disabled 0x1: Transmit Draining interrupt enabled | RW | 0 |
| 13 | RDR_IE | Receive Draining interrupt enable set. Mask or unmask the interrupt signaled by bit in I2C_STAT[RDR] . 0x0: Receive Draining interrupt disabled 0x1: Receive Draining interrupt enabled | RW | 0 |
| 12 | RESERVED | reserved | R | 0 |
| 11 | ROVR | Receive overrun enable set. 0x0: Receive overrun interrupt disabled 0x1: Receive Draining interrupt enabled | RW | 0 |
| 10 | XUDF | Transmit underflow enable set. 0x0: Transmit underflow interrupt disabled 0x1: Transmit underflow interrupt enabled | RW | 0 |
| 9 | ASS_IE | Addressed as Slave interrupt enable set. Mask or unmask the interrupt signaled by bit in I2C_STAT[AAS] . 0x0: Addressed as Slave interrupt disabled 0x1: Addressed as Slave interrupt enabled | RW | 0 |
| 8 | BF_IE | Bus Free interrupt enable set. Mask or unmask the interrupt signaled by bit in I2C_STAT[BF] . 0x0: Bus Free interrupt disabled 0x1: Bus Free interrupt enabled | RW | 0 |
| 7 | AERR_IE | Access Error interrupt enable set. Mask or unmask the interrupt signaled by bit in I2C_STAT[AERR] . 0x0: Access Error interrupt disabled 0x1: Access Error interrupt enabled | RW | 0 |
| 6 | STC_IE | Start Condition interrupt enable set. Mask or unmask the interrupt signaled by bit in I2C_STAT[STC] . 0x0: Start Condition interrupt disabled 0x1: Start Condition interrupt enabled | RW | 0 |
| 5 | GC_IE | General call Interrupt enable set. Mask or unmask the interrupt signaled by bit in I2C_STAT[GC] . 0x0: General call interrupt disabled 0x1: General call interrupt enabled | RW | 0 |
| 4 | XRDY_IE | Transmit data ready interrupt enable set. Mask or unmask the interrupt signaled by bit in I2C_STAT[XRDY] . 0x0: Transmit data ready interrupt disabled 0x1: Transmit data ready interrupt enabled | RW | 0 |
| 3 | RRDY_IE | Receive data ready interrupt enable set. Mask or unmask the interrupt signaled by bit in I2C_STAT[RRDY] . 0x0: Receive data ready interrupt disabled 0x1: Receive data ready interrupt enabled | RW | 0 |
| 2 | ARDY_IE | Register access ready interrupt enable set. Mask or unmask the interrupt signaled by bit in I2C_STAT[ARDY] . 0x0: Register access ready interrupt disabled 0x1: Register access ready interrupt enabled | RW | 0 |
| 1 | NACK_IE | No acknowledgement interrupt enable set. Mask or unmask the interrupt signaled by bit in I2C_STAT[NACK] . 0x0: Not Acknowledge interrupt disabled 0x1: Not Acknowledge interrupt enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | AL_IE | Arbitration lost interrupt enable set. Mask or unmask the interrupt signaled by bit in I2C_STAT[AL] 0x0: Arbitration lost interrupt disabled 0x1: Arbitration lost interrupt enabled | RW | 0 |

Table 24-44. Register Call Summary for Register I2C_IRQENABLE_SET

Multimaster High-Speed I2C Controller

- [HS I2C Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [HS I2C Register Summary: \[15\] \[16\]](#)

Table 24-45. I2C_IRQENABLE_CLR

| | |
|-------------------------|--|
| Address Offset | 0x0000 0030 |
| Physical Address | 0x4806 0030 0x4807 0030 0x4807 2030 0x4835 0030 |
| Description | Per-event interrupt clear bit vector. |
| Type | RW |

| | | | | | | | | | | | | | | | |
|----------|--------|--------|----------|------|------|--------|-------|---------|--------|-------|---------|---------|---------|---------|-------|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | XDR_IE | RDR_IE | RESERVED | ROVR | XUDF | ASS_IE | BF_IE | AERR_IE | STC_IE | GC_IE | XRDY_IE | RRDY_IE | ARDY_IE | NACK_IE | AL_IE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 15 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0 |
| 14 | XDR_IE | Transmit Draining interrupt enable clear. Mask or unmask the interrupt signaled by bit in I2C_STAT[XDR] . 0x0: Transmit Draining interrupt disabled 0x1: Transmit Draining interrupt enabled | RW | 0 |
| 13 | RDR_IE | Receive Draining interrupt enable clear. Mask or unmask the interrupt signaled by bit in I2C_STAT[RDR] . 0x0: Receive Draining interrupt disabled 0x1: Receive Draining interrupt enabled | RW | 0 |
| 12 | RESERVED | reserved | R | 0 |
| 11 | ROVR | Receive overrun enable clear. 0x0: Receive overrun interrupt disabled 0x1: Receive Draining interrupt enabled | RW | 0 |
| 10 | XUDF | Transmit underflow enable clear. 0x0: Transmit underflow interrupt disabled 0x1: Transmit underflow interrupt enabled | RW | 0 |
| 9 | ASS_IE | Addressed as Slave interrupt enable clear. Mask or unmask the interrupt signaled by bit in I2C_STAT[AAS] . 0x0: Addressed as Slave interrupt disabled 0x1: Addressed as Slave interrupt enabled | RW | 0 |
| 8 | BF_IE | Bus Free interrupt enable clear. Mask or unmask the interrupt signaled by bit in I2C_STAT[BF] . 0x0: Bus Free interrupt disabled 0x1: Bus Free interrupt enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7 | AERR_IE | Access Error interrupt enable clear. Mask or unmask the interrupt signaled by bit in I2C_STAT[AERR] . 0x0: Access Error interrupt disabled 0x1: Access Error interrupt enabled | RW | 0 |
| 6 | STC_IE | Start Condition interrupt enable clear. Mask or unmask the interrupt signaled by bit in I2C_STAT[STC] . 0x0: Start Condition interrupt disabled 0x1: Start Condition interrupt enabled | RW | 0 |
| 5 | GC_IE | General call Interrupt enable clear. Mask or unmask the interrupt signaled by bit in I2C_STAT[GC] . 0x0: General call interrupt disabled 0x1: General call interrupt enabled | RW | 0 |
| 4 | XRDY_IE | Transmit data ready interrupt enable clear. Mask or unmask the interrupt signaled by bit in I2C_STAT[XRDY] . 0x0: Transmit data ready interrupt disabled 0x1: Transmit data ready interrupt enabled | RW | 0 |
| 3 | RRDY_IE | Receive data ready interrupt enable clear. Mask or unmask the interrupt signaled by bit in I2C_STAT[RRDY] . 0x0: Receive data ready interrupt disabled 0x1: Receive data ready interrupt enabled | RW | 0 |
| 2 | ARDY_IE | Register access ready interrupt enable clear. Mask or unmask the interrupt signaled by bit in I2C_STAT[ARDY] . 0x0: Register access ready interrupt disabled 0x1: Register access ready interrupt enabled | RW | 0 |
| 1 | NACK_IE | No acknowledgement interrupt enable clear. Mask or unmask the interrupt signaled by bit in I2C_STAT[NACK] . 0x0: Not Acknowledge interrupt disabled 0x1: Not Acknowledge interrupt enabled | RW | 0 |
| 0 | AL_IE | Arbitration lost interrupt enable clear. Mask or unmask the interrupt signaled by bit in I2C_STAT[AL] . 0x0: Arbitration lost interrupt disabled 0x1: Arbitration lost interrupt enabled | RW | 0 |

Table 24-46. Register Call Summary for Register I2C_IRQENABLE_CLR

Multimaster High-Speed I2C Controller

- [HS I2C Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [HS I2C Register Summary: \[15\] \[16\]](#)

Table 24-47. I2C_WE

| | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0034 | | | | | | | | | | | | | | |
| Physical Address | 0x4806 0034 0x4807 0034 0x4807 2034 0x4835 0034 | | | | | | | | | | | | | | |
| Description | I2C wakeup enable vector. | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|----------|-----|-----|----------|------|------|-----|----|----------|-----|----|----------|------|------|------|----|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | XDR | RDR | RESERVED | ROVR | XUDF | AAS | BF | RESERVED | STC | GC | RESERVED | DRDY | ARDY | NACK | AL |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 15 | RESERVED | Reserved. | R | 0 |
| 14 | XDR | Transmit Draining wakeup set. 0x0: Transmit draining wakeup disabled 0x1: Transmit draining wakeup enabled | RW | 0 |
| 13 | RDR | Receive Draining wakeup set. 0x0: Receive draining wakeup disabled 0x1: Receive draining wakeup enabled | RW | 0 |
| 12 | RESERVED | Reserved. | R | 0 |
| 11 | ROVR | Receive overrun wakeup set. 0x0: Receive overrun wakeup disabled 0x1: Receive overrun wakeup enabled | RW | 0 |
| 10 | XUDF | Transmit underflow wakeup set. 0x0: Transmit underflow wakeup disabled 0x1: Transmit underflow wakeup enabled | RW | 0 |
| 9 | AAS | Address as slave IRQ wakeup set. 0x0: Addressed as slave wakeup disabled 0x1: Addressed as slave wakeup enabled | RW | 0 |
| 8 | BF | Bus Free IRQ wakeup set. 0x0: Bus Free wakeup disabled 0x1: Bus Free wakeup enabled | RW | 0 |
| 7 | RESERVED | Reserved. | R | 0 |
| 6 | STC | Start Condition IRQ wakeup set. 0x0: Start condition wakeup disabled 0x1: Start condition wakeup enabled | RW | 0 |
| 5 | GC | General call IRQ wakeup set. 0x0: General call wakeup disabled 0x1: General call wakeup enabled | RW | 0 |
| 4 | RESERVED | Reserved. | R | 0 |
| 3 | DRDY | Receive/Transmit data ready IRQ wakeup set. 0x0: Transmit/receive data ready wakeup disabled 0x1: Transmit/receive data ready wakeup enabled | RW | 0 |
| 2 | ARDY | Register access ready IRQ wakeup set. 0x0: Register access ready wakeup disabled 0x1: Register access ready wakeup enabled | RW | 0 |
| 1 | NACK | No acknowledgment IRQ wakeup set. 0x0: Not Acknowledge wakeup disabled 0x1: Not Acknowledge wakeup enabled | RW | 0 |
| 0 | AL | Arbitration lost IRQ wakeup set. 0x0: Arbitration lost wakeup disabled 0x1: Arbitration lost wakeup enabled | RW | 0 |

Table 24-48. Register Call Summary for Register I2C_WE

Multimaster High-Speed I2C Controller

- [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-49. I2C_DMARXENABLE_SET

| | |
|-------------------------|--|
| Address Offset | 0x0000 0038 |
| Physical Address | 0x4806 0038 0x4807 0038 0x4807 2038 0x4835 0038 |
| Description | Per-event DMA RX enable set. |
| Type | RW |

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|------------------|---|
| RESERVED | | | | | | | | | | | | | | DMARX_ENABLE_SET | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---------------------------------|------|--------|
| 15:1 | RESERVED | Reserved. | R | 0x0000 |
| 0 | DMARX_ENABLE_SET | Receive DMA channel enable set. | RW | 0 |

Table 24-50. Register Call Summary for Register I2C_DMARXENABLE_SET

Multimaster High-Speed I2C Controller

- [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-51. I2C_DMATXENABLE_SET

| | |
|-------------------------|--|
| Address Offset | 0x0000 003C |
| Physical Address | 0x4806 003C 0x4807 003C 0x4807 203C 0x4835 003C |
| Description | Per-event DMA TX enable set. |
| Type | RW |

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|------------------|---|
| RESERVED | | | | | | | | | | | | | | DMATX_ENABLE_SET | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|----------------------------------|------|--------|
| 15:1 | RESERVED | Reserved. | R | 0x0000 |
| 0 | DMATX_ENABLE_SET | Transmit DMA channel enable set. | RW | 0 |

Table 24-52. Register Call Summary for Register I2C_DMATXENABLE_SET

Multimaster High-Speed I2C Controller

- [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-53. I2C_DMARXENABLE_CLR

| | |
|-------------------------|--|
| Address Offset | 0x0000 0040 |
| Physical Address | 0x4806 0040 0x4807 0040 0x4807 2040 0x4835 0040 |
| Description | Per-event DMA RX enable clear. |
| Type | RW |

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|--------------------|---|
| RESERVED | | | | | | | | | | | | | | DMARX_ENABLE_CLEAR | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|-----------------------------------|------|--------|
| 15:1 | RESERVED | Reserved. | R | 0x0000 |
| 0 | DMARX_ENABLE_CLEAR | Receive DMA channel enable clear. | RW | 0 |

Table 24-54. Register Call Summary for Register I2C_DMARXENABLE_CLR

Multimaster High-Speed I2C Controller

- [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-55. I2C_DMATXENABLE_CLR

| | |
|-------------------------|--|
| Address Offset | 0x0000 0044 |
| Physical Address | 0x4806 0044 0x4807 0044 0x4807 2044 0x4835 0044 |
| Description | Per-event DMA TX enable clear. |
| Type | RW |

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|--------------------|---|
| RESERVED | | | | | | | | | | | | | | DMATX_ENABLE_CLEAR | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|------------------------------------|------|--------|
| 15:1 | RESERVED | Reserved. | R | 0x0000 |
| 0 | DMATX_ENABLE_CLEAR | Transmit DMA channel enable clear. | RW | 0 |

Table 24-56. Register Call Summary for Register I2C_DMATXENABLE_CLR

Multimaster High-Speed I2C Controller

- [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-57. I2C_DMARXWAKE_EN

| | |
|-------------------------|--|
| Address Offset | 0x0000 0048 |
| Physical Address | 0x4806 0048 0x4807 0048 0x4807 2048 0x4835 0048 |
| Description | Per-event DMA RX wakeup enable. |
| Type | RW |

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|-----|-----|----------|------|------|-----|----|----------|-----|----|----------|------|------|------|----|
| RESERVED | XDR | RDR | RESERVED | ROVR | XUDF | AAS | BF | RESERVED | STC | GC | RESERVED | DRDY | ARDY | NACK | AL |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 15 | RESERVED | Reserved. | R | 0 |
| 14 | XDR | Transmit Draining wakeup set. 0x0: Transmit draining wakeup disabled 0x1: Transmit draining wakeup enabled | RW | 0 |
| 13 | RDR | Receive Draining wakeup set. 0x0: Receive draining wakeup disabled 0x1: Receive draining wakeup enabled | RW | 0 |
| 12 | RESERVED | Reserved. | R | 0 |
| 11 | ROVR | Receive overrun wakeup set. 0x0: Receive overrun wakeup disabled 0x1: Receive overrun wakeup enabled | RW | 0 |
| 10 | XUDF | Transmit underflow wakeup set. 0x0: Transmit underflow wakeup disabled 0x1: Transmit underflow wakeup enabled | RW | 0 |
| 9 | AAS | Address as slave IRQ wakeup set. 0x0: Addressed as slave wakeup disabled 0x1: Addressed as slave wakeup enabled | RW | 0 |
| 8 | BF | Bus Free IRQ wakeup set. 0x0: Bus Free wakeup disabled 0x1: Bus Free wakeup enabled | RW | 0 |
| 7 | RESERVED | Reserved. | R | 0 |
| 6 | STC | Start Condition IRQ wakeup set. 0x0: Start condition wakeup disabled 0x1: Start condition wakeup enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 5 | GC | General call IRQ wakeup set. 0x0: General call wakeup disabled 0x1: General call wakeup enabled | RW | 0 |
| 4 | RESERVED | Reserved | R | 0 |
| 3 | DRDY | Receive/Transmit data ready IRQ wakeup set. 0x0: Transmit/receive data ready wakeup disabled 0x1: Transmit/receive data ready wakeup enabled | RW | 0 |
| 2 | ARDY | Register access ready IRQ wakeup set. 0x0: Register access ready wakeup disabled 0x1: Register access ready wakeup enabled | RW | 0 |
| 1 | NACK | No acknowledgment IRQ wakeup set. 0x0: Not Acknowledge wakeup disabled 0x1: Not Acknowledge wakeup enabled | RW | 0 |
| 0 | AL | Arbitration lost IRQ wakeup set. 0x0: Arbitration lost wakeup disabled 0x1: Arbitration lost wakeup enabled | RW | 0 |

Table 24-58. Register Call Summary for Register I2C_DMARXWAKE_EN

Multimaster High-Speed I2C Controller
• [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-59. I2C_DMATXWAKE_EN

| | |
|-------------------------|--|
| Address Offset | 0x0000 004C |
| Physical Address | 0x4806 004C 0x4807 004C 0x4807 204C 0x4835 004C |
| Description | Per-event DMA TX wakeup enable. |
| Type | RW |

| | | | | | | | | | | | | | | | |
|----------|-----|-----|----------|------|------|-----|----|----------|-----|----|----------|------|------|------|----|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | XDR | RDR | RESERVED | ROVR | XUDF | AAS | BF | RESERVED | STC | GC | RESERVED | DRDY | ARDY | NACK | AL |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 15 | RESERVED | Reserved. | R | 0 |
| 14 | XDR | Transmit Draining wakeup set. 0x0: Transmit draining wakeup disabled 0x1: Transmit draining wakeup enabled | RW | 0 |
| 13 | RDR | Receive Draining wakeup set. 0x0: Receive draining wakeup disabled 0x1: Receive draining wakeup enabled | RW | 0 |
| 12 | RESERVED | Reserved. | R | 0 |
| 11 | ROVR | Receive overrun wakeup set. 0x0: Receive overrun wakeup disabled 0x1: Receive overrun wakeup enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 10 | XUDF | Transmit underflow wakeup set. 0x0: Transmit underflow wakeup disabled 0x1: Transmit underflow wakeup enabled | RW | 0 |
| 9 | AAS | Address as slave IRQ wakeup set. 0x0: Addressed as slave wakeup disabled 0x1: Addressed as slave wakeup enabled | RW | 0 |
| 8 | BF | Bus Free IRQ wakeup set. 0x0: Bus Free wakeup disabled 0x1: Bus Free wakeup enabled | RW | 0 |
| 7 | RESERVED | Reserved. | R | 0 |
| 6 | STC | Start Condition IRQ wakeup set. 0x0: Start condition wakeup disabled 0x1: Start condition wakeup enabled | RW | 0 |
| 5 | GC | General call IRQ wakeup set. 0x0: General call wakeup disabled 0x1: General call wakeup enabled | RW | 0 |
| 4 | RESERVED | Reserved | R | 0 |
| 3 | DRDY | Receive/Transmit data ready IRQ wakeup set. 0x0: Transmit/receive data ready wakeup disabled 0x1: Transmit/receive data ready wakeup enabled | RW | 0 |
| 2 | ARDY | Register access ready IRQ wakeup set. 0x0: Register access ready wakeup disabled 0x1: Register access ready wakeup enabled | RW | 0 |
| 1 | NACK | No acknowledgment IRQ wakeup set. 0x0: Not Acknowledge wakeup disabled 0x1: Not Acknowledge wakeup enabled | RW | 0 |
| 0 | AL | Arbitration lost IRQ wakeup set. 0x0: Arbitration lost wakeup disabled 0x1: Arbitration lost wakeup enabled | RW | 0 |

Table 24-60. Register Call Summary for Register I2C_DMATXWAKE_EN

Multimaster High-Speed I2C Controller

- [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-61. I2C_IE

| | | | | | | | | | | | | | | | |
|-------------------------|--|--------|----------|------|------|--------|-------|---------|--------|-------|---------|---------|---------|---------|-------|
| Address Offset | 0x0000 0084 | | | | | | | | | | | | | | |
| Physical Address | 0x4806 0084 0x4807 0084 0x4807 2084 0x4835 0084 | | | | | | | | | | | | | | |
| Description | I2C interrupt enable vector (legacy). | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | |
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | XDR_IE | RDR_IE | RESERVED | ROVR | XUDF | ASS_IE | BF_IE | AERR_IE | STC_IE | GC_IE | XRDY_IE | RRDY_IE | ARDY_IE | NACK_IE | AL_IE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 15 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0 |
| 14 | XDR_IE | Transmit Draining interrupt enable. Mask or unmask the interrupt signaled by bit in I2C_STAT[XDR] . 0x0: Transmit Draining interrupt disabled 0x1: Transmit Draining interrupt enabled | RW | 0 |
| 13 | RDR_IE | Receive Draining interrupt enable. Mask or unmask the interrupt signaled by bit in I2C_STAT[RDR] . 0x0: Receive Draining interrupt disabled 0x1: Receive Draining interrupt enabled | RW | 0 |
| 12 | RESERVED | reserved | R | 0 |
| 11 | ROVR | Receive overrun enable set. 0x0: Receive overrun interrupt disabled 0x1: Receive Draining interrupt enabled | RW | 0 |
| 10 | XUDF | Transmit underflow enable set. 0x0: Transmit underflow interrupt disabled 0x1: Transmit underflow interrupt enabled | RW | 0 |
| 9 | ASS_IE | Addressed as Slave interrupt enable. Mask or unmask the interrupt signaled by bit in I2C_STAT[AAS] . 0x0: Addressed as Slave interrupt disabled 0x1: Addressed as Slave interrupt enabled | RW | 0 |
| 8 | BF_IE | Bus Free interrupt enable. Mask or unmask the interrupt signaled by bit in I2C_STAT[BF] . 0x0: Bus Free interrupt disabled 0x1: Bus Free interrupt enabled | RW | 0 |
| 7 | AERR_IE | Access Error interrupt enable. Mask or unmask the interrupt signaled by bit in I2C_STAT[AERR] . 0x0: Access Error interrupt disabled 0x1: Access Error interrupt enabled | RW | 0 |
| 6 | STC_IE | Start Condition interrupt enable. Mask or unmask the interrupt signaled by bit in I2C_STAT[STC] . 0x0: Start Condition interrupt disabled 0x1: Start Condition interrupt enabled | RW | 0 |
| 5 | GC_IE | General call Interrupt enable. Mask or unmask the interrupt signaled by bit in I2C_STAT[GC] . 0x0: General call interrupt disabled 0x1: General call interrupt enabled | RW | 0 |
| 4 | XRDY_IE | Transmit data ready interrupt enable. Mask or unmask the interrupt signaled by bit in I2C_STAT[XRDY] . 0x0: Transmit data ready interrupt disabled 0x1: Transmit data ready interrupt enabled | RW | 0 |
| 3 | RRDY_IE | Receive data ready interrupt enable. Mask or unmask the interrupt signaled by bit in I2C_STAT[RRDY] . 0x0: Receive data ready interrupt disabled 0x1: Receive data ready interrupt enabled | RW | 0 |
| 2 | ARDY_IE | Register access ready interrupt enable. Mask or unmask the interrupt signaled by bit in I2C_STAT[ARDY] . 0x0: Register access ready interrupt disabled 0x1: Register access ready interrupt enabled | RW | 0 |
| 1 | NACK_IE | No acknowledgement interrupt enable. Mask or unmask the interrupt signaled by bit in I2C_STAT[NACK] . 0x0: Not Acknowledge interrupt disabled 0x1: Not Acknowledge interrupt enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | AL_IE | Arbitration lost interrupt enable. Mask or unmask the interrupt signaled by bit in I2C_STAT[AL] 0x0: Arbitration lost interrupt disabled 0x1: Arbitration lost interrupt enabled | RW | 0 |

Table 24-62. Register Call Summary for Register I2C_IE

Multimaster High-Speed I2C Controller

- HS I2C FIFO Interrupt Mode: [0]
- HS I2C FIFO Polling Mode: [1] [2]
- HS I2C Draining Feature (I2C Mode Only): [3] [4]
- HS I2C Programming Model in I2C Mode: [5] [6] [7] [8] [9] [10] [11] [12] [13] [14]
- HS I2C Basic Programming Model in SCCB Mode: [15] [16] [17] [18] [19] [20]
- HS I2C Register Summary: [21] [22]

Table 24-63. I2C_STAT

| | |
|-------------------------|--|
| Address Offset | 0x0000 0088 |
| Physical Address | 0x4806 0088 0x4807 0088 0x4807 2088 0x4835 0088 |
| Description | I2C interrupt status vector (legacy). |
| Type | RW |

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|-----|-----|----|------|------|-----|----|------|-----|----|------|------|------|------|----|
| RESERVED | XDR | RDR | BB | ROVR | XUDF | AAS | BF | AERR | STC | GC | XRDY | RRDY | ARDY | NACK | AL |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 15 | RESERVED | Write 0s for future compatibility. Read returns 0. | RW | 0 |
| 14 | XDR | Transmit draining IRQ status. 0x0: Transmit draining inactive. 0x1: Transmit draining enabled. | RW W1toClr | 0 |
| 13 | RDR | Receive draining IRQ status. 0x0: Receive draining inactive. 0x1: Receive draining enabled. | RW W1toClr | 0 |
| 12 | BB | Bus busy status. Writing into this bit has no effect. Read 0x1: Bus is occupied. Read 0x0: Bus is free. | R | 0 |
| 11 | ROVR | Receive overrun status. Writing into this bit has no effect. Read 0x1: Receiver overrun. Read 0x0: Normal operation. | RW W1toClr | 0 |
| 10 | XUDF | Transmit underflow status. Writing into this bit has no effect. Read 0x1: Transmit underflow. Read 0x0: Normal operation. | RW W1toClr | 0 |
| 9 | AAS | Address recognized as slave IRQ status. 0x0: No action. 0x1: Address recognized. | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------|
| 8 | BF | Bus Free IRQ status. 0x0: No action. 0x1: Bus Free. | RW W1toClr | 0 |
| 7 | AERR | Access Error IRQ status. 0x0: No action. 0x1: Access Error. | RW W1toClr | 0 |
| 6 | STC | Start Condition IRQ status. 0x0: No action. 0x1: Start Condition detected. | RW W1toClr | 0 |
| 5 | GC | General call IRQ status. Set to 1 by core when General call address detected and interrupt signaled to MPUSS. Write 1 to clear. 0x0: No general call detected. 0x1: General call address detected. | RW W1toClr | 0 |
| 4 | XRDY | Transmit data ready IRQ status. Set to 1 by core when transmitter and when new data is requested. When set to 1 by core, an interrupt is signaled to MPUSS. Write 1 to clear. 0x0: Transmission ongoing. 0x1: Transmit data ready. | RW W1toClr | 0 |
| 3 | RRDY | Receive data ready IRQ status. Set to 1 by core when receiver mode, a new data is able to be read. When set to 1 by core, an interrupt is signaled to MPUSS. Write 1 to clear. 0x0: No data available. 0x1: Receive data available. | RW W1toClr | 0 |
| 2 | ARDY | Register access ready IRQ status. When set to 1 it indicates that previous access has been performed and registers are ready to be accessed again. An interrupt is signaled to MPUSS. Write 1 to clear. 0x0: Module busy. 0x1: Access ready. | RW W1toClr | 0 |
| 1 | NACK | No acknowledgement IRQ status. Bit is set when No Acknowledge has been received, an interrupt is signaled to MPUSS. Write 1 to clear this bit. 0x0: Normal operation. 0x1: Not Acknowledge detected. | RW W1toClr | 0 |
| 0 | AL | Arbitration lost IRQ status. This bit is automatically set by the hardware when it loses the Arbitration in master transmit mode, an interrupt is signaled to MPUSS. During reads, it always returns 0. 0x0: Normal operation. 0x1: Arbitration lost detected. | RW W1toClr | 0 |

Table 24-64. Register Call Summary for Register I2C_STAT

| | |
|---------------------------------------|---|
| Multimaster High-Speed I2C Controller | |
| • | HS I2C Typical Connection Protocol and Data Format: [0] [1] |
| • | HS I2C FIFO Interrupt Mode: [2] [3] |
| • | HS I2C FIFO Polling Mode: [4] [5] [6] [7] [8] [9] |
| • | HS I2C Draining Feature (I2C Mode Only): [10] [11] [12] [13] [14] |
| • | HS I2C System Test Mode: [15] [16] [17] |
| • | HS I2C Programming Model in I2C Mode: [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42] [43] [44] [45] [46] [47] [48] [49] |
| • | HS I2C Basic Programming Model in SCCB Mode: [50] [51] [52] [53] [54] [55] [56] [57] [58] [59] [60] [61] [62] [63] [64] |
| • | HS I2C Register Summary: [65] [66] |
| • | HS I2C Register Description: [67] [68] [69] [70] [71] [72] [73] [74] [75] [76] [77] [78] [79] [80] [81] [82] [83] [84] [85] [86] [87] [88] [89] [90] [91] [92] [93] [94] [95] [96] [97] [98] [99] [100] [101] [102] |

Table 24-65. I2C_SYSS

| | |
|-------------------------|--|
| Address Offset | 0x0000 0090 |
| Physical Address | 0x4806 0090 0x4807 0090 0x4807 2090 0x4835 0090 |
| Description | System Status register |
| Type | RW |

| | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-------|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | RDONE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|--------|
| 15:1 | RESERVED | Reserved | R | 0x0000 |
| 0 | RDONE | Reset done bit | RW | 1 |
| | | Read 0x1: Reset completed | | |
| | | Read 0x0: Internal module reset in ongoing | | |

Table 24-66. Register Call Summary for Register I2C_SYSS

| | |
|---------------------------------------|--|
| Multimaster High-Speed I2C Controller | |
| • | HS I2C Software Reset: [0] [1] [2] |
| • | HS I2C Register Summary: [3] [4] |

Table 24-67. I2C_BUF

| | |
|-------------------------|--|
| Address Offset | 0x0000 0094 |
| Physical Address | 0x4806 0094 0x4807 0094 0x4807 2094 0x4835 0094 |
| Description | Buffer Configuration register |
| Type | RW |

| | | | | | | | | | | | | | | | |
|---------|------------|--------|----|----|----|---|---|---------|------------|--------|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RDMA_EN | RXFIFO_CLR | RXTRSH | | | | | | XDMA_EN | TXFIFO_CLR | TXTRSH | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 15 | RDMA_EN | Receive DMA channel enable 0x0: Receive DMA channel disabled 0x1: Receive DMA channel enabled | RW | 0 |
| 14 | RXFIFO_CLR | Receive FIFO clear 0x0: Normal mode 0x1: Rx FIFO is reset | RW | 0 |
| 13:8 | RXTRSH | Threshold value for FIFO buffer in RX mode | RW | 0x00 |
| 7 | XDMA_EN | Transmit DMA channel enable 0x0: Transmit DMA channel disabled 0x1: Transmit DMA channel enabled | RW | 0 |
| 6 | TXFIFO_CLR | Transmit FIFO clear 0x0: Normal mode 0x1: Tx FIFO is reset | RW | 0 |
| 5:0 | TXTRSH | Threshold value for FIFO buffer in TX mode | RW | 0x00 |

Table 24-68. Register Call Summary for Register I2C_BUF

Multimaster High-Speed I2C Controller

- [HS I2C FIFO Interrupt Mode: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [HS I2C FIFO Polling Mode: \[8\] \[9\]](#)
- [HS I2C FIFO DMA Mode \(I2C Mode Only\): \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [HS I2C Draining Feature \(I2C Mode Only\): \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\]](#)
- [HS I2C Write and Read Operations in SCCB Mode: \[25\] \[26\]](#)
- [HS I2C Programming Model in I2C Mode: \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\] \[44\]](#)
- [HS I2C Basic Programming Model in SCCB Mode: \[45\] \[46\] \[47\] \[48\]](#)
- [HS I2C Register Summary: \[49\] \[50\]](#)

Table 24-69. I2C_CNT

| | |
|-------------------------|--|
| Address Offset | 0x0000 0098 |
| Physical Address | 0x4806 0098 0x4807 0098 0x4807 2098 0x4835 0098 |
| Description | Data counter register |
| Type | RW |

| | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DCOUNT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|--------|
| 15:0 | DCOUNT | Data count Note: Because the transfer length for DCOUNT = 0x0000 is 65536, the module does not allow the initiation of zero-data-byte transfers. | RW | 0x0000 |

Table 24-70. Register Call Summary for Register I2C_CNT

Multimaster High-Speed I2C Controller

- [HS I2C Draining Feature \(I2C Mode Only\): \[0\]](#)
- [HS I2C Programming Model in I2C Mode: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [HS I2C Register Summary: \[10\] \[11\]](#)

Table 24-71. I2C_DATA

| | |
|-------------------------|--|
| Address Offset | 0x0000 009C |
| Physical Address | 0x4806 009C 0x4807 009C 0x4807 209C 0x4835 009C |
| Description | Data access register |
| Type | RW |

| | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DATA | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------------------------|------|-------|
| 15:8 | RESERVED | Reserved | R | 0x00 |
| 7:0 | DATA | Transmit/Receive data FIFO endpoint | RW | 0x-- |

Table 24-72. Register Call Summary for Register I2C_DATA

Multimaster High-Speed I2C Controller

- [HS I2C DMA Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [HS I2C Write and Read Operations in SCCB Mode: \[8\] \[9\]](#)
- [HS I2C System Test Mode: \[10\] \[11\]](#)
- [HS I2C Programming Model in I2C Mode: \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [HS I2C Basic Programming Model in SCCB Mode: \[24\] \[25\] \[26\] \[27\] \[28\] \[29\]](#)
- [HS I2C Register Summary: \[30\] \[31\]](#)

Table 24-73. I2C_CON

| | |
|-------------------------|--|
| Address Offset | 0x0000 00A4 |
| Physical Address | 0x4806 00A4 0x4807 00A4 0x4807 20A4 0x4835 00A4 |
| Description | I2C configuration register. |
| Type | RW |

| | | | | | | | | | | | | | | | |
|--------|----------|--------|-----|-----|-----|-----|------|------|------|------|----------|-----|-----|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| I2C_EN | RESERVED | OPMODE | STB | MST | TRX | XSA | XOA0 | XOA1 | XOA2 | XOA3 | RESERVED | STP | STT | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 15 | I2C_EN | I2C module enable. 0x0: Controller in reset. FIFO are cleared and status bits are set to their default value 0x1: Module enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 14 | RESERVED | Reserved | R | 0 |
| 13:12 | OPMODE | Operation mode selection. 0x0: I2C Fast/Standard mode. 0x1: I2C High Speed mode. 0x3: Reserved. 0x2: SCCB mode. | RW | 0x0 |
| 11 | STB | Start byte mode (master mode only). 0x0: Normal mode 0x1: Start byte mode | RW | 0 |
| 10 | MST | Master/slave mode. 0x0: Slave mode 0x1: Master mode | RW | 0 |
| 9 | TRX | Transmitter/Receiver mode (master mode only). 0x0: Receiver mode 0x1: Transmitter mode | RW | 0 |
| 8 | XSA | Expand Slave address. 0x0: 7-bit address mode 0x1: 10-bit address mode | RW | 0 |
| 7 | XOA0 | Expand Own address 0. 0x0: 7-bit address mode 0x1: 10-bit address mode | RW | 0 |
| 6 | XOA1 | Expand Own address 1. 0x0: 7-bit address mode 0x1: 10-bit address mode | RW | 0 |
| 5 | XOA2 | Expand Own address 2. 0x0: 7-bit address mode 0x1: 10-bit address mode | RW | 0 |
| 4 | XOA3 | Expand Own address 3. 0x0: 7-bit address mode 0x1: 10-bit address mode | RW | 0 |
| 3:2 | RESERVED | Reserved. | R | 0x0 |
| 1 | STP | Stop condition (master mode only). 0x0: No action or stop condition detected 0x1: Stop condition queried | RW | 0 |
| 0 | STT | Start condition (master mode only). 0x0: No action or start condition detected 0x1: Start condition queried | RW | 0 |

Table 24-74. Register Call Summary for Register I2C_CON

Multimaster High-Speed I2C Controller

- [HS I2C SCCB Interface Typical Connections: \[0\]](#)
- [HS I2C Block Diagram: \[1\] \[2\]](#)
- [HS I2C Clocking: \[3\]](#)
- [HS I2C Software Reset: \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [HS I2C Programmable Multislave Channel Feature \(I2C Mode Only\): \[9\] \[10\] \[11\] \[12\]](#)
- [HS I2C FIFO Interrupt Mode: \[13\] \[14\]](#)
- [HS I2C Write and Read Operations in SCCB Mode: \[15\] \[16\] \[17\] \[18\]](#)
- [HS I2C System Test Mode: \[19\] \[20\] \[21\]](#)
- [HS I2C Programming Model in I2C Mode: \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\] \[44\] \[45\] \[46\] \[47\] \[48\] \[49\] \[50\] \[51\] \[52\] \[53\] \[54\] \[55\] \[56\] \[57\] \[58\] \[59\] \[60\] \[61\] \[62\] \[63\]](#)
- [HS I2C Basic Programming Model in SCCB Mode: \[64\] \[65\] \[66\] \[67\] \[68\] \[69\] \[70\] \[71\] \[72\] \[73\] \[74\]](#)
- [HS I2C Register Summary: \[75\] \[76\]](#)

Table 24-75. I2C_OA

Address Offset

0x0000 00A8

Physical Address

[0x4806 00A8](#)
[0x4807 00A8](#)
[0x4807 20A8](#)
[0x4835 00A8](#)

Description

Own address register

Type

RW

| | | | | | | | | | | | | | | | |
|-------|----|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| MCODE | | | RESERVED | | | OA | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-------------|------|-------|
| 15:13 | MCODE | Master Code | RW | 0x0 |
| 12:10 | RESERVED | Reserved | R | 0x0 |
| 9:0 | OA | Own address | RW | 0x000 |

Table 24-76. Register Call Summary for Register I2C_OA

Multimaster High-Speed I2C Controller

- [HS I2C Automatic Blocking of the I2C Clock Feature \(I2C Mode Only\): \[0\] \[1\]](#)
- [HS I2C Programmable Multislave Channel Feature \(I2C Mode Only\): \[2\] \[3\]](#)
- [HS I2C Write and Read Operations in SCCB Mode: \[4\] \[5\]](#)
- [HS I2C Programming Model in I2C Mode: \[6\] \[7\] \[8\]](#)
- [HS I2C Basic Programming Model in SCCB Mode: \[9\] \[10\]](#)
- [HS I2C Register Summary: \[11\] \[12\]](#)

Table 24-77. I2C_SA

| | |
|-------------------------|--|
| Address Offset | 0x0000 00AC |
| Physical Address | 0x4806 00AC 0x4807 00AC 0x4807 20AC 0x4835 00AC |
| Description | Slave address register |
| Type | RW |

| | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | SA | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------|------|-------|
| 15:10 | RESERVED | Reserved | R | 0x00 |
| 9:0 | SA | Slave address | RW | 0x3FF |

Table 24-78. Register Call Summary for Register I2C_SA

Multimaster High-Speed I2C Controller

- [HS I2C Write and Read Operations in SCCB Mode: \[0\] \[1\]](#)
- [HS I2C Programming Model in I2C Mode: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [HS I2C Basic Programming Model in SCCB Mode: \[10\] \[11\]](#)
- [HS I2C Register Summary: \[12\] \[13\]](#)

Table 24-79. I2C_PSC

| | |
|-------------------------|--|
| Address Offset | 0x0000 00B0 |
| Physical Address | 0x4806 00B0 0x4807 00B0 0x4807 20B0 0x4835 00B0 |
| Description | I2C Clock Prescaler Register |
| Type | RW |

| | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | PSC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 15:8 | RESERVED | Reserved | R | 0x00 |
| 7:0 | PSC | Fast/Standard mode prescale sampling clock divider value 0x0: Divide by 1 0x1: Divide by 2 0xFF: Divide by 256 | RW | 0x00 |

Table 24-80. Register Call Summary for Register I2C_PSC

Multimaster High-Speed I2C Controller

- [HS I2C Typical Connection Protocol and Data Format: \[0\] \[1\] \[2\]](#)
- [HS I2C Clocking: \[3\] \[4\] \[5\]](#)
- [HS I2C Noise Filter: \[6\] \[7\]](#)
- [HS I2C System Test Mode: \[8\]](#)
- [HS I2C Programming Model in I2C Mode: \[9\] \[10\]](#)
- [HS I2C Basic Programming Model in SCCB Mode: \[11\] \[12\] \[13\]](#)
- [HS I2C Register Summary: \[14\] \[15\]](#)

Table 24-81. I2C_SCLL

| | |
|-------------------------|--|
| Address Offset | 0x0000 00B4 |
| Physical Address | 0x4806 00B4 0x4807 00B4 0x4807 20B4 0x4835 00B4 |
| Description | I2C SCL Low Time Register. |
| Type | RW |

| | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HSSCLL | | | | | | | | SCLL | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------------------------|------|-------|
| 15:8 | HSSCLL | High Speed mode SCL low time | RW | 0x00 |
| 7:0 | SCLL | Fast/Standard mode SCL low time. | RW | 0x00 |

Table 24-82. Register Call Summary for Register I2C_SCLL

Multimaster High-Speed I2C Controller

- [HS I2C Clocking: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [HS I2C System Test Mode: \[9\]](#)
- [HS I2C Programming Model in I2C Mode: \[10\] \[11\] \[12\]](#)
- [HS I2C Basic Programming Model in SCCB Mode: \[13\] \[14\] \[15\] \[16\]](#)
- [HS I2C Register Summary: \[17\] \[18\]](#)

Table 24-83. I2C_SCLH

| | |
|-------------------------|--|
| Address Offset | 0x0000 00B8 |
| Physical Address | 0x4806 00B8 0x4807 00B8 0x4807 20B8 0x4835 00B8 |
| Description | I2C SCL High Time Register. |
| Type | RW |

| | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HSSCLH | | | | | | | | SCLH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------------------|------|-------|
| 15:8 | HSSCLH | High Speed mode SCL high time | RW | 0x00 |
| 7:0 | SCLH | Fast/Standard mode SCL high time. | RW | 0x00 |

Table 24-84. Register Call Summary for Register I2C_SCLH

Multimaster High-Speed I2C Controller

- [HS I2C Clocking: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [HS I2C System Test Mode: \[11\]](#)
- [HS I2C Programming Model in I2C Mode: \[12\] \[13\] \[14\]](#)
- [HS I2C Basic Programming Model in SCCB Mode: \[15\] \[16\]](#)
- [HS I2C Register Summary: \[17\] \[18\]](#)

Table 24-85. I2C_SYSTEST

| | |
|-------------------------|--|
| Address Offset | 0x0000 00BC |
| Physical Address | 0x4806 00BC 0x4807 00BC 0x4807 20BC 0x4835 00BC |
| Description | I2C System Test Register. |
| Type | RW |

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------|------|-------|-----|----------|------------|------------|------------|------------|----------|-------|-------|-------|-------|---|---|
| ST_EN | FREE | TMODE | SSB | RESERVED | SCL_I_FUNC | SCL_O_FUNC | SDA_I_FUNC | SDA_O_FUNC | SCCB_E_O | SCL_I | SCL_O | SDA_I | SDA_O | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 15 | ST_EN | System test enable. 0x0: Normal mode. All others bits in register are read only 0x1: System test enabled. Permit other system test registers bits to be set | RW | 0 |
| 14 | FREE | Free running mode (on breakpoint) 0x0: Stop mode (on breakpoint condition). If Master mode, it stops after completion of the ongoing bit transfer. In slave mode, it stops during the phase transfer when 1 byte is completely transmitted/received. 0x1: Free running mode | RW | 0 |
| 13:12 | TMODE | Test mode select. 0x0: Functional mode (default) 0x1: Reserved 0x3: Loop back mode select + SDA/SCL IO mode select 0x2: Test of SCL counters (SCLL, SCLH, PSC). SCL provides a permanent clock with master mode. | RW | 0x0 |
| 11 | SSB | Set status bits from 0 to 14. 0x0: No action 0x1: Set interrupt status bits to 1 | RW | 0 |
| 10:9 | RESERVED | Reserved | R | 0x0 |
| 8 | SCL_I_FUNC | SCL line input value (functional mode). Read 0x1: Read 1 from SCL line Read 0x0: Read 0 from SCL line | R | 1 |
| 7 | SCL_O_FUNC | SCL line output value (functional mode). Read 0x1: Driven 1 on SCL line Read 0x0: Driven 0 on SCL line | R | 1 |
| 6 | SDA_I_FUNC | SDA line input value (functional mode). Read 0x1: Read 1 from SDA line Read 0x0: Read 0 from SDA line | R | 1 |
| 5 | SDA_O_FUNC | SDA line output value (functional mode). Read 0x1: Driven 1 to SDA line Read 0x0: Driven 0 to SDA line | R | 1 |
| 4 | SCCB_E_O | SCCB_E line sense output value. 0x0: Write 0 to SCCBE line 0x1: Write 1 to SCCBE line | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 3 | SCL_I | SCL line sense input value. Read 0x1: Read 1 from SCL line Read 0x0: Read 0 from SCL line | R | 0 |
| 2 | SCL_O | SCL line drive output value. 0x0: Write 0 to SCL line 0x1: Write 1 to SCL line | RW | 0 |
| 1 | SDA_I | SDA line sense input value. Read 0x1: Read 1 from SDA line Read 0x0: Read 0 from SDA line | R | 0 |
| 0 | SDA_O | SDA line drive output value. 0x0: Write 0 to SDA line 0x1: Write 1 to SDA line | RW | 0 |

Table 24-86. Register Call Summary for Register I2C_SYSTEST

Multimaster High-Speed I2C Controller

- [HS I2C System Test Mode: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [HS I2C Register Summary: \[9\] \[10\]](#)

Table 24-87. I2C_BUFSTAT

| | |
|-------------------------|--|
| Address Offset | 0x0000 00C0 |
| Physical Address | 0x4806 00C0 0x4807 00C0 0x4807 20C0 0x4835 00C0 |
| Description | I2C Buffer Status Register. |
| Type | R |

| | | | | | | | | | | | | | | | |
|-----------|----|--------|----|----|----|---|---|----------|---|--------|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FIFODEPTH | | RXSTAT | | | | | | RESERVED | | TXSTAT | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|------------------------------|------|-------|
| 15:14 | FIFODEPTH | Internal FIFO buffers depth. | R | 0x1 |
| 13:8 | RXSTAT | RX Buffer Status | R | 0x00 |
| 7:6 | RESERVED | Reserved | R | 0x0 |
| 5:0 | TXSTAT | TX Buffer Status. | R | 0x00 |

Table 24-88. Register Call Summary for Register I2C_BUFSTAT

Multimaster High-Speed I2C Controller

- [HS I2C FIFO Management: \[0\]](#)
- [HS I2C Draining Feature \(I2C Mode Only\): \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [HS I2C Programming Model in I2C Mode: \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [HS I2C Register Summary: \[17\] \[18\]](#)

Table 24-89. I2C_OA1

| | |
|-------------------------|--|
| Address Offset | 0x0000 00C4 |
| Physical Address | 0x4806 00C4 0x4807 00C4 0x4807 20C4 0x4835 00C4 |
| Description | I2C Own Address 1 Register |
| Type | RW |

| | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | OA1 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------|------|-------|
| 15:10 | RESERVED | Reserved | R | 0x00 |
| 9:0 | OA1 | Own address 1 | RW | 0x000 |

Table 24-90. Register Call Summary for Register I2C_OA1

Multimaster High-Speed I2C Controller

- [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-91. I2C_OA2

| | |
|-------------------------|--|
| Address Offset | 0x0000 00C8 |
| Physical Address | 0x4806 00C8 0x4807 00C8 0x4807 20C8 0x4835 00C8 |
| Description | I2C Own Address 2 Register |
| Type | RW |

| | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | OA2 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------|------|-------|
| 15:10 | RESERVED | Reserved | R | 0x00 |
| 9:0 | OA2 | Own address 2 | RW | 0x000 |

Table 24-92. Register Call Summary for Register I2C_OA2

Multimaster High-Speed I2C Controller

- [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-93. I2C_OA3

| | |
|-------------------------|--|
| Address Offset | 0x0000 00CC |
| Physical Address | 0x4806 00CC 0x4807 00CC 0x4807 20CC 0x4835 00CC |
| Description | I2C Own Address 3 Register |
| Type | RW |

| | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | OA3 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------|------|-------|
| 15:10 | RESERVED | Reserved | R | 0x00 |
| 9:0 | OA3 | Own address 3 | RW | 0x000 |

Table 24-94. Register Call Summary for Register I2C_OA3

Multimaster High-Speed I2C Controller

- [HS I2C Register Summary: \[0\] \[1\]](#)

Table 24-95. I2C_ACTOA

| | |
|-------------------------|--|
| Address Offset | 0x0000 00D0 |
| Physical Address | 0x4806 00D0 0x4807 00D0 0x4807 20D0 0x4835 00D0 |
| Description | I2C Active Own Address Register. |
| Type | R |

| | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|---|---|---|---|---|---|---------|---------|---------|---------|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | OA3_ACT | OA2_ACT | OA1_ACT | OA0_ACT |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 15:4 | RESERVED | Reserved | R | 0x000 |
| 3 | OA3_ACT | Own Address 3 active. Read 0x1: Own Address active. Read 0x0: Own Address inactive. | R | 0 |
| 2 | OA2_ACT | Own Address 2 active. Read 0x1: Own Address active. Read 0x0: Own Address inactive. | R | 0 |
| 1 | OA1_ACT | Own Address 1 active. Read 0x1: Own Address active. Read 0x0: Own Address inactive. | R | 0 |
| 0 | OA0_ACT | Own Address 0 active. Read 0x1: Own Address active. Read 0x0: Own Address inactive. | R | 0 |

Table 24-96. Register Call Summary for Register I2C_ACTOA

Multimaster High-Speed I2C Controller

- [HS I2C Programmable Multislave Channel Feature \(I2C Mode Only\): \[0\]](#)
- [HS I2C Register Summary: \[1\] \[2\]](#)

Table 24-97. I2C_SBLOCK

| | |
|-------------------------|--|
| Address Offset | 0x0000 00D4 |
| Physical Address | 0x4806 00D4 0x4807 00D4 0x4807 20D4 0x4835 00D4 |
| Description | I2C Clock Blocking Enable Register. |
| Type | RW |

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|---|---|---|---|---|---|--------|--------|--------|--------|
| RESERVED | | | | | | | | | | | | OA3_EN | OA2_EN | OA1_EN | OA0_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 15:4 | RESERVED | Reserved | R | 0x000 |
| 3 | OA3_EN | Enable I2C Clock Blocking for Own Address 3. 0x0: I2C Clock Released. 0x1: I2C Clock Blocked. | RW | 0 |
| 2 | OA2_EN | Enable I2C Clock Blocking for Own Address 2. 0x0: I2C Clock Released. 0x1: I2C Clock Blocked. | RW | 0 |
| 1 | OA1_EN | Enable I2C Clock Blocking for Own Address 1. 0x0: I2C Clock Released. 0x1: I2C Clock Blocked. | RW | 0 |
| 0 | OA0_EN | Enable I2C Clock Blocking for Own Address 0. 0x0: I2C Clock Released. 0x1: I2C Clock Blocked. | RW | 0 |

Table 24-98. Register Call Summary for Register I2C_SBLOCK

Multimaster High-Speed I2C Controller

- [HS I2C Automatic Blocking of the I2C Clock Feature \(I2C Mode Only\): \[0\]](#)
- [HS I2C Register Summary: \[1\] \[2\]](#)

24.2 HDQ/1-Wire

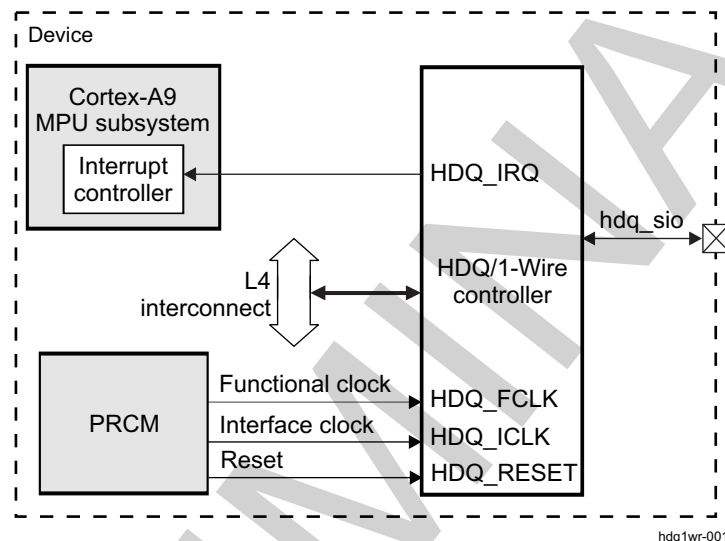
This section describes the HDQ™/ 1-Wire® interface for the device.

24.2.1 HDQ/1-Wire Overview

The HDQ/1-Wire module implements the hardware protocol of the master functions of the TI/Benchmark HDQ and the Dallas Semiconductor 1-Wire® protocols. These protocols use a single wire for communication between the master (HDQ/1-Wire controller) and the slaves (HDQ/1-Wire external compliant devices).

Figure 24-42 shows the HDQ/1-Wire.

Figure 24-42. HDQ/1-Wire Overview



The HDQ/1-Wire has a generic L4 interface and is intended to be used in an interrupt-driven fashion. The 1-pin interface is implemented as an open-drain output at the device level.

The main features supported by the HDQ/1-Wire are the following:

- Benchmark HDQ protocol
- Dallas Semiconductor 1-Wire protocol
- Power-down mode

The HDQ/1-Wire provides a communication rate of 5 Kbps over an address space of 128 bytes.

A typical application of the HDQ/1-Wire is the communication with battery monitor (gas gauge) integrated circuits.

24.2.2 HDQ/1-Wire Environment

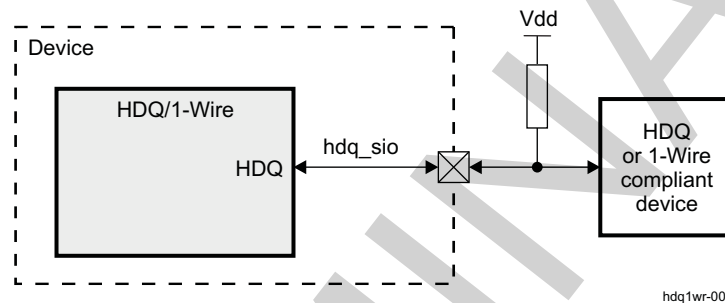
24.2.2.1 HDQ/1-Wire Functional Modes

The HDQ/1-Wire has two main modes: HDQ and 1-Wire. Each of these modes includes idle, active, and power-down submodes. [Table 24-99](#) lists the HDQ/1-Wire functional modes, and [Figure 24-43](#) shows an overview of a typical application.

Table 24-99. Functional Modes

| Functions | Description |
|-----------|--------------------------------------|
| HDQ | Benchmark HDQ protocol |
| 1-Wire | Dallas Semiconductor 1-Wire protocol |

Figure 24-43. HDQ/1-Wire Typical Application System Overview



An external pullup is required, because the two protocols use a return-to-1 mechanism (that is, after any command by any of the connected devices, the line is pulled to a logical high level).

The HDQ/1-Wire operates according to a command structure that is programmed into transmit command registers (as described in [Section 24.2.5.1.2, HDQ/1-Wire Low-level Programming Model](#)).

The 1-Wire mode runs at slower speeds than the capabilities of the mode.

[Table 24-100](#) describes the external signal of the HDQ/1-Wire compliant module.

Table 24-100. I/O Description

| Signal | I/O ⁽¹⁾ | Description | Value at Reset |
|---------|--------------------|--|------------------------------|
| hdq_sio | I/O | Serial data input/output. Output is open drain type. | hi-Z (pulled to 1 by pullup) |

⁽¹⁾ I = Input; O = Output; I/O = Bidirectional; hi-Z = High impedance

24.2.2.2 HDQ and 1-Wire (SDQ) Protocols

24.2.2.2.1 HDQ Protocol Initialization (Default)

In HDQ mode, the firmware does not require the host to create an initialization pulse to the slave. However, the slave can be reset by using an initialization pulse (also referred to as a break pulse). The initialization pulse is generated by setting the [HDQ_CTRL_STATUS\[2\] INITIALIZATION](#) bit and then setting the [HDQ_CTRL_STATUS\[4\] GO](#) bit. The slave does not respond with a presence pulse as it does in the 1-Wire protocol.

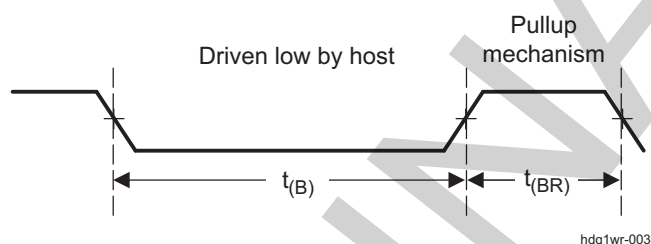
The HDQ is a command-based protocol in which the host sends a command byte to the slave. The command directs the slave either to store the next eight bits of data received to a register specified by the command byte (write operation) or to output the eight bits of data from a register specified by the command byte (read operation). The master implementation is a simple byte engine. Sending of the ID, command/address, and data is controlled by firmware. The master engine provides only a single [HDQ.HDQ_TX_DATA](#) register.

The command and data bytes consist of a stream of eight bits with a maximum transmission rate of 5 Kbps. The least-significant bit (LSB) of a command or data byte is transmitted first. If a communication time-out occurs between the host and the slave (for example, if the host waits longer than the specified time for the slave to respond, or if this is the first access command), then the host must send an initialization pulse (BREAK) before sending the command again.

The slave detects a break when the HDQ pin is driven to a logic-low state for a specified break time $t_{(B)}$ or greater. The HDQ pin then returns to its normal ready-high logic state for a specified break-recovery time $t_{(BR)}$. The slave is then ready for a command from the host processor. Figure 24-44 shows this behavior.

An interrupt condition indicates a TX-complete, an RX-complete, or a time-out condition. Reading the interrupt status register clears all interrupt conditions. Only one interrupt signal is sent to the microcontroller, and only one overall mask bit can enable or disable the interrupt. The interrupt conditions cannot be individually masked.

Figure 24-44. HDQ Break-Pulse Timing Diagram

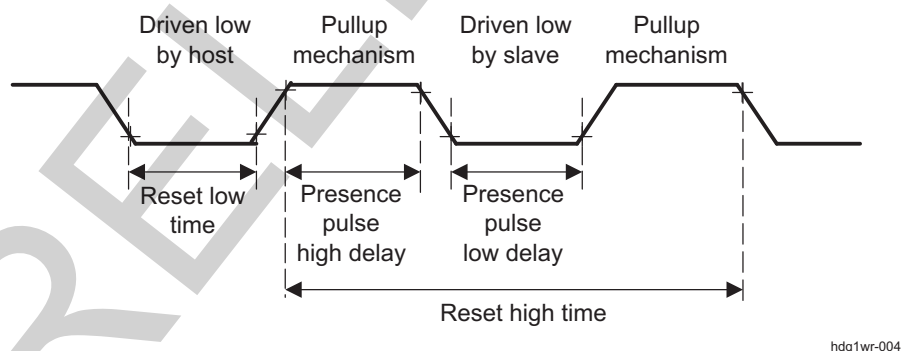


24.2.2.2.2 1-Wire (SDQ) Protocol Initialization

In 1-Wire (SDQ) protocol, the host first sends an initialization pulse (by pulling the line to a logic-low state) and then waits for the slave to respond with a presence pulse before enabling any communication sequence.

As for the initialization pulse, the presence pulse is a low-level pulse on the line initiated by the slave. The timing diagram in Figure 24-45 shows the 1-Wire (SDQ) reset sequence.

Figure 24-45. 1-Wire (SDQ) Reset Timing Diagram



The host drives the line to a logic-low state for a minimum of reset low time. Once the slave detects this pulse, it must drive the line to a logic-low state within the presence pulse high delay for a minimum period of presence pulse low time.

If the slave does not respond within this interval of time, a time-out event occurs and no transaction can be initiated. The host must initiate the reset sequence again before sending any command to the slave.

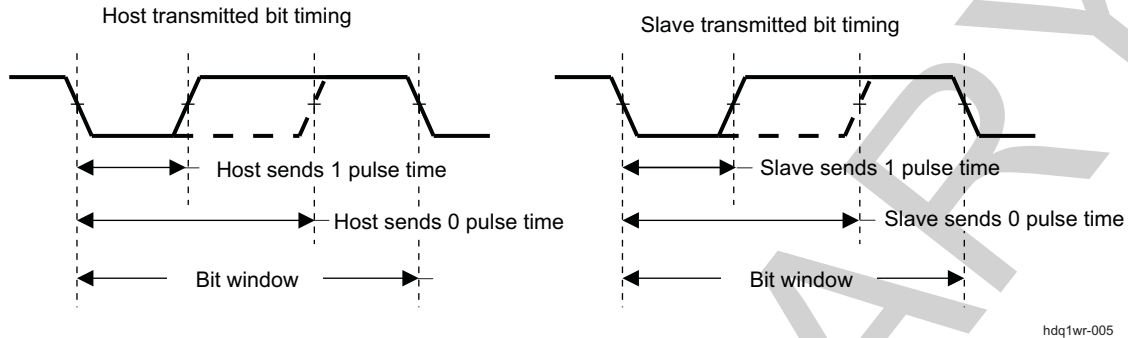
On the other hand, if the slave sends back its presence pulse within the specified time interval, the communication can be enabled after the reset high time.

24.2.2.2.3 Communication Sequence (HDQ and 1-Wire Protocols)

The description in this section applies to both protocols.

After a successful break pulse (HDQ mode) or initialization sequence (1-Wire protocol), the host and slave are ready for bit transmission. Each bit to transmit (either from the host to the slave or from the slave to the host) is preceded by a low-going edge on the line, as shown in [Figure 24-46](#).

Figure 24-46. HDQ/1-Wire Transmitted Bit Timing



The return-to-1 data-bit frame consists of three distinct sections. The first section starts the transmission when either the slave or the host takes the line to a logic-low state. The next section is the actual data transmission in which the data must be valid during a specified period of time after the negative edge that starts the communication. The final section stops the transmission by returning the HDQ/1-Wire line to a logic-high state. Communication with an HDQ/1-Wire slave always occurs with the LSB being transmitted first.

The command byte of the HDQ/1-Wire protocols consists of eight contiguous valid command bits. The command byte contains two fields: R/W command and address. The R/W bit of the command byte determines whether the command is a read or a write, and the address field containing bits AD6-AD0 indicates the address to be read or written. [Table 24-101](#) lists the command byte values.

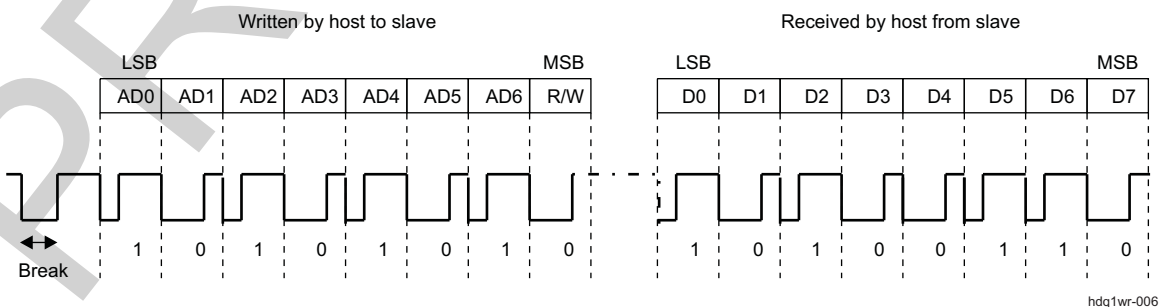
Table 24-101. HDQ/1-Wire Command Byte

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----|-----|-----|-----|-----|-----|-----|-----|
| R/W | AD6 | AD5 | AD4 | AD3 | AD2 | AD1 | AD0 |

R/W Indicates whether the command byte is a read or a write. A 1 indicates a write command; the following eight bits must be written to the register specified by the address field of the command byte. A 0 indicates that the command is a read. On a read command, the slave outputs the requested register contents.

AD6-AD0 Represent the seven bits labeled AD6-AD0 containing the address portion of the register to be accessed. The communication sequence example in [Figure 24-47](#) shows a read command at address 0x55; the received data is 0x65.

Figure 24-47. HDQ/1-Wire Communication Sequence



24.2.3 HDQ/1-Wire Integration

Figure 24-48 shows HDQ/1-Wire integration in the device.

Figure 24-48. HDQ/1-Wire Integration

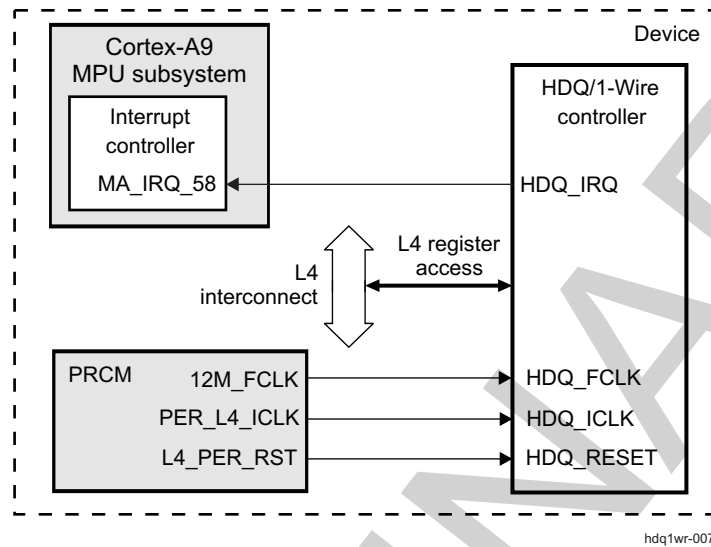


Table 24-102 through Table 24-104 summarize the integration of the module in the device.

Table 24-102. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| HDQ/1-Wire | DPLL_PER | No | L4_PER |

Table 24-103. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|-------------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| HDQ/1-Wire | HDQ_ICLK | PER_L4_ICLK | PRCM | Interface clock |
| HDQ/1-Wire | HDQ_FCLK | 12M_FCLK | PRCM | Functional clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| HDQ/1-Wire | HDQ_RESET | L4_PER_RST | PRCM | HDQ/1-wire reset signal |

Table 24-104. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------|---|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| HDQ/1-Wire | HDQ_IRQ | MA_IRQ_58 | Cortex-A9 | Interrupt to the Cortex A9 MPU subsystem interrupt controller (INTC). |

NOTE: For the description of the interrupt source, see [Section 18.4.1, Cortex-A9 MPU INTC Functional Description](#), in [Chapter 18, Interrupt Controllers](#).

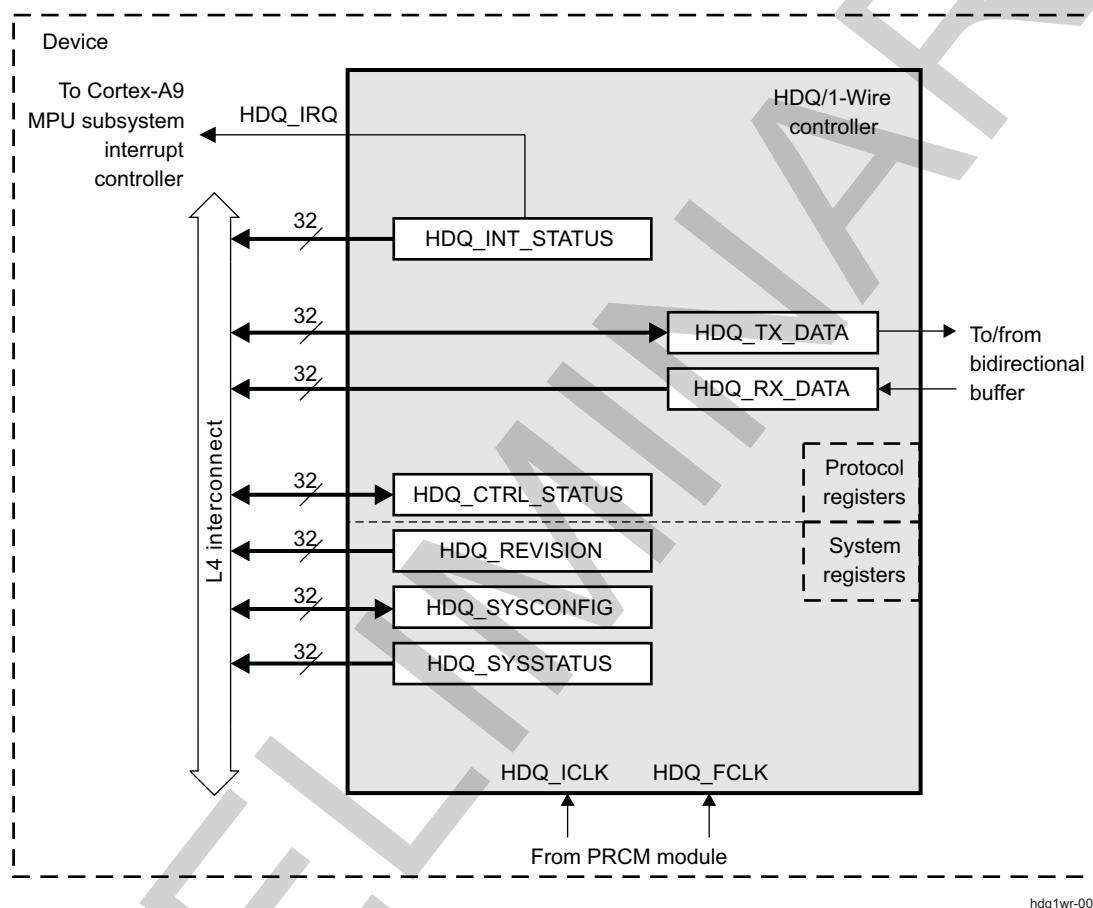
24.2.4 HDQ/1-Wire Functional Description

The HDQ/1-Wire works with HDQ and 1-Wire protocols. The protocols use a single wire to establish communication between the master and the slave. Both protocols use a return-to-1 mechanism; that is, after any command is driven, the line is pulled to a high level. This mechanism requires an external pullup.

24.2.4.1 HDQ/1-Wire Block Diagram

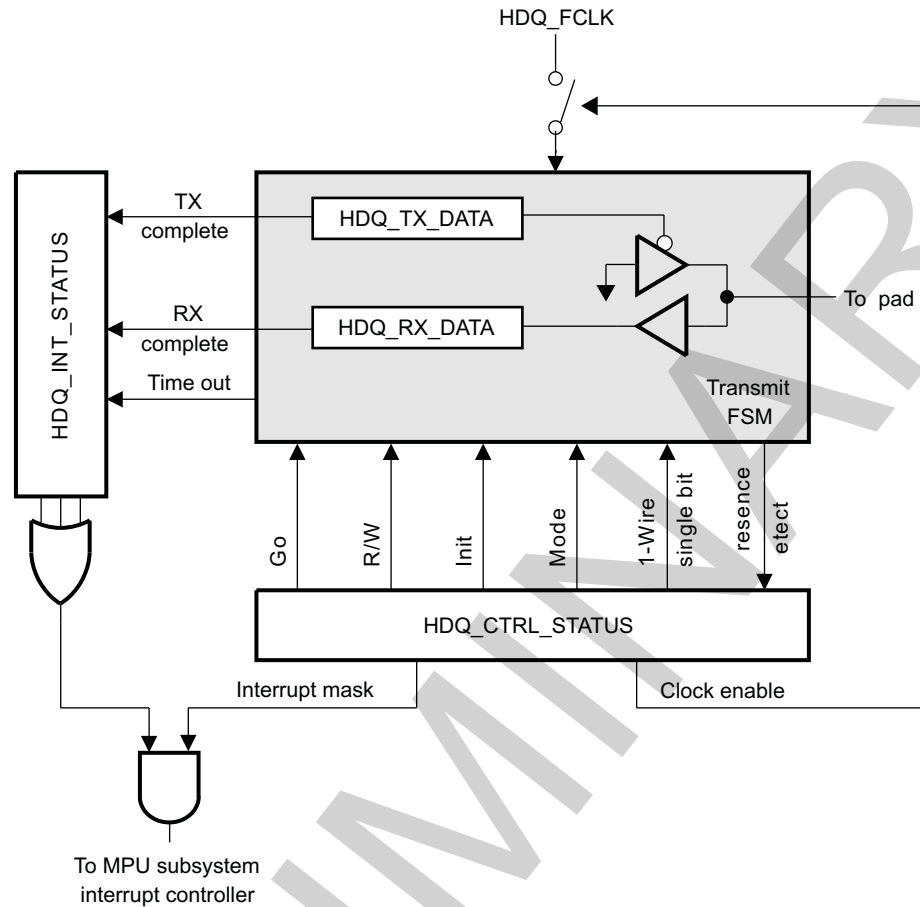
Figure 24-49 is the HDQ/1-Wire block diagram.

Figure 24-49. HDQ/1-Wire Block Diagram



The HDQ.HDQ_CTRL_STATUS[0] MODE bit allows selection between the HDQ and 1-Wire protocols. This bit is assumed static for design purposes. The configuration is in HDQ mode by default.

Figure 24-50 shows the protocol-dedicated register scheme.

Figure 24-50. Protocol Registers Description

hdq1wr-009

The receive and transmit operations of the HDQ/1-Wire module are performed with respect to the timing of the slower HDQ protocol. When the 1-Wire protocol is used, it runs at lower speed than its full capabilities, but is still able to meet the timing requirements and practical considerations.

24.2.4.2 HDQ/1-Wire Clocking Configuration

24.2.4.2.1 HDQ/1-Wire Clocks

The HDQ/1-Wire subsystem operates from two clocks: a functional clock (**HDQ_FCLK**) and an interface clock (**HDQ_ICLK**). When these clocks are set in the PRCM module, the following rule must be observed: $\text{HDQ_ICLK} \geq \text{HDQ_FCLK}$.

- The **HDQ_FCLK** functional clock is a fixed clock provided by the PRCM module. It is used to clock the internal module logic.

For more information about the clock, see [Section 3.6.8, CD_L4_PER Clock Domain](#), in [Chapter 3, Power, Reset, and Clock Management](#).

When the HDQ/1-Wire no longer requires the **HDQ_FCLK**, the software can disable it at the PRCM level. The clock is effectively cut, provided the other modules that receive it do not require it either.

For details about the PRCM register settings and clock configuration, see [Section 3.6.8, CD_L4_PER Clock Domain](#), in [Chapter 3, Power, Reset, and Clock Management](#).

- The **HDQ_ICLK** interface clock runs at L4 interconnect clock speed and is used to trigger access to the HDQ/1-Wire L4 interface.

When the HDQ/1-Wire no longer requires the **HDQ_ICLK** (no transfer is in progress), the software can disable it at the PRCM level. The clock is effectively cut, provided the other modules that receive it do

not require it either.

For more information, see [Section 3.6.8, CD_L4_PER Clock Domain](#).

24.2.4.3 HDQ/1-Wire Hardware and Software Reset

Global reset of the module is done at the power, reset, and clock management (PRCM) module level (for more information, see [Section 3.6.8, CD_L4_PER Clock Domain](#)) or by setting the HDQ.HDQ_SYSCONFIG[1] SOFTRESET bit to 1. Setting this bit enables an active software reset functionality equivalent to a hardware reset. The HDQ_FCLK functional clock must be enabled from the PRCM level and locally through the HDQ_CTRL_STATUS[5] CLOCKENABLE bit (set to 1) for the software reset to complete.

24.2.4.4 HDQ/1-Wire Power Management

[Table 24-105](#) describes power-management features available to the HDQ/1-Wire.

Table 24-105. Local Power-Management Features

| Feature | Registers | Description |
|------------------------|--|-----------------|
| Clock auto gating | HDQ_SYSCONFIG [0] AUTOIDLE bit | Auto-idle mode |
| Slave idle modes | N/A | N/A |
| Clock enable | HDQ.HDQ_CTRL_STATUS[5] CLOCKENABLE bit | Power-down mode |
| Master standby modes | N/A | N/A |
| Global wake-up enable | N/A | N/A |
| Wake-up sources enable | N/A | N/A |

24.2.4.4.1 Auto-Idle Mode

The HDQ/1-Wire provides an auto-idle function in its interconnect clock domain.

The interconnect clock auto-idle power-saving mode is enabled or disabled through the HDQ.HDQ_SYSCONFIG[0] AUTOIDLE bit. When this mode is enabled and there is no activity on the interconnect interface, the interconnect clock (HDQ_ICLK) is disabled inside the module, thereby reducing power consumption. When there is new activity on the interconnect interface, the interconnect clock is restarted with no latency penalty. This mode is disabled by default after a reset.

The auto-idle mode can be enabled in order to reduce power consumption.

24.2.4.4.2 Power-Down Mode

The HDQ/1-Wire also provides a power-saving function in its functional clock domain.

Setting the CLOCKENABLE bit in the control and status register (HDQ.HDQ_CTRL_STATUS[5] CLOCKENABLE bit) to 0 shuts off the functional clock (HDQ_FCLK) to the state-machine. The state-machine is reset when the functional clock is disabled; if any transaction is ongoing, it is aborted into the reset state.

Before shutting off the functional clock, the software must wait for transaction-complete interrupt. In write operation the software must check whether the interrupt was generated after address/command byte was sent or after data byte was sent. The functional clock must not be shut off after address/command byte is sent; otherwise, the data is not written to the slave.

The register values are not affected by disabling the functional clock.

CAUTION

There is no hardware mechanism to prevent cutting off the HDQ/1-Wire clocks while the module is performing a transfer. This would result in loss of data being transferred.

24.2.4.5 HDQ Interrupt Requests

The HDQ/1-Wire can generate one interrupt:

- HDQ_IRQ: This is an interrupt to the MPU subsystem INTC. It is mapped on MA_IRQ_58. [Table 24-106](#) lists the events that can generate this interrupt.

Table 24-106. Events

| Event Flag | Event Mask | Sync | Sensitivity | Map to | Description |
|---|--|------|-------------|---------|--|
| HDQ_INT_STATUS [2] TXCOMPLETE | HDQ_CTRL_STATUS [31] INTERRUPTMASK | Yes | Level | HDQ_IRQ | A write operation of one byte was completed. |
| HDQ_INT_STATUS [1] RXCOMPLETE | HDQ_CTRL_STATUS [31] INTERRUPTMASK | Yes | Level | HDQ_IRQ | A byte has been successfully read. |
| HDQ_INT_STATUS [0] TIMEOUT | HDQ_CTRL_STATUS [31] INTERRUPTMASK | Yes | Level | HDQ_IRQ | After a read command initiated by the host, the slave did not pull the line low within the specified time. |

24.2.4.6 HDQ Mode (Default)

24.2.4.6.1 HDQ Mode Features

The HDQ mode supports the following:

- Benchmarq HDQ protocol
- Power-down mode

24.2.4.6.2 Description

In the HDQ mode, there is no need for the host to create an initialization pulse to the slave. However, the host can reset the slave by using an initialization pulse (also known as a break pulse). Setting the [HDQ.HDQ_CTRL_STATUS](#)[2] INITIALIZATION bit and then setting the [HDQ_CTRL_STATUS](#)[4] GO bit creates this pulse by pulling the line down for a defined duration. When the slave receives the pulse, it is ready for communication but does not respond with a presence pulse.

In a typical write operation, two bytes are sent to the slave. The first byte corresponds to the command/address byte, and the second byte corresponds to the data to be written.

In a typical read operation, the host sends a command/address byte and the slave returns a byte of data.

The master is implemented to send and receive bytes. Sending the command/address and data is controlled by the firmware. The master provides only a single data TX register.

The HDQ protocol is a return-to-1 protocol. Consequently, after a byte is sent to the slave (either command/address + data for a write, or just command/address for a read), the host pulls the line up. The line is set to the high-impedance state in the device and an external pullup brings it to a logical high level.

In the case of a read operation, the slave also drives the line to a logic-low state before sending the requested data.

If the host initiates a read and does not receive data within a specified interval of time (that is, the slave does not drive the line low within this interval), the [HDQ.HDQ_INT_STATUS](#)[0] TIMEOUT bit is set, thereby indicating a read failure. The TIMEOUT bit remains set until the host reads the interrupt status register ([HDQ.HDQ_INT_STATUS](#)).

An interrupt condition indicates either a TX-complete, an RX-complete, or a time-out on a transaction. The corresponding bit is set in the interrupt status register ([HDQ.HDQ_INT_STATUS](#)). This register is cleared as soon as it is read.

Only one interrupt signal is sent to the MPU, and only an overall mask can enable or disable the interrupts. These interrupts cannot be individually masked.

24.2.4.6.3 Single-Bit Mode

In HDQ mode, the single-bit mode (HDQ.HDQ_CTRL_STATUS[7] ONE_WIRE_SINGLE_BIT bit set to 1) has no effect because the HDQ protocol supports only byte transfers.

24.2.4.6.4 Interrupt Conditions

The HDQ/1-Wire provides the following interrupt status:

- Transmission complete:
A write operation of one byte was completed. Successful or failed completion is not indicated, because there is no acknowledgment from the slave in HDQ protocol. This interrupt condition is cleared by reading the interrupt status register (HDQ.HDQ_INT_STATUS).
- Read complete:
In HDQ mode, the interrupt status indicates that a byte has been successfully read. This interrupt condition is cleared by reading the interrupt status register (HDQ.HDQ_INT_STATUS).
- Presence detect/time-out:
In HDQ mode, the interrupt status indicates that after a read command initiated by the host, the slave did not pull the line low within the specified time. This interrupt condition is cleared by reading the interrupt status register (HDQ.HDQ_INT_STATUS).
In HDQ mode, a time-out condition is also used to indicate the successful completion of a break pulse. That is, if the master has sent the break pulse, it is indicated with a time-out instead of a TX-complete.

Only one interrupt is generated to the MPU based on any of these interrupt conditions. A read operation on the interrupt status register clears all the interrupt status bits that were previously set.

24.2.4.7 1-Wire Mode

24.2.4.7.1 1-Wire Mode Features

The 1-Wire mode supports the following:

- Dallas Semiconductor 1-Wire protocol
- Power-down mode
- Single-bit mode

24.2.4.7.2 Description

The 1-Wire mode requires an initialization pulse to be sent to the slave(s) connected on the interface. If a slave is present, it responds with a presence pulse.

The initialization pulse is sent when the HDQ.HDQ_CTRL_STATUS[2] INITIALIZATION bit is set and the HDQ_CTRL_STATUS[4] GO bit is set afterwards.

When the slave receives the initialization pulse, it sends back its presence pulse by pulling down the line for a defined duration. The module detects this low-level pulse and sets the HDQ.HDQ_CTRL_STATUS[3] PRESENCEDETECT bit.

In a similar way, if a presence pulse is not received from the slave after an initialization pulse is sent, the PRESENCEDETECT bit remains cleared.

Whether or not a presence pulse is detected after an initialization pulse is sent, the HDQ.HDQ_INT_STATUS[0] TIMEOUT bit is set and an interrupt condition is generated.

In 1-Wire mode, the generated interrupt condition means the maximum time allowed for receiving the response has elapsed and the software must check the PRESENCEDETECT bit to determine whether or not there was a presence pulse.

The INITIALIZATION bit is cleared at the end of the initialization pulse at the same time as the TIMEOUT bit is set. The TIMEOUT bit is cleared when the interrupt status register (HDQ.HDQ_INT_STATUS) is read.

For read operations, 1-Wire is a bit-by-bit protocol, which means the slave must be clocked by the host for each bit of the byte to read.

The line is pulled up at the end of the command/address byte. On the first read, the host creates a low-going edge to initiate a bit read. The line is then pulled up (pulled to the high-impedance state by the host and set to a high logical level by the external pullup) and the slave either drives the line low to transmit a 0, or does not drive the line to transmit a 1. This sequence is repeated for each bit to read.

The first bit the host receives is the LSB, and the last bit is the most-significant bit (MSB) in the receive data register (HDQ.HDQ_RX_DATA).

An interrupt condition indicates either a TX-complete, an RX-complete, or a time-out condition (that is, the time allowed for the slave to indicate its presence has elapsed). A read operation on the interrupt status register clears the interrupt conditions previously set. As in the HDQ mode, only one interrupt signal is sent to the MPU. Only an overall mask bit can enable or disable the interrupt (the interrupt conditions cannot be masked individually).

24.2.4.7.3 1-Wire Single-Bit Mode Operation

A single-bit mode can be entered by setting the appropriate bit in the control and status register (ONE_WIRE_SINGLE_BIT bit HDQ.HDQ_CTRL_STATUS[7]). In this mode, only one bit of data at a time is transferred between the master and the slave. After the bit is transferred, an interrupt is generated (that is, there is an RX-complete for a read operation and a TX-complete for a write operation). The ONE_WIRE_SINGLE_BIT bit is cleared by hardware after every single bit is received. Software must set this bit to re-enable reception in single-bit mode. Bit 0 of the RX register (HDQ.HDQ_RX_DATA) is updated each time a bit is received from the slave; bit 0 of the TX register (HDQ.HDQ_TX_DATA) contains the bit to be sent.

24.2.4.7.4 Interrupt Conditions

The HDQ/1-Wire provides the following interrupt status:

- Transmission complete:
A write operation of one byte was completed. Successful or failed completion is not indicated, because there is no acknowledgment from the slave in 1-Wire protocol. This interrupt condition is cleared by reading the interrupt status register (HDQ.[HDQ_INT_STATUS](#)).
- Read complete:
In 1-Wire mode, the interrupt status indicates that a byte has been successfully read. This interrupt condition is cleared by reading the interrupt status register (HDQ.[HDQ_INT_STATUS](#)).
- Presence detect/time-out:
In 1-Wire mode, the interrupt status indicates that it is now valid to check the PRESENCEDETECT bit. This interrupt condition is cleared by reading the interrupt status register (HDQ.[HDQ_INT_STATUS](#)).

Only one interrupt is generated to the MPU based on any of these interrupt conditions. A read operation on the interrupt status register clears all interrupt status bits that were previously set.

24.2.4.7.5 Status Flags

The presence-condition-detected status flag is contained in the HDQ.[HDQ_CTRL_STATUS](#)[3] PRESENCEDETECT bit. This is valid only in 1-Wire mode. The flag is updated when the HDQ.[HDQ_INT_STATUS](#)[0] TIMEOUT bit is set. Therefore, its correct value shows only after the interrupt is generated. The firmware must wait for the time-out condition; otherwise, the flag keeps its previous value and is undefined.

24.2.5 HDQ/1-Wire Programming Models

This section describes the low-level hardware programming sequences for configuration and usage of the module. The basic protocol functions, such as slave initialization (reset), read-byte, and write-byte operations, are described. For a description of the functions, see the HDQ/1-Wire protocol documentation.

24.2.5.1 Global Initialization

24.2.5.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the HDQ/1-Wire module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the HDQ/1-Wire. Refer to the HDQ/1-Wire Module Integration and Environment Sections for further information.

Table 24-107. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|---|
| PRCM | Module interface and functional clocks must be enabled. The interface clock must not be slower than the functional clock ($HDQ_ICLK \geq HDQ_FCLK$). For more information about the module configuration, see Chapter 3, Power, Reset, and Clock Management . |
| Control Module | Module specific pad muxing and pullup must be set in the control module. For more information about the module configuration, see Chapter 19, Control Module . |
| MPU INTC | MPU INTC configuration must be done to enable the interrupts from HDQ/1-Wire module. See Section 18.4.1, Cortex-A9 MPU INTC Functional Description , in Chapter 18, Interrupt Controllers . |

24.2.5.1.2 HDQ/1-Wire Module Global Initialization

Table 24-108. HDQ/1-Wire Module Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|----------------------------|--|-------|
| Initiate software reset. | HDQ_SYSCONFIG[1] SOFTRESET | 0x1 |
| Disable power-down mode. | HDQ_CTRL_STATUS[5] CLOCKENABLE | 0x1 |
| Wait until reset complete? | HDQ_SYSSTATUS[0] RESETDONE | = 0x1 |
| Disable power-down mode. | HDQ_CTRL_STATUS[5] CLOCKENABLE | 0x1 |
| Configure auto-idle mode. | HDQ_SYSCONFIG[0] AUTOIDLE | x |

24.2.5.2 HDQ Operational Modes Configuration

24.2.5.2.1 Main Sequence – HDQ Write Operation Mode

Table 24-109. HDQ Mode Selection

| Step | Register/Bit Field/Programming Model | Value |
|------------------------------|--|-------|
| Select HDQ mode. | HDQ_CTRL_STATUS[0] MODE | 0x0 |
| Enable interrupt generation. | HDQ_CTRL_STATUS[6] INTERRUPTMASK | 0x1 |
| Initialize HDQ slave. | See Section 24.2.5.2.2.1 | |

Table 24-110. HDQ Write Operation Mode

| Step | Register/Bit Field/Programming Model | Value |
|--------------------------------------|--|-------|
| Write command/address or data value. | HDQ_TX_DATA[7:0] | 0x– |
| Select write operation. | HDQ_CTRL_STATUS[1] DIR | 0x0 |
| Start operation. | HDQ_CTRL_STATUS[4] GO | 0x1 |
| Wait for interrupt. | | |

Table 24-110. HDQ Write Operation Mode (continued)

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Reading HDQ_INT_STATUS clears interrupt conditions. | HDQ_INT_STATUS [2] TXCOMPLETE | 0x1 |

24.2.5.2.2 Main Sequence - HDQ Read Operation Mode

24.2.5.2.2.1 Sub-sequence - Initialize HDQ Slave

Table 24-111. HDQ Read Operation Mode

| Step | Register/Bit Field/ Programming Model | Value |
|---|---|-------|
| Select read operation. | HDQ_CTRL_STATUS [1] DIR | 0x1 |
| Start operation. | HDQ_CTRL_STATUS [4] GO | 0x1 |
| Wait for interrupt. | | |
| Read and store HDQ_INT_STATUS . Reading HDQ_INT_STATUS clears interrupt conditions. | HDQ_INT_STATUS | 0x- |
| IF: Read operation successful? | HDQ_INT_STATUS [1] RXCOMPLETE | = 0x1 |
| | HDQ_INT_STATUS [0] TIMEOUT | = 0x0 |
| Get received data. | HDQ_RX_DATA [7:0] | 0x- |
| ENDIF | | |

Table 24-112. Initialize HDQ Slave

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------|--|-------|
| Send Initialization Pulse | HDQ_CTRL_STATUS [2] INITIALIZATION | 0x1 |
| Send Command | HDQ_CTRL_STATUS [4] GO | 0x1 |

24.2.5.3 1-Wire Operational Modes Configuration

24.2.5.3.1 Main Sequence - 1-Wire Write Operation Mode

Table 24-113. 1-Wire Mode Selection

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Reset HDQ/1-Wire module. | See Section 24.2.5.1.2 . | |
| Select 1-Wire mode. | HDQ_CTRL_STATUS [0] MODE | 0x1 |
| Enable interrupt generation. | HDQ_CTRL_STATUS [6] INTERRUPTMASK | 0x1 |
| Initialize 1-Wire slave, check for slave presence. | See Section 24.2.5.3.3 . | |

Table 24-114. 1-Wire Write Operation Mode

| Step | Register/Bit Field/ Programming Model | Value |
|---|---|-------|
| Write ID/command or data value. | HDQ_TX_DATA [7:0] | 0x- |
| Select write operation. | HDQ_CTRL_STATUS [1] DIR | 0x0 |
| Start operation. | HDQ_CTRL_STATUS [4] GO | 0x1 |
| Wait for interrupt. | | |
| Reading HDQ_INT_STATUS clears interrupt conditions. | HDQ_INT_STATUS [2] TXCOMPLETE | 0x1 |

24.2.5.3.2 Main Sequence - 1-Wire Read Operation Mode

Table 24-115. 1-Wire Read Operation Mode

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Select read operation. | HDQ_CTRL_STATUS[1] DIR | 0x1 |
| Start operation. | HDQ_CTRL_STATUS[4] GO | 0x1 |
| Wait for interrupt. | | |
| Read and store HDQ_INT_STATUS. Reading HDQ_INT_STATUS clears interrupt conditions. | HDQ_INT_STATUS | 0x– |
| IF: Read operation successful? | HDQ_INT_STATUS[1] RXCOMPLETE | = 0x1 |
| Get received data. | HDQ_RX_DATA[7:0] | 0x– |
| ENDIF | | |

24.2.5.3.3 Sub-sequence - Initialize 1-Wire Slave

Table 24-116. Initialize 1-Wire Slave

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Select sending initialization pulse operation. | HDQ_CTRL_STATUS[2] INITIALIZATION | 0x1 |
| Start operation. | HDQ_CTRL_STATUS[4] GO | 0x1 |
| Wait for interrupt. | | |
| IF: Presence pulse detected? | HDQ_INT_STATUS[0] TIMEOUT | = 0x1 |
| | HDQ_CTRL_STATUS[3] PRESENCEDETECT | = 0x1 |
| Slave is present and initialized. | | |
| ELSE | | |
| Repeat initialization subsequence. | | |
| ENDIF | | |

24.2.6 HDQ/1-Wire Register Manual

24.2.6.1 HDQ/1-Wire Instance Summary

Table 24-117. HDQ/1-Wire Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|------|
| HDQ/1-Wire | 0x480B 2000 | 4KB |

24.2.6.2 HDQ/1-Wire Registers

CAUTION

The following rules must be observed when accessing the module registers:

- A read from the [HDQ_INT_STATUS](#) register or the [HDQ_RX_DATA](#) register is not allowed unless the processor has been interrupted by the module.
- After the release of the GO bit in the [HDQ_CTRL_STATUS](#) register, no access to the [HDQ_TX_DATA](#) or [HDQ_CTRL_STATUS](#) register is allowed until the processor has been interrupted by the module.
- Polling of the [HDQ_INT_STATUS](#) register by software to determine whether an interrupt was generated is not allowed.

CAUTION

The HDQ/1-Wire registers are limited to 32-bit data accesses; 16-bit and 8-bit data accesses are not allowed and can corrupt register content.

24.2.6.2.1 HDQ/1-Wire Register Summary

Table 24-118. HDQ/1-Wire Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | HDQ/1-Wire L4 Base Address |
|---------------------------------|------|-----------------------|----------------|----------------------------|
| HDQ_REVISION | R | 32 | 0x0000 0000 | 0x480B 2000 |
| HDQ_TX_DATA | RW | 32 | 0x0000 0004 | 0x480B 2004 |
| HDQ_RX_DATA | R | 32 | 0x0000 0008 | 0x480B 2008 |
| HDQ_CTRL_STATUS | RW | 32 | 0x0000 000C | 0x480B 200C |
| HDQ_INT_STATUS | R | 32 | 0x0000 0010 | 0x480B 2010 |
| HDQ_SYSCONFIG | RW | 32 | 0x0000 0014 | 0x480B 2014 |
| HDQ_SYSSTATUS | R | 32 | 0x0000 0018 | 0x480B 2018 |

24.2.6.2.2 HDQ/1-Wire Register Description

Table 24-119. HDQ_REVISION

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0000 | Instance | HDQ/1-Wire |
| Physical Address | 0x480B 2000 | | |
| Description | This register contains the IP revision code | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | REV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP revision | R | TI internal data |

Table 24-120. Register Call Summary for Register HDQ_REVISION

HDQ/1-Wire

- [HDQ/1-Wire Register Summary: \[0\]](#)

Table 24-121. HDQ_TX_DATA

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0004 | Instance | HDQ/1-Wire |
| Physical Address | 0x480B 2004 | | |
| Description | This register contains the data to be transmitted. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TX_DATA | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:8 | RESERVED | Reads returns 0 | R | 0x0000000 |
| 7:0 | TX_DATA | Transmit data (used in both HDQ and 1-Wire modes) | RW | 0x00 |

Table 24-122. Register Call Summary for Register HDQ_TX_DATA

HDQ/1-Wire

- [HDQ Protocol Initialization \(Default\): \[0\]](#)
- [1-Wire Single-Bit Mode Operation: \[1\]](#)
- [Main Sequence – HDQ Write Operation Mode: \[2\]](#)
- [Main Sequence - 1-Wire Write Operation Mode: \[3\]](#)
- [HDQ/1-Wire Registers: \[4\]](#)
- [HDQ/1-Wire Register Summary: \[5\]](#)

Table 24-123. HDQ_RX_DATA

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 0008 | Instance | HDQ/1-Wire |
| Physical Address | 0x480B 2008 | | |
| Description | This register contains the data to be received. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RX_DATA | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Reads returns 0 | R | 0x000000 |
| 7:0 | RX_DATA | Receive data (used in both HDQ and 1-Wire modes) | R | 0x00 |

Table 24-124. Register Call Summary for Register HDQ_RX_DATA

HDQ/1-Wire

- [Description: \[0\]](#)
- [1-Wire Single-Bit Mode Operation: \[1\]](#)
- [Main Sequence - HDQ Read Operation Mode: \[2\]](#)
- [Main Sequence - 1-Wire Read Operation Mode: \[3\]](#)
- [HDQ/1-Wire Registers: \[4\]](#)
- [HDQ/1-Wire Register Summary: \[5\]](#)

Table 24-125. HDQ_CTRL_STATUS

| | | | |
|-------------------------|---|-----------------|------------|
| Address Offset | 0x0000 000C | Instance | HDQ/1-Wire |
| Physical Address | 0x480B 200C | | |
| Description | This register provides status information about the module. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|---------------|----|-------------|----|----|---|----------------|---|----------------|---|-----|---|------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ONE_WIRE_SINGLE_BIT | | INTERRUPTMASK | | CLOCKENABLE | | GO | | PRESENCEDETECT | | INITIALIZATION | | DIR | | MODE | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|----------|
| 31:8 | RESERVED | Reads returns 0 | RW | 0x000000 |
| 7 | ONE_WIRE_SINGLE_BIT | Single-bit mode for 1-Wire 0x0: Disabled 0x1: Enabled | RW | 0 |
| 6 | INTERRUPTMASK | Interrupt masking bit 0x0: Interrupts disable 0x1: Interrupts enable | RW | 0 |
| 5 | CLOCKENABLE | Power-down mode bit 0x0: Clock disable (power down) 0x1: Clock enable | RW | 0 |
| 4 | GO | Go bit. Write 1 to start the appropriate operation. Bit returns to 0 after the operation is complete. | RW | 0 |
| 3 | PRESENCEDETECT | Slave presence indicator. Actual only just after initialization time-out. Used in 1-Wire mode. Read-only flag. 0x0: No slave detected 0x1: Slave detected | R | 0 |
| 2 | INITIALIZATION | Write 1 to send initialization pulse. Bit returns to 0 after pulse is sent. | RW | 0 |
| 1 | DIR | DIR bit, determines if next command is read or write 0x0: Write 0x1: Read | RW | 0 |
| 0 | MODE | Mode selection bit 0x0: HDQ mode 0x1: 1-Wire mode | RW | 0 |

Table 24-126. Register Call Summary for Register HDQ_CTRL_STATUS

HDQ/1-Wire

- HDQ Protocol Initialization (Default): [0] [1]
- HDQ/1-Wire Block Diagram: [2]
- HDQ/1-Wire Hardware and Software Reset: [3]
- HDQ/1-Wire Power Management: [4]
- Power-Down Mode: [5]
- HDQ Interrupt Requests: [6] [7] [8]
- Description: [9] [10]
- Single-Bit Mode: [11]
- Description: [12] [13] [14]
- 1-Wire Single-Bit Mode Operation: [15]
- Status Flags: [16]
- HDQ/1-Wire Module Global Initialization: [17] [18]
- Main Sequence – HDQ Write Operation Mode: [19] [20] [21] [22]
- Main Sequence - HDQ Read Operation Mode: [23] [24] [25] [26]
- Main Sequence - 1-Wire Write Operation Mode: [27] [28] [29] [30]
- Main Sequence - 1-Wire Read Operation Mode: [31] [32]
- Sub-sequence - Initialize 1-Wire Slave: [33] [34] [35]
- HDQ/1-Wire Registers: [36] [37]
- HDQ/1-Wire Register Summary: [38]

Table 24-127. HDQ_INT_STATUS

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0010 | Instance | HDQ/1-Wire |
| Physical Address | 0x480B 2010 | | |
| Description | This register controls interrupts status | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|------------|----|----|---------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TXCOMPLETE | | | RXCOMPLETE | | | TIMEOUT | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | Reads returns 0 | R | 0x0000 0000 |
| 2 | TXCOMPLETE | TX-complete interrupt flag. Set to 1 if cause of interrupt. Set to 0 when register read. | R | 0 |
| 1 | RXCOMPLETE | Read-complete interrupt flag. Set to 1 if cause of interrupt. Set to 0 when register read. | R | 0 |
| 0 | TIMEOUT | Presence detect/timeout interrupt flag. In 1-Wire mode, set to 1 if slave's presence detected. In HDQ mode, set to 1 if timeout on read occurs. Set to 0 when register read. | R | 0 |

Table 24-128. Register Call Summary for Register HDQ_INT_STATUS
HDQ/1-Wire

- [HDQ Interrupt Requests: \[0\] \[1\] \[2\]](#)
- [Description: \[3\] \[4\] \[5\]](#)
- [Interrupt Conditions: \[6\] \[7\] \[8\]](#)
- [Description: \[9\] \[10\]](#)
- [Interrupt Conditions: \[11\] \[12\] \[13\]](#)
- [Status Flags: \[14\]](#)
- [Main Sequence – HDQ Write Operation Mode: \[15\] \[16\]](#)
- [Main Sequence - HDQ Read Operation Mode: \[17\] \[18\] \[19\] \[20\] \[21\]](#)
- [Main Sequence - 1-Wire Write Operation Mode: \[22\] \[23\]](#)
- [Main Sequence - 1-Wire Read Operation Mode: \[24\] \[25\] \[26\] \[27\]](#)
- [Sub-sequence - Initialize 1-Wire Slave: \[28\]](#)
- [HDQ/1-Wire Registers: \[29\] \[30\]](#)
- [HDQ/1-Wire Register Summary: \[31\]](#)

Table 24-129. HDQ_SYSCONFIG

| | | | |
|-------------------------|-------------------------------------|-----------------|------------|
| Address Offset | 0x0000 0014 | Instance | HDQ/1-Wire |
| Physical Address | 0x480B 2014 | | |
| Description | This register controls various bits | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SOFTRESET | | AUTOIDLE | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:2 | RESERVED | Reads returns 0 | RW | 0x0000 0000 |
| 1 | SOFTRESET | Start soft reset sequence. 0x0: Disabled 0x1: Enabled | RW | 0 |
| 0 | AUTOIDLE | Interconnect idle. 0x0: Module clock is free-running. 0x1: Module is in power saving mode: Clock is running only when module is accessed or inside logic is in function to process events. | RW | 0 |

Table 24-130. Register Call Summary for Register HDQ_SYSCONFIG
HDQ/1-Wire

- [HDQ/1-Wire Hardware and Software Reset: \[0\]](#)
- [HDQ/1-Wire Power Management: \[1\]](#)
- [Auto-Idle Mode: \[2\]](#)
- [HDQ/1-Wire Module Global Initialization: \[3\] \[4\]](#)
- [HDQ/1-Wire Register Summary: \[5\]](#)

Table 24-131. HDQ_SYSSTATUS

| | | | |
|-------------------------|--|-----------------|------------|
| Address Offset | 0x0000 0018 | Instance | HDQ/1-Wire |
| Physical Address | 0x480B 2018 | | |
| Description | This register monitors the reset sequence. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESETDONE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reads returns 0 | R | 0x0000 0000 |
| 0 | RESETDONE | Reset monitoring. 0x0: The module is currently performing its reset. When the module is in power-down mode, set to 0 to indicate this fact. 0x1: The module has finished its reset. | R | 1 |

Table 24-132. Register Call Summary for Register HDQ_SYSSTATUS

HDQ/1-Wire

- [HDQ/1-Wire Module Global Initialization: \[0\]](#)
- [HDQ/1-Wire Register Summary: \[1\]](#)

24.3 UART/IrDA/CIR

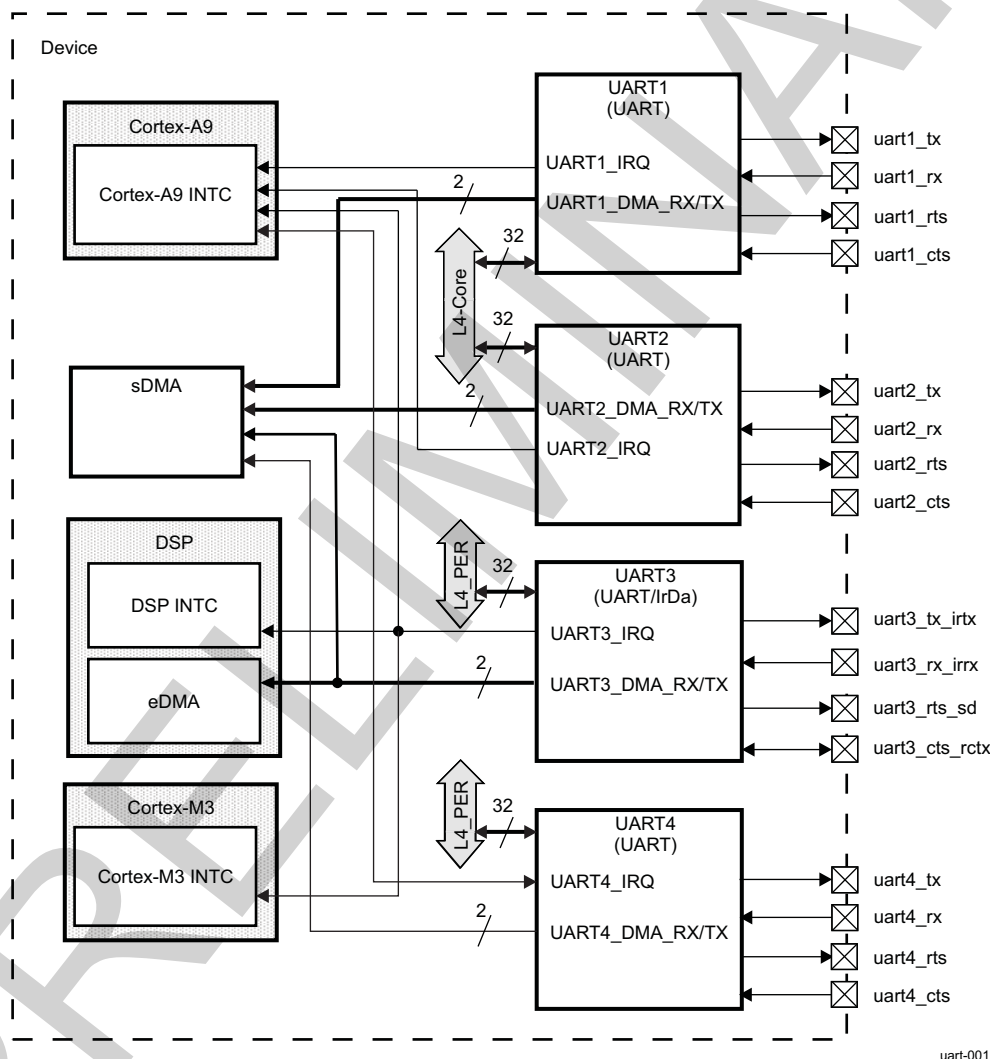
This chapter describes the function, operation, and configuration of the universal asynchronous receiver/transmitter (UART)/infrared data association (IrDA)/consumer infrared (CIR) module in the device.

24.3.1 UART/IrDA/CIR Overview

The device contains four UART devices controlled by the MPU (see Figure 24-51):

- Three UART-only modules (UART1, UART2, and UART4) are pinned out for use as UART devices only.
- UART3, which adds infrared communication support, is pinned out for use as a UART, IrDA, or CIR device, and can be programmed to any available operating mode.

Figure 24-51. UART Module



24.3.1.1 UART Features

The UARTs (UART1, UART2, UART3 when in UART mode, and UART4) include the following key features:

- 16C750 compatibility
- 64-byte FIFO buffer for receiver and 64-byte FIFO for transmitter
- Programmable interrupt trigger levels for FIFOs

- Baud generation based on programmable divisors N (N = 1...16,384) operating from a fixed functional clock of 48 MHz

Oversampling is programmed by software as 16 or 13; thus, the baud rate computation is one of two options:

- Baud rate = (functional clock/16)/N
- Baud rate = (functional clock/13)/N

This software programming mode enables higher baud rates with the same error amount without changing the clock source:

- Break character detection and generation
- Configurable data format:
 - Data bit: 5, 6, 7, or 8 bits
 - Parity bit: Even, odd, none
 - Stop-bit: 1, 1.5, 2 bit(s)
- Flow control: Hardware (RTS/CTS) or software (XON/XOFF)

The UART clocks are connected to produce a baud rate of up to 3.6 Mbps. [Table 24-133](#) lists the supported baud rates, the requested divisor, and the corresponding error versus the standard baud rate.

Table 24-133. UART Mode Baud Rates, Divisor Values, and Error Rates

| Baud Rate | Oversampling | Divisor | Error (%) |
|-----------|--------------|---------|-----------|
| 300 | 16 | 10,000 | 0 |
| 600 | 16 | 5000 | 0 |
| 1200 | 16 | 2500 | 0 |
| 2400 | 16 | 1250 | 0 |
| 4800 | 16 | 625 | 0 |
| 9600 | 16 | 312 | 0.16 |
| 14,400 | 16 | 208 | 0.16 |
| 19,200 | 16 | 156 | 0.16 |
| 28,800 | 16 | 704 | 0.16 |
| 38,400 | 16 | 78 | 0.16 |
| 57,600 | 16 | 52 | 0.16 |
| 115,200 | 16 | 26 | 0.16 |
| 230,400 | 16 | 13 | 0.16 |
| 460,800 | 13 | 8 | 0.16 |
| 921,600 | 13 | 4 | 0.16 |
| 1,843,200 | 13 | 2 | 0.16 |
| 3,000,000 | 16 | 1 | 0 |
| 3,686,400 | 13 | 1 | 0.16 |

24.3.1.2 IrDA Features

The IrDA (UART3 only) includes the following key features:

- Support of IrDA 1.4 slow infrared (SIR), medium infrared (MIR), and fast infrared (FIR) communications:
 - Frame formatting: Addition of variable beginning-of-frame (xBOF) characters and end-of-frame (EOF) characters
 - Uplink/downlink cyclic redundancy check (CRC) generation/detection
 - Asynchronous transparency (automatic insertion of break character)
 - Eight-entry status FIFO (with selectable trigger levels) to monitor frame length and frame errors
 - Framing error, CRC error, illegal symbol (FIR), and abort pattern (SIR, MIR) detection

Table 24-134 lists the supported baud rates, the requested divisor, and the corresponding error versus the standard baud rate.

Table 24-134. UART IrDA Mode Baud Rates, Divisor Values, and Error Rates

| Baud Rate | IR Mode | Encoding | Divisor | Error (%) |
|-----------|---------|----------------------|---------|-----------|
| 2400 | SIR | 3/16 | 1250 | 0 |
| 9600 | SIR | 3/16 | 312 | 0.16 |
| 19,200 | SIR | 3/16 | 156 | 0.16 |
| 38,400 | SIR | 3/16 | 78 | 0.16 |
| 57,600 | SIR | 3/16 | 52 | 0.16 |
| 115,200 | SIR | 3/16 | 26 | 0.16 |
| 576,000 | MIR | 1/4 | 2 | 0 |
| 1,152,000 | MIR | 1/4 | 1 | 0 |
| 4,000,000 | FIR | 4 PPM ⁽¹⁾ | 1 | 0 |

⁽¹⁾ PPM = pulse-position modulation

24.3.1.3 CIR Features

The CIR mode uses a variable pulse-width modulation (PWM) technique (based on multiples of a programmable t period) to encompass the various formats of infrared encoding for remote-control applications. The CIR logic transmits data packets based on a user-definable frame structure and packet content.

The CIR (UART3 only) includes the following key features to provide CIR support for remote-control applications:

- Transmit mode only (Receive mode is not supported.)
- Free data format (supports any remote-control private standards)
- Selectable bit rate
- Configurable carrier frequency
- 1/2, 5/12, 1/3, or 1/4 carrier duty cycle

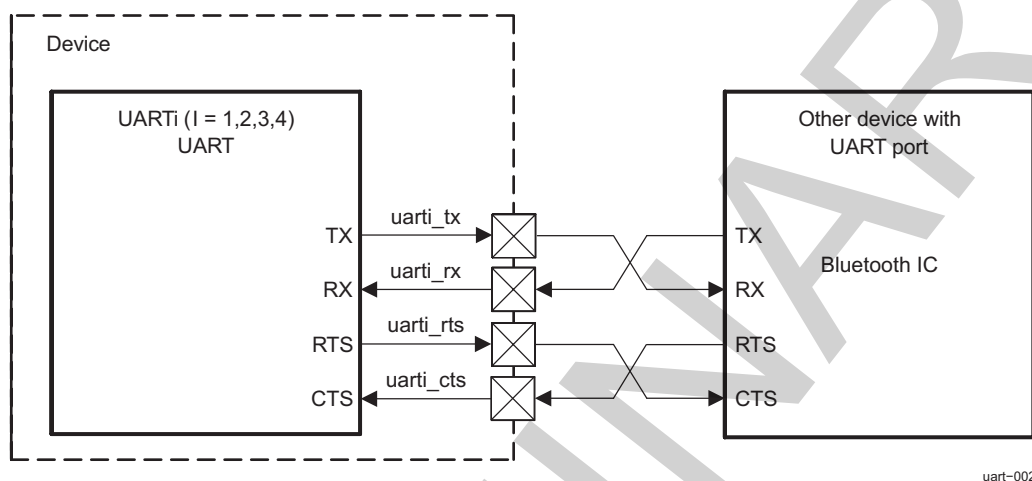
24.3.2 UART/IrDA/CIR Environment

This section describes the UART/IrDA/CIR connection with an external device.

24.3.2.1 System Using UART Communication With Hardware Handshake

Each UART instance can be easily connected to the UART port of an external IC (see [Figure 24-52](#)).

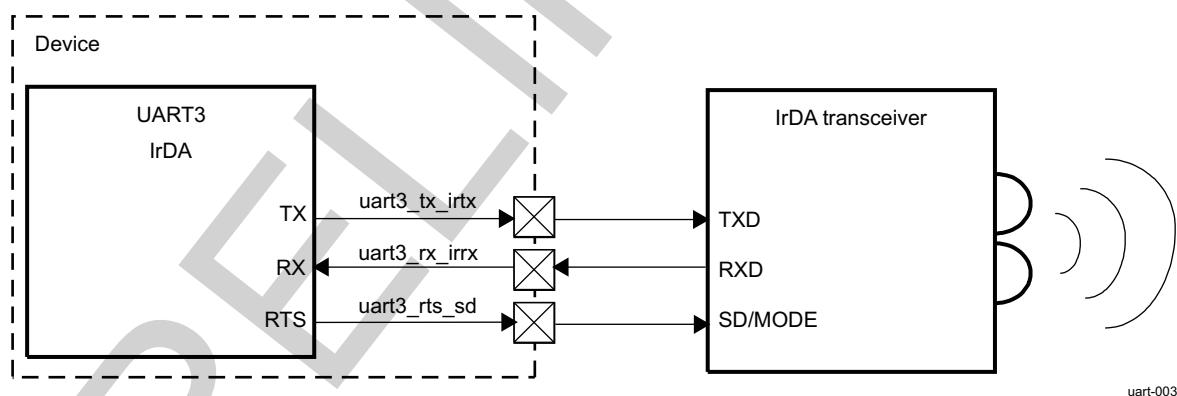
Figure 24-52. UART Mode Bus System Overview



24.3.2.2 System Using IrDA Communication Protocol

As [Figure 24-53](#) shows, UART3 can be connected to an external infrared transceiver in the IrDA modes (FIR, SIR, and MIR).

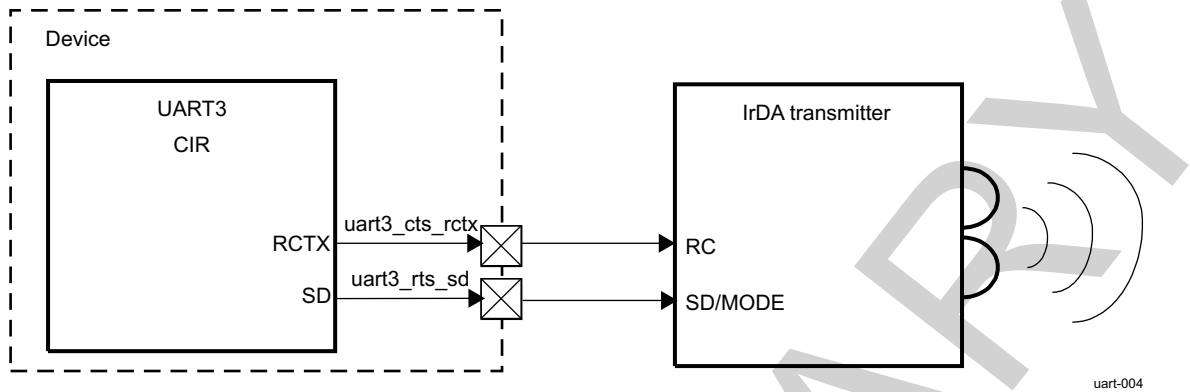
Figure 24-53. IrDA System Overview



24.3.2.3 System Using CIR Communication Protocol With Remote Control

UART3 can be connected to an external infrared transceiver in CIR mode (see [Figure 24-54](#)).

Figure 24-54. CIR System Overview



24.3.2.4 UART Interface

24.3.2.4.1 Description

Table 24-135 lists the UART interface input/output (I/O) signals.

Table 24-135. UART I/O Pins

| Signal | I/O ⁽¹⁾ | Description | Reset |
|---------------------------|--------------------|---|---------|
| UART Modem Signals | | | |
| uarti_rx | I | Serial data input | Unknown |
| uarti_tx | O | Serial data output | 1 |
| | | Because this pin is active high in IrDA mode and the output is muxed, this pin is set to low on reset (when the UARTi.UART_MDR1[2:0] bit field is set to 0x7) and takes the defined inactive level of that signal corresponding to when and how the UARTi.UART_MDR1 register is programmed; that is, the output is 1 (inactive for UART modem modes) and 0 (inactive for IrDA modes). | |
| uarti_cts | I | Clear to send | Unknown |
| | | Active-low modem status signal. Reading the UARTi.UART_MSR[4] NCTS_STS bit checks the condition of uarti_cts. Reading the UARTi.UART_MSR[0] CTS_STS bit checks a change of state of uarti_cts since the last read of the modem status register. The auto-nCTS mode uses uarti_cts to control the transmitter. | |
| uarti_rts | O | Request to send | 1 |
| | | When active (low), the module is ready to receive data. Setting the UARTi.UART_MCR[1] RTS bit activates uarti_rts, which becomes inactive as the result of a module reset, loopback mode, or clearing the UARTi.UART_MCR[1] RTS bit. In auto-RTS mode, uarti_rts becomes inactive as a result of the receiver threshold logic. | |

⁽¹⁾ I = Input; O = Output

24.3.2.4.2 UART Protocol and Data Format

The UART device operates in three modes:

- UART 16x (= 230.4 kbps)
- UART 16x with autobauding (= 1200 bps and = 115.2 kbps)
- UART 13x (= 460.8 kbps)

CAUTION

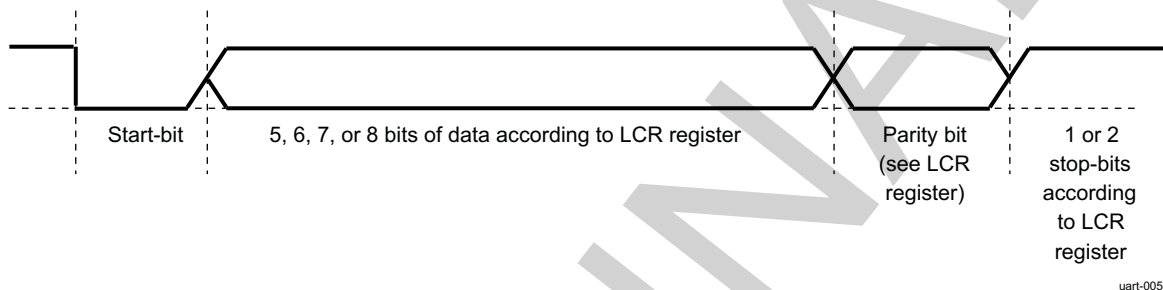
To be used as a UART, the operating mode must be programmed appropriately in the UARTi.UART_MDR1[2:0] MODE_SELECT bit field to select UART, IrDA, or CIR mode.

The UART uses a wired interface for serial communication with a remote device.

The UART is functionally compatible with the TL16C750 UART and earlier designs such as the TL16C550.

Figure 24-55 shows the UART frame data format.

Figure 24-55. UART Frame Data Format



24.3.2.5 IrDA Functional Interfaces

24.3.2.5.1 UART3 Interface Description

Table 24-136 lists the UART3 interface I/O signals.

Table 24-136. UART3 I/O Signals

| Signal | I/O ⁽¹⁾ | Description | Reset |
|---------------------|--------------------|---|---------|
| IrDA Signals | | | |
| uart3_rx_irrx | I | Serial data input | Unknown |
| uart3_tx_irtx | O | Serial data output in IrDA modes (SIR, MIR, and FIR). In other modes, this pin is set to the reset value (inactive state). | 0 |
| uart3_rts_sd | O | SD mode is used to configure the transceivers. The SD pinout is an inverted value of the UART3.UART_ACREG[6] SD_MOD bit. | 1 |

⁽¹⁾ I = Input; O = Output

24.3.2.5.2 IrDA Protocol and Data Format

24.3.2.5.2.1 SIR Mode

In SIR mode, data is transferred between the MPU and peripheral devices at speeds of up to 115,200 baud. A SIR transmit frame begins with start flags (a single 0xC0, a multiple 0xC0, or a single 0xC0 preceded by a number of 0xFF flags), is followed by frame data and a CRC-16, and ends with a stop flag (0xC1).

The bit format for a single word uses 1 start-bit, 8 data bits, and 1 stop-bit, and is unaffected by the use and settings of the UART3.UART_LCR register.

The UART3.UART_BLR[6] XBOF_TYPE bit selects whether the 0xC0 or 0xFF start patterns are used when multiple start flags are required.

The SIR transmit state-machine attaches start flags, CRC-16, and stop flags, and checks the outgoing data to establish whether data transparency is required.

SIR transparency is carried out if the outgoing data between the start and stop flags contains 0xC0, 0xC1, or 0x7D. If one of these start flags is about to be transmitted, the SIR state-machine first sends an escape character (0x7D), then inverts the fifth bit of the real data to be sent and sends this data immediately after the 0x7D character.

The SIR receive state-machine recovers the receive clock, removes the start flags and any transparency from the incoming data, and determines the frame boundary with reception of the stop flag. The SIR state-machine also checks for errors such as a frame abort (0x7D character followed immediately by a 0xC1 stop flag without transparency), a CRC error, or a frame-length error. At the end of a frame reception, the MPU reads the line status register (UART3.UART_LSR) to find possible errors of the received frame.

NOTE: The module can transmit and receive data, but when the device is transmitting, the IR RX circuitry is automatically disabled by hardware. See the description of the UART3.UART_ACREG[5] DIS_IR_RX bit. This applies to all three modes: SIR, MIR, and FIR.

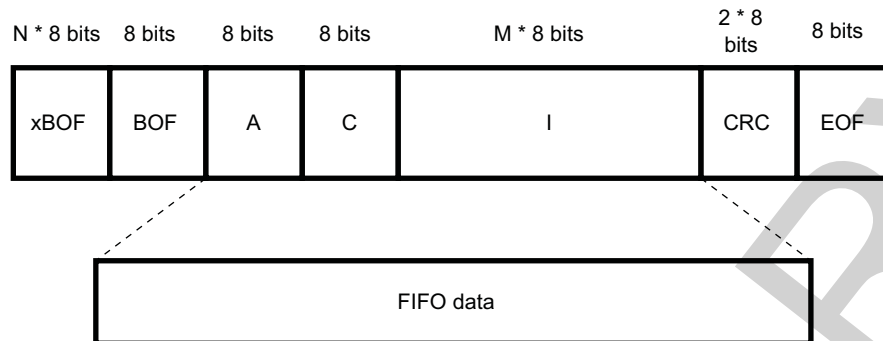
Infrared output in SIR mode can be 1.6-μs or 3/16 encoding, selected by the UART3.UART_ACREG[7] PULSE_TYPE bit. In 1.6-μs encoding, the infrared pulse width is 1.6 μs; and in 3/16th encoding, the infrared pulse width is 3/16th of a bit duration (1/ baud rate).

For back-to-back frames, the transmitting device must send at least two start flags at the start of each frame.

NOTE: Reception supports variable-length stop-bits.

24.3.2.5.2.1.1 Frame Format

Figure 24-56 shows the IrDA SIR frame format.

Figure 24-56. IrDA SIR Frame Format

The CRC is applied on the address (A), control (C), and information (I) bytes.

NOTE: The two words of CRC are written to the FIFO in reception.

24.3.2.5.2.1.2 Asynchronous Transparency

Before transmitting a byte, the UART IrDA controller examines each byte of the payload and the CRC field (between BOF and EOF). For each byte equal to 0xC0 (BOF), 0xC1 (EOF), or 0x7D (control escape), the controller performs certain tasks:

- In transmission:

- Inserts a control escape (CE) byte preceding the byte
- Complements bit 5 of the byte (that is, exclusive ORs the byte with 0x20)

The byte sent for the CRC computation is the initial byte written in the TX FIFO (before the XOR with 0x20).

- In reception:

For the A, C, I, CRC field:

- Compares the byte with the CE byte; if they are not equal, sends the byte to the CRC detector and stores it in the RX FIFO.
- If the byte is equal to the CE byte, discards the CE byte
- Complements bit 5 of the byte following the CE
- Sends the complemented byte to the CRC detector and stores it in the RX FIFO

24.3.2.5.2.1.3 Abort Sequence

The transmitter can prematurely close a frame (abort) by sending the sequence 0x7DC1. The abort pattern closes the frame without a CRC field or an ending flag.

When a 0x7D character that is followed immediately by a 0xC1 character is received without transparency, the receiver treats the frame as an aborted frame.

24.3.2.5.2.1.4 Pulse Shaping

The SIR mode supports the 3/16 and the 1.6-us pulse duration methods in receive and transmit. The UART3.UART_ACREG[7] PULSE_TYPE bit selects the pulse-width method in transmit mode.

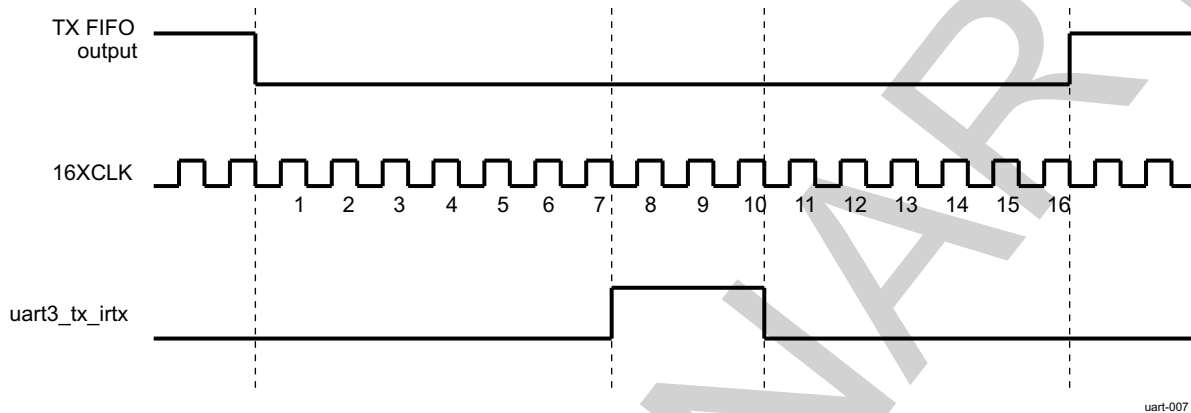
24.3.2.5.2.1.5 Encoder

Serial data from the transmit state-machine are encoded to transmit data to the optoelectronics. While the TX FIFO output is high, the uart3_tx_irtx line is always low, and the counter used to form a pulse on uart3_tx_irtx is cleared continuously.

After the TX FIFO output resets to 0, `uart3_tx_irtx` rises on the falling edge of the seventh 16XCLK. On the falling edge of the tenth 16XCLK pulse, `uart3_tx_irtx` falls, creating a 3-clock-wide pulse. While the TX FIFO output stays low, a pulse is transmitted during the seventh to the tenth clock of each 16-clock bit cycle.

Figure 24-57 shows the IrDA SIR encoding mechanism.

Figure 24-57. IrDA SIR Encoding Mechanism



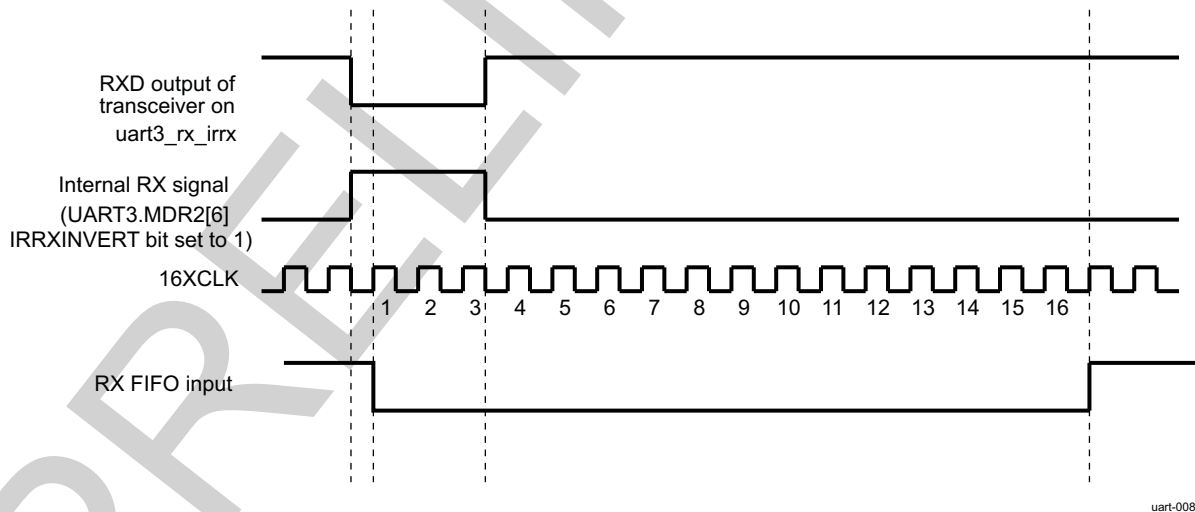
uart-007

24.3.2.5.2.1.6 Decoder

After reset, the RX FIFO input is high and the 4-bit counter is cleared. When a rising edge is detected on RX, the RX FIFO input falls on the next rising edge of 16XCLK with sufficient setup time. The RX FIFO input stays low for 16 cycles (16XCLK) and then returns to high as required by the IrDA specification. As long as no pulses (rising edges) are detected on the RX, the RX FIFO input remains high.

Figure 24-58 shows the IrDA SIR decoding mechanism.

Figure 24-58. IrDA SIR Decoding Mechanism



uart-008

The module can transmit and receive data, but when the device is transmitting, the IR RX circuitry is automatically disabled by hardware. The operation of the `uart3_rx_irrx` input can be disabled using the `UART3.UART_ACREG[5] DIS_IR_RX` bit. The `UART3.UART_MDR2[6] IRRXINVERT` bit can invert the signal from the transceiver (RXD) pin to the IR RX logic in the UART. This inversion is performed by default.

24.3.2.5.2.1.7 IR Address Checking

In all IR modes, when address checking is enabled by setting the `UART_EFR[1:0]` bit field (see [Table 24-137](#)), only frames intended for the device are written to the RX FIFO. This is to avoid receiving frames not meant for this device in a multipoint infrared environment. To program two frame addresses that the UART3 receives in IrDA mode, use the `UART3.UART_XON1_ADDR1[7:0]` and `UART3.UART_XON2_ADDR2[7:0]` bit fields.

Table 24-137. UART_EFR[1:0] IR Address Checking Options

| UART_EFR[1] | UART_EFR[0] | IR Address Checking |
|-------------|-------------|--|
| 0 | 0 | All address-checking operations disabled |
| 0 | 1 | Only address 1 checking enabled |
| 1 | 0 | Only address 2 checking enabled |
| 1 | 1 | All address-checking operations enabled |

24.3.2.5.2.2 SIR Free-Format Mode

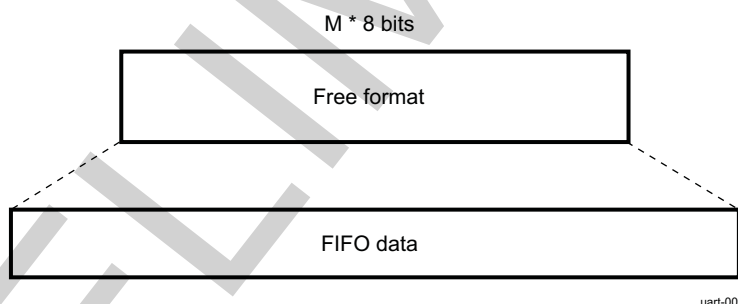
To allow complete software flexibility when transmitting and receiving infrared data packets, the SIR free-format (FF) mode is a subfunction of the existing SIR mode. In FF mode, all frames going to and from the FIFO buffers are untouched with respect to appending and removing control characters and CRC values.

The FF mode corresponds to a UART mode with a pulse modulation of 3/16 of baud rate pulse width.

For example, a normal SIR packet has BOF control and CRC error-checking data appended (transmitting) or removed (receiving) from the data going to and from the FIFOs.

[Figure 24-59](#) shows SIR FF mode.

Figure 24-59. SIR FF Mode

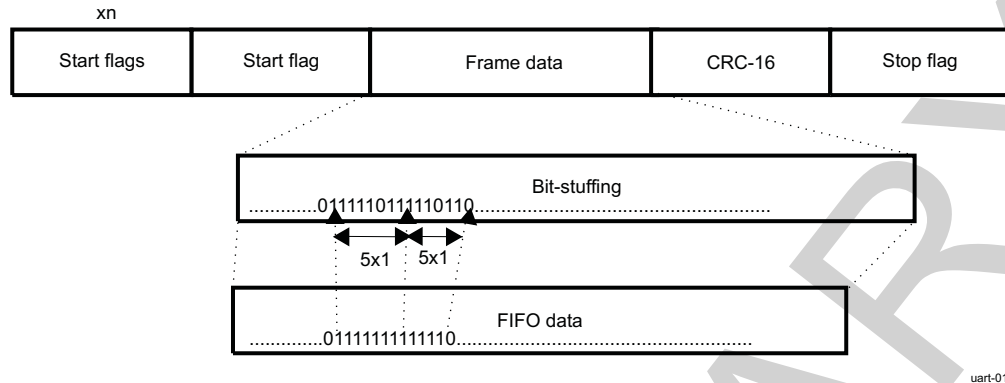


In SIR FF mode, the MPU software must construct (that is, encode and decode) the entire FIFO data packet.

24.3.2.5.2.3 MIR Mode

In MIR mode, data is transferred between the MPU and the peripheral devices at 0.576 or 1.152 Mbps speed. A MIR transmit frame starts with at least two start flags followed by a frame data and a CRC-16, and ends with a stop flag (see [Figure 24-60](#)).

Figure 24-60. MIR Transmit Frame Format



On transmit, the MIR state-machine attaches start flags, a CRC-16, and stop flags, as in SIR mode. All fields are transmitted LSB of each byte first.

In MIR mode:

- The state-machine looks for consecutive 1s in the frame data and automatically inserts 0 after five consecutive 1s (this is called bit-stuffing).
- 0x7E is used for start and stop flags (unambiguously, not data, because of bit-stuffing).
- An abort sequence requires a minimum of seven consecutive 1s (unambiguously, not data, because of bit-stuffing).
- Back-to-back frames are allowed with three or more stop flags between them. If two consecutive frames are not back to back, the gap between the last stop flag of the first frame and the start flag of the second frame must be separated by at least seven bit durations.

On receive, the MIR receive state-machine recovers the receive clock, removes the start flags, destuffs the incoming data, and determines the frame boundary with reception of the stop flag. The state-machine also checks for errors such as frame abort, CRC error, and frame-length error. At the end of a frame reception, the MPU reads the line status register (UART3.UART_LSR) to detect errors of the received frame.

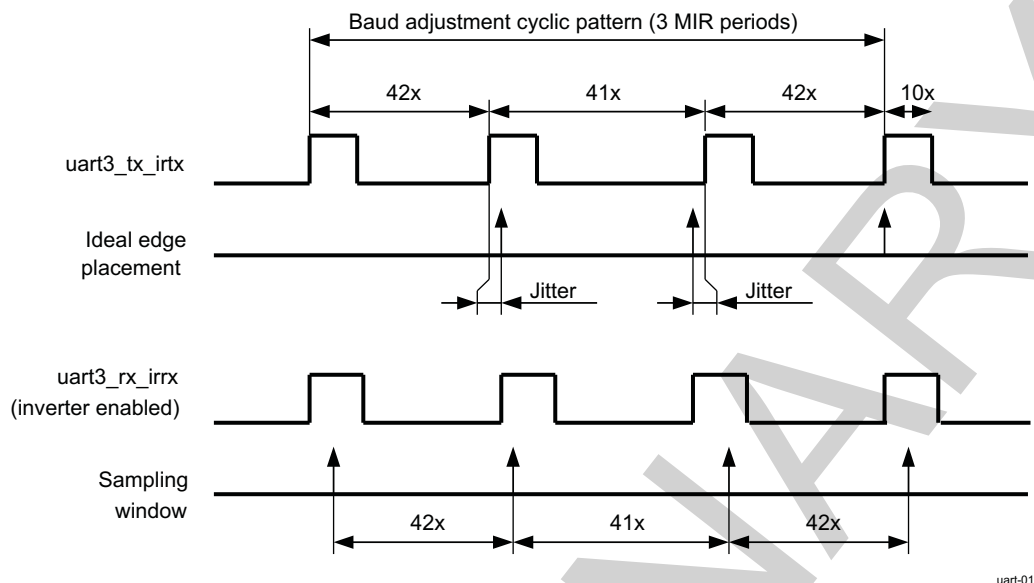
The module can transmit and receive data, but when the device is transmitting, the IR RX circuitry is automatically disabled by hardware.

24.3.2.5.2.3.1 MIR Encoder/Decoder

To meet the MIR baud rate tolerance of 0.1 percent with a 48-MHz clock input, a 42-41-42 encoding/decoding adjustment is performed. The reference start point is the first start flag, and the 42-41-42 cyclic pattern is repeated until the stop flag is sent or detected.

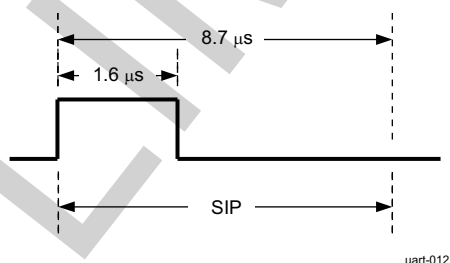
The jitter created this way is within MIR tolerances. The pulse width is not exactly 1/4, but it is within the tolerances defined by IrDA specifications.

Figure 24-61 shows the MIR baud rate adjustment mechanism.

Figure 24-61. MIR Baud Rate Adjustment Mechanism**24.3.2.5.2.3.2 SIP Generation**

In the MIR and FIR operation modes, the transmitter must send a serial infrared interaction pulse (SIP) at least once every 500 ms. The SIP informs slow devices (operating in SIR mode) that the medium is occupied.

Figure 24-62 shows the SIP.

Figure 24-62. SIP**24.3.2.5.2.4 FIR Mode**

In FIR mode, data is transferred between the MPU and the peripheral devices at 4 Mbps. A FIR transmit frame starts with a preamble that is followed by a start flag, frame data, CRC-32, and ends with a stop flag.

Figure 24-63 shows the FIR transmit frame format.

Figure 24-63. FIR Transmit Frame Format

| | | | | |
|-------------------|------------|------------|--------|-----------|
| Preamble (16x) | Start flag | Frame data | CRC-32 | Stop flag |
|-------------------|------------|------------|--------|-----------|

On transmit, the FIR transmit state-machine attaches the preamble, start flag, CRC-32, and stop flag. An abort sequence requires at least two transmissions of 0000. Back-to-back frames are allowed, but each frame must be complete.

The state-machine also encodes the transmit data into 4-PPM format (see [Table 24-138](#)) and generates the SIP (see [Section 24.3.2.5.2.3.2, SIP Generation](#)).

Table 24-138. 4-PPM Format

| Data Bit Pair (Bin) | 4-PPM Data Symbol (Bin) |
|---------------------|-------------------------|
| 00 | 1000 |
| 01 | 0100 |
| 10 | 0010 |
| 11 | 0001 |

The four symbols described in [Table 24-138](#) are the legal, encoded data symbols. All other combinations are illegal for encoding data. Some of these illegal symbols are used in the definition of the preamble, start flag, and stop flag because they are unambiguously not data (see [Table 24-139](#)).

Table 24-139. FIR Preamble, Start Flag, and Stop Flag

| Frame Part | Transmitted Frame (Bin) |
|------------|---|
| Preamble | 1000 0000 1010 1000 (16 repeated transmissions) |
| Start flag | 0000 1100 0000 1100 0110 0000 0110 0000 |
| Stop flag | 0000 1100 0000 1100 0000 0110 0000 0110 |

All fields are transmitted the LSBs of each byte first (see [Table 24-140](#)).

Table 24-140. FIR Data Byte Transmission Order Example

| Data Byte (Hex) | Data Byte Pair (Bin) | 4-PPM Data Symbol (Bin) | Transmission Order |
|-----------------|----------------------|-------------------------|--------------------|
| 0x0B | 00 | 1000 | 4 |
| | 00 | 1000 | 3 |
| | 10 | 0010 | 2 |
| | 11 | 0001 | 1 |

On receive, the FIR receive state-machine recovers the receive clock, removes the preamble and the start flag, decodes the 4-PPM incoming data, and determines the frame boundary with reception of the stop flag. The state-machine also checks for errors such as illegal symbol, CRC error, and frame-length error. At the end of a frame reception, the MPU reads the line status register (UART3.UART_LSR) to detect errors of the received frame.

The module can transmit and receive data, but when the device is transmitting, the IR RX circuitry is automatically disabled by hardware.

24.3.2.6 CIR Functional Interfaces

24.3.2.6.1 CIR Interface Description

[Table 24-141](#) lists the CIR interface I/O signals.

Table 24-141. CIR I/O Signals

| Signal | I/O ⁽¹⁾ | Description | Reset |
|--------------------|--------------------|--|---------|
| CIR Signals | | | |
| uart3_rx_irrx | I | Serial data input | Unknown |
| uart3_cts_rctx | O | Serial data output in CIR mode. In other modes, this pin is set to the reset value (inactive state). | 0 |

⁽¹⁾ I = Input; O = Output

Table 24-141. CIR I/O Signals (continued)

| Signal | I/O ⁽¹⁾ | Description | Reset |
|--------------|--------------------|---|-------|
| uart3_rts_sd | O | SD mode is used to configure the transceivers. The SD pinout is an inverted value of the UART3.UART_ACREG[6] SD_MOD bit. | 1 |

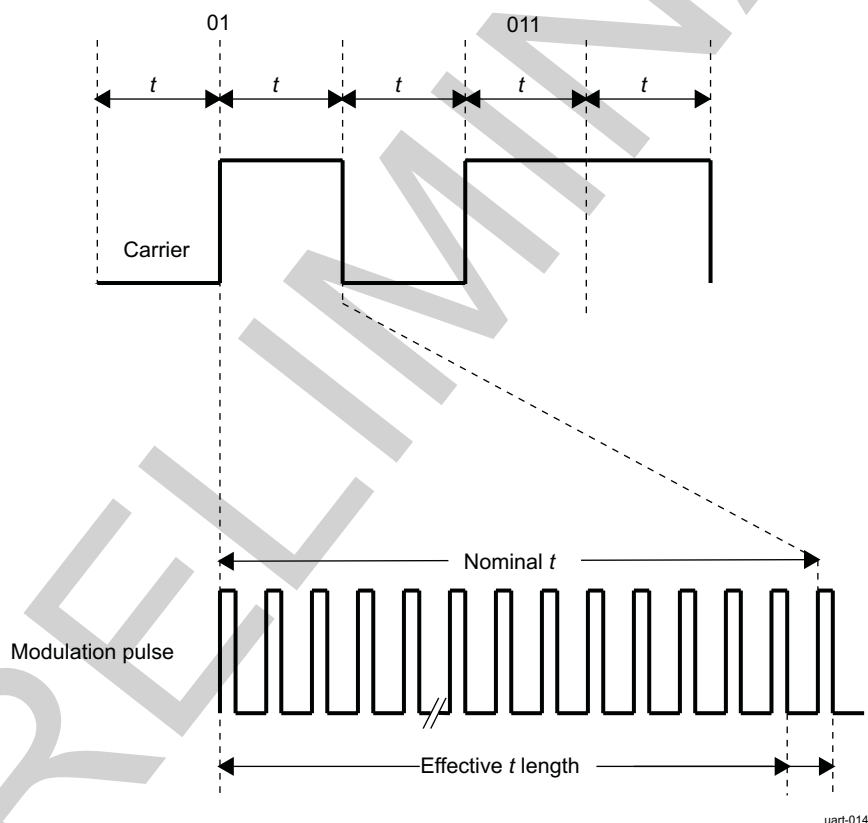
24.3.2.6.2 CIR Protocol and Data Format

In CIR mode, the infrared operation functions as a programmable (universal) remote control.

CIR mode uses a variable PWM technique (based on multiples of a programmable t period) to encompass the various formats of infrared encoding for remote-control applications. The CIR logic transmits data packets based on user-defined frame structure and packet content.

24.3.2.6.2.1 Carrier Modulation

Each modulated pulse that constitutes a digit is a train of on/off pulses (see [Figure 24-64](#)).

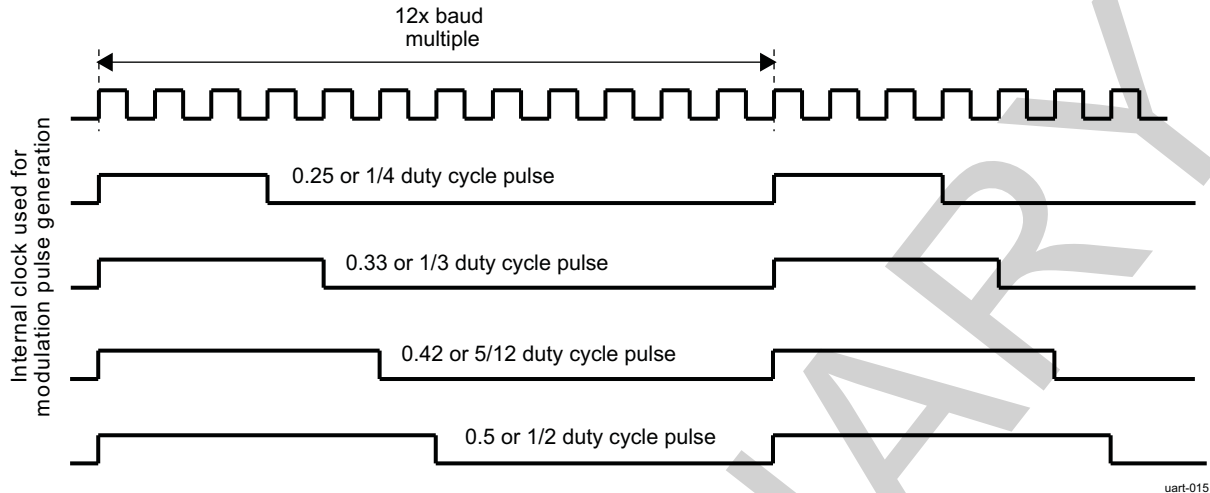
Figure 24-64. CIR Pulse Modulation

24.3.2.6.2.2 Pulse Duty Cycle

The programmer can choose one of four duty cycles for modulation pulses by setting the appropriate value in the UART3.UART_MDR2[5:4] CIR_PULSE_MODE bit field (1/4, 1/3, 5/12, or 1/2).

[Figure 24-65](#) shows the CIR modulation duty cycles.

Figure 24-65. CIR Modulation Duty Cycle



The transmission logic ensures that all pulses are transmitted completely (no cutoff during transmission). While transmitting continuous bytes back-to-back, no delay is inserted between 2 transmitted bytes. Thus, software must handle the delay between consecutively transmitted bytes if the receiving end requires it.

24.3.2.6.2.3 Consumer IR Encoding/Decoding

There are two methods of encoding for remote-control applications:

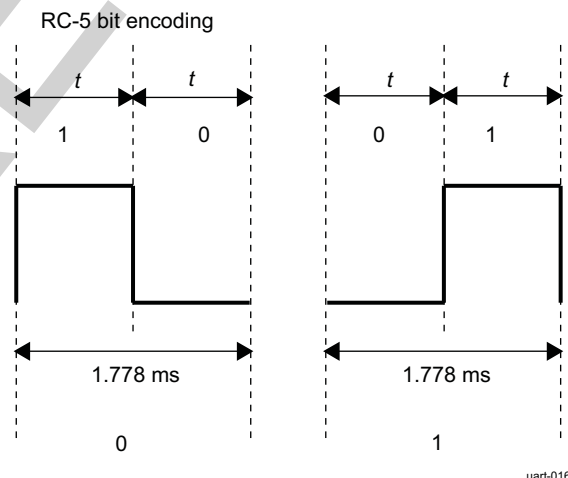
- Pulse duration encoding (time-extended bit forms): A variable pulse distance, or duration, in which the difference between logic 1 and logic 0 is the length of the pulse width
- Biphase encoding: The encoding of logic 0 and logic 1 is in the change of signal level from 1 to 0 or 0 to 1, respectively.

Japanese manufacturers favor pulse duration encoding; European manufacturers favor biphase encoding.

The CIR mode uses a completely flexible free-format encoding in which 1 is transmitted from the TX FIFO as a modulated pulse with duration t .

Similarly, 0 is transmitted as a blank duration T . The MPU constructs and deciphers the protocol of the data. For example, the RC-5 protocol using Manchester encoding can be emulated as using a 01 pair for 1 and a 10 pair for 0 (see [Figure 24-66](#)).

Figure 24-66. RC-5 Bit Encoding

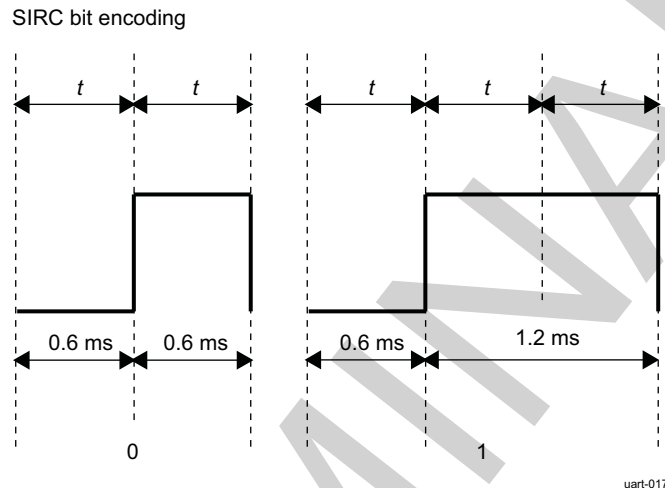


Because CIR mode logic does not impose a fixed format for infrared packets of data, the MPU software can define the format using simple data structures that are then modulated into an industry standard, such as RC-5 or SIRC. To send a sequence of 0101 in RC-5, the MPU software must write an 8-bit binary character of 10011001 to the data FIFO of the UART.

For SIRC, the modulation length (multiples of t) is used to distinguish between 1 and 0. The subsequent SIRC digits show the difference in encoding between this and, for example, RC-5. The pulse width is extended for one digit.

Figure 24-67 shows SIRC bit encoding.

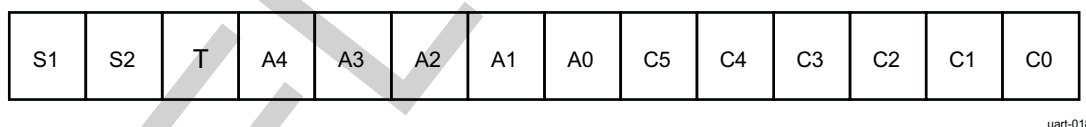
Figure 24-67. SIRC Bit Encoding



To construct comprehensive packets constituting remote-control commands, the MPU software must combine a number of 8-bit data characters in a sequence that follows one of the universally accepted formats.

Figure 24-68 shows a standard RC-5 frame as detected by UART3 in CIR mode (the SIRC format follows this). Each field in RC-5 can be considered as two t pulses (digital bits) from the TX FIFO.

Figure 24-68. RC-5 Standard Packet Format



Where:

- S1, S2: Start-bits (always 1)
- T: Toggle bit
- A4..A0: Address (or system) bits
- C5..C0: Command bits

The toggle bit T changes when a new command is transmitted to detect when the same key is pressed twice (effectively receiving the same data from the host consecutively). A brief delay in the transmission of the same command is detected by the use of the toggle bit because a code is sent while the MPU transmits characters to the UART for transmission. The address bits define the machine or device for which the infrared transmission is intended, and the command defines the operation.

To accommodate an extended RC-5 format, the S2 bit is replaced by an additional command bit (C6) that lets the command range increase to 7 bits. This format is known as the extended RC-5 format.

SIRC encoding uses the duration of modulation for mark and space; therefore, the duration of data bits in the standard frame length varies.

Figure 24-69 shows the packet format and bit encoding. As Figure 24-70 shows, 1 start-bit of 2.4 ms and control codes are followed by data that constitute the entire frame.

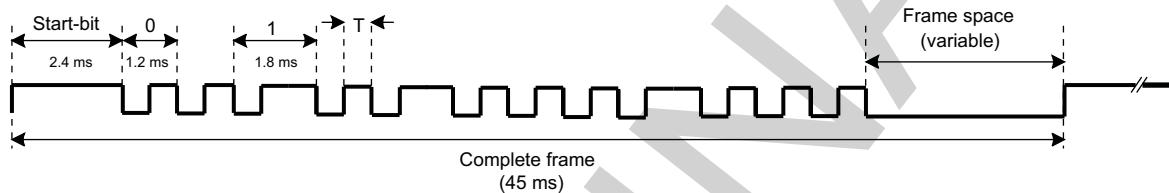
Figure 24-69. SIRC Packet Format



uart-019

NOTE: The encoding must take a standard duration, but the contents of the data can vary. This implies that the control software for sending and receiving data packets must exercise a scheme of interpacket delay, where successive packets can be sent only after a real-time delay expires.

Figure 24-70. SIRC Bit Transmission Example



uart-020

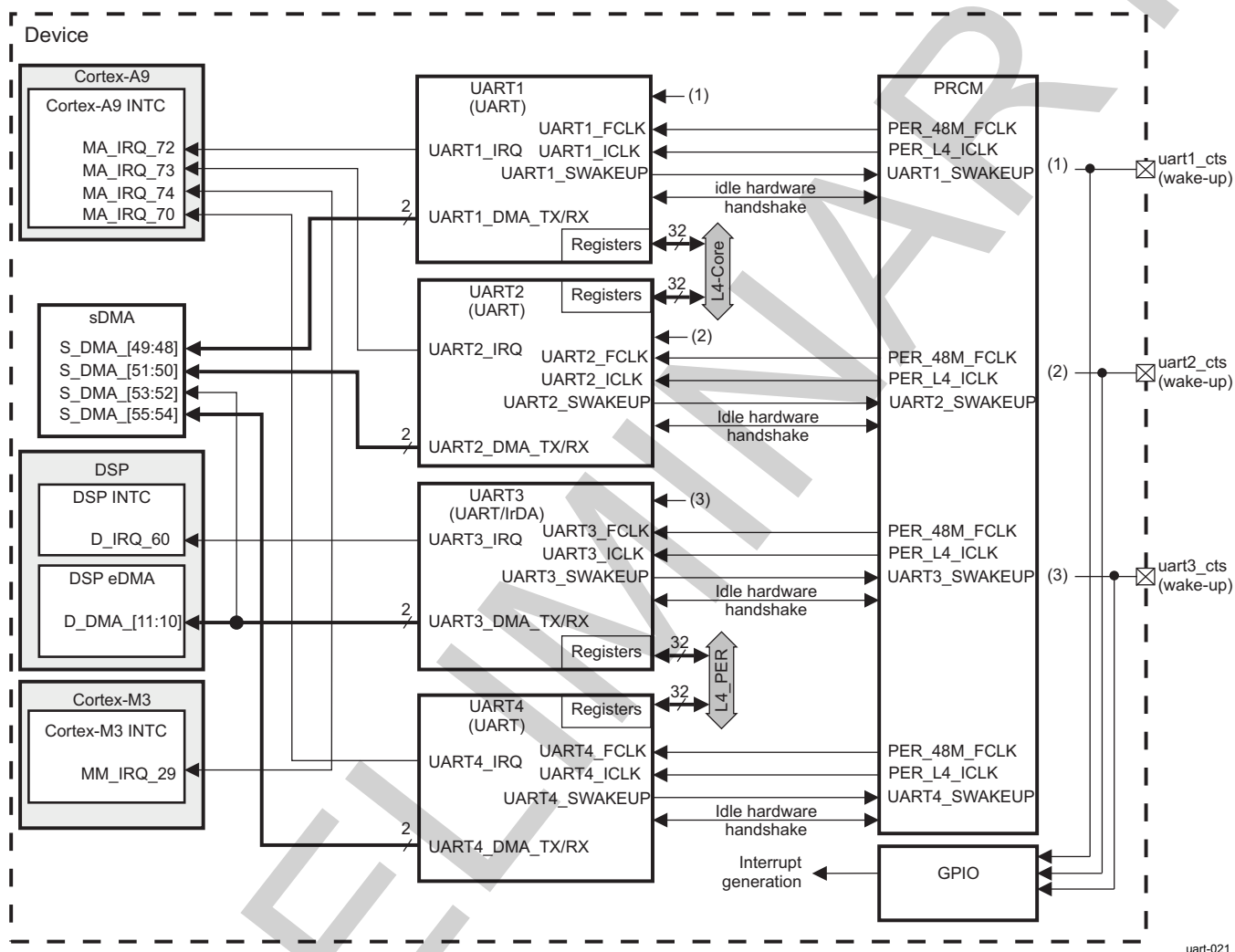
This document does not describe all encoding methods and techniques; the previous information discusses the considerations required to employ different encoding methods for different industry-standard protocols. See industry-standard documentation for specific methods of encoding and protocol use.

24.3.3 UART/IrDA/CIR Integration

This section describes module integration in the device, including information about clocks, resets, and hardware requests.

Figure 24-71 shows the device internal connections with related modules for UART functions.

Figure 24-71. UART/IrDA/CIR Integration



NOTE: For more information about the idle and standby hardware handshakes and the wake-up request, see *Clock Domain-Level Clock Management*, in [Chapter 3, Power, Reset, and Clock Management](#).

Table 24-142 through Table 24-144 summarize the integration of the module in the device.

Table 24-142. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| UART1 | PD_L4_PER | Yes | L4_PER |
| UART2 | PD_L4_PER | Yes | L4_PER |
| UART3 | PD_L4_PER | Yes | L4_PER |
| UART4 | PD_L4_PER | Yes | L4_PER |

Table 24-143. Clocks and Resets

| Clocks | | | | |
|-----------------|--------------------|---------------|--------|------------------------|
| Module Instance | Destination Signal | Source Signal | Source | Description |
| UART1 | UART1_ICLK | PER_L4_ICLK | PRCM | UART1 interface clock |
| | UART1_FCLK | PER_48M_FCLK | PRCM | UART1 functional clock |
| UART2 | UART2_ICLK | PER_L4_ICLK | PRCM | UART2 interface clock |
| | UART2_FCLK | PER_48M_FCLK | PRCM | UART2 functional clock |
| UART3 | UART3_ICLK | PER_L4_ICLK | PRCM | UART3 interface clock |
| | UART3_FCLK | PER_48M_FCLK | PRCM | UART3 functional clock |
| UART4 | UART4_ICLK | PER_L4_ICLK | PRCM | UART4 interface clock |
| | UART4_FCLK | PER_48M_FCLK | PRCM | UART4 functional clock |
| Resets | | | | |
| Module Instance | Destination Signal | Source Signal | Source | Description |
| UART1 | UART1_RST | L4_PER_RST | PRCM | UART1 reset signal |
| UART2 | UART2_RST | L4_PER_RST | PRCM | UART2 reset signal |
| UART3 | UART3_RST | L4_PER_RST | PRCM | UART3 interface reset |
| UART4 | UART4_RST | L4_PER_RST | PRCM | UART4 reset |

Table 24-144. Hardware Requests

| Interrupt Requests | | | | |
|-------------------------------------|---------------|--------------------|-------------|--|
| Module Instance | Source Signal | Destination Signal | Destination | Description |
| UART1 | UART1_IRQ | MA_IRQ_72 | Cortex-A9 | UART module 1 |
| UART2 | UART2_IRQ | MA_IRQ_73 | Cortex-A9 | UART module 2 |
| UART3 | UART3_IRQ | D_IRQ_60 | DSP | UART module 3 (also infrared) |
| | UART3_IRQ | MA_IRQ_74 | Cortex-A9 | UART module 3 (also infrared) |
| | UART3_IRQ | MM_IRQ_29 | Cortex-M3 | UART module 3 (also infrared) |
| UART4 | UART4_IRQ | MA_IRQ_70 | Cortex-A9 | UART module 4 |
| Direct Memory Access (DMA) Requests | | | | |
| Module Instance | Source Signal | Destination Signal | Destination | Description |
| UART1 | UART1_DMA_TX | S_DMA_48 | sDMA | UART module 1 – transmit request |
| | UART1_DMA_RX | S_DMA_49 | sDMA | UART module 1 – receive request |
| UART2 | UART2_DMA_TX | S_DMA_50 | sDMA | UART module 2 – transmit request |
| | UART2_DMA_RX | S_DMA_51 | sDMA | UART module 2 – receive request |
| UART3 | UART3_DMA_TX | S_DMA_52 | sDMA | UART module 3 – transmit request (also infrared) |
| | UART3_DMA_RX | S_DMA_53 | sDMA | UART module 3 – receive request (also infrared) |
| | UART3_DMA_TX | D_DMA_10 | dDMA | UART module 3 – transmit request [0] |
| | UART3_DMA_RX | D_DMA_11 | dDMA | UART module 3 – receive request [0] |
| UART4 | UART4_DMA_TX | S_DMA_54 | sDMA | UART module 4 – transmit request |
| | UART4_DMA_RX | S_DMA_55 | sDMA | UART module 4 – receive request |

24.3.4 UART/IrDA/CIR Functional Description

24.3.4.1 Block Diagram

The UART/IrDA/CIR module can be divided into three main blocks:

- FIFO management
- Mode selection
- Protocol formatting

FIFO management is common to all functions and enables the transmission and reception of data from the host processor point of view.

There are two modes:

- Function mode: Routes the data to the chosen function (UART, IrDA, or CIR) and enables the mechanism corresponding to the chosen function
- Register mode: Enables conditional access to registers

For more information about mode configuration, see [Section 24.3.4.7, Mode Selection](#).

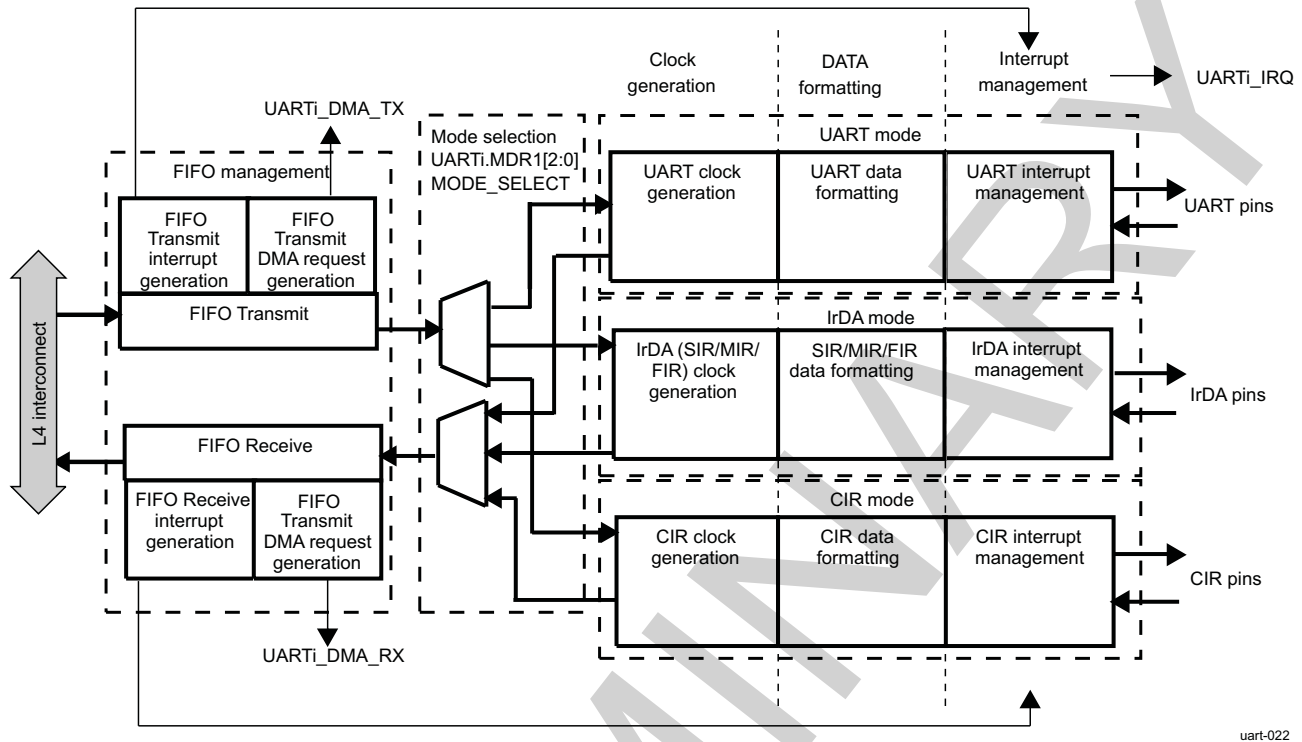
Protocol formatting has three subcategories:

- Clock generation: The 48-MHz input clock generates all necessary clocks.
- Data formatting: Each function uses its own state-machine that is responsible for the transition between FIFO data and frame data associated with it.
- Interrupt management: Different interrupt types are generated depending on the chosen function:
 - UART mode interrupts: Seven interrupts prioritized in six different levels
 - IrDA mode interrupts: Eight interrupts. The interrupt line is activated when any interrupt is generated (there is no priority).
 - CIR mode interrupts: A subset of existing IrDA mode interrupts is used.In each mode, when an interrupt is generated, the [UART_IIR](#) register indicates the interrupt type.

In parallel with these functional blocks, a power-saving strategy exists for each function.

[Figure 24-72](#) is the UART/IrDA/CIR block diagram.

Figure 24-72. UART/IrDA/CIR Functional Specification Block Diagram



uart-022

24.3.4.2 Clock Configuration

Each UART uses a 48-MHz functional clock for its logic and to generate external interface signals. Each UART uses an interface clock for register accesses. The PRCM module generates and controls all these clocks (for more information, see [Clock Domain Module Attributes](#), in [Chapter 3, Power, Reset, and Clock Management](#)).

The idle and wake-up processes use a handshake protocol between the PRCM and the UART (for a description of the protocol, see [Section 3.1.1.1.2, Module-Level Clock Managment](#), in [Chapter 3, Power, Reset, and Clock Management](#)). The `UARTi.UART_SYSC[4:3] IDLEMODE` bit field controls UART idle mode.

24.3.4.3 Software Reset

The `UARTi.UART_SYSC[1] SOFTRESET` bit controls the software reset; setting this bit to 1 triggers a software reset functionally equivalent to hardware reset.

24.3.4.4 Power Management

24.3.4.4.1 UART Mode Power Management

24.3.4.4.1.1 Module Power Saving

In UART modes, sleep mode is enabled by setting the `UARTi.UART_IER[4] SLEEP_MODE` bit to 1 (when the `UARTi.UART_EFR[4] ENHANCED_EN` bit is set to 1).

Sleep mode is entered when all the following conditions exist:

- The serial data input line, `uarti_rx`, is idle.
- The TX FIFO and TX shift register are empty.
- The RX FIFO is empty.
- The only pending interrupts are THR interrupts.

Sleep mode is a good way to lower UART power consumption, but this state can be achieved only when the UART is set to modem mode. Therefore, even if the UART has no key role functionally, it must be initialized in a functional mode to take advantage of sleep mode.

In sleep mode, the module clock and baud rate clock are stopped internally. Because most registers are clocked by these clocks, this greatly reduces power consumption. The module wakes up when a change is detected on the uarti_rx line, when data is written to the TX FIFO, and when there is a change in the state of the modem input pins.

An interrupt can be generated on a wake-up event by setting the UARTi.UART_SCR[4] RX_CTS_WU_EN bit to 1. To understand how to manage the interrupt, see [Section 24.3.4.5.1.2, Wake-Up Interrupt](#).

NOTE: There must be no writing to the divisor latches, UARTi.UART_DLL and UARTi.UART_DLH, to set the baud clock (BCLK) while in sleep mode. It is advisable to disable sleep mode using the UARTi.UART_IER[4] SLEEP_MODE bit before writing to the UARTi.UART_DLL register or the UARTi.UART_DLH register.

24.3.4.4.1.2 System Power Saving

Sleep and auto-idle modes are embedded power-saving features. Power-reduction techniques can be applied at the system level by shutting down certain internal clock and power domains of the device.

The UART supports an idle req/idle ack handshaking protocol used at the system level to shut down the UART clocks in a clean and controlled manner and to switch the UART from interrupt-generation mode to wake-up generation mode for unmasked events (see the UARTi.UART_SYSC[2] ENAWAKEUP bit and the UARTi.UART_WER register).

For more information, see [Section 3.1.1.1.2, Module Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

24.3.4.4.2 IrDA Mode Power Management (UART3 Only)

24.3.4.4.2.1 Module Power Saving

In IrDA modes, sleep mode is enabled by setting the UART3.MDR[3] IR_SLEEP bit to 1.

Sleep mode is entered when all the following conditions exist:

- The serial data input line, uart3.rx_irrx, is idle.
- The TX FIFO and TX shift register are empty.
- The RX FIFO is empty.
- No interrupts are pending except THR interrupts.

The module wakes up when a change is detected on the uart3_rx_irrx line or when data is written to the TX FIFO.

24.3.4.4.2.2 System Power Saving

System power saving for the IrDA mode has the same function as for the UART mode (see [Section 24.3.4.4.1.2, System Power Saving](#)).

24.3.4.4.3 CIR Mode Power Management (UART3 Only)

24.3.4.4.3.1 Module Power Saving

Module power saving for the CIR mode has the same function as for the IrDA mode (see [Section 24.3.4.4.2.1, Module Power Saving](#)).

24.3.4.4.3.2 System Power Saving

System power saving for the CIR mode has the same function as for the UART mode (see [Section 24.3.4.4.1.2, System Power Saving](#)).

24.3.4.4.4 Local Power Management

[Table 24-145](#) describes power-management features available for the UART.

NOTE: For information about source clock gating and sleep/wake-up transitions description, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 24-145. Local Power-Management Features

| Feature | Registers | Description |
|------------------------|--|--|
| Clock autogating | UART_SYSC [0] AUTOIDLE | This bit allows local power optimization in the module by gating the UARTi_ICLK clock on interface activity or gating the UARTi_FCLK clock on internal activity. |
| Slave idle modes | UART_SYSC [4:3] IDLEMODE | Force-idle, no-idle, smart-idle, and smart-idle wakeup-capable modes are available |
| Clock activity | N/A | Feature not available |
| Master standby modes | N/A | Feature not available |
| Global wake-up enable | UART_SYSC [2] ENAWAKEUP | This bit enables the wake-up feature at module level. |
| Wake-Up sources enable | N/A | Feature not available |

24.3.4.5 Interrupt Requests

24.3.4.5.1 UART Mode Interrupt Management

24.3.4.5.1.1 UART Interrupts

UART mode includes seven possible interrupts prioritized to six levels.

When an interrupt is generated, the interrupt identification register (UARTi.[UART_IIR](#)) sets the UARTi.[UART_IIR](#)[0] IT_PENDING bit to 0 to indicate that an interrupt is pending, and indicates the type of interrupt through the UARTi.[UART_IIR](#)[5:1] bit field. [Table 24-146](#) summarizes the interrupt control functions.

Table 24-146. UART Mode Interrupts

| UART_IIR [5:0] | Priority Level | Interrupt Type | Interrupt Source | Interrupt Reset Method |
|--------------------------------|----------------|----------------------|---|---|
| 000001 | None | None | None | None |
| 000110 | 1 | Receiver line status | OE, FE, PE, or BI errors occur in characters in the RX FIFO. | FE, PE, BI: Read the UART_RHR register. OE: Read the UART_LSR register. |
| 001100 | 2 | RX time-out | Stale data in RX FIFO | Read the UART_RHR register. |
| 000100 | 2 | RHR interrupt | DRDY (data ready) (FIFO disable) RX FIFO above trigger level (FIFO enable) | Read the UART_RHR register until the interrupt condition disappears. |
| 000010 | 3 | THR interrupt | TFE (UART_THR empty) (FIFO disable) TX FIFO below trigger level (FIFO enable) | Write to the UART_THR until the interrupt condition disappears. |

Table 24-146. UART Mode Interrupts (continued)

| UART_IIR[5:0] | Priority Level | Interrupt Type | Interrupt Source | Interrupt Reset Method |
|---------------|----------------|--|---|--|
| 000000 | 4 | Modem status | See the UART_MSR register. | Read the UART_MSR register. |
| 010000 | 5 | XOFF interrupt/special character interrupt | Receive XOFF characters/special character | Receive XON character(s), if XOFF interrupt/read of the UART_IIR register, if special character interrupt. |
| 100000 | 6 | CTS, RTS | RTS pin or CTS pin change state from active (low) to inactive (high). | Read the UART_IIR register. |

For the receiver-line status interrupt, the RX_FIFO_STS bit (UARTi.[UART_LSR](#)[7]) generates the interrupt.

For the XOFF interrupt, if an XOFF flow character detection caused the interrupt, the interrupt is cleared by an XON flow character detection. If special character detection caused the interrupt, the interrupt is cleared by a read of the UARTi.[UART_IIR](#) register.

24.3.4.5.1.2 Wake-Up Interrupt

Wake-up interrupt is a special interrupt that works differently from other interrupts. This interrupt is enabled when the UARTi.[UART_SCR](#)[4] RX_CTS_WU_EN bit is set to 1. The UARTi.[UART_IIR](#) register is not modified when this occurs; the UART3.[UART_SSR](#)[1] RX_CTS_WU_STS bit must be checked to detect a wake-up event.

When a wake-up interrupt occurs, it can be cleared only by resetting the UARTi.[UART_SCR](#)[4] RX_CTS_WU_EN bit. This bit must be reenabled (set to 1) after the current wake-up interrupt event is processed to detect the next incoming wake-up event.

24.3.4.5.2 IrDA Mode Interrupt Management

24.3.4.5.2.1 IrDA Interrupts

The IrDA function generates interrupts. All interrupts can be enabled and disabled by writing to the appropriate bit in the interrupt enable register (UART3.[UART_IER](#)). The interrupt status of the device can be checked by reading the interrupt identification register (UART3.[UART_IIR](#)).

UART, IrDA, and CIR modes have different interrupts in the UART/IrDA/CIR module and, therefore, different UART3.[UART_IER](#) and UART3.[UART_IIR](#) mappings, depending on the selected mode.

IrDA modes have eight possible interrupts (see [Table 24-147](#)). The interrupt line is activated when any interrupt is generated (there is no priority).

Table 24-147. IrDA Mode Interrupts

| UART_IIR Bit | Interrupt Type | Interrupt Source | Interrupt Reset Method |
|--------------|----------------------|---|--|
| 0 | RHR interrupt | DRDY (data ready) (FIFO disable) RX FIFO above trigger level (FIFO enable) | Read the UART_RHR register until the interrupt condition disappears. |
| 1 | THR interrupt | TFE (UART_THR empty) (FIFO disable) TX FIFO below trigger level (FIFO enable) | Write to the UART_THR until the interrupt condition disappears. |
| 2 | Last byte in RX FIFO | Last byte of frame in RX FIFO is available to be read at the RHR port. | Read the UART_RHR register. |
| 3 | RX overrun | Write to the UART_RHR register when the RX FIFO is full. | Read UART_RESUME register. |

Table 24-147. IrDA Mode Interrupts (continued)

| UART_IIR Bit | Interrupt Type | Interrupt Source | Interrupt Reset Method |
|--------------|--------------------------------|--|---|
| 4 | Status FIFO interrupt | Status FIFO triggers level reached. | Read STATUS FIFO. |
| 5 | TX status | <ol style="list-style-type: none"> 1. UART_THR empty before EOF sent. Last bit of transmission of the IrDA frame occurred, but with an underrun error. OR 2. Transmission of the last bit of the IrDA frame completed successfully. | <ol style="list-style-type: none"> 1. Read the UART_RESUME register. OR 2. Read the UART_IIR register. |
| 6 | Receiver line status interrupt | CRC, ABORT, or frame-length error is written into the STATUS FIFO. | Read the STATUS FIFO (read until empty - maximum of eight reads required). |
| 7 | Received EOF | Received end-of-frame | Read the UART_IIR register. |

24.3.4.5.2.2 Wake-Up Interrupts

The wake-up interrupt for IrDA mode has the same function as that for UART mode (see [Section 24.3.4.5.1.2, Wake-Up Interrupt](#)).

CAUTION

Wake-Up interface implementation in this mode is based on the UARTi_SIDLEACK low-to-high transition instead of the UARTi_SIDLEACK state.

This does not ensure wake-up event generation as expected when configured in smart-idle mode, and the system wakes up for a short period.

24.3.4.5.3 CIR Mode Interrupt Management

24.3.4.5.3.1 CIR Interrupts

The CIR function generates interrupts that can be enabled and disabled by writing to the appropriate bit in the interrupt enable register (UART3.[UART_IER](#)). The interrupt status of the device can be checked by reading the interrupt identification register (UART3.[UART_IIR](#)).

UART, IrDA, and CIR modes have different interrupts in the UART/IrDA/CIR module and, therefore, different UART3.[UART_IER](#) and UART3.[UART_IIR](#) mappings, depending on the selected mode.

[Table 24-148](#) lists the interrupt modes to be maintained. In CIR mode, the sole purpose of the UART3.[UART_IIR](#)[5] bit is to indicate that the last bit of infrared data was passed to the uart3_cts_rctx pin.

Table 24-148. CIR Mode Interrupts

| UART_IIR Bit Number | Interrupt Type | Interrupt Source | Interrupt Reset Method |
|---------------------|------------------|---|--|
| 0 | N/A for CIR mode | N/A for CIR mode | N/A for CIR mode |
| 1 | THR interrupt | TFE (UART_THR empty) (FIFO disable) TX FIFO below trigger level (FIFO enable) | Write to the UART_THR register until the interrupt condition disappears. |
| 2 | N/A for CIR mode | N/A for CIR mode | N/A for CIR mode |
| 3 | N/A for CIR mode | N/A for CIR mode | N/A for CIR mode |
| 4 | N/A for CIR mode | N/A for CIR mode | N/A for CIR mode |

Table 24-148. CIR Mode Interrupts (continued)

| UART_IIR Bit Number | Interrupt Type | Interrupt Source | Interrupt Reset Method |
|----------------------------|-----------------------|---|---|
| 5 | TX status | Transmission of the last bit of the frame is complete successfully. | Read the UART_IIR register. |
| 6 | N/A for CIR mode | N/A for CIR mode | N/A for CIR mode |
| 7 | N/A for CIR mode | N/A for CIR mode | N/A for CIR mode |

24.3.4.5.3.2 Wake-Up Interrupts

The wake-up interrupt for CIR mode has the same function as that for UART mode (see [Section 24.3.4.5.1.2, Wake-Up Interrupt](#)).

24.3.4.6 FIFO Management

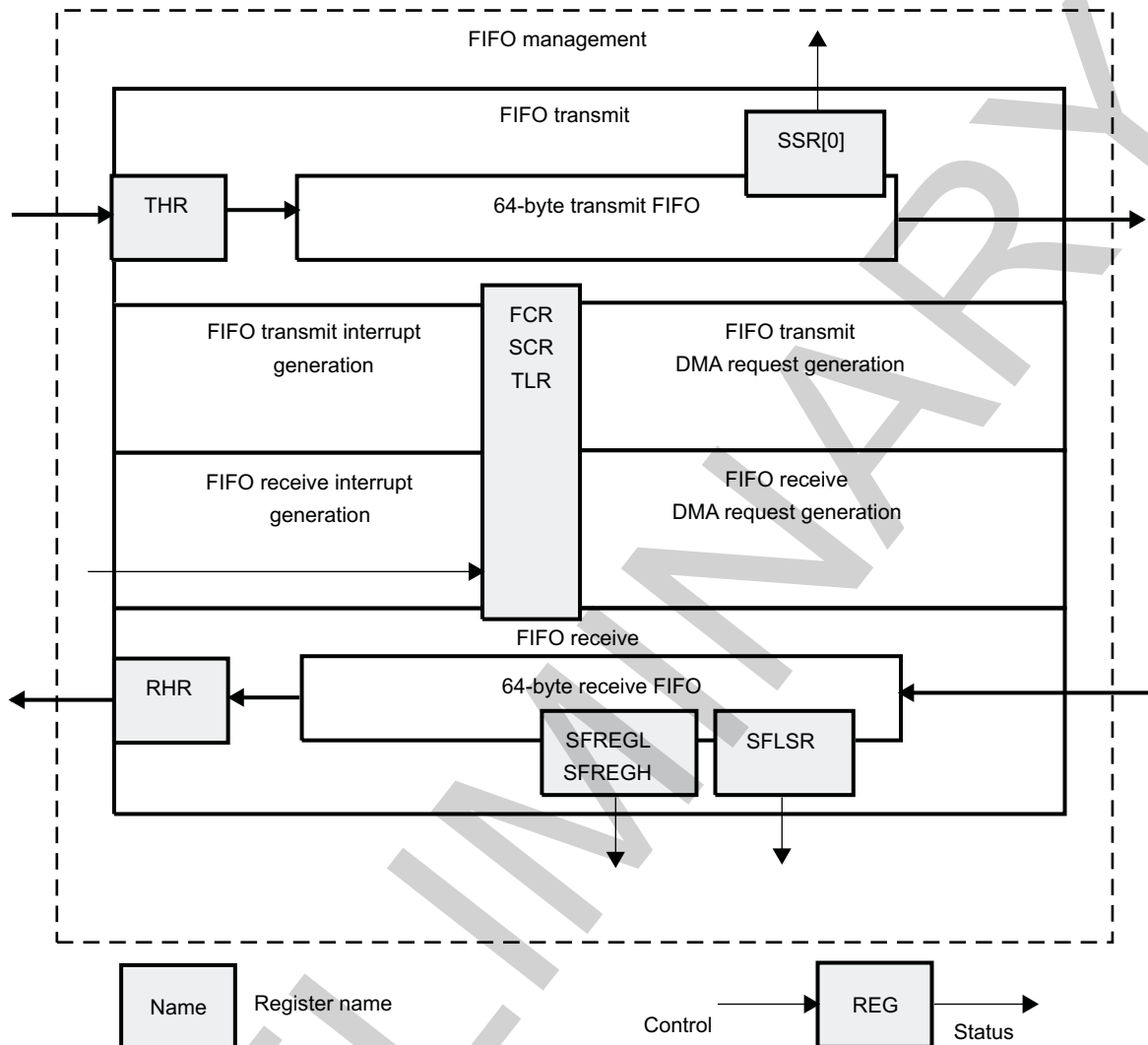
The FIFO is accessed by reading and writing the UARTi.[UART_RHR](#) and UARTi.[UART_THR](#) registers. Parameters are controlled using the FIFO control register (UARTi.[UART_FCR](#)) and supplementary control register (UARTi.[UART_SCR](#)). Reading the UARTi.[UART_SSR](#)[0] TX_FIFO_FULL bit at 1 means the FIFO is full.

The UARTi.[UART_TLR](#) register controls the FIFO trigger level, which enables DMA and interrupt generation. After reset, transmit (TX) and receive (RX) FIFOs are disabled; thus, the trigger level is the default value of 1 byte. [Figure 24-73](#) shows the FIFO management registers.

NOTE: Data in the UARTi.[UART_RHR](#) register is not overwritten when an overflow occurs.

NOTE: The UARTi.[UART_SFLSR](#), UARTi.[UART_SFREGL](#), and UARTi.[UART_SFREGH](#) status registers are used in IrDA mode only. For use, see [Section 24.3.4.8.2.3, IrDA Data Formatting](#).

Figure 24-73. FIFO Management Registers



uart-023

24.3.4.6.1 FIFO Trigger

24.3.4.6.1.1 Transmit FIFO Trigger

Table 24-149 lists the TX FIFO trigger level settings.

Table 24-149. TX FIFO Trigger Level Setting Summary

| UART_SCR[6] | UART_TLR[3:0] | TX FIFO Trigger Level |
|-------------|---------------|---|
| 0 | = 0x0 | Defined by the UARTi.UART_FCR[5:4] TX_FIFO_TRIG bit field (8,16, 32, or 56 spaces) |
| 0 | != 0x0 | Defined by the UARTi.UART_TLR[3:0] TX_FIFO_TRIG_DMA bit field (from 4 to 60 spaces with a granularity of 4 spaces) |
| 1 | Value | Defined by the concatenated value of TX_FIFO_TRIG_DMA and TX_FIFO_TRIG (from 1 to 63 spaces with a granularity of 1 space) Note: The combination of TX_FIFO_TRIG_DMA = 0x0 and TX_FIFO_TRIG = 0x0 (all zeros) is not supported (minimum of one space required). All zeros result in unpredictable behavior. |

24.3.4.6.1.2 Receive FIFO Trigger

Table 24-150 lists the RX FIFO trigger level settings.

Table 24-150. RX FIFO Trigger Level Setting Summary

| UART_SCR[7] | UART_TLR[7:4] | RX FIFO Trigger Level |
|-------------|---------------|---|
| 0 | = 0x0 | Defined by the UARTi.UART_FCR[7:6] RX_FIFO_TRIG bit field (8,16, 56, or 60 characters) |
| 0 | != 0x0 | Defined by the UARTi.UART_TLR[7:4] RX_FIFO_TRIG_DMA bit field (from 4 to 60 characters with a granularity of 4 characters) |
| 1 | Value | Defined by the concatenated value of RX_FIFO_TRIG_DMA and RX_FIFO_TRIG (from 1 to 63 characters with a granularity of 1 character) Note: The combination of RX_FIFO_TRIG_DMA = 0x0 and RX_FIFO_TRIG = 0x0 (all zeros) is not supported (minimum of one character required). All zeros result in unpredictable behavior. |

The receive threshold is programmed using the UARTi.UART_TCR[7:4] RX_FIFO_TRIG_START and UARTi.UART_TCR[3:0] RX_FIFO_TRIG_HALT bit fields:

- Trigger levels from 0 to 60 bytes are available with a granularity of 4 (trigger level = 4 x [4-bit register value]).
- To ensure correct device operation, ensure that RX_FIFO_TRIG_HALT RX_FIFO_TRIG when auto-RTS is enabled.

$$\text{Delay} = [4 + 16 \times (1 + \text{CHAR_LENGTH} + \text{Parity} + \text{Stop } 0.5)] \times \text{Baud_rate} + 4 \times \text{FCLK}$$

NOTE: The RTS signal is deasserted after the UART module receives the data over RX_FIFO_TRIG_HALT. Delay means how long the UART module takes to deassert the RTS signal after reaching RX_FIFO_TRIG_HALT.

- In FIFO interrupt mode with flow control, ensure that the trigger level to HALT transmission is greater than or equal to the RX FIFO trigger level (the UARTi.UART_TCR[7:4] RX_FIFO_TRIG_START bit field or the UARTi.UART_FCR[7:6] RX_FIFO_TRIG bit field); otherwise, FIFO operation stalls. In FIFO DMA mode with flow control, this concept does not exist, because a DMA request is sent when a byte is received.

24.3.4.6.2 FIFO Interrupt Mode

In FIFO interrupt mode (the FIFO control register UARTi.UART_FCR[0] FIFO_EN bit is set to 1 and

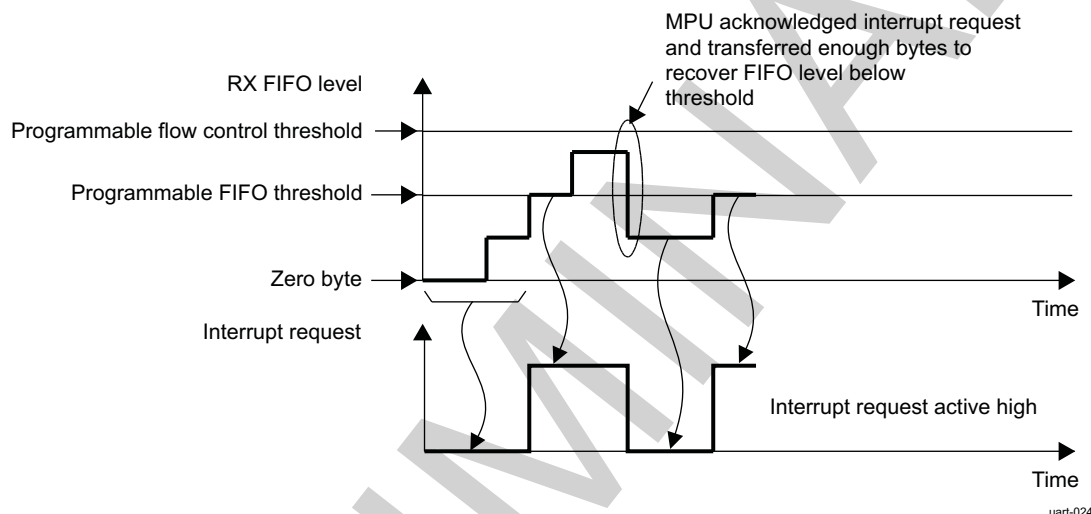
relevant interrupts are enabled by the UARTi.UART_IER register), an interrupt signal informs the processor of the status of the receiver and transmitter. These interrupts are raised when the RX/TX FIFO threshold (the UARTi.UART_TLR[7:4] RX_FIFO_TRIG_DMA and UARTi.UART_TLR[3:0] TX_FIFO_TRIG_DMA bit fields or the UARTi.UART_FCR[7:6] RX_FIFO_TRIG and UARTi.UART_FCR[5:4] TX_FIFO_TRIG bit fields, respectively) is reached.

The interrupt signals instruct the MPU to transfer data to the destination (from the UART in receive mode and/or from any source to the UART FIFO in transmit mode).

When UART flow control is enabled with interrupt capabilities, the UART flow control FIFO threshold (the UARTi.UART_TCR[3:0] RX_FIFO_TRIG_HALT bit field) must be greater than or equal to the RX FIFO threshold.

Figure 24-74 shows the generation of the RX FIFO interrupt request.

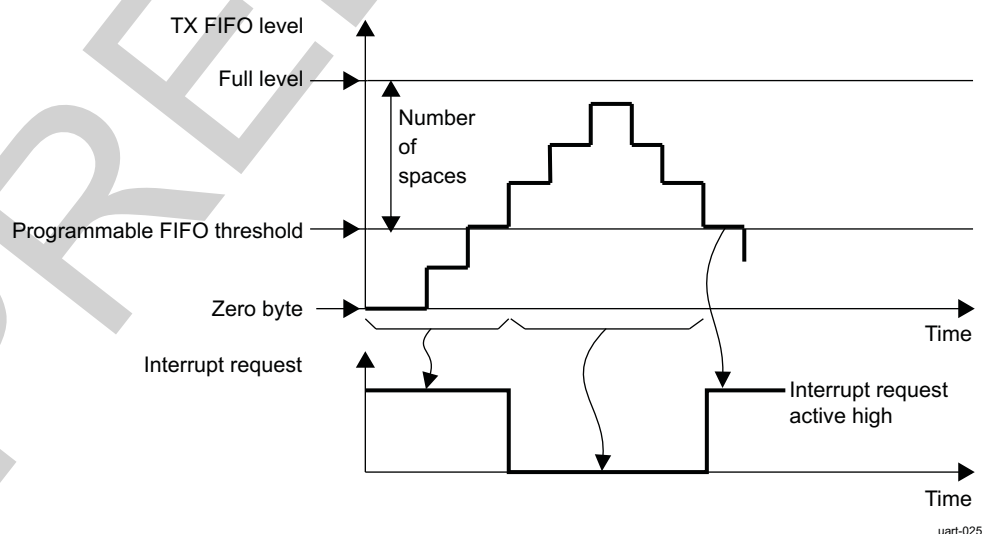
Figure 24-74. RX FIFO Interrupt Request Generation



In receive mode, no interrupt is generated until the RX FIFO reaches its threshold. Once low, the interrupt can be deasserted only when the MPU has handled enough bytes to put the FIFO level below threshold. The flow control threshold is set at a higher value than the FIFO threshold.

Figure 24-75 shows the generation of the TX FIFO interrupt request.

Figure 24-75. TX FIFO Interrupt Request Generation



In transmit mode, an interrupt request is automatically asserted when the TX FIFO is empty. This request is deasserted when the TX FIFO crosses the threshold level. The interrupt line is deasserted until a sufficient number of elements is transmitted to go below the TX FIFO threshold.

24.3.4.6.3 FIFO Polled Mode Operation

In FIFO polled mode (the UARTi.UART_FCR[0] FIFO_EN bit is set to 0 and the relevant interrupts are disabled by the UARTi.UART_IER register), the status of the receiver and transmitter can be checked by polling the line status register (UARTi.UART_LSR).

This mode is an alternative to the FIFO interrupt mode of operation in which the status of the receiver and transmitter is automatically determined by sending interrupts to the MPU.

24.3.4.6.4 FIFO DMA Mode Operation

Although DMA operation includes four modes (DMA modes 0 through 3), the information in [Table 24-144](#) assumes that mode 1 is used. (Mode 2 and mode 3 are legacy modes that use only one DMA request for each module.)

In mode 2, the remaining DMA request is used for RX. In mode 3, the remaining DMA request is used for TX.

DMA requests in mode 2 and mode 3 use the following signals:

- S_DMA_48
- S_DMA_50
- S_DMA_52/D_DMA_10
- S_DMA_54

The following signals are not used by the module in mode 2 and mode 3:

- S_DMA_49
- S_DMA_51
- S_DMA_53/D_DMA_11
- S_DMA_55

These signals can be selected as follows:

- When the UARTi.UART_SCR[0] DMA_MODE_CTL bit is set to 0, setting the UARTi.UART_FCR[3] DMA_MODE_CTL bit to 0 enables DMA mode 0. Setting the DMA_MODE_CTL bit to 1 enables DMA mode 1.
- When the DMA_MODE_CTL bit is set to 1, the UARTi.UART_FCR[2:1] DMA_MODE_2 bit field determines DMA mode 0 to mode 3 based on the supplementary control register (UART_SCR) description.

For example:

- If no DMA operation is desired, set the DMA_MODE_CTL bit to 1 and the DMA_MODE_2 bit field to 0x0. (The DMA_MODE bit is discarded.)
- If DMA mode 1 is desired, set the DMA_MODE_CTL bit to 0 and the DMA_MODE bit to 1, or set the DMA_MODE_CTL bit to 1 and the DMA_MODE_2 bit field to 01. (The DMA_MODE bit is discarded.)

If the FIFOs are disabled (the UARTi.UART_FCR[0] FIFO_EN bit is set to 0), the DMA occurs in single-character transfers.

When DMA mode 0 is programmed, the signals associated with DMA operation are not active.

Depending on UART_MDR3[2] SET_DMA_TX_THRESHOLD, the threshold can be programmed different ways:

- SET_TX_DMA_THRESHOLD = 1:

The threshold value will be the value of the UART_TX_DMA_THRESHOLD register. If SET_TX_DMA_THRESHOLD + TX trigger spaces 64, then the default method of threshold is used: threshold value = TX FIFO size.

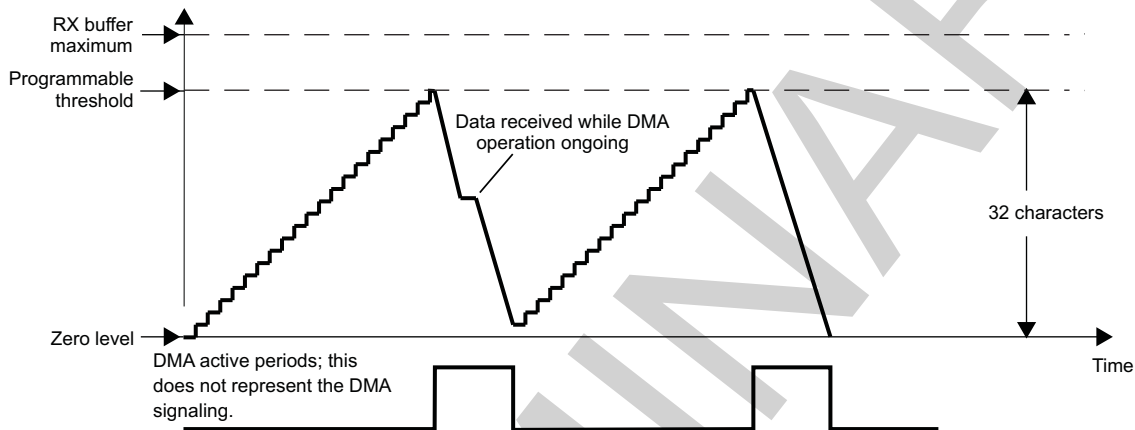
- SET_TX_DMA_THRESHOLD = 0:

The threshold value = TX FIFO size TX trigger space. The TX DMA line is asserted if the TX FIFO level is lower than the threshold. It remains asserted until TX trigger spaces number of bytes are written into the FIFO. The DMA line is then deasserted and the FIFO level is compared with the threshold value.

24.3.4.6.4.1 DMA Transfers (DMA Mode 1, 2, or 3)

Figure 24-76 through Figure 24-79 show the supported DMA operations.

Figure 24-76. Receive FIFO DMA Request Generation (32 Characters)

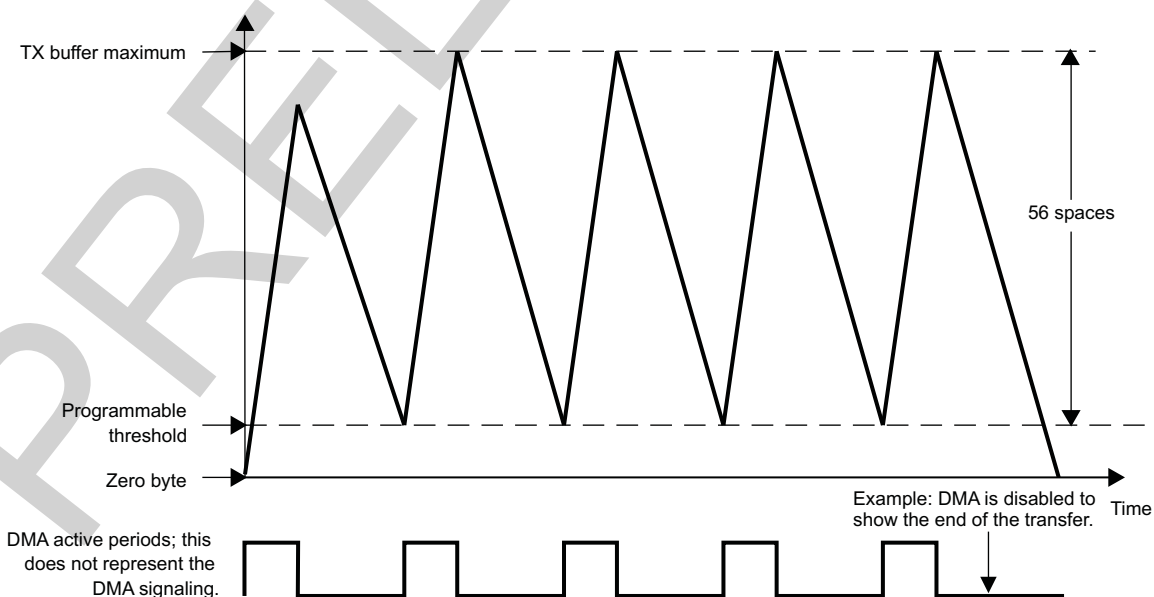


uart-026

In receive mode, a DMA request is generated when the RX FIFO reaches its threshold level defined in the trigger level register (UARTi.UART_TLR). This request is deasserted when the number of bytes defined by the threshold level is read by the sDMA.

In transmit mode, a DMA request is automatically asserted when the TX FIFO is empty. This request is deasserted when the number of bytes defined by the number of spaces in the UARTi.UART_TLR register is written by the sDMA. If an insufficient number of characters is written, the DMA request stays active.

Figure 24-77. Transmit FIFO DMA Request Generation (56 Spaces)



uart-027

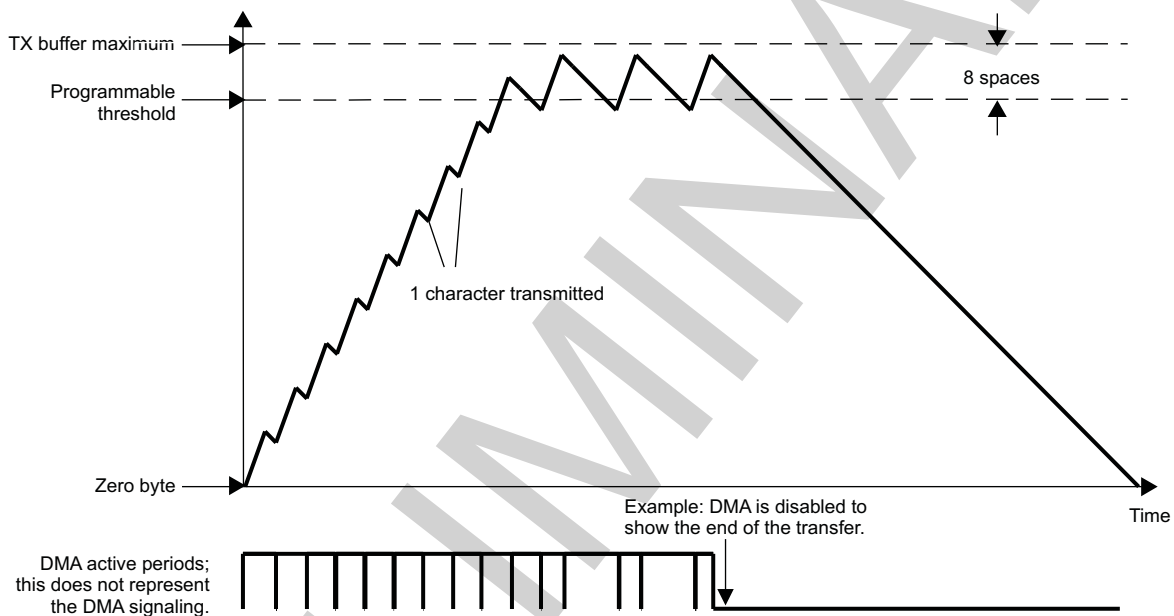
The DMA request is again asserted if the FIFO can receive the number of bytes defined by the UARTi.UART_TLR register.

The threshold can be programmed in a number of ways. Figure 24-77 shows a DMA transfer operating with a space setting of 56 that can arise from using the auto settings in the UARTi.UART_FCR[5:4] TX_FIFO_TRIG bit field or the UARTi.UART_TLR[3:0] TX_FIFO_TRIG_DMA bit field concatenated with the TX_FIFO_TRIG bit field.

The setting of 56 spaces in the UART/IrDA/CIR module must correlate with the settings of the sDMA so that the buffer does not overflow (program the DMA request size of the LH controller to equal the number of spaces in the UART/IrDA/CIR module).

Figure 24-78 shows an example with eight spaces to show the buffer level crossing the space threshold. The LH DMA controller settings must correspond to those of the UART/IrDA/CIR module.

Figure 24-78. Transmit FIFO DMA Request Generation (8 Spaces)



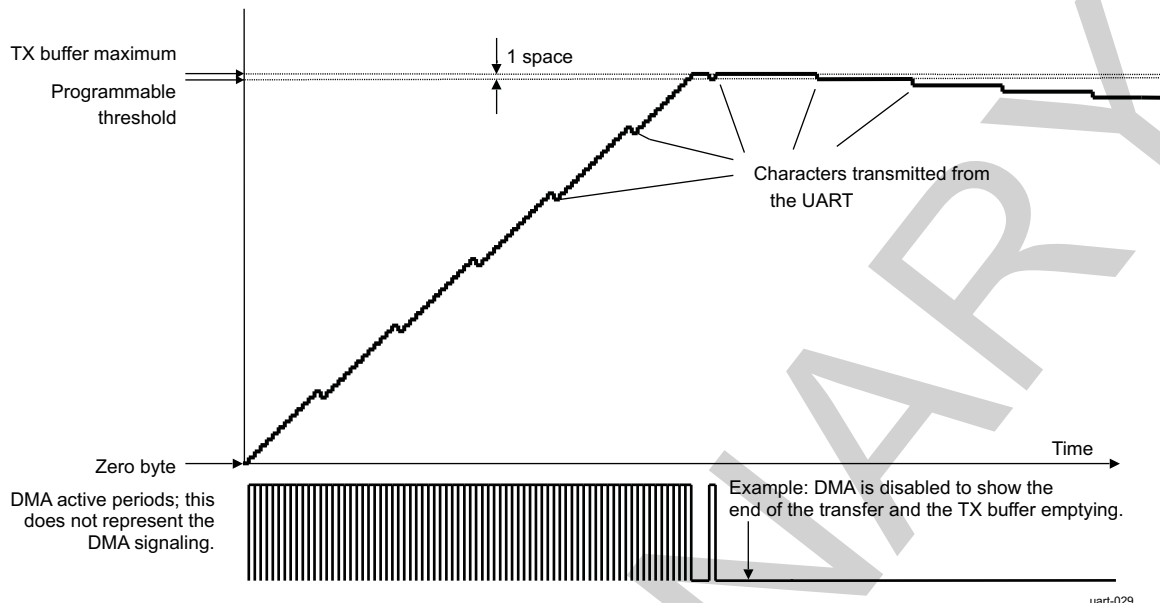
uart-028

The next example shows the setting of one space that uses the DMA for each transfer of one character to the transmit buffer (see Figure 24-79). The buffer is filled faster than the baud rate at which data is transmitted to the TX pin. Eventually, the buffer is completely full and the DMA operations stop transferring data to the transmit buffer.

On two occasions, the buffer holds the maximum amount of data words; shortly after this, the DMA is disabled to show the slower transmission of the data words to the TX pin. Eventually, the buffer is emptied at the rate specified by the baud rate settings of the UARTi.UART_DLL and UARTi.UART_DLH registers.

The DMA settings must correspond to the system LH DMA controller settings to ensure correct operation of this logic.

Figure 24-79. Transmit FIFO DMA Request Generation (1 Space)



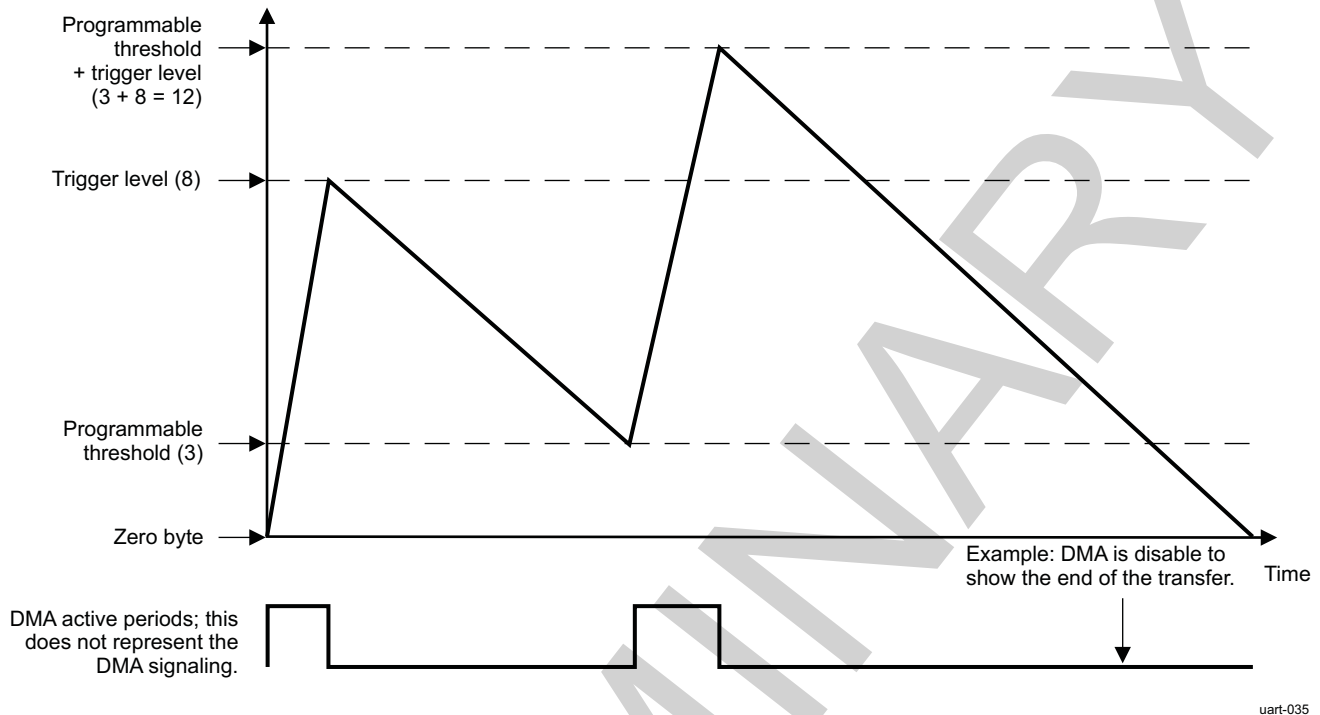
The final example shows the setting of eight spaces, but setting the TX DMA threshold directly by setting the `UART_MDR3[1]` `NONDEFAULT_FREQ` bit and the `UART_TX_DMA_THRESHOLD` register (see Figure 24-80). In the example, `UART_TX_DMA_THRESHOLD[5:0]` `TX_DMA_THRESHOLD` = 3 and the trigger level is 8. The buffer is filled at a faster rate than the baud rate transmits data to the TX pin. The buffer is filled with 8 bytes and the DMA operations stop transferring data to the transmit buffer. When the buffer is emptied to the threshold level by transmission, the DMA operation activates again to fill the buffer with 8 bytes.

Eventually, the buffer is emptied at the rate specified by the baud rate settings of the `UART_DLL` and `UART_DLH` registers.

If the selected threshold level plus the trigger level exceed the maximum buffer size, the original TX DMA threshold method is used to prevent TX overrun, regardless of the value of the `UART_MDR3[1]` `NONDEFAULT_FREQ` bit.

The DMA settings must correspond to the settings of the system local host DMA controller to ensure the correct operation of this logic.

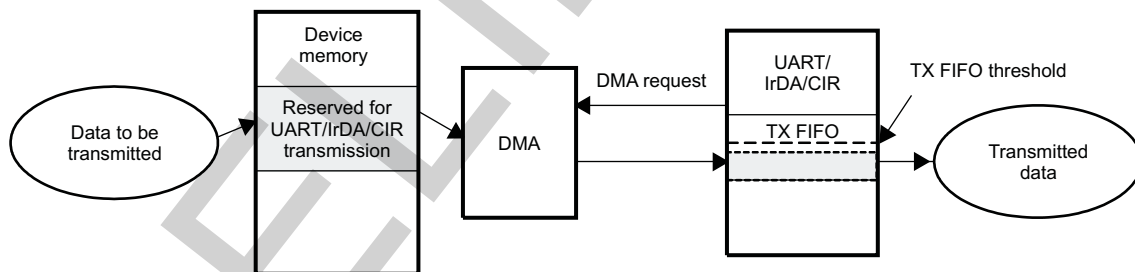
**Figure 24-80. Transmit FIFO DMA Request Generation Using Direct TX DMA Threshold Programming.
(Threshold = 3; Spaces = 8)**



24.3.4.6.4.2 DMA Transmission

Figure 24-81 shows DMA transmission.

Figure 24-81. DMA Transmission



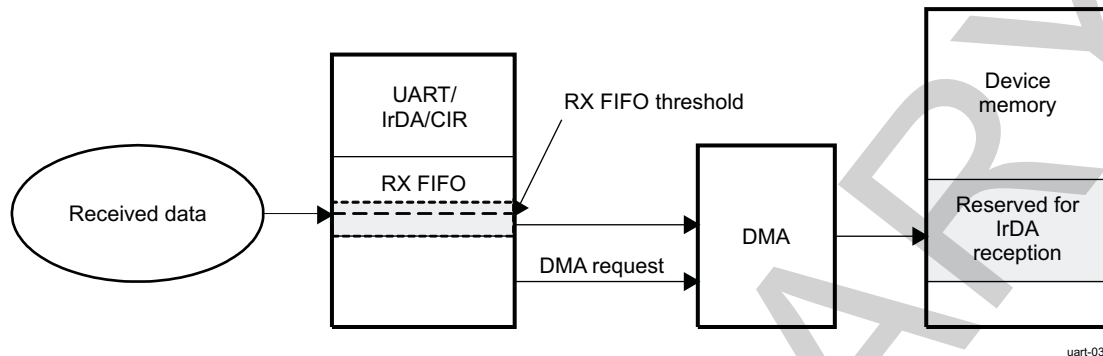
1. Data to be transmitted are put in the device memory reserved for UART/IrDA/CIR transmission by the DMA:
 - (a) Until the TX FIFO trigger level is not reached, a DMA request is generated
 - (b) An element (1 byte) is transferred from the SDRAM to the TX FIFO at each DMA request (DMA element synchronization).
2. Data in the TX FIFO are automatically transmitted.
3. The end of the transmission is signaled by the UARTi.UART_THR empty (TX FIFO empty).

NOTE: In IrDA mode, the transmission does not end immediately after the TX FIFO empties, at which point the last data byte, the CRC field, and the stop flag still must be transmitted; thus, the end of transmission occurs a few milliseconds after the UARTi.UART_THR register empties.

24.3.4.6.4.3 DMA Reception

Figure 24-82 shows DMA reception.

Figure 24-82. DMA Reception



1. Enable the reception.
2. Received data are put in the RX FIFO.
3. Data are transferred from the RX FIFO to the device memory by the DMA:
 - (a) At each received byte, the RX FIFO trigger level (one character) is reached and a DMA request is generated.
 - (b) An element (1 byte) is transferred from the RX FIFO to the SDRAM at each DMA request (DMA element synchronization).
4. The end of the reception is signaled by the EOF interrupt.

24.3.4.7 Mode Selection

24.3.4.7.1 Register Access Modes

24.3.4.7.1.1 Operational Mode and Configuration Modes

Register access depends on the register access mode, although register access modes are not correlated to functional mode selection. Three different modes are available:

- Operational mode
- Configuration mode A
- Configuration mode B

Operational mode is the selected mode when the function is active; serial data transfer can be performed in this mode.

Configuration mode A and configuration mode B are used during module initialization steps. These modes enable access to configuration registers, which are hidden in the operational mode. The modes are used when the module is inactive (no serial data transfer processed) and only for initialization or reconfiguration of the module.

The value of the UARTi.UART_LCR register determines the register access mode (see Table 24-151).

Table 24-151. UART/IrDA/CIR Register Access Mode Programming (Using UART_LCR)

| Mode | Condition |
|----------------------|---|
| Configuration mode A | UART_LCR[7] = 0x1 and UART_LCR[7:0] != 0xBF |
| Configuration mode B | UART_LCR[7] = 0x1 and UART_LCR[7:0] = 0xBF |
| Operational mode | UART_LCR[7] = 0x0 |

24.3.4.7.1.2 Register Access Submode

In each access register mode (operational mode or configuration mode A/B), some register accesses are conditional on the programming of a submode (MSR_SPR, TCR_TLR, and XOFF). These registers are identified in [Section 24.3.6, UART/IrDA/CIR Register Manual](#).

[Table 24-152](#) through [Table 24-154](#) summarize the register access submodes.

Table 24-152. Subconfiguration Mode A Summary

| Mode | Condition |
|---------|---|
| MSR_SPR | (UART_EFR [4] = 0x0 or UART_MCR [6] = 0x0) |
| TCR_TLR | UART_EFR [4] = 0x1 and UART_MCR [6] = 0x1 |

Table 24-153. Subconfiguration Mode B Summary

| Mode | Condition |
|---------|---|
| TCR_TLR | UART_EFR [4] = 0x1 and UART_MCR [6] = 0x1 |
| XOFF | (UART_EFR [4] = 0x0 or UART_MCR [6] = 0x0) |

Table 24-154. Suboperational Mode Summary

| Mode | Condition |
|---------|---|
| MSR_SPR | UART_EFR [4] = 0x0 or UART_MCR [6] = 0x0 |
| TCR_TLR | UART_EFR [4] = 0x1 and UART_MCR [6] = 0x1 |

24.3.4.7.1.3 Registers Available for the Register Access Modes

[Table 24-155](#) lists the names of the register bits in each access register mode. Gray shading indicates that the register does not depend on the register access mode (available in all modes).

Table 24-155. UART/IrDA/CIR Register Access Mode Overview

| Address Offset | Registers | | | | | |
|-------------------|---|--|--|---|--|---|
| | Configuration Mode A | | Configuration Mode B | | Operational Mode | |
| | Read | Write | Read | Write | Read | Write |
| 0x000 | UART_DLL | UART_DLL | UART_DLL | UART_DLL | UART_RHR | UART_THR |
| 0x004 | UART_DLH | UART_DLH | UART_DLH | UART_DLH | UART_IER | UART_IER |
| 0x008 | UART_IIR | UART_FCR | UART_EFR | UART_EFR | UART_IIR | UART_FCR |
| 0x00C | UART_LCR | UART_LCR | UART_LCR | UART_LCR | UART_LCR | UART_LCR |
| 0x010 | UART_MCR | UART_MCR | UART_XON1_ADD R1 | UART_XON1_AD DR1 | UART_MCR | UART_MCR |
| 0x014 | UART_LSR | — | UART_XON2_ADD R2 | UART_XON2_AD DR2 | UART_LSR | — |
| 0x018 | UART_MSR (⁽¹⁾ / UART_TCR (⁽²⁾) | UART_TCR (⁽²⁾) | UART_TCR (⁽²⁾ / UART_XOFF1 (⁽³⁾) | UART_TCR (⁽²⁾ / UART_XOFF1 (⁽³⁾) | UART_MSR (⁽¹⁾ / UART_TCR (⁽²⁾) | UART_TCR (⁽²⁾) |
| 0x01C | UART_SPR (⁽¹⁾ / UART_TLR (⁽²⁾) | UART_SPR (⁽¹⁾ / UART_TLR (⁽²⁾) | UART_TLR (⁽²⁾ / UART_XOFF2 (⁽³⁾) | UART_TLR (⁽²⁾ / UART_XOFF2 (⁽³⁾) | UART_SPR (⁽¹⁾ / UART_TLR (⁽²⁾) | UART_SPR (⁽¹⁾ / UART_TLR (⁽²⁾) |
| 0x020 | UART_MDR1 | UART_MDR1 | UART_MDR1 | UART_MDR1 | UART_MDR1 | UART_MDR1 |
| 0x024 | UART_MDR2 | UART_MDR2 | UART_MDR2 | UART_MDR2 | UART_MDR2 | UART_MDR2 |
| 0x028 | UART_SFLSR | UART_TXFLR | UART_SFLSR | UART_TXFLR | UART_SFLSR | UART_TXFLR |

(⁽¹⁾) MSR_SPR mode is active (see [Section 24.3.4.7.1.2, Register Access Submode](#))

(⁽²⁾) TCR_TLR mode is active (see [Section 24.3.4.7.1.2, Register Access Submode](#))

(⁽³⁾) XOFF mode is active (see [Section 24.3.4.7.1.2, Register Access Submode](#))

Table 24-155. UART/IrDA/CIR Register Access Mode Overview (continued)

| Address Offset | Registers | | | | | |
|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Configuration Mode A | | Configuration Mode B | | Operational Mode | |
| | Read | Write | Read | Write | Read | Write |
| 0x02C | UART_RESUME | UART_TXFLH | UART_RESUME | UART_TXFLH | UART_RESUME | UART_TXFLH |
| 0x030 | UART_SFREG_L | UART_RXFLL | UART_SFREGL | UART_RXFLL | UART_SFREGL | UART_RXFLL |
| 0x034 | UART_SFREG_H | UART_RXFLH | UART_SFREGH | UART_RXFLH | UART_SFREGH | UART_RXFLH |
| 0x038 | UART_UASR | – | UART_UASR | – | UART_BLR | UART_BLR |
| 0x03C | – | – | – | – | UART_ACREG | UART_ACREG |
| 0x040 | UART_SCR | UART_SCR | UART_SCR | UART_SCR | UART_SCR | UART_SCR |
| 0x044 | UART_SSR | – | UART_SSR | – | UART_SSR | – |
| 0x048 | – | – | – | – | UART_EBLR | UART_EBLR |
| 0x050 | UART_MVR | – | UART_MVR | – | UART_MVR | – |
| 0x054 | UART_SYSC | UART_SYSC | UART_SYSC | UART_SYSC | UART_SYSC | UART_SYSC |
| 0x058 | UART_SYSS | – | UART_SYSS | – | UART_SYSS | – |
| 0x05C | UART_WER | UART_WER | UART_WER | UART_WER | UART_WER | UART_WER |
| 0x060 | UART_CFPS | UART_CFPS | UART_CFPS | UART_CFPS | UART_CFPS | UART_CFPS |
| 0x064 | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL |
| 0x068 | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL |
| 0x06C | UART_IER2 | UART_IER2 | UART_IER2 | UART_IER2 | UART_IER2 | UART_IER2 |
| 0x070 | UART_ISR2 | UART_ISR2 | UART_ISR2 | UART_ISR2 | UART_ISR2 | UART_ISR2 |
| 0x074 | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL |
| 0x080 | UART_MDR3 | UART_MDR3 | UART_MDR3 | UART_MDR3 | UART_MDR3 | UART_MDR3 |
| 0x084 | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD |

24.3.4.7.2 UART/IrDA (SIR, MIR, FIR)/CIR Mode Selection

To select a mode, set the UARTi.UART_MDR1[2:0] MODE_SELECT bit field (see Table 24-156).

Table 24-156. UART Mode Selection

| Value | Mode |
|-------|-----------------------|
| 0x0: | UART 16x mode |
| 0x1: | SIR mode (UART3 only) |
| 0x2: | UART 16x auto-baud |
| 0x3: | UART 13x mode |
| 0x4: | MIR mode (UART3 only) |
| 0x5: | FIR mode (UART3 only) |
| 0x6: | CIR mode (UART3 only) |

MODE_SELECT is effective when the module is in operational mode (see [Section 24.3.4.7.1, Register Access Modes](#)).

24.3.4.7.2.1 Registers Available for the UART Function

Only the registers listed in [Table 24-157](#) are used for the UART function.

Table 24-157. UART Mode Register Overview^{(1) (2)}

| Address Offset | Registers | | | | | |
|-------------------|----------------------|-------------------|----------------------|---------------------|-------------------|-------------------|
| | Configuration Mode A | | Configuration Mode B | | Operational Mode | |
| | Read | Write | Read | Write | Read | Write |
| 0x000 | UART_DLL | UART_DLL | UART_DLL | UART_DLL | UART_RHR | UART_THR |
| 0x004 | UART_DLH | UART_DLH | UART_DLH | UART_DLH | UART_IER(UART) | UART_IER(UART) |
| 0x008 | UART_IIR | UART_FCR | UART_EFR[4] | UART_EFR[4] | UART_IIR(UART) | UART_FCR(UART) |
| 0x00C | UART_LCR | UART_LCR | UART_LCR | UART_LCR | UART_LCR | UART_LCR |
| 0x010 | UART_MCR | UART_MCR | UART_XON1_ADD R1 | UART_XON1_AD DR1 | UART_MCR | UART_MCR |
| 0x014 | UART_LSR(UART) | – | UART_XON2_ADD R2 | UART_XON2_AD DR2 | UART_LSR(UART) | – |
| 0x018 | UART_MSR/UART_TCR | UART_TCR | UART_XOFF1/UART_TCR | UART_XOFF1/UART_TCR | UART_MSR/UART_TCR | UART_TCR |
| 0x01C | UART_TLR/UART_SPR | UART_TLR/UART_SPR | UART_TLR/UART_XOFF2 | UART_TLR/UART_XOFF2 | UART_TLR/UART_SPR | UART_TLR/UART_SPR |
| 0x020 | UART_MDR1 | UART_MDR1[2:0] | UART_MDR1[2:0] | UART_MDR1[2:0] | UART_MDR1[2:0] | UART_MDR1[2:0] |
| 0x024 | UART_MDR2 | UART_MDR2 | UART_MDR2 | UART_MDR2 | UART_MDR2 | UART_MDR2 |
| 0x028 | – | – | – | – | – | – |
| 0x02C | – | – | – | – | – | – |
| 0x030 | – | – | – | – | – | – |
| 0x034 | – | – | – | – | – | – |
| 0x038 | UART_UASR | – | UART_UASR | – | – | – |
| 0x03C | – | – | – | – | – | – |
| 0x040 | UART_SCR | UART_SCR | UART_SCR | UART_SCR | UART_SCR | UART_SCR |
| 0x044 | UART_SSR | – | UART_SSR | – | UART_SSR | – |
| 0x048 | – | – | – | – | – | – |
| 0x050 | UART_MVR | – | UART_MVR | – | UART_MVR | – |
| 0x054 | UART_SYSC | UART_SYSC | UART_SYSC | UART_SYSC | UART_SYSC | UART_SYSC |
| 0x058 | UART_SYSS | – | UART_SYSS | – | UART_SYSS | – |
| 0x05C | UART_WER | UART_WER | UART_WER | UART_WER | UART_WER | UART_WER |
| 0x060 | – | – | – | – | – | – |
| 0x064 | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL |
| 0x068 | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL |
| 0x06C | UART_IER2 | UART_IER2 | UART_IER2 | UART_IER2 | UART_IER2 | UART_IER2 |
| 0x070 | UART_ISR2 | UART_ISR2 | UART_ISR2 | UART_ISR2 | UART_ISR2 | UART_ISR2 |
| 0x074 | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL |
| 0x080 | UART_MDR3 | UART_MDR3 | UART_MDR3 | UART_MDR3 | UART_MDR3 | UART_MDR3 |

⁽¹⁾ REGISTER_NAME(UART) notation indicates that the register exists for other functions (IrDA or CIR), but fields have different meanings for other functions (described separately in [Section 24.3.6, UART/IrDA/CIR Register Manual](#)).

⁽²⁾ REGISTER_NAME[m:n] notation indicates that only register bits numbered m to n apply to the UART function.

Table 24-157. UART Mode Register Overview^{(1) (2)} (continued)

| Address Offset | Registers | | | | | |
|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Configuration Mode A | | Configuration Mode B | | Operational Mode | |
| | Read | Write | Read | Write | Read | Write |
| 0x084 | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD |

24.3.4.7.2.2 Registers Available for the IrDA Function (UART3 Only)

Only the registers listed in [Table 24-158](#) are used for the IrDA function.

Table 24-158. IrDA Mode Register Overview^{(1) (2)}

| Address Offset | Registers | | | | | |
|-------------------|----------------------|-------------------|----------------------|------------------|-------------------|-------------------|
| | Configuration Mode A | | Configuration Mode B | | Operational Mode | |
| | Read | Write | Read | Write | Read | Write |
| 0x000 | UART_DLL | UART_DLL | UART_DLL | UART_DLL | UART_RHR | UART_THR |
| 0x004 | UART_DLH | UART_DLH | UART_DLH | UART_DLH | UART_IER(IrDA) | UART_IER(IrDA) |
| 0x008 | UART_IIR | UART_FCR | UART_EFR[4] | UART_EFR[4] | UART_IIR(IrDA) | UART_FCR(IrDA) |
| 0x00C | UART_LCR[7] | UART_LCR[7] | UART_LCR[7] | UART_LCR[7] | UART_LCR[7] | UART_LCR[7] |
| 0x010 | – | – | UART_XON1_ADD R1 | UART_XON1_ADD R1 | – | – |
| 0x014 | UART_LSR(IrDA) | – | UART_XON2_ADD R2 | UART_XON2_ADD R2 | UART_LSR(IrDA) | – |
| 0x018 | UART_MSR/UART_TCR | UART_TCR | UART_TCR | UART_TCR | UART_MSR/UART_TCR | UART_TCR |
| 0x01C | UART_TLR/UART_SPR | UART_TLR/UART_SPR | UART_TLR | UART_TLR | UART_TLR/UART_SPR | UART_TLR/UART_SPR |
| 0x020 | UART_MDR1 | UART_MDR1 | UART_MDR1 | UART_MDR1 | UART_MDR1 | UART_MDR1 |
| 0x024 | UART_MDR2 | UART_MDR2 | UART_MDR2 | UART_MDR2 | UART_MDR2 | UART_MDR2 |
| 0x028 | UART_SFLSR | UART_TXFLL | UART_SFLSR | UART_TXFLL | UART_SFLSR | UART_TXFLL |
| 0x02C | UART_RESUME | UART_TXFLH | UART_RESUME | UART_TXFLH | UART_RESUME | UART_TXFLH |
| 0x030 | UART_SFREG L | UART_RXFLL | UART_SFREG L | UART_RXFLL | UART_SFREG L | UART_RXFLL |
| 0x034 | UART_SFREG H | UART_RXFLH | UART_SFREG H | UART_RXFLH | UART_SFREG H | UART_RXFLH |
| 0x038 | – | – | – | – | UART_BLR | UART_BLR |
| 0x03C | – | – | – | – | UART_ACREG | UART_ACREG |
| 0x040 | UART_SCR | UART_SCR | UART_SCR | UART_SCR | UART_SCR | UART_SCR |
| 0x044 | UART_SSR | – | UART_SSR | – | UART_SSR | – |
| 0x048 | – | – | – | – | UART_EBLR | UART_EBLR |
| 0x050 | UART_MVR | – | UART_MVR | – | UART_MVR | – |
| 0x054 | UART_SYSC | UART_SYSC | UART_SYSC | UART_SYSC | UART_SYSC | UART_SYSC |
| 0x058 | UART_SYSS | – | UART_SYSS | – | UART_SYSS | – |
| 0x05C | UART_WER[6:4] | UART_WER[6:4] | UART_WER[6:4] | UART_WER[6:4] | UART_WER[6:4] | UART_WER[6:4] |
| 0x060 | – | – | – | – | – | – |

⁽¹⁾ REGISTER_NAME(UART) notation indicates that the register exists for other functions (IrDA or CIR), but fields have different meanings for other functions (described separately in [Section 24.3.6, UART/IrDA/CIR Register Manual](#)).

⁽²⁾ REGISTER_NAME[m:n] notation indicates that only register bits numbered m to n apply to the UART function.

Table 24-158. IrDA Mode Register Overview^{(1) (2)} (continued)

| Address Offset | Registers | | | | | |
|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Configuration Mode A | | Configuration Mode B | | Operational Mode | |
| | Read | Write | Read | Write | Read | Write |
| 0x064 | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL |
| 0x068 | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL |
| 0x06C | UART_IER2 | UART_IER2 | UART_IER2 | UART_IER2 | UART_IER2 | UART_IER2 |
| 0x070 | UART_ISR2 | UART_ISR2 | UART_ISR2 | UART_ISR2 | UART_ISR2 | UART_ISR2 |
| 0x074 | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL |
| 0x080 | UART_MDR3 | UART_MDR3 | UART_MDR3 | UART_MDR3 | UART_MDR3 | UART_MDR3 |
| 0x084 | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD |

24.3.4.7.2.3 Registers Available for the CIR Function (UART3 Only)

Only the registers listed in [Table 24-159](#) are used for the CIR function.

Table 24-159. CIR Mode Register Overview^{(1) (2)}

| Address Offset | Registers | | | | | |
|----------------|----------------------|-------------------|----------------------|----------------|-------------------|-------------------|
| | Configuration Mode A | | Configuration Mode B | | Operational Mode | |
| | Read | Write | Read | Write | Read | Write |
| 0x000 | UART_DLL | UART_DLL | UART_DLL | UART_DLL | – | UART_THR |
| 0x004 | UART_DLH | UART_DLH | UART_DLH | UART_DLH | UART_IER(CIR) | UART_IER(CIR) |
| 0x008 | UART_IIR | UART_FCR | UART_EFR | UART_EFR | UART_IIR(CIR) | UART_FCR(CIR) |
| 0x00C | UART_LCR | UART_LCR[7] | UART_LCR[7] | UART_LCR[7] | UART_LCR[7] | UART_LCR[7] |
| 0x010 | – | – | – | – | – | – |
| 0x014 | UART_LSR(IrDA) | – | – | – | UART_LSR(IrDA) | – |
| 0x018 | UART_MSR/UART_TCR | UART_TCR | UART_TCR | UART_TCR | UART_MSR/UART_TCR | UART_TCR |
| 0x01C | UART_TLR/UART_SPR | UART_TLR/UART_SPR | UART_TLR | UART_TLR | UART_TLR/UART_SPR | UART_TLR/UART_SPR |
| 0x020 | UART_MDR1[3:0] | UART_MDR1[3:0] | UART_MDR1[3:0] | UART_MDR1[3:0] | UART_MDR1[3:0] | UART_MDR1[3:0] |
| 0x024 | UART_MDR2 | UART_MDR2 | UART_MDR2 | UART_MDR2 | UART_MDR2 | UART_MDR2 |
| 0x028 | – | – | – | – | – | – |
| 0x02C | UART_RESUME | – | UART_RESUME | – | UART_RESUME | – |
| 0x030 | – | – | – | – | – | – |
| 0x034 | – | – | – | – | – | – |
| 0x038 | – | – | – | – | – | – |
| 0x03C | – | – | – | – | UART_ACREG | UART_ACREG |
| 0x040 | UART_SCR | UART_SCR | UART_SCR | UART_SCR | UART_SCR | UART_SCR |
| 0x044 | UART_SSR | – | UART_SSR | – | UART_SSR | – |

⁽¹⁾ REGISTER_NAME(UART) notation indicates that the register exists for other functions (IrDA or CIR), but fields have different meanings for other functions (described separately in [Section 24.3.6, UART/IrDA/CIR Register Manual](#)).

⁽²⁾ REGISTER_NAME[m:n] notation indicates that only register bits numbered m to n apply to the UART function.

Table 24-159. CIR Mode Register Overview^{(1) (2)} (continued)

| Address Offset | Registers | | | | | |
|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Configuration Mode A | | Configuration Mode B | | Operational Mode | |
| | Read | Write | Read | Write | Read | Write |
| 0x048 | – | – | – | – | UART_EBLR | UART_EBLR |
| 0x050 | UART_MVR | – | UART_MVR | – | UART_MVR | – |
| 0x054 | UART_SYSC | UART_SYSC | UART_SYSC | UART_SYSC | UART_SYSC | UART_SYSC |
| 0x058 | UART_SYSS | – | UART_SYSS | – | UART_SYSS | – |
| 0x05C | UART_WER[6:4] | UART_WER[6:4] | UART_WER[6:4] | UART_WER[6:4] | UART_WER[6:4] | UART_WER[6:4] |
| 0x060 | UART_CFPS | UART_CFPS | UART_CFPS | UART_CFPS | UART_CFPS | UART_CFPS |
| 0x064 | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL | UART_RXFIFO_LVL |
| 0x068 | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL | UART_TXFIFO_LVL |
| 0x06C | UART_IER2 | UART_IER2 | UART_IER2 | UART_IER2 | UART_IER2 | UART_IER2 |
| 0x070 | UART_ISR2 | UART_ISR2 | UART_ISR2 | UART_ISR2 | UART_ISR2 | UART_ISR2 |
| 0x074 | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL | UART_FREQ_SEL |
| 0x080 | UART_MDR3 | UART_MDR3 | UART_MDR3 | UART_MDR3 | UART_MDR3 | UART_MDR3 |
| 0x084 | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD | UART_TX_DMA_THRESHOLD |

24.3.4.8 Protocol Formatting

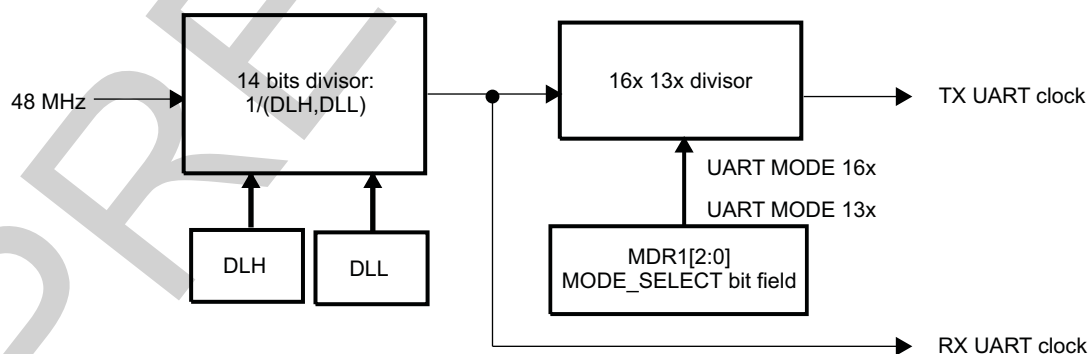
24.3.4.8.1 UART Mode

24.3.4.8.1.1 UART Clock Generation: Baud Rate Generation

The UART function contains a programmable baud generator and a set of fixed dividers that divide the 48-MHz clock input down to the expected baud rate.

Figure 24-83 shows the baud rate generator and associated controls.

Figure 24-83. Baud Rate Generation



uart-032

CAUTION

Before initializing or modifying clock parameter controls (UARTi.UART_DLH, UARTi.UART_DLL), MODE_SELECT = DISABLE (UARTi.UART_MDR1[2:0]) must be set to 0x7. Failure to observe this rule can result in unpredictable module behavior.

24.3.4.8.1.2 Choosing the Appropriate Divisor Value

Two divisor values are:

- UART 16x mode: Divisor value = Operating frequency/(16x baud rate)
- UART 13x mode: Divisor value = Operating frequency/(13x baud rate)

Table 24-160 describes the UART baud rate settings.

Table 24-160. UART Baud Rate Settings (48-MHz Clock)

| Baud Rate | Baud Multiple | DLH,DLL (Decimal) | DLH,DLL (Hex) | Actual Baud Rate | Error (%) |
|-------------|---------------|-------------------|---------------|------------------|-----------|
| 0.3 kbps | 16x | 10000 | 0x27, 0x10 | 0.3 kbps | 0 |
| 0.6 kbps | 16x | 5000 | 0x13, 0x88 | 0.6 kbps | 0 |
| 1.2 kbps | 16x | 2500 | 0x09, 0xC4 | 1.2 kbps | 0 |
| 2.4 kbps | 16x | 1250 | 0x04, 0xE2 | 2.4 kbps | 0 |
| 4.8 kbps | 16x | 625 | 0x02, 0x71 | 4.8 kbps | 0 |
| 9.6 kbps | 16x | 312 | 0x01, 0x38 | 9.6153 kbps | +0.16 |
| 14.4 kbps | 16x | 208 | 0x00, 0xD0 | 14.423 kbps | +0.16 |
| 19.2 kbps | 16x | 156 | 0x00, 0x9C | 19.231 kbps | +0.16 |
| 28.8 kbps | 16x | 104 | 0x00, 0x68 | 28.846 kbps | +0.16 |
| 38.4 kbps | 16x | 78 | 0x00, 0x4E | 38.462 kbps | +0.16 |
| 57.6 kbps | 16x | 52 | 0x00, 0x34 | 57.692 kbps | +0.16 |
| 115.2 kbps | 16x | 26 | 0x00, 0x1A | 115.38 kbps | +0.16 |
| 230.4 kbps | 16x | 13 | 0x00, 0x0D | 230.77 kbps | +0.16 |
| 460.8 kbps | 13x | 8 | 0x00, 0x08 | 461.54 kbps | +0.16 |
| 921.6 kbps | 13x | 4 | 0x00, 0x04 | 923.08 kbps | +0.16 |
| 1.843 Mbps | 13x | 2 | 0x00, 0x02 | 1.846 Mbps | +0.16 |
| 3.6884 Mbps | 13x | 1 | 0x00, 0x01 | 3.6923 Mbps | +0.16 |

24.3.4.8.1.3 UART Data Formatting

The UART can use hardware flow control to manage transmission and reception. Hardware flow control significantly reduces software overhead and increases system efficiency by automatically controlling serial data flow using the RTS output and CTS input signals.

The UART is enhanced with the autobauding function. In control mode, autobauding lets the speed, the number of bits per character, and the parity selected be set automatically.

24.3.4.8.1.3.1 Frame Formatting

When autobauding is not used, frame format attributes must be defined in the UARTi.UART_LCR register.

Character length is specified using the UARTi.UART_LCR[1:0] CHAR_LENGTH bit field.

The number of stop-bits is specified using the UARTi.UART_LCR[2] NB_STOP bit.

The parity bit is programmed using the UARTi.UART_LCR[5:3] PARITY_EN, PARITY_TYPE_1, and PARITY_TYPE_2 bit fields (see Table 24-161).

Table 24-161. UART Parity Bit Encoding

| PARITY_EN | PARITY_TYPE_1 | PARITY_TYPE_2 | Parity |
|-----------|---------------|---------------|-------------|
| 0 | N/A | N/A | No parity |
| 1 | 0 | 0 | Odd parity |
| 1 | 1 | 0 | Even parity |
| 1 | 0 | 1 | Forced 1 |
| 1 | 1 | 1 | Forced 0 |

24.3.4.8.1.3.2 Hardware Flow Control

Hardware flow control is composed of auto-CTS and auto-RTS. Auto-CTS and auto-RTS can be enabled and disabled independently by programming the UARTi.UART_EFR[7:6] AUTO_CTS_EN and AUTO_RTS_EN bit fields, respectively.

With auto-CTS, uarti_cts must be active before the module can transmit data.

Auto-RTS activates the uarti_rts output only when there is enough room in the RX FIFO to receive data. It deactivates the uarti_rts output when the RX FIFO is sufficiently full. The HALT and RESTORE trigger levels in the UARTi.UART_TCR register determine the levels at which uarti_rts is activated and deactivated.

If auto-CTS and auto-RTS are enabled, data transmission does not occur unless the RX FIFO has empty space. Thus, overrun errors are eliminated during hardware flow control. If auto-CTS and auto-RTS are not enabled, overrun errors occur if the transmit data rate exceeds the RX FIFO latency.

- Auto-RTS:

Auto-RTS data flow control originates in the receiver block. The RX FIFO trigger levels used in auto-RTS are stored in the UARTi.UART_TCR register. uarti_rts is active if the RX FIFO level is below the HALT trigger level in the UARTi.UART_TCR[3:0] RX_FIFO_TRIG_HALT bit field. When the RX FIFO HALT trigger level is reached, uarti_rts is deasserted. The sending device (for example, another UART) can send an additional byte after the trigger level is reached because it may not recognize the deassertion of RTS until it begins sending the additional byte.

uarti_rts is automatically reasserted when the RX FIFO reaches the RESUME trigger level programmed by the UARTi.UART_TCR[7:4] RX_FIFO_TRIG_START bit field. This reassertion requests the sending device to resume transmission.

In this case, uarti_rts is an active-low signal.

- Auto-CTS:

The transmitter circuitry checks uarti_cts before sending the next data byte. When uarti_cts is active, the transmitter sends the next byte. To stop the transmitter from sending the next byte, uarti_cts must be deasserted before the middle of the last stop-bit currently sent.

The auto-CTS function reduces interrupts to the host system. When auto-CTS flow control is enabled, the uarti_cts state changes do not have to trigger host interrupts because the device automatically controls its own transmitter. Without auto-CTS, the transmitter sends any data present in the transmit FIFO, and a receiver overrun error can result.

In this case, uarti_cts is an active-low signal.

24.3.4.8.1.3.3 Software Flow Control

Software flow control is enabled through the enhanced feature register (UARTi.UART_EFR) and the modem control register (UARTi.UART_MCR). Different combinations of software flow control can be enabled by setting different combinations of the UARTi.UART_EFR[3:0] bit field (see Table 24-162).

Two other enhanced features relate to software flow control:

- XON any function (UARTi.UART_MCR[5]): Operation resumes after receiving any character after the XOFF character is recognized. If special character detect is enabled and special character is received after XOFF1, it does not resume transmission. The special character is stored in the RX FIFO.

NOTE: The XON-any character is written into the RX FIFO even if it is a software flow character.

- Special character (UARTi.UART_EFR[5]): Incoming data is compared to XOFF2. When the special character is detected, the XOFF interrupt (UARTi.UART_IIR[4]) is set, but it does not halt transmission. The XOFF interrupt is cleared by a read of UARTi.UART_IIR. The special character is transferred to the RX FIFO. Special character does not work with XON2, XOFF2, or sequential XOFFs.

Table 24-162. UART_EFR[3:0] Software Flow Control Options

| Bit 3 | Bit 2 | Bit 1 | Bit 0 | TX, RX Software Flow Controls |
|-------|-------|-------|-------|---|
| 0 | 0 | X | X | No transmit flow control |
| 1 | 0 | X | X | Transmit XON1, XOFF1 |
| 0 | 1 | X | X | Transmit XON2, XOFF2 |
| 1 | 1 | X | X | Transmit XON1, XON2: XOFF1, XOFF2 ⁽¹⁾ |
| X | X | 0 | 0 | No receive flow control |
| X | X | 1 | 0 | Receiver compares XON1, XOFF1 |
| X | X | 0 | 1 | Receiver compares XON2, XOFF2 |
| X | X | 1 | 1 | Receiver compares XON1, XON2: XOFF1, XOFF2 ⁽¹⁾ |

⁽¹⁾ In these cases, the XON1 and XON2 characters or the XOFF1 and XOFF2 characters must be transmitted/received sequentially with XON1/XOFF1 followed by XON2/XOFF2. XON1 is defined in the UARTi.UART_XON1_ADDR1[7:0] XON_WORD1 bit field. XON2 is defined in the UARTi.UART_XON2_ADDR2[7:0] XON_WORD2 bit field. XOFF1 is defined in the UARTi.UART_XOFF1[7:0] XOFF_WORD1 bit field. XOFF2 is defined in the UARTi.UART_XOFF2[7:0] XOFF_WORD2 bit field.

24.3.4.8.1.3.3.1 Receive (RX)

When software flow control operation is enabled, the UART compares incoming data with XOFF1/2 programmed characters (in certain cases, XOFF1 and XOFF2 must be received sequentially). When the correct XOFF characters are received, transmission stops after transmission of the current character completes. Detection of XOFF also sets the UARTi.UART_IIR[4] bit (if enabled by UARTi.UART_IER[5]) and causes the interrupt line to go low.

To resume transmission, an XON1/2 character must be received (in certain cases, XON1 and XON2 must be received sequentially). When the correct XON characters are received, the UARTi.UART_IIR[4] bit is cleared and the XOFF interrupt disappears.

NOTE: When a parity, framing, or break error occurs while receiving a software flow control character, this character is treated as normal data and is written to the RX FIFO.

When XON-any and special character detect are disabled and software flow control is enabled, no valid XON or XOFF characters are written to the RX FIFO. For example, when UARTi.UART_EFR[1:0] = 0x2, if XON1 and XOFF1 characters are received, they are not written to the RX FIFO.

When pairs of software flow characters are programmed to be received sequentially (UARTi.UART_EFR[1:0] = 0x3), the software flow characters are not written to the RX FIFO if they are received sequentially. However, received XON1/XOFF1 characters must be written to the RX FIFO if the subsequent character is not XON2/XOFF2.

24.3.4.8.1.3.3.2 Transmit (TX)

Two XOFF1 characters are transmitted when the RX FIFO passes the trigger level programmed by UARTi.UART_TCR[3:0]. As soon as the RX FIFO reaches the trigger level programmed by UARTi.UART_TCR[7:4], two XON1 characters are sent, so the data transfer recovers.

NOTE: If software flow control is disabled after an XOFF character is sent, the module transmits XON characters automatically to enable normal transmission.

The transmission of XOFF(s)/XON(s) follows the same protocol as transmission of an ordinary byte from the TX FIFO. This means that even if the word length is 5, 6, or 7 characters, the 5, 6, or 7 LSBs of XOFF1/2 and XON1/2 are transmitted. The 5, 6, or 7 bits of a character are seldom transmitted, but this function is included to maintain compatibility with earlier designs.

It is assumed that software flow control and hardware flow control are never enabled simultaneously.

24.3.4.8.1.3.4 Autobauding Modes

In autobauding mode, the UART can extract transfer characteristics (speed, length, and parity) from an "at" (AT) command (ASCII code). These characteristics are used to receive data after an AT and to send data.

The following AT commands are valid:

| | | |
|----|------|----|
| AT | DATA | CR |
| at | DATA | CR |
| A/ | | |
| a/ | | |

A line break during the acquisition of the sequence AT is not recognized, and an echo function is not implemented in hardware.

A/ and a/ are not used to extract characteristics, but they must be recognized because of their special meaning. A/ or a/ is used to instruct the software to repeat the last received AT command; therefore, an a/ always follows an AT, and transfer characteristics are not expected to change between an AT and an a/.

When a valid AT is received, AT and all subsequent data, including the final CR (0x0D), are saved to the RX FIFO. The autobaud state-machine waits for the next valid AT command. If an a/ (A/) is received, the a/ (A/) is saved in the RX FIFO and the state-machine waits for the next valid AT command.

On the first successful detection of the baud rate, the UART activates an interrupt to signify that the AT (upper or lower case) sequence is detected. The UARTi.UART_UASR register reflects the correct settings for the baud rate detected. Interrupt activity can continue in this fashion when a subsequent character is received. Therefore, it is recommended that the software enable the RHR interrupt when using the autobaud mode.

The following settings are detected in autobaud mode with a module clock of 48 MHz:

- Speed:
 - 115.2K baud
 - 57.6K baud
 - 38.4K baud
 - 28.8K baud
 - 19.2K baud
 - 14.4K baud
 - 9.6K baud
 - 4.8K baud
 - 2.4K baud
 - 1.2K baud
- Length: 7 or 8 bits
- Parity: Odd, even, or space

NOTE: The combination of 7-bit character plus space parity is not supported.

Autobauding mode is selected when the UARTi.UART_MDR1[2:0] MODE_SELECT bit field is set to 0x2. In UART autobauding mode, UARTi.UART_DLL, UARTi.UART_DLH, and UARTi.UART_LCR[5:0] bit field settings are not used; instead, UART_UASR is updated with the configuration detected by the autobauding logic.

UART_UASR Autobauding Status Register Use

This register is used to set up transmission according to the characteristics of the previous reception instead of the UARTi.UART_LCR, UARTi.UART_DLL, and UARTi.UART_DLH registers when the UART is in autobauding mode.

To reset the autobauding hardware (to start a new AT detection) or to set the UART in standard mode (no autobaud), the UARTi.UART_MDR1[2:0] MODE_SELECT bit field must be set to reset state (0x7) and then to the UART in autobauding mode (0x2) or to the UART in standard mode (0x0).

Use limitation:

- Only 7- and 8-bit characters (5- and 6-bit not supported)
- 7-bit character with space parity not supported
- Baud rate between 1200 and 115,200 bps (10 possibilities)

24.3.4.8.1.3.5 Error Detection

When the UARTi.UART_LSR register is read, the UARTi.UART_LSR[4:2] bit field reflects the error bits (BI: break condition, FE: framing error, PE: parity error) of the character at the top of the RX FIFO (the next character to be read). Therefore, reading the UARTi.UART_LSR register and then reading the UARTi.UART_RHR register identifies errors in a character.

Reading the UARTi.UART_RHR register updates the BI, FE, and PE bits (see Table 24-146 for the UART mode interrupts).

The UARTi.UART_LSR[7] RX_FIFO_STS bit is set when there is an error in the RX FIFO and is cleared only when no errors remain in the RX FIFO.

NOTE: Reading the UARTi.UART_LSR register does not cause an increment of the RX FIFO read pointer. The RX FIFO read pointer is incremented by reading the UARTi.UART_RHR register.

Reading the UARTi.UART_LSR register clears the OE bit if it is set (see Table 24-146 for the UART mode interrupts).

24.3.4.8.1.3.6 Overrun During Receive

Overrun during receive occurs if the RX state-machine tries to write data into the RX FIFO when it is already full. When overrun occurs, the device interrupts the MPU with the UARTi.UART_IIR[5:1] IT_TYPE bit field set to 0x3 (receiver line status error) and discards the remaining portion of the frame.

Overrun also causes an internal flag to be set, which disables further reception. Before the next frame can be received, the MPU must:

- Reset the RX FIFO.
- Read the UARTi.UART_RESUME register, which clears the internal flag.

24.3.4.8.1.3.7 Time-Out and Break Conditions

24.3.4.8.1.3.7.1 Time-Out Counter

An RX idle condition is detected when the receiver line (uarti_rx) is high for a time that equals 4x the programmed word length + 12 bits. uarti_rx is sampled midway through each bit.

For sleep mode, the counter is reset when there is activity on uarti_rx.

For the time-out interrupt, the counter counts only when there is data in the RX FIFO, and the count is reset when there is activity on uarti_rx or when the UARTi.UART_RHR register is read.

24.3.4.8.1.3.7.2 Break Condition

When a break condition occurs, `uarti_tx` is pulled low. A break condition is activated by setting the UARTi.UART_LCR[6] BREAK_EN bit. The break condition is not aligned on word stream (a break condition can occur in the middle of a character). The only way to send a break condition on a full character is:

1. Reset the TX FIFO (if enabled).
2. Wait for the transmit shift register to empty (the UARTi.UART_LSR[6] TX_SR_E bit is set to 1).
3. Take a guard time according to stop-bit definition.
4. Set the BREAK_EN bit to 1.

The break condition is asserted while the BREAK_EN bit is set to 1.

The time-out counter and break condition apply only to UART modem operation and not to IrDA/CIR mode operation.

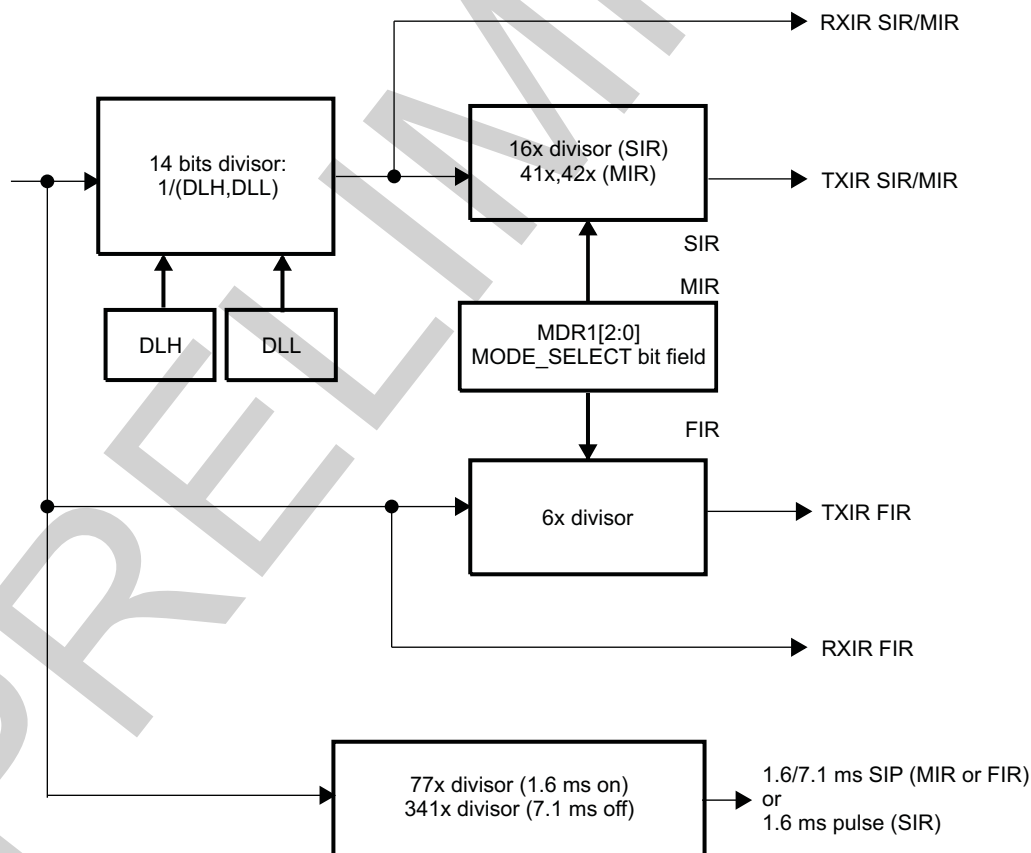
24.3.4.8.2 IrDA Mode (UART3 Only)

24.3.4.8.2.1 IrDA Clock Generation: Baud Generator

The IrDA function contains a programmable baud generator and a set of fixed dividers that divide the 48-MHz clock input down to the expected baud rate.

Figure 24-84 shows the baud rate generator and associated controls.

Figure 24-84. Baud Rate Generator



uart-033

CAUTION

Before initializing or modifying clock parameter controls (UARTi.UART_DLH, UARTi.UART_DLL), MODE_SELECT=DISABLE (UARTi.UART_MDR1[2:0]) must be set to 0x7). Failure to observe this rule can result in unpredictable module behavior.

24.3.4.8.2.2 Choosing the Appropriate Divisor Value

Three divisor values are:

- SIR mode: Divisor value = Operating frequency/(16x baud rate)
- MIR mode: Divisor value = Operating frequency/(41x/42x baud rate)
- FIR mode: Divisor value = None

Table 24-163 lists the IrDA baud rate settings.

Table 24-163. IrDA Baud Rate Settings

| Baud Rate | IR Mode | Baud Multiple | Encoding | DLH, DLL (Decimal) | Actual Baud Rate | Error (%) | Source Jitter (%) | Pulse Duration |
|------------|---------|---------------|----------|--------------------|----------------------------|-----------|-------------------|----------------|
| 2.4 kbps | SIR | 16x | 3/16 | 1250 | 2.4 kbps | 0 | 0 | 78.1 µs |
| 9.6 kbps | SIR | 16x | 3/16 | 312 | 9.6153 kbps | +0.16 | 0 | 19.5 µs |
| 19.2 kbps | SIR | 16x | 3/16 | 156 | 19.231 kbps | +0.16 | 0 | 9.75 µs |
| 38.4 kbps | SIR | 16x | 3/16 | 78 | 38.462 kbps | +0.16 | 0 | 4.87 µs |
| 57.6 kbps | SIR | 16x | 3/16 | 52 | 57.692 kbps | +0.16 | 0 | 3.25 µs |
| 115.2 kbps | SIR | 16x | 3/16 | 26 | 115.38 kbps | +0.16 | 0 | 1.62 µs |
| 0.576 Mbps | MIR | 41x/42x | 1/4 | 2 | 0.5756 Mbps ⁽¹⁾ | 0 | +1.63/–0.80 | 416 ns |
| 1.152 Mbps | MIR | 41x/42x | 1/4 | 1 | 1.1511 Mbps ⁽¹⁾ | 0 | +1.63/–0.80 | 208 ns |
| 4 Mbps | FIR | 6x | 4 PPM | – | 4 Mbps | 0 | 0 | 125 ns |

⁽¹⁾ Average value

NOTE: Baud rate error and source jitter table values do not include 48-MHz reference clock error and jitter.

24.3.4.8.2.3 IrDA Data Formatting

The methods described in this section apply to all IrDA modes (SIR, MIR, and FIR).

24.3.4.8.2.3.1 IR RX Polarity Control

The UART3.UART_MDR2[6] IRRXINVERT bit provides the flexibility to invert the uart3_rx_irrx pin in the UART to ensure that the protocol at the output of the transceiver has the same polarity at module level. By default, the uart3_rx_irrx pin is inverted because most transceivers invert the IR receive pin.

24.3.4.8.2.3.2 IrDA Reception Control

The module can transmit and receive data, but when the device is transmitting, the IR RX circuitry is automatically disabled by hardware.

Operation of the uart3_rx_irrx input can be disabled by the UART3.UART_ACREG[5] DIS_IR_RX bit.

24.3.4.8.2.3.3 IR Address Checking

In all IR modes, when address checking is enabled, only frames intended for the device are written to the RX FIFO. This restriction avoids receiving frames not meant for this device in a multipoint infrared environment. It is possible to program two frame addresses that the UART IrDA receives, with the UART3.UART_XON1_ADDR1[7:0] XON_WORD1 and UART3.UART_XON2_ADDR2[7:0] XON_WORD2 bit fields.

Setting the UART_EFR[0] bit to 1 selects address1 checking. Setting the UART_EFR[1] bit to 1 selects address2 checking. Setting the UART_EFR[1:0] bit field to 0 disables all address checking operations. If both bits are set, the incoming frame is checked for private and public addresses.

If address checking is disabled, all received frames write to the RX FIFO.

24.3.4.8.2.3.4 Frame Closing

A transmission frame can be terminated in two ways:

- Frame-length method: Set the UART3.UART_MDR1[7] FRAME_END_MODE bit to 0. The MPU writes the value of the frame length to the UART3.UART_TXFLH and UART3.UART_TXFLL registers. The device automatically attaches end flags to the frame when the number of bytes transmitted equals the value of the frame length.
- Set-EOT bit method: Set the FRAME_END_MODE bit to 1. The MPU writes 1 to the UART3.UART_ACREG[0] EOT bit just before it writes the last byte to the TX FIFO. When the MPU writes the last byte to the TX FIFO, the device internally sets the tag bit for that character in the TX FIFO. As the TX state-machine reads data from the TX FIFO, it uses this tag-bit information to attach end flags and correctly terminate the frame.

24.3.4.8.2.3.5 Store and Controlled Transmission

In store and controlled transmission (SCT) mode, the MPU starts writing data to the TX FIFO. Then, after writing a part of a frame (for a bigger frame) or an entire frame (a small frame; that is, a supervisory frame), the MPU writes 1 to the UART3.UART_ACREG[2] SCTX_EN bit (deferred TX start) to start transmission.

SCT mode is enabled by setting the UART3.UART_MDR1[5] SCT bit to 1. This transmission method differs from normal mode, in which data transmission starts immediately after data is written to the TX FIFO. SCT mode is useful for sending short frames without TX underrun.

24.3.4.8.2.3.6 Error Detection

When the UART3.UART_LSR register is read, the UART3.UART_LSR[4:2] bit field reflects the error bits [FL, CRC, ABORT] of the frame at the top of the STATUS FIFO (the next frame status to be read).

The error is triggered by an interrupt (for IrDA mode interrupts, see Table 24-147). The STATUS FIFO must be read until empty (a maximum of eight reads is required).

24.3.4.8.2.3.7 Underrun During Transmission

Underrun during transmission occurs when the TX FIFO is empty before the end of the frame is transmitted. When underrun occurs, the device closes the frame with end flags but attaches an incorrect CRC value. The receiving device detects a CRC error and discards the frame; it can then ask for a retransmission.

Underrun also causes an internal flag to be set, which disables additional transmissions. Before the next frame can be transmitted, the MPU must:

- Reset the TX FIFO.
- Read the UART3.UART_RESUME register, which clears the internal flag.

This function can be disabled by the UART3.UART_ACREG[4] DIS_TX_UNDERRUN bit, compensated by the extension of the stop-bit in transmission if the TX FIFO is empty.

24.3.4.8.2.3.8 **Overrun During Receive**

Overrun during receive for the IrDA mode has the same function as that for the UART mode (see [Section 24.3.4.8.1.3.6, Overrun During Receive](#)).

24.3.4.8.2.3.9 **Status FIFO**

In IrDA modes, a status FIFO records the received frame status. When a complete frame is received, the length of the frame and the error bits associated with the frame are written to the status FIFO.

Reading the UART3.UART_SFREGH[3:0] MSB and UART3.UART_SFREGL[3:0] (LSB) bit fields obtains the frame length. The frame error status is read in the UART3.UART_SFLSR register. Reading the UART3.UART_SFLSR register increments the status FIFO read pointer. Because the status FIFO is eight entries deep, it can hold the status of eight frames.

The MPU uses the frame-length information to locate the frame boundary in the received frame data. The MPU can screen bad frames using the error status information and can later request the sender to resend only the bad frames.

This status FIFO can be used effectively in DMA mode because the MPU must be interrupted only when the programmed status FIFO trigger level is reached, not each time a frame is received.

24.3.4.8.2.4 **SIR Mode Data Formatting**

This section provides specific instructions for SIR mode programming.

24.3.4.8.2.4.1 **Abort Sequence**

The transmitter can prematurely close a frame (abort) by sending the sequence 0x7DC1. The abort pattern closes the frame without a CRC field or an ending flag.

A transmission frame can be aborted by setting the UART3.UART_ACREG[1] ABORT_EN bit to 1. When this bit is set to 1, 0x7D and 0xC1 are transmitted and the frame is not terminated with CRC or stop flags.

When a 0x7D character followed immediately by a 0xC1 character is received without transparency, the receiver treats a frame as an aborted frame.

CAUTION

When the TX FIFO is not empty and the UART3.UART_MDR1[5] SCT bit is set to 1, the UART IrDA starts a new transfer with data of a previous frame when the aborted frame is sent. Therefore, the TX FIFO must be reset before sending an aborted frame.

24.3.4.8.2.4.2 **Pulse Shaping**

SIR mode supports the 3/16 or the 1.6-μs pulse duration methods in receive and transmit. The UART3.UART_ACREG[7] PULSE_TYPE bit selects the pulse width method in the transmit mode.

24.3.4.8.2.4.3 **SIR Free Format Programming**

The SIR FF mode is selected by setting the module in the UART mode (UART3.UART_MDR1[2:0] MODE_SELECT = 0x0) and the UART3.UART_MDR2[3] UART_PULSE bit to 1 to allow pulse shaping.

Because the bit format stays the same, some UART mode configuration registers must be set at specific values:

- UART3.UART_LCR[1:0] CHAR_LENGTH bit field = 0x3 (8 data bits)
- UART3.UART_LCR[2] NB_STOP bit = 0x0 (1 stop-bit)
- UART3.UART_LCR[3] PARITY_EN bit = 0x0 (no parity)

The UART mode interrupts are used for the SIR FF mode, but many are not relevant (XOFF, RTS, CTS, modem status register, etc.).

24.3.4.8.2.5 MIR and FIR Mode Data Formatting

This section describes common instructions for FIR and MIR mode programming.

At the end of a frame reception, the MPU reads the line status register (UART3.UART_LSR) to detect errors in the received frame.

When the UART3.UART_MDR1[6] SIP_MODE bit is set to 1, the TX state-machine always sends one SIP at the end of a transmission frame. However, when the SIP_MODE bit is set to 0, SIP transmission depends on the UART3.UART_ACREG[3] SEND_SIP bit.

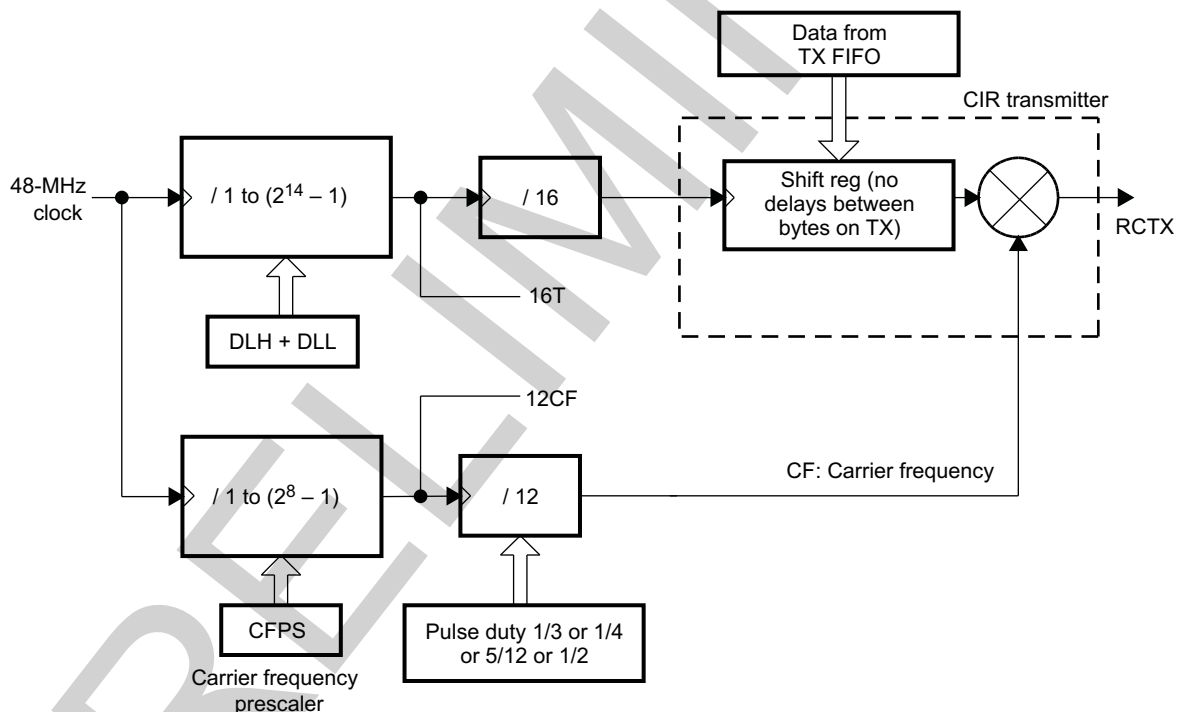
The MPU can set the SEND_SIP bit at least once every 500 ms. The advantage of this approach over the default approach is that the TX state-machine does not have to send the SIP at the end of each frame, thus reducing the overhead required.

24.3.4.8.3 CIR Mode (UART3 Only)

24.3.4.8.3.1 CIR Mode Clock Generation

Depending on the encoding method (variable pulse distance/biphase), the MPU must develop a data structure that combines 1 and 0 with a t period to encode the complete frame to transmit. This can then be transmitted to the infrared output with a modulation method, as shown in Figure 24-85.

Figure 24-85. CIR Mode Block Components



uart-034

Based on the requested modulation frequency, the UART3.UART_CFPS register must be set with the correct dividing value to provide an accurate pulse frequency:

$$\text{Dividing value} = (\text{FCLK}/12)/\text{MODfreq}$$

Where:

FCLK = System clock frequency (48 MHz)

12 = Real value of baud multiple

MODfreq = Effective frequency of the modulation (MHz)

Example: For a targeted modulation frequency of 36 kHz, the value of UART_CFPS must be set to 0x7 (decimal), which provides a modulation frequency of 36.04 kHz.

NOTE: The UART3.UART_CFPS register starts with a reset value of 105 (decimal), which translates to a frequency of 38.1 kHz.

The duty cycle of these pulses is user-defined by the pulse duty register bits in the UART3.UART_MDR2 register. [Table 24-164](#) shows the duty cycle.

Table 24-164. Duty Cycle

| UART_MDR2[5:4] | Duty Cycle (High-Level) |
|----------------|-------------------------|
| 00 | 1/4 |
| 01 | 1/3 |
| 10 | 5/12 |
| 11 | 1/2 |

24.3.4.8.3.2 CIR Data Formatting

The methods described in this section apply to all CIR modes.

24.3.4.8.3.2.1 IR RX Polarity Control

The IR RX polarity control for CIR mode has the same function as that for IrDA mode (see [Section 24.3.4.8.2.3.1, IR RX Polarity Control](#)).

24.3.4.8.3.2.2 CIR Transmission

In transmission, the MPU software must exercise an element of real-time control to transmit data packets, each of which must be emitted at a constant delay from the start-bits of each individual packet. Thus, when sending a series of packets, the packet-to-packet delay must respect a specific delay. Two methods can be used to control this delay:

- Filling the TX FIFO with a number of zero bits that are transmitted with a t period
- Using an external system timer to control the delay between each start-of-frame or between the end of a frame and the start of the next one. This can be performed by:
 - Controlling the start of the frame using the UART3.UART_MDR1[5] SCT bit and the UART3.UART_ACREG[2] SCTX_EN bit, depending on the timer status
 - Using the UART3.UART_IIR[5] TX_STATUS_IT interrupt bit to preload the next frame in the TX FIFO and to control the start of the timer (in case of control delay between the end of a frame and the start of the next frame)

24.3.5 UART/IrDA/CIR Basic Programming Model

24.3.5.1 UART Programming Model

24.3.5.1.1 Quick Start

This section describes the procedure for operating the UART with FIFO and DMA or interrupts. This three-part procedure ensures the quick start of the UART. It does not cover every UART feature.

The first programming model covers software reset of the UART. The second programming model describes FIFO and DMA configuration. The last programming model describes protocol, baud rate, and interrupt configuration.

NOTE: Each programming model can be used independently of the other two; for instance, reconfiguring the FIFOs and DMA settings only.

Each programming model can be executed starting from any UART register access mode (register modes, submodes, and other register dependencies). However, if the UART register access mode is known before executing the programming model, some steps that enable or restore register access are optional. For more information, see [Section 24.3.4.7.1, Register Access Modes](#).

24.3.5.1.1.1 Software Reset

To clear the UART registers, perform the following steps:

1. Initiate a software reset:
Set the UARTi.UART_SYSC[1] SOFTRESET bit to 1.
2. Wait for the end of the reset operation:
Poll the UARTi.UART_SYSS[0] RESETDONE bit until it equals 1.

24.3.5.1.1.2 FIFOs and DMA Settings

To enable and configure the receive and transmit FIFOs and program the DMA mode, perform the following steps:

1. Switch to register configuration mode B to access the UARTi.UART_EFR register:
 - (a) Save the current UARTi.UART_LCR register value.
 - (b) Set the UARTi.UART_LCR register value to 0x00BF.
2. Enable register submode TCR_TLR to access the UARTi.UART_TLR register (part 1 of 2):
 - (a) Save the UARTi.UART_EFR[4] ENHANCED_EN value.
 - (b) Set the UARTi.UART_EFR[4] ENHANCED_EN bit to 1.
3. Switch to register configuration mode A to access the UARTi.UART_MCR register:
Set the UARTi.UART_LCR register value to 0x0080.
4. Enable register submode TCR_TLR to access the UARTi.UART_TLR register (part 2 of 2):
 - (a) Save the UARTi.UART_MCR[6] TCR_TLR value.
 - (b) Set the UARTi.UART_MCR[6] TCR_TLR bit to 1.
5. Enable the FIFO; load the new FIFO triggers (part 1 of 3) and the new DMA mode (part 1 of 2):
Set the following bits to the desired values:
 - UARTi.UART_FCR[7:6] RX_FIFO_TRIG
 - UARTi.UART_FCR[5:4] TX_FIFO_TRIG
 - UARTi.UART_FCR[3] DMA_MODE
 - UARTi.UART_FCR[0] FIFO_ENABLE (0: Disable the FIFO; 1: Enable the FIFO)

NOTE: The UARTi.UART_FCR register is not readable.

6. Switch to register configuration mode B to access the UARTi.UART_EFR register:
Set the UARTi.UART_LCR register value to 0x00BF.
7. Load the new FIFO triggers (part 2 of 3):
Set the following bits to the desired values:
 - UARTi.UART_TLR[7:4] RX_FIFO_TRIG_DMA
 - UARTi.UART_TLR[3:0] TX_FIFO_TRIG_DMA
8. Load the new FIFO triggers (part 3 of 3) and the new DMA mode (part 2 of 2):
Set the following bits to the desired values:
 - UARTi.UART_SCR[7] RX_TRIG_GRANU1
 - UARTi.UART_SCR[6] TX_TRIG_GRANU1
 - UARTi.UART_SCR[2:1] DMA_MODE_2
 - UARTi.UART_SCR[0] DMA_MODE_CTL
9. Restore the UARTi.UART_EFR[4] ENHANCED_EN value saved in Step 2a.
10. Switch to register configuration mode A to access the UARTi.UART_MCR register:
Set the UARTi.UART_LCR register value to 0x0080.
11. Restore the UARTi.UART_MCR[6] TCR_TLR value saved in Step 4a.
12. Restore the UARTi.UART_LCR value saved in Step 1a.

Triggers are used to generate interrupt and DMA requests. See [Section 24.3.4.6.1.1, Transmit FIFO Trigger](#), to choose the following values:

- UArTi.UArT_FCR[5:4] TX_FIFO_TRIG
- UArTi.UArT_TLR[3:0] TX_FIFO_TRIG_DMA
- UArTi.UArT_SCR[6] TX_TRIG_GRANU1

Triggers are used to generate interrupt and DMA requests. See [Section 24.3.4.6.1.2, Receive FIFO Trigger](#), to choose the following values:

- UArTi.UArT_FCR[7:6] RX_FIFO_TRIG
- UArTi.UArT_TLR[7:4] RX_FIFO_TRIG_DMA
- UArTi.UArT_SCR[7] RX_TRIG_GRANU1

DMA mode enables DMA requests. See [Section 24.3.4.6.4, FIFO DMA Mode Operation](#), to choose the following values:

- UArTi.UArT_FCR[3] DMA_MODE
- UArTi.UArT_SCR[2:1] DMA_MODE_2
- UArTi.UArT_SCR[0] DMA_MODE_CTL

24.3.5.1.1.3 Protocol, Baud Rate, and Interrupt Settings

To program the protocol, baud rate, and interrupt settings, perform the following steps:

1. Disable UART to access the UArTi.UArT_DLL and UArTi.UArT_DLH registers:
Set the UArTi.UArT_MDR1[2:0] MODE_SELECT bit field to 0x7.
2. Switch to register configuration mode B to access the UArTi.UArT_EFR register:
Set the UArTi.UArT_LCR register value to 0x00BF.
3. Enable access to the UArTi.UArT_IER[7:4] bit field:
 - (a) Save the UArTi.UArT_EFR[4] ENHANCED_EN value.
 - (b) Set the UArTi.UArT_EFR[4] ENHANCED_EN bit to 1.
4. Switch to register operational mode to access the UArTi.UArT_IER register:
Set the UArTi.UArT_LCR register value to 0x0000.
5. Clear the UArTi.UArT_IER register (set the UArTi.UArT_IER[4] SLEEP_MODE bit to 0 to change the UArTi.UArT_DLL and UArTi.UArT_DLH registers). Set the UArTi.UArT_IER register value to 0x0000.
6. Switch to register configuration mode B to access the UArTi.UArT_DLL and UArTi.UArT_DLH registers:
Set the UArTi.UArT_LCR register value to 0x00BF.
7. Load the new divisor value:
Set the UArTi.UArT_DLL[7:0] CLOCK_LSB and UArTi.UArT_DLH[5:0] CLOCK_MSB bit fields to the desired values.
8. Switch to register operational mode to access the UArTi.UArT_IER register:
Set the UArTi.UArT_LCR register value to 0x0000.
9. Load the new interrupt configuration (0: Disable the interrupt; 1: Enable the interrupt):
Set the following bits to the desired values:
 - UArTi.UArT_IER[7] CTS_IT
 - UArTi.UArT_IER[6] RTS_IT
 - UArTi.UArT_IER[5] XOFF_IT
 - UArTi.UArT_IER[4] SLEEP_MODE
 - UArTi.UArT_IER[3] MODEM_STS_IT
 - UArTi.UArT_IER[2] LINE_STS_IT
 - UArTi.UArT_IER[1] THR_IT

- UARTi.UART_IER[0] RHR_IT
10. Switch to register configuration mode B to access the UARTi.UART_EFR register:
Set the UARTi.UART_LCR register value to 0x00BF.
 11. Restore the UARTi.UART_EFR[4] ENHANCED_EN value saved in Step 3a.
 12. Load the new protocol formatting (parity, stop-bit, character length) and switch to register operational mode:
Set the UARTi.UART_LCR[7] DIV_EN bit to 0.
Set the UARTi.UART_LCR[6] BREAK_EN bit to 0.
Set the following bits to the desired values:
 - UARTi.UART_LCR[5] PARITY_TYPE_2
 - UARTi.UART_LCR[4] PARITY_TYPE_1
 - UARTi.UART_LCR[3] PARITY_EN
 - UARTi.UART_LCR[2] NB_STOP
 - UARTi.UART_LCR[1:0] CHAR_LENGTH
 13. Load the new UART mode:
Set the UARTi.UART_MDR1[2:0] MODE_SELECT bit field to the desired value.
- See [Section 24.3.4.8.1.2](#), *Choosing the Appropriate Divisor Value*, to choose the following values:
- UARTi.UART_DLL[7:0] CLOCK_LSB
 - UARTi.UART_DLH[5:0] CLOCK_MSB
 - UARTi.UART_MDR1[2:0] MODE_SELECT
- See [Section 24.3.4.8.1.3.1](#), *Frame Formatting*, to choose the following values:
- UARTi.UART_LCR[5] PARITY_TYPE_2
 - UARTi.UART_LCR[4] PARITY_TYPE_1
 - UARTi.UART_LCR[3] PARITY_EN
 - UARTi.UART_LCR[2] NB_STOP
 - UARTi.UART_LCR[1:0] CHAR_LENGTH

24.3.5.1.2 Hardware and Software Flow Control Configuration

This section describes the programming steps to enable and configure hardware and software flow control. Hardware and software flow control cannot be used at the same time.

NOTE: Each programming model can be executed starting from any UART register access mode (register modes, submodes, and other register dependencies). However, if the UART register access mode is known before executing the programming model, some steps that enable or restore register access are optional. For more information, see [Section 24.3.4.7.1](#), *Register Access Modes*.

24.3.5.1.2.1 Hardware Flow Control Configuration

To enable and configure hardware flow control, perform the following steps:

1. Switch to register configuration mode A to access the UARTi.UART_MCR register:
 - (a) Save the current UARTi.UART_LCR register value.
 - (b) Set the UARTi.UART_LCR register value to 0x0080.
2. Enable register submode TCR_TLR to access the UARTi.UART_TCR register (part 1 of 2):
 - (a) Save the UARTi.UART_MCR[6] TCR_TLR value.
 - (b) Set the UARTi.UART_MCR[6] TCR_TLR bit to 1.
3. Switch to register configuration mode B to access the UARTi.UART_EFR register:

Set the UARTi.UART_LCR register value to 0x00BF.

4. Enable register submode TCR_TLR to access the UARTi.UART_TCR register (part 2 of 2):
 - (a) Save the UARTi.UART_EFR[4] ENHANCED_EN value.
 - (b) Set the UARTi.UART_EFR[4] ENHANCED_EN bit to 1.

5. Load the new start and halt trigger values for hardware flow control:

Set the following bits to the desired values:

- UARTi.UART_TCR[7:4] AUTO_RTS_START
- UARTi.UART_TCR[3:0] AUTO_RTS_HALT

6. Enable or disable receive and transmit hardware flow control mode and restore the UARTi.UART_EFR[4] ENHANCED_EN value saved in Step 4a.

Set the following bits to the desired values:

- UARTi.UART_EFR[7] AUTO_CTS_EN (0: Disable; 1: Enable)
- UARTi.UART_EFR[6] AUTO_RTS_EN (0: Disable; 1: Enable)

Restore the UARTi.UART_EFR[4] ENHANCED_EN bit to the saved value.

7. Switch to register configuration mode A to access the UARTi.UART_MCR register:

Set the UARTi.UART_LCR register value to 0x0080.

8. Restore the UARTi.UART_MCR[6] TCR_TLR value saved in Step 2a.
9. Restore the UARTi.UART_LCR value saved in Step 1a.

See [Section 24.3.4.8.1.3.2, Hardware Flow Control](#), to choose the following values:

- UARTi.UART_EFR[7] AUTO_CTS_EN
- UARTi.UART_EFR[6] AUTO_RTS_EN
- UARTi.UART_TCR[7:4] AUTO_RTS_START
- UARTi.UART_TCR[3:0] AUTO_RTS_HALT

24.3.5.1.2.2 Software Flow Control Configuration

To enable and configure software flow control, perform the following steps:

1. Switch to register configuration mode B to access the UARTi.UART_EFR register.
 - (a) Save the current UARTi.UART_LCR register value.
 - (b) Set the UARTi.UART_LCR register value to 0x00BF.
2. Enable register submode XOFF to access the UARTi.UART_XOFF1 and UARTi.UART_XOFF2 registers:
 - (a) Save the UARTi.UART_EFR[4] ENHANCED_EN value.
 - (b) Set the UARTi.UART_EFR[4] ENHANCED_EN bit to 0.
3. Load the new software flow control characters:

Set the following bits to the desired values:

 - UARTi.UART_XON1_ADDR1[7:0] XON_WORD1
 - UARTi.UART_XON2_ADDR2[7:0] XON_WORD2
 - UARTi.UART_XOFF1[7:0] XOFF_WORD1
 - UARTi.UART_XOFF2[7:0] XOFF_WORD2
4. Enable access to the UARTi.UART_MCR[7:5] bit field and enable register submode TCR_TLR to access the UARTi.UART_TCR register (part 1 of 2):

Set the UARTi.UART_EFR[4] ENHANCED_EN bit to 1.
5. Switch to register configuration mode A to access the UARTi.UART_MCR register:

Set the UARTi.UART_LCR register value to 0x0080.
6. Enable register submode TCR_TLR to access the UARTi.UART_TCR register (part 2 of 2) and enable or disable XON any function:

- (a) Save the UARTi.UART_MCR[6] TCR_TLR value.
 - (b) Set the UARTi.UART_MCR[6] TCR_TLR bit to 1.
 - (c) Set the UARTi.UART_MCR[5] XON_EN bit to the desired value (0: Disable; 1: Enable).
 7. Switch to register configuration mode B to access the UARTi.UART_EFR register:
Set the UARTi.UART_LCR register value to 0x00BF.
 8. Load the new start and halt trigger values for software flow control:
Set the following bits to the desired values:
 - UARTi.UART_TCR[7:4] AUTO_RTS_START
 - UARTi.UART_TCR[3:0] AUTO_RTS_HALT
 9. Enable or disable special character function and load the new software flow control mode and restore the UARTi.UART_EFR[4] ENHANCED_EN value saved in Step 2a:
Set the following bits to the desired values:
 - UARTi.UART_EFR[5] SPEC_CHAR (0: Disable; 1: Enable)
 - UARTi.UART_EFR[3:0] SW_FLOW_CONTROLRestore the UARTi.UART_EFR[4] ENHANCED_EN bit to the saved value.
 10. Switch to register configuration mode A to access the UARTi.UART_MCR register:
Set the UARTi.UART_LCR register value to 0x0080.
 11. Restore the UARTi.UART_MCR[6] TCR_TLR bit value saved in Step 6a.
 12. Restore the UARTi.UART_LCR value saved in Step 1a.
- See [Section 24.3.4.8.1.3.3, Software Flow Control](#), to choose the following values:
- UARTi.UART_EFR[5] SPEC_CHAR
 - UARTi.UART_EFR[3:0] SW_FLOW_CONTROL
 - UARTi.UART_TCR[7:4] AUTO_RTS_START
 - UARTi.UART_TCR[3:0] AUTO_RTS_HALT
 - UARTi.UART_XON1_ADDR1[7:0] XON_WORD1
 - UARTi.UART_XON2_ADDR2[7:0] XON_WORD2
 - UARTi.UART_XOFF1[7:0] XOFF_WORD1
 - UARTi.UART_XOFF2[7:0] XOFF_WORD2

24.3.5.2 IrDA Programming Model (UART3 Only)

24.3.5.2.1 SIR Mode

24.3.5.2.1.1 Receive

The following programming model explains how to program the module to receive an IrDA frame with parity forced to 1, baud rate = 112.5KB, FIFOs disabled, 2 stop-bits, and 8-bit word length:

1. Disable the UART before accessing the UARTi.UART_DLL and UARTi.UART_DLH registers:
Set the UARTi.UART_MDR1[2:0] MODE_SELECT bit field to 0x7.
2. Grant access to the UART_DLL and UART_DLH registers (the UART_LCR[7] DIV_EN bit = 1):
UART3.UART_LCR = 0x80 (Data format is unaffected by the use and settings of the UART3.UART_LCR register in IrDA mode.)
3. Load the new baud rate (115.2 kbps):
UART3.UART_DLL = 0x1A
UART3.UART_DLH = 0x00
4. Set SIR mode:
UART3.UART_MDR1[2:0] MODE_SELECT = 0x1
5. Disable access to the UART_DLL and UART_DLH registers and switch to register operational mode:
UART3.UART_LCR = 0x00.
6. Optional: Enable the RHR interrupt:
UART3.UART_IER[0] RHR_IT = 0x1

24.3.5.2.1.2 Transmit

The following programming model explains how to program the module to transmit an IrDA 6-byte frame with no parity, baud rate = 112.5 kbps, FIFOs disabled, 3/16 encoding, 2 stop-bits, and 7-bit word length:

1. Disable the UART before accessing the UARTi.UART_DLL and UARTi.UART_DLH registers:
Set the UART_MDR1[2:0] MODE_SELECT bit field to 0x7.
2. Grant access to the UART_EFR register:
UART3.UART_LCR = 0xBF
3. Enable the enhanced features (the UART_EFR[4] ENHANCED_EN bit = 1):
Set the UART3.UART_EFR register value to 0x10.
4. Grant access to the UART_DLL and UART_DLH registers (the UART_LCR[7] DIV_EN bit = 1):
UART3.UART_LCR = 0x80 (Data format is unaffected by the use and settings of the UART3.UART_LCR register in IrDA mode.)
5. Load the new baud rate (115.2 kbps):
UART3.UART_DLL = 0x1A
UART3.UART_DLH = 0x00
6. Set SIR mode (the UART_MDR1[2:0] MODE_SELECT bit field = 0x1):
UART3.UART_MDR1 = 0x01
7. Disable access to the UART_DLL and UART_DLH registers and switch to register operational mode:
UART3.UART_LCR = 0x00.
8. Force DTR output to active:
UART3.UART_MCR[0] DTR = 1
9. Optional: Enable the THR interrupt:
UART3.UART_IER[1] THR_IT = 1
10. Set transmit frame length to 6 bytes:
UART3.UART_TXFL = 0x06
11. Set 7 starts of frame transmission:
UART3.UART_EBLR = 0x08
12. Optional: Set SIR pulse width to be 1.6 us:
UART3.UART_ACREG[7] PULSE_TYPE = 1
13. Load the UART_THR register with the data to be transmitted.

24.3.5.2.2 MIR Mode

24.3.5.2.2.1 Receive

The following programming model explains how to program the module to receive an IrDA frame with no parity, baud rate = 1.152 Mbps, and FIFOs disabled.

1. Disable the UART before accessing the UARTi.UART_DLL and UARTi.UART_DLH registers:
Set the UARTi.UART_MDR1[2:0] MODE_SELECT bit field to 0x7.
2. Grant access to the UART_DLL and UART_DLH registers (UART_LCR[7] DIV_EN bit = 1):
UART3.UART_LCR = 0x80 (Data format is unaffected by the use and settings of the UART3.UART_LCR register in IrDA mode.)
3. Load the new baud rate (1.152 Mbps):
UART3.UART_DLL = 0x01
UART3.UART_DLH = 0x00
4. Set MIR mode:
UART3.UART_MDR1[2:0] MODE_SELECT = 0x4
5. Disable access to the UART_DLL and UART_DLH registers and switch to register operational mode:
UART3.UART_LCR = 0x00
6. Force DTR output to active (UART_MCR[0] DTR = 1):
Force RTS output to active (UART_MCR[1] RTS = 1).
UART3.UART_MCR = 0x3
7. Optional: Enable the RHR interrupt:
UART3.UART_IER[0] RHR_IT = 1

24.3.5.2.2.2 Transmit

The following programming model explains how to program the module to transmit an IrDA 60-byte frame with no parity, baud rate = 1.152 Mbps, and FIFOs disabled:

1. Disable the UART before accessing the UARTi.UART_DLL and UARTi.UART_DLH registers:
Set the UARTi.UART_MDR1[2:0] MODE_SELECT bit field to 0x7.
2. Grant access to the UART_DLL and UART_DLH registers (UART_LCR[7] DIV_EN bit = 1):
UART3.UART_LCR = 0x80 (Data format is unaffected by the use and settings of the UART3.UART_LCR register in IrDA mode.)
3. Load the new baud rate (1.152 Mbps):
UART3.UART_DLL = 0x01
UART3.UART_DLH = 0x00
4. Set MIR mode:
UART3.UART_MDR1[2:0] MODE_SELECT = 0x4
5. Disable access to the UART_DLL and UART_DLH registers and switch to register operational mode:
UART3.UART_LCR = 0x00
6. Force DTR output to active:
UART3.UART_MCR[0] DTR = 1
7. Optional: Enable the THR interrupt:
UART3.UART_IER[1] THR_IT = 1
8. Set the frame length to 60 bytes:
UART3.UART_TXFL = 0x3C
9. Optional: Transmit eight additional starts of frame (MIR mode requires two starts):
UART3.UART_EBLR = 0x08
10. SIP is sent at the end of transmission:
UART3.UART_ACREG[3] = 1
11. Load the UART_THR register with the data to be transmitted.

24.3.5.2.3 FIR Mode

24.3.5.2.3.1 Receive

The following programming model explains how to program the module to receive the IrDA frame with no parity, baud rate = 4 Mbps, FIFOs enabled, 8-bit word length.

1. Disable the UART before accessing the UART3.UART_DLL and UART3.UART_DLH registers:
Set the UART3.UART_MDR1[2:0] MODE_SELECT bit field to 0x7.
2. Grant access to the UART_DLL and UART_DLH registers (UART_LCR[7] DIV_EN bit = 1):
UART3.UART_LCR = 0x80 (Data format is unaffected by the use and settings of the UART3.UART_LCR register in IrDA mode.)
3. FIFO clear and enable:
UART3.UART_FCR = 0x7 (TX/RX FIFO trigger: UART_FCR[7:6] and UART_FCR[5:4])
UART3.UART_LCR[7] = 0
4. Set FIR mode:
UART3.UART_MDR1[2:0] MODE_SELECT = 0x5
5. Set frame length:
UART3.UART_RXFLL = 0xA (Data + CRC + STOP)
6. Disable access to the UART3.UART_DLL registers and UART3.UART_DLH and switch to register operational mode:
UART3.UART_LCR[7] DIV_EN = 0x0
7. Optional: Enable the RHR interrupt:
UART3.UART_IER[0] RHR_IT = 1

24.3.5.2.3.2 Transmit

The following programming model explains how to program the module to transmit an IrDA 4-byte frame with no parity, baud rate = 4 Mbps, FIFOs enabled, and 8-bit word length.

1. Disable the UART before accessing the UART3.UART_DLL and UART3.UART_DLH registers:
Set the UART3.UART_MDR1[2:0] MODE_SELECT bit field to 0x7.
2. Grant access to EFR_REG:
UART3.UART_LCR = 0xBF
3. Enable the enhanced features (EFR_REG[4] ENHANCED_EN = 0x1):
UART3.UART_EFR = 0x10
4. FIFO clear and enable:
UART3.UART_FCR = 0x7 (TX/RX FIFO trigger: UART_FCR[7:6] and UART_FCR[5:4]).
UART3.UART_LCR[7] = 0
5. Set FIR mode and enable auto-SIP mode:
UART3.UART_MDR1 = 0x45
6. Set frame length:
UART3.UART_TXFLL = 0x4
UART3.UART_TXFLH = 0x0
UART3.UART_RXFLL = 0xA (Data + CRC + STOP)
UART3.UART_RXFLH = 0x0
7. Force DTR output to active:
UART3.UART_MCR[0] DTR = 0x1
8. Optional: Enable the THR interrupt:
UART3.UART_IER[1] THR_IT = 0x1
9. Optional: Transmit eight additional starts of frame (MIR mode requires two starts):
UART3.UART_EBLR = 0x08
10. SIP is sent at the end of transmission:
UART3.UART_ACREG[3] = 1
11. Load the UART_THR register with the data to be transmitted.

24.3.6 UART/IrDA/CIR Register Manual

24.3.6.1 UART/IrDA/CIR Instance Summary

Table 24-165 shows the base address and address space for the UART/IrDA/CIR module instances.

Table 24-165. UART/IrDA/CIR Instance Summary

| Module Name | Base Address | Size |
|----------------------|--------------|------|
| UART1 ⁽¹⁾ | 0x4806 A000 | 1KB |
| UART2 ⁽¹⁾ | 0x4806 C000 | 1KB |
| UART3 ⁽²⁾ | 0x4802 0000 | 1KB |
| UART4 ⁽¹⁾ | 0x4806 E000 | 1KB |

⁽¹⁾ UART mode only

⁽²⁾ UART, IrDA, or CIR mode

24.3.6.2 UART/IrDA/CIR Registers

24.3.6.2.1 UART/IrDA/CIR Register Summary

Table 24-166. UART/IrDA/CIR Register Mapping Summary (UART1 and UART2)

| Register Name | Type | Register Width (Bits) | Address Offset | UART1 Base Address | UART2 Base Address |
|-----------------|------|-----------------------|----------------|--------------------|--------------------|
| UART_THR | W | 32 | 0x0000 0000 | 0x4806 A000 | 0x4806 C000 |
| UART_RHR | R | 32 | 0x0000 0000 | 0x4806 A000 | 0x4806 C000 |
| UART_DLL | RW | 32 | 0x0000 0000 | 0x4806 A000 | 0x4806 C000 |
| UART_IER | RW | 32 | 0x0000 0004 | 0x4806 A004 | 0x4806 C004 |
| UART_IIR | R | 32 | 0x0000 0008 | 0x4806 A008 | 0x4806 C008 |
| UART_DLH | RW | 32 | 0x0000 0004 | 0x4806 A004 | 0x4806 C004 |
| UART_FCR | W | 32 | 0x0000 0008 | 0x4806 A008 | 0x4806 C008 |
| UART_EFR | RW | 32 | 0x0000 0008 | 0x4806 A008 | 0x4806 C008 |
| UART_LCR | RW | 32 | 0x0000 000C | 0x4806 A00C | 0x4806 C00C |
| UART_XON1_ADDR1 | RW | 32 | 0x0000 0010 | 0x4806 A010 | 0x4806 C010 |
| UART_MCR | RW | 32 | 0x0000 0010 | 0x4806 A010 | 0x4806 C010 |
| UART_LSR | R | 32 | 0x0000 0014 | 0x4806 A014 | 0x4806 C014 |
| UART_XON2_ADDR2 | RW | 32 | 0x0000 0014 | 0x4806 A014 | 0x4806 C014 |
| UART_TCR | RW | 32 | 0x0000 0018 | 0x4806 A018 | 0x4806 C018 |
| UART_XOFF1 | RW | 32 | 0x0000 0018 | 0x4806 A018 | 0x4806 C018 |
| UART_MSR | R | 32 | 0x0000 0018 | 0x4806 A018 | 0x4806 C018 |
| UART_SPR | RW | 32 | 0x0000 001C | 0x4806 A01C | 0x4806 C01C |
| UART_TLR | RW | 32 | 0x0000 001C | 0x4806 A01C | 0x4806 C01C |
| UART_XOFF2 | RW | 32 | 0x0000 001C | 0x4806 A01C | 0x4806 C01C |
| UART_MDR1 | RW | 32 | 0x0000 0020 | 0x4806 A020 | 0x4806 C020 |
| UART_MDR2 | RW | 32 | 0x0000 0024 | 0x4806 A024 | 0x4806 C024 |
| UART_SFLSR | R | 32 | 0x0000 0028 | 0x4806 A028 | 0x4806 C028 |
| UART_TXFLL | W | 32 | 0x0000 0028 | 0x4806 A028 | 0x4806 C028 |
| UART_RESUME | R | 32 | 0x0000 002C | 0x4806 A02C | 0x4806 C02C |
| UART_TXFLH | W | 32 | 0x0000 002C | 0x4806 A02C | 0x4806 C02C |
| UART_SFREGL | R | 32 | 0x0000 0030 | 0x4806 A030 | 0x4806 C030 |
| UART_RXFLL | W | 32 | 0x0000 0030 | 0x4806 A030 | 0x4806 C030 |
| UART_SFREGH | R | 32 | 0x0000 0034 | 0x4806 A034 | 0x4806 C034 |
| UART_RXFLH | W | 32 | 0x0000 0034 | 0x4806 A034 | 0x4806 C034 |

Table 24-166. UART/IrDA/CIR Register Mapping Summary (UART1 and UART2) (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | UART1 Base Address | UART2 Base Address |
|-----------------------|------|-----------------------|----------------|--------------------|--------------------|
| UART_BLR | RW | 32 | 0x0000 0038 | 0x4806 A038 | 0x4806 C038 |
| UART_UASR | R | 32 | 0x0000 0038 | 0x4806 A038 | 0x4806 C038 |
| UART_ACREG | RW | 32 | 0x0000 003C | 0x4806 A03C | 0x4806 C03C |
| UART_SCR | RW | 32 | 0x0000 0040 | 0x4806 A040 | 0x4806 C040 |
| UART_SSR | R | 32 | 0x0000 0044 | 0x4806 A044 | 0x4806 C044 |
| UART_EBLR | RW | 32 | 0x0000 0048 | 0x4806 A048 | 0x4806 C048 |
| UART_MVR | R | 32 | 0x0000 0050 | 0x4806 A050 | 0x4806 C050 |
| UART_SYSC | RW | 32 | 0x0000 0054 | 0x4806 A054 | 0x4806 C054 |
| UART_SYSS | R | 32 | 0x0000 0058 | 0x4806 A058 | 0x4806 C058 |
| UART_WER | RW | 32 | 0x0000 005C | 0x4806 A05C | 0x4806 C05C |
| UART_CFPS | RW | 32 | 0x0000 0060 | 0x4806 A060 | 0x4806 C060 |
| UART_RXFIFO_LVL | R | 32 | 0x0000 0064 | 0x4806 A064 | 0x4806 C064 |
| UART_TXFIFO_LVL | R | 32 | 0x0000 0068 | 0x4806 A068 | 0x4806 C068 |
| UART_IER2 | RW | 32 | 0x0000 006C | 0x4806 A06C | 0x4806 C06C |
| UART_ISR2 | RW | 32 | 0x0000 0070 | 0x4806 A070 | 0x4806 C070 |
| UART_FREQ_SEL | RW | 32 | 0x0000 0074 | 0x4806 A074 | 0x4806 C074 |
| UART_MDR3 | RW | 32 | 0x0000 0080 | 0x4806 A080 | 0x4806 C080 |
| UART_TX_DMA_THRESHOLD | RW | 32 | 0x0000 0084 | 0x4806 A084 | 0x4806 C084 |

Table 24-167. UART/IrDA/CIR Register Mapping Summary (UART3 and UART4)

| Register Name | Type | Register Width (Bits) | Address Offset | UART3 Base Address | UART4 Base Address |
|-----------------|------|-----------------------|----------------|--------------------|--------------------|
| UART_THR | W | 32 | 0x0000 0000 | 0x4802 0000 | 0x4806 E000 |
| UART_RHR | R | 32 | 0x0000 0000 | 0x4802 0000 | 0x4806 E000 |
| UART_DLL | RW | 32 | 0x0000 0000 | 0x4802 0000 | 0x4806 E000 |
| UART_IER | RW | 32 | 0x0000 0004 | 0x4802 0004 | 0x4806 E004 |
| UART_IIR | R | 32 | 0x0000 0008 | 0x4802 0008 | 0x4806 E008 |
| UART_DLH | RW | 32 | 0x0000 0004 | 0x4802 0004 | 0x4806 E004 |
| UART_FCR | W | 32 | 0x0000 0008 | 0x4802 0008 | 0x4806 E008 |
| UART_EFR | RW | 32 | 0x0000 0008 | 0x4802 0008 | 0x4806 E008 |
| UART_LCR | RW | 32 | 0x0000 000C | 0x4802 000C | 0x4806 E00C |
| UART_XON1_ADDR1 | RW | 32 | 0x0000 0010 | 0x4802 0010 | 0x4806 E010 |
| UART_MCR | RW | 32 | 0x0000 0010 | 0x4802 0010 | 0x4806 E010 |
| UART_LSR | R | 32 | 0x0000 0014 | 0x4802 0014 | 0x4806 E014 |
| UART_XON2_ADDR2 | RW | 32 | 0x0000 0014 | 0x4802 0014 | 0x4806 E014 |
| UART_TCR | RW | 32 | 0x0000 0018 | 0x4802 0018 | 0x4806 E018 |
| UART_XOFF1 | RW | 32 | 0x0000 0018 | 0x4802 0018 | 0x4806 E018 |
| UART_MSR | R | 32 | 0x0000 0018 | 0x4802 0018 | 0x4806 E018 |
| UART_SPR | RW | 32 | 0x0000 001C | 0x4802 001C | 0x4806 E01C |
| UART_TLR | RW | 32 | 0x0000 001C | 0x4802 001C | 0x4806 E01C |
| UART_XOFF2 | RW | 32 | 0x0000 001C | 0x4802 001C | 0x4806 E01C |
| UART_MDR1 | RW | 32 | 0x0000 0020 | 0x4802 0020 | 0x4806 E020 |
| UART_MDR2 | RW | 32 | 0x0000 0024 | 0x4802 0024 | 0x4806 E024 |
| UART_SFLSR | R | 32 | 0x0000 0028 | 0x4802 0028 | 0x4806 E028 |
| UART_TXFLL | W | 32 | 0x0000 0028 | 0x4802 0028 | 0x4806 E028 |
| UART_RESUME | R | 32 | 0x0000 002C | 0x4802 002C | 0x4806 E02C |

Table 24-167. UART/IrDA/CIR Register Mapping Summary (UART3 and UART4) (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | UART3 Base Address | UART4 Base Address |
|---------------------------|------|-----------------------|----------------|--------------------|--------------------|
| UART_TXFLH | W | 32 | 0x0000 002C | 0x4802 002C | 0x4806 E02C |
| UART_SFREGL | R | 32 | 0x0000 0030 | 0x4802 0030 | 0x4806 E030 |
| UART_RXFLL | W | 32 | 0x0000 0030 | 0x4802 0030 | 0x4806 E030 |
| UART_SFREGH | R | 32 | 0x0000 0034 | 0x4802 0034 | 0x4806 E034 |
| UART_RXFLH | W | 32 | 0x0000 0034 | 0x4802 0034 | 0x4806 E034 |
| UART_BLR | RW | 32 | 0x0000 0038 | 0x4802 0038 | 0x4806 E038 |
| UART_UASR | R | 32 | 0x0000 0038 | 0x4802 0038 | 0x4806 E038 |
| UART_ACREG | RW | 32 | 0x0000 003C | 0x4802 003C | 0x4806 E03C |
| UART_SCR | RW | 32 | 0x0000 0040 | 0x4802 0040 | 0x4806 E040 |
| UART_SSR | R | 32 | 0x0000 0044 | 0x4802 0044 | 0x4806 E044 |
| UART_EBLR | RW | 32 | 0x0000 0048 | 0x4802 0048 | 0x4806 E048 |
| UART_MVR | R | 32 | 0x0000 0050 | 0x4802 0050 | 0x4806 E050 |
| UART_SYSC | RW | 32 | 0x0000 0054 | 0x4802 0054 | 0x4806 E054 |
| UART_SYSS | R | 32 | 0x0000 0058 | 0x4802 0058 | 0x4806 E058 |
| UART_WER | RW | 32 | 0x0000 005C | 0x4802 005C | 0x4806 E05C |
| UART_CFPS | RW | 32 | 0x0000 0060 | 0x4802 0060 | 0x4806 E060 |
| UART_RXFIFO_LVL | R | 32 | 0x0000 0064 | 0x4802 0064 | 0x4806 E064 |
| UART_TXFIFO_LVL | R | 32 | 0x0000 0068 | 0x4802 0068 | 0x4806 E068 |
| UART_IER2 | RW | 32 | 0x0000 006C | 0x4802 006C | 0x4806 E06C |
| UART_ISR2 | RW | 32 | 0x0000 0070 | 0x4802 0070 | 0x4806 E070 |
| UART_FREQ_SEL | RW | 32 | 0x0000 0074 | 0x4802 0074 | 0x4806 E074 |
| UART_MDR3 | RW | 32 | 0x0000 0080 | 0x4802 0080 | 0x4806 E080 |
| UART_TX_DMA_THRESHOL D | RW | 32 | 0x0000 0084 | 0x4802 0084 | 0x4806 E084 |

24.3.6.2.2 UART/IrDA/CIR Registers**Table 24-168. UART_THR**

| | | | |
|------------------|---|----------|-------------------------|
| Address Offset | 0x0000 0000 | Instance | UART1 |
| Physical Address | 0x4806 A000 0x4806 C000 0x4802 0000 0x4806 E000 | | UART2 UART3 UART4 |
| Description | The transmitter section consists of the transmit holding register (THR) and the transmit shift register. The THR is a 64-byte FIFO. The local host (LH) writes data to the THR. The data is placed in the transmit shift register where it is shifted out serially on the TX output. If the FIFO is disabled, location 0 of the FIFO stores the data. | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | THR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------|------|----------|
| 31:8 | RESERVED | Write has no effect. | W | 0x000000 |
| 7:0 | THR | Transmit holding register | W | 0x- |

Table 24-169. Register Call Summary for Register UART_THR

UART/IrDA/CIR

- [UART Mode Interrupt Management: \[0\] \[1\]](#)
- [IrDA Mode Interrupt Management: \[2\] \[3\] \[4\]](#)
- [CIR Mode Interrupt Management: \[5\] \[6\]](#)
- [FIFO Management: \[7\]](#)
- [FIFO DMA Mode Operation: \[8\] \[9\]](#)
- [Register Access Modes: \[10\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[11\] \[12\] \[13\]](#)
- [SIR Mode: \[14\]](#)
- [MIR Mode: \[15\]](#)
- [FIR Mode: \[16\]](#)
- [UART/IrDA/CIR Register Summary: \[17\] \[18\]](#)

Table 24-170. UART_RHR

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | |
| Physical Address | 0x4806 A000 0x4806 C000 0x4802 0000 0x4806 E000 | | | | | | | | | | | | | | | |
| | Instance | | | | | | | | | | | | | | | |
| | UART1 UART2 UART3 UART4 | | | | | | | | | | | | | | | |
| Description | The receiver section consists of the receiver holding register (RHR) and the receiver shift register. The RHR is a 64-byte FIFO. The receiver shift register receives serial data from RX input. The data is converted to parallel data and moved to the RHR. If the FIFO is disabled, location 0 of the FIFO stores the single data character. Note: If an overflow occurs, the data in the RHR is not overwritten. | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RHR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------|------|----------|
| 31:8 | RESERVED | Read returns 0 | R | 0x000000 |
| 7:0 | RHR | Receive holding register | R | 0x- |

Table 24-171. Register Call Summary for Register UART_RHR

UART/IrDA/CIR

- [UART Mode Interrupt Management: \[0\] \[1\] \[2\]](#)
- [IrDA Mode Interrupt Management: \[3\] \[4\] \[5\]](#)
- [FIFO Management: \[6\] \[7\]](#)
- [Register Access Modes: \[8\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[9\] \[10\]](#)
- [UART Mode: \[11\] \[12\] \[13\] \[14\]](#)
- [UART/IrDA/CIR Register Summary: \[15\] \[16\]](#)

Table 24-172. UART_DLL

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4806 A000 0x4806 C000 0x4802 0000 0x4806 E000 | Instance | UART1 UART2 UART3 UART4 |
| Description | This register, with UART_DLH , stores the 14-bit divisor for generation of the baud clock in the baud rate generator. DLH stores the most-significant part of the divisor. DLL stores the least-significant part of the divisor. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLOCK_LSB | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------------------|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7:0 | CLOCK_LSB | Stores the 8-bit LSB divisor value | RW | 0x00 |

Table 24-173. Register Call Summary for Register UART_DLL

UART/IrDA/CIR

- [UART Mode Power Management](#): [0] [1]
- [FIFO DMA Mode Operation](#): [2] [3]
- [Register Access Modes](#): [4] [5] [6] [7]
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection](#): [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19]
- [UART Mode](#): [20] [21] [22]
- [IrDA Mode \(UART3 Only\)](#): [23]
- [Quick Start](#): [24] [25] [26] [27] [28]
- [SIR Mode](#): [29] [30] [31] [32] [33] [34] [35] [36]
- [MIR Mode](#): [37] [38] [39] [40] [41] [42] [43] [44]
- [FIR Mode](#): [45] [46] [47] [48]
- [UART/IrDA/CIR Register Summary](#): [49] [50]
- [UART/IrDA/CIR Registers](#): [51] [52]

Table 24-174. UART_IER

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0004 | | |
| Physical Address | 0x4806 A004 0x4806 C004 0x4802 0004 0x4806 E004 | Instance | UART1 UART2 UART3 UART4 |
| Description | Interrupt enable register | | |
| Type | RW | | |

UART Bit Field Details

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|--------|----|---------|----|------------|---|--------------|---|-------------|---|--------|---|--------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CTS_IT | | RTS_IT | | XOFF_IT | | SLEEP_MODE | | MODEM_STS_IT | | LINE_STS_IT | | THR_IT | | RHR_IT | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7 | CTS_IT | 0x0: Disables the CTS* interrupt 0x1: Enables the CTS* interrupt | RW | 0 |
| 6 | RTS_IT | 0x0: Disables the RTS* interrupt 0x1: Enables the RTS* interrupt | RW | 0 |
| 5 | XOFF_IT | 0x0: Disables the XOFF interrupt 0x1: Enables the XOFF interrupt | RW | 0 |
| 4 | SLEEP_MODE | 0x0: Disables sleep mode 0x1: Enables sleep mode (stop baud rate clock when the module is inactive) | RW | 0 |
| 3 | MODEM_STS_IT | 0x0: Disables the modem status register interrupt 0x1: Enables the modem status register interrupt | RW | 0 |
| 2 | LINE_STS_IT | 0x0: Disables the receiver line status interrupt 0x1: Enables the receiver line status interrupt | RW | 0 |
| 1 | THR_IT | 0x0: Disables the THR interrupt 0x1: Enables the THR interrupt | RW | 0 |
| 0 | RHR_IT | 0x0: Disables the RHR interrupt and time-out interrupt 0x1: Enables the RHR interrupt and time-out interrupt | RW | 0 |

Table 24-175. Register Call Summary for Register UART_IER
UART/IrDA/CIR

- [UART Mode Power Management: \[0\] \[1\]](#)
- [IrDA Mode Interrupt Management: \[2\] \[3\]](#)
- [CIR Mode Interrupt Management: \[4\] \[5\]](#)
- [FIFO Interrupt Mode: \[6\]](#)
- [FIFO Polled Mode Operation: \[7\]](#)
- [Register Access Modes: \[8\] \[9\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)
- [UART Mode: \[16\]](#)
- [Quick Start: \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\]](#)
- [SIR Mode: \[31\] \[32\]](#)
- [MIR Mode: \[33\] \[34\]](#)
- [FIR Mode: \[35\] \[36\]](#)
- [UART/IrDA/CIR Register Summary: \[37\] \[38\]](#)

IrDA Bit Field Details

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|-------------|----|--------------|----|------------------|---|---------------|---|-----------------|---|--------|---|--------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | EOF_IT | | LINE_STS_IT | | TX_STATUS_IT | | STS_FIFO_TRIG_IT | | RX_OVERRUN_IT | | LAST_RX_BYTE_IT | | THR_IT | | RHR_IT | |

UART/IrDA/CIR

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7 | EOF_IT | 0x0: Disables the received EOF interrupt 0x1: Enables the received EOF interrupt | RW | 0 |
| 6 | LINE_STS_IT | 0x0: Disables the receiver line status interrupt 0x1: Enables the receiver line status interrupt | RW | 0 |
| 5 | TX_STATUS_IT | 0x0: Disables the TX status interrupt 0x1: Enables the TX status interrupt | RW | 0 |
| 4 | STS_FIFO_TRIG_IT | 0x0: Disables status FIFO trigger level interrupt 0x1: Enables status FIFO trigger level interrupt | RW | 0 |
| 3 | RX_OVERRUN_IT | 0x0: Disables the RX overrun interrupt 0x1: Enables the RX overrun interrupt | RW | 0 |
| 2 | LAST_RX_BYTE_IT | 0x0: Disables the last byte of frame in RX FIFO interrupt 0x1: Enables the last byte of frame in RX FIFO interrupt | RW | 0 |
| 1 | THR_IT | 0x0: Disables the THR interrupt 0x1: Enables the THR interrupt | RW | 0 |
| 0 | RHR_IT | 0x0: Disables the RHR interrupt and time-out interrupt 0x1: Enables the RHR interrupt and time-out interrupt | RW | 0 |

CIR Bit Field Details

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|--------------|----|----------|----|---------------|---|------------|---|--------|---|--------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | TX_STATUS_IT | | RESERVED | | RX_OVERRUN_IT | | RX_STOP_IT | | THR_IT | | RHR_IT | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7:6 | RESERVED | Not used in CIR mode | RW | 0x0 |
| 5 | TX_STATUS_IT | 0x0: Disables the TX status interrupt 0x1: Enables the TX status interrupt | RW | 0 |
| 4 | RESERVED | Not used in CIR mode | RW | 0 |
| 3 | RX_OVERRUN_IT | 0x0: Disables the RX overrun interrupt 0x1: Enables the RX overrun interrupt | RW | 0 |
| 2 | RX_STOP_IT | 0x0: Disables the receive stop interrupt 0x1: Enables the receive stop interrupt | RW | 0 |
| 1 | THR_IT | 0x0: Disables the THR interrupt 0x1: Enables the THR interrupt | RW | 0 |
| 0 | RHR_IT | 0x0: Disables the RHR interrupt 0x1: Enables the RHR interrupt | RW | 0 |

Table 24-176. UART_IIR

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0008 | | |
| Physical Address | 0x4806 A008 0x4806 C008 0x4802 0008 0x4806 E008 | Instance | UART1 UART2 UART3 UART4 |
| Description | Interrupt identification register. The IIR is a read-only register that provides the source of the interrupt in a prioritized manner. | | |
| Type | R | | |

UART Bit Field Details

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|---------|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FCR_MIRROR | | IT_TYPE | | | | | | IT_PENDING | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | R | 0x000000 |
| 7:6 | FCR_MIRROR | Mirror the contents of UART_FCR[0] on both bits. | R | 0x0 |
| 5:1 | IT_TYPE | Read 0x0: Modem interrupt. Priority = 4 Read 0x1: THR interrupt. Priority = 3 Read 0x2: RHR interrupt. Priority = 2 Read 0x3: Receiver line status error. Priority = 3 Read 0x6: Rx time-out. Priority = 2 Read 0x8: XOFF/special character. Priority = 5 Read 0x10: CTS, RTS, DSR change state from active (low) to inactive (high) Priority = 6 | R | 0x00 |
| 0 | IT_PENDING | Read 0x0: An interrupt is pending. Read 0x1: No interrupt is pending. | R | 1 |

Table 24-177. Register Call Summary for Register UART_IIR
UART/IrDA/CIR

- [Block Diagram: \[0\]](#)
- [UART Mode Interrupt Management: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [IrDA Mode Interrupt Management: \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [CIR Mode Interrupt Management: \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [Register Access Modes: \[19\] \[20\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[21\] \[22\] \[23\] \[24\] \[25\] \[26\]](#)
- [UART Mode: \[27\] \[28\] \[29\] \[30\] \[31\]](#)
- [CIR Mode \(UART3 Only\): \[32\]](#)
- [UART/IrDA/CIR Register Summary: \[33\] \[34\]](#)
- [UART/IrDA/CIR Registers: \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\]](#)

IrDA Bit Field Details

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|-------------|----|--------------|----|-------------|---|----------|---|----------------------|---|--------|---|--------|---|
| RESERVED | | | | | | | | | | | | | | | | EOF_IT | | LINE_STS_IT | | TX_STATUS_IT | | STS_FIFO_IT | | RX_OE_IT | | RX_FIFO_LAST_BYTE_IT | | THR_IT | | RHR_IT | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | R | 0x000000 |
| 7 | EOF_IT | Read 0x0: Receive EOF interrupt inactive Read 0x1: Received EOF interrupt active | R | 0 |
| 6 | LINE_STS_IT | Read 0x0: Receiver line status interrupt inactive Read 0x1: Receiver line status interrupt active | R | 0 |
| 5 | TX_STATUS_IT | Read 0x0: TX status interrupt inactive Read 0x1: TX status interrupt active | R | 0 |
| 4 | STS_FIFO_IT | Read 0x0: Status FIFO trigger level interrupt inactive Read 0x1: Status FIFO trigger level interrupt active | R | 0 |
| 3 | RX_OE_IT | Read 0x0: RX overrun interrupt inactive Read 0x1: RX overrun interrupt active | R | 0 |
| 2 | RX_FIFO_LAST_BYTE_IT | Read 0x0: Last byte of frame in RX FIFO interrupt inactive Read 0x1: Last byte of frame in RX FIFO interrupt active | R | 0 |
| 1 | THR_IT | Read 0x0: THR interrupt inactive Read 0x1: THR interrupt active | R | 0 |
| 0 | RHR_IT | Read 0x0: RHR interrupt inactive Read 0x1: RHR interrupt active | R | 1 |

CIR Bit Field Details

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|--------------|----------|----------|------------|--------|--------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RESERVED | TX_STATUS_IT | RESERVED | RX_OE_IT | RX_STOP_IT | THR_IT | RHR_IT | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | R | 0x000000 |
| 7:6 | RESERVED | Not used in CIR mode | R | 0x0 |
| 5 | TX_STATUS_IT | Read 0x0: TX status interrupt inactive Read 0x1: TX status interrupt active | R | 0 |
| 4 | RESERVED | Not used in CIR mode | R | 0 |
| 3 | RX_OE_IT | Read 0x0: RX overrun interrupt inactive Read 0x1: RX overrun interrupt active | R | 0 |
| 2 | RX_STOP_IT | Read 0x0: Receive stop interrupt inactive Read 0x1: Receive stop interrupt active | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1 | THR_IT | Read 0x0: THR interrupt inactive Read 0x1: THR interrupt active | R | 0 |
| 0 | RHR_IT | Read 0x0: RHR interrupt inactive Read 0x1: RHR interrupt active | R | 0 |

Table 24-178. UART_DLH

| | | | |
|-------------------------|---|-----------------|----------------------------------|
| Address Offset | 0x0000 0004 | | |
| Physical Address | 0x4806 A004 0x4806 C004 0x4802 0004 0x4806 E004 | Instance | UART1 UART2 UART3 UART4 |
| Description | This register, with UART_DLL , stores the 14-bit divisor for generating the baud clock in the baud rate generator. DLH stores the most-significant part of the divisor. DLL stores the least-significant part of the divisor. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|-----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | CLOCK_MSB | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------------------|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7:6 | RESERVED | Read returns 0. Write has no effect. | RW | 0x0 |
| 5:0 | CLOCK_MSB | Stores the 6-bit MSB divisor value | RW | 0x00 |

Table 24-179. Register Call Summary for Register UART_DLH
UART/IrDA/CIR

- [UART Mode Power Management: \[0\] \[1\]](#)
- [FIFO DMA Mode Operation: \[2\] \[3\]](#)
- [Register Access Modes: \[4\] \[5\] \[6\] \[7\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\]](#)
- [UART Mode: \[20\] \[21\] \[22\]](#)
- [IrDA Mode \(UART3 Only\): \[23\]](#)
- [Quick Start: \[24\] \[25\] \[26\] \[27\] \[28\]](#)
- [SIR Mode: \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\]](#)
- [MIR Mode: \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\] \[44\]](#)
- [FIR Mode: \[45\] \[46\] \[47\] \[48\]](#)
- [UART/IrDA/CIR Register Summary: \[49\] \[50\]](#)
- [UART/IrDA/CIR Registers: \[51\] \[52\]](#)

Table 24-180. UART_FCR

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0008 | | |
| Physical Address | 0x4806 A008 0x4806 C008 0x4802 0008 0x4806 E008 | Instance | UART1 UART2 UART3 UART4 |
| Description | FIFO control register Notes: Bits 4 and 5 can only be written to when UART_EFR[4] = 1. Bits 0 and 3 can be changed only when the baud clock is not running (DLL and DLH set to 0). See Table 24-149 for UART_FCR[5:4] setting restriction when UART_SCR[6] = 1. See Table 24-150 for UART_FCR[7:6] setting restriction when UART_SCR[7] = 1. | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|--------------|----|----------|----|---------------|---|---------------|---|---------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RX_FIFO_TRIG | | TX_FIFO_TRIG | | DMA_MODE | | TX_FIFO_CLEAR | | RX_FIFO_CLEAR | | FIFO_EN | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-----------|
| 31:8 | RESERVED | Write has no effect. | W | 0x0000000 |
| 7:6 | RX_FIFO_TRIG | Sets the trigger level for the RX FIFO: If UART_SCR[7] = 0 and UART_TLR[7:4] = 0000: 00: 8 characters 01: 16 characters 10: 56 characters 11: 60 characters If UART_SCR[7] = 0 and UART_TLR[7:4] != 0000, RX_FIFO_TRIG is not considered. If UART_SCR[7] = 1, RX_FIFO_TRIG is 2 LSBs of the trigger level (1-63 on 6 bits) with the granularity 1. | W | 0x0 |
| 5:4 | TX_FIFO_TRIG | Sets the trigger level for the TX FIFO: If UART_SCR[6] = 0 and UART_TLR[3:0] = 0000: 00: 8 spaces 01: 16 spaces 10: 32 spaces 11: 56 spaces If UART_SCR[6] = 0 and UART_TLR[3:0] != 0000, TX_FIFO_TRIG is not considered. If UART_SCR[6] = 1, TX_FIFO_TRIG is 2 LSBs of the trigger level (1-63 on 6 bits) with the granularity 1 | W | 0x0 |
| 3 | DMA_MODE | This register is considered if UART_SCR[0] = 0. Write 0x0: DMA_MODE 0 (No DMA) Write 0x1: DMA_MODE 1 (UART_nDMA_REQ[0] in TX, UART_nDMA_REQ[1] in RX) | W | 0 |
| 2 | TX_FIFO_CLEAR | Write 0x0: No change Write 0x1: Clears the TX FIFO and resets its counter logic to 0. Returns to 0 after clearing FIFO. | W | 0 |
| 1 | RX_FIFO_CLEAR | Write 0x0: No change Write 0x1: Clears the RX FIFO and resets its counter logic to 0. Returns to 0 after clearing FIFO. | W | 0 |
| 0 | FIFO_EN | Write 0x0: Disables the transmit and RX FIFOs. The transmit and receive holding registers are 1-byte FIFOs. Write 0x1: Enables the transmit and RX FIFOs. The transmit and receive holding registers are 64-byte FIFOs. | W | 0 |

Table 24-181. Register Call Summary for Register UART_FCR
UART/IrDA/CIR

- [FIFO Management: \[0\]](#)
- [FIFO Trigger: \[1\] \[2\] \[3\]](#)
- [FIFO Interrupt Mode: \[4\] \[5\] \[6\]](#)
- [FIFO Polled Mode Operation: \[7\]](#)
- [FIFO DMA Mode Operation: \[8\] \[9\] \[10\] \[11\]](#)
- [Register Access Modes: \[12\] \[13\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[14\] \[15\] \[16\] \[17\] \[18\] \[19\]](#)
- [Quick Start: \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\]](#)
- [FIR Mode: \[28\] \[29\] \[30\] \[31\] \[32\] \[33\]](#)
- [UART/IrDA/CIR Register Summary: \[34\] \[35\]](#)
- [UART/IrDA/CIR Registers: \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\]](#)

Table 24-182. UART_EFR

| | | | |
|-------------------------|---|-----------------|----------------------------------|
| Address Offset | 0x0000 0008 | | |
| Physical Address | 0x4806 A008 0x4806 C008 0x4802 0008 0x4806 E008 | Instance | UART1 UART2 UART3 UART4 |
| Description | Enhanced feature register This register enables or disables enhanced features. Most of the enhanced functions apply only to UART modes, but UART_EFR [4] enables write accesses to UART_FCR [5:4], the TX trigger level, which is also used in IrDA modes. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|-------------|----|---------------------|----|-------------|---|-----------------|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | AUTO_CTS_EN | | AUTO_RTS_EN | | SPECIAL_CHAR_DETECT | | ENHANCED_EN | | SW_FLOW_CONTROL | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7 | AUTO_CTS_EN | Auto-CTS enable bit 0x0: Normal operation 0x1: Auto-CTS flow control is enabled. Transmission is halted when the CTS* pin is high (inactive). | RW | 0 |
| 6 | AUTO_RTS_EN | Auto-RTS enable bit 0x0: Normal operation 0x1: Auto-RTS flow control is enabled. RTS* pin goes high (inactive) when the RX FIFO HALT trigger level, UART_TCR [3:0], is reached, and goes low (active) when the RX FIFO RESTORE transmission trigger level is reached. | RW | 0 |
| 5 | SPECIAL_CHAR_DETECT | 0x0: Normal operation 0x1: Special character detect enable. Received data is compared with XOFF2 data. If a match occurs, the received data is transferred to the RX FIFO and the UART_IIR [4] bit is set to 1 to indicate that a special character was detected. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------|
| 4 | ENHANCED_EN | Enhanced functions write enable bit 0x0: Disables writing to IER bits 4-7, UART_FCR bits 4-5, and MCR bits 5-7. 0x1: Enables writing to IER bits 4-7, UART_FCR bits 4-5, and MCR bits 5-7. | RW | 0 |
| 3:0 | SW_FLOW_CONTROL | Combinations of software flow control can be selected by programming bit 3 - bit 0. See Table 24-162 . | RW | 0x0 |

Table 24-183. Register Call Summary for Register UART_EFR

UART/IrDA/CIR

- IrDA Protocol and Data Format: [0] [1] [2]
- UART Mode Power Management: [3]
- Register Access Modes: [4] [5] [6] [7] [8] [9] [10] [11]
- UART/IrDA (SIR, MIR, FIR)/CIR Mode Selection: [12] [13] [14] [15] [16] [17]
- UART Mode: [18] [19] [20] [21] [22] [23]
- IrDA Mode (UART3 Only): [24] [25] [26]
- Quick Start: [27] [28] [29] [30] [31] [32] [33] [34] [35] [36]
- Hardware and Software Flow Control Configuration: [37] [38] [39] [40] [41] [42] [43] [44] [45] [46] [47] [48] [49] [50] [51] [52] [53] [54] [55] [56]
- SIR Mode: [57] [58] [59]
- FIR Mode: [60]
- UART/IrDA/CIR Register Summary: [61] [62]
- UART/IrDA/CIR Registers: [63] [64]

Table 24-184. UART_LCR

| | | | |
|-------------------------|---|-----------------|----------------------------------|
| Address Offset | 0x0000 000C | | |
| Physical Address | 0x4806 A00C 0x4806 C00C 0x4802 000C 0x4806 E00C | Instance | UART1 UART2 UART3 UART4 |
| Description | Line control register LCR[6:0] define transmission and reception parameters. Note: When LCR[6] is set to 1, the TX line is forced to 0 and remains in this state as long as LCR[6] = 1. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----------|----|--------------|----|--------------|---|-----------|---|---------|---|-------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DIV_EN | | BREAK_EN | | PARITY_TYPE2 | | PARITY_TYPE1 | | PARITY_EN | | NB_STOP | | CHAR_LENGTH | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7 | DIV_EN | 0x0: Normal operating condition 0x1: Divisor latch enable. Allows access to DLL, DLH, and other registers (see Table 24-166 and Table 24-167). | RW | 0 |
| 6 | BREAK_EN | Break control bit 0x0: Normal operating condition 0x1: Forces the transmitter output to go low to alert the communication terminal | RW | 0 |

| Bits | Field Name | Description | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------|-----------------------------|---|-----------------------------|-----------------------------|-----------------------------|--------|---|-----|-----|-----------|---|---|---|------------|---|---|---|-------------|---|---|---|----------|---|---|---|----------|----|---|
| 5 | PARITY_TYPE2 | <p>Selects the forced parity format (if UART_LCR[3] = 1). If UART_LCR[5] = 1 and UART_LCR[4] = 0, the parity bit is forced to 1 in the transmitted and received data. If UART_LCR[5] = 1 and UART_LCR[4] = 1, the parity bit is forced to 0 in the transmitted and received data.</p> <table><thead><tr><th>UART_LCR[3]</th><th>UART_LCR[4]</th><th>UART_LCR[5]</th><th>Parity</th></tr></thead><tbody><tr><td>0</td><td>N/A</td><td>N/A</td><td>No parity</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Odd parity</td></tr><tr><td>1</td><td>1</td><td>0</td><td>Even parity</td></tr><tr><td>1</td><td>0</td><td>1</td><td>Forced 1</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Forced 0</td></tr></tbody></table> | UART_LCR[3] | UART_LCR[4] | UART_LCR[5] | Parity | 0 | N/A | N/A | No parity | 1 | 0 | 0 | Odd parity | 1 | 1 | 0 | Even parity | 1 | 0 | 1 | Forced 1 | 1 | 1 | 1 | Forced 0 | RW | 0 |
| UART_LCR[3] | UART_LCR[4] | UART_LCR[5] | Parity | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | N/A | N/A | No parity | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 0 | Odd parity | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 0 | Even parity | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | Forced 1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | Forced 0 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | PARITY_TYPE1 | <p>0x0: Odd parity is generated (if UART_LCR[3] = 1). 0x1: Even parity is generated (if UART_LCR[3] = 1).</p> | RW | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | PARITY_EN | <p>0x0: No parity 0x1: A parity bit is generated during transmission and the receiver checks for received parity.</p> | RW | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | NB_STOP | <p>Specifies the number of stop-bits 0x0: 1 stop-bit (word length = 5, 6, 7, 8) 0x1: 1.5 stop-bits (word length = 5) 2 stop-bits (word length = 6, 7, 8)</p> | RW | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1:0 | CHAR_LENGTH | <p>Specifies the word length to be transmitted or received 0x0: 5 bits 0x1: 6 bits 0x2: 7 bits 0x3: 8 bits</p> | RW | 0x0 | | | | | | | | | | | | | | | | | | | | | | | | |

Table 24-185. Register Call Summary for Register UART_LCR
UART/IrDA/CIR

- [IrDA Protocol and Data Format: \[0\]](#)
- [Register Access Modes: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\]](#)
- [UART Mode: \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\]](#)
- [IrDA Mode \(UART3 Only\): \[38\] \[39\] \[40\]](#)
- [Quick Start: \[41\] \[42\] \[43\] \[44\] \[45\] \[46\] \[47\] \[48\] \[49\] \[50\] \[51\] \[52\] \[53\] \[54\] \[55\] \[56\] \[57\] \[58\] \[59\] \[60\] \[61\] \[62\] \[63\]](#)
- [Hardware and Software Flow Control Configuration: \[64\] \[65\] \[66\] \[67\] \[68\] \[69\] \[70\] \[71\] \[72\] \[73\] \[74\]](#)
- [SIR Mode: \[75\] \[76\] \[77\] \[78\] \[79\] \[80\] \[81\] \[82\] \[83\]](#)
- [MIR Mode: \[84\] \[85\] \[86\] \[87\] \[88\] \[89\] \[90\] \[91\]](#)
- [FIR Mode: \[92\] \[93\] \[94\] \[95\] \[96\] \[97\] \[98\]](#)
- [UART/IrDA/CIR Register Summary: \[99\] \[100\]](#)
- [UART/IrDA/CIR Registers: \[101\] \[102\] \[103\] \[104\] \[105\] \[106\] \[107\] \[108\] \[109\] \[110\] \[111\]](#)

Table 24-186. UART_XON1_ADDR1

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0010 | Instance | UART1 UART2 UART3 UART4 |
| Physical Address | 0x4806 A010 0x4806 C010 0x4802 0010 0x4806 E010 | | |
| Description | UART mode: XON1 character, IrDA mode: ADDR1 address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XON_WORD1 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7:0 | XON_WORD1 | Stores the 8-bit XON1 character in UART modes and ADDR1 address 1 for IrDA modes | RW | 0x00 |

Table 24-187. Register Call Summary for Register UART_XON1_ADDR1

UART/IrDA/CIR

- IrDA Protocol and Data Format: [0]
- Register Access Modes: [1] [2]
- UART/IrDA (SIR, MIR, FIR)/CIR Mode Selection: [3] [4] [5] [6]
- IrDA Mode (UART3 Only): [7]
- Hardware and Software Flow Control Configuration: [8] [9]
- UART/IrDA/CIR Register Summary: [10] [11]

Table 24-188. UART_MCR

| | | | |
|------------------|---|----------|----------------------------------|
| Address Offset | 0x0000 0010 | Instance | UART1 UART2 UART3 UART4 |
| Physical Address | 0x4806 A010 0x4806 C010 0x4802 0010 0x4806 E010 | | |
| Description | Modem control register MCR[3:0] controls the interface with the modem, data set, or peripheral device that emulates the modem. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|---------|--------|-------------|-----------|-----------|-----|-----|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | TCR_TLR | XON_EN | LOOPBACK_EN | CD_STS_CH | RI_STS_CH | RTS | DTR | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7 | RESERVED | Read returns 0. Write has no effect. | RW | 0 |
| 6 | TCR_TLR | 0x0: No action 0x1: Enables access to the UART_TCR and UART_TLR registers | RW | 0 |
| 5 | XON_EN | 0x0: Disable XON any function. 0x1: Enable XON any function. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 4 | LOOPBACK_EN | 0x0: Normal operating mode 0x1: Enable local loopback mode (internal). In this mode, the MCR[3:0] signals are looped back into the UART_MSR[7:4] bit field. The transmit output is looped back to the receive input internally. | RW | 0 |
| 3 | CD_STS_CH | 0x0: In loopback, forces DCD* input high and IRQ outputs to inactive state 0x1: In loopback, forces DCD* input low and IRQ outputs to inactive state | RW | 0 |
| 2 | RI_STS_CH | 0x0: In loopback, forces RI* input high 0x1: In loopback, forces RI* input low | RW | 0 |
| 1 | RTS | In loopback, controls the UART_MSR[4] bit. If auto-RTS is enabled, the RTS* output is controlled by hardware flow control. 0x0: Force RTS* output to inactive (high). 0x1: Force RTS* output to active (low). | RW | 0 |
| 0 | DTR | 0x0: Force DTR* output to inactive (high). 0x1: Force DTR* output to active (low). | RW | 0 |

Table 24-189. Register Call Summary for Register UART_MCR
UART/IrDA/CIR

- [Description: \[0\] \[1\]](#)
- [Register Access Modes: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[12\] \[13\] \[14\] \[15\]](#)
- [UART Mode: \[16\] \[17\]](#)
- [Quick Start: \[18\] \[19\] \[20\] \[21\] \[22\]](#)
- [Hardware and Software Flow Control Configuration: \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\]](#)
- [SIR Mode: \[35\]](#)
- [MIR Mode: \[36\] \[37\] \[38\] \[39\]](#)
- [FIR Mode: \[40\]](#)
- [UART/IrDA/CIR Register Summary: \[41\] \[42\]](#)
- [UART/IrDA/CIR Registers: \[43\] \[44\] \[45\] \[46\] \[47\] \[48\] \[49\] \[50\]](#)

Table 24-190. UART_LSR

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0014 | Instance | UART1 UART2 UART3 UART4 |
| Physical Address | 0x4806 A014 0x4806 C014 0x4802 0014 0x4806 E014 | | |
| Description | Line status register | | |
| Type | R | | |

UART Bit Field Details

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------------|---------|-----------|-------|-------|-------|-------|-----------|
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RX_FIFO_STS | TX_SR_E | TX_FIFO_E | RX_BI | RX_FE | RX_PE | RX_OE | RX_FIFO_E |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x000000 |
| 7 | RX_FIFO_STS | Read 0x0: Normal operation Read 0x1: At least one parity error, framing error, or break indication in the RX FIFO. Bit 7 is cleared when no more errors are present in the RX FIFO. | R | 0 |
| 6 | TX_SR_E | Read 0x0: Transmitter hold (TX FIFO) and shift registers are not empty. Read 0x1: Transmitter hold (TX FIFO) and shift registers are empty. | R | 1 |
| 5 | TX_FIFO_E | Read 0x0: Transmit hold register (TX FIFO) is not empty. Read 0x1: Transmit hold register (TX FIFO) is empty. The transmission is not necessarily complete. | R | 1 |
| 4 | RX_BI | Read 0x0: No break condition Read 0x1: A break was detected while the data from the RX FIFO was received (for example, RX input was low for one character + 1 bit time frame). | R | 0 |
| 3 | RX_FE | Read 0x0: No framing error in data RX FIFO Read 0x1: Framing error occurred in data from RX FIFO (received data did not have a valid stop-bit). | R | 0 |
| 2 | RX_PE | Read 0x0: No parity error in data from RX FIFO Read 0x1: Parity error in data from RX FIFO | R | 0 |
| 1 | RX_OE | Read 0x0: No overrun error Read 0x1: Overrun error occurred. Set when the character in the receive shift register is not transferred to the RX FIFO. This occurs only when the RX FIFO is full. | R | 0 |
| 0 | RX_FIFO_E | Read 0x0: No data in the RX FIFO Read 0x1: At least one data character in the RX FIFO | R | 0 |

Table 24-191. Register Call Summary for Register UART_LSR

UART/IrDA/CIR

- IrDA Protocol and Data Format: [0] [1] [2]
- UART Mode Interrupt Management: [3] [4]
- FIFO Polled Mode Operation: [5]
- Register Access Modes: [6] [7]
- UART/IrDA (SIR, MIR, FIR)/CIR Mode Selection: [8] [9] [10] [11] [12] [13]
- UART Mode: [14] [15] [16] [17] [18] [19] [20]
- IrDA Mode (UART3 Only): [21] [22] [23]
- UART/IrDA/CIR Register Summary: [24] [25]
- UART/IrDA/CIR Registers: [26]

IrDA Bit Field Details

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|---------------|----|--------------|----|----------------|---|-------|---|-----|---|------------|---|-----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | THR_EMPTY | | STS_FIFO_FULL | | RX_LAST_BYTE | | FRAME_TOO_LONG | | ABORT | | CRC | | STS_FIFO_E | | RX_FIFO_E | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x000000 |
| 7 | THR_EMPTY | Read 0x0: Transmit holding register (TX FIFO) is not empty. Read 0x1: Transmit hold register (TX FIFO) is empty. The transmission is not necessarily complete. | R | 1 |
| 6 | STS_FIFO_FULL | Read 0x0: Status FIFO not full Read 0x1: Status FIFO full | R | 0 |
| 5 | RX_LAST_BYTE | Read 0x0: The RX FIFO (RHR) does not contain the last byte of the frame to be read. Read 0x1: The RX FIFO (RHR) contains the last byte of the frame to be read. This bit is set only when the last byte of a frame is available to be read. It determines the frame boundary. It is cleared on a single read of the LSR register. See the note below. | R | 0 |
| 4 | FRAME_TOO_LONG | Read 0x0: No frame-too-long error in frame Read 0x1: Frame-too-long error in the frame at the top of the STATUS FIFO, (next character to be read). This bit is set to 1 when a frame exceeding the maximum length (set by RXFLH and RXFLL registers) is received. When this error is detected, current frame reception is terminated. Reception is stopped until the next START flag is detected. | R | 0 |
| 3 | ABORT | Read 0x0: No abort pattern error in frame Read 0x1: Abort pattern is received. SIR and MIR: Abort pattern FIR: Illegal symbol | R | 0 |
| 2 | CRC | Read 0x0: No CRC error in frame Read 0x1: CRC error in the frame at the top of the STATUS FIFO (next character to be read) | R | 0 |
| 1 | STS_FIFO_E | Read 0x0: Status FIFO not empty Read 0x1: Status FIFO empty | R | 1 |
| 0 | RX_FIFO_E | Read 0x0: No data in the RX FIFO Read 0x1: At least one data character in the RX FIFO | R | 1 |

CIR Bit Field Details

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-----------|----------|---------|----------|---|---|---|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | THR_EMPTY | RESERVED | RX_STOP | RESERVED | | | | RX_FIFO_E |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x000000 |
| 7 | THR_EMPTY | Read 0x0: Transmit holding register (TX FIFO) is not empty. Read 0x1: Transmit hold register (TX FIFO) is empty. The transmission is not necessarily complete. | R | 1 |
| 6 | RESERVED | Not used in CIR mode | R | 0 |
| 5 | RX_STOP | The RX_STOP is generated based on the value set in the BOF Length register (UART_EBLR). It is cleared on a single read of the UART_LSR register. Read 0x0: Reception is ongoing or waiting for a new frame. Read 0x1: Reception is complete. | R | 0 |
| 4:1 | RESERVED | Not used in CIR mode | R | 0x0 |
| 0 | RX_FIFO_E | Read 0x0: At least one data character in the RX FIFO | R | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------------------------|------|-------|
| | | Read 0x1: No data in the RX FIFO | | |

Table 24-192. UART_XON2_ADDR2

| | | | | |
|-------------------------|--|-----------------|----------------------------------|--|
| Address Offset | 0x0000 0014 | | | |
| Physical Address | 0x4806 A014 0x4806 C014 0x4802 0014 0x4806 E014 | Instance | UART1 UART2 UART3 UART4 | |
| Description | Stores the 8-bit XON2 character in UART modes and ADDR2 address 2 for IrDA modes | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XON_WORD2 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x0000000 |
| 7:0 | XON_WORD2 | Stores the 8-bit XON2 character in UART modes and ADDR2 address 2 for IrDA modes | RW | 0x00 |

Table 24-193. Register Call Summary for Register UART_XON2_ADDR2

UART/IrDA/CIR

- IrDA Protocol and Data Format: [0]
- Register Access Modes: [1] [2]
- UART/IrDA (SIR, MIR, FIR)/CIR Mode Selection: [3] [4] [5] [6]
- IrDA Mode (UART3 Only): [7]
- Hardware and Software Flow Control Configuration: [8] [9]
- UART/IrDA/CIR Register Summary: [10] [11]

Table 24-194. UART_TCR

| | | | | |
|-------------------------|--|-----------------|----------------------------------|--|
| Address Offset | 0x0000 0018 | | | |
| Physical Address | 0x4806 A018 0x4806 C018 0x4802 0018 0x4806 E018 | Instance | UART1 UART2 UART3 UART4 | |
| Description | Transmission control register This register stores the RX FIFO threshold levels to start/stop transmission during hardware/software flow control. Notes: Trigger levels from 0 to 60 bytes are available with a granularity of 4. (Trigger level = 4 x [4-bit register value]) The programmer must ensure that UART_TCR[3:0] UART_TCR[7:4] when auto-RTS or software flow control is enabled to avoid a mis-operation of the device. In FIFO interrupt mode with flow control, the programmer must ensure that the trigger level to halt transmission is greater than or equal to the RX FIFO trigger level (UART_TLR[7:4] or UART_FCR[7:6]); otherwise, FIFO operation stalls. In FIFO DMA mode with flow control, this concept does not exist because a DMA request is sent each time a byte is received. | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------------|----|----|----|-------------------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RX_FIFO_TRIG_START | | | | RX_FIFO_TRIG_HALT | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7:4 | RX_FIFO_TRIG_START | RX FIFO trigger level to RESTORE transmission (0 - 60) | RW | 0x0 |
| 3:0 | RX_FIFO_TRIG_HALT | RX FIFO trigger level to HALT transmission (0 - 60) | RW | 0xF |

Table 24-195. Register Call Summary for Register UART_TCR

UART/IrDA/CIR

- [FIFO Trigger: \[0\] \[1\] \[2\]](#)
- [FIFO Interrupt Mode: \[3\]](#)
- [Register Access Modes: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\]](#)
- [UART Mode: \[28\] \[29\] \[30\] \[31\] \[32\] \[33\]](#)
- [Hardware and Software Flow Control Configuration: \[34\] \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\] \[44\] \[45\]](#)
- [UART/IrDA/CIR Register Summary: \[46\] \[47\]](#)
- [UART/IrDA/CIR Registers: \[48\] \[49\] \[50\] \[51\]](#)

Table 24-196. UART_XOFF1

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0018 | | |
| Physical Address | 0x4806 A018 0x4806 C018 0x4802 0018 0x4806 E018 | Instance | UART1 UART2 UART3 UART4 |
| Description | UART mode XOFF1 character | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XOFF_WORD1 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7:0 | XOFF_WORD1 | Stores the 8-bit XOFF1 character used in UART modes | RW | 0x00 |

Table 24-197. Register Call Summary for Register UART_XOFF1

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[2\] \[3\]](#)
- [Hardware and Software Flow Control Configuration: \[4\] \[5\] \[6\]](#)
- [UART/IrDA/CIR Register Summary: \[7\] \[8\]](#)

Table 24-198. UART_MSR

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0018 | Instance | UART1 UART2 UART3 UART4 |
| Physical Address | 0x4806 A018 0x4806 C018 0x4802 0018 0x4806 E018 | | |
| Description | Modem status register. UART mode only. This register provides information about the current state of the control lines from the modem, data set, or peripheral device to the LH. It also indicates when a control input from the modem changes state. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---------|---------|----------|----------|---------|--------|---------|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | NCD_STS | NRI_STS | NDSR_STS | NCTS_STS | DCD_STS | RI_STS | DSR_STS | CTS_STS |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x000000 |
| 7 | NCD_STS | This bit is the complement of the DCD* input. In loopback mode, it is equivalent to UART_MCR[3] . | R | - |
| 6 | NRI_STS | This bit is the complement of the RI* input. In loopback mode, it is equivalent to UART_MCR[2] . | R | - |
| 5 | NDSR_STS | This bit is the complement of the DSR* input. In loopback mode, it is equivalent to UART_MCR[0] . | R | - |
| 4 | NCTS_STS | This bit is the complement of the CTS* input. In loopback mode, it is equivalent to UART_MCR[1] . | R | - |
| 3 | DCD_STS | Indicates that DCD* input (or UART_MCR[3] in loopback) changed. Cleared on a read. | R | 0 |
| 2 | RI_STS | Indicates that RI* input (or UART_MCR[2] in loopback) changed state from low to high. Cleared on a read. | R | 0 |
| 1 | DSR_STS | Read 0x1: Indicates that DSR* input (or UART_MCR[0] in loopback) changed state. Cleared on a read. | R | 0 |
| 0 | CTS_STS | Read 0x1: Indicates that CTS* input (or UART_MCR[1] in loopback) changed state. Cleared on a read. | R | 0 |

Table 24-199. Register Call Summary for Register UART_MSR

UART/IrDA/CIR

- [Description: \[0\] \[1\]](#)
- [UART Mode Interrupt Management: \[2\] \[3\]](#)
- [Register Access Modes: \[4\] \[5\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [UART/IrDA/CIR Register Summary: \[12\] \[13\]](#)
- [UART/IrDA/CIR Registers: \[14\] \[15\]](#)

Table 24-200. UART_SPR

| | | | |
|-------------------------|---|-----------------|----------------------------------|
| Address Offset | 0x0000 001C | | |
| Physical Address | 0x4806 A01C 0x4806 C01C 0x4802 001C 0x4806 E01C | Instance | UART1 UART2 UART3 UART4 |
| Description | Scratchpad register This read/write register does not control the module. It is a scratchpad register to be used by the programmer to hold temporary data. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SPR_WORD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------------------|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7:0 | SPR_WORD | Scratchpad register | RW | 0x00 |

Table 24-201. Register Call Summary for Register UART_SPR

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\] \[2\] \[3\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)
- [UART/IrDA/CIR Register Summary: \[16\] \[17\]](#)

Table 24-202. UART_TLR

| | | | |
|-------------------------|---|-----------------|----------------------------------|
| Address Offset | 0x0000 001C | | |
| Physical Address | 0x4806 A01C 0x4806 C01C 0x4802 001C 0x4806 E01C | Instance | UART1 UART2 UART3 UART4 |
| Description | Trigger level register This register stores the programmable transmit and RX FIFO trigger levels for DMA and IRQ generation. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------------------|---|---|---|------------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RX_FIFO_TRIG_DMA | | | | TX_FIFO_TRIG_DMA | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--------------------------------------|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7:4 | RX_FIFO_TRIG_DMA | Receive FIFO trigger level | RW | 0x0 |
| 3:0 | TX_FIFO_TRIG_DMA | Transmit FIFO trigger level | RW | 0x0 |

Table 24-203. Register Call Summary for Register UART_TLR

UART/IrDA/CIR

- [FIFO Management: \[0\]](#)
- [FIFO Trigger: \[1\] \[2\] \[3\] \[4\]](#)
- [FIFO Interrupt Mode: \[5\] \[6\]](#)
- [FIFO DMA Mode Operation: \[7\] \[8\] \[9\] \[10\]](#)
- [Register Access Modes: \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\]](#)
- [Quick Start: \[35\] \[36\] \[37\] \[38\] \[39\] \[40\]](#)
- [UART/IrDA/CIR Register Summary: \[41\] \[42\]](#)
- [UART/IrDA/CIR Registers: \[43\] \[44\] \[45\] \[46\] \[47\] \[48\]](#)

Table 24-204. UART_XOFF2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 001C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4806 A01C 0x4806 C01C 0x4802 001C 0x4806 E01C | | | | | | | | | | | | | | | | Instance | UART1 UART2 UART3 UART4 | | | | | | | | | | | | | | | |
| Description | UART mode XOFF2 character | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | XOFF_WORD2 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7:0 | XOFF_WORD2 | Stores the 8-bit XOFF2 character used in UART modes. | RW | 0x00 |

Table 24-205. Register Call Summary for Register UART_XOFF2

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[2\] \[3\]](#)
- [Hardware and Software Flow Control Configuration: \[4\] \[5\] \[6\]](#)
- [UART/IrDA/CIR Register Summary: \[7\] \[8\]](#)

Table 24-206. UART_MDR1

| | | | |
|-------------------------|---|-----------------|----------------------------------|
| Address Offset | 0x0000 0020 | Instance | UART1 UART2 UART3 UART4 |
| Physical Address | 0x4806 A020 0x4806 C020 0x4802 0020 0x4806 E020 | | |
| Description | Mode definition register 1 The mode of operation can be programmed by writing to MDR1[2:0] and therefore the MDR1 must be programmed on startup after configuration of the configuration registers (UART_DLL , UART_DLH , and UART_LCR). The value of MDR1[2:0] must not be changed again during normal operation. Note: If the module is disabled by setting the MODE_SELECT field to 111, interrupt requests can still be generated unless disabled through the interrupt enable register (IER). In this case, UART mode interrupts are visible. Reading the interrupt identification register (IIR) shows UART mode interrupt flags. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----------|----|-----|----|----------|---|----------|---|-------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FRAME_END_MODE | | SIP_MODE | | SCT | | SET_TXIR | | IR_SLEEP | | MODE_SELECT | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7 | FRAME_END_MODE | IrDA mode only 0x0: Frame-length method 0x1: Set EOT bit method | RW | 0 |
| 6 | SIP_MODE | MIR/FIR modes only 0x0: Manual SIP mode: SIP is generated with the control of ACREG[3]. 0x1: Automatic SIP mode: SIP is generated after each transmission. | RW | 0 |
| 5 | SCT | Store and control the transmission. 0x0: Starts the infrared transmission when a value is written to THR 0x1: Starts the infrared transmission with the control of ACREG[2]. Note: Before starting any transmission, there must be no reception ongoing. | RW | 0 |
| 4 | SET_TXIR | Used to configure the infrared transceiver 0x0: a) No action if MDR2[7] = 0 b) TXIR pin output is forced low if MDR2[7] = 1. 0x1: IRTX pin output is forced high (not dependent on MDR2[7] value). | RW | 0 |
| 3 | IR_SLEEP | 0x0: IrDA/CIR sleep mode disabled 0x1: IrDA/CIR sleep mode enabled | RW | 0 |
| 2:0 | MODE_SELECT | 0x0: UART 16x mode 0x1: SIR mode 0x2: UART 16x auto-baud 0x3: UART 13x mode 0x4: MIR mode 0x5: FIR mode | RW | 0x7 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-------|
| | | 0x6: CIR mode | | |
| | | 0x7: Disable (default state) | | |

Table 24-207. Register Call Summary for Register UART_MDR1

UART/IrDA/CIR

- Description: [0] [1]
- UART Protocol and Data Format: [2]
- Register Access Modes: [3] [4] [5] [6] [7] [8]
- UART/IrDA (SIR, MIR, FIR)/CIR Mode Selection: [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27]
- UART Mode: [28] [29] [30]
- IrDA Mode (UART3 Only): [31] [32] [33] [34] [35] [36]
- CIR Mode (UART3 Only): [37]
- Quick Start: [38] [39] [40]
- SIR Mode: [41] [42] [43] [44] [45]
- MIR Mode: [46] [47] [48] [49]
- FIR Mode: [50] [51] [52] [53]
- UART/IrDA/CIR Register Summary: [54] [55]
- UART/IrDA/CIR Registers: [56]

Table 24-208. UART_MDR2

| | | | |
|-------------------------|---|-----------------|-------------------------|
| Address Offset | 0x0000 0024 | Instance | UART1 |
| Physical Address | 0x4806 A024 0x4806 C024 0x4802 0024 0x4806 E024 | | UART2 UART3 UART4 |
| Description | Mode definition register 2 IR-IrDA and IR-CIR modes only. UART_MDR2[0] describes the status of the interrupt in UART_IIR[5] . The IRTX_UNDERRUN bit should be read after an UART_IIR[5] TX_STATUS_IT interrupt. The bits [2:1] of this register set the trigger level for the frame status FIFO (8 entries) and must be programmed before the mode is programmed in UART_MDR1[2:0] . Note: The UART_MDR2[6] gives the flexibility to invert the RX pin in the UART to ensure that the protocol at the input of the transceiver module has the same polarity at module level. By default, the RX pin is inverted because most transceivers invert the IR receive pin. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|------------|----|----------------|----|------------|---|---------------|---|---------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SET_TXIR_ALT | | IRRXINVERT | | CIR_PULSE_MODE | | UART_PULSE | | STS_FIFO_TRIG | | IRTX_UNDERRUN | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7 | SET_TXIR_ALT | Provide alternate function for MDR1[4] (SET_TXIR). 0x0: Normal mode 0x1: Alternate mode for SET_TXIR | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------|
| 6 | IRRXINVERT | IR mode only (IrDA and CIR). Invert RX pin in the module before the voting or sampling system logic of the infrared block. This does not affect the RX path in UART modem modes. 0x0: Inversion is performed. 0x1: No inversion is performed. | RW | 0 |
| 5:4 | CIR_PULSE_MODE | CIR pulse modulation definition. Defines high level of the pulse width associated with a digit: 0x0: Pulse width of 3 from 12 cycles 0x1: Pulse width of 4 from 12 cycles 0x2: Pulse width of 5 from 12 cycles 0x3: Pulse width of 6 from 12 cycles | RW | 0x0 |
| 3 | UART_PULSE | UART mode only. Allows pulse shaping in UART mode. 0x0: Normal UART mode 0x1: UART mode with a pulse shaping | RW | 0 |
| 2:1 | STS_FIFO_TRIG | IR-IrDA mode only. Frame status FIFO threshold select: 0x0: 1 entry 0x1: 4 entries 0x2: 7 entries 0x3: 8 entries | RW | 0x0 |
| 0 | IRTX_UNDERRUN | IrDA transmission status interrupt. When the UART_IIR[5] interrupt occurs, the meaning of the interrupt is: Read 0x0: The last bit of the frame transmitted successfully without error. Read 0x1: An underrun occurred. The last bit of the frame was transmitted but with an underrun error. The bit is reset to 0 when the UART_RESUME register is read. | R | 0 |

Table 24-209. Register Call Summary for Register UART_MDR2
UART/IrDA/CIR

- [IrDA Protocol and Data Format](#): [0]
- [CIR Protocol and Data Format](#): [1]
- [Register Access Modes](#): [2] [3] [4] [5] [6] [7]
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection](#): [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25]
- [IrDA Mode \(UART3 Only\)](#): [26] [27]
- [CIR Mode \(UART3 Only\)](#): [28] [29]
- [UART/IrDA/CIR Register Summary](#): [30] [31]
- [UART/IrDA/CIR Registers](#): [32] [33]

Table 24-210. UART_SFLSR

| | | | |
|-------------------------|---|-----------------|----------------------------------|
| Address Offset | 0x0000 0028 | | |
| Physical Address | 0x4806 A028 0x4806 C028 0x4802 0028 0x4806 E028 | Instance | UART1 UART2 UART3 UART4 |
| Description | Status FIFO line status register IrDA modes only. Reading this register effectively reads frame status information from the status FIFO (this register does not physically exist). Reading this register increments the status FIFO read pointer (SFREGL and SFREGH must be read first). | | |
| Type | R | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|----------|---|----------------------|---|--------------|---|-----------|---|----------|--|
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | OE_ERROR | | FRAME_TOO_LONG_ERROR | | ABORT_DETECT | | CRC_ERROR | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x000000 |
| 7:5 | RESERVED | Read returns 0. | R | 0x0 |
| 4 | OE_ERROR | Read 0x1: Overrun error in RX FIFO when frame at top of RX FIFO was received Note: Top of RX FIFO = Next frame to be read from RX FIFO | R | - |
| 3 | FRAME_TOO_LONG_ERROR | Read 0x1: Frame-length too long error in frame at top of RX FIFO | R | - |
| 2 | ABORT_DETECT | Read 0x1: Abort pattern detected in frame at top of RX FIFO | R | - |
| 1 | CRC_ERROR | Read 0x1: CRC error in frame at top of RX FIFO | R | - |
| 0 | RESERVED | | R | 0 |

Table 24-211. Register Call Summary for Register UART_SFLSR

UART/IrDA/CIR

- [FIFO Management: \[0\]](#)
- [Register Access Modes: \[1\] \[2\] \[3\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[4\] \[5\] \[6\]](#)
- [IrDA Mode \(UART3 Only\): \[7\] \[8\]](#)
- [UART/IrDA/CIR Register Summary: \[9\] \[10\]](#)
- [UART/IrDA/CIR Registers: \[11\] \[12\]](#)

Table 24-212. UART TXFLL

| | | |
|-------------------------|--|---|
| Address Offset | 0x0000 0028 | |
| Physical Address | 0x4806 A028 0x4806 C028 0x4802 0028 0x4806 E028 | Instance UART1 UART2 UART3 UART4 |
| Description | <p>Transmit frame length register low</p> <p>IrDA modes only. The UART_TXFLL and UART_TXFLH registers hold the 13-bit transmit frame length (expressed in bytes). UART_TXFLL holds the LSBs and UART_TXFLH holds the MSBs. The frame length value is used if the frame length method of frame closing is used.</p> | |
| Type | W | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | TXFLL | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Write has no effect. | W | 0x000000 |
| 7:0 | TXFLL | LSB register used to specify the frame length | W | 0x00 |

Table 24-213. Register Call Summary for Register UART_TXFLR

UART/IrDA/CIR

- Register Access Modes: [0] [1] [2]
- UART/IrDA (SIR, MIR, FIR)/CIR Mode Selection: [3] [4] [5]
- IrDA Mode (UART3 Only): [6]
- SIR Mode: [7]
- MIR Mode: [8]
- FIR Mode: [9]
- UART/IrDA/CIR Register Summary: [10] [11]
- UART/IrDA/CIR Registers: [12] [13] [14] [15]

Table 24-214. UART RESUME

| | | | |
|-------------------------|---|-----------------|-------|
| Address Offset | 0x0000 002C | | |
| Physical Address | 0x4806 A02C | Instance | UART1 |
| | 0x4806 C02C | | UART2 |
| | 0x4802 002C | | UART3 |
| | 0x4806 E02C | | UART4 |
| Description | IR-IrDA and IR-CIR modes only. This register is used to clear internal flags, which halt transmission/reception when an underrun/overflow error occurs. Reading this register resumes the halted operation. This register does not physically exist and reads always as 0x00. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|--------|---|---|---|---|---|---|---|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RESUME | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------------|------|----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x000000 |
| 7:0 | RESUME | Dummy read to restart the TX or RX | R | 0x00 |

Table 24-215. Register Call Summary for Register UART_RESUME

UART/IrDA/CIR

- [IrDA Mode Interrupt Management](#): [0] [1]
- [Register Access Modes](#): [2] [3] [4]
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection](#): [5] [6] [7] [8] [9] [10]
- [UART Mode](#): [11]
- [IrDA Mode \(UART3 Only\)](#): [12]
- [UART/IrDA/CIR Register Summary](#): [13] [14]
- [UART/IrDA/CIR Registers](#): [15]

Table 24-216. UART_TXFLH

| | | | | |
|-------------------------|--|--|-----------------|-------------------------|
| Address Offset | 0x0000 002C | | Instance | UART1 |
| Physical Address | 0x4806 A02C 0x4806 C02C 0x4802 002C 0x4806 E02C | | | UART2 UART3 UART4 |
| Description | Transmit frame length register high IrDA modes only. The UART_TXFLL and UART_TXFLH registers hold the 13-bit transmit frame length (expressed in bytes). UART_TXFLL holds the LSBs and UART_TXFLH holds the MSBs. The frame length value is used if the frame length method of frame closing is used. | | | |
| Type | W | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|-------|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | TXFLH | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Write has no effect. | W | 0x000000 |
| 7:5 | RESERVED | Write has no effect. | W | 0x0 |
| 4:0 | TXFLH | MSB register used to specify the frame length | W | 0x00 |

Table 24-217. Register Call Summary for Register UART_TXFLH

UART/IrDA/CIR

- [Register Access Modes](#): [0] [1] [2]
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection](#): [3] [4] [5]
- [IrDA Mode \(UART3 Only\)](#): [6]
- [FIR Mode](#): [7]
- [UART/IrDA/CIR Register Summary](#): [8] [9]
- [UART/IrDA/CIR Registers](#): [10] [11] [12] [13]

Table 24-218. UART_SFREGL

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0030 | Instance | UART1 UART2 UART3 UART4 |
| Physical Address | 0x4806 A030 0x4806 C030 0x4802 0030 0x4806 E030 | | |
| Description | Status FIFO register low IrDA modes only. The frame lengths of received frames are written into the status FIFO. This information can be read by reading the UART_SFREGL and UART_SFREGH registers (these registers do not physically exist). The LSBs are read from UART_SFREGL and the MSBs are read from UART_SFREGH . Reading these registers does not alter the status FIFO read pointer. These registers should be read before the pointer is incremented by reading the UART_SFLSR register. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SFREGL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x0000000 |
| 7:0 | SFREGL | LSB part of the frame length | R | 0x- |

Table 24-219. Register Call Summary for Register UART_SFREGL

- UART/IrDA/CIR
- [FIFO Management: \[0\]](#)
 - [Register Access Modes: \[1\] \[2\] \[3\]](#)
 - [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[4\] \[5\] \[6\]](#)
 - [IrDA Mode \(UART3 Only\): \[7\]](#)
 - [UART/IrDA/CIR Register Summary: \[8\] \[9\]](#)
 - [UART/IrDA/CIR Registers: \[10\] \[11\] \[12\] \[13\]](#)

Table 24-220. UART_RXFLL

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0030 | Instance | UART1 UART2 UART3 UART4 |
| Physical Address | 0x4806 A030 0x4806 C030 0x4802 0030 0x4806 E030 | | |
| Description | Received frame length register low IrDA modes only. The UART_RXFLL and UART_RXFLH registers hold the 12-bit receive maximum frame length. UART_RXFLL holds the LSBs and UART_RXFLH holds the MSBs. If the intended maximum receive frame length is n bytes, program the UART_RXFLL and UART_RXFLH registers to be n + 3 in SIR or MIR modes and n + 6 in FIR mode (+3 and +6 are the result of frame format with CRC and stop flag; 2 bytes are associated with the FIR stop flag). | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RXFLL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:8 | RESERVED | Write has no effect. | W | 0x0000000 |
| 7:0 | RXFLL | LSB register used to specify the frame length in reception | W | 0x00 |

Table 24-221. Register Call Summary for Register UART_RXFLL

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\] \[2\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[3\] \[4\] \[5\]](#)
- [FIR Mode: \[6\] \[7\]](#)
- [UART/IrDA/CIR Register Summary: \[8\] \[9\]](#)
- [UART/IrDA/CIR Registers: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)

Table 24-222. UART_SFREGH

| | | | |
|-------------------------|---|-----------------|-------------------------|
| Address Offset | 0x0000 0034 | Instance | UART1 |
| Physical Address | 0x4806 A034 0x4806 C034 0x4802 0034 0x4806 E034 | | UART2 UART3 UART4 |
| Description | Status FIFO register high IrDA modes only. The frame lengths of received frames are written into the status FIFO. This information can be read by reading the UART_SFREGL and UART_SFREGH registers (these registers do not physically exist). The LSBs are read from UART_SFREGL and the MSBs are read from UART_SFREGH . Reading these registers does not alter the status FIFO read pointer. These registers should be read before the pointer is incremented by reading the UART_SFLSR register. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|--------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | SFREGH | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x000000 |
| 7:4 | RESERVED | Read returns 0. | R | 0x0 |
| 3:0 | SFREGH | MSB part of the frame length | R | 0x- |

Table 24-223. Register Call Summary for Register UART_SFREGH

UART/IrDA/CIR

- [FIFO Management: \[0\]](#)
- [Register Access Modes: \[1\] \[2\] \[3\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[4\] \[5\] \[6\]](#)
- [IrDA Mode \(UART3 Only\): \[7\]](#)
- [UART/IrDA/CIR Register Summary: \[8\] \[9\]](#)
- [UART/IrDA/CIR Registers: \[10\] \[11\] \[12\] \[13\]](#)

Table 24-224. UART RXFLH

| | | |
|-------------------------|--|---|
| Address Offset | 0x0000 0034 | |
| Physical Address | 0x4806 A034 0x4806 C034 0x4802 0034 0x4806 E034 | Instance UART1 UART2 UART3 UART4 |
| Description | <p>Received frame length register high</p> <p>IrDA modes only. The UART_RXFLL and UART_RXFLH registers hold the 12-bit receive maximum frame length. UART_RXFLH holds the LSBs and UART_RXFLH holds the MSBs. If the intended maximum receive frame length is n bytes, program the UART_RXFLL and UART_RXFLH to be n + 3 in SIR or MIR modes and n + 6 in FIR mode (+3 and +6 are the result of frame format with CRC and stop flag; 2 bytes are associated with the FIR stop flag).</p> | |
| Type | W | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | RXFLH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Write has no effect. | W | 0x000000 |
| 7:4 | RESERVED | Write has no effect. | W | 0x0 |
| 3:0 | RXFLH | MSB register used to specify the frame length in reception | W | 0x0 |

Table 24-225. Register Call Summary for Register UART_RXFLH

- [Register Access Modes: \[0\] \[1\] \[2\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[3\] \[4\] \[5\]](#)
- [FIR Mode: \[6\]](#)
- [UART/IrDA/CIR Register Summary: \[7\] \[8\]](#)
- [UART/IrDA/CIR Registers: \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)

Table 24-226. UART BLR

| | | |
|-------------------------|---|---|
| Address Offset | 0x0000 0038 | |
| Physical Address | 0x4806 A038 0x4806 C038 0x4802 0038 0x4806 E038 | Instance UART1 UART2 UART3 UART4 |
| Description | BOF control register IrDA modes only. The UART_BLR[6] bit selects whether 0xC0 or 0xFF start patterns are to be used, when multiple start flags are required in SIR mode. If only one start flag is required, this is always 0xC0. If n start flags are required, (-1) 0xC0 or (-1) 0xFF flags are sent, followed by a single 0xC0 flag (immediately preceding the first data byte). | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------------|-----------|----------|---|---|---|---|---|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | STS_FIFO_RESET | XBOF_TYPE | RESERVED | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7 | STS_FIFO_RESET | Status FIFO reset. This bit is self-clearing. | RW | 0 |
| 6 | XBOF_TYPE | SIR xBOF select 0x0: 0xFF 0x1: 0xC0 | RW | 1 |
| 5:0 | RESERVED | Read returns 0. | R | 0x00 |

Table 24-227. Register Call Summary for Register UART_BLR

UART/IrDA/CIR

- [IrDA Protocol and Data Format: \[0\]](#)
- [Register Access Modes: \[1\] \[2\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[3\] \[4\]](#)
- [UART/IrDA/CIR Register Summary: \[5\] \[6\]](#)
- [UART/IrDA/CIR Registers: \[7\]](#)

Table 24-228. UART_UASR

| | | | |
|-------------------------|---|-----------------|----------------------------------|
| Address Offset | 0x0000 0038 | Instance | UART1 UART2 UART3 UART4 |
| Physical Address | 0x4806 A038 0x4806 C038 0x4802 0038 0x4806 E038 | | |
| Description | UART autobauding status register UART autobauding mode only. This status register returns the speed, the number of bits by characters, and the type of the parity in UART autobauding mode. In autobauding mode, the input frequency of the UART modem must be fixed to 48 MHz. Any other module clock frequency results in incorrect baud rate recognition. Note: When the UART is in autobauding mode, this register, instead of the LCR, DLL, and DLH registers, is used to set up transmission according to the characteristics of the previous reception. To reset the autobauding hardware (to start a new AT detection), set MDR1[2:0] to 111 (reset value), then set MDR1[2:1] to 010 (UART in autobaud mode). To set the UART to standard mode (no autobaud), set MDR1[2:1] to 000. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|-------------|----|-------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PARITY_TYPE | | BIT_BY_CHAR | | SPEED | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x000000 |
| 7:6 | PARITY_TYPE | Read 0x0: No parity identified Read 0x1: Parity space Read 0x2: Even parity Read 0x3: Odd parity | R | 0x0 |
| 5 | BIT_BY_CHAR | Read 0x0: 7-bit character identified Read 0x1: 8-bit character identified | R | 0 |
| 4:0 | SPEED | Used to report the speed identified Read 0x0: No speed identified Read 0x1: 115,200 baud Read 0x2: 57,600 baud | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------|------|-------|
| | | Read 0x3: 38,400 baud | | |
| | | Read 0x4: 28,800 baud | | |
| | | Read 0x5: 19,200 baud | | |
| | | Read 0x6: 14,400 baud | | |
| | | Read 0x7: 9,600 baud | | |
| | | Read 0x8: 4,800 baud | | |
| | | Read 0x9: 2,400 baud | | |
| | | Read 0xA: 1,200 baud | | |

Table 24-229. Register Call Summary for Register UART_UASR

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[2\] \[3\]](#)
- [UART Mode: \[4\] \[5\] \[6\]](#)
- [UART/IrDA/CIR Register Summary: \[7\] \[8\]](#)

Table 24-230. UART_ACREG

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 003C | Instance | UART1 UART2 UART3 UART4 |
| Physical Address | 0x4806 A03C 0x4806 C03C 0x4802 003C 0x4806 E03C | | |
| Description | Auxiliary control register. IR-IrDA and IR-CIR modes only. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|--------|----|-----------|----|-----------------|---|----------|---|---------|---|----------|---|--------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PULSE_TYPE | | SD_MOD | | DIS_IR_RX | | DIS_TX_UNDERRUN | | SEND_SIP | | SCTX_EN | | ABORT_EN | | EOT_EN | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x0000000 |
| 7 | PULSE_TYPE | SIR pulse width select 0x0: 3/16 of baud-rate pulse width 0x1: 1.6 μ s | RW | 0 |
| 6 | SD_MOD | Primary output used to configure transceivers. Connected to the SD/MODE input pin of IrDA transceivers. 0x0: SD pin is set to high. 0x1: SD pin is set to low. | RW | 0 |
| 5 | DIS_IR_RX | 0x0: Normal operation (RX input automatically disabled during transmit but enabled outside of transmit operation) 0x1: Disables RX input (permanent state - independent of transmit) | RW | 0 |
| 4 | DIS_TX_UNDERRUN | It is recommended to disable TX FIFO underrun capability by masking corresponding underrun interrupt. When disabling underrun by setting ACREG[4] = 1, garbage data is sent over TX line. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| | | 0x0: Long stop-bits cannot be transmitted; TX underrun is enabled. 0x1: Long stop-bits can be transmitted; TX underrun is disabled. | | |
| 3 | SEND_SIP | MIR/FIR modes only. Send serial infrared interaction pulse (SIP). If this bit is set during an MIR/FIR transmission, the SIP is sent at the end of it. This bit is cleared automatically at the end of the SIP transmission. 0x0: No action 0x1: Send SIP pulse. | RW | 0 |
| 2 | SCTX_EN | Store and controlled TX start. When MDR1[5] = 1 and the LH writes 1 to this bit, the TX state-machine starts frame transmission. This bit is self-clearing. | RW | 0 |
| 1 | ABORT_EN | Frame abort. The LH can intentionally abort transmission of a frame by writing 1 to this bit. Neither the end flag nor the CRC bits are appended to the frame. If TX FIFO is not empty and MDR1[5] = 1, UART IrDA starts a new transfer with data of the previous frame when the abort frame is sent. Therefore, TX FIFO must be reset before sending an abort frame. | RW | 0 |
| 0 | EOT_EN | EOT (end of transmission) bit. The LH writes 1 to this bit just before it writes the last byte to the TX FIFO in set-EOT bit frame closing method. This bit is cleared automatically when the LH writes to the THR (TX FIFO). | RW | 0 |

Table 24-231. Register Call Summary for Register UART_ACREG

UART/IrDA/CIR

- [UART3 Interface Description: \[0\]](#)
- [IrDA Protocol and Data Format: \[1\] \[2\] \[3\] \[4\]](#)
- [CIR Interface Description: \[5\]](#)
- [Register Access Modes: \[6\] \[7\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[8\] \[9\] \[10\] \[11\]](#)
- [IrDA Mode \(UART3 Only\): \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [CIR Mode \(UART3 Only\): \[19\]](#)
- [SIR Mode: \[20\]](#)
- [MIR Mode: \[21\]](#)
- [FIR Mode: \[22\]](#)
- [UART/IrDA/CIR Register Summary: \[23\] \[24\]](#)

Table 24-232. UART_SCR

| | | | |
|------------------|--|----------|----------------------------------|
| Address Offset | 0x0000 0040 | | |
| Physical Address | 0x4806 A040 0x4806 C040 0x4802 0040 0x4806 E040 | Instance | UART1 UART2 UART3 UART4 |
| Description | Supplementary control register Note: Bit 4 enables the wake-up interrupt, but this interrupt is not mapped into the UART_IIR register. Therefore, when an interrupt occurs and there is no interrupt pending in the UART_IIR register, the SSR[1] bit must be checked. To clear the wake-up interrupt, bit UART_SCR[4] must be reset to 0. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | | | | | | | | | RX_TRIG_GRANU1 | | | | | | | | | | | | | | | | TX_TRIG_GRANU1 | | | | | | | | | | | | | | | | DSR_IT | | | | | | | | | | | | | | | | RX_CTS_DSR_WAKE_UP_ENABLE | | | | | | | | | | | | | | | | TX_EMPTY_CTL_IT | | | | | | | | | | | | | | | | DMA_MODE_2 | | | | | | | | | | | | | | | | DMA_MODE_CTL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7 | RX_TRIG_GRANU1 | 0x0: Disables the granularity of 1 for trigger RX level 0x1: Enables the granularity of 1 for trigger RX level | RW | 0 |
| 6 | TX_TRIG_GRANU1 | 0x0: Disables the granularity of 1 for trigger TX level 0x1: Enables the granularity of 1 for trigger TX level | RW | 0 |
| 5 | DSR_IT | 0x0: Disables DSR* interrupt 0x1: Enables DSR* interrupt | RW | 0 |
| 4 | RX_CTS_DSR_WAKE_UP_ENABLE | 0x0: Disables the wake-up interrupt and clears SSR[1] 0x1: Waits for a falling edge of pins RX, CTS*, or DSR* to generate an interrupt | RW | 0 |
| 3 | TX_EMPTY_CTL_IT | 0x0: Normal mode for THR interrupt (see UART mode interrupts table) 0x1: The THR interrupt is generated when TX FIFO and TX shift register are empty. | RW | 0 |
| 2:1 | DMA_MODE_2 | Used to specify the DMA mode valid if the UART_SCR [0] bit = 1 0x0: DMA mode 0 (no DMA) 0x1: DMA mode 1 (UART_nDMA_REQ[0] in TX, UART_nDMA_REQ[1] in RX) 0x2: DMA mode 2 (UART_nDMA_REQ[0] in RX) 0x3: DMA mode 3 (UART_nDMA_REQ[0] in TX) | RW | 0x0 |
| 0 | DMA_MODE_CTL | 0x0: The DMA_MODE is set with UART_FCR [3]. 0x1: The DMA_MODE is set with UART_SCR [2:1]. | RW | 0 |

Table 24-233. Register Call Summary for Register UART_SCR
UART/IrDA/CIR

- [UART Mode Power Management: \[0\]](#)
- [UART Mode Interrupt Management: \[1\] \[2\]](#)
- [FIFO Management: \[3\]](#)
- [FIFO Trigger: \[4\] \[5\]](#)
- [FIFO DMA Mode Operation: \[6\] \[7\]](#)
- [Register Access Modes: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\]](#)
- [Quick Start: \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\]](#)
- [UART/IrDA/CIR Register Summary: \[40\] \[41\]](#)
- [UART/IrDA/CIR Registers: \[42\] \[43\] \[44\] \[45\] \[46\] \[47\] \[48\] \[49\] \[50\] \[51\] \[52\] \[53\] \[54\]](#)

Table 24-234. UART_SSR

| | | | |
|-------------------------|---|-----------------|----------------------------------|
| Address Offset | 0x0000 0044 | | |
| Physical Address | 0x4806 A044 0x4806 C044 0x4802 0044 0x4806 E044 | Instance | UART1 UART2 UART3 UART4 |
| Description | Supplementary status register Note: Bit 1 is reset only when UART_SCR[4] is reset to 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-----------------|---|------------------------|---|--------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | DMA_COUNTER_RST | | RX_CTS_DSR_WAKE_UP_STS | | TX_FIFO_FULL |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|--|------|-----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x0000000 |
| 7:3 | RESERVED | Read returns 0. | R | 0x00 |
| 2 | DMA_COUNTER_RST | 0x0: The DMA counter will not be reset if the corresponding FIFO is reset (through FCR[1] or FCR[2]). 0x1: The DMA counter will be reset if corresponding FIFO is reset (through FCR[1] or FCR[2]). | RW | 1 |
| 1 | RX_CTS_DSR_WAKE_UP_STS | Read 0x0: No falling edge event on RX, CTS*, and DSR* Read 0x1: A falling edge occurred on RX, CTS*, or DSR*. | R | 0 |
| 0 | TX_FIFO_FULL | Read 0x0: TX FIFO is not full. Read 0x1: TX FIFO is full. | R | 0 |

Table 24-235. Register Call Summary for Register UART_SSR

UART/IrDA/CIR

- [UART Mode Interrupt Management](#): [0]
- [FIFO Management](#): [1]
- [Register Access Modes](#): [2] [3] [4]
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection](#): [5] [6] [7] [8] [9] [10] [11] [12] [13]
- [UART/IrDA/CIR Register Summary](#): [14] [15]

Table 24-236. UART_EBLR

| | | | |
|-------------------------|---|-----------------|----------------------------------|
| Address Offset | 0x0000 0048 | | |
| Physical Address | 0x4806 A048 0x4806 C048 0x4802 0048 0x4806 E048 | Instance | UART1 UART2 UART3 UART4 |
| Description | BOF length register IR-IrDA and IR-CIR modes only. In IR-IrDA SIR operation, this register specifies the number of BOF + xBOFs to transmit. Value set into this register must account for the BOF character; therefore, to send only one BOF with no XBOF, this register must be set to 1. To send one BOF with N XBOF, this register must be set to N + 1. The value 0 sends 1 BOF plus 255 XBOF. In IR-IrDA MIR mode, this register specifies the number of additional start flags (MIR protocol mandates a minimum of 2 start flags). In IR-CIR mode, this register specifies the number of consecutive 0s to be received before generating the RX_STOP interrupt (UART_IIR[2]). All received 0s are stored in the RX FIFO. When the register is set to 0, this feature is deactivated and always in reception state, which can be disabled by setting the ACREG[5] to 1. Note: If the RX_STOP interrupt occurs before a byte boundary, the remaining bits of the last byte are filled with 0s and passed into the RX FIFO. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | EBLR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7:0 | EBLR | IR-IrDA mode: This register allows definition of up to 176 xBOFs, the maximum required by IrDA specification. IR-CIR mode: This register specifies the number of consecutive 0s to be received before generating the RX_STOP interrupt (UART_IIR[2]). 0x00: Feature disabled 0x01: Generate RX_STOP interrupt after receiving one zero bit. ... 0xFF: Generate RX_STOP interrupt after receiving 255 zero bits. | RW | 0x00 |

Table 24-237. Register Call Summary for Register UART_EBLR
UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[2\] \[3\] \[4\] \[5\]](#)
- [SIR Mode: \[6\]](#)
- [MIR Mode: \[7\]](#)
- [FIR Mode: \[8\]](#)
- [UART/IrDA/CIR Register Summary: \[9\] \[10\]](#)
- [UART/IrDA/CIR Registers: \[11\]](#)

Table 24-238. UART_MVR

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0050 | Instance | UART1 UART2 UART3 UART4 |
| Physical Address | 0x4806 A050 0x4806 C050 0x4802 0050 0x4806 E050 | | |
| Description | Module version register The reset value is fixed by hardware and corresponds to the RTL revision of this module. A reset has no effect on the value returned. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|--------------------------|
| 31:0 | REV | Revision number | R | 0x-- TI internal data |

Table 24-239. Register Call Summary for Register UART_MVR

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\] \[2\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [UART/IrDA/CIR Register Summary: \[12\] \[13\]](#)

Table 24-240. UART_SYSC

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0054 | Instance | UART1 UART2 UART3 UART4 |
| Physical Address | 0x4806 A054 0x4806 C054 0x4802 0054 0x4806 E054 | | |
| Description | System configuration register The AUTOIDLE bit controls a power-saving technique to reduce the logic power consumption of the open-core protocol (OCP) interface. When the feature is enabled, the clock is gated off until an OCP command for this device is detected. When the software reset bit is set high, it causes a full device reset. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|----------|---|-----------|-----------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RESERVED | | | IDLEMODE | | ENAWAKEUP | SOFTRESET | AUTOIDLE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7:5 | RESERVED | Read returns 0. | R | 0x0 |
| 4:3 | IDLEMODE | Power management req/ack control ref: OCP Design Guidelines Version 1.1 0x0: Force-idle: Idle request is acknowledged unconditionally. 0x1: No-idle: Idle request is never acknowledged. 0x2: Smart-idle: Idle request is acknowledged based in module internal activity. 0x3: Smart-idle Wake-up: Acknowledgement to an idle request is given based in the internal activity of the module. The module is allowed to generate wake-up request. | RW | 0x0 |
| 2 | ENAWAKEUP | Wake-up feature control 0x0: Wakeup is disabled. 0x1: Wake-up capability is enabled. | RW | 0 |
| 1 | SOFTRESET | Software reset. Set this bit to 1 to trigger a module reset. This bit is automatically reset by the hardware. Read returns 0. 0x0: Normal mode 0x1: The module is reset. | RW | 0 |
| 0 | AUTOIDLE | Internal OCP clock gating strategy 0x0: Clock is running. 0x1: Automatic OCP clock gating strategy is applied, based on OCP interface activity | RW | 0 |

Table 24-241. Register Call Summary for Register UART_SYSC

UART/IrDA/CIR

- [Clock Configuration: \[0\]](#)
- [Software Reset: \[1\]](#)
- [UART Mode Power Management: \[2\]](#)
- [Local Power Management: \[3\] \[4\] \[5\]](#)
- [Register Access Modes: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\]](#)
- [Quick Start: \[30\]](#)
- [UART/IrDA/CIR Register Summary: \[31\] \[32\]](#)

Table 24-242. UART_SYSS

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0058 | | |
| Physical Address | 0x4806 A058 0x4806 C058 0x4802 0058 0x4806 E058 | Instance | UART1 UART2 UART3 UART4 |
| Description | System status register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|-----------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | RESETDONE | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x000000 |
| 7:1 | RESERVED | Read returns 0. | R | 0x00 |
| 0 | RESETDONE | Internal reset monitoring Read 0x0: Internal module reset is ongoing. Read 0x1: Reset complete | R | 0 |

Table 24-243. Register Call Summary for Register UART_SYSS

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\] \[2\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [Quick Start: \[12\]](#)
- [UART/IrDA/CIR Register Summary: \[13\] \[14\]](#)

Table 24-244. UART_WER

| | | | |
|-------------------------|---|-----------------|----------------------------------|
| Address Offset | 0x0000 005C | Instance | UART1 UART2 UART3 UART4 |
| Physical Address | 0x4806 A05C 0x4806 C05C 0x4802 005C 0x4806 E05C | | |
| Description | Wake-up enable register The UART wake-up enable register is used to mask and unmask a UART event that would subsequently notify the system. An event is any activity in the logic that could cause an interrupt and/or an activity that would require the system to wake up. Even if the wakeup is disabled for certain events, if these events are also an interrupt to the UART, the UART registers the interrupt. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|--|----|-----------------------|----|---------------------|---|-------------------------|---|---------------------|---|----------------------|---|----------------------|---|
| RESERVED | | | | | | | | | | | | | | | | TX_WAKEUP_EN | | EVENT_6_RECEIVER_LINE_STATUS_INTERRUPT | | EVENT_5_RHR_INTERRUPT | | EVENT_4_RX_ACTIVITY | | EVENT_3_DCD_CD_ACTIVITY | | EVENT_2_RL_ACTIVITY | | EVENT_1_DSR_ACTIVITY | | EVENT_0_CTS_ACTIVITY | |

| Bits | Field Name | Description | Type | Reset |
|------|--|---|------|----------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x000000 |
| 7 | TX_WAKEUP_EN | 0x0: Event is not allowed to wake up the system. 0x1: Event can wake up the system: it can be THR_IT or TX_DMA request and/or TX_SATUS_IT. | RW | 0 |
| 6 | EVENT_6_RECEIVER_LINE_STATUS_INTERRUPT | 0x0: Event is not allowed to wake up the system. 0x1: Event can wake up the system. | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|--|------|-------|
| 5 | EVENT_5_RHR_INTERRUPT | 0x0: Event is not allowed to wake up the system. 0x1: Event can wake up the system. | RW | 1 |
| 4 | EVENT_4_RX_ACTIVITY | 0x0: Event is not allowed to wake up the system. 0x1: Event can wake up the system. | RW | 1 |
| 3 | EVENT_3_DCD_CD_ACTIVITY | 0x0: Event is not allowed to wake up the system 0x1: Event can wake up the system | RW | 1 |
| 2 | EVENT_2_RI_ACTIVITY | 0x0: Event is not allowed to wake up the system. 0x1: Event can wake up the system. | RW | 1 |
| 1 | EVENT_1_DSR_ACTIVITY | 0x0: Event is not allowed to wake up the system. 0x1: Event can wake up the system. | RW | 1 |
| 0 | EVENT_0_CTS_ACTIVITY | 0x0: Event is not allowed to wake up the system. 0x1: Event can wake up the system. | RW | 1 |

Table 24-245. Register Call Summary for Register UART_WER

UART/IrDA/CIR

- [UART Mode Power Management: \[0\]](#)
- [Register Access Modes: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\]](#)
- [UART/IrDA/CIR Register Summary: \[25\] \[26\]](#)

Table 24-246. UART_CFPS

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|--|----|----|-------------------|----|---|---|------|---|---|---|---|---|---|------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0060 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4806 A060 0x4806 C060 0x4802 0060 0x4806 E060 | | | | | | | | | | | | | | | | Instance UART1 UART2 UART3 UART4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | <div>Carrier frequency prescaler</div> <div>Because the consumer IR works at modulation rates of 30 to 56.8 kHz, the 48-MHz clock must be prescaled before the clock can drive the IR logic. This register sets the divisor rate to give a range to accommodate the remote-control requirements in baud multiples of 12x. The value of the CFPS at reset is 0105 decimal, which equals 38.1 kHz output from starting conditions. The 48-MHz carrier is prescaled by the CFPS, which is then divided by the 12x baud multiple.</div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="24">RESERVED</td><td colspan="8">CFPS</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | CFPS | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | CFPS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:8 | RESERVED | Read returns 0. Write has no effect. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RW | 0x000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7:0 | CFPS | System clock frequency prescaler at (12x multiple). Examples for CFPS values: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RW | 0x69 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Target Freq (kHz) | | | | | | | | | CFPS (decimal) | | | | | | | | | Actual Freq (kHz) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 30 | | | | | | | | | 133 | | | | | | | | | 30.08 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 32.75 | | | | | | | | | 122 | | | | | | | | | 32.79 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 36 | | | | | | | | | 111 | | | | | | | | | 36.04 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 36.7 | | | | | | | | | 109 | | | | | | | | | 36.69 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 38* | | | | | | | | | 105 | | | | | | | | | 38.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 40 | | | | | | | | | 100 | | | | | | | | | 40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 56.8 | | | | | | | | | 70 | | | | | | | | | 57.14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | *configured at reset to this value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Note: CFPS = 0 is not supported. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 24-247. Register Call Summary for Register UART_CFPS

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [CIR Mode \(UART3 Only\): \[12\] \[13\] \[14\]](#)
- [UART/IrDA/CIR Register Summary: \[15\] \[16\]](#)

Table 24-248. UART_RXFIFO_LVL

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0064 | | |
| Physical Address | 0x4806 A064 0x4806 C064 0x4802 0064 0x4806 E064 | Instance | UART1 UART2 UART3 UART4 |
| Description | Level of the RX FIFO | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RXFIFO_LVL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x000000 |
| 7:0 | RXFIFO_LVL | Shows the number of received bytes in the RX FIFO | R | 0x00 |

Table 24-249. Register Call Summary for Register UART_RXFIFO_LVL

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [UART/IrDA/CIR Register Summary: \[24\] \[25\]](#)

Table 24-250. UART_TXFIFO_LVL

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0068 | | |
| Physical Address | 0x4806 A068 0x4806 C068 0x4802 0068 0x4806 E068 | Instance | UART1 UART2 UART3 UART4 |
| Description | Level of the TX FIFO | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TXFIFO_LVL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Read returns 0. | R | 0x000000 |
| 7:0 | TXFIFO_LVL | Shows the number of written bytes in the TX FIFO | R | 0x00 |

Table 24-251. Register Call Summary for Register UART_TXFIFO_LVL

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [UART/IrDA/CIR Register Summary: \[24\] \[25\]](#)

Table 24-252. UART_IER2

| | | | |
|-------------------------|--|-----------------|-------------------------|
| Address Offset | 0x0000 006C | Instance | UART1 |
| Physical Address | 0x4806 A06C 0x4806 C06C 0x4802 006C 0x4806 E06C | | UART2 UART3 UART4 |
| Description | Enables RX/TX FIFOs empty corresponding interrupts | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|-----------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | EN_TXFIFO_EMPTY | | EN_RXFIFO_EMPTY | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------------|
| 31:2 | RESERVED | Read returns 0. Write has no effect. | RW | 0x0000 0000 |
| 1 | EN_TXFIFO_EMPTY | Enables TX FIFO empty corresponding interrupt 0x0: Enables EN_TXFIFO_EMPTY interrupt 0x1: Disables EN_TXFIFO_EMPTY interrupt | RW | 0 |
| 0 | EN_RXFIFO_EMPTY | Enables RX FIFO empty corresponding interrupt 0x0: Enables EN_RXFIFO_EMPTY interrupt 0x1: Disables EN_RXFIFO_EMPTY interrupt | RW | 0 |

Table 24-253. Register Call Summary for Register UART_IER2

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [UART/IrDA/CIR Register Summary: \[24\] \[25\]](#)

Table 24-254. UART_ISR2

| | | | |
|-------------------------|--|-----------------|-------------------------|
| Address Offset | 0x0000 0070 | Instance | UART1 |
| Physical Address | 0x4806 A070 0x4806 C070 0x4802 0070 0x4806 E070 | | UART2 UART3 UART4 |
| Description | Status of RX/TX FIFOs empty corresponding interrupts | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|------------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TXFIFO_EMPTY_STS | | RXFIFO_EMPTY_STS | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-------------|
| 31:2 | RESERVED | Read returns 0. Write has no effect. | RW | 0x0000 0000 |
| 1 | TXFIFO_EMPTY_STS | Used to generate interrupt if the TX_FIFO is empty (software flow control) 0x0: TXFIFO_EMPTY interrupt not pending. 0x1: TXFIFO_EMPTY interrupt pending. | RW | 1 |
| 0 | RXFIFO_EMPTY_STS | Used to generate interrupt if the RX_FIFO is empty (software flow control) 0x0: RXFIFO_EMPTY interrupt not pending. 0x1: RXFIFO_EMPTY interrupt pending. | RW | 1 |

Table 24-255. Register Call Summary for Register UART_ISR2

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [UART/IrDA/CIR Register Summary: \[24\] \[25\]](#)

Table 24-256. UART_FREQ_SEL

| | | | |
|-------------------------|--|-----------------|-------|
| Address Offset | 0x0000 0074 | Instance | UART1 |
| Physical Address | 0x4806 A074 0x4806 C074 0x4802 0074 0x4806 E074 | | UART2 |
| | | | UART3 |
| | | | UART4 |
| Description | Sample per bit selector | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FREQ_SEL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:8 | RESERVED | Read returns 0. Write has no effect. | RW | 0x0000 0000 |
| 7:0 | FREQ_SEL | Sets the sample per bit if nondefault frequency is used. MDR3[1] must be set to 1 after this value is set. Must be equal to or higher then 6. | RW | 0x1A |

Table 24-257. Register Call Summary for Register UART_FREQ_SEL

UART/IrDA/CIR

- [Register Access Modes: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [UART/IrDA/CIR Register Summary: \[24\] \[25\]](#)

Table 24-258. UART_MDR3

| | | | |
|-------------------------|--|-----------------|----------------------------------|
| Address Offset | 0x0000 0080 | | |
| Physical Address | 0x4806 A080 0x4806 C080 0x4802 0080 0x4806 E080 | Instance | UART1 UART2 UART3 UART4 |
| Description | Mode definition register 3 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|----------------------|-----------------|----------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | SET_DMA_TX_THRESHOLD | NONDEFAULT_FREQ | DISABLE_CIR_RX_DEMOD |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|-------------|
| 31:3 | RESERVED | Read returns 0. Write has no effect. | RW | 0x0000 0000 |
| 2 | SET_DMA_TX_THRESHOLD | Enable to set different TXDMA threshold in UART_TX_DMA_THRESHOLD register. | RW | 0 |
| 1 | NONDEFAULT_FREQ | Used to enable the NONDEFAULT fclk frequencies. 0x0: Disables using NONDEFAULT fclk frequencies. 0x1: Enables using NONDEFAULT fclk frequencies (set FREQ_SEL and DLH/DLL). | RW | 0 |
| 0 | DISABLE_CIR_RX_DEMOD | Used to enable CIR RX demodulation. 0x0: Enables CIR RX demodulation. 0x1: Disables CIR RX demodulation. | RW | 0 |

Table 24-259. Register Call Summary for Register UART_MDR3

UART/IrDA/CIR

- [FIFO DMA Mode Operation](#): [0] [1] [2]
- [Register Access Modes](#): [3] [4] [5] [6] [7] [8]
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection](#): [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26]
- [UART/IrDA/CIR Register Summary](#): [27] [28]
- [UART/IrDA/CIR Registers](#): [29]

Table 24-260. UART_TX_DMA_THRESHOLD

| | | | |
|-------------------------|---|-----------------|----------------------------------|
| Address Offset | 0x0000 0084 | | |
| Physical Address | 0x4806 A084 0x4806 C084 0x4802 0084 0x4806 E084 | Instance | UART1 UART2 UART3 UART4 |
| Description | Use to manually set the TX DMA threshold level. UART_MDR3 [2] SET_TX_DMA_THRESHOLD must be 1 and must be value + tx_trigger_level = 64 (TX FIFO size). If not, 64-tx_trigger_level will be used without modifying the value of this register. | | |
| Type | RW | | |

UART/IrDA/CIR

www.ti.com

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TX_DMA_THRESHOLD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|------------|
| 31:6 | RESERVED | Reserved | RW | 0x00000000 |
| 5:0 | TX_DMA_THRESHOLD | Used to manually set the TX DMA threshold level | RW | 0x00 |

Table 24-261. Register Call Summary for Register UART_TX_DMA_THRESHOLD

UART/IrDA/CIR

- [FIFO DMA Mode Operation: \[0\] \[1\] \[2\]](#)
- [Register Access Modes: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [UART/IrDA \(SIR, MIR, FIR\)/CIR Mode Selection: \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\]](#)
- [UART/IrDA/CIR Register Summary: \[27\] \[28\]](#)
- [UART/IrDA/CIR Registers: \[29\]](#)

24.4 Multichannel Serial Port Interface

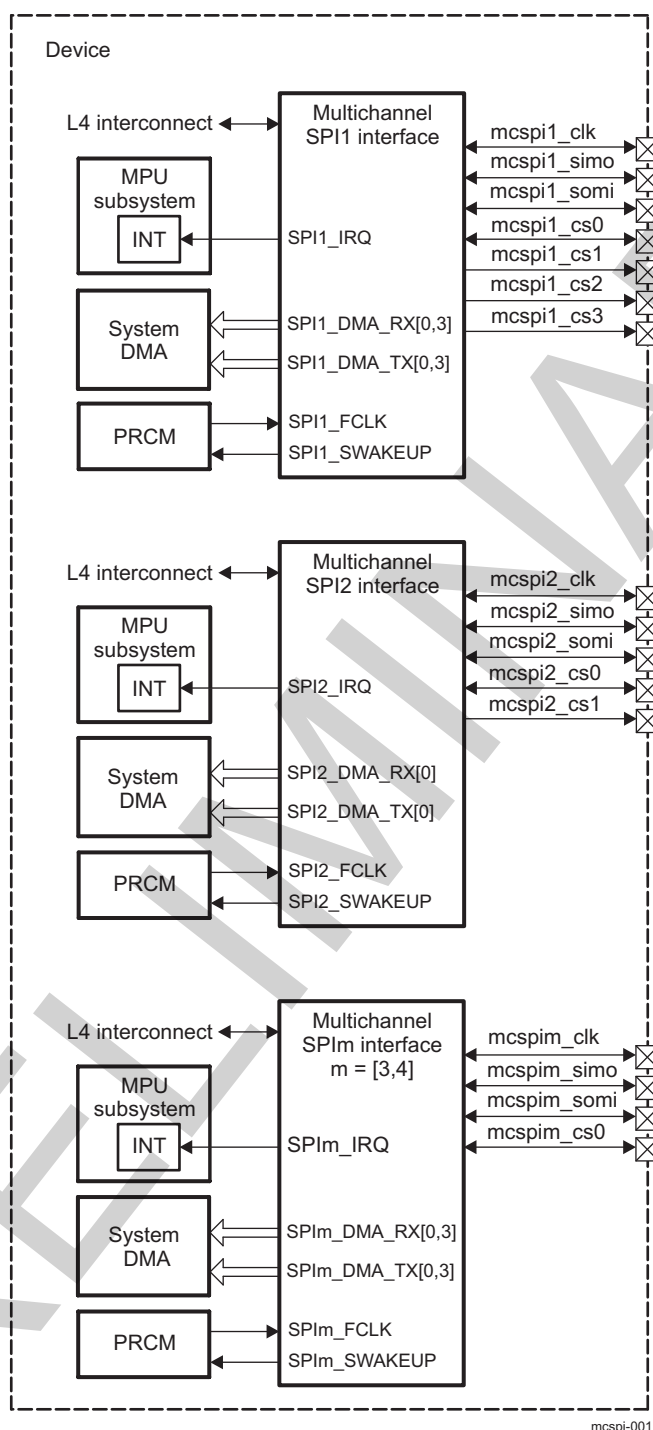
This section describes the four multichannel serial port interface (MCSPi) modules for the device.

24.4.1 MCSPi Overview

The MCSPi is a master/slave synchronous serial bus. The MCSPi has four separate modules (SPi1, SPi2, SPi3, and SPi4) in the device (see [Figure 24-86](#)). The MCSPi modules differ as follows: SPi1 supports up to four peripherals, SPi2 supports up to two peripherals, SPi3 and SPi4 support only one peripheral.

NOTE: In this chapter, $m = [1,4]$ represents the module instance and x represents the channel in signal and register naming. The MCSPi has four instances, with each module instance having different channel numbers:

- SPi1: 4 channels (if $m = 1$, $x = 4$)
 - SPi2: 2 channels (if $m = 2$, $x = 2$)
 - SPi3: 1 channel (if $m = 3$, $x = 1$)
 - SPi4: 1 channel (if $m = 4$, $x = 1$)
-

Figure 24-86. Multichannel Modules SPI1, SPI2, SPI3, and SPI4

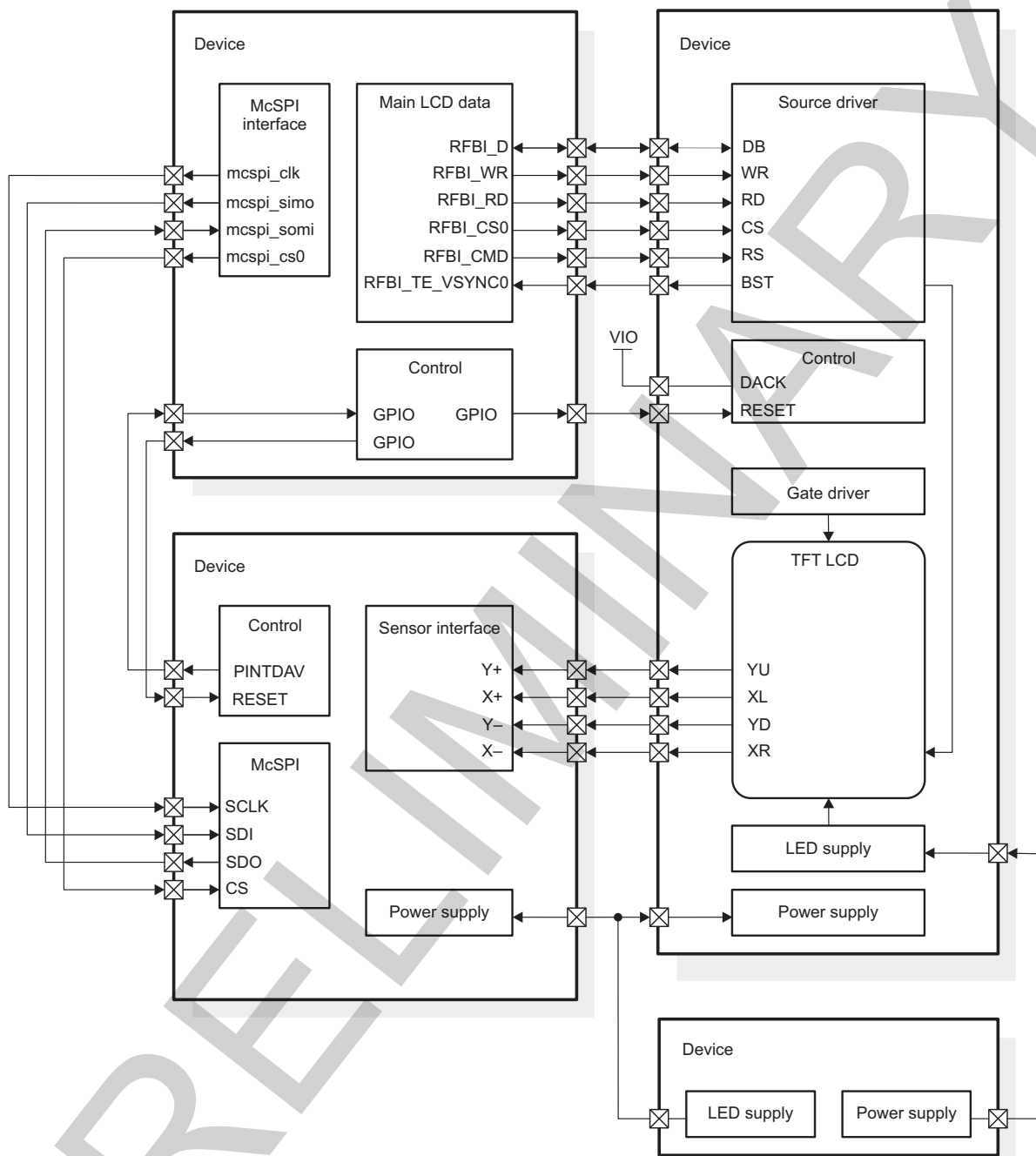
The MCSPI instances include the following main features:

- Serial clock with programmable frequency, polarity, and phase for each channel
- Wide selection of SPI word lengths, ranging from 4 to 32 bits
- Up to four master channels, or single channel in slave mode
- Master multichannel mode:
 - Full duplex/half duplex
 - Transmit-only/receive-only/transmit-and-receive modes

- Flexible I/O port controls per channel
- Two DMA requests (read/write) per channel
- Single interrupt line for multiple interrupt source events
- Power management through wake-up capabilities
- Enable the addition of a programmable start-bit for SPI transfer per channel (start-bit mode)
- Supports start-bit write command
- Supports start-bit pause and break sequence
- 64-byte built-in FIFO available for a single channel
- Force CS mode for continuous transfers

24.4.2 MCSPI Environment

Figure 24-87 shows a simplified overview of a typical application system using the MCSPI. This example is based on a TFS chip set, including a 2.2-inch color-active matrix thin-film transistor (TFT) liquid crystal display (LCD) with a light-emitting diode (LED) front light, a 4-wire resistive touch-screen panel, and LCD controllers. This chip set is associated with a touch-screen controller, powered by a power-management unit, and driven by the device. The MCSPI device interface is set to master mode; the touch-screen MCSPI controller interface operates in slave mode.

Figure 24-87. Typical Application Using the MCSPI

mcspi-034

24.4.2.1 MCSPI Interface

24.4.2.1.1 Basic MCSPI Pins for Master Mode

Figure 24-88 shows all of the MCSPI interface signals in master mode.

Figure 24-88. MCSPI Interface Signals in Master Mode

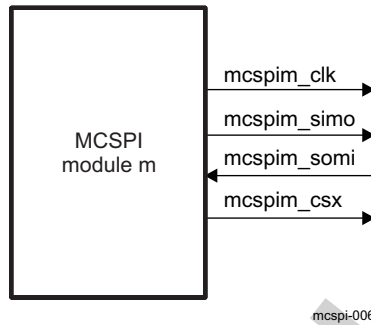


Table 24-262 describes the MCSPI I/O in master mode.

Table 24-262. MCSPI I/O Description (Master Mode)

| Signal Name | I/O | Description | Reset ⁽¹⁾ |
|-------------|-----|---|----------------------|
| mcspim_clk | O | SPIm module serial clock | Unknown |
| mcspim_simo | O | SPIm module serial data master out (slave input, master output) | Unknown |
| mcspim_somi | I | SPIm module serial data master input (slave output, master input) | — |
| mcspim_csx | O | SPIm module chip-select x output | Low |

⁽¹⁾ After reset, the SPI modules are in slave mode by default. This paragraph implies that the MCSPI module is configured in slave mode. (See the MCSPI_MODULCTRL[2] MS bit in the module control register [MCSPI_MODULCTRL]).

24.4.2.1.2 Basic MCSPI Pins for Slave Mode

Figure 24-89 shows all of the MCSPI interface signals in slave mode.

Figure 24-89. MCSPI Interface Signals in Slave Mode

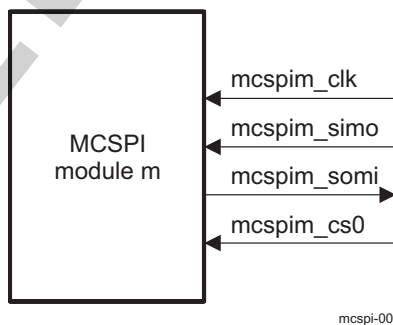


Table 24-263 describes the MCSPI I/O in slave mode.

Table 24-263. MCSPI I/O Description (Slave Mode)

| Signal Name | I/O | Description | Reset ⁽¹⁾ |
|-------------|-----|--------------------------|----------------------|
| mcspim_clk | I | SPIm module serial clock | Unknown |

⁽¹⁾ After reset, the SPI modules are in slave mode by default. This paragraph implies that the MCSPI module is configured in slave mode. (See the MCSPI_MODULCTRL[2] MS bit in the module control register (MCSPI_MODULCTRL).)

Table 24-263. MCSPI I/O Description (Slave Mode) (continued)

| Signal Name | I/O | Description | Reset ⁽¹⁾ |
|-------------|-----|---|----------------------|
| mcsnim_simo | I | SPIm module serial data master out (slave input, master output) | Unknown |
| mcsnim_somi | O | SPIm module serial data master input (slave output, master input) | — |
| mcsnim_csx | I | SPIm module chip-select x output | Low |

24.4.2.1.3 Multichannel SPI Protocol and Data Format

The synchronous SPI protocol allows a master device to initiate serial data transfers to a slave device. A slave select line (mcsnim_csx) allows selection of an individual slave SPI device. Slave devices that are not selected do not interfere with SPI bus activities.

MCSPI offers the flexibility to modify the following parameters to adapt to the device features:

- Word length
MCSPI supports any SPI word ranging from 4 bits to 32 bits long (the SPIm.MCSPI_CHxCONF[11:7] WL bit field).
SPI word length can be changed between transmissions to allow the master device to communicate with peripheral slaves that have different requirements.
- SPI enable (mcsnim_csx, for channel x of instance m)
The polarity of the SPI enable signals is programmable (the SPIm.MCSPI_CHxCONF[6] EPOL bit). mcsnim_csx signals can be active high or low.
Assertion of the mcsnim_csx signals is programmable and can be done manually or automatically. The manual assertion mode is available in single master mode only. mcsnim_csx can be kept active between words with the SPIm.MCSPI_CHxCONF[20] FORCE bit.
Two consecutive words for two different slave devices can go along with active mcsnim_csx signals with different polarity.
- Programmable start-bit
In start-bit mode a start-bit is added before the SPI word length to indicate how the next SPI word must be handled. The start-bit is enabled by setting the SPIm.MCSPI_CHxCONF[23] SBE bit to 1. The SPIm.MCSPI_CHxCONF[24] SBPOL bit defines the polarity of the start-bit.
- Programmable SPI clock
 - Bit rate
In master mode, the baud rate of the SPI serial clock is programmable using the 48-MHz reference clock (from the PRCM module). Table 24-264 lists the spim_clk bit rates obtained for data transfer when programming the clock divider (the SPIm.MCSPI_CHxCONF[5:2] CLKD bit field).

Table 24-264. SPI Master Clock Rates

| Divider | Clock Rate |
|---------|------------|
| 1 | 48 MHz |
| 2 | 24 MHz |
| 4 | 12 MHz |
| 8 | 6 MHz |
| 16 | 3 MHz |
| 32 | 1.5 MHz |
| 64 | 750 kHz |
| 128 | 375 kHz |
| 256 | ~187 kHz |
| 512 | ~93.7 kHz |
| 1024 | ~46.8 kHz |

Table 24-264. SPI Master Clock Rates (continued)

| Divider | Clock Rate |
|---------|------------|
| 2048 | ~23.4 kHz |
| 4096 | ~11.7 kHz |

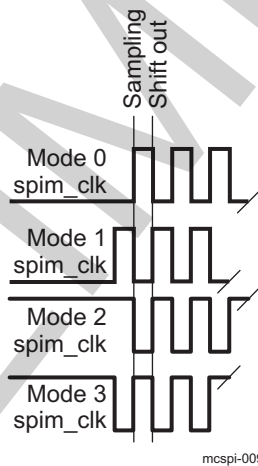
– Polarity and phase

The polarity (the SPI_{Im}.MCSPI_CHxCONF[1] POL bit) and the phase (the SPI_{Im}.MCSPI_CHxCONF[0] PHA bit) of the SPI serial clock (mcspim_clk) are configurable to offer four combinations. Software selects the right combination, depending on the device. See [Table 24-265](#) and [Figure 24-90](#).

Table 24-265. Phase and Polarity Combinations

| Polarity (POL) | Phase (PHA) | SPI Mode | Comments |
|----------------|-------------|----------|--|
| 0 | 0 | Mode 0 | mcspim_clk is active high and sampling occurs on the rising edge. |
| 0 | 1 | Mode 1 | mcspim_clk is active high and sampling occurs on the falling edge. |
| 1 | 0 | Mode 2 | mcspim_clk is active low and sampling occurs on the falling edge. |
| 1 | 1 | Mode 3 | mcspim_clk is active low and sampling occurs on the rising edge. |

Figure 24-90. Phase and Polarity Combinations



24.4.2.1.3.1 Transfer Format

In master and slave modes, the MCSPI drives the data lines when spim_csx is asserted.

Each word is transmitted starting with the MSB.

This section explains the two cases of data transmission determined by the clock phase (PHA) and the type of data transmission using a start-bit (SBE) called the start-bit mode:

- Transmission in mode 0 and mode 2 (PHA = 0)

When PHA = 0, the first bit of the SPI word to transmit (on the master or the slave data output pin) is valid one-half cycle of spim_clk after the assertion of spim_csx.

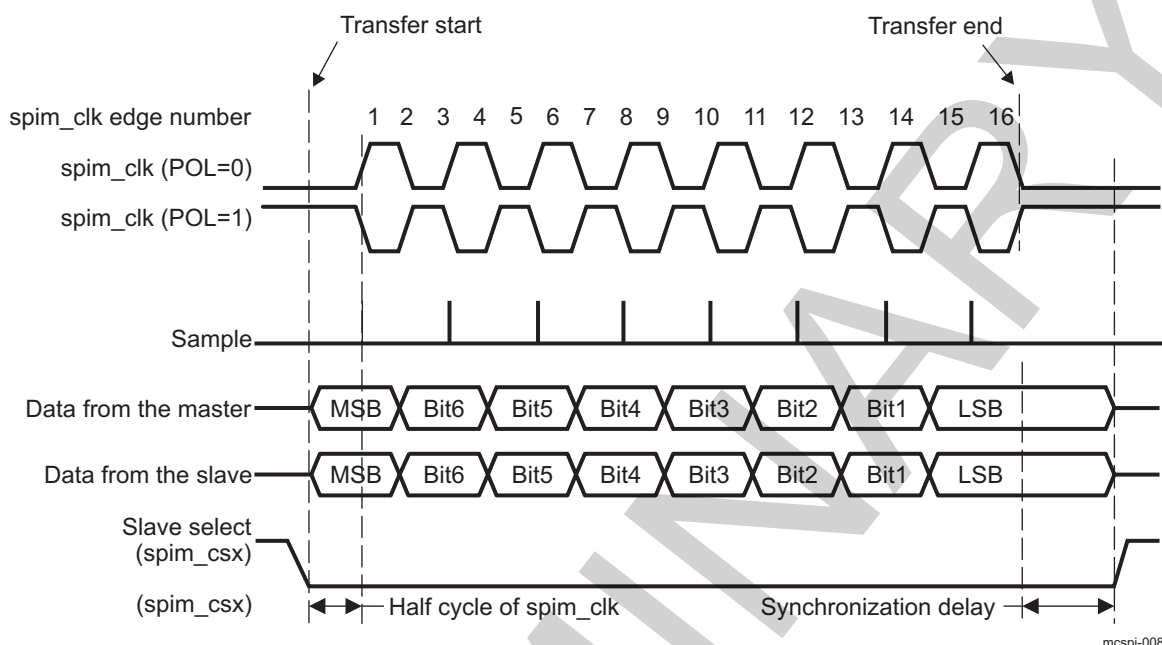
Therefore, the first edge of the mcspim_clk line is used by the master to sample the first data bit sent by the slave. On the same edge, the first data bit sent by the master is sampled by the slave.

On the next mcspim_clk edge, the received data bit is shifted into the receive shift register and a new data bit is transmitted on the serial data line.

This process continues for a number of pulses on the spim_clk line defined by the SPI word length

programmed in the master device, with data being latched on odd-numbered edges and shifted on even-numbered edges. See [Figure 24-91](#).

Figure 24-91. Full-Duplex Transfer Format With PHA = 0



- Transmission in mode 1 and mode 3 (PHA = 1)

When PHA = 1, the first bit of the SPI word to transmit (on the master or the slave data output pin) is valid on the following mcspim_clk edge (one-half cycle later). This is the sampling edge for the master and slave. A synchronization delay is added between the activation of mcspim_csx and the first mcspim_clk edge.

The received data bit is shifted into the shift register on the third mcspim_clk edge.

This process continues for a number of pulses on the mcspim_clk line defined by the SPI word length programmed in the master device, with data being latched on even-numbered edges and shifted on odd-numbered edges.

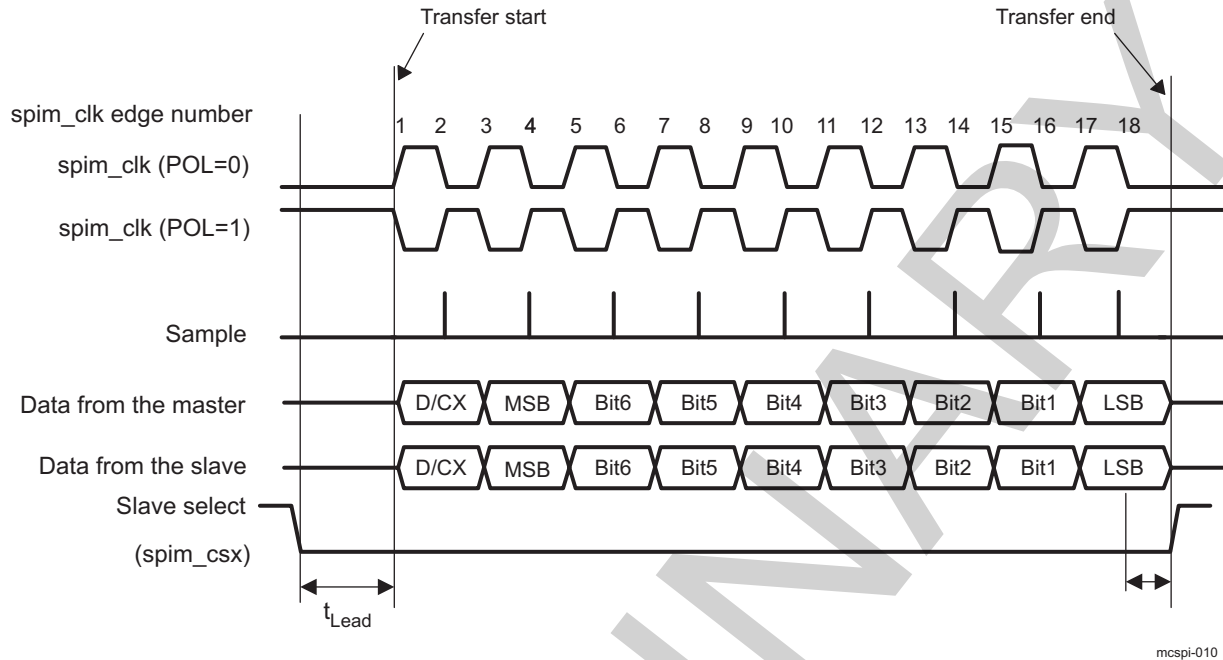
NOTE: The minimum synchronization delay is one cycle of mcspim_clk, if the frequency of mcspim_clk equals the frequency of SPIm_FCLK (MCSPIm functional clock) in master mode. The minimum synchronization delay is one-half cycle of mcspim_clk, if the frequency of mcspim_clk is lower than the frequency of SPIm_FCLK in the master and slave modes.

- Transmission with a start-bit (SBE = 1)

When the SPIm.MCSPI_CHxCONF[23] SBE bit is set to 1, a start-bit is added before the MSB to indicate whether the next SPI word must be handled as a command or as data.

[Figure 24-92](#) shows an example of a data transfer with an extra start-bit.

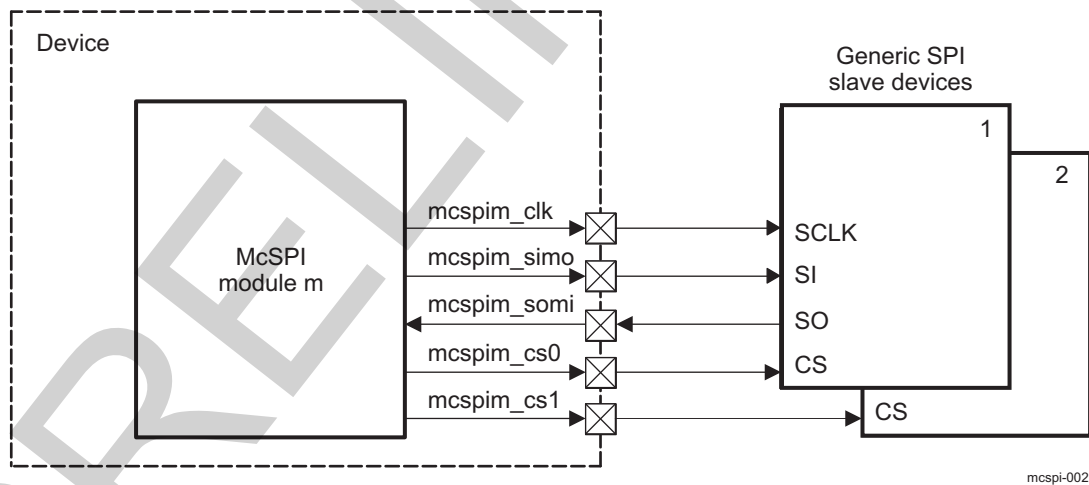
Figure 24-92. Extended SPI Transfer With a Start-Bit (SBE = 1)



24.4.2.2 SPI in Master Mode

Figure 24-93 shows a case in master mode (full-duplex) where the MCSPI module is connected with two slave devices.

Figure 24-93. MCSPI Master Mode (Full Duplex)



NOTE: In this case $m = [1,3]$.

Figure 24-94 shows the master single mode, which can also be configured in receive-only mode.

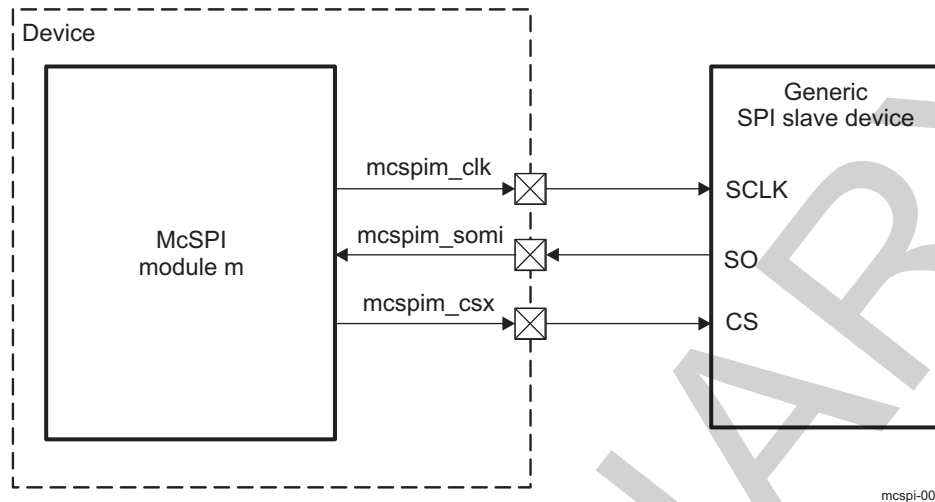
Figure 24-94. MCSPI Master Single Mode (Receive Only)**24.4.2.3 SPI in Slave Mode**

Figure 24-95 shows a case in slave mode (full-duplex).

NOTE: Only channel 0 can be configured as slave, but the chip-enable signal can be connected to any mcspim_csx pin and then rerouted internally to channel 0 (the SPI_m.MCSPI_CHxCONF[22:21] SPIENSLV bit field [where x = 0]). For more information, see Section 24.4.4.3, *Slave Mode*.

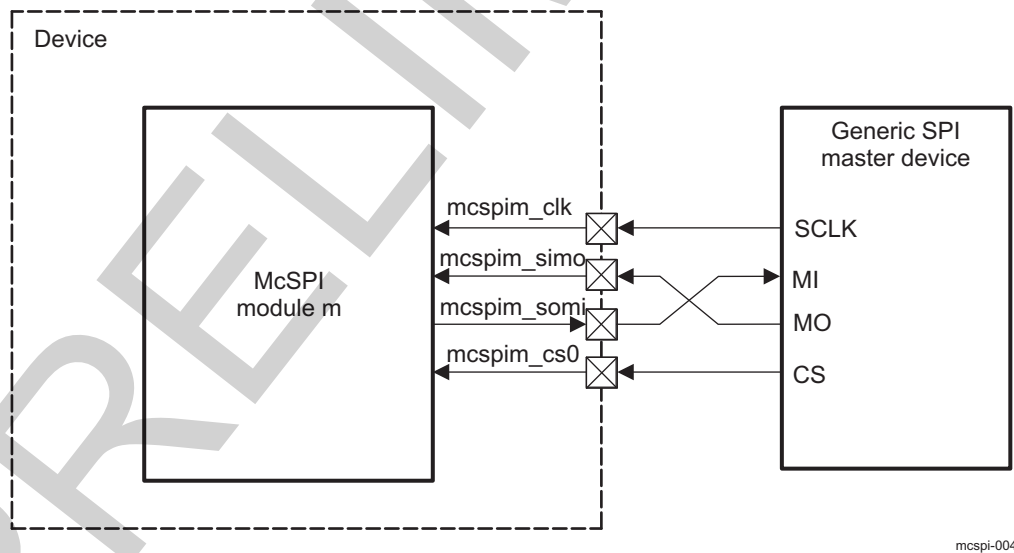
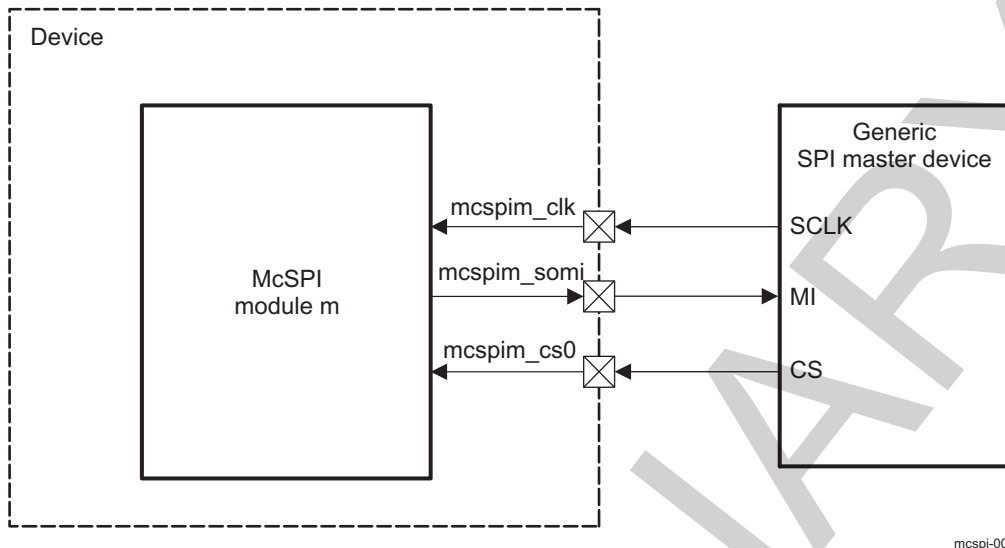
Figure 24-95. MCSPI Slave Mode (Full Duplex)

Figure 24-96 shows the slave single mode, which can also be configured in transmit-only mode.

Figure 24-96. MCSPI Slave Single Mode (Transmit Only)

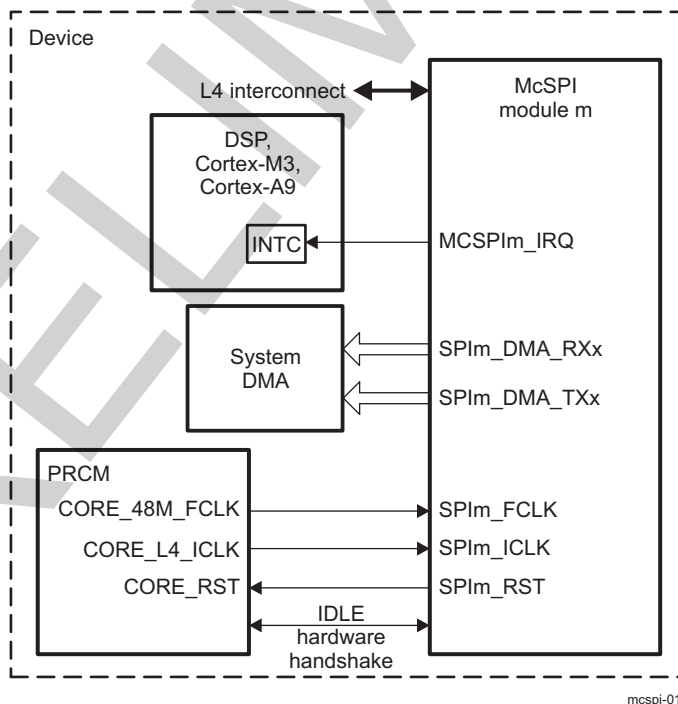


24.4.3 MCSPI Integration

This section describes module integration in the device, including information about clocks, resets, and hardware requests.

Figure 24-97 shows MCSPI integration.

Figure 24-97. MCSPI Integration



NOTE: For more information about the IDLE hardware handshake and the wake-up request, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

NOTE: For the names of the signals going from the MCSPI and to the DSP, Cortex-M3, and Cortex-A9 INTC, see [Table 24-268](#).

[Table 24-266](#) through [Table 24-268](#) summarize the integration of the module in the device.

Table 24-266. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| MCSP1 | PD_L4_PER | L4_PER |
| MCSP2 | PD_L4_PER | L4_PER |
| MCSP3 | PD_L4_PER | L4_PER |
| MCSP4 | PD_L4_PER | L4_PER |

Table 24-267. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|----------------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| MCSP1 | SPI1_ICLK | PER_L4_ICLK | PRCM | Interface clock |
| | SPI1_FCLK | PER_48M_FCLK | PRCM | Functional clock |
| MCSP2 | SPI2_ICLK | PER_L4_ICLK | PRCM | Interface clock |
| | SPI2_FCLK | PER_48M_FCLK | PRCM | Functional clock |
| MCSP3 | SPI3_ICLK | PER_L4_ICLK | PRCM | Interface clock |
| | SPI3_FCLK | PER_48M_FCLK | PRCM | Functional clock |
| MCSP4 | SPI4_ICLK | PER_L4_ICLK | PRCM | Interface clock |
| | SPI4_FCLK | PER_48M_FCLK | PRCM | Functional clock |
| Resets | | | | |
| MCSP1 | SPI1_RST | L4_PER_RST | PRCM | Reset from the PRCM module |
| MCSP2 | SPI2_RST | L4_PER_RST | PRCM | Reset from the PRCM module |
| MCSP3 | SPI3_RST | L4_PER_RST | PRCM | Reset from the PRCM module |
| MCSP4 | SPI4_RST | L4_PER_RST | PRCM | Reset from the PRCM module |

Table 24-268. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|----------------|---|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| MCSP1 | SPI1_IRQ | D_IRQ_87 | DSP INTC | Interrupt request to the DSP INTC |
| | SPI1_IRQ | MA_IRQ_65 | Cortex-A9 INTC | Interrupt request to the Cortex-A9 INTC |
| | SPI1_IRQ | MM_IRQ_41 | Cortex-M3 INTC | Interrupt request to the Cortex-M3 INTC |
| MCSP2 | SPI2_IRQ | MA_IRQ_66 | Cortex-A9 INTC | Interrupt request to the Cortex-A9 INTC |
| | SPI2_IRQ | MM_IRQ_42 | Cortex-M3 INTC | Interrupt request to the Cortex-M3 INTC |
| MCSP3 | SPI3_IRQ | MA_IRQ_91 | Cortex-A9 INTC | Interrupt request to the Cortex-A9 INTC |
| MCSP4 | SPI4_IRQ | MA_IRQ_48 | Cortex-A9 INTC | Interrupt request to the Cortex-A9 INTC |
| DMA Requests | | | | |
| MCSP1 | SPI1_DMA_TX0 | S_DMA_34 | sDMA | Destination is system DMA. |
| | SPI1_DMA_RX0 | S_DMA_35 | sDMA | Destination is system DMA. |
| | SPI1_DMA_TX1 | S_DMA_36 | sDMA | Destination is system DMA. |

Table 24-268. Hardware Requests (continued)

| | | | | |
|--------|--------------|----------|------|----------------------------|
| | SPI1_DMA_RX1 | S_DMA_37 | sDMA | Destination is system DMA. |
| | SPI1_DMA_TX2 | S_DMA_38 | sDMA | Destination is system DMA. |
| | SPI1_DMA_RX2 | S_DMA_39 | sDMA | Destination is system DMA. |
| | SPI1_DMA_TX3 | S_DMA_40 | sDMA | Destination is system DMA. |
| | SPI1_DMA_RX3 | S_DMA_41 | sDMA | Destination is system DMA. |
| MCSPI2 | SPI2_DMA_TX0 | S_DMA_42 | sDMA | Destination is system DMA. |
| | SPI2_DMA_RX0 | S_DMA_43 | sDMA | Destination is system DMA. |
| | SPI2_DMA_TX1 | S_DMA_44 | sDMA | Destination is system DMA. |
| | SPI2_DMA_RX1 | S_DMA_45 | sDMA | Destination is system DMA. |
| MCSPI3 | SPI3_DMA_TX0 | S_DMA_14 | sDMA | Destination is system DMA. |
| | SPI3_DMA_RX0 | S_DMA_15 | sDMA | Destination is system DMA. |
| | SPI3_DMA_TX1 | S_DMA_22 | sDMA | Destination is system DMA. |
| | SPI3_DMA_RX1 | S_DMA_23 | sDMA | Destination is system DMA. |
| MCSPI4 | SPI4_DMA_TX0 | S_DMA_69 | sDMA | Destination is system DMA. |
| | SPI4_DMA_RX0 | S_DMA_70 | sDMA | Destination is system DMA. |

Table 24-269 lists the wake-up requests.

Table 24-269. Wake-Up Requests

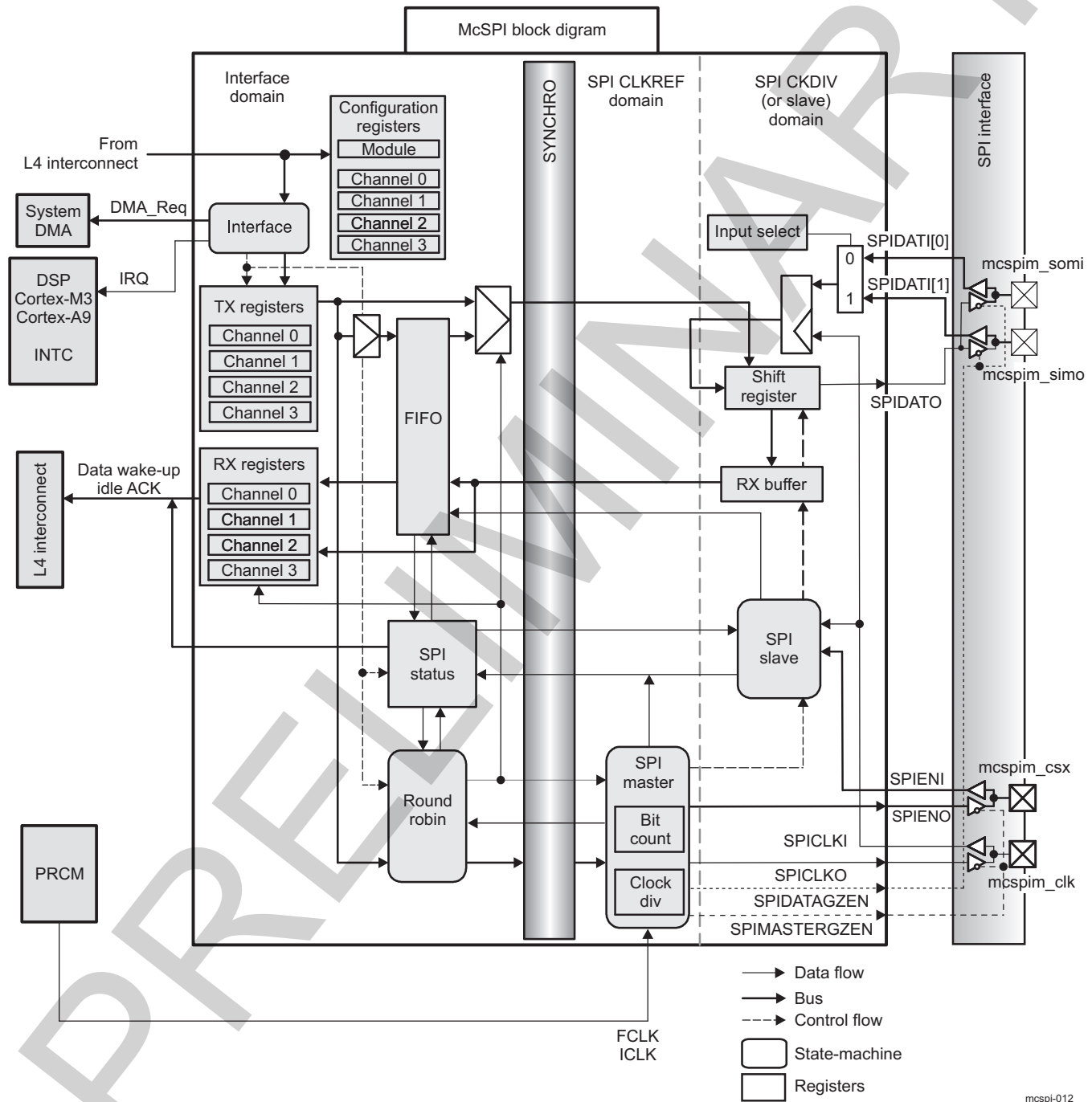
| Attributes | Wake Request | Name | Mapping | Comments |
|------------|--------------|----------|--------------|---------------------------------|
| SPI1 | 1 | spi1_cs0 | SPI1_SWAKEUP | Destination is the PRCM module. |
| SPI2 | 1 | spi2_cs0 | SPI2_SWAKEUP | Destination is the PRCM module. |
| SPI3 | 1 | spi3_cs0 | SPI3_SWAKEUP | Destination is the PRCM module. |
| SPI4 | 1 | spi4_cs0 | SPI4_SWAKEUP | Destination is the PRCM module. |

24.4.4 MCSPI Functional Description

24.4.4.1 MCSPI Block Diagram

Figure 24-98 shows the MCSPI module.

Figure 24-98. MCSPI Block Diagram



24.4.4.2 Master Mode

24.4.4.2.1 Master Mode Features

The MCSPI master mode supports multichannel communication with up to four independent SPI communication channel contexts. The MCSPI initiates a data transfer on the data lines (mcspim_simo and mcspim_somi) and generates clock (mcspim_clk) and control (mcspim_csx) signals.

Connected to multiple external devices, the MCSPI exchanges data with one SPI device at a time through two main modes (available in slave mode):

- Two-data-pins interface mode (transmit-and-receive mode for full-duplex transmission)
- Single-data-pin interface mode (recommended for half-duplex transmission)

Two DMA request events (read and write) allow synchronized accesses of the DMA controller with the activity of MCSPI.

Three interrupt events can be used for data transmission and reception in master mode (for more information about interrupts, see [Section 24.4.4.5.1, Interrupt Events in Master Mode](#)).

24.4.4.2.2 Master Transmit-and-Receive Mode (Full Duplex)

In full-duplex transmission, data is transmitted (shifted out serially on mcspim_simo) and received (shifted in serially on mcspim_somi) simultaneously on separate data lines.

The master transmit-and-receive mode is programmable per channel (the SPI1.MCSPI_CHxCONF[13:12] TRM bit field).

Channel access to the shift registers for transmission/reception is based on the MCSPI_TXx transmitter register state, the MCSPI_RXx receiver register state, and round-robin arbitration.

Channels that meet the following rules are included in the round-robin list of active channels scheduled for transmission and/or reception. The arbiter skips channels that do not meet the rules and searches in the rotation for the next enabled channel.

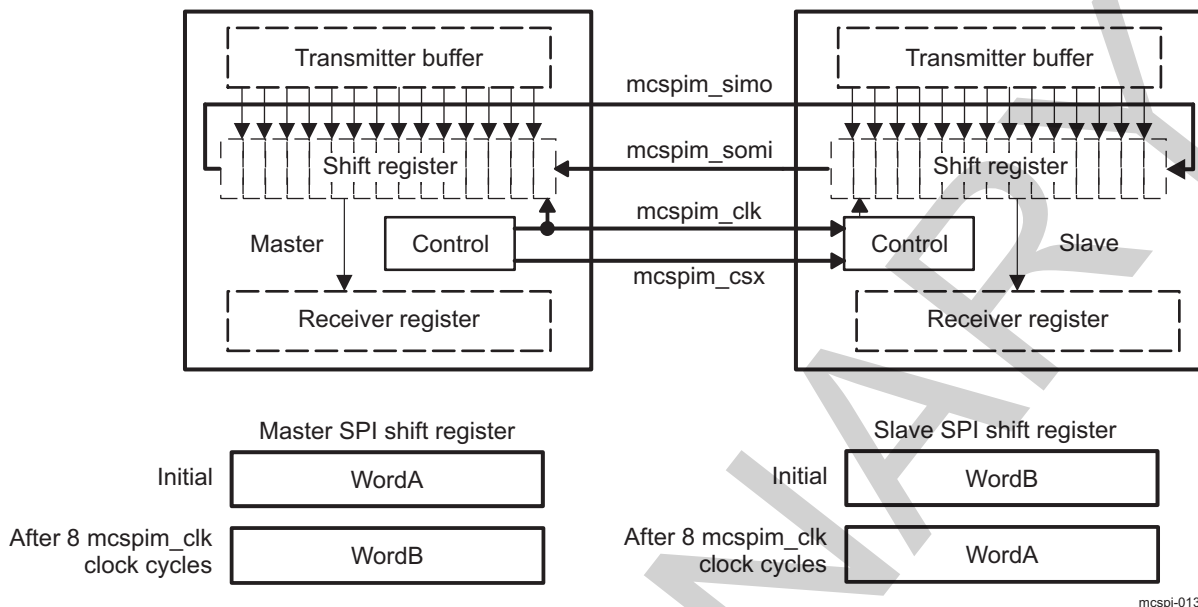
- Rule 1: Only enabled channels (the SPI1.MCSPI_CHxCTRL[0] EN bit) can be scheduled for transmission and/or reception.
- Rule 2: If its MCSPI_TXx transmitter register is not empty (the SPI1.MCSPI_CHxSTAT[1] TXS bit), an enabled channel can be scheduled when the shift register is assigned. If the MCSPI_TXx register is empty when the shift register is assigned, the TXx_UNDERFLOW event is activated, and the next enabled channel with new data to transmit is scheduled (see also transmit-only mode).
- Rule 3: An enabled channel can be scheduled if its receive register is not full (the SPI1.MCSPI_CHxSTAT[0] RXS bit) when the shift register is assigned (see also receive-only mode). Therefore, the MCSPI_RXx register cannot be overwritten. The SPI1.MCSPI_IRQSTATUS[3] RX0_OVERFLOW bit is never set to this mode.

When SPI word transfer completes (the SPI1.MCSPI_CHxSTAT[2] EOT bit is set), the updated MCSPI_TXx register of the next scheduled channel is loaded into the shift register. The serialization (transmit-and-receive) starts depending on the channel communication configuration. When serialization completes, the received data transfers to the channel receive register.

The serial clock (mcspim_clk) synchronizes shifting and sampling of the information on the two serial data lines (mcspim_simo and mcspim_somi). Each time a bit transfers out from the master, 1 bit transfers in from the slave.

[Figure 24-99](#) shows an example of a full-duplex system with a master device (MCSPI module *m*) on the left and a slave device on the right. After eight cycles of the serial clock mcspim_clk, WordA transfers from the master to the slave. At the same time, WordB transfers from the slave to the master.

Figure 24-99. SPI Full-Duplex Transmission (Example)



24.4.4.2.3 Master Transmit-Only Mode (Half Duplex)

The master transmit-only mode prevents the MPU from reading the **MCSPi_RXx** register (minimizing data movement) when only transmission is meaningful.

The master transmit-only mode is programmable per channel (the `SPIm.MCSPIm_CHxCONF[13:12]` TRM field). Transmission starts only after data is loaded into the `MCSPIm_TXx` register.

Rule 1 and Rule 2, defined in [Section 24.4.4.2.2](#), apply in this mode.

Rule 3, defined in [Section 24.4.4.2.2](#), does not apply.

In master transmit-only mode, the **MCSPi_RXx** register state FULL does not prevent transmission and the **MCSPi_RXx** register is always overwritten with the new SPI word. This event is not significant when only transmission is meaningful. Thus, the RX0_OVERFLOW bit in the SPIm.**MCSPi_IRQSTATUS** register is never set in this mode.

The hardware automatically disables the RX FULL interrupt and the DMA read requests.

The transfer status is given by the SPIm.MCSPI_CHxSTAT[2] EOT bit.

24.4.4.2.4 Master Receive-Only Mode (Half Duplex)

The master receive mode prevents the MPU from refilling the `MCSPi_TXx` register (minimizing data movement) when only reception is meaningful.

The master receive mode is programmable per channel (the SPIm.MCSPI_CHxCONF[13:12] TRM bit field).

The master receive-only mode enables channel scheduling only on the empty state of the [MCSPI_RXx](#) register.

Rule 1 and Rule 3, defined in [Section 24.4.4.2.2](#), apply in this mode.

Rule 2, defined in [Section 24.4.4.2.2](#), does not apply.

In the master receive-only mode, software must write dummy data to the [MCSPI_TXx](#) register. Only one dummy write is enough to receive any number of words from the slave. Software should ensure that the [MCSPI_TXx](#) register is always full (the TXx_EMPTY bits of SPIm.[MCSPI_IRQSTATUS](#)) when receiving. The content of the [MCSPI_TXx](#) register is always loaded into the shift register when the shift register is assigned. After writing the dummy data to the [MCSPI_TXx](#) register, the TXx_EMPTY and TXx_UNDERFLOW bits in the SPIm.[MCSPI_IRQSTATUS](#) register are never set in receive-only mode.

The SPIm.[MCSPI_CHxSTAT](#)[2] EOT bit gives the status of serialization. The RXx_FULL bits of the SPIm.[MCSPI_IRQSTATUS](#) register are set when received data is loaded from the shift register to the corresponding [MCSPI_RXx](#) register. The SPIm.[MCSPI_IRQSTATUS](#)[3] RX0_OVERFLOW bit is never set in this mode.

24.4.4.2.5 Single-Channel Master Mode

When the MCSPI is configured as a master device with a single enabled channel, the assertion of the mcsnim_csx signal can be controlled in two different ways:

- If the [MCSPI_MODULCTRL](#)[0] SINGLE bit is set to 0, mcsnim_csx assertion and deassertion after each SPI word is automatically controlled by the MCSPI (see subsections of [Section 24.4.4.2.1](#), *Master Mode Features*).
- If the [MCSPI_MODULCTRL](#)[0] SINGLE and [MCSPI_CHxCONF](#)[20] FORCE bits are set to 1, mcsnim_csx assertion and deassertion is controlled by software (see [Section 24.4.4.2.5.1](#), *Programming Tips When Switching to Another Channel*).

24.4.4.2.5.1 Programming Tips When Switching to Another Channel

When a single channel is enabled and data transfer is ongoing:

- Wait for completion of the SPI word transfer (wait until the SPIm.[MCSPI_CHxSTAT](#)[2] EOT bit is set to 1) before disabling the current channel and enabling a different channel.
- Disable the current channel, and then enable the other channel.

24.4.4.2.5.2 Force mcsnim_csx Mode

Continuous transfers are allowed manually by keeping the mcsnim_csx signal active for successive SPI words transfer. Several sequences (configuration/enable/disable of the channel) can be run without deactivating the mcsnim_csx line. This mode is supported by all channels and any master sequence can be used (transmit-receive, transmit-only, receive-only).

Keeping the mcsnim_csx active mode is supported when:

- A single channel is used (with the SPIm.[MCSPI_MODULCTRL](#)[0] SINGLE bit set to 1).
- Transfer parameters are loaded in the configuration register of the appropriate channel (SPIm.[MCSPI_CHxCONF](#)).

The state of the mcsnim_csx signal is programmable.

- Writing 1 to the SPIm.[MCSPI_CHxCONF](#)[20] FORCE bit drives the mcsnim_csx line high when the SPIm.[MCSPI_CHxCONF](#)[6] EPOL bit is set to 0. mcsnim_csx is driven low when the SPIm.[MCSPI_CHxCONF](#)[6] EPOL bit is set to 1.
- Writing 0 to the SPIm.[MCSPI_CHxCONF](#)[20] FORCE bit drives the mcsnim_csx line low when the SPIm.[MCSPI_CHxCONF](#)[6] EPOL bit is set to 0. mcsnim_csx is driven high when the SPIm.[MCSPI_CHxCONF](#)[6] EPOL bit is set to 1.
- A single channel is enabled (the SPIm.[MCSPI_CHxCTRL](#)[0] EN bit is set to 1). The first enabled channel activates the mcsnim_csx line.

When the channel is enabled, the mcsnim_csx signal activates with the programmed polarity. As in the multichannel master mode, the transfer start depends on the status of the [MCSPI_TXx](#) register (the SPIm.[MCSPI_CHxSTAT](#)[1] TXS bit), the status of the [MCSPI_RXx](#) register (the SPIm.[MCSPI_CHxSTAT](#)[1] RXS bit), and the defined mode (the SPIm.[MCSPI_CHxCONF](#)[13:12] TRM bit field) of the channel enabled.

The SPI_m.MCSPI_CHxSTAT[2] EOT bit gives the transfer status of each SPI word. The RXx_FULL bit in the SPI_m.MCSPI_IRQSTATUS register is set when received data is loaded from the shift register to the MCSPI_RXx register.

A change in the configuration parameters is propagated directly on the SPI interface. If the mcspim_csx signal is activated, ensure that the configuration is changed only between SPI words to avoid corrupting the current transfer.

NOTE: To avoid data corruption, mcspim_csx polarity and mcspim_clk phase and mcspim_clk polarity must not be modified when the mcspim_csx signal is activated.

A delay between SPI words that requires the connected SPI slave device to switch from one configuration to another (for instance, from transmit-only to receive-only) must be handled by software.

At the end of the last SPI word, the channel must be deactivated (the SPI_m.MCSPI_CHxCTRL[0] EN bit set to 0) and mcspim_csx can be forced to its INACTIVE state using the SPI_m.MCSPI_CHxCONF[20] FORCE bit.

Figure 24-100 and Figure 24-101 show successive transfers with mcspim_csx maintained active low with a different configuration for each SPI word in single-data-pin and dual-data-pin interface modes, respectively.

Figure 24-100. Continuous Transfers With mcspim_csx Maintained Active (Single-Data-Pin Interface Mode)

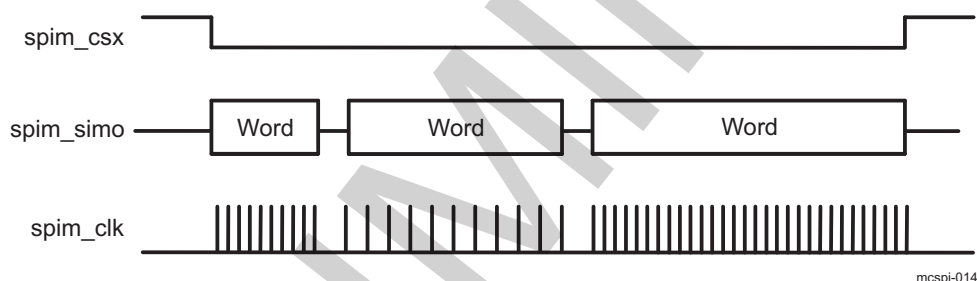
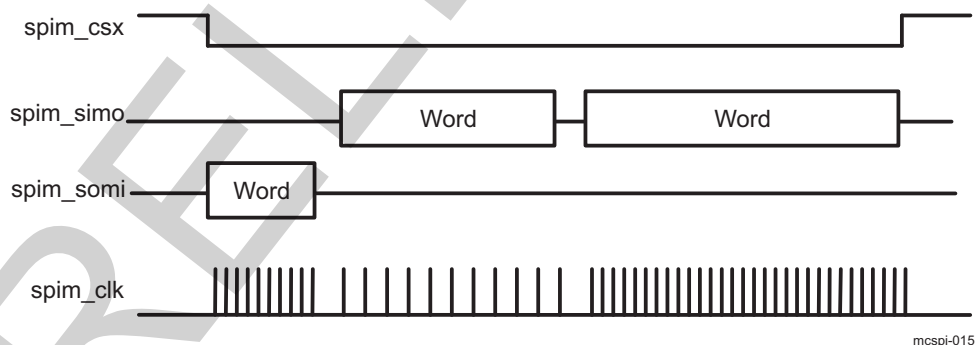


Figure 24-101. Continuous Transfers With mcspim_csx Maintained Active (Dual-Data-Pin Interface Mode)



NOTE: Turbo mode described in Section 24.4.4.2.5.3, *Turbo Mode*, maintains mcspim_csx in active mode when the following conditions are met:

- A single channel is explicitly used (the SPI_m.MCSPI_MODULCTRL[0] SINGLE bit is set to 1).
- Turbo mode is enabled in the configuration of the channel (the SPI_m.MCSPI_CHxCONF[19] TURBO bit is set to 1).

24.4.4.2.5.3 Turbo Mode

Turbo mode improves the throughput of the SPI interface when a single channel is enabled by allowing transfers until the shift register and the `MCSPI_RXx` register are full. Turbo mode is time saving when a transfer exceeds two words. This mode is programmable per channel (through the `SPI1.MCSPI_CHxCONF[9]` TURBO bit).

When several channels are enabled, the TURBO bit has no effect and the channel access to the shift registers remains as previously described.

In turbo mode, Rule 1 and Rule 2 apply, but Rule 3 does not (see [Section 24.4.4.2.2](#)). An enabled channel can be scheduled if its receive register is full (the `SPI1.MCSPI_CHxSTAT[0]` RXS bit) at the time of the shift-register assignment until the shift register is full.

The `MCSPI_RXx` register cannot be overwritten in turbo mode. Consequently, the `SPI1.MCSPI_IRQSTATUS[3]` RX0_OVERFLOW bit is never set in this mode.

24.4.4.2.6 Start-Bit Mode

In start-bit mode, an extended bit is added before the SPI word to indicate whether the next SPI word must be handled as a command or as data. This feature is available only in master mode. Start-bit mode cannot be used at the same time as turbo mode and/or force `mcsnim_csx` mode. In this case, only one channel can be used; round-robin arbitration is not possible.

This mode is programmable per channel by setting the `SPI1.MCSPI_CHxCONF[23]` SBE bit to 1. The polarity of the extended bit is programmable per channel. When the `SPI1.MCSPI_CHxCONF[24]` SBPOL bit is set to 0, the SPI word must be handled as a command. When the `SPI1.MCSPI_CHxCONF[24]` SBPOL bit is set to 1, the SPI word must be handled as data. Moreover, start-bit polarity can be changed dynamically during start-bit transfer without disabling the channel for reconfiguration; in this case, users must configure the `SPI1.MCSPI_CHxCONF[24]` SBPOL bit before writing the SPI word to be transmitted to the TX register.

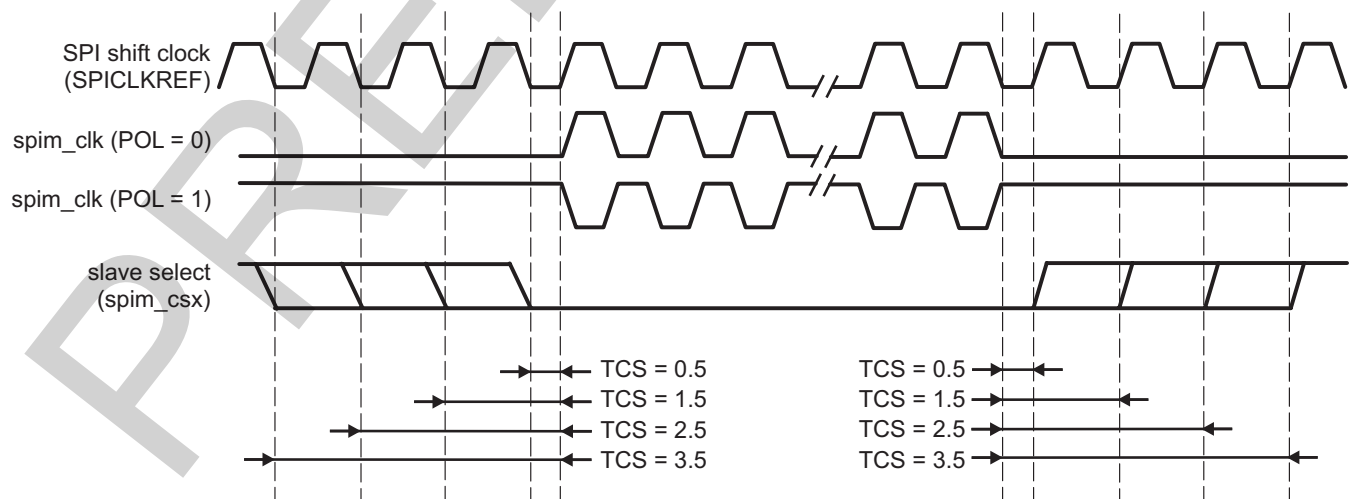
24.4.4.2.7 Chip-Select Timing Control

The chip-select (CS) timing control is available only in master mode with automatic CS generation (the `MCSPI_MODULCTRL[0]` SINGLE bit field set to 0) to add a programmable delay between CS assertion and first clock edge, or CS removal and last clock edge.

This mode is programmable per channel (the `SPI1.MCSPI_CHxCONF` TCS bit).

[Figure 24-102](#) shows the CS SPIEN timing control.

Figure 24-102. CS SPIEN Timing Controls



mcspl-016

NOTE: Because of the design implementation for transfers using a clock divider ratio set to 1 (clock bypassed), a half cycle must be added to the value between CS assertion and the first clock edge with PHA = 1 or between CS removal and the last clock edge with PHA = 0.

24.4.4.2.8 Programmable SPI Clock (mcspim_clk)

In master mode, the baud rate of the SPI serial clock is programmable.

An internal reference clock, SPIm_FCLK, is used as input of a programmable divider (the SPIm.MCSPI_CHxCONF[5:2] CLKD bit field) to generate the bit rate of the serial output clock mcspim_clk. Table 24-270 summarizes the supported divisor values.

Table 24-270. SPI Master Clock Rates

| Divider | Clock Rate |
|---|------------|
| 1 | 48 MHz |
| 2 | 24 MHz |
| 4 | 12 MHz |
| 8 | 6 MHz |
| 16 | 3 MHz |
| 32 | 1.5 MHz |
| 64 | 750 kHz |
| 128 | 375 kHz |
| 256 | ~187 kHz |
| 512 | ~93.7 kHz |
| 1024 | ~46.8 kHz |
| 2048 | ~23.4 kHz |
| 4096 | ~11.7 kHz |
| 8192 and higher: Division not supported | |
| | – |

24.4.4.2.8.1 Clock Ratio Granularity

By default, the clock division ratio is defined by the SPIm.MCSPI_CHxCONF[5:2] CLKD bit field with power-of-2 granularity leading to a clock division in the range 1 to 4096; in this case, the duty cycle is always 50 percent. With the SPIm.MCSPI_CHxCONF[29] CLKG bit, clock division granularity can be changed to one clock cycle; in that case the SPIm.MCSPI_CHxCTRL[15:8] EXTCLK bit field is concatenated with the SPIm.MCSPI_CHxCONF[5:2] CLKD bit field to give a 12-bit-wide division ratio in the range 1 to 4096.

When granularity is one clock cycle (the CLKG bit set to 1), for the odd value of the clock ratio, the clock high level lasts one clock cycle more than the low level, depending on the SPIm.MCSPI_CHxCONF[1] POL and SPIm.MCSPI_CHxCONF[0] PHA bits (see Table 24-271).

Table 24-271. CLKSPIO High/Low Time Computation

| Clock Ratio Fratio | CLKSPIO High Time | CLKSPIO Low Time |
|---------------------|------------------------|------------------------|
| 1 | Thigh_ref | Tlow_ref |
| Even >= 2 | T_ref * (Fratio/2) | T_ref * (Fratio/2) |
| Odd >= (POL = PHA) | T_ref * (Fratio – 1)/2 | T_ref * (Fratio + 1)/2 |
| Odd >= (POL != PHA) | T_ref * (Fratio + 1)/2 | T_ref * (Fratio – 1)/2 |

NOTE: Fratio = spi1_clk frequency (Fout) division ratio
Thigh = spi1_clk high time period
Tlow = spi1_clk low time period
T_ref = SPI1_FCLK period
Thigh_ref = SPI1_FCLK high time period
Tlow_ref = SPI1_FCLK low time period

If the CLKG bit is set to 1; Fratio = EXTCLK concatenated with CLKD + 1.

For odd ratio values, the duty cycle is calculated as follows:

$$\text{Duty_cycle} = (1 - 1/\text{Fratio})/2$$

Table 24-272 shows examples of clock granularity with a clock source frequency of 48 MHz.

Table 24-272. Clock Granularity Examples

| EXTCLK | CLKD | CLKG | Fratio | PHA | POL | Thigh (ns) | Tlow (ns) | Tperiod (ns) | Duty Cycle | Fout (MHz) |
|--------|------|------|--------|-----|-----|------------|-----------|--------------|------------|------------|
| X | 0 | 0 | 1 | X | X | 10.4 | 10.4 | 20.8 | 50–50 | 48 |
| X | 1 | 0 | 2 | X | X | 20.8 | 20.8 | 41.6 | 50–50 | 24 |
| X | 2 | 0 | 4 | X | X | 41.6 | 41.6 | 83.2 | 50–50 | 12 |
| X | 3 | 0 | 8 | X | X | 83.2 | 83.2 | 166.4 | 50–50 | 6 |
| 0 | 0 | 1 | 1 | X | X | 10.4 | 10.4 | 20.8 | 50–50 | 48 |
| 0 | 1 | 1 | 2 | X | X | 20.8 | 20.8 | 41.6 | 50–50 | 24 |
| 0 | 2 | 1 | 3 | 1 | 0 | 41.6 | 20.8 | 62.4 | 66–33 | 16 |
| 0 | 2 | 1 | 3 | 1 | 1 | 20.8 | 41.6 | 62.4 | 33–66 | 16 |
| 0 | 3 | 1 | 4 | X | X | 41.6 | 41.6 | 83.2 | 50–50 | 12 |
| 5 | 0 | 1 | 81 | 1 | 0 | 852.8 | 832 | 1684.8 | 50.6–49.4 | 0.592 |
| 5 | 7 | 1 | 88 | X | X | 915.2 | 915.2 | 1830.4 | 50–50 | 0.545 |

24.4.4.3 Slave Mode

To select the MCSPI slave mode, set the SPI1.MCSPI_MODULCTRL[2] MS bit.

A MCSPI slave device can be connected to up to four external SPI master devices but handles transactions with one SPI master device at a time.

In slave mode, the MCSPI initiates data transfer on the data lines (mcspim_simo and mcspim_somi) when it is selected by an active control signal (mcspim_csx) and receives an SPI clock (mcspim_clk) from the external SPI master device. Only channel 0 can be configured as a slave. In slave mode, the MCSPI uses the edge of mcspim_csx to detect word length. For this reason, mcspim_csx must become inactive between each word.

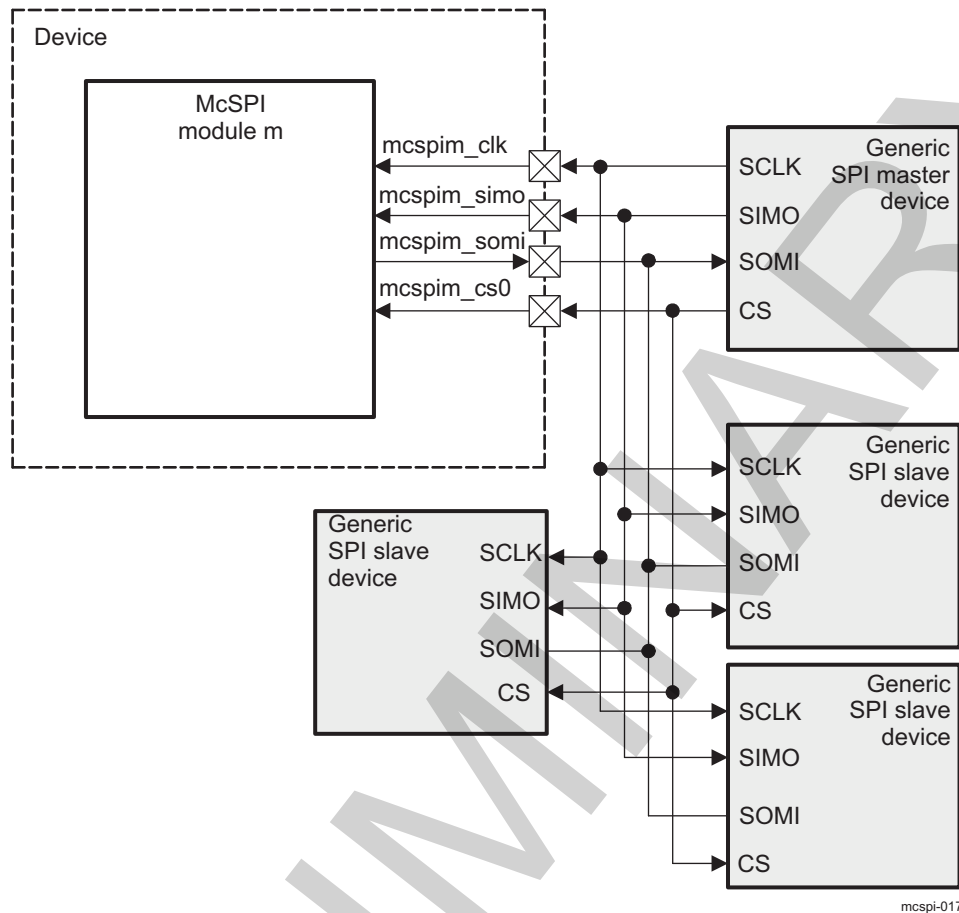
The MCSPI does not support mcspim_csx active between SPI words. It uses the edge to detect word length.

24.4.4.3.1 Dedicated Resources

Only channel 0 can be enabled in slave mode. In this section register names such as SPI1.MCSPI_CHxCTRL stand for SPI1.MCSPI_CH0CTRL, where x = 0 (channel 0 control register).

Figure 24-103 shows an example of four slaves wired on a single master device.

Figure 24-103. Example of MCSPI Slave With One Master and Multiple Slave Devices on Channel 0



The channel 0 in slave mode has the following resources:

- Its own channel enable, programmable with the SPI_m.[MCSPI_CHxCTRL](#)[0] EN bit (where x = 0). This channel must be enabled before transmission and reception.
- For this mode, the slave-select signal can be detected on any one of the mcspim_csx ports. This is programmable with the SPI_m.[MCSPI_CHxCONF](#)[22:21] SPIENSLV bit field (where x = 0).
- Its own transmitter register, SPI_m.[MCSPI_TXx](#) (where x = 0), on top of the common transmit shift register. If the [MCSPI_TXx](#) register is empty, the SPI_m.[MCSPI_CHxSTAT](#)[1] TXS bit (where x = 0) is set. If MCSPI is selected by an external master (the active signal on the mcspim_csx port assigned to channel 0), the [MCSPI_TXx](#) register content of channel 0 is always loaded into the shift register, whether its content is updated or not. The [MCSPI_TXx](#) register must be loaded before MCSPI is selected by a master.
- Its own receiver register, SPI_m.[MCSPI_RXx](#) (where x = 0), on top of the common receive shift register. If the [MCSPI_RXx](#) register is full, the SPI_m.[MCSPI_CHxSTAT](#)[0] RXS bit (where x = 0) is set.

NOTE: The [MCSPI_TXx](#) register and [MCSPI_RXx](#) registers of the other channels are not used. Reading from or writing to a channel register other than channel 0 has no effect.

- Its own communication configuration with the following parameters through the SPI_m.[MCSPI_CHxCONF](#) register (where x = 0):
 - Transmit and receive modes, programmable with the TRM field
 - Interface mode (two data pins or single data pin) and data pins assignment, both programmable with the IS and DPE bits. (The SPI_m modules are in slave mode after reset and must be properly configured for the modules to act in master mode.)

- SPI word length, programmable with the WL bit
- mcsnim_csx polarity, programmable with the EPOL bit
- mcsnim_clk polarity, programmable with the POL bit
- mcsnim_clk phase, programmable with the PHA bit

The mcsnim_clk frequency of a transfer is controlled by the external SPI master connected to the MCSPI slave device. The SPIm.MCSPI_CHxCONF[5:2] CLKD bit field (where x = 0) is not used in slave mode.

NOTE: The configuration of the channel can be loaded in the SPIm.MCSPI_CHxCONF register (where x = 0) only when the channel is disabled.

- Two DMA request events, read and write, synchronize read/write accesses of the DMA controller with the activity of MCSPI. DMA requests are asserted using the SPIm.MCSPI_CHxCONF[15] DMAR bit (where x = 0) for reading and the SPIm.MCSPI_CHxCONF[14] DMAW bit (where x = 0) for writing.
- Four interrupt events (see [Section 24.4.4.5.2, Interrupt Events in Slave Mode](#))

24.4.4.3.2 Slave Transmit-and-Receive Mode

The slave receive mode is programmable (set the SPIm.MCSPI_CHxCONF[13:12] TRM bit field [where x = 0] to 0x0).

In slave transmit-and-receive mode, the MCSPI_TXx register must be loaded before MCSPI is selected by an external SPI master device.

After a channel is enabled, transmission and reception proceed with interrupt and DMA request events.

The MCSPI_TXx register content is always loaded in the shift register whether it is updated or not. The event TXx_UNDERFLOW is activated accordingly and does not prevent transmission.

When an SPI word transfer completes (the SPIm.MCSPI_CHxSTAT0[2] EOT bit [where x = 0] set to 1), the received data is transferred to the channel receive register.

To use MCSPI as a slave transmit-only device, the RXx_FULL and RX0_OVERFLOW interrupts and DMA read requests must be disabled due to the MCSPI_RXx register state (see [Section 24.4.4.5.2, Interrupt Events in Slave Mode](#)).

24.4.4.3.3 Slave Transmit-Only Mode

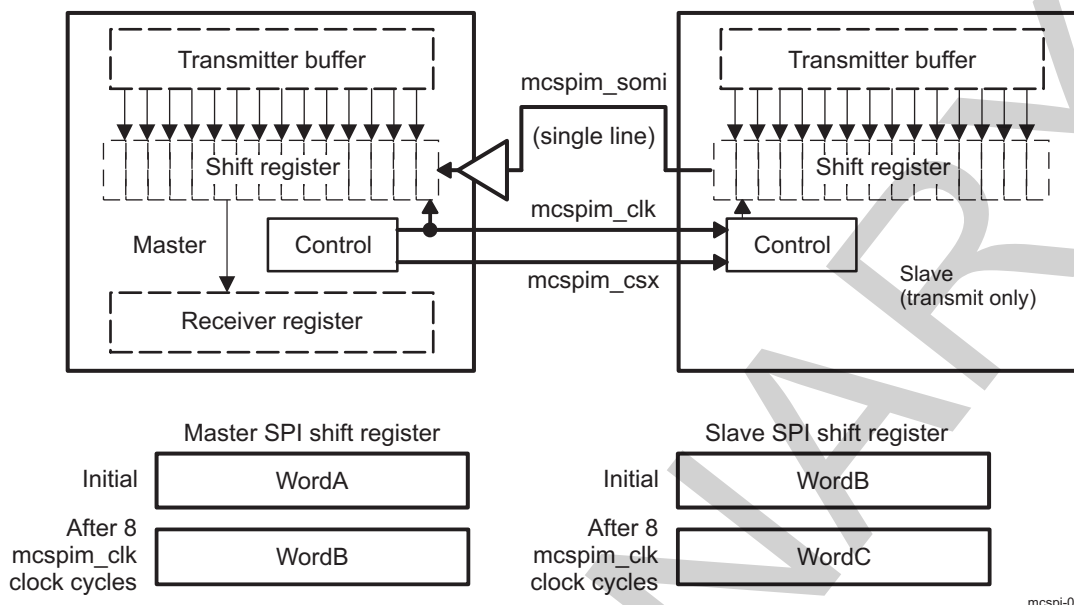
The slave transmit-only mode is programmable (set the SPIm.MCSPI_CHxCONF[13:12] TRM bit field [where x = 0] to 0x2) and avoids the requirement for the MPU to read the MCSPI_RXx register (minimizing data movement) only when transmission is meaningful.

To use the MCSPI as a slave transmit-only device, the RXx_FULL and RX0_OVERFLOW interrupts and DMA read requests must be disabled due to the MCSPI_RXx register state.

When the SPI word transfer completes, the SPIm.MCSPI_CHxSTAT[2] EOT bit is set (where x = 0).

[Figure 24-104](#) shows a half-duplex system with a master device on the left and a transmit-only slave device on the right. Each time a bit transfers out from the slave device, 1 bit transfers in the master. After eight cycles of the serial clock mcsnim_clk, WordB transfers from the slave to the master.

Figure 24-104. SPI Half-Duplex Transmission (Transmit-Only Slave)



24.4.4.3.4 Slave Receive-Only Mode

The slave receive mode is programmable (set the SPI_m.MCSPI_CHxCONF[13:12] TRM bit field [where x = 0] to 0x1).

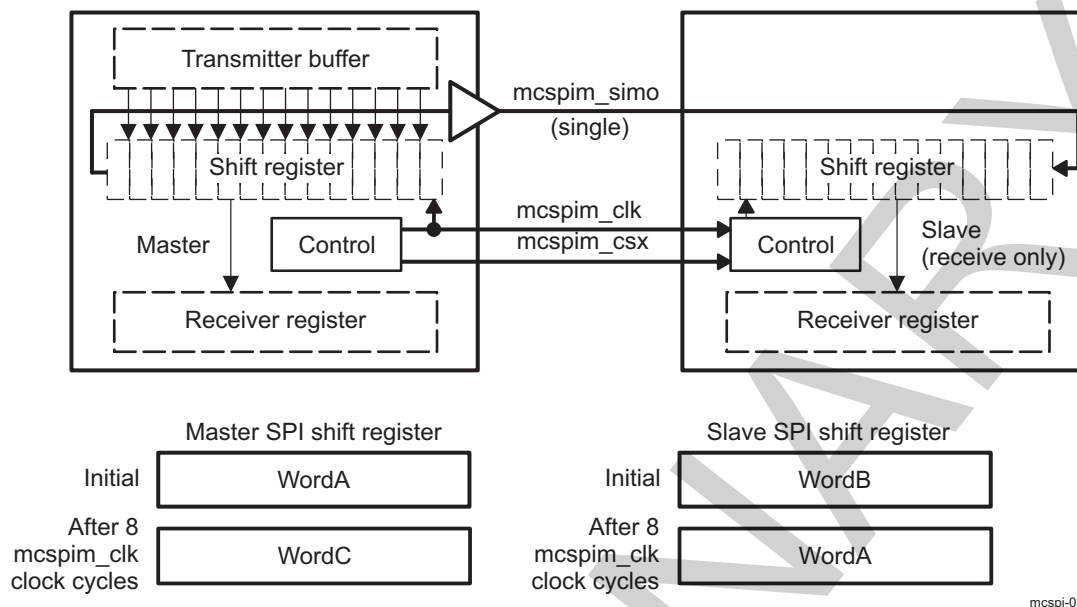
In receive-only mode, the MCSPI_Tx_x register must be loaded before the MCSPI is selected by an external SPI master device. The MCSPI_Tx_x register content is always loaded into the shift register whether it is updated or not. The TX_x_UNDERFLOW event is activated accordingly and does not prevent transmission.

When an SPI word transfer completes (the SPI_m.MCSPI_CHxSTAT0[2] EOT bit [where x = 0] is set to 1), the received data is transferred to the channel receive register.

To use the MCSPI as a slave receive-only device, the TX_x_EMPTY and TX_x_UNDERFLOW interrupts and the DMA write requests must be disabled due to the MCSPI_Tx_x register state.

For a full-duplex transmission, the serial clock (mcs pim_clk) synchronizes shifting and sampling of the information on the single serial data line. For full duplex, two data lines are required. If mcs pim_clk synchronizes on a single serial data line, the data line should be half-duplex.

Figure 24-105 shows an example of a half-duplex system with a master device on the left and a receive-only slave device on the right. Each time a bit transfers out from the master, 1 bit transfers in from the slave. After eight cycles of the serial clock mcs pim_clk, Word A transfers from the master to the slave.

Figure 24-105. SPI Half-Duplex Transmission (Receive-Only Slave)

24.4.4.4 FIFO Buffer Management

The MCSPI controller has a built-in 64-byte buffer to unload the DMA or interrupt handler and improve data throughput.

This buffer can be used by only one channel at a time and is selected by setting the `SPI.MCSPI_CHxCONF[28] FFER` or `SPI.MCSPI_CHxCONF[27] FFEW` bits to 1. If several channels are selected and several FIFO enable bit fields are set to 1, the controller forces the buffer not to be used; the driver must set only one FIFO enable bit field.

The buffer can be used in the following modes:

- Master or slave mode
- Transmit-only, receive-only, or transmit-and-receive mode
- Single channel or turbo mode, or normal round-robin mode. In round-robin mode the buffer is used by only one channel.

Every word length (`SPI.MCSPI_CHxCONF[11:7] WL`) is supported.

In transmit-and-receive mode, the buffer can be used in transmit (see [Figure 24-106](#)) or receive (see [Figure 24-107](#)) directions, or in both directions. If only one direction is chosen in transmit-and-receive mode, the full buffer is used for this direction. In both directions, the buffer is split into two 32-byte buffers, one for each direction (see [Figure 24-108](#)).

Figure 24-106. Buffer Used in Transmit Direction Only

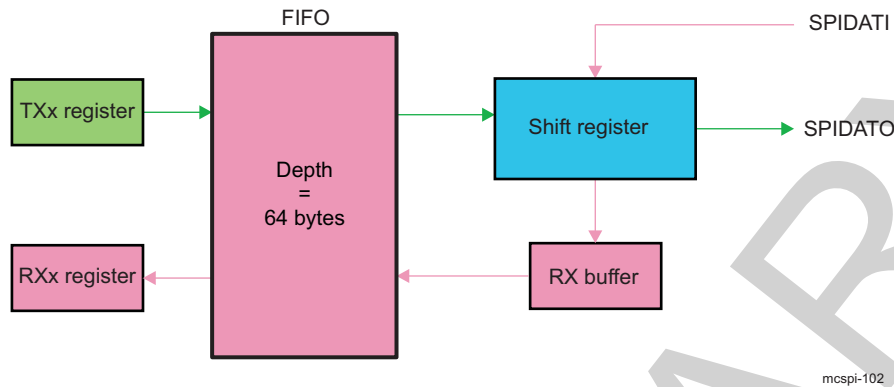


Figure 24-107. Buffer Used in Receive Direction Only

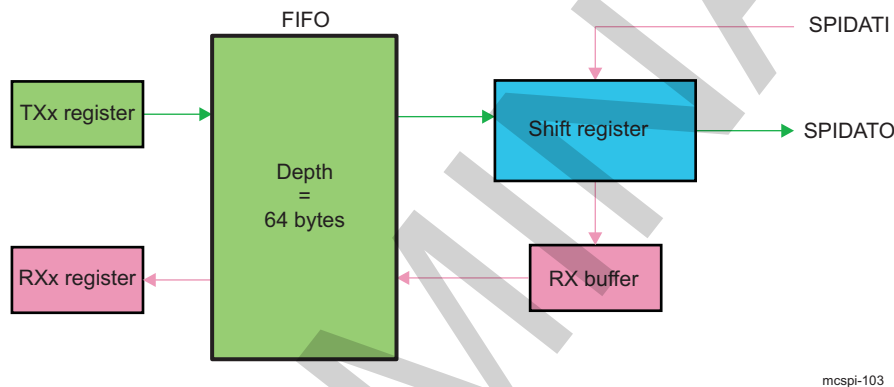
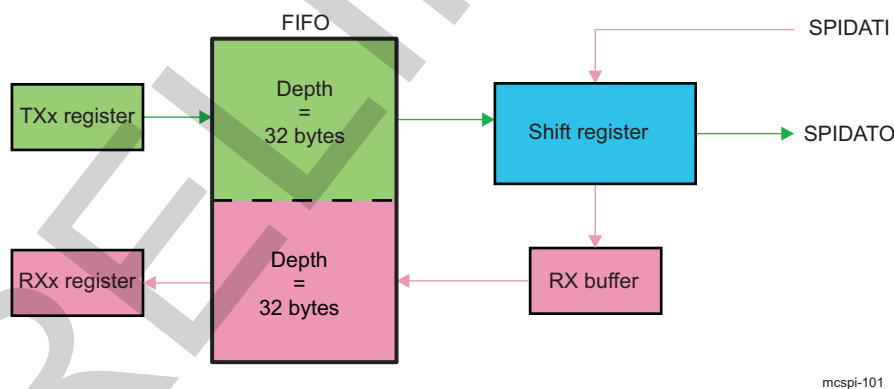


Figure 24-108. Buffer Used for Transmit and Receive Directions



Two levels (SPIm.MCSPI_XFERLEVEL[5:0] AEL and SPIm.MCSPI_XFERLEVEL[13:8] AFL) rule the buffer management. The granularity of these levels is 1 byte; it is not aligned with the SPI word length. The driver must set these values as a multiple of the SPI word length defined in WL. Table 24-273 shows the number of bytes written in the FIFO, depending on the word length.

Table 24-273. FIFO Writes, Word Length Relationship

| SPI Word Length WL | 3 ≤ WL ≤ 7 | 8 ≤ WL ≤ 15 | 16 ≤ WL ≤ 31 |
|-------------------------------------|------------|-------------|--------------|
| Number of bytes written in the FIFO | 1 byte | 2 bytes | 4 bytes |

The FIFO buffer pointers are reset when the corresponding channel is enabled or the FIFO configuration changes.

24.4.4.4.1 Buffer Almost Full

The [MCSPI_XFERLEVEL](#)[15:8] AFL bit field is needed when the buffer is used to receive an SPI word from a slave (the [MCSPI_CHxCONF](#)[28] FFER bit must be set to 1). It defines the almost-full buffer status. See [Figure 24-109](#).

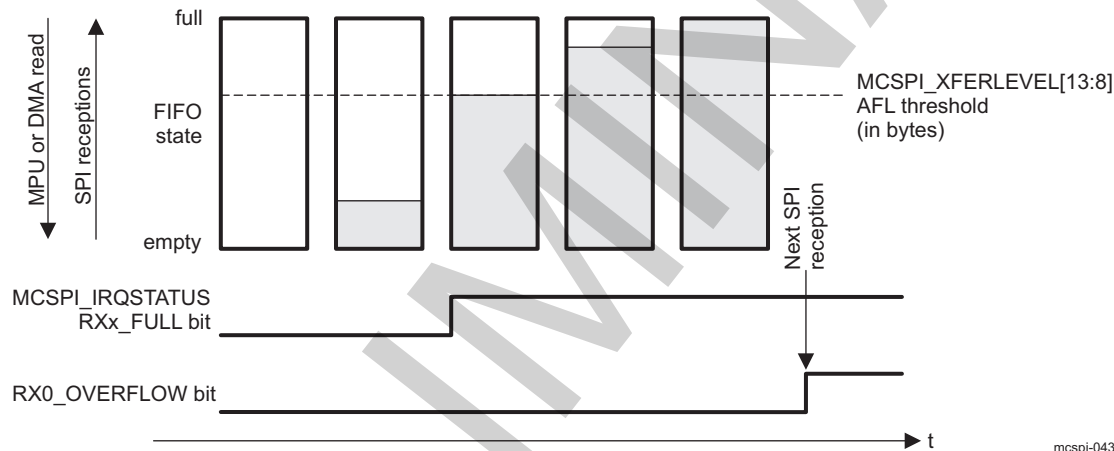
When the FIFO pointer reaches this level, an interrupt or a DMA request is sent to the MPU to enable the system to read AFL + 1 bytes from the receive register.

NOTE: AFL + 1 must correspond to a multiple value of the [MCSPI_CHxCONF](#)[11:7] WL bit field.

When DMA is used, the request is deasserted after the first receive register read.

No new request will be asserted again as long as the system has not performed the right number of read accesses.

Figure 24-109. Buffer Almost Full Level (AFL)



NOTE: The [MCSPI_IRQSTATUS](#) register bits are not available in DMA mode. In DMA mode, the SPI_{IM}_DMA_RXx request is asserted on the same conditions as the [MCSPI_IRQSTATUS](#) Rx_x_FULL flag.

24.4.4.4.2 Buffer Almost Empty

The [MCSPI_XFERLEVEL](#)[7:0] AEL bit field is needed when the buffer is used to transmit an SPI word to a slave (the [MCSPI_CHxCONF](#)[27] FFEW bit must be set to 1). It defines the almost-empty buffer status. See [Figure 24-110](#).

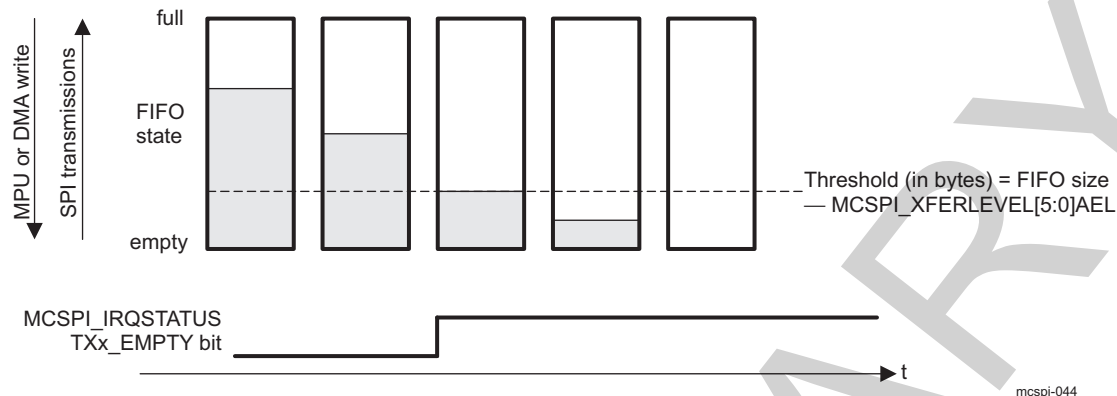
When the FIFO pointer has not reached this level, an interrupt or a DMA request is sent to the MPU to enable the system to write AEL + 1 bytes to the transmit register.

NOTE: AEL + 1 must correspond to a multiple value of the [MCSPI_CHxCONF](#)[11:7] WL bit field.

When DMA is used, the request is deasserted after the first transmit register write.

No new request will be asserted again as long as the system has not performed the right number of write accesses.

Figure 24-110. Buffer Almost Empty Level (AEL)



NOTE: The [MCSPi_IRQSTATUS](#) register bits are not available in DMA mode. In DMA mode, the [SPIm_DMA_TXx](#) request is asserted on the same conditions as the [MCSPi_IRQSTATUS TXx_EMPTY](#) flag.

24.4.4.4.3 End of Transfer Management

When the FIFO buffer is enabled for a channel, the user must previously configure in the [MCSPi_XFERLEVEL](#) register the AEL and AFL levels and especially the [MCSPi_XFERLEVEL\[31:16\]](#) WCNT bit field to define the number of SPI words to be transferred using the FIFO before enabling the channel.

This counter allows the controller to stop the transfer correctly after a defined number of SPI word transfers. If WCNT is set to 0x0000, the counter is not used and the user must stop the transfer manually by disabling the channel; in this case, the user does not know how many SPI transfers have been done. For received words, software must poll the [CHxSTAT\[5\]](#) RXFFE bit and read the [MCSPi_RXx](#) receive register to empty the FIFO buffer.

When the end-of-word count interrupt is generated (the [MCSPi_IRQSTATUS\[17\]](#) EOW bit is set), the user can disable the channel and poll the [MCSPi_CHxSTAT\[5\]](#) RXFFE bit to know it lasts SPI words in the FIFO buffer and read them.

No new request is asserted as long as the system has not performed the correct number of write accesses.

24.4.4.5 Interrupts

Each channel can issue interrupt events.

Each interrupt event has status bits in the [SPIm.MCSPi_IRQSTATUS](#) register ([RXx_FULL](#), [TXx_UNDERFLOW](#), [TXx_EMPTY](#), ...) (where x = 0, 3) that indicate whether service is required. Each status bit has an interrupt enable bit (a mask) in the [SPIm.MCSPi_IRQENABLE](#) register ([RXx_FULL_ENABLE](#), [TXx_UNDERFLOW_ENABLE](#), [TXx_EMPTY_ENABLE](#), ...).

When an interrupt occurs and a mask is later applied on it, the interrupt line is not asserted again, even if the interrupt source is not serviced.

The MCSPi supports interrupt-driven and polling operations.

24.4.4.5.1 Interrupt Events in Master Mode

In master mode, the interrupt events related to the [MCSPi_TXx](#) register state are [TXx_EMPTY](#) and [TXx_UNDERFLOW](#). The interrupt event related to the [MCSPi_RXx](#) register state is [RXx_FULL](#).

24.4.4.5.1.1 TXx_EMPTY

The TXx_EMPTY event is activated when a channel is enabled and its MCSPI_TXx register is empty (transient event). Enabling a channel automatically triggers this event, except in master receive-only mode (see [Section 24.4.4.2.4, Master Receive-Only Mode](#)). When the FIFO buffer is enabled (the MCSPI_CHxCONF[27] FFEW bit is set to 1), the MCSPI_IRQSTATUS TXx_EMPTY bit is set as soon as there is enough space in the buffer to write a number of bytes defined by the MCSPI_XFERLEVEL[5:0] AEL bit field.

The MCSPI_TXx register must be loaded with data to remove the source of the interrupt; the SPI.MCSPI_IRQSTATUS TXx_EMPTY interrupt status bit must be cleared for interrupt line deassertion (if the event is enabled as the interrupt source).

When FIFO is enabled, no new TXx_EMPTY event will be asserted as soon as the MPU has not performed the number of writes into the MCSPI_TXx register defined by the MCSPI_XFERLEVEL[5:0] AEL bit field. The MPU must perform the right number of writes.

24.4.4.5.1.2 TXx_UNDERFLOW

The event TXx_UNDERFLOW is activated when the channel is enabled and if the MCSPI_TXx register or the FIFO is empty (not updated with new data) when an external master device starts a data transfer with the MCSPI (transmit and receive).

The TXx_UNDERFLOW is a harmless warning in master mode.

To avoid having a TXx_UNDERFLOW event at the beginning of a transmission, the event TXx_UNDERFLOW is not activated when no data has been loaded into the MCSPI_TXx register, because the channel has been enabled. To avoid having a TXx_UNDERFLOW event, the MCSPI_TXx register must seldom be loaded.

The SPI.MCSPI_IRQSTATUS TXx_UNDERFLOW interrupt status bit must be cleared for interrupt line deassertion (if event enabled as the interrupt source).

24.4.4.5.1.3 RXx_FULL

The RXx_FULL event is activated when channel is enabled and MCSPI_RXx register becomes filled (transient event). When the FIFO buffer is enabled (the MCSPI_CHxCONF[28] FFER bit is set to 1), RXx_FULL is asserted as soon as the number of bytes holds in the FIFO to be read reaches the MCSPI_XFERLEVEL[13:8] AFL threshold.

The MCSPI_RXx register must be read to remove the source of the interrupt; the MCSPI_IRQSTATUS RXx_FULL interrupt status bit must be cleared for interrupt line deassertion (if the event is enabled as the interrupt source).

When FIFO is enabled, no new RXx_FULL event will be asserted as soon as the MPU has not performed AFL + 1 reads into MCSPI_RXx. The MPU must perform the right number of reads.

24.4.4.5.1.4 End Of Word Count

The MCSPI_IRQSTATUS[17] EOW event (end of word count) is activated when the channel is enabled and configured to use the built-in FIFO. This interrupt is raised when the controller performs the number of transfers defined in the MCSPI_XFERLEVEL[31:16] WCNT bit field. If WCNT is set to 0x0000, the counter is not enabled and this interrupt is not generated.

The end of word count interrupt also indicates that the SPI transfer is halted on the channel using the FIFO buffer as soon as MCSPI_XFERLEVEL[31:16] WCNT is not reloaded and the channel is not re-enabled.

The MCSPI_IRQSTATUS[17] EOW interrupt status bit must be cleared for interrupt line deassertion (if the event enabled as interrupt source).

24.4.4.5.2 Interrupt Events in Slave Mode

In slave mode, the interrupt events related to the [MCSPI_TXx](#) register state are TXx_EMPTY and TXx_UNDERFLOW. The interrupt events related to the [MCSPI_RXx](#) register state are RXx_FULL and RX0_OVERFLOW (channels 1, 2, and 3 do not have a receiver overflow status bit). See the [MCSPI_IRQSTATUS](#) register.

24.4.4.5.2.1 TXx_EMPTY

The TXx_EMPTY event is activated when a channel is enabled and its [MCSPI_TXx](#) register is empty. Enabling the channel automatically raises this event. If the FIFO buffer is enabled (the [MCSPI_CHxCONF](#)[27] FFEW bit is set to 1), the TXx_EMPTY event will be asserted as soon as there is enough space in buffer to write a number of bytes defined by the [MCSPI_XFERLEVEL](#)[5:0] AEL bit field.

The [MCSPI_TXx](#) register must be loaded with data to remove the source of the interrupt; the SPIm.[MCSPI_IRQSTATUS](#) TXx_EMPTY interrupt status bit must be cleared for interrupt line deassertion (if the event is enabled as the interrupt source).

When FIFO is enabled, no new TXx_EMPTY event will be asserted as soon as the MPU has not performed the number of write into the [MCSPI_TXx](#) register defined by [MCSPI_XFERLEVEL](#)[5:0] AEL bit field. The MPU must perform the right number of writes.

24.4.4.5.2.2 TXx_UNDERFLOW

The TXx_UNDERFLOW event is activated when a channel is enabled and if the [MCSPI_TXx](#) register is empty (not updated with new data) when an external master device starts a data transfer with the MCSPI (transmit and receive).

When FIFO is enabled, the data emitted while the underflow event is raised is not the last data written in the FIFO but the next data in the FIFO (an old transmitted value or a dummy data in the FIFO has been reset).

TXx_UNDERFLOW indicates an error (data loss) in slave mode.

To avoid having a TXx_UNDERFLOW event at the beginning of a transmission, the TXx_UNDERFLOW event is not activated when no data has been loaded into the [MCSPI_TXx](#) register because the channel is enabled.

The SPIm.[MCSPI_IRQSTATUS](#) TXx_UNDERFLOW interrupt status bit must be cleared for interrupt line deassertion (if the event is enabled as the interrupt source).

24.4.4.5.2.3 RXx_FULL

The RXx_FULL event is activated when a channel is enabled and the [MCSPI_RXx](#) register is being filled (transient event). When the FIFO buffer is enabled (the [MCSPI_CHxCONF](#)[28] FFER bit is set to 1), RXx_FULL is asserted as soon as the number of bytes holds in the buffer to read defined by the [MCSPI_XFERLEVEL](#)[13:8] AFL bit field.

The [MCSPI_RXx](#) register must be read to remove the source of the interrupt; the SPIm.[MCSPI_IRQSTATUS](#) RXx_FULL interrupt status bit must be cleared for interrupt line deassertion (if the event is enabled as the interrupt source).

When FIFO is enabled, no new RXx_FULL event will be asserted as soon as the MPU has not performed AFL + 1 reads into [MCSPI_RXx](#). The MPU must perform the correct number of reads.

24.4.4.5.2.4 RX0_OVERFLOW

The RX0_OVERFLOW event is activated in slave mode in either transmit-and-receive or receive-only mode, when a channel is enabled and the [MCSPI_RXx](#) register or FIFO is full when a new SPI word is received. The [MCSPI_RXx](#) register is always overwritten with the new SPI word. If the FIFO is enabled data within the FIFO are overwritten, it must be considered as corrupted. The RX0_OVERFLOW event should not appear in slave mode using the FIFO.

The RX0_OVERFLOW event indicates an error (data loss) in slave mode.

The [MCSPI_IRQSTATUS](#)[3] `RX0_OVERFLOW` interrupt status bit must be cleared for interrupt line deassertion (if the event is enabled as the interrupt source).

24.4.4.5.2.5 End Of Word Count

The [MCSPI_IRQSTATUS](#)[17] EOW event (end of word count) is activated when the channel is enabled and configured to use the built-in FIFO. This interrupt is raised when the controller performs the number of transfer defined in the [MCSPI_XFERLEVEL](#)[31:16] `WCNT` bit field. If `WCNT` is set to `0x0000`, the counter is not enabled and this interrupt is not generated.

The end of word count interrupt also indicates that the SPI transfer is halted on the channel using the FIFO buffer as soon as `WCNT` is not reloaded and the channel re-enabled.

The [MCSPI_IRQSTATUS](#)[17] EOW interrupt status bit must be cleared for interrupt line deassertion (if event enable as interrupt source).

24.4.4.5.3 Interrupt-Driven Operation

An interrupt enable bit in the SPIm.[MCSPI_IRQENABLE](#) register can be set to enable each event to generate interrupt requests when the corresponding event occurs. Status bits are automatically set by hardware logic conditions.

When an event occurs (the single interrupt line is asserted), the MPU must:

1. Read the SPIm.[MCSPI_IRQSTATUS](#) register to identify which event occurred.
2. Read the [MCSPI_RXx](#) register that corresponds to the event to remove the source of an `RXx_FULL` event or write into the [MCSPI_TXx](#) register that corresponds to the event to remove the source of a `TXx_EMPTY` event. No action is required to remove the source of the `WKS` (wake-up), `TXx_UNDERFLOW`, and `RX0_OVERFLOW` events.
3. Set the corresponding bit of the SPIm.[MCSPI_IRQSTATUS](#) register to 1 to clear an interrupt status and then release the interrupt line.

The interrupt status bit must always be reset after channel enabling and before events are enabled as interrupt sources.

24.4.4.5.4 Polling

When the interrupt capability of an event is disabled in the SPIm.[MCSPI_IRQENABLE](#) register, the interrupt line is not asserted, but the status bits in the SPIm.[MCSPI_IRQSTATUS](#) register can be polled by software to detect when the corresponding event occurs.

Once the expected event occurs:

- `RXx_FULL`: To remove the source of the event, the MPU must read the corresponding [MCSPI_RXx](#) register.
- `TXx_EMPTY`: To remove the source of the event, the MPU must write into the corresponding [MCSPI_TXx](#) register.
- `WKS` (wake-up), `TXx_UNDERFLOW`, and `RX0_OVERFLOW`: No action is required to remove the source of the event.

To clear an interrupt, set the corresponding status bit of the SPIm.[MCSPI_IRQSTATUS](#) register to 1. This does not affect the interrupt line state.

24.4.4.6 DMA Requests

The sDMA controller module manages DMA accesses. The sDMA controller advantage is to reduce the MPU charge for data transfers.

Each MCSPI channel, if enabled, can issue DMA requests. There are two DMA request lines per MCSPI channel (one for read and one for write).

The DMA read request line is asserted when the MCSPI channel is enabled and new data is available in the receive register of the MCSPI channel. A DMA read request can be individually masked with the SPI1.MCSPI_CHxCONF[15] DMAR bit. The DMA read request line is deasserted when reading of the MCSPI_RXx register of the MCSPI channel is complete.

The DMA write request line is asserted when the MCSPI channel is enabled and the MCSPI_TXx register of the MCSPI channel is empty. A DMA write request can be individually masked with the SPI1.MCSPI_CHxCONF[14] DMAW bit. The DMA write request line is deasserted when loading of the MCSPI_TXx register of the channel is complete.

24.4.4.7 Power Saving Management

Power consumption can be optimized by switching off internal clocks (interface and functional clock) when there is no activity. The MCSPI is compliant with the idle and wake-up system handshake protocol.

24.4.4.7.1 Normal Mode

In normal mode, internal SPI module clocks are automatically switched off (autogated) when there is no activity in slave or master mode.

Autogating of the module interface clock and functional clock occurs when the following conditions are met:

- The SPI1.MCSPI_SYSCONFIG[0] AUTOIDLE bit is set.
- In master mode, there is no data to transmit or receive in all channels.
- In slave mode, the MCSPI is not selected by the external master and there are no register accesses.

Autogating of the module interface clock and functional clock stops when the following conditions are met:

- In master mode, an internal access occurs.
- In slave mode, an internal access occurs or the MCSPI is selected by the external master.

24.4.4.7.2 Idle Mode

At the PRCM module level, when all conditions are met to shut off the CORE_48M_FCLK or CORE_L4_ICLK output clocks (for details, see [Chapter 3, Power, Reset, and Clock Management](#)), the PRCM module automatically launches a hardware handshake protocol to ensure that the MCSPI is ready to have its clocks switched off. Namely, the PRCM module asserts an idle request to the MCSPI.

Although this handshake is completely hardware-oriented and out of software control, the method in which the MCSPI module acknowledges the PRCM idle request is configurable through the MCSPI.SYSCONFIG[4:3] SIDLEMODE bit field.

The settings of the SIDLEMODE bit field and the related acknowledgment modes are:

- Force-idle mode (the SPI1.MCSPI_SYSCONFIG[4:3] SIDLEMODE bit field is set to 0x0): The MCSPI module acknowledges unconditionally the idle request from the PRCM module, regardless of its internal operations. This mode must be used carefully in this case because it does not prevent the loss of data when the clock is switched off.
- No-idle mode (the SIDLEMODE bit is set to 0x1): The MCSPI never acknowledges an idle request from the PRCM module and is safe from a module point of view because it ensures that the clocks remain active. However, it is not efficient to save power because it does not allow the PRCM output clock to be shut off and thus the power domain to be set to a lower power state.
- Smart-idle mode (the SIDLEMODE bit is set to 0x2): The MCSPI acknowledges the idle request, basing its decision on its internal activity. Namely, the acknowledge signal is asserted only when all pending transactions, IRQs, or DMA requests are treated. This is the best approach for efficient system power management.

When configured in smart-idle mode, the MCSPI also offers an additional granularity on the CORE_48M_FCLK and CORE_L4_ICLK gating. The SPI1.SYSCONFIG[9:8] CLOCKACTIVITY bit field determines which clock shuts down (the CORE_48M_FCLK, CORE_L4_ICLK, neither clock, or both clocks).

The CLOCKACTIVITY setting is used internally to the MCSPI to determine on which part of the module the conditions to acknowledge the PRCM idle request are tested. For example, if CORE_48M_FCLK is not shut down on a PRCM idle request, the MCSPI considers only CORE_L4_ICLK and the associated pending activities before acknowledging the request.

Some MCSPI features are associated with CORE_L4_ICLK and others with CORE_48M_FCLK. Using the CLOCKACTIVITY bit field with the smart-idle mode ensures that the features associated with the clock that remains active are always enabled, even if the MCSPI acknowledges an idle request.

The CLOCKACTIVITY settings and the associated features are:

- CLOCKACTIVITY set to 00: ICLK off and FCLK off, ICLK and FCLK are considered for generating the acknowledge. This setting also means that FCLK and ICLK are likely to be shut down on a PRCM idle request.
- CLOCKACTIVITY set to 01: ICLK on and FCLK off, ICLK is not shut down on a PRCM idle request; only FCLK is concerned.
- CLOCKACTIVITY set to 10: ICLK off and FCLK on, FCLK is not shut down on a PRCM idle request; only ICLK is concerned.
- CLOCKACTIVITY set to 11: ICLK on and FCLK on, none of the clocks are shut down. This means the MCSPI can potentially acknowledge the idle request without checking the internal functions linked to its clocks.

CAUTION

The PRCM module does not have a hardware means of reading the CLOCKACTIVITY settings. Therefore, software must ensure consistent programming between CLOCKACTIVITY and the CORE_48M_FCLK and CORE_L4_ICLK control bits in the PRCM module. If the MCSPI is disabled in the CM_FCLKEN and CM_ICLKEN PRCM registers while CLOCKACTIVITY is set to 11, nothing prevents the PRCM module from asserting its idle request, which is acknowledged regardless of the features associated with the MCSPI clocks. This can lead to unpredictable behavior.

24.4.4.7.2.1 Wake-Up Event in Smart-Idle Mode

The module wake-up feature is enabled when the SPIm.MCSPI_SYSCONFIG[2] ENAWAKEUP and SPIm.MCSPI_WAKEUPENABLE[0] WKEN bits are set. Wake-up capability is relevant only when the module is configured in slave mode.

The module generates an asynchronous wakeup request to the system power manager to switch back the interface clock and the functional clock. A wake-up is requested when channel 0 is enabled and an asynchronous selection occurs on the mcs pim.csx port associated with channel 0 (see the definition for the SPIm.MCSPI_CHxCONF[22:21] SPIENSLV bit field [where x = 0] in the register description table).

After the McSPI wake-up request, the system power manager must reactivate the interface clock:

- Before the beginning of the second SPI word serialization when the McSPI is in slave transmit-only mode or in slave transmit-and-receive mode
- Before the end of the second received SPI word in slave receive-only mode. To avoid data loss, the first received SPI word must be read from the SPIm.MCSPI_RXx register (where x = 0) before the completion of the second SPI word serialization.

Table 24-274 lists the supported cases in wake-up mode.

Table 24-274. Smart-Idle Mode and Wake-Up Capabilities

| Mode | Interface Clock | SPI Clock Ref | Functionality | Wake-Up Event |
|--------|--------------------|--------------------|---|------------------|
| Master | Must be maintained | Must be maintained | Full functionality, but the module does not generate a new interrupt or DMA request until the system exits wake-up mode | No wake-up event |

Table 24-274. Smart-Idle Mode and Wake-Up Capabilities (continued)

| Mode | Interface Clock | SPI Clock Ref | Functionality | Wake-Up Event |
|-------|---------------------|---------------------|--|---|
| Slave | Can be switched off | Can be switched off | An SPI word can be transmitted and/or received, but the module does not generate any new interrupts or DMA requests until the system exits wake-up mode. | The module asynchronously sends a wake-up request if an event on the mcsxim_csx port associated with channel 0 is detected. |

In wake-up mode, the interrupt and DMA request lines are no longer asserted.

Any access to the module in wake-up mode generates an error as long as the interface clock is alive.

24.4.4.7.2.2 Transitions From Smart-Idle Mode to Normal Mode

The MCSPI detects the end of the wake period through the idle and wake-up hardware handshake protocol.

The interrupt status register (the SPI.MCSPI_IRQSTATUS[16] WKS bit) is updated with the event causing the wakeup; the wake-up event at the origin of the transition to the normal mode is converted to its corresponding interrupt when enabled by the SPI.MCSPI_IRQENABLE[16] WKE bit or the DMA request.

Interrupts and wake-up events have independent enable and disable controls, accessible through the SPI.MCSPI_IRQENABLE and SPI.MCSPI_WAKEUPENABLE registers. Software must ensure the overall consistency.

The interrupt status register SPI.MCSPI_IRQSTATUS is updated with the event causing the wake-up; the wake-up event at the origin of the transition to normal mode is converted to its corresponding interrupt request or DMA request. The module is fully operational.

24.4.4.7.2.3 Force-Idle Mode

Force-idle mode is enabled and exited as follows:

- Force-idle mode is enabled when the SPI.MCSPI_SYSCONFIG[4:3] SIDLEMODE bit field is set to 0x0.
 - In force-idle mode, the MCSPI responds unconditionally to the idle request by deasserting unconditionally the interrupt and DMA request lines, if asserted. In addition, the wake-up capability is totally inhibited even if the SPI.MCSPI_SYSCONFIG[2] ENAWAKEUP and SPI.MCSPI_WAKEUPENABLE[0] WKEN bits are set.
 - The transition from normal mode to idle mode does not affect the interrupt event bits of the SPI.MCSPI_IRQSTATUS register.
 - In force-idle mode, because the module must be disabled, the interrupt and DMA request lines are likely deasserted. The interface clock and SPI clock provided to the MCSPI can be switched off.
 - An idle request during an SPI data transfer can lead to an unexpected and unpredictable result. Software must avoid such a request.
- The module exits force-idle mode through the idle and wake-up hardware handshake protocol. The module is fully operational. The interrupt and DMA request lines are optionally asserted one clock cycle later.

24.4.5 MCSPI Programming Guide

24.4.5.1 MCSPI Low-Level Programming Models

This section describes the low-level hardware programming sequences for the configuration and use of the MCSPI module.

24.4.5.1.1 Global Initialization

24.4.5.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the I²C module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the I²C. For further information, see the *I²C Module Integration* and *Environment* sections.

For more information, see [Section 24.4.3](#).

[Table 24-275](#) lists the information on the global initialization of the surrounding modules.

Table 24-275. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|--|
| PRCM | MCSPI_FCLK functional clock must be enabled. See Section 3.1.1.1.2 , <i>Module Level Clock Management</i> , in Chapter 3 , <i>Power, Reset, and Clock Management</i> . |
| L4 Interconnect | For information about L4-PER interconnect configuration, see Section 14.3 , <i>L4 Interconnects</i> , in Chapter 14 , <i>Interconnect</i> . |
| sDMA | DMA configuration must be done to enable the module DMA channel requests. See Chapter 17 , <i>SDMA</i> . |
| MPU INTC | Cortex-A9 MPU, Cortex-M3 MPU, or DSP INTC must be configured to enable the interrupt request generation to the Cortex-A9 MPU or Cortex-M3 MPU, or in <i>INTC</i> , in Chapter 5 , <i>DSP Subsystem</i> . |

24.4.5.1.1.2 MCSPI Global Initialization

24.4.5.1.1.2.1 Main Sequence – MCSPI Global Initialization

This procedure initializes the MCSPI module after a POR or software reset.

Table 24-276. MCSPI Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|-------------------------------|--------------------------------------|-------|
| Perform a software reset. | SPIm.MCSPI_SYSCONFIG[1] SOFTRESET | 0x1 |
| Wait until reset is finished? | SPIm.MCSPI_SYSSTATUS[0] RESETDONE | =0x1 |

24.4.5.1.2 Operational Mode Configuration

24.4.5.1.2.1 MCSPI Operational Modes

The selection of the working mode is done with the SPIm.MCSPI_CHxCONF register. [Table 24-277](#) through [Table 24-279](#) list the possible operating modes and their configurations.

Table 24-277. MCSPI Receive Mode Initialization

| Step | Register/Bit Field/Programming Model | Value |
|---|--------------------------------------|-------|
| Set receive mode. | SPIm.MCSPI_CHxCONF[13:12] TRM | 0x1 |
| Set the word length. | SPIm.MCSPI_CHxCONF[11:7] WL | 0x8 |
| Clock initialization and channel enabling | SPIm.MCSPI_MODULCTRL[2] MS | 0x0 |
| | SPIm.MCSPI_CHxCTRL[0] EN | 0x1 |

Table 24-277. MCSPI Receive Mode Initialization (continued)

| Step | Register/Bit Field/Programming Model | Value |
|---|--------------------------------------|-------|
| Channels activated low during active state | SPIm.MCSPI_CHxCONF[6] EPOL | 0x1 |
| Clock held high during active state | SPIm.MCSPI_CHxCONF[1] POL | 0x0 |
| Data latched on odd-numbered edges of the SPI clock | SPIm.MCSPI_CHxCONF[0] PHA | 0x0 |
| Reset the status bits. | SPIm.MCSPI_IRQSTATUS | 0x0 |

Table 24-278. MCSPI Transmit Mode Initialization

| Step | Register/Bit Field/Programming Model | Value |
|---|--|------------|
| Set transmit mode. | SPIm.MCSPI_CHxCONF[13:12] TRM | 0x2 |
| Set the word length. | SPIm.MCSPI_CHxCONF[11:7] WL | 0x8 |
| Clock initialization and channel enabling | SPIm.MCSPI_MODULCTRL[2] MS SPIm.MCSPI_CHxCTRL[0] EN | 0x0 0x1 |
| Channels activated low during active state | SPIm.MCSPI_CHxCONF[6] EPOL | 0x1 |
| Clock held high during active state | SPIm.MCSPI_CHxCONF[1] POL | 0x0 |
| Data latched on odd-numbered edges of the SPI clock | SPIm.MCSPI_CHxCONF[0] PHA | 0x0 |
| Reset the status bits. | SPIm.MCSPI_IRQSTATUS | 0x0 |

Table 24-279. MCSPI Transmit-and-Receive Mode Initialization

| Step | Register/Bit Field/Programming Model | Value |
|---|--|------------|
| Set transmit and receive mode. | SPIm.MCSPI_CHxCONF[13:12] TRM | 0x0 |
| Set the word length. | SPIm.MCSPI_CHxCONF[11:7] WL | 0x8 |
| Clock initialization and channel enabling | SPIm.MCSPI_MODULCTRL[2] MS SPIm.MCSPI_CHxCTRL[0] EN | 0x0 0x1 |
| Channels activated low during active state | SPIm.MCSPI_CHxCONF[6] EPOL | 0x1 |
| Clock held high during active state | SPIm.MCSPI_CHxCONF[1] POL | 0x0 |
| Data latched on odd-numbered edges of the SPI clock | SPIm.MCSPI_CHxCONF[0] PHA | 0x0 |
| Reset the status bits. | SPIm.MCSPI_IRQSTATUS | 0x0 |

24.4.5.1.2.1.1 Common Transfer Procedures Without FIFO – Polling Method

24.4.5.1.2.1.1.1 Receive-Only Procedure – Polling Method

Table 24-280 lists the receive-only procedure using the polling method. The MCSPI is acting as slave.

Table 24-280. Receive-Only Procedure – Polling Method

| Step | Register/Bit Field/Programming Model | Value |
|---|--------------------------------------|-------|
| Configure the channel according to the mode | See Table 24-277. | |
| Start the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x1 |
| Wait until receive register is full? | SPIm.MCSPI_RXx | =0x1 |
| Stop the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x0 |

24.4.5.1.2.1.1.2 Receive-Only Procedure – Interrupt Method

Table 24-281 lists the receive-only procedure using the interrupt method. The MCSPI is acting as slave.

Table 24-281. Receive-Only Procedure – Interrupt Method

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Configure the channel according to the mode. | See Table 24-277 . | |
| Start the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x1 |
| Enable the interrupt for the receiver register. | SPIm.MCSPI_IRQENABLE[2] RX_FULL_ENABLE | 0x1 |
| Read the status register. | SPIm.MCSPI_IRQSTATUS[2] RX_FULL | 0x0 |
| Disable the interrupt. | SPIm.MCSPI_IRQENABLE[2] RX_FULL_ENABLE | 0x0 |
| Stop the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x0 |
| Read the receiver register. | SPIm.MCSPI_RXx | xxxx |

24.4.5.1.2.1.1.3 Transmit-Only Procedure – Polling Method

[Table 24-282](#) lists the transmit-only procedure using the polling method. The MCSPI is acting as master.

Table 24-282. Transmit-Only Procedure – Polling Method

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Configure the channel according to the mode. | See Table 24-278 | |
| Start the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x1 |
| Wait until end of transfer? | SPIm.MCSPI_CHxSTAT[2:1] | =0x2 |
| Stop the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x0 |

24.4.5.1.2.1.1.4 Transmit-and-Receive Procedure – Polling Method

[Table 24-282](#) lists the transmit-and-receive procedure using the polling method. The MCSPI is acting as master and slave.

Table 24-283. Transmit-and-Receive Procedure – Polling Method

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Configure the channel according to the mode. | See Table 24-279 . | |
| Start the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x1 |
| Wait until transmit/receive word? | SPIm.MCSPI_CHxSTAT[2:0] | =0x3 |
| Stop the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x0 |

24.4.5.1.3 Common Transfer Procedures With FIFO – Polling Method

When using FIFO the MCSPI module can start the transfer only after the first write request is released by writing the [MCSPI_TXx](#) register. The first write request can be managed by the IRQ routine or DMA handler. The end of transfer is more complex and depends on the transfer type. See [Table 24-282](#) through [Table 24-289](#).

24.4.5.1.3.1 Receive-Only Procedure With Word Count – Polling Method

Table 24-284. Receive-Only Procedure With Word Count – Polling Method

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Configure the channel according to the mode. | See Table 24-277 . | |
| Start the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x1 |
| Wait until end of word count? | SPIm.MCSPI_IRQSTATUS[17] EOW | =0x1 |
| Stop the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x0 |
| Read from the receiver register. | SPIm.MCSPI_RXx | xxxx |

24.4.5.1.3.2 Transmit-Only Procedure With and Without Word Count – Polling Method

Table 24-285. Transmit-Only Procedure Without Word Count – Polling Method

| Step | Register/Bit Field/Programming Model | Value |
|--|--|--------------|
| Configure the channel according to the mode. | See Table 24-278 . | |
| Start the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x1 |
| Wait until end of word count? | SPIm.MCSPI_IRQSTATUS[17] EOW | =0x1 |
| Wait until end of transfer? | SPIm.MCSPI_CHxSTAT[2] EOT SPIm.MCSPI_CHxSTAT[3] TXFFE | =0x1 =0x1 |
| Stop the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x0 |

24.4.5.1.3.3 Transmit-Only Procedure With and Without Word Count – Interrupt Method

Table 24-286. Transmit-Only Procedure With Word Count – Interrupt Method

| Step | Register/Bit Field/Programming Model | Value |
|--|--|--------------|
| Configure the channel according to the mode. | See Table 24-278 . | |
| Start the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x1 |
| Enable the interrupt for the transmit register. | SPIm.MCSPI_IRQENABLE[4] TX_EMPTY_ENABLE | 0x1 |
| End of word count. | SPIm.MCSPI_IRQSTATUS[17] EOW | =0x1 |
| End of transfer | SPIm.MCSPI_CHxSTAT[2] EOT SPIm.MCSPI_CHxSTAT[3] TXFFE | =0x1 =0x1 |
| Clear the interrupt. | SPIm.MCSPI_IRQENABLE[17] EOW_ENABLE | =0x0 |
| Disable the interrupt for the transmit register. | SPIm.MCSPI_IRQENABLE[4] TX_EMPTY_ENABLE | 0x0 |
| Stop the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x0 |

24.4.5.1.3.4 Transmit-and-Receive Procedure With Word Count – Polling Method

Table 24-287. Transmit-and-Receive Procedure With Word Count – Polling Method

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Configure the channel according to the mode. | See Table 24-279 . | |
| Start the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x1 |
| Wait until end of word count? | SPIm.MCSPI_IRQSTATUS[17] EOW | =0x1 |
| Stop the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x0 |
| Read from the receiver register. | SPIm.MCSPI_RXx | xxxx |

24.4.5.1.3.5 Transmit-and-Receive Procedure with Word Count – Interrupt Method

Table 24-288. Transmit-and-Receive Procedure With Word Count – Interrupt Method

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Configure the channel according to the mode. | See Table 24-279 . | |
| Start the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x1 |
| Enable the interrupt for the receiver register. | SPIm.MCSPI_IRQENABLE[2] RX_FULL_ENABLE | 0x1 |
| Enable the interrupt for the transmit register. | SPIm.MCSPI_IRQENABLE[4] TX_EMPTY_ENABLE | 0x1 |
| End of word count? | SPIm.MCSPI_IRQSTATUS[17] EOW | =0x1 |
| Clear the interrupt. | SPIm.MCSPI_IRQENABLE[17] EOW_ENABLE | =0x0 |

Table 24-288. Transmit-and-Receive Procedure With Word Count – Interrupt Method (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Disable the interrupt for the receiver register. | SPIm.MCSPI_IRQENABLE[4] TX_EMPTY_ENABLE | 0x0 |
| Disable the interrupt for the transmit register. | SPIm.MCSPI_IRQENABLE[2] RX_FULL_ENABLE | 0x0 |
| Stop the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x0 |
| Read from the receiver register. | SPIm.MCSPI_RXx | xxxx |

24.4.5.1.3.6 Transmit-and-Receive Procedure Without Word Count – Polling Method**Table 24-289. Transmit-and-Receive Procedure Without Word Count – Polling Method**

| Step | Register/Bit Field/Programming Model | Value |
|--|--|--------------|
| Configure the channel according to the mode. | See Table 24-279 . | |
| Start the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x1 |
| Wait until end of transfer? | SPIm.MCSPI_CHxSTAT[2] EOT SPIm.MCSPI_CHxSTAT[3] TXFFE | =0x1 =0x1 |
| Stop the channel. | SPIm.MCSPI_CHxCTRL[0] EN | 0x0 |
| Read from the receiver register. | SPIm.MCSPI_RXx | xxxx |

24.4.6 MCSPI Register Manual

24.4.6.1 MCSPI Instance Summary

Table 24-290. MCSPI Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|------|
| MCSP11 | 0x4809 8000 | 4KB |
| MCSP12 | 0x4809 A000 | 4KB |
| MCSP13 | 0x480B 8000 | 4KB |
| MCSP14 | 0x480B A000 | 4KB |

24.4.6.2 MCSPI Registers

24.4.6.2.1 MCSPI Register Summary

Table 24-291 lists the MCSPI registers. Each register is 32 bits wide.

Table 24-291. MCSPI Register Summary

| Register | Type | Offset Address | MCSP11 L3 Physical Address | MCSP12 L3 Physical Address | MCSP13 L3 Physical Address | MCSP14 L3 Physical Address |
|------------------------------|------|--------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| MCSP1_HL_REV | Rw | 0x00 | 0x4809 8000 | 0x4809 A000 | 0x480B 8000 | 0x480B A000 |
| MCSP1_HL_HWINFO | Rw | 0x04 | 0x4809 8004 | 0x4809 A004 | 0x480B 8004 | 0x480B A004 |
| MCSP1_HL_SYSCONFIG | Rw | 0x10 | 0x4809 8010 | 0x4809 A010 | 0x480B 8010 | 0x480B A010 |
| MCSP1_REVISION | R | 0x100 | 0x4809 8100 | 0x4809 A100 | 0x480B 8100 | 0x480B A100 |
| MCSP1_SYSCONFIG | RW | 0x110 | 0x4809 8110 | 0x4809 A110 | 0x480B 8110 | 0x480B A110 |
| MCSP1_SYSSTATUS | R | 0x114 | 0x4809 8114 | 0x4809 A114 | 0x480B 8114 | 0x480B A114 |
| MCSP1_IRQSTATUS | RW | 0x118 | 0x4809 8118 | 0x4809 A118 | 0x480B 8118 | 0x480B A118 |
| MCSP1_IRQENABLE | RW | 0x1C | 0x4809 811C | 0x4809 A11C | 0x480B 811C | 0x480B A11C |
| MCSP1_WAKEUPENABLE | RW | 0x120 | 0x4809 8120 | 0x4809 A120 | 0x480B 8120 | 0x480B A120 |
| MCSP1_SYST | RW | 0x124 | 0x4809 8124 | 0x4809 A124 | 0x480B 8124 | 0x480B A124 |
| MCSP1_MODULCTRL | RW | 0x128 | 0x4809 8128 | 0x4809 A128 | 0x480B 8128 | 0x480B A128 |
| MCSP1_CHxCONF ⁽¹⁾ | RW | 0x12C + (0x14 * x) | 0x4809 812C + (0x14 * x) | 0x4809 A12C + (0x14 * x) | 0x480B 812C + (0x14 * x) | 0x480B A12C + (0x14 * x) |
| MCSP1_CHxSTAT ⁽¹⁾ | R | 0x130 + (0x14 * x) | 0x4809 8130 + (0x14 * x) | 0x4809 A130 + (0x14 * x) | 0x480B 8130 + (0x14 * x) | 0x480B A130 + (0x14 * x) |
| MCSP1_CHxCTRL ⁽¹⁾ | RW | 0x134 + (0x14 * x) | 0x4809 8134 + (0x14 * x) | 0x4809 A134 + (0x14 * x) | 0x480B 8134 + (0x14 * x) | 0x480B A134 + (0x14 * x) |
| MCSP1_TXx ⁽¹⁾ | RW | 0x138 + (0x14 * x) | 0x4809 8138 + (0x14 * x) | 0x4809 A138 + (0x14 * x) | 0x480B 8138 + (0x14 * x) | 0x480B A138 + (0x14 * x) |
| MCSP1_RXx ⁽¹⁾ | R | 0x13C + (0x14 * x) | 0x4809 813C + (0x14 * x) | 0x4809 A13C + (0x14 * x) | 0x480B 813C + (0x14 * x) | 0x480B A13C + (0x14 * x) |
| MCSP1_XFERLEVEL | RW | 0x17C | 0x4809 817C | 0x4809 A17C | 0x480B 817C | 0x480B A17C |

⁽¹⁾ x = 0 to 3 for MCSP11
x = 0 to 1 for MCSP12
x = 0 for MCSP13
x = 0 for MCSP14

24.4.6.2.2 MCSPI Register Description

Table 24-292 through Table 24-324 describe the individual MCSPI register bits.

Table 24-292. MCSPI_HL_REV

| | | | |
|-------------------------|---|-----------------|--------------------------------------|
| Address Offset | 0x00 | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Physical Address | See Table 24-291 . | | |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP Revision | R | TI internal data |

Table 24-293. Register Call Summary for Register MCSPI_HL_REV

- Multichannel Serial Port Interface (MCSPI)
- [MCSPI Register Summary: \[0\]](#)

Table 24-294. MCSPI_HL_HWINFO

| | | | |
|------------------|--|----------|--------------------------------------|
| Address Offset | 0x04 | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Physical Address | See Table 24-291 . | | |
| Description | Information about the IP module's hardware configuration, that is, typically the module's HDL generics (if any). Actual field format and encoding is up to the module's designer to decide. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---------|---------|---|---|---|---------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RSVD | | | | | | | | | | | | | | | | | | | | | | | | RETMODE | FFNBYTE | | | | USEFIFO | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:7 | RSVD | Reserved These bits are initialized to 0, and writes to them are ignored. | R | 0x00000000 |
| 6 | RETMODE | Retention Mode generic parameter. This bit field indicates whether the retention mode is supported using the pin PIRFFRET. 0x0: Retention mode disabled 0x1: Retention mode enabled | R | RETMODE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 5:1 | FFNBYTE | FIFO number of byte generic parameter This register defines the value of FFNBYTE generic parameter, only MSB bits from 8 down to 4 are taken into account. Read 0x1: FIFO 16 bytes depth Read 0x2: FIFO 32 bytes depth Read 0x4: FIFO 64 bytes depth Read 0x8: FIFO 128 bytes depth Read 0x10: FIFO 256 bytes depth | R | 0x04 |
| 0 | USEFIFO | Use of a FIFO enable: This bit indicates if a FIFO is integrated within controller design with its management. Read 0x0: FIFO not implemented in design Read 0x1: FIFO and its management implemented in design with depth defined by FFNBYTE generic | R | 0 |

Table 24-295. Register Call Summary for Register MCSPI_HL_HWINFO

Multichannel Serial Port Interface (MCSPI)

- [MCSPI Register Summary: \[0\]](#)

Table 24-296. MCSPI_HL_SYSCONFIG

| | | | |
|-------------------------|------------------------------------|-----------------|--------------------------------------|
| Address Offset | 0x10 | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Physical Address | See Table 24-291 . | | |
| Description | Clock management configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|----------|---------|-----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RSVD | | | | | | | | | | | | | | | | | | | | | | | | | | | IDLEMODE | FREEEMU | SOFTRESET | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RSVD | | R | 0x00000000 |
| 3:2 | IDLEMODE | <p>Configuration of the local target state management mode.</p> <p>By definition, target can handle read/write transaction as long as it is out of IDLE state.</p> <p>0x0: Force-idle mode: local target's IDLE state follows (acknowledges) the system's idle requests unconditionally, that is, regardless of the IP module's internal requirements. Backup mode, for debug only.</p> <p>0x1: No-idle mode: local target never enters IDLE state. Backup mode, for debug only.</p> <p>0x2: Smart-idle mode: local target's IDLE state eventually follows (acknowledges) the system's idle requests, depending on the IP module's internal requirements. IP module shall not generate (IRQ- or DMA-request-related) wake-up events.</p> <p>0x3: Smart-idle wake-up-capable mode: local target's IDLE state eventually follows (acknowledges) the system's idle requests, depending on the IP module's internal requirements. IP module may generate (IRQ- or DMA-request-related) wake-up events when in IDLE state. Mode is relevant only if the appropriate IP module "swake-up" output(s) is (are) implemented.</p> | RW | 0x2 |
| 1 | FREEEMU | <p>Sensitivity to emulation (debug) suspend input signal.</p> <p>0x0: IP module is sensitive to emulation suspend.</p> <p>0x1: IP module is not sensitive to emulation suspend.</p> | RW | 0 |
| 0 | SOFTRESET | <p>Software reset. (Optional)</p> <p>Write 0x0: No action</p> <p>Read 0x0: Reset done, no pending action</p> <p>Read 0x1: Reset (software or other) ongoing</p> <p>Write 0x1: Initiate software reset</p> | RW | 0 |

Table 24-297. Register Call Summary for Register MCSPI_HL_SYSCONFIG

Multichannel Serial Port Interface (MCSPI)

- [MCSPI Register Summary: \[0\]](#)

Table 24-298. MCSPI_REVISION

| | | | |
|-------------------------|---|-----------------|--------------------------------------|
| Address Offset | 0x100 | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Physical Address | See Table 24-291 . | | |
| Description | This register contains the revision number. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP revision | R | TI Internal data |

Table 24-299. Register Call Summary for Register MCSPI_REVISION

Multichannel Serial Port Interface (MCSPI)

- [MCSPI Register Summary: \[0\]](#)

Table 24-300. MCSPI_SYSCONFIG

| | | | |
|-------------------------|---|-----------------|--------------------------------------|
| Address Offset | 0x110 | | |
| Physical Address | See Table 24-291 | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Description | This register allows controlling various parameters of the OCP interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----------|----|-----------|----|-----------|---|-----------|---|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLOCKACTIVITY | | RESERVED | | SIDLEMODE | | ENAWAKEUP | | SOFTRESET | | AUTOIDLE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|----------|
| 31:10 | RESERVED | Reads returns 0 | RW | 0x000000 |
| 9:8 | CLOCKACTIVITY | Clocks activity during wake-up mode period 0x0: OCP and functional clocks may be switched off. 0x1: OCP clock is maintained. Functional clock may be switched off. 0x2: Functional clock is maintained. OCP clock may be switched off. 0x3: OCP and functional clocks are maintained. | RW | 0x0 |
| 7:5 | RESERVED | Reads returns 0 | RW | 0x0 |
| 4:3 | SIDLEMODE | Power management 0x0: If an idle request is detected, the McSPI acknowledges it unconditionally and goes in inactive mode. Interrupt, DMA requests and wake-up lines are unconditionally deasserted and the module wake-up capability is deactivated even if the MCSPI_SYSCONFIG[EnaWakeUp] bit is set. 0x1: If an idle request is detected, the request is ignored and the module does not switch to wake-up mode, and keeps on behaving normally. 0x2: If an idle request is detected, the module will switch to wake-up mode based on its internal activity, and the wake-up capability can be used if the bit MCSPI_SYSCONFIG[EnaWakeUp] is set. 0x3: Reserved - do not use. | RW | 0x2 |
| 2 | ENAWAKEUP | Wake-up feature control 0x0: Wake-up capability is disabled. 0x1: Wake-up capability is enabled. | RW | 1 |
| 1 | SOFTRESET | Software reset. During reads it always returns 0. 0x0: (write) Normal mode 0x1: (write) Set this bit to 1 to trigger a module reset. The bit is automatically reset by the hardware. | RW | 0 |
| 0 | AUTOIDLE | Internal OCP clock-gating strategy 0x0: OCP clock is free-running. 0x1: Automatic OCP clock gating strategy is applied, based on the OCP interface activity. | RW | 1 |

Table 24-301. Register Call Summary for Register MCSPI_SYSCONFIG

Multichannel Serial Port Interface (MCSPI)

- [Normal Mode: \[0\]](#)
- [Idle Mode: \[1\]](#)
- [Wake-Up Event in Smart-Idle Mode: \[2\]](#)
- [Force-Idle Mode: \[3\] \[4\]](#)
- [MCSPI Global Initialization: \[5\]](#)
- [MCSPI Register Summary: \[6\]](#)
- [MCSPI Register Description: \[7\] \[8\]](#)

Table 24-302. MCSPI_SYSSTATUS

| | | | |
|-------------------------|--|-----------------|--------------------------------------|
| Address Offset | 0x114 | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Physical Address | See Table 24-291 . | | |
| Description | This register provides status information about the module excluding the interrupt status information. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESETDONE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Reserved for module specific status information. Read returns 0. | R | 0x0000 0000 |
| 0 | RESETDONE | Internal reset monitoring Read 0x0: Internal module reset is ongoing Read 0x1: Reset completed | R | 0 |

Table 24-303. Register Call Summary for Register MCSPI_SYSSTATUS

Multichannel Serial Port Interface (MCSPI)

- [MCSPI Global Initialization: \[0\]](#)
- [MCSPI Register Summary: \[1\]](#)

Table 24-304. MCSPI_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|--------------------------------------|
| Address Offset | 0x118 | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Physical Address | See Table 24-291 . | | |
| Description | The interrupt status regroups all the status of the module internal events that can generate an interrupt. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|----------|----------|---------------|-----------|----------|----------|---------------|-----------|----------|----------|---------------|-----------|--------------|----------|---------------|-----------|
| RESERVED | | | | | | | | | | | | | | | | EOW | WKS | RESERVED | RX3_FULL | TX3_UNDERFLOW | TX3_EMPTY | RESERVED | RX2_FULL | TX2_UNDERFLOW | TX2_EMPTY | RESERVED | RX1_FULL | TX1_UNDERFLOW | TX1_EMPTY | RX0_OVERFLOW | RX0_FULL | TX0_UNDERFLOW | TX0_EMPTY |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|---------------|--------|
| 31:18 | RESERVED | Reads returns 0 | RW | 0x0000 |
| 17 | EOW | End of word count event when a channel is enabled using the FIFO buffer and the channel had sent the number of SPI word defined by MCSPI_XFERLEVEL [WCNT]. Write 0x0: w:Event status bit unchanged Read 0x0: r: Event false Read 0x1: r: Event is pending Write 0x1: w:Event status bit is reset | RW W1toClr | 0 |
| 16 | WKS | Wake-up event in slave mode when an active control signal is detected on the SPIEN line programmed in the field MCSPI_CH0CONF[SPIENSLV] Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |
| 15 | RESERVED | Reads returns 0 | RW | 0 |
| 14 | RX3_FULL | Receiver register is full or almost full. Only when Channel 3 is enabled Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |
| 13 | TX3_UNDERFLOW | Transmitter register underflow. Only when Channel 3 is enabled. The transmitter register is empty (not updated by host or DMA with new data) before its time slot assignment. Exception: No TX_underflow event when no data has been loaded into the transmitter register since channel has been enabled. Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |
| 12 | TX3_EMPTY | Transmitter register is empty or almost empty. Note: Enabling the channel automatically rises this event. Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |
| 11 | RESERVED | Reads returns 0. | RW | 0 |

Multichannel Serial Port Interface

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------|-------|
| 10 | RX2_FULL | Receiver register full or almost full. Channel 2 Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |
| 9 | TX2_UNDERFLOW | Transmitter register underflow. Channel 2 Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |
| 8 | TX2_EMPTY | Transmitter register empty or almost empty. Channel 2 Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |
| 7 | RESERVED | Reads returns 0 | RW | 0 |
| 6 | RX1_FULL | Receiver register full or almost full. Channel 1 Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |
| 5 | TX1_UNDERFLOW | Transmitter register underflow. Channel 1 Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |
| 4 | TX1_EMPTY | Transmitter register empty or almost empty. Channel 1 Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |
| 3 | RX0_OVERFLOW | Receiver register overflow (slave mode only). Channel 0 Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |
| 2 | RX0_FULL | Receiver register full or almost full. Channel 0 Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |
| 1 | TX0_UNDERFLOW | Transmitter register underflow. Channel 0 Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 0 | TX0_EMPTY | Transmitter register empty or almost empty. Channel 0 Read 0x0: r: Event false Write 0x0: w:Event status bit unchanged Write 0x1: w:Event status bit is reset Read 0x1: r: Event is pending | RW W1toClr | 0 |

Table 24-305. Register Call Summary for Register MCSPI_IRQSTATUS

Multichannel Serial Port Interface (MCSPI)

- [Master Transmit-and-Receive Mode \(Full Duplex\): \[0\]](#)
- [Master Transmit-Only Mode \(Half Duplex\): \[1\]](#)
- [Master Receive-Only Mode \(Half Duplex\): \[2\] \[3\] \[4\] \[5\]](#)
- [Force mcsxim_csx Mode: \[6\]](#)
- [Turbo Mode: \[7\]](#)
- [Buffer Almost Full: \[8\] \[9\]](#)
- [Buffer Almost Empty: \[10\] \[11\]](#)
- [End of Transfer Management: \[12\]](#)
- [Interrupts: \[13\]](#)
- [TXx_EMPTY: \[14\] \[15\]](#)
- [TXx_UNDERFLOW: \[16\]](#)
- [RXx_FULL: \[17\]](#)
- [End Of Word Count: \[18\] \[19\]](#)
- [Interrupt Events in Slave Mode: \[20\]](#)
- [TXx_EMPTY: \[21\]](#)
- [TXx_UNDERFLOW: \[22\]](#)
- [RXx_FULL: \[23\]](#)
- [RX0_OVERFLOW: \[24\]](#)
- [End Of Word Count: \[25\] \[26\]](#)
- [Interrupt-Driven Operation: \[27\] \[28\]](#)
- [Polling: \[29\] \[30\]](#)
- [Transitions From Smart-Idle Mode to Normal Mode: \[31\] \[32\]](#)
- [Force-Idle Mode: \[33\]](#)
- [MCSPI Operational Modes: \[34\] \[35\] \[36\] \[37\]](#)
- [Receive-Only Procedure With Word Count- Polling Method: \[38\]](#)
- [Transmit-Only Procedure With and Without Word Count- Polling Method: \[39\]](#)
- [Transmit-Only Procedure With and Without Word Count- Interrupt Method: \[40\]](#)
- [Transmit and Receive Procedure with Word Count- Polling Method: \[41\]](#)
- [Transmit and Receive Procedure with Word Count - Interrupt Method: \[42\]](#)
- [MCSPI Register Summary: \[43\]](#)
- [MCSPI Register Description: \[44\] \[45\] \[46\]](#)

Table 24-306. MCSPI_IRQENABLE

| | | | |
|-------------------------|--|-----------------|--------------------------------------|
| Address Offset | 0x11C | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Physical Address | See Table 24-291 . | | |
| Description | This register allows enabling/disabling of the module internal sources of interrupt, on an event-by-event basis. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|-----|----|----------|----|-----------------|----|----------------------|---|------------------|---|----------|---|-----------------|---|----------------------|---|------------------|--|----------|--|-----------------|--|----------------------|--|------------------|--|---------------------|--|-----------------|--|----------------------|--|------------------|--|
| RESERVED | | | | | | | | | | | | | | EOW_ENABLE | | WKE | | RESERVED | | RX3_FULL_ENABLE | | TX3_UNDERFLOW_ENABLE | | TX3_EMPTY_ENABLE | | RESERVED | | RX2_FULL_ENABLE | | TX2_UNDERFLOW_ENABLE | | TX2_EMPTY_ENABLE | | RESERVED | | RX1_FULL_ENABLE | | TX1_UNDERFLOW_ENABLE | | TX1_EMPTY_ENABLE | | RX0_OVERFLOW_ENABLE | | RX0_FULL_ENABLE | | TX0_UNDERFLOW_ENABLE | | TX0_EMPTY_ENABLE | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|--------|
| 31:18 | RESERVED | Reads return 0. | RW | 0x0000 |
| 17 | EOW_ENABLE | End of Word count Interrupt Enable. 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 16 | WKE | Wake-up event interrupt enable in slave mode when an active control signal is detected on the SPIEN line programmed in the MCSPI_CH0CONF[SPIENSLV] bit 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 15 | RESERVED | Reads returns 0. | RW | 0 |
| 14 | RX3_FULL_ENABLE | Receiver register Full Interrupt Enable. Channel 3 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 13 | TX3_UNDERFLOW_ENABLE | Transmitter register Underflow Interrupt Enable. Channel 3 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 12 | TX3_EMPTY_ENABLE | Transmitter register Empty Interrupt Enable. Channel 3 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 11 | RESERVED | Reads return 0. | RW | 0 |
| 10 | RX2_FULL_ENABLE | Receiver register Full Interrupt Enable. Channel 2 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 9 | TX2_UNDERFLOW_ENABLE | Transmitter register Underflow Interrupt Enable. Channel 2 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|------|-------|
| 8 | TX2_EMPTY_ENABLE | Transmitter register Empty Interrupt Enable. Channel 2 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 7 | RESERVED | Reads return 0. | RW | 0 |
| 6 | RX1_FULL_ENABLE | Receiver register Full Interrupt Enable. Channel 1 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 5 | TX1_UNDERFLOW_ENABLE | Transmitter register Underflow Interrupt Enable. Channel 1 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 4 | TX1_EMPTY_ENABLE | Transmitter register Empty Interrupt Enable. Channel 1 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 3 | RX0_OVERFLOW_ENABLE | Receiver register Overflow Interrupt Enable. Channel 0 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 2 | RX0_FULL_ENABLE | Receiver register Full Interrupt Enable. Channel 0 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 1 | TX0_UNDERFLOW_ENABLE | Transmitter register Underflow Interrupt Enable. Channel 0 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |
| 0 | TX0_EMPTY_ENABLE | Transmitter register Empty Interrupt Enable. Channel 0 0x0: Interrupt disabled 0x1: Interrupt enabled | RW | 0 |

Table 24-307. Register Call Summary for Register MCSPI_IRQENABLE

Multichannel Serial Port Interface (MCSPI)

- [Interrupts: \[0\]](#)
- [Interrupt-Driven Operation: \[1\]](#)
- [Polling: \[2\]](#)
- [Transitions From Smart-Idle Mode to Normal Mode: \[3\] \[4\]](#)
- [MCSPI Operational Modes: \[5\] \[6\]](#)
- [Transmit-Only Procedure With and Without Word Count- Interrupt Method: \[7\] \[8\] \[9\]](#)
- [Transmit and Receive Procedure with Word Count - Interrupt Method: \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [MCSPI Register Summary: \[15\]](#)

Table 24-308. MCSPI_WAKEUPENABLE

| | | | |
|-------------------------|---|-----------------|--------------------------------------|
| Address Offset | 0x120 | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Physical Address | See Table 24-291 . | | |
| Description | The wake-up enable register allows enabling and disabling of the module internal sources of wakeup on event-by-event basis. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WKEN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reads returns 0. | RW | 0x0000 0000 |
| 0 | WKEN | Wake-up functionality in slave mode when an active control signal is detected on the SPIEN line programmed in the MCSPI_CH0CONF[SPIENSLV] bit 0x0: The event is not allowed to wake-up the system, even if the global control bit MCSPI_SYSCONF[EnaWakeUp] is set. 0x1: The event is allowed to wake-up the system if the global control bit MCSPI_SYSCONF[EnaWakeUp] is set. | RW | 0 |

Table 24-309. Register Call Summary for Register MCSPI_WAKEUPENABLE

Multichannel Serial Port Interface (MCSPI)

- [Wake-Up Event in Smart-Idle Mode: \[0\]](#)
- [Transitions From Smart-Idle Mode to Normal Mode: \[1\]](#)
- [Force-Idle Mode: \[2\]](#)
- [MCSPI Register Summary: \[3\]](#)

Table 24-310. MCSPI_SYST

| | | | |
|-------------------------|---|-----------------|--------------------------------------|
| Address Offset | 0x124 | Instance | MCSPi1 MCSPi2 MCSPi3 MCSPi4 |
| Physical Address | See Table 24-291 . | | |
| Description | This register is used to check the correctness of the system interconnect either internally to peripheral bus, or externally to device I/O pads, when the module is configured in system test (SYSTEST) mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----------|------------|------------|------|--------|----------|----------|---------|---------|---------|---------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SSB | SPIENDIR | SPIDATDIR1 | SPIDATDIR0 | WAKD | SPICLK | SPIDAT_1 | SPIDAT_0 | SPIEN_3 | SPIEN_2 | SPIEN_1 | SPIEN_0 | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | RESERVED | Reads returns 0. | RW | 0x00000 |
| 11 | SSB | Set status bit 0x0: No action. Writing 0 does not clear already set status bits. This bit must be cleared before trying to clear a status bit of the <MCSPI_IRQSTATUS> register. 0x1: Force to 1 all status bits of MCSPI_IRQSTATUS register. Writing 1 into this bit sets to 1 all status bits in the <MCSPI_IRQSTATUS> register. | RW | 0 |
| 10 | SPIENDIR | Set the direction of the SPIEN[3:0] lines and SPICLK line. 0x0: Output (as in master mode) 0x1: Input (as in slave mode) | RW | 0 |
| 9 | SPIDATDIR1 | Set the direction of the SPIDAT[1]. 0x0: Output 0x1: Input | RW | 0 |
| 8 | SPIDATDIR0 | Set the direction of the SPIDAT[0]. 0x0: Output 0x1: Input | RW | 0 |
| 7 | WAKD | SWAKEUP output (signal data value of internal signal to system). The signal is driven high or low according to the value written into this register bit. 0x0: The pin is driven low. 0x1: The pin is driven high. | RW | 0 |
| 6 | SPICLK | SPICLK line (signal data value) If MCSPI_SYST[SPIENDIR] = 1 (input mode direction), this bit returns the value on the CLKSPI line (high or low), and a write into this bit has no effect. If MCSPI_SYST[SPIENDIR] = 0 (output mode direction), the CLKSPI line is driven high or low according to the value written into this register. | RW | 0 |
| 5 | SPIDAT_1 | SPIDAT[1] line (signal data value) If MCSPI_SYST[SPIDATDIR1] = 0 (output mode direction), the SPIDAT[1] line is driven high or low according to the value written into this register. If MCSPI_SYST[SPIDATDIR1] = 1 (input mode direction), this bit returns the value on the SPIDAT[1] line (high or low), and a write into this bit has no effect. | RW | 0 |
| 4 | SPIDAT_0 | SPIDAT[0] line (signal data value) If MCSPI_SYST[SPIDATDIR0] = 0 (output mode direction), the SPIDAT[0] line is driven high or low according to the value written into this register. If MCSPI_SYST[SPIDATDIR0] = 1 (input mode direction), this bit returns the value on the SPIDAT[0] line (high or low), and a write into this bit has no effect. | RW | 0 |
| 3 | SPIEN_3 | SPIEN[3] line (signal data value) If MCSPI_SYST[SPIENDIR] = 0 (output mode direction), the SPIEN[3] line is driven high or low according to the value written into this register. If MCSPI_SYST[SPIENDIR] = 1 (input mode direction), this bit returns the value on the SPIEN[3] line (high or low), and a write into this bit has no effect. | RW | 0 |
| 2 | SPIEN_2 | SPIEN[2] line (signal data value) If MCSPI_SYST[SPIENDIR] = 0 (output mode direction), the SPIEN[2] line is driven high or low according to the value written into this register. If MCSPI_SYST[SPIENDIR] = 1 (input mode direction), this bit returns the value on the SPIEN[2] line (high or low), and a write into this bit has no effect. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 1 | SPIEN_1 | SPIEN[1] line (signal data value) If MCSPI_SYST[SPIENDIR] = 0 (output mode direction), the SPIEN[1] line is driven high or low according to the value written into this register. If MCSPI_SYST[SPIENDIR] = 1 (input mode direction), this bit returns the value on the SPIEN[1] line (high or low), and a write into this bit has no effect. | RW | 0 |
| 0 | SPIEN_0 | SPIEN[0] line (signal data value) If MCSPI_SYST[SPIENDIR] = 0 (output mode direction), the SPIEN[0] line is driven high or low according to the value written into this register. If MCSPI_SYST[SPIENDIR] = 1 (input mode direction), this bit returns the value on the SPIEN[0] line (high or low), and a write into this bit has no effect. | RW | 0 |

Table 24-311. Register Call Summary for Register MCSPI_SYST

Multichannel Serial Port Interface (MCSPI)

- [MCSPI Register Summary: \[0\]](#)
- [MCSPI Register Description: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)

Table 24-312. MCSPI_MODULCTRL

| | | | |
|-------------------------|---|-----------------|--------------------------------------|
| Address Offset | 0x128 | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Physical Address | See Table 24-291 . | | |
| Description | This register is dedicated to the configuration of the serial port interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|---------|----|----|-------------|----|-------|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FDA | MOA | INITDLY | | | SYSTEM_TEST | MS | PIN34 | SINGLE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:9 | RESERVED | Reads returns 0. | RW | 0x000000 |
| 8 | FDA | FIFO DMA address 256-bit aligned This register is used when a FIFO is managed by the module and DMA connected to the controller provides only 256-bit aligned address. If this bit is set the enabled channel which uses the FIFO has its data managed through MCSPI_DAFTX and MCSPI_DAFRX registers instead of MCSPI_TX(i) and MCSPI_RX(i) registers. 0x0: FIFO data managed by MCSPI_TX(i) and MCSPI_RX(i) registers. 0x1: FIFO data managed by MCSPI_DAFTX and MCSPI_DAFRX registers. | RW | 0 |
| 7 | MOA | Multiple word OCP access: This register can only be used when a channel is enabled using a FIFO. It allows the system to perform multiple SPI word access for a single 32-bit OCP word access. This is possible for WL < 16. 0x0: Multiple word access disabled 0x1: Multiple word access enabled with FIFO | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 6:4 | INITDLY | Initial SPI delay for first transfer: This register is an option only available in SINGLE master mode. The controller waits for a delay to transmit the first SPI word after channel enabled and corresponding TX register filled. This delay is based on SPI output frequency clock. No clock output provided to the boundary and chip select is not active in 4-pin mode within this period. 0x0: No delay for first spi transfer. 0x1: The controller wait 4 SPI bus clock 0x2: The controller wait 8 SPI bus clock 0x3: The controller wait 16 SPI bus clock 0x4: The controller wait 32 SPI bus clock | RW | 0x0 |
| 3 | SYSTEM_TEST | Enables the system test mode 0x0: Functional mode 0x1: System test mode (SYSTEST) | RW | 0 |
| 2 | MS | Master/slave 0x0: Master - The module generates the SPICLK and SPIEN[3:0]. 0x1: Slave - The module receives the SPICLK and SPIEN[3:0]. | RW | 1 |
| 1 | PIN34 | Pin mode selection: This register is used to configure the SPI pin mode, in master or slave mode. If asserted the controller only use SIMO, SOMI, and SPICLK clock pin for SPI transfers. 0x0: SPIEN is used as a chip-select. 0x1: SPIEN is not used. In this mode all related options to chip-select have no meaning. | RW | 0 |
| 0 | SINGLE | Single channel/Multi Channel (master mode only) 0x0: More than one channel will be used in master mode. 0x1: Only one channel will be used in master mode. This bit must be set in Force SPIEN mode. | RW | 0 |

Table 24-313. Register Call Summary for Register MCSPI_MODULCTRL

Multichannel Serial Port Interface (MCSPI)

- [Single-Channel Master Mode: \[0\] \[1\]](#)
- [Force mcs pim_csx Mode: \[2\] \[3\]](#)
- [Chip-Select Timing Control: \[4\]](#)
- [Slave Mode: \[5\]](#)
- [MCSPI Operational Modes: \[6\] \[7\] \[8\]](#)
- [MCSPI Register Summary: \[9\]](#)
- [MCSPI Register Description: \[10\] \[11\]](#)

Table 24-314. MCSPI_CHxCONF

| | | | |
|------------------|--|----------|--|
| Address Offset | 0x12C + (0x14 * x) | Index | x= 0 to 3 for MCSPI1. x= 0 to 1 for MCSPI2 . x= 0 for MCSPI4 and MCSPI3. |
| Physical Address | See Table 24-291 . | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Description | This register is dedicated to the configuration of the channel 0 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|------|------|------|------|----|-------|-----|----------|----|-------|-------|----|------|------|------|------|-----|----|----|----|---|------|------|---|---|-----|-----|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | CLKG | FFER | FFEW | TCS0 | | SBPOL | SBE | SPIENSLV | | FORCE | TURBO | IS | DPE1 | DPE0 | DMAR | DMAW | TRM | | WL | | | EPOL | CLKD | | | POL | PHA | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:30 | RESERVED | Read returns 0. | R | 0x0 |
| 29 | CLKG | Clock divider granularity This register defines the granularity of channel clock divider: power of 2 or one clock cycle granularity. When this bit is set the register MCSPI_CHCTRL[EXTCLK] must be configured to reach a maximum of 4096 clock divider ratio. Then the clock divider ratio is a concatenation of MCSPI_CHCONF[CLKD] and MCSPI_CHCTRL[EXTCLK] values 0x0: Clock granularity of power of 2 0x1: One clock cycle granularity | RW | 0 |
| 28 | FFER | FIFO enabled for receive: Only one channel can have this bit field set. 0x0: The buffer is not used to receive data. 0x1: The buffer is used to receive data. | RW | 0 |
| 27 | FFEW | FIFO enabled for transmit: Only one channel can have this bit field set. 0x0: The buffer is not used to transmit data. 0x1: The buffer is used to transmit data. | RW | 0 |
| 26:25 | TCS0 | Chip-select time control This 2-bit field defines the number of interface clock cycles between CS toggling and first or last edge of SPI clock. 0x0: 0.5 clock cycle 0x1: 1.5 clock cycles 0x2: 2.5 clock cycles 0x3: 3.5 clock cycles | RW | 0x0 |
| 24 | SBPOL | Start-bit polarity 0x0: Start-bit polarity is held to 0 during SPI transfer. 0x1: Start-bit polarity is held to 1 during SPI transfer. | RW | 0 |
| 23 | SBE | Start-bit enable for SPI transfer 0x0: Default SPI transfer length as specified by WL bit field 0x1: Start bit D/CX added before SPI transfer polarity is defined by MCSPI_CH0CONF[SBPOL] | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 22:21 | SPIENSLV | Channel 0 only and slave mode only: SPI slave select signal detection. Reserved bits for other cases. 0x0: Detection enabled only on SPIEN[0] 0x1: Detection enabled only on SPIEN[1] 0x2: Detection enabled only on SPIEN[2] 0x3: Detection enabled only on SPIEN[3] | RW | 0x0 |
| 20 | FORCE | Manual SPIEN assertion to keep SPIEN active between SPI words (single channel master mode only). 0x0: Writing 0 into this bit drives low the SPIEN line when MCSPI_CHCONF(i)[EPOL]=0, and drives it high when MCSPI_CHCONF(i)[EPOL]=1. 0x1: Writing 1 into this bit drives high the SPIEN line when MCSPI_CHCONF(i)[EPOL]=0, and drives it low when MCSPI_CHCONF(i)[EPOL]=1. | RW | 0 |
| 19 | TURBO | Turbo mode 0x0: Turbo is deactivated (recommended for single SPI word transfer). 0x1: Turbo is activated to maximize the throughput for multiple SPI words transfer. | RW | 0 |
| 18 | IS | Input Select 0x0: Data line 0 (SPIDAT[0]) selected for reception 0x1: Data line 1 (SPIDAT[1]) selected for reception | RW | 1 |
| 17 | DPE1 | Transmission enable for data line 1 (SPIDATAGZEN[1]) 0x0: Data line 1 (SPIDAT[1]) selected for transmission 0x1: No transmission on Data Line1 (SPIDAT[1]) | RW | 1 |
| 16 | DPE0 | Transmission Enable for data line 0 (SPIDATAGZEN[0]) 0x0: Data Line0 (SPIDAT[0]) selected for transmission 0x1: No transmission on data line 0 (SPIDAT[0]) | RW | 0 |
| 15 | DMAR | DMA read request The DMA read request line is asserted when the channel is enabled and a new data is available in the receive register of the channel. The DMA read request line is deasserted on read completion of the receive register of the channel. 0x0: DMA read request disabled 0x1: DMA read request enabled | RW | 0 |
| 14 | DMAW | DMA write request. The DMA write request line is asserted when The channel is enabled and the transmitter register of the channel is empty. The DMA write request line is deasserted on load completion of the transmitter register of the channel. 0x0: DMA write request disabled 0x1: DMA write request enabled | RW | 0 |
| 13:12 | TRM | Transmit/receive modes 0x0: Transmit-and-receive mode 0x1: Receive-only mode 0x2: Transmit-only mode 0x3: Reserved | RW | 0x0 |

Multichannel Serial Port Interface

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 11:7 | WL | SPI word length 0x0: Reserved 0x1: Reserved 0x2: Reserved 0x3: The SPI word is 4 bits long 0x4: The SPI word is 5 bits long 0x5: The SPI word is 6 bits long 0x6: The SPI word is 7 bits long 0x7: The SPI word is 8 bits long 0x8: The SPI word is 9 bits long 0x9: The SPI word is 10 bits long 0xA: The SPI word is 11 bits long 0xB: The SPI word is 12 bits long 0xC: The SPI word is 13 bits long 0xD: The SPI word is 14 bits long 0xE: The SPI word is 15 bits long 0xF: The SPI word is 16 bits long 0x10: The SPI word is 17 bits long 0x11: The SPI word is 18 bits long 0x12: The SPI word is 19 bits long 0x13: The SPI word is 20 bits long 0x14: The SPI word is 21 bits long 0x15: The SPI word is 22 bits long 0x16: The SPI word is 23 bits long 0x17: The SPI word is 24 bits long 0x18: The SPI word is 25 bits long 0x19: The SPI word is 26 bits long 0x1A: The SPI word is 27 bits long 0x1B: The SPI word is 28 bits long 0x1C: The SPI word is 29 bits long 0x1D: The SPI word is 30 bits long 0x1E: The SPI word is 31 bits long 0x1F: The SPI word is 32 bits long | RW | 0x00 |
| 6 | EPOL | SPIEN polarity 0x0: SPIEN is held high during the ACTIVE state. 0x1: SPIEN is held low during the ACTIVE state. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 5:2 | CLKD | <p>Frequency divider for SPICLK (only when the module is a Master SPI device). A programmable clock divider divides the SPI reference clock (CLKSPIREF) with a 4-bit value, and results in a new clock SPICLK available to shift-in and shift-out data. By default the clock divider ratio has a power of 2 granularity when MCSPI_CHCONF[CLKG] is cleared. Otherwise this register is the 4-LSB bit of a 12-bit register concatenated with clock divider extension MCSPI_CHCTRL[EXTCLK] register. The value description below defines the clock ratio when MCSPI_CHCONF[CLKG] is set to 0.</p> <p>0x0: 1 0x1: 2 0x2: 4 0x3: 8 0x4: 16 0x5: 32 0x6: 64 0x7: 128 0x8: 256 0x9: 512 0xA: 1024 0xB: 2048 0xC: 4096 0xD: 8192 0xE: 16384 0xF: 32768</p> | RW | 0x0 |
| 1 | POL | <p>SPICLK polarity</p> <p>0x0: SPICLK is held high during the ACTIVE state 0x1: SPICLK is held low during the ACTIVE state</p> | RW | 0 |
| 0 | PHA | <p>SPICLK phase</p> <p>0x0: Data are latched on odd-numbered edges of SPICLK. 0x1: Data are latched on even-numbered edges of SPICLK.</p> | RW | 0 |

Table 24-315. Register Call Summary for Register MCSPI CHxCONF

- Multichannel SPI Protocol and Data Format: [0] [1] [2] [3] [4] [5] [6] [7]
- Transfer Format: [8]
- SPI Interface in Slave Mode: [9]
- Master Transmit-and-Receive Mode (Full Duplex): [10]
- Master Transmit-Only Mode (Half Duplex): [11]
- Master Receive-Only Mode (Half Duplex): [12]
- Single-Channel Master Mode: [13]
- Force mcsxim_csb Mode: [14] [15] [16] [17] [18] [19] [20] [21] [22] [23]
- Turbo Mode: [24]
- Start Bit Mode: [25] [26] [27] [28]
- Chip-Select Timing Control: [29]
- Programmable SPI Clock (mcsxim_clk): [30]
- Clock Ratio Granularity: [31] [32] [33] [34] [35]
- Dedicated Resources: [36] [37] [38] [39] [40] [41]
- Slave Transmit-and-Receive Mode: [42]
- Slave Transmit-Only Mode: [43]
- Slave Receive-Only Mode: [44]
- FIFO Buffer Management: [45] [46] [47]
- Buffer Almost Full: [48] [49]
- Buffer Almost Empty: [50] [51]
- TXx_EMPTY: [52]
- RXx_FULL: [53]
- TXx_EMPTY: [54]
- RXx_FULL: [55]
- DMA Requests: [56] [57]
- Wake-Up Event in Smart-Idle Mode: [58]
- MCSPI Operational Modes: [59] [60] [61] [62] [63] [64] [65] [66] [67] [68] [69] [70] [71] [72] [73] [74]
- MCSPI Register Summary: [75]

Table 24-316. MCSPI CHxSTAT

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x130 + (0x14 * x) | Index | x= 0 to 3 for MCSPI1. x= 0 to 1 for MCSPI2 . x= 0 for MCSPI4 and MCSPI3. |
| Physical Address | See Table 24-291 . | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Description | This register provides status information about transmitter and receiver registers of channel 0. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|------|------|------|-----|-----|-----|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RXFF | RXFE | TXFF | TXFE | EOT | TXS | RXS | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:7 | RESERVED | Read returns 0. | R | 0x0000000 |
| 6 | RXFFF | Channel "i" FIFO receive buffer full status Read 0x0: FIFO receive buffer is not full Read 0x1: FIFO receive buffer is full | R | 0 |
| 5 | RXFFE | Channel "i" FIFO receive buffer empty status Read 0x0: FIFO receive buffer is not empty Read 0x1: FIFO receive buffer is empty | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 4 | TXFFF | Channel "i" FIFO transmit buffer full status Read 0x0: FIFO transmit buffer is not full Read 0x1: FIFO transmit buffer is full | R | 0 |
| 3 | TXFFE | Channel "i" FIFO transmit buffer empty status Read 0x0: FIFO transmit buffer is not empty Read 0x1: FIFO transmit buffer is empty | R | 0 |
| 2 | EOT | Channel "i" end of transfer status. The definitions of beginning and end of transfer vary with master versus slave and the transfer format (transmit/receive modes, turbo mode). See dedicated chapters for details. Read 0x0: This flag is automatically cleared when the shift register is loaded with the data from the transmitter register (beginning of transfer). Read 0x1: This flag is automatically set to one at the end of an SPI transfer. | R | 0 |
| 1 | TXS | Channel "i" transmitter register status Read 0x0: Register is full. Read 0x1: Register is empty. | R | 0 |
| 0 | RXS | Channel "i" receiver register status Read 0x0: Register is empty. Read 0x1: Register is full. | R | 0 |

Table 24-317. Register Call Summary for Register MCSPI_CHxSTAT

Multichannel Serial Port Interface (MCSPI)

- [Master Transmit-and-Receive Mode \(Full Duplex\): \[0\] \[1\] \[2\]](#)
- [Master Transmit-Only Mode \(Half Duplex\): \[3\]](#)
- [Master Receive-Only Mode \(Half Duplex\): \[4\]](#)
- [Programming Tips When Switching to Another Channel: \[5\]](#)
- [Force mcs pim_csx Mode: \[6\] \[7\] \[8\]](#)
- [Turbo Mode: \[9\]](#)
- [Dedicated Resources: \[10\] \[11\]](#)
- [Slave Transmit-and-Receive Mode: \[12\]](#)
- [Slave Transmit-Only Mode: \[13\]](#)
- [Slave Receive-Only Mode: \[14\]](#)
- [End of Transfer Management: \[15\]](#)
- [MCSPI Operational Modes: \[16\] \[17\]](#)
- [Transmit-Only Procedure With and Without Word Count- Polling Method: \[18\] \[19\]](#)
- [Transmit-Only Procedure With and Without Word Count- Interrupt Method: \[20\] \[21\]](#)
- [Transmit and Receive Procedure without Word Count- Polling Method: \[22\] \[23\]](#)
- [MCSPI Register Summary: \[24\]](#)

Table 24-318. MCSPI_CHxCTRL

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x134 + (0x14 * x) | Index | x= 0 to 3 for MCSPI1. x= 0 to 1 for MCSPI2 . x= 0 for MCSPI4 and MCSPI3. |
| Physical Address | See Table 24-291 . | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Description | This register is dedicated to enable channel 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | EXTCLK | | | | | | | | RESERVED | | | | | | | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Read returns 0. | RW | 0x0000 |
| 15:8 | EXTCLK | Clock ratio extension: This register is used to concatenate with MCSPI_CHCONF[CLKD] register for clock ratio only when granularity is one clock cycle (MCSPI_CHCONF[CLKG] set to 1). Then the maximum value reached is 4096 clock divider ratio. 0x0: Clock ratio is CLKD + 1. 0x1: Clock ratio is CLKD + 1 + 16. 0xFF: Clock ratio is CLKD + 1 + 4080. | RW | 0x00 |
| 7:1 | RESERVED | Read returns 0. | RW | 0x00 |
| 0 | EN | Channel enable 0x0: Channel "i" is not active. 0x1: Channel "i" is active. | RW | 0 |

Table 24-319. Register Call Summary for Register MCSPI_CHxCTRL

Multichannel Serial Port Interface (MCSPI)

- [Master Transmit-and-Receive Mode \(Full Duplex\): \[0\]](#)
- [Force mcs pim_csx Mode: \[1\] \[2\]](#)
- [Clock Ratio Granularity: \[3\]](#)
- [Dedicated Resources: \[4\] \[5\]](#)
- [MCSPI Operational Modes: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [Receive-Only Procedure With Word Count- Polling Method: \[17\] \[18\]](#)
- [Transmit-Only Procedure With and Without Word Count- Polling Method: \[19\] \[20\]](#)
- [Transmit-Only Procedure With and Without Word Count- Interrupt Method: \[21\] \[22\]](#)
- [Transmit and Receive Procedure with Word Count- Polling Method: \[23\] \[24\]](#)
- [Transmit and Receive Procedure with Word Count - Interrupt Method: \[25\] \[26\]](#)
- [Transmit and Receive Procedure without Word Count- Polling Method: \[27\] \[28\]](#)
- [MCSPI Register Summary: \[29\]](#)

Table 24-320. MCSPI_TXx

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x138 + (0x14 * x) | Index | x= 0 to 3 for MCSPI1. x= 0 to 1 for MCSPI2 . x= 0 for MCSPI4 and MCSPI3. |
| Physical Address | See Table 24-291 . | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Description | This register contains a single SPI word to transmit on the serial link, what ever SPI word length is. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TDATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------------------|------|-------------|
| 31:0 | TDATA | Channel 0 data to transmit | RW | 0x0000 0000 |

Table 24-321. Register Call Summary for Register MCSPI_TXx

Multichannel Serial Port Interface (MCSPI)

- [Master Transmit-and-Receive Mode \(Full Duplex\): \[0\] \[1\] \[2\] \[3\]](#)
- [Master Transmit-Only Mode \(Half Duplex\): \[4\]](#)
- [Master Receive-Only Mode \(Half Duplex\): \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [Force mcs pim_csx Mode: \[10\]](#)
- [Dedicated Resources: \[11\] \[12\] \[13\] \[14\] \[15\]](#)
- [Slave Transmit-and-Receive Mode: \[16\] \[17\]](#)
- [Slave Receive-Only Mode: \[18\] \[19\] \[20\]](#)
- [Interrupt Events in Master Mode: \[21\]](#)
- [TXx_EMPTY: \[22\] \[23\] \[24\]](#)
- [TXx_UNDERFLOW: \[25\] \[26\] \[27\]](#)
- [Interrupt Events in Slave Mode: \[28\]](#)
- [TXx_EMPTY: \[29\] \[30\] \[31\]](#)
- [TXx_UNDERFLOW: \[32\] \[33\]](#)
- [Interrupt-Driven Operation: \[34\]](#)
- [Polling: \[35\]](#)
- [DMA Requests: \[36\] \[37\]](#)
- [Common Transfer Procedures with FIFO- Polling Method: \[38\]](#)
- [MCSPI Register Summary: \[39\]](#)

Table 24-322. MCSPI_RXx

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x13C + (0x14 * x) | Index | x= 0 to 3 for MCSPI1. x= 0 to 1 for MCSPI2 . x= 0 for MCSPI4 and MCSPI3. |
| Physical Address | See Table 24-291 . | Instance | MCSPI1 MCSPI2 MCSPI3 MCSPI4 |
| Description | This register contains a single SPI word received through the serial link, what ever SPI word length is. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RDATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------------|------|-------------|
| 31:0 | RDATA | Channel 0 received data | R | 0x0000 0000 |

Table 24-323. Register Call Summary for Register MCSPI_RXx

Multichannel Serial Port Interface (MCSPI)

- Master Transmit-and-Receive Mode (Full Duplex): [0] [1]
- Master Transmit-Only Mode (Half Duplex): [2] [3] [4]
- Master Receive-Only Mode (Half Duplex): [5] [6]
- Force mcsxim_csx Mode: [7] [8]
- Turbo Mode: [9] [10]
- Dedicated Resources: [11] [12] [13]
- Slave Transmit-and-Receive Mode: [14]
- Slave Transmit-Only Mode: [15] [16]
- End of Transfer Management: [17]
- Interrupt Events in Master Mode: [18]
- RXx_FULL: [19] [20] [21]
- Interrupt Events in Slave Mode: [22]
- RXx_FULL: [23] [24] [25]
- RX0_OVERFLOW: [26] [27]
- Interrupt-Driven Operation: [28]
- Polling: [29]
- DMA Requests: [30]
- Wake-Up Event in Smart-Idle Mode: [31]
- MCSPI Operational Modes: [32] [33]
- Receive-Only Procedure With Word Count- Polling Method: [34]
- Transmit and Receive Procedure with Word Count- Polling Method: [35]
- Transmit and Receive Procedure with Word Count - Interrupt Method: [36]
- Transmit and Receive Procedure without Word Count- Polling Method: [37]
- MCSPI Register Summary: [38]

Table 24-324. MCSPI_XFERLEVEL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x17C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | | See Table 24-291 . | | | | | | | | | | | | | | | | Instance | | MCSPI1 MCSPI2 MCSPI3 MCSPI4 | | | | | | | | | | | | | | | |
| Description | | This register provides transfer levels needed while using FIFO buffer during transfer. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|-----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| WCNT | | | | | | | | | | | | | | | | AFL | | | | | | | | AEL | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | WCNT | <p>SPI word counter. This register holds the programmable value of number of SPI word to be transferred on channel which is using the FIFO buffer. When transfer had started, a read back in this register returns the current SPI word transfer index.</p> <p>0x0: Counter not used</p> <p>0x1: One word</p> <p>0xFFFFE: 65534 SPI word</p> <p>0xFFFFF: 65535 SPI word</p> | RW | 0x0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 15:8 | AFL | <p>Buffer almost full</p> <p>This register holds the programmable almost full level value used to determine almost full buffer condition. If the user wants an interrupt or a DMA read request to be issued during a receive operation when the data buffer holds at least n bytes, then the buffer MCSPI_MODULCTRL[AFL] must be set with n-1. The size of this register is defined by the generic parameter FFNBYTE.</p> <p>0x0: 1 byte 0x1: 2 bytes 0xFE: 255bytes 0xFF: 256bytes</p> | RW | 0x00 |
| 7:0 | AEL | <p>Buffer almost empty. This register holds the programmable almost empty level value used to determine almost empty buffer condition. If the user wants an interrupt or a DMA write request to be issued during a transmit operation when the data buffer is able to receive n bytes, then the buffer MCSPI_MODULCTRL[AEL] must be set with – 1.</p> <p>0x0: 1 byte 0x1: 2 bytes 0xFE: 255 bytes 0xFF: 256bytes</p> | RW | 0x00 |

Table 24-325. Register Call Summary for Register MCSPI_XFERLEVEL

Multichannel Serial Port Interface (MCSPI)

- [FIFO Buffer Management: \[0\] \[1\]](#)
- [Buffer Almost Full: \[2\]](#)
- [Buffer Almost Empty: \[3\]](#)
- [End of Transfer Management: \[4\] \[5\]](#)
- [TXx_EMPTY: \[6\] \[7\]](#)
- [RXx_FULL: \[8\]](#)
- [End Of Word Count: \[9\] \[10\]](#)
- [TXx_EMPTY: \[11\] \[12\]](#)
- [RXx_FULL: \[13\]](#)
- [End Of Word Count: \[14\]](#)
- [MCSPI Register Summary: \[15\]](#)
- [MCSPI Register Description: \[16\]](#)

24.5 Multichannel Buffered Serial Port (McBSP)

This section introduces the multichannel buffered serial port (McBSP)

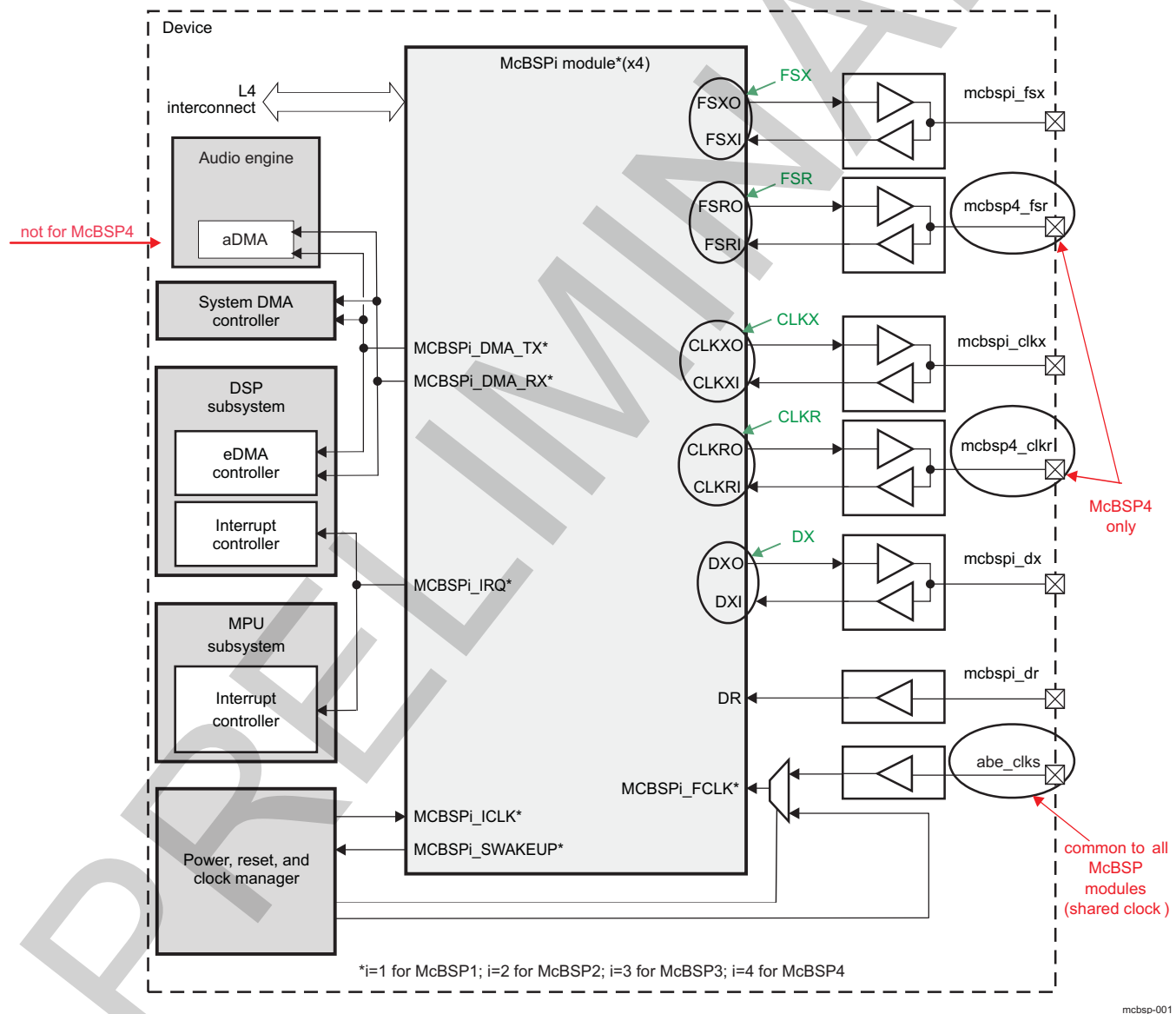
24.5.1 McBSP Overview

The McBSP provides a full-duplex direct serial interface between the device and other devices in a system such as other application devices (digital base band), audio and voice codec, etc. Because of its high level of versatility, it can accommodate a wide range of peripherals and clocked frame oriented protocols (for more information, see [Section 24.5.1.1, McBSP Features](#)).

The device provides four instances of the McBSP module.

[Figure 24-111](#) is an overview of the McBSP in the device.

Figure 24-111. McBSP Highlight



24.5.1.1 McBSP Features

The main features of the McBSP modules are:

- L4 interconnect slave interface supports:

- 32-bit data bus width
- 32-bit access supported
- 16-/8-bit access not supported
- 10-bit address bus width
- Burst mode not supported
- Write nonposted transaction mode supported
- 128 × 32-bit words (512 bytes) for each buffer for transmit/receive operations
- Transmit and receive direct memory access (DMA) requests triggered with programmable FIFO thresholds
- Serial interface description
 - 6-pin configuration (McBSP 4 only)
 - 4-pin configuration (McBSP1, 2, 3)
 - Full-duplex communication
 - Multichannel selection modes
 - Support to enable or block transfers in each channel
 - 128 channels for transmission and reception
 - Direct interface to industry-standard codecs, analog interface chips (AICs), and other serially connected A/D and D/A devices:
 - Inter-IC sound (I2S™) compliant devices
 - Pulse code modulation (PCM) devices
 - Time division multiplexed (TDM) bus devices

CAUTION

McBSP modules do not offer support for μ -law and A-law companding, two partitions mode dynamic reassignment, AC'97, and SPI protocol.

- A wide selection of data sizes: 8, 12, 16, 20, 24, and 32 bits
- Bit reordering (send/receive least-significant bit [LSB])
- Clock and frame-synchronization generation support:
 - Independent clocking and framing for reception and for transmission up to 48 MHz
 - Support for external generation of clock signals and frame-synchronization (frame-sync) signals
 - A programmable sample rate generator (SRG) for internal generation and control of clock signals and frame-sync signals
 - Programmable polarity for frame-sync pulses and clock signals

NOTE:

- McBSP modules do not support features such as retransmit or re-receive of an erroneous frame or word.
- McBSP modules support dual-phase frames to provide I2S fully compliant capabilities. This dual-phase mode, however, is limited to one channel (or word) for each phase instead of 128 channels maximum for single-phase mode.

24.5.2 McBSP Environment

This section describes the intended functions for the McBSP module from an environment point of view (that is, external connections). It presents the McBSP connectivity options, lists the possible interfaces, and details the protocol and data format used in each case.

24.5.2.1 McBSP Functions

The device provides four instances of the McBSP module called McBSP1, McBSP2, McBSP3, and McBSP4.

The recommended use (nonexhaustive) for each McBSP module in the device is:

- McBSP1: Digital baseband (DBB) data
- McBSP2: Audio data
- McBSP3: Bluetooth® voice data
- McBSP4: Midi data

[Table 24-326](#) describes the functions and the corresponding application fields.

Table 24-326. Functions Description

| Function | Application Field | Recommended McBSP Module | Description |
|------------------|--|--------------------------|---|
| Control and data | DBB data | McBSP1 | Serial interface to transfer data |
| Audio data | Audio data without audio buffer and sidetone feature | McBSP2 | Audio interface to transfer audio data with I2S |
| | Midi data | McBSP4 | |
| Voice data | Bluetooth voice data without sidetone feature | McBSP3 | Voice interface to transfer voice data with PCM |

24.5.2.2 McBSP Signals Descriptions

The four McBSP modules consist of a data-flow path and a control path connected to external devices by a serial interface with 6-pin configuration (McBSP 4 only) or 4-pin configuration (McBSP1, 2, 3).

For a McBSP module with 6-pin configuration, an internal loopback capability between transmitter and receiver clock signals, and both frame-sync signals, enables using the McBSP module with 4-pin configuration. The related internal multiplexers are controlled through the system control module on the device (see [Section 24.5.3, McBSP Integration](#)). [Table 24-327](#) describes the inputs/outputs (I/Os).

Table 24-327. I/O Description

| Pin Name | I/O | Description | Internal Signal Name | Reset Value | Control and Data | Audio Data | Voice Data |
|-----------------|---------------------|---|----------------------|-------------|------------------|------------|------------|
| abe_clks | I | External clock (shared by all McBSP modules) | CLKS | 0 | ✓ | ✓ | ✓ |
| abe_mcbspi_dr | I | Receive serial data | DR | Z | ✓ | ✓ | ✓ |
| abe_mcbspi_dx | (I)O ⁽¹⁾ | Transmit serial data | DX | Z | ✓ | ✓ | ✓ |
| abe_mcbspi_clkx | I/O ⁽²⁾ | Transmit clock ⁽³⁾ | CLKX | Z | ✓ | ✓ | ✓ |
| abe_mcbspi_fsx | I/O ⁽²⁾ | Transmit frame synchronization ⁽⁴⁾ | FSX | Z | ✓ | ✓ | ✓ |
| mcbbsp4_dr | I | Receive serial data | DR | Z | ✓ | ✓ | ✓ |
| mcbbsp4_dx | (I)O ⁽¹⁾ | Transmit serial data | DX | Z | ✓ | ✓ | ✓ |
| mcbbsp4_clkx | I/O ⁽²⁾ | Transmit clock ⁽³⁾ | CLKX | Z | ✓ | ✓ | ✓ |
| mcbbsp4_fsx | I/O ⁽²⁾ | Transmit frame synchronization ⁽⁴⁾ | FSX | Z | ✓ | ✓ | ✓ |
| mcbbsp4_clkr | I/O ⁽²⁾ | Receive clock ⁽⁵⁾ | CLKR | Z | ✓ | | |
| mcbbsp4_fsr | I/O ⁽²⁾ | Receive frame synchronization ⁽⁶⁾ | FSR | Z | ✓ | | |

⁽¹⁾ i = 1 to 3; I = Input; O = Output; I/O = Bidirectional

⁽²⁾ For details of the I/O selection, see [Section 24.5.2.3.1, McBSP Modes](#).

⁽³⁾ This signal is also used as CLKR when it is configured as output.

⁽⁴⁾ This signal is also used as FSR when it is configured as output.

⁽⁵⁾ This signal is also used as CLKX when it is configured as input.

⁽⁶⁾ This signal is also used as FSX when it is configured as input.

- The abe_clks pin can be used to inject an external clock. This clock is used to generate control signals depending on the module internal configuration (see [Section 24.5.4.9, McBSP SRG](#)). The CLKS signal of the McBSP modules is linked to an external signal through the abe_clks pin, but the CLKS signal can also be linked to an internal clock provided by the power, reset, and clock management (PRCM) module of the device. For more information, see [Section 24.5.3, McBSP Integration](#).
- Data are transmitted to external devices interfacing with McBSP modules through the mcbspi_dx pin. Data from those devices are received on the mcbspi_dr pin.

NOTE: The mcbspi_dx pin is an I/O signal to use the McBSP module in half-duplex mode.

- Control information is communicated by the following pins:
 - mcbspi_clkx (transmit clock)
 - mcbbsp4_clkr (receive clock)
 - mcbspi_fsx (transmit frame-sync)
 - mcbbsp4_fsr (receive frame-sync)

CAUTION

External pins mcbbsp4_clkr and mcbbsp4_fsr are connected to pads only for McBSP4; other McBSP modules do not have these connections. For these modules, CLKR and FSR signals sources are mcbspi_clkx and mcbspi_fsx pins, respectively. Consequently, there is a light restriction on other McBSP modules when used in full-duplex mode. Reception and transmission use the same clock signal and the same frame-sync signal.

24.5.2.3 McBSP Functions Description**24.5.2.3.1 McBSP Modes**

For all McBSP functions, McBSP modules can operate in master or slave mode. The difference between these modes is the definition of the source of McBSP clocks and McBSP frames synchronization:

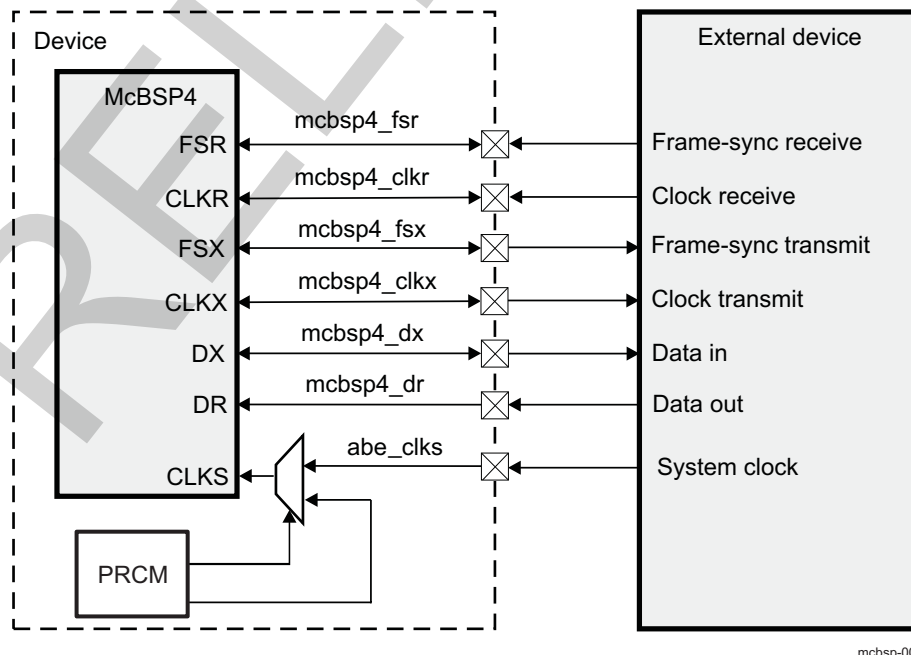
- Master mode: McBSP module provides them to the external device
- Slave mode: McBSP module receives them from the external device

The choice between the two modes depends on technical data of the external device and the type of interface (protocols and data formats). For one McBSP module, there are four possible functions:

- Transmit-and-receive master mode
- Transmit-and-receive slave mode
- Transmit master mode and receive slave mode
- Transmit slave mode and receive master mode

NOTE: If the McBSP has a serial interface with 4-pin configuration (McBSP1, 2, 3), only modes 1 and 2 are possible.

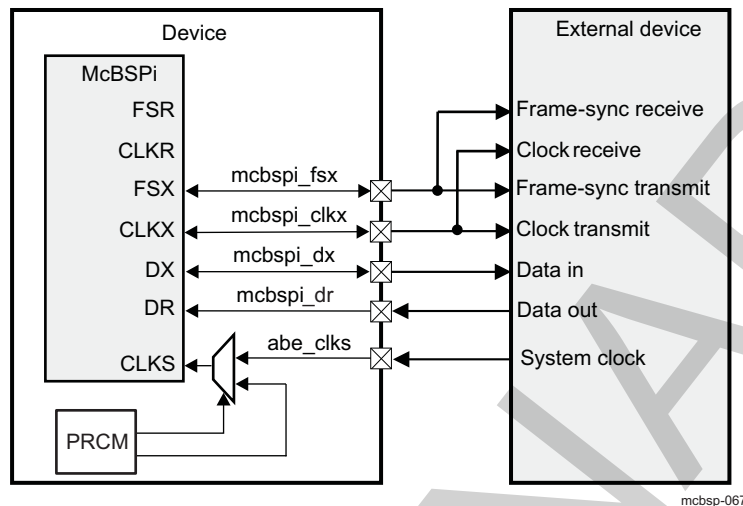
Figure 24-112 shows the connection between McBSP4 (6-pin configuration) and an external device in transmit master mode and receive slave mode.

Figure 24-112. Mode Overview of McBSP4

mcbbsp-003

Figure 24-113 shows the connection between the McBSPi module, where i = 1, 2, or 3 (4-pin configuration) and an external device in transmit and receive master mode.

Figure 24-113. Mode Overview of McBSPi

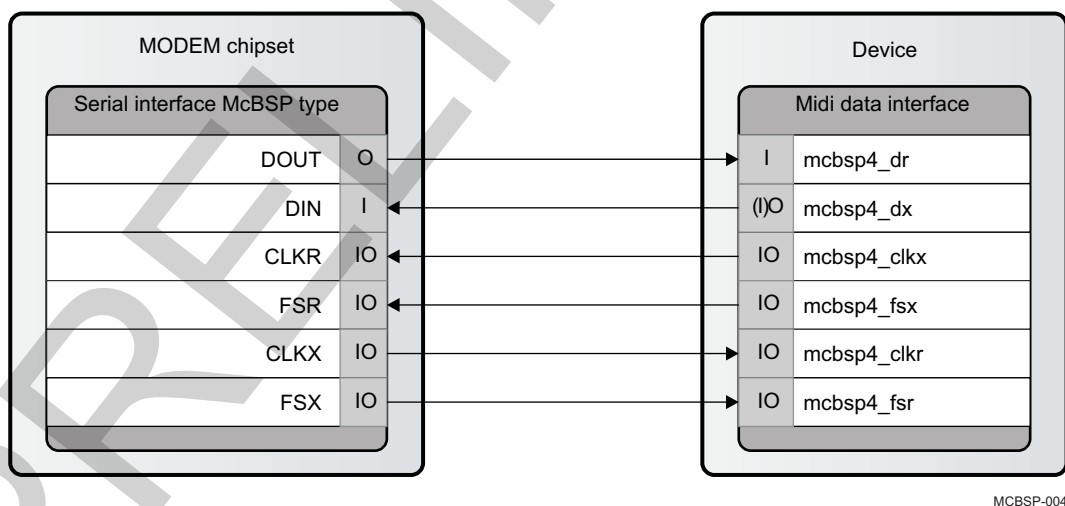


24.5.2.3.2 McBSP Functions

24.5.2.3.2.1 McBSP Function 1: Control and Data

In full-duplex mode (reception and transmission use independent clock signals and frame-sync signals), the McBSP module can be used to exchange control and data with an external chipset, allowing the device to be interfaced with a modem device. Figure 24-114 shows typical connections between device and modem chipset to show the Midi data application.

Figure 24-114. Midi Data Application



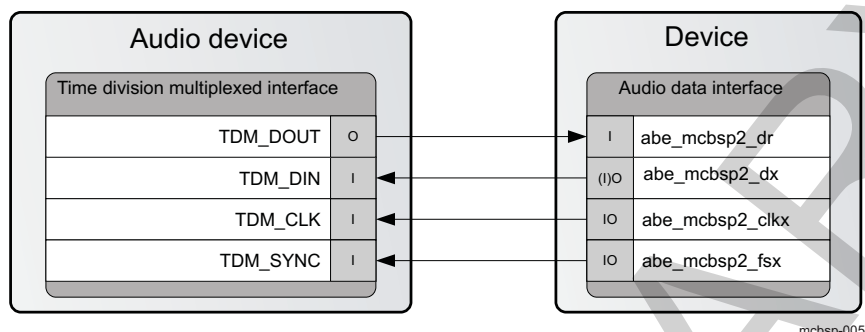
In Figure 24-114, McBSP4 is configured in transmit master mode and receive slave mode.

24.5.2.3.2.2 McBSP Function 2: Audio Data

The McBSP module is connected to audio devices through the I2S interface. The I2S link serial interface is a TDM slot-based serial interface that is used to transfer audio data. Those audio devices can be either AICs or other serially connected A/D and D/A devices.

Figure 24-115 shows typical connections between a device and a typical device of analog audio interface to show the audio data application. The typical device contains several audio analog inputs and outputs and digital microphone inputs.

Figure 24-115. Audio Data Application



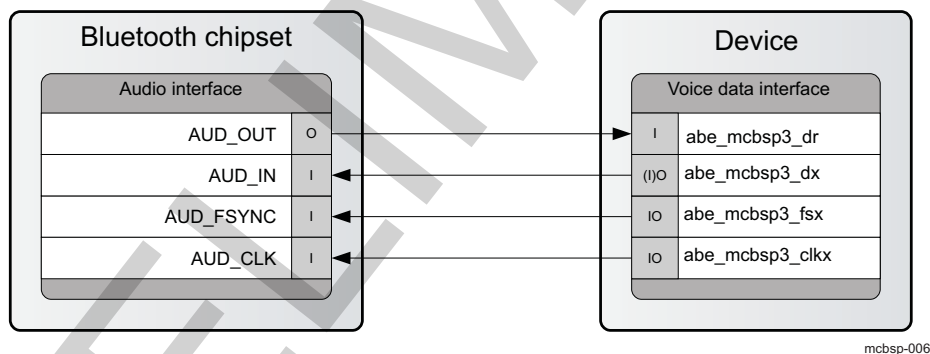
In Figure 24-115, McBSP2 is configured in transmit-and-receive master mode.

24.5.2.3.3 McBSP Function 3: Voice Data

The McBSP module is connected to a voice device through the PCM interface. The PCM link serial interface is a TDM slot-based serial interface that is used to transfer voice data. The voice devices can be modem chipsets, Bluetooth chipsets, or other devices with voice data interface.

Figure 24-116 shows typical connections between a device and a Bluetooth chipset (TI BRF6300 or TI BRF6350) to show voice data application.

Figure 24-116. Voice Data Application



In Figure 24-116, McBSP3 is configured in transmit-and-receive master mode.

24.5.2.4 McBSP Protocols and Data Formats

The McBSP module can use one of the three protocols with associated data formats:

- Serial protocol to exchange serial data
- Audio protocol to exchange the audio samples
- Voice protocol to exchange the voice samples

The McBSP modules offer the flexibility to modify the following parameters to adapt to the device features as described in the following subsections.

24.5.2.4.1 Words, Frames, and Phases Definitions

24.5.2.4.1.1 Words or Channels

The data bits are transferred (transmission or reception) in a group called a serial word or channel. The number of bits in a word (length) is programmable through bit fields (McBSPi.MCBSPLP_RCR1_REG[7:5] RWDLEN1 and McBSPi.MCBSPLP_RCR2_REG[7:5] RWDLEN2, McBSPi.MCBSPLP_XCR1_REG[7:5] XWDLEN1 and McBSPi.MCBSPLP_XCR2_REG[7:5] XWDLEN2) and can be 8, 12, 16, 20, 24, or 32 bits (see [Section 24.5.4.8.3, Clocking and Framing Data](#)). The McBSP module uses clock signals to control the time for each bit transfer. Data are sampled/driven on the rising or falling edge of clock signals. This clock polarity is programmable through bit fields of the pin-control register (McBSPi.MCBSPLP_PCR_REG).

For more information, see [Section 24.5.4.8.4, Frame Phases \(Dual-Phase Frame I2S Support\)](#).

24.5.2.4.1.2 Frames

One or more words (maximum 128) are transferred in a group called a frame. The McBSP module can transmit and receive a maximum of 128 words per frame, programmable through bit fields of transmit-and-receive control registers (McBSPi.MCBSPLP_XCR1_REG/McBSPi.MCBSPLP_XCR2_REG and McBSPi.MCBSPLP_RCR1_REG/McBSPi.MCBSPLP_RCR2_REG). For more details, see [Section 24.5.4.8.3, Clocking and Framing Data](#).

All the words in a frame are sent in a continuous stream. However, there can be pauses between frame transfers. The McBSP module uses frame-sync signals to determine when each frame is received or transmitted. When a pulse occurs on a frame-sync signal, the McBSP module begins receiving or transmitting a frame of data. When the next pulse occurs, the McBSP module receives or transmits the next frame, and so on. The frame-sync pulse is active high or low. This pulse polarity is programmable through bit fields of the pin control register (McBSPi.MCBSPLP_PCR_REG).

Each frame transfer can be delayed by 0, 1, or 2 clock cycles, depending on the value of bits for transmit and receive control registers (McBSPi.MCBSPLP_XCR2_REG and McBSPi.MCBSPLP_RCR2_REG). For more information, see [Section 24.5.4.10.6.3, Preventing Unexpected Transmit Frame-sync Pulses](#) and [Section 24.5.4.10.3.3, Preventing Unexpected Receive Frame-sync Pulses](#).

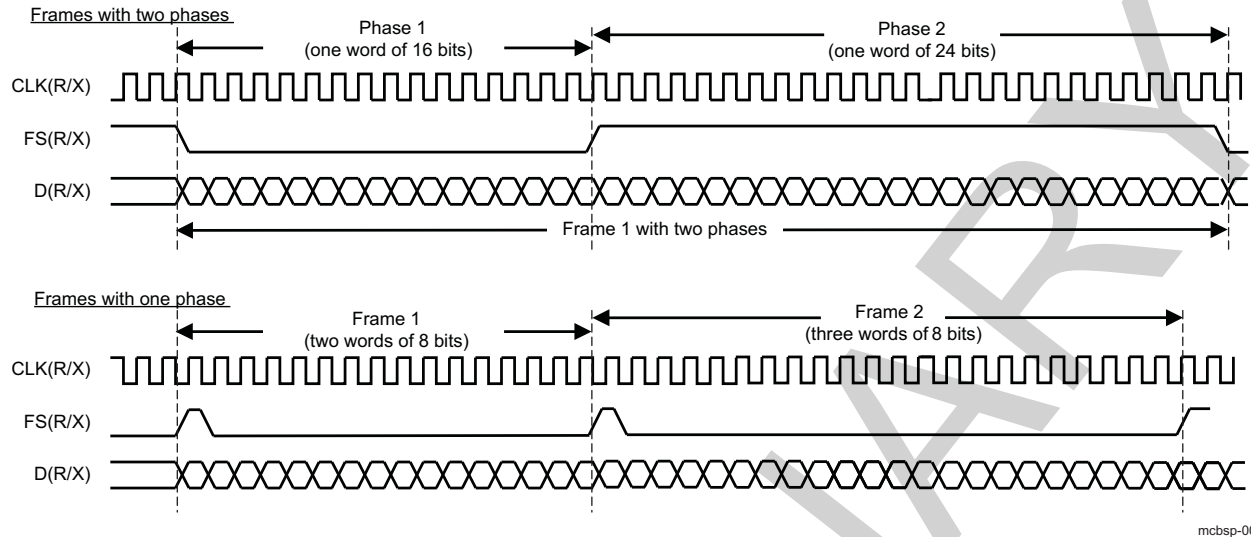
24.5.2.4.1.3 Phases

The McBSP module allows configuring of each frame to contain one or two phases. The McBSP module supports dual-phase frames to provide I2S fully compliant capabilities. These two phases represent left and right channels of audio stereo signals.

The limitation on dual-phase frame is that the number of words per phase must be set to 1 for both first and second phases. The number of bits per word, however, can be specified differently for each of the two phases of a frame, allowing greater flexibility in structuring data transfers.

For example, software may define a frame composed of a first phase with one 12-bit word and a second phase with one 16-bit word. This configuration allows the software to compose frames for custom applications. For more details, see [Section 24.5.4.8.4, Frame Phases \(Dual-Phase Frame I2S Support\)](#).

[Figure 24-117](#) shows signal activity for two possible reception/transmission scenarios.

Figure 24-117. McBSP Reception/Transmission Signal Activity

mcbasp-007

24.5.2.4.2 Serial Protocol and Data Formats

24.5.2.4.2.1 Protocol

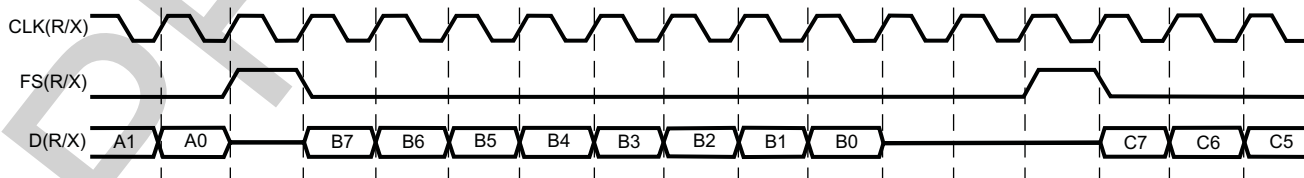
The serial protocol is used to send and receive control data without specific formats. This allows the McBSP module to accommodate all serial devices and their protocols.

24.5.2.4.2.2 Data Format

Figure 24-118 shows typical operation of the McBSP clock and frame-sync signals. Serial clocks CLKR and CLKX define the boundaries between bits for receive and transmit, respectively. Similarly, frame-sync signals FSR and FSX define the beginning of an element and/or frame transfer. The McBSP module allows the configuration of the following parameters for data and frame synchronization:

- Polarity of FSR, FSX, CLKX, and CLKR
- The number of words per frame
- The number of bits per word
- Whether subsequent frame synchronization restarts the serial data stream or is ignored
- The data delay from frame synchronization to first data bit which can be 0-, 1-, or 2-bit delays

The configuration is independent for receive and transmit parts. For more details and configuration examples, see [Section 24.5.4, McBSP Functional Description](#), and [Section 24.5.5, McBSP Basic Programming Model](#).

Figure 24-118. Serial Data Formats

mcbasp-009

24.5.2.4.3 Audio Protocol and Data Formats

24.5.2.4.3.1 Protocol

The I2S protocol is used to send and receive audio data from 8-kHz to 48-kHz sampling rate (frame-sync frequency), with 16 bits or 32 bits per words (supported frequencies are 8, 11.025, 12, 16, 22.05, 24, 32, 44.1, and 48 kHz).

The frame-sync signal defines the frame length in the I2S protocol. Each frame consists of a fixed number of words. In dual-phase frame, the frame-sync signal is low for the left phase time slot and is high for the right phase time slot. In addition, the frame-sync signal is synchronous to the falling edge of the clock signal.

24.5.2.4.3.2 Data Formats

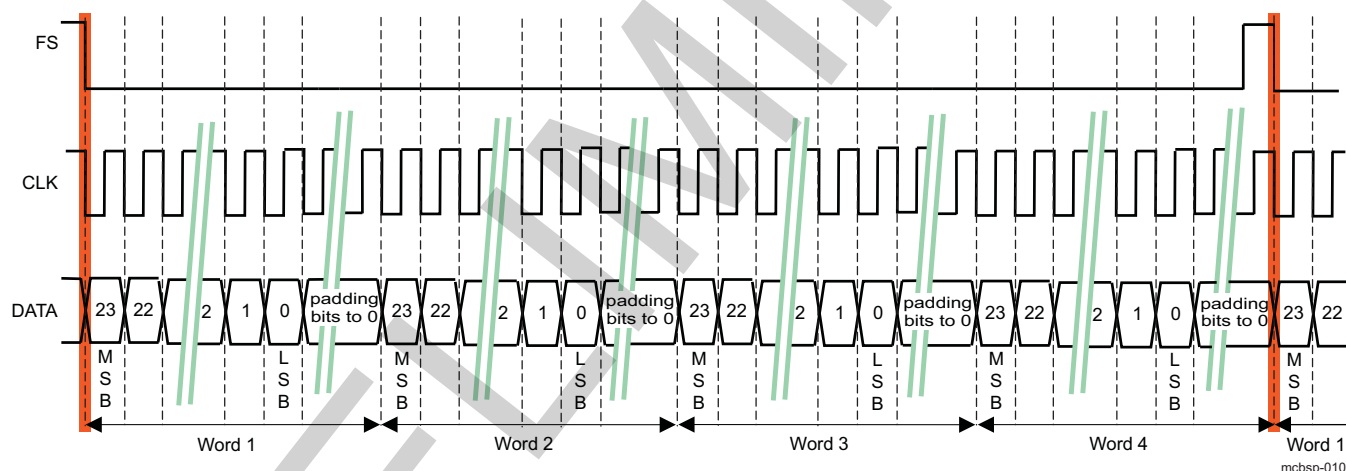
The I2S protocol supports TDM, I2S, left-justified, and right-justified data formats.

Bits of each word (sample) are clocked using the clock signal. For each word, the most-significant bit (MSB) is first. LSBs are padded to 0 when the data length (8, 12, 16, 20, or 24 bits) is less than the sample word width (16 or 32 bits).

24.5.2.4.3.2.1 TDM Data Format

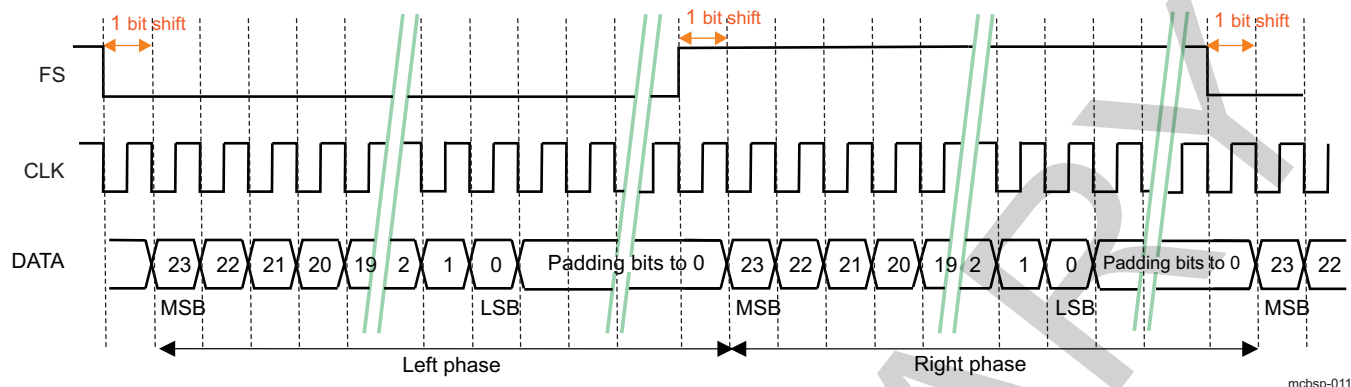
Figure 24-119 shows that each frame of TDM data format is composed of four words (or channels).

Figure 24-119. TDM Data Format; Word Width: 32 Bits; Data Length: 24 Bits



24.5.2.4.3.2.2 I2S Data Format

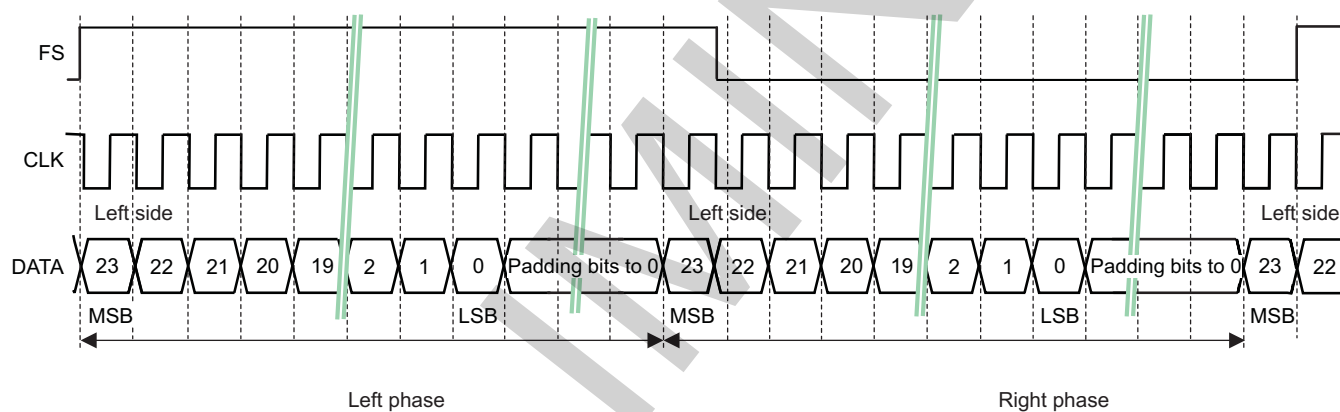
Figure 24-120 shows an example with 24-bit data (MSB first) and 8 padding bits at 0.

Figure 24-120. I2S Data Format; Word Width: 32 Bits; Data Length: 24 Bits

mcbasp-011

24.5.2.4.3.2.3 Left-Justified Data Format

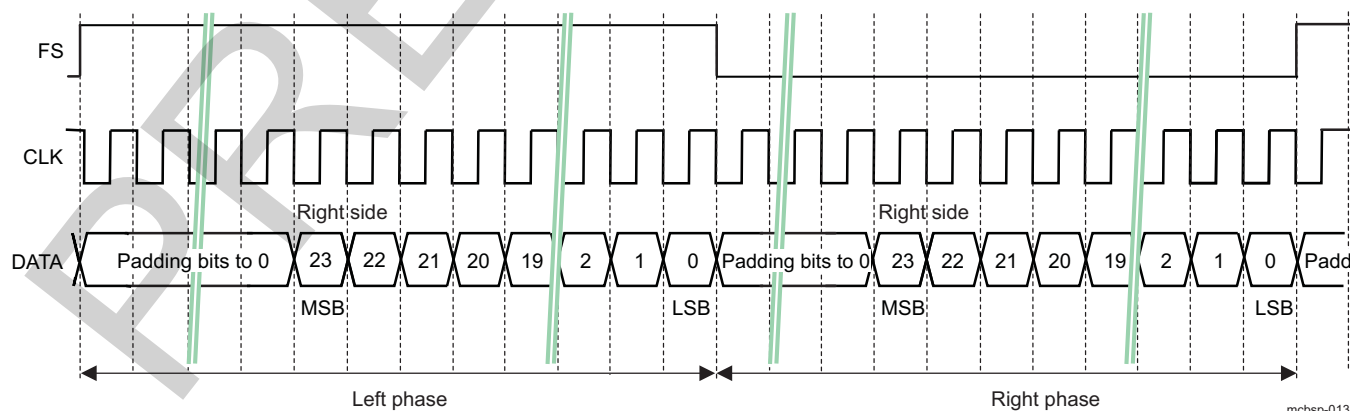
Figure 24-121 shows an example with 24-bit data (MSB first) and 8 padding bits at 0.

Figure 24-121. Left-Justified Data Format; Word Width: 32 Bits; Data Length: 24 Bits

mcbasp-012

24.5.2.4.3.2.4 Right-Justified Data Format

Figure 24-122 shows an example with 24-bit data (MSB first) and 8 padding bits at 0.

Figure 24-122. Right-Justified Data Format; Word Width: 32 Bits; Data Length: 24 Bits

mcbasp-013

24.5.2.4.4 Voice Protocol and Data Formats

24.5.2.4.4.1 Protocol

The PCM protocol is intended to transfer voice data at 8-kHz (default narrowband mode) or 16-kHz (wideband mode) sample rate (frame-sync frequency). PCM protocol can act as a slave or master, and is used by the Bluetooth interface and the modem generic interface. The frame synchronization defines the frame length in the PCM protocol. Bits are clocked using the PCM clock signal, with the MSB first.

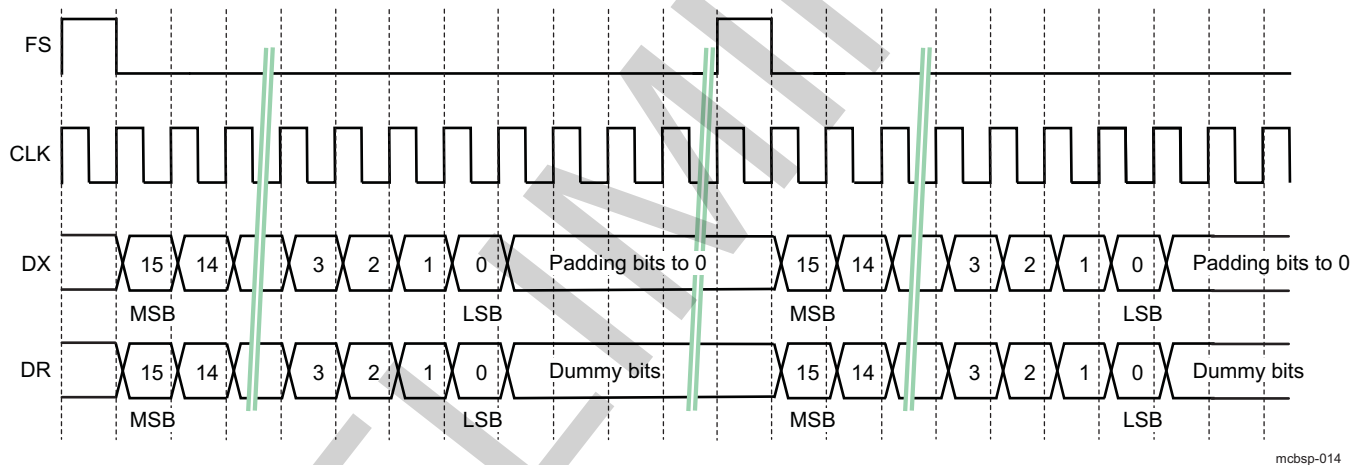
24.5.2.4.4.2 Data Formats

Two modes are available for the PCM protocol: mode 1 and mode 2. Both modes have two types of operations: mono or stereo channels. The difference between PCM mode 1 and PCM mode 2 is in the way in which they use the rising or the falling edge of the clock signal, and the frame-sync polarity.

- PCM mode 1: Input data is latched on the falling edge of the clock, and the transmitted data starts on the rising edge of the clock. The frame-sync pulse is active high.
- PCM mode 2: Input data is latched on the rising edge of the clock, and the transmitted data starts on the falling edge of the clock. The frame-sync pulse is active low.

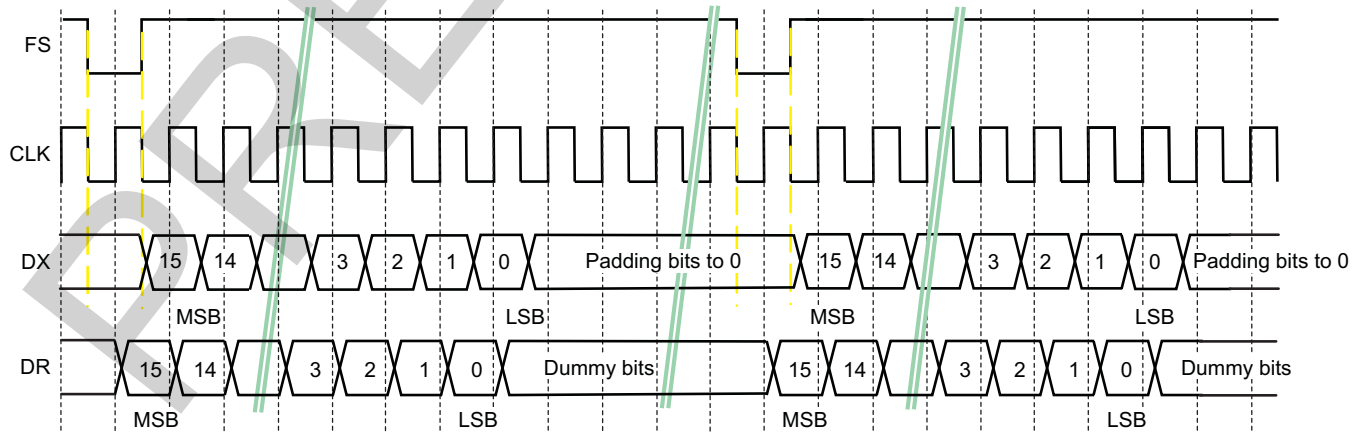
Figure 24-123 and Figure 24-124 show an example of PCM protocol, mode 1 and mode 2, respectively, for a frame composed of one word (32 bits wide) with 16 bits of data.

Figure 24-123. PCM Protocol – Mode 1 Data Format



mcbasp-014

Figure 24-124. PCM Protocol – Mode 2 Data Format



mcbasp-015

24.5.3 McBSP Integration

This section describes the integration of the McBSP module in the device, including information about clocks, resets, and hardware requests.

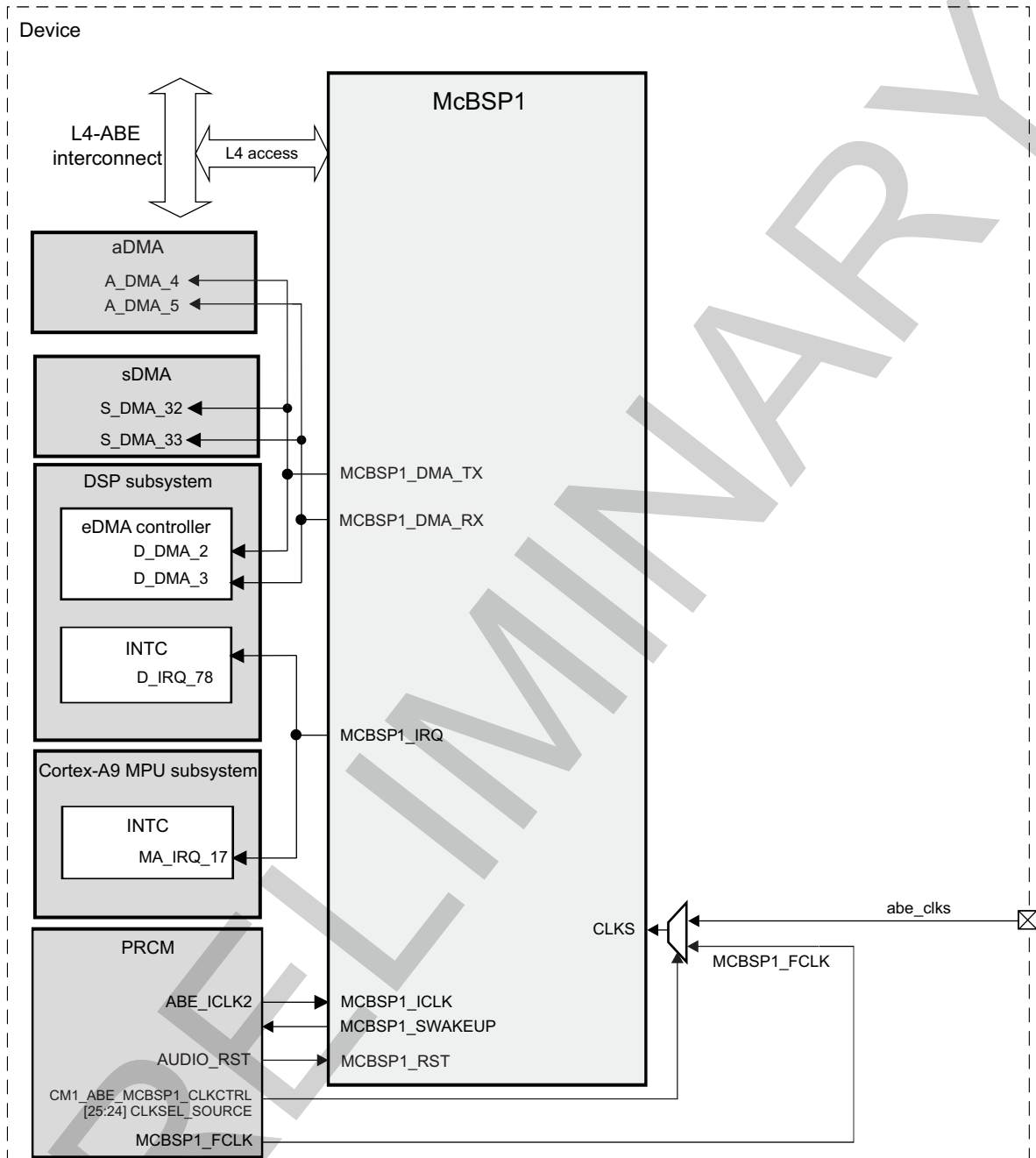
McBSP modules are divided into two families: McBSP modules that are gated in the AUDIO power domain (McBSP1, 2, and 3) and in the L4_PER power domain (McBSP4).

[Figure 24-125](#) through [Figure 24-128](#) show the integration of the McBSP modules in the device, including interrupt handlers, DMA requests, clock generators, and interconnections.

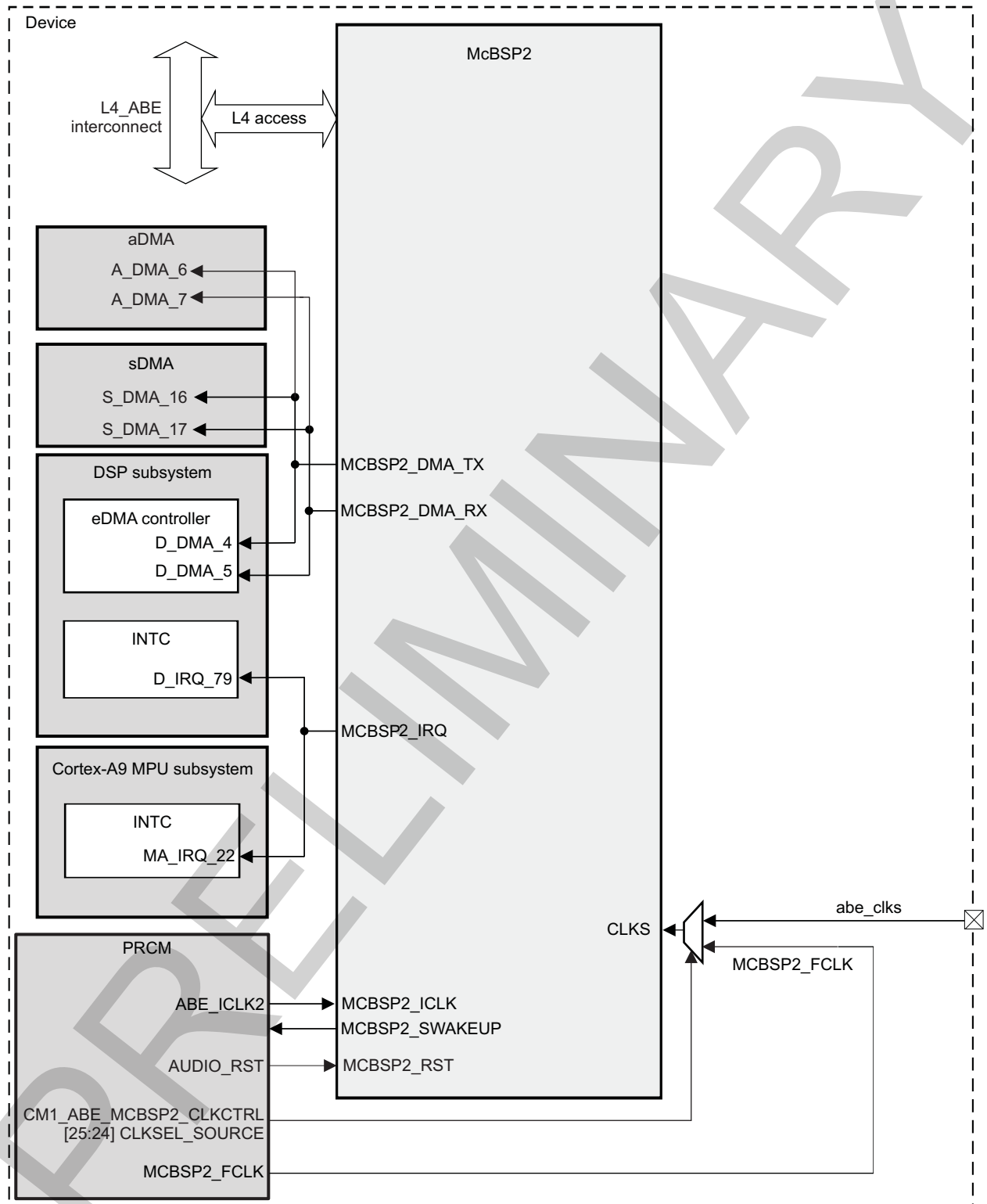
The features of the McBSP modules are:

- Wake-up request
- Two DMA requests
- One IRQ
- One functional clock
- One interface clock

Figure 24-125. McBSP1 Integration

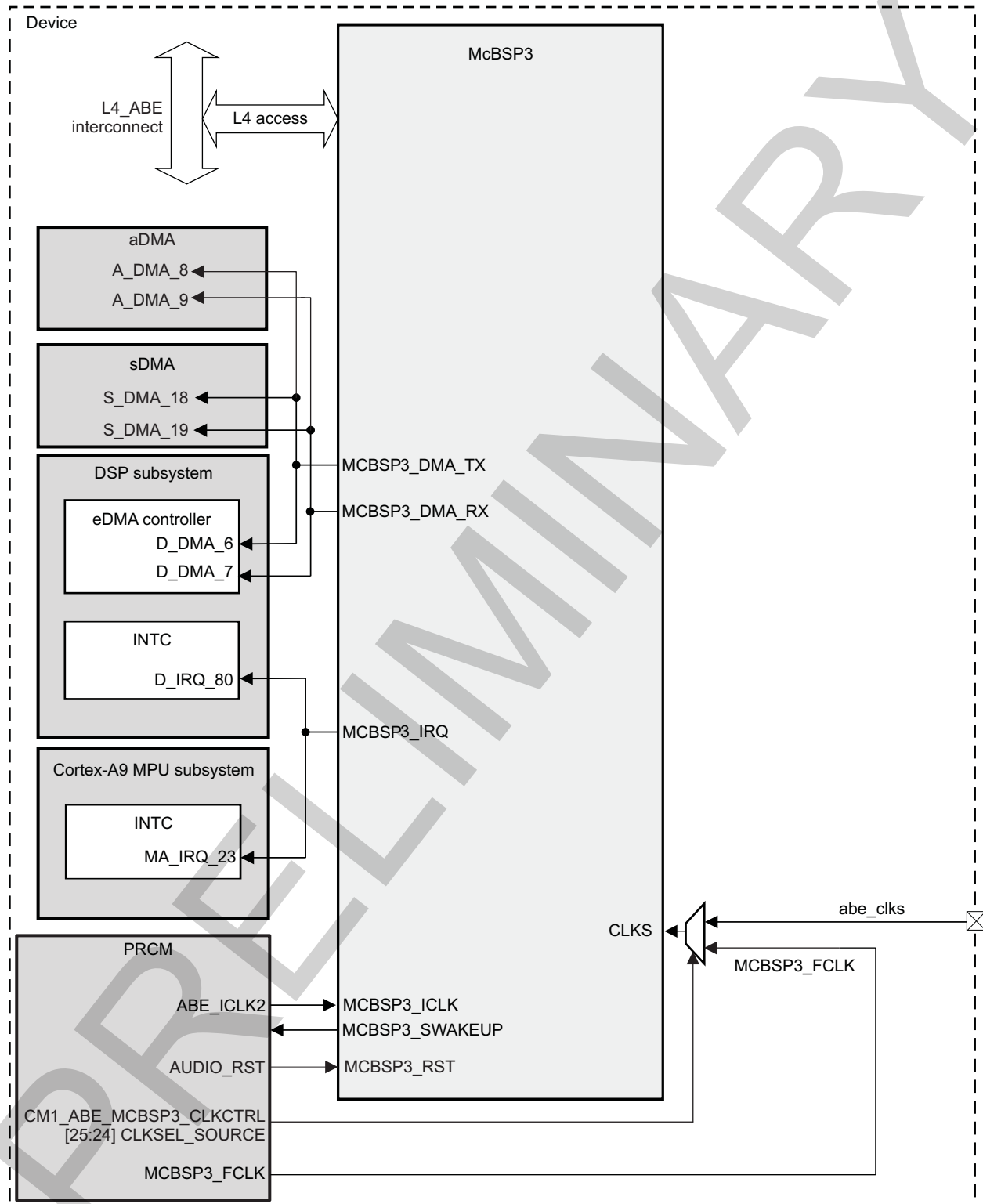


mcbasp-074

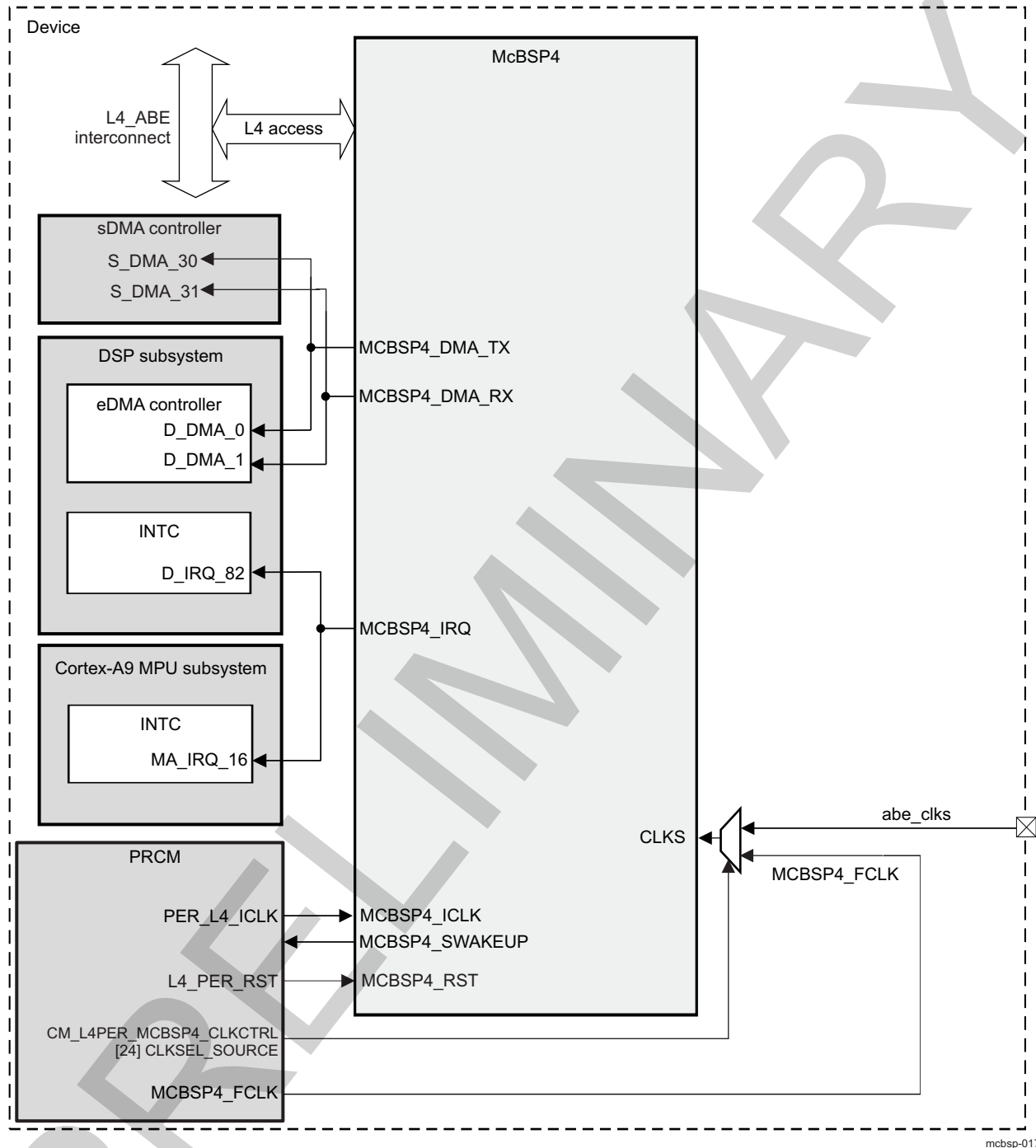
Figure 24-126. McBSP2 Integration

mcbasp-018

Figure 24-127. McBSP3 Integration



mcbasp-019

Figure 24-128. McBSP4 Integration

mcbasp-017

NOTE: The selection between the FSX and FSR signals is made in the CONTROL_MCBSP4[31] ALBCTRLRX_FSX bit in the control module register. The selection between the CLKR and CLKX signals is made in the CONTROL_MCBSP4[30] ALBCTRLRX_CLKX bit in the control module register.

Table 24-328 through Table 24-330 summarize the integration of the module in the device.

Table 24-328. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| MCBSP1 | PD_AUDIO | Yes | L4_ABE |
| MCBSP2 | PD_AUDIO | Yes | L4_ABE |
| MCBSP3 | PD_AUDIO | Yes | L4_ABE |
| MCBSP4 | PD_L4_PER | Yes | L4_PER |

Table 24-329. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|---------------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| MCBSP1 | MCBSP1_ICLK | ABE_ICLK2 | PRCM | MCBSP1 interface clock |
| | MCBSP1_FCLK | MCBSP1_FCLK | PRCM | MCBSP1 functional clock |
| MCBSP2 | MCBSP2_ICLK | ABE_ICLK2 | PRCM | MCBSP2 interface clock |
| | MCBSP2_FCLK | MCBSP2_FCLK | PRCM | MCBSP2 functional clock |
| MCBSP3 | MCBSP3_ICLK | ABE_ICLK2 | PRCM | MCBSP3 interface clock |
| | MCBSP3_FCLK | MCBSP3_FCLK | PRCM | MCBSP3 functional clock |
| MCBSP4 | MCBSP4_ICLK | PER_L4_ICLK | PRCM | MCBSP4 interface clock |
| | MCBSP4_FCLK | MCBSP4_FCLK | PRCM | MCBSP4 functional clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| MCBSP1 | MCBSP1_RST | AUDIO_RST | PRCM | AUDIO power domain reset |
| MCBSP2 | MCBSP2_RST | AUDIO_RST | PRCM | AUDIO power domain reset |
| MCBSP3 | MCBSP3_RST | AUDIO_RST | PRCM | AUDIO power domain reset |
| MCBSP4 | MCBSP4_RST | L4_PER_RST | PRCM | L4_PER power domain reset |

Table 24-330. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|--------------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| MCBSP1 | MCBSP1_IRQ | D_IRQ_78 | DSP INTC | McBSP 1: Common synchronous interrupt request line |
| | MCBSP1_IRQ | MA_IRQ_17 | Cortex-A9 MPU INTC | McBSP 1: Common synchronous interrupt request line |
| MCBSP2 | MCBSP2_IRQ | D_IRQ_79 | DSP INTC | McBSP 2: Common synchronous interrupt request line |
| | MCBSP2_IRQ | MA_IRQ_22 | Cortex-A9 MPU INTC | McBSP 2: Common synchronous interrupt request line |
| MCBSP3 | MCBSP3_IRQ | D_IRQ_80 | DSP INTC | McBSP 3: Common synchronous interrupt request line |
| | MCBSP3_IRQ | MA_IRQ_23 | Cortex-A9 MPU INTC | McBSP 3: Common synchronous interrupt request line |
| MCBSP4 | MCBSP4_IRQ | D_IRQ_82 | DSP INTC | McBSP 4: Common synchronous interrupt request line |
| | MCBSP4_IRQ | MA_IRQ_16 | Cortex-A9 MPU INTC | McBSP 4: Common synchronous interrupt request line |
| DMA Requests | | | | |
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| MCBSP1 | MCBSP1_DMA_TX | A_DMA_4 | aDMA | MCBSP module 1: Transmit DMA request |
| | MCBSP1_DMA_RX | A_DMA_5 | aDMA | MCBSP module 1: Receive DMA request |

Table 24-330. Hardware Requests (continued)

| | | | | |
|--------|---------------|----------|------|--------------------------------------|
| | MCBSP1_DMA_TX | S_DMA_32 | sDMA | MCBSP module 1: Transmit DMA request |
| | MCBSP1_DMA_RX | S_DMA_33 | sDMA | MCBSP module 1: Receive DMA request |
| | MCBSP1_DMA_TX | D_DMA_2 | dDMA | MCBSP module 1: Transmit DMA request |
| | MCBSP1_DMA_RX | D_DMA_3 | dDMA | MCBSP module 1: Receive DMA request |
| MCBSP2 | MCBSP2_DMA_TX | A_DMA_6 | aDMA | MCBSP module 2: Transmit DMA request |
| | MCBSP2_DMA_RX | A_DMA_7 | aDMA | MCBSP module 2: Receive DMA request |
| | MCBSP2_DMA_TX | S_DMA_16 | sDMA | MCBSP module 2: Transmit DMA request |
| | MCBSP2_DMA_RX | S_DMA_17 | sDMA | MCBSP module 2: Receive DMA request |
| | MCBSP2_DMA_TX | D_DMA_4 | dDMA | MCBSP module 2: Transmit DMA request |
| | MCBSP2_DMA_RX | D_DMA_5 | dDMA | MCBSP module 2: Receive DMA request |
| MCBSP3 | MCBSP3_DMA_TX | A_DMA_8 | aDMA | MCBSP module 3: Transmit DMA request |
| | MCBSP3_DMA_RX | A_DMA_9 | aDMA | MCBSP module 3: Receive DMA request |
| | MCBSP3_DMA_TX | S_DMA_18 | sDMA | MCBSP module 3: Transmit DMA request |
| | MCBSP3_DMA_RX | S_DMA_19 | sDMA | MCBSP module 3: Receive DMA request |
| | MCBSP3_DMA_TX | D_DMA_6 | dDMA | MCBSP module 3: Transmit DMA request |
| | MCBSP3_DMA_RX | D_DMA_7 | dDMA | MCBSP module 3: Receive DMA request |
| MCBSP4 | MCBSP4_DMA_TX | S_DMA_30 | sDMA | MCBSP module 4: Transmit DMA request |
| | MCBSP4_DMA_RX | S_DMA_31 | sDMA | MCBSP module 4: Receive DMA request |
| | MCBSP4_DMA_TX | D_DMA_0 | aDMA | MCBSP module 4: Transmit DMA request |
| | MCBSP4_DMA_RX | D_DMA_1 | aDMA | MCBSP module 4: Receive DMA request |

NOTE:

- For more information about the interrupt source, see [Section 24.5.4.6, Interrupt Requests](#).
- For more information about the DMA source, see [Section 24.5.4.7, DMA Requests](#).

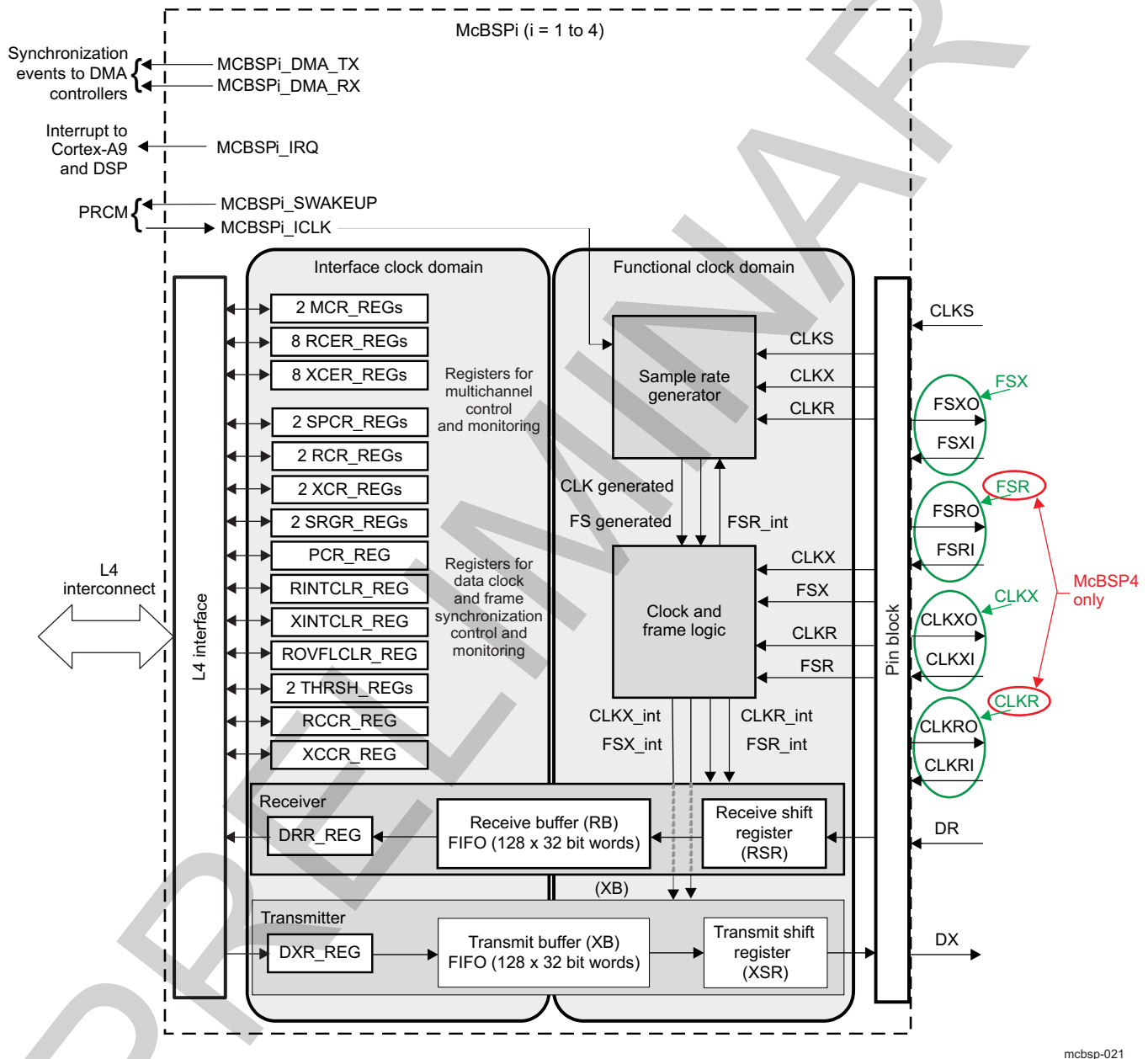
24.5.4 McBSP Functional Description

This section is a functional description of the McBSP module.

24.5.4.1 Block Diagram

Figure 24-129 shows the functional block diagram of the four instances of the McBSP modules.

Figure 24-129. McBSPi Block Diagram



mcbbsp-021

24.5.4.2 Signal Source Control

The sources of the CLKX, DX, DR, FSX, FSR, and CLKR signals are defined by the system control module. The control registers of the system control module are used to select these signal sources. For more information, see [Chapter 19, Control Module](#).

24.5.4.3 McBSP Clock Configuration

24.5.4.3.1 McBSP1 Clocks

McBSP1 is clocked by a functional clock (CLKS and CLKX) and an interface clock (MCBSP1_ICLK).

- The functional clock is used to generate control signals depending on the internal configuration of the module (see [Section 24.5.4, McBSP Functional Description](#)). For McBSP1, the functional clock comes from the CLKS and CLKX signals. The choice between these two clocks is defined by the MCBSP1.MCBSPLP_PCR_REG[7] SCLKME bit and the MCBSP1.MCBSPLP_SRGR2_REG[13] CLKSM bit.

The CLKS signal of McBSP1 is linked to an internal clock (MCBSP1_FCLK) provided by the PRCM module. The CLKS signal can also be linked to an external signal through the `abe_clks` pin of the device boundary.

NOTE: When McBSP1 no longer requires the functional clock, software can disable it at the PRCM level by configuring the MODULEMODE bit field to 0x0 (PRCM.CM1_ABE_MCBSP1_CLKCTRL[1:0]) in the PRCM registers. The clock is effectively cut, provided the other modules that receive it do not require it.

At the PRCM level, when all the conditions to shut off the MCBSP1_FCLK clock are met, the PRCM module automatically launches a hardware handshake protocol to ensure McBSP is ready to have this clock switched off. Namely, the PRCM module asserts an IDLE request to the McBSP module. For more information, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Only the CLKX signal is connected by `mcbbsp4_clkx` pads. The CLKR signal is connected to the CLKX signal. These signals are used like functional clocks by the intermediary of SRG.

- The MCBSP1_ICLK runs at the L4 core interconnect clock speed. It is used to trigger access to the McBSP1 L4 interface and McBSP1 configuration interface through the Cortex-A9 MPU/DSP shared bus. It can also be an input clock for the McBSP SRG (clock divider), depending on the module configuration (see [Section 24.5.4.9, McBSP SRG](#)). Its source is the ABE_ICLK2 signal.

NOTE: When McBSP1 no longer requires the interface clock, software can disable it at the PRCM level by configuring the MODULEMODE bit field (PRCM.CM1_ABE_MCBSP1_CLKCTRL[1:0]) in the PRCM registers. The clock is effectively cut, provided the other modules that receive it do not require it.

At the PRCM level, when all the conditions to shut off the ABE_ICLK2 clock are met the PRCM module automatically launches a hardware handshake protocol to ensure McBSP is ready to have this clock switched off. Namely, the PRCM module asserts an IDLE request to the McBSP module. For more information, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

24.5.4.3.2 McBSP2 Clocks

McBSP2 is clocked by a functional clock (CLKS or CLKX) and an interface clock (MCBSP2_ICLK).

- The functional clock is used to generate control signals depending on the internal configuration of the module (see [Section 24.5.4, McBSP Functional Description](#)). For McBSP2, the functional clock comes from the CLKS and CLKX signals. The choice between these two clocks is defined by the MCBSP2.MCBSPLP_PCR_REG[7] SCLKME bit and the MCBSP2.MCBSPLP_SRGR2_REG[13] CLKSM bit.

NOTE: When McBSP2 no longer requires the functional clock, software can disable it at the PRCM level by configuring the MODULEMODE bit field to 0x0 (PRCM.CM1_ABE_MCBSP2_CLKCTRL[1:0]) in the PRCM registers. The clock is effectively cut, provided the other modules that receive it do not require it.

At the PRCM level, when all the conditions to shut off the MCBSP2_FCLK clock are met the PRCM automatically launches a hardware handshake protocol to ensure McBSP is ready to have this clock switched off. Namely, the PRCM module asserts an IDLE request to the McBSP module. For more information, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Only the CLKX signal is connected by mcbasp2_clkx pads. The CLKR signal is connected to the CLKX signal. These signals are used like functional clocks by the intermediary of the SRG.

- The MCBSP2_ICLK runs at the L4 core interconnect clock speed. It is used to trigger access to the McBSP2 L4 interface and McBSP2 configuration interface through the Cortex-A9 MPU/DSP shared bus. It can also be an input clock for the McBSP SRG (clock divider), depending on the module configuration (see [Section 24.5.4.9, McBSP SRG](#)). Its source is the ABE_ICLK2 signal.

NOTE: When McBSP2 no longer requires the interface clock, software can disable it at the PRCM level by configuring the MODULEMODE bit field (PRCM.CM1_ABE_MCBSP2_CLKCTRL[1:0]) in the PRCM registers. The clock is effectively cut, provided the other modules that receive it do not require it.

At the PRCM level, when all the conditions to shut off the ABE_ICLK2 clock are met the PRCM module automatically launches a hardware handshake protocol to ensure McBSP is ready to have this clock switched off. Namely, the PRCM module asserts an IDLE request to the McBSP module. For more information, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

24.5.4.3.3 McBSP3 Clocks

McBSP3 is clocked by a functional clock (CLKS or CLKX) and an interface clock (MCBSP3_ICLK).

- The functional clock is used to generate control signals depending on the internal configuration of the module (see [Section 24.5.4, McBSP Functional Description](#)). For McBSP3, the functional clock comes from the CLKS and CLKX signals. The choice between these two clocks is defined by the MCBSP3.MCBSPLP_PCR_REG[7] SCLKME bit and the MCBSP3.MCBSPLP_SRGR2_REG[13] CLKSM bit.

NOTE: When McBSP3 no longer requires the functional clock, software can disable it at the PRCM level by configuring the MODULEMODE bit field to 0x0 (PRCM.CM1_ABE_MCBSP3_CLKCTRL[1:0]) in the PRCM registers. The clock is effectively cut, provided the other modules that receive it do not require it.

At the PRCM level, when all the conditions to shut off the MCBSP3_FCLK clock are met the PRCM module automatically launches a hardware handshake protocol to ensure McBSP is ready to have this clock switched off. Namely, the PRCM module asserts an IDLE request to the McBSP module. For more information, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Only, the CLKX signal is connected by mcbasp3_clkx pads. The CLKR signal is connected to the CLKX signal. These signals are used like functional clocks by the intermediary of SRG.

- The MCBSP3_ICLK runs at the L4 core interconnect clock speed. It is used to trigger access to the McBSP3 L4 interface and McBSP3 configuration interface via the Cortex-A9 MPU/DSP shared bus. It can also be an input clock for the McBSP sample-rate generator (clock divider), depending on the module configuration (see [Section 24.5.4.9, McBSP SRG](#)). Its source is either the ABE_ICLK2 signal.

NOTE: When the McBSP2 module does not require the interface clock anymore, the software can disable it at the PRCM level by configuring the MODULEMODE bit field (PRCM.CM1_ABE_MCBSP3_CLKCTRL[1:0]) in the PRCM registers. The clock is effectively cut, provided the other modules that receive it do not require it.

At PRCM level, when all the conditions to shut-off ABE_ICLK2 clock are met the PRCM automatically launches a hardware handshake protocol to ensure McBSP is ready to have this clock switched off. Namely, the PRCM asserts an IDLE request to McBSP module. For more information, see [Section 3.1.1.1.2, Module Level Clock Management](#) in [Chapter 3, Power, Reset, and Clock Management](#).

It is also possible to activate an autoidle mode for this clock (PRCM.CM_AUTOIDLE_PER[1] register AUTO_MCBSP3 bit set to 1). In this case, McBSP3_ICLK follows the AUDIO_L4 clock domain behavior on the device. For more information, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

24.5.4.3.4 McBSP4 Clocks

McBSP4 is clocked by a functional clock (CLKS, CLKX, or CLKR) and an interface clock (MCBSP4_ICLK).

- The functional clock is used to generate control signals depending on the internal configuration of the module (see [Section 24.5.4, McBSP Functional Description](#)). For McBSP4, the functional clock comes from the CLKS, CLKX, or CLKR signal. The choice between these three clocks is defined by the MCBSP4.MCBSPLP_PCR_REG[7] SCLKME bit and the MCBSP4.MCBSPLP_SRGR2_REG[13] CLKSM bit.

NOTE: When McBSP4 no longer requires the PRCM functional clock, software can disable it at the PRCM level by setting the MODULEMODE bit (PRCM.CM_L4PER_MCBSP4_CLKCTRL[1:0]) in the PRCM registers. The clock is effectively cut, provided the other modules that receive it do not require it.

At the PRCM level, when all the conditions to shut off the MCBSP4_FCLK clock are met the PRCM module automatically launches a hardware handshake protocol to ensure McBSP is ready to have this clock switched off. Namely, the PRCM asserts an IDLE request to McBSP module. For more information, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

The CLKX and CLKR signals are connected either by mcbbsp4_clkx or mcbbsp4_clkr pads. These signals are used like functional clocks by the intermediary of the SRG.

- The McBSP4_ICLK runs at the L4 core interconnect clock speed. It is used to trigger access to the McBSP4 L4 interface and McBSP4 configuration interface via the Cortex-A9 MPU/DSP shared bus. It can also be an input clock for the McBSP sample-rate generator (clock divider), depending on the module configuration (see [Section 24.5.4.9, McBSP SRG](#)). Its source is the PER_L4_ICLK signal.

NOTE: When the McBSP4 module does not require the interface clock anymore, the software can disable it at the PRCM level by setting the MODULEMODE bit (PRCM.CM_L4PER_MCBSP4_CLKCTRL[1:0]) in the PRCM registers. The clock is effectively cut, provided the other modules that receive it do not require it.

At PRCM level, when all the conditions to shut-off PER_L4_ICLK clock are met the PRCM automatically launches a hardware handshake protocol to ensure McBSP is ready to have this clock switched off. Namely, the PRCM module asserts an IDLE request to the McBSP module. For more information, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

24.5.4.4 McBSP Software Reset

McBSP4 belongs to the L4_PER domain and its reset signal is L4_PER_RST from the PRCM module. The McBSP1, 2, and 3 modules belong to the AUDIO domain and their reset signal is AUDIO_RST from the PRCM module. [Table 24-331](#) lists the software reset signals to all McBSP modules.

Table 24-331. Software Reset Signals to All McBSP Modules

| Type | Bit Field | Register Source | Activation | Description |
|----------|-----------|---------------------------------|-------------|---|
| Software | SOFTRESET | MCBSPi.MCBSPLP_SYSCONFIG_REG[1] | Active high | McBSP global software reset |
| | RRST | MCBSPi.MCBSPLP_SPCR1_REG[0] | Active low | This resets and disables the receiver, including the RB. |
| | XRST | MCBSPi.MCBSPLP_SPCR2_REG[0] | | This resets and disables the transmitter, including the XB. |
| | GRST | MCBSPi.MCBSPLP_SPCR2_REG[6] | | SRG is reset. |
| | FRST | MCBSPi.MCBSPLP_SPCR2_REG[7] | | Frame-sync logic is reset. Frame-sync generated signal is not generated by the SRG. |

For a complete description of the McBSP initialization procedure, see [Section 24.5.5.1, McBSP Initialization Procedure](#).

24.5.4.5 McBSP Power Management

24.5.4.5.1 McBSP Operating States

Two operating states are defined for all the McBSP modules:

- **ACTIVE state:** The module is running synchronously on the interface and functional clocks. Interrupts and DMA requests can be generated according to the configuration (register, master or slave mode, etc) and the external signals.
- **IDLE state:** As part of the system power management, the PRCM module can request the McBSP modules to enter IDLE state. Depending on the configured acknowledgment mode (force-idle, no-idle and smart-idle modes), a McBSP module effectively enters IDLE state or not. As soon as a McBSP module enters IDLE state, its only activities are those unrelated to clock activity (for example, wake-up features) and its clocks are likely to be switched off at the PRCM level.

NOTE: IDLE request and IDLE acknowledge are only internal signals, with no means to observe or to control. The generation and control of the signals is purely hardware (managed automatically by the PRCM module and the McBSP depending on the SIDLEMODE settings).

24.5.4.5.2 McBSP Acknowledgment Modes

During initialization or configuration of the McBSP module, software must configure how the McBSP module will answer an IDLE solicitation from the PRCM module (that is, the way IDLE acknowledge is asserted following assertion of an idle request).

Each McBSP module can be configured through the MCBSPi.MCBSPLP_SYSCONFIG_REG[4:3] SIDLEMODE bit field as one of the following acknowledgment modes:

- **Force-idle mode (SIDLEMODE bit = 0x0):** An IDLE request is acknowledged unconditionally, regardless of the internal state of the module. The McBSP module immediately enters IDLE state (no activity), interface and PRCM functional clocks can be stopped, and no interrupts and DMA requests can be generated. In this mode, the McBSP module freezes all the internal activity when the PRCM clocks are switched off by the PRCM module, leading to a potential loss of data.

CAUTION

In force-idle mode, the wake-up feature is inhibited.

CAUTION

If the McBSP functional part, transmitter or receiver, is running within this period of time (the functional clock source is not the PRCM functional clock), the internal state of the McBSP module will not be idle (FSM states, processes, etc.), and when the McBSP module exits from the Force Idle state unexpected behavior may happen in both receiver and transmitter. To avoid this, both receive and transmit parts, must be disabled by software prior to idle request assertion (all functional clock external sources must be disabled).

- No-idle mode (SIDLEMODE bit = 0x1): An IDLE request is never acknowledged, meaning it prevents the PRCM module from switching off its related clocks and from putting in a lower power state than the power domain to which it belongs. The McBSP module never enters IDLE state (is active).
- Smart-idle mode (SIDLEMODE bit = 0x2): Acknowledgement to an IDLE request is given based on the internal activity of the McBSP module. The McBSP module is in a waiting state, interface and functional clocks can be stopped, no interrupts can be generated, and a wake-up signal can be generated according to the configuration (see [Section 24.5.4.5.4, Analysis of the Receiver Smart-Idle Behavior](#)) and external signals.

NOTE: The value MCBSPi.MCBSPLP_SYSCONFIG_REG[4:3] SIDLEMODE field = 0x3 must not be used.

When configured in smart-idle mode, the McBSP module also offers an additional granularity on MCBSPi_FCLK and MCBSPi_ICLK gating. The MCBSPi.MCBSPLP_SYSCONFIG_REG[9:8] CLOCKACTIVITY bit field is used to determine which clock will be shut down (MCBSPi_FCLK, MCBSPi_ICLK, none of them, or both of them).

CLOCKACTIVITY setting is used in the McBSP module to determine on which part of the module the conditions to acknowledge the PRCM IDLE request will be tested. As an example, if MCBSPi_FCLK is said not to be shut down upon a PRCM IDLE request, this means the McBSP module will consider only MCBSPi_ICLK and the associated pending activities before acknowledging the request.

NOTE: Some McBSP features are associated with MCBSPi_ICLK and others with MCBSPi_FCLK. Using CLOCKACTIVITY along with the smart-idle mode ensures that the features associated with the clock that remain active are always enabled, even if the McBSP has acknowledged an IDLE request. For more information, see [Section 24.5.4.5.4, Analysis of the Receiver Smart-Idle Behavior](#).

[Table 24-332](#) lists the value of the bit field and indicates whether the interface (MCBSPi_ICLK) and PRCM functional (MCBSPi_FCLK) clocks can be switched off or not when an IDLE request is received by the McBSP module.

Table 24-332. State of Clocks When the Module is in Idle State

| CLOCKACTIVITY Value | Interface Clock (MCBSPi_ICLK) | PRCM Functional Clock |
|---------------------|-------------------------------|-----------------------|
| 0b00 | Off | Off |
| 0b01 | Off | On |
| 0b10 | On | Off |
| 0b11 | On | On |

NOTE: Off means this clock can be switched off.

On means this clock must be maintained during the wake-up period.

CAUTION

The PRCM module does not have any hardware means to read CLOCKACTIVITY settings. Software must ensure a consistent programming between the McBSPi.MCBSPLP_SYSCONFIG_REG[9:8] CLOCKACTIVITY bit field and the PRCM McBSPi_FCLK and L4_ICLK control bits (see notes in [Section 24.5.4.3, McBSP Clock Configuration](#)). If the McBSP module is disabled while CLOCKACTIVITY is set to 0x3, nothing prevents the PRCM module from asserting its IDLE request, which is acknowledged regardless of the features associated with the McBSP clocks. This may lead to unpredictable behaviors.

24.5.4.5.3 Wake-Up Capability

When configured in smart-idle mode, the sources for wake-up generation are a subset of the interrupt sources. The wake-up sources are enabled by setting the McBSPi.MCBSPLP_SYSCONFIG_REG[2] ENAWAKEUP bit (wake-up feature control):

- Set to 0, wake-up capability is disabled.
- Set to 1, wake-up capability is enabled.

The McBSPi_SWAKEUP signal is the McBSP module asynchronous wake-up signal sent to the PRCM module when a wake-up generation is requested.

The wake-up configurations are defined by setting the corresponding bits in the McBSPi.MCBSPLP_WAKEUPEN_REG register.

24.5.4.5.3.1 Receive Wakeup

There are four receive possible wake-up configurations:

- McBSPi.MCBSPLP_WAKEUPEN_REG[3] RRDYEN bit: The McBSP module asserts the McBSPi_SWAKEUP request when the receive buffer reaches the high threshold value (RTHRESHOLD value + 1) of the McBSPi.MCBSPLP_THRSH1_REG register. If the McBSPi.MCBSPLP_IRQENABLE_REG[3] RRDYEN bit is set to 1, the McBSP module sends an interrupt (McBSPi_IRQ) request to the MPU or DSP subsystems when exiting from idle mode (interrupt will be asserted once the McBSPi.MCBSPLP_IRQSTATUS_REG[3] RRDY bit changes from 0 to 1, indicating that received data is ready to be read).
- McBSPi.MCBSPLP_WAKEUPEN_REG[2] REOFEN bit: The McBSP module asserts the McBSPi_SWAKEUP request at the end of the frame. If the McBSPi.MCBSPLP_IRQENABLE_REG[2] REOFEN bit is set to 1, the McBSP module sends an interrupt (McBSPi_IRQ) request to the MPU or DSP subsystems when exiting idle mode.
- McBSPi.MCBSPLP_WAKEUPEN_REG[1] RFSREN bit: The McBSP module sends a McBSPi_SWAKEUP request to the PRCM module when a receive frame-sync pulse is detected while the McBSP module is in idle mode. If the McBSPi.MCBSPLP_IRQENABLE_REG[1] RFSREN bit is set to 1, the McBSP module sends an interrupt (McBSPi_IRQ) request to the MPU or DSP subsystems when exiting idle mode.
- McBSPi.MCBSPLP_WAKEUPEN_REG[0] RSYNCERREN bit: The McBSP module asserts the McBSPi_SWAKEUP request when an unexpected receive frame-sync pulse is detected. If the McBSPi.MCBSPLP_IRQENABLE_REG[0] RSYNCERREN bit is set to 1, the McBSP module sends an interrupt (McBSPi_IRQ) request to the MPU or DSP subsystems when exiting from idle mode (interrupt is asserted once the McBSPi.MCBSPLP_IRQSTATUS_REG[0] RSYNCERR bit changes from 0 to 1, indicating that a receive error occurred).

24.5.4.5.3.2 Transmit Wakeup

For transmit, there are five possible wake-up configuration scenarios:

- McBSPi.MCBSPLP_WAKEUPEN_REG[14] XEMPTYEOFEN bit: The McBSP module asserts the McBSPi_SWAKEUP request when a complete frame was transmitted and the transmit buffer is empty. If the McBSPi.MCBSPLP_IRQENABLE_REG[14] XEMPTYEOFEN bit is set to 1, the McBSP module sends an interrupt (McBSPi_IRQ) request to the MPU or DSP subsystems when exiting idle mode.
- McBSPi.MCBSPLP_WAKEUPEN_REG[10] XRDYEN bit: The McBSP module asserts the McBSPi_SWAKEUP request when the transmit buffer reaches the high threshold value (XTHRESHOLD value + 1) of the McBSPi.MCBSPLP_THRSH2_REG register. If the McBSPi.MCBSPLP_IRQENABLE_REG[10] XRDYEN bit is set to 1, the McBSP module sends an interrupt (McBSPi_IRQ) request to the MPU or DSP subsystems when exiting from idle mode (interrupt is asserted once the McBSPi.MCBSPLP_IRQSTATUS_REG[10] XRDY bit changes from 0 to 1, indicating that transmit buffer data is ready to accept new data).
- McBSPi.MCBSPLP_WAKEUPEN_REG[9] XEOFEN bit: The McBSP module asserts the McBSPi_SWAKEUP request at the end of the frame. If the McBSPi.MCBSPLP_IRQENABLE_REG[9] XEOFEN bit is set to 1, the McBSP module sends an interrupt (McBSPi_IRQ) request to the MPU or DSP subsystems when exiting idle mode.
- McBSPi.MCBSPLP_WAKEUPEN_REG[8] XFSXEN bit: The McBSP module sends a McBSPi_SWAKEUP request when a transmit frame-sync pulse is detected while the module is in idle mode. If the McBSPi.MCBSPLP_IRQENABLE_REG[8] XFSXEN bit is set to 1, the McBSP module sends an interrupt (McBSPi_IRQ) request to the MPU or DSP subsystems when exiting idle mode.
- McBSPi.MCBSPLP_WAKEUPEN_REG[7] XSYNCERREN bit: The McBSP module asserts the McBSPi_SWAKEUP request when an unexpected transmits frame-sync pulse is detected. If the McBSPi.MCBSPLP_IRQENABLE_REG[7] XSYNCERREN bit is set to 1, the McBSP module sends an interrupt (McBSPi_IRQ) request to the MPU or DSP subsystems when exiting idle mode (interrupt is asserted once the McBSPi.MCBSPLP_IRQSTATUS_REG[7] XSYNCERR bit changes from 0 to 1, indicating that a transmit error occurred).

24.5.4.5.3.3 Notes

When the mcbbsp4_fsr/mcbbspi_fsx pin is configured as an output, FSR/FSX wake-up generation makes no sense (the module cannot be in smart-idle mode).

Detection of RSYNCERR/XSYNCERR during idle mode can be used only when the mcbbsp4_fsr/mcbbspi_fsx pin is configured as an input and the remote system knows to assert such an error to trigger the wakeup of the McBSP module.

The module does not implement interrupt request (IRQ) assertion when configured as GPIO (pins that can be used to accept input signals and/or send output signals but are not linked to specific uses); also a wake-up capability in this mode is not available.

24.5.4.5.4 Analysis of the Receiver Smart-Idle Behavior

Table 24-333 provides an analysis of the power mode behavior.

In this table, the CLKRM bit is in the McBSPi.MCBSPLP_PCR_REG register on position 8, the CLKXM bit is in the McBSPi.MCBSPLP_PCR_REG[9] register, and the CLOCKACTIVITY bit is in the McBSPi.MCBSPLP_SYSCONFIG_REG[9:8] register.

The value X indicates that the bit value is not significant.

Table 24-333. McBSP Smart-Idle Mode Configuration Behavior

| CLKRM Bit | CLKXM Bit | McBSP Mode | Source of Functional Clock | CLOCKACTIVITY Bit | Behavior |
|-----------|-----------|-----------------|----------------------------|-------------------|--|
| 0 | 0 | Slave | Outside | 0bXX | The module acknowledges the IDLE request as soon as there is no pending DMA, interrupt request, or transmit buffer threshold synchronization (only when wake-up event is set on transmit threshold reached), regardless of the CLOCKACTIVITY settings or receive and transmit activity. |
| 0 | 1 | Transmit master | MCBSPi_ICLK | 0b0X | The McBSP does not acknowledge the IDLE request unless: <ul style="list-style-type: none"> The transmit part is disabled (XDISABLE) or under software reset (XRST). Transmit and receive parts are disabled (XDISABLE/RDISABLE) or under software reset (XRST/RRST). The IDLE acknowledge is asserted as soon as there is no pending DMA, interrupt request, or transmit/receive buffer threshold synchronization (only when the wake-up event is set on transmit/receive threshold reached) and the pending transmit and/or receive frames were completed in case of transmit and/or receive disable. |
| | | | CLKS | 0bX0 | |
| | | | MCBSPi_ICLK | 0b1X | The module acknowledges the IDLE request as soon as there is no pending DMA, interrupt request, or transmit/receive buffer threshold synchronization (only when the wake-up event is set on transmit/receive threshold reached). |
| | | | CLKS | 0bX1 | |
| | | | CLKR (outside) | 0bXX | The module acknowledges the idle request as soon as there is no pending DMA, interrupt request, or transmit/receive buffer threshold synchronization (only when the wake-up event is set on transmit/receive threshold reached), regardless of the CLOCKACTIVITY settings. |
| | | | | | |
| 1 | 0 | Receive master | MCBSPi_ICLK | 0b0X | The McBSP does not acknowledge the IDLE request unless the receive part is disabled (RDISABLE) or under software reset (RRST). The IDLE acknowledge is asserted as soon as there is no pending DMA, interrupt request, or transmit/receive buffer threshold synchronization (only when the wake-up event is set on transmit/receive threshold reached) and the pending transmit and/or receive frames were completed in case of transmit and/or receive disable. |
| | | | CLKS | 0bX0 | |
| | | | MCBSPi_ICLK | 0b1X | The module acknowledges the IDLE request as soon as there is no pending DMA, interrupt request, or transmit/receive buffer threshold synchronization (only when wake-up event is set on transmit/receive threshold reached). |
| | | | CLKS | 0bX1 | |
| | | | CLKX | 0bXX | When CLKX is used as source (the functional clock is provided from outside), the module acknowledges the IDLE request as soon as there is no pending DMA, interrupt request, or transmit/receive buffer threshold synchronization (only when the wake-up event is set on transmit/receive threshold reached), regardless of the CLOCKACTIVITY settings. |
| | | | | | |

Table 24-333. McBSP Smart-Idle Mode Configuration Behavior (continued)

| CLKRM Bit | CLKXM Bit | McBSP Mode | Source of Functional Clock | CLOCKACTIVITY Bit | Behavior |
|-----------|-----------|-----------------------------|----------------------------|-------------------|---|
| 1 | 1 | Transmit and receive master | MCBSPi_ICLK | 0b0X | The McBSP does not acknowledge the IDLE request unless transmit and receive parts are disabled (XDISABLE/RDISABLE) or under software reset (XRST/RRST). The IDLE acknowledge is asserted as soon as there is no pending DMA, interrupt request, or transmit/receive buffer threshold synchronization (only when the wake-up event is set on transmit/receive threshold reached) and the pending transmit and/or receive frames were completed in case of transmit and/or receive disable. No wake-up event is available in this mode, because the entire McBSP and remote device activity is frozen. |
| | | | CLKS | 0bX0 | |
| | | | MCBSPi_ICLK | 0b1X | The module acknowledges the IDLE request as soon as there is no pending DMA, interrupt request, or transmit/receive buffer threshold synchronization (only when the wake-up event is set on transmit/receive threshold reached). |
| | | | CLKS | 0bX1 | |

NOTE: The RFSREN/XFSXEN mode is suitable for wake-up generation when both clocks (PRCM functional and interface) are switched off and the mcbasp4_fsr/mcbspi_fsx pin is configured as input. The frame-sync pulse is asynchronously detected during idle.

The RSYNCERREN/XSYNCERREN mode can be used to wake up the McBSP module only by a remote module implementing such a feature to trigger a wakeup. In this mode, the functional clock must be active.

24.5.4.6 McBSP Interrupt Requests

Each of the four McBSP modules can generate one common interrupt (MCBSPi_IRQ), shared between the Cortex-A9 MPU subsystem and DSP subsystem interrupt controllers (INTCs).

An event can generate an interrupt request when the corresponding mask bit in the MCBSPi.MCBSPLP_IRQENABLE_REG register is set to 1.

Once an interrupt request is generated, software must read the MCBSPi.MCBSPLP_IRQSTATUS_REG register to check which event has caused the interrupt request generation, and acknowledge each processed event by setting the corresponding bit in the MCBSPi.MCBSPLP_IRQSTATUS_REG register to 1.

24.5.4.7 McBSP DMA Requests

The DMA requests are shared between the DSP subsystem DMA (eDMA) controller, system DMA (sDMA) controller, and audio engine DMA (aDMA) controller. Each of the four McBSP modules can generate two DMA events:

- MCBSPi_DMA_TX: McBSPi module transmit DMA request
- MCBSPi_DMA_RX: McBSPi module receive DMA request

Table 24-330 summarizes the DMA events with the mapping on both DMA controllers.

The receive and transmit DMA requests can be individually disabled by setting the MCBSPi.MCBSPLP_RCCR_REG[3] RDMAEN and MCBSPi.MCBSPLP_XCCR_REG[3] XDMAEN bits to 0. When disabling the DMA, the DMA request line is deasserted even if a DMA transfer is pending and the DMA state-machine is not reset.

For more information, see [Section 24.5.4.11, McBSP DMA Configuration](#).

24.5.4.8 McBSP Data Transfer Process

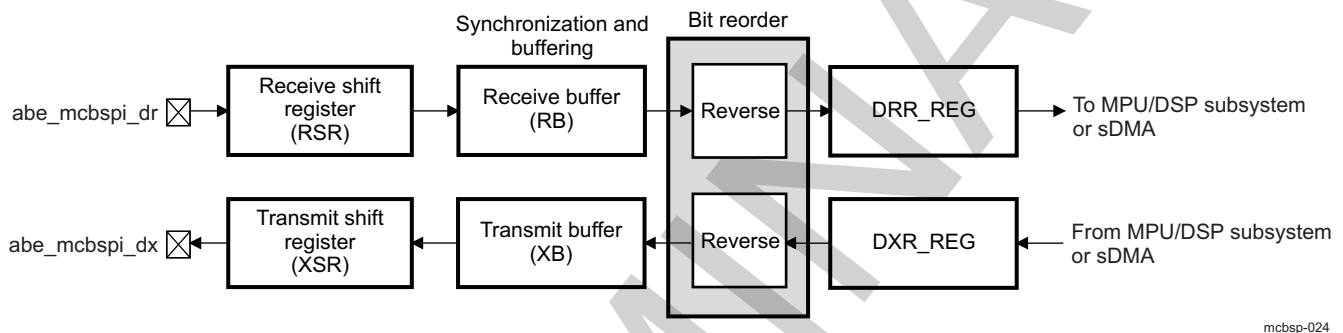
For McBSP modules, receive and transmit operations are triple-buffered (512 bytes buffers organized in 32-bit words are used).

All registers of McBSP data transfer paths are 32 bits wide. Figure 24-130 shows the McBSP data transfer paths.

CAUTION

The McBSP registers (DRR_REG and DXR_REG) are limited to 32-bit data accesses (L4 Interconnect); 16-and 8-bit accesses are not allowed and can corrupt register content.

Figure 24-130. McBSP Data Transfer Paths



mcbasp-024

24.5.4.8.1 Data Transfer Process for 8-/12-/16-/20-/24-/32-Bit-Long Words

NOTE: For each data word length, one data occupies one 32-bit buffer word.

Receive data arrives on the mcbspi_dr pin and is shifted into the receive shift register (RSR). When a full word (depending on the data length configuration) is received, the content of the shift register is copied into the receive buffer (RB) if it is not full. When the threshold of the RB is reached, the McBSP module asserts DMA or interrupt request and the content of the RB is then transferred (the sDMA or the eDMA controller reads the data receive register McBSPi.MCBSPLP_DRR_REG).

Transmit data is written by the MPU subsystem, DSP subsystem, or the DMA controller to the data transmit register (McBSPi.MCBSPLP_DXR_REG) using the McBSPi.MCBSPLP_SPCR2_REG[1] XRDY bit enable input (when a byte is not enabled, the byte value in the memory contains the previous written value). If there is no previous data in the transmit shift register (XSR), the value from the transmit buffer (XB) is copied to the XSR; otherwise, the content is copied to the XSR when the last bit of the previous data is shifted out on the mcbspi_dx pin.

24.5.4.8.2 Bit Reordering (Option to Transfer LSB First)

Generally, the McBSP module transmits or receives all data with the MSB first. However, some data protocols require the LSB to be transferred first.

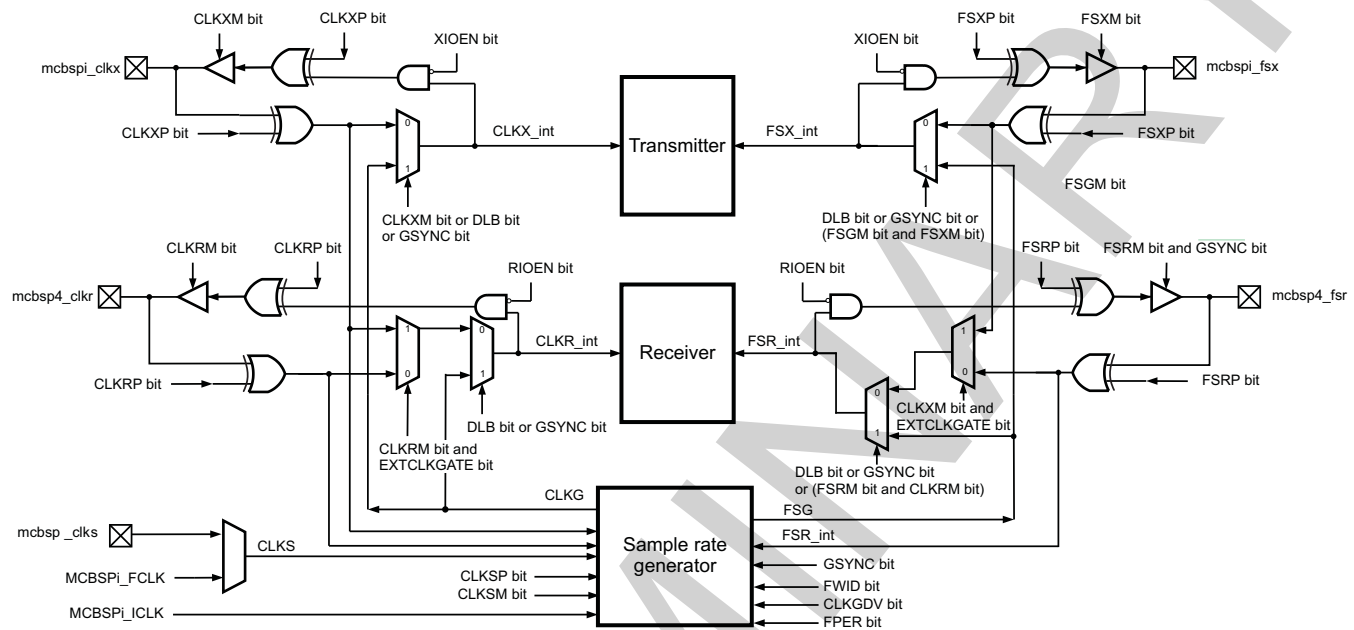
If the McBSPi.MCBSPLP_XCR2_REG[4:3] XREVERSE bit field is set to 0b01, the bit ordering of the data words is reversed (LSB first) before being sent to the serial port. If McBSPi.MCBSPLP_RCR2_REG[4:3] RREVERSE bit field is set to 0b01, the bit ordering of the data words is reversed during reception (LSB first).

This feature is available for all the data formats from 8- to 32-bit data length.

24.5.4.8.3 Clocking and Framing Data

This section explains basic concepts and terminology important for understanding how McBSP data transfers are timed and delimited.

Figure 24-131. Conceptual Block Diagram for Clock and Frame Generation When MCBSP1P_SPCR1_REG[15] ALB = 0



mcbbsp-025

NOTE: For McBSP1, McBSP2, and McBSP3, the mcbspi_clkr pin is connected to the mcbspi_clkx pin, and the mcbspi_fsr pin is connected to the mcbspi_fsx pin.

The CLKR_int clock signal can be derived from three sources:

- The sample rate generator (CLKG): When [MCBSPLP_XCCR_REG\[5\] DLB = 1](#) or [MCBSPLP_SRGR2_REG\[15\] GSYNC = 1](#)
- mcbbsp4_clkr pin (CLKR): When [MCBSPLP_PCR_REG\[9\] CLKXM = 0](#) and [MCBSPLP_XCCR_REG\[15\] EXTCLKGATE = 0](#) and ([MCBSPLP_XCCR_REG\[5\] DLB = 0](#) or [MCBSPLP_SRGR2_REG\[15\] GSYNC = 0](#))
- mcbspi_clkx pin (CLKX) driven by sample rate generator (CLKG): When [MCBSPLP_PCR_REG\[9\] CLKXM = 1](#) and [MCBSPLP_XCCR_REG\[15\] EXTCLKGATE = 1](#) and ([MCBSPLP_XCCR_REG\[5\] DLB = 0](#) or [MCBSPLP_SRGR2_REG\[15\] GSYNC = 0](#))

The CLKX_int clock signal can be derived from two sources:

- The sample rate generator (CLKG): When [MCBSPLP_PCR_REG\[9\] CLKXM = 1](#) or [MCBSPLP_XCCR_REG\[5\] DLB = 1](#) or [MCBSPLP_SRGR2_REG\[15\] GSYNC = 1](#)
- mcbspi_clkx pin (CLKX): When [MCBSPLP_PCR_REG\[9\] CLKXM = 0](#) or [MCBSPLP_XCCR_REG\[5\] DLB = 0](#) or [MCBSPLP_SRGR2_REG\[15\] GSYNC = 0](#)

The FSR_int frame-sync signal can be derived from three sources:

- The sample rate generator (FSG): When [MCBSPLP_XCCR_REG\[5\] DLB = 1](#) or [MCBSPLP_SRGR2_REG\[15\] GSYNC = 1](#) or ([MCBSPLP_PCR_REG\[10\] FSRM = 1](#) and [MCBSPLP_PCR_REG\[8\] CLKRM = 1](#))
- mcbbsp4_fsr pin (FSR): When [MCBSPLP_PCR_REG\[9\] CLKXM = 0](#) and [MCBSPLP_XCCR_REG\[15\] EXTCLKGATE = 0](#) and ([MCBSPLP_XCCR_REG\[5\] DLB = 0](#) or [MCBSPLP_SRGR2_REG\[15\] GSYNC = 0](#) or ([MCBSPLP_PCR_REG\[10\] FSRM = 0](#) and [MCBSPLP_PCR_REG\[8\] CLKRM = 0](#)))
- mcbspi_fsx pin (FSX) driven by sample rate generator (FSG): When [MCBSPLP_PCR_REG\[9\] CLKXM = 1](#) and [MCBSPLP_XCCR_REG\[15\] EXTCLKGATE = 1](#) and ([MCBSPLP_XCCR_REG\[5\] DLB = 0](#) or

MCBSPLP_SRGR2_REG[15] GSYNC = 0 or (MCBSPLP_PCR_REG[10] FSRM = 0 and MCBSP_PCR_REG[8] CLKRM = 0))

The FSX_int frame-sync signal can be derived from two sources:

- The sample rate generator (FSG): When MCBSP_XCCR_REG[5] DLB = 1 or MCBSP_SRGR2_REG[15] GSYNC = 1 or (MCBSPLP_SRGR2_REG[12] FSGM = 1 and MCBSP_PCR_REG[11] FSXM = 1)
- mcbspi_fsx pin (FSX): When MCBSP_XCCR_REG[5] DLB = 0 or MCBSP_SRGR2_REG[15] GSYNC = 0 or (MCBSPLP_SRGR2_REG[12] FSGM = 0 and MCBSP_PCR_REG[11] FSXM = 0)

24.5.4.8.3.1 Clocking

Data is shifted 1 bit at a time from the mcbspi_dr pin to the RSRs or from the XSRs to the mcbspi_dx pin. The time for each bit transfer is controlled by the rising or falling edge of a clock signal.

The receive clock signal (CLKR_int) controls bit transfers from the mcbspi_dr pin to the RSRs. The transmit clock signal (CLKX_int) controls bit transfers from the XSRs to the mcbspi_dx pin. The CLKR_int and CLKX_int signals can be derived from a pin at the boundary of the McBSP module (mcbbsp4_clkr and mcbspi_clkx, respectively) or derived from inside the McBSP module (see Figure 24-131). The clock source is selected by programming the McBSPi.MCBSPLP_PCR_REG[9] CLKXM and McBSPi.MCBSPLP_PCR_REG[8] CLKRM bits, respectively.

When the McBSPi.MCBSPLP_PCR_REG[9] CLKXM bit (transmitter clock mode) is set to:

- 0: CLKX_int is driven by an external clock and mcbspi_clkx is an input pin.
- 1: CLKX_int is driven by the internal SRG and mcbspi_clkx is an output pin.

For the McBSPi.MCBSPLP_PCR_REG[8] CLKRM bit (receiver clock mode), see Table 24-334.

Table 24-334. Receiver Clock Mode

| Value | Digital Loopback Mode | mcbbsp4_clkr Pin | Description |
|-------|------------------------------------|------------------|--|
| 0x0 | McBSPi.MCBSPLP_XCCR_REG[5] DLB = 0 | Input | CLKR_int is driven by an external clock. |
| | McBSPi.MCBSPLP_XCCR_REG[5] DLB = 1 | High -impedance | CLKR_int is driven by CLKX_int. The CLKX_int is derived based on the value of CLKXM. |
| 0x1 | McBSPi.MCBSPLP_XCCR_REG[5] DLB = 0 | Output | CLKR_int is driven by the internal SRG. |
| | McBSPi.MCBSPLP_XCCR_REG[5] DLB = 1 | Output | CLKR_int is driven by CLKX_int. The CLKX_int is derived based on the value of CLKXM. |

The polarities of CLKR and CLKX signals are configured in McBSPi.MCBSPLP_PCR_REG register.

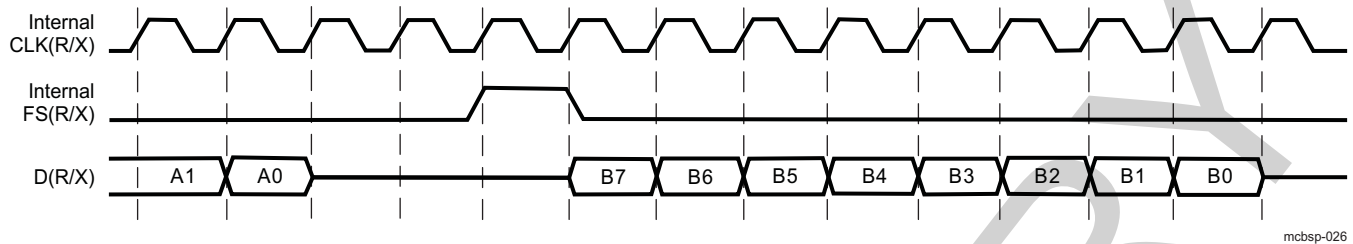
The McBSPi.MCBSPLP_PCR_REG[1] CLKXP bit defines the transmit clock polarity:

- When set to 0, transmit data is driven on the rising edge of the CLKX signal.
- When set to 1, transmit data is driven on the falling edge of the CLKX signal.

The McBSPi.MCBSPLP_PCR_REG[0] CLKRP bit defines the receive clock polarity:

- When set to 0, receive data is sampled on the falling edge of the CLKX signal.
- When set to 1, transmit data sampled on the rising edge of the CLKX signal.

Figure 24-132 shows an example in which the clock signal controls the timing of each bit transfer on the pin.

Figure 24-132. Clock Signal Control of Bit Transfer Timing

NOTE: The McBSP module is constrained to operate at an internal functional frequency of up to L4 interface frequency divided by 2. When driving CLKX or CLKR at the pin, choose an appropriate input clock frequency. When using the internal SRG for CLKX/CLKR/CLKS, choose an appropriate input clock frequency (up to L4 interface frequency) and divide down value by programming the McBSPi.MCBSPLP_SRGR1_REG[7:0] CLKGDV bit field.

24.5.4.8.3.2 Serial Words

Bits traveling between a shift register (RSR or XSR) and a data pin (mcbspi_dr or mcbspi_dx) are transferred in a group called a serial word. Software defines how many bits are in a word by programming:

- For the receiver: The McBSPi.MCBSPLP_RCR1_REG[7:5] RWDLEN1 and McBSPi.MCBSPLP_RCR2_REG[7:5] RWDLEN2 bit fields
- For the transmitter: The McBSPi.MCBSPLP_XCR1_REG[7:5] XWDLEN1 and McBSPi.MCBSPLP_XCR2_REG[7:5] XWDLEN2 bit fields

The difference of use is explained in [Section 24.5.4.8.4.1, Number of Phases, Words, and Bits per Frame](#).

The various possibilities of word length are 8, 12, 16, 20, 24, and 32 bits (for field values, see [Section 24.5.6, McBSP Register Manual](#))

Bits coming from the mcbspi_dr pin are held in the RSR until it holds a full serial word, and then the word is passed to the RB and the McBSPi.MCBSPLP_DRR_REG register.

During transmission, the XSR accepts new data from the XB after a full serial word has been passed from the XSR to the mcbspi_dx pin.

In the example in [Figure 24-135](#), an 8-bit word size was defined (see the transfer of the 8-bit word B).

24.5.4.8.3.3 Frames and Frame Synchronization

One or more words (up to 128) are transferred in a group called a frame. Software defines how many words are in a frame by programming:

- For the receiver: The McBSPi.MCBSPLP_RCR1_REG[14:8] RFRLLEN1 and McBSPi.MCBSPLP_RCR2_REG[14:8] RFRLLEN2 bit fields
- For the transmitter: The McBSPi.MCBSPLP_XCR1_REG[14:8] XFRLLEN1 and McBSPi.MCBSPLP_XCR2_REG[14:8] XFRLLEN2 bit fields

The difference between these registers is explained in [Section 24.5.4.8.4.1, Number of Phases, Words, and Bits per Frame](#). For the corresponding field values and number of words, see [Section 24.5.6, McBSP Register Manual](#).

All the words in a frame are sent in a continuous stream. However, there can be pauses between frame transfers. The McBSP module uses frame-sync signals (FSG) to determine when each frame is received/transmitted. When a pulse occurs on a frame-sync signal, the McBSP module begins receiving/transmitting a frame of data. When the next pulse occurs, the McBSP module receives/transmits the next frame, and so on.

Pulses on the receive frame-sync (FSR_int) signal initiate frame transfers on mcbspi_dr. Pulses on the transmit frame-sync (FSX_int) signal initiate frame transfers on mcbspi_dx. FSR_int or FSX_int signals can be derived from a pin at the boundary of the McBSP module (mcbbsp4_fsr and mcbbsp4_fsx, respectively) or derived from inside the McBSP module (see [Figure 24-130](#)). The frame-sync source is selected by programming the McBSPi.MCBSPLP_PCR_REG[11] FSXM and McBSPi.MCBSPLP_PCR_REG[10] FSRM bits, respectively.

When the McBSPi.MCBSPLP_PCR_REG[11] FSXM bit (transmitter frame-sync mode) is set to:

- 0: FSX_int is derived from an external source and mcbbsp4_fsx is an input pin.
- 1: FSX_int is determined by the McBSPi.MCBSPLP_SRGR2_REG[12] FSGM bit and mcbbsp4_fsx is an output pin.

For the McBSPi.MCBSPLP_PCR_REG[10] FSRM bit (receiver frame-sync mode), is set to:

- 0: FSR_int is generated by an external source and mcbbsp4_fsr is an input pin.
- 1: FSR_int is generated internally by the SRG. The mcbbsp4_fsr is an output pin except when McBSPi.MCBSPLP_SRGR2_REG[15] GSYNC bit is set to 0x1.

In the example in [Figure 24-131](#), a one-word frame is transferred when a frame-sync pulse occurs. The polarities of FSR and FSX signals are programmable by bits in the McBSPi.MCBSPLP_PCR_REG register.

The McBSPi.MCBSPLP_PCR_REG[3] FSXP bit defines the transmit frame-sync polarity:

- When set to 0, frame-sync pulse FSX is active high.
- When set to 1, frame-sync pulse FSX is active low.

The McBSPi.MCBSPLP_PCR_REG[2] FSRP bit defines the receive frame-sync polarity:

- When set to 0, frame-sync pulse FSR is active high.
- When set to 1, frame-sync pulse FSR is active low.

In McBSP operation, the inactive-to-active transition of the frame-sync signal indicates the start of the next frame. For this reason, the frame-sync signal may be high for an arbitrary number of clock cycles. Only after the signal is recognized to have gone inactive, and then active again, does the next frame synchronization occur.

24.5.4.8.3.4 Detecting Frame-Sync Pulses, Even in Reset State

The McBSP module can generate receive and transmit interrupts to the Cortex-A9 MPU/DSP subsystems to indicate specific events in the McBSP module. To facilitate detection of frame synchronization, these interrupts can be sent in response to frame-sync pulses (see [Section 24.5.5, McBSP Basic Programming Model](#) for more information).

Unlike other serial port interrupt modes, this mode can operate while the associated portion of the serial port is in reset (such as activating receive interrupt when the receiver is in reset). In this case, the McBSPi.MCBSPLP_PCR_REG[0] FSRM/McBSPi.MCBSPLP_PCR_REG[1] FSXM bit and the McBSPi.MCBSPLP_PCR_REG[2] FSRP/McBSPi.MCBSPLP_PCR_REG[3] FSXP bit still selects the appropriate source and polarity of frame synchronization. Thus, even when the serial port is in reset state, these signals are synchronized to the interface clock (MCBSPi_ICLK) and then sent to the Cortex-A9 MPU/DSP subsystem in the form of receive interrupt and transmit interrupt at the point where they feed the receiver and transmitter of the serial port. Consequently, a new frame-sync pulse can be detected, and then the Cortex-A9 MPU/DSP subsystem can take the serial port out of reset safely.

24.5.4.8.3.5 Ignoring Frame-Sync Pulses

The McBSP module ignores transmit and/or receive frame-sync pulses if the frame transfer was started by a previous frame-sync pulse (unexpected frame-sync pulses). The McBSP module does not support features such as retransmit or re-receive of an erroneous frame or word. The receiver or transmitter ignores frame-sync pulses until the desired frame length or number of words is reached. For more information about unexpected frame-sync pulses, see [Section 24.5.4.10.3, Unexpected Receive Frame-Sync Pulse](#), or [Section 24.5.4.10.6, Unexpected Transmit Frame-Sync Pulse](#).

24.5.4.8.3.6 Frame Frequency

The frame frequency is determined by the period between frame-sync pulses and is defined as shown in the following equation:

Frame frequency = Clock frequency / (number of clock cycles between two rising edges [or falling edges] of two consecutive frame-sync pulses)

The frame frequency can be increased by decreasing the time between frame-sync pulses (limited only by the number of bits per frame). As the frame transmit frequency increases, the inactivity period between the data packets for adjacent transfers decreases to zero.

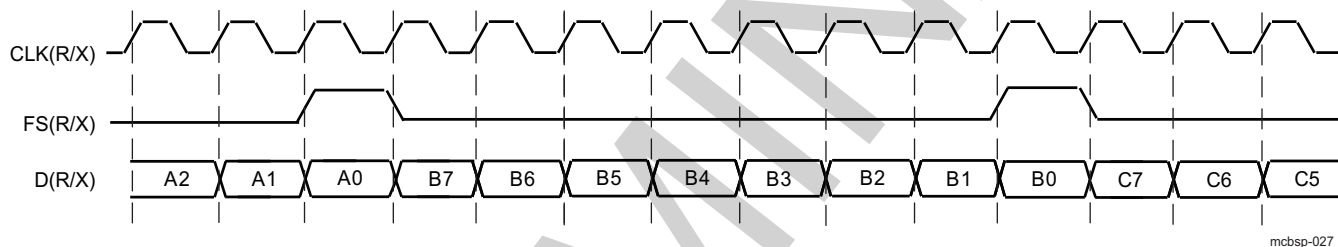
24.5.4.8.3.7 Maximum Frame Frequency

The minimum number of clock cycles between frame-sync pulses is equal to the number of bits transferred per frame. The maximum frame frequency is defined as shown in the following equation:

Maximum frame frequency = Clock frequency / number of bits per frame

Figure 24-133 shows the McBSP operating at maximum packet frequency. At maximum packet frequency, the data bits in consecutive packets are transmitted contiguously with no inactivity between bits.

Figure 24-133. McBSP Operating at Maximum Packet Frequency



mcbasp-027

If there is a 1-bit data delay as shown in Figure 24-133, the frame-sync pulse overlaps the last bit transmitted in the previous frame. Effectively, this permits a continuous stream of data, back-to-back transfers.

NOTE: When the McBSPi.MCBSPLP_XCR2_REG[1:0] XDATDLY bit field is set to 0x0 (0-bit data delay), the first bit of data is transmitted asynchronously to the internal transmit clock signal (CLKX_int). For more information, see Table 24-384.

24.5.4.8.4 Frame Phases (Dual-Phase Frame I2S Support)

The McBSP module allows configuration of each frame to contain one or two phases. The support for dual-phase frames is required to provide I2S fully compliant capabilities (audio left and right channels—stereo audio stream).

CAUTION

The limitation on dual-phase frame support is that the number of words per phase must be set to 1 for both first and second phases. It is the only possible value for word per frame when using the dual-phase frame.

The number of bits per word can be specified differently for each of the two phases of a frame, allowing greater flexibility in structuring data transfers. For example, a user may define a frame as consisting of one phase containing one 16-bit word, followed by a second phase consisting of one 32-bit word. This configuration allows the user to compose frames for custom applications such as I2S protocol.

24.5.4.8.4.1 Number of Phases, Words, and Bits per Frame

Table 24-335 shows which bit fields in the receive control registers (McBSPi.MCBSPLP_RCR1_REG and McBSPi.MCBSPLP_RCR2_REG) and in the transmit control registers (McBSPi.MCBSPLP_XCR1_REG and McBSPi.MCBSPLP_XCR2_REG) determine the number of phases per frame, the number of words per frame, and the number of bits per word for each phase, for both receiver and transmitter. The maximum number of words per frame is limited to 2 when using dual-phase frames (one word for each phase), and to 128 for a single-phase frame. The number of bits per word can be 8, 12, 16, 20, 24, or 32 bits.

The following legend applies to Table 24-335:

- RPHASE = McBSPi.MCBSPLP_RCR2_REG[15] RPHASE bit
- XPHASE = McBSPi.MCBSPLP_XCR2_REG[15] XPHASE bit
- RFRLEN1 = McBSPi.MCBSPLP_RCR1_REG[14:8] RFRLEN1 bit field
- RFRLEN2 = McBSPi.MCBSPLP_RCR2_REG[14:8] RFRLEN2 bit field
- XFRLEN1 = McBSPi.MCBSPLP_XCR1_REG[14:8] XFRLEN1 bit field
- XFRLEN2 = McBSPi.MCBSPLP_XCR2_REG[14:8] XFRLEN2 bit field
- RWDLEN1 = McBSPi.MCBSPLP_RCR1_REG[7:5] RWDLEN1 bit field
- RWDLEN2 = McBSPi.MCBSPLP_RCR2_REG[7:5] RWDLEN2 bit field
- XWDLEN1 = McBSPi.MCBSPLP_XCR1_REG[7:5] XWDLEN1 bit field
- XWDLEN2 = McBSPi.MCBSPLP_XCR2_REG[7:5] XWDLEN2 bit field

Table 24-335. Phases, Words and Bits per Frame Control Bit

| Operation | Number of Phases | Words per Frame Set With | Bits per Word Set With |
|--------------|------------------|---------------------------------|---|
| Reception | 1 (RPHASE = 0) | RFRLEN1 | RWDLEN1 |
| Reception | 2 (RPHASE = 1) | RFRLEN1 = 0x0 and RFRLEN2 = 0x0 | RWDLEN1 for phase 1 RWDLEN2 for phase 2 |
| Transmission | 1 (XPHASE = 0) | XFRLEN1 | XWDLEN1 |
| Transmission | 2 (XPHASE = 1) | XFRLEN1 = 0x0 and XFRLEN2 = 0x0 | XWDLEN1 for phase 1 XWDLEN2 for phase 2 |

24.5.4.8.4.2 Single-Phase Frame Example

Figure 24-134 shows an example of a single-phase data frame containing one 8-bit word. Because the transfer is configured for one data bit delay, the data on the mcbspi_dx and mcbspi_dr pins are available one clock cycle after FS(R/X) goes active. Table 24-336 lists the assumptions used in the example in Figure 24-134.

Table 24-336. Assumptions for the Single-Phase Frame Example

| Assumption | Value | Bit or Field Name |
|--------------------------------------|---------|---------------------------------------|
| Single-phase frame | 0 | McBSPi.MCBSPLP_RCR2_REG[15] RPHASE |
| | | McBSPi.MCBSPLP_XCR2_REG[15] XPHASE |
| One word per frame | 0x0 | McBSPi.MCBSPLP_RCR1_REG[14:8] RFRLEN1 |
| | | McBSPi.MCBSPLP_XCR1_REG[14:8] XFRLEN1 |
| 8-bit word length | 0x0 | McBSPi.MCBSPLP_RCR1_REG[7:5] RWDLEN1 |
| | | McBSPi.MCBSPLP_XCR1_REG[7:5] XWDLEN1 |
| Word length in register2 | Ignored | McBSPi.MCBSPLP_RCR2_REG[14:8] RFRLEN2 |
| | | McBSPi.MCBSPLP_XCR2_REG[14:8] XWDLEN2 |
| Receive data clocked on falling edge | 0 | McBSPi.MCBSPLP_PCR_REG[0] CLKRP |
| Transmit data clocked on rising edge | | McBSPi.MCBSPLP_PCR_REG[1] CLKXP |
| Active-high frame-sync signals | 0 | McBSPi.MCBSPLP_PCR_REG[2] FSRP |
| | | McBSPi.MCBSPLP_PCR_REG[3] FSXP |
| 1-bit data delay | 01b | McBSPi.MCBSPLP_RCR2_REG[1:0] RDATDLY |
| | | McBSPi.MCBSPLP_XCR2_REG[1:0] XDARDLY |

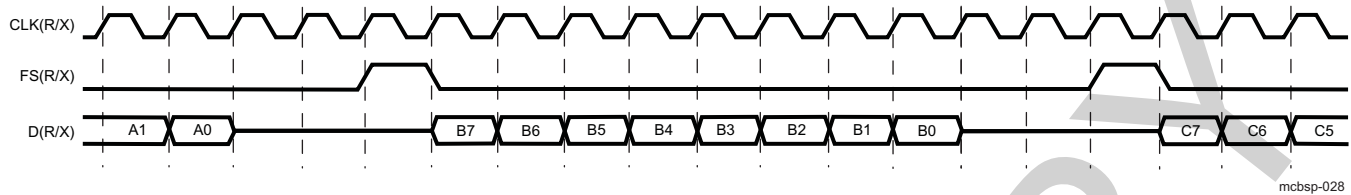
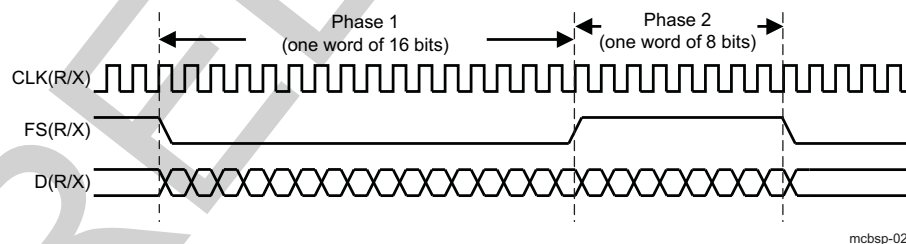
Figure 24-134. Single-Phase Frame for a McBSP Data Transfer**24.5.4.8.4.3 Dual-Phase Frame Example**

Figure 24-135 shows an example of a frame. The first phase consists of one word of 16 bits, followed by a second phase of one word of 8 bits. The entire bitstream in the frame is contiguous. There are no gaps between words/phases. Table 24-337 lists the assumptions used in the example in Figure 24-135.

Table 24-337. Assumptions for the Dual-Phase Frame Example

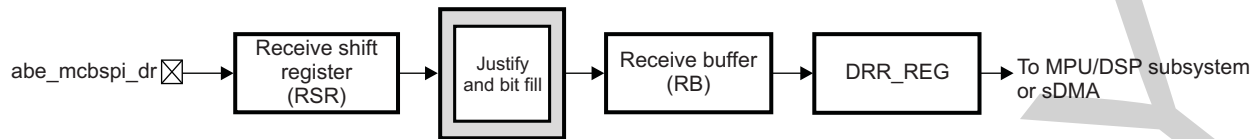
| Assumption | Value | Bit or Field Name |
|--------------------------------------|-------|---------------------------------------|
| Single-phase frame | 1 | McBSPi.MCBSPLP_RCR2_REG[15] RPHASE |
| | | McBSPi.MCBSPLP_XCR2_REG[15] XPHASE |
| One word per frame | 0x0 | McBSPi.MCBSPLP_RCR1_REG[14:8] RFLEN1 |
| | | McBSPi.MCBSPLP_XCR1_REG[14:8] XFLEN1 |
| 16-bit word length | 0x0 | McBSPi.MCBSPLP_RCR1_REG[7:5] RWDLEN1 |
| | | McBSPi.MCBSPLP_XCR1_REG[7:5] XWDLEN1 |
| 8-bit word length | 0x2 | McBSPi.MCBSPLP_RCR2_REG[14:8] RFLEN2 |
| | | McBSPi.MCBSPLP_XCR2_REG[14:8] XWDLEN2 |
| Receive data clocked on falling edge | 0 | McBSPi.MCBSPLP_PCR_REG[0] CLKRP |
| Transmit data clocked on rising edge | | McBSPi.MCBSPLP_PCR_REG[1] CLKXP |
| Active-high frame-sync signals | 0 | McBSPi.MCBSPLP_PCR_REG[2] FSRP |
| | | McBSPi.MCBSPLP_PCR_REG[3] FSXP |
| 0-bit data delay | 00b | McBSPi.MCBSPLP_RCR2_REG[1:0] RDATDLY |
| | | McBSPi.MCBSPLP_XCR2_REG[1:0] XDARDLY |

Figure 24-135. Dual-Phase Frame for a McBSP Data Transfer**24.5.4.8.5 McBSP Reception**

This section explains the fundamental process of reception in the McBSP module. For information about how to program the McBSP receiver, see Section 24.5.5, *McBSP Basic Programming Model*, Section 24.5.5.4, *Interrupt Configuration*, and Section 24.5.5.5, *Receiver Configuration*.

Figure 24-136 and Figure 24-137 show how reception occurs in the McBSP module. A description of the process follows the figures. Figure 24-136 shows the physical path for the data.

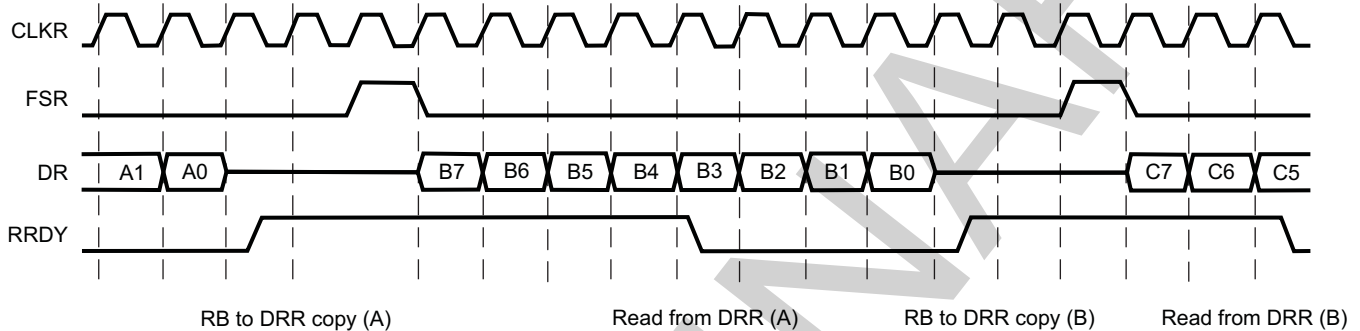
Figure 24-136. McBSP Reception Physical Data Path



mcbbsp-030

Figure 24-137 is a timing diagram showing signal activity for one possible reception scenario.

Figure 24-137. McBSP Reception Signal Activity



RRDY: Status of receiver ready bit (high is 1)

mcbbsp-031

The following process describes how data travels from the mcbspi_dr pin to the MPU/DSP subsystem or to the sDMA controller:

1. The McBSP module waits for a receive frame-sync pulse on FSR_int.
2. When the pulse arrives, the McBSP module inserts the appropriate data delay that is selected with the McBSPi.MCBSPLP_RCR2_REG[1:0] RDATDLY bit field. In the preceding timing diagram a 1-bit data delay is selected.
3. The McBSP module accepts data bits on the mcbspi_dr pin and shifts them into the RSR. For information about choosing a word length, see [Section 24.5.5.6, Transmitter Configuration](#).
4. When a full word is received, the McBSP module copies the contents of the RSR to the RB, provided that RB is not full.
5. When the programmed receive threshold is reached (McBSPi.MCBSPLP_THRSH1_REG[6:0] RTHRESHOLD bit field), the McBSP module asserts the receiver ready bit (McBSPi.MCBSPLP_SPCR1_REG[1] RRDY). This indicates that receive data is ready to be read by the Cortex-A9 MPU/DSP subsystem or the sDMA controller by accessing the McBSPi.MCBSPLP_DRR_REG register.
The data copied from RB to McBSPi.MCBSPLP_DRR_REG is justified and bit-filled according to the McBSPi.MCBSPLP_SPCR1_REG[14:13] RJUST bit field.
6. The Cortex-A9 MPU/DSP subsystem or the sDMA controller reads the data from the data receive register. When the RB is empty, the McBSPi.MCBSPLP_SPCR1_REG[1] RRDY bit is cleared.

24.5.4.8.6 McBSP Transmission

This section explains the fundamental process of transmission in the McBSP module. For information about how to program the McBSP transmitter, see [Section 24.5.5, McBSP Basic Programming Model](#) and [Section 24.5.5.6, Transmitter Configuration](#).

Figure 24-138 and Figure 24-139 show how transmission occurs in the McBSP module. A description of the process follows the figures. Figure 24-138 shows the physical path for the data.

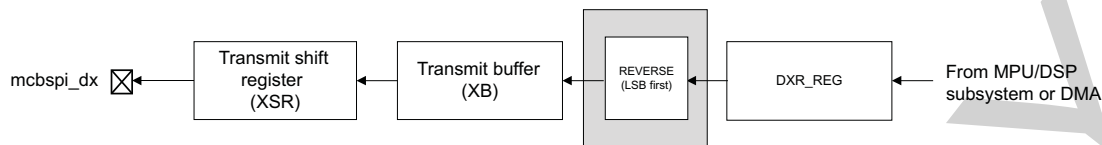
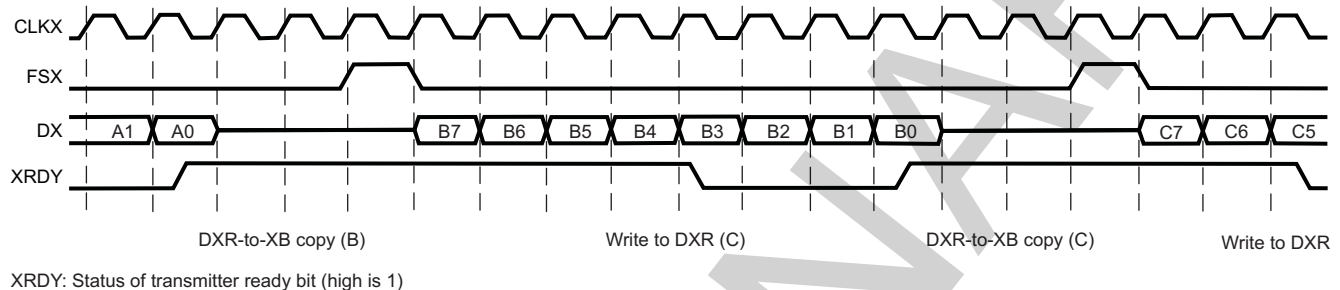
Figure 24-138. McBSP Transmission Physical Data Path

Figure 24-139 is a timing diagram showing signal activity for one possible transmission scenario.

Figure 24-139. McBSP Transmission Signal Activity

1. The Cortex-A9 MPU/DSP subsystem or the sDMA controller writes data to the data transmit register (McBSPi.MCBSPLP_DXR_REG). When the XB is reached the transmitter ready bit (McBSPi.MCBSPLP_SPCR2_REG[1] XRDY) is cleared to indicate that the transmitter is not ready for new data. For information about choosing a word length, see [Table 24-380](#).
2. When new data arrives in the McBSPi.MCBSPLP_DXR_REG register, the McBSP module copies the content of the data transmit register to the XB. In addition, the transmit ready bit (McBSPi.MCBSPLP_SPCR2_REG[1] XRDY) is set as long as the buffer contains at least the transmit threshold number of free locations (the McBSPi.MCBSPLP_THRSH2_REG[6:0] XTHRESHOLD bit field). This indicates that the transmitter is ready to accept new data from the MPU/DSP subsystem or the sDMA controller.
3. The McBSP module waits for a transmit frame-sync pulse on FSX_int.
4. When the pulse arrives, the McBSP module inserts the appropriate data delay that is selected with the McBSPi.MCBSPLP_XCR2_REG[1:0] XDATDLY bit field.
In the preceding timing diagram, a 1-bit data delay is selected.
5. The McBSP module shifts data bits from the XSR to the mcbspi_dx pin.

24.5.4.8.7 Enable/Disable the Transmit and Receive Processes

The McBSP module has the option to stop and resume the transmit/receive process while the module is in functional mode (out of transmit/receive reset).

When the transmit/receive disable bit (McBSPi.MCBSPLP_XCCR_REG[0] XDISABLE/McBSPi.MCBSPLP_RCCR_REG[0] RDISABLE) is set, the McBSP module stops the transmit/receive operation at the next frame boundary (frame corruption avoided).

During the receive disable state, the frames that are sent (when the FSR signal is asserted while receive disable) by the remote device are lost, and the receive buffer overflow status bit (McBSPi.MCBSPLP_IRQSTATUS_REG[5] ROVFLSTAT) is not set. Also, the frames received by the remote device while the McBSPi.MCBSPLP_XCCR_REG[0] XDISABLE bit is set (when the FSX signal is asserted while transmit disable) are meaningless undefined data frames, and transmit buffer underflow status bit (McBSPi.MCBSPLP_IRQSTATUS_REG[11] XUNDFLSTAT) is not set. The presence of the frame synchronization while transmit/receive process is disabled can be checked by reading the transmit/receive frame-sync interrupt status: McBSPi.MCBSPLP_IRQSTATUS_REG[8] XFSX/McBSPi.MCBSPLP_IRQSTATUS_REG[1] RFSR bits.

As soon as the McBSPi.MCBSPLP_XCCR_REG[0] XDISABLE/McBSPi.MCBSPLP_RCCR_REG[0] RDISABLE bit is cleared, the transmit/receive process resumes at the next frame boundary.

NOTE: It is not recommended to use this mechanism together with the possibility to interrogate the transmit/receive buffer status register (McBSPi.MCBSPLP_XBUFFSTAT_REG[7:0] XBUFFSTAT/McBSPi.MCBSPLP_RBUFFSTAT_REG[7:0] RBUFFSTAT bit field indicating the occupied/available buffer locations), because this register is an interface clock (McBSPi_ICLK) synchronous register and does not reflect the exact number of occupied/free locations available in the functional clock domain.

24.5.4.8.8 MCBSP Data Transfer Mode

NOTE: For all examples in this section, the configured CLKX edge is the rising edge (McBSPi.MCBSPLP_PCR_REG[1] CLKXP = 0x0) and the configured CLKR edge is the falling edge (McBSPi.MCBSPLP_PCR_REG[0] CLKRP = 0x0). These are the reset values.

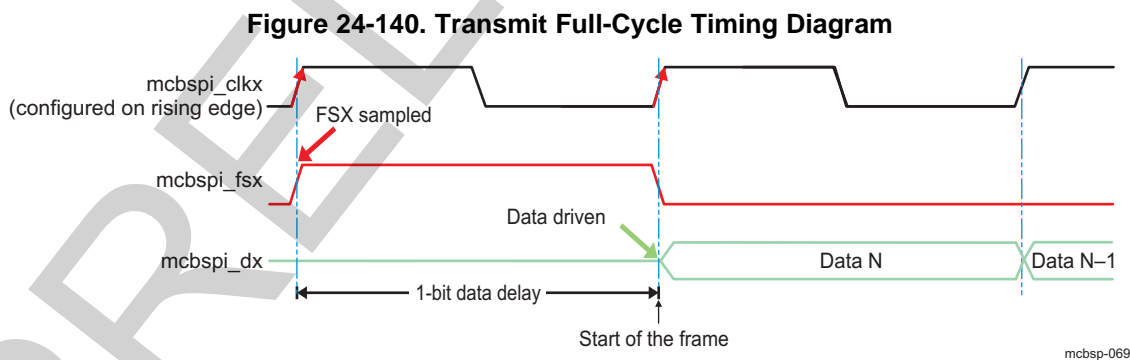
In the following timing diagrams, a 1-bit data delay is selected (McBSPi.MCBSPLP_RCR2_REG[1:0] RDATDLY = 0x01 and McBSPi.MCBSPLP_XCR2_REG[1:0] XDATDLY = 0x01), because data often follows a 1-cycle active frame-synchronization.

McBSP modules can support two edge selection modes for transmit and receive data transfer at the system level:

- The full-cycle mode, for which one clock period is used to transfer the data, generated on one edge and captured on the same edge (one clock period later)
- The half-cycle mode, for which one-half clock period is used to transfer the data, generated on one edge and captured on the opposite edge (one-half clock period later). New data are generated only every clock period, which ensures the required hold time.

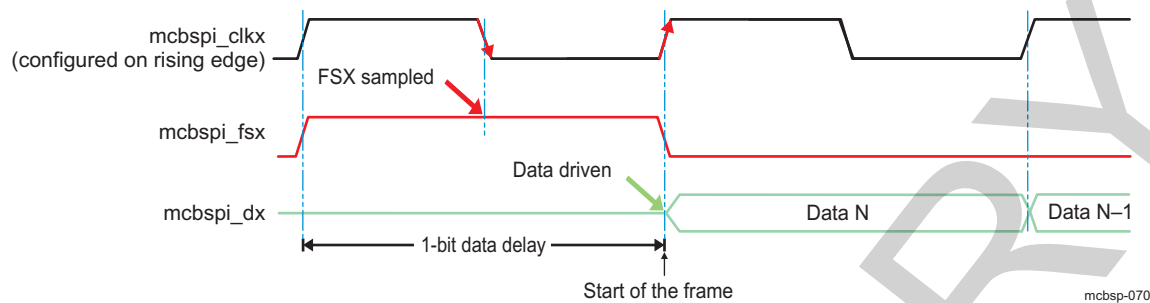
24.5.4.8.8.1 Transmit Full-Cycle Mode

When configured in full-cycle mode (McBSPi.MCBSPLP_XCCR_REG[11] XFULL_CYCLE = 0x1), the FSX signal is sampled on the configured CLKX edge and the data is driven on the same configured edge. See Figure 24-140.

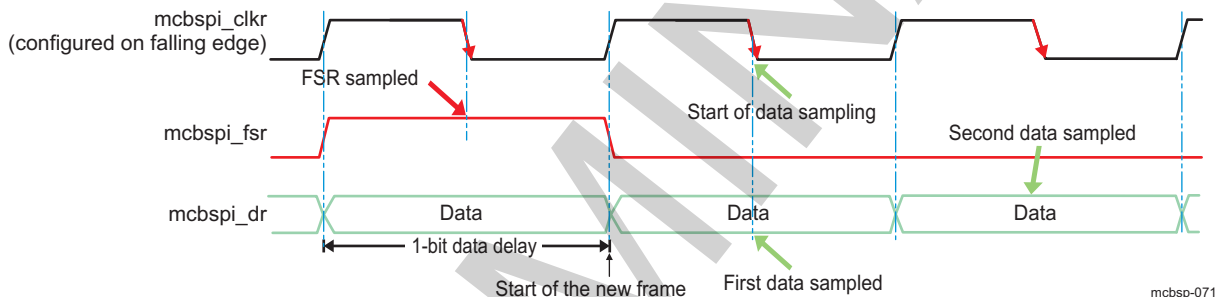


24.5.4.8.8.2 Transmit Half-Cycle Mode

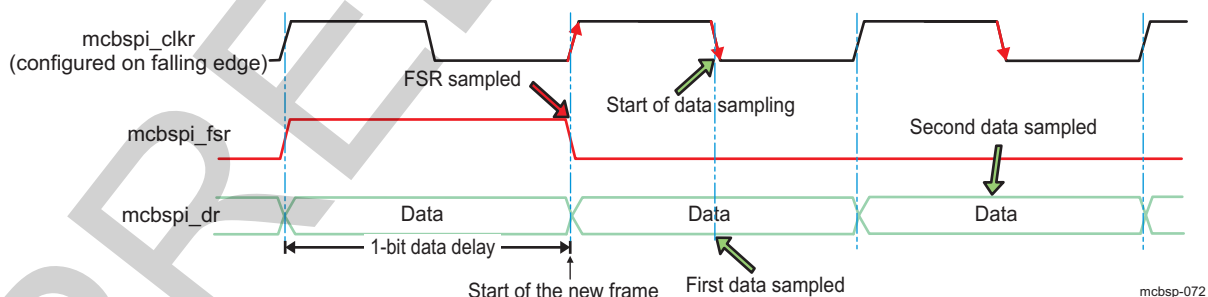
When configured in half-cycle mode (McBSPi.MCBSPLP_XCCR_REG[11] XFULL_CYCLE = 0x0, reset value), the FSX signal is sampled on the opposite configured CLKX edge and the data is driven on the next configured edge. See Figure 24-141.

Figure 24-141. Transmit Half-Cycle Timing Diagram**24.5.4.8.8.3 Receive Full-Cycle Mode**

When configured in full-cycle mode (McBSPi.MCBSPLP_RCCR_REG[11] RFULL_CYCLE = 0x1, reset value), the FSR signal is sampled on the configured CLKR edge and the data is driven on the same configured edge. See [Figure 24-142](#).

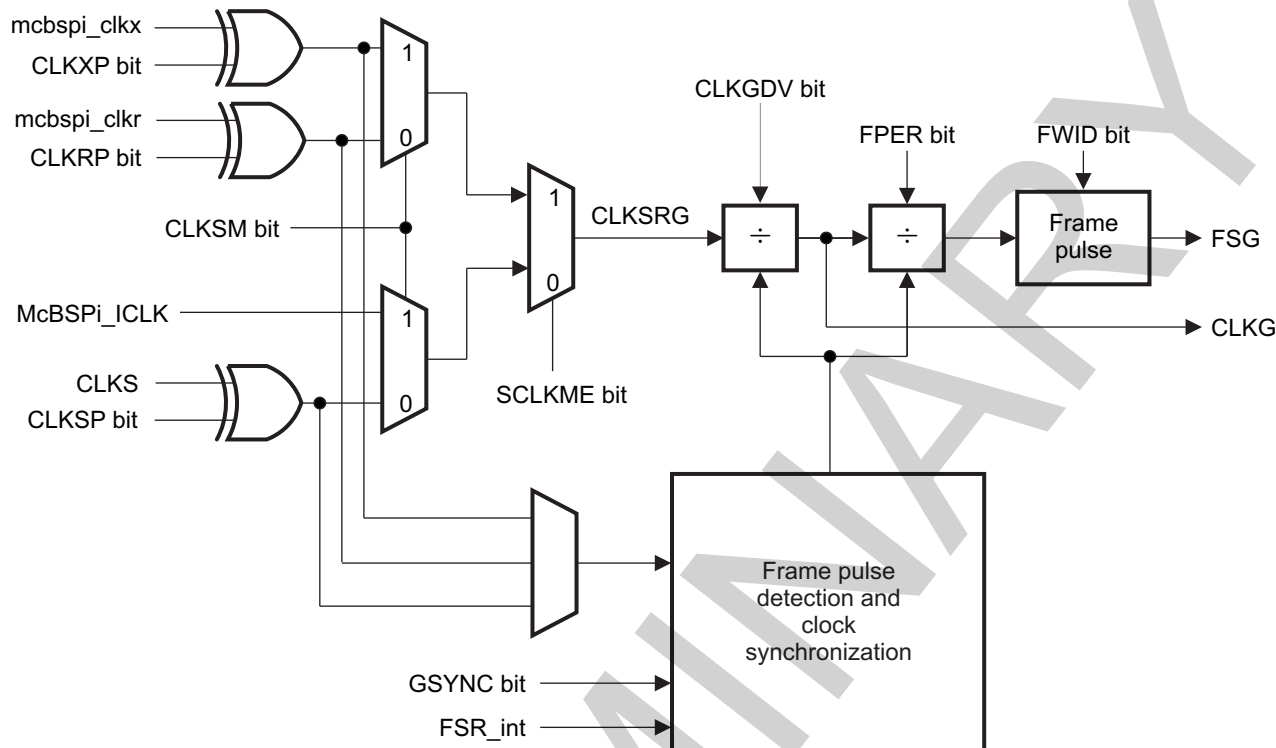
Figure 24-142. Receive Full-Cycle Timing Diagram**24.5.4.8.8.4 Receive Half-Cycle Mode**

When configured in half-cycle mode (McBSPi.MCBSPLP_RCCR_REG[11] RFULL_CYCLE = 0x0), the FSR signal is sampled on the opposite configured CLKR edge and the data is driven on the next configured edge. See [Figure 24-143](#).

Figure 24-143. Receive Half-Cycle Timing Diagram**24.5.4.9 McBSP SRG**

The McBSP module contains an internal SRG that can be used to generate an internal data clock (CLKG) and an internal frame-sync signal (FSG). CLKG can be used for bit shifting on the data receive pin (mcbspi_dr) and/or the data transmit pin (mcbspi_dx). FSG can be used to initiate frame transfers on the mcbspi_dr pin and/or mcbspi_dx pin. [Figure 24-144](#) is a conceptual block diagram of the SRG.

Figure 24-144. Conceptual Block Diagram of the SRG



mcbasp-034

The source clock for the SRG (labeled CLKS_{RG} in the diagram) can be supplied by the interface clock (McBSPi_ICLK) or the functional clock (CLKS input), or by an external pin (mcbspi_clkx or mcbasp4_clkr). The source is selected with the McBSPi.MCBSPLP_PCR_REG[7] SCLKME bit and the McBSPi.MCBSPLP_SRGR2_REG[13] CLKSM bit.

If a pin or CLKS signal is used, the polarity of the incoming signal can be inverted with the appropriate polarity bit (McBSPi.MCBSPLP_SRGR2_REG[14] CLKSP, McBSPi.MCBSPLP_PCR_REG[1] CLKXP, or McBSPi.MCBSPLP_PCR_REG[0] CLKRP).

The SRG has a 3-stage clock divider that gives CLKG and FSG programmability.

The three stages provide:

- Clock divide-down: The source clock (CLKS_{RG}) is divided according to the McBSPi.MCBSPLP_SRGR1_REG[7:0] CLKGDV bit field to produce the CLKG signal.
- Frame period divide-down: CLKG is divided according to the McBSPi.MCBSPLP_SRGR2_REG[11:0] FPER bit field to control the period from the start of a frame-pulse to the start of the next pulse.
- Frame-sync pulse-width countdown: CLKG cycles are counted according to the McBSPi.MCBSPLP_SRGR1_REG[15:8] FWID bit field to control the width of each frame-sync pulse.

NOTE: The McBSP module cannot operate at an internal functional frequency faster than L4 interface frequency divided by 2. Choose an input clock frequency and a McBSPi.MCBSPLP_SRGR1_REG[7:0] CLKGDV value such that CLKG is less than or equal to L4 interface frequency divided by 2.

In addition to the 3-stage clock divider, the SRG has a frame-sync pulse detection and clock synchronization module that allows synchronization of the clock divide-down with an incoming frame-sync pulse on the mcbasp4_fsr pin. This feature is enabled or disabled with the McBSPi.MCBSPLP_SRGR2_REG[15] GSYNC bit.

CLKG is used as source to generate the output clocks CLKX and CLKR when the McBSPi.MCBSPLP_PCR_REG[9] CLKXM/McBSPi.MCBSPLP_PCR_REG[8] CLKRM bit indicates that the clock is an output. The output CLKX/CLKR is generated according to the clock polarity setting (see [Figure 24-131](#)).

For information about preparing the SRG for operation, see [Section 24.5.5, McBSP Basic Programming Model](#).

24.5.4.9.1 Clock Generation in the SRG

The SRG can produce a clock signal (CLKG) for use by the receiver, the transmitter, or both. Use of the SRG to drive clocking is controlled by the clock mode bits (McBSPi.MCBSPLP_PCR_REG[9] CLKXM and McBSPi.MCBSPLP_PCR_REG[8] CLKRM) and polarity mode bits (McBSPi.MCBSPLP_PCR_REG[1] CLKXP and McBSPi.MCBSPLP_PCR_REG[0] CLKRP).

When a clock mode bit is set to 1 (CLKRM = 1 for reception, CLKXM = 1 for transmission), the corresponding data clock (CLKR for reception, CLKX for transmission) is driven by the internal SRG output clock (CLKG) according to the polarity setting.

The effects of this setting on the McBSP module are partially affected by use of the digital loopback (DLB) mode, the analog loopback (ALB) mode, and by the synchronous receive/transmit setting, respectively, as described in [Table 24-338](#). ALB mode is selected with the McBSPi.MCBSPLP_SPCR1_REG[15] ALB bit. DLB mode is selected with the McBSPi.MCBSPLP_XCCR_REG[5] DLB bit. The synchronous setting is controlled by input signals. These signals are defined by the control registers of the control module (for more information, see [Chapter 19, Control Module](#)).

When using the SRG as a clock source, ensure that the SRG is enabled (the McBSPi.MCBSPLP_SPCR2_REG[6] GRST bit is set to 1).

Table 24-338. Effects of DLB and ALB Bits on Clock Modes

| Mode Bit Settings | | Effect |
|-------------------|---|--|
| CLKRM=1 | DLB = 0 and ALB = 0 (Digital and analog loopback mode disabled) | mcbasp1_clkr is an output pin driven by the SRG output clock (CLKG). |
| | DLB = 0 and ALB = 1 (Digital loopback mode disabled and analog loopback mode enabled) | <p>mcbasp1_clkr is an output pin driven by the SRG output clock (CLKG).</p> <p>The receiver functional part internal clock is driven by the CLKX input signal provided by the mcbasp1_clkx pin. The source of CLKX depends on the CLKXM bit.</p> <p>The receive frame synchronization is driven by the FSX input signal provided by the mcbasp1_fsx pin.</p> <p>The receive data is driven by the DX input loopback pin (mcbasp1_dx).</p> |
| | DLB = 1 and ALB = 0 (Digital loopback mode enabled and analog loopback mode disabled) | <p>The SRG and the frame-sync generator must be enabled.</p> <p>The internal transmit and receive clocks are driven by the SRG (CLKG having the appropriate CLKXP polarity).</p> <p>The transmit and receive frame-sync signals are driven by the FSG (having the appropriate FSXP polarity).</p> <p>The transmit data is connected to the DR input data.</p> <p>In digital loopback mode, no serial link activity is seen by the remote device.</p> |
| | DLB = 1 and ALB = 1 (Reserved mode) | Undefined functionality. |

Table 24-338. Effects of DLB and ALB Bits on Clock Modes (continued)

| Mode Bit Settings | | Effect |
|-------------------|---|--|
| CLKXM=1 | DLB = 0 and ALB = 0 (Digital and analog loopback mode disabled) | mcbspi_clkx is an output pin driven by the SRG output clock (CLKG). |
| | DLB = 0 and ALB = 1 (Digital loopback mode disabled and analog loopback mode enabled) | mcbspi_clkx is an output pin driven by the SRG output clock (CLKG). |
| | DLB = 1 and ALB = 0 (Digital loopback mode enabled and analog loopback mode disabled) | <p>The SRG and the frame-sync generator must be enabled.</p> <p>The internal transmit and receive clocks are driven by the SRG (CLKG having the appropriate CLKXP polarity).</p> <p>The transmit and receive frame-sync signals are driven by the FSG (having the appropriate FSXP polarity).</p> <p>The transmit data is connected to the DR input data.</p> <p>In digital loopback mode, no serial link activity is seen by the remote device.</p> |
| | DLB = 1 and ALB = 1 (Reserved mode) | Undefined functionality |
| | CONTROL_MCBSPPLP[30] ALBCTRLRX_CLKX bit = 1 (synchronous setting and DLB = 0 and ALB = 0) | CLKX is an output pin driven by the SRG output clock (CLKG). CLKR is connected to the CLKX. |

24.5.4.9.2 Frame-Sync Generation in the SRG

The SRG can produce a frame-sync signal (FSG) for use by the receiver, the transmitter, or both.

For the receiver to use FSG for frame synchronization, make sure the McBSPi.MCBSPPLP_PCR_REG[10] FSRM bit is set to 1. (When FSRM is set to 0, receive frame synchronization is supplied through the mcbbsp4_fsr pin.)

For the transmitter to use FSG for frame synchronization, the following bits must be set:

- McBSPi.MCBSPPLP_PCR_REG[11] FSXM = 1: This indicates that transmit frame synchronization is supplied by the McBSP module rather than from the mcbspi_fsx pin.
- McBSPi.MCBSPPLP_SRGR2_REG[12] FSGM = 1: This indicates that when FSXM is set to 1, transmit frame synchronization is supplied by the SRG.

NOTE: When FSGM = 0 and FSXM = 1, the transmit frame-sync signal (FSX) is generated when XB is not empty. When FSGM = 0, the McBSPi.MCBSPPLP_SRGR2_REG[11:0] FPER and McBSPi.MCBSPPLP_SRGR1_REG[15:8] FWID bit fields are used to determine the frame-sync period and width (external FSX is gated by the buffer empty condition).

In either case, the SRG must be enabled (the McBSPi.MCBSPPLP_SPCR2_REG[6] GRST bit is set to 1) and the frame-sync logic in the SRG must be enabled (the McBSPi.MCBSPPLP_SPCR2_REG[7] FRST bit is set to 0).

24.5.4.9.2.1 Choosing the Width of the Frame-Sync Pulse

Each pulse on FSG has a programmable width. Program the McBSPi.MCBSPPLP_SRGR1_REG[15:8] FWID bit field, and the resulting pulse width is (FWID + 1) CLKG cycles, where CLKG is the output clock of the SRG. The range is from 1 to 256 clock periods.

24.5.4.9.2.2 Controlling the Period Between the Starting Edges of Frame-Sync Pulses

The user can control the amount of time from the starting edge of one FSG pulse to the starting edge of the next FSG pulse. This period is controlled in one of two ways, depending on the configuration of the SRG:

- If the SRG is using an external input clock and the cBSPi.MCBSPPLP_SRGR2_REG[15] GSYNC bit is set to 1, FSG pulses in response to an inactive-to-active transition on the mcbbsp4_fsr pin. Thus, an external device controls the frame-sync period.

- Otherwise, software programs the McBSPi.MCBSPLP_SRGR2_REG[11:0] FPER bit field, and the resulting frame-sync period is (FPER + 1) CLKG cycles, where CLKG is the output clock of the SRG. The range is from 1 to 4096 clock periods.

24.5.4.9.2.3 Keeping FSG Synchronized to an External Clock

When an external signal is selected to drive the SRG, the McBSPi.MCBSPLP_SRGR2_REG[15] GSYNC bit and the mcbbsp4_fsr pin can be used to configure the timing of FSG pulses.

Setting the McBSPi.MCBSPLP_SRGR2_REG[15] GSYNC bit to 1 ensures that the McBSP module and an external device are dividing down the input clock with the same phase relationship.

If the McBSPi.MCBSPLP_SRGR2_REG[15] GSYNC bit is set to 1, an inactive-to-active transition on the mcbbsp4_fsr pin triggers a resynchronization of CLKG and generation of FSG.

24.5.4.9.3 Synchronizing SRG Outputs to an External Clock

The SRG can produce a clock signal (CLKG) and an FSG based on an input clock signal that is either:

- The interface clock signal (McBSPi_ICLK)
- The CLKS signal (PRCM functional clock or abe_clks)
- A signal at the mcbbsp4_clkr
- The mcbspi_clkx pin

When an external clock (abe_clks, mcbbsp4_clkr, or mcbspi_clkx) is selected to drive the SRG, the McBSPi.MCBSPLP_SRGR2_REG[15] GSYNC bit and the mcbbsp4_fsr pin can be used to control the timing of CLKG and the pulsing of FSG relative to the chosen input clock. Set the GSYNC bit to 1 so that the McBSP module and an external device divide-down the input clock with the same phase relationship.

If the McBSPi.MCBSPLP_SRGR2_REG[15] GSYNC bit is set to 1:

- An inactive-to-active transition on the mcbbsp4_fsr pin triggers a resynchronization of the CLKG signal and a pulsing of the FSG signal.
- The CLKG signal always begins with a high state after synchronization.
- The FSR signal is always detected at the same edge of the input clock signal that generates the CLKG signal, no matter how long the FSR pulse is.
- The McBSPi.MCBSPLP_SRGR2_REG[11:0] FPER bit field is ignored because the frame-sync period on FSG is determined by the arrival of the next frame-sync pulse on the mcbbsp4_fsr pin.

If the McBSPi.MCBSPLP_SRGR2_REG[15] GSYNC bit is set to 0, the CLKG signal runs freely and is not resynchronized, and the frame-sync period on the FSG signal is determined by the McBSPi.MCBSPLP_SRGR2_REG[11:0] FPER bit field.

24.5.4.9.3.1 Operating the Transmitter Synchronously With the Receiver

When the McBSPi.MCBSPLP_SRGR2_REG[15] GSYNC bit is set to 1, the transmitter can operate synchronously with the receiver, provided that the FSX signal is programmed to be driven by the FSG signal (McBSPi.MCBSPLP_SRGR2_REG[12] FSGM = 1 and McBSPi.MCBSPLP_PCR_REG[11] FSXM = 1). If the FSR input signal has appropriate timing so that it can be sampled by the falling edge of the CLKG signal, it can be used, instead, by setting the McBSPi.MCBSPLP_PCR_REG[11] FSXM bit to 0 and connecting the FSR signal to FSX externally.

The SRG clock drives the transmit and receive clocking (the McBSPi.MCBSPLP_PCR_REG[8] CLKRM and McBSPi.MCBSPLP_PCR_REG[9] CLKXM bits are set to 1). Therefore, the CLK(R/X) pin must not be driven by any other driving source.

24.5.4.9.3.2 Synchronization Examples

Figure 24-145 and Figure 24-146 show the clock and frame-sync operation with various polarities of CLKS (the chosen input clock) and FSR signals. These figures assume McBSPi.MCBSPLP_SRGR1_REG[15:8] FWID = 0x0, for an FSG pulse that is one CLKG cycle wide. The McBSPi.MCBSPLP_SRGR2_REG[11:0] FPER bit field is not programmed; the period from the start of a frame-sync pulse to the start of the next pulse is determined by the arrival of the next inactive-to-active transition on the mcbbsp4_fsr pin.

Both figures show what happens to the CLKG signal when the McBSPi.MCBSPLP_SRGR2_REG[15] GSYNC bit is set to 1 and if it is initially synchronized or not initially synchronized. Figure 24-146 has a slower CLKG frequency (it has a larger divide-down value in the McBSPi.MCBSPLP_SRGR1_REG[7:0] CLKGDV bit field).

Figure 24-145. CLKG Synchronization and FSG Generation (GSYNC = 1 and CLKGDV = 0x1)

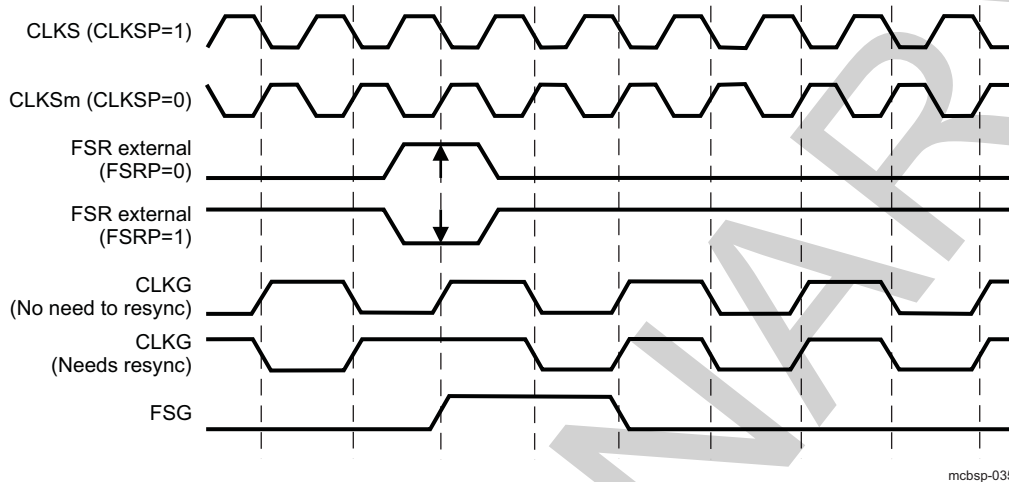
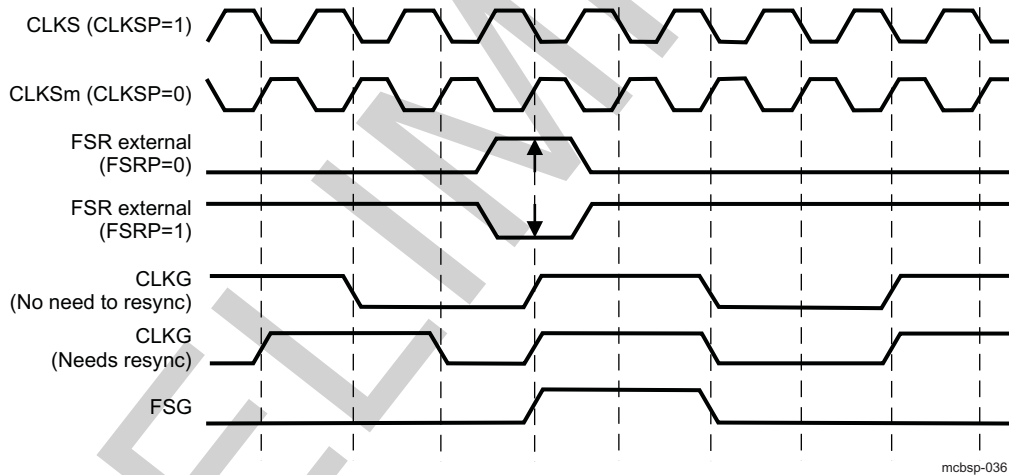


Figure 24-146. CLKG Synchronization and FSG Generation (GSYNC = 1 and CLKGDV = 0x3)



24.5.4.10 McBSP Exception/Error Conditions

24.5.4.10.1 Introduction

Several serial port events can constitute a system error. Any error condition can be a source of an interrupt:

- Receiver overrun (the McBSPi.MCBSPLP_IRQSTATUS_REG[5] ROVFLSTAT bit is set to 1, and the legacy mode McBSPi.MCBSPLP_SPCR1_REG[2] RFULL bit is set to 1)

This occurs when the RB is full and the RSR is full with another new word shifted in from *mcbspi_dr*. Therefore, the McBSPi.MCBSPLP_IRQSTATUS_REG[5] ROVFLSTAT bit (McBSPi.MCBSPLP_SPCR1_REG[2] RFULL) indicates an error condition wherein any new data that can arrive at this time on *mcbspi_dr* replaces the contents of the RSR, and the previous word is lost. The RSR continues to be overwritten as long as new data arrives on *mcbspi_dr* and the McBSPi.MCBSPLP_DRR_REG register is not read. For more information about overrun in the receiver, see Section 24.5.4.10.2, *Overrun in the Receiver*.

- Unexpected receive frame-sync pulse (the McBSPi.MCBSPLP_IRQSTATUS_REG[0] RSYNCERR bit is set to 1, and the legacy mode McBSPi.MCBSPLP_SPCR1_REG[3] RSYNCERR bit is set to 1)
This occurs during reception when an unexpected frame-sync pulse arrives. An unexpected frame-sync pulse is one that is supposed to begin the next frame transfer before all the bits of the current frame are received. Such a pulse is ignored by the receiver, but sets the McBSPi.MCBSPLP_SPCR1_REG[3] RSYNCERR bit. For more information about receive frame-sync errors, see [Section 24.5.4.10.3, Unexpected Receive Frame-Sync Pulse](#).
- Receiver underflow (the McBSPi.MCBSPLP_IRQSTATUS_REG[4] RUNDFLSTAT bit is set to 1)
This occurs when the sDMA controller or MPU/DSP subsystem reads data from an empty receive buffer. For more information about underflow in the receiver, see [Section 24.5.4.10.4, Underflow in the Receiver](#).
- Transmitter underflow (the McBSPi.MCBSPLP_IRQSTATUS_REG[11] XUNDFLSTAT bit is set to 1, and the legacy mode McBSPi.MCBSPLP_SPCR2_REG[2] XEMPTY bit is set to 0)
If a new frame-sync signal arrives when the XB is empty, the previous data in the XSR is re-sent. This procedure continues for every new frame-sync pulse that arrives until the McBSPi.MCBSPLP_DXR_REG register is loaded with new data (and the XB is no longer empty). For more information about underflow in the transmitter, see [Section 24.5.4.10.5, Underflow in the Transmitter](#).
- Unexpected transmit frame-sync pulse (the McBSPi.MCBSPLP_IRQSTATUS_REG[7] XSYNCERR bit is set to 1, and the legacy mode McBSPi.MCBSPLP_SPCR2_REG[3] XSYNCERR bit is set to 1)
This occurs during transmission when an unexpected frame-sync pulse arrives. An unexpected frame-sync pulse is one that is supposed to begin the next frame transfer before all the bits of the current frame are transferred. Such a pulse is ignored by the transmitter, but sets the McBSPi.MCBSPLP_SPCR2_REG[3] XSYNCERR bit. For more information, see [Section 24.5.4.10.6, Unexpected Transmit Frame-Sync Pulse](#).
- Transmitter overflow (the McBSPi.MCBSPLP_IRQSTATUS_REG[12] XOVLSTAT bit is set to 1)
This occurs when the sDMA controller or MPU/DSP subsystem writes data to a full XB. For more information about overflow in the transmitter, see [Section 24.5.4.10.7, Overflow in the Transmitter](#).

24.5.4.10.2 Overrun in the Receiver

When the McBSPi.MCBSPLP_IRQSTATUS_REG[5] ROVLSTAT bit is set to 1, and the McBSPi.MCBSPLP_SPCR1_REG[2] RFULL bit is set to 1 (legacy mode) indicates that the receiver has experienced overrun and is in an error condition. Receive overrun is set when all of the following conditions are met:

1. McBSPi.MCBSPLP_DRR_REG is not read even if the McBSPi.MCBSPLP_IRQSTATUS_REG[3] RRDY bit is set (legacy mode) and DMA or interrupt request has been asserted.
2. RB is full.
3. RSR is full.

As previously described, data arriving on mcbspi_dr is continuously shifted into the RSR. Once a complete word is shifted into the RSR, an RSR-to-RB copy can occur only if the RB is not full.

Either of the following events clears the legacy mode McBSPi.MCBSPLP_SPCR1_REG[2] RFULL bit and allows subsequent transfers to be read properly:

- The MPU/DSP subsystems or sDMA controller reads the McBSPi.MCBSPLP_DRR_REG register.
- The receiver is reset individually (the McBSPi.MCBSPLP_SPCR1_REG[0] RST bit is set to 0) or as part of a global reset.

Another frame-sync pulse is required to restart the receiver.

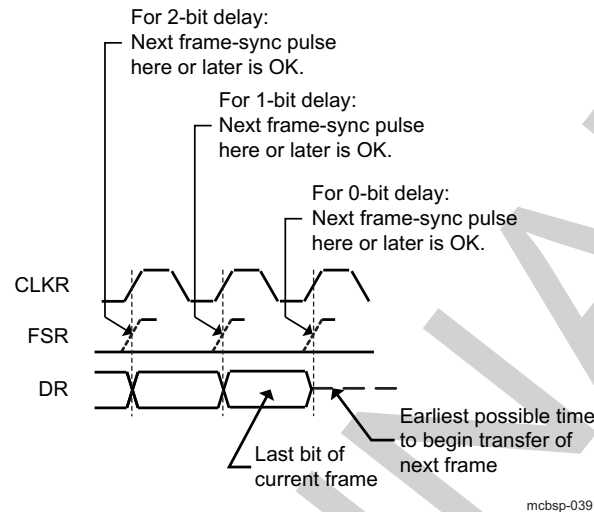
According to the McBSPi.MCBSPLP_IRQENABLE_REG register setting, this condition can generate the McBSPi_IRQ line to be asserted low. Writing 1 to the corresponding bit in the McBSPi.MCBSPLP_IRQSTATUS_REG register clears the interrupt.

[Figure 24-147](#) shows the receive overrun condition.

24.5.4.10.3.3 Preventing Unexpected Receive Frame-Sync Pulses

Each frame transfer can be delayed by 0, 1, or 2 CLKR cycles, depending on the value of the McBSPi.MCBSPLP_RCR2_REG[1:0] RDATDLY bit field. For each possible data delay, Figure 24-149 shows when a new frame-sync pulse on FSR can safely occur relative to the last bit of the current frame.

Figure 24-149. Proper Positioning of Receive Frame-Sync Pulses



24.5.4.10.4 Underflow in the Receiver

The McBSP module indicates a receiver underflow condition by setting the McBSPi.MCBSPLP_IRQSTATUS_REG[4] RUNDLSTAT bit. This error occurs when sDMA controller or MPU/DSP subsystem reads data from an empty RB; this happens only if the MPU/DSP subsystem or sDMA controller does not respect the DMA length, does not wait for DMA request, or does not check the buffer status before reading data. According to the McBSPi.MCBSPLP_IRQENABLE_REG register settings, this condition can generate the McBSPi_IRQ line to be asserted low. Writing 1 to the corresponding bit in McBSPi.MCBSPLP_IRQSTATUS_REG register clears the interrupt.

24.5.4.10.5 Underflow in the Transmitter

The McBSP module indicates a transmitter empty (or underflow) condition by setting the McBSPi.MCBSPLP_IRQSTATUS_REG[11] XUNDLSTAT bit. The legacy mode McBSPi.MCBSPLP_SPCR2_REG[2] XEMPTY bit is also cleared. Either of the following events activates the XEMPTY bit (XEMPTY = 0):

- The McBSPi.MCBSPLP_DXR_REG register has not been loaded and the XB is empty, and all bits of the data word in the XSR have been shifted out on the mcbspi_dx pin.
- The transmitter is reset (by forcing McBSPi.MCBSPLP_SPCR2_REG[0] XRST to 0, or by a global reset) and is then restarted.

The XEMPTY bit is deactivated (XEMPTY = 1) when a new word in the McBSPi.MCBSPLP_DXR_REG register is transferred to the XB. If the McBSPi.MCBSPLP_PCR_REG[11] FSXM bit is set to 1 and the McBSPi.MCBSPLP_SRGR2_REG[12] FSGM bit is set to 0, the FSX signal is generated when the XB is not empty. When the McBSPi.MCBSPLP_SRGR2_REG[12] FSGM bit is set to 0, the McBSPi.MCBSPLP_SRGR2_REG[11:0] FPER and McBSPi.MCBSPLP_SRGR1_REG[15:8] FWID bit fields are used to determine the frame-sync period and width (external FSX is gated by the buffer empty condition). Otherwise, the transmitter waits for the next frame-sync pulse before sending the next frame on the mcbspi_dx pin.

When the transmitter is taken out of reset (the McBSPi.MCBSPLP_SPCR2_REG[0] XRST bit is set to 1), it is in a transmitter ready state (the McBSPi.MCBSPLP_SPCR2_REG[1] XRDY bit is set to 1) and transmitter empty (the McBSPi.MCBSPLP_SPCR2_REG[2] XEMPTY bit is set to 0) state. If the

McBSPi.MCBSPLP_DXR_REG register is loaded by the MPU/DSP subsystem or the sDMA controller before internal the FSX goes active high, a valid XB-to-XSR transfer occurs. This allows for the first word of the first frame to be valid even before the transmit frame-sync pulse is generated or detected. Alternatively, if a transmit frame-sync pulse is detected before McBSPi.MCBSPLP_DXR_REG is loaded, zeros are output on the mcbspi_dx pin.

The McBSPi.MCBSPLP_IRQSTATUS_REG[11] XUNDFLSTAT bit indicates a real underflow condition, in which the frame is corrupted due to lack of data availability during the transmit process. According to the settings of the McBSPi.MCBSPLP_IRQENABLE_REG register, this condition can generate the McBSPi_IRQ line to be asserted low. Writing 1 to the corresponding bit in McBSPi.MCBSPLP_IRQSTATUS_REG register clears the interrupt.

24.5.4.10.6 Unexpected Transmit Frame-Sync Pulse

24.5.4.10.6.1 Possible Responses to Transmit Frame-Sync Pulses

If a frame-sync pulse starts the transfer of a new frame before the current frame is fully transmitted, this pulse is treated as an unexpected frame-sync pulse, and the transmitter sets the transmit frame-sync error bit McBSPi.MCBSPLP_IRQSTATUS_REG[7] XSYNCERR (and the legacy McBSPi.MCBSPLP_SPCR2_REG[3] XSYNCERR bit).

According to the settings of the McBSPi.MCBSPLP_IRQENABLE_REG register, this condition can generate the McBSPi_IRQ line to be asserted low. Writing 1 to the corresponding bit in the status register clears the interrupt.

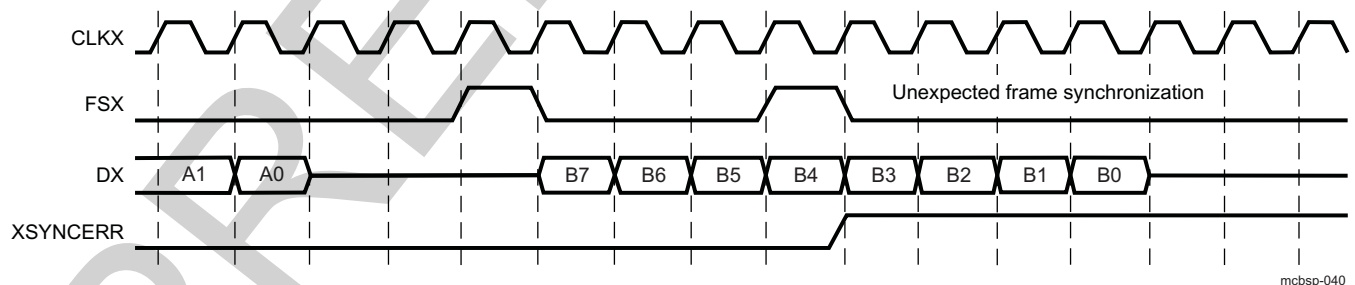
Using the legacy mode, the McBSPi.MCBSPLP_SPCR2_REG[3] XSYNCERR bit can be cleared only by a transmitter reset or by setting this bit to 0. For the McBSP module to notify the MPU/DSP subsystem of frame-sync errors, set a special transmit interrupt mode with the McBSPi.MCBSPLP_SPCR2_REG[5:4] XINTM bit field. When XINTM is set to 0b11, the McBSP module sends a transmit interrupt request to the MPU/DSP subsystem each time XSYNCERR is set.

24.5.4.10.6.2 Example of Unexpected Transmit Frame-Sync Pulse

Figure 24-150 shows an unexpected transmit frame-sync pulse during normal operation of the serial port with intervals between the data packets.

NOTE: The unexpected transmit frame-sync pulse does not influence the data transmit process, being ignored by the data transmit state-machine.

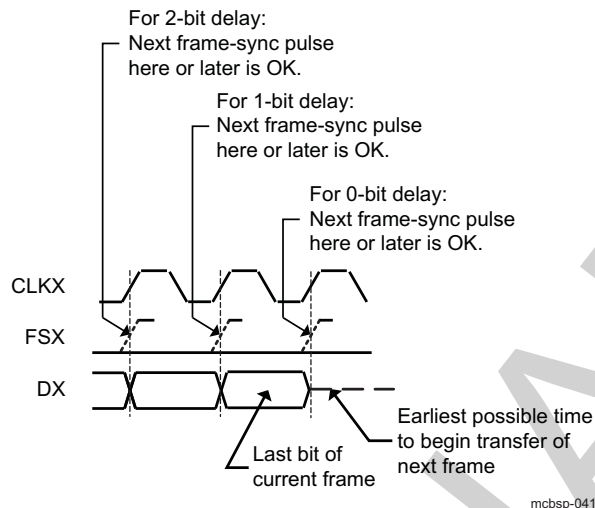
Figure 24-150. Unexpected Frame-Sync Pulse During a McBSP Transmission



mcbbsp-040

24.5.4.10.6.3 Preventing Unexpected Transmit Frame-Sync Pulses

Each frame transfer can be delayed by 0, 1, or 2 CLKX cycles, depending on the value in the McBSPi.MCBSPLP_XCR2_REG[1:0] XDATDLY bit field. For each possible data delay, Figure 24-151 shows when a new frame-sync pulse on FSX can safely occur relative to the last bit of the current frame.

Figure 24-151. Proper Positioning of Transmit Frame-Sync Pulses**24.5.4.10.7 Overflow in the Transmitter**

The McBSP module indicates a transmitter overflow condition by setting the McBSPi.MCBSPLP_IRQSTATUS_REG[12] XOVLSTAT bit. This error occurs when the sDMA controller or MPU/DSP subsystem writes data to a full XB (this happens only if the MPU/DSP subsystem or sDMA controller does not respect the DMA length, does not wait for DMA request, or does not check the buffer status before writing data). According to the settings of the McBSPi.MCBSPLP_IRQENABLE_REG register, this condition can generate the McBSPi_IRQ line to be asserted low. Writing 1 to the corresponding bit in the status register clears the interrupt.

24.5.4.11 McBSP DMA Configuration

The McBSP receive and transmit data DMA requests are active after the receive McBSPi.MCBSPLP_SPCR1_REG[0] RST and transmit McBSPi.MCBSPLP_SPCR2_REG[0] XRST bits are released. After reset the default DMA threshold (and length) is one.

The receive and transmit DMA requests can be individually disabled by setting the McBSPi.MCBSPLP_RCCR_REG[3] RDMAEN and McBSPi.MCBSPLP_XCCR_REG[3] XDMAEN bits to 0. When disabling the DMA, the DMA request line is deasserted even if a DMA transfer is pending and the DMA state-machine is not reset.

The DMA threshold and length configuration is done through the McBSPi.MCBSPLP_THRSH1_REG and McBSPi.MCBSPLP_THRSH2_REG registers as follows:

- (THRSH1_REG + 1) value represents the required receive DMA request length (the length of the transfer is the same as the threshold value plus 1). As long as the RB occupied locations level is greater than or equal to the THRSH1_REG value + 1, the DMA request is asserted. After transferring the configured (THRSH1_REG + 1) number of words, the receive DMA request is deasserted and reasserted as soon as the conditions are met again.
- (THRSH2_REG + 1) value represents the required transmit DMA request length (the length of the transfer is the same as the threshold value plus 1). As long as the XB free locations level is greater than or equal to the THRSH2_REG value + 1, the DMA request is asserted. After transferring the configured (THRSH2_REG + 1) number of words, the transmit DMA request is deasserted and reasserted as soon as the conditions are met.

NOTE: The MPU/DSP subsystem can decide not to use the DMA to transfer the data. In this case, the DMA must be disabled (or the DMA request can be ignored by MPU/DSP subsystem) and the common interrupt line (MCBSPi_IRQ) can be used. The MCBSPi.MCBSPLP_SPCR1_REG[1] RRDY bit for receive and the MCBSPi.MCBSPLP_SPCR2_REG[1] XRDY bit for transmit indicate when the threshold values are reached. Also, by reading the receive buffer status MCBSPi.MCBSPLP_RBUFFSTAT_REG register and transmit buffer status MCBSPi.MCBSPLP_XBUFFSTAT_REG register, the MPU/DSP subsystem can decide to transfer data even if the threshold is not reached. This mechanism is useful on the last transfer on the receive side when the threshold value is bigger than the occupied locations inside the receive buffer and the MPU/DSP subsystem needs to read this data. Because no interrupt or DMA request is asserted, the only option in this case is to read the value of the RB status register and to transfer the remaining data without using the DMA or interrupt indication.

24.5.4.12 Multichannel Selection Modes

24.5.4.12.1 Channels, Blocks and Partitions

A McBSP channel is a time slot for shifting in/out the bits of one serial word. The McBSP module supports up to 128 channels for reception and 128 channels for transmission. In the receiver and in the transmitter, the 128 available channels are divided into eight blocks that contain 16 contiguous channels each (see [Table 24-339](#)).

Table 24-339. McBSP Channels

| | |
|--------------------------------|----------------------------------|
| Block 0: Channels 0–15 | Block 4: Channels 64–79 |
| Block 1: Channels 16–31 | Block 5: Channels 80–95 |
| Block 2: Channels 32–47 | Block 6: Channels 96–111 |
| Block 3: Channels 48–63 | Block 6: Channels 112–127 |

The blocks are assigned to partitions according to the selected partition mode. In the 2-partition mode described in [Section 24.5.4.12.6, Using Two Partitions \(Legacy Only\)](#), assign one even-numbered block (0, 2, 4, or 6) to partition A and one odd-numbered block (1, 3, 5, or 7) block to partition B. In the 8-partition mode described in [Section 24.5.4.12.4, Using Eight Partitions](#), blocks 0 through 7 are automatically assigned to partitions A through H, respectively.

The number of partitions for reception and the number of partitions for transmission are independent of one another. For example, it is possible to use two receive partitions (A and B) and eight transmit partitions (A–H).

24.5.4.12.2 Multichannel Selection

When a McBSP module uses a time-division multiplexed (TDM) data stream while communicating with other McBSP modules or serial devices, the McBSP module may need to receive and/or transmit on only a few channels. To save memory and bus bandwidth, use a multichannel selection mode to prevent data flow in some of the channels.

Each channel partition has a dedicated channel enable register. If the appropriate multichannel selection mode is on, each bit in the register controls whether data flow is allowed or prevented in one of the channels that is assigned to that partition.

The McBSP module has one receive multichannel selection mode (see [Section 24.5.4.12.5, Receive Multichannel Selection Mode](#)) and three transmit multichannel selection modes (see [Section 24.5.4.12.7, Transmit Multichannel Selection Modes](#)).

24.5.4.12.3 Configuring a Frame for Multichannel Selection

Before enabling a multichannel selection mode, ensure that the data frame is properly configured:

- Select a single-phase frame (the McBSPi.MCBSPLP_RCR2_REG[15] RPHASE and McBSPi.MCBSPLP_XCR2_REG[15] XPHASE bits are set to 0). Each frame represents a TDM data stream.
- Set a frame length (in the McBSPi.MCBSPLP_RCR1_REG[14:8] RFLEN1 and McBSPi.MCBSPLP_XCR1_REG[14:8] XFLEN1 bit fields) that includes the highest numbered channel to be used. For example, to use channels 0, 15, and 39 for reception, the receive frame length must be at least 40 (RFLEN1 = 39). In this case, if XFLEN1 = 39, the receiver creates 40 time slots per frame but receives data only during time slots 0, 15, and 39 of each frame.

24.5.4.12.4 Using Eight Partitions

For multichannel selection operation in the receiver and/or transmitter, eight partitions or two partitions (as previously described) can be used. If 8-partition mode (McBSPi.MCBSPLP_MCR1_REG[9] RMCME = 1 for reception, and McBSPi.MCBSPLP_MCR2_REG[9] XMCME = 1 for transmission) is selected, McBSP channels are activated in the following order: A, B, C, D, E, F, G, H.

In response to a frame-sync pulse, the receiver or transmitter begins with the channels in partition A and then continues with the other partitions, in order, until the complete frame is transferred. When the next frame-sync pulse occurs, the next frame is transferred, beginning with the channels in partition A.

In 8-partition mode, the McBSPi.MCBSPLP_MCR1_REG[6:5] RPABLK/McBSPi.MCBSPLP_MCR2_REG[6:5] XPABLK bit fields, and the McBSPi.MCBSPLP_MCR1_REG[8:7] RPBBLK/McBSPi.MCBSPLP_MCR2_REG[8:7] XPBBLK bit fields are ignored and the 16-channel blocks are assigned to the partitions as shown in Table 24-340 and Table 24-341. These assignments cannot be changed. The tables also show the registers used to control the channels in the partitions.

Table 24-340. Eight Partitions – Receive Channel Assignment and Control

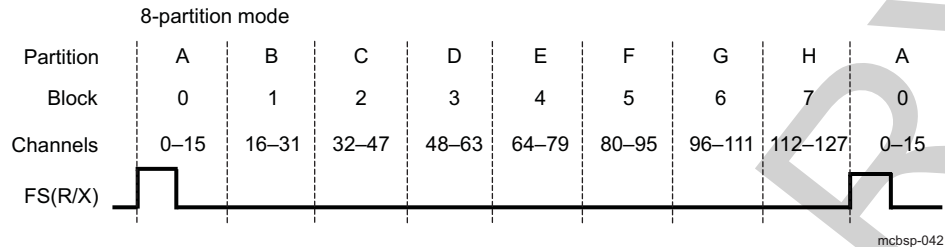
| Receive Partition | Assigned Block of Receive Channels | Register Used for Channel Control |
|-------------------|------------------------------------|-----------------------------------|
| A | Block 0: Channels 0–15 | McBSPi.MCBSPLP_RCERA_REG |
| B | Block 1: Channels 16–31 | McBSPi.MCBSPLP_RCERB_REG |
| C | Block 2: Channels 32–47 | McBSPi.MCBSPLP_RCERC_REG |
| D | Block 3: Channels 48–63 | McBSPi.MCBSPLP_RCERD_REG |
| E | Block 4: Channels 64–79 | McBSPi.MCBSPLP_RCERE_REG |
| F | Block 5: Channels 80–95 | McBSPi.MCBSPLP_RCERF_REG |
| G | Block 6: Channels 96–111 | McBSPi.MCBSPLP_RCERG_REG |
| H | Block 7: Channels 112–127 | McBSPi.MCBSPLP_RCERH_REG |

Table 24-341. Eight Partitions – Transmit Channel Assignment and Control

| Transmit Partition | Assigned Block of Receive Channels | Register Used for Channel Control |
|--------------------|------------------------------------|-----------------------------------|
| A | Block 0: Channels 0–15 | McBSPi.MCBSPLP_XCERA_REG |
| B | Block 1: Channels 16–31 | McBSPi.MCBSPLP_XCERB_REG |
| C | Block 2: Channels 32–47 | McBSPi.MCBSPLP_XCERC_REG |
| D | Block 3: Channels 48–63 | McBSPi.MCBSPLP_XCERD_REG |
| E | Block 4: Channels 64–79 | McBSPi.MCBSPLP_XCERE_REG |
| F | Block 5: Channels 80–95 | McBSPi.MCBSPLP_XCERF_REG |
| G | Block 6: Channels 96–111 | McBSPi.MCBSPLP_XCERG_REG |
| H | Block 7: Channels 112–127 | McBSPi.MCBSPLP_XCERH_REG |

Figure 24-152 shows an example of the McBSP using 8-partition mode. In response to a frame-sync pulse, the McBSP module begins a frame transfer with partition A and then activates B, C, D, E, F, G, and H to complete a 128-word frame.

Figure 24-152. McBSP Data Transfer in 8-Partition Mode



24.5.4.12.5 Receive Multichannel Selection Mode

The McBSPi.MCBSPLP_MCR1_REG[0] RMCME bit determines whether all channels or only selected channels are enabled for reception.

- When RMCME = 0, all 128 receive channels are enabled and cannot be disabled.
- When RMCME = 1, the receive multichannel selection mode is enabled. In this mode:
 - Channels can be individually enabled or disabled. The enabled channels are those selected in the appropriate receive channel enable registers (McBSPi.MCBSPLP_RCERA_REG/McBSPi.MCBSPLP_RCERH_REG). The channels assigned to the McBSPi.MCBSPLP_RCERA_REG/McBSPi.MCBSPLP_RCERH_REG registers depend on the number of receive channel partitions (2 or 8), as defined by the McBSPi.MCBSPLP_MCR1_REG[9] RMCME bit.
 - If a receive channel is disabled, any bits received in that channel are not transferred to the RB, and as a result, the receiver ready bit (RRDY) is not set. Therefore, no DMA synchronization event is generated and, if the receiver interrupt mode depends on RRDY (McBSPi.MCBSPLP_SPCR1_REG[5:4] RINTM = 0b00), no interrupt is generated.

As an example of how the McBSP module behaves in the receive multichannel selection mode, suppose only channels 0, 15, and 39 are enabled and that the frame length is 40. The McBSP module:

1. Accepts bits shifted in from the mcbspi_dr pin in channel 0
2. Ignores bits received in channels 1–14
3. Accepts bits shifted in from the mcbspi_dr pin in channel 15
4. Ignores bits received in channels 16–38
5. Accepts bits shifted in from the mcbspi_dr pin in channel 39

24.5.4.12.6 Using Two Partitions (Legacy Only)

For multichannel selection operation in the receiver and/or the transmitter, two partitions or eight partitions can be used. If 2-partition mode (the McBSPi.MCBSPLP_MCR1_REG[9] RMCME bit is set to 0 for reception, and the McBSPi.MCBSPLP_MCR2_REG[9] XMCME bit is set to 0 for transmission) is selected, the McBSP channels are activated using an alternating scheme. In response to a frame-sync pulse, the receiver or transmitter begins with the channels in partition A and then alternates between partitions B and A until the complete frame is transferred. When the next frame-sync pulse occurs, the next frame is transferred beginning with the channels in partition A.

For reception, any two of the eight receive-channel blocks can be assigned to receive partitions A and B, which means up to 32 receive channels can be enabled at any given point. Similarly, any two of the eight transmit-channel blocks (up to 32 enabled transmit channels) can be assigned to transmit partitions A and B.

For reception:

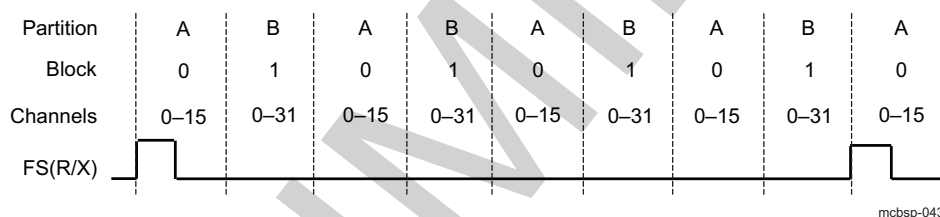
- Assign an even-numbered channel block (0, 2, 4, or 6) to receive partition A by writing to the McBSPi.MCBSPLP_MCR1_REG[6:5] RPABLK bit field. In the receive multichannel selection mode, the channels in this partition are controlled by receive channel enable register A (McBSPi.MCBSPLP_RCERA_REG).
- Assign an odd-numbered block (1, 3, 5, or 7) to receive partition B with the McBSPi.MCBSPLP_MCR1_REG[8:7] RPBBLK bit field. In the receive multichannel selection mode, the channels in this partition are controlled by receive channel enable register B (McBSPi.MCBSPLP_RCERB_REG).

For transmission:

- Assign an even-numbered channel block (0, 2, 4, or 6) to transmit partition A by writing to the McBSPi.MCBSPLP_MCR2_REG[6:5] XPABLK bit field. In one of the transmit multichannel selection modes, the channels in this partition are controlled by transmit channel enable register A (McBSPi.MCBSPLP_XCERA_REG).
- Assign an odd-numbered block (1, 3, 5, or 7) to transmit partition B with the McBSPi.MCBSPLP_MCR1_REG[8:7] XPBBLK bit field. In one of the transmit multichannel selection modes, the channels in this partition are controlled by transmit channel enable register B (McBSPi.MCBSPLP_XCERB_REG).

Figure 24-153 shows an example of alternating between the channels of partition A and the channels of partition B. Channels 0–15 have been assigned to partition A, and channels 16–31 have been assigned to partition B. In response to a frame-sync pulse, the McBSP module begins a frame transfer with partition A and then alternates between partitions B and A until the complete frame is transferred.

Figure 24-153. Alternating Between Partitions A and B Channels



24.5.4.12.7 Transmit Multichannel Selection Modes

The McBSPi.MCBSPLP_MCR2_REG[1:0] XMCM bit field determines whether all channels or only selected channels are enabled and unmasked for transmission. The McBSP module has three transmit multichannel selection modes (XMCM = 0b01, XMCM = 0b10, and XMCM = 0b11), which are described in Table 24-342.

Table 24-342. Selecting a Transmit Multichannel Selection Mode With the XMCM Bit Field

| XMCM | Transmit Multichannel Selection Mode |
|------|---|
| 0b00 | No transmit multichannel selection mode is on. All channels are enabled and unmasked. No channels can be disabled or masked. |
| 0b01 | All channels are disabled unless they are selected in the appropriate transmit channel enable registers (McBSPi.MCBSPLP_XCERA_REG/McBSPi.MCBSPLP_XCERH_REG). If enabled, a channel in this mode is also unmasked. The McBSPi.MCBSPLP_MCR2_REG[9] XMCME bit determines whether 32 or 128 channels are selectable in the McBSPi.MCBSPLP_XCERA_REG/McBSPi.MCBSPLP_XCERH_REG registers. |
| 0b10 | All channels are enabled, but they are masked unless they are selected in the appropriate transmit channel enable registers (McBSPi.MCBSPLP_XCERA_REG/McBSPi.MCBSPLP_XCERH_REG). The McBSPi.MCBSPLP_MCR2_REG[9] XMCME bit determines whether 32 or 128 channels are selectable in the McBSPi.MCBSPLP_XCERA_REG/McBSPi.MCBSPLP_XCERH_REG registers. |
| 0b11 | This mode is used for symmetric transmission and reception. All channels are disabled for transmission unless they are enabled for reception in the appropriate receive channel enable registers (McBSPi.MCBSPLP_RCERA_REG/McBSPi.MCBSPLP_RCERH_REG). Once enabled, they are masked unless they are also selected in the appropriate transmit channel enable registers (McBSPi.MCBSPLP_XCERA_REG/McBSPi.MCBSPLP_XCERH_REG). The McBSPi.MCBSPLP_MCR2_REG[9] XMCME bit determines whether 32 or 128 channels are selectable in the McBSPi.MCBSPLP_RCERA_REG/McBSPi.MCBSPLP_RCERH_REG registers and the McBSPi.MCBSPLP_XCERA_REG/McBSPi.MCBSPLP_XCERH_REG registers. |

As an example of how the McBSP module behaves in a transmit multichannel selection mode, suppose that XMCM = 0b01 (all channels disabled unless individually enabled) and that only channels 0, 15, and 39 are enabled. Suppose also that the frame length is 40. The McBSP module:

1. Shifts data to the mcbspi_dx pin in channel 0
2. Places the mcbspi_dx pin in the high-impedance state in channels 1–14
3. Shifts data to the mcbspi_dx pin in channel 15
4. Places the mcbspi_dx pin in the high-impedance state in channels 16–38
5. Shifts data to the mcbspi_dx pin in channel 39

24.5.4.12.7.1 Disabling/Enabling Versus Masking/Unmasking

For transmission, a channel can be:

- Enabled and unmasked (transmission can begin and can be completed)
- Enabled but masked (transmission can begin but cannot be completed)
- Disabled (transmission cannot occur)

The definitions in [Table 24-343](#) explain the channel control options:

Table 24-343. McBSP Channel Control Options

| | |
|-------------------------|--|
| Enabled channel | A channel that can begin transmission by passing data from the data transmit register (McBSPi.MCBSPLP_DXR_REG) to the XSR through the XB. |
| Masked channel | A channel that cannot complete transmission. The mcbspi_dx pin is held in high-impedance state; data cannot be shifted out on the mcbspi_dx pin. In systems where symmetric transmit and receive provide software benefits, this feature allows transmit channels to be disabled on a shared serial bus. A similar feature is not needed for reception because multiple receptions cannot cause serial bus contention. |
| Disabled channel | A channel that is not enabled. A disabled channel is also masked. Because no DXR-to-XB copy occurs, the McBSPi.MCBSPLP_SPCR2_REG[1] XRDY bit is not set. Therefore, no DMA synchronization event is generated, and if the transmit interrupt mode depends on XRDY (McBSPi.MCBSPLP_SPCR2_REG[5:4] XINTM = 00b), no interrupt is generated. The McBSPi.MCBSPLP_SPCR2_REG[2] XEMPTY bit is not affected. |
| Unmasked channel | A channel that is not masked. Data in the XSR(s) is shifted out on the mcbspi_dx pin. |

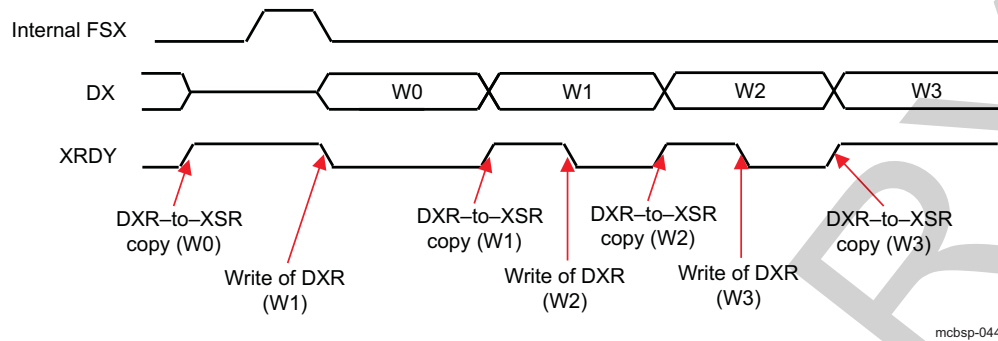
24.5.4.12.7.2 Activity on McBSP Pins for Different Values of XMCM

[Figure 24-154](#) shows the activity on the McBSP pins for the various values of the McBSPi.MCBSPLP_MCR2_REG[1:0] XMCM bit field. In all cases, the transmit frame is configured as follows:

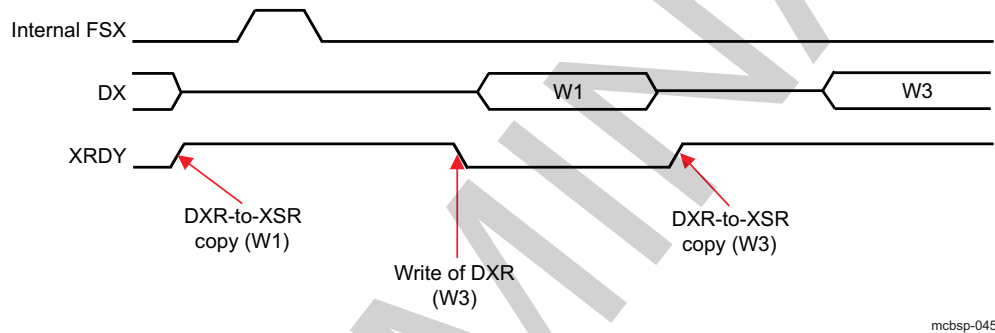
- XPHASE = 0: Single-phase frame (required for multichannel selection modes)
- XFRLN1 = 0b0000011: 4 words per frame
- XWDLEN1 = 0b000: 8 bits per word
- XMCME = 0: 2-partition mode (only partitions A and B are used)

In the case where McBSPi.MCBSPLP_MCR2_REG[1:0] XMCM = 0b11, transmission and reception are symmetric, which means the corresponding bits for the receiver (RPHASE, RFRLN1, RWDLEN1, and RMCME) must have the same values as XPHASE, XFRLN1, and XWDLEN1, respectively.

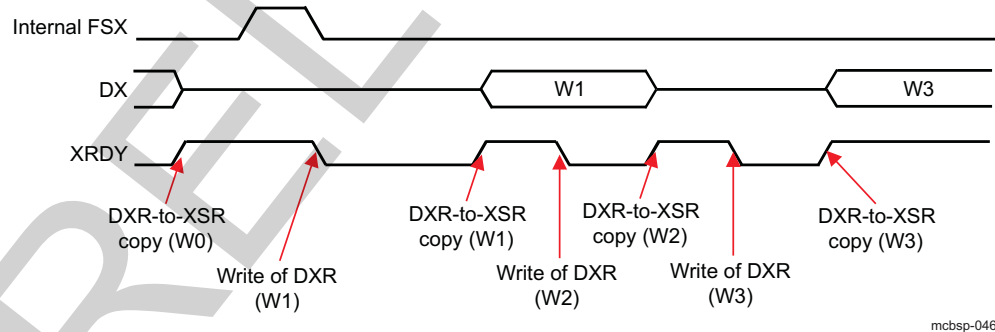
In [Figure 24-154](#), the arrows showing where the various events occur are only sample indications. Wherever possible, there is a time window in which these events can occur.

Figure 24-154. Activity on McBSP Pins When XMCM = 0b00

If XMCM = 0b00, all channels are enabled and unmasked. Words W0, W1, W2, and W3 are written to the XB, and then, from the XB, they are transferred by mcbspi_dx.

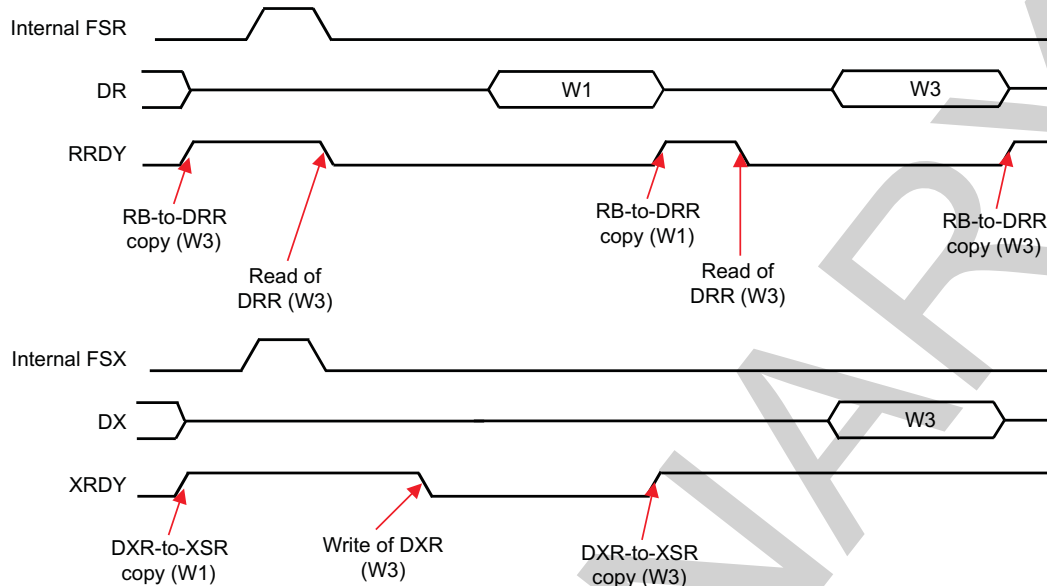
Figure 24-155. Activity on McBSP Pins When XMCM = 0b01

In [Figure 24-155](#) if XMCM = 0b01, XPABLK = 0b00, and XCERA = 0b1010, only channels 1 and 3 are enabled and unmasked. Words W1 and W3 are written to the XB, and then, from the XB, they are transferred by mcbspi_dx.

Figure 24-156. Activity on McBSP Pins When XMCM = 0b10

In [Figure 24-156](#) if XMCM = 0b10, XPABLK = 0b00, and XCERA = 0b1010, all channels are enabled, and only 1 and 3 are unmasked. Words W0, W1, W2, and W3 are written to the XB, but only W1 and W3, from the XB, are transferred by mcbspi_dx.

Figure 24-157. Activity on McBSP Pins When XMCM = 0b11



mcbsp-047

In [Figure 24-157](#) if XMCM = 0b11, RPABLK = 0b00, XPABLK = 0bX, RCERA = 0b1010, and XCERA = 0b1000, channels 1 and 3 are enabled in receive and transmit mode, but only 3 is unmasked. Words W1 and W3 are written to the XB, but only W3, from the XB, is transferred by mcbspi_dx.

24.5.5 McBSP Basic Programming Model

This section describes the programming model of a typical McBSP module.

CAUTION

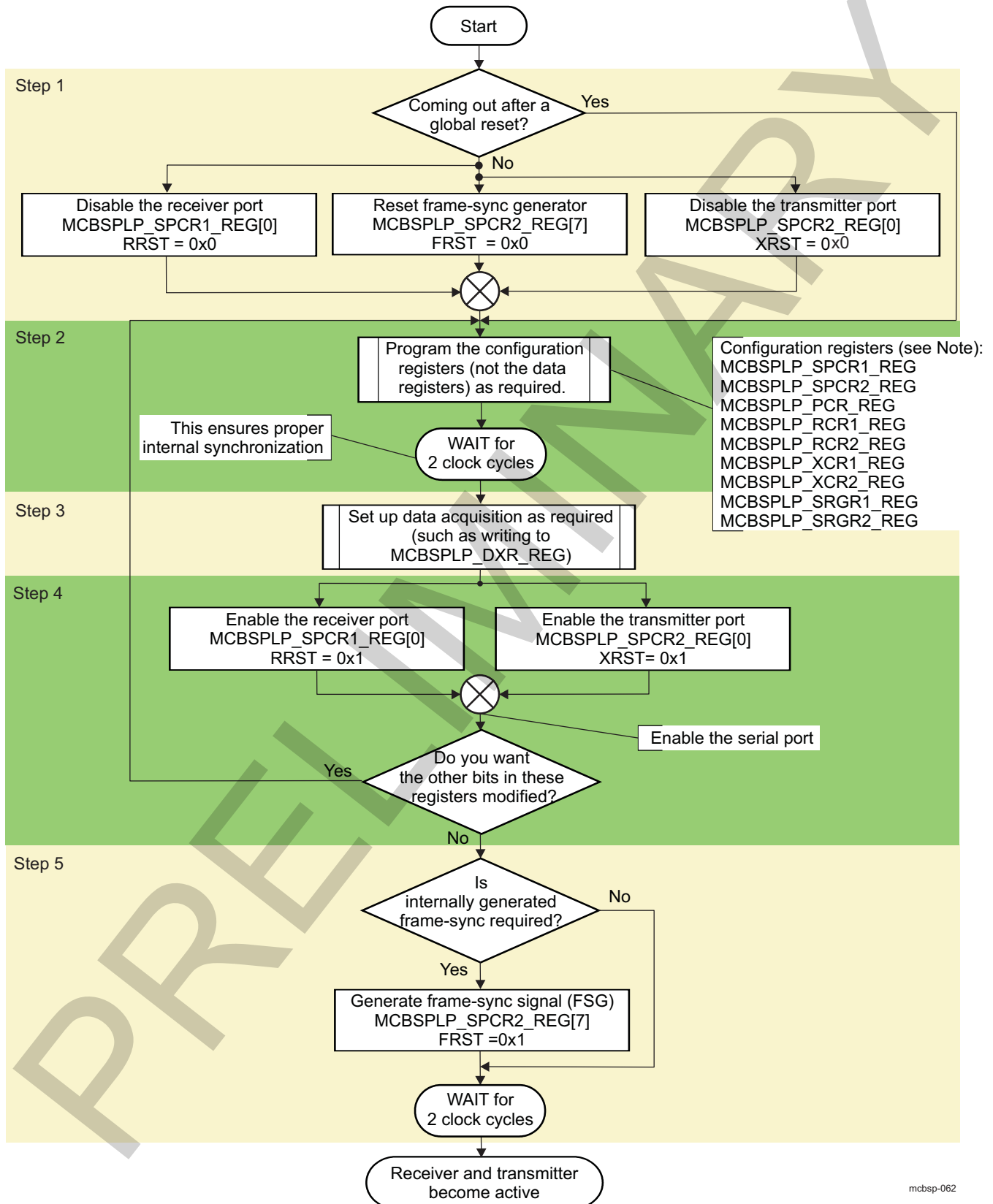
For all descriptions in this section, the McBSPi.MCBSPLP_XCCR_REG[11] XFULL_CYCLE and McBSPi.MCBSPLP_RCCR_REG[11] RFULL_CYCLE bits are their reset value (XFULL_CYCLE is set to 0 and RFULL_CYCLE is set to 1).

24.5.5.1 McBSP Initialization Procedure

This procedure for reset/initialization can be applied in general when the receiver or transmitter must be reset during its normal operation, and also when the SRG is not used for either operation.

[Figure 24-158](#) shows the serial port initialization procedure for master mode.

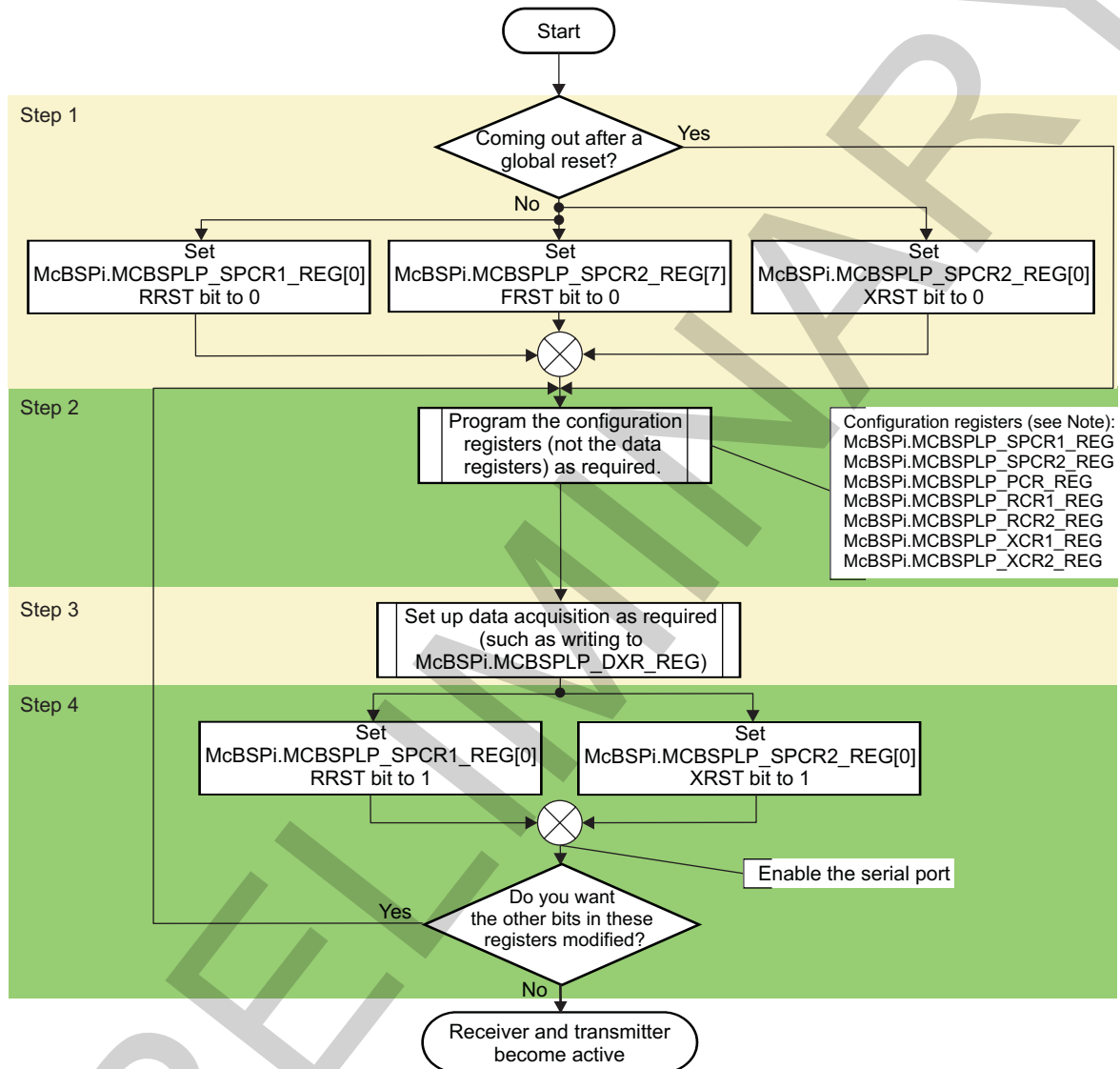
Figure 24-158. Flow Diagram of McBSP Initialization Procedure for Master Mode



Alternatively, on write (Step 1 or Step 4), the transmitter and receiver can be placed in or taken out of reset by modifying the McBSPi.MCBSPLP_SPCR2_REG[0] XRST and McBSPi.MCBSPLP_SPCR1_REG[0] RRST bits, respectively.

Figure 24-159 shows the flow diagram of the McBSP initialization procedure for slave mode.

Figure 24-159. Flow Diagram of McBSP Initialization Procedure for Slave Mode



mcbasp-075

NOTE:

- Alternatively, on write (Step 1 or Step 4), the transmitter and receiver can be placed in or taken out of reset by modifying the McBSPi.MCBSPLP_SPCR2_REG[0] XRST and McBSPi.MCBSPLP_SPCR1_REG[0] RRST bits, respectively.
- The necessary duration of the active-low period of XRST or RRST is at least two CLKR/CLKX cycles.
- The appropriate bits in serial port configuration registers (McBSPi.MCBSPLP_SPCR1_REG, McBSPi.MCBSPLP_SPCR2_REG, McBSPi.MCBSPLP_PCR_REG, McBSPi.MCBSPLP_RCR1_REG, McBSPi.MCBSPLP_RCR2_REG, McBSPi.MCBSPLP_XCR1_REG, McBSPi.MCBSPLP_XCR2_REG, McBSPi.MCBSPLP_THRSH2_REG, McBSPi.MCBSPLP_XCCR_REG, McBSPi.MCBSPLP_SYSCONFIG_REG, McBSPi.MCBSPLP_SRGR1_REG and McBSPi.MCBSPLP_SRGR2_REG) should be modified only when the affected portion of the serial port is in its reset state.
- In most cases, the data transmit register (McBSPi.MCBSPLP_DXR_REG) should be loaded by the MPU/DSP subsystem or the sDMA controller only when the transmitter is enabled (McBSPi.MCBSPLP_SPCR2_REG[0] XRST = 1). An exception to this rule is when these registers are used for loopback internal data.
- The bits of the channel control registers (McBSPi.MCBSPLP_MCR1_REG, McBSPi.MCBSPLP_MCR2_REG, McBSPi.MCBSPLP_RCER{A-H}_REG and McBSPi.MCBSPLP_XCER{A-H}_REG) can be modified at any time as long as they are not being used by the current reception/transmission in a multichannel selection mode.
- The SRG is reset by setting the McBSPi.MCBSPLP_SPCR2_REG[6] GRST bit to 0.
- It is not necessary to wait if SRG is not used.
- The necessary duration of the active-low period of XRST or RRST is at least two
- Modification on-the-fly has no effect if a reset is not performed first.

Table 24-344. Register Call Summary for Flow Diagram of McBSP Initialization Procedure

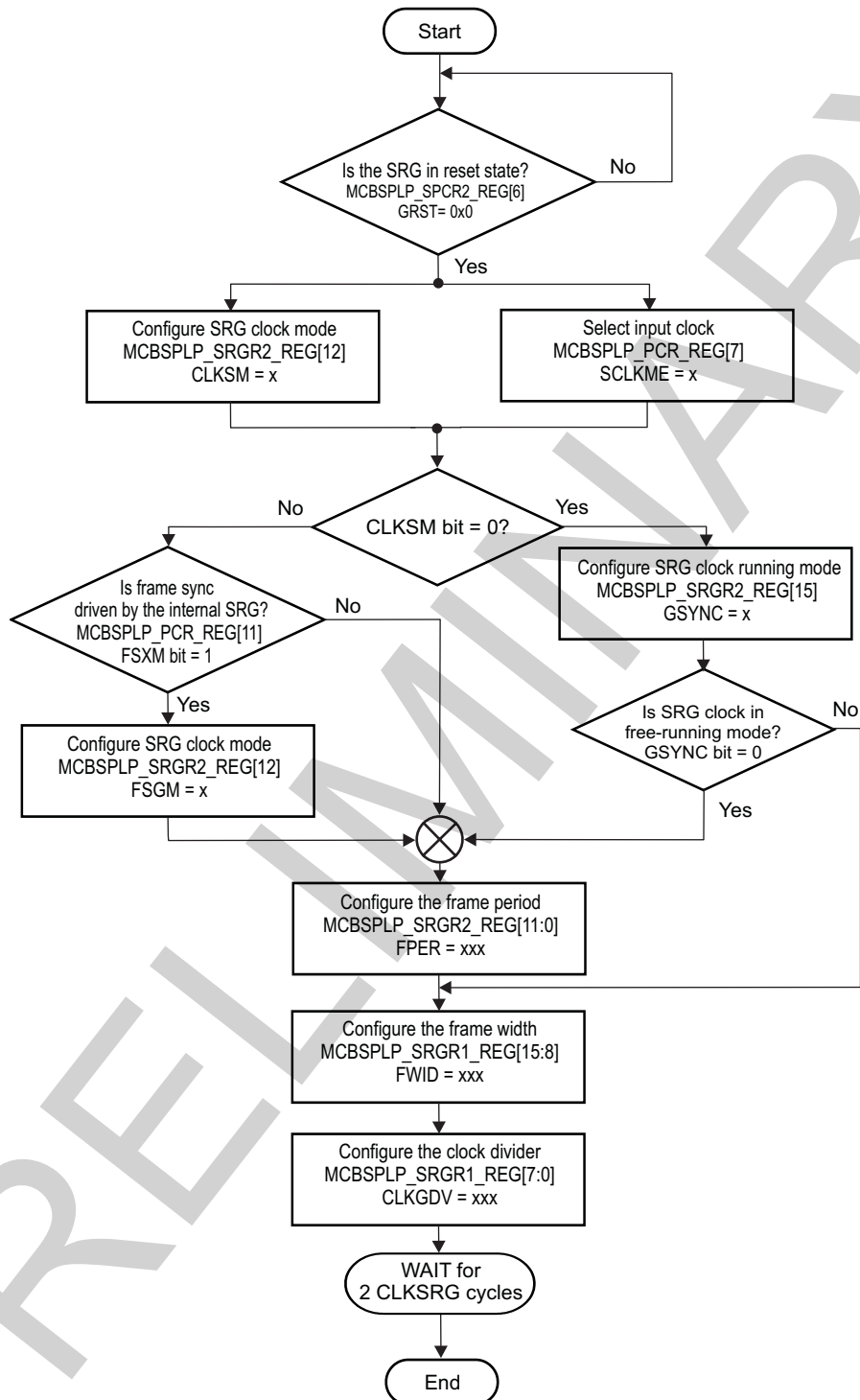
| Register Name | Register Name | Register Name |
|-------------------|------------------|-------------------|
| MCBSPLP_SPCR1_REG | MCBSPLP_RCR1_REG | MCBSPLP_XCR2_REG |
| MCBSPLP_SPCR2_REG | MCBSPLP_RCR2_REG | MCBSPLP_SRGR1_REG |
| MCBSPLP_PCR_REG | MCBSPLP_XCR1_REG | MCBSPLP_SRGR2_REG |

24.5.5.2 Reset and Initialization Procedure for the SRG

To reset and initialize the SRG:

1. Place the McBSP SRG in reset.
2. Program the registers that affect the SRG.
3. Enable the SRG (take it out of reset).
4. If necessary, enable the receiver and/or the transmitter.
5. If necessary, remove the receiver and/or transmitter from reset

Figure 24-160 shows the flow diagram for programming the SRG registers.

Figure 24-160. Flow Diagram for the SRG Registers Programming

mcbasp-073

Table 24-345. Register Call Summary for Flow Diagram for the SRG Registers Programming

| Register Name | Register Name |
|-------------------|-------------------|
| MCBSPLP_SPCR2_REG | MCBSPLP_PCR_REG |
| MCBSPLP_SRGR2_REG | MCBSPLP_SRGR1_REG |

24.5.5.3 Data Transfer DMA Request Configuration

This procedure configures the McBSP receive/transmit data DMA requests (MCBSPi_DMA_RX and MCBSPi_DMA_TX) (see [Table 24-346](#)).

Table 24-346. Data Transfer DMA Request Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|---------------------------------------|-------|
| Write the required receive DMA request length. | MCBSPLP_THRSH1_REG[6:0] RTHRESHOLD | x..x |
| Write the required transmit DMA request length. | MCBSPLP_THRSH2_REG[6:0] RTHRESHOLD | x..x |

NOTE:

- The length of the transfer is the same as the threshold value + 1
- In case of a number of transfers that exceed the number of the programmed DMA length, the McBSP module will respond to the command and will perform the transfer regardless of the receive buffer empty condition.
- In case of a number of transfers that exceed the number of the programmed DMA length, the McBSP module will respond to the command and will perform the transfer regardless of the transmit buffer full condition.

24.5.5.4 Interrupt Configuration

This procedure configures the common receive/transmit interrupt request line (see [Table 24-347](#)).

Table 24-347. Interruption Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------------|--------------------------------------|-------|
| Enable the required IRQ events. | MCBSPLP_IRQENABLE_REG | x..x |

24.5.5.5 Receiver Configuration

To configure the McBSP receiver, perform the following steps:

- Step 1. Place the McBSP receiver in reset.
- Step 2. Program the McBSP registers for the desired receiver operation.
- Step 3. Take the receiver out of reset.

24.5.5.5.1 Place the Receiver in Reset (Step 1)

Table 24-348. Receiver Reset

| Step | Register/Bit Field/Programming Model | Value |
|------------------------------|--------------------------------------|-------|
| Place the receiver in reset. | MCBSPLP_SPCR1_REG[0] RST | 0x0 |

24.5.5.5.2 Programming the McBSP Registers for the Desired Receiver Configuration (Step 2)

This section describes the steps to be performed when software configures the McBSP receiver.

Global Configuration

Table 24-349 describes the steps to perform the global configuration.

Table 24-349. Global Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|--------------------------------------|------------|
| Set the receiver pins to operate as McBSP pins. | MCBSPLP_PCR_REG[12] RIOEN | 0x0 |
| Enable/disable DLB mode ⁽¹⁾ . | MCBSPLP_XCCR_REG[5] DLB | 0x0 or 0x1 |
| Enable/disable ALB mode ⁽¹⁾ . | MCBSPLP_SPCR1_REG[5] ALB | 0x0 or 0x1 |
| Select the clock used in synchronous transmit-receive mode (McBSP4 only) ⁽¹⁾ . | CONTROL_MCBSPLP[30] ALBCTRLRX_CLKX | 0x0 or 0x1 |
| Select frame synchronization used in the synchronous transmit-receive mode (McBSP4 only) ⁽¹⁾ . | CONTROL_MCBSPLP[31] ALBCTRLRX_FSX | 0x0 or 0x1 |
| Enable/disable the receive multichannel selection Mode ⁽¹⁾ . | MCBSPLP_MCR1_REG[0] RCMCM | 0x0 or 0x1 |

⁽¹⁾ Software decision

NOTE: In DLB mode the SRG and frame-sync generator must be enabled to generate the CLKX and FSX signals.

Data Configuration

Table 24-350 describes the steps to perform the data configuration.

Table 24-350. Data Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|------------|
| Select single/dual-phase frame ⁽¹⁾ . | MCBSPLP_RCR2_REG[15] RPHASE | 0x0 or 0x1 |
| Set the receive word length(s) for phase 1 ⁽¹⁾ . | MCBSPLP_RCR1_REG[7:5] RWDLEN1 | xxx |
| Set the receive word length(s) for phase 2 ⁽¹⁾ . | MCBSPLP_RCR2_REG[7:5] XWDLEN2 | xxx |
| Set the receive frame length*. | MCBSPLP_RCR1_REG[14:8] RFRLEN1 MCBSPLP_RCR2_REG[14:8] RFRLEN2 | xxx |
| Set the receive reverse mode ⁽¹⁾ . | MCBSPLP_RCR2_REG[4:3] RREVERSE | xx |
| Set the receive data delay ⁽¹⁾ . | MCBSPLP_RCR2_REG[1:0] RDATLY | xx |
| Set the receive sign-extension and justification mode ⁽¹⁾ . | MCBSPLP_SPCR1_REG[14:13] RJUST | xx |
| Enable the serial receiver port. | MCBSPLP_SPCR1_REG[0] RRST | 0x1 |
| Configure the receive buffer threshold value ⁽¹⁾ . | MCBSPLP_THRSH1_REG[6:0] RTHRESHOLD | x..x |

⁽¹⁾ Software decision

NOTE:

- When dual-phase frame is selected, the number of words per phase must be set to 1.
- If a single-phase frame is selected, RWDLEN1 selects the length for every serial word received in the frame. If a dual-phase frame is selected, RWDLEN1 and RWDLEN2 must be set to select both lengths. These bits can have different values.
- If a dual-phase frame is selected, the frame length must be two words.

Frame-Sync Configuration

Table 24-351 describes the steps to perform the frame-sync configuration.

Table 24-351. Frame-Sync Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|------------|
| Set the receive frame-sync mode ⁽¹⁾ . | MCBSPLP_PCR_REG[10] FSRM | 0x0 or 0x1 |
| Select SRG synchronization ⁽¹⁾ . | MCBSPLP_SRGR2_REG[15] GSYNC | 0x0 or 0x1 |
| Set the receive frame-sync polarity ⁽¹⁾ . | MCBSPLP_PCR_REG[2] FSRP | 0x0 or 0x1 |
| Set the SRG frame-sync period ⁽¹⁾ . | MCBSPLP_SRGR2_REG[11:0] FPER | x..x |
| Set the SRG frame-sync pulse width ⁽¹⁾ . | MCBSPLP_SRGR1_REG[15:8] FWID | x..x |

⁽¹⁾ Software decision

Clock Configuration

Table 24-352 describes the steps to perform clock configuration.

Table 24-352. Clock Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|---|------------|
| Set the receive clock mode ⁽¹⁾ . | MCBSPLP_PCR_REG[8] CLKRM | 0x0 or 0x1 |
| Set the receive clock polarity ⁽¹⁾ . | MCBSPLP_PCR_REG[0] CLKRP | 0x0 or 0x1 |
| Set the SRG clock divide-down value ⁽¹⁾ . | MCBSPLP_SRGR1_REG[7:0] CLKGDV | x..x |
| Set the SRG clock synchronization mode ⁽¹⁾ . | MCBSPLP_SRGR2_REG[15] GSYNC | 0x0 or 0x1 |
| Set the SRG input clock mode ⁽¹⁾ . | MCBSPLP_PCR_REG[7] SCKLME MCBSPLP_SRGR2_REG[13] CLKSM | 0x0 or 0x1 |
| Set the SRG input clock polarity ⁽¹⁾ . | MCBSPLP_SRGR2_REG[14] CLKSP MCBSPLP_PCR_REG[1] CLKXP MCBSPLP_PCR_REG[0] CLKRP | 0x0 or 0x1 |

⁽¹⁾ Software decision

NOTE: CLKRP = CLKXP in a system in which the same clock (internal or external) is used to clock the receiver and transmitter. The receiver uses the opposite edge as the transmitter to ensure valid setup and hold of data around this edge.

24.5.5.5.3 Take the Receiver Out of Reset (Step 3)

Table 24-353. Take the Receiver Out of Reset

| Step | Register/Bit Field/Programming Model | Value |
|----------------------|--------------------------------------|-------|
| Enable the receiver. | MCBSPLP_SPCR1_REG[0] RST | 0x1 |

24.5.5.6 Transmitter Configuration

To configure the McBSP transmitter, perform the following steps:

- Step 1. Place the McBSP transmitter in reset.
- Step 2. Program the McBSP registers for the desired transmitter operation.
- Step 3. Take the transmitter out of reset.

24.5.5.6.1 Place the Transmitter in Reset (Step 1)

Table 24-354. Transmitter Reset

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------------|--------------------------------------|-------|
| Place the transmitter in reset. | MCBSPLP_SPCR2_REG[0] RST | 0x0 |

24.5.5.6.2 Programming the McBSP Registers for the Desired Transmitter Operation (Step 2)

This section describes the steps to be performed when software configures the McBSP transmitter.

Global Configuration

Table 24-355 describes the steps to perform the global configuration.

Table 24-355. Global Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|--------------------------------------|------------|
| Set the transmitter pins to operate as McBSP pins. | MCBSPLP_PCR_REG[13] XIOEN | 0x0 |
| Enable/disable DLB mode ⁽¹⁾ . | MCBSPLP_XCCR_REG[5] DLB | 0x0 or 0x1 |
| Enable/disable ALB mode ⁽¹⁾ . | MCBSPLP_SPCR1_REG[5] ALB | 0x0 or 0x1 |
| Select clock used in the synchronous transmit-receive mode (McBSP4 only) ⁽¹⁾ . | CONTROL_MCBSPLP[30] ALBCTRLRX_CLKX | 0x0 or 0x1 |
| Select frame synchronization used in the synchronous transmit-receive mode (McBSP4 only) ⁽¹⁾ . | CONTROL_MCBSPLP[31] ALBCTRLRX_FSX | 0x0 or 0x1 |
| Enable/disable the transmit multichannel selection mode ⁽¹⁾ . | MCBSPLP_MCR1_REG[0] RCMCM | 0x0 or 0x1 |

⁽¹⁾ Software decision

Data Configuration

Table 24-356 describes the steps to perform the data configuration.

Table 24-356. Data Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|------------|
| Select single/dual-phase frame ⁽¹⁾ . | MCBSPLP_RCR2_REG[15] XPHASE | 0x0 or 0x1 |
| Set the transmit word length(s) for phase 1 ⁽¹⁾ . | MCBSPLP_XCR1_REG[7:5] XWDLEN1 | xxx |
| Set the transmit word length(s) for phase 2 ⁽¹⁾ . | MCBSPLP_XCR2_REG[7:5] XWDLEN2 | xxx |
| Set the transmit frame length ⁽¹⁾ . | MCBSPLP_XCR1_REG[14:8] XFRLEN1 MCBSPLP_XCR2_REG[14:8] XFRLEN2 | xxx |
| Set the transmit reverse mode ⁽¹⁾ . | MCBSPLP_XCR2_REG[4:3] XREVERSE | xx |
| Set the transmit data delay ⁽¹⁾ . | MCBSPLP_XCR2_REG[1:0] XDATLY | xx |
| Set the extra delay (DX delay) mode ⁽¹⁾ . | MCBSPLP_SPCR1_REG[7] DXENA | xx |
| Select the inserted delay value ⁽¹⁾ . | MCBSPLP_XCCR_REG[13:12] DXENDLY | xx |
| Set the interrupt line. | MCBSPLP_IRQENABLE_REG | x..x |
| Configure the transmit buffer threshold value ⁽¹⁾ . | MCBSPLP_THRSH2_REG[6:0] XTHRESHOLD | x..x |

⁽¹⁾ Software decision

NOTE:

- When dual-phase frame is selected, the number of words per phase must be set to 1.
- If a single-phase frame is selected, XWDLEN1 selects the length for every serial word transmit in the frame. If a dual-phase frame is selected, XWDLEN1 and XWDLEN2 must be set to select both lengths. These bits can have different values.
- If a dual-phase frame is selected, the frame length must be two words.

The DXENA bit controls the delay enabler on the mcbasp_dx pin. Set DXENA to enable an extra delay for turn-on time. Because this bit does not control the data itself, only the first bit is delayed (the delay is given by a combinatorial delay buffer). The inserted delay, 80 ps, 160 ps (default), 240 ps, or 320 ps, can be set using the McBSPi.MCBSPLP_XCCR_REG[13:12] DXENDLY bit field. If the mcbasp_dx pins of multiple McBSP modules are tied together, ensure that DXENA is set to 1 to avoid having more than one McBSP at a time transmitting on the data line.

Frame-Sync Configuration

Table 24-357 describes the steps to perform the frame-sync configuration.

Table 24-357. Frame-Sync Configuration

| Step | Register / Bit Field / Programming Model | Value |
|---|--|------------|
| Set the transmit frame-sync mode ⁽¹⁾ . | MCBSPLP_PCR_REG[11] FSXM MCBSPLP_SRGR2_REG[12] FSGM | 0x0 or 0x1 |
| Set the transmit frame-sync polarity ⁽¹⁾ . | MCBSPLP_PCR_REG[3] FSXP | 0x0 or 0x1 |
| Set the SRG frame-sync period ⁽¹⁾ . | MCBSPLP_SRGR2_REG[11:0] FPER | x..x |
| Set the SRG frame-sync pulse width ⁽¹⁾ . | MCBSPLP_SRGR1_REG[15:8] FWID | x..x |

⁽¹⁾ Software decision

Clock Configuration

Table 24-358 describes the steps to perform the clock configuration.

Table 24-358. Clock Configuration

| Step | Register / Bit Field / Programming Model | Value |
|---|---|------------|
| Set the transmit clock mode ⁽¹⁾ . | MCBSPLP_PCR_REG[9] CLKXM | 0x0 or 0x1 |
| Set the transmit clock polarity ⁽¹⁾ . | MCBSPLP_PCR_REG[1] CLKXP | 0x0 or 0x1 |
| Set the SRG clock divide-down value ⁽¹⁾ . | MCBSPLP_SRGR1_REG[7:0] CLKGDV | x..x |
| Set the SRG clock synchronization mode ⁽¹⁾ . | MCBSPLP_SRGR2_REG[15] GSYNC | 0x0 or 0x1 |
| Set the SRG input clock mode ⁽¹⁾ . | MCBSPLP_PCR_REG[7] SCKLME MCBSPLP_SRGR2_REG[13] CLKSM | 0x0 or 0x1 |
| Set the SRG input clock polarity ⁽¹⁾ . | MCBSPLP_SRGR2_REG[14] CLKSP MCBSPLP_PCR_REG[1] CLKXP MCBSPLP_PCR_REG[0] CLKRP | 0x0 or 0x1 |

⁽¹⁾ Software decision

NOTE: CLKRP = CLKXP in a system in which the same clock (internal or external) is used to clock the receiver and transmitter. The receiver uses the opposite edge as the transmitter to ensure valid setup and hold of data around this edge.

24.5.5.6.3 Take the Receiver Out of Reset (Step 3)

Table 24-359. Take the Receiver Out of Reset

| Step | Register/Bit Field/Programming Model | Value |
|-------------------------|--------------------------------------|-------|
| Enable the transmitter. | MCBSPLP_SPCR2_REG[0] RST | 0x1 |

24.5.5.7 GPIO on the McBSP Pins (Legacy Only)

To use McBSP pins as GPIO pins rather than as serial port pins, follow these steps:

- For the receive pins (mcbssp_clkr, mcbssp_fsr, and mcbssp_dr as)

Table 24-360. Use Serial Receive Pins as GPIO Pins

| Step | Register/Bit Field/Programming Model | Value |
|---|--------------------------------------|-------|
| Place the receiver in reset. | MCBSPLP_SPCR1_REG[0] RRST | 0x0 |
| Enable GPIO for the serial port receiver. | MCBSPLP_PCR_REG[12] RIOEN | 0x1 |

- For the transmitter pins (mcbssp_clkx, mcbssp_fsx, and mcbssp_dx)

Table 24-361. Use Serial Transmit Pins as GPIO Pins

| Step | Register/Bit Field/ Programming Model | Value |
|--|---|-------|
| Place the transmit in reset. | MCBSPLP_SPCR2_REG[0] XRST | 0x0 |
| Enable GPIO for the serial port transmitter. | MCBSPLP_PCR_REG[12] XIOEN | 0x1 |

- **For the external clock pins (abe_clks)**

For the abe_clks pin (common to all McBSP modules), all of the reset and I/O conditions must be met as follows:

Table 24-362. Use External Clock Pin as GPIO Pin

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Place the receiver in reset. | MCBSPLP_SPCR1_REG[0] RRST | 0x0 |
| Place the transmit in reset. | MCBSPLP_SPCR2_REG[0] XRST | 0x0 |
| Enable GPIO for the serial port receiver. | MCBSPLP_PCR_REG[12] RIOEN | 0x1 |
| Enable GPIO for the serial port transmitter. | MCBSPLP_PCR_REG[12] XIOEN | 0x1 |

24.5.6 MCBSP Register Manual

Table 24-363 shows the base address and address space for the device module instances.

24.5.6.1 MCBSP Instance Summary

Table 24-363. MCBSP Instance Summary

| Module Name | Base Address L3 Interconnect | Base Address Cortex-A9 Private Access | Base Address DSP Private Access | Base Address L4-PER Interconnect | Size |
|-------------|---------------------------------|---|---------------------------------------|--|------|
| MCBSP1 | 0x4902 2000 | 0x4012 2000 | 0x2 2000 | N/A | 4KB |
| MCBSP2 | 0x4902 4000 | 0x4012 4000 | 0x2 4000 | N/A | 4KB |
| MCBSP3 | 0x4902 6000 | 0x4012 6000 | 0x2 6000 | N/A | 4KB |
| MCBSP4 | N/A | N/A | N/A | 0x4809 6000 | 4KB |

NOTE: Private access is an access that does not use the L3/L4 interconnects.

24.5.6.2 MCBSP Registers

CAUTION

The McBSP registers are limited to 32-bit data accesses; 16- and 8-bit accesses are not allowed and can corrupt register content.

24.5.6.2.1 MCBSP Register Summary

Table 24-364 through Table 24-367 summarize the MCBSP1, MCBSP2, MCBSP3, and MCBSP4 registers, respectively.

Table 24-364. MCBSP1 Register Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|-------------------|------|--------------------------|----------------|-------------------------------------|---|---|
| MCBSPLP_DRR_REG | R | 32 | 0x0000 0000 | 0x4902 2000 | 0x4012 2000 | 0x2 2000 |
| MCBSPLP_DXR_REG | W | 32 | 0x0000 0008 | 0x4902 2008 | 0x4012 2008 | 0x2 2008 |
| MCBSPLP_SPCR2_REG | RW | 32 | 0x0000 0010 | 0x4902 2010 | 0x4012 2010 | 0x2 2010 |
| MCBSPLP_SPCR1_REG | RW | 32 | 0x0000 0014 | 0x4902 2014 | 0x4012 2014 | 0x2 2014 |
| MCBSPLP_RCR2_REG | RW | 32 | 0x0000 0018 | 0x4902 2018 | 0x4012 2018 | 0x2 2018 |
| MCBSPLP_RCR1_REG | RW | 32 | 0x0000 001C | 0x4902 201C | 0x4012 201C | 0x2 201C |
| MCBSPLP_XCR2_REG | RW | 32 | 0x0000 0020 | 0x4902 2020 | 0x4012 2020 | 0x2 2020 |
| MCBSPLP_XCR1_REG | RW | 32 | 0x0000 0024 | 0x4902 2024 | 0x4012 2024 | 0x2 2024 |
| MCBSPLP_SRGR2_REG | RW | 32 | 0x0000 0028 | 0x4902 2028 | 0x4012 2028 | 0x2 2028 |
| MCBSPLP_SRGR1_REG | RW | 32 | 0x0000 002C | 0x4902 202C | 0x4012 202C | 0x2 202C |
| MCBSPLP_MCR2_REG | RW | 32 | 0x0000 0030 | 0x4902 2030 | 0x4012 2030 | 0x2 2030 |
| MCBSPLP_MCR1_REG | RW | 32 | 0x0000 0034 | 0x4902 2034 | 0x4012 2034 | 0x2 2034 |
| MCBSPLP_RCERA_REG | RW | 32 | 0x0000 0038 | 0x4902 2038 | 0x4012 2038 | 0x2 2038 |
| MCBSPLP_RCERB_REG | RW | 32 | 0x0000 003C | 0x4902 203C | 0x4012 203C | 0x2 203C |
| MCBSPLP_XCERA_REG | RW | 32 | 0x0000 0040 | 0x4902 2040 | 0x4012 2040 | 0x2 2040 |
| MCBSPLP_XCERB_REG | RW | 32 | 0x0000 0044 | 0x4902 2044 | 0x4012 2044 | 0x2 2044 |
| MCBSPLP_PCR_REG | RW | 32 | 0x0000 0048 | 0x4902 2048 | 0x4012 2048 | 0x2 2048 |
| MCBSPLP_RCERC_REG | RW | 32 | 0x0000 004C | 0x4902 204C | 0x4012 204C | 0x2 204C |

Table 24-364. MCBSP1 Register Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|-----------------------|------|-----------------------|----------------|----------------------------------|---|-------------------------------------|
| MCBSPLP_RCERD_REG | RW | 32 | 0x0000 0050 | 0x4902 2050 | 0x4012 2050 | 0x2 2050 |
| MCBSPLP_XCERC_REG | RW | 32 | 0x0000 0054 | 0x4902 2054 | 0x4012 2054 | 0x2 2054 |
| MCBSPLP_XCERD_REG | RW | 32 | 0x0000 0058 | 0x4902 2058 | 0x4012 2058 | 0x2 2058 |
| MCBSPLP_RCERE_REG | RW | 32 | 0x0000 005C | 0x4902 205C | 0x4012 205C | 0x2 205C |
| MCBSPLP_RCERF_REG | RW | 32 | 0x0000 0060 | 0x4902 2060 | 0x4012 2060 | 0x2 2060 |
| MCBSPLP_XCERE_REG | RW | 32 | 0x0000 0064 | 0x4902 2064 | 0x4012 2064 | 0x2 2064 |
| MCBSPLP_XCERF_REG | RW | 32 | 0x0000 0068 | 0x4902 2068 | 0x4012 2068 | 0x2 2068 |
| MCBSPLP_RCERG_REG | RW | 32 | 0x0000 006C | 0x4902 206C | 0x4012 206C | 0x2 206C |
| MCBSPLP_RCERH_REG | RW | 32 | 0x0000 0070 | 0x4902 2070 | 0x4012 2070 | 0x2 2070 |
| MCBSPLP_XCERG_REG | RW | 32 | 0x0000 0074 | 0x4902 2074 | 0x4012 2074 | 0x2 2074 |
| MCBSPLP_XCERH_REG | RW | 32 | 0x0000 0078 | 0x4902 2078 | 0x4012 2078 | 0x2 2078 |
| MCBSPLP_REV_REG | R | 32 | 0x0000 007C | 0x4902 207C | 0x4012 207C | 0x2 207C |
| MCBSPLP_RINTCLR_REG | RW | 32 | 0x0000 0080 | 0x4902 2080 | 0x4012 2080 | 0x2 2080 |
| MCBSPLP_XINTCLR_REG | RW | 32 | 0x0000 0084 | 0x4902 2084 | 0x4012 2084 | 0x2 2084 |
| MCBSPLP_ROVFLCLR_REG | RW | 32 | 0x0000 0088 | 0x4902 2088 | 0x4012 2088 | 0x2 2088 |
| MCBSPLP_SYSCONFIG_REG | RW | 32 | 0x0000 008C | 0x4902 208C | 0x4012 208C | 0x2 208C |
| MCBSPLP_THRSH2_REG | RW | 32 | 0x0000 0090 | 0x4902 2090 | 0x4012 2090 | 0x2 2090 |
| MCBSPLP_THRSH1_REG | RW | 32 | 0x0000 0094 | 0x4902 2094 | 0x4012 2094 | 0x2 2094 |
| MCBSPLP_IRQSTATUS_REG | RW | 32 | 0x0000 00A0 | 0x4902 20A0 | 0x4012 20A0 | 0x2 20A0 |
| MCBSPLP_IRQENABLE_REG | RW | 32 | 0x0000 00A4 | 0x4902 20A4 | 0x4012 20A4 | 0x2 20A4 |
| MCBSPLP_WAKEUPEN_REG | RW | 32 | 0x0000 00A8 | 0x4902 20A8 | 0x4012 20A8 | 0x2 20A8 |
| MCBSPLP_XCCR_REG | RW | 32 | 0x0000 00AC | 0x4902 20AC | 0x4012 20AC | 0x2 20AC |
| MCBSPLP_RCCR_REG | RW | 32 | 0x0000 00B0 | 0x4902 20B0 | 0x4012 20B0 | 0x2 20B0 |
| MCBSPLP_XBUFFSTAT_REG | R | 32 | 0x0000 00B4 | 0x4902 20B4 | 0x4012 20B4 | 0x2 20B4 |
| MCBSPLP_RBUFFSTAT_REG | R | 32 | 0x0000 00B8 | 0x4902 20B8 | 0x4012 20B8 | 0x2 20B8 |

Table 24-365. MCBSP2 Register Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|-------------------|------|-----------------------|----------------|----------------------------------|---|-------------------------------------|
| MCBSPLP_DRR_REG | R | 32 | 0x0000 0000 | 0x4902 4000 | 0x4012 4000 | 0x2 4000 |
| MCBSPLP_DXR_REG | W | 32 | 0x0000 0008 | 0x4902 4008 | 0x4012 4008 | 0x2 4008 |
| MCBSPLP_SPCR2_REG | RW | 32 | 0x0000 0010 | 0x4902 4010 | 0x4012 4010 | 0x2 4010 |
| MCBSPLP_SPCR1_REG | RW | 32 | 0x0000 0014 | 0x4902 4014 | 0x4012 4014 | 0x2 4014 |
| MCBSPLP_RCR2_REG | RW | 32 | 0x0000 0018 | 0x4902 4018 | 0x4012 4018 | 0x2 4018 |
| MCBSPLP_RCR1_REG | RW | 32 | 0x0000 001C | 0x4902 401C | 0x4012 401C | 0x2 401C |
| MCBSPLP_XCR2_REG | RW | 32 | 0x0000 0020 | 0x4902 4020 | 0x4012 4020 | 0x2 4020 |
| MCBSPLP_XCR1_REG | RW | 32 | 0x0000 0024 | 0x4902 4024 | 0x4012 4024 | 0x2 4024 |
| MCBSPLP_SRGR2_REG | RW | 32 | 0x0000 0028 | 0x4902 4028 | 0x4012 4028 | 0x2 4028 |
| MCBSPLP_SRGR1_REG | RW | 32 | 0x0000 002C | 0x4902 402C | 0x4012 402C | 0x2 402C |
| MCBSPLP_MCR2_REG | RW | 32 | 0x0000 0030 | 0x4902 4030 | 0x4012 4030 | 0x2 4030 |
| MCBSPLP_MCR1_REG | RW | 32 | 0x0000 0034 | 0x4902 4034 | 0x4012 4034 | 0x2 4034 |

Table 24-365. MCBSP2 Register Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|-----------------------|------|-----------------------|----------------|-------------------------------------|--|--|
| MCBSPLP_RCERA_REG | RW | 32 | 0x0000 0038 | 0x4902 4038 | 0x4012 4038 | 0x2 4038 |
| MCBSPLP_RCERB_REG | RW | 32 | 0x0000 003C | 0x4902 403C | 0x4012 403C | 0x2 403C |
| MCBSPLP_XCERA_REG | RW | 32 | 0x0000 0040 | 0x4902 4040 | 0x4012 4040 | 0x2 4040 |
| MCBSPLP_XCERB_REG | RW | 32 | 0x0000 0044 | 0x4902 4044 | 0x4012 4044 | 0x2 4044 |
| MCBSPLP_PCR_REG | RW | 32 | 0x0000 0048 | 0x4902 4048 | 0x4012 4048 | 0x2 4048 |
| MCBSPLP_RCERC_REG | RW | 32 | 0x0000 004C | 0x4902 404C | 0x4012 404C | 0x2 404C |
| MCBSPLP_RCERD_REG | RW | 32 | 0x0000 0050 | 0x4902 4050 | 0x4012 4050 | 0x2 4050 |
| MCBSPLP_XCERC_REG | RW | 32 | 0x0000 0054 | 0x4902 4054 | 0x4012 4054 | 0x2 4054 |
| MCBSPLP_XCERD_REG | RW | 32 | 0x0000 0058 | 0x4902 4058 | 0x4012 4058 | 0x2 4058 |
| MCBSPLP_RCERE_REG | RW | 32 | 0x0000 005C | 0x4902 405C | 0x4012 405C | 0x2 405C |
| MCBSPLP_RCERF_REG | RW | 32 | 0x0000 0060 | 0x4902 4060 | 0x4012 4060 | 0x2 4060 |
| MCBSPLP_XCERE_REG | RW | 32 | 0x0000 0064 | 0x4902 4064 | 0x4012 4064 | 0x2 4064 |
| MCBSPLP_XCERF_REG | RW | 32 | 0x0000 0068 | 0x4902 4068 | 0x4012 4068 | 0x2 4068 |
| MCBSPLP_RCERG_REG | RW | 32 | 0x0000 006C | 0x4902 406C | 0x4012 406C | 0x2 406C |
| MCBSPLP_RCERH_REG | RW | 32 | 0x0000 0070 | 0x4902 4070 | 0x4012 4070 | 0x2 4070 |
| MCBSPLP_XCERG_REG | RW | 32 | 0x0000 0074 | 0x4902 4074 | 0x4012 4074 | 0x2 4074 |
| MCBSPLP_XCERH_REG | RW | 32 | 0x0000 0078 | 0x4902 4078 | 0x4012 4078 | 0x2 4078 |
| MCBSPLP_REV_REG | R | 32 | 0x0000 007C | 0x4902 407C | 0x4012 407C | 0x2 407C |
| MCBSPLP_RINTCLR_REG | RW | 32 | 0x0000 0080 | 0x4902 4080 | 0x4012 4080 | 0x2 4080 |
| MCBSPLP_XINTCLR_REG | RW | 32 | 0x0000 0084 | 0x4902 4084 | 0x4012 4084 | 0x2 4084 |
| MCBSPLP_ROVFLCLR_REG | RW | 32 | 0x0000 0088 | 0x4902 4088 | 0x4012 4088 | 0x2 4088 |
| MCBSPLP_SYSCONFIG_REG | RW | 32 | 0x0000 008C | 0x4902 408C | 0x4012 408C | 0x2 408C |
| MCBSPLP_THRSH2_REG | RW | 32 | 0x0000 0090 | 0x4902 4090 | 0x4012 4090 | 0x2 4090 |
| MCBSPLP_THRSH1_REG | RW | 32 | 0x0000 0094 | 0x4902 4094 | 0x4012 4094 | 0x2 4094 |
| MCBSPLP_IRQSTATUS_REG | RW | 32 | 0x0000 00A0 | 0x4902 40A0 | 0x4012 40A0 | 0x2 40A0 |
| MCBSPLP_IRQENABLE_REG | RW | 32 | 0x0000 00A4 | 0x4902 40A4 | 0x4012 40A4 | 0x2 40A4 |
| MCBSPLP_WAKEUPEN_REG | RW | 32 | 0x0000 00A8 | 0x4902 40A8 | 0x4012 40A8 | 0x2 40A8 |
| MCBSPLP_XCCR_REG | RW | 32 | 0x0000 00AC | 0x4902 40AC | 0x4012 40AC | 0x2 40AC |
| MCBSPLP_RCCR_REG | RW | 32 | 0x0000 00B0 | 0x4902 40B0 | 0x4012 40B0 | 0x2 40B0 |
| MCBSPLP_XBUFFSTAT_REG | R | 32 | 0x0000 00B4 | 0x4902 40B4 | 0x4012 40B4 | 0x2 40B4 |
| MCBSPLP_RBUFFSTAT_REG | R | 32 | 0x0000 00B8 | 0x4902 40B8 | 0x4012 40B8 | 0x2 40B8 |

Table 24-366. MCBSP3 Register Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|-------------------|------|-----------------------|----------------|-------------------------------------|--|--|
| MCBSPLP_DRR_REG | R | 32 | 0x0000 0000 | 0x4902 6000 | 0x4012 6000 | 0x2 6000 |
| MCBSPLP_DXR_REG | W | 32 | 0x0000 0008 | 0x4902 6008 | 0x4012 6008 | 0x2 6008 |
| MCBSPLP_SPCR2_REG | RW | 32 | 0x0000 0010 | 0x4902 6010 | 0x4012 6010 | 0x2 6010 |
| MCBSPLP_SPCR1_REG | RW | 32 | 0x0000 0014 | 0x4902 6014 | 0x4012 6014 | 0x2 6014 |
| MCBSPLP_RCR2_REG | RW | 32 | 0x0000 0018 | 0x4902 6018 | 0x4012 6018 | 0x2 6018 |
| MCBSPLP_RCR1_REG | RW | 32 | 0x0000 001C | 0x4902 601C | 0x4012 601C | 0x2 601C |

Table 24-366. MCBSP3 Register Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|-----------------------|------|-----------------------|----------------|----------------------------------|---|-------------------------------------|
| MCBSPLP_XCR2_REG | RW | 32 | 0x0000 0020 | 0x4902 6020 | 0x4012 6020 | 0x2 6020 |
| MCBSPLP_XCR1_REG | RW | 32 | 0x0000 0024 | 0x4902 6024 | 0x4012 6024 | 0x2 6024 |
| MCBSPLP_SRGR2_REG | RW | 32 | 0x0000 0028 | 0x4902 6028 | 0x4012 6028 | 0x2 6028 |
| MCBSPLP_SRGR1_REG | RW | 32 | 0x0000 002C | 0x4902 602C | 0x4012 602C | 0x2 602C |
| MCBSPLP_MCR2_REG | RW | 32 | 0x0000 0030 | 0x4902 6030 | 0x4012 6030 | 0x2 6030 |
| MCBSPLP_MCR1_REG | RW | 32 | 0x0000 0034 | 0x4902 6034 | 0x4012 6034 | 0x2 6034 |
| MCBSPLP_RCERA_REG | RW | 32 | 0x0000 0038 | 0x4902 6038 | 0x4012 6038 | 0x2 6038 |
| MCBSPLP_RCERB_REG | RW | 32 | 0x0000 003C | 0x4902 603C | 0x4012 603C | 0x2 603C |
| MCBSPLP_XCERA_REG | RW | 32 | 0x0000 0040 | 0x4902 6040 | 0x4012 6040 | 0x2 6040 |
| MCBSPLP_XCERB_REG | RW | 32 | 0x0000 0044 | 0x4902 6044 | 0x4012 6044 | 0x2 6044 |
| MCBSPLP_PCR_REG | RW | 32 | 0x0000 0048 | 0x4902 6048 | 0x4012 6048 | 0x2 6048 |
| MCBSPLP_RCERC_REG | RW | 32 | 0x0000 004C | 0x4902 604C | 0x4012 604C | 0x2 604C |
| MCBSPLP_RCERD_REG | RW | 32 | 0x0000 0050 | 0x4902 6050 | 0x4012 6050 | 0x2 6050 |
| MCBSPLP_XCERC_REG | RW | 32 | 0x0000 0054 | 0x4902 6054 | 0x4012 6054 | 0x2 6054 |
| MCBSPLP_XCERD_REG | RW | 32 | 0x0000 0058 | 0x4902 6058 | 0x4012 6058 | 0x2 6058 |
| MCBSPLP_RCERE_REG | RW | 32 | 0x0000 005C | 0x4902 605C | 0x4012 605C | 0x2 605C |
| MCBSPLP_RCERF_REG | RW | 32 | 0x0000 0060 | 0x4902 6060 | 0x4012 6060 | 0x2 6060 |
| MCBSPLP_XCERE_REG | RW | 32 | 0x0000 0064 | 0x4902 6064 | 0x4012 6064 | 0x2 6064 |
| MCBSPLP_XCERF_REG | RW | 32 | 0x0000 0068 | 0x4902 6068 | 0x4012 6068 | 0x2 6068 |
| MCBSPLP_RCERG_REG | RW | 32 | 0x0000 006C | 0x4902 606C | 0x4012 606C | 0x2 606C |
| MCBSPLP_RCERH_REG | RW | 32 | 0x0000 0070 | 0x4902 6070 | 0x4012 6070 | 0x2 6070 |
| MCBSPLP_XCERG_REG | RW | 32 | 0x0000 0074 | 0x4902 6074 | 0x4012 6074 | 0x2 6074 |
| MCBSPLP_XCERH_REG | RW | 32 | 0x0000 0078 | 0x4902 6078 | 0x4012 6078 | 0x2 6078 |
| MCBSPLP_REV_REG | R | 32 | 0x0000 007C | 0x4902 607C | 0x4012 607C | 0x2 607C |
| MCBSPLP_RINTCLR_REG | RW | 32 | 0x0000 0080 | 0x4902 6080 | 0x4012 6080 | 0x2 6080 |
| MCBSPLP_XINTCLR_REG | RW | 32 | 0x0000 0084 | 0x4902 6084 | 0x4012 6084 | 0x2 6084 |
| MCBSPLP_ROVFLCLR_REG | RW | 32 | 0x0000 0088 | 0x4902 6088 | 0x4012 6088 | 0x2 6088 |
| MCBSPLP_SYSCONFIG_REG | RW | 32 | 0x0000 008C | 0x4902 608C | 0x4012 608C | 0x2 608C |
| MCBSPLP_THRSH2_REG | RW | 32 | 0x0000 0090 | 0x4902 6090 | 0x4012 6090 | 0x2 6090 |
| MCBSPLP_THRSH1_REG | RW | 32 | 0x0000 0094 | 0x4902 6094 | 0x4012 6094 | 0x2 6094 |
| MCBSPLP_IRQSTATUS_REG | RW | 32 | 0x0000 00A0 | 0x4902 60A0 | 0x4012 60A0 | 0x2 60A0 |
| MCBSPLP_IRQENABLE_REG | RW | 32 | 0x0000 00A4 | 0x4902 60A4 | 0x4012 60A4 | 0x2 60A4 |
| MCBSPLP_WAKEUPEN_REG | RW | 32 | 0x0000 00A8 | 0x4902 60A8 | 0x4012 60A8 | 0x2 60A8 |
| MCBSPLP_XCCR_REG | RW | 32 | 0x0000 00AC | 0x4902 60AC | 0x4012 60AC | 0x2 60AC |
| MCBSPLP_RCCR_REG | RW | 32 | 0x0000 00B0 | 0x4902 60B0 | 0x4012 60B0 | 0x2 60B0 |
| MCBSPLP_XBUFFSTAT_REG | R | 32 | 0x0000 00B4 | 0x4902 60B4 | 0x4012 60B4 | 0x2 60B4 |
| MCBSPLP_RBUFFSTAT_REG | R | 32 | 0x0000 00B8 | 0x4902 60B8 | 0x4012 60B8 | 0x2 60B8 |

Table 24-367. McBSP4 Register Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L4-PER Interconnect |
|-----------------------|------|-----------------------|----------------|---|
| MCBSPLP_DRR_REG | R | 32 | 0x0000 0000 | 0x4809 6000 |
| MCBSPLP_DXR_REG | W | 32 | 0x0000 0008 | 0x4809 6008 |
| MCBSPLP_SPCR2_REG | RW | 32 | 0x0000 0010 | 0x4809 6010 |
| MCBSPLP_SPCR1_REG | RW | 32 | 0x0000 0014 | 0x4809 6014 |
| MCBSPLP_RCR2_REG | RW | 32 | 0x0000 0018 | 0x4809 6018 |
| MCBSPLP_RCR1_REG | RW | 32 | 0x0000 001C | 0x4809 601C |
| MCBSPLP_XCR2_REG | RW | 32 | 0x0000 0020 | 0x4809 6020 |
| MCBSPLP_XCR1_REG | RW | 32 | 0x0000 0024 | 0x4809 6024 |
| MCBSPLP_SRGR2_REG | RW | 32 | 0x0000 0028 | 0x4809 6028 |
| MCBSPLP_SRGR1_REG | RW | 32 | 0x0000 002C | 0x4809 602C |
| MCBSPLP_MCR2_REG | RW | 32 | 0x0000 0030 | 0x4809 6030 |
| MCBSPLP_MCR1_REG | RW | 32 | 0x0000 0034 | 0x4809 6034 |
| MCBSPLP_RCERA_REG | RW | 32 | 0x0000 0038 | 0x4809 6038 |
| MCBSPLP_RCERB_REG | RW | 32 | 0x0000 003C | 0x4809 603C |
| MCBSPLP_XCERA_REG | RW | 32 | 0x0000 0040 | 0x4809 6040 |
| MCBSPLP_XCERB_REG | RW | 32 | 0x0000 0044 | 0x4809 6044 |
| MCBSPLP_PCR_REG | RW | 32 | 0x0000 0048 | 0x4809 6048 |
| MCBSPLP_RCERC_REG | RW | 32 | 0x0000 004C | 0x4809 604C |
| MCBSPLP_RCERD_REG | RW | 32 | 0x0000 0050 | 0x4809 6050 |
| MCBSPLP_XCERC_REG | RW | 32 | 0x0000 0054 | 0x4809 6054 |
| MCBSPLP_XCERD_REG | RW | 32 | 0x0000 0058 | 0x4809 6058 |
| MCBSPLP_RCERE_REG | RW | 32 | 0x0000 005C | 0x4809 605C |
| MCBSPLP_RCERF_REG | RW | 32 | 0x0000 0060 | 0x4809 6060 |
| MCBSPLP_XCERE_REG | RW | 32 | 0x0000 0064 | 0x4809 6064 |
| MCBSPLP_XCERF_REG | RW | 32 | 0x0000 0068 | 0x4809 6068 |
| MCBSPLP_RCERG_REG | RW | 32 | 0x0000 006C | 0x4809 606C |
| MCBSPLP_RCERH_REG | RW | 32 | 0x0000 0070 | 0x4809 6070 |
| MCBSPLP_XCERG_REG | RW | 32 | 0x0000 0074 | 0x4809 6074 |
| MCBSPLP_XCERH_REG | RW | 32 | 0x0000 0078 | 0x4809 6078 |
| MCBSPLP_REV_REG | R | 32 | 0x0000 007C | 0x4809 607C |
| MCBSPLP_RINTCLR_REG | RW | 32 | 0x0000 0080 | 0x4809 6080 |
| MCBSPLP_XINTCLR_REG | RW | 32 | 0x0000 0084 | 0x4809 6084 |
| MCBSPLP_ROVFLCLR_REG | RW | 32 | 0x0000 0088 | 0x4809 6088 |
| MCBSPLP_SYSCONFIG_REG | RW | 32 | 0x0000 008C | 0x4809 608C |
| MCBSPLP_THRSH2_REG | RW | 32 | 0x0000 0090 | 0x4809 6090 |
| MCBSPLP_THRSH1_REG | RW | 32 | 0x0000 0094 | 0x4809 6094 |
| MCBSPLP_IRQSTATUS_REG | RW | 32 | 0x0000 00A0 | 0x4809 60A0 |
| MCBSPLP_IRQENABLE_REG | RW | 32 | 0x0000 00A4 | 0x4809 60A4 |
| MCBSPLP_WAKEUPEN_REG | RW | 32 | 0x0000 00A8 | 0x4809 60A8 |
| MCBSPLP_XCCR_REG | RW | 32 | 0x0000 00AC | 0x4809 60AC |
| MCBSPLP_RCCR_REG | RW | 32 | 0x0000 00B0 | 0x4809 60B0 |
| MCBSPLP_XBUFFSTAT_REG | R | 32 | 0x0000 00B4 | 0x4809 60B4 |
| MCBSPLP_RBUFFSTAT_REG | R | 32 | 0x0000 00B8 | 0x4809 60B8 |

24.5.6.2.2 MCBSP Register Description

Table 24-368 through Table 24-452 describe the individual MCBSP registers.

Table 24-368. MCBSP1P_DRR_REG

| | | | |
|------------------|--|----------|---|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4902 2000 0x4012 2000 0x2 2000 0x4902 4000 0x4012 4000 0x2 4000 0x4902 6000 0x4012 6000 0x2 6000 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSPLP data receive register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DRR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------|------|-------------|
| 31:0 | DRR | Data receive register | R | 0x0000 0000 |

Table 24-369. Register Call Summary for Register MCBSP1P_DRR_REG

Multichannel Buffered Serial Port (McBSP)

- [Data Transfer Process for 8-/12-/16-/20-/24-/32-Bit-Long Words: \[0\]](#)
- [Clocking and Framing Data: \[1\]](#)
- [McBSP Reception: \[2\] \[3\]](#)
- [Introduction: \[4\]](#)
- [Overrun in the Receiver: \[5\] \[6\]](#)
- [MCBSP Register Summary: \[7\] \[8\] \[9\] \[10\]](#)

Table 24-370. MCBSP1P_DXR_REG

| | | | |
|------------------|--|----------|---|
| Address Offset | 0x0000 0008 | | |
| Physical Address | 0x4902 2008 0x4012 2008 0x2 2008 0x4902 4008 0x4012 4008 0x2 4008 0x4902 6008 0x4012 6008 0x2 6008 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSPLP data transmit register | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DXR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------|------|-------------|
| 31:0 | DXR | Data transmit register | W | 0x0000 0000 |

Table 24-371. Register Call Summary for Register MCBSP_LP_DXR_REG

Multichannel Buffered Serial Port (McBSP)

- [Data Transfer Process for 8-/12-/16-/20-/24-/32-Bit-Long Words: \[0\]](#)
- [McBSP Transmission: \[1\] \[2\]](#)
- [Introduction: \[3\]](#)
- [Underflow in the Transmitter: \[4\] \[5\] \[6\] \[7\]](#)
- [Transmit Multichannel Selection Modes: \[8\]](#)
- [McBSP Initialization Procedure: \[9\]](#)
- [MCBSP Register Summary: \[10\] \[11\] \[12\] \[13\]](#)

Table 24-372. MCBSP_LP_SPCR2_REG

| | | | |
|------------------|--|----------|---|
| Address Offset | 0x0000 0010 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Physical Address | 0x4902 2010 0x4012 2010 0x2 2010 0x4902 4010 0x4012 4010 0x2 4010 0x4902 6010 0x4012 6010 0x2 6010 | | |
| Description | McBSPLP serial port control register 2 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|------|------|------|-------|----------|--------|------|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FREE | SOFT | FRST | GRST | XINTM | XSYNCERR | XEMPTY | XRDY | XRST | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-----------|
| 31:10 | RESERVED | Reserved | R | 0x0000000 |
| 9 | FREE | Free Running Mode (When this bit is set, the module ignores the Msuspend input) 0x0: Free running mode is disabled 0x1: Free running mode is enabled | RW | 0 |
| 8 | SOFT | Soft Bit 0x0: SOFT mode is disabled: the module stops its activity immediately following MSuspend assertion 0x1: SOFT mode is enabled: the module freezes its state after completion of the current operation when MSuspend is asserted | RW | 0 |
| 7 | FRST | Frame-Sync Generator Reset 0x0: Frame-sync logic is reset. Frame-sync signal FSG is not generated by the sample-rate generator 0x1: Frame-sync signal FSG is generated after (FPER+1) number of CLKG clocks; that is, all frame counters are loaded with their programmed values | RW | 0 |
| 6 | GRST | Sample-Rate Generator Reset 0x0: SRG is reset 0x1: SRG is pulled out of reset. CLKG is driven as per programmed value in SRG registers (SRGR[1,2]) | RW | 0 |

Multichannel Buffered Serial Port (McBSP)

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 5:4 | XINTM | Transmit Interrupt Mode (legacy) 0x0: XINT is driven by XRDY 0x1: XINT generated by end-of-frame 0x2: XINT generated by a new frame synchronization 0x3: XINT generated by XSYNCERR | RW | 0x0 |
| 3 | XSYNCERR | Transmit Synchronization Error (writing 0 to this bit clear the legacy transmit interrupt if asserted due to XSYNCERR condition) 0x0: No synchronization error 0x1: Synchronization error detected by McBSP | RW | 0 |
| 2 | XEMPTY | Transmit Shift Register XSR Empty Read 0x0: XSR is empty Read 0x1: XSR is not empty | R | 0 |
| 1 | XRDY | Transmitter ready Read 0x0: Transmitter is not ready. Read 0x1: Transmitter is ready for new data in DXR | R | 0 |
| 0 | XRST | Transmitter reset. This resets and enables the transmitter. 0x0: The serial port transmitter is disabled and in reset state. 0x1: The serial port transmitter is enabled. | RW | 0 |

Table 24-373. Register Call Summary for Register MCBSP_LP_SPCR2_REG

Multichannel Buffered Serial Port (McBSP)

- [McBSP Software Reset: \[0\] \[1\] \[2\]](#)
- [Data Transfer Process for 8-/12-/16-/20-/24-/32-Bit-Long Words: \[3\]](#)
- [McBSP Transmission: \[4\] \[5\]](#)
- [Clock Generation in the SRG: \[6\]](#)
- [Frame-Sync Generation in the SRG: \[7\] \[8\]](#)
- [Introduction: \[9\] \[10\] \[11\]](#)
- [Underflow in the Transmitter: \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [Unexpected Transmit Frame-Sync Pulse: \[17\] \[18\] \[19\]](#)
- [McBSP DMA Configuration: \[20\] \[21\]](#)
- [Transmit Multichannel Selection Modes: \[22\] \[23\] \[24\]](#)
- [McBSP Initialization Procedure: \[25\] \[26\] \[27\] \[28\] \[29\] \[30\]](#)
- [Reset and Initialization Procedure for the SRG: \[31\]](#)
- [Place the Transmitter in Reset \(Step 1\): \[32\]](#)
- [Take the Receiver Out of Reset \(Step 3\): \[33\]](#)
- [GPIO on the McBSP Pins \(Legacy Only\): \[34\] \[35\]](#)
- [McBSP Register Summary: \[36\] \[37\] \[38\] \[39\]](#)

Table 24-374. MCBSP_LP_SPCR1_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0014 | | |
| Physical Address | 0x4902 2014 0x4012 2014 0x2 2014 0x4902 4014 0x4012 4014 0x2 4014 0x4902 6014 0x4012 6014 0x2 6014 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSP serial port control register 1 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-------|----------|----|----|----|-------|----------|-------|---|----------|-------|------|------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ALB | RJUST | RESERVED | | | | DXENA | RESERVED | RINTM | | RSYNCERR | RFULL | RRDY | RRST | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15 | ALB | Analog Loopback Mode 0x0: Analog loopback mode disabled 0x1: Analog loopback mode enabled | RW | 0 |
| 14:13 | RJUST | Receive Sign-Extension and Justification Mode 0x0: Right-justify and zero-fill MSBs in DRR 0x1: Right-justify and sign-extend MSBs in DRR 0x2: Left-justify and zero-fill LSBs in DRR 0x3: Reserved | RW | 0x0 |
| 12:8 | RESERVED | Reserved | R | 0x00 |
| 7 | DXENA | DX Enabler 0x0: DX enabler is off 0x1: DX enabler is on | RW | 0 |
| 6 | RESERVED | Reserved | R | 0 |
| 5:4 | RINTM | Receive Interrupt Mode (legacy) 0x0: RINT driven by RRDY (that is, end of word) and end of frame in A-bis mode 0x1: RINT generated by end-of-block or end-of-frame in multichannel operation 0x2: RINT generated by a new frame synchronization 0x3: RINT generated by RSYNCERR | RW | 0x0 |
| 3 | RSYNCERR | Receive Synchronization Error (writing 0 to this bit clear the legacy receive interrupt if asserted due to RSYNCERR condition) 0x0: No synchronization error 0x1: Synchronization error detected by McBSP | RW | 0 |
| 2 | RFULL | Receive Shift Register (RSR) Full Read 0x0: DRR is not read, RB is full and RSR is also full with new word Read 0x1: RB is not in overrun condition | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 1 | RRDY | Receiver Ready Read 0x0: Receiver is not ready Read 0x1: Receiver is ready with data to be read from DRR | R | 0 |
| 0 | RRST | Receiver reset. This resets and enables the receiver. 0x0: The serial port receiver is disabled and in reset state. 0x1: The serial port receiver is enabled. | RW | 0 |

Table 24-375. Register Call Summary for Register MCBSP1_SPCR1_REG

Multichannel Buffered Serial Port (McBSP)

- [McBSP Software Reset: \[0\]](#)
- [McBSP Reception: \[1\] \[2\] \[3\]](#)
- [Clock Generation in the SRG: \[4\]](#)
- [Introduction: \[5\] \[6\] \[7\] \[8\]](#)
- [Overrun in the Receiver: \[9\] \[10\] \[11\]](#)
- [Unexpected Receive Frame-Sync Pulse: \[12\] \[13\] \[14\]](#)
- [McBSP DMA Configuration: \[15\] \[16\]](#)
- [Receive Multichannel Selection Mode: \[17\]](#)
- [McBSP Initialization Procedure: \[18\] \[19\] \[20\] \[21\]](#)
- [Place the Receiver in Reset \(Step 1\): \[22\]](#)
- [Programming the McBSP Registers for the Desired Receiver Configuration \(Step 2\): \[23\] \[24\] \[25\]](#)
- [Take the Receiver Out of Reset \(Step 3\): \[26\]](#)
- [Programming the McBSP Registers for the Desired Transmitter Operation \(Step 2\): \[27\] \[28\]](#)
- [GPIO on the McBSP Pins \(Legacy Only\): \[29\] \[30\]](#)
- [MCBSP Register Summary: \[31\] \[32\] \[33\] \[34\]](#)

Table 24-376. MCBSP1_RCR2_REG

| | | | |
|------------------|--|----------|--|
| Address Offset | 0x0000 0018 | Instance | MCBSP1_L3 |
| Physical Address | 0x4902 2018 0x4012 2018 0x2 2018 0x4902 4018 0x4012 4018 0x2 4018 0x4902 6018 0x4012 6018 0x2 6018 | | MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSPLP receive control register 2 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|--------|----|----|----|----|---|---|---|---------|---|---|---|----------|----------|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RPHASE | RFRLN2 | | | | | | | | RWDLEN2 | | | | RREVERSE | RESERVED | RDATDLY |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15 | RPHASE | Receive Phases 0x0: Single-phase frame 0x1: Dual-phase frame | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 14:8 | RFLEN2 | Receive Frame Length 2 Single-phase frame selected: RFLEN2=don't care Dual-phase frame selected: RFLEN2=000 0000 - 1 word per second phase (other values are reserved) | RW | 0x00 |
| 7:5 | RWDLEN2 | Receive Word Length 2 0x0: 8 bits 0x1: 12 bits 0x2: 16 bits 0x3: 20 bits 0x4: 24 bits 0x5: 32 bits 0x6: Reserved (do not use) 0x7: Reserved (do not use) | RW | 0x0 |
| 4:3 | RREVERSE | Receive reverse mode. 0x0: Data transfer starts with MSB first. 0x1: Data transfer starts with LSB first. 0x2: Reserved (do not use) 0x3: Reserved (do not use) | RW | 0x0 |
| 2 | RESERVED | Reserved | R | 0 |
| 1:0 | RDATDLY | Receive Data Delay 0x0: 0-bit data delay 0x1: 1-bit data delay 0x2: 2-bit data delay 0x3: Reserved | RW | 0x0 |

Table 24-377. Register Call Summary for Register MCBSP_LP_RCR2_REG

Multichannel Buffered Serial Port (McBSP)

- [Words, Frames, and Phases Definitions: \[0\] \[1\] \[2\]](#)
- [Bit Reordering \(Option to Transfer LSB First\): \[3\]](#)
- [Clocking and Framing Data: \[4\] \[5\]](#)
- [Frame Phases \(Dual-Phase Frame I2S Support\): \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)
- [McBSP Reception: \[16\]](#)
- [McBSP Data Transfer Mode: \[17\]](#)
- [Unexpected Receive Frame-Sync Pulse: \[18\]](#)
- [Configuring a Frame for Multichannel Selection: \[19\]](#)
- [McBSP Initialization Procedure: \[20\] \[21\]](#)
- [Programming the McBSP Registers for the Desired Receiver Configuration \(Step 2\): \[22\] \[23\] \[24\] \[25\] \[26\]](#)
- [Programming the McBSP Registers for the Desired Transmitter Operation \(Step 2\): \[27\]](#)
- [McBSP Register Summary: \[28\] \[29\] \[30\] \[31\]](#)

Table 24-378. MCBSP1P RCR1 REG

| Address Offset | 0x0000 001C | Instance | |
|------------------|------------------------------------|----------|------------------|
| Physical Address | 0x4902 201C | | MCBSP1_L3 |
| | 0x4012 201C | | MCBSP1_CORTEX-A9 |
| | 0x2 201C | | MCBSP1_DSP |
| | 0x4902 401C | | MCBSP2_L3 |
| | 0x4012 401C | | MCBSP2_CORTEX-A9 |
| | 0x2 401C | | MCBSP2_DSP |
| | 0x4902 601C | | MCBSP3_L3 |
| | 0x4012 601C | | MCBSP3_CORTEX-A9 |
| | 0x2 601C | | MCBSP3_DSP |
| Description | McBSPLP receive control register 1 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---------|---|---|----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RFRLEN1 | | | | | | RWDLEN1 | | | RESERVED | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:15 | RESERVED | Reserved | R | 0x00000 |
| 14:8 | RFRLEN1 | Receive Frame Length 1 Single-phase frame selected: RFRLEN1=000 0000 - 1 word per frame RFRLEN1=000 0001 - 2 words per frame RFRLEN1=111 1111 - 128 words per frame Dual-phase frame selected: RFRLEN1=000 0000 - 1 word per phase (other values are reserved) | RW | 0x00 |
| 7:5 | RWDLEN1 | Receive Word Length 1 0x0: 8 bits 0x1: 12 bits 0x2: 16 bits 0x3: 20 bits 0x4: 24 bits 0x5: 32 bits 0x6: Reserved (do not use) 0x7: Reserved (do not use) | RW | 0x0 |
| 4:0 | RESERVED | Reserved | R | 0x00 |

Table 24-379. Register Call Summary for Register MCBSP_LP_RCR1_REG

Multichannel Buffered Serial Port (McBSP)

- [Words, Frames, and Phases Definitions: \[0\] \[1\]](#)
- [Clocking and Framing Data: \[2\] \[3\]](#)
- [Frame Phases \(Dual-Phase Frame I2S Support\): \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [Configuring a Frame for Multichannel Selection: \[11\]](#)
- [McBSP Initialization Procedure: \[12\] \[13\]](#)
- [Programming the McBSP Registers for the Desired Receiver Configuration \(Step 2\): \[14\] \[15\]](#)
- [MCBSP Register Summary: \[16\] \[17\] \[18\] \[19\]](#)

Table 24-380. MCBSP_LP_XCR2_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0020 | | |
| Physical Address | 0x4902 2020 0x4012 2020 0x2 2020 0x4902 4020 0x4012 4020 0x2 4020 0x4902 6020 0x4012 6020 0x2 6020 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSPLP transmit control register 2 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|---------|----|----|----|----|---|---------|---|---|----------|----------|---------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XPHASE | XFRLEN2 | | | | | | XWDLEN2 | | | XREVERSE | RESERVED | XDATDLY | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15 | XPHASE | Transmit Phases 0x0: Single-phase frame 0x1: Dual-phase frame | RW | 0 |
| 14:8 | XFRLEN2 | Transmit Frame Length 2 Single-phase frame selected: XFRLEN2=don't care Dual-phase frame selected: XFRLEN2=000 0000 - 1 word per second phase (other values are reserved) | RW | 0x00 |
| 7:5 | XWDLEN2 | Transmit Word Length 2 0x0: 8 bits 0x1: 12 bits 0x2: 16 bits 0x3: 20 bits 0x4: 24 bits 0x5: 32 bits 0x6: Reserved (do not use) 0x7: Reserved (do not use) | RW | 0x0 |
| 4:3 | XREVERSE | Transmit reverse mode. 0x0: Data transfer starts with MSB first. 0x1: Data transfer starts with LSB first. 0x2: Reserved (do not use) 0x3: Reserved (do not use) | RW | 0x0 |
| 2 | RESERVED | Reserved | R | 0 |
| 1:0 | XDATDLY | Transmit Data Delay 0x0: 0-bit data delay 0x1: 1-bit data delay 0x2: 2-bit data delay 0x3: Reserved | RW | 0x0 |

Table 24-381. Register Call Summary for Register MCBSP_LP_XCR2_REG

Multichannel Buffered Serial Port (McBSP)

- [Words, Frames, and Phases Definitions](#): [0] [1] [2]
- [Bit Reordering \(Option to Transfer LSB First\)](#): [3]
- [Clocking and Framing Data](#): [4] [5] [6]
- [Frame Phases \(Dual-Phase Frame I2S Support\)](#): [7] [8] [9] [10] [11] [12] [13] [14] [15] [16]
- [McBSP Transmission](#): [17]
- [McBSP Data Transfer Mode](#): [18]
- [Unexpected Transmit Frame-Sync Pulse](#): [19]
- [Configuring a Frame for Multichannel Selection](#): [20]
- [McBSP Initialization Procedure](#): [21] [22]
- [Programming the McBSP Registers for the Desired Transmitter Operation \(Step 2\)](#): [23] [24] [25] [26]
- [McBSP Register Summary](#): [27] [28] [29] [30]

Table 24-382. MCBSP_LP_XCR1_REG

| | | | |
|------------------|--|----------|---|
| Address Offset | 0x0000 0024 | | |
| Physical Address | 0x4902 2024 0x4012 2024 0x2 2024 0x4902 4024 0x4012 4024 0x2 4024 0x4902 6024 0x4012 6024 0x2 6024 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSPLP transmit control register 1 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---------|---|---|----------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XFRLN1 | | | | | | XWDLEN1 | | | RESERVED | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:15 | RESERVED | Reserved | R | 0x00000 |
| 14:8 | XFRLN1 | Transmit Frame Length 1 Single-phase frame selected: XFRLN1=000 0000 - 1 word per frame XFRLN1=000 0001 - 2 words per frame XFRLN1=111 1111 - 128 words per frame Dual-phase frame selected: XFRLN1=000 0000 - 1 word per phase (other values are reserved) | RW | 0x00 |
| 7:5 | XWDLEN1 | Transmit Word Length 1 0x0: 8 bits 0x1: 12 bits 0x2: 16 bits 0x3: 20 bits 0x4: 24 bits 0x5: 32 bits 0x6: Reserved (do not use) 0x7: Reserved (do not use) | RW | 0x0 |
| 4:0 | RESERVED | Reserved | R | 0x00 |

Table 24-383. Register Call Summary for Register MCBSP_LP_XCR1_REG

Multichannel Buffered Serial Port (McBSP)

- [Words, Frames, and Phases Definitions: \[0\] \[1\]](#)
- [Clocking and Framing Data: \[2\] \[3\]](#)
- [Frame Phases \(Dual-Phase Frame I2S Support\): \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [Configuring a Frame for Multichannel Selection: \[11\]](#)
- [McBSP Initialization Procedure: \[12\] \[13\]](#)
- [Programming the McBSP Registers for the Desired Transmitter Operation \(Step 2\): \[14\] \[15\]](#)
- [MCBSP Register Summary: \[16\] \[17\] \[18\] \[19\]](#)

Table 24-384. MCBSP_LP_SRGR2_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0028 | | |
| Physical Address | 0x4902 2028 0x4012 2028 0x2 2028 0x4902 4028 0x4012 4028 0x2 4028 0x4902 6028 0x4012 6028 0x2 6028 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSP_LP sample rate generator register 2 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|-------|-------|------|------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | GSYNC | CLKSP | CLKSM | FSGM | FPER | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15 | GSYNC | 0x0: The SRG clock (CLKG) is free running. 0x1: The SRG clock (CLKG) is running. But CLKG is resynchronized and frame-sync signal (FSG) is generated only after detecting the receive frame-sync signal (FSR). Also, frame period, FPER, is a don't care because the period is dictated by the external frame-sync pulse. | RW | 0 |
| 14 | CLKSP | CLKS Polarity Clock Edge Select Only used when the external clock CLKS drives the SRG clock (CLKSM=0). 0x0: Rising edge of CLKG and FSG. 0x1: Falling edge of CLKG and FSG. | RW | 0 |
| 13 | CLKSM | McBSP_LP Sample Rate Generator Clock Mode 0x0: SCLKME=0: SRG clock derived from the CLKS pin. SCLKME=1: SRG clock derived from the CLKRI pin. 0x1: SCLKME=0: SRG clock derived from the CPU clock. SCLKME=1: SRG clock derived from the CLKXI clock. | RW | 1 |
| 12 | FSGM | Sample Rate Generator Transmit Frame-Synchronization Mode Used when FSXM=1 in the PCR. 0x0: Transmit frame-sync signal (FSX) is generated when transmit buffer is not empty When FSGM=0, FPER and FWID are used to determine the frame-sync period and width (external FSX is gated by the buffer empty condition). 0x1: Transmit frame-sync signal driven by the SRG frame-sync signal, FSG. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 11:0 | FPER | Frame Period. This field plus 1 determines when the next frame-sync signal becomes active. Range: 1 to 4096 CLKG periods | RW | 0x000 |

Table 24-385. Register Call Summary for Register MCBSP_LP_SRGR2_REG

Multichannel Buffered Serial Port (McBSP)

- [McBSP1 Clocks: \[0\]](#)
- [McBSP2 Clocks: \[1\]](#)
- [McBSP3 Clocks: \[2\]](#)
- [McBSP4 Clocks: \[3\]](#)
- [Clocking and Framing Data: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\]](#)
- [McBSP SRG: \[18\] \[19\] \[20\] \[21\]](#)
- [Frame-Sync Generation in the SRG: \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\]](#)
- [Synchronizing SRG Outputs to an External Clock: \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\]](#)
- [Underflow in the Transmitter: \[38\] \[39\] \[40\]](#)
- [McBSP Initialization Procedure: \[41\] \[42\]](#)
- [Reset and Initialization Procedure for the SRG: \[43\]](#)
- [Programming the McBSP Registers for the Desired Receiver Configuration \(Step 2\): \[44\] \[45\] \[46\] \[47\] \[48\]](#)
- [Programming the McBSP Registers for the Desired Transmitter Operation \(Step 2\): \[49\] \[50\] \[51\] \[52\] \[53\]](#)
- [MCBSP Register Summary: \[54\] \[55\] \[56\] \[57\]](#)

Table 24-386. MCBSP_LP_SRGR1_REG

| | | | |
|------------------|--|------------------|------------------|
| Address Offset | 0x0000 002C | Instance | |
| Physical Address | 0x4902 202C | | MCBSP1_L3 |
| | 0x4012 202C | | MCBSP1_CORTEX-A9 |
| | 0x2 202C | | MCBSP1_DSP |
| | 0x4902 402C | | MCBSP2_L3 |
| | 0x4012 402C | | MCBSP2_CORTEX-A9 |
| | 0x2 402C | | MCBSP2_DSP |
| | 0x4902 602C | | MCBSP3_L3 |
| | 0x4012 602C | MCBSP3_CORTEX-A9 | |
| | 0x2 602C | MCBSP3_DSP | |
| Description | McBSPLP sample rate generator register 1 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|--------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FWID | | | | | | CLKGDV | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:8 | FWID | Frame Width. This field plus 1 determines the width of the frame-sync pulse, FSG, during its active period. Range: 1 to 256 CLKG periods. | RW | 0x00 |
| 7:0 | CLKGDV | Sample Rate Generator Clock Divider This value is used as the divide-down number to generate the required SRG clock frequency. Default value is 1. | RW | 0x01 |

Table 24-387. Register Call Summary for Register MCBSP_LP_SRGR1_REG

Multichannel Buffered Serial Port (McBSP)

- [Clocking and Framing Data: \[0\]](#)
- [McBSP SRG: \[1\] \[2\] \[3\]](#)
- [Frame-Sync Generation in the SRG: \[4\] \[5\]](#)
- [Synchronizing SRG Outputs to an External Clock: \[6\] \[7\]](#)
- [Underflow in the Transmitter: \[8\]](#)
- [McBSP Initialization Procedure: \[9\] \[10\]](#)
- [Reset and Initialization Procedure for the SRG: \[11\]](#)
- [Programming the McBSP Registers for the Desired Receiver Configuration \(Step 2\): \[12\] \[13\]](#)
- [Programming the McBSP Registers for the Desired Transmitter Operation \(Step 2\): \[14\] \[15\]](#)
- [McBSP Register Summary: \[16\] \[17\] \[18\] \[19\]](#)

Table 24-388. MCBSP_LP_MCR2_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0030 | | |
| Physical Address | 0x4902 2030 0x4012 2030 0x2 2030 0x4902 4030 0x4012 4030 0x2 4030 0x4902 6030 0x4012 6030 0x2 6030 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSP_LP multi channel register 2 | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|--------|----|--------|----|----------|---|------|---|---|---|---|---|---|---|---|
| RESERVED | | | | | | | | | | | | | | | | XMCME | XPBBLK | | XPABLK | | RESERVED | | XMCM | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-----------|
| 31:10 | RESERVED | Reserved | R | 0x0000000 |
| 9 | XMCME | 0x0: 2-partition mode: Only partitions A and B are used. You can control up to 32 channels in the transmit multichannel selection mode selected with the XMCM bits. If XMCM = 01b or 10b, assign 16 channels to partition A with the XPABLK bits. Assign 16 channels to partition B with the XPBBLK bits. If XMCM = 11b (for symmetric transmission and reception), assign 16 channels to receive partition A with the RPABLK bits. Assign 16 channels to receive partition B with the RPBBLK bits. You control the channels with the appropriate transmit channel enable registers: XCERA: Channels in partition A XCERB: Channels in partition B 0x1: 8-partition mode: All partitions (A through H) are used. You can control up to 128 channels in the transmit multichannel selection mode selected with the XMCM bits. You control the channels with the appropriate transmit channel enable registers: XCERA: Channels 0 through 15 XCERB: Channels 16 through 31 XCERC: Channels 32 through 47 XCERD: Channels 48 through 63 XCERE: Channels 64 through 79 XCERF: Channels 80 through 95 XCERG: Channels 96 through 111 XCERH: Channels 112 through 127 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 8:7 | XPBBLK | Transmit Partition B Block (legacy) 0x0: Block 1. Channel 16 to channel 31 0x1: Block 3. Channel 48 to channel 63 0x2: Block 5. Channel 80 to channel 95 0x3: Block 7. Channel 112 to channel 127 | RW | 0x0 |
| 6:5 | XPABLK | Transmit Partition A Block (legacy) 0x0: Block 0. Channel 0 to channel 15 0x1: Block 2. Channel 32 to channel 47 0x2: Block 4. Channel 64 to channel 79 0x3: Block 6. Channel 96 to channel 111 | RW | 0x0 |
| 4:2 | RESERVED | Reserved | R | 0x0 |
| 1:0 | XMCM | Transmit Multichannel Selection Enable 0x0: All channels enabled without masking (DX is always driven during transmission of data). 0x1: All channels disabled and therefore masked by default. Required channels are selected by enabling XP(A/B)BLK and XCER(A/B) appropriately. Also, these selected channels are not masked and therefore DX is always driven. 0x2: All channels enabled, but masked. Selected channels enabled via XP(A/B)BLK and XCER(A/B) are unmasked. 0x3: All channels disabled and therefore masked by default. Required channels are selected by enabling RP(A/B)BLK and RCER(A/B) appropriately. Selected channels can be unmasked by RP(A/B)BLK and XCER(A/B). This mode is used for symmetric transmit and receive operation. | RW | 0x0 |

Table 24-389. Register Call Summary for Register MCBSP1P_MCR2_REG

Multichannel Buffered Serial Port (McBSP)

- [Using Eight Partitions: \[0\] \[1\] \[2\]](#)
- [Using Two Partitions \(Legacy Only\): \[3\] \[4\]](#)
- [Transmit Multichannel Selection Modes: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [McBSP Initialization Procedure: \[11\]](#)
- [McBSP Register Summary: \[12\] \[13\] \[14\] \[15\]](#)

Table 24-390. MCBSP1P_MCR1_REG

| | | | |
|-------------------------|----------------------------------|-----------------|------------------|
| Address Offset | 0x0000 0034 | Instance | MCBSP1_L3 |
| Physical Address | 0x4902 2034 | | MCBSP1_CORTEX-A9 |
| | 0x4012 2034 | | MCBSP1_DSP |
| | 0x2 2034 | | MCBSP2_L3 |
| | 0x4902 4034 | | MCBSP2_CORTEX-A9 |
| | 0x4012 4034 | | MCBSP2_DSP |
| | 0x2 4034 | | MCBSP3_L3 |
| | 0x4902 6034 | | MCBSP3_CORTEX-A9 |
| | 0x4012 6034 | | MCBSP3_DSP |
| | 0x2 6034 | | |
| Description | McBSPLP multi channel register 1 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|--------|--------|----------|---|---|---|-------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | RMCME | RPBBLK | RPABLK | RESERVED | | | | RMCME | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------|
| 31:10 | RESERVED | Reserved | R | 0x000000 |
| 9 | RMCM | (legacy) 0x0: 2-partition mode. Only partitions A and B are used. You can control up to 32 channels in the receive multichannel selection mode (RMCM = 1). Assign 16 channels to partition A with the RPABLK bits. Assign 16 channels to partition B with the RPBBLK bits. You control the channels with the appropriate receive channel enable registers: RCERA: Channels in partition A RCERB: Channels in partition B 0x1: 8-partition mode: All partitions (A through H) are used. You can control up to 128 channels in the receive multichannel selection mode. You control the channels with the appropriate receive channel enable registers: RCERA: Channels 0 through 15 RCERB: Channels 16 through 31 RCERC: Channels 32 through 47 RCERD: Channels 48 through 63 RCERE: Channels 64 through 79 RCERF: Channels 80 through 95 RCERG: Channels 96 through 111 RCERH: Channels 112 through 127 | RW | 0 |
| 8:7 | RPBBLK | Receive Partition B Block (legacy) 0x0: Block 1. Channel 16 to channel 31 0x1: Block 3. Channel 48 to channel 63 0x2: Block 5. Channel 80 to channel 95 0x3: Block 7. Channel 112 to channel 127 | RW | 0x0 |
| 6:5 | RPABLK | Receive Partition A Block (legacy) 0x0: Block 0. Channel 0 to channel 15 0x1: Block 2. Channel 32 to channel 47 0x2: Block 4. Channel 64 to channel 79 0x3: Block 6. Channel 96 to channel 111 | RW | 0x0 |
| 4:1 | RESERVED | Reserved | R | 0x0 |
| 0 | RMCM | Receive Multichannel Selection Enable 0x0: All 128 channels 0x1: All channels disabled by default. Required channels are selected by enabling RP(A/B)BLK and RCER(A/B) appropriately | RW | 0 |

Table 24-391. Register Call Summary for Register MCBSP_LP_MCR1_REG

Multichannel Buffered Serial Port (McBSP)

- [Using Eight Partitions: \[0\] \[1\] \[2\]](#)
- [Receive Multichannel Selection Mode: \[3\] \[4\]](#)
- [Using Two Partitions \(Legacy Only\): \[5\] \[6\] \[7\] \[8\]](#)
- [McBSP Initialization Procedure: \[9\]](#)
- [Programming the McBSP Registers for the Desired Receiver Configuration \(Step 2\): \[10\]](#)
- [Programming the McBSP Registers for the Desired Transmitter Operation \(Step 2\): \[11\]](#)
- [McBSP Register Summary: \[12\] \[13\] \[14\] \[15\]](#)

Table 24-392. MCBSP_LP_RCERA_REG

| | | | |
|-------------------------|---|-----------------|------------------|
| Address Offset | 0x0000 0038 | Instance | MCBSP1_L3 |
| Physical Address | 0x4902 2038 | | MCBSP1_CORTEX-A9 |
| | 0x4012 2038 | | MCBSP1_DSP |
| | 0x2 2038 | | MCBSP2_L3 |
| | 0x4902 4038 | | MCBSP2_CORTEX-A9 |
| | 0x4012 4038 | | MCBSP2_DSP |
| | 0x2 4038 | | MCBSP3_L3 |
| | 0x4902 6038 | | MCBSP3_CORTEX-A9 |
| | 0x4012 6038 | | MCBSP3_DSP |
| | 0x2 6038 | | |
| Description | McBSPLP receive channel enable register partition A | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RCERA | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | RCERA | Receive Channel Enable RCERA n=0 Disables reception of n-th channel in an even-numbered block in partition A RCERA n=1 Enables reception of n-th channel in an even-numbered block in partition A | RW | 0x0000 |

Table 24-393. Register Call Summary for Register MCBSP_LP_RCERA_REG

- [Using Eight Partitions: \[0\]](#)
- [Receive Multichannel Selection Mode: \[1\] \[2\]](#)
- [Using Two Partitions \(Legacy Only\): \[3\]](#)
- [Transmit Multichannel Selection Modes: \[4\] \[5\]](#)
- [MCBSP Register Summary: \[6\] \[7\] \[8\] \[9\]](#)

Table 24-394. MCBSPPL RCERB REG

| | | | |
|-------------------------|---|-----------------|------------------|
| Address Offset | 0x0000 003C | Instance | MCBSP1_L3 |
| Physical Address | 0x4902 203C | | MCBSP1_CORTEX-A9 |
| | 0x4012 203C | | MCBSP1_DSP |
| | 0x2 203C | | MCBSP2_L3 |
| | 0x4902 403C | | MCBSP2_CORTEX-A9 |
| | 0x4012 403C | | MCBSP2_DSP |
| | 0x2 403C | | MCBSP3_L3 |
| | 0x4902 603C | | MCBSP3_CORTEX-A9 |
| | 0x4012 603C | | MCBSP3_DSP |
| | 0x2 603C | | |
| Description | McBSPLP receive channel enable register partition B | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RCERB | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | RCERB | Receive Channel Enable RCERB n=0 Disables reception of n-th channel in a even-numbered block in partition B RCERB n=1 Enables reception of n-th channel in a even-numbered block in partition B | RW | 0x0000 |

Table 24-395. Register Call Summary for Register MCBSP_LP_RCERB_REG

Multichannel Buffered Serial Port (McBSP)

- Using Eight Partitions: [0]
- Using Two Partitions (Legacy Only): [1]
- MCBSP Register Summary: [2] [3] [4] [5]

Table 24-396. MCBSPPL XCERA REG

| Address Offset | 0x0000 0040 | | |
|--------------------|--|----------|------------------|
| Physical Address | 0x4902 2040 | Instance | MCBSP1_L3 |
| | 0x4012 2040 | | MCBSP1_CORTEX-A9 |
| | 0x2 2040 | | MCBSP1_DSP |
| | 0x4902 4040 | | MCBSP2_L3 |
| | 0x4012 4040 | | MCBSP2_CORTEX-A9 |
| | 0x2 4040 | | MCBSP2_DSP |
| | 0x4902 6040 | | MCBSP3_L3 |
| | 0x4012 6040 | | MCBSP3_CORTEX-A9 |
| | 0x2 6040 | | MCBSP3_DSP |
| Description | McBSPLP transmit channel enable register partition A | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XCERA | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | XCERA | Transmit Channel Enable XCERA n=0 Disables transmission of n-th channel in an event-numbered block in partition A XCERA n=1 Enables transmission of n-th channel in an event-numbered block in partition A | RW | 0x0000 |

Table 24-397. Register Call Summary for Register MCBSP_LP_XCERA_REG

Multichannel Buffered Serial Port (McBSP)

- Using Eight Partitions: [0]
- Using Two Partitions (Legacy Only): [1]
- Transmit Multichannel Selection Modes: [2] [3] [4] [5] [6] [7]
- MCBSP Register Summary: [8] [9] [10] [11]

Table 24-398. MCBSPPLP XCERB REG

| Address Offset | 0x0000 0044 | | |
|------------------|--|----------|------------------|
| Physical Address | 0x4902 2044 | Instance | MCBSP1_L3 |
| | 0x4012 2044 | | MCBSP1_CORTEX-A9 |
| | 0x2 2044 | | MCBSP1_DSP |
| | 0x4902 4044 | | MCBSP2_L3 |
| | 0x4012 4044 | | MCBSP2_CORTEX-A9 |
| | 0x2 4044 | | MCBSP2_DSP |
| | 0x4902 6044 | | MCBSP3_L3 |
| | 0x4012 6044 | | MCBSP3_CORTEX-A9 |
| | 0x2 6044 | | MCBSP3_DSP |
| Description | McBSPLP transmit channel enable register partition B | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | XCERB | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | XCERB | Transmit Channel Enable XCERB n=0 Disables transmission of n-th channel in an even-numbered block in partition B XCERB n=1 Enables transmission of n-th channel in an even-numbered block in partition B | RW | 0x0000 |

Table 24-399. Register Call Summary for Register MCBSP1P_XCERB_REG

Multichannel Buffered Serial Port (McBSP)

- [Using Eight Partitions: \[0\]](#)
- [Using Two Partitions \(Legacy Only\): \[1\]](#)
- [MCBSP Register Summary: \[2\] \[3\] \[4\] \[5\]](#)

Table 24-400. MCBSP1P_PCR_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0048 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Physical Address | 0x4902 2048 0x4012 2048 0x2 2048 0x4902 4048 0x4012 4048 0x2 4048 0x4902 6048 0x4012 6048 0x2 6048 | | |
| Description | McBSP1P pin control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|-------|-------|------|------|-------|-------|--------|-----------|---------|---------|------|------|-------|-------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | IDLE_EN | XIOEN | RIOEN | FSXM | FSRM | CLKXM | CLKRM | SCLKME | CLKS_STAT | DX_STAT | DR_STAT | FSXP | FSRP | CLKXP | CLKRP | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------|
| 31:15 | RESERVED | Reserved | R | 0x000000 |
| 14 | IDLE_EN | Idle enable. This bit allows stopping all the clocks in the MCBSP1P. (legacy) 0x0: The McBSP is running 0x1: The clocks in the McBSP are shut off when both IDLE_EN=1 and peripheral domain is in idle mode | RW | 0 |
| 13 | XIOEN | Transmit General Purpose I/O Mode only when XRST=0 in SPCR[1,2] (legacy) 0x0: DX, FSX and CLKX are configured as serial port pins and do not function as general-purpose I/Os. 0x1: DX pin is a general purpose output. FSX and CLKX are general purpose I/Os. These serial port pins do not perform serial port operation. | RW | 0 |
| 12 | RIOEN | Receive General Purpose I/O Mode when RRST=0 in SPCR[1,2] (legacy) 0x0: DR, FSR, CLKR and CLKS are configured as serial port pins and do not function as general-purpose I/Os. 0x1: DR and CLKS pins are general purpose inputs; FSR and CLKR are general purpose I/Os. These serial port pins do not perform serial port operation. The CLKS pin is affected by a combination of RRST and RIOEN signals of the receiver. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 11 | FSXM | Transmit Frame-Synchronization Mode 0x0: Frame-sync signal derived from an external source 0x1: Frame synchronization is determined by the SRG frame-sync mode bit FSGM in SRGR2. | RW | 0 |
| 10 | FSRM | Receive Frame-Synchronization Mode 0x0: Frame-sync pulses generated by an external device. FSR is an input pin. 0x1: Frame synchronization generated internally by SRG. FSR is an output pin except when GSYNC=1 in SRGR. | RW | 0 |
| 9 | CLKXM | Transmitter Clock Mode 0x0: Transmitter clock is driven by an external clock with CLKX as an input pin. 0x1: CLKX is an output pin and is driven by the internal sample rate generator. | RW | 0 |
| 8 | CLKRM | Receiver Clock Mode 0x0: Case 1: Digital loopback mode not set (DLB=0) in SPCR1: Receive clock (CLKR) is an input driven by an external clock. Case 2: Digital loopback mode set (DLB=1) in SPCR1: Receive clock (not the CLKR pin) is driven by transmit clock (CLKX) which is based on the CLKXM bit in the PCR. CLKR pin is in high-impedance. 0x1: Case 1: Digital loopback mode not set (DLB=0) in SPCR1: CLKR is an output pin and is driven by the internal SRG. Case 2: Digital loopback mode set (DLB=1) in SPCR1: CLKR is an output pin and is driven by the transmit clock. The transmit clock is derived based on the CLKRM bit in the PCR. | RW | 0 |
| 7 | SCLKME | The frequency of CLKG is: $\text{CLKG frequency} = (\text{Input clock frequency}) / (\text{CLKGDV} + 1)$ SCLKME is used in conjunction with the CLKSM bit to select the input clock: 0x0: CLKSM = 0: Signal on CLKS pin CLKSM = 1: CPU clock 0x1: CLKSM = 0: Signal on CLKR pin CLKSM = 1: Signal on CLKX pin | RW | 0 |
| 6 | CLKS_STAT | CLKS pin status. Reflects value on CLKS pin when selected as a general purpose input. (legacy) Read 0x0: The signal on the CLKS pin is low Read 0x1: The signal on the CLKS pin is high | R | 0 |
| 5 | DX_STAT | DX pin status. Reflects value driven on to DX pin when selected as a general purpose output. (legacy) 0x0: Drive the signal on the DX pin low 0x1: Drive the signal on the DX pin high | RW | 0 |
| 4 | DR_STAT | DR pin status. Reflects value on DR pin when selected as a general purpose input. (legacy) Read 0x0: The signal on DR pin is low Read 0x1: The signal on DR pin is high | R | 0 |
| 3 | FSXP | Transmit Frame-Synchronization Polarity 0x0: Frame-sync pulse FSX is active high 0x1: Frame-sync pulse FSX is active low | RW | 0 |
| 2 | FSRP | Receive Frame-Synchronization Polarity 0x0: Frame-sync pulse FSR is active high 0x1: Frame-sync pulse FSR is active low | RW | 0 |
| 1 | CLKXP | Transmit Clock Polarity 0x0: Transmit data driven on rising edge of CLKX 0x1: Transmit data driven on falling edge of CLKX | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | CLKRP | Receive Clock Polarity 0x0: Receive data sampled on falling edge of CLKR 0x1: Receive data sampled on rising edge of CLKR | RW | 0 |

Table 24-401. Register Call Summary for Register MCBSP_LP_PCR_REG

Multichannel Buffered Serial Port (McBSP)

- [Words, Frames, and Phases Definitions: \[0\] \[1\]](#)
- [McBSP1 Clocks: \[2\]](#)
- [McBSP2 Clocks: \[3\]](#)
- [McBSP3 Clocks: \[4\]](#)
- [McBSP4 Clocks: \[5\]](#)
- [Analysis of the Receiver Smart-Idle Behavior: \[6\] \[7\]](#)
- [Clocking and Framing Data: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\]](#)
- [Frame Phases \(Dual-Phase Frame I2S Support\): \[40\] \[41\] \[42\] \[43\] \[44\] \[45\] \[46\] \[47\]](#)
- [MCBSP Data Transfer Mode: \[48\] \[49\]](#)
- [McBSP SRG: \[50\] \[51\] \[52\] \[53\] \[54\]](#)
- [Clock Generation in the SRG: \[55\] \[56\] \[57\] \[58\]](#)
- [Frame-Sync Generation in the SRG: \[59\] \[60\]](#)
- [Synchronizing SRG Outputs to an External Clock: \[61\] \[62\] \[63\] \[64\]](#)
- [Underflow in the Transmitter: \[65\]](#)
- [McBSP Initialization Procedure: \[66\] \[67\]](#)
- [Reset and Initialization Procedure for the SRG: \[68\]](#)
- [Programming the McBSP Registers for the Desired Receiver Configuration \(Step 2\): \[69\] \[70\] \[71\] \[72\] \[73\] \[74\] \[75\] \[76\]](#)
- [Programming the McBSP Registers for the Desired Transmitter Operation \(Step 2\): \[77\] \[78\] \[79\] \[80\] \[81\] \[82\] \[83\] \[84\]](#)
- [GPIO on the McBSP Pins \(Legacy Only\): \[85\] \[86\] \[87\] \[88\]](#)
- [MCBSP Register Summary: \[89\] \[90\] \[91\] \[92\]](#)

Table 24-402. MCBSP_LP_RCERC_REG

| | | | |
|------------------|--|----------|--|
| Address Offset | 0x0000 004C | Instance | MCBSP1_L3 |
| Physical Address | 0x4902 204C 0x4012 204C 0x2 204C 0x4902 404C 0x4012 404C 0x2 404C 0x4902 604C 0x4012 604C 0x2 604C | | MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSPLP receive channel enable register partition C | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RCERC | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | RCERC | Receive Channel Enable RCERC n=0 Disables reception of n-th channel in an even-numbered block in partition C RCERC n=1 Enables reception of n-th channel in an even-numbered block in partition C | RW | 0x0000 |

Table 24-403. Register Call Summary for Register MCBSP_LP_RCERC_REG

Multichannel Buffered Serial Port (McBSP)

- Using Eight Partitions: [0]
- MCBSP Register Summary: [1] [2] [3] [4]

Table 24-404. MCBSPPLP RCERD REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0050 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Physical Address | 0x4902 2050 0x4012 2050 0x2 2050 0x4902 4050 0x4012 4050 0x2 4050 0x4902 6050 0x4012 6050 0x2 6050 | | |
| Description | McBSPLP receive channel enable register partition D | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RCERD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | RCERD | Receive Channel Enable RCERD n=0 Disables reception of n-th channel in an even-numbered block in partition D RCERD n=1 Enables reception of n-th channel in an even-numbered block in partition D | RW | 0x0000 |

Table 24-405. Register Call Summary for Register MCBSP_LP_RCERD_REG

Multichannel Buffered Serial Port (McBSP)

- Using Eight Partitions: [0]
- MCBSP Register Summary: [1] [2] [3] [4]

Table 24-406. MCBSPPLP XCERC REG

| Address Offset | Physical Address | Instance |
|----------------|--|------------------|
| 0x0000 0054 | 0x4902 2054 | MCBSP1_L3 |
| | 0x4012 2054 | MCBSP1_CORTEX-A9 |
| | 0x2 2054 | MCBSP1_DSP |
| | 0x4902 4054 | MCBSP2_L3 |
| | 0x4012 4054 | MCBSP2_CORTEX-A9 |
| | 0x2 4054 | MCBSP2_DSP |
| | 0x4902 6054 | MCBSP3_L3 |
| | 0x4012 6054 | MCBSP3_CORTEX-A9 |
| | 0x2 6054 | MCBSP3_DSP |
| Description | McBSPLP transmit channel enable register partition C | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XCERC | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | XCERC | Transmit Channel Enable XCERC n=0 Disables transmission of n-th channel in an event-numbered block in partition C XCERC n=1 Enables transmission of n-th channel in an event-numbered block in partition C | RW | 0x0000 |

Table 24-407. Register Call Summary for Register MCBSP1P_XCERC_REG

Multichannel Buffered Serial Port (McBSP)

- [Using Eight Partitions: \[0\]](#)
- [MCBSP Register Summary: \[1\] \[2\] \[3\] \[4\]](#)

Table 24-408. MCBSP1P_XCERD_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0058 | | |
| Physical Address | 0x4902 2058 0x4012 2058 0x2 2058 0x4902 4058 0x4012 4058 0x2 4058 0x4902 6058 0x4012 6058 0x2 6058 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | MCBSP1P transmit channel enable register partition D | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XCERD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | XCERD | Transmit Channel Enable XCERD n=0 Disables transmission of n-th channel in an even-numbered block in partition D XCERD n=1 Enables transmission of n-th channel in an even-numbered block in partition D | RW | 0x0000 |

Table 24-409. Register Call Summary for Register MCBSP1P_XCERD_REG

Multichannel Buffered Serial Port (McBSP)

- [Using Eight Partitions: \[0\]](#)
- [MCBSP Register Summary: \[1\] \[2\] \[3\] \[4\]](#)

Table 24-410. MCBSPPL RCERE REG

| Address Offset | 0x0000 005C | Instance | |
|------------------|---|----------|------------------|
| Physical Address | 0x4902 205C | | MCBSP1_L3 |
| | 0x4012 205C | | MCBSP1_CORTEX-A9 |
| | 0x2 205C | | MCBSP1_DSP |
| | 0x4902 405C | | MCBSP2_L3 |
| | 0x4012 405C | | MCBSP2_CORTEX-A9 |
| | 0x2 405C | | MCBSP2_DSP |
| | 0x4902 605C | | MCBSP3_L3 |
| | 0x4012 605C | | MCBSP3_CORTEX-A9 |
| | 0x2 605C | | MCBSP3_DSP |
| Description | McBSPLP receive channel enable register partition E | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RCERE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | RCERE | Receive Channel Enable RCERE n=0 Disables reception of n-th channel in an even-numbered block in partition E RCERE n=1 Enables reception of n-th channel in an even-numbered block in partition E | RW | 0x0000 |

Table 24-411. Register Call Summary for Register MCBSPLP_RCERE_REG

Multichannel Buffered Serial Port (McBSP)

- Using Eight Partitions: [0]
- MCBSP Register Summary: [1] [2] [3] [4]

Table 24-412. MCBSPLP RCERF REG

| Address Offset | 0x0000 0060 | Instance | |
|------------------|---|----------|------------------|
| Physical Address | 0x4902 2060 | | MCBSP1_L3 |
| | 0x4012 2060 | | MCBSP1_CORTEX-A9 |
| | 0x2 2060 | | MCBSP1_DSP |
| | 0x4902 4060 | | MCBSP2_L3 |
| | 0x4012 4060 | | MCBSP2_CORTEX-A9 |
| | 0x2 4060 | | MCBSP2_DSP |
| | 0x4902 6060 | | MCBSP3_L3 |
| | 0x4012 6060 | | MCBSP3_CORTEX-A9 |
| | 0x2 6060 | | MCBSP3_DSP |
| Description | McBSPLP receive channel enable register partition F | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | RCERF | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | RCERF | Receive Channel Enable RCERF n=0 Disables reception of n-th channel in an even-numbered block in partition F RCERF n=1 Enables reception of n-th channel in an even-numbered block in partition F | RW | 0x0000 |

Table 24-413. Register Call Summary for Register MCBSPPLP_RCERF_REG

Multichannel Buffered Serial Port (McBSP)

- [Using Eight Partitions: \[0\]](#)
- [MCBSP Register Summary: \[1\] \[2\] \[3\] \[4\]](#)

Table 24-414. MCBSPPLP_XCERE_REG

| | | | | | |
|------------------|--|----------|---|--|--|
| Address Offset | 0x0000 0064 | | | | |
| Physical Address | 0x4902 2064 0x4012 2064 0x2 2064 0x4902 4064 0x4012 4064 0x2 4064 0x4902 6064 0x4012 6064 0x2 6064 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP | | |
| Description | McBSPPLP transmit channel enable register partition E | | | | |
| Type | RW | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XCERE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | XCERE | Transmit Channel Enable XCERE n=0 Disables transmission of n-th channel in an event-numbered block in partition E XCERE n=1 Enables transmission of n-th channel in an event-numbered block in partition E | RW | 0x0000 |

Table 24-415. Register Call Summary for Register MCBSPPLP_XCERE_REG

Multichannel Buffered Serial Port (McBSP)

- [Using Eight Partitions: \[0\]](#)
- [MCBSP Register Summary: \[1\] \[2\] \[3\] \[4\]](#)

Table 24-416. MCBSPPLP_XCERF_REG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0068 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | XCERF | Transmit Channel Enable XCERF n=0 Disables transmission of n-th channel in an even-numbered block in partition F XCERF n=1 Enables transmission of n-th channel in an even-numbered block in partition F | RW | 0x0000 |

Table 24-417. Register Call Summary for Register MCBSP1P_XCERF_REG

Multichannel Buffered Serial Port (McBSP)

- [Using Eight Partitions: \[0\]](#)
- [MCBSP Register Summary: \[1\] \[2\] \[3\] \[4\]](#)

Table 24-418. MCBSP1P_RCERG_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 006C | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Physical Address | 0x4902 206C 0x4012 206C 0x2 206C 0x4902 406C 0x4012 406C 0x2 406C 0x4902 606C 0x4012 606C 0x2 606C | | |
| Description | McBSP1P receive channel enable register partition G | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RCERG | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | RCERG | Receive Channel Enable RCERG n=0 Disables reception of n-th channel in an even-numbered block in partition G RCERG n=1 Enables reception of n-th channel in an even-numbered block in partition G | RW | 0x0000 |

Table 24-419. Register Call Summary for Register MCBSP1P_RCERG_REG

Multichannel Buffered Serial Port (McBSP)

- [Using Eight Partitions: \[0\]](#)
- [MCBSP Register Summary: \[1\] \[2\] \[3\] \[4\]](#)

Table 24-420. MCBSP1P_RCERH_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0070 | | |
| Physical Address | 0x4902 2070 0x4012 2070 0x2 2070 0x4902 4070 0x4012 4070 0x2 4070 0x4902 6070 0x4012 6070 0x2 6070 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSP1P receive channel enable register partition H | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RCERH | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | RCERH | Receive Channel Enable RCERH n=0 Disables reception of n-th channel in an even-numbered block in partition H RCERH n=1 Enables reception of n-th channel in an even-numbered block in partition H | RW | 0x0000 |

Table 24-421. Register Call Summary for Register MCBSP1P_RCERH_REG

Multichannel Buffered Serial Port (McBSP)

- [Using Eight Partitions: \[0\]](#)
- [Receive Multichannel Selection Mode: \[1\] \[2\]](#)
- [Transmit Multichannel Selection Modes: \[3\] \[4\]](#)
- [MCBSP Register Summary: \[5\] \[6\] \[7\] \[8\]](#)

Table 24-422. MCBSP1P_XCERG_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0074 | | |
| Physical Address | 0x4902 2074 0x4012 2074 0x2 2074 0x4902 4074 0x4012 4074 0x2 4074 0x4902 6074 0x4012 6074 0x2 6074 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSP1P transmit channel enable register partition G | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XCERG | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | XCERG | Transmit Channel Enable XCERG n=0 Disables transmission of n-th channel in an event-numbered block in partition G XCERG n=1 Enables transmission of n-th channel in an event-numbered block in partition G | RW | 0x0000 |

Table 24-423. Register Call Summary for Register MCBSPPLP_XCERG_REG

Multichannel Buffered Serial Port (McBSP)

- [Using Eight Partitions: \[0\]](#)
- [MCBSP Register Summary: \[1\] \[2\] \[3\] \[4\]](#)

Table 24-424. MCBSPPLP_XCERH_REG

| | | | | |
|------------------|--|----------|---|--|
| Address Offset | 0x0000 0078 | | | |
| Physical Address | 0x4902 2078 0x4012 2078 0x2 2078 0x4902 4078 0x4012 4078 0x2 4078 0x4902 6078 0x4012 6078 0x2 6078 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP | |
| Description | McBSPLP transmit channel enable register partition H | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XCERH | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | XCERH | Transmit Channel Enable XCERH n=0 Disables transmission of n-th channel in an even-numbered block in partition H XCERH n=1 Enables transmission of n-th channel in an even-numbered block in partition H | RW | 0x0000 |

Table 24-425. Register Call Summary for Register MCBSPPLP_XCERH_REG

Multichannel Buffered Serial Port (McBSP)

- [Using Eight Partitions: \[0\]](#)
- [Transmit Multichannel Selection Modes: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [MCBSP Register Summary: \[7\] \[8\] \[9\] \[10\]](#)

Table 24-426. MCBSPPLP_REV_REG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|
| Address Offset | 0x0000 007C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | </ |
|-----------------------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7:0 | REV | Revision number | R | 0x11 |

Table 24-427. Register Call Summary for Register MCBSP_LP_REV_REG

Multichannel Buffered Serial Port (McBSP)

- [MCBSP Register Summary: \[0\] \[1\] \[2\] \[3\]](#)

Table 24-428. MCBSP_LP_RINTCLR_REG

| | | | |
|------------------|--|----------|---|
| Address Offset | 0x0000 0080 | | |
| Physical Address | 0x4902 2080 0x4012 2080 0x2 2080 0x4902 4080 0x4012 4080 0x2 4080 0x4902 6080 0x4012 6080 0x2 6080 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSPLP receive interrupt clear | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RINTCLR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | RINTCLR | Read from this register will clear the IRQ generated by receive end-of-frame indication or MCBSP_LP.FSR detection. Write to this register has no effect. (legacy) | RW | 0x0000 0000 |

Table 24-429. Register Call Summary for Register MCBSP_LP_RINTCLR_REG

Multichannel Buffered Serial Port (McBSP)

- [MCBSP Register Summary: \[0\] \[1\] \[2\] \[3\]](#)

Table 24-430. MCBSP_LP_XINTCLR_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0084 | | |
| Physical Address | 0x4902 2084 0x4012 2084 0x2 2084 0x4902 4084 0x4012 4084 0x2 4084 0x4902 6084 0x4012 6084 0x2 6084 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSP_LP transmit interrupt clear (legacy) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| XINTCLR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | XINTCLR | Read from this register will clear the IRQ generated by transmit end-of-frame indication or MCBSP.LP.FSX detection. Write to this register has no effect. | RW | 0x0000 0000 |

Table 24-431. Register Call Summary for Register MCBSP.LP.XINTCLR_REG

Multichannel Buffered Serial Port (McBSP)

- [MCBSP Register Summary: \[0\] \[1\] \[2\] \[3\]](#)

Table 24-432. MCBSP.LP.ROVFLCLR_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0088 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Physical Address | 0x4902 2088 0x4012 2088 0x2 2088 0x4902 4088 0x4012 4088 0x2 4088 0x4902 6088 0x4012 6088 0x2 6088 | | |
| Description | McBSP.LP receive overflow interrupt clear | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ROVFLCLR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | ROVFLCLR | Read from this register will clear the IRQ generated by the receive overflow condition. Write to this register has no effect. | RW | 0x0000 0000 |

Table 24-433. Register Call Summary for Register MCBSP.LP.ROVFLCLR_REG

Multichannel Buffered Serial Port (McBSP)

- [MCBSP Register Summary: \[0\] \[1\] \[2\] \[3\]](#)

Table 24-434. MCBSP.LP.SYSCONFIG_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 008C | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Physical Address | 0x4902 208C 0x4012 208C 0x2 208C 0x4902 408C 0x4012 408C 0x2 408C 0x4902 608C 0x4012 608C 0x2 608C | | |
| Description | McBSP.LP System Configuration register | | |
| Type | RW | | |

Multichannel Buffered Serial Port (McBSP)

www.ti.com

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----------|----|-----------|----|-----------|---|-----------|---|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLOCKACTIVITY | | RESERVED | | SIDLEMODE | | ENAWAKEUP | | SOFTRESET | | RESERVED | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|----------|
| 31:10 | RESERVED | Reserved | R | 0x000000 |
| 9:8 | CLOCKACTIVITY | 0x0: The MCBSPi_ICLK clock can be switched off. The PRCM functional clock can be switched off. 0x1: The MCBSPi_ICLK clock must be maintained during wakeup. The PRCM functional clock can be switched off. 0x2: The MCBSPi_ICLK clock can be switched off. The PRCM functional clock must be maintained during wakeup. 0x3: The MCBSPi_ICLK clock must be maintained during wakeup. The PRCM functional clock must be maintained during wakeup | RW | 0x0 |
| 7:5 | RESERVED | Reserved | R | 0x0 |
| 4:3 | SIDLEMODE | Slave interface power management, req/ack control: 0x0: Force-idle. An idle request is acknowledged unconditionally. 0x1: No-idle. An idle request is never acknowledged. 0x2: Smart-idle. Acknowledgement to an idle request is given based on the internal activity of the module 0x3: Reserved | RW | 0x0 |
| 2 | ENAWAKEUP | WakeUp feature control: 0x0: WakeUp is disabled 0x1: WakeUp capability is enabled | RW | 0 |
| 1 | SOFTRESET | McBSP global software reset 0x0: NO soft reset 0x1: Soft reset triggered | RW | 0 |
| 0 | RESERVED | Reserved | R | 0 |

Table 24-435. Register Call Summary for Register MCBSPPLP_SYSCONFIG_REG

Multichannel Buffered Serial Port (McBSP)

- [McBSP Software Reset: \[0\]](#)
- [McBSP Acknowledgment Modes: \[1\] \[2\] \[3\] \[4\]](#)
- [Wake-Up Capability: \[5\]](#)
- [Analysis of the Receiver Smart-Idle Behavior: \[6\]](#)
- [McBSP Initialization Procedure: \[7\]](#)
- [MCBSP Register Summary: \[8\] \[9\] \[10\] \[11\]](#)

Table 24-436. MCBSP_LP_THRSH2_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0090 | | |
| Physical Address | 0x4902 2090 0x4012 2090 0x2 2090 0x4902 4090 0x4012 4090 0x2 4090 0x4902 6090 0x4012 6090 0x2 6090 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSPLP transmit buffer threshold (DMA or IRQ trigger) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XTHRESHOLD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:7 | RESERVED | Reserved | R | 0x00000000 |
| 6:0 | XTHRESHOLD | Transmit buffer threshold value. The DMA request (if enabled) of interrupt assertion (if enabled) will be triggered if the number of free locations inside transmit buffer are above or equal to the XTHRESHOLD value + 1. Also, this value (XTHRESHOLD value + 1) indicates the number of words transferred during a transmit data DMA request, if transmit DMA is enabled | RW | 0x00 |

Table 24-437. Register Call Summary for Register MCBSP_LP_THRSH2_REG

Multichannel Buffered Serial Port (McBSP)

- [Wake-Up Capability: \[0\]](#)
- [McBSP Transmission: \[1\]](#)
- [McBSP DMA Configuration: \[2\]](#)
- [McBSP Initialization Procedure: \[3\]](#)
- [Data Transfer DMA Request Configuration: \[4\]](#)
- [Programming the McBSP Registers for the Desired Transmitter Operation \(Step 2\): \[5\]](#)
- [MCBSP Register Summary: \[6\] \[7\] \[8\] \[9\]](#)

Table 24-438. MCBSP_LP_THRSH1_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0094 | | |
| Physical Address | 0x4902 2094 0x4012 2094 0x2 2094 0x4902 4094 0x4012 4094 0x2 4094 0x4902 6094 0x4012 6094 0x2 6094 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSPLP receive buffer threshold (DMA or IRQ trigger) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RTHRESHOLD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:7 | RESERVED | Reserved | R | 0x00000000 |
| 6:0 | RTHRESHOLD | Receive buffer threshold value. The DMA request (if enabled) of interrupt assertion (if enabled) will be triggered if the number of occupied locations inside receive buffer are above or equal to the RTHRESHOLD value + 1. Also, this value (RTHRESHOLD value + 1) indicates the number of words transferred during a receive data DMA request, if receive DMA is enabled. | RW | 0x00 |

Table 24-439. Register Call Summary for Register MCBSPPL_THRSH1_REG

Multichannel Buffered Serial Port (McBSP)

- [Wake-Up Capability: \[0\]](#)
- [McBSP Reception: \[1\]](#)
- [McBSP DMA Configuration: \[2\]](#)
- [Data Transfer DMA Request Configuration: \[3\]](#)
- [Programming the McBSP Registers for the Desired Receiver Configuration \(Step 2\): \[4\]](#)
- [MCBSP Register Summary: \[5\] \[6\] \[7\] \[8\]](#)

Table 24-440. MCBSPPL_IRQSTATUS_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 00A0 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Physical Address | 0x4902 20A0 0x4012 20A0 0x2 20A0 0x4902 40A0 0x4012 40A0 0x2 40A0 0x4902 60A0 0x4012 60A0 0x2 60A0 | | |
| Description | McBSPPL Interrupt Status register (interconnect compliant IRQ line) | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----------|-----------|------------|------|------|------|----------|----------|-----------|------------|------|------|------|----------|---|
| RESERVED | | | | | | | | | | | | | | | | XEMPTYEOF | RESERVED | XOVFLSTAT | XUNDFLSTAT | XRDY | XEOF | XFSX | XSYNCERR | RESERVED | ROVFLSTAT | RUNDFLSTAT | RRDY | REOF | RFSR | RSYNCERR | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|----------|
| 31:15 | RESERVED | Reserved | R | 0x000000 |
| 14 | XEMPTYEOF | Transmit Buffer Empty at end of frame (XEMPTYEOF is set to 1 when a complete frame was transmitted and the transmit buffer is empty). 0x0: XEMPTYEOF is NOT set to when a complete frame was transmitted and the transmit buffer is empty 0x1: XEMPTYEOF is set to 1 when a complete frame was transmitted and the transmit buffer is empty. Writing 1 to this bit clears the bit. | RW | 0 |
| 13 | RESERVED | Reserved | R | 0 |
| 12 | XOVFLSTAT | Transmit Buffer Overflow (XOVFLSTAT bit is set to 1 when transmit buffer overflow; the data which is written while overflow condition is discarded). Writing 1 to this bit clears the bit. 0x0: Transmit buffer NOT overflow 0x1: Transmit buffer overflow; Writing 1 to this bit clears the bit. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 11 | XUNDFLSTAT | <p>Transmit Buffer Underflow (XUNDFLSTAT bit is set to 1 when the transmit data buffer is empty new data is required to be transmitted). Writing 1 to this bit clears the bit.</p> <p>0x0: the transmit data buffer is NOT empty new data is required to be transmitted.</p> <p>0x1: the transmit data buffer is empty new data is required to be transmitted. Writing 1 to this bit clears the bit.</p> | RW | 0 |
| 10 | XRDY | <p>Transmit Buffer Threshold Reached (XRDY bit is set to 1 when the transmit buffer free locations are equal or above the THRSH2_REG value). Writing 1 to this bit clears the bit.</p> <p>0x0: Transmit buffer occupied locations are below the THRSH2_REG value).</p> <p>0x1: Transmit buffer occupied locations are equal or above the THRSH2_REG value). Writing 1 to this bit clears the bit.</p> | RW | 0 |
| 9 | XEOF | <p>Transmit End Of Frame (XEOF is set to 1 when a complete frame was transmitted). Writing 1 to this bit clears the bit.</p> <p>0x0: complete frame was NOT transmitted</p> <p>0x1: complete frame was transmitted; Writing 1 to this bit clears the bit.</p> | RW | 0 |
| 8 | XFSX | <p>Transmit Frame Synchronization (XFSX bit is set to 1 when a new transmit frame synchronization is asserted). Writing 1 to this bit clears the bit.</p> <p>0x0: new transmit frame synchronization is NOT asserted</p> <p>0x1: new transmit frame synchronization is asserted; Writing 1 to this bit clears the bit.</p> | RW | 0 |
| 7 | XSYNCERR | <p>Transmit Frame Synchronization Error (XSYNCERR is set to 1 when a transmit frame-sync error is detected). Writing 1 to this bit clears the bit.</p> <p>0x0: Transmit frame-sync error is NOT detected</p> <p>0x1: Transmit frame-sync error is detected. Writing 1 to this bit clears the bit.</p> | RW | 0 |
| 6 | RESERVED | Reserved | R | 0 |
| 5 | ROVFLSTAT | <p>Receive Buffer Overflow (ROVFLSTAT bit is set to 1 when receive buffer overflow; the data which is written while overflow condition is discarded). Writing 1 to this bit clears the bit.</p> <p>0x0: receive buffer NOT overflow</p> <p>0x1: receive buffer overflow; Writing 1 to this bit clears the bit.</p> | RW | 0 |
| 4 | RUNDFLSTAT | <p>Receive Buffer Underflow (RUNDFLSTAT bit is set to 1 when read operation is performed to the receive data register while receive buffer is empty; data read while underflow condition is undefined). Writing 1 to this bit clears the bit.</p> <p>0x0: read operation is performed to the receive data register while receive buffer is NOT empty</p> <p>0x1: read operation is performed to the receive data register while receive buffer is empty; Writing 1 to this bit clears the bit.</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 3 | RRDY | Receive Buffer Threshold Reached (RRDY bit is set to 1 when the receive buffer occupied locations are equal or above the THRSH1_REG value). Writing 1 to this bit clears the bit. 0x0: receive buffer occupied locations are below the THRSH1_REG value). 0x1: receive buffer occupied locations are equal or above the THRSH1_REG value). Writing 1 to this bit clears the bit. | RW | 0 |
| 2 | REOF | Receive End Of Frame (REOF is set to 1 when a complete frame was received). Writing 1 to this bit clears the bit. 0x0: complete frame was NOT received 0x1: complete frame was received; Writing 1 to this bit clears the bit. | RW | 0 |
| 1 | RFSR | Receive Frame Synchronization (RFSR bit is set to 1 when a new receive frame synchronization is asserted). Writing 1 to this bit clears the bit. 0x0: new receive frame synchronization is NOT asserted 0x1: new receive frame synchronization is asserted; Writing 1 to this bit clears the bit. | RW | 0 |
| 0 | RSYNCERR | Receive Frame Synchronization Error (RSYNCERR is set to 1 when a receive frame-sync error is detected). Writing 1 to this bit clears the bit. 0x0: Receive frame-synchronization error is NOT detected 0x1: Receive frame-synchronization error is detected. Writing 1 to this bit clears the bit. | RW | 0 |

Table 24-441. Register Call Summary for Register MCBSP_LP_IRQSTATUS_REG

Multichannel Buffered Serial Port (McBSP)

- [Wake-Up Capability: \[0\] \[1\] \[2\] \[3\]](#)
- [McBSP Interrupt Requests: \[4\] \[5\]](#)
- [Enable/Disable the Transmit and Receive Processes: \[6\] \[7\] \[8\] \[9\]](#)
- [Introduction: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [Overrun in the Receiver: \[17\] \[18\] \[19\]](#)
- [Unexpected Receive Frame-Sync Pulse: \[20\] \[21\]](#)
- [Underflow in the Receiver: \[22\] \[23\]](#)
- [Underflow in the Transmitter: \[24\] \[25\] \[26\]](#)
- [Unexpected Transmit Frame-Sync Pulse: \[27\]](#)
- [Overflow in the Transmitter: \[28\]](#)
- [MCBSP Register Summary: \[29\] \[30\] \[31\] \[32\]](#)

Table 24-442. MCBSP1_IRQENABLE_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 00A4 | | |
| Physical Address | 0x4902 20A4 0x4012 20A4 0x2 20A4 0x4902 40A4 0x4012 40A4 0x2 40A4 0x4902 60A4 0x4012 60A4 0x2 60A4 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSP1 Interrupt Enable register (interconnect compliant IRQ line) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----------|---------|----------|--------|--------|--------|------------|----------|---------|----------|--------|--------|--------|------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XEMPTYEOFEN | RESERVED | XOVFLEN | XUNDFLEN | XRDYEN | XEOFEN | XFSXEN | XSYNCERREN | RESERVED | XOVFLEN | XUNDFLEN | XRDYEN | XEOFEN | XFSXEN | XSYNCERREN | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|---------|
| 31:15 | RESERVED | Reserved | R | 0x00000 |
| 14 | XEMPTYEOFEN | Transmit buffer empty at end of frame enable bit. 0x0: Transmit Buffer Empty at End Of Frame NOT enabled 0x1: Transmit Buffer Empty at End Of Frame enabled | RW | 0 |
| 13 | RESERVED | Reserved | R | 0 |
| 12 | XOVFLEN | Transmit Buffer Overflow enable bit. 0x0: Transmit Buffer Overflow NOT enabled 0x1: Transmit Buffer Overflow enabled | RW | 0 |
| 11 | XUNDFLEN | Transmit Buffer Underflow enable bit. 0x0: Transmit Buffer Underflow NOT enabled 0x1: Transmit Buffer Underflow enabled | RW | 0 |
| 10 | XRDYEN | Transmit Buffer Threshold Reached enable bit. 0x0: Transmit Buffer Threshold Reached NOT enabled 0x1: Transmit Buffer Threshold Reached enabled | RW | 0 |
| 9 | XEOFEN | Transmit End Of Frame enable bit. 0x0: Transmit End Of Frame NOT enabled 0x1: Transmit End Of Frame enabled | RW | 0 |
| 8 | XFSXEN | Transmit Frame Synchronization enable bit. 0x0: Transmit Frame Synchronization NOT enabled 0x1: Transmit Frame Synchronization enabled | RW | 0 |
| 7 | XSYNCERREN | Transmit Frame Synchronization Error enable bit. 0x0: Transmit Frame Synchronization Error NOT enabled 0x1: Transmit Frame Synchronization Error enabled | RW | 0 |
| 6 | RESERVED | Reserved | R | 0 |
| 5 | XOVFLEN | Receive Buffer Overflow enable bit. 0x0: Receive Buffer Overflow NOT enabled 0x1: Receive Buffer Overflow enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 4 | RUNDLEN | Receive Buffer Underflow enable bit. 0x0: Receive Buffer Underflow NOT enabled 0x1: Receive Buffer Underflow enabled | RW | 0 |
| 3 | RRDYEN | Receive Buffer Threshold enable bit. 0x0: Receive Buffer Threshold NOT enabled 0x1: Receive Buffer Threshold enabled | RW | 0 |
| 2 | REOFEN | Receive End Of Frame enable bit. 0x0: Receive End Of Frame NOT enabled 0x1: Receive End Of Frame enabled | RW | 0 |
| 1 | RFSREN | Receive Frame Synchronization enable bit. RW 0x0: Receive Frame Synchronization NOT enabled 0x1: Receive Frame Synchronization enabled | RW | 0 |
| 0 | RSYNCRREN | Receive Frame Synchronization Error enable bit. 0x0: Receive Frame Synchronization Error NOT enabled 0x1: Receive Frame Synchronization Error enabled | RW | 0 |

Table 24-443. Register Call Summary for Register MCBSP_LP_IRQENABLE_REG

Multichannel Buffered Serial Port (McBSP)

- Wake-Up Capability: [0] [1] [2] [3] [4] [5] [6] [7] [8]
- McBSP Interrupt Requests: [9]
- Overrun in the Receiver: [10]
- Unexpected Receive Frame-Sync Pulse: [11]
- Underflow in the Receiver: [12]
- Underflow in the Transmitter: [13]
- Unexpected Transmit Frame-Sync Pulse: [14]
- Overflow in the Transmitter: [15]
- Interrupt Configuration: [16]
- Programming the McBSP Registers for the Desired Transmitter Operation (Step 2): [17]
- McBSP Register Summary: [18] [19] [20] [21]

Table 24-444. MCBSP_LP_WAKEUPEN_REG

| | | | |
|------------------|--------------------------------|----------|------------------|
| Address Offset | 0x0000 00A8 | Instance | MCBSP1_L3 |
| Physical Address | 0x4902 20A8 | | MCBSP1_CORTEX-A9 |
| | 0x4012 20A8 | | MCBSP1_DSP |
| | 0x2 20A8 | | MCBSP2_L3 |
| | 0x4902 40A8 | | MCBSP2_CORTEX-A9 |
| | 0x4012 40A8 | | MCBSP2_DSP |
| | 0x2 40A8 | | MCBSP3_L3 |
| | 0x4902 60A8 | | MCBSP3_CORTEX-A9 |
| | 0x4012 60A8 | | MCBSP3_DSP |
| | 0x2 60A8 | | |
| Description | McBSPLP Wakeup Enable register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----------|----|----|----|--------|--------|--------|-----------|----------|---|---|---|--------|--------|--------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | XEMPTYEOFEN | RESERVED | | | | XRDYEN | XEOFEN | XFSXEN | XSYNCRREN | RESERVED | | | | RRDYEN | REOFEN | RFSREN | RSYNCRREN |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|---------|
| 31:15 | RESERVED | Reserved | R | 0x00000 |
| 14 | XEMPTYEOFEN | Transmit Buffer Empty at End Of Frame enable bit. 0x0: Transmit Buffer Empty at End Of Frame WK enable is NOT active 0x1: Transmit Buffer Empty at End Of Frame WK enable is active | RW | 0 |
| 13:11 | RESERVED | Reserved | R | 0x0 |
| 10 | XRDYEN | Transmit Buffer Threshold Reached WK enable bit. 0x0: Transmit Buffer Threshold WK enable is NOT active 0x1: Transmit Buffer Threshold WK enable is active | RW | 0 |
| 9 | XEOFEN | Transmit End Of Frame WK enable bit. 0x0: Transmit End Of Frame WK enable is NOT active 0x1: Transmit End Of Frame WK enable is active | RW | 0 |
| 8 | XFSXEN | Transmit Frame Synchronization WK enable bit. 0x0: Transmit Frame Synchronization WK enable is NOT active 0x1: Transmit Frame Synchronization WK enable is active | RW | 0 |
| 7 | XSYNCERREN | Transmit Frame Synchronization Error WK enable bit. 0x0: Transmit Frame Synchronization Error WK enable is NOT active 0x1: Transmit Frame Synchronization Error WK enable is active | RW | 0 |
| 6:4 | RESERVED | Reserved | R | 0x0 |
| 3 | RRDYEN | Receive Buffer Threshold wakeup enable bit. 0x0: Receive Buffer Threshold WK enable is NOT active 0x1: Receive Buffer Threshold WK enable is active | RW | 0 |
| 2 | REOFEN | Receive End Of Frame WK enable bit. 0x0: Receive End Of Frame WK enable is NOT active 0x1: Receive End Of Frame WK enable is active | RW | 0 |
| 1 | RFSREN | Receive Frame Synchronization WK enable bit. 0x0: Receive Frame Synchronization WK enable is NOT active 0x1: Receive Frame Synchronization WK enable is active | RW | 0 |
| 0 | RSYNCERREN | Receive Frame Synchronization Error WK enable bit. 0x0: Receive Frame Synchronization Error WK enable is NOT active 0x1: Receive Frame Synchronization Error WK enable is active | RW | 0 |

Table 24-445. Register Call Summary for Register MCBSP_LP_WAKEUPEN_REG

Multichannel Buffered Serial Port (McBSP)

- [Wake-Up Capability: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [MCBSP Register Summary: \[10\] \[11\] \[12\] \[13\]](#)

Table 24-446. MCBSP_LP_XCCR_REG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00AC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4902 20AC 0x4012 20AC 0x2 20AC 0x4902 40AC 0x4012 40AC 0x2 40AC 0x4902 60AC 0x4012 60AC 0x2 60AC | | | | | | | | | | | | | | | | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP | | | | | | | | | | | | | | | |
| Description | McBSPLP transmit configuration control register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|-----------|---------|-------------|----------|----|---|---|-----|----------|--------|----------|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | EXTCLKGATE | PPCONNECT | DXENDLY | XFULL_CYCLE | RESERVED | | | | DLB | RESERVED | XDMAEN | RESERVED | XDISABLE | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15 | EXTCLKGATE | External clock gating enable (CLKX and FSX master only). When this bit is set and the transmit clock and FSX are set as output, the CLKX is enabled when FSX is active plus 3 clock cycles after (clock is provided for FWID + 4 clock cycles, assuming that the FSX width, active, is FWID + 1 clock cycles); outside this window the external transmit clock is gated. The receive use the same gated transmit clock and transmit frame synchronization signals regardless of the CLKRM/FSRM settings. When using this mode the frame synchronization signal must be active during reception of the entire frame (FWID must be programmed accordingly) to ensure the proper receive process, which requires at least 3 cycles after the frame complete to transfer the data into the receive buffer. 0x0: External clock gating disabled. 0x1: External clock gating enable. | RW | 0 |
| 14 | PPCONNECT | Pair to pair connection. When set the DXENO pin is always set to 0 regardless of the frame boundary, setting the tree state buffer as output 0x0: Pair to pair connection. When set the DXENO pin is always set to 0 regardless of the frame boundary, setting the tree state buffer as output 0x1: Pair to pair connection. When set the DXENO pin is always set to 0 regardless of the frame boundary, setting the tree state buffer as output | RW | 0 |
| 13:12 | DXENDLY | When DXENA bit in SPCR1 is set to 1 this field selects the added delay as follow: 0x0: 80 ps 0x1: 160 ps (default) 0x2: 240 ps 0x3: 320 ps | RW | 0x1 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 11 | XFULL_CYCLE | Transmit full-cycle mode select. 0x0: McBSP operates in transmit half-cycle mode (transmit frame synchronization is sampled by the opposite edge of the clock used to drive transmit data). 0x1: McBSP operates in transmit full-cycle mode (transmit frame synchronization is sampled by the same edge of the clock used to drive transmit data). | RW | 0 |
| 10:6 | RESERVED | Reserved | R | 0x00 |
| 5 | DLB | Digital Loop-Back 0x0: No DLB 0x1: DLB | RW | 0 |
| 4 | RESERVED | Reserved | R | 0 |
| 3 | XDMAEN | Transmit DMA Enable bit. When set to 0 this bit will gate the external transmit DMA request, without resetting the DMA state machine. It is recommended to change this bit value only during transmit reset. 0x0: When set to 0 this bit will gate the external transmit DMA request, 0x1: When set to 1 this bit will NOT gate the external transmit DMA request, | RW | 1 |
| 2:1 | RESERVED | Reserved | R | 0 |
| 0 | XDISABLE | Transmit Disable bit. When this bit is set the transmit process will stop at the next frame boundary. 0x0: The transmit process will NOT stop at the next frame boundary. 0x1: The transmit process will stop at the next frame boundary. | RW | 0 |

Table 24-447. Register Call Summary for Register MCBSP_XCCR_REG

Multichannel Buffered Serial Port (McBSP)

- [McBSP DMA Requests: \[0\]](#)
- [Clocking and Framing Data: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [Enable/Disable the Transmit and Receive Processes: \[19\] \[20\] \[21\]](#)
- [MCBSP Data Transfer Mode: \[22\] \[23\]](#)
- [Clock Generation in the SRG: \[24\]](#)
- [McBSP DMA Configuration: \[25\]](#)
- [McBSP Basic Programming Model: \[26\]](#)
- [McBSP Initialization Procedure: \[27\]](#)
- [Programming the McBSP Registers for the Desired Receiver Configuration \(Step 2\): \[28\]](#)
- [Programming the McBSP Registers for the Desired Transmitter Operation \(Step 2\): \[29\] \[30\] \[31\]](#)
- [MCBSP Register Summary: \[32\] \[33\] \[34\] \[35\]](#)

Table 24-448. MCBSP1P_RCCR_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 00B0 | | |
| Physical Address | 0x4902 20B0 0x4012 20B0 0x2 20B0 0x4902 40B0 0x4012 40B0 0x2 40B0 0x4902 60B0 0x4012 60B0 0x2 60B0 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Description | McBSPLP receive configuration control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----------|----|----|----|----|---|--------|----------|---|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RFULL_CYCLE | RESERVED | | | | | | RDMAEN | RESERVED | | RDISABLE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|---------|
| 31:12 | RESERVED | Reserved | R | 0x00000 |
| 11 | RFULL_CYCLE | Receive full-cycle mode select. 0x0: McBSPLP operates in receive half-cycle mode (receive frame synchronization is sampled by the opposite edge of the clock used to sample receive data). 0x1: McBSPLP operates in receive full-cycle mode (receive frame synchronization is sampled by the same edge of the clock used to sample receive data). | RW | 1 |
| 10:4 | RESERVED | Reserved | R | 0x00 |
| 3 | RDMAEN | Receive DMA Enable bit. When set to 0 this bit will gate the external transmit DMA request, without resetting the DMA state machine. It is recommended to change this bit value only during receive reset. 0x0: When set to 0 this bit will gate the external transmit DMA request 0x1: When set to 1 this bit will NOT gate the external transmit DMA request | RW | 1 |
| 2:1 | RESERVED | Reserved | R | 0 |
| 0 | RDISABLE | Receive Disable bit. When this bit is set the receive process will stop at the next frame boundary. 0x0: the receive process will NOT stop at the next frame boundary. 0x1: When this bit is set the receive process will stop at the next frame boundary. | RW | 0 |

Table 24-449. Register Call Summary for Register MCBSP1P_RCCR_REG

Multichannel Buffered Serial Port (McBSP)

- [McBSP DMA Requests: \[0\]](#)
- [Enable/Disable the Transmit and Receive Processes: \[1\] \[2\]](#)
- [MCBSP Data Transfer Mode: \[3\] \[4\]](#)
- [McBSP DMA Configuration: \[5\]](#)
- [McBSP Basic Programming Model: \[6\]](#)
- [MCBSP Register Summary: \[7\] \[8\] \[9\] \[10\]](#)

Table 24-450. MCBSP_L3_XBUFFSTAT_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 00B4 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Physical Address | 0x4902 20B4 0x4012 20B4 0x2 20B4 0x4902 40B4 0x4012 40B4 0x2 40B4 0x4902 60B4 0x4012 60B4 0x2 60B4 | | |
| Description | McBSPLP transmit buffer status | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XBUFFSTAT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31:8 | RESERVED | Reserved | R | 0x0 |
| 7:0 | XBUFFSTAT | Transmit Buffer Status (indicates the number of free locations inside transmit buffer). The XBUFFSTAT value reflects the buffer status on the interface clock domain and it can be smaller than the number of free locations which are seen by the transmit state machine. | R | 0x80 |

Table 24-451. Register Call Summary for Register MCBSP_L3_XBUFFSTAT_REG

Multichannel Buffered Serial Port (McBSP)

- [Enable/Disable the Transmit and Receive Processes: \[0\]](#)
- [McBSP DMA Configuration: \[1\]](#)
- [MCBSP Register Summary: \[2\] \[3\] \[4\] \[5\]](#)

Table 24-452. MCBSP_L3_RBUFFSTAT_REG

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 00B8 | Instance | MCBSP1_L3 MCBSP1_CORTEX-A9 MCBSP1_DSP MCBSP2_L3 MCBSP2_CORTEX-A9 MCBSP2_DSP MCBSP3_L3 MCBSP3_CORTEX-A9 MCBSP3_DSP |
| Physical Address | 0x4902 20B8 0x4012 20B8 0x2 20B8 0x4902 40B8 0x4012 40B8 0x2 40B8 0x4902 60B8 0x4012 60B8 0x2 60B8 | | |
| Description | McBSPLP receive buffer status | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RBUFFSTAT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 31:8 | RESERVED | Reserved | R | 0x0 |
| 7:0 | RBUFFSTAT | Receive Buffer Status (indicates the number of occupied locations inside receive buffer). The RBUFFSTAT value reflects the buffer status on the interface clock domain and it can be smaller than the real number of the occupied locations which are seen by the receive state machine. | R | 0x00 |

Table 24-453. Register Call Summary for Register MCBSP_LP_RBUFFSTAT_REG

Multichannel Buffered Serial Port (McBSP)

- [Enable/Disable the Transmit and Receive Processes: \[0\]](#)
 - [McBSP DMA Configuration: \[1\]](#)
 - [MCBSP Register Summary: \[2\] \[3\] \[4\] \[5\]](#)
-

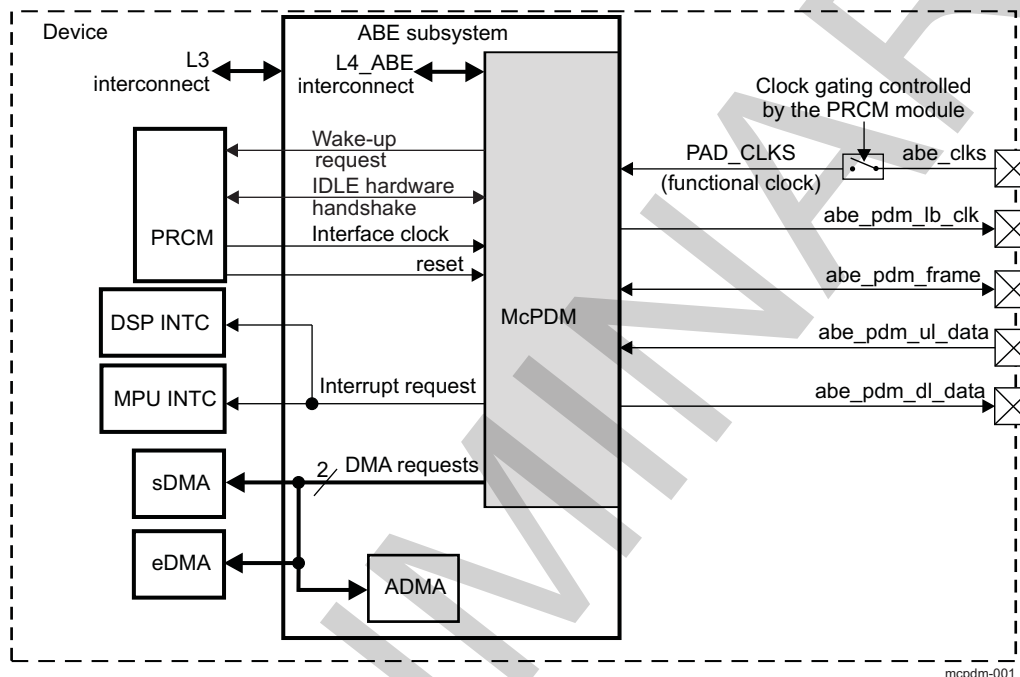
24.6 Multichannel PDM Controller

24.6.1 McPDM Overview

The multichannel pulse density modulation (McPDM) module consists in a proprietary audio module dedicated to mobile phone terminals. It is composed of audio uplink and downlink paths communicating with an external audio companion chip through a dedicated interface.

Figure 24-161 is an overview of the McPDM module.

Figure 24-161. McPDM Overview



The McPDM module can support the following features:

- Full-duplex communication:
 - Five audio downlink channels with up to 3.84 Mbps each
 - Three audio uplink channels with up to 3.84 Mbps each
 - One command channel with up to 3.84 Mbps
 - One status channel with up to 3.84 Mbps
- Uplink and downlink FIFO operations:
 - 16 × 96-bit words for FIFO uplink, where a 96-bit word contains three 24-bit words for the audio uplink channels (one 24-bit word per audio uplink channel) and one 16-bit word for status information
 - 16 × 144-bit words for FIFO downlink, where a 144-bit word contains five 24-bit words for the audio downlink channels (one 24-bit word per audio downlink channel) and one 16-bit word for the command data.
- Interrupt request to MPU and DSP subsystems
- DMA requests with programmable FIFO thresholds:
 - One DMA request for downlink path
 - One DMA request for uplink path
- Upsampling and pulse-density modulators for each audio downlink channel (five channels)
- Offset cancellation feature for audio downlink channels 1 and 2
- Decimation filter and downsampling for each audio uplink channel (three channels)

- IDLE state hardware handshake
- Wake-up request

24.6.2 McPDM Environment

This section describes the McPDM application fields from an environment point of view (external connections). It describes McPDM connectivity options, lists all possible interfaces, and describes the protocol and data format used in each case.

24.6.2.1 McPDM Modes

Table 24-454 describes the modes and application fields of the McPDM module.

Table 24-454. Modes

| Mode | Description |
|--------------|---|
| Normal mode | Up to five audio channels are transmitted to, and up to three audio channels are received from, the audio companion chip. |
| Command mode | In addition to the audio channels, commands are transmitted to the audio companion chip. |
| Status mode | In addition to the audio channels, status information is received from the audio companion chip. |

24.6.2.2 McPDM Signals

Table 24-455 describes the McPDM module signals and specifies their links to modes.

Table 24-455. I/O

| Signal | I/O (1) | Description | Reset Value | Normal Mode | Command Mode | Status Mode |
|-----------------|------------|---|----------------|----------------|-----------------|----------------|
| abe_clks | I | Clock received from the audio companion chip. The clock frequency is: <ul style="list-style-type: none"> • 17.64 MHz for a sampling frequency of 88.2/176.4 kHz • 19.2 MHz for a sampling frequency of 96/192 kHz | 0 | x | x | x |
| abe_pdm_lb_clk | O | Clock loopback to the audio companion chip from the abe_clks clock signal. The frequency is the same as abe_clks frequency. (2) | 0 | x | x | x |
| abe_pdm_frame | I/O | Frame synchronization and command/status data | Z | x | x | x |
| abe_pdm_ul_data | I | Audio uplink path data | Z | x | x | x |
| abe_pdm_dl_data | O | Audio downlink path data | 0 | x | x | x |

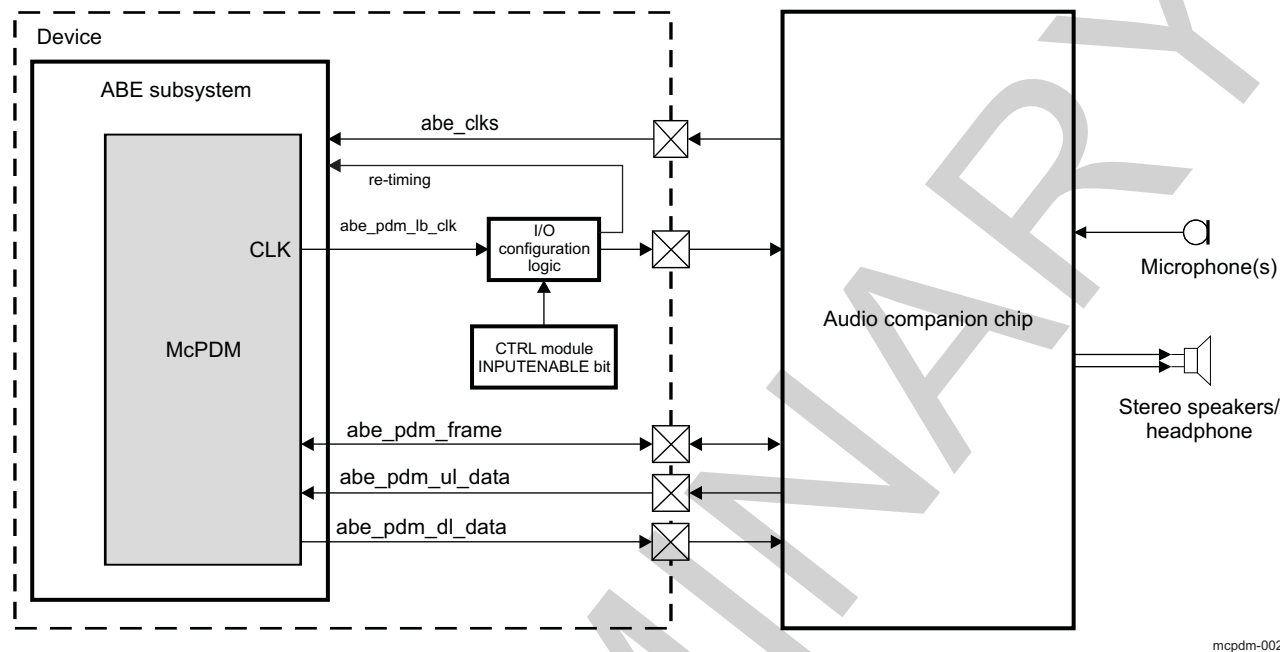
(1) I = Input; O = Output; I/O = Bidirectional

(2) This output signal is also used as retiming input (the INPUTENABLE bit in the corresponding pad configuration register must be set to 1).

24.6.2.3 McPDM Configurations

Figure 24-162 shows the McPDM generic configuration.

Figure 24-162. McPDM Generic Configuration

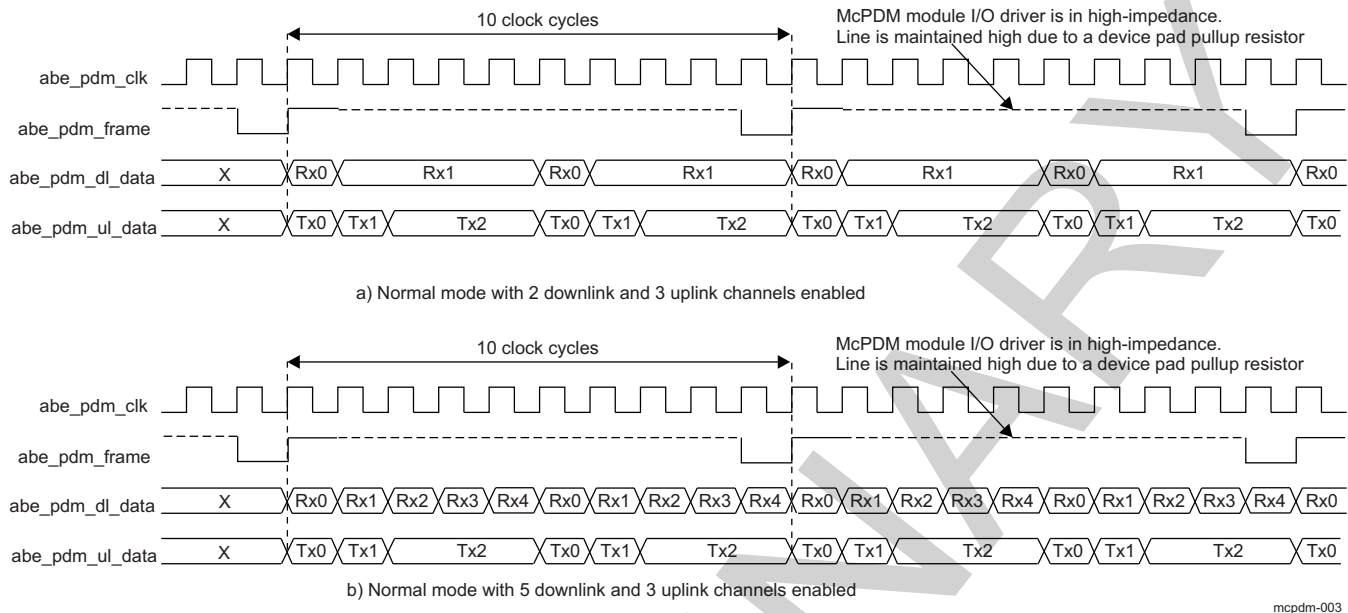


24.6.2.4 Protocols and Data Formats

24.6.2.4.1 Protocols and Data Formats in Normal Mode

This section describes data transfer on the interface in normal mode. In this mode, the `abe_pdm_frame` signal is used only for frame synchronization purposes. Figure 24-163 shows the protocols and data formats in normal mode for two examples:

- (a) With two downlink and three uplink channels enabled
- (b) With five downlink and three uplink channels enabled

Figure 24-163. Protocols and Data Formats in Normal Mode

In normal mode, the frequency ratio between the `abe_pdm_frame` and `abe_pdm_lb_clk` signals is 10. This ratio is static and the `abe_pdm_frame` signal low-pulse width is one clock period longer than the `abe_pdm_lb_clk` signal.

The `abe_pdm_frame` signal is driven by the McPDM module in the device to the external audio companion chip. The McPDM module drives the `abe_pdm_frame` signal low during one clock period of the `abe_pdm_lb_clk` signal, then it drives it high during one clock period of the `abe_pdm_lb_clk` signal before releasing the `abe_pdm_frame` I/O driver in high-impedance state. The McPDM module pad internal pullup resistor allows keeping a high-level state on the `abe_pdm_frame` line when the `abe_pdm_frame` I/O driver is in high-impedance state.

A maximum of two samples × five downlink channels (10 samples) can be transmitted by the McPDM module to the external audio companion chip during a frame period.

A maximum of two samples × three uplink channels (six samples) can be received by the McPDM module from the external audio companion chip during a frame period.

Each downlink and uplink channel can be independently enabled or disabled by setting to 1 or clearing to 0 the corresponding bit in the `MCPDM_CTRL` register.

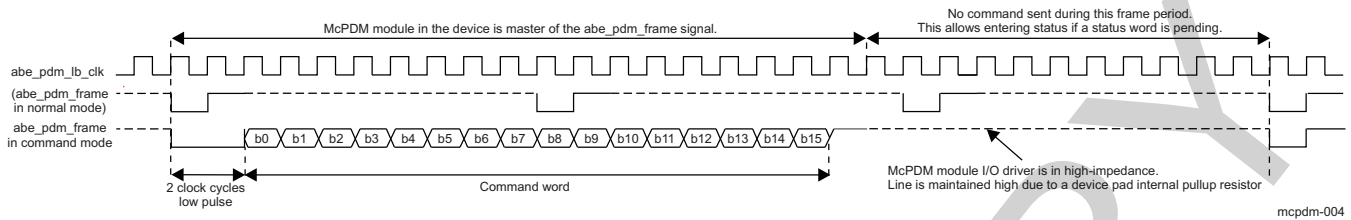
24.6.2.4.2 Protocols and Data Formats in Command Mode

This section describes data transfer on the interface in command mode. In this mode, the `abe_pdm_frame` signal is used to transmit command words to the external audio companion chip. It allows configuring audio registers in the external audio companion chip (that is, amplifier gains) without using the legacy I²C interface, which may be busy and add latency to gain correction.

NOTE: In command mode, uplink channel samples are transmitted to and downlink channel samples are received from the external audio companion chip as in normal mode.

Figure 24-164 shows the protocols and data formats in command mode.

Figure 24-164. Protocols and Data Formats in Command Mode



24.6.2.4.2.1 Entering Command Mode

Command mode can be entered when command data are pending and no status mode is ongoing or detected.

If both of these conditions are met and the `MCPDM_CTRL[9]` `CMD_INT` bit is set to 1, the McPDM module automatically enters command mode.

To enter command mode, the McPDM module must drive the `abe_pdm_frame` signal low during two periods of the `abe_pdm_lb_clk` clock signal.

The external audio companion chip detects a command mode request from the McPDM module when a low state is detected during two periods of the `abe_pdm_lb_clk` clock signal. Once a command mode request is detected, the external audio companion chip enters command mode. In this mode, the status mode cannot be entered during at least four frame cycles.

If a status mode is detected or ongoing while a command is ready to be sent, the command data are stored in an internal register.

If one or more command data are written before the previous one is sent, the previous one is overwritten with the new one and only the last stored 16-bit command data are sent.

If new command data are available while the system is already in command mode, the current command completes normally and exits before re-entering command mode and transmitting the new command data a frame period later.

24.6.2.4.2.2 Command Data Transmission

The 16-bit command data are transmitted directly after the `abe_pdm_frame` signal is driven low during two periods of the `abe_pdm_lb_clk` clock signal.

When the `MCPDM_CTRL[9]` `CMD_INT` bit is set to 1, 16-bit command data must be written to the `MCPDM_DN_DATA` register. Only the 16 lower bits are significant. When no command must be transmitted on the `abe_pdm_frame` line, a null word (0x00000000) must be written as the command data.

When the `MCPDM_CTRL[9]` `CMD_INT` bit is cleared to 0, no 16-bit command data has to be written to the `MCPDM_DN_DATA` register.

24.6.2.4.2.3 Exiting Command Mode

After the 16-bit command data is sent, the McPDM module drives the `abe_pdm_frame` signal high during one period of the `abe_pdm_lb_clk` clock signal before releasing the `abe_pdm_frame` I/O driver in high-impedance state. The McPDM module pad internal pullup resistor allows keeping a high-level state on the `abe_pdm_frame` line when the `abe_pdm_frame` I/O driver is in high-impedance state.

The McPDM module exits automatically from command mode one period of the `abe_pdm_lb_clk` clock signal after the last bit of the command data has been transmitted on the `abe_pdm_frame` line.

NOTE: Due to this protocol mechanism, frame synchronization is lost (replaced by the ninth bit of the command data) during one frame period. The external audio companion chip must internally emulate a frame synchronization to send uplink channel samples and received downlink channel samples as in normal mode while receiving command data on the `abe_pdm_frame` line.

24.6.2.4.2.4 Multiple Command Data Access

As shown in [Figure 24-164](#), two consecutive command data can be sent every three frames. If no status mode is entered after a command data has been sent, the next command data is sent three frames after starting to send the current command data.

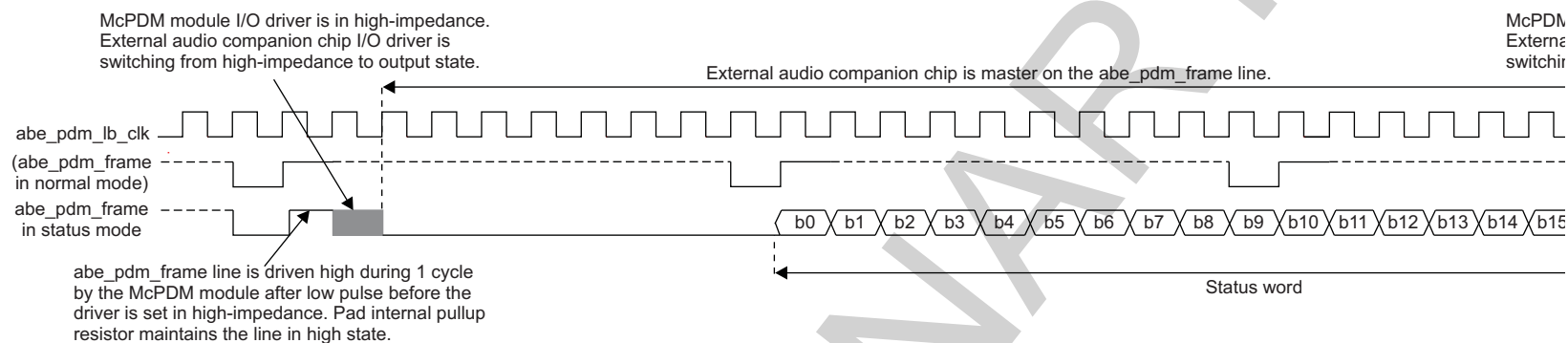
24.6.2.4.3 Protocols and Data Formats in Status Mode

This section describes data transfer on the interface in status mode. In this mode, the `abe_pdm_frame` signal is used to receive status information from the external audio companion chip.

NOTE: In status mode, uplink channel samples are transmitted to and downlink channel samples are received from the external audio companion chip as in normal mode.

Figure 24-165 shows the protocols and data formats in status mode.

Figure 24-165. Protocols and Data Formats in Status Mode



24.6.2.4.3.1 Entering Status Mode

Status mode can be entered when no command mode is detected during the last frame low pulse and no command mode is ongoing.

If both of these conditions are met and the [MCPDM_CTRL](#)[10] STATUS_INT bit is set to 1, the McPDM module automatically enters status mode when the command mode is complete.

In status mode, the status information data are sent by the external audio companion chip to the McPDM module. The status information is stored in an internal register.

If one or more status information packages are received before the previous status information is read, the status information stored in the internal register is overwritten with the new one.

In status mode, the external audio companion chip drives the `abe_pdm_frame` line low until the next frame synchronization low pulse. Then, it sends the 16-bit status information data on the `abe_pdm_frame` line. During the transmission of the status information, the McPDM module does not generate any frame-sync low pulse on the `abe_pdm_frame` line for one frame period.

24.6.2.4.3.2 Status Information Data Reception

The 16-bit status information data are received directly after the second frame-sync low pulse on the `abe_pdm_frame` line.

When the [MCPDM_CTRL](#)[10] STATUS_INT bit is set to 1, 16 bits of status information data must be read from the [MCPDM_UP_DATA](#) register. Only the 16 lower bits are significant. When the value of the status information is a null word (0x00000000), it means that no status information has been sent by the external audio companion chip.

When the [MCPDM_CTRL](#)[10] STATUS_INT bit is cleared to 0, no status information data has to be read from the [MCPDM_UP_DATA](#) register.

24.6.2.4.3.3 Exiting Status Mode

After the 16-bit status information data is sent, the external audio companion chip drives the `abe_pdm_frame` line high during one period of the `abe_pdm_lb_clk` clock signal before releasing its I/O driver in high-impedance state.

The McPDM module automatically exits the status mode one period of the `abe_pdm_lb_clk` clock signal after the last bit of the status information data has been transmitted on the `abe_pdm_frame` line. After exiting status mode, the McPDM module generates frame-sync low pulses.

NOTE: Due to the protocol mechanism, frame synchronization is lost during three frame periods. The external audio companion chip must internally emulate a frame synchronization to send uplink channel samples and received downlink channel samples as in normal mode while transmitting status information data on the `abe_pdm_frame` line.

24.6.2.4.3.4 Multiple Status Information Data Access

Multiple status information data can be sent by the external audio companion chip to the McPDM module every four frames.

Table 24-458. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------|---|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| McPDM | MCPDM_IRQ | D_IRQ_63 | DSP | McPDM interrupt request to the DSP INTC |
| | MCPDM_IRQ | MA_IRQ_112 | Cortex-A9 | McPDM interrupt request to the Cortex-A9 MPU INTC |
| DMA Requests | | | | |
| McPDM | MCPDM_DMA_UP | S_DMA_64 | sDMA | McPDM uplink path DMA request to the sDMA |
| | MCPDM_DMA_DOWN | S_DMA_65 | sDMA | McPDM downlink path DMA request to the sDMA |
| | MCPDM_DMA_UP | D_DMA_42 | dDMA | McPDM uplink path DMA request to the eDMA |
| | MCPDM_DMA_DOWN | D_DMA_43 | dDMA | McPDM downlink path DMA request to the eDMA |
| | MCPDM_DMA_UP | A_DMA_3 | aDMA | McPDM uplink path DMA request to the aDMA |
| | MCPDM_DMA_DOWN | A_DMA_2 | aDMA | McPDM downlink path DMA request to the aDMA |

NOTE:

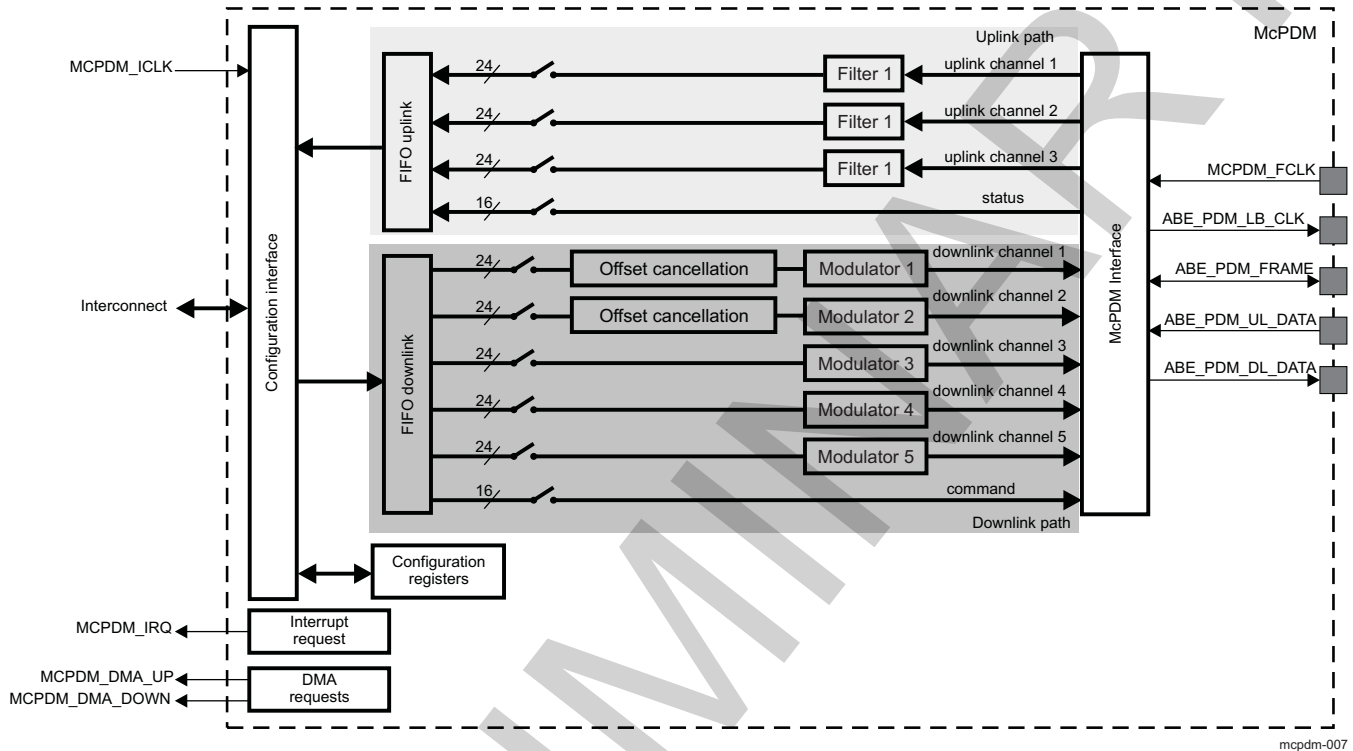
- For the description of the interrupt source, see [Section 24.6.4.5, Interrupt Requests](#).
- For the description of the DMA source, see [Section 24.6.4.6, DMA Requests](#).

24.6.4 McPDM Functional Description

24.6.4.1 McPDM Block Diagram

Figure 24-167 shows the McPDM block diagram.

Figure 24-167. McPDM Block Diagram



24.6.4.2 McPDM Clock Configuration

The functional clock MCPDM_FCLK is provided by the external audio companion chip. Its frequency can be either 17.64 MHz for a sampling frequency of 88.2/176.4 kHz, or 19.2 MHz for a sampling frequency of 96/192 kHz.

The functional clock is also looped-back to the audio companion chip through ABE_PDM_LB_CLK for resynchronization purposes.

24.6.4.3 McPDM Software Reset

To perform a software reset of the McPDM module, the MCPDM_SYSCONFIG[0] SOFTRESET bit must be set to 1. Reading the MCPDM_SYSCONFIG[0] SOFTRESET bit gives the status of the software reset:

- Read 1: The software reset is ongoing.
- Read 0: The software reset is complete.

Software must ensure that the software reset completes before doing McPDM operations. Moreover, uplink and downlink paths can be independently software reset by setting the MCPDM_CTRL[11] SW_UP_RST bit for the uplink path, and the MCPDM_CTRL[12] SW_DN_RST bit for the downlink path to 1. The software reset is stopped by clearing the MCPDM_CTRL[11] SW_UP_RST bit for the uplink path, and the MCPDM_CTRL[12] SW_DN_RST bit for the downlink path to 0.

The software reset of the McPDM module, after completion, puts all McPDM registers in their default state. The downlink/uplink reset, resets only the downlink/uplink hardware logic (no registers are affected).

24.6.4.4 McPDM Power Management

Table 24-459 describes the power-management features available to the McPDM module.

Table 24-459. Local Power-Management Features

| Feature | Registers | Description |
|------------------------|--|---|
| Clock autogating | N/A | Feature not available |
| Slave idle modes | MCPDM_SYSCONFIG [3:2] IDLEMODE bit field | Force-idle, no-idle, smart-idle, and smart-idle wake-up capable modes are available for the interface clock |
| Clock activity | N/A | Feature not available |
| Master standby modes | N/A | Feature not available |
| Global wake-up enable | N/A | Feature not available |
| Wake-up sources enable | MCPDM_IRQWAKEEN and MCPDM_DMAWAKEEN registers | Each register holds one active-high enable bit per event source able to generate wake-up signal |
| Audio channel enable | MCPDM_CTRL [0] PDM_UP1_EN to MCPDM_CTRL [2] PDM_UP3_EN bits for audio uplink channels MCPDM_CTRL [3] PDM_DN1_EN to MCPDM_CTRL [7] PDM_DN5_EN bits for audio downlink channels | Each of these bits allows enabling (set to 1) or disabling (clear to 0) the corresponding audio channel. |
| Status channel enable | MCPDM_CTRL [10] STATUS_INT bit for the status channel | This bit allows enabling (set to 1) or disabling (clear to 0) the status channel |
| Command channel enable | MCPDM_CTRL [9] CMD_INT bit for the command channel | This bit allows enabling (set to 1) or disabling (clear to 0) the command channel |

The MCPDM_ICLK interface clock is controlled through the PRCM module by using IDLE request and acknowledge signals. The [MCPDM_SYSCONFIG](#)[3:2] IDLEMODE bit field allows controlling the interface clock gating in idle mode.

For the uplink path, the interface clock can be put in idle after the uplink path is enabled. Wakeup is available according to the settings of the [MCPDM_IRQWAKEEN](#) and [MCPDM_DMAWAKEEN](#) registers and the FIFO uplink threshold configured in the [MCPDM_FIFO_CTRL_UP](#)[3:0] UP_TRESH bit field. The wake-up signal is asserted when the FIFO uplink level is equal to or greater than the FIFO uplink threshold value.

For the downlink path, the interface clock can be put in idle after the FIFO downlink level reaches the FIFO downlink threshold at least once. Wakeup is available according to the settings of the [MCPDM_IRQWAKEEN](#) and [MCPDM_DMAWAKEEN](#) registers and the FIFO downlink threshold configured in the [MCPDM_FIFO_CTRL_DN](#)[3:0] DN_TRESH bit field. The wake-up signal is asserted when the FIFO downlink level is below the FIFO downlink threshold value.

24.6.4.5 McPDM Interrupt Requests

The McPDM can generate interrupt requests to the Cortex-A9 MPU and DSP INTCs through the MCPDM_IRQ signal.

Table 24-460 lists the nonmaskable and maskable event flags and their mask that can cause the McPDM module to generate interrupts.

Table 24-460. Interrupt Events

| Nonmaskable Event Flag ⁽¹⁾ | Maskable Event Flag | Event Mask Bit | Event Unmask Bit | Description |
|--|--|---|---|--|
| MCPDM_IRQSTATUS_RAW [11] UP_IRQ_FULL | MCPDM_IRQSTATUS [11] UP_IRQ_FULL | MCPDM_IRQENABLE_CLR [11] UP_IRQ_FULL_MASK | MCPDM_IRQENABLE_SET [11] UP_IRQ_FULL_MASK | FIFO-uplink-full event. This event occurs when FIFO uplink is already full and a new word is written to the FIFO uplink by the uplink part of the McPDM module. |
| MCPDM_IRQSTATUS_RAW [10] UP_IRQ_ALST_FULL | MCPDM_IRQSTATUS [10] UP_IRQ_ALST_FULL | MCPDM_IRQENABLE_CLR [10] UP_IRQ_ALST_FULL_MASK | MCPDM_IRQENABLE_SET [10] UP_IRQ_ALST_FULL_MASK | FIFO-uplink-almost-full event. This event occurs when FIFO uplink contains (FIFO uplink size – 1) words and a new word is written to the FIFO uplink by the uplink part of the McPDM module. |
| MCPDM_IRQSTATUS_RAW [9] UP_IRQ_EMPTY | MCPDM_IRQSTATUS [9] UP_IRQ_EMPTY | MCPDM_IRQENABLE_CLR [9] UP_IRQ_EMPTY_MASK | MCPDM_IRQENABLE_SET [9] UP_IRQ_EMPTY_MASK | FIFO-uplink-empty event. This event occurs when FIFO uplink is already empty and a new word is read from the FIFO uplink by software. |
| MCPDM_IRQSTATUS_RAW [8] UP_IRQ | MCPDM_IRQSTATUS [8] UP_IRQ | MCPDM_IRQENABLE_CLR [8] UP_IRQ_MASK | MCPDM_IRQENABLE_SET [8] UP_IRQ_MASK | FIFO-uplink-read-request event. This event occurs when the number of words stored in the FIFO uplink is equal to or greater than the FIFO uplink threshold. |
| MCPDM_IRQSTATUS_RAW [3] DN_IRQ_FULL | MCPDM_IRQSTATUS [3] DN_IRQ_FULL | MCPDM_IRQENABLE_CLR [3] DN_IRQ_FULL_MASK | MCPDM_IRQENABLE_SET [3] DN_IRQ_FULL_MASK | FIFO-downlink-full event. This event occurs when FIFO downlink is already full and a new word is written to the FIFO downlink by software. |
| MCPDM_IRQSTATUS_RAW [2] DN_IRQ_ALST_EMPTY | MCPDM_IRQSTATUS [2] DN_IRQ_ALST_EMPTY | MCPDM_IRQENABLE_CLR [2] DN_IRQ_ALST_EMPTY_MASK | MCPDM_IRQENABLE_SET [2] DN_IRQ_ALST_EMPTY_MASK | FIFO-downlink-almost-empty event. This event occurs when FIFO downlink contains one word and a new word is read from the FIFO downlink by the downlink part of the McPDM module. |
| MCPDM_IRQSTATUS_RAW [1] DN_IRQ_EMPTY | MCPDM_IRQSTATUS [1] DN_IRQ_EMPTY | MCPDM_IRQENABLE_CLR [1] DN_IRQ_EMPTY_MASK | MCPDM_IRQENABLE_SET [1] DN_IRQ_EMPTY_MASK | FIFO-downlink-empty event. This event occurs when FIFO downlink is empty and a new word is read from the FIFO downlink by the downlink part of the McPDM module. |
| MCPDM_IRQSTATUS_RAW [0] DN_IRQ | MCPDM_IRQSTATUS [0] DN_IRQ | MCPDM_IRQENABLE_CLR [0] DN_IRQ_MASK | MCPDM_IRQENABLE_SET [0] DN_IRQ_MASK | FIFO-downlink-write-request event. This event occurs when the number of words stored in the FIFO downlink is less than the FIFO downlink threshold. |

⁽¹⁾ The MCPDM_IRQSTATUS_RAW register is mainly used for debug purposes.

CAUTION

Once an event generating the interrupt request has been processed by software, this event must be cleared by writing a logical 1 to the corresponding bit of the [MCPDM_IRQSTATUS](#) register.

Writing a logical 1 in a bit of the [MCPDM_IRQSTATUS](#) register also clears the corresponding bit in the [MCPDM_IRQSTATUS_RAW](#) register to 0.

An event can generate an interrupt request when a logical 1 is written to the corresponding mask bit in the [MCPDM_IRQENABLE_SET](#) register. Events are reported in the [MCPDM_IRQSTATUS](#) and [MCPDM_IRQSTATUS_RAW](#) registers.

An event stops generating interrupt requests when a logical 1 is written to the corresponding mask bit in the [MCPDM_IRQENABLE_CLR](#) register. Events are reported only in the [MCPDM_IRQSTATUS_RAW](#) register.

In case of the [MCPDM_IRQSTATUS_RAW](#) register, the event is reported in the corresponding bit, even if the interrupt request generation is disabled for this event.

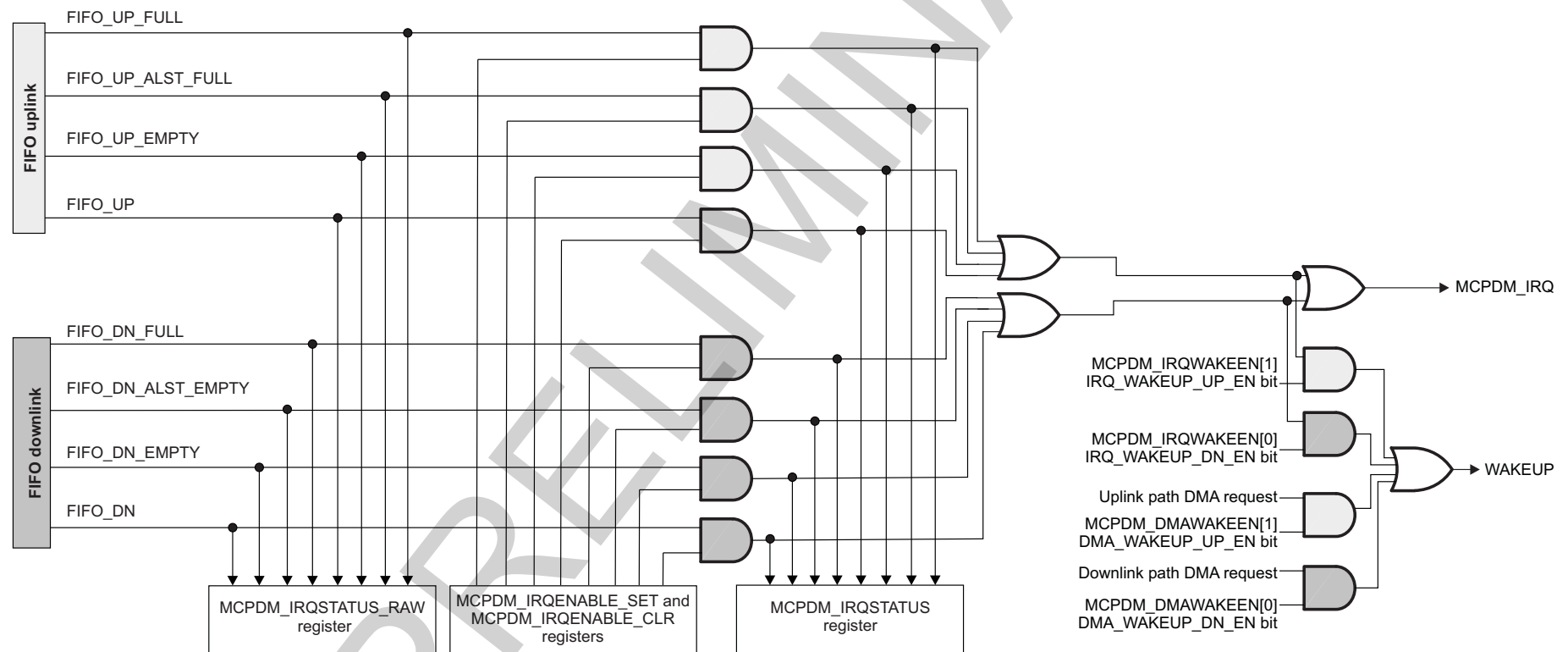
Writing a logical 1 in a bit of the [MCPDM_IRQSTATUS_RAW](#) register sets the corresponding bit in the [MCPDM_IRQSTATUS](#) register to 1.

The [MCPDM_IRQSTATUS_RAW](#) register is used primarily for debug purposes.

For more information about interrupt request signal mapping, see [Table 24-458](#).

[Figure 24-168](#) shows the interrupt tree of the McPDM module.

Figure 24-168. Interrupt Tree



mcpdm-008

24.6.4.6 McPDM DMA Requests

The McPDM module can generate two DMA requests to the sDMA, aDMA, and eDMA controllers:

- The uplink path can generate a DMA request through the MCPDM_DMA_UP signal.
- The downlink path can generate a DMA request through the MCPDM_DMA_DOWN signal.

Table 24-461 lists the DMA requests of the McPDM module.

Table 24-461. McPDM DMA Requests

| DMA Request Signal | DMA Request Generation Enabling Bit | DMA Request Generation Disabling Bit | Description |
|--------------------|---|---|--|
| MCPDM_DMA_UP | MCPDM_DMAENABLE_SET [1] DMA_UP_ENABLE | MCPDM_DMAENABLE_CLR [1] DMA_UP_ENABLE | Uplink path DMA request. This request is generated when the number of words in the FIFO uplink is equal to or above the FIFO uplink threshold. |
| MCPDM_DMA_DOWN | MCPDM_DMAENABLE_SET [0] DMA_DN_ENABLE | MCPDM_DMAENABLE_CLR [0] DMA_DN_ENABLE | Downlink path DMA request. This request is generated when the number of words in the FIFO downlink is below the FIFO downlink threshold. |

To enable or disable the DMA request generation on the MCPDM_DMA_UP signal, one of the following actions must be performed:

- Write a logical 1 to the [MCPDM_DMAENABLE_SET](#)[1] DMA_UP_ENABLE bit to enable the DMA request generation on the MCPDM_DMA_UP signal.
- Write a logical 1 to the [MCPDM_DMAENABLE_CLR](#)[1] DMA_UP_ENABLE bit to disable the DMA request generation on the MCPDM_DMA_UP signal.

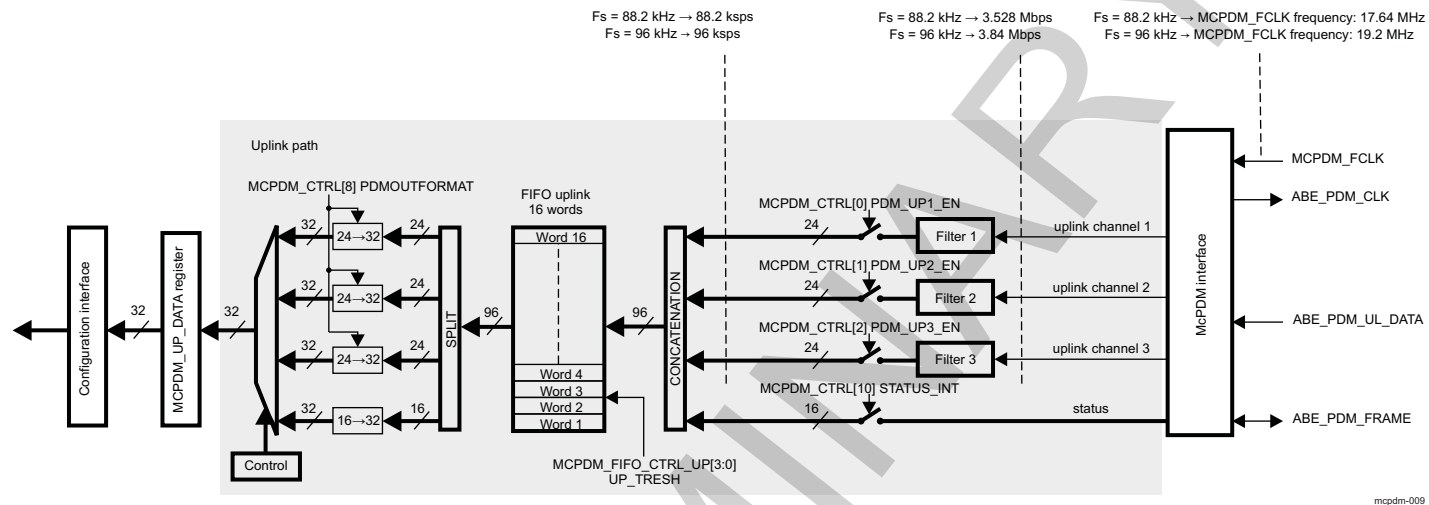
To enable or disable the DMA request generation on the MCPDM_DMA_DOWN signal, one of the following actions must be performed:

- Write a logical 1 to the [MCPDM_DMAENABLE_SET](#)[0] DMA_DN_ENABLE bit to enable the DMA request generation on the MCPDM_DMA_DOWN signal.
- Write a logical 1 to the [MCPDM_DMAENABLE_CLR](#)[0] DMA_DN_ENABLE bit to disable the DMA request generation on the MCPDM_DMA_DOWN signal.

For more information about DMA request signals mapping, see [Table 24-458](#).

24.6.4.7 Uplink Path

[Figure 24-169](#) is a detailed block diagram of the uplink path in the McPDM module.

Figure 24-169. Uplink Path Detailed Block Diagram

24.6.4.7.1 Uplink Path Features

The uplink path has the following features:

- Three audio uplink channels
- One status channel
- Decimation filter for each audio uplink channel
- 16-word FIFO uplink with threshold setting
- Audio channel data formatting
- High-frequency sampling feature

24.6.4.7.2 Uplink Path Description

24.6.4.7.2.1 Uplink Data Received From the External Audio Companion Chip

The McPDM interface receives audio uplink channel data and status information data from the external audio companion chip at a clock rate of 17.64 MHz for a sampling frequency of 88.2 kHz, or 19.2 MHz for a sampling frequency of 96 kHz. This low-frequency sampling feature is enabled by default. The uplink path supports a high-frequency sampling feature to work with an ultrasonic external microphone. This feature is enabled by setting the [MCPDM_CTRL\[13\] DIV_SEL](#) bit to 1. Thus, the McPDM interface receives audio uplink channel data and status information data from the external audio companion chip at a clock rate of 17.64 MHz for a sampling frequency of 176.4 kHz, or 19.2 MHz for a sampling frequency of 192 kHz.

The McPDM interface extracts each data bit related to audio and sends it to the decimation filter of the corresponding channel. Therefore, for each audio uplink channel, the McPDM interface generates one bit data flow to the corresponding decimation filter at a rate of 3.528 Mbps for a sampling frequency of 88.2 kHz, or 3.84 Mbps for a sampling frequency of 96 kHz.

Moreover, when status information data are detected on the frame-sync signal ([ABE_PDM_FRAME](#)), the status information data are recovered and sent to the status channel. When no status information data are detected on the frame-sync signal, a null word (0x0000) is sent on the status channel.

For more information about protocols and data formats in normal mode, see [Section 24.6.2.4.1, Protocols and Data Formats in Normal Mode](#). For more information about protocols and data formats in status mode, see [Section 24.6.2.4.3, Protocols and Data Formats in Status Mode](#).

24.6.4.7.2.2 Decimation Filter

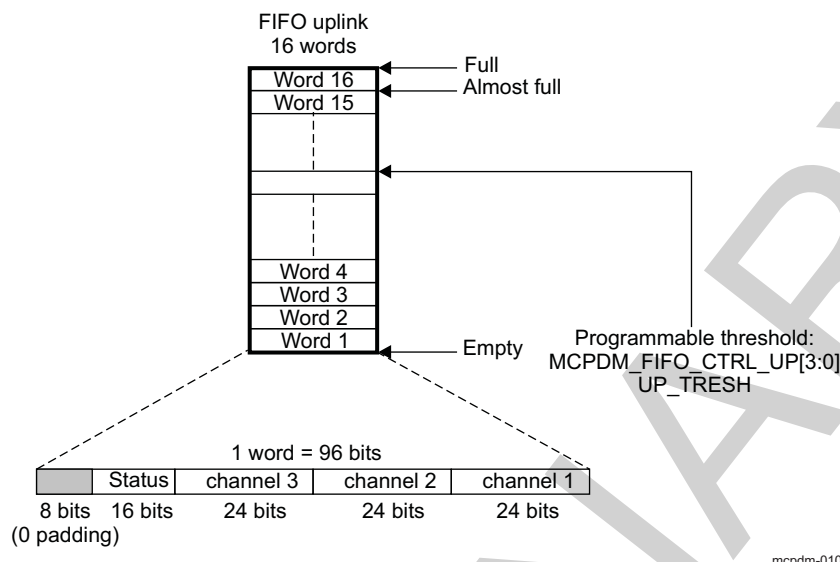
Each bit data flow is related to an audio uplink channel and is provided by the McPDM interface is processed by a decimation filter. The purpose of this filter is to band-limit the noise and downsample the incoming bit data flow to generate a 24-bit-wide signed data flow at a rate of 88.2 kbps for a sampling frequency of 88.2 kHz, or 96 kbps for a sampling frequency of 96 kHz.

24.6.4.7.2.3 FIFO Uplink Management

24.6.4.7.2.3.1 General Description

The McPDM module implements a FIFO for the uplink path for communication with the host processor in the device. The FIFO uplink can store up to 16 words. Each word is 96 bits wide and is a combination of 24-bit-wide signed audio uplink channel data coming from decimation filters and 16-bit-wide status information data coming from the McPDM interface.

[Figure 24-170](#) shows the FIFO uplink overview.

Figure 24-170. FIFO Uplink Overview

24.6.4.7.2.3.2 FIFO Operations

The FIFO uplink is filled with audio uplink channel data coming from decimation filters and status information data from the McPDM interface. Once the FIFO uplink threshold ([MCPDM_FIFO_CTRL_UP\[3:0\] UP_TRESH](#) bit field) is reached and, depending on conditions, an event occurs and generates an interrupt or DMA request.

NOTE: For more information about events generating an interrupt request, see [Section 24.6.4.5, McPDM Interrupt Requests](#).

For more information about conditions for DMA request generation, see [Section 24.6.4.6, McPDM DMA Requests](#).

When an interrupt request upon a FIFO uplink read-request event or an MCPDM_DMA_UP request occurs, the host processor or the DMA controller must read the words from the FIFO uplink ([MCPDM_UP_DATA](#) register). The number of read accesses from the host/DMA is determined by the following equation:

$$\text{Num_read_access} = (\text{PDM_UP1_EN} + \text{PDM_UP2_EN} + \text{PDM_UP3_EN} + \text{STAT_INT}) * (\text{UP_THRESH}),$$
 where the PDM_UP_THRESHOLD is programmed through the [MCPDM_FIFO_CTRL_UP\[3:0\] UP_TRESH](#) bit field.

PDM_UP1_EN, PDM_UP2_EN, PDM_UP3_EN, and STAT_INT are boolean values representing whether or not the corresponding channel is enabled.

For example, if audio uplink channels 1 and 3 are enabled, audio uplink channel 2 is disabled, the status channel is enabled, and the uplink threshold is programmed for one line only ([MCPDM_FIFO_CTRL_UP\[3:0\] UP_TRESH](#) = 0x0):

- Num_read_access = 3 because two audio uplink and the status channels are enabled.
- The first reading of the [MCPDM_UP_DATA](#) register should correspond to the audio uplink channel 1 data.
- The second reading of the [MCPDM_UP_DATA](#) register should correspond to the audio uplink channel 3 data.
- The third reading of the [MCPDM_UP_DATA](#) register should correspond to the status information data.

NOTE: No status information has been sent by the external audio companion chip if the status channel is enabled and the 16 lower bits of the corresponding data read from the [MCPDM_UP_DATA](#) register is 0x0000 .

The audio uplink and status channels cannot be enabled or disabled on the fly during uplink signaling. The uplink path must first be forced to reset by setting the [MCPDM_CTRL](#)[11] SW_UP_RST bit to 1 before enabling or disabling any channels.

Because the audio uplink channel data are 24 bits wide and the [MCPDM_UP_DATA](#) register is 32 bits wide, the [MCPDM_CTRL](#)[8] PDMOUTFORMAT bit allows selecting the justification of the 24-bit audio uplink channel data in the [MCPDM_UP_DATA](#) register:

- When the [MCPDM_CTRL](#)[8] PDMOUTFORMAT bit is cleared to 0, the 24-bit-wide signed audio uplink channel data are left-justified with eight 0 padding bits for the lower bits.
- When the [MCPDM_CTRL](#)[8] PDMOUT FORMAT is set to 1, the 24-bit-wide signed audio uplink channel data are right-justified and sign-extended.

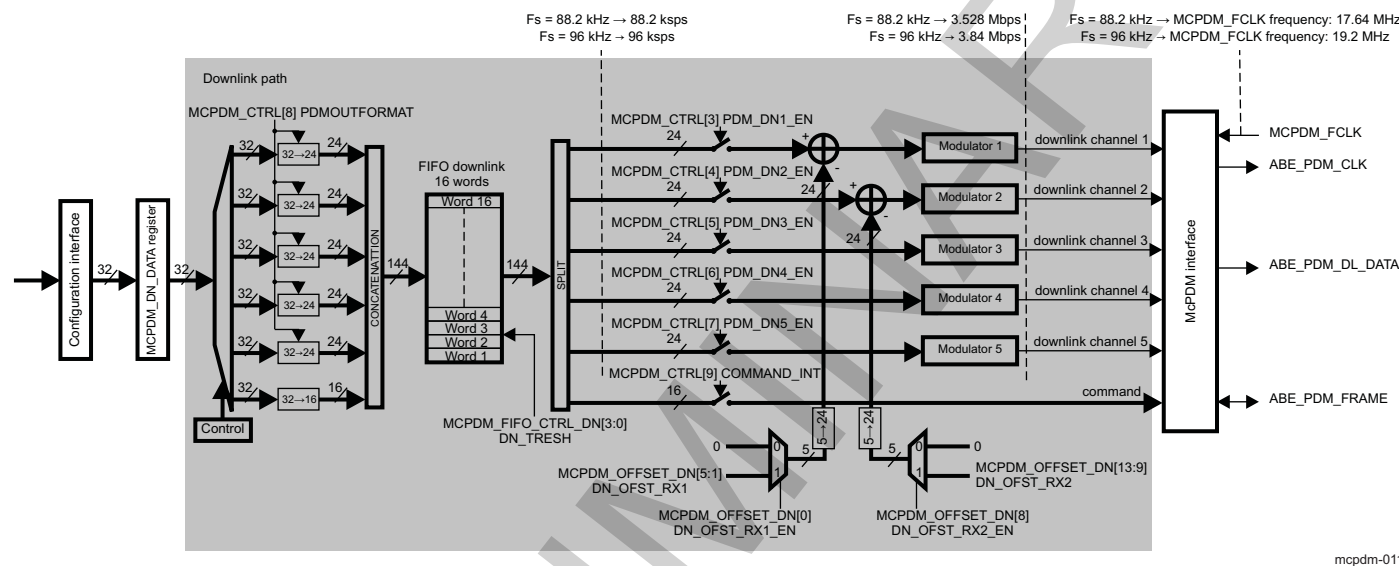
NOTE: The [MCPDM_CTRL](#)[8] PDMOUTFORMAT bit does not affect the status information format. When the status information data are read from the [MCPDM_UP_DATA](#) register, only the 16 lower bits are significant.

The setting of the [MCPDM_CTRL](#)[8] PDMOUTFORMAT bit also affects the audio downlink channel data format.

24.6.4.8 Downlink Path

Figure 24-171 is a detailed block diagram of the downlink path in the McPDM module.

Figure 24-171. Downlink Path Detailed Block Diagram



24.6.4.8.1 Downlink Path Features

The downlink path has the following features:

- Five audio downlink channels
- Offset cancellation for audio downlink channels 1 and 2
- One command channel
- Delta-sigma modulator for each audio downlink channel
- 16-word FIFO downlink with threshold setting
- Audio channel data formatting

24.6.4.8.2 Downlink Path Description

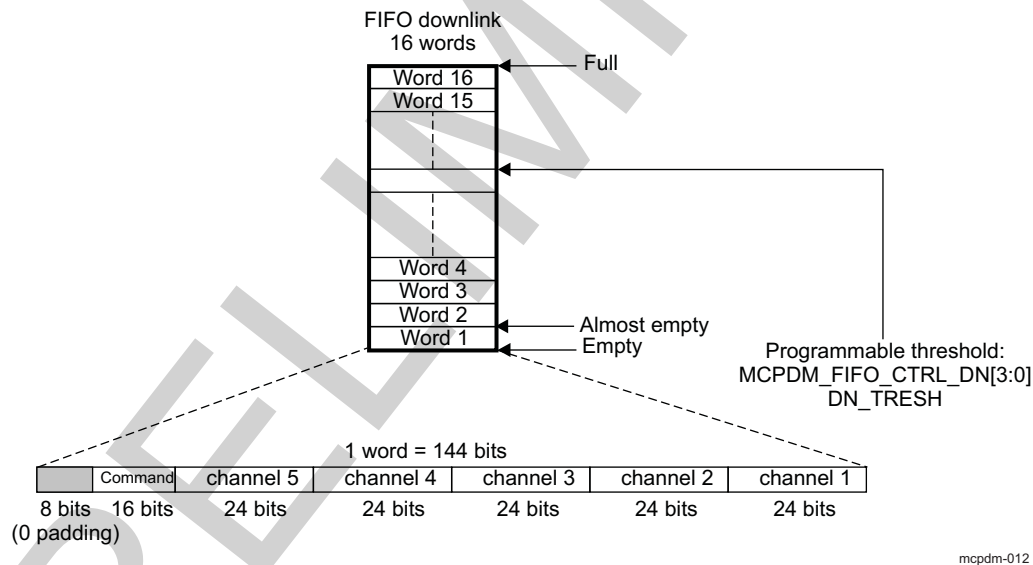
24.6.4.8.2.1 FIFO Downlink Management

24.6.4.8.2.1.1 General Description

The McPDM module implements a FIFO for the downlink path for communication with the host processor in the device. The FIFO downlink can store up to 16 words. Each word is 144 bits wide and is a combination of 24-bit-wide signed audio downlink channels data and 16-bit-wide command information data.

Figure 24-172 shows the FIFO downlink overview.

Figure 24-172. FIFO Downlink Overview



24.6.4.8.2.1.2 FIFO Operations

The FIFO downlink is read by the McPDM module and data related to the audio downlink channels are sent to the delta-sigma modulators, while the data related to the command information is sent to the McPDM interface. Once the FIFO pointer goes below the programmed threshold (the `MCPDM_FIFO_CTRL_DN[3:0] DN_TRESH` bit field), a DMA or interrupt request is sent to the DMA or interrupt handler and, depending on conditions, an event occurs and generates an interrupt or DMA request.

NOTE: For more information about events generating an interrupt request, see [Section 24.6.4.5, McPDM Interrupt Requests](#).

For more information about conditions for DMA request generation, see [Section 24.6.4.6, McPDM DMA Requests](#).

When an interrupt request upon a FIFO downlink write-request event or a MCPDM_DMA_DOWN request occurs, it indicates that the next words are available to be written to the [MCPDM_DN_DATA](#) register. The minimum number of write accesses from the host/DMA is determined by the following equation:

$$\text{Num_min_write_access} = \text{PDM_DN1_EN} + \text{PDM_DN2_EN} + \text{PDM_DN3_EN} + \text{PDM_DN4_EN} + \text{PDM_DN5_EN} + \text{CMD_INT}$$

PDM_DN1_EN, PDM_DN2_EN, PDM_DN3_EN, PDM_DN4_EN, PDM_DN5_EN and CMD_INT are boolean values representing whether the corresponding channel is enable or not.

The maximum number of write accesses (before overwriting the data in the FIFO still to be transmitted) from the host/DMA is determined by the following equation:

$$\text{Num_max_write_access} = (\text{FIFO_SIZE} - \text{DN_THRESH} + 1) * (\text{PDM_DN1_EN} + \text{PDM_DN2_EN} + \text{PDM_DN3_EN} + \text{PDM_DN4_EN} + \text{PDM_DN5_EN} + \text{CMD_INT})$$

FIFO_SIZE is the size of the downlink FIFO, and DN_THRESH is the downlink FIFO threshold, programmed through the [MCPDM_FIFO_CTRL_DN\[3:0\] DN_THRESHOLD](#) bit field.

For example, if audio downlink channels 1, 2, and 3 are enabled, audio downlink channels 4 and 5 are disabled, and the command channel is enabled:

- Num_min_write_access = 4, because three audio downlinks and the command channels are enabled.
- The first writing to the [MCPDM_DN_DATA](#) register should correspond to the audio downlink channel 1 data.
- The second writing to the [MCPDM_DN_DATA](#) register should correspond to the audio downlink channel 2 data.
- The third writing to the [MCPDM_DN_DATA](#) register should correspond to the audio downlink channel 3 data.
- The fourth writing to the [MCPDM_DN_DATA](#) register should correspond to the command information data.

NOTE: When the command channel is enabled and no command data need to be sent to the external audio companion chip, 0x0000 must be written to the 16 lower bits of the [MCPDM_DN_DATA](#) register as command data.

The audio downlink and command channels cannot be enabled or disabled on the fly during downlink signaling. The downlink path must first be forced to reset by setting the [MCPDM_CTRL\[12\] SW_DN_RST](#) bit to 1 before enabling or disabling any channels.

Because the audio downlink channel data are 24 bits wide and the [MCPDM_DN_DATA](#) register is 32 bits wide, the [MCPDM_CTRL\[8\] PDMOUTFORMAT](#) bit indicates the justification of the 24-bit audio downlink channel data in the [MCPDM_DN_DATA](#) register:

- When the [MCPDM_CTRL\[8\] PDMOUTFORMAT](#) is cleared to 0, the 24-bit-wide signed audio downlink channel data are left-justified with eight 0 padding bits for the lower bits.
- When [MCPDM_CTRL\[8\] PDMOUTFORMAT](#) is set to 1, the 24-bit-wide signed audio downlink channel data are right-justified and sign-extended.

NOTE: The [MCPDM_CTRL\[8\] PDMOUTFORMAT](#) bit does not affect the command information format. When the command information data are written to the [MCPDM_DN_DATA](#) register, only the 16 lower bits are significant.

The setting of the [MCPDM_CTRL\[8\] PDMOUTFORMAT](#) bit also affects the audio uplink channel data format.

24.6.4.8.2.1.3 Offset Cancellation

Because audio downlink channels 1 and 2 are related to the analog headset downlink path within the external audio companion chip, an offset cancellation feature is available for these channels to eliminate the offset of the analog headset downlink path.

When the offset cancellation feature is enabled, an offset value is subtracted from the audio data before being sent to the pulse-density modulator. The offset values are read from registers within the external audio companion chip and configured in the [MCPDM_DN_OFFSET\[5:1\] DN_OFST_RX1](#) bit field for the audio downlink channel 1, and in the [MCPDM_DN_OFFSET\[13:9\] DN_OFST_RX2](#) bit field for the audio downlink channel 2.

The offset cancellation feature is enabled or disabled by configuring the [MCPDM_DN_OFFSET\[0\] DN_OFST_RX1_EN](#) bit for the audio downlink channel 1, and the [MCPDM_DN_OFFSET\[8\] DN_OFST_RX2_EN](#) bit for the audio downlink channel 2 (00: Disabled, 10: Enabled).

24.6.4.8.2.1.4 Pulse-Density Modulators

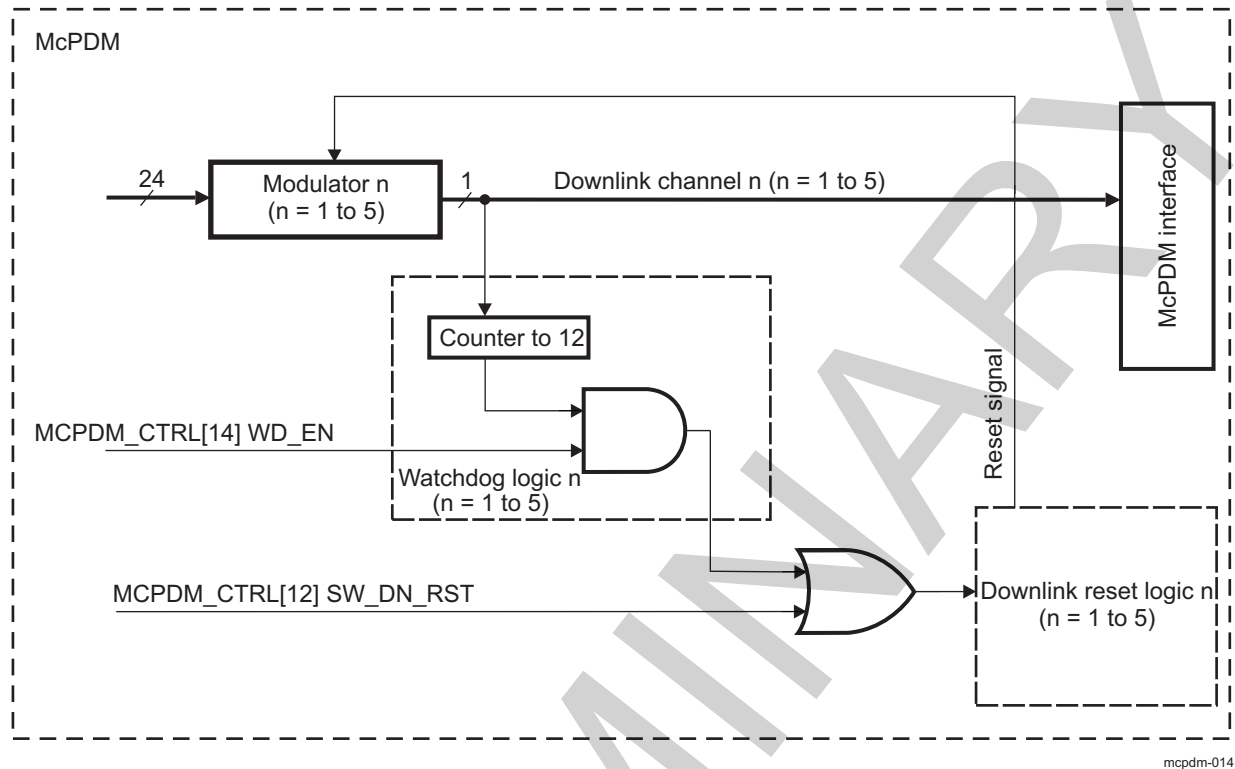
Each 24-bit-wide data related to an audio downlink channel is processed by a pulse-density modulator. The purpose of this modulator is to upsample the incoming audio data and then perform a 1-bit pulse-density modulation to generate a 1-bit data flow at a rate of 3.528 Mbps for a sampling frequency of 88.2 kHz, or 3.84 Mbps for a sampling frequency of 96 kHz. The 1-bit pulse-density modulation allows using a 1-bit analog-to-digital converter (ADC) implemented in the external audio companion chip to convert the audio digital data into an audio analog signal.

24.6.4.8.2.1.4.1 Pulse-Density Modulators Watchdog Logic

If the 1-bit data flow coming out of the pulse-density modulator has 12 or more consecutive 1s or 0s, the pulse-density modulator had entered into an unstable or saturated condition. An unstable or saturated condition leads to unpredictable behavior of the pulse-density modulator, thereby producing random noise. To prevent this unstable or saturated condition from occurring, a watchdog logic is used to monitor the 1-bit output of the pulse-density modulator for 12 consecutive 1s or 12 consecutive 0s. If entry to an unstable condition is detected, the watchdog logic asserts the reset of the McPDM downlink paths for one clock pulse to put the McPDM hardware logic, related to the downlink mechanism, to initial state.

The watchdog logic is disabled by default. To enable it, the [MCPDM_CTRL\[14\] WD_EN](#) bit must be set to 0x1. If the watchdog logic is disabled, only the assertion of the downlink path reset [MCPDM_CTRL\[12\] SW_DN_RST](#) bit is allowed to reset the McPDM hardware logic, which is related to the downlink mechanism. If the watchdog logic is enabled, the downlink mechanism logic is reset when the downlink path reset or the watchdog reset is asserted.

[Figure 24-173](#) shows the McPDM watchdog logic mechanism.

Figure 24-173. McPDM Watchdog Logic

24.6.4.8.2.1.5 Downlink Data Sent to the External Audio Companion Chip

The McPDM interface transmits the audio downlink channel data and command data to the external audio companion chip at a clock rate of 17.64 MHz for a sampling frequency of 88.2 kHz, or 19.2 MHz for a sampling frequency of 96 kHz.

The command data are sent on the frame-sync signal (ABE_PDM_FRAME) when the command channel is enabled. When the command channel is disabled or the command data is 0x0000, no command data is sent on the frame-sync signal.

NOTE: For more information about protocols and data formats in normal mode, see [Section 24.6.2.4.1, Protocols and Data Formats in Normal Mode](#).

For more information about protocols and data formats in command mode, see [Section 24.6.2.4.2, Protocols and Data Formats in Command Mode](#).

24.6.4.9 Error Reporting

During normal operation, when interrupt and DMA requests are properly served, no FIFO-uplink-full and no FIFO-downlink-empty events should occur.

Nevertheless, if one of these events occurs, the corresponding path must be forced to reset by software before being reconfigured. For more information about events servicing, see [Section 24.6.5.1.2, McPDM Events Servicing](#).

Moreover, a FIFO-uplink-empty or FIFO-downlink-full event occurs only when all the channels of the corresponding path have been disabled during normal operation.

NOTE: Channels must not be enabled or disabled during normal operation.

Channels can be enabled or disabled when the corresponding path is forced to reset. For more information about McPDM software reset, see [Section 24.6.4.3, McPDM Software Reset](#).

24.6.5 McPDM Programming Guide

24.6.5.1 McPDM Low-Level Programming Models

This section describes the low-level hardware programming sequences for the configuration and use of the module.

24.6.5.1.1 Global Initialization

24.6.5.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules in the device when the McPDM module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the environment and the integration of the McPDM. For more information, see [Section 24.6.2, McPDM Environment](#), and [Section 24.6.3, McPDM Integration](#).

[Table 24-462](#) describes the global initialization of surrounding modules.

Table 24-462. Global Initialization of Surrounding Modules

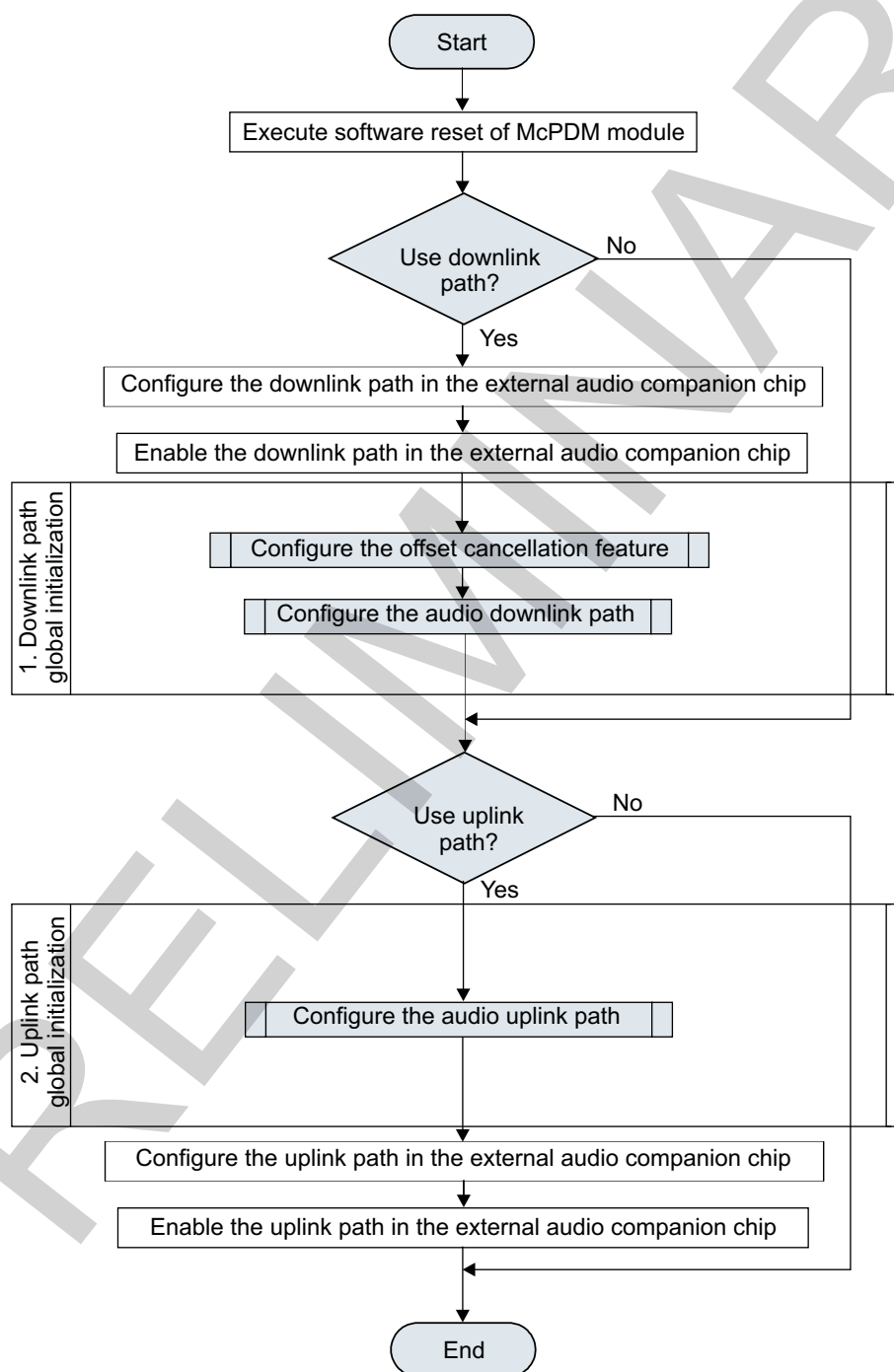
| Surrounding Modules | Comments |
|---|--|
| PRCM module | The McPDM interface clock must be enabled and the functional clock must not be gated. |
| Control module | The McPDM-specific pad muxing must be configured in the device control module. |
| (Optional) Cortex-A9 MPU INTC (or DSP INTC) | The Cortex-A9 MPU (or DSP) INTC must be configured to enable the interrupt request generation to the Cortex-A9 MPU (or DSP) subsystem when interrupt requests are generated by the McPDM module. |
| (Optional) sDMA (or eDMA or aDMA) | The sDMA (or eDMA or aDMA) controller must be configured to account for the DMA requests generated by the McPDM module in the case of autonomous data transfers from/to memory. |
| (Optional) Interconnect | For more information about the interconnect configuration, see Chapter 14, Interconnect . |
| External audio chip | Initialize the external audio chip according to the specific needs. |
| I ² C controller | For more information about the I ² C initialization, see Section 24.1, Multimaster High-Speed I²C Controller . |

24.6.5.1.1.2 McPDM Global Initialization

24.6.5.1.1.2.1 Main Sequence – McPDM Global Initialization

This procedure initializes the McPDM after a power-on reset (POR) or software reset. [Figure 24-174](#) shows a flow chart for the global initialization of the McPDM module.

Figure 24-174. McPDM Global Initialization Flow Chart



mcpdm-013

The McPDM software reset is executed by setting the [MCPDM_SYSCONFIG\[0\]](#) SOFTRESET bit to 0x1. To detect the reset done event, user software must check this bit until it is cleared to 0x0 by the hardware.

Configuration of the offset cancellation feature is optional. The use of that feature depends on the characteristics of the external audio chip attached to the McPDM interface. If the external chip adds some DC offset on its output, then the offset cancellation feature of the McPDM must be used.

Table 24-463 describes the steps of the downlink path global initialization.

Table 24-463. McPDM Downlink Path Global Initialization

| Procedure | Step | Access Type | Register/Bit Field/Programming Model | Value |
|--|--|-------------|---|--|
| Configure the offset cancellation feature. Only downlink path 1 and downlink path 2 can use the offset cancellation feature. | 1. Read the offset value for the audio downlink path 1 from the external audio companion chip through the I ² C interface. | R | Offset register 1 in the external audio companion chip | OFFSET1 |
| | 2. Configure the offset of the audio downlink path 1. | W | MCPDM_DN_OFFSET [5:1] DN_OFST_RX1 | OFFSET1 |
| | 3. Enable the offset cancellation feature for the audio downlink path 1. | W | MCPDM_DN_OFFSET [0] DN_OFST_RX1_EN | 0x1 |
| | 4. Read the offset value for the audio downlink path 2 from the external audio companion chip through the I ² C interface. | R | Offset register 2 in the external audio companion chip | OFFSET2 |
| | 5. Configure the offset of the audio downlink path 2. | W | MCPDM_DN_OFFSET [13:9] DN_OFST_RX2 | OFFSET2 |
| | 6. Enable the offset cancellation feature for the audio downlink path 2. | W | MCPDM_DN_OFFSET [8] DN_OFST_RX2_EN | 0x1 |
| Configure the audio downlink path. | 1. Enable the interrupt request generation for the downlink path. | W | a. MCPDM_IRQENABLE_SET [3] DN_IRQ_FULL_MASK b. MCPDM_IRQENABLE_SET [2] DN_IRQ_ALMST_EMPTY_MASK c. MCPDM_IRQENABLE_SET [1] DN_IRQ_EMPTY_MASK d. MCPDM_IRQENABLE_SET [0] DN_IRQ_MASK | When downlink DMA request not used: 0xF When downlink DMA request used: 0xE |
| | 2. Configure the FIFO downlink threshold. | W | MCPDM_FIFO_CTRL_DN [3:0] DN_TRESH | FIFO downlink threshold |
| | 3. Enable the DMA request generation for the downlink path (optional: only if DMA request generation for the downlink path is required). | W | MCPDM_DMAENABLE_SET [0] DMA_DN_ENABLE | 0x1 |
| | 4. Enable the downlink channels. | W | MCPDM_CTRL | See Table 24-459 . |

Table 24-464 describes the steps of the uplink path global initialization.

Table 24-464. McPDM Uplink Path Global Initialization

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|--|-------------|--|--|
| 1. Enable the interrupt request generation for the uplink path. | W | a. MCPDM_IRQENABLE_SET [11] UP_IRQ_FULL_MASK b. MCPDM_IRQENABLE_SET [10] UP_IRQ_ALMST_FULL_MASK c. MCPDM_IRQENABLE_SET [9] UP_IRQ_EMPTY_MASK d. MCPDM_IRQENABLE_SET [8] UP_IRQ_MASK | When uplink DMA request not used: 0xF When uplink DMA request used: 0xE |
| 2. Configure the FIFO uplink threshold. | W | MCPDM_FIFO_CTRL_UP [3:0] UP_TRESH | FIFO uplink threshold |
| 3. Enable the DMA request generation for the uplink path (optional: only if DMA request generation for the uplink path is required). | W | MCPDM_DMAENABLE_SET [1] DMA_UP_ENABLE | 0x1 |

Table 24-464. McPDM Uplink Path Global Initialization (continued)

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|--|-------------|---|------------------------------------|
| 4. Configure the FIFO uplink sampling frequency. | W | MCPDM_CTRL [13] DIV_SEL | 0x- |
| 5. Enable the uplink channels. | W | MCPDM_CTRL | See Table 24-459 . |

24.6.5.1.2 McPDM Events Servicing

24.6.5.1.2.1 Downlink Path Event Servicing

[Table 24-465](#) to [Table 24-468](#) describe the downlink path event servicing.

When the four downlink interrupts are enabled and then the downlink channel(s) is enabled, the FIFO-downlink-write request ([MCPDM_IRQSTATUS](#) = 0x1), instead of the FIFO-downlink-empty request ([MCPDM_IRQSTATUS](#) = 0x2), is generated. The first audio data to be sent is written from the interrupt handler. The McPDM module can work in two ways:

- Enable the desired downlink channels, and then write in the downlink FIFO the audio data that is going to be sent.
- Write the audio data in the downlink FIFO, and then enable the desired downlink channels to send this audio data.

In either way, the FIFO-downlink-write request is generated.

Table 24-465. FIFO-Downlink-Full Event Servicing

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|--|-------------|---|-------|
| TEST TA: Is FIFO downlink full? | R | MCPDM_IRQSTATUS [3] DN_IRQ_FULL | |
| IF: TRUE | | | 0x1 |
| Acknowledge event. | W | MCPDM_IRQSTATUS [3] DN_IRQ_FULL | 0x1 |
| Downlink path reset | W | MCPDM_CTRL [12] SW_DN_RST | 0x1 |
| Downlink path global initialization | | See Table 24-463 . | |
| Downlink path reset release | W | MCPDM_CTRL [12] SW_DN_RST | 0x0 |
| END | | | |
| ELSE | | | 0x0 |
| END | | | |
| END TEST TA | | | |

Table 24-466. FIFO-Downlink-Empty Event Servicing

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|---|-------------|--|-------|
| TEST TA: Is FIFO downlink empty? | R | MCPDM_IRQSTATUS [1] DN_IRQ_EMPTY | |
| IF: TRUE | | | 0x1 |
| Acknowledge event. | W | MCPDM_IRQSTATUS [1] DN_IRQ_EMPTY | 0x1 |
| Downlink path reset | W | MCPDM_CTRL [12] SW_DN_RST | 0x1 |
| Downlink path reconfiguration | | See Table 24-463 . | |
| Downlink path reset release | W | MCPDM_CTRL [12] SW_DN_RST | 0x0 |
| END | | | |
| ELSE | | | 0x0 |
| END | | | |

Table 24-466. FIFO-Downlink-Empty Event Servicing (continued)

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|-------------|-------------|--------------------------------------|-------|
| END TEST TA | | | |

Table 24-467. FIFO-Downlink-Almost-Empty Event Servicing

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|--|-------------|---|-------|
| TEST TA: Is FIFO downlink almost empty? | R | MCPDM_IRQSTATUS [2] DN_IRQ_ALST_EMPTY | |
| IF: TRUE | | | 0x1 |
| Acknowledge event. | W | MCPDM_IRQSTATUS [2] DN_IRQ_ALST_EMPTY | 0x1 |
| Downlink path reset | W | MCPDM_CTRL [12] SW_DN_RST | 0x1 |
| Downlink path reconfiguration | | See Table 24-463 . | |
| Downlink path reset release | W | MCPDM_CTRL [12] SW_DN_RST | 0x0 |
| END | | | |
| ELSE | | | 0x0 |
| END | | | |
| END TEST TA | | | |

Table 24-468. FIFO Downlink Write-Request Event Servicing

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|---|-------------|--|-------|
| TEST TA: Is FIFO downlink write requested? | R | MCPDM_IRQSTATUS [0] DN_IRQ | |
| IF: TRUE | | | 0x1 |
| Write FIFO downlink register (see Section 24.6.4.8.2.1.2 for more information). | W | MCPDM_DN_DATA | |
| Acknowledge event. | W | MCPDM_IRQSTATUS [0] DN_IRQ | 0x1 |
| END | | | |
| ELSE | | | 0x0 |
| END | | | |
| END TEST TA | | | |

24.6.5.1.2.2 Uplink Path Events Servicing

[Table 24-469](#) to [Table 24-471](#) describe the uplink path event servicing.

Table 24-469. FIFO-Uplink-Full Event Servicing

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|--------------------------------------|-------------|--|-------|
| TEST TA: Is FIFO-uplink-full? | R | MCPDM_IRQSTATUS [11] UP_IRQ_FULL | |
| IF: TRUE | | | 0x1 |
| Acknowledge event. | W | MCPDM_IRQSTATUS [11] UP_IRQ_FULL | 0x1 |
| Uplink path reset | W | MCPDM_CTRL [11] SW_UP_RST | 0x1 |
| Uplink path global initialization | | See Table 24-464 . | |
| Uplink path reset release | W | MCPDM_CTRL [11] SW_UP_RST | 0x0 |
| END | | | |
| ELSE | | | 0x0 |
| END | | | |
| END TEST TA | | | |

Table 24-470. FIFO-Uplink-Almost-Full Event Servicing

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|---|-------------|---|-------|
| TEST TA: Is FIFO-uplink-almost-full? | R | MCPDM_IRQSTATUS [10] UP_IRQ_ALST_FULL | |
| IF: TRUE | | | 0x1 |
| Acknowledge event. | W | MCPDM_IRQSTATUS [10] UP_IRQ_ALST_FULL | 0x1 |
| Uplink path reset | W | MCPDM_CTRL [12] SW_DN_RST | 0x1 |
| Uplink path reconfiguration | | See Table 24-464 . | |
| Uplink path reset release | W | | 0x0 |
| END | | | |
| ELSE | | | 0x0 |
| END | | | |
| END TEST TA | | | |

Table 24-471. FIFO-Uplink-Empty Event Servicing

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|---------------------------------------|-------------|--|-------|
| TEST TA: Is FIFO uplink empty? | R | MCPDM_IRQSTATUS [9] UP_IRQ_EMPTY | |
| IF: TRUE | | | 0x1 |
| Acknowledge event. | W | MCPDM_IRQSTATUS [9] UP_IRQ_EMPTY | 0x1 |
| Uplink path reset | W | MCPDM_CTRL [11] SW_UP_RST | 0x1 |
| Uplink path reconfiguration | | See Table 24-464 | |
| Uplink path reset release | W | MCPDM_CTRL [11] SW_UP_RST | 0x0 |
| END | | | |
| ELSE | | | 0x0 |
| END | | | |
| END TEST TA | | | |

Table 24-472. FIFO-Uplink-Read-Request Event Servicing

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|--|-------------|--|-------|
| TEST TA: Is FIFO uplink read requested? | R | MCPDM_IRQSTATUS [8] UP_IRQ | |
| IF: TRUE | | | 0x1 |
| Read FIFO uplink register (see Section 24.6.4.7.2.3.2 for more information). | R | MCPDM_UP_DATA | |
| Acknowledge event. | W | MCPDM_IRQSTATUS [8] UP_IRQ | 0x1 |
| END | | | |
| ELSE | | | 0x0 |
| END | | | |
| END TEST TA | | | |

24.6.6 McPDM Register Manual

24.6.6.1 McPDM Instance Summary

Table 24-473 summarizes the McPDM instance.

Table 24-473. McPDM Instance Summary

| Module Name | Base Address L3 Interconnect | Base Address Cortex-A9 Private Access | Base Address DSP Private Access | Size |
|-------------|---------------------------------|---|------------------------------------|------|
| McPDM | 0x4903 2000 | 0x4013 2000 | 0x3 2000 | 4KB |

NOTE: Private access is an access that does not use the L3/L4 interconnects.

24.6.6.2 McPDM Registers

24.6.6.2.1 McPDM Register Summary

Table 24-474 summarizes the McPDM register mapping.

Table 24-474. McPDM Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|---------------------|------|--------------------------|----------------|-------------------------------------|---|---|
| MCPDM_REVISION | R | 32 | 0x0000 0000 | 0x4903 2000 | 0x4013 2000 | 0x3 2000 |
| MCPDM_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4903 2010 | 0x4013 2010 | 0x3 2010 |
| RESERVED | RW | 32 | 0x0000 0020 | 0x4903 2020 | 0x4013 2020 | 0x3 2020 |
| MCPDM_IRQSTATUS_RAW | RW | 32 | 0x0000 0024 | 0x4903 2024 | 0x4013 2024 | 0x3 2024 |
| MCPDM_IRQSTATUS | RW | 32 | 0x0000 0028 | 0x4903 2028 | 0x4013 2028 | 0x3 2028 |
| MCPDM_IRQENABLE_SET | RW | 32 | 0x0000 002C | 0x4903 202C | 0x4013 202C | 0x3 202C |
| MCPDM_IRQENABLE_CLR | RW | 32 | 0x0000 0030 | 0x4903 2030 | 0x4013 2030 | 0x3 2030 |
| MCPDM_IRQWAKEEN | RW | 32 | 0x0000 0034 | 0x4903 2034 | 0x4013 2034 | 0x3 2034 |
| MCPDM_DMAENABLE_SET | RW | 32 | 0x0000 0038 | 0x4903 2038 | 0x4013 2038 | 0x3 2038 |
| MCPDM_DMAENABLE_CLR | RW | 32 | 0x0000 003C | 0x4903 203C | 0x4013 203C | 0x3 203C |
| MCPDM_DMAWAKEEN | RW | 32 | 0x0000 0040 | 0x4903 2040 | 0x4013 2040 | 0x3 2040 |
| MCPDM_CTRL | RW | 32 | 0x0000 0044 | 0x4903 2044 | 0x4013 2044 | 0x3 2044 |
| MCPDM_DN_DATA | RW | 32 | 0x0000 0048 | 0x4903 2048 | 0x4013 2048 | 0x3 2048 |
| MCPDM_UP_DATA | R | 32 | 0x0000 004C | 0x4903 204C | 0x4013 204C | 0x3 204C |
| MCPDM_FIFO_CTRL_DN | RW | 32 | 0x0000 0050 | 0x4903 2050 | 0x4013 2050 | 0x3 2050 |
| MCPDM_FIFO_CTRL_UP | RW | 32 | 0x0000 0054 | 0x4903 2054 | 0x4013 2054 | 0x3 2054 |
| MCPDM_DN_OFFSET | RW | 32 | 0x0000 0058 | 0x4903 2058 | 0x4013 2058 | 0x3 2058 |
| RESERVED | RW | 32 | 0x0000 005C | 0x4903 205C | 0x4013 205C | 0x3 205C |
| RESERVED | RW | 32 | 0x0000 0060 | 0x4903 2060 | 0x4013 2060 | 0x3 2060 |
| RESERVED | RW | 32 | 0x0000 0064 | 0x4903 2064 | 0x4013 2064 | 0x3 2064 |
| RESERVED | R | 32 | 0x0000 0068 | 0x4903 2068 | 0x4013 2068 | 0x3 2068 |
| RESERVED | RW | 32 | 0x0000 006C | 0x4903 206C | 0x4013 206C | 0x3 206C |
| RESERVED | RW | 32 | 0x0000 0070 | 0x4903 2070 | 0x4013 2070 | 0x3 2070 |
| RESERVED | R | 32 | 0x0000 0074 | 0x4903 2074 | 0x4013 2074 | 0x3 2074 |

24.6.6.2.2 McPDM Register Description

Table 24-475 through Table 24-505 describe the individual McPDM registers.

Table 24-475. MCPDM_REVISION

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0000 | Instance | MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Physical Address | 0x4903 2000 0x4013 2000 0x3 2000 | | |
| Description | IP revision identifier (X.Y.R) used by software to track features, bugs, and compatibility | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP revision | R | TI internal data |

Table 24-476. Register Call Summary for Register MCPDM_REVISION

Multichannel PDM Controller

- [McPDM Register Summary: \[0\]](#)

Table 24-477. MCPDM_SYSCONFIG

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0010 | Instance | MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Physical Address | 0x4903 2010 0x4013 2010 0x3 2010 | | |
| Description | This register allows controlling various parameters of the OCP interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------|--------|-----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | IDLEMODE | FREEMU | SOFTRESET | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:2 | IDLEMODE | Configuration of the idle mode. 0x0: Force- idle. idle request is acknowledged unconditionally and immediately. No wake-up capability. 0x1: No-idle. Idle request is never acknowledged. No wake-up capability. 0x2: Smart-idle. The acknowledgment to an idle request is given based on the internal activity. No wake-up capability. 0x3: Idle request acknowledged pending internal conditions, asynchronous wake-up enabled. Wakeup capability. | RW | 0x2 |
| 1 | FREEMU | Sensitivity to emulation (debug) suspend input signal. 0x0: McPDM module is sensitive to emulation suspend. 0x1: McPDM module is not sensitive to emulation suspend. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | SOFTRESET | McPDM software Reset. Write 0x0: No Action Read 0x0: No ongoing software reset Read 0x1: Reset is ongoing Write 0x1: Start software reset | RW | 0 |

Table 24-478. Register Call Summary for Register MCPDM_SYSCONFIG

Multichannel PDM Controller

- [McPDM Software Reset: \[0\] \[1\]](#)
- [McPDM Power Management: \[2\] \[3\]](#)
- [Global Initialization: \[4\]](#)
- [McPDM Register Summary: \[5\]](#)

Table 24-479. MCPDM_IRQSTATUS_RAW

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0024 | Instance | MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Physical Address | 0x4903 2024 0x4013 2024 0x3 2024 | | |
| Description | Interrupt request raw status register (for debug purpose). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|------------------|----|---|---|--------------|---|---|---|--------|---|---|---|----------|--|--|--|-------------|--|--|--|-------------------|--|--|--|--------------|--|--|--|--------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | UP_IRQ_FULL | | | | UP_IRQ_ALST_FULL | | | | UP_IRQ_EMPTY | | | | UP_IRQ | | | | RESERVED | | | | DN_IRQ_FULL | | | | DN_IRQ_ALST_EMPTY | | | | DN_IRQ_EMPTY | | | | DN_IRQ | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11 | UP_IRQ_FULL | FIFO-uplink-full signal appears when a write access is performed and the FIFO uplink is already full. Read 0x0: No event pending Write 0x0: No action Write 0x1: Set the event (for debug) Read 0x1: Event pending | RW | 0 |
| 10 | UP_IRQ_ALST_FULL | FIFO uplink almost-full signal appears when the FIFO uplink contains (FIFO uplink size – 1) elements. Read 0x0: No event pending Write 0x0: No action Write 0x1: Set the event (for debug) Read 0x1: Event pending | RW | 0 |
| 9 | UP_IRQ_EMPTY | FIFO uplink empty signal appears when a read access is done and FIFO uplink already empty. Read 0x0: No event pending Write 0x0: No action Write 0x1: Set the event (for debug) Read 0x1: Event pending | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|-------|
| 8 | UP_IRQ | FIFO uplink interrupt appears when the number of data present in the FIFO uplink has reached the value of the FIFO uplink threshold. Read 0x0: No event pending Write 0x0: No action Write 0x1: Set the event (for debug) Read 0x1: Event pending | RW | 0 |
| 7:4 | RESERVED | Reserved | R | 0x0 |
| 3 | DN_IRQ_FULL | FIFO downlink full signal appears when the FIFO uplink is full and another a write access is performed. Read 0x0: No event pending Write 0x0: No action Write 0x1: Set the event (for debug) Read 0x1: Event pending | RW | 0 |
| 2 | DN_IRQ_ALST_EMPTY | FIFO downlink almost empty signal appears when the FIFO downlink contains only one element. Read 0x0: No event pending Write 0x0: No action Write 0x1: Set the event (for debug) Read 0x1: Event pending | RW | 0 |
| 1 | DN_IRQ_EMPTY | FIFO-downlink-empty signal appears when read access is performed and FIFO downlink is already empty. Read 0x0: No event pending Write 0x0: No action Write 0x1: Set the event (for debug) Read 0x1: Event pending | RW | 0 |
| 0 | DN_IRQ | FIFO downlink status is set when the number of data is below the FIFO downlink threshold value. Read 0x0: No event pending Write 0x0: No action Write 0x1: Set the event (for debug) Read 0x1: Event pending | RW | 0 |

Table 24-480. Register Call Summary for Register MCPDM_IRQSTATUS_RAW

Multichannel PDM Controller

- [McPDM Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [McPDM Register Summary: \[14\]](#)

Table 24-481. MCPDM_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0028 | | |
| Physical Address | 0x4903 2028 0x4013 2028 0x3 2028 | Instance | MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Description | Interrupt request status register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-------------|------------------|--------------|--------|----------|---|---|---|-------------|-------------------|--------------|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | | | | UP_IRQ_FULL | UP_IRQ_ALST_FULL | UP_IRQ_EMPTY | UP_IRQ | RESERVED | | | | DN_IRQ_FULL | DN_IRQ_ALST_EMPTY | DN_IRQ_EMPTY | DN_IRQ |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11 | UP_IRQ_FULL | FIFO-uplink-full signal appears when a write access is performed and the FIFO uplink is already full. Read 0x0: No event pending Write 0x0: No action Write 0x1: Clear pending event Read 0x1: Event pending | RW | 0 |
| 10 | UP_IRQ_ALST_FULL | FIFO uplink almost-full signal appears when the FIFO uplink contains (FIFO uplink size – 1) elements. Read 0x0: No event pending Write 0x0: No action Write 0x1: Clear pending event Read 0x1: Event pending | RW | 0 |
| 9 | UP_IRQ_EMPTY | FIFO uplink empty signal appears when a read access is done and FIFO uplink already empty. Read 0x0: No event pending Write 0x0: No action Write 0x1: Clear pending event Read 0x1: Event pending | RW | 0 |
| 8 | UP_IRQ | FIFO uplink interrupt appears when the number of data present in the FIFO uplink has reached the value of the FIFO uplink threshold. Read 0x0: No event pending Write 0x0: No action Write 0x1: Clear pending event Read 0x1: Event pending | RW | 0 |
| 7:4 | RESERVED | | R | 0x0 |
| 3 | DN_IRQ_FULL | FIFO downlink full signal appears when the FIFO uplink is full and another a write access is performed. Read 0x0: No event pending Write 0x0: No action Write 0x1: Clear pending event Read 0x1: Event pending | RW | 0 |
| 2 | DN_IRQ_ALST_EMPTY | FIFO downlink almost empty signal appears when the FIFO downlink contains only one element. Read 0x0: No event pending Write 0x0: No action Write 0x1: Clear pending event Read 0x1: Event pending | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|---------------|-------|
| 1 | DN_IRQ_EMPTY | FIFO-downlink-empty signal appears when read access is performed and FIFO downlink is already empty. Read 0x0: No event pending Write 0x0: No action Write 0x1: Clear pending event Read 0x1: Event pending | RW W1toSet | 0 |
| 0 | DN_IRQ | FIFO downlink status is set when the number of data is below the FIFO downlink threshold value. Read 0x0: No event pending Write 0x0: No action Write 0x1: Clear pending event Read 0x1: Event pending | RW | 0 |

Table 24-482. Register Call Summary for Register MCPDM_IRQSTATUS

Multichannel PDM Controller

- [McPDM Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [McPDM Events Servicing: \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\]](#)
- [McPDM Register Summary: \[30\]](#)

Table 24-483. MCPDM_IRQENABLE_SET

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 002C | Instance | MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Physical Address | 0x4903 202C 0x4013 202C 0x3 202C | | |
| Description | Interrupt request enable set register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|-----------------------|----|---|---|-------------------|---|---|---|-------------|---|---|---|----------|--|--|--|--|--|--|--|------------------|--|--|--|------------------------|--|--|--|-------------------|--|--|--|-------------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | UP_IRQ_FULL_MASK | | | | UP_IRQ_ALST_FULL_MASK | | | | UP_IRQ_EMPTY_MASK | | | | UP_IRQ_MASK | | | | RESERVED | | | | | | | | DN_IRQ_FULL_MASK | | | | DN_IRQ_ALST_EMPTY_MASK | | | | DN_IRQ_EMPTY_MASK | | | | DN_IRQ_MASK | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11 | UP_IRQ_FULL_MASK | FIFO-uplink-full event interrupt enabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------|
| 10 | UP_IRQ_ALST_FULL_MASK | FIFO-uplink-almost-full event interrupt enabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled | RW | 0 |
| 9 | UP_IRQ_EMPTY_MASK | FIFO-uplink-empty event interrupt enabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled | RW | 0 |
| 8 | UP_IRQ_MASK | FIFO-uplink-read-request event interrupt enabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled | RW | 0 |
| 7:4 | RESERVED | | R | 0x0 |
| 3 | DN_IRQ_FULL_MASK | FIFO-downlink-full event interrupt enabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled | RW | 0 |
| 2 | DN_IRQ_ALST_EMPTY_MASK | FIFO downlink almost-empty event interrupt enabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled | RW | 0 |
| 1 | DN_IRQ_EMPTY_MASK | FIFO-downlink-empty event interrupt enabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled | RW | 0 |
| 0 | DN_IRQ_MASK | FIFO downlink write-request event interrupt enabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled | RW | 0 |

Table 24-484. Register Call Summary for Register MCPDM_IRQENABLE_SET

Multichannel PDM Controller

- [McPDM Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [Global Initialization: \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [McPDM Register Summary: \[17\]](#)

Table 24-485. MCPDM_IRQENABLE_CLR

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0030 | Instance | MCPDM_L3 MCPDM_CORTX-A9 MCPDM_DSP |
| Physical Address | 0x4903 2030 0x4013 2030 0x3 2030 | | |
| Description | Interrupt request enable clear register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|----|----|-----------------------|----|---|---|-------------------|---|---|---|-------------|---|---|---|----------|--|--|--|------------------|--|--|--|------------------------|--|--|--|-------------------|--|--|--|-------------|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | UP_IRQ_FULL_MASK | | | | UP_IRQ_ALST_FULL_MASK | | | | UP_IRQ_EMPTY_MASK | | | | UP_IRQ_MASK | | | | RESERVED | | | | DN_IRQ_FULL_MASK | | | | DN_IRQ_ALST_EMPTY_MASK | | | | DN_IRQ_EMPTY_MASK | | | | DN_IRQ_MASK | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|--|------|----------|
| 31:12 | RESERVED | | R | 0x000000 |
| 11 | UP_IRQ_FULL_MASK | FIFO-uplink-full event interrupt disabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW | 0 |
| 10 | UP_IRQ_ALST_FULL_MASK | FIFO-uplink-almost-full event interrupt disabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW | 0 |
| 9 | UP_IRQ_EMPTY_MASK | FIFO-uplink-empty event interrupt disabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW | 0 |
| 8 | UP_IRQ_MASK | FIFO-uplink-read-request event interrupt disabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW | 0 |
| 7:4 | RESERVED | | R | 0x0 |
| 3 | DN_IRQ_FULL_MASK | FIFO-downlink-full event interrupt disabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|---|------|-------|
| 2 | DN_IRQ_ALST_EMPTY_MASK | FIFO downlink almost-empty event interrupt disabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW | 0 |
| 1 | DN_IRQ_EMPTY_MASK | FIFO-downlink-empty event interrupt disabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW | 0 |
| 0 | DN_IRQ_MASK | FIFO downlink write-request event interrupt disabling bit. Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW | 0 |

Table 24-486. Register Call Summary for Register MCPDM_IRQENABLE_CLR

Multichannel PDM Controller

- [McPDM Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [McPDM Register Summary: \[9\]](#)

Table 24-487. MCPDM_IRQWAKEEN

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0034 | Instance | MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Physical Address | 0x4903 2034 0x4013 2034 0x3 2034 | | |
| Description | Interrupt request wake-up enable register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------------------|---|------------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | IRQ_WAKEUP_UP_EN | | IRQ_WAKEUP_DN_EN | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | IRQ_WAKEUP_UP_EN | Enabling/disabling bit for wake-up request generation upon a FIFO-uplink-read-request event. 0x0: Disable the wake-up request generation 0x1: Enable the wake-up request generation | RW | 1 |
| 0 | IRQ_WAKEUP_DN_EN | Enabling/disabling bit for wake-up by FIFO downlink write-request event. 0x0: Disable the wake-up request generation 0x1: Enable the wake-up request generation | RW | 1 |

Table 24-488. Register Call Summary for Register MCPDM_IRQWAKEEN

Multichannel PDM Controller

- [McPDM Power Management: \[0\] \[1\] \[2\]](#)
- [McPDM Register Summary: \[3\]](#)

Table 24-489. MCPDM_DMAENABLE_SET

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0038 | Instance | MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Physical Address | 0x4903 2038 0x4013 2038 0x3 2038 | | |
| Description | DMA request enable set register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---------------|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DMA_UP_ENABLE | DMA_DN_ENABLE |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | DMA_UP_ENABLE | Uplink path DMA request generation enabling bit. Read 0x0: DMA request disabled Write 0x0: No action Write 0x1: Enable DMA request Read 0x1: DMA request enabled | RW | 0 |
| 0 | DMA_DN_ENABLE | Downlink path DMA request generation enabling bit. Read 0x0: DMA request disabled Write 0x0: No action Write 0x1: Enable DMA request Read 0x1: DMA request enabled | RW | 0 |

Table 24-490. Register Call Summary for Register MCPDM_DMAENABLE_SET

Multichannel PDM Controller

- [McPDM DMA Requests: \[0\] \[1\] \[2\] \[3\]](#)
- [Global Initialization: \[4\] \[5\]](#)
- [McPDM Register Summary: \[6\]](#)

Table 24-491. MCPDM_DMAENABLE_CLR

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 003C | | |
| Physical Address | 0x4903 203C 0x4013 203C 0x3 203C | Instance | MCPDM_L3 MCPDM_CORTEx-A9 MCPDM_DSP |
| Description | DMA request enable clear register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---------------|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DMA_UP_ENABLE | DMA_DN_ENABLE |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | DMA_UP_ENABLE | Uplink path DMA request generation disabling bit. Read 0x0: DMA request disabled Write 0x0: No action Write 0x1: Disable DMA request Read 0x1: DMA request enabled | RW | 0 |
| 0 | DMA_DN_ENABLE | Downlink path DMA request generation disabling bit. Read 0x0: DMA request disabled Write 0x0: No action Write 0x1: Disable DMA request Read 0x1: DMA request enabled | RW | 0 |

Table 24-492. Register Call Summary for Register MCPDM_DMAENABLE_CLR

- Multichannel PDM Controller
- [McPDM DMA Requests: \[0\] \[1\] \[2\] \[3\]](#)
 - [McPDM Register Summary: \[4\]](#)

Table 24-493. MCPDM_DMAWAKEEN

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0040 | | |
| Physical Address | 0x4903 2040 0x4013 2040 0x3 2040 | Instance | MCPDM_L3 MCPDM_CORTEx-A9 MCPDM_DSP |
| Description | DMA request wake-up enable register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|------------------|------------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DMA_WAKEUP_UP_EN | DMA_WAKEUP_DN_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | DMA_WAKEUP_UP_EN | Enabling/disabling bit for wake-up request generation upon an uplink path DMA request. 0x0: Disable the wake-up request generation 0x1: Enable the wake-up request generation | RW | 1 |
| 0 | DMA_WAKEUP_DN_EN | Enabling/disabling bit for wake-up request generation upon a downlink path DMA request. 0x0: Disable the wake-up request generation 0x1: Enable the wake-up request generation | RW | 1 |

Table 24-494. Register Call Summary for Register MCPDM_DMAWAKEEN

Multichannel PDM Controller

- [McPDM Power Management: \[0\] \[1\] \[2\]](#)
- [McPDM Register Summary: \[3\]](#)

Table 24-495. MCPDM_CTRL

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0044 | Instance | MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Physical Address | 0x4903 2044 0x4013 2044 0x3 2044 | | |
| Description | MCPDM control register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|---------|-----------|-----------|------------|---------|--------------|------------|------------|------------|------------|------------|------------|------------|------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WD_EN | DIV_SEL | SW_DN_RST | SW_UP_RST | STATUS_INT | CMD_INT | PDMOUTFORMAT | PDM_DN5_EN | PDM_DN4_EN | PDM_DN3_EN | PDM_DN2_EN | PDM_DN1_EN | PDM_UP3_EN | PDM_UP2_EN | PDM_UP1_EN | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:15 | RESERVED | Reserved | R | 0x00000 |
| 14 | WD_EN | This bit is used to enable or disable the pulse-density modulator watchdog logic. 0x0: Disabled (default after reset) 0x1: Enabled | RW | 0 |
| 13 | DIV_SEL | Multiply by 2 the FS of the uplink path 0x0: FS = 88.2 kHz, or 96 kHz 0x1: FS = 176.4 kHz, or 192 kHz | RW | 0 |
| 12 | SW_DN_RST | Software reset of the downlink path. 0x0: Downlink path is out of reset. 0x1: Reset of the downlink path | RW | 0 |
| 11 | SW_UP_RST | Software reset of the uplink path. 0x0: Uplink path is out of reset. 0x1: Reset of the uplink path | RW | 0 |
| 10 | STATUS_INT | Status channel enabling/disabling bit. 0x0: Status channel is disabled. 0x1: Status channel is enabled. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------|
| 9 | CMD_INT | Command channel enabling/disabling bit. 0x0: Command channel is disabled. 0x1: Command channel is enabled. | RW | 0 |
| 8 | PDMOUTFORMAT | Audio format selection: 0x0: Left justification with eight 0-bit padding added for the less significant bits 0x1: Right justification with sign bit extended to the 8 MSBs | RW | 0 |
| 7 | PDM_DN5_EN | Audio downlink channel 5 enabling/disabling bit | RW | 0 |
| 6 | PDM_DN4_EN | Audio downlink channel 4 enabling/disabling bit | RW | 0 |
| 5 | PDM_DN3_EN | Audio downlink channel 3 enabling/disabling bit | RW | 0 |
| 4 | PDM_DN2_EN | Audio downlink channel 2 enabling/disabling bit | RW | 0 |
| 3 | PDM_DN1_EN | Audio downlink channel 1 enabling/disabling bit | RW | 0 |
| 2 | PDM_UP3_EN | Audio uplink channel 3 enabling/disabling bit | RW | 0 |
| 1 | PDM_UP2_EN | Audio uplink channel 2 enabling/disabling bit | RW | 0 |
| 0 | PDM_UP1_EN | Audio uplink channel 1 enabling/disabling bit | RW | 0 |

Table 24-496. Register Call Summary for Register MCPDM_CTRL

Multichannel PDM Controller

- [Protocols and Data Formats in Normal Mode: \[0\]](#)
- [Protocols and Data Formats in Command Mode: \[1\] \[2\] \[3\]](#)
- [Protocols and Data Formats in Status Mode: \[4\] \[5\] \[6\]](#)
- [McPDM Software Reset: \[7\] \[8\] \[9\] \[10\]](#)
- [McPDM Power Management: \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [Uplink Path Description: \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [Downlink Path Description: \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\]](#)
- [Global Initialization: \[32\] \[33\] \[34\]](#)
- [McPDM Events Servicing: \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\] \[44\] \[45\]](#)
- [McPDM Register Summary: \[46\]](#)

Table 24-497. MCPDM_DN_DATA

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0048 | Instance | MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Physical Address | 0x4903 2048 0x4013 2048 0x3 2048 | | |
| Description | Downlink path data register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DN_DATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------|------|-------------|
| 31:0 | DN_DATA | Downlink path data value | RW | 0x0000 0000 |

Table 24-498. Register Call Summary for Register MCPDM_DN_DATA

Multichannel PDM Controller

- [Protocols and Data Formats in Command Mode: \[0\] \[1\]](#)
- [Downlink Path Description: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [McPDM Events Servicing: \[11\]](#)
- [McPDM Register Summary: \[12\]](#)

Table 24-499. MCPDM_UP_DATA

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 004C | | |
| Physical Address | 0x4903 204C 0x4013 204C 0x3 204C | Instance | MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Description | Uplink path data register. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| UP_DATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------|------|-------------|
| 31:0 | UP_DATA | Uplink path data value | R | 0x0000 0000 |

Table 24-500. Register Call Summary for Register MCPDM_UP_DATA

Multichannel PDM Controller

- [Protocols and Data Formats in Status Mode: \[0\] \[1\]](#)
- [Uplink Path Description: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [McPDM Events Servicing: \[10\]](#)
- [McPDM Register Summary: \[11\]](#)

Table 24-501. MCPDM_FIFO_CTRL_DN

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0050 | | |
| Physical Address | 0x4903 2050 0x4013 2050 0x3 2050 | Instance | MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Description | FIFO downlink control register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | DN_TRESH | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------------------|------|--------|
| 31:4 | RESERVED | Reserved | R | 0x0000 |
| 3:0 | DN_TRESH | FIFO downlink threshold value | RW | 0x2 |

Table 24-502. Register Call Summary for Register MCPDM_FIFO_CTRL_DN

Multichannel PDM Controller

- [McPDM Power Management: \[0\]](#)
- [Downlink Path Description: \[1\] \[2\]](#)
- [Global Initialization: \[3\]](#)
- [McPDM Register Summary: \[4\]](#)

Table 24-503. MCPDM FIFO CTRL UP

| | | |
|-------------------------|--|---|
| Address Offset | 0x0000 0054 | |
| Physical Address | 0x4903 2054 0x4013 2054 0x3 2054 | Instance MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Description | FIFO uplink control register. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | UP TRESH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------------|------|--------|
| 31:4 | RESERVED | Reserved | R | 0x0000 |
| 3:0 | UP_TRESH | FIFO uplink threshold value | RW | 0x2 |

Table 24-504. Register Call Summary for Register MCPDM FIFO CTRL UP

Multichannel PDM Controller

- McPDM Power Management: [0]
- Uplink Path Description: [1] [2] [3]
- Global Initialization: [4]
- McPDM Register Summary: [5]

Table 24-505. MCPDM_DN_OFFSET

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0058 | | |
| Physical Address | 0x4903 2058 0x4013 2058 0x3 2058 | Instance | MCPDM_L3 MCPDM_CORTEX-A9 MCPDM_DSP |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|----------------|----------|---|-------------|---|---|---|---|---|----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DN_OFST_RX2 | | | | | | DN_OFST_RX2_EN | RESERVED | | DN_OFST_RX1 | | | | | | DN_OFST_RX1_EN |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|---------|
| 31:14 | RESERVED | Reserved | R | 0x00000 |
| 13:9 | DN_OFST_RX2 | Offset value for the audio downlink channel 2 | RW | 0x00 |
| 8 | DN_OFST_RX2_EN | Offset cancellation feature enabling/disabling bit for the audio downlink channel 2. 0x0: Offset cancellation disabled. 0x1: Offset cancellation enabled. | RW | 0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5:1 | DN_OFST_RX1 | Offset value for the audio downlink channel 1 | RW | 0x00 |
| 0 | DN_OFST_RX1_EN | Offset cancellation feature enabling/disabling bit for the audio downlink channel 1. 0x0: Offset cancellation disabled. 0x1: Offset cancellation enabled. | RW | 0 |

Table 24-506. Register Call Summary for Register MCPDM_DN_OFFSET

Multichannel PDM Controller

- [Downlink Path Description](#): [0] [1] [2] [3]
 - [Global Initialization](#): [4] [5] [6] [7]
 - [McPDM Register Summary](#): [8]
-

24.7 Digital Microphone Module

This section describes the digital microphone (DMIC) module.

24.7.1 DMIC Overview

The digital microphone (DMIC) module consists of an audio module dedicated to a mobile telephone terminal. The DMIC allows the support of up to six digital microphones. It provides an interface between the audio backend (ABE) module and microphones connected through the 6-wire DMIC serial interface.

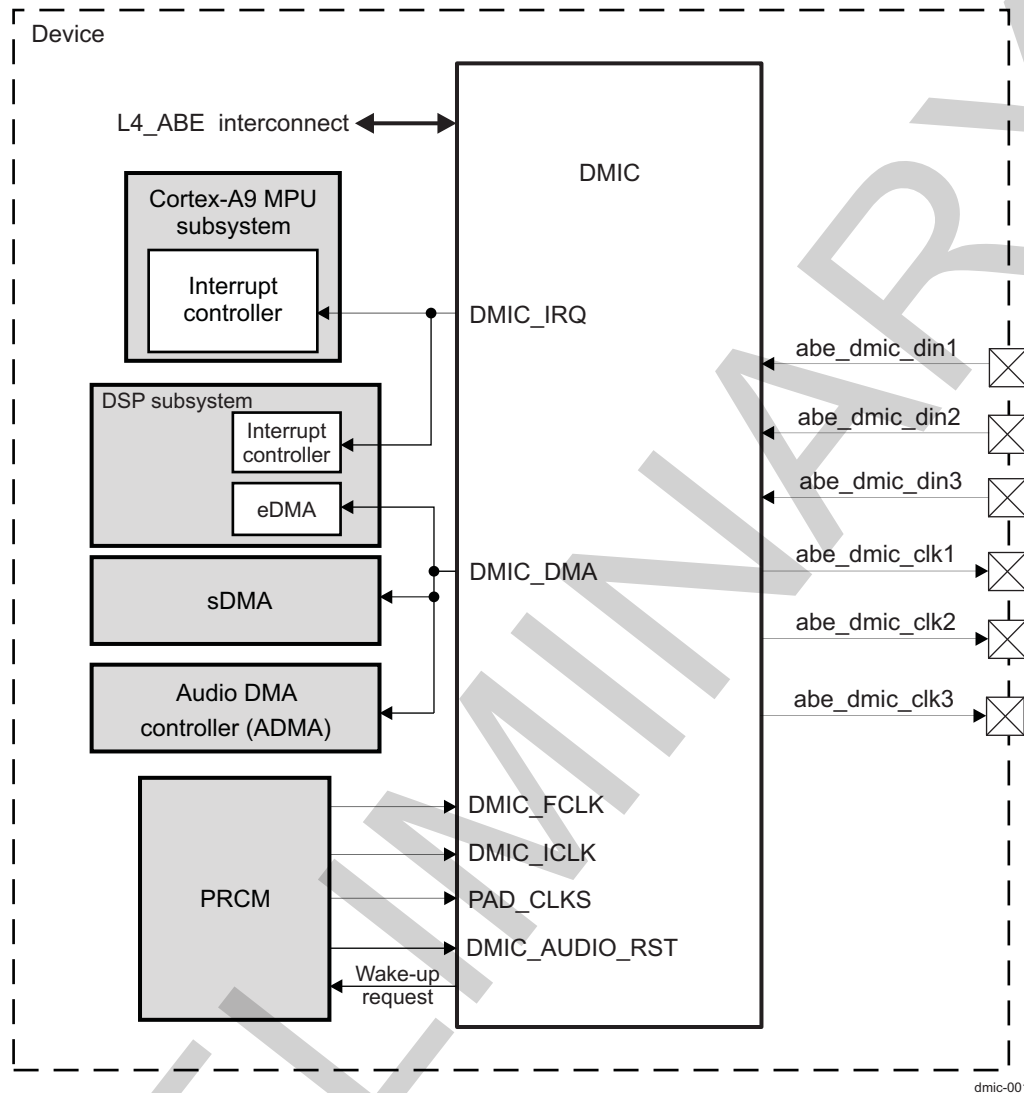
The DMIC supports six paths. Because each path is composed of two digital microphone channels, the DMIC can be used with three stereo or six mono microphones. Each path is enabled or disabled independently.

The DMIC generates a pulse-density modulated (PDM) stream of bits and transfers it in one period or one half-period of the clock provided by the DMIC (oversampling clock).

Each microphone is directly connected to a filter decimator to extract the audio samples at the desired accuracy and sample rate. Data are stored in the first in first out (FIFO), which is controlled by interrupt request (IRQ) and direct memory access (DMA) request.

The DMIC pads are supplied with 1.8 V. These pads assure the transition to the host supply.

[Figure 24-175](#) shows the DMIC in the device.

Figure 24-175. DMIC

The main features of the DMIC are:

- Six external pin connections (three data lines and three clock lines)
- Using the three clock lines, the DMIC delivers three clock signals (same frequency, individually gateable) for all digital microphones.
- Using the three data lines, the DMIC receives audio data from external microphones.
- Supports stereo (up to three) and mono (up to six) digital microphones
- Each line can support two microphones working in clock phase opposition.
- Selectable functional clock source
- Programmable output clock frequency ($32 \times FS$, $50 \times FS$, $64 \times FS$, or $80 \times FS$, where $FS = 48 \text{ kHz}$)
- Programmable data sampling sensibility (rising or falling edge)
- One RX FIFO (16 words of 144 bits)
- Supports idle request/acknowledge power, reset, and clock management (PRCM) module protocol
- Interconnect sample format: 32 bits (only 24 are significant)
- One IRQ to the microprocessor unit (Cortex™-A9 microprocessor unit [MPU]) and digital signal processor (DSP) subsystems
- One DMA request capability on programmable FIFO threshold

24.7.2 DMIC Environment

This section describes the DMIC application fields from an environment point of view (that is, external connections). It presents the DMIC connectivity options, lists possible interfaces, and details the protocol and data format used in each case.

24.7.2.1 DMIC Interface With External MIC

24.7.2.1.1 DMIC Interface Overview

The DMIC interface is a 6-wire interface. The DMIC module can support up to three external stereo and six mono digital microphones. A DMIC is an external module that can deliver data. A clock is sent from the host to the microphone.

Figure 24-176 and Figure 24-177 show two cases of use of the DMIC, but all configurations are possible with stereo and mono digital microphones. The output of the DMIC is in 32-bit format.

Figure 24-176 shows the DMIC used with three stereo DMICs.

Figure 24-176. DMIC With Three Stereo DMICs

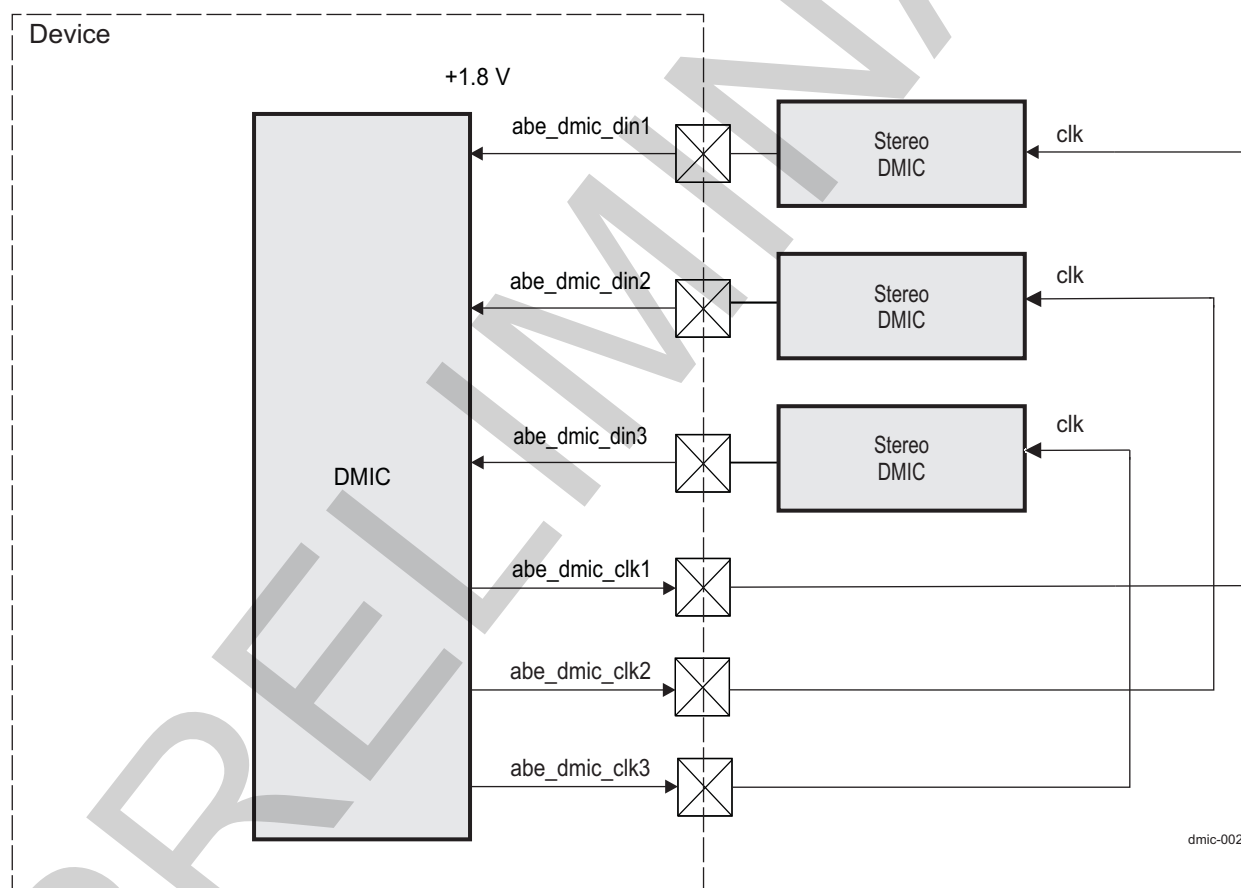


Figure 24-177 shows the DMIC used with six mono DMICs.

dmic-002

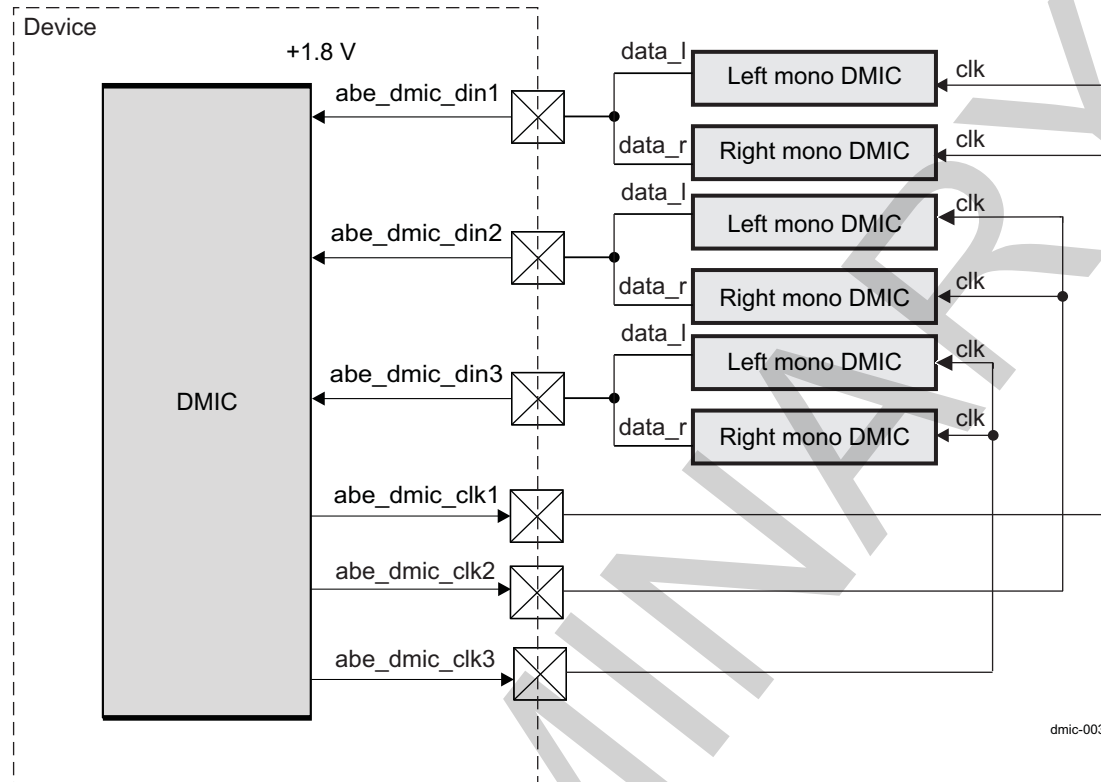
Figure 24-177. DMIC With Six Mono DMICs**24.7.2.1.2 DMIC Signals**

Table 24-507 describes the signals in the DMIC module.

Table 24-507. Input/Output

| Signal Name | I/O ⁽¹⁾ | Description | Reset Value ⁽¹⁾ |
|---------------|--------------------|--|----------------------------|
| abe_dmic_clk1 | O | Digital (stereo) microphone clock output 1 | 0 |
| abe_dmic_clk2 | O | Digital (stereo) microphone clock output 2 | 0 |
| abe_dmic_clk3 | O | Digital (stereo) microphone clock output 3 | 0 |
| abe_dmic_din1 | I | Digital (stereo) microphone data input 1 | Hi-Z |
| abe_dmic_din2 | I | Digital (stereo) microphone data input 2 | Hi-Z |
| abe_dmic_din3 | I | Digital (stereo) microphone data input 3 | Hi-Z |

⁽¹⁾ I = Input; O = Output; Hi-Z = High impedance

All DMIC external connections have pullup or pulldown resistors, selected and configured in the control module registers.

24.7.2.1.3 Serial Data Format

The DMIC generates a PDM stream of bits and transfers it in one period or one half-period of the clock. Then, the filter decimator extracts the 24-bit audio samples.

24.7.2.1.3.1 DMIC Clock Generation and Synchronization

When DMIC_POLAR is set to 0, the microphone left data is generated on the abe_dmic_clk low level. When DMIC_POLAR is set to 1, the microphone left data is generated on the abe_dmic_clk high level. There are three DMIC_POLARx bits (where x = 1, 2, or 3) corresponding to the three stereo paths:

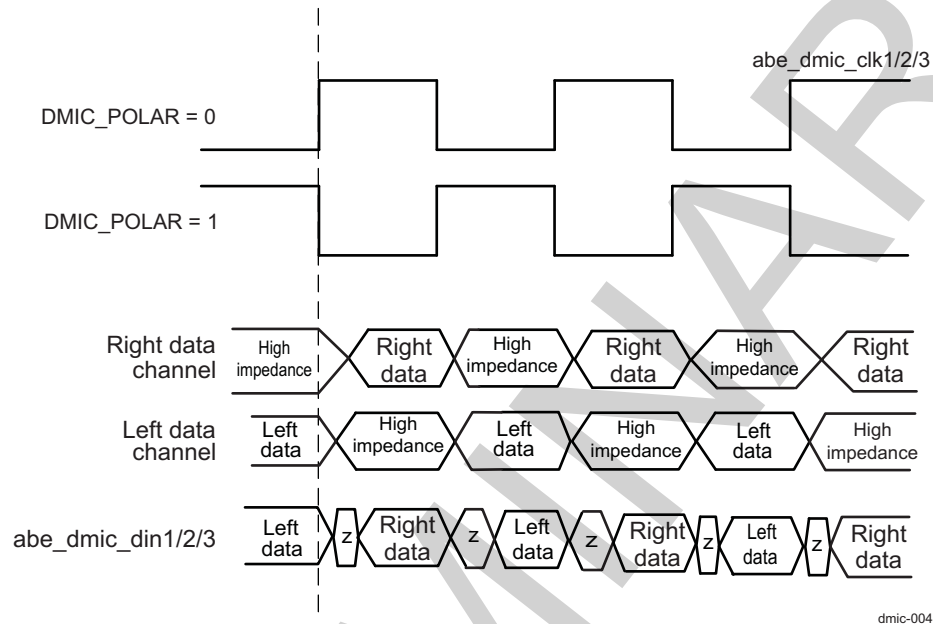
- **DMIC_CTRL[4]** for path 1

- [DMIC_CTRL\[5\]](#) for path 2
- [DMIC_CTRL\[6\]](#) for path 3

The DMIC_POLARx bits are set depending on the configuration of the external digital microphone.

[Figure 24-178](#) is a diagram of the DMIC interface with a DMIC.

Figure 24-178. DMIC Interface Diagram With External DMICs



24.7.2.2 DMIC Functional Path

The DMIC path processes, decimates, and filters the data from the DMIC interface, and stores the processed data in the FIFO. The FIFO is controlled by IRQ and DMA requests and is fed outside of the DMIC.

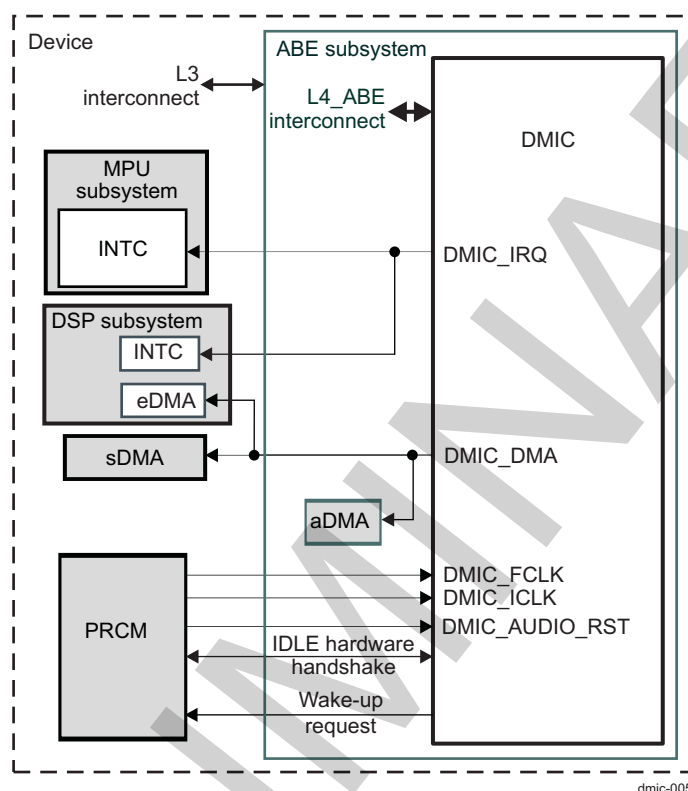
For more information about microphone data processing, see [Section 24.7.4.7, Audio Data Processing](#).

24.7.3 DMIC Integration

This section describes the integration of the DMIC in the device, and includes information about clocks, resets, and hardware requests.

Figure 24-179 shows the DMIC integration.

Figure 24-179. DMIC Integration



NOTE: For more information about the IDLE hardware handshake and the wake-up request, see [Section 3.1.1.1.2, Module Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

The DMIC integration includes:

- One functional clock
- One interface clock
- One IRQ
- One sDMA/aDMA/eDMA request
- IDLE hardware handshake
- Wake-up request

[Table 24-508](#) through [Table 24-510](#) summarize the integration of the module in the device.

Table 24-508. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| DMIC | PD_AUDIO | Yes | L4_ABE |

Table 24-509. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|-------------------------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| DMIC | DMIC_ICLK | ABE_ICLK2 | PRCM | Interface clock |
| | DMIC_FCLK | DMIC_ABE_FCLK | PRCM | Functional clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| DMIC | DMIC_AUDIO_RST | AUDIO_RST | PRCM | Module hardware reset, nonretention |

Table 24-510. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|----------------|---|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| DMIC | DMIC_IRQ | D_IRQ_83 | DSP | DMIC interrupt to the DSP subsystem |
| | DMIC_IRQ | MA_IRQ_114 | Cortex™-A9 MPU | DMIC interrupt to the Cortex-A9 MPU subsystem |
| DMA Requests | | | | |
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| DMIC | DMIC_DMA | S_DMA_66 | sDMA | DMA request to the system DMA (sDMA) |
| | DMIC_DMA | A_DMA_1 | aDMA | DMA request to the audio DMA (aDMA) |
| | DMIC_DMA | D_DMA_44 | eDMA | DMA request to the DSP DMA (eDMA) |

NOTE:

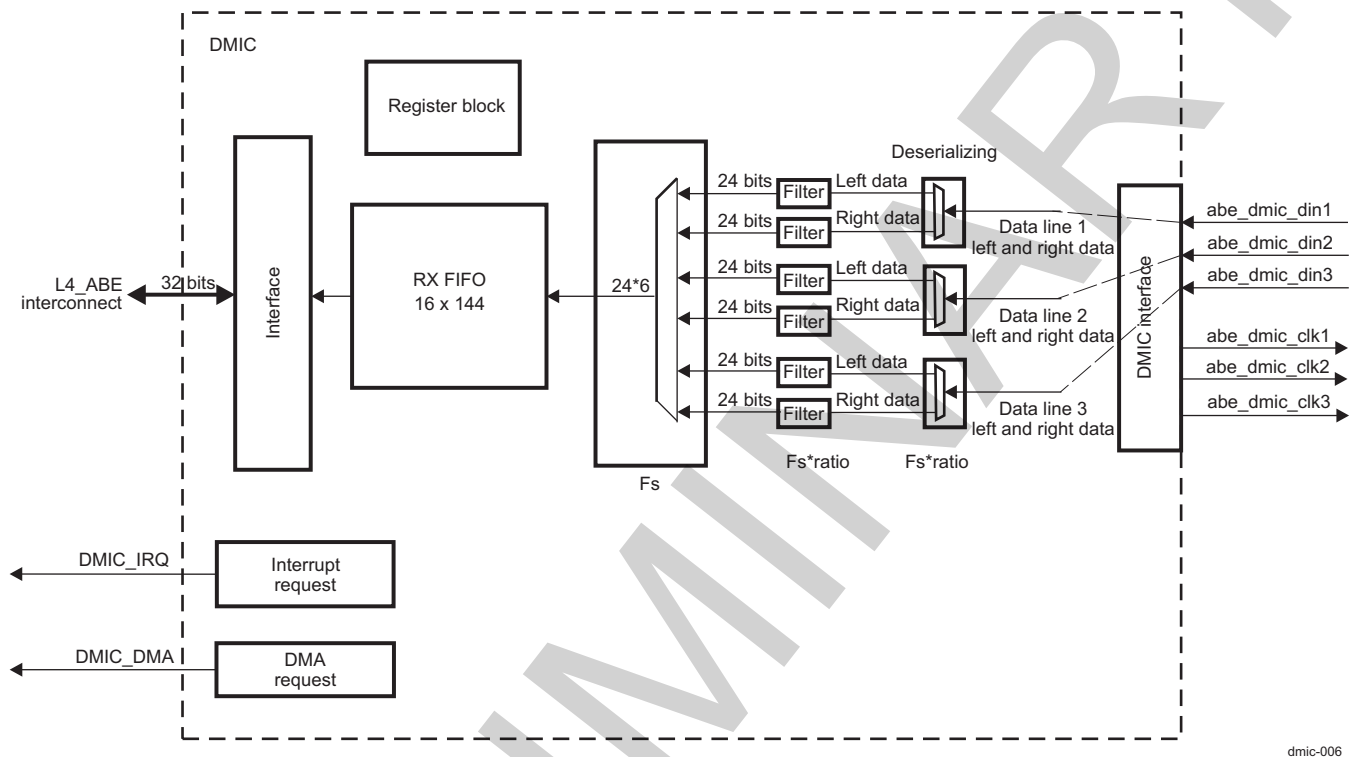
- For a description of the interrupt source, see [Section 24.7.4.5, Interrupt Requests](#).
- For a description of the DMA source, see [Section 24.7.4.6, DMA Requests](#).
- For information about PRCM clock gating and management and PRCM reset sources and distribution, see , *Power Domain*, in [Chapter 3, Power, Reset, and Clock Management](#).

24.7.4 DMIC Functional Description

24.7.4.1 Block Diagram

Figure 24-180 is the DMIC block diagram.

Figure 24-180. DMIC Block Diagram

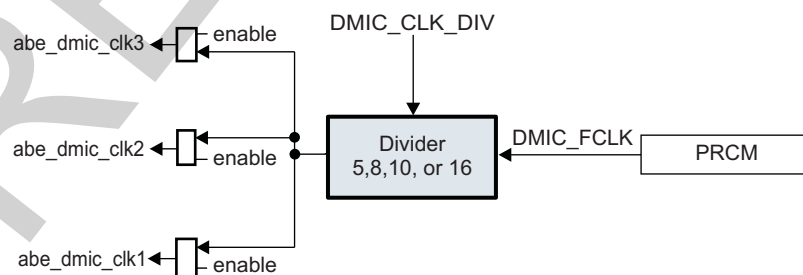


24.7.4.2 DMIC Clock Configuration

The DMIC operates from one interface clock to interface with the L4-ABE interconnect and one selectable (among three) functional clock. These clocks are provided by the PRCM module. For the interface clock, request and acknowledge are set up between the PRCM module and the DMIC.

Figure 24-181 shows the DMIC clock selection.

Figure 24-181. DMIC Clock Selection



DMIC_FCLK is the source clock signal. Several source clocks are available and are selected according to the configuration of the [DMIC_CTRL\[9:7\]](#) DMIC_CLK_DIV bit field. For more information about

DMIC_FCLK selection, see [Figure 24-181](#). `abe_dmic_clkx` are the output clocks generated in the DMIC and are fed to the external microphones. They are also the internal clocks of the external microphones. The performance in terms of signal-to-noise ratio (SNR) depends on these clocks. Users must take care about the value of `abe_dmic_clkx` (the analog-to-digital converter [ADC] clock) when selecting the source clock (DMIC_FCLK). [Table 24-511](#) describes the `abe_dmic_clkx` generation.

Table 24-511. `abe_dmic_clkx` Generation

| DMIC_FCLK | DMIC_CLK_DIV | DMIC_FCLK/ <code>abe_dmic_clk</code> | <code>abe_dmic_clk</code> = ADC Clock | Ratio = <code>abe_dmic_clk</code> /FS = 48 kHz |
|------------|--------------|---|--|---|
| 19.2 MHz | 000 | 8 | 2.4 MHz | 50 |
| | 001 | 5 | 3.84 MHz | 80 |
| 24 MHz | 010 | 10 | 2.4 MHz | 50 |
| 24.576 MHz | 011 | 8 | 3.072 MHz | 64 |
| | 100 | 16 | 1.536 MHz | 32 |
| 12 MHz | 101 | 5 | 2.4 MHz | 50 |

The maximum clock on the interface is 3.84 MHz, with a source clock of 19.2 MHz.

24.7.4.3 DMIC Software Reset

[Table 24-512](#) lists the different types of software reset available at the module level.

Table 24-512. Reset Description

| Type | Name | Source | Description |
|----------|---|--------|--------------------------|
| Software | DMIC_SYSCONFIG[1] SOFTRESET | — | Module software reset |
| Software | DMIC_CTRL[10] SW_DMIC_RST | — | Reset-enabled DMIC paths |

The software path reset is gated by:

- [DMIC_CTRL\[0\]](#) DMIC_UP1_EN for path 1
- [DMIC_CTRL\[1\]](#) DMIC_UP2_EN for path 2
- [DMIC_CTRL\[2\]](#) DMIC_UP3_EN for path 3
- [DMIC_CTRL\[10\]](#) SW_DMIC_RST

When the [DMIC_CTRL\[10\]](#) SW_DMIC_RST bit is set to 1, the corresponding enabled DMIC paths are reset. Resets are cleared by writing 0.

NOTE: A software reset is required to change the configuration of enabled paths; for example, to disable path 3, a software reset of path 3 is mandatory for the change to be considered.

A module software reset can be performed by setting the [DMIC_SYSCONFIG\[1\]](#) SOFTRESET bit. This action starts a soft reset sequence.

The software reset status of the module can be checked by reading the [DMIC_SYSCONFIG\[0\]](#) SOFTRESET bit (0: reset is done; 1: reset is ongoing).

24.7.4.4 DMIC Power Management

[Table 24-513](#) describes the power-management features available for the DMIC.

Table 24-513. Local Power-Management Features

| Feature | Registers | Description |
|------------------|---|---|
| Clock autogating | N/A | Feature not available |
| Slave idle modes | DMIC_SYSCONFIG[3:2] SIDLEMODE | Force-idle, no-idle, smart-idle, and smart-idle wakeup capable modes are available. |
| Clock activity | N/A | Feature not available |

Table 24-513. Local Power-Management Features (continued)

| Feature | Registers | Description |
|------------------------|--|---|
| Master standby modes | N/A | Feature not available |
| Global wake-up enable | N/A | Feature not available |
| Wake-up sources enable | DMIC_IRQWAKEEN [0] IRQ_WAKEUP_EN DMIC_DMAWAKEEN [0] DMA_WAKEUP_EN | This register holds one active-high enable bit per event source that can generate a wake-up signal. |

24.7.4.5 DMIC Interrupt Requests

[Table 24-514](#) lists the event flags, and their mask, that can cause module interrupts.

Table 24-514. Interrupt Events

| Nonmaskable Event Flag ⁽¹⁾ | Maskable Event Flag | Event Mask Bit | Event Unmask Bit | Description |
|---|---|--|--|--|
| DMIC_IRQSTATUS_RAW[3] DMIC_IRQ_EMPTY | DMIC_IRQSTATUS[3] DMIC_IRQ_EMPTY | DMIC_IRQENABLE_CLR[3] DMIC_IRQ_EMPTY_MASK | DMIC_IRQENABLE_SET[3] DMIC_IRQ_EMPTY_MASK | FIFO empty event. This event occurs when the FIFO is already empty and a new word is read from the FIFO by software. |
| DMIC_IRQSTATUS_RAW[2] DMIC_IRQ_ALST_FULL | DMIC_IRQSTATUS[2] DMIC_IRQ_ALST_FULL | DMIC_IRQENABLE_CLR[2] DMIC_IRQ_ALST_FULL_MASK | DMIC_IRQENABLE_SET[2] DMIC_IRQ_ALST_FULL_MASK | FIFO almost-full event. This event occurs when the FIFO contains (FIFO size – 1) words and a new word is written to the FIFO. |
| DMIC_IRQSTATUS_RAW[1] DMIC_IRQ_FULL | DMIC_IRQSTATUS[1] DMIC_IRQ_FULL | DMIC_IRQENABLE_CLR[1] DMIC_IRQ_FULL_MASK | DMIC_IRQENABLE_SET[1] DMIC_IRQ_FULL_MASK | FIFO full event. This event occurs when the FIFO is already full and a new word is written to the FIFO. |
| DMIC_IRQSTATUS_RAW[0] DMIC_IRQ | DMIC_IRQSTATUS[0] DMIC_IRQ | DMIC_IRQENABLE_CLR[0] DMIC_IRQ_MASK | DMIC_IRQENABLE_SET[0] DMIC_IRQ_MASK | FIFO read request event. This event occurs when the number of words stored in the FIFO is equal to or greater than the FIFO threshold. |

⁽¹⁾ The DMIC_IRQSTATUS_RAW register is used primarily for debug purposes.

The interrupt line is asserted (active high) when one of the following signals appears:

- DMIC_IRQ_EMPTY
- DMIC_IRQ_ALST_FULL
- DMIC_IRQ_FULL
- DMIC_IRQ

Read the [DMIC_IRQSTATUS](#) register to determine which event occurs.

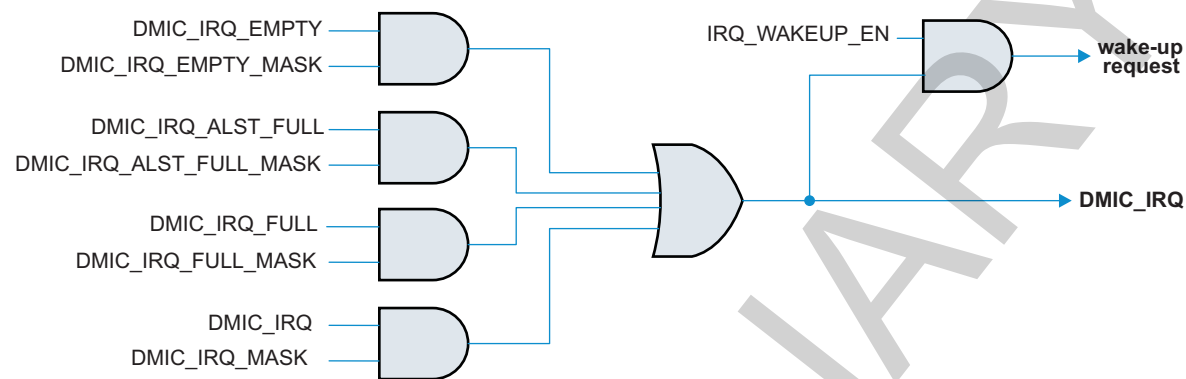
CAUTION

Interrupt lines must be cleared by software. Write 1 in the [DMIC_IRQSTATUS](#) register to clear the corresponding event.

An event can generate an IRQ when the corresponding mask bit in the [DMIC_IRQENABLE_SET](#) register is set to 1. Events are register bits that belong to the [DMIC_IRQSTATUS](#) and [DMIC_IRQSTATUS_RAW](#) registers (the same register accessed by two interconnect addresses). In the case of the [DMIC_IRQSTATUS_RAW](#) register, status event is set even if it is not enabled (used primarily for debug purposes). The [DMIC_IRQSTATUS](#) register is set by writing 1 to the [DMIC_IRQSTATUS_RAW](#) register.

Each internal interrupt signal can be masked by enabling the corresponding mask in the [DMIC_IRQENABLE_SET](#) register or disabling it in the [DMIC_IRQENABLE_CLR](#) register. This mechanism is defined in [Section 24.7.6, DMIC Register Manual](#).

[Figure 24-182](#) shows the interrupt tree with the event generated and the mask that enables or disables the event. All events are summarized to give the single interrupt generation.

Figure 24-182. Interrupt Tree

dmic-008

24.7.4.6 DMIC DMA Requests

The DMIC can generate one DMA request to the sDMA, aDMA, and eDMA controllers (see [Table 24-515](#)).

Table 24-515. DMIC DMA Request

| Name | Description | Enable DMA Bit | Disable DMA Bit |
|-----------------|---|--|--|
| DMIC_DMA_ENABLE | Data ready in FIFO (threshold is reached) | DMIC_DMAENABLE_SET [0] DMA_ENABLE | DMIC_DMAENABLE_CLR [0] DMA_ENABLE |

The DMA lines can be enabled or disabled depending on the value of the bits in the [DMIC_DMAENABLE_SET](#) and [DMIC_DMAENABLE_CLR](#) registers.

A DMA request is sent when data is ready in the FIFO. This request is used only to notify the host that data are ready in the FIFO.

24.7.4.7 Audio Data Processing

The DMIC supports six audio paths and can be used with three stereo or six mono microphones. Each path is independent and is enabled or disabled by using the following bits:

- [DMIC_CTRL](#)[0] DMIC_UP1_EN
- [DMIC_CTRL](#)[1] DMIC_UP2_EN
- [DMIC_CTRL](#)[2] DMIC_UP3_EN

24.7.4.7.1 Filtering

The external DMIC generates a PDM stream of bits and transfers it in one period or one half-period of the clock provided by the DMIC inside the device. The aim of the DMIC audio path is to process data from the DMIC interface, decimate and filter the data, and store the processed data in the FIFO.

The format of the DMIC data is 24 bits (the transfer format is 32 bits long). The following bits allow switching the polarity of the interface:

- [DMIC_CTRL](#)[4] DMIC_POLAR1
- [DMIC_CTRL](#)[5] DMIC_POLAR2
- [DMIC_CTRL](#)[6] DMIC_POLAR3

For more information, see [Section 24.7.2.1.3.1, DMIC Clock Generation and Synchronization](#).

Processed data from the DMIC interface are stored in the FIFO. The FIFO is controlled by the IRQ and DMA request and externally fed by the DMIC using the following interconnect format.

The three uplink paths are identical. Each uplink path is composed of a left and a right channel. The DMIC interface delivers six parallel data of 1 bit (3×2 paths of stereo data that can be used at six mono paths). Each bit goes to a filter. The aim of the filter is to limit the noise and perform decimation by factor D. Factor D depends on the DMIC_CLK_DIV register bits, as described in the ratio defined in [Table 24-511](#). The filters are sinc filter order 4. They are chosen with regard to the nature of the analog converter.

The format of the filter output is 24 bits.

24.7.4.8 FIFO Management

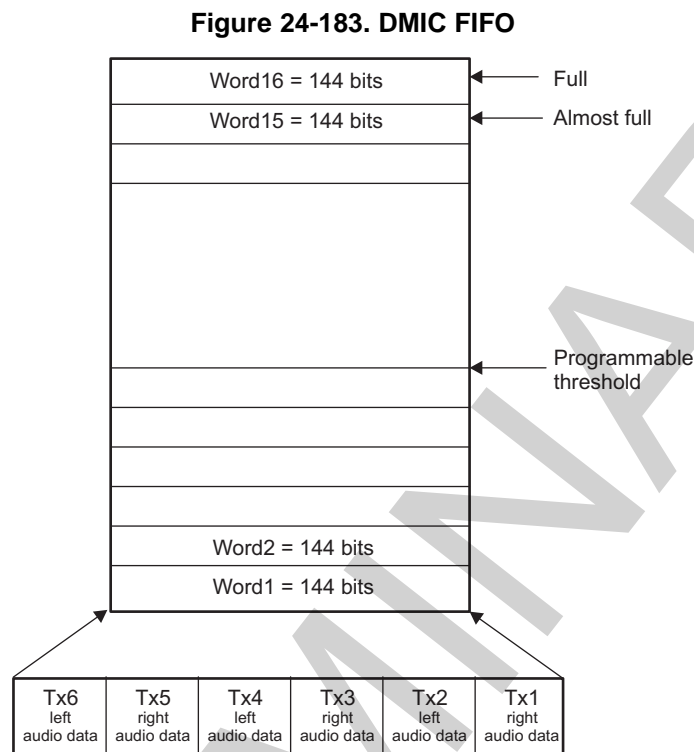
The DMIC implements an internal FIFO controlled by IRQ and DMA request. The host must read words in the FIFO. The interrupt line is used not only to inform the host that data are ready in the FIFO, but also to warn the host about events that can occur, such as FIFO full, almost full, or empty. A DMA request is used only to inform the host that data are ready in the FIFO.

24.7.4.8.1 FIFO General Description

The DMIC communicates with the host through L4-ABE interconnect access. DMIC audio data coming from external microphones are stored in the FIFO. The DMIC FIFO allows the exchange of information between the DMIC and the host. Each audio data is 24 bits long. The DMIC FIFO contains 16 words. Each word is the combination of six audio data ($24 \times 6 = 144$ bits) coming from the interface. The FIFO is controlled by interrupt lines and DMA requests. For more information about IRQs and DMA controls, see [Section 24.7.4.5, DMIC Interrupt Requests](#), and [Section 24.7.4.6, DMIC DMA Requests](#).

FIFO write access is done in the functional clock domain, and read access is done in the interface clock domain.

Figure 24-183 is an overview of the DMIC FIFO.



dmic-009

24.7.4.8.2 FIFO Operations

Audio data are filled in the FIFO from DMIC internal filters. The host must read words in the FIFO. The number of reads depends on the application that is configured by the following bits:

- [DMIC_CTRL\[0\]](#) DMIC_UP1_EN
- [DMIC_CTRL\[2\]](#) DMIC_UP3_EN
- [DMIC_CTRL\[1\]](#) DMIC_UP2_EN
- [DMIC_FIFO_CTRL\[3:0\]](#) DMIC_TRESH (FIFO threshold)

If only uplink path 2 and path 3 are enabled, for example, the Tx1 and Tx2 words are left and right data for path 2, and Tx3 and Tx4 are left and right data for path 3.

When the FIFO threshold is reached, and depending on conditions, an event is sent to the DMA handler. The host must read the exact number of words in the FIFO.

Two accesses are required to read a complete stereo audio path.

The number of read accesses from the host is determined by the following equation:

$$\text{Num_rd_access} = (\text{DMIC_UP1_EN} + \text{DMIC_UP2_EN} + \text{DMIC_UP3_EN}) \times 2 \times (\text{DMIC_TRESH})$$

The FIFO threshold is programmed through the [DMIC_FIFO_CTRL\[3:0\]](#) DMIC_TRESH bit field.

NOTE: If DMIC_TRESH = 1, the host is expected to perform $1 \times (\text{DMIC_UP1_EN} + \text{DMIC_UP2_EN} + \text{DMIC_UP3_EN}) \times 2$ read access every 96 kHz ($2 \times \text{FS}$).

If DMIC_TRESH = 2, the host is expected to perform $(\text{DMIC_UP1_EN} + \text{DMIC_UP2_EN} + \text{DMIC_UP3_EN}) \times 4$ read access every 48 kHz (FS).

If DMIC_TRESH = 12, the host is expected to perform $(\text{DMIC_UP1_EN} + \text{DMIC_UP2_EN} + \text{DMIC_UP3_EN}) \times 12$ access every 8 kHz (FS/6).

24.7.4.8.3 FIFO Output Range Definition

The [DMIC_CTRL\[3\]](#) DMICOUTFORMAT bit allows determining the format of the output of the DMIC uplink module.

When DMICOUTFORMAT = 0, the data going from the FIFO are left-shifted by 8 bits. When DMICOUTFORMAT = 1, the data are signed-extended on 32 bits.

The DMIC uplink modules process audio data based on twos complement format.

NOTE: When DMICOUTFORMAT = 0, the maximum positive swing analog voltage corresponds to a final DMIC output of 0x7FFF FF00. The maximum negative swing analog voltage corresponds to a final DMIC output of 0x8000 0000.

When DMICOUTFORMAT = 1, the sign is extended: The maximum positive swing analog voltage corresponds to a final DMIC output of 0x007F FFFF. The maximum negative swing analog voltage corresponds to a final DMIC output of 0xFF80 0000.

Reading the value of the corresponding audio data in the FIFO requires access to the [DMIC_DATA_REG](#) register. The first access gives the value of Tx1 right data, the second gives the value of Tx2 left data, up to Tx6 (the left audio data of the last audio path). If the path is disabled, 0x0 is read. All data are duplicated (for debug purposes) in their corresponding left or right data registers. [Table 24-516](#) describes the audio data path registers.

Table 24-516. Audio Data Path Registers

| Stereo Audio Path | Mono Audio Path | Data Register |
|-------------------|-----------------|---|
| Right path 1 | Mono path 1 | DMIC_FIFO_DMIC1R_DATA[23:0] |
| Left path 1 | Mono path 2 | DMIC_FIFO_DMIC1L_DATA[23:0] |
| Right path 2 | Mono path 3 | DMIC_FIFO_DMIC2R_DATA[23:0] |
| Left path 2 | Mono path 4 | DMIC_FIFO_DMIC2L_DATA[23:0] |
| Right path 3 | Mono path 5 | DMIC_FIFO_DMIC3R_DATA[23:0] |
| Left path 3 | Mono path 6 | DMIC_FIFO_DMIC3L_DATA[23:0] |

The output of the DMIC path for interconnect access is in 32-bit format.

24.7.5 DMIC Programming Guide

24.7.5.1 DMIC Low-Level Programming Models

This section describes the low-level hardware programming sequences for the configuration and use of the module.

24.7.5.1.1 Global Initialization

24.7.5.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the DMIC is used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the DMIC. For more information, see [Section 24.7.3, DMIC Integration](#) and [Section 24.7.2, DMIC Environment](#).

[Table 24-517](#) describes the global initialization of surrounding modules.

Table 24-517. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|--|---|
| PRCM | Module interface and functional clocks must be enabled. See Chapter 3, Power, Reset, and Clock Management . |
| Control module | Module-specific pad muxing must be set in the control module. See Chapter 19, Control Module . |
| (optional) Cortex-A9 MPU interrupt controller (INTC) (or DSP INTC) | INTC configuration must be done to enable the interrupts from the DMIC. See Chapter 18, Interrupt Controllers . |
| (optional) sDMA (or eDMA or aDMA) | DMA configuration must be done to enable the DMIC DMA channel requests. |
| (optional) Interconnect | For more information about the interconnect configuration, see Chapter 14, Interconnect . |

NOTE: The INTC and DMA configurations are necessary if the interrupt and DMA-based communication modes are used.

24.7.5.1.1.2 DMIC Global Initialization

24.7.5.1.1.2.1 Main Sequence – DMIC Global Initialization

The procedure in [Table 24-518](#) initializes the DMIC after a power-on reset (POR).

Table 24-518. DMIC Global Initialization

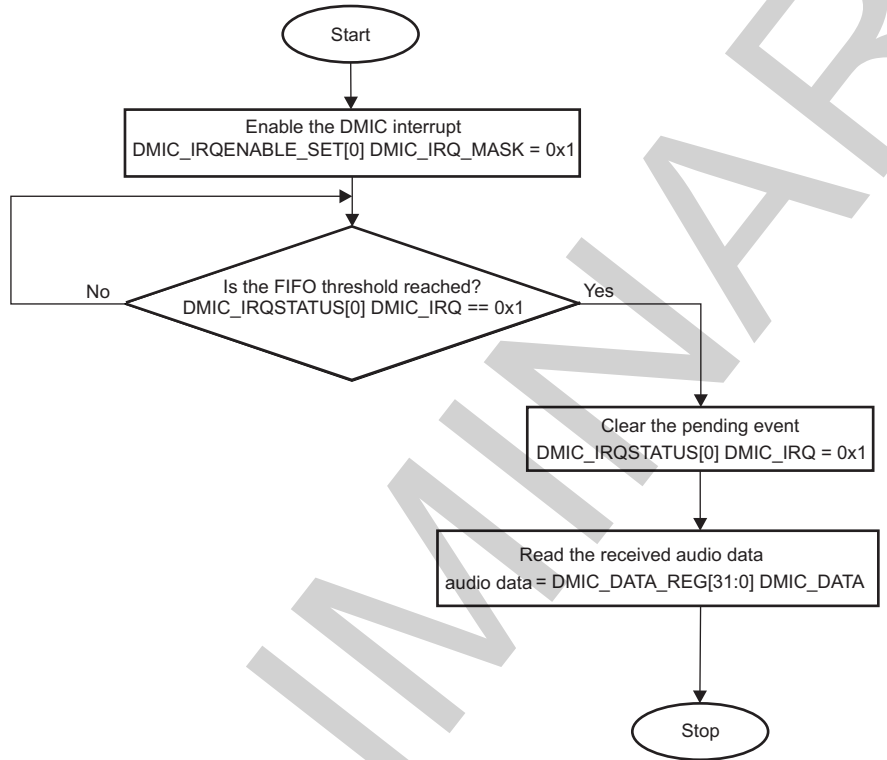
| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Execute a software reset. | DMIC_SYSCONFIG[0] SOFTRESET | 0x1 |
| Wait for the software reset completion by polling. | DMIC_SYSCONFIG[0] SOFTRESET | ==0x0 |
| Configure the local power management. | DMIC_SYSCONFIG[3:2] SIDLEMODE | 0x- |
| Select the DMIC FIFO threshold. | DMIC_FIFO_CTRL[3:0] DMIC_TRESH | 0x- |
| Select the DMIC output clock frequency. | DMIC_CTRL[9:7] DMIC_CLK_DIV | 0x- |
| Select the DMIC FIFO data output format. | DMIC_CTRL[3] DMICOUTFORMAT | 0x- |
| Select the level (high or low) of the clock signal <code>abe_dmic_clki</code> when the left data is to be generated (extracted) from the external microphone <code>i</code> (where <code>i</code> = 1 to 3). | DMIC_CTRL[j] DMIC_POLAR _i (where <code>j</code> = 4 to 6, and <code>i</code> = 1 to 3) | 0x- |
| Enable audio path <code>i</code> (where <code>i</code> = 1 to 3). | DMIC_CTRL[k] DMIC_POLAR _i (where <code>k</code> = 0 to 2, and <code>i</code> = 1 to 3) | 0x1 |

24.7.5.1.2 Operational Mode Configuration

24.7.5.1.2.1 DMIC Polling Mode

Figure 24-184 shows the polling mode. Table 24-519 summarizes the register call for the polling mode. For the number of read accesses used while reading the received audio data, see Section 24.7.4.8, *FIFO Management*.

Figure 24-184. Polling Mode



dmic-010

Table 24-519. Register Call Summary for Polling Mode

| Register Name | Register Name | Register Name |
|--------------------|----------------|---------------|
| DMIC_IRQENABLE_SET | DMIC_IRQSTATUS | DMIC_DATA_REG |

24.7.5.1.2.2 DMIC Interrupt Mode

Table 24-520 lists the procedure to initialize interrupt mode.

Table 24-520. Interrupt Mode

| Step | Register/Bit Field/Programming Model | Value |
|-----------------------------|--------------------------------------|-------|
| Enable the DMIC interrupts. | DMIC_IRQENABLE_SET[3:0] | 0xF |

24.7.5.1.2.3 DMIC DMA Mode

Table 24-521 lists the procedure to initialize DMA mode.

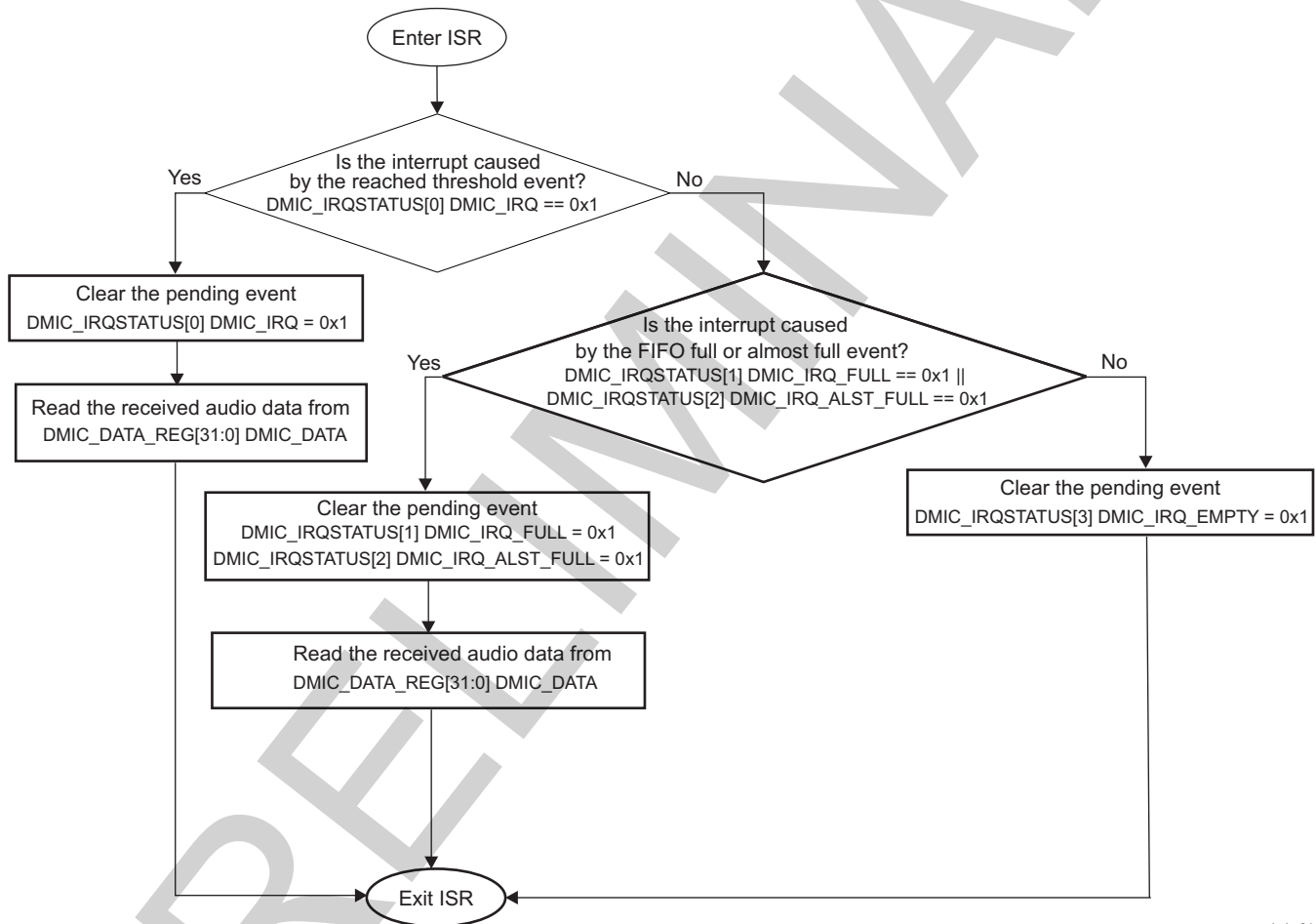
Table 24-521. DMA Mode

| Step | Register/Bit Field/Programming Model | Value |
|--------------------------------------|--|-------|
| Enable the DMIC DMA interrupt event. | DMIC_DMAENABLE_SET [0] DMA_ENABLE | 0x1 |

24.7.5.1.3 DMIC Events Servicing

24.7.5.1.3.1 DMIC Interrupt Servicing

This section describes the interrupt event servicing of the module. [Figure 24-185](#) shows the interrupt handler.

Figure 24-185. Interrupt Handler

dmic-011

When the interrupt is caused by the reached threshold event, for the number of read accesses used while reading the received audio data, see [Section 24.7.4.8, FIFO Management](#).

When the interrupt is caused by a FIFO full or almost-full event, software must read all the available data in the FIFO. If a FIFO full event occurred, the number of read accesses must be the maximum:

$$\text{Num_rd_access} = (\text{DMIC_UP1_EN} + \text{DMIC_UP2_EN} + \text{DMIC_UP3_EN}) \times 2 \times 15$$

If a FIFO almost-full event occurred, the number of read accesses must be:

$$\text{Num_rd_access} = (\text{DMIC_UP1_EN} + \text{DMIC_UP2_EN} + \text{DMIC_UP3_EN}) \times 2 \times 14$$

[Table 24-522](#) summarizes the register call for the interrupt handler.

Table 24-522. Register Call Summary for the Interrupt Handler

| Register Name | Register Name |
|--------------------------------|-------------------------------|
| DMIC_IRQSTATUS | DMIC_DATA_REG |

24.7.6 DMIC Register Manual

24.7.6.1 DMIC Instance Summary

Table 24-523 is the DMIC instance summary.

Table 24-523. DMIC Instance Summary

| Module Name | Base Address L3 Interconnect | Base Address Cortex-A9 Private Access | Base Address DSP Private Access | Size |
|-------------|---------------------------------|---|------------------------------------|------|
| DMIC | 0x4902 E000 | 0x4012 E000 | 0x2 E000 | 4KB |

NOTE: Private access is an access that does not use the L3/L4 interconnects.

24.7.6.2 DMIC Registers

24.7.6.2.1 DMIC Register Summary

Table 24-524 summarizes the DMIC register mapping.

Table 24-524. DMIC Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|-----------------------|------|-----------------------------|----------------|-------------------------------------|---|---|
| DMIC_REVISION | R | 32 | 0x0000 0000 | 0x4902 E000 | 0x4012 E000 | 0x2 E000 |
| DMIC_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4902 E010 | 0x4012 E010 | 0x2 E010 |
| RESERVED | RW | 32 | 0x0000 0020 | 0x4902 E020 | 0x4012 E020 | 0x2 E020 |
| DMIC_IRQSTATUS_RAW | RW | 32 | 0x0000 0024 | 0x4902 E024 | 0x4012 E024 | 0x2 E024 |
| DMIC_IRQSTATUS | RW | 32 | 0x0000 0028 | 0x4902 E028 | 0x4012 E028 | 0x2 E028 |
| DMIC_IRQENABLE_SET | RW | 32 | 0x0000 002C | 0x4902 E02C | 0x4012 E02C | 0x2 E02C |
| DMIC_IRQENABLE_CLR | RW | 32 | 0x0000 0030 | 0x4902 E030 | 0x4012 E030 | 0x2 E030 |
| DMIC_IRQWAKEEN | RW | 32 | 0x0000 0034 | 0x4902 E034 | 0x4012 E034 | 0x2 E034 |
| DMIC_DMAENABLE_SET | RW | 32 | 0x0000 0038 | 0x4902 E038 | 0x4012 E038 | 0x2 E038 |
| DMIC_DMAENABLE_CLR | RW | 32 | 0x0000 003C | 0x4902 E03C | 0x4012 E03C | 0x2 E03C |
| DMIC_DMAWAKEEN | RW | 32 | 0x0000 0040 | 0x4902 E040 | 0x4012 E040 | 0x2 E040 |
| DMIC_CTRL | RW | 32 | 0x0000 0044 | 0x4902 E044 | 0x4012 E044 | 0x2 E044 |
| DMIC_DATA_REG | R | 32 | 0x0000 0048 | 0x4902 E048 | 0x4012 E048 | 0x2 E048 |
| DMIC_FIFO_CTRL | RW | 32 | 0x0000 004C | 0x4902 E04C | 0x4012 E04C | 0x2 E04C |
| DMIC_FIFO_DMIC1R_DATA | R | 32 | 0x0000 0050 | 0x4902 E050 | 0x4012 E050 | 0x2 E050 |
| DMIC_FIFO_DMIC1L_DATA | R | 32 | 0x0000 0054 | 0x4902 E054 | 0x4012 E054 | 0x2 E054 |
| DMIC_FIFO_DMIC2R_DATA | R | 32 | 0x0000 0058 | 0x4902 E058 | 0x4012 E058 | 0x2 E058 |
| DMIC_FIFO_DMIC2L_DATA | R | 32 | 0x0000 005C | 0x4902 E05C | 0x4012 E05C | 0x2 E05C |
| DMIC_FIFO_DMIC3R_DATA | R | 32 | 0x0000 0060 | 0x4902 E060 | 0x4012 E060 | 0x2 E060 |
| DMIC_FIFO_DMIC3L_DATA | R | 32 | 0x0000 0064 | 0x4902 E064 | 0x4012 E064 | 0x2 E064 |

24.7.6.2.2 DMIC Register Descriptions

through describe the DMIC registers.

Table 24-525. DMIC REVISION

| | | | |
|-------------------------|--|-----------------|----------------------------|
| Address Offset | 0x0000 0000 | Instance | DMIC_L3 |
| Physical Address | 0x4902 E000 0x4012 E000 0x2 E000 | | DMIC_CORTEX-A9 DMIC_DSP |
| Description | IP Revision Identifier (X.Y.R) used by software to track features, bugs, and compatibility | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|----------------------|
| 31:0 | REVISION | IP revision | R | See ⁽¹⁾ . |

(1) TI internal data

Table 24-526. Register Call Summary for Register DMIC_REVISION

- [DMIC Register Summary](#): [0]

Table 24-527. DMIC SYSCONFIG

| | | | |
|-------------------------|--|-----------------|----------------------------|
| Address Offset | 0x0000 0010 | Instance | DMIC_L3 |
| Physical Address | 0x4902 E010 0x4012 E010 0x2 E010 | | DMIC_CORTEX-A9 DMIC_DSP |
| Description | This register allows controlling various parameters of the DMIC interface. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------|---|--------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | SIDLEMODE | | FREEMU | SOFTRESET |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3:2 | SIDLEMODE | Configuration of the local target state management (idlereq/idleack control) 0x0: Force-idle. IDLE request is acknowledged unconditionally and immediately. 0x1: No-idle. IDLE request is never acknowledged. 0x2: Smart-idle. The acknowledgment to an IDLE request is given based on the internal activity. 0x3: Smart-idle wakeup capable mode | RW | 0x2 |
| 1 | FREEMU | Sensitivity to emulation (debug) suspend input signal 0x0: IP module is sensitive to emulation suspend. 0x1: IP module is not sensitive to emulation suspend. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | SOFTRESET | Module software reset. The bit is automatically reset by the hardware. It has same effect as the main hardware reset. Write 0x0: No action Read 0x0: Reset done, no pending action Read 0x1: Reset (software or other) ongoing Write 0x1: Initiate software reset. | RW | 0 |

Table 24-528. Register Call Summary for Register DMIC_SYSCONFIG

Digital Microphone Module

- [DMIC Software Reset: \[0\] \[1\] \[2\]](#)
- [DMIC Power Management: \[3\]](#)
- [Global Initialization: \[4\] \[5\] \[6\]](#)
- [DMIC Register Summary: \[7\]](#)

Table 24-529. DMIC_IRQSTATUS_RAW

| | | | |
|-------------------------|---|-----------------|---------------------------------------|
| Address Offset | 0x0000 0024 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E024 0x4012 E024 0x2 E024 | | |
| Description | Component (that is, main) interrupt request status. Check the corresponding secondary status register. Raw status is set even if event is not enabled. Write 1 to set the (raw) status, mostly for debug. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|--------------------|----|---|---|---------------|---|---|---|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DMIC_IRQ_EMPTY | | | | DMIC_IRQ_ALST_FULL | | | | DMIC_IRQ_FULL | | | | DMIC_IRQ | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|---------------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | DMIC_IRQ_EMPTY | Read 0x0: No event pending Write 0x0: No action Write 0x1: Set Read 0x1: IRQ event pending | RW | 0 |
| 2 | DMIC_IRQ_ALST_FULL | Read 0x0: No event pending Write 0x0: No action Write 0x1: Set Read 0x1: IRQ event pending | RW W1toSet | 0 |
| 1 | DMIC_IRQ_FULL | Read 0x0: No event pending Write 0x0: No action Write 0x1: Set Read 0x1: IRQ event pending | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 0 | DMIC_IRQ | Read 0x0: No event pending Write 0x0: No action Write 0x1: Set Read 0x1: IRQ event pending | RW W1toSet | 0 |

Table 24-530. Register Call Summary for Register DMIC_IRQSTATUS_RAW

Digital Microphone Module

- [DMIC Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [DMIC Register Summary: \[7\]](#)

Table 24-531. DMIC_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|---------------------------------------|
| Address Offset | 0x0000 0028 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E028 0x4012 E028 0x2 E028 | | |
| Description | Component (that is, main) interrupt request status. Check the corresponding secondary status register. Enabled status is not set unless event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|--------------------|----|---|---|---------------|---|---|---|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DMIC_IRQ_EMPTY | | | | DMIC_IRQ_ALST_FULL | | | | DMIC_IRQ_FULL | | | | DMIC_IRQ | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|---------------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | DMIC_IRQ_EMPTY | Read 0x0: No event pending Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending | RW | 0 |
| 2 | DMIC_IRQ_ALST_FULL | This interrupt status is set when only one FIFO space is still available. Read 0x0: No event pending Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending | RW W1toClr | 0 |
| 1 | DMIC_IRQ_FULL | This interrupt status is set when FIFO is full and a new write access has been performed by filter. Read 0x0: No event pending Write 0x0: No action Write 0x1: Clear pending event, if any. Read 0x1: IRQ event pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 0 | DMIC_IRQ | <p>This interrupt status is set when FIFO threshold value defined in DMIC_FIFO_CTRL is reached.</p> <p>Read 0x0: No event pending</p> <p>Write 0x0: No action</p> <p>Write 0x1: Clear pending event, if any.</p> <p>Read 0x1: IRQ event pending</p> | RW W1toClr | 0 |

Table 24-532. Register Call Summary for Register DMIC_IRQSTATUS

Digital Microphone Module

- [DMIC Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [Operational Mode Configuration: \[8\]](#)
- [DMIC Events Servicing: \[9\]](#)
- [DMIC Register Summary: \[10\]](#)

Table 24-533. DMIC_IRQENABLE_SET

| | | | |
|-------------------------|--|-----------------|---------------------------------------|
| Address Offset | 0x0000 002C | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E02C 0x4012 E02C 0x2 E02C | | |
| Description | Component (that is, main) interrupt request enable. Write 1 to set (enable interrupt). Readout equal to corresponding _SET register. _SET register is cleared when writing 1 to _CLR register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|-------------------------|----|---|---|--------------------|---|---|---|---------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DMIC_IRQ_EMPTY_MASK | | | | DMIC_IRQ_ALST_FULL_MASK | | | | DMIC_IRQ_FULL_MASK | | | | DMIC_IRQ_MASK | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|---------------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | DMIC_IRQ_EMPTY_MASK | <p>Read 0x0: Interrupt disabled</p> <p>Write 0x0: No action</p> <p>Write 0x1: Enable interrupt</p> <p>Read 0x1:</p> | RW W1toSet | 0 |
| 2 | DMIC_IRQ_ALST_FULL_MASK | <p>Read 0x0: Interrupt disabled</p> <p>Write 0x0: No action</p> <p>Write 0x1: Enable interrupt</p> <p>Read 0x1: Interrupt enabled</p> | RW W1toSet | 0 |
| 1 | DMIC_IRQ_FULL_MASK | <p>Read 0x0: Interrupt disabled</p> <p>Write 0x0: No action</p> <p>Write 0x1: Enable interrupt</p> <p>Read 0x1: Interrupt enabled</p> | RW W1toSet | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|---------------|-------|
| 0 | DMIC_IRQ_MASK | Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled | RW W1toSet | 0 |

Table 24-534. Register Call Summary for Register DMIC_IRQENABLE_SET

Digital Microphone Module

- [DMIC Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Operational Mode Configuration: \[6\] \[7\]](#)
- [DMIC Register Summary: \[8\]](#)

Table 24-535. DMIC_IRQENABLE_CLR

| | | | |
|-------------------------|--|-----------------|---------------------------------------|
| Address Offset | 0x0000 0030 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E030 0x4012 E030 0x2 E030 | | |
| Description | Component (that is, main) interrupt request enable Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. _SET register is cleared when writing 1 to _CLR register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------------|----|----|----|-------------------------|----|---|---|--------------------|---|---|---|---------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DMIC_IRQ_EMPTY_MASK | | | | DMIC_IRQ_ALST_FULL_MASK | | | | DMIC_IRQ_FULL_MASK | | | | DMIC_IRQ_MASK | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------|---|---------------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | DMIC_IRQ_EMPTY_MASK | Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW W1toClr | 0 |
| 2 | DMIC_IRQ_ALST_FULL_MASK | Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW W1toClr | 0 |
| 1 | DMIC_IRQ_FULL_MASK | Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------|-------|
| 0 | DMIC_IRQ_MASK | Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW W1toClr | 0 |

Table 24-536. Register Call Summary for Register DMIC_IRQENABLE_CLR

Digital Microphone Module

- [DMIC Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [DMIC Register Summary: \[5\]](#)

Table 24-537. DMIC_IRQWAKEEN

| | | | |
|-------------------------|---|-----------------|---------------------------------------|
| Address Offset | 0x0000 0034 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E034 0x4012 E034 0x2 E034 | | |
| Description | This register allows to enable the wake-up capability on interrupt event. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | IRQ_WAKEUP_EN |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | IRQ_WAKEUP_EN | Write 1 to allow wake-up by IRQ source (register threshold value reached). | RW | 1 |

Table 24-538. Register Call Summary for Register DMIC_IRQWAKEEN

Digital Microphone Module

- [DMIC Power Management: \[0\]](#)
- [DMIC Register Summary: \[1\]](#)

Table 24-539. DMIC_DMAENABLE_SET

| | | | |
|-------------------------|---|-----------------|---------------------------------------|
| Address Offset | 0x0000 0038 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E038 0x4012 E038 0x2 E038 | | |
| Description | Component DMA enable (1 bit per DMA-capable channel)/Write 1 to set (enable DMA). Readout equal to corresponding _SET register. _SET register is cleared when writing 1 to _CLR register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DMA_ENABLE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | DMA_ENABLE | Write 1 to set (enable DMA request) Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Enable interrupt Read 0x1: Interrupt enabled | RW W1toSet | 0 |

Table 24-540. Register Call Summary for Register DMIC_DMAENABLE_SET

Digital Microphone Module

- [DMIC DMA Requests: \[0\] \[1\]](#)
- [Operational Mode Configuration: \[2\]](#)
- [DMIC Register Summary: \[3\]](#)

Table 24-541. DMIC_DMAENABLE_CLR

| | | | |
|-------------------------|--|-----------------|---------------------------------------|
| Address Offset | 0x0000 003C | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E03C 0x4012 E03C 0x2 E03C | | |
| Description | Component DMA enable (1 bit per DMA-capable channel)/Write 1 to clear (disable DMA). Readout equal to corresponding _SET register. _SET register is cleared when writing 1 to _CLR register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DMA_ENABLE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | DMA_ENABLE | Write 1 to clear (disable DMA request) Read 0x0: Interrupt disabled Write 0x0: No action Write 0x1: Disable interrupt Read 0x1: Interrupt enabled | RW W1toClr | 0 |

Table 24-542. Register Call Summary for Register DMIC_DMAENABLE_CLR

Digital Microphone Module

- [DMIC DMA Requests: \[0\] \[1\]](#)
- [DMIC Register Summary: \[2\]](#)

Table 24-543. DMIC_DMAWAKEEN

| | | | |
|-------------------------|---|-----------------|---------------------------------------|
| Address Offset | 0x0000 0040 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E040 0x4012 E040 0x2 E040 | | |
| Description | This register allows to enable the wake-up capability on DMA request event. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | DMA_WAKEUP_EN |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | DMA_WAKEUP_EN | Write 1 to allow wakeup by DMA source (register threshold value reached). | RW | 1 |

Table 24-544. Register Call Summary for Register DMIC_DMAWAKEEN

Digital Microphone Module

- [DMIC Power Management: \[0\]](#)
- [DMIC Register Summary: \[1\]](#)

Table 24-545. DMIC_CTRL

| | | | |
|-------------------------|---|-----------------|---------------------------------------|
| Address Offset | 0x0000 0044 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E044 0x4012 E044 0x2 E044 | | |
| Description | This register configures the various parameters of the DMIC module. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|--------------|----|-------------|----|-------------|---|-------------|---|---------------|---|-------------|---|-------------|---|-------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | SW_DMIC_RST | | DMIC_CLK_DIV | | DMIC_POLAR3 | | DMIC_POLAR2 | | DMIC_POLAR1 | | DMICOUTFORMAT | | DMIC_UP3_EN | | DMIC_UP2_EN | | DMIC_UP1_EN | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|----------|
| 31:11 | RESERVED | Reserved | R | 0x000000 |
| 10 | SW_DMIC_RST | Software reset of the DMIC path. When 1, the DMIC path is reset. Clearing the reset is done by writing 0 to the register. | RW | 0 |
| 9:7 | DMIC_CLK_DIV | Select the DMIC output clock frequency. See Table 24-511 for details. | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 6 | DMIC_POLAR3 | 0x0: When 0, the left data is generated in the external microphone 3 on abe_dmic_clk3 low level. 0x1: When 1, the left data is generated in the external microphone 3 on abe_dmic_clk3 high level. | RW | 0 |
| 5 | DMIC_POLAR2 | 0x0: When 0, the left data is generated in the external microphone 2 on abe_dmic_clk2 low level. 0x1: When 1, the left data is generated in the external microphone 2 on abe_dmic_clk2 high level. | RW | 0 |
| 4 | DMIC_POLAR1 | 0x0: When 0, the left data is generated in the external microphone 1 on abe_dmic_clk1 low level. 0x1: When 1, the left data is generated in the external microphone 1 on abe_dmic_clk1 high level. | RW | 0 |
| 3 | DMICOUTFORMAT | When 0, the data going out from the FIFO are left shifted from 8 bits. When 1, the data going are signed extended on 32 bits | RW | 0 |
| 2 | DMIC_UP3_EN | When 1, uplink path 3 is powered up. | RW | 0 |
| 1 | DMIC_UP2_EN | When 1, uplink path 2 is powered up. | RW | 0 |
| 0 | DMIC_UP1_EN | When 1, uplink path 1 is powered up. | RW | 0 |

Table 24-546. Register Call Summary for Register DMIC_CTRL

Digital Microphone Module

- [Serial Data Format: \[0\] \[1\] \[2\]](#)
- [DMIC Clock Configuration: \[3\]](#)
- [DMIC Software Reset: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [Audio Data Processing: \[10\] \[11\] \[12\]](#)
- [Filtering: \[13\] \[14\] \[15\]](#)
- [FIFO Operations: \[16\] \[17\] \[18\]](#)
- [FIFO Output Range Definition: \[19\]](#)
- [Global Initialization: \[20\] \[21\] \[22\] \[23\]](#)
- [DMIC Register Summary: \[24\]](#)

Table 24-547. DMIC_DATA_REG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--------------------|---------------------------------------|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0048 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4902 E048 0x4012 E048 0x2 E048 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | DMIC FIFO data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="32">DMIC_DATA</td></tr></table> | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | DMIC_DATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DMIC_DATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:0 | DMIC_DATA | DMIC FIFO data | R | 0x000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 24-548. Register Call Summary for Register DMIC_DATA_REG

Digital Microphone Module

- [FIFO Output Range Definition: \[0\]](#)
- [Operational Mode Configuration: \[1\]](#)
- [DMIC Events Servicing: \[2\]](#)
- [DMIC Register Summary: \[3\]](#)

Table 24-549. DMIC_FIFO_CTRL

| | | | |
|-------------------------|---|-----------------|---------------------------------------|
| Address Offset | 0x0000 004C | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E04C 0x4012 E04C 0x2 E04C | | |
| Description | This register sets the FIFO threshold for the data-ready event. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DMIC_TRESH | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------|------|--------|
| 31:4 | RESERVED | Reserved | R | 0x0000 |
| 3:0 | DMIC_TRESH | Uplink FIFO threshold | RW | 0x2 |

Table 24-550. Register Call Summary for Register DMIC_FIFO_CTRL

- Digital Microphone Module
- [FIFO Operations: \[0\] \[1\]](#)
 - [Global Initialization: \[2\]](#)
 - [DMIC Register Summary: \[3\]](#)
 - [DMIC Register Descriptions: \[4\]](#)

Table 24-551. DMIC_FIFO_DMIC1R_DATA

| | | | |
|-------------------------|---|-----------------|---------------------------------------|
| Address Offset | 0x0000 0050 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E050 0x4012 E050 0x2 E050 | | |
| Description | Data of the first FIFO DMIC right channel | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIFO_DMIC1R_DAT | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|------------------------------------|------|----------|
| 31:24 | RESERVED | Reserved | R | 0x00 |
| 23:0 | FIFO_DMIC1R_DAT | Data of the right FIFO DMIC path 1 | R | 0x000000 |

Table 24-552. Register Call Summary for Register DMIC_FIFO_DMIC1R_DATA

- Digital Microphone Module
- [FIFO Output Range Definition: \[0\]](#)
 - [DMIC Register Summary: \[1\]](#)

Table 24-553. DMIC_FIFO_DMIC1L_DATA

| | | | |
|-------------------------|--|-----------------|---------------------------------------|
| Address Offset | 0x0000 0054 | | |
| Physical Address | 0x4902 E054 0x4012 E054 0x2 E054 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Description | Data of the first FIFO DMIC left channel | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIFO DMIC1R DAT | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|-----------------------------------|------|----------|
| 31:24 | RESERVED | Reserved | R | 0x00 |
| 23:0 | FIFO_DMIC1R_DAT | Data of the left FIFO DMIC path 1 | R | 0x000000 |

Table 24-554. Register Call Summary for Register DMIC_FIFO_DMIC1L_DATA

Digital Microphone Module

- [FIFO Output Range Definition: \[0\]](#)
- [DMIC Register Summary: \[1\]](#)

Table 24-555. DMIC_FIFO_DMIC2R_DATA

| | | | |
|-------------------------|--|-----------------|---------------------------------------|
| Address Offset | 0x0000 0058 | | |
| Physical Address | 0x4902 E058 0x4012 E058 0x2 E058 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Description | Data of the second FIFO DMIC right channel | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIFO DMIC2R DAT | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|------------------------------------|------|----------|
| 31:24 | RESERVED | Reserved | R | 0x00 |
| 23:0 | FIFO_DMIC2R_DAT | Data of the right FIFO DMIC path 2 | R | 0x000000 |

Table 24-556. Register Call Summary for Register DMIC_FIFO_DMIC2R_DATA

Digital Microphone Module

- [FIFO Output Range Definition: \[0\]](#)
- [DMIC Register Summary: \[1\]](#)

Table 24-557. DMIC_FIFO_DMIC2L_DATA

| | | | |
|-------------------------|---|-----------------|---------------------------------------|
| Address Offset | 0x0000 005C | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E05C 0x4012 E05C 0x2 E05C | | |
| Description | Data of the second FIFO DMIC left channel | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIFO DMIC2L DAT | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|-----------------------------------|------|----------|
| 31:24 | RESERVED | Reserved | R | 0x00 |
| 23:0 | FIFO_DMIC2L_DAT | Data of the left FIFO DMIC path 2 | R | 0x000000 |

Table 24-558. Register Call Summary for Register DMIC_FIFO_DMIC2L_DATA

Digital Microphone Module

- [FIFO Output Range Definition: \[0\]](#)
- [DMIC Register Summary: \[1\]](#)

Table 24-559. DMIC_FIFO_DMIC3R_DATA

| | | | |
|-------------------------|---|-----------------|---------------------------------------|
| Address Offset | 0x0000 0060 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Physical Address | 0x4902 E060 0x4012 E060 0x2 E060 | | |
| Description | Data of the third FIFO DMIC right channel | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIFO DMIC3R DAT | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|------------------------------------|------|----------|
| 31:24 | RESERVED | Reserved | R | 0x00 |
| 23:0 | FIFO_DMIC3R_DAT | Data of the right FIFO DMIC path 3 | R | 0x000000 |

Table 24-560. Register Call Summary for Register DMIC_FIFO_DMIC3R_DATA

Digital Microphone Module

- [FIFO Output Range Definition: \[0\]](#)
- [DMIC Register Summary: \[1\]](#)

Table 24-561. DMIC_FIFO_DMIC3L_DATA

| | | | |
|-------------------------|--|-----------------|---------------------------------------|
| Address Offset | 0x0000 0064 | | |
| Physical Address | 0x4902 E064 0x4012 E064 0x2 E064 | Instance | DMIC_L3 DMIC_CORTEX-A9 DMIC_DSP |
| Description | Data of the third FIFO DMIC left channel | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | FIFO_DMIC3R_DAT | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|-----------------------------------|------|----------|
| 31:24 | RESERVED | Reserved | R | 0x00 |
| 23:0 | FIFO_DMIC3R_DAT | Data of the left FIFO DMIC path 3 | R | 0x000000 |

Table 24-562. Register Call Summary for Register DMIC_FIFO_DMIC3L_DATA

- Digital Microphone Module
- [FIFO Output Range Definition: \[0\]](#)
 - [DMIC Register Summary: \[1\]](#)

24.8 Multichannel Audio Serial Port

This section describes the multichannel audio serial port (McASP).

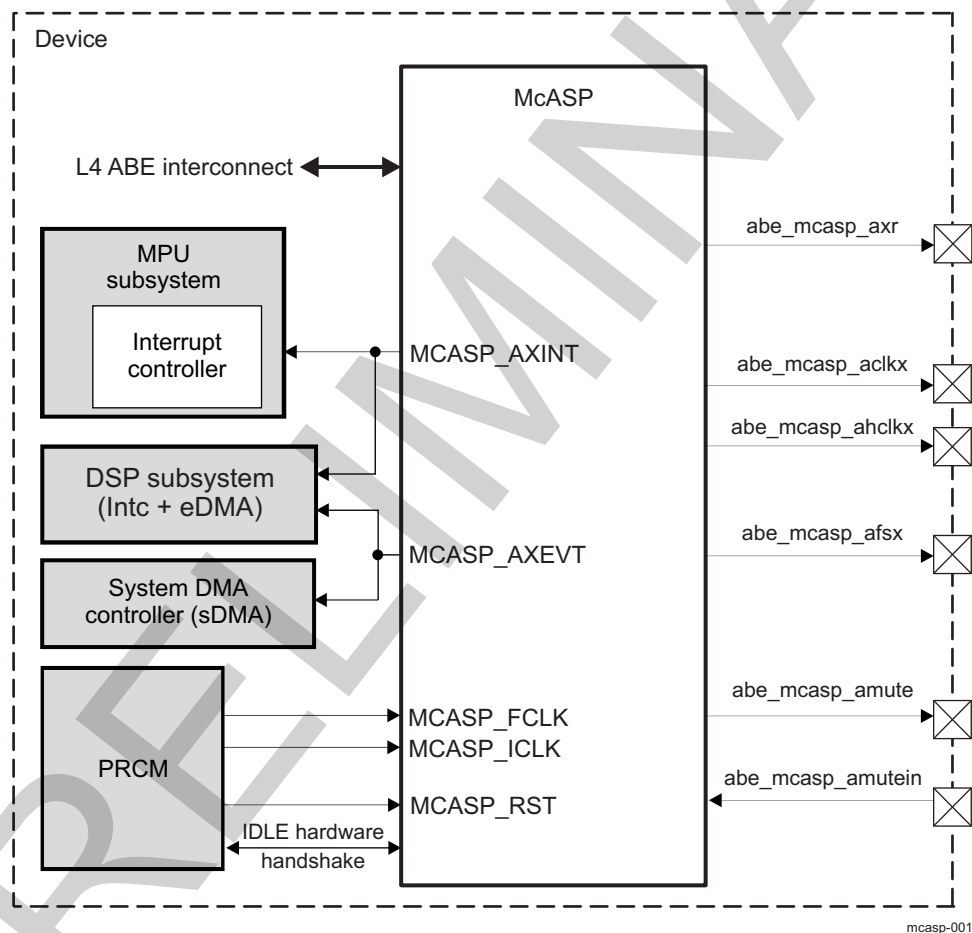
24.8.1 McASP Overview

This section introduces the multichannel audio serial port (McASP) module and describes its main functions and connections in the device.

The McASP functions as a general-purpose audio serial port optimized to the requirements of various audio applications. The McASP is useful for intercomponent digital audio interface transmission (DIT). The McASP has the flexibility to gluelessly connect to a Sony/Philips digital interface (S/PDIF) transmit physical layer component. The McASP module operates in transmit mode only; it has no receive capabilities.

Figure 24-186 shows the McASP module in the device.

Figure 24-186. McASP Module



The McASP module includes the following main features:

- Support of the idle request/acknowledge protocol
- Buffer for transmit operations
- One transmit direct memory access (DMA) request linked with a 32-bit register, and one transmit interrupt request
- One transmit channel
- One serializer

24.8.2 McASP Environment

This section describes the McASP application fields from an environment point of view (external connections), along with the McASP connectivity options. This section also lists all of the possible interfaces and describes the protocol and data format used in each case.

24.8.2.1 McASP Signals

Table 24-563 describes the McASP signals and specifies their links to functions.

Table 24-563. I/O

| Signal | I/O ⁽¹⁾ | Description |
|-------------------|--------------------|--------------------------------------|
| abe_mcasp_axr | O | Audio transmit data |
| abe_mcasp_aclkx | O | Transmit bit clock |
| abe_mcasp_ahclkx | O | Transmit high-frequency master clock |
| abe_mcasp_afsx | O | Transmit frame synchronization |
| abe_mcasp_amute | O | Mute out to external |
| abe_mcasp_amutein | I | Mute in from external |

⁽¹⁾ I = Input; O = Output

All McASP pins on the device can be individually programmed as general-purpose input/output (GPIO) if they are not used for serial port functions.

The McASP includes the following pins:

- Serializer:
 - Data pin abe_mcasp_axr
- Transmit clock generator:
 - abe_mcasp_aclkx: McASP transmit bit clock
 - abe_mcasp_ahclkx: McASP transmit high-frequency master clock
- Transmit frame-sync generator:
 - abe_mcasp_afsx: McASP transmit frame sync
- Mute in/out:
 - abe_mcasp_amutein: McASP mute input (from external device)
 - abe_mcasp_amute: McASP mute output

24.8.2.2 Protocols and Data Formats

24.8.2.2.1 Protocols Supported

The McASP transmit section uses the S/PDIF industry format, which is supported by the DIT transfer mode of the module.

Each transmit section can be programmed to support the following options on the basic serial protocol:

- Programmable clock and frame-sync polarity (rising or falling edge): abe_mcasp_aclkx, abe_mcasp_ahclkx, and abe_mcasp_afsx
- Slot length (number of bits per time slot): 8, 12, 16, 20, 24, 28, 32 bits supported
- Word length (bits per word): 8, 12, 16, 20, 24, 28, 32 bits; always less than or equal to the time slot length
- First-bit data delay: 0-, 1-, 2-bit clocks
- Left/right alignment of word inside slot
- Bit order: Most-significant bit (MSB) first or least-significant bit (LSB) first
- Bit mask/pad/rotate function
- Automatically aligns data in Q31 or integer format

- Automatically masks nonsignificant bits (sets to 0, 1, or extends value of another bit)

The DIT transfer mode includes the following additional transmitter features:

- Transmit-only mode: 384 time slots (subframe) per frame
- Biphase encoded LVCMOS output
- Channel status RAM (384 bits)
- User data RAM (384 bits)
- Separate valid bit (V) for subframes A and B

NOTE: An external transceiver must be connected to the McASP port in the device to translate the electrical signals delivered by the McASP (1.2 V or 1.8 V LVCMOS levels) to the electrical levels of the S/PDIF standard.

24.8.2.2.2 Definition of Terms

The serial bitstream transmitted by the McASP is a long sequence of 1s and 0s on an audio transmit pin (abe_mcasp_axr). However, the sequence has a hierarchical organization that can be described in terms of frames of data, slots, words, and bits.

A basic synchronous serial interface consists of three important components: clock, frame sync, and data. [Figure 24-187](#) shows two of the three basic components: the clock (abe_mcasp_aclx) and the data (abe_mcasp_axr). In operation, the transmitter uses abe_mcasp_aclx as serial clock.

- Bit:

A bit is the smallest entity in the serial data stream. The beginning and end of each bit is marked by an edge of the serial clock. The duration of a bit is a serial clock period. A 1 is represented by a logic high on the abe_mcasp_axr pin for the entire duration of the bit. A 0 is represented by a logic low on the abe_mcasp_axr pin for the entire duration of the bit.

- Word:

A word is a group of bits that make up the data being transferred between the McASP and the external device. [Figure 24-187](#) shows an 8-bit word.

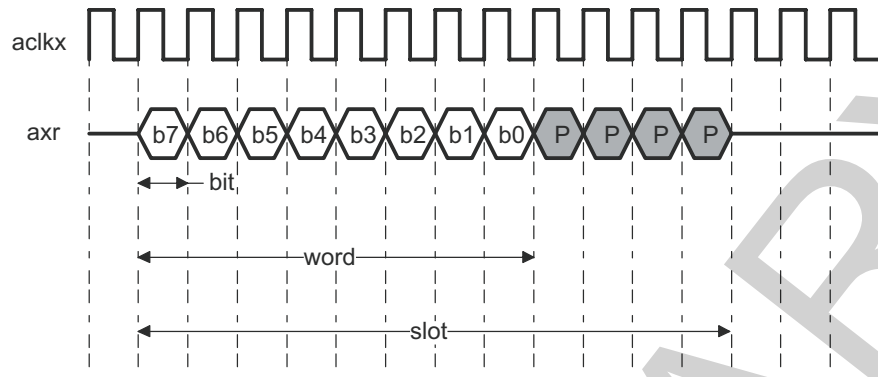
- Slot:

A slot consists of the bits that make up the word and can consist of additional bits used to pad the word to a convenient number of bits for the interface between the McASP and the external device. In [Figure 24-187](#), the audio data consists of only 8 bits of useful data (8-bit word), but it is padded with four 0s (12-bit slot) to satisfy the desired protocol in interfacing to an external device. Within a slot, the bits can be shifted out of the McASP on the abe_mcasp_axr pin with either MSB or LSB first.

When the word size is smaller than the slot size, the word can be aligned to the left of the slot (beginning) or to the right of the slot (end). The additional bits in the slot not belonging to the word can be padded with 0, 1, or with one of the bits (typically, the MSB or LSB) from the data word.

[Figure 24-188](#) shows these options.

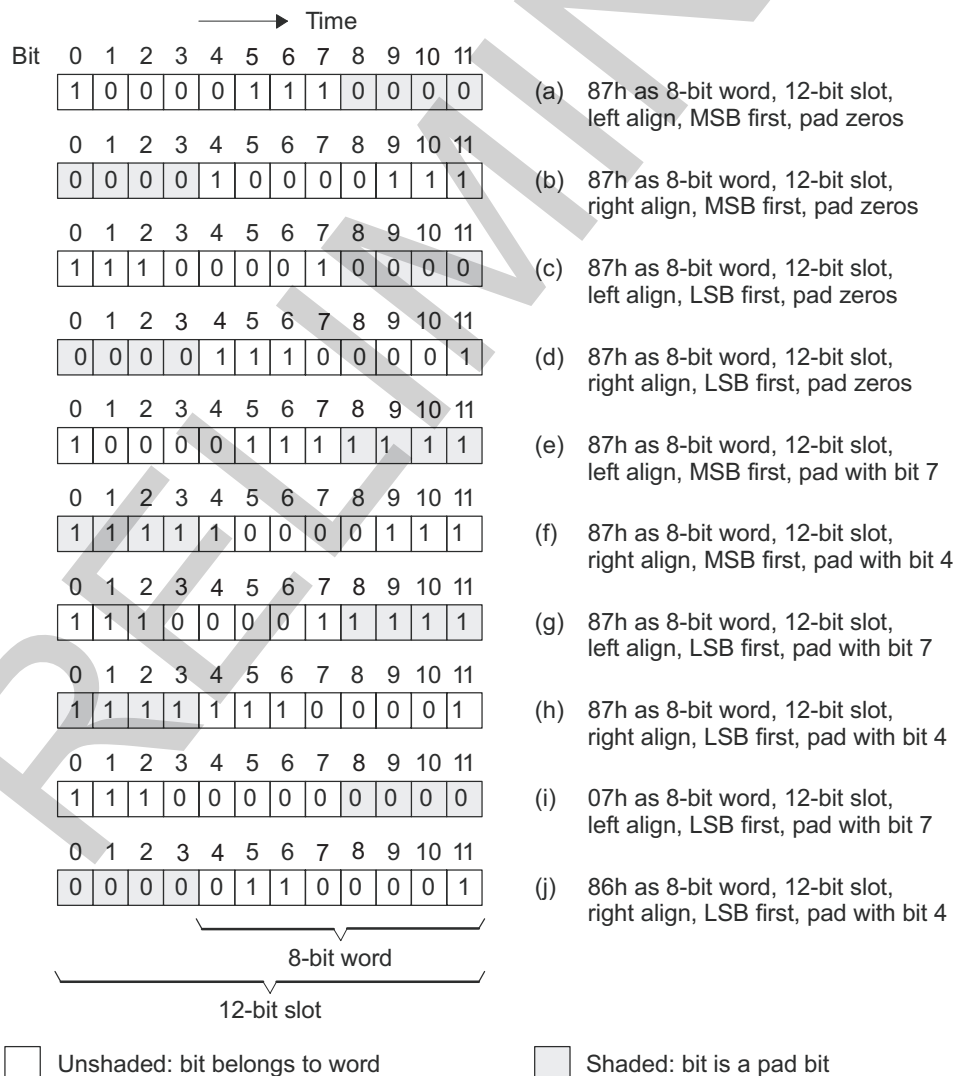
Figure 24-187. Definition of Bit, Word, and Slot



- (1) b7:b0 - bits. Bits b7 to b0 form a word.
- (2) P - pad bits. Bits b7 to b0, together with the 4 pad bits, form a slot.
- (3) In this example, the data is transmitted MSB first, left-aligned.

mcas-p-010

Figure 24-188. Bit Order and Word Alignment Within a Slot Examples



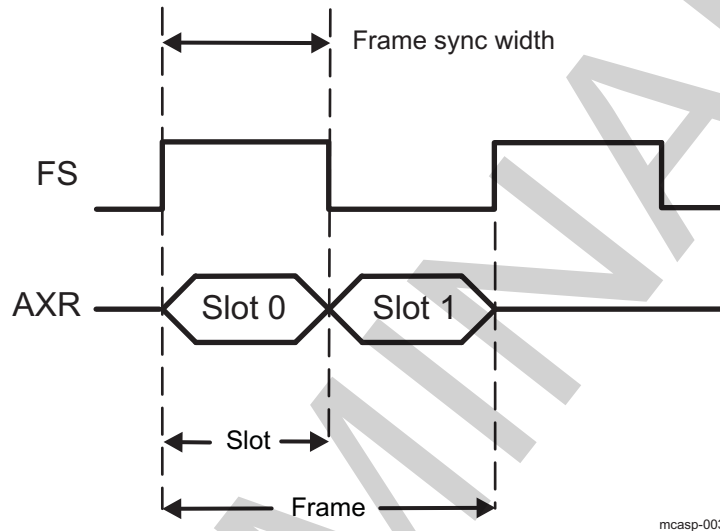
mcas-p-008

- Frame

The third basic element of a synchronous serial interface is the frame synchronization signal, also referred to as frame sync in this document. A frame contains one or multiple slots, as determined by the desired protocol. [Figure 24-189](#) shows an example frame of data and the frame definitions. In operation, the transmitter uses `abe_mcaspx_afx`. This example shows two slots in a frame and the frame-sync (FS) duration of the slot length.

This section shows only the generic definition of the frame sync. For more information about the frame-sync formats required for the transfer modes and protocols (DIT mode and S/PDIF format), see [Section 24.8.2.2.3, Frame Format](#).

Figure 24-189. Definition of Frame and Frame-Sync Width



The following terms are used throughout this chapter:

- DIT: Digital audio interface transmit. The McASP supports transmitting in S/PDIF format on the `abe_mcaspx_axr` data pin.
- Slot or time slot: For DIT format, a McASP time slot corresponds to a DIT subframe.

24.8.2.2.3 S/PDIF Coding Format

The McASP transmitter supports the S/PDIF format with 3.3-V biphase-mark encoded output. The S/PDIF format is supported by the DIT transfer mode of the McASP. This section briefly discusses the S/PDIF coding format.

24.8.2.2.3.1 Biphase-Mark Code

In S/PDIF format, the digital signal is coded using the biphase-mark code (BMC). The clock, frame, and data are embedded in only one signal: data pin `abe_mcaspx_axr`. In the BMC system, each data bit is encoded into two logical states (00, 01, 10, or 11) at the pin. These two logical states form a cell. The duration of the cell, which equals the duration of the data bit, is called a time interval. A logical 1 is represented by two transitions of the signal within a time interval, which corresponds to a cell with logical states 01 or 10. A logical 0 is represented by one transition within a time interval, which corresponds to a cell with logical states 00 or 11. In addition, the logical level at the start of a cell is inverted from the level at the end of the previous cell. [Figure 24-190](#) and [Table 24-564](#) show how data is encoded to the BMC format.

As shown in [Figure 24-190](#), the clock frequency is twice the unencoded data bit rate. In addition, the clock is always programmed to $128 \times f_s$, where f_s is the sample rate (see [Section 24.8.2.2.3.3, Frame Format](#), for details on how this clock rate is derived based on the S/PDIF format).

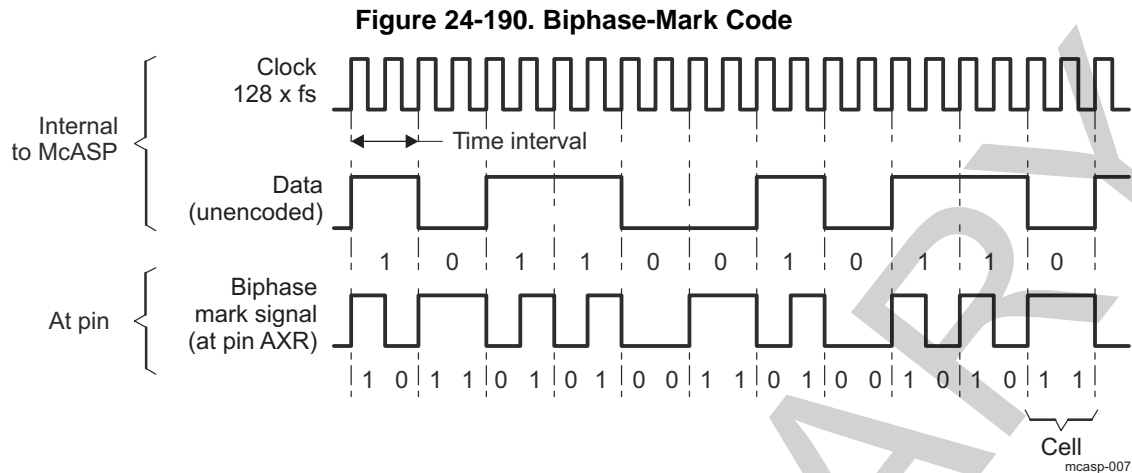


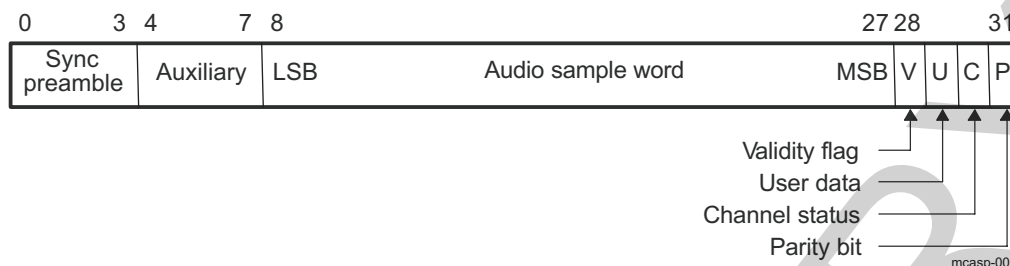
Table 24-564. Biphase-Mark Encoder

| Data (Unencoded) | Previous State at Pin abe_mcasep_axr | BMC-Encoded Cell Output at abe_mcasep_axr |
|------------------|---|--|
| 0 | 0 | 11 |
| 0 | 1 | 00 |
| 1 | 0 | 10 |
| 1 | 1 | 01 |

24.8.2.2.3.2 Subframe Format

Every audio sample transmitted in a subframe consists of 32 S/PDIF time intervals (or cells), numbered 0 to 31. [Figure 24-191](#) shows a subframe.

- Time intervals 0–3 carry one of the three permitted preambles to signify the type of audio sample in the current subframe. The preamble is not encoded in BMC format, and therefore the preamble code can contain more than two consecutive 0 or 1 logical states in a row. See [Table 24-565](#).
- Time intervals 4–27 carry the audio sample word in linear 2s-complement representation. The MSB is carried by time interval 27. When a 24-bit coding range is used, the LSB is in time interval 4. When a 20-bit coding range is used, time intervals 8–27 carry the audio sample word with the LSB in time interval 8. Time intervals 4–7 may be used for other applications and are designated auxiliary sample bits.
- If the source provides fewer bits than the interface allows (20 or 24), the unused LSBs are set to logical 0. For a nonlinear PCM audio application or a data application, the main data field can carry any other information.
- Time interval 28 carries the validity bit (V) associated with the main data field in the subframe.
- Time interval 29 carries the user data channel (U) associated with the main data field in the subframe.
- Time interval 30 carries the channel status information (C) associated with the main data field in the subframe. The channel status indicates if the data in the subframe is digital audio or some other type of data.
- Time interval 31 carries a parity bit (P) such that time intervals 4–31 carry an even number of 1s and an even number of 0s (even parity). As listed in [Table 24-565](#), the preambles (time intervals 0–3) are also defined with even parity.

Figure 24-191. S/PDIF Subframe Format

As listed in [Table 24-565](#), the McASP DIT generates only one polarity of preambles, and it assumes the previous logical state is 0. This is because the McASP assures an even-polarity encoding scheme when transmitting in DIT mode. If an underrun condition occurs, the DIT resynchronizes to the correct logic level on the `abe_mcasp_axr` pin before continuing with the next transmission.

Table 24-565. Preamble Codes

| Preamble Code ⁽¹⁾ | Previous Logical State | Logical States on pin <code>abe_mcasp_axr</code> ⁽²⁾ | Description |
|------------------------------|------------------------|---|---------------------------------|
| B (or Z) | 0 | 1110 1000 | Start of a block and subframe 1 |
| M (or X) | 0 | 1110 0010 | Subframe 1 |
| W (or Y) | 0 | 1110 0100 | Subframe 2 |

⁽¹⁾ Historically, preamble codes are referred to as B, M, and W. For use in professional applications, preambles are referred to as Z, X, and Y, respectively.

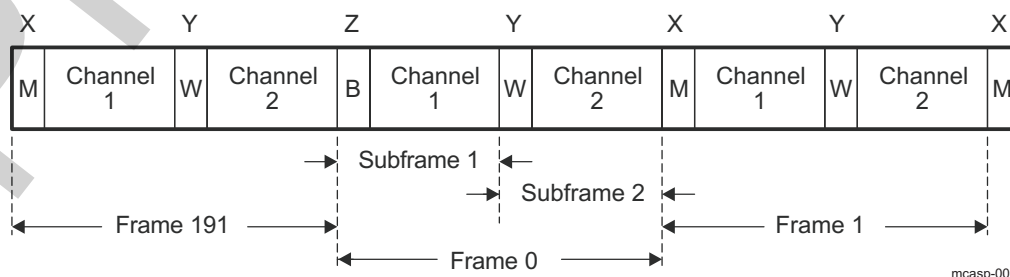
⁽²⁾ The preamble is not BMC-encoded. Each logical state is synchronized to the serial clock. These eight logical states make up time slots (cells) 0 to 3 in the S/PDIF stream.

24.8.2.2.3.3 Frame Format

An S/PDIF frame is composed of two subframes (see [Figure 24-192](#)). For linear coded audio applications, the rate of frame transmission normally corresponds exactly to the source sampling frequency f_s . The S/PDIF format clock rate is therefore $128 \times f_s$ ($128 = 32$ cells per subframe $\times 2$ clocks per cell $\times 2$ subframes per sample). For example, for an S/PDIF stream at a 192-kHz sampling frequency, the serial clock is 128×192 kHz = 24.58 MHz.

In 2-channel operation mode, the samples taken from both channels are transmitted by time multiplexing in consecutive subframes. Both subframes contain valid data. The first subframe (left or A channel in stereophonic operation and primary channel in monophonic operation) normally starts with preamble M. However, the preamble of the first subframe changes to preamble B once every 192 frames to identify the start of the block structure used to organize the channel status information. The second subframe (right or B channel in stereophonic operation and secondary channel in monophonic operation) always starts with preamble W.

In single-channel operation mode in a professional application, the frame format is the same as in the 2-channel mode. Data is carried in the first subframe and may be duplicated in the second subframe. If the second subframe is not carrying duplicate data, cell 28 (validity bit) is set to logical 1.

Figure 24-192. S/PDIF Frame Format

24.8.3 McASP Integration

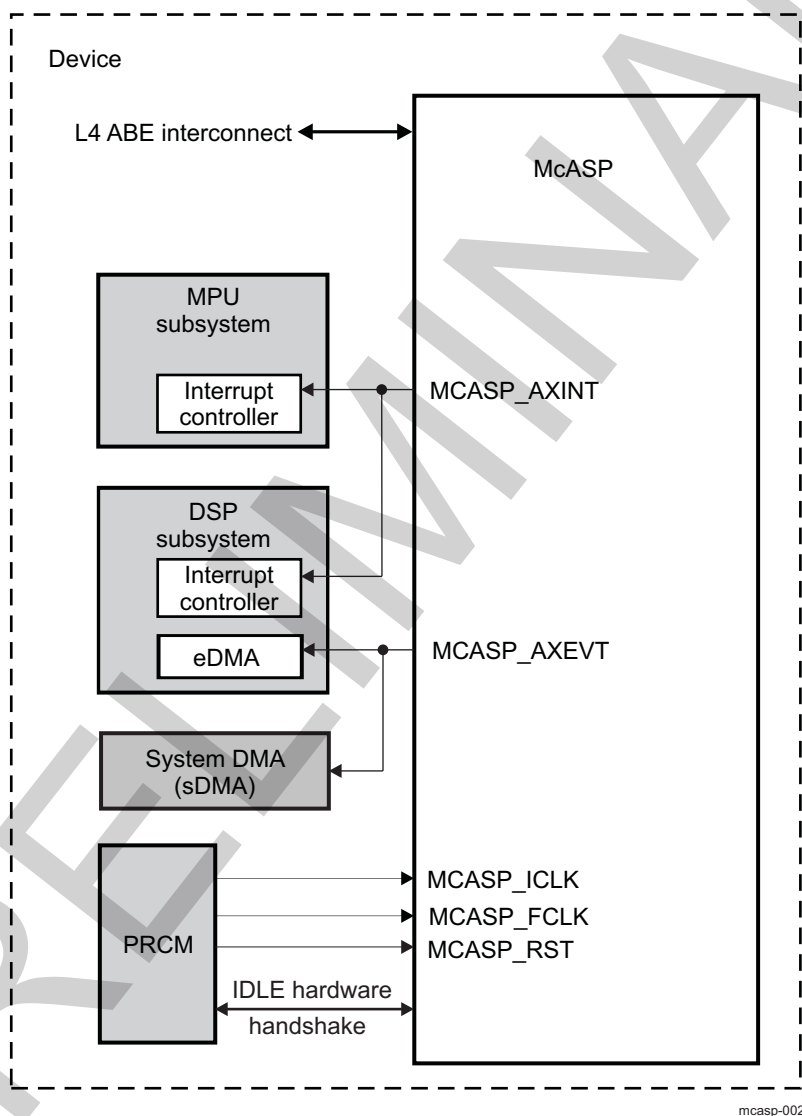
This section describes module integration in the device, including information about clocks, resets, and hardware requests.

The McASP includes the following features:

- IDLE hardware handshake
- One DMA request
- One interrupt request (IRQ)

Figure 24-193 shows McASP integration.

Figure 24-193. McASP Integration



NOTE: For more information about the IDLE hardware handshake, see [Section 3.1.1.1.2, Module Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 24-566 through Table 24-568 summarize the integration of the module in the device.

Table 24-566. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| McASP | PD_AUDIO | NO | L4_ABE |

Table 24-567. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|--------------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| McASP | MCASP_ICLK | ABE_ICLK2 | PRCM | McASP interface clock |
| | MCASP_FCLK | MCASP1_FCLK | PRCM | McASP functional clock |
| Resets | | | | |
| McASP | MCASP_RST | AUDIO_RST | PRCM | AUDIO power domain reset |

Table 24-568. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|--------------------------|---|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| McASP | MCASP_AXINT | D_IRQ_92 | DSP | McASP transmit interrupt |
| | MCASP_AXINT | MA_IRQ_109 | Cortex TM -A9 | McASP transmit interrupt |
| DMA Requests | | | | |
| McASP | MCASP_AXEVT | S_DMA_7 | sDMA | McASP data transmit DMA request line to the system DMA (sDMA) |
| | MCASP_AXEVT | D_DMA_36 | eDMA | McASP data transmit DMA request line to the DSP DMA (eDMA) |

NOTE:

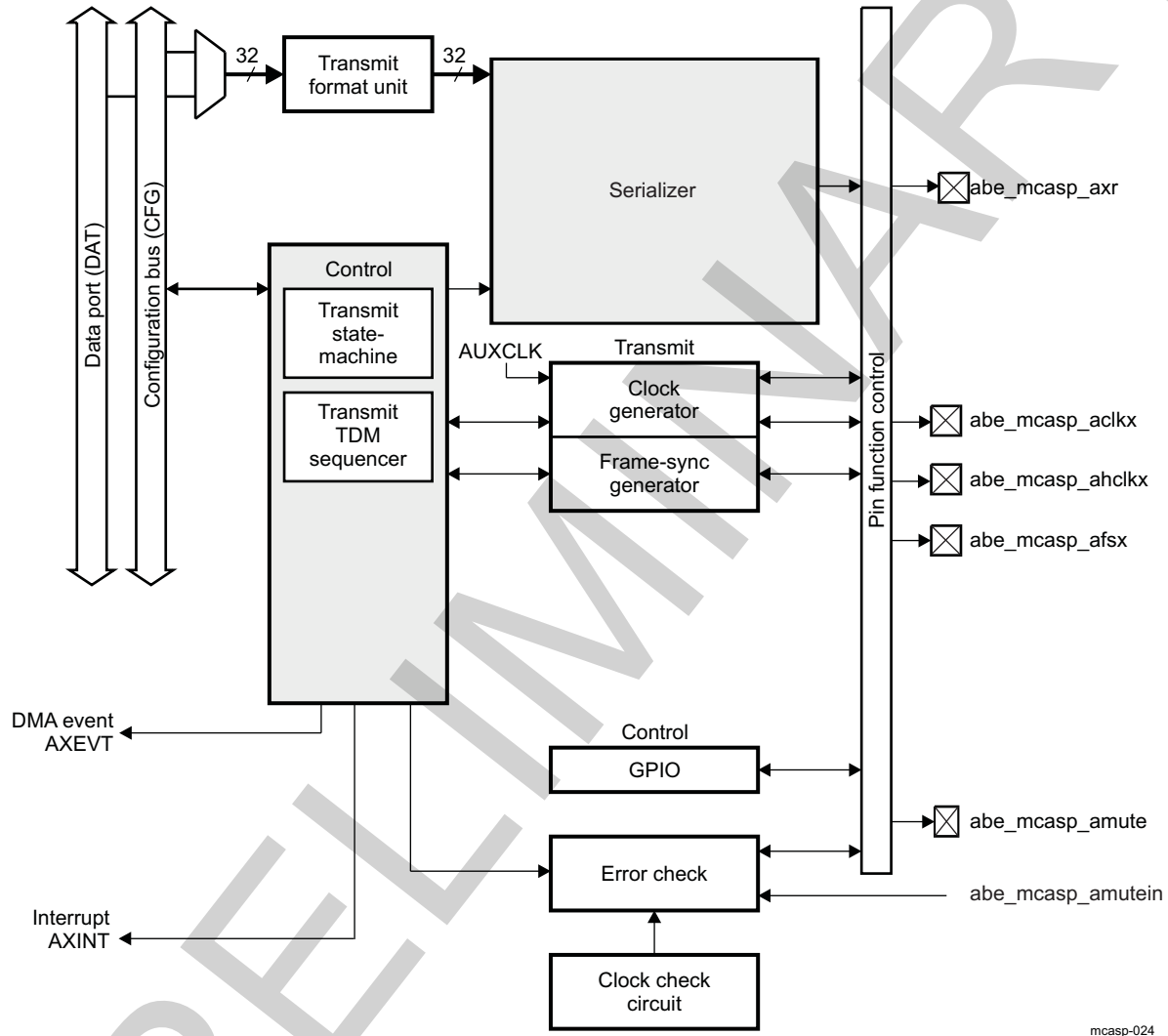
- For the description of the interrupt source, see [Section 24.8.4.11, Interrupt Requests](#).
- For the description of the DMA source, see [Section 24.8.4.12, DMA Requests](#).

24.8.4 McASP Functional Description

24.8.4.1 Block Diagram

Figure 24-194 shows the major blocks of the McASP. The McASP has a transmit clock generator and a frame-sync generator, serializer, format unit, and error-checking logic.

Figure 24-194. McASP Block Diagram



NOTE: The AUXCLK clock is sourced directly from MCASP_FCLK.

24.8.4.2 McASP Clock and Frame-Sync Configuration

The transmit serial clock (clock at the bit rate) can be sourced internally by passing through two clock dividers off the internal clock source (AUXCLK). The bit rate clock is generated internally and is driven out on the `abe_mcasp_aclkx` pin. An internally generated high-frequency clock can be driven out onto the `abe_mcasp_ahclkx` pin to serve as a reference clock for other components in the system.

24.8.4.2.1 Transmit Clock

The transmit bit clock, `abe_mcasp_aclkx`, is generated internally. For this purpose, the `MCASP_ACLKXCTL[5]` `CLKXM` bit must be set to 1. Thus, the clock is divided down by a programmable bit clock divider (the `MCASP_ACLKXCTL[4:0]` `CLKXDIV` bit field) from the source signal.

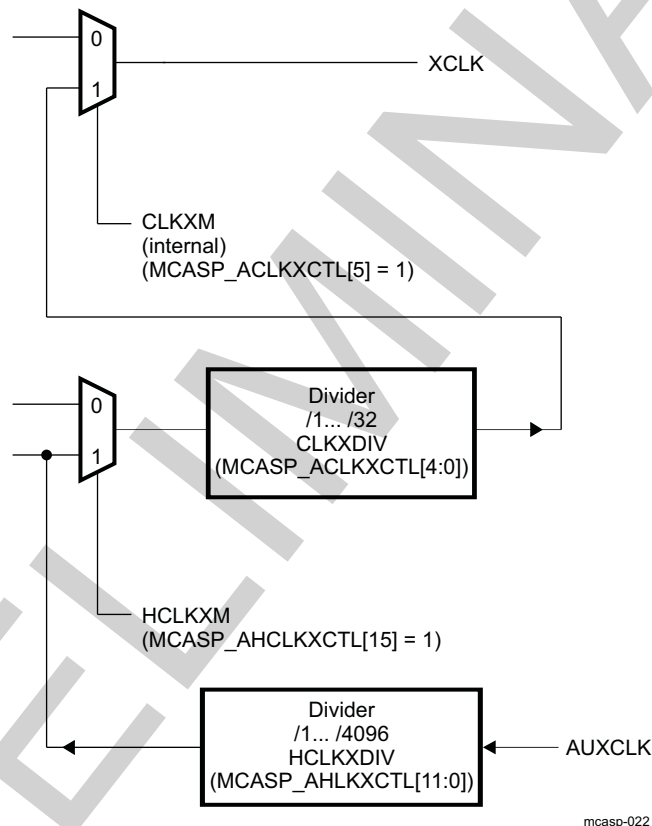
The transmit high-frequency master clock, `abe_mcasp_ahclkx`, is also generated internally. For this purpose, the `MCASP_AHCLKXCTL[15]` `HCLKXM` bit must be set to 1. Thus, the clock is divided down by a programmable high-clock divider (the `MCASP_AHCLKXCTL[11:0]` `HCLKXDIV` bit field) from the McASP internal clock source `AUXCLK`.

The transmit clock configuration is controlled by the following registers:

- `MCASP_ACLKXCTL`
- `MCASP_AHCLKXCTL`

Figure 24-195 is the block diagram of the transmit clock generator.

Figure 24-195. Transmit Clock Generator Block Diagram



24.8.4.2.2 Frame-Sync Generator

The transmit frame-sync pin is `abe_mcasp_afsx`. The frame-sync generator must be configured through the control register (`MCASP_TXFMCTL`) as:

- Internally generated `MCASP_TXFMCTL[1]` `FSXM` = 1
- Frame-sync polarity: Rising edge `MCASP_TXFMCTL[0]` `FSXP` = 0
- Frame-sync width: Single bit `MCASP_TXFMCTL[4]` `FXWID` = 0
- 384-slot, `MCASP_TXFMCTL[15:7]` `XMOD` = 1 1000 0000b

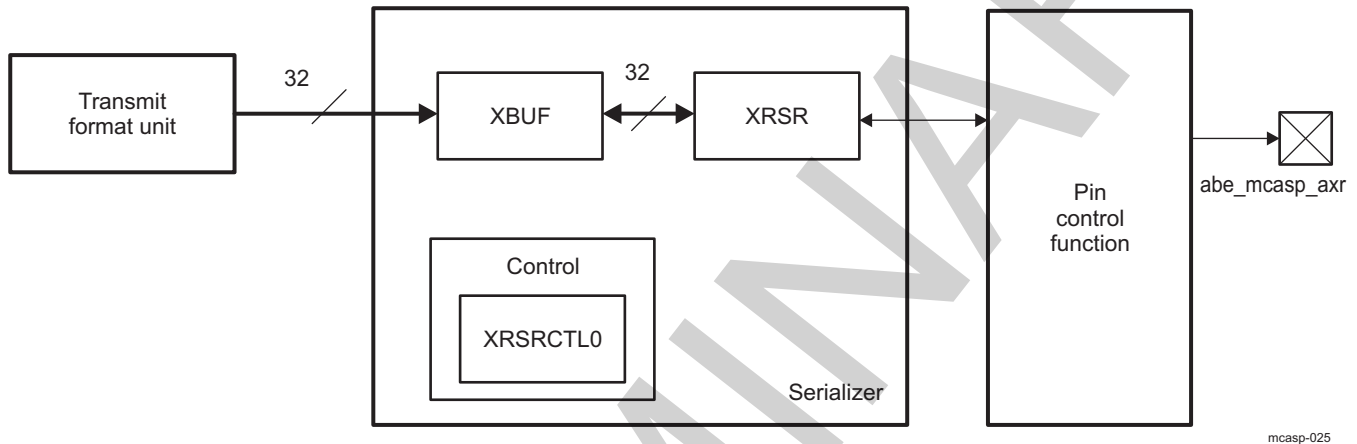
24.8.4.3 Serializers

The serializer shifts serial data out of the McASP. It consists of a shift register (XRSR), a data buffer (XBUF), a control register ([MCASP_XRSRCTL0](#)), a serial data pin ([abe_mcasp_axr](#)), and logic to support the data alignment options of the McASP.

The serializer must be configured to transmit through the control register, thus shifting out data to [abe_mcasp_axr](#). The serializer is clocked from the transmit section clock ([abe_mcasp_aclkx](#)) if configured to transmit. A serializer configured to transmit operates in lockstep.

[Figure 24-196](#) is the serializer block diagram.

Figure 24-196. Individual Serializer and Connections Within McASP



For transmit, the microprocessor unit (MPU) services the McASP by writing data into the XBUF register, which is an alias of the [MCASP_TXBUF0](#) register. The data automatically passes through the transmit format unit before reaching the XBUF register in the serializer. The data is then copied from XBUF to XRSR and shifted out from [abe_mcasp_axr](#) synchronously to the serial clock.

In addition to the data, the serializer shifts out other DIT-specific information accordingly (preamble, user data, etc.). The serializer configuration is controlled by [MCASP_XRSRCTL0\[1:0\]](#) SRMOD = 0x1. Thus, the serializer is configured to operate in transmit mode.

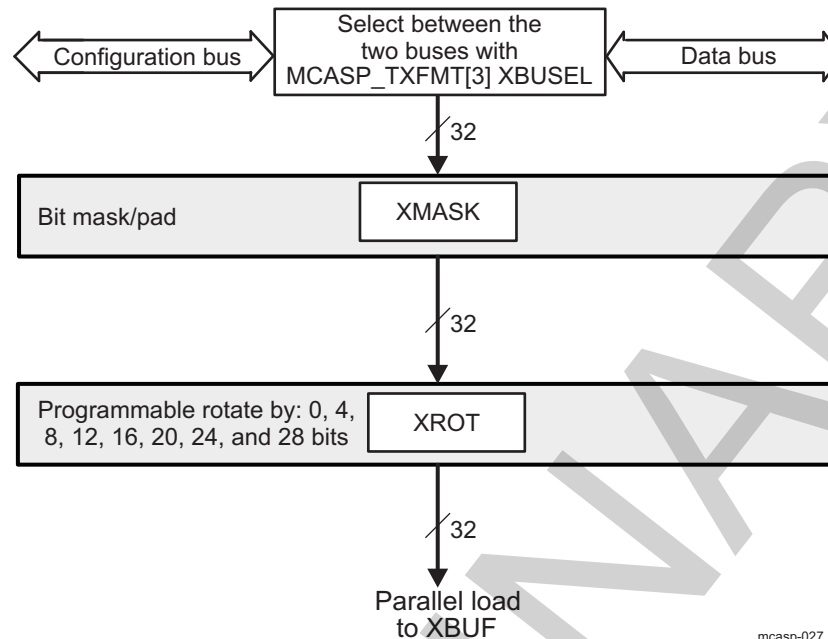
24.8.4.4 Format Unit

The McASP has one transmit data formatting unit. This unit automatically remaps the data bits within the transmitted words between a natural format for the MPU (such as a Q31 representation) and the required format for the external serial device. During the remapping process, the format unit can also mask off certain bits.

This formatting unit consists of two stages:

- Bit mask (masks off bits)
- Rotate right (aligns data within word)

[Figure 24-197](#) shows the transmit formatting unit.

Figure 24-197. Transmit Format Unit

As shown in [Figure 24-197](#), the data to the transmit format unit can come from the configuration bus or the data bus. The selection is made through the [MCASP_TXFMT\[3\] XBUSEL](#) bit.

The bit mask stage includes a full 32-bit mask register, allowing selected individual bits to pass through the stage unchanged or be masked off.

The rotate-right stage performs bitwise rotation by 0 bits for right-aligned Q31 data and bitwise rotation by 8 bits for left-aligned Q31 data, programmable by the [MCASP_TXFMT\[2:0\] XROT](#) bit field. This is a rotation process, not a shifting process, so bit 0 gets shifted back into bit 31 during the process.

The [MCASP_TXFMT\[17:16\] XDATLY](#) bit field must be set to a 0-bit delay (0x0 value).

For left-aligned Q31 data, the following transmit format unit settings process the data into right-aligned 24-bit audio data, ready for transmission:

- [MCASP_TXFMT\[2:0\] XROT](#) = 0x2 (rotate right by 8 bits)
- [MCASP_TXFMT\[15\] XRVRS](#) = 0x0 – Bit reversal is not enabled; the McASP naturally transmits and receives in an LSB-first order.
- [MCASP_TXMASK\[32\] XMASK](#) = 0xFFFFFFF0 – 0xFFFFF000
- [MCASP_TXFMT\[14:13\] XPAD](#) = 0x0 (Pad extra bits with 0s.)

For right-aligned data, the following transmit format unit settings process the data into right-aligned 24-bit audio data ready for transmission:

- [MCASP_TXFMT\[2:0\] XROT](#) = 0x0 (rotate right by 0 bits)
- [MCASP_TXFMT\[15\] XRVRS](#) = 0x0 – Bit reversal is not enabled; the McASP naturally transmits and receives in an LSB-first order.
- [MCASP_TXMASK\[32\] XMASK](#) = 0x00FFFFFF – 0x0000FFFF
- [MCASP_TXFMT\[14:13\] XPAD](#) = 0x0 (Pad extra bits with 0s.)

[Table 24-589](#) provides more details and specific examples. The examples use internal representation in integer and Q31 notation, but other fractional notations are also possible.

24.8.4.5 Transmit State-Machine

The transmit state-machine controls the interactions between the various units in the transmit section. In addition, the state-machine keeps track of error conditions and serial port status. No serial transfers can occur until the transmit state-machine is released from reset.

The transmit state-machine is controlled by the transmit bitstream format register ([MCASP_TXFMT](#)) and it reports the McASP status and error conditions in the transmitter status register ([MCASP_TXSTAT](#)).

24.8.4.6 Transmit TDM Sequencer

The time division multiplexing (TDM) sequencer is used to count the 384 subframes (slots) in the DIT block. If currently transmitting slot 1, slot 2 (next value of the TDM slot counter) should be used during the encode phase to select the appropriate C, V, and U bit, because the data encoded and written to the [MCASP_TXBUF0](#) register during the current time slot (slot 1) is actually shifted out on the next time slot.

The transmit TDM sequencer is controlled by the [MCASP_TXTDM](#) register and reports the current transmit slot to the [MCASP_TXTDMSLOT\[9:0\]](#) XSLOT CNT bit field.

24.8.4.7 McASP Software Reset

The McASP can be put into reset through the global transmit control register ([MCASP_GBLCTL](#)). A valid serial clock must be supplied to the McASP to assert the software reset bits in the [MCASP_GBLCTL](#) register.

24.8.4.8 McASP Power Management

[Table 24-569](#) describes power-management features available to the McASP.

Table 24-569. Local Power-Management Features

| Feature | Registers | Description |
|------------------|---|--|
| Slave idle modes | MCASP_SYSCONFIG[1:0] IDLE_MODE | Force-idle, no-idle, and smart-idle modes are available. |

24.8.4.9 Transfer Modes

24.8.4.9.1 DIT Transfer Mode

The DIT transfer mode of the McASP also supports transmission of audio data in S/PDIF, AES-3, and IEC-60958 formats. These formats are designed to carry audio data between different systems through an optical or coaxial cable. The DIT mode applies only to a serializer configured as transmitter, not receiver. For a description of the S/PDIF format, see [Section 24.8.2.2.3, S/PDIF Coding Format](#).

24.8.4.9.1.1 Transmit DIT Encoding

When the McASP operates in DIT mode, the data transmitted is output as a biphasic-mark encoded bitstream, with preamble, channel status, user data, validity, and parity automatically stuffed into the bitstream by the McASP. The McASP includes separate validity bits for even/odd subframes and two 384-bit RAM modules to hold channel status and user data bits.

The transmit TDM time slot register ([MCASP_TXTDM](#)) should be programmed to all 1s during DIT mode. TDM functionality is not supported in DIT mode, except that the TDM slot counter counts the DIT subframes.

To transmit data in DIT mode, the following pins are typically required:

- `abe_mcasp_ahclkx` – transmit high-frequency master clock (The internal clock source can be used instead.)
- One serial data pin, `abe_mcasp_axr`, with serializer configured to transmit

The actual 24-bit audio data must always be in bit positions 23–0 after passing through the first three stages of the transmit format unit.

24.8.4.9.1.2 Transmit DIT Clock and Frame-Sync Generation

The DIT transmitter works only in the following configuration:

- In the transmit frame control register ([MCASP_TXFMCTL](#)):
 - Internally generated transmit frame sync, FSXM = 1
 - Rising-edge frame sync, FSXP = 0
 - Bit-width frame sync, FXWID = 0
 - 384-slot TDM, XMOD = 1 1000 0000b
- In the transmit clock control register ([MCASP_ACLKXCTL](#)), ASYNC = 1
- In the transmit bitstream format register ([MCASP_TXFMT](#)), XSSZ = 1111 (32-bit slot size)

All combinations of `abe_mcasp_ahclkx` and `abe_mcasp_aclkx` are supported.

The following summarizes the register configurations required for DIT mode. DIT mode-specific bit fields are in bold face:

- [MCASP_PFUNC](#): The data pin must be configured for McASP function. If `abe_mcasp_ahclkx` is used, it must also be configured for McASP function. Other pins can be configured to function as GPIOs, if desired.
- [MCASP_PDIR](#): The data pin must be configured as output. If internal clock source AUXCLK is used as the reference clock, it may be output on the `abe_mcasp_ahclkx` pin by configuring `abe_mcasp_ahclkx` as an output.
- [MCASP_GBLCTL](#): Global initialization
- [MCASP_AMUTE](#): Program all fields according to the mute control desired.
- [MCASP_TXDITCTL](#): The **DITEN** bit must be set to 1 to enable DIT mode. Configure other bits as desired.
- [MCASP_TXMASK](#): Mask the desired bits, depending upon left-aligned or right-aligned internal data.
- [MCASP_TXFMT](#): **XDATDLY** = 0. **XRVR** = 0. **XPAD** = 0. **XSSZ** = Fh (32-bit slot). **XBUSEL** = configured as desired. The **XROT** bit is configured either 0 or 8-bit rotate.
- [MCASP_TXFMCTL](#): Configure the bits according to former discussions.
- [MCASP_ACLKXCTL](#): **ASYNC** = 1. Program the CLKXDIV bits to obtain the bit clock rate desired. CLKXM = 1.
- [MCASP_AHCLKXCTL](#): Program the HCLKXDIV bits to obtain the high-frequency bit clock rate desired.
- [MCASP_TXTDM](#): Set to FFFF FFFFh for all active slots for DIT transfers.
- [MCASP_TXEVTCTL](#): Program all fields according to the interrupts desired.
- [MCASP_TXCLKCHK](#): Program all fields according to the clock checking desired.
- [MCASP_XRSRCTL0](#): Set **SRMOD** = 1 (transmitter) for the DIT pins.
- [MCASP_DITCSRAi](#) and [MCASP_DITCSRBi](#): Program the channel status bits as desired.
- [MCASP_DITUDRAi](#) and [MCASP_DITUDRBi](#): Program the user data bits as desired.

24.8.4.9.1.3 DIT Channel Status and User Data Register Files

The channel status registers ([MCASP_DITCSRAi](#) and [MCASP_DITCSRBi](#)) and user data registers ([MCASP_DITUDRAi](#) and [MCASP_DITUDRBi](#)) are not double-buffered. Typically, programmers use one of the synchronizing interrupts, such as the last slot, to create an event at a safe time so the register may be updated. In addition, the MPU reads the transmit TDM slot counter to determine which word of the register is being used.

It is a software requirement to avoid writing to the word of user data and channel status that are being used to encode the current time slot; otherwise, it is undetermined whether old or new data is used to encode the bitstream.

The DIT subframe format is defined in [Section 24.8.2.2.3.2, Subframe Format](#). The channel status information (C) and user data (U) are defined in the following DIT control registers:

- MCASP_DITCSRA0 to MCASP_DITCSRA5: The 192 bits in these six registers contain the channel status information for the left channel within each frame.
- MCASP_DITCSRB0 to MCASP_DITCSRB5: The 192 bits in these six registers contain the channel status information for the right channel within each frame.
- MCASP_DITUDRA0 to MCASP_DITUDRA5: The 192 bits in these six registers contain the user data information for the left channel within each frame.
- MCASP_DITUDRB0 to MCASP_DITUDRB5: The 192 bits in these six registers contain the user data information for the right channel within each frame.
- The S/PDIF block format is shown in [Figure 24-192](#). There are 192 frames within a block (frame 0 to frame 191). There are two subframes within each frame (subframes 1 and 2 for the left and right channels, respectively).

The channel status and user data information sent on each subframe is summarized in [Table 24-570](#).

Table 24-570. Channel Status and User Data for Each DIT Block

| Frame | Subframe | Preamble | Channel Status Defined in: | User Data Defined in: |
|--|----------|----------|----------------------------|-----------------------|
| Defined by DITCSRA0, DITCSRB0, DITUDRA0, DITUDRB0 | | | | |
| 0 | 1 (L) | B | DITCSRA0[0] | DITUDRA0[0] |
| 0 | 2 (R) | W | DITCSRB0[0] | DITUDRB0[0] |
| 1 | 1 (L) | M | DITCSRA0[1] | DITUDRA0[1] |
| 1 | 2 (R) | W | DITCSRB0[1] | DITUDRB0[1] |
| 2 | 1 (L) | M | DITCSRA0[2] | DITUDRA0[2] |
| 2 | 2 (R) | W | DITCSRB0[2] | DITUDRB0[2] |
| ... | ... | ... | ... | ... |
| 31 | 1 (L) | M | DITCSRA0[31] | DITUDRA0[31] |
| 31 | 2 (R) | W | DITCSRB0[31] | DITUDRB0[31] |
| Defined by DITCSRA1, DITCSRB1, DITUDRA1, DITUDRB1 | | | | |
| 32 | 1 (L) | M | DITCSRA1[0] | DITUDRA1[0] |
| 32 | 2 (R) | W | DITCSRB1[0] | DITUDRB1[0] |
| ... | ... | ... | ... | ... |
| 63 | 1 (L) | M | DITCSRA1[31] | DITUDRA1[31] |
| 63 | 2 (R) | W | DITCSRB1[31] | DITUDRB1[31] |
| Defined by DITCSRA2, DITCSRB2, DITUDRA2, DITUDRB2 | | | | |
| 64 | 1 (L) | M | DITCSRA2[0] | DITUDRA2[0] |
| 64 | 2 (R) | W | DITCSRB2[0] | DITUDRB2[0] |
| ... | ... | ... | ... | ... |
| 95 | 1 (L) | M | DITCSRA2[31] | DITUDRA2[31] |
| 95 | 2 (R) | W | DITCSRB2[31] | DITUDRB2[31] |
| Defined by DITCSRA3, DITCSRB3, DITUDRA3, DITUDRB3 | | | | |
| 96 | 1 (L) | M | DITCSRA3[0] | DITUDRA3[0] |
| 96 | 2 (R) | W | DITCSRB3[0] | DITUDRB3[0] |
| ... | ... | ... | ... | ... |
| 127 | 1 (L) | M | DITCSRA3[31] | DITUDRA3[31] |
| 127 | 2 (R) | W | DITCSRB3[31] | DITUDRB3[31] |
| Defined by DITCSRA4, DITCSRB4, DITUDRA4, DITUDRB4 | | | | |
| 128 | 1 (L) | M | DITCSRA4[0] | DITUDRA4[0] |
| 128 | 2 (R) | W | DITCSRB4[0] | DITUDRB4[0] |
| ... | ... | ... | ... | ... |
| 159 | 1 (L) | M | DITCSRA4[31] | DITUDRA4[31] |
| 159 | 2 (R) | W | DITCSRB4[31] | DITUDRB4[31] |
| Defined by DITCSRA5, DITCSRB5, DITUDRA5, DITUDRB5 | | | | |

Table 24-570. Channel Status and User Data for Each DIT Block (continued)

| Frame | Subframe | Preamble | Channel Status Defined in: | User Data Defined in: |
|-------|----------|----------|----------------------------|-----------------------|
| 160 | 1 (L) | M | DITCSRA5[0] | DITUDRA5[0] |
| 160 | 2 (R) | W | DITCSRB5[0] | DITUDRB5[0] |
| ... | ... | ... | ... | ... |
| 191 | 1 (L) | M | DITCSRA5[31] | DITUDRA5[31] |
| 191 | 2 (R) | W | DITCSRB5[31] | DITUDRB5[31] |

24.8.4.10 Data Transmission

The MPU services the McASP by writing data to the [MCASP_TXBUF0](#) register for transmit operations. The McASP sets status flags and notifies the MPU whenever data is ready to be transmitted.

[Section 24.8.4.10.1](#), *Data Ready Status and Event/Interrupt Generation*, discusses data-ready status in detail.

The [MCASP_TXBUF0](#) register can be accessed through one of the two peripheral ports of the device:

- Data port (DAT): This port is dedicated to data transfers on the device.
- Configuration bus (CFG): This port is used for data transfers and peripheral configuration control on the device.

[Section 24.8.4.10.1.2](#), *Transfers Through the Data Port (DAT)*, and [Section 24.8.4.10.1.3](#), *Transfers Through the Configuration Bus (CFG)*, discuss how to perform transfers through the data port and the configuration bus, respectively.

The MPU or the DMA can be used to service the McASP through either of these peripheral ports. The MPU and DMA usages are discussed in [Section 24.8.4.10.1.4](#), *Using the MPU for McASP Servicing*, and [Section 24.8.4.10.1.5](#), *Using the DMA for McASP Servicing*, respectively.

24.8.4.10.1 Data Ready Status and Event/Interrupt Generation

24.8.4.10.1.1 Transmit Data Ready

The transmit data ready flag XDATA bit in the [MCASP_TXSTAT](#) register reflects the status of the [MCASP_TXBUF0](#) register. The XDATA flag is set when data is transferred from the [MCASP_TXBUF0\[n\]](#) buffer to the XRSR[n] shift register, thus indicating that the [MCASP_TXBUF0](#) is empty and ready to accept new data from the MPU. This flag is cleared when the XDATA bit is written with 1, or when the serializer configured as transmitter is written by the MPU.

Whenever XDATA is set, the DMA AXEVT event is automatically generated to notify the DMA of the [MCASP_TXBUF0](#) empty status. An AXINTn interrupt is also generated if the XDATA interrupt is enabled in the [MCASP_EVTCTLX](#) register (for details, see [Section 24.8.4.11.1](#), *Transmit Data Ready Interrupt*).

For DMA requests, the McASP does not require that [MCASP_TXSTAT](#) be read between DMA events. This means that, even if [MCASP_TXSTAT](#) already has the XDATA flag set to 1 from a previous request, the next transfer triggers another DMA request.

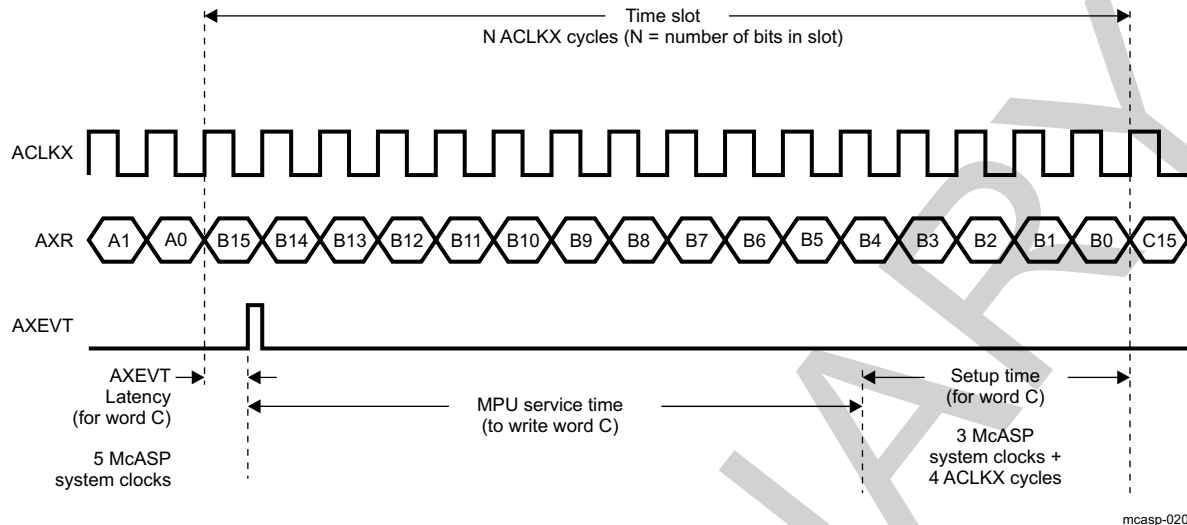
Because the serializer acts in lockstep, only one DMA event is generated to indicate that the transmit serializer is ready to be written to with new data.

[Figure 24-198](#) shows the timing details of when AXEVT is generated at the McASP boundary. In this example, as soon as the last bit (A0) of word A is transmitted, the McASP sets the XDATA flag and generates an AXEVT event. However, it takes up to five McASP system clocks (AXEVT latency) before AXEVT is active at the McASP boundary. Upon AXEVT, the MPU can begin servicing the McASP by writing word C into the [MCASP_TXBUF0](#) (service time). The MPU must write word C into the [MCASP_TXBUF0](#) within the setup time required by the McASP (setup time).

The maximum service time (see [Figure 24-198](#)) can be calculated as:

$$\text{Service Time} = \text{Time Slot} - \text{AXEVT Latency} - \text{Setup Time}$$

Figure 24-198. MPU Service Time Upon Transmit DMA Event (AXEVT)



24.8.4.10.1.2 Transfers Through the Data Port (DAT)

CAUTION

To perform internal transfers through the data port, clear the XBUSEL bit to 0 in the [MCASP_TXFMT](#) register. Failure to do so may result in software malfunction.

Typically, the [MCASP_TXBUF0](#) register is accessed through the data port. To access through the data port, simply have the MPU or DMA access [MCASP_TXBUF0](#) through its data port location.

NOTE: DAT allows the MPU, DSP subsystem, or DMA to access only the transmit buffer [MCASP_TXBUF0](#) register. There is no way to access the McASP configuration registers within the MPU/DSP subsystem/DMA DAT address ranges.

For transmit operations through the data port, the DMA/MPU must write to the [MCASP_TXBUF0](#) data port address to service the active transmit serializer.

When transmitting, the DMA/MPU must write data to the serializer and transmit within each time slot. Failure to do so may result in a buffer underrun condition (see [Section 24.8.4.14.1, Buffer Underrun Error – Transmitter](#)).

24.8.4.10.1.3 Transfers Through the Configuration Bus (CFG)

CAUTION

To perform internal transfers through the configuration bus, set the XBUSEL bit to 1 in the [MCASP_TXFMT](#) register. Failure to do so may result in software malfunction.

In this method, the DMA/MPU accesses the [MCASP_TXBUF0](#) register through the configuration bus address.

When transmitting, the DMA/MPU must write data to the serializer and transmit within each time slot. Failure to do so may result in a buffer underrun condition ([Section 24.8.4.14.1, Buffer Underrun Error – Transmitter](#)).

24.8.4.10.1.4 Using the MPU for McASP Servicing

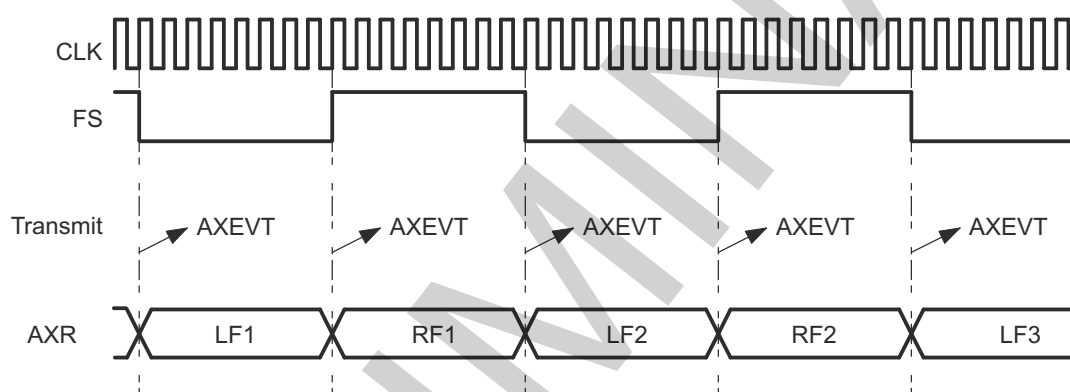
The MPU can be used to service the McASP through interrupts (upon MCASP_AXINT interrupt) or through polling the XDATA bit in the [MCASP_TXSTAT](#) register. As discussed in [Section 24.8.4.10.1.2, Transfers Through the Data Port \(DAT\)](#), and [Section 24.8.4.10.1.3, Transfers Through the Configuration Bus \(CFG\)](#), the MPU can access through the data port or the configuration bus.

To use the MPU to service the McASP through interrupts, the XSTAT bit must be enabled in the [MCASP_TXEVTCTL](#) register to generate the MCASP_AXINT interrupt to the MPU upon data ready.

24.8.4.10.1.5 Using the DMA for McASP Servicing

The typical scenario is to use the DMA to service the McASP through the data port, although the DMA can also service the McASP through the configuration bus.

Figure 24-199. DMA Transmit Event in an Audio Example – One Event



mcasep-013

The DMA event AXEVT, which is triggered upon each XDATA transition from 0 to 1, is used to service the McASP transmit buffer (XBUF). [Figure 24-199](#) is an example of an audio system with two audio channels (LF and RF) transmitted through the `abe_mcasp_axr` pin on the McASP. It shows the points at which event AXEVT is triggered.

The DMA AXEVT event is triggered on each time slot. In the example, AXEVT is triggered for each transmit audio channel time slot (time slot for channel LF, and time slot for channel RF). DMA events are generated automatically upon data ready, whereas MPU interrupt generation must be enabled in the [MCASP_EVTCTLX](#) register.

24.8.4.11 Interrupt Requests

[Table 24-571](#) lists the event flags that can cause module interrupts.

Table 24-571. TX Events

| Event Mask | Event Flag | Map to | Description |
|---|--|-------------|-----------------------------------|
| MCASP_EVTCTLX[0] XUNDRN | MCASP_TXSTAT[0] XUNDRN | MCASP_AXINT | Transmit underrun |
| MCASP_EVTCTLX[1] XSYNCERR | MCASP_TXSTAT[1] XSYNCERR | MCASP_AXINT | Unexpected transmit frame sync |
| MCASP_EVTCTLX[2] XCKFAIL | MCASP_TXSTAT[2] XCKFAIL | MCASP_AXINT | Transmit clock failure |
| MCASP_EVTCTLX[4] XLAST | MCASP_TXSTAT[4] XLAST | MCASP_AXINT | Transmit last slot interrupt |
| MCASP_EVTCTLX[5] XDATA | MCASP_TXSTAT[5] XDATA | MCASP_AXINT | Transmit data-ready interrupt |
| MCASP_EVTCTLX[7] XSTAFRM | MCASP_TXSTAT[7] XSTAFRM | MCASP_AXINT | Transmit start of frame interrupt |

An interrupt line is asserted (active high) when one of these events occurs. Read the [MCASP_TXSTAT](#) register to determine which event occurs.

24.8.4.11.1 Transmit Data Ready Interrupt

The transmit data-ready interrupt (XDATA) is generated if XDATA is 1 in the [MCASP_TXSTAT](#) register and XDATA is enabled in [MCASP_EVTCTLX](#). [Section 24.8.4.10.1, Data Ready Status and Event/Interrupt Generation](#), provides details on when XDATA is set in the [MCASP_TXSTAT](#) register.

A transmit-start-of-frame interrupt (XSTAFRM) is triggered by the recognition of a transmit frame sync.

A transmit-last-slot interrupt (XLAST) is a qualified version of the data-ready interrupt (XDATA). It has the same behavior as the data-ready interrupt, but is further qualified by having the data requested belonging to the last slot (the slot that just ended is the next-to-last TDM slot, the current slot is the last slot).

24.8.4.11.2 Error Interrupt

Upon detection, the following error conditions generate interrupt flags:

In the transmit status register ([MCASP_TXSTAT](#)):

- Transmit underrun (XUNDRN)
- Transmit DMA error (XDMAERR)

Each interrupt source also has a corresponding enable bit in the transmit interrupt control register ([MCASP_EVTCTLX](#)). If the enable bit is set, an interrupt is requested when the interrupt flag is set in [MCASP_TXSTAT](#). If the enable bit is not set, no interrupt request is generated. However, the interrupt flag may be polled.

24.8.4.12 DMA Requests

The McASP can generate one DMA request to the sDMA and eDMA controllers to transmit data ([MCASP_AXEVT](#)).

A DMA request to transmit data is generated if the XDATDMA bit in the [MCASP_TXEVTCTL](#) register is cleared.

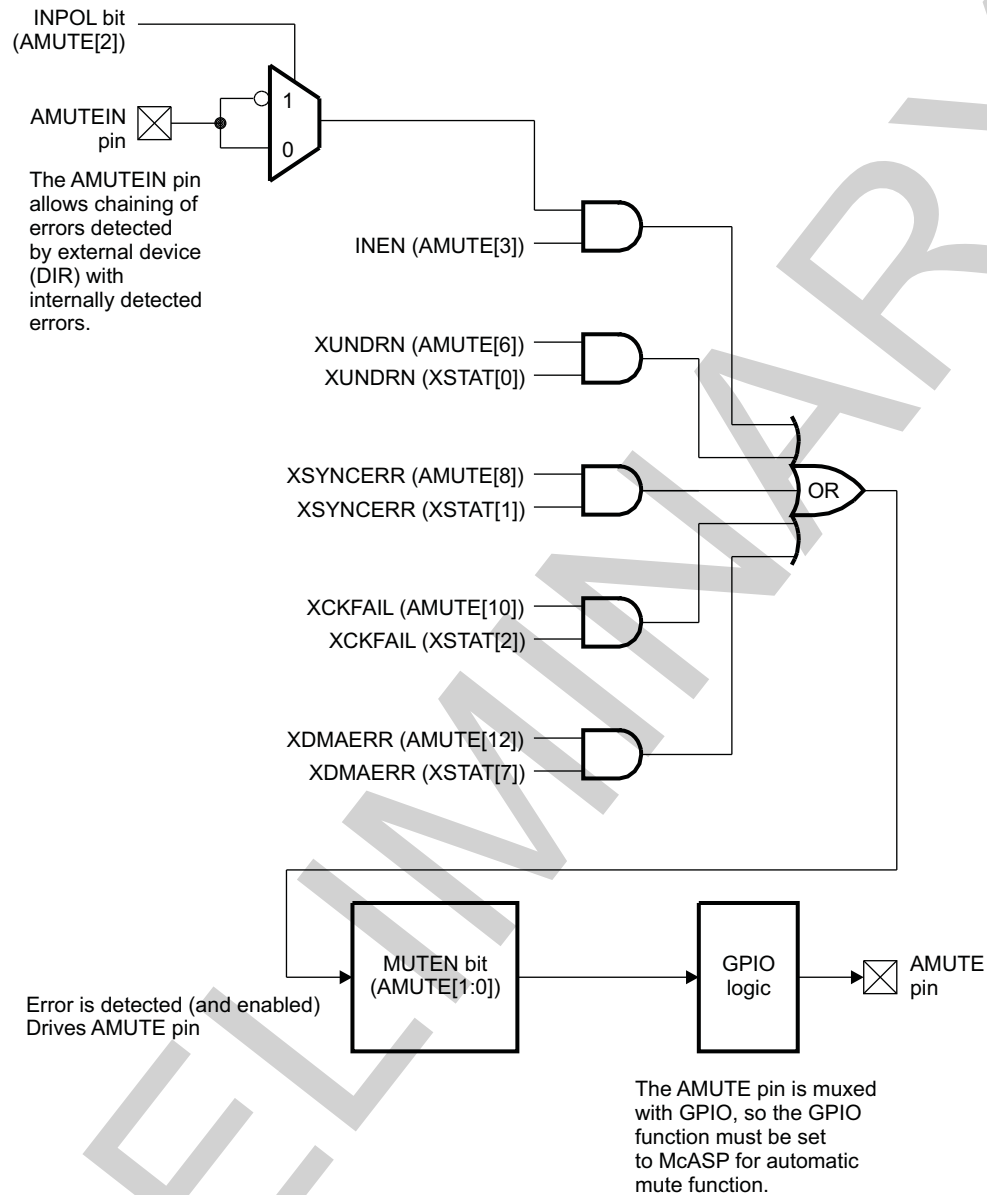
24.8.4.13 Audio Mute (AMUTE) Function

The McASP includes an automatic audio mute function (see [Figure 24-200](#)) that asserts, in hardware, the AMUTE pin to a preprogrammed output state, as selected by the MUTEN bit in the audio mute control register ([MCASP_AMUTE](#)). The AMUTE pin is asserted when one of the interrupt flags is set or an external device issues an error signal on the `abe_mcasp_amutein` input. Typically, the `abe_mcasp_amutein` input is shared with a device interrupt pin.

The `abe_mcasp_amutein` input allows the on-chip logic to consider a mute input from other devices in the system so that all errors may be considered. The `abe_mcasp_amutein` input has a programmable polarity to allow it to adapt to different devices, as selected by the INPOL bit in the [MCASP_AMUTE](#) register, and it must be explicitly enabled.

In addition to the external `abe_mcasp_amutein` input, the `abe_mcasp_amute` pin output may be asserted when one of the error interrupt flags is set and its mute function is enabled in the [MCASP_AMUTE](#) register.

When one or more errors are detected and enabled, the `abe_mcasp_amute` pin is driven to an active state that is selected by MUTEN in the [MCASP_AMUTE](#) register. The active polarity of the AMUTE pin is programmable by the MUTEN bit (the inactive polarity is the opposite of the active polarity). The `abe_mcasp_amute` pin remains driven active until software clears all the error interrupt flags that are enabled to mute, and until the `abe_mcasp_amutein` is inactive.

Figure 24-200. Audio Mute (AMUTE) Block Diagram

mcasep-017

24.8.4.14 Error Reporting

The McASP includes error-checking capability for the serial protocol and data underrun. In addition, the McASP includes a timer that continually measures the high-frequency master clock every 32 AHCLKX clock cycles. The value of the timer can be read to get a measurement of the clock frequency and has a minimum and maximum range setting that can set an error flag if the master clock goes out of a specified range.

When one or more errors (software selectable) are detected or the `abe_mcasep_amutein` input pin is asserted, the `abe_mcasep_amute` output pin may be asserted to a high or low level to immediately mute the audio output. In addition, an interrupt can be generated if desired, based on one or more error sources.

24.8.4.14.1 Buffer Underrun Error – Transmitter

A buffer underrun occurs when the serializer is instructed by the transmit state-machine to transfer data from [MCASP_TXBUF0](#) to XRSR, but [MCASP_TXBUF0](#) has not yet been written with new data since the last time the transfer occurred. When this occurs, the transmit state-machine sets the XUNDRN flag.

An underrun is checked only once per time slot. The [MCASP_TXSTAT\[0\]](#) XUNDRN flag is set when an underrun condition occurs. Once set, the XUNDRN flag remains set until the host explicitly writes 1 to the XUNDRN bit to clear it.

A pair of BMC zeros is shifted out when an underrun occurs (four bit times at 128 bps). By shifting out a pair of zeros, a clock can be recovered on the receiver. To recover, reset the McASP and restart with the proper initialization.

24.8.4.14.2 DMA Error – Transmitter

A transmit DMA error, as indicated by the XDMAERR flag in the [MCASP_TXSTAT](#) register, occurs when the DMA (or MPU) writes more words to the data port of the McASP than it should.

XDMAERR indicates that the DMA (or MPU) wrote too many words to the McASP for a given transmit DMA event. Writing too few words results in a transmit underrun error setting XUNDRN in [MCASP_TXSTAT](#).

While XDMAERR occurs infrequently, an occurrence indicates a serious loss of synchronization between the McASP and the DMA or MPU. The McASP transmitter and the DMA must be reinitialized to resynchronize them.

24.8.4.14.3 Clock Failure Detection

24.8.4.14.3.1 Clock Failure Check Startup

It is initially expected of the clock failure circuits to generate an error until at least one measurement is taken. Therefore, the clock failure interrupts, clock switch, and mute functions should not be enabled immediately, but only after a specific startup procedure.

The start the transmit clock failure check procedure:

1. Configure the transmit clock failure detect logic (XMIN, XMAX, XPS) in the transmit clock check control register ([MCASP_TXCLKCHK](#)).
2. Clear the transmit clock failure flag (XCKFAIL) in the transmit status register ([MCASP_TXSTAT](#)).
3. Wait until the first measurement is taken (32 AHCLKX clock periods).
4. Verify that no clock failure is detected.
5. Repeat Step 2 through Step 4 until the clock is running and is no longer issuing clock failure errors.
6. After the transmit clock is measured and falls within the acceptable range, the following can be enabled:
 - (a) The transmit clock failure interrupt enable bit (XCKFAIL) in the transmitter interrupt control register ([MCASP_EVTCTLX](#))
 - (b) The mute option (XCKFAIL) in the mute control register ([MCASP_AMUTE](#))

24.8.4.14.3.2 Transmit Clock Failure Check and Recovery

The transmit clock failure check circuit (see [Figure 24-201](#)) works off the internal McASP system clock and the external high-frequency serial clock ([abe_mcasp_ahclkx](#)). It continually counts the number of system clocks for every 32 high-rate serial clock ([abe_mcasp_ahclkx](#)) periods, and stores the count in XCNT of the transmit clock check control register ([MCASP_TXCLKCHK](#)) every 32 high-rate serial clock cycles.

The logic compares the count against a user-defined minimum allowable boundary (XMIN), and automatically flags an interrupt (XCKFAIL in [MCASP_TXSTAT](#)) when an out-of-range condition occurs. An

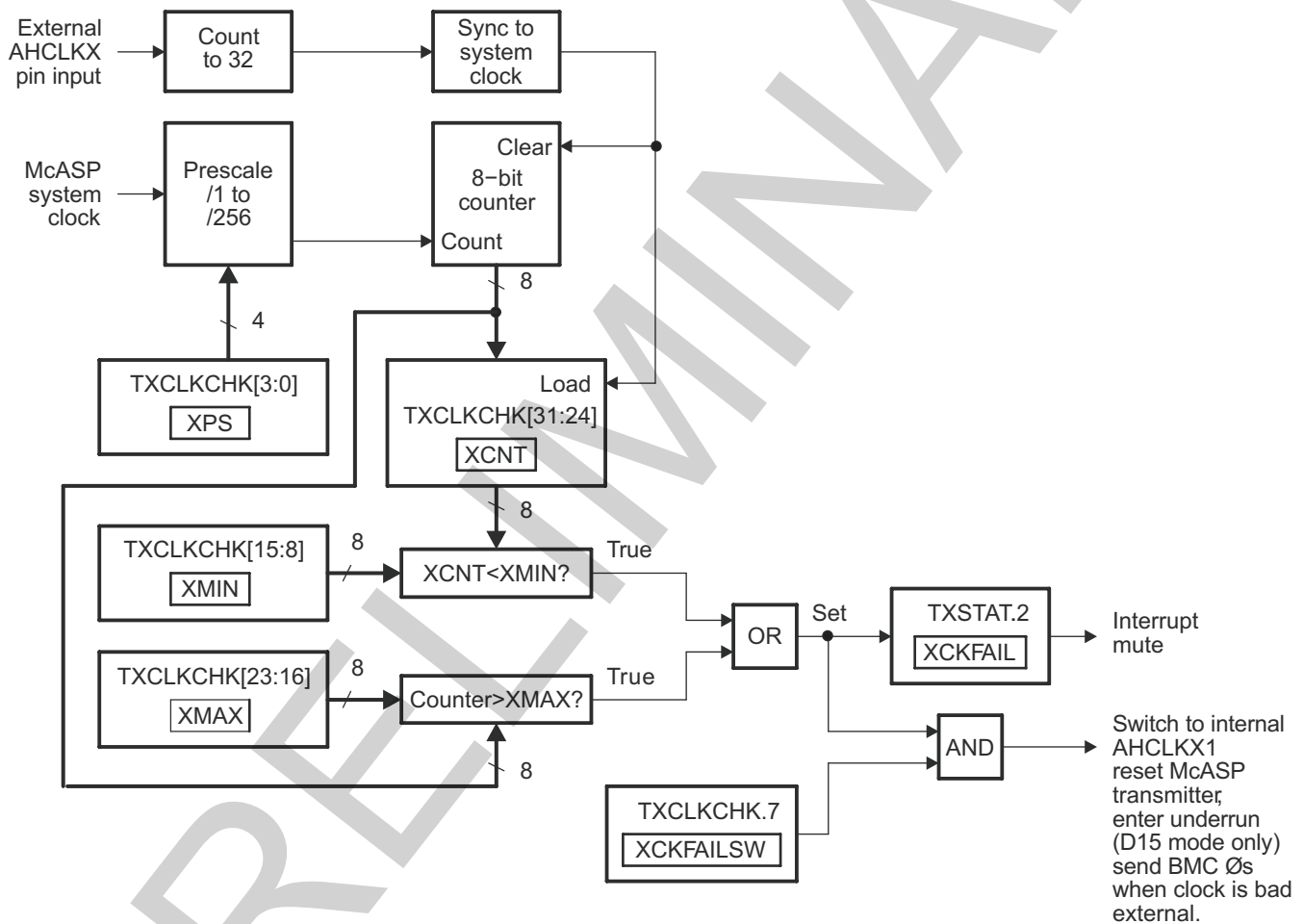
out-of-range minimum condition occurs when the count is less than XMIN. The logic continually compares the current count (from the running system clock counter) to the maximum allowable boundary (XMAX). This is so that if the external clock completely stops, the counter value is not copied to XCNT. An out-of-range maximum condition occurs when the count is greater than XMAX. The XMIN and XMAX fields are 8-bit unsigned values, and the comparison is performed using unsigned arithmetic.

An out-of-range count may indicate that an unstable clock was detected or that the audio source has changed and a new sample rate is being used.

For the transmit clock failure check circuit to operate correctly, the high-frequency serial clock divider must be taken out of reset.

If a clock failure is detected, the transmit clock failure flag (XCKFAIL) in `MCASP_TXSTAT` is set. This causes an interrupt if the transmit clock failure interrupt enable bit (XCKFAIL) in `MCASP_EVTCTLX` is set.

Figure 24-201. Transmit Clock Failure Detection Circuit Block Diagram



mcasp-014

24.8.5 McASP Low-Level Programming Model

This section describes the low-level hardware programming sequences for the configuration and use of the McASP module.

24.8.5.1 Global Initialization

24.8.5.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the McASP module is used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the McASP (for more information, see the [Section 24.8.3](#), *McASP Integration*, and [Section 24.8.2](#), *McASP Environment*).

[Table 24-572](#), describes the global initialization of surrounding modules.

Table 24-572. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---|---|
| PRCM | Module functional and interface clocks must be enabled. (See Chapter 3 , <i>Power, Reset, and Clock Management</i> .) |
| Control module | Module-specific pad muxing and other pad configurations must be set in the control module. (See Chapter 19 , <i>Control Module</i> .) |
| (Optional) Cortex-A9 MPU INTC or DSP INTC | INTC configuration must be done to enable the interrupts from the McASP. (See Chapter 18 , <i>Interrupt Controllers</i> .) |
| (Optional) sDMA (or eDMA or aDMA) | DMA configuration must be done to enable the McASP DMA data channel requests. |
| (Optional) ABE_L4 and L3 Interconnects | For more information about the interconnect configuration, see Chapter 14 , <i>Interconnect</i> . |

NOTE: The MPU/DSP INTC and the sDMA/eDMA/aDMA configurations are required when the interrupt and DMA-based communication modes are used.

24.8.5.1.2 McASP Global Initialization

24.8.5.1.2.1 Main Sequence – McASP Global Initialization

The procedure in [Table 24-573](#) initializes the McASP after a power-on reset (POR).

Table 24-573. McASP Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------------|
| Apply software reset to different McASP components. | MCASP_GBLCTL [12:8] | 0x00 |
| Poll the bits to ensure the active reset value (0x00) is successfully latched into the register. | MCASP_GBLCTL [12:8] | =0x00 |
| Configure the local power management. | MCASP_SYSCONFIG [1:0] IDLE_MODE | 0x- |
| Configure the transmit format unit. | See Section 24.8.5.1.2.2 . | |
| Configure the transmit frame sync generator. | See Section 24.8.5.1.2.3 . | |
| Configure the transmit clock generator. | See Section 24.8.5.1.2.4 . | |
| Configure the TDM sequencer—set all slots active. | MCASP_TXTDM [31:0] XTDMs | 0xFFFF FFFF |
| Configure the serializer for transmit mode operation. | MCASP_XRSRCTL0 [1:0] SRMOD | 0x1 |
| Configure the McASP pins functionality. | See Section 24.8.5.1.2.5 . | |
| Configure the McASP mute input/output conditions. | See Table 24-578 . | |
| Enable the McASP DIT-transmission mode. | MCASP_TXDITCTL [0] DITEN | 0x1 |
| Configure DIT-specific subframe fields. | See Table 24-579 . | |

Table 24-573. McASP Global Initialization (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Release from reset state the divider that outputs the <code>abe_mcaspl_ahclkx</code> clock. ⁽¹⁾ | <code>MCASP_GBLCTL</code> [9] XHCLKRST | 0x1 |
| Poll the bit to ensure that it is successfully latched in the register. | <code>MCASP_GBLCTL</code> [9] XHCLKRST | =0x1 |
| Release from reset state the divider that outputs the <code>abe_mcaspl_aclkx</code> clock. ⁽¹⁾ | <code>MCASP_GBLCTL</code> [8] XCLKRST | 0x1 |
| Poll the bit to ensure that it is successfully latched in the register. | <code>MCASP_GBLCTL</code> [8] XCLKRST | =0x1 |

⁽¹⁾ During reset state the local McASP internal clock dividers maintain a 1:1 ratio at their outputs. The values stored in the `MCASP_AHCLKX` and `MCASP_ACLKX` registers are ignored; hence, the transmission clock does not stop during the reset state of the dividers.

24.8.5.1.2.2 Subsequence – Transmit Format Unit Configuration

The procedure in [Table 24-574](#) configures the transmit frame format unit of the McASP module.

NOTE:

- The first transmit data bit always has a 0-bit delay.
- The bitstream is always transmitted in least-significant-bit (LSB)-first order.
- Pad value for extra bits in a certain slot is always 0.

Table 24-574. Transmit Format Unit Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Configure the slot size to 32 bits. | <code>MCASP_TXFMT</code> [7:4] XSSZ | 0xF |
| IF: the MPU or DMA data to transmit is left- aligned | Software test condition | |
| Set data mask in the range 0xFFFF FF00 – 0xFFFF 0000. | <code>MCASP_TXMASK</code> [31:0] XMASK | 0x- |
| Rotate data right by 8-bit positions. | <code>MCASP_TXFMT</code> [2:0] XROT | 0x2 |
| ELSE | | |
| Set data mask in the range 0x00FF FFFF– 0x0000 FFFF. | <code>MCASP_TXMASK</code> [31:0] XMASK | 0x- |
| Rotate data right by 0-bit positions. | <code>MCASP_TXFMT</code> [2:0] XROT | 0x0 |
| ENDIF | | |

24.8.5.1.2.3 Subsequence – Transmit Frame Synchronization Generator Configuration

The procedure in [Table 24-575](#) configures the transmit frame synchronization generator of the McASP module.

NOTE: The frame synchronization signal is always rising-edge active and always has a single-bit width.

Table 24-575. Transmit Frame-Synchronization Generator Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Select 384-slot size block. | <code>MCASP_TXFMCTL</code> [15:7] XMOD | 0x180 |
| Select internally-generated transmit frame sync. | <code>MCASP_TXFMCTL</code> [1] FSXM | 0x1 |

24.8.5.1.2.4 Subsequence – Transmit Clock Generator Configuration

NOTE: By default, the ACLKX and AHCLKX clocks are generated only from the McASP internal clock source.

The procedure in [Table 24-576](#) configures the transmit clock generator of the McASP module.

Table 24-576. Transmit Clock Generator Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Set the divisor for the internally generated high frequency clock– <code>abe_mcasp_ahclkx</code> . | MCASP_AHCLKXCTL [11:0] HCLKXDIV | 0x- |
| Set the divisor for the internally generated transmission clock– <code>abe_mcasp_aclkx</code> . | MCASP_ACLKXCTL [4:0] CLKXDIV | 0x- |
| Configure the transmit clock failure detect logic. | See Section 24.8.4.14.3.1 , <i>Clock Failure Check Startup</i> . | |

24.8.5.1.2.5 Subsequence—McASP Pins Functional Configuration

The procedure in [Table 24-577](#) configures the McASP pins for McASP functionality.

Table 24-577. McASP Pins Functional Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Configure module different pins to have McASP functionality. | MCASP_PFUNC [31:0] | 0x0 |
| Configure the McASP pins as outputs: | | |
| <code>abe_mcasp_afsx</code> | MCASP_PDIR [28] AFSX; | 0x1 |
| <code>abe_mcasp_ahclkx</code> | MCASP_PDIR [27] AHCLKX; | 0x1 |
| <code>abe_mcasp_aclkx</code> | MCASP_PDIR [26] ACLKX; | 0x1 |
| <code>abe_mcasp_amute</code> | MCASP_PDIR [25] AMUTE; | 0x1 |
| <code>abe_mcasp_axr</code> | MCASP_PDIR [0] AXR0; | 0x1 |

24.8.5.1.2.6 Subsequence – McASP Mute Input/Output Trigger Condition Settings

The procedure in [Table 24-578](#) configures the behavior of the mute associated I/Os and different trigger conditions for the McASP mute output functionality.

Table 24-578. McASP Mute Input/Output Trigger Condition Settings

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Optional: Select to drive AMUTE active enable bit on transmit DMA error. | MCASP_AMUTE [12] XDMAERR | 0x1 |
| Optional: Select to drive AMUTE active enable bit on transmit clock failure. | MCASP_AMUTE [10] XCKFAIL | 0x1 |
| Optional: Select to drive AMUTE active enable bit on transmit frame synchronization error. | MCASP_AMUTE [8] XSYNCERR | 0x1 |
| Optional: Select to drive AMUTE active enable bit on transmit underrun error. | MCASP_AMUTE [6] XUNDRN | 0x1 |
| Optional: Enable sensitivity of the <code>abe_mcasp_amute</code> output to <code>abe_mcasp_amutein</code> error source. | MCASP_AMUTE [3] INEN | 0x1 |
| Optional: Select the <code>abe_mcasp_amutein</code> input polarity. | MCASP_AMUTE [2] INPOL | 0x1 |
| Optional: Configure the behavior of the <code>abe_mcasp_amute</code> output. | MCASP_AMUTE [1:0] MUTEN | 0x1 |

24.8.5.1.2.7 Subsequence – DIT-Specific Subframe Fields Configuration

NOTE: The McASP integrated in the device supports only the DIT transmission mode that uses the S/PDIF protocol.

The procedure in [Table 24-579](#) configures the DIT-specific subframe fields as part of the S/PDIF format data.

Table 24-579. DIT-Specific Subframe Fields Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Configure the valid bit value for odd time slots. | MCASP_TXDITCTL[3] VB | 0x- |
| Configure the valid bit value for even time slots. | MCASP_TXDITCTL[2] VA | 0x- |
| Configure the user data bit for each subframe A and B in a 384-slot S/PDIF block. | MCASP_DITUDRAi[31:0] DITUDRAi, where i = 0 to 5 | 0x- |
| | MCASP_DITUDRBi[31:0] DITUDRBi, where i = 0 to 5 | 0x- |
| Configure the channel status bit for each subframe A and B in a 384-slot S/PDIF block. | MCASP_DITCSRAi[31:0], where i = 0 to 5 | 0x- |
| | MCASP_DITCSRBi[31:0], where i = 0 to 5 | 0x- |

24.8.5.2 Operational Modes Configuration

24.8.5.2.1 McASP DIT Transmission Mode

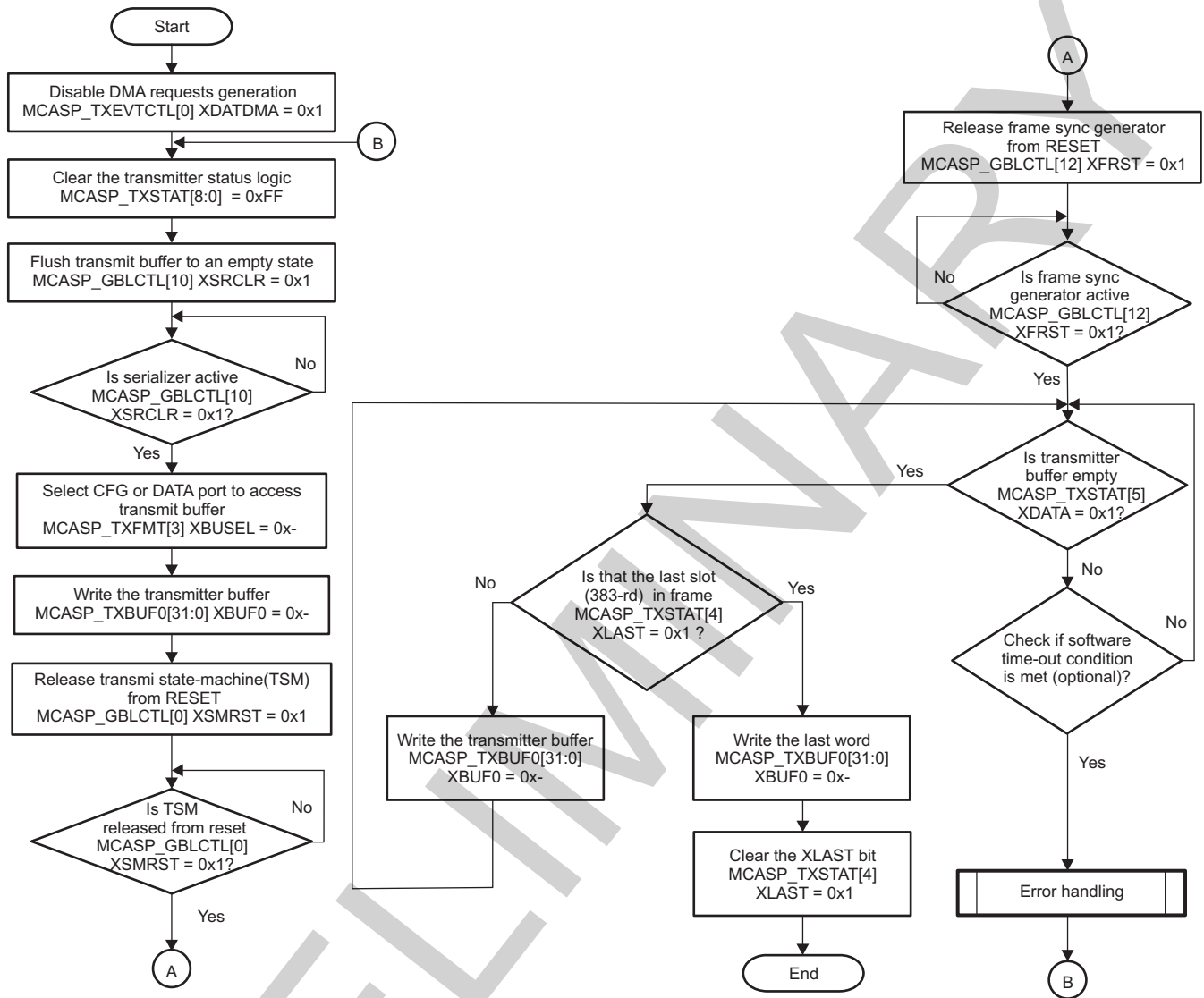
24.8.5.2.1.1 Main Sequence – McASP DIT Polling Transmission Method

[Figure 24-202](#) shows the McASP DIT polling method.

NOTE:

- The McASP polling transmission model considers the MPU/DSP as the source of audio data for the McASP transmission buffer.
- The DMA request is disabled and the XDMAERR event is not analyzed.
- The flow chart shown in [Figure 24-202](#) shows the sequence for transmitting one DIT frame.

Figure 24-202. McASP DIT Transmission Polling Method



mcasp-028

Table 24-580 summarizes the register call for the polling mode.

Table 24-580. Register Call Summary for Main Sequence – McASP DIT Transmission Polling Method

| Register Name | Register Name | Register Name | Register Name | Register Name |
|---------------|---------------|---------------|---------------|----------------|
| MCASP_TXSTAT | MCASP_GBLCTL | MCASP_TXBUF0 | MCASP_TXFMT | MCASP_TXEVTCTL |

Table 24-581 summarizes the subprocess call for the polling mode.

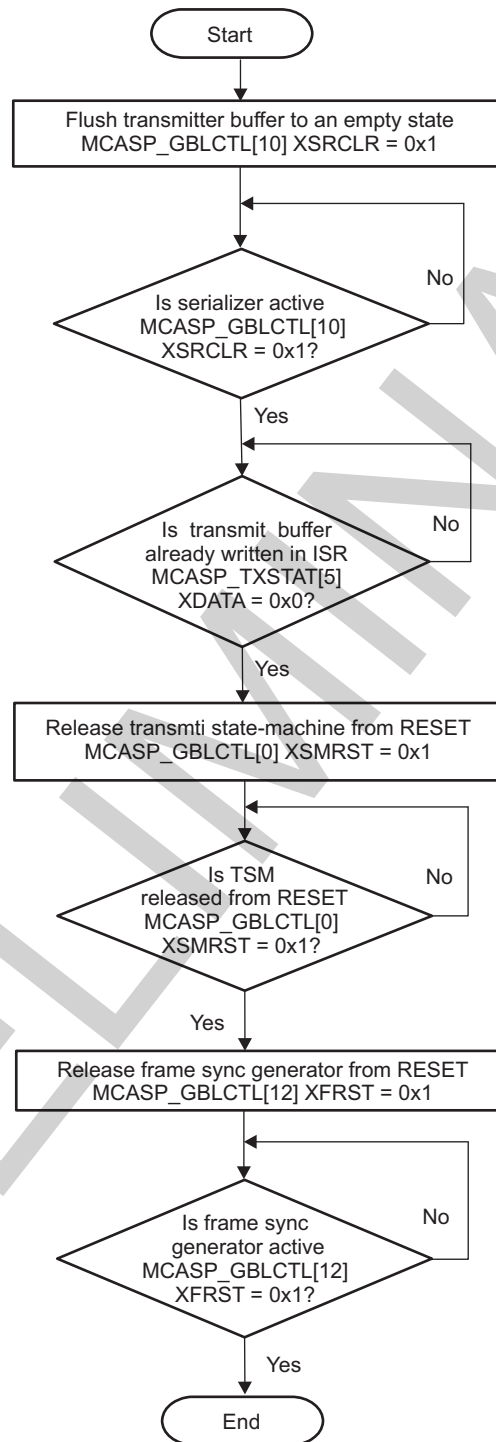
Table 24-581. Subprocess Call Summary for Main Sequence – McASP DIT Transmission Polling Method

| Subprocess Name | Cross-Reference |
|-----------------|-----------------|
| Error handling | Figure 24-206 |

24.8.5.2.1.2 Main Sequence – McASP DIT Interrupt Transmission Method

Figure 24-203 shows the initial setup for interrupt-based transmission.

Figure 24-203. Subsequence – DIT Transmission Startup Procedure



mcasep-029

Table 24-582 shows the configuration of the McASP using the McASP DIT interrupt method for transmission.

Table 24-582. McASP Interrupt Transmission Model

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Select the CFG or DATA port to access the transmit buffer. | MCASP_TXFMT[3] XBUSEL | 0x- |
| Disable DMA requests generation. | MCASP_TXEVTCTL[0] XDATDMA | 0x1 |
| Clear the transmitter status logic. | MCASP_TXSTAT[8:0] | 0xFF |
| Enable the data ready event transmit interrupt. | MCASP_EVTCTLX[5] XDATA | 0x1 |
| Optional: Enable the transmit error event interrupts. | MCASP_EVTCTLX[2] XCKFAIL | 0x1 |
| | MCASP_EVTCTLX[1] XSYNCERR | 0x1 |
| | MCASP_EVTCTLX[0] XUNDRN | 0x1 |
| Optional: Enable the start of frame interrupt. Optional: Enable the last slot data interrupt. | MCASP_EVTCTLX [7] XSTAFRM | 0x1 |
| | MCASP_EVTCTLX[4] XLAST | 0x1 |
| Disable the DMA error event. | MCASP_EVTCTLX[7] XDMAERR | 0x0 |
| DIT transmission startup procedure | See Figure 24-203. | |

Table 24-583 summarizes the register call to initialize the McASP to transmit using interrupt events.

Table 24-583. Register Call Summary for Subsequence – McASP DIT Transmission Startup Procedure

| Register Name | Register Name |
|---------------|---------------|
| MCASP_GBLCTL | MCASP_TXBUF0 |

24.8.5.2.1.3 Main Sequence –McASP DIT DMA Transmission Method

Table 24-584 shows the configuration of the McASP using the DMA method for transmission. Possible interrupt error event servicing is also considered. Table 24-583 shows the initial setup for DMA-based transmission.

NOTE: Because of the DATA port burst access capability with the DMA method, It is preferable for transfers to be initiated through the DATA port rather than through the CFG port.

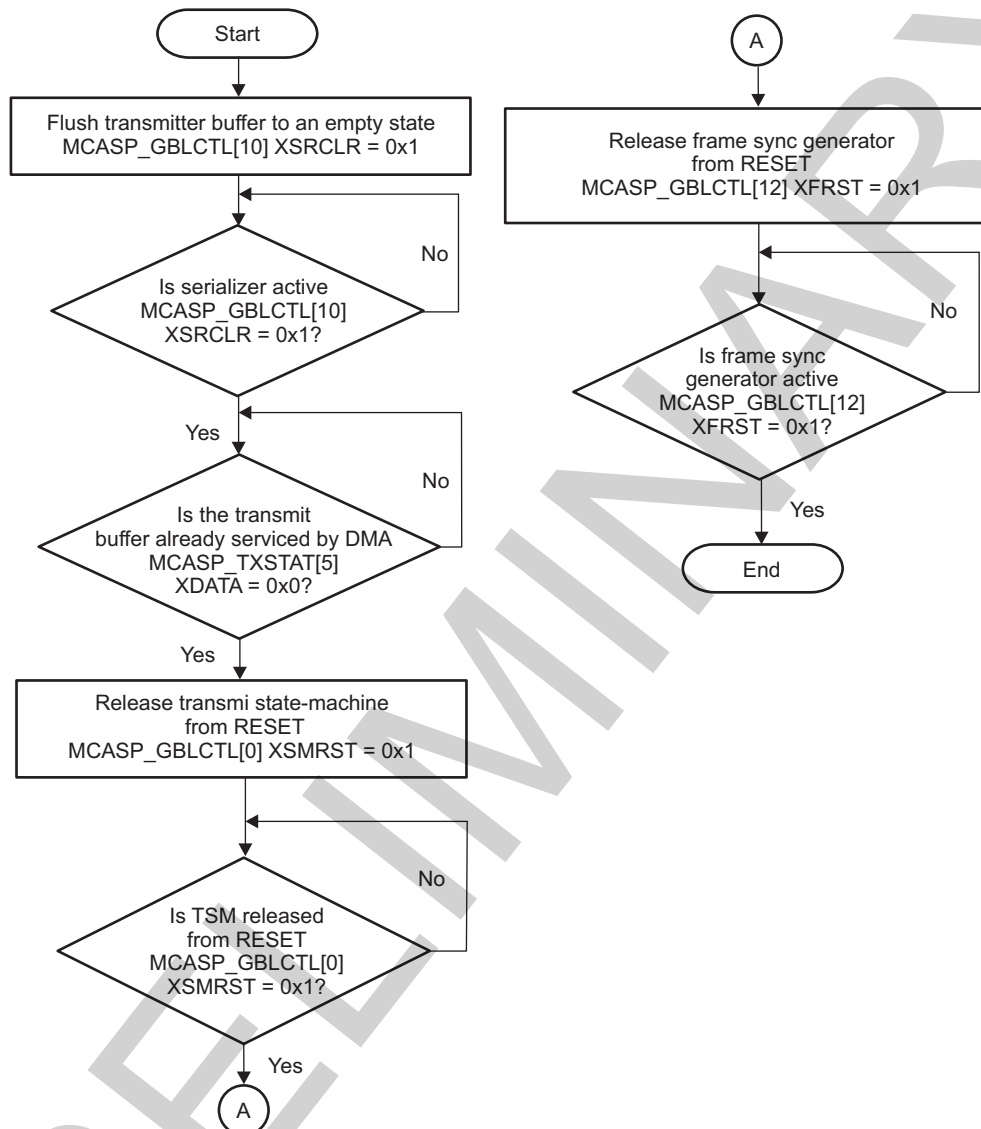
Table 24-584. McASP DMA Transmission Model with Interrupt Events Servicing

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Select DATA port to access the transmit buffer. | MCASP_TXFMT[3] XBUSEL | 0x0 |
| Enable the DMA requests generation. | MCASP_TXEVTCTL[0] XDATDMA | 0x0 |
| Clear the transmitter status logic. | MCASP_TXSTAT[8:0] | 0xFF |
| Enable the DMA error event. | MCASP_EVTCTLX[7] XDMAERR | 0x1 |
| Optional: Enable the transmit error event interrupts. | MCASP_EVTCTLX[2] XCKFAIL | 0x1 |
| | MCASP_EVTCTLX[1] XSYNCERR | 0x1 |
| | MCASP_EVTCTLX[0] XUNDRN | 0x1 |
| Optional: Enable the start of frame interrupt. Optional: Enable the last slot data interrupt. | MCASP_EVTCTLX [7] XSTAFRM | 0x1 |
| | MCASP_EVTCTLX[4] XLAST | 0x1 |
| Disable the data ready event transmit interrupt. | MCASP_EVTCTLX[5] XDATA | 0x0 |
| DMA transmission procedure | See Section 24.8.5.2.1.4. | |

24.8.5.2.1.4 Subsequence – DIT DMA Transmission Procedure

Figure 24-204 shows the McASP initial setup when the DMA method is used for transmission.

Figure 24-204. Subsequence – DIT DMA Transmission Procedure



mcas-030

Table 24-585 shows the register call summary for the McASP DMA transmission procedure subsequence.

Table 24-585. Register Call Summary for Subsequence – McASP DMA Transmission Procedure

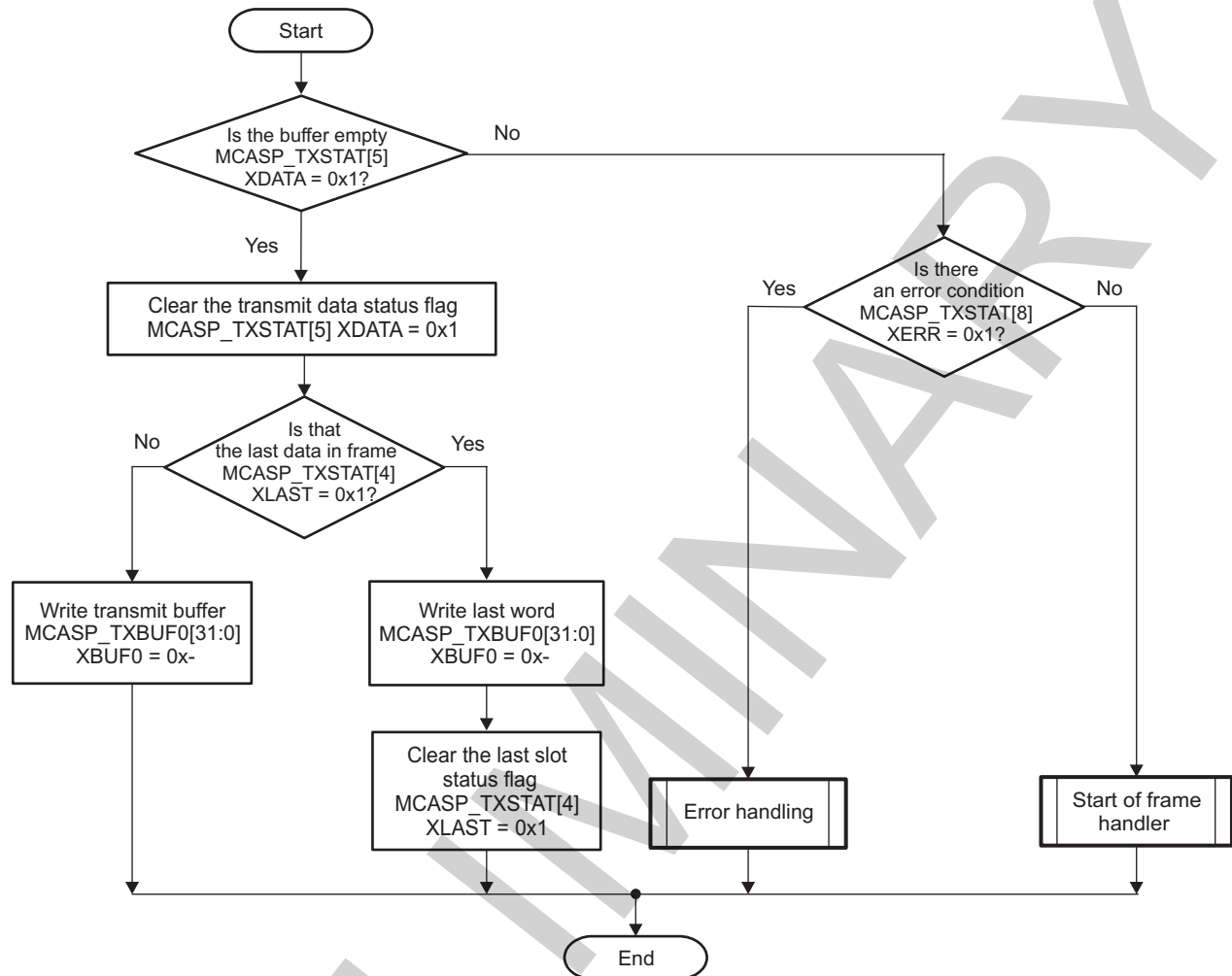
| Register Name | Register Name |
|---------------|---------------|
| MCASP_TXSTAT | MCASP_GBLCTL |

24.8.5.2.2 McASP Event Servicing

24.8.5.2.2.1 McASP Interrupt Events Servicing

Figure 24-205 shows the flow of interrupt events servicing for the McASP module.

Figure 24-205. McASP Interrupt Events Servicing



mcasp-031

Table 24-586 lists the register call summary for the interrupt event servicing.

Table 24-586. Register Call Summary for McASP Interrupt Events Servicing

| Register Name | Register Name |
|---------------|---------------|
| MCASP_TXSTAT | MCASP_TXBUF0 |

Table 24-587 lists the subprocess call summary for interrupt events servicing.

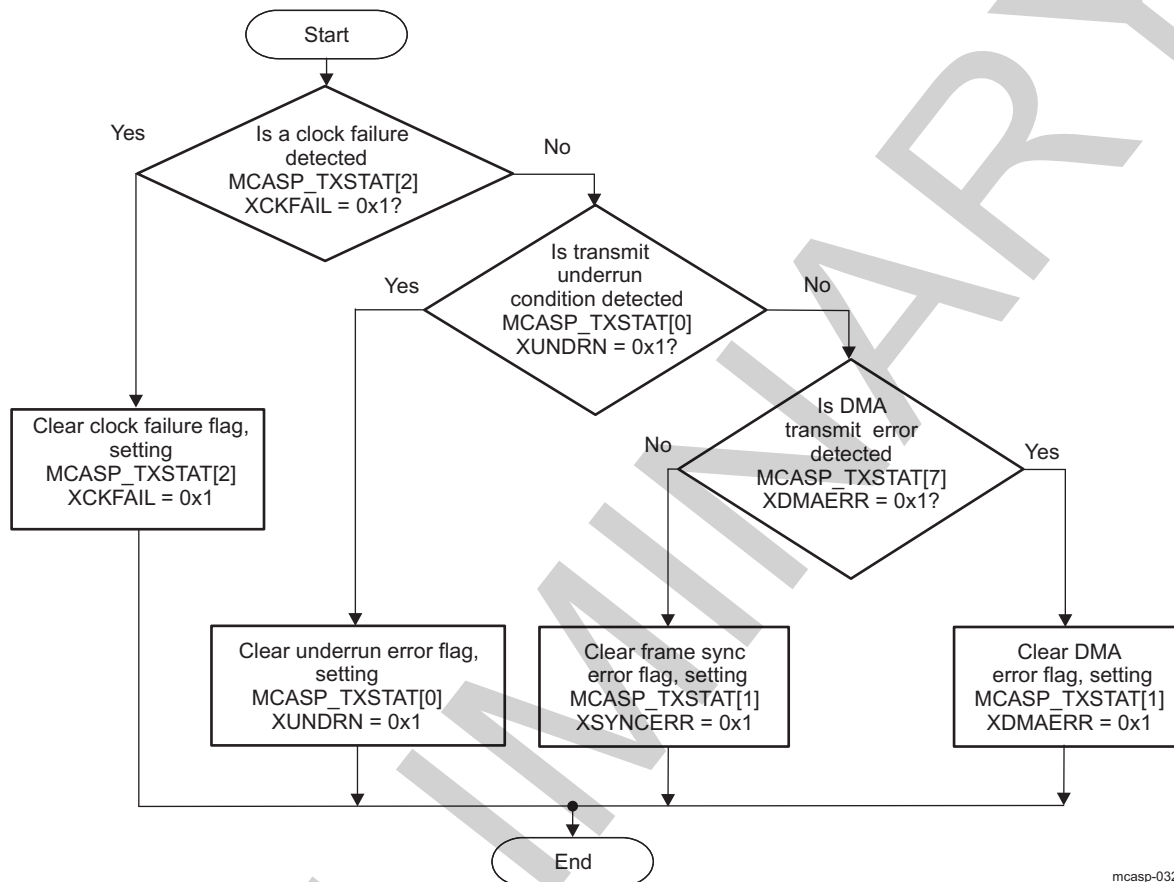
Table 24-587. Subprocess Call Summary for Interrupt Events Servicing

| Subprocess Name | Cross-Reference |
|-------------------------|---------------------|
| Error handling | Figure 24-206 |
| Start of frame handling | Section 24.8.4.11.1 |

24.8.5.2.2 Subsequence – Error Handling

Figure 24-206 shows the error handling schema for the McASP, which can be implemented as part of the interrupt service routine or as part of polling sequence.

Figure 24-206. McASP Error Handling



mcasp-032

Table 24-588 lists the register call summary for the McASP error handling.

Table 24-588. Register Call Summary for McASP Error Handling

| Register Name |
|---------------|
| MCASP_TXSTAT |

NOTE:

- For more information about clock failure handling, see [Section 24.8.4.14.3](#).
- For more information about transmit buffer underrun handling, see [Section 24.8.4.14.1](#).
- For more information about DMA error handling, see [Section 24.8.4.14.2](#).

24.8.6 McASP Register Manual

24.8.6.1 McASP Instance Summary

Table 24-589 summarizes the McASP instances.

Table 24-589. McASP Instance Summary

| Module Name | Base Address L3 Interconnect | Base Address Cortex-A9 Private Access | Base Address DSP Private Access | Size |
|-------------|------------------------------|---------------------------------------|---------------------------------|------|
| McASP | 0x4902 8000 | 0x4012 8000 | 0x01D2 8000 | 4KB |

NOTE: Private access is an access that does not use the L3 / L4 interconnects.

24.8.6.2 McASP Registers

24.8.6.2.1 McASP Register Summary

Table 24-590 summarizes the McASP register mapping.

Table 24-590. McASP Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|-----------------|------|-----------------------|----------------|----------------------------------|---|-------------------------------------|
| MCASP_PID | R | 32 | 0x0000 0000 | 0x4902 8000 | 0x4012 8000 | 0x01D2 8000 |
| MCASP_SYSCONFIG | RW | 32 | 0x0000 0004 | 0x4902 8004 | 0x4012 8004 | 0x01D2 8004 |
| MCASP_PFUNC | RW | 32 | 0x0000 0010 | 0x4902 8010 | 0x4012 8010 | 0x01D2 8010 |
| MCASP_PDIR | RW | 32 | 0x0000 0014 | 0x4902 8014 | 0x4012 8014 | 0x01D2 8014 |
| MCASP_PDOUT | RW | 32 | 0x0000 0018 | 0x4902 8018 | 0x4012 8018 | 0x01D2 8018 |
| MCASP_PDIN | R | 32 | 0x0000 001C | 0x4902 801C | 0x4012 801C | 0x01D2 801C |
| MCASP_PDSET | W | 32 | 0x0000 001C | 0x4902 801C | 0x4012 801C | 0x01D2 801C |
| MCASP_PDCLR | RW | 32 | 0x0000 0020 | 0x4902 8020 | 0x4012 8020 | 0x01D2 8020 |
| RESERVED | RW | 32 | 0x0000 0030 | 0x4902 8030 | 0x4012 8030 | 0x01D2 8030 |
| RESERVED | RW | 32 | 0x0000 0034 | 0x4902 8034 | 0x4012 8034 | 0x01D2 8034 |
| RESERVED | RW | 32 | 0x0000 0038 | 0x4902 8038 | 0x4012 8038 | 0x01D2 8038 |
| MCASP_GBLCTL | RW | 32 | 0x0000 0044 | 0x4902 8044 | 0x4012 8044 | 0x01D2 8044 |
| MCASP_AMUTE | RW | 32 | 0x0000 0048 | 0x4902 8048 | 0x4012 8048 | 0x01D2 8048 |
| RESERVED | RW | 32 | 0x0000 004C | 0x4902 804C | 0x4012 804C | 0x01D2 804C |
| MCASP_TXDITCTL | RW | 32 | 0x0000 0050 | 0x4902 8050 | 0x4012 8050 | 0x01D2 8050 |
| RESERVED | RW | 32 | 0x0000 0060 | 0x4902 8060 | 0x4012 8060 | 0x01D2 8060 |
| RESERVED | RW | 32 | 0x0000 0064 | 0x4902 8064 | 0x4012 8064 | 0x01D2 8064 |
| RESERVED | RW | 32 | 0x0000 0068 | 0x4902 8068 | 0x4012 8068 | 0x01D2 8068 |
| RESERVED | RW | 32 | 0x0000 006C | 0x4902 806C | 0x4012 806C | 0x01D2 806C |
| RESERVED | RW | 32 | 0x0000 0070 | 0x4902 8070 | 0x4012 8070 | 0x01D2 8070 |
| RESERVED | RW | 32 | 0x0000 0074 | 0x4902 8074 | 0x4012 8074 | 0x01D2 8074 |
| RESERVED | RW | 32 | 0x0000 0078 | 0x4902 8078 | 0x4012 8078 | 0x01D2 8078 |
| RESERVED | RW | 32 | 0x0000 007C | 0x4902 807C | 0x4012 807C | 0x01D2 807C |
| RESERVED | RW | 32 | 0x0000 0080 | 0x4902 8080 | 0x4012 8080 | 0x01D2 8080 |
| RESERVED | R | 32 | 0x0000 0084 | 0x4902 8084 | 0x4012 8084 | 0x01D2 8084 |
| RESERVED | RW | 32 | 0x0000 0088 | 0x4902 8088 | 0x4012 8088 | 0x01D2 8088 |
| RESERVED | RW | 32 | 0x0000 008C | 0x4902 808C | 0x4012 808C | 0x01D2 808C |

Table 24-590. McASP Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|-------------------------------|------|-----------------------|---------------------------------------|----------------------------------|---|-------------------------------------|
| RESERVED | RW | 32 | 0x0000 00A0 | 0x4902 80A0 | 0x4012 80A0 | 0x01D2 80A0 |
| MCASP_TXMASK | RW | 32 | 0x0000 00A4 | 0x4902 80A4 | 0x4012 80A4 | 0x01D2 80A4 |
| MCASP_TXFMT | RW | 32 | 0x0000 00A8 | 0x4902 80A8 | 0x4012 80A8 | 0x01D2 80A8 |
| MCASP_TXFMCTL | RW | 32 | 0x0000 00AC | 0x4902 80AC | 0x4012 80AC | 0x01D2 80AC |
| MCASP_ACLKXCTL | RW | 32 | 0x0000 00B0 | 0x4902 80B0 | 0x4012 80B0 | 0x01D2 80B0 |
| MCASP_AHCLKXCTL | RW | 32 | 0x0000 00B4 | 0x4902 80B4 | 0x4012 80B4 | 0x01D2 80B4 |
| MCASP_TXTDM | RW | 32 | 0x0000 00B8 | 0x4902 80B8 | 0x4012 80B8 | 0x01D2 80B8 |
| MCASP_EVTCTLX | RW | 32 | 0x0000 00BC | 0x4902 80BC | 0x4012 80BC | 0x01D2 80BC |
| MCASP_TXSTAT | RW | 32 | 0x0000 00C0 | 0x4902 80C0 | 0x4012 80C0 | 0x01D2 80C0 |
| MCASP_TXTDMSLOT | R | 32 | 0x0000 00C4 | 0x4902 80C4 | 0x4012 80C4 | 0x01D2 80C4 |
| MCASP_TXCLKCHK | RW | 32 | 0x0000 00C8 | 0x4902 80C8 | 0x4012 80C8 | 0x01D2 80C8 |
| MCASP_TXEVTCTL | RW | 32 | 0x0000 00CC | 0x4902 80CC | 0x4012 80CC | 0x01D2 80CC |
| RESERVED | RW | 32 | 0x0000 00D0 | 0x4902 80D0 | 0x4012 80D0 | 0x01D2 80D0 |
| MCASP_DITCSRAi ⁽¹⁾ | RW | 32 | 0x0000 0100 + (0x04*i) | 0x4902 8100 + (0x04*i) | 0x4012 8100 + (0x04*i) | 0x01D2 8100 + (0x04*i) |
| MCASP_DITCSRBi ⁽¹⁾ | RW | 32 | 0x0000 0118 + (0x04*i) | 0x4902 8118 + (0x04*i) | 0x4012 8118 + (0x04*i) | 0x01D2 8118 + (0x04*i) |
| MCASP_DITUDRAi ⁽¹⁾ | RW | 32 | 0x0000 0130 + (0x04*i) | 0x4902 8130 + (0x04*i) | 0x4012 8130 + (0x04*i) | 0x01D2 8130 + (0x04*i) |
| MCASP_DITUDRBi ⁽¹⁾ | RW | 32 | 0x0000 0148 + (0x04*i) | 0x4902 8148 + (0x04*i) | 0x4012 8148 + (0x04*i) | 0x01D2 8148 + (0x04*i) |
| MCASP_XRSRCTL0 | RW | 32 | 0x0000 0180 | 0x4902 8180 | 0x4012 8180 | 0x01D2 8180 |
| RESERVED | RW | 32 | 0x0000 0184 + (0x04*j) ⁽²⁾ | 0x4902 8184 + (0x04*j) | 0x4012 8184 + (0x04*j) | 0x01D2 8184 + (0x04*j) |
| MCASP_TXBUF0 | RW | 32 | 0x0000 0200 | 0x4902 8200 | 0x4012 8200 | 0x01D2 8200 |
| RESERVED | RW | 32 | 0x0000 0204 + (0x04*k) ⁽³⁾ | 0x4902 8204 + (0x04*k) | 0x4012 8204 + (0x04*k) | 0x01D2 8204 + (0x04*k) |

⁽¹⁾ i = 0 to 5 for McASP_L3Interconnect
i = 0 to 5 for McASP_Cortex-A9
i = 0 to 5 for McASP_DSP

⁽²⁾ j = 0 to 14

⁽³⁾ k = 0 to 30

NOTE: The address locations listed in [Table 24-590, McASP Register Mapping Summary](#), are relevant for accessing all McASP configuration registers and McASP_TXBUF0 registers through the McASP peripheral configuration (CFG) port.

McASP DAT allows the L3-interconnect, DSP subsystem, and MPU to access the McASP_TXBUF0 register at locations 0x4902 A200, 0x01D2 A200, and 0x4012 A200, respectively.

24.8.6.2.2 McASP Register Description

[Table 24-591](#) through [Table 24-645](#) describe the individual register bits.

Table 24-591. MCASP PID

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4902 8000 0x4012 8000 0x01D2 8000 | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Description | Peripheral identification register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP revision | R | Tl internal data |

Table 24-592. Register Call Summary for Register MCASP PID

- [McASP Register Summary: \[0\]](#)

Table 24-593. MCASP_SYSCONFIG

| | | |
|-------------------------|---|---|
| Address Offset | 0x0000 0004 | |
| Physical Address | 0x4902 8004 0x4012 8004 0x01D2 8004 | Instance MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Description | Power idle module configuration register. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | IDLE_MODE | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:2 | RESERVED | Reserved | R | 0x00000000 |
| 1:0 | IDLE_MODE | 0x0: Force-idle mode 0x1: No-idle mode 0x2: Smart-idle mode - default state 0x3: Reserved | RW | 0x2 |

Table 24-594. Register Call Summary for Register MCASP_SYSCONFIG

Multichannel Audio Serial Port

- [McASP Power Management: \[0\]](#)
- [McASP Global Initialization: \[1\]](#)
- [McASP Register Summary: \[2\]](#)

Table 24-595. MCASP_PFUNC

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0010 | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Physical Address | 0x4902 8010 0x4012 8010 0x01D2 8010 | | |
| Description | Specifies the function of the pins as either a McASP pin or a GPIO pin | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|------|--------|-------|-------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------|
| RESERVED | | | | AFSX | AHCLKX | ACLKX | AMUTE | RESERVED | | | | | | | | | | | | | | | | | | | | | | | AXR0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:29 | RESERVED | Reserved | RW | 0 |
| 28 | AFSX | Determines if abe_mcasp_afsx pin functions as McASP or GPIO. 0x0: Pin functions as McASP pin 0x1: Pin functions as GIO pin | RW | 0 |
| 27 | AHCLKX | Determines if abe_mcasp_ahclkx pin functions as McASP or GPIO. 0x0: Pin functions as McASP pin 0x1: Pin functions as GIO pin | RW | 0 |
| 26 | ACLKX | Determines if abe_mcasp_aclkx pin functions as McASP or GPIO. 0x0: Pin functions as McASP pin 0x1: Pin functions as GIO pin | RW | 0 |
| 25 | AMUTE | Determines if abe_mcasp_amute pin functions as McASP or GPIO. 0x0: Pin functions as McASP pin 0x1: Pin functions as GIO pin | RW | 0 |
| 24:1 | RESERVED | Reserved | RW | 0x000 |
| 0 | AXR0 | Determines if abe_mcasp_axr pin functions as McASP or GPIO. 0x0: Pin functions as McASP pin 0x1: Pin functions as GIO pin | RW | 0 |

Table 24-596. Register Call Summary for Register MCASP_PFUNC

Multichannel Audio Serial Port

- [DIT Transfer Mode: \[0\]](#)
- [McASP Global Initialization: \[1\]](#)
- [McASP Register Summary: \[2\]](#)
- [McASP Register Description: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)

Table 24-597. MCASP_PDIR

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0014 | | |
| Physical Address | 0x4902 8014 0x4012 8014 0x01D2 8014 | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Description | Pin direction register - specifies the direction of the McASP pins as either an input or an output pin. For the module to operate properly, configure them as outputs. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | RESERVED | | | | | | | | | | | | | | | | | | | | | | AXR0 | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:29 | RESERVED | Reserved | RW | 0 |
| 28 | AFSX | Determines if abe_mcasp_afsx pin functions as an input or output. 0x0: Input 0x1: Output | RW | 0 |
| 27 | AHCLKX | Determines if abe_mcasp_ahclkx pin functions as an input or output. 0x0: Input 0x1: Output | RW | 0 |
| 26 | ACLKX | Determines if abe_mcasp_aclkx pin functions as an input or output. 0x0: Input 0x1: Output | RW | 0 |
| 25 | AMUTE | Determines if abe_mcasp_amute pin functions as an input or output. 0x0: Input 0x1: Output | RW | 0 |
| 24:1 | RESERVED | Reserved | RW | 0x000 |
| 0 | AXR0 | Determines if abe_mcasp_axr pin functions as an input or output. 0x0: Input 0x1: Output | RW | 0 |

Table 24-598. Register Call Summary for Register MCASP_PDIR

Multichannel Audio Serial Port

- [DIT Transfer Mode: \[0\]](#)
- [McASP Global Initialization: \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [McASP Register Summary: \[6\]](#)
- [McASP Register Description: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\]](#)

Table 24-599. MCASP_PDOUT

| | |
|------------------|---|
| Address Offset | 0x0000 0018 |
| Physical Address | 0x4902 8018 0x4012 8018 0x01D2 8018 |
| Description | <p>Pin data output register - holds a value for data out at all times, and may be read back at all times. The value held by MCASP_PDOUT is not affected by writing to MCASP_PDIR and MCASP_PFUNC. However, the data value in MCASP_PDOUT is driven out onto the McASP pin only if the corresponding bit in MCASP_PFUNC is set to 1 (GPIO function) and the corresponding bit in MCASP_PDIR is set to 1 (output).</p> <p>When reading data, it returns the corresponding bit value in MCASP_PDOUT[n]; it does not return the input from the I/O pin.</p> <p>When writing data, writes to the corresponding MCASP_PDOUT[n] bit.</p> <p>PDOUT has these aliases or alternate addresses:</p> <ul style="list-style-type: none">MCASP_PDSET - when written to at this address, writing a 1 to a bit in MCASP_PDSET sets the corresponding bit in MCASP_PDOUT to 1; writing a 0 has no effect and keeps the bits in MCASP_PDOUT unchanged.MCASP_PDCLR - when written to at this address, writing a 1 to a bit in MCASP_PDCLR clears the corresponding bit in MCASP_PDOUT to 0; writing a 0 has no effect and keeps the bits in MCASP_PDOUT unchanged. <p>There is only one set of data-out bits, MCASP_PDOUT[31:0]. The other registers, MCASP_PDSET and MCASP_PDCLR, are just different addresses for the same control bits, with different behaviors during writes.</p> |
| Type | RW |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------|--------|-------|-------|----------|----|----|----|----|----|----|----|----|----|------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | AFSX | AHCLKX | ACLKX | AMUTE | RESERVED | | | | | | | | | | AXR0 | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:29 | RESERVED | Reserved | RW | 0 |
| 28 | AFSX | Determines drive on AFSX output pin when the corresponding MCASP_PFUNC[28] and MCASP_PDIR[28] bits are set to 1. 0x0: The pin drives low. 0x1: The pin drives high. | RW | 0 |
| 27 | AHCLKX | Determines drive on AHCLKX output pin when the corresponding MCASP_PFUNC[27] and MCASP_PDIR[27] bits are set to 1. 0x0: The pin drives low. 0x1: The pin drives high. | RW | 0 |
| 26 | ACLKX | Determines drive on ACLKX output pin when the corresponding MCASP_PFUNC[26] and MCASP_PDIR[26] bits are set to 1 0x0: The pin drives low. 0x1: The pin drives high. | RW | 0 |
| 25 | AMUTE | Determines drive on AMUTE output pin when the corresponding MCASP_PFUNC[25] and MCASP_PDIR[25] bits are set to 1. 0x0: The pin drives low. 0x1: The pin drives high. | RW | 0 |
| 24:1 | RESERVED | Reserved | RW | 0x000 |
| 0 | AXR0 | Determines drive on abe_mcasps_axr output pin when the corresponding MCASP_PFUNC[0] and MCASP_PDIR[0] bits are set to 1. 0x0: The pin drives low. 0x1: The pin drives high. | RW | 0 |

Table 24-600. Register Call Summary for Register MCASP_PDOUT

Multichannel Audio Serial Port

- [McASP Register Summary: \[0\]](#)
- [McASP Register Description: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\]](#)

Table 24-601. MCASP_PDIN

| | |
|------------------|---|
| Address Offset | 0x0000 001C |
| Physical Address | 0x4902 801C 0x4012 801C 0x01D2 801C |
| Description | Pin data input register - holds the state of all the McASP pins. MCASP_PDIN allows reading the actual value of the pin, regardless of the state of MCASP_PFUNC and MCASP_PDIR . |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------|--------|-------|-------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | AFSX | AHCLKX | ACLKX | AMUTE | RESERVED | | | | | | | | | | | | | | | | AXR0 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:29 | RESERVED | Reserved | R | 0 |
| 28 | AFSX | Logic level on abe_mcaspx_afx pin. 0x0: Pin is logic low. 0x1: Pin is logic high. | R | 0 |
| 27 | AHCLKX | Logic level on abe_mcaspx_ahclkx pin. 0x0: Pin is logic low. 0x1: Pin is logic high. | R | 0 |
| 26 | ACLKX | Logic level on abe_mcaspx_aclkx pin. 0x0: Pin is logic low. 0x1: Pin is logic high. | R | 0 |
| 25 | AMUTE | Logic level on abe_mcaspx_amute pin. 0x0: Pin is logic low. 0x1: Pin is logic high. | R | 0 |
| 24:1 | RESERVED | Reserved | R | 0x000 |
| 0 | AXR0 | Logic level on abe_mcaspx_axr pin. 0x0: Pin is logic low. 0x1: Pin is logic high. | R | 0 |

Table 24-602. Register Call Summary for Register MCASP_PDIN

Multichannel Audio Serial Port

- [McASP Register Summary: \[0\]](#)
- [McASP Register Description: \[1\]](#)

Table 24-603. MCASP_PDSET

| | |
|-------------------------|--|
| Address Offset | 0x0000 001C |
| Physical Address | 0x4902 801C 0x4012 801C 0x01D2 801C |
| Description | The pin data set register is an alias of the pin data output register (MCASP_PDOUT) for writes only. Writing a 1 to the MCASP_PDSET bit sets the corresponding bit in MCASP_PDOUT and, if MCASP_PFUNC = 1 (GPIO function) and MCASP_PDIR = 1 (output), drives a logic high on the pin. |
| Type | W |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|------|--------|-------|-------|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------|
| RESERVED | | | AFSX | AHCLKX | ACLKX | AMUTE | | RESERVED | | | | | | | | | | | | | | | | | | | | | | | AXR0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:29 | RESERVED | Reserved | W | 0 |
| 28 | AFSX | Allows the corresponding AFSX bit in MCASP_PDOUT to be set to a logic high without affecting other I/O pins controlled by the same port. 0x0: No effect 0x1: MCASP_PDOUT [28] bit is set to 1. | W | 0 |
| 27 | AHCLKX | Allows the corresponding AHCLKX bit in MCASP_PDOUT to be set to a logic high without affecting other I/O pins controlled by the same port. 0x0: No effect 0x1: MCASP_PDOUT [27] bit is set to 1. | W | 0 |
| 26 | ACLKX | Allows the corresponding ACLKX bit in MCASP_PDOUT to be set to a logic high without affecting other I/O pins controlled by the same port. 0x0: No effect 0x1: MCASP_PDOUT [26] bit is set to 1. | W | 0 |
| 25 | AMUTE | Allows the corresponding AMUTE bit in MCASP_PDOUT to be set to a logic high without affecting other I/O pins controlled by the same port. 0x0: No effect 0x1: MCASP_PDOUT [25] bit is set to 1. | W | 0 |
| 24:1 | RESERVED | Reserved | W | 0x000 |
| 0 | AXR0 | Allows the AXR0 bit in MCASP_PDOUT to be set to a logic high without affecting other I/O pins controlled by the same port. 0x0: No effect 0x1: MCASP_PDOUT [0] bit is set to 1. | W | 0 |

Table 24-604. Register Call Summary for Register MCASP_PDSET

Multichannel Audio Serial Port

- [McASP Register Summary: \[0\]](#)
- [McASP Register Description: \[1\] \[2\] \[3\] \[4\]](#)

Table 24-605. MCASP_PDCLR

| | |
|-------------------------|---|
| Address Offset | 0x0000 0020 |
| Physical Address | 0x4902 8020 0x4012 8020 0x01D2 8020 |
| Description | The pin data clear register is an alias of the pin data output register (MCASP_PDOUT) for writes only. Writing a 1 to the MCASP_PDCLR bit clears the corresponding bit in MCASP_PDOUT and, if MCASP_PFUNC = 1 (GPIO function) and MCASP_PDIR = 1 (output), drives a logic low on the pin. |
| Type | RW |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|------|--------|-------|-------|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------|
| RESERVED | | | AFSX | AHCLKX | ACLKX | AMUTE | | RESERVED | | | | | | | | | | | | | | | | | | | | | | | AXR0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:29 | RESERVED | Reserved | RW | 0 |
| 28 | AFSX | Allows the corresponding AFSX bit in MCASP_PDOUT to be cleared to a logic low without affecting other I/O pins controlled by the same port. 0x0: No effect 0x1: MCASP_PDOUT [28] bit is cleared to 0. | RW | 0 |
| 27 | AHCLKX | Allows the corresponding AHCLKX bit in MCASP_PDOUT to be cleared to a logic low without affecting other I/O pins controlled by the same port. 0x0: No effect 0x1: MCASP_PDOUT [27] bit is cleared to 0. | RW | 0 |
| 26 | ACLKX | Allows the corresponding ACLKX bit in MCASP_PDOUT to be cleared to a logic low without affecting other I/O pins controlled by the same port. 0x0: No effect 0x1: MCASP_PDOUT [26] bit is cleared to 0. | RW | 0 |
| 25 | AMUTE | Allows the corresponding AMUTE bit in MCASP_PDOUT to be cleared to a logic low without affecting other I/O pins controlled by the same port. 0x0: No effect 0x1: MCASP_PDOUT [25] bit is cleared to 0. | RW | 0 |
| 24:1 | RESERVED | Reserved | RW | 0x000 |
| 0 | AXR0 | Allows the AXR0 bit in MCASP_PDOUT to be cleared to a logic low without affecting other I/O pins controlled by the same port. 0x0: No effect 0x1: MCASP_PDOUT [0] bit is cleared to 0. | RW | 0 |

Table 24-606. Register Call Summary for Register MCASP_PDCLR

Multichannel Audio Serial Port

- [McASP Register Summary: \[0\]](#)
- [McASP Register Description: \[1\] \[2\] \[3\] \[4\]](#)

Table 24-607. MCASP_GBLCTL

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0044 | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Physical Address | 0x4902 8044 0x4012 8044 0x01D2 8044 | | |
| Description | Global transmit control register - provides initialization of the transmit section. The bit fields in MCASP_GBLCTL are synchronized and latched by the <code>abe_mcasp_aclkx</code> clock. Before programming MCASP_GBLCTL , ensure that the serial clocks are running. If the corresponding external serial clock, <code>abe_mcasp_clkx</code> , is not yet running, select the internal serial clock source in AHCLKXCTL and ACLKXCTL before programming MCASP_GBLCTL . Also, after programming any bits in MCASP_GBLCTL , do not proceed until reading back from MCASP_GBLCTL and verifying that the bits in MCASP_GBLCTL are latched. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|--------|--------|----------|---------|----------|---|---|---|---|---|---|---|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | XFRST | XSMRST | XSRCLR | XHCLKRST | XCLKRST | RESERVED | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | Reserved | RW | 0x00000 |
| 12 | XFRST | Transmit frame-sync generator reset enable bit 0x0: The transmit frame-sync generator is reset. 0x1: The transmit frame-sync generator is active. When released from reset, the transmit frame-sync generator begins counting serial clocks and generating frame sync as programmed. | RW | 0 |
| 11 | XSMRST | Transmit state-machine reset enable bit 0x0: The transmit state-machine is held in reset. <code>abe_mcasp_axr</code> pin state: If MCASP_PFUNC [0] = 0 and MCASP_PDIR [0] = 1, the serializer drives the <code>abe_mcasp_axr</code> pin to the state specified for inactive time slot 0x1: The transmit state-machine is released from reset. When released from reset, the transmit state-machine immediately transfers data from <code>XBUF[n]</code> to <code>XRSR[n]</code> . The transmit state-machine sets the underrun flag (<code>XUNDRN</code>) in MCASP_TXSTAT , if <code>XBUF[n]</code> have not been preloaded with data before reset is released. The transmit state-machine also immediately begins detecting frame sync and is ready to transmit. Transmission of TDM time slot begins at slot 0 after reset is released. | RW | 0 |
| 10 | XSRCLR | Transmit serializer clear enable bit. By clearing and then setting this bit, the transmit buffer is flushed to an empty state (<code>XDATA</code> = 1). If <code>XSMRST</code> = 1, <code>XSRCLR</code> = 1, <code>XDATA</code> = 1, and <code>XBUF</code> is not loaded with new data before the start of the next active time slot, an underrun occurs. 0x0: The transmit serializer is cleared. 0x1: The transmit serializer is active. When the transmit serializer is first taken out of reset (<code>XSRCLR</code> changes from 0 to 1), the transmit data ready bit (<code>XDATA</code>) in MCASP_TXSTAT is set to indicate <code>XBUF</code> is ready to be written. | RW | 0 |
| 9 | XHCLKRST | Transmit high-frequency clock divider reset enable bit 0x0: The transmitter high-frequency clock divider is held in reset. 0x1: The transmitter high-frequency clock divider is running. | RW | 0 |
| 8 | XCLKRST | Transmit clock divider reset enable bit 0x0: The transmit clock divider is held in reset. When the clock divider is in reset, it passes through a divide-by-1 of its input. 0x1: The transmit clock divider is running. | RW | 0 |
| 7:0 | RESERVED | Reserved | RW | 0x0 |

Table 24-608. Register Call Summary for Register MCASP_GBLCTL

Multichannel Audio Serial Port

- [McASP Software Reset](#): [0] [1]
- [DIT Transfer Mode](#): [2]
- [McASP Global Initialization](#): [3] [4] [5] [6] [7] [8]
- [McASP DIT Transmission Mode](#): [9] [10] [11]
- [McASP Register Summary](#): [12]
- [McASP Register Description](#): [13] [14] [15] [16] [17] [18]

Table 24-609. MCASP_AMUTE

| | | | |
|-------------------------|---|-----------------|------------------------------|
| Address Offset | 0x0000 0048 | Instance | MCASP_L3 |
| Physical Address | 0x4902 8048 0x4012 8048 0x01D2 8048 | | MCASP_CORTEX-A9 MCASP_DSP |
| Description | Mute control register - Controls the McASP mute output pin (abe_mcasp_amute) | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----------|---------|----------|----------|----------|--------|----------|--------|------|-------|-------|---|
| RESERVED | | | | | | | | | | | | | | | | | | | XDMAERR | RESERVED | XCKFAIL | RESERVED | XSYNCERR | RESERVED | XUNDRN | RESERVED | INSTAT | INEN | INPOL | MUTEN | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | Reserved | RW | 0x00000 |
| 12 | XDMAERR | Drives AMUTE active enable bit on transmit DMA error (XDMAERR). 0x0: Drive is disabled. Detection of transmit DMA error is ignored by abe_mcasp_amute. 0x1: Drive is enabled (active). Upon detection of transmit DMA error, abe_mcasp_amute is active and is driven according to MUTEN bits. | RW | 0 |
| 11 | RESERVED | Reserved | RW | 0 |
| 10 | XCKFAIL | XMT bad clock. Drives AMUTE active enable bit on transmit clock failure (XCKFAIL). 0x0: Drive is disabled. Detection of transmit clock failure is ignored by abe_mcasp_amute. 0x1: Drive is enabled (active). Upon detection of transmit clock failure, abe_mcasp_amute is active and is driven according to MUTEN bits. | RW | 0 |
| 9 | RESERVED | Reserved | RW | 0 |
| 8 | XSYNCERR | XMT unexpected FS. Drives AMUTE active enable bit on unexpected transmit frame-sync error (XSYNCERR). 0x0: Drive is disabled. Detection of unexpected transmit frame-sync error is ignored by abe_mcasp_amute. 0x1: Drive is enabled (active). Upon detection of unexpected transmit frame-sync error, abe_mcasp_amute is active and is driven according to MUTEN bit. | RW | 0 |
| 7 | RESERVED | Reserved | RW | 0 |
| 6 | XUNDRN | XMT underrun occurs. Drives AMUTE active enable bit on transmit underrun error (XUNDRN). 0x0: Drive is disabled. Detection of transmit underrun error is ignored by abe_mcasp_amute. 0x1: Drive is enabled (active). Upon detection of transmit underrun error, abe_mcasp_amute is active and is driven according to MUTEN bit. | RW | 0 |
| 5 | RESERVED | Reserved | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 4 | INSTAT | Status of mute in pin, determines drive on abe_mcasp_axr pin when the MCASP_PFUNC[0] and MCASP_PDIR[0] bits are set to 1. Read 0x0: Inactive Read 0x1: Active. Audio mute in error is detected. | R | 0 |
| 3 | INEN | Drive abe_mcasp_amute active when abe_mcasp_amutein error is active. 0x0: Drive is disabled. abe_mcasp_amutein is ignored by abe_mcasp_amute. 0x1: Drive is enabled (active). INSTAT = 1 drives abe_mcasp_amute active. | RW | 0 |
| 2 | INPOL | Audio mute in (abe_mcasp_amutein) polarity select bit 0x0: Polarity is active high. A high on abe_mcasp_amutein sets INSTAT to 1. 0x1: Polarity is active low. A low on abe_mcasp_amutein sets INSTAT to 1. | RW | 0 |
| 1:0 | MUTEN | abe_mcasp_amute pin enable bit field (unless overridden by GPIO registers) 0x0: Disabled, pin goes to 3-state condition. 0x1: Pin is driven high if error is detected. 0x2: Pin is driven low if error is detected. | RW | 0x0 |

Table 24-610. Register Call Summary for Register MCASP_AMUTE

Multichannel Audio Serial Port

- [DIT Transfer Mode: \[0\]](#)
- [Audio Mute \(AMUTE\) Function: \[1\] \[2\] \[3\] \[4\]](#)
- [Clock Failure Detection: \[5\]](#)
- [McASP Global Initialization: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [McASP Register Summary: \[13\]](#)

Table 24-611. MCASP_TXDITCTL

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0050 | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Physical Address | 0x4902 8050 0x4012 8050 0x01D2 8050 | | |
| Description | Transmit DIT mode control register, controls DIT operations of the McASP | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|----|---|----|---|----------|---|-------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | VB | | VA | | RESERVED | | DITEN | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:4 | RESERVED | Reserved | RW | 0x0000000 |
| 3 | VB | Valid bit for odd time slots (DIT right subframe). 0x0: V bit is 0 during odd DIT subframes. 0x1: V bit is 1 during odd DIT subframes. | RW | 0 |
| 2 | VA | Valid bit for even time slots (DIT left subframe). 0x0: V bit is 0 during even DIT subframes. 0x1: V bit is 1 during even DIT subframes. | RW | 0 |
| 1 | RESERVED | Reserved | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | DITEN | DIT mode enable bit 0x0: DIT mode is disabled. 0x1: DIT mode is enabled. Transmitter operates in DIT encoded mode. | RW | 0 |

Table 24-612. Register Call Summary for Register MCASP_TXDITCTL

Multichannel Audio Serial Port

- [DIT Transfer Mode: \[0\]](#)
- [McASP Global Initialization: \[1\] \[2\] \[3\]](#)
- [McASP Register Summary: \[4\]](#)

Table 24-613. MCASP_TXMASK

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 00A4 | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Physical Address | 0x4902 80A4 0x4012 80A4 0x01D2 80A4 | | |
| Description | Transmit format unit bit mask register - Determines which bits of the transmitted data are masked off before being shifted out the McASP | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| XMASK31 | XMASK30 | XMASK29 | XMASK28 | XMASK27 | XMASK26 | XMASK25 | XMASK24 | XMASK23 | XMASK22 | XMASK21 | XMASK20 | XMASK19 | XMASK18 | XMASK17 | XMASK16 | XMASK15 | XMASK14 | XMASK13 | XMASK12 | XMASK11 | XMASK10 | XMASK9 | XMASK8 | XMASK7 | XMASK6 | XMASK5 | XMASK4 | XMASK3 | XMASK2 | XMASK1 | XMASK0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 31:0 | XMASK[31:0] | Transmit data mask enable bit 0x0: The corresponding bit of transmit data is masked out and then transmitted out the McASP in place of the original bit. 0x1: The corresponding bit of transmit data is transmitted out the McASP. | RW | 0 |

Table 24-614. Register Call Summary for Register MCASP_TXMASK

Multichannel Audio Serial Port

- [Format Unit: \[0\] \[1\]](#)
- [DIT Transfer Mode: \[2\]](#)
- [McASP Global Initialization: \[3\] \[4\]](#)
- [McASP Register Summary: \[5\]](#)

Table 24-615. MCASP_TXFMT

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 00A8 | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Physical Address | 0x4902 80A8 0x4012 80A8 0x01D2 80A8 | | |
| Description | Transmit bitstream format register - configures the transmit data format | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|------|------|----------|----|----|----|------|---|---|---|--------|------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | XDATDLY | XRVR | XPAD | RESERVED | | | | XSSZ | | | | XBUSEL | XROT | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:18 | RESERVED | Reserved | RW | 0x0000 |
| 17:16 | XDATDLY | Transmit sync bit delay 0x0: 0 bit delay - The first transmit data bit, <code>abe_mcaspxr</code> , occurs in the same <code>abe_mcaspxclkx</code> cycle as the transmit frame sync (<code>abe_mcaspxfsx</code>). 0x1: Reserved 0x2: Reserved | RW | 0x0 |
| 15 | XRVRS | Transmit serial bitstream order 0x0: Bitstream is LSB first. No bit reversal is performed in transmit format unit. 0x1: Reserved | RW | 0x0 |
| 14:13 | XPAD | Pad value for extra bits in slot not belonging to word defined by <code>XMASK</code> . This field only applies to bits when <code>XMASK[n] = 0</code> . 0x0: Pad extra bits with 0. 0x1 to 0x3: Reserved | RW | 0x00 |
| 12:8 | RESERVED | Reserved | RW | 0x0 |
| 7:4 | XSSZ | Transmit slot size 0x0 to 0xE: Reserved 0xF: Slot size is 32 bits. | RW | 0x0 |
| 3 | XBUSEL | Selects whether writes to the serializer buffer <code>XBUF</code> originate from the peripheral configuration port or the DMA port. 0x0: Writes to <code>XBUF</code> originate from the data port. Writes to <code>XBUF</code> from the peripheral configuration port are ignored with no effect on the McASP. 0x1: Writes to <code>XBUF</code> originate from the peripheral configuration port. Writes to <code>XBUF</code> from the data port are ignored with no effect on the McASP. | RW | 0 |
| 2:0 | XROT | Right-rotation value for transmit rotate right format unit 0x0: Rotate right by 0 (no rotation). 0x1: Rotate right by 4 bit positions. 0x2: Rotate right by 8 bit positions. 0x3: Rotate right by 12 bit positions. 0x4: Rotate right by 16 bit positions. 0x5: Rotate right by 20 bit positions. 0x6: Rotate right by 24 bit positions. 0x7: Rotate right by 28 bit positions. | RW | 0x0 |

Table 24-616. Register Call Summary for Register MCASP_TXFMT

Multichannel Audio Serial Port

- [Format Unit: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [Transmit State-Machine: \[9\]](#)
- [DIT Transfer Mode: \[10\] \[11\]](#)
- [Data Ready Status and Event/Interrupt Generation: \[12\] \[13\]](#)
- [McASP Global Initialization: \[14\] \[15\] \[16\]](#)
- [McASP DIT Transmission Mode: \[17\] \[18\] \[19\]](#)
- [McASP Register Summary: \[20\]](#)

Table 24-617. MCASP_TXFMCTL

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 00AC | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Physical Address | 0x4902 80AC 0x4012 80AC 0x01D2 80AC | | |
| Description | Transmit frame-sync control register - configures the transmit frame sync (abe_mcasp_afsx). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|-------|----------|------|------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | XMOD | | | | | | | | RESERVED | FXWID | RESERVED | FSXM | FSXP | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | RW | 0x0000 |
| 15:7 | XMOD | Transmit frame-sync mode select bits 0x180: 384-slot DIT mode All other: Reserved | RW | 0x000 |
| 6:5 | RESERVED | Reserved | RW | 0x0 |
| 4 | FXWID | The transmit frame-sync width select bit indicates the width of the transmit frame sync (abe_mcasp_afsx) during its active period. 0x0: Single bit 0x1: Reserved | RW | 0 |
| 3:2 | RESERVED | Reserved | RW | 0x0 |
| 1 | FSXM | Transmit frame-sync generation select bit 0x0: Reserved 0x1: Internally-generated transmit frame sync | RW | 0 |
| 0 | FSXP | Transmit frame-sync polarity select bit 0x0: Rising Edge - A rising edge on transmit frame sync (abe_mcasp_afsx) indicates the beginning of a frame. 0x1: Reserved | RW | 0 |

Table 24-618. Register Call Summary for Register MCASP_TXFMCTL

Multichannel Audio Serial Port

- [Frame-Sync Generator](#): [0] [1] [2] [3] [4]
- [DIT Transfer Mode](#): [5] [6]
- [McASP Global Initialization](#): [7] [8]
- [McASP Register Summary](#): [9]

Table 24-619. MCASP_ACLKXCTL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00B0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4902 80B0 0x4012 80B0 0x01D2 80B0 | | | | | | | | | | | | | | | | Instance MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP | | | | | | | | | | | | | | | |
| Description | Transmit clock control register - Configures the transmit bit clock (abe_mcasp_aclkx) and the transmit clock generator. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|-------|---|-------|---|---------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | ASYNC | | CLKXM | | CLKXDIV | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 31:7 | RESERVED | Reserved | RW | 0x00 |
| 6 | ASYNC | Transmit operation asynchronous enable bit 0x0: Reserved 0x1: Asynchronous | RW | 1 |
| 5 | CLKXM | Transmit bit clock source bit 0x0: Reserved 0x1: Internal (output of divider) | RW | 1 |
| 4:0 | CLKXDIV | Transmit bit clock divide ratio bits, determine the divide-down ratio from AHCLKX to ACLKX. 0x0: Divide-by-1 0x1: Divide-by-2 0x2 to 0x1F: Divide-by-3 to divide-by-32 | RW | 0x00 |

Table 24-620. Register Call Summary for Register MCASP_ACLKXCTL

Multichannel Audio Serial Port

- [Transmit Clock: \[0\] \[1\] \[2\]](#)
- [DIT Transfer Mode: \[3\] \[4\]](#)
- [McASP Global Initialization: \[5\]](#)
- [McASP Register Summary: \[6\]](#)

Table 24-621. MCASP_AHCLKXCTL

| | | |
|------------------|---|--|
| Address Offset | 0x0000 00B4 | |
| Physical Address | 0x4902 80B4 0x4012 80B4 0x01D2 80B4 | Instance MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Description | High-frequency transmit clock control register - Configures the transmit high-frequency master clock (abe_mcasp_ahclkx) and the transmit clock generator. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----------|----|----------|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HCLKXM | RESERVED | | HCLKXDIV | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:16 | RESERVED | Reserved | RW | 0x000 |
| 15 | HCLKXM | Transmit high-frequency clock source bit 0x0: Reserved 0x1: Internal transmit high-frequency clock source from output of programmable high clock divider | RW | 1 |
| 14:12 | RESERVED | Reserved | RW | 0x0 |
| 11:0 | HCLKXDIV | Transmit high-frequency clock divide ratio bits determine the divide-down ratio from AUXCLK to abe_mcaspl_ahclkx. ⁽¹⁾ 0x0: Divide-by-1 0x1: Divide-by-2 0x2 to 0xFFF: Divide-by-3 to divide-by-4096 | RW | 0x000 |

⁽¹⁾ The AUXCLK clock is sourced directly from MCASP_FCLK.

Table 24-622. Register Call Summary for Register MCASP_AHCLKXCTL

Multichannel Audio Serial Port

- [Transmit Clock: \[0\] \[1\] \[2\]](#)
- [DIT Transfer Mode: \[3\]](#)
- [McASP Global Initialization: \[4\]](#)
- [McASP Register Summary: \[5\]](#)

Table 24-623. MCASP_TXTDM

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 00B8 | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Physical Address | 0x4902 80B8 0x4012 80B8 0x01D2 80B8 | | |
| Description | Transmit TDM slot 0-31 register - TDM time slot counter range is to 384 slots (to support SPDIF blocks of 384 subframes). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| XTDMS31 | XTDMS30 | XTDMS29 | XTDMS28 | XTDMS27 | XTDMS26 | XTDMS25 | XTDMS24 | XTDMS23 | XTDMS22 | XTDMS21 | XTDMS20 | XTDMS19 | XTDMS18 | XTDMS17 | XTDMS16 | XTDMS15 | XTDMS14 | XTDMS13 | XTDMS12 | XTDMS11 | XTDMS10 | XTDMS9 | XTDMS8 | XTDMS7 | XTDMS6 | XTDMS5 | XTDMS4 | XTDMS3 | XTDMS2 | XTDMS1 | XTDMS0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------|
| 31:0 | XTDMS[31:0] | Transmitter mode during TDM time slot n 0x0: Reserved 0x1: The transmit TDM time slot n is active. The transmit serializer shifts out data during this slot according to the serializer control register (MCASP_SRCTL). | RW | 0 |

Table 24-624. Register Call Summary for Register MCASP_TXTDM

Multichannel Audio Serial Port

- [Transmit TDM Sequencer: \[0\]](#)
- [DIT Transfer Mode: \[1\] \[2\]](#)
- [McASP Global Initialization: \[3\]](#)
- [McASP Register Summary: \[4\]](#)

Table 24-625. MCASP_EVTCTLX

| | | | |
|-------------------------|---|-----------------|------------------------------|
| Address Offset | 0x0000 00BC | Instance | MCASP_L3 |
| Physical Address | 0x4902 80BC 0x4012 80BC 0x01D2 80BC | | MCASP_CORTEX-A9 MCASP_DSP |
| Description | Transmitter Interrupt control register - controls generation of the McASP transmit interrupt (XINT). When the register bit(s) is set to 1, the occurrence of the enabled McASP condition(s) generates XINT. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----------|-------|-------|---------|---------|----------|--------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | XSTAFRM | RESERVED | XDATA | XLAST | XDMAERR | XCKFAIL | XSYNCERR | XUNDRN | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Reserved | RW | 0x000000 |
| 7 | XSTAFRM | Transmit start of frame interrupt enable bit 0x0: Interrupt is disabled. A transmit-start-of-frame interrupt does not generate a McASP transmit interrupt (XINT). 0x1: Interrupt is enabled. A transmit-start-of-frame interrupt generates a McASP transmit interrupt (XINT). | RW | 0 |
| 6 | RESERVED | Reserved | RW | 0 |
| 5 | XDATA | Transmit data-ready interrupt enable bit 0x0: Interrupt is disabled. A transmit data-ready interrupt does not generate a McASP transmit interrupt (XINT). 0x1: Interrupt is enabled. A transmit data-ready interrupt generates a McASP transmit interrupt (XINT). | RW | 0 |
| 4 | XLAST | Transmit last slot interrupt enable bit 0x0: Interrupt is disabled. A transmit-last-slot interrupt does not generate a McASP transmit interrupt (XINT). 0x1: Interrupt is enabled. A transmit-last-slot interrupt generates a McASP transmit interrupt (XINT). | RW | 0 |
| 3 | XDMAERR | Transmit DMA error interrupt enable bit 0x0: Interrupt is disabled. A transmit DMA error interrupt does not generate a McASP transmit interrupt (XINT). 0x1: Interrupt is enabled. A transmit DMA error interrupt generates a McASP transmit interrupt (XINT). | RW | 0 |
| 2 | XCKFAIL | Transmit clock failure interrupt enable bit 0x0: Interrupt is disabled. A transmit clock failure interrupt does not generate a McASP transmit interrupt (XINT). 0x1: Interrupt is enabled. A transmit clock failure interrupt generates a McASP transmit interrupt (XINT). | RW | 0 |
| 1 | XSYNCERR | Unexpected transmit frame-sync interrupt enable bit 0x0: Interrupt is disabled. An unexpected transmit frame-sync interrupt does not generate a McASP transmit interrupt (XINT). 0x1: Interrupt is enabled. An unexpected transmit frame-sync interrupt generates a McASP transmit interrupt (XINT). | RW | 0 |
| 0 | XUNDRN | Transmitter underrun interrupt enable bit 0x0: Interrupt is disabled. A transmitter underrun interrupt does not generate a McASP transmit interrupt (XINT). 0x1: Interrupt is enabled. A transmitter underrun interrupt generates a McASP transmit interrupt (XINT). | RW | 0 |

Table 24-626. Register Call Summary for Register MCASP_EVTCTLX

Multichannel Audio Serial Port

- [Data Ready Status and Event/Interrupt Generation: \[0\] \[1\]](#)
- [Interrupt Requests: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [Transmit Data Ready Interrupt: \[8\]](#)
- [Error Interrupt: \[9\]](#)
- [Clock Failure Detection: \[10\] \[11\]](#)
- [McASP DIT Transmission Mode: \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\]](#)
- [McASP Register Summary: \[26\]](#)
- [McASP Register Description: \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\]](#)

Table 24-627. MCASP_TXSTAT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 00C0 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP | | | | | | | |
| Physical Address | 0x4902 80C0 0x4012 80C0 0x01D2 80C0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Transmitter status register - If the McASP logic attempts to set an interrupt flag in the same cycle that the CPU writes to the flag to clear it, the McASP logic has priority and the flag remains set. This also causes the generation of a new interrupt request. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---------|---------|-------|-------|----------|---------|----------|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | XERR | XDMAERR | XSTAFRM | XDATA | XLAST | XTDMSLOT | XCKFAIL | XSYNCERR | XUNDRN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:9 | RESERVED | Reserved | RW | 0x0000000 |
| 8 | XERR | XERR bit always returns a logic-OR of: XUNDRN XSYNCERR XCKFAIL XDMAERR. Allows a single bit to be checked to determine if a transmitter error interrupt has occurred. 0x0: No errors have occurred. 0x1: An error has occurred. | RW | 0 |
| 7 | XDMAERR | Transmit DMA error flag. XDMAERR is set when the CPU or DMA writes more words to the data port of the McASP in a given time slot than it should. Causes a transmit interrupt (XINT) if this bit and XDMAERR in MCASP_EVTCTLX are set. This bit is cleared by writing a 1 to it. Writing a 0 has no effect. 0x0: Transmit DMA error did not occur. 0x1: Transmit DMA error occurred. | RW | 0 |
| 6 | XSTAFRM | Transmit start of frame flag. Causes a transmit interrupt (XINT) if this bit and XSTAFRM in MCASP_EVTCTLX are set. This bit is cleared by writing a 1 to it. Writing a 0 has no effect. 0x0: No new transmit frame sync (AFSX) is detected. 0x1: A new transmit frame sync (AFSX) is detected. | RW | 0 |
| 5 | XDATA | Transmit data ready flag. Causes a transmit interrupt (XINT) if this bit and XDATA in MCASP_EVTCTLX are set. This bit is cleared by writing a 1 to it. Writing a 0 has no effect 0x0: XBUF is written and is full 0x1: Data is copied from XBUF to XRSR. XBUF is empty and ready to be written. XDATA is also set when the transmit serializers are taken out of reset. When XDATA is set, it always causes a DMA event (AXEVT). | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 4 | XLAST | Transmit last slot flag. XLAST, along with XDATA, are set if the current slot is the last slot in a frame. Causes a transmit interrupt (XINT) if this bit and XLAST in MCASP_EVTCTLX are set. This bit is cleared by writing a 1 to it. Writing a 0 has no effect. 0x0: Current slot is not the last slot in a frame. 0x1: Current slot is the last slot in a frame. XDATA is also set. | RW | 0 |
| 3 | XTDMSLOT | Returns the LSB of XSLOT. Allows a single read of XSTAT to determine whether the current TDM time slot is even or odd. read 0x0: Current TDM time slot is odd. read 0x1: Current TDM time slot is even. | R | 0 |
| 2 | XCKFAIL | Transmit clock failure flag. XCKFAIL is set when the transmit clock failure detection circuit reports an error. Causes a transmit interrupt (XINT) if this bit and XCKFAIL in MCASP_EVTCTLX are set. This bit is cleared by writing a 1 to it. Writing a 0 has no effect. 0x0: Transmit clock failure did not occur. 0x1: Transmit clock failure occurred | RW | 0 |
| 1 | XSYNCERR | Unexpected transmit frame-sync flag. XSYNCERR is set when a new transmit frame sync (AFSX) occurs before it is expected. Causes a transmit interrupt (XINT) if this bit and XSYNCERR in MCASP_EVTCTLX are set. This bit is cleared by writing a 1 to it. Writing a 0 has no effect. 0x0: Unexpected transmit frame sync did not occur 0x1: Unexpected transmit frame sync occurred. | RW | 0 |
| 0 | XUNDRN | Transmitter underrun flag. XUNDRN is set when the transmit serializer is instructed to transfer data from XBUF to XRSR, but XBUF has not yet been serviced with new data since the last transfer. Causes a transmit interrupt (XINT) if this bit and XUNDRN in MCASP_EVTCTLX are set. This bit is cleared by writing a 1 to it. Writing a 0 has no effect. 0x0: Transmitter underrun did not occur 0x1: Transmitter underrun occurred. | RW | 0 |

Table 24-628. Register Call Summary for Register MCASP_TXSTAT

Multichannel Audio Serial Port

- [Transmit State-Machine: \[0\]](#)
- [Data Ready Status and Event/Interrupt Generation: \[1\] \[2\] \[3\] \[4\]](#)
- [Interrupt Requests: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)
- [Transmit Data Ready Interrupt: \[12\] \[13\]](#)
- [Error Interrupt: \[14\] \[15\]](#)
- [Buffer Underrun Error –Transmitter: \[16\]](#)
- [DMA Error –Transmitter: \[17\] \[18\]](#)
- [Clock Failure Detection: \[19\] \[20\] \[21\]](#)
- [McASP DIT Transmission Mode: \[22\] \[23\] \[24\] \[25\]](#)
- [McASP Event Servicing: \[26\] \[27\]](#)
- [McASP Register Summary: \[28\]](#)

Table 24-629. MCASP TXDMSLOT

| | | |
|-------------------------|---|---|
| Address Offset | 0x0000 00C4 | |
| Physical Address | 0x4902 80C4 0x4012 80C4 0x01D2 80C4 | Instance MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Description | Current transmit TDM time slot register | |
| Type | R | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | XSLOT CNT | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------|
| 31:10 | RESERVED | Reserved | R | 0x000000 |
| 9:0 | XSLOTCNT | Current transmit time slot count. the value of this register is 0b0101111111 (0x1f) during reset and 0 after reset. | R | 0x000 |

Table 24-630. Register Call Summary for Register MCASP_TXTDMSLOT

- [Transmit TDM Sequencer: \[0\]](#)
- [McASP Register Summary: \[1\]](#)

Table 24-631. MCASP_TXCLKCHK

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 00C8 | | |
| Physical Address | 0x4902 80C8 0x4012 80C8 0x01D2 80C8 | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Description | Transmit clock check control register - configures the transmit clock failure detection circuit. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|----------|---|---|---|-----|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| XCNT | | | | | | | | XMAX | | | | | | | | XMIN | | | | | | | | RESERVED | | | | XPS | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:24 | XCNT | Transmit clock count value (from previous measurement). The clock circuit continually counts the number of system clocks for every 32 transmit high-frequency master clock (abe_mcasg_ahclkx) signals, and stores the count in XCNT until the next measurement is taken | R | 0x00 |
| 23:16 | XMAX | 0x0 to 0xFF: Transmit clock maximum boundary. This 8-bit unsigned value sets the maximum allowed boundary for the clock check counter after 32 transmit high-frequency master clock (abe_mcasg_ahclkx) signals have been received. If the current counter value is greater than XMAX after counting 32 AHCLKX signals, XCKFAIL in XSTAT is set. The comparison is performed using unsigned arithmetic. | RW | 0x00 |
| 15:8 | XMIN | 0x0 to 0xFF: Transmit clock minimum boundary. This 8-bit unsigned value sets the minimum allowed boundary for the clock check counter after 32 transmit high-frequency master clock (abe_mcasg_ahclkx) signals have been received. If XCNT is less than XMIN after counting 32 AHCLKX signals, XCKFAIL in XSTAT is set. The comparison is performed using unsigned arithmetic. | RW | 0x00 |
| 7:4 | RESERVED | Reserved | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 3:0 | XPS | Transmit clock check prescaler value 0x0: McASP system clock divided by 1 0x1: McASP system clock divided by 2 0x2: McASP system clock divided by 4 0x3: McASP system clock divided by 8 0x4: McASP system clock divided by 16 0x5: McASP system clock divided by 32 0x6: McASP system clock divided by 64 0x7: McASP system clock divided by 128 0x8: McASP system clock divided by 256 0x9 to 0xF: Reserved | RW | 0x0 |

Table 24-632. Register Call Summary for Register MCASP_TXCLKCHK

Multichannel Audio Serial Port

- [DIT Transfer Mode: \[0\]](#)
- [Clock Failure Detection: \[1\] \[2\]](#)
- [McASP Register Summary: \[3\]](#)

Table 24-633. MCASP_TXEVTCTL

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 00CC | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Physical Address | 0x4902 80CC 0x4012 80CC 0x01D2 80CC | | |
| Description | Transmitter DMA event control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | XDATDMA |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | RW | 0x0000 0000 |
| 0 | XDATDMA | Transmit data DMA request enable bit. When writing to this field, always write the default value of 0. 0x0: The transmit data DMA request is enabled. 0x1: The transmit data DMA request is disabled. | RW | 0 |

Table 24-634. Register Call Summary for Register MCASP_TXEVTCTL

Multichannel Audio Serial Port

- [DIT Transfer Mode: \[0\]](#)
- [Data Ready Status and Event/Interrupt Generation: \[1\]](#)
- [DMA Requests: \[2\]](#)
- [McASP DIT Transmission Mode: \[3\] \[4\] \[5\]](#)
- [McASP Register Summary: \[6\]](#)

Table 24-635. MCASP_DITCSRAi

| | | |
|-------------------------|--|---|
| Address Offset | 0x0000 0100 + (0x04*i) | |
| Physical Address | 0x4902 8100 + (0x04*i) 0x4012 8100 + (0x04*i) 0x01D2 8100 + (0x04*i) | Instance MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Description | DIT left channel status register - All six 32-bit registers (I = 0 to 5) can store 192 bits of channel status data for a complete block of transmission. The DIT reuses the same data for the next block. Make sure to update the register file before a different set of data needs to be sent. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DITCSRAi | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------------------|------|-------------|
| 31:0 | DITCSRAi | Left (even TDM slot) channel status | RW | 0x0000 0000 |

Table 24-636. Register Call Summary for Register MCASP_DITCSRAi

Multichannel Audio Serial Port

- [DIT Transfer Mode: \[0\] \[1\]](#)
- [McASP Global Initialization: \[2\]](#)
- [McASP Register Summary: \[3\]](#)

Table 24-637. MCASP_DITCSRBi

| | | |
|-------------------------|---|---|
| Address Offset | 0x0000 0118+ (0x04*i) | |
| Physical Address | 0x4902 8118 + (0x04*i) 0x4012 8118 + (0x04*i) 0x01D2 8118 + (0x04*i) | Instance MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Description | DIT right channel status register - All six 32-bit registers (I = 0 to 5) can store 192 bits of channel status data for a complete block of transmission. The DIT reuses the same data for the next block. Make sure to update the register file before a different set of data needs to be sent. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DITCSRBi | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------------------------|------|-------------|
| 31:0 | DITCSRBi | Right (odd TDM slot) channel status | RW | 0x0000 0000 |

Table 24-638. Register Call Summary for Register MCASP_DITCSRBi

Multichannel Audio Serial Port

- [DIT Transfer Mode: \[0\] \[1\]](#)
- [McASP Global Initialization: \[2\]](#)
- [McASP Register Summary: \[3\]](#)

Table 24-639. MCASP_DITUDRAi

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0130 + (0x04*i) | | |
| Physical Address | 0x4902 8130 + (0x04*i) 0x4012 8130 + (0x04*i) 0x01D2 8130 + (0x04*i) | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Description | DIT left channel user data register - provides the user data of each left channel (even TDM time slot). All six 32-bit registers (I = 0 to 5) can store 192 bits of user data for a complete block of transmission. The DIT reuses the same data for the next block. Make sure to update the register before a different set of data needs to be sent. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DITUDRAi | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------------|------|-------------|
| 31:0 | DITUDRAi | Left (even TDM slot) user data | RW | 0x0000 0000 |

Table 24-640. Register Call Summary for Register MCASP_DITUDRAi

Multichannel Audio Serial Port

- [DIT Transfer Mode: \[0\] \[1\]](#)
- [McASP Global Initialization: \[2\]](#)
- [McASP Register Summary: \[3\]](#)

Table 24-641. MCASP_DITUDRBi

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0148+ (0x04*i) | | |
| Physical Address | 0x4902 8148 + (0x04*i) 0x4012 8148 + (0x04*i) 0x01D2 8148 + (0x04*i) | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Description | DIT right user data register - provides the user data of each right channel (odd TDM time slot). All six 32-bit registers (I = 0 to 5) can store 192 bits of user data for a complete block of transmission. The DIT reuses the same data for the next block. Make sure to update the register before a different set of data needs to be sent. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DITUDRBi | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------------|------|-------------|
| 31:0 | DITUDRBi | Right (odd TDM slot) user data | RW | 0x0000 0000 |

Table 24-642. Register Call Summary for Register MCASP_DITUDRBi

Multichannel Audio Serial Port

- [DIT Transfer Mode: \[0\] \[1\]](#)
- [McASP Global Initialization: \[2\]](#)
- [McASP Register Summary: \[3\]](#)

Table 24-643. MCASP_XRSRCTL0

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0180 | | |
| Physical Address | 0x4902 8180 0x4012 8180 0x01D2 8180 | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Description | Serializer control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----------|----|----|-------|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | XRDY | | RESERVED | | | SRMOD | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:5 | RESERVED | Reserved | RW | 0x00000000 |
| 4 | XRDY | Transmit buffer ready bit Read 0x0: The transmit buffer (MCASP_TXBUF0) contains data. Read 0x1: The transmit buffer (MCASP_TXBUF0) is empty and needs to be written before the start of the next time slot or a transmit underrun occurs. | R | 0 |
| 3:2 | RESERVED | Reserved | RW | 0x0 |
| 1:0 | SRMOD | Serializer mode bit 0x0:The serializer is inactive 0x1:The serializer is operating in transmit mode. 0x2: Reserved 0x3: Reserved | RW | 0x0 |

Table 24-644. Register Call Summary for Register MCASP_XRSRCTL0

Multichannel Audio Serial Port

- [Serializers: \[0\] \[1\]](#)
- [DIT Transfer Mode: \[2\]](#)
- [McASP Global Initialization: \[3\]](#)
- [McASP Register Summary: \[4\]](#)

Table 24-645. MCASP_TXBUF0

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0200 | | |
| Physical Address | 0x4902 8200 0x4012 8200 0x01D2 8200 | Instance | MCASP_L3 MCASP_CORTEX-A9 MCASP_DSP |
| Description | Transmit buffer - The transmit buffer for the serializer holds data from the transmit format unit. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| XBUF0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|-------------|
| 31:0 | XBUF0 | Transmit buffer | RW | 0x0000 0000 |

Table 24-646. Register Call Summary for Register MCASP_TXBUF0

Multichannel Audio Serial Port

- [Serializers: \[0\]](#)
- [Transmit TDM Sequencer: \[1\]](#)
- [Data Transmission: \[2\] \[3\]](#)
- [Data Ready Status and Event/Interrupt Generation: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [Buffer Underrun Error –Transmitter: \[15\] \[16\]](#)
- [McASP DIT Transmission Mode: \[17\] \[18\]](#)
- [McASP Event Servicing: \[19\]](#)
- [McASP Register Summary: \[20\]](#)
- [McASP Register Description: \[21\] \[22\]](#)

24.9 Serial Low-Power Inter-Chip Media Bus Controller

This section describes the features and functions of the serial low-power inter-chip media bus (SLIMbus®) controller.

24.9.1 SLIMbus Overview

There are two SLIMbus module instantiations, SLIMBUS1 and SLIMBUS2, in the device. SLIMbus1 is implemented in the audio backend (ABE) subsystem and is intended for the connection of external audio peripherals. SLIMBUS2 is at the top-level of the device and is intended for the connection of other types of peripherals.

The SLIMbus controller provides a bidirectional, multidrop, multichannel two-line serial interface between the device and other SLIMbus components in a system, such as audio codecs, Bluetooth® modules, and FM radio receivers/transmitters. Because of its versatility, the SLIMbus controller can play the role of a wide range of peripherals and clocked frame-oriented protocols (I2S™, PCM, and TDM).

Figure 24-207 shows the SLIMbus1 controller highlight.

Figure 24-207. SLIMbus1 Highlight

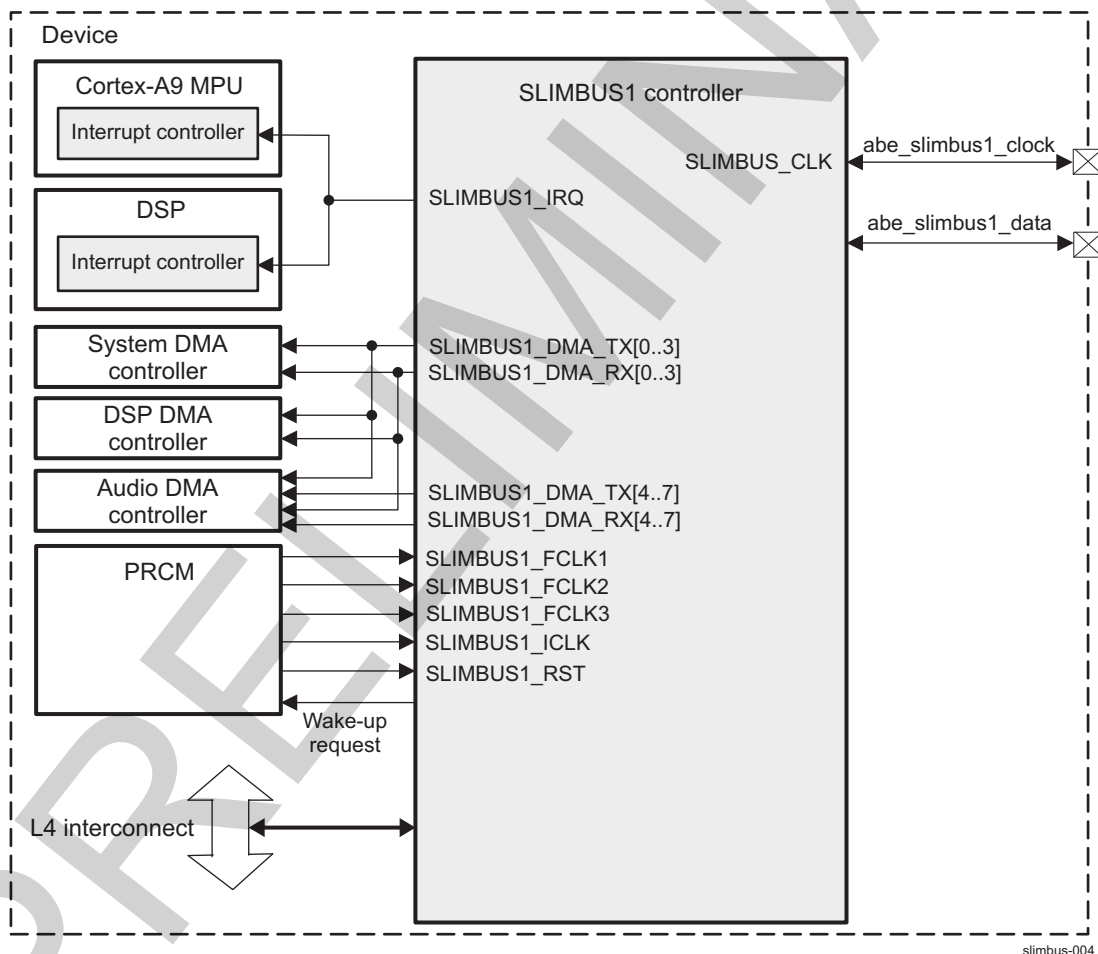
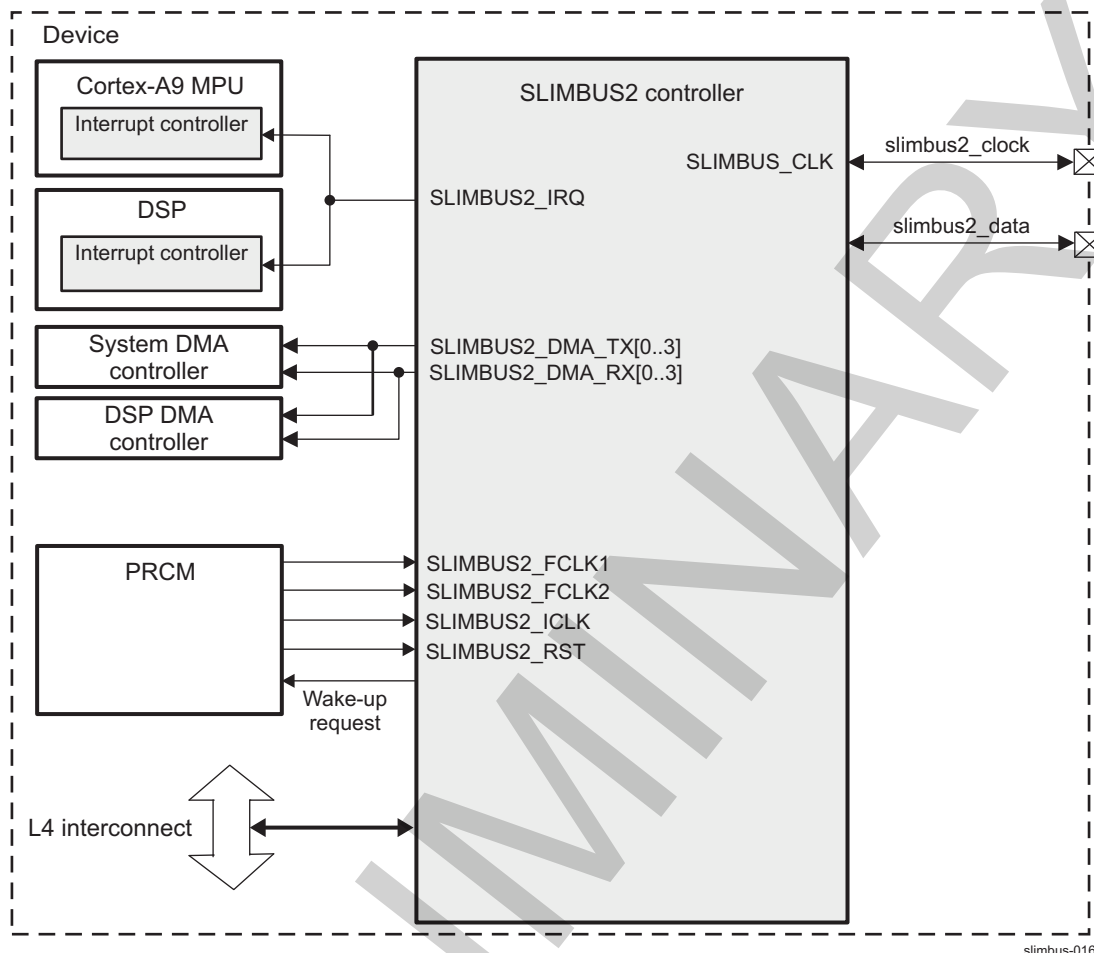


Figure 24-208 shows the SLIMbus2 controller highlight.

Figure 24-208. SLIMbus2 Highlight

24.9.1.1 Terminology

The SLIMbus module is by default the SLIMbus controller IP. The module implements a SLIMbus component by integrating together several submodules: a SLIMbus component contains a set of devices and the necessary logic needed to provide bus access to these devices.

Every component contains one Interface device and can contain additional devices belonging to other device classes (framer, manager, or generic devices).

- An interface device is the central status and control location of the component. All components have only one interface device.
- A framer device can generate the clock and synchronization information for the entire SLIMbus. Consequently, only one framer device (for all SLIMbus components) at a time can be active on the bus.
- A manager device controls the bus scheduling at high level: It assigns logical addresses to any device that is authorized to communicate using the bus, gives the bandwidth allocation, and so on. Only one manager device at a time can be active on the bus.
- A generic device implements the "useful" functionality of the component by sourcing/sinking the payload data. A component may include several generic devices so that each appears as a separate, standardized entity to the software driver.

NOTE: Typically, generic devices are used to transport data (rather than the specialized manager, framer, or interface devices, which typically do not feature data ports).

A device is a separately addressable entity within a SLIMbus component. Each device belongs to a single device class. After enumeration each device is addressed with a single logical address. A device (and especially a generic device) contains data ports to transmit and/or receive data. Each port is identified within the device by its port number (PN). A port is identified within the SLIMbus by its device address (logical address or enumeration address) and PN.

An enumeration address (EA) is a 48-bit value (composed of the manufacturer ID, product code, device ID, and instance value) that allows a device to receive messages.

A logical address (LA) is an 8-bit number used to uniquely identify an enumerated device on the bus.

24.9.1.2 Main Features

Each SLIMbus module includes the following main features:

- SLIMbus controller compliant with the MIPI SLIMbus standard version 1.01.00
- Support of seven SLIMbus devices:
 - One Interface device
 - One framer device
 - One manager device
 - Four generic devices
- SLIMBUS1: Eight TX and eight RX independent ports (data channels)
- SLIMBUS2: Four TX and four RX independent ports (data channels)
- FIFO access (one FIFO for transmit and one for receive), with DMA request (one line for transmit port and one line for receive port)
- SLIMBUS1: Message FIFO size is 32 bytes for transmit and 32 bytes for receive.
- SLIMBUS2: Message FIFO size is 32 bytes for transmit and 32 bytes for receive, by default. The message FIFO size can be reprogrammed to 64 (or 16 or 48) bytes if needed. However, typical use never exceeds 32 bytes.
- Data channel FIFO size is programmable for both modules.
- Programmable data length (sample size) from 4 to 32 bits
- Programmable port assignment to either of the four generic devices
- Supported transport protocols: Isochronous, pulled, pushed, asynchronous, and extended asynchronous transport protocols (the latter two in simplex and one-half duplex mode)
- No support for locked protocol
- SLIMbus clock rate: From 0 to 24.576 MHz

Each SLIMbus module has the following characteristics:

- The component is implemented by a digital controller (the current module), plus a physical layer (a set of CLK + DATA bidirectional input/output [I/O] drivers).
- Devices are logical entities implemented by a combination of hardware (automatic address decoding for message reception) and software (message decode, encode, etc.).
- Ports (and their mapping to data channels) are supported by the module hardware-implemented data channel agents. Each agent features a unidirectional FIFO, a DMA request, support for a number of transfer protocols, etc. One agent is used per port and per data direction: Transfer protocols are unidirectional and require only one data channel agent per data channel.

24.9.2 SLIMbus Environment

24.9.2.1 SLIMbus Component Connection Example

Figure 24-209 shows an example of a system with the SLIMbus1 controller connected to an audio peripheral component.

Figure 24-209. SLIMbus1 Typical Application System Overview

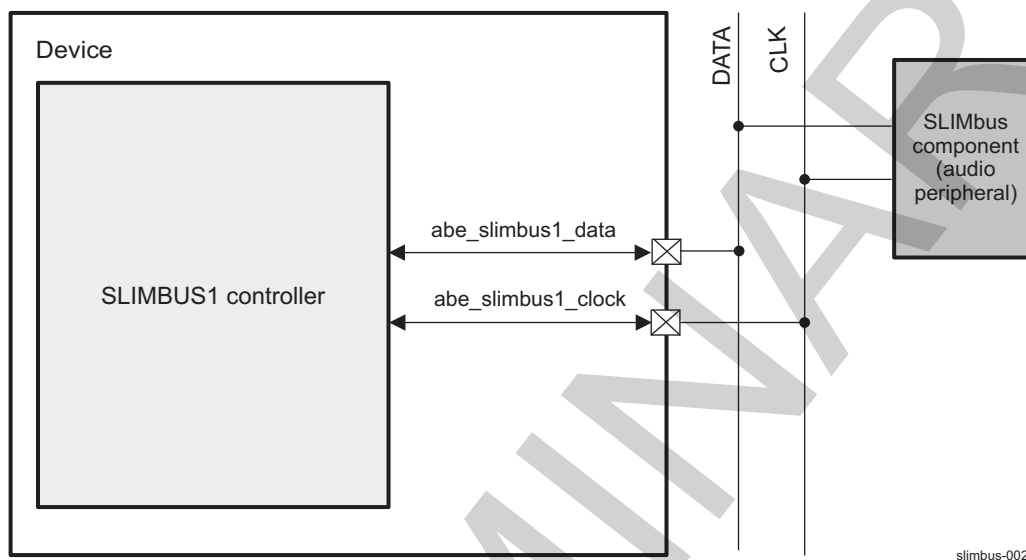
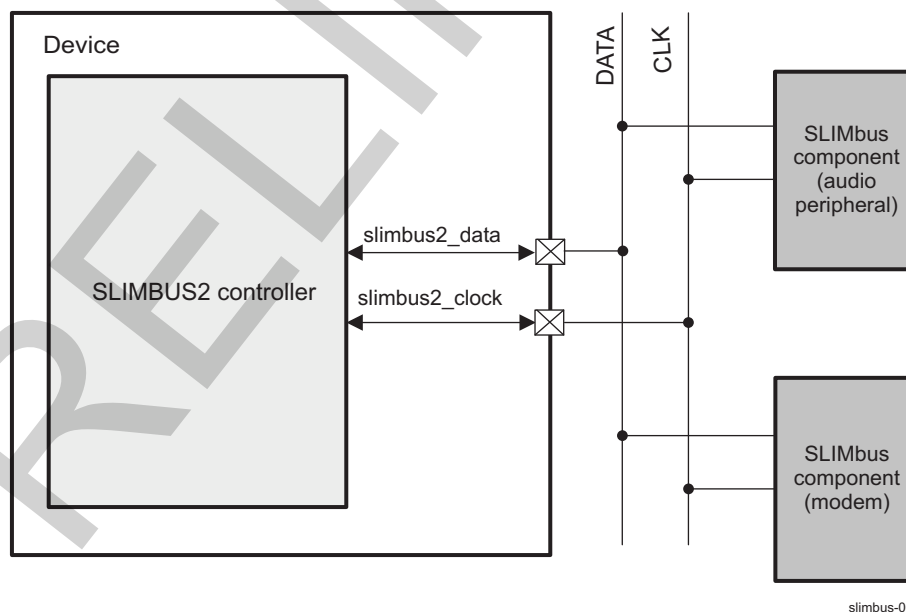


Figure 24-210 shows an example of a system with the SLIMbus2 controller connected to one audio peripheral component and one modem component.

Figure 24-210. SLIMbus2 Typical Application System Overview



The physical medium of SLIMbus is composed of two lines: CLK and DATA. All components of the bus are attached to both lines. The clock line (CLK) is driven by the (component containing the) active framer, and received (and used) by all other components on the bus. The data line (DATA) is driven alternately by all components, following the SLIMbus protocol.

The SLIMbus uses non-return-to-zero inverted (NRZI) signalling:

- A logical 1 is represented by a transition (a change) in the physical level.
- A logical 0 is represented by the same physical level as the previous bit.

24.9.2.2 SLIMbus Functional Interface

Table 24-647 describes the SLIMbus1 interface.

Table 24-647. SLIMbus1 Signals Description

| Signal | I/O | Description | Value at Reset |
|--------------------|-----|--------------------|----------------|
| abe_slimbus1_data | I/O | SLIMbus1 DATA pad | 1 |
| abe_slimbus1_clock | I/O | SLIMbus1 CLOCK pad | 1 |

Table 24-648 describes the SLIMbus2 interface.

Table 24-648. SLIMbus2 Signals Description

| Signal | I/O | Description | Value at Reset |
|----------------|-----|--------------------|----------------|
| slimbus2_data | I/O | SLIMbus2 DATA pad | 1 |
| slimbus2_clock | I/O | SLIMbus2 CLOCK pad | 1 |

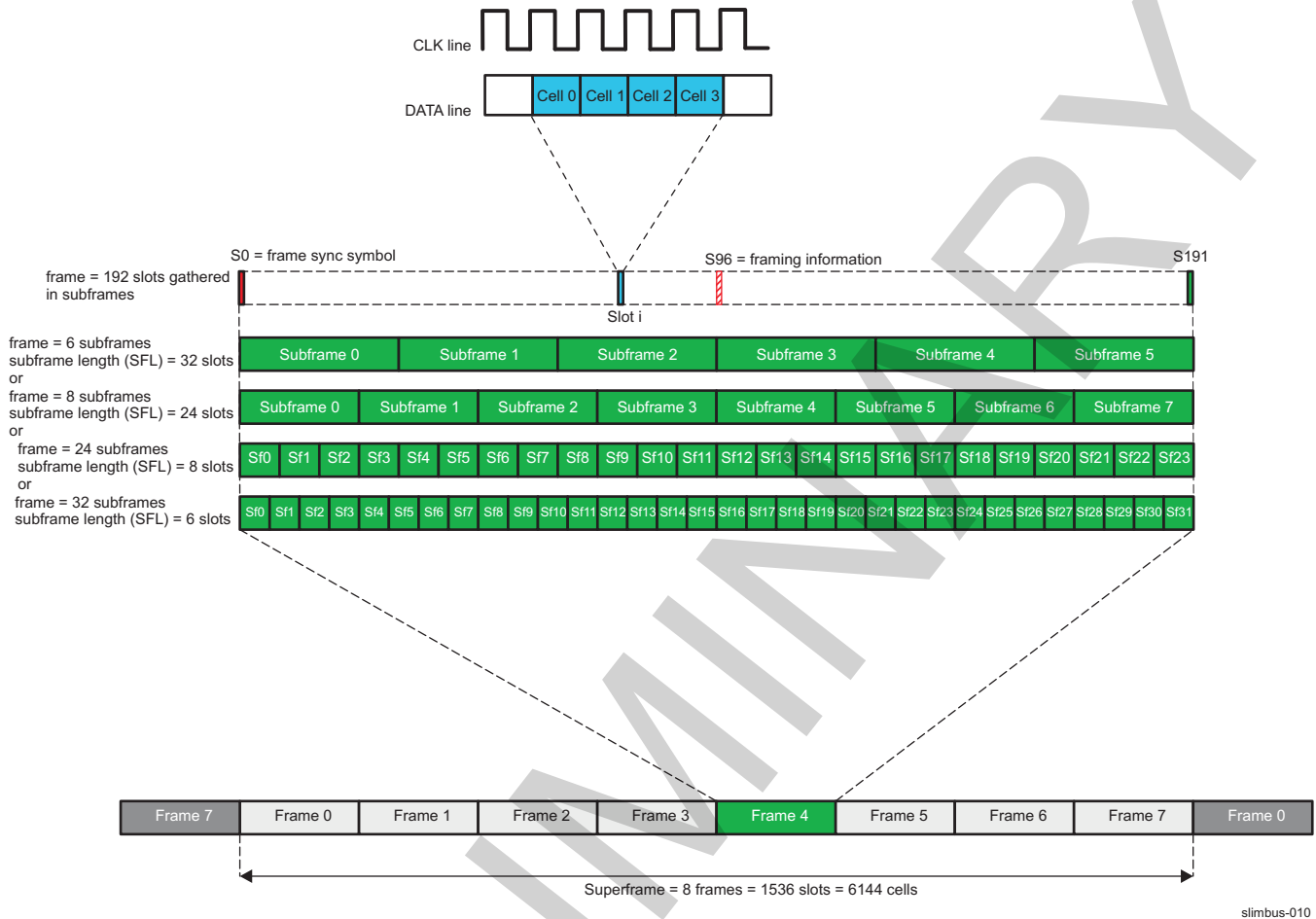
24.9.2.3 SLIMbus Protocols and Data Formats

24.9.2.3.1 Frame Structure

The SLIMbus bitstream is transferred in time-division multiplexing (TDM) organization. TDM is a type of multiplexing in which two or more bitstreams are transferred apparently simultaneously as subchannels in one communication channel, but are physically taking turns on the channel. This organization allows SLIMbus to transfer control, data, and configuration information through only one DATA signal. The organization of information on the bus is called a frame structure. The frame structure is composed of five building blocks: cells, slots, subframes, frames and superframes.

- A cell is the smallest division of the SLIMbus data stream. A cell is defined as the region of the DATA line signal that lies between two consecutive positive edges of the CLK signal.
- A slot is a group of four contiguous cells. It is at the slot level that the SLIMbus DATA signal is time division-multiplexed between different channels.
- A frame is a group of 192 contiguous slots (768 cells). The first slot of each frame carries the frame-sync symbol.
- A subframe is the division of the frame structure at which control space and, if present, data space are interleaved. The subframe length can be 6, 8, 24, or 32 slots (24, 32, 96, and 128 cells).
- A superframe is composed of eight consecutive frames and contains a complete set of Framing Information.

Figure 24-211 shows the organization of the frame structure.

Figure 24-211. SLIMbus Frame Structure Overview

24.9.2.3.2 Control and Data Channels

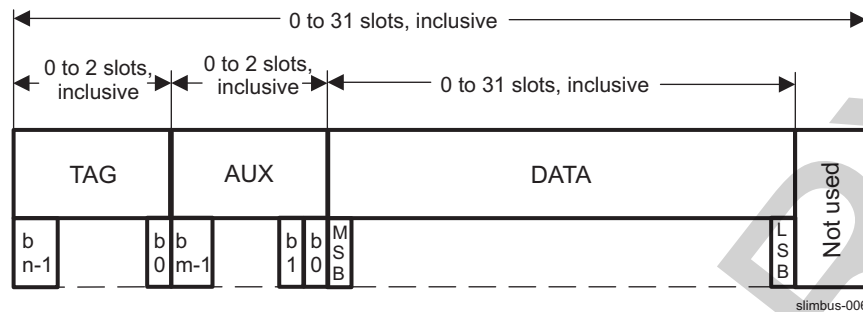
A frame is divided into two parts: the control space and the data space. The control space contains the information needed for a device to discover the bus state, to track messages, and for the messages themselves. The control space size is programmable by setting the control space width (number of control space slots per subframe) and the subframe length. Data space is interleaved with control space at the subframe level. Slots not explicitly allocated to control space are considered data space. The active manager can organize these slots into data channels to transport application-specific data streams between devices on the bus. Data space can contain up to 256 data channels.

A data channel is a stream of one or more contiguous slots organized in a consistent data structure that repeats at a fixed interval. The largest possible group of contiguous slots within a data channel is known as a segment.

A data channel connects one data source port and one or several data sink ports, depending on the protocol used. A port can be connected only to a single data channel at a time.

A segment is composed of three fields: TAG, auxiliary information (AUX), and data fields. These fields are organized within the segment, as shown in [Figure 24-212](#). The exact composition of the segment depends on the transport protocol.

Figure 24-212. Segment Organization



24.9.2.3.2.1 Control Space Scheduling

The control space is a periodic allocation of blocks of contiguous slots with the following properties:

- Although the control space is composed of periodic blocks of 4-bit slots, it functions as a continuous stream of bits, and the interruptions for noncontrol space (that is, data space) sequences have no effect on its operation.
- The control space contains all synchronization references for the SLIMbus TDM structure; that is, it is not referenced to anything else because it is the reference.
- The control space scheduling changes only on reconfiguration boundaries.
- The subframe mode (SM) parameters unambiguously determine which slots belong to the control space.

The control space scheduling, encoded inside the SM, has the following structure:

- Each (fixed-length) frame is divided into a (whole) number of variable-sized subframes.
- The subframe length (SFL, encoded in the SM) is defined as the number of slots in a subframe.
- The control space is allocated in each subframe: The control-space width (CSW, also encoded in SM) is the number of control slots at the beginning of each subframe.

The control space is composed of $192/\text{SFL}$ blocks of CSW slots each, starting at intervals of SFL slots (knowing that there are 192 slots per frame). If the frame slots from $j = 0$ to $j = (192-1)$ and the blocks from $k = 0$ to $k = (192/\text{SFL})-1$ are indexed, the control space occupies in each frame, for the whole range of k :

- from slot $j = (k \times \text{SFL})$ included
- to slot $j = (k \times \text{SFL}) + \text{CSW} - 1$ included

The control space is further subdivided into a framing channel, guide channel, and shared message channel (SMC).

- The framing channel is composed of:
 - A 1-slot frame sync symbol (FSS), at the beginning (slot 0) of each frame. The FSS is the reference for the position of the frame in the bitstream. The fixed scheduling means that it can be retrieved and tracked regardless of the SM.
 - A framing information slot, at mid-frame (slot 96). This fixed offset means that it can also be retrieved independently of the SM. The framing information contains (among others) the value of SM, which allows all devices to determine the structure of the control space.
 - For all legal control space structures (encoded in the SM), the framing channel (slot 0 and slot 96) is inside the control space.
- The guide channel is composed of a periodic transmission of the guide byte. It is sent in the first two control space slots of each superframe (a fixed block of eight frames), after the FSS, in slot 0. The guide channel provides a sync point for the SMC (defined as follows). The two guide channel slots are not necessarily contiguous, depending on the SM, which determines the control space length and the subframe length:
 - Guide channel = slot 1 and slot 32 for $\text{SM} = 11$

- Guide channel = slot 6 and slot 12 for SM = 4
- Guide channel = slot 1 and slot 2 for SM > 12
- Etc.
- The SMC is by definition the rest of the control space; that is, not already allocated to the framing or guide channel. All devices may concurrently try to access the SMC following an arbitration process. The SMC contains an even number of slots (whole number of bytes) per frame and per superframe.

24.9.2.3.2.2 Data Channel Allocation, Segments

The bandwidth allocated for a given data channel is determined by the segment distribution (SD) and segment length (SL) of the channel. This allocation is fixed, periodic, reserved exclusively for the channel, and changes only on reconfiguration boundaries.

- Each data channel is allocated periodic blocks of contiguous slots, called data segments.
- Segments are all of equal length (SL) (in slots).
- Segment scheduling is periodic (with true, cycle-accurate periodicity).
 - The segment period is called the segment interval (SI), in slots, encoded in the SD).
 - There is always a whole number of data segments per superframe, called the channel rate multiplier (CRM), encoded in SD). The CRM is another way to express the period, because $CRM = 1536/SI$ (there are 1536 slots per superframe).
 - The segment window is another way to express the period: Each superframe can be divided into CRM segment windows, of length SI. For each data channel, each segment window contains one entire contiguous segment. Segments cannot cross segment window boundaries because some of the segments would then collide with the control space.
- The constant phase of a segment is the segment offset (SO), which is the distance between the start of the segment window and the start of the segment, in slots. SO is also encoded in SD, and its value is bounded as follows:
 - Because scheduling is periodic, offsets are defined modulo SI (that is, the segment must start inside the current window, not the next. SD encoding ensures that $SO < SI$).
 - Segment must not overlap with control space. The consequences of that vary with SM (encoded in SM), but the following is true for all SMs:
 - $SO > CSW \geq 1$: By definition, each superframe boundary is both the start of a frame (starting with CSW slots of control space; that is, at least one slot: the frame sync symbol) and the start of a segment window (the first window of the superframe, for all SD). To prevent overlap in that window, the segment must start (slot number = SO) after the control space end (slot number = $CSW-1$). Although it can be encoded in SD, the value $SO = 0$ is therefore illegal.
 - $SO+SL \leq SI$: By definition, each superframe boundary is both the start of a frame (starting at the FSS slot) and the end of a segment window (the last window of the superframe, for all SD). To prevent overlap in that window, the segment must end (slot number = $192-SI+SO+SL-1$) before the control space (frame sync symbol in slot 0 of following frame).

Notes on scheduling

- Data segments cannot cross a superframe/frame/subframe boundary, because the first slot (at least) of each subframe is allocated to the control space. This means that a data channel can be safely redefined (new SD, SL) at a reconfiguration boundary (which is also a superframe boundary), because that point cannot be in the middle of a segment.
- The composition of the segment, as defined by the transfer protocol (TP), and the contents of the channel have no affect on the allocation of the channel, although they must be compatible: the segment must be long enough (SL) to contain the TAG, AUX, and DATA fields. Some slots and some segments may remain unused.

24.9.2.3.2.3 Data Channel Presence

Data may or may not be present in each segment of the fixed, periodic series allocated to a data channel.

- The channel rate (CR) is defined as the number of data segments available per second. It depends on the channel rate multiplier (number of segments per superframe, encoded in SD[11:0]), and of the SLIMbus clock frequency. It does not depend on the total length of the segment, data length, or other.
- The presence rate (PR) is defined as the number of data segments used (that is, that contain actual data) per second, and is encoded in PR[6:0]. It depends on the selected application.

Data channel presence properties:

- The data presence determination depends on the TP:
 - Pushed: TAG presence bit (P) driven by the data source
 - Pulled: TAG presence bit (P) driven by the data source upon request driven by the data sink (SRQ)
 - Asynchronous: TAG presence bit (P) driven by the segment owner (either side)
 - Isochronous: All segments contain data, no presence indication required (because it would always be asserted).
- The presence rate is necessarily smaller than the channel rate: $PR \leq CR$. At best they are equal, which is always the case for isochronous protocol.
- The difference between channel rate and presence rate (CR-PR) is unused bandwidth and must be kept as small as possible in most cases. In other words, the CR must be kept as small as possible for a given PR requirement. The unused bandwidth has multiple uses:
 - Padding: Adjust the required PR to a nonmultiple bus speed.
 - PR jitter margin: Allow the PR to fluctuate around an average, with enough margin to allow faster-than-average periods, that compensate for slower-than-average periods.
 - Wasted bandwidth

When data presence is not fully determined by the properties of the data channel or by the other side of the interface (pulled data source, pushed data sink), it must be controlled based on the capacity of the local system to generate data (for sources) and absorb data (for sinks).

- Pushed or asynchronous source: The data source (transmitter) asserts the presence bit ($P = 1$) and transmits data when some data is available (in a transmit buffer).
- Pulled sink: The data sink (receiver) asserts the sample request ($SRQ = 1$) when it can accept more data (in a receive buffer).

24.9.2.3.2.4 Data Channel Segment Composition

The allocated size of a data channel segment is set by the SL parameter. The segment can be broken down into:

- TAG slots
- AUX slots
- DATA slots
- Unused slots

The parameters listed in [Table 24-649](#) configure the different lengths.

Table 24-649. Segment Composition

| Parameter | Register Field | Segment Field | Size Range (Slots) | Comments |
|--------------------|---|---------------|--------------------|---------------------------|
| Segment length | SLIMBUS_DCR_CONF1 G1_j[9:5] / SLIMBUS_DCT_CONF1 G1_j[9:5] SL | Segment | 1 to 31 | Encoding 0x0 is reserved. |
| Transport protocol | SLIMBUS_DCR_CONF1 G1_j[3:0] / SLIMBUS_DCT_CONF1 G1_j[3:0] TP | TAG | 0, 1, 2 | N/A |
| AUX format | SLIMBUS_DCR_CONF1 G1_j[19:16] / SLIMBUS_DCT_CONF1 G1_j[19:16] AF | AUX | 0, 1, 2 | N/A |

Table 24-649. Segment Composition (continued)

| Parameter | Register Field | Segment Field | Size Range (Slots) | Comments |
|-----------------------|---|---------------|--------------------|--|
| Data length | SLIMBUS_DCR_CONF1 G1_j[14:10] / SLIMBUS_DCT_CONF1 G1_j[14:10] DL | DATA | 0 to 31 | Encoding 0x0 is "all remaining slots," don't care if NVB is present. |
| Number of valid bytes | NVB (not in a register field, sent in the message) | DATA | 0 to 28, even only | Encoded in AUX field, overrides DL, exists only for TP = extended asynchronous |

NOTE:

- Explicit data length (DL) range is 1 to 31 slots. When encoding 0x0 is used, the DATA field occupies all remaining slots of the segment; that is, those not occupied by TAG and AUX. This allows the encoding of a 0-slot data length.
- NVB is available only in the extended asynchronous TP, which uses two TAG slots. The maximum remaining length is 31 (SL max) – 2 = 29 slots; that is, the maximum NVB is 14 bytes = 28 slots ≤ 29 (because NVB is byte-granular and cannot encode odd slot counts).
- Not all combinations are legal. For example, the DATA field of a pushed channel (TP = 0x1: 1 TAG slot) with no AUX information (AF = 0x0) and a 5-slot overall segment length (SL = 0x5) can have only one to four slots, encoded respectively as DL = 0x1, 0x2, 0x3, and 0x4/0x0.

In the current SLIMbus module:

- The SL, TP, AF, and DL setup parameters are received from the appropriate control messages (inside or outside reconfiguration sequences), and programmed into appropriate control registers. They are typically static over long periods.
- The TAG slots are generated (driven) and decoded (received) on the fly by the hardware:
 - The first TAG slot (if present, for all but isochronous TP) negotiates the value of the presence bit (P).
 - The second TAG slot (for extended asynchronous TP) contains the NVB field, which indicates the number of valid bytes contained in the segment. When the presence bit (P) is not asserted, the NVB is then not driven and implicitly = 0. There is no separate NVB setup register, as for SL, TP, AF, etc.
- AUX slots (if present) go through the same data path as the DATA slots. The decoding/encoding of the AUX information is assumed to be done outside the SLIMbus controller. Their value has no effect on the protocol.
- DATA slots (if present) go through the same data path as the AUX slots. Their value has no effect on the protocol.
- The encoding/decoding, merging/splitting between the different FIFO-stored slots is assumed to be done outside the SLIMbus controller; that is, before writing to the FIFO (in transmit) and after reading from the FIFO (in receive). No support logic is provided for those functions.
- When no data is transmitted during a given segment (presence bit P/VP = 0), only the first TAG slot (if any) is actively driven and the AUX/DATA slots are not used.

Table 24-650 gives the three cases of size calculation formulas for the TAG, AUX, and DATA fields, plus the FIFO-stored section of a segment, in slots with:

- SL, DL, NVB, TP, AF, and DL, the standard SLIMbus fields, as their integer value
- Size(TP), the TAG field size in slots, as a function of the TP (see *MIPI Alliance Specification for SLIMbus Version 1.01.00*)
- Size(AF), the AUX field size in slots, as a function of the AUX format ID AF (see *MIPI Alliance Specification for SLIMbus Version 1.01.00*)

Table 24-650. Data Segment Field Size Calculations

| Case | TAG Size = Size (TP) | AUX Size = Size (AF) | DATA Field Size | FIFO-Stored Size |
|--|----------------------|----------------------|--------------------------|--------------------------|
| Extended asynchronous protocol (TP = 0x6 or 0x7) | 2 | 0, 1, 2 | 1 + size(AF) + (2 x NVB) | 1 + size(AF) + (2 x NVB) |
| Other TP, DL > 0 | 0, 1 | 0, 1, 2 | DL | DL + size(AF) |
| Other TP, DL = 0 | 0, 1 | 0, 1, 2 | SL – size(TP) – size(AF) | SL – size(TP) |

24.9.2.3.3 SLIMbus Transfer Protocols

The SLIMbus module supports seven the following protocols:

- Isochronous
- Pushed
- Pulled
- Asynchronous
 - Simplex
 - Half-duplex
- Extended asynchronous
 - Simplex
 - Half-duplex

Table 24-651. SLIMbus Transfer Protocols

| Transfer Protocol | Multicast Capability | Data Length | AUX Length | LPCM (DT) | CTS Forcing | Pairing |
|------------------------------------|----------------------|-------------|------------|-----------|-------------|---------|
| Isochronous | Yes | 1–8 slots | 0–2 | Yes | N/A | Yes |
| Pushed | Yes | 1–8 slots | 0–2 | Yes | N/A | Yes |
| Pulled | No | 1–8 slots | 0–2 | Yes | N/A | Yes |
| Asynchronous, simplex | No | 1–8 slots | 0–2 | Yes | Yes | No |
| Asynchronous, half-duplex | No | 1–8 slots | 0–2 | Yes | Yes | No |
| Extended asynchronous, simplex | No | Any (NVB) | 0 | N/A | Yes | N/A |
| Extended asynchronous, half-duplex | No | Any (NVB) | 0 | N/A | Yes | N/A |

24.9.2.3.3.1 Isochronous Transfer Protocol

The isochronous transfer protocol is a unidirectional, streaming, multicast communication mode. Data is to be present in all allocated segments (this transfer protocol has no TAG field).

- 100 percent of the bandwidth is usable for AUX + DATA slots (no control TAG overhead).
- Because no flow control exists, multiple data sinks may be connected to the same data source (multicast capability).
- The range of possible presence rates (number of segments per second) is limited to simple ratios of the SLIMbus clock. If several data streams with incompatible presence rates must be multiplexed over the same bus, no combination of isochronous-based schedulings works. In those cases, the pushed or pulled transfer protocol must be used.

24.9.2.3.3.2 Pushed Transfer Protocol

The pushed transfer protocol is unidirectional, multicast, and controlled by the data source (transmitter), which pushes data toward the data sink (receiver). The presence of valid data in a segment is indicated by the presence (P) bit in the TAG field, driven by the source. The TAG field is composed of four bits: one reserved, one strobe (STR) bit, one reserved, and one presence (P) bit.

- The pushed data source is the master of the data flow through the presence (P) bit.
- The pushed data sink is slaved to the presence (P) bit.
- The TAG control field creates a 1-slot overhead per segment. The rest of the segment is usable for AUX + DATA slots.
- Because the flow control is generated by the source with no feedback from the sink, multiple data sinks may be connected to that source (multicast capability).
- The presence rate can be modulated at will from 0 (no data at all) to the full segment rate (data present in all segments) according to the requirement. Intermediate settings allow several streams with incompatible presence rates to be multiplexed over the same bus, at the cost of less than 100 percent bandwidth utilization (for example, a 44.1-kHz sample flow transmitted over a reserved 48-kHz data channel).

24.9.2.3.3.3 Pulled Transfer Protocol

The pulled transfer protocol is unidirectional, unicast, and controlled by the data sink (receiver), which pulls data from the data transmitter (source). The presence of valid data in a segment is indicated by the presence bit (P) in the TAG field, driven by the source. The TAG field is composed of four bits: one reserved, one sample request (SRQ) bit, one reserved, and one presence (P) bit.

- The pulled data sink is the master of the data flow through the (SRQ bit, itself determining the value of the presence bit (P), driven by the data source.
- The pulled data source is slaved to the SRQ bit.
- The TAG control field creates a 1-slot overhead per segment. The rest of the segment is usable for AUX + DATA slots.
- Because the flow control is generated by the sink with feedback from the source, only a single data sink may be connected to that source (unicast-only, no multicast capability).
- The presence rate can be modulated at will from 0 (no data at all) to the full segment rate (data present in all segments) according to the requirement. Intermediate settings allow several streams with incompatible presence rates to be multiplexed over the same bus, at the cost of less than 100 percent bandwidth utilization (for example, a 44.1-kHz sample flow transmitted over a reserved 48-kHz data channel).

24.9.2.3.3.4 Asynchronous Transfer Protocols

The asynchronous transfer protocols are typically used for on-demand, packet-based data transfers (that is, nonstreaming). Because the SLIMbus protocol and architecture are optimized for data streaming scenarios, asynchronous protocols are considered a useful extension rather than a central feature of the SLIMbus. An asynchronous data channel gets the same periodic, reserved, fixed-bandwidth slot allocation as a streaming (for example, isochronous) data channel.

An asynchronous data channel is a point-to-point (unicast) communication link between a primary owner device and a secondary owner device.

A half-duplex asynchronous channel is a bidirectional data channel.

- A handshake protocol is used to determine the direction of the channel through its ownership. The channel owner is the data source, and the other is the sink.
- Once the ownership (data direction) is determined, both source and sink can regulate the flow of data, depending on data availability (source) and free buffer availability (sink).
- Half-duplex ports can be used when bandwidth is sparse (compare simplex and full duplex).
- However, each half-duplex port requires two data channel agents (with FIFO and control logic) inside the controller, one in each direction, contrary to all other asynchronous modes and transfer protocols. Those two associated agents must be configured coherently.

A simplex asynchronous channel is a unidirectional data channel, a simplified version of the half-duplex channel defined perviously. The ownership is never given to the secondary owner.

- Secondary owner never requests the channel. As a consequence, the roles are never exchanged: the primary owner is always data source, and the secondary owner always data sink.
- Simplex ports are used in pairs of opposite directions to implement full-duplex communication, where each direction has its own reserved bandwidth. As far as the controller is concerned, the two simplex links are treated as fully independent data channels, with independent configurations; only the higher layers (software) associate the two.
- Two simplex ports use the same number of data channel agents (that is, FIFOs and control logic) as a single half-duplex port (two per controller in each case; the only difference is in the bandwidth management).

24.9.2.3.3.5 Extended Asynchronous Transfer Protocols

The extended asynchronous transfer protocols are extensions of the plain asynchronous transfer protocol. The main features are retained: point-to-point (unicast) between a primary and a secondary owner, simplex (unidirectional) or half-duplex (bidirectional), and so on.

The difference lies in a more flexible management of the DATA slots: In the plain asynchronous TP, each segment contains no data (presence [P] bit = 0) or a fixed amount of data (P = 1), preconfigured for all segments. In the extended asynchronous mode, a number of valid bytes (NVB) 4-bit field is added before each segment, in a second TAG slot, to indicate a variable number of significant DATA slots (the granularity is 1 byte = 2 slots).

NOTE: AUX slots (when present; not in the current implementation) are not counted in NVB, just as they are not counted in DL in the plain asynchronous TP.

24.9.2.3.4 Half-Duplex Versus Full-Duplex Asynchronous Configurations

Half-duplex and full-duplex modes are similar in their operation, in that they use two data channel agents (FIFOs and associated control hardware) in opposite directions (one TX, one RX) to transmit and receive data over a bidirectional, unicast (point-to-point) asynchronous link. However, there are differences:

- The half-duplex setup uses a single data channel (in the SLIMbus sense); that is, a single reserved data space segment allocation, used alternately in both directions, according to the dynamic ownership negotiated in the TAG slots.
- The full-duplex setup uses two data channels (in the SLIMbus sense); that is, two separate reserved data space segment allocations, each used in a fixed direction (opposite of the other) (that is, with no ownership change).

24.9.3 SLIMbus Integration

Figure 24-213 and Figure 24-214 show the integration of the two SLIMbus module instantiations in the device. The SLIMBUS1 module is part of the ABE module

Figure 24-213. SLIMBUS1 Integration

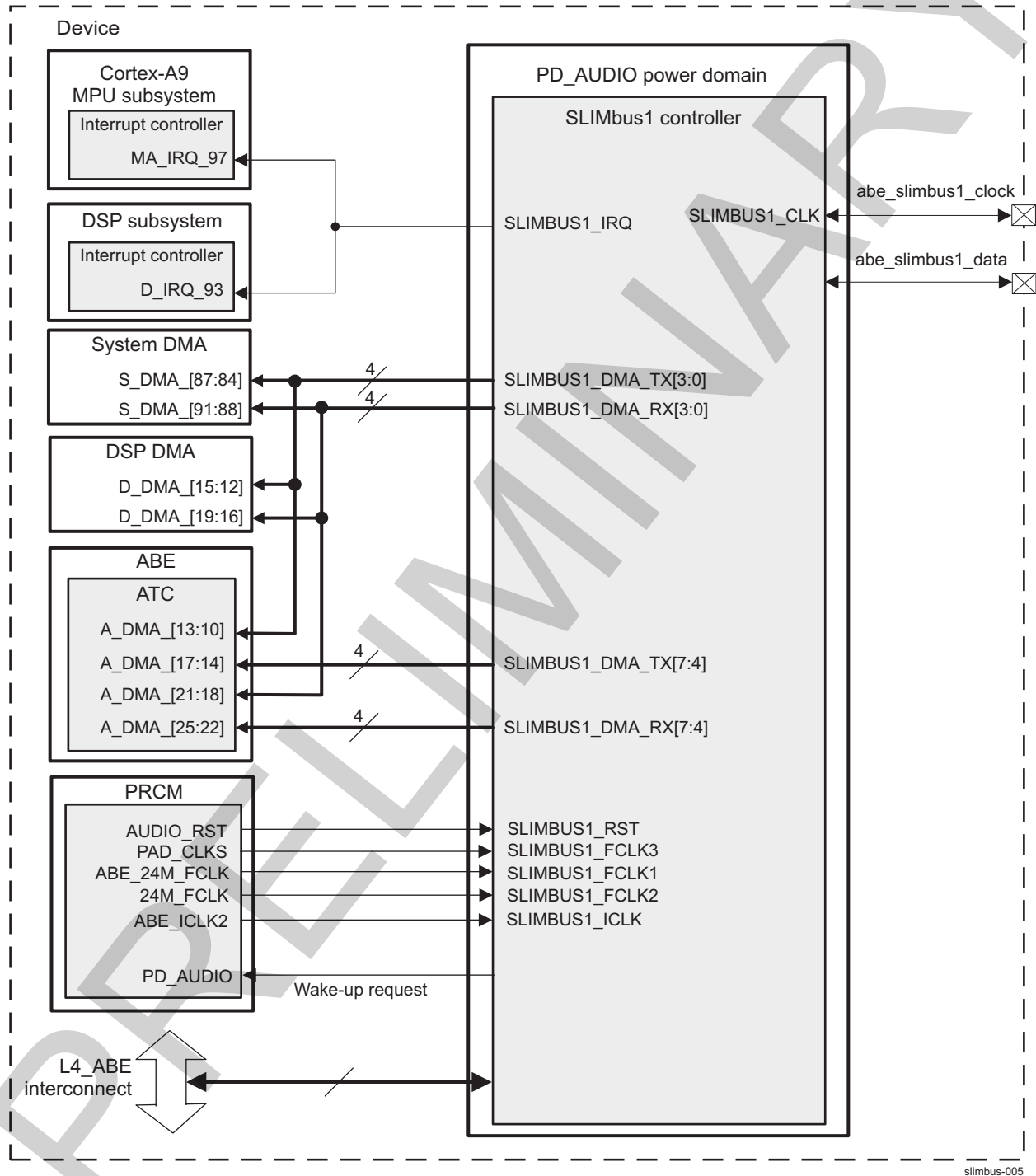


Figure 24-214. SLIMBUS2 Integration

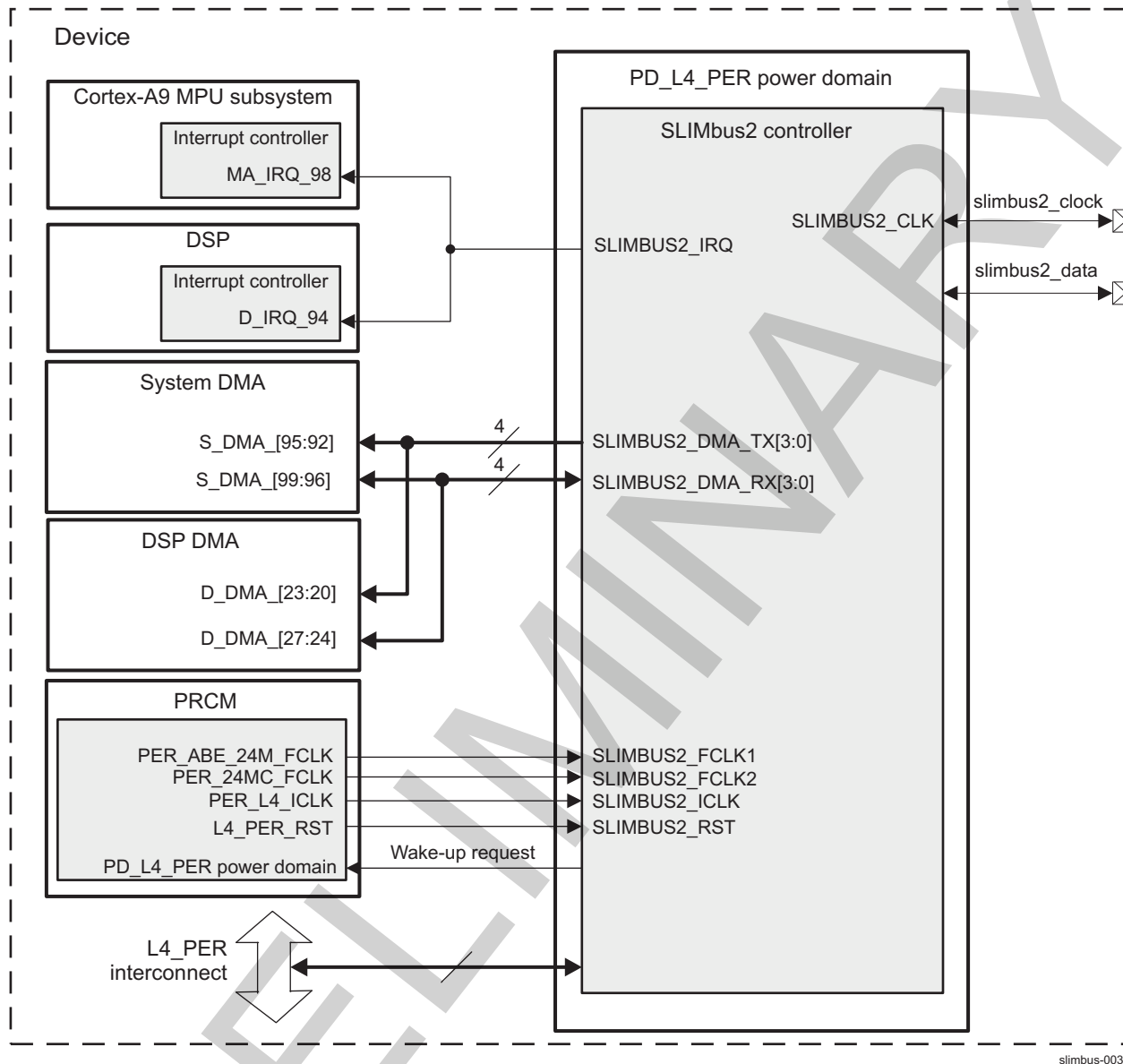


Table 24-652 through Table 24-654 summarize the integration of the modules in the device.

Table 24-652. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| SLIMBUS1 | PD_AUDIO | Yes | L4_ABE |
| SLIMBUS2 | PD_L4_PER | Yes | L4_PER |

Table 24-653. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|-------------------------------------|---|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| SLIMBUS1 | SLIMBUS1_FCLK3 | PAD_CLKS | PRCM | Functional clock, divided by 4 or more inside SLIMbus module. The source is the <code>abe_clks</code> pin gated by the PRCM module. |
| | SLIMBUS1_FCLK1 | ABE_24M_FCLK | PRCM | Functional clock, divided by 4 or more inside SLIMbus module |
| | SLIMBUS1_ICLK | ABE_ICLK2 | PRCM | Interface clock |
| | SLIMBUS1_FCLK2 | 24M_FCLK | PRCM | Functional clock, divided by 4 or more inside SLIMbus module |
| | SLIMBUS1_CLK | SLIMBUS_UCLKS | <code>abe_slimbus1_clock</code> pin | SLIMBUS clock, may or may not be locally generated |
| SLIMBUS2 | SLIMBUS2_ICLK | PER_L4_ICLK | PRCM | Interface clock |
| | SLIMBUS2_CLK | PAD_SLIMBUS_CLKS | <code>slimbus2_clock</code> pin | SLIMBUS clock, may or may not be locally generated |
| | SLIMBUS2_FCLK2 | PER_24MC_FCLK | PRCM | Functional clock, divided by 4 or more inside SLIMbus module |
| | SLIMBUS2_FCLK1 | PER_ABE_24M_FCLK | PRCM | Functional clock, divided by 4 or more inside SLIMbus module |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| SLIMBUS1 | SLIMBUS1_RST | AUDIO_RST | PRCM | Reset to SLIMbus1 module |
| SLIMBUS2 | SLIMBUS2_RST | L4_PER_RST | PRCM | Reset to SLIMbus2 module |

Table 24-654. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|------------------|---|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| SLIMBUS1 | SLIMBUS1_IRQ | MA_IRQ_97 | Cortex-A9 INTC | SLIMBUS1 interrupt to Cortex-A9 MPU |
| | SLIMBUS1_IRQ | D_IRQ_93 | DSP INTC | SLIMBUS1 interrupt to DSP |
| SLIMBUS2 | SLIMBUS2_IRQ | MA_IRQ_98 | Cortex-A9 INTC | SLIMBUS2 interrupt to Cortex-A9 MPU |
| | SLIMBUS2_IRQ | D_IRQ_94 | DSP INTC | SLIMBUS2 interrupt to DSP |
| DMA Requests | | | | |
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| SLIMBUS1 | SLIMBUS1_DMA_TX0 | A_DMA_10 | aDMA (Audio DMA) | SLIMbus module 1 – transmit request channel 0 |
| | SLIMBUS1_DMA_TX1 | A_DMA_11 | aDMA | SLIMbus module 1 – transmit request channel 1 |
| | SLIMBUS1_DMA_TX2 | A_DMA_12 | aDMA | SLIMbus module 1 – transmit request channel 2 |
| | SLIMBUS1_DMA_TX3 | A_DMA_13 | aDMA | SLIMbus module 1 – transmit request channel 3 |
| | SLIMBUS1_DMA_TX4 | A_DMA_14 | aDMA | SLIMbus module 1 – transmit request channel 4 |
| | SLIMBUS1_DMA_TX5 | A_DMA_15 | aDMA | SLIMbus module 1 – transmit request channel 5 |
| | SLIMBUS1_DMA_TX6 | A_DMA_16 | aDMA | SLIMbus module 1 – transmit request channel 6 |
| | SLIMBUS1_DMA_TX7 | A_DMA_17 | aDMA | SLIMbus module 1 – transmit request channel 7 |
| | SLIMBUS1_DMA_RX0 | A_DMA_18 | aDMA | SLIMbus module 1 – receive request channel 0 |

Table 24-654. Hardware Requests (continued)

| | | | | |
|----------|----------------------|----------|----------------------|---|
| | SLIMBUS1_DM A_RX1 | A_DMA_19 | aDMA | SLIMbus module 1 – receive request channel 1 |
| | SLIMBUS1_DM A_RX2 | A_DMA_20 | aDMA | SLIMbus module 1 – receive request channel 2 |
| | SLIMBUS1_DM A_RX3 | A_DMA_21 | aDMA | SLIMbus module 1 – receive request channel 3 |
| | SLIMBUS1_DM A_RX4 | A_DMA_22 | aDMA | SLIMbus module 1 – receive request channel 4 |
| | SLIMBUS1_DM A_RX5 | A_DMA_23 | aDMA | SLIMbus module 1 – receive request channel 5 |
| | SLIMBUS1_DM A_RX6 | A_DMA_24 | aDMA | SLIMbus module 1 – receive request channel 6 |
| | SLIMBUS1_DM A_RX7 | A_DMA_25 | aDMA | SLIMbus module 1 – receive request channel 7 |
| | SLIMBUS1_DM A_TX0 | S_DMA_84 | sDMA (System DMA) | SLIMbus module 1 – transmit request channel 0 |
| | SLIMBUS1_DM A_TX1 | S_DMA_85 | sDMA | SLIMbus module 1 – transmit request channel 1 |
| | SLIMBUS1_DM A_TX2 | S_DMA_86 | sDMA | SLIMbus module 1 – transmit request channel 2 |
| | SLIMBUS1_DM A_TX3 | S_DMA_87 | sDMA | SLIMbus module 1 – transmit request channel 3 |
| | SLIMBUS1_DM A_RX0 | S_DMA_88 | sDMA | SLIMbus module 1 – receive request channel 0 |
| | SLIMBUS1_DM A_RX1 | S_DMA_89 | sDMA | SLIMbus module 1 – receive request channel 1 |
| | SLIMBUS1_DM A_RX2 | S_DMA_90 | sDMA | SLIMbus module 1 – receive request channel 2 |
| | SLIMBUS1_DM A_RX3 | S_DMA_91 | sDMA | SLIMbus module 1 – receive request channel 3 |
| | SLIMBUS1_DM A_TX0 | D_DMA_12 | dDMA (DSP DMA) | SLIMbus module 1 – transmit request channel 0 |
| | SLIMBUS1_DM A_TX1 | D_DMA_13 | dDMA | SLIMbus module 1 – transmit request channel 1 |
| | SLIMBUS1_DM A_TX2 | D_DMA_14 | dDMA | SLIMbus module 1 – transmit request channel 2 |
| | SLIMBUS1_DM A_TX3 | D_DMA_15 | dDMA | SLIMbus module 1 – transmit request channel 3 |
| | SLIMBUS1_DM A_RX0 | D_DMA_16 | dDMA | SLIMbus module 1 – receive request channel 0 |
| | SLIMBUS1_DM A_RX1 | D_DMA_17 | dDMA | SLIMbus module 1 – receive request channel 1 |
| | SLIMBUS1_DM A_RX2 | D_DMA_18 | dDMA | SLIMbus module 1 – receive request channel 2 |
| | SLIMBUS1_DM A_RX3 | D_DMA_19 | dDMA | SLIMbus module 1 – receive request channel 3 |
| SLIMBUS2 | SLIMBUS2_DM A_TX0 | D_DMA_20 | dDMA | SLIMbus module 2 – transmit request channel 0 |
| | SLIMBUS2_DM A_TX1 | D_DMA_21 | dDMA | SLIMbus module 2 – transmit request channel 1 |
| | SLIMBUS2_DM A_TX2 | D_DMA_22 | dDMA | SLIMbus module 2 – transmit request channel 2 |
| | SLIMBUS2_DM A_TX3 | D_DMA_23 | dDMA | SLIMbus module 2 – transmit request channel 3 |
| | SLIMBUS2_DM A_RX0 | D_DMA_24 | dDMA | SLIMbus module 2 – receive request channel 0 |

Table 24-654. Hardware Requests (continued)

| | | | |
|----------------------|----------|------|---|
| SLIMBUS2_DM A_RX1 | D_DMA_25 | dDMA | SLIMbus module 2 – receive request channel 1 |
| SLIMBUS2_DM A_RX2 | D_DMA_26 | dDMA | SLIMbus module 2 – receive request channel 2 |
| SLIMBUS2_DM A_RX3 | D_DMA_27 | dDMA | SLIMbus module 2 – receive request channel 3 |
| SLIMBUS2_DM A_TX0 | S_DMA_92 | sDMA | SLIMbus module 2 – transmit request channel 0 |
| SLIMBUS2_DM A_TX1 | S_DMA_93 | sDMA | SLIMbus module 2 – transmit request channel 1 |
| SLIMBUS2_DM A_TX2 | S_DMA_94 | sDMA | SLIMbus module 2 – transmit request channel 2 |
| SLIMBUS2_DM A_TX3 | S_DMA_95 | sDMA | SLIMbus module 2 – transmit request channel 3 |
| SLIMBUS2_DM A_RX0 | S_DMA_96 | sDMA | SLIMbus module 2 – receive request channel 0 |
| SLIMBUS2_DM A_RX1 | S_DMA_97 | sDMA | SLIMbus module 2 – receive request channel 1 |
| SLIMBUS2_DM A_RX2 | S_DMA_98 | sDMA | SLIMbus module 2 – receive request channel 2 |
| SLIMBUS2_DM A_RX3 | S_DMA_99 | sDMA | SLIMbus module 2 – receive request channel 3 |

NOTE:

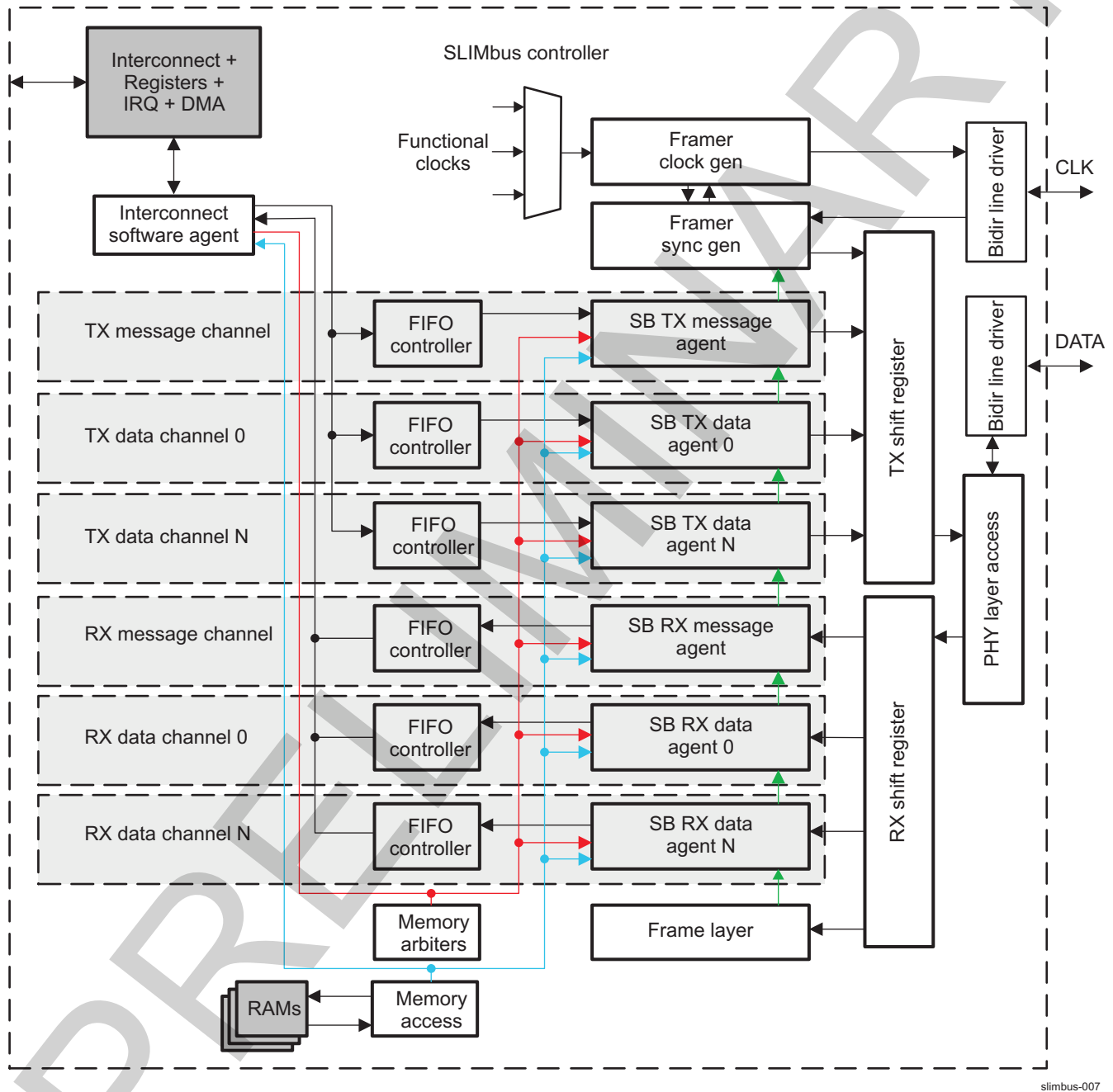
- For the description of the interrupt, see [Section 24.9.4.11](#), *Interrupt Service Routines*, and [Chapter 18](#), *Interrupt Controllers*.
- For the description of the DMA, see [Section 24.9.4.5.2](#), *Data Input/Output: DMA Request Mode*, and [Chapter 17](#), *SDMA*.

24.9.4 SLIMbus Functional Description

24.9.4.1 SLIMbus Block Description

Figure 24-215 shows the the overall architecture of a SLIMbus module.

Figure 24-215. SLIMbus Block Diagram



slimbus-007

- The red arrows represent the shared memory arbitration interface, from the arbiter to each agent.
- The blue arrows represent the shared memory access interface, from the memory access module to each agent.
- The green arrows represent the frame layer sync information broadcasted to all SB-side agents.

24.9.4.2 SLIMbus Clock Configuration

Most of the SLIMbus module runs off two main clocks: the L4 interface clock for the data input and output registers, and the control and status control registers; and the SLIMbus clock, taken from the serial interface (CLK line) for the SLIMbus-side logic.

The SLIMbus controller operates as clock source component (active framer), which drives the SLIMbus clock line CLK, or as clock receiver component, which gets its clock from the same CLK line.

- As a clock receiver, the module has by definition no control over the clock activity and can perform required operations based on that. Even clock pause is mostly transparent as far as the receiver logic is concerned (that is, everything happens as if time had stopped at the clock pause, and activity resumes seamlessly upon clock restart).
- As a clock source (also called active framer), the module relies on a local functional clock to drive the SLIMbus clock line. Such a functional clock is selected out of the available clock inputs. The appropriate input is expected to be active whenever it is needed (that is, when selected and used to run the SLIMbus clock and/or the module internal logic). In this case, the SLIMbus clock output is generated by selecting and dividing one functional clock input provided to the controller. Internal logic selects and divides the appropriate one depending on the SLIMbus configuration.

24.9.4.3 Software Reset

The [SLIMBUS_CMP_SYSCONFIG\[1\] SOFTRESET](#) bit controls the software reset; writing 1 to this bit starts a soft reset sequence.

24.9.4.4 System Power Management and Wakeup

24.9.4.4.1 Wake-Up Request

Both SLIMbus controllers are wake-up capable.

There are several levels of wake-up capability:

- Most IRQ events are potential wake-up sources, because they can occur while the external interface is idle, assuming the external and SLIMbus clocks are still running.
- The clock restart IRQ event (the [SLIMBUS_FR_INFO\[5\] CLOCK_RESTART](#) bit) following a clock pause is the only one that can take place when all module clocks are stopped.

24.9.4.4.2 Power Management

[Table 24-655](#) describes power-management features available for the SLIMbus module.

NOTE: For the description of the IdleMode feature, see [Chapter 3, Power, Reset, and Clock Management](#).

Table 24-655. Local Power-Management Features

| Feature | Registers | Description |
|------------------------|--|--|
| Clock auto gating | SLIMBUS_CMP_SYSCONFIG[8] AUTOGATINGDISABLE | Internal clock autogating is intended to conserve power when the module is not in use. |
| Slave idle modes | SLIMBUS_CMP_SYSCONFIG[3:2] IDLEMODE | Force-idle, no-idle, smart-idle, and smart-idle wake-up-capable modes are available. |
| Wake-up sources enable | SLIMBUS_FR_INFO[5] CLOCK_RESTART and most IRQ events | See Section 24.9.4.4.1 |

24.9.4.4.3 SLIMbus Boot and Reset Procedures

The SLIMbus standard defines different levels of resets and default states from which to boot. They are implemented by a mix of software and hardware.

NOTE: This does not include the module-wide software or hardware resets of the controller, which simply wipe off the entire logic with no consideration for any potentially ongoing SLIMbus operation.

Table 24-656 summarizes the control bit fields to set in the various reset and/or boot sequences. Any combination other than the ones described here may yield unpredictable results.

Table 24-656. Reset and Boot Control Summary

| Register / Field | SLIMBUS_FR_CONTROL | | SLIMBUS_FL_CONTROL | | |
|---|--------------------|-----------|--------------------|--------------|----------------------------------|
| | Boot | bus_reset | Boot | bus_shutdown | force_reconfigure ⁽¹⁾ |
| Clock receiver boot ⁽²⁾ | | | 1 | | 1 |
| Clock source boot | 1 | | | | 1 |
| Clock receiver component reset ^{(2) (3)} | | | 1 | | 1 |
| Clock source component reset | | 1 | | | 1 |
| Bus reset ^{(4) (5)} | | 1 | | | |
| Bus shutdown ⁽⁴⁾ | | | | 1 | |

⁽¹⁾ When used, the SLIMBUS_FL_CONTROL[2] FORCE_RECONFIGURE bit must be set (written to 1) last, because its action can be immediate. Other control bits can be set in any order.

⁽²⁾ The controls for boot and component reset look identical for the clock receiver. The difference is in the initial state of the component: in the first case, the component is in the undefined state (not started), in the second case it is operational.

⁽³⁾ The clock receiver component reset case shown here corresponds to the reception by the component interface of the RESET_DEVICE. In the two other cases, a bus reset is detected and the hardware automatically goes to the correct state.

⁽⁴⁾ The bus reset and shutdown belong to a reconfiguration (message) sequence and take place on the reconfiguration boundary: the SLIMBUS_FL_CONTROL[2] FORCE_RECONFIGURE is therefore not used.

⁽⁵⁾ The bus reset is executed only by the clock source (active framer).

24.9.4.4.3.1 Clock Receiver Component Boot

A clock receiver boot sequence is initiated when a component that is not the default active framer decides to join the SLIMbus. Provided the clock line is driven (that is, a framer is active), the clock receiver must eventually acquire the synchronization.

Clock receiver boot sequence:

- Initial state: Out of hardware module reset or following a SLIMbus shutdown
- Write 1 to the SLIMBUS_FL_CONTROL[0] BOOT bit to start the clock receiver.
- Write 1 to the SLIMBUS_FL_CONTROL[2] FORCE_RECONFIGURE bit.

24.9.4.4.3.2 Clock Source Component Boot

Source component is, by definition, the component including the active framer (that is, the clock driver). A clock source boot sequence is initiated when a component that is the default active framer joins the SLIMbus. The clock source drives the clock line and runs the SLIMbus boot sequence, allowing the connected clock receivers to synchronize to it.

NOTE: The component knows in advance that it is the only default active framer, in charge of booting the bus: That information must be available for the component, as well as the default SM, CG, and RF configuration parameters.

Clock source boot sequence:

- Initial state: The component is the designated default active framer and is out of hardware module reset or follows a SLIMbus shutdown.
- Write 1 to the SLIMBUS_FR_CONTROL[0] BOOT bit.
- Write the basic bus configuration, to be used by the active framer device to generate the clock and the framing channel contents:
 - Subframe mode (M) in the SLIMBUS_FL_SM[4:0] SM bit field: Sets the control space width and

- subframe length
- Clock gear (G) in the [SLIMBUS_FL.CG](#)[3:0] CG bit field: The root/SLIMbus frequency ratio is defined as $2^{(10-CG)}$
- Root frequency (F) in the [SLIMBUS_FL.RF](#)[3:0] RF bit field: Sets the root frequency
- Clock source selection, in the [SLIMBUS_FR.CLOCK_SOURCE](#)[5:3] CLKSEL and [SLIMBUS_FR.CLOCK_SOURCE](#)[2:0] CLKDIV bit fields
- The relationships (and limitations) between CG, RF, and the clock source selection also apply here.
- Write 1 to the [SLIMBUS_FL.CONTROL](#)[2] FORCE_RECONFIGURE bit to trigger the sequence execution
- The clock source starts immediately and eventually drives the CLK line and allows other components (clock receivers) to join the bus.

24.9.4.4.3.3 Bus Reset

A bus reset is a specific DATA and CLK sequence run by the active framer, scheduled after the bus has already booted, and which causes all components of the bus to reset. For more information about the bus reset detection mechanism, see [Section 24.9.4.4.3.4, Component Reset](#).

The bus reset is requested by the manager device through a reconfiguration sequence, and is run by the active framer starting at the following reconfiguration boundary.

Bus reset sequence, to be executed by all components:

- Write 1 to the [SLIMBUS_FR.CONTROL](#)[1] BUS_RESET bit.
- Wait for the end of the reconfiguration sequence to execute:
 - On the clock source (active framer), this must trigger a bus reset sequence.
 - On any other device (that is, a clock receiver), this must have no direct effect (other than clearing the [SLIMBUS_FR.CONTROL](#)[1] BUS_RESET bit).
 - Because all bus devices are being reset (bus is rebooted, almost from the beginning), the configuration (M, G, F parameters) can change (because those parameters must be reacquired by all attached devices as part of the resynchronization sequence, this is not a problem).

24.9.4.4.3.4 Component Reset

A component reset implies the (device) reset of all devices within that component. When a component reset condition is detected, software must therefore run the device reset sequence defined in [Section 24.9.4.4.3.5, Device Reset](#), as many times as necessary. Additional operations are also required.

A component reset has two possible causes:

- Bus reset sequence detected
- Interface device of the local component receives a reset order. (This is not a reconfiguration message; that is, the reset is effective immediately upon reception. Nevertheless, a specific action is needed to perform the device reset:)
 - Use the [SLIMBUS_FL.CONTROL](#)[1] COMPONENT_RESET bit.
 - If the component is a clock receiver (clock receiver FSM), the sequence is :
 - Write 1 to the [SLIMBUS_FL.CONTROL](#)[0] BOOT bit.
 - Write 1 to the [SLIMBUS_FL.CONTROL](#)[2] FORCE_RECONFIGURE bit to trigger the reset execution.
 - If the component is the active framer (clock source FSM), the sequence is :
 - Write 1 to the [SLIMBUS_FR.CONTROL](#)[1] BUS_RESET bit.
 - Write 1 to the [SLIMBUS_FL.CONTROL](#)[2] FORCE_RECONFIGURE bit to trigger the reset execution.
 - The effect of a clock source component reset is the same as a bus reset, except it takes place immediately instead of waiting for a reconfiguration boundary.

24.9.4.4.3.5 Device Reset

A device reset can have several causes:

- Component reset of the receiver component containing that device, caused by a bus reset reconfiguration message. If the cause of the device reset is a component reset, the sequence defined in [Section 24.9.4.4.3.4, Component Reset](#), is applied.
- A reset order targeted at the device itself. (This is not a reconfiguration message; that is, it is effective immediately upon reception. In this case, no additional action is required.)

The following sequence must be executed for all devices:

- Release the logical address (LA) of the device by clearing (writing 0 to) the [SLIMBUS_DEV_LA_i\[8\]](#) LA_ENABLE bit. It is assumed that the [SLIMBUS_DEV_LA_i\[9\]](#) EA_ENABLE bit remains set (1). The device returns to the default, nonenumerated state where it is identified by its hard-coded enumeration address (EA). The [SLIMBUS_DEV_LA_i\[7:0\]](#) LA bit may be assigned to another device by the bus manager (that is, keeping track of all device resets).
- The following hardware bits must also be cleared (by writing 1) when the device to which they belong (identified by the message target LA) is being reset:
 - The [SLIMBUS_FR_INFO\[2\]](#) FS, [SLIMBUS_FR_INFO\[1\]](#) FI, and [SLIMBUS_FR_INFO\[0\]](#) GC_TX_COL bits (framer device-specific IEs)
 - The [SLIMBUS_FL_INFO\[2\]](#) LOST_FS, [SLIMBUS_FL_INFO\[1\]](#) LOST_SFS, and [SLIMBUS_FL_INFO\[0\]](#) LOST_MS bits (interface device-specific IEs)
 - The [SLIMBUS_SMR_INFO\[0\]](#) MC_TX_COL, [SLIMBUS_SMT_INFO\[0\]](#) MC_TX_COL bit (primitives of interface device-specific IE)
 - The [SLIMBUS_DCT_INFO_i\[0\]](#)/[SLIMBUS_DCR_INFO_i\[0\]](#) DATA_TX_COL bit (generic device IEs)
- Reset all pending reconfiguration parameters by writing 1 to the [SLIMBUS_FL_CONTROL\[7\]](#) CLEAR_RECONFIGURATION bit (see [Section 24.9.4.4.4](#)).
- Reset all device ports (if any), as explained in [Section 24.9.4.4.3.6, Port Reset](#).

24.9.4.4.3.6 Port Reset

A port reset can have several causes:

- Device reset of the device to which the port belongs, which may be part of a wider component of the bus reset
- Synchronization loss. Although all ports are reset, this is not equivalent to a device reset, because logical addresses are not cleared.
- Specific software messages reception

24.9.4.4.3.7 Bus Shutdown

A bus shutdown stops definitively all SLIMbus activity (CLK and DATA) and brings the bus back to its original (preboot) state. When the shutdown is executed, the system must reboot from scratch.

The bus shutdown is requested by the manager device through a reconfiguration sequence.

Bus shutdown sequence:

- Write 1 to the [SLIMBUS_FL_CONTROL\[6\]](#) BUS_SHUTDOWN bit. This is valid for an active framer (clock source) or a clock receiver.
- Wait for the end of the reconfiguration sequence to execute.
- Beyond that point, the bus is down and can be restarted only by a boot sequence.

24.9.4.4.4 SLIMbus Reconfigure Parameters

During a reconfiguration message sequence, the controller accumulates parameter changes to be applied at the following reconfiguration boundary. If the sequence does not complete correctly, all changes are discarded. In specific boot and reset cases, the parameters are also set or reset automatically.

This section provides an overview of all the configuration register fields and their use.

Writing 1 to the [SLIMBUS_FL_CONTROL\[7\]](#) CLEAR_RECONFIGURATION bit has an immediate effect on the configuration registers.

- The following registers fields revert to their current value; that is, the value currently used for SLIMbus operations. The value previously written in is discarded.
 - The [SLIMBUS_FL_SM\[4:0\]](#) SM bit field: Sets the control space width and subframe length.
 - The [SLIMBUS_FL_CG\[3:0\]](#) CG bit field: The root/SLIMbus frequency ratio is defined as $2^{(10-G)}$.
 - The [SLIMBUS_FL_RF\[3:0\]](#) RF bit field: Sets the root frequency
 - The [SLIMBUS_FR_CLOCK_SOURCE\[5:3\]](#) CLKSEL: Clock input source selection
 - [SLIMBUS_FR_CLOCK_SOURCE\[2:0\]](#) CLKDIV bit field: Root divider ratio, applied on clock input to obtain root clock, to be used at next reconfiguration boundary. Input/ root frequency ratio is defined as $2^{(CLKDIV-1)}$.
 - The [SLIMBUS_DCT_CONFIG1_j\[31\]/SLIMBUS_DCR_CONFIG1_j\[31\]](#) ENABLE bit (this field is also cleared when the superframe or frame sync is lost): Data channel agent enabling control
 - The [SLIMBUS_DCT_CONFIG1_j\[15\]/SLIMBUS_DCR_CONFIG1_j\[15\]](#) CL bit: Channel link configuration mode selection
 - The [SLIMBUS_DCT_CONFIG1_j\[26:20\]/SLIMBUS_DCR_CONFIG1_j\[26:20\]](#) PR bit field: Presence rate configuration
 - The [SLIMBUS_DCT_CONFIG1_j\[3:0\]/SLIMBUS_DCR_CONFIG1_j\[3:0\]](#) TP bit field: Transfer protocol selection
 - The [SLIMBUS_DCT_CONFIG2_j\[11:0\]/SLIMBUS_DCR_CONFIG2_j\[11:0\]](#) SD bit field: Segment distribution
- The following register bits are cleared to 0. They correspond to features enabled for the upcoming reconfiguration boundary, and that are discarded here.
 - The [SLIMBUS_FR_CONTROL\[1\]](#) BUS_RESET bit: Bus reset request control
 - The [SLIMBUS_FR_CONTROL\[0\]](#) BOOT bit: Initiate an active framer (clock source) boot sequence for the component when the component is default active framer.
 - The [SLIMBUS_FL_CONTROL\[6\]](#) BUS_SHUTDOWN
 - [SLIMBUS_FL_CONTROL\[0\]](#) BOOT bit: Boot the component when not in active framer mode.
 - The [SLIMBUS_FL_CONTROL\[4\]](#) KILL_SFS bit is set when the reconfiguration sequence terminates incorrectly (in that case the bit must be set after the clear-up). Forces immediate frame synchronization loss.
 - The [SLIMBUS_FL_CONTROL\[7\]](#) CLEAR_RECONFIGURATION bit itself; that is, the bit never reads out 1.
 - The [SLIMBUS_FR_FRAMER_HANDBOVER\[12\]](#) HANDBOVER_ENABLE bit: Enable framer handover, upon NEXT_ACTIVE_FRAMER(NCO,NCI) reception.
 - The [SLIMBUS_FR_CLOCK_PAUSE\[0\]](#) CLOCK_PAUSE bit: Controls clock pause/restart
- The following bit fields do not change, although they are updated as part of the reconfiguration message sequence:
 - The [SLIMBUS_FR_FRAMER_HANDBOVER\[11:0\]](#) NCO_NCI bit field: The value is don't care as long as [SLIMBUS_FR_FRAMER_HANDBOVER\[12\]](#) HANDBOVER_ENABLE = 0, and is overwritten if a new handover is scheduled.
 - The [SLIMBUS_FR_CLOCK_PAUSE\[2:1\]](#) TRT bit field: The value is don't care as long as [SLIMBUS_FR_CLOCK_PAUSE\[0\]](#) CLOCK_PAUSE = 0, and is overwritten if a new pause is scheduled.

24.9.4.5 Data Channels (Ports) Management

Ports (contained in devices) are associated with data channels that connect several ports, typically one output port on a data source device and one or more inputs ports on a data sink device, over periodically scheduled data segments and using a given transfer protocol (TP).

24.9.4.5.1 Data input/output: manual mode

A data channel agent FIFO stores a whole number of FIFO words. A FIFO word is a chunk of data that contains the AUX and DATA information of one SLIMbus data segment, with the following properties:

- The FIFO word size minimum is 4 bits (one slot) in the current implementation, as defined in the MIPI SLIMbus standard 1.01.00; they are of little practical use.
- The FIFO word size maximum is 32 bits (eight slots) in the current implementation, equal to one physical FIFO RAM word and to one read/write access. Larger segment sizes (up to 31 slots = 124 bits) segments are defined in the MIPI SLIMbus standard version 1.01.00, but they are not implemented here.
- Between the minimum and maximum values, the FIFO word size is programmable, with a slot (that is, 4 bits) granularity.
- The AUX information is a field of 0, 1, or 2 slots (that is, 0, 4, or 8 bits) transmitted immediately before the DATA slots. All sizes are supported by current implementation. It is stored and managed along with the DATA by the module FIFOs.
- The DATA information is a field of 0 to 31 slots in the MIPI SLIMbus standard version 1.01.00, with slot granularity. This is implemented within the limits of the FIFO word size given previously, with AUX size + DATA size = FIFO word size; therefore, the DATA information is a field of 0 to 8 slots.
- The extended asynchronous transfer protocols (TP; that is, simplex and half-duplex) are exceptions to the previously discussed rules. In that case, the source device fills each segment with as many bytes as it deems necessary (provided it fits in the segment), and lets the sink device know how many through the TAG NVB field:
 - The source transmits as many whole FIFO words as it deems necessary. This implies that the FIFO word is a byte multiple (that is, an even number of 4-bit slots).
 - The sink receives a whole number of bytes, which it stores in byte-size FIFO words.
 - AUX is not applicable and is not supported in these modes.

Each read (or write) access to the appropriate [SLIMBUS_DCR_DATA_j](#) (respectively, [SLIMBUS_DCT_DATA_j](#)) removes (respectively, adds) one FIFO word from RX (TX) FIFO #N. [Table 24-657](#) lists examples of possible FIFO word mappings (with the AUX and DATA slots indicated as A() and D()) inside 32-bit read and write accesses.

NOTE: The transmission over the SLIMbus serial interface is always A(0) to A(N1), and then D(0) to D(N2); that is, MSB to LSB.

Table 24-657. Examples of AUX + DATA Mapping in 32-bit Read/Write Accesses

| FIFO Format | Word | FIFO Word Size (in Slots) | 32-bit Access Read/Write Data (Bit Range) | | | | | | | |
|----------------|------|---------------------------|---|--------|--------|--------|--------|-------|------|------|
| | | | 31..28 | 27..24 | 23..20 | 19..16 | 15..12 | 11..8 | 7..4 | 3..0 |
| 4-bit + 0 aux | | 1 (min) | | | | | | | | D(0) |
| 8-bit + 0 aux | | 2 | | | | | | | D(0) | D(1) |
| 12-bit + 0 aux | | 3 | | | | | | D(0) | D(1) | D(2) |
| 16-bit + 0 aux | | 4 | | | | | D(0) | D(1) | D(2) | D(3) |
| 24-bit + 0 aux | | 6 | | | D(0) | D(1) | D(2) | D(3) | D(4) | D(5) |
| 32-bit + 0 aux | | 8 (max) | D(0) | D(1) | D(2) | D(3) | D(4) | D(5) | D(6) | D(7) |
| 4-bit + 4 aux | | 2 | | | | | | | A(0) | D(0) |
| 24-bit + 4 aux | | 7 | | A(0) | D(0) | D(1) | D(2) | D(3) | D(4) | D(5) |
| 28-bit + 4 aux | | 8 (max) | A(0) | D(0) | D(1) | D(2) | D(3) | D(4) | D(5) | D(6) |
| 4-bit + 8 aux | | 3 | | | | | | A(0) | A(1) | D(0) |
| 24-bit + 8 aux | | 8 (max) | A(0) | A(1) | D(0) | D(1) | D(2) | D(3) | D(4) | D(5) |

24.9.4.5.2 Data Input/Output: DMA Request Mode

The DMA mode reuses all the features of the manual mode defined in [Section 24.9.4.5.1](#), but adds a DMA request generation mechanism to offload the data manipulation task to an external (off-module) DMA controller. As far as the FIFOs themselves are concerned, the accesses are unchanged. For more information about the DMA controller configuration see [Chapter 17](#), *SDMA*.

DMA data channels can be enabled by the [SLIMBUS_CMP_DMAENABLE_SET](#) register and disabled by the [SLIMBUS_CMP_DMAENABLE_CLR](#) register.

24.9.4.5.3 Data Channel Agent FIFO Control and Status

Each data channel agent is associated with a FIFO, fixed in either TX or RX direction. All TX FIFOs are mapped to a shared buffer space, all RX FIFOs to another shared buffer space. FIFO sizes are software-programmable.

A FIFO must be configured before the data channel is enabled, depending on system-related parameters. For instance, more or less FIFO depth may be required. More FIFO is desirable to prevent underflow/overflow errors in a jittery transmission, but may also carry an unacceptable latency penalty in a voice stream. In any case, FIFO depth is beyond the SLIMbus protocol.

24.9.4.6 FIFO Management

The SLIMbus controller includes two FIFOs, used to buffer transmit/receive data/messages. The SLIMBUS1 FIFO is 32 bytes for TX and 32 bytes for RX. The SLIMBUS2 FIFO is 64 bytes for TX and 64 bytes for RX. FIFO size information is given by the [SLIMBUS_CMP_HWINFO](#)[19:12] RRSZ and [11:4] TRSZ bit fields.

FIFOs are connected to SLIMbus-side agents, which transmit and receive data on the serial SLIMbus DATA line. All ports are synchronous to the SLIMbus clock. The numbers of data channel agents are given by [SLIMBUS_CMP_HWINFO](#)[27:24] TDC and [23:20] RDC bit fields.

A segment (see [Section 24.9.2.3.2](#)) passes through the internal RX and TX FIFOs, where it is stored in FIFO words. The size of the FIFO word, expressed in 4-bit slots, is configurable by software. The FIFO word size is hardware-calculated with the following parameters:

- The [SLIMBUS_DCR_CONFIG1_j](#)[9:5]/[SLIMBUS_DCT_CONFIG1_j](#)[9:5] SL bit field: Channel segment length, in slots
- The [SLIMBUS_DCR_CONFIG1_j](#)[14:10]/[SLIMBUS_DCT_CONFIG1_j](#)[14:10] DL bit field: Channel data length, integer
- The [SLIMBUS_DCR_CONFIG1_j](#)[3:0]/[SLIMBUS_DCT_CONFIG1_j](#)[3:0] TP (tag_length) bit field: Length of segment TAG field, function of the channel transfer protocol, in slots.
- The [SLIMBUS_DCR_CONFIG1_j](#)[19:16]/[SLIMBUS_DCT_CONFIG1_j](#)[19:16] AF (aux_length) bit field: Length of segment AUX field, function of the channel auxiliary format, in slots.

The FIFO word size is computed as follows by the module hardware:

- if DL is equal to 0, FIFO word size = SL tag_length(TP)
- if DL is not equal to 0, FIFO word size = aux_length(AF) + DL

24.9.4.6.1 FIFO Mapping

Each FIFO must be mapped in a free zone of the shared buffer before enabling, as follows:

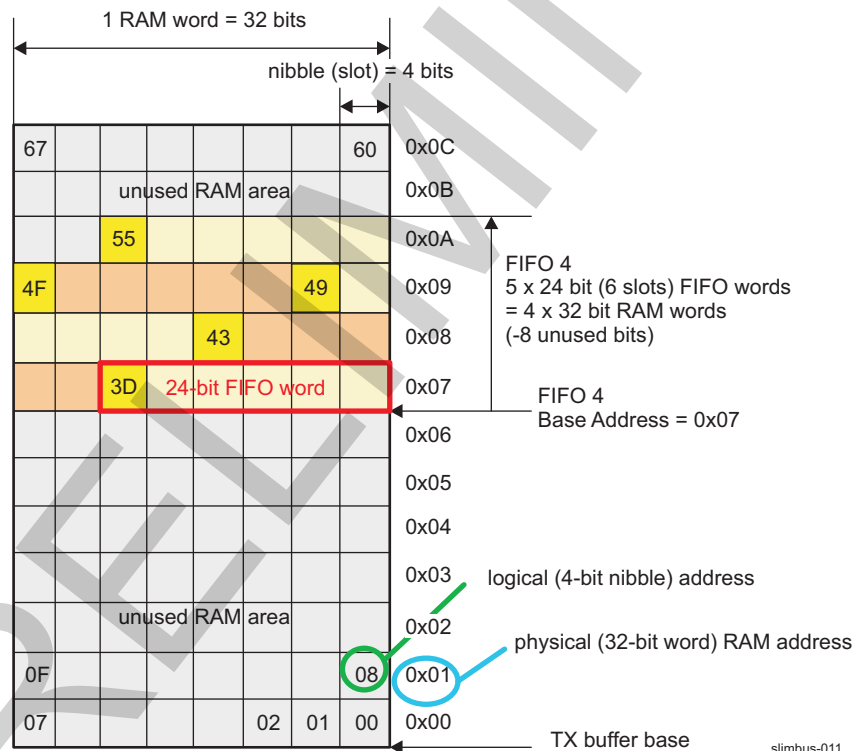
- The [SLIMBUS_DCR_FIFO_SETUP2_j](#)[7:0] SIZE and/or [SLIMBUS_DCT_FIFO_SETUP2_j](#)[7:0] SIZE + 1: Capacity of FIFO in FIFO words. (The minimum setting recommended by the SLIMbus protocol is 4-word deep.)
- The [SLIMBUS_SMT_FIFO_SETUP](#)[6:5] SIZE_HI/[SLIMBUS_SMR_FIFO_SETUP](#)[6:5] SIZE_HI and [SLIMBUS_SMT_FIFO_SETUP](#)[4:1] SIZE_LO/[SLIMBUS_SMR_FIFO_SETUP](#)[4:1] SIZE_LO bit fields: Capacity of shared TX/RX FIFOs, in bytes, minus 1.
- The [SLIMBUS_DCR_FIFO_SETUP1_j](#)[11:5] BASE_ADDR and/or [SLIMBUS_DCT_FIFO_SETUP1_j](#)[11:5] BASE_ADDR bit fields: RX and/or TX data channel agent FIFO base address within shared RX/TX RAM

- FIFO base nibble address = FIFO base physical add * 8
- FIFO top nibble address = FIFO base nibble add + (FIFO size * FIFO word size) – 1
- FIFO top physical address = FIFO top nibble add / 8
- The next base physical address available to map another FIFO is the current FIFO top physical address + 1.
- The shared RX and TX buffers are independent; that is, the RX and TX FIFOs are mapped to separate address spaces.

Figure 24-216 is an example mapping, with the following numerical configuration:

- Isochronous (SLIMBUS_DCT_CONFIG1_4[3:0] TP = 0x0) TX FIFO using TX data channel agent 4
- FIFO word size: 6 slots = 24 bits, 20 DATA + 4 AUX (AF = 0xB, DL = 0x5)
- FIFO size: SLIMBUS_DCT_FIFO_SETUP2_4[7:0] SIZE = 4 (4 + 1 = 5 FIFO words stored in FIFO)
- FIFO base physical address: SLIMBUS_DCT_FIFO_SETUP1_4[11:5] BASE_ADDR = 0x7 (= 7)
- FIFO base nibble address = 0x7 * 8 = 0x38 (56)
- FIFO top nibble address = 0x38 + (0x5 * 0x6) - 1 = 0x55 (= 85)
- FIFO top physical address = 0x55 / 0x8 = 0xA (= 10, this is a integer division)
- Next base physical address available to map another FIFO: 0xA + 1 = 0xB (= 11)

Figure 24-216. Example of FIFO Mapping in Shared Buffer



24.9.4.6.2 FIFO Status

The following receive-side status is available from the register fields:

- The [SLIMBUS_DCR_FIFO_STATUS_j\[11:2\]](#) RD_LEVEL bit field: Number of FIFO words stored in RX FIFO #n. (This field is 1 bit longer than the size and threshold fields, because it ranges from 0 to the FIFO size, whereas the other fields range only from 0 to the FIFO size minus 1.
- The [SLIMBUS_DCR_FIFO_STATUS_j\[0\]](#) EMPTYbit: Active (1) status when RX FIFO #n contains 0 words (rd_level = 0); otherwise, low (0). A read may cause an underflow.
- The [SLIMBUS_DCR_FIFO_STATUS_j\[1\]](#) HILEVEL bit: Active (1) status when FIFO (read) level is

(strictly) above the high threshold (that is, when there is more than a certain maximum of FIFO words stored in the FIFO). Equivalent to full in case `dma_hi_threshold = FIFO size - 1` (the maximum allowed value).

Table 24-658 shows numerical examples for all valid DMA threshold values and all levels in an RX FIFO of FIFO size = 4 FIFO words ([SLIMBUS_DCR_FIFO_SETUP2_j\[7:0\] SIZE = 0x3](#)).

NOTE: The valid threshold range is from 0 to FIFO size - 1: the case threshold = FIFO size is functionally useless and impossible to program for maximum-sized FIFOs (because the `rd_level` field is 1 bit wider than the threshold fields).

Table 24-658. HILEVEL/Empty Status of a 4-Word Receive FIFO, for all DMA Threshold Values

| rd_level (FIFO Words) | Empty | HILEVEL | | | |
|-----------------------|-------|---------|---------|---------|---------|
| | | thr = 0 | thr = 1 | thr = 2 | thr = 3 |
| 0 (empty FIFO) | 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 |
| 2 | 0 | 1 | 1 | 0 | 0 |
| 3 | 0 | 1 | 1 | 1 | 0 |
| 4 (full FIFO) | 0 | 1 | 1 | 1 | 1 |

The following transmit-side status is available from the following bit fields:

- [SLIMBUS_DCT_FIFO_STATUS_j\[11:2\]](#) WR_LEVEL: Number of free FIFO words in TX FIFO #n. (This field is 1 bit longer than the size and threshold fields, because it ranges from 0 to the FIFO size, whereas the other fields range only from 0 to the FIFO size minus 1).
- [SLIMBUS_DCT_FIFO_STATUS_j\[0\]](#) FULL: Active (1) status when TX FIFO #n contains FIFO size words (wr_level = 0); otherwise, low (0). A write may cause an overflow.
- [SLIMBUS_DCT_FIFO_STATUS_j\[1\]](#) LOLEVEL: Active (1) status when FIFO (write) level is under (or equal to) the low threshold; that is, when there is less than a certain minimum of free FIFO words in the FIFO. Equivalent to full in case dma_lo_threshold = 0.

Table 24-659 shows numerical examples for all valid DMA threshold values and all levels in a TX FIFO of FIFO size = 4 FIFO words ([SLIMBUS_DCT_FIFO_SETUP2_j\[7:0\]](#) SIZE = 0x3).

NOTE: The valid threshold range is from 0 to FIFO size – 1: the case threshold = FIFO size is functionally useless and impossible to program for maximum-sized FIFOs (because the wr_level field is 1 bit wider than the threshold fields).

Table 24-659. LOLEVEL/Full Status of a 4-Word Transmit FIFO, for all DMA Threshold Values

| wr_level (FIFO Words) | Full | LOLEVEL | | | |
|-----------------------|------|---------|---------|---------|---------|
| | | thr = 3 | thr = 2 | thr = 1 | thr = 0 |
| 4 (empty FIFO) | 1 | 1 | 1 | 1 | 0 |
| 3 | 0 | 1 | 1 | 1 | 0 |
| 2 | 0 | 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 |
| 0 (full FIFO) | 0 | 0 | 0 | 0 | 1 |

24.9.4.6.3 FIFO Configuration

The bit fields used to configure the FIFOs are:

- [SLIMBUS_DCR_FIFO_SETUP1_j\[11:5\]](#) BASE_ADDR and/or [SLIMBUS_DCT_FIFO_SETUP1_j\[11:5\]](#) BASE_ADDR: RX and/or TX data channel agent FIFO base address within shared RX/TX RAM
- [SLIMBUS_DCR_FIFO_SETUP1_j\[4:1\]](#) DMA_REQ_SIZE and/or [SLIMBUS_DCT_FIFO_SETUP1_j\[4:1\]](#) DMA_REQ_SIZE: DMA request size minus 1, in accesses
- [SLIMBUS_DCR_FIFO_SETUP2_j\[7:0\]](#) SIZE and/or [SLIMBUS_DCT_FIFO_SETUP2_j\[7:0\]](#) SIZE: Capacity of FIFO in FIFO words. (The FIFO can be 1-word deep [the minimum possible value], but it is not recommended. The minimum setting recommended by the SLIMbus protocol is 4-word deep).
- [SLIMBUS_DCR_FIFO_SETUP2_j\[15:8\]](#) SB_TRESHOLD: SLIMbus-side RX data channel agent FIFO threshold, used for SLIMbus reception.
- [SLIMBUS_DCT_FIFO_SETUP2_j\[15:8\]](#) SB_TRESHOLD: SLIMbus-side TX data channel agent FIFO threshold, used for SLIMbus transmission.
- [SLIMBUS_DCR_FIFO_SETUP2_j\[23:16\]](#) DMA_TRESHOLD: Software-side RX data channel agent FIFO low threshold. DMA write requests stop when [SLIMBUS_DCR_FIFO_STATUS_j\[11:2\]](#) RD_LEVEL goes under threshold.

- [SLIMBUS_DCT_FIFO_SETUP2_j\[23:16\]](#) DMA_TRESHOLD: Software-side TX data channel agent FIFO low threshold. DMA write requests stop when [SLIMBUS_DCT_FIFO_STATUS_j\[11:2\]](#) WR_LEVEL goes under threshold.
- [SLIMBUS_DCR_FIFO_SETUP2_j\[23:16\]](#) DMA_TRESHOLD: Software-side RX data channel agent FIFO high threshold. DMA read requests start when [SLIMBUS_DCR_FIFO_STATUS_j\[11:2\]](#) RD_LEVEL goes above threshold.
- [SLIMBUS_DCT_FIFO_SETUP2_j\[23:16\]](#) DMA_TRESHOLD: Software-side TX data channel agent FIFO high threshold. DMA read requests start when [SLIMBUS_DCT_FIFO_STATUS_j\[11:2\]](#) WR_LEVEL goes above threshold.
- [SLIMBUS_DCR_FIFO_STATUS_j\[0\]](#) EMPTY: Active (1) status when RX FIFO #n contains 0 words (rd_level = 0), else low (0). A read may cause an underflow.
- [SLIMBUS_DCT_FIFO_STATUS_j\[0\]](#) FULL: Active (1) status when TX FIFO #n contains FIFO size words (wr_level = 0), else low (0). A write may cause an overflow.
- [SLIMBUS_DCT_FIFO_STATUS_j\[1\]](#) LOLEVEL: Active (1) status when FIFO (write) level is under (or equal to) the low threshold, that is, when there is less than a certain minimum of free FIFO words in the FIFO. Equivalent to full in case dma_lo_threshold = 0.
- [SLIMBUS_DCR_FIFO_STATUS_j\[1\]](#) HILEVEL: Active (1) status when FIFO (read) level is (strictly) above the high threshold, that is, when there is more than a certain maximum of FIFO words stored in the FIFO. Equivalent to full in case dma_hi_threshold = FIFO size - 1 (the maximum allowed value).
- [SLIMBUS_DCR_FIFO_STATUS_j\[11:2\]](#) RD_LEVEL: Number of FIFO words stored in RX FIFO #n. (This field is 1 bit longer than the size and threshold fields, because it ranges from 0 to the FIFO size, whereas the other fields only range from 0 to the FIFO size minus 1).
- [SLIMBUS_DCT_FIFO_STATUS_j\[11:2\]](#) WR_LEVEL: Number of free FIFO words in TX FIFO #n. (This field is 1 bit longer than the size and threshold fields, because it ranges from 0 to the FIFO size, whereas the other fields only range from 0 to the FIFO size minus 1).

24.9.4.7 SLIMbus Transfer Protocols

Several registers are used to configure each Transfer Protocol. [Table 24-660](#) shows a description of these registers and fields.

Table 24-660. Register Fields Used to Configure Transfer Protocols

| Register | Field | Description |
|---|--------------|---|
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [3:0] | TP | Transfer protocol choice |
| SLIMBUS_DCR_CONFIG1_j [4] | TP_QUALIFIER | Used only for asynchronous TPs (qualifier for plain/extended half-duplex asynchronous TPs) |
| SLIMBUS_DCT_CONFIG1_j [4] | TP_QUALIFIER | Used only for asynchronous TPs (qualifier for plain/extended half-duplex asynchronous TPs) |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [9:5] | SL | Total segment length (SL), in 4-bit slots, SL = TAG length + AUX length + DATA length |
| SLIMBUS_DCR_CONFIG1_j [26:23] | PR_HI | 4-MSB presence rate (PR). Selects the base frequency and the calculation mode of N, with: $PR = 2^N \times \text{base frequency}$. |
| SLIMBUS_DCR_CONFIG1_j [22:20] | PR_LO | 3-LSB presence rate (PR). Sets the multiple of the base frequency for the presence frequency. |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [14:10] | DL | Segment data length, in 4-bits slots. AUX+DATA length must fit in a FIFO word. |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [15] | CL | N/A |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [31] | ENABLE | Enable/disable data channel |
| SLIMBUS_DCR_CONFIG2_j / SLIMBUS_DCT_CONFIG2_j [11:0] | SD | Segment periodicity and offset (segment distribution) |

24.9.4.7.1 Isochronous Transfer Protocol

[Table 24-661](#) lists the register fields to program isochronous data transfer protocol.

Table 24-661. Register Fields Used for Isochronous Transfer Protocol

| Register | Field | Value |
|---|--------------|-------------------------------------|
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [3:0] | TP | 0x0 (isochronous transfer protocol) |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [4] | TP_QUALIFIER | Unused in this mode |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [9:5] | SL | 2 to 8, see |
| SLIMBUS_DCR_CONFIG1_j [26:23] | PR_HI | N/A, only for information |
| SLIMBUS_DCR_CONFIG1_j [22:20] | PR_LO | N/A |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [14:10] | DL | 2 to 8, see |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [15] | CL | N/A |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [31] | ENABLE | 1 (enabled) |
| SLIMBUS_DCR_CONFIG2_j / SLIMBUS_DCT_CONFIG2_j [11:0] | SD | Segment periodicity and offset |

24.9.4.7.1.1 Isochronous Segment Composition

Like for all other TPs, the TDM allocation of a pushed data channel is composed of periodic segments of equal length, with the 5-bit segment length (SL) defining the reserved length, in slots (1 to 31), and the segment distribution (SD) defining the segmen offset and periodicity.

Isochronous has no explicit presence bit because data is always assumed to be present. The SL-slots segment is therefore always composed of the following elements:

- 0, 1, or 2 AUX slots, as defined by the 4-bit auxiliary format (AF) configuration field
- 2 to 8 DATA slots, as defined by the 5-bit data length (DL) configuration field. Full range defined by standard is 1 to 31.
- 0 or more unused slots (should be 0, because this is wasted bandwidth)

NOTE:

- Maximum supported SL and DL are limited by the maximum FIFO word size (the actual implementation of the agent), because each segment (with data present) contains one FIFO word of DATA + AUX. In the current case, FIFO word size is 2 to 8 slots (8 to 32 bits):
 - DL range is 2 to 8 (assuming no AUX slot, or AUX slots stored with the DATA in the FIFO)
 - SL range is 2 to 8 (= DL, since there is no TAG in isochronous protocol).
 - DL = 0 is a special encoding where all slots after the AUX are considered to be DATA slots. In that case, there are by definition no unused slots.
- DL = 0 is a special encoding where all slots after the AUX are considered to be DATA slots. In that case, there are by definition no unused slots.
- Not all combinations of legal field values are legal. The condition is that AUX and DATA slots must fit within the allocated segment, that is, the sum must not be (strictly) greater than SL.
 - DL = 31 cannot be used with 1-slot AUX contents because 1 AUX slot + 31 DATA slots (DL) 31 segment slots (SL max) (assuming no more FIFO word size limit)
 - DL = 30 cannot be used with 2-slot AUX contents (assuming no more FIFO word size limit)
 - ...

24.9.4.7.2 Pushed Transfer Protocol

Table 24-662 lists the register fields to program to have a pushed data transfer protocol.

Table 24-662. Register Fields Used for Pushed Transfer Protocol

| Register | Field | Value |
|---|--------------|--------------------------------|
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j[3:0] | TP | 0x1 (pushed Transfer Protocol) |
| SLIMBUS_DCR_CONFIG1_j[4] | TP_QUALIFIER | unused in this mode |
| SLIMBUS_DCT_CONFIG1_j[4] | TP_QUALIFIER | unused in this mode |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j[9:5] | SL | 3 to 9, see |
| SLIMBUS_DCR_CONFIG1_j[26:23] | PR_HI | N/A, only for information |
| SLIMBUS_DCR_CONFIG1_j[22:20] | PR_LO | N/A, only for information |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j[14:10] | DL | 2 to 8, see |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j[15] | CL | N/A |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j[31] | ENABLE | 1 (enabled) |
| SLIMBUS_DCR_CONFIG2_j / SLIMBUS_DCT_CONFIG2_j[11:0] | SD | segment periodicity and offset |

24.9.4.7.2.1 Pushed Segment Composition

Like for all other TPs, the TDM allocation of a pushed data channel is composed of periodic segments of equal length, with the 5-bit segment length (SL) defining the reserved length, in slots (1 to 31), and the segment distribution (SD) defining the segment's offset and periodicity.

When data is present (P=1), the SL-slots segment is composed of the following elements:

- 1 TAG slot for STR, P control bits (Sample TRAnsmit, Presence)
- 0, 1 or 2 AUX slots, as defined by the 4-bit auxiliary format (AF) configuration field
- 2 to 8 DATA slots, as defined by the 5-bit data length (DL) configuration field. Full range defined by standard is 1 to 30
- 0 or more unused slots. (should be 0, as this is wasted bandwidth)

When no data is present (P=0), all slots except the TAG are unused and undriven.

NOTE:

- Maximum supported SL and DL are limited by the maximum FIFO word size (that is, the agent's actual implementation), as each segment (with data present) contains one FIFO word of DATA + AUX. In the current case, FIFO word size is 2 to 8 slots (8 to 32 bits), that is,
 - DL range is 2 to 8 (assuming no AUX slot, or AUX slots stored with the DATA in the FIFO)
 - SL range is 3 to 9 (= DL + 1 TAG)
- DL=0 is a special encoding where all slots after the AUX are considered to be DATA slots. In that case, there are by definition no unused slots.
- Not all combinations of legal field values are legal. The condition is that AUX and DATA slots must fit within the allocated segment, that is, the sum must not be (strictly) greater than SL.
 - DL=31 cannot be used at all for pushed (although it is legal for other TPs) because 1 TAG slot + 31 DATA slots (DL) 31 segment slots (SL max).
 - DL=30 cannot be used with 1-slot AUX contents (assuming no more FIFO word size limit)
 - DL=29 cannot be used with 2-slot AUX contents (assuming no more FIFO word size limit)
 - ...

24.9.4.7.3 Pulled Transfer Protocol

Table 24-663 lists the register fields to program to have a pulled data transfer protocol.

Table 24-663. Register fields used for Pulled Transfer Protocol

| Register | Field | Value |
|---|--------------|--------------------------------|
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [3:0] | TP | 0x2 (pulled Transfer Protocol) |
| SLIMBUS_DCR_CONFIG1_j [4] | TP_QUALIFIER | unused in this mode |
| SLIMBUS_DCT_CONFIG1_j [4] | TP_QUALIFIER | unused in this mode |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [9:5] | SL | 3 to 9, see |
| SLIMBUS_DCR_CONFIG1_j [26:23] | PR_HI | N/A, only for information |
| SLIMBUS_DCR_CONFIG1_j [22:20] | PR_LO | N/A, only for information |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [14:10] | DL | 2 to 8, see |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [15] | CL | N/A |

Table 24-663. Register fields used for Pulled Transfer Protocol (continued)

| Register | Field | Value |
|--|--------|--------------------------------|
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [31] | ENABLE | 1 (enabled) |
| SLIMBUS_DCR_CONFIG2_j / SLIMBUS_DCT_CONFIG2_j [11:0] | SD | segment periodicity and offset |

24.9.4.7.3.1 Pulled Segment Composition

Like for all other TPs, the TDM allocation of a pushed data channel is composed of periodic segments of equal length, with the 5-bit segment length (SL) defining the reserved length, in slots (1 to 31), and the segment distribution (SD) defining the segment's offset and periodicity.

When data is present (P=1), the SL-slots segment is composed of the following elements:

- 1 TAG slot for SRQ, P control bits (Sample ReQuest, Presence)
- 0, 1 or 2 AUX slots, as defined by the 4-bit auxiliary format (AF) configuration field
- 2 to 8 DATA slots, as defined by the 5-bit data length (DL) configuration field. Full range defined by standard is 1 to 30.
- 0 or more unused slots. (should be 0, as this is wasted bandwidth)

When no data is present (P=0), all slots except the TAG are unused and undriven.

NOTE:

- Maximum supported SL and DL are limited by the maximum FIFO word size (that is, the agent's actual implementation), as each segment (with data present) contains one FIFO word of DATA + AUX. In the current case, FIFO word size is 2 to 8 slots (8 to 32 bits), that is,
 - DL range is 2 to 8 (assuming no AUX slot, or AUX slots stored with the DATA in the FIFO)
 - SL range is 3 to 9 (= DL + 1 TAG)
- DL=0 is a special encoding where all slots after the AUX are considered to be DATA slots. In that case, there are by definition no unused slots.
- Not all combinations of legal field values are legal. The condition is that AUX and DATA slots must fit within the allocated segment, that is, the sum must not be (strictly) greater than SL.
 - DL=31 cannot be used at all for pushed (although it is legal for other TPs) because 1 TAG slot + 31 DATA slots (DL) 31 segment slots (SL max).
 - DL=30 cannot be used with 1-slot AUX contents (assuming no more FIFO word size limit)
 - DL=29 cannot be used with 2-slot AUX contents (assuming no more FIFO word size limit)
 - ...

24.9.4.7.4 Asynchronous Transfer Protocol

[Table 24-666](#) shows the configuration required for a (plain) asynchronous data channel agent, whether in simplex or in half-duplex mode.

One data channel requires one agent, except for 1/2 duplex where 2 agents are required (one in each direction).

Table 24-664. "Plain" Asynchronous Endpoint Configurations

| Agent Setup | Type | TP | TP_qualifier | SD, SL, DL, ENABLE | Notes |
|--------------------------|------|--|-----------------------|---|--------------------------|
| TX simplex | TX | 0x4 = "plain" asynchronous, simplex | 0b0 = primary owner | independent | always primary owner |
| TX 1/2 duplex, primary | TX | 0x5 = "plain" asynchronous, 1/2 duplex | 0b0 = primary owner | same than RX (programming identical in both associated agent) | associated with RX agent |
| TX 1/2 duplex, secondary | TX | 0x5 = "plain" asynchronous, 1/2 duplex | 0b1 = secondary owner | same than RX (programming identical in both associated agent) | associated with RX agent |
| RX simplex | RX | 0x4 = "plain" asynchronous, simplex | 0b1 = secondary owner | independent | always secondary owner |
| RX 1/2 duplex, primary | RX | 0x5 = "plain" asynchronous, 1/2 duplex | 0b0 = primary owner | same than TX (programming identical in both associated agent) | associated with TX agent |
| RX 1/2 duplex secondary | RX | 0x5 = "plain" asynchronous, 1/2 duplex | 0b1 = secondary owner | same than TX (programming identical in both associated agent) | associated with TX agent |

Table 24-667 lists the register fields to program to have a "plain" asynchronous transfer protocol.

Table 24-665. Register fields used for "Plain" Asynchronous Transfer Protocol

| Register (for a given data channel agent) | Field | Value |
|---|--------------|--|
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j[3:0] | TP | 0x4 (simplex) or 0x5 (half duplex) |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j[4] | TP_QUALIFIER | primary or secondary ownership setup |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j[9:5] | SL | 3 to 9, see |
| SLIMBUS_DCR_CONFIG1_j[26:23] | PR_HI | Presence Rate, only for information |
| SLIMBUS_DCR_CONFIG1_j[22:20] | PR_LO | N/A, only for information |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j[14:10] | DL | 2 to 8, see |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j[15] | CL | 0 (disabled: makes no sense in asynchronous context) |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j[31] | ENABLE | 1 (enabled) |
| SLIMBUS_DCR_CONFIG2_j / SLIMBUS_DCT_CONFIG2_j[11:0] | SD | segment periodicity and offset |

24.9.4.7.4.1 Asynchronous Segment Composition

Like for all other TPs, the TDM allocation of an asynchronous data channel is composed of periodic segments of equal length, with the 5-bit segment length (SL) defining the reserved length, in slots (2 to 31), and the segment distribution (SD) defining the segment's offset and periodicity.

When data is present (P=1), the SL-slots segment is composed of the following elements:

- 1 TAG slot for T1, T2, CTS, P control bits
- 0, 1 or 2 AUX slots, as defined by the 4-bit auxiliary format (AF) configuration field
- 2 to 8 DATA slots, as defined by the 5-bit data length (DL) configuration field. Full range defined by standard is 1 to 30.
- 0 or more unused slots. (should be 0, as this is wasted bandwidth)

When no data is present ($P=0$), only the TAG slot is (partially) driven, depending on the ownership control and data flow control protocol phases. All other slots are unused and undriven.

NOTE:

- Maximum supported SL and DL are limited by the maximum FIFO word size (that is, the agent's actual implementation), as each segment (with data present) contains one FIFO word of DATA + AUX. In the current case, FIFO word size is 2 to 8 slots (8 to 32 bits), that is,
 - DL range is 2 to 8 (assuming no AUX slot, or AUX slots stored with the DATA in the FIFO)
 - SL range is 3 to 9 (= DL + 1 TAG)
- DL=0 is a special encoding where all slots after the AUX are considered to be DATA slots. In that case, there are by definition no unused slots. When used, the actual length of the segment data (in slots) is determined by hardware, by subtracting the TAG and AUX slots from the total segment length (SL). This case is strictly equivalent to the "direct" encoding, that is, where DL is a non-zero figure.
- Not all combinations of legal field values are legal, even in an ideal implementation. The condition is that TAG, AUX and DATA slots must fit within the allocated segment, that is, the sum must not be (strictly) greater than SL.
 - DL=31 cannot be used at all for asynchronous (although it is legal for other TPs) because 1 TAG slot + 31 DATA slots (DL) 31 segment slots (SL max).
 - DL=30 cannot be used with 1-slot AUX contents (assuming no more FIFO word size limit)
 - DL=29 cannot be used with 2-slot AUX contents (assuming no more FIFO word size limit)
 - SL = 1 is forbidden, since the smallest asynchronous segment is 1 TAG slots + 1 DATA slot = 2 slots long.
 - ...

24.9.4.7.4.2 Programming Specificities for Half-Duplex Protocol

Contrary to all other standard transfer protocols (TP), the half-duplex asynchronous ones (plain or extended) are bidirectional, that is, DATA slots can go in both directions. This means that 1 half-duplex asynchronous port (mapped on 1 half-duplex asynchronous data channel) uses 2 unidirectional data channel agents (FIFOs and logic) in the same controller.

The two agents are of opposite directions (1 TX + 1 RX), and the configuration register fields must always be programmed simultaneously and with matching values for both, so that both own the exact same slots (the data channel's allocated distribution).

24.9.4.7.5 Extended Asynchronous Transfer Protocol

Table 24-666 shows the configuration required for an extended asynchronous data channel agent, whether in simplex or in half-duplex mode.

One data channel requires one agent, except for 1/2 duplex where 2 agents are required (one in each direction).

Table 24-666. Extended Asynchronous Endpoint Configurations

| Agent Setup | Type | TP | TP_qualifier | SD, SL, DL, ENABLE | Notes |
|-------------|------|--------------------------------------|---------------------|--------------------|----------------------|
| TX simplex | TX | 0x6 = extended asynchronous, simplex | 0b0 = primary owner | independent | always primary owner |

Table 24-666. Extended Asynchronous Endpoint Configurations (continued)

| Agent Setup | Type | TP | TP_qualifier | SD, SL, DL, ENABLE | Notes |
|--------------------------|------|---|-----------------------|---|--------------------------|
| TX 1/2 duplex, primary | TX | 0x7 = extended asynchronous, 1/2 duplex | 0b0 = primary owner | same than RX (programming identical in both associated agent) | associated with RX agent |
| TX 1/2 duplex, secondary | TX | 0x7 = extended asynchronous, 1/2 duplex | 0b1 = secondary owner | same than RX (programming identical in both associated agent) | associated with RX agent |
| RX simplex | RX | 0x6 = extended asynchronous, simplex | 0b1 = secondary owner | independent | always secondary owner |
| RX 1/2 duplex, primary | RX | 0x7 = extended asynchronous, 1/2 duplex | 0b0 = primary owner | same than TX (programming identical in both associated agent) | associated with TX agent |
| RX 1/2 duplex secondary | RX | 0x7 = extended asynchronous, 1/2 duplex | 0b1 = secondary owner | same than TX (programming identical in both associated agent) | associated with TX agent |

The data length within the segment is now determined in the TAG NVB field, so that the SLIMbus data length (DL) parameter is not needed in the SLIMbus definition. The corresponding configuration register field [SLIMBUS_DCR_CONFIG1_j](#) / [SLIMBUS_DCT_CONFIG1_j](#)[14:10] DL is still needed to set the FIFO word size: it must always be programmed to 0x2 (slots) = 1 byte, in both the data sinks and sources, which corresponds to the NVB granularity unit.

[Table 24-667](#) lists the register fields to program to have a "plain" asynchronous transfer protocol.

Table 24-667. Register fields used for Extended Asynchronous Transfer Protocol

| Register (for a given data channel agent) | Field | Value |
|---|--------------|---|
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [3:0] | TP | 0x6 (simplex) or 0x7 (half duplex) |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [4] | TP_QUALIFIER | primary or secondary ownership setup |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [9:5] | SL | 4 to 31, see |
| SLIMBUS_DCR_CONFIG1_j [26:23] | PR_HI | Presence Rate, only for information |
| SLIMBUS_DCR_CONFIG1_j [22:20] | PR_LO | N/A, only for information |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [14:10] | DL | 2: NVB data granularity (not the Slimbus "data length") |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [15] | CL | 0 (disabled: makes no sense in asynchronous context) |
| SLIMBUS_DCR_CONFIG1_j / SLIMBUS_DCT_CONFIG1_j [31] | ENABLE | 1 (enabled) |
| SLIMBUS_DCR_CONFIG2_j / SLIMBUS_DCT_CONFIG2_j [11:0] | SD | segment periodicity and offset |

24.9.4.7.5.1 Extended Asynchronous Segment Composition

Like for all other TPs, the TDM allocation of an extended asynchronous data channel is composed of periodic segments of equal length, with the 5-bit segment length (SL) defining the reserved length, in slots (1 to 31), and the segment distribution (SD) defining the segment's offset and periodicity.

When data is present (P=1), the segment is composed of the following elements:

- 2 TAG slots for T1, T2, CTS, P control bits + 4-bit NVB field

- no (0) AUX slots. The current implementation does not support auxiliary fields in the extended asynchronous TP, that is, the only legal value in the 4-bit auxiliary format (AF) is 0b0000. Other values are theoretically allowed by the SLIMbus standard, but for this TP they have little functional use.
- 0 to 28 DATA slots, as defined by the 4-bit number of valid bytes (NVB) field
- 0 or more unused slots. (this is wasted bandwidth, but as NVB can change for each segment this is normal)

When no data is present (P=0):

- 1st TAG slot is (partially) driven, depending on the ownership / data flow control protocol phases.
- 2nd TAG slot is either driven to all-zero, or undriven, that is, it always reads out as all-zero.
- All other slots are unused and undriven

NOTE:

- SL should be configured so that the maximum number of DATA slots is even, otherwise there will always be at least one unused slot.
 - Largest supported SL is not limited by the maximum FIFO word size (that is, the agent's actual implementation), unlike all other transfer protocols, as several FIFO words can be concatenated inside the same data segment.
 - Not all combinations of legal field values are legal. The condition is that TAG, AUX and DATA slots must fit within the allocated segment, that is, the sum must not be (strictly) greater than SL.
 - NVB = 15 (15 valid data bytes = 30 slots) cannot be used, because 2 TAG slots + 30 DATA slots (NVB x 2) = 32 > 31 segment slots (SL max).
 - SL = 1,2,3 are forbidden, since the smallest extended asynchronous segment is 2 TAG slots + 1 DATA byte (NVB = 1) = 4 slots long.
 - ...
-

24.9.4.7.5.2 Programming Specificities for Half-Duplex Protocol

Contrary to all other standard transfer protocols (TP), the half-duplex asynchronous ones (plain or extended) are bidirectional, that is, DATA slots can go in both directions. This means that 1 half-duplex asynchronous port (mapped on 1 half-duplex asynchronous data channel) uses 2 unidirectional data channel agents (FIFOs and logic) in the same controller.

The two agents are of opposite directions (1 TX + 1 RX), and the configuration register fields must always be programmed simultaneously and with matching values for both, so that both own the exact same slots (the data channel's allocated distribution).

24.9.4.8 Paired-up channels

Two (or more) data channels with common properties can be paired up to operate in lockstep, for example, the left and right channels of a stereo audio flow: paired up data samples are generated together by a data source and need to arrive together at the data sink after going over the SLIMbus interface.

Assuming that pairing up has been implemented in both the sink and the source SLIMbus controllers of the data channel, it is enabled by configuring the channel as follows:

- Same segment windows: same channel rate, also expressed as segment interval (expressed in slots). This is encoded in the channel's Segment Distribution ([SLIMBUS_DCT_CONFIG2_j](#) / [SLIMBUS_DCR_CONFIG2_j](#)[11:0] SD).
- Same Segment Length ([SLIMBUS_DCT_CONFIG1_j](#) / [SLIMBUS_DCR_CONFIG1_j](#)[9:5] SL)
- Segment offset (also encoded in SD) is necessarily different, otherwise the two channels would be scheduled in the same slots. SD is therefore different.
- Sequential Channel Numbers (CN) are assigned to the channels to be paired up
- Data channel numbering and scheduling are defined by the active manager device, through the broadcasts of the NEXT_DEFINE_CHANNEL() message.

Contents must be aligned, as follows:

- Same Transfer Protocol ([SLIMBUS_DCT_CONFIG1_j](#) / [SLIMBUS_DCR_CONFIG1_j](#)[3:0] TP). Asynchronous protocols (extended or not) do not support pairing.
- Same Aux Format ([SLIMBUS_DCT_CONFIG1_j](#) / [SLIMBUS_DCR_CONFIG1_j](#)[19:16] AF)
- Same Data Length ([SLIMBUS_DCT_CONFIG1_j](#) / [SLIMBUS_DCR_CONFIG1_j](#)[14:10] DL)
- Pairing can be enabled through the Channel Link ([SLIMBUS_DCT_CONFIG1_j](#) / [SLIMBUS_DCR_CONFIG1_j](#)[15] CL) data channel content bit. Pairing between channel #N-1 and channel #N is enabled by setting the Channel Link (CL) content bit to 1 on channel #N. For example, to pair up channels #1 and #2, CL = 1 in channel #2 (thus linking it to #1) and CL = 0 in channel #1 (thus keeping it separate from channel #0).
- Data channel contents are defined by active manager device, through the broadcasting of the `NEXT_DEFINE_CONTENT()` and `CHANGE_CONTENT()` messages.

24.9.4.8.1 Paired-up behaviour for Isochronous TP

Data is by definition present in all segments, so that isochronous data channels with the same channel rate (as extracted from SD) are naturally paired up in normal operation. However, pairing also ensures that transmit underflows are also coupled:

- On the source side, if one of the channels has no data to transmit (TX underflow error, reported by IRQ) the other channels won't transmit any data either (even if they have some). This prevents the transmitter from getting out of sync.
- On the sink side, the underflow error will not be detected since no presence indication is transmitted, but the channels will remain in sync when the correct data flow resumes.

24.9.4.8.2 Paired-up behaviour for Pushed TP

Data presence in each segment is flagged by the STR/P bits (strobe/presence) driven by the data source in the TAG slot. On the source side, paired up channels must have the same P value in a given segment window, that is, data must only be transmitted (STR=P=1) when both channels have data to send. No requirements on the sink side.

24.9.4.8.3 Paired-up behaviour for Pulled TP

Data presence in a segment is requested by the SRQ TAG bit (sample request), driven by the sink, and confirmed by the P TAG bit (presence), driven by the source, so that SRQ and P are always equal in normal operation. The main pairing up requirement is therefore that the SRQ are aligned for all channel sinks, that is, that data is requested on all channels only if all sinks are ready to receive it, otherwise it is requested on none.

Pairing also ensures that transmit underflows are also coupled between channels: if for some reason a source cannot fulfill a request to drive data (SRQ=1, P=0: transmit underflow error, reported by IRQ), none of the other channels must drive data either, and all must flag P=0. The source side can only implement correct pairing if the sink side is correct in the first place; indeed, unless an underflow occurs, it is sufficient that the sink side implements pairing for the channels to be paired.

24.9.4.9 Device and Addressing Management

One of the manager device tasks is to keep track of devices present on the bus and to enumerate them, that is, assign a (different) Logical Address (LA) to each.

The manager device itself is implicitly enumerated by default, to Logical Address (LA) 0xFF. This is the only case where a device enumerates without `ASSIGN_LOGICAL_ADDRESS` message transmitted over the bus. Therefore for the manager device the following default configuration must be applied :

- [SLIMBUS_DEV_LA_i](#)[7:0] LA = 0xFF
- [SLIMBUS_DEV_LA_i](#)[8] LA_ENABLE = 1
- [SLIMBUS_DEV_LA_i](#)[9] EA_ENABLE = 1 (although manager is never addressed by Enumeration Address, EA)

The SLIMbus controller implements several devices, each of which is identified by its address. Addresses are used to exchange control messages over the shared message channel (SMC). The controller will recognize, store and respond (that is, acknowledge) to any message on the SMC targeted at one of the component's devices in the RX message FIFO.

The Enumeration Addresses (EA) composition is described in [Table 24-668](#), with:

- MI, PC and IV are Software-programmable and have the same value for all devices of the component with [SLIMBUS_CMP_MI_PC\[15:0\]](#) MI, [SLIMBUS_CMP_MI_PC\[31:16\]](#) PC and [SLIMBUS_CMP_IV\[7:0\]](#) IV.
- DI is hardwired and unique for each device within the component. It is given by [SLIMBUS_DCT_MAP_j / SLIMBUS_DCR_MAP_j\[7:0\]](#) DI bit field.
- Each device individual EA is Software-accessible, for reference, in read-only registers ([SLIMBUS_DEV_EA_LO_i](#) and [SLIMBUS_DEV_EA_HI_i](#) registers)

Table 24-668. Enumeration Address (EA) makeup

| EA Subfield | Size (bits) | Top Bit | Bottom Bit | Source |
|---------------------|-------------|---------|------------|---|
| MI: Manufacturer ID | 16 | 47 | 32 | SLIMBUS_CMP_MI_PC[15:0] MI |
| PC: Product Code | 16 | 31 | 16 | SLIMBUS_CMP_MI_PC[31:16] PC |
| DI: Device Index | 8 | 15 | 8 | hardwired |
| IV: Instance Value | 8 | 7 | 0 | SLIMBUS_CMP_IV[7:0] IV |
| Total: EA | 48 | 47 | 0 | SLIMBUS_DEV_EA_HI_i / SLIMBUS_DEV_EA_LO_i |

The Logical Address (LA) assigned by the manager range from 0x00 to 0xEF, with the exception of the active manager located by definition at LA = 0xFF. It is configured through [SLIMBUS_DEV_LA_i\[7:0\]](#) LA for device m.

By default, a device uses a unique, static 48-bit Enumeration Address (EA). The EA is used only for enumeration, that is, the acquisition a dynamic Logical Address (LA) assigned by the active manager device.

NOTE: The port number is given by [SLIMBUS_DCT_MAP_j / SLIMBUS_DCR_MAP_j\[13:8\]](#) PN bit field.

24.9.4.10 Message Management

24.9.4.10.1 Transmission

24.9.4.10.1.1 TX Message Sequence

The message transmission software sequence is the following:

- Initial state:
 - [SLIMBUS_SMT_CONTROL\[0\]](#) MESSAGE_ENABLE = 0: No ongoing TX message. This also implies that TX message FIFO can receive another message.
 - [SLIMBUS_SMT_INFO\[5:0\]](#) = 0 : TX message event flags must be cleared (to 0) by Software by writing 1 to the corresponding bit(s). Failing to meet this condition will not prevent the message transmission, but will prevent a proper readout of the message transmission's outcome
 - Optional: If the IRQ method is to be used (instead of polling), it must be cleared and enabled, that is, [SLIMBUS_CMP_IRQENABLE_SET\[2\]](#) SMT_INFO_EN = 1 and [SLIMBUS_CMP_IRQSTATUS\[2\]](#) SMT_INFO = 0. For more information about interrupts see [Section 24.9.4.11](#).
- FIFO loading:
 - The message is written byte by byte to register [SLIMBUS_SMT_MESSAGE\[7:0\]](#). SLIMbus endianness is retained (big-endian) that is, serial message starts with the MSB (bit 7) of the first byte written into the FIFO and ends with the LSB (bit 0) of the last written byte.

- The minimum message size is 6 bytes (5 entered to the FIFO), for a short-arbitration (that is, logical source address LA = 1 byte), broadcast (that is, no destination address), no-payload message.
- The maximum theoretical message size is 39 bytes (38 entered to the FIFO), for a long-arbitration (that is, enumeration source address EA = 6 bytes), maximum remaining length (RL = 5b11111 = 31 bytes) message. The TX message FIFO can hold 32 bytes, that is, most messages (of 33 bytes or less).
- An overflow event is flagged ([SLIMBUS_SMT_INFO\[1\] OVERFLOW](#) is set) if too many bytes are written in. The TX message FIFO is then cleared before another TX message sequence attempt is made.
- Transmission enabling:
 - Once the message has been loaded into the TX message FIFO, software must write 1 on field [SLIMBUS_SMT_CONTROL\[0\] MESSAGE_ENABLE](#).
- Transmission:
 - From that point on, the device will attempt to transmit the message stored in the FIFO. Actual transmission may be delayed because of Message Sync acquisition time (if not already operational), Ongoing message on the SMC, and Arbitration(s) lost to higher-priority messages.
- Transmission completion and reporting:
 - Transmission is considered complete if one of the following -mutually exclusive- conditions is met, and the corresponding bit of [SLIMBUS_SMT_INFO](#) is set : Negative response [SLIMBUS_SMT_INFO\[3\] NACK = 1](#), or Positive response : [SLIMBUS_SMT_INFO\[2\] PACK = 1](#), or No response: [SLIMBUS_SMT_INFO\[4\] NORE = 1](#), or Illegal response: [SLIMBUS_SMT_INFO\[5\] UDEF = 1](#), or Transmit collision: [SLIMBUS_SMT_INFO\[0\] MC_TX_COL = 1](#).
 - If enabled ([SLIMBUS_CMP_IRQENABLE_SET\[2\] SMT_INFO_EN = 1](#)), an interrupt request flag is set ([SLIMBUS_CMP_IRQSTATUS\[2\] SMT_INFO = 1](#)) and the IRQ line asserted.
 - Additionally, bit [SLIMBUS_SMT_CONTROL\[0\] MESSAGE_ENABLE](#) must auto-clear. Polling this bit will also work as an alternative to waiting for the IRQ.
 - Following the transmission, all message bytes have been removed from the TX message FIFO.

24.9.4.10.1.2 TX Message FIFO Clearing

The TX message FIFO must not be cleared as part of the normal message transmission operation, between messages. However, the clearing becomes necessary in case of error:

- FIFO overflow: the bit [SLIMBUS_SMT_INFO\[1\] OVERFLOW](#) is set
- FIFO underflow: the bit [SLIMBUS_SMR_INFO\[1\] UNDERFLOW](#) is set
- TX collision: the bit [SLIMBUS_SMT_INFO\[0\] MC_TX_COL](#) or the bit [SLIMBUS_SMR_INFO\[0\] MC_TX_COL](#) is set
- Undefined error condition, unknown FIFO content

Clearing is done by writing 0 to bit field [SLIMBUS_SMT_CONTROL\[0\] MESSAGE_ENABLE](#).

24.9.4.10.2 Message reception

24.9.4.10.2.1 Message Responding

The message responding and message receiving are separate but intertwined processes. Message responding starts as soon as a message is received, and consists in sending back information, including PACK or NACK.

24.9.4.10.2.2 RX Message Sequence

The message reception software sequence is the following:

- Initial state
 - [SLIMBUS_SMR_INFO](#) = 0x0: Pending (at 1) RX message event flags must be cleared (to 0) by Software by writing 1 to the corresponding bit(s).
 - Optional: If the IRQ method is to be used (instead of polling), it must be cleared and enabled, that

is, [SLIMBUS_CMP_IRQENABLE_SET](#)[3] SMR_INFO_EN = 1 and [SLIMBUS_CMP_IRQSTATUS](#)[3] SMR_INFO = 0. For more information about interrupts see [Section 24.9.4.11](#)

- Message reception
 - Message reception requires no intervention: Messages with target addresses enabled in [SLIMBUS_DEV_LA_i](#) registers are automatically loaded into the RX message FIFO.
- FIFO unloading
 - The message is read byte by byte off the FIFO and put into register [SLIMBUS_SMR_MESSAGE](#)[7:0]. SLIMbus endianness is used (big-endian) that is, serial message starts with the MSB (bit 7) of the first byte written into the FIFO and ends with the LSB (bit 0) of the last written byte.
 - The minimum message size is 6 bytes, for a short-arbitration (that is, logical source address LA = 1 byte), broadcast (that is, no destination address), no-payload message.
 - The maximum theoretical message size is 39 bytes, for a long-arbitration (that is, enumeration source address EA = 6 bytes), maximum remaining length (RL = 5b11111 = 31 bytes) message. The RX message FIFO can hold 32 bytes, that is, most message types.
 - An overflow event is flagged ([SLIMBUS_SMR_INFO](#)[1] OVERFLOW bit is set) if too many bytes are received, which will overwrite previous bytes.
 - An underflow event is flagged ([SLIMBUS_SMR_INFO](#)[1] UNDERFLOW bit is set) if too many bytes are read out. The RX message FIFO is cleared before another RX message sequence attempt is made.
- Message decoding and servicing
 - This phase takes place in parallel with the unloading phase above. In some cases, a partial decoding can lead the software to skip the end of the unloading and flush the FIFO. The software will check Device Association (thanks to the [SLIMBUS_SMR_INFO](#)[2] RECEIVED_MESSAGE bit) and Message Support.

24.9.4.10.2.3 RX Message FIFO Clearing

- While the software is reading the message off the FIFO, the receive message agent unconditionally answers NACK, forcing remote side to retransmit any new incoming message.
- Only once the message has been read out of the FIFO, the software writes 1 on [SLIMBUS_SMR_INFO](#)[2] RECEIVED_MESSAGE bit. This will automatically clear the FIFO.

The RX message FIFO is cleared as part of the normal message reception operation, between messages, although it is not strictly necessary. However, the clearing becomes compulsory in case of error:

- FIFO overflow: the bit [SLIMBUS_SMT_INFO](#)[1] OVERFLOW is set
- FIFO underflow: the bit [SLIMBUS_SMR_INFO](#)[1] UNDERFLOW is set
- Undefined error condition, unknown FIFO content

Clearing is done by writing 1 to register bit field [SLIMBUS_SMR_INFO](#)[2] RECEIVED_MESSAGE bit.

24.9.4.11 Interrupt Service Routines

This section lists specific software programming sequences, to be applied at specific phases of the SLIMbus protocol. This section covers the low-level software service of IRQs. More information about interrupts in the device can be found in [Chapter 18, Interrupt Controllers](#).

The SLIMbus controller has a single IRQ output line, controlled through 9-bit registers [SLIMBUS_CMP_IRQSTATUS](#), [SLIMBUS_CMP_IRQENABLE_SET](#) and [SLIMBUS_CMP_IRQENABLE_CLR](#). Each bit of this 1st level IRQ management points to a 2nd level information register. There are thus 9 such information registers, each connected with a specific submodule (framer device, interface device, message receiver, message transmitter, and one per generic data device).

2nd level information register and status register are written independently each other. When an event occurs, both bits are set to 1, and when the software writes 1 on either register the corresponding bit is cleared to 0. IRQ line is the status register output.

- When an event takes place, the corresponding 2nd level information bit must be set to 1 (if already 1: no change)
- When an event takes place, the corresponding 1st level IRQ status bit must be set to 1 (if enabled and if not already 1) and trigger an interrupt (if not already active). Note that this does not depend on the information bit's value: if the information bit is already high, the event must still potentially set the IRQ status bit.
- Writing 1 to a set IRQ status bit clears the bit and deasserts the IRQ line (if another status bit is set, the IRQ line will reassert immediately). Note that the clearing of the IRQ status does not depend on the information bit, that is, it will work even if the information bit has not been cleared.
- Writing 1 to a set information bit will clear the bit, but have no impact on the IRQ status

CAUTION

The software sequence should always be as follows:

1. Clear the status bit
2. Read the relative information register
3. When needed and allowed, clear the information register

24.9.4.11.1 Interrupt Requests

Table 24-669 lists the event flags, and their mask, that can cause module interrupts.

Table 24-669. Interrupts

| Interrupt Line | Event Flag | Event Mask |
|--------------------------------|--|--|
| SLIMBUS1_IRQ / SLIMBUS2_IRQ | SLIMBUS_CMP_IRQSTATUS_RAW[11:0] and SLIMBUS_CMP_IRQSTATUS[11:0] | SLIMBUS_CMP_IRQENABLE_SET[11:0] and SLIMBUS_CMP_IRQENABLE_CLR[11:0] |

24.9.4.11.2 Possible Interrupts

Table 24-670 lists all the interrupts that can occur and the related registers.

Table 24-670. Event Summary

| Register | Field Name | Wake-Up Source | IE | Description |
|-----------------------------|--------------------|----------------|-----|--|
| Frame layer events | | | | |
| SLIMBUS_FL_INFO[6] | RECONFIGURED | Yes | No | Reconfiguration boundary crossed |
| SLIMBUS_FL_INFO[5] | SAW_BUS_RESET | Yes | No | Bus reset sequence detected on the bus |
| SLIMBUS_FL_INFO[3] | FOUND_MS | Yes | No | Message synchronization acquired |
| SLIMBUS_FL_INFO[2] | LOST_MS | Yes | Yes | Message synchronization lost |
| SLIMBUS_FL_INFO[1] | LOST_SFS | Yes | Yes | Superframe synchronization lost |
| SLIMBUS_FL_INFO[0] | LOST_FS | Yes | Yes | Frame synchronization lost |
| Framer device events | | | | |
| SLIMBUS_FR_INFO[5] | CLOCK_RESTART | Yes | No | Clock restart request event detected |
| SLIMBUS_FR_INFO[4] | FRAMER_UNACTIVATED | Yes | Yes | Framer has left clock source operational state. |
| SLIMBUS_FR_INFO[3] | FRAMER_ACTIVATED | Yes | Yes | Framer has reached clock source operational state. |
| SLIMBUS_FR_INFO[2] | GC_TX_COL | Yes | Yes | Collision during guide byte transmit |
| SLIMBUS_FR_INFO[1] | FI_TX_COL | Yes | Yes | Collision during framing information transmit |

Table 24-670. Event Summary (continued)

| Register | Field Name | Wake-Up Source | IE | Description |
|---|----------------------|----------------|-----|--|
| SLIMBUS_FR_INFO[0] | FS_TX_COL | Yes | Yes | Collision during frame synchronization symbol transmit |
| Shared message transmit channel events | | | | |
| SLIMBUS_SMT_INFO[7] | ABORT | Yes | No | TX message was aborted before completion because of message synchronization loss. |
| SLIMBUS_SMT_INFO[5] | UDEF | Yes | No | TX message has UDEF response: Undefined response, protocol error. |
| SLIMBUS_SMT_INFO[4] | NORE | Yes | No | TX message has NORE response: No or all-zero message response. |
| SLIMBUS_SMT_INFO[3] | NACK | Yes | No | TX message has NACK response: At least one of the recipient components requested message retransmission. |
| SLIMBUS_SMT_INFO[2] | PACK | Yes | No | TX message has PACK response: All recipient devices accepted the message. |
| SLIMBUS_SMT_INFO[1] | OVERFLOW | No | No | Overflow in TX message FIFO |
| SLIMBUS_SMT_INFO[0] | MC_TX_COL | Yes | Yes | Transmit collision in message channel during message transmission |
| Shared message receive channel events | | | | |
| SLIMBUS_SMR_INFO[4] | OVERFLOW | Yes | No | Overflow in RX message FIFO. Message is larger than the FIFO. |
| SLIMBUS_SMR_INFO[3] | RECEIVED_RECONFIGURE | Yes | No | RECONFIGURE_NOW() message received |
| SLIMBUS_SMR_INFO[2] | RECEIVED_MESSAGE | Yes | No | Message is available in the RX message FIFO. |
| SLIMBUS_SMR_INFO[1] | UNDERFLOW | No | No | Underflow in RX message FIFO. Software tried to read more bytes than available. |
| SLIMBUS_SMR_INFO[0] | MC_TX_COL | Yes | Yes | Transmit collision in message channel during message reception |
| Data channel events | | | | |
| SLIMBUS_DCT_INFO_j[3] | LOLEVEL | Yes | No | Write level of TX data agent FIFO has gone above the threshold. |
| SLIMBUS_DCR_INFO_j[3] | HILEVEL | Yes | No | Read level of RX data agent FIFO has gone above the threshold. |
| SLIMBUS_DCT_INFO_j[2], SLIMBUS_DCR_INFO_j[2] | UNDERFLOW | Yes | No | Underflow in TX/RX data agent FIFO |
| SLIMBUS_DCT_INFO_j[1], SLIMBUS_DCR_INFO_j[1] | OVERFLOW | Yes | No | Overflow in TX/RX data agent FIFO |
| SLIMBUS_DCT_INFO_j[0], SLIMBUS_DCR_INFO_j[0] | DATA_TX_COL | Yes | Yes | TX collision in TX/RX data agent |

24.9.4.11.3 Interface Device ISRs

The Interface Device ISRs are applied when a bit of status register [SLIMBUS_FL_INFO](#) is set, which also triggers the assertion of bit field [SLIMBUS_CMP_IRQSTATUS\[0\] FL_INFO](#) and of the IRQ line, when enabled in bit field [SLIMBUS_CMP_IRQENABLE_SET\[0\] FL_INFO_EN](#). Service routines must be applied and the FL_INFO bit field cleared (by writing 1 to it).

24.9.4.11.3.1 Lost Frame Synchronization (LOST_FS)

24.9.4.11.3.1.1 Root Event

This interrupt occurs when a loss of frame synchronization happens. All data channels automatically stop, that is, all active [SLIMBUS_DCT_CONFIG1_j](#) / [SLIMBUS_DCR_CONFIG1_j](#)[31] ENABLE bits are cleared. Component automatically reacquires frame, superframe and message synchronization.

24.9.4.11.3.1.2 Interrupt Service Routine

Frame synchronization (FS) loss implies the loss of higher-level superframe and message synchronizations:

- Messages cannot be expected to be transmitted / received until the component is operational again. Additionally, any ongoing reconfiguration sequence must be interrupted and made invalid by MS loss. No action required if no reconfiguration sequence is ongoing.
- Implicit superframe synchronization loss triggers a reset of all component ports: see [Section 24.9.4.4.3.6](#).

This field, [SLIMBUS_FL_INFO](#)[0] LOST_FS, is not cleared by software into the ISR. Instead, it stays set until the component receives a REQUEST_CLEAR_INFORMATION message by the remote manager (Receiving a message implies of course that message synchronization has been restored in the mean time). Only at this point, software can apply the message and clear the designated field.

24.9.4.11.3.2 Lost Superframe Synchronization (LOST_SFS)

24.9.4.11.3.2.1 Root Event

This interrupt occurs when a loss of superframe synchronization happens. The loss of lower-level frame synchronization also implies the loss of superframe synchronization, if already acquired, but does not trigger the assertion of LOST_SFS Information Element. All data channels automatically stop, that is, all active [SLIMBUS_DCT_CONFIG1_j](#) / [SLIMBUS_DCR_CONFIG1_j](#)[31] ENABLE bits must be cleared. Component automatically reacquires superframe and message synchronization.

24.9.4.11.3.2.2 Interrupt Service Routine

Superframe synchronization (SFS) loss will trigger the reset of all ports of the component: see [Section 24.9.4.4.3.6](#).

Superframe synchronization loss implies the loss of message synchronization, that is, messages cannot be expected to be transmitted / received until the component is operational again. Additionally, any ongoing reconfiguration sequence must be interrupted and made invalid by MS loss. No action required if no reconfiguration sequence is ongoing.

This field, [SLIMBUS_FL_INFO](#)[1] LOST_SFS, is not cleared by software into the ISR. Instead, it stays set until the component receives a REQUEST_CLEAR_INFORMATION message by the remote manager (Receiving a message implies of course that message synchronization has been restored in the mean time). Only at this point, software can apply the message and clear the designated field.

24.9.4.11.3.3 Lost Message Synchronization (LOST_MS)

24.9.4.11.3.3.1 Root Event

This interrupt occurs when a loss of message synchronization happens. The loss of either lower-level frame or superframe synchronization also implies the loss of message synchronization, if already acquired, but does not trigger the assertion of LOST_MS Information Element. Component automatically reacquires message synchronization, by seeking for Guide Channel information.

24.9.4.11.3.3.2 Interrupt Service Routine

Any ongoing reconfiguration sequence must be interrupted and made invalid by the Message Synchronisation (MS) loss. No action required here if no reconfiguration sequence is ongoing.

This field, [SLIMBUS_FL_INFO\[2\]](#) LOST_MS, is not cleared by software into the ISR. Instead, it stays set until the component receives a REQUEST_CLEAR_INFORMATION message by the remote manager, requiring to clear it (Receiving a message implies of course that message synchronization has been restored in the mean time). Only at this point, software can apply the message and clear the designated field.

24.9.4.11.3.4 Found Message Synchronization (FOUND_MS)

24.9.4.11.3.4.1 Root Event

This interrupt occurs when acquisition of message synchronization. In that state, messages may be transmitted and received over the SMC.

24.9.4.11.3.4.2 Interrupt Service Routine

If MS is reacquired, following a previous LOST_MS event, then a REPORT_INFORMATION message must be transmitted, as follows:

- Source: interface device
- Destination: SLIMbus manager device (LA = 0xFF)
- Information Element: LOST_MS

If MS is reacquired, following a previous LOST_FS event, then a REPORT_INFORMATION message must be transmitted, as follows:

- Source: interface device
- Destination: SLIMbus manager device (LA = 0xFF)
- Information Element: LOST_FS

If MS is reacquired, following a previous LOST_SFS event, then a REPORT_INFORMATION message must be transmitted, as follows:

- Source: interface device
- Destination: SLIMbus manager device (LA = 0xFF)
- Information Element: LOST_SFS

If MS is reacquired, following a previous MC_TX_COL event, then a REPORT_INFORMATION message must be transmitted, as follows:

- Source: interface device
- Destination: SLIMbus manager device (LA = 0xFF)
- Information Element: MC_TX_COL

If MS is reacquired, following a previous UDEF (Received undefined message response) event, the message that caused UDEF must be retransmitted until it succeeds or until the retransmit maximum (fully managed by software) is reached.

In any case, software must clear the field [SLIMBUS_FL_INFO\[3\]](#) FOUND_MS. From that point on, any pending messages in the TX FIFO will be sent.

24.9.4.11.3.5 Reconfigured (RECONFIGURED)

24.9.4.11.3.5.1 Root Event

This interrupt occurs when crossing of a reconfiguration boundary. In case of clock pause, where the SLIMbus clock stops at the boundary (1st rising edge of the new superframe), the bit (and therefore the IRQ) is asserted at the clock pause, not at the clock restart.

24.9.4.11.3.5.2 Interrupt Service Routine

Completes the software-controller reconfiguration sequence. No reconfiguration must be applied to the control registers between the RECONFIGURE_NOW reception and the reconfiguration boundary. A attempt by the manager to start a new reconfiguration sequence during that interval is an error.

In the case of framer release handover and/or root frequency change, the active framer must start using a new clock input selection at the reconfiguration boundary (as per register field [SLIMBUS_FR_CLOCK_SOURCE\[5:3\] CLKSEL](#)). All non-selected SLIMbus clock inputs of active framer components and all SLIMbus clock inputs for clock receiver components (inactive framers), and that may have been used until the boundary, can be turned off at that point.

Field [SLIMBUS_FL_INFO\[6\] RECONFIGURED](#) must be software cleared (by writing 1 to it).

24.9.4.11.4 Framer Device ISRs

The Framer Device ISRs are applied when a bit of status register [FR_INFO](#) is set, which also triggers the assertion of bit field [SLIMBUS_CMP_IRQSTATUS\[1\] FR_INFO](#) and of the IRQ line, when enabled in bit field [SLIMBUS_CMP_IRQENABLE_SET\[1\] FR_INFO_EN](#). Service routines must be applied, and the [fr_info](#) bit field cleared (by writing 1 to it). Some interrupt generating events are collisions, which occur when the framer detects on DATA line a different value than it's actively driving.

24.9.4.11.4.1 Transmit Collision in Frame Sync Symbol (FS_TX_COL)

24.9.4.11.4.1.1 Root Event

Transmit collision detected while driving the frame sync symbol (as active framer) of the framing channel.

24.9.4.11.4.1.2 Interrupt Service Routine

A REPORT_INFORMATION message must be transmitted, as follows:

- Sender: framer device
- Destination: SLIMbus manager device (LA = 0xFF)
- Information Element: FS_TX_COL

This field is not cleared by software into the ISR. Instead, it stays set until the component receives a REQUEST_CLEAR_INFORMATION message by the remote manager (Receiving a message implies of course that message synchronization has been restored in the mean time). Only at this point, software can apply the message and clear the designated field.

24.9.4.11.4.2 Transmit Collision in Frame Sync Symbol (FI_TX_COL)

24.9.4.11.4.2.1 Root Event

Transmit collision detected while driving the framing information (as active framer) of the framing channel.

24.9.4.11.4.2.2 Interrupt Service Routine

A REPORT_INFORMATION message must be transmitted, as follows:

- Sender: framer device
- Destination: SLIMbus manager device (LA = 0xFF)
- Information Element: FI_TX_COL

This field is not cleared by software into the ISR. Instead, it stays set until the component receives a REQUEST_CLEAR_INFORMATION message by the remote manager (Receiving a message implies of course that message synchronization has been restored in the mean time). Only at this point, software can apply the message and clear the designated field.

24.9.4.11.4.3 Transmit Collision in Guide Channel (GC_TX_COL)

24.9.4.11.4.3.1 Root Event

Transmit collision detected while driving the guide byte (as active framer), that is, during the guide channel.

24.9.4.11.4.3.2 Interrupt Service Routine

A REPORT_INFORMATION message must be transmitted, as follows:

- Sender: framer device
- Destination: SLIMbus manager device (LA = 0xFF)
- Information Element: GC_TX_COL

This field is not cleared by software into the ISR. Instead, it stays set until the component receives a REQUEST_CLEAR_INFORMATION message by the remote manager (Receiving a message implies of course that message synchronization has been restored in the mean time). Only at this point, software can apply the message and clear the designated field.

24.9.4.11.4.4 Framer Device Activated (FRAMER_ACTIVATED)

24.9.4.11.4.4.1 Root Event

Acquisition of active framer role by the component. This event is only possible on bus boot (when default active framer) and incoming framer handover (when inactive framer).

24.9.4.11.4.4.2 Interrupt Service Routine

Assert software implemented ACTIVE_FRAMER information element.

Field [SLIMBUS_FR_INFO](#)[4] FRAMER_UNACTIVATED must be software cleared (by writing 1 to it).

The ACTIVE_FRAMER information element's assertion does not trigger the transmission by the framer device of a REPORT_INFORMATION message, since the information is already "publicized" by the framer handover process.

24.9.4.11.4.5 Framer Device Unactivated (FRAMER_UNACTIVATED)

24.9.4.11.4.5.1 Root Event

Loss of active framer role by the component. This event is only possible on bus shutdown and outgoing framer handover (when active framer).

24.9.4.11.4.5.2 Interrupt Service Routine

Deassert software-implemented ACTIVE_FRAMER information element.

Field [SLIMBUS_FR_INFO](#)[3] FRAMER_ACTIVATED must be software cleared (by writing 1 to it).

The ACTIVE_FRAMER information element's deassertion does not trigger the transmission by the framer device of a REPORT_INFORMATION message, since the information is already "publicized" by the framer handover process.

24.9.4.11.4.6 Restart After Clock Pause (CLOCK_RESTART)

24.9.4.11.4.6.1 Root Event

Transition detected on the DATA line during a clock pause, driven by any of the connected components and seen by the clock source (active framer) as a restart request. Note that this field is set for all clock restarts, even if the local framer is inactive.

24.9.4.11.4.6.2 Interrupt Service Routine

Field [SLIMBUS_FR_INFO](#)[5] CLOCK_RESTART must be software cleared (by writing 1 to it).

NOTE: Restart event is a source of asynchronous wakeup.

24.9.4.11.5 Shared Message Channel Transmit ISRs

These ISRs are applied when a bit of status register SMT_INFO is set, which also triggers the assertion of bit field [SLIMBUS_CMP_IRQSTATUS](#)[2] SMT_INFO and of the IRQ line, when enabled in bit field [SLIMBUS_CMP_IRQENABLE_SET](#)[2] SMT_INFO_EN. Service routines must be applied, and the fr_info bit field cleared (by writing 1 to it)

24.9.4.11.5.1 Transmit Collision in Message Body (MC_TX_COL)

24.9.4.11.5.1.1 Root Event

Transmit collision detected while transmitting a message, that is, writing any subfield except message response (arbitration, header, payload, or message integrity). The device immediately (before next cell) stop transmission and the component automatically lose message synchronization. The message has to be sent again, once message synchronization has been regained.

24.9.4.11.5.1.2 Interrupt Service Routine

This field, [SLIMBUS_SMT_INFO](#)[0] MC_TX_COL, is not cleared by software into the ISR. Instead, it stays set until the component receives a REQUEST_CLEAR_INFORMATION message by the remote manager (Receiving a message implies of course that message synchronization has been restored in the mean time). Only at this point, software can apply the message and clear the designated field.

24.9.4.11.5.2 TX Message FIFO Overflow (OVERFLOW)

24.9.4.11.5.2.1 Root Event

Overflow occurs when too many bytes are written into the TX message FIFO by the software, either because the entered message is too long or because the FIFO still contains bytes from previous messages. The state of the FIFO after an overflow event is undetermined, but the other FIFOs are unaffected.

24.9.4.11.5.2.2 Interrupt Service Routine

TX message FIFO must be cleared as explained in [Section 24.9.4.10.1.2](#).

Field [SLIMBUS_SMT_INFO](#)[1] OVERFLOW must be software cleared (by writing 1 to it).

Message transmission must resume normally.

24.9.4.11.5.3 Received Positive Acknowledge Message Response (PACK)

24.9.4.11.5.3.1 Root Event

Message written in the TX message FIFO was transmitted after unlimited, automatic arbitration retries, and removed from the FIFO. Received message response (MR) is PACK.

24.9.4.11.5.3.2 Interrupt Service Routine

No action required for this field: [SLIMBUS_SMT_INFO](#)[2] PACK. FIFO is now available for another message.

24.9.4.11.5.4 Received Negative Acknowledge Message Response (NACK)

24.9.4.11.5.4.1 Root Event

Message written in the TX message FIFO was transmitted after unlimited, automatic arbitration retries, and removed from the FIFO. Received message response (MR) is NACK.

24.9.4.11.5.4.2 Interrupt Service Routine

Current message must be eventually retransmitted until it succeeds or until the retransmit maximum (fully managed by software) is reached.

Field [SLIMBUS_SMT_INFO](#)[3] NACK must be software cleared (by writing 1 to it).

FIFO is available for another message, which can be the same or another one.

24.9.4.11.5.5 Received No Message Response (NORE)

24.9.4.11.5.5.1 Root Event

Message written in the TX message FIFO was transmitted after unlimited, automatic arbitration retries, and removed from the FIFO. Received message response (MR) is NORE.

24.9.4.11.5.5.2 Interrupt Service Routine

Current message must be eventually retransmitted until it succeeds or until the retransmit maximum (fully managed by software) is reached.

Field [SLIMBUS_SMT_INFO](#)[4] NORE must be software cleared (by writing 1 to it).

FIFO is available for another message, which can be the same or another one.

24.9.4.11.5.6 Received Undefined Message Response (UDEF)

24.9.4.11.5.6.1 Root Event

Message written in the TX message FIFO was transmitted after unlimited, automatic arbitration retries, and removed from the FIFO. Received message response (MR) is UDEF, that is, one of several undefined MR codes that are not combinations of legal responses, implying that an error has taken place. Component loses message synchronization, and reacquires it automatically.

24.9.4.11.5.6.2 Interrupt Service Routine

Field [SLIMBUS_SMT_INFO](#)[5] UDEF must be software cleared (by writing 1 to it).

FIFO is available for another message, which can be the same or another one.

24.9.4.11.5.7 TX Message FIFO Underflow (UNDERFLOW)

24.9.4.11.5.7.1 Root Event

Underflow takes place when the message transmission logic attempts to read more bytes than the FIFO contains. The state of the FIFO after an underflow event is undetermined, but the other FIFOs are unaffected.

24.9.4.11.5.7.2 Interrupt Service Routine

TX message FIFO must be cleared as explained in [Section 24.9.4.10.1.2](#).

Field must be software-cleared (by writing 1 to it).

Message transmission must resume normally, making sure the error is not repeated.

24.9.4.11.6 Shared Message Channel Receive ISRs

These ISRs are applied when a bit of status register SMR_INFO is set, which also triggers the assertion of bit field [SLIMBUS_CMP_IRQSTATUS\[3\]](#) SMR_INFO and of the IRQ line, when enabled in bit field [SLIMBUS_CMP_IRQENABLE_SET\[3\]](#) SMR_INFO_EN. Service routines must be applied, and the FR_INFO bit field cleared (by writing 1 to it)

24.9.4.11.6.1 Transmit Collision in Message Response (MC_TX_COL)

24.9.4.11.6.1.1 Root Event

Transmit collision detected while receiving a message, that is, writing the message response subfield. The component automatically loses message synchronization, and eventually reacquires it.

24.9.4.11.6.1.2 Interrupt Service Routine

The field [SLIMBUS_SMR_INFO\[0\]](#) MC_TX_COL must not be unconditionally software cleared, as it implements a Boolean IE that can only be cleared under specific conditions (and together with the [SLIMBUS_SMT_INFO\[0\]](#) MC_TX_COL).

24.9.4.11.6.2 RX Message FIFO Underflow (UNDERFLOW)

24.9.4.11.6.2.1 Root Event

Underflow takes place when too many bytes are read out of the RX message FIFO by the software, because of an error when estimating the message length, as defined in [Section 24.9.4.10.2.2](#). The state of the FIFO after an underflow event is undetermined, but the other FIFOs are unaffected.

24.9.4.11.6.2.2 Interrupt Service Routine

RX message FIFO must be cleared as explained in [Section 24.9.4.10.2.3](#).

Field [SLIMBUS_SMR_INFO\[1\]](#) UNDERFLOW must be software-cleared (by writing 1 to it).

NOTE: This software error is not supposed to take place, since the message itself is assumed to be correct and could affect the correct running of the SLIMbus protocol, if the received message cannot be recovered.

24.9.4.11.6.3 RX Message FIFO Overflow (OVERFLOW)

24.9.4.11.6.3.1 Root Event

Overflow occurs when too many bytes are received into the RX message FIFO because the entered message is too long. The state of the FIFO after an overflow event is undetermined, but the other FIFOs are unaffected.

24.9.4.11.6.3.2 Interrupt Service Routine

RX message FIFO must be cleared as explained in [Section 24.9.4.10.2.3](#).

Field must be software cleared (by writing 1 to it).

Message transmission must resume normally.

24.9.4.11.6.4 Message Received (RECEIVED_MESSAGE)

24.9.4.11.6.4.1 Root Event

A message has been received and checked by the hardware: target address matches a local device (LA or EA), message length is coherent with AT/RL fields, integrity is correct for both PI and MI, all target devices acknowledged the message (PACK MR transmitted and received).

24.9.4.11.6.4.2 Interrupt Service Routine

Received message must be unloaded from RX message FIFO, parsed, and the appropriate action taken, as explained in [Section 24.9.4.10.2.2](#).

Field [SLIMBUS_SMR_INFO\[2\]](#) RECEIVED_MESSAGE must be software cleared (by writing 1 to it). This will also clear the message FIFO and allow the local component to respond PACK to new incoming messages.

24.9.4.11.6.5 Reconfigure_now Message Received (RECEIVED_RECONFIGURE)

24.9.4.11.6.5.1 Root Event

A message has been received as in RECEIVED_MESSAGE event above, with the additional condition that it has been recognized by hardware as a RECONFIGURE_NOW() message. Note that by the time the ISR is executed, the reconfiguration may have already taken place.

24.9.4.11.6.5.2 Interrupt Service Routine

Field [SLIMBUS_SMR_INFO\[3\]](#) RECEIVED_CONFIGURE must be software cleared (by writing 1 to it).

24.9.4.11.7 Data Channel Port ISRs

These ISRs are applied when a bit of a status register [SLIMBUS_DCT_INFO_j](#) and/or [SLIMBUS_DCR_INFO_j](#) is set, which also triggers the assertion of bit field [SLIMBUS_CMP_IRQSTATUS\[11:4\]](#) DCT_INFO_j/DCR_INFO_j and of the IRQ line, when enabled in bit field [SLIMBUS_CMP_IRQENABLE_SET\[11:4\]](#) DCT/DCR_INFO_j. Service routines must be applied, and the [SLIMBUS_DCT_INFO_j](#) and/or [SLIMBUS_DCR_INFO_j](#) bit fields cleared (by writing 1 to it).

24.9.4.11.7.1 Transmit Collision in Data Channel Port (DATA_TX_COL)

24.9.4.11.7.1.1 Root Event

Transmit collision detected while writing to the considered data channel, in any of the TAG, AUX, or DATA fields. Note that transmit collisions are possible even for receive ports, as those port may also write some TAG cells (that is, for pulled TP), where transmit collisions are possible. The device must immediately (before next cell) stop writing to the bus, only resuming on next segment.

24.9.4.11.7.1.2 Interrupt Service Routine

The REPORT_INFORMATION message must be transmitted, from the port's stereo or voice device (that is, with that device's LA in source address of arbitration field), to the active manager (that is, with manager's target LA in header = 0xFF), and containing the information element (IE) of the same name (DATA_TX_COL).

The field [SLIMBUS_DCT_INFO_j\[0\]](#) DATA_TX_COL and/or [SLIMBUS_DCR_INFO_j\[0\]](#) DATA_TX_COL must not be unconditionally software cleared, as it implements a boolean IE that can only be cleared under specific conditions.

24.9.4.11.7.2 Data Channel FIFO Overflow (OVERFLOW)

24.9.4.11.7.2.1 Root Event

Overflow occurs when the data rate into the FIFO exceeds the data rate out of the FIFO for a sufficient amount of time, which can happen in both TX and RX ports. The state of the FIFO after an overflow event is undetermined, but the other FIFOs are unaffected.

24.9.4.11.7.2.2 Interrupt Service Routine

The SLIMbus protocol does not specify the handling of such an event. However, since data integrity cannot be guaranteed following an that event, stopping the channel is an option.

Field [SLIMBUS_DCT_INFO_j\[1\]](#) / [SLIMBUS_DCR_INFO_j\[1\]](#) OVERFLOW must be software cleared (by writing 1 to it).

24.9.4.11.7.3 Data Channel FIFO Underflow (UNDERFLOW)

24.9.4.11.7.3.1 Root Event

Underflow occurs when the data rate out of the FIFO exceeds the data rate into the FIFO for a sufficient amount of time, which can happen in both TX and RX ports. The state of the FIFO after an underflow event is undetermined, but the other FIFOs are unaffected.

24.9.4.11.7.3.2 Interrupt Service Routine

The SLIMbus protocol does not specify the handling of such an event. However, since data integrity cannot be guaranteed following an that event, stopping the channel is an option.

Field [SLIMBUS_DCT_INFO_j\[2\]](#) / [SLIMBUS_DCR_INFO_j\[2\]](#) UNDERFLOW must be software cleared (by writing 1 to it).

24.9.5 SLIMbus Programming Guide

24.9.5.1 SLIMbus Low-Level Programming Models

This section describes the low-level programming sequences for the configuration and use of the SLIMbus module. Because the SLIMbus protocol is implemented partly by hardware and partly by software in the current module, some higher-level procedures, such as sending and answering specific SLIMbus protocol messages, are mentioned for the sake of clarity.

24.9.5.1.1 Global Initialization

24.9.5.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the SLIMbus module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the SLIMbus module. See [Section 24.9.3, SLIMbus Integration](#), and [Section 24.9.2, SLIMbus Environment](#), for further information.

Table 24-671. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|-----------------------------|--|
| PRCM | The required SLIMbus clocks must be enabled. If the SLIMbus module does not contain the active frame, it receives its functional clock (SLIMbus clock) from the CLK pin. For a summary of the SLIMbus clocks, see Table 24-653 . See Chapter 3, Power, Reset, and Clock Management . |
| Control Module | Module specific pad multiplexing must be set in the control module. For more information about the module configuration, see Control Module . |
| (Optional) L4 Interconnect | For information about the L4-PER interconnect configuration, see Chapter 14, Interconnect . |
| (Optional) INTC | Cortex-A9 MPU and DSP subsystem INTCs must be configured to enable the interrupt requests to the Cortex-A9 MPU or to the DSP subsystem. |
| (Optional) sDMA and/or aDMA | sDMA (aDMA) configuration must be done to enable the module DMA channel requests. See sDMA . |

24.9.5.1.1.2 SLIMbus Global Initialization

24.9.5.1.1.2.1 SLIMbus Module Software Reset

This procedure brings the SLIMbus module to a known state.

Table 24-672. SLIMbus Module Software Reset

| Step | Register/Bit Field/Programming Model | Value |
|-------------------------------|--|-------|
| Initiate a software reset. | SLIMBUS_CMP_SYSCONFIG[0] SOFTRESET | 0x1 |
| Wait until reset is finished. | SLIMBUS_CMP_SYSCONFIG[0] SOFTRESET | =0x0 |

24.9.5.1.1.2.2 Power Management and Wake-Up Configuration

This procedure configures the idle mode for SLIMbus component. By definition, the target can handle read/write transactions as long as it is out of IDLE state.

Table 24-673. SLIMbus Power Management

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Configure the local power management. | SLIMBUS_CMP_SYSCONFIG[3:2] IDLEMODE | 0x- |
| Turn on/off internal clock autogating. | SLIMBUS_CMP_SYSCONFIG[8] AUTOGATINGDISABLE | 0x- |

24.9.5.1.2 SLIMbus Component Boot

The component boot sequence is initiated when the component decides to join the bus.

24.9.5.1.2.1 Clock Source Component Boot

This procedure performs component boot in clock source mode (the component contains the active framer of the given bus).

Table 24-674. Clock Source Component Boot

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Set the active-framer boot flag. | SLIMBUS_FR_CONTROL[0] BOOT | 0x1 |
| Select the subframe length and the control space width: subframe mode (SM). | SLIMBUS_FL_SM[4:0] SM | 0x-- |
| Select root/SLIMbus frequency ratio: clock gear (CG). | SLIMBUS_FL_CG[3:0] CG | 0x- |
| Indicate the root frequency (RF) to the framer device. | SLIMBUS_FL_RF[3:0] RF | 0x- |
| Select a source of the functional (SLIMbus) clock (See also , <i>SLIMbus Integration</i>). | SLIMBUS_FR_CLOCK_SOURCE[5:3] CLKSEL | 0x- |
| Select a root divider ratio to obtain the desired root frequency (RF). | SLIMBUS_FR_CLOCK_SOURCE[2:0] CLKDIV | 0x- |
| Initiate reconfiguration. | SLIMBUS_FL_CONTROL[2] FORCE_RECONFIGURE | 0x1 |
| Wait for reconfiguration to finish. | SLIMBUS_FL_CONTROL[2] FORCE_RECONFIGURE | =0x0 |

24.9.5.1.2.2 Clock Receiver Component Boot

This procedure boots the SLIMbus when the component is in clock receiver mode (inactive framer).

Table 24-675. Clock Receiver Component Boot

| Step | Register/Bit Field/Programming Model | Value |
|-------------------------------------|---|-------|
| Set inactive-framer boot flag. | SLIMBUS_FL_CONTROL[0] BOOT | 0x1 |
| Initiate reconfiguration. | SLIMBUS_FL_CONTROL[2] FORCE_RECONFIGURE | 0x1 |
| Wait for reconfiguration to finish. | SLIMBUS_FL_CONTROL[2] FORCE_RECONFIGURE | =0x0 |

24.9.5.1.3 Data Agent Assignment

Before a SLIMbus device enumeration, it is assumed to have a given number of ports, and each port a given set of properties. Software must keep a data port table, updated by various events including SLIMbus resets, data channel config messages, and some reconfiguration messages.

At least one data agent (which implements the data ports in hardware) must be assigned to a SLIMbus device before it can receive/transmit actual payload data. The following settings must be done to configure the SLIMbus module.

Table 24-676. Data Agent Assignment

| Step | Register/Bit Field/ Programming Model | Value |
|---|--|-------|
| Set the port number (PN) for TX and/or RX data agent j. Must be unique within the device that it is mapped to.. | SLIMBUS_DCT_MAP_j[13:8] PN SLIMBUS_DCR_MAP_j[13:8] PN | 0x-- |
| Set the index of the device (DI) TX and or RX data agent j belongs to. | SLIMBUS_DCT_MAP_j[7:0] DI SLIMBUS_DCR_MAP_j[7:0] DI | 0x-- |
| Validate settings. | SLIMBUS_FL_CONTROL [8] VALIDATE_DCMAP | 0x1 |

24.9.5.1.4 Device Enumeration

Device enumeration is an acquisition of a dynamic logical address (LA) assigned by the active manager device. The LA ranges from 0x00 to 0xEF, with the exception of the active manager itself, located by definition at LA = 0xFF.

24.9.5.1.4.1 Manager Device Enumeration

This procedure performs an manager device enumeration when the local manager device is the bus active manager.

Table 24-677. Manager Device Enumeration

| Step | Register/Bit Field/Programming Model | Value |
|---|--|--------------------|
| Wait for message synchronization. | SLIMBUS_FL_INFO [3] FOUND_MS | =0x1 |
| Explicitly enumerate the device as active manager device. | SLIMBUS_DEV_LA_i[7:0] LA SLIMBUS_DEV_LA_i[8] LA_ENABLE SLIMBUS_DEV_LA_i[9] EA_ENABLE | 0xFF 0x1 0x1 |

24.9.5.1.4.2 Non-Manager Device Enumeration

This procedure is used when a non-manager device decides to participate on the bus. When the SLIMbus module contains the active manager, software must also perform the manager-side actions.

Table 24-678. Non-Manager Device Enumeration

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------------|
| Enable the device to receive broadcast messages. | SLIMBUS_DEV_LA_i[9] EA_ENABLE | 0x1 |
| Wait for message synchronization or for REQUEST_SELF_ANNOUNCEMENT() message from active manager. | SLIMBUS_FL_INFO [3] FOUND_MS or see Section 24.9.5.1.6 , <i>SLIMbus Transfer Procedures</i> . | =0x1 |
| Send REPORT_PRESENT() message to the active manager (LA = 0xFF). | See Section 24.9.5.1.6 , <i>SLIMbus Transfer Procedures</i> . | |
| Wait for ASSIGN_LOGICAL_ADDRESS(LA) message from the active manager. | See Section 24.9.5.1.6 , <i>SLIMbus Transfer Procedures</i> . | |
| Extract the LA from the message and set it in the hardware. | SLIMBUS_DEV_LA_i[7:0] LA SLIMBUS_DEV_LA_i[8] LA_ENABLE | 0x-- 0x1 |

24.9.5.1.5 Operational Modes Configuration

24.9.5.1.5.1 SLIMbus Transfer Protocol Configuration

This procedure configures the data channel(s) for a specific transfer protocol use. It is assumed that at this moment the required channels are connected by means of CONNECT_SOURCE(PN,CN) and CONNECT_SINK(PN,CN) messages. No action on hardware is required after receiving these messages, except for the standard checks and clearing of the message FIFO. The channel numbers (CN) are kept and handled by software. The steps listed are required from the configured side, but if the local component contains the active manager software must also perform the configuration steps. Changing the order of NEXT_* messages is allowed.

Table 24-679. SLIMbus Transfer Protocol Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Wait for BEGIN_RECONFIGURATION() message. | | |
| Clear reconfiguration parameters. | SLIMBUS_FL_CONTROL [7] CLEAR_RECONFIGURATION | 0x1 |
| Wait for NEXT_DEFINE_CHANNEL(CN, TP, SD, SL) message. | See Section 24.9.5.1.6 , <i>SLIMbus Transfer Procedures</i> . | |

Table 24-679. SLIMbus Transfer Protocol Configuration (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|--|--------------|
| Extract and set in hardware the transfer protocol (TP) for RX data agent j and/or for TX data agent j. | SLIMBUS_DCR_CONFIG1_j[3:0] TP SLIMBUS_DCT_CONFIG1_j[3:0] TP | 0x- |
| Extract and set in hardware the segment distribution (SD) for RX data agent j and/or for TX data agent j. | SLIMBUS_DCR_CONFIG2_j[11:0] SD SLIMBUS_DCT_CONFIG2_j[11:0] SD | 0x--- |
| Extract and set in hardware the segment length (SL) for RX data agent j and/or for TX data agent j. | SLIMBUS_DCR_CONFIG1_j[9:5] SL SLIMBUS_DCT_CONFIG1_j[9:5] SL | 0x-- |
| IF: Transfer protocol is asynchronous simplex | TP | =0x4 or =0x6 |
| Set secondary owner if data agent j is RX or set primary owner if data agent j is TX. | SLIMBUS_DCR_CONFIG1_j[4] TP_QUALIFIER SLIMBUS_DCT_CONFIG1_j[4] TP_QUALIFIER | 0x1 0x0 |
| ELSEIF: Asynchronous half-duplex | TP | =0x5 or =0x7 |
| Set ownership for data channel (combines one TX and one RX data agent). | SLIMBUS_DCR_CONFIG1_j[4] TP_QUALIFIER SLIMBUS_DCT_CONFIG1_j[4] TP_QUALIFIER | 0x- |
| ENDIF | | |
| Wait for NEXT_DEFINE_CONTENT(CN, FL, PR, AF, DT, CL, DL) message. | See Section 24.9.5.1.6, SLIMbus Transfer Procedures . | |
| Extract and set in hardware the number of AUX slots in a segment for RX data agent j and/or for TX data agent j. | SLIMBUS_DCR_CONFIG1_j[19:16] AF SLIMBUS_DCT_CONFIG1_j[19:16] AF | 0x-- |
| IF: Data type (DT) extracted from message is LPCM audio | DT | =0x1 |
| Enable unsigned-to-OSAM encoding for RX data agent j and/or for TX data agent j. | SLIMBUS_DCR_CONFIG1_j[28] DT_LPCM SLIMBUS_DCT_CONFIG1_j[28] DT_LPCM | 0x1 |
| ELSE | | |
| Disable unsigned-to-OSAM encoding for RX data agent j and/or for TX data agent j. | SLIMBUS_DCR_CONFIG1_j[28] DT_LPCM SLIMBUS_DCT_CONFIG1_j[28] DT_LPCM | 0x0 |
| ENDIF | | |
| Extract and set in hardware the channel link bit (CL) for RX data agent j and/or for TX data agent j. | SLIMBUS_DCR_CONFIG1_j[15] CL SLIMBUS_DCT_CONFIG1_j[15] CL | 0x- |
| Extract and set in hardware the AUX + data length (DL) for RX data agent j and/or for TX data agent j. | SLIMBUS_DCR_CONFIG1_j[14:10] DL SLIMBUS_DCT_CONFIG1_j[14:10] DL | 0x-- |
| Perform the data FIFO(s) setup for RX and/or TX data agent(s). | See Section 24.9.5.1.5.2, SLIMbus Data FIFO Mapping and Setup . | |
| Wait for NEXT_ACTIVATE_CHANNEL() message. | See Section 24.9.5.1.6, SLIMbus Transfer Procedures . | |
| Request enabling of RX data agent j and/or of TX data agent j. | SLIMBUS_DCR_CONFIG1_j[31] ENABLE SLIMBUS_DCT_CONFIG1_j[31] ENABLE | 0x1 |
| Wait for RECONFIGURE_NOW() message. | See Section 24.9.5.1.6, SLIMbus Transfer Procedures . | |
| This message is hardware-decoded and executed. No software action on the module is required except for emptying the FIFO to allow receiving of further messages. | SLIMBUS_SMR_INFO[2] RECEIVED_MESSAGE [3] RECEIVED_CONFIGURE | 0x1 |

24.9.5.1.5.2 SLIMbus Data FIFO Mapping and Setup

This procedure maps each used FIFO to a free zone of the shared buffer. It also sets the FIFO thresholds used to trigger loading and unloading the FIFOs. These settings depend on the available free space, segment word length, and required FIFO depth. Thus, at this moment, the protocol type must be known and the data agent must not be enabled.

Table 24-680. SLIMbus Data FIFO Mapping and Setup

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Set the capacity (in segment words) of data FIFO for RX agent j and/or for TX data agent j. | SLIMBUS_DCR_FIFO_SETUP2_j[7:0] SIZE SLIMBUS_DCT_FIFO_SETUP2_j[7:0] SIZE | 0x-- |
| Set the FIFO base address within shared RAM for RX agent j and/or for TX data agent j. | SLIMBUS_DCR_FIFO_SETUP1_j[11:5] BASE_ADDR SLIMBUS_DCT_FIFO_SETUP1_j[11:5] BASE_ADDR | 0x-- |
| Set SLIMbus-side FIFO threshold for RX data agent j and/or for TX data agent j. | SLIMBUS_DCR_FIFO_SETUP2_j[15:8] SB_THRESHOLD SLIMBUS_DCT_FIFO_SETUP2_j[15:8] SB_THRESHOLD | 0x-- |
| Set software-side FIFO threshold for RX data agent j and/or for TX data agent j. | SLIMBUS_DCR_FIFO_SETUP2_j[23:16] DMA_THRESHOLD SLIMBUS_DCT_FIFO_SETUP2_j[23:16] DMA_THRESHOLD | 0x-- |
| Bring the FIFO to empty state: RX data agent j and/or TX data agent j. | SLIMBUS_DCR_FIFO_SETUP1_j[0] FIFO_CLEAR SLIMBUS_DCT_FIFO_SETUP1_j[0] FIFO_CLEAR | 0x1 |
| Wait for clearing to complete. | SLIMBUS_DCR_FIFO_SETUP1_j[0] FIFO_CLEAR SLIMBUS_DCT_FIFO_SETUP1_j[0] FIFO_CLEAR | =0x0 |

24.9.5.1.6 SLIMbus Transfer Procedures

This section describes the low-level programming steps for message and data reception and transmission. For more information about message syntax, see the *MIPI Alliance Specification for SLIMbus Version 1.01.00*.

24.9.5.1.6.1 Transmitting Message, Polling Mode

This procedure transmits a message over the SLIMbus without the use of interrupts.

Table 24-681. Message Transmit Procedure, Polling Method

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Wait if an ongoing TX message is still in progress. | SLIMBUS_SMT_CONTROL[0] MESSAGE_ENABLE | =0x0 |
| Clear TX message event flags. | SLIMBUS_SMT_INFO[7:0] | 0xBF |
| Load the whole message byte-by-byte, except for the last one. That is, message integrity (MI) and response (MR), which are handled by hardware. The primary integrity (PI) field is computed and overwritten by hardware; thus, write any value for PI. The message cannot be larger than the FIFO size. | SLIMBUS_SMT_MESSAGE[7:0] | 0x-- |
| Initiate the transmit sequence. | SLIMBUS_SMT_CONTROL[0] MESSAGE_ENABLE | 0x1 |
| Check the message outcome by polling the information register bits. Process the event as described in Section 24.9.5.1.7, Event Handling . | SLIMBUS_SMT_INFO Negative response: [3] NACK Positive response: [2] PACK No response: [4] NORE Illegal response: [5] UDEF FIFO overflow: [1] OVERFLOW Transmit collision: [0] MC_TX_COL Message sync loss: [7] ABORT | =0x1 |

24.9.5.1.6.2 Transmitting Message, Interrupt Mode

This procedure transmits a message over the SLIMbus with interrupts enabled.

Table 24-682. Message Transmit Procedure, Interrupt Method

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Enable the shared-message-channel transmit interrupts. | SLIMBUS_CMP_IRQENABLE_SET[2] SMT_INFO_EN | 0x1 |
| Clear the interrupt status bit. | SLIMBUS_CMP_IRQSTATUS [2] SMT_INFO | 0x1 |
| The procedure continues without difference from polling mode. The exception is that if any info bit is set, it triggers an interrupt. The interrupt-service-routine then checks which info bit is set. | See Section 24.9.5.1.6.1, Transmitting Message, Polling Mode . | |

24.9.5.1.6.3 Receiving Message, Polling Mode

This procedure reads a received in FIFO message without using interrupts.

Table 24-683. Message Receive Procedure, Polling Method

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Check for a received message. | SLIMBUS_SMR_INFO[2] RECEIVED_MESSAGE | =0x1 |
| IF: Message is RECONFIGURE_NOW() | SLIMBUS_SMR_INFO[3] RECEIVED_RECONFIGURE | =0x1 |
| RECONFIGURE_NOW() is hardware-decoded and executed. Software is required only to allow further message reception. | SLIMBUS_SMR_INFO[2] RECEIVED_MESSAGE SLIMBUS_SMR_INFO[3] RECEIVED_RECONFIGURE | 0x1 |
| ELSE | | |

Table 24-683. Message Receive Procedure, Polling Method (continued)

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------------|
| Read the message byte-by-byte and decode it in parallel. The message size is determined from the message itself, from the arbitration type (AT) and remaining length (RL) fields. Read until message end is reached: (2 bytes if AT = 0xF, or 7 bytes if AT = 0x5) + 1 byte + RL bytes | SLIMBUS_SMR_MESSAGE[7:0] | 0x- |
| Optionally, software can check for FIFO underflow event after every read out. Last byte then must be ignored. The event flag must be cleared by writing 0x1 to it. | SLIMBUS_SMR_INFO[1] UNDERFLOW SLIMBUS_SMR_INFO[1] UNDERFLOW | =0x1 0x1 |
| Allow further message reception. | SLIMBUS_SMR_INFO[2] RECEIVED_MESSAGE | 0x1 |
| ENDIF | | |

24.9.5.1.6.4 Receiving Message, Interrupt Mode

This procedure reads the received in FIFO message by using interrupts.

Table 24-684. Message Receive, Interrupt Method

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Enable the shared-message-channel receive interrupts. | SLIMBUS_CMP_IRQENABLE_SET[3] SMR_INFO_EN | 0x1 |
| Clear the interrupt status bit. | SLIMBUS_CMP_IRQSTATUS [3] SMR_INFO | 0x1 |
| Wait for SMR_INFO interrupt. | | |
| Clear the interrupt status bit. | SLIMBUS_CMP_IRQSTATUS [3] SMR_INFO | 0x1 |
| The procedure continues without difference from polling mode. The exception is that any set info bit triggers an interrupt. The interrupt-service-routine then checks to determine which event occurred. | See Section 24.9.5.1.6.3, Receiving Message, Polling Mode . | |

24.9.5.1.6.5 Receiving Data

This procedure reads actual payload data off the FIFO. The data is read one data segment at a time (AUX + data) with no packing mode. Packing allows several small segments to be fit in a single FIFO access. Packing mode is selected through the SLIMBUS_DCR_FIFO_SETUP2_j[31] PACKING bit field.

Table 24-685. Receiving Data, Polling Method

| Step | Register/Bit Field/Programming Model | Value |
|--|---------------------------------------|----------------------|
| Wait for SLIMBUS_DCR_FIFO_SETUP2_j[23:16] DMA_THRESHOLD number of segment words to be available in FIFO. | SLIMBUS_DCR_FIFO_STATUS_j [1] HILEVEL | =0x1 |
| Read SLIMBUS_DCR_FIFO_SETUP2_j[23:16] DMA_THRESHOLD segment words from FIFO. | SLIMBUS_DCR_DATA_j | See ⁽¹⁾ . |
| Additionally, software can check whether no more segments are available to read. | SLIMBUS_DCR_FIFO_STATUS_j [0] EMPTY | =0x1 |

⁽¹⁾ Segment word size varies between 1 and 8 slots (4 and 32 bits). Segments can be in packed or nonpacked mode.

The following procedure uses an interrupt method to receive data.

Table 24-686. Receiving Data, Interrupt Method

| Step | Register/Bit Field/Programming Model | Value |
|---|---|--------------------|
| Enable the data receive interrupt. Write 0x1 for the required data agent. | SLIMBUS_CMP_IRQENABLE_SET | 0x1 |
| Clear the corresponding interrupt status bit. | SLIMBUS_CMP_IRQSTATUS | 0x1 |
| Wait for interrupt. | | |
| Check the high-level info bit. | SLIMBUS_DCR_INFO_j [3] HILEVEL | =0x1 |
| Clear the interrupt status bit of the data agent. | SLIMBUS_CMP_IRQSTATUS | 0x1 |
| Read SLIMBUS_DCR_FIFO_SETUP2_j [23:16] DMA_THRESHOLD segment words from FIFO. | SLIMBUS_DCR_DATA_j | See ⁽¹⁾ |
| Additionally, software can check whether no more segments are available to read. | SLIMBUS_DCR_FIFO_STATUS_j [0] EMPTY | =0x1 |
| Clear the high-level info bit. | SLIMBUS_DCR_INFO_j [3] HILEVEL | 0x1 |

⁽¹⁾ Segment word size varies between 1 and 8 slots (4 and 32 bits). Segments can be in packed or nonpacked mode.

This procedure enables DMA request generation to the sDMA or aDMA engine, which must be configured in advance. DMA request starts whenever the threshold condition is met. DMA request stops after a certain number of nonempty read accesses to the FIFO are complete. This size typically corresponds to a DMA burst and in the [SLIMBUS_DCR_FIFO_SETUP1_j](#)[4:1] DMA_REQ_SIZE bit field.

Table 24-687. Receiving Data, DMA Enable

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Set DMA request size (for precise DMA mode). | SLIMBUS_DCR_FIFO_SETUP1_j [4:1] DMA_REQ_SIZE | 0x- |
| Enable the data receive DMA requests. Write 0x1 for the required RX data agent. | SLIMBUS_CMP_DMAENABLE_SET | 0x1 |

24.9.5.1.6.6 Transmitting Data

This procedure loads actual payload data into the FIFO. The data is loaded one data segment at a time (AUX + data), when packing mode is not used. Packing allows several small segments to be fit into a single FIFO access. Packing mode is selected through the [SLIMBUS_DCT_FIFO_SETUP2_j](#)[31] PACKING bit field.

Table 24-688. Transmitting Data, Polling Method

| Step | Register/Bit Field/Programming Model | Value |
|--|---|--------------------|
| Wait for SLIMBUS_DCT_FIFO_SETUP2_j [23:16] DMA_THRESHOLD number of free segment words. | SLIMBUS_DCT_FIFO_STATUS_j [1] LOLEVEL | =0x1 |
| Write SLIMBUS_DCR_FIFO_SETUP2_j [23:16] DMA_THRESHOLD segment words to FIFO. | SLIMBUS_DCT_DATA_j | See ⁽¹⁾ |
| Additionally, software can check whether no more FIFO space is available to write. | SLIMBUS_DCT_FIFO_STATUS_j [0] FULL | =0x1 |

⁽¹⁾ Segment word size varies between 1 and 8 slots (4 and 32 bits). Segments can be in packed or nonpacked mode.

The following procedure uses an interrupt method to transmit data.

Table 24-689. Transmitting Data, Interrupt Method

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Enable the data transmit interrupt. Write 0x1 for the required data agent. | SLIMBUS_CMP_IRQENABLE_SET | 0x1 |
| Clear the corresponding interrupt status bit. | SLIMBUS_CMP_IRQSTATUS | 0x1 |
| Wait for interrupt. | | |

Table 24-689. Transmitting Data, Interrupt Method (continued)

| Step | Register/Bit Field/Programming Model | Value |
|---|--|--------------------|
| Check the low-level info bit. | SLIMBUS_DCT_INFO_j [3] LOLEVEL | =0x1 |
| Clear the interrupt status bit of the data agent. | SLIMBUS_CMP_IRQSTATUS | 0x1 |
| Read SLIMBUS_DCT_FIFO_SETUP2_j [23:16] DMA_THRESHOLD segment words from FIFO. | SLIMBUS_DCT_DATA_j | See ⁽¹⁾ |
| Additionally, software can check if no more space is available to write | SLIMBUS_DCT_FIFO_STATUS_j [0] FULL | =0x1 |
| Clear the low-level info bit. | SLIMBUS_DCT_INFO_j [3] LOLEVEL | 0x1 |

⁽¹⁾ Segment word size varies between 1 and 8 slots (4 and 32 bits). Segments can be in packed or nonpacked mode.

This procedure enables DMA request generation to the sDMA or aDMA engine, which must be configured in advance. DMA request starts whenever the threshold condition is met. DMA requests stops after a certain number of nonempty read accesses to the FIFO are complete. This size typically corresponds to a DMA burst and in the [SLIMBUS_DCT_FIFO_SETUP1_j](#)[4:1] DMA_REQ_SIZE bit field.

Table 24-690. Transmitting Data, DMA Enable

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Set DMA request size (for presize DMA mode). | SLIMBUS_DCT_FIFO_SETUP1_j [4:1] DMA_REQ_SIZE | 0x- |
| Enable the data receive DMA requests. Write 0x1 for the required TX data agent. | SLIMBUS_CMP_DMAENABLE_SET | 0x1 |

24.9.5.1.7 Event Handling

Events must be serviced in the following way:

1. Clear the interrupt status bit (if interrupts are enabled).
2. Read the relative information register to determine the event.
3. Process the event as required. See [Section 24.9.4.11.1, Interrupt Requests](#).
4. When needed and allowed, clear the information register bit(s). For example, it is not necessary to clear the [SLIMBUS_SMR_INFO](#)[2] RECEIVED_MESSAGE bit until the message is read, decoded, and executed, as it will allow the reception of other messages.

24.9.6 SLIMbus Register Manual

24.9.6.1 SLIMbus Register Overview

The registers described in this section are prefixed with one of the following:

- **CMP:** Component- (that is, module) level control and status.
- **SMT:** Shared Messages Transmit: All messages transmitted to the serial SLIMbus interface. This resource is shared by all devices within the component (all devices can transmit messages).
- **SMR:** Shared Messages Receive: All messages received from the serial SLIMbus interface. This resource is shared by all devices within the component (all devices can receive messages).
- **FL:** Frame Layer status and control. The frame layer is the hardware-implemented protocol layer located just above the physical layer, and shared by all devices of a component.
- **FR:** Framer device-specific status and control. The framer device is one of the component's devices (logical entities of the SLIMbus); exactly one framer device may optionally be implemented in each SLIMbus component. Note that the framer device is not always active (in which case the related registers aren't used either), and that some of the framer's control and status is shared with the (always-present, always-active) interface device.
- **DEV:** Device control and status. The same register structure is repeated as many times as there are devices supported by the component (that is, the module), including the (compulsory) interface device, the framer device (optional), the manager device (optional), and the generic devices (optional, one or several instances).
- **DCT:** Data Channel Transmit: The same register structure is repeated as many times as there are transmit data channels supported, that is, FIFOs and associated logic. Devices (typically generic devices) are associated to a data channel for the transmissions of data towards the SLIMbus serial interface.
- **DCR:** Data Channel Receive: The same register structure is repeated as many times as there are receive data channels supported, that is, FIFOs and associated logic. Devices (typically generic devices) are associated to a data channel for the reception of data from the SLIMbus serial interface.

24.9.6.2 SLIMbus Instance Summary

Table 24-691 shows the base address and address space for the SLIMbus module instances.

Table 24-691. SLIMbus Instance Summary

| Module Name | Base Address L3 Interconnect | Base Address Cortex-A9 Private Access | Base Address DSP Private Access | Size |
|-------------|---------------------------------|--|------------------------------------|------|
| SLIMBUS1 | 0x4902 C000 | 0x4012 C000 | 0x2 C000 | 4 KB |
| SLIMBUS2 | 0x4807 6000 | - | - | 4 KB |

NOTE: Private Access is an access which is not using the L3/L4 interconnects.

24.9.6.3 SLIMbus Registers

24.9.6.3.1 SLIMBUS1 Register Summary

Table 24-692. SLIMBUS1 Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|---------------------------------------|------|-----------------------------|----------------|--|--|---|
| SLIMBUS_CMP_REVISION | R | 32 | 0x0000 0000 | 0x4902 C000 | 0x4012 C000 | 0x2 C000 |
| SLIMBUS_CMP_HWINFO | R | 32 | 0x0000 0004 | 0x4902 C004 | 0x4012 C004 | 0x2 C004 |
| SLIMBUS_CMP_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4902 C010 | 0x4012 C010 | 0x2 C010 |

Table 24-692. SLIMBUS1 Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|---|------|-----------------------|--------------------------|----------------------------------|---|-------------------------------------|
| RESERVED | RW | 32 | 0x0000 0020 | 0x4902 C020 | 0x4012 C020 | 0x2 C020 |
| SLIMBUS_CMP_IRQSTATUS_RAW | RW | 32 | 0x0000 0024 | 0x4902 C024 | 0x4012 C024 | 0x2 C024 |
| SLIMBUS_CMP_IRQSTATUS | RW | 32 | 0x0000 0028 | 0x4902 C028 | 0x4012 C028 | 0x2 C028 |
| SLIMBUS_CMP_IRQENABLE_SET | RW | 32 | 0x0000 002C | 0x4902 C02C | 0x4012 C02C | 0x2 C02C |
| SLIMBUS_CMP_IRQENABLE_CLR | RW | 32 | 0x0000 0030 | 0x4902 C030 | 0x4012 C030 | 0x2 C030 |
| SLIMBUS_CMP_DMAENABLE_SET | RW | 32 | 0x0000 0034 | 0x4902 C034 | 0x4012 C034 | 0x2 C034 |
| SLIMBUS_CMP_DMAENABLE_CLR | RW | 32 | 0x0000 0038 | 0x4902 C038 | 0x4012 C038 | 0x2 C038 |
| SLIMBUS_CMP_IV | RW | 32 | 0x0000 0040 | 0x4902 C040 | 0x4012 C040 | 0x2 C040 |
| SLIMBUS_CMP_MI_PC | RW | 32 | 0x0000 0044 | 0x4902 C044 | 0x4012 C044 | 0x2 C044 |
| SLIMBUS_SMT_INFO | RW | 32 | 0x0000 0050 | 0x4902 C050 | 0x4012 C050 | 0x2 C050 |
| SLIMBUS_SMT_MESSAGE | RW | 32 | 0x0000 0054 | 0x4902 C054 | 0x4012 C054 | 0x2 C054 |
| SLIMBUS_SMT_CONTROL | RW | 32 | 0x0000 0058 | 0x4902 C058 | 0x4012 C058 | 0x2 C058 |
| SLIMBUS_SMT_FIFO_SETUP | RW | 32 | 0x0000 005C | 0x4902 C05C | 0x4012 C05C | 0x2 C05C |
| SLIMBUS_SMR_INFO | RW | 32 | 0x0000 0060 | 0x4902 C060 | 0x4012 C060 | 0x2 C060 |
| SLIMBUS_SMR_MESSAGE | R | 32 | 0x0000 0064 | 0x4902 C064 | 0x4012 C064 | 0x2 C064 |
| SLIMBUS_SMR_CONTROL | RW | 32 | 0x0000 0068 | 0x4902 C068 | 0x4012 C068 | 0x2 C068 |
| SLIMBUS_SMR_FIFO_SETUP | RW | 32 | 0x0000 006C | 0x4902 C06C | 0x4012 C06C | 0x2 C06C |
| SLIMBUS_FL_INFO | RW | 32 | 0x0000 0070 | 0x4902 C070 | 0x4012 C070 | 0x2 C070 |
| SLIMBUS_FL_CONTROL | RW | 32 | 0x0000 0074 | 0x4902 C074 | 0x4012 C074 | 0x2 C074 |
| SLIMBUS_FL_SM | RW | 32 | 0x0000 0078 | 0x4902 C078 | 0x4012 C078 | 0x2 C078 |
| SLIMBUS_FL_CG | RW | 32 | 0x0000 007C | 0x4902 C07C | 0x4012 C07C | 0x2 C07C |
| SLIMBUS_FL_RF | RW | 32 | 0x0000 0080 | 0x4902 C080 | 0x4012 C080 | 0x2 C080 |
| SLIMBUS_FR_INFO | RW | 32 | 0x0000 0090 | 0x4902 C090 | 0x4012 C090 | 0x2 C090 |
| SLIMBUS_FR_CLOCK_SOURCE | RW | 32 | 0x0000 0094 | 0x4902 C094 | 0x4012 C094 | 0x2 C094 |
| SLIMBUS_FR_CONTROL | RW | 32 | 0x0000 0098 | 0x4902 C098 | 0x4012 C098 | 0x2 C098 |
| SLIMBUS_FR_FRAMER_HANOVER | RW | 32 | 0x0000 009C | 0x4902 C09C | 0x4012 C09C | 0x2 C09C |
| SLIMBUS_FR_CLOCK_PAUSE | RW | 32 | 0x0000 00A0 | 0x4902 C0A0 | 0x4012 C0A0 | 0x2 C0A0 |
| SLIMBUS_DEV_LA _i ⁽¹⁾ | RW | 32 | 0x0000 0100 + (0x10 * i) | 0x4902 C100 + (0x10 * i) | 0x4012 C100 + (0x10 * i) | 0x2 C100 + (0x10 * i) |
| SLIMBUS_DEV_EA_LO _i ⁽¹⁾ | R | 32 | 0x0000 0104 + (0x10 * i) | 0x4902 C104 + (0x10 * i) | 0x4012 C104 + (0x10 * i) | 0x2 C104 + (0x10 * i) |
| SLIMBUS_DEV_EA_HI _i ⁽¹⁾ | R | 32 | 0x0000 0108 + (0x10 * i) | 0x4902 C108 + (0x10 * i) | 0x4012 C108 + (0x10 * i) | 0x2 C108 + (0x10 * i) |
| SLIMBUS_DCT_INFO _j ⁽²⁾ | RW | 32 | 0x0000 0200 + (0x20 * j) | 0x4902 C200 + (0x20 * j) | 0x4012 C200 + (0x20 * j) | 0x2 C200 + (0x20 * j) |
| SLIMBUS_DCT_FIFO_SETUP1 _j ⁽²⁾ | RW | 32 | 0x0000 0204 + (0x20 * j) | 0x4902 C204 + (0x20 * j) | 0x4012 C204 + (0x20 * j) | 0x2 C204 + (0x20 * j) |
| SLIMBUS_DCT_FIFO_SETUP2 _j ⁽²⁾ | RW | 32 | 0x0000 0208 + (0x20 * j) | 0x4902 C208 + (0x20 * j) | 0x4012 C208 + (0x20 * j) | 0x2 C208 + (0x20 * j) |

⁽¹⁾ i = 0 to 6⁽²⁾ j = 0 to 7

Table 24-692. SLIMBUS1 Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect | Physical Address Cortex-A9 Private Access | Physical Address DSP Private Access |
|--|------|-----------------------|-----------------------------|----------------------------------|---|-------------------------------------|
| SLIMBUS_DCT_FIFO_STATU S_j ⁽²⁾ | RW | 32 | 0x0000 020C + (0x20 * j) | 0x4902 C20C + (0x20 * j) | 0x4012 C20C + (0x20 * j) | 0x2 C20C + (0x20 * j) |
| SLIMBUS_DCT_MAP_j ⁽²⁾ | RW | 32 | 0x0000 0210 + (0x20 * j) | 0x4902 C210 + (0x20 * j) | 0x4012 C210 + (0x20 * j) | 0x2 C210 + (0x20 * j) |
| SLIMBUS_DCT_CONFIG1_j ⁽²⁾ | RW | 32 | 0x0000 0214 + (0x20 * j) | 0x4902 C214 + (0x20 * j) | 0x4012 C214 + (0x20 * j) | 0x2 C214 + (0x20 * j) |
| SLIMBUS_DCT_CONFIG2_j ⁽²⁾ | RW | 32 | 0x0000 0218 + (0x20 * j) | 0x4902 C218 + (0x20 * j) | 0x4012 C218 + (0x20 * j) | 0x2 C218 + (0x20 * j) |
| SLIMBUS_DCT_DATA_j ⁽²⁾ | RW | 32 | 0x0000 021C + (0x20 * j) | 0x4902 C21C + (0x20 * j) | 0x4012 C21C + (0x20 * j) | 0x2 C21C + (0x20 * j) |
| SLIMBUS_DCR_INFO_j ⁽²⁾ | RW | 32 | 0x0000 0300 + (0x20 * j) | 0x4902 C300 + (0x20 * j) | 0x4012 C300 + (0x20 * j) | 0x2 C300 + (0x20 * j) |
| SLIMBUS_DCR_FIFO_SETU P1_j ⁽²⁾ | RW | 32 | 0x0000 0304 + (0x20 * j) | 0x4902 C304 + (0x20 * j) | 0x4012 C304 + (0x20 * j) | 0x2 C304 + (0x20 * j) |
| SLIMBUS_DCR_FIFO_SETU P2_j ⁽²⁾ | RW | 32 | 0x0000 0308 + (0x20 * j) | 0x4902 C308 + (0x20 * j) | 0x4012 C308 + (0x20 * j) | 0x2 C308 + (0x20 * j) |
| SLIMBUS_DCR_FIFO_STAT US_j ⁽²⁾ | RW | 32 | 0x0000 030C + (0x20 * j) | 0x4902 C30C + (0x20 * j) | 0x4012 C30C + (0x20 * j) | 0x2 C30C + (0x20 * j) |
| SLIMBUS_DCR_MAP_j ⁽²⁾ | RW | 32 | 0x0000 0310 + (0x20 * j) | 0x4902 C310 + (0x20 * j) | 0x4012 C310 + (0x20 * j) | 0x2 C310 + (0x20 * j) |
| SLIMBUS_DCR_CONFIG1_j ⁽³⁾ | RW | 32 | 0x0000 0314 + (0x20 * j) | 0x4902 C314 + (0x20 * j) | 0x4012 C314 + (0x20 * j) | 0x2 C314 + (0x20 * j) |
| SLIMBUS_DCR_CONFIG2_j ⁽³⁾ | RW | 32 | 0x0000 0318 + (0x20 * j) | 0x4902 C318 + (0x20 * j) | 0x4012 C318 + (0x20 * j) | 0x2 C318 + (0x20 * j) |
| SLIMBUS_DCR_DATA_j ⁽³⁾ | R | 32 | 0x0000 031C + (0x20 * j) | 0x4902 C31C + (0x20 * j) | 0x4012 C31C + (0x20 * j) | 0x2 C31C + (0x20 * j) |

⁽³⁾ j = 0 to 7

24.9.6.3.2 SLIMBUS2 Register Summary

Table 24-693. SLIMBUS2 Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect |
|---------------------------|------|-----------------------|----------------|----------------------------------|
| SLIMBUS_CMP_REVISION | R | 32 | 0x0000 0000 | 0x4807 6000 |
| SLIMBUS_CMP_HWINFO | R | 32 | 0x0000 0004 | 0x4807 6004 |
| SLIMBUS_CMP_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4807 6010 |
| RESERVED | RW | 32 | 0x0000 0020 | 0x4807 6020 |
| SLIMBUS_CMP_IRQSTATUS_RAW | RW | 32 | 0x0000 0024 | 0x4807 6024 |
| SLIMBUS_CMP_IRQSTATUS | RW | 32 | 0x0000 0028 | 0x4807 6028 |
| SLIMBUS_CMP_IRQENABLE_SET | RW | 32 | 0x0000 002C | 0x4807 602C |
| SLIMBUS_CMP_IRQENABLE_CLR | RW | 32 | 0x0000 0030 | 0x4807 6030 |
| SLIMBUS_CMP_DMAENABLE_SET | RW | 32 | 0x0000 0034 | 0x4807 6034 |
| SLIMBUS_CMP_DMAENABLE_CLR | RW | 32 | 0x0000 0038 | 0x4807 6038 |
| SLIMBUS_CMP_IV | RW | 32 | 0x0000 0040 | 0x4807 6040 |
| SLIMBUS_CMP_MI_PC | RW | 32 | 0x0000 0044 | 0x4807 6044 |
| SLIMBUS_SMT_INFO | RW | 32 | 0x0000 0050 | 0x4807 6050 |
| SLIMBUS_SMT_MESSAGE | RW | 32 | 0x0000 0054 | 0x4807 6054 |
| SLIMBUS_SMT_CONTROL | RW | 32 | 0x0000 0058 | 0x4807 6058 |
| SLIMBUS_SMT_FIFO_SETUP | RW | 32 | 0x0000 005C | 0x4807 605C |

Table 24-693. SLIMBUS2 Register Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address L3 Interconnect |
|--|------|-----------------------|--------------------------|----------------------------------|
| SLIMBUS_SMR_INFO | RW | 32 | 0x0000 0060 | 0x4807 6060 |
| SLIMBUS_SMR_MESSAGE | R | 32 | 0x0000 0064 | 0x4807 6064 |
| SLIMBUS_SMR_CONTROL | RW | 32 | 0x0000 0068 | 0x4807 6068 |
| SLIMBUS_SMR_FIFO_SETUP | RW | 32 | 0x0000 006C | 0x4807 606C |
| SLIMBUS_FL_INFO | RW | 32 | 0x0000 0070 | 0x4807 6070 |
| SLIMBUS_FL_CONTROL | RW | 32 | 0x0000 0074 | 0x4807 6074 |
| SLIMBUS_FL_SM | RW | 32 | 0x0000 0078 | 0x4807 6078 |
| SLIMBUS_FL_CG | RW | 32 | 0x0000 007C | 0x4807 607C |
| SLIMBUS_FL_RF | RW | 32 | 0x0000 0080 | 0x4807 6080 |
| SLIMBUS_FR_INFO | RW | 32 | 0x0000 0090 | 0x4807 6090 |
| SLIMBUS_FR_CLOCK_SOURCE | RW | 32 | 0x0000 0094 | 0x4807 6094 |
| SLIMBUS_FR_CONTROL | RW | 32 | 0x0000 0098 | 0x4807 6098 |
| SLIMBUS_FR_FRAMER_HANDOVER | RW | 32 | 0x0000 009C | 0x4807 609C |
| SLIMBUS_FR_CLOCK_PAUSE | RW | 32 | 0x0000 00A0 | 0x4807 60A0 |
| SLIMBUS_DEV_LA_i ⁽¹⁾ | RW | 32 | 0x0000 0100 + (0x10 * i) | 0x4807 6100 + (0x10 * i) |
| SLIMBUS_DEV_EA_LO_i ⁽¹⁾ | R | 32 | 0x0000 0104 + (0x10 * i) | 0x4807 6104 + (0x10 * i) |
| SLIMBUS_DEV_EA_HI_i ⁽¹⁾ | R | 32 | 0x0000 0108 + (0x10 * i) | 0x4807 6108 + (0x10 * i) |
| SLIMBUS_DCT_INFO_j ⁽²⁾ | RW | 32 | 0x0000 0200 + (0x20 * j) | 0x4807 6200 + (0x20 * j) |
| SLIMBUS_DCT_FIFO_SETUP1_j ⁽²⁾ | RW | 32 | 0x0000 0204 + (0x20 * j) | 0x4807 6204 + (0x20 * j) |
| SLIMBUS_DCT_FIFO_SETUP2_j ⁽²⁾ | RW | 32 | 0x0000 0208 + (0x20 * j) | 0x4807 6208 + (0x20 * j) |
| SLIMBUS_DCT_FIFO_STATUS_j ⁽²⁾ | RW | 32 | 0x0000 020C + (0x20 * j) | 0x4807 620C + (0x20 * j) |
| SLIMBUS_DCT_MAP_j ⁽²⁾ | RW | 32 | 0x0000 0210 + (0x20 * j) | 0x4807 6210 + (0x20 * j) |
| SLIMBUS_DCT_CONFIG1_j ⁽²⁾ | RW | 32 | 0x0000 0214 + (0x20 * j) | 0x4807 6214 + (0x20 * j) |
| SLIMBUS_DCT_CONFIG2_j ⁽²⁾ | RW | 32 | 0x0000 0218 + (0x20 * j) | 0x4807 6218 + (0x20 * j) |
| SLIMBUS_DCT_DATA_j ⁽²⁾ | RW | 32 | 0x0000 021C + (0x20 * j) | 0x4807 621C + (0x20 * j) |
| SLIMBUS_DCR_INFO_j ⁽²⁾ | RW | 32 | 0x0000 0280 + (0x20 * j) | 0x4807 6280 + (0x20 * j) |
| SLIMBUS_DCR_FIFO_SETUP1_j ⁽²⁾ | RW | 32 | 0x0000 0284 + (0x20 * j) | 0x4807 6284 + (0x20 * j) |
| SLIMBUS_DCR_FIFO_SETUP2_j ⁽²⁾ | RW | 32 | 0x0000 0288 + (0x20 * j) | 0x4807 6288 + (0x20 * j) |
| SLIMBUS_DCR_FIFO_STATUS_j ⁽²⁾ | RW | 32 | 0x0000 028C + (0x20 * j) | 0x4807 628C + (0x20 * j) |
| SLIMBUS_DCR_MAP_j ⁽²⁾ | RW | 32 | 0x0000 0290 + (0x20 * j) | 0x4807 6290 + (0x20 * j) |
| SLIMBUS_DCR_CONFIG1_j ⁽²⁾ | RW | 32 | 0x0000 0294 + (0x20 * j) | 0x4807 6294 + (0x20 * j) |
| SLIMBUS_DCR_CONFIG2_j ⁽²⁾ | RW | 32 | 0x0000 0298 + (0x20 * j) | 0x4807 6298 + (0x20 * j) |
| SLIMBUS_DCR_DATA_j ⁽²⁾ | R | 32 | 0x0000 029C + (0x20 * j) | 0x4807 629C + (0x20 * j) |

⁽¹⁾ i = 0 to 6⁽²⁾ j = 0 to 3**24.9.6.3.3 SLIMbus Register Descriptions**

Table 24-694. SLIMBUS_CMP_REVISION

| | | | |
|------------------|---|----------|--|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4902 C000 0x4012 C000 0x2 C000 0x4807 6000 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | IP Revision Identifier Used by software to track features, bugs, and compatibility | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|----------------------------|
| 31:0 | REVISION | Revision Number | R | 0x---- ---- ⁽¹⁾ |

⁽¹⁾ TI internal data.

Table 24-695. Register Call Summary for Register SLIMBUS_CMP_REVISION

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMBUS1 Register Summary: \[0\]](#)
- [SLIMBUS2 Register Summary: \[1\]](#)

Table 24-696. SLIMBUS_CMP_HWINFO

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0004 | | |
| Physical Address | 0x4902 C004 0x4012 C004 0x2 C004 0x4807 6004 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Those read-only, hardcoded fields display the values of the eponymous hardware configuration depending on module instantiation - SLIMBUS1 or SLIMBUS2. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|-----|----|----|----|-----|----|----|----|------|----|----|----|------|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DEV | | | | TDC | | | | RDC | | | | RRSZ | | | | TRSZ | | | | PSZ | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------------------------------|
| 31:28 | DEV | Device count: number of devices supported by the component, most notably through the automatic reception of the messages addressed to them. Sets the number of instances of the "DEV_XYZ" registers. | R | 0x7 |
| 27:24 | TDC | Transmit Data agent Count: Number of transmit hardware data agents (FIFO and associated logic) Sets the number of instances of the "DCT_XYZ" registers. | R | See Table 24-698 |
| 23:20 | RDC | Receive Data agent Count: Number of receive hardware data agents (FIFO and associated logic) Sets the number of instances of the "DCR_XYZ" registers. | R | See Table 24-698 |
| 19:12 | RRSZ | Size of receive FIFO RAM, in 32-bit words. RX message FIFO and all RX data FIFOs map to that shared RAM. | R | See Table 24-698 |
| 11:4 | TRSZ | Size of transmit FIFO RAM, in 32-bit words. TX message FIFO and all TX data FIFOs map to that shared RAM. | R | See Table 24-698 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 3:0 | PSZ | Size of (both TX and RX) FIFO segment word pointers, in bits. Determines the maximum number of (variable-sized) segment words a data agent FIFO can contain. Sets the width of FIFO control and status fields: size, threshold, level. | R | 0x8 |

Table 24-697. Register Call Summary for Register SLIMBUS_CMP_HWINFO

Serial Low-Power Inter-Chip Media Bus Controller

- [FIFO Management: \[0\] \[1\]](#)
- [SLIMBUS1 Register Summary: \[2\]](#)
- [SLIMBUS2 Register Summary: \[3\]](#)

Table 24-698. Reset values for SLIMBUS_CMP_HWINFO

| | TDC | RDC | RRSZ | TRSZ |
|----------|-----|-----|------|------|
| SLIMBUS1 | 0x8 | 0x8 | 0x38 | 0x38 |
| SLIMBUS2 | 0x4 | 0x4 | 0x80 | 0x80 |

Table 24-699. SLIMBUS_CMP_SYSCONFIG

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0010 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Physical Address | 0x4902 C010 0x4012 C010 0x2 C010 0x4807 6010 | | |
| Description | This register allows controlling various parameters of the interconnect interface | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----------|----|----|----|----------|---|----------|---|-----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | AUTOGATINGDISABLE | | RESERVED | | | | IDLEMODE | | RESERVED | | SOFTRESET | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|--|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | AUTOGATINGDISABLE | Control of the internal clock autogating for safety / debug only. No impact on module functionality, only on dynamic power. 0x0: Internal clocks are gated off when unused, power is optimized. 0x1: Internal clocks are free-running, maximum dynamic power. | RW | 0 |
| 7:4 | RESERVED | | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 3:2 | IDLEMODE | <p>Configuration of the local target state management mode. By definition, target can handle read/write transaction as long as it is out of IDLE state.</p> <p>0x0: Force-idle mode: local target's idle state follows (acknowledges) the system's idle requests unconditionally, that is, regardless of the IP module's internal requirements. Backup mode, for debug only.</p> <p>0x1: No-idle mode: local target never enters idle state. Backup mode, for debug only.</p> <p>0x3: Smart-idle wakeup-capable mode: local target's idle state eventually follows (acknowledges) the system's idle requests, depending on the IP module's internal requirements. IP module may generate (IRQ- or DMA-request-related) wakeup events when in idle state. Mode is only relevant if the appropriate IP module "swakeup" output(s) is (are) implemented.</p> <p>0x2: Smart-idle mode: local target's idle state eventually follows (acknowledges) the system's idle requests, depending on the IP module's internal requirements. IP module shall not generate (IRQ- or DMA-request-related) wakeup events.</p> | RW | 0x2 |
| 1 | RESERVED | | R | 0 |
| 0 | SOFTRESET | <p>Software reset. (Optional)</p> <p>Write 0x0: No action</p> <p>Write 0x1: Initiate software reset</p> <p>Read 0x1: Reset (software or other) ongoing</p> <p>Read 0x0: Reset done, no pending action</p> | RW | 0 |

Table 24-700. Register Call Summary for Register SLIMBUS_CMP_SYSCONFIG

Serial Low-Power Inter-Chip Media Bus Controller

- [Software Reset: \[0\]](#)
- [Power Management: \[1\] \[2\]](#)
- [Global Initialization: \[3\] \[4\] \[5\] \[6\]](#)
- [SLIMBUS1 Register Summary: \[7\]](#)
- [SLIMBUS2 Register Summary: \[8\]](#)

Table 24-701. SLIMBUS_CMP_IRQSTATUS_RAW

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0024 | | |
| Physical Address | 0x4902 C024 0x4012 C024 0x2 C024 0x4807 6024 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | <p>Component (that is, main) interrupt request status. Check the corresponding secondary status register. Raw status is set even if event is not enabled. Write 1 to set the (raw) status, mostly for debug.</p> | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|----------|----------|---------|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | DCR_INFO_7 | DCR_INFO_6 | DCR_INFO_5 | DCR_INFO_4 | DCR_INFO_3 | DCR_INFO_2 | DCR_INFO_1 | DCR_INFO_0 | DCT_INFO_7 | DCT_INFO_6 | DCT_INFO_5 | DCT_INFO_4 | DCT_INFO_3 | DCT_INFO_2 | DCT_INFO_1 | DCT_INFO_0 | SMR_INFO | SMT_INFO | FR_INFO | FL_INFO |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|--|---------------|-------|
| 31:20 | RESERVED | | R | 0x000 |
| 19 | DCR_INFO_7 ⁽¹⁾ | IRQ status for RX Data agent 7 ⁽¹⁾ If implemented: Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 18 | DCR_INFO_6 ⁽¹⁾ | IRQ status for RX Data agent 6 ⁽¹⁾ If implemented: Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 17 | DCR_INFO_5 ⁽¹⁾ | IRQ status for RX Data agent 5 ⁽¹⁾ If implemented: Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 16 | DCR_INFO_4 ⁽¹⁾ | IRQ status for RX Data agent 4 ⁽¹⁾ If implemented: Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 15 | DCR_INFO_3 ⁽¹⁾ | IRQ status for RX Data agent 3 ⁽¹⁾ If implemented: Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 14 | DCR_INFO_2 ⁽¹⁾ | IRQ status for RX Data agent 2 ⁽¹⁾ If implemented: Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 13 | DCR_INFO_1 ⁽¹⁾ | IRQ status for RX Data agent 1 ⁽¹⁾ If implemented: Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 12 | DCR_INFO_0 ⁽¹⁾ | IRQ status for RX Data agent 0 ⁽¹⁾ If implemented: Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 11 | DCT_INFO_7 ⁽²⁾ | IRQ status for TX Data agent 7 ⁽²⁾ Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |

⁽¹⁾ This bit field is RESERVED in SLIMBUS2

⁽²⁾ This bit field is DCR_INFO_3 (IRQ status for RX Data agent 3) in SLIMBUS2

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|--|---------------|-------|
| 10 | DCT_INFO_6 ⁽³⁾ | IRQ status for TX Data agent 6 ⁽³⁾ Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 9 | DCT_INFO_5 ⁽⁴⁾ | IRQ status for TX Data agent 5 ⁽⁴⁾ Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 8 | DCT_INFO_4 ⁽⁵⁾ | IRQ status for TX Data agent 4 ⁽⁵⁾ Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 7 | DCT_INFO_3 | IRQ status for TX Data agent 3 Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 6 | DCT_INFO_2 | IRQ status for TX Data agent 2 Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 5 | DCT_INFO_1 | IRQ status for TX Data agent 1 Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 4 | DCT_INFO_0 | IRQ status for TX Data agent 0 Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 3 | SMR_INFO | IRQ status for message receive Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 2 | SMT_INFO | IRQ status for message transmit Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |

⁽³⁾ This bit field is DCR_INFO_2 (IRQ status for RX Data agent 2) in SLIMBUS2

⁽⁴⁾ This bit field is DCR_INFO_1 (IRQ status for RX Data agent 1) in SLIMBUS2

⁽⁵⁾ This bit field is DCR_INFO_0 (IRQ status for RX Data agent 0) in SLIMBUS2

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------|
| 1 | FR_INFO | IRQ status for Framer device, when active Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |
| 0 | FL_INFO | IRQ status for Frame Layer Write 0x0: No action Write 0x1: Trigger IRQ event by software Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toSet | 0 |

Table 24-702. Register Call Summary for Register SLIMBUS_CMP_IRQSTATUS_RAW

Serial Low-Power Inter-Chip Media Bus Controller

- [Interrupt Requests: \[0\]](#)
- [SLIMBUS1 Register Summary: \[1\]](#)
- [SLIMBUS2 Register Summary: \[2\]](#)

Table 24-703. SLIMBUS_CMP_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0028 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Physical Address | 0x4902 C028 0x4012 C028 0x2 C028 0x4807 6028 | | |
| Description | Component (that is, main) interrupt request status. Check the corresponding secondary status register. Enabled status isn't set unless event is enabled. Write 1 to clear the status after interrupt has been serviced (raw status gets cleared, that is, even if not enabled). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|----------|----------|---------|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | DCR_INFO_7 | DCR_INFO_6 | DCR_INFO_5 | DCR_INFO_4 | DCR_INFO_3 | DCR_INFO_2 | DCR_INFO_1 | DCR_INFO_0 | DCT_INFO_7 | DCT_INFO_6 | DCT_INFO_5 | DCT_INFO_4 | DCT_INFO_3 | DCT_INFO_2 | DCT_INFO_1 | DCT_INFO_0 | SMR_INFO | SMT_INFO | FR_INFO | FL_INFO |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------------|--|---------------|-------|
| 31:20 | RESERVED | | R | 0x000 |
| 19 | DCR_INFO_7 ⁽¹⁾ | IRQ status for RX Data agent 7 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 18 | DCR_INFO_6 ⁽¹⁾ | IRQ status for RX Data agent 6 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |

⁽¹⁾ This bit field is RESERVED in SLIMBUS2

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|--|---------------|-------|
| 17 | DCR_INFO_5 ⁽¹⁾ | IRQ status for RX Data agent 5 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 16 | DCR_INFO_4 ⁽¹⁾ | IRQ status for RX Data agent 4 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 15 | DCR_INFO_3 ⁽¹⁾ | IRQ status for RX Data agent 3 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 14 | DCR_INFO_2 ⁽²⁾ | IRQ status for RX Data agent 2 ⁽²⁾ . If implemented: Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 13 | DCR_INFO_1 ⁽²⁾ | IRQ status for RX Data agent 1 ⁽²⁾ . If implemented: Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 12 | DCR_INFO_0 ⁽²⁾ | IRQ status for RX Data agent 0 ⁽²⁾ . If implemented: Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 11 | DCT_INFO_7 ⁽³⁾ | IRQ status for TX Data agent 7 ⁽³⁾ Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 10 | DCT_INFO_6 ⁽⁴⁾ | IRQ status for TX Data agent 6 ⁽⁴⁾ Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 9 | DCT_INFO_5 ⁽⁵⁾ | IRQ status for TX Data agent 5 ⁽⁵⁾ Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |

⁽²⁾ This bit field is RESERVED in SLIMBUS2

⁽³⁾ This bit field is DCR_INFO_3 (IRQ status for RX Data agent 3) in SLIMBUS2

⁽⁴⁾ This bit field is DCR_INFO_2 (IRQ status for RX Data agent 2) in SLIMBUS2

⁽⁵⁾ This bit field is DCR_INFO_1 (IRQ status for RX Data agent 1) in SLIMBUS2

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|--|---------------|-------|
| 8 | DCT_INFO_4 ⁽⁶⁾ | IRQ status for TX Data agent 4 ⁽⁶⁾ Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 7 | DCT_INFO_3 | IRQ status for TX Data agent 3 Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 6 | DCT_INFO_2 | IRQ status for TX Data agent 2 Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 5 | DCT_INFO_1 | IRQ status for TX Data agent 1 Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 4 | DCT_INFO_0 | IRQ status for TX Data agent 0 Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 3 | SMR_INFO | IRQ status for message receive Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 2 | SMT_INFO | IRQ status for message transmit Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 1 | FR_INFO | IRQ status for Framer device, when active Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 0 | FL_INFO | IRQ status for Frame Layer Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |

⁽⁶⁾ This bit field is DCR_INFO_0 (IRQ status for RX Data agent 0) in SLIMBUS2

Table 24-704. Register Call Summary for Register SLIMBUS_CMP_IRQSTATUS

Serial Low-Power Inter-Chip Media Bus Controller

- [Transmission: \[0\] \[1\]](#)
- [Message reception: \[2\]](#)
- [Interrupt Service Routines: \[3\]](#)
- [Interrupt Requests: \[4\]](#)
- [Interface Device ISRs: \[5\]](#)
- [Framer Device ISRs: \[6\]](#)
- [Shared Message Channel Transmit ISRs: \[7\]](#)
- [Shared Message Channel Receive ISRs: \[8\]](#)
- [Data Channel Port ISRs: \[9\]](#)
- [SLIMbus Transfer Procedures: \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\]](#)
- [SLIMBUS1 Register Summary: \[17\]](#)
- [SLIMBUS2 Register Summary: \[18\]](#)

Table 24-705. SLIMBUS_CMP_IRQENABLE_SET

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 002C | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Physical Address | 0x4902 C02C 0x4012 C02C 0x2 C02C 0x4807 602C | | |
| Description | Component (that is, main) interrupt request enable Write 1 to set (enable interrupt). Readout equal to corresponding _CLR register. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------|-------------|------------|------------|
| RESERVED | | | | | | | | | | | | DCR_INFO_7_EN | DCR_INFO_6_EN | DCR_INFO_5_EN | DCR_INFO_4_EN | DCR_INFO_3_EN | DCR_INFO_2_EN | DCR_INFO_1_EN | DCR_INFO_0_EN | DCT_INFO_7_E7 | DCT_INFO_6_EN | DCT_INFO_5_EN | DCT_INFO_4_EN | DCT_INFO_3_EN | DCT_INFO_2_EN | DCT_INFO_1_EN | DCT_INFO_0_EN | SMR_INFO_EN | SMT_INFO_EN | FR_INFO_EN | FL_INFO_EN |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|---|---------------|-------|
| 31:20 | RESERVED | | R | 0x000 |
| 19 | DCR_INFO_7_EN ⁽¹⁾ | IRQ enable for RX Data agent 7 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 18 | DCR_INFO_6_EN ⁽¹⁾ | IRQ enable for RX Data agent 6 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 17 | DCR_INFO_5_EN ⁽¹⁾ | IRQ enable for RX Data agent 5 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |

⁽¹⁾ This bit field is RESERVED in SLIMBUS2

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|---|---------------|-------|
| 16 | DCR_INFO_4_EN ⁽¹⁾ | IRQ enable for RX Data agent 4 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 15 | DCR_INFO_3_EN ⁽¹⁾ | IRQ enable for RX Data agent 3 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 14 | DCR_INFO_2_EN ⁽¹⁾ | IRQ enable for RX Data agent 2 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 13 | DCR_INFO_1_EN ⁽²⁾ | IRQ enable for RX Data agent 1 ⁽²⁾ . If implemented: Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 12 | DCR_INFO_0_EN ⁽²⁾ | IRQ enable for RX Data agent 0 ⁽²⁾ . If implemented: Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 11 | DCT_INFO_7_EN ⁽³⁾ | IRQ enable for TX Data agent 7 ⁽³⁾ Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 10 | DCT_INFO_6_EN ⁽⁴⁾ | IRQ enable for TX Data agent 6 ⁽⁴⁾ Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 9 | DCT_INFO_5_EN ⁽⁵⁾ | IRQ enable for TX Data agent 5 ⁽⁵⁾ Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 8 | DCT_INFO_4_EN ⁽⁶⁾ | IRQ enable for TX Data agent 4 ⁽⁶⁾ Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |

⁽²⁾ This bit field is RESERVED in SLIMBUS2

⁽³⁾ This bit field is DCR_INFO_3_EN (IRQ enable for RX Data agent 3) in SLIMBUS2

⁽⁴⁾ This bit field is DCR_INFO_2_EN (IRQ enable for RX Data agent 2) in SLIMBUS2

⁽⁵⁾ This bit field is DCR_INFO_1_EN (IRQ enable for RX Data agent 1) in SLIMBUS2

⁽⁶⁾ This bit field is DCR_INFO_0_EN (IRQ enable for RX Data agent 0) in SLIMBUS2

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------|-------|
| 7 | DCT_INFO_3_EN | IRQ enable for TX Data agent 3 Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 6 | DCT_INFO_2_EN | IRQ enable for TX Data agent 2 Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 5 | DCT_INFO_1_EN | IRQ enable for TX Data agent 1 Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 4 | DCT_INFO_0_EN | IRQ enable for TX Data agent 0 Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 3 | SMR_INFO_EN | IRQ enable for message receive Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 2 | SMT_INFO_EN | IRQ enable for message transmit Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 1 | FR_INFO_EN | IRQ enable for Framer device, when active Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |
| 0 | FL_INFO_EN | IRQ enable for Frame Layer Write 0x0: No action Write 0x1: Set IRQ enable (that is, enable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toSet | 0 |

Table 24-706. Register Call Summary for Register SLIMBUS_CMP_IRQENABLE_SET

Serial Low-Power Inter-Chip Media Bus Controller

- [Transmission: \[0\] \[1\]](#)
- [Message reception: \[2\]](#)
- [Interrupt Service Routines: \[3\]](#)
- [Interrupt Requests: \[4\]](#)
- [Interface Device ISRs: \[5\]](#)
- [Framer Device ISRs: \[6\]](#)
- [Shared Message Channel Transmit ISRs: \[7\]](#)
- [Shared Message Channel Receive ISRs: \[8\]](#)
- [Data Channel Port ISRs: \[9\]](#)
- [SLIMbus Transfer Procedures: \[10\] \[11\] \[12\] \[13\]](#)
- [SLIMBUS1 Register Summary: \[14\]](#)
- [SLIMBUS2 Register Summary: \[15\]](#)

Table 24-707. SLIMBUS_CMP_IRQENABLE_CLR

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0030 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Physical Address | 0x4902 C030 0x4012 C030 0x2 C030 0x4807 6030 | | |
| Description | Component (that is, main) interrupt request enable Write 1 to clear (disable interrupt). Readout equal to corresponding _SET register. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----|----|----|----|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------|-------------|------------|------------|
| RESERVED | | | | | | | | | | | | DCR_INFO_7_EN | DCR_INFO_6_EN | DCR_INFO_5_EN | DCR_INFO_4_EN | DCR_INFO_3_EN | DCR_INFO_2_EN | DCR_INFO_1_EN | DCR_INFO_0_EN | DCT_INFO_7_E7 | DCT_INFO_6_EN | DCT_INFO_5_EN | DCT_INFO_4_EN | DCT_INFO_3_EN | DCT_INFO_2_EN | DCT_INFO_1_EN | DCT_INFO_0_EN | SMR_INFO_EN | SMT_INFO_EN | FR_INFO_EN | FL_INFO_EN |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------------------|--|---------------|-------|
| 31:20 | RESERVED | | R | 0x000 |
| 19 | DCR_INFO_7_EN ⁽¹⁾ | IRQ enable for RX data agent 7 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 18 | DCR_INFO_6_EN ⁽¹⁾ | IRQ enable for RX data agent 6 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 17 | DCR_INFO_5_EN ⁽¹⁾ | IRQ enable for RX data agent 5 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |

⁽¹⁾ This bit field is RESERVED in SLIMBUS2

| Bits | Field Name | Description | Type | Reset |
|------|------------------------------|--|---------------|-------|
| 16 | DCR_INFO_4_EN ⁽¹⁾ | IRQ enable for RX data agent 4 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 15 | DCR_INFO_3_EN ⁽¹⁾ | IRQ enable for RX data agent 3 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 14 | DCR_INFO_2_EN ⁽¹⁾ | IRQ enable for RX data agent 2 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 13 | DCR_INFO_1_EN ⁽²⁾ | IRQ enable for RX data agent 1 ⁽²⁾ . If implemented: Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 12 | DCR_INFO_0_EN ⁽²⁾ | IRQ enable for RX data agent 0 ⁽²⁾ . If implemented: Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 11 | DCT_INFO_7_EN ⁽³⁾ | IRQ enable for TX Data agent 7 ⁽³⁾ Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 10 | DCT_INFO_6_EN ⁽⁴⁾ | IRQ enable for TX Data agent 6 ⁽⁴⁾ Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 9 | DCT_INFO_5_EN ⁽⁵⁾ | IRQ enable for TX Data agent 5 ⁽⁵⁾ Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 8 | DCT_INFO_4_EN ⁽⁶⁾ | IRQ enable for TX Data agent 4 ⁽⁶⁾ Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |

⁽²⁾ This bit field is RESERVED in SLIMBUS2

⁽³⁾ This bit field is DCR_INFO_3_EN (IRQ enable for RX Data agent 3) in SLIMBUS2

⁽⁴⁾ This bit field is DCR_INFO_2_EN (IRQ enable for RX Data agent 2) in SLIMBUS2

⁽⁵⁾ This bit field is DCR_INFO_1_EN (IRQ enable for RX Data agent 1) in SLIMBUS2

⁽⁶⁾ This bit field is DCR_INFO_0_EN (IRQ enable for RX Data agent 0) in SLIMBUS2

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------|-------|
| 7 | DCT_INFO_3_EN | IRQ enable for TX Data agent 3 Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 6 | DCT_INFO_2_EN | IRQ enable for TX Data agent 2 Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 5 | DCT_INFO_1_EN | IRQ enable for TX Data agent 1 Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 4 | DCT_INFO_0_EN | IRQ enable for TX Data agent 0 Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 3 | SMR_INFO_EN | IRQ enable for message receive Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 2 | SMT_INFO_EN | IRQ enable for message transmit Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 1 | FR_INFO_EN | IRQ enable for Frammer device, when active Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |
| 0 | FL_INFO_EN | IRQ enable for Frame Layer Write 0x0: No action Write 0x1: Clear IRQ enable (that is, disable event) Read 0x1: IRQ event is enabled Read 0x0: IRQ event is disabled | RW W1toClr | 0 |

Table 24-708. Register Call Summary for Register SLIMBUS_CMP_IRQENABLE_CLR

Serial Low-Power Inter-Chip Media Bus Controller

- [Interrupt Service Routines: \[0\]](#)
- [Interrupt Requests: \[1\]](#)
- [SLIMBUS1 Register Summary: \[2\]](#)
- [SLIMBUS2 Register Summary: \[3\]](#)

Table 24-709. SLIMBUS_CMP_DMAENABLE_SET

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0034 | | |
| Physical Address | 0x4902 C034 0x4012 C034 0x2 C034 0x4807 6034 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Components DMA enable (1 bit per DMA-capable channel) Write 1 to set (enable DMA). Readout equal to corresponding _CLR register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------|---|---|---|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | DCR_DMA_7_EN | DCR_DMA_6_EN | DCR_DMA_5_EN | DCR_DMA_4_EN | DCR_DMA_3_EN | DCR_DMA_2_EN | DCR_DMA_1_EN | DCR_DMA_0_EN | DCT_DMA_7_EN | DCT_DMA_6_EN | DCT_DMA_5_EN | DCT_DMA_4_EN | DCT_DMA_3_EN | DCT_DMA_2_EN | DCT_DMA_1_EN | DCT_DMA_0_EN | RESERVED | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|---|----------------|-------|
| 31:20 | RESERVED | | R | 0x000 |
| 19 | DCR_DMA_7_EN ⁽¹⁾ | DMA enable for RX Data agent 7 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet. | 0 |
| 18 | DCR_DMA_6_EN ⁽¹⁾ | DMA enable for RX Data agent 6 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet. | 0 |
| 17 | DCR_DMA_5_EN ⁽¹⁾ | DMA enable for RX Data agent 5 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet. | 0 |
| 16 | DCR_DMA_4_EN ⁽¹⁾ | DMA enable for RX Data agent 4 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet. | 0 |
| 15 | DCR_DMA_3_EN ⁽¹⁾ | DMA enable for RX Data agent 3 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet. | 0 |
| 14 | DCR_DMA_2_EN ⁽¹⁾ | DMA enable for RX Data agent 2 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet. | 0 |

⁽¹⁾ This bit field is RESERVED in SLIMBUS2

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|---|----------------|-------|
| 13 | DCR_DMA_1_EN ⁽¹⁾ | DMA enable for RX Data agent 1 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet. | 0 |
| 12 | DCR_DMA_0_EN ⁽¹⁾ | DMA enable for RX Data agent 0 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet. | 0 |
| 11 | DCT_DMA_7_EN ⁽²⁾ | DMA enable for TX Data agent 7 ⁽²⁾ Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet | 0 |
| 10 | DCT_DMA_6_EN ⁽³⁾ | DMA enable for TX Data agent 6 ⁽³⁾ Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet | 0 |
| 9 | DCT_DMA_5_EN ⁽⁴⁾ | DMA enable for TX Data agent 5 ⁽⁴⁾ Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet | 0 |
| 8 | DCT_DMA_4_EN ⁽⁵⁾ | DMA enable for TX Data agent 4 ⁽⁵⁾ Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet | 0 |
| 7 | DCT_DMA_3_EN | DMA enable for TX Data agent 3 Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet | 0 |
| 6 | DCT_DMA_2_EN | DMA enable for TX Data agent 2 Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet | 0 |
| 5 | DCT_DMA_1_EN | DMA enable for TX Data agent 1 Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet | 0 |

⁽²⁾ This bit field is DCR_DMA_3_EN (DMA enable for RX Data agent 3) in SLIMBUS2

⁽³⁾ This bit field is DCR_DMA_2_EN (DMA enable for RX Data agent 2) in SLIMBUS2

⁽⁴⁾ This bit field is DCR_DMA_1_EN (DMA enable for RX Data agent 1) in SLIMBUS2

⁽⁵⁾ This bit field is DCR_DMA_0_EN (DMA enable for RX Data agent 0) in SLIMBUS2

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|---------------|-------|
| 4 | DCT_DMA_0_EN | DMA enable for TX Data agent 0 Write 0x0: No action Write 0x1: Set DMA enable (that is, enable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toSet | 0 |
| 3:0 | RESERVED | | R | 0x0 |

Table 24-710. Register Call Summary for Register SLIMBUS_CMP_DMAENABLE_SET

Serial Low-Power Inter-Chip Media Bus Controller

- [Data Input/Output: DMA Request Mode: \[0\]](#)
- [SLIMbus Transfer Procedures: \[1\] \[2\]](#)
- [SLIMBUS1 Register Summary: \[3\]](#)
- [SLIMBUS2 Register Summary: \[4\]](#)

Table 24-711. SLIMBUS_CMP_DMAENABLE_CLR

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0038 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Physical Address | 0x4902 C038 0x4012 C038 0x2 C038 0x4807 6038 | | |
| Description | Components DMA enable (1 bit per DMA-capable channel) Write 1 to clear (disable DMA). Readout equal to corresponding _SET register. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | DCR_DMA_7_EN | DCR_DMA_6_EN | DCR_DMA_5_EN | DCR_DMA_4_EN | DCR_DMA_3_EN | DCR_DMA_2_EN | DCR_DMA_1_EN | DCR_DMA_0_EN | DCT_DMA_7_EN | DCT_DMA_6_EN | DCT_DMA_5_EN | DCT_DMA_4_EN | DCT_DMA_3_EN | DCT_DMA_2_EN | DCT_DMA_1_EN | DCT_DMA_0_EN | RESERVED | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------------|--|---------------|-------|
| 31:20 | RESERVED | | R | 0x000 |
| 19 | DCR_DMA_7_EN ⁽¹⁾ | DMA enable for RX Data agent 7 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 18 | DCR_DMA_6_EN ⁽¹⁾ | DMA enable for RX Data agent 6 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 17 | DCR_DMA_5_EN ⁽¹⁾ | DMA enable for RX Data agent 5 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |

⁽¹⁾ This bit field is RESERVED in SLIMBUS2

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------------|--|---------------|-------|
| 16 | DCR_DMA_4_EN ⁽¹⁾ | DMA enable for RX Data agent 4 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 15 | DCR_DMA_3_EN ⁽¹⁾ | DMA enable for RX Data agent 3 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 14 | DCR_DMA_2_EN ⁽¹⁾ | DMA enable for RX Data agent 2 ⁽¹⁾ . If implemented: Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 13 | DCR_DMA_1_EN ⁽²⁾ | DMA enable for RX Data agent 1 ⁽²⁾ . If implemented: Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 12 | DCR_DMA_0_EN ⁽²⁾ | DMA enable for RX Data agent 0 ⁽²⁾ . If implemented: Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 11 | DCT_DMA_7_EN ⁽³⁾ | DMA enable for TX Data agent 7 ⁽³⁾ Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 10 | DCT_DMA_6_EN ⁽⁴⁾ | DMA enable for TX Data agent 6 ⁽⁴⁾ Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 9 | DCT_DMA_5_EN ⁽⁵⁾ | DMA enable for TX Data agent 5 ⁽⁵⁾ Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 8 | DCT_DMA_4_EN ⁽⁶⁾ | DMA enable for TX Data agent 4 ⁽⁶⁾ Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |

⁽²⁾ This bit field is RESERVED in SLIMBUS2

⁽³⁾ This bit field is DCR_DMA_3_EN (DMA enable for RX Data agent 3) in SLIMBUS2

⁽⁴⁾ This bit field is DCR_DMA_2_EN (DMA enable for RX Data agent 2) in SLIMBUS2

⁽⁵⁾ This bit field is DCR_DMA_1_EN (DMA enable for RX Data agent 1) in SLIMBUS2

⁽⁶⁾ This bit field is DCR_DMA_0_EN (DMA enable for RX Data agent 0) in SLIMBUS2

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|---------------|-------|
| 7 | DCT_DMA_3_EN | DMA enable for TX Data agent 3 Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 6 | DCT_DMA_2_EN | DMA enable for TX Data agent 2 Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 5 | DCT_DMA_1_EN | DMA enable for TX Data agent 1 Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 4 | DCT_DMA_0_EN | DMA enable for TX Data agent 0 Write 0x0: No action Write 0x1: Clear DMA enable (that is, disable channel) Read 0x1: DMA channel is enabled Read 0x0: DMA channel is disabled | RW W1toClr | 0 |
| 3:0 | RESERVED | | R | 0x0 |

Table 24-712. Register Call Summary for Register SLIMBUS_CMP_DMAENABLE_CLR

Serial Low-Power Inter-Chip Media Bus Controller

- [Data Input/Output: DMA Request Mode: \[0\]](#)
- [SLIMBUS1 Register Summary: \[1\]](#)
- [SLIMBUS2 Register Summary: \[2\]](#)

Table 24-713. SLIMBUS_CMP_IV

| | | | |
|------------------|--|----------|--|
| Address Offset | 0x0000 0040 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Physical Address | 0x4902 C040 0x4012 C040 0x2 C040 0x4807 6040 | | |
| Description | Component IV field, used as lower 8 bits of the devices' Enumeration Address (EA[47:0]). Identical for all devices of the component. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | IV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7:0 | IV | Device component's Instance Value (IV[7:0]) | RW | 0x00 |

Table 24-714. Register Call Summary for Register SLIMBUS_CMP_IV

Serial Low-Power Inter-Chip Media Bus Controller

- [Device and Addressing Management: \[0\] \[1\]](#)
- [SLIMBUS1 Register Summary: \[2\]](#)
- [SLIMBUS2 Register Summary: \[3\]](#)

Table 24-715. SLIMBUS_CMP_MI_PC

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|--|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|
| Address Offset | 0x0000 0044 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4902 C044 0x4012 C044 0x2 C044 0x4807 6044 | | | | | | | | | | | | | | | | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 | | | | | | | | | | | | | | | |
| Description | Component MI and PC fields, used as upper 32 bits of the devices' Enumeration Address (EA[47:0]). Identical for all devices of the component. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| PC | | | | | | | | | | | | | | | | MI | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | PC | Device component's Product Code (PC[15:0]) | RW | 0x0000 |
| 15:0 | MI | Device component's Manufacturer Index (MI[15:0]) | RW | 0x0102 |

Table 24-716. Register Call Summary for Register SLIMBUS_CMP_MI_PC

Serial Low-Power Inter-Chip Media Bus Controller

- [Device and Addressing Management: \[0\] \[1\] \[2\] \[3\]](#)
- [SLIMBUS1 Register Summary: \[4\]](#)
- [SLIMBUS2 Register Summary: \[5\]](#)

Table 24-717. SLIMBUS_SMT_INFO

| | | | |
|------------------|---|----------|--|
| Address Offset | 0x0000 0050 | | |
| Physical Address | 0x4902 C050 0x4012 C050 0x2 C050 0x4807 6050 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | IRQ status for Shared Message Transmit channel. Write 1 to a bit to clear it. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----------|----|------|----|------|---|------|---|------|---|----------|---|-----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ABORT | | RESERVED | | UDEF | | NORE | | NACK | | PACK | | OVERFLOW | | MC TX COL | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-----------|
| 31:8 | RESERVED | | R | 0x0000000 |
| 7 | ABORT | TX message was aborted before completion because of message sync loss. Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 6 | RESERVED | | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|-------|
| 5 | UDEF | TX message was UDEF'ed: undefined response, protocol error. Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 4 | NORE | TX message was NORE'ed: no or all-zero message response Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 3 | NACK | TX message was NACK'ed: at least one of the recipient devices requested message retransmission. Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 2 | PACK | TX message was PACK'ed: all recipient devices accepted the message. Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 1 | OVERFLOW | Overflow in TX message FIFO: Software tried to write more bytes than available in the FIFO. Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 0 | MC_TX_COL | Transmit collision in Message Channel (MC) during message transmission. Interface device class-specific information element (IE) Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |

Table 24-718. Register Call Summary for Register SLIMBUS_SMT_INFO

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Boot and Reset Procedures: \[0\]](#)
- [Transmission: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [Message reception: \[11\]](#)
- [Possible Interrupts: \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [Shared Message Channel Transmit ISRs: \[19\] \[20\] \[21\] \[22\] \[23\] \[24\]](#)
- [Shared Message Channel Receive ISRs: \[25\]](#)
- [SLIMbus Transfer Procedures: \[26\] \[27\]](#)
- [SLIMBUS1 Register Summary: \[28\]](#)
- [SLIMBUS2 Register Summary: \[29\]](#)

Table 24-719. SLIMBUS_SMT_MESSAGE

| | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0054 | | | | | | | | | | | | | | | |
| Physical Address | <div> <div>0x4902 C054</div> <div>0x4012 C054</div> <div>0x2 C054</div> <div>0x4807 6054</div> </div> | | | | | | | | | | | | | | | |
| Description | Shared Message Transmit FIFO input | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TX_MESSAGE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | TX_MESSAGE | TX message byte(s), depending on packing mode. Reads return 0. Enter the whole message except last byte (Message Integrity MI and Response MR), and with a don't care placeholder for Primary Integrity (PI). | RW | 0x0000 0000 |

Table 24-720. Register Call Summary for Register SLIMBUS_SMT_MESSAGE

Serial Low-Power Inter-Chip Media Bus Controller

- [Transmission: \[0\]](#)
- [SLIMbus Transfer Procedures: \[1\]](#)
- [SLIMBUS1 Register Summary: \[2\]](#)
- [SLIMBUS2 Register Summary: \[3\]](#)

Table 24-721. SLIMBUS SMT CONTROL

| | | |
|-------------------------|---|---|
| Address Offset | 0x0000 0058 | |
| Physical Address | 0x4902 C058 0x4012 C058 0x2 C058 0x4807 6058 | Instance SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Control of Shared Message channel Transmission. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | MESSAGE_ENABLE |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | MESSAGE_ENABLE | <p>Enable the transmission of the message(s) previously written into the TX Message FIFO, with unlimited arbitration auto-retries.</p> <p>Self-cleared after either a message not get PACK'ed or the FIFO is empty.</p> <p>Write 0x0: No effect</p> <p>Write 0x1: Request transmission of stored messages</p> <p>Read 0x1: Message transmission is ongoing</p> <p>Read 0x0: Message transmission is stopped / complete</p> | RW | 0 |

Table 24-722. Register Call Summary for Register SLIMBUS_SMT_CONTROL

Serial Low-Power Inter-Chip Media Bus Controller

- [Transmission: \[0\] \[1\] \[2\] \[3\]](#)
- [SLIMbus Transfer Procedures: \[4\] \[5\]](#)
- [SLIMBUS1 Register Summary: \[6\]](#)
- [SLIMBUS2 Register Summary: \[7\]](#)

Table 24-723. SLIMBUS_SMT_FIFO_SETUP

| | | | |
|-------------------------|---|-----------------|--------------------|
| Address Offset | 0x0000 005C | Instance | SLIMBUS1_L3 |
| Physical Address | 0x4902 C05C 0x4012 C05C 0x2 C05C 0x4807 605C | | SLIMBUS1_CORTEX-A9 |
| | | | SLIMBUS1_DSP |
| | | | SLIMBUS2_L3 |
| Description | <p>Shared Message Transmit channel configuration. To be kept static during operation.</p> <p>Note that message segment word size is 2 slots = 1 byte (= message size granularity) and that message FIFO base address is always 0x0.</p> | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|---------|----|---------|----|----|---|------------|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PACKING | SIZE_HI | | SIZE_LO | | | | FIFO_CLEAR | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7 | PACKING | <p>Packing enable control for TX message FIFO</p> <p>0x0: Packing disabled: one byte per access only (LSByte), byte enable is don't care.</p> <p>0x1: Packing enabled: one or several bytes per access, depending on byte enable.</p> | RW | 0 |
| 6:5 | SIZE_HI | <p>(Upper bits of the) capacity of shared TX message FIFO, in bytes, minus one.</p> <p>To be set for largest supported (transmitted) message(s).</p> <p>0x0: 16 bytes (minimum size)</p> <p>0x1: 32 bytes (recommended)</p> <p>0x3: 64 bytes (max size)</p> <p>0x2: 48 bytes (large messages)</p> | RW | 0x1 |
| 4:1 | SIZE_LO | <p>(Lower bits of the) capacity of shared TX message FIFO, in bytes, minus one. Read-only, for reference only.</p> | R | 0xF |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 0 | FIFO_CLEAR | Returns FIFO to initial empty state. Write 0x0: No effect Write 0x1: Clear FIFO Read 0x1: Ongoing Clear. Completion requires the SLIMbus clock. Read 0x0: No event, last clear completed | RW | 0 |

Table 24-724. Register Call Summary for Register SLIMBUS_SMT_FIFO_SETUP

Serial Low-Power Inter-Chip Media Bus Controller

- [FIFO Mapping: \[0\] \[1\]](#)
- [SLIMBUS1 Register Summary: \[2\]](#)
- [SLIMBUS2 Register Summary: \[3\]](#)

Table 24-725. SLIMBUS_SMR_INFO

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0060 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Physical Address | 0x4902 C060 0x4012 C060 0x2 C060 0x4807 6060 | | |
| Description | IRQ status for Shared Message Receive channel. Write 1 to a bit to clear it. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----------------------|----|------------------|----|-----------|---|-----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OVERFLOW | | RECEIVED_RECONFIGURE | | RECEIVED_MESSAGE | | UNDERFLOW | | MC_TX_COL | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|---|---------------|------------|
| 31:5 | RESERVED | | R | 0x00000000 |
| 4 | OVERFLOW | Overflow in RX message FIFO: received message is larger than the FIFO. Write 0x0: no action Write 0x1: clear event Read 0x1: event pending Read 0x0: no event pending | RW W1toClr | 0 |
| 3 | RECEIVED_RECONFIGURE | RECONFIGURE_NOW message received, available in RX message FIFO Write 0x0: no action Write 0x1: clear event Read 0x1: event pending Read 0x0: no event pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|---------------|-------|
| 2 | RECEIVED_MESSAGE | <p>Message available in the RX message FIFO. Clear bit to clear the FIFO and allow the reception of further messages (incoming messages will be NACK'ed until then).</p> <p>Write 0x0: no action</p> <p>Write 0x1: clear event, clear FIFO, allow further messages.</p> <p>Read 0x1: event pending</p> <p>Read 0x0: no event pending</p> | RW W1toClr | 0 |
| 1 | UNDERFLOW | <p>Underflow in RX message FIFO: Software tried to read out more bytes than available.</p> <p>Write 0x0: no action</p> <p>Write 0x1: clear event</p> <p>Read 0x1: event pending</p> <p>Read 0x0: no event pending</p> | RW W1toClr | 0 |
| 0 | MC_TX_COL | <p>Transmit collision in Message Channel (MC) during RX message during message reception. Interface device class-specific information element (IE)</p> <p>Write 0x0: no action</p> <p>Write 0x1: clear event</p> <p>Read 0x1: event pending</p> <p>Read 0x0: no event pending</p> | RW W1toClr | 0 |

Table 24-726. Register Call Summary for Register SLIMBUS_SMR_INFO

Serial Low-Power Inter-Chip Media Bus Controller

- SLIMbus Boot and Reset Procedures: [0]
- Transmission: [1] [2]
- Message reception: [3] [4] [5] [6] [7] [8] [9]
- Possible Interrupts: [10] [11] [12] [13] [14]
- Shared Message Channel Receive ISRs: [15] [16] [17] [18]
- Operational Modes Configuration: [19]
- SLIMbus Transfer Procedures: [20] [21] [22] [23] [24] [25] [26]
- Event Handling: [27]
- SLIMBUS1 Register Summary: [28]
- SLIMBUS2 Register Summary: [29]

Table 24-727. SLIMBUS SMR MESSAGE

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0064 | | |
| Physical Address | 0x4902 C064 0x4012 C064 0x2 C064 0x4807 6064 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Shared Message Receive channel FIFO output. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RX MESSAGE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | RX_MESSAGE | <p>RX message byte(s), depending on packing mode. Writes have no effect. Readout value from an empty FIFO is undefined, that is, there is no defined "reset value".</p> <p>Message is guaranteed to have destination address matching a local device address (LA or EA), correct Primary and Message Integrity (PI MI) and PACK Message Response (MR).</p> <p>Whole message available for readout, including the last byte (Message Integrity MI and Response MR)</p> | R | 0x0000 0000 |

Table 24-728. Register Call Summary for Register SLIMBUS_SMR_MESSAGE

Serial Low-Power Inter-Chip Media Bus Controller

- [Message reception: \[0\]](#)
- [SLIMbus Transfer Procedures: \[1\]](#)
- [SLIMBUS1 Register Summary: \[2\]](#)
- [SLIMBUS2 Register Summary: \[3\]](#)

Table 24-729. SLIMBUS_SMR_CONTROL

| | | | |
|-------------------------|---|-----------------|--------------------|
| Address Offset | 0x0000 0068 | Instance | SLIMBUS1_L3 |
| Physical Address | 0x4902 C068 0x4012 C068 0x2 C068 0x4807 6068 | | SLIMBUS1_CORTEX-A9 |
| | | | SLIMBUS1_DSP |
| | | | SLIMBUS2_L3 |
| Description | Control of Shared Message channel Reception. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MESSAGE_DISABLE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | MESSAGE_DISABLE | <p>Disables the reception of incoming messages (that is, broadcast or locally addressed) into the RX Message FIFO.</p> <p>Same effect for the same value than SMR_INFO[2] RECEIVED_MESSAGE, but this bit can be set to 1.</p> <p>0x0: Enabled: incoming messages will be PACK'ed</p> <p>0x1: Disabled: incoming messages will be NACK'ed</p> | RW | 0 |

Table 24-730. Register Call Summary for Register SLIMBUS_SMR_CONTROL

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMBUS1 Register Summary: \[0\]](#)
- [SLIMBUS2 Register Summary: \[1\]](#)

Table 24-731. SLIMBUS_SMR_FIFO_SETUP

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 006C | | |
| Physical Address | 0x4902 C06C 0x4012 C06C 0x2 C06C 0x4807 606C | Instance | SLIMBUS1_L3 SLIMBUS1_Cortex-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Shared Message Receive channel setup. To be kept static during operation. Note that message segment word size is 2 slots = 1 byte (= message size granularity) and that message FIFO base address is always 0x0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|---------|----|---------|----|---|---|------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PACKING | | SIZE_HI | | SIZE_LO | | | | FIFO_CLEAR | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | | R | 0x000000 |
| 7 | PACKING | Packing enable control for RX message FIFO 0x0: Packing disabled: one byte per access only (LSByte), byte enable is don't care. 0x1: Packing enabled: one or several bytes per access, depending on byte enable. | RW | 0 |
| 6:5 | SIZE_HI | (Upper bits of the) capacity of shared RX message FIFO, in bytes, minus one. To be set for largest supported (received) message. 0x0: 16 bytes (minimum size) 0x1: 32 bytes (recommended) 0x3: 64 bytes (max size) 0x2: 48 bytes (large messages) | RW | 0x1 |
| 4:1 | SIZE_LO | (Lower bits of the) capacity of shared RX message FIFO, in bytes, minus one. Read-only, for reference only. | R | 0xF |
| 0 | FIFO_CLEAR | Returns message FIFO to initial empty state. Write 0x0: No effect Write 0x1: Clear FIFO Read 0x1: Ongoing Clear. Completion requires the SLIMbus clock. Read 0x0: No event, last clear completed | RW | 0 |

Table 24-732. Register Call Summary for Register SLIMBUS_SMR_FIFO_SETUP

Serial Low-Power Inter-Chip Media Bus Controller

- [FIFO Mapping: \[0\] \[1\]](#)
- [SLIMBUS1 Register Summary: \[2\]](#)
- [SLIMBUS2 Register Summary: \[3\]](#)

Table 24-733. SLIMBUS_FL_INFO

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0070 | | |
| Physical Address | 0x4902 C070 0x4012 C070 0x2 C070 0x4807 6070 | Instance | SLIMBUS1_L3 SLIMBUS1_Cortex-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Frame Layer IRQ status. Write 1 to a bit to clear it. Note: FS loss implies SFS loss, and SFS loss implies MS loss, but only the "strongest" loss event is logged for a given event. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|---------------|----|----------|----|----------|---|---------|---|----------|---|---------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RECONFIGURED | | SAW_BUS_RESET | | RESERVED | | FOUND_MS | | LOST_MS | | LOST_SFS | | LOST_FS | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|---------------|------------|
| 31:7 | RESERVED | | R | 0x00000000 |
| 6 | RECONFIGURED | Reconfiguration boundary crossed Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 5 | SAW_BUS_RESET | Bus reset sequence detected on the bus: no activity on DATA line (all-zero) for 2 to 4 frames. Clock receiver FSM has returned to Reset state. Should trigger a local component reset (software sequence). Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 4 | RESERVED | | R | 0 |
| 3 | FOUND_MS | Message sync was acquired: operational state reached Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 2 | LOST_MS | Message Synchronization was lost Interface device class-specific information element (IE) Note: Not asserted in case of FS or SFS loss. Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|-------|
| 1 | LOST_SFS | Super Frame Synchronization was lost Interface device class-specific information element (IE) Note: Not asserted in case of FS loss. Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 0 | LOST_FS | Frame Synchronization was lost Interface device class-specific information element (IE) Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |

Table 24-734. Register Call Summary for Register SLIMBUS_FL_INFO

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Boot and Reset Procedures: \[0\] \[1\] \[2\]](#)
- [Possible Interrupts: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [Interface Device ISRs: \[9\] \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [Device Enumeration: \[15\] \[16\]](#)
- [SLIMBUS1 Register Summary: \[17\]](#)
- [SLIMBUS2 Register Summary: \[18\]](#)

Table 24-735. SLIMBUS_FL_CONTROL

| | | | |
|-------------------------|---|-----------------|---|
| Address Offset | 0x0000 0074 | Instance | SLIMBUS1_L3 |
| Physical Address | 0x4902 C074 0x4012 C074 0x2 C074 0x4807 6074 | | SLIMBUS1_Cortex-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Frame Layer control. (Self-cleared bits) | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|-----------------------|----|--------------|----|---------|---|----------|---|---------|---|-------------------|---|-----------------|---|------|--|
| RESERVED | | | | | | | | | | | | | | | | VALIDATE_DCMAP | | CLEAR_RECONFIGURATION | | BUS_SHUTDOWN | | KILL_FS | | KILL_SFS | | KILL_MS | | FORCE_RECONFIGURE | | COMPONENT_RESET | | BOOT | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8 | VALIDATE_DCMAP | Validates the mapping of data channels on devices: to be used after modifying the DC*_MAP* fields (DI and PN). Write 0x0: No action Write 0x1: Validates all DCT_MAP / DCR_MAP values | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------------|--|------|-------|
| 7 | CLEAR_RECONFIGURATION | Clear all updates cumulated since the last reconfiguration, return reconfiguration fields to currently active value. Self-cleared immediately. Write 0x0: No action Write 0x1: Clear reconfiguration | RW | 0 |
| 6 | BUS_SHUTDOWN | Sets both the clock source or the clock receiver FSMs back to "Undefined" state at the next reconfiguration boundary. Executed (and bit self-cleared) on next reconfiguration (forced or not); also cleared by a "clear_reconfiguration". Write 0x0: Cancel pending request (not used in normal operation) if any, otherwise no action Write 0x1: Assert request for next reconfiguration Read 0x1: Request pending for next reconfiguration Read 0x0: No request pending for next reconfiguration | RW | 0 |
| 5 | KILL_FS | Force immediate Frame Synchronization loss (implying as well message and superframe sync) When in "Operational", "SeekingMessageSync" or "SeekingSuperFrameSync" states, component shall go to "SeekingFrameSync" and start reaquiring frame sync. No effect otherwise. For debug use. Write 0x0: No action Write 0x1: Force frame sync loss Read 0x0: Always reads 0 because of immediate action. | RW | 0 |
| 4 | KILL_SFS | Force SuperFrame Synchronization loss at next reconfiguration boundary (implying as well message sync loss). When in "Operational" or "SeekingMessageSync" states, component shall go to "SeekingSuperFrameSync" and start reaquiring superframe sync. No effect otherwise. Used by clock receiver component upon imcompletely received reconfiguration sequence. Write 0x0: No action Write 0x1: Schedule superframe sync loss Read 0x1: Superframe sync loss pending Read 0x0: No pending superframe sync loss | RW | 0 |
| 3 | KILL_MS | Force an immediate Message Synchronization loss. When in "Operational" state, component shall go to "SeekingMessageSync" and start reaquiring message sync. No effect otherwise. For debug use. Write 0x0: No action Write 0x1: Force message sync loss Read 0x0: Always reads 0 because of immediate action. | RW | 0 |
| 2 | FORCE_RECONFIGURE | Force a reconfiguration boundary at next superframe boundary, rather than wait for a RECONFIGURE_NOW() message. Write 0x0: Cancel pending request (not used in normal operation) if any, otherwise no action Write 0x1: Assert reconfiguration request for next superframe boundary Read 0x1: Reconfiguration request pending for next superframe boundary Read 0x0: No request pending | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------|
| 1 | COMPONENT_RESET | Component reset request control: Transitions clock receiver FSM to state "Reset" (from any other state). Immediate action. Set upon reception of the RESET_DEVICE() message by the interface device, which requires a component-level reset. Note that a component-level reset is also required in case of bus reset, but the transition to "Reset" state happens automatically in that case and this bit is not used. Write 0x1: Assert request for next reconfiguration | RW | 0 |
| 0 | BOOT | Boot the component when not in active framer mode (don't care when in active framer mode). Transitions clock receiver FSM from state "Undefined" to "Reset". 0x0: No action 0x1: Enable clock receiver boot sequence | RW | 0 |

Table 24-736. Register Call Summary for Register SLIMBUS_FL_CONTROL

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Boot and Reset Procedures: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [SLIMbus Reconfigure Parameters: \[10\] \[11\] \[12\] \[13\] \[14\]](#)
- [SLIMbus Component Boot: \[15\] \[16\] \[17\] \[18\] \[19\]](#)
- [Data Agent Assignment: \[20\]](#)
- [Operational Modes Configuration: \[21\]](#)
- [SLIMBUS1 Register Summary: \[22\]](#)
- [SLIMBUS2 Register Summary: \[23\]](#)

Table 24-737. SLIMBUS_FL_SM

| | | | |
|------------------|---|----------|---|
| Address Offset | 0x0000 0078 | Instance | SLIMBUS1_L3 |
| Physical Address | 0x4902 C078 0x4012 C078 0x2 C078 0x4807 6078 | | SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Subframe mode (SM: defines control vs. data space partition) control status Software must write in values : a) to use when booting in active framer mode. b) extracted from NEXT_SUBFRAME_MODE(SM), to use at following reconfiguration boundary. Hardware-updated upon superframe sync acquisition, when booting in clock receiver mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | SM | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:5 | RESERVED | | R | 0x0000000 |
| 4:0 | SM | <p>Subframe Mode, which sets Control Space Width (CSW) and Subframe Length (SFL), both expressed in slots. Note that we always have CSW = SFL since the control is included in the subframe.</p> <p>0xD: CSW=3; SFL=8 (37.5% control)</p> <p>0x15: CSW=6; SFL=8 (75% control)</p> <p>0x1E: reserved. Same effect than 0b00000</p> <p>0x8: CSW=2; SFL=6 (33.3% control)</p> <p>0x5: CSW=1; SFL=8 (12.5% control)</p> <p>0x1B: CSW=12; SFL=32 (37.5% control)</p> <p>0x2: reserved. Same as 0x00</p> <p>0x4: CSW=1; SFL=6 (16.7% control)</p> <p>0x6: CSW=1; SFL=24 (4.17% control)</p> <p>0x1: reserved. Same as 0x05</p> <p>0x1D: CSW=16; SFL=32 (50% control)</p> <p>0x0: CSW=8; SFL=8 (100% control vs. 0% data)</p> <p>0xB: CSW=2; SFL=32 (6.25% control)</p> <p>0x3: reserved. Same as 0x07</p> <p>0x17: CSW=6; SFL=32 (18.8% control)</p> <p>0x11: CSW=4; SFL=8 (50% control)</p> <p>0xA: CSW=2; SFL=24 (8.33% control)</p> <p>0x9: CSW=2; SFL=8 (25% control)</p> <p>0x10: CSW=4; SFL=6 (66.7% control)</p> <p>0x12: CSW=4; SFL=24 (16.7% control)</p> <p>0x13: CSW=4; SFL=32 (12.5% control)</p> <p>0x18: CSW=8; SFL=24 (33.3% control)</p> <p>0x14: reserved. Same as 0x00</p> <p>0xE: CSW=3; SFL=24 (12.5% control)</p> <p>0x16: CSW=6; SFL=24 (25% control)</p> <p>0x1C: CSW=16; SFL=24 (66.7% control)</p> <p>0x7: CSW=1; SFL=32 (3.13% control)</p> <p>0x19: CSW=8; SFL=32 (25% control)</p> <p>0x1F: CSW=24; SFL=32 (75% control)</p> <p>0x1A: CSW=12; SFL=24 (50% control)</p> <p>0xF: CSW=3; SFL=32 (9.38% control)</p> <p>0xC: CSW=3; SFL=6 (50% control)</p> | RW | 0x00 |

Table 24-738. Register Call Summary for Register SLIMBUS_FL_SM

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Boot and Reset Procedures: \[0\]](#)
- [SLIMbus Reconfigure Parameters: \[1\]](#)
- [SLIMbus Component Boot: \[2\]](#)
- [SLIMBUS1 Register Summary: \[3\]](#)
- [SLIMBUS2 Register Summary: \[4\]](#)

Table 24-739. SLIMBUS_FL.CG

| | | |
|------------------|---|--|
| Address Offset | 0x0000 007C | |
| Physical Address | 0x4902 C07C 0x4012 C07C 0x2 C07C 0x4807 607C | Instance SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Clock Gear (CG) control and status Software must write in values : a) to use when booting in active framer mode. b) extracted from NEXT_CLOCK_GEAR(CG), to use at following reconfiguration boundary. Hardware-updated upon superframe sync acquisition, when booting in clock receiver mode. | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | CG | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | CG | Clock Gear (CG) to be used after the next reconfiguration boundary. Root / SLIMbus frequency ratio is defined as $2^{(10-CG)}$ 0x6: Ratio to root frequency: 16 0x1: Ratio to root frequency: 512 0xA: Ratio to root frequency: 1 (undivided) 0x7: Ratio to root frequency: 8 0x3: Ratio to root frequency: 128 0x2: Ratio to root frequency: 256 0x8: Ratio to root frequency: 4 0x9: Ratio to root frequency: 2 0x5: Ratio to root frequency: 32 0x4: Ratio to root frequency: 64 | RW | 0x0 |

Table 24-740. Register Call Summary for Register SLIMBUS_FL.CG

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Boot and Reset Procedures: \[0\]](#)
- [SLIMbus Reconfigure Parameters: \[1\]](#)
- [SLIMbus Component Boot: \[2\]](#)
- [SLIMBUS1 Register Summary: \[3\]](#)
- [SLIMBUS2 Register Summary: \[4\]](#)

Table 24-741. SLIMBUS_FL_RF

| | | | |
|------------------|---|----------|--|
| Address Offset | 0x0000 0080 | | |
| Physical Address | 0x4902 C080 0x4012 C080 0x2 C080 0x4807 6080 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Root frequency (RF = SLIMbus clock frequency when in gear 10) control status Software must write in values : a) to use when booting in active framer mode. b) extracted from NEXT_ROOT_FREQUENCY(RF), to use at following reconfiguration boundary. Hardware-updated upon superframe sync acquisition, when booting in clock receiver mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RF | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3:0 | RF | Root frequency 0x6: 24 MHz 0x1: 24.576 MHz 0x7: 25 MHz 0x0: Root frequency not indicated 0x2: 22.5792 MHz 0x8: 26 MHz 0x9: 27 MHz 0x4: 16.8 MHz 0x5: 19.2 MHz 0x3: 15.36 MHz | RW | 0x0 |

Table 24-742. Register Call Summary for Register SLIMBUS_FL_RF

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Boot and Reset Procedures: \[0\]](#)
- [SLIMbus Reconfigure Parameters: \[1\]](#)
- [SLIMbus Component Boot: \[2\]](#)
- [SLIMBUS1 Register Summary: \[3\]](#)
- [SLIMBUS2 Register Summary: \[4\]](#)

Table 24-743. SLIMBUS_FR_INFO

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0090 | | |
| Physical Address | 0x4902 C090 0x4012 C090 0x2 C090 0x4807 6090 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Framer device status (when active). Write 1 to a bit to clear it. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---------------|--------------------|------------------|-----------|-----------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | CLOCK_RESTART | FRAMER_UNACTIVATED | FRAMER_ACTIVATED | GC_TX_COL | FI_TX_COL | FS_TX_COL |

| Bits | Field Name | Description | Type | Reset |
|------|--------------------|---|---------------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5 | CLOCK_RESTART | Clock restart request event detected (that is, asynchronous DATA line transition during clock pause) 0x0: no event pending 0x1: event pending | RW W1toClr | 0 |
| 4 | FRAMER_UNACTIVATED | Framer has left clock source operational state. Set on ACTIVE_FRAMER information element deassertion. (framer device class-specific IE) 0x0: no event pending 0x1: event pending | RW W1toClr | 0 |
| 3 | FRAMER_ACTIVATED | Framer has reached clock source operational state. Set on ACTIVE_FRAMER information element assertion. (framer device class-specific IE) 0x0: no event pending 0x1: event pending | RW W1toClr | 0 |
| 2 | GC_TX_COL | Collision during guide byte transmit (Guide Channel) Framer device class-specific information element (IE) 0x0: no event pending 0x1: event pending | RW W1toClr | 0 |
| 1 | FI_TX_COL | Collision during Framing Information transmit (framing channel) Framer device class-specific information element (IE) 0x0: no event pending 0x1: event pending | RW W1toClr | 0 |
| 0 | FS_TX_COL | Collision during Frame Sync symbol transmit (framing channel) Framer device class-specific information element (IE) 0x0: no event pending 0x1: event pending | RW W1toClr | 0 |

Table 24-744. Register Call Summary for Register SLIMBUS_FR_INFO

Serial Low-Power Inter-Chip Media Bus Controller

- [Wake-Up Request: \[0\]](#)
- [Power Management: \[1\]](#)
- [SLIMbus Boot and Reset Procedures: \[2\] \[3\] \[4\]](#)
- [Possible Interrupts: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [Framer Device ISRs: \[11\] \[12\] \[13\]](#)
- [SLIMBUS1 Register Summary: \[14\]](#)
- [SLIMBUS2 Register Summary: \[15\]](#)

Table 24-745. SLIMBUS_FR_CLOCK_SOURCE

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0094 | | |
| Physical Address | 0x4902 C094 0x4012 C094 0x2 C094 0x4807 6094 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Root clock configuration for active framer mode, used at next reconfiguration boundary. Unused when not active framer. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|--------|---|---|---|--------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | CLKSEL | | | | CLKDIV | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-----------|
| 31:7 | RESERVED | | R | 0x0000000 |
| 6:4 | CLKSEL | SLIMbus clock selection 0x0: FCLK1 0x1: FCLK2 0x2: FCLK3 | RW | 0x0 |
| 3:0 | CLKDIV | Root divider ratio, applied on clock input to obtain root clock, to be used at next reconfiguration boundary. Input/ root frequency ratio is defined as $2^{(\text{CLKDIV}-5)}$ With CG the SLIMbus clock gear, Input / SLIMbus frequency ratio is therefore $2^{(5+\text{CLKDIV}-\text{CG})}$ WARNING: that last ratio has to be 1 or greater, to be implementable by the actual clock divider. 0x6: Ratio is 2 0x1: Ratio is 1/16: Gears 7 to 10 forbidden 0xA: Ratio is 32 0x7: Ratio is 4 0x0: Ratio is 1/32: Gears 6 to 10 forbidden 0x2: Ratio is 1/8: Gears 8 to 10 forbidden 0x8: Ratio is 8 0x9: Ratio is 16 0x4: Ratio is 1/2: Gear 10 forbidden. 0x5: Ratio is 1 (root freq. = input freq.) 0x3: Ratio is 1/4: Gears 9-10 forbidden | RW | 0x0 |

Table 24-746. Register Call Summary for Register SLIMBUS_FR_CLOCK_SOURCE

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Boot and Reset Procedures: \[0\] \[1\]](#)
- [SLIMbus Reconfigure Parameters: \[2\] \[3\]](#)
- [Interface Device ISRs: \[4\]](#)
- [SLIMbus Component Boot: \[5\] \[6\]](#)
- [SLIMBUS1 Register Summary: \[7\]](#)
- [SLIMBUS2 Register Summary: \[8\]](#)

Table 24-747. SLIMBUS_FR_CONTROL

| | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0098 | | | | | | | | | | | | | | | |
| Physical Address | 0x4902 C098 0x4012 C098 0x2 C098 0x4807 6098 | | | | | | | | | | | | | | | |
| | Instance | | | | | | | | | | | | | | | |
| | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 | | | | | | | | | | | | | | | |
| Description | Framer Device control. Unused when not active framer. (Self-cleared bits) | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|-----------|---|------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | BUS_RESET | | BOOT | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:2 | RESERVED | | R | 0x0000 0000 |
| 1 | BUS_RESET | Bus reset request control, when framer is already active. Set upon reception of the NEXT_RESET_BUS() message. Transitions clock source FSM to state "StartingClock" (from "Operational"). Write 0x0: Cancel pending request (not used in normal operation) if any, otherwise no action Write 0x1: Assert request for next reconfiguration Read 0x1: Request pending for next reconfiguration Read 0x0: No request pending for next reconfiguration | RW | 0 |
| 0 | BOOT | Initiate an active framer (clock source) boot sequence for the component, that is, when component is default active framer. Transitions clock source FSM from state "Undefined" to "CheckingDataLine". Transitions clock receiver FSM from state "Undefined" to "Reset". No effect if bus has already booted. Write 0x0: Cancel pending request (not used in normal operation) if any, otherwise no action Write 0x1: Assert request for next reconfiguration Read 0x1: Request pending for next reconfiguration Read 0x0: No request pending for next reconfiguration | RW | 0 |

Table 24-748. Register Call Summary for Register SLIMBUS_FR_CONTROL

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Boot and Reset Procedures: \[0\] \[1\] \[2\] \[3\] \[4\]](#)
- [SLIMbus Reconfigure Parameters: \[5\] \[6\]](#)
- [SLIMbus Component Boot: \[7\]](#)
- [SLIMBUS1 Register Summary: \[8\]](#)
- [SLIMBUS2 Register Summary: \[9\]](#)

Table 24-749. SLIMBUS_FR_FRAMER_HANDOVER

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 009C | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Physical Address | 0x4902 C09C 0x4012 C09C 0x2 C09C 0x4807 609C | | |
| Description | Framer handover control (outgoing if currently active, incoming if currently inactive) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|---------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HANDOVER_ENABLE | | NCO_NCI | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12 | HANDOVER_ENABLE | Enable framer handover, upon NEXT_ACTIVE_FRAMER(NCi,NCo) reception. Self-cleared upon handover, that is, at next reconfiguration boundary. 0x0: No framer handover 0x1: Framer handover at next configuration boundary. | RW | 0 |
| 11:0 | NCO_NCI | NCo[11:0] / NCi[11:0] for outgoing / incoming framer respectively, as extracted from NEXT_ACTIVE_FRAMER(NCi,NCo) Used on framer handover at next reconfiguration boundary. | RW | 0x000 |

Table 24-750. Register Call Summary for Register SLIMBUS_FR_FRAMER_HANDOVER

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Reconfigure Parameters: \[0\] \[1\] \[2\]](#)
- [SLIMBUS1 Register Summary: \[3\]](#)
- [SLIMBUS2 Register Summary: \[4\]](#)

Table 24-751. SLIMBUS_FR_CLOCK_PAUSE

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 00A0 | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Physical Address | 0x4902 C0A0 0x4012 C0A0 0x2 C0A0 0x4807 60A0 | | |
| Description | Clock pause restart control. Applied at following reconfiguration boundary, that is, where the clock is paused. Note that programming is identical for an active framer (clock source) and a clock receiver. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|-------------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | RT_HI | | | | RT | | CLOCK_PAUSE | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|----------|
| 31:9 | RESERVED | | R | 0x000000 |
| 8:3 | RT_HI | MSBs of 8-bit SLIMbus parameter. Constant. Read 0x0: Only legal, unreserved value. | R | 0x00 |
| 2:1 | RT | Restart Time (RT) for recovery after clock pause, as extracted from NEXT_PAUSE_CLOCK(RT) LSBs of 8-bit SLIMbus parameter. Unused when not active framer. 0x0: Fast recovery (less than 4 cells) 0x1: Constant-phase recovery (superframe phase preserved) 0x2: Unspecified recovery delay | RW | 0x0 |
| 0 | CLOCK_PAUSE | Control clock pause / restart. Self-cleared upon restart. 0x0: Force clock restart if paused, no effect otherwise. 0x1: Pause clock (clock source) or expect clock pause (clock receiver) at next configuration boundary | RW | 0 |

Table 24-752. Register Call Summary for Register SLIMBUS_FR_CLOCK_PAUSE

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Reconfigure Parameters: \[0\] \[1\] \[2\]](#)
- [SLIMBUS1 Register Summary: \[3\]](#)
- [SLIMBUS2 Register Summary: \[4\]](#)

Table 24-753. SLIMBUS_DEV_LA_i

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0100 + (0x10 * i) | Index | i = 0 to 6 |
| Physical Address | 0x4902 C100 + (0x10 * i) 0x4012 C100 + (0x10 * i) 0x2 C100 + (0x10 * i) 0x4807 6100 + (0x10 * i) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Device Logical Address control | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|-----------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | EA_ENABLE | | LA_ENABLE | | LA | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9 | EA_ENABLE | Enables the reception of "long-header" messages to the device's hardwired Enumeration Address (EA). Don't care if LA_ENABLE is 1. 0x0: EA is not valid 0x1: EA is used for message reception | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 8 | LA_ENABLE | Enables the reception of "short-header" messages to the device's Logical Address (LA). 0x0: LA is not valid 0x1: LA valid, to be used for message reception | RW | 0 |
| 7:0 | LA | Device Logical Address, assigned by manager device at enumeration (0x00 through 0xEF). The active manager device itself has address 0xFF by default. 0xFF: active manager device address | RW | 0x00 |

Table 24-754. Register Call Summary for Register SLIMBUS_DEV_LA_i

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Boot and Reset Procedures: \[0\] \[1\] \[2\]](#)
- [Device and Addressing Management: \[3\] \[4\] \[5\] \[6\]](#)
- [Message reception: \[7\]](#)
- [Device Enumeration: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [SLIMBUS1 Register Summary: \[14\]](#)
- [SLIMBUS2 Register Summary: \[15\]](#)

Table 24-755. SLIMBUS_DEV_EA_LO_i

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0104 + (0x10 * i) | Index | i = 0 to 6 |
| Physical Address | 0x4902 C104 + (0x10 * i) 0x4012 C104 + (0x10 * i) 0x2 C104 + (0x10 * i) 0x4807 6104 + (0x10 * i) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Device's Enumeration Address (EA[47:0]), lower 32 bits. For reference. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|-------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| EA_PC | | | | | | | | | | | | | | | | EA_DI | | | | | | | | EA_IV | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | EA_PC | Product Code (PC[15:0]), shared by all devices of the component | R | 0x0000 |
| 15:8 | EA_DI | Device Index (DI[15:0]), hardcoded from 0 upwards (0x00,0x01,0x02, etc...) each device of the component. WARNING: value is incorrectly given as 0x00 for all indexes. | R | 0x00 |
| 7:0 | EA_IV | Component's Instance Value (IV[7:0]), shared by all devices of the component | R | 0x00 |

Table 24-756. Register Call Summary for Register SLIMBUS_DEV_EA_LO_i

Serial Low-Power Inter-Chip Media Bus Controller

- [Device and Addressing Management: \[0\] \[1\]](#)
- [SLIMBUS1 Register Summary: \[2\]](#)
- [SLIMBUS2 Register Summary: \[3\]](#)

Table 24-757. SLIMBUS_DEV_EA_HI_i

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0108 + (0x10 * i) | Index | i = 0 to 6 |
| Physical Address | 0x4902 C108 + (0x10 * i) 0x4012 C108 + (0x10 * i) 0x2 C108 + (0x10 * i) 0x4807 6108 + (0x10 * i) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Device's Enumeration Address (EA[47:0]), upper 16 bits. For reference. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | EA_MI | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | EA_MI | Manufacturer Index (MI[15:0]), shared by all devices | R | 0x0102 |

Table 24-758. Register Call Summary for Register SLIMBUS_DEV_EA_HI_i

Serial Low-Power Inter-Chip Media Bus Controller

- [Device and Addressing Management: \[0\] \[1\]](#)
- [SLIMBUS1 Register Summary: \[2\]](#)
- [SLIMBUS2 Register Summary: \[3\]](#)

Table 24-759. SLIMBUS_DCT_INFO_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0200 + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C200 + (0x20 * j) 0x4012 C200 + (0x20 * j) 0x2 C200 + (0x20 * j) 0x4807 6200 + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | TX data agent status. Write 1 to a bit to clear it. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | LOLEVEL UNDERFLOW OVERFLOW DATA TX COL | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|---------------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | LOLEVEL | Write level of TX data agent FIFO has gone above DMA threshold (that is, writes required to fill FIFO) Note: Defaults to 0 (even though FIFO is then empty) as it sets to 1 only when read-only status bit DCT_FIFO_STATUS.LOLEVEL transitions from 0 to 1, that is, when threshold is actually crossed downward. Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|---------------|-------|
| 2 | UNDERFLOW | Underflow in TX data agent FIFO. Note: never asserted in pushed or async TPs, by construction. Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 1 | OVERFLOW | Overflow in TX data agent FIFO. Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 0 | DATA_TX_COL | TX collision in TX data agent. Core information element (IE). Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |

Table 24-760. Register Call Summary for Register SLIMBUS_DCT_INFO_j

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Boot and Reset Procedures: \[0\]](#)
- [Possible Interrupts: \[1\] \[2\] \[3\] \[4\]](#)
- [Data Channel Port ISRs: \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [SLIMbus Transfer Procedures: \[10\] \[11\]](#)
- [SLIMBUS1 Register Summary: \[12\]](#)
- [SLIMBUS2 Register Summary: \[13\]](#)

Table 24-761. SLIMBUS_DCT_FIFO_SETUP1_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0204 + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C204 + (0x20 * j) 0x4012 C204 + (0x20 * j) 0x2 C204 + (0x20 * j) 0x4807 6204 + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | TX data agent FIFO setup. To be kept static during channel operation. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|--------------|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BASE_ADDR | | | | | | | | DMA_REQ_SIZE | | | | FIFO_CLEAR | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:5 | BASE_ADDR | TX data agent FIFO base address within shared TX RAM. (physical address of the 32-bit wide RAM array) | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------|
| 4:1 | DMA_REQ_SIZE | DMA request size minus 1, in write accesses. In counting (packet) mode, last request may be smaller. Only applicable in precise DMA mode. 0xF: 16 accesses per DMA request 0x0: 1 access per DMA request | RW | 0x0 |
| 0 | FIFO_CLEAR | Returns FIFO to initial empty state. Write 0x0: No effect Write 0x1: Clear FIFO Read 0x1: Ongoing Clear. Completion requires the SLIMbus clock. Read 0x0: No event, last clear completed | RW | 0 |

Table 24-762. Register Call Summary for Register SLIMBUS_DCT_FIFO_SETUP1_j

Serial Low-Power Inter-Chip Media Bus Controller

- [FIFO Mapping: \[0\]](#)
- [FIFO Configuration: \[1\] \[2\]](#)
- [Operational Modes Configuration: \[3\] \[4\] \[5\]](#)
- [SLIMbus Transfer Procedures: \[6\] \[7\]](#)
- [SLIMBUS1 Register Summary: \[8\]](#)
- [SLIMBUS2 Register Summary: \[9\]](#)

Table 24-763. SLIMBUS_DCT_FIFO_SETUP2_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0208 + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C208 + (0x20 * j) 0x4012 C208 + (0x20 * j) 0x2 C208 + (0x20 * j) 0x4807 6208 + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | TX data agent FIFO setup, continued. To be kept static during channel operation. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------|-------------|----------|----|----|----|----|----|----|---------------|----|----|----|----|----|----|--------------|----|----|----|----|----|---|------|---|---|---|---|---|---|---|---|
| PACKING | MSB_ALIGNED | RESERVED | | | | | | | DMA_THRESHOLD | | | | | | | SB_THRESHOLD | | | | | | | SIZE | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|-------|
| 31 | PACKING | Packing enable control 0x0: Packing disabled: one segment word per write access. Byte enable is don't care. 0x1: Packing enabled: one or several segment words per write access, depending on segment word size and byte enable. Only works in LSB-aligned mode. Behaviour in LSB-aligned mode is undefined. | RW | 0 |
| 30 | MSB_ALIGNED | PLACEHOLDER, NO EFFECT: DATA ALWAYS LSB-aligned LSB/MSB-alignment of FIFO input (write) TX data. 0x0: Input data is LSB-aligned 0x1: Input data is MSB-aligned | RW | 0 |
| 29:24 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|-------|
| 23:16 | DMA_THRESHOLD | SW-side TX data agent FIFO threshold. DMA write requests get (re-)asserted when WR_LEVEL is above threshold. Range: 0 to SIZE field value (included). 0xFF: DMA writes requested whenever FIFO is empty (assuming maximum FIFO size) 0x0: DMA writes requested whenever FIFO is not full | RW | 0x00 |
| 15:8 | SB_THRESHOLD | SLIMbus-side TX data agent FIFO threshold, used for SLIMbus transmission. 0xFF: Threshold condition = FIFO is full (assuming maximum FIFO size) 0x0: Threshold condition = FIFO is not empty | RW | 0x00 |
| 7:0 | SIZE | Capacity of FIFO in segment words, minus one. 0xFF: Maximum FIFO size 0x0: FIFO is 1-word deep (not recommended) 0x3: FIFO is 4-word deep. Recommended minimum setting (SLIMbus protocol). | RW | 0x00 |

Table 24-764. Register Call Summary for Register SLIMBUS_DCT_FIFO_SETUP2_j

Serial Low-Power Inter-Chip Media Bus Controller

- [FIFO Mapping: \[0\]](#)
- [FIFO Status: \[1\]](#)
- [FIFO Configuration: \[2\] \[3\] \[4\] \[5\]](#)
- [Operational Modes Configuration: \[6\] \[7\] \[8\]](#)
- [SLIMbus Transfer Procedures: \[9\] \[10\] \[11\]](#)
- [SLIMBUS1 Register Summary: \[12\]](#)
- [SLIMBUS2 Register Summary: \[13\]](#)

Table 24-765. SLIMBUS_DCT_FIFO_STATUS_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 020C + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C20C + (0x20 * j) 0x4012 C20C + (0x20 * j) 0x2 C20C + (0x20 * j) 0x4807 620C + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | TX data agent FIFO status, for software (non-DMA) FIFO management. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----------|----|----|----|----------|---|---|---|---|---|---------|------|---|---|
| COUNT_EN | ACC_CNT | | | | | | | | | | | | | | | | IMPRECISE_EN | RESERVED | | | | WR_LEVEL | | | | | | LOLEVEL | FULL | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|--------|
| 31 | COUNT_EN | <p>Down-counter mode control. Only applicable in precise DMA mode.</p> <p>Write 0x0: Disable down-counter mode. Should typically be used only when ACC_CNT = 0. If ACC_CNT 0, DMA request gets deasserted immediately.</p> <p>Write 0x1: Enable down-counter mode. ACC_CNT is typically set to the desired value in the same write access.</p> <p>Read 0x1: Down-counter mode is enabled. DMA request can only be active when ACC_CNT 0</p> <p>Read 0x0: Down-counter mode is disabled: DMA request follows FIFO level, and is active during no-tx periods.</p> | RW | 0 |
| 30:16 | ACC_CNT | <p>"Packet mode" down-counter of segment words, decremented on DCT_DATA write accesses. In that mode, DMA request shall deassert when ACC_CNT = 0 (that is, packet fully transmitted / stored in TX FIFO).</p> <p>Write 0x0: Deasserts current DMA request by forcing the count to zero (not typical operation)</p> <p>Write 0x7F: Set largest packet size (in accesses) to transfer before DMA request deassertion. Any lower value is also valid to enter.</p> <p>Read 0x7F: Maximum number of accesses still to be transferred before DMA deassertion. Unless interrupted, counter shall go through all values down to zero.</p> <p>Read 0x0: No access left to transfer, DMA request currently inactive.</p> | RW | 0x0000 |
| 15 | IMPRECISE_EN | <p>Precise vs. Imprecise DMA requesting mode control. (A DMA request is a single assertion-deassertion cycle.)</p> <p>0x0: DMA request contains a precise number of accesses</p> <p>0x1: DMA request is not expected to trigger a fixed number of accesses</p> | RW | 0 |
| 14:11 | RESERVED | | R | 0x0 |
| 10:2 | WR_LEVEL | <p>Number of free segment words in FIFO, that could be filled by writes.</p> <p>Read 0x100: FIFO is empty and entirely available for writes (assuming maximum FIFO size)</p> <p>Read 0x0: FIFO is full and cannot be written to</p> | R | 0x001 |
| 1 | LOLEVEL | <p>Indicator of write level (WR_LEVEL: number of free words in FIFO) with respect to (write) threshold (DMA_threshold). Activates DMA write requests when high.</p> <p>Read 0x1: WR_LEVEL DMA_THRESHOLD</p> <p>Read 0x0: WR_LEVEL = DMA_THRESHOLD</p> | R | 1 |
| 0 | FULL | <p>FIFO full indicator</p> <p>Read 0x1: no space left in FIFO to write a word (WR_LEVEL = 0)</p> <p>Read 0x0: some space left in FIFO to write at least one word (WR_LEVEL 0)</p> | R | 0 |

Table 24-766. Register Call Summary for Register SLIMBUS_DCT_FIFO_STATUS_j

Serial Low-Power Inter-Chip Media Bus Controller

- [FIFO Status: \[0\] \[1\] \[2\]](#)
- [FIFO Configuration: \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [SLIMbus Transfer Procedures: \[8\] \[9\] \[10\]](#)
- [SLIMBUS1 Register Summary: \[11\]](#)
- [SLIMBUS2 Register Summary: \[12\]](#)

Table 24-767. SLIMBUS_DCT_MAP_j

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0210 + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C210 + (0x20 * j) 0x4012 C210 + (0x20 * j) 0x2 C210 + (0x20 * j) 0x4807 6210 + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Associates a device and port to the TX data agent. Write to field FL_CONTROL.validate_dcmmap to validate changes. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PN | | | | | | | | DI | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:8 | PN | Port Number (PN), identifies the data channel's port for the device. Shall be unique within a device. Note that a half-duplex (bidirectional) port has 2 data agents with the same PN, 1 TX + 1 Rx. | RW | 0x00 |
| 7:0 | DI | Index (DI) of the device this data agent belongs to. Devices are hard-indexed from 0 upwards. | RW | 0x00 |

Table 24-768. Register Call Summary for Register SLIMBUS_DCT_MAP_j

Serial Low-Power Inter-Chip Media Bus Controller

- [Device and Addressing Management: \[0\] \[1\]](#)
- [Data Agent Assignment: \[2\] \[3\]](#)
- [SLIMBUS1 Register Summary: \[4\]](#)
- [SLIMBUS2 Register Summary: \[5\]](#)

Table 24-769. SLIMBUS_DCT_CONFIG1_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0214 + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C214 + (0x20 * j) 0x4012 C214 + (0x20 * j) 0x2 C214 + (0x20 * j) 0x4807 6214 + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | TX data agent configuration, applied at the next reconfiguration boundary | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | |
|--------|----|----------------|----|----------|----|---------|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|----|---|---|---|--|--|--------------|--|----|--|--|--|
| ENABLE | | CTS_LAST_VALUE | | RESERVED | | DT_LPCM | | RESERVED | | | | | | | | AF | | | | CL | | DL | | | | | | SL | | | | | | TP_QUALIFIER | | TP | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|-------|
| 31 | ENABLE | Data agent enabling control. Auto-cleared upon frame or superframe sync loss. Read 0x1: Data agent is enabled Read 0x0: Data agent is disabled | RW | 0 |
| 30 | CTS_LAST_VALUE | Last received value of the CTS TAG bit. Only updated for asynchronous TP, when primary owner (that is, transmitter) of the channel. Read 0x1: Local sink signals TAG.CTS=1 that is, it can receive data (and remote source can transmit some) Read 0x0: Local sink signals TAG.CTS=0 that is, it cannot receive any data (and remote source shall not transmit any) | R | 0 |
| 29 | RESERVED | | R | 0 |
| 28 | DT_LPCM | Unsigned-to-OSAM encoding enable for Data Type (DT) = LPCM audio (0x1) 0x0: DT!=0x1: encoding disabled 0x1: DT=0x1: encoding enabled | RW | 0 |
| 27:20 | RESERVED | | R | 0x00 |
| 19:16 | AF | Auxilliary Format (AF) used in segment word size calculation. Non-zero values not supported in extended asynchronous TPs. 0xF: User-defined 8-bit AUX (2 AUX slot per segment) 0x0: No AUX information (0 AUX slots per segment) 0x1: ZCUV for tunneling IEC60958 (1 AUX slot per segment) 0xB: User-defined 4-bit AUX (1 AUX slot per segment) | RW | 0x0 |
| 15 | CL | Channel Link (CL) enable: Pairing up of current channel with previous one (that is, channel index below) Tied-0, read-only field for channel index 0, since there is no "previous" channel in that case. TP and segment interval (encoded in SD) must be equal between the linked channels. 0x0: Current channel independent from previous one. 0x1: Current channel paired up with previous one. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|-------|
| 14:10 | DL | <p>Segment Data Length (DL), in 4-bit slots (except when 0). AUX + DATA length shall fit in a segment word, that is, 1 to 32 bits.</p> <p>In extended async TPs, sets segment word size (0 and odd values illegal) instead.</p> <p>0x6: 6 slots (24 bits)</p> <p>0x1: 1 slot (4 bits)</p> <p>0x7: 7 slots (28 bits), requiring at most 1 AUX slot to fit in max-size 32-bit segment word</p> <p>0x0: Length not indicated: Segment slots that are not TAG or AUX are DATA (that is, no unused slot)</p> <p>0x2: 2 slots (8 bits)</p> <p>0x8: 8 slots (32 bits), requiring zero AUX slot, to fit in a max-size 32-bit segment word</p> <p>0x4: 4 slots (16 bits)</p> <p>0x5: 5 slots (20 bits)</p> <p>0x3: 3 slots (12 bits)</p> | RW | 0x00 |
| 9:5 | SL | <p>total Segment Length (SL), in 4-bit slots.</p> <p>SL = TAG length + AUX length + DATA length</p> <p>0x0: Reserved value</p> | RW | 0x00 |
| 4 | TP_QUALIFIER | <p>Qualifier for plain/extended half-duplex asynchronous TPs (owner ID).</p> <p>Unused and don't care for other TPs.</p> <p>0x0: 1/2 duplex TPs: Local device is primary channel owner, uses T1 token</p> <p>0x1: 1/2 duplex TPs: Local device is secondary channel owner, uses T2 token</p> | RW | 0 |
| 3:0 | TP | <p>Transport Protocol (TP)</p> <p>Determines also the TAG length (from 0 to 2 slots).</p> <p>0x6: Extended asynchronous-half-duplex (unicast, 2-slot TAG)</p> <p>0x1: Pushed (multicast, 1-slot TAG)</p> <p>0x7: Extended asynchronous-simplex (unicast, 2-slot TAG)</p> <p>0x0: Isochronous (multicast, no TAG)</p> <p>0x2: Pulled (unicast, 1-slot TAG)</p> <p>0x4: Asynchronous-simplex (unicast, 1-slot TAG)</p> <p>0x5: Asynchronous-half-duplex (unicast, 1-slot TAG)</p> <p>0xF: User-defined protocol 2 NOT SUPPORTED, RESERVED VALUE</p> <p>0x3: Locked (multicast, no TAG) NOT SUPPORTED, RESERVED VALUE</p> <p>0xE: User-defined protocol 1 NOT SUPPORTED, RESERVED VALUE</p> | RW | 0x0 |

Table 24-770. Register Call Summary for Register SLIMBUS_DCT_CONFIG1_j

Serial Low-Power Inter-Chip Media Bus Controller

- [Control and Data Channels: \[0\] \[1\] \[2\] \[3\]](#)
- [SLIMbus Reconfigure Parameters: \[4\] \[5\] \[6\] \[7\]](#)
- [FIFO Management: \[8\] \[9\] \[10\] \[11\]](#)
- [SLIMbus Transfer Protocols: \[12\] \[13\] \[14\] \[15\] \[16\] \[17\]](#)
- [Isochronous Transfer Protocol: \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)
- [Pushed Transfer Protocol: \[24\] \[25\] \[26\] \[27\] \[28\] \[29\]](#)
- [Pulled Transfer Protocol: \[30\] \[31\] \[32\] \[33\] \[34\] \[35\]](#)
- [Asynchronous Transfer Protocol: \[36\] \[37\] \[38\] \[39\] \[40\] \[41\]](#)
- [Extended Asynchronous Transfer Protocol: \[42\] \[43\] \[44\] \[45\] \[46\] \[47\] \[48\]](#)
- [Paired-up channels: \[49\] \[50\] \[51\] \[52\] \[53\]](#)
- [Interface Device ISRs: \[54\] \[55\]](#)
- [Operational Modes Configuration: \[56\] \[57\] \[58\] \[59\] \[60\] \[61\] \[62\] \[63\] \[64\] \[65\]](#)
- [SLIMBUS1 Register Summary: \[66\]](#)
- [SLIMBUS2 Register Summary: \[67\]](#)

Table 24-771. SLIMBUS_DCT_CONFIG2_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0218 + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C218 + (0x20 * j) 0x4012 C218 + (0x20 * j) 0x2 C218 + (0x20 * j) 0x4807 6218 + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | TX data agent configuration (continued), applied at the next reconfiguration boundary | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:0 | SD | Segment Distribution (see <i>MIPI Alliance Specification for SLIMbus Version 1.01.00</i>) | RW | 0x000 |

Table 24-772. Register Call Summary for Register SLIMBUS_DCT_CONFIG2_j

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Reconfigure Parameters: \[0\]](#)
- [SLIMbus Transfer Protocols: \[1\]](#)
- [Isochronous Transfer Protocol: \[2\]](#)
- [Pushed Transfer Protocol: \[3\]](#)
- [Pulled Transfer Protocol: \[4\]](#)
- [Asynchronous Transfer Protocol: \[5\]](#)
- [Extended Asynchronous Transfer Protocol: \[6\]](#)
- [Paired-up channels: \[7\]](#)
- [Operational Modes Configuration: \[8\]](#)
- [SLIMBUS1 Register Summary: \[9\]](#)
- [SLIMBUS2 Register Summary: \[10\]](#)

Table 24-773. SLIMBUS_DCT_DATA_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 021C + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C21C + (0x20 * j) 0x4012 C21C + (0x20 * j) 0x2 C21C + (0x20 * j) 0x4807 621C + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | TX data agent DATA FIFO input. Reads have no effect on FIFO. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | DATA | Data segment word, single-word or packed, LSB or MSB-aligned. | RW | 0x0000 0000 |

Table 24-774. Register Call Summary for Register SLIMBUS_DCT_DATA_j

Serial Low-Power Inter-Chip Media Bus Controller

- [Data input/output: manual mode: \[0\]](#)
- [SLIMbus Transfer Procedures: \[1\] \[2\]](#)
- [SLIMBUS1 Register Summary: \[3\]](#)
- [SLIMBUS2 Register Summary: \[4\]](#)

Table 24-775. SLIMBUS_DCR_INFO_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0300 + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C300 + (0x20 * j) 0x4012 C300 + (0x20 * j) 0x2 C300 + (0x20 * j) 0x4807 6280 + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | RX data agent status. Write 1 to a bit to clear it. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---------|-----------|----------|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | HILEVEL | UNDERFLOW | OVERFLOW | DATA_TX_COL |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|---------------|------------|
| 31:4 | RESERVED | | R | 0x00000000 |
| 3 | HILEVEL | Read level of RX data agent FIFO has gone above DMA threshold (that is, reads required to empty FIFO) Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|---------------|-------|
| 2 | UNDERFLOW | Underflow in RX data agent FIFO Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 1 | OVERFLOW | Overflow in RX data agent FIFO Note: never asserted in pulled or async TPs, by construction. Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |
| 0 | DATA_TX_COL | TX collision in RX data agent. Core information element (IE). Write 0x0: No action Write 0x1: Clear pending event, if any Read 0x1: IRQ event pending Read 0x0: No event pending | RW W1toClr | 0 |

Table 24-776. Register Call Summary for Register SLIMBUS_DCR_INFO_j

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Boot and Reset Procedures: \[0\]](#)
- [Possible Interrupts: \[1\] \[2\] \[3\] \[4\]](#)
- [Data Channel Port ISRs: \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [SLIMbus Transfer Procedures: \[10\] \[11\]](#)
- [SLIMBUS1 Register Summary: \[12\]](#)
- [SLIMBUS2 Register Summary: \[13\]](#)

Table 24-777. SLIMBUS_DCR_FIFO_SETUP1_j

| | | | |
|------------------|---|----------|--|
| Address Offset | 0x0000 0304 + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C304 + (0x20 * j) 0x4012 C304 + (0x20 * j) 0x2 C304 + (0x20 * j) 0x4807 6284 + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | RX data agent FIFO setup. To be kept static during channel operation. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|--------------|---|---|------------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BASE_ADDR | | | | | | | | DMA_REQ_SIZE | | | FIFO_CLEAR | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:13 | RESERVED | | R | 0x00000 |
| 12:5 | BASE_ADDR | RX data agent FIFO base address within shared RX RAM. (physical address of the 32-bit wide RAM array) | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------|
| 4:1 | DMA_REQ_SIZE | DMA request size minus 1, in read accesses. In counting (packet) mode, last request may be smaller. Only applicable in precise DMA mode. 0xF: 16 accesses per DMA request 0x0: 1 access per DMA request | RW | 0x0 |
| 0 | FIFO_CLEAR | Returns FIFO to initial empty state. Write 0x0: No effect Write 0x1: Clear FIFO Read 0x1: Ongoing Clear. Completion requires the SLIMbus clock. Read 0x0: No event, last clear completed | RW | 0 |

Table 24-778. Register Call Summary for Register SLIMBUS_DCR_FIFO_SETUP1_j

Serial Low-Power Inter-Chip Media Bus Controller

- [FIFO Mapping: \[0\]](#)
- [FIFO Configuration: \[1\] \[2\]](#)
- [Operational Modes Configuration: \[3\] \[4\] \[5\]](#)
- [SLIMbus Transfer Procedures: \[6\] \[7\]](#)
- [SLIMBUS1 Register Summary: \[8\]](#)
- [SLIMBUS2 Register Summary: \[9\]](#)

Table 24-779. SLIMBUS_DCR_FIFO_SETUP2_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0308 + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C308 + (0x20 * j) 0x4012 C308 + (0x20 * j) 0x2 C308 + (0x20 * j) 0x4807 6288 + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | RX data agent FIFO setup, continued. To be kept static during channel operation. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------|-------------|----------|----|----|----|----|----|----|---------------|----|----|----|----|----|----|--------------|----|----|----|----|----|---|------|---|---|---|---|---|---|---|---|
| PACKING | MSB_ALIGNED | RESERVED | | | | | | | DMA_THRESHOLD | | | | | | | SB_THRESHOLD | | | | | | | SIZE | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|-------|
| 31 | PACKING | Packing enable control 0x0: Packing disabled: one segment word per read access. Byte enable is don't care. 0x1: Packing enabled: one or several segment words per read access, depending on segment word size and byte enable. Only works in LSB-aligned mode. Behaviour in LSB-aligned mode is undefined. | RW | 0 |
| 30 | MSB_ALIGNED | PLACEHOLDER, NO EFFECT: DATA ALWAYS LSB-aligned LSB/MSB-alignment of FIFO output (read) RX data. 0x0: Output data is LSB-aligned 0x1: Output data is MSB-aligned | RW | 0 |
| 29:24 | RESERVED | | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|-------|
| 23:16 | DMA_THRESHOLD | SW-side RX data agent FIFO threshold. DMA read requests get (re-)asserted when RD_LEVEL is above threshold. Range: 0 to SIZE field value (included). 0xFF: DMA reads requested whenever FIFO is full (assuming maximum FIFO size) 0x0: DMA reads requested whenever FIFO is not empty | RW | 0x00 |
| 15:8 | SB_THRESHOLD | SLIMbus-side RX data agent FIFO threshold, used for SLIMbus reception. 0xFF: Threshold condition = FIFO is full (assuming maximum FIFO size) 0x0: Threshold condition = FIFO is not empty | RW | 0x00 |
| 7:0 | SIZE | Capacity of FIFO in segment words, minus one. 0xFF: Maximum FIFO size 0x0: FIFO is 1-word deep (not recommended) 0x3: FIFO is 4-word deep. Recommended minimum setting (SLIMbus protocol). | RW | 0x00 |

Table 24-780. Register Call Summary for Register SLIMBUS_DCR_FIFO_SETUP2_j

Serial Low-Power Inter-Chip Media Bus Controller

- [FIFO Mapping: \[0\]](#)
- [FIFO Status: \[1\]](#)
- [FIFO Configuration: \[2\] \[3\] \[4\] \[5\]](#)
- [Operational Modes Configuration: \[6\] \[7\] \[8\]](#)
- [SLIMbus Transfer Procedures: \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [SLIMBUS1 Register Summary: \[14\]](#)
- [SLIMBUS2 Register Summary: \[15\]](#)

Table 24-781. SLIMBUS_DCR_FIFO_STATUS_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 030C + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C30C + (0x20 * j) 0x4012 C30C + (0x20 * j) 0x2 C30C + (0x20 * j) 0x4807 628C + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | RX data agent FIFO status, for software (non-DMA) FIFO management. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----------|----|----|----|----|----------|---|---|---|---|---------|---|-------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| COUNT_EN | ACC_CNT | | | | | | | | | | | | | | | IMPRECISE_EN | RESERVED | | | | | RD_LEVEL | | | | | HILEVEL | | EMPTY | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|--------|
| 31 | COUNT_EN | <p>Down-counter mode control. Only applicable in precise DMA mode.</p> <p>Write 0x0: Disable down-counter mode. Should typically be used only when ACC_CNT = 0. If ACC_CNT 0, DMA request gets deasserted immediately.</p> <p>Write 0x1: Enable down-counter mode. ACC_CNT is typically set to the desired value in the same write access.</p> <p>Read 0x1: Down-counter mode is enabled: DMA request can only be active when ACC_CNT 0</p> <p>Read 0x0: Down-counter mode is disabled: DMA request follows FIFO level, and is active during no-transmission periods.</p> | RW | 0 |
| 30:16 | ACC_CNT | <p>"Packet mode" down-counter of segment words, decremented on DCR_DATA read accesses. In that mode, DMA request shall reassert when ACC_CNT = RD_LEVEL (that is, whole packet received).</p> <p>Write 0x0: Deasserts current DMA request by forcing the count to zero (not typical operation)</p> <p>Write 0x7F: Set largest packet size (in accesses) to transfer before DMA request deassertion. Any lower value is also valid to enter.</p> <p>Read 0x7F: Maximum number of accesses still to be transferred before DMA deassertion. Unless interrupted, counter shall go through all values down to zero.</p> <p>Read 0x0: No access left to transfer, DMA request currently inactive.</p> | RW | 0x0000 |
| 15 | IMPRECISE_EN | <p>Precise vs. Imprecise DMA requesting mode control. (A DMA request is a single assertion-deassertion cycle.)</p> <p>0x0: DMA request contains a defined number of accesses</p> <p>0x1: DMA request is not expected to trigger a fixed number of accesses</p> | RW | 0 |
| 14:11 | RESERVED | | R | 0x0 |
| 10:2 | RD_LEVEL | <p>Number of segment words stored in FIFO, that can be read out.</p> <p>Read 0x100: FIFO is full of readable words (assuming maximum size)</p> <p>Read 0x0: FIFO contains no readable word</p> | R | 0x000 |
| 1 | HILEVEL | <p>Indicator of read level (RD_LEVEL: number of readable segment words) with respect to (read) threshold (DMA_THRESHOLD). Activates DMA read requests when high.</p> <p>Read 0x1: RD_LEVEL DMA_THRESHOLD</p> <p>Read 0x0: RD_LEVEL = DMA_THRESHOLD</p> | R | 0 |
| 0 | EMPTY | <p>FIFO empty indicator</p> <p>Read 0x1: FIFO contains no readable word (RD_LEVEL = 0)</p> <p>Read 0x0: FIFO contains at least one readable word (RD_LEVEL 0)</p> | R | 1 |

Table 24-782. Register Call Summary for Register SLIMBUS_DCR_FIFO_STATUS_j

Serial Low-Power Inter-Chip Media Bus Controller

- [FIFO Status: \[0\] \[1\] \[2\]](#)
- [FIFO Configuration: \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [SLIMbus Transfer Procedures: \[8\] \[9\] \[10\]](#)
- [SLIMBUS1 Register Summary: \[11\]](#)
- [SLIMBUS2 Register Summary: \[12\]](#)

Table 24-783. SLIMBUS_DCR_MAP_j

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0310 + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C310 + (0x20 * j) 0x4012 C310 + (0x20 * j) 0x2 C310 + (0x20 * j) 0x4807 6290 + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | Associates a device and port to the RX data agent. Write to field FL_CONTROL[8] VALIDATE_DCMAP to validate changes. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PN | | | | DI | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:8 | PN | Port Number (PN), identifies the data channel's port for the device. Shall be unique within a device. Note that a half-duplex (bidirectional) port has 2 data agents with the same PN, 1 TX + 1 Rx. | RW | 0x00 |
| 7:0 | DI | Index (DI) of the device this data agent belongs to. Devices are hard-indexed from 0 upwards. | RW | 0x00 |

Table 24-784. Register Call Summary for Register SLIMBUS_DCR_MAP_j

Serial Low-Power Inter-Chip Media Bus Controller

- [Device and Addressing Management: \[0\] \[1\]](#)
- [Data Agent Assignment: \[2\] \[3\]](#)
- [SLIMBUS1 Register Summary: \[4\]](#)
- [SLIMBUS2 Register Summary: \[5\]](#)

Table 24-785. SLIMBUS_DCR_CONFIG1_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0314 + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C314 + (0x20 * j) 0x4012 C314 + (0x20 * j) 0x2 C314 + (0x20 * j) 0x4807 6294 + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | RX data agent configuration, applied at the next reconfiguration boundary | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
|--------|----|-----------------|----|--------------|----|---------|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|----|---|---|---|--------------|---|----|--|--|--|
| ENABLE | | CTS_FORCE_VALUE | | CTS_FORCE_EN | | DT_LPCM | | RESERVED | | | | | | | | AF | | | | CL | | DL | | | | SL | | | | TP_QUALIFIER | | TP | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|-------|
| 31 | ENABLE | Data agent enabling control. Auto-cleared upon frame or superframe sync loss. 0x0: Data agent is disabled 0x1: Data agent is enabled | RW | 0 |
| 30 | CTS_FORCE_VALUE | Value to force the CTS TAG bit value when in asynchronous TP and secondary channel owner (that is, receiver) and CTS is forced (CTS_force_en=1) Don't care in all other cases. Warning: forcing CTS=1 can result in a FIFO overflow. 0x0: Local sink signals TAG.CTS=0 that is, it cannot receive any data (and remote source shall not transmit any) 0x1: Local sink signals TAG.CTS=1 that is, it can receive data (and remote source can transmit some) | RW | 0 |
| 29 | CTS_FORCE_EN | Forces the CTS TAG bit value when in an asynchronous TP and secondary owner (that is, receiver) of the channel. Don't care in other cases. 0x0: CTS bit generated according to RX FIFO level 0x1: CTS bit forced to CTS_force_value | RW | 0 |
| 28 | DT_LPCM | OSAM-to-unsigned decoding enable for Data Type (DT) = LPCM audio (0x1) 0x0: DT!=0x1: decoding disabled 0x1: DT=0x1: decoding enabled | RW | 0 |
| 27:20 | RESERVED | | R | 0x00 |
| 19:16 | AF | Auxiliary Format (AF) used in segment word size calculation. Non-zero values not supported in extended asynchronous TPs. 0xF: User-defined 8-bit AUX (2 AUX slot per segment) 0x0: No AUX information (0 AUX slots per segment) 0x1: ZCUV for tunneling IEC60958 (1 AUX slot per segment) 0xB: User-defined 4-bit AUX (1 AUX slot per segment) | RW | 0x0 |
| 15 | CL | Channel Link (CL) enable: Pairing up of current channel with previous one (that is, channel index below) Channel index 0 should have CL=0, since there is no "previous" channel in that case. TP and segment interval (encoded in SD) must be equal between the linked channels. 0x0: Current channel independent from previous one. 0x1: Current channel paired up with previous one. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|-------|
| 14:10 | DL | <p>Segment Data Length (DL), in 4-bit slots (except when 0). AUX + DATA length shall fit in a segment word, that is, 1 to 32 bits.</p> <p>In extended async TPs, sets segment word size (0 and odd values illegal) instead.</p> <p>0x6: 6 slots (24 bits)</p> <p>0x1: 1 slot (4 bits)</p> <p>0x7: 7 slots (28 bits), requiring at most 1 AUX slot to fit in max-size 32-bit segment word</p> <p>0x0: Length not indicated: Segment slots that are not TAG or AUX are DATA (that is, no unused slot)</p> <p>0x2: 2 slots (8 bits)</p> <p>0x8: 8 slots (32 bits), requiring zero AUX slot, to fit in a max-size 32-bit segment word</p> <p>0x4: 4 slots (16 bits)</p> <p>0x5: 5 slots (20 bits)</p> <p>0x3: 3 slots (12 bits)</p> | RW | 0x00 |
| 9:5 | SL | <p>total Segment Length (SL), in 4-bit slots.</p> <p>SL = TAG length + AUX length + DATA length</p> <p>0x0: Reserved value</p> | RW | 0x00 |
| 4 | TP_QUALIFIER | <p>Qualifier for plain/extended half-duplex asynchronous TPs (owner ID).</p> <p>Unused and don't care for other TPs</p> <p>0x0: 1/2 duplex TPs: Local device is primary channel owner, uses T1 token</p> <p>0x1: 1/2 duplex TPs: Local device is secondary channel owner, uses T2 token</p> | RW | 0 |
| 3:0 | TP | <p>Transport Protocol (TP)</p> <p>Determines also the TAG length (from 0 to 2 slots).</p> <p>0x6: Extended asynchronous-half-duplex (unicast, 2-slot TAG)</p> <p>0x1: Pushed (multicast, 1-slot TAG)</p> <p>0x7: Extended asynchronous-simplex (unicast, 2-slot TAG)</p> <p>0x0: Isochronous (multicast, no TAG)</p> <p>0x2: Pulled (unicast, 1-slot TAG)</p> <p>0x4: Asynchronous-simplex (unicast, 1-slot TAG)</p> <p>0x5: Asynchronous-half-duplex (unicast, 1-slot TAG)</p> <p>0xF: User-defined protocol 2 NOT SUPPORTED, RESERVED VALUE</p> <p>0x3: Locked (multicast, no TAG) NOT SUPPORTED, RESERVED VALUE</p> <p>0xE: User-defined protocol 1 NOT SUPPORTED, RESERVED VALUE</p> | RW | 0x0 |

Table 24-786. Register Call Summary for Register SLIMBUS_DCR_CONFIG1_j

Serial Low-Power Inter-Chip Media Bus Controller

- [Control and Data Channels: \[0\] \[1\] \[2\] \[3\]](#)
- [SLIMbus Reconfigure Parameters: \[4\] \[5\] \[6\] \[7\]](#)
- [FIFO Management: \[8\] \[9\] \[10\] \[11\]](#)
- [SLIMbus Transfer Protocols: \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\]](#)
- [Isochronous Transfer Protocol: \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\]](#)
- [Pushed Transfer Protocol: \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\]](#)
- [Pulled Transfer Protocol: \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\]](#)
- [Asynchronous Transfer Protocol: \[44\] \[45\] \[46\] \[47\] \[48\] \[49\] \[50\] \[51\]](#)
- [Extended Asynchronous Transfer Protocol: \[52\] \[53\] \[54\] \[55\] \[56\] \[57\] \[58\] \[59\] \[60\]](#)
- [Paired-up channels: \[61\] \[62\] \[63\] \[64\] \[65\]](#)
- [Interface Device ISRs: \[66\] \[67\]](#)
- [Operational Modes Configuration: \[68\] \[69\] \[70\] \[71\] \[72\] \[73\] \[74\] \[75\] \[76\] \[77\]](#)
- [SLIMBUS1 Register Summary: \[78\]](#)
- [SLIMBUS2 Register Summary: \[79\]](#)

Table 24-787. SLIMBUS_DCR_CONFIG2_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0318 + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C318 + (0x20 * j) 0x4012 C318 + (0x20 * j) 0x2 C318 + (0x20 * j) 0x4807 6298 + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | RX data agent configuration (continued), applied at the next reconfiguration boundary | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|----------------------|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:0 | SD | Segment Distribution | RW | 0x000 |

Table 24-788. Register Call Summary for Register SLIMBUS_DCR_CONFIG2_j

Serial Low-Power Inter-Chip Media Bus Controller

- [SLIMbus Reconfigure Parameters: \[0\]](#)
- [SLIMbus Transfer Protocols: \[1\]](#)
- [Isochronous Transfer Protocol: \[2\]](#)
- [Pushed Transfer Protocol: \[3\]](#)
- [Pulled Transfer Protocol: \[4\]](#)
- [Asynchronous Transfer Protocol: \[5\]](#)
- [Extended Asynchronous Transfer Protocol: \[6\]](#)
- [Paired-up channels: \[7\]](#)
- [Operational Modes Configuration: \[8\]](#)
- [SLIMBUS1 Register Summary: \[9\]](#)
- [SLIMBUS2 Register Summary: \[10\]](#)

Table 24-789. SLIMBUS_DCR_DATA_j

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 031C + (0x20 * j) | Index | j = 0 to 7 for SLIMBUS1 j = 0 to 3 for SLIMBUS2 |
| Physical Address | 0x4902 C31C + (0x20 * j) 0x4012 C31C + (0x20 * j) 0x2 C31C + (0x20 * j) 0x4807 629C + (0x20 * j) | Instance | SLIMBUS1_L3 SLIMBUS1_CORTEX-A9 SLIMBUS1_DSP SLIMBUS2_L3 |
| Description | RX data agent DATA FIFO output. Writes have no effect on FIFO. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | DATA | Data segment word, single-word or packed, LSB or MSB-aligned. | R | 0x0000 0000 |

Table 24-790. Register Call Summary for Register SLIMBUS_DCR_DATA_j

Serial Low-Power Inter-Chip Media Bus Controller

- [Data input/output: manual mode: \[0\]](#)
- [SLIMbus Transfer Procedures: \[1\] \[2\]](#)
- [SLIMBUS1 Register Summary: \[3\]](#)
- [SLIMBUS2 Register Summary: \[4\]](#)

24.10 MIPI-HSI

This section describes the MIPI high-speed synchronous serial interface (HSI).

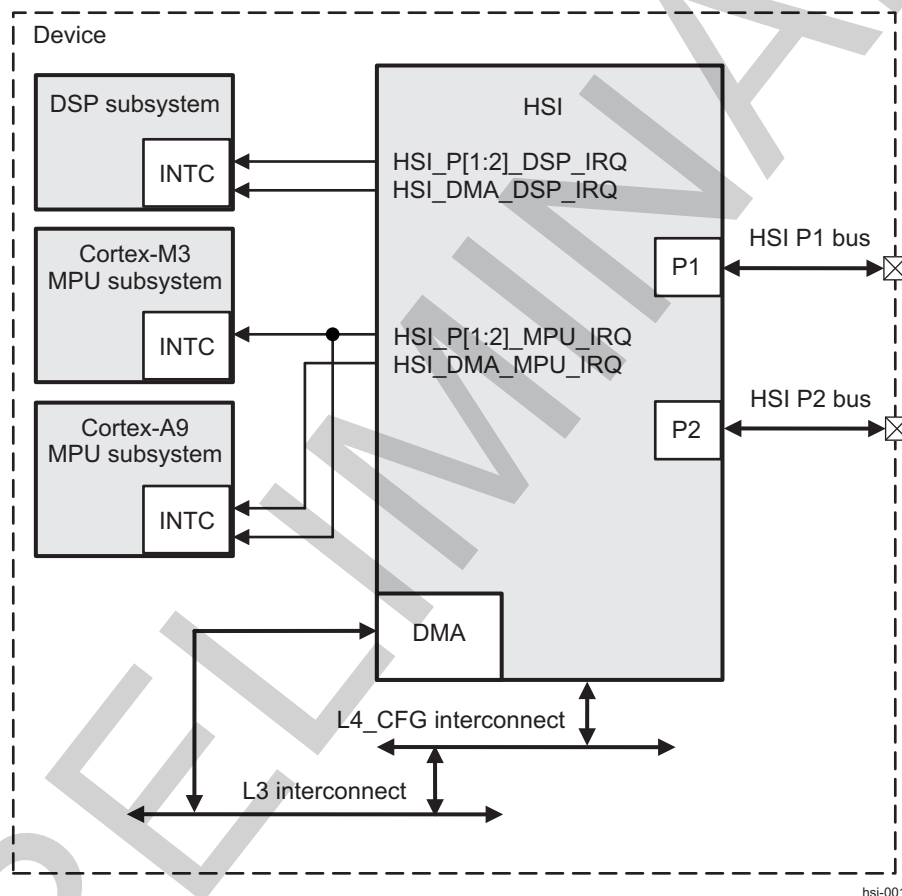
24.10.1 HSI Overview

The MIPI HSI module is a multichannel and full-duplex serial communications interface, composed of two transmitters (HST) in charge of the transmitted information and two receivers (HSR) in charge of the received information, sharing a 16-channel DMA.

The HSI peripheral is typically used to enable the device to exchange information with an external cellular modem.

Figure 24-217 is an overview of the HSI module.

Figure 24-217. HSI Overview



HSI supports the following features:

- Full duplex
- No static clock matching
- Interface speed up to 192 Mbps on transmitter and up to 225 Mbps on receiver
- Transmission speed and operation mode dynamically configurable
- Logical channels:
 - Up to 16 logical channels on receiver
 - Up to 16 logical channels on transmitter
- One 32-request DMA engine:
 - 16 transmit + 16 receive requests from HSI port

- 16 logical DMA channels
- Interrupt requests:
 - Three to each processor subsystem (two from HSI port, one from DMA)

24.10.2 HSI Environment

This section describes the HSI application fields from an environment point of view (external connections).

24.10.2.1 HSI Signals

[Table 24-791](#) describes the HSI module I/O signals.

Table 24-791. HSI I/O Signals

| Pin Name | I/O ⁽¹⁾ | Description | Reset Value ⁽²⁾ |
|--------------|--------------------|---|----------------------------|
| hsi1_cawake | I | HSI port 1 wake-up signal from an external serial transmitter | hi-Z |
| hsi1_cadata | I | HSI port 1 receiver data from an external transmitter | hi-Z |
| hsi1_caflag | I | HSI port 1 receiver flag from an external transmitter | hi-Z |
| hsi1_acready | O | HSI port 1 synchronization signal to an external transmitter | 1 |
| hsi1_acwake | O | HSI port 1 wake-up signal to an external serial receiver | 0 |
| hsi1_acdata | O | HSI port 1 transmission data (level transmission signaling) to an external receiver | 0 |
| hsi1_acflag | O | HSI port 1 transmission flag (bit transition signaling) to an external receiver | 1 |
| hsi1_caready | I | HSI port 1 synchronization signal from an external receiver | hi-Z |
| hsi2_cawake | I | HSI port 2 wake-up signal from an external serial transmitter | hi-Z |
| hsi2_cadata | I | HSI port 2 receiver data from an external transmitter | hi-Z |
| hsi2_caflag | I | HSI port 2 receiver flag from an external transmitter | hi-Z |
| hsi2_acready | O | HSI port 2 synchronization signal to an external transmitter | hi-Z |
| hsi2_acwake | O | HSI port 2 wake-up signal to an external serial receiver | hi-Z |
| hsi2_acdata | O | HSI port 2 transmission data (level transmission signaling) to an external receiver | hi-Z |
| hsi2_acflag | O | HSI port 2 transmission flag (bit transition signaling) to an external receiver | hi-Z |
| hsi2_caready | I | HSI port 2 synchronization signal from an external receiver | hi-Z |

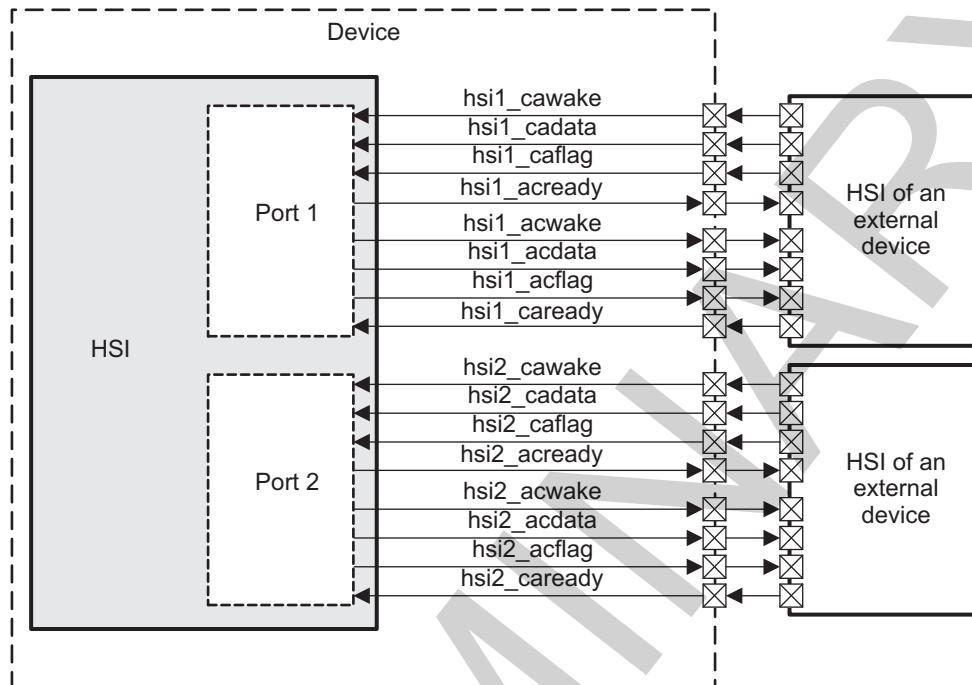
⁽¹⁾ I = input; O = output; I/O = Bidirectional

⁽²⁾ hi-Z = High impedance

24.10.2.2 HSI Typical Application

Figure 24-218 shows the HSI typical application.

Figure 24-218. HSI Typical Application



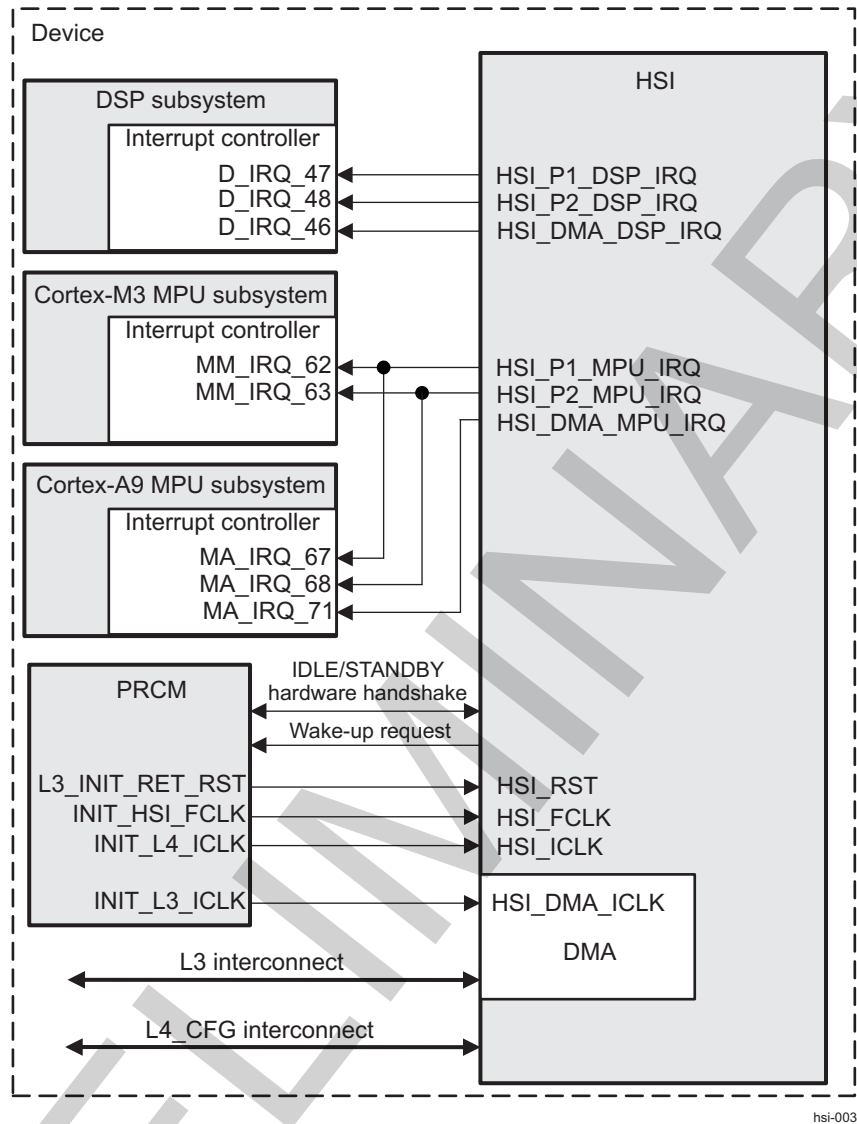
hsi-002

24.10.3 HSI Integration

This section describes module integration in the device, including information about clocks, resets, and hardware requests.

Figure 24-219 shows the HSI module integration.

Figure 24-219. HSI Integration



NOTE: For more information about the IDLE/STANDBY hardware handshake and the wake-up request, see [Section 3.1.1.1.2, Module Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Interrupt lines HSI_P1_MPU_IRQ and HSI_P2_MPU_IRQ are shared between the Cortex-A9 MPU and Cortex-M3 MPU INTCs. It is strongly recommended to unmask each interrupt source in only one INTC at a time.

[Table 24-792](#) through [Table 24-794](#) summarize the integration of the module in the device.

Table 24-792. Integration Attributes

| Module Instance | Attributes | | |
|-----------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| HSI | PD_L3_INIT | NA | L3 L4_CFG |

Table 24-793. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|--------------------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| HSI | HSI_FCLK | INIT_HSI_FCLK | PRCM | HSI module functional clock |
| | HSI_ICLK | INIT_L4_ICLK | PRCM | HSI module interface clock |
| | HSI_DMA_ICLK | INIT_L3_ICLK | PRCM | HSI DMA engine interface clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| HSI | HSI_RST | L3_INIT_RET_RST | PRCM | HSI module asynchronous reset |

Table 24-794. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|-------------------------------|-------------------------|-------------|----------------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| HSI | HSI_P1_MPU_IRQ ⁽¹⁾ | MM_IRQ_62 | Cortex-M3 | HSI MPU request – Port 1 |
| | HSI_P2_MPU_IRQ ⁽¹⁾ | MM_IRQ_63 | Cortex-M3 | HSI MPU request – Port 2 |
| | HSI_DMA_DSP_IRQ | D_IRQ_46 | DSP | HSI DMA engine DSP request |
| | HSI_P1_DSP_IRQ | D_IRQ_47 | DSP | HSI DSP request – Port 1 |
| | HSI_P2_DSP_IRQ | D_IRQ_48 | DSP | HSI DSP request – Port 2 |
| | HSI_DMA_MPU_IRQ | MA_IRQ_71 | Cortex-A9 | HSI DMA engine MPU request |
| | HSI_P1_MPU_IRQ ⁽¹⁾ | MA_IRQ_67 | Cortex-A9 | HSI MPU request – Port 1 |
| | HSI_P2_MPU_IRQ ⁽¹⁾ | MA_IRQ_68 | Cortex-A9 | HSI MPU request – Port 2 |
| No DMA Requests | | | | |

⁽¹⁾ Interrupts shared between the Cortex-A9 MPU INTC and Cortex-M3 MPU INTC

NOTE: For a description of interrupt sources, see [Section 24.10.4.5, Interrupt Requests](#).

24.10.4 HSI Functional Description

NOTE: In the functional description section, the following common internal signal names are used for the corresponding external HSI signals (for simplification):

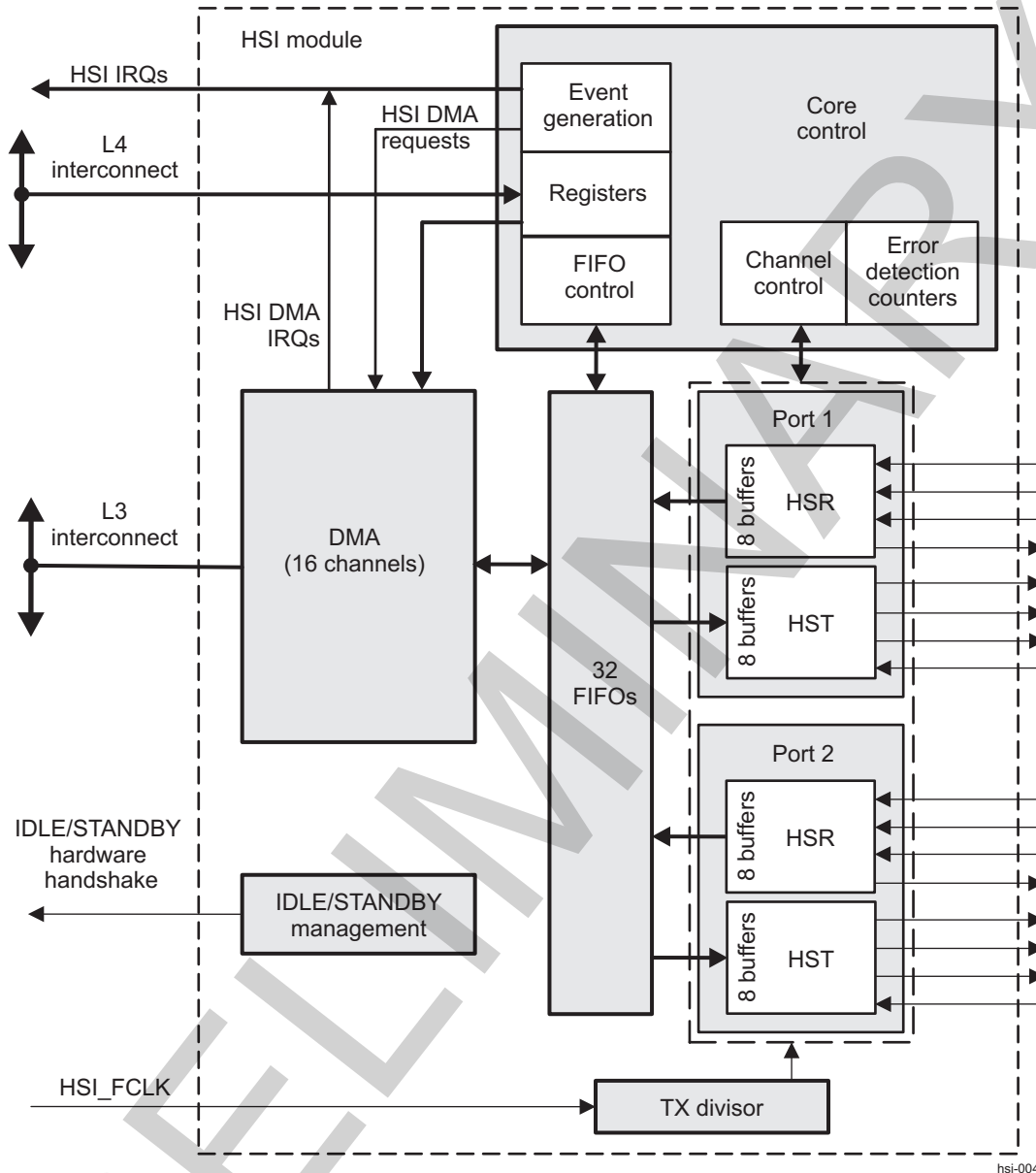
- WAKE: hsi1_cawake, hsi1_acwake, hsi2_cawake, and hsi2_acwake
 - DATA: hsi1_cadata, hsi1_acdata, hsi2_cadata, and hsi2_acdata
 - FLAG: hsi1_caflag, hsi1_acflag, hsi2_caflag, and hsi2_acflag
 - READY: hsi1_acready, hsi1_caready, hsi2_acready, and hsi2_caready
-

24.10.4.1 Block Diagram

The HSI controller is a subsystem built around two full-duplex multichannel synchronous serial interfaces. It contains a 16-bidirectional-logical-channel DMA in charge of handling data transfers between HSI modules and the L3 interconnect. Interrupt access to data is also available.

NOTE: Transmit data cannot be read back, and received data cannot be written in DMA and IRQ-based transfers.

[Figure 24-220](#) shows most HSI module features.

Figure 24-220. HSI Controller Architecture Overview

hsi-004

NOTE: A bypass path in the DMA allows a processor (MPU or DSP) to retrieve or provide data received or to be transmitted on an interrupt triggered access, when the DMA is not enabled.

24.10.4.2 Clock Configuration

The HSI module has four fully asynchronous clock domains:

- Interface clock domain
- Functional clock domain
- Receive clock domain on port 1
- Receive clock domain on port 2

24.10.4.2.1 Interface Clock Domain

The following clocks are part of the interface clock domain:

- HSI_DMA_ICLK runs the interface master port (L3). This clock is used for DMA master access to the L3 interconnect and also serves as the DMA functional clock.
- HSI_ICLK runs the interface slave port (L4). This clock is used to configure the module and to transmit and receive data through register access in an interrupt-based manner.

24.10.4.2.2 Functional Clock Domain

The functional clock (HSI_FCLK) runs the transmitter/receiver logic.

24.10.4.2.2.1 Transmit Clock

The transmit clock is obtained from the functional clock and is used to generate transmitter DATA and FLAG lines, according to the standard. Namely, the DATA line must always reflect the transmitted bit value, whereas the FLAG line must provide a transition (0 to 1, or 1 to 0) when the current DATA value is the same as the previous one.

The transmit data rate is programmable through the [HST_DIVISOR_Pp\[7:0\]](#) TX_RATE_DIV_VAL bit field.

Transmit clock = HSI_FCLK / (TX_RATE_DIV_VAL + 1).

24.10.4.2.2.2 Receive Error Detection Counters Clocks

The functional clock is also used to obtain clocks for receive error counters, which are independently divided versions of the functional clock. Division is set by software through the [HSR_DIVISOR_Pp\[7:0\]](#) RX_RATE_DIV_VAL bit field, which sets the bit rate clock for the frame time-out counter. This clock is further divided to generate an edge per frame to be sent to the frame burst counter.

24.10.4.2.3 Receive Clock Domain (Port 1 and Port 2)

The RX clock is retrieved from the DATA and FLAG signals available on the serial interface. A self-clocked source synchronous receiver implementation is done as follows: simple XOR of the DATA and FLAG signals recovers a signal displaying a transition on every bit time. From this signal, two clocks are generated with the appropriate phase, which can recover bit values, by sampling the DATA line, where the transmitted bit is always available.

24.10.4.3 Software Reset

The HSI module can be reset by software through the [HSI_SYSCONFIG\[1\]](#) SOFTRESET bit. Setting this bit to 1 enables an active global software reset that is functionally equivalent to a hardware reset. The [HSI_SYSSTATUS\[0\]](#) RESETDONE bit indicates that the software reset is complete when its value is set to 1. Software must ensure that the software reset completes before performing HSI operations.

The DMA engine can be independently reset by software through the [DMA_GRST\[0\]](#) SWRESET bit. Setting this bit to 1 resets the DMA registers and logic. This bit is automatically cleared when the DMA reset completes.

24.10.4.4 Power Management

[Table 24-795](#) describes power-management features available for the HSI module.

NOTE: For descriptions of IdleMode and StandbyMode features, see [Section 3.1.1.1.2](#), *Module-Level Clock Management*, in [Chapter 3](#), *Power, Reset, and Clock Management*.

Table 24-795. Local Power-Management Features

| Feature | Registers | Description |
|----------------------|--|--|
| Clock auto gating | HSI_SYSCONFIG [0] AUTOIDLE DMA_GCR [3] AUTOGATING | This bit allows a local power optimization inside the module by gating the HSI_ICLK clock upon the interface activity. This bit allows a local power optimization inside the module by gating the HSI_DMA_ICLK clock upon the interface activity. |
| Slave idle modes | HSI_SYSCONFIG [4:3] SIDLEMODE | Force-idle, no-idle, smart-idle, and smart-idle wakeup-capable modes are available. |
| Master standby modes | HSI_SYSCONFIG [13:12] MIDLEMODE | Force-standby, no-standby, smart-standby, and smart-standby wake-up modes are available. |

24.10.4.4.1 HSI Module Power-Management Modes

24.10.4.4.1.1 Standby

When asserted, this signal informs the PRCM module that HSI is quiet and does not generate any traffic on the interconnect.

The HSI module supports four STANDBY handshake modes, selected through the [HSI_SYSCONFIG](#)[13:12] MIDLEMODE bit field:

- Force-standby (0x0): Selecting this mode asserts the standby signal unconditionally of the HSI activity. Software must ensure that HSI is disabled and does not generate any activity before activating this mode.
- No-standby (0x1): Standby signal is never asserted.
- Smart-standby (0x2): Standby signal is asserted when internal HSI DMA does not generate activity anymore (namely, upon DMA idle acknowledge signal assertion).
- Smart-standby wakeup (0x3): Standby signal is asserted when internal HSI DMA does not generate activity anymore (namely, upon DMA idle acknowledge signal assertion). It can also generate a wake-up request.

24.10.4.4.1.2 Idle

The PRCM module asserts an IDLE request signal when it requires the HSI slave port to be idled. Any access to this port after the IDLE request signal has been asserted generates an error.

The HSI module supports four IDLE handshake modes, selected through the [HSI_SYSCONFIG](#)[4:3] SIDLEMODE bit field:

- Force-idle (0x0): An IDLE request is acknowledged unconditionally.
- No-idle (0x1): An IDLE request is never acknowledged.
- Smart-idle (0x2): Acknowledgment to an IDLE request is given based on the internal HSI module activity.
- Smart-idle wakeup (0x3): Acknowledgment to an IDLE request is given based on the internal HSI module activity. Additionally, when in this mode, the HSI module is allowed to generate a wake-up request.

24.10.4.4.1.3 Auto-Idle

The HSI module provides an auto-idle option for the interface clock domain. Auto-idle mode is enabled by setting the [HSI_SYSCONFIG](#)[0] AUTOIDLE and/or [DMA_GCR](#)[3] AUTOGATING bits to 1. When this mode is enabled and there is no activity on the interconnect interface, the interface clock is disabled internally to the module to reduce power consumption. When there is new activity on the interconnect interface, the interface clock is restarted without any latency penalty.

24.10.4.4.1.4 DMA Engine Switch Off Mode

The DMA interface clock (HSI_DMA_ICLK) can be switched off by setting the [DMA_GCR\[0\] SWITCH_OFF](#) bit to 1. DMA clock activity is then cut off. Software must ensure that ongoing transitions are complete before cutting off clocks. Once the DMA is switched off, access to reset this bit is possible only through the configuration port.

24.10.4.5 Interrupt Requests

[Table 24-796](#) lists the event flags, and their mask, that can cause module interrupts.

Table 24-796. Events

| Event Flag | Event Mask | Map to | Description |
|---|---|----------------------------------|--|
| HSI_Pp_M_IRQrU_STATUS [26] HSR_WAKE | HSI_Pp_M_IRQrU_ENABLE [26] HSR_WAKE | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Wake detected on any channel 8–15. |
| HSI_Pp_D_IRQrU_STATUS [26] HSR_WAKE | HSI_Pp_D_IRQrU_ENABLE [26] HSR_WAKE | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |
| HSI_Pp_M_IRQrU_STATUS [25] HSR_BREAK | HSI_Pp_M_IRQrU_ENABLE [25] HSR_BREAK | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Break detected on any channel 8–15. |
| HSI_Pp_D_IRQrU_STATUS [25] HSR_BREAK | HSI_Pp_D_IRQrU_ENABLE [25] HSR_BREAK | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |
| HSI_Pp_M_IRQrU_STATUS [24] HSR_ERROR | HSI_Pp_M_IRQrU_ENABLE [24] HSR_ERROR | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Error detected on any channel 8–15 |
| HSI_Pp_D_IRQrU_STATUS [24] HSR_ERROR | HSI_Pp_D_IRQrU_ENABLE [24] HSR_ERROR | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |
| HSI_Pp_M_IRQrU_STATUS [23:16] HSR_OVERRUN_CHI | HSI_Pp_M_IRQrU_ENABLE [23:16] HSR_OVERRUN_ENI | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Data overrun in real time mode on any channel 8–15 |
| HSI_Pp_D_IRQrU_STATUS [23:16] HSR_OVERRUN_CHI | HSI_Pp_D_IRQrU_ENABLE [23:16] HSR_OVERRUN_ENI | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |
| HSI_Pp_M_IRQrU_STATUS [15:8] HSR_AVAILABLE_CHI | HSI_Pp_M_IRQrU_ENABLE [15:8] HSR_AVAILABLE_ENI | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Data received on any channel 8–15 |
| HSI_Pp_D_IRQrU_STATUS [15:8] HSR_AVAILABLE_CHI | HSI_Pp_D_IRQrU_ENABLE [15:8] HSR_AVAILABLE_ENI | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |
| HSI_Pp_M_IRQrU_STATUS [7:0] HST_ACCEPTED_CHI | HSI_Pp_M_IRQrU_ENABLE [7:0] HST_ACCEPTED_ENI | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Data transmitted on any channel 8–15 |
| HSI_Pp_D_IRQrU_STATUS [7:0] HST_ACCEPTED_CHI | HSI_Pp_D_IRQrU_ENABLE [7:0] HST_ACCEPTED_ENI | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |
| HSI_Pp_M_IRQr_STATUS [26] HSR_WAKE | HSI_Pp_M_IRQr_ENABLE [26] HSR_WAKE | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Wake detected on any channel 0–7 |
| HSI_Pp_D_IRQr_STATUS [26] HSR_WAKE | HSI_Pp_D_IRQr_ENABLE [26] HSR_WAKE | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |
| HSI_Pp_M_IRQr_STATUS [25] HSR_BREAK | HSI_Pp_M_IRQr_ENABLE [25] HSR_BREAK | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Break detected on any channel 0–7 |
| HSI_Pp_D_IRQr_STATUS [25] HSR_BREAK | HSI_Pp_D_IRQr_ENABLE [25] HSR_BREAK | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |
| HSI_Pp_M_IRQr_STATUS [24] HSR_ERROR | HSI_Pp_M_IRQr_ENABLE [24] HSR_ERROR | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Error detected on any channel 0–7 |
| HSI_Pp_D_IRQr_STATUS [24] HSR_ERROR | HSI_Pp_D_IRQr_ENABLE [24] HSR_ERROR | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |
| HSI_Pp_M_IRQr_STATUS [23:16] HSR_OVERRUN_CHI | HSI_Pp_M_IRQr_ENABLE [23:16] HSR_OVERRUN_ENI | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Data overrun in real time mode on any channel 0–7 |
| HSI_Pp_D_IRQr_STATUS [23:16] HSR_OVERRUN_CHI | HSI_Pp_D_IRQr_ENABLE [23:16] HSR_OVERRUN_ENI | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |
| HSI_Pp_M_IRQr_STATUS [15:8] HSR_AVAILABLE_CHI | HSI_Pp_M_IRQr_ENABLE [15:8] HSR_AVAILABLE_ENI | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Data received on any channel 0–7 |
| HSI_Pp_D_IRQr_STATUS [15:8] HSR_AVAILABLE_CHI | HSI_Pp_D_IRQr_ENABLE [15:8] HSR_AVAILABLE_ENI | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |

Table 24-796. Events (continued)

| Event Flag | Event Mask | Map to | Description |
|---|---|------------------------------------|-------------------------------------|
| HSI_Pp_M_IRQr_STATUS[7:0] HST_ACCEPTED_CHI | HSI_Pp_M_IRQr_ENABLE[7:0] HST_ACCEPTED_ENI | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Data transmitted on any channel 0–7 |
| HSI_Pp_D_IRQr_STATUS[7:0] HST_ACCEPTED_CHI | HSI_Pp_D_IRQr_ENABLE[7:0] HST_ACCEPTED_ENI | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |
| HSI_DMA_M_IRQSTATUS[15:0] DMA_CHI | HSI_DMA_M_IRQENABLE[15:0] DMA_EN_CHI | HSI_P1_MPU_IRQ HSI_P2_MPU_IRQ | Channel 0–15 status |
| HSI_DMA_D_IRQSTATUS[15:0] DMA_CHI | HSI_DMA_D_IRQENABLE[15:0] DMA_EN_CHI | HSI_P1_DSP_IRQ HSI_P2_DSP_IRQ | |
| DMA_CSR_CCIR_i[21] BLOCK_IS | DMA_CSR_CCIR_i[5] BLOCK_IE | HSI_DMA_DSP_IRQ HSI_DMA_MPU_IRQ | Block transferred |
| DMA_CSR_CCIR_i[18] HALF_IS | DMA_CSR_CCIR_i[2] HALF_IE | HSI_DMA_DSP_IRQ HSI_DMA_MPU_IRQ | Half block reached |
| DMA_CSR_CCIR_i[16] TOUT_IS | DMA_CSR_CCIR_i[0] TOUT_IE | HSI_DMA_DSP_IRQ HSI_DMA_MPU_IRQ | Time-out event |

24.10.4.5.1 Interrupts

By default, there are four interrupt output lines per HSI port (Mpuirq_0, Mpuirq_1, Dspirq_0, Dspirq_1), and two in the case of the DMA interrupt (MPU, DSP). The following registers are related to these interrupt outputs as follows:

- Status registers:
 - [HSI_Pp_M_IRQrU_STATUS](#) / [HSI_Pp_M_IRQr_STATUS](#) for Mpuirq_r (where r = 0 or 1)
 - [HSI_Pp_D_IRQrU_STATUS](#)/ [HSI_Pp_D_IRQr_STATUS](#) for Dspirq_r (where r = 0 or 1)
 - [HSI_DMA_M_IRQSTATUS](#) for DMA interrupt to MPU
 - [HSI_DMA_D_IRQSTATUS](#) for DMA interrupt to DSP
- Enable registers:
 - [HSI_Pp_M_IRQrU_ENABLE](#) / [HSI_Pp_M_IRQr_ENABLE](#) for Mpuirq_r (where r = 0 or 1)
 - [HSI_Pp_D_IRQrU_ENABLE](#)/ [HSI_Pp_D_IRQr_ENABLE](#) for Dspirq_r (where r = 0 or 1)
 - [HSI_DMA_M_IRQENABLE](#) for DMA interrupt to MPU
 - [HSI_DMA_D_IRQENABLE](#) for DMA interrupt to DSP

However, Mpuirq_0 and Mpuirq_1 are further combined (logical OR) into one common interrupt output per port (HSI_P1_MPU_IRQ for port 1, and HSI_P2_MPU_IRQ for port 2). The same goes for Dspirq_0 and Dspirq_1 (HSI_P1_DSP_IRQ for port 1, and HSI_P2_DSP_IRQ for port 2).

This means that it is enough to enable one of the FIFO/WAKE/BREAK/ERROR interrupt events per port (for example, in [HSI_Pp_M_IRQ0\(U\)_ENABLE](#)) to raise the corresponding interrupt request. Enabling both [HSI_Pp_M_IRQ0\(U\)_ENABLE](#) and [HSI_Pp_M_IRQ1\(U\)_ENABLE](#) would only mean extra checks and clears (in the corresponding IRQ status register). The same is true for the DSP-related IRQ enable/status registers.

The HSI module outputs six interrupt signals (for more information, see [Section 24.10.3, MIPI HSI Integration](#)). All the interrupts are active-high level-sensitive. Each interrupt line is activated by a set of individual sources. All interrupt sources can individually be enabled and disabled.

For each interrupt, 2 status bits and 2 mask bits are provided, allowing independent masking for the different processors (that is, 1 status bit and 1 mask bit for the MPU [Cortex-A9 or Cortex-M3] interrupts, and 1 status bit and 1 mask bit for the DSP interrupts).

Interrupts in the HSI module are intended to:

- Signal any error condition in reception
- Support the WAKE condition detection
- Support the BREAK condition detection
- Warn of DMA transfer status or problems

- Signal to processors when to read received data and to write data to transmit

Because DMA has only 16 channels, 16 RX FIFO and 16 TX FIFO are managed by a mix of DMA-driven and interrupt-driven read/write policies.

24.10.4.5.1.1 HSI Interrupt Generation

Five types of interrupt events can be generated by each HSI port:

- Transmit FIFO not full: Occurs when TX FIFO is not full, so data can be written for transmission
- Received data available: Occurs when one data frame has been received and is available on the RX FIFO for reading
- Overrun: Occurs when data overrun is detected on HSI port p channel i
- Error: Any error defined by the MIPI HSI protocol activates this source of interrupt if this source is enabled.
- Break condition detected: Occurs upon reception of a continuous string of 0s that exceed those possible in any FRAME mode frame (data + header). Because FRAME mode always put a 1 before any frame, the maximum number of 0s occurring during normal transmission is clearly 32 plus the base 2 logarithm of channels used. Hardware works out this number based on register information on channels and receive mode, sets the [HSR_BREAK_Pp\[0\]](#) BREAK_VAL bit to 1, and issues an interrupt if this source is enabled.

All the events are cleared by software, upon setting the corresponding register bit to 1. Setting the bit to 0 has no effect.

24.10.4.5.1.2 DMA Interrupt Generation

Three types of interrupt events can be generated by each DMA channel:

- End of Block: Enabled through the [DMA_CSR_CCIR_i\[5\]](#) BLOCK_IE bit, it occurs when the last element of the transfer has been written into destination. The [DMA_CEN_i\[15:0\]](#) SIZE bit field defines the number of elements in a block.
- Half Block: Enabled through the [DMA_CSR_CCIR_i\[2\]](#) HALF_IE bit, it occurs when a half of the elements have been written into destination.
- Time-out error: Enabled through the [DMA_CSR_CCIR_i\[0\]](#) TOU_IE bit, it occurs when destination slave answers by an error code.

All interrupt events are generated on the same logical channel dedicated interrupt line. When an interrupt is issued by a logical channel, its [DMA_CSR_CCIR_i](#) status register is set to record the interrupt cause, if the interrupt event bit is enabled in the relevant [DMA_CSR_CCIR_i](#) register. The processor interrupt service routine can read this channel status register to identify the sources of the interrupt. The status bits are automatically cleared after they are read by the processor, unless it is an emulation read.

There are two classes of DMA interrupt events:

- Error events: Errors during the transfer
- Status events: DMA transfer status, such as end of block or half-block

The DMA manages the two classes differently.

For an enabled error event, the following sequence occurs:

1. The appropriate bit in the [DMA_CSR_CCIR_i](#) register is set.
2. An interrupt is generated.
3. The ports are released.
4. The currently active logical channel is disabled and must be reprogrammed.
5. Other channels are not affected, and a new channel can get over, according to programmed priorities.

For an enabled status event, the following sequence occurs:

1. The appropriate bit in the [DMA_CSR_CCIR_i](#) register is set.
2. An interrupt is generated.
3. A new interrupt cannot be generated until the status register is read and thereby cleared.

All the events are cleared by software, upon setting the corresponding interrupt status register ([HSI_DMA_M_IRQSTATUS](#) or [HSI_DMA_D_IRQSTATUS](#)) to 1. Setting the interrupt status register to 0 has no effect.

24.10.4.6 DMA Module

24.10.4.6.1 DMA Overview

The DMA module transfers data between the HSI interfaces and the device on-chip memories. The DMA module supports 16 logical channels and is a dual-port initiator (peripheral port/memory port) with one slave port for configuration. The memory port provides an interface to the memory space and the peripheral port provides an interface to the HSI interfaces. In the HSI controller, the L4_CFG port accesses can be routed directly to the HSI interfaces. This is done by setting the DMA in bypass mode to route the DMA slave port to the DMA peripheral port.

DMA features:

- One target port, for configuration
- 16 logical channels: n for transmission and $16-n$ for reception
- One initiator port, for transfer to/from memory
- One port to/from LCH memory (this memory holds some registers)
- 32-bit data handling only
- Constant addressing mode on peripheral port/FIFO
- Post-increment addressing mode with burst support on memory port
- Software enabling
- Hardware activation of data transfer on peripheral port
- Logical channels interleaving with only few-cycles-latency
- Fixed allocation of memory and peripheral port to a logical channel
- LCH first-come-first-served + fixed priority arbitration
- Low-power operation (hardware control for clock domains activity)
- Software reset

24.10.4.6.2 DMA Memories

DMA channel register memory is managed by the DMA. Only the DMA interfaces this memory. A processor must program the DMA registers included in this memory.

The DMA has access to 16 dual-port FIFO 8×32 bits for reception and 16 dual-port FIFO 8×32 bits for transmission. They are provided in the form of two separate memories.

24.10.4.6.3 DMA Basic Operation Outline

DMA write and read operations are helped by tags, to manage possibly disorderly answers. Posted or nonposted operations are possible. In any case, the interconnect always manages them as nonposted. This is consistent with DMA operations that need to know (for example, if main memory write was successful). If not, the error response from L3 interconnect slave produces a DMA error and the corresponding interrupt. DMA addressing of FIFO memories is always on a constant address, corresponding to 1 of the 16 [HST_BUFFER_Pp_CHN_i](#) (or [HSR_BUFFER_Pp_CHN_i](#)) registers.

These registers are associated with the 16 FIFOs, and the naming reflects only the reset value of the association FIFO, HSI logical channel. Therefore, at reset, the FIFO addressed on the [HSR_BUFFER_P2_CHN_4](#) register is associated with the fourth logical channel of the second port. Nevertheless, software can change this mapping and associate the same FIFO (for example, to the seventh channel of the first port). This mapping is performed by software through the [HST_MAPPINGf\[4:1\]](#) CH_NUMBER or [HSR_MAPPINGf\[4:1\]](#) CH_NUMBER bit fields.

24.10.4.6.4 DMA Configuration

Before performing a DMA transfer, the following DMA registers must be configured:

- [DMA_CCR_CSDP_i](#): Sets source and destination parameters and channel control
 - [DMA_CCR_CSDP_i](#)[15:14] DST_BURST_EN: Destination burst enable (0x0 and 0x1: single access; 0x2: burst 4 × 32 bits; 0x3: burst 8 × 32 bits)
 - [DMA_CCR_CSDP_i](#)[12:9] DST: Transfer destination (0x8: transfer to memory port; 0x9: transfer to peripheral port)
 - [DMA_CCR_CSDP_i](#)[8:7] SRC_BURST_EN: Source burst enable (0x0 and 0x1: single access; 0x2: burst 4 × 32 bits; 0x3: burst 8 × 32 bits)
 - [DMA_CCR_CSDP_i](#)[5:2] SRC: Transfer source (0x8: transfer from memory port; 0x9: transfer from peripheral port)
 - [DMA_CCR_CSDP_i](#)[31:30] DST_ADD_MODE: Destination addressing mode (0x0: constant address mode; 0x1: post-incremented address mode)
 - [DMA_CCR_CSDP_i](#)[29:28] SRC_ADD_MODE: Source addressing mode (0x0: constant address mode; 0x1: post-incremented address mode)
- [DMA_CSR_CCIR_i](#): Enables DMA sources of interrupt events
- [DMA_CSSA_i](#)[31:0] ADDR: Stores 32 bits of the source address
- [DMA_CDSA_i](#)[31:0] ADDR: Stores 32 bits of the destination address
- [DMA_CEN_i](#)[31:0] SIZE: Defines the number of elements in a block. The maximum number of elements is 65535.

To start a DMA transfer, the DMA channel to be used must be enabled by setting the [DMA_CCR_CSDP_i](#)[23] ENABLE bit to 1. Once the DMA transfer is finished, the [DMA_CCR_CSDP_i](#)[23] ENABLE bit is automatically reset by hardware.

The [DMA_CDAC_CSAC_i](#)[15:0] ADDRESS_CSAC (or [DMA_CDAC_CSAC_i](#)[31:15] ADDRESS_CDAC) bit field can be used to monitor the progress of a DMA transfer on the channel source (or destination). It is a snapshot of the source (or destination) address generated by the channel counter. It is incremented on each access made on channels.

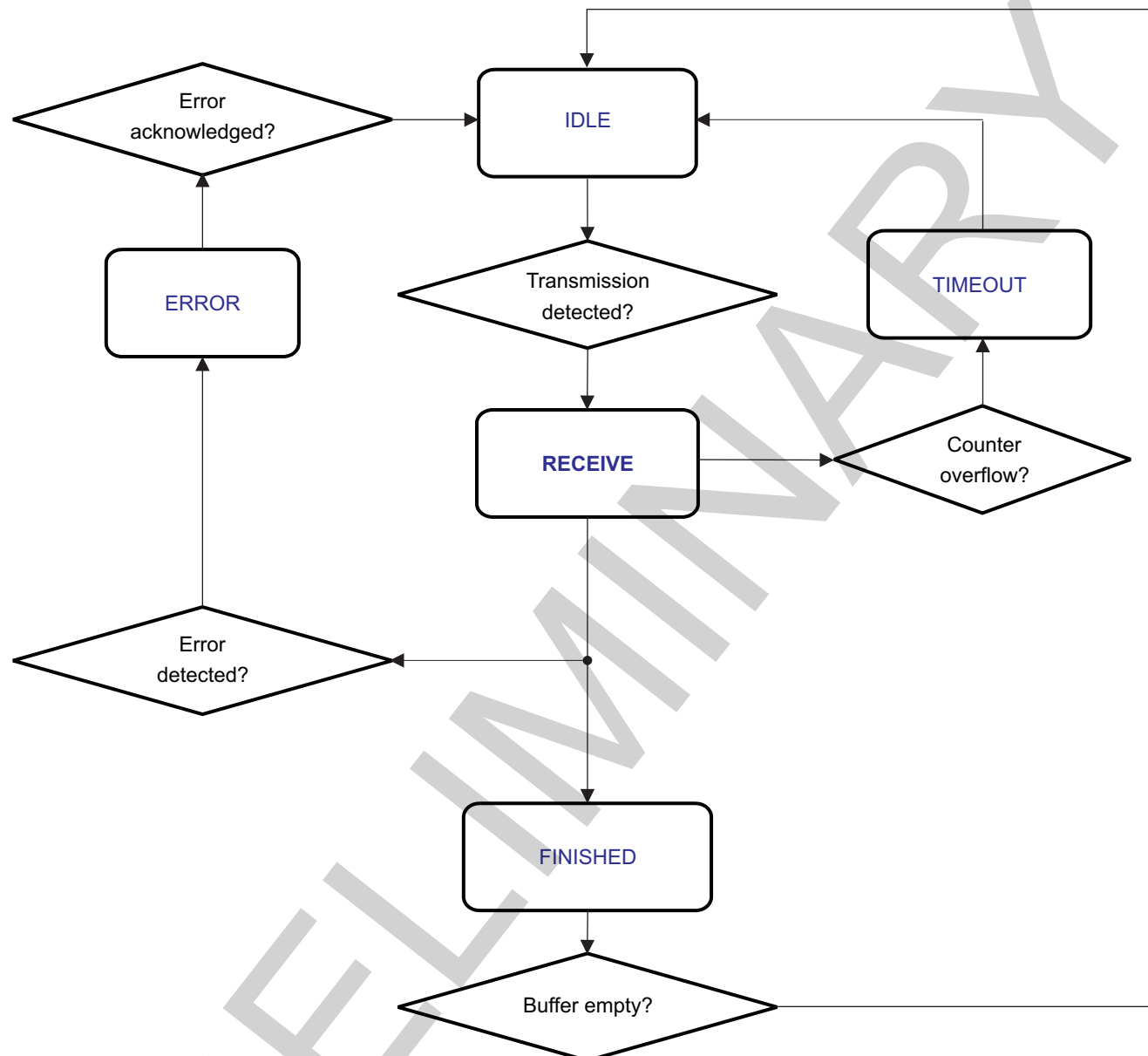
24.10.4.7 HSR Module

The HSR module is the receiver part of the HSI module. It features 16 channels.

24.10.4.7.1 Receive Data

The value on the DATA line is always the transmitted bit, when sampled by the clock recovered. The double level of buffering allows the data to be safely transferred to the FIFO, while a new frame is stored. Data headers do not belong in FIFO and must be decoded to load data on the correct FIFO (there is one logical FIFO per logical channel).

[Figure 24-221](#) shows the receive state-machine implemented in the HSI module.

Figure 24-221. Receive FSM

hsi-007

24.10.4.7.2 Transmission Detection

Reception starts upon two alternate conditions:

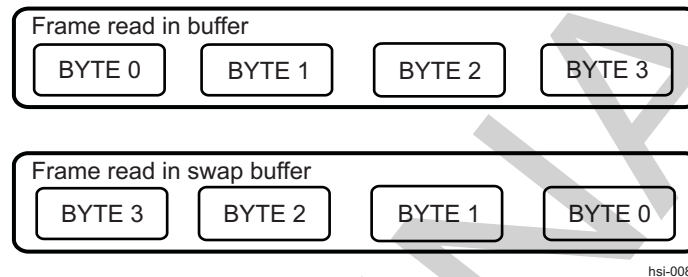
- The remote transmitter raises the WAKE line (in this case, it does not actually transmit until the local receiver raises the READY line).
- An activity (in the form of transitions) appears on the FLAG/DATA lines, in case the remote transmitter does not implement the WAKE signal. The receiver must then save and store the received data, at least one frame long, before preventing further transmission by setting READY to 0.

24.10.4.7.3 Receive Buffers

For each logical channel, the [HSR_BUFFER_Pp_CHN_i](#)[31:0] DATA bit field holds one frame. The appropriate bit in the [HSR_BUFSTATE_Pp](#) register is set to 1 by hardware when the corresponding [HSR_BUFFER_Pp_CHN_i](#) register holds one frame. Reading the [HSR_BUFFER_Pp_CHN_i](#)[31:0] DATA bit field automatically resets the appropriate bit in [HSR_BUFSTATE_Pp](#). This lets the receiver put another data frame in [HSR_BUFFER_Pp_CHN_i](#), setting again [HSR_BUFSTATE_Pp](#).

Some applications need reversed byte ordering of frames. This is supported by the [HSR_SWAPBUFFER_Pp_CHN_i](#) register (see [Figure 24-222](#)). By reading this register instead of the corresponding [HSR_BUFFER_Pp_CHN_i](#) register on the same channel, byte ordering of the 4 bytes in a frame is reversed.

Figure 24-222. HSR_SWAPBUFFER_Pp_CHN_i Register



hsi-008

Reading the MSB of the [HSR_SWAPBUFFER_Pp_CHN_i](#) register sets the corresponding bit of [HSR_BUFSTATE_Pp](#) to empty.

NOTE: Read access to the register with 0x3 and 0xF byte-enable removes the receive FIFO-related item. If only 16-bit accesses are used, the upper 2 bytes must be read first (byte-enable 0xC). Between two consecutive 16-bit FIFO-related accesses there cannot be any other FIFO-related OCP access.

24.10.4.7.4 Receive Operations

Logically, the receiver amounts to the receiver shift register, double-buffering and the FSM. The current state of the FSM can be observed and controlled through the [HSR_RXSTATE_Pp](#)[2:0] RXSTATEVAL bit field. For the receive FSM, a functional description is shown in [Figure 24-221](#).

The receiver FSM is in IDLE state when no transmission is detected, or the [HSR_MODE_Pp](#)[1:0] MODE_VAL bit field = FRAME and no synchronization bit is detected. Otherwise, it stores the first received bit and transitions to RECEIVING state, where it stops until a full frame is received.

Depending on the selected flow control, the READY line may have to go to 0 after the first bit is received.

Upon receiving a full frame, the FSM transitions to FINISHED state. Otherwise, the FSM transitions to TIMEOUT state as soon as a time-out value (if enabled and programmed in the [HSR_COUNTERS_Pp](#)[19:0] FT bit field) is reached. Then it moves to IDLE state.

After entering RECEIVED state, the FSM stays there until the received frame is correctly stored and there is room for another frame. At this point, READY is raised and the FSM goes to IDLE state. In pipelined flow, flow control by READY is not operating at each byte, and in real time flow it is never operating. In both cases, the FSM transitions immediately to IDLE, to receive more data. Illegal transitions or flags raised by error counters (see [Section 24.10.4.11, Error Reporting](#)), move the FSM to ERROR state, and then to HALT, to wait until the error is acknowledged by software, warned by an interrupt. Except for pipelined control flow, the READY output is always 1 in IDLE state and 0 anywhere else. In pipelined mode, the READY signal stays to 1, and is cleared by a condition on buffer full. The FSM state can be controlled by software by writing in the [HSR_RXSTATE_Pp](#)[2:0] RXSTATEVAL bit field. This can be useful to recover from an error condition.

24.10.4.7.5 Receive Exceptions

24.10.4.7.5.1 Break

Remote transmitter can force synchronization by a long enough string of 0s (equal to the number of header + data bits in the frame + 1). In frame mode, this sets the [HSR_BREAK_Pp\[0\]](#) BREAK_VAL bit to 1, which in turn sends an interrupt.

24.10.4.7.5.2 Overrun

An overrun condition is possible during real-time flow, if received data occur when the FSM is in FINISHED state. Whenever this happens, the [HSR_OVERRUN_Pp\[15:0\]](#) OVERRUN_VAL bit field is set for the corresponding logical channel, which in turn generates an interrupt.

An overrun exception is a legacy condition required in previous SSI hardware, where reception without the READY signal had to be supported. In HSI the READY signal always exists, but it cannot be used during real-time flow and the last 8 bits of a frame during pipelined flow. During real-time data flow, overrun can occur at any time. The main goal of using real-time flow is flushing FIFOs after an error. In that case, an overrun interrupt does not seem worth to be raised. Data does not have to be discarded. The real-time data are discarded if the receiver cannot follow the transmission rate, otherwise, the real-time data is kept in FIFO.

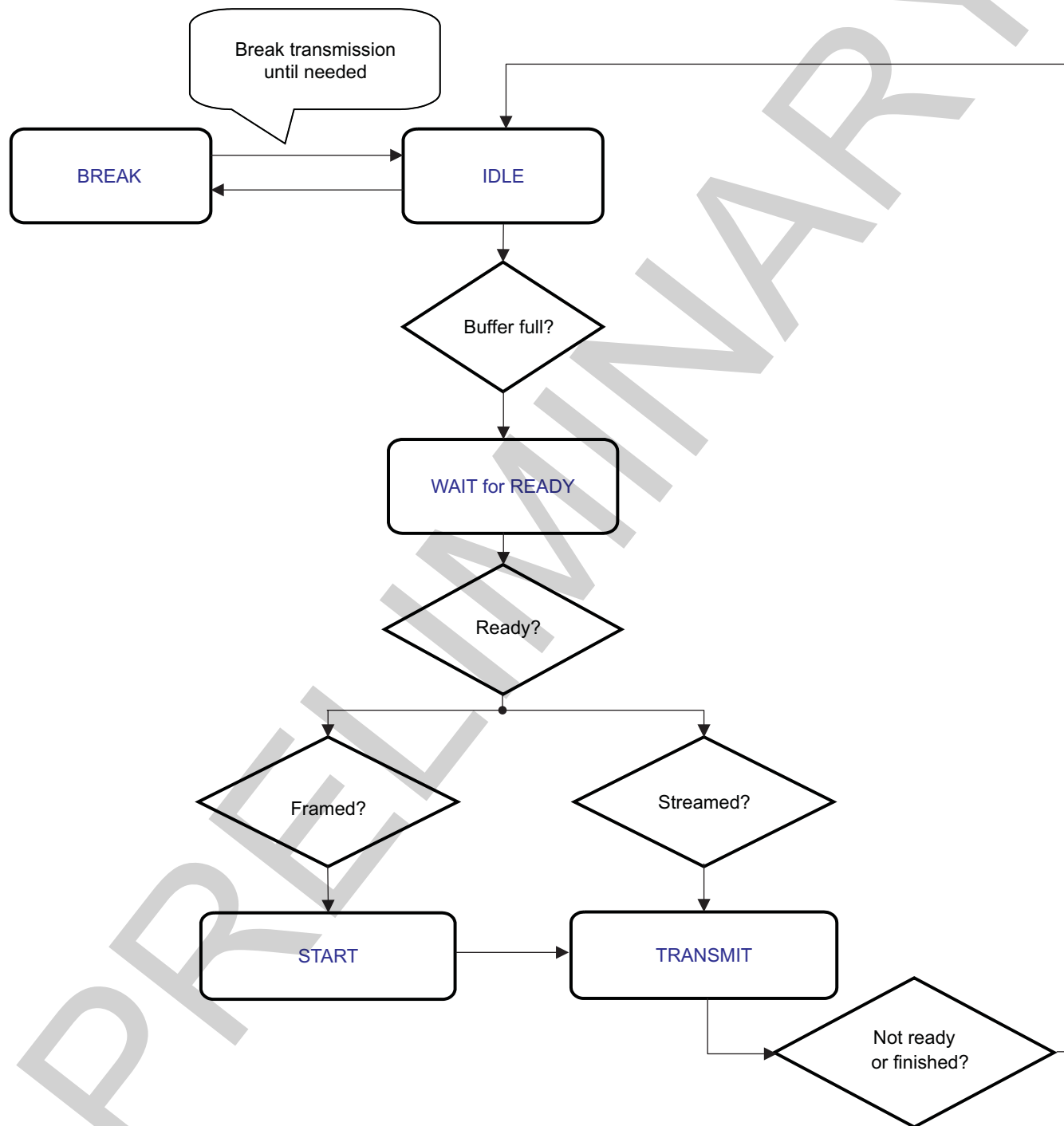
24.10.4.7.5.3 Errors

Several sources of errors are possible. In any of them, the receiver FSM stays in ERROR state until the error interrupt is acknowledged by writing the [HSR_ERRORACK_Pp](#) registers. Sources of errors include receive FRAME TIMEOUT, other receive errors flagged by error counters, and any other abnormal condition, as explained in [Section 24.10.4.11](#), *Error Reporting*.

24.10.4.8 HST Block

The HST block is the transmitter part of the HSI module. It features 16 channels. Figure 24-223 shows the receive state-machine implemented in the HSI module.

Figure 24-223. Transmit FSM



hsi-009

24.10.4.8.1 Configuration

Configuration of the component is expressed in terms of operation mode, number of logical channels, bit rate divisor, and arbitration mode.

24.10.4.8.1.1 Mode Register

The **HST_MODE_Pp** register cannot be changed without stopping the link.

There is one **HST_MODE_Pp**[3:2] FLOW_VAL bit field for each active transmit channel and another **HSR_MODE_Pp**[3:2] FLOW_VAL bit field for each active receive channel. The local transmitter (communicating with the remote receiver) uses the **HST_MODE_Pp**[3:2] FLOW_VAL bit field for interpretation of the received READY line, for example to signal errors.

The **HST_MODE_Pp** register has the following bit fields:

- WAKE_CTRL selects between software (when 0x0) or automatic (when 0x1) control for the WAKE line. The default is software control.
- MODE_VAL defines the following operation modes:
 - Sleep: Specifies whether internal clocks must run and port be operating
 - Stream: Receiver does not use start-bits.
 - Frame: Allows break transmission/reception defined as a longer-than-frame 0 sequence
- FLOW_VAL defines the following data flows:
 - Synchronized flow: The READY signal from the receiver drops after every first frame bit, rising when data are stored, and transmission of a new frame is possible.
 - Pipelined flow: The receiver cannot drop the READY line at some times.
 - Real-time flow: The receiver drops the READY line at the first received bit and raises it at the last one.

NOTE: READY is activated when the module is going into ACTIVE state (stream or frame mode). Receive mode must be selected at the end of the configuration of the module, because it activates the transfer from the remote side. This prevents the device from receiving incorrect data, losing data, and falsely starting communication.

24.10.4.8.1.2 Other Registers

- The **HST_FRAMESIZE_Pp** register is kept to offer legacy compatibility. It is a read-only register, returning 0x1F.
- The **HST_DIVISOR_Pp**[7:0] RX_RATE_DIV_VAL bit field sets the transmission bit rate, with 1 transmitted bit per clock cycle. Bit rate can be changed by software at any time.
- The **HST_CHANNELS_Pp**[4:0] CHAN_NUM_VAL bit field sets the number of logical channels. It must be a power of 2. The default value is 0x1. This corresponds to only one logical channel, always the same, and in that case, a header is not transmitted; It cannot be changed without stopping the link.
- **HST_MAPPINGf** contains important settings for each FIFO (one register per FIFO):
 - **HST_MAPPINGf**[0] ENABLE bit: FIFO is enabled or not.
 - **HST_MAPPINGf**[4:1] CH_NUMBER and **HSR_MAPPINGf**[7] PORT_NUMBER bit fields (channel number and port number): FIFO is assigned to an HSI logical channel on a physical port.
 - **HST_MAPPINGf**[13:10] THRESHOLD bit field is the number of empty TX FIFO locations that will activate interrupt automatically.
- The **HST_ARBMODE_Pp**[0] ARB_VAL bit allows choosing of the arbitration policy for time allocation to logical channels, when several channels have to transmit. Round-robin algorithm implements a circular scan: the same channel cannot transmit twice if another channel is ready to transmit. Scan proceeds in the same, unspecified direction (design choice). Fixed priority algorithm grants maximum priority to logical channel 0, minimum priority to channel 15. The right to transmit is assigned to the higher priority channel ready to transmit, independently of previous transmissions.

The choice between algorithms must consider that round-robin sets a maximum wait time for each channel, but it may require a long time to transmit long sequences of frames, on any channel. On the other hand, fixed priority allows limiting of transmission time for high priority channels, while low priority channel may wait for a long time.

It is important to understand that this register sets the allocation of one port resource (transmission lines) from 2 to 16 vying transmit FIFOs. Allocation of the 16 transmit FIFOs to 32 logical channels is

done by the [HST_MAPPINGf](#) register. For this second kind of allocation, no arbitration makes sense, because software is in charge to ensure against more than 16 logical channels transmitting at the same time.

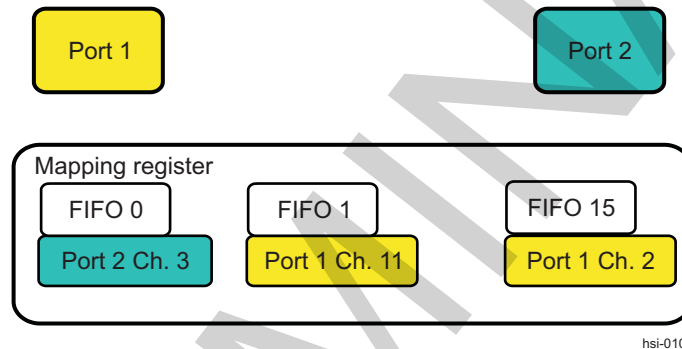
24.10.4.8.2 Mapping

[Figure 24-224](#) shows an example of programming the [HST_MAPPINGf](#) register. No limitation is set on the choice of channel/FIFO/port association.

Each port has its [HST_ARBMODE_Pp](#) register so that it is also possible to program alternate algorithms on ports.

While the [HST_MAPPINGf](#) register cares only about FIFO, the [HST_ARBMODE_Pp](#) register is associated to a port and each port has its own one, which only selects a winner between ready-to-transmit channels of this port. For example, suppose that in [Figure 24-224](#) only the three represented channels need to transmit; then a yellow (Port 1) arbiter chooses between channel 11 and channel 2, while the cyan (Port 2) arbiter has no decision to take and lets channel 3 transmit.

Figure 24-224. MAPPING Register



24.10.4.8.3 Transmission Buffer

The transmission buffer holds a frame to be transmitted for each channel. The [HST_BUFSTATE_Pp\[7:0\]](#) BUFSTATE_VAL bit field indicates whether the [HST_BUFFER_Pp_CHN_i\[31:0\]](#) DATA bit field holds significant data, and it is not be cleared until transmit FSM is in IDLE state and arbitration indicates the channel is the next in line to transmit. The [HST_BUFSTATE_Pp](#) register is automatically written by hardware.

NOTE: Write access to the register with 0x3 and 0xF byte-enable loads its value into the transmit FIFO. If only 16-bit accesses are used, the upper 2 bytes must be written first (byte-enable 0xC). Between two consecutive 16-bit FIFO-related accesses there cannot be any other FIFO-related OCP access.

Some applications need reversed byte ordering of frames. This is supported by the [HST_SWAPBUFFER_Pp_CHN_i](#) register. By reading this register instead of the corresponding [HST_BUFFER_Pp_CHN_i](#) register on the same channel, byte ordering of the 4 bytes in a frame is reversed (see [Section 24.10.4.7.3, Receive Buffers](#)).

24.10.4.8.4 Break Pattern Transmission

Break pattern transmission is an alternative to normal transmission mode, and is used when trying to recover lost synchronization. It is started by software by setting the [HST_BREAK_Pp\[0\]](#) BREAK_VAL bit. As soon as transmit FSM is in IDLE state (ready to accept another frame for transmission), a nonzero value on the [HST_BREAK_Pp\[0\]](#) BREAK_VAL bit starts the BREAK sequence, and automatically clears the [HST_BREAK_Pp\[0\]](#) BREAK_VAL bit. A sequence of 0, longer than a frame, is transmitted.

24.10.4.8.5 Transmission Operations

The transmitter adds up to the transmit shift register, loaded from the transmission buffer, and the transmit FSM current state of the FSM can be observed and controlled through the [HST_TXSTATE_Pp\[2:0\]](#) TXSTATEVAL bit field. A functional description of the transmit FSM is shown in [Figure 24-223](#).

After reset, the transmitter is in IDLE state. It starts transmission when there is data in one of the transmission [HST_BUFFER_Pp_CHN_i](#) registers, depending on the value of [HST_BUFSTATE_Pp\[7:0\]](#) BUFSTATE_VAL bit field, or when the value of BREAK is not 0.

When transmitting a data frame (not a BREAK sequence), the frame to be transmitted is clocked from the [HST_BUFFER_Pp_CHN_i](#) register to the transmission shift register, and the FSM enters WAIT state until it receives READY = 1. At this point, it starts driving the DATA and FLAG lines with a preliminary start-bit at 1, if in STREAM mode, or with the frame, which amounts to header and payload data.

In case of synchronized data flow, the TRANSMIT state is left after one frame is transmitted, because READY always drops after the first transmitted bit. Transmit FSM transitions through IDLE and WAIT states before retransmitting, when READY rises.

In case of pipelined data flow, transmit FSM remains in TRANSMIT state as long as READY = 1, and transmission goes on, always clocking data from the appropriate [HST_BUFFER_Pp_CHN_i](#) register, as selected by arbitration. Transmission is stopped by the condition READY = 0, forcing FSM to go into IDLE state. READY must not switch during the last 8 nominal bit times.

24.10.4.8.6 Transmission Exceptions

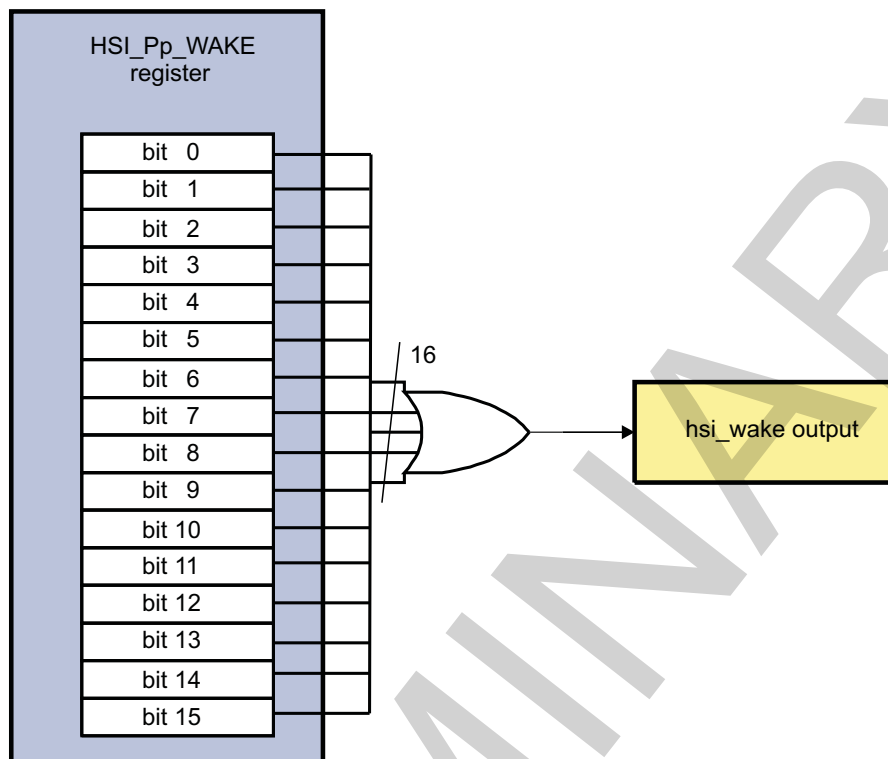
There are no transmission errors. Reception of READY = 0 in the last 8 bits of frames is not flagged. The DATA ACCEPTED interrupt is used to inform software that the [HST_BUFFER_Pp_CHN_i\[31:0\]](#) DATA bit field is empty and to request more data.

24.10.4.9 HSI Wake Generator

The WAKE line is used to create a wake-up event for the external module that interfaces with HSI before a data transfer through the HSI serial interface.

The 16 bits (1 per HSI channel) of the [HSI_Pp_WAKE\[15:0\]](#) WAKE_CHI bit field are ORed together to drive the WAKE line, as shown in [Figure 24-225](#).

Figure 24-225. HSI_Pp_WAKE Control in Case of Managed Wake



hsi-011

The wake generator can be managed by software operations or automatically by hardware. If the wake generator is not managed, the WAKE signal is driven to 0 and the remote transmitter must wake itself upon activity detection on the DATA and FLAG lines.

24.10.4.9.1 Software Management of HSI Wake Generator

Software can get the responsibility to use and manage those bits to create and release wake-up events consistently with HSI use.

Because the [HSI_Pp_WAKE\[15:0\]](#) WAKE_CHI bit field can be managed by different threads/processors, this mechanism allows independent bit management by each thread. Without locking the [HSI_Pp_WAKE](#) register (as a read-modify-write does), it avoids one thread to overwrite the register change made by another thread. Each bit of the [HSI_Pp_SET_WAKE\[15:0\]](#) HSI_SET_WAKE_CHI bit field is owned by one thread at a time.

- The thread can set this bit by setting the corresponding bit of the [HSI_Pp_SET_WAKE\[15:0\]](#) HSI_SET_WAKE_CHI bit field to 1. This sets only this bit, thus leaving the other bits unchanged (no need of a read-modify-write).
- The thread can clear this bit by setting the corresponding bit of the [HSI_Pp_CLEAR_WAKE\[16:0\]](#) HSI_HSI_CLEAR_WAKE_CHI bit field to 1. This clears only this bit, thus leaving the other bits unchanged (no need of a read-modify-write).

24.10.4.9.2 Automatic Management of HSI Wake Generator

The wake generator is automatically managed when there is a transmission to be performed. When data are waiting for transmission in a FIFO TX, the hardware sets the corresponding bit of the [HSI_Pp_WAKE\[15:0\]](#) WAKE_CHI bit field, and this raises the WAKE signal on port p. Then WAKE is deasserted by the first occurrence of one event between a fixed time-out from the end of the last transfer, a transition to IDLE in idle-req protocol, a software clear of register.

24.10.4.10 FIFO Subsystem

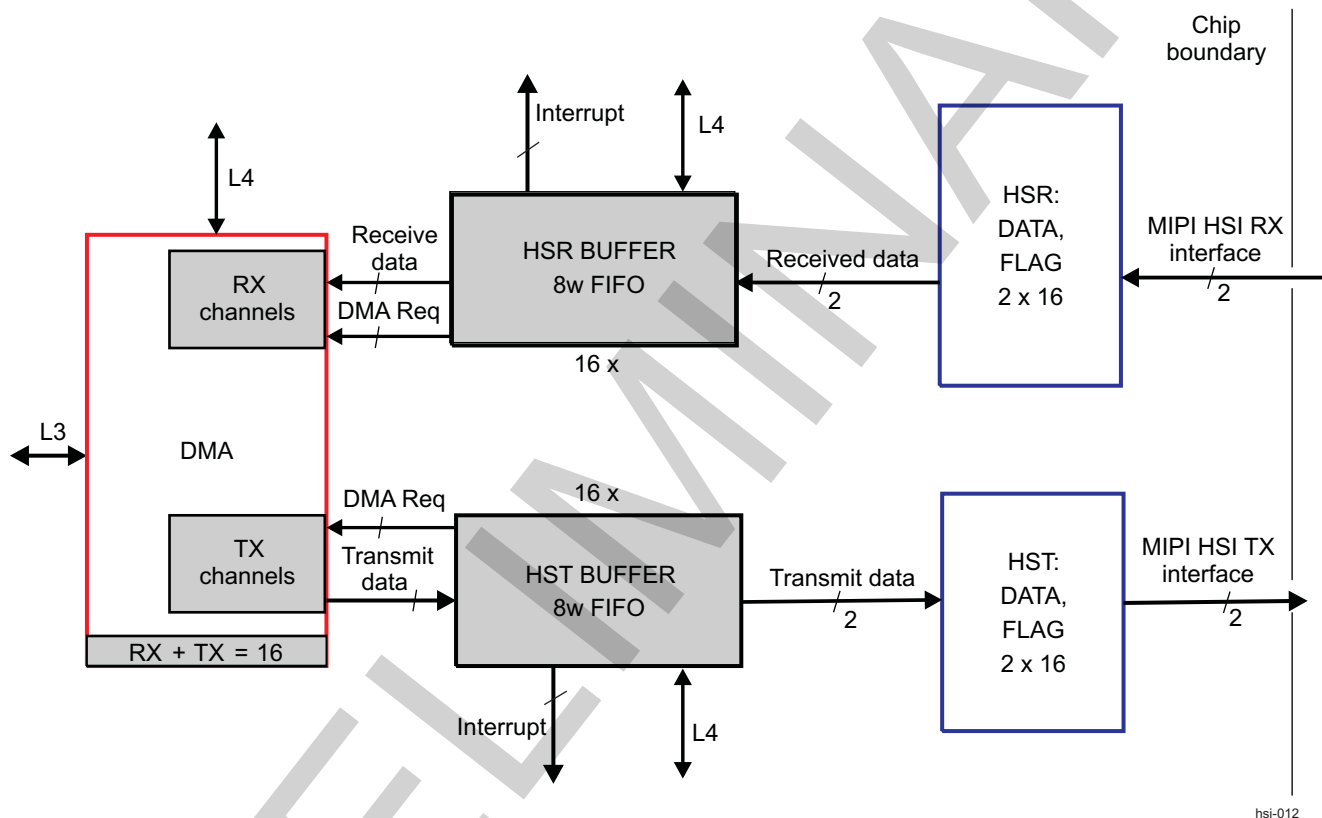
The FIFO subsystem allows temporary buffering while receive data is transferred from the receiver through DMA or the L4 interconnect to main memory, and the storing of transmit data read in main memory through DMA (or written by L4) before transmitting it. The FIFO depth is 8×32 -bit words for each channel, yielding a total size of 1KB with 16 bidirectional channels.

RX FIFOs are clocked by interconnect clock, TX FIFOs are clocked by undivided functional clock.

24.10.4.10.1 FIFO Subsystem Architecture

Figure 24-226 shows the overall FIFO architecture.

Figure 24-226. Overall FIFO Architecture



hsi-012

There are 16 DMA channels available. They can be used for RX or TX in any combination; direction is programmable.

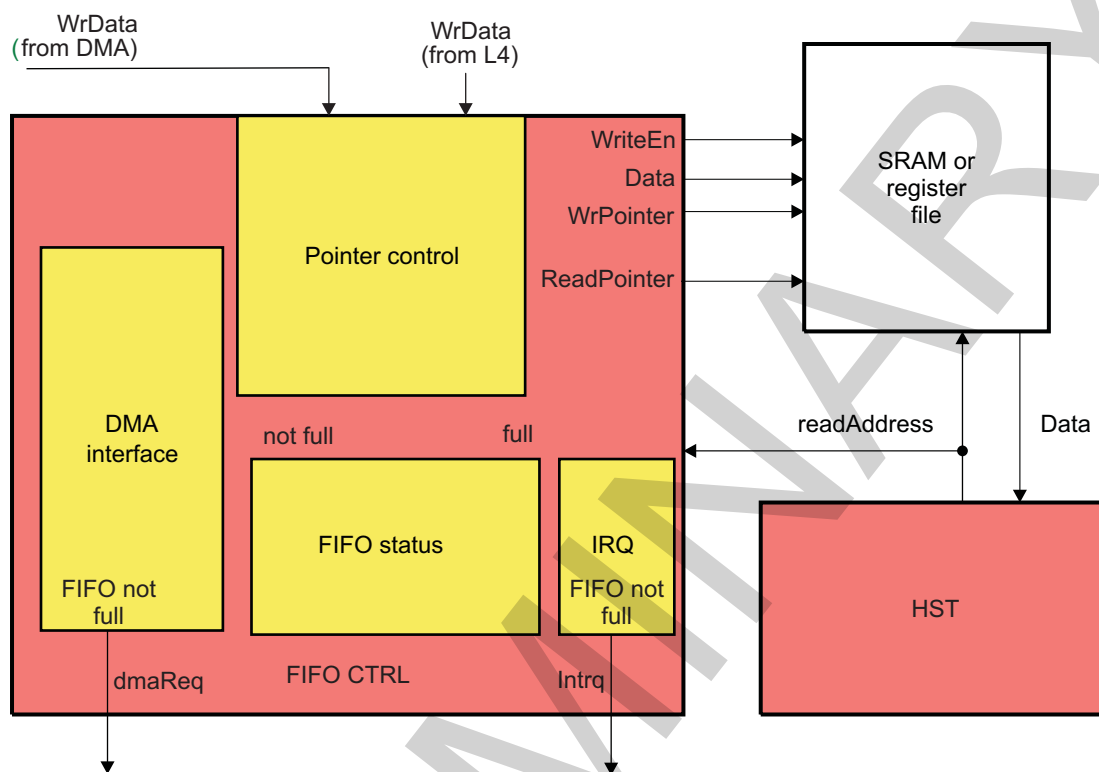
There are 16 RX FIFOs and 16 TX FIFOs. Not all FIFOs can be served by DMA, but all RX FIFOs (or else TX FIFOs) can be served by DMA, if needed. The other FIFOs, if used, must be read/written through the L4_CFG interconnect.

Both HSI ports provide up to 16×2 logical channels. This means that only one half of the HSI logical channels can be accommodated on the existing FIFOs. The others must not be used, and their use must flag an error. The 16 **HST_MAPPINGf** or **HSR_MAPPINGf** registers specify which HSI logical channel number is allowed to be received on RX FIFOs and/or fed for transmission by TX FIFOs. There is one mapping register for transmission and one for reception. Any attempt to transmit or process received data on HSI logical channels not previously mapped on mapping registers results in an error. In other words, some header values (bits 35 to 32) are not allowed at any given time, and generate an error when received. Software must ensure that the remote side sends payload on the allowed logical channels, specified by header values.

24.10.4.10.2 Transmit FIFO Architecture

Figure 24-227 shows the transmission FIFO architecture.

Figure 24-227. Transmission FIFO Architecture



hsi-013

The FIFO controller flags the condition of "room available in FIFO" or "FIFO not full" at any time when FIFO can host new data for transmission. This condition raises an interrupt request and a DMA request, if enabled. A programmable threshold in the corresponding [HST_MAPPING\[13:10\] THRESHOLD](#) bit field reduces the number of requests (they can be sent only when four words can be written in FIFO). The default value for the threshold is 0x0 (that is, a request rises as soon as one word can be written in FIFO). See [Table 24-797](#).

Table 24-797. Threshold for Transmit FIFO Interrupt/DMA Request

| HST_MAPPING[13:10] THRESHOLD | Number of Words in FIFO | Request |
|--|-------------------------|---------|
| 0 (legacy default) | Less than 8 | Yes |
| 1 | Less than 1 | Yes |
| 2 | Less than 2 | Yes |
| 3 | Less than 3 | Yes |
| 4 | Less than 4 | Yes |
| 5 | Less than 5 | Yes |
| 6 | Less than 6 | Yes |
| 7 | Less than 7 | Yes |
| 8 | Less than 8 | Yes |
| 9 to 15 | Any | No |

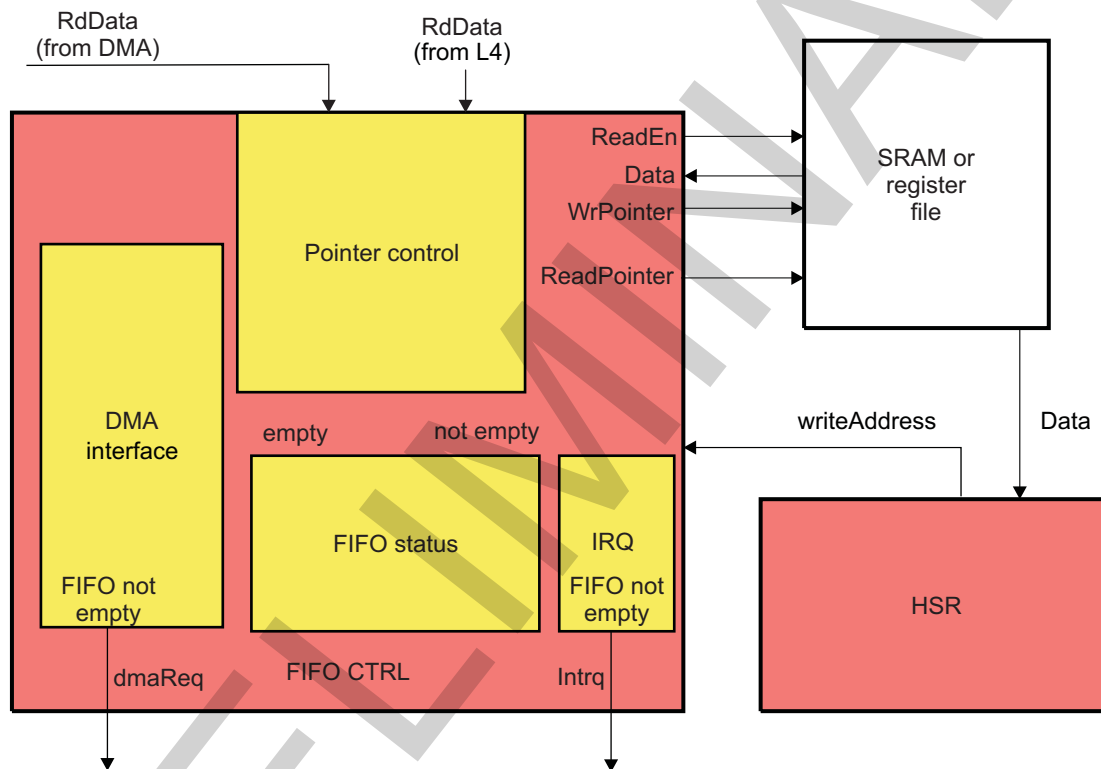
FIFO can be written by DMA and the L4 interconnect configuration port, but the L4 interconnect has fixed priority at any time. Software controls correct access. No hardware mechanism is provided to analyze and block concurrent operation, nor is any hardware control provided on reprogramming DMA registers during a transfer in which they are involved.

The address of FIFO is the corresponding [HST_BUFFER_Pp_CHN_i](#) register address. The FIFO controller generates the RAM addresses; namely, it manages the write pointer when DMA or the L4 interconnect access the [HST_BUFFER_Pp_CHN_i](#) address and it manages the read pointer when HST needs a data to transmit.

24.10.4.10.3 Receive FIFO Architecture

Figure 24-228 shows the reception FIFO architecture.

Figure 24-228. Reception FIFO Architecture



hsi-014

FIFO controller flags the condition of "unread data in FIFO" or "FIFO not empty" at any time when a FIFO hosts new data, received and not read. This condition can be simply the misalignment of the read pointer and write pointer. The condition raises an interrupt request and a DMA request, if enabled. The [HSR_MAPPING\[13:10\]](#) WORDS bit field informs software how many words must be read.

Unlike transmission, it is not possible here to filter requests through a threshold on the number of received words. If such a threshold is bigger than one, and a last single word is received after the last read, software is unaware that more data waits to be read.

The address of FIFO is the corresponding [HSR_BUFFER_Pp_CHN_i](#) register address. The FIFO controller generates the RAM addresses; namely, it manages the write pointer when HSR has received data, and it manages the read pointer when DMA or the L4 interconnect access the [HST_BUFFER_Pp_CHN_i](#) register.

24.10.4.10.4 FIFO Addressing

From a software point of view, a FIFO is seen at a single address, the corresponding [HST_BUFFER_Pp_CHN_i](#) or [HSR_BUFFER_Pp_CHN_i](#) register address. The [HST_SWAPBUFFER_Pp_CHN_i](#) or [HSR_SWAPBUFFER_Pp_CHN_i](#) register address is also provided to invert data endianness with byte granularity. FIFO overflow in RX is extremely unlikely, because of the large difference in HSI and L3 interconnect bit rate. However, if this occurs, the hardware prevents any loss of data by deasserting (setting to 0) the READY signal to the remote transmitter. FIFO overflow in TX is not flagged and must be avoided by software drivers.

24.10.4.11 Error Reporting

24.10.4.11.1 Detection of Errors

Error detection on the module is limited to the physical layer. No data corruption is checked, and no error is flagged as long as the receiver and transmitter agree on frame boundaries. Because clocking and data are recovered from alternate edges on the DATA and FLAG signals, three kinds of error can appear:

- Simultaneous edges
- Missing edges
- Additional edges

24.10.4.11.1.1 Simultaneous Edges

The transmitter is not supposed to produce simultaneous edges on the DATA and FLAG signals, but they can appear if the transmission rate is far higher than the receiver can handle. Given to the sampling protocol, this event may introduce errors in sampled data. Detecting this error is not easy, because the recovered clock is also affected, and in some configurations no other clock is available. One bit is available in the [HSR_ERROR_Pp](#) register, to report any hardware abnormal condition in data reception.

24.10.4.11.1.2 Missing Edges

Missing edges result in missing clock cycles, thus causing the receiver to get less data than expected on a given frame.

In synchronized flow, when the transmit side has completed transmission, the receiver side is still waiting for more data, and does not raise READY, thus stopping the transmitter from going on with more frames. A frame time-out counter (see [Section 24.10.4.11.2.1, Frame Time-Out Counter](#)) is used to escape this deadlock condition.

In pipelined flow, when the transmit side has completed transmission and has more data to transmit, the receiver accepts and processes this data as if they were part of the previous frame. Frame synchronization is then lost. It may randomly resume when in frame mode, as zeroes at the end of a frame are automatically discarded. But even in this case, a number of frames may be lost or corrupted. When in stream mode, no self-recovery is ever possible, and synchronization is lost forever. A frame burst counter (see [Section 24.10.4.11.2.3, Frame Burst Counter](#)) is used to limit the number of these potentially corrupted frames, simply by limiting the number of frames a transmitter can send back-to-back in a pipelined mode. A trailing bit counter (see [Section 24.10.4.11.2.2, Frame Tailing Bit Counter](#)) is used to check that the receiver and transmitter agree on being at the end of frame.

24.10.4.11.1.3 Additional Edges

Additional edges result in additional clock cycles, thus causing the receiver to get more data than expected on a given frame.

In synchronized flow, when the receive side thinks the frame is over, the transmitter keeps sending data until the end of frame is reached. In frame mode, if these additional bits are all 0s, they are discarded by the receiver, the transmission stops, and the receiver raises READY when it is available to receive a new frame. The transmit side starts a new frame and synchronization is recovered. But if at least one of the additional bits is set to 1, this can misguide the receiver that a new frame has already started and READY

stays at 0. The transmit side stops, waiting for $READY = 1$, a never occurring condition, because the receiver has lost synchronization. In this case, the link is stuck. This is also the case in stream mode, when the receiver wrongly thinks that a new frame is started, so it is not available to receive a full new frame, and it does not set $READY = 1$. A frame time-out counter (see [Section 24.10.4.11.2.1, Frame Time-out Counter](#)) is used to escape this deadlock condition.

24.10.4.11.2 Error Counters

Clocks for these three counters are provided through a division of the functional clock. These counters can be set to a value and can be stopped when some events occur. Events flag errors and set a corresponding bit in the [HSR_ERROR_Pp](#) register.

24.10.4.11.2.1 Frame Time-Out Counter

This counter is clocked by the functional clock, divided by the factor specified in the [HSR_DIVISOR_Pp\[7:0\]](#) RX_RATE_DIV_VAL bit field, to provide a clock at receive bit rate. Receive bit rate is always communicated by the remote transmitter through the protocol layer. This counter starts when the first bit of the frame is found and stops when 36 (or 37 depending on the mode) bits are correctly received by the receiver. If the counter overflows, an error is generated (the [HSR_ERROR_Pp\[1\]](#) FTE bit is set to 0). In OPP reduction of the functional clock only (receive side kept in fixed voltage domain), software can decide to reduce either the division factor for the clock, or the count, to use a clock consistent with receive rate, or a reduced count of a slower clock. This is transparent for hardware. This counter is not started when the receive rate is outside the full error detection rate range.

24.10.4.11.2.2 Frame Tailing Bit Counter

This counter can be clocked by the same clock as the frame time-out counter, which has the receiver bit rate frequency. It starts after the last bit of a frame is received, and $READY = 0$; in pipelined flow, this counter is started only after the end of the last frame received. No event stops the counter, except its own overflow. It counts up to 8. An error is logged (the [HSR_ERROR_Pp\[4\]](#) TBE bit is set to 0) if a 1 bit is received in frame mode before counter overflow, or any bit is received in stream mode before counter overflow. In OPP reduction of functional clock only (receive side kept in fixed voltage domain), software can decide to reduce either the division factor for the clock, or the count, to use a clock consistent with receive rate, or a reduced count of a slower clock. This is transparent for hardware. This counter is not started when receive rate is outside the full error detection rate range.

24.10.4.11.2.3 Frame Burst Counter

Differently from previous counters, this counter is clocked by a frame-sync signal obtained directly by received data. Its goal is to reduce the number of contiguous frames sent in pipelined flow. As explained in [Section 24.10.4.11.1, Detection of Errors](#), in some cases after missing/additional clock cycles, synchronization is lost and these pipelined frames can be corrupted. Software sets the count value, which can be as high as 256 (no higher values are supported by hardware). If $READY$ is dropped to 0, for reasons other than counter expiration, the counter is stopped and restarted as soon as transmission resumes. At the end of the count, $READY$ drops to 0. The tailing bit counter is started, and if it overflows without error detection and the receiver has enough room for another frame, $READY$ is reset to 1. No error and no interrupt are generated on this counter.

24.10.4.11.3 Error Registers

One error register per port is provided to check the error source that issued an interrupt, with more details than the error bit in the interrupt status register.

- The [HSR_ERROR_Pp\[0\]](#) SIG bit: Signal error bits are kept for legacy reasons, and they can be used for any abnormal situation the hardware wants to flag.
- The [HSR_ERROR_Pp\[1\]](#) FTE bit: Frame time-out error bits flag the situation when not even a frame has been received in the time corresponding to two or more frames, depending on the FTE counter software setting.
- The [HSR_ERROR_Pp\[4\]](#) FBE bit: Tailing bit error bits flag the situation when at least one spurious bit is received after the end of a frame, in the time corresponding to two or more bit times.

- The [HSR_ERROR_Pp\[7\]](#) RME bit: Receive mapping error bits flag the situation when data are received on a channel that is not mapped to any enabled FIFO.
- The [HSR_ERROR_Pp\[11\]](#) TME bit: Transmit mapping error bits flag the situation when DMA tries to access a FIFO that is not mapped to any logical channel, or is not enabled.

These two registers each have a companion [HSR_ERRORACK_Pp](#) register, where software must set the corresponding error bit to 1 to clear it.

24.10.5 HSI Programming Guide

24.10.5.1 HSI Low-Level Programming Models

This section describes the low-level hardware programming sequences for the configuration and use of the HSI module.

24.10.5.1.1 Global Initialization

24.10.5.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the HSI module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration of the HSI.

For more information, see [Section 24.10.3, HSI Integration](#).

Table 24-798. Global Initialization of Surrounding Modules for HSI

| Surrounding Modules | Comments |
|---------------------------------|---|
| PRCM | HSI functional and interface clocks must be enabled. For more information, see Chapter 3 . |
| Control module | Module-specific pad muxing must be set in the control module. For more information, see Chapter 19 . |
| (Optional) Interrupt controller | The Cortex-A9 MPU, Cortex-M3 MPU, or DSP INTC must be configured to enable the interrupt request generation to the Cortex-A9 MPU, Cortex-M3 MPU, or DSP subsystem. For information about enabling interrupts, see Chapter 5 . |
| (Optional) Interconnect | For information about the L4 interconnect configuration, see Chapter 14, Interconnects . For information about L3 interconnect configuration, see Chapter 14, Interconnects . |

24.10.5.1.1.2 HSI Global Initialization

24.10.5.1.1.2.1 Main Sequence – HSI Global Initialization

This procedure initializes the HSI module after a power-on reset (POR) or software reset.

Table 24-799. HSI Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Perform an HSI software reset. | HSI_SYSCONFIG [1] SOFTRESET | 0x1 |
| WAIT UNTIL HSI reset is complete. | HSI_SYSSTATUS [0] RESETDONE | = 0x1 |
| Set standby mode configuration. | HSI_SYSCONFIG [13:12] MIDDLEMODE | 0x- |
| Set idle mode configuration. | HSI_SYSCONFIG [4:3] SIDLEMODE | 0x- |
| Clock auto gating. | HSI_SYSCONFIG [0] AUTOIDLE | 0x- |
| Set the transmit data rate. | HST_DIVISOR_Pp [7:0] TX_RATE_DIV_VAL | 0x- |
| (Optional) Enable DMA. | DMA_GCR [0] SWITCH_OFF | 0x0 |

24.10.5.1.2 HSI Operational Modes Configuration

24.10.5.1.2.1 HSI Transmit Mode/Receive Mode

24.10.5.1.2.1.1 Main Sequence – Configure HSI Transmitter

Table 24-800. HSI Configure HSI Transmitter

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Set the mode. | HST_MODE_Pp[1:0] MODE_VAL | 0x- |
| Set the data flow type. | HST_MODE_Pp[3:2] FLOW_VAL | 0x- |
| Set the hsi_wake line control. | HST_MODE_Pp[4] WAKE_CTRL | 0x- |
| Set the transmission bit rate | HST_DIVISOR_Pp[7:0] TX_RATE_DIV_VAL | 0x- |
| Set the arbitration mode. | HST_ARBMODE_Pp[0] ARB_VAL | 0x- |
| Set the number of active HSI logical channels. | HST_CHANNELS_Pp[4:0] CHAN_NUM_VAL | 0x- |
| Set the TX FIFO threshold. | HST_MAPPINGf[13:10] THRESHOLD | 0x- |
| Associate the TX FIFO to an HSI port. | HST_MAPPINGf[7] PORT_NUMBER | 0x- |
| Associate the TX FIFO to an HSI logical channel. | HST_MAPPINGf[4:1] CH_NUMBER | 0x- |
| Enable the TX FIFO. | HST_MAPPINGf[0] ENABLE | 0x- |

24.10.5.1.2.1.2 Main Sequence – Configure HSI Receiver

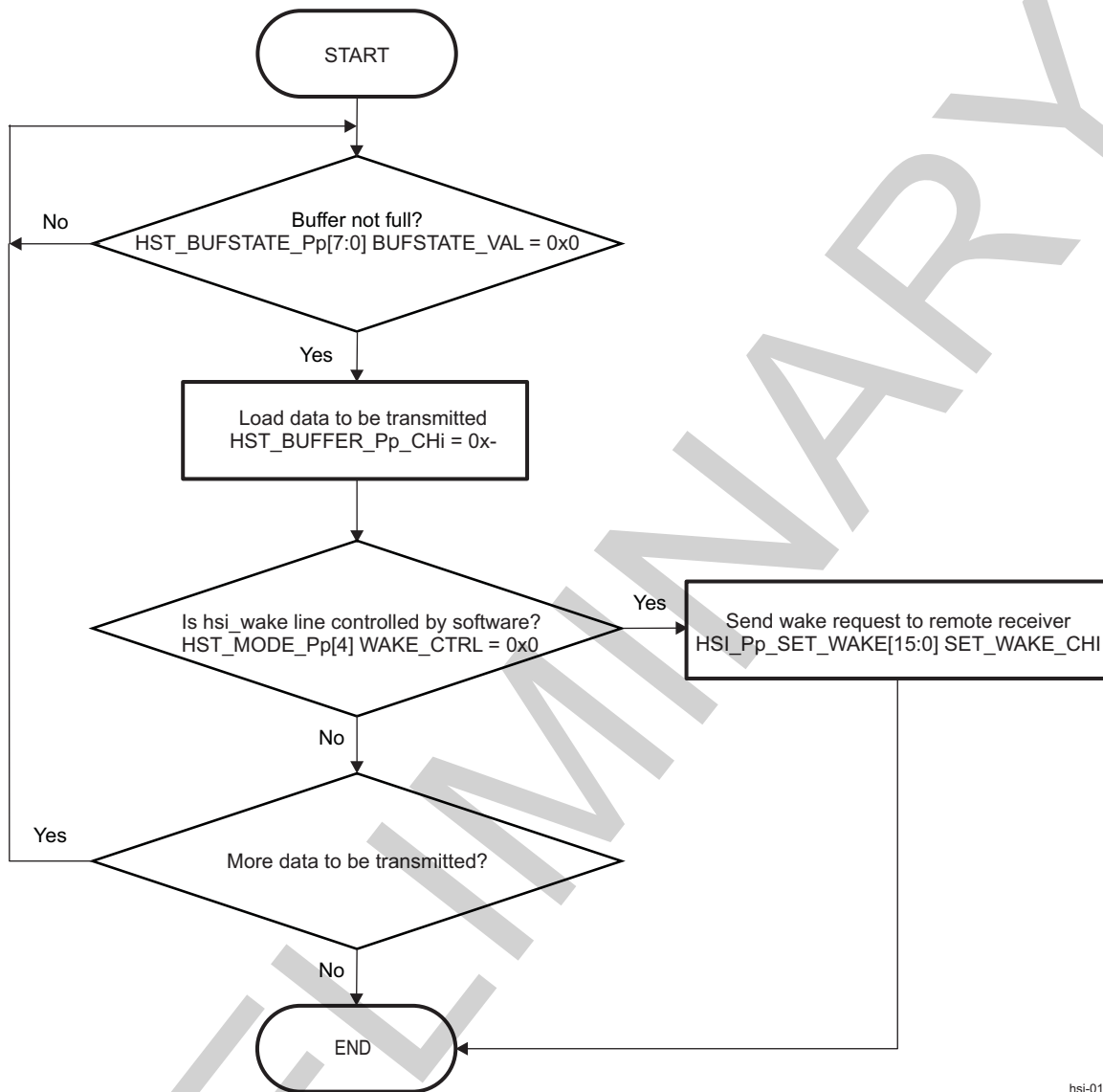
Table 24-801. HSI Configure HSI Receiver

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Set a clock frequency for the error detection counters. | HSR_DIVISOR_Pp[7:0] RX_RATE_DIV_VAL | 0x- |
| Set the number of active HSI logical channels. | HSR_CHANNELS_Pp[4:0] CHAN_NUM_VAL | 0x- |
| Set the frame timeout error counter. | HSR_COUNTERS_Pp[19:0] FT | 0x- |
| Set the tailing bit error counter. | HSR_COUNTERS_Pp[23:20] TB | 0x- |
| Set the frame burst error counter. | HSR_COUNTERS_Pp[31:24] FB | 0x- |
| Associate the RX FIFO to an HSI port. | HSR_MAPPINGf[7] PORT_NUMBER | 0x- |
| Associate the RX FIFO to an HSI logical channel. | HSR_MAPPINGf[4:1] CH_NUMBER | 0x- |
| Enable the RX FIFO. | HSR_MAPPINGf[0] ENABLE | 0x- |
| Set the mode in receive mode. | HSR_MODE_Pp[1:0] MODE_VAL | 0x- |
| Set the data flow type in receive mode. | HSR_MODE_Pp[3:2] FLOW_VAL | 0x- |

24.10.5.1.2.1.3 Main Sequence – HSI Polling Method

24.10.5.1.2.1.3.1 Sub-sequence – HSI Transmit in Polling Method

[Figure 24-229](#) is a procedure flow chart for HSI transmit in polling method.

Figure 24-229. HSI Transmit in Polling Method**Table 24-802. Register Call Summary for Subsequence – HSI Transmit in Polling Method**

| Register Name | Register Name | Register Name |
|---------------------------------|-------------------------------------|-----------------------------|
| HST_BUFSTATE_Pp | HST_BUFFER_Pp_CHN_i | HST_MODE_Pp |
| HSI_Pp_SET_WAKE | | |

24.10.5.1.2.1.3.2 Subsequence – HSI Receive in Polling Method

Table 24-803. Event Servicing in HSI Receive in Polling Method

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| IF: Is there data frame to be read? | HSR_BUFSTATE_Pp[7:0] BUFSTATE_VAL | =0x1 |
| Identify number of words available in RX FIFO for reading. | HSR_MAPPING[13:10] WORDS | 0x- |
| Read data from RX FIFO. | HSR_BUFFER_Pp_CHN_i[31:0] DATA | 0x- |

Table 24-803. Event Servicing in HSI Receive in Polling Method (continued)

| Step | Register/Bit Field/Programming Model | Value |
|-------|--------------------------------------|-------|
| ENDIF | | |

24.10.5.1.2.1.4 Main Sequence – HSI Interrupt Mode

Table 24-804. HSI Interrupt Mode

| Step | Register/Bit Field/Programming Model | Value |
|-------------------------------------|---------------------------------------|-------|
| Disable DMA engine. | DMA_GCR[0] SWITCH_OFF | 0x1 |
| Configure transmitter. | See Table 24-800 . | |
| Configure receiver. | See Table 24-801 . | |
| Enable HSI transmission interrupts. | See Table 24-805 . | |
| WHEN HSI INTERRUPT OCCURS | See Figure 24-230 . | |
| Enable HSI reception interrupts. | See Table 24-807 . | |
| WHEN HSI INTERRUPT OCCURS | See Table 24-803 . | |

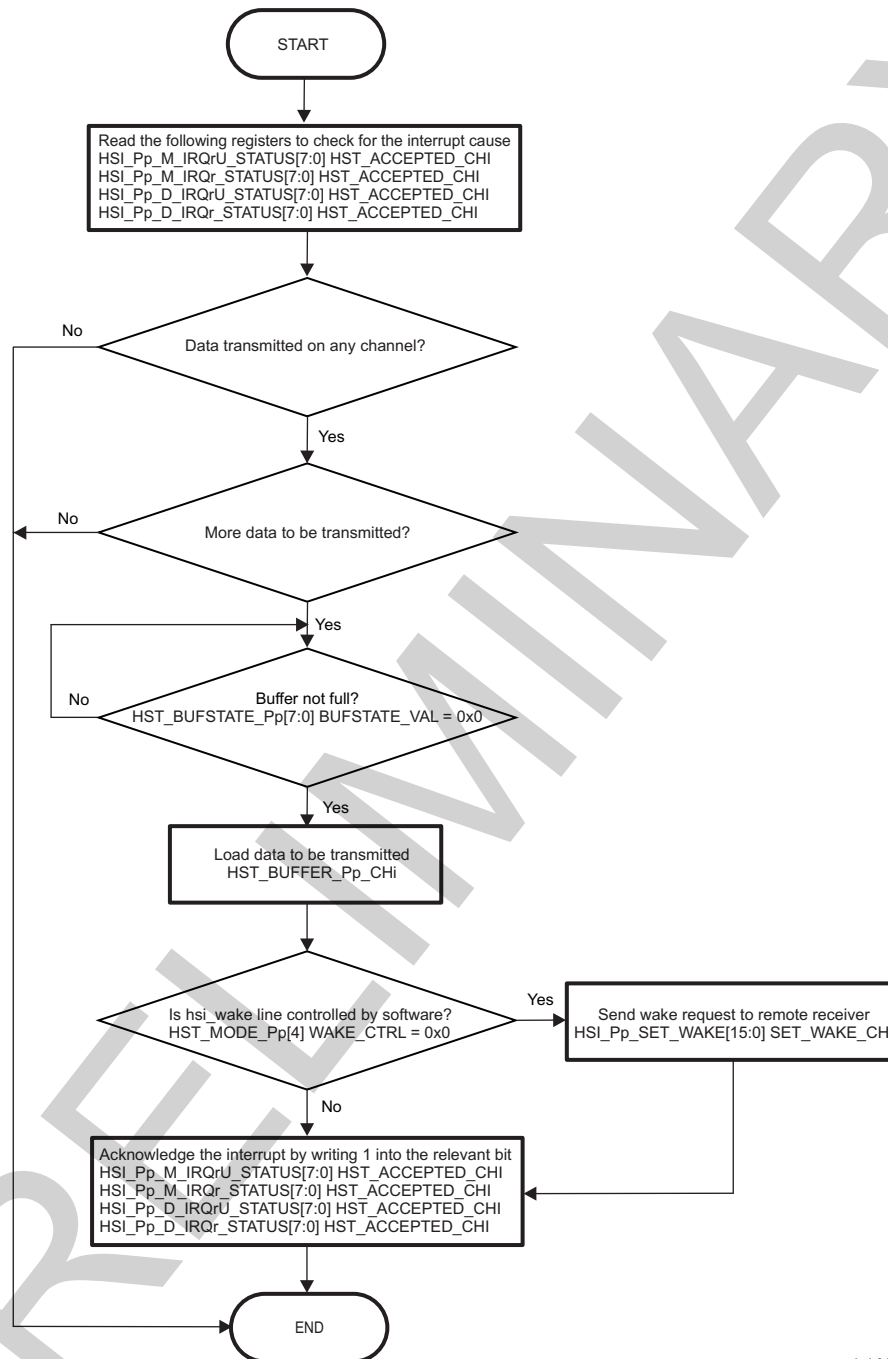
24.10.5.1.2.1.4.1 Subsequence – Interrupt Transmit Mode

Table 24-805. Enable HSI Transmit Interrupts

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------------|---|-------|
| Enable data accepted interrupt. | HSI_Pp_M_IRQrU_ENABLE[7:0] HST_ACCEPTED_ENI and/or HSI_Pp_D_IRQrU_ENABLE[7:0] HST_ACCEPTED_ENI and/or HSI_Pp_M_IRQr_ENABLE[7:0] HST_ACCEPTED_ENI and/or HSI_Pp_D_IRQr_ENABLE[7:0] HST_ACCEPTED_ENI | 0x- |

Figure 24-230 is a procedure flow chart for event servicing in HSI transmission mode.

Figure 24-230. Event Servicing in HSI Transmission Mode



hsi-016

Table 24-806. Register Call Summary for Subsequence – Event Servicing in HSI Transmission Mode

| Register Name | Register Name | Register Name |
|--|--|---|
| HSI_Pp_M_IRQrU_STATUS[7:0]HST_ACCEPTED_CHI | HSI_Pp_D_IRQrU_STATUS[7:0]HST_ACCEPTED_CHI | HSI_Pp_M_IRQr_STATUS[7:0]HST_ACCEPTED_CHI |
| HSI_Pp_D_IRQr_STATUS[7:0]HST_ACCEPTED_CHI | HST_BUFFER_Pp_CHN_i[31:0] DATA | HST_MODE_Pp[4] WAKE_CTRL |

Table 24-806. Register Call Summary for Subsequence – Event Servicing in HSI Transmission Mode (continued)

| Register Name | Register Name | Register Name |
|--|---------------|---------------|
| HSI_Pp_SET_WAKE [15:0] | | |
| HSI_SET_WAKE_CHi | | |

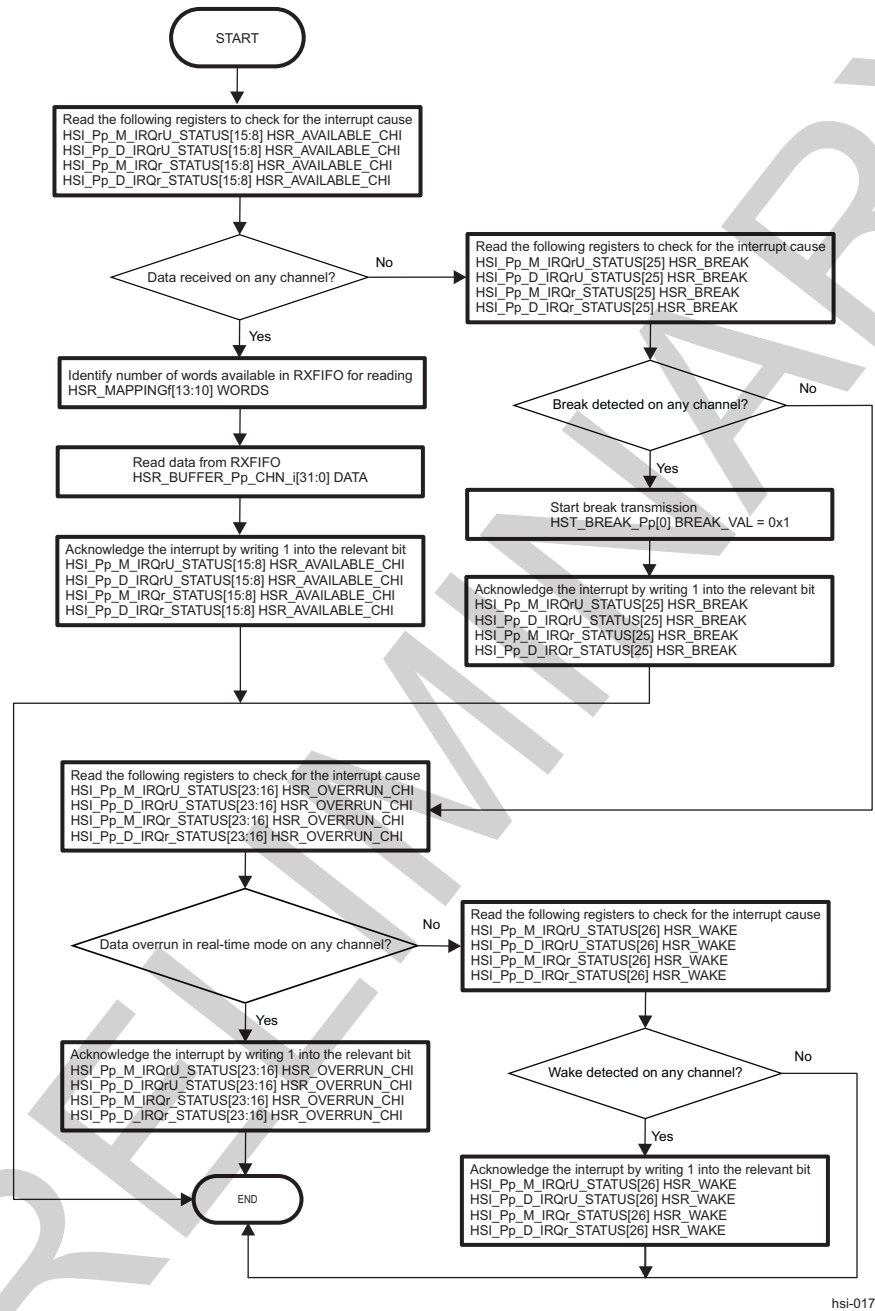
24.10.5.1.2.1.4.2 Subsequence – Interrupt Receive Mode

Table 24-807. Enable HSI Receive Interrupts

| Step | Register/Bit Field/Programming Model | Value |
|----------------------------------|---|-------|
| Enable break detected interrupt. | HSI_Pp_M_IRQrU_ENABLE [25] HSR_BREAK and/or HSI_Pp_D_IRQrU_ENABLE [25] HSR_BREAK and/or HSI_Pp_M_IRQr_ENABLE [25] HSR_BREAK and/or HSI_Pp_D_IRQr_ENABLE [25] HSR_BREAK | 0x1 |
| Enable wake detected interrupt. | HSI_Pp_M_IRQrU_ENABLE [26] HSR_WAKE and/or HSI_Pp_D_IRQrU_ENABLE [26] HSR_WAKE and/or HSI_Pp_M_IRQr_ENABLE [26] HSR_WAKE and/or HSI_Pp_D_IRQr_ENABLE [26] HSR_WAKE | 0x1 |
| Enable overrun interrupt. | HSI_Pp_M_IRQrU_ENABLE [23:16] HSR_OVERRUN_ENI and/or HSI_Pp_D_IRQrU_ENABLE [23:16] HSR_OVERRUN_ENI and/or HSI_Pp_M_IRQr_ENABLE [23:16] HSR_OVERRUN_ENI and/or HSI_Pp_D_IRQr_ENABLE [23:16] HSR_OVERRUN_ENI | 0x- |
| Enable data available interrupt. | HSI_Pp_M_IRQrU_ENABLE [15:8] HSR_AVAILABLE_ENI and/or HSI_Pp_D_IRQrU_ENABLE [15:8] HSR_AVAILABLE_ENI and/or HSI_Pp_M_IRQr_ENABLE [15:8] HSR_AVAILABLE_ENI and/or HSI_Pp_D_IRQr_ENABLE [15:8] HSR_AVAILABLE_ENI | 0x- |

Figure 24-231 is a procedure flow chart for event servicing in HSI reception mode.

Figure 24-231. Event Servicing in HSI Reception Mode



hsi-017

Table 24-808. Register Call Summary for Subsequence – Event Servicing in HSI Reception Mode

| Register Name | Register Name | Register Name |
|--|--|---|
| HSI_Pp_M_IRQrU_STATUS[15:8] HSR_AVAILABLE_CHI | HSI_Pp_D_IRQrU_STATUS[15:8] HSR_AVAILABLE_CHI | HSI_Pp_M_IRQr_STATUS[15:8] HSR_AVAILABLE_CHI |
| HSI_Pp_D_IRQr_STATUS[15:8] HSR_AVAILABLE_CHI | HSR_MAPPING[13:10] WORDS | HSR_BUFFER_Pp_CHN_i[31:0] DATA |
| HSI_Pp_M_IRQrU_STATUS[25] HSR_BREAK | HSI_Pp_D_IRQrU_STATUS[25] HSR_BREAK | HSI_Pp_M_IRQr_STATUS[25] HSR_BREAK |
| HSI_Pp_D_IRQr_STATUS[25] HSR_BREAK | HST_BREAK_Pp[0] BREAK_VAL | HSI_Pp_M_IRQrU_STATUS[23:16] HSR_OVERRUN_CHI |

Table 24-808. Register Call Summary for Subsequence – Event Servicing in HSI Reception Mode (continued)

| Register Name | Register Name | Register Name |
|--|---|---|
| HSI_Pp_D_IRQrU_STATUS [23:16] HSR_OVERRUN_CHI | HSI_Pp_M_IRQr_STATUS [23:16] HSR_OVERRUN_CHI | HSI_Pp_D_IRQr_STATUS [23:16] HSR_OVERRUN_CHI |

24.10.5.1.2.1.5 Main Sequence – HSI DMA Mode

24.10.5.1.2.1.5.1 Sub-sequence – DMA Configuration

Table 24-809. HSI DMA Configuration

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Perform a DMA software reset. | DMA_GRST [0] SWRESET | 0x1 |
| WAIT UNTIL DMA reset is complete. | DMA_GRST [0] SWRESET | = 0x0 |
| Set autoidle mode configuration for DMA. | DMA_GCR [3] AUTOGATING | 0x1 |
| Configure HSI DMI receiver. | See Table 24-810 . | |
| Configure HSI DMI transmit. | See Table 24-811 . | |
| Enable DMA interrupts. | See Section 24.10.5.1.2.1.5.4 . | |
| Enable DMA channel to start DMA transfer. | DMA_CCR_CSDP_i [23] ENABLE | 0x1 |
| WHEN DMA INTERRUPT OCCURS | See Table 24-804 . | |

24.10.5.1.2.1.5.2 Subsequence – DMA Receive Mode

Table 24-810. Configure DMA Receive Mode

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Set the transfer source to peripheral port. | DMA_CCR_CSDP_i [5:2] SRC | 0x9 |
| (Optional) Set the source burst enable. | DMA_CCR_CSDP_i [8:7] SRC_BURST_EN | 0x1 |
| Set the transfer destination to memory port. | DMA_CCR_CSDP_i [12:9] DST | 0x8 |
| (Optional) Set the destination burst enable. | DMA_CCR_CSDP_i [15:14] DST_BURST_EN | 0x1 |
| Set the source addressing mode to constant address. | DMA_CCR_CSDP_i [29:28] SRC_ADD_MODE | 0x0 |
| Set the destination addressing mode to post-incremented address. | DMA_CCR_CSDP_i [31:30] DST_ADD_MODE | 0x1 |
| Set the source start address. | DMA_CSSA_i [31:0] ADDR | 0x- |
| Set the destination start address. | DMA_CDSA_i [31:0] ADDR | 0x- |
| Set the number of elements in a block. | DMA_CEN_i [15:0] SIZE | 0x- |

24.10.5.1.2.1.5.3 Subsequence – DMA Transmit Mode

Table 24-811. Configure DMA Transmit Mode

| Step | Register/Bit Field/Programming Model | Value |
|---|--|-------|
| Set the transfer source to memory port. | DMA_CCR_CSDP_i[5:2] SRC | 0x8 |
| (Optional) Set the source burst enable. | DMA_CCR_CSDP_i[8:7] SRC_BURST_EN | 0x1 |
| Set the transfer destination to peripheral port. | DMA_CCR_CSDP_i[12:9] DST | 0x9 |
| (Optional) Set the destination burst enable to single access. | DMA_CCR_CSDP_i[15:14] DST_BURST_EN | 0x1 |
| Set the source addressing mode to post-incremented address. | DMA_CCR_CSDP_i[29:28] SRC_ADD_MODE | 0x1 |
| Set the destination addressing mode to constant address. | DMA_CCR_CSDP_i[31:30] DST_ADD_MODE | 0x0 |
| Set the source start address. | DMA_CSSA_i[31:0] ADDR | 0x- |
| Set the destination start address. | DMA_CDSA_i[31:0] ADDR | 0x- |
| Set the number of elements in a block. | DMA_CEN_i[15:0] SIZE | 0x- |

24.10.5.1.2.1.5.4 Subsequence – Enable DMA Interrupts

Table 24-812. Enable DMA Interrupts

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Enable the DMA channels that shall generate an interrupt to a processor (MPU and/or DSP). | HSI_DMA_M_IRQENABLE[15:0] DMA_EN_CHI and/or HSI_DMA_D_IRQENABLE[15:0] DMA_EN_CHI | 0x- |
| Enable the DMA full-block interrupt event. | DMA_CSR_CCIR_i[5] BLOCK_IE | 0x1 |
| Enable the DMA half-block interrupt event. | DMA_CSR_CCIR_i[2] HALF_IE | 0x1 |
| Enable the DMA time-out overflow interrupt event. | DMA_CSR_CCIR_i[0] TOUT_IE | 0x1 |

24.10.5.1.2.1.5.5 Subsequence – DMA Interrupt Servicing

Table 24-813. Event Servicing in DMA Transmit/Receive Mode

| Step | Register/Bit Field /Programming Model | Value |
|--|---|-------|
| Identify which DMA channel has generated an interrupt. | HSI_DMA_M_IRQSTATUS[15:0] DMA_CHI and/or HSI_DMA_D_IRQSTATUS[15:0] DMA_CHI | 0x- |
| Identify the interrupt event type. | DMA_CSR_CCIR_i[21] BLOCK_IS and/or DMA_CSR_CCIR_i[18] HALF_IS and/or DMA_CSR_CCIR_i[16] TOUT_IS | 0x- |
| Acknowledge DMA global interrupt by setting the relevant bit to 1. | HSI_DMA_M_IRQSTATUS[15:0] DMA_CHI and/or HSI_DMA_D_IRQSTATUS[15:0] DMA_CHI | 0x- |

24.10.5.1.2.1.6 Main Sequence – HSI Error Reporting

Table 24-814. Enable HSI Error Interrupts

| Step | Register/Bit Field/Programming Model | Value |
|----------------------------------|---|-------|
| Enable error detected interrupt. | HSI_Pp_M_IRQrU_ENABLE[24] HSR_ERROR and/or HSI_Pp_D_IRQrU_ENABLE[24] HSR_ERROR and/or HSI_Pp_M_IRQr_ENABLE[24] HSR_ERROR and/or HSI_Pp_D_IRQr_ENABLE[24] HSR_ERROR | 0x1 |

Table 24-815. Event Servicing Error

| Step | Register/Bit Field/Programming Model | Value |
|---|---|-------|
| Read interrupt status register. | HSI_Pp_M_IRQrU_STATUS[24] HSR_ERROR and/or HSI_Pp_D_IRQrU_STATUS[24] HSR_ERROR and/or HSI_Pp_M_IRQr_STATUS[24] HSR_ERROR and/or HSI_Pp_D_IRQr_STATUS[24] HSR_ERROR | 0x- |
| Identify the interrupt event type. | HSR_ERROR_Pp[0] SIG HSR_ERROR_Pp[1] FTE HSR_ERROR_Pp[4] FBE HSR_ERROR_Pp[7] RME HSR_ERROR_Pp[11] TME | 0x- |
| Clear the event by writing 1 into the relevant bit. | HSR_ERRORACK_Pp[0] SIG HSR_ERRORACK_Pp[1] FTE HSR_ERRORACK_Pp[4] FBE HSR_ERRORACK_Pp[7] RME HSR_ERRORACK_Pp[11] TME | 0x1 |
| Acknowledge the interrupt by writing 1 into the relevant bit. | HSI_Pp_M_IRQrU_STATUS[24] HSR_ERROR and/or HSI_Pp_D_IRQrU_STATUS[24] HSR_ERROR and/or HSI_Pp_M_IRQr_STATUS[24] HSR_ERROR and/or HSI_Pp_D_IRQr_STATUS[24] HSR_ERROR | 0x1 |

24.10.6 HSI Register Manual

24.10.6.1 HSI Instance Summary

Table 24-816 summarizes the HSI instance.

Table 24-816. HSI Instance Summary

| Module Name | Module Base Address | Size |
|------------------|---------------------|------|
| HSI_TOP | 0x4A05 8000 | 5 KB |
| HSI_DMA_CHANNELS | 0x4A05 9800 | 1 KB |
| HSI_PORTS | 0x4A05 A000 | 8 KB |

24.10.6.2 HSI_TOP Registers

24.10.6.2.1 HSI_TOP Register Summary

Table 24-817 summarizes the mapping of the HSI_TOP registers.

Table 24-817. HSI_TOP Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | HSI_TOP Physical Address |
|---------------|------|-----------------------|----------------|--------------------------|
| HSI_REVISION | R | 32 | 0x0000 0000 | 0x4A05 8000 |
| HSI_HWINFO | R | 32 | 0x0000 0004 | 0x4A05 8004 |
| HSI_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4A05 8010 |
| HSI_SYSSTATUS | R | 32 | 0x0000 0014 | 0x4A05 8014 |

Table 24-817. HSI_TOP Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | HSI_TOP Physical Address |
|--|------|-----------------------|--------------------------------------|--------------------------------------|
| HSI_Pp_M_IRQrU_STATUS ⁽¹⁾ | RW | 32 | 0x0000 0408 + (0x10 * b) + (0x8 * r) | 0x4A05 8408 + (0x10 * b) + (0x8 * r) |
| HSI_Pp_M_IRQrU_ENABLE ⁽¹⁾ | RW | 32 | 0x0000 040C + (0x10 * b) + (0x8 * r) | 0x4A05 840C + (0x10 * b) + (0x8 * r) |
| HSI_Pp_D_IRQrU_STATUS ⁽¹⁾ | RW | 32 | 0x0000 0430 + (0x10 * b) + (0x8 * r) | 0x4A05 8430 + (0x10 * b) + (0x8 * r) |
| HSI_Pp_D_IRQrU_ENABLE ⁽¹⁾ | RW | 32 | 0x0000 0434 + (0x10 * b) + (0x8 * r) | 0x4A05 8434 + (0x10 * b) + (0x8 * r) |
| HSI_DMA_M_IRQSTATUS | RW | 32 | 0x0000 0800 | 0x4A05 8800 |
| HSI_DMA_M_IRQENABLE | RW | 32 | 0x0000 0804 | 0x4A05 8804 |
| HSI_Pp_M_IRQr_STATUS ⁽¹⁾ | RW | 32 | 0x0000 0808 + (0x10 * b) + (0x8 * r) | 0x4A05 8808 + (0x10 * b) + (0x8 * r) |
| HSI_Pp_M_IRQr_ENABLE ⁽¹⁾ | RW | 32 | 0x0000 080C + (0x10 * b) + (0x8 * r) | 0x4A05 880C + (0x10 * b) + (0x8 * r) |
| HSI_DMA_D_IRQSTATUS | RW | 32 | 0x0000 0828 | 0x4A05 8828 |
| HSI_DMA_D_IRQENABLE | RW | 32 | 0x0000 082C | 0x4A05 882C |
| HSI_Pp_D_IRQr_STATUS ⁽²⁾ | RW | 32 | 0x0000 0830 + (0x10 * b) + (0x8 * r) | 0x4A05 8830 + (0x10 * b) + (0x8 * r) |
| HSI_Pp_D_IRQr_ENABLE ⁽²⁾ | RW | 32 | 0x0000 0834 + (0x10 * b) + (0x8 * r) | 0x4A05 8834 + (0x10 * b) + (0x8 * r) |
| HSI_Pp_WAKE ⁽²⁾ | RW | 32 | 0x0000 0C00 + (0x10 * b) | 0x4A05 8C00 + (0x10 * b) |
| HSI_Pp_CLEAR_WAKE ⁽²⁾ | RW | 32 | 0x0000 0C04 + (0x10 * b) | 0x4A05 8C04 + (0x10 * b) |
| HSI_Pp_SET_WAKE ⁽²⁾ | RW | 32 | 0x0000 0C08 + (0x10 * b) | 0x4A05 8C08 + (0x10 * b) |
| RESERVED | RW | 32 | 0x0000 1000 | 0x4A05 9000 |
| DMA_GCR | RW | 32 | 0x0000 1100 | 0x4A05 9100 |
| DMA_GRST | RW | 32 | 0x0000 1200 | 0x4A05 9200 |

- ⁽¹⁾ p = 1 to 2
r = 0 to 1
b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1)
- ⁽²⁾ p = 1 to 2
r = 0 to 1
b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1)

24.10.6.2.2 HSI_TOP Register Description

Table 24-818 through Table 24-858 describe the HSI_TOP registers.

Table 24-818. HSI_REVISION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|----------|----|----|----|----|----|-------------|-------------|----|----|----|----|----|----|----------|---------|----|----|----|----|---|------|---|---|---|---|---|---|-------|------------------|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A05 8000 | | | | | | | | | | | | | | | Instance | HSI_TOP | | | | | | | | | | | | | | | | |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | Description | | | | | | | | | | | | | | | Type | | | | | | | Reset | | | |
| 31:0 | | REVISION | | | | | | | IP Revision | | | | | | | | | | | | | | | R | | | | | | | TI Internal Data | | |

Table 24-819. Register Call Summary for Register HSI_REVISION

MIPI-HSI

- HSI_TOP Register Summary: [0]

Table 24-820. HSI HWINFO

| | |
|-------------------------|---|
| Address Offset | 0x0000 0004 |
| Physical Address | 0x4A05 8004 |
| Instance | HSI_TOP |
| Description | Information about the IP module hardware configuration, that is, typically the module HDL generics (if any). Actual field format and encoding is decided by the module designer. |
| Type | R |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HWINFO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------------------------|------|----------------------|
| 31:0 | HWINFO | IP module hardware configuration | R | See ⁽¹⁾ . |

(1) TI Internal Data

Table 24-821. Register Call Summary for Register HSI_HWINFO

MIP1-HSI

- HSI_TOP Register Summary: [0]

Table 24-822. HSI SYSCONFIG

| | | | |
|------------------|---|----------|---------|
| Address Offset | 0x0000 0010 | | |
| Physical Address | 0x4A05 8010 | Instance | HSI_TOP |
| Description | This register allows controlling various parameters of the L4_CFG interface | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----------|----|----|----|---|---|---|---|-----------|---|----------|---|-----------|---|-----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | MIDLEMODE | | RESERVED | | | | | | | | SIDLEMODE | | FREE_EMU | | SOFTRESET | | AUTOTIDLE | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | Reserved | R | 0x00000 |
| 13:12 | MIDLEMODE | Master interface power management, standby/wait control 0x0: Force-standby 0x1: No-standby 0x2: Smart-standby 0x3: Smart-standby wakeup | RW | 0x2 |
| 11:5 | RESERVED | Reserved | R | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 4:3 | SIDLEMODE | Slave interface power management, request/acknowledgment control 0x0: Force-idle 0x1: No-idle 0x2: Smart-idle 0x3: Smart-idle wakeup | RW | 0x2 |
| 2 | FREE_EMU | Sensitivity to emulation (debug) suspend input signal 0x0: Module is sensitive to emulation suspend. 0x1: Module is not sensitive to emulation suspend. | RW | 0x0 |
| 1 | SOFTRESET | Software reset 0x0: No reset applied 0x1: Software reset applied | RW | 0x0 |
| 0 | AUTOIDLE | Internal interface clock gating strategy 0x0: Interface clock is free-running 0x1: Automatic interface clock gating strategy, based on interconnect interface activity | RW | 0x1 |

Table 24-823. Register Call Summary for Register HSI_SYSCONFIG

MIPI-HSI

- [Software Reset: \[0\]](#)
- [Power Management: \[1\] \[2\] \[3\]](#)
- [HSI Module Power-Management Modes: \[4\] \[5\] \[6\]](#)
- [Global Initialization: \[7\] \[8\] \[9\] \[10\]](#)
- [HSI_TOP Register Summary: \[11\]](#)

Table 24-824. HSI_SYSSTATUS

| | | | |
|-------------------------|---|-----------------|---------|
| Address Offset | 0x0000 0014 | Instance | HSI_TOP |
| Physical Address | 0x4A05 8014 | | |
| Description | Status on module (reset done on bit 0, available for more status information) | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESETDONE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | RESETDONE | internal reset monitoring Read 0x0: Internal reset is ongoing. Read 0x1: Internal reset is completed and the module is ready to be used. | R | 0x0000 0001 |

Table 24-825. Register Call Summary for Register HSI_SYSSTATUS

MIPI-HSI

- [Software Reset: \[0\]](#)
- [Global Initialization: \[1\]](#)
- [HSI_TOP Register Summary: \[2\]](#)

Table 24-826. HSI_Pp_M_IRQrU_STATUS

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0408 + (0x10 * b) + (0x8 * r) | Index | p = 1 to 2 r = 0 to 1 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 8408 + (0x10 * b) + (0x8 * r) | Instance | HSI_TOP |
| Description | IRQ status register for FIFO (8..15) events and for port p break, wake and error events Events will signal interrupt for MPU line r (Mpuirq_r) Read 0: Event has not occurred. Read 1: Event has occurred. Write 0: Bit stays unchanged. Write 1: Bit is reset to 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | HSR_OVERRUN_CHI | | | | | | | | HSR_AVAILABLE_CHI | | | | | | | | HST_ACCEPTED_CHI | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:27 | RESERVED | Reserved | R | 0x00 |
| 26 | HSR_WAKE | Wake detected on Port p | RW | 0x0 |
| 25 | HSR_BREAK | Break detected on Port p | RW | 0x0 |
| 24 | HSR_ERROR | Error detected on Port p | RW | 0x0 |
| 23:16 | HSR_OVERRUN_CHI | Data overrun in real-time mode channel 8..15 (LSB stands for channel 8 and MSB for channel 15). | RW | 0x00 |
| 15:8 | HSR_AVAILABLE_CHI | Data received on channel 8..15 (LSB stands for channel 8 and MSB for channel 15). The status bit shows data on the respective channel when data are in the FIFO. Clearing the status bit has no effect when the FIFO is not empty. | RW | 0x00 |
| 7:0 | HST_ACCEPTED_CHI | Data transmitted on channel 8..15 (LSB stands for channel 8 and MSB for channel 15) | RW | 0xFF |

Table 24-827. Register Call Summary for Register HSI_Pp_M_IRQrU_STATUS

MIPI-HSI

- [Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Interrupts: \[6\]](#)
- [HSI Operational Modes Configuration: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [HSI_TOP Register Summary: \[13\]](#)

Table 24-828. HSI_Pp_M_IRQrU_ENABLE

| | | |
|-------------------------|--|--|
| Address Offset | 0x0000 040C + (0x10 * b) + (0x8 * r) | p = 1 to 2 r = 0 to 1 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 840C + (0x10 * b) + (0x8 * r) | Instance HSI_TOP |
| Description | IRQ enable register for FIFO (8..15) events and for port p break, wake and error events signaled to MPU line r (Mpuirq_r) Write 0: Event is masked. Write 1: Event is enabled. | |
| Type | RW | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----------|-----------|-----------|-----------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|---|------------------|---|---|---|---|---|---|---|---|
| RESERVED | | | | HSR_WAKE | HSR_BREAK | HSR_ERROR | HSR_OVERRUN_ENI | | | | | | | | HSR_AVAILABLE_ENI | | | | | | | | HST_ACCEPTED_ENI | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 24-830. HSI_Pp_D_IRQrU_STATUS

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0430 + (0x10 * b) + (0x8 * r) | Index | p = 1 to 2 r = 0 to 1 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 8430 + (0x10 * b) + (0x8 * r) | Instance | HSI_TOP |
| Description | IRQ status register for FIFO (8..15) events and for port p break, wake and error events. Events will signal interrupt for DSP line r (Dspirq_r) Read 0: Event has not occurred. Read 1: Event has occurred. Write 0: Bit stays unchanged. Write 1: Bit is reset to 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | HSR_OVERRUN_CHI | | | | | | | | HSR_AVAILABLE_CHI | | | | | | | | HST_ACCEPTED_CHI | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:27 | RESERVED | Reserved | R | 0x00 |
| 26 | HSR_WAKE | Wake detected on Port p | RW | 0x0 |
| 25 | HSR_BREAK | Break detected on Port p | RW | 0x0 |
| 24 | HSR_ERROR | Error on Port p | RW | 0x0 |
| 23:16 | HSR_OVERRUN_CHI | Data overrun in real-time mode channel 8..15 (LSB stands for channel 8 and MSB for channel 15) | RW | 0x00 |
| 15:8 | HSR_AVAILABLE_CHI | Data received on channel 8..15 (LSB stands for channel 8 and MSB for channel 15). The status bit shows data on the respective channel when data are in the FIFO. Clearing the status bit has no effect when the FIFO is not empty. | RW | 0x00 |
| 7:0 | HST_ACCEPTED_CHI | Data transmitted on channel 8..15 (LSB stands for channel 8 and MSB for channel 15) | RW | 0xFF |

Table 24-831. Register Call Summary for Register HSI_Pp_D_IRQrU_STATUS

MIPI-HSI

- [Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Interrupts: \[6\]](#)
- [HSI Operational Modes Configuration: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [HSI_TOP Register Summary: \[13\]](#)

Table 24-832. HSI_Pp_D_IRQrU_ENABLE

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0434 + (0x10 * b) + (0x8 * r) | Index | p = 1 to 2 r = 0 to 1 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 8434 + (0x10 * b) + (0x8 * r) | Instance | HSI_TOP |
| Description | IRQ enable register for FIFO (8..15) events and for port p break, wake and error events signaled to DSP line r (Dspirq_r) Write 0: Event is masked. Write 1: Event is enabled. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----------|-----------|-----------|----|-----------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | HSR_WAKE | HSR_BREAK | HSR_ERROR | | HSR_OVERRUN_ENI | | | | | | | | HSR_AVAILABLE_ENI | | | | | | | | HST_ACCEPTED_ENI | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31:27 | RESERVED | Reserved | R | 0x00 |
| 26 | HSR_WAKE | Wake interrupt enable for Port p | RW | 0x0 |
| 25 | HSR_BREAK | Break interrupt enable for Port p | RW | 0x0 |
| 24 | HSR_ERROR | Error interrupt enable for Port p | RW | 0x0 |
| 23:16 | HSR_OVERRUN_ENI | Overrun interrupt enable for channel 8..15 | RW | 0x00 |
| 15:8 | HSR_AVAILABLE_ENI | Data available interrupt enable for channel 8..15 (LSB stands for channel 8 and MSB for channel 15) | RW | 0x00 |
| 7:0 | HST_ACCEPTED_ENI | Data accepted interrupt enable for channel 8..15 (LSB stands for channel 8 and MSB for channel 15) | RW | 0x00 |

Table 24-833. Register Call Summary for Register HSI_Pp_D_IRQrU_ENABLE

MIPI-HSI

- [Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Interrupts: \[6\]](#)
- [HSI Operational Modes Configuration: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [HSI_TOP Register Summary: \[13\]](#)

Table 24-834. HSI_DMA_M_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 0800 | Instance | HSI_TOP |
| Physical Address | 0x4A05 8800 | | |
| Description | This register collects status for all of the DMA events able to generate interrupt to MPU: Read 0: Event has not occurred. Read 1: Event has occurred. Write 0: Bit stays unchanged. Write 1: Bit is reset to 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | DMA_CHI | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | DMA_CHI | Channel 0..15 status (LSB stands for channel 0 and MSB for channel 15) | RW | 0x0000 |

Table 24-835. Register Call Summary for Register HSI_DMA_M_IRQSTATUS

MIPI-HSI

- [Interrupt Requests: \[0\]](#)
- [Interrupts: \[1\] \[2\]](#)
- [HSI Operational Modes Configuration: \[3\] \[4\]](#)
- [HSI_TOP Register Summary: \[5\]](#)

Table 24-836. HSI_DMA_M_IRQENABLE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|--|----------|---------|----|----|----|---|---|---|---|---|---|---|---|------|---|--------|--|
| Address Offset | 0x0000 0804 | | | | | | | | | | | | | | | | Instance | HSI_TOP | | | | | | | | | | | | | | | |
| Physical Address | 0x4A05 8804 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | This register masks and unmaskes DMA sources of interrupt to MPU: Write 0: event is masked Write 1: event is enabled | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | DMA_EN_CHI | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | | Field Name | | | | | | | | | | | | | | Description | | | | | | | | | | | | | | Type | | Reset | |
| 31:16 | | RESERVED | | | | | | | | | | | | | | Reserved | | | | | | | | | | | | | | R | | 0x0000 | |
| 15:0 | | DMA_EN_CHI | | | | | | | | | | | | | | Channel 0..15 status (LSB stands for channel 0 and MSB for channel 15) | | | | | | | | | | | | | | RW | | 0x0000 | |

Table 24-837. Register Call Summary for Register HSI_DMA_M_IRQENABLE

MIPI-HSI

- [Interrupt Requests: \[0\]](#)
- [Interrupts: \[1\]](#)
- [HSI Operational Modes Configuration: \[2\]](#)
- [HSI_TOP Register Summary: \[3\]](#)

Table 24-838. HSI_Pp_M_IRQr_STATUS

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0808 + (0x10 * b) + (0x8 * r) | Index | p = 1 to 2 r = 0 to 1 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 8808 + (0x10 * b) + (0x8 * r) | Instance | HSI_TOP |
| Description | IRQ status register for FIFO (0..7) events and for port p break, wake and error events Events will signal interrupt for MPU line r (Mpuirq_r) Read 0: Event has not occurred. Read 1: Event has occurred. Write 0: Bit stays unchanged. Write 1: Bit is reset to 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | HSR_OVERRUN_CHI | | | | | | | | HSR_AVAILABLE_CHI | | | | | | | | HST_ACCEPTED_CHI | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:27 | RESERVED | Reserved | R | 0x00 |
| 26 | HSR_WAKE | Wake detected on Port p | RW | 0x0 |
| 25 | HSR_BREAK | Break detected on Port p | RW | 0x0 |
| 24 | HSR_ERROR | Error on Port p | RW | 0x0 |
| 23:16 | HSR_OVERRUN_CHI | Data overrun in real time mode channel 0..7 (LSB stands for channel 0 and MSB for channel 7) | RW | 0x00 |
| 15:8 | HSR_AVAILABLE_CHI | Data received on channel 0..7 (LSB stands for channel 0 and MSB for channel 7). The status bit shows data on the respective channel when data are in the FIFO. Clearing the status bit has no effect when the FIFO is not empty. | RW | 0x00 |
| 7:0 | HST_ACCEPTED_CHI | Data transmitted on channel 0..7 (LSB stands for channel 0 and MSB for channel 7) | RW | 0xFF |

Table 24-839. Register Call Summary for Register HSI_Pp_M_IRQr_STATUS

MIPI-HSI

- [Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Interrupts: \[6\]](#)
- [HSI Operational Modes Configuration: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [HSI_TOP Register Summary: \[13\]](#)

Table 24-840. HSI_Pp_M_IRQr_ENABLE

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 080C + (0x10 * b) + (0x8 * r) | Index | p = 1 to 2 r = 0 to 1 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 880C + (0x10 * b) + (0x8 * r) | Instance | HSI_TOP |
| Description | IRQ enable register for FIFO (0..7) events and for port p break, wake and error events signaled to MPU line r (Mpuirq_r) Write 0: Event is masked. Write 1: Event is enabled. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | HSR_OVERRUN_ENI | | | | | | | | HSR_AVAILABLE_ENI | | | | | | | | HST_ACCEPTED_ENI | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31:27 | RESERVED | Reserved | R | 0x00 |
| 26 | HSR_WAKE | Wake interrupt enable for Port p | RW | 0x0 |
| 25 | HSR_BREAK | Break interrupt enable for Port p | RW | 0x00 |
| 24 | HSR_ERROR | Error interrupt enable for Port p | RW | 0x0 |
| 23:16 | HSR_OVERRUN_ENI | Overrun interrupt enable for channel 0..7 (LSB stands for channel 0 and MSB for channel 7) | RW | 0x00 |
| 15:8 | HSR_AVAILABLE_ENI | Data available interrupt enable for channel 0..7 (LSB stands for channel 0 and MSB for channel 7) | RW | 0x00 |
| 7:0 | HST_ACCEPTED_ENI | Data accepted interrupt enable for channel 0..7 (LSB stands for channel 0 and MSB for channel 7) | RW | 0x00 |

Table 24-841. Register Call Summary for Register HSI_Pp_M_IRQr_ENABLE

MIPI-HSI

- [Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Interrupts: \[6\]](#)
- [HSI Operational Modes Configuration: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [HSI_TOP Register Summary: \[13\]](#)

Table 24-842. HSI_DMA_D_IRQSTATUS

| | | | |
|------------------|---|----------|---------|
| Address Offset | 0x0000 0828 | | |
| Physical Address | 0x4A05 8828 | Instance | HSI_TOP |
| Description | IRQ status register for all DMA events. Events generate interrupt for DSP. Read 0: Event has not occurred; Read 1: Event has occurred ; Write 0: Bit stays unchanged; Write 1: Bit is reset to 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DMA_CHI | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | DMA_CHI | IRQ event happened on DMA channel 0..15 (LSB stands for channel 0 and MSB for channel 15). | RW | 0x0000 |

Table 24-843. Register Call Summary for Register HSI_DMA_D_IRQSTATUS

MIPI-HSI

- [Interrupt Requests: \[0\]](#)
- [Interrupts: \[1\] \[2\]](#)
- [HSI Operational Modes Configuration: \[3\] \[4\]](#)
- [HSI_TOP Register Summary: \[5\]](#)

Table 24-844. HSI_DMA_D_IRQENABLE

| | | | |
|-------------------------|--|-----------------|---------|
| Address Offset | 0x0000 082C | Instance | HSI_TOP |
| Physical Address | 0x4A05 882C | | |
| Description | IRQ enable register for all DMA events signaled to DSP. Write 0: Event is masked. Write 1: Event is enabled. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DMA_EN_CHI | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | DMA_EN_CHI | Channel 0..15 (LSB stands for channel 0 and MSB for channel 15) | RW | 0x0000 |

Table 24-845. Register Call Summary for Register HSI_DMA_D_IRQENABLE

MIPI-HSI

- [Interrupt Requests: \[0\]](#)
- [Interrupts: \[1\]](#)
- [HSI Operational Modes Configuration: \[2\]](#)
- [HSI_TOP Register Summary: \[3\]](#)

Table 24-846. HSI_Pp_D_IRQr_STATUS

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | $0x0000\ 0830 + (0x10 * b) + (0x8 * r)$ | Index | p = 1 to 2 r = 0 to 1 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | $0x4A05\ 8830 + (0x10 * b) + (0x8 * r)$ | Instance | HSI_TOP |
| Description | IRQ status register for FIFO (0..7) events and for port p break, wake and error events Events will signal interrupt for DSP line r (Dspirq_r) Read 0: Event has not occurred. Read 1: Event has occurred. Write 0: Bit stays unchanged. Write 1: Bit is reset to 0. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----------|-----------|-----------|-----------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | HSR_WAKE | HSR_BREAK | HSR_ERROR | HSR_OVERRUN_CHI | | | | | | | | HSR_AVAILABLE_CHI | | | | | | | | HST_ACCEPTED_CHI | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|-------|
| 31:27 | RESERVED | Reserved | R | 0x00 |
| 26 | HSR_WAKE | Wake detected on Port p | RW | 0x0 |
| 25 | HSR_BREAK | Break detected on Port p | RW | 0x0 |
| 24 | HSR_ERROR | Error on Port p | RW | 0x0 |
| 23:16 | HSR_OVERRUN_CHI | Data overrun in real time mode channel 0..7 (LSB stands for channel 0 and MSB for channel 7) | RW | 0x00 |
| 15:8 | HSR_AVAILABLE_CHI | Data received on channel 0..7 (LSB stands for channel 0 and MSB for channel 7). The status bit shows data on the respective channel when data are in the FIFO. Clearing the status bit has no effect when the FIFO is not empty. | RW | 0x00 |
| 7:0 | HST_ACCEPTED_CHI | Data transmitted on channel 0..7 (LSB stands for channel 0 and MSB for channel 7). | RW | 0xFF |

Table 24-847. Register Call Summary for Register HSI_Pp_D_IRQr_STATUS

MIPI-HSI

- [Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Interrupts: \[6\]](#)
- [HSI Operational Modes Configuration: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [HSI_TOP Register Summary: \[13\]](#)

Table 24-848. HSI_Pp_D_IRQr_ENABLE

| | | | |
|------------------|---|----------|--|
| Address Offset | 0x0000 0834 + (0x10 * b) + (0x8 * r) | Index | p = 1 to 2 r = 0 to 1 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 8834 + (0x10 * b) + (0x8 * r) | Instance | HSI_TOP |
| Description | IRQ enable register for FIFO (0..7) events and for port p break, wake and error events signaled to DSP line r (Dspirq_r) Write 0: Event is masked. Write 1: Event is enabled. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----------|-----------|-----------|-----------------|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|---|---|------------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | HSR_WAKE | HSR_BREAK | HSR_ERROR | HSR_OVERRUN_ENI | | | | | | | | HSR_AVAILABLE_ENI | | | | | | | | HST_ACCEPTED_ENI | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31:27 | RESERVED | Reserved | R | 0x00 |
| 26 | HSR_WAKE | Wake interrupt enable for Port p | RW | 0x0 |
| 25 | HSR_BREAK | Break interrupt enable for Port p | RW | 0x0 |
| 24 | HSR_ERROR | Error interrupt enable for Port p | RW | 0x0 |
| 23:16 | HSR_OVERRUN_ENI | Overrun interrupt enable for channel 0..7 (LSB stands for channel 0 and MSB for channel 7) | RW | 0x00 |
| 15:8 | HSR_AVAILABLE_ENI | Data available interrupt enable for channel 0..7 (LSB stands for channel 0 and MSB for channel 7) | RW | 0x00 |
| 7:0 | HST_ACCEPTED_ENI | Data accepted interrupt enable for channel 0..7 (LSB stands for channel 0 and MSB for channel 7). | RW | 0x00 |

Table 24-849. Register Call Summary for Register HSI_Pp_D_IRQr_ENABLE

MIPI-HSI

- [Interrupt Requests: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Interrupts: \[6\]](#)
- [HSI Operational Modes Configuration: \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)
- [HSI_TOP Register Summary: \[13\]](#)

Table 24-850. HSI_Pp_WAKE

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0C00 + (0x10 * b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 8C00 + (0x10 * b) | Instance | HSI_TOP |
| Description | Programmed wake state for each channel, in port p 0x0: No channel wakeup on WAKE line requested. 0x1: Channel wakeup requested | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | HSI WAKE CHI | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | HSI_WAKE_CHI | Channel 0..15 (LSB stands for channel 0 and MSB for channel 15) | R | 0x0000 |

Table 24-851. Register Call Summary for Register HSI_Pp_WAKE

- [HSI Wake Generator: \[0\]](#)
- [Software Management of HSI Wake Generator: \[1\] \[2\]](#)
- [Automatic Management of HSI Wake Generator: \[3\]](#)
- [HSI_TOP Register Summary: \[4\]](#)

Table 24-852. HSI_Pp_CLEAR_WAKE

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0C04 + (0x10 * b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 8C04 + (0x10 * b) | Instance | HSI_TOP |
| Description | Clear register for programmed wake state on port p HST_WAKE for each channel 0x0: No effect 0x1: Clears bit | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSI HSI_CLEAR WAKE_CHI | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | HSI_CLEAR_WAKE_CHI | Channel 0..15 (LSB stands for channel 0 and MSB for channel 15) | W | 0x0000 |

Table 24-853. Register Call Summary for Register HSI_Pp_CLEAR_WAKE

MIPI-HSI

- [Software Management of HSI Wake Generator: \[0\]](#)
- [HSI_TOP Register Summary: \[1\]](#)

Table 24-854. HSI_Pp_SET_WAKE

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0C08 + (0x10 * b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 8C08 + (0x10 * b) | Instance | HSI_TOP |
| Description | Set function for wake state for each channel, in port p 0x0: No effect 0x1: Sets bit | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------------|----|-------------|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | HSI_SET_WAKE_CHI | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | HSI_READY_LVL | | HSI_3_WIRES | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|--------|
| 31:18 | RESERVED | Reserved | R | 0x0000 |
| 17 | HSI_READY_LVL | READY default level 0x0: READY defaults to 0. 0x1: READY defaults to 1. | RW | 0x0 |
| 16 | HSI_3_WIRES | Sets 3-wire behavior 0x0: Sets 4-wire behavior (wakeup with WAKE signal) 0x1: Sets 3-wire behavior (wakeup on line activity without WAKE signal) | RW | 0x0 |
| 15:0 | HSI_SET_WAKE_CHI | Sets programmed WAKE state for channel i Write 0x0: No effect Write 0x1: Sets bit | W | 0x0000 |

Table 24-855. Register Call Summary for Register HSI_Pp_SET_WAKE

MIPI-HSI

- [Software Management of HSI Wake Generator: \[0\] \[1\]](#)
- [HSI Operational Modes Configuration: \[2\] \[3\]](#)
- [HSI_TOP Register Summary: \[4\]](#)

Table 24-856. DMA_GCR

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 1100 | | | | | | | | | | | | | | | | Instance | HSI_TOP | | | | | | | | | | | | | | |
| Physical Address | 0x4A05 9100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Global Control Register: suspend and clock gating | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------------|---|----------|---|------------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | AUTOGATING | | RESERVED | | SWITCH_OFF | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | RESERVED | Reserved | R | 0x00000000 |
| 3 | AUTOGATING | DMA clock autogating enable 0x0: No DMA clock control 0x1: DMA clock control | RW | 0x0 |
| 2:1 | RESERVED | Reserved | R | 0x0 |
| 0 | SWITCH_OFF | DMA global clock control 0x0: DMA clock released 0x1: DMA clock cutoff | RW | 0x0 |

Table 24-857. Register Call Summary for Register DMA_GCR

MIPI-HSI

- [Power Management: \[0\]](#)
- [HSI Module Power-Management Modes: \[1\] \[2\]](#)
- [Global Initialization: \[3\]](#)
- [HSI Operational Modes Configuration: \[4\] \[5\]](#)
- [HSI_TOP Register Summary: \[6\]](#)

Table 24-858. DMA_GRST

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|-------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 1200 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | HSI_TOP | | | | | | | | | | | | | | | |
| Physical Address | 0x4A05 9200 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | DMA software reset control register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | SWRESET |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|--|------------|--------------------------------|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | SWRESET | DMA software reset control bit | RW | 0x0 |
| 0x1: Writing 1 resets the DMA. It is automatically reset to 0 by hardware once software reset is done. | | | | |

Table 24-859. Register Call Summary for Register DMA_GRST

MIPI-HSI

- [Software Reset: \[0\]](#)
- [HSI Operational Modes Configuration: \[1\] \[2\]](#)
- [HSI_TOP Register Summary: \[3\]](#)

24.10.6.3 HSI_DMA_CHANNELS Registers

24.10.6.3.1 HSI_DMA_CHANNELS Register Summary

[Table 24-860](#) summarizes the mapping of the HSI_DMA_CHANNELS registers.

Table 24-860. HSI_DMA_CHANNELS Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | HSI_DMA_CHANNELS Base Address |
|---|------|-----------------------|--------------------------|-------------------------------|
| DMA_CCR_CSDP_i⁽¹⁾ | RW | 32 | 0x0000 0000 + (0x40 * i) | 0x4A05 9800 + (0x40 * i) |
| DMA_CSR_CCIR_i⁽¹⁾ | RW | 32 | 0x0000 0004 + (0x40 * i) | 0x4A05 9804 + (0x40 * i) |
| DMA_CSSA_i⁽¹⁾ | RW | 32 | 0x0000 0008 + (0x40 * i) | 0x4A05 9808 + (0x40 * i) |
| DMA_CDSA_i⁽¹⁾ | RW | 32 | 0x0000 000C + (0x40 * i) | 0x4A05 980C + (0x40 * i) |
| DMA_CEN_i⁽¹⁾ | RW | 32 | 0x0000 0010 + (0x40 * i) | 0x4A05 9810 + (0x40 * i) |
| DMA_CDAC_CSAC_i⁽¹⁾ | R | 32 | 0x0000 0018 + (0x40 * i) | 0x4A05 9818 + (0x40 * i) |
| Reserved | R | 32 | 0x0000 0028 + (0x40 * i) | 0x4A05 9828 + (0x40 * i) |

⁽¹⁾ i = 0 to 15

24.10.6.3.2 HSI_DMA_CHANNELS Register Description

[Table 24-861](#) through [Table 24-871](#) describe the HSI_DMA_CHANNELS registers.

Table 24-861. DMA_CCR_CSDP_i

| | | | |
|-------------------------|---|-----------------|------------------|
| Address Offset | 0x0000 0000 + (0x40 * i) | Index | i = 0 to 15 |
| Physical Address | 0x4A05 9800 + (0x40 * i) | Instance | HSI_DMA_CHANNELS |
| Description | Stores source and destination parameters and channel control bits | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------|----|--------------|----|----------|----|----|----|--------|----|----------|----|----|----|----|----|--------------|----|----------|----|-----|----|---|--------------|---|----------|---|-----|---|---|---|-----------|
| DST_ADD_MODE | | SRC_ADD_MODE | | RESERVED | | | | ENABLE | | RESERVED | | | | | | DST_BURST_EN | | RESERVED | | DST | | | SRC_BURST_EN | | RESERVED | | SRC | | | | DATA_TYPE |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|-------|
| 31:30 | DST_ADD_MODE | Destination addressing mode 0x0: Constant address 0x1: Post-increment address | RW | 0x0 |

MIPI-HSI

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|-------|
| 29:28 | SRC_ADD_MODE | Source addressing mode 0x0: Constant address 0x1: Post-increment address | RW | 0x0 |
| 27:24 | RESERVED | Reserved | R | 0 |
| 23 | ENABLE | Logical channel enable 0x0: Transfer stops and is reset. 0x1: Transfer is enabled. Automatically cleared by hardware once transfer is finished. | RW | 0 |
| 22:16 | RESERVED | Reserved | R | 0 |
| 15:14 | DST_BURST_EN | Destination burst enable 0x0: Single access 0x1: Single access 0x3: Burst 8 × 32 bits (not implemented) 0x2: Burst 4 × 32 bits | RW | 0x0 |
| 13 | RESERVED | Reserved | R | 0 |
| 12:9 | DST | Transfer destination 0x8: Transfer to memory port 0x9: Transfer to peripheral port | RW | 0x0 |
| 8:7 | SRC_BURST_EN | Source burst enable 0x0: Single access 0x1: Single access 0x3: Burst 8 × 32 bits (not implemented) 0x2: Burst 4 × 32 bits | RW | 0x0 |
| 6 | RESERVED | Reserved | R | 0 |
| 5:2 | SRC | Transfer source 0x8: Transfer from memory port 0x9: Transfer from peripheral port | RW | 0x0 |
| 1:0 | DATA_TYPE | Defines data types Implemented bit field but not used | RW | 0x0 |

Table 24-862. Register Call Summary for Register DMA_CCR_CSDP_i

MIPI-HSI

- [DMA Configuration: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [HSI Operational Modes Configuration: \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\]](#)
- [HSI_DMA_CHANNELS Register Summary: \[22\]](#)

Table 24-863. DMA_CSR_CCIR_i

| | | | |
|-------------------------|---|-----------------|------------------|
| Address Offset | 0x0000 0004 + (0x40 * i) | Index | i = 0 to 15 |
| Physical Address | 0x4A05 9804 + (0x40 * i) | Instance | HSI_DMA_CHANNELS |
| Description | Interrupt enable and status register Interrupt flag fields will be cleared through read access using the following byte-enable values: 0xC 0xF | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----------|----------|---------|----------|---------|----------|----|----|----|----|----|----|----|----------|----------|---------|----------|---------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | BLOCK_IS | RESERVED | HALF_IS | RESERVED | TOUT_IS | RESERVED | | | | | | | | BLOCK_IE | RESERVED | HALF_IE | RESERVED | TOUT_IE | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:22 | RESERVED | Reserved | R | 0x000 |
| 21 | BLOCK_IS | Block transferred Read 0x1: Block transferred Read 0x0: No event | R | 0 |
| 20:19 | RESERVED | Reserved | R | 0x0 |
| 18 | HALF_IS | Half block reached Read 0x1:Half-block transferred Read 0x0: No event | R | 0 |
| 17 | RESERVED | Reserved | R | 0 |
| 16 | TOUT_IS | Time-out overflow event Read 0x1: Time-out occurred Read 0x0: No event | R | 0 |
| 15:6 | RESERVED | Reserved | R | 0x000 |
| 5 | BLOCK_IE | Interrupt is sent when a full block is transferred 0x0: No interrupt 0x1:Interrupt enable | RW | 0 |
| 4:3 | RESERVED | Reserved | R | 0x0 |
| 2 | HALF_IE | Interrupt is sent when a half block is transferred 0x0: No interrupt 0x1: Interrupt enable | RW | 0 |
| 1 | RESERVED | Reserved | R | 0 |
| 0 | TOUT_IE | Interrupt is sent when a time-out overflow occurs 0x0: No interrupt 0x1: Interrupt enable | RW | 0 |

Table 24-864. Register Call Summary for Register DMA CSR CCIR i

MIPI-HSI

- Interrupt Requests: [0] [1] [2] [3] [4] [5]
- Interrupts: [6] [7] [8] [9] [10] [11] [12]
- DMA Configuration: [13]
- HSI Operational Modes Configuration: [14] [15] [16] [17] [18] [19]
- HSI_DMA_CHANNELS Register Summary: [20]

Table 24-865. DMA CSSA i

| | | | |
|-------------------------|---|-----------------|------------------|
| Address Offset | 0x0000 0008 + (0x40 * i) | Index | i = 0 to 15 |
| Physical Address | 0x4A05 9808 + (0x40 * i) | Instance | HSI_DMA_CHANNELS |
| Description | Stores source start address If the transfer configured from memory port, all bits are taken into account as an address. If the transfer configured from peripheral port, the lower 4 bits will determine the FIFO ID. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------------|------|-------------|
| 31:0 | ADDR | Source start address | RW | 0x0000 0000 |

Table 24-866. Register Call Summary for Register DMA_CSSA_i

MIPI-HSI

- [DMA Configuration: \[0\]](#)
- [HSI Operational Modes Configuration: \[1\] \[2\]](#)
- [HSI_DMA_CHANNELS Register Summary: \[3\]](#)

Table 24-867. DMA_CDSA_i

| | | | |
|------------------|--|----------|------------------|
| Address Offset | 0x0000 000C + (0x40 * i) | Index | i = 0 to 15 |
| Physical Address | 0x4A05 980C + (0x40 * i) | Instance | HSI_DMA_CHANNELS |
| Description | Stores destination start address If the transfer configured to memory port, all bits are taken into account as an address. If the transfer configured to peripheral port, the lower 4 bits will determine the FIFO ID. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------|------|-------------|
| 31:0 | ADDR | Destination start address | RW | 0x0000 0000 |

Table 24-868. Register Call Summary for Register DMA_CDSA_i

MIPI-HSI

- [DMA Configuration: \[0\]](#)
- [HSI Operational Modes Configuration: \[1\] \[2\]](#)
- [HSI_DMA_CHANNELS Register Summary: \[3\]](#)

Table 24-869. DMA_CEN_i

| | | | |
|-------------------------|---|-----------------|------------------|
| Address Offset | 0x0000 0010 + (0x40 * i) | Index | i = 0 to 15 |
| Physical Address | 0x4A05 9810 + (0x40 * i) | Instance | HSI_DMA_CHANNELS |
| Description | Stores the number of 4-byte words in a DMA data block. Maximum is 65,536. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SIZE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | SIZE | Number of elements in a block. Maximum is 65,536. | RW | 0x0000 |

Table 24-870. Register Call Summary for Register DMA_CEN_i

MIPI-HSI

- [Interrupts: \[0\]](#)
- [DMA Configuration: \[1\]](#)
- [HSI Operational Modes Configuration: \[2\] \[3\]](#)
- [HSI_DMA_CHANNELS Register Summary: \[4\]](#)

Table 24-871. DMA_CDAC_CSAC_i

| | | | |
|-------------------------|--|-----------------|------------------|
| Address Offset | 0x0000 0018 + (0x40 * i) | Index | i = 0 to 15 |
| Physical Address | 0x4A05 9818 + (0x40 * i) | Instance | HSI_DMA_CHANNELS |
| Description | Monitors the progress of DMA transfer, by storing the 16-bit counter address for source and destination. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADDRESS_CDAC | | | | | | | | | | | | | | | | ADDRESS_CSAC | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---------------------|------|--------|
| 31:16 | ADDRESS_CDAC | Destination address | R | 0x0000 |
| 15:0 | ADDRESS_CSAC | Source address | R | 0x0000 |

Table 24-872. Register Call Summary for Register DMA_CDAC_CSAC_i

MIPI-HSI

- [DMA Configuration: \[0\] \[1\]](#)
- [HSI_DMA_CHANNELS Register Summary: \[2\]](#)

24.10.6.4 HSI_PORTS Registers

24.10.6.4.1 HSI_PORTS Register Summary

[Table 24-873](#) summarizes the mapping of the HSI_PORTS registers.

Table 24-873. HSI_PORTS Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | HSI_PORTS Physical Address |
|---|------|-----------------------|---------------------------------------|---------------------------------------|
| HST_ID_Pp⁽¹⁾ | R | 32 | 0x0000 0000 + (0x1000* b) | 0x4A05 A000 + (0x1000* b) |
| HST_MODE_Pp⁽¹⁾ | RW | 32 | 0x0000 0004 + (0x1000* b) | 0x4A05 A004 + (0x1000* b) |
| HST_FRAMESIZE_Pp⁽¹⁾ | R | 32 | 0x0000 0008 + (0x1000* b) | 0x4A05 A008 + (0x1000* b) |
| HST_TXSTATE_Pp⁽¹⁾ | R | 32 | 0x0000 000C + (0x1000* b) | 0x4A05 A00C + (0x1000* b) |
| HST_BUFSTATE_Pp⁽¹⁾ | R | 32 | 0x0000 0010 + (0x1000* b) | 0x4A05 A010 + (0x1000* b) |
| HST_DIVISOR_Pp⁽¹⁾ | RW | 32 | 0x0000 0018 + (0x1000* b) | 0x4A05 A018 + (0x1000* b) |
| HST_BREAK_Pp⁽¹⁾ | W | 32 | 0x0000 0020 + (0x1000* b) | 0x4A05 A020 + (0x1000* b) |
| HST_CHANNELS_Pp⁽¹⁾ | RW | 32 | 0x0000 0024 + (0x1000* b) | 0x4A05 A024 + (0x1000* b) |
| HST_ARBMODE_Pp⁽¹⁾ | RW | 32 | 0x0000 0028 + (0x1000* b) | 0x4A05 A028 + (0x1000* b) |
| HST_BUFFER_Pp_CHN_i⁽¹⁾ | W | 32 | 0x0000 0080 + (0x1000* b) + (0x4 * i) | 0x4A05 A080 + (0x1000* b) + (0x4 * i) |
| HST_SWAPBUFFER_Pp_CHN_i⁽¹⁾ | W | 32 | 0x0000 00C0 + (0x1000* b) + (0x4 * i) | 0x4A05 A0C0 + (0x1000* b) + (0x4 * i) |
| HST_MAPPINGf⁽¹⁾ | RW | 32 | 0x0000 0100 + (0x4 * f) | 0x4A05 A100 + (0x4 * f) |
| RESERVED | RW | 32 | 0x0000 0144 | 0x4A05 A144 |

⁽¹⁾ p = 1 to 2
i = 0 to 7
f = 0 to 15
b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1)

Table 24-873. HSI_PORTS Registers Mapping Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | HSI_PORTS Physical Address |
|--|------|-----------------------|--|--|
| HSR_ID_Pp ⁽¹⁾ | R | 32 | 0x0000 0800 + (0x1000* b) | 0x4A05 A800 + (0x1000* b) |
| HSR_MODE_Pp ⁽¹⁾ | RW | 32 | 0x0000 0804 + (0x1000* b) | 0x4A05 A804 + (0x1000* b) |
| HSR_FRAMESIZE_Pp ⁽¹⁾ | R | 32 | 0x0000 0808 + (0x1000* b) | 0x4A05 A808 + (0x1000* b) |
| HSR_RXSTATE_Pp ⁽¹⁾ | R | 32 | 0x0000 080C + (0x1000* b) | 0x4A05 A80C + (0x1000* b) |
| HSR_BUFSTATE_Pp ⁽¹⁾ | R | 32 | 0x0000 0810 + (0x1000* b) | 0x4A05 A810 + (0x1000* b) |
| HSR_BREAK_Pp ⁽¹⁾ | R | 32 | 0x0000 081C + (0x1000* b) | 0x4A05 A81C + (0x1000* b) |
| HSR_ERROR_Pp ⁽¹⁾ | R | 32 | 0x0000 0820 + (0x1000* b) | 0x4A05 A820 + (0x1000* b) |
| HSR_ERRORACK_Pp ⁽¹⁾ | W | 32 | 0x0000 0824 + (0x1000* b) | 0x4A05 A824 + (0x1000* b) |
| HSR_CHANNELS_Pp ⁽¹⁾ | RW | 32 | 0x0000 0828 + (0x1000* b) | 0x4A05 A828 + (0x1000* b) |
| HSR_OVERRUN_Pp ⁽²⁾ | RW | 32 | 0x0000 082C + (0x1000* b) | 0x4A05 A82C + (0x1000* b) |
| HSR_OVERRUNACK_Pp ⁽²⁾ | R | 32 | 0x0000 0830 + (0x1000* b) | 0x4A05 A830 + (0x1000* b) |
| HSR_COUNTERS_Pp ⁽²⁾ | W | 32 | 0x0000 0834 + (0x1000* b) | 0x4A05 A834 + (0x1000* b) |
| HSR_BUFFER_Pp_CHN_i ⁽²⁾ | R | 32 | 0x0000 0880 + (0x1000* b) + (0x4 * i) | 0x4A05 A880 + (0x1000* b) + (0x4 * i) |
| HSR_SWAPBUFFER_Pp_CHN_i ⁽²⁾ | R | 32 | 0x0000 08C0 + (0x1000* b) + (0x4 * i) | 0x4A05 A8C0 + (0x1000* b) + (0x4 * i) |
| HSR_MAPPINGf ⁽²⁾ | RW | 32 | 0x0000 0900 + (0x4 * f) | 0x4A05 A900 + (0x4 * f) |
| RESERVED | RW | 32 | 0x0000 0944 | 0x4A05 A944 |
| RESERVED | RW | 32 | 0x0000 0948 | 0x4A05 A948 |
| HSR_DIVISOR_Pp ⁽²⁾ | RW | 32 | 0x0000 094C + (0x1000* b) | 0x4A05 A94C + (0x1000* b) |

⁽²⁾ p = 1 to 2
i = 0 to 7
f = 0 to 15
b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1)

24.10.6.4.2 HSI_PORTS Register Description

Table 24-874 through Table 24-928 describe the HSI_PORTS registers.

Table 24-874. HST_ID_Pp

| | | | |
|------------------|---------------------------------|----------|--|
| Address Offset | 0x0000 0000 + (0x1000* b) | | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A000 + (0x1000* b) | Instance | HSI_PORTS |
| Description | Legacy identification on port p | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| | | | | | | | | | | | | | | | | ID_VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|----------------------|
| 31:0 | ID_VAL | Legacy ID | R | See ⁽¹⁾ . |

⁽¹⁾ TI Internal Data

Table 24-875. Register Call Summary for Register HST_ID_Pp

MIPI-HSI

- [HSI_PORTS Register Summary: \[0\]](#)

Table 24-876. HST_MODE_Pp

| | | |
|------------------|--|--|
| Address Offset | 0x0000 0004 + (0x1000* b) | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A004 + (0x1000* b) | Instance HSI_PORTS |
| Description | Defines operation mode and data flow on port p | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------|---|----------|---|----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | WAKE_CTRL | | FLOW_VAL | | MODE_VAL | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4 | WAKE_CTRL | Wake control 0x0: Software control 0x1: Automatic control | RW | 0 |
| 3:2 | FLOW_VAL | Flow 0x0: Synchronized 0x1: Pipelined 0x2: Real-time | RW | 0x0 |
| 1:0 | MODE_VAL | Mode 0x0: Sleep 0x1: Stream 0x2: Frame 0x3: Reserved | RW | 0x0 |

Table 24-877. Register Call Summary for Register HST_MODE_Pp

MIPI-HSI

- [Configuration: \[0\] \[1\] \[2\] \[3\]](#)
- [HSI Operational Modes Configuration: \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [HSI_PORTS Register Summary: \[9\]](#)

Table 24-878. HST_FRAME_SIZE_Pp

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0008 + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A008 + (0x1000* b) | Instance | HSI_PORTS |
| Description | This register is provided for legacy and possible future extension of protocol. Returns 0x1f. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | SIZE_VAL | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4:0 | SIZE_VAL | In the current implementation it must be always written 31, meaning the frame payload size is 32 bits. Read 0x1F: Only possible value | R | 0x1F |

Table 24-879. Register Call Summary for Register HST_FRAME_SIZE_Pp

MIPI-HSI

- [Configuration: \[0\]](#)
- [HSI_PORTS Register Summary: \[1\]](#)

Table 24-880. HST_TXSTATE_Pp

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 000C + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A00C + (0x1000* b) | Instance | HSI_PORTS |
| Description | Define the state of the transmitter on port p. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TXSTATEVAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2:0 | TXSTATEVAL | State of the transmitter Read 0x0: Idle Read 0x1: Wait Read 0x2: Transmit Read 0x3: Start Read 0x4: Break Read 0x5: Reserved Read 0x6: Reserved Read 0x7: Reserved | R | 0x0 |

Table 24-881. Register Call Summary for Register HST_TXSTATE_Pp

MIPI-HSI

- [Transmission Operations: \[0\]](#)
- [HSI_PORTS Register Summary: \[1\]](#)

Table 24-882. HST_BUFSTATE_Pp

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0010 + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A010 + (0x1000* b) | Instance | HSI_PORTS |
| Description | Transmitter state for FIFO 0..7 Each bit gives the state of transmit FIFOs: 0x1: FIFO full 0x0: FIFO not full | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BUFSTATE VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7:0 | BUFSTATE_VAL | Each bit gives the state of transmit buffer register: 0x0: Buffer is not full. 0x1: Buffer is full. | R | 0x00 |

Table 24-883. Register Call Summary for Register HST_BUFSTATE_Pp

MIPI-HSI

- [Transmission Buffer: \[0\] \[1\]](#)
- [Transmission Operations: \[2\]](#)
- [HSI Operational Modes Configuration: \[3\]](#)
- [HSI_PORTS Register Summary: \[4\]](#)

Table 24-884. HST_DIVISOR_Pp

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0018 + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A018 + (0x1000* b) | Instance | HSI_PORTS |
| Description | Transmission bit rate divisor for port p | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TX_RATE_DIV_VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-----------|
| 31:8 | RESERVED | Reserved | R | 0x0000000 |
| 7:0 | TX_RATE_DIV_VAL | This bit field B has a range [0..255] and it programs a division factor [1..256], B + 1. Example: Writing 0 divides by 1, writing 1 divides by 2, writing 2 divides by 3, etc. | RW | 0x00 |

Table 24-885. Register Call Summary for Register HST_DIVISOR_Pp

MIPI-HSI

- [Functional Clock Domain: \[0\]](#)
- [Configuration: \[1\]](#)
- [Global Initialization: \[2\]](#)
- [HSI Operational Modes Configuration: \[3\]](#)
- [HSI_PORTS Register Summary: \[4\]](#)

Table 24-886. HST_BREAK_Pp

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0020 + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A020 + (0x1000* b) | Instance | HSI_PORTS |
| Description | Transmit break strobe register on port p | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BREAK_VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | W | 0x0000 0000 |
| 0 | BREAK_VAL | Send a break signal on the port Write 0x0: No break Write 0x1: Transmit break | W | 0x0 |

Table 24-887. Register Call Summary for Register HST_BREAK_Pp

MIPI-HSI

- [Break Pattern Transmission: \[0\] \[1\] \[2\]](#)
- [HSI Operational Modes Configuration: \[3\]](#)
- [HSI_PORTS Register Summary: \[4\]](#)

Table 24-888. HST_CHANNELS_Pp

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0024 + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A024 + (0x1000* b) | Instance | HSI_PORTS |
| Description | Number of active channels on port p (this determines the number of the used channel descriptor bits on the MIPI port as well) It can be 1, 2, 4, 8, or 16. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CHAN_NUM_VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4:0 | CHAN_NUM_VAL | Number of active channels up to 16 0x1: One logical channel used, number of the channel descriptor bits is 0. 0x2: Two logical channels used, number of the channel descriptor bits is 1. 0x4: Four logical channels used, number of the channel descriptor bits is 2. 0x8: Eight logical channels used, number of the channel descriptor bits is 3. 0x10: Sixteen logical channels used, number of the channel descriptor bits is 4. | RW | 0x01 |

Table 24-889. Register Call Summary for Register HST_CHANNELS_Pp

MIPI-HSI

- [Configuration: \[0\]](#)
- [HSI Operational Modes Configuration: \[1\]](#)
- [HSI_PORTS Register Summary: \[2\]](#)

Table 24-890. HST_ARBMODE_Pp

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0028 + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A028 + (0x1000* b) | Instance | HSI_PORTS |
| Description | Arbitration type for the transmit FIFOs on port p. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | ARB_VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | ARB_VAL | Mode 0x0: Round robin 0x1: Priority | RW | 0 |

Table 24-891. Register Call Summary for Register HST_ARBMODE_Pp

MIPI-HSI

- [Configuration](#): [0]
- [Mapping](#): [1] [2]
- [HSI Operational Modes Configuration](#): [3]
- [HSI_PORTS Register Summary](#): [4]

Table 24-892. HST_BUFFER_Pp_CHN_i

| | | | |
|------------------|---|----------|--|
| Address Offset | 0x0000 0080 + (0x1000* b) + (0x4 * i) | Index | p = 1 to 2 i = 0 to 7 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A080 + (0x1000* b) + (0x4 * i) | Instance | HSI_PORTS |
| Description | Transmit register for FIFO 0..7 Important: Write access to the register with 0xC and 0xF byteen loads its value into the transmit FIFO. If using only 16- bit accesses, the lower 2 bytes must be written first (byteen 0x3). Between two consecutive 16-bit FIFO-related access there cannot be any other FIFO-related OCP access. | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|-------------|
| 31:0 | DATA | 32 bits of data | W | 0x0000 0000 |

Table 24-893. Register Call Summary for Register HST_BUFFER_Pp_CHN_i

MIPI-HSI

- [DMA Basic Operation Outline](#): [0]
- [Transmission Buffer](#): [1] [2]
- [Transmission Operations](#): [3] [4] [5]
- [Transmission Exceptions](#): [6]
- [Transmit FIFO Architecture](#): [7] [8]
- [FIFO Addressing](#): [9]
- [HSI Operational Modes Configuration](#): [10] [11]
- [HSI_PORTS Register Summary](#): [12]

Table 24-894. HST_SWAPBUFFER_Pp_CHN_i

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 00C0 + (0x1000* b) + (0x4 * i) | Index | p = 1 to 2 i = 0 to 7 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A0C0 + (0x1000* b) + (0x4 * i) | Instance | HSI_PORTS |
| Description | Transmit register with byte swapping for FIFO 0..7 Important: Write access to the register with 0x3 and 0xF byteen loads its value into the transmit FIFO. If using only 16-bit accesses, the upper 2 bytes must be written first (byteen 0xC). Between two consecutive 16-bit FIFO-related access there cannot be any other FIFO-related OCP access. | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SWAPDATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-------------|
| 31:0 | SWAPDATA | 32 bits of byte-swapped data | W | 0x0000 0000 |

Table 24-895. Register Call Summary for Register HST_SWAPBUFFER_Pp_CHN_i

MIPI-HSI

- [Transmission Buffer: \[0\]](#)
- [FIFO Addressing: \[1\]](#)
- [HSI_PORTS Register Summary: \[2\]](#)

Table 24-896. HST_MAPPINGf

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0100 + (0x4 * f) | Index | f = 0 to 15 |
| Physical Address | 0x4A05 A100 + (0x4 * f) | Instance | HSI_PORTS |
| Description | TX FIFO configuration register. One register per FIFO. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|----------|---|-------------|----------|---|-----------|---|---|---|--------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | THRESHOLD | | | | | | RESERVED | | PORT_NUMBER | RESERVED | | CH_NUMBER | | | | ENABLE |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:14 | RESERVED | Reserved | R | 0x00000 |
| 13:10 | THRESHOLD | Number of empty TX FIFO locations that will activate interrupt or DMA requests. DMA requests (if enabled) or interrupt assertion (if enabled) is triggered if the number of free locations in FIFO is less than the THRESHOLD value. 0x0: Less than 8 words in the FIFO 0x1: Less than 1 words in the FIFO 0x2: Less than 2 words in the FIFO ... 0x8: Less than 8 words in the FIFO | RW | 0x0 |

MIPI-HSI

www.ti.com

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------|
| | | 0x9 through 0xF: No request generated | | |
| 9:8 | RESERVED | Reserved | R | 0x0 |
| 7 | PORT_NUMBER | Associates the FIFO to a HSI port 0x0: Port 1 0x1: Port 2 | RW | 0 |
| 6:5 | RESERVED | Reserved | R | 0x0 |
| 4:1 | CH_NUMBER | Associates the TX FIFO to a HSI logical channel number (0-15): 0x0: Logical channel number 0 0x1: Logical channel number 1 ... 0xF: Logical channel number 15 | RW | 0x0 |
| 0 | ENABLE | Enables the FIFO 0x0: Disabled 0x1: Enabled | RW | 1 |

Table 24-897. Register Call Summary for Register HST_MAPPINGf

MIPI-HSI

- [DMA Basic Operation Outline: \[0\]](#)
- [Configuration: \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Mapping: \[6\] \[7\]](#)
- [FIFO Subsystem Architecture: \[8\]](#)
- [Transmit FIFO Architecture: \[9\] \[10\]](#)
- [HSI Operational Modes Configuration: \[11\] \[12\] \[13\] \[14\]](#)
- [HSI_PORTS Register Summary: \[15\]](#)

Table 24-898. HSR_ID_Pp

| | | | |
|------------------|---------------------------|----------|--|
| Address Offset | 0x0000 0800 + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A800 + (0x1000* b) | Instance | HSI_PORTS |
| Description | Legacy identification | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ID_VAL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | ID_VAL | Legacy ID | R | See ⁽¹⁾ |

⁽¹⁾ TI Internal Data**Table 24-899. Register Call Summary for Register HSR_ID_Pp**

MIPI-HSI

- [HSI_PORTS Register Summary: \[0\]](#)

Table 24-900. HSR_MODE_Pp

| | | |
|-------------------------|--|--|
| Address Offset | 0x0000 0804 + (0x1000* b) | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A804 + (0x1000* b) | Instance HSI_PORTS |
| Description | Defines operation mode and data flow on port p | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----------|----|---|---|----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WAKE_STATUS | | | | FLOW_VAL | | | | MODE_VAL | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4 | WAKE_STATUS | Level of WAKE line | R | - |
| 3:2 | FLOW_VAL | Flow 0x0: Synchronized 0x1: Pipelined 0x2: Real-time | RW | 0x0 |
| 1:0 | MODE_VAL | Mode 0x0: Sleep 0x1: Stream ⁽¹⁾ 0x2: Frame ⁽¹⁾ 0x3: Reserved | RW | 0x0 |

⁽¹⁾ Selecting stream or frame mode activates the READY line and causes the start of communication. The mode must be set at the end of the module configuration, just before the start.

Table 24-901. Register Call Summary for Register HSR_MODE_Pp
MIPI-HSI

- [Receive Operations: \[0\]](#)
- [Configuration: \[1\]](#)
- [HSI Operational Modes Configuration: \[2\] \[3\]](#)
- [HSI_PORTS Register Summary: \[4\]](#)

Table 24-902. HSR_FRAME_SIZE_Pp

| | | |
|-------------------------|---------------------------|--|
| Address Offset | 0x0000 0808 + (0x1000* b) | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A808 + (0x1000* b) | Instance HSI_PORTS |
| Description | Legacy returns 0x1f | |
| Type | R | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | SIZE_VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4:0 | SIZE_VAL | 0x1F | R | 0x1F |

Table 24-903. Register Call Summary for Register HSR_FRAMESIZE_Pp

MIPI-HSI

- [HSI_PORTS Register Summary: \[0\]](#)

Table 24-904. HSR_RXSTATE_Pp

| | | | |
|-------------------------|---------------------------|-----------------|--|
| Address Offset | 0x0000 080C + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A80C + (0x1000* b) | Instance | HSI_PORTS |
| Description | Receiver state on port p | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | RXSTATEVAL | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2:0 | RXSTATEVAL | RX state Read 0x0: Idle Read 0x1: Receiving Read 0x2: Finished Read 0x3: Error Read 0x4: Halt Read 0x5: Time-out | R | 0x0 |

Table 24-905. Register Call Summary for Register HSR_RXSTATE_Pp

MIPI-HSI

- [Receive Operations: \[0\] \[1\]](#)
- [HSI_PORTS Register Summary: \[2\]](#)

Table 24-906. HSR_BUFSTATE_Pp

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0810 + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A810 + (0x1000* b) | Instance | HSI_PORTS |
| Description | State of receiver buffer register for port p | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BUFSTATE VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7:0 | BUFSTATE_VAL | Each bit gives the state of receiver buffer register: 0x0: Buffer is not full. 0x1: Buffer is full. | R | 0x00 |

Table 24-907. Register Call Summary for Register HSR_BUFSTATE_Pp

MIPI-HSI

- [Receive Buffers: \[0\] \[1\] \[2\] \[3\]](#)
- [HSI Operational Modes Configuration: \[4\]](#)
- [HSI_PORTS Register Summary: \[5\]](#)

Table 24-908. HSR_BREAK_Pp

| | | | |
|-------------------------|---------------------------|-----------------|--|
| Address Offset | 0x0000 081C + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A81C + (0x1000* b) | Instance | HSI_PORTS |
| Description | Break detected on port p | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | BREAK VAL | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | BREAK_VAL | Break detected Read 0x0: No break detected Read 0x1: Break detected | R | 0 |

Table 24-909. Register Call Summary for Register HSR_BREAK_Pp

MIPI-HSI

- [Interrupts: \[0\]](#)
- [Receive Exceptions: \[1\]](#)
- [HSI_PORTS Register Summary: \[2\]](#)

Table 24-910. HSR_ERROR_Pp

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0820 + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A820 + (0x1000* b) | Instance | HSI_PORTS |
| Description | Error detection state register for port p | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----------|----|----|----|-----|----------|---|---|---|-----|----------|---|---|-----|----------|--|--|-----|----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | RESERVED | | | | TME | RESERVED | | | | RME | RESERVED | | | TBE | RESERVED | | | FTE | SG |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-----------------------|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15 | RESERVED | Reserved | R | 0x0 |
| 14:12 | RESERVED | Reserved | R | 0x0 |
| 11 | TME | TX mapping error | R | 0x0 |
| 10:8 | RESERVED | Reserved | R | 0x0 |
| 7 | RME | RX mapping error | R | 0x0 |
| 6:5 | RESERVED | Reserved | R | 0x0 |
| 4 | TBE | Tailing bit error | R | 0x0 |
| 3:2 | RESERVED | Reserved | R | 0x0 |
| 1 | FTE | Frame time-out error | R | 0x0 |
| 0 | SIG | Signal error (legacy) | R | 0x0 |

Table 24-911. Register Call Summary for Register HSR_ERROR_Pp

MIPI-HSI

- [Detection of Errors: \[0\]](#)
- [Error Counters: \[1\] \[2\] \[3\]](#)
- [Error Registers: \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [HSI Operational Modes Configuration: \[9\] \[10\] \[11\] \[12\] \[13\]](#)
- [HSI_PORTS Register Summary: \[14\]](#)

Table 24-912. HSR_ERRORACK_Pp

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0824 + (0x1000* b) | Instance | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A824 + (0x1000* b) | Instance | HSI_PORTS |
| Description | Error detection acknowledge register on port p: write 1 to clear. | | |
| Type | W | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----------|----|----|----|-----|----------|---|---|---|-----|----------|---|---|-----|----------|--|--|-----|-----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| RESERVED | | | | | | | | | | | | | | | | RESERVED | RESERVED | | | | TME | RESERVED | | | | RME | RESERVED | | | TBE | RESERVED | | | FTE | SIG |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|-----------------------|------|--------|
| 31:16 | RESERVED | Reserved | W | 0x0000 |
| 15 | RESERVED | Reserved | W | 0x0 |
| 14:12 | RESERVED | Reserved | W | 0x0 |
| 11 | TME | TX mapping error | W | 0x0 |
| 10:8 | RESERVED | Reserved | W | 0x0 |
| 7 | RME | RX mapping error | W | 0x0 |
| 6:5 | RESERVED | Reserved | W | 0x0 |
| 4 | TBE | Tailing bit error | W | 0x0 |
| 3:2 | RESERVED | Reserved | W | 0x0 |
| 1 | FTE | Frame time-out error | W | 0x0 |
| 0 | SIG | Signal error (legacy) | W | 0x0 |

Table 24-913. Register Call Summary for Register HSR_ERRORACK_Pp

MIPI-HSI

- [Receive Exceptions: \[0\]](#)
- [Error Registers: \[1\]](#)
- [HSI Operational Modes Configuration: \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [HSI_PORTS Register Summary: \[7\]](#)

Table 24-914. HSR_CHANNELS_Pp

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0828 + (0x1000* b) | | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A828 + (0x1000* b) | Instance | HSI_PORTS |
| Description | Number of active channels on port p (this determines the number of the used channel descriptor bits on the MIPI port as well) It can be 1, 2, 4, 8, or 16. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CHAN_NUM_VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-----------|
| 31:5 | RESERVED | Reserved | R | 0x0000000 |
| 4:0 | CHAN_NUM_VAL | Number of active channels 0x1: One logical channel used, number of the channel descriptor bits is 0 0x2: Two logical channels used, number of the channel descriptor bits is 1 0x4: Four logical channels used, number of the channel descriptor bits is 2 0x8: Eight logical channels used, number of the channel descriptor bits is 3 0x10: Sixteen logical channels used, number of the channel descriptor bits is 4 | RW | 0x01 |

Table 24-915. Register Call Summary for Register HSR_CHANNELS_Pp

MIPI-HSI

- [HSI Operational Modes Configuration: \[0\]](#)
- [HSI_PORTS Register Summary: \[1\]](#)

Table 24-916. HSR_OVERRUN_Pp

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 082C + (0x1000* b) | | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A82C + (0x1000* b) | Instance | HSI_PORTS |
| Description | Overflow detection state register for those receive FIFOs that are mapped to port p | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OVERRUN_VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | OVERRUN_VAL | Bit n is set when overrun is detected on channel n Read 0x1: Overrun detected Read 0x0: No overrun | R | 0x0000 |

Table 24-917. Register Call Summary for Register HSR_OVERRUN_Pp

MIPI-HSI

- [Receive Exceptions: \[0\]](#)
- [HSI_PORTS Register Summary: \[1\]](#)

Table 24-918. HSR_OVERRUNACK_Pp

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0830 + (0x1000* b) | | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A830 + (0x1000* b) | Instance | HSI_PORTS |
| Description | Overrun acknowledge register for those receive FIFOs that are mapped to port p | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | OVERRUNACK_VAL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | OVERRUNACK_VAL | Bit n is set when overrun is acknowledged on channel n. Write 0x0: No action Write 0x1: Overrun acknowledge | W | 0x0000 |

Table 24-919. Register Call Summary for Register HSR_OVERRUNACK_Pp

MIPI-HSI

- [HSI_PORTS Register Summary: \[0\]](#)

Table 24-920. HSR_COUNTERS_Pp

| | | | |
|-------------------------|--------------------------------------|-----------------|--|
| Address Offset | 0x0000 0834 + (0x1000* b) | | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A834 + (0x1000* b) | Instance | HSI_PORTS |
| Description | Counters setting register for port p | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FB | | | | | | | | TB | | | | FT | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:24 | FB | Setting for Frame Burst Counter. Setting n as a value results in n + 1 counter value. | RW | 0x00 |
| 23:20 | TB | Setting for Tailing Bit Counter. Setting n as a value results in n + 1 counter value. | RW | 0x0 |
| 19:0 | FT | Setting for Frame Time-out counter. Set n as a value results in n+1 counter value. | RW | 0x00000 |

Table 24-921. Register Call Summary for Register HSR_COUNTERS_Pp

MIPI-HSI

- [Receive Operations: \[0\]](#)
- [HSI Operational Modes Configuration: \[1\] \[2\] \[3\]](#)
- [HSI_PORTS Register Summary: \[4\]](#)

Table 24-922. HSR_BUFFER_Pp_CHN_i

| | | | |
|------------------|--|----------|--|
| Address Offset | 0x0000 0880 + (0x1000* b) + (0x4 * i) | Index | p = 1 to 2 i = 0 to 7 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A880 + (0x1000* b) + (0x4 * i) | Instance | HSI_PORTS |
| Description | Receive register for receive FIFO 0..7 Important: Read access to the register with 0xC and 0xF byteen removes the receive FIFO-related item. If using only 16-bit accesses, the lower 2 bytes must be read first (byteen 0x3). Between two consecutive 16-bit FIFO-related access there cannot be any other FIFO-related OCP access. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------|------|---------|
| 31:0 | DATA | Received data | R | 0x----- |

Table 24-923. Register Call Summary for Register HSR_BUFFER_Pp_CHN_i

MIPI-HSI

- [DMA Basic Operation Outline: \[0\]](#)
- [Receive Buffers: \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Receive FIFO Architecture: \[6\] \[7\]](#)
- [FIFO Addressing: \[8\]](#)
- [HSI Operational Modes Configuration: \[9\] \[10\]](#)
- [HSI_PORTS Register Summary: \[11\]](#)

Table 24-924. HSR_SWAPBUFFER_Pp_CHN_i

| | | | |
|------------------|--|----------|--|
| Address Offset | 0x0000 08C0 + (0x1000* b) + (0x4 * i) | Index | p = 1 to 2 i = 0 to 7 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) |
| Physical Address | 0x4A05 A8C0 + (0x1000* b) + (0x4 * i) | Instance | HSI_PORTS |
| Description | Byte swapped receive register for receive FIFO 0..7 Important: Read access to the register with 0x3 and 0xF byteen removes the receive FIFO-related item. If using only 16-bit accesses, the upper 2 bytes must be read first (byteen 0xC). Between two consecutive 16-bit FIFO-related access there cannot be any other FIFO- related OCP access. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SWAPDATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------------|------|---------|
| 31:0 | SWAPDATA | Received data swapped | R | 0x----- |

Table 24-925. Register Call Summary for Register HSR_SWAPBUFFER_Pp_CHN_i

MIPI-HSI

- [Receive Buffers: \[0\] \[1\]](#)
- [FIFO Addressing: \[2\]](#)
- [HSI_PORTS Register Summary: \[3\]](#)

Table 24-926. HSR_MAPPINGf

| | | | |
|-------------------------|--|-----------------|-------------|
| Address Offset | 0x0000 0900 + (0x4 * f) | Index | f = 0 to 15 |
| Physical Address | 0x4A05 A900 + (0x4 * f) | Instance | HSI_PORTS |
| Description | RX FIFO Configuration register. One register per FIFO. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|----------|---|-------------|---|----------|---|-----------|---|---|---|--------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | WORDS | | | | | | RESERVED | | PORT_NUMBER | | RESERVED | | CH_NUMBER | | | | ENABLE | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|--|------|---------|
| 31:14 | RESERVED | Reserved | R | 0x00000 |
| 13:10 | WORDS | Number of words available in the RX FIFO for reading | R | 0x0 |
| 9:8 | RESERVED | Reserved | R | 0x0 |
| 7 | PORT_NUMBER | Associates the RX FIFO to a HSI port 0x0: Port 1 0x1: Port 2 | RW | 0x0 |
| 6:5 | RESERVED | Reserved | R | 0x0 |
| 4:1 | CH_NUMBER | Associates RX FIFO to a HSI logical channel 0x0: Logical channel number 0 0x1: Logical channel number 1 ... 0xF: Logical channel number 15 | RW | 0x0 |
| 0 | ENABLE | Enables or disables RX FIFO 0x0: Disabled 0x1: Enabled | RW | 0x1 |

Table 24-927. Register Call Summary for Register HSR_MAPPINGf

MIPI-HSI

- [DMA Basic Operation Outline: \[0\]](#)
- [Configuration: \[1\]](#)
- [FIFO Subsystem Architecture: \[2\]](#)
- [Receive FIFO Architecture: \[3\]](#)
- [HSI Operational Modes Configuration: \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [HSI_PORTS Register Summary: \[9\]](#)

Table 24-928. HSR_DIVISOR_Pp

| | | | | |
|-------------------------|--|-----------------|--|--|
| Address Offset | 0x0000 094C + (0x1000* b) | Index | p = 1 to 2 b = 0 to 1 (for p = 1, b = 0 and p = 2, b = 1) | |
| Physical Address | 0x4A05 A94C + (0x1000* b) | Instance | HSI_PORTS | |
| Description | Receive bit rate divisor for port p. This must be set for correct protocol timing detection (tailing time-out, frame time-out). | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-----------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RX_RATE_DIV_VAL | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|-----------|
| 31:8 | RESERVED | Reserved | R | 0x0000000 |
| 7:0 | RX_RATE_DIV_VAL | The functional clock source divided by this value is used as a clock base for the receive counters. Setting n as a value results in the n + 1 divisor value. | RW | 0x00 |

Table 24-929. Register Call Summary for Register HSR_DIVISOR_Pp

MIPI-HSI

- [Functional Clock Domain: \[0\]](#)
- [Error Counters: \[1\]](#)
- [HSI Operational Modes Configuration: \[2\]](#)
- [HSI_PORTS Register Summary: \[3\]](#)

24.11 High-Speed Multiport USB Host Subsystem

This section describes the HS universal serial bus (USB) host subsystem of the device.

24.11.1 High-Speed Multiport USB Host Subsystem Overview

NOTE: Copyright ©2004, 2005, 2006, 2007, 2008 Synopsys, Inc. All rights reserved. Used with permission.

The HS USB host subsystem is composed of:

- HS multiport USB host controller module
- USB TLL module
- Three HSIC digital front end (DFE) modules

The HS USB host subsystem consists of several ports delivered outside the device, with several modes per port. The modes are:

- UTMI+ low pin-count interface (ULPI) for external PHY
- ULPI transceiverless link (TLL)
- Serial TLL
- High-speed interchip (HSIC)

The HS USB host controller module contains two quasi-independent host controllers that operate in parallel:

- The EHCI controller, based on the *Enhanced Host Controller Interface (EHCI) Specification for USB Release 1.1*, is responsible for HS traffic (480 Mbps), over ULPI/USB 2.0 transceiver macrocell interface (UTMI).
- The OHCI controller, based on the *Open Host Controller Interface (OHCI) Specification for USB Release 1.0a*, is responsible for full-speed (FS)/low-speed (LS) traffic (12/1.5 Mbps, respectively), over a serial interface.

Each of the three external ports of the HS USB host controller module is owned by one of the controllers (EHCI or OHCI) at a given time. Each port can work in several modes:

- When the port is owned by the OHCI (FS) host, the 6-pin internal serial interface to the TLL is used.
- When the port is owned by the EHCI (HS) host, UTMI internal interface to the TLL, or ULPI to external PHY is used.

For more details on USB controller module internal architecture, see [Section 24.11.4.1, USB Host Controller Functionality](#).

The current subsystem does not support all dynamic USB speed negotiations, as expected from a standard USB host port at the same time. It supports:

- HS-only (with external HS physical layer [PHY]/HS TLL mode HSIC) on the EHCI
- FS-/LS-only (with external FS PHY/FS TLL mode) on the OHCI

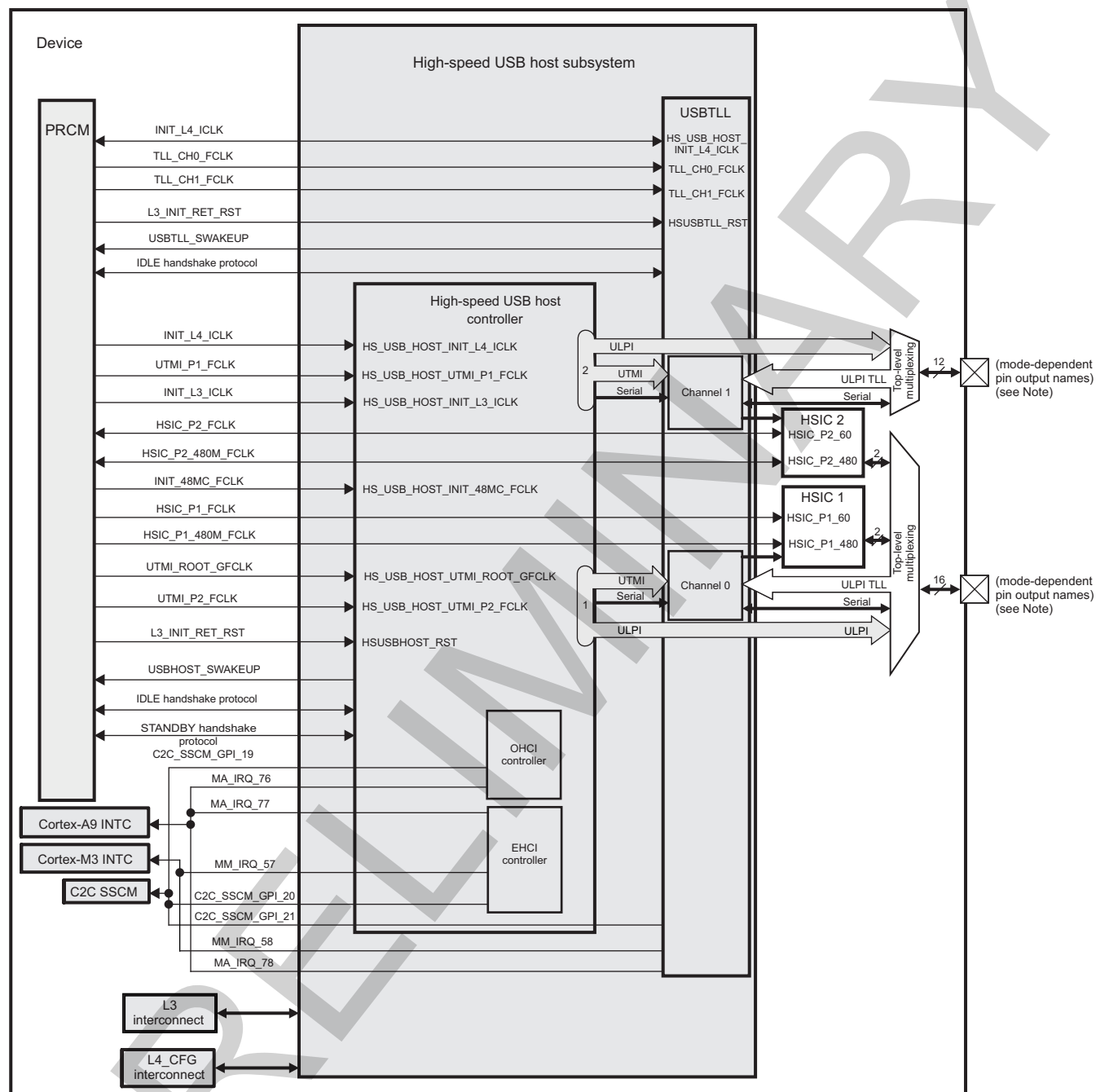
The USB TLL module is the adapter on the host ports. It consists of two channels that are seen as emulating a pair of back-to-back PHYs and has:

- UTMI port, connected to the host controller module
- ULPI port, connected to a ULPI peripheral

The three HSIC DFEs plug into the UTMI port of the host controller module and control HSIC-capable bidirectional I/O drivers driving the HSIC lines (strobe/data).

[Figure 24-232](#) shows the HS USB host subsystem.

Figure 24-232. HS USB Host Controller



usb-006

NOTE: For more information about output pin names in different modes, see [Section 24.11.2.1, ULPIs](#); [Section 24.11.2.2, FS/LS Serial Interfaces](#); and [Section 24.11.2.3, HSIC Interface](#).

24.11.1.1 Main Features

The HS multiport USB host subsystem supports the following features:

- HS USB host controller:
 - One initiator on level 3 (L3)
 - One target on level 4 (L4)
 - Two IRQs

- No DMA request
- Implements a USB 2.0 HS host controller:
 - HS (480 Mbps) communication with HS USB peripherals or hubs
 - FS (12 Mbps) communication with FS USB peripherals or hubs
 - LS (1.5 Mbps) communication with LS USB peripherals
- Support for suspend, resume, remote wakeup
- Two downstream ports (2-port root hub, with each port supporting UTMI, ULPI, and serial interface)
- Heterogeneous port configuration (that is, different HS/FS PHYs with different clocking methods on different ports, supported simultaneously)
- Single FS host controller, compliant with OHCI software application programming interface (API), per-port power switching support
- Interface with UTMI PHYs (that is, the TLL module) on all ports
 - 8-bit data path
 - Synchronous (on-chip) interface, independent clock input per port (that is, the TLL module provides a clock to the host controller and to the remote USB controller).
 - HSIC front-end (after appropriate internal configuration)
- Interface with ULPI PHYs (transceivers) on all ports
 - 8-bit bidirectional data bus (SDR mode)
 - 12-pin interface
 - Independent clock input per port (ULPI PHY in output mode)
 - Supports only HS data transactions

CAUTION

The HS USB host subsystem can support only the external charge pump of PHY (no support of internal charge pump for ULPI PHY).

- Interconnect initiator for built-in DMA operation of EHCI/OHCI
- Interconnect target for configuration
- Link power management (LPM) support in OHCI and EHCI hosts
- Hardware save-and-restore (SAR) feature of the hardware context of the suspended host
- USBTLL module:
 - One interconnect target on L4
 - One IRQ
 - No DMA request
 - HS USB ports and each of them has four ports (A to D):
 - Port A: Host module UTMI+ port. Connects to the local link controller (host module). The UTMI "local" port is used in all configurations (that is, the entire channel can be seen as a protocol converted from that port to one of the other, "remote" ports. The port complies with UTMI+ version 1.0 and supports:
 - 8-data-bit, UTMI (HS/FS-capable)
 - UTMI+ L3 extensions
 - Vcontrol/Vstatus (from UTMI)
 - Serial FS 6-pin mode
 - Port B: Link-side UTMI+ port. Connects to HSIC front-end module.
 - Port C: PHY-side ULPI slave port. Connects to a remote (off-chip) ULPI link controller through I/O pads.
 - SDR ULPI mode (8-bit data width)

- Port D: Serial multimode port.
 - Supports 6-pin unidirectional and 4-/3-/2-pin bidirectional modes
 - All modes are supported for TLL or PHY interface configuration, except 2-pin mode (which is TLL-only).
 - Supports sideband signals (pullup/down control, speed/suspend enable, etc.)
- HSIC module: Converts UTMI into HSIC standard (2-wire TLL HS protocol)

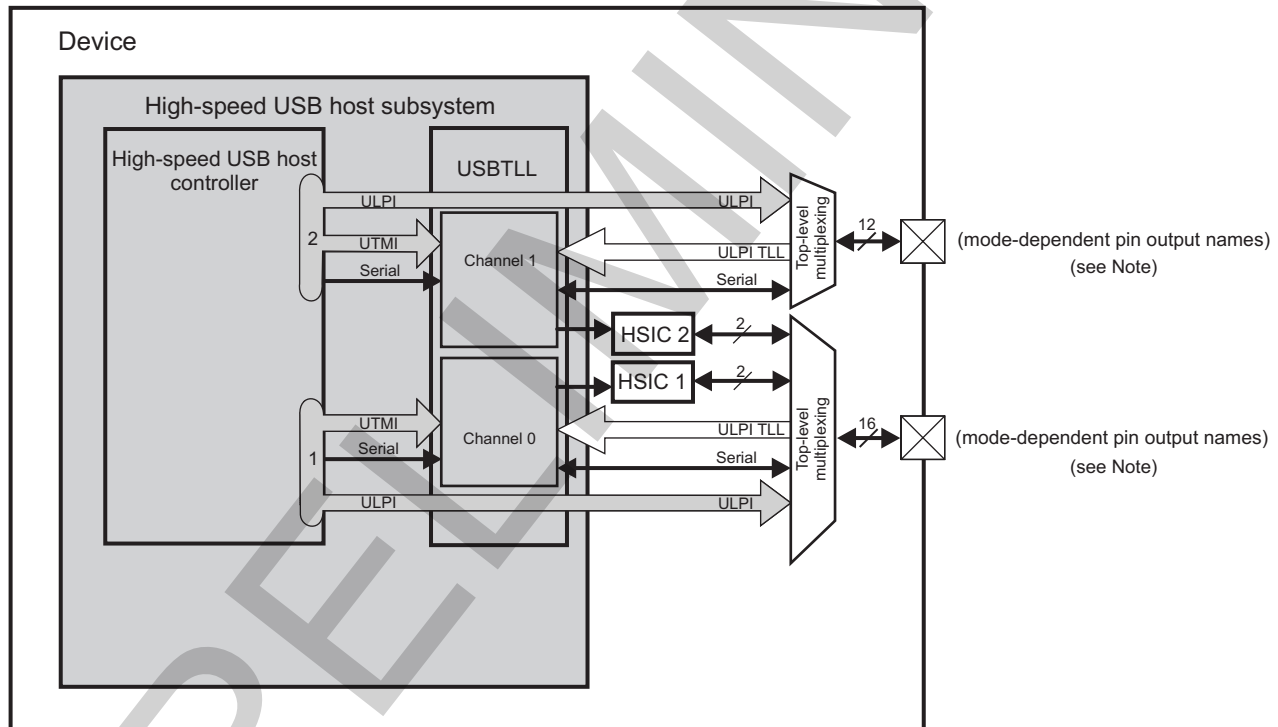
24.11.2 HS Multiport USB Host Subsystem Environment

The HS USB host subsystem provides three kinds of interfaces for connection:

- ULPIs for HS data transactions (up to 480 Mbps) (see [Section 24.11.2.1, ULPIs](#))
- Serial interfaces, using the USBTLL module, for FS and LS data transactions (up to 12 Mbps) (see [Section 24.11.2.2, FS/LS Serial Interfaces](#))
- HSIC interface to two HSIC lines over HSIC-capable I/O drivers (see [Section 24.11.2.3, HSIC Interface](#))

Figure 24-233 is an overview of the environment of the HS USB host subsystem.

Figure 24-233. HS Multiport USB Host Subsystem Environment



usb_swpu140-072

NOTE: For more information about output pin names in different modes, see [Section 24.11.2.1, ULPIs](#); [Section 24.11.2.2, FS/LS Serial Interfaces](#); and [Section 24.11.2.3, HSIC Interface](#).

NOTE: The two ports are configured independently and can be in different modes.

For more information how the pins are multiplexed, see [Section 19.4.8, PAD Functional Multiplexing and Configuration](#).

24.11.2.1 ULPIs

The HS USB host subsystem supports the following configurations with the ULPIs:

- External USB transceiver:

- ULPIs: 12-pin/8-bit data SDR version
- TLL:
 - SDR ULPI mode (12-pin/8-bit data width)

The HS USB host subsystem supports USB ports that use the ULPI mode to connect to an off-chip HS ULPI transceiver (12-pin/8-bit data SDR mode) for data transactions (up to 480 Mbps). FS and LS are not supported over the ULPI.

The device supports TLL logic interfaces on its ports in ULPI TLL interface mode. TLL modes enable glueless interconnect to another USB device port.

The external USB transceiver ULPIs and ULPI TLL interfaces cannot be used together on the same port. It is possible for one port to use ULPI and the other port to use ULPI TLL.

Figure 24-234 and Figure 24-235 show typical applications using the HS USB host subsystem with ULPI and the ULPI TLL interface, respectively.

Figure 24-234. External USB Transceiver ULPIs

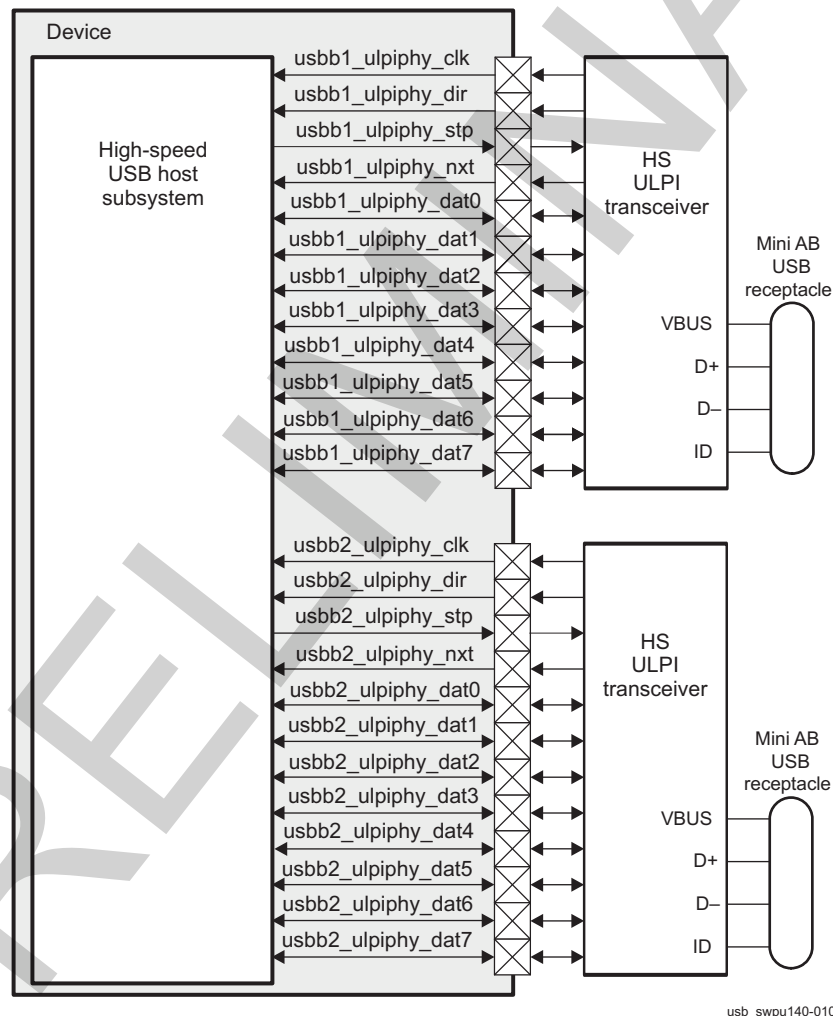
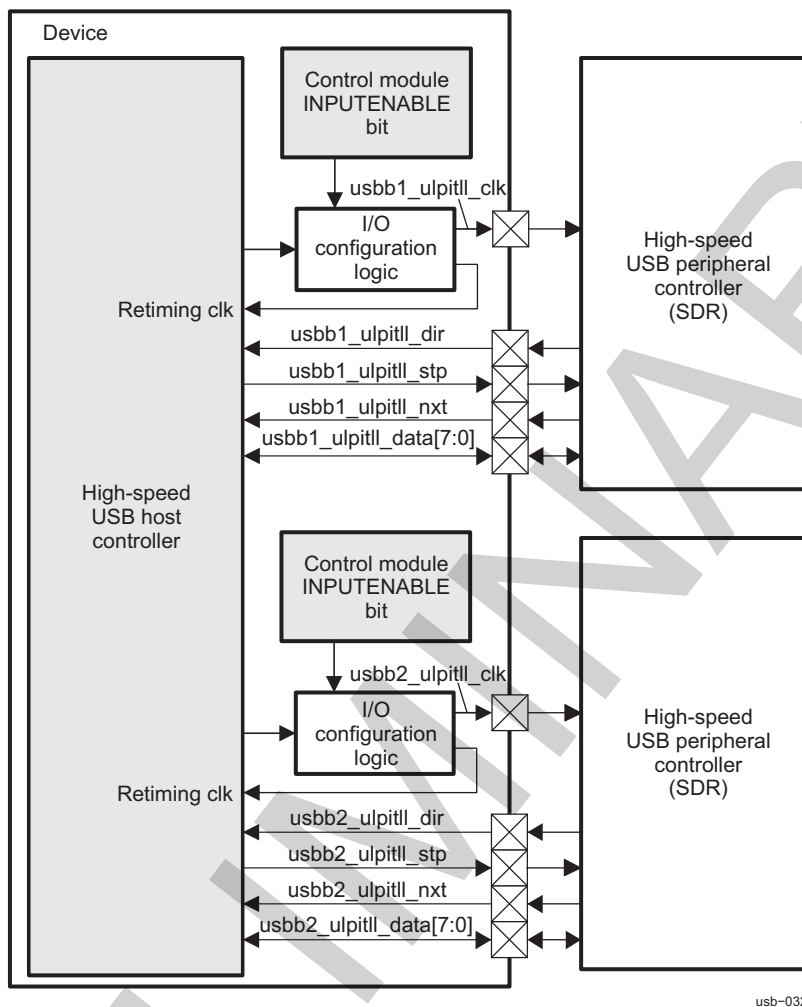


Figure 24-235. ULPI TLL Interfaces

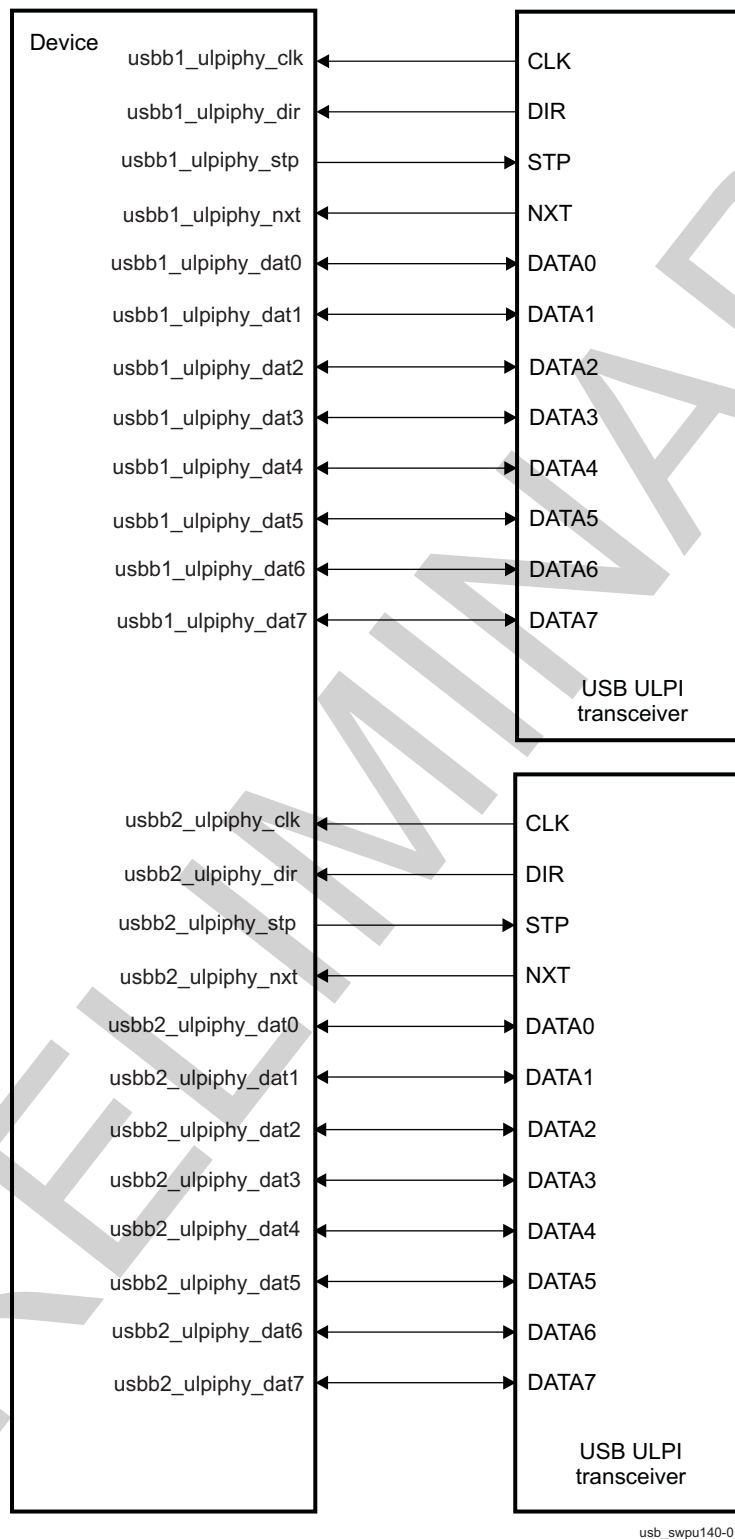


The 12-pin ULPI uses an 8-bit data bus with data synchronous to the rising edge of the PHY (transceiver) clock (SDR mode).

24.11.2.1.1 Transceiver Interface Configuration in ULPI Mode

The HS USB host subsystem supports only the 12-pin/8-bit data SDR version of the ULPI mode.

Figure 24-236 shows USB ports using the 12-pin/8-bit data SDR version of the ULPI mode.

Figure 24-236. ULPIs – 12-Pin/8-Bit Data SDR Version

[Table 24-930](#) describes the I/O pins of the USB ports using the 12-pin/8-bit data SDR version of the ULPI mode.

Table 24-930. ULPI – 12-Pin/8-Bit Data SDR Version I/O Description

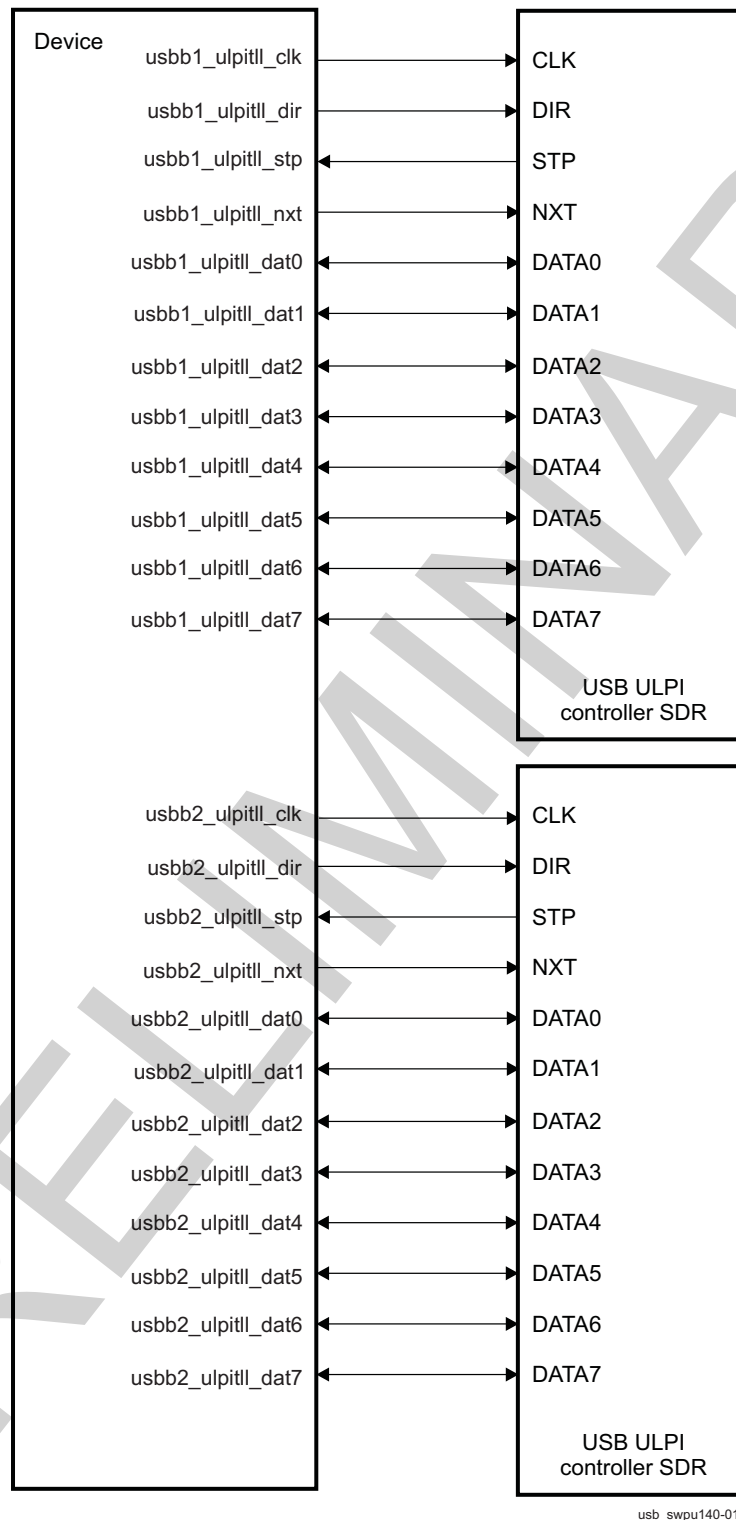
| Signal Name | I/O ⁽¹⁾ | Description | Reset Value |
|--------------------------------------|--------------------|---|-------------|
| HS USB Host Controller Port 1 | | | |
| usbb1_ulpiiphy_clk | I | Clock input from remote PHY IC | 0 |
| usbb1_ulpiiphy_dir | I | Data direction control from remote PHY IC | Unknown |
| usbb1_ulpiiphy_stp | O | Stop signal to remote PHY IC | 1 |
| usbb1_ulpiiphy_nxt | I | Next signal from remote PHY IC | Unknown |
| usbb1_ulpiiphy_dat0 | I/O | Bidirectional DATA0 | Unknown |
| usbb1_ulpiiphy_dat1 | I/O | Bidirectional DATA1 | Unknown |
| usbb1_ulpiiphy_dat2 | I/O | Bidirectional DATA2 | Unknown |
| usbb1_ulpiiphy_dat3 | I/O | Bidirectional DATA3 | Unknown |
| usbb1_ulpiiphy_dat4 | I/O | Bidirectional DATA4 | Unknown |
| usbb1_ulpiiphy_dat5 | I/O | Bidirectional DATA5 | Unknown |
| usbb1_ulpiiphy_dat6 | I/O | Bidirectional DATA6 | Unknown |
| usbb1_ulpiiphy_dat7 | I/O | Bidirectional DATA7 | Unknown |
| HS USB Host Controller Port 2 | | | |
| usbb2_ulpiiphy_clk | I | Clock input from remote PHY IC | 0 |
| usbb2_ulpiiphy_dir | I | Data direction control from remote PHY IC | Unknown |
| usbb2_ulpiiphy_stp | O | Stop signal to remote PHY IC | 1 |
| usbb2_ulpiiphy_nxt | I | Next signal from remote PHY IC | Unknown |
| usbb2_ulpiiphy_dat0 | I/O | Bidirectional DATA0 | Unknown |
| usbb2_ulpiiphy_dat1 | I/O | Bidirectional DATA1 | Unknown |
| usbb2_ulpiiphy_dat2 | I/O | Bidirectional DATA2 | Unknown |
| usbb2_ulpiiphy_dat3 | I/O | Bidirectional DATA3 | Unknown |
| usbb2_ulpiiphy_dat4 | I/O | Bidirectional DATA4 | Unknown |
| usbb2_ulpiiphy_dat5 | I/O | Bidirectional DATA5 | Unknown |
| usbb2_ulpiiphy_dat6 | I/O | Bidirectional DATA6 | Unknown |
| usbb2_ulpiiphy_dat7 | I/O | Bidirectional DATA7 | Unknown |

⁽¹⁾ I = Input; O = Output

24.11.2.1.2 TLL Interface Configuration in ULPI Mode

The HS USB host controller is coupled with the USBTLL module to compose the ULPI TLL interface modes.

Figure 24-237 shows USB ports using the 12-pin/8-bit data SDR version of the ULPI TLL interface mode.

Figure 24-237. ULPI TLL Interfaces – 12-Pin/8-Bit Data SDR Version

[Table 24-931](#) describes the I/O pins of the USB ports using the 12-pin/8-bit data SDR version of the ULPI TLL interface mode.

Table 24-931. ULPI TLL Interfaces – 12-Pin/8-Bit Data SDR Version I/O Description

| Signal Name | I/O ⁽¹⁾ | Description | Reset Value |
|--------------------------|--------------------|--|-------------|
| HS USB TLL Port 1 | | | |
| usbb1_ulpitll_clk | O | Clock output to remote ULPI link controller ⁽²⁾ | 0 |
| usbb1_ulpitll_dir | O | Data direction control from remote ULPI link controller | 0 |
| usbb1_ulpitll_stp | I | Stop signal to remote ULPI link controller | Unknown |
| usbb1_ulpitll_nxt | O | Next signal from remote ULPI link controller | 0 |
| usbb1_ulpitll_dat0 | I/O | Bidirectional DATA0 | 0 |
| usbb1_ulpitll_dat1 | I/O | Bidirectional DATA1 | 0 |
| usbb1_ulpitll_dat2 | I/O | Bidirectional DATA2 | 0 |
| usbb1_ulpitll_dat3 | I/O | Bidirectional DATA3 | 0 |
| usbb1_ulpitll_dat4 | I/O | Bidirectional DATA4 | 0 |
| usbb1_ulpitll_dat5 | I/O | Bidirectional DATA5 | 0 |
| usbb1_ulpitll_dat6 | I/O | Bidirectional DATA6 | 0 |
| usbb1_ulpitll_dat7 | I/O | Bidirectional DATA7 | 0 |
| HS USB TLL Port 2 | | | |
| usbb2_ulpitll_clk | O | Clock output to remote ULPI link controller ⁽²⁾ | 0 |
| usbb2_ulpitll_dir | O | Data direction control from remote ULPI link controller | 0 |
| usbb2_ulpitll_stp | I | Stop signal to remote ULPI link controller | Unknown |
| usbb2_ulpitll_nxt | O | Next signal from remote ULPI link controller | 0 |
| usbb2_ulpitll_dat0 | I/O | Bidirectional DATA0 | 0 |
| usbb2_ulpitll_dat1 | I/O | Bidirectional DATA1 | 0 |
| usbb2_ulpitll_dat2 | I/O | Bidirectional DATA2 | 0 |
| usbb2_ulpitll_dat3 | I/O | Bidirectional DATA3 | 0 |
| usbb2_ulpitll_dat4 | I/O | Bidirectional DATA4 | 0 |
| usbb2_ulpitll_dat5 | I/O | Bidirectional DATA5 | 0 |
| usbb2_ulpitll_dat6 | I/O | Bidirectional DATA6 | 0 |
| usbb2_ulpitll_dat7 | I/O | Bidirectional DATA7 | 0 |

⁽¹⁾ I = Input; O = Output

⁽²⁾ This signal is also used as retiming input (the INPUTENABLE bit in the corresponding pad configuration register must be set to 1).

24.11.2.2 FS/LS Serial Interfaces

The HS USB host subsystem supports the following configurations with the serial interfaces:

- External USB transceiver (see [Section 24.11.2.2.3, External USB Transceiver Interface Configurations in Serial Modes](#))
 - Serial 6-pin PHY (transceiver) interfaces: 6-pin mode (TX: DAT/SE0 or TX: DP/DM unidirectional mode), 4-pin mode (DP/DM bidirectional mode), and 3-pin mode (DAT/SE0 bidirectional mode)
- TLL (see [Section 24.11.2.2.4, TLL Interface Configurations in Serial Modes](#))
 - Serial 6-pin TLL interfaces: 6-pin mode (DAT/SE0 and DP/DM unidirectional modes), 4-pin mode (DP/DM bidirectional mode), 3-pin mode (DAT/SE0 bidirectional mode), and 2-pin mode (DAT/SE0 and DP/DM bidirectional modes)

CAUTION

Only FS and LS data transactions are possible in serial mode. Transceiver interface is serial (its frequency is that of the actual USB line) and combinatorial (no clock is passed).

Whether in TLL or external transceiver configuration, the serial interface follows the same principles: it is limited to FS/LS, and HS requires a parallel interface.

24.11.2.2.1 Encoding in Serial Mode

24.11.2.2.1.1 Unidirectional

When an external USB transceiver is connected to the device and is used in 6-pin unidirectional DAT/SE0 encoding mode, the encoding described in [Table 24-932](#) is used.

Table 24-932. Signaling Between HS USB Host Subsystem and 6-Pin Unidirectional USB Transceiver (DAT/SE0 Signaling)

| Logical Signal Name | Device Pin Direction | Transceiver Pin Direction | Description | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|----------------------|---------------------------|---|----------|-----|-----|----|----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----------|----------|
| TXEN | Output | Input | When low, the USB transceiver drives D+ and D–. | | | | | | | | | | | | | | | | | | | | | | | | | |
| DAT and SE0 | Output | Input | Controls the values output by the USB transceiver on D+ and D– when TXEN is low; ignored when TXEN is high. <table><tr><td>TXEN</td><td>DAT</td><td>SE0</td><td>D+</td><td>D–</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>X</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>X</td><td>X</td><td>Undriven</td><td>Undriven</td></tr></table> | TXEN | DAT | SE0 | D+ | D– | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | X | 1 | 0 | 0 | 1 | X | X | Undriven | Undriven |
| TXEN | DAT | SE0 | D+ | D– | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | 0 | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 0 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | X | 1 | 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | X | X | Undriven | Undriven | | | | | | | | | | | | | | | | | | | | | | | | |
| RCV | Input | Output | Output from transceiver differential receiver <table><tr><td>D+</td><td>D–</td><td>RCV</td></tr><tr><td>0</td><td>0</td><td>X</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>X</td></tr></table> | D+ | D– | RCV | 0 | 0 | X | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | X | | | | | | | | | | |
| D+ | D– | RCV | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DP | Input | Output | Output from transceiver single-ended D+ signal receiver <table><tr><td>D+</td><td>DP</td></tr><tr><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td></tr></table> | D+ | DP | 0 | 0 | 1 | 1 | | | | | | | | | | | | | | | | | | | |
| D+ | DP | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DM | Input | Output | Output from transceiver single-ended D- signal receiver <table><tr><td>D–</td><td>DM</td></tr><tr><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td></tr></table> | D– | DM | 0 | 0 | 1 | 1 | | | | | | | | | | | | | | | | | | | |
| D– | DM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

When an external USB transceiver is connected to the device and is used in 6-pin unidirectional DP/DM encoding mode, the encoding described in [Table 24-933](#) is used.

Table 24-933. Signaling Between HS USB Host Subsystem and 6-Pin Unidirectional USB Transceiver (DP/DM Signaling)

| Logical Signal Name | Device Pin Direction | Transceiver Pin Direction | Description | | | | |
|---------------------|----------------------|---------------------------|---|-----|-----|----------|----------|
| TXEN | Output | Input | When low, the USB transceiver drives D+ and D−. | | | | |
| DAT and SE0 | Output | Input | Controls the values output by the USB transceiver on D+ and D− when TXEN is low; ignored when TXEN is high. | | | | |
| | | | TXEN | DAT | SE0 | D+ | D− |
| | | | 0 | 0 | 1 | 0 | 1 |
| | | | 0 | 1 | 0 | 1 | 0 |
| | | | 0 | 0 | 0 | 0 | 0 |
| | | | 1 | X | X | Undriven | Undriven |

Table 24-933. Signaling Between HS USB Host Subsystem and 6-Pin Unidirectional USB Transceiver (DP/DM Signaling) (continued)

| Logical Signal Name | Device Pin Direction | Transceiver Pin Direction | Description |
|---------------------|----------------------|---------------------------|---|
| RCV | Input | Output | Output from transceiver differential receiver |
| | | | D+ D- RCV |
| | | | 0 0 X |
| | | | 0 1 0 |
| | | | 1 0 1 |
| DP | Input | Output | Output from transceiver single-ended D+ signal receiver |
| | | | D+ DP |
| | | | 0 0 |
| DM | Input | Output | Output from transceiver single-ended D-signal receiver |
| | | | D- DM |
| | | | 0 0 |
| | | | 1 1 |

24.11.2.2.1.2 Bidirectional

When an external USB or USB OTG transceiver is connected to the device and is used in 3-pin bidirectional DAT/SE0 encoding mode, the encoding described in [Table 24-934](#) is used.

Table 24-934. Signaling Between HS USB Host Subsystem and 3-Pin Bidirectional USB Transceiver Using DAT/SE0 Signaling

| Logical Signal Name | Device Pin Direction | Transceiver Pin Direction | Description |
|---------------------|----------------------|---------------------------|--|
| TXEN | Output | Input | When low, the USB transceiver drives D+ and D-. |
| DAT and SE0 | Output | Input | When TXEN is low, the device drives DAT and SE0 and the transceiver drives D+ and D- based on the values of DAT and SE0. |
| | | | TXEN DAT SE0 D+ D- |
| | | | 0 0 0 0 1 |
| | | | 1 0 0 1 0 |
| | | | X 1 0 0 0 |
| | Input | Output | TXEN D+ D- DAT SE0 |
| | | | 1 0 0 0 1 |
| | | | 0 1 0 0 0 |
| | | | 1 0 1 1 0 |
| | | | 1 1 Undefined 0 |

NOTE: The device does not support 3-wire bidirectional signaling using DP/DM signals.

When an external USB or USB OTG transceiver is connected to the device and is used in 4-pin bidirectional DP/DM encoding mode, the encoding described in [Table 24-935](#) is used.

Table 24-935. Signaling Between HS USB Host Subsystem and 4-Pin Bidirectional USB Transceiver Using DP/DM Signaling

| Logical Signal Name | Device Pin Direction | Transceiver Pin Direction | Description |
|---------------------|----------------------|---------------------------|---|
| TXEN | Output | Input | When low, the USB transceiver drives D+ and D-. |

Table 24-935. Signaling Between HS USB Host Subsystem and 4-Pin Bidirectional USB Transceiver Using DP/DM Signaling (continued)

| Logical Signal Name | Device Pin Direction | Transceiver Pin Direction | Description | | |
|---------------------|----------------------|---------------------------|---|----|-----|
| DM | Output | Input | Value driven to or received from D– | | |
| | | | TXEN | DM | D– |
| | | | 0 | 0 | 0 |
| | | | 0 | 1 | 1 |
| | Input | Output | TXEN | D– | DM |
| | | | 1 | 0 | 0 |
| | | | 1 | 1 | 1 |
| DP | Output | Input | Value driven to or received from D+ | | |
| | | | TXEN | DP | D+ |
| | | | 0 | 0 | 0 |
| | | | 0 | 1 | 1 |
| | Input | Output | TXEN | D+ | DP |
| | | | 1 | 0 | 0 |
| | | | 1 | 1 | 1 |
| RCV | Input | Output | Output from transceiver differential receiver | | |
| | | | D+ | D– | RCV |
| | | | 0 | 0 | X |
| | | | 0 | 1 | 0 |
| | | | 1 | 0 | 1 |
| | | | 1 | 1 | X |

24.11.2.2.2 Sideband Signals for Serial Modes

Serial interfaces carry only the USB data information. Sideband control and status (respectively, to/from the transceiver/TLL or to the bus lines themselves) require additional signals, which are usually implemented in a case-by-case, ad hoc way.

- Sideband control examples: FS/LS (slew rate control), transceiver suspend, connect (D+/D– pullup), pulldown enable, VBUS drive, etc.
- Sideband status example: VBUS level (VBUS valid, session valid, session end, etc.)
- Sideband signal implementations: Dedicated lines (one per sideband information bit), serial bus + interrupt line with register-mapped control/status (I²C) UART, etc.)

Figure 24-238 and Figure 24-239 show system integration for sideband signals for two logically identical USB connections: one in transceiver configuration and one in TLL configuration. Although the sideband (purple) arrows are oriented from the controller to the transceiver in the two figures, the sideband information flow is bidirectional (that is, it flows from the controller to the transceiver [control] and from the transceiver to the controller [status]).

Figure 24-238 shows the transceiver configuration, where each side connects the sideband signals to its own transceiver. On the device (containing the USBTLL module), the sideband is decoded/re-encoded. The sideband signals available at the device boundary (and the USBTLL module) are decoded from the standard UTMI+ interface.

- The software-driven VBUS reporting procedure is described in [Section 24.11.4.2.6.1.1, VBUS Management in Serial Transceiver Configurations](#).

Figure 24-238. Serial Interface Sideband Integration – Transceiver Configuration

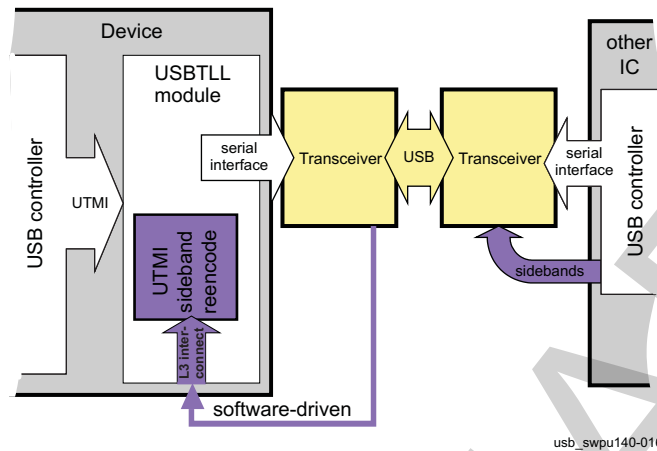
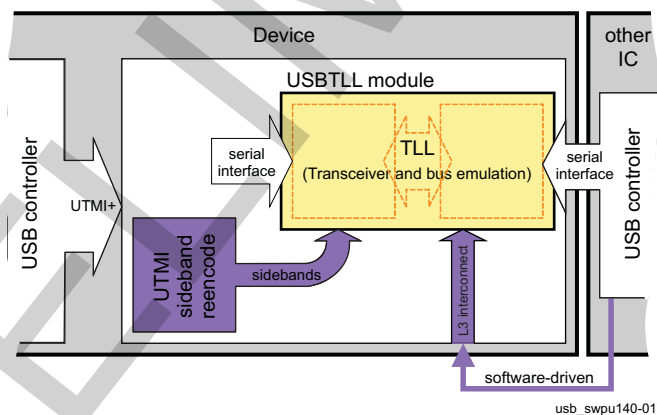


Figure 24-239 shows the TLL configuration, where both transceivers are emulated inside the USBTLL module.

- The transceiver of the local controller (left side of the figure) is working with the sideband information to/from the UTMI+ port. This is internal to the USBTLL module.
- The transceiver of the remote controller (right side of the figure) must communicate with its controller, which is on another IC. This is done in two ways:
 - The sideband input signals at the TLL module boundary (tlpuen, tldrvvbus, tllvbusvalid, etc.)
 - The software-driven VBUS control procedure described in [Section 24.11.4.2.6.2.2, VBUS Emulation in Serial TLL Modes](#)

Figure 24-239. Serial Interface Sideband Integration – TLL Configuration



24.11.2.2.3 External USB Transceiver Interface Configurations in Serial Modes

An external USB transceiver is required for each USB port used in the system. It converts between appropriate signaling for the HS USB host subsystem and appropriate signaling for the USB wire.

The serial interface mode of the HS USB host subsystem includes support for several types of USB transceivers. It provides signaling to up to two external USB transceivers.

Several types of external transceiver signaling are supported. Signaling between the HS USB subsystem in serial interface mode and the external USB transceiver for monitoring and controlling the differential USB signal can be done through a 6-, 4-, or 3-wire signaling interface, with two or more control signals provided by additional signals or through an I²C link.

The following subsections describe the transceiver interface modes supported by the HS USB host subsystem in the serial interface mode. In each case, the subsystem is connected to external transceivers, on the other side of the USB lines (D+/D-).

24.11.2.2.3.1 Unidirectional Transceiver Interface Modes: 6-Pin

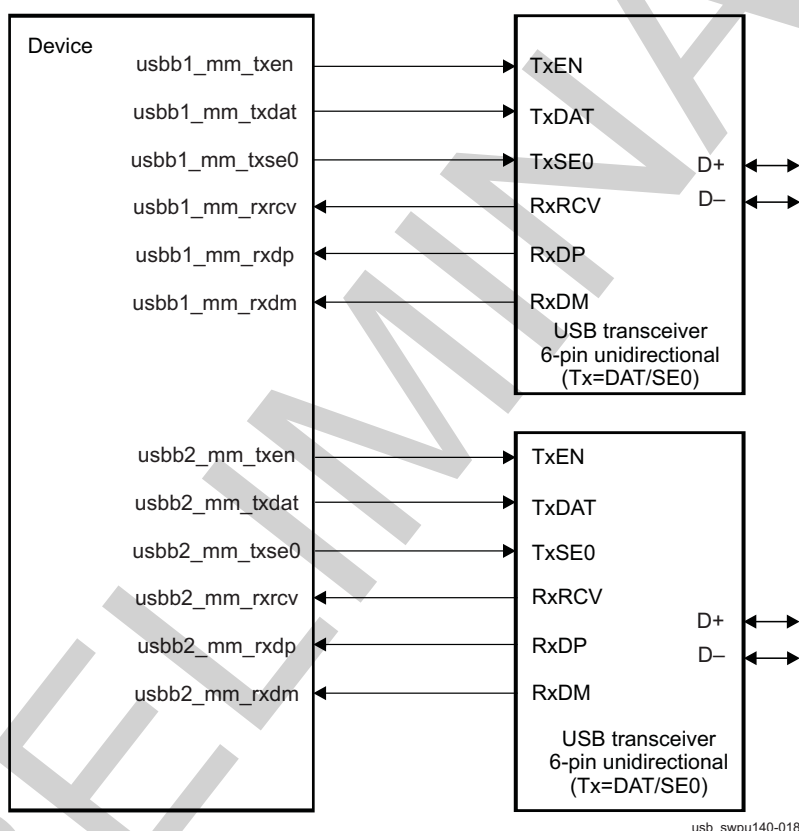
The 6-pin modes are the "natural" transceiver interface modes for the FS transceivers in the sense that they mirror the internal makeup of the transceivers.

Two encodings exist for TX: DAT/SE0 and DP/DM.

When an external USB is connected to the device and is used in 6-pin unidirectional DAT/SE0 signaling mode, the signaling described in [Table 24-932](#) is used.

[Figure 24-240](#) shows a USB port using DAT/SE0 encoding.

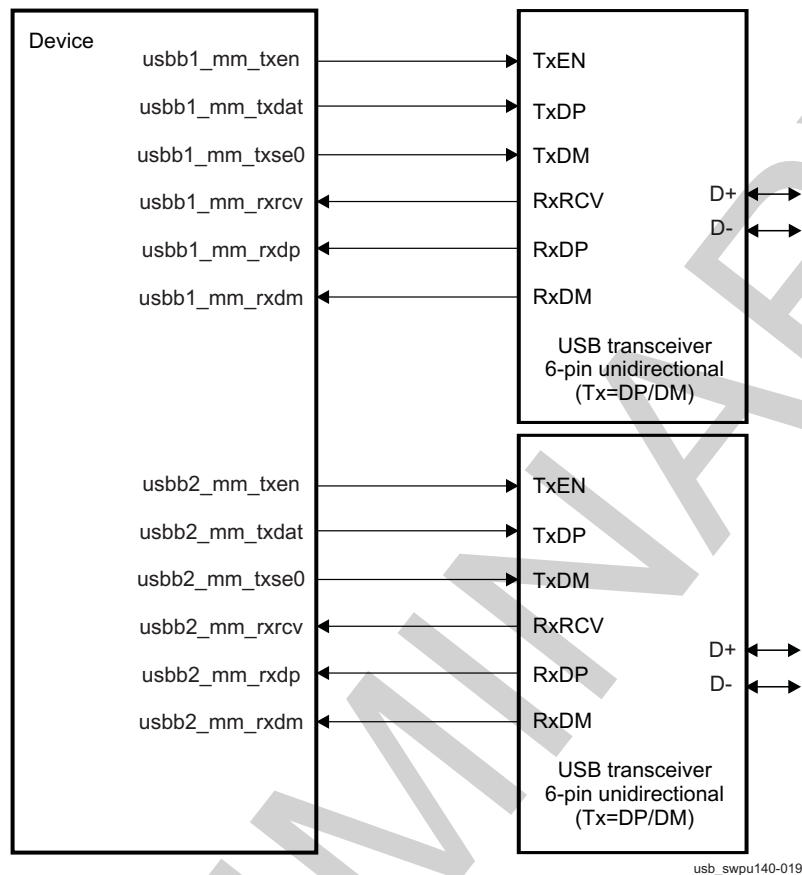
Figure 24-240. 6-Pin Unidirectional Using DAT/SE0 Signaling



When a USB is connected to the device and is used in 6-pin unidirectional DP/DM signaling mode, the signaling described in [Table 24-933](#) is used.

[Figure 24-241](#) shows a USB port using DP/DM encoding.

Figure 24-241. 6-Pin Unidirectional Using DP/DM Signaling



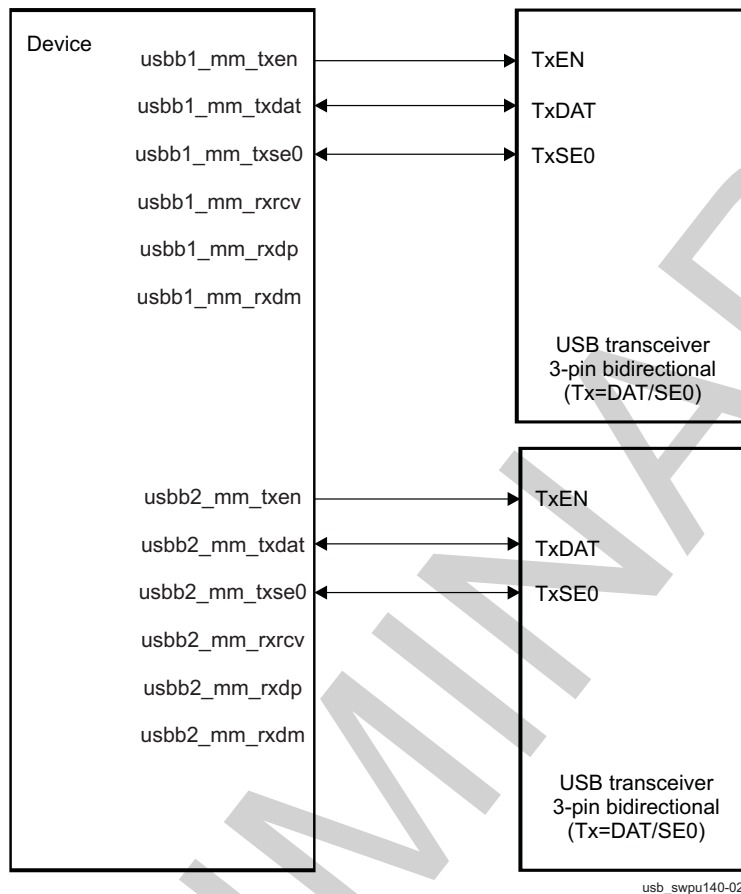
24.11.2.2.3.2 Bidirectional Transceiver Interface Modes: 3-Pin, 4-Pin

The bidirectional transceiver interface modes are pin-count optimizations of the unidirectional modes. They take advantage of the fact that a USB port is sending or receiving at any given time, but never both. The TX and RX paths of the unidirectional mode can be multiplexed on bidirectional lines. To prevent glitches at TX/RX turnaround, the same encoding is used for both directions (DAT/SE0 or DP/DM).

The signaling described in [Table 24-934](#) is used when a USB transceiver is connected to the device and is used in 3-pin bidirectional DAT/SE0 signaling mode.

NOTE: The device does not support 3-wire bidirectional signaling using DP/DM signals.

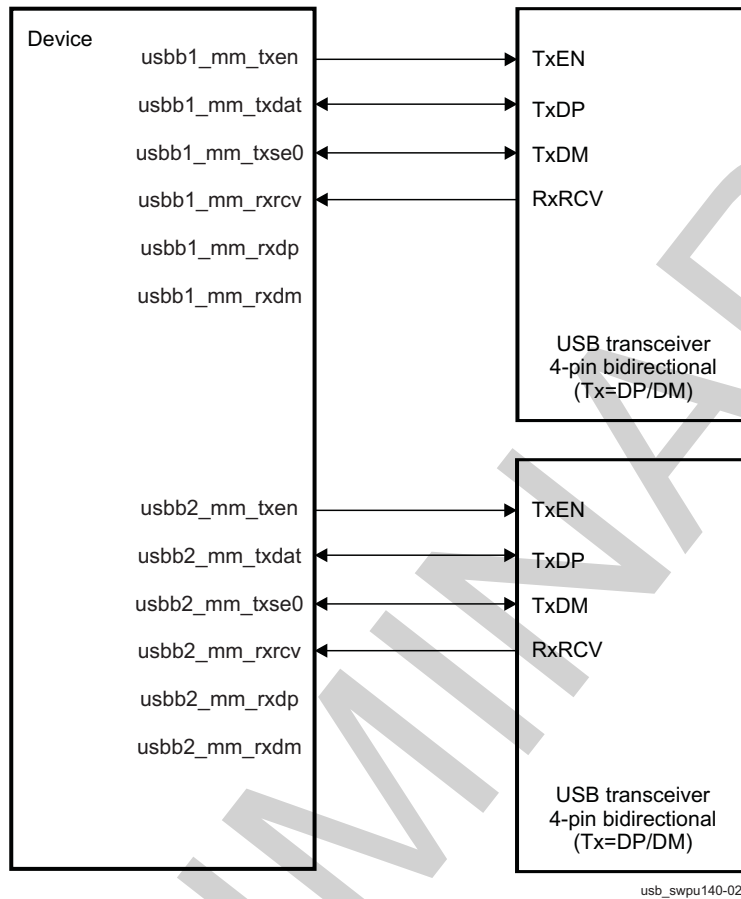
[Figure 24-242](#) shows a USB port using DAT/SE0 encoding.

Figure 24-242. 3-Pin Bidirectional Using DAT/SE0 Signaling

The signaling described in [Table 24-935](#) is used when a USB transceiver is connected to the device and is used in 4-pin bidirectional DP/DM signaling mode.

[Figure 24-243](#) shows a USB port using DP/DM encoding.

Figure 24-243. 4-Pin Bidirectional Using DP/DM Signaling



24.11.2.2.4 TLL Interface Configurations in Serial Modes

The HS USB host subsystem supports unidirectional and bidirectional TLL logic interfaces on its ports. The TLL modes enable glueless interconnect to the USB device port of another device without needing a costly transceiver.

Serial interface modes are FS or LS only. Transceiver interface is serial (its frequency is that of the actual USB line) and combinatorial (no clock is passed).

24.11.2.2.4.1 Unidirectional TLL Serial Modes

The 6-pin TLL configurations are mirror images of the 6-pin transceiver configurations previously discussed. The same signals are mapped on the same physical pins, but in opposite directions.

Two possible modes exist, depending on the TX data encoding used by the external device.

Figure 24-244 shows an external device using DAT/SE0 encoding.

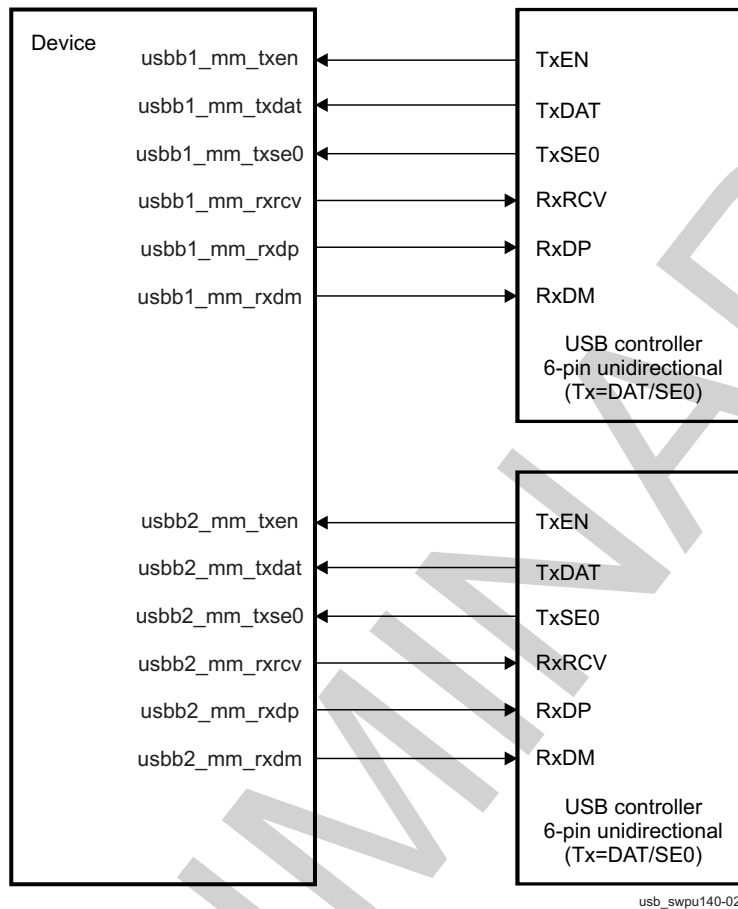
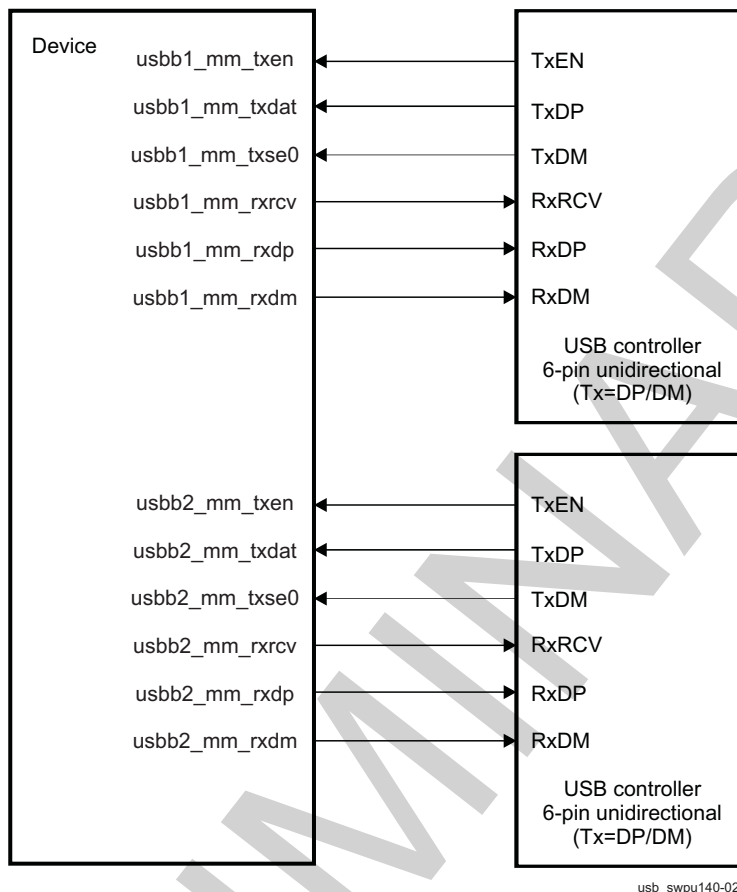
Figure 24-244. 6-Pin Unidirectional TLL Using DAT/SE0 Signaling

Figure 24-245 shows an external device using DP/DM encoding.

Figure 24-245. 6-Pin Unidirectional TLL Using DP/DM Signaling



24.11.2.2.4.2 Bidirectional TLL Serial Modes

The 3-pin/4-pin TLL configurations are mirror images of the 3-pin/4-pin transceiver configurations previously discussed. The same signals are mapped on the same physical pins, but in opposite directions (bidirectional lines remain bidirectional).

Two possible modes exist, depending on the TX data encoding used by the external device.

Figure 24-246 shows an external device using DAT/SE0 encoding.

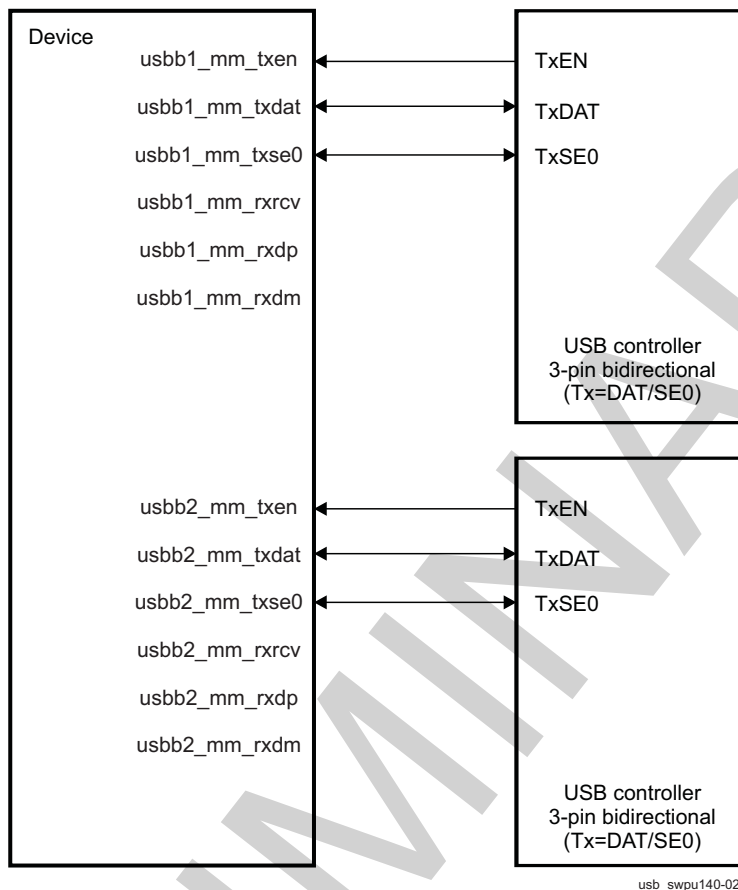
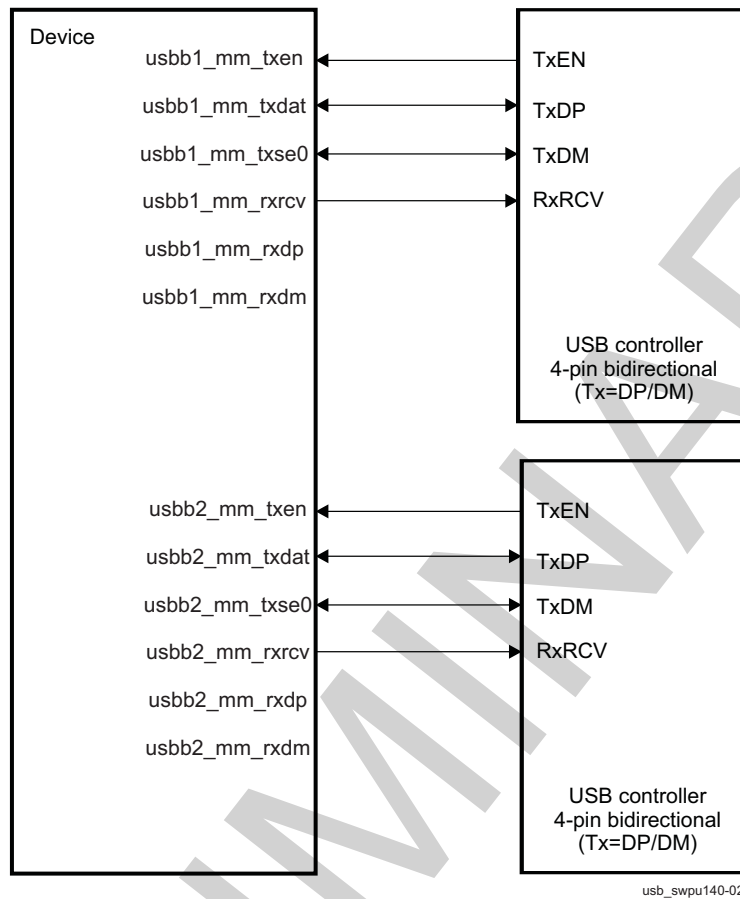
Figure 24-246. 3-Pin Bidirectional TLL Using DAT/SE0 Signaling

Figure 24-247 shows an external device using DP/DM encoding.

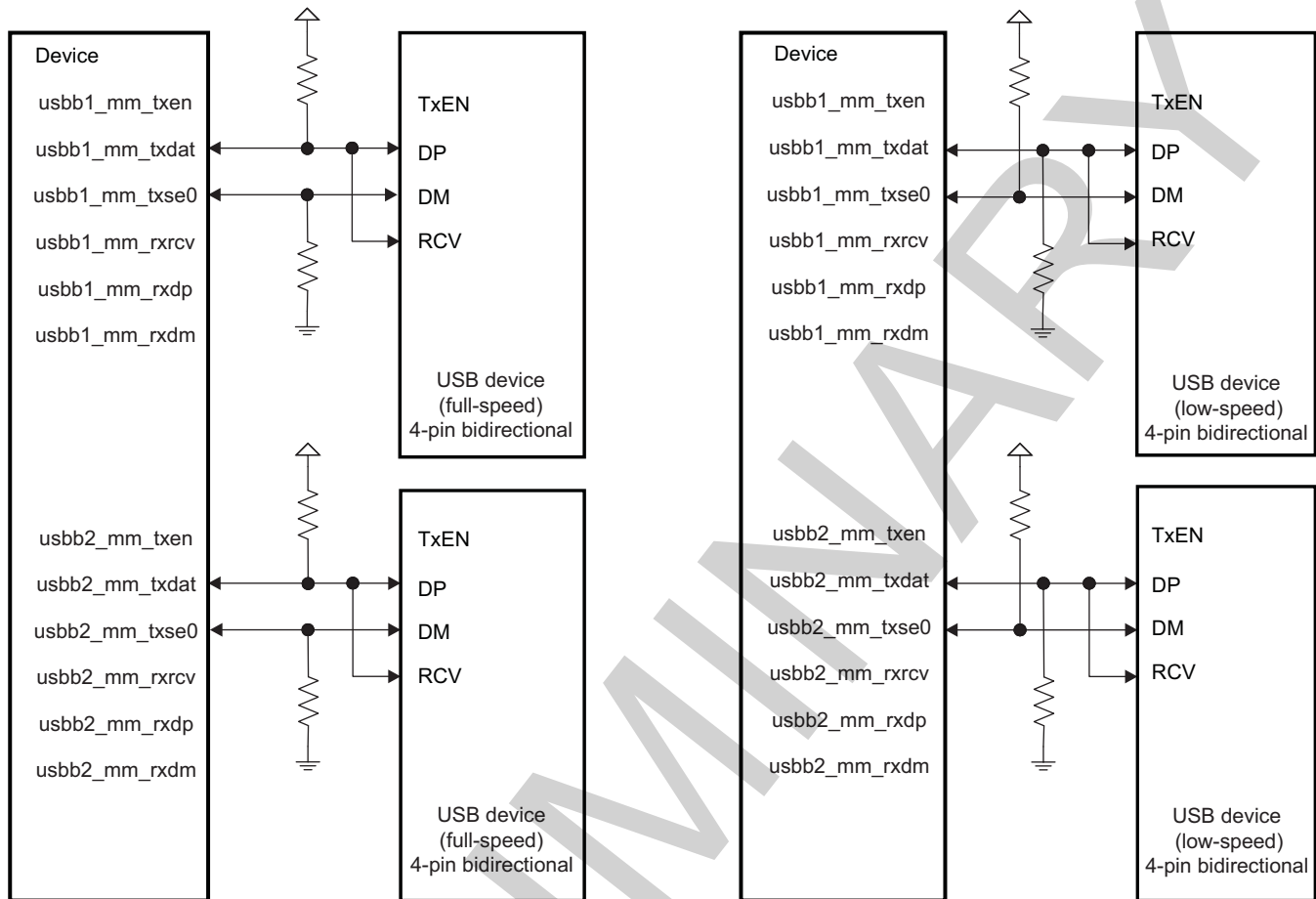
Figure 24-247. 4-Pin Bidirectional TLL Using DP/DM Signaling



The 2-pin TLL configurations have unique specifications:

- They require pullups/pulldowns to operate, because the bidirectional lines are not driven at all times like the other serial transceiver interfaces described previously. The connection of pull resistors depends on the speed of the controller.
- The module supports explicit 2-pin TLL modes, with DAT/SE0 or DP/DM encoding.
- Non-TLL modes (that is, transceiver configuration mode) can be used to implement the 2-pin functionality, using a specific connectivity.

Figure 24-248 shows a USB port using DP/DM encoding.

Figure 24-248. 2-Pin Bidirectional TLL Using DP/DM Encoding, With 4-Pin Bidirectional USB Device

usb_swpu140-026

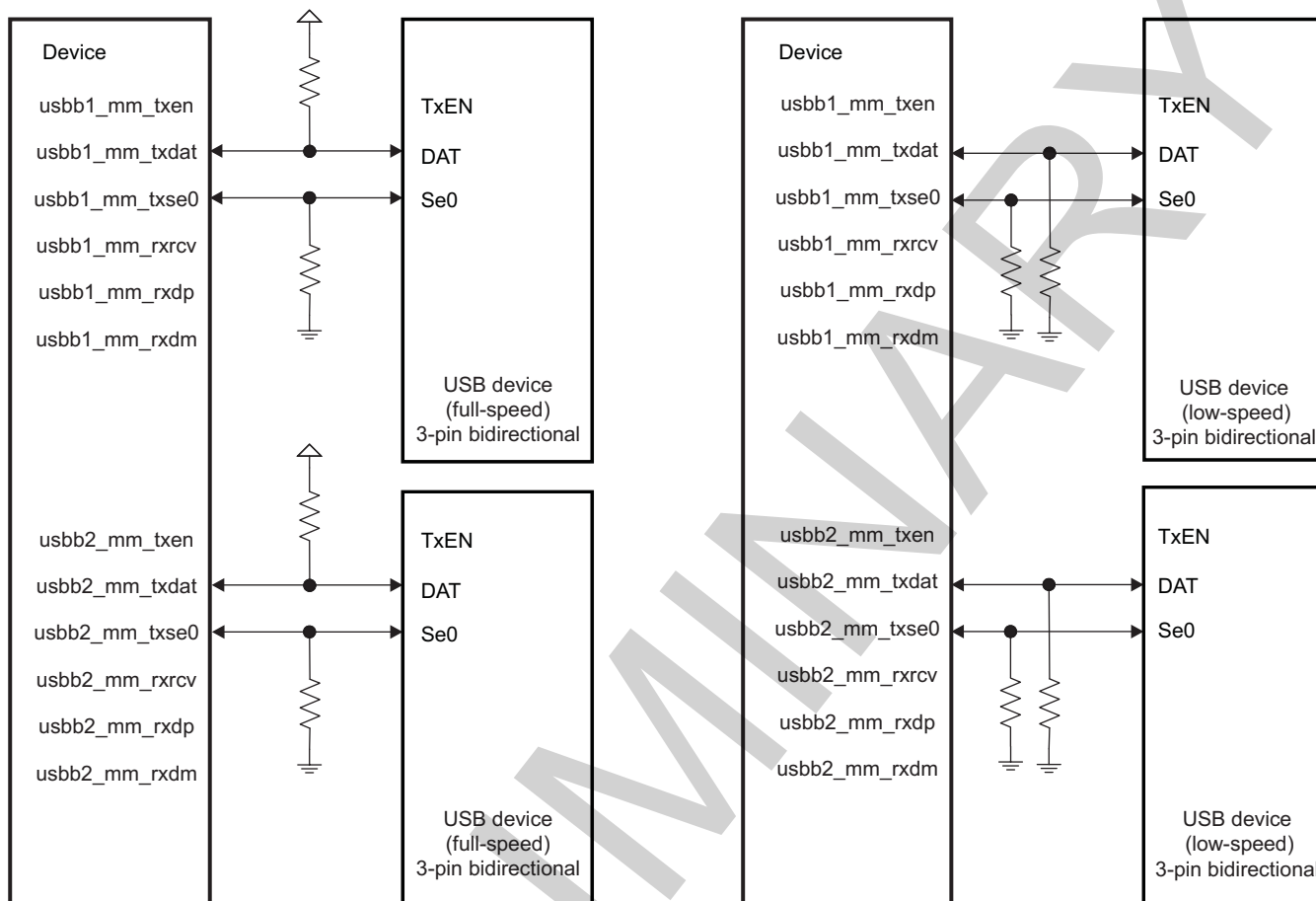
Table 24-936 shows the pullup/pulldown configuration for DP/DM encoding.

Table 24-936. Pullup/Pulldown Configuration for DP/DM Encoding

| | Nonconnected Device (Any Speed) | Connected LS Device | Connected FS Device |
|----|------------------------------------|------------------------|------------------------|
| DP | Pulldown | Pulldown | Pullup |
| DM | Pulldown | Pullup | Pulldown |

Figure 24-249 shows a USB port using DAT/SE0 encoding.

Figure 24-249. 2-Pin Bidirectional TLL Using DAT/SE0 Encoding, With 3-Pin Bidirectional USB Device



usb_swpu140-027

Table 24-937 shows the pullup/pulldown configuration for DAT/SE0 encoding.

Table 24-937. Pullup/Pulldown Configuration for DAT/SE0 Encoding

| | Nonconnected Device (Any Speed) | Connected LS Device | Connected FS Device |
|-----|------------------------------------|------------------------|------------------------|
| DAT | Pulldown | Pulldown | Pullup |
| SE0 | Pullup | Pulldown | Pulldown |

24.11.2.2.5 Interface Description in Serial Modes

Table 24-938 describes the I/O of the HS USB host subsystem serial interfaces.

Table 24-938. I/O Description

| Signal Name | I/O ⁽¹⁾ | Description | Value at Reset |
|--|--------------------|--|----------------|
| Multiple-Mode FS/LS Serial Interface: Port 1 | | | |
| usbb1_mm_txse0 | I/O | SE0 function in 3-pin bidirectional DAT/SE0 mode | 0 |
| | I/O | DM function in 4-pin bidirectional DP/DM mode | |
| | O | SE0 output in 6-pin unidirectional DAT/SE0 mode | |
| | O | DM output in 6-pin unidirectional DP/DM mode | |
| | I/O | SE0-TLL in 2-/3-pin bidirectional DAT/SE0 TLL mode | |
| | I/O | DM-TLL in 2-/4-pin bidirectional DP/DM TLL mode | |
| | I | SE0-TLL input in 6-pin unidirectional DAT/SE0 TLL mode | |
| | I | DM-TLL input in 6-pin unidirectional DP/DM TLL mode | |
| usbb1_mm_txdat | I/O | DAT function in 3-pin bidirectional DAT/SE0 mode | Unknown |
| | I/O | DP function in 4-pin bidirectional DP/DM mode | |
| | O | DAT output in 6-pin unidirectional DAT/SE0 mode | |
| | O | DP output in 6-pin unidirectional DAT/SE0 mode | |
| | I/O | DAT-TLL in 2-/3-pin bidirectional DAT/SE0 TLL mode | |
| | I/O | DP-TLL in 2-/4-pin bidirectional DP/DM TLL mode | |
| | I | DAT-TLL input in 6-pin unidirectional DAT/SE0 TLL mode | |
| | I | DP-TLL input in 6-pin unidirectional DP/DM TLL mode | |
| usbb1_mm_txen | O | Transmit enable in 3-pin bidirectional DAT/SE0 or 4-pin bidirectional DP/DM or 6-pin unidirectional modes | 1 |
| | I | Transmit enable in 3-pin bidirectional DAT/SE0 TLL or 4-pin bidirectional DP/DM TLL or 6-pin unidirectional TLL modes (not used in 2-pin bidirectional TLL modes) | |
| usbb1_mm_rxcv | I | Differential receiver signal input in 4-pin bidirectional DP/DM or 6-pin unidirectional modes (not used in 3-pin bidirectional DAT/SE0 mode) | Unknown |
| | O | Differential receiver signal output in 4-pin bidirectional DP/DM TLL or 6-pin unidirectional TLL modes (not used in 3-pin bidirectional DAT/SE0 TLL or 2-pin bidirectional TLL modes) | |
| usbb1_mm_rxdp | I | Single-ended DP receiver signal input in 6-pin unidirectional modes (not used in 3-pin bidirectional DAT/SE0 or 4-pin bidirectional DP/DM modes) | Unknown |
| | O | Single-ended DP receiver signal output in 6-pin unidirectional TLL modes (not used in 3-pin bidirectional DAT/SE0 TLL or 4-pin bidirectional DP/DM TLL or 2-pin bidirectional TLL modes) | |
| usbb1_mm_rxdm | I | Single-ended DM receiver signal input in 6-pin unidirectional TLL modes (not used in 3-pin bidirectional DAT/SE0 or 4-pin bidirectional DP/DM or 2-pin bidirectional TLL modes) | Unknown |
| | O | Single-ended DM receiver signal output in 6-pin unidirectional TLL modes (not used in 3-pin bidirectional DAT/SE0 TLL or 4-pin bidirectional DP/DM TLL or 2-pin bidirectional TLL modes) | |
| Multiple-Mode FS/LS Serial Interface: Port 2 | | | |
| usbb2_mm_txse0 | I/O | SE0 function in 3-pin bidirectional DAT/SE0 mode | 0 |
| | I/O | DM function in 4-pin bidirectional DP/DM mode | |
| | O | SE0 output in 6-pin unidirectional DAT/SE0 mode | |
| | O | DM output in 6-pin unidirectional DP/DM mode | |
| | I/O | SE0-TLL in 2-/3-pin bidirectional DAT/SE0 TLL mode | |
| | I/O | DM-TLL in 2-/4-pin bidirectional DP/DM TLL mode | |
| | I | SE0-TLL input in 6-pin unidirectional DAT/SE0 TLL mode | |
| | I | DM-TLL input in 6-pin unidirectional DP/DM TLL mode | |
| usbb2_mm_txdat | I/O | DAT function in 3-pin bidirectional DAT/SE0 mode | Unknown |
| | I/O | DP function in 4-pin bidirectional DP/DM mode | |
| | O | DAT output in 6-pin unidirectional DAT/SE0 mode | |
| | O | DP output in 6-pin unidirectional DAT/SE0 mode | |

⁽¹⁾ I = Input; O = Output

Table 24-938. I/O Description (continued)

| Signal Name | I/O ⁽¹⁾ | Description | Value at Reset |
|---|--------------------|---|----------------|
| Multiple-Mode FS/LS Serial Interface: Port 1 | | | |
| | I/O | DAT-TLL in 2-/3-pin bidirectional DAT/SE0 TLL mode | |
| | I/O | DP-TLL in 2-/4-pin bidirectional DP/DM TLL mode | |
| | I | DAT-TLL input in 6-pin unidirectional DAT/SE0 TLL mode | |
| | I | DP-TLL input in 6-pin unidirectional DP/DM TLL mode | |
| usbb2_mm_txen | O | Transmit enable in 3-pin bidirectional DAT/SE0 or 4-pin bidirectional DP/DM or 6-pin unidirectional modes | 1 |
| | I | Transmit enable in 3-pin bidirectional DAT/SE0 TLL or 4-pin bidirectional DP/DM TLL or 6-pin unidirectional TLL modes (not used in 2-pin bidirectional TLL modes) | |
| usbb2_mm_rxcv | I | Differential receiver signal input in 4-pin bidirectional DP/DM or 6-pin unidirectional modes (not used in 3-pin bidirectional DAT/SE0 mode) | Unknown |
| | O | Differential receiver signal output in the 4-pin bidirectional DP/DM TLL or 6-pin unidirectional TLL modes (not used in 3-pin bidirectional DAT/SE0 TLL or 2-pin bidirectional TLL modes) | |
| usbb2_mm_rxdp | I | Single-ended DP receiver signal input in 6-pin unidirectional modes (not used in 3-pin bidirectional DAT/SE0 or 4-pin bidirectional DP/DM modes) | Unknown |
| | O | Single-ended DP receiver signal output in 6-pin unidirectional TLL modes (not used in 3-pin bidirectional DAT/SE0 TLL or 4-pin bidirectional DP/DM TLL or 2-pin bidirectional TLL modes) | |
| usbb2_mm_rxdm | I | Single-ended DM receiver signal input in 6-pin unidirectional TLL modes (not used in 3-pin bidirectional DAT/SE0 or 4-pin bidirectional DP/DM or 2-pin bidirectional TLL modes) | Unknown |
| | O | Single-ended DM receiver signal output in 6-pin unidirectional TLL modes (not used in 3-pin bidirectional DAT/SE0 TLL or 4-pin bidirectional DP/DM TLL or 2-pin bidirectional TLL modes) | |

NOTE: ULPI (PHY) interfaces and ULPI TLL interfaces cannot be used together: either the ULPI (PHY) interfaces or the ULPI TLL interfaces are selected

24.11.2.3 HSIC Interface

The HS USB host subsystem supports the configurations with the HSIC interfaces shown in Figure 24-250.

Figure 24-250. HSIC Interface

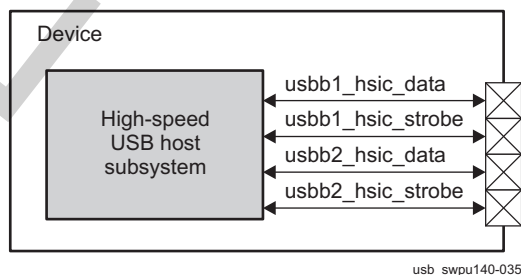


Table 24-939 describes the I/O of the HSIC interface of the HS USB host subsystem.

Table 24-939. HSIC Interface

| Signal Name | I/O ⁽¹⁾ | Description | Reset Value |
|--------------------|--------------------|-------------------|-------------|
| HSUSB HSIC1 | | | |
| usbb1_hsic_data | I/O | HS interchip data | Unknown |

⁽¹⁾ I = Input; O = Output

Table 24-939. HSIC Interface (continued)

| Signal Name | I/O ⁽¹⁾ | Description | Reset Value |
|--------------------|--------------------|---------------------|-------------|
| usbb1_hsic_strobe | I/O | HS interchip strobe | Unknown |
| HSUSB HSIC2 | | | |
| usbb2_hsic_data | I/O | HS interchip data | Unknown |
| usbb2_hsic_strobe | I/O | HS interchip strobe | Unknown |

24.11.3 HS Multiport USB Host Subsystem Integration

This section describes the integration of the HS USB host subsystem, including information about clocks, resets, and hardware requests.

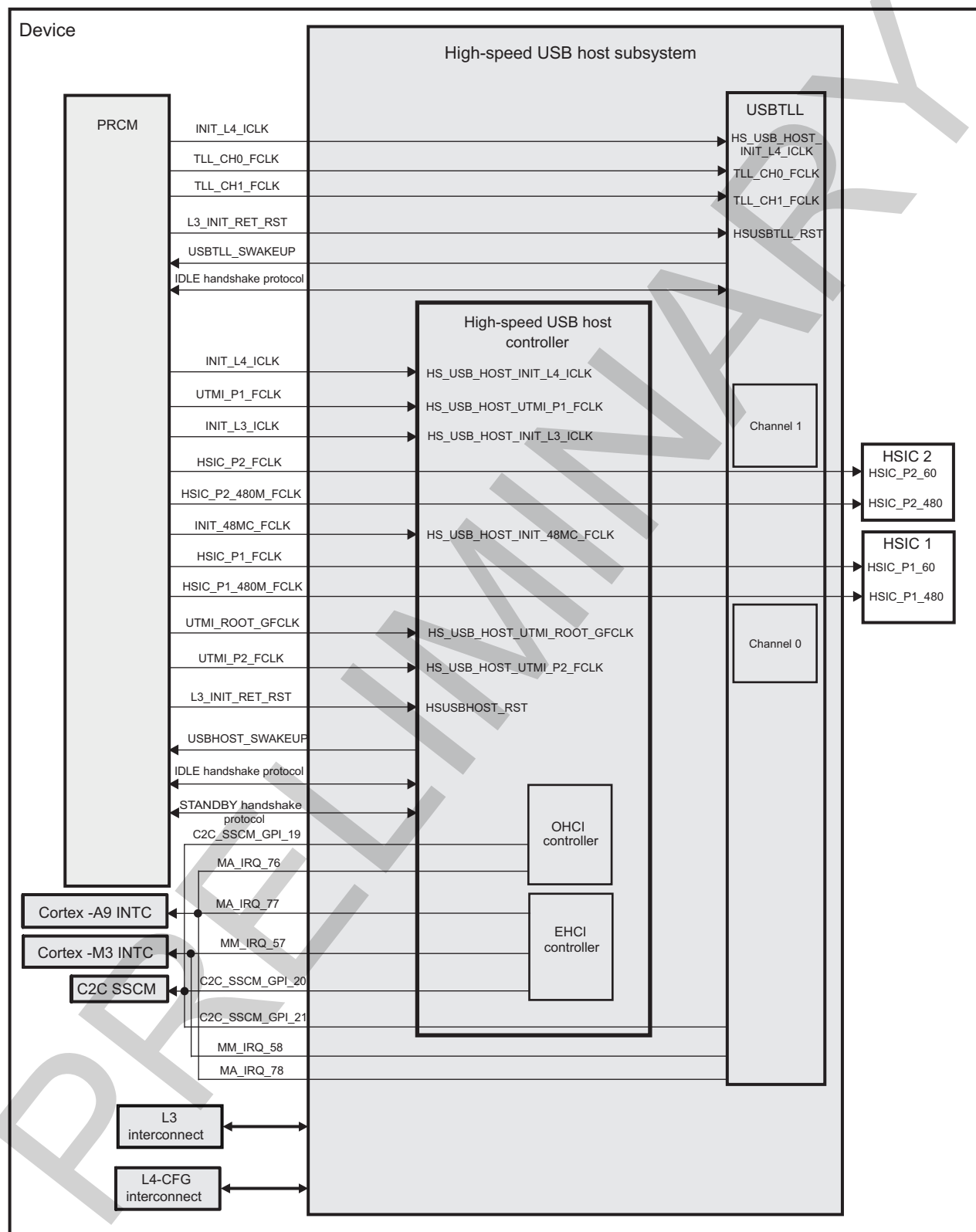
The USB host controller module includes other modules and additional logic attached to the UTMI/ULPI ports. The HS USB host controller is connected to the L3 interconnect master (initiator) and L4_CFG interconnect slave (target) interfaces.

The elements of the USB HS host subsystem are:

- The multiport USB host controller. Each port uses one of the following modes:
 - ULPI, to a ULPI PHY (typically, off-chip)
 - UTMI, to a local UTMI (typically, on-chip) PHY or emulation of a PHY
- A local phase-locked loop (PLL), able to provide the USB-grade 48-, 60-, 480-MHz clocks
- Two TLL channels, bundled inside a USBTLL module. Each HS TLL channel can be seen as emulating a pair of back-to-back PHYs, and has:
 - A UTMI port, connected to a controller port (the host, in this case)
 - A ULPI port, connected to a (typically, off-chip) ULPI controller (peripheral, in this case)
- Two HSIC DFEs. The DFE plugs into the UTMI port of an HSIC-capable controller (the host, in this case), and controls HSIC-capable bidirectional I/O drivers driving the HSIC lines (strobe/data).

Figure 24-251 shows the HS USB subsystem integration.

Figure 24-251. HS USB Subsystem Integration



usb_swpu140-028

Table 24-940 through Table 24-942 summarize the integration of the module in the device.

Table 24-940. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| HSUSBHOST | PD_L3_INIT | L3 L4_CFG |
| HSUSBTLL | PD_L3_INIT | |

Table 24-941. Clocks and Resets

| Clocks | | | | |
|-----------------|-----------------------------|---------------------------------|----------------------|--|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| HSUSBHOST | HS_USB_HOST_INIT_L4_ICLK | INIT_L4_ICLK | PRCM | L4 interconnect enable signal for the slave interface on L4 (see CD_L3_INIT Clock Source , in Chapter 3, Power, Reset, and Clock Management) |
| | HS_USB_HOST_INIT_L3_ICLK | INIT_L3_ICLK | PRCM | L3 interconnect clock for the L3 master port interface (see CD_L3_INIT Clock Domain , in Chapter 3, Power, Reset, and Clock Management) |
| | HSIC_P2_480 | HSIC_P2_480M_FCLK | PRCM | 480-MHz clock for the USB HSIC (see CD_L3_INIT Clock Domain in Chapter 3, Power, Reset, and Clock Management) |
| | HS_USB_HOST_UTMI_P1_FCLK | UTMI_P1_FCLK/usbb1_ulpi phy_clk | PRCM/external PHY IC | Port 1 UTMI interface functional clock (see CD_L3_INIT Clock Domain , and CM1_USB Clock Generator , in Chapter 3, Power, Reset, and Clock Management) |
| | HSIC_P1_60 | HSIC_P1_FCLK | PRCM | 60-MHz clock for the USB HSIC (see CD_L3_INIT Clock Domain , in Chapter 3, Power, Reset, and Clock Management) |
| | HSIC_P1_480 | HSIC_P1_480M_FCLK | PRCM | 480-MHz clock for the USB HSIC (see CD_L3_INIT Clock Domain in Chapter 3, Power, Reset, and Clock Management) |
| | HS_USB_HOST_INIT_48MC_FCLK | INIT_48MC_FCLK | PRCM | 48-MHz functional clock for OHCI and EHCI (see CD_L3_INIT Clock Domain , in Chapter 3, Power, Reset, and Clock Management) |
| | HSIC_P2_60 | HSIC_P2_FCLK | PRCM | 60-MHz clock for the USB HSIC (see CD_L3_INIT Clock Domain , in Chapter 3, Power, Reset, and Clock Management) |
| | HS_USB_HOST_UTMI_ROOT_GFCLK | UTMI_ROOT_GFCLK | PRCM | 60-MHz root hub clock (see CD_L3_INIT Clock Domain , in Chapter 3, Power, Reset, and Clock Management) |
| HSUSBTLL | HS_USB_HOST_UTMI_P2_FCLK | UTMI_P2_FCLK/usbb2_ulpi phy_clk | PRCM/external PHY IC | Port 2 UTMI interface functional clock (see CD_L3_INIT Clock Domain , and CM1_USB Clock Generator , in Chapter 3, Power, Reset, and Clock Management) |
| | HS_USB_HOST_INIT_L4_ICLK | INIT_L4_ICLK | PRCM | L4 interconnect enable signal for the slave interface on L4 (see CD_L3_INIT Clock Source , in Chapter 3, Power, Reset, and Clock Management) |
| | TLL_CH0_FCLK | TLL_CH0_FCLK | PRCM | Functional clock for channel 0 (see CD_L3_INIT Clock Domain , in Chapter 3, Power, Reset, and Clock Management) |
| | TLL_CH1_FCLK | TLL_CH1_FCLK | PRCM | Functional clock for channel 1 (see CD_L3_INIT Clock Domain , in Chapter 3, Power, Reset, and Clock Management) |

Table 24-941. Clocks and Resets (continued)

| Resets | | | | |
|-----------------|-------------------------|--------------------|--------|---|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| HSUSBHOST | HSUSBHOST_RST | L3_INIT_RET_RST | PRCM | The signal resets the HSUSBHOST module. |
| HSUSBTLL | HSUSBTLL_RST | L3_INIT_RET_RST | PRCM | The signal resets the HSUSBTLL module. |

Table 24-942. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|----------------|---|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| HSUSBHOST | HSUSB_EHCI_IRQ | MA_IRQ_77 | Cortex-A9 INTC | Destination is Cortex-A9 interrupt controller (INTC). |
| | HSUSB_OHCI_IRQ | MA_IRQ_76 | Cortex-A9 INTC | Destination is Cortex-A9 INTC. |
| | HSUSB_EHCI_IRQ | MM_IRQ_57 | Cortex-M3 INTC | Destination is Cortex-M3 INTC. |
| | HSUSB_OHCI_IRQ | C2C_SSCM_GPI_19 | C2C SSCM | Destination is C2C SSCM. |
| | HSUSB_EHCI_IRQ | C2C_SSCM_GPI_20 | C2C SSCM | Destination is C2C SSCM. |
| HSUSBTLL | HSUSB_TLL_IRQ | MA_IRQ_78 | Cortex-A9 INTC | Destination is Cortex-A9 INTC. |
| | HSUSB_TLL_IRQ | MM_IRQ_58 | Cortex-M3 INTC | Destination is Cortex-M3 INTC. |
| | HSUSB_TLL_IRQ | C2C_SSCM_GPI_21 | C2C SSCM | Destination is C2C SSCM. |

The HS USB host controller and TLL module are attached to the L3_INIT_RET_RST reset domain. The L3_INIT_RET_RST signal resets the HS USB host controller and TLL module (see [Chapter 3, Power, Reset, and Clock Management](#)).

24.11.4 HS Multiport USB Host Subsystem Functional Description

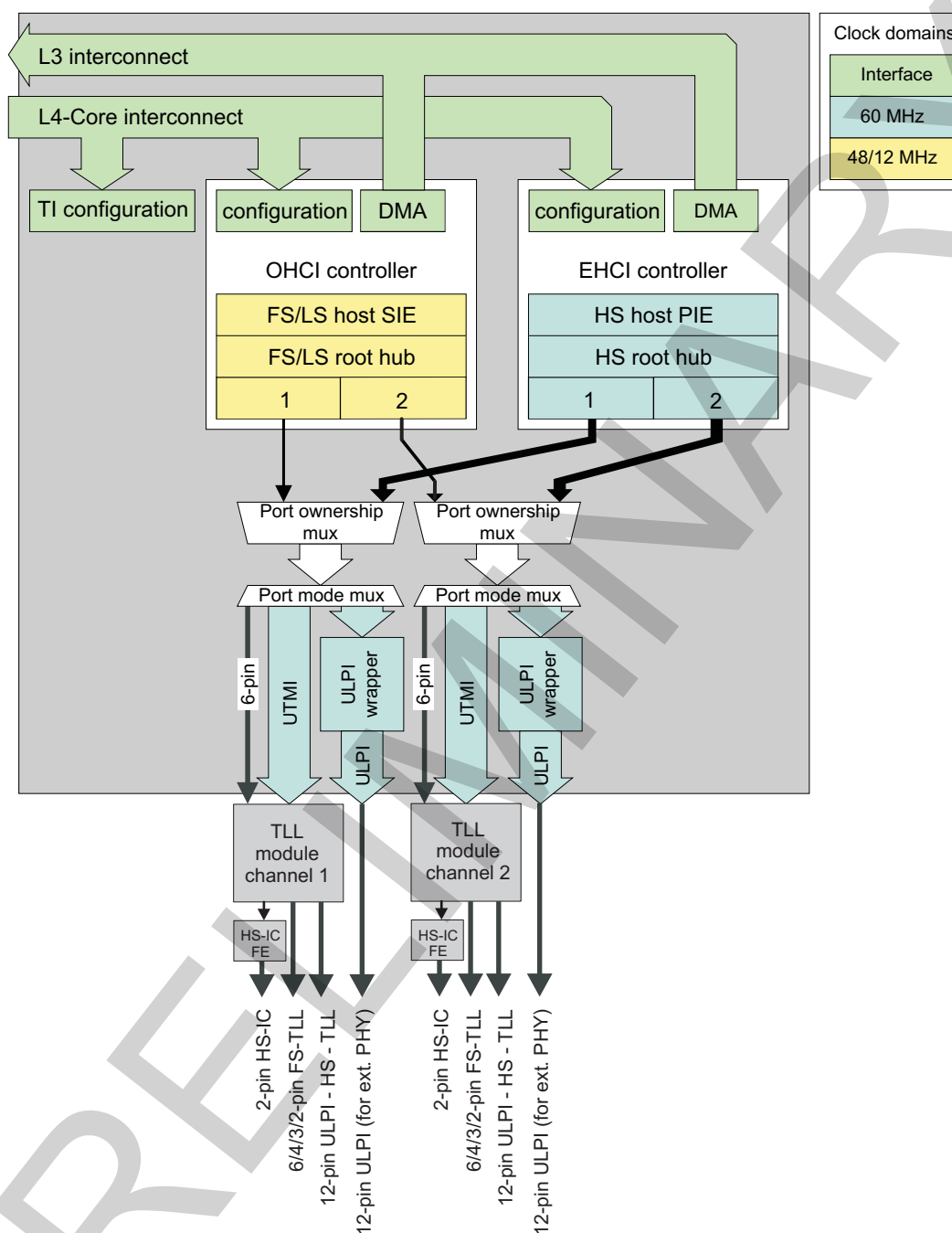
This section describes the functionality of the HS USB host subsystem by describing the HS USB host controller, USBTLL module.

24.11.4.1 USB Host Controller Functionality

The full details of the standard OHCI and EHCI host controller APIs (implemented by the current module) are not repeated here. For more information, see the following specifications:

- *Open Host Controller Interface (OHCI) Specification for USB Release 1.0a*
- *Enhanced Host Controller Interface (EHCI) Specification for USB Release 1.1*

[Figure 24-252](#) is an overview of the HS USB host controller internal architecture. It contains two independent, 3-port host controllers (OHCI and EHCI) that operate in parallel; however, only two physical ports are mapped in the device processor.

Figure 24-252. HS USB Host Controller Architecture

usb_swpu140-029

24.11.4.1.1 HS USB Host Controller Software Reset

The HS USB host controller has its own software-reset function through the [UHH_SYSCONFIG\[0\] SOFTRESET](#) bit. Setting this bit to 0x1 resets the HS USB host controller. The bit value of 0x1 remains until the reset completes. When the software reset completes, the SOFTRESET bit is automatically set to 0x0 and has the same effect as the hardware reset.

24.11.4.1.2 HS USB Host Controller Power Management

The USB protocol defines power-saving modes, where clocks can be shut down. The host asynchronously detects ULPI/UTMI events and asserts the wake-up output, which causes the clocks to restart.

To reduce dynamic power consumption, an efficient idle scheme in the device is based on:

- Efficient local autoclock gating for each module
- Implementation of control sideband signals between the PRCM module and each module

This enhanced idle control allows clocks to be activated and deactivated safely without complex software intervention. In both cases, the HS USB host controller power management is applied only to the interface clock domain.

The HS USB host controller has master (initiator) and slave (target) interfaces:

- As an initiator, the HS USB host controller implements the standby handshake protocol to inform the PRCM module when it enters standby mode and does not generate traffic on the interconnect.
- As a target, the HS USB host controller implements the IDLE handshake protocol to allow the PRCM module requiring it to enter idle mode.

24.11.4.1.2.1 Standby Handshake Protocol

The HS USB host controller can go into standby mode, in which case it stops generating transactions on the interconnect. To save power, the module standby leads the PRCM module to disable the USB clocks.

The HS USB host controller has an Mstandby/Mwait handshake mechanism with the PRCM module (see [Chapter 3, Power, Reset, and Clock Management](#)).

The module is ready to enter standby mode (indicated by the Mstandby signal to the PRCM module asserted) when there is no USB activity and the module is idle. It means:

- The module is committed not to start any new transaction on its master interface.
- The whole module is idle and, therefore, the power manager can start the procedure to turn off the interface clock, if needed. This procedure must be implemented using the slave power-management protocol.

The handshake mechanism lets the module go into standby mode based on the [UHH_SYSCONFIG\[5:4\] STANDBYMODE](#) bit field.

[Table 24-943](#) lists the settings of standby mode.

Table 24-943. HS USB Host Controller Standby Mode Settings

| MIDLEMODE Value | Selected Mode | Description |
|-----------------|---------------|--|
| 0x0 | Force-standby | The HS USB host controller enters standby mode unconditionally (Mstandby is asserted unconditionally). |
| 0x1 | No-standby | The HS USB host controller never enters standby mode (Mstandby is never asserted). |
| 0x2 | Smart-standby | The HS USB host controller is ready to enter standby mode (Mstandby is asserted) when there is no more activity on the USB master interface of the interconnect. |

24.11.4.1.2.2 IDLE Handshake Protocol

The PRCM module handles an IDLE handshake protocol for the HS USB host controller. The IDLE handshake protocol lets the PRCM module requiring the HS USB host controller to enter idle mode. Although this handshake is completely hardware and out of any software control, the way in which the HS USB host controller acknowledges the PRCM IDLE request is configurable through the [UHH_SYSCONFIG\[3:2\] SIDLEMODE](#) bit field. [Table 24-944](#) lists the settings of SIDLEMODE and the related acknowledgment modes.

Table 24-944. HS USB Host Controller SIDLEMODE Settings

| SIDLEMODE Value | Selected Mode | Description |
|------------------------|----------------------|--|
| 0x0 | Force-idle | The HS USB host controller acknowledges unconditionally the IDLE request from the PRCM module, regardless of its internal operations. Because such a mode does not prevent the loss of data when the clock is switched off, the mode must be used carefully. |
| 0x1 | No-idle | The HS USB host controller never acknowledges any IDLE request from the PRCM module. This mode is safe from a module point of view because it ensures the clocks remain active; however, it is not efficient from a power-saving perspective because it does not allow the PRCM output clock to be shut off, and thus the power domain to be set to a lower power state. |
| 0x2 | Smart-idle | The HS USB host controller acknowledges the IDLE request basing its decision on its internal activity. Namely, the acknowledge signal is asserted only when all pending transactions, IRQs, or DMA requests are treated. This is the best approach for an efficient system power management. |
| 0x3 | Smart-idle + wakeup | The HS USB host controller enters smart mode with asynchronous (master) wakeup enabled. |

24.11.4.1.2.3 Wake-Up Request

The wake-up request signal USBHOST_SWAKEUP is generated by the HS USB host controller to the PRCM module.

24.11.4.1.3 HS USB Host Controller Save and Restore

The hardware context of the USB HS host can be frozen, saved, and restored.

The SAR mechanism extracts the hardware context of the HS USB host controller (after all USB activity is suspended) before switching off (saving), saves it to an external always-on memory, and reinjects it later after the module is switched on again and reset (restored) seamlessly for the USB. For more information, see [Chapter 3, Power, Reset, and Clock Management](#).

24.11.4.1.4 HS USB Host Controller Port Status

The USB port status is given through the [UHH_HOSTCONFIG](#)[8] P1_CONNECT_STATUS and [UHH_HOSTCONFIG](#)[9] P2_CONNECT_STATUS bits. The default value of these bits is 0x0 indicating that peripheral is disconnected.

24.11.4.1.5 HS USB Host Controller Burst Control

To avoid buffer underflow, bursts must be enabled by setting the [UHH_HOSTCONFIG](#)[4:2] bit field to 0x7, and the [UHH_HOSTCONFIG](#)[5] ENA_INCR_ALIGN bit to 1.

24.11.4.1.6 OHCI Implementation Specifications

Some features of the OHCI API are optional and/or implementation-specific. The choices made in the current implementation, the HS USB host controller, are described in the following list and are reflected in the register descriptions (see [Section 24.11.6.5, OHCI Registers](#)). For all standard features, see the *Open Host Controller Interface (OHCI) Specification for USB Release 1.0a*.

- [HCFMINTERVAL](#)[30:16] FSMPS bit field (FullSpeedMaxPacketSize) = 0x0000: The host stops scheduling new packets 0 bit times before the end of the frame (that is, by default, there is no scheduling overrun protection). To be updated by the software driver.
- [HCRHDESCRIPTORA](#)[7:0] NDP bit field (NumberDownstreamPorts) = 0x03 = three ports
- [HCRHDESCRIPTORA](#)[9] NPS bit (NoPowerSwitching) = 0: Ports are power-switched by default.
- [HCRHDESCRIPTORA](#)[8] PSM bit (PowerSwitchingMode) = 1: Per-port power switching is supported, although PPCM default setup has all ports controlled globally.
- [HCRHDESCRIPTORA](#)[31:24] POTPG bit field (PowerOnToPowerGood) = 0x0A = 10: Power ramp-up time is 10 x 2 ms = 20 ms.
- [HCRHDESCRIPTORB](#)[15:0] DR bit field (DeviceRemovable) = 0x0000: By default, no nonremovable devices (that is, devices attached to any of the ports) are removable.

- [HCRHDESCRIPTORB](#)[31:16] PPCM bit field (PortPowerControlMask) = 0x0000: By default, all ports are affected only by global power control.

24.11.4.1.7 UTMI Interface

The host controller supports two ports. Each host controller port is configured to be in UTMI or ULPI mode (see the [UHH_HOSTCONFIG](#)[21:16] Px_MODE bit field).

In UTMI mode, a port has its UTMI signal set broadcasting the outgoing packets (from the host to the peripherals) and gathering the incoming ones (from the addressed peripheral to the host). ULPI signals for that port are undefined/don't care on all ports.

The UTMI ports between the HS USB host controller and the USBTLL module are on-chip and remain invisible.

UTMI transparent mode is used to connect with the HSIC, (see the [UHH_HOSTCONFIG](#)[17:16] P1_MODE or [UHH_HOSTCONFIG](#)[17:16] P2_MODE bit fields).

24.11.4.1.8 ULPI Interface

The host supports two ports. Each host controller port is configured to be either in UTMI or in ULPI mode (see the [UHH_HOSTCONFIG](#)[17:16] P1_MODE or [UHH_HOSTCONFIG](#)[17:16] P2_MODE bit fields).

In ULPI mode, a port has its ULPI signal set broadcasting the outgoing packets (that is, from the host to the peripherals) and gathering the incoming packets (that is, from the addressed peripheral to the host). UTMI signal sets are undefined/don't care on all ports.

NOTE: The ULPI clock (part of the 12-wire ULPI interface) is expected to be routed by the system from the ULPI CLK input I/O pad to the clock input used by all HS modes (ULPI and UTMI) for the current port.

24.11.4.2 USBTLL Module Functionality

24.11.4.2.1 USBTLL Software Reset

Writing 0x1 to the [USBTLL_SYSCONFIG](#)[1] SOFTRESET bit resets the USBTLL module. The bit value of 0x1 remains until the reset completes. When the software reset completes, the SOFTRESET bit is automatically set to 0x0 and has the same effect as the hardware reset.

24.11.4.2.2 USBTLL Power Management

The USB protocol defines power-saving modes, where clocks can be shut down.

24.11.4.2.2.1 IDLE Handshake Protocol

The PRCM module handles an IDLE handshake protocol for the USBTLL module. The IDLE handshake protocol lets the PRCM module require the HS USBTLL module to enter idle mode.

The way in which the HS USBTLL module acknowledges the PRCM IDLE request is configurable through the [USBTLL_SYSCONFIG](#)[4:3] SIDLEMODE bit field. [Table 24-945](#) lists related acknowledgment modes.

Table 24-945. HS USBTLL Module SIDLEMODE Settings

| SIDLEMODE Value | Selected Mode | Description |
|-----------------|---------------|---|
| 0x0 | Force-idle | The HS USB host controller acknowledges unconditionally the IDLE request from the PRCM module, regardless of its internal operations. |
| 0x1 | No-idle | The HS USB host controller never acknowledges any IDLE request from the PRCM module. |
| 0x2 | Smart-idle | The HS USB host controller acknowledges the IDLE request, basing its decision on its internal activity. |

24.11.4.2.3 USBTLL Save and Restore

The SAR mechanism extracts the hardware context of the USBTLL module (after all USB activity is suspended) before switching off (saving), saves it to an external always-on memory, and reinjects it later after the module is switched on again and reset (restored) seamlessly for the USB.

Hardware context of the USBTLL module is accessed through the USBTLL_SAR_CNTX_i[31:0] CNTX bit field.

The PRCM module enables the SAR mechanism for the USBTLL module. When set, the PRM module initiates the save and/or the restore sequences at the appropriate time. When not set, the USB host is treated as a standard module, and the save/restore sequences do not occur.

For more information, see [\[1\]](#).

[Table 24-946](#) lists the USBTLL registers affected by the SAR context.

NOTE: Because all addresses give access to the same physical register (that is, to the same piece of context), the ULPI registers with multiple accesses (write, set, clear) are listed only once in the table.

Table 24-946. USBTLL Registers Affected by the SAR Context

| Register Name | Comments on SAR Policy |
|------------------------------------|---------------------------------------|
| USBTLL_SYSCONFIG | Except the SOFTRESET bit (write-only) |
| USBTLL_IRQENABLE | — |
| TLL_SHARED_CONF | Except the FCLK_REQ bit |
| TLL_CHANNEL_CONF_i | Except the FLSLSTATE bit field |
| FUNCTION_CTRL_i | — |
| INTERFACE_CTRL_i | — |
| OTG_CTRL_i | — |
| USB_INT_EN_RISE_i | — |
| USB_INT_EN_FALL_i | — |
| USB_INT_STATUS_i | — |

24.11.4.2.4 USBTLL Channels and Ports

Following the same convention as UTMI and ULPI, the current specification is consistently PHY-centric (that is, directions are always given with respect to the transceiver emulated here by the TLL, and not with respect to the link controller): An input goes from the link controller to the TLL (transceiver emulator) (that is, it is an input for the USBTLL module). Reciprocally, an output goes from the TLL (transceiver) to the link controller (that is, it is an output for the USBTLL module).

By convention, the local link controller is the controller integrated on the same IC as the USBTLL module: This is the HS USB host controller in the device. The remote link controller is the other controller, located off-chip (that is, on another IC). One controller is always the USB host, the other is the USB peripheral, and they communicate through the USBTLL module.

A channel is defined as a independent USB path through the USBTLL module, which always converts the UTMI+ transceiver interface protocol coming from the local link controller (the HS USB host controller in the device). There are two channels of the USBTLL module in the device.

A USB port is a set of I/O signals that carry the data and control information from/to a USB line. Several port formats exist, with different capabilities. A channel has three ports. If the channel is active, two ports are active at the same time, depending on the configuration of the channel. The mode remains static throughout the USB operation.

24.11.4.2.5 USBTLL Channel Configuration

A channel configuration is a set of software settings that specifies the connection of two of the channel ports through the USBTLL module. USB data and control injected on one side (or port) comes out on the other side (or port) after a certain amount of processing, depending on the mode. [Table 24-947](#), lists the modes.

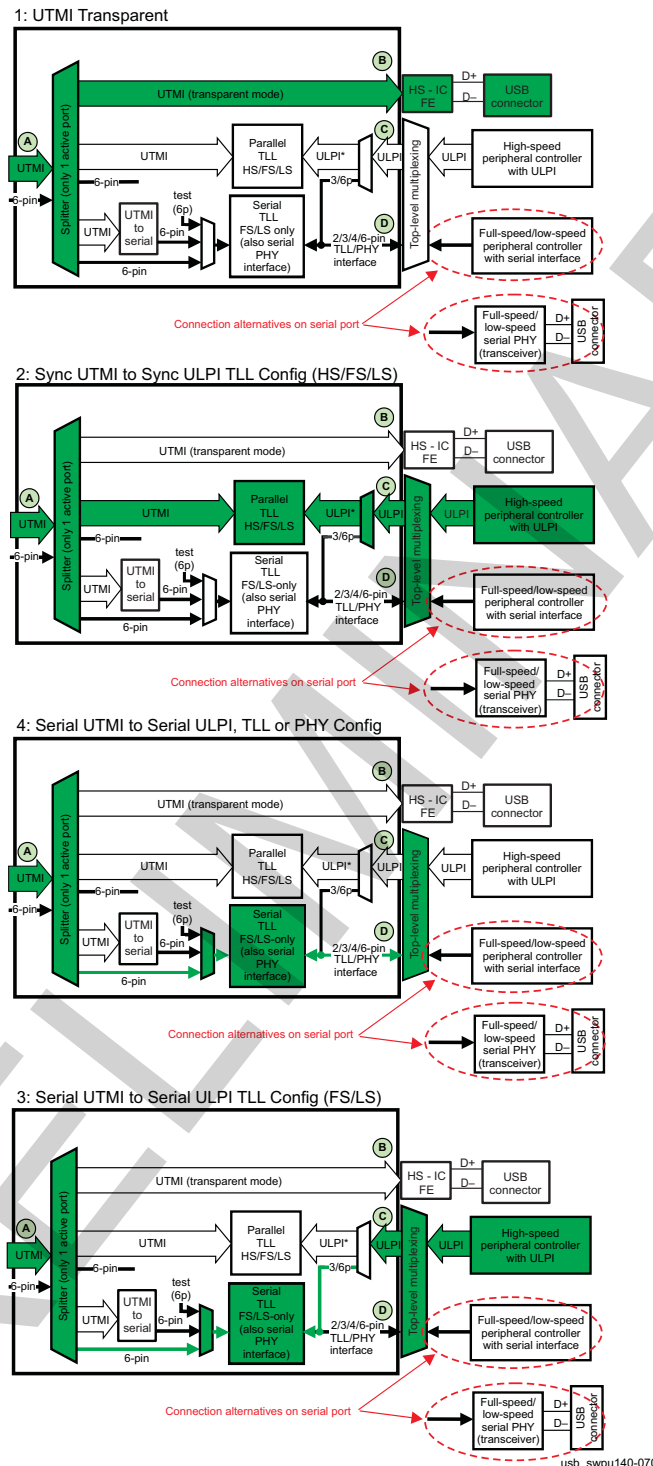
All configurations connect the PHY UTMI port (attached to the HS USB host controller) to one of the other two ports (attached to a variety of transceivers or controllers on the pad side).

[Table 24-947](#) describes the available modes and the software settings required for each. Channel *i* has the following settings:

- CHANMODE: [TLL_CHANNEL_CONF_i\[2:1\]](#) CHANMODE bit field
- FLSMODE: [TLL_CHANNEL_CONF_i\[27:24\]](#) FLSMODE bit field
- FLSSEIRIALMODE_3PIN/6PIN: Either the ULPI PHY-side [INTERFACE_CTRL_i\[1\]](#) FLSSEIRIALMODE_3PIN bit or the [INTERFACE_CTRL_i\[0\]](#) FLSSEIRIALMODE_6PIN bit (only one at a time can be set to 1)

Table 24-947. USBTLL Channel Configuration

| Configuration | Mode | CHANMODE | FLSMODE | Other Settings | Ports | Speed | Remote Port Connection |
|---------------|--------------------------------|----------|---------------------|------------------------------|-------|-------|--|
| 1 | UTMI transparent | 0 | N/A | – | A-B | – | UTMI transparent |
| 2 | ULPI synchronous TLL | 0 | N/A | FLSSEIRIALMODE_3PIN/6PIN = 0 | A-C | HFL | ULPI link (peripheral controller) |
| 3 | Serial UTMI to serial ULPI TLL | 0 | N/A | FLSSEIRIALMODE_3PIN/6PIN = 1 | A-C | FL | ULPI link (peripheral controller) supporting 3-/6-pin mode |
| 4 | Serial UTMI to serial TLL | 1 | 0x4-0x7; 0xA-0xB | – | A-D | FL | Serial link (2-/3-/4-/6-pin) |
| 4 | Serial UTMI to serial PHY | 1 | 0x0-0x3 | – | A-D | FL | Serial transceiver (2-/3-/4-/6-pin) |

Figure 24-253. Per-Configuration Data Path Through USBTLL

usb_swpu140-070

24.11.4.2.6 USBTLL VBUS Management and Emulations

In transceiver configurations, a USB cable is present, including a 5-V VBUS supply line. On the other hand, in TLL configurations, the physical USB lines are emulated and have no physical existence. This is especially true for the VBUS line, which distributes the 5-V power provided by the default host (or A-device) to the entire bus. VBUS is also used for signaling purposes, and those features must be emulated:

- A peripheral detects the presence of a host by detecting the presence of VBUS.
- USB OTG defines an elaborate voltage-sensing scheme to dynamically switch on and off VBUS (start and stop sessions). In the context of TLL, this brings no power savings compared to a simple suspend.
- In particular, USB OTG uses VBUS as a wake-up source (VBUS-pulsing SRP) for the default peripheral (or B-device).

For more information on how sideband controls are integrated, see [Figure 24-238](#) and [Figure 24-239](#) and the related explanations.

24.11.4.2.6.1 VBUS Control and Status for Transceiver (Non-TLL) Configurations

In non-TLL modes, VBUS exists, and the problem is to propagate control and status to and from the VBUS manager IC (typically, the transceiver).

Only serial transceiver configurations are concerned in the case of the HS USB host subsystem in the device.

24.11.4.2.6.1.1 VBUS Management in Serial Transceiver Configurations

VBUS management is not standardized in transceiver configurations. The chosen implementation is described in the following list (also see [Figure 24-238](#)).

- VBUS control required for host and OTG operation (VBUS drive, VBUS pullup "charge," VBUS pulldown "discharge") is assumed to be handled separately from the USBTLL module (that is, by software and straight to the power IC, which can be the transceiver, especially in OTG cases).
- The status of VBUS must be sampled by the appropriate hardware (again, most often the transceiver) and reported by software to the USBTLL module, using the [TLL_CHANNEL_CONF_i\[16\]](#) DRVVBUS and [TLL_CHANNEL_CONF_i\[15\]](#) CHRGVBUS bits, as indicated in [Table 24-948](#).

[Table 24-948](#) lists the values to write to the [TLL_CHANNEL_CONF_i](#) register depending on the status of VBUS observed by the transceiver on the VBUS line. The same register fields are also used in TLL configuration, and have been named according to that second configuration. In transceiver configurations, the signification of the fields is:

- DRVVBUS: Set to 1 to report a VBUS level greater than VBUS valid.
- CHRGVBUS: Set to 1 to report a VBUS level greater than session valid.

Table 24-948. VBUS Level Software Reporting for Serial Transceiver Configuration

| VBUS Status | TLL_CHANNEL_CONF_i[16] DRVVBUS | TLL_CHANNEL_CONF_i[15] CHRGVBUS |
|---------------------|--|---|
| VBUS valid | 1 | 1 |
| Session valid (A/B) | 0 | 1 |
| Session not valid | 0 | 0 |
| Session end | 0 | 0 |

24.11.4.2.6.2 VBUS Emulation for TLL Configurations

The TLL VBUS emulation sums up all actions on the VBUS line and obtains a voltage level, which is reported in the VBUS status bits following the protocol. The level depends on the immediate VBUS actions and has no memory of previous levels, whereas an actual VBUS line behaves like an RC circuit and takes time to charge and discharge. This causes the following differences:

- The TLL level always jumps abruptly from session valid to session end (and back) with no transient time in between (where session is neither valid nor ended) as in real life.
- The charge feature is used for VBUS-pulsing SRP and is enabled long enough to go over the session valid threshold, but without reaching VBUS valid. In the TLL, the transition to session valid is immediate, and VBUS valid is never reached even if the charge is intentionally kept active.
- The discharge feature is used in real life to accelerate the voltage drop of an undriven VBUS toward the session-end level. For TLL, therefore, this is useless (although the UTMI input/ULPI register bit does exist, for compatibility), and is always don't care.

24.11.4.2.6.2.1 VBUS Emulation in ULPI TLL Modes

Table 24-949 summarizes the VBUS emulation in ULPI TLL modes. VBUS controls are writable, static PHY-side registers on the ULPI side, and input signals on the ULPI ports (port A). VBUS status bits are read-only, volatile PHY-side registers on the ULPI, and output signals on the ULPI ports (port A).

Table 24-949. Emulation of VBUS Levels for UTMI-to-ULPI TLL Mode

| VBUS Controls (Actions) | | | VBUS Level | VBUS Status | | |
|--------------------------|---------------------------|------------------------------|-------------|---|--|--|
| OTG_CTRL_i[5] DRVVBUS | OTG_CTRL_i[4] CHRGVBUS | OTG_CTRL_i[3] DISCHRGVBUS | | USB_INT_STATU S_i[1] VBUSVALID bit | USB_INT_STATU S_i[2] SESSVALID bit | USB_INT_STATU S_i[3] SESEND bit |
| 1 | X | X | VBUS valid | 1 | 1 | 0 |
| 0 | 1 | X | VBUS valid | 0 | 1 | 0 |
| 0 | 0 | X | Session end | 0 | 0 | 1 |

24.11.4.2.6.2.2 VBUS Emulation in Serial TLL Modes

In serial TLL modes, VBUS status and control is implemented with ad hoc sideband signals (see Figure 24-239).

VBUS control can be done in software by writing to the following fields of the [TLL_CHANNEL_CONF_i](#) register:

- DRVVBUS: Set to 1 to drive VBUS to 5 V (for A-device or host)
- CHRGVBUS: Set to 1 to pull up VBUS (for SRP)
- There is no pulldown (discharge) control, because the emulated VBUS has no latency and VBUS level goes to the session-end level as soon as it is neither driven nor pulled up.

Alternatively, VBUS drive can also be hardware-controlled through a dedicated input. (The DRVVBUS bit and input signal are ORed internally.)

VBUS status is available on dedicated output signals. If those outputs are not available at the top level, a software alternative is to use the voltage status reported on the interface (through the standard UTMI+ sideband signals) of the local controller (the HS USB host controller in the device) and to pass it to the remote controller (a peripheral controller) by means of an ad hoc software-controller interface other than the USB. This is based on the fact that the level of VBUS is the same on both extremities of the bus (that is, it does not matter which side does the measurement).

24.11.4.2.7 USBTLL Multimode Serial Port

The multimode serial port requires six bidirectional I/O pads to support all eight defined modes (selected in the [TLL_CHANNEL_CONF_i](#)[27:24] FLSMODE bit field when field CHANMODE = 0x1 = UTMI-to-serial). Those modes are FS/LS only (that is, HS is not supported over a serial interface).

The pads are named TXEN, TXDAT, TXSE0, RXRCV, RXDP, and RXDM after their functionality in standard 6-pin mode (mode 0). Each pad has an input, output, and output-enable signal associated with it on the USBTLL entity.

Table 24-950 lists the function of each pad in each mode. USBTLL outputs are shown in yellow, inputs in blue, and bidirectional pads in green.

Table 24-950. Serial Mode Description, Signal Functionality

| Usual Name | 6-Pin Mode | 6-Pin Mode (Alt) | 3-Pin Mode | 4-Pin Mode | 6-Pin TLL Mode | 6-Pin TLL (Alt) Mode | 3-Pin TLL Mode | 4-Pin TLL Mode | 2-Pin TLL Mode | 2-Pin TLL (Alt) Mode |
|--|------------------|------------------|-----------------|---------------------|-----------------------|-----------------------|-----------------|-----------------------|-----------------|----------------------|
| TLL_CHANNEL_CONF_i [27:24] FLSMODE bit field | 0x0 | 0x1 | 0x2 | 0x3 | 0x4 | 0x5 | 0x6 | 0x7 | 0xA | 0xB |
| TX encoding | DAT/SE0 | DP/DM | DAT/SE0 | DP/DM | DAT/SE0 | DP/DM | DAT/SE0 | DP/DM | DAT/SE0 | DP/DM |
| RX encoding | DP/DM/RCV | DP/DM/RCV | DAT/SE0 | DP/DM/RCV | DP/DM/RCV | DP/DM/RCV | DAT/SE0 | DP/DM/RCV | DAT/SE0 | DP/DM |
| Pin use | Unidirectional | Unidirectional | Bidirectional | Bidirectional | Unidirectional | Unidirectional | Bidirectional | Bidirectional | Bidirectional | Bidirectional |
| Pin count | 6 | 6 | 3 | 4 | 6 or 5 ⁽¹⁾ | 6 or 5 ⁽¹⁾ | 3 | 4 or 3 ⁽²⁾ | 2 | 2 |
| I/O Pad Function Per Mode | | | | | | | | | | |
| TXEN | TX Enable | TX Enable | TX Enable | TX Enable | TX Enable | TX Enable | TX Enable | TX Enable | N/C | N/C |
| TXDAT | TX Diff Data | TX SE Plus Data | TX/RX Diff Data | TX/RX SE Plus Data | TX Diff Data | TX SE Plus Data | TX/RX Diff Data | TX/RX Diff Data | TX/RX Diff Data | TX/RX SE Plus Data |
| TXSE0 | TX force SE0 | TX SE Minus Data | TX/RX force SE0 | TX/RX SE Minus Data | TX force SE0 | TX SE Minus Data | TX/RX force SE0 | TX/RX force SE0 | TX/RX force SE0 | TX/RX SE Minus Data |
| RXRCV | RX Diff Data | RX Diff Data | N/C | RX Diff Data | RX Diff Data | RX Diff Data | N/C | RX Diff Data | N/C | N/C |
| RXDP | RX SE Plus Data | RX SE Plus Data | N/C | N/C | RX SE Plus Data | RX SE Plus Data | N/C | N/C | N/C | N/C |
| RXDP | RX SE Minus Data | RX SE Minus Data | N/C | N/C | RX SE Minus Data | RX SE Minus Data | N/C | N/C | N/C | N/C |

⁽¹⁾ RXRCV and RXDP carry the same information: RXDP can drive both inputs of the remote controller, and RXRCV can be kept unused.

⁽²⁾ Same remark for TXDAT (for outputs) and RXRCV: TXDAT only is enough.

24.11.4.2.8 USBTLL Attach/Connect Emulation for Serial Modes

This section applies to all serial TLL modes in the following circumstances:

- In UTMI-to-serial mode ([TLL_CHANNEL_CONF_i](#)[2:1] CHANMODE = 0x1) for all TLL values of the [TLL_CHANNEL_CONF_i](#)[27:24] FLSMODE bit field (0x4–0x7; 0xA–0xB)
- In UTMI-to-ULPI TLL mode ([TLL_CHANNEL_CONF_i](#)[2:1] CHANMODE = 0x0) when the ULPI bus is switched to 6-pin or 3-pin serial modes

In those modes, the USB bus lines are emulated by USBTLL internal logic and are never available on the outside. The pullup/pulldown actions described in the USB specification cannot be applied directly, and the USB cable cannot be physically attached.

Because serial modes do not specify a standard format for those sideband settings, a custom software-controlled one is implemented:

- The [TLL_CHANNEL_CONF_i](#)[4] TLLATTACH bit emulates the physical attachment of the two controllers through a TLL cable:
 - When this bit is cleared, the local controller RX path shows only the local controller (the HS USB host controller) actions on the bus: TX driving, pullups, pulldowns. The same applies for the remote controller RX path (except that test override is not available).
 - When the bit is set, the actions of both sides are applied to the same bus and are resolved, similar to a real bus. The RX path for both sides shows the same bus state.
- The [TLL_CHANNEL_CONF_i](#)[5] TLLCONNECT bit emulates the USB electrical connect (that is, the pullup by the USB peripheral of one of the two USB lines [by a 1.5-kΩ resistor]), which causes the line state to transition from SE0 to J, which is detected by the USB host. The register bit is ORed with a USBTLL module input signal; the connect control can be software (L4_CFG interconnect write access) or hardware (input level). The speed of the connection is determined by the TLLFULLSPEED bit.
- The [TLL_CHANNEL_CONF_i](#)[6] TLLFULLSPEED bit determines the speed (full or low) of the USB connect to be emulated. The connect enable (controlled as previously defined) results in the pulling up of D+ (1 = full speed) or D– (0 = low speed) (see [Table 24-951](#)).
- The 15-kΩ pulldowns are implicit: Because they are supposed to be turned on at least on the host side of the bus, they do not require additional control.

NOTE: Sideband control and status actions such as pullups are included in parallel (that is, nonserial) standards (UTMI, ULPI), and do not require custom additions.

Table 24-951. Pullup Enable Emulation in Serial TLL Modes

| TLL_CHANNEL_CONF_i Fields | | Input Signal | Resulting TLL Pullup Emulation | |
|---|------------|------------------------|--------------------------------|-----------|
| TLLFULLSPEED | TLLCONNECT | USB State | D+ Pullup | D– Pullup |
| 1 | 0 | Full-speed unconnected | Off | Off |
| 1 | 1 | Full-speed connected | On | Off |
| 0 | 0 | Low-speed unconnected | Off | Off |
| 0 | 1 | Low-speed connected | Off | On |

24.11.5 HS Multiport USB Host Subsystem Low-Level Programming Model

This section describes the low-level hardware programming sequences for the configuration and use of the HS USB host subsystem.

24.11.5.1 Global Initialization

24.11.5.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the HS USB host subsystem is used for the first time after a device reset. This initialization of surrounding modules is based on the integration of the HS USB host subsystem.

[Table 24-952](#) describes the global initialization of surrounding modules.

Table 24-952. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|--|--|
| PRCM | All required clocks must be enabled. For ULPI PHY mode, mux the UTMI_P1_FCLK or UTMI_P2_FCLK to come from the external pad. See Section 3.6.3.2, CM Clock Source , in Chapter 3, Power, Reset, and Clock Management . |
| Cortex-A9 MPU INTC or Cortex-M3 MPU INTC | The Cortex-A9 MPU or Cortex-M3 MPU INTC must be configured to enable the interrupt request generation to the Cortex-A9 MPU or Cortex-M3 MPU subsystem when interrupt requests are generated by the HS multiport USB host subsystem. See the respective functional description in Chapter 18, Interrupt Controller , for the MPUs. |
| Interconnect (L3 and L4) | For more information, see Section 14.2, L3 Interconnect , and Section 14.3, L4 Interconnect . |

24.11.5.1.2 HS Multiport USB Host Subsystem Global Initialization

This procedure in [Table 24-953](#) initializes the HS multiport USB host subsystem after a power-on or software reset.

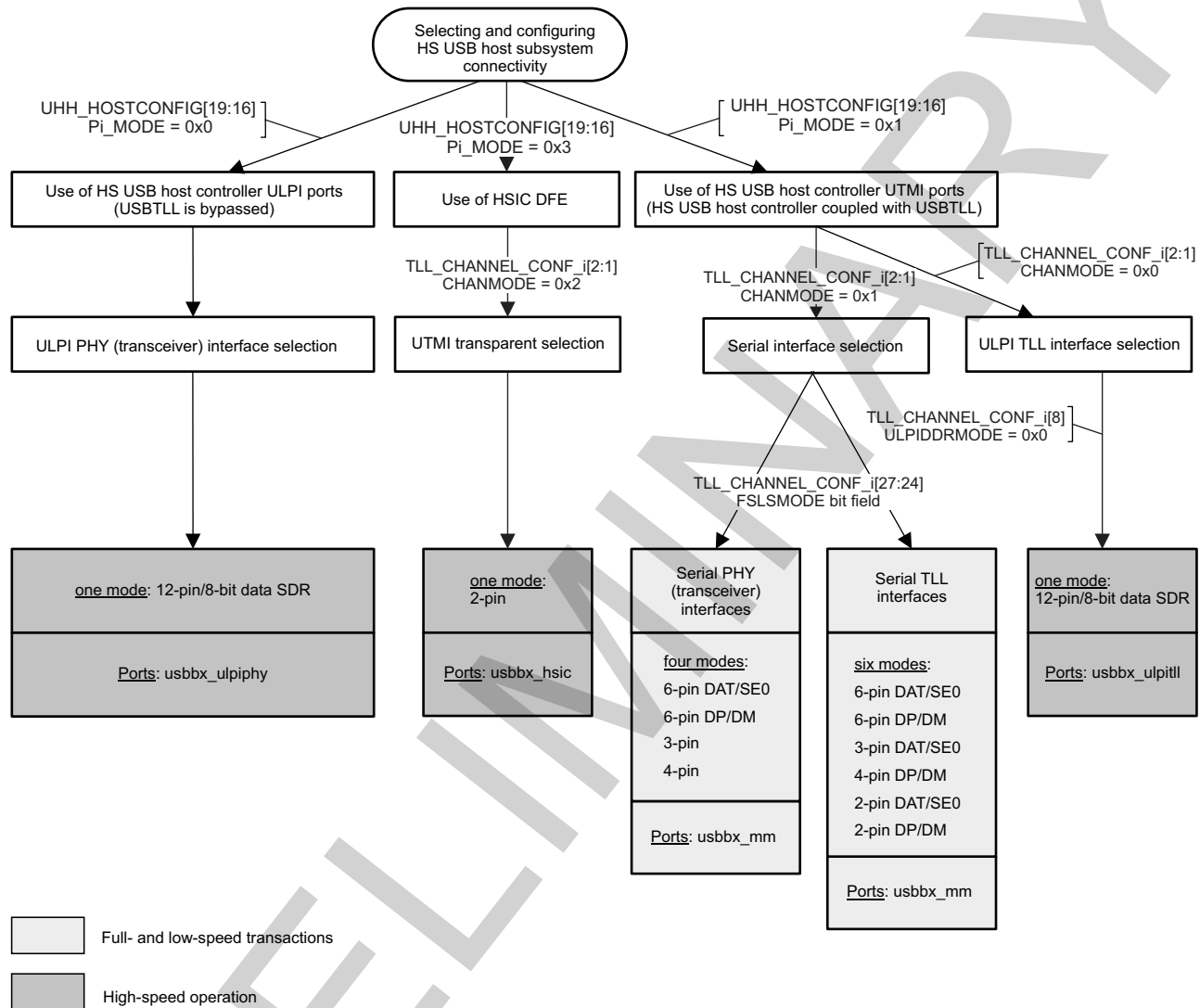
Table 24-953. HS Multiport USB Host Subsystem Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Perform a software reset on the TLL module. | USBTLL_SYSCONFIG[1] SOFTRESET | 0x1 |
| Wait until reset is finished. | USBTLL_SYSSTATUS[0] RESETDONE | =0x1 |
| Enable IRQ event for the TLL module. | USBTLL_IRQENABLE[1] FCLK_END_EN | 0x1 |
| Enable IRQ event for the TLL module. | USBTLL_IRQENABLE[0] FCLK_START_EN | =0x1 |
| Perform a software reset on the HS USB controller. | UHH_SYSCONFIG[0] SOFTRESET | 0x1 |
| Wait until the EHCI HS host is out of reset. | UHH_SYSSTATUS[2] EHCI_RESETDONE | =0x0 |
| Wait until the OHCI HS host is out of reset. | UHH_SYSSTATUS[1] OHCI_RESETDONE | =0x0 |
| Enable IRQ event for the OHCI HS host. | HCINTERRUPTENABLE[31] MIE | 0x1 |
| Enable IRQ event for the EHCI HS host. | USBINTR[0] USBIE | 0x1 |

24.11.5.2 Operational Modes Configuration (Selecting and Configuring USB Connectivity)

Figure 24-254 shows how to select and configure the HS USB host subsystem connectivity.

Figure 24-254. Selecting and Configuring HS USB Host Subsystem Connectivity



usb_swpu140-034

Table 24-954. Register Call Summary for Selecting and Configuring High-Speed USB Host Subsystem Connectivity

| Register Name | |
|----------------|--------------------|
| UHH_HOSTCONFIG | TLL_CHANNEL_CONF_i |

24.11.5.3 USBTLL Registers

The USBTLL module contains two types of software-programmable registers: TLL control and status registers and ULPI PHY-side registers.

24.11.5.3.1 TLL Control and Status Registers

These 32-bit registers configure the various channels. These registers are accessed by the MPU through the L4_CFG interconnect. They are used primarily before USB activity starts. The registers are:

- OCP-standard registers for revision number, IRQ, clocking management, etc.
- TLL-specific registers

24.11.5.3.2 ULPI PHY-Side Registers

Each TLL channel emulates a ULPI transceiver and therefore contains this set of 8-bit PHY-side registers, per ULPI specification. The registers are:

- All ULPI-mandatory standard registers and fields
- A selection of ULPI-optional standard registers and fields, when relevant to the TLL context
- Vendor-specific registers, mapped at the addresses specified for that purpose in the ULPI specification

These registers are accessed by the external (that is, off-chip) link controller over the ULPI port of each channel, in the 0x100-byte ULPI address space, using the ULPI register access protocol.

They are accessible by the L4_CFG interconnect: The ULPI register sets of all channels are mapped side by side in the upper part of the L4_CFG interconnect address space, where they can be accessed through byte accesses. If a conflict occurs between the two access modes, access over ULPI has priority, but both accesses eventually complete correctly. For normal USB activity, all register accesses are expected to go over ULPI, and register changes caused by L4_CFG interconnect accesses can compromise proper USB operation. The L4_CFG interconnect access port is intended for:

- Miscellaneous test and debug
- Nonintrusive observation of ongoing USB operations (test)
- Context restore: During USB suspend periods, the USBTLL module can be switched off to save power. When the module is switched on again, the ULPI register contents, which have been lost, can be restored over the L4_CFG interconnect before USB operations restart, provided they were saved elsewhere beforehand.

24.11.6 HS USB Host Subsystem Register Manual

This section provides the register description of the module.

24.11.6.1 USB_Host_HS Instance Summary

Table 24-955 summarizes the USB_Host_HS instance.

Table 24-955. USB_Host_HS Instance Summary

| Module Name | L4_CFG Base Address | Size |
|-----------------|---------------------|------|
| USBTLLHS_config | 0x4A06 2000 | 2KB |
| USBTLLHS_ULPI | 0x4A06 2800 | 2KB |
| HSUSBHOST | 0x4A06 4000 | 2KB |
| OHCI | 0x4A06 4800 | 1KB |
| EHCI | 0x4A06 4C00 | 1KB |

24.11.6.2 USBTLLHS_config Registers

24.11.6.2.1 USBTLLHS_config Register Summary

Table 24-956 summarizes the USBTLLHS_config register mapping.

Table 24-956. USBTLLHS_config Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address |
|--|------|-----------------------|-------------------------|-------------------------|
| USBTLL_REVISION | R | 32 | 0x0000 0000 | 0x4A06 2000 |
| USBTLL_HWINFO | R | 32 | 0x0000 0004 | 0x4A06 2004 |
| USBTLL_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4A06 2010 |
| USBTLL_SYSSTATUS | R | 32 | 0x0000 0014 | 0x4A06 2014 |
| USBTLL_IRQSTATUS | RW | 32 | 0x0000 0018 | 0x4A06 2018 |
| USBTLL_IRQENABLE | RW | 32 | 0x0000 001C | 0x4A06 201C |
| TLL_SHARED_CONF | RW | 32 | 0x0000 0030 | 0x4A06 2030 |
| TLL_CHANNEL_CONF _i ⁽¹⁾ | RW | 32 | 0x0000 0040 + (0x4 * i) | 0x4A06 2040 + (0x4 * i) |
| USBTLL_SAR_CNTX _j ⁽²⁾ | RW | 32 | 0x0000 0400 + (0x4 * j) | 0x4A06 2400 + (0x4 * j) |

⁽¹⁾ i = 0 or 1

⁽²⁾ j = 0 to 6

CAUTION

The USBTLLHS_config registers are limited to 32-bit data accesses; 16-bit and 8-bit accesses are not allowed and can corrupt register content.

24.11.6.2.2 USBTLLHS_config Register Description

Table 24-957 through Table 24-973 describe the USBTLLHS_config registers.

Table 24-957. USBTLL_REVISION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A06 2000 | | | | | | | | | | | | | | | | InstanceUSBTLLHS_config | | | | | | | | | | | | | | | |
| Description | OCP standard revision number, BCD encoded | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-----------------|------|------------------|
| 31:0 | REVISION | Revision number | R | Ti internal data |

Table 24-958. Register Call Summary for Register USBTLL_REVISION

High-Speed Multiport USB Host Subsystem

- [USBTLLHS_config Register Summary: \[0\]](#)

Table 24-959. USBTLL_HWINFO

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A06 2004 | | | | | | | | | | | | | | | | Instance USBTLLHS_config | | | | | | | | | | | | | | | |
| Description | Information on hardware configuration of host | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | SAR_CNTX_SIZE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|--|------|-----------|
| 31:8 | RESERVED | | R | 0x0000000 |
| 7:0 | SAR_CNTX_SIZE | Save-and-Restore context size, in 32-bit words, i.e. number of 32-bit registers with significant context information, mapped from offset 0x400 upward. | R | 0x07 |

Table 24-960. Register Call Summary for Register USBTLL_HWINFO

High-Speed Multiport USB Host Subsystem

- [USBTLLHS_config Register Summary: \[0\]](#)
- [USBTLLHS_config Register Description: \[1\]](#)

Table 24-961. USBTLL_SYSCONFIG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0010 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A06 2010 | | | | | | | | | | | | | | | | Instance USBTLLHS_config | | | | | | | | | | | | | | | |
| Description | OCP standard system configuration register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----------|----|-----------|----|-----------|---|-----------|---|----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLOCKACTIVITY | | RESERVED | | SIDLEMODE | | ENAWAKEUP | | SOFTRESET | | AUTOIDLE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|----------|
| 31:9 | RESERVED | Reserved | R | 0x000000 |
| 8 | CLOCKACTIVITY | Enable autogating of OCP-derived internal clocks while module is idle. 0x0: OCP-derived internal clocks OFF during idle 0x1: OCP-derived internal clocks ON during idle | RW | 0 |
| 7:5 | RESERVED | Reserved | R | 0x0 |
| 4:3 | SIDLEMODE | Slave interface power management control. Idle Req/ack control 0x0: Force-idle mode. Sideack[1] asserted after Sidlreq assertion 0x1: No-idle mode. Sideack[1] never asserted. 0x2: Smart-idle mode. Sideack[1] asserted after Sidlreq assertion when no more activity on the OCP. | RW | 0x0 |
| 2 | ENAWAKEUP | Asynchronous wake-up generation control (Swakeup) 0x0: Wake-up generation disabled 0x1: Wake-up generation enabled | RW | 0 |
| 1 | SOFTRESET | Module software reset Write 0x0: No effect Write 0x1: Starts softreset sequence. | W | 0 |
| 0 | AUTOIDLE | Internal autogating control 0x0: Clock always running 0x1: When no activity on OCP, clock is cut off. | RW | 1 |

Table 24-962. Register Call Summary for Register USBTLL_SYSCONFIG

High-Speed Multiport USB Host Subsystem

- [USBTLL Software Reset: \[0\]](#)
- [USBTLL Power Management: \[1\]](#)
- [USBTLL Save and Restore: \[2\]](#)
- [HS Multiport USB Host Subsystem Global Initialization: \[3\]](#)
- [USBTLLHS_config Register Summary: \[4\]](#)

Table 24-963. USBTLL_SYSSTATUS

| | | |
|------------------|-------------------------------------|--------------------------|
| Address Offset | 0x0000 0014 | |
| Physical Address | 0x4A06 2014 | Instance USBTLLHS_config |
| Description | OCP standard system status register | |
| Type | R | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESETDONE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | RESETDONE | Indicates when the module has entirely come out of reset Read 0x0: Reset is ongoing Read 0x1: Reset is done | R | 0 |

Table 24-964. Register Call Summary for Register USBTLL_SYSSTATUS

High-Speed Multiport USB Host Subsystem

- [HS Multiport USB Host Subsystem Global Initialization: \[0\]](#)
- [USBTLLHS_config Register Summary: \[1\]](#)

Table 24-965. USBTLL_IRQSTATUS

| | | | |
|-------------------------|---|-----------------|-----------------|
| Address Offset | 0x0000 0018 | Instance | USBTLLHS_config |
| Physical Address | 0x4A06 2018 | | |
| Description | OCP standard IRQ status vector. Write 1 to clear a bit. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|--------------|----------|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ACCESS_ERROR | FCLK_END | FCLK_START |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | ACCESS_ERROR | Access error to ULPI register over OCP: USB clock must run for that type of access to succeed. 0x0: No event pending 0x1: Event pending | RW | 0 |
| 1 | FCLK_END | Functional clock is no longer requested for USB clocking 0x0: No event pending 0x1: Event pending | RW | 0 |
| 0 | FCLK_START | Functional clock is requested for USB clocking 0x0: No event pending 0x1: Event pending | RW | 0 |

Table 24-966. Register Call Summary for Register USBTLL_IRQSTATUS

High-Speed Multiport USB Host Subsystem

- [USBTLLHS_config Register Summary: \[0\]](#)
- [USBTLLHS_config Register Description: \[1\] \[2\]](#)

Table 24-967. USBTLL_IRQENABLE

| | | | |
|-------------------------|--------------------------------|-----------------|-----------------|
| Address Offset | 0x0000 001C | Instance | USBTLLHS_config |
| Physical Address | 0x4A06 201C | | |
| Description | OCP standard IRQ enable vector | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|-----------------|-------------|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ACCESS_ERROR_EN | FCLK_END_EN | FCLK_START_EN |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|------------|
| 31:3 | RESERVED | Reserved | R | 0x00000000 |
| 2 | ACCESS_ERROR_EN | Enable IRQ generation upon access error to ULPI register over L3 interconnect 0x0: IRQ event is masked 0x1: IRQ event is enabled | RW | 0x0 |
| 1 | FCLK_END_EN | IRQ event mask for FCLK_END interrupt (see USBTLL_IRQSTATUS[1]) 0x0: IRQ event is masked 0x1: IRQ event is enabled | RW | 0x0 |
| 0 | FCLK_START_EN | IRQ event mask for FCLK_START interrupt (see USBTLL_IRQSTATUS[0]) 0x0: IRQ event is masked 0x1: IRQ event is enabled | RW | 0x0 |

Table 24-968. Register Call Summary for Register USBTLL_IRQENABLE

High-Speed Multiport USB Host Subsystem

- [USBTLL Save and Restore: \[0\]](#)
- [HS Multiport USB Host Subsystem Global Initialization: \[1\] \[2\]](#)
- [USBTLLHS_config Register Summary: \[3\]](#)

Table 24-969. TLL_SHARED_CONF

| | | | |
|-------------------------|--|-----------------|-----------------|
| Address Offset | 0x0000 0030 | Instance | USBTLLHS_config |
| Physical Address | 0x4A06 2030 | | |
| Description | Common control register for all TLL channels | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|----------|------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | FCLK_REQ | FCLK_IS_ON | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:2 | RESERVED | Reserved | R | 0x00000000 |
| 1 | FCLK_REQ | Functional clock request, ORed from all channels depending on their respective USB bus state. Combined with the Fclk_is_on status to generate fclk_start/end IRQs. 0x0: Func clock input is not requested by TLL 0x1: Func clock input is requested by TLL | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | FCLK_IS_ON | Status of the functional clock input, provided by the system to the TLL module. The TLL module will only use that clock if the current status indicated that it is ready. Combined with the Fclk_request to generate fclk_start/end IRQs. 0x0: Functional clock input is not guaranteed ON (can actually be ON, OFF, or unstable) 0x1: Functional clock input is guaranteed ON and stable | RW | 0x0 |

Table 24-970. Register Call Summary for Register TLL_SHARED_CONF

High-Speed Multiport USB Host Subsystem

- [USBTLL Save and Restore: \[0\]](#)
- [USBTLLHS_config Register Summary: \[1\]](#)

Table 24-971. TLL_CHANNEL_CONF_i

| | | | | | | | |
|------------------|--|--|--|----------|--|-----------------|--|
| Address Offset | | 0x0000 0040 + (0x4 * i) | | Index | | i = 0 to 1 | |
| Physical Address | | 0x4A06 2040 + (0x4 * i) | | Instance | | USBTLLHS_config | |
| Description | | Control and Status register for channel i. | | | | | |
| Type | | RW | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|---------------|----|----------|----|----|----|----------|----|-----------|-----------|----------|--------|---------|----------|----------|----|----------------|----|--------------|--------------|----------|----------------|--------------|------------|-----------|------------|----------|--------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | FSLSLINESTATE | | FSLSMODE | | | | RESERVED | | TESTTXSE0 | TESTTXDAT | TESTTXEN | TESTEN | DRVVBUS | CHRGVBUS | RESERVED | | ULPINOBITSTUFF | | ULPIAUTOIDLE | UTMIAUTOIDLE | RESERVED | ULPIOUTCLKMODE | TLLFULLSPEED | TLLCONNECT | TLLATTACH | UTMIISADEV | CHANMODE | CHANEN | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|-------|
| 31:30 | RESERVED | | R | 0x0 |
| 29:28 | FSLSLINESTATE | Line state for Full/low speed serial modes Bit 1 = D- / Bit0 = D+ Read 0x0: Single-ended 0 Read 0x1: Full-Speed J = differential 1 Read 0x2: Full-Speed K = differential 0 Read 0x3: Single-ended 1 (illegal in USB) | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|-------|
| 27:24 | FSLSMODE | Multiple-mode serial interface's mode select. Only when main channel mode is serial. No effect in other main modes. 0x0: 6-pin unidirectional PHY i/f mode. TX encoding is Dat/Se0 (default). 0x1: 6-pin unidirectional PHY i/f mode. TX encoding is Dp/Dm. 0x2: 3-pin bidirectional PHY i/f mode 0x3: 4-pin bidirectional PHY i/f mode 0x4: 6-pin unidirectional TLL mode. TX encoding is Dat/Se0. 0x5: 6-pin unidirectional TLL mode. TX encoding is Dp/Dm. 0x6: 3-pin bidirectional TLL mode 0x7: 4-pin bidirectional TLL mode 0xA: 2-pin bidirectional TLL mode. Encoding is Dat/Se0. 0xB: 2-pin bidirectional TLL mode. Encoding is Dp/Dm. | RW | 0x0 |
| 23:21 | RESERVED | | R | 0x0 |
| 20 | TESTTXSE0 | Force-Se0 transmit override value for serial mode test Don't care if TestEn = 0 (functional mode) or = TestTxen = 1 (TX = hiz) 0x0: drive differential value on TX according to TestTxDat 0x1: drive SE0 on TX | RW | 0 |
| 19 | TESTTXDAT | Differential data transmit override value for serial mode test Don't care if TestEn = 0 (functional mode) or = TestTxen = 1 (TX = hiz) or TestSe0 = 1 (TX = se0) 0x0: Drive full-speed K = differential 0 0x1: Drive full-speed J = differential 1 | RW | 0 |
| 18 | TESTTXEN | Differential data transmit override value for serial mode test Don't care if TestEn = 0 (functional mode) 0x0: Drive Tx according to TestTxDat/Se0 0x1: Drive Tx Hiz (no drive: pullups determine line state) | RW | 0 |
| 17 | TESTEN | Enable manual test override for serial mode TX path (from local controller UTMI port) 0x0: No override. Tx is from local link controller 0x1: Override enabled | RW | 0 |
| 16 | DRVVBUS | VBUS-drive for ChanMode = serial * In TLL config, write 1 to emulate serial-side VBUS drive * In PHY config, write 1 to report "VBUS valid" status (of actual VBUS) to UTMI controller 0x0: VBUS not driven 0x1: VBUS driven to 5 V | RW | 0 |
| 15 | CHRGVBUS | VBUS-drive for ChanMode = serial * In TLL config, write 1 to emulate serial-side VBUS charge/pullup (OTG) * In PHY config, write 1 to reports "session valid" status (of actual VBUS) to UTMI controller 0x0: VBUS not charged, session not valid 0x1: VBUS charged, session valid | RW | 0 |
| 14:12 | RESERVED | | R | 0x0 |
| 11 | ULPINOBITSTUFF | Disable bitstuff emulation in ULPI TLL for ULPI ChanMode 0x0: Bitstuff enabled, following USB standard 0x1: No bitstuff or associated delays (nonstandard) | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|-----------------|-------|
| 10 | ULPIAUTOIDLE | For ChanMode = ULPI TLL only. Allow the ULPI output clock to be stopped when ULPI goes into asynchronous mode (low-power, 3-pin serial, 6-pin serial). No effect in ULPI input clock mode. 0x0: ULPI output clock always-on 0x1: ULPI output clock stops during asynchronous ULPI modes | RW | 1 |
| 9 | UTMIAUTOIDLE | For ChanMode = ULPI TLL only. Allow the UTMI clock (output) to be stopped when UTMI goes to suspended mode (suspendm = 0) 0x0: UTMI clock output always on 0x1: UTMI clock output gated upon suspend | RW | 1 |
| 8 | RESERVED | | R | 0 |
| 7 | ULPIOUTCLKMODE | ULPI clocking mode select for ULPI TLL ChanMode. Hardcoded, for legacy only. Read 0x1: ULPI clock provided by PHY side (i.e. TLL, from functional clock). ULPI clock is output | R Returns 1s | 1 |
| 6 | TLLFULLSPEED | Sets PHY speed emulation in TLL (full/slow), which determines the line to pull up upon connect. The two connect source controls are: input m(N)_tlpuen, register field TllConnect. 0x0: Connect is Low-speed: D- pullup 0x1: Connect is Full-Speed: D+ pullup | RW | 1 |
| 5 | TLLCONNECT | Emulation of Full/Low-Speed connect (that is, D+ resp D- pullup) for serial TLL modes. Speed is determined by field TllSpeed. 0x0: Unconnected 0x1: Connected | RW | 0 |
| 4 | TLLATTACH | Emulates cable attach/detach for all serial TLL modes: * ChanMode = serial, in TLL mode (FsLsMode) * ChanMode = ULPI, in serial mode (6pin/3pin TLL) 0x0: Cable detach emulated on serial TLL 0x1: Cable attach emulated on serial TLL | RW | 1 |
| 3 | UTMIISADEV | Select the cable end "seen" by UTMI side of TLL, i.e. the emulated USB cable's orientation. The host must always be on A-side, peripheral on B-side. Reset value depends on generic DEFUTMIISHOST. 0x0: UTMI side is peripheral, ULPI side is host 0x1: UTMI side is host, ULPI side is peripheral | RW | 1 |
| 2:1 | CHANMODE | Main channel mode selection 0x0: UTMI-to-ULPI TLL mode (HS capable): to ULPI controller 0x1: UTMI-to-serial (FS/LS) mode: to serial controller (TLL) or serial PHY 0x2: Transparent UTMI mode: to UTMI PHY 0x3: No mode selected | RW | 0x0 |
| 0 | CHANEN | Active-high channel enable. A disabled channel is unclocked and kept under reset. 0x0: Channel i disabled 0x1: Channel i enabled | RW | 0 |

Table 24-972. Register Call Summary for Register TLL_CHANNEL_CONF_i

High-Speed Multiport USB Host Subsystem

- [USBTLL Save and Restore: \[0\]](#)
- [USBTLL Channel Configuration: \[1\] \[2\]](#)
- [USBTLL VBUS Management and Emulations: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)
- [USBTLL Multimode Serial Port: \[9\] \[10\]](#)
- [USBTLL Attach/Connect Emulation for Serial Modes: \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\]](#)
- [Operational Modes Configuration \(Selecting and Configuring USB Connectivity\): \[18\]](#)
- [USBTLLHS_config Register Summary: \[19\]](#)

Table 24-973. USBTLL_SAR_CNTX_j

| | | | |
|-------------------------|--|-----------------|-----------------|
| Address Offset | 0x0000 0400 + (0x4 * j) | Index | j = 0 to 6 |
| Physical Address | 0x4A06 2400 + (0x4 * j) | Instance | USBTLLHS_config |
| Description | Save and Restore context array. Array size is indicated in USBTLL_HWINFO . When in SAR mode, read to save and write to restore. Do not access when not in SAR mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CNTX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------|------|-------------|
| 31:0 | CNTX | Context bits | RW | 0x0000 0000 |

Table 24-974. Register Call Summary for Register USBTLL_SAR_CNTX_j

High-Speed Multiport USB Host Subsystem

- [USBTLLHS_config Register Summary: \[0\]](#)

24.11.6.3 USBTLLHS_ULPI Registers

24.11.6.3.1 USBTLLHS_ULPI Register Summary

[Table 24-975](#) summarizes the USBTLLHS_ULPI register mapping.

Table 24-975. USBTLLHS_ULPI Register Mapping Summary

| Register Name ⁽¹⁾ | Type | Register Width (Bits) | Address Offset | Physical Address |
|--------------------------------------|------|-----------------------|---------------------------|---------------------------|
| VENDOR_ID_LO_i | R | 8 | 0x0000 0000 + (0x100 * i) | 0x4A06 2800 + (0x100 * i) |
| VENDOR_ID_HI_i | R | 8 | 0x0000 0001 + (0x100 * i) | 0x4A06 2801 + (0x100 * i) |
| PRODUCT_ID_LO_i | R | 8 | 0x0000 0002 + (0x100 * i) | 0x4A06 2802 + (0x100 * i) |
| PRODUCT_ID_HI_i | R | 8 | 0x0000 0003 + (0x100 * i) | 0x4A06 2803 + (0x100 * i) |
| FUNCTION_CTRL_i | RW | 8 | 0x0000 0004 + (0x100 * i) | 0x4A06 2804 + (0x100 * i) |
| FUNCTION_CTRL_SET_i | RW | 8 | 0x0000 0005 + (0x100 * i) | 0x4A06 2805 + (0x100 * i) |
| FUNCTION_CTRL_CLR_i | RW | 8 | 0x0000 0006 + (0x100 * i) | 0x4A06 2806 + (0x100 * i) |
| INTERFACE_CTRL_i | RW | 8 | 0x0000 0007 + (0x100 * i) | 0x4A06 2807 + (0x100 * i) |
| INTERFACE_CTRL_SET_i | RW | 8 | 0x0000 0008 + (0x100 * i) | 0x4A06 2808 + (0x100 * i) |
| INTERFACE_CTRL_CLR_i | RW | 8 | 0x0000 0009 + (0x100 * i) | 0x4A06 2809 + (0x100 * i) |
| OTG_CTRL_i | RW | 8 | 0x0000 000A + (0x100 * i) | 0x4A06 280A + (0x100 * i) |
| OTG_CTRL_SET_i | RW | 8 | 0x0000 000B + (0x100 * i) | 0x4A06 280B + (0x100 * i) |
| OTG_CTRL_CLR_i | RW | 8 | 0x0000 000C + (0x100 * i) | 0x4A06 280C + (0x100 * i) |
| USB_INT_EN_RISE_i | RW | 8 | 0x0000 000D + (0x100 * i) | 0x4A06 280D + (0x100 * i) |

⁽¹⁾ i = 0 or 1

Table 24-975. USBTLLHS_ULPI Register Mapping Summary (continued)

| Register Name ⁽¹⁾ | Type | Register Width (Bits) | Address Offset | Physical Address |
|------------------------------|------|-----------------------|---------------------------|---------------------------|
| USB_INT_EN_RISE_SET_i | RW | 8 | 0x0000 000E + (0x100 * i) | 0x4A06 280E + (0x100 * i) |
| USB_INT_EN_RISE_CLR_i | RW | 8 | 0x0000 000F + (0x100 * i) | 0x4A06 280F + (0x100 * i) |
| USB_INT_EN_FALL_i | RW | 8 | 0x0000 0010 + (0x100 * i) | 0x4A06 2810 + (0x100 * i) |
| USB_INT_EN_FALL_SET_i | RW | 8 | 0x0000 0011 + (0x100 * i) | 0x4A06 2811 + (0x100 * i) |
| USB_INT_EN_FALL_CLR_i | RW | 8 | 0x0000 0012 + (0x100 * i) | 0x4A06 2812 + (0x100 * i) |
| USB_INT_STATUS_i | R | 8 | 0x0000 0013 + (0x100 * i) | 0x4A06 2813 + (0x100 * i) |
| USB_INT_LATCH_i | R | 8 | 0x0000 0014 + (0x100 * i) | 0x4A06 2814 + (0x100 * i) |
| DEBUG_i | R | 8 | 0x0000 0015 + (0x100 * i) | 0x4A06 2815 + (0x100 * i) |
| SCRATCH_REGISTER_i | RW | 8 | 0x0000 0016 + (0x100 * i) | 0x4A06 2816 + (0x100 * i) |
| SCRATCH_REGISTER_SET_i | RW | 8 | 0x0000 0017 + (0x100 * i) | 0x4A06 2817 + (0x100 * i) |
| SCRATCH_REGISTER_CLR_i | RW | 8 | 0x0000 0018 + (0x100 * i) | 0x4A06 2818 + (0x100 * i) |
| EXTENDED_SET_ACCESS_i | R | 8 | 0x0000 002F + (0x100 * i) | 0x4A06 282F + (0x100 * i) |
| UTMI_VCONTROL_EN_i | RW | 8 | 0x0000 0030 + (0x100 * i) | 0x4A06 2830 + (0x100 * i) |
| UTMI_VCONTROL_EN_SET_i | RW | 8 | 0x0000 0031 + (0x100 * i) | 0x4A06 2831 + (0x100 * i) |
| UTMI_VCONTROL_EN_CLR_i | RW | 8 | 0x0000 0032 + (0x100 * i) | 0x4A06 2832 + (0x100 * i) |
| UTMI_VCONTROL_STATUS_i | RW | 8 | 0x0000 0033 + (0x100 * i) | 0x4A06 2833 + (0x100 * i) |
| UTMI_VCONTROL_LATCH_i | R | 8 | 0x0000 0034 + (0x100 * i) | 0x4A06 2834 + (0x100 * i) |
| UTMI_VSTATUS_i | RW | 8 | 0x0000 0035 + (0x100 * i) | 0x4A06 2835 + (0x100 * i) |
| UTMI_VSTATUS_SET_i | RW | 8 | 0x0000 0036 + (0x100 * i) | 0x4A06 2836 + (0x100 * i) |
| UTMI_VSTATUS_CLR_i | RW | 8 | 0x0000 0037 + (0x100 * i) | 0x4A06 2837 + (0x100 * i) |
| USB_INT_LATCH_NOCLR_i | R | 8 | 0x0000 0038 + (0x100 * i) | 0x4A06 2838 + (0x100 * i) |
| VENDOR_INT_EN_i | RW | 8 | 0x0000 003B + (0x100 * i) | 0x4A06 283B + (0x100 * i) |
| VENDOR_INT_EN_SET_i | RW | 8 | 0x0000 003C + (0x100 * i) | 0x4A06 283C + (0x100 * i) |
| VENDOR_INT_EN_CLR_i | RW | 8 | 0x0000 003D + (0x100 * i) | 0x4A06 283D + (0x100 * i) |
| VENDOR_INT_STATUS_i | R | 8 | 0x0000 003E + (0x100 * i) | 0x4A06 283E + (0x100 * i) |
| VENDOR_INT_LATCH_i | R | 8 | 0x0000 003F + (0x100 * i) | 0x4A06 283F + (0x100 * i) |

24.11.6.3.2 USBTLLHS_ULPI Register Description

Table 24-976 through Table 24-1054 describe the USBTLLHS_ULPI registers.

Table 24-976. VENDOR_ID_LO_i

| | | | |
|-------------------------|--|-----------------|---------------|
| Address Offset | 0x0000 0000 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2800 + (0x100 * i) | Instance | USBTLLHS_ULPI |
| Description | Lower byte of USB-IF-supplied 16-bit vendor ID Value is set for all channels. Default is Texas Instruments Vendor ID = 0x0451. | | |
| Type | R | | |

| | | | | | | | |
|--------------|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VENDOR_ID_LO | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|-------------|------|-------|
| 7:0 | VENDOR_ID_LO | | R | 0x51 |

Table 24-977. Register Call Summary for Register VENDOR_ID_LO_i

High-Speed Multiport USB Host Subsystem

- [USBLLHS_ULPI Register Summary: \[0\]](#)

Table 24-978. VENDOR_ID_HI_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 0001 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2801 + (0x100 * i) | Instance | USBLLHS_ULPI |
| Description | Upper byte of USB-IF-supplied 16-bit vendor ID Value is set for all channels. Default is Texas-Instruments Vendor ID = 0x0451. | | |
| Type | R | | |

| | | | | | | | |
|--------------|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VENDOR_ID_HI | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|-------------|------|-------|
| 7:0 | VENDOR_ID_HI | | R | 0x04 |

Table 24-979. Register Call Summary for Register VENDOR_ID_HI_i

High-Speed Multiport USB Host Subsystem

- [USBLLHS_ULPI Register Summary: \[0\]](#)

Table 24-980. PRODUCT_ID_LO_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0002 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2802 + (0x100 * i) | Instance | USBLLHS_ULPI |
| Description | Lower byte of 16-bit product ID Value is set for all channels. Default is | | |
| Type | R | | |

| | | | | | | | |
|---------------|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PRODUCT_ID_LO | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|-------------|------|-------|
| 7:0 | PRODUCT_ID_LO | | R | 0x00 |

Table 24-981. Register Call Summary for Register PRODUCT_ID_LO_i

High-Speed Multiport USB Host Subsystem

- [USBLLHS_ULPI Register Summary: \[0\]](#)

Table 24-982. PRODUCT_ID_HI_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0003 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2803 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Upper byte of 16-bit product ID Value is set for all channels. Default is | | |
| Type | R | | |

| | | | | | | | |
|---------------|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PRODUCT_ID_HI | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|-------------|------|-------|
| 7:0 | PRODUCT_ID_HI | | R | 0x00 |

Table 24-983. Register Call Summary for Register PRODUCT_ID_HI_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-984. FUNCTION_CTRL_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 0004 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2804 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Controls UTMI function settings of the PHY. Read/write address. | | |
| Type | RW | | |

| | | | | | | | |
|----------|----------|-------|--------|---|------------|------------|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | SUSPENDM | RESET | OPMODE | | TERMSELECT | XCVRSELECT | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7 | RESERVED | | R | 0 |
| 6 | SUSPENDM | Active low PHY suspend: puts the ULPI bus in low-power mode. Automatically set back to 1 upon low-power mode exit. 0x0: PHY is in low-power mode. 0x1: PHY is not in low-power mode. | RW | 1 |
| 5 | RESET | Active high UTMI transceiver reset. Auto-cleared. Does not reset the ULPI interface or ULPI register set. 0x0: No ongoing reset/no action 0x1: Ongoing reset/apply reset | RW | 0 |
| 4:3 | OPMODE | Select the required bit encoding style during transmit 0x0: Normal operation 0x1: Nondriving 0x3: Reserved 0x2: Disable bit-stuff and NRZI encoding | RW | 0x0 |
| 2 | TERMSELECT | Controls the internal 1.5-kΩ HS terminations. Control over bus resistors changes depending on XcvtSelect, OpMode, DpPulldown and DmPulldown. 0x0: HS termination enabled (other conditions) 0x1: FS termination enabled (other conditions) | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1:0 | XCVRSELECT | Select the required transceiver speed. 0x0: Enable HS transceiver 0x1: Enable FS transceiver 0x3: Enable FS transceiver for LS packets (automatic FS preamble prepending) 0x2: Enable LS transceiver | RW | 0x1 |

Table 24-985. Register Call Summary for Register FUNCTION_CTRL_i

High-Speed Multiport USB Host Subsystem

- [USBTLL Save and Restore: \[0\]](#)
- [USBTLLHS_ULPI Register Summary: \[1\]](#)

Table 24-986. FUNCTION_CTRL_SET_i

| | | | |
|-------------------------|---|-----------------|---------------|
| Address Offset | 0x0000 0005 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2805 + (0x100 * i) | Instance | USBTLLHS_ULPI |
| Description | Controls UTMI function settings of the PHY. Read/set address (write 1 to a bit to set it to 1, writing 0 has no effect on bit value). See the field description at the read/write address of the same register. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----------|-------|--------|---|------------|------------|---|
| RESERVED | SUSPENDM | RESET | OPMODE | | TERMSELECT | XCVRSELECT | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7 | RESERVED | Reserved | R | 0x0 |
| 6 | SUSPENDM | Active low PHY suspend: Puts the ULPI bus in low-power mode. Automatically set back to 1 upon low-power mode exit. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x1 |
| 5 | RESET | Active high UTMI transceiver reset. Autocleared. Does not reset the ULPI interface or ULPI register set. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 4:3 | OPMODE | Select the required bit encoding style during transmit. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 2 | TERMSELECT | Controls the internal 1.5-kΩ pullup resistor and 45-Ω HS terminations. Control over bus resistors changes depending on XcvrSelect, OpMode, DpPulldown and DmPulldown. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 1:0 | XCVRSELECT | Select the required transceiver speed. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x1 |

Table 24-987. Register Call Summary for Register FUNCTION_CTRL_SET_i

High-Speed Multiport USB Host Subsystem

- [USBTLLHS_ULPI Register Summary: \[0\]](#)

Table 24-988. FUNCTION_CTRL_CLR_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0006 + (0x100 * i) | Index | i =0 to 1 |
| Physical Address | 0x4A06 2806 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Controls UTMI function settings of the PHY. Read/clear address (write 1 to a bit to clear it to 0, writing 0 has no effect on bit value). See the field description at the read/write address of the same register. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----------|-------|--------|---|------------|------------|---|
| RESERVED | SUSPENDM | RESET | OPMODE | | TERMSELECT | XCVRSELECT | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7 | RESERVED | Reserved | R | 0x0 |
| 6 | SUSPENDM | Active low PHY suspend: Puts the ULPI bus in low-power mode. Automatically set back to 1 upon low-power mode exit. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x1 |
| 5 | RESET | Active high UTMI transceiver reset. Autocleared. Does not reset the ULPI interface or ULPI register set. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 4:3 | OPMODE | Select the required bit encoding style during transmit Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 2 | TERMSELECT | Controls the internal 1.5-kΩ pull-up resistor and 45-Ω HS terminations. Control over bus resistors changes depending on XcvtSelect, OpMode, DpPulldown and DmPulldown. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 1:0 | XCVRSELECT | Select the required transceiver speed. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x1 |

Table 24-989. Register Call Summary for Register FUNCTION_CTRL_CLR_i

- High-Speed Multiport USB Host Subsystem
- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-990. INTERFACE_CTRL_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0007 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2807 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Enables alternative interfaces and PHY features. Read/write address. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------------------|----------|---|------------|---------------|----------|---------------------|---------------------|
| INTERFACE_PROTECT_DISABLE | RESERVED | | AUTORESUME | CLOCKSUSPENDM | RESERVED | FSLSSERIALMODE_3PIN | FSLSSERIALMODE_6PIN |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|-------|
| 7 | INTERFACE_PROTECT_DISABLE | Controls circuitry built into the PHY for protecting the ULPI interface when the link 3-states stp and data. 0x0: Enables the interface protect circuit 0x1: Disables the interface protect circuit | RW | 0 |
| 6:5 | RESERVED | | R | 0x0 |
| 4 | AUTORESUME | Enables the PHY to automatically drive resume signaling. On by default. 0x0: AutoResume disabled 0x1: AutoResume enabled | RW | 1 |
| 3 | CLOCKSUSPENDM | Active low clock suspend for serial modes (6-pin/3-pin). 0x0: ULPI clock will stop during serial modes. 0x1: ULPI clock will run during serial modes. | RW | 0 |
| 2 | RESERVED | | R | 0 |
| 1 | FSLSSERIALMODE_3PIN | Sets the ULPI interface to 3-pin (FS/LS only) serial mode. Auto-cleared when serial mode is exited. 0x0: ULPI is not in 3-pin mode. 0x1: ULPI is in 3-pin serial mode. | RW | 0 |
| 0 | FSLSSERIALMODE_6PIN | Sets the ULPI interface to 6-pin (FS/LS only) serial mode. Auto-cleared when serial mode is exited. 0x0: ULPI is not in 6-pin mode. 0x1: ULPI is in 6-pin serial mode. | RW | 0 |

Table 24-991. Register Call Summary for Register INTERFACE_CTRL_i

High-Speed Multiport USB Host Subsystem

- [USBTLL Save and Restore: \[0\]](#)
- [USBTLL Channel Configuration: \[1\] \[2\]](#)
- [USBTLLHS_ULPI Register Summary: \[3\]](#)

Table 24-992. INTERFACE_CTRL_SET_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 0008 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2808 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Enables alternative interfaces and PHY features. Read/set address (write 1 to a bit to set it to 1, writing 0 has no effect on bit value). See field description at the read/write address of the same register. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------------------|----------|---|------------|---------------|----------|---------------------|---------------------|
| INTERFACE_PROTECT_DISABLE | RESERVED | | AUTORESUME | CLOCKSUSPENDM | RESERVED | FSLSSERIALMODE_3PIN | FSLSSERIALMODE_6PIN |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|-------|
| 7 | INTERFACE_PROTECT_DISABLE | Controls circuitry built into the PHY for protecting the ULPI interface when the link 3-states stp and data. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 6:5 | RESERVED | Reserved | R | 0x0 |
| 4 | AUTORESUME | Enables the PHY to automatically drive resume signaling. On by default. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 3 | CLOCKSUSPENDM | Active low clock suspend for serial modes (6-pin/3-pin). Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 2 | RESERVED | Reserved | R | 0x0 |
| 1 | FSLSSERIALMODE_3PIN | Sets the ULPI interface to 3-pin (FS/LS only) serial mode. Autocleared when serial mode is exited. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 0 | FSLSSERIALMODE_6PIN | Sets the ULPI interface to 6-pin (FS/LS only) serial mode. Autocleared when serial mode is exited. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |

Table 24-993. Register Call Summary for Register INTERFACE_CTRL_SET_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-994. INTERFACE_CTRL_CLR_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0009 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2809 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Enables alternative interfaces and PHY features. Read/clear address (write 1 to a bit to clear it to 0, writing 0 has no effect on bit value). See fields description at the read/write address of the same register. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------------------|----------|---|------------|---------------|----------|---------------------|---------------------|
| INTERFACE_PROTECT_DISABLE | RESERVED | | AUTORESUME | CLOCKSUSPENDM | RESERVED | FSLSSERIALMODE_3PIN | FSLSSERIALMODE_6PIN |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------------|---|------|-------|
| 7 | INTERFACE_PROTECT_DISABLE | Controls circuitry built into the PHY for protecting the ULPI interface when the link 3-states stp and data. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 6:5 | RESERVED | Reserved | R | 0x0 |
| 4 | AUTORESUME | Enables the PHY to automatically drive resume signaling. On by default. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 3 | CLOCKSUSPENDM | Active low clock suspend for serial modes (6-pin/3-pin). Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 2 | RESERVED | Reserved | R | 0x0 |
| 1 | FSLSSERIALMODE_3PIN | Sets the ULPI interface to 3-pin (FS/LS only) serial mode. Autocleared when serial mode is exited. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 0 | FSLSSERIALMODE_6PIN | Sets the ULPI interface to 6-pin (FS/LS only) serial mode. Autocleared when serial mode is exited. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |

Table 24-995. Register Call Summary for Register INTERFACE_CTRL_CLR_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-996. OTG_CTRL_i

| | | | |
|-------------------------|---|-----------------|---------------|
| Address Offset | 0x0000 000A + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 280A + (0x100 * i) | Instance | USBTLLHS_ULPI |
| Description | Controls UTMI+ OTG functions of the PHY. Read/write address. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---|---------|----------|-------------|------------|------------|----------|
| RESERVED | | DRVVBUS | CHRGVBUS | DISCHRGVBUS | DMPULLDOWN | DPPULLDOWN | IDPULLUP |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|-------|
| 7:6 | RESERVED | | R | 0x0 |
| 5 | DRVVBUS | Drive 5 V on VBUS 0x0: No action 0x1: Drive VBUS. | RW | 0 |
| 4 | CHRGVBUS | Charge VBUS through a resistor for VBUS-pulsing SRP. 0x0: No action 0x1: Charge VBUS. | RW | 0 |
| 3 | DISCHRGVBUS | Discharge VBUS through a resistor, until the session-end VBUS state is reached. 0x0: No action 0x1: Discharge VBUS. | RW | 0 |
| 2 | DMPULLDOWN | Enables the 15-kΩ pulldown resistor on D– 0x0: Pulldown resistor not connected to D– 0x1: Pulldown resistor connected to D– | RW | 1 |
| 1 | DPPULLDOWN | Enables the 15-kΩ pulldown resistor on D+ 0x0: Pulldown resistor not connected to D+ 0x1: Pulldown resistor connected to D+ | RW | 1 |
| 0 | IDPULLUP | Pullup to the (OTG) ID line to allow its sampling 0x0: Disable sampling of ID line. 0x1: Enable sampling of ID line. | RW | 0 |

Table 24-997. Register Call Summary for Register OTG_CTRL_i

High-Speed Multiport USB Host Subsystem

- [USBTLL Save and Restore: \[0\]](#)
- [USBTLL VBUS Management and Emulations: \[1\] \[2\] \[3\]](#)
- [USBTLLHS_ULPI Register Summary: \[4\]](#)

Table 24-998. OTG_CTRL_SET_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 000B + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 280B + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Controls UTMI+ OTG functions of the PHY. Read/set address (write 1 to a bit to set it to 1, writing 0 has no effect on bit value). See field description at the read/write address of the same register. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---|---------|----------|-------------|------------|------------|----------|
| RESERVED | | DRVVBUS | CHRGVBUS | DISCHRGVBUS | DMPULLDOWN | DPPULLDOWN | IDPULLUP |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 7:6 | RESERVED | Reserved | R | 0x0 |
| 5 | DRVVBUS | Drive 5 V on VBUS Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 4 | CHRGVBUS | Charge VBUS through a resistor for VBUS-pulsing SRP. Write 0x0: No effect on bit value 0x1: Set the bit to 1. | RW | 0x0 |
| 3 | DISCHRGVBUS | Discharge VBUS through a resistor, until the session-end VBUS state is reached. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 2 | DMPULLDOWN | Enables the 15-kΩ pulldown resistor on D– Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 1 | DPPULLDOWN | Enables the 15-kΩ pulldown resistor on D+ Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 0 | IDPULLUP | Pullup to the (OTG) ID line to allow its sampling Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |

Table 24-999. Register Call Summary for Register OTG_CTRL_SET_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1000. OTG_CTRL_CLR_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 000C + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 280C + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Controls UTMI+ OTG functions of the PHY. Read/clear address (write 1 to a bit to clear it to 0, writing 0 has no effect on bit value). See fields description at the read/write address of the same register. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---|---------|----------|-------------|------------|------------|----------|
| RESERVED | | DRVVBUS | CHRGVBUS | DISCHRGVBUS | DMPULLDOWN | DPPULLDOWN | IDPULLUP |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 7:6 | RESERVED | Reserved | R | 0x0 |
| 5 | DRVVBUS | Drive 5 V on VBUS Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 4 | CHRGVBUS | Charge VBUS through a resistor for VBUS-pulsing SRP. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 3 | DISCHRGVBUS | Discharge VBUS through a resistor, until the session-end VBUS state is reached. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 2 | DMPULLDOWN | Enables the 15k pulldown resistor on D– Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 1 | DPPULLDOWN | Enables the 15kΩ pulldown resistor on D+ Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 0 | IDPULLUP | Pullup to the (OTG) ID line to allow its sampling Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |

Table 24-1001. Register Call Summary for Register OTG_CTRL_CLR_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1002. USB_INT_EN_RISE_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 000D + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 280D + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Enables an interrupt event notification when the corresponding status bit changes from low to high. By default, all transitions are enabled. Read/write address. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---|---|---|------------|--------------|----------------|---------------------|
| RESERVED | | | | IDGND_RISE | SESSEND_RISE | SESSVALID_RISE | VBUSVALID_RISE |
| | | | | | | | HOSTDISCONNECT_RISE |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|-------|
| 7:5 | RESERVED | | R | 0x0 |
| 4 | IDGND_RISE | Generate an interrupt event notification when IdGnd changes from low to high. Event is automatically masked if IdPullup bit is clear to 0 and for 50ms after IdPullup is set to 1. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1 | RW | 1 |
| 3 | SESSEND_RISE | Generate an interrupt event notification when SessEnd changes from low to high. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1 | RW | 1 |
| 2 | SESSVALID_RISE | Generate an interrupt event notification when SessValid changes from low to high. SessValid is the same as UTMI+ AValid. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1 | RW | 1 |
| 1 | VBUSVALID_RISE | Generate an interrupt event notification when VbusValid changes from low to high. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1 | RW | 1 |
| 0 | HOSTDISCONNECT_RISE | Generate an interrupt event notification when Hostdisconnect changes from low to high. Applicable only in host mode (DpPulldown and DmPulldown both set to 1b). Write 0x0: No effect on bit value Write 0x1: Set the bit to 1 | RW | 1 |

Table 24-1003. Register Call Summary for Register USB_INT_EN_RISE_i

High-Speed Multiport USB Host Subsystem

- [USBTL Save and Restore: \[0\]](#)
- [USBTLHS_ULPI Register Summary: \[1\]](#)

Table 24-1004. USB_INT_EN_RISE_SET_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 000E + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 280E + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Enables an interrupt event notification when the corresponding status bit changes from low to high. Read/set address (write 1 to a bit to set it to 1, writing 0 has no effect on bit value). See fields description at the read/write address of the same register. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---|---|---|------------|-------------|----------------|---------------------|
| RESERVED | | | | IDGND_RISE | SESEND_RISE | SESSVALID_RISE | VBUSVALID_RISE |
| | | | | | | | HOSTDISCONNECT_RISE |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|-------|
| 7:5 | RESERVED | | R | 0x0 |
| 4 | IDGND_RISE | Generate an interrupt event notification when IdGnd changes from low to high. Event is automatically masked if IdPullup bit is clear to 0 and for 50ms after IdPullup is set to 1. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 3 | SESEND_RISE | Generate an interrupt event notification when SessEnd changes from low to high. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 2 | SESSVALID_RISE | Generate an interrupt event notification when SessValid changes from low to high. SessValid is the same as UTMI+ AValid. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 1 | VBUSVALID_RISE | Generate an interrupt event notification when VbusValid changes from low to high. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 0 | HOSTDISCONNECT_RISE | Generate an interrupt event notification when Hostdisconnect changes from low to high. Applicable only in host mode (DpPulldown and DmPulldown both set to 1b). Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |

Table 24-1005. Register Call Summary for Register USB_INT_EN_RISE_SET_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1006. USB_INT_EN_RISE_CLR_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 000F + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 280F + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Enables an interrupt event notification when the corresponding status bit changes from low to high. Read/clear address (write 1 to a bit to clear it to 0, writing 0 has no effect on bit value). See the field description at the read/write address of the same register. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---|---|---|------------|--------------|----------------|---------------------|
| RESERVED | | | | IDGND_RISE | SESSEND_RISE | SESSVALID_RISE | VBUSVALID_RISE |
| | | | | | | | HOSTDISCONNECT_RISE |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|-------|
| 7:5 | RESERVED | Reserved | R | 0x0 |
| 4 | IDGND_RISE | Generate an interrupt event notification when IdGnd changes from low to high. Event is automatically masked if IdPullup bit is clear to 0 and for 50 ms after IdPullup is set to 1. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 3 | SESSEND_RISE | Generate an interrupt event notification when SessEnd changes from low to high. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 2 | SESSVALID_RISE | Generate an interrupt event notification when SessValid changes from low to high. SessValid is the same as UTMI+ AValid. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 1 | VBUSVALID_RISE | Generate an interrupt event notification when VbusValid changes from low to high. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 0 | HOSTDISCONNECT_RISE | Generate an interrupt event notification when Hostdisconnect changes from low to high. Applicable only in host mode (DpPulldown and DmPulldown both set to 1b). Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |

Table 24-1007. Register Call Summary for Register USB_INT_EN_RISE_CLR_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1008. USB_INT_EN_FALL_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0010 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2810 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Enables an interrupt event notification when the corresponding status bit changes from high to low. By default, all transitions are enabled. Read/write address. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---|---|---|--------------|----------------|----------------|---------------------|
| RESERVED | | | | SESSEND_FALL | SESSVALID_FALL | VBUSVALID_FALL | HOSTDISCONNECT_FALL |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|---|------|-------|
| 7:5 | RESERVED | | R | 0x0 |
| 4 | IDGND_FALL | Generate an interrupt event notification when IdGnd changes from high to low. Event is automatically masked if IdPullup bit is clear to 0 and for 50 ms after IdPullup is set to 1. | RW | 1 |
| 3 | SESSEND_FALL | Generate an interrupt event notification when SessEnd changes from high to low. | RW | 1 |
| 2 | SESSVALID_FALL | Generate an interrupt event notification when SessValid changes from high to low. SessValid is the same as UTMI+ AValid. | RW | 1 |
| 1 | VBUSVALID_FALL | Generate an interrupt event notification when VbusValid changes from high to low. | RW | 1 |
| 0 | HOSTDISCONNECT_FALL | Generate an interrupt event notification when Hostdisconnect changes from high to low. Applicable only in host mode (DpPulldown and DmPulldown both set to 1b). | RW | 1 |

Table 24-1009. Register Call Summary for Register USB_INT_EN_FALL_i

High-Speed Multiport USB Host Subsystem

- [USBTL Save and Restore: \[0\]](#)
- [USBTLHS_ULPI Register Summary: \[1\]](#)

Table 24-1010. USB_INT_EN_FALL_SET_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 0011 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2811 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Enables an interrupt event notification when the corresponding status bit changes from high to low. Read/set address (write 1 to a bit to set it to 1, writing 0 has no effect on bit value). See fields description at the read/write address of the same register. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---|---|------------|-------------|----------------|----------------|---------------------|
| RESERVED | | | IDGND_RISE | SESEND_RISE | SESSVALID_RISE | VBUSVALID_RISE | HOSTDISCONNECT_RISE |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|-------|
| 7:5 | RESERVED | | R | 0x0 |
| 4 | IDGND_RISE | Generate an interrupt event notification when IdGnd changes from low to high. Event is automatically masked if IdPullup bit is clear to 0 and for 50 ms after IdPullup is set to 1. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 3 | SESEND_RISE | Generate an interrupt event notification when SessEnd changes from low to high. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 2 | SESSVALID_RISE | Generate an interrupt event notification when SessValid changes from low to high. SessValid is the same as UTMI+ AValid. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 1 | VBUSVALID_RISE | Generate an interrupt event notification when VbusValid changes from low to high. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 0 | HOSTDISCONNECT_RISE | Generate an interrupt event notification when Hostdisconnect changes from low to high. Applicable only in host mode (DpPulldown and DmPulldown both set to 1b). Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |

Table 24-1011. Register Call Summary for Register USB_INT_EN_FALL_SET_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1012. USB_INT_EN_FALL_CLR_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0012 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2812 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Enables an interrupt event notification when the corresponding status bit changes from high to low. Read/clear address (write 1 to a bit to clear it to 0, writing 0 has no effect on bit value). See field description at the read/write address of the same register. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---|---|---|------------|-------------|----------------|---------------------|
| RESERVED | | | | IDGND_RISE | SESEND_RISE | SESSVALID_RISE | VBUSVALID_RISE |
| | | | | | | | HOSTDISCONNECT_RISE |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|-------|
| 7:5 | RESERVED | | R | 0x0 |
| 4 | IDGND_RISE | Generate an interrupt event notification when IdGnd changes from low to high. Event is automatically masked if IdPullup bit is clear to 0 and for 50 ms after IdPullup is set to 1. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 3 | SESEND_RISE | Generate an interrupt event notification when SessEnd changes from low to high. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 2 | SESSVALID_RISE | Generate an interrupt event notification when SessValid changes from low to high. SessValid is the same as UTMI+ AValid. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 1 | VBUSVALID_RISE | Generate an interrupt event notification when VbusValid changes from low to high. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |
| 0 | HOSTDISCONNECT_RISE | Generate an interrupt event notification when Hostdisconnect changes from low to high. Applicable only in host mode (DpPulldown and DmPulldown both set to 1b). Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |

Table 24-1013. Register Call Summary for Register USB_INT_EN_FALL_CLR_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1014. USB_INT_STATUS_i

| | | | |
|-------------------------|---|-----------------|---------------|
| Address Offset | 0x0000 0013 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2813 + (0x100 * i) | Instance | USBTLLHS_ULPI |
| Description | Indicates the current value of the interrupt source signal. | | |
| Type | R | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---|---|-------|--------|-----------|-----------|----------------|
| RESERVED | | | IDGND | SESEND | SESSVALID | VBUSVALID | HOSTDISCONNECT |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------|
| 7:5 | RESERVED | Reserved | R | 0x0 |
| 4 | IDGND | Value of UTMI+ IdDig output. Undefined unless IdPullup = 1 Read 0x1: ID pin is floating = OTG B = default peripheral Read 0x0: ID pin is grounded = OTG A = default host | R | 0 |
| 3 | SESEND | Current value of UTMI+ SessEnd output. Read 0x1: VBUS is below Session-End threshold. Read 0x0: VBUS is above Session-End threshold. | R | 0 |
| 2 | SESSVALID | Current value of UTMI+ SessValid output. SessValid is the same as UTMI+ AValid. Read 0x1: VBUS is above Session-Valid threshold. Read 0x0: VBUS is below Session-Valid threshold. | R | 0 |
| 1 | VBUSVALID | Current value of UTMI+ VbusValid output. Read 0x1: VBUS is above Vbus-Valid threshold. Read 0x0: VBUS is below Vbus-Valid threshold. | R | 0 |
| 0 | HOSTDISCONNECT | Current value of UTMI+ Hostdisconnect output. Applicable only in host mode. Automatically reset to 0 when low-power mode is entered. Read 0x1: Peripheral disconnected Read 0x0: Peripheral not disconnected or nonhost mode | R | 0 |

Table 24-1015. Register Call Summary for Register USB_INT_STATUS_i

High-Speed Multiport USB Host Subsystem

- [USBTLL Save and Restore: \[0\]](#)
- [USBTLL VBUS Management and Emulations: \[1\] \[2\] \[3\]](#)
- [USBTLLHS_ULPI Register Summary: \[4\]](#)

Table 24-1016. USB_INT_LATCH_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0014 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2814 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Set by unmasked changes on the corresponding status bits to generate the ULPI interrupt. Cleared upon read, and when low-power mode, serial mode, or carkit mode are entered. | | |
| Type | R | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---|---|-------------|--------------|-----------------|-----------------|----------------------|
| RESERVED | | | IDGND_LATCH | SESEND_LATCH | SESSVALID_LATCH | VBUSVALID_LATCH | HOSTDISCONNECT_LATCH |
| | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|-------|
| 7:5 | RESERVED | Reserved | R | 0x0 |
| 4 | IDGND_LATCH | Set to 1 by the PHY when an unmasked event occurs on IdGnd. Cleared when this register is read. | R | 0 |
| 3 | SESEND_LATCH | Set to 1 by the PHY when an unmasked event occurs on SessEnd. Cleared when this register is read. | R | 0 |
| 2 | SESSVALID_LATCH | Set to 1 by the PHY when an unmasked event occurs on SessValid. Cleared when this register is read. SessValid is the same as UTMI+ AValid. | R | 0 |
| 1 | VBUSVALID_LATCH | Set to 1 by the PHY when an unmasked event occurs on VbusValid. Cleared when this register is read. | R | 0 |
| 0 | HOSTDISCONNECT_LATCH | Set to 1 by the PHY when an unmasked event occurs on Hostdisconnect. Cleared when this register is read. Applicable only in host mode. | R | 0 |

Table 24-1017. Register Call Summary for Register USB_INT_LATCH_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1018. DEBUG_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 0015 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2815 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Indicates the current value of various signals useful for debugging. | | |
| Type | R | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|---|---|---|---|---|------------|---|
| RESERVED | | | | | | LINE STATE | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7:2 | RESERVED | | R | 0x00 |
| 1:0 | LINE STATE | Current state of the USB line: D+ (bit 0) and D– (bit 1). Read 0x3: SE1 (LS/FS), Invalid (HS/Chirp) Read 0x2: LS: J state, FS: K state, HS: Invalid, Chirp: !Squelch !HS_Differential_Receiver_Output Read 0x1: LS: K state, FS: J state, HS: !Squelch, Chirp: !Squelch HS_Differential_Receiver_Output Read 0x0: SE0 (LS/FS), Squelch (HS/Chirp) | R | 0x0 |

Table 24-1019. Register Call Summary for Register DEBUG_i

High-Speed Multiport USB Host Subsystem

- [USBLLHS_ULPI Register Summary: \[0\]](#)

Table 24-1020. SCRATCH_REGISTER_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 0016 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2816 + (0x100 * i) | Instance | USBLLHS_ULPI |
| Description | Register byte for register access testing purposes. Value has no functional effect on PHY. Read/write address. | | |
| Type | RW | | |

| | | | | | | | |
|---------|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SCRATCH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------|------|-------|
| 7:0 | SCRATCH | Scratch data | RW | 0x00 |

Table 24-1021. Register Call Summary for Register SCRATCH_REGISTER_i

High-Speed Multiport USB Host Subsystem

- [USBLLHS_ULPI Register Summary: \[0\]](#)

Table 24-1022. SCRATCH_REGISTER_SET_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 0017 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2817 + (0x100 * i) | Instance | USBLLHS_ULPI |
| Description | Register byte for register access testing purposes. Value has no functional effect on PHY. Read/set address (write 1 to a bit to set it to 1, writing 0 has no effect on bit value). See field description at the read/write address of the same register. | | |
| Type | RW | | |

| | | | | | | | |
|---------|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SCRATCH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7:0 | SCRATCH | Scratch data Write 1 to a bit to set it to 1. Writing 0 has no effect on bit value. | RW | 0x00 |

Table 24-1023. Register Call Summary for Register SCRATCH_REGISTER_SET_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1024. SCRATCH_REGISTER_CLR_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 0018 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2818 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Register byte for register access testing purposes. Value has no functional effect on PHY. Read/clear address (write 1 to a bit to clear it to 0, writing 0 has no effect on bit value). See field description at the read/write address of the same register. | | |
| Type | RW | | |

| | | | | | | | |
|---------|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SCRATCH | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7:0 | SCRATCH | Scratch data Write 1 to a bit to clear it to 0. Writing 0 has no effect on bit value. | RW | 0x00 |

Table 24-1025. Register Call Summary for Register SCRATCH_REGISTER_CLR_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1026. EXTENDED_SET_ACCESS_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 002F + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 282F + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | This address is used to access the extended register set; that is, addresses above 0x40. | | |
| Type | RW | | |

| | | | | | | | |
|------------|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| SET_ACCESS | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7:0 | SET_ACCESS | This bit field is used to access the extended register set; that is, addresses above 0x40. | RW | 0x00 |

Table 24-1027. Register Call Summary for Register EXTENDED_SET_ACCESS_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1028. UTMI_VCONTROL_EN_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0030 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2830 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Part of nonstandard UTMI-to-ULPI mailbox system, implemented if HDL generic VCS_MAILBOX bit is 1 Enables an interrupt notification when the corresponding vcontrol_status bit changes. Read/write address. Lowest VCS_CTRL_WIDTH (HDL generic) bits are implemented, others are always-0, read-only. (UTMI standard is 4-bit.) | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------|--------|--------|--------|--------|--------|--------|--------|
| VC7_EN | VC6_EN | VC5_EN | VC4_EN | VC3_EN | VC2_EN | VC1_EN | VC0_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7 | VC7_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 6 | VC6_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 5 | VC5_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 4 | VC4_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 3 | VC3_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 2 | VC2_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 1 | VC1_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 0 | VC0_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |

Table 24-1029. Register Call Summary for Register UTMI_VCONTROL_EN_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1030. UTMI_VCONTROL_EN_SET_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 0031 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2831 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Part of nonstandard UTMI-to-ULPI mailbox system, implemented if HDL generic VCS_MAILBOX bit is 1 Enables an interrupt notification when the corresponding vcontrol_status bit changes. Read/set address (write 1 to a bit to set it to 1, writing 0 has no effect on bit value). See fields description at the read/write address of the same register. | | |
| Type | RW | | |

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------|--------|--------|--------|--------|--------|--------|--------|
| VC7_EN | VC6_EN | VC5_EN | VC4_EN | VC3_EN | VC2_EN | VC1_EN | VC0_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7 | VC7_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 6 | VC6_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 5 | VC5_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 4 | VC4_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 3 | VC3_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 2 | VC2_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 1 | VC1_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |
| 0 | VC0_EN | Enable alt_int assertion upon vcontrol_status bit change: Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |

Table 24-1031. Register Call Summary for Register UTMI_VCONTROL_EN_SET_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1032. UTMI_VCONTROL_EN_CLR_i

| | | | |
|---|--|-------------------------------------|--------------|
| Address Offset | 0x0000 0032 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2832 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Part of nonstandard UTMI-to-ULPI mailbox system, implemented if HDL generic VCS_MAILBOX bit is 1. Enables an interrupt notification when the corresponding vcontrol_status bit changes. Read/clear address (write 1 to a bit to clear it to 0, writing 0 has no effect on bit value). See fields description at the read/write address of the same register. | | |
| Type | RW | | |
| <div><div>7</div><div>6</div><div>5</div><div>4</div><div>3</div><div>2</div><div>1</div><div>0</div></div> | | | |
| VC | | | |
| Bits | Field Name | Description | Type |
| 7:0 | VC | User-defined UTMI control data byte | RW |
| | | | 0x00 |

Table 24-1033. Register Call Summary for Register UTMI_VCONTROL_EN_CLR_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1034. UTMI_VCONTROL_STATUS_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 0033 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2833 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Part of nonstandard UTMI-to-ULPI mailbox system, implemented if HDL generic VCS_MAILBOX bit is 1. UTMI-standard Vcontrol vector byte is sent by the UTMI controller (other side of TLL) to its PHY (emulated here by the TLL). Alternatively, data can be also written directly into the register. Can contain any user-defined data. Vcontrol bit changes can be used to assert the ULPI ALT interrupt. Lowest VCS_CTRL_WIDTH (HDL generic) bits are implemented, others are always-0, read-only. (UTMI standard is 4-bit). | | |
| Type | RW | | |

| | | | | | | | |
|----|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VC | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------------------------|------|-------|
| 7:0 | VC | User-defined UTMI Control data byte | RW | 0x00 |

Table 24-1035. Register Call Summary for Register UTMI_VCONTROL_STATUS_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1036. UTMI_VCONTROL_LATCH_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0034 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2834 + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Part of nonstandard UTMI-to-ULPI mailbox system, implemented if HDL generic VCS_MAILBOX bit is 1. Set by unmasked changes on the corresponding vcontrol_status bits to generate the ULPI ALT interrupt. Cleared upon read, and when low-power mode, serial mode or carkit mode are entered. Lowest VCS_CTRL_WIDTH (HDL generic) bits are implemented, others are always-0, read-only. (UTMI standard is 4-bit.) | | |
| Type | R | | |

| | | | | | | | |
|------------|------------|------------|------------|------------|------------|------------|------------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VC7_CHANGE | VC6_CHANGE | VC5_CHANGE | VC4_CHANGE | VC3_CHANGE | VC2_CHANGE | VC1_CHANGE | VC0_CHANGE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7 | VC7_CHANGE | Unmasked change on vcontrol_status bit | R | 0 |
| 6 | VC6_CHANGE | Unmasked change on vcontrol_status bit | R | 0 |
| 5 | VC5_CHANGE | Unmasked change on vcontrol_status bit | R | 0 |
| 4 | VC4_CHANGE | Unmasked change on vcontrol_status bit | R | 0 |
| 3 | VC3_CHANGE | Unmasked change on vcontrol_status bit | R | 0 |
| 2 | VC2_CHANGE | Unmasked change on vcontrol_status bit | R | 0 |
| 1 | VC1_CHANGE | Unmasked change on vcontrol_status bit | R | 0 |
| 0 | VC0_CHANGE | Unmasked change on vcontrol_status bit | R | 0 |

Table 24-1037. Register Call Summary for Register UTMI_VCONTROL_LATCH_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1038. UTMI_VSTATUS_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0035 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2835 + (0x100 * i) | Instance | USBLLHS_ULPI |
| Description | Part of nonstandard UTMI-to-ULPI mailbox system, implemented if HDL generic VCS_MAILBOX bit is 1. UTMI-standard Vstatus vector byte is sent by the PHY (emulated here by the TLL) to the UTMI controller (other side of TLL): information written into this register goes directly to the UTMI controller, and can contain any user-defined data. Read/write address. Lowest VCS_STAT_WIDTH (HDL generic) bits are implemented, others are always-0, read-only. (UTMI standard is 8-bit.) | | |
| Type | RW | | |

| | | | | | | | |
|----|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VS | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------------|------|-------|
| 7:0 | VS | User-defined UTMI status data byte | RW | 0x00 |

Table 24-1039. Register Call Summary for Register UTMI_VSTATUS_i

High-Speed Multiport USB Host Subsystem

- [USBLLHS_ULPI Register Summary: \[0\]](#)

Table 24-1040. UTMI_VSTATUS_SET_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0036 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2836 + (0x100 * i) | Instance | USBLLHS_ULPI |
| Description | Part of nonstandard UTMI-to-ULPI mailbox system, implemented if HDL generic VCS_MAILBOX bit is 1. UTMI-standard Vstatus vector byte is sent by the PHY (emulated here by the TLL) to the UTMI controller (other side of TLL): information written into this register goes directly to the UTMI controller, and can contain any user-defined data. Read/set address (write 1 to a bit to set it to 1, writing 0 has no effect on bit value). See field description at the read/write address of the same register. | | |
| Type | RW | | |

| | | | | | | | |
|----|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VS | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7:0 | VS | User-defined UTMI status data byte Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x00 |

Table 24-1041. Register Call Summary for Register UTMI_VSTATUS_SET_i

High-Speed Multiport USB Host Subsystem

- [USBLLHS_ULPI Register Summary: \[0\]](#)

Table 24-1042. UTMI_VSTATUS_CLR_i

| | | | |
|-------------------------|---|-----------------|---------------|
| Address Offset | 0x0000 0037 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2837 + (0x100 * i) | Instance | USBTLLHS_ULPI |
| Description | Part of nonstandard UTMI-to-ULPI mailbox system, implemented if HDL generic VCS_MAILBOX bit is 1. UTMI-standard Vstatus vector byte is sent by the PHY (emulated here by the TLL) to the UTMI controller (other side of TLL): information written into this register goes directly to the UTMI controller, and can contain any user-defined data. Read/clear address (write 1 to a bit to clear it to 0, writing 0 has no effect on bit value). See field description at the read/write address of the same register. | | |
| Type | RW | | |

| | | | | | | | |
|----|---|---|---|---|---|---|---|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VS | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7:0 | VS | User-defined UTMI status data byte: Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x00 |

Table 24-1043. Register Call Summary for Register UTMI_VSTATUS_CLR_i

High-Speed Multiport USB Host Subsystem

- [USBTLLHS_ULPI Register Summary: \[0\]](#)

Table 24-1044. USB_INT_LATCH_NOCLR_i

| | | | |
|-------------------------|---|-----------------|---------------|
| Address Offset | 0x0000 0038 + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 2838 + (0x100 * i) | Instance | USBTLLHS_ULPI |
| Description | Set by unmasked changes on the corresponding status bits to generate the ULPI interrupt. Debug, nonstandard address to the standard register: Register is not cleared on read. See field description at the "clear-on-read" address of the same register. | | |
| Type | R | | |

| | | | | | | | |
|----------|---|---|---|-------------|--------------|-----------------|----------------------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | IDGND_LATCH | SESEND_LATCH | SESSVALID_LATCH | VBUSVALID_LATCH |
| | | | | | | | HOSTDISCONNECT_LATCH |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|-------|
| 7:5 | RESERVED | Reserved | R | 0x0 |
| 4 | IDGND_LATCH | Set to 1 by the PHY when an unmasked event occurs on IdGnd. | R | 0x0 |
| 3 | SESEND_LATCH | Set to 1 by the PHY when an unmasked event occurs on SessEnd. | R | 0x0 |
| 2 | SESSVALID_LATCH | Set to 1 by the PHY when an unmasked event occurs on SessValid. SessValid is the same as UTMI+ AValid. | R | 0x0 |
| 1 | VBUSVALID_LATCH | Set to 1 by the PHY when an unmasked event occurs on VbusValid. | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------------|--|------|-------|
| 0 | HOSTDISCONNECT_LATCH | Set to 1 by the PHY when an unmasked event occurs on Hostdisconnect. Applicable only in host mode. | R | 0x0 |

Table 24-1045. Register Call Summary for Register USB_INT_LATCH_NOCLR_i

High-Speed Multiport USB Host Subsystem

- [USBLLHS_ULPI Register Summary: \[0\]](#)

Table 24-1046. VENDOR_INT_EN_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 003B + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 283B + (0x100 * i) | Instance | USBLLHS_ULPI |
| Description | Vendor-specific interrupt enables (mask) for miscellaneous ULPI alt_int events. Read/write address. | | |
| Type | RW | | |

| | | | | | | | |
|----------|---|---|---|---|---|---|--------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | P2P_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7:1 | RESERVED | | R | 0x00 |
| 0 | P2P_EN | Enable PHY-to-PHY ULPI wakeup upon inactive UTMI suspendm. 0x0: PHY-to-PHY wakeup enabled 0x1: PHY-to-PHY wakeup enabled | RW | 0 |

Table 24-1047. Register Call Summary for Register VENDOR_INT_EN_i

High-Speed Multiport USB Host Subsystem

- [USBLLHS_ULPI Register Summary: \[0\]](#)

Table 24-1048. VENDOR_INT_EN_SET_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 003C + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 283C + (0x100 * i) | Instance | USBLLHS_ULPI |
| Description | Vendor-specific interrupt enable bit (mask) for miscellaneous ULPI alt_int events. Read/set address (write 1 to a bit to set it to 1, writing 0 has no effect on bit value). See field description at the read/write address of the same register. | | |
| Type | RW | | |

| | | | | | | | |
|----------|---|---|---|---|---|---|--------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | P2P_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7:1 | RESERVED | Reserved | R | 0x00 |
| 0 | P2P_EN | Enable PHY-to-PHY ULPI wakeup upon inactive UTMI suspendm. Write 0x0: No effect on bit value Write 0x1: Set the bit to 1. | RW | 0x0 |

Table 24-1049. Register Call Summary for Register VENDOR_INT_EN_SET_i

High-Speed Multiport USB Host Subsystem

- [USBLLHS_ULPI Register Summary: \[0\]](#)

Table 24-1050. VENDOR_INT_EN_CLR_i

| | | | |
|-------------------------|--|-----------------|--------------|
| Address Offset | 0x0000 003D + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 283D + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Vendor-specific interrupt enables (mask) for miscellaneous ULPI alt_int events. Read/clear address (write 1 to a bit to clear it to 0, writing 0 has no effect on bit value). See fields description at the read/write address of the same register. | | |
| Type | RW | | |

| | | | | | | | |
|----------|---|---|---|---|---|---|--------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | P2P_EN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7:1 | RESERVED | Reserved | R | 0x00 |
| 0 | P2P_EN | Enable PHY-to-PHY ULPI wakeup upon inactive UTMI suspendm. Write 0x0: No effect on bit value Write 0x1: Clear the bit to 0. | RW | 0x0 |

Table 24-1051. Register Call Summary for Register VENDOR_INT_EN_CLR_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1052. VENDOR_INT_STATUS_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 003E + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 283E + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Vendor-specific interrupt sources for miscellaneous ULPI alt_int events | | |
| Type | R | | |

| | | | | | | | |
|----------|---|---|---|---|---|---|---------------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | UTMI_SUSPENDM |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------|
| 7:1 | RESERVED | | R | 0x00 |
| 0 | UTMI_SUSPENDM | UTMI suspendm status (active-low), source of TLL PHY-to-PHY wake-up interrupt. Read 0x1: UTMI interface is active (not suspended). Read 0x0: UTMI interface is suspended. | R | 1 |

Table 24-1053. Register Call Summary for Register VENDOR_INT_STATUS_i

High-Speed Multiport USB Host Subsystem

- [USBTLHS_ULPI Register Summary: \[0\]](#)

Table 24-1054. VENDOR_INT_LATCH_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 003F + (0x100 * i) | Index | i = 0 to 1 |
| Physical Address | 0x4A06 283F + (0x100 * i) | Instance | USBTLHS_ULPI |
| Description | Vendor-specific interrupt latches for miscellaneous ULPI alt_int events. Cleared upon read, and when low-power mode, serial mode or carkit mode are entered. | | |
| Type | R | | |

| | | | | | | | |
|----------|---|---|---|---|---|---|-----------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | P2P_LATCH |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7:1 | RESERVED | | R | 0x00 |
| 0 | P2P_LATCH | PHY-to-PHY ULPI wake-up event latch. Set when ULPI is in low-power mode (suspendm = 0) and UTMI is active (suspendm = 1). Read 0x1: PHY-to-PHY wake-up event was latched, ALT interrupt active. Read 0x0: No PHY-to-PHY wake-up event was latched. | R | 0 |

Table 24-1055. Register Call Summary for Register VENDOR_INT_LATCH_i

- High-Speed Multiport USB Host Subsystem
- [USBTLHS_ULPI Register Summary: \[0\]](#)

24.11.6.4 HSUSBHOST Controller Registers

24.11.6.4.1 HSUSBHOST Controller Register Summary

[Table 24-1056](#) summarizes the HSUSBHOST register mapping.

Table 24-1056. HSUSBHOST Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address |
|--|------|-----------------------|-------------------------|-------------------------|
| UHH_REVISION | R | 32 | 0x0000 0000 | 0x4A06 4000 |
| UHH_HWINFO | R | 32 | 0x0000 0004 | 0x4A06 4004 |
| UHH_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4A06 4010 |
| UHH_SYSSTATUS | R | 32 | 0x0000 0014 | 0x4A06 4014 |
| UHH_HOSTCONFIG | RW | 32 | 0x0000 0040 | 0x4A06 4040 |
| UHH_DEBUG_CSR | RW | 32 | 0x0000 0044 | 0x4A06 4044 |
| UHH_SAR_CNTX_i⁽¹⁾ | RW | 32 | 0x0000 0100 + (0x4 * i) | 0x4A06 4100 + (0x4 * i) |

⁽¹⁾ i = 0 to 383

CAUTION

The UHH_config registers are limited to 32-bit data accesses; 16-bit and 8-bit accesses are not allowed and can corrupt register content.

24.11.6.4.2 HSUSB Controller Register Description

[Table 24-1057](#) through [Table 24-1069](#) describe the HSUSB controller registers.

Table 24-1057. UHH_REVISION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A06 4000 | | | | | | | | | | | | | | | | InstanceHSUSBHOST | | | | | | | | | | | | | | | |
| Description | USB high-speed host (UHH) revision identifier (X.Y.R) Used by software to track features, bugs, and compatibility | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------|
| 31:0 | REVISION | IP revision | R | TI Internal data |

Table 24-1058. Register Call Summary for Register UHH_REVISION

High-Speed Multiport USB Host Subsystem

- [HSUSBHOST Controller Register Summary: \[0\]](#)

Table 24-1059. UHH_HWINFO

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A06 4004 | | | | | | | | | | | | | | | | Instance HSUSBHOST | | | | | | | | | | | | | | | |
| Description | Information on host hardware configuration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | SAR_CNTX_SIZE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|----------|
| 31:10 | RESERVED | | R | 0x000000 |
| 9:0 | SAR_CNTX_SIZE | Save-and-restore context size, in 32-bit words; that is, number of 32-bit registers with significant context information, mapped from offset 0x100 upward. | R | 0x180 |

Table 24-1060. Register Call Summary for Register UHH_HWINFO

High-Speed Multiport USB Host Subsystem

- [HSUSBHOST Controller Register Summary: \[0\]](#)
- [HSUSB Controller Register Description: \[1\]](#)

Table 24-1061. UHH_SYSCONFIG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0010 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A06 4010 | | | | | | | | | | | | | | | | InstanceHSUSBHOST | | | | | | | | | | | | | | | |
| Description | OCP standard system configuration register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|-------------|---|---|---|----------|---|----------|---|-----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | STANDBYMODE | | | | IDLEMODE | | RESERVED | | SOFTRESET | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|------------|
| 31:6 | RESERVED | | R | 0x00000000 |
| 5:4 | STANDBYMODE | Mstandby/Mwait/[Mwakeup] initiator power-management interface configuration 0x0: Force-standby mode. Mstandby asserted unconditionally. Asynchronous (master) wake-up disabled. 0x1: No-standby mode. Mstandby never asserted. Asynchronous (master) wakeup disabled. 0x2: Smart-standby mode. Mstandby asserted when initiator activity stops. Asynchronous (master) wake-up disabled. 0x3: Reserved | RW | 0x0 |
| 3:2 | IDLEMODE | Sidlereq/Sidleack(1:0)/[Swakeup] target power management interface configuration. 0x0: Force-Idle mode. Sidleack asserted after Idlereq assertion. Asynchronous (slave) wake-up disabled. 0x1: No-idle mode. Sidleack never asserted. Asynchronous (slave) wakeup disabled. 0x2: Smart-idle mode. Sidleack asserted upon Idlereq assertion, after target activity is over. Asynchronous (slave) wake-up disabled. 0x3: Smart-idle wake-up mode. Like smart mode with asynchronous (slave) wakeup enabled. | RW | 0x2 |
| 1 | RESERVED | | R | 0 |
| 0 | SOFTRESET | Module software reset Read 0x0: No reset pending Write 0x0: No effect Write 0x1: Starts softreset sequence. Read 0x1: Reset (soft or other) is pending. | RW | 0 |

Table 24-1062. Register Call Summary for Register UHH_SYSCONFIG

High-Speed Multiport USB Host Subsystem

- [HS USB Host Controller Software Reset: \[0\]](#)
- [HS USB Host Controller Power Management: \[1\] \[2\]](#)
- [HS Multiport USB Host Subsystem Global Initialization: \[3\]](#)
- [HSUSBHOST Controller Register Summary: \[4\]](#)

Table 24-1063. UHH_SYSSTATUS

| | | | |
|------------------|-------------------------------|----------|-----------|
| Address Offset | 0x0000 0014 | Instance | HSUSBHOST |
| Physical Address | 0x4A06 4014 | | |
| Description | Module-specific system status | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|----------------|----------------|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | EHCI_RESETDONE | OHCI_RESETDONE | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------------|
| 31:3 | RESERVED | | R | 0x0000 0000 |
| 2 | EHCI_RESETDONE | Indicates when the EHCI HS host is out of reset Read 0x0: Out of reset Read 0x1: Under reset | R | 1 |
| 1 | OHCI_RESETDONE | Indicates when the OHCI FS/LS host is out of reset Read 0x0: Out of reset Read 0x1: Under reset | R | 1 |
| 0 | RESERVED | | R | 0 |

Table 24-1064. Register Call Summary for Register UHH_SYSSTATUS

High-Speed Multiport USB Host Subsystem

- [HS Multiport USB Host Subsystem Global Initialization: \[0\] \[1\]](#)
- [HSUSBHOST Controller Register Summary: \[2\]](#)

Table 24-1065. UHH_HOSTCONFIG

| | | | |
|-------------------------|---|-----------------|-----------|
| Address Offset | 0x0000 0040 | Instance | HSUSBHOST |
| Physical Address | 0x4A06 4040 | | |
| Description | Static configuration of the USB HS host | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | |
|---------------|----------|----|----|----|----|----|----|----|----|----|----|----|---------|----|---------|----|----------|----|----|----|----|---|---|---|-------------------|---|-------------------|---|----------|---|----------------|--|------------|--|-----------|--|-----------|--|-----------------------|--|----------|--|
| APP_START_CLK | RESERVED | | | | | | | | | | | | P2_MODE | | P1_MODE | | RESERVED | | | | | | | | P2_CONNECT_STATUS | | P1_CONNECT_STATUS | | RESERVED | | ENA_INCR_ALIGN | | ENA_INCR16 | | ENA_INCR8 | | ENA_INCR4 | | AUTOPPD_ON_OVERCUR_EN | | RESERVED | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|-------|
| 31 | APP_START_CLK | When the OHCI clocks are suspended, the system must assert this signal to start the clocks (12 and 48 MHz). This must be deasserted after the clocks are started and before the host is suspended again. (Host is suspended means HCFS = SUSPEND or all the OHCI ports are suspended.) | RW | 0 |
| 30:20 | RESERVED | | R | 0X000 |
| 19:18 | P2_MODE | Port 2 interface configuration. Each bit corresponds to an internal "strap" signal, and output: Bit 0 = ulpi_bypass Bit 1 = hsic_en 0x0: To external ULPI PHY, HS only 0x1: To UTMI PHY (or ULPI TLL), FS/LS capable 0x2: Forbidden 0x3: To HSIC digital front-end (DFE), HS only | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------------|---|------|-------|
| 17:16 | P1_MODE | Port 1 interface configuration. Each bit corresponds to an internal "strap" signal, and output: Bit 0 = ulpi_bypass Bit 1 = hsic_en 0x0: To external ULPI PHY, HS only 0x1: To UTMI PHY (or ULPI TLL), FS/LS capable 0x2: Forbidden 0x3: To HSIC digital front-end (DFE), HS only | RW | 0x0 |
| 15:10 | RESERVED | | R | 0x00 |
| 9 | P2_CONNECT_STATUS | Connection status for port 2 Read 0x0: Disconnected Read 0x1: Peripheral connected and active on port | R | 0x0 |
| 8 | P1_CONNECT_STATUS | Connection status for port 1 Read 0x0: Disconnected Read 0x1: Peripheral connected and active on port | R | 0x0 |
| 7:6 | RESERVED | | R | 0x0 |
| 5 | ENA_INCR_ALIGN | Force alignment of bursts to the respective burst-size boundaries ⁽¹⁾ 0x0: Disable burst type 0x1: Enable burst type | RW | 0 |
| 4 | ENA_INCR16 | Control the use of INCR16-type bursts (in AHB sense) 0x0: Disable burst type 0x1: Enable burst type | RW | 1 |
| 3 | ENA_INCR8 | Control the use of INCR8-type bursts (in AHB sense) 0x0: Disable burst type 0x1: Enable burst type | RW | 1 |
| 2 | ENA_INCR4 | Control the use of INCR4-type bursts (in AHB sense) 0x0: Disable burst type 0x1: Enable burst type | RW | 1 |
| 1 | AUTOPPD_ON_OVERCUR_EN | Configure reaction upon port overcurrent condition. This function is not supported at the device level. 0x0: Port remains on upon overcurrent. 0x1: Port is powered down automatically upon overcurrent. | RW | 0x0 |
| 0 | RESERVED | | R | 0 |

⁽¹⁾ This bit must be set to 1 to avoid buffer underflow.

Table 24-1066. Register Call Summary for Register UHH_HOSTCONFIG

High-Speed Multiport USB Host Subsystem

- [HS USB Host Controller Port Status: \[0\] \[1\]](#)
- [HS USB Host Controller Burst Control: \[2\] \[3\]](#)
- [UTMI Interface: \[4\] \[5\] \[6\]](#)
- [ULPI Interface: \[7\] \[8\]](#)
- [Operational Modes Configuration \(Selecting and Configuring USB Connectivity\): \[9\]](#)
- [HSUSBHOST Controller Register Summary: \[10\]](#)

Table 24-1067. UHH_DEBUG_CSR

| | | | |
|------------------|---|----------|-----------|
| Address Offset | 0x0000 0044 | Instance | HSUSBHOST |
| Physical Address | 0x4A06 4044 | | |
| Description | Debug control and status for the EHCI, OHCI hosts | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|------------|------------|--------------------|----------|----|----|----|----|----|---|---|-------------|----------------------|------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | OHCI_CCS_2 | OHCI_CCS_1 | OHCI_GLOBALSUSPEND | RESERVED | | | | | | | | OCHI_CNTSEL | EHCI_SIMULATION_MODE | EHCI_FLADJ | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|-------|
| 31:19 | RESERVED | Reserved | R | 0x000 |
| 18 | OHCI_CCS_2 | Current connect status of port 2 Read 0x0: No peripheral connected Read 0x1: Peripheral connected | R | 0 |
| 17 | OHCI_CCS_1 | Current connect status of port 1 Read 0x0: No peripheral connected Read 0x1: Peripheral connected | R | 0 |
| 16 | OHCI_GLOBALSUSPEND | OHCI global suspend status, asserted 5 ms after the suspend order. Read 0x0: Host is not suspended. Read 0x1: Host is suspended. | R | 0 |
| 15:8 | RESERVED | | R | 0x00 |
| 7 | OCHI_CNTSEL | Selection of a shorter "1 ms" counter in OHCI host, to speed up long USB phases such as reset, resume, etc. (used only for simulation) 0x0: Functional mode, 1ms = 12,000 × 12 MHz cycles 0x1: Simulation mode, 1ms = 7 × 12 MHz cycles = 583 ns | RW | 0 |
| 6 | EHCI_SIMULATION_MODE | Sets the PHY to nondriving mode (used only for simulation) 0x0: Functional mode 0x1: PHY set to nondriving | RW | 0 |
| 5:0 | EHCI_FLADJ | EHCI host frame length adjust. Modify only when EHCI Bit Field USBSTS.HCHalted = 1 Field value + 59,488 = 60,000 by default = Number of 60-MHz UTM/ULPI clock cycles per 1 ms USB frame = Number of 480-MHz HS bits per 125 μs HS USB microframe | RW | 0x20 |

Table 24-1068. Register Call Summary for Register UHH_DEBUG_CSR

High-Speed Multiport USB Host Subsystem

- [HSUSBHOST Controller Register Summary: \[0\]](#)

Table 24-1069. UHH_SAR_CNTX_i

| | | | |
|-------------------------|---|-----------------|--------------|
| Address Offset | 0x0000 0100 + (0x4 * i) | Index | i = 0 to 383 |
| Physical Address | 0x4A06 4100 + (0x4 * i) | Instance | HSUSBHOST |
| Description | Save and restore context array. Array size is indicated in UHH_HWINFO . When in SAR mode, read out to save and write to restore. Do not access when not in SAR mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CNTX | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------|------|-------------|
| 31:0 | CNTX | Context bits | RW | 0x0000 0000 |

Table 24-1070. Register Call Summary for Register UHH_SAR_CNTX_i

High-Speed Multiport USB Host Subsystem

- [HSUSBHOST Controller Register Summary: \[0\]](#)

24.11.6.5 OHCI Registers

24.11.6.5.1 OHCI Register Summary

[Table 24-1071](#) summarizes the OHCI register mapping.

Table 24-1071. OHCI Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address |
|------------------------------------|------|-----------------------|----------------|------------------|
| HCREVISION | R | 32 | 0x0000 0000 | 0x4A06 4800 |
| HCCONTROL | RW | 32 | 0x0000 0004 | 0x4A06 4804 |
| HCCOMMANDSTATUS | RW | 32 | 0x0000 0008 | 0x4A06 4808 |
| HCINTERRUPTSTATUS | RW | 32 | 0x0000 000C | 0x4A06 480C |
| HCINTERRUPTENABLE | RW | 32 | 0x0000 0010 | 0x4A06 4810 |
| HCINTERRUPTDISABLE | RW | 32 | 0x0000 0014 | 0x4A06 4814 |
| HCHCCA | RW | 32 | 0x0000 0018 | 0x4A06 4818 |
| HCPERIODCURRENTED | R | 32 | 0x0000 001C | 0x4A06 481C |
| HCCONTROLHEADED | RW | 32 | 0x0000 0020 | 0x4A06 4820 |
| HCCONTROLCURRENTED | RW | 32 | 0x0000 0024 | 0x4A06 4824 |
| HCBULKHEADED | RW | 32 | 0x0000 0028 | 0x4A06 4828 |
| HCBULKCURRENTED | RW | 32 | 0x0000 002C | 0x4A06 482C |
| HCDONEHEAD | R | 32 | 0x0000 0030 | 0x4A06 4830 |
| HCFMINTERVAL | RW | 32 | 0x0000 0034 | 0x4A06 4834 |
| HCFMREMAINING | R | 32 | 0x0000 0038 | 0x4A06 4838 |
| HCFMNUMBER | R | 32 | 0x0000 003C | 0x4A06 483C |
| HCPERIODICSTART | RW | 32 | 0x0000 0040 | 0x4A06 4840 |
| HCLSTHRESHOLD | RW | 32 | 0x0000 0044 | 0x4A06 4844 |
| HCRHDESCRIPTORA | RW | 32 | 0x0000 0048 | 0x4A06 4848 |
| HCRHDESCRIPTORB | RW | 32 | 0x0000 004C | 0x4A06 484C |
| HCRHSTATUS | RW | 32 | 0x0000 0050 | 0x4A06 4850 |
| HCRHPORTSTATUS_1 | RW | 32 | 0x0000 0054 | 0x4A06 4854 |
| HCRHPORTSTATUS_2 | RW | 32 | 0x0000 0058 | 0x4A06 4858 |
| RESERVED | RW | 32 | 0x0000 005C | 0x4A06 485C |

CAUTION

The high-speed USB registers are limited to 32-bit data accesses; 16-bit and 8-bit accesses are not allowed and can corrupt register content.

OHCI register descriptions conform to the OHCI USB standard: *Open Host Controller Interface Specification for USB, Release 1.0a*. For more information about these registers or for new specification releases, search OHCI on www.usb.org.

24.11.6.5.2 OHCI Register Description

Table 24-1072 through Table 24-1116 describe the OHCI registers.

Table 24-1072. HCREVISION

| | | | |
|-------------------------|----------------------|-----------------|------|
| Address Offset | 0x0000 0000 | Instance | OHCI |
| Physical Address | 0x4A06 4800 | | |
| Description | OHCI revision number | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | REV | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7:0 | REV | OHCI specification revision the OHCI revision number upon which the USB host controller is based. Examples: 0x10 for 1.0, 0x21 for 2.1 | R | 0x10 |

Table 24-1073. Register Call Summary for Register HCREVISION

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1074. HCCONTROL

| | | | |
|-------------------------|----------------------------|-----------------|------|
| Address Offset | 0x0000 0004 | Instance | OHCI |
| Physical Address | 0x4A06 4804 | | |
| Description | HC operating mode register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|----|------|-----|-----|----|-----|------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | RWE | RWC | IR | HCFS | BLE | CLE | IE | PLE | CBSR | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------|
| 31:11 | RESERVED | Reserved | R | 0x000000 |
| 10 | RWE | Remote wake-up enable This bit is used to enable or disable the remote wakeup feature upon detection of upstream resume signaling. | RW | 0 |
| 9 | RWC | Remote wake-up connected. This bit indicates whether the host controller supports remote wakeup signaling. | RW | 0 |
| 8 | IR | Interrupt routing | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| | | This bit determines the routing of interrupts generated by events registered in HCINTERRUPTSTATUS . 0x0: All interrupts are routed to the normal host bus interrupt mechanism.. 0x1: Interrupts are routed to the system management Interrupt. | | |
| 7:6 | HCFS | Host controller functional state 0x0: HCFS: USB reset 0x1: HCFS: USB resume 0x2: HCFS: USB operational 0x3: HCFS: USB suspend | RW | 0x0 |
| 5 | BLE | Bulk list processing enable 0x0: Bulk ED list is not processed after the next SOF. 0x1: Enables processing of bulk ED list in the next frame. | RW | 0 |
| 4 | CLE | Control list processing enable 0x0: Control ED list is not processed after the next SOF. 0x1: Enables processing of control ED list in the next frame. | RW | 0 |
| 3 | IE | Isochronous ED processing enabled by host controller driver 0x0: Isochronous EDs are not processed. 0x1: Enables processing of isochronous EDs | RW | 0 |
| 2 | PLE | Periodic list enable 0x0: Periodic ED lists are not processed after the next frame. 0x1: Enables processing of periodic ED lists in the next frame. | RW | 0 |
| 1:0 | CBSR | Control/bulk service ratio. Specifies the ratio between control and bulk EDs processed in a frame. 0x0: One control ED per bulk ED 0x1: Two control ED per bulk ED 0x2: Three control ED per bulk ED 0x3: Four control ED per bulk ED | RW | 0x0 |

Table 24-1075. Register Call Summary for Register HCCONTROL

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1076. HCCOMMANDSTATUS

| | | | |
|------------------|-----------------------|----------|------|
| Address Offset | 0x0000 0008 | Instance | OHCI |
| Physical Address | 0x4A06 4808 | | |
| Description | HC command and status | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----------|----|----|----|----|----|---|---|---|---|-----|-----|-----|-----|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | SOC | | RESERVED | | | | | | | | | | OCR | BLF | CLF | HCR | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | Reserved | R | 0x0000 |
| 17:16 | SOC | Scheduling overrun count This is used to monitor any persistent scheduling problems. These bits are incremented on each scheduling overrun error. It is initialized to 0x0 and wraps around at 0x3. | R | 0x0 |
| 15:4 | RESERVED | Reserved | R | 0x000 |
| 3 | OCR | Ownership change request. This bit is set to request a change of control of the host controller. | RW | 0 |
| 2 | BLF | Bulk list filled This bit is used to indicate whether there are any TDs on the bulk list. It is set whenever it adds a TD to an ED in the bulk list. | RW | 0 |
| 1 | CLF | Control list filled This bit is used to indicate whether there are any TDs on the control list. It is set whenever it adds a TD to an ED in the control list. | RW | 0 |
| 0 | HCR | Host controller reset (software reset). Set this bit to initiate a USB host controller reset. This resets most USB host controller OHCI registers. OHCI register accesses must not be attempted until a read of this register returns a 0. 0x0: No effect 0x1: USB host controller is reset. | RW | 0 |

Table 24-1077. Register Call Summary for Register HCCOMMANDSTATUS

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)
- [OHCI Register Description: \[1\]](#)

Table 24-1078. HCINTERRUPTSTATUS

| | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|---------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|------|--|
| Address Offset | | 0x0000 000C | | | | | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A06 480C | | | | | | | | | | | | | | | | Instance | | OHCI | |
| Description | | HC interrupt status | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|------|-----|----|----|----|-----|----|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | OC | RESERVED | | | | | | | | | | | | | | RHSC | FNO | UE | RD | SF | WDH | SO | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31 | RESERVED | Reserved | R | 0 |
| 30 | OC | Ownership change This bit is set when the HCCOMMANDSTATUS[3] OCR bit is set. Read 0x1: An ownership change has occurred. Write 0x0: No effect Write 0x1: Clears this bit | R | 0 |
| 29:7 | RESERVED | Reserved | R | 0x000000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 6 | RHSC | Root hub status change When 0x1: A root hub status change has occurred. Write 0x0: No effect Write 0x1: Clears this bit | RW | 0 |
| 5 | FNO | Frame number overflow When 0x1: A frame number overflow has occurred. Write 0x0: No effect Write 0x1: Clears this bit | RW | 0 |
| 4 | UE | Unrecoverable error When 0x1: An unrecoverable error has occurred. Write 0x0: No effect Write 0x1: Clears this bit | RW | 0 |
| 3 | RD | Resume detected When 0x1: A downstream device has issued a resume request. Write 0x0: No effect Write 0x1: Clears this bit | RW | 0 |
| 2 | SF | Start of frame When 0x1: A SOF has been issued. Write 0x0: No effect Write 0x1: Clears this bit | RW | 0 |
| 1 | WDH | Write done head When 0x1: The USB host controller has updated the HCDONEHEAD register. Write 0x0: No effect Write 0x1: Clears this bit | RW | 0 |
| 0 | SO | Scheduling overrun When 0x1: A scheduling overrun has occurred. Write 0x0: No effect Write 0x1: Clears this bit | RW | 0 |

Table 24-1079. Register Call Summary for Register HCINTERRUPTSTATUS

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)
- [OHCI Register Description: \[1\]](#)

Table 24-1080. HCINTERRUPTENABLE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0010 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | OHCI | | | | | | | | | | | | | | | |
| Physical Address | 0x4A06 4810 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | HC interrupt enable | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|------|-----|----|----|----|-----|----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| MIE | OC | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | RHSC | FNO | UE | RD | SF | WDH | SO |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 31 | MIE | Master interrupt enable When 0x1: Allows other enabled OHCI interrupt sources to propagate to the device interrupt controller When 0x0: OHCI interrupt sources are ignored. Write 0x0: No effect Write 0x1: Sets this bit | RW | 0 |
| 30 | OC | Ownership change Write 0x0: No effect Write 0x1: Enable interrupt generation due to ownership change. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 29:7 | RESERVED | Reserved | R | 0x000000 |
| 6 | RHSC | Root hub status change When 0x1 and MIE is 0x1: Allows root hub status change interrupts to propagate to the device interrupt controller When 0x0 or MIE is 0x0: Root hub status change interrupts do not propagate. Write 0x0: No effect Write 0x1: Sets this bit | RW | 0 |
| 5 | FNO | Frame number overflow When 0x1 and MIE is 0x1: Allows FNO interrupts to propagate to the device interrupt controller When 0x0 or MIE is 0x0: FNO interrupts do not propagate. Write 0x0: No effect Write 0x1: Sets this bit | RW | 0 |
| 4 | UE | Unrecoverable error When 0x1 and MIE is 0x1: Allows UE interrupts to propagate to the device interrupt controller When 0x0 or MIE is 0x0: UE interrupts do not propagate. Write 0x0: No effect Write 0x1: Sets this bit | RW | 0 |
| 3 | RD | Resume detected When 0x1 and MIE is 0x1: Allows RD interrupts to propagate to the device interrupt controller When 0x0 or MIE is 0x0: RD interrupts do not propagate. Write 0x0: No effect Write 0x1: Sets this bit | RW | 0 |
| 2 | SF | Start of frame When 0x1 and MIE is 0x1: Allows SF interrupts to propagate to the device interrupt controller When 0x0 or MIE is 0x0: SF interrupts do not propagate. Write 0x0: No effect Write 0x1: Sets this bit | RW | 0 |
| 1 | WDH | Write done head When 0x1 and MIE is 0x1: Allows WDH interrupts to propagate to the device interrupt controller When 0x0 or MIE is 0x0: WDH interrupts do not propagate. Write 0x0: No effect Write 0x1: Sets this bit | RW | 0 |
| 0 | SO | Scheduling overrun When 0x1 and MIE is 0x1: Allows SO interrupts to propagate to the device interrupt controller When 0x0 or MIE is 0x0: SO interrupts do not propagate. Write 0x0: No effect Write 0x1: Sets this bit | RW | 0 |

Table 24-1081. Register Call Summary for Register HCINTERRUPTENABLE

High-Speed Multiport USB Host Subsystem

- [HS Multiport USB Host Subsystem Global Initialization: \[0\]](#)
- [OHCI Register Summary: \[1\]](#)
- [OHCI Register Description: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)

Table 24-1082. HCINTERRUPTDISABLE

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0014 | Instance | OHCI |
| Physical Address | 0x4A06 4814 | | |
| Description | HC interrupt disable | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|-----|----|----|----|-----|----|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| MIE | OC | RESERVED | | | | | | | | | | | | | | | | | | | | | | RHSC | FNO | UE | RD | SF | WDH | SO | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31 | MIE | Master interrupt enable Always reads 0x0. Write 0x0: No effect Write 0x1: Clears the HCINTERRUPTENABLE MIE bit | RW | 0 |
| 30 | OC | Ownership change. Write 0x0: No effect. Write 0x1: Disable interrupt generation due to ownership change. | RW | 0 |
| 29:7 | RESERVED | Reserved | R | 0x000000 |
| 6 | RHSC | Root hub status change Always reads 0x0. Write 0x0: No effect Write 0x1: Clears the HCINTERRUPTENABLE RHSC bit | RW | 0 |
| 5 | FNO | Frame number overflow Always reads 0x0. Write 0x0: No effect Write 0x1: Clears the HCINTERRUPTENABLE FNO bit | RW | 0 |
| 4 | UE | Unrecoverable error Always reads 0x0. Write 0x0: No effect Write 0x1: Clears the HCINTERRUPTENABLE UE bit | RW | 0 |
| 3 | RD | Resume detected Always reads 0x0. Write 0x0: No effect Write 0x1: Clears the HCINTERRUPTENABLE RD bit | RW | 0 |
| 2 | SF | Start of frame Always reads 0x0. Write 0x0: No effect Write 0x1: Clears the HCINTERRUPTENABLE SF bit | RW | 0 |
| 1 | WDH | Write done head Always reads 0x0. Write 0x0: No effect Write 0x1: Clears the HCINTERRUPTENABLE WDH bit | RW | 0 |
| 0 | SO | Scheduling overrun Always reads 0x0. Write 0x0: No effect Write 0x1: Clears the HCINTERRUPTENABLE SO bit | RW | 0 |

Table 24-1083. Register Call Summary for Register HCINTERRUPTDISABLE

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1084. HCHCCA

| | | | |
|-------------------------|--------------------------|-----------------|------|
| Address Offset | 0x0000 0018 | Instance | OHCI |
| Physical Address | 0x4A06 4818 | | |
| Description | HC HCCA address register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HCCA | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|----------|
| 31:8 | HCCA | Physical address of the beginning of the HCCA | RW | 0x000000 |
| 7:0 | RESERVED | Reserved | R | 0x00 |

Table 24-1085. Register Call Summary for Register HCHCCA

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1086. HCPERIODCURRENTED

| | | | |
|-------------------------|------------------------------|-----------------|------|
| Address Offset | 0x0000 001C | Instance | OHCI |
| Physical Address | 0x4A06 481C | | |
| Description | HC current periodic register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PCED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | PCED | Physical address of current ED on the periodic ED list | R | 0x00000000 |
| 3:0 | RESERVED | Reserved | R | 0x0 |

Table 24-1087. Register Call Summary for Register HCPERIODCURRENTED

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1088. HCCONTROLHEADED

| | | | |
|-------------------------|--------------------------|-----------------|------|
| Address Offset | 0x0000 0020 | Instance | OHCI |
| Physical Address | 0x4A06 4820 | | |
| Description | HC head control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CHED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | CHED | Physical address of head ED on the control ED list | RW | 0x00000000 |
| 3:0 | RESERVED | Reserved | R | 0x0 |

Table 24-1089. Register Call Summary for Register HCCONTROLHEADED

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1090. HCCONTROLCURRENTED

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0024 | | |
| Physical Address | 0x4A06 4824 | Instance | OHCI |
| Description | HC current control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CCED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | CCED | Physical address of current ED on the control ED list | RW | 0x00000000 |
| 3:0 | RESERVED | Reserved | R | 0x0 |

Table 24-1091. Register Call Summary for Register HCCONTROLCURRENTED

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1092. HCBULKHEADED

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0028 | | |
| Physical Address | 0x4A06 4828 | Instance | OHCI |
| Description | HC head bulk register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BHED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:4 | BHED | Physical address of head ED on the bulk ED list | RW | 0x00000000 |
| 3:0 | RESERVED | Reserved | R | 0x0 |

Table 24-1093. Register Call Summary for Register HCBULKHEADED

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1094. HCBULKCURRENTED

| | | | |
|-------------------------|--------------------------|-----------------|------|
| Address Offset | 0x0000 002C | Instance | OHCI |
| Physical Address | 0x4A06 482C | | |
| Description | HC current bulk register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BCED | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | BCED | Physical address of current ED on the bulk ED list | RW | 0x00000000 |
| 3:0 | RESERVED | Reserved | R | 0x0 |

Table 24-1095. Register Call Summary for Register HCBULKCURRENTED

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1096. HCDONEHEAD

| | | | |
|-------------------------|-----------------------|-----------------|------|
| Address Offset | 0x0000 0030 | Instance | OHCI |
| Physical Address | 0x4A06 4830 | | |
| Description | HC head done register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DH | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:4 | DH | Physical address of last TD that was added to the Done queue | R | 0x00000000 |
| 3:0 | RESERVED | Reserved | R | 0x0 |

Table 24-1097. Register Call Summary for Register HCDONEHEAD

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)
- [OHCI Register Description: \[1\]](#)

Table 24-1098. HCFMINTERVAL

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0034 | | | | | | | | | | | | | | | | Instance | | OHCI | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A06 4834 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | HC frame interval register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | |
| FIT | | FSMPS | | | | | | | | | | | | | | | | RESERVED | | FI | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31 | FIT | Frame interval toggle This bit is toggled whenever it loads a new value to FI. | RW | 0 |
| 30:16 | FSMPS | Largest data packet size for full-speed packets, bit times This field specifies a value which is loaded into the largest data packet counter at the beginning of each frame. | RW | 0x0000 |
| 15:14 | RESERVED | Reserved | R | 0x0 |
| 13:0 | FI | Frame interval. Number of 12-MHz clocks in the USB frame. The nominal value is set to 11,999, to give a 1-ms frame. | RW | 0x2EDF |

Table 24-1099. Register Call Summary for Register HCFMINTERVAL

High-Speed Multiport USB Host Subsystem

- [OHCI Implementation Specifications: \[0\]](#)
- [OHCI Register Summary: \[1\]](#)
- [OHCI Register Description: \[2\] \[3\] \[4\]](#)

Table 24-1100. HCFMREMAINING

| | | | | | |
|-------------------------|--|-----------------------------|--|-----------------|--|
| Address Offset | | 0x0000 0038 | | | |
| Physical Address | | 0x4A06 4838 | | Instance | |
| Description | | HC frame remaining register | | OHCI | |
| Type | | R | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FRT | | | | | | | | RESERVED | | | | | | | | FR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31 | FRT | Frame remaining toggle This bit is used for the synchronization between HCFMINTERVAL[13:0] FI and FR. This bit is loaded from the HCFMINTERVAL[31] FIT bit whenever FR reaches 0. | R | 0 |
| 30:14 | RESERVED | Reserved | R | 0x00000 |
| 13:0 | FR | Frame remaining This counter is decremented at each bit time. When it reaches 0, it is reset by loading the value of the USBHOST. HCFMINTERVAL[13:0] FI bit field at the next bit time boundary. | R | 0x0000 |

Table 24-1101. Register Call Summary for Register HCFMREMAINING

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)
- [OHCI Register Description: \[1\]](#)

Table 24-1102. HCFMNUMBER

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 003C | Instance | OHCI |
| Physical Address | 0x4A06 483C | | |
| Description | HC frame number register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FN | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15:0 | FN | Frame number This is incremented when HCFMREMAINING is reloaded. It is rolled over to 0x0000 after 0xFFFF. | R | 0x0000 |

Table 24-1103. Register Call Summary for Register HCFMNUMBER

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1104. HCPERIODICSTART

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0040 | Instance | OHCI |
| Physical Address | 0x4A06 4840 | | |
| Description | HC periodic start register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PS | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:14 | RESERVED | Reserved | R | 0x00000 |
| 13:0 | PS | Periodic start. The host controller driver must program this value to be about 10 percent less than the frame interval field value so that control and bulk EDs have priority for the first 10 percent of the frame; then periodic EDs have priority for the remaining 90 percent of the frame. | RW | 0x0000 |

Table 24-1105. Register Call Summary for Register HCPERIODICSTART

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1106. HCLSTHRESHOLD

| | | | |
|-------------------------|---------------------------------|-----------------|------|
| Address Offset | 0x0000 0044 | Instance | OHCI |
| Physical Address | 0x4A06 4844 | | |
| Description | HC low-speed threshold register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LST | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---------------------|------|---------|
| 31:12 | RESERVED | Reserved | R | 0x00000 |
| 11:0 | LST | Low-speed threshold | RW | 0x628 |

Table 24-1107. Register Call Summary for Register HCLSTHRESHOLD

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1108. HCRHDESCRIPTORA

| | | | |
|-------------------------|------------------------|-----------------|------|
| Address Offset | 0x0000 0048 | Instance | OHCI |
| Physical Address | 0x4A06 4848 | | |
| Description | HC root hub A register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|------|----|------|----|----|----|-----|---|-----|---|-----|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| POTPG | | | | | | | | RESERVED | | | | | | | | NOCP | | OCPM | | DT | | NPS | | PSM | | NDP | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:24 | POTPG | Power-on to power-good time. Defines the minimum amount of time (2 ms * POTPG) between the USB host controller turning on power to a downstream port and when the USB host can access the downstream device. | RW | 0x0A |
| 23:13 | RESERVED | Reserved | R | 0x0 |
| 12 | NOCP | No overcurrent protection. This function is not supported at the device level. 0x0: Overcurrent status is reported collectively for all downstream ports. 0x1: The USB host controller does not implement overcurrent protection inputs. | RW | 0x0 |
| 11 | OCPM | Overcurrent protection mode. This function is not supported at the device level. | RW | 0x1 |
| 10 | DT | Device type Always reads 0x0: Indicates that the USB host controller implemented is not a compound device. | R | 0 |
| 9 | NPS | No power switching 0x0: VBUS power switching is supported, either per-port or all-port switched per the power. 0x1: VBUS power switching is not supported; power is available to all downstream ports. | RW | 0 |
| 8 | PSM | Power switching mode 0x0: Indicates that all ports are powered at the same time 0x1: Individual port power switching is supported. | RW | 1 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 7:0 | NDP | Number of downstream ports These bits specify the number of downstream ports supported by the root hub. It is implementation-specific. The minimum number of ports is 1. The maximum number of ports supported by OHCI is 15. | R | 0x03 |

Table 24-1109. Register Call Summary for Register HCRHDESCRIPTORA

High-Speed Multiport USB Host Subsystem

- [OHCI Implementation Specifications: \[0\] \[1\] \[2\] \[3\]](#)
- [OHCI Register Summary: \[4\]](#)

Table 24-1110. HCRHDESCRIPTORB

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 004C | Instance | OHCI |
| Physical Address | 0x4A06 484C | | |
| Description | HC root hub B register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| PPCM | | | | | | | | | | | | | | | | DR | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | PPCM | Port power control mask. Each bit defines whether a corresponding downstream port has port power controlled by the global power control. When set, the port's power state is only affected by per-port power control. When cleared, the port is controlled by the global power switch. If the device is configured to global switch mode this field is not valid. Bit 0: Reserved, bit 1: Ganged-power mask on port 1, ..., bit 15: Ganged-power mask on port 15. | RW | 0x0000 |
| 15:0 | DR | Device removable. Each bit defines whether a corresponding downstream port has a removable device. When cleared, the attached device is removable. When set, the attached device is not removable. Bit 0: Reserved, bit 1: Device attached to port 1, , bit 15: Device attached to port 15. | RW | 0x0000 |

Table 24-1111. Register Call Summary for Register HCRHDESCRIPTORB

High-Speed Multiport USB Host Subsystem

- [OHCI Implementation Specifications: \[0\] \[1\]](#)
- [OHCI Register Summary: \[2\]](#)
- [OHCI Register Description: \[3\] \[4\] \[5\] \[6\]](#)

Table 24-1112. HCRHSTATUS

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0050 | Instance | OHCI |
| Physical Address | 0x4A06 4850 | | |
| Description | HC root hub status register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|------|------|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|-----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CRWE | RESERVED | | | | | | | | | | | | | | LPSC | DRWE | RESERVED | | | | | | | | | | | | | | LPS |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31 | CRWE | Clear remote wakeup enable Write 0x0: No effect Write 0x1: Clears the device remote wake-up enable bit | W | 0 |
| 30:17 | RESERVED | Reserved | R | 0x0000 |
| 16 | LPSC | Local power status change Always reads 0x0: The root hub does not support the local power status feature. Write 0x0: No effect Write 0x1: Sets port power status bits for all ports, if power switching mode is 0. Sets port power status bits for ports with their corresponding port power control mask bits cleared if power switching mode is 1. | RW | 0 |
| 15 | DRWE | Device remote wake-up enable. Enables a connect status change event as a resume event, causing a USB suspend to USB resume state transition and sets the resume detected interrupt status bit. Read 0x1: Connect status change is a remote wake-up event. Read 0x0: Connect status change is not a remote wake-up event. Write 0x0: No effect Write 0x1: Sets the device remote wake-up enable bit | RW | 0 |
| 14:1 | RESERVED | Reserved | R | 0x0000 |
| 0 | LPS | Local power status Always reads 0x0 Write 0x0: No effect Write 0x1: When in global power mode (power switching mode = 0), turns off power to all ports. If in per-port power mode (power switching mode = 1), turns of power to those ports whose corresponding port power control mask bit is 0. | RW | 0 |

Table 24-1113. Register Call Summary for Register HCRHSTATUS

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1114. HCRHPORTSTATUS_1

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---------------------------------------|----|----|----|----|----|----|----|----|----|----|------|----------|------|------|-----|--|----|----|----|----|---|----------|---------|----------|---------|----------|---------|---------|---------|---|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0054 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A06 4854 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | OHCI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | HC port 1 status and control register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | PRSC | RESERVED | PSSC | PESC | CSC | RESERVED | | | | | | LSDA_CPP | PPS_SPP | RESERVED | PRS_SPR | RESERVED | PSS_SPS | PES_SPE | CCS_CPE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | | | | | | | | | | Description | | | | | | | | | | | | | | | | Type | | | | | | | | | | | | | | | | Reset | | | | | | | | | | | | | | | |
| 31:21 | RESERVED | | | | | | | | | | | | | | | | Reserved | | | | | | | | | | | | | | | | R | | | | | | | | | | | | | | | | 0x000 | | | | | | | | | | | | | | | |
| 20 | PRSC | | | | | | | | | | | | | | | | Port 1 reset status change. This bit is set when the port 1 port reset status bit has changed. Write 0x0: No effect Write 0x1: Clears this bit | | | | | | | | | | | | | | | | RW | | | | | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | |
| 19 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | | | | | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 18 | PSSC | Port 1 suspends status change. Set when the port leaves the suspend state; that is, after the full resume sequence has completed. Write 0x0: No effect Read 0x0: No resume completed (since either the last software clear, or the last port reset). Read 0x1: Resume completed on the port Write 0x1: Clears the bit | RW | 0 |
| 17 | PESC | Port 1 enable status change. This bit is set when the port 1 port enable status has changed. Write 0x0: No effect Write 0x1: Clears this bit | RW | 0 |
| 16 | CSC | Port 1 connect status change. This bit is set when the port1 port current connect status has changed due to a connect or disconnect event. If current connect status is 0 when a set port reset, set port enable, or set port suspend write occurs, this bit is set. Write 0x0: No effect Write 0x1: Clears this bit Note: If the HCRHDESCRIPTORB[1] DR bit is set, this bit is set only after a root hub reset to inform the system that the device is attached. | RW | 0 |
| 15:10 | RESERVED | Reserved | R | 0x00 |
| 9 | LSDA_CPP | Port 1 low-speed device attached/clear port power. This bit is valid only when port 1 current connect status is 1. Read 0x0: A full-speed device is attached to port 1. Read 0x1: A low-speed device is attached to port 1. Write 0x0: No effect Write 0x1: Clears the port 1 port power status | RW | 0 |
| 8 | PPS_SPP | Port 1 port power status/set port power Read 0x0: Port 1 power is enabled. Read 0x1: Port 1 power is not enabled. Write 0x0: No effect Write 0x1: Sets the port 1 port power status bit | RW | 0 |
| 7:5 | RESERVED | Reserved | R | 0x0 |
| 4 | PRS_SPR | Port 1 port reset status/set port reset Read 0x0: USB reset is not being sent to port 1. Read 0x1: Port 1 is signaling the USB reset. Write 0x0: No effect Write 0x1: Sets the port 1 port reset status bit and causes the USB host controller to begin signaling USB reset to port 1 | RW | 0 |
| 3 | RESERVED | | R | 0 |
| 2 | PSS_SPS | Port 1 port suspend status/set port suspend. This bit is cleared automatically at the end of the USB resume sequence and also at the end of the USB reset sequence. Write 0x0: No effect Read 0x0: Port 1 is not in the USB suspend state. Read 0x1: Port 1 is in the USB suspend state or is in the resume sequence. Write 0x1: If port 1 current connect status is 1, sets the port 1 port suspend status bit and places port 1 in USB suspend state. If current connect status is 0, sets instead connect status change to inform the USB host controller driver of an attempt to suspend a disconnected port. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 1 | PES_SPE | Port 1 port enable status/set port enable. This bit is automatically set at completion of port 1 USB reset if it was not already set before the USB reset completed, and is automatically set at the end of a USB suspend if the port was not enabled when the USB resume completed. Read 0x0: Port 1 is not enabled. Read 0x1: Port 1 is enabled. Write 0x0: No effect Write 0x1: When port 1 current connect status is 1 sets the port 1 port enable status bit. When port 1 current status is 0 has no effect. | RW | 0 |
| 0 | CCS_CPE | Port 1 current connection status/clear port enable Read 0x0: No USB device is attached to port 1. Read 0x1: A USB device is currently attached to port 1. Write 0x0: No effect Write 0x1: Clears the port 1 port enable bit Note: This bit is set to 1 if the HCRHDESCRIPTORB [1 DR bit] is set to indicate a nonremovable device on port 1. | RW | 0 |

Table 24-1115. Register Call Summary for Register HCRHPORTSTATUS_1

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

Table 24-1116. HCRHPORTSTATUS_2

| | | | |
|-------------------------|---------------------------------------|-----------------|------|
| Address Offset | 0x0000 0058 | Instance | OHCI |
| Physical Address | 0x4A06 4858 | | |
| Description | HC port 2 status and control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|------|----------|------|------|-----|----------|----|----|----|----|----|---|----------|---------|----------|---|---|---------|----------|---------|---------|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | PRSC | RESERVED | PSSC | PESC | CSC | RESERVED | | | | | | | LSDA_CPP | PPS_SPP | RESERVED | | | PRS_SPR | RESERVED | PSS_SPS | PES_SPE | CCS_CPE |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:21 | RESERVED | Reserved | R | 0x000 |
| 20 | PRSC | Port 2 reset status change. This bit is set when the port 2 port reset status bit has changed. Write 0x0: No effect Write 0x1: Clears this bit | RW | 0 |
| 19 | RESERVED | | RW | 0 |
| 18 | PSSC | Port 2 suspend status change. Set when the port leaves the suspend state; that is, after the full resume sequence has completed. Write 0x0: No effect Read 0x0: No resume completed (since either the last software clear, or the last port reset). Read 0x1: Resume completed on the port. Write 0x1: Clears the bit | RW | 0 |
| 17 | PESC | Port 2 enable status change. This bit is set when the port 2 port enable status has changed. Write 0x0: No effect Write 0x1: Clears this bit | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 16 | CSC | Port 2 connect status change. This bit is set when the port 2 port current connect status has changed due to a connect or disconnect event. If current connect status is 0 when a set port reset, set port enable, or set port suspend write occurs, this bit is set. Write 0x0: No effect Write 0x1: Clears this bit Note: If the HCRHDESCRIPTORB[1] DR bit is set, this bit is set only after a root hub reset to inform the system that the device is attached. | RW | 0 |
| 15:10 | RESERVED | Reserved | R | 0x00 |
| 9 | LSDA_CPP | Port 2 low-speed device attached/clear port power. This bit is valid only when port 2 current connect status is 1. Read 0x0: A full-speed device is attached to port 2. Read 0x1: A low-speed device is attached to port 2. Write 0x0: No effect Write 0x1: Clears the port 2 port power status | RW | 0 |
| 8 | PPS_SPP | Port 2 port power status/set port power Read 0x0: Port 2 power is enabled. Read 0x1: Port 2 power is not enabled. Write 0x0: No effect Write 0x1: Sets the port 2 port power status bit | RW | 0 |
| 7:5 | RESERVED | Reserved | R | 0x0 |
| 4 | PRS_SPR | Port 2 port reset status/set port reset Read 0x0: USB reset is not being sent to port 2. Read 0x1: Port 2 is signaling the USB reset. Write 0x0: No effect Write 0x1: Sets the port 2 port reset status bit and causes the USB host controller to begin signaling USB reset to port 2 | RW | 0 |
| 3 | RESERVED | | RW | 0 |
| 2 | PSS_SPS | Port 2 port suspend status/set port suspend. This bit is cleared automatically at the end of the USB resume sequence and also at the end of the USB reset sequence. Write 0x0: No effect Read 0x0: Port 2 is not in the USB suspend state. Read 0x1: Port 2 is in the USB suspend state or is in the resume sequence. Write 0x1: If port 2 current connect status is 1, sets the port 2 port suspend status bit and places port 2 in USB suspend state. If current connect status is 0, sets instead connect status change to inform the USB host controller driver of an attempt to suspend a disconnected port. | RW | 0 |
| 1 | PES_SPE | Port 2 port enable status/set port enable. This bit is automatically set at completion of port 2 USB reset if it was not already set before the USB reset completed, and is automatically set at the end of a USB suspend if the port was not enabled when the USB resume completed. Read 0x0: Port 2 is not enabled. Read 0x1: Port 2 is enabled. Write 0x0: No effect Write 0x1: When port 2 current connect status is 1 sets the port 2 port enable status bit. When port 2 current status is 0 has no effect. | RW | 0 |
| 0 | CCS_CPE | Port 2 current connection status/clear port enable Read 0x0: No USB device is attached to port 2. Read 0x1: A USB device is currently attached to port 2. Write 0x0: No effect Write 0x1: Clears the port 2 port enable bit Note: This bit is set to 1 if the HCRHDESCRIPTORB[1] DR bit is set to indicate a nonremovable device on port 2. | RW | 0 |

Table 24-1117. Register Call Summary for Register HCRHPORTSTATUS_2

High-Speed Multiport USB Host Subsystem

- [OHCI Register Summary: \[0\]](#)

24.11.6.6 EHCI Registers

24.11.6.6.1 EHCI Register Summary

Table 24-1118 summarizes the EHCI register mapping.

Table 24-1118. EHCI Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address |
|--|------|-----------------------|-------------------------|-------------------------|
| HCCAPBASE | R | 32 | 0x0000 0000 | 0x4A06 4C00 |
| HCSPARAMS | R | 32 | 0x0000 0004 | 0x4A06 4C04 |
| HCCPARAMS | R | 32 | 0x0000 0008 | 0x4A06 4C08 |
| USBCMD | RW | 32 | 0x0000 0010 | 0x4A06 4C10 |
| USBSTS | RW | 32 | 0x0000 0014 | 0x4A06 4C14 |
| USBINTR | RW | 32 | 0x0000 0018 | 0x4A06 4C18 |
| FRINDEX | RW | 32 | 0x0000 001C | 0x4A06 4C1C |
| CTRLDSSEGMENT | R | 32 | 0x0000 0020 | 0x4A06 4C20 |
| PERIODICLISTBASE | RW | 32 | 0x0000 0024 | 0x4A06 4C24 |
| ASYNCLISTADDR | RW | 32 | 0x0000 0028 | 0x4A06 4C28 |
| CONFIGFLAG | RW | 32 | 0x0000 0050 | 0x4A06 4C50 |
| PORTSC_i⁽¹⁾ | RW | 32 | 0x0000 0054 + (0x4 * i) | 0x4A06 4C54 + (0x4 * i) |
| INSNREG00 | RW | 32 | 0x0000 0090 | 0x4A06 4C90 |
| INSNREG01 | RW | 32 | 0x0000 0094 | 0x4A06 4C94 |
| INSNREG02 | RW | 32 | 0x0000 0098 | 0x4A06 4C98 |
| INSNREG03 | RW | 32 | 0x0000 009C | 0x4A06 4C9C |
| INSNREG04 | RW | 32 | 0x0000 00A0 | 0x4A06 4CA0 |
| INSNREG05_UTMI | RW | 32 | 0x0000 00A4 | 0x4A06 4CA4 |
| INSNREG05_ULPI | RW | 32 | 0x0000 00A4 | 0x4A06 4CA4 |
| INSNREG06 | RW | 32 | 0x0000 00A8 | 0x4A06 4CA8 |
| INSNREG07 | R | 32 | 0x0000 00AC | 0x4A06 4CAC |
| INSNREG08 | RW | 32 | 0x0000 00B0 | 0x4A06 4CB0 |

⁽¹⁾ i = 0 to 2

CAUTION

The high-speed USB registers are limited to 32-bit data accesses; 16-bit and 8-bit accesses are not allowed and can corrupt register content.

EHCI register descriptions conform to the EHCI USB standard: *Enhanced Host Controller Interface (EHCI) Specification for USB, Release 1.1*. For more information about these registers or for new specification releases, search EHCI on www.usb.org.

24.11.6.6.2 EHCI Register Description

Table 24-1119 through Table 24-1161 describe the EHCI registers.

Table 24-1119. HCCAPBASE

| | | | |
|-------------------------|-------------------------------------|-----------------|------|
| Address Offset | 0x0000 0000 | Instance | EHCI |
| Physical Address | 0x4A06 4C00 | | |
| Description | Host controller capability register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----------|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| HCVERSION | | | | | | | | RESERVED | | | | | | | | CAPLENGTH | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | HCVERSION | Interface version number. It contains a BCD encoding of the EHCI revision number supported by this host controller. [7:4] Major revision [3:0] Minor revision | R | 0x0100 |
| 15:8 | RESERVED | Reserved | R | 0x00 |
| 7:0 | CAPLENGTH | Capability register length | R | 0x10 |

Table 24-1120. Register Call Summary for Register HCCAPBASE

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)

Table 24-1121. HCSPARAMS

| | | | |
|------------------|---------------------------------------|----------|------|
| Address Offset | 0x0000 0004 | Instance | EHCI |
| Physical Address | 0x4A06 4C04 | | |
| Description | Host controller structural parameters | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----------|-------------|------|----|----|----|-------|----|----|----|-----|----------|-----|---------|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | RESERVED | P_INDICATOR | N_CC | | | | N_PCC | | | | PRR | RESERVED | PPC | N_PORTS | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|-------|
| 31:20 | RESERVED | Reserved | R | 0x000 |
| 19:17 | RESERVED | Reserved | R | 0x0 |
| 16 | P_INDICATOR | Port indicator support indication This bit indicates whether the ports support port indicator control. 0x1: The port status and control registers include a read/write field for controlling the state of the port indicator. | R | 0 |
| 15:12 | N_CC | Number of companion controllers This field indicates the number of companion controllers associated with this USB 2.0 host controller. 0x0: There are no companion host controllers. Port-ownership hand-off is not supported. Only high-speed devices are supported on the host controller root ports. | R | 0x1 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| | | Others: There are companion USB 1.1 host controller(s). Port-ownership hand-off is supported. High-, full-, and low-speed devices are supported on the host controller root ports. | | |
| 11:8 | N_PCC | Number of ports per companion controller This field indicates the number of ports supported per companion host controller. It is used to indicate the port routing configuration to system software. For example, if N_PORTS has a value of 6 and N_CC has a value of 2, then N_PCC can have a value of 3. The convention is that the first N_PCC ports are assumed to be routed to companion controller 1, the next N_PCC ports to companion controller 2, etc. The number in this field must be consistent with N_PORTS and N_CC. | R | 0x3 |
| 7 | PRR | Port routing rules The first N_PCC ports are routed to the lowest-numbered function companion host controller, the next N_PCC ports are routed to the next lowest-function companion controller, and so on. | R | 0 |
| 6:5 | RESERVED | Reserved | R | 0x0 |
| 4 | PPC | Port power control This field indicates whether the host controller implementation includes port power control. 0x0: The ports do not have port power switches. 0x1: The ports have port power switches. | R | 1 |
| 3:0 | N_PORTS | Number of downstream ports This field specifies the number of physical downstream ports implemented on this host controller. | R | 0x3 |

Table 24-1122. Register Call Summary for Register HCSPARAMS

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)
- [EHCI Register Description: \[1\] \[2\] \[3\]](#)

Table 24-1123. HCCPARAMS

| | | | |
|------------------|---------------------------------------|----------|------|
| Address Offset | 0x0000 0008 | Instance | EHCI |
| Physical Address | 0x4A06 4C08 | | |
| Description | Host controller capability parameters | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----------|------|----|----|----|----|----|-----|---|---|---|----------|------|------|---------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | LPM | RESERVED | EECP | | | | | | IST | | | | RESERVED | ASPC | PFLF | BIT64AC | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:18 | RESERVED | Reserved | R | 0x0000 |
| 17 | LPM | Link power management capability 0: Link power management not supported 1: Link power management supported | R | 1 |
| 16 | RESERVED | Reserved | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 15:8 | EECP | EHCI extended capabilities pointer This field indicates the existence of a capabilities list. 0x0: No extended capabilities are implemented. Others: The offset in PCI configuration space of the first EHCI extended capability. | R | 0x00 |
| 7:4 | IST | Isochronous scheduling threshold This field indicates where software can reliably update the isochronous schedule in relation to the current position of the executing host controller. The host controller can hold one microframe of isochronous data structures before flushing the state. | R | 0x1 |
| 3 | RESERVED | Reserved | R | 0 |
| 2 | ASPC | Asynchronous schedule park capability 0x1: The host controller supports the park feature for high-speed queue heads in the asynchronous schedule. The feature can be disabled or enabled and set to a specific level by using the USBHOST.USBCMD[11]ASPME bit and the USBHOST.USBCMD[9:8] ASPMC bit field. | R | 1 |
| 1 | PFLF | Programmable frame list flag 0x0: System software must use a frame list length of 1024 elements with this host controller. 0x1: System software can specify and use a smaller frame list and configure the host controller through the USBHOST.USBCMD[3:2] FLS bit field. The frame list must always be aligned on a 4-K page boundary. | R | 1 |
| 0 | BIT64AC | 64-bit addressing capability This field documents the addressing range capability of this implementation. 0x0: Data structures using 32-bit address memory pointers 0x1: Data structures using 64-bit address memory pointers | R | 0 |

Table 24-1124. Register Call Summary for Register HCCPARAMS

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)
- [EHCI Register Description: \[1\]](#)

Table 24-1125. USBCMD

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0010 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | EHCI | | | | | | | | | | | | | | | |
| Physical Address | | 0x4A06 4C10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | USB command | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|------|----|----|----|-----|----|----|----|----|----|----|----|----------|----|----|----|-------|----------|-------|---|---|------|------|-----|-----|-----|---|-----|----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | HIRD | | | | ITC | | | | | | | | RESERVED | | | | ASPME | RESERVED | ASPMC | | | LHCR | IAAD | ASE | PSE | FLS | | HCR | RS |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:28 | RESERVED | Reserved | R | 0x0 |
| 27:24 | HIRD | Host-initiated resume duration. If LPM is enabled, this field is RW; otherwise, it is R. The minimum for K-state during resume from LPM: 0x0: 50 μ s Each increment adds 75 μ s. | RW | 0x0 |
| 23:16 | ITC | Interrupt threshold control This field is used by the system software to select the maximum rate at which the host controller issues interrupts. The only valid values are defined below. If software writes an invalid value to this register, the results are undefined. 0x00: Reserved 0x01: 1 microframe 0x02: 2 microframes 0x04: 4 microframes 0x08: 8 microframes (default, equates to 1 ms) 0x10: 16 microframes (2 ms) 0x20: 32 microframes (4 ms) 0x40: 64 microframes (8 ms) Others: Undefined | RW | 0x08 |
| 15:12 | RESERVED | Reserved | R | 0x0 |
| 11 | ASPME | Asynchronous schedule park mode enable 0x0: Park mode is disabled. 0x1: Park mode is enabled. | RW | 1 |
| 10 | RESERVED | Reserved | R | 0 |
| 9:8 | ASPMC | Asynchronous schedule park mode count It contains a count of the number of successive transactions the host controller is allowed to execute from a high-speed queue head on the asynchronous schedule before continuing traversal of the asynchronous schedule. Valid values are 0x1 to 0x3. Software must not write 0 to this bit when park mode enable is 1 because this may result in undefined behavior. | RW | 0x3 |
| 7 | LHCR | Light host controller reset It allows the driver to reset the EHCI controller without affecting the state of the ports or the relationship to the companion host controllers. Read 0x0: Light host controller reset is complete and it is safe for host software to reinitialize the host controller. Read 0x1: Light host controller reset is still ongoing. | RW | 0 |
| 6 | IAAD | Interrupt on async advance doorbell This bit is used as a doorbell by software to tell the host controller to issue an interrupt the next time it advances asynchronous schedule. Write 0x1: Ring the doorbell. Software must not write 1 to this bit when the asynchronous schedule is disabled. Doing so may yield undefined results. | RW | 0 |
| 5 | ASE | Asynchronous schedule enable This bit controls whether the host controller skips processing the asynchronous schedule. 0x0: Do not process the asynchronous schedule | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| | | 0x1: Use the USBHOST.ASYNCLISTADDR register to access the asynchronous schedule. | | |
| 4 | PSE | Periodic schedule enable This bit controls whether the host controller skips processing the periodic schedule. 0x0: Do not process the periodic schedule 0x1: Use the USBHOST.PERIODICLISTBASE register to access the periodic schedule. | RW | 0 |
| 3:2 | FLS | Frame list size This field specifies the size of the frame list. The size of the frame list controls which bits in the frame index register should be used for the frame list current index. 0x0: 1024 elements (4096 bytes) 0x1: 512 elements (2048 bytes) 0x2: 256 elements (1024 bytes), for resource-constrained environments 0x3: Reserved | RW | 0 |
| 1 | HCR | Host controller reset This control bit is used by software to reset the host controller. Write 0x1: Reset the host controller, the PCI configuration registers are not affected by this reset and all operational registers are set to their initial values. This bit is set to 0 by the host controller when the reset process is complete. | W | 0 |
| 0 | RS | Run/stop 0x1: Run, the host controller proceeds with execution of the schedule. The host controller continues execution as long as this bit is set to 1. 0x0: Stop, the host controller completes the current and any actively pipelined transactions on the USB and then halts. | RW | 0 |

Table 24-1126. Register Call Summary for Register USBCMD

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)
- [EHCI Register Description: \[1\] \[2\] \[3\] \[4\] \[5\]](#)

Table 24-1127. USBSTS

| | | | |
|------------------|-------------|----------|------|
| Address Offset | 0x0000 0014 | Instance | EHCI |
| Physical Address | 0x4A06 4C14 | | |
| Description | USB status | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|----------|----|---|---|---|---|---|-----|-----|-----|-----|-------|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | ASS | PSS | REC | HCH | RESERVED | | | | | | | IAA | HSE | FLR | PCD | USBEI | USBI |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 31:16 | RESERVED | Reserved | R | 0x0000 |
| 15 | ASS | Asynchronous schedule status | R | 0 |
| | | The bit reports the current real status of the asynchronous schedule. | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| | | 0x0: The status of the asynchronous schedule is disabled. 0x1: The status of the asynchronous schedule is enabled. | | |
| 14 | PSS | Periodic schedule status The bit reports the current real status of the periodic schedule. 0x0: The status of the periodic schedule is disabled. 0x1: The status of the periodic schedule is enabled. | R | 0 |
| 13 | REC | Reclamation It is used to detect an empty asynchronous schedule. | R | 0 |
| 12 | HCH | Host controller halted This bit is a 0 whenever the USBHOST.USB_CMD[0] RS bit is a 1. The host controller sets this bit to 1 after it has stopped executing as a result of the RS bit being set to 0, either by software or by the host controller hardware. | R | 1 |
| 11:6 | RESERVED | Reserved | R | 0x00 |
| 5 | IAA | Interrupt on async advance System software can force the host controller to issue an interrupt the next time the host controller advances the asynchronous schedule by setting the USBHOST.USB_CMD[6] IAA bit to 1. This status bit indicates the assertion of that interrupt source. | RW | 0 |
| 4 | HSE | Host system error The host controller sets this bit to 1 when a serious error occurs during a host system access involving the host controller module. | RW | 0 |
| 3 | FLR | Frame list rollover The host controller sets this bit to 1 when the USBHOST.FRINDEX rolls over from its maximum value to 0. The exact value at which the rollover occurs depends on the frame list size. | RW | 0 |
| 2 | PCD | Port change detect The host controller sets this bit to 1 when any port for which the USBHOST.PORTSC_i[13] PO bit is set to 0 has a change bit transition from 0 to 1 or a USBHOST.PORTSC_i[6] FPR bit transition from 0 to 1. This bit is also set as a result of the USBHOST.PORTSC_i[1] CSC bit being set to 1 after system software has relinquished ownership of a connected port by setting the USBHOST.PORTSC_i[13] PO bit to 1. | RW | 0 |
| 1 | USBEI | USB error interrupt The host controller sets this bit to 1 when completion of a USB transaction results in an error condition. | RW | 0 |
| 0 | USBI | USB interrupt The host controller sets this bit to 1 on completion of a USB transaction, which results in the retirement of a transfer descriptor that had its IOC bit set. The host controller also sets this bit to 1 when a short packet is detected (actual number of bytes received was less than the expected number of bytes). | RW | 0 |

Table 24-1128. Register Call Summary for Register USBSTS

High-Speed Multiport USB Host Subsystem

- [HSUSB Controller Register Description: \[0\]](#)
- [EHCI Register Summary: \[1\]](#)
- [EHCI Register Description: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\]](#)

Table 24-1129. USBINTR

| | | | |
|-------------------------|----------------------|-----------------|------|
| Address Offset | 0x0000 0018 | Instance | EHCI |
| Physical Address | 0x4A06 4C18 | | |
| Description | USB interrupt enable | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|------|----|------|----|------|---|--------|---|-------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | IAAE | | HSEE | | FLRE | | PCIE | | USBEIE | | USBIE | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:6 | RESERVED | Reserved | R | 0x0000000 |
| 5 | IAAE | Interrupt on async advance enable 0x1: When the USBSTS[5] IAA bit is 1, the host controller issues an interrupt at the next interrupt threshold. The interrupt is acknowledged by software clearing the USBSTS[5] IAA bit. | RW | 0 |
| 4 | HSEE | Host system error enable 0x1: When the USBSTS[4] HSE bit is 1, the host controller issues an interrupt. The interrupt is acknowledged by software clearing the USBSTS[4] HSE bit. | RW | 0 |
| 3 | FLRE | Frame list rollover enable 0x1: When the USBSTS[3] FLR bit is 1, the host controller issues an interrupt. The interrupt is acknowledged by software clearing the USBSTS[3] FLR bit. | RW | 0 |
| 2 | PCIE | Port change interrupt enable 0x1: When the USBSTS[2] PCD bit is 1, the host controller issues an interrupt. The interrupt is acknowledged by software clearing the USBSTS[3] FLR bit. | RW | 0 |
| 1 | USBEIE | USB error interrupt enable 0x1: When the USBSTS[1] USBEI bit is 1, the host controller issues an interrupt at the next interrupt threshold. The interrupt is acknowledged by software clearing the USBSTS[1] USBEI bit. | RW | 0 |
| 0 | USBIE | USB interrupt enable 0x1: When the USBSTS[0] USBI bit is 1, the host controller issues an interrupt at the next interrupt threshold. The interrupt is acknowledged by software clearing the USBSTS[0] USBI bit. | RW | 0 |

Table 24-1130. Register Call Summary for Register USBINTR

High-Speed Multiport USB Host Subsystem

- [HS Multiport USB Host Subsystem Global Initialization: \[0\]](#)
- [EHCI Register Summary: \[1\]](#)

Table 24-1131. FRINDEX

| | | | |
|-------------------------|-----------------|-----------------|------|
| Address Offset | 0x0000 001C | Instance | EHCI |
| Physical Address | 0x4A06 4C1C | | |
| Description | USB frame index | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | FI | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:14 | RESERVED | Reserved | R | 0x00000 |
| 13:0 | FI | Frame index | RW | 0x0000 |
| | | The value in this register is incremented at the end of each time frame. | | |

Table 24-1132. Register Call Summary for Register FRINDEX

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)
- [EHCI Register Description: \[1\]](#)

Table 24-1133. CTRLDSSEGMENT

| | | | |
|-------------------------|---------------------|-----------------|------|
| Address Offset | 0x0000 0020 | Instance | EHCI |
| Physical Address | 0x4A06 4C20 | | |
| Description | 4G segment selector | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CDSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|------------|
| 31:0 | CDSS | This 32-bit register corresponds to the most-significant address bits [63:32] for all EHCI data structures. | R | 0x00000000 |

Table 24-1134. Register Call Summary for Register CTRLDSSEGMENT

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)

Table 24-1135. PERIODICLISTBASE

| | | | |
|-------------------------|-------------------------|-----------------|------|
| Address Offset | 0x0000 0024 | Instance | EHCI |
| Physical Address | 0x4A06 4C24 | | |
| Description | Frame list base address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| BAL | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:12 | BAL | Base address (low) These bits correspond to memory address signals. | RW | 0x00000 |
| 11:0 | RESERVED | Reserved | R | 0x000 |

Table 24-1136. Register Call Summary for Register PERIODICLISTBASE

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)
- [EHCI Register Description: \[1\]](#)

Table 24-1137. ASYNCLISTADDR

| | | | |
|-------------------------|--------------------------------|-----------------|------|
| Address Offset | 0x0000 0028 | Instance | EHCI |
| Physical Address | 0x4A06 4C28 | | |
| Description | Next asynchronous list address | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| LPL | | | | | | | | | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------|
| 31:5 | LPL | Link pointer low It contains the address of the next asynchronous queue head to be executed. | RW | 0x0000000 |
| 4:0 | RESERVED | Reserved | R | 0x00 |

Table 24-1138. Register Call Summary for Register ASYNCLISTADDR

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)
- [EHCI Register Description: \[1\]](#)

Table 24-1139. CONFIGFLAG

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 0050 | Instance | EHCI |
| Physical Address | 0x4A06 4C50 | | |
| Description | Configured flag register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | LC |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:1 | RESERVED | Reserved | R | 0x00000000 |
| 0 | CF | Configure flag This bit controls the default port-routing control logic. 0x0: Port routing control logic default-routes each port to an implementation-dependent classic host controller. 0x1: Port routing control logic default-routes all ports to this host controller. | RW | 0 |

Table 24-1140. Register Call Summary for Register CONFIGFLAG

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)
- [EHCI Register Description: \[1\] \[2\]](#)

Table 24-1141. PORTSC_i

| | | | |
|-------------------------|-------------------------|-----------------|------------|
| Address Offset | 0x0000 0054 + (0x4 * i) | Index | i = 0 to 2 |
| Physical Address | 0x4A06 4C54 + (0x4 * i) | Instance | EHCI |
| Description | Port status/control | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---------------|----|----|----|----|----|----|----|---------------|----------|-----|-----|-----|-----|----|----|----|-----------|----|-----|-----|----------|------|-----|-----|-----|---|---|---|---|---|---|
| DEVICEADDRESS | | | | | | | | SUSPENDSTATUS | RESERVED | WDE | WCE | PTC | PIC | PO | PP | LS | SUSPENDL1 | PR | SUS | FPR | RESERVED | PEDC | PED | CSC | CCS | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|-------|
| 31:25 | DEVICEADDRESS | The USB device address for the device attached to and immediately downstream from the associated root port. R/W only if LPM is enabled; otherwise, R. | RW | 0x00 |
| 24:23 | SUSPENDSTATUS | Addition for LPM support. Indicates status of L1 suspend request: 0x0: Success 0x1: Not yet 0x2: Not supported 0x3: Time-out/error | R | 0x0 |
| 22 | RESERVED | Reserved | R | 0 |
| 21 | WDE | Wake on disconnect enable This field is 0 if the PP bit is 0. Write 0x1: Enables the port to be sensitive to device disconnects as wake-up events. | RW | 0 |
| 20 | WCE | Wake on connect enable This field is 0 if the PP bit is 0. Write 0x1: Enables the port to be sensitive to device connects as wake-up events. | RW | 0 |
| 19:16 | PTC | Port test control The port is operating in specific test modes as indicated by the specific value. The encoding of the test mode bits are: 0x0: Test mode not enabled 0x1: Test J_STATE 0x2: Test K_STATE 0x3: Test SE0_NAK 0x4: Test Packet 0x5: Test FORCE_ENABLE Others: Reserved | RW | 0x0 |
| 15:14 | PIC | Port indicator control (not implemented) | R | 0x0 |
| 13 | PO | Port owner | RW | 1 |

| Bits | Field Name | Description | Type | Reset | | | | | | | | | | | | | | | |
|-------------|------------|---|-------------|-----------|----------------|-----|-----|---|-----|---------|---|-----|---------|---|-----|-----------|--|----|-----|
| | | This bit unconditionally goes to 0x0 when the USBHOST.CONFIGFLAG[0] CF bit makes a transition from 0 to 1. This bit unconditionally goes to 0 whenever the USBHOST.CONFIGFLAG[0] CF bit is 0. 0x1: A companion host controller owns and controls the port. | | | | | | | | | | | | | | | | | |
| 12 | PP | Port power The function of this bit depends on the value of the USBHOST.HCSPARAMS[4] PPC bit. The behavior is as follows: <table><tr><th>PPC</th><th>PP</th><th>Operation</th></tr><tr><td>0x0</td><td>0x0</td><td>Forbidden</td></tr><tr><td>0x0</td><td>0x1</td><td>Host controller does not have port power control switches. Each port is hardwired to power.</td></tr><tr><td>0x1</td><td>0x0</td><td>Host controller has port power control switches. Current switch state is off.</td></tr><tr><td>0x1</td><td>0x1</td><td>Host controller has port power control switches. Current switch state is on.</td></tr></table> When an overcurrent condition is detected on a powered port and the USBHOST.HCSPARAMS[4] PPC bit is a 1, the PP bit in each affected port may be transitioned by the host controller from 1 to 0. | PPC | PP | Operation | 0x0 | 0x0 | Forbidden | 0x0 | 0x1 | Host controller does not have port power control switches. Each port is hardwired to power. | 0x1 | 0x0 | Host controller has port power control switches. Current switch state is off. | 0x1 | 0x1 | Host controller has port power control switches. Current switch state is on. | RW | 0 |
| PPC | PP | Operation | | | | | | | | | | | | | | | | | |
| 0x0 | 0x0 | Forbidden | | | | | | | | | | | | | | | | | |
| 0x0 | 0x1 | Host controller does not have port power control switches. Each port is hardwired to power. | | | | | | | | | | | | | | | | | |
| 0x1 | 0x0 | Host controller has port power control switches. Current switch state is off. | | | | | | | | | | | | | | | | | |
| 0x1 | 0x1 | Host controller has port power control switches. Current switch state is on. | | | | | | | | | | | | | | | | | |
| 11:10 | LS | Line status These bits reflect the current logical levels of the D+ (bit 11) and D- (bit 10) signal lines. This field is valid only when the port enable bit is 0 and the current connect status bit is set to 1. The encoding of the bits is: <table><tr><th>Bits[11:10]</th><th>USB State</th><th>Interpretation</th></tr><tr><td>0x0</td><td>SE0</td><td>Not low-speed device, perform EHCI reset.</td></tr><tr><td>0x2</td><td>J-state</td><td>Not low-speed device, perform EHCI reset.</td></tr><tr><td>0x1</td><td>K-state</td><td>Low-speed device, release ownership of port.</td></tr><tr><td>0x3</td><td>Undefined</td><td>Not low-speed device, perform EHCI reset.</td></tr></table> | Bits[11:10] | USB State | Interpretation | 0x0 | SE0 | Not low-speed device, perform EHCI reset. | 0x2 | J-state | Not low-speed device, perform EHCI reset. | 0x1 | K-state | Low-speed device, release ownership of port. | 0x3 | Undefined | Not low-speed device, perform EHCI reset. | R | 0x0 |
| Bits[11:10] | USB State | Interpretation | | | | | | | | | | | | | | | | | |
| 0x0 | SE0 | Not low-speed device, perform EHCI reset. | | | | | | | | | | | | | | | | | |
| 0x2 | J-state | Not low-speed device, perform EHCI reset. | | | | | | | | | | | | | | | | | |
| 0x1 | K-state | Low-speed device, release ownership of port. | | | | | | | | | | | | | | | | | |
| 0x3 | Undefined | Not low-speed device, perform EHCI reset. | | | | | | | | | | | | | | | | | |
| 9 | SUSPENDL1 | When this bit is set to 1, an LPM token is generated. 0: Suspend using L2 1: Suspend using L1 (LPM) | RW | 0 | | | | | | | | | | | | | | | |
| 8 | PR | Port reset This field is 0 if the PP bit is 0. 0x0: Port is not in reset. 0x1: Port is in reset. Write 0x0: Terminate the bus reset sequence. Write 0x1 when at 0x0: The bus reset sequence is started. | RW | 0 | | | | | | | | | | | | | | | |
| 7 | SUS | Suspend This field is 0 if the PP bit is 0. 0x0 when PED = 0x1: Port enabled 0x1 when PED = 0x1: Port in suspend state When PED = 0x0: Port disabled | RW | 0 | | | | | | | | | | | | | | | |
| 6 | FPR | Force port resume This field is 0 if the PP bit is 0. 0x0: No resume (K-state) detected/driven on port 0x1: Resume detected/driven on port | RW | 0 | | | | | | | | | | | | | | | |
| 5:4 | RESERVED | Reserved | R | 0 | | | | | | | | | | | | | | | |
| 3 | PEDC | Port enabled/disabled change This field is 0 if the PP bit is 0. Read 0x0: No change. | RW | 0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| | | Read 0x1: Port enabled/disabled status has changed. Write 0x1: Clears this bit to 0. | | |
| 2 | PED | Port enabled/disabled Software cannot enable a port by setting this bit to 1. The host controller only sets this to 1 when the reset sequence determines that the attached device is a high-speed device. Ports can be disabled by either a fault condition (disconnect event or other fault condition) or by host software. This field is 0 if the PP bit is 0. 0x0: Disable 0x1: Enable | RW | 0 |
| 1 | CSC | Connect status change Indicates a change has occurred in the port CCS bit. This field is 0 if the PP bit is 0. Read 0x0: No change Read 0x1: Change in current connect status Write 0x1: Clears this bit to 0 | RW | 0 |
| 0 | CCS | Current connect status This value reflects the current state of the port, and may not correspond directly to the event that caused the CSC bit to be set. This field is 0 if the PP bit is 0. 0x0: No device is present. 0x1: Device is present on port. | R | 0 |

Table 24-1142. Register Call Summary for Register PORTSC_i

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)
- [EHCI Register Description: \[1\] \[2\] \[3\] \[4\]](#)

Table 24-1143. INSNREG00

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0090 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | EHCI | | | | | | | | | | | | | | | |
| Physical Address | 0x4A06 4C90 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Implementation-specific register 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | UFRAME_CNT | | | | | | | | | | | | | | | | EN |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:14 | RESERVED | | R | 0x00000 |
| 13:1 | UFRAME_CNT | 1-microframe length value, to reduce simulation time. SIMULATIONS ONLY, NOT AN ACTUAL REGISTER. | RW | 0x0000 |
| 0 | EN | Enable of this register | RW | 0 |

Table 24-1144. Register Call Summary for Register INSNREG00

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)

Table 24-1145. INSNREG01

| | | | |
|-------------------------|------------------------------------|-----------------|------|
| Address Offset | 0x0000 0094 | Instance | EHCI |
| Physical Address | 0x4A06 4C94 | | |
| Description | Implementation-specific register 1 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| OUT_THRESHOLD | | | | | | | | | | | | | | | | IN_THRESHOLD | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|--------|
| 31:16 | OUT_THRESHOLD | Programmable output packet buffer threshold, in 32-bit words | RW | 0x0020 |
| 15:0 | IN_THRESHOLD | Programmable input packet buffer threshold, in 32-bit words | RW | 0x0020 |

Table 24-1146. Register Call Summary for Register INSNREG01

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)
- [EHCI Register Description: \[1\]](#)

Table 24-1147. INSNREG02

| | | | |
|-------------------------|------------------------------------|-----------------|------|
| Address Offset | 0x0000 0098 | Instance | EHCI |
| Physical Address | 0x4A06 4C98 | | |
| Description | Implementation-specific register 2 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BUF_DEPTH | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31:12 | RESERVED | | R | 0x00000 |
| 11:0 | BUF_DEPTH | Programmable packet buffer depth, in 32-bit words | RW | 0x080 |

Table 24-1148. Register Call Summary for Register INSNREG02

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)

Table 24-1149. INSNREG03

| | | | |
|-------------------------|------------------------------------|-----------------|------|
| Address Offset | 0x0000 009C | Instance | EHCI |
| Physical Address | 0x4A06 4C9C | | |
| Description | Implementation-specific register 3 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | BRK_MEM_TRSF | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:1 | RESERVED | | R | 0x0000 0000 |
| 0 | BRK_MEM_TRSF | Break memory transfer, in conjunction with INSNREG01 0x0: Disabled 0x1: Enabled | RW | 1 |

Table 24-1150. Register Call Summary for Register INSNREG03

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)

Table 24-1151. INSNREG04

| | | | |
|-------------------------|------------------------------------|-----------------|------|
| Address Offset | 0x0000 00A0 | Instance | EHCI |
| Physical Address | 0x4A06 4CA0 | | |
| Description | Implementation-specific register 4 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----|----|---|---|---|---|---|---|----------|-----------------|---------------|---------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | NAK_FIX_DIS | | | | | | | | | | | | RESERVED | SHORT_PORT_ENUM | HCCPARAMS_WRE | HCSPARAMS_WRE |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|--|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4 | NAK_FIX_DIS | Disable NAK fix (don't touch) | RW | 0 |
| 3 | RESERVED | Reserved | R | 0 |
| 2 | SHORT_PORT_ENUM | Scale down port enumeration time (debug) | RW | 0 |
| 1 | HCCPARAMS_WRE | Make read-only HCCPARAMS register writable (debug) | RW | 0 |
| 0 | HCSPARAMS_WRE | Make read-only HCSPARAMS register writable (debug) | RW | 0 |

Table 24-1152. Register Call Summary for Register INSNREG04

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)
- [EHCI Register Description:](#)

Table 24-1153. INSNREG05_UTMI

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 00A4 | Instance | EHCI |
| Physical Address | 0x4A06 4CA4 | | |
| Description | Implementation-specific register 5. Register functionality for UTMI mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|-------|----|----|----|---------------|----------|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | VBUSY | VPORT | | | | VCONTROLLOADM | VCONTROL | | | | VSTATUS | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|--------|
| 31:18 | RESERVED | | R | 0x0000 |
| 17 | VBUSY | Read 0x0: Vendor interface is done/inactive Read 0x1: Vendor interface is busy | R | 0 |
| 16:13 | VPORT | Vendor interface port selection 0x1: Port 1 vendor interface selected 0x2: Port 2 vendor interface selected | RW | 0x0 |
| 12 | VCONTROLLOADM | UTMI VcontrolLoadM output (active-low) 0x0: Load Vcontrol value into PHY 0x1: No Action | RW | 0 |
| 11:8 | VCONTROL | UTMI Vcontrol output, to be loaded into the PHY | RW | 0x0 |
| 7:0 | VSTATUS | UTMI Vstatus input image, from PHY | R | 0x00 |

Table 24-1154. Register Call Summary for Register INSNREG05_UTMI

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)

Table 24-1155. INSNREG05_ULPI

| | | | |
|-------------------------|--|-----------------|------|
| Address Offset | 0x0000 00A4 | Instance | EHCI |
| Physical Address | 0x4A06 4CA4 | | |
| Description | Implementation-specific register 5. Register functionality for ULPI mode. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----------|----|----|---------|----|----|----|-------|--------|----|----|----|-----------|----|----|----|----------|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CONTROL | RESERVED | | | PORTSEL | | | | OPSEL | REGADD | | | | EXTREGADD | | | | RDWRDATA | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31 | CONTROL | Control/status of the ULPI register access Write 0x0: No effect 0x0: ULPI access done 0x1: Start ULPI access | RW | 0 |
| 30:28 | RESERVED | | R | 0x0 |
| 27:24 | PORTSEL | 0x1: Port 1 selected for register access 0x2: Port 2 selected for register access | RW | 0x0 |
| 23:22 | OPSEL | 0x2: Register access is write. 0x3: Register access is read. | RW | 0x0 |
| 21:16 | REGADD | ULPI direct register address, for any value different than 0x2F. 0x2F: Triggers an extended address | RW | 0x00 |
| 15:8 | EXTREGADD | Address for extended register accesses. Don't care for direct accesses. | RW | 0x00 |
| 7:0 | RDWRDATA | Read/write data of (resp. read/write) register access | RW | 0x00 |

Table 24-1156. Register Call Summary for Register INSNREG05_ULPI

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)

Table 24-1157. INSNREG06

| | | | |
|-------------------------|------------------|-----------------|------|
| Address Offset | 0x0000 00A8 | Instance | EHCI |
| Physical Address | 0x4A06 4CA8 | | |
| Description | AHB error status | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----------|----|----|----|-----------|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ERRORCAP | RESERVED | | | | | | | | | | | | | | | HBURST | | BEATSEXP | | | | BEATSCOMP | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|---------|
| 31 | ERRORCAP | Indicator that an AHB error was encountered and values were captured Read 0x0: No error Write 0x0: Clear pending error Write 0x1: No action Read 0x1: Error pending | RW | 0 |
| 30:12 | RESERVED | | R | 0x00000 |
| 11:9 | HBURST | HBURST Value of the control phase at which the AHB error occurred | R | 0x0 |
| 8:4 | BEATSEXP | Number of beats expected in the burst at which the AHB error occurred. Valid values are 0 to 16. | R | 0x00 |
| 3:0 | BEATSCOMP | Number of successfully completed beats in the current burst before the AHB error occurred | R | 0x0 |

Table 24-1158. Register Call Summary for Register INSNREG06

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)

Table 24-1159. INSNREG07

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 00AC | Instance | EHCI |
| Physical Address | 0x4A06 4CAC | | |
| Description | AHB master error address | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| MASTERERRADD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--------------------------|------|-------------|
| 31:0 | MASTERERRADD | AHB master error address | R | 0x0000 0000 |

Table 24-1160. Register Call Summary for Register INSNREG07

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)

Table 24-1161. INSNREG08

| | | | |
|-------------------------|-----------------------------|-----------------|------|
| Address Offset | 0x0000 00B0 | Instance | EHCI |
| Physical Address | 0x4A06 4CB0 | | |
| Description | | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | NEWBITFIELD1 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|-------------|------|--------|
| 31:16 | RESERVED | | R | 0x0000 |
| 15:0 | NEWBITFIELD1 | | RW | 0x0000 |

Table 24-1162. Register Call Summary for Register INSNREG08

High-Speed Multiport USB Host Subsystem

- [EHCI Register Summary: \[0\]](#)

24.12 High-Speed USB OTG Controller

This section describes the high-speed USB On-The-Go (OTG) controller of the device.

NOTE: The high-speed USB OTG controller is an instantiation of the MUSBMHDC from Mentor Graphics Corporation.

This document contains materials that are ©2003-2007 Mentor Graphics Corporation.

Mentor Graphics is a registered trademarks of Mentor Graphics Corporation or its affiliated companies in the United States and other countries.

24.12.1 High-Speed USB OTG Controller Overview

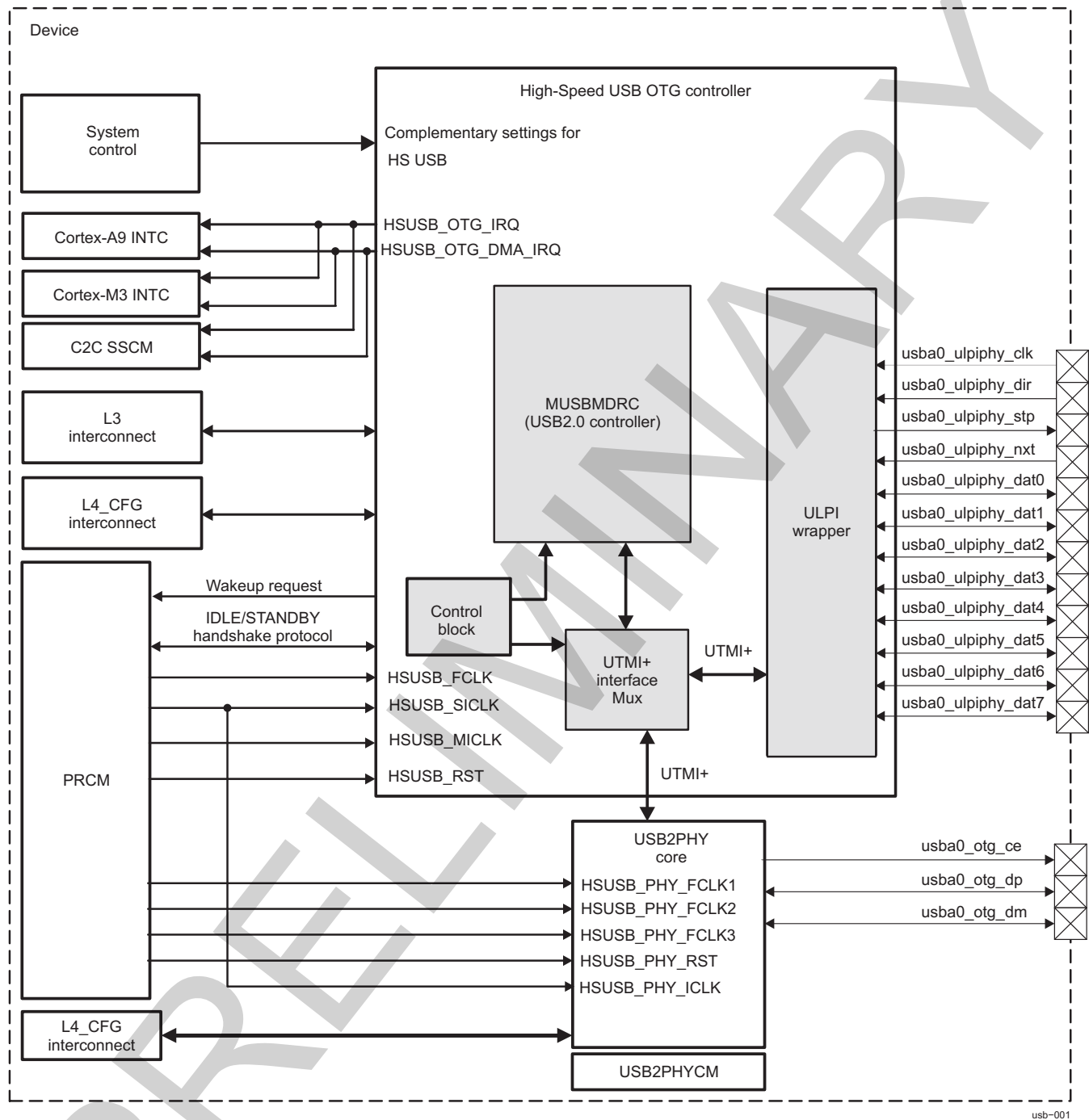
The High-Speed USB controller is a high-speed, USB OTG dual-role-device (DRD) link controller supporting the following modes:

- USB 2.0 peripheral (function controller) in high/full speed (480/12 Mbps, respectively)
- USB 2.0 host in high/full/low speed (480/12/1.5 Mbps, respectively), with one downstream port but multipoint capability when a hub is connected to it (split transaction support, etc.)
- USB 2.0 OTG DRD in high/full speed, with HNP (OTG1.3) and SRP support.

The high-speed USB OTG controller supports a single USB port, which uses the ULPI interface mode, to connect to an off-chip transceiver (12-pin/8-bit data SDR mode) and to connect on D+/D- (+ID) USB bus thanks to an embedded USB-HS OTG PHY.

It is connected to L3 master and L4 slave interfaces. It is clocked from independent functional clock from a PHY. This module operates either as the function controller of a high-/full-speed USB peripheral or as the host/peripheral in point-to-point or multi-point communications with other USB functions.

[Figure 24-255](#) highlights the high-speed USB controller.

Figure 24-255. High-Speed USB OTG Controller Highlight

24.12.1.1 Main Features

The high-speed USB controller features:

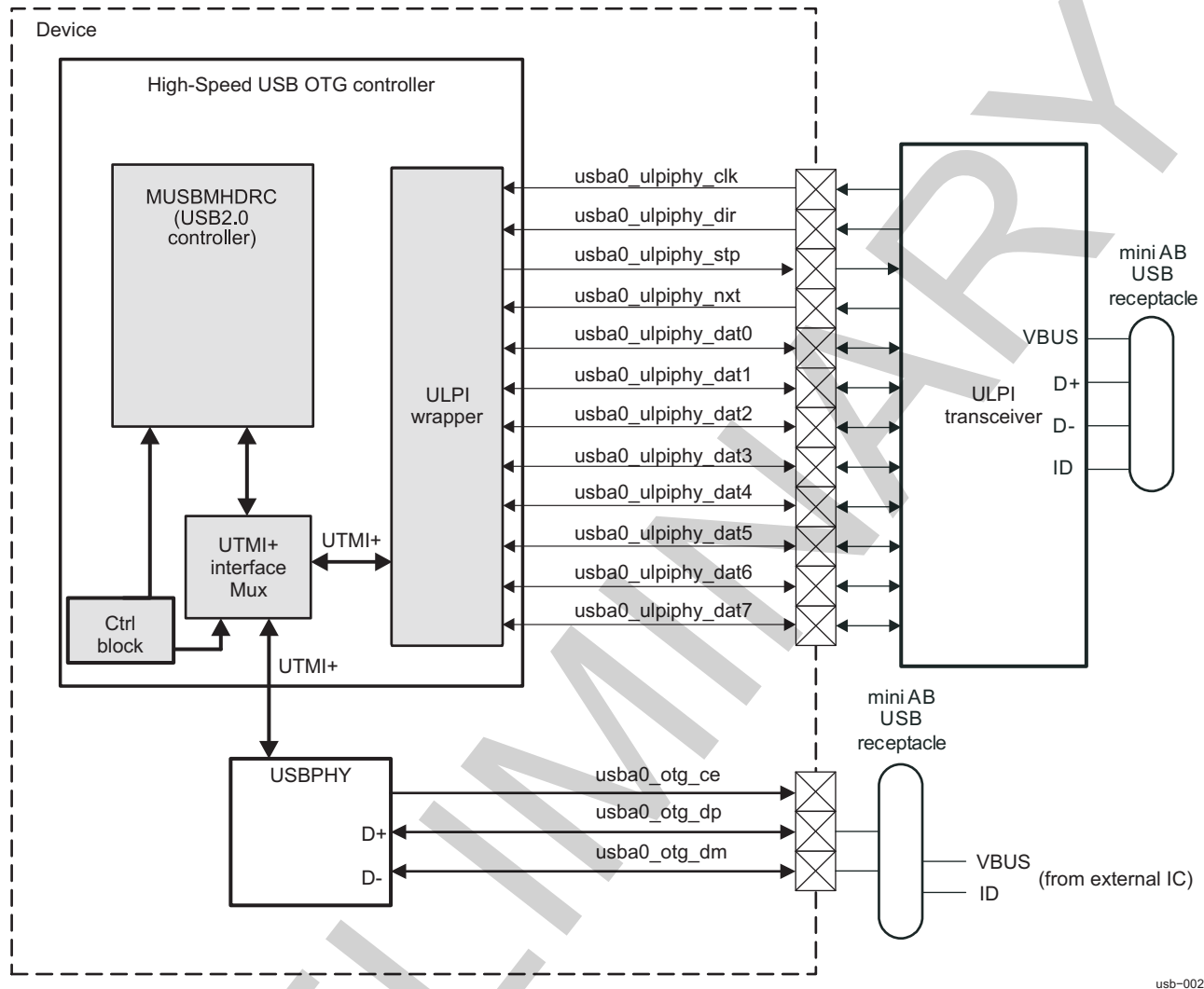
- L3 (master) interface supports:
 - 32-bit data bus width
 - 8/16/32 bit access supported
 - 32-bit address bus width
 - Burst supported
 - WNP not supported
- L4 (slave) interface supports:
 - 32-bit data bus width
 - 16/32 bit access supported
 - 12-bit address bus width
 - Burst not supported
 - WNP supported
- Complies with USB2.0 standard for high-speed (480 Mb/s) functions and with the OTG 1.3 (On-The-Go) supplement. Implement Link Power Management
- Contains embedded HS PHY with battery charger detection
- Contains PHY (physical layer) interface: ULPI interface (12-bit version)
- 15 transmit endpoints and 15 receive endpoints in addition to control endpoint 0
- Supports OTG communications with one or more high/full/low speed devices.
- Supports packet splitting / combining for bulk transfers
- Soft connect/disconnect option
- Performs all transaction scheduling in hardware
- Each endpoint can be configured for types (interrupt, bulk or isochronous), for size and double buffering operation within a limit of a 8KB of data and total RAM size of 16KB.
- Supports high-bandwidth isochronous and interrupt transfers.
- Supports suspend/resume and remote wake-up.
- Two interrupt lines.
- DMA access to endpoint FIFOs with internal DMA controller supporting 8 channels
- Supports host negotiation and session request protocols (HNP (OTG1.3) and SRP)
- CarKit feature implementation

USB-HS OTG PHY (USBPHY). This embedded PHY is composed of two modules:

- USB2PHYCORE contains the USB functions, drivers, receivers and pads for correct D+/D– signalling and the battery charger detection (supporting dead-battery mode). Delivers a 3.3-V output signal (charger enable) to control external battery charger.
- USB2PHYCM contains LDO and bandgap for providing voltage reference to USB2PHYCORE module.

24.12.2 High-Speed USB OTG Controller Environment

[Figure 24-256](#) shows a typical application using the high-speed USB controller.

Figure 24-256. High-Speed USB Controller Typical Application System

usb-002

NOTE: Only one interface can be active at a time.

The high-speed USB OTG controller supports a single USB port, which uses the ULPI interface mode, to connect to an off-chip transceiver (12-pin/8-bit data SDR mode). A mini A-B external receptacle allows the connection of an external device.

The 12-pin ULPI interface uses an 8-bit data bus with data synchronous to the rising edge of the PHY clock (SDR mode); the 8-pin ULPI uses a 4-bit data bus with data generated on both the rising and falling clock edge (DDR mode).

The current implementation of high-speed USB controller supports only the 12-pin, 8-bit version ULPI interface. The 12-pin/8-bit data SDR ULPI interface is selected through the [OTG_INTERFSEL\[2:0\]](#) PHYSEL field and must be set to 0x1.

Embedded PHY interface is 8-bit, UTMI+ and is selected through setting [OTG_INTERFSEL \[2:0\]](#) PHYSEL field to 0x0.

24.12.2.1 High-Speed USB OTG Controller Functional Interfaces

[Table 24-1163](#) describes the I/O signals of the high-speed USB controller interfaces shown in [Figure 24-256](#)

Table 24-1163. Input/Output Description

| Signal Name | I/O ⁽¹⁾ | Description | Reset Value ⁽²⁾ |
|---------------------|--------------------|--|----------------------------|
| usba0_ulpiiphy_clk | I | Clock input from external transceiver | hi-Z |
| usba0_ulpiiphy_dir | I | Data direction control from external transceiver | hi-Z |
| usba0_ulpiiphy_stp | O | Output to external transceiver to stop data stream | 1 |
| usba0_ulpiiphy_nxt | I | Next signal control from external transceiver | hi-Z |
| usba0_ulpiiphy_dat0 | I/O | Data 0 to/from external transceiver | hi-Z |
| usba0_ulpiiphy_dat1 | I/O | Data 1 to/from external transceiver | hi-Z |
| usba0_ulpiiphy_dat2 | I/O | Data 2 to/from external transceiver | hi-Z |
| usba0_ulpiiphy_dat3 | I/O | Data 3 to/from external transceiver | hi-Z |
| usba0_ulpiiphy_dat4 | I/O | Data 4 to/from external transceiver | hi-Z |
| usba0_ulpiiphy_dat5 | I/O | Data 5 to/from external transceiver | hi-Z |
| usba0_ulpiiphy_dat6 | I/O | Data 6 to/from external transceiver | hi-Z |
| usba0_ulpiiphy_dat7 | I/O | Data 7 to/from external transceiver | hi-Z |
| usba0_otg_ce | O | Charging Enable signal | 0 |
| usba0_otg_dp | I/O | USB Data + | hi-Z |
| usba0_otg_dm | I/O | USB Data - | hi-Z |

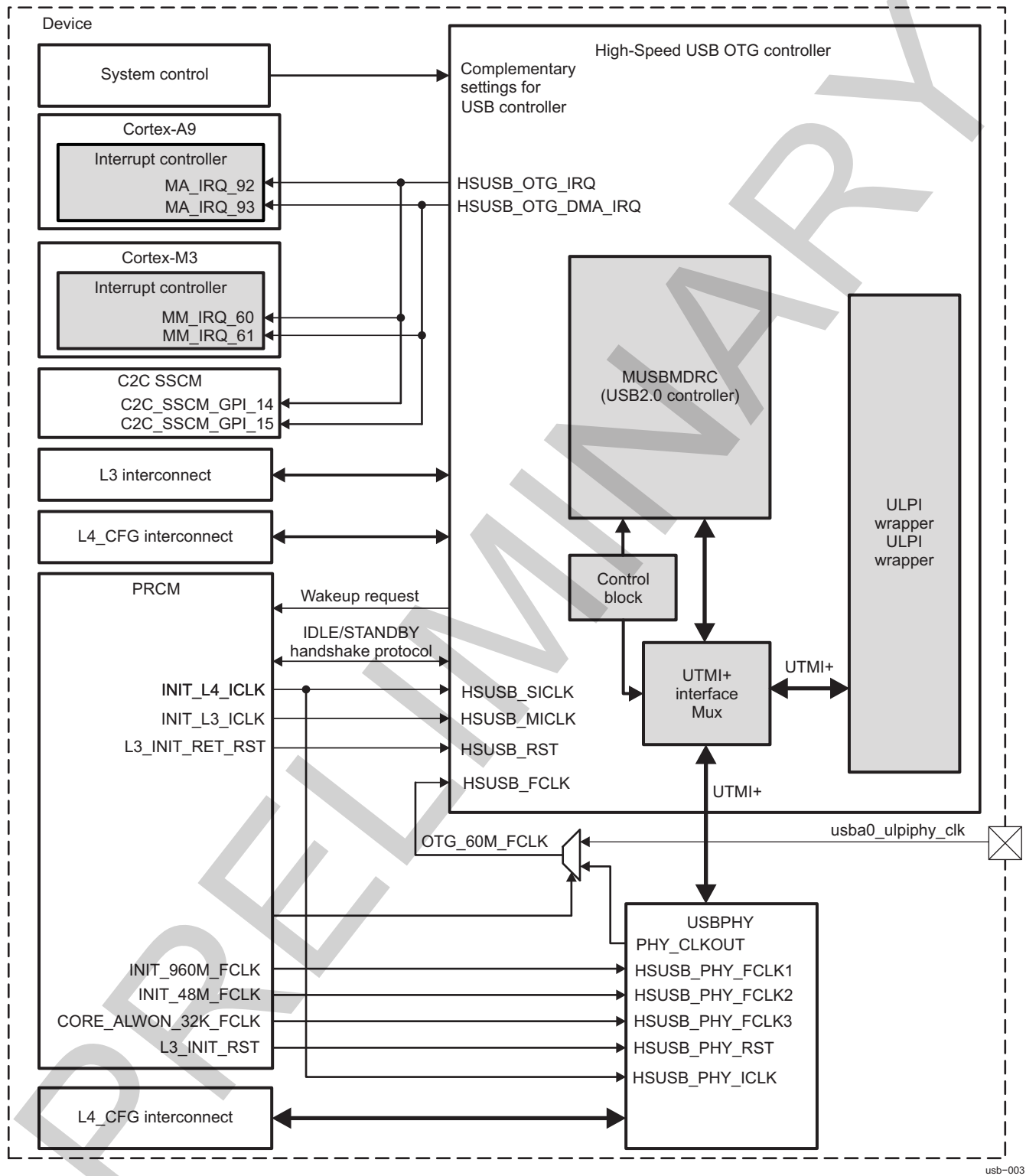
⁽¹⁾ I = Input; O = Output; I/O = Bidirectional

⁽²⁾ hi-Z = High impedance

24.12.3 High-Speed USB OTG Controller Integration

The L3 (master) interconnect generates data traffic within the device. The L4(slave) interconnect is a configuration port for register setting.

[Figure 24-257](#) shows the high-speed USB controller integration in the device.

Figure 24-257. High-Speed USB Controller Integration

usb-003

Table 24-1164 through Table 24-1166 summarize the integration of the module in the device.

Table 24-1164. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| HSUSBOTG | PD_L3_INIT | L3 L4_CFG |
| USBPHY | PD_L3_INIT | L4_CFG |

Three clocks are provided to the high-speed USB controller, as listed in [Table 24-1165](#)

Table 24-1165. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|---------------------|----------------------------------|---|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| HSUSBOTG | HSUSB_FCLK | OTG_60M_FCLK | usba0_ulpi phy clk/ USBPHY | Functional clock. Source is selected between external and embedded PHY. Section 3.6.3.2, CM Clock Source , in Chapter 3, Power, Reset, and Clock Management . |
| | HSUSB_SICLK | INIT_L4_ICLK | PRCM | L4 interconnect enable signal for the slave interface on L4 Section 3.6.3.2, CM Clock Source in Chapter 3, Power, Reset and Clock Management |
| | HSUSB_MICLK | INIT_L3_ICLK | PRCM | L3 interconnect clock, for the L3 master port interface Section 3.6.9, CD_L3_INIT Clock Domain in Chapter 3, Power, Reset and Clock Management . |
| USBPHY | HSUSB_PHY_FCLK1 | INIT_960M_FCLK | PRCM | Functional clock |
| | HSUSB_PHY_FCLK2 | INIT_48M_FCLK | PRCM | Optional functional clock |
| | HSUSB_PHY_FCLK3 | CORE_ALWON_32K_FCLK | PRCM | Optional functional clock |
| | HSUSB_PHY_ICLK | INIT_L4_ICLK | PRCM | Interface clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| HSUSBOTG | HSUSB_RST | L3_INIT_RET_RST | PRCM | HSUSBOTG controller hardware reset |
| USBPHY | HSUSB_PHY_RST | L3_INIT_RST | PRCM | USBPHY module hardware reset |

[Table 24-1166](#) lists the interrupt lines that are driven out from the high-speed USB controller.

Table 24-1166. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|--------------------|--------------------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| HSUSBOTG | HSUSB_OTG_IRQ | MA_IRQ_92 | Cortex™-A9 INTC | HSUSBOTG interrupt request |
| | HSUSB_OTG_DMA_IRQ | MA_IRQ_93 | Cortex-A9 INTC | HSUSBOTG DMA interrupt request |
| | HSUSB_OTG_IRQ | MM_IRQ_60 | Cortex™-M3 INTC | HSUSBOTG interrupt request |
| | HSUSB_OTG_DMA_IRQ | MM_IRQ_61 | Cortex-M3 INTC | HSUSBOTG DMA interrupt request |
| | HSUSB_OTG_IRQ | C2C_SSCM_GPI_14 | C2C SSCM | HSUSBOTG interrupt request |
| | HSUSB_OTG_DMA_IRQ | C2C_SSCM_GPI_15 | C2C SSCM | HSUSBOTG DMA interrupt request |

24.12.4 High-Speed USB OTG Controller Functional Description

24.12.4.1 Software Reset

The high-speed USB controller has a software reset through the [OTG_SYSCONFIG](#)[1] SOFTRESET bit. Writing 0x1 to this bit initiates reset of the module. The bit value 0x1 remains until the reset is complete. When the software reset is complete, the SOFTRESET bit is automatically cleared to 0x0 and has the same effect as the hardware reset. The status of the reset can be observed through the [OTG_SYSSTATUS](#)[0] RESETDONE bit.

24.12.4.2 Power Management

24.12.4.2.1 Overview

To save dynamic power consumption, an efficient idle scheme in the device is based on the following:

- An efficient local autoclock gating for each module
- The implementation of control sideband signals between the PRCM module and each module

This enhanced idle control allows clocks to be activated/deactivated safely without complex software intervention. In both cases, the high-speed USB controller power management is applied only to the interface clock domain. The USB OTG functional clock, HSUSB_FCLK, is controlled by the transceiver and is responsible only for a very small percentage of the module overall power consumption.

The high-speed USB controller has both master (initiator) and slave (target) interfaces.

- As an initiator, the high-speed USB OTG controller implements the standby handshake protocol to inform the PRCM module when it enters standby mode and does not generate traffic on the interconnect.
- As a target, the high-speed USB OTG controller implements the IDLE handshake protocol to allow the PRCM module requiring it to enter idle mode.

24.12.4.2.2 System Power Management

24.12.4.2.2.1 Standby Handshake Protocol

The high-speed USB OTG controller can choose to go to standby mode, in which case it stops generating transactions on the interconnect. The module standby leads the PRCM to disable the USB clocks to save power.

The high-speed USB OTG controller has a MSTANDBY handshake mechanism with the PRCM module

The module is ready to enter standby mode (indicated by the MSTANDBY signal to the PRCM asserted) when the USB is in suspend mode and the module is idle. It means the following:

- The module is committed not to start any new transaction on its master interface.
- The module is idle and, therefore, the power manager can start the procedure to turn off the interface clock, if needed. This procedure must be implemented using the slave power-management protocol.

The handshake mechanism lets the module to go to standby state based on the [OTG_SYSCONFIG](#)[13:12] MIDDLEMODE field.

- Smart-standby

The high-speed USB controller is configured in smart-standby mode ([OTG_SYSCONFIG](#)[13:12] MIDDLEMODE field = 0x2). The module is ready to enter standby mode (MSTANDBY is asserted) when there is no more activity on the USB master interface of the interconnect. MSTANDBY is asserted when the module is idle and deasserted when the module is activated by either an external USB event or an appropriate register access. The module then waits for MWAIT deassertion before a DMA transfer is started.

- Force-standby

- When the high-speed USB controller operates as a host: The USBOTG.POWER[1] SUSPENDMODE bit is set to 0x1 to bring the module to low-power mode (suspend mode). After this setting, the high-speed USB controller waits for its idle state. Software must set

OTG_SYSCONFIG[13:12] MIDDLEMODE = 0x0. Hardware then asserts MSTANDBY. Similarly, to release the MSTANDBY signal, an appropriate register access must be applied, which can be either of the following two cases:

- Remote wakeup causes a RESUME interrupt
- Set the USBOTG.POWER[3] RESET bit to 0x1
- Write 0x2 to the **OTG_SYSCONFIG**[13:12] MIDDLEMODE.

OR

- Set the USBOTG.POWER[3] RESET bit to 0x1
- Write 0x2 to the **OTG_SYSCONFIG**[13:12] MIDDLEMODE.

- When the high-speed USB controller operates as a peripheral: When the USB bus is idle for 3 ms, a SUSPEND interrupt is generated by the high-speed USB controller. Software must set **OTG_SYSCONFIG**[13:12] MIDDLEMODE = 0x0. Hardware then asserts MSTANDBY. The high-speed USB controller then asserts MSTANDBY. Similarly, to release the MSTANDBY signal, an appropriate register access must be applied, which can be either of the following two cases:

- Set the USBOTG.POWER[2] RESUME bit to 0x1.
 - Write 0x2 to the **OTG_SYSCONFIG**[13:12] MIDDLEMODE.
- OR
- RESET interrupt is generated by the high-speed USB controller.
 - Write 0x2 to the **OTG_SYSCONFIG**[13:12] MIDDLEMODE.

When MSTANDBY is deasserted as a consequence of the previous register access, the module waits for MWAIT deassertion before a DMA transfer is started.

- No-standby

The high-speed USB controller is configured in no-standby mode (**OTG_SYSCONFIG**[13:12] MIDDLEMODE field = 0x1). The module never enters standby mode (that is, MSTANDBY is never asserted).

Table 24-1167 describes the high-speed USB standby mode settings.

Table 24-1167. HSUSBOTG Host Controller STANDBYMODE Settings

| OTG_SYSCONFIG [13:12] MIDDLEMODE Value | Selected Mode | Description |
|--|----------------------|---|
| 0x0 | Force-standby | The HSUSBOTG host controller enters standby mode unconditionally |
| 0x1 | No-standby | The HSUSBOTG host controller never enters standby mode |
| 0x2 | Smart-standby | The HSUSBOTG host controller is ready to enter standby mode when there is no more activity on the USB master interface of the interconnect. |

24.12.4.2.2 IDLE Handshake Protocol

The high-speed USB controller can be configured through the **OTG_SYSCONFIG**[4:3] SIDLEMODE field as one of the following acknowledgment modes:

- Smart-idle mode

When the high-speed USB controller receives an IDLE request from the PRCM module:

- The interface clock INIT_L3_ICLK is disabled, see [CD_L3_INIT Clock Domain](#)
- L4 interface clock idle transitions:

Configured in smart-idle mode (**OTG_SYSCONFIG**[4:3] SIDLEMODE field = 0x2), the high-speed USB controller checks for no ongoing activity. The idle acknowledge then is asserted and the module waits for active system clock gating by the PRCM module (this occurs only when all peripherals supplied by the same L3 clock domain are also ready for idle).

Once in smart idle mode (when the PRCM module gates the interface clock), the module has no activity, the interface clock paths are gated, no interrupt request can be generated, and the module is

ready to issue a wake-up request. If a wake-up condition occurs, the high-speed USB controller exits from smart idle mode if the [OTG_SYSCONFIG\[2\] ENABLEWAKEUP](#) bit is set to 0x1 (wake-up capability enabled).

- Smart-idle wake-up mode

The high-speed USB OTG controller is configured in smart-idle wake-up mode ([OTG_SYSCONFIG\[4:3\] Smart Idle Wkp](#) field = 0x3). The functionality of this mode is the same as smart-idle mode, additionally Wake up feature is enabled.

- Force-idle mode

When the high-speed USB controller receives an IDLE request from the PRCM module:

- The interface clock [INIT_L3_ICLK](#) is disabled, see [CD_L3_INIT Clock Domain](#)
- The L4 interface clock idle transitions:

Configured in force-idle mode ([OTG_SYSCONFIG\[4:3\] SIDLEMODE](#) field = 0x0), the high-speed USB controller waits unconditionally for active system clock gating by the PRCM module (this occurs only when all peripherals supplied by the same L3 clock domain are also ready for idle).

Once in idle mode (when the PRCM module gates the interface clock), the module has no activity, the interface clock paths are gated, no interrupt request can be generated, and the wake-up feature is totally inhibited.

- No-idle mode

When the high-speed USB controller receives an IDLE request from the PRCM module:

- The interface clock [INIT_L3_ICLK](#) is disabled [CD_L3_INIT Clock Domain](#)
- L4 interface clock idle transitions

Configured in no-idle mode ([OTG_SYSCONFIG\[4:3\] SIDLEMODE](#) bit field = 0x1), the high-speed USB controller module does not go to idle mode and the idle acknowledge is never sent.

[Table 24-1168](#) describes the high-speed USB sidle mode settings. For more information, see [Chapter 3, Power, Reset, and Clock Management](#).

Table 24-1168. HSUSBOTG Host Controller SIDLEMODE Settings

| OTG_SYSCONFIG[4:3] SIDLEMODE Value | Selected Mode | Description |
|--|--------------------|---|
| 0x0 | Force-idle | The HSUSBOTG host controller acknowledges unconditionally the IDLE request from the PRCM, regardless of its internal operations. |
| 0x1 | No-idle | The HSUSBOTG host controller never acknowledges any IDLE request from the PRCM. |
| 0x2 | Smart-idle | The HSUSBOTG host controller acknowledges the IDLE request basing its decision on its internal activity. Namely, the acknowledge signal is asserted only when all pending transactions, IRQs or DMA requests are treated. |
| 0x3 | Smart-idle wake-up | The HSUSBOTG host controller enters smart mode with wakeup enabled. |

24.12.4.2.2.3 Wake-Up Request

Wake-up request is enabled by setting [OTG_SYSCONFIG\[2\] ENABLEWAKEUP](#) to 0x1. The enable wake-up feature works only when smart-idle wakeup is enabled.

24.12.4.2.3 Local Power Management

The high-speed USB OTG controller has local power management by internal clock gating features:

- Internal interface clock autogating: Clock for the L3 interconnect logic can be gated when the module is not accessed, if the [OTG_SYSCONFIG\[0\] AUTOIDLE](#) bit is set. Otherwise, this logic is free-running on the interface clock. This bit is used to save power when the module is not used because of the multiplexing configuration selected at the chip level. This bit has precedence over all other internal configuration bits.

24.12.4.3 Inventra MUSBMHDC

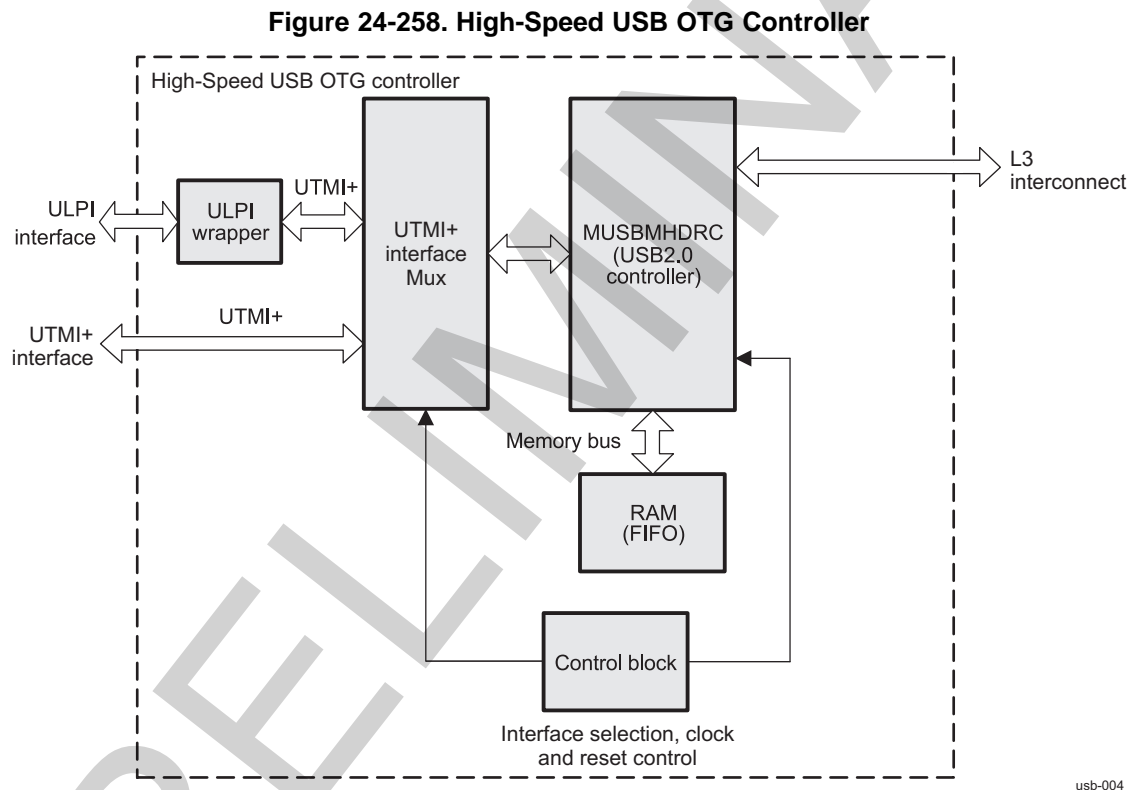
The core functionality of the module is provided by a third-party IP, the Inventra™ MUSBMHDC from Mentor Graphics® Corporation.

The high-speed USB OTG controller is basically the appropriate adaptation/integration of this IP to comply with TI requirements.

The high-speed USB OTG controller includes the following:

- MUSBMHDC (USB 2.0 controller)
- Master and slave bridges for conversion AHB to L3 interconnect and L3 interconnect to AHB
- Built-in self-test (BIST) controller
- Two memories (total of 16KB; available for various endpoints)
- Reset and clock generation
- DFT compliance with regards to latest specs

Figure 24-258 shows the high-speed USB controller.



24.12.4.4 Configuration

The following options are implemented in the TI high-speed USB OTG controller:

- 8-bit internal data path processing width (mandated by the use of ULPI)
- 32-bit vcontrol/vstatus support
- External charge pump: Hacked
- Software connect/disconnect supported
- Little-endian and big-endian byte ordering
- Eight DMA channels (with internal DMA initiator implemented)
- Dynamic FIFO sizing enabled
- 16-KB RAM buffer

- 15 IN/OUT endpoints in addition to control endpoint 0
- IN/OUT bulk packet splitting enabled
- High-bandwidth IN/OUT isochronous support enabled (see *Universal Serial Bus Specification Revision 2.0*)

24.12.4.5 Basic Operation

This section provides an overview of the module basic operation.

To implement the most time-critical functions in hardware, the module provides all of the encoding, decoding, and checking required to send and receive USB packets, interrupting the MPU only when endpoint data is successfully transferred. Generally, the following steps are performed.

24.12.4.5.1 Module Initialization

First, the firmware must do the overall initialization of the module by configuring the interrupts, DMA controller, and individual endpoints.

The specific items of a configuration for each endpoint are:

- Direction TX/RX
- Speed: High/full/low
- Special host settings when used in host mode (function address/hub parameters, etc.)
- Transaction protocol: Control/isochronous/bulk/interrupt
- Maximum packet size, that can be transferred through the endpoint
- Whether DMA is required (DMA enable)
- DMA mode
- Start address of the endpoint FIFO within the RAM block
- Maximum packet size allowed
- Whether double-buffering is required. This and the previous option define the amount of space that must be allocated to the FIFO. In the case of double-buffering, the FIFO size is doubled; therefore, the maximum supported size is 8196 bytes for the endpoint FIFOs.

NOTE: On the system level, it must be ensured that the reset and the interface are selected before the functional clock (OTG_60M_FCLK) is applied to the module. Correct functionality is not ensured if a reset deassertion or a change in the interface selection occurs when the functional clock OTG_60M_FCLK is already running.

24.12.4.5.2 Transaction Handling

Depending on whether the module is in the host or peripheral mode, an RX endpoint is assigned to IN or OUT transactions, respectively. Similarly, a TX endpoint is used for IN transactions in the peripheral mode and for OUT transactions in the host mode. When a transaction is complete, the appropriate endpoint interrupt is generated (if enabled).

When a transaction is handled through an RX endpoint, the received packet is placed in the RX FIFO, and the appropriate RX endpoint interrupt is generated. The packet can then be unloaded from the FIFO either manually (that is, by the MPU) or by the DMA. Although an RX endpoint is always active for a peripheral, in host mode the transaction must first be initiated by setting the appropriate request flag (REQPKT). This indicates to the transaction scheduler that there is an active transaction on this endpoint, which requires an IN token to be sent to the target function.

When a transaction is handled through a TX endpoint, the packet to send is loaded into the TX FIFO either manually (that is, by the MPU) or by the DMA. The transaction then must be initiated by setting the appropriate ready flag (TXPKTRDY) to indicate the availability of the new packet. When the packet is successfully sent (scheduled according to the protocol rules), the appropriate TX interrupt is generated.

24.12.4.6 Optional Features

This section gives a quick overview of the optional features that are available, depending on the endpoint configuration.

24.12.4.6.1 Double Packet Buffering

When double packet buffering is enabled (by setting the MSB of the FIFOSZ register two data packets can be stored in the FIFO. This option can be set for both the TX and RX endpoints in both the peripheral and host mode. For a TX endpoint, double-buffering means that up to two packets can be loaded into the FIFO awaiting transmission; for an RX endpoint, one packet can be received while another is being read. Double packet buffering is especially advisable for isochronous transactions to avoid underrun or overrun errors.

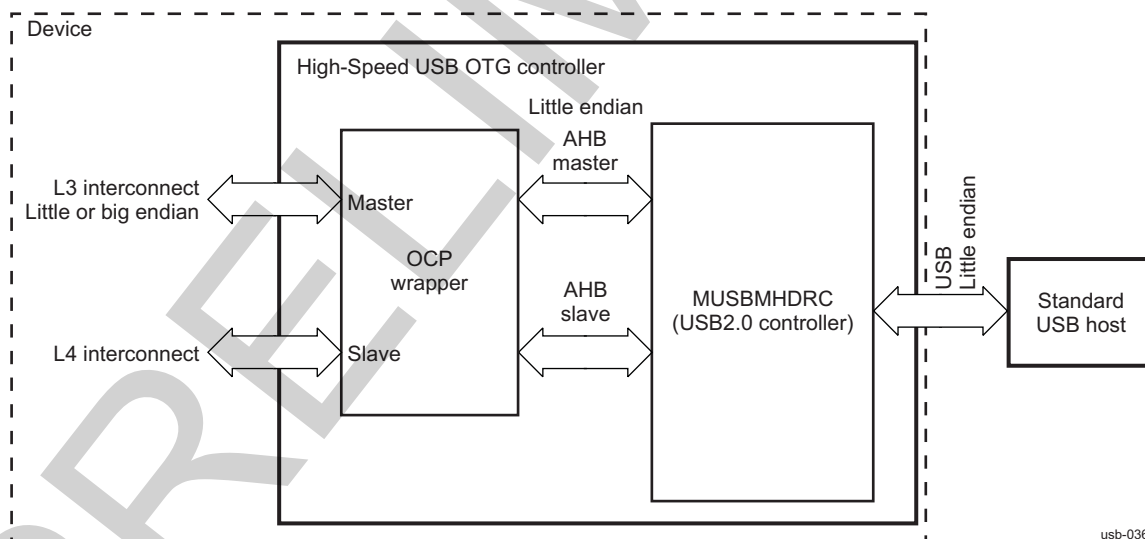
The high-speed USB controller provides dynamic FIFO sizing with an overall RAM size of 16KB, which can then be allocated to the different endpoints when the module is initialized. The maximum size of an endpoint FIFO is 4096 bytes for single packet buffering and 8192 bytes for double packet buffering. The firmware must ensure that a block of RAM is properly assigned to all TX and RX endpoints, considering the total RAM size and the maximum packet size set for the endpoint.

24.12.4.6.2 USBOTGHS Support for Big Endian

In the example in [Figure 24-259](#), the high-speed USB OTG controller module is configured as a USB device and is connected to a standard USB host. The two interconnect interfaces of the high-speed USB OTG controller connect it to the system bus. The register read/write is performed through the interconnect slave interface (control path). The data transfer to/from system memory takes place through the interconnect master interface (data path).

The data transfer on USB is always in little-endian mode, but on interconnect it can be in little- or big-endian mode, as shown in [Figure 24-259](#).

Figure 24-259. High-Speed USB OTG Controller Endianness



Big-endian support in the high-speed USB OTG controller may or may not require byte-swapping in the data path. Byte-swapping is performed based on the unit size of data. For example, if multiple bytes are packed into a single 32-bit word, these bytes must be swapped in a big-endian interconnect. On the other hand, if the data is simply a 32-bit word (for example, a 32-bit descriptor pointer in a memory buffer), the bytes in the word must not be swapped in big-endian mode.

In the high-speed USB OTG controller, the unit size of descriptors/descriptor pointers is 32 bits, and the unit size of USB data is 8 bits. Four 8-bit USB data are packed to form a 32-bit word. This 32-bit data requires byte-swapping, whereas the descriptors/descriptor pointers do not require byte-swapping.

NOTE: Byte-swapping is not required in the control path (slave interface).

The interconnect master interface (a submodule within the interconnect wrapper) supports big-endian conversion by setting the [OTG_BIGENDIAN\[0\]](#) BIG_ENDIAN bit to 0x1.

For interconnect write transactions, the data word is swapped, as shown in [Table 24-1169](#), before its output on the interconnect master interface. In case of an interconnect read transaction, the received data is swapped before its output on the AHB master interface of the MUSBMHDRC core. The interconnect MByteEn is swapped before the command is issued on the interconnect master interface. The interconnect MAddr is always aligned to the size of the interconnect data (32 bits). Hence, the interconnect MAddr is always word-aligned.

Table 24-1169. Interconnect Data and MByteEn in Little- and Big-Endian Modes

| Unit Size of Data | AHB Size (of Packed/Nonpacked Data) | AHB Start Address Offset (Always in Little-Endian Mode) | Interconnect MByteEn in Little-Endian Mode | Interconnect MByteEn in Big-Endian Mode | Interconnect Data in Little-Endian Mode | Interconnect Data in Big-Endian Mode |
|-------------------|-------------------------------------|---|--|---|---|--------------------------------------|
| Byte | Byte | 0 | 0001 | 1000 | xxxb0 | b0xxx |
| Byte | Byte | 1 | 0010 | 0100 | xxb0x | xb0xx |
| Byte | Byte | 2 | 0100 | 0010 | xb0xx | xxb0x |
| Byte | Byte | 3 | 1000 | 0001 | b0xxx | xxxb0 |
| Byte | Half-word | 0 | 0011 | 1100 | xxb1b0 | b0b1xx |
| Byte | Half-word | 2 | 1100 | 0011 | b1b0xx | xxb0b1 |
| Byte | Word | 0 | 1111 | 1111 | b3b2b1b0 | b0b1b2b3 |
| Half-word | Half-word ⁽¹⁾ | 0 | 0011 | 1100 | xxb1b0 | b1b0xx |
| Half-word | Half-word ⁽¹⁾ | 2 | 1100 | 0011 | b1b0xx | xxb1b0 |
| Half-word | Word ⁽¹⁾ | 0 | 1111 | 1111 | b3b2b1b0 | b1b0b3b2 |
| Word | Word ⁽²⁾ | 0 | 1111 | 1111 | b3b2b1b0 | b3b2b1b0 |

⁽¹⁾ Not a likely scenario for high-speed USB OTG controller

⁽²⁾ Corresponds to descriptor and descriptor pointer. No bytes are packed to form a word; hence, no byte-swapping is done in this case.

24.12.4.6.3 DMA

The high-speed USB controller has an internal DMA controller for efficient loading/unloading of the endpoint FIFOs. The DMA controller is configured for 8 channels and it has its own block of control registers and its own interrupt controller.

If the DMA is enabled for a TX endpoint, a DMA transfer occurs whenever the endpoint can accept another packet in its FIFO (that is, the DMA controller loads the packets into the FIFO without processor intervention).

If the DMA is enabled for an RX endpoint, a DMA transfer occurs whenever the endpoint has a packet in its FIFO (that is, the DMA CONTROLLER unloads the packets from the FIFO without processor intervention).

The high-speed USB controller supports two DMA request modes, which also affects the generation of endpoint interrupts.

- DMA request mode 0 is especially advisable for isochronous transfers but can also be used for bulk and interrupt transfers.
- DMA request mode 1 is mainly valuable for bulk transfers, where typically a large block of data is split into a series of packets of the maximum size.

24.12.4.6.3.1 DMA Request Mode 0

For RX endpoints, the DMA transfer is initiated when a data packet is available in the endpoint FIFO. The appropriate endpoint interrupt is also generated after the packets are received.

For TX endpoints, the DMA transfer is initiated when the endpoint FIFO can accept a data packet. The appropriate endpoint interrupt is also generated to prompt the loading of the packets.

24.12.4.6.3.2 DMA Request Mode 1

For RX endpoints the DMA transfer is initiated only when the received packet is the maximum packet size (as set in the RXMAXP register for the corresponding endpoint). The appropriate endpoint interrupt is generated only when the received packet is a short packet (that is, one less than the maximum packet size); otherwise, it is suppressed.

For TX endpoints, the DMA transfer is initiated when the endpoint FIFO can accept a data packet. The appropriate endpoint interrupt is suppressed.

24.12.4.6.3.3 Internal DMA Controller

The high-speed USB controller has an internal DMA controller to perform DMA transfers acting as host on the L3 interconnect. The DMA controller has eight channels, which can be independently programmed based on the following configuration options:

- DMA enable
- Direction (DMA write/DMA read)
- DMA mode (transfer one or more packets)
- Interrupt enable
- Endpoint number
- L3 interconnect memory address (32 bits)
- Byte count

The DMA controller can issue single accesses (8-bit, 16-bit, or 32-bit) and also bursts (4 × 32-bit, 8 × 32-bit, or 16 × 32-bit) on the L3 interconnect. The start address provided to the DMA controller must be 32-bit aligned.

24.12.4.7 Automatic Packet Splitting/Combining for Bulk Transfers

The high-speed USB controller offers the facility for bulk endpoints to store larger amounts of data in their FIFOs than can be transferred in a single USB operation. In other words, the module includes a configuration option that, if selected, allows larger data packets to be written to bulk TX endpoints, which are then split into packets of an appropriate size for transfer across the USB. A similar option exists for bulk RX endpoints, which, if selected, causes the module to combine the packet received across the USB into larger data packets before being read by the application software.

The firmware can enable these options by setting the corresponding bits (MPRXE and MPTXE) in the CONFIGDATA register. The necessary packet size information contains the payload size for one transaction and a multiplier defining the maximum number of USB packets. The payload is required to be either 8, 16, 32, 64, or (in case of high-speed transfers) 512 bytes; the multiplier can be any value up to 32.

24.12.4.8 High-Bandwidth Isochronous Endpoints

In the high-speed mode, isochronous endpoints can transfer up to three USB packets in any microframe with a payload of up to 1024 bytes in each packet, corresponding to a data transfer rate of up to 3072 bytes per microframe (see *Universal Serial Bus Specification Revision 2.0*).

For TX endpoints, the high-speed USB controller supports this by allowing loading data packets of up to 3072 bytes (that is, 3 × 1024 bytes) into the associated endpoint FIFO, which is then automatically split into USB packets of the maximum payload, or smaller to be transmitted in one microframe.

For RX endpoints, the module automatically combines all the USB packets received during a microframe into a single packet of up to 3072 bytes (that is, 3 × 1024 bytes) within the RX FIFO.

The number of USB packets transferred per microframe and the maximum payload in each packet is defined through the appropriate registers (RXMAXP and TXMAXP).

24.12.4.9 Carkit Implementation

Carkit feature implementation:

UART3 RX/TX muxing on the usba0_ulpihy_dat0 and usba0_ulpihy_dat1. To support carkit interrupt through USB0HS.DATA3, three different methods can be used:

- External PHY interrupt if provided: IRQ_SYS interrupt
- UART3 interrupt: CTS edge detection
- GPIO interrupt: Edge detection on GPIO associated to usba0_ulpihy_dat3 line

24.12.4.10 USB PHY

The device-embedded USB PHY is composed of the following modules:

- USB2PHYCORE: Contains the USB functions, drivers, receivers, and pads for correct D+/D- signaling, and the battery charger detection (supporting dead-battery mode). Delivers a 3.3-V output signal (charger enable [pin usba0_otg_ce]) to control an external battery charger.
- USB2PHYCM: Contains LDO and bandgap to provide voltage reference to the USB2PHYCORE module

The embedded PHY does not support the OTG features of USB-OTG standards (that is, ID pin detection and VBUS detection). This function is exported to an external companion chip (for example, the TWL6030). Software must retrieve the OTG HNP and SRP status from the TWL6030 (using the I2C1 interface) and configure the bits inside the control module that drive the related USBOTGHS UTMI+ interface signals. It must also read back the UTMI+ signals needed to configure the TWL6030 OTG module.

These signals are:

- Inputs of the USB controller driven by the control module:
 - Avalid: Indicates whether VBUS is above the A-Device session valid threshold
 - Bvalid (currently not used)
 - Vbusvalid: Indicates whether VBUS is above the threshold for normal operation
 - Sessend: Indicates whether VBUS is below the B-Device session end threshold
 - Iddig: Indicates the value of the ID pin of the USB connector
- Outputs of the USB controller readable in the control module:
 - Idpullup: Enables sampling of the ID pin of the USB connector
 - Drv vbus: Controls the driving of 5-V power on VBUS
 - Chrg vbus: Controls the charging of VBUS for initiating SRP
 - Dischrg vbus: Controls the discharging of VBUS for completing SRP

See the CONTROL_USBOTGHS_CONTROL register in [Chapter 19, Control Module](#), and the TWL6030 documentation.

The following UTMI signals are not connected:

- Txbitstufferable (no bit-stuffing out from the USB controller)
- Txbitstufferableh (because only 8 bits are used)

The following USBPHY signals are routed internally to the GPIO6 module pins to generate interrupts when any of the following events occur:

- CHGDETECTED: This signal indicates the output of the charger detection protocol.
 - 0: Charger not detected
 - 1: Charger detected

The value is latched until the charger protocol is reset.

- DPDM5VSHORT: This signal is asserted high if a short-circuit-to-VBUS condition is detected on the USB DP or DM pins. This signal is valid only if all power supplies are present. The short is detected if any or even none of the supplies are present.
 - 0: No short

1: VBUS short on DP or DM detected

For information about how to enable these interrupts, see [Chapter 26, General-Purpose Interface](#).

The USBPHY internal registers are listed in [Section 24.12.6.3, USBPHY Registers](#), for debug purposes.

CAUTION

For a correct read out of the USBPHY registers, the value of the [OCP2SCP_TIMING\[3:0\]](#) SYNC2 bit field must be set to 0x6 or more, and the [OCP2SCP_TIMING\[9:7\]](#) DIVISIONRATIO bit field must be left untouched.

24.12.5 High-Speed USB OTG Controller Basic Programming Model

This section describes the low-level hardware programming sequences for configuration and use of the high-speed USB OTG controller.

24.12.5.1 Global Initialization

24.12.5.1.1 Surrounding Modules Global Initialization

This section identifies the requirements of initializing the surrounding modules when the high-speed USB OTG controller is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration of the high-speed USB OTG controller.

Table 24-1170. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|--|--|
| PRCM | All required clocks must be enabled, see Table 24-1165 . Do not apply OTG_60M_FCLK clock before the interface is selected. Refer to Section 3.6.3.2, CM Clock Source , in Chapter 3, Power, Reset, and Clock Management . |
| Cortex-A9 MPU INTC or Cortex-M3 MPU INTC | Cortex-A9 MPU or Cortex-M3 MPU interrupt controller must be configured to enable the interrupt request generation to the Cortex-A9 MPU or Cortex-M3 MPU subsystem when interrupt requests are generated by the High-Speed Multiport USB Host Subsystem. See the respective Functional Description in the Interrupt Controller chapter for the MPUs. |
| Interconnect (L3 and L4) | See Section 14.2, L3 Interconnect , and Section 14.3, L4 Interconnect , for more information. |

24.12.5.1.2 High-Speed USB OTG Controller Global Initialization

This procedure initializes the high-speed multiport USB host subsystem after a power-on or software reset. The module USBPHY is reset through boundary reset signal L3_INIT_RST coming from PRCM module.

Table 24-1171. High-Speed USB OTG Software Reset

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Perform a software reset on the USB OTG controller | OTG_SYSCONFIG[1] SOFTRESET | 0x1 |
| Wait until reset is finished | OTG_SYSSTATUS[0] RESETDONE | =0x1 |

Table 24-1172. Power Management Configuration

| Step | Register/Bit Field/Programming Model | Value |
|--------------------------------------|--|-------|
| Select master interface standby mode | OTG_SYSCONFIG[13:12] MIDLEMODE | 0x- |
| Select slave interface idle mode | OTG_SYSCONFIG[4:3] SIDLEMODE | 0x- |

Table 24-1172. Power Management Configuration (continued)

| Step | Register/Bit Field/Programming Model | Value |
|----------------------|--------------------------------------|-------|
| Set clock autogating | OTG_SYSCONFIG[0] AUTOIDLE | 0x- |

24.12.5.2 High-Speed USB OTG Controller Interface Modes

This procedure describes TI high-speed USB controller interface selection:

Table 24-1173. High-Speed USB Controller Interface Selection

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Select between embedded and external PHY interface | OTG_INTERFSEL[2:0] PHYSEL | 0x- |
| Enable functional PHY clock (OTG_60M_FCLK) | Refer to | - |

24.12.5.3 High-Speed USB OTG Controller Power Management Configuration

This section describes the settings for optimal high-speed USB controller power management, depending on the use of this module in the application.

24.12.5.3.1 No Application Mode

The optimal configuration when the high-speed USB controller is not used by the application is as follows:

Table 24-1174. Power Management Configuration - No Application Mode

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Switch master interface to force standby mode | OTG_SYSCONFIG[13:12] MIDDLEMODE | 0x0 |
| Switch slave interface to force-idle mode | OTG_SYSCONFIG[4:3] SIDLEMODE | 0x0 |
| Set the clock to smart mode - clock is cut-off if no activity on the interface | OTG_SYSCONFIG[0] AUTOIDLE | 0x1 |

24.12.5.3.2 Host or Peripheral Mode

When used as a host or in peripheral mode, the high-speed USB controller must be programmed as follows:

Table 24-1175. Power Management Configuration - Host or Peripheral Mode

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Switch Master interface to smart standby mode | OTG_SYSCONFIG[13:12] MIDDLEMODE | 0x2 |
| Switch Slave interface to smart-idle mode | OTG_SYSCONFIG[4:3] SIDLEMODE | 0x2 |
| Set the clock to smart mode - clock is cut-off if no activity on the interface | OTG_SYSCONFIG[0] AUTOIDLE | 0x1 |

24.12.5.3.3 Switching Between Host and Peripheral Mode

When used as a host/peripheral, the high-speed USB OTG controller must be programmed as follows:

Table 24-1176. Power Management Configuration - Switching Between Host and Peripheral Mode

| Step | Register/Bit Field/Programming Model | Value |
|--|--------------------------------------|-------|
| Switch Master interface to force standby mode | OTG_SYSCONFIG[13:12] MIDDLEMODE | 0x0 |
| Switch Slave interface to smart-idle mode | OTG_SYSCONFIG[4:3] SIDLEMODE | 0x2 |
| Set the clock to smart mode - clock is cut-off if no activity on the interface | OTG_SYSCONFIG[0] AUTOIDLE | 0x1 |

24.12.6 High-Speed USB OTG Controller Register Manual

This section presents only the TI-specific registers of the high-speed USB controller.

Table 24-1177 lists the base address and address space for the high-speed USB controller.

Table 24-1177. High-Speed USB OTG Controller Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|------------|
| HSUSBOTG | 0x4A0A B000 | 4KB |
| OCP2SCP | 0x4A0A D000 | 64 bytes |
| USBPHY | 0x4A0A D080 | 3968 bytes |

24.12.6.1 HSUSBOTG Registers

24.12.6.1.1 HSUSBOTG Register Summary

Table 24-1178. HSUSBOTG Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address |
|--------------------------------|------|-----------------------|----------------|------------------|
| OTG_REVISION | R | 32 | 0x0000 0400 | 0x4A0A B400 |
| OTG_SYSCONFIG | RW | 32 | 0x0000 0404 | 0x4A0A B404 |
| OTG_SYSSTATUS | R | 32 | 0x0000 0408 | 0x4A0A B408 |
| OTG_INTERFSEL | RW | 32 | 0x0000 040C | 0x4A0A B40C |
| OTG_SIMENABLE | RW | 32 | 0x0000 0410 | 0x4A0A B410 |
| OTG_FORCESTDBY | RW | 32 | 0x0000 0414 | 0x4A0A B414 |
| OTG_BIGENDIAN | RW | 32 | 0x0000 0418 | 0x4A0A B418 |

24.12.6.1.2 HSUSBOTG Register Description

Table 24-1179. OTG_REVISION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|----------|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--------------------|--|
| Address Offset | 0x0000 0400 | | | | | | | | | | | | | | | | Instance | HSUSBOTG | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A0A B400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | OCP standard USB OTG HS core revision number | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <div><div><div>313029282726252423222120191817161514131211109876543210</div></div></div> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | Type | | Reset | |
| 31:0 | RESERVED | | IP Revision | | | | | | | | | | | | | | | | | | | | | | | | | | | | R | | See ⁽¹⁾ | |

⁽¹⁾ TI internal data

Table 24-1180. Register Call Summary for Register OTG_REVISION

High-Speed USB OTG Controller

- [HSUSBOTG Register Summary: \[0\]](#)

Table 24-1181. OTG_SYSCONFIG

| | | | |
|------------------|----------------------------|----------|----------|
| Address Offset | 0x0000 0404 | Instance | HSUSBOTG |
| Physical Address | 0x4A0A B404 | | |
| Description | OCP standard configuration | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------|----|----------|----|----|----|---|---|---|---|-----------|---|--------------|-----------|----------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | MIDLEMODE | | RESERVED | | | | | | | | SIDLEMODE | | ENABLEWAKEUP | SOFTRESET | AUTOIDLE | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|--|------|---------|
| 31:14 | RESERVED | reserved | R | 0x00000 |
| 13:12 | MIDLEMODE | Master interface power management control. Standby/wait control 0x0: Force standby mode. Mstandby asserted unconditionally 0x1: No standby mode. Mstandby never asserted. 0x2: Smart standby mode. Mstandby asserted when no more activity on the USB master. | RW | 0x2 |
| 11:5 | RESERVED | reserved | R | 0x00 |
| 4:3 | SIDLEMODE | Slave interface power management control. Req/ack control 0x0: Force Idle mode. Sidleack asserted after Midlereq assertion 0x1: No idle mode. Sidleack never asserted. 0x2: SmartIdle mode. Sidleack asserted after Midlereq assertion when no more activity on the USB. Swakeup is not asserted in this mode. 0x3: SmartIdle - Wakeup mode. Sidleack asserted after Midlereq assertion when no more activity on the USB. Swakeup is asserted in this mode if ENABLEWAKEUP is set. | RW | 0x2 |
| 2 | ENABLEWAKEUP | Enable wakeup capability. 0x0: Wakeup disabled 0x1: Wakeup enabled | RW | 0 |
| 1 | SOFTRESET | Software reset bit 0x1: Starts softreset sequence. | RW | 0 |
| 0 | AUTOIDLE | Autoidle bit 0x0: Clock always running 0x1: When no activity on OCP, clock is cut off. | RW | 1 |

Table 24-1182. Register Call Summary for Register OTG_SYSCONFIG

High-Speed USB OTG Controller

- [Software Reset: \[0\]](#)
- [System Power Management: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\]](#)
- [Local Power Management: \[19\]](#)
- [High-Speed USB OTG Controller Global Initialization: \[20\] \[21\] \[22\] \[23\]](#)
- [No Application Mode: \[24\] \[25\] \[26\]](#)
- [Host or Peripheral Mode: \[27\] \[28\] \[29\]](#)
- [Switching Between Host and Peripheral Mode: \[30\] \[31\] \[32\]](#)
- [HSUSBOTG Register Summary: \[33\]](#)

Table 24-1183. OTG_SYSSTATUS

| | | | |
|------------------|---------------------|----------|----------|
| Address Offset | 0x0000 0408 | Instance | HSUSBOTG |
| Physical Address | 0x4A0A B408 | | |
| Description | OCP standard status | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESETDONE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | reserved | R | 0x0000 0000 |
| 0 | RESETDONE | Reset done Read 0x0: Reset is ongoing Read 0x1: Reset is finished. | R | 1 |

Table 24-1184. Register Call Summary for Register OTG_SYSSTATUS

High-Speed USB OTG Controller

- [Software Reset: \[0\]](#)
- [High-Speed USB OTG Controller Global Initialization: \[1\]](#)
- [HSUSBOTG Register Summary: \[2\]](#)

Table 24-1185. OTG_INTERFSEL

| | | | |
|-------------------------|--|-----------------|----------|
| Address Offset | 0x0000 040C | | |
| Physical Address | 0x4A0A B40C | Instance | HSUSBOTG |
| Description | USB OTG HS interface selection. The interface selection has to be done before the PHY is activated and is not allowed to change when the PHY clock is already running. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PHYSEL | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:3 | RESERVED | reserved | R | 0x0000 0000 |
| 2:0 | PHYSEL | PHY interface selection 0x0: PHY interface is 8-bit, UTMI+ level 3 0x1: PHY interface is 12-pin, 8-bit SDR ULPI 0x2: PHY interface is 8-pin, 4-bit DDR ULPI (Non-functional mode in current implementation. Do not use.) | RW | 0x1 |

Table 24-1186. Register Call Summary for Register OTG_INTERFSEL

High-Speed USB OTG Controller

- [High-Speed USB OTG Controller Environment: \[0\] \[1\]](#)
- [High-Speed USB OTG Controller Interface Modes: \[2\]](#)
- [HSUSBOTG Register Summary: \[3\]](#)

Table 24-1187. OTG_SIMENABLE

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0410 | Instance | HSUSBOTG |
| Physical Address | 0x4A0A B410 | | |
| Description | Enable simulation acceleration features. WARNING: For simulations only, since those features have an impact on USB protocol. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | TM1 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | reserved | R | 0x0000 0000 |
| 0 | TM1 | Test Mode 1 enabling (timer shortcuts) | RW | 0 |

Table 24-1188. Register Call Summary for Register OTG_SIMENABLE

High-Speed USB OTG Controller

- [HSUSBOTG Register Summary: \[0\]](#)

Table 24-1189. OTG_FORCESTDBY

| | | | |
|-------------------------|---|-----------------|----------|
| Address Offset | 0x0000 0414 | Instance | HSUSBOTG |
| Physical Address | 0x4A0A B414 | | |
| Description | Enabling MSTANDBY in FORCESTANDBY mode. Programming this register will impact SmartStandby functionality. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | ENABLEFORCE |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|------------------------------|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | ENABLEFORCE | Enabling MSTANDBY to go high | RW | 0 |

Table 24-1190. Register Call Summary for Register OTG_FORCESTDBY

High-Speed USB OTG Controller

- [HSUSBOTG Register Summary: \[0\]](#)

Table 24-1191. OTG_BIGENDIAN

| | | | |
|-------------------------|-------------------------------------|-----------------|----------|
| Address Offset | 0x0000 0418 | Instance | HSUSBOTG |
| Physical Address | 0x4A0A B418 | | |
| Description | Enable BIG ENDIANESS for OCP MASTER | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|------------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | BIG_ENDIAN |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------------|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | BIG_ENDIAN | Enable BIG ENDIAN in OCP MASTER | RW | 0 |

Table 24-1192. Register Call Summary for Register OTG_BIGENDIAN

High-Speed USB OTG Controller

- [USBOTGHS Support for Big Endian: \[0\]](#)
- [HSUSBOTG Register Summary: \[1\]](#)

24.12.6.2 OCP2SCP Registers

24.12.6.2.1 OCP2SCP Register Summary

CAUTION

The OCP2SCP registers are limited to 32-bit data accesses; 16- and 8-bit accesses are not allowed and can corrupt register content.

Table 24-1193. OCP2SCP Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address |
|-----------------------------------|------|-----------------------|----------------|------------------|
| OCP2SCP_REVISION | R | 32 | 0x0000 0000 | 0x4A0A D000 |
| OCP2SCP_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4A0A D010 |
| OCP2SCP_SYSSTATUS | R | 32 | 0x0000 0014 | 0x4A0A D014 |
| OCP2SCP_TIMING | RW | 32 | 0x0000 0018 | 0x4A0A D018 |

Table 24-1197. Register Call Summary for Register OCP2SCP_SYSCONFIG

High-Speed USB OTG Controller

- [OCP2SCP Register Summary: \[0\]](#)

Table 24-1198. OCP2SCP_SYSSTATUS

| | | | |
|-------------------------|-----------------------------|-----------------|---------|
| Address Offset | 0x0000 0014 | Instance | OCP2SCP |
| Physical Address | 0x4A0A D014 | | |
| Description | System status register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESETDONE | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | RESETDONE | 0: Internal reset is on-going. 1: Reset is complete. | R | 1 |

Table 24-1199. Register Call Summary for Register OCP2SCP_SYSSTATUS

High-Speed USB OTG Controller

- [OCP2SCP Register Summary: \[0\]](#)

Table 24-1200. OCP2SCP_TIMING

| | | | |
|-------------------------|-------------------------------|-----------------|---------|
| Address Offset | 0x0000 0018 | Instance | OCP2SCP |
| Physical Address | 0x4A0A D018 | | |
| Description | Timing configuration register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|---|-------|---|---|---|-------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | DIVISIONRATIO | | SYNC1 | | | | SYNC2 | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|----------|
| 31:10 | RESERVED | Reserved | R | 0x000000 |
| 9:7 | DIVISIONRATIO | Division ratio of the SCP clock in relation to the OCP input clock. When the value 0x0 is programmed, and the transaction to be made is a valid transaction on the SCP interface, the value of DIVISIONRATIO is set to 0x7 by hardware to avoid a block on the OCP interface. CAUTION: To ensure correct operation, DIVISIONRATIO must not be modified. See also the SYNC2 description. | RW | 0x0 |
| 6:4 | SYNC1 | Number of SCP clock cycles defining SYNC1 delay | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 3:0 | SYNC2 | Number of SCP clock cycles defining the SYNC2 delay. When the value 0x0 is programmed, and the transaction to be made is a valid transaction on the SCP interface, SYNC2 is set to the minimum allowed value 0x1 to avoid a block on the OCP interface. CAUTION: To ensure correct operation, the value of SYNC2 must be set to 0x6 or more. | RW | 0x1 |

Table 24-1201. Register Call Summary for Register OCP2SCP_TIMING

High-Speed USB OTG Controller

- [USB PHY: \[0\] \[1\]](#)
- [OCP2SCP Register Summary: \[2\]](#)

24.12.6.3 USBPHY Registers

24.12.6.3.1 USBPHY Register Summary

CAUTION

The USBPHY registers are limited to 32-bit data accesses; 16- and 8-bit accesses are not allowed and can corrupt register content.

Table 24-1202. USBPHY Registers Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Physical Address |
|--|------|-----------------------|----------------|------------------|
| USBPHY_TERMINATION_CONTROL | RW | 32 | 0x0000 0000 | 0x4A0A D080 |
| USBPHY_RX_CALIB | RW | 32 | 0x0000 0004 | 0x4A0A D084 |
| USBPHY_DLLHS_2 | RW | 32 | 0x0000 0008 | 0x4A0A D088 |
| USBPHY_RX_TEST_2 | RW | 32 | 0x0000 000C | 0x4A0A D08C |
| USBPHY_TX_TEST_CHRG_DET | RW | 32 | 0x0000 0010 | 0x4A0A D090 |
| USBPHY_CHRG_DET | RW | 32 | 0x0000 0014 | 0x4A0A D094 |
| USBPHY_PWR_CNTL | RW | 32 | 0x0000 0018 | 0x4A0A D098 |
| USBPHY_UTMI_INTERFACE_CNTL_1 | RW | 32 | 0x0000 001C | 0x4A0A D09C |
| USBPHY_UTMI_INTERFACE_CNTL_2 | RW | 32 | 0x0000 0020 | 0x4A0A D0A0 |
| USBPHY_BIST | RW | 32 | 0x0000 0024 | 0x4A0A D0A4 |
| USBPHY_BIST_CRC | RW | 32 | 0x0000 0028 | 0x4A0A D0A8 |
| USBPHY_CDR_BIST2 | RW | 32 | 0x0000 002C | 0x4A0A D0AC |
| USBPHY_GPIO | RW | 32 | 0x0000 0030 | 0x4A0A D0B0 |
| USBPHY_DLLHS | RW | 32 | 0x0000 0034 | 0x4A0A D0B4 |
| USBPHY_USB2PHYCM_TRIM | RW | 32 | 0x0000 0038 | 0x4A0A D0B8 |
| USBPHY_USB2PHYCM_CONFIG | RW | 32 | 0x0000 003C | 0x4A0A D0BC |
| USBPHY_USBOTG | RW | 32 | 0x0000 0040 | 0x4A0A D0C0 |
| USBPHY_AD_INTERFACE_REG1 | RW | 32 | 0x0000 0044 | 0x4A0A D0C4 |
| USBPHY_AD_INTERFACE_REG2 | RW | 32 | 0x0000 0048 | 0x4A0A D0C8 |
| USBPHY_AD_INTERFACE_REG3 | RW | 32 | 0x0000 004C | 0x4A0A D0CC |
| USBPHY_ANA_CONFIG1 | RW | 32 | 0x0000 0050 | 0x4A0A D0D0 |
| USBPHY_ANA_CONFIG2 | RW | 32 | 0x0000 0054 | 0x4A0A D0D4 |

24.12.6.3.2 USBPHY Register Description

Table 24-1203. USBPHY_TERMINATION_CONTROL

| | | | |
|-------------------------|--|-----------------|--------|
| Address Offset | 0x0000 0000 | Instance | USBPHY |
| Physical Address | 0x4A0A D080 | | |
| Description | Contains bits related to control of terminations in USBPHY | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|---------------|----|----|----|----------------|----|----|----|-------------|----|----|----|----------|----|----|----|-------------------|----|---|---|-----------|---|---|---|-------------|---|---|---|----------------|--|--|--|-------------------|--|--|--|--------------------|--|--|--|-------------------|--|--|--|-----------|--|--|--|
| RESERVED | | | | ALWAYS_UPDATE | | | | RTERM_CAL_DONE | | | | FS_CODE_SEL | | | | RESERVED | | | | USE_RTERM_RMX_REG | | | | RTERM_RMX | | | | HS_CODE_SEL | | | | RTERM_COMP_OUT | | | | RESTART_RTERM_CAL | | | | DISABLE_TEMP_TRACK | | | | USE_RTERM_CAL_REG | | | | RTERM_CAL | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------------------------------|-------|
| 31:30 | RESERVED | reserved | RW | 0x0 |
| 29 | ALWAYS_UPDATE | When set to 1, the calibration code is updated immediately after a code computation without waiting for idle periods. | RW | 0 |
| 28 | RTERM_CAL_DONE | Rterm calibration is done. First time cal is done this bit gets set and gets reset at a restart cal. Read value is valid only if VDDLDO is on. | R | 0 |
| 27:24 | FS_CODE_SEL | FS Code selection control | RW | 0x1 |
| 23:22 | RESERVED | reserved | RW | 0x0 |
| 21 | USE_RTERM_RMX_REG | Override termination resistor trim code with RTERM_RMX from this register | RW | 0 |
| 20:14 | RTERM_RMX | When read, this field returns the current Termination resistor trim code. Read value is valid only if VDDLDO is on. The value written to this field is used as Termination resistor trim code if bit 21 is set to 1 | RW | 0x00 |
| 13:11 | HS_CODE_SEL | HS Code selection control. A higher positive value (for example, +3 -- 011) reduces the termination resistance and improves the vertical eye opening. | RW | 0x1 |
| | HS_CODE_SEL | Offset Value | Termination Calibrated Value | |
| | 000 | 0 | ~1.5% | |
| | 001 | +1 (default) | 0% | |
| | 010 | +2 | ~-1.5% | |
| | 011 | +3 | ~-3% | |
| | 100 | -1 | 3% | |
| | 101 | -2 | 4.5% | |
| | 110 | -3 | 6% | |
| | 111 | -4 | 7.5% | |
| 10 | RTERM_COMP_OUT | Master loop comparator output. Read value is valid only if VDDLDO is on. | R | 0 |
| 9 | RESTART_RTERM_CAL | Restart the rterm calibration. the calibration restarts on any toggle 0-1 or 1-0 on this bit. | RW | 0 |
| 8 | DISABLE_TEMP_TRACK | Disables the temperature tracking function of the termination calibration | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------|---|------|-------|
| 7 | USE_RTERM_CAL_REG | When 1, the rterm cal code is overridden by values in RTERM_CAL | RW | 0 |
| 6:0 | RTERM_CAL | When read this field returns the current rterm calibration code. Read value is valid only if VDDLDO is on. The value written to this field is used as rterm calibration code if the bit USE_RTERM_CAL_REG is 1. | RW | 0x00 |

Table 24-1204. Register Call Summary for Register USBPHY_TERMINATION_CONTROL

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1205. USBPHY_RX_CALIB

| | | | |
|-------------------------|---|-----------------|--------|
| Address Offset | 0x0000 0004 | Instance | USBPHY |
| Physical Address | 0x4A0A D084 | | |
| Description | Contains bits related to RX calibration | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------|----------------|-------------|----|----|----|----|----|---------------|---------------|-----------------|------------------|----|----|----|----|-----------------|------------------|----|----|----|-----------------|------------------|---|---|---|-------------|-------------|----------------|---|---|---|
| RESTART_HSRX_CAL | USE_HS_OFF_REG | HS_OFF_CODE | | | | | | HSRX_COMP_OUT | HSRX_CAL_DONE | USE_SQ_OFF_DAC1 | SQ_OFF_CODE_DAC1 | | | | | USE_SQ_OFF_DAC2 | SQ_OFF_CODE_DAC2 | | | | USE_SQ_OFF_DAC3 | SQ_OFF_CODE_DAC3 | | | | SQ_COMP_OUT | SQ_CAL_DONE | RESTART_SQ_CAL | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|---|------|-------|
| 31 | RESTART_HSRX_CAL | Restart the HSRX calibration state machine when this bit goes from 0 to 1. | RW | 0 |
| 30 | USE_HS_OFF_REG | Override HS offset correction with HS_OFF_CODE when set to 1 | RW | 0 |
| 29:24 | HS_OFF_CODE | HS offset code, this code is forced when bit 30 is 1. Code is updated from calibration logic when bit 30 = 0. | RW | 0x00 |
| 23 | HSRX_COMP_OUT | The output of the HSRX comparator. Read value is valid only if VDDLDO is on. | R | 0 |
| 22 | HSRX_CAL_DONE | Signal that indicates that the HSRX calibration is done. This gets reset at every restart. Read value is valid only if VDDLDO is on. | R | 0 |
| 21 | USE_SQ_OFF_DAC1 | Override Squelch offset DAC1 code when '1' | RW | 0 |
| 20:15 | SQ_OFF_CODE_DAC1 | When read returns current Sq offset code for DAC1, if VDDLDO is on. When written this is used as Sq offset code for DAC1 when USE_SQ_OFF_DAC1 = 1 | RW | 0x00 |
| 14 | USE_SQ_OFF_DAC2 | Override Squelch offset DAC2 code when '1' | RW | 0 |
| 13:9 | SQ_OFF_CODE_DAC2 | When read returns current Sq offset code for DAC2, if VDDLDO is on. When written this is used as Sq offset code for DAC2 when USE_SQ_OFF_DAC2 = 1 | RW | 0x00 |
| 8 | USE_SQ_OFF_DAC3 | Override Squelch offset DAC3 code when 1 | RW | 0 |
| 7:3 | SQ_OFF_CODE_DAC3 | When read returns current Sq offset code for DAC3, if VDDLDO is on. When written this is used as Sq offset code for DAC3 when USE_SQ_OFF_DAC3 = 1 | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------|
| 2 | SQ_COMP_OUT | Sq comp output. Read value is valid only if VDDLDO is on. | R | 0 |
| 1 | SQ_CAL_DONE | Sq calibration is done when this bit = 1. See RESTART_SQ_CAL for more description. Read value is valid only if VDDLDO is on. | R | 0 |
| 0 | RESTART_SQ_CAL | The squelch calibration continuously goes through restart cycles when this bit is 1. | RW | 0 |

Table 24-1206. Register Call Summary for Register USBPHY_RX_CALIB

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1207. USBPHY_DLLHS_2

| | | | |
|------------------|--|----------|--------|
| Address Offset | 0x0000 0008 | Instance | USBPHY |
| Physical Address | 0x4A0A D088 | | |
| Description | Second DLLHS control register. Bits 4:0 are unrelated to the DLLHS and are linestate filter settings. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|----|----|----|----|----|----|----|------------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|-----------------------|---|-------------------------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DLLHS_CNTRL_LDO | | | | | | | | DLLHS_STATUS_LDO | | | | | | | | RESERVED | | | | | | | | LINESTATE_DEBOUNCE_EN | | LINESTATE_DEBOUNCE_CNTL | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|---|------|-------|
| 31:24 | DLLHS_CNTRL_LDO | | RW | 0x00 |
| 23:16 | DLLHS_STATUS_LDO | | R | 0x00 |
| 15:5 | RESERVED | reserved | RW | 0x000 |
| 4 | LINESTATE_DEBOUNCE_EN | Enables the linestate debounce filter | RW | 1 |
| 3:0 | LINESTATE_DEBOUNCE_CNTL | Used for control of the linestate debounce filter when going from synchronous to async linestate. | RW | 0xF |

Table 24-1208. Register Call Summary for Register USBPHY_DLLHS_2

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1209. USBPHY_RX_TEST_2

| | | | |
|-------------------------|-------------------------------|-----------------|--------|
| Address Offset | 0x0000 000C | Instance | USBPHY |
| Physical Address | 0x4A0A D08C | | |
| Description | Second receiver test register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------|------------------|--------------------|----------|---------------|---------------|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|-------------|----|---|---|---|---|---|---|---|---|---|---|
| HSOSREVERSAL | HSOSBITINVERSION | PHYCLKOUTINVERSION | RXPIDERR | USEINTDATAOUT | INTDATAOUTREG | | | | | | | | | | | RESERVED | | | | CDR_TESTOUT | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|---|------|--------|
| 31 | HSOSREVERSAL | Swaps the dataout from HSOS | RW | 0 |
| 30 | HSOSBITINVERSION | Inverts the HSOS bits | RW | 0 |
| 29 | PHYCLKOUTINVERSION | This inverts the phase for the PHYCLKOUT | RW | 0 |
| 28 | RXPIDERR | Flags if the RX data packet has PID error. NOT IMPLEMENTED. | R | 0 |
| 27 | USEINTDATAOUT | This will bypass the analog and will send data packet to controller incase of receiver (Faking the receive data). data used will be INTDATAOUTREG | RW | 0 |
| 26:11 | INTDATAOUTREG | This register will be loaded through OCP and this data will be given to the controller if USEINTDATAOUT is set to 1 | RW | 0x0000 |
| 10:8 | RESERVED | reserved | RW | 0x0 |
| 7:0 | CDR_TESTOUT | CDR debug bits. Read value is valid only if VDDLDO is on. | R | 0x00 |

Table 24-1210. Register Call Summary for Register USBPHY_RX_TEST_2

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1211. USBPHY_TX_TEST_CHRG_DET

| | | | |
|-------------------------|---|-----------------|--------|
| Address Offset | 0x0000 0010 | Instance | USBPHY |
| Physical Address | 0x4A0A D090 | | |
| Description | TX test register and also charger detect register | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | |
|-----------|----|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----------|----|-----------------|---|-------|---|-------|---|---------|---|---------|---|----------|--|---------------|--|---------------|--|---------------|--|---------------|--|--------------------|--|--------------------|--|----------|--|
| TXSYNCERR | | UTMIDATATX | | | | | | | | | | | | | | | RESERVED | | TXPIDERR | | USE_CHGDET_DPDM | | SW0EN | | SW1EN | | DMSW0EN | | DMSW1EN | | RESERVED | | RDPPDCHGDETEN | | RDMPDCHGDETEN | | RDPPUCHGDETEN | | RDMPUCHGDETEN | | USE_CHG_DET_PU_REG | | USE_CHG_DET_PD_REG | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------------|--|------|--------|
| 31 | TXSYNCERR | Sync error on TX data. NOT IMPLEMENTED. | R | 0 |
| 30:15 | UTMIDATATX | Stores Last 2 byte of transmit data coming from the controller. NOT IMPLEMENTED | R | 0x0000 |
| 14 | RESERVED | reserved | RW | 0 |
| 13 | TXPIDERR | Flags if the TX packet has PID error. NOT IMPLEMENTED. | R | 0 |
| 12 | USE_CHGDET_DPMSW | Use bits 11:8 as override bits | RW | 0 |
| 11 | CHGDET_DPSW0EN | Overrides the same named A/D interface signal for the charger detect block | RW | 0 |
| 10 | CHGDET_DPSW1EN | Overrides the same named A/D interface signal for the charger detect block. Read value is valid only if VCHGLDO is on. | RW | 0 |
| 9 | CHGDET_DMSW0EN | Overrides the same named A/D interface signal for the charger detect block. Read value is valid only if VCHGLDO is on. | RW | 0 |
| 8 | CHGDET_DMSW1EN | Overrides the same named A/D interface signal for the charger detect block..Read value is valid only if VCHGLDO is on. | RW | 0 |
| 7 | RESERVED | reserved | RW | 0 |
| 6 | RDPPDCHGDETEN | When set to 1 connects a 15K (+/- 30%) pulldown resistor on DP. Read value is valid only if VCHGLDO is on. | RW | 0 |
| 5 | RDMPDCHGDETEN | When set to 1 connects a 15K (+/- 30%) pulldown resistor on DM. Read value is valid only if VCHGLDO is on. | RW | 0 |
| 4 | RDPPUCHGDETEN | When set to 1 connects a 150K (+/- 30%) pullup resistor on DP. Read value is valid only if VCHGLDO is on. | RW | 0 |
| 3 | RDMPUCHGDETEN | When set to 1 connects a 150K (+/- 30%) pullup resistor on DM. Read value is valid only if VCHGLDO is on. | RW | 0 |
| 2 | USE_CHG_DET_PU_REG | Use bits 4:3 from this register | RW | 0 |
| 1 | USE_CHG_DET_PD_REG | Use bits 6:5 from this register. | RW | 0 |
| 0 | RESERVED | reserved | RW | 0 |

Table 24-1212. Register Call Summary for Register USBPHY_TX_TEST_CHRG_DET

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1213. USBPHY_CHRG_DET

| | | | |
|------------------|--|----------|--------|
| Address Offset | 0x0000 0014 | Instance | USBPHY |
| Physical Address | 0x4A0A D094 | | |
| Description | This is the charger detect register. This register is not used in the dead battery case. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|-----------------|-------------|-----------|------------|-----------------|-----------------|--------------|--------------|----------|----------|----|--------------|-------------|---------|---------|-------------------|---------------|----|----|----|---|---|----------|---------------|---------------|--------|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | USE_CHG_DET_REG | DIS_CHG_DET | SRC_ON_DM | SINK_ON_DP | CHG_DET_EXT_CTL | RESTART_CHG_DET | CHG_DET_DONE | CHG_DETECTED | DATA_DET | RESERVED | | CHG_ISINK_EN | CHG_VSRC_EN | COMP_DP | COMP_DM | CHG_DET_OSC_CNTRL | CHG_DET_TIMER | | | | | | RESERVED | CHG_DET_ICTRL | CHG_DET_VCTRL | FOR_CE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31:30 | RESERVED | reserved | RW | 0x0 |
| 29 | USE_CHG_DET_REG | Use bits 28:24 and 18:17 from this register | RW | 0 |
| 28 | DIS_CHG_DET | When read, returns current value of charger detect input. When USE_CHG_DET_REG = 1, the value written to this field overrides the corresponding charger detect input. | RW | 0 |
| 27 | SRC_ON_DM | When read, returns current value of charger detect input. When USE_CHG_DET_REG = 1, the value written to this field overrides the corresponding charger detect input. | RW | 0 |
| 26 | SINK_ON_DP | When read, returns current value of charger detect input. When USE_CHG_DET_REG = 1, the value written to this field overrides the corresponding charger detect input. | RW | 0 |
| 25 | CHG_DET_EXT_CTL | When read, returns current value of charger detect input. When USE_CHG_DET_REG = 1, the value written to this field overrides the corresponding charger detect input. | RW | 0 |
| 24 | RESTART_CHG_DET | Restart the charger detection protocol when this goes from 0 to 1 | RW | 0 |
| 23 | CHG_DET_DONE | Charger detect protocol has completed | R | 0 |
| 22 | CHG_DETECTED | Same signal as CE pin | R | 0 |
| 21 | DATA_DET | Output of the data det comparator | R | 0 |
| 20:19 | RESERVED | reserved | RW | 0x0 |
| 18 | CHG_ISINK_EN | When read, returns current value of charger detect input. When USE_CHG_DET_REG = 1, the value written to this field overrides the corresponding charger detect input. | RW | 0 |
| 17 | CHG_VSRC_EN | When read, returns current value of charger detect input. When USE_CHG_DET_REG = 1, the value written to this field overrides the corresponding charger detect input. | RW | 0 |
| 16 | COMP_DP | Comparator on the DP line value | R | 0 |
| 15 | COMP_DM | Comparator on the DM line value | R | 0 |
| 14:13 | CHG_DET_OSC_CNTRL | Charger detect osc control | RW | 0x0 |
| 12:7 | CHG_DET_TIMER | Charger detect timer control. | RW | 0x00 |
| 6:5 | RESERVED | reserved | RW | 0x0 |
| 4:3 | CHG_DET_ICTRL | Charger detect current control | RW | 0x0 |
| 2:1 | CHG_DET_VCTRL | Charger detect voltage buffer control | RW | 0x0 |
| 0 | FOR_CE | Force CE = 1 when this bit is set | RW | 0 |

Table 24-1214. Register Call Summary for Register USBPHY_CHRG_DET

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1215. USBPHY_PWR_CNTRL

| | | | |
|------------------|-------------------------------------|----------|--------|
| Address Offset | 0x0000 0018 | Instance | USBPHY |
| Physical Address | 0x4A0A D098 | | |
| Description | Includes all the power control bits | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | |
|---------------|----|------------------|----|-------------------------|----|---------------|----|------------------|----|---------------|----|----|----|----|----|----|----|----|----|----|----|---|---|-----------------|---|------------|---|------------|---|----------|---|---------|--|------------|--|-----------------------|--|---------------|--|------------|--|----|--|----------|--|
| RESETDONETCLK | | RESET_DONE_VMAIN | | VMAIN_GLOBAL_RESET_DONE | | RESETDONEMCLK | | RESETDONE_CHGDET | | LDOPWRCOUNTER | | | | | | | | | | | | | | FORCEPLLSLOWCLK | | FORCELDOON | | FORCEPLLON | | RESERVED | | PLLLOCK | | USEPLLLOCK | | USE_DATAPOLARITYN_REG | | DATAPOLARITYN | | USE_PD_REG | | PD | | RESERVED | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------------|--|------|--------|
| 31 | RESETDONETCLK | Goes high when the RESET is synchronized to TCLK | R | 0 |
| 30 | RESET_DONE_VMAIN | Goes high when LDO domain is up, PLL LOCK is available, and utmi_reset is deasserted. | R | 0 |
| 29 | VMAIN_GLOBAL_RESET_DONE | Goes high when LDO domain is up and PLL LOCK is available. | R | 0 |
| 28 | RESETDONEMCLK | Goes high when the RESET is synchronized to MCLK | R | 0 |
| 27 | RESETDONE_CHGDET | Goes high when the RESET is synchronized to charger detect oscillator clock domain | R | 0 |
| 26:12 | LDOPWRCOUNTER | This is the value of the counter used for LDO power up. RESET to default. | RW | 0x0400 |
| 11 | FORCEPLLSLOWCLK | Forces the PLL to the slow clk mode | RW | 0 |
| 10 | FORCELDOON | Forces the LDO to be ON. | RW | 0 |
| 9 | FORCEPLLON | Forces the PLL to be ON. | RW | 0 |
| 8:7 | RESERVED | reserved | RW | 0x0 |
| 6 | PLLLOCK | Lock signal from the PLL | R | 0 |
| 5 | USEPLLLOCK | This signal is used to indicate to the Phy, not to do any clock related activity until PLLLOCK = 1. This is not the default option. 0 - do not use PLLLOCK. 1 - use PLLLOCK as a clock gate. | RW | 0 |
| 4 | USE_DATAPOLARITYN_REG | 1 - use bit 3 as override for the DATAPOLARITYN signal. | RW | 0 |
| 3 | DATAPOLARITYN | Override value of datapolarityn | RW | 0 |
| 2 | USE_PD_REG | Use bit 1 from this register as PD override when set to 1 | RW | 0 |
| 1 | PD | Override value for PD | RW | 0 |
| 0 | RESERVED | reserved | RW | 0 |

Table 24-1216. Register Call Summary for Register USBPHY_PWR_CNTL

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1217. USBPHY_UTMI_INTERFACE_CNTL_1

| | | | |
|-------------------------|---|-----------------|--------|
| Address Offset | 0x0000 001C | Instance | USBPHY |
| Physical Address | 0x4A0A D09C | | |
| Description | register to override UTMI interface control pins. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|---------------|--------------|--------------|--------|----|------------------|----------|-----------|-----------------|---------|---|---------------|---------|----------|---|
| USEUTMIDATAREG | UTMIDATAIN | | | | | | | | | | | | | | | RESERVED | USEDATABUSREG | DATABUS16OR8 | USEOPMODEREG | OPMODE | | OVERRIDESUSRESET | SUSPENDM | UTMIRESET | OVERRIDEXCVRSEL | XCVRSEL | | USETXVALIDREG | TXVALID | TXVALIDH | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|--|------|--------|
| 31 | USEUTMIDATAREG | Use datain from UTMI interface register | RW | 0 |
| 30:15 | UTMIDATAIN | Override value for the UTMIDATAIN | RW | 0x0000 |
| 14 | RESERVED | reserved | RW | 0 |
| 13 | USEDATABUSREG | When set to 1 use bit 12 from register instead of interface | RW | 0 |
| 12 | DATABUS16OR8 | Override value for UTMI signal DATABUS16OR8 | RW | 0 |
| 11 | USEOPMODEREG | When set to 1 use bits 10:9 from register instead of interface | RW | 0 |
| 10:9 | OPMODE | Override value for UTMI signal OPMODE[1:0] | RW | 0x0 |
| 8 | OVERRIDESUSRESET | Override the suspend and reset values. Use bits 6 and 7 | RW | 0 |
| 7 | SUSPENDM | Override value for UTMI signal SUSPENDM | RW | 0 |
| 6 | UTMIRESET | Override value for UTMI signal UTMIRESET | RW | 0 |
| 5 | OVERRIDEXCVRSEL | When set to 1 use bits 4:3 from register instead of interface | RW | 0 |
| 4:3 | XCVRSEL | Override value for UTMI signal XCVRSEL[1:0] | RW | 0x0 |
| 2 | USETXVALIDREG | When set to 1 use bits 1:0 from register instead of interface | RW | 0 |
| 1 | TXVALID | Override value for UTMI signal TXVALID | RW | 0 |
| 0 | TXVALIDH | Override value for UTMI signal TXVALIDH | RW | 0 |

Table 24-1218. Register Call Summary for Register USBPHY_UTMI_INTERFACE_CNTL_1

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1219. USBPHY_UTMI_INTERFACE_CNTL_2

| | | | |
|-------------------------|--|-----------------|--------|
| Address Offset | 0x0000 0020 | Instance | USBPHY |
| Physical Address | 0x4A0A D0A0 | | |
| Description | UTMI interface override and observe register 2 | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|-------------------------------|------|------|----------------|-----------|---------|----------|----------|---------|---------|---------------|----------------|------------------|-------------------|-------------------|---------|------------|------------|----------|----------|----------|----------|------------------|-------|-------|----------------|-----------|----------|----------|----------|----------|----------|----------|
| RXRCV | RXDP | RXDM | HOSTDISCONNECT | LINESTATE | RXVALID | RXVALIDH | RXACTIVE | RXERROR | TXREADY | UTMIRESETDONE | USEBITSTUFFREG | TXBITSTUFFENABLE | TXBITSTUFFENABLEH | USETERMCONTROLREG | TERMSEL | DPPULLDOWN | DMPULLDOWN | RESERVED | RESERVED | RESERVED | RESERVED | USEREGSERIALMODE | TXSE0 | TXDAT | FSLSSERIALMODE | TXENABLEN | RESERVED | RESERVED | RESERVED | RESERVED | RESERVED | RESERVED |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SIG_BYPASS_SUSPENDMPULSE_INCR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|---|------|-------|
| 31 | RXRCV | Read for UTMI signal. Read value is valid only if VDDLDO is on. Read value is valid only if VDDLDO is on. | R | 0 |
| 30 | RXDP | Read for UTMI signal. Read value is valid only if VDDLDO is on. | R | 0 |
| 29 | RXDM | Read for UTMI signal. Read value is valid only if VDDLDO is on. | R | 0 |
| 28 | HOSTDISCONNECT | Read for UTMI signal. Read value is valid only if VDDLDO is on. | R | 0 |
| 27:26 | LINESTATE | Read for UTMI signal. Read value is valid only if VDDLDO is on. | R | 0x0 |
| 25 | RXVALID | Read for UTMI signal. Read value is valid only if VDDLDO is on. | R | 0 |
| 24 | RXVALIDH | Read for UTMI signal. Read value is valid only if VDDLDO is on. | R | 0 |
| 23 | RXACTIVE | Read for UTMI signal. Read value is valid only if VDDLDO is on. | R | 0 |
| 22 | RXERROR | Read for UTMI signal. Read value is valid only if VDDLDO is on. | R | 0 |
| 21 | TXREADY | Read for UTMI signal. Read value is valid only if VDDLDO is on. | R | 0 |
| 20 | UTMIRESETDONE | Read for UTMIRESETDONE signal | R | 0 |
| 19 | USEBITSTUFFREG | When set to 1 use bits 18-17 from register instead of interface | RW | 0 |
| 18 | TXBITSTUFFENABLE | Override value for signal TXBITSTUFFENABLE | RW | 0 |
| 17 | TXBITSTUFFENABLEH | Override value for pin TXBITSTUFFENABLE | RW | 0 |
| 16 | USETERMCONTROLREG | When set to 1, bits 15:13 from register are used instead of interface | RW | 0 |
| 15 | TERMSEL | Override value for signal TERMSEL | RW | 0 |
| 14 | DPPULLDOWN | Override value for signal DPPULLDOWN | RW | 0 |
| 13 | DMPULLDOWN | Override value for signal DMPULLDOWN | RW | 0 |
| 12:10 | RESERVED | reserved | RW | 0x0 |
| 9 | USEREGSERIALMODE | When set to 1 use bits 8:5 from register instead of interface | RW | 0 |
| 8 | TXSE0 | Override value for signal TXSE0 | RW | 0 |
| 7 | TXDAT | Override value for signal TXDAT | RW | 0 |
| 6 | FSLSSERIALMODE | Override value for signal FSLSSERIALMODE | RW | 0 |
| 5 | TXENABLEN | Override value for signal TXENABLEN | RW | 0 |
| 4:1 | RESERVED | reserved | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------------------------|--|------|-------|
| 0 | SIG_BYPASS_SUSPENDMPULSE_INCR | If the suspend signal is asserted for a short time, it is pulse-extended so that the sampling logic samples it reliably. 0: Pulse extension active 1: Bypass pulse extension | RW | 0 |

Table 24-1220. Register Call Summary for Register USBPHY_UTMI_INTERFACE_CNTL_2

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1221. USBPHY_BIST

| | | | |
|-------------------------|--|-----------------|--------|
| Address Offset | 0x0000 0024 | Instance | USBPHY |
| Physical Address | 0x4A0A D0A4 | | |
| Description | Contains bits related to the built in self test of the phy | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
|------------|----|---------------|----|------------------|----|-----------------|----|----|----|----|----|----|----|-------------|----|-------------------|----|----|----|----------|----|------------|---|---|---|-----------|---|-----------|---|----------|---|--|--|---------|--|--|--|--------------|--|----------|--|----------------------|--|------------------|--|--------------------|--|
| BIST_START | | REDUCED_SWING | | BIST_CRC_CALC_EN | | BIST_PKT_LENGTH | | | | | | | | LOOPBACK_EN | | BIST_OP_PHASE_SEL | | | | SWEEP_EN | | SWEEP_MODE | | | | BIST_PASS | | BIST_BUSY | | RESERVED | | | | OP_CODE | | | | RX_TEST_MODE | | RESERVED | | INTER_PKT_DELAY_TEST | | HS_ALL_ONES_TEST | | USE_BIST_TX_PHASES | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|-------|
| 31 | BIST_START | When set to 1 the BIST mode is started. | RW | 0 |
| 30 | REDUCED_SWING | When 1 the TX swing is reduced in BIST mode | RW | 0 |
| 29 | BIST_CRC_CALC_EN | Enables CRC calculation during BIST when set to 1 | RW | 0 |
| 28:20 | BIST_PKT_LENGTH | Address for which BIST to select | RW | 0x000 |
| 19 | LOOPBACK_EN | Enables the loopback mode | RW | 0 |
| 18:16 | BIST_OP_PHASE_SEL | Selects which phase to use for data transmission during BIST | RW | 0x0 |
| 15 | SWEEP_EN | Enables freq sweep on CDR | RW | 0 |
| 14:12 | SWEEP_MODE | Selects the freq sweep mode. | RW | 0x0 |
| 11 | BIST_PASS | Indicates that the BIST has passed. Read value is valid only if VDDLDO is on. | R | 0 |
| 10 | BIST_BUSY | Indicates that BIST is running. Read value is valid only if VDDLDO is on. | R | 0 |
| 9:7 | RESERVED | Reserved | RW | 0x0 |
| 6:5 | OP_CODE | | RW | 0x0 |
| 4 | RX_TEST_MODE | | RW | 0 |
| 3 | RESERVED | Reserved | RW | 0 |
| 2 | INTER_PKT_DELAY_TEST | | RW | 0 |
| 1 | HS_ALL_ONES_TEST | | RW | 0 |
| 0 | USE_BIST_TX_PHASES | When set to 1 bits 18:16 are activated for choosing the transmitting phase. | RW | 0 |

Table 24-1222. Register Call Summary for Register USBPHY_BIST

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1223. USBPHY_BIST_CRC

| | | | |
|-------------------------|------------------------|-----------------|--------|
| Address Offset | 0x0000 0028 | Instance | USBPHY |
| Physical Address | 0x4A0A D0A8 | | |
| Description | CRC code for BIST test | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-------------|
| 31:0 | BIST_CRC | The CRC value from the BIST. | RW | 0x0000 0000 |

Table 24-1224. Register Call Summary for Register USBPHY_BIST_CRC

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1225. USBPHY_CDR_BIST2

| | | | |
|-------------------------|--|-----------------|--------|
| Address Offset | 0x0000 002C | Instance | USBPHY |
| Physical Address | 0x4A0A D0AC | | |
| Description | clock data recovery register and BIST register 2 | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|--------------|----|---------------|----|------------------|----|-----------------|----|---------------|----|----|----|----|----|--------------------|----|-----------------|----|----|----|---|---|---------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CDR_EXE_EN | | CDR_EXE_MODE | | NUM_DECISIONS | | CDR_CHOSEN_PHASE | | FORCE_CDR_PHASE | | CDR_CONFIGURE | | | | | | FORCE_CDR_PHASE_EN | | BIST_START_ADDR | | | | | | BIST_END_ADDR | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|----------------|------|-------|
| 31 | CDR_EXE_EN | CDR debug bits | RW | 0 |
| 30:28 | CDR_EXE_MODE | CDR debug bits | RW | 0x0 |
| 27:25 | NUM_DECISIONS | CDR debug bits | RW | 0x0 |
| 24:12 | RESERVED | reserved | R | 0x000 |
| 11:6 | BIST_START_ADDR | | RW | 0x00 |
| 5:0 | BIST_END_ADDR | | RW | 0x00 |

Table 24-1226. Register Call Summary for Register USBPHY_CDR_BIST2

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1227. USBPHY_GPIO

| | | | |
|-------------------------|------------------------------------|-----------------|--------|
| Address Offset | 0x0000 0030 | Instance | USBPHY |
| Physical Address | 0x4A0A D0B0 | | |
| Description | GPIO mode configurations and reads | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | |
|----------------|----------|----------|----------|---------|---------|---------|---------|------------|------------|----|----|-----------|-----------|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| USEGPIOMODEREG | GPIOMODE | DPGPIOGZ | DMGPIOGZ | DPGPIOA | DMGPIOA | DPGPIOY | DMGPIOY | 1P8VCONFIG | GPIOCONFIG | | | DMGPIOIPD | DPGPIOIPD | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|--|------|---------|
| 31 | USEGPIOMODEREG | When set to 1 use bits 31:24 from this register instead of primary inputs | RW | 0 |
| 30 | GPIOMODE | Overrides the corresponding primary input | RW | 0 |
| 29 | DPGPIOGZ | Overrides the corresponding primary input | RW | 0 |
| 28 | DMGPIOGZ | Overrides the corresponding primary input | RW | 0 |
| 27 | DPGPIOA | Overrides the corresponding primary input | RW | 0 |
| 26 | DMGPIOA | Overrides the corresponding primary input | RW | 0 |
| 25 | DPGPIOY | The GPIO Y output is stored here | R | 0 |
| 24 | DMGPIOY | The GPIO Y output is stored here | R | 0 |
| 23 | GPIO1P8VCONFIG | Overrides the corresponding primary input | RW | 0 |
| 22:20 | GPIOCONFIG | Used for configuring the GPIOs. | RW | 0x0 |
| 19 | DMGPIOIPD | GPIO mode DM pull-down enabled. Overrides the corresponding primary input | RW | 0 |
| 18 | DPGPIOIPD | GPIO mode DP pull-down enabled. Overrides the corresponding primary input. | RW | 0 |
| 17:0 | RESERVED | reserved | RW | 0x00000 |

Table 24-1228. Register Call Summary for Register USBPHY_GPIO

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1229. USBPHY_DLLHS

| | | | |
|-------------------------|---|-----------------|--------|
| Address Offset | 0x0000 0034 | Instance | USBPHY |
| Physical Address | 0x4A0A D0B4 | | |
| Description | Bits for control and debug of the DLL inside the USBPHY | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|----|----|----|----|----|----|----|----------------------|----|----|----|----|----|----|----|------------------|----|----|----|----|----|---|---|----------------|---|---|---|---|---|---|---|-------------|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--------------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|------------|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| RESERVED | | | | | | | | DLLHS_GENERATED_CODE | | | | | | | | DLL_PHS0_8 | | | | | | | | FORCE_DLL_CODE | | | | | | | | DLL_RATE | | | | | | | | DLL_FILT | | | | | | | | DLL_CDR_MODE | | | | | | | | DLL_IDLE | | | | | | | | DLL_FREEZE | | | | | | | | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DLLHS_LOCK | | | | | | | | | | | | | | | | DLL_SEL_CODE_PHS | | | | | | | | DLL_LOCKCHK | | | | | | | | DLL_SEL_COD | | | | | | | | DLL_FORCED_CODE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------------|---|------|-------|
| 31:29 | RESERVED | reserved | RW | 0x0 |
| 28 | DLLHS_LOCK | Read the AFE output by this name | R | 0 |
| 27:22 | DLLHS_GENERATED_CODE | Read the AFE output by this name. Read value is valid only if VDDLDO is on. | R | 0x00 |
| 21 | DLL_SEL_CODE_PHS | Connect to DLLHS_TEST_LDO[0] on AFE interface. | RW | 0 |
| 20:19 | DLL_LOCKCHK | Connect to DLLHS_TEST_LDO[2:1] on AFE interface. | RW | 0x0 |
| 18:16 | DLL_SEL_COD | Connect to DLLHS_TEST_LDO[5:3] on AFE interface. | RW | 0x0 |
| 15 | DLL_PHS0_8 | Connect to DLLHS_TEST_LDO[6] on AFE interface. | RW | 1 |
| 14:9 | DLL_FORCED_CODE | Connect to the pin of this name on AFE interface. | RW | 0x00 |
| 8 | FORCE_DLL_CODE | Connect to DLLHS_TEST_LDO[11] on AFE interface. | RW | 0 |
| 7:6 | DLL_RATE | Connect to DLLHS_TEST_LDO[8:7] on AFE interface. | RW | 0x0 |
| 5:4 | DLL_FILT | Connect to DLLHS_TEST_LDO[10:9] on AFE interface. | RW | 0x0 |
| 3 | DLL_CDR_MODE | Connect to the pin of this name on AFE interface. | RW | 0 |
| 2 | DLL_IDLE | Connect to DLLHS_TEST_LDO[12] on AFE interface. | RW | 0 |
| 1 | DLL_FREEZE | Connect to DLLHS_TEST_LDO[13] on AFE interface. | RW | 0 |
| 0 | RESERVED | reserved | RW | 0 |

Table 24-1230. Register Call Summary for Register USBPHY_DLLHS

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1231. USBPHY_USB2PHYCM_TRIM

| | | | |
|-------------------------|--|-----------------|--------|
| Address Offset | 0x0000 0038 | Instance | USBPHY |
| Physical Address | 0x4A0A D0B8 | | |
| Description | Contains trim bit overrides for the USBPHYCM | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
|-----------|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|--------|----|----|----|----|---|---|---|-------------------|----------------|---|---|---|----------|---|--|--|
| USEBGTRIM | BGTRIM | | | | | | | | | | | | | | | USE_SW_TRIM | SWTRIM | | | | | | | | USE_NWELLTRIM_REG | NWELLTRIM_CODE | | | | RESERVED | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------------|--|------|--------|
| 31 | USEBGTRIM | When set to 1 bits 30:16 are used as the trim value for the USBPHYCM bandgap | RW | 0 |
| 30:16 | BGTRIM | Override value for the BGTRIM value | RW | 0x0000 |
| 15 | USE_SW_TRIM | Use bits 14:8 to override the switch cap trim value. | RW | 0 |
| 14:8 | SWTRIM | Override value for the switch cap trim value. | RW | 0x00 |
| 7 | USE_NWELLTRIM_REG | Override NWELL resistor trim using NWELLTRIM_CODE | RW | 0 |
| 6:4 | NWELLTRIM_CODE | NWELL resistor trim code. | RW | 0x0 |
| 3:0 | RESERVED | reserved | RW | 0x0 |

Table 24-1232. Register Call Summary for Register USBPHY_USB2PHYCM_TRIM

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1233. USBPHY_USB2PHYCM_CONFIG

| | | | | |
|-------------------------|--|--|-----------------|--------|
| Address Offset | 0x0000 003C | | Instance | USBPHY |
| Physical Address | 0x4A0A D0BC | | | |
| Description | Configuration and status register for the USBPHYCM and LDO | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----|----|----|----|----|----|----|----------|----|----|----|-----------|----|----|----|----|----|----|----|----|----|---|---|-----------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| CONFIGURECM | | | | | | | | CMSTATUS | | | | LDOCONFIG | | | | | | | | | | | | LDOSTATUS | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|-----------------------------------|------|--------|
| 31:24 | CONFIGURECM | Connects to the CONFIGURECM pins. | RW | 0x00 |
| 23:18 | CMSTATUS | Reads the CMSTATUS bits. | R | 0x00 |
| 17:2 | LDOCONFIG | The LDOCONFIG bit settings. | RW | 0x0000 |
| 1:0 | LDOSTATUS | Reads the LDOSTATUS bits. | R | 0x0 |

Table 24-1234. Register Call Summary for Register USBPHY_USB2PHYCM_CONFIG

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1235. USBPHY_USBOTG

| | | | | |
|-------------------------|-----------------------------|--|-----------------|--------|
| Address Offset | 0x0000 0040 | | Instance | USBPHY |
| Physical Address | 0x4A0A D0C0 | | | |
| Description | | | | |
| Type | RW | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|---------------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| TESTOTGCONFIG | | | | | | | | TESTOTGSTATUS | | | | | | | | RESERVED | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|--------|
| 31:16 | TESTOTGCONFIG | Used to control the OTG module if used. | RW | 0x0000 |
| 15:6 | TESTOTGSTATUS | The OTG status bits (if OTG macro is used) | R | 0x000 |
| 5:0 | RESERVED | reserved | R | 0x00 |

Table 24-1236. Register Call Summary for Register USBPHY_USBOTG

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1237. USBPHY_AD_INTERFACE_REG1

| | | | |
|-------------------------|--|-----------------|--------|
| Address Offset | 0x0000 0044 | Instance | USBPHY |
| Physical Address | 0x4A0A D0C4 | | |
| Description | All bits (unless defined) are bypass bits for internal analog to digital interface pins with the same name. All the bits of this register, except the over-ride bits return a '0' on read, if VDDLDO is off. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|------------|------------|-------------------|-----------|--------------|--------------|---------------|----------|----------|----------|-------|----------|--------------|----------|----------|--------------|---------|-------------|----------|---------------------|------------|------------|------------|------------------------|--------------|-------------|---------------|----------------|------------|--------------|---------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| USE_AD_DATA_REG | HS_TX_DATA | FS_TX_DATA | TEST_PRE_EN_CNTRL | SQ_PRE_EN | HS_TX_PRE_EN | HS_RX_PRE_EN | TEST_EN_CNTRL | HS_TX_EN | FS_RX_EN | RESERVED | SQ_EN | HS_RX_EN | TEST_HS_MODE | HS_HV_SW | HS_CHIRP | TEST_FS_MODE | FSTX_GZ | FSTX_PRE_EN | RESERVED | TEST_SQ_CAL_CONTROL | SQ_CAL_EN3 | SQ_CAL_EN1 | SQ_CAL_EN2 | TEST_RTERM_CAL_CONTROL | RTERM_CAL_EN | DLL_RX_DATA | DISCON_DETECT | USE_LSHOST_REG | LSHOSTMODE | LSFS_RX_DATA | SQUELCH |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|-------------------------|------|-------|
| 31 | USE_AD_DATA_REG | Override for bits 30:29 | RW | 0 |
| 30 | HS_TX_DATA | | RW | 0 |
| 29 | FS_TX_DATA | | RW | 0 |
| 28 | TEST_PRE_EN_CNTRL | Override for bits 27:25 | RW | 0 |
| 27 | SQ_PRE_EN | | RW | 0 |
| 26 | HS_TX_PRE_EN | | RW | 0 |
| 25 | HS_RX_PRE_EN | | RW | 0 |
| 24 | TEST_EN_CNTRL | Override for bits 23:19 | RW | 0 |
| 23 | HS_TX_EN | | RW | 0 |
| 22 | FS_RX_EN | | RW | 0 |
| 21 | RESERVED | | RW | 0 |
| 20 | SQ_EN | | RW | 0 |
| 19 | HS_RX_EN | | RW | 0 |
| 18 | TEST_HS_MODE | Override for bits 17:16 | RW | 0 |
| 17 | HS_HV_SW | | RW | 0 |
| 16 | HS_CHIRP | | RW | 0 |
| 15 | TEST_FS_MODE | Override for bits 14:12 | RW | 0 |
| 14 | FSTX_GZ | | RW | 0 |
| 13 | FSTX_PRE_EN | | RW | 0 |
| 12 | RESERVED | | RW | 0 |
| 11 | TEST_SQ_CAL_CONTROL | Override for bits 10:8 | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------------------|------------------------|------|-------|
| 10 | SQ_CAL_EN3 | | RW | 0 |
| 9 | SQ_CAL_EN1 | | RW | 0 |
| 8 | SQ_CAL_EN2 | | RW | 0 |
| 7 | TEST_RTERM_CAL_CONTROL | Override for bits 6 | RW | 0 |
| 6 | RTERM_CAL_EN | | RW | 0 |
| 5 | DLL_RX_DATA | | R | 0 |
| 4 | DISCON_DETECT | | R | 0 |
| 3 | USE_LSHOST_REG | Use bit 2 for this reg | RW | 0 |
| 2 | LSHOSTMODE | | RW | 0 |
| 1 | LSFS_RX_DATA | | R | 0 |
| 0 | SQUELCH | | R | 0 |

Table 24-1238. Register Call Summary for Register USBPHY_AD_INTERFACE_REG1

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1239. USBPHY_AD_INTERFACE_REG2

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--------|--|--|--|--|--|--|--|--|--|
| Address Offset | | 0x0000 0048 | | | | | | | | | | | | | | | | Instance | | USBPHY | | | | | | | | | |
| Physical Address | | 0x4A0A D0C8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | | All bits (unless defined) are bypass bits for internal analog to digital interface pins with the same name. All the bits of this register, except the override bits return a '0' on read, if VDDLDO is off. | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|-----------------|---------------|-----------------|---------------|----------------|-----------|---------------|----------|----------------|----|----|----|----|----|----|--------------|--------------|---------------------|-------------|-----------------|--------------------|--------------------|--------------------|--------------------|---------------------|---------------------|----------------|---------------|---|---|---|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| USE_SUSP_DRV_REG | SUS_DRV_DP_DATA | SUS_DRV_DP_EN | SUS_DRV_DM_DATA | SUS_DRV_DM_EN | USE_DISCON_REG | DISCON_EN | DISCON_PRE_EN | RESERVED | SPARE_OUT_CORE | | | | | | | SERX_DP_CORE | SERX_DM_CORE | USE_HSRX_CAL_EN_REG | HSRX_CAL_EN | USE_RPU_RPD_REG | RPU_DP_SW1_EN_CORE | RPU_DP_SW2_EN_CORE | RPU_DM_SW1_EN_CORE | RPU_DM_SW2_EN_CORE | DP_PULLDOWN_EN_CORE | DM_PULLDOWN_EN_CORE | DP_DM_5V_SHORT | SPARE_IN_CORE | | | | PORZ |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|-------|
| 31 | USE_SUSP_DRV_REG | Use bits 30:27 from this register as overrides | RW | 0 |
| 30 | SUS_DRV_DP_DATA | | RW | 0 |
| 29 | SUS_DRV_DP_EN | | RW | 0 |
| 28 | SUS_DRV_DM_DATA | | RW | 0 |
| 27 | SUS_DRV_DM_EN | | RW | 0 |
| 26 | USE_DISCON_REG | Use bits 25:24 from this register as override | RW | 0 |
| 25 | DISCON_EN | | RW | 0 |
| 24 | DISCON_PRE_EN | | RW | 0 |
| 23 | RESERVED | reserved | RW | 0 |
| 22:18 | SPARE_OUT_CORE | | R | 0x00 |
| 17 | SERX_DP_CORE | | R | 0 |
| 16 | SERX_DM_CORE | | R | 0 |
| 15 | USE_HSRX_CAL_EN_REG | Use bit 14 from this register as override | RW | 0 |
| 14 | HSRX_CAL_EN | | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|---------------------|--|------|-------|
| 13 | USE_RPU_RPD_REG | Use override from bits 12:7 | RW | 0 |
| 12 | RPU_DP_SW1_EN_CORE | | RW | 0 |
| 11 | RPU_DP_SW2_EN_CORE | | RW | 0 |
| 10 | RPU_DM_SW1_EN_CORE | | RW | 0 |
| 9 | RPU_DM_SW2_EN_CORE | | RW | 0 |
| 8 | DP_PULLDOWN_EN_CORE | | RW | 0 |
| 7 | DM_PULLDOWN_EN_CORE | | RW | 0 |
| 6 | DP_DM_5V_SHORT | | R | 0 |
| 5:1 | SPARE_IN_CORE | | RW | 0x00 |
| 0 | PORZ | Read only bit - the PORZ generated from the digital registered on the A-D interface. | R | 0 |

Table 24-1240. Register Call Summary for Register USBPHY_AD_INTERFACE_REG2

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1241. USBPHY_AD_INTERFACE_REG3

| | | | |
|-------------------------|---|-----------------|--------|
| Address Offset | 0x0000 004C | Instance | USBPHY |
| Physical Address | 0x4A0A D0CC | | |
| Description | All bits (unless defined) are bypass bits for internal analog to digital interface pins with the same name. All the bits of this register, except the override bits return a '0' on read, if VDDLDO is off. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------------|-----------|----|----|----|----|----|----|-------------|-----------|----|----------|---------------------|-------------|--------------|----|----|----|---------------|----|----|----|-----------------|---------|---|---|---|---|---|---|---|---|
| USE_HSOS_DATA_REG | HSOS_DATA | | | | | | | USE_FS_REG3 | FSTX_MODE | | FSTX_SE0 | USE_HS_TERM_RES_REG | HS_TERM_RES | SPARE_IN_LDO | | | | SPARE_OUT_LDO | | | | USE_FARCORE_REG | FARCORE | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------------|--|------|-------|
| 31 | USE_HSOS_DATA_REG | Use bits 30:23 in this register as bypass bits | RW | 0 |
| 30:23 | HSOS_DATA | | RW | 0x00 |
| 22 | USE_FS_REG3 | Use bits 21:20 as bypass bits | RW | 0 |
| 21 | FSTX_MODE | | RW | 0 |
| 20 | FSTX_SE0 | | RW | 0 |
| 19 | USE_HS_TERM_RES_REG | Use bit 18 as override bit | RW | 0 |
| 18 | HS_TERM_RES | | RW | 0 |
| 17:10 | SPARE_IN_LDO | | RW | 0x00 |
| 9:2 | SPARE_OUT_LDO | | R | 0x00 |
| 1 | USE_FARCORE_REG | Use bit 0 from this register as bypass | RW | 0 |
| 0 | FARCORE | | RW | 0 |

Table 24-1242. Register Call Summary for Register USBPHY_AD_INTERFACE_REG3

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1243. USBPHY_ANA_CONFIG1

| | | | |
|-------------------------|--|-----------------|--------|
| Address Offset | 0x0000 0050 | Instance | USBPHY |
| Physical Address | 0x4A0A D0D0 | | |
| Description | Used to configure and debug the analog blocks. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|------------------|-------------|----|----|---|--------------|---|---|---|---|---|---|---|---|
| SQ_CTRL_REG | | | | | | | | | | | | | | | | FS_SLEW | | HS_PRE_EMP_CNTRL | HSFSTX_TEST | | | | PROTECT_TEST | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------------|-------------|------|--------|
| 31:17 | SQ_CTRL_REG | | RW | 0x0000 |
| 16:14 | FS_SLEW | | RW | 0x0 |
| 13:12 | HS_PRE_EMP_CNTRL | | RW | 0x0 |
| 11:5 | HSFSTX_TEST | | RW | 0x00 |
| 4:0 | PROTECT_TEST | | RW | 0x00 |

Table 24-1244. Register Call Summary for Register USBPHY_ANA_CONFIG1

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)

Table 24-1245. USBPHY_ANA_CONFIG2

| | | | |
|-------------------------|--|-----------------|--------|
| Address Offset | 0x0000 0054 | Instance | USBPHY |
| Physical Address | 0x4A0A D0D4 | | |
| Description | Used to configure and debug the analog blocks. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------|----|----|----|--------------|----|----|----|----|----|----|----|-----------|----|------------|----|-------------|----|----|----|-----------|----|---|---|-----------|---|-----------------|---|------------|---|---|---|
| RTERM_CAL_TEST | | | | REF_GEN_TEST | | | | | | | | FSRX_TEST | | RTERM_TEST | | DISCON_TEST | | | | HSRX_TEST | | | | SERX_TEST | | SERX_HYST_CNTRL | | SQ_LPMODEZ | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-----------------|---|------|-------|
| 31:27 | RTERM_CAL_TEST | | RW | 0x00 |
| 26:20 | REF_GEN_TEST | USBPHY_ANA_CONFIG2[26:24] = 000 is default USBPHY_ANA_CONFIG2[26:24] = 110 for increasing the vertical eye opening by 15 mV USBPHY_ANA_CONFIG2[26:24] = 101 for decreasing the vertical eye opening by 15 mV Note: Keep USBPHY_ANA_CONFIG2[23:20] untouched | RW | 0x00 |
| 19:18 | FSRX_TEST | | RW | 0x00 |
| 17:15 | RTERM_TEST | 0x0 is default 0x3 decreases the termination impedance by 2 to 3% (can be used to get 1 to 1.5% better eye vertical opening) | RW | 0x0 |
| 14:11 | DISCON_TEST | | RW | 0x0 |
| 10:6 | HSRX_TEST | | RW | 0x00 |
| 5:3 | SERX_TEST | | RW | 0x0 |
| 2:1 | SERX_HYST_CNTRL | | RW | 0x0 |
| 0 | SQ_LPMODEZ | | RW | 0 |

Table 24-1246. Register Call Summary for Register USBPHY_ANA_CONFIG2

High-Speed USB OTG Controller

- [USBPHY Register Summary: \[0\]](#)
- [USBPHY Register Description:](#)

PRELIMINARY

MMC/SD/SDIO

This chapter describes the features and functions of the multimedia card/SD card (MMC/SD/SDIO) interface of the device.

| Topic | Page |
|---|------|
| 25.1 MMC/SD/SDIO Overview | 5256 |
| 25.2 MMC/SD/SDIO Environment | 5263 |
| 25.3 MMC/SD/SDIO Integration | 5271 |
| 25.4 MMC/SD/SDIO Functional Description | 5274 |
| 25.5 MMC/SD/SDIO Programming Guide | 5303 |
| 25.6 MMC/SD/SDIO Register Manual | 5329 |

25.1 MMC/SD/SDIO Overview

The multimedia card high-speed/SD/SDIO (MMC/SD/SDIO) host controller provides an interface between a local host (LH) such as a microprocessor unit (MPU) or digital signal processor (DSP) and either MMC, SD memory cards, or SDIO cards and handles MMC/SD/SDIO transactions with minimal LH intervention.

Optionally, the controller is connected to the level 3 (L3) interconnect to have a direct access to system memory. It also supports two direct memory access (DMA) slave channels or a DMA master access (in this case, slave DMA channels are deactivated) depending on its integration. These controllers are embedded MMC/SD (eMMC/SD) controllers.

The application interface manages transaction semantics. The MMC/SD/SDIO host controller deals with MMC/SD/SDIO protocol at transmission level, data packing, adding cyclic redundancy checks (CRCs), start/end bit, and checking for syntactical correctness.

The application interface can send every MMC/SD/SDIO command and poll for the status of the adapter or wait for an interrupt request, which is sent back in case of exceptions or to warn of end of operation.

The application interface can read card responses or flag registers. It can also mask individual interrupt sources. All these operations can be performed by reading and writing control registers. The MMC/SD/SDIO host controller also supports two DMA channels.

There are five MMC/SD/SDIO host controllers inside the device:

[Figure 25-1](#) gives an overview of the MMC/SD/SDIO1 controller instance (eMMC/SD).

[Figure 25-2](#) gives an overview of the MMC/SD/SDIO2 controller instance (eMMC/SD).

[Figure 25-3](#) gives an overview of the MMC/SD/SDIO3 through MMC/SD/SDIO5 controller instances.

Figure 25-1. MMC/SD/SDIO1 Overview (where i = 1)

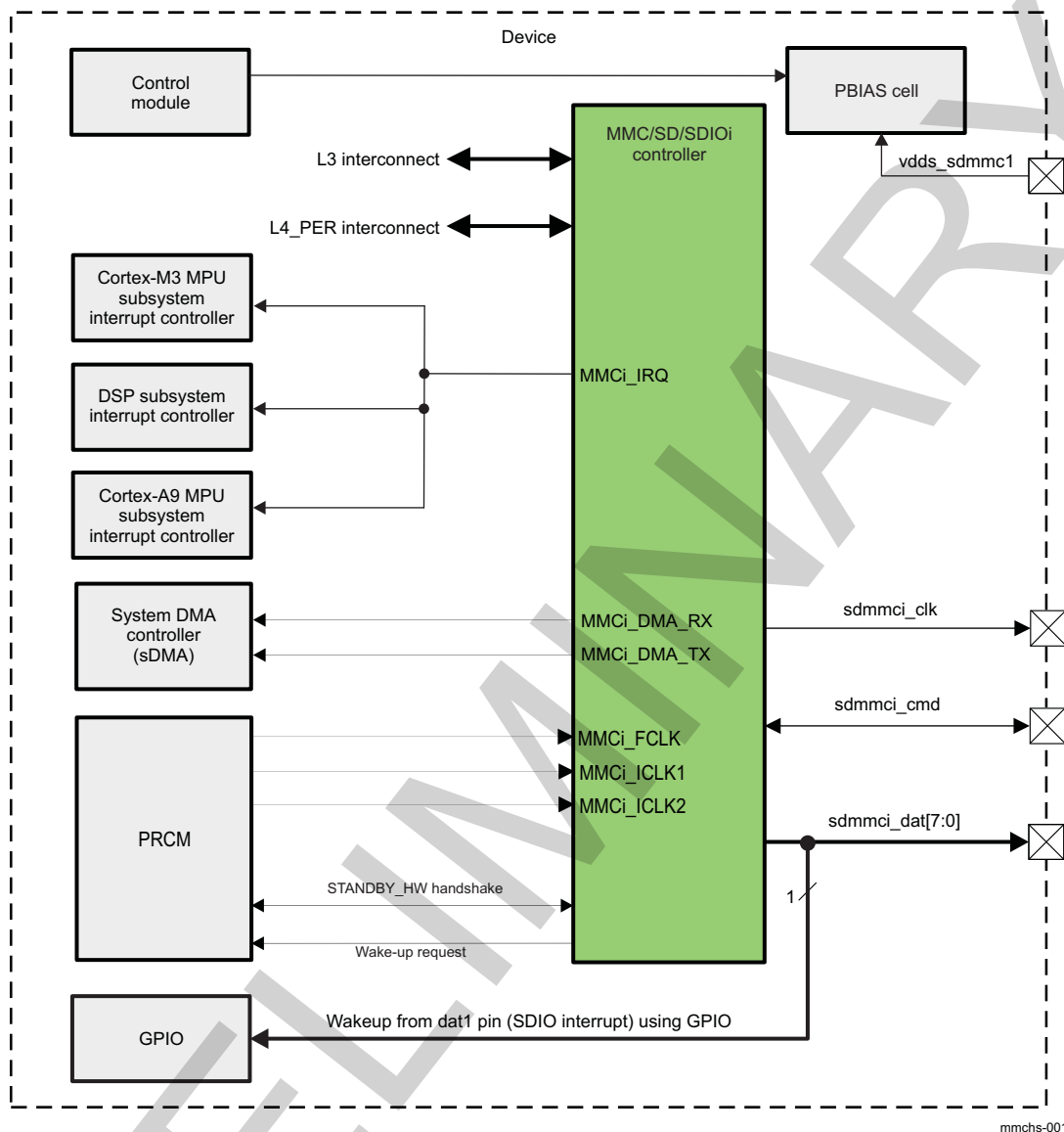


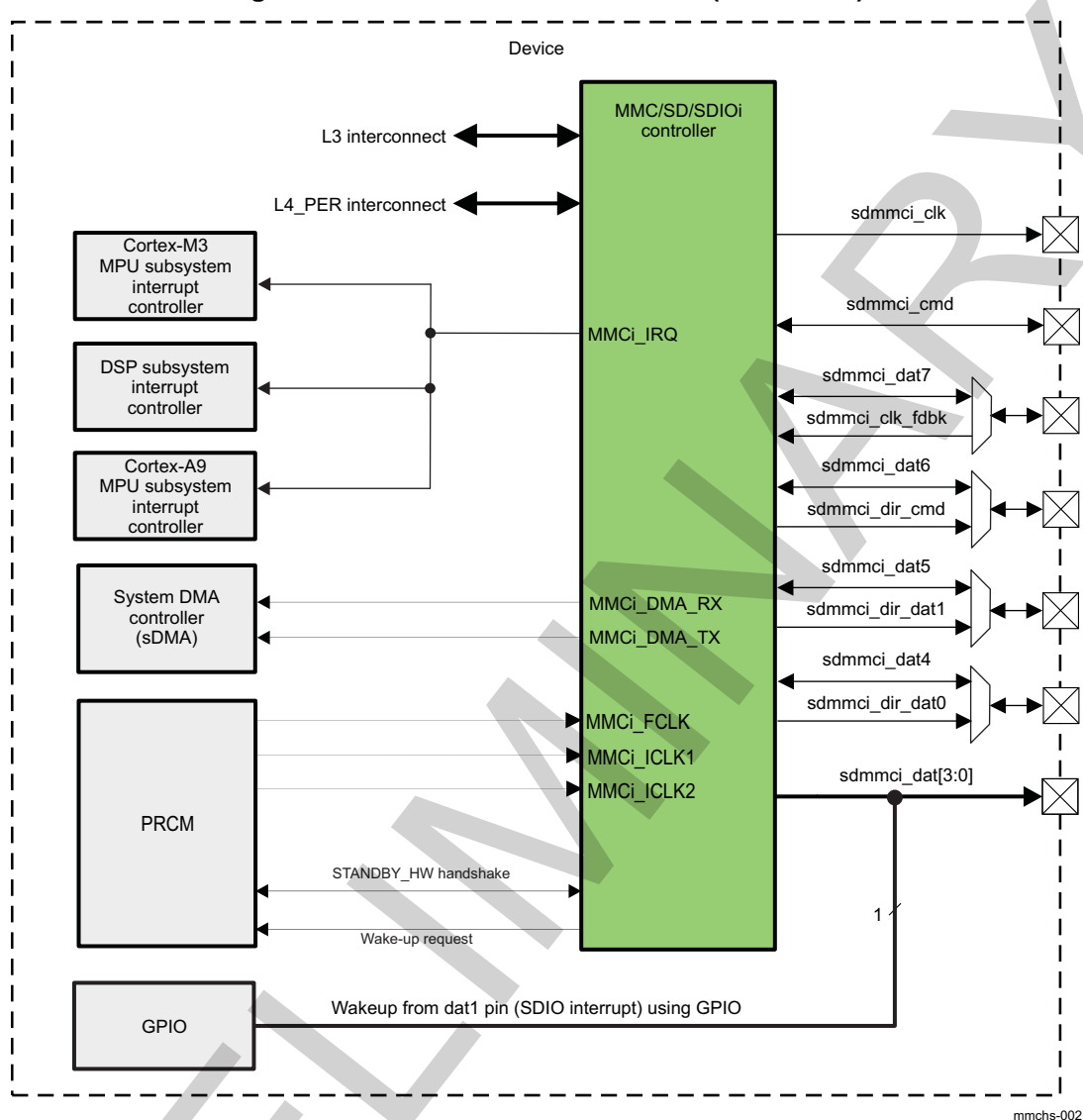
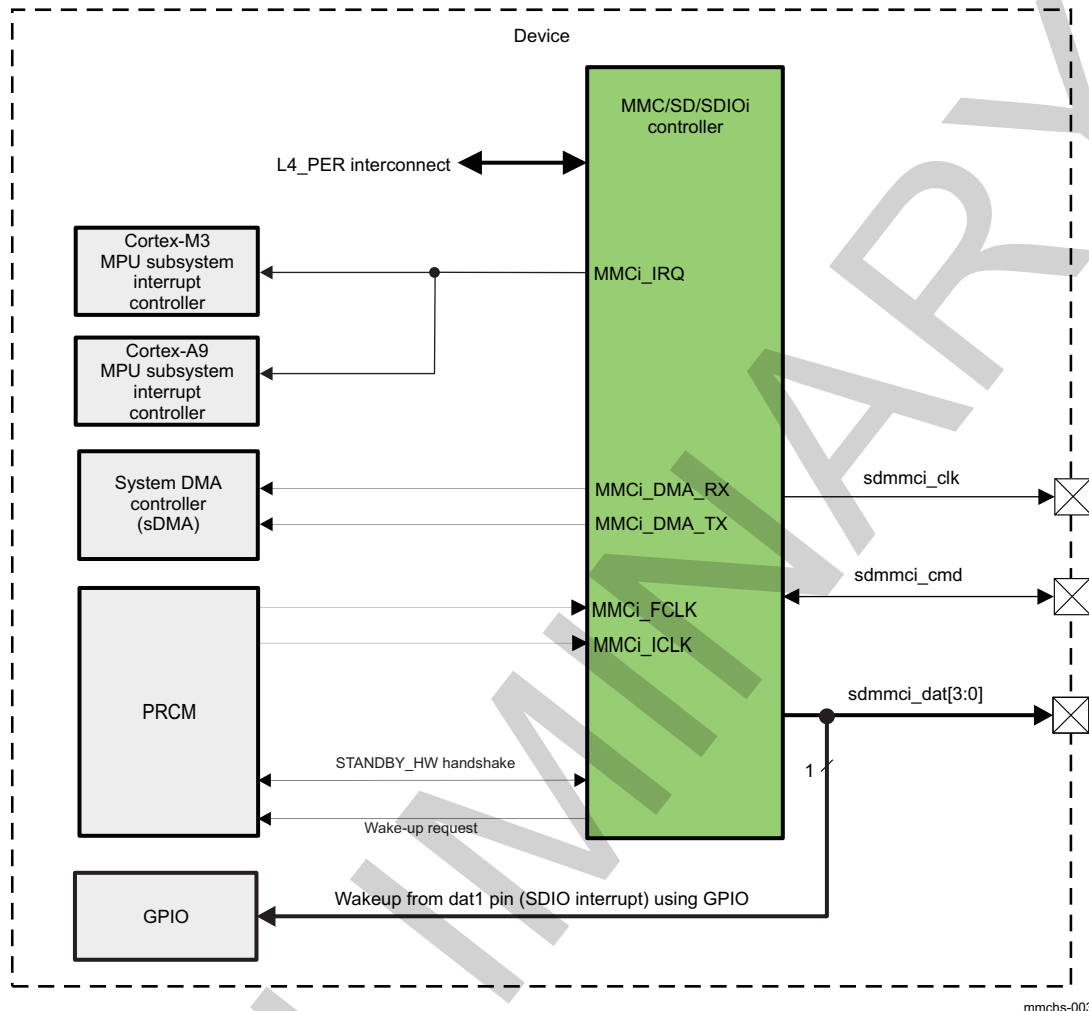
Figure 25-2. MMC/SD/SDIO2 Overview (where i = 2)

Figure 25-3. MMC/SD/SDIO3 Through MMC/SD/SDIO5 Overview (where i = 3, 4, or 5)


25.1.1 MMC/SD/SDIO Features

This section describes the features supplied by the MMC/SD/SDIO module.

Compliance with standards:

- Full compliance with MMC/eMMC command/response sets as defined in the *JC64 MMC/eMMC Standard Specification v4.41*, including high-capacity (size 2GB) cards HC MMC
- Full compliance with SD command/response sets as defined in the *SD Specifications Part 1 Physical Layer Simplified Specification*, v3.01, including high-capacity SDXC cards up to 2TB
- Full compliance with SDIO command/response sets and interrupt/read-wait suspend-resume operations, as defined in the *SDIO Card Specification, Part E1*, v2.00
- Full compliance with sets as defined in the *SD Card Specification, Part A2, SD Host Controller Standard Specification*, v2.00
- Full compliance with MMC bus testing procedure as defined in the *Multimedia Card System Specification*, v4.41
- Full compliance with CE-ATA command/response sets as defined in the *CE-ATA Standard Specification*
- Full compliance with ATA for MMCA specification
- Support command completion signal (CCS) and command completion signal disable (CCSD) management as specified in the *CE-ATA Standard Specification*

Main features of the MMC/SD/SDIO host controller:

- Flexible architecture allowing support for new command structure
- Support:
 - 1- or 4-bit transfer mode specifications for SD and SDIO cards
 - 1-, 4-, or 8-bit transfer mode specifications for MMC cards
- Built-in buffer for read or write (up to 2048 bytes in single-buffering, 1024 bytes in double-buffering)
- 32-bit-wide access bus to maximize bus throughput
- Single interrupt line for interrupt source events
- Two slave DMA channels (one for TX, one for RX)
- Designed for low power
- Programmable clock generation
- Support SDIO read wait and suspend/resume functions
- Support stop at block gap
- Support boot mode operations as specified in the *JEDEC JC 64 MMC/eMMC Standard Specification, v4.41*
- Support dual data rate transfers (DDR mode) as specified in *JEDEC JC64 MMC/eMMC Standard Specification, v4.41*
- Support SDA 2.0 Part A2 programming model

Optional features (depending on module integration):

- Master interface (L3 interconnect)
- One master DMA (32-bit ADMA2), replacing the two slave DMA channels
- Retention mode is supported
- Support SDA 2.0 Part A2 DMA feature (ADMA2)

Supported data rates:

- In MMC mode:
 - Up to 768 Mbps (96 MB/s), 8-bit DDR data transfer, with a clock running at 48 MHz
 - Up to 384 Mbps (48 MB/s), 8-bit SDR data transfer, with a clock running at 48 MHz
- In SD mode:
 - Up to 384 Mbps (48 MB/s), 4-bit DDR data transfer with a clock running at 48 MHz
 - Up to 384 Mbps (48 MB/s), 4-bit SDR data transfer with a clock running at 96 MHz
- In SDIO mode:
 - Up to 192 Mbps (24 MB/s) in high-speed mode, 4-bit data transfer with a clock running at 48 MHz
 - Up to 24 Mbps (3 MB/s) in default speed mode, 1-bit data transfer with a clock running at 24 MHz

Supported clock frequencies:

- MMC mode:
 - Up to 48 MHz in DDR and SDR modes
- SD mode:
 - Up to 48 MHz in DDR mode
 - Up to 96 MHz in SDR mode
- SDIO mode:
 - Up to 48 MHz in SDR mode

Known limitations:

- No built-in hardware support for error correction codes (ECCs). For information about ECC, see the *Multimedia Card System Specification, v4.4*, and the *SD Memory Card Specifications, v3.0*.

- The maximum block size defined in the *SD Memory Card Specifications*, v3.0, which the host driver can read and write to the buffer in the host controller, is 2048 bytes. The host controller supports a maximum block size of 1024 bytes. Up to 512 byte transfers, the buffer in the host controller is considered as a double-buffering with ping-pong management; half of the buffer can be written while the other half is read. For 512 to 1024 byte transfers, the entire buffer is dedicated to the transfer (read only or write only).
- SPI transfers are not supported.
- The module does not support card insertion and removal sensing with pullup resistor on the sdmmc_i_dat3 bus line, as specified in the *SD Memory Card Specifications – Part 1 Physical Layer Specification* (SD Group, May 2006).

The differences between the MMC/SD/SDIO host controllers and a standard SD host controller defined by the *SD Card Specification, Part A2, SD Host Controller Standard Specification*, v2.00 are:

- The MMC/SD/SDIO host controllers support MMC cards.
- The clock divider in the MMC/SD/SDIO host controller supports a wider range of frequency than specified in the *SD Memory Card Specifications*, v2.0. The MMC/SD/SDIO host controller supports odd and even clock ratio.
- The MMC/SD/SDIO host controller supports configurable busy time-out.
- sDMA and ADMA2 64-bit modes are not supported.
- There is no external LED control.

NOTE: Only even ratios are supported in DDR mode.

Table 25-1 lists the features supported in the 4.41 standard.

Table 25-1. Standard 4.41 Supported Features

| Feature | Support | Limitation | Comment |
|-----------------------------------|--|---|--|
| Bus width | 1-bit mode | | x 1, 4, 8 bits |
| | 4-bit mode | | |
| | 8-bit mode | | |
| Support density | No hardware limitation for density support | Limitation can come from file system (32GB) | |
| Simple boot (CMD, alternate boot) | No | | ROM code supports the following boot mode: In raw mode the booting image can be at one of the four consecutive locations in the main area: offset 0x0 0x20000 (128KB) 0x40000 (256KB) 0x60000 (384KB) (That is, it supports four boot partitions.) |
| Sleep mode | Yes | | |
| Reliable write | Yes | | |
| Secure write protection | Yes | | |
| Hardware reset | No | | Use the reset command instead of GPIO if hardware reset is needed. |
| Secure memory block (RPMB) | Yes | | |
| Partition feature | Yes | | |
| Secure erase | Yes | | |
| 1.2 V | Yes | | |

Table 25-1. Standard 4.41 Supported Features (continued)

| Feature | Support | Limitation | Comment |
|--|----------------------------------|------------|---------|
| DDR Interface (bandwidth) | Up to 96MBps in DDR mode – 8-bit | | |
| High-priority interrupt (read while write) | Yes | | |
| Background operation | Yes | | |
| Enhanced reliable write | Yes | | |

25.2 MMC/SD/SDIO Environment

One MMC/SD/SDIO host controller can support one MMC memory card, one SD memory card, or one SDIO card.

Other combinations (for example, two SD cards, one MMC card, and one SD card) are not supported through a single controller.

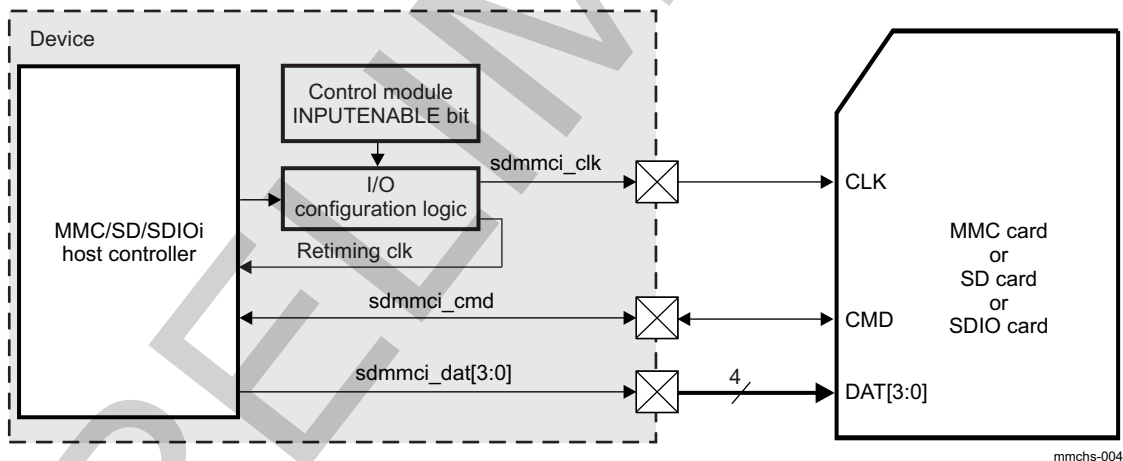
- The MMC/SD/SDIO1 controller integrates an internal transceiver that allows a direct connection to the MMC/SD/SDIO card (1.8 V and 3 V), without external transceiver. It is connected to the level 3 (L3) interconnect (internal DMA enabled) and supports 1-, 4-, and 8-bit data transfers.
- The MMC/SD/SDIO2 controller allows connecting MMC/SD/SDIO cards (only 1.8V cards) or an external device that uses the MMC/SD/SDIO interface (JC64, for example). The module is connected to the L3 interconnect (internal DMA enabled) and supports 1-, 4-, and 8-bit data transfers. The second instance also supports an external transceiver and provides direction signals for data and command.
- The MMC/SD/SDIO3, MMC/SD/SDIO4, and MMC/SD/SDIO5 controllers allow connecting MMC/SD/SDIO cards (only 1.8V cards) or an external device that uses the MMC/SD/SDIO interface (wireless LAN, for example). The modules are connected to the L4 interconnect and support 1-and 4-bit data transfers.

25.2.1 MMC/SD/SDIO Functional Modes

25.2.1.1 MMC/SD/SDIO Connected to an MMC, an SD, or an SDIO Card

Figure 25-4 shows the MMC/SD/SDIO_i host controller (where *i* = 1 through 5) connected to an MMC, an SD, or an SDIO card and its related external connections.

Figure 25-4. MMC/SD/SDIO_i Controller Connected to an MMC, an SD, or an SDIO Card Without External Transceiver (where *i* = 1 through 5)



NOTE: MMC/SD/SDIO1 and MMC/SD/SDIO2 support data transfers on 8 bits (and thus handle data on signals sdmmc_i_dat[7:0]).

Table 25-2 describes the MMC/SD/SDIO_i inputs and outputs.

Table 25-2. MMC/SD/SDIO_i I/O Description Without External Transceiver (where *i* = 1 through 5)

| Signal Name | I/O ⁽¹⁾ | Description | Reset Value ⁽²⁾ |
|-------------|--------------------|--|----------------------------|
| sdmmc_i_clk | O | External clock for MMC/SD/SDIO card ⁽³⁾ | 0 |

⁽¹⁾ I = Input; O = Output; I/O = Bidirectional

⁽²⁾ hi-Z = High impedance

⁽³⁾ This output signal is also used as retiming input (the INPUTENABLE bit in the corresponding pad configuration register must be set to 1).

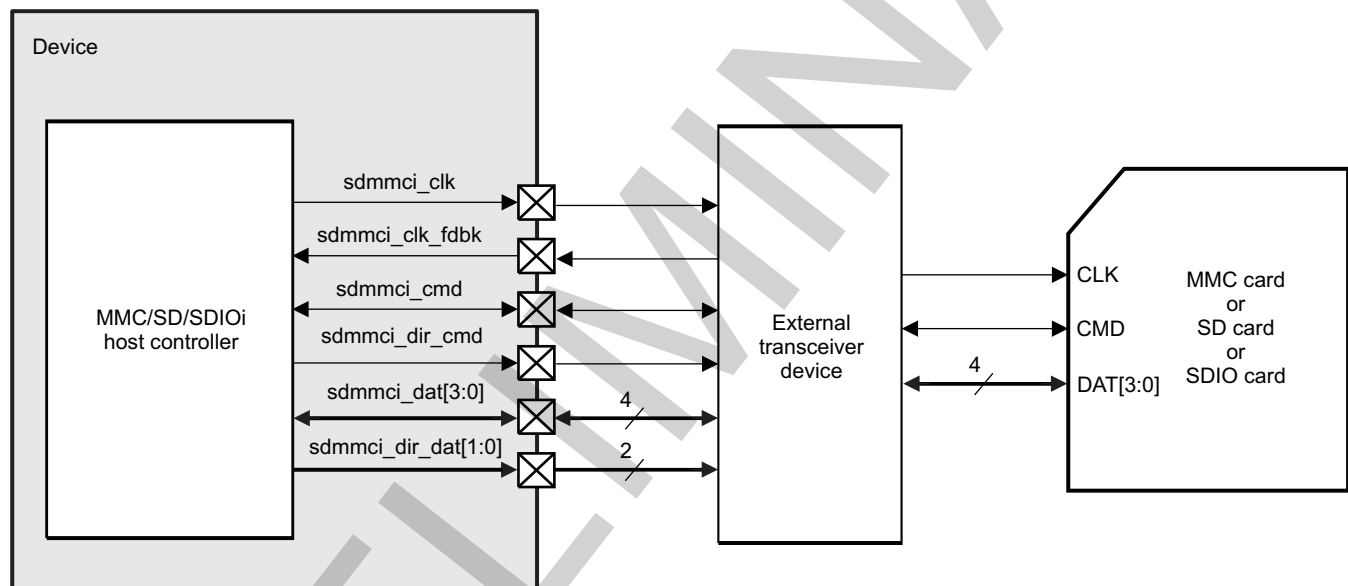
**Table 25-2. MMC/SD/SDIOi I/O Description Without External Transceiver (where i = 1 through 5)
(continued)**

| Signal Name | I/O ⁽¹⁾ | Description | Reset Value ⁽²⁾ |
|------------------|--------------------|---|----------------------------|
| sdmmc_i_cmd | I/O | Command signal | hi-Z ⁽⁴⁾ |
| sdmmc_i_dat[3:0] | I/O | Data signals | hi-Z ⁽⁴⁾ |
| sdmmc_i_dat[7:4] | I/O | Data signals (only for modules MMC/SD/SDIO1 and MMC/SD/SDIO2) | hi-Z ⁽⁴⁾ |

⁽⁴⁾ Initialized as input upon reset

25.2.1.2 MMC/SD/SDIO Connected to an MMC, an SD, or an SDIO Card Through an External Transceiver Device

Figure 25-5 shows the MMC/SD/SDIOi host controller (where i = 2) connected to an MMC, an SD, or an SDIO card and its related external connections.

Figure 25-5. MMC/SD/SDIOi Controller Connected to an MMC, an SD, or an SDIO Card With External Transceiver (where i = 2)

mmchs-005

Table 25-3 describes the MMC/SD/SDIOi inputs and outputs.

Table 25-3. MMC/SD/SDIOi I/O Description With External Transceiver (where i = 2)

| Signal Name | I/O ⁽¹⁾ | Description | Reset Value ⁽²⁾ |
|------------------|--------------------|--|----------------------------|
| sdmmc_i_clk | O | External clock for MMC/SD/SDIO card | 0 |
| sdmmc_i_clk_fdbk | I | Input clock from MMC/SD/SDIO card | 0 |
| sdmmc_i_cmd | I/O | Command signal | hi-Z ⁽³⁾ |
| sdmmc_i_dir_cmd | O | Direction control for mmc2_cmd signal when an external transceiver is used (high when transmit, low when receive) | 0 |
| sdmmc_i_dat[3:0] | I/O | Data signals | hi-Z ⁽³⁾ |
| sdmmc_i_dir_dat0 | O | Direction control for mmc2_dat0 signal when an external transceiver is used (high when transmit, low when receive) | 0 |

⁽¹⁾ I = Input; O = Output; I/O = Bidirectional

⁽²⁾ hi-Z = High impedance

⁽³⁾ Initialized as input upon reset

Table 25-3. MMC/SD/SDIOi I/O Description With External Transceiver (where i = 2) (continued)

| Signal Name | I/O ⁽¹⁾ | Description | Reset Value ⁽²⁾ |
|----------------|--------------------|--|----------------------------|
| sdmmc_dir_dat1 | O | Direction control for mmc2_dat1 signal when an external transceiver is used (high when transmit, low when receive) | 0 |

NOTE: There is no signal for individually controlling the sdmmc_dir_dat2 and sdmmc_dir_dat3 direction (sdmmc_dir_dat2 and sdmmc_dir_dat3 are not delivered). This may limit the use of this interface with the SDIO card requesting the wait feature on the sdmmc_dir_dat2 line.

25.2.2 Protocol and Data Format

The bus protocol between the MMC/SD/SDIOi host controller and the card is message-based. Each message is represented by one of the following parts:

Command: A command starts an operation. The command is transferred serially from the MMC/SD/SDIO host controller to the card on the sdmmc_cmd line.

Response: A response is an answer to a command. The response is sent from the card to the MMC/SD/SDIO host controller. It is transferred serially on the sdmmc_cmd line.

Data: Data are transferred from the MMC/SD/SDIOi host controller to the card or from a card to the MMC/SD/SDIO host controller using the data lines.

Busy: The sdmmc_dat0 signal is maintained low by the card as far as it is programming the data received.

CRC status: The CRC result is sent by the card through the sdmmc_dat0 line when executing a write transfer. In the case of transmission error, occurring on any of the active data lines, the card sends a negative CRC status on sdmmc_dat0. In the case of successful transmission, over all active data lines, the card sends a positive CRC status on sdmmc_dat0 and starts the data programming procedure.

25.2.2.1 Protocol

There are two types of data transfer:

- Sequential operation
- Block-oriented operation

There are specific commands for each type of operation (sequential or block-oriented).

For information about commands and programming sequences supported by the MMC, SD, and SDIO cards, see the *Multimedia Card System Specification*, *SD Memory Card Specifications*, and *SDIO Card Specification (Part E1)*.

[Figure 25-6](#) and [Figure 25-7](#) show how sequential operations are defined. Sequential operation is only for 1-bit transfer and initiates a continuous data stream. The transfer terminates when a stop command follows on the sdmmc_cmd line.

CAUTION

Stream commands are supported only by MMC cards.

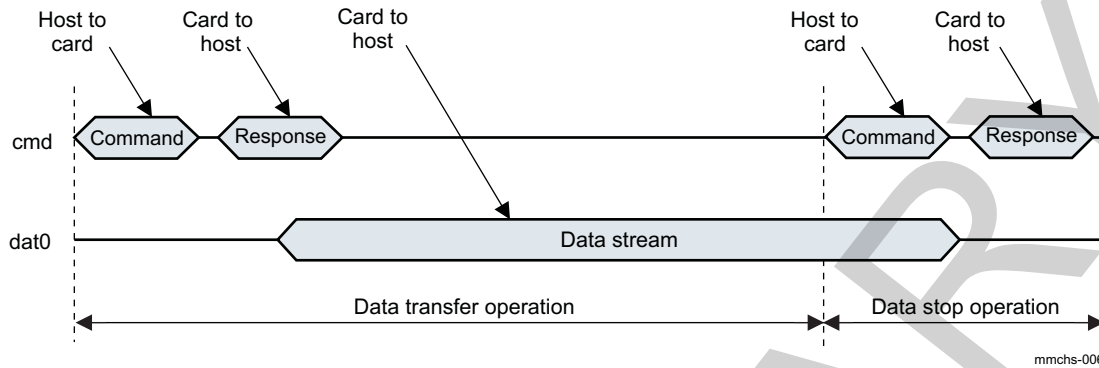
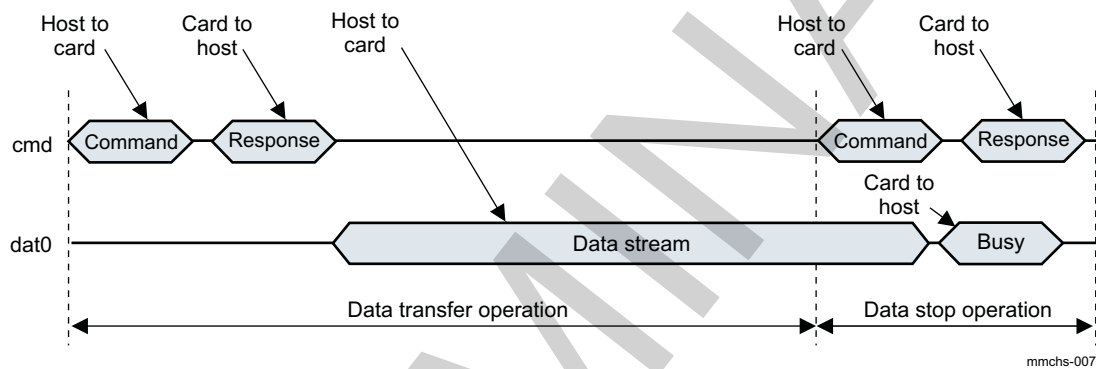
Figure 25-6. Sequential Read Operation (MMC Cards Only)**Figure 25-7. Sequential Write Operation (MMC Cards Only)**

Figure 25-8 and Figure 25-9 show how multiple block-oriented operations are defined. A multiple block-oriented operation sends a data block plus CRC bits. The transfer terminates when a stop command follows on the sdmmc_cmd line. These operations are available for all kinds of cards.

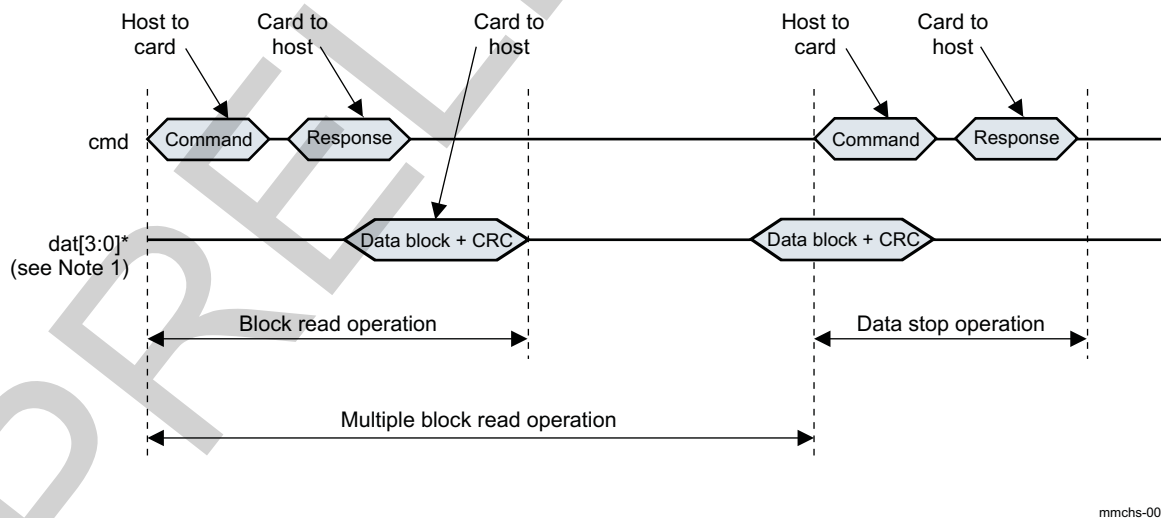
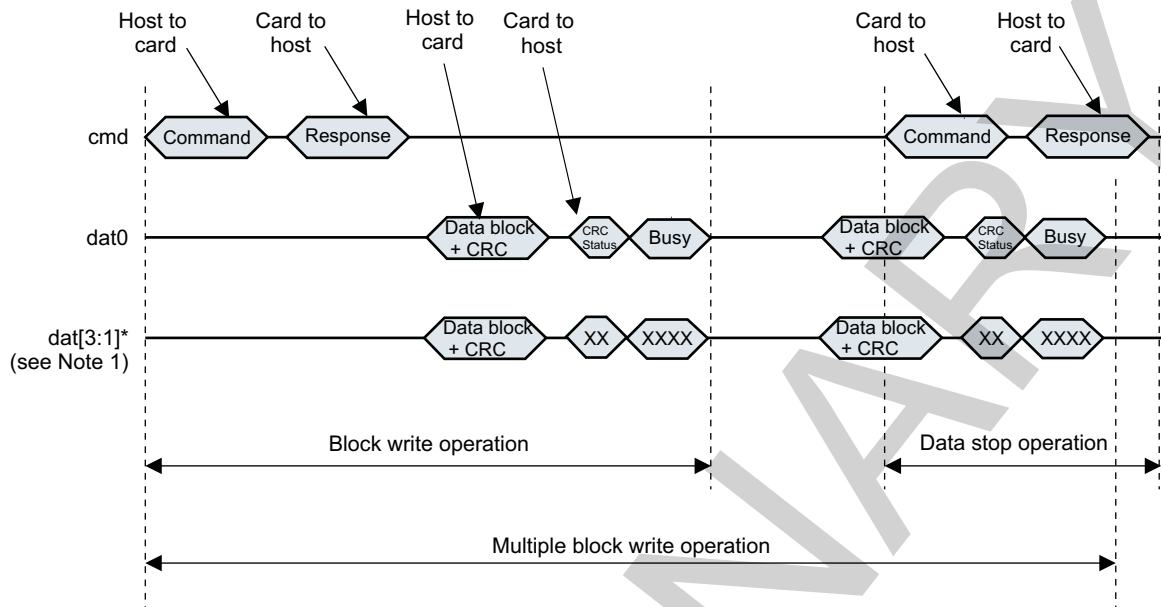
Figure 25-8. Multiple Block Read Operation

Figure 25-9. Multiple Block Write Operation With Card Busy Signal



mmchs-009

NOTE:

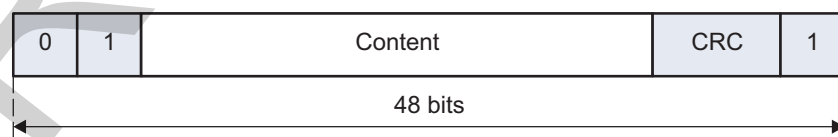
1. The card busy signal is not always generated by the card; the previous examples show a particular case.
2. Software must perform a software reset (set the MMCI.MMCHS_SYSCTL[26] SRD bit to 0x1) after a data time-out to ensure sdmmc_i_clk is stopped.
3. For multiblock transfer, and especially for MMC cards, a transfer can be aborted without using a stop command. If a CMD23 is used before data transfer to define the number of blocks that will be transferred, then the transfer stops automatically after the last block (if the MMC card supports this feature).

25.2.2.2 Data Format

Coding Scheme for Command Token

Command tokens always start with 0 and end with 1. The second bit is a transmitter bit: 1 for a host command. The content is the command index (coded by 6 bits) and an argument (for example, an address), coded by 32 bits. The content is protected by 7-bit CRC checksum (see [Figure 25-10](#)).

Figure 25-10. Command Token Format



mmchs-010

Coding Scheme for Response Token

Response tokens always start with 0 and end with 1. The second bit is a transmitter bit: 0 for a card response. The content is different for each type of response (R1, R2, R3, R4, and R5, R6, R7 [for SDIO])

and the content is protected by 7-bit CRC checksum (see [Figure 25-11](#) and [Figure 25-12](#)). Depending on the type of commands sent to the card, the [MMCHS_CMD](#) register must be configured differently to avoid false CRC or index errors to be flagged on command response (see [Table 25-4](#)). For more information about response types, see the *Multimedia Card System Specification*, *SD Memory Card Specifications*, and *SDIO Card Specification*.

Figure 25-11. Response Token Format (R1, R3, R4, R5, R6, R7)

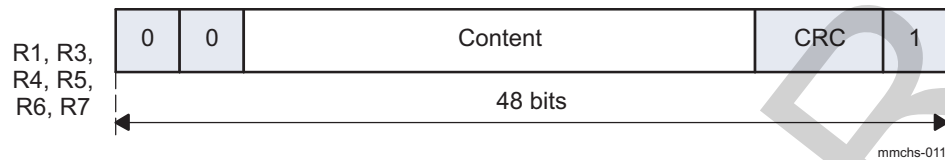


Figure 25-12. Response Token Format (R2)

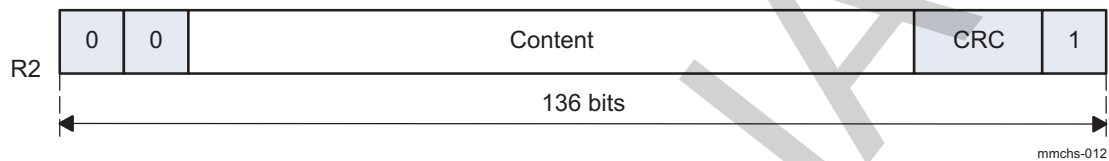


Table 25-4. Relationship Between Configuration and Name of Response Type

| Response Type MMCi.MMCHS_CMD[17:16] RSP_TYPE | Index Check Enable MMCi.MMCHS_CMD[20] CICE | CRC Check Enable MMCi.MMCHS_CMD[19] CCCE | Name of Response Type |
|--|--|--|-----------------------|
| 00 | 0 | 0 | No response |
| 01 | 0 | 1 | R2 |
| 10 | 0 | 0 | R3 (R4 for SD cards) |
| 10 | 1 | 1 | R1, R6, R5, R7 |
| 11 | 1 | 1 | R1b, R5b |

Coding Scheme for Data Token

Data tokens always start with 0 and end with 1 (see [Figure 25-13](#) through [Figure 25-15](#)).

Figure 25-13. Data Token Format for 1-Bit Transfers

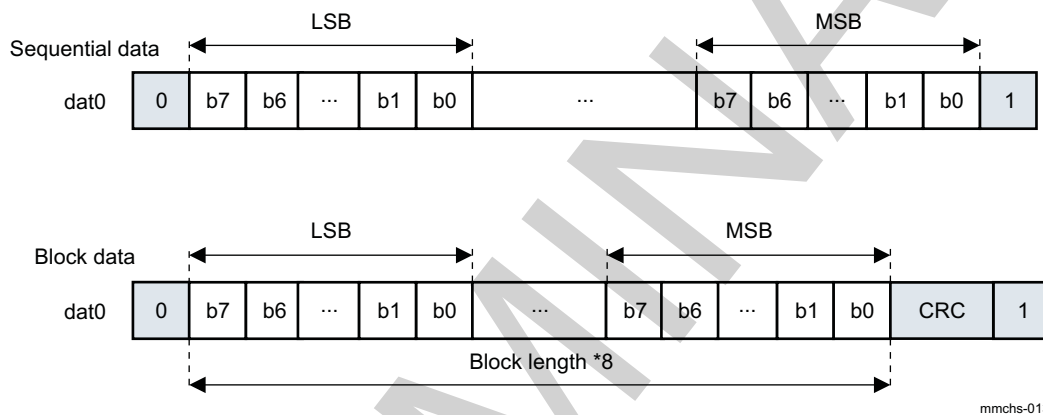


Figure 25-14. Data Token Format for 4-Bit Transfers

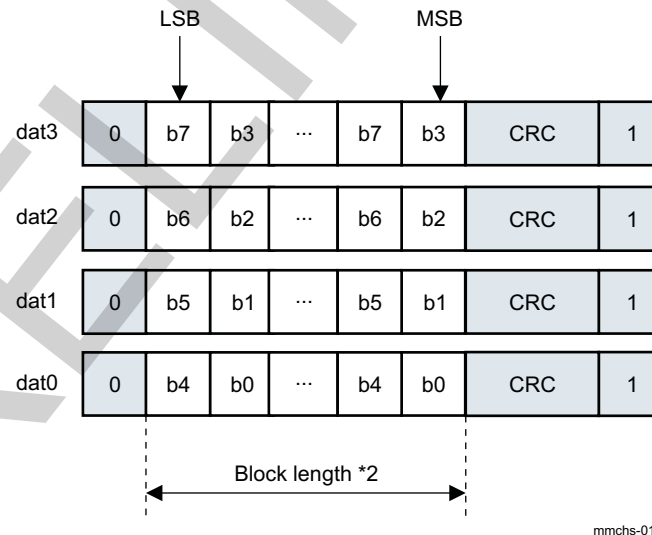
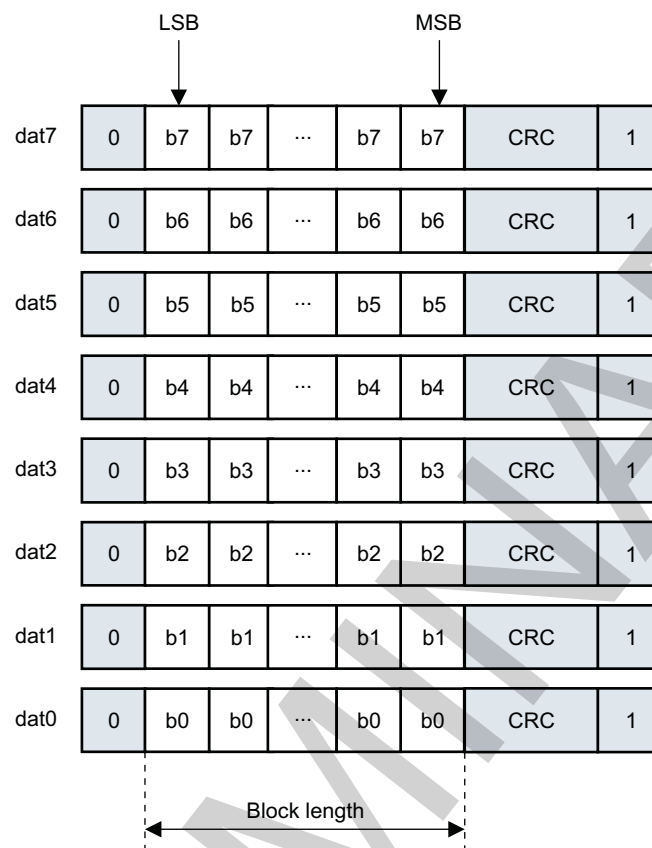


Figure 25-15. Data Token Format for 8-Bit Transfers

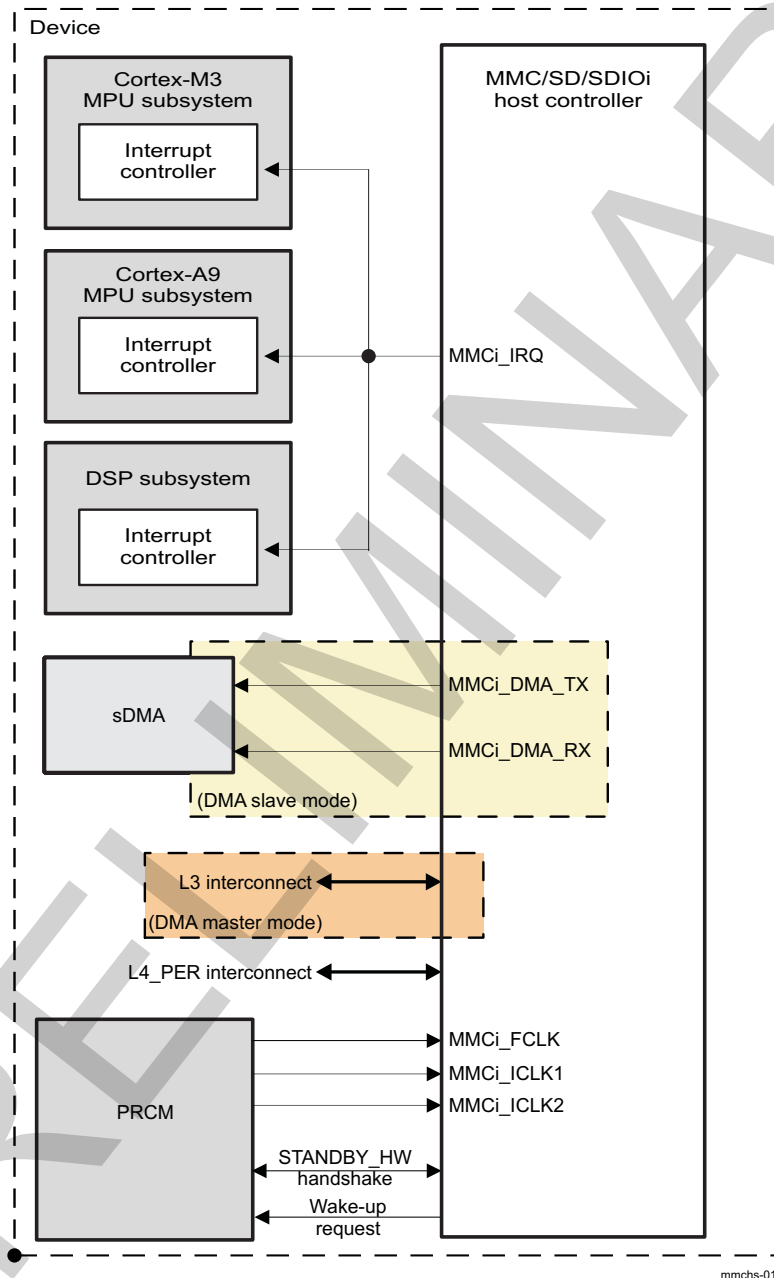
mmchs-015

25.3 MMC/SD/SDIO Integration

This section describes module integration in the device, including information about clocks, resets, and hardware requests.

Figure 25-16 shows the MMC/SD/SDIO integration.

Figure 25-16. MMC/SD/SDIO Controllers Integration



NOTE: For more information about the IDLE hardware handshake and the wake-up request, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 25-5 through Table 25-7 summarize the integration of the module in the device.

Table 25-5. Integration Attributes

| Module Instance | Attributes | |
|-----------------|--------------|--------------|
| | Power Domain | Interconnect |
| HSMMC1 | PD_L3_INIT | L3 L4_PER |
| HSMMC2 | PD_L3_INIT | L3 L4_PER |
| HSMMC3 | PD_L4_PER | L4_PER |
| HSMMC4 | PD_L4_PER | L4_PER |
| HSMMC5 | PD_L4_PER | L4_PER |

Table 25-6. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|----------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| HSMMC1 | MMC1_FCLK | MMC1_FCLK | PRCM | MMC1 function clock |
| | MMC1_ICLK2 | INIT_L4_ICLK | PRCM | MMC1 interface clock |
| | MMC1_ICLK1 | INIT_L3_ICLK | PRCM | MMC1 interface clock |
| HSMMC2 | MMC2_FCLK | MMC2_FCLK | PRCM | MMC2 function clock |
| | MMC2_ICLK2 | INIT_L4_ICLK | PRCM | MMC2 interface clock |
| | MMC2_ICLK1 | INIT_L3_ICLK | PRCM | MMC2 interface clock |
| HSMMC3 | MMC3_ICLK | PER_L4_ICLK | PRCM | MMC3 interface clock |
| | MMC3_FCLK | PER_48M_FCLK | PRCM | MMC3 function clock |
| HSMMC4 | MMC4_ICLK | PER_L4_ICLK | PRCM | MMC4 interface clock |
| | MMC4_FCLK | PER_48M_FCLK | PRCM | MMC4 function clock |
| HSMMC5 | MMC5_ICLK | PER_L4_ICLK | PRCM | MMC5 interface clock |
| | MMC5_FCLK | PER_48M_FCLK | PRCM | MMC5 function clock |
| Resets | | | | |
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| HSMMC1 | MMC1_RST | L3_INIT_RET_RST | PRCM | L3 reset to MMC1 |
| HSMMC2 | MMC2_RST | L3_INIT_RET_RST | PRCM | L3 reset to MMC2 |
| HSMMC3 | MMC3_RST | L4_PER_RST | PRCM | L4 reset to MMC3 |
| HSMMC4 | MMC4_RST | L4_PER_RST | PRCM | L4 reset to MMC4 |
| HSMMC5 | MMC5_RST | L4_PER_RST | PRCM | L4 reset to MMC5 |

Table 25-7. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|----------------|-----------------------------|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| HSMMC1 | MMC1_IRQ | MM_IRQ_50 | Cortex-M3 INTC | MMC1 interrupt to Cortex-M3 |
| | MMC1_IRQ | D_IRQ_16 | DSP INTC | MMC1 interrupt to DSP |
| | MMC1_IRQ | MA_IRQ_83 | Cortex-A9 INTC | MMC1 interrupt to Cortex-A9 |
| HSMMC2 | MMC2_IRQ | MM_IRQ_51 | Cortex-M3 INTC | MMC2 interrupt to Cortex-M3 |
| | MMC2_IRQ | D_IRQ_17 | DSP INTC | MMC2 interrupt to DSP |
| | MMC2_IRQ | MA_IRQ_86 | Cortex-A9 INTC | MMC2 interrupt to Cortex-A9 |
| HSMMC3 | MMC3_IRQ | MM_IRQ_52 | Cortex-M3 INTC | MMC3 interrupt to Cortex-M3 |
| | MMC3_IRQ | MA_IRQ_94 | Cortex-A9 INTC | MMC3 interrupt to Cortex-A9 |
| HSMMC4 | MMC4_IRQ | MM_IRQ_53 | Cortex-M3 INTC | MMC4 interrupt to Cortex-M3 |
| | MMC4_IRQ | MA_IRQ_96 | Cortex-A9 INTC | MMC4 interrupt to Cortex-A9 |
| HSMMC5 | MMC5_IRQ | MM_IRQ_54 | Cortex-M3 INTC | MMC5 interrupt to Cortex-M3 |
| | MMC5_IRQ | MA_IRQ_59 | Cortex-A9 INTC | MMC5 interrupt to Cortex-A9 |
| DMA Requests | | | | |
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| HSMMC1 | MMC1_DMA_TX | S_DMA_60 | sDMA | MMC1 DMA TX |
| | MMC1_DMA_RX | S_DMA_61 | sDMA | MMC1 DMA RX |
| HSMMC2 | MMC2_DMA_TX | S_DMA_46 | sDMA | MMC2 DMA TX |
| | MMC2_DMA_RX | S_DMA_47 | sDMA | MMC2 DMA RX |
| HSMMC3 | MMC3_DMA_TX | S_DMA_76 | sDMA | MMC3 DMA TX |
| | MMC3_DMA_RX | S_DMA_77 | sDMA | MMC3 DMA RX |
| HSMMC4 | MMC4_DMA_TX | S_DMA_56 | sDMA | MMC4 DMA TX |
| | MMC4_DMA_RX | S_DMA_57 | sDMA | MMC4 DMA RX |
| HSMMC5 | MMC5_DMA_TX | S_DMA_58 | sDMA | MMC5 DMA TX |
| | MMC5_DMA_RX | S_DMA_59 | sDMA | MMC5 DMA RX |

NOTE:

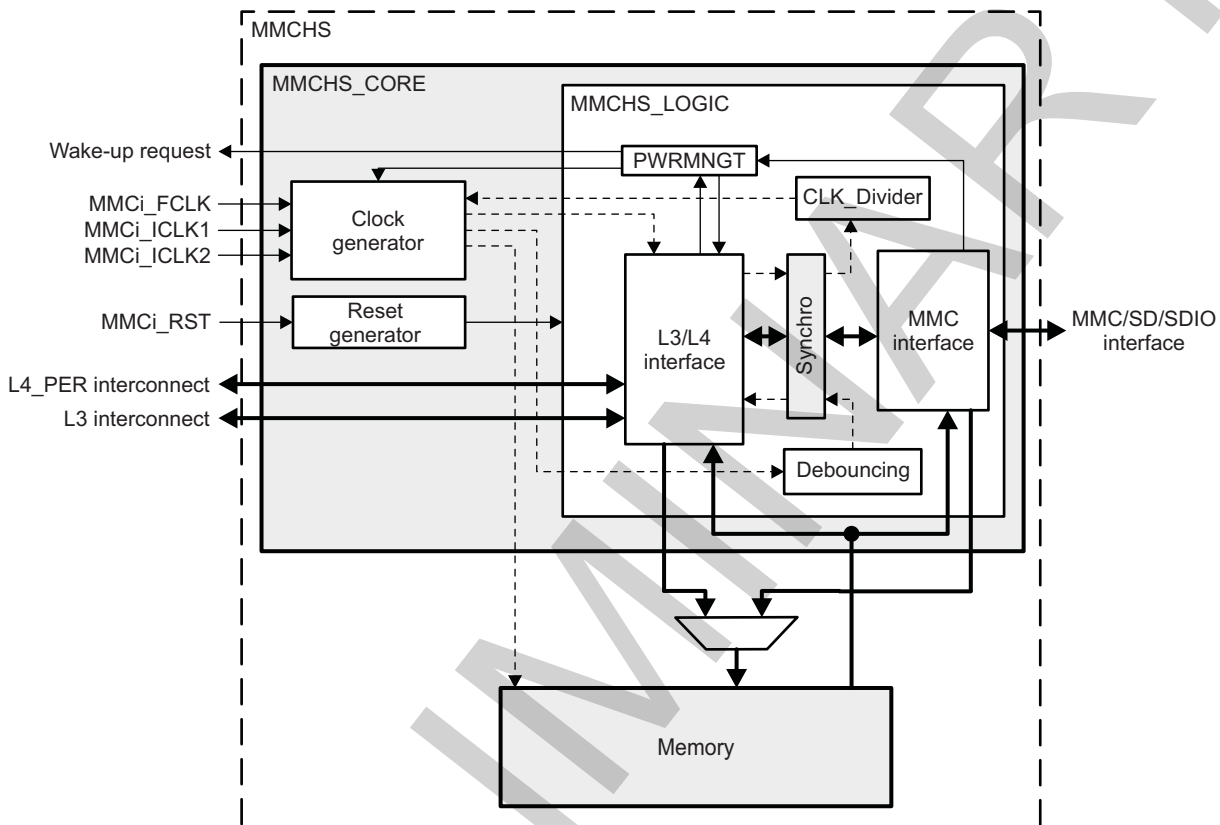
- For a description of the interrupt source, see [Section 25.4.4, Interrupt Requests](#).
- For a description of the DMA source, see [Section 25.4.5, DMA Modes](#).

25.4 MMC/SD/SDIO Functional Description

25.4.1 Block Diagram

Figure 25-17 is a block diagram of the MMC/SD/SDIOi host controller.

Figure 25-17. MMC/SD/SDIO Diagram



mmchs-017

25.4.2 Resets

25.4.2.1 Hardware Reset

The module is reinitialized by the hardware (see Table 25-6 for more information about reset signals).

The MMCHS.MMCHS_SYSSTATUS[0] RESETDONE bit can be monitored by software to check whether the module is ready to use after a hardware reset.

NOTE: The functional clock (MMCHS_FCLK) and interface clock (MMCHS_ICLK) must be provided to the module to allow the RESETDONE status bit to be set.

The debounce clock (MMCHS_32K) must be active to reset the module correctly.

This hardware reset signal has a global reset action on the module. All configuration registers and all state-machines are reset in all clock domains.

25.4.2.2 Software Reset

The module is reinitialized by software through the MMCHS.MMCHS_SYSCONFIG[1] SOFTRESET bit. This bit has the same action on the module logic as the hardware signal (MMCHS_RST), with the following exceptions:

- Debounce logic

- MMCI.MMCHS_PSTATE, MMCI.MMCHS_CAPA, and MMCI.MMCHS_CUR_CAPA registers (see the corresponding register description)

The SOFTRESET bit is active high. The bit is automatically reinitialized to 0 by hardware. The MMCI.MMCHS_SYSCTL[24] SRA bit has the same action on the design as the SOFTRESET bit.

The MMCI.MMCHS_SYSSTATUS[0] RESETDONE bit can be monitored by software to check whether the module is ready to use after a software reset.

Moreover, two partial software reset bits are provided:

- MMCI.MMCHS_SYSCTL[26] SRD
- MMCI.MMCHS_SYSCTL[25] SRC

These two reset bits are useful to reinitialize data or command processes, respectively, in case of line conflict. When these bits are set to 1, a reset process is automatically released when the reset completes:

- The MMCI.MMCHS_SYSCTL[26] SRD bit resets all finite state-machines (FSMs) and status management that handle data transfers on the interface and functional sides.
- The MMCI.MMCHS_SYSCTL[25] SRC bit resets all FSMs and status management that handle command transfers on the interface and functional sides.

25.4.3 Power Management

The MMC/SD/SDIO host controller can enter into different modes and save power:

- Normal mode
- Idle mode

The two modes are mutually exclusive (the module can be in normal mode or in idle mode). The MMC/SD/SDIO host controller is compliant with the handshake protocol of the PRCM module.

When the MMC/SD/SDIO power domain is off, the only way to wake up the power domain and different MMC/SD/SDIO clocks is to monitor the state of the sdmmc_i_dat1 input pin through a different GPIO line for each MMC/SD/SDIO interface (for more information, see [Section 26.1](#), *GPIO Overview*, in [Chapter 26](#), *GPIO*).

Normal Mode

The autogating of interface and functional clocks occurs when the following conditions are met:

- The MMCI.MMCHS_SYSCONFIG[0] AUTOIDLE bit is set to 1.
- There is no transaction on the MMC interface.

The autogating of interface and functional clocks stops when the following conditions are met:

- A register access occurs through the L4 interconnect.
- A wake-up event occurs (an interrupt from an SDIO card).
- A transaction on the MMC/SD/SIO interface starts.

Then the MMC/SD/SDIO host controller enters into LOW-POWER state (MMCI_ICLK clock autogated) even if the MMCI.MMCHS_SYSCONFIG[0] AUTOIDLE bit is set to 0.

The functional clock is internally switched off and only interconnect read and write accesses are allowed.

Idle Mode

The MMCI_ICLK and MMCI_FCLK clocks provided to the MMC/SD/SDIO host controller are switched off upon a PRCM module request. They are switched back upon module request.

The MMC/SD/SDIO host controller complies with the handshaking protocol of the PRCM module:

- Idle request from the system power manager
- Idle acknowledgment from the MMC/SD/SDIO host controller
- Wake-up request from the MMC/SD/SDIO host controller

The idle acknowledgment varies according to the MMCI.MMCHS_SYSCONFIG[4:3] SIDLEMODE bit field:

- 0x0: Force-idle mode. The MMC/SD/SDIO host controller acknowledges the system power manager request unconditionally.
- 0x1: No-idle mode. The MMC/SD/SDIO host controller ignores the system power manager request and behaves normally as if the request was not asserted.
- 0x2: Smart-idle mode. The MMC/SD/SDIO host controller acknowledges the system power manager request according to its internal state.
- 0x3: Smart-idle wake-up-capable mode. The MMC/SD/SDIO host controller acknowledges the system power manager request according to its internal state. However, the module may generate wake-up events when in IDLE state (related to IRQ or DMA requests)

During the smart-idle mode period, the MMC/SD/SDIO host controller acknowledges that the MMCi_ICLK and MMCi_FCLK clocks may be switched off, regardless of the value set in the MMCi.MMCHS_SYSCONFIG[9:8] CLOCKACTIVITY bit field.

Transition From Normal Mode to Smart-Idle Mode

Smart-idle mode is enabled when the MMCi.MMCHS_SYSCONFIG[4:3] SIDLEMODE bit field is set to 0x2 or 0x3.

The MMC/SD/SDIOi host controller goes into idle mode when the PRCM issues an idle request, according to its internal activity.

The MMC/SD/SDIO host controller acknowledges the idle request from the PRCM after ensuring the following:

- The current multi- or single-block transfer is complete.
- Any interrupt or DMA request is asserted.
- There is no card interrupt on the sdmmc_i_dat1 signal.

As long as the MMC/SD/SDIOi controller does not acknowledge the idle request, if an event occurs, the MMC/SD/SDIOi host controller can still generate an interrupt or a DMA request. In this case, the module ignores the idle request from the PRCM module.

As soon as the MMC/SD/SDIOi controller acknowledges the idle request from the PRCM module:

- If smart-idle mode: The module does not assert any new interrupt or DMA request.
- If smart-idle wake-up-capable mode: The module may generate wake-up events related to an interrupt or DMA request.

Wake-Up Event in Smart-Idle Mode

The wake-up feature is enabled when the following enable wake-up bits are set:

- The MMCi.MMCHS_SYSCONFIG[2] ENAWAKEUP bit is set to 0x1.
- The MMCi.MMCHS_HCTL[24] IWE bit is set to 0x1.
- The MMCi.MMCHS_IE[8] CIRQ_ENABLE bit is set to 0x1.

The wakeup is generated only in smart-idle mode, when the module is in idle mode.

Table 25-8 lists the supported cases in smart-idle mode.

Table 25-8. Smart-Idle Mode and Wake-Up Capabilities

| Mode | MMCi_ICLK Clock | MMCi_FCLK Clock | Wake-Up Event |
|----------------|------------------------------------|------------------------------------|--|
| Card interrupt | May be switched off ⁽¹⁾ | May be switched off ⁽¹⁾ | The module sends an asynchronous wake-up request when a card interrupt on sdmmc_i_dat1 signal is detected. |

⁽¹⁾ The MMC/SD/SDIOi host controller assumes that both clocks may be switched off, regardless of the value set in the MMCi.MMCHS_SYSCONFIG[9:8] CLOCKACTIVITY bit field.

Transition From Smart-Idle Mode to Normal Mode

The MMC/SD/SDIO host controller detects the end of the idle period when the PRCM module deasserts the idle request.

For the wake-up event, there is a corresponding interrupt status in the MMCi.MMCHS_STAT register. The MMC/SD/SDIOi host controller operates the conversion between the wake-up and interrupt (or DMA request) upon exit from smart-idle mode, if the associated enable bit is set in the MMCi.MMCHS_ISE register.

Interrupts and wake-up events have independent enable and disable controls, accessible through the MMCi.MMCHS_HCTL and MMCi.MMCHS_ISE registers. The overall consistency must be ensured by software.

The interrupt status register MMCi.MMCHS_STAT is updated in the CIRQ bit with the event that caused the wake-up when the MMCi.MMCHS_IE[8] CIRQ_ENABLE associated bit is enabled.

Then, the wake-up event at the origin of the transition from smart-idle mode to normal mode is converted into its corresponding interrupt or DMA request. (The MMCi.MMCHS_STAT register is updated and the status of the interrupt signal changes.)

When the idle request from the PRCM module is deasserted, the module switches back to normal mode. The module is fully operational.

Force-Idle Mode

Force-idle mode is enabled when the MMCi.MMCHS_SYSCONFIG[4:3] SIDLEMODE bit field is set to 0x0.

Force-idle mode is an idle mode in which the MMC/SD/SDIOi host controller responds unconditionally to the idle request from the PRCM module. Moreover, in this mode, the MMC/SD/SDIOi host controller unconditionally deasserts interrupts and DMA request lines asserted.

The transition from normal mode to force-idle mode does not affect the bits of the MMCi.MMCHS_STAT register.

In force-idle mode, the interrupt and DMA request lines are deasserted. MMCi_ICLK and MMCi_FCLK can be switched off.

CAUTION

In force-idle mode, an idle request from the PRCM module during a command or a data transfer can lead to an unexpected and unpredictable result. When the module is idle, any access to the module generates an error as long as the MMCi_ICLK clock is alive.

The module exits force-idle mode when the PRCM module deasserts the idle request. Then the module switches back to normal mode. The module is fully operational. Interrupt and DMA request lines are optionally asserted one clock cycle later.

Local Power Management

Table 25-9 describes the power-management features available for the MMC/SD/SDIOi modules.

NOTE: For information about source clock gating and a description of the sleep/wake-up transitions, see Section 3.1.1.1, *Clock Management*, in Chapter 3, *Power, Reset, and Clock Management*.

Table 25-9. Local Power-Management Features

| Feature | Registers | Description |
|-------------------|--------------------------------|---|
| Clock auto gating | MMCHS_SYSCONFIG[0] AUTOIDLE | This bit allows a local power optimization inside the module by gating the MMCi_ICLK clock upon the interface activity, or gating the MMCi_FCLK clock upon the internal activity. |

Table 25-9. Local Power-Management Features (continued)

| Feature | Registers | Description |
|------------------------|--|--|
| Slave idle modes | MMCHS_SYSCONFIG [3:4] SIDLEMODE | Force-idle, no-idle, and smart-idle modes are available. |
| Clock activity | MMCHS_SYSCONFIG [8:9] CLOCKACTIVITY | For configuration details, see Table 25-10 . |
| Master standby modes | MMCHS_SYSCONFIG [12:13] STANDBYMODE | Force-idle, no-idle, and smart-idle modes are available. |
| Global wake-up enable | MMCHS_SYSCONFIG [2] ENAWAKEUP | This bit enables the wake-up feature at the module level. |
| Wake-up sources enable | MMCHS_HCTL register | This register holds one active-high enable bit per event source that is able to generate a wake-up signal. |

Table 25-10. Clock Activity Settings

| CLOCKACTIVITY Values | Clock State When Module is in IDLE State | | Features Available When Module is in IDLE State | Wake-Up Events |
|----------------------|--|-----------|---|----------------|
| | MMCi_ICLK | MMCi_FCLK | | |
| 00 | OFF | OFF | None | Card interrupt |
| 10 | OFF | ON | None | |
| 01 | ON | OFF | None | |
| 11 | ON | ON | All | |

CAUTION

The PRCM module has no hardware means of reading CLOCKACTIVITY settings. Thus, software must ensure consistent programming between the CLOCKACTIVITY and MMCi clock PRCM control bits. For a description of the ClockActivity feature, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

25.4.4 Interrupt Requests

Several internal module events can generate an interrupt. Each interrupt has a status bit, an interrupt enable bit, and a signal status enable:

- The status of each type of interrupt is automatically updated in the MMCi.[MMCHS_STAT](#) register; it indicates which service is required.
- The interrupt status enable bits of the MMCi.[MMCHS_IE](#) register enable or disable the automatic update of the MMCi.[MMCHS_STAT](#) register on an event-by-event basis.
- The interrupt signal enable bits of the MMCi.[MMCHS_ISE](#) register enable or disable the transmission of an interrupt request on the interrupt line MMCi_IRQ (from the MMC/SD/SDIOi host controller to the MPU subsystem INTC) on an event-by-event basis.

If an interrupt status is disabled in the MMCi.[MMCHS_IE](#) register, then the corresponding interrupt request is not transmitted, and the value of the corresponding interrupt signal enable in the MMCi.[MMCHS_ISE](#) register is ignored.

When an interrupt event occurs, the corresponding status bit is automatically set to 0x1 (the MMC/SD/SDIOi host controller updates the status bit) in the MMCi.[MMCHS_STAT](#) register. If a mask is later applied on the interrupt in the MMCi.[MMCHS_ISE](#) register, the interrupt request is deactivated.

When the interrupt source has not been serviced, if the interrupt status is cleared in the MMCi.[MMCHS_STAT](#) register and the corresponding mask is removed from the MMCi.[MMCHS_ISE](#) register, the interrupt status is not asserted again in the MMCi.[MMCHS_STAT](#) register and the MMC/SD/SDIOi host controller does not transmit an interrupt request.

CAUTION

If the buffer write ready (BWR) interrupt or the buffer read ready (BRR) only interrupt are not serviced and are cleared in the MMCi.MMCHS_STAT register, and the corresponding mask is removed, then the MMC/SD/SDIOi host controller waits for the service of the interrupt without updating the status MMCi.MMCHS_STAT register or transmitting an interrupt request.

Table 25-11 lists the event flags, and their mask, that can cause module interrupts.

Table 25-11. Events

| Event Flag | Event Mask | Map to | Description |
|----------------------|------------------------------|----------|---|
| MMCHS_STAT[29] BADA | MMCHS_IE[29] BADA_ENABLE | MMCi_IRQ | <p>Bad access to data space. This bit is set automatically to indicate a bad access to buffer when not allowed:</p> <p>This bit is set during a read access to the data register (MMCHS_DATA) while buffer reads are not allowed (MMCHS_PSTATE[11] BRE = 0).</p> <p>This bit is set during a write access to the data register (MMCHS_DATA) while buffer writes are not allowed (MMCHS_STATE[10] BWE = 0).</p> |
| MMCHS_STAT[28] CERR | MMCHS_IE[28] CERR_ENABLE | MMCi_IRQ | Card error. This bit is set automatically when there is at least one error in a response of type R1, R1b, R6, R5, or R5b. Only bits referenced as type E (error) in the status field in the response can set a card status error. An error bit in the response is flagged only if the corresponding bit in the card status response error MMCHS_CSRE is set. There is no card error detection for the auto CMD12 command. |
| MMCHS_STAT[25] ADMAE | MMCHS_IE[25] ADMAE_ENABLE | MMCi_IRQ | ADMA error. This bit is set when the host controller detects errors during an ADMA-based data transfer. The state of the ADMA at an error occurrence is saved in the ADMA error status register. In addition, the host controller generates this interrupt when it detects invalid descriptor data (Valid=0) at the ST_FDS state. |
| MMCHS_STAT[24] ACE | MMCHS_IE[24] ACE_ENABLE | MMCi_IRQ | Auto CMD12 error. This bit is set automatically when one bit in the auto CMD12 error status register changes from 0 to 1. |
| MMCHS_STAT[22] DEB | MMCHS_IE[22] DEB_ENABLE | MMCi_IRQ | Data end bit error. This bit is set automatically when detecting a 0 at the end bit position of read data on the DAT line or at the end position of the CRC status in write mode. |
| MMCHS_STAT[21] DCRC | MMCHS_IE[21] DCRC_ENABLE | MMCi_IRQ | Data CRC error. This bit is set automatically when there is a CRC16 error in the data phase response following a block read command or if there is a 3-bit CRC status difference of a position 010 token during a block write command. |
| MMCHS_STAT[20] DTO | MMCHS_IE[20] DTO_ENABLE | MMCi_IRQ | <p>Data time-out error. This bit is set automatically according to the following conditions:</p> <ul style="list-style-type: none"> – Busy time-out for R1b, R5b response type – Busy time-out after write CRC status – Write CRC status time-out – Read data time-out |
| MMCHS_STAT[19] CIE | MMCHS_IE[19] CIE_ENABLE | MMCi_IRQ | Command index error. This bit is set automatically when the response index differs from the corresponding command index previously emitted. The check is enabled through the MMCHS_CMD[20] CICE bit. |

Table 25-11. Events (continued)

| Event Flag | Event Mask | Map to | Description |
|--------------------------------------|---|----------|--|
| MMCHS_STAT [18] CEB | MMCHS_IE [18] CEB_ENABLE | MMCi_IRQ | Command end bit error. This bit is set automatically when detecting a 0 at the end bit position of a command response. |
| MMCHS_STAT [17] CCRC | MMCHS_IE [17] CCRC_ENABLE | MMCi_IRQ | Command CRC error. This bit is set automatically when there is a CRC7 error in the command response. CRC check is enabled through the MMCHS_CMD [19] CCCE bit. |
| MMCHS_STAT [16] CTO | MMCHS_IE [16] CTO_ENABLE | MMCi_IRQ | Command time-out error. This bit is set automatically when no response is received within 64 clock cycles from the end bit of the command. For commands that reply within five clock cycles, the time-out is still detected at 64 clock cycles. |
| MMCHS_STAT [15] ERRI | MMCHS_IE [15] ERRI_ENABLE | MMCi_IRQ | Error interrupt. If any of the bits in the error interrupt status register (MMCHS_STAT [24:15]) are set, this bit is set to 1. |
| MMCHS_STAT [10] BSR | MMCHS_IE [10] BSR_ENABLE | MMCi_IRQ | Boot status received interrupt. This bit is set automatically when the MMCHS_CON [18] BOOT_CF0 bit is set to 0x1 or 0x2 and a boot status is received on the dat0 line. This interrupt is useful only for the MMC card. |
| MMCHS_STAT [8] CIRQ | MMCHS_IE [8] CIRQ_ENABLE | MMCi_IRQ | Card interrupt. This bit is used only for SD, SDIO, and CE-ATA cards. In 1-bit mode, the interrupt source is asynchronous (can be a source of asynchronous wakeup). In 4-bit mode, the interrupt source is sampled during the interrupt cycle. In CE-ATA mode, the interrupt source is detected when the card drives the CMD line to 0 during one cycle after data transmission end. |
| MMCHS_STAT [5] BRR | MMCHS_IE [5] BRR_ENABLE | MMCi_IRQ | Buffer read ready. This bit is set automatically during a read operation to the card (see class 2 block-oriented read commands) when one block specified by the MMCHS_BLK [10:0] BLEN bit field is completely written in the buffer. It indicates that the memory card has filled out the buffer and that the LH needs to empty the buffer by reading it. |
| MMCHS_STAT [4] BWR | MMCHS_IE [4] BWR_ENABLE | MMCi_IRQ | Buffer write ready. This bit is set automatically during a write operation to the card (see class 4 block-oriented write command) when the host can write a complete block as specified by the MMCHS_BLK [10:0] BLEN bit field. It indicates that the memory card has emptied one block from the buffer and that the LH can write one block of data into the buffer. |
| MMCHS_STAT [3] DMA | MMCHS_IE [3] DMA_ENABLE | MMCi_IRQ | DMA interrupt. This status is set when an interrupt is required in the ADMA instruction and after the data transfer completes. |
| MMCHS_STAT [2] BGE | MMCHS_IE [2] BGE_ENABLE | MMCi_IRQ | Block gap event. When a stop at the block gap is requested (MMCHS_HCTL [16] SBGR), this bit is automatically set when transaction is stopped at the block gap during a read or write operation. |
| MMCHS_STAT [1] TC | MMCHS_IE [1] TC_ENABLE | MMCi_IRQ | Transfer completed. This bit is always set when a read/write transfer is complete or between two blocks when the transfer is stopped because of a stop at block gap request (MMCHS_HCTL [16] SBGR). – In read mode: This bit is automatically set on completion of a read transfer (MMCHS_PSTATE [9] RTA). |

Table 25-11. Events (continued)

| Event Flag | Event Mask | Map to | Description |
|----------------------------------|---------------------------------------|----------|--|
| | | | – In write mode: This bit is automatically set on completion of the DAT line use (MMCHS_PSTATE[2] DLA). |
| MMCHS_STAT[0] CC | MMCHS_IE[0] CC_ENABLE | MMCi_IRQ | Command complete. This bit is set when a 1-to-0 transition occurs in the register command inhibit (MMCHS_PSTATE[0] CMDI). If the command is a type for which no response is expected, then the command complete interrupt is generated at the end of the command. A command time-out error (MMCHS_STAT[16] CTO) has higher priority than command complete (MMCHS_STAT[0] CC). If a response is expected but none is received, then a command time-out error is detected and signaled, instead of the command complete interrupt. |

NOTE: To send an interrupt request to the MMCi_IRQ line, the mask/unmask bit must be set in the MMCi.[MMCHS_IE](#) and MMCi.[MMCHS_ISE](#) registers.

The MMC/SD/SDIOi host controller supports interrupt-driven operation and polling.

25.4.4.1 Interrupt-Driven Operation

An interrupt enable bit must be set in the MMCi.[MMCHS_IE](#) register to enable the module internal source of interrupt.

When an interrupt event occurs, the single interrupt line is asserted and the LH must:

1. Read the MMCi.[MMCHS_STAT](#) register to identify which event occurred.
2. Write 1 into the corresponding bit of the MMCi.[MMCHS_STAT](#) register to clear the interrupt status and release the interrupt line (if a read is done after this write, this returns 0).

NOTE: In the MMCi.[MMCHS_STAT](#) register, the card interrupt (CIRQ) and error interrupt (ERRI) bits cannot be cleared.

The MMCi.[MMCHS_STAT\[8\] CIRQ](#) status bit must be masked by disabling the MMCi.[MMCHS_IE\[8\] CIRQ_ENABLE](#) bit (set to 0x0), and then the interrupt routine must clear the SDIO interrupt source in the SDIO card common control register (CCCR).

The MMCi.[MMCHS_STAT\[15\] ERRI](#) bit is automatically cleared when all status bits in the MMCi.[MMCHS_STAT\[31:16\]](#) bit field are cleared.

25.4.4.2 Polling

When the interrupt capability of an event is disabled in the MMCi.[MMCHS_ISE](#) register, the interrupt line is not asserted:

- Software can poll the status bit in the MMCi.[MMCHS_STAT](#) register to detect when the corresponding event occurs.
- Writing 1 into the corresponding bit of the MMCi.[MMCHS_STAT](#) register clears the interrupt status and does not affect the interrupt line state.

NOTE: Refer to the previous note concerning clearing of the CIRQ and ERRI bits.

25.4.5 DMA Modes

Two DMA managements can be used to load data from memory to the internal buffer of the controller (or vice versa). These modes are exclusive and depend on the module integration.

- DMA master mode

DMA master mode is selected by setting the [MMCHS_CON\[20\]](#) DMA_MNS bit to 1. In this case, the controller has direct access to data using a specific algorithm called ADMA2 (prevents the system from being interrupted). Data are exchanged using the L3 master interface, which supports burst accesses to maximize throughput.

NOTE: This mode is supported only by modules connected to the L3 interconnect. See [Section 25.1, MMC/SD/SDIO Overview](#), for more information and/or check the value of the [MMCHS_HL_HWINFO\[0\]](#) MADMA_EN bit.

This mode is available for modules MMC1 and MMC2.

- DMA slave mode

DMA slave mode is selected by setting the [MMCHS_CON\[20\]](#) DMA_MNS bit to 0. In this case, the controller is slave on the DMA transaction managed by two separated requests (MMCi_DMA_TX and MMcI_DMA_RX).

NOTE: This mode is the only mode supported by modules that are not connected to the L3 interconnect (regardless of the value of the [MMCHS_CON\[20\]](#) DMA_MNS bit). See [Section 25.1, MMC/SD/SDIO Overview](#), for more information and/or to check the value of the [MMCHS_HL_HWINFO\[0\]](#) MADMA_EN bit.

This mode is available for all MMC modules.

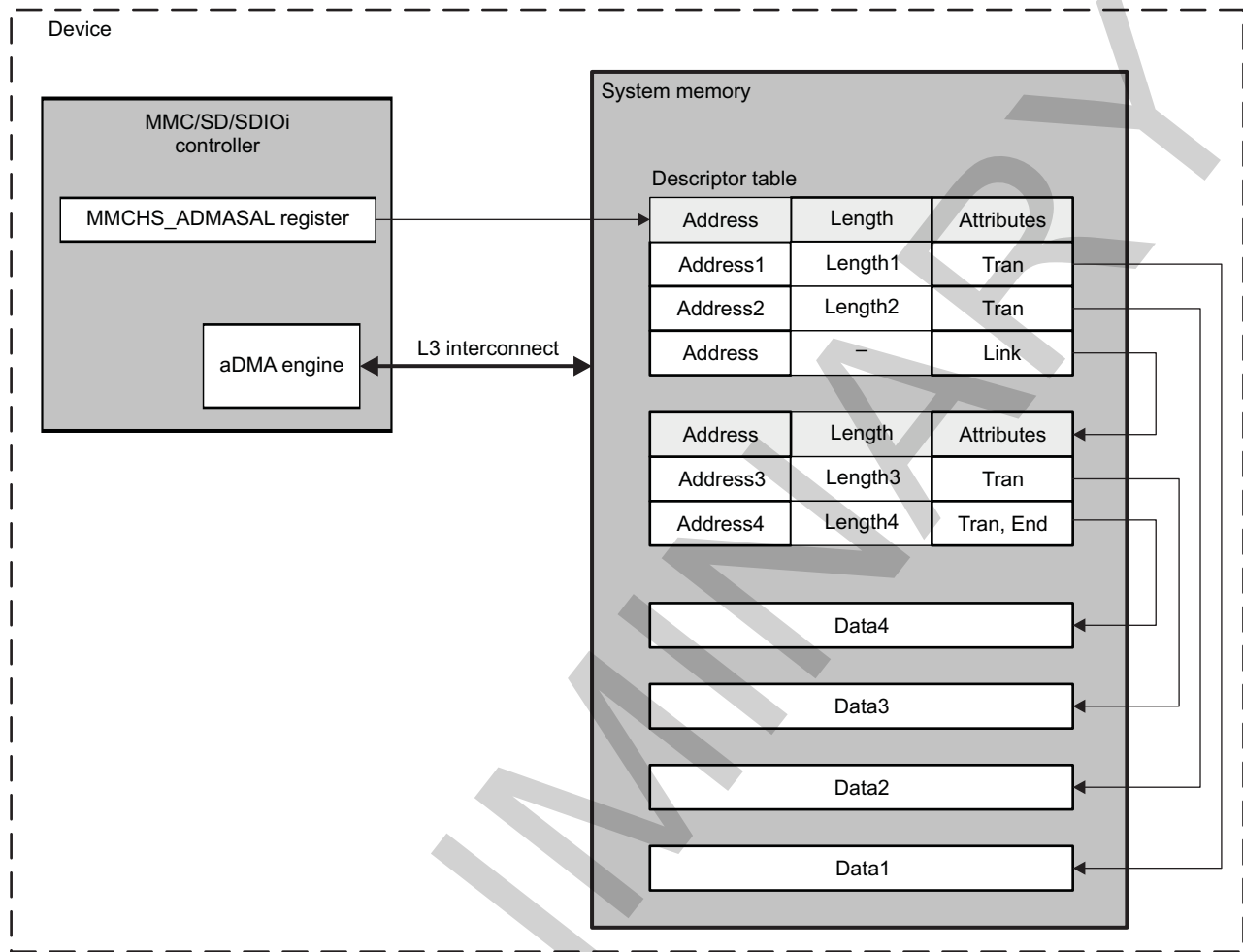
25.4.5.1 Master DMA Operations

The MMC/SD/SDIOi host controller has direct access to the internal data. This feature is called advanced DMA (ADMA). It follows a specific algorithm (ADMA2) defined by an instruction in memory that starts at an address previously loaded in the [MMCHS_ADMASAL](#) register before any data command issued to the MMC card. Only 32-bit address spacing is supported by the controller for data storage.

NOTE: This mode is supported only by modules connected to the L3 interconnect. See [Section 25.1, MMC/SD/SDIO Overview](#), for more information and/or to check the value of the [MMCHS_HL_HWINFO\[0\]](#) MADMA_EN bit.

These instructions must be loaded by software in a 32-bit-addressed descriptor table in system memory, as shown in [Figure 25-18](#). In this case the [MMCHS_ADMASAL](#) register is used as the program address pointer

Figure 25-18. ADMA Block Diagram Overview



mmchs-018

25.4.5.1.1 Descriptor Table Description

Each descriptor line contains an address, a length, and attributes fields. The attributes define which operation will be processed. Every descriptor line is a 64-bit-wide register that is fetched in the controller using the L3 master interface, and requires two 32-bit accesses to memory.

Table 25-12 shows the structure of a descriptor line.

Table 25-12. Descriptor Line Overview

| Address Field | | Length | | Reserved | | Attributes | | | | |
|----------------|----|---------------|----|----------|---|------------|------|---|-----|-----------|
| 63 | 32 | 31 | 16 | 15 | 6 | 5 | 4 | 3 | 2 | 1 0 |
| 32-bit Address | | 16-bit Length | | 0x0 | | Act2 | Act1 | 0 | Int | Ent Valid |

The attribute of the descriptor line is divided into two parts:

- Attributes[5:4]: The action to be processed by the ADMA engine
- Attributes[3:0]: Additional parameters characterizing the behavior of the ADMA engine

Table 25-13 describes the available actions of a descriptor line.

Table 25-13. Available Actions of a Descriptor Line

| Act2 | Act1 | Symbol | Comment | Operation |
|------|------|--------|-----------------|--|
| 0 | 0 | Nop | No operation | Do not execute the current line and go to the next line. |
| 0 | 1 | Rsv | Reserved | Reserved action. Behaves the same as the Nop command. |
| 1 | 0 | Tran | Transfer data | Transfer data of one descriptor line. |
| 1 | 1 | Link | Link descriptor | Link to another descriptor. |

Table 25-14 describes the additional parameters of a descriptor line.

Table 25-14. Additional Parameters of a Descriptor Line

| Bit | Description |
|-------|--|
| Valid | Valid = 1 indicates that this descriptor line is effective. If Valid = 0, an ADMA error interrupt is generated and the ADMA is stopped. This prevents runaways. |
| End | End = 1 indicates the end of a descriptor. The transfer-complete interrupt is generated when the operation of the descriptor line is complete. |
| Int | Int = 1 generates a DMA interrupt when the operation of the descriptor line is complete. |

25.4.5.1.2 Requirements for Descriptors

The following sections discuss restrictions and tips on how to correctly configure the descriptors to be used by the ADMA engine.

25.4.5.1.2.1 Data Length

There are three requirements to program descriptors:

- The minimum unit of address is 4 bytes.
- The maximum data length of each descriptor line is less than 64KB.
- Total length = Length₁ + Length₂ + Length₃ + ... + Length_n must be a multiple of the block size.

If the total length of a descriptor is not a multiple of the block size, data transfer with the ADMA engine may not have been terminated. In this case, the controller returns a data time-out event and the transfer is aborted.

The block count register (the [MMCHS_BLK\[31:16\]](#) NBLK bit field) is defined as 16 bits and limits data transfers to a maximum of 65,535 blocks. If the ADMA data transfer size is less than or equal to the 65,535-block transfer, the block count register can be used. In this case, the total length of the descriptor table must be equivalent to "block size" by "block count." If the ADMA data transfer is greater than 65,535 blocks, the block count register must be disabled by setting the block count enable bit (the [MMCHS_CMD\[1\]](#) BCE bit) to 0. In this case, the length of the data transfer is not designated by the block count but by the descriptor table.

NOTE: The timing for detecting the last block on the SD bus may differ, which affects control of the read transfer active ([MMCHS_PSTATE\[9\]](#) RTA), write transfer active ([MMCHS_PSTATE\[8\]](#) WTA), and DAT line active ([MMCHS_PSTATE\[2\]](#) DLA) bits. In case of a read operation, more blocks than required may be read from the card. The host driver must ignore an out-of-range error if the read operation is for the last block of the memory area.

25.4.5.1.2.2 Supported Features

The ADMA engine does not support the suspend/resume function. However, the stop and continue functions are available.

When the stop-at-block-gap-request (the [MMCHS_HCTL\[16\]](#) SBGR bit) is set during the ADMA operation, the block gap event interrupt is generated when the ADMA is stopped at block gap (the [MMCHS_STAT\[2\]](#) BGE bit). The host controller must stop the ADMA read operation by using read wait or by stopping the SD clock. While stopping ADMA, SD commands cannot be issued.

25.4.5.1.2.3 Error Generation

When an error occurs during an ADMA transfer, the ADMA operation is stopped and the ADMA error interrupt is generated. The ADMA error state field (the [MMCHS_ADMAES\[1:0\]](#) AES bit field) holds the state of the ADMA when it is stopped. Software can identify the erroneous descriptor line by using the following method:

- If ADMA stopped at ST_FDS state, the ADMA system address register ([MMCHS_ADMASAL](#)) points to the erroneous descriptor line.
- If ADMA stopped at ST_TFR or ST_STOP state, the ADMA system address register points to the descriptor line following the erroneous one.

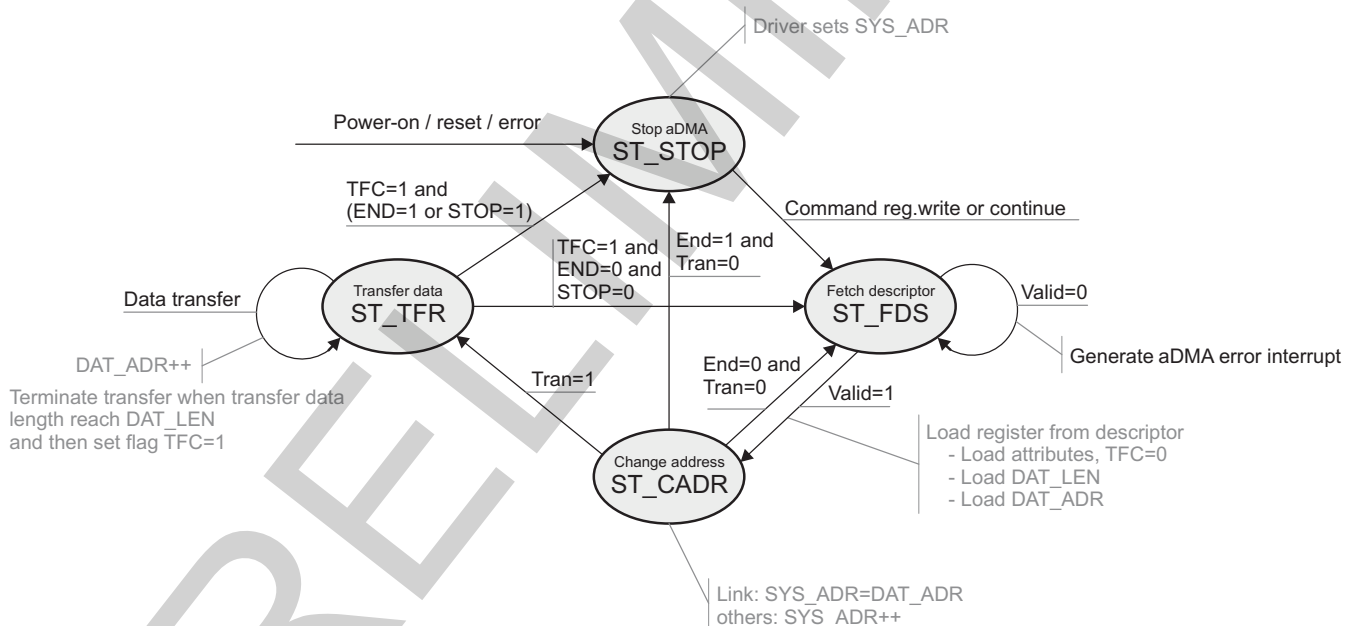
25.4.5.1.3 Advanced DMA Description

The ADMA is a DMA controller embedded in each eMMC controller. It can be seen as a small sequencer that fetches a descriptor line and executes the corresponding action. The base address of the descriptor table is stored in the [MMCHS_ADMASAL](#) register.

NOTE: Software must write the base address of the descriptor table in the [MMCHS_ADMASAL](#) register before the first use of the ADMA engine.

The ADMA program is executed according to descriptor attributes (see [Section 25.4.5.1.1, Descriptor Table Description](#)) and an FSM, as shown in [Figure 25-19](#).

Figure 25-19. ADMA Finite State-Machine



mmchs-019

[Table 25-15](#) describes each state of the ADMA FSM.

Table 25-15. ADMA2 States Description

| State Name | Operation |
|------------------------------|---|
| ST_FDS (fetch descriptor) | ADMA2 fetches a descriptor line and sets parameters in internal registers. It then goes to the ST_CADR state. |
| ST_CADR (change address) | Link operation loads another descriptor address to the ADMA system address register (MMCHS_ADMASAL). In other operations, the ADMA system address register is incremented to point to the next descriptor line. NOTE: ADMA2 does not stop at this state if some errors occur. |

Table 25-15. ADMA2 States Description (continued)

| State Name | Operation |
|---------------------------|--|
| ST_TFR (transfer data) | Data transfer of one descriptor line is executed between system memory and the SD card: <ul style="list-style-type: none"> • If data transfer continues (End = 0) go to ST_FDS state. • If data transfer completes, go to ST_STOP state. |
| ST_STOP (stop DMA) | ADMA2 stays in this state in the following cases: <ul style="list-style-type: none"> • After power on reset (POR) or software reset • All descriptor data transfers are complete. If a new ADMA operation is stated by writing the command register, go to ST_FDS state. |

Table 25-16 gives the description of each symbol used in the ADMA FSM state-machine (see Figure 25-19).

Table 25-16. ADMA FSM Symbol Definition

| Symbol | Definition |
|-----------|-----------------------------------|
| SYS_ADR | ADMA system address register |
| SYS_ADR++ | Point to next descriptor line |
| DAT_ADR | Data address register (internal) |
| DAT_LEN | Data length register (internal) |
| TFC | Transfer complete flag (internal) |
| STOP | Stop-at-block-gap request |

25.4.5.2 Slave DMA Operations

The MMC/SD/SDIOi host controller can be interfaced with a DMA controller. At the system level, the advantage is to discharge the LH of the data transfers. The module does not support wide DMA access (above 1024 bytes) for SD cards, as specified in the *SD Card Specification* and *SD Host Controller Standard Specification*.

NOTE: This mode is implied by modules that are not connected to the L3 interconnect (regardless of the value of the [MMCHS_CON\[20\]](#) DMA_MNS bit). See [Section 25.4.5.1, Master DMA Operations](#), for more information and/or to check the value of the [MMCHS_HL_HWINFO\[0\]](#) MADMA_EN bit.

The DMA request is issued if the following conditions are met:

- The MMCI.MMCHS_CMD[0] DE bit is set to 1 to trigger the initial DMA request (the write must be done when running the data transfer command).
- A command was emitted on the sdmmci_cmd line.
- There is enough space in the buffer of the MMC/SD/SDIOi host controller to write an entire block (BLEN writes).

25.4.5.2.1 DMA Receive Mode

In a DMA block read operation (single or multiple), the request signal MMCI_DMA_RX is asserted to its active level when a complete block is written in the buffer. The block size transfer is specified in the MMCI.MMCHS_BLK[10:0] BLEN bit field.

MMCI_DMA_RX is deasserted to its inactive level when the sDMA reads one word from the buffer.

Only one request is sent per block; the DMA controller can make a 1-shot read access or several DMA bursts, in which case the DMA controller must manage the number of burst accesses, according to the BLEN field block size.

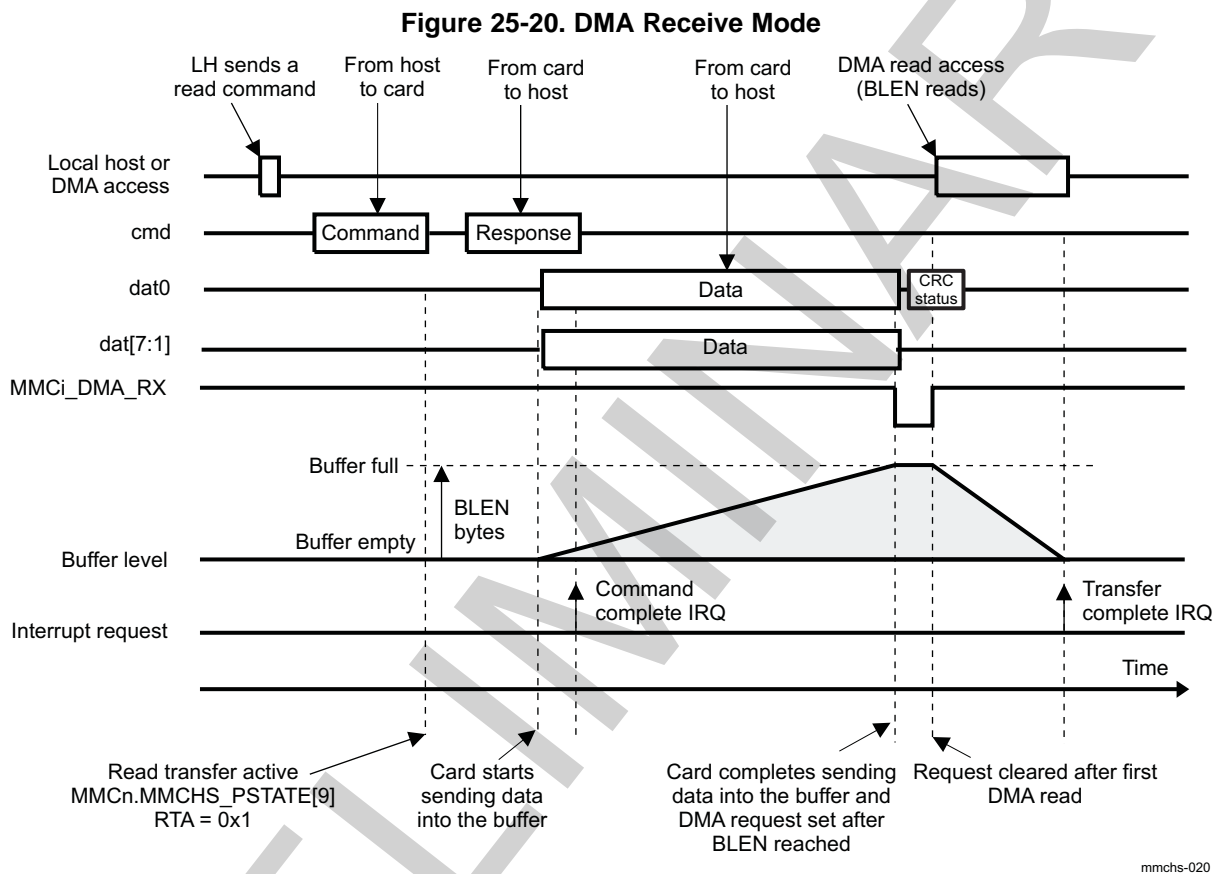
New DMA requests are internally masked if the sDMA has not read exactly BLEN bytes and a new complete block is not ready. Because DMA accesses are 32-bit accesses, the number of sDMA read is Integer(BLEN/4) + 1.

The receive buffer never overflows. In multiple block transfers for block sizes larger than 512 bytes, when the buffer becomes full, the `sdmhci_clk` clock signal (provided to the card) is momentarily stopped until the sDMA or the MPU performs a read access, which reads a complete block in the buffer.

To summarize:

- DMA transfer size = BLEN buffer size in one shot or by burst
- One DMA request per block

Figure 25-20 shows DMA receive mode.



25.4.5.2.2 DMA Transmit Mode

In a DMA block write operation (single or multiple), the request signal `MMCi_DMA_TX` is asserted to its active level when a complete block is to be written to the buffer. The block size transfer is specified in the `MMCi.MMCHS_BLK[10:0]` BLEN bit field.

`MMCi_DMA_TX` is deasserted to its inactive level when the sDMA writes one word to the buffer.

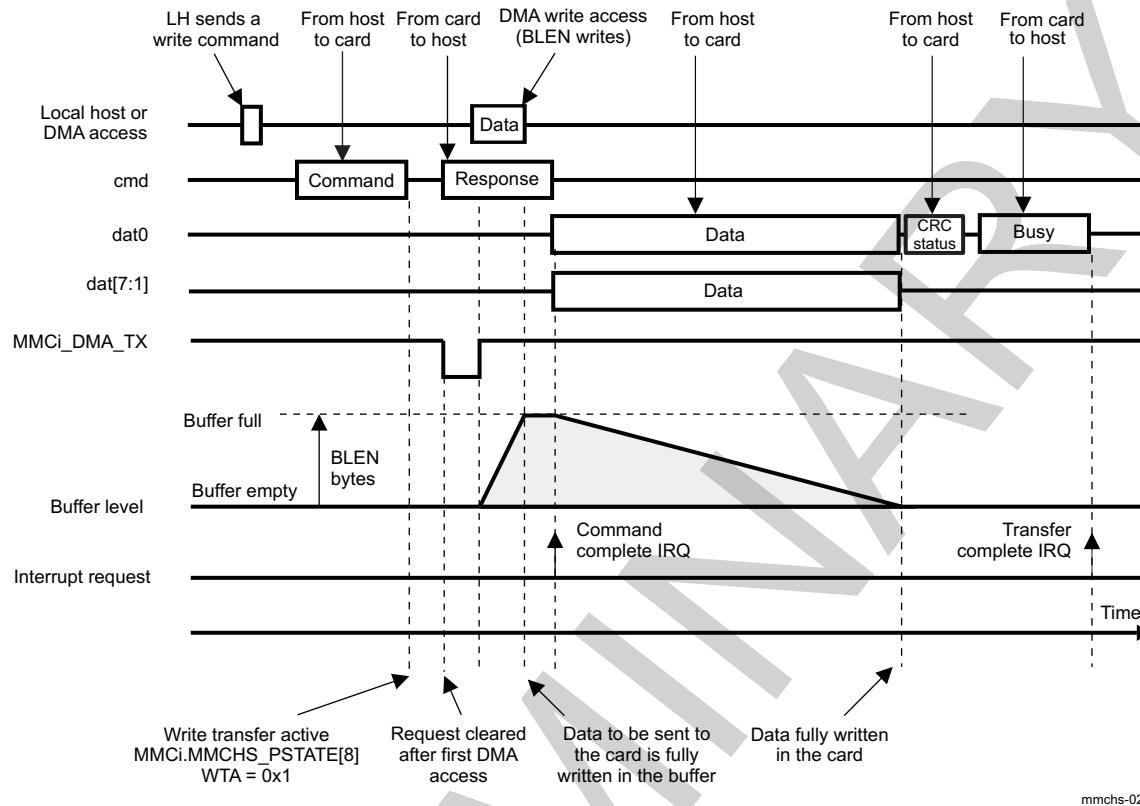
Only one request is sent per block; the DMA controller can make a 1-shot write access or multiple write DMA bursts, in which case the DMA controller must manage the number of burst accesses, according to the BLEN field block size.

New DMA requests are internally masked if the sDMA has not written exactly BLEN bytes (because DMA accesses are 32-bit accesses, the number of sDMA reads is $\text{Integer}(\text{BLEN}/4) + 1$) and if there is not enough memory space to write a complete block in the buffer.

To summarize:

- DMA transfer size = BLEN buffer size in one shot or by burst
- One DMA request per block

Figure 25-21 shows DMA transmit mode.

Figure 25-21. DMA Transmit Mode

25.4.6 Mode Selection

The MMC/SD/SDIO host controller can be used in two modes: MMC and SD/SDIO. It has been designed to be the most transparent with the type of card.

The type of the card connected is differentiated by the software initialization procedure. Software identifies the type of card connected during software initialization. For each card type, there are corresponding commands. Some commands are not supported by all cards. For more information, see the *Multimedia Card System Specification*, *SD Memory Card Specifications*, and *SDIO Card Specification, Part E1*.

The purpose of the module is to transfer commands and data to whatever card is connected, respecting the protocol of the connected card.

Writes and reads to the card must respect the appropriate protocol of that card.

25.4.7 Buffer Management

25.4.7.1 Data Buffer

The MMC/SD/SDIOi host controller uses a data buffer. This buffer transfers data from one data bus (interconnect) to another data bus (SD/SDIO or MMC card bus) and vice versa.

The buffer is the heart of the interface and ensures the transfer between the two interfaces (interconnect and the card).

To enhance performance, the data buffer is completed by a prefetch register and a post-write buffer that are not accessible by the host controller.

The read access time of the prefetch register is faster than that of the data buffer. The prefetch register allows data to be read from the data buffer at an increased speed by preloading data into the prefetch register.

The entry point of the data buffer, prefetch buffer, and post-write buffer is the 32-bit register MMCi.MMCHS_DATA register. A write access to the MMCi.MMCHS_DATA register followed by a read access from the MMCi.MMCHS_DATA register corresponds to a write access to the post-write buffer followed by a read access to the prefetch buffer. As a consequence, it is normal that the data of the write access to the MMCi.MMCHS_DATA register and the data of the read access to the MMCi.MMCHS_DATA register are different.

The number of 32-bit accesses to the MMCi.MMCHS_DATA register that are needed to read (or write) a data block with a size of the MMCi.MMCHS_BLK[10:0] BLEN bit field equals the rounded up result of BLEN divided by 4.

The maximum block size supported by the host controller is hard-coded in the MMCi.MMCHS_CAPA[17:16] MBL bit field and cannot be changed.

A read access to the MMCi.MMCHS_DATA register is allowed only when the buffer read-enable status is set to 1 (the MMCi.MMCHS_PSTATE[11] BRE bit); otherwise, a bad access (the MMCi.MMCHS_STAT[29] BADA bit) is signaled.

A write access to the MMCi.MMCHS_DATA register is allowed only when the buffer write-enable status is set to 1 (the MMCi.MMCHS_PSTATE[10] BWE bit); otherwise, a bad access (the MMCi.MMCHS_STAT[29] BADA bit) is signaled and the data are not written.

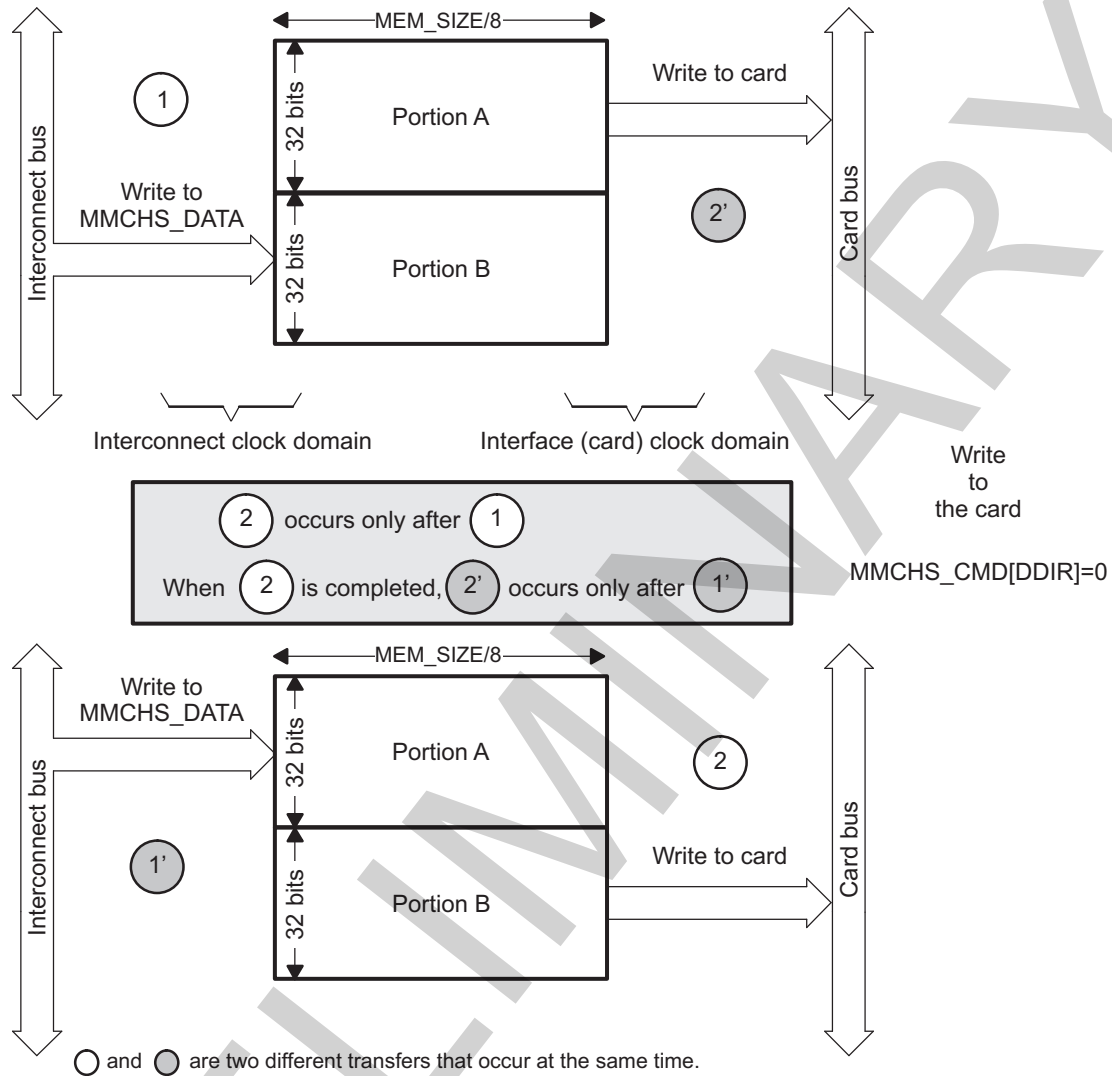
The data buffer has two modes of operation to store and read of the first and second portions of the data buffer:

- When the size of the data block to transfer is less than or equal to MEM_SIZE/2 (in double-buffering), two data transfers can occur at the same time from one data bus to the other data bus, and vice versa. The MMC/SD/SDIO host controller uses the two portions of the data buffer in a ping-pong manner so that storing and reading the first and second portions of the data buffer are automatically interchanged from time to time so that data may be read from one portion (for instance, through a DMA read access on the interconnect bus) while data (for instance, from the card) are being stored into the other portion, and vice versa. When BLEN is less than or equal to 0x200 (that is, less than or equal to 512 bytes), each of the two portions of the buffer that can be used have a size of BLEN (that is, 32 bits × BLEN divided by 4). No more than this total size of 2 × 32 bits × BLEN divided by 4 can be used.

CAUTION

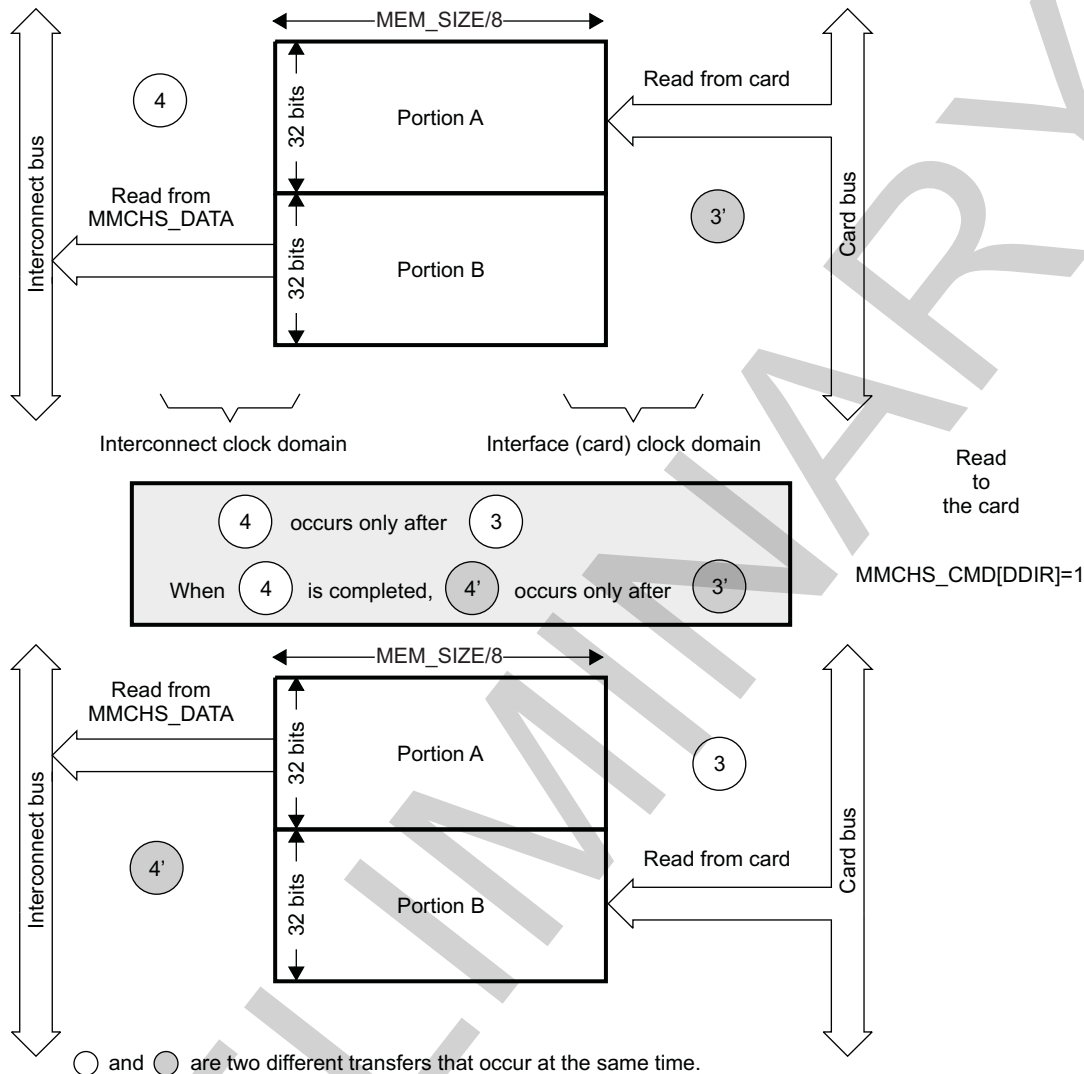
The MMCi.MMCHS_CMD[4] DDIR bit must be configured before a transfer to indicate the direction of the transfer.

Figure 25-22 and Figure 25-23 show the buffer management for a write and for a read, respectively.

Figure 25-22. Buffer Management for a Write

mmchs-022

Figure 25-23. Buffer Management for a Read



mmchs-023

- When the size of the data block to transfer is larger than $\text{MEM_SIZE}/2$, only one data transfer can occur at a time from one data bus to the other data bus. The MMC/SD/SDIOi host controller uses the entire data buffer as a single portion.

In this mode, a bad access (the MMCi.MMCHS_STAT[29] BADA bit) is signaled when two data transfers occur at the same time from one data bus to the other data bus, and vice versa.

25.4.7.1.1 Memory Size, Block Length, and Buffer-Management Relationship

The maximum block length and buffer management that can be targeted by the system depend on the memory depth setting (see Table 25-17).

NOTE: Double-buffering is always the buffer management for larger memory depth.

Table 25-17. Memory Size, BLLEN, and Buffer Relationship

| Memory Size (MMCHS_HL_HWINFO[5:2] MEM_SIZE in bytes) | 512 | 1024 |
|---|-----|------|
| Maximum block length supported | 512 | 1024 |

Table 25-17. Memory Size, BLEN, and Buffer Relationship (continued)

| Memory Size (MMCHS_HL_HWINFO [5:2] MEM_SIZE in bytes) | 512 | 1024 |
|---|----------|--------------|
| Double-buffering for maximum block length | N/A | BLEN=512 |
| Single-buffering for block length | BLEN=512 | 512BLEN=1024 |

NOTE: For single-buffering management, throughput on the MMC bus interface deteriorates in multiblock transfers, because the controller must wait for the filling or emptying of the buffer between each block transfer on the MMC bus. The clock is maintained on write MMC transfers (the [MMCHS_CMD](#)[3] DDIR bit is 0) and halted on read MMC transfers (the [MMCHS_CMD](#)[3] DDIR bit is 1).

25.4.7.1.2 Data Buffer Status

The data buffer status is defined in the following interrupt status register and status register:

- Interrupt status registers:
 - MMCi.[MMCHS_STAT](#)[29] BADA: Bad access to data space
 - MMCi.[MMCHS_STAT](#)[5] BRR: Buffer read ready
 - MMCi.[MMCHS_STAT](#)[4] BWR: Buffer write ready
- Status registers:
 - MMCi.[MMCHS_PSTATE](#)[11] BRE: Buffer read enable
 - MMCi.[MMCHS_PSTATE](#)[10] BWE: Buffer write enable

25.4.8 Transfer Process

The process of a transfer depends on the type of command. It can be with or without a response, and with or without data.

25.4.8.1 Different Types of Commands

Different types of commands are specific to the MMC, SD, and SDIO cards. For more information, see the *Multimedia Card System Specification*, *SD Memory Card Specifications*, *SDIO Card Specification, Part E1*, or *SD Card Specification, Part A2*, *SD Host Controller Standard Specification*.

25.4.8.2 Different Types of Responses

Different types of responses are specific to the MMC, SD, and SDIO cards. For more information, see the *Multimedia Card System Specification*, *SD Memory Card Specifications*, *SDIO Card Specification, Part E1*, or the *SD Card Specification, Part A2*, *SD Host Controller Standard Specification*.

[Table 25-18](#) describes how the MMC, SD, and SDIO responses are stored in the [MMCHS_RSPxx](#) registers.

Table 25-18. MMC, SD, SDIO Responses in the [MMCHS_RSPxx](#) Registers

| Kind of Response | Response Field | Response Register |
|--|---|--|
| R1, R1b (normal response), R3, R4, R5, R5b, R6, R7 | RESP [39:8] ⁽¹⁾ | MMCHS_RSP10 [31:0] |
| R1b (Auto CMD12 response) | RESP [39:8] ⁽¹⁾ | MMCHS_RSP76 [31:0] |
| R2 | RESP [127:0] ⁽¹⁾ | MMCHS_RSP76 [31:0] MMCHS_RSP54 [31:0] MMCHS_RSP32 [31:0] MMCHS_RSP10 [31:0] |

⁽¹⁾ RESP refers to the command response format described in the specifications mentioned.

When the host controller modifies part of the MMCHS_RSPxx registers, it preserves the unmodified bits.

The host controller stores the Auto CMD12 response in the [MMCHS_RSP76](#)[31:0] register because the host controller may have a multiple block data DAT line transfer executing concurrently with a command. This lets the host controller avoid overwriting the Auto CMD12 response with the command response stored in the [MMCHS_RSP10](#) register, and vice versa.

25.4.9 Transfer or Command Status and Errors Reporting

Flags in the MMC/SD/SDIOi host controller show the status of communication with the card:

- A time-out (of a command, data, or response)
- A CRC error

Error conditions generate interrupts. For more information, see [Table 25-19](#) and the register description.

Table 25-19. CC and TC Values Upon Error Detected

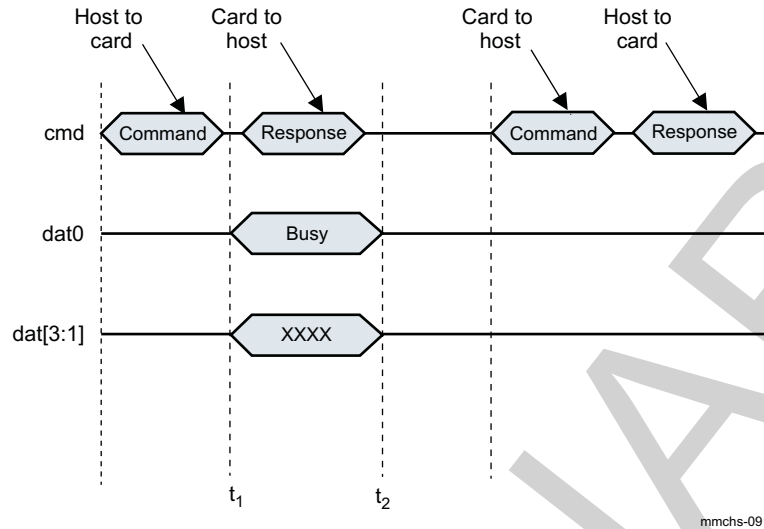
| Error Hold in MMCHS_STAT | CC | TC | Comments |
|--------------------------|----|----|--|
| 29 BADA | | | No dependency with CC or TC BADA is related to the MMCHS_DATA register accesses. Its assertion does not depend on the ongoing transfer. |
| 28 CERR | 1 | | CC is set upon CERR. |
| 22 DEB | | 1 | TC is set upon DEB. |
| 21 DCRC | | 1 | TC is set upon DCRC. |
| 20 DTO | | | DTO and TC are mutually exclusive. DCRC and DEB cannot occur with DTO. |
| 19 CIE | 1 | | CC is set upon CIE. |
| 18 CEB | 1 | | CC is set upon CEB. |
| 17 CCRC | 1 | | CC can be set upon CCRC. See CTO comment. |
| 16 CTO | | | CTO and CC are mutually exclusive. CIE, CEB, and CERR cannot occur with CTO. CTO can occur at the same time as CCRC: It indicates a command abort due to contention on the CMD line. In this case no CC appears. |

A [MMCHS_STAT](#)[21] DCRC event can be asserted in the following conditions:

- Busy time-out for R1b, R5b response type
- Busy time-out after write CRC status
- Write CRC status time-out
- Read data time-out
- Boot acknowledge time-out

25.4.9.1 Busy Time-Out for R1b, R5b Response Type

[Figure 25-24](#) shows the DCRC event condition asserted when there is busy time-out for Rb1, R5b response.

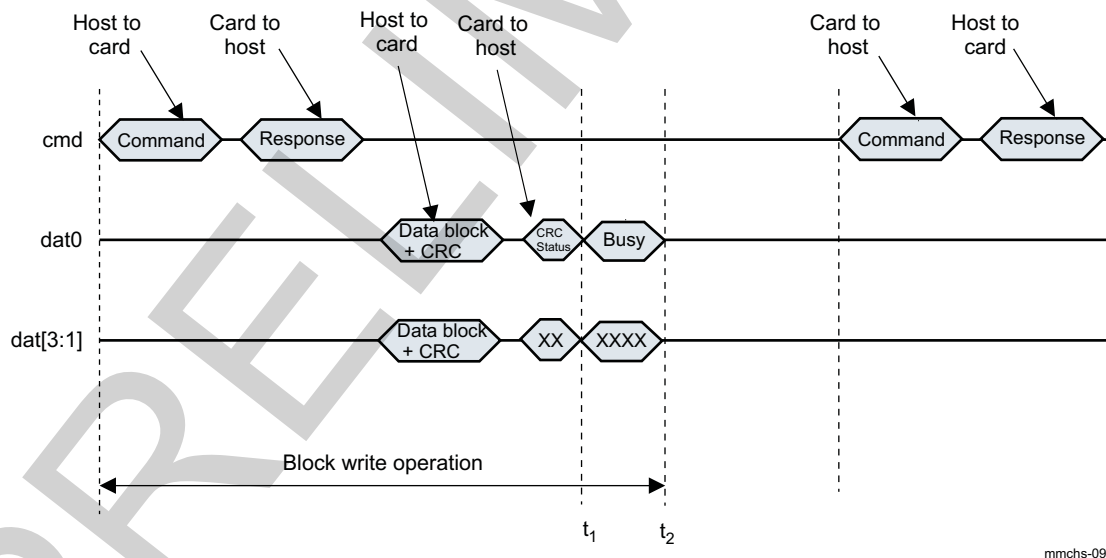
Figure 25-24. Busy Time-Out for R1b, R5b Response Type

t_1 – Data time-out counter is loaded and starts after R1b, R5b response type.

t_2 – Data time-out counter stops and if it is 0, the [MMCHS_STAT\[21\]](#) DCRC bit is generated.

25.4.9.2 Busy Time-Out After Write CRC Status

[Figure 25-25](#) shows the DCRC event condition asserted when there is busy time-out after write CRC status.

Figure 25-25. Busy Time-Out After Write CRC Status

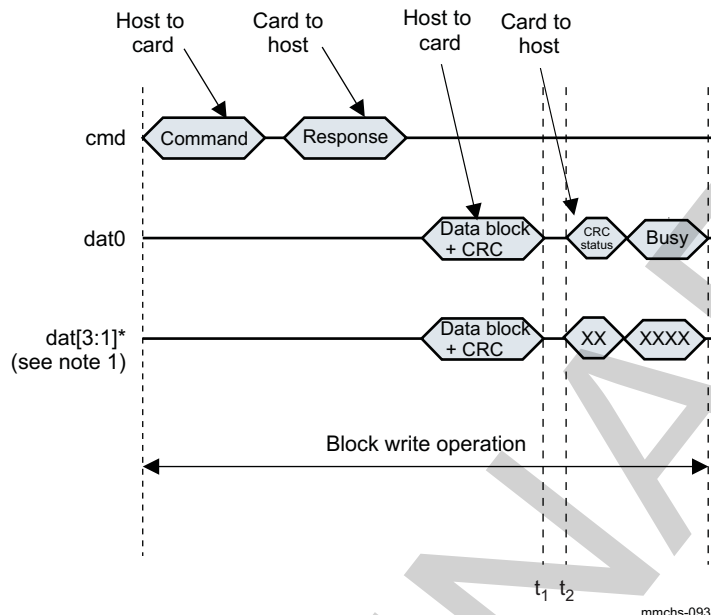
t_1 – Data time-out counter is loaded and starts after CRC status.

t_2 – Data time-out counter stops and if it is 0, the [MMCHS_STAT\[21\]](#) DCRC bit is generated.

25.4.9.3 Write CRC Status Time-Out

[Figure 25-26](#) shows the DCRC event condition asserted when there is write CRC status time-out.

Figure 25-26. Write CRC Status Time-Out



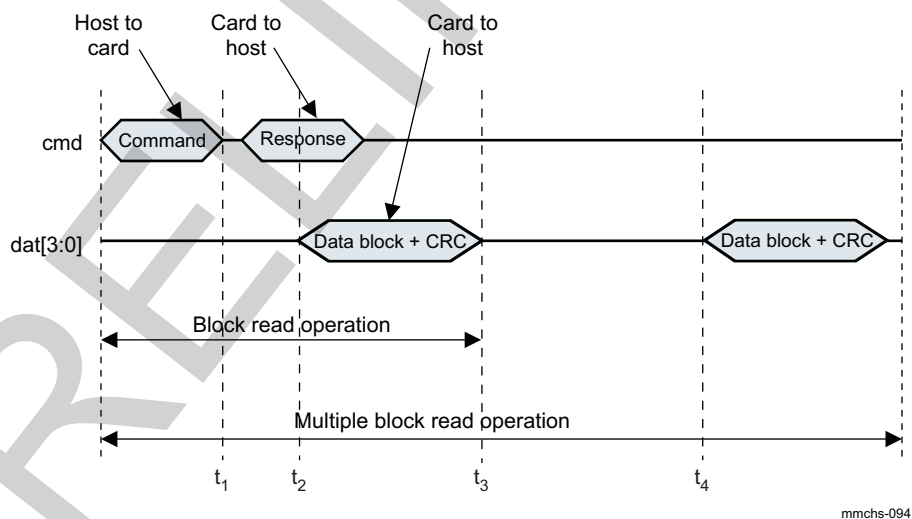
t_1 – Data time-out counter is loaded and starts after data block + CRC.

t_2 – Data time-out counter stops and if it is 0, the [MMCHS_STAT\[21\]](#) DCRC bit is generated.

25.4.9.4 Read Data Time-Out

[Figure 25-27](#) shows the DCRC event condition asserted when there is read data time-out.

Figure 25-27. Read Data Time-Out



t_1 – Data time-out counter is loaded and starts after command transmission.

t_2 – Data time-out counter stops and if it is 0, the [MMCHS_STAT\[21\]](#) DCRC bit is generated.

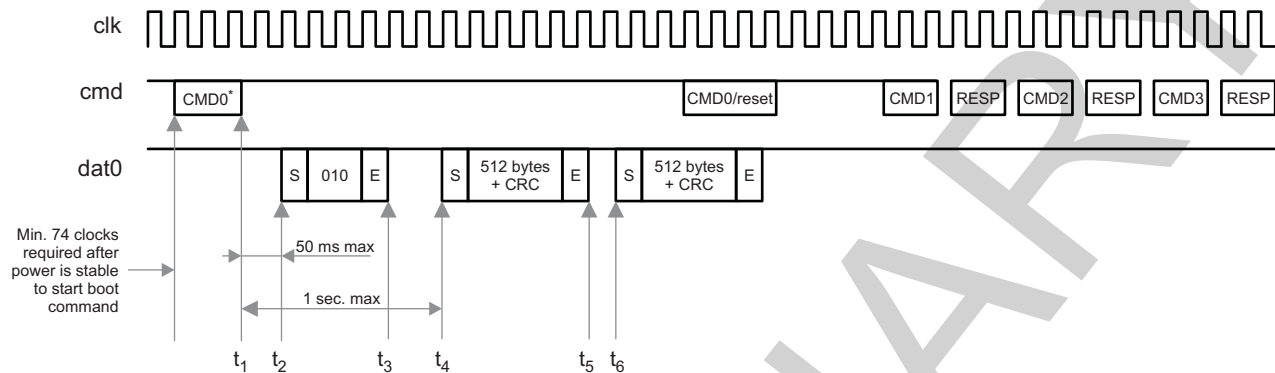
t_3 – Data time-out counter is loaded and starts after data block + CRC transmission.

t_4 – Data time-out counter stops and if it is 0, the [MMCHS_STAT\[21\]](#) DCRC bit is generated.

25.4.9.5 Boot Acknowledge Time-Out

Figure 25-28 shows the DCRC event condition asserted when there is a boot acknowledge time-out and CMD0 is used.

Figure 25-28. Boot Acknowledge Time-Out When Using CMD0



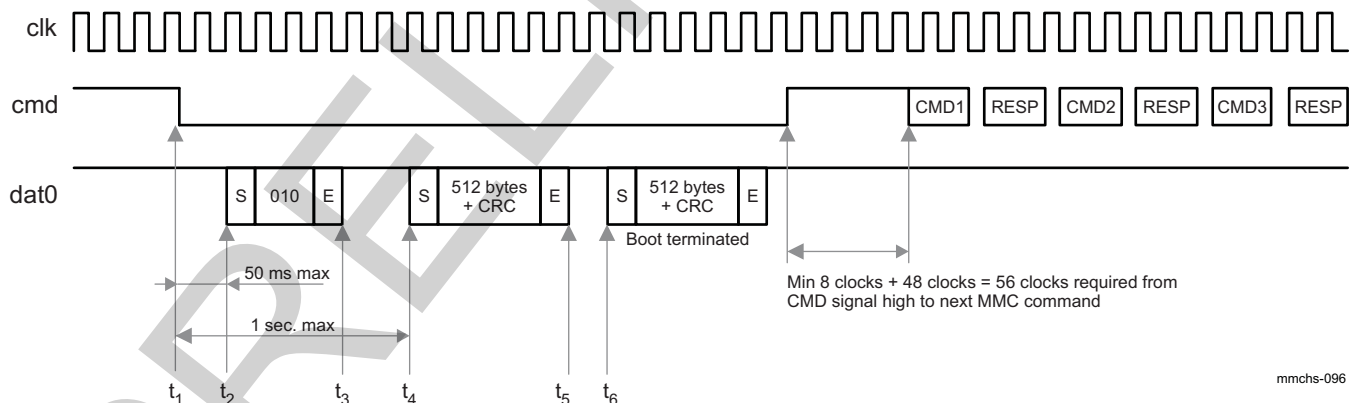
* Refer to MMC specification for correct Argument

mmchs-095

- t₁ – Data time-out counter is loaded and starts after CMD0.
- t₂ – Data time-out counter stops and if it is 0, the [MMCHS_STAT\[21\]](#) DCRC bit is generated.
- t₃ – Data time-out counter is loaded and starts.
- t₄ – Data time-out counter stops and if it is 0, the [MMCHS_STAT\[21\]](#) DCRC bit is generated.
- t₅ – Data time-out counter is loaded and starts after data + CRC transmission.
- t₆ – Data time-out counter stops and if it is 0, the [MMCHS_STAT\[21\]](#) DCRC bit is generated.

Figure 25-29 shows the DCRC event condition asserted when there is boot acknowledge time-out when the CMD line is tied to 0.

Figure 25-29. Boot Acknowledge Time-Out When CMD Line Tied to 0



mmchs-096

- t₁ – Data time-out counter is loaded and starts after the CMD line is tied to 0.
- t₂ – Data time-out counter stops and if it is 0, the [MMCHS_STAT\[21\]](#) DCRC bit is generated.
- t₃ – Data time-out counter is loaded and starts.
- t₄ – Data time-out counter stops and if it is 0, the [MMCHS_STAT\[21\]](#) DCRC bit is generated.
- t₅ – Data time-out counter is loaded and starts after data + CRC transmission.
- t₆ – Data time-out counter stops and if it is 0, the [MMCHS_STAT\[21\]](#) DCRC bit is generated.

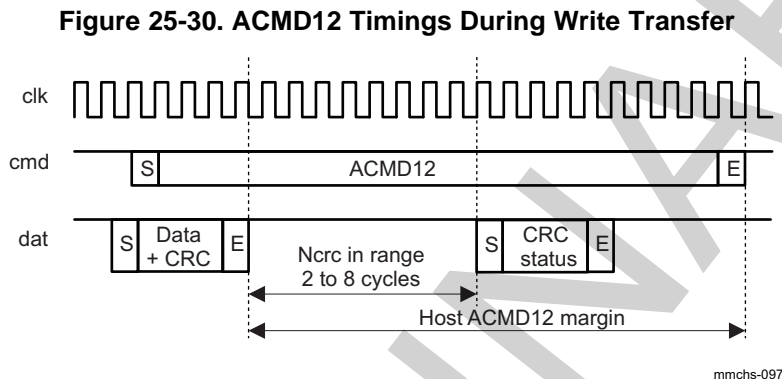
25.4.10 Auto Command 12 Timings

With the UHS definition of SD cards with higher frequency for MMC clock up to 208, the SD standard imposes a specific timing for the arrival of the auto command 12 (ACMD12) end bit.

25.4.10.1 ACMD12 Timings During Write Transfer

A margin named Nrc in the range of two to eight cycles has been defined for SDR50 and SDR104 card components for write data transfers, because the ACMD12 end bit must arrive after the CRC status end bit.

Figure 25-30 shows the ACMD12 timings during write transfer.

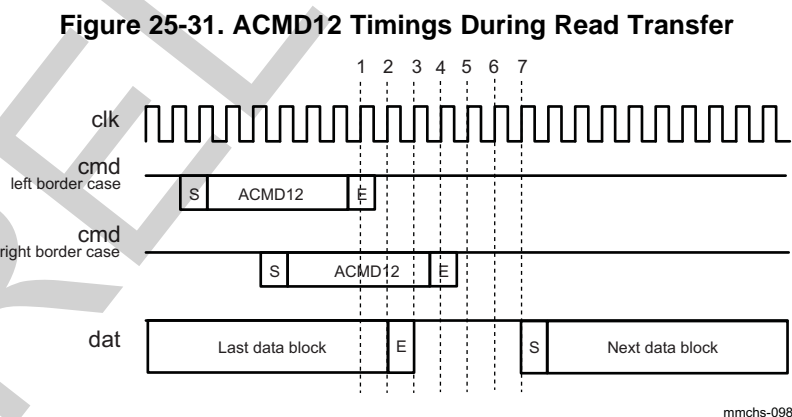


The host controller has a margin of 18 clock cycles to ensure that the ACMD12 end bit arrives after the CRC status. This margin does not depend on the MMC bus configuration, DDR, or standard transfer, 1-, 4-, or 8-bit bus width.

25.4.10.2 ACMD12 Timings During Read Transfer

With UHS cards, the gap timing between two successive cards has been extended from two cycles to four cycles. It provides more flexibility for the host ACMD12 arrival to receive the last complete and reliable block. The MMCHS controller follows only the left border case defined by the SD UHS specification.

Figure 25-31 shows ACMD12 timings during read transfer.



The ACMD12 arrival sent by the host controller is not sensitive to the MMC bus configuration, whether it is a DDR or standard transfer and whether it is a 1-, 4-, or 8-bit bus width transfer.

25.4.11 Transfer Stop

Whenever a transfer is initiated, the transmission may be willed to stop while it is still not finished. Several cases are possible, depending on the transfer type:

- Multiple-block-oriented transfers (transfer length is known)

- Continuous stream transfers (transfer has an infinite length)

NOTE: Because the MMC/SD/SDIOi controller manages transfers based on a block granularity, the buffer accepts a block only if there is enough space to store it completely. Consequently, if a block is pending in the buffer, no command is sent to the card because the card clock will be shut off by the controller.

The MMC/SD/SDIOi controller includes two features that make a transfer stop more convenient and easier to manage:

- ACMD12 (for MMC and SD only):

This feature is enabled by setting the MMCI.MMCHS_CMD[2] ACEN bit to 0x1 (this setting is relevant for a MMC/SD transfer with a known number of blocks to transfer). When the ACMD12 feature is enabled, the MMC/SD/SDIOi controller automatically issues a CMD12 command when the expected number of blocks is exchanged.

- Stop at block gap:

This feature is enabled by setting the MMCI.MMCHS_HCTL[16] SBGR bit to 0x1. When enabled, this capability holds the transfer on until the end of a block boundary. If a stop transmission is needed, software can use this pause to send a CMD12 to the card.

- ADMA mode:

For ADMA-capable modules (MMC1 and MMC2) (for more information, see [Section 25.4.5, DMA Modes](#)), the last instruction can stop the transfer (the END bit is enabled in the descriptor line).

NOTE: For MMC and SD cards, the stop-at-block-gap feature is not supported in read mode.

For SDIO cards, this setting can be supported in read mode if the card has a read-wait capability.

[Table 25-20](#) shows the common way to stop a transfer, indicating the command to send and the features to enable.

Table 25-20. MMC/SD/SDIOi Controller Transfer Stop Command Summary

| | | Write Transfer | | Read Transfer | |
|-------------------------------------|---|---|---|---|---|
| | | SD/MMC | SDIO | SD/MMC | SDIO |
| Single block | | Transfer ends automatically. Wait TC. | Transfer ends automatically. Wait TC. | Transfer ends automatically. Wait TC. | Transfer ends automatically. Wait TC. |
| Multiblocks (finite or infinite) | Before the programmed block boundary | Send CMD12. Wait TC. | Send CMD52. Wait TC. | Send CMD12. Wait TC. | Send CMD52. Wait TC. |
| | Stop at the end of the transfer (finite transfer only) | ACMD12 active Transfer ends automatically. Wait TC. | Set MMCI.MMCHS_HCTL[16] SBGR bit to 0x1. Send CMD52. Wait TC. | ACMD12 active Transfer ends automatically. Wait TC. | If READ_WAIT supported Stop at block gap. Wait TC. <hr/> If READ_WAIT not supported Send CMD52. Wait TC. |

NOTE: The MMC/SD/SDIOi controller sends the stop command to the card on a block boundary, regardless of when the command was written to the controller registers.

25.4.12 Retention Mode

This mode is enabled if the generic parameter bit MMCHS_HL_HWINFO[6] RETMODE is set to 1 during module integration. The controller can enter into retention mode when the module was previously set in

idle mode. When the module goes into retention mode all clocks are left inactive at low level except for registers that are driven by a falling-edge clock, which are kept as free during retention mode. This also means that all divided functional clock subdomains are forced low when the module enters smart-idle mode. In force-idle mode, the system must ensure that all divided functional clocks are set inactive or are in bypass mode by configuring the [MMCHS_SYSCTL](#) register correctly before entering idle mode (under software responsibility).

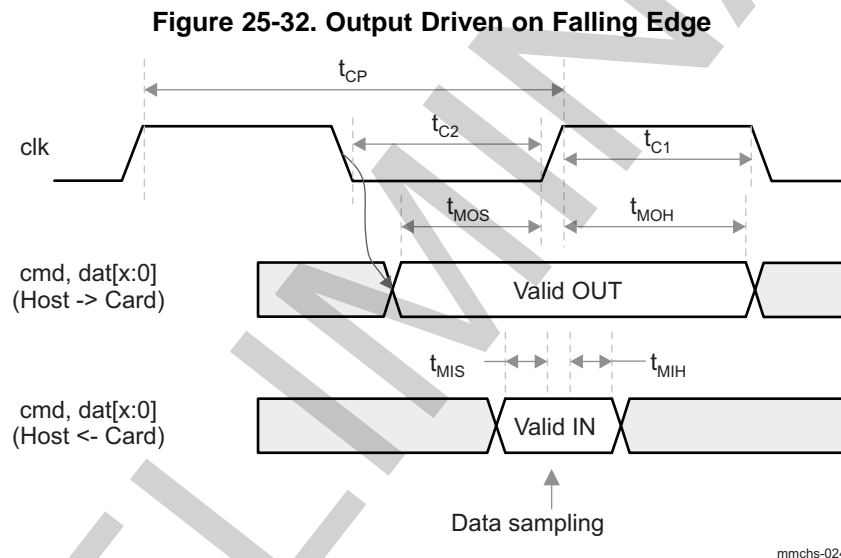
25.4.13 Output Signals Generation

The MMC/SD/SDIO output signals can be driven on the falling edge or rising edge, depending on the [MMCHS_HCTL\[2\]](#) HSPE bit. This feature allows reaching better timing performance, and thus increasing data transfer frequency.

25.4.13.1 Generation on Falling Edge of MMC Clock

The controller is by default in this mode to maximize hold timings. In this case, the [MMCHS_HCTL\[2\]](#) HSPE bit is set to 0.

[Figure 25-32](#) shows the output signals of the module when generating from the falling edge of the MMC clock.

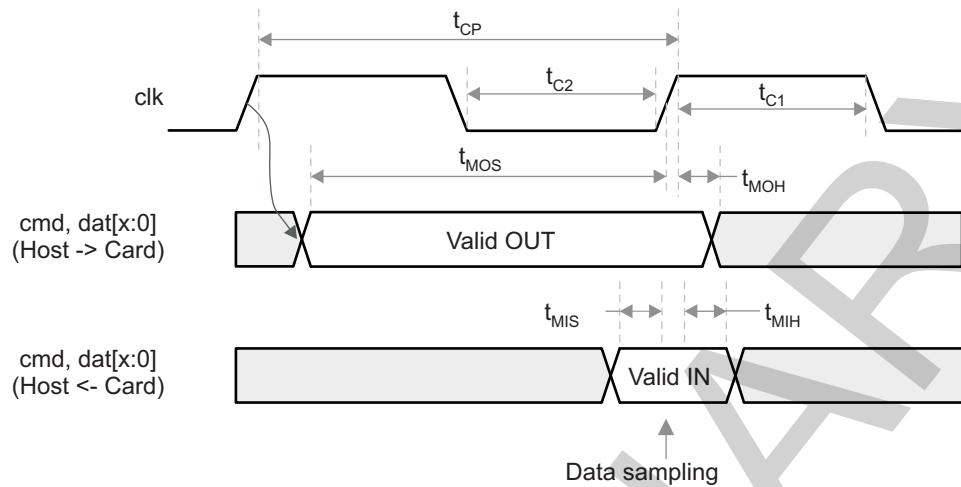


25.4.13.2 Generation on Rising Edge of MMC Clock

This mode increases setup timings and allows reaching higher bus frequency. This feature is activated by setting the [MMCHS_HCTL\[2\]](#) HSPE bit to 1. The controller must be set in this mode to support SDR transfers.

NOTE: Do not use this feature in DDR mode (when the [MMCHS_CON\[19\]](#) DDR bit is set to 1).

[Figure 25-33](#) shows the output signals of the module when generating from the rising edge of the MMC clock.

Figure 25-33. Output Driven on Rising Edge

mmchs-025

25.4.14 Card Boot Mode Management

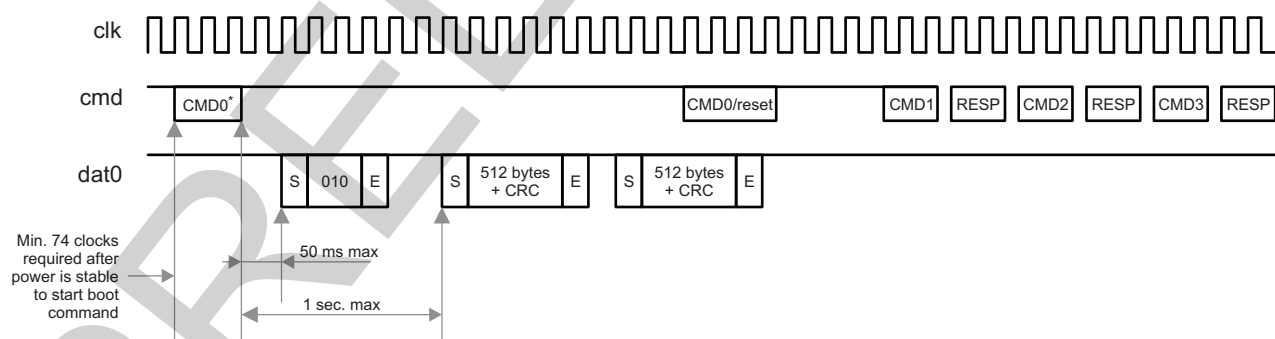
Boot operation mode allows the MMC/SD/SDIOi host controller to read boot data from the connected slave (MMC device) by keeping CMD line low after power on (or sending CMD0 with a specific argument) before issuing CMD1. The data can be read from the boot area or user area, depending on the register setting.

Power-on boot defines a way for the boot code to be accessed by the MMC/SD/SDIOi host controller without an upper-level software driver, speeding the time it takes for a controller to access the boot code.

The two possible ways to issue a boot command (issuing a CMD0 or driving the CMD line to 0 during the whole boot phase) are described in the following sections.

25.4.14.1 Boot Mode Using CMD0

Figure 25-34 shows the timing diagram of a boot sequence using CMD0.

Figure 25-34. Boot Mode Using the CMD0 Timing Diagram

* Refer to MMC specification for correct Argument

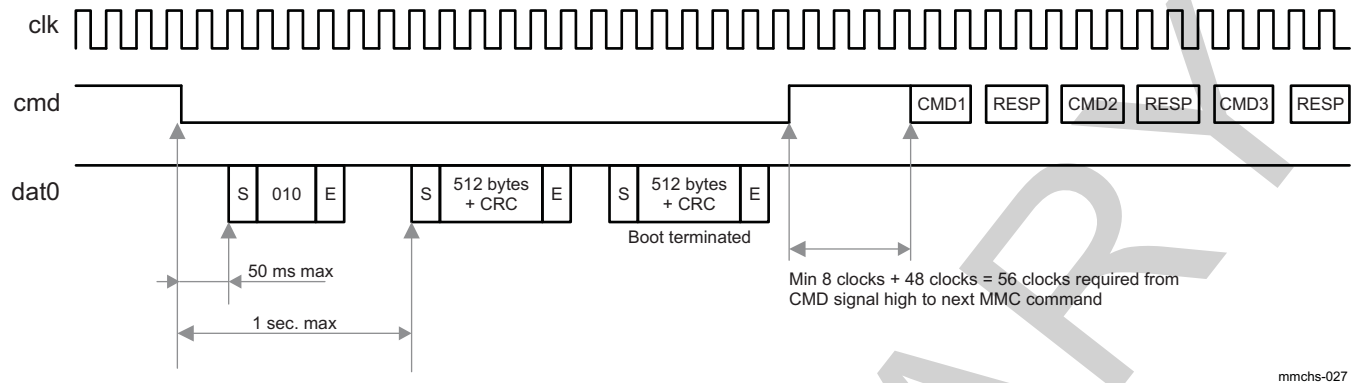
mmchs-026

For more information about how to configure the MMC/SD/SDIO host controller, see [Section 25.5.1.2.3.1, Boot Using the CMD0](#).

25.4.14.2 Boot Mode With CMD Line Tied to 0

Figure 25-35 shows the timing diagram of a boot sequence with CMD line tied to 0.

Figure 25-35. Boot Mode With CMD Line Tied to 0 Timing Diagram



For more information about how to configure the MMC/SD/SDIO host controller, see [Section 25.5.1.2.3.2, Boot With CMD Line Tied to 0](#).

25.4.15 MMC CE-ATA Command Completion Disable Management

The MMC/SD/SDIOi host controller supports CE-ATA features, in particular the detection of command completion token. When a command that requires a command completion signal (the [MMCHS_CON\[12\]](#) CEATA and [MMCHS_CMD\[2\]](#) ACEN bits set to 1) is launched, the host system is no longer allowed to emit a new command in parallel to the data transfer unless it is a command completion disable token.

The settings to emit a command completion disable token are:

- The [MMCHS_CON\[12\]](#) CEATA bit is set to 1.
- The [MMCHS_CON\[2\]](#) bit HR set to 1.
- Clear the [MMCHS_ARG](#) register.
- Write into the [MMCHS_CMD](#) register with the value 0x00000000.

When a command completion disable token was emitted (that is, the [MMCHS_STAT\[0\]](#) CC bit received), the host system is again allowed to emit another type of command (for example, a CMD12 to abort transfer).

A critical case can be encountered when command completion signal disable (CCSD) is emitted during the last data block transfer, and the sequence on the command line is sent close to the command completion signal (CCS) token sent by the card.

Three possible cases are:

- CCS is received immediately before CCSD is emitted:
An interrupt CIRQ is generated with CCS detection, CCSD is transmitted to the card, and then an interrupt CC is generated when CCSD ends. In this case, the card considers the CCSD sequence.
- CCS is not generated or is generated during the CCSD transfer:
The CCS bit cannot be detected (conflict is not possible because they drive the same level on the command line, and no CIRQ interrupt is generated; a CC interrupt is generated when CCSD ends).
- CCS is generated without CCSD token required:
Only the interrupt CIRQ is generated when CCS is detected.

25.4.16 Test Registers

Test registers are available to comply with the *SD Host Controller Specification*. This feature is useful to generate interrupts manually for driver debugging.

The force event register ([MMCHS_FE](#)) is used to control the error interrupt status and ACMD12 error status.

The system test register ([MMCHS_SYSTEST](#)) is used to control the signals that connect to I/O pins when the module is configured in the system test mode (the [MMCHS_CON](#)[4] MODE bit = 1) for boundary connectivity verification.

25.4.17 MMC/SD/SDIO Hardware Status Features

[Table 25-21](#) describes the MMC/SD/SDIO hardware status features.

Table 25-21. MMC/SD/SDIO Hardware Status Features

| Feature | Type | Register/Bit Field/Observability Control | Description |
|-----------------------------|--------|--|---|
| Interrupt flags | | See Section 25.4.4 , <i>Interrupt Requests</i> . | |
| CMD line signal level | Status | MMCHS_PSTATE [24] CLEV | Indicates the level of the command line |
| DAT lines signal level | Status | MMCHS_PSTATE [23:20] DLEV | Indicates the level of the data lines |
| Buffer read enable | Status | MMCHS_PSTATE [11] BRE | Readable data exists in the buffer. |
| Buffer write enable | Status | MMCHS_PSTATE [10] BWE | Indicates whether there is enough space in the buffer to write BLEN bytes of data |
| Read transfer active | Status | MMCHS_PSTATE [9] RTA | Used to detect completion of a read transfer. |
| Write transfer active | Status | MMCHS_PSTATE [8] WTA | Indicates a write transfer active |
| Data line active | Status | MMCHS_PSTATE [2] DLA | Indicates whether the data lines are active |
| Command Inhibit (DAT lines) | Status | MMCHS_PSTATE [1] DATI | Indicates whether issuing of command using data lines is allowed |
| Command inhibit (CMD line) | Status | MMCHS_PSTATE [0] CMDI | Indicates whether issuing of command using command line is allowed |

25.5 MMC/SD/SDIO Programming Guide

25.5.1 Low-Level Programming Models

25.5.1.1 Global Initialization

25.5.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the module must be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the MMC/SD/SDIO modules. For more information, see [Section 25.3](#), *MMC/SD/SDIO Integration*, and [Section 25.2](#), *MMC/SD/SDIO Environment*.

Table 25-22. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|-----------------------------------|---|
| PRCM | Module interface and functional clocks must be enabled. See Chapter 3 , <i>Power, Reset, and Clock Management</i> . |
| Control module | Module-specific pad muxing and configuration must be set in the control module. See Chapter 19 , <i>Control Module</i> . |
| (optional) MPU INTC (or DSP INTC) | MPU INTC configuration must be done to enable the interrupts from the MMCHS module. See Chapter 18 , <i>Interrupt Controllers</i> . |
| (optional) sDMA (or dDMA) | DMA configuration must be done to enable the module DMA channel requests. See Chapter 17 , <i>sDMA</i> . |
| (optional) Interconnect | For more information about the interconnect configuration, see Chapter 14 , <i>Interconnect</i> . |

NOTE: The MPU/DSP INTC and the sDMA/dDMA configurations are necessary if the interrupt and DMA-based communication modes are used.

25.5.1.1.2 MMC/SD/SDIO Host Controller Initialization Flow

[Table 25-23](#) shows the general boot process.

Table 25-23. MMC/SD/SDIO Controller Meta Initialization Steps

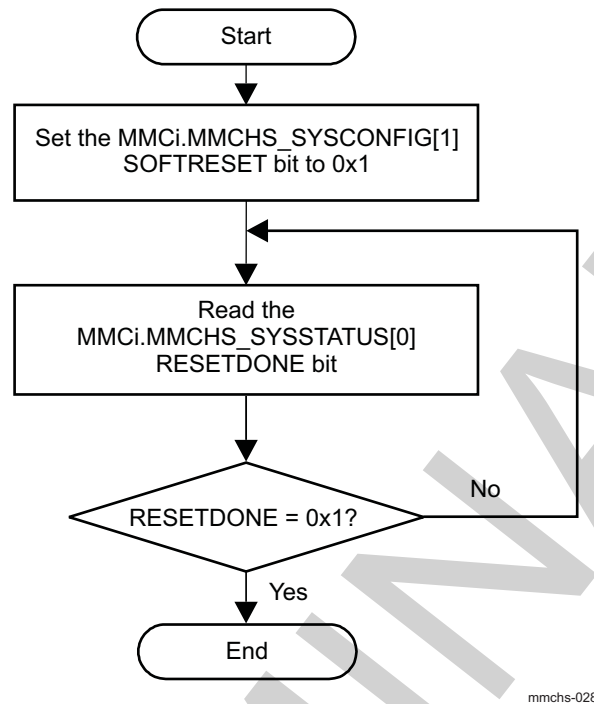
| Step | Access Type | Register/Bit Field/Programming Model | Value |
|------------------------------------|-------------|--|-------|
| Initialize clocks. | | See Section 25.5.1.1.2.1 . | |
| Software reset of the controller. | | See Section 25.5.1.1.2.2 . | |
| Set module hardware capabilities. | | See Section 25.5.1.1.2.3 . | |
| Set module idle and wake-up modes. | | See Section 25.5.1.1.2.4 . | |

25.5.1.1.2.1 Enable Interface and Functional clock for MMC Controller

Before any MMCHS register access, the MMCHS interface clock and functional clock in the PRCM module registers must be enabled. See [Section 3.6.9.4](#), *Clock Domain Module Attributes*, in [Chapter 3](#), *Power, Reset, and Clock Management*.

25.5.1.1.2.2 MMCHS Soft Reset Flow

[Figure 25-36](#) shows the soft reset process of the MMCHS controller.

Figure 25-36. MMC/SD/SDIO Controller Software Reset Flow**Table 25-24. Register Call Summary for Main Sequence – Software Reset Flow**

| Register Name | Register Name |
|---------------------------------|---------------------------------|
| MMCHS_SYSCONFIG | MMCHS_SYSSTATUS |

25.5.1.1.2.3 Set MMCHS Default Capabilities

Software must read capabilities (in boot ROM, for example) and is allowed to set (write) the MMCi.[MMCHS_CAPA](#)[26:24] and MMCi.[MMCHS_CUR_CAPA](#)[23:0] bit fields before the MMC/SD/SDIO host driver is started.

25.5.1.1.2.4 Wake-Up Configuration

[Table 25-25](#) describes the MMCHS controller wake-up configuration.

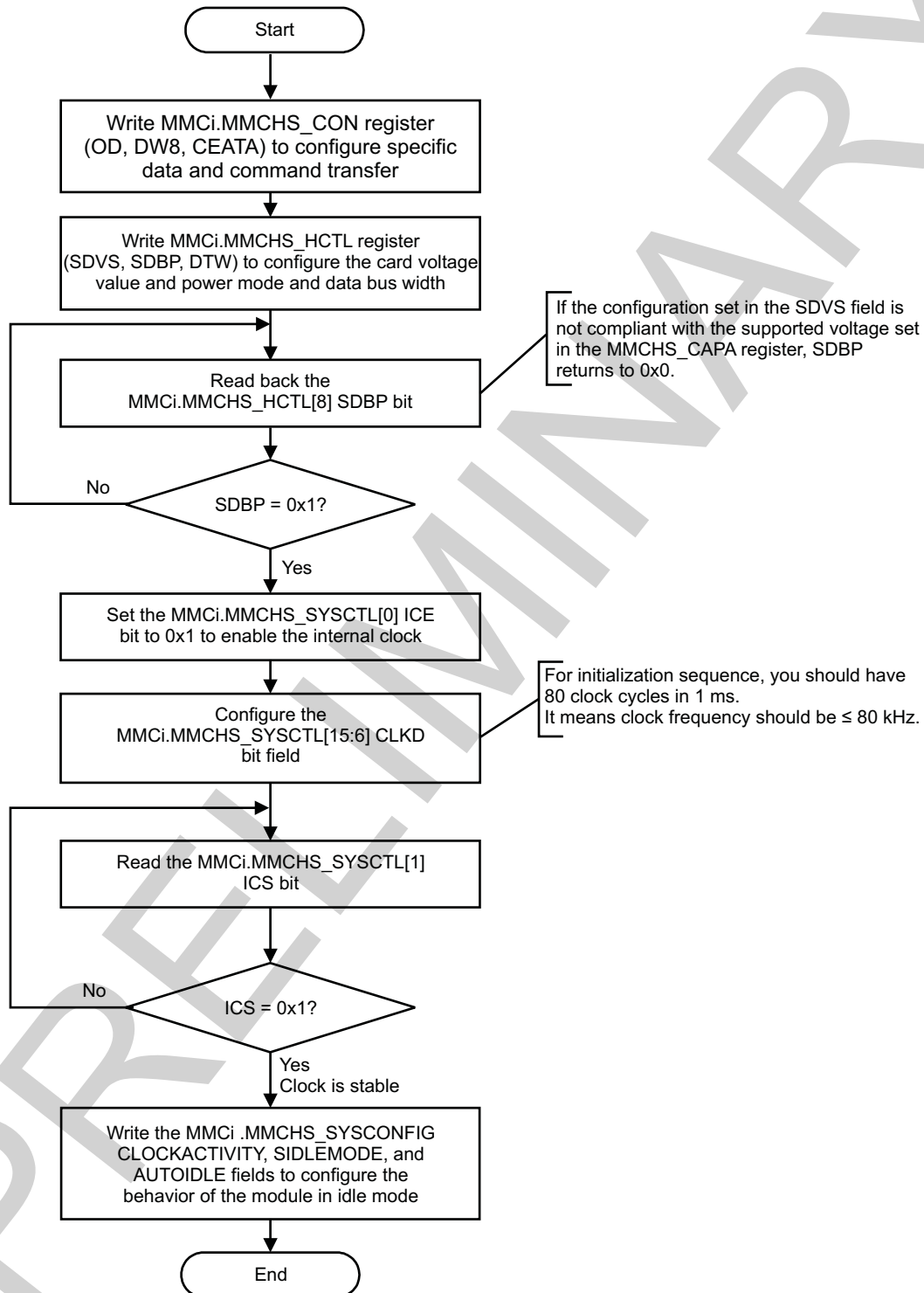
Table 25-25. MMC/SD/SDIO Controller Wake-Up Configuration

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|--|-------------|---|-------|
| Configure wake-up bit (if necessary). | W | MMCi. MMCHS_SYSCONFIG [2] ENAWAKEUP | 0x1 |
| Enable wake-up events on SD card interrupt (if necessary). | W | MMCi. MMCHS_HCTL [24] IWE | 0x1 |
| SDIO card only: Enable card interrupt (if necessary). | W | MMCi. MMCHS_IE [8] CIRQ_ENABLE | 0x1 |

25.5.1.1.2.5 MMC Host and Bus Configuration

Figure 25-37 shows the MMC bus configuration process.

Figure 25-37. MMC/SD/SDIO Controller Bus Configuration



mmchs-029

Table 25-26. Register Call Summary for Main Sequence – Bus Configuration

| Register Name | Register Name |
|---------------------------------|------------------------------|
| MMCHS_CON | MMCHS_HCTL |
| MMCHS_SYSCONFIG | MMCHS_SYSCTL |

25.5.1.2 Operational Modes Configuration

25.5.1.2.1 Basic Operations for MMC/SD/SDIO Host Controller

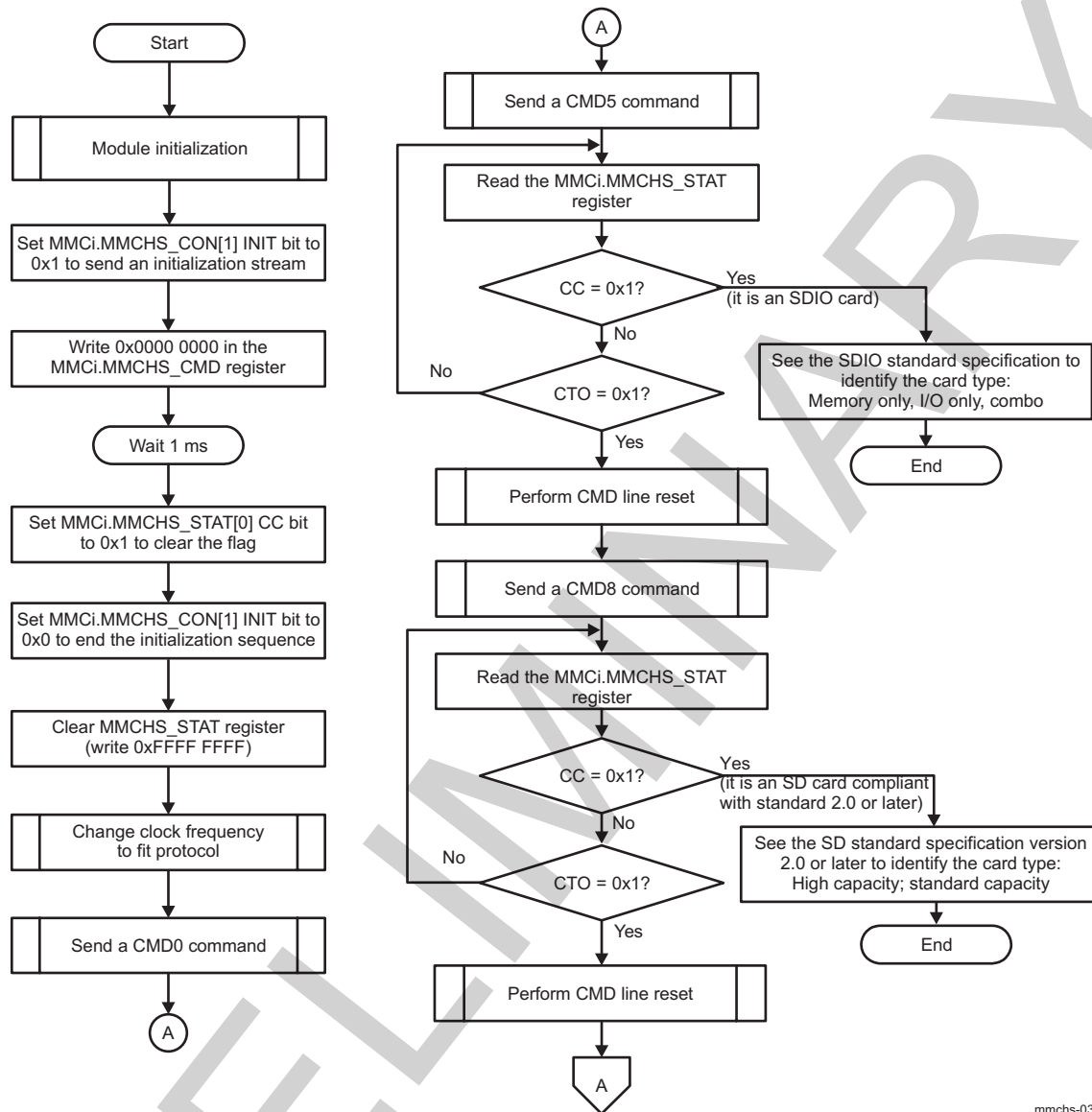
The MMC/SD/SDIO host controller performs data transfers: data to card (referred to as write transfers) and data from card (referred to as read transfers).

The host controller requires transfers to run on a block-by-block basis rather than on a DMA burst size basis. A single DMA request (or block request interrupt) is signaled for each block. Pipelining is supported as long as the block size is less than one half of the memory buffer size.

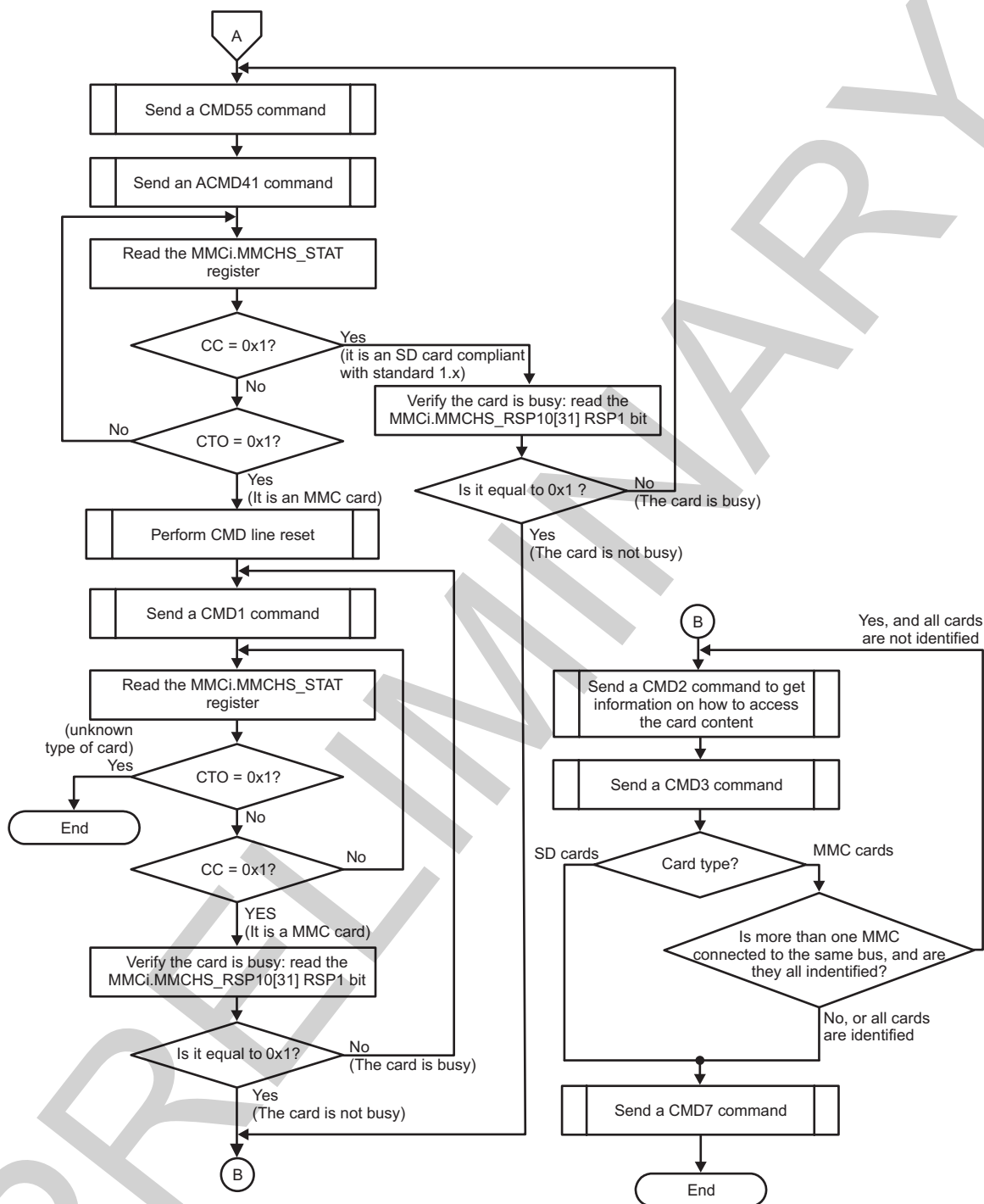
25.5.1.2.1.1 Card Detection, Identification, and Selection

[Figure 25-38](#) and [Figure 25-39](#) show the card identification and selection process.

Figure 25-38. MMC/SD/SDIO Controller Card Identification and Selection – Part 1



mmchs-030

Figure 25-39. MMC/SD/SDIO Controller Card Identification and Selection – Part 2

mmchs-031

Table 25-27. Register Call Summary for Main Sequence – Card Identification and Selection

| Register Name | Register Name | Register Name |
|---------------|---------------|---------------|
| MMCHS_CON | MMCHS_CMD | MMCHS_STAT |
| MMCHS_SYSCCTL | MMCHS_RSP10 | |

Table 25-28. Subprocess Call Summary for Main Sequence – Card Identification and Selection

| Subprocess Name | Cross-Reference |
|---|--|
| Initialize module. | Section 25.5.1.1.2 |
| Change clock frequency to fit protocol. | Section 25.5.1.2.1.7.2 |
| Send a command. | Section 25.5.1.2.1.7.1 |
| Perform CMD line reset. | Section 25.5.1.2.1.1.1 |

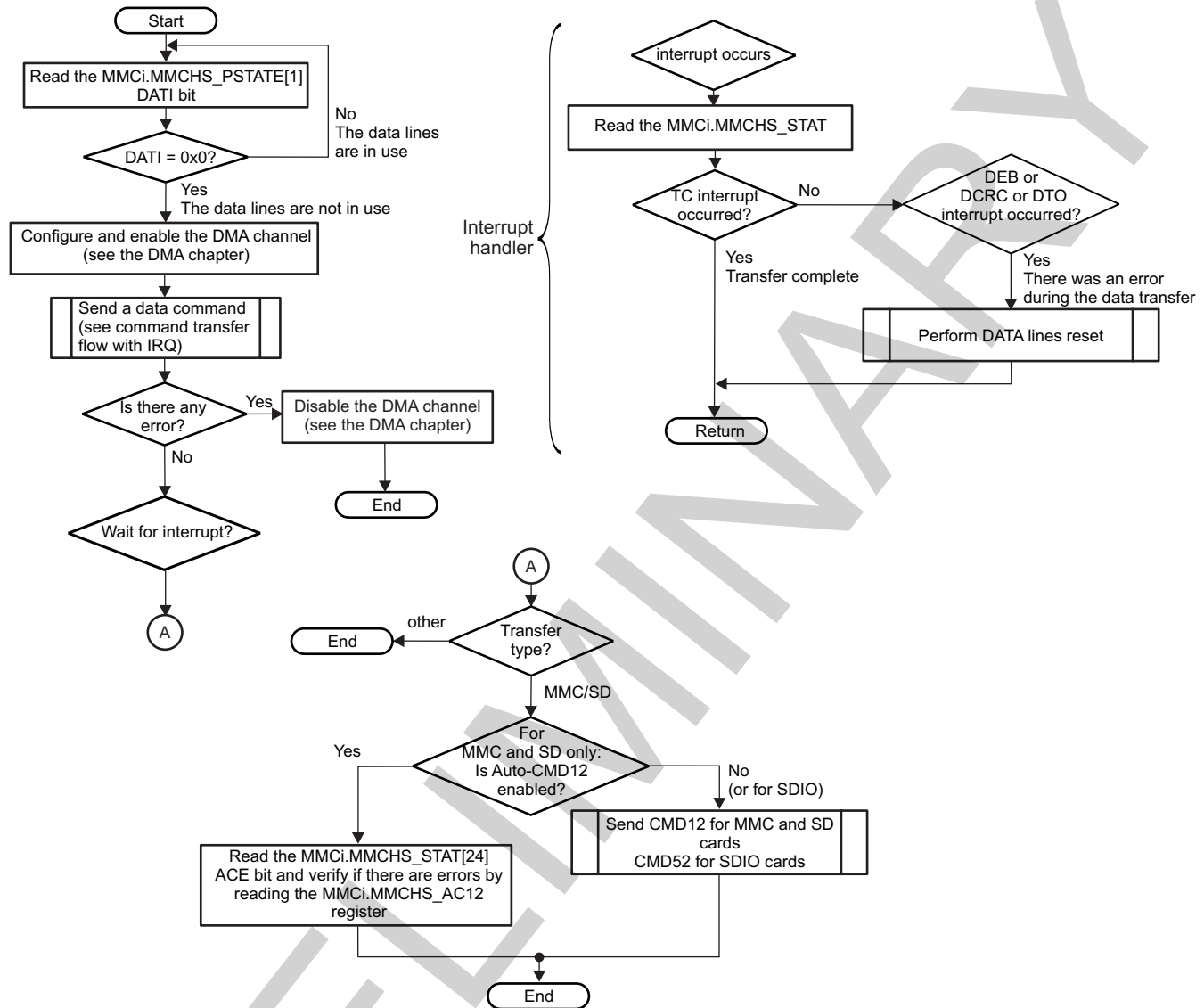
25.5.1.2.1.1.1 CMD Line Reset Procedure

Table 25-29. CMD Line Reset

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|---|-------------|--------------------------------------|-------|
| Initiate CMD line reset. | W | MMCI.MMCHS_SYSCTL[25] SRC | 0x1 |
| Poll the SRC bit until it is set to 0x1. | R | MMCI.MMCHS_SYSCTL[25] SRC | = 0x1 |
| Wait until the SRC bit returns to 0x0 (reset procedure is completed). | R | MMCI.MMCHS_SYSCTL[25] SRC | = 0x0 |

25.5.1.2.1.2 Read/Write Transfer Flow in DMA Mode With Interrupt

[Figure 25-40](#) shows the read and write protocol in DMA slave mode with interrupt signaling. For more information about the DMA settings, see [Section 17.5](#), *sDMA Basic Programming Model*, in [Chapter 17](#), *sDMA*.

Figure 25-40. MMC/SD/SDIO Controller Read/Write Transfer Flow in DMA Slave Mode With interrupt

mmchs-032

Table 25-30. Register Call Summary for Main Sequence – Read/Write Transfer Flow in DMA Mode With interrupt

| Register Name | Register Name |
|---------------|---------------|
| MMCHS_PSTATE | MMCHS_STAT |
| MMCHS_SYSCTL | MMCHS_CMD |

Table 25-31. Subprocess Call Summary for Main Sequence – MMC/SD/SDIO Controller Read/Write Transfer Flow in DMA Mode With Interrupt

| Subprocess Name | Cross-Reference |
|---------------------------|------------------------|
| Send a data command. | Figure 25-47 |
| Perform DATA lines reset. | Section 25.5.1.2.1.2.1 |

25.5.1.2.1.2.1 DATA Lines Reset Procedure

Table 25-32 describes the DATA lines reset.

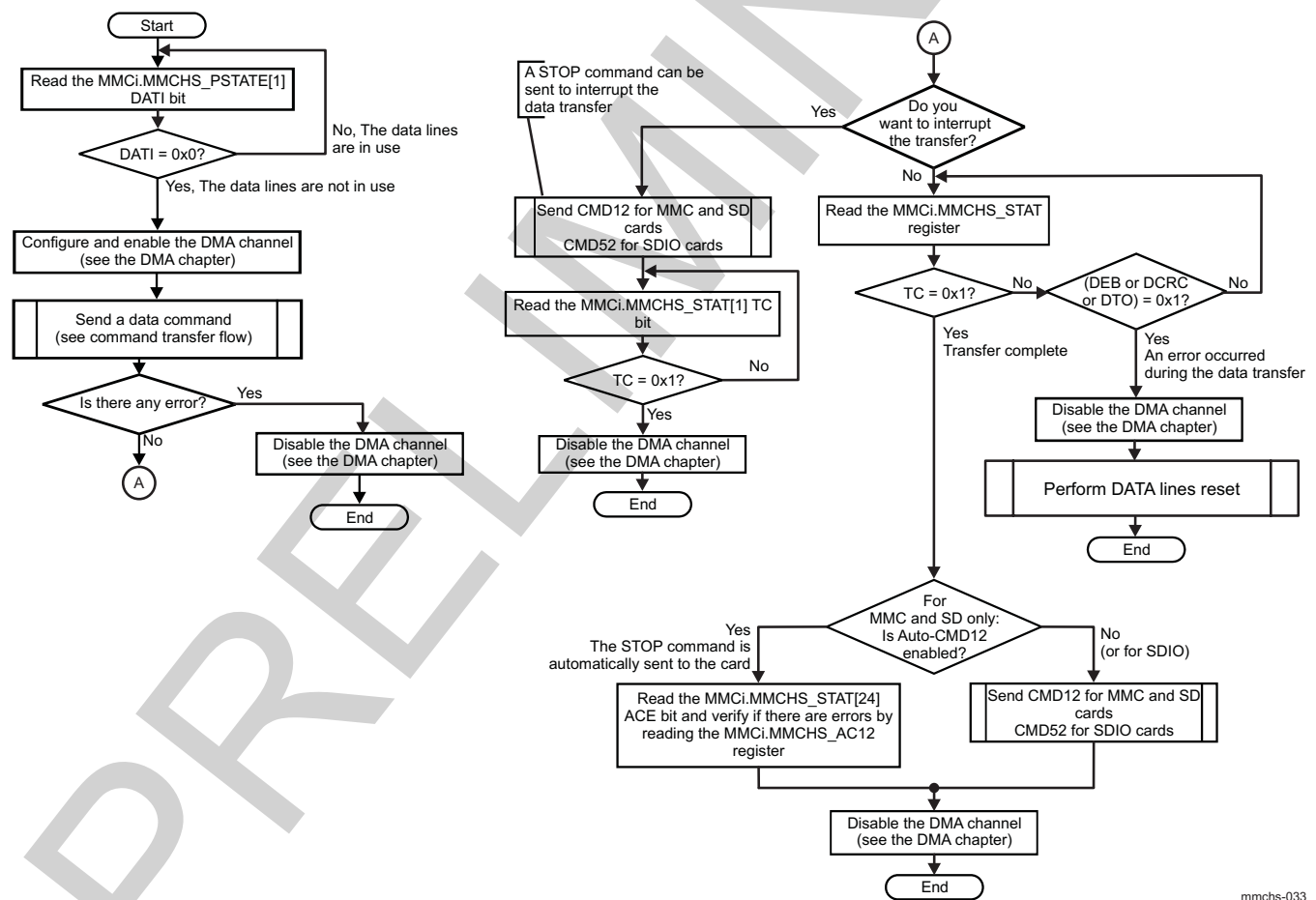
Table 25-32. DATA Lines Reset

| Step | Access Type | Register/Bit Field/Programming Model | Value |
|--|-------------|--------------------------------------|-------|
| Initiate DATA lines reset. | W | MMCi.MMCHS_SYSCCTL[26] SRD | 0x1 |
| Poll the SRD bit until it is set to 0x1. | R | MMCi.MMCHS_SYSCCTL[26] SRD | = 0x1 |
| Wait until the SRD bit returns to 0x0 (reset procedure is complete). | R | MMCi.MMCHS_SYSCCTL[26] SRD | = 0x0 |

25.5.1.2.1.3 Read/Write Transfer Flow in DMA Mode With Polling

Figure 25-41 shows the read and write protocol in DMA mode. For more information about the DMA settings, see Section 17.5, sDMA Basic Programming Model in Chapter 17, sDMA.

Figure 25-41. MMC/SD/SDIO Controller Read/Write Transfer Flow in DMA Mode With Polling



mmchs-033

Table 25-33. Register Call Summary for Main Sequence – Read/Write Transfer Flow in DMA Mode With Polling

| Register Name | Register Name | Register Name |
|---------------|---------------|---------------|
| MMCHS_PSTATE | MMCHS_STAT | MMCHS_SYSCCTL |

Table 25-33. Register Call Summary for Main Sequence – Read/Write Transfer Flow in DMA Mode With Polling (continued)

| Register Name | Register Name | Register Name |
|---------------------------|----------------------------|---------------|
| MMCHS_CMD | MMCHS_AC12 | |

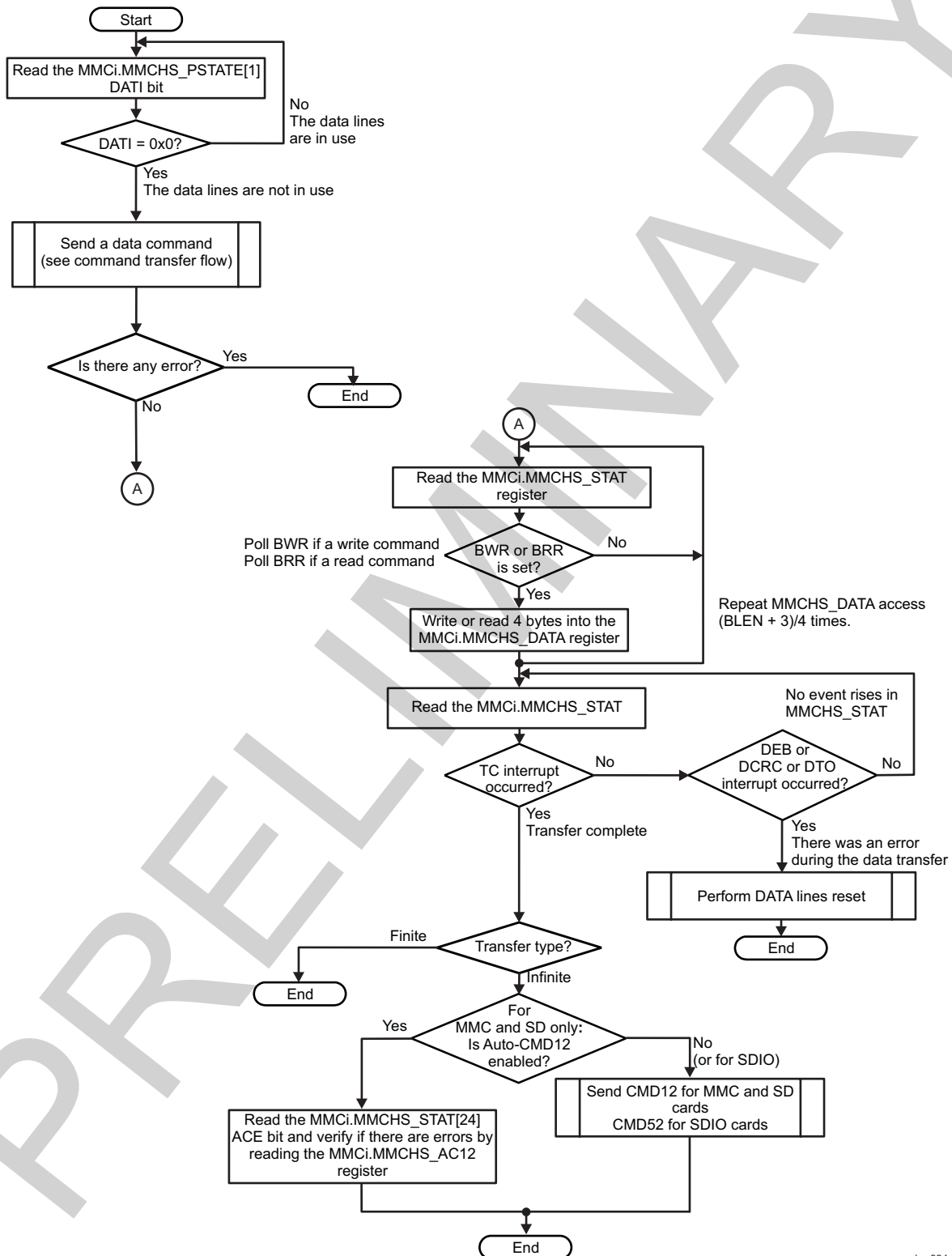
Table 25-34. Subprocess Call Summary for Main Sequence – Read/Write Transfer Flow in DMA Mode With Polling

| Subprocess Name | Cross-Reference |
|---------------------------|--|
| Send command. | Section 25.5.1.2.1.7.1 |
| Perform DATA lines reset. | Section 25.5.1.2.1.2.1 |

25.5.1.2.1.4 Read/Write Transfer Flow Without DMA With Polling

Figure 25-42 shows a read/write transfer without using the DMA and with polling.

Figure 25-42. MMC/SD/SDIO Controller Read/Write Transfer Flow Without DMA and With Polling



mmchs-034

Table 25-35. Register Call Summary for Main Sequence – Read/Write Transfer Flow Without DMA With Polling

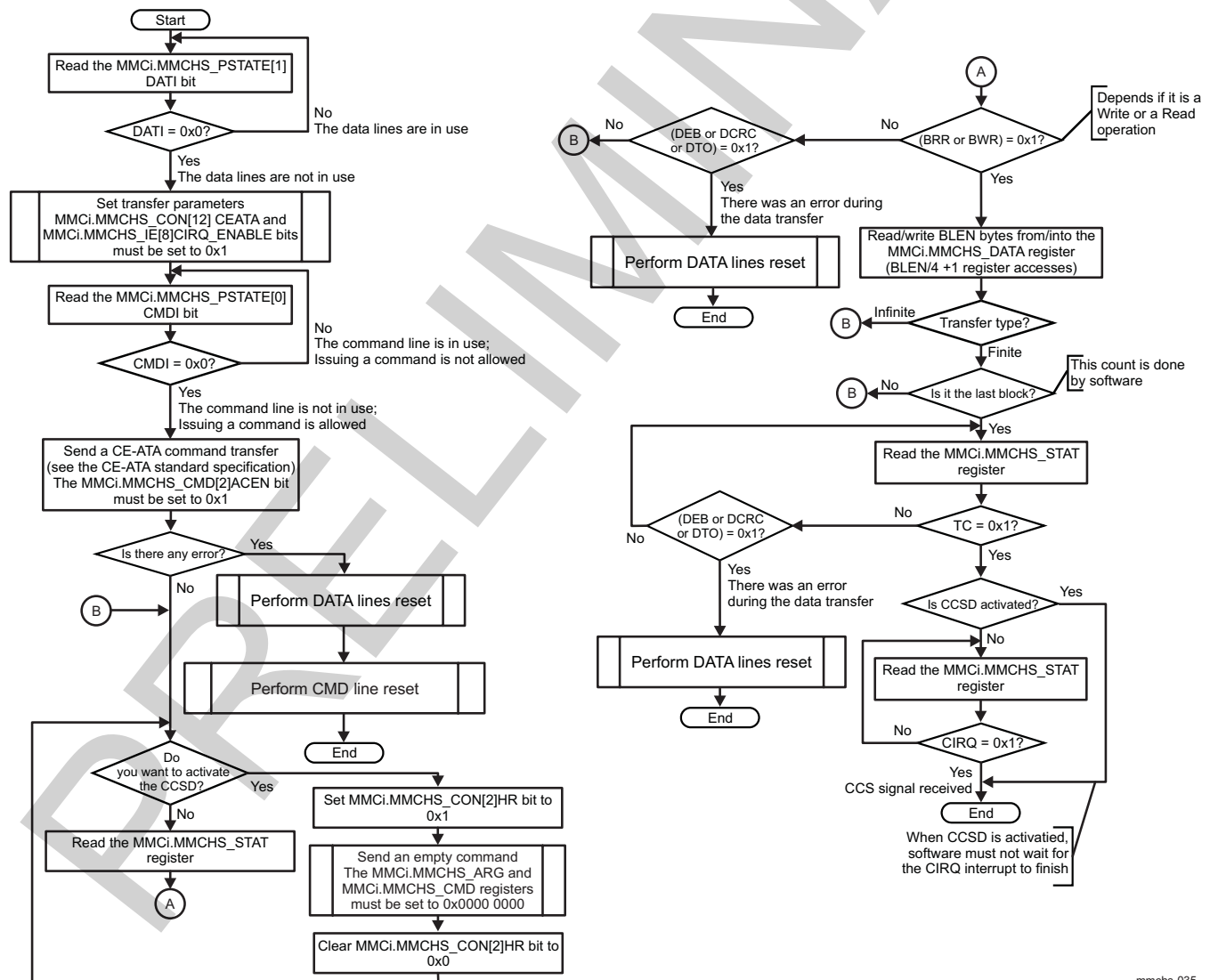
| Register Name | Register Name | Register Name |
|---------------|---------------|---------------|
| MMCHS_PSTATE | MMCHS_DATA | MMCHS_STAT |
| MMCHS_SYSCTL | MMCHS_CMD | MMCHS_AC12 |

Table 25-36. Subprocess Call Summary for Main Sequence – Read/Write Transfer Flow Without DMA With Polling

| Subprocess Name | Cross-Reference |
|---------------------------|--|
| Send data command. | Section 25.5.1.2.1.7.1 |
| Perform DATA lines reset. | Section 25.5.1.2.1.2.1 |

25.5.1.2.1.5 Read/Write Transfer Flow in CE-ATA Mode

Figure 25-43 shows the read and write CE-ATA protocol when in polling mode.

Figure 25-43. MMC/SD/SDIO Controller Read/Write in CE-ATA Mode

mmchs-035

Table 25-37. Register Call Summary for Main Sequence – Read/Write in CE-ATA Mode

| Register Name | Register Name | Register Name |
|------------------------------|------------------------------|--------------------------|
| MMCHS_PSTATE | MMCHS_CON | MMCHS_IE |
| MMCHS_CMD | MMCHS_STAT | |
| MMCHS_ARG | MMCHS_SYSCTL | |

Table 25-38. Subprocess Call Summary for Main Sequence – Read/Write in CE-ATA Mode

| Subprocess Name | Cross-Reference |
|---------------------------|--|
| Perform CMD line reset. | Section 25.5.1.2.1.1.1 |
| Perform DATA lines reset. | Section 25.5.1.2.1.2.1 |

CAUTION

CE-ATA protocol is supported only by MMC cards.

In CE-ATA mode, issuing a command during the transfer (except a CCSD command) is not allowed.

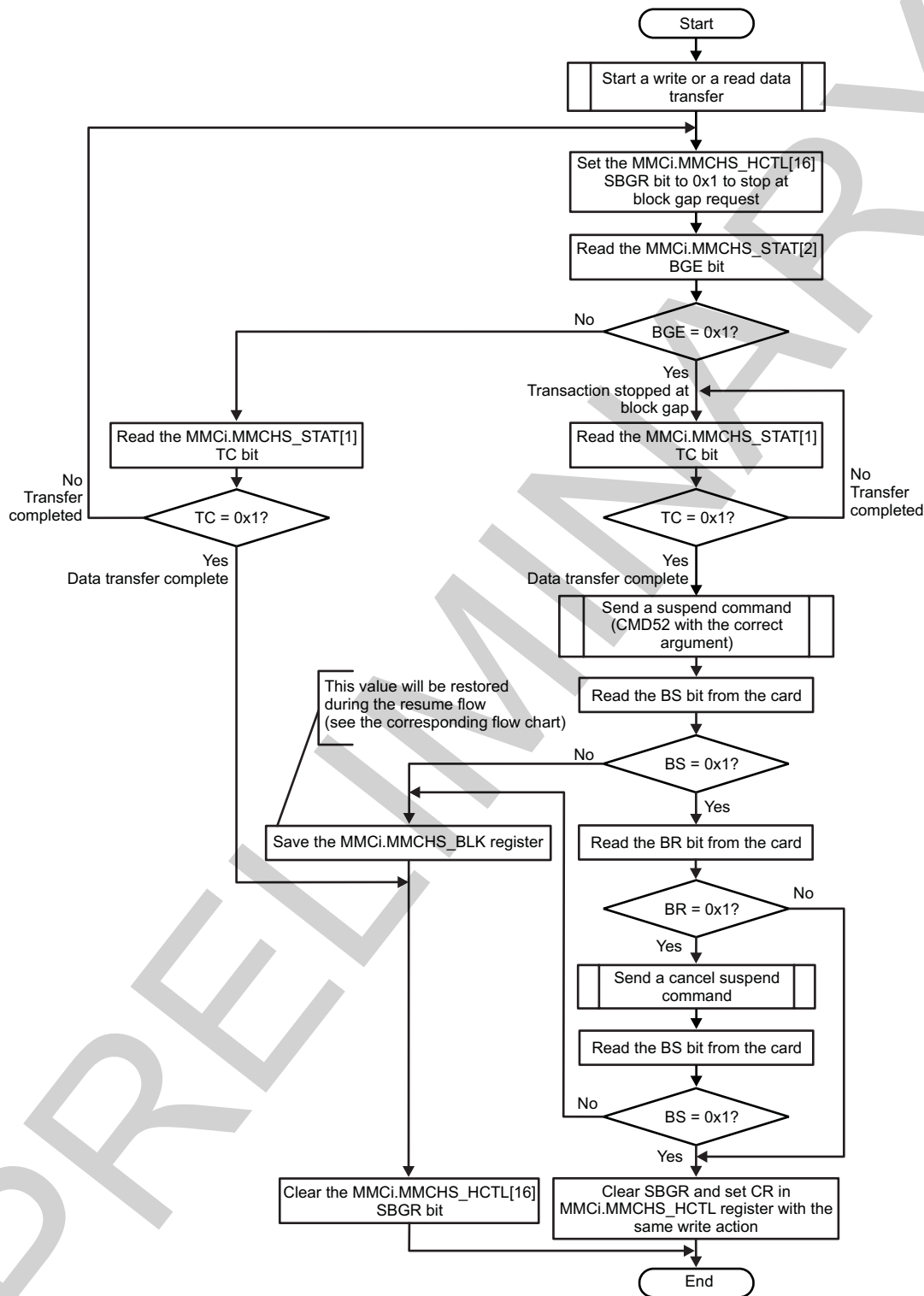
In CE-ATA mode, infinite transfers are not allowed; only finite transfers are permitted.

25.5.1.2.1.6 Suspend-Resume Flow

The suspend and resume feature is supported only by SDIO cards.

25.5.1.2.1.6.1 Suspend Flow

[Figure 25-44](#) shows the suspend flow for SDIO cards.

Figure 25-44. MMC/SD/SDIO Controller Suspend Flow

mmchs-036

Table 25-39. Register Call Summary for Main Sequence – Suspend Flow

| Register Name | Register Name | Register Name |
|---------------|---------------|---------------|
| MMCHS_HCTL | MMCHS_STAT | MMCHS_BLK |

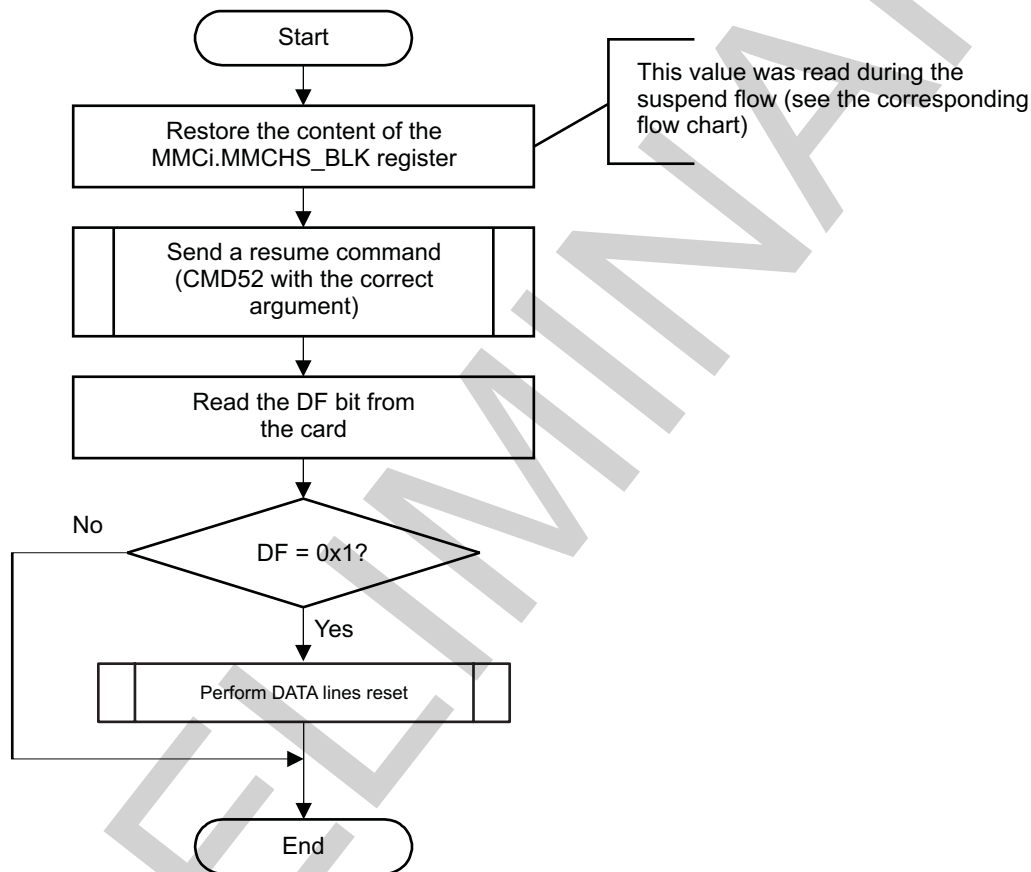
Table 25-40. Subprocess Call Summary for Main Sequence – Suspend Flow

| Subprocess Name | Cross-Reference |
|---|--|
| Start a write or a read data transfer. | Section 25.5.1.2.1 |
| Send a suspend command (CMD52 with the correct argument). | Section 25.5.1.2.1.7.1 |
| Send a cancel suspend command. | Section 25.5.1.2.1.7.1 |

25.5.1.2.1.6.2 Resume Flow

Figure 25-45 shows the resume flow for SDIO cards.

Figure 25-45. MMC/SD/SDIO Controller Resume Flow



mmchs-037

Table 25-41. Register Call Summary for Main Sequence - Resume Flow

| Register Name | Register Name |
|---------------------------|------------------------------|
| MMCHS_BLK | MMCHS_SYSCTL |

Table 25-42. Subprocess Call Summary for Main Sequence - Resume Flow

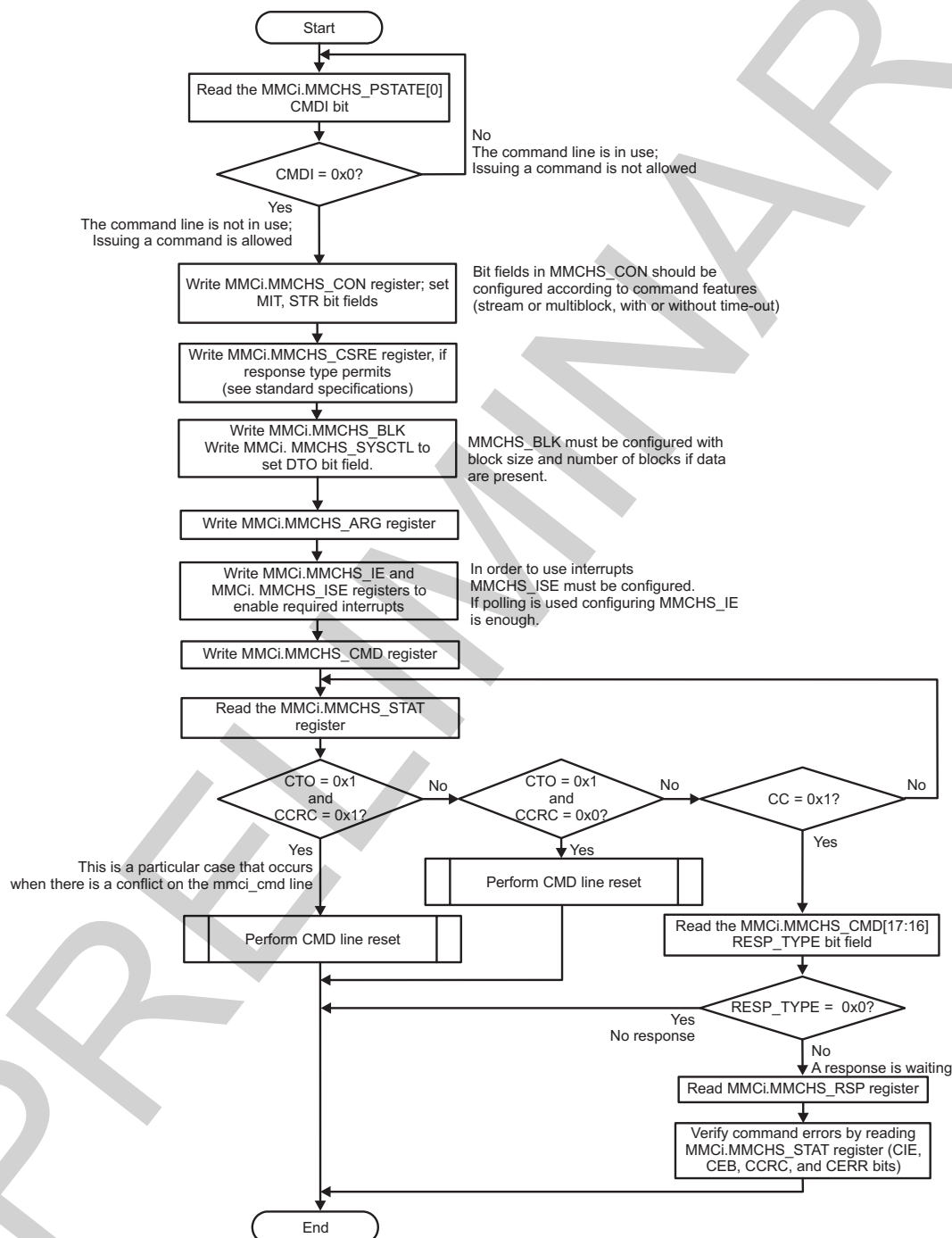
| Subprocess Name | Cross-Reference |
|--|--|
| Send a resume command (CMD52 with the correct argument). | Section 25.5.1.2.1.7.1 |
| Perform DATA lines reset. | Section 25.5.1.2.1.2.1 |

25.5.1.2.1.7 Basic Operations – Steps Detailed

25.5.1.2.1.7.1 Command Transfer Flow

Figure 25-46 shows how to send a command to the card using polling instead of interrupts for event signaling.

Figure 25-46. MMC/SD/SDIO Controller Command Transfer Flow With Polling



mmchs-038

Table 25-43. Register Call Summary for Main Sequence – Command Transfer Flow With Polling

| Register Name | Register Name | Register Name |
|------------------------------|-----------------------------|-------------------------------|
| MMCHS_PSTATE | MMCHS_CON | MMCHS_CSRE |
| MMCHS_STAT | MMCHS_BLK | MMCHS_SYSCCTL |
| MMCHS_ARG | MMCHS_IE | MMCHS_CMD |
| MMCHS_RSP10 | MMCHS_RSP32 | MMCHS_RSP54 |
| MMCHS_RSP76 | | |

Table 25-44. Subprocess Call Summary for Main Sequence – Command Transfer Flow With Polling

| Subprocess Name | Cross-Reference |
|-------------------------|--|
| Perform CMD line reset. | Section 25.5.1.2.1.1.1 |

Figure 25-47 shows how to send a command to the card using interrupts for event signaling.

Figure 25-47. MMC/SD/SDIO Controller Command Transfer Flow With interrupts

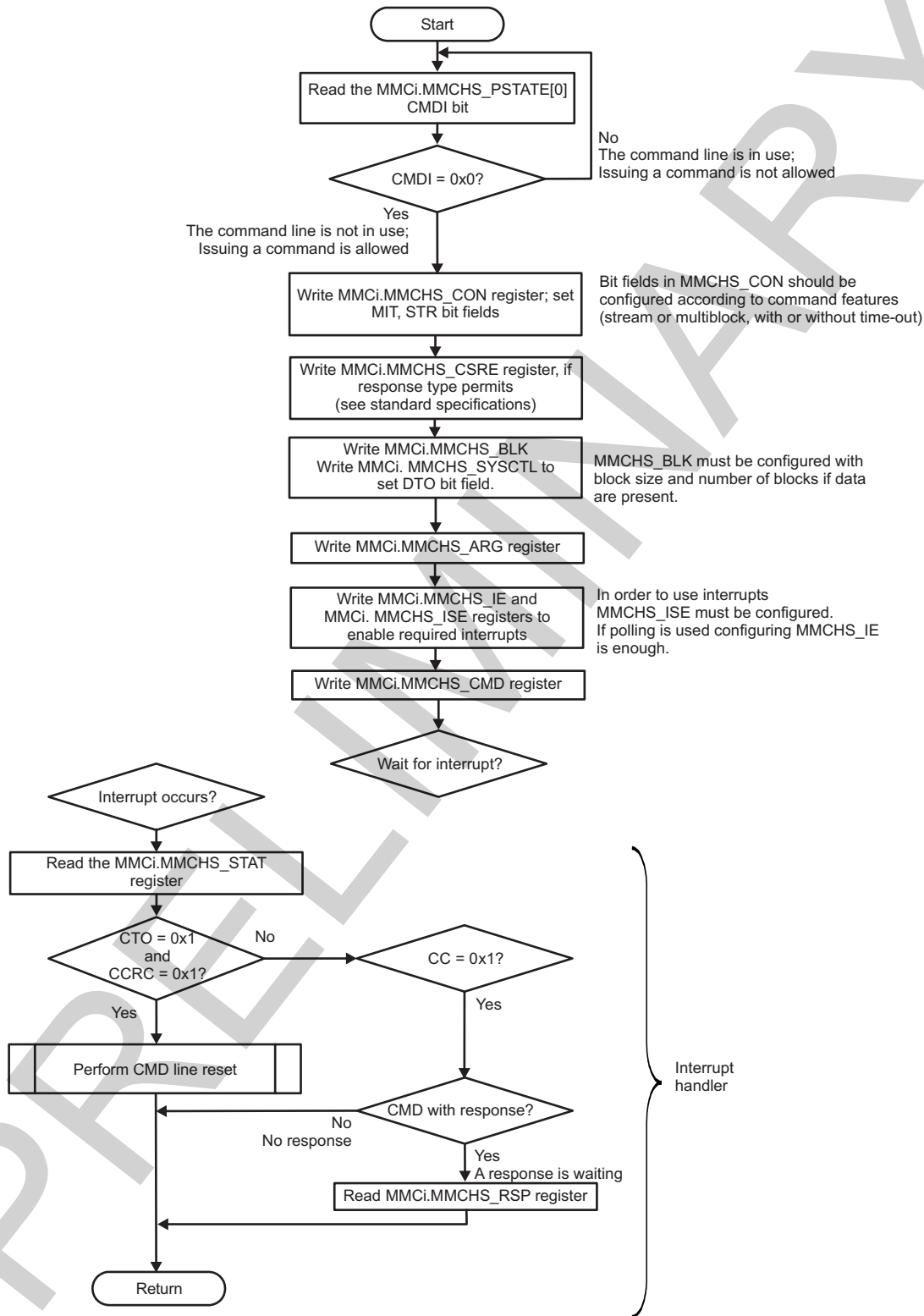


Table 25-45. Register Call Summary for Main Sequence – Command Transfer Flow With Interrupts

| Register Name | Register Name | Register Name |
|---------------|---------------|----------------|
| MMCHS_PSTATE | MMCHS_CON | MMCHS_CSRE |
| MMCHS_STAT | MMCHS_BLK | MMCHS_SYSCCTL |
| MMCHS_ARG | MMCHS_IE | MMCi.MMCHS_ISE |
| MMCHS_RSP10 | MMCHS_RSP32 | MMCHS_RSP54 |
| MMCHS_RSP76 | MMCHS_CMD | |

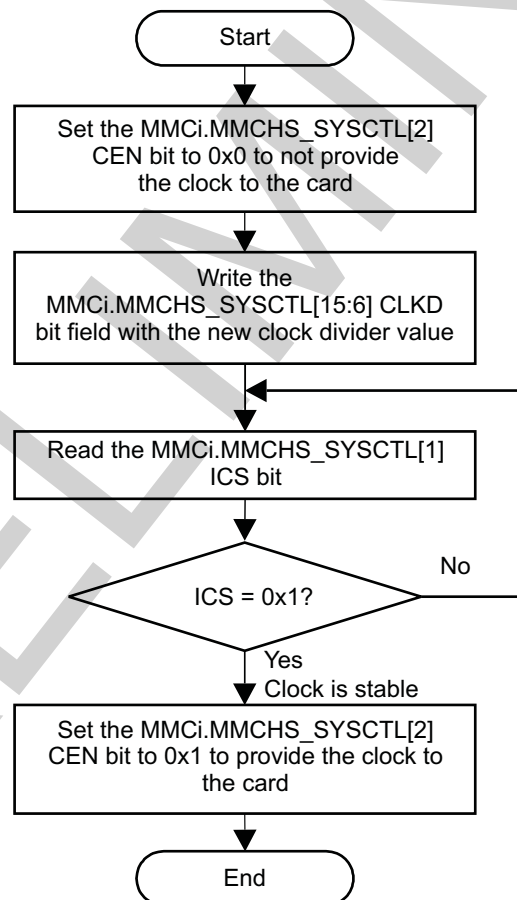
Table 25-46. Subprocess Call Summary for Main Sequence – Command Transfer Flow With Interrupts

| Subprocess Name | Cross-Reference |
|-------------------------|--|
| Perform CMD line reset. | Section 25.5.1.2.1.1.1 |

25.5.1.2.1.7.2 MMCHS Clock Frequency Change

Figure 25-48 shows the different steps that allow changing the MMC/SD/SDIO output clock frequency.

Figure 25-48. MMC/SD/SDIO Controller Clock Frequency Change Flow



mmchs-040

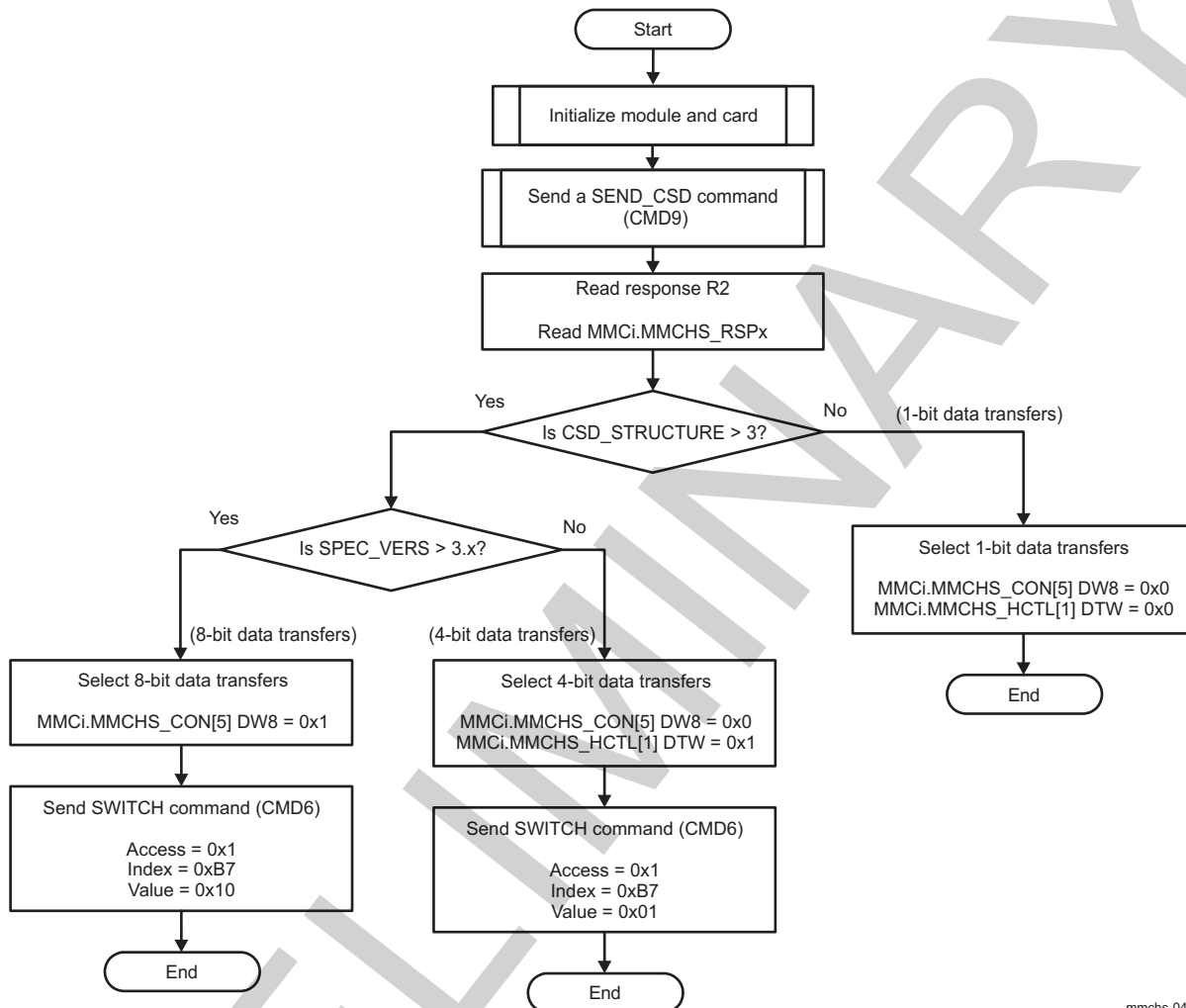
Table 25-47. Register Call Summary for Main Sequence – Clock Frequency Change Flow

| Register Name |
|---------------|
| MMCHS_SYSCCTL |

25.5.1.2.1.7.3 Bus Width Selection

Figure 25-49 shows the different steps that allow changing the MMC/SD/SDIO bus width.

Figure 25-49. MMC/SD/SDIO Controller Bus Width Configuration Flow



mmchs-041

Table 25-48. Register Call Summary for Main Sequence – Bus Width Configuration Flow

| Register Name | Register Name | Register Name |
|---------------|---------------|---------------|
| MMCHS_RSP10 | MMCHS_RSP32 | MMCHS_RSP54 |
| MMCHS_RSP76 | MMCHS_CON | MMCHS_HCTL |

Table 25-49. Subprocess Call Summary for Main Sequence – Bus Width Configuration Flow

| Subprocess Name | Cross-Reference |
|---------------------------------|--|
| Initialize module and card. | Section 25.5.1.1.2 Section 25.5.1.2.1.1 |
| Send a SEND_CSD command (CMD9). | Section 25.5.1.2.1.7.1 |
| Send SWITCH command (CMD6). | Section 25.5.1.2.1.7.1 |

25.5.1.2.2 Bus Voltage Selection

The MMC/SD/SDIO1 controller can operate with two types of card voltages: 1.8 V and 3.0 V. For this reason, dual voltage pads are implemented on this interface. For technological concerns, those pads must have an internal bias voltage reference to operate. The PBIAS module supplies this bias voltage, depending on the settings of the CONTROL.CONTROL_PBIASLITE register.

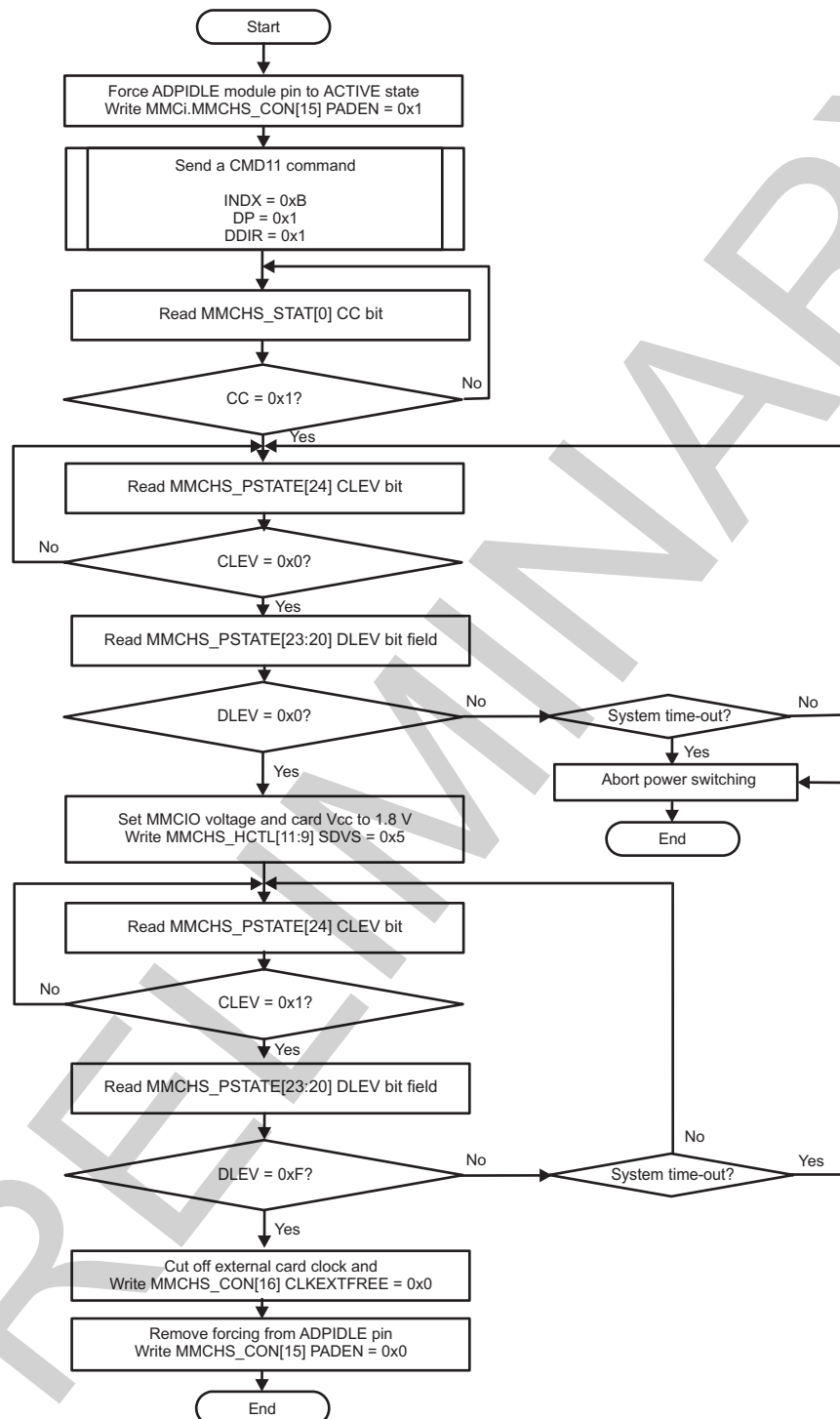
For more information about the MMC1_PBIAS cell, see [Section 19.4.9](#), *Extended-Drain I/O and PBIAS Cell*, in [Chapter 19](#), *Control Module*.

For the steps involved in transitioning from 1.8 V to 3.0 V and from 3.0 V to 1.8 V, applicable to the MMC/SD/SDIO1 controller, see [Section 19.5.1.2.1](#), *Extended-Drain I/Os and PBIAS Cell Programming Guide*, in [Chapter 19](#), *Control Module*.

CAUTION

The BIAS voltage must be set using the procedure described in [Section 19.5.1.2.1](#), *Extended-Drain I/Os and PBIAS Cell Programming Guide*, in [Chapter 19](#), *Control Module*. Failure to follow this procedure can damage the MMCHS interface.

[Figure 25-50](#) shows how to configure the MMCHS controller to fit with power switching sequence.

Figure 25-50. MMC/SD/SDIO Power Switching Procedure

mmchs-042

Table 25-50. Register Call Summary for Main Sequence – Power Switching Procedure

| Register Name | Register Name |
|---------------|---------------|
| MMCHS_STAT | MMCHS_PSTATE |
| MMCHS_CMD | MMCHS_CON |

Table 25-51. Subprocess Call Summary for Main Sequence – Power Switching Procedure

| Subprocess Name | Cross-Reference |
|---|--|
| Send a READ_DAT_UNTIL_STOP command (CMD11). | Section 25.5.1.2.1.7.1 |

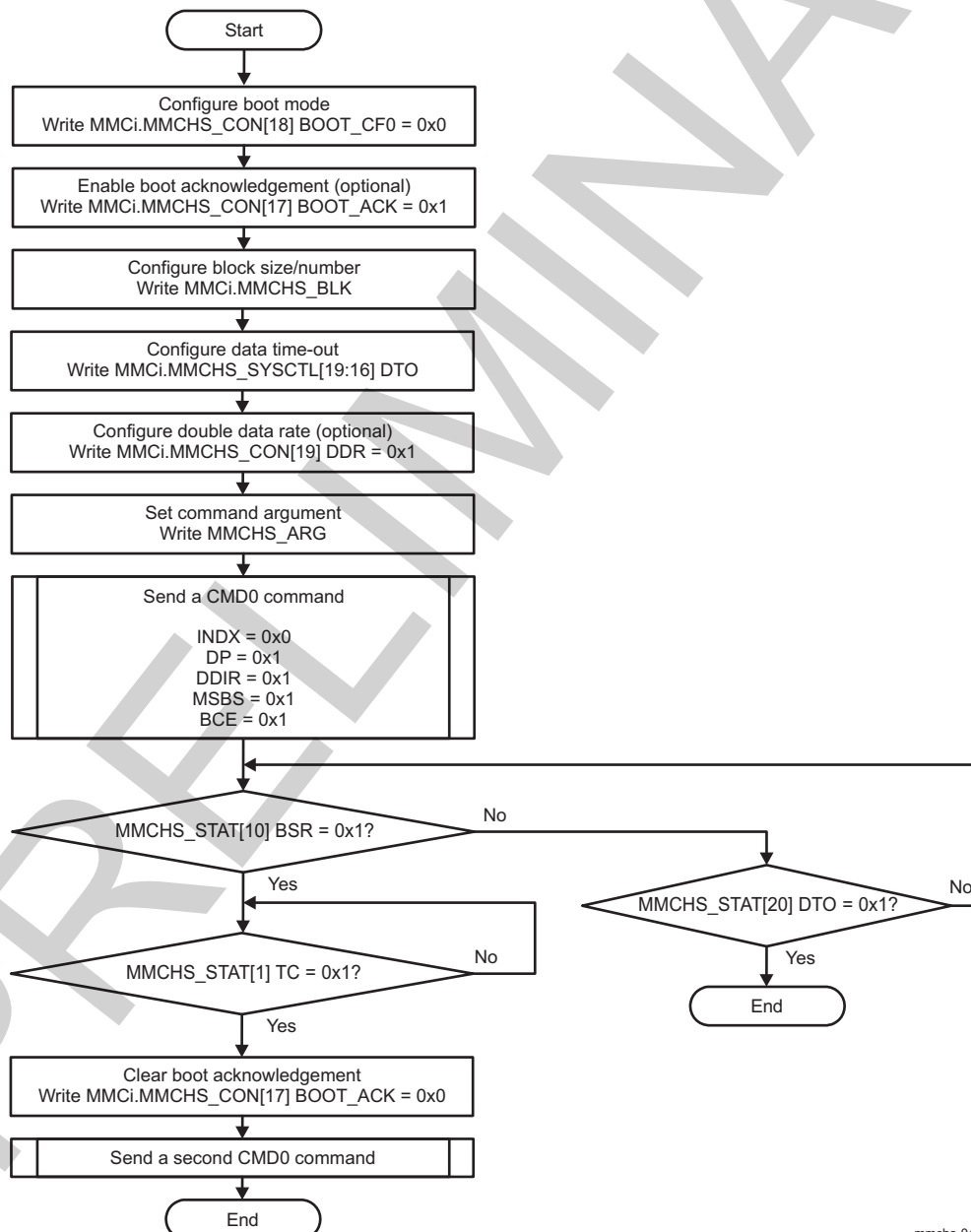
25.5.1.2.3 Boot Mode Configuration

The following sections describe the two possible ways to issue a boot command: issue a CMD0 or drive the CMD line to 0 during the whole boot phase.

25.5.1.2.3.1 Boot Using CMD0

[Figure 25-51](#) shows the necessary steps to configure the controller boot mode using CMD0.

Figure 25-51. MMC/SD/SDIO Controller Boot Using CMD0



mmchs-043

To abort a boot sequence, the system must issue a CMD0 with the [MMCHS_CMD](#)[23:22] CMD_TYPE bit field set to 0x3 (the [MMCHS_CON](#)[17] BOOT_ACK bit previously cleared to 0x0) during the transfer to abort the transfer and enable the card to exit from boot state.

Table 25-52. Register Call Summary for Main Sequence – Boot Using CMD0

| Register Name | Register Name | Register Name |
|---------------------------|----------------------------|------------------------------|
| MMCHS_CON | MMCHS_BLK | MMCHS_SYSCTL |
| MMCHS_ARG | MMCHS_STAT | |

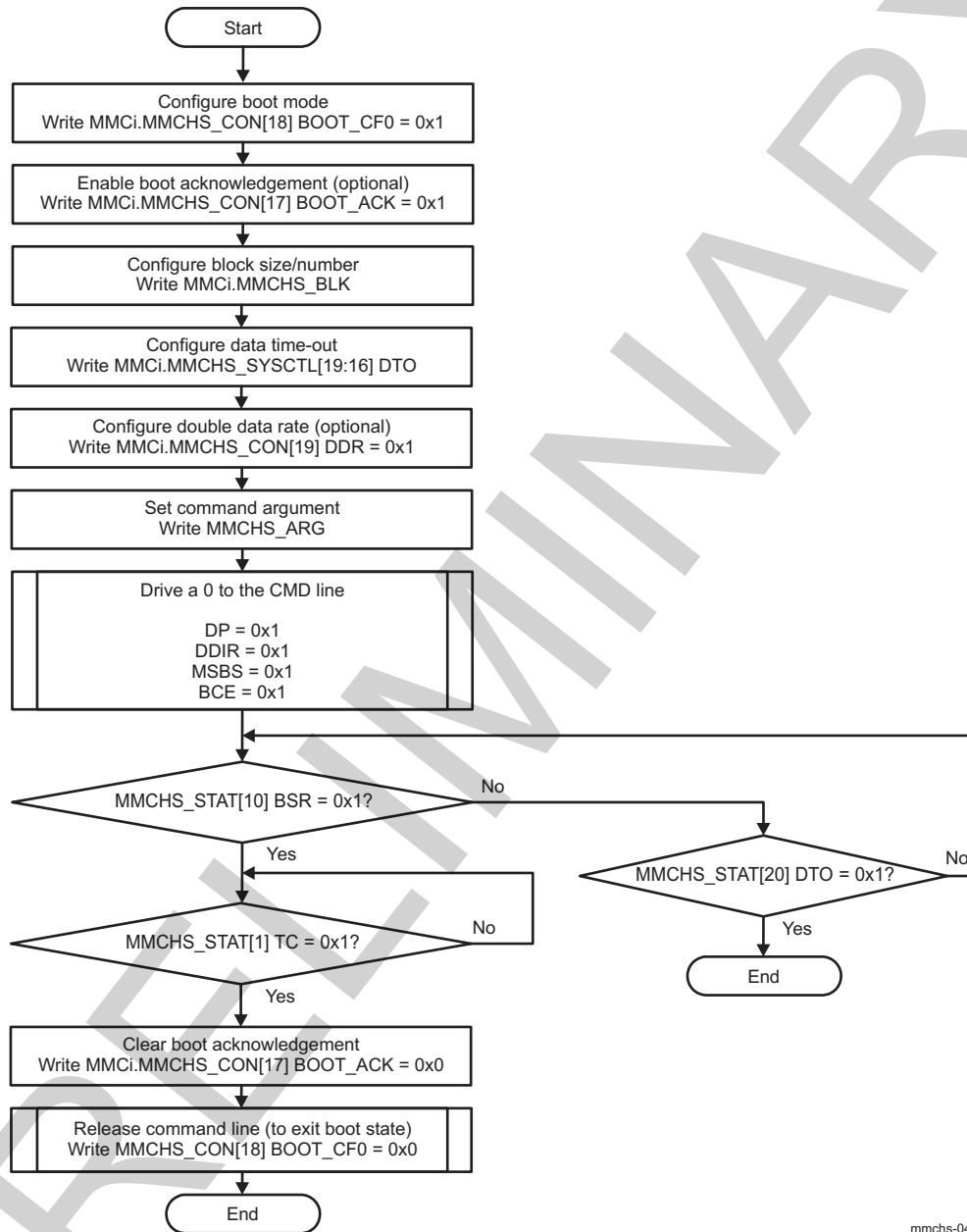
Table 25-53. Subprocess Call Summary for Main Sequence – Boot Using CMD0

| Subprocess Name | Cross-Reference |
|----------------------|--|
| Send a CMD0 command. | Section 25.5.1.2.1.7.1 |

25.5.1.2.3.2 Boot With CMD Line Tied to 0

Figure 25-52 shows the necessary steps to configure the controller in this mode; the driver must follow this sequence.

Figure 25-52. MMC/SD/SDIO Controller Boot With CMD Line Tied to 0



mmchs-044

To abort the boot sequence, the system must clear the [MMCHS_CON\[18\] BOOT_CF0](#) bit to 0x0 during the transfer to abort the transfer and enable the card to exit from boot state.

Table 25-54. Register Call Summary for Main Sequence – Boot Using CMD0

| Register Name | Register Name | Register Name |
|---------------------------|----------------------------|-------------------------------|
| MMCHS_CON | MMCHS_BLK | MMCHS_SYSCCTL |
| MMCHS_ARG | MMCHS_STAT | MMCHS_CMD |

Table 25-55. Subprocess Call Summary for Main Sequence – Boot Using CMD0

| Subprocess Name | Cross-Reference |
|----------------------|--|
| Send a CMD0 command. | Section 25.5.1.2.1.7.1 |

25.6 MMC/SD/SDIO Register Manual

25.6.1 MMC/SD/SDIO Instance Summary

Table 25-56. MMC/SD/SDIO Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|------|
| MMCHS1 | 0x4809 C000 | 4KB |
| MMCHS2 | 0x480B 4000 | 4KB |
| MMCHS3 | 0x480A D000 | 4KB |
| MMCHS4 | 0x480D 1000 | 4KB |
| MMCHS5 | 0x480D 5000 | 4KB |

25.6.2 MMC/SD/SDIO Registers

25.6.2.1 MMC/SD/SDIO Register Summary

Table 25-57. MMC/SD/SDIO Registers Mapping Summary 1

| Register Name | Type | Register Width (Bits) | Address Offset | MMCHS1 Physical Address | MMCHS2 Physical Address | MMCHS3 Physical Address |
|--------------------|------|-----------------------|----------------|-------------------------|-------------------------|-------------------------|
| MMCHS_HL_REV | R | 32 | 0x0000 0000 | 0x4809 C000 | 0x480B 4000 | 0x480A D000 |
| MMCHS_HL_HWINFO | R | 32 | 0x0000 0004 | 0x4809 C004 | 0x480B 4004 | 0x480A D004 |
| MMCHS_HL_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4809 C010 | 0x480B 4010 | 0x480A D010 |
| MMCHS_SYSCONFIG | RW | 32 | 0x0000 0110 | 0x4809 C110 | 0x480B 4110 | 0x480A D110 |
| MMCHS_SYSSTATUS | R | 32 | 0x0000 0114 | 0x4809 C114 | 0x480B 4114 | 0x480A D114 |
| MMCHS_CSRE | RW | 32 | 0x0000 0124 | 0x4809 C124 | 0x480B 4124 | 0x480A D124 |
| MMCHS_SYSTEST | RW | 32 | 0x0000 0128 | 0x4809 C128 | 0x480B 4128 | 0x480A D128 |
| MMCHS_CON | RW | 32 | 0x0000 012C | 0x4809 C12C | 0x480B 412C | 0x480A D12C |
| MMCHS_PWCNT | RW | 32 | 0x0000 0130 | 0x4809 C130 | 0x480B 4130 | 0x480A D130 |
| RESERVED | R | 32 | 0x0000 0200 | 0x4809 C200 | 0x480B 4200 | 0x480A D200 |
| MMCHS_BLK | RW | 32 | 0x0000 0204 | 0x4809 C204 | 0x480B 4204 | 0x480A D204 |
| MMCHS_ARG | RW | 32 | 0x0000 0208 | 0x4809 C208 | 0x480B 4208 | 0x480A D208 |
| MMCHS_CMD | RW | 32 | 0x0000 020C | 0x4809 C20C | 0x480B 420C | 0x480A D20C |
| MMCHS_RSP10 | R | 32 | 0x0000 0210 | 0x4809 C210 | 0x480B 4210 | 0x480A D210 |
| MMCHS_RSP32 | R | 32 | 0x0000 0214 | 0x4809 C214 | 0x480B 4214 | 0x480A D214 |
| MMCHS_RSP54 | R | 32 | 0x0000 0218 | 0x4809 C218 | 0x480B 4218 | 0x480A D218 |
| MMCHS_RSP76 | R | 32 | 0x0000 021C | 0x4809 C21C | 0x480B 421C | 0x480A D21C |
| MMCHS_DATA | RW | 32 | 0x0000 0220 | 0x4809 C220 | 0x480B 4220 | 0x480A D220 |
| MMCHS_PSTATE | R | 32 | 0x0000 0224 | 0x4809 C224 | 0x480B 4224 | 0x480A D224 |
| MMCHS_HCTL | RW | 32 | 0x0000 0228 | 0x4809 C228 | 0x480B 4228 | 0x480A D228 |
| MMCHS_SYSCTL | RW | 32 | 0x0000 022C | 0x4809 C22C | 0x480B 422C | 0x480A D22C |
| MMCHS_STAT | RW | 32 | 0x0000 0230 | 0x4809 C230 | 0x480B 4230 | 0x480A D230 |
| MMCHS_IE | RW | 32 | 0x0000 0234 | 0x4809 C234 | 0x480B 4234 | 0x480A D234 |
| MMCHS_ISE | RW | 32 | 0x0000 0238 | 0x4809 C238 | 0x480B 4238 | 0x480A D238 |
| MMCHS_AC12 | R | 32 | 0x0000 023C | 0x4809 C23C | 0x480B 423C | 0x480A D23C |
| MMCHS_CAPA | RW | 32 | 0x0000 0240 | 0x4809 C240 | 0x480B 4240 | 0x480A D240 |
| MMCHS_CUR_CAPA | RW | 32 | 0x0000 0248 | 0x4809 C248 | 0x480B 4248 | 0x480A D248 |
| MMCHS_FE | RW | 32 | 0x0000 0250 | 0x4809 C250 | 0x480B 4250 | 0x480A D250 |
| MMCHS_ADMAES | RW | 32 | 0x0000 0254 | 0x4809 C254 | 0x480B 4254 | N/A |

Table 25-57. MMC/SD/SDIO Registers Mapping Summary 1 (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | MMCHS1 Physical Address | MMCHS2 Physical Address | MMCHS3 Physical Address |
|---------------|------|-----------------------|----------------|-------------------------|-------------------------|-------------------------|
| MMCHS_ADMASAL | RW | 32 | 0x0000 0258 | 0x4809 C258 | 0x480B 4258 | N/A |
| RESERVED | R | 32 | 0x0000 025C | 0x4809 C25C | 0x480B 425C | 0x480A D25C |
| MMCHS_REV | R | 32 | 0x0000 02FC | 0x4809 C2FC | 0x480B 42FC | 0x480A D2FC |

Table 25-58. MMC/SD/SDIO Registers Mapping Summary 2

| Register Name | Type | Register Width (Bits) | Address Offset | MMCHS4 Physical Address | MMCHS5 Physical Address |
|--------------------|------|-----------------------|----------------|-------------------------|-------------------------|
| MMCHS_HL_REV | R | 32 | 0x0000 0000 | 0x480D 1000 | 0x480D 5000 |
| MMCHS_HL_HWINFO | R | 32 | 0x0000 0004 | 0x480D 1004 | 0x480D 5004 |
| MMCHS_HL_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x480D 1010 | 0x480D 5010 |
| MMCHS_SYSCONFIG | RW | 32 | 0x0000 0110 | 0x480D 1110 | 0x480D 5110 |
| MMCHS_SYSSTATUS | R | 32 | 0x0000 0114 | 0x480D 1114 | 0x480D 5114 |
| MMCHS_CSRE | RW | 32 | 0x0000 0124 | 0x480D 1124 | 0x480D 5124 |
| MMCHS_SYSTEST | RW | 32 | 0x0000 0128 | 0x480D 1128 | 0x480D 5128 |
| MMCHS_CON | RW | 32 | 0x0000 012C | 0x480D 112C | 0x480D 512C |
| MMCHS_PWCNT | RW | 32 | 0x0000 0130 | 0x480D 1130 | 0x480D 5130 |
| RESERVED | R | 32 | 0x0000 0200 | 0x480D 1200 | 0x480D 5200 |
| MMCHS_BLK | RW | 32 | 0x0000 0204 | 0x480D 1204 | 0x480D 5204 |
| MMCHS_ARG | RW | 32 | 0x0000 0208 | 0x480D 1208 | 0x480D 5208 |
| MMCHS_CMD | RW | 32 | 0x0000 020C | 0x480D 120C | 0x480D 520C |
| MMCHS_RSP10 | R | 32 | 0x0000 0210 | 0x480D 1210 | 0x480D 5210 |
| MMCHS_RSP32 | R | 32 | 0x0000 0214 | 0x480D 1214 | 0x480D 5214 |
| MMCHS_RSP54 | R | 32 | 0x0000 0218 | 0x480D 1218 | 0x480D 5218 |
| MMCHS_RSP76 | R | 32 | 0x0000 021C | 0x480D 121C | 0x480D 521C |
| MMCHS_DATA | RW | 32 | 0x0000 0220 | 0x480D 1220 | 0x480D 5220 |
| MMCHS_PSTATE | R | 32 | 0x0000 0224 | 0x480D 1224 | 0x480D 5224 |
| MMCHS_HCTL | RW | 32 | 0x0000 0228 | 0x480D 1228 | 0x480D 5228 |
| MMCHS_SYSCTL | RW | 32 | 0x0000 022C | 0x480D 122C | 0x480D 522C |
| MMCHS_STAT | RW | 32 | 0x0000 0230 | 0x480D 1230 | 0x480D 5230 |
| MMCHS_IE | RW | 32 | 0x0000 0234 | 0x480D 1234 | 0x480D 5234 |
| MMCHS_ISE | RW | 32 | 0x0000 0238 | 0x480D 1238 | 0x480D 5238 |
| MMCHS_AC12 | R | 32 | 0x0000 023C | 0x480D 123C | 0x480D 523C |
| MMCHS_CAPA | RW | 32 | 0x0000 0240 | 0x480D 1240 | 0x480D 5240 |
| MMCHS_CUR_CAPA | RW | 32 | 0x0000 0248 | 0x480D 1248 | 0x480D 5248 |
| MMCHS_FE | RW | 32 | 0x0000 0250 | 0x480D 1250 | 0x480D 5250 |
| MMCHS_ADMAES | R | 32 | 0x0000 0254 | N/A | N/A |
| MMCHS_ADMASAL | RW | 32 | 0x0000 0258 | N/A | N/A |
| RESERVED | R | 32 | 0x0000 025C | 0x480D 125C | 0x480D 525C |
| MMCHS_REV | R | 32 | 0x0000 02FC | 0x480D 12FC | 0x480D 52FC |

25.6.2.2 MMC/SD/SDIO Register Description

Table 25-59. MMCHS_HL_REV

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4809 C000 0x480B 4000 0x480A D000 0x480D 1000 0x480D 5000 | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | IP Revision Identifier (X.Y.R) Used by software to track features, bugs, and compatibility | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------|------|--------------------|
| 31:0 | REVISION | IP Revision. | R | See ⁽¹⁾ |

⁽¹⁾ TI internal data.

Table 25-60. Register Call Summary for Register MMCHS_HL_REV

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[0\] \[1\]](#)

Table 25-61. MMCHS_HL_HWINFO

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0004 | | |
| Physical Address | 0x4809 C004 0x480B 4004 0x480A D004 0x480D 1004 0x480D 5004 | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | Information about the IP module's hardware configuration, that is, typically the module's HDL generics (if any). Actual field format and encoding is up to the module's designer to decide. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---------|----------|---|---|-----------|----------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | RETMODE | MEM_SIZE | | | MERGE_MEM | MADMA_EN | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-----------------------------------|
| 31:7 | RESERVED | Reserved | R | 0x00000000 |
| 6 | RETMODE | Retention mode generic parameter This bit field indicates whether the retention mode is supported using the pin PIRFFRET. 0x0: Retention mode disabled 0x1: Retention mode enabled | R | See Table 25-63 . |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|---|
| 5:2 | MEM_SIZE | Memory size for FIFO buffer: Read 0x1: Memory of 512 bytes, max block length is 512 bytes Read 0x2: Memory of 1024 bytes, max block length is 1024 bytes Read 0x4: Memory of 2048 bytes, max block length is 2048 bytes Read 0x8: Memory of 4096 bytes, max block length is 2048 bytes | R | 0x2 |
| 1 | MERGE_MEM | Memory merged for FIFO buffer: This register defines the configuration of FIFO buffer architecture. If the bit is set STA and DFT shall support clock multiplexing and balancing. Read 0x0: 2 memories instantiated, one per data transfer direction. Read 0x1: A single memory is used with multiplexed addresses, data and clocks. | R | 0 |
| 0 | MADMA_EN | Master DMA enabled generic parameter: This register defines the configuration of the controller to know if it supports the master DMA management called ADMA. Read 0x0: No Master DMA (ADMA) management supported Read 0x1: Controller supports ADMA | R | Please refer to Table 25-64 |

Table 25-62. Register Call Summary for Register MMCHS_HL_HWINFO

MMC/SD/SDIO Functional Description

- [DMA Modes: \[0\] \[1\]](#)
- [Master DMA Operations: \[2\]](#)
- [Slave DMA Operations: \[3\]](#)
- [Data Buffer: \[4\]](#)
- [Retention Mode: \[5\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[6\] \[7\]](#)
- [MMC/SD/SDIO Register Description: \[8\] \[9\] \[10\] \[11\] \[12\]](#)

Table 25-63. Reset value for MMCHS_HL_HWINFO

| Instance | RETMODE |
|----------|---------|
| MMCHS1 | 1 |
| MMCHS2 | 1 |
| MMCHS3 | 0 |
| MMCHS4 | 0 |
| MMCHS5 | 0 |

Table 25-64. Reset value for MADMA_EN

| Instance | RETMODE |
|----------|---------|
| MMCHS1 | 1 |
| MMCHS2 | 1 |
| MMCHS3 | 0 |
| MMCHS4 | 0 |
| MMCHS5 | 0 |

Table 25-65. MMCHS HL SYSCONFIG

| | | |
|-------------------------|---|---|
| Address Offset | 0x0000 0010 | |
| Physical Address | 0x4809 C010 0x480B 4010 0x480A D010 0x480D 1010 0x480D 5010 | Instance MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | Clock management configuration | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----|----|----------|----|---|---|---------|---|-----------|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STANDBYMODE | | | | IDLEMODE | | | | FREEEMU | | SOFTRESET | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-----------|
| 31:6 | RESERVED | | R | 0x0000000 |
| 5:4 | STANDBYMODE | <p>Configuration of the local initiator state management mode.</p> <p>By definition, initiator may generate read/write transaction as long as it is out of STANDBY state.</p> <p>0x0: Force-standby mode: local initiator is unconditionally placed in standby state.Backup mode, for debug only.</p> <p>0x1: No-standby mode: local initiator is unconditionally placed out of standby state.Backup mode, for debug only.</p> <p>0x2: Smart-standby mode: local initiator standby status depends on local conditions, that is, the module's functional requirement from the initiator.IP module shall not generate (initiator-related) wakeup events.</p> <p>0x3: Smart-Standby wakeup-capable mode: local initiator standby status depends on local conditions, that is, the module's functional requirement from the initiator. IP module may generate (master-related) wakeup events when in standby state.Mode is only relevant if the appropriate IP module "mwakeup" output is implemented.</p> | RW | 0x2 |
| 3:2 | IDLEMODE | <p>Configuration of the local target state management mode.</p> <p>By definition, target can handle read/write transaction as long as it is out of IDLE state.</p> <p>0x0: Force-idle mode: local target's idle state follows (acknowledges) the system's idle requests unconditionally, that is, regardless of the IP module's internal requirements.Backup mode, for debug only.</p> <p>0x1: No-idle mode: local target never enters idle state.Backup mode, for debug only.</p> <p>0x2: Smart-idle mode: local target's idle state eventually follows (acknowledges) the system's idle requests, depending on the IP module's internal requirements.IP module shall not generate (IRQ- or DMA-request-related) wakeup events.</p> <p>0x3: Smart-idle wakeup-capable mode: local target's idle state eventually follows (acknowledges) the system's idle requests, depending on the IP module's internal requirements.IP module may generate (IRQ- or DMA-request-related) wakeup events when in idle state.Mode is only relevant if the appropriate IP module "swakeup" output(s) is (are) implemented.</p> | RW | 0x2 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 1 | FREEEMU | Sensitivity to emulation (debug) suspend input signal. Functionality NOT implemented in MMCHS. 0x0: IP module is sensitive to emulation suspend 0x1: IP module is not sensitive to emulation suspend | RW | 0 |
| 0 | SOFTRESET | Software reset. (Optional) Write 0x0: No action Read 0x0: Reset done, no pending action Read 0x1: Reset (software or other) ongoing Write 0x1: Initiate software reset | RW | 0 |

Table 25-66. Register Call Summary for Register MMCHS_HL_SYSCONFIG

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[0\] \[1\]](#)

Table 25-67. MMCHS_SYSCONFIG

| | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0110 | | | | | | | | | | | | | | | |
| Physical Address | <div>0x4809 C110</div> <div>0x480B 4110</div> <div>0x480A D110</div> <div>0x480D 1110</div> <div>0x480D 5110</div> | | | | | | | | | | | | | | | |
| | <div>Instance</div> <div>MMCHS1</div> <div>MMCHS2</div> <div>MMCHS3</div> <div>MMCHS4</div> <div>MMCHS5</div> | | | | | | | | | | | | | | | |
| Description | System Configuration Register This register allows controlling various parameters of the Interconnect interface. | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------|----|----------|----|---------------|----|----------|----------|----------|-----------|---|-----------|-----------|----------|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | STANDBYMODE | | RESERVED | | CLOCKACTIVITY | | RESERVED | RESERVED | RESERVED | SIDLEMODE | | ENAWAKEUP | SOFTRESET | AUTOIDLE | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|---------|
| 31:14 | RESERVED | Reserved These bits are initialized to zero, and writes to them are ignored. Reads return 0. | R | 0x00000 |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|-------|
| 13:12 | STANDBYMODE | <p>Master interface power Management, standby/wait control.</p> <p>The bit field is only useful when generic parameter MMCHS_HL_HWINFO[0] MADMA_EN (Master ADMA enable) is set as active, otherwise it is a read only register read a 0.</p> <p>0x0: Force-standby. Mstandby is forced unconditionnaly.</p> <p>0x1: No-standby. Mstandby is never asserted.</p> <p>0x2: Smart-standby mode: local initiator standby status depends on local conditions, that is, the module's functional requirement from the initiator.IP module shall not generate (initiator-related) wakeup events.</p> <p>0x3: Smart-Standby wakeup-capable mode: local initiator standby status depends on local conditions, that is, the module's functional requirement from the initiator. IP module may generate (master-related) wakeup events when in standby state.Mode is only relevant if the appropriate IP module "mwakeup" output is implemented.</p> | RW | 0x0 |
| 11:10 | RESERVED | <p>Reserved</p> <p>These bits are initialized to zero, and writes to them are ignored.</p> <p>Reads return 0.</p> | R | 0x0 |
| 9:8 | CLOCKACTIVITY | <p>Clocks activity during wake up mode period.</p> <p>Bit8: Interface clock</p> <p>Bit9: Functional clock</p> <p>0x0: Interface and Functional clock may be switched off.</p> <p>0x1: Interface clock is maintained. Functional clock may be switched-off.</p> <p>0x2: Functional clock is maintained. Interface clock may be switched-off.</p> <p>0x3: Interface and Functional clocks are maintained.</p> | RW | 0x0 |
| 7 | RESERVED | <p>Reserved</p> <p>This bit is initialized to zero, and writes to it are ignored.</p> <p>Reads return 0.</p> | R | 0 |
| 6 | RESERVED | <p>Reserved - EmuSoft not supported</p> <p>This bit is initialized to zero, and writes to it are ignored.</p> <p>Reads return 0.</p> | R | 0 |
| 5 | RESERVED | <p>Reserved - EmuFree not supported</p> <p>This bit is initialized to zero, and writes to it are ignored.</p> <p>Reads return 0.</p> | R | 0 |
| 4:3 | SIDLEMODE | <p>Power management</p> <p>0x0: If an idle request is detected, the MMCHS acknowledges it unconditionally and goes in Inactive mode. Interrupt and DMA requests are unconditionally de-asserted.</p> <p>0x1: If an idle request is detected, the request is ignored and the module keeps on behaving normally.</p> <p>0x2: Smart-idle mode: local target's idle state eventually follows (acknowledges) the system's idle requests, depending on the IP module's internal requirements.IP module shall not generate (IRQ- or DMA-request-related) wakeup events.</p> <p>0x3: Smart-idle wakeup-capable mode: local target's idle state eventually follows (acknowledges) the system's idle requests, depending on the IP module's internal requirements.IP module may generate (IRQ- or DMA-request-related) wakeup events when in idle state.Mode is only relevant if the appropriate IP module "swakeup" output(s) is (are) implemented.</p> | RW | 0x2 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 2 | ENAWAKEUP | Wakeup feature control 0x0: Wakeup capability is disabled 0x1: Wakeup capability is enabled | RW | 1 |
| 1 | SOFTRESET | Software reset. The bit is automatically reset by the hardware. During reset, it always returns 0. Read 0x0: Normal mode Write 0x0: No effect. Write 0x1: Trigger a module reset. Read 0x1: The module is reset. | RW | 0 |
| 0 | AUTOIDLE | Internal Clock gating strategy 0x0: Clocks are free-running 0x1: Automatic clock gating strategy is applied, based on the Interconnect and MMC interface activity | RW | 1 |

Table 25-68. Register Call Summary for Register MMCHS_SYSCONFIG

MMC/SD/SDIO Functional Description

- [Software Reset: \[0\]](#)
- [Power Management: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\]](#)

MMC/SD/SDIO Programming Guide

- [Global Initialization: \[13\] \[14\] \[15\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[16\] \[17\]](#)
- [MMC/SD/SDIO Register Description: \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)

Table 25-69. MMCHS_SYSSTATUS

| | | |
|------------------|---|--|
| Address Offset | 0x0000 0114 | |
| Physical Address | 0x4809 C114 0x480B 4114 0x480A D114 0x480D 1114 0x480D 5114 | Instance MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | System Status Register This register provides status information about the module excluding the interrupt status information | |
| Type | R | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESETDONE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Reserved These bits are initialized to zero, and writes to them are ignored. Reads return 0. | R | 0x0000 0000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | RESETDONE | Internal Reset Monitoring Note: the debounce clock , the system clock (Interface) and the functional clock shall be provided to the MMC/SD/SDIO host controller to allow the internal reset monitoring. Read 0x0: Internal module reset is on-going Read 0x1: Reset completed. | R | 0 |

Table 25-70. Register Call Summary for Register MMCHS_SYSSTATUS

MMC/SD/SDIO Functional Description

- [Hardware Reset: \[0\]](#)
- [Software Reset: \[1\]](#)

MMC/SD/SDIO Programming Guide

- [Global Initialization: \[2\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[3\] \[4\]](#)

Table 25-71. MMCHS_CSRE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|----------------------------|--------------------------------------|-------------|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0124 | Instance | MMCHS1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4809 C124 0x480B 4124 0x480A D124 0x480D 1124 0x480D 5124 | | MMCHS2 MMCHS3 MMCHS4 MMCHS5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | <p>Card status response error</p> <p>This register enables the host controller to detect card status errors of response type R1, R1b for all cards and of R5, R5b and R6 response for cards types SD or SDIO.</p> <p>When a bit MMCHS_CSRE[i] is set to 1, if the corresponding bit at the same position in the response MMCHS_RSP10[i] is set to 1, the host controller indicates a card error (MMCHS_STAT[CERR]) interrupt status to avoid the host driver reading the response register (MMCHS_RSP10).</p> <p>Note: No automatic card error detection for autoCMD12 is implemented; the host system has to check autoCMD12 response register (MMCHS_RSP76) for possible card errors.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="16"></td><td colspan="16">CSRE</td></tr></table> | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | CSRE | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | CSRE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:0 | CSRE | Card status response error | RW | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------------------|------|-------------|
| 31:0 | CSRE | Card status response error | RW | 0x0000 0000 |

Table 25-72. Register Call Summary for Register MMCHS_CSRE

MMC/SD/SDIO Functional Description

- [Interrupt Requests: \[0\]](#)

MMC/SD/SDIO Programming Guide

- [Operational Modes Configuration: \[1\] \[2\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[3\] \[4\]](#)
- [MMC/SD/SDIO Register Description: \[5\] \[6\]](#)

Table 25-73. MMCHS_SYSTEST

| | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0128 | | | | | | | | | | | | | | | |
| Physical Address | 0x4809 C128 0x480B 4128 0x480A D128 0x480D 1128 0x480D 5128 | | | | | | | | | | | | | | | |
| | Instance | | | | | | | | | | | | | | | |
| | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 | | | | | | | | | | | | | | | |
| Description | System Test register This register is used to control the signals that connect to I/O pins when the module is configured in system test (SYSTEST) mode for boundary connectivity verification. Note: In SYSTEST mode, a write into MMCHS_CMD register will not start a transfer. The buffer behaves as a stack accessible only by the local host (push and pop operations). In this mode, the Transfer Block Size (MMCHS_BLK [11:0] BLEN) and the Blocks count for current transfer (MMCHS_BLK [31:16] NBLK) are needed to generate a Buffer write ready interrupt (MMCHS_STAT [4] BWR) or a Buffer read ready interrupt (MMCHS_STAT [5] BRR) and DMA requests if enabled. | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | OBI | SDCD | SDWP | WAKD | SSB | D7D | D6D | D5D | D4D | D3D | D2D | D1D | D0D | DDIR | CDAT | CDIR | MCKD |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:17 | RESERVED | Reserved These bits are initialized to zero, and writes to them are ignored. Reads return 0. | R | 0x0000 |
| 16 | OBI | Out-Of-Band Interrupt (OBI) data value Read 0x0: The Out-of-Band Interrupt pin is driven low. Read 0x1: The Out-of-Band Interrupt pin is driven high. | RW | 0 |
| 15 | SDCD | Card detect input signal (SDCD) data value Read 0x0: The card detect pin is driven low. Read 0x1: The card detect pin is driven high. | R | 0 |
| 14 | SDWP | Write protect input signal (SDWP) data value Read 0x0: The write protect pin SDWP is driven low. Read 0x1: The write protect pin SDWP is driven high. | R | 0 |
| 13 | WAKD | Wake request output signal data value Write 0x0: The pin SWAKEUP is driven low. Read 0x0: No action. Returns 0. Write 0x1: The pin SWAKEUP is driven high. Read 0x1: No action. Returns 1. | RW | 0 |
| 12 | SSB | Set status bit This bit must be cleared prior attempting to clear a status bit of the interrupt status register (MMCHS_STAT). Write 0x0: Clear this SSB bit field. Writing 0 does not clear already set status bits; Read 0x0: No action. Returns 0. Read 0x1: No action. Returns 1. Write 0x1: Force to 1 all status bits of the interrupt status register (MMCHS_STAT) only if the corresponding bit field in the Interrupt signal enable register (MMCHS_ISE) is set. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 11 | D7D | <p>DAT7 input/output signal data value</p> <p>Read 0x0: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT7 line (low). If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 0</p> <p>Write 0x0: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT7 line is driven low. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> <p>Read 0x1: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT7 line (high) If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 1</p> <p>Write 0x1: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT7 line is driven high. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> | RW | 0 |
| 10 | D6D | <p>DAT6 input/output signal data value</p> <p>Read 0x0: If SYSTEST[DDIR] = 1 (input mode direction), returns the value on the DAT6 line (low). If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 0</p> <p>Write 0x0: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT6 line is driven low. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> <p>Read 0x1: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT6 line (high) If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 1</p> <p>Write 0x1: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT6 line is driven high. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> | RW | 0 |
| 9 | D5D | <p>DAT5 input/output signal data value</p> <p>Read 0x0: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT5 line (low). If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 0</p> <p>Write 0x0: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT5 line is driven low. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> <p>Read 0x1: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT5 line (high) If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 1</p> <p>Write 0x1: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT5 line is driven high. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 8 | D4D | <p>DAT4 input/output signal data value</p> <p>Write 0x0: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT4 line is driven low. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> <p>Read 0x0: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT4 line (low). If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 0</p> <p>Write 0x1: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT4 line is driven high. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> <p>Read 0x1: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT4 line (high) If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 1</p> | RW | 0 |
| 7 | D3D | <p>DAT3 input/output signal data value</p> <p>Write 0x0: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT3 line is driven low. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> <p>Read 0x0: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT3 line (low). If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 0</p> <p>Read 0x1: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT3 line (high) If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 1</p> <p>Write 0x1: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT3 line is driven high. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> | RW | 0 |
| 6 | D2D | <p>DAT2 input/output signal data value</p> <p>Write 0x0: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT2 line is driven low. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> <p>Read 0x0: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT2 line (low). If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 0</p> <p>Write 0x1: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT2 line is driven high. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> <p>Read 0x1: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT2 line (high) If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 1</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 5 | D1D | <p>DAT1 input/output signal data value</p> <p>Read 0x0: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT1 line (low). If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 0</p> <p>Write 0x0: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT1 line is driven low. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> <p>Read 0x1: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT1 line (high). If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 1</p> <p>Write 0x1: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT1 line is driven high. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> | RW | 0 |
| 4 | D0D | <p>DAT0 input/output signal data value</p> <p>Write 0x0: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT0 line is driven low. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> <p>Read 0x0: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT0 line (low). If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 0</p> <p>Write 0x1: If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), the DAT0 line is driven high. If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), no effect.</p> <p>Read 0x1: If MMCHS_SYSTEST[3] DDIR = 1 (input mode direction), returns the value on the DAT0 line (high). If MMCHS_SYSTEST[3] DDIR = 0 (output mode direction), returns 1</p> | RW | 0 |
| 3 | DDIR | <p>Control of the DAT[7:0] pins direction.</p> <p>Write 0x0: The DAT lines are outputs (host to card)</p> <p>Read 0x0: No action. Returns 0.</p> <p>Read 0x1: No action. Returns 1.</p> <p>Write 0x1: The DAT lines are inputs (card to host)</p> | RW | 0 |
| 2 | CDAT | <p>CMD input/output signal data value</p> <p>Write 0x0: If MMCHS_SYSTEST[1] CDIR = 0 (output mode direction), the CMD line is driven low. If MMCHS_SYSTEST[1] CDIR = 1 (input mode direction), no effect.</p> <p>Read 0x0: If MMCHS_SYSTEST[1] CDIR = 1 (input mode direction), returns the value on the CMD line (low). If MMCHS_SYSTEST[1] CDIR = 0 (output mode direction), returns 0</p> <p>Write 0x1: If MMCHS_SYSTEST[1] CDIR = 0 (output mode direction), the CMD line is driven high. If MMCHS_SYSTEST[1] CDIR = 1 (input mode direction), no effect.</p> <p>Read 0x1: If MMCHS_SYSTEST[1] CDIR = 1 (input mode direction), returns the value on the CMD line (high). If MMCHS_SYSTEST[1] CDIR = 0 (output mode direction), returns 1</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 1 | CDIR | Control of the CMD pin direction. Read 0x0: No action. Returns 0. Write 0x0: The CMD line is an output (host to card) Read 0x1: No action. Returns 1. Write 0x1: The CMD line is an input (card to host) | RW | 0 |
| 0 | MCKD | MMC clock output signal data value Read 0x0: No action. Returns 0. Write 0x0: The output clock is driven low. Write 0x1: The output clock is driven high. Read 0x1: No action. Returns 1. | RW | 0 |

Table 25-74. Register Call Summary for Register MMCHS_SYSTEST

MMC/SD/SDIO Functional Description

- [Test Registers: \[0\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[1\] \[2\]](#)
- [MMC/SD/SDIO Register Description: \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\] \[44\] \[45\] \[46\] \[47\] \[48\] \[49\] \[50\] \[51\] \[52\] \[53\] \[54\] \[55\] \[56\] \[57\] \[58\] \[59\] \[60\] \[61\] \[62\] \[63\] \[64\] \[65\] \[66\] \[67\] \[68\] \[69\] \[70\] \[71\] \[72\] \[73\]](#)

Table 25-75. MMCHS_CON

| | | | |
|-------------------------|--|-----------------|--------------------------------------|
| Address Offset | 0x0000 012C | Instance | MMCHS1 |
| Physical Address | 0x4809 C12C 0x480B 412C 0x480A D12C 0x480D 112C 0x480D 512C | | MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | Configuration register This register is used: - to select the functional mode or the SYSTEST mode for any card. - to send an initialization sequence to any card. - to enable the detection on DAT[1] of a card interrupt for SDIO cards only. and also to configure : - specific data and command transfers for MMC cards only. - the parameters related to the card detect and write protect input signals. | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|----|----|----|----|----|----|----|----------|---------|-----|----------|----------|------------|-------|------|------|-------|------|------|-----|-----|-----|-----|------|-----|----|------|----|---|---|---|
| RESERVED | | | | | | | | SDMA_LNE | DMA_MNS | DDR | BOOT_CF0 | BOOT_ACK | CLKEXTFREE | PADEN | OBIE | OBIP | CEATA | CTPL | DVAL | WPP | CDP | MIT | DW8 | MODE | STR | HR | INIT | OD | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:22 | RESERVED | Reserved These bits are initialized to zero, and writes to them are ignored. Reads return 0. | R | 0x000 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 21 | SDMA_LNE | <p>Slave DMA Level/Edge Request: The waveform of the DMA request can be configured either edge sensitive with early de-assertion on first access to MMCHS_DATA register or late de-assertion, request remains active until last allowed data written into MMCHS_DATA.</p> <p>0x0: Slave DMA edge sensitive, Early DMA de-assertion 0x1: Slave DMA level sensitive, Late DMA de-assertion</p> | RW | 0 |
| 20 | DMA_MNS | <p>DMA Master or Slave selection: When this bit is set and the controller is configured to use the DMA, Interconnect master interface is used to get datas from system using ADMA2 procedure (direct access to the memory). This option is only available if generic parameter MMCHS_HL_HWINFO[0] MADMA_EN is asserted to 1.</p> <p>0x0: The controller is slave on data transfers with system. 0x1: The controller is master on data exchange with system, controller must be configured as using DMA.</p> | RW | 0 |
| 19 | DDR | <p>Dual Data Rate mode: When this register is set, the controller uses both clock edge to emit or receive data. Odd bytes are transmitted on falling edges and even bytes are transmitted on rise edges. It only applies on Data bytes and CRC, Start, end bits and CRC status are kept full cycle. This bit field is only meaningful and active for even clock divider ratio of MMCHS_SYSCCTL[15:6] CLKD, it is insensitive to MMCHS_HCTL[2] HSPE setting.</p> <p>0x0: Standard mode : data are transmitted on a single edge depending on MMCHS_HCTL[2] HSPE. 0x1: Data Bytes and CRC are transmitted on both edge.</p> | RW | 0 |
| 18 | BOOT_CF0 | <p>Boot status supported: This register is set when the CMD line need to be forced to 0 for a boot sequence. CMD line is driven to 0 after writing in MMCHS_CMD. The line is released when this bit field is de-asserted and abort data transfer in case of a pending transaction.</p> <p>Write 0x0: CMD line is released when it was previously forced to 0 by a boot sequence. Read 0x0: CMD line not forced Read 0x1: CMD line forced to 0 is enabled Write 0x1: CMD line forced to 0 is enabled and will be active after writing into MMCHS_CMD</p> | RW | 0 |
| 17 | BOOT_ACK | <p>Book acknowledge received: When this bit is set the controller should receive a boot status on DAT0 line after next command issued. If no status is received a data timeout will be generated.</p> <p>0x0: No acknowledge to be received 0x1: A boot status will be received on DAT0 line after issuing a command.</p> | RW | 0 |
| 16 | CLKEXTFREE | <p>External clock free running: This register is used to maintain card clock out of transfer transaction to enable slave module for example to generate a synchronous interrupt on DAT[1]. The Clock will be maintain only if MMCHS_SYSCCTL[2] CEN is set.</p> <p>0x0: External card clock is cut off outside active transaction period. 0x1: External card clock is maintain even out of active transaction period only if MMCHS_SYSCCTL[2] CEN is set.</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 15 | PADEN | Control Power for MMC Lines: This register is only useful when MMC PADs contain power saving mechanism to minimize its leakage power. It works as a GPIO that directly control the ACTIVE pin of PADs. Excepted for DAT[1], the signal is also combine outside the module with the dedicated power control MMCHS_CON[11] CTPL bit. 0x0: ADPIDLE module pin is not forced, it is automatically generated by the MMC fsms. 0x1: ADPIDLE module pin is forced to active state. | RW | 0 |
| 14 | OBIE | Out-of-Band Interrupt Enable MMC cards only: This bit enables the detection of Out-of-Band Interrupt on MMC_OBI input pin. The usage of the Out-of-Band signal (OBI) is optional and depends on the system integration. 0x0: Out-of-Band interrupt detection disabled 0x1: Out-of-Band interrupt detection enabled | RW | 0 |
| 13 | OBIP | Out-of-Band Interrupt Polarity MMC cards only: This bit selects the active level of the out-of-band interrupt coming from MMC cards. The usage of the Out-of-Band signal (OBI) is optional and depends on the system integration. 0x0: active high level 0x1: active low level | RW | 0 |
| 12 | CEATA | CE-ATA control mode MMC cards compliant with CE-ATA:By default, this bit is set to 0. It is use to indicate that next commands are considered as specific CE-ATA commands that potentially use 'command completion' features. 0x0: Standard MMC/SD/SDIO mode. 0x1: CE-ATA mode next commands are considered as CE-ATA commands. | RW | 0 |
| 11 | CTPL | Control Power for DAT[1] line MMC and SD cards: By default, this bit is set to 0 and the host controller automatically disables all the input buffers outside of a transaction to minimize the leakage current. SDIO cards: When this bit is set to 1, the host controller automatically disables all the input buffers except the buffer of DAT[1] outside of a transaction in order to detect asynchronous card interrupt on DAT[1] line and minimize the leakage current of the buffers. 0x0: Disable all the input buffers outside of a transaction. 0x1: Disable all the input buffers except the buffer of DAT[1] outside of a transaction. | RW | 0 |
| 10:9 | DVAL | Debounce filter value All cards This register is used to define a debounce period to filter the card detect input signal (SDCD). The usage of the card detect input signal (SDCD) is optional and depends on the system integration and the type of the connector housing that accommodates the card. 0x0: 33 us debounce period 0x1: 231 us debounce period 0x2: 1 ms debounce period 0x3: 8,4 ms debounce period | RW | 0x3 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 8 | WPP | <p>Write protect polarity For SD and SDIO cards only This bit selects the active level of the write protect input signal (SDWP). The usage of the write protect input signal (SDWP) is optional and depends on the system integration and the type of the connector housing that accommodates the card.</p> <p>0x0: active high level 0x1: active low level</p> | RW | 0 |
| 7 | CDP | <p>Card detect polarity All cards This bit selects the active level of the card detect input signal (SDCD). The usage of the card detect input signal (SDCD) is optional and depends on the system integration and the type of the connector housing that accommodates the card.</p> <p>0x0: active high level 0x1: active low level</p> | RW | 0 |
| 6 | MIT | <p>MMC interrupt command Only for MMC cards. This bit must be set to 1, when the next write access to the command register (MMCHS_CMD) is for writing a MMC interrupt command (CMD40) requiring the command timeout detection to be disabled for the command response.</p> <p>0x0: Command timeout enabled 0x1: Command timeout disabled</p> | RW | 0 |
| 5 | DW8 | <p>8-bit mode MMC select For SD/SDIO cards, this bit must be set to 0. For MMC card, this bit must be set following a valid SWITCH command (CMD6) with the correct value and extend CSD index written in the argument. Prior to this command, the MMC card configuration register (CSD and EXT_CSD) must be verified for compliancy with MMC standard specification 4.x (see section 3.6).</p> <p>0x0: 1-bit or 4-bit Data width (DAT[0] used, MMC, SD cards) 0x1: 8-bit Data width (DAT[7:0] used, MMC cards)</p> | RW | 0 |
| 4 | MODE | <p>Mode select All cards These bits select between Functional mode and SYSTEST mode.</p> <p>0x0: Functional mode. Transfers to the MMC/SD/SDIO cards follow the card protocol. MMC clock is enabled. MMC/SD transfers are operated under the control of the CMD register.</p> <p>0x1: SYSTEST mode The signal pins are configured as general-purpose input/output and the 1024-byte buffer is configured as a stack memory accessible only by the local host or system DMA. The pins retain their default type (input, output or in-out). SYSTEST mode is operated under the control of the SYSTEST register.</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 3 | STR | <p>Stream command Only for MMC cards. This bit must be set to 1 only for the stream data transfers (read or write) of the adtc commands. Stream read is a class 1 command (CMD11: READ_DAT_UNTIL_STOP). Stream write is a class 3 command (CMD20: WRITE_DAT_UNTIL_STOP). 0x0: Block oriented data transfer 0x1: Stream oriented data transfer</p> | RW | 0 |
| 2 | HR | <p>Broadcast host response Only for MMC cards. This register is used to force the host to generate a 48-bit response for bc command type. It can be used to terminate the interrupt mode by generating a CMD40 response by the core (see section 4.3, "Interrupt Mode", in the MMC [1] specification). In order to have the host response to be generated in open drain mode, the register MMCHS_CON[0] OD must be set to 1. When MMCHS_CON[12] CEATA is set to 1 and MMCHS_ARG set to 0x00000000 when writing 0x00000000 into MMCHS_CMD register, the host controller performs a 'command completion signal disable' token that is, CMD line held to 0 during 47 cycles followed by a 1. 0x0: The host does not generate a 48-bit response instead of a command. 0x1: The host generates a 48-bit response instead of a command or a command completion signal disable token.</p> | RW | 0 |
| 1 | INIT | <p>Send initialization stream All cards. When this bit is set to 1, and the card is idle, an initialization sequence is sent to the card. An initialization sequence consists of setting the CMD line to 1 during 80 clock cycles. The initialisation sequence is mandatory - but it is not required to do it through this bit - this bit makes it easier. Clock divider (MMCHS_SYSCTL[15:6] CLKD) should be set to ensure that 80 clock periods are greater than 1ms. (see section 9.3, "Power-Up", in the MMC card specification [1], or section 6.4 in the SD card specification [2]). Note: in this mode, there is no command sent to the card and no response is expected 0x0: The host does not send an initialization sequence. 0x1: The host sends an initialization sequence.</p> | RW | 0 |
| 0 | OD | <p>Card open drain mode. Only for MMC cards. This bit must be set to 1 for MMC card commands 1, 2, 3 and 40, and if the MMC card bus is operating in open-drain mode during the response phase to the command sent. Typically, during card identification mode when the card is either in idle, ready or ident state. It is also necessary to set this bit to 1, for a broadcast host response (see Broadcast host response register MMCHS_CON[2] HR) 0x0: No Open Drain 0x1: Open Drain or Broadcast host response</p> | RW | 0 |

Table 25-76. Register Call Summary for Register MMCHS_CON

| |
|---|
| MMC/SD/SDIO Functional Description |
| <ul style="list-style-type: none"> Interrupt Requests: [0] DMA Modes: [1] [2] [3] Slave DMA Operations: [4] Generation on Rising Edge of MMC Clock: [5] MMC CE-ATA Command Completion Disable Management: [6] [7] [8] Test Registers: [9] |
| MMC/SD/SDIO Programming Guide |
| <ul style="list-style-type: none"> Global Initialization: [10] Operational Modes Configuration: [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] |
| MMC/SD/SDIO Register Manual |
| <ul style="list-style-type: none"> MMC/SD/SDIO Register Summary: [21] [22] MMC/SD/SDIO Register Description: [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42] [43] |

Table 25-77. MMCHS_PWCNT

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0130 | | |
| Physical Address | 0x4809 C130 0x480B 4130 0x480A D130 0x480D 1130 0x480D 5130 | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | Power counter register This register is used to program a mmc counter to delay command transfers after activating the PAD power, this value depends on PAD characteristics and voltage. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PWCNT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved These bits are initialized to zero, and writes to them are ignored. Reads return 0. | R | 0x0000 |
| 15:0 | PWCNT | Power counter register. This register is used to introduce a delay between the PAD ACTIVE pin assertion and the command issued. 0x0: No additional delay added 0x1: TCF delay (card clock period) 0x2: TCF x 2 delay (card clock period) 0xFFFF: TCF x 65534 delay (card clock period) 0xFFFF: TCF x 65535 delay (card clock period) | RW | 0x0000 |

Table 25-78. Register Call Summary for Register MMCHS_PWCNT

| |
|---|
| MMC/SD/SDIO Register Manual |
| <ul style="list-style-type: none"> MMC/SD/SDIO Register Summary: [0] [1] |

Table 25-79. MMCHS_SDMA SA

| | | | |
|-------------------------|--|-----------------|-------|
| Address Offset | 0x0000 0200 | Instance | MMCHS |
| Physical Address | See Table 25-57 to Table 25-58 | | |
| Description | sDMA System address: This register is used to program a mmc counter to delay command transfers after activating the PAD power, this value depends on PAD characteristics and voltage. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | PWRCNT | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | RESERVED | Reserved These bits are initialized to zero, and writes to them are ignored. Reads return 0. | R | 0x0000 |
| 15:0 | PWRCNT | Power counter register. This register is used to introduce a delay between the PAD ACTIVE pin assertion and the command issued. 0x0: No additional delay added 0x1: TCF delay (card clock period) 0x2: TCF x 2 delay (card clock period) 0xFFFFE: TCF x 65534 delay (card clock period) 0xFFFFF: TCF x 65535 delay (card clock period) | RW | 0x0000 |

Table 25-80. MMCHS_BLK

| | | | |
|------------------|---|----------|--------|
| Address Offset | 0x0000 0204 | Instance | MMCHS1 |
| Physical Address | 0x4809 C204 | | MMCHS2 |
| | 0x480B 4204 | | MMCHS3 |
| | 0x480A D204 | | MMCHS4 |
| | 0x480D 1204 | | MMCHS5 |
| | 0x480D 5204 | | |
| Description | Transfer Length Configuration register MMCHS_BLK[11:0] BLEN is the block size register. MMCHS_BLK[31:16] NBLK is the block count register. This register shall be used for any card. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|----|----|----|------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| NBLK | | | | | | | | | | | | | | | | RESERVED | | | | BLEN | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|--------|
| 31:16 | NBLK | <p>Blocks count for current transfer</p> <p>This register is enabled when Block count Enable (MMCHS_CMD[1] BCE) is set to 1 and is valid only for multiple block transfers. Setting the block count to 0 results no data blocks being transferred.</p> <p>Note: The host controller decrements the block count after each block transfer and stops when the count reaches zero.</p> <p>This register can be accessed only if no transaction is executing (i.e, after a transaction has stopped). Read operations during transfers may return an invalid value and write operation will be ignored.</p> <p>In suspend context, the number of blocks yet to be transferred can be determined by reading this register. When restoring transfer context prior to issuing a Resume command, The local host shall restore the previously saved block count.</p> <p>0x0: Stop count</p> <p>0x1: 1 block</p> <p>0x2: 2 blocks</p> <p>0xFFFF: 65535 blocks</p> | RW | 0x0000 |
| 15:12 | RESERVED | <p>Reserved.</p> <p>Host DMA Buffer Boundary not supported. These bits are initialized to zero, and writes to them are ignored.</p> | R | 0x0 |
| 11:0 | BLEN | <p>Transfer Block Size.</p> <p>This register specifies the block size for block data transfers.</p> <p>Read operations during transfers may return an invalid value, and write operations are ignored.</p> <p>When a CMD12 command is issued to stop the transfer, a read of the BLEN field after transfer completion (MMCHS_STAT[1] TC set to 1) will not return the true byte number of data length while the stop occurs but the value written in this register before transfer is launched.</p> <p>0x0: No data transfer</p> <p>0x1: 1 byte block length</p> <p>0x2: 2 bytes block length</p> <p>0x3: 3 bytes block length</p> <p>0x1FF: 511 bytes block length</p> <p>0x200: 512 bytes block length</p> <p>0x400: 1024 bytes block length</p> | RW | 0x000 |

Table 25-81. Register Call Summary for Register MMCHS_BLK

MMC/SD/SDIO Functional Description

- [Interrupt Requests: \[0\] \[1\]](#)
- [Master DMA Operations: \[2\]](#)
- [Slave DMA Operations: \[3\] \[4\]](#)
- [Data Buffer: \[5\]](#)

MMC/SD/SDIO Programming Guide

- [Operational Modes Configuration: \[6\] \[7\] \[8\] \[9\] \[10\] \[11\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[12\] \[13\]](#)
- [MMC/SD/SDIO Register Description: \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\]](#)

Table 25-82. MMCHS_ARG

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0208 | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Physical Address | 0x4809 C208 0x480B 4208 0x480A D208 0x480D 1208 0x480D 5208 | | |
| Description | Command argument Register This register contains command argument specified as bit 39-8 of Command-Format These registers must be initialized prior to sending the command itself to the card (write action into the register MMCHS_CMD register). Only exception is for a command index specifying stuff bits in arguments, making a write unnecessary. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ARG | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-------------|
| 31:0 | ARG | Command argument bits [31:0] | RW | 0x0000 0000 |

Table 25-83. Register Call Summary for Register MMCHS_ARG

MMC/SD/SDIO Functional Description

- [MMC CE-ATA Command Completion Disable Management: \[0\]](#)

MMC/SD/SDIO Programming Guide

- [Operational Modes Configuration: \[1\] \[2\] \[3\] \[4\] \[5\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[6\] \[7\]](#)
- [MMC/SD/SDIO Register Description: \[8\]](#)

Table 25-84. MMCHS_CMD

| | | | |
|------------------|---|----------|--|
| Address Offset | 0x0000 020C | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Physical Address | 0x4809 C20C 0x480B 420C 0x480A D20C 0x480D 120C 0x480D 520C | | |
| Description | Command and transfer mode register MMCHS_CMD[31:16] = the command register MMCHS_CMD[15:0] = the transfer mode. This register configures the data and command transfers. A write into the most significant byte send the command. A write into MMCHS_CMD[15:0] registers during data transfer has no effect. This register shall be used for any card. Note: In SYSTEST mode, a write into MMCHS_CMD register will not start a transfer. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|------|----|----|----|----|----|----------|----|------|------|----------|----------|----------|----|----|----|----|----|----|----|------|------|----------|------|-----|----|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | INDX | | | | | | CMD_TYPE | DP | CICE | CCCE | RESERVED | RSP_TYPE | RESERVED | | | | | | | | MSBS | DDIR | RESERVED | ACEN | BCE | DE | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:30 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |
| 29:24 | INDX | Command index Binary encoded value from 0 to 63 specifying the command number send to card 0x0: CMD0 or ACMD0 0x1: CMD1 or ACMD1 0x2: CMD2 or ACMD2 0x3: CMD3 or ACMD3 0x4: CMD4 or ACMD4 0x5: CMD5 or ACMD5 0x6: CMD6 or ACMD6 0x7: CMD7 or ACMD7 0x8: CMD8 or ACMD8 0x9: CMD9 or ACMD9 0xA: CMD10 or ACMD10 0xB: CMD11 or ACMD11 0xC: CMD12 or ACMD12 0xD: CMD13 or ACMD13 0xE: CMD14 or ACMD14 0xF: CMD15 or ACMD15 0x10: CMD16 or ACMD16 0x11: CMD17 or ACMD17 0x12: CMD18 or ACMD18 0x13: CMD19 or ACMD19 0x14: CMD20 or ACMD20 0x15: CMD21 or ACMD21 0x16: CMD22 or ACMD22 0x17: CMD23 or ACMD23 0x18: CMD24 or ACMD24 0x19: CMD25 or ACMD25 0x1A: CMD26 or ACMD26 0x1B: CMD27 or ACMD27 0x1C: CMD28 or ACMD28 0x1D: CMD29 or ACMD29 0x1E: CMD30 or ACMD30 0x1F: CMD31 or ACMD31 0x20: CMD32 or ACMD32 0x21: CMD33 or ACMD33 0x22: CMD34 or ACMD34 0x23: CMD35 or ACMD35 0x24: CMD36 or ACMD36 0x25: CMD37 or ACMD37 0x26: CMD38 or ACMD38 0x27: CMD39 or ACMD39 0x28: CMD40 or ACMD40 0x29: CMD41 or ACMD41 0x2A: CMD42 or ACMD42 0x2B: CMD43 or ACMD43 | RW | 0x00 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| | | 0x2C: CMD44 or ACMD44 0x2D: CMD45 or ACMD45 0x2E: CMD46 or ACMD46 0x2F: CMD47 or ACMD47 0x30: CMD48 or ACMD48 0x31: CMD49 or ACMD49 0x32: CMD50 or ACMD50 0x33: CMD51 or ACMD51 0x34: CMD52 or ACMD52 0x35: CMD53 or ACMD53 0x36: CMD54 or ACMD54 0x37: CMD55 or ACMD55 0x38: CMD56 or ACMD56 0x39: CMD57 or ACMD57 0x3A: CMD58 or ACMD58 0x3B: CMD59 or ACMD59 0x3C: CMD60 or ACMD60 0x3D: CMD61 or ACMD61 0x3E: CMD62 or ACMD62 0x3F: CMD63 or ACMD63 | | |
| 23:22 | CMD_TYPE | <p>Command type This register specifies three types of special command: Suspend, Resume and Abort. These bits shall be set to 00b for all other commands.</p> <p>0x0: Others Commands 0x1: CMD52 for writing "Bus Suspend" in CCCR 0x2: CMD52 for writing "Function Select" in CCCR 0x3: Abort command CMD12, CMD52 for writing " I/O Abort" in CCCR</p> | RW | 0x0 |
| 21 | DP | <p>Data present select This register indicates that data is present and DAT line shall be used. It must be set to 0 in the following conditions: - command using only CMD line - command with no data transfer but using busy signal on DAT[0] - Resume command</p> <p>0x0: Command with no data transfer 0x1: Command with data transfer</p> | RW | 0 |
| 20 | CICE | <p>Command Index check enable This bit must be set to 1 to enable index check on command response to compare the index field in the response against the index of the command. If the index is not the same in the response as in the command, it is reported as a command index error (MMCHS_STAT[19] CIE set to 1) Note: The register CICE cannot be configured for an Auto CMD12, then index check is automatically checked when this command is issued.</p> <p>0x0: Index check disable 0x1: Index check enable</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 19 | CCCE | <p>Command CRC check enable</p> <p>This bit must be set to 1 to enable CRC7 check on command response to protect the response against transmission errors on the bus.</p> <p>If an error is detected, it is reported as a command CRC error (MMCHS_STAT[17] CCRC set to 1).</p> <p>Note: The register CCCE cannot be configured for an Auto CMD12, and then CRC check is automatically checked when this command is issued.</p> <p>0x0: CRC7 check disable</p> <p>0x1: CRC7 check enable</p> | RW | 0 |
| 18 | RESERVED | <p>Reserved.</p> <p>This bit is initialized to zero, and writes to it are ignored.</p> | R | 0 |
| 17:16 | RSP_TYPE | <p>Response type</p> <p>This bits defines the response type of the command</p> <p>0x0: No response</p> <p>0x1: Response Length 136 bits</p> <p>0x2: Response Length 48 bits</p> <p>0x3: Response Length 48 bits with busy after response</p> | RW | 0x0 |
| 15:6 | RESERVED | <p>Reserved.</p> <p>These bits are initialized to zero, and writes to them are ignored.</p> | R | 0x000 |
| 5 | MSBS | <p>Multi/Single block select</p> <p>This bit must be set to 1 for data transfer in case of multi block command.</p> <p>For any others command this bit shall be set to 0.</p> <p>0x0: Single block.</p> <p>If this bit is 0, it is not necessary to set the register MMCHS_BLK[31:16] NBLK.</p> <p>0x1: Multi block.</p> <p>When Block Count is disabled (MMCHS_CMD[1] BCE is set to 0) in Multiple block transfers (MMCHS_CMD[5] MSBS is set to 1), the module can perform infinite transfer.</p> | RW | 0 |
| 4 | DDIR | <p>Data transfer Direction Select</p> <p>This bit defines either data transfer will be a read or a write.</p> <p>0x0: Data Write (host to card)</p> <p>0x1: Data Read (card to host)</p> | RW | 0 |
| 3 | RESERVED | <p>Reserved.</p> <p>These bits are initialized to zero, and writes to them are ignored.</p> | R | 0 |
| 2 | ACEN | <p>Auto CMD12 Enable</p> <p>SDIO does not support this feature.</p> <p>When this bit is set to 1, the host controller issues a CMD12 automatically after the transfer completion of the last block.</p> <p>The Host Driver shall not set this bit to issue commands that do not require CMD12 to stop data transfer. In particular, safe commands do not require CMD12.</p> <p>0x0: Auto CMD12 disable</p> <p>0x1: Auto CMD12 enable or CCS detection enabled.</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 1 | BCE | Block Count Enable Multiple block transfers only. This bit is used to enable the block count register (MMCHS_BLK[31:16] NBLK). When Block Count is disabled (MMCHS_CMD[1] BCE is set to 0) in Multiple block transfers (MMCHS_CMD[5] MSBS is set to 1), the module can perform infinite transfer. 0x0: Block count disabled for infinite transfer. 0x1: Block count enabled for multiple block transfer with known number of blocks | RW | 0 |
| 0 | DE | DMA Enable This bit is used to enable DMA mode for host data access. 0x0: DMA mode disable 0x1: DMA mode enable | RW | 0 |

Table 25-85. Register Call Summary for Register MMCHS_CMD

MMC/SD/SDIO Environment

- [Data Format: \[0\] \[1\] \[2\] \[3\]](#)

MMC/SD/SDIO Functional Description

- [Interrupt Requests: \[4\] \[5\]](#)
- [Master DMA Operations: \[6\]](#)
- [Slave DMA Operations: \[7\]](#)
- [Data Buffer: \[8\] \[9\] \[10\]](#)
- [Transfer Stop: \[11\]](#)
- [MMC CE-ATA Command Completion Disable Management: \[12\] \[13\]](#)

MMC/SD/SDIO Programming Guide

- [Operational Modes Configuration: \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[24\] \[25\]](#)
- [MMC/SD/SDIO Register Description: \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\] \[40\] \[41\] \[42\] \[43\] \[44\] \[45\] \[46\] \[47\]](#)

Table 25-86. MMCHS_RSP10

| | | | |
|-------------------------|---|-----------------|--------------------------------------|
| Address Offset | 0x0000 0210 | Instance | MMCHS1 |
| Physical Address | 0x4809 C210 0x480B 4210 0x480A D210 0x480D 1210 0x480D 5210 | | MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | Command response[31:0] Register This 32-bit register holds bits positions [31:0] of command response type R1/R1b/R2/R3/R4/R5/R5b/R6 | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RSP1 | | | | | | | | | | | | | | | | RSP0 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------|------|--------|
| 31:16 | RSP1 | Command Response [31:16] | R | 0x0000 |
| 15:0 | RSP0 | Command Response [15:0] | R | 0x0000 |

Table 25-87. Register Call Summary for Register MMCHS_RSP10

MMC/SD/SDIO Functional Description

- [Different Types of Responses: \[0\] \[1\] \[2\]](#)

MMC/SD/SDIO Programming Guide

- [Operational Modes Configuration: \[3\] \[4\] \[5\] \[6\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[7\] \[8\]](#)
- [MMC/SD/SDIO Register Description: \[9\] \[10\]](#)

Table 25-88. MMCHS_RSP32

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0214 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4809 C214 0x480B 4214 0x480A D214 0x480D 1214 0x480D 5214 | | | | | | | | | | | | | | | | Instance MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 | | | | | | | | | | | | | | | |
| Description | Command response[63:32] Register This 32-bit register holds bits positions [63:32] of command response type R2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RSP3 | | | | | | | | | | | | | | | | RSP2 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------|------|--------|
| 31:16 | RSP3 | Command Response [63:48] | R | 0x0000 |
| 15:0 | RSP2 | Command Response [47:32] | R | 0x0000 |

Table 25-89. Register Call Summary for Register MMCHS_RSP32

MMC/SD/SDIO Functional Description

- [Different Types of Responses: \[0\]](#)

MMC/SD/SDIO Programming Guide

- [Operational Modes Configuration: \[1\] \[2\] \[3\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[4\] \[5\]](#)

Table 25-90. MMCHS_RSP54

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|---|----|----|----|----|---|---|---|---|---|---|---|---|---|---|--|
| Address Offset | 0x0000 0218 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4809 C218 0x480B 4218 0x480A D218 0x480D 1218 0x480D 5218 | | | | | | | | | | | | | | | | Instance MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 | | | | | | | | | | | | | | | |
| Description | Command response[95:64] Register This 32-bit register holds bits positions [95:64] of command response type R2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RSP5 | | | | | | | | | | | | | | | | RSP4 | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--------------------------|------|--------|
| 31:16 | RSP5 | Command Response [95:80] | R | 0x0000 |
| 15:0 | RSP4 | Command Response [79:64] | R | 0x0000 |

Table 25-91. Register Call Summary for Register MMCHS_RSP54

MMC/SD/SDIO Functional Description

- [Different Types of Responses: \[0\]](#)

MMC/SD/SDIO Programming Guide

- [Operational Modes Configuration: \[1\] \[2\] \[3\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[4\] \[5\]](#)

Table 25-92. MMCHS_RSP76

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 021C | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Physical Address | 0x4809 C21C 0x480B 421C 0x480A D21C 0x480D 121C 0x480D 521C | | |
| Description | Command response[127:96] Register This 32-bit register holds bits positions [127:96] of command response type R2 | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RSP7 | | | | | | | | | | | | | | | | RSP6 | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|----------------------------|------|--------|
| 31:16 | RSP7 | Command Response [127:112] | R | 0x0000 |
| 15:0 | RSP6 | Command Response [111:96] | R | 0x0000 |

Table 25-93. Register Call Summary for Register MMCHS_RSP76

MMC/SD/SDIO Functional Description

- [Different Types of Responses: \[0\] \[1\] \[2\]](#)

MMC/SD/SDIO Programming Guide

- [Operational Modes Configuration: \[3\] \[4\] \[5\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[6\] \[7\]](#)
- [MMC/SD/SDIO Register Description: \[8\] \[9\]](#)

Table 25-94. MMCHS_DATA

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0220 | | |
| Physical Address | 0x4809 C220 0x480B 4220 0x480A D220 0x480D 1220 0x480D 5220 | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | <p>Data Register</p> <p>This register is the 32-bit entry point of the buffer for read or write data transfers. The buffer size is 32bits x256(1024 bytes). Bytes within a word are stored and read in little endian format. This buffer can be used as two 512 byte buffers to transfer data efficiently without reducing the throughput.</p> <p>Sequential and contiguous access is necessary to increment the pointer correctly. Random or skipped access is not allowed. In little endian, if the local host accesses this register byte-wise or 16bit-wise, the least significant byte (bits [7:0]) must always be written/read first. The update of the buffer address is done on the most significant byte write for full 32-bit DATA register or on the most significant byte of the last word of block transfer.</p> <p>Example 1: Byte or 16-bit access</p> <p>Mbyteen[3:0]=0001 (1-byte) = Mbyteen[3:0]=0010 (1-byte) = Mbyteen[3:0]=1100 (2-bytes) OK</p> <p>Mbyteen[3:0]=0001 (1-byte) = Mbyteen[3:0]=0010 (1-byte) = Mbyteen[3:0]=0100 (1-byte) OK</p> <p>Mbyteen[3:0]=0001 (1-byte) = Mbyteen[3:0]=0010 (1-byte) = Mbyteen[3:0]=1000 (1-byte) Bad</p> | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DATA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | DATA | <p>Data Register [31:0]</p> <p>In functional mode (MMCHS_CON[4] MODE set to the default value 0) ,</p> <p>A read access to this register is allowed only when the buffer read enable status is set to 1 (MMCHS_PSTATE[11] BRE), otherwise a bad access (MMCHS_STAT[29] BADA) is signaled.</p> <p>A write access to this register is allowed only when the buffer write enable status is set to 1(MMCHS_PSTATE[10] BWE), otherwise a bad access (MMCHS_STAT[29] BADA) is signaled and the data is not written.</p> | RW | 0x0000 0000 |

Table 25-95. Register Call Summary for Register MMCHS_DATA

MMC/SD/SDIO Functional Description

- [Interrupt Requests: \[0\] \[1\]](#)
- [Data Buffer: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\]](#)
- [Transfer or Command Status and Errors Reporting: \[10\]](#)

MMC/SD/SDIO Programming Guide

- [Operational Modes Configuration: \[11\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[12\] \[13\]](#)
- [MMC/SD/SDIO Register Description: \[14\] \[15\] \[16\] \[17\] \[18\] \[19\]](#)

Table 25-96. MMCHS_PSTATE

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0224 | | |
| Physical Address | 0x4809 C224 0x480B 4224 0x480A D224 0x480D 1224 0x480D 5224 | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | Present state register The Host can get status of the Host Controller from this 32-bit read only register. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|------|----|----|----|----|------|-----|------|----------|----|----|----|----|-----|-----|-----|-----|----------|---|---|---|---|-----|------|------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | CLEV | DLEV | | | | WP | CDPL | CSS | CINS | RESERVED | | | | | BRE | BWE | RTA | WTA | RESERVED | | | | | DLA | DATI | CMDI |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:25 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x00 |
| 24 | CLEV | CMD line signal level This status is used to check the CMD line level to recover from errors, and for debugging. The value of this register after reset depends on the CMD line level at that time. Read 0x0: The CMD line level is 0. Read 0x1: The CMD line level is 1. | R | - |
| 23:20 | DLEV | DAT[3:0] line signal level DAT[3] = bit 23 DAT[2] = bit 22 DAT[1] = bit 21 DAT[0] = bit 20 This status is used to check DAT line level to recover from errors, and for debugging. This is especially useful in detecting the busy signal level from DAT[0]. The value of these registers after reset depends on the DAT lines level at that time. | R | 0x- |
| 19 | WP | Write protect switch pin level For SDIO cards only. This bit reflects the write protect input pin (SDWP) level. The value of this register after reset depends on the protect input pin (SDWP) level at that time. Read 0x0: If MMCHS_CON[8] WPP is set to 0 (default), the card is write protected, otherwise the card is not protected. Read 0x1: If MMCHS_CON[8] WPP is set to 0 (default), the card is not write protected, otherwise the card is protected. | R | - |
| 18 | CDPL | Card detect pin level This bit reflects the inverse value of the card detect input pin (SDCD), debouncing is not performed on this bit and bit is valid only when Card State Stable (MMCHS_PSTATE[17] CSS) is set to 1. Use of this bit is limited to testing since it must be debounced by software. The value of this register after reset depends on the card detect input pin (SDCD) level at that time. Read 0x0: The value of the card detect input pin (SDCD) is 1 Read 0x1: The value of the card detect input pin (SDCD) is 0 | R | - |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 17 | CSS | <p>Card State Stable</p> <p>This bit is used for testing. It is set to 1 only when Card Detect Pin Level is stable (MMCHS_PSTATE[18] CDPL). Debouncing is performed on the card detect input pin (SDCD) to detect card stability.</p> <p>This bit is not affected by a software reset.</p> <p>Read 0x0: Reset or Debouncing</p> <p>Read 0x1: No card or card inserted</p> | R | 0 |
| 16 | CINS | <p>Card inserted</p> <p>This bit is the debounced value of the card detect input pin (SDCD).</p> <p>An inactive to active transition of the card detect input pin (SDCD) will generate a card insertion interrupt (MMCHS_STAT[6] CINS).</p> <p>A active to inactive transition of the card detect input pin (SDCD) will generate a card removal interrupt (MMCHS_STAT[7] CREM).</p> <p>This bit is not affected by a software reset.</p> <p>Read 0x0: If MMCHS_CON[7] CDP is set to 0 (default), no card is detected. The card may have been removed from the card slot.</p> <p>If MMCHS_CON[7] CDP is set to 1, the card has been inserted.</p> <p>Read 0x1: If MMCHS_CON[7] CDP is set to 0 (default), the card has been inserted from the card slot.</p> <p>If MMCHS_CON[7] CDP is set to 1, no card is detected. The card may have been removed from the card slot.</p> | R | 0 |
| 15:12 | RESERVED | <p>Reserved.</p> <p>These bits are initialized to zero, and writes to them are ignored.</p> | R | 0x0 |
| 11 | BRE | <p>Buffer read enable</p> <p>This bit is used for non-DMA read transfers.</p> <p>It indicates that a complete block specified by MMCHS_BLK[11:0] BLEN has been written in the buffer and is ready to be read.</p> <p>It is set to 0 when the entire block is read from the buffer.</p> <p>It is set to 1 when a block data is ready in the buffer and generates the Buffer read ready status of interrupt (MMCHS_STAT[5] BRR).</p> <p>Read 0x0: Read BLEN bytes disable</p> <p>Read 0x1: Read BLEN bytes enable. Readable data exists in the buffer.</p> | R | 0 |
| 10 | BWE | <p>Buffer Write enable</p> <p>This status is used for non-DMA write transfers.</p> <p>It indicates if space is available for write data.</p> <p>Read 0x0: There is no room left in the buffer to write BLEN bytes of data.</p> <p>Read 0x1: There is enough space in the buffer to write BLEN bytes of data.</p> | R | 0 |
| 9 | RTA | <p>Read transfer active</p> <p>This status is used for detecting completion of a read transfer. It is set to 1 after the end bit of read command or by activating a continue request (MMCHS_HCTL[17] CR) following a stop at block gap request. This bit is set to 0 when all data have been read by the local host after last block or after a stop at block gap request.</p> <p>Read 0x0: No valid data on the DAT lines.</p> <p>Read 0x1: read data transfer on going.</p> | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 8 | WTA | <p>Write transfer active</p> <p>This status indicates a write transfer active. It is set to 1 after the end bit of write command or by activating a continue request (MMCHS_HCTL[17] CR) following a stop at block gap request. This bit is set to 0 when CRC status has been received after last block or after a stop at block gap request.</p> <p>Read 0x0: No valid data on the DAT lines.</p> <p>Read 0x1: Write data transfer on going.</p> | R | 0 |
| 7:3 | RESERVED | <p>Reserved.</p> <p>These bits are initialized to zero, and writes to them are ignored.</p> | R | 0x00 |
| 2 | DLA | <p>DAT line active</p> <p>This status bit indicates whether one of the DAT line is in use.</p> <p>In the case of read transactions (card to host):</p> <p>This bit is set to 1 after the end bit of read command or by activating continue request MMCHS_HCTL[17] CR. This bit is set to 0 when the host controller received the end bit of the last data block or at the beginning of the read wait mode.</p> <p>In the case of write transactions (host to card):</p> <p>This bit is set to 1 after the end bit of write command or by activating continue request MMCHS_HCTL[17] CR. This bit is set to 0 on the end of busy event for the last block; host controller must wait 8 clock cycles with line not busy to really consider not "busy state" or after the busy block as a result of a stop at gap request.</p> <p>Read 0x0: DAT Line inactive</p> <p>Read 0x1: DAT Line active</p> | R | 0 |
| 1 | DATI | <p>Command inhibit(DAT)</p> <p>This status bit is generated if either DAT line is active (MMCHS_PSTATE[2] DLA) or Read transfer is active (MMCHS_PSTATE[9] RTA) or when a command with busy is issued. This bit prevents the local host to issue a command.</p> <p>A change of this bit from 1 to 0 generates a transfer complete interrupt (MMCHS_STAT[1] TC).</p> <p>Read 0x0: Issuing of command using the DAT lines is allowed</p> <p>Read 0x1: Issuing of command using DAT lines is not allowed</p> | R | 0 |
| 0 | CMDI | <p>Command inhibit(CMD)</p> <p>This status bit indicates that the CMD line is in use. This bit is set to 0 when the most significant byte is written into the command register. This bit is not set when Auto CMD12 is transmitted.</p> <p>This bit is set to 0 in either the following cases:</p> <ul style="list-style-type: none"> - After the end bit of the command response, excepted if there is a command conflict error (MMCHS_STAT[17] CCRC or MMCHS_STAT[18] CEB set to 1) or a Auto CMD12 is not executed (MMCHS_AC12[0] ACNE). - After the end bit of the command without response (MMCHS_CMD[17:16] RSP_TYPE set to "00") <p>In case of a command data error is detected (MMCHS_STAT[16] CTO set to 1), this register is not automatically cleared.</p> <p>Read 0x0: Issuing of command using CMD line is allowed</p> <p>Read 0x1: Issuing of command using CMD line is not allowed</p> | R | 0 |

Table 25-97. Register Call Summary for Register MMCHS_PSTATE

| |
|--|
| MMC/SD/SDIO Functional Description |
| <ul style="list-style-type: none"> • Software Reset: [0] • Interrupt Requests: [1] [2] [3] [4] • Master DMA Operations: [5] [6] [7] • Data Buffer: [8] [9] [10] [11] • MMC/SD/SDIO Hardware Status Features: [12] [13] [14] [15] [16] [17] [18] [19] [20] |
| MMC/SD/SDIO Programming Guide |
| <ul style="list-style-type: none"> • Operational Modes Configuration: [21] [22] [23] [24] [25] [26] [27] |
| MMC/SD/SDIO Register Manual |
| <ul style="list-style-type: none"> • MMC/SD/SDIO Register Summary: [28] [29] • MMC/SD/SDIO Register Description: [30] [31] [32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42] [43] [44] [45] [46] [47] [48] [49] [50] [51] [52] [53] [54] |

Table 25-98. MMCHS_HCTL

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0228 | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Physical Address | 0x4809 C228 0x480B 4228 0x480A D228 0x480D 1228 0x480D 5228 | | |
| Description | Control register This register defines the host controls to set power, wakeup and transfer parameters. MMCHS_HCTL[31:24] = Wakeup control MMCHS_HCTL[23:16] = Block gap control MMCHS_HCTL[15:8] = Power control MMCHS_HCTL[7:0] = Host control | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
|----------|----|----|----|------|-----|-----|-----|----------|----|----|----|-----|-----|----|------|----------|----|----|----|------|----|---|---|------|------|------|----------|------|---|------|-----|-----|
| RESERVED | | | | OBWE | REM | INS | IWE | RESERVED | | | | IBG | RWC | CR | SBGR | RESERVED | | | | SDVS | | | | SDBP | CDSS | CDTL | RESERVED | DMAS | | HSPE | DTW | LED |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:28 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |
| 27 | OBWE | Wakeup event enable for 'Out-of-Band' Interrupt. This bit enables wakeup events for 'Out-of-Band' assertion. Wakeup is generated if the wakeup feature is enabled (MMCHS_SYSCONFIG[2] ENAWAKEUP). The write to this register is ignored when MMCHS_CON[14] OBIE is not set. 0x0: Disable wakeup on 'Out-of-Band' Interrupt 0x1: Enable wakeup on 'Out-of-Band' Interrupt | RW | 0 |
| 26 | REM | Wakeup event enable on SD card removal This bit enables wakeup events for card removal assertion. Wakeup is generated if the wakeup feature is enabled (MMCHS_SYSCONFIG[2] ENAWAKEUP). 0x0: Disable wakeup on card removal 0x1: Enable wakeup on card removal | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 25 | INS | Wakeup event enable on SD card insertion This bit enables wakeup events for card insertion assertion. Wakeup is generated if the wakeup feature is enabled (MMCHS_SYSCONFIG[2] ENAWAKEUP). 0x0: Disable wakeup on card insertion 0x1: Enable wakeup on card insertion | RW | 0 |
| 24 | IWE | Wakeup event enable on SD card interrupt This bit enables wakeup events for card interrupt assertion. Wakeup is generated if the wakeup feature is enabled (MMCHS_SYSCONFIG[2] ENAWAKEUP). 0x0: Disable wakeup on card interrupt 0x1: Enable wakeup on card interrupt | RW | 0 |
| 23:20 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |
| 19 | IBG | Interrupt block at gap This bit is valid only in 4-bit mode of SDIO card to enable interrupt detection in the interrupt cycle at block gap for a multiple block transfer. For MMC cards and for SD card this bit should be set to 0. 0x0: Disable interrupt detection at the block gap in 4-bit mode 0x1: Enable interrupt detection at the block gap in 4-bit mode | RW | 0 |
| 18 | RWC | Read wait control The read wait function is optional only for SDIO cards. If the card supports read wait, this bit must be enabled, then requesting a stop at block gap (MMCHS_HCTL[16] SBGR) generates a read wait period after the current end of block. Be careful, if read wait is not supported it may cause a conflict on DAT line. 0x0: Disable Read Wait Control. Suspend/Resume cannot be supported. 0x1: Enable Read Wait Control | RW | 0 |
| 17 | CR | Continue request This bit is used to restart a transaction that was stopped by requesting a stop at block gap (MMCHS_HCTL[16] SBGR). Set this bit to 1 restarts the transfer. The bit is automatically set to 0 by the host controller when transfer has restarted i.e DAT line is active (MMCHS_PSTATE[2] DLA) or transferring data (MMCHS_PSTATE[8] WTA). The Stop at block gap request must be disabled (MMCHS_HCTL[16] SBGR = 0) before setting this bit. 0x0: No affect 0x1: transfer restart | RW | 0 |
| 16 | SBGR | Stop at block gap request This bit is used to stop executing a transaction at the next block gap. The transfer can restart with a continue request (MMCHS_HCTL[17] CR) or during a suspend/resume sequence. In case of read transfer, the card must support read wait control. In case of write transfer, the host driver shall set this bit after all block data written. Until the transfer completion (MMCHS_STAT[1] TC set to 1), the host driver shall leave this bit set to 1. If this bit is set, the local host shall not write to the data register (MMCHS_DATA). 0x0: Transfer mode 0x1: Stop at block gap | RW | 0 |
| 15:12 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 11:9 | SDVS | SD bus voltage select All cards. The host driver should set to these bits to select the voltage level for the card according to the voltage supported by the system (MMCHS_CAPA[26:24]) before starting a transfer. 0x5: 1.8V (Typical) 0x6: 3.0V (Typical) 0x7: 3.3V (Typical) | RW | 0x0 |
| 8 | SDBP | SD bus power Before setting this bit, the host driver shall select the SD bus voltage (MMCHS_HCTL[11:9] SDVS). If the host controller detects the No card state, this bit is automatically set to 0. If the module is power off, a write in the command register (MMCHS_CMD) will not start the transfer. A write to this bit has no effect if the selected SD bus voltage is not supported according to capability register (MMCHS_CAPA[26:24]). 0x0: Power off 0x1: Power on | RW | 0 |
| 7 | CDSS | Card Detect Signal Selection This bit selects source for the card detection. When the source for the card detection is switched, the interrupt should be disabled during the switching period by clearing the Interrupt Status/Signal Enable register in order to mask unexpected interrupt being caused by the glitch. The Interrupt Status/Signal Enable should be disabled during over the period of debouncing. 0x0: SDCD# is selected (for normal use) 0x1: The Card Detect Test Level is selected (for test purpose) | RW | 0 |
| 6 | CDTL | Card Detect Test Level: This bit is enabled while the Card Detect Signal Selection is set to 1 and it indicates card inserted or not. 0x0: No Card 0x1: Card Inserted | RW | 0 |
| 5 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0 |
| 4:3 | DMAS | DMA Select Mode: One of supported DMA modes can be selected. The host driver shall check support of DMA modes by referring the Capabilities register. Use of selected DMA is determined by DMA Enable of the Transfer Mode register. This register is only meaningful when MMCHS_HL_HWINFO[0] MADMA_EN is set to 1. When MMCHS_HL_HWINFO[0] MADMA_EN is set to 0 the bit field is read only and returned value is 0. 0x0: Reserved 0x1: Reserved 0x2: 32-bit Address ADMA2 is selected 0x3: Reserved | RW | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 2 | HSPE | <p>High Speed Enable: Before setting this bit, the Host Driver shall check the High Speed Support in the Capabilities register. If this bit is set to 0 (default), the Host Controller outputs CMD line and DAT lines at the falling edge of the SD Clock. If this bit is set to 1, the Host Controller outputs CMD line and DAT lines at the rising edge of the SD Clock. This bit shall not be set when dual data rate mode is activated in MMCHS_CON[19] DDR.</p> <p>0x0: Normal speed mode 0x1: High speed mode</p> | RW | 0 |
| 1 | DTW | <p>Data transfer width For MMC card, this bit must be set following a valid SWITCH command (CMD6) with the correct value and extend CSD index written in the argument. Prior to this command, the MMC card configuration register (CSD and EXT_CSD) must be verified for compliance with MMC standard specification 4.x (see section 3.6). This register has no effect when the MMC 8-bit mode is selected (register MMCHS_CON[5] DW8 set to 1), For SD/SDIO cards, this bit must be set following a valid SET_BUS_WIDTH command (ACMD6) with the value written in bit 1 of the argument. Prior to this command, the SD card configuration register (SCR) must be verified for the supported bus width by the SD card.</p> <p>0x0: 1-bit Data width (DAT[0] used) 0x1: 4-bit Data width (DAT[3:0] used)</p> | RW | 0 |
| 0 | LED | <p>Reserved bit. LED control feature is not supported This bit is initialized to zero, and writes to it are ignored.</p> | R | 0 |

Table 25-99. Register Call Summary for Register MMCHS_HCTL

MMC/SD/SDIO Functional Description

- [Power Management: \[0\] \[1\] \[2\]](#)
- [Interrupt Requests: \[3\] \[4\]](#)
- [Master DMA Operations: \[5\]](#)
- [Transfer Stop: \[6\] \[7\]](#)
- [Output Signals Generation: \[8\]](#)
- [Generation on Falling Edge of MMC Clock: \[9\]](#)
- [Generation on Rising Edge of MMC Clock: \[10\]](#)

MMC/SD/SDIO Programming Guide

- [Global Initialization: \[11\] \[12\]](#)
- [Operational Modes Configuration: \[13\] \[14\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[15\] \[16\]](#)
- [MMC/SD/SDIO Register Description: \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\] \[25\] \[26\] \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\]](#)

Table 25-100. MMCHS_SYSCCTL

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 022C | | |
| Physical Address | 0x4809 C22C 0x480B 422C 0x480A D22C 0x480D 122C 0x480D 522C | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | SD system control register This register defines the system controls to set software resets, clock frequency management and data timeout. MMCHS_SYSCCTL[31:24] = Software resets MMCHS_SYSCCTL[23:16] = Timeout control MMCHS_SYSCCTL[15:0] = Clock control | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|-----|-----|-----|----------|----|----|----|-----|----|----|----|------|----|----|----|----|----|---|---|----------|---|---|---|-----|-----|-----|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | SRD | SRC | SRA | RESERVED | | | | DTO | | | | CLKD | | | | | | | | RESERVED | | | | CEN | ICS | ICE | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:27 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x00 |
| 26 | SRD | Software reset for DAT line. This bit is set to 1 for reset and released to 0 when completed. For more information about SRD bit manipulation, see Section 25.5.1.2.1.1, DATA Lines Reset Procedure . DAT finite state machine in both clock domain are also reset. The following registers are cleared by MMCHS_SYSCCTL[26] SRD: - MMCHS_DATA - MMCHS_PSTATE[11] BRE, MMCHS_PSTATE[10] BWE, MMCHS_PSTATE[9] RTA, MMCHS_PSTATE[8] WTA, MMCHS_PSTATE[2] DLA, MMCHS_PSTATE[1] DATI - MMCHS_HCTL: SBGR and CR - MMCHS_STAT: MMCHS_STAT[5] BRR, MMCHS_STAT[4] BWR, MMCHS_STAT[2] BGE and MMCHS_STAT[1] TC Interconnect and MMC buffer data management is reinitialized. 0x0: Reset completed 0x1: Software reset for DAT line | RW | 0 |
| 25 | SRC | Software reset for CMD line For more information about SRC bit manipulation, see Section 25.5.1.2.1.1, CMD Line Reset Procedure . This bit is set to 1 for reset and released to 0 when completed. CMD finite state-machine in both clock domain are also reset. The following registers are cleared by MMCHS_SYSCCTL[25] SRC: - MMCHS_PSTATE[0] CMDI - MMCHS_STAT[0] CC Interconnect and MMC command status management is reinitialized. 0x0: Reset completed 0x1: Software reset for CMD line | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 24 | SRA | Software reset for all This bit is set to 1 for reset, and released to 0 when completed. This reset affects the entire host controller except for the card detection circuit and capabilities registers. 0x0: Reset completed 0x1: Software reset for all the design | RW | 0 |
| 23:20 | RESERVED | Reserved. These bits are initialized to 0, and writes to them are ignored. | R | 0x0 |
| 19:16 | DTO | Data timeout counter value and busy timeout. This value determines the interval by which DAT lines timeouts are detected. The host driver needs to set this bit field based on - the maximum read access time (NAC) (Refer to the SD Specification Part1 Physical Layer), - the data read access time values (TAAC and NSAC) in the card specific data register (CSD) of the card, - the timeout clock base frequency (MMCHS_CAPA[5:0] TCF). If the card does not respond within the specified number of cycles, a data timeout error occurs (MMCHS_STAT[20] DTO). The MMCHS_SYSCTL[19:16] DTO register is also used to check busy duration, to generate busy timeout for commands with busy response or for busy programming during a write command. Timeout on CRC status is generated if no CRC token is present after a block write. 0x0: TCF x 2 ¹³ 0x1: TCF x 2 ¹⁴ 0xE: TCF x 2 ²⁷ 0xF: Reserved | RW | 0x0 |
| 15:6 | CLKD | Clock frequency select These bits define the ratio between MMCI_FCLK and the output clock frequency on the CLK pin of either the memory card (MMC, SD or SDIO). 0x0: MMCI_FCLK bypass 0x1: MMCI_FCLK bypass 0x2: MMCI_FCLK / 2 0x3: MMCI_FCLK / 3 0x3FF: MMCI_FCLK / 1023 | RW | 0x000 |
| 5:3 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |
| 2 | CEN | Clock enable This bit controls if the clock is provided to the card or not. 0x0: The clock is not provided to the card . Clock frequency can be changed . 0x1: The clock is provided to the card and can be automatically gated when MMCHS_SYSCONFIG[0] AUTOIDLE is set to 1 (default value) . The host driver shall wait to set this bit to 1 until the Internal clock is stable (MMCHS_SYSCTL[1] ICS). | RW | 0 |
| 1 | ICS | Internal clock stable (status) This bit indicates either the internal clock is stable or not. Read 0x0: The internal clock is not stable. Read 0x1: The internal clock is stable after enabling the clock (MMCHS_SYSCTL[1] ICE) or after changing the clock ratio (MMCHS_SYSCTL[15:6] CLKD). | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | ICE | <p>Internal clock enable</p> <p>This register controls the internal clock activity. In very low power state, the internal clock is stopped. Note: The activity of the debounce clock (used for wakeup events) and the interface clock (used for reads and writes to the module register map) are not affected by this register.</p> <p>0x0: The internal clock is stopped (very low power state).</p> <p>0x1: The internal clock oscillates and can be automatically gated when MMCHS_SYSCONFIG[0] AUTOIDLE is set to 1 (default value) .</p> | RW | 0 |

Table 25-101. Register Call Summary for Register MMCHS_SYSCTL

MMC/SD/SDIO Environment

- [Protocol: \[0\]](#)

MMC/SD/SDIO Functional Description

- [Software Reset: \[1\] \[2\] \[3\] \[4\] \[5\]](#)
- [Retention Mode: \[6\]](#)

MMC/SD/SDIO Programming Guide

- [Global Initialization: \[7\]](#)
- [Operational Modes Configuration: \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[25\] \[26\]](#)
- [MMC/SD/SDIO Register Description: \[27\] \[28\] \[29\] \[30\] \[31\] \[32\] \[33\] \[34\] \[35\] \[36\] \[37\] \[38\] \[39\] \[40\]](#)

Table 25-102. MMCHS_STAT

| | | | |
|------------------|---|----------|--|
| Address Offset | 0x0000 0230 | | |
| Physical Address | 0x4809 C230 0x480B 4230 0x480A D230 0x480D 1230 0x480D 5230 | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | Interrupt status register The interrupt status regroups all the status of the module internal events that can generate an interrupt. MMCHS_STAT[31:16] = Error Interrupt Status MMCHS_STAT[15:0] = Normal Interrupt Status | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|------|------|----------|----|-------|-----|-----|-----|------|-----|-----|-----|------|-----|------|----------|----|----|----|----|-----|-----|------|------|------|-----|-----|-----|-----|----|----|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | BADA | CERR | RESERVED | | ADMAE | ACE | CLE | DEB | DCRC | DTO | CIE | CEB | CCRC | CTO | ERRI | RESERVED | | | | | BSR | OBI | CIRQ | CREM | CINS | BRR | BWR | DMA | BGE | TC | CC |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:30 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |
| 29 | BADA | Bad access to data space This bit is set automatically to indicate a bad access to buffer when not allowed: -This bit is set during a read access to the data register (MMCHS_DATA) while buffer reads are not allowed (MMCHS_PSTATE [11] BRE = 0) -This bit is set during a write access to the data register (MMCHS_DATA) while buffer writes are not allowed (MMCHS_PSTATE [10] BWE = 0) Write 0x0: Status bit unchanged Read 0x0: No Interrupt. Read 0x1: Bad Access Write 0x1: Status is cleared | RW | 0 |
| 28 | CERR | Card error This bit is set automatically when there is at least one error in a response of type R1, R1b, R6, R5 or R5b. Only bits referenced as type E(error) in status field in the response can set a card status error. An error bit in the response is flagged only if corresponding bit in card status response error MMCHS_CSRE is set. There is no card error detection for autoCMD12 command. The host driver shall read MMCHS_RSP76 register to detect error bits in the command response. Write 0x0: Status bit unchanged Read 0x0: No Error Write 0x1: Status is cleared Read 0x1: Card error | RW | 0 |
| 27:26 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |
| 25 | ADMAE | ADMA Error: This bit is set when the Host Controller detects errors during ADMA based data transfer. The state of the ADMA at an error occurrence is saved in the ADMA Error Status Register. In addition, the Host Controller generates this interrupt when it detects invalid descriptor data (Valid=0) at the ST_FDS state. ADMA Error State in the ADMA Error Status indicates that an error occurs in ST_FDS state. The Host Driver may find that Valid bit is not set at the error descriptor. Write 0x0: Status bit unchanged Read 0x0: No Interrupt. Write 0x1: Status is cleared Read 0x1: ADMA error | RW | 0 |
| 24 | ACE | Auto CMD12 error This bit is set automatically when one of the bits in Auto CMD12 Error status register has changed from 0 to 1. Write 0x0: Status bit unchanged Read 0x0: No Error. Read 0x1: AutoCMD12 error Write 0x1: Status is cleared | RW | 0 |
| 23 | CLE | Reserved. Current limit error is not supported. These bits are initialized to zero, and writes to them are ignored. | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 22 | DEB | <p>Data End Bit error</p> <p>This bit is set automatically when detecting a 0 at the end bit position of read data on DAT line or at the end position of the CRC status in write mode.</p> <p>Read 0x0: No Error</p> <p>Write 0x0: Status bit unchanged</p> <p>Write 0x1: Status is cleared</p> <p>Read 0x1: Data end bit error</p> | RW | 0 |
| 21 | DCRC | <p>Data CRC Error</p> <p>This bit is set automatically when there is a CRC16 error in the data phase response following a block read command or if there is a 3-bit CRC status different of a position "010" token during a block write command.</p> <p>Read 0x0: No Error.</p> <p>Write 0x0: Status bit unchanged</p> <p>Read 0x1: Data CRC error</p> <p>Write 0x1: Status is cleared</p> | RW | 0 |
| 20 | DTO | <p>Data timeout error</p> <p>This bit is set automatically according to the following conditions:</p> <ul style="list-style-type: none"> - busy timeout for R1b, R5b response type - busy timeout after write CRC status - write CRC status timeout - read data timeout <p>Read 0x0: No error.</p> <p>Write 0x0: Status bit unchanged</p> <p>Write 0x1: Status is cleared</p> <p>Read 0x1: Time out</p> | RW | 0 |
| 19 | CIE | <p>Command index error</p> <p>This bit is set automatically when response index differs from corresponding command index previously emitted. It depends on the enable in MMCHS_CMD[20] CICE register.</p> <p>Read 0x0: No error.</p> <p>Write 0x0: Status bit unchanged</p> <p>Read 0x1: Command index error</p> <p>Write 0x1: Status is cleared</p> | RW | 0 |
| 18 | CEB | <p>Command end bit error</p> <p>This bit is set automatically when detecting a 0 at the end bit position of a command response.</p> <p>Write 0x0: Status bit unchanged</p> <p>Read 0x0: No error.</p> <p>Read 0x1: Command end bit error</p> <p>Write 0x1: Status is cleared</p> | RW | 0 |
| 17 | CCRC | <p>Command CRC Error</p> <p>This bit is set automatically when there is a CRC7 error in the command response depending on the enable in MMCHS_CMD[19] CCCE register.</p> <p>Read 0x0: No Error.</p> <p>Write 0x0: Status bit unchanged</p> <p>Write 0x1: Status is cleared</p> <p>Read 0x1: Command CRC error</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 16 | CTO | <p>Command Timeout Error</p> <p>This bit is set automatically when no response is received within 64 clock cycles from the end bit of the command. For commands that reply within 5 clock cycles - the timeout is still detected at 64 clock cycles.</p> <p>Write 0x0: Status bit unchanged</p> <p>Read 0x0: No error</p> <p>Read 0x1: Time Out</p> <p>Write 0x1: Status is cleared</p> | RW | 0 |
| 15 | ERRI | <p>Error Interrupt</p> <p>If any of the bits in the Error Interrupt Status register (MMCHS_STAT[24:15]) are set, then this bit is set to 1. Therefore the host driver can efficiently test for an error by checking this bit first. Writes to this bit are ignored.</p> <p>Read 0x0: No Interrupt.</p> <p>Read 0x1: Error interrupt event(s) occurred</p> | R | 0 |
| 14:11 | RESERVED | <p>Reserved.</p> <p>These bits are initialized to zero, and writes to them are ignored.</p> | R | 0x0 |
| 10 | BSR | <p>Boot status received interrupt</p> <p>This bit is set automatically when MMCHS_CON[18] BOOT_CF0 is set 0x0 or 0x1 and a boot status is received on DAT[0] line. This interrupt is only useful for MMC card.</p> <p>Write 0x0: Status bit unchanged</p> <p>Read 0x0: No Interrupt.</p> <p>Write 0x1: Status is cleared</p> <p>Read 0x1: Boot status received interrupt.</p> | RW | 0 |
| 9 | OBI | <p>Out-Of-Band interrupt</p> <p>This bit is set automatically when MMCHS_CON[14] OBIE is set and an Out-of-Band interrupt occurs on OBI pin.</p> <p>The interrupt detection depends on polarity controlled by MMCHS_CON[13] OBIP.</p> <p>This interrupt is only useful for MMC card.</p> <p>The Out-of-Band interrupt signal is a system specific feature for future use, this signal is not required for existing specification implementation.</p> <p>Read 0x0: No Out-Of-Band interrupt.</p> <p>Write 0x0: Status bit unchanged</p> <p>Read 0x1: Interrupt Out-Of-Band occurs</p> <p>Write 0x1: Status is cleared</p> | RW | 0 |
| 8 | CIRQ | <p>Card interrupt</p> <p>This bit is only used for SD and SDIO and CE-ATA cards.</p> <p>In 1-bit mode, interrupt source is asynchronous (can be a source of asynchronous wakeup).</p> <p>In 4-bit mode, interrupt source is sampled during the interrupt cycle.</p> <p>In CE-ATA mode, interrupt source is detected when the card drives CMD line to zero during one cycle after data transmission end. All modes above are fully exclusive.</p> <p>The controller interrupt must be clear by setting MMCHS_IE[8] CIRQ_ENABLE to 0, then the host driver must start the interrupt service with card (clearing card interrupt status) to remove card interrupt source. Otherwise the Controller interrupt will be reasserted as soon as MMCHS_IE[8] CIRQ_ENABLE is set to 1. Writes to this bit are ignored.</p> <p>Read 0x0: No card interrupt</p> <p>Read 0x1: Generate card interrupt</p> | R | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 7 | CREM | <p>Card removal</p> <p>This bit is set automatically when MMCHS_PSTATE[16] CINS changes from 1 to 0.</p> <p>A clear of this bit doesn't affect Card inserted present state (MMCHS_PSTATE[16] CINS).</p> <p>Write 0x0: Status bit unchanged</p> <p>Read 0x0: Card state stable or Debouncing</p> <p>Read 0x1: Card removed</p> <p>Write 0x1: Status is cleared</p> | RW | 0 |
| 6 | CINS | <p>Card insertion</p> <p>This bit is set automatically when MMCHS_PSTATE[16] changes from 0 to 1.</p> <p>A clear of this bit doesn't affect Card inserted present state (MMCHS_PSTATE[16] CINS).</p> <p>Read 0x0: Card state stable or debouncing</p> <p>Write 0x0: Status bit unchanged</p> <p>Write 0x1: Status is cleared</p> <p>Read 0x1: Card inserted</p> | RW | 0 |
| 5 | BRR | <p>Buffer read ready</p> <p>This bit is set automatically during a read operation to the card (see class 2 - block oriented read commands) when one block specified by MMCHS_BLK[11:0] BLEN is completely written in the buffer. It indicates that the memory card has filled out the buffer and that the local host needs to empty the buffer by reading it. Note: If the DMA receive-mode is enabled, this bit is never set; instead a DMA receive request to the main DMA controller of the system is generated.</p> <p>Read 0x0: Not Ready to read buffer</p> <p>Write 0x0: Status bit unchanged</p> <p>Read 0x1: Ready to read buffer</p> <p>Write 0x1: Status is cleared</p> | RW | 0 |
| 4 | BWR | <p>Buffer write ready</p> <p>This bit is set automatically during a write operation to the card (see class 4 - block oriented write command) when the host can write a complete block as specified by MMCHS_BLK[11:0] BLEN. It indicates that the memory card has emptied one block from the buffer and that the local host is able to write one block of data into the buffer. Note: If the DMA transmit mode is enabled, this bit is never set; instead, a DMA transmit request to the main DMA controller of the system is generated.</p> <p>Write 0x0: Status bit unchanged</p> <p>Read 0x0: Not Ready to write buffer</p> <p>Read 0x1: Ready to write buffer</p> <p>Write 0x1: Status is cleared</p> | RW | 0 |
| 3 | DMA | <p>DMA interrupt :</p> <p>This status is set when an interrupt is required in the ADMA instruction and after the data transfer completion.</p> <p>Read 0x0: Dma interrupt detected</p> <p>Write 0x0: Status bit unchanged</p> <p>Write 0x1: Status is cleared</p> <p>Read 0x1: No dma interrupt</p> | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 2 | BGE | <p>Block gap event</p> <p>When a stop at block gap is requested (MMCHS_HCTL[16] SBGR), this bit is automatically set when transaction is stopped at the block gap during a read or write operation.</p> <p>This event does not occur when the stop at block gap is requested on the last block.</p> <p>In read mode, a 1-to-0 transition of the DAT Line active status (MMCHS_PSTATE[2] DLA) between data blocks generates a Block gap event interrupt.</p> <p>Read 0x0: No block gap event</p> <p>Write 0x0: Status bit unchanged</p> <p>Write 0x1: Status is cleared</p> <p>Read 0x1: Transaction stopped at block gap</p> | RW | 0 |
| 1 | TC | <p>Transfer completed</p> <p>This bit is always set when a read/write transfer is completed or between two blocks when the transfer is stopped due to a stop at block gap request (MMCHS_HCTL[16] SBGR).</p> <p>In Read mode:</p> <p>This bit is automatically set on completion of a read transfer (MMCHS_PSTATE[9] RTA).</p> <p>In write mode:</p> <p>This bit is set automatically on completion of the DAT line use (MMCHS_PSTATE[2] DLA).</p> <p>Write 0x0: Status bit unchanged</p> <p>Read 0x0: No transfer complete</p> <p>Write 0x1: Status is cleared</p> <p>Read 0x1: Data transfer complete</p> | RW | 0 |
| 0 | CC | <p>Command complete</p> <p>This bit is set when a 1-to-0 transition occurs in the register command inhibit (MMCHS_PSTATE[0] CMDI)</p> <p>If the command is a type for which no response is expected, then the command complete interrupt is generated at the end of the command.</p> <p>A command timeout error (MMCHS_STAT[16] CTO) has higher priority than command complete (MMCHS_STAT[0] CC).</p> <p>If a response is expected but none is received, then a command timeout error is detected and signaled instead of the command complete interrupt.</p> <p>Write 0x0: Status bit unchanged</p> <p>Read 0x0: No Command complete</p> <p>Write 0x1: Status is cleared</p> <p>Read 0x1: Command complete</p> | RW | 0 |

Table 25-103. Register Call Summary for Register MMCHS_STAT
MMC/SD/SDIO Functional Description

- [Power Management](#): [0] [1] [2] [3]
- [Interrupt Requests](#): [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28] [29] [30] [31] [32] [33]
- [Interrupt-Driven Operation](#): [34] [35] [36] [37] [38] [39]
- [Polling](#): [40] [41]
- [Master DMA Operations](#): [42]
- [Data Buffer](#): [43] [44] [45] [46] [47] [48]
- [Transfer or Command Status and Errors Reporting](#): [49] [50]
- [Busy Time-Out for R1b, R5b Response Type](#): [51]
- [Busy Time-Out After Write CRC Status](#): [52]
- [Write CRC Status Time-Out](#): [53]
- [Read Data Time-Out](#): [54] [55]
- [Boot Acknowledge Time-Out](#): [56] [57] [58] [59] [60] [61]
- [MMC CE-ATA Command Completion Disable Management](#): [62]

MMC/SD/SDIO Programming Guide

- [Operational Modes Configuration](#): [63] [64] [65] [66] [67] [68] [69] [70] [71] [72] [73]

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary](#): [74] [75]
- [MMC/SD/SDIO Register Description](#): [76] [77] [78] [79] [80] [81] [82] [83] [84] [85] [86] [87] [88] [89] [90] [91] [92] [93] [94] [95] [96] [97] [98] [99] [100] [101] [102] [103] [104] [105] [106] [107] [108]

Table 25-104. MMCHS_IE

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|-------------|--|-------------|----|----------|----|--------------|----|------------|----|-----|----|------------|----|-------------|----------|--|----|------------|----|------------|---|-------------|---|------------|------|------|-------|----------|---|--|----|------------|----|------------|----|-------------|----|-------------|----|-------------|----|------------|----|------------|----|------------|----|------------|----|-----------|----|-----------|---|---|---|---|---|---|---|---|---|---|----------|--|-------------|--|-------------|--|----------|--|--------------|--|------------|--|-----|--|------------|--|-------------|--|------------|--|------------|--|------------|--|-------------|--|------------|--|------|--|----------|--|--|--|------------|--|------------|--|-------------|--|-------------|--|-------------|--|------------|--|------------|--|------------|--|------------|--|-----------|--|-----------|--|
| Address Offset | 0x0000 0234 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4809 C234 0x480B 4234 0x480A D234 0x480D 1234 0x480D 5234 | | | | | | | | | | | | | | | | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Interrupt SD enable register This register allows to enable/disable the module to set status bits, on an event-by-event basis. MMCHS_IE[31:16] = Error Interrupt Status Enable MMCHS_IE[15:0] = Normal Interrupt Status Enable | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="2">RESERVED</td><td colspan="2">BADA_ENABLE</td><td colspan="2">CERR_ENABLE</td><td colspan="2">RESERVED</td><td colspan="2">ADMAE_ENABLE</td><td colspan="2">ACE_ENABLE</td><td colspan="2">CLE</td><td colspan="2">DEB_ENABLE</td><td colspan="2">DCRC_ENABLE</td><td colspan="2">DTO_ENABLE</td><td colspan="2">CIE_ENABLE</td><td colspan="2">CEB_ENABLE</td><td colspan="2">CCRC_ENABLE</td><td colspan="2">CTO_ENABLE</td><td colspan="2">NULL</td><td colspan="4">RESERVED</td><td colspan="2">BSR_ENABLE</td><td colspan="2">OBI_ENABLE</td><td colspan="2">CIRQ_ENABLE</td><td colspan="2">CREM_ENABLE</td><td colspan="2">CINS_ENABLE</td><td colspan="2">BRR_ENABLE</td><td colspan="2">BWR_ENABLE</td><td colspan="2">DMA_ENABLE</td><td colspan="2">BGE_ENABLE</td><td colspan="2">TC_ENABLE</td><td colspan="2">CC_ENABLE</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | BADA_ENABLE | | CERR_ENABLE | | RESERVED | | ADMAE_ENABLE | | ACE_ENABLE | | CLE | | DEB_ENABLE | | DCRC_ENABLE | | DTO_ENABLE | | CIE_ENABLE | | CEB_ENABLE | | CCRC_ENABLE | | CTO_ENABLE | | NULL | | RESERVED | | | | BSR_ENABLE | | OBI_ENABLE | | CIRQ_ENABLE | | CREM_ENABLE | | CINS_ENABLE | | BRR_ENABLE | | BWR_ENABLE | | DMA_ENABLE | | BGE_ENABLE | | TC_ENABLE | | CC_ENABLE | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | BADA_ENABLE | | CERR_ENABLE | | RESERVED | | ADMAE_ENABLE | | ACE_ENABLE | | CLE | | DEB_ENABLE | | DCRC_ENABLE | | DTO_ENABLE | | CIE_ENABLE | | CEB_ENABLE | | CCRC_ENABLE | | CTO_ENABLE | | NULL | | RESERVED | | | | BSR_ENABLE | | OBI_ENABLE | | CIRQ_ENABLE | | CREM_ENABLE | | CINS_ENABLE | | BRR_ENABLE | | BWR_ENABLE | | DMA_ENABLE | | BGE_ENABLE | | TC_ENABLE | | CC_ENABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:30 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | R | | 0x0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | BADA_ENABLE | | Bad access to data space Interrupt Enable 0x0: Masked 0x1: Enabled | | | | | | | | | | | | | | | | | | | | | | | | RW | | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28 | CERR_ENABLE | | Card error interrupt Enable 0x0: Masked 0x1: Enabled | | | | | | | | | | | | | | | | | | | | | | | | RW | | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 27:26 | RESERVED | | Reserved. These bits are initialized to zero, and writes to them are ignored. | | | | | | | | | | | | | | | | | | | | | | | | R | | 0x0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|--------------|---|------|-------|
| 25 | ADMAE_ENABLE | ADMA error Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 24 | ACE_ENABLE | Auto CMD12 error Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 23 | CLE | Reserved bit. Current limit error is not supported. These bits are initialized to zero, and writes to them are ignored. | R | 0 |
| 22 | DEB_ENABLE | Data end bit error Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 21 | DCRC_ENABLE | Data CRC error Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 20 | DTO_ENABLE | Data timeout error Interrupt Enable 0x0: The data timeout detection is deactivated. The host controller provides the clock to the card until the card sends the data or the transfer is aborted. 0x1: The data timeout detection is enabled. | RW | 0 |
| 19 | CIE_ENABLE | Command index error Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 18 | CEB_ENABLE | Command end bit error Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 17 | CCRC_ENABLE | Command CRC error Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 16 | CTO_ENABLE | Command timeout error Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 15 | NULL | Fixed to 0 The host driver shall control error interrupts using the Error Interrupt Signal Enable register. Writes to this bit are ignored | R | 0 |
| 14:11 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |
| 10 | BSR_ENABLE | Boot status interrupt Enable A write to this register when MMCHS_CON[17] BOOT_ACK is set to 0x0 is ignored. 0x0: Masked 0x1: Enabled | RW | 0 |
| 9 | OBI_ENABLE | Out-of-Band interrupt Enable A write to this register when MMCHS_CON[14] OBIE is set to 0 is ignored. 0x0: Masked 0x1: Enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|--|------|-------|
| 8 | CIRQ_ENABLE | Card interrupt Enable A clear of this bit also clears the corresponding status bit. During 1-bit mode, if the interrupt routine doesn't remove the source of a card interrupt in the SDIO card, the status bit is reasserted when this bit is set to 1. 0x0: Masked 0x1: Enabled | RW | 0 |
| 7 | CREM_ENABLE | Card removal Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 6 | CINS_ENABLE | Card insertion Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 5 | BRR_ENABLE | Buffer Read Ready Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 4 | BWR_ENABLE | Buffer Write Ready Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 3 | DMA_ENABLE | DMA interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 2 | BGE_ENABLE | Block Gap Event Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 1 | TC_ENABLE | Transfer completed Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 0 | CC_ENABLE | Command completed Interrupt Enable 0x0: Masked 0x1: Enabled | RW | 0 |

Table 25-105. Register Call Summary for Register MMCHS_IE

MMC/SD/SDIO Functional Description

- [Power Management: \[0\] \[1\]](#)
- [Interrupt Requests: \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\] \[16\] \[17\] \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\]](#)
- [Interrupt-Driven Operation: \[25\] \[26\]](#)

MMC/SD/SDIO Programming Guide

- [Global Initialization: \[27\]](#)
- [Operational Modes Configuration: \[28\] \[29\] \[30\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[31\] \[32\]](#)
- [MMC/SD/SDIO Register Description: \[33\] \[34\] \[35\] \[36\]](#)

Table 25-106. MMCHS_ISE

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0238 | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Physical Address | 0x4809 C238 0x480B 4238 0x480A D238 0x480D 1238 0x480D 5238 | | |
| Description | Interrupt signal enable register This register allows to enable/disable the module internal sources of status, on an event-by-event basis. MMCHS_ISE [31:16] = Error Interrupt Signal Enable MMCHS_ISE [15:0] = Normal Interrupt Signal Enable | | |
| Type | RW | | |

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------|------------|------------|----------|-------------|-----------|-----|-----------|------------|-----------|-----------|-----------|------------|-----------|------|----------|-----------|-----------|------------|------------|------------|-----------|-----------|-----------|-----------|----------|----------|---|---|---|---|---|
| RESERVED | BADA_SIGEN | CERR_SIGEN | RESERVED | ADMAE_SIGEN | ACE_SIGEN | CLE | DEB_SIGEN | DCRC_SIGEN | DTO_SIGEN | CIE_SIGEN | CEB_SIGEN | CCRC_SIGEN | CTO_SIGEN | NULL | RESERVED | BSR_SIGEN | OBI_SIGEN | CIRQ_SIGEN | CREM_SIGEN | CINS_SIGEN | BRR_SIGEN | BWR_SIGEN | DMA_SIGEN | BGE_SIGEN | TC_SIGEN | CC_SIGEN | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|-------------|---|------|-------|
| 31:30 | RESERVED | | R | 0x0 |
| 29 | BADA_SIGEN | Bad access to data space signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 28 | CERR_SIGEN | Card error interrupt signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 27:26 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |
| 25 | ADMAE_SIGEN | ADMA error signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 24 | ACE_SIGEN | Auto CMD12 error signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 23 | CLE | Reserved bit. Current limit error is not supported. These bits are initialized to zero, and writes to them are ignored. | R | 0 |
| 22 | DEB_SIGEN | Data end bit error signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 21 | DCRC_SIGEN | Data CRC error signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 20 | DTO_SIGEN | Data timeout error signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 19 | CIE_SIGEN | Command index error signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 18 | CEB_SIGEN | Command end bit error signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 17 | CCRC_SIGEN | Command CRC error signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 16 | CTO_SIGEN | Command timeout error signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 15 | NULL | Fixed to 0 The host driver shall control error interrupts using the Error Interrupt Signal Enable register. Writes to this bit are ignored | R | 0 |
| 14:11 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |
| 10 | BSR_SIGEN | Boot status signal status Enable A write to this register when MMCHS_CON[17] BOOT_ACK is set to 0x0 is ignored. 0x0: Masked 0x1: Enabled | RW | 0 |
| 9 | OBI_SIGEN | Out-Of-Band Interrupt signal status Enable A write to this register when MMCHS_CON[14] OBIE is set to 0 is ignored. 0x0: Masked 0x1: Enabled | RW | 0 |
| 8 | CIRQ_SIGEN | Card interrupt signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 7 | CREM_SIGEN | Card removal signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 6 | CINS_SIGEN | Card insertion signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 5 | BRR_SIGEN | Buffer Read Ready signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 4 | BWR_SIGEN | Buffer Write Ready signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 3 | DMA_SIGEN | DMA interrupt Signal status enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 2 | BGE_SIGEN | Black Gap Event signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |
| 1 | TC_SIGEN | Transfer completed signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------|
| 0 | CC_SIGEN | Command completed signal status Enable 0x0: Masked 0x1: Enabled | RW | 0 |

Table 25-107. Register Call Summary for Register MMCHS_ISE

MMC/SD/SDIO Functional Description

- [Power Management: \[0\] \[1\]](#)
- [Interrupt Requests: \[2\] \[3\] \[4\] \[5\] \[6\]](#)
- [Polling: \[7\]](#)

MMC/SD/SDIO Programming Guide

- [Operational Modes Configuration: \[8\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[9\] \[10\]](#)
- [MMC/SD/SDIO Register Description: \[11\] \[12\] \[13\]](#)

Table 25-108. MMCHS_AC12

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 023C | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Physical Address | 0x4809 C23C 0x480B 423C 0x480A D23C 0x480D 123C 0x480D 523C | | |
| Description | Auto CMD12 Error Status Register The host driver may determine which of the errors cases related to Auto CMD12 has occurred by checking this MMCHS_AC12 register when an Auto CMD12 Error interrupt occurs. This register is valid only when Auto CMD12 is enabled (MMCHS_CMD[2] ACEN) and Auto CMD12Error (MMCHS_STAT[24] ACE) is set to 1. Note: These bits are automatically reset when starting a new adtc command with data. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----|----------|----|------|------|------|------|------|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CNI | RESERVED | | ACIE | ACEB | ACCE | ACTO | ACNE | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|----------|
| 31:8 | RESERVED | Reserved These bits are initialized to zero, and writes to them are ignored. | R | 0x000000 |
| 7 | CNI | Command not issue by Auto CMD12 error If this bit is set to 1, it means that pending command is not executed due to Auto CMD12 error : ACEB, ACCE, ACTO or ACNE. Read 0x0: Not error Read 0x1: Command not issued | R | 0 |
| 6:5 | RESERVED | Reserved These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 4 | ACIE | <p>Auto CMD12 index error This bit is a set to 1 when response index differs from corresponding command auto CMD12 index previously emitted. This bit depends on the command index check enable (MMCHS_CMD[20] CICE).</p> <p>Read 0x0: No error Read 0x1: Auto CMD12 Index Error</p> | R | 0 |
| 3 | ACEB | <p>Auto CMD12 end bit error This bit is set to 1 when detecting a 0 at the end bit position of auto CMD12 command response.</p> <p>Read 0x0: No error Read 0x1: AutoCMD12 End bit Error</p> | R | 0 |
| 2 | ACCE | <p>Auto CMD12 CRC error This bit is automatically set to 1 when a CRC7 error is detected in the auto CMD12 command response depending on the enable in MMCHS_CMD[19] CCCE register.</p> <p>Read 0x0: No error Read 0x1: Auto CMD12 CRC Error</p> | R | 0 |
| 1 | ACTO | <p>Auto CMD12 timeout error This bit is set to 1 if no response is received within 64 clock cycles from the end bit of the auto CMD12 command.</p> <p>Read 0x0: No error Read 0x1: Auto CMD12 Time Out</p> | R | 0 |
| 0 | ACNE | <p>Auto CMD12 not executed This bit is set to 1 if multiple block data transfer command has started and if an error occurs in command before Auto CMD12 starts.</p> <p>Read 0x0: Auto CMD12 Executed Read 0x1: Auto CMD12 Not Executed</p> | R | 0 |

Table 25-109. Register Call Summary for Register MMCHS AC12

MMC/SD/SDIO Programming Guide

- Operational Modes Configuration: [0] [1]

MMC/SD/SDIO Register Manual

- MMC/SD/SDIO Register Summary: [2] [3]
- MMC/SD/SDIO Register Description: [4] [5]

Table 25-110. MMCHS CAPA

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0240 | | |
| Physical Address | 0x4809 C240 0x480B 4240 0x480A D240 0x480D 1240 0x480D 5240 | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | Capabilities register This register lists the capabilities of the MMC/SD/SDIO host controller. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|-------|----------|----|------|------|------|-----|----|-----|----------|------|----------|-----|----------|-----|----|----|----|---|---|-----|----------|-----|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | BIT64 | RESERVED | | VS18 | VS30 | VS33 | SRS | DS | HSS | RESERVED | AD2S | RESERVED | MBL | RESERVED | BCF | | | | | | TCU | RESERVED | TCF | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:29 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |
| 28 | BIT64 | 64-bit system bus support: Setting 1 to this bit indicates that the Host Controller supports 64-bit address descriptor mode and is connected to 64-bit address system bus. Read 0x0: 32-bit system bus address Read 0x1: 64-bit system bus address | R | 0 |
| 27 | RESERVED | | R | 0 |
| 26 | VS18 | Voltage support 1.8 V Initialization of this register (via a write access to this register) depends on the system capabilities. The host driver shall not modify this register after the initialization. This register is only reinitialized by a hard reset (via RESETN signal) Write 0x0: 1.8 V not supported Read 0x0: 1.8 V not supported Read 0x1: 1.8 V supported Write 0x1: 1.8 V supported | RW | 0 |
| 25 | VS30 | Voltage support 3.0 V Initialization of this register (via a write access to this register) depends on the system capabilities. The host driver shall not modify this register after the initialization. This register is only reinitialized by a hard reset (via RESETN signal) Read 0x0: 3.0 V not supported Write 0x0: 3.0 V not supported Write 0x1: 3.0 V supported Read 0x1: 3.0 V supported | RW | 0 |
| 24 | VS33 | Voltage support 3.3 V Initialization of this register (via a write access to this register) depends on the system capabilities. The host driver shall not modify this register after the initialization. This register is only reinitialized by a hard reset (via RESETN signal) Read 0x0: 3.3 V not supported Write 0x0: 3.3 V not supported Write 0x1: 3.3 V supported Read 0x1: 3.3 V supported | RW | 0 |
| 23 | SRS | Suspend/Resume support (SDIO cards only) This bit indicates whether the host controller supports suspend/resume functionality. Read 0x0: The host controller does not suspend/resume functionality. Read 0x1: The host controller supports suspend/resume functionality. | R | 1 |
| 22 | DS | DMA support This bit indicates that the Host Controller is able to use DMA to transfer data between system memory and the Host Controller directly. Read 0x0: DMA not supported Read 0x1: DMA supported | R | 1 |
| 21 | HSS | High-speed support This bit indicates that the host controller supports high-speed operations and can supply an up-to maximum card frequency. Read 0x0: High speed not supported Read 0x1: High speed supported | R | 1 |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 20 | RESERVED | Reserved. This bit is initialized to zero, and writes to it are ignored. | R | 0 |
| 19 | AD2S | ADMA2 support: This bit indicates whether the host controller is capable of using ADMA2. It depends on setting of generic parameter MMCHS_HL_HWINFO[0] MADMA_EN Read 0x0: ADMA2 not supported Read 0x1: ADMA2 supported | R | 1 |
| 18 | RESERVED | Reserved. This bit is initialized to zero, and writes to it are ignored. | R | 0 |
| 17:16 | MBL | Maximum block length This value indicates the maximum block size that the host driver can read and write to the buffer in the host controller. This value depends on definition of generic parameter with a max value of 2048 bytes. The host controller supports 512- byte and 1024-byte block transfers. Read 0x0: 512 bytes Read 0x1: 1024 bytes Read 0x2: 2048 bytes | R | 0x1 |
| 15:14 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | R | 0x0 |
| 13:8 | BCF | Base clock frequency for clock provided to the card. Read 0x0: The value indicating the base (maximum) frequency for the output clock provided to the card is system dependent and is not available in this register. Get the information via another method. | R | 0x00 |
| 7 | TCU | Timeout clock unit This bit shows the unit of base clock frequency used to detect Data Timeout Error (MMCHS_STAT[20] DTO). Read 0x0: kHz Read 0x1: MHz | R | 1 |
| 6 | RESERVED | Reserved. This bit is initialized to zero, and writes to it are ignored. | R | 0 |
| 5:0 | TCF | Timeout clock frequency The timeout clock frequency is used to detect Data Timeout Error (MMCHS_STAT[20] DTO). Read 0x0: The timeout clock frequency depends on the frequency of the clock provided to the card. The value of the timeout clock frequency is not available in this register. | R | 0x00 |

Table 25-111. Register Call Summary for Register MMCHS_CAPA

MMC/SD/SDIO Functional Description

- [Software Reset: \[0\]](#)
- [Data Buffer: \[1\]](#)

MMC/SD/SDIO Programming Guide

- [Global Initialization: \[2\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[3\] \[4\]](#)
- [MMC/SD/SDIO Register Description: \[5\] \[6\] \[7\] \[8\]](#)

Table 25-112. MMCHS_CUR_CAPA

| | | | |
|-------------------------|---|-----------------|--|
| Address Offset | 0x0000 0248 | | |
| Physical Address | 0x4809 C248 0x480B 4248 0x480A D248 0x480D 1248 0x480D 5248 | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | Maximum current capabilities Register This register indicates the maximum current capability for each voltage. The value is meaningful if the voltage support is set in the capabilities register (MMCHS_CAPA). Initialization of this register (via a write access to this register) depends on the system capabilities. The host driver shall not modify this register after the initialization. This register is only reinitialized by a hard reset (via RESETN signal) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|---------|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | CUR_1V8 | | | | | | | | CUR_3V0 | | | | | | | | CUR_3V3 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|--|------|-------|
| 31:24 | RESERVED | Reserved. This bit is initialized to zero, and writes to it are ignored. | R | 0x00 |
| 23:16 | CUR_1V8 | Maximum current for 1.8V Read 0x0: The maximum current capability for this voltage is not available. Feature not implemented. | RW | 0x00 |
| 15:8 | CUR_3V0 | Maximum current for 3.0V Read 0x0: The maximum current capability for this voltage is not available. Feature not implemented. | RW | 0x00 |
| 7:0 | CUR_3V3 | Maximum current for 3.3V Read 0x0: The maximum current capability for this voltage is not available. Feature not implemented. | RW | 0x00 |

Table 25-113. Register Call Summary for Register MMCHS_CUR_CAPA

MMC/SD/SDIO Functional Description

- [Software Reset: \[0\]](#)

MMC/SD/SDIO Programming Guide

- [Global Initialization: \[1\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[2\] \[3\]](#)

Table 25-114. MMCHS_FE

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0250 | | |
| Physical Address | 0x4809 C250 0x480B 4250 0x480A D250 0x480D 1250 0x480D 5250 | Instance | MMCHS1 MMCHS2 MMCHS3 MMCHS4 MMCHS5 |
| Description | Force Event Register for Error Interrupt status The force Event Register is not a physically implemented register. Rather, it is an address at which the Error Interrupt Status register can be written. The effect of a write to this address will be reflected in the Error Interrupt Status Register, if corresponding bit of the Error Interrupt Status Enable Register is set. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|---------|---------|----------|----------|--------|--------|--------|---------|--------|--------|--------|---------|--------|----------|----|----|----|----|----|----|----|--------|----------|---------|---------|---------|---------|---------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | FE_BADA | FE_CERR | RESERVED | FE_ADMAE | FE_ACE | FE_CLE | FE_DEB | FE_DCRC | FE_DTO | FE_CIE | FE_CEB | FE_CCRC | FE_CTO | RESERVED | | | | | | | | FE_CNI | RESERVED | FE_ACIE | FE_ACEB | FE_ACCE | FE_ACTO | FE_ACNE | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|--------------------|-------|
| 31:30 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | N/A ⁽¹⁾ | 0x0 |
| 29 | FE_BADA | Force Event Bad access to data space Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 28 | FE_CERR | Force Event Card error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 27:26 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | N/A ⁽¹⁾ | 0x0 |
| 25 | FE_ADMAE | Force Event ADMA Error: Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 24 | FE_ACE | Force Event Auto CMD12 error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 23 | FE_CLE | Reserved. Current limit error is not supported. These bits are initialized to zero, and writes to them are ignored. | N/A ⁽¹⁾ | 0 |
| 22 | FE_DEB | Force Event Data End Bit error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 21 | FE_DCRC | Force Event Data CRC Error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 20 | FE_DTO | Force Event Data timeout error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |

⁽¹⁾ N/A = Not accessible

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|--------------------|-------|
| 19 | FE_CIE | Force Event Command index error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 18 | FE_CEB | Force Event Command end bit error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 17 | FE_CCRC | Force Event Command CRC Error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 16 | FE_CTO | Command Timeout Error This bit is set automatically when no response is received within 64 clock cycles from the end bit of the command. For commands that reply within 5 clock cycles - the timeout is still detected at 64 clock cycles. Write 0x0: Status bit unchanged Write 0x1: Status is cleared | W | 0 |
| 15:8 | RESERVED | Reserved. These bits are initialized to zero, and writes to them are ignored. | N/A ⁽²⁾ | 0x00 |
| 7 | FE_CNI | Force Event Command not issue by Auto CMD12 error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 6:5 | RESERVED | Reserved These bits are initialized to zero, and writes to them are ignored. | N/A ⁽²⁾ | 0x0 |
| 4 | FE_ACIE | Force Event Auto CMD12 index error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 3 | FE_ACEB | Force Event Auto CMD12 end bit error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 2 | FE_ACCE | Force Event Auto CMD12 CRC error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 1 | FE_ACTO | Force Event Auto CMD12 timeout error Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |
| 0 | FE_ACNE | Force Event Auto CMD12 not executed Write 0x0: No effect, No Interrupt. Write 0x1: Interrupt Forced | W | 0 |

⁽²⁾ N/A = Not accessible

Table 25-115. Register Call Summary for Register MMCHS_FE

MMC/SD/SDIO Functional Description

- [Test Registers: \[0\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[1\] \[2\]](#)

Table 25-116. MMCHS_ADMAES

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|----------|------------------|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-----|---|-----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----|--|-----|--|
| Address Offset | 0x0000 0254 | | Instance | MMCHS1 MMCHS2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4809 C254 0x480B 4254 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | ADMA Error Status Register When ADMA Error Interrupt is occurred, the ADMA Error States field in this register holds the ADMA state and the ADMA System Address Register holds the address around the error descriptor. For recovering the error, the Host Driver requires the ADMA state to identify the error descriptor address as follows: ST_STOP: Previous location set in the ADMA System Address register is the error descriptor address ST_FDS: Current location set in the ADMA System Address register is the error descriptor address ST_CADR: This state is never set because do not generate ADMA error in this state. ST_TFR: Previous location set in the ADMA System Address register is the error descriptor address In case of write operation, the Host Driver should use ACMD22 to get the number of written block rather than using this information, since unwritten data may exist in the Host Controller. The Host Controller generates the ADMA Error Interrupt when it detects invalid descriptor data (Valid=0) at the ST_FDS state. In this case, ADMA Error State indicates that an error occurs at ST_FDS state. The Host Driver may find that the Valid bit is not set in the error descriptor. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="28">RESERVED</td><td colspan="2">LME</td><td colspan="2">AES</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LME | | AES | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | LME | | AES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | Description | | Type | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:3 | RESERVED | | | R | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | LME | ADMA Length Mismatch Error: (1) While Block Count Enable being set, the total data length specified by the Descriptor table is different from that specified by the Block Count and Block Length. (2) Total data length can not be divided by the block length. 0x0: No Error 0x1: Error | | RW | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1:0 | AES | ADMA Error State his field indicates the state of ADMA when error is occurred during ADMA data transfer. This field never indicates "10" because ADMA never stops in this state. 0x0: ST_STOP (Stop DMA)Contents of SYS_SDR register 0x1: ST_STOP (Stop DMA)Points the error descriptor 0x2: Never set this state(Not used) 0x3: ST_TFR (Transfer Data)Points the next of the error descriptor | | RW | 0x0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 25-117. Register Call Summary for Register MMCHS_ADMAES

MMC/SD/SDIO Functional Description

- [Master DMA Operations: \[0\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[1\] \[2\]](#)

Table 25-118. MMCHS_ADMASAL

| | | | |
|-------------------------|------------------------------|-----------------|------------------|
| Address Offset | 0x0000 0258 | Instance | MMCHS1 MMCHS2 |
| Physical Address | 0x4809 C258 0x480B 4258 | | |
| Description | ADMA System address Low bits | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| ADMA_A32B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | ADMA_A32B | ADMA System address 32 bits. This register holds byte address of executing command of the Descriptor table. 32-bit Address Descriptor uses lower 32-bit of this register. At the start of ADMA, the Host Driver shall set start address of the Descriptor table. The ADMA increments this register address, which points to next line, when every fetching a Descriptor line. When the ADMA Error Interrupt is generated, this register shall hold valid Descriptor address depending on the ADMA state. The Host Driver shall program Descriptor Table on 32-bit boundary and set 32-bit boundary address to this register. ADMA2 ignores lower 2-bit of this register and assumes it to be 00b. | RW | 0x0000 0000 |

Table 25-119. Register Call Summary for Register MMCHS_ADMASAL

MMC/SD/SDIO Functional Description

- [Master DMA Operations: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[6\] \[7\]](#)

Table 25-120. MMCHS_REV

| | | | |
|------------------|--|----------|--------|
| Address Offset | 0x0000 02FC | Instance | MMCHS1 |
| Physical Address | 0x4809 C2FC | | MMCHS2 |
| | 0x480B 42FC | | MMCHS3 |
| | 0x480A D2FC | | MMCHS4 |
| | 0x480D 12FC | | MMCHS5 |
| | 0x480D 52FC | | |
| Description | Versions Register This register contains the hard coded RTL vendor revision number, the version number of SD specification compliancy and a slot status bit. MMCHS_REV[31:16] = Host controller version MMCHS_REV[15:0] = Slot Interrupt Status | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|---|---|-----|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| VREV | | | | | | | | SREV | | | | | | | | RESERVED | | | | | | | | | | SIS | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:24 | VREV | Vendor Version Number: IP revision [7:4] Major revision [3:0] Minor revision Examples: 0x10 for 1.0 0x21 for 2.1 | R | 0x-- |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|--------|
| 23:16 | SREV | Specification Version Number This status indicates the Standard SD Host Controller Specification Version. The upper and lower 4-bits indicate the version. Read 0x0: SD Host Specification Version 1.0 Read 0x1: SD Host Specification Version 2.0 | R | 0x01 |
| 15:1 | RESERVED | Reserved These bits are initialized to zero, and writes to them are ignored. | R | 0x0000 |
| 0 | SIS | Slot Interrupt Status This status bit indicates the inverted state of interrupt signal for the module. By a power on reset or by setting a software reset for all (MMCHS_SYSCTL[24] SRA), the interrupt signal shall be de-asserted and this status shall read 0. | R | 0 |

Table 25-121. Register Call Summary for Register MMCHS_REV

MMC/SD/SDIO Register Manual

- [MMC/SD/SDIO Register Summary: \[0\] \[1\]](#)
- [MMC/SD/SDIO Register Description: \[2\] \[3\]](#)

PRELIMINARY

General-Purpose Interface

This chapter describes the general-purpose interface on the device.

| Topic | Page |
|---|------|
| 26.1 General-Purpose Interface Overview | 5390 |
| 26.2 General-Purpose Interface Environment | 5393 |
| 26.3 General-Purpose Interface Integration | 5399 |
| 26.4 General-Purpose Interface Functional Description | 5402 |
| 26.5 General-Purpose Interface Programming Guide | 5417 |
| 26.6 General-Purpose Interface Register Manual | 5419 |

26.1 General-Purpose Interface Overview

The general-purpose interface combines six general-purpose input/output (GPIO) banks.

Each GPIO module provides 32 dedicated general-purpose pins with input and output capabilities; thus, the general-purpose interface supports up to 192 (6×32) pins.

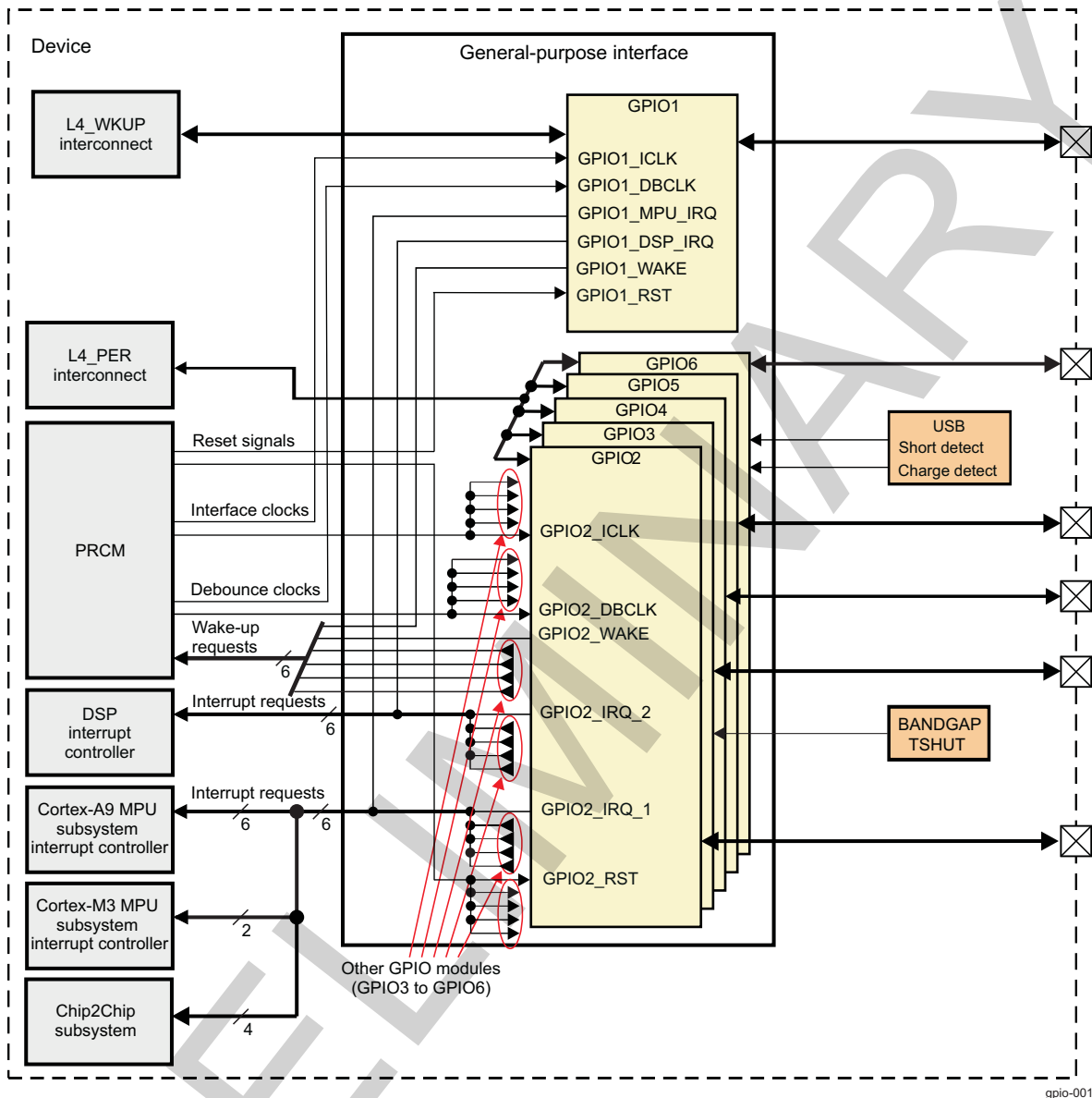
These pins can be configured for the following applications:

- Data input (capture)/output (drive)
- Keyboard interface with a debounce cell
- Interrupt generation in active mode upon the detection of external events. Detected events are processed by two parallel independent interrupt-generation submodules to support biprocessor operations.
- Wake-up request generation in idle mode upon the detection of external events

These modules do not include pad control (pullup/pulldown control, open-drain feature). For more information, see [Section 19.4.8](#), *Pad Functional Multiplexing and Configuration*, in [Chapter 19](#), *Control Module*.

[Figure 26-1](#) is an overview of the general-purpose interface.

Figure 26-1. General-Purpose Interface Overview



The GPIOs include the following global features:

- Synchronous interrupt requests in active mode from each channel are processed by two identical interrupt generation submodules used independently by the digital signal processor (DSP) and microprocessor unit (MPU) Cortex™-A9 and Cortex™-M3 subsystems. One of these interrupts is mapped on the DSP subsystem interrupt controller (INTC) and the other on the MPU Cortex-A9 and Cortex-M3 subsystem INTCs.
- Asynchronous wake-up requests in idle mode from input channels are merged together to issue one wake-up signal per GPIO.
- Data input (capture)/output (drive)
- Power management support

The general-purpose interface has 12 interrupt lines (two interrupt lines per GPIO instance).

Each GPIO produces a wake-up request signal to the power, reset, and clock management (PRCM) module.

Each channel in the GPIOs has the following features:

- The GPIOi.GPIO_OE register controls the output capability for each pin.
- The output line level reflects the value written in the GPIOi.GPIO_DATAOUT register through the level 4 (L4) interconnect.
- The input line can be fed to the GPIO through an optional and configurable debounce cell. (Because the debouncing time value is global for all ports of one GPIO, up to five different debouncing time values are possible.)
- The input line value is sampled into the GPIOi.GPIO_DATAIN register and can be read through the L4 interconnect.
- In active mode, the input line can be used through level and edge detectors to trigger synchronous interrupts. The edge (rising, falling, or both) or the level used (logical 0, logical 1, or both) can be configured.
- In idle mode, the input line can be used to activate the asynchronous wake-up request (on edge detection: rising edge, falling edge, or both).

The module provides an alternative to the atomic test and set operations for the following registers:

- GPIOi.GPIO_DATAOUT
- GPIOi.GPIO_IRQSTATUS_SET_0
- GPIOi.GPIO_IRQSTATUS_SET_1
- GPIOi.GPIO_IRQSTATUS_CLR_0
- GPIOi.GPIO_IRQSTATUS_CLR_1

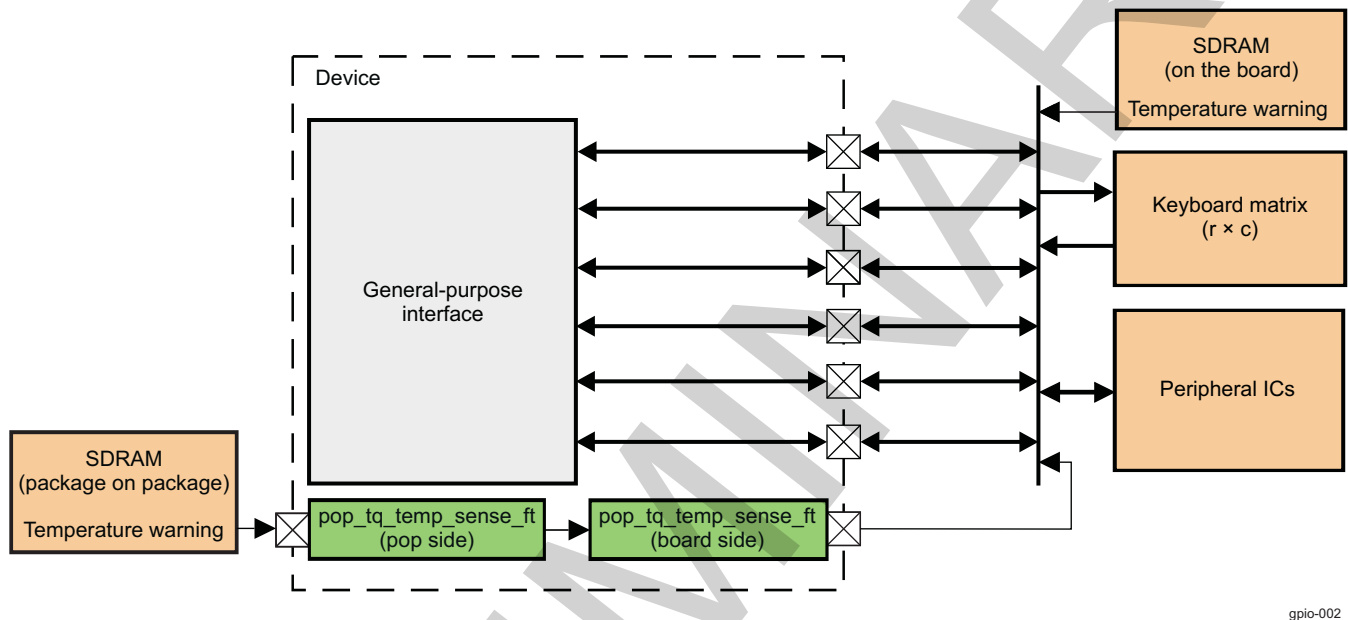
For these registers, the modules implement the set-and-clear protocol register update (see [Section 26.4.9, General-Purpose Interface Set-and-Clear Protocol](#)).

26.2 General-Purpose Interface Environment

The general-purpose interface combines six GPIO modules for a flexible, user-programmable, GPIO controller. The general-purpose interface implements functions that are not implemented with the dedicated controllers in the device and require simple input and/or output software-controlled signals. The general-purpose interface allows a variety of custom connections and expands the I/O capabilities of the system to the real world.

Figure 26-2 shows a typical application using the general-purpose interface.

Figure 26-2. General-Purpose Interface Typical Application



NOTE: Most memories provide a temperature sensor to control the autorefresh duty cycle. The device monitors the temperature of the external memory using the pop_tq_temp_sense_ft ball and a GPIO input. To do this, pop_tq_temp_sense_ft is connected to a GPIO through the customer board. This feature is application-dependent.

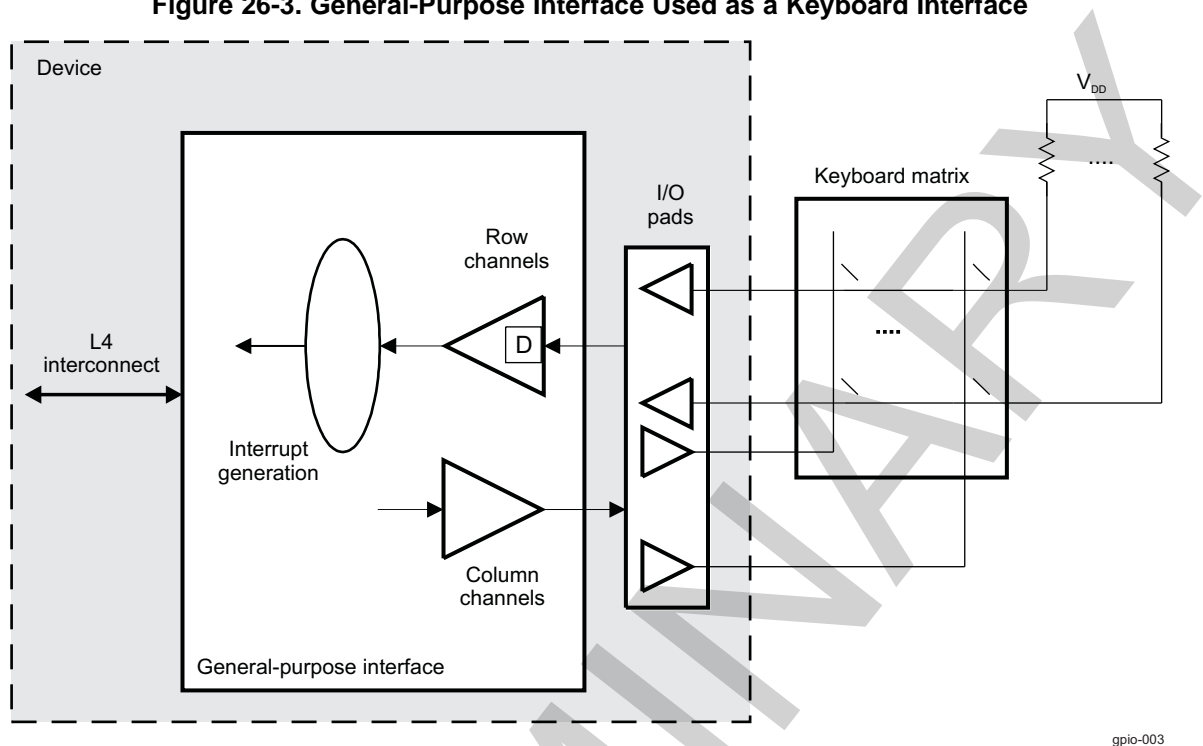
CAUTION

Because of buffer strength, an external serial resistor must be connected to the balls where gpio_106 through gpio_109 are muxed with MMC signals.

The general-purpose interface can physically connect the device to a keyboard matrix and peripheral integrated circuits (ICs).

26.2.1 General-Purpose Interface as a Keyboard Interface

The general-purpose interface can be used as a keyboard interface. Channels can be dedicated based on the keyboard matrix ($r \times c$). Figure 26-3 shows row channels configured as inputs with the input debounce feature enabled. The row channels are driven high with an external pullup. Column channels are configured as outputs and drive a low level.

Figure 26-3. General-Purpose Interface Used as a Keyboard Interface

When a keyboard matrix key is pressed, the corresponding row and column lines are shorted together and a low level is driven on the corresponding row channel. This generates an interrupt based on the proper configuration (see [Section 26.4.6, General-Purpose Interface Interrupt and Wake-Up Requests](#)).

When the keyboard interrupt is received, the processor (MPU and/or DSP subsystem) can disable the keyboard interrupt and scan the column channels for the key coordinates.

- The scanning sequence has as many states as column channels: For each step in the sequence, the processor drives one column channel low and the others high.
- The processor reads the values of the row channels and thus detects which keys in the column are pressed.

At the end of the scanning sequence, the processor establishes which keys are pressed. The keyboard interface can then be reconfigured in the interrupt waiting state.

26.2.2 General-Purpose Interface Signals

[Table 26-1](#) describes the module signals.

Table 26-1. I/O Description

| Signal | I/O ⁽¹⁾ | Description | Reset Value ⁽²⁾ |
|---------------|--------------------|----------------------------|----------------------------|
| gpio_[1:0] | I/O | GPIO | Hi-Z |
| gpio_wk[1:0] | I/O | GPIO (direct wake-up path) | Hi-Z |
| gpio_[3:2] | I/O | GPIO | Hi-Z |
| gpio_wk[3:2] | I/O | GPIO (direct wake-up path) | Hi-Z |
| gpio_wk[10:4] | I/O | GPIO (direct wake-up path) | Hi-Z |
| gpio_[28:11] | I/O | GPIO | Hi-Z |
| gpio_wk29 | I/O | GPIO (direct wake-up path) | Hi-Z |
| gpi_wk30 | I | GPIO (direct wake-up path) | Hi-Z |
| gpo_wk31 | O | GPIO (direct wake-up path) | Hi-Z |

⁽¹⁾ I = Input; O = Output; I/O = Bidirectional

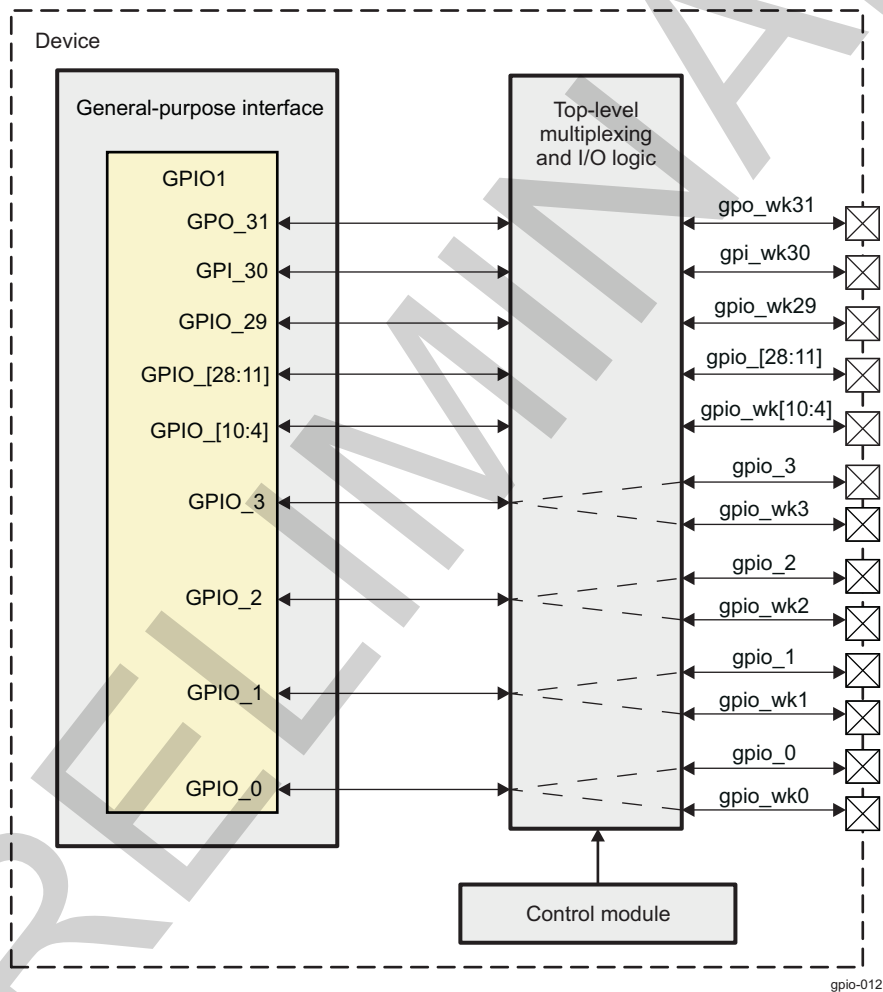
⁽²⁾ Hi-Z = High impedance

Table 26-1. I/O Description (continued)

| Signal | I/O ⁽¹⁾ | Description | Reset Value ⁽²⁾ |
|----------------|--------------------|------------------|----------------------------|
| gpio_[56:32] | I/O | GPIO | Hi-Z |
| gpio_[66:59] | I/O | GPIO | Hi-Z |
| gpi_[80:67] | I | GPIO inputs only | Hi-Z |
| gpio_[174:81] | I/O | GPIO | Hi-Z |
| gpi_[178:175] | I | GPIO | Hi-Z |
| gpio_[191:181] | I/O | GPIO | Hi-Z |

Figure 26-4 shows the signal connections of GPIO1.

Figure 26-4. GPIO1 Signal Connections



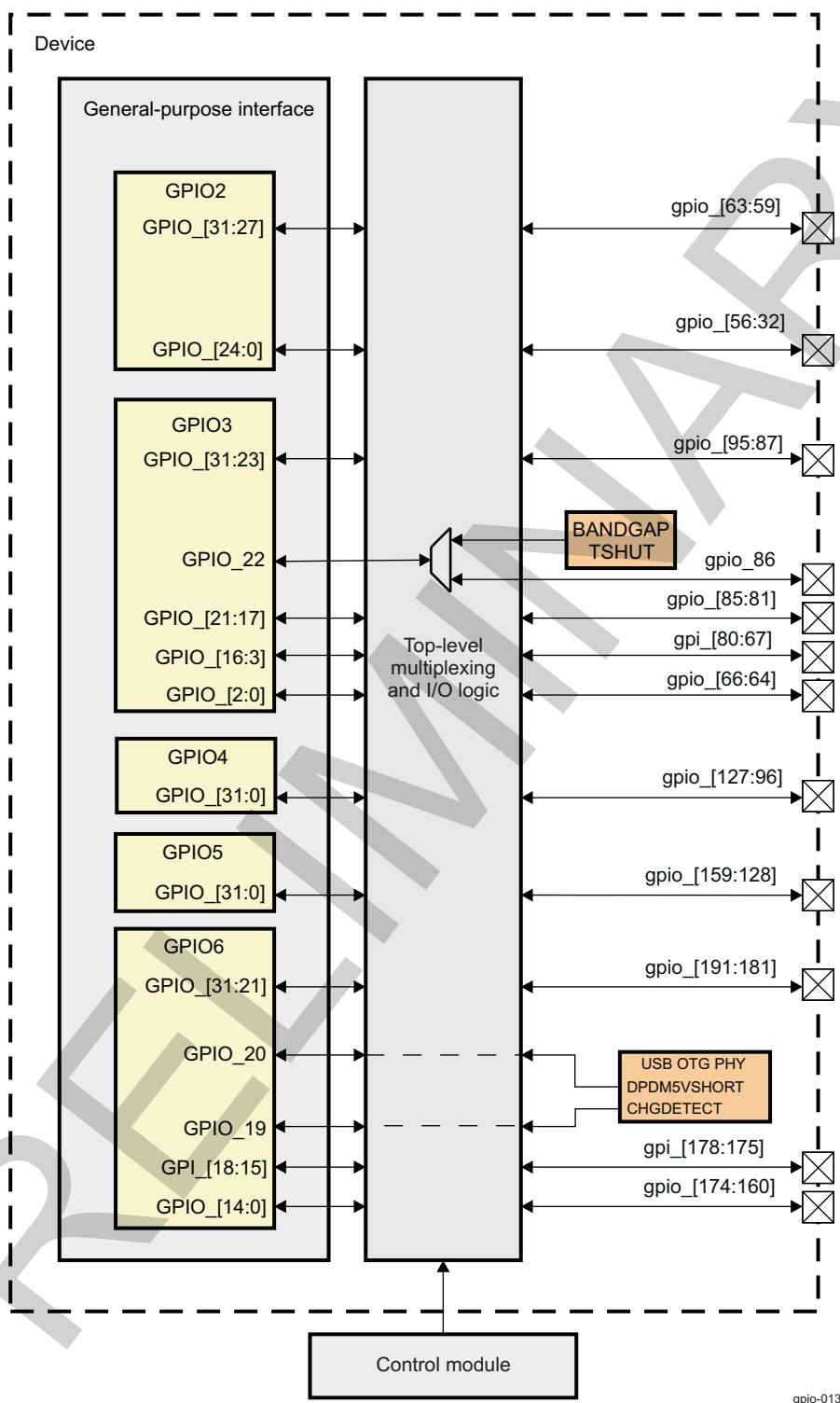
NOTE: Users must not use a GPIO channel through two device pads simultaneously. The following channels can be mapped on two different device pads:

- GPIO[3:2] of the GPIO1 module (signals gpio_[3:2] or gpio_wk[3:2]; each can be routed to a different device pad). See [Figure 26-4](#).
- GPIO[8:4] of the GPIO4 module (signals gpio_[104:100]; each can be routed to two different device pads)

Therefore, appropriate configuration must be done through the pad configuration registers. See [Section 19.4.8, Pad Functional Multiplexing and Configuration](#), in [Chapter 19, Control Module](#).

[Figure 26-5](#) shows the signal connections of GPIO2 through GPIO6.

Figure 26-5. GPIO2 Through GPIO6 Signal Connections



NOTE: The GPIO_22 channel of the GPIO3 module receives a thermal shutdown (TSHUT) signal from the BANDGAP module whenever pad mux mode is not set to 3 (gpio_86 signal selected). See [Section 19.4.8, Pad Functional Multiplexing and Configuration](#), in [Chapter 19, Control Module](#).

NOTE: For more information about the signals and channel descriptions of GPIO1 through GPIO6, see [Section 26.4.7](#), *General-Purpose Interface Channels Description*.

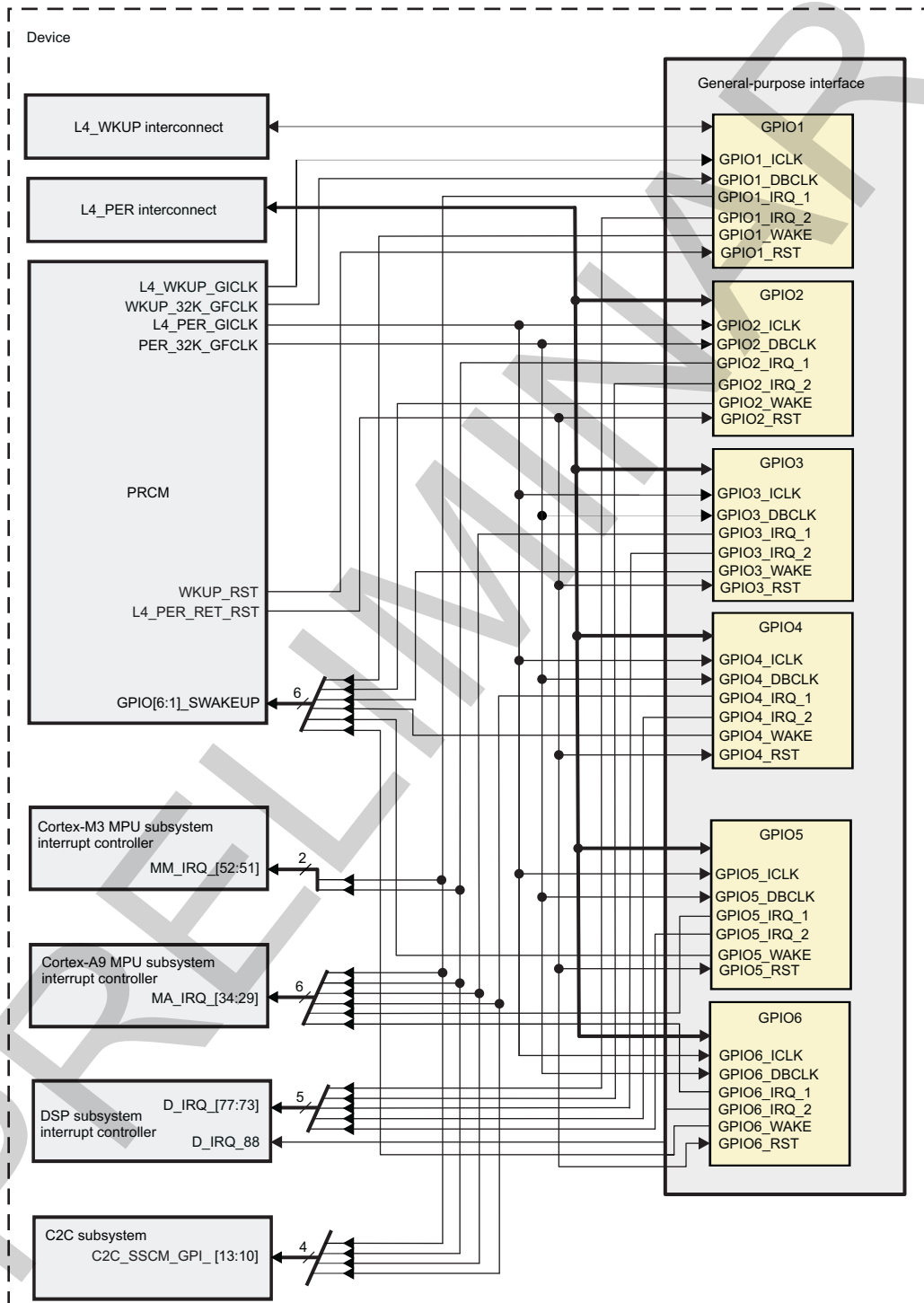
NOTE: For more information about GPIO signal multiplexing, see [Section 19.4.8](#), *Pad Functional Multiplexing and Configuration*, in [Chapter 19](#), *Control Module*.

26.3 General-Purpose Interface Integration

This section describes module integration in the device, including information about clocks, resets, and hardware requests.

Figure 26-6 shows this module integration.

Figure 26-6. GPIO Integration



gpio-004

NOTE: For more information about the IDLE hardware handshake and the wake-up request, see [Section 3.1.1.1, Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

[Table 26-2](#) through [Table 26-4](#) summarize the integration of the module in the device.

Table 26-2. Integration Attributes

| Module Instance | Attributes | |
|-------------------------|--------------|--------------|
| | Power Domain | Interconnect |
| GPIO1 | PD_WKUP | L4_WKUP |
| GPIOi, where i = 2 to 6 | PD_L4_PER | L4_PER |

Table 26-3. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|----------------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| GPIO1 | GPIO1_ICLK | LWKUP_L4_ICLK | PRCM | GPIO interface clock |
| | GPIO1_DBCLK | WKUP_32K_FCLK | PRCM | GPIO debounce clock |
| GPIO2 | GPIO2_ICLK | PER_L4_ICLK | PRCM | GPIO interface clock |
| | GPIO2_DBCLK | PER_32K_FCLK | PRCM | GPIO debounce clock |
| GPIO3 | GPIO3_ICLK | PER_L4_ICLK | PRCM | GPIO interface clock |
| | GPIO3_DBCLK | PER_32K_FCLK | PRCM | GPIO debounce clock |
| GPIO4 | GPIO4_ICLK | PER_L4_ICLK | PRCM | GPIO interface clock |
| | GPIO4_DBCLK | PER_32K_FCLK | PRCM | GPIO debounce clock |
| GPIO5 | GPIO5_ICLK | PER_L4_ICLK | PRCM | GPIO interface clock |
| | GPIO5_DBCLK | PER_32K_FCLK | PRCM | GPIO debounce clock |
| GPIO6 | GPIO6_ICLK | PER_L4_ICLK | PRCM | GPIO interface clock |
| | GPIO6_DBCLK | PER_32K_FCLK | PRCM | GPIO debounce clock |
| Resets | | | | |
| GPIO1 | GPIO1_RST | WKUP_RST | PRCM | GPIO reset signal |
| GPIO2 | GPIO2_RST | L4_PER_RET_RST | PRCM | GPIO reset signal |
| GPIO3 | GPIO3_RST | L4_PER_RET_RST | PRCM | GPIO reset signal |
| GPIO4 | GPIO4_RST | L4_PER_RET_RST | PRCM | GPIO reset signal |
| GPIO5 | GPIO5_RST | L4_PER_RET_RST | PRCM | GPIO reset signal |
| GPIO6 | GPIO6_RST | L4_PER_RET_RST | PRCM | GPIO reset signal |

Table 26-4. Hardware Requests

| Interrupt Requests | | | | |
|--------------------|--------------------|-------------------------|-------------|--|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| GPIO1 | GPIO1_DSP_IRQ | D_IRQ_73 | DSP | An interrupt to the DSP (second interrupt) |
| | GPIO1_MPU_IRQ | MA_IRQ_29 | Cortex-A9 | An interrupt to the MPU subsystem INTC (first interrupt) |
| | GPIO1_MPU_IRQ | MM_IRQ_51 | Cortex-M3 | An interrupt to the MPU subsystem INTC (first interrupt) |
| | GPIO1_MPU_IRQ | C2C_SSCM_GPI_10 | C2C | An interrupt to distant device through the Chip2Chip (C2C) subsystem (first interrupt) |

Table 26-4. Hardware Requests (continued)

| | | | | |
|-------|---------------|-----------------|-----------|--|
| GPIO2 | GPIO2_DSP_IRQ | D_IRQ_74 | DSP | An interrupt to the DSP (second interrupt) |
| | GPIO2_MPU_IRQ | MA_IRQ_30 | Cortex-A9 | An interrupt to the MPU subsystem INTC (first interrupt) |
| | GPIO2_MPU_IRQ | MM_IRQ_52 | Cortex-M3 | An interrupt to the MPU subsystem INTC (first interrupt) |
| | GPIO2_MPU_IRQ | C2C_SSCM_GPI_11 | C2C | An interrupt to distant device through the C2C subsystem (first interrupt) |
| GPIO3 | GPIO3_DSP_IRQ | D_IRQ_75 | DSP | An interrupt to the DSP (second interrupt) |
| | GPIO3_MPU_IRQ | MA_IRQ_31 | Cortex-A9 | An interrupt to the MPU subsystem (first interrupt) |
| | GPIO3_MPU_IRQ | C2C_SSCM_GPI_12 | C2C | An interrupt to distant device through the C2C subsystem (first interrupt) |
| GPIO4 | GPIO4_DSP_IRQ | D_IRQ_76 | DSP | An interrupt to the DSP (second interrupt) |
| | GPIO4_MPU_IRQ | MA_IRQ_32 | Cortex-A9 | An interrupt to the MPU subsystem (first interrupt) |
| | GPIO4_MPU_IRQ | C2C_SSCM_GPI_13 | C2C | An interrupt to distant device through the C2C subsystem (first interrupt) |
| GPIO5 | GPIO5_DSP_IRQ | D_IRQ_77 | DSP | An interrupt to the DSP (second interrupt) |
| | GPIO5_MPU_IRQ | MA_IRQ_33 | Cortex-A9 | An interrupt to the MPU subsystem (first interrupt) |
| GPIO6 | GPIO6_DSP_IRQ | D_IRQ_88 | DSP | An interrupt to the DSP (second interrupt) |
| | GPIO6_MPU_IRQ | MA_IRQ_34 | Cortex-A9 | An interrupt to the MPU subsystem (first interrupt) |

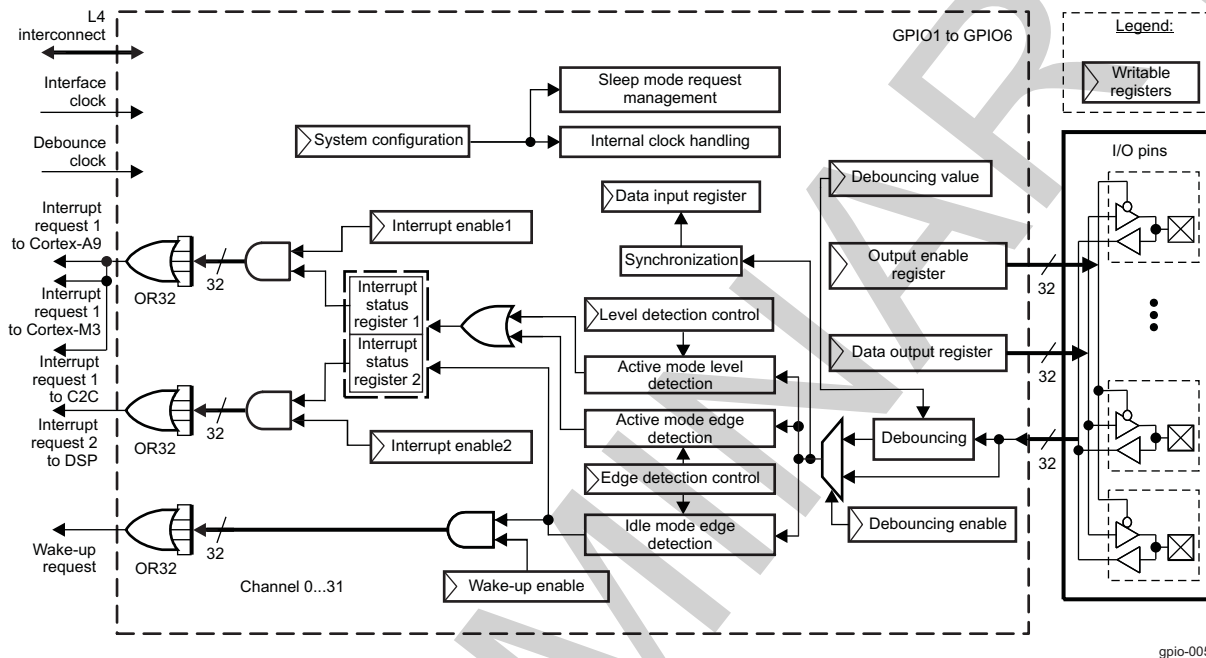
NOTE: For a description of interrupt source, see [Section 26.4.6, General-Purpose Interface Interrupt and Wake-Up Requests](#).

26.4 General-Purpose Interface Functional Description

26.4.1 General-Purpose Interface Description

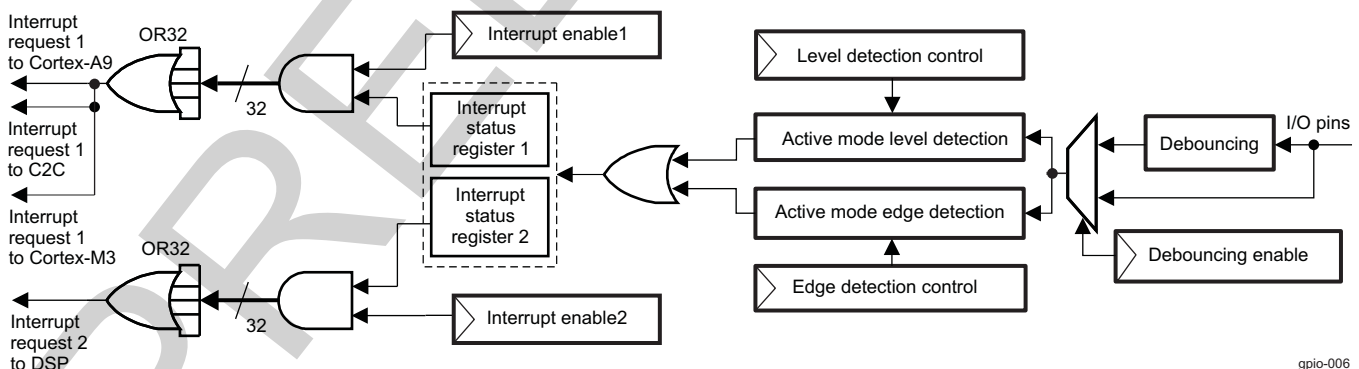
Figure 26-7 shows the details of the GPIOs in the general-purpose interface block diagram, including their configuration registers and main functional paths.

Figure 26-7. General-Purpose Interface Block Diagram



The synchronous path (for active mode operation) used to generate a synchronous interrupt request on expected event detection on any input GPIO. Synchronous interrupt request lines 1 and 2 are active based on their respective interrupt enable 1 and 2 registers (GPIOi.GPIO_IRQSTATUS_SET_0, GPIOi.GPIO_IRQSTATUS_SET_1, GPIOi.GPIO_IRQSTATUS_CLR_0, and GPIOi.GPIO_IRQSTATUS_CLR_1). See Figure 26-8.

Figure 26-8. Synchronous Path



The asynchronous path (for idle mode operation) used to generate an asynchronous wake-up request on the expected edge detection on any input GPIO. The asynchronous wake-up request line is active based on the wake-up-enable register. See Figure 26-9.

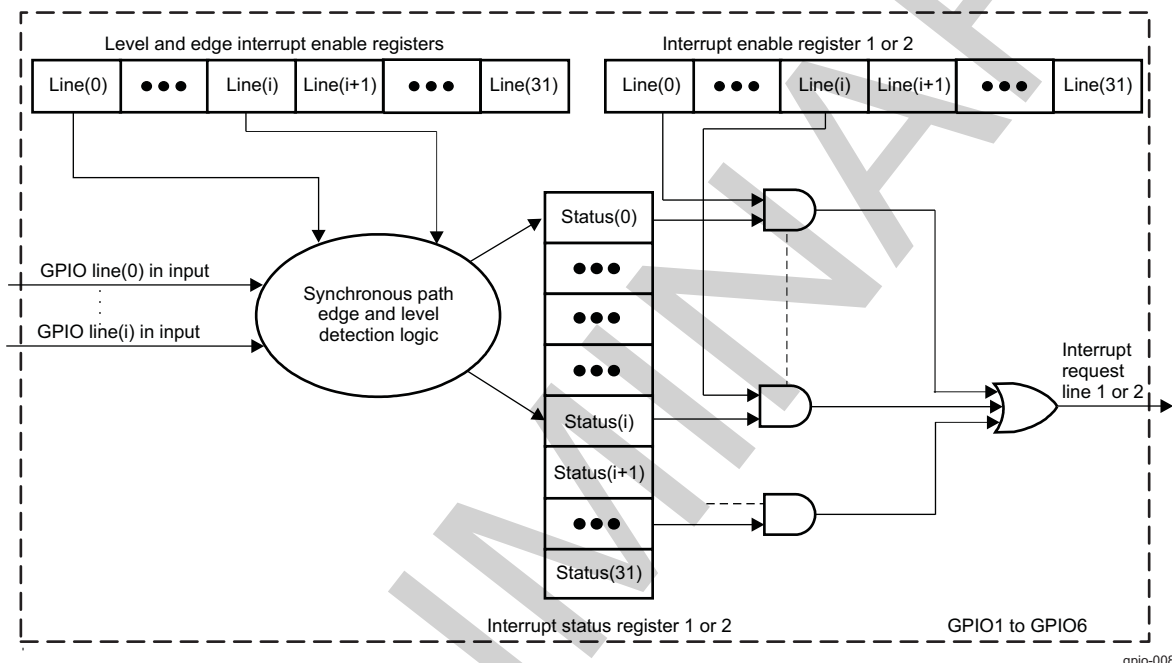
When the debounce feature is active, the latency depends on the value of the debouncing time register (GPIOi.GPIO_DEBOUNCINGTIME) (see [Section 26.4.3, General-Purpose Interface Clock Configuration](#)) and is less than three internally gated interface clock cycles plus two interface clock cycles plus GPIOi.GPIO_DEBOUNCINGTIME register value debounce clock cycles plus three debounce clock cycles.

Synchronous interrupt request line 1 is mapped on the Cortex-A9 MPU, Cortex-M3 MPU, and C2C subsystems.

Synchronous interrupt request line 2 is mapped on the DSP INTC.

Figure 26-10 is an overview of the interrupt request generation.

Figure 26-10. Interrupt Request Generation



26.4.2.2 Asynchronous Path: Wake-Up Request Generation

In the general-purpose interface, six wake-up lines (one wake-up line per GPIO module instance) connect to the PRCM module.

Asynchronous wake-up requests from input channels are merged to issue one wake-up signal to the system per each GPIO module. The wake-up-enable registers (GPIOi.GPIO_IRQWAKEN_0 and GPIOi.GPIO_IRQWAKEN_1) select the channel(s) considered for the wake-up request generation. The asynchronous wake-up request is reflected into the synchronous interrupt status registers (GPIOi.GPIO_IRQSTATUS_0 and GPIOi.GPIO_IRQSTATUS_1).

In idle mode (the interface clock is shut down and the GPIO configuration registers are programmed; see [Section 26.4.6, General-Purpose Interface Interrupt and Wake-Up Requests](#)), an asynchronous path detects the expected transition(s) on a GPIO input (based on register programming) and activates an asynchronous wake-up request by the sideband signal (GPIOi_SWAKEUP, where i = 1, 2, 3, 4, 5, or 6), if the wake-up-enable register is set.

When the system is awakened, the interface clock is restarted and synchronously set to 1 based on the input GPIO pin triggering the wake-up request and the corresponding bit in the interrupt status registers (GPIOi.GPIO_IRQSTATUS_0 and GPIOi.GPIO_IRQSTATUS_1). On the following internal clock cycle, interrupt lines 1 and/or 2 are active (active low) when the corresponding bits are set in the interrupt-enable registers (GPIOi.GPIO_IRQSTATUS_SET_0, GPIOi.GPIO_IRQSTATUS_SET_1, GPIOi.GPIO_IRQSTATUS_CLR_0, and GPIOi.GPIO_IRQSTATUS_CLR_1).

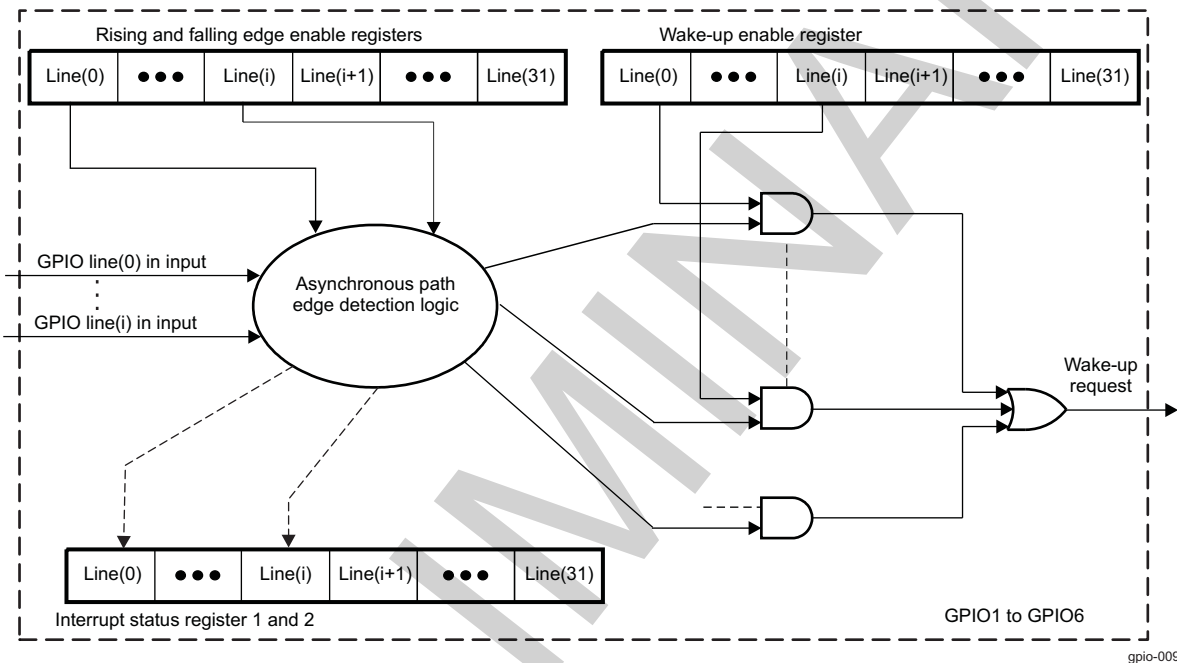
NOTE: When debouncing is not enabled, a minimum input pulse width does not trigger the wake-up request because there is no sampling operation.

When debouncing is enabled, the minimum pulse width is set by the specified debouncing time.

The GPIOi.GPIO_SYSCONFIG[2] ENAWAKEUP bit enables or disables the GPIO wake-up feature globally. If this bit is set to 0, the wake-up-enable registers (GPIOi.GPIO_IRQWAKEN_0 and GPIOi.GPIO_IRQWAKEN_1) have no effect.

Figure 26-11 is an overview of wake-up request generation.

Figure 26-11. Wake-Up Request Generation



26.4.2.3 Wake-Up Event Conditions During Transition To and From IDLE State

Figure 26-12 shows the wake-up event conditions.

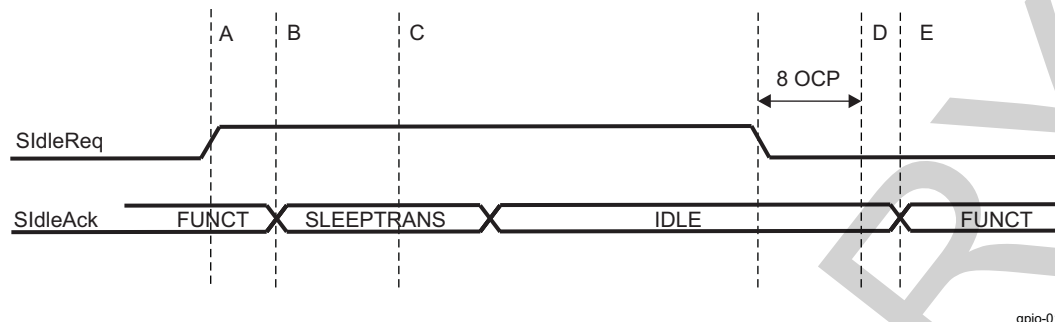
In phase A, only the synchronous path is enabled. A synchronous interrupt request (see [Section 26.4.2.1, Synchronous Path: Interrupt Request Generation](#)) activates the interrupt line(s) and prevents the GPIO from transitioning into IDLE state until the interrupt is cleared.

In phase B, the asynchronous path and synchronous path are enabled during the first five functional clock cycles of the SLEEPTRANS state. During this period a synchronous interrupt request (see [Section 26.4.2.1, Synchronous Path: Interrupt Request Generation](#)) prevents the GPIO from transitioning into IDLE state. A shorter pulse puts the module into IDLE state but triggers a wakeup once in IDLE.

In phase C, only the asynchronous path is enabled. A wake-up request (see [Section 26.4.2.2, Asynchronous Path: Wake-Up Request Generation](#)) triggers a wake-up request from the GPIO and when the module is awakened an interrupt is generated. If debouncing is not enabled, there is no minimum input pulse width to trigger the wake-up request.

In phase D, eight OCP clock cycles occur until the module is in FUNCT state, the synchronous path is enabled, and an event that fulfills the pulse width requirements (see [Section 26.4.2.1, Synchronous Path: Interrupt Request Generation](#)) activates the interrupt line(s).

In phase E, only the synchronous path is enabled. A synchronous interrupt request (see [Section 26.4.2.1, Synchronous Path: Interrupt Request Generation](#)) activates the interrupt line(s).

Figure 26-12. Wake-Up Event Conditions

26.4.2.4 Interrupt (or Wake-Up) Line Release

When the host processor (the MPU and/or DSP subsystem in the device) receives an interrupt request issued by the GPIO, it reads the corresponding interrupt status register (GPIOi.GPIO_IRQSTATUS_0 or GPIOi.GPIO_IRQSTATUS_1) to determine which GPIO input triggered the interrupt (or the wake-up request).

After servicing the interrupt (or acknowledging the wake-up request), the processor resets the status bit and releases the interrupt line by setting the corresponding bit of the interrupt status register to 1. If there is still a pending interrupt request to serve (all bits in the interrupt status register that are not masked by the interrupt-enable register are not cleared), the interrupt line is reasserted.

NOTE: The status bit must be reset to re-enter idle mode.

26.4.3 General-Purpose Interface Clock Configuration

26.4.3.1 Clocking

Each GPIO uses two clocks:

- **Debounce clock:** The 32-kHz debounce clock, GPIOi_DBCLK (where i = 1, 2, 3, 4, 5, or 6, with one debounce clock per module), comes from the PRCM module and is used for the debounce cell logic (without the corresponding configuration registers). This cell can sample the input line and filters the input level using a programmed delay.

The debouncing value register (GPIOi.GPIO_DEBOUNCINGTIME) is used to set the debouncing time for all input lines in the GPIO module. The value is global for all the ports of one GPIO, so up to six different debouncing values are possible. The debounce cell runs with the debounce clock (32 kHz). This register represents the number of clock cycle(s) to be used (one cycle is 31 μs long).

The following formula describes the required input stable time to be propagated to the debounced output:

Required input line stable = (GPIOi.GPIO_DEBOUNCINGTIME[7:0] DEBOUNCVAL bit field value + 1) × 31,

where the value of the DEBOUNCVAL bit field is from 0 to 255.

For more information, see [CD_L4_PER_Clock Domain](#), and [CD_WKUP_Clock Domain](#), in [Chapter 3, Power, Reset, and Clock Management](#).

- **Interface clock:** The interface clock, GPIOi_ICLK (where i = 1, 2, 3, 4, 5, or 6), comes from the PRCM module and is used throughout the GPIO (except within the debounce cell logic). GPIOi_ICLK clocks the data exchanges between the L4 interconnect and the internal logic. The clock-gating features allow module power consumption to be adapted to the activity.

For more information, see [CD_L4_PER_Clock Domain](#), and [CD_WKUP_Clock Domain](#), in [Chapter 3, Power, Reset, and Clock Management](#).

[Table 26-3](#) describes the GPIO clocks.

Table 26-5 summarizes the functional clock configuration.

Table 26-5. Functional Clock Configuration

| Interface Clock | GPIO_CTRL[2:1] GATINGRATIO | Functional Clock |
|------------------------------|----------------------------|----------------------------------|
| GPIOi_ICLK, where i = 1 to 6 | 00 | GPIOi_ICLK / 1, where i = 1 to 6 |
| GPIOi_ICLK, where i = 1 to 6 | 01 | GPIOi_ICLK / 2, where i = 1 to 6 |
| GPIOi_ICLK, where i = 1 to 6 | 10 | GPIOi_ICLK / 4, where i = 1 to 6 |
| GPIOi_ICLK, where i = 1 to 6 | 11 | GPIOi_ICLK / 8, where i = 1 to 6 |

26.4.4 General-Purpose Interface Hardware and Software Reset

The GPIO can be reset by using the domain reset (hardware reset) or by setting a dedicated configuration bit (software reset) in each GPIO.

- Hardware reset: GPIO2 to GPIO6 are attached to the PER_RST reset domain. GPIO1 is attached to the WKUP_RST reset domain.

The hardware reset has a global reset action on the GPIOs of the general-purpose interface. All configuration registers and internal logic are reset when it is active (low level). In each GPIO, the GPIOi.GPIO_SYSSTATUS[0] RESETDONE bit monitors the internal reset status; it is set when the reset completes. For more information, see [Reset Domains](#), in [Chapter 3, Power, Reset, and Clock Management](#).

- Software reset: Each GPIO has its own software reset using the GPIOi.GPIO_SYSCONFIG[1] SOFTRESET bit (where i = 1, 2, 3, 4, 5, or 6). The software reset has the same effect as the hardware reset signal, but this reset can be applied on one or more modules.

Setting the GPIOi.GPIO_SYSCONFIG[1] SOFTRESET bit to 1, (where i = 1, 2, 3, 4, 5, or 6) resets the module. A bit value of 1 remains until the reset completes. When the software reset completes, the GPIOi.GPIO_SYSCONFIG[1] SOFTRESET bit is automatically reset to 0 and has the same effect as a hardware reset. The GPIOi.GPIO_SYSSTATUS[0] RESETDONE bit is cleared during a software reset. This bit is set to 1 when the software reset completes.

26.4.5 General-Purpose Interface Power Management

26.4.5.1 Power Domain

GPIO1 is attached to the WKUP power domain (see [Section 3.1.1.2, Power Management](#), in [Chapter 3, Power, Reset, and Clock Management](#)). This domain is composed of the logic permanently supplied to manage domain power state transitions and detect wake-up events. The WKUP power domain is continuously active. GPIO2 to GPIO6 are attached to the PER power domain (see [Section 3.1.1.2, Power Management](#), in [Chapter 3, Power, Reset, and Clock Management](#)). The PER power domain is not active continuously.

26.4.5.2 Power Management

26.4.5.2.1 Idle Scheme

To reduce dynamic consumption, an efficient idle scheme is based on the following:

- An efficient local autoclock gating for each module
- The implementation of control sideband signals between the PRCM module and each module

This enhanced idle control allows clocks to be activated and deactivated safely without requiring complex software management.

The idle mode request, idle acknowledge, and wake-up request (GPIOi_WAKEUP, where i = 1, 2, 3, 4, 5, or 6) are sideband signals between the PRCM module and the general-purpose interface (see [Section 26.4.6.2, Wake-Up Request Generation](#)).

26.4.5.2.2 Operating Modes

The following four operating modes are defined for the modules:

- **Active mode:** The module runs synchronously on the interface clock; interrupts can be generated based on the configuration and external signals.
- **Idle mode:** Power-saving mode with the module in a waiting state. The interface clock can be stopped, an interrupt cannot be generated, and a wake-up signal can be generated based on the configuration and external signals.

If the debounce clock provided by the PRCM module is active, the debounce cell can sample and filter the input to generate a wake-up event. If the debounce clock is inactive, the debounce cell gates all input signals and thus cannot be used.

- **Inactive mode:** The module has no activity. The interface clock can be stopped, an interrupt cannot be generated, and the wake-up feature is inhibited.
- **Disabled mode:** The module is not used. The internal clock paths are gated, and an interrupt or wake-up request cannot be generated.

Idle and inactive modes are configured within the module and activated on request by the PRCM module (see [Section 3.1.1.2, Power Management](#), in [Chapter 3, Power, Reset, and Clock Management](#)) through sideband signals (see [Section 26.4.5.2.3, System Power Management and Wakeup](#)).

The disabled mode is set by software through a dedicated configuration bit, GPIOi.GPIO_CTRL[0] DISABLEMODULE (0: The module is enabled and clocks are not gated; 1: The module is disabled and clocks are gated). It unconditionally gates the internal clock paths that are not used for the L4 interconnect.

26.4.5.2.3 System Power Management and Wakeup

The PRCM module can require the GPIOs to be idled for power-saving purposes.

The general-purpose interface has six identical idle mode request/acknowledge (handshake) mechanisms with the PRCM module (see [Section 26.4.6.2, Wake-Up Request Generation](#)): one per GPIO. The general-purpose interface allows the GPIOs to enter idle mode based on the GPIOi.GPIO_SYSCONFIG[4:3] IDLEMODE bit field.

Idle acknowledge depends on the configuration and activity of each GPIO:

- **Smart-idle mode**

When the GPIO is configured in smart-idle mode, it checks for more activity (capture of the input GPIO pins in the GPIOi.GPIO_DATAIN register is complete with no pending interrupt; all interrupt status bits are cleared), and there is no access to the GPIO.GPIO_DEBOUNCINGTIME register, which is waiting to be synchronized.

Idle acknowledge is then asserted and the module enters into idle mode. It waits for active system clock gating by the PRCM module (when all peripherals supplied by the same L4 interface clock domain are also ready for idle).

In idle mode (that is, when the PRCM module gates the interface clock), no interrupt occurs and the module is ready to issue a wake-up request.

When the expected transition occurs on an enabled GPIO input pin, the GPIO exits from idle mode if the GPIOi.GPIO_SYSCONFIG[2] ENAWAKEUP bit is set to 1 (wake-up capability is enabled).

- **Smart-idle wake-up mode**

If the GPIOi.GPIO_SYSCONFIG[4:3] IDLEMODE bit field selects smart-idle or smart-idle wake-up mode, the GPIO module evaluates its internal capability to switch off the interface clock. When all internal activity ceases (the data input register captures the input GPIO pins, there is no pending interrupt, all interrupt status bits are cleared, and there is no write access to the GPIO.GPIO_DEBOUNCINGTIME register pending to be synchronized), the Idle acknowledge is asserted and the GPIO enters into idle mode, ready to issue a wake-up request when the expected transition occurs on an enabled GPIO input pin. This wake-up request is sent only if the GPIOi.GPIO_SYSCONFIG[2] ENAWAKEUP bit of the system configuration register enables the GPIO wake-up capability (see [Section 26.6.2.2, System Configuration Register](#)). When the system is awake, the idle request goes inactive, the idle acknowledge and wake-up request (if the GPIO triggered the systems wakeup) signals are immediately deasserted, and the asynchronous wake-up request (if

existing) is reflected into the synchronous interrupt status registers.

- Force-idle mode

When the GPIO is configured in force-idle mode (the GPIOi.GPIO_SYSCONFIG[4:3] IDLEMODE bit field = 2b00) and receives an idle request from the PRCM module, the GPIO waits unconditionally for active system clock gating by the PRCM module. (This occurs only when all peripherals supplied by the same L4 interface clock domain are also ready for idle.)

When in idle mode (that is, when the PRCM module gates the interface clock), the module (in inactive mode) has no activity, the interface clock paths are gated, an interrupt cannot be generated, and the wake-up feature is inhibited.

- No-idle mode

When the GPIO is configured in no-idle mode (the GPIOi.GPIO_SYSCONFIG[4:3] IDLEMODE bit field = 2b01) and receives an idle request from the PRCM module, the GPIO does not go into idle mode and the idle acknowledge is never sent.

NOTE: For more information about idle modes, see [Section 3.1.1.2, Power Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

26.4.5.2.4 Module Power Saving

The GPIO has local power management by internal clock-gating features:

- Internal interface clock gating: The clock for the L4 interconnect logic can be gated when the GPIO module is not accessed, if the GPIOi.GPIO_SYSCONFIG[0] AUTOIDLE bit is set. Otherwise, this logic is free-running on the interface clock.
- Clock gating for the input data sample logic: Clock for the input data sample logic can be gated when the data in the GPIOi.GPIO_DATAIN register is not accessed.
- Clock gating for the event detection logic: Each GPIO implements four clock groups used for the logic in the synchronous event detection. Each group of eight input GPIO pins has a separate enable signal depending on the setting of the edge/level detection register (because the input is 32 bits, four groups of eight inputs are defined for each GPIO). If a group requires no detection, the corresponding clock is gated.

Grouping the edge/level enable can save the power consumption of the GPIO module.

If any of the following registers is set to 0x01 01 01 01, then all clocks are active (power consumption is high). If they are set to 0x00 00 00 FF, then a single clock is active (power saving).

- GPIOi.GPIO_LEVELDETECT0
- GPIOi.GPIO_LEVELDETECT1
- GPIOi.GPIO_RISINGDETECT
- GPIOi.GPIO_FALLINGDETECT

NOTE: When the clocks are enabled by writing to the following registers, the detection starts after five clock cycles. This period is required to clean the synchronization edge/level detection pipeline.

- GPIOi.GPIO_LEVELDETECT0
- GPIOi.GPIO_LEVELDETECT1
- GPIOi.GPIO_RISINGDETECT
- GPIOi.GPIO_FALLINGDETECT

The mechanism is independent of each clock group. If the clock has been started before and a new setting is performed, the following steps are recommended:

1. Set the new detection required.
2. Disable the previous setting (if necessary).

In this way, the corresponding clock is not gated and the detection starts immediately.

All channels are also gated using a one-out-of-N scheme. N is the GPIOi.GPIO_CTRL[2:1]

GATINGRATIO bit field and can take the values 1 (2b00), 2 (2b01), 4 (2b10), or 8 (2b11). The interface clock is enabled for this logic one cycle every N cycles. When N is equal to 1, there is no gating and this logic is free-running on the interface clock. When N is 2, 4, or 8, this logic runs at the equivalent frequency of interface clock frequency divided by N.

- Inactive mode: In inactive mode, all internal clock paths are gated.
- Disabled mode: All internal clock paths not used for the L4 interconnect are gated. The GPIOi.GPIO_CTRL[0] DISABLEMODULE bit controls a clock-gating feature at the module level. When set to 1, this bit forces clock gating for all internal clock paths. Internal activity in the module is suspended. The L4 interconnect is not affected by this bit.

The interface clock gating is controlled through the GPIOi.GPIO_SYSCONFIG[0] AUTOIDLE bit, which is used to save power when the module is not used because of the multiplexing configuration selected at the device level. This bit takes precedence over all other internal configuration bits.

Table 26-6 describes the power-management features available for the general-purpose interface module.

NOTE: For information about source clock gating and a description of sleep/wake-up transitions, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

For descriptions of the EnaWakeUp, IdleMode, ClockActivity, and StandbyMode features, see [Section 3.1.1.1.2, Module-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 26-6. Local Power-Management Features

| Feature | Registers | Description |
|------------------------|--|---|
| Clock autogating | GPIOi.GPIO_SYSCONFIG[0] AUTOIDLE | Sets the clock-gating strategy for the OCP interface block. |
| Slave idle modes | GPIOi.GPIO_SYSCONFIG[4:3] IDLEMODE | Force-idle, no-idle, and smart-idle wake-up-capable modes are available. |
| Clock activity | GPIOi.GPIO_CTRL[0] DISABLEMODULE | Enable and disable the module. |
| Debouncing enable | GPIOi.GPIO_DEBOUNCENABLE[31:0] DEBOUNCEENABLE | Debouncing mode is available. |
| Global wake-up enable | GPIOi.GPIO_SYSCONFIG[2] ENAWAKEUP | This bit enables the wake-up feature at module level. |
| Wake-up sources enable | GPIOi.GPIO_IRQWAKEN_0[31:0] INTLINE GPIOi.GPIO_IRQWAKEN_1[31:0] INTLINE | This register enables or disables a specific IRQ request source to generate a wake-up signal. |

Table 26-7 describes the clock activity settings.

Table 26-7. Clock Activity Settings

| GPIOi.GPIO_SYSCONFIG[4:3] IDLEMODE | Selected Mode | Description | Wake-Up Events |
|------------------------------------|--------------------|---|----------------|
| 00 | Force-idle | The GPIO goes into inactive mode independently of the internal module state, and the idle acknowledge is never sent. | No |
| 01 | No-idle | The GPIO does not go into the idle mode and the idle acknowledge is never sent. | No |
| 10 | Smart-idle | The GPIO evaluates its internal capability to switch off the interface clock. If there is no more internal activity, the idle acknowledge is asserted and the GPIO enters into idle mode. | No |
| 11 | Smart-idle wake-up | The GPIO evaluates its internal capability to have the interface clock switched off. If there is no more internal activity, the idle acknowledge is asserted and the GPIO enters into idle mode. | Yes |

26.4.6 General-Purpose Interface Interrupt and Wake-Up Requests

26.4.6.1 Interrupt Request Generation

All interrupt sources (the 32 GPIO input channels) are merged to issue two synchronous interrupt requests in each GPIO module. Thus, the general-purpose interface has 12 interrupt lines (two interrupt lines per each GPIO instance).

- Synchronous interrupt request line 1 is mapped on the Cortex-A9 and Cortex-M3 MPU INTCs, and on the C2C subsystem.
- Synchronous interrupt request line 2 is mapped on the DSP INTC.

Table 26-8 lists the event flags, and their mask, that can cause module interrupts.

Table 26-8. Events

| Event Flag | Event Mask | Synchronous | Sensitivity | Map to | Description |
|---------------------------------------|--|-------------|-------------|---|---|
| GPIOi.GPIO_IRQSTATUS_0[31:0] INTLINE | GPIOi.GPIO_IRQSTATUS_SET_0[31:0] INTLINE | Yes | Edge/level | MA_IRQ_n MM_IRQ_n ⁽¹⁾ C2C_IRQ_n ⁽²⁾ | Corresponds to the first line of interrupt |
| GPIOi.GPIO_IRQSTATUS_1[31:0] INTLINE | GPIOi.GPIO_IRQSTATUS_SET_1[31:0] INTLINE | Yes | Edge/level | D_IRQ_n | Corresponds to the second line of interrupt |
| GPIOi.GPIO_IRQSTATUS_0 [31:0] INTLINE | GPIOi.GPIO_IRQSTATUS_CLR_0[31:0] INTLINE | Yes | Edge/level | MA_IRQ_n MM_IRQ_n ⁽¹⁾ C2C_IRQ_n ⁽²⁾ | Corresponds to the first line of interrupt |
| GPIOi.GPIO_IRQSTATUS_1[31:0] INTLINE | GPIOi.GPIO_IRQSTATUS_CLR_1[31:0] INTLINE | Yes | Edge/level | D_IRQ_n | Corresponds to the second line of interrupt |
| GPIOi.GPIO_IRQSTATUS_0[31:0] INTLINE | GPIOi.GPIO_IRQWAKEN_0[31:0] INTLINE | No | Edge/level | MA_IRQ_n MM_IRQ_n ⁽¹⁾ C2C_IRQ_n ⁽²⁾ | Corresponds to the first line of interrupt |
| GPIOi.GPIO_IRQSTATUS_1[31:0] INTLINE | GPIOi.GPIO_IRQWAKEN_1[31:0] INTLINE | No | Edge/level | D_IRQ_n | Corresponds to the second line of interrupt |

⁽¹⁾ For GPIO1 and GPIO2 only

⁽²⁾ For GPIO1 to GPIO4 only

Synchronous interrupt request lines 1 and 2 are active depending on their respective interrupt-enable 1 and 2 registers (GPIOi.GPIO_IRQSTATUS_SET_0, GPIOi.GPIO_IRQSTATUS_SET_1, GPIOi.GPIO_IRQSTATUS_CLR_0, and GPIOi.GPIO_IRQSTATUS_CLR_1).

- Interrupt-enable registers (GPIOi.GPIO_IRQSTATUS_SET_0 and GPIOi.GPIO_IRQSTATUS_SET_1)

The interrupt-enable 1 (or interrupt-enable 2) register allows masking of the expected transition on input GPIO to prevent the generation of an interrupt request on line 1 (or line 2). The interrupt-enable registers are programmed synchronously with the interface clock.

These registers can be accessed with direct read/write operations or using the alternate set-and-clear protocol feature for register update. This feature allows the setting or clearing of explicit bits of these registers with a single write access (see Section 26.4.9, *General-Purpose Interface Set-and-Clear Protocol*).

- Interrupt status registers (GPIOi.GPIO_IRQSTATUS_0 and GPIOi.GPIO_IRQSTATUS_1)

The interrupt status 1 (or interrupt status 2) register determines which of the input GPIO pins triggered the interrupt line1 (or interrupt line 2) request (or the wake-up line).

When a bit in this register is set to 1, it indicates that the corresponding GPIO pin is requesting the interrupt (or the wakeup). To reset a bit in this register, set the appropriate bit to 1. However, an interrupt cannot be generated by setting the interrupt status 1 (or interrupt status 2) register to 1.

If 0 is written to a bit in this register, the value remains unchanged. The interrupt status 1 (or interrupt status 2) register is synchronous with the interface clock. In idle mode, the event is detected through an asynchronous path, and the corresponding bit in the interrupt status1 and interrupt status 2 registers are set when the GPIO is awakened.

CAUTION

After servicing the interrupt, the status bit in the interrupt status register (GPIOi.GPIO_IRQSTATUS_0 or GPIOi.GPIO_IRQSTATUS_1) must be reset and the interrupt line must be released (by setting the corresponding bit of the interrupt status register to 1) before enabling an interrupt for the GPIO channel in the interrupt-enable register (GPIOi.GPIO_IRQSTATUS_SET_0 or GPIOi.GPIO_IRQSTATUS_SET_1) to prevent the occurrence of unexpected interrupts when enabling an interrupt for the GPIO channel.

26.4.6.2 Wake-Up Request Generation

GPIO1 of the general-purpose interface is attached to the WKUP power domain (see [Section 3.1.1.2, Power Management](#), in [Chapter 3, Power, Reset, and Clock Management](#)) and can wake up the system.

NOTE: GPIO2 to GPIO6 belong to the PER power domain and thus their wake-up capabilities are operational only when the PER power domain is active.

All wake-up sources (the 32 input GPIO channels) are merged together to issue a single asynchronous wake-up request in each GPIO following the expected transition(s) (based on register programming). Each GPIO generates a wake-up signal to the PRCM module.

NOTE: Only gpio_wk[10:0] and gpio_wk[31:29] can be used to generate a direct wake-up event.

The asynchronous wake-up request line is active based on the GPIOi.GPIO_IRQWAKEN_0 and GPIOi.GPIO_IRQWAKEN_1 wake-up-enable registers (where i = 1, 2, 3, 4, 5, or 6).

The wake-up-enable register allows masking of the expected transition on input GPIO to prevent the generation of a wake-up request. The wake-up-enable register is programmed synchronously with the interface clock before any idle mode request coming from the host processor.

NOTE: There must be a correlation between the wake-up-enable and interrupt-enable registers. If a GPIO pin has a wakeup configured on it, it must also have the corresponding interrupt enabled (on one of the two interrupt lines). Otherwise, it is possible to have a wake-up event, but after exiting the IDLE state, no interrupt is generated; thus, the corresponding bit from the interrupt status register is not cleared, and the module does not acknowledge a future idle request.

[Table 26-9](#) lists the mapping of the wake-up signals.

Table 26-9. Wake-Up Signals

| Name | Mapping | Comments |
|------------|---------------|---|
| GPIOi_WAKE | GPIOi_SWAKEUP | Where i = 1, 2, 3, 4, 5, and 6. Destination is the PRCM module. |

26.4.7 General-Purpose Interface Channel Description

[Table 26-10](#) describes the GPIO channels.

Table 26-10. GPIO Channel Description

| Channel Number | Type ⁽¹⁾ | Mapping | Wake-Up Feature | Comments |
|----------------|---------------------|---------|-----------------|----------|
| GPIO1 | | | | |

⁽¹⁾ I = Input; O = Output; I/O = Bidirectional

Table 26-10. GPIO Channel Description (continued)

| Channel Number | Type ⁽¹⁾ | Mapping | Wake-Up Feature | Comments |
|---------------------|---------------------|----------------|--------------------|--|
| [31] | O | gpo_wk31 | Yes ⁽²⁾ | Wake-up path |
| [30] | I | gpi_wk30 | Yes ⁽²⁾ | Wake-up path |
| [29] | I/O | gpio_wk29 | Yes ⁽²⁾ | Wake-up path |
| [28:11] | I/O | gpio_[28:11] | Yes ⁽²⁾ | GPIO |
| [10:4] | I/O | gpio_wk[10:4] | Yes ⁽²⁾ | Wake-up path |
| [3] | I/O | gpio_wk3 | Yes ⁽²⁾ | Wake-up path |
| | I/O | gpio_3 | Yes ⁽²⁾ | GPIO |
| [2] | I/O | gpio_wk2 | Yes ⁽²⁾ | Wake-up path |
| | I/O | gpio_2 | Yes ⁽²⁾ | GPIO |
| [1:0] | I/O | gpio_wk[1:0] | Yes ⁽²⁾ | Wake-up path |
| | I/O | gpio_[1:0] | Yes ⁽²⁾ | GPIO |
| GPIO2 | | | | |
| [31:27] | I/O | gpio_[63:59] | Yes ⁽²⁾ | GPIO |
| [26] ⁽³⁾ | I | gpi_58 | Yes ⁽²⁾ | Reserved for internal use only |
| [25] ⁽⁴⁾ | I | gpi_57 | Yes ⁽⁵⁾ | Reserved for internal use only |
| [24:0] | I/O | gpio_[56:32] | Yes ⁽⁵⁾ | GPIO |
| GPIO3 | | | | |
| [31:23] | I/O | gpio_[95:87] | Yes ⁽⁵⁾ | GPIO |
| [22] ⁽⁶⁾ | I/O | gpio_86 | Yes ⁽⁵⁾ | GPIO |
| | I | TSHUT | Yes ⁽⁵⁾ | Bandgap internal TSHUT |
| [21:17] | I/O | gpio_[85:81] | Yes ⁽⁵⁾ | GPIO |
| [16:3] | I | gpi_[80:67] | Yes ⁽⁵⁾ | GPIO inputs only |
| [2:0] | I/O | gpio_[66:64] | Yes ⁽⁵⁾ | GPIO |
| GPIO4 | | | | |
| [31:0] | I/O | gpio_[127:96] | Yes ⁽⁵⁾ | GPIO |
| GPIO5 | | | | |
| [31:0] | I/O | gpio_[159:128] | Yes ⁽⁵⁾ | GPIO |
| GPIO6 | | | | |
| [31:21] | I/O | gpio_[191:181] | Yes ⁽⁵⁾ | GPIO |
| [20] ⁽⁴⁾ | I | DPDM5VSHORT | Yes ⁽⁵⁾ | USB OTG PHY short detect (DPDM5VSHORT) |
| [19] ⁽⁴⁾ | I | CHGDETECT | Yes ⁽⁵⁾ | USB OTG PHY charge detect (CHGDETECT) |
| [18:15] | I | gpi_[178:175] | Yes ⁽⁵⁾ | GPIO inputs only |
| [14:0] | I/O | gpio_[174:160] | Yes ⁽⁵⁾ | GPIO |

⁽²⁾ Only when the PER power domain is active

⁽³⁾ The GPIO channel is not available on device pads. Reserved for internal use only (see the Comments column).

⁽⁴⁾ The GPIO channel is not available on device pads. Reserved for internal use only (see the Comments column).

⁽⁵⁾ Only when the PER power domain is active

⁽⁶⁾ The GPIO channel provides additional internal functionality (see the Comments column), besides its GPIO capabilities, when it is not connected to a pad of the device. That is, the corresponding pad is configured in a mode different from multiplexing mode 3. For more information about pad configuration and multiplexing, see [Section 19.4.8, Pad Functional Multiplexing and Configuration](#), in [Chapter 19, Control Module](#).

NOTE: The thermal shutdown comparator output signal (TSHUT) is an output from the BANDGAP module. This signal is low during normal operation and goes high during a thermal shutdown event. When channel 22 of GPIO3 is not connected to a ball of the device (the corresponding pin is configured in a mode different from configuration mode 4), TSHUT is connected to channel 22 of GPIO3. The channel has to be correctly configured so that it can generate an interrupt when a low-to-high transition occurs on TSHUT.

For more information about pin configuration, see [Section 19.4.8, Pad Functional Multiplexing and Configuration](#), in [Chapter 19, Control Module](#).

NOTE: Channels 20 and 19 of GPIO6 are internally connected inside the device to the short detection (DPDM5VSHORT) and charger detection (CHGDETECT) outputs, respectively, of the USB OTG PHY module. This allows interrupt generation on the corresponding GPIO channel, if either of the mentioned events occurs.

26.4.8 General-Purpose Interface Data Input/Output Capabilities

The output-enable register (GPIOi.GPIO_OE) controls the output/input capability of each pin. At reset, all the GPIO-related pins are configured as inputs, and their output capabilities are disabled. This register is not used within the module. Its only function is to carry the pad configuration.

When configured as an output (the desired bit is reset in the GPIOi.GPIO_OE register), the value of the corresponding bit in the GPIOi.GPIO_DATAOUT register is driven on the corresponding GPIO pin. Data is written to the data-output register synchronously with the interface clock. This register can be accessed with read/write operations or by using the alternate set-and-clear protocol register update feature. This feature gives the possibility to set or clear specific bits of this register with a single write access to the set-output data register (GPIOi.GPIO_SETDATAOUT) or to the clear-output data register (GPIOi.GPIO_CLEARDATAOUT) address (see [Section 26.4.9, General-Purpose Interface Set-and-Clear Protocol](#)). If the application uses a pin as an output and does not want interrupt/wake-up generation from this pin, the application must properly configure the wake-up-enable registers (GPIOi.GPIO_IRQWAKEN_0 and GPIOi.GPIO_IRQWAKEN_1) and the interrupt-enable registers (GPIOi.GPIO_IRQSTATUS_SET_0 and GPIOi.GPIO_IRQSTATUS_SET_1).

When configured as an input (the desired bit is set to 1 in the GPIOi.GPIO_OE register), the state of the input can be read from the corresponding bit in the GPIOi.GPIO_DATAIN register. The input data is sampled synchronously with the interface clock and then captured in the data input register synchronously with the interface clock. When the GPIO pin levels change, they are captured into this register after two interface clock cycles (the required cycles to synchronize and to write data). If the application uses a pin as an input, the application must properly configure the wake-up enable registers (GPIOi.GPIO_IRQWAKEN_0 and GPIOi.GPIO_IRQWAKEN_1) and the interrupt-enable registers (GPIOi.GPIO_IRQSTATUS_SET_0 and GPIOi.GPIO_IRQSTATUS_SET_0) to the interrupt and wake-up feature as needed.

For more information on the alternate set-and-clear protocol, see [Section 26.4.9, General-Purpose Interface Set-and-Clear Protocol](#).

26.4.9 General-Purpose Interface Set-and-Clear Protocol

26.4.9.1 Description

The GPIO module implements the set-and-clear protocol register update for the following registers:

- GPIOi.GPIO_DATAOUT
- GPIOi.GPIO_IRQSTATUS_CLR_0
- GPIOi.GPIO_IRQSTATUS_CLR_1
- GPIOi.GPIO_IRQSTATUS_SET_0
- GPIOi.GPIO_IRQSTATUS_SET_1

This protocol is an alternative to the atomic test and set operations and consists of writing operations at dedicated addresses (one address for setting bit[s] and one address for clearing bit[s]). The data to write is 1 at bit position(s) to clear (or to set) and 0 at unaffected bit(s). Registers can be accessed in two ways:

- Standard: Full register read and write operations at the primary register address
- Set and clear: Separate addresses are provided to set (and clear) bits in registers. Writing 1 at these addresses sets (or clears) the corresponding bit into the equivalent register; writing 0 has no effect.

Therefore, for these registers, three addresses are defined for one unique physical register. Reading these addresses has the same effect and returns the register value.

26.4.9.2 Clear Instruction

26.4.9.2.1 Clear Register Addresses

- Clear interrupt-enable registers (GPIOi.GPIO_IRQSTATUS_CLR_0 and GPIOi.GPIO_IRQSTATUS_CLR_1).

A write operation in the GPIOi.GPIO_IRQSTATUS_CLR_0 (or GPIOi.GPIO_IRQSTATUS_CLR_1) register clears the corresponding bit in the same register when the written bit is 1; a written bit at 0 has no effect.

A read of the clear interrupt-enable 0 (or enable 1) register returns the value of the GPIOi.GPIO_IRQSTATUS_CLR_0 (or GPIOi.GPIO_IRQSTATUS_CLR_1) register.

- Clear data-output register (GPIOi.GPIO_CLEARDATAOUT).

A write operation in the clear data-output register clears the corresponding bit in the data-output register when the written bit is 1; a written bit at 0 has no effect.

A read of the clear data-output register returns the value of the data-output register.

26.4.9.2.2 Clear Instruction Example

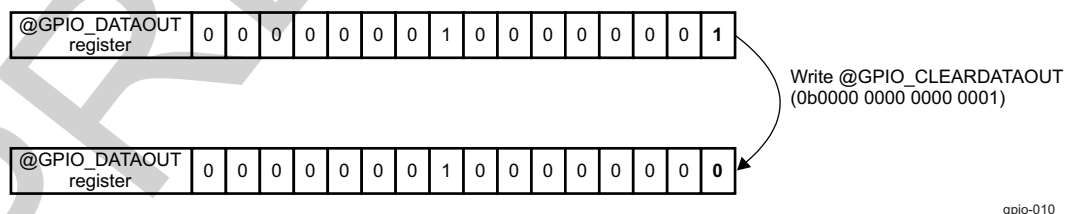
Assume the data-output register (or one of the interrupt/wake-up-enable register) contains the binary value, 0b0000 0001 0000 0001, and bit 0 is to be clear.

With the clear instruction feature, write 0b0000 0000 0000 0001 at the address of the clear data-output register (or at the address of the clear interrupt/wake-up-enable register). After this write operation, a reading of the data-output register (or the interrupt/wake-up-enable register) returns 0b0000 0001 0000 0000; bit 0 is cleared.

NOTE: Although the general-purpose interface registers are 32 bits wide, only the least-significant 16 bits are represented in this example.

Figure 26-13 shows an example of a clear instruction.

Figure 26-13. GPIO_CLEARDATAOUT Register Example



26.4.9.3 Set Instruction

26.4.9.3.1 Set Register Addresses

- Set interrupt-enable registers (GPIOi.GPIO_IRQSTATUS_SET_0 and GPIOi.GPIO_IRQSTATUS_SET_1).

A write operation in the GPIOi.GPIO_IRQSTATUS_SET_0 (or GPIOi.GPIO_IRQSTATUS_SET_1)

register sets the corresponding bit in the same register when the written bit is 1; a written bit at 0 has no effect.

A read of the set interrupt-enable 0 (or enable 1) register returns the value of the interrupt GPIOi.GPIO_IRQSTATUS_SET_0 (or GPIOi.GPIO_IRQSTATUS_SET_1) register.

- Set data-output register (GPIOi.GPIO_SETDATAOUT).

A write operation in the set data-output register sets the corresponding bit in the data-output register when the written bit is 1; a written bit at 0 has no effect.

A read of the set data-output register returns the value of the data-output register.

26.4.9.3.2 Set Instruction Example

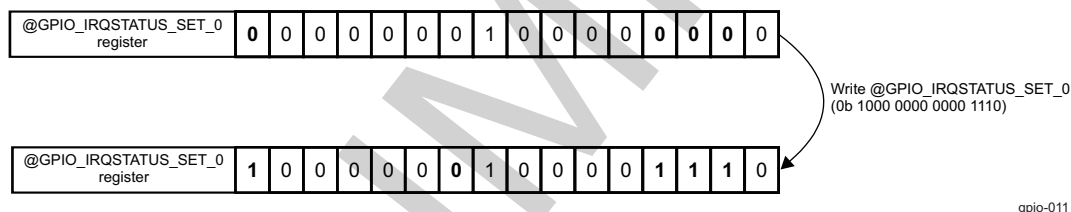
Assume the interrupt-enable 1 (or enable 2) register (or the data-output register) contains the binary value, 0b0000 0001 0000 0000, and bits 15, 3, 2, and 1 are to be set.

With the set instruction feature, write 0b1000 0000 0000 1110 at the address of the set interrupt enable 1 (or enable 2) register (or at the address of the set data-output register). After this write operation, a reading of the interrupt-enable 1 (or enable 2) register (or the data-output register) returns 0b1000 0001 0000 1110; bits 15, 3, 2, and 1 are set.

NOTE: Although the general-purpose interface registers are 32 bits wide, only the least-significant 16 bits are represented in this example.

Figure 26-14 shows an example of a set instruction.

Figure 26-14. Write in GPIO_IRQSTATUS_SET_0 Register Example



gpio-011

The set wake-up-enable register offers the same feature with the wake-up-enable register.

26.5 General-Purpose Interface Programming Guide

26.5.1 General-Purpose Interface Low-Level Programming Models

26.5.1.1 Global Initialization

26.5.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the general-purpose interface module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the general-purpose interface. For more information, see [Section 26.3, General-Purpose Interface Integration](#), and [Section 26.2, General-Purpose Interface Environment](#).

[Table 26-11](#) describes the global initialization of modules surrounding the general-purpose interface module.

Table 26-11. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|--|
| PRCM | Module interface and functional clocks must be enabled. For more information about the module configuration, see Chapter 3, Power, Reset, and Clock Management . |
| Control module | Module-specific pad muxing must be set in the control module. For more information about the module configuration, see Chapter 19, Control Module . |
| MPU INTC | MPU INTC configuration must be done to enable the interrupts from the general-purpose interface module. See Chapter 18, Interrupt Controllers . |
| DSP INTC | DSP INTC configuration must be done to enable the interrupts from the general-purpose interface module. See Chapter 18, Interrupt Controllers . |

26.5.1.1.2 General-Purpose Interface Module Global Initialization

This procedure in [Table 26-12](#) initializes the general-purpose interface module after a POR or software reset.

Table 26-12. General-Purpose Interface Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------------|
| Execute software reset. | GPIO_SYSCONFIG[1] SOFTRESET | 0x1 |
| Wait until reset completed? | GPIO_SYSSTATUS[0] RESETDONE | = 0x1 |
| Configure idle mode. | GPIO_SYSCONFIG[4:3] IDLEMODE | 0x– |
| Configure interface clock gating. | GPIO_SYSCONFIG[0] AUTOIDLE | 0x– |
| Set clock gating power saving. | GPIO_LEVELDETECT0[31:0] LEVELDETECT0 and GPIO_LEVELDETECT1[31:0] LEVELDETECT1 and GPIO_RISINGDETECT[31:0] RISINGDETECT and GPIO_FALLINGDETECT[31:0] FALLINGDETECT | 0x0000 00FF |
| Set clock gating ratio. | GPIO_CTRL[2:1] GATINGRATIO | 0x– |
| Configure GPIO channels as input or output. | GPIO_OE[31:0] OUTPUTEN | 0x– |
| Set debounce time value. | GPIO_DEBOUNCINGTIME[7:0] DEBOUNCETIME | 0x– |
| Enable/disable debouncing for desired input line. | GPIO_DEBOUNCENABLE[7:0] DEBOUNCEENABLE | 0x– |
| Interrupt and Wake-Up Request Configuration | | |
| Enable/disable interrupts. | GPIO_IRQSTATUS_SET_0[31:0] INTLINE and/or GPIO_IRQSTATUS_SET_1[31:0] INTLINE | 0x– |
| Enable/disable wakeup for GPIO channels. | GPIO_IRQWAKEN_0[31:0] INTLINE and/or GPIO_IRQWAKEN_1[31:0] INTLINE | 0x– |
| Enable/disable wake-up generation. | GPIO_SYSCONFIG[2] ENAWAKEUP | 0x1 |

26.5.1.2 General-Purpose Interface Operational Modes Configuration

Table 26-13 through Table 26-16 list the configurations of the various steps of general-purpose interface operational modes.

26.5.1.2.1 General-Purpose Interface Read Input Register

Table 26-13. General-Purpose Interface Read Input Register

| Step | Register/Bit Field/Programming Model | Value |
|----------------------------|---|-------|
| Read input register value. | GPIO_DATAIN [31:0] DATAIN | 0x– |

26.5.1.2.2 General-Purpose Interface Write Output Register

Table 26-14. General-Purpose Interface Write Output Register

| Step | Register/Bit Field/Programming Model | Value |
|---------------------------------|---|-------|
| Write value to output register. | GPIO_DATAOUT [31:0] DATAOUT | 0x– |

26.5.1.2.3 General-Purpose Interface Set Bit Function

Table 26-15. General-Purpose Interface Set Bit Function

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------|
| Write 0x1 to set desired bit(s) in register. | GPIO_SETDATAOUT [31:0] INTLINE | 0x- |
| | GPIO_IRQSTATUS_SET_0 [31:0] INTLINE | |
| | GPIO_IRQSTATUS_SET_1 [31:0] INTLINE | |

26.5.1.2.4 General-Purpose Interface Clear Bit Function

Table 26-16. General-Purpose Interface Clear Bit Function

| Step | Register/Bit Field /Programming Model | Value |
|--|---|-------|
| Write 0x1 to clear desired bit(s) in register. | GPIO_CLEARDATAOUT [31:0] INTLINE | 0x1 |
| | GPIO_IRQSTATUS_CLR_0 [31:0] INTLINE | |
| | GPIO_IRQSTATUS_CLR_1 [31:0] INTLINE | |

26.6 General-Purpose Interface Register Manual

26.6.1 General-Purpose Interface Instance Summary

Table 26-17 summarizes the general-purpose interface instance.

Table 26-17. Instance Summary

| Module Name | Base Address | Size |
|-------------|--------------|------|
| GPIO1 | 0x4A31 0000 | 4KB |
| GPIO2 | 0x4805 5000 | 4KB |
| GPIO3 | 0x4805 7000 | 4KB |
| GPIO4 | 0x4805 9000 | 4KB |
| GPIO5 | 0x4805 B000 | 4KB |
| GPIO6 | 0x4805 D000 | 4KB |

26.6.2 General-Purpose Interface Registers

26.6.2.1 General-Purpose Interface Register Summary

Table 26-18 summarizes the general-purpose interface GPIO1 to GPIO3 registers.

Table 26-18. General-Purpose Interface GPIO1 to GPIO3 Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset | GPIO1 L4 Physical Address | GPIO2 L4 Physical Address | GPIO3 L4 Physical Address |
|--------------------------------------|------|-----------------------|----------------|---------------------------|---------------------------|---------------------------|
| GPIO_REVISION | R | 32 | 0x0000 0000 | 0x4A31 0000 | 0x4805 5000 | 0x4805 7000 |
| GPIO_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4A31 0010 | 0x4805 5010 | 0x4805 7010 |
| RESERVED | | | 0x0000 0020 | 0x4A31 0020 | 0x4805 5020 | 0x4805 7020 |
| GPIO_IRQSTATUS_RAW_0 | RW | 32 | 0x0000 0024 | 0x4A31 0024 | 0x4805 5024 | 0x4805 7024 |
| GPIO_IRQSTATUS_RAW_1 | RW | 32 | 0x0000 0028 | 0x4A31 0028 | 0x4805 5028 | 0x4805 7028 |
| GPIO_IRQSTATUS_0 | RW | 32 | 0x0000 002C | 0x4A31 002C | 0x4805 502C | 0x4805 702C |
| GPIO_IRQSTATUS_1 | RW | 32 | 0x0000 0030 | 0x4A31 0030 | 0x4805 5030 | 0x4805 7030 |
| GPIO_IRQSTATUS_SET_0 | RW | 32 | 0x0000 0034 | 0x4A31 0034 | 0x4805 5034 | 0x4805 7034 |
| GPIO_IRQSTATUS_SET_1 | RW | 32 | 0x0000 0038 | 0x4A31 0038 | 0x4805 5038 | 0x4805 7038 |
| GPIO_IRQSTATUS_CLR_0 | RW | 32 | 0x0000 003C | 0x4A31 003C | 0x4805 503C | 0x4805 703C |
| GPIO_IRQSTATUS_CLR_1 | RW | 32 | 0x0000 0040 | 0x4A31 0040 | 0x4805 5040 | 0x4805 7040 |
| GPIO_IRQWAKEN_0 | RW | 32 | 0x0000 0044 | 0x4A31 0044 | 0x4805 5044 | 0x4805 7044 |
| GPIO_IRQWAKEN_1 | RW | 32 | 0x0000 0048 | 0x4A31 0048 | 0x4805 5048 | 0x4805 7048 |
| GPIO_SYSSTATUS | R | 32 | 0x0000 0114 | 0x4A31 0114 | 0x4805 5114 | 0x4805 7114 |
| RESERVED | RW | 32 | 0x0000 0118 | 0x4A31 0118 | 0x4805 5118 | 0x4805 7118 |
| RESERVED | RW | 32 | 0x0000 011C | 0x4A31 011C | 0x4805 511C | 0x4805 711C |
| GPIO_WAKEUPENABLE | RW | 32 | 0x0000 0120 | 0x4A31 0120 | 0x4805 5120 | 0x4805 7120 |
| RESERVED | RW | 32 | 0x0000 0128 | 0x4A31 0128 | 0x4805 5128 | 0x4805 7128 |
| RESERVED | RW | 32 | 0x0000 012C | 0x4A31 012C | 0x4805 512C | 0x4805 712C |
| GPIO_CTRL | RW | 32 | 0x0000 0130 | 0x4A31 0130 | 0x4805 5130 | 0x4805 7130 |
| GPIO_OE | RW | 32 | 0x0000 0134 | 0x4A31 0134 | 0x4805 5134 | 0x4805 7134 |
| GPIO_DATAIN | R | 32 | 0x0000 0138 | 0x4A31 0138 | 0x4805 5138 | 0x4805 7138 |
| GPIO_DATAOUT | RW | 32 | 0x0000 013C | 0x4A31 013C | 0x4805 513C | 0x4805 713C |
| GPIO_LEVELDETECT0 | RW | 32 | 0x0000 0140 | 0x4A31 0140 | 0x4805 5140 | 0x4805 7140 |
| GPIO_LEVELDETECT1 | RW | 32 | 0x0000 0144 | 0x4A31 0144 | 0x4805 5144 | 0x4805 7144 |
| GPIO_RISINGDETECT | RW | 32 | 0x0000 0148 | 0x4A31 0148 | 0x4805 5148 | 0x4805 7148 |
| GPIO_FALLINGDETECT | RW | 32 | 0x0000 014C | 0x4A31 014C | 0x4805 514C | 0x4805 714C |

Table 26-18. General-Purpose Interface GPIO1 to GPIO3 Registers Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | GPIO1 L4 Physical Address | GPIO2 L4 Physical Address | GPIO3 L4 Physical Address |
|-------------------------------------|------|-----------------------|----------------|---------------------------|---------------------------|---------------------------|
| GPIO_DEBOUNCENABLE | RW | 32 | 0x0000 0150 | 0x4A31 0150 | 0x4805 5150 | 0x4805 7150 |
| GPIO_DEBOUNCINGTIME | RW | 32 | 0x0000 0154 | 0x4A31 0154 | 0x4805 5154 | 0x4805 7154 |
| RESERVED | RW | 32 | 0x0000 0160 | 0x4A31 0160 | 0x4805 5160 | 0x4805 7160 |
| RESERVED | RW | 32 | 0x0000 0164 | 0x4A31 0164 | 0x4805 5164 | 0x4805 7164 |
| RESERVED | RW | 32 | 0x0000 0170 | 0x4A31 0170 | 0x4805 5170 | 0x4805 7170 |
| RESERVED | RW | 32 | 0x0000 0174 | 0x4A31 0174 | 0x4805 5174 | 0x4805 7174 |
| GPIO_CLEARWKUPENA | RW | 32 | 0x0000 0180 | 0x4A31 0180 | 0x4805 5180 | 0x4805 7180 |
| GPIO_SETWKUENA | RW | 32 | 0x0000 0184 | 0x4A31 0184 | 0x4805 5184 | 0x4805 7184 |
| GPIO_CLEARDATAOUT | RW | 32 | 0x0000 0190 | 0x4A31 0190 | 0x4805 5190 | 0x4805 7190 |
| GPIO_SETDATAOUT | RW | 32 | 0x0000 0194 | 0x4A31 0194 | 0x4805 5194 | 0x4805 7194 |

Table 26-19 summarizes the general-purpose interface GPIO4 to GPIO6 registers.

Table 26-19. General-Purpose Interface GPIO4 to GPIO6 Registers Summary

| Register Name | Type | Register Width (Bits) | Address Offset | GPIO4 L4 Physical Address | GPIO5 L4 Physical Address | GPIO6 L4 Physical Address |
|--------------------------------------|------|-----------------------|----------------|---------------------------|---------------------------|---------------------------|
| GPIO_REVISION | R | 32 | 0x0000 0000 | 0x4805 9000 | 0x4805 B000 | 0x4805 D000 |
| GPIO_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4805 9010 | 0x4805 B010 | 0x4805 D010 |
| RESERVED | | | 0x0000 0020 | 0x4805 9020 | 0x4805 B020 | 0x4805 D020 |
| GPIO_IRQSTATUS_RAW_0 | RW | 32 | 0x0000 0024 | 0x4805 9024 | 0x4805 B024 | 0x4805 D024 |
| GPIO_IRQSTATUS_RAW_1 | RW | 32 | 0x0000 0028 | 0x4805 9028 | 0x4805 B028 | 0x4805 D028 |
| GPIO_IRQSTATUS_0 | RW | 32 | 0x0000 002C | 0x4805 902C | 0x4805 B02C | 0x4805 D02C |
| GPIO_IRQSTATUS_1 | RW | 32 | 0x0000 0030 | 0x4805 9030 | 0x4805 B030 | 0x4805 D030 |
| GPIO_IRQSTATUS_SET_0 | RW | 32 | 0x0000 0034 | 0x4805 9034 | 0x4805 B034 | 0x4805 D034 |
| GPIO_IRQSTATUS_SET_1 | RW | 32 | 0x0000 0038 | 0x4805 9038 | 0x4805 B038 | 0x4805 D038 |
| GPIO_IRQSTATUS_CLR_0 | RW | 32 | 0x0000 003C | 0x4805 903C | 0x4805 B03C | 0x4805 D03C |
| GPIO_IRQSTATUS_CLR_1 | RW | 32 | 0x0000 0040 | 0x4805 9040 | 0x4805 B040 | 0x4805 D040 |
| GPIO_IRQWAKEN_0 | RW | 32 | 0x0000 0044 | 0x4805 9044 | 0x4805 B044 | 0x4805 D044 |
| GPIO_IRQWAKEN_1 | RW | 32 | 0x0000 0048 | 0x4805 9048 | 0x4805 B048 | 0x4805 D048 |
| GPIO_SYSSTATUS | R | 32 | 0x0000 0114 | 0x4805 9114 | 0x4805 B114 | 0x4805 D114 |
| RESERVED | RW | 32 | 0x0000 0118 | 0x4805 9118 | 0x4805 B118 | 0x4805 D118 |
| RESERVED | RW | 32 | 0x0000 011C | 0x4805 911C | 0x4805 B11C | 0x4805 D11C |
| GPIO_WAKEUPENABLE | RW | 32 | 0x0000 0120 | 0x4805 9120 | 0x4805 B120 | 0x4805 D120 |
| RESERVED | RW | 32 | 0x0000 0128 | 0x4805 9128 | 0x4805 B128 | 0x4805 D128 |
| RESERVED | RW | 32 | 0x0000 012C | 0x4805 912C | 0x4805 B12C | 0x4805 D12C |
| GPIO_CTRL | RW | 32 | 0x0000 0130 | 0x4805 9130 | 0x4805 B130 | 0x4805 D130 |
| GPIO_OE | RW | 32 | 0x0000 0134 | 0x4805 9134 | 0x4805 B134 | 0x4805 D134 |
| GPIO_DATAIN | R | 32 | 0x0000 0138 | 0x4805 9138 | 0x4805 B138 | 0x4805 D138 |
| GPIO_DATAOUT | RW | 32 | 0x0000 013C | 0x4805 913C | 0x4805 B13C | 0x4805 D13C |
| GPIO_LEVELDETECT0 | RW | 32 | 0x0000 0140 | 0x4805 9140 | 0x4805 B140 | 0x4805 D140 |
| GPIO_LEVELDETECT1 | RW | 32 | 0x0000 0144 | 0x4805 9144 | 0x4805 B144 | 0x4805 D144 |
| GPIO_RISINGDETECT | RW | 32 | 0x0000 0148 | 0x4805 9148 | 0x4805 B148 | 0x4805 D148 |
| GPIO_FALLINGDETECT | RW | 32 | 0x0000 014C | 0x4805 914C | 0x4805 B14C | 0x4805 D14C |
| GPIO_DEBOUNCENABLE | RW | 32 | 0x0000 0150 | 0x4805 9150 | 0x4805 B150 | 0x4805 D150 |
| GPIO_DEBOUNCINGTIME | RW | 32 | 0x0000 0154 | 0x4805 9154 | 0x4805 B154 | 0x4805 D154 |
| RESERVED | RW | 32 | 0x0000 0160 | 0x4805 9160 | 0x4805 B160 | 0x4805 D160 |
| RESERVED | RW | 32 | 0x0000 0164 | 0x4805 9164 | 0x4805 B164 | 0x4805 D164 |

Table 26-19. General-Purpose Interface GPIO4 to GPIO6 Registers Summary (continued)

| Register Name | Type | Register Width (Bits) | Address Offset | GPIO4 L4 Physical Address | GPIO5 L4 Physical Address | GPIO6 L4 Physical Address |
|-----------------------------------|------|-----------------------|----------------|---------------------------|---------------------------|---------------------------|
| RESERVED | RW | 32 | 0x0000 0170 | 0x4805 9170 | 0x4805 B170 | 0x4805 D170 |
| RESERVED | RW | 32 | 0x0000 0174 | 0x4805 9174 | 0x4805 B174 | 0x4805 D174 |
| GPIO_CLEARWKUPENA | RW | 32 | 0x0000 0180 | 0x4805 9180 | 0x4805 B180 | 0x4805 D180 |
| GPIO_SETWKUENA | RW | 32 | 0x0000 0184 | 0x4805 9184 | 0x4805 B184 | 0x4805 D184 |
| GPIO_CLEARDATAOUT | RW | 32 | 0x0000 0190 | 0x4805 9190 | 0x4805 B190 | 0x4805 D190 |
| GPIO_SETDATAOUT | RW | 32 | 0x0000 0194 | 0x4805 9194 | 0x4805 B194 | 0x4805 D194 |

26.6.2.2 General-Purpose Interface Register Description

[Table 26-20](#) through [Table 26-74](#) describe the individual general-purpose interface registers.

Table 26-20. GPIO_REVISION

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0000 | | |
| Physical Address | 0x4A31 0000 0x4805 5000 0x4805 7000 0x4805 9000 0x4805 B000 0x4805 D000 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | IP revision identifier (X.Y.R) | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|--------------------|
| 31:0 | REVISION | IP revision | R | See ⁽¹⁾ |

⁽¹⁾ TI Internal Data

Table 26-21. Register Call Summary for Register GPIO_REVISION

- General-Purpose Interface Register Manual
- [General-Purpose Interface Register Summary: \[0\] \[1\]](#)

Table 26-22. GPIO_SYSCONFIG

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0010 | | |
| Physical Address | 0x4A31 0010 0x4805 5010 0x4805 7010 0x4805 9010 0x4805 B010 0x4805 D010 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | System configuration register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|----------|---|---|---|-----------|---|-----------|---|----------|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | IDLEMODE | | | | ENAWAKEUP | | SOFTRESET | | AUTOIDLE | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|------------|
| 31:5 | RESERVED | Reserved | R | 0x00000000 |
| 4:3 | IDLEMODE | 0x0: Force-idle: An idle request is acknowledged unconditionally. 0x1: No-idle: An idle request is never acknowledged. 0x2: Smart-idle: The acknowledgment to an idle request is given based on the internal activity (see 4.1.2). 0x3: Smart-idle wakeup | RW | 0x0 |
| 2 | ENAWAKEUP | Wake-up control 0x0: Wake-up generation is disabled. 0x1: Wake-up capability is enabled upon expected transition on input GPIO pin. | RW | 0 |
| 1 | SOFTRESET | Software reset. Set this bit to 1 to trigger a module reset. The bit is automatically reset by the hardware. During reads, it always returns 0. 0x0: Normal mode 0x1: The module is reset. | RW | 0 |
| 0 | AUTOIDLE | OCF clock gating control. 0x0: Internal Interface OCF clock is free-running. 0x1: Automatic internal OCF clock gating, based on the OCF interface activity | RW | 0 |

Table 26-23. Register Call Summary for Register GPIO_SYSCONFIG

General-Purpose Interface Functional Description

- [Asynchronous Path: Wake-Up Request Generation: \[0\]](#)
- [General-Purpose Interface Hardware and Software Reset: \[1\] \[2\] \[3\]](#)
- [Power Management: \[4\] \[5\] \[6\] \[7\] \[8\] \[9\] \[10\] \[11\] \[12\] \[13\] \[14\] \[15\]](#)

General-Purpose Interface Programming Guide

- [Global Initialization: \[16\] \[17\] \[18\] \[19\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[20\] \[21\]](#)

Table 26-24. GPIO_IRQSTATUS_RAW_0

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|------------|-------|-------------------------------|----|------|----|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| Address Offset | 0x0000 0024 | Instance | GPIO1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A31 0024 | | GPIO2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4805 5024 | | GPIO3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4805 7024 | | GPIO4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4805 9024 | | GPIO5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4805 B024 | | GPIO6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0x4805 D024 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Per-event raw interrupt status vector (corresponding to first line of interrupt) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | | Field Name | | Description | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | |
| 31:0 | | INTLINE | | Status raw for interrupt line | | RW | | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | |

Table 26-25. Register Call Summary for Register GPIO_IRQSTATUS_RAW_0

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[0\] \[1\]](#)

Table 26-26. GPIO_IRQSTATUS_RAW_1

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0028 | | |
| Physical Address | 0x4A31 0028 0x4805 5028 0x4805 7028 0x4805 9028 0x4805 B028 0x4805 D028 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Per-event raw interrupt status vector (corresponding to second line of interrupt) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------------------|------|-------------|
| 31:0 | INTLINE | Status raw for interrupt line | RW | 0x0000 0000 |

Table 26-27. Register Call Summary for Register GPIO_IRQSTATUS_RAW_1

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[0\] \[1\]](#)

Table 26-28. GPIO_IRQSTATUS_0

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 002C | | |
| Physical Address | 0x4A31 002C 0x4805 502C 0x4805 702C 0x4805 902C 0x4805 B02C 0x4805 D02C | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Per-event interrupt status vector (enabled) (corresponding to first line of interrupt) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------|------|-------------|
| 31:0 | INTLINE | Status for interrupt line | RW | 0x0000 0000 |

Table 26-29. Register Call Summary for Register GPIO_IRQSTATUS_0

General-Purpose Interface Functional Description

- [Synchronous Path: Interrupt Request Generation: \[0\]](#)
- [Asynchronous Path: Wake-Up Request Generation: \[1\] \[2\]](#)
- [Interrupt \(or Wake-Up\) Line Release: \[3\]](#)
- [Interrupt Request Generation: \[4\] \[5\] \[6\] \[7\] \[8\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[9\] \[10\]](#)

Table 26-30. GPIO_IRQSTATUS_1

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0030 | | |
| Physical Address | 0x4A31 0030 0x4805 5030 0x4805 7030 0x4805 9030 0x4805 B030 0x4805 D030 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Per-event enabled interrupt status vector (corresponding to second line of interrupt) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------|------|-------------|
| 31:0 | INTLINE | Status for interrupt line | RW | 0x0000 0000 |

Table 26-31. Register Call Summary for Register GPIO_IRQSTATUS_1

General-Purpose Interface Functional Description

- [Synchronous Path: Interrupt Request Generation: \[0\]](#)
- [Asynchronous Path: Wake-Up Request Generation: \[1\] \[2\]](#)
- [Interrupt \(or Wake-Up\) Line Release: \[3\]](#)
- [Interrupt Request Generation: \[4\] \[5\] \[6\] \[7\] \[8\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[9\] \[10\]](#)

Table 26-32. GPIO_IRQSTATUS_SET_0

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0034 | | |
| Physical Address | 0x4A31 0034 0x4805 5034 0x4805 7034 0x4805 9034 0x4805 B034 0x4805 D034 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Per-event interrupt enable set vector (corresponding to first line of interrupt) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------------------|------|-------------|
| 31:0 | INTLINE | Status set for interrupt line | RW | 0x0000 0000 |

Table 26-33. Register Call Summary for Register GPIO_IRQSTATUS_SET_0

General-Purpose Interface Overview

- [General-Purpose Interface Overview: \[0\]](#)

General-Purpose Interface Functional Description

- [General-Purpose Interface Description: \[1\]](#)
- [Synchronous Path: Interrupt Request Generation: \[2\]](#)
- [Asynchronous Path: Wake-Up Request Generation: \[3\]](#)
- [Interrupt Request Generation: \[4\] \[5\] \[6\] \[7\]](#)
- [General-Purpose Interface Data Input/Output Capabilities: \[8\] \[9\] \[10\]](#)
- [Description: \[11\]](#)
- [Set Instruction: \[12\] \[13\] \[14\]](#)

General-Purpose Interface Programming Guide

- [Global Initialization: \[15\]](#)
- [General-Purpose Interface Operational Modes Configuration: \[16\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[17\] \[18\]](#)

Table 26-34. GPIO_IRQSTATUS_SET_1

| | | | |
|------------------|--|----------|--|
| Address Offset | 0x0000 0038 | | |
| Physical Address | 0x4A31 0038 0x4805 5038 0x4805 7038 0x4805 9038 0x4805 B038 0x4805 D038 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Per-event enable set interrupt vector (corresponding to second line of interrupt) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------------------|------|-------------|
| 31:0 | INTLINE | Status set for interrupt line | RW | 0x0000 0000 |

Table 26-35. Register Call Summary for Register GPIO_IRQSTATUS_SET_1

General-Purpose Interface Overview

- [General-Purpose Interface Overview: \[0\]](#)

General-Purpose Interface Functional Description

- [General-Purpose Interface Description: \[1\]](#)
- [Synchronous Path: Interrupt Request Generation: \[2\]](#)
- [Asynchronous Path: Wake-Up Request Generation: \[3\]](#)
- [Interrupt Request Generation: \[4\] \[5\] \[6\] \[7\]](#)
- [General-Purpose Interface Data Input/Output Capabilities: \[8\]](#)
- [Description: \[9\]](#)
- [Set Instruction: \[10\] \[11\] \[12\]](#)

General-Purpose Interface Programming Guide

- [Global Initialization: \[13\]](#)
- [General-Purpose Interface Operational Modes Configuration: \[14\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[15\] \[16\]](#)

Table 26-36. GPIO_IRQSTATUS_CLR_0

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 003C | | |
| Physical Address | 0x4A31 003C 0x4805 503C 0x4805 703C 0x4805 903C 0x4805 B03C 0x4805 D03C | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Per-event interrupt enable clear vector (corresponding to first line of interrupt) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------------|------|-------------|
| 31:0 | INTLINE | Status clear for interrupt line | RW | 0x0000 0000 |

Table 26-37. Register Call Summary for Register GPIO_IRQSTATUS_CLR_0

General-Purpose Interface Overview

- [General-Purpose Interface Overview: \[0\]](#)

General-Purpose Interface Functional Description

- [General-Purpose Interface Description: \[1\]](#)
- [Synchronous Path: Interrupt Request Generation: \[2\]](#)
- [Asynchronous Path: Wake-Up Request Generation: \[3\]](#)
- [Interrupt Request Generation: \[4\] \[5\]](#)
- [Description: \[6\]](#)
- [Clear Instruction: \[7\] \[8\] \[9\]](#)

General-Purpose Interface Programming Guide

- [General-Purpose Interface Operational Modes Configuration: \[10\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[11\] \[12\]](#)

Table 26-38. GPIO_IRQSTATUS_CLR_1

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0040 | | |
| Physical Address | 0x4A31 0040 0x4805 5040 0x4805 7040 0x4805 9040 0x4805 B040 0x4805 D040 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Per-event enable clear interrupt vector (corresponding to second line of interrupt) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------------|------|-------------|
| 31:0 | INTLINE | Status clear for interrupt line | RW | 0x0000 0000 |

Table 26-39. Register Call Summary for Register GPIO_IRQSTATUS_CLR_1

General-Purpose Interface Overview

- [General-Purpose Interface Overview: \[0\]](#)

General-Purpose Interface Functional Description

- [General-Purpose Interface Description: \[1\]](#)
- [Synchronous Path: Interrupt Request Generation: \[2\]](#)
- [Asynchronous Path: Wake-Up Request Generation: \[3\]](#)
- [Interrupt Request Generation: \[4\] \[5\]](#)
- [Description: \[6\]](#)
- [Clear Instruction: \[7\] \[8\] \[9\]](#)

General-Purpose Interface Programming Guide

- [General-Purpose Interface Operational Modes Configuration: \[10\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[11\] \[12\]](#)

Table 26-40. GPIO_IRQWAKEN_0

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0044 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A31 0044 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | GPIO1 | | | | | | | | | | | | | | | |
| | 0x4805 5044 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GPIO2 | | | | | | | | | | | | | | | |
| | 0x4805 7044 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GPIO3 | | | | | | | | | | | | | | | |
| | 0x4805 9044 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GPIO4 | | | | | | | | | | | | | | | |
| | 0x4805 B044 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GPIO5 | | | | | | | | | | | | | | | |
| | 0x4805 D044 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GPIO6 | | | | | | | | | | | | | | | |
| Description | Per-event wake-up enable set vector (corresponding to first line of interrupt) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------------------------|------|-------------|
| 31:0 | INTLINE | Wakeup Set for Interrupt Line | RW | 0x0000 0000 |
| | | 0x0: Wakeup disable | | |
| | | 0x1 Wakeup enable | | |

Table 26-41. Register Call Summary for Register GPIO_IRQWAKEN_0

General-Purpose Interface Functional Description

- [Asynchronous Path: Wake-Up Request Generation: \[0\] \[1\]](#)
- [Power Management: \[2\]](#)
- [Interrupt Request Generation: \[3\]](#)
- [Wake-Up Request Generation: \[4\]](#)
- [General-Purpose Interface Data Input/Output Capabilities: \[5\] \[6\]](#)

General-Purpose Interface Programming Guide

- [Global Initialization: \[7\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[8\] \[9\]](#)
- [General-Purpose Interface Register Description: \[10\] \[11\] \[12\]](#)

Table 26-42. GPIO_IRQWAKEN_1

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0048 | | |
| Physical Address | 0x4A31 0048 0x4805 5048 0x4805 7048 0x4805 9048 0x4805 B048 0x4805 D048 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Per-event wake-up enable set vector (corresponding to second line of interrupt) | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | INTLINE | Wakeup Set for Interrupt Line 0x0 Wakeup disable 0x1 Wakeup enable | RW | 0x0000 0000 |

Table 26-43. Register Call Summary for Register GPIO_IRQWAKEN_1

General-Purpose Interface Functional Description

- [Asynchronous Path: Wake-Up Request Generation: \[0\] \[1\]](#)
- [Power Management: \[2\]](#)
- [Interrupt Request Generation: \[3\]](#)
- [Wake-Up Request Generation: \[4\]](#)
- [General-Purpose Interface Data Input/Output Capabilities: \[5\] \[6\]](#)

General-Purpose Interface Programming Guide

- [Global Initialization: \[7\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[8\] \[9\]](#)
- [General-Purpose Interface Register Description: \[10\] \[11\] \[12\]](#)

Table 26-44. GPIO_SYSSTATUS

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0114 | | |
| Physical Address | 0x4A31 0114 0x4805 5114 0x4805 7114 0x4805 9114 0x4805 B114 0x4805 D114 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | System status register | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESETDONE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:1 | RESERVED | Reserved | R | 0x0000 0000 |
| 0 | RESETDONE | Read 0x0: Internal reset is on-going. Read 0x1: Reset completed | R | 0 |

Table 26-45. Register Call Summary for Register GPIO_SYSSTATUS

General-Purpose Interface Functional Description

- [General-Purpose Interface Hardware and Software Reset: \[0\] \[1\]](#)

General-Purpose Interface Programming Guide

- [Global Initialization: \[2\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[3\] \[4\]](#)

Table 26-46. GPIO_WAKEUPENABLE

| | | | |
|--|--|----------|--|
| Address Offset | 0x0000 0120 | | |
| Physical Address | 0x4A31 0120 0x4805 5120 0x4805 7120 0x4805 9120 0x4805 B120 0x4805 D120 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Wake-up enable register (legacy) for first line of interrupt | | |
| Type | RW | | |
| <div><div><div>3130292827262524</div><div>2322212019181716</div><div>15141312111098</div><div>76543210</div></div><div>INTLINE</div></div> | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | INTLINE | Wake-up enable for interrupt line Caution: This register is kept for backward software compatibility. Use GPIO_IRQWAKEN_0 and GPIO_IRQWAKEN_1 instead. Caution: A wake-up event can be enabled using a legacy register as well as the new one, but it must be disabled only through the register that enabled it. 0x0: Wake-up generation is disabled. 0x1: Wake-up generation is enabled. | RW | 0x0000 0000 |

Table 26-47. Register Call Summary for Register GPIO_WAKEUPENABLE

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[0\] \[1\]](#)

Table 26-48. GPIO_CTRL

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0130 | | |
| Physical Address | 0x4A31 0130 0x4805 5130 0x4805 7130 0x4805 9130 0x4805 B130 0x4805 D130 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | GPIO control register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|-------------|---|---------------|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | GATINGRATIO | | DISABLEMODULE | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------------|
| 31:3 | RESERVED | Reserved | R | 0x0000 0000 |
| 2:1 | GATINGRATIO | Clock gating ratio for event detection 0x0: N = 1 0x1: N = 2 0x2: N = 4 0x3: N = 8 | RW | 0x1 |
| 0 | DISABLEMODULE | 0x0: Module is enabled, clocks are not gated. 0x1: Module is disabled, internal clocks are gated | RW | 0 |

Table 26-49. Register Call Summary for Register GPIO_CTRL

General-Purpose Interface Functional Description

- [Clocking: \[0\]](#)
- [Power Management: \[1\] \[2\] \[3\] \[4\]](#)

General-Purpose Interface Programming Guide

- [Global Initialization: \[5\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[6\] \[7\]](#)

Table 26-50. GPIO_OE

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0134 | | |
| Physical Address | 0x4A31 0134 0x4805 5134 0x4805 7134 0x4805 9134 0x4805 B134 0x4805 D134 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Output enable register. 0: Output enabled ; 1: Output disabled | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| OUTPUTEN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | OUTPUTEN | Output enable 0x0: Output enabled 0x1: Output disabled | RW | 0xFFFF FFFF |

Table 26-51. Register Call Summary for Register GPIO_OE

General-Purpose Interface Overview

- [General-Purpose Interface Overview: \[0\]](#)

General-Purpose Interface Functional Description

- [General-Purpose Interface Data Input/Output Capabilities: \[1\] \[2\] \[3\]](#)

General-Purpose Interface Programming Guide

- [Global Initialization: \[4\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[5\] \[6\]](#)

Table 26-52. GPIO_DATAIN

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0138 | | |
| Physical Address | 0x4A31 0138 0x4805 5138 0x4805 7138 0x4805 9138 0x4805 B138 0x4805 D138 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Data input register (with sampled input data) | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DATAIN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--------------------|------|-------------|
| 31:0 | DATAIN | Sampled input data | R | 0x0000 0000 |

Table 26-53. Register Call Summary for Register GPIO_DATAIN

General-Purpose Interface Overview

- [General-Purpose Interface Overview: \[0\]](#)

General-Purpose Interface Functional Description

- [Power Management: \[1\] \[2\]](#)
- [General-Purpose Interface Data Input/Output Capabilities: \[3\]](#)

Table 26-53. Register Call Summary for Register GPIO_DATAIN (continued)

General-Purpose Interface Programming Guide

- [General-Purpose Interface Operational Modes Configuration: \[4\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[5\] \[6\]](#)

Table 26-54. GPIO_DATAOUT

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 013C | Instance | GPIO1 |
| Physical Address | 0x4A31 013C 0x4805 513C 0x4805 713C 0x4805 913C 0x4805 B13C 0x4805 D13C | | GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Data output register (data to set on output pins). | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DATAOUT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|----------------------------|------|-------------|
| 31:0 | DATAOUT | Data to set on output pins | RW | 0x0000 0000 |

Table 26-55. Register Call Summary for Register GPIO_DATAOUT

General-Purpose Interface Overview

- [General-Purpose Interface Overview: \[0\] \[1\]](#)

General-Purpose Interface Functional Description

- [General-Purpose Interface Data Input/Output Capabilities: \[2\]](#)
- [Description: \[3\]](#)

General-Purpose Interface Programming Guide

- [General-Purpose Interface Operational Modes Configuration: \[4\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[5\] \[6\]](#)

Table 26-56. GPIO_LEVELDETECT0

| | | | |
|-------------------------|--|-----------------|---|
| Address Offset | 0x0000 0140 | Instance | GPIO1 |
| Physical Address | 0x4A31 0140 0x4805 5140 0x4805 7140 0x4805 9140 0x4805 B140 0x4805 D140 | | GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Detect low-level register. 0: Low-level detection disabled; 1: Low-level detection enabled | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| LEVELDETECT0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|--|------|-------------|
| 31:0 | LEVELDETECT0 | Low-level detection 0x0: Low-level detection disabled 0x1: Low-level detection enabled | RW | 0x0000 0000 |

Table 26-57. Register Call Summary for Register GPIO_LEVELDETECT0

General-Purpose Interface Functional Description

- [Power Management: \[0\] \[1\]](#)

General-Purpose Interface Programming Guide

- [Global Initialization: \[2\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[3\] \[4\]](#)

Table 26-58. GPIO_LEVELDETECT1

| | | | |
|-------------------------|--|-----------------------|--|
| Address Offset | 0x0000 0144 | | |
| Physical Address | 0x4A31 0144 0x4805 5144 0x4805 7144 0x4805 9144 0x4805 B144 0x4805 D144 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Detect high-level register | | |
| Type | RW | | |
| 31 30 29 28 27 26 25 24 | 23 22 21 20 19 18 17 16 | 15 14 13 12 11 10 9 8 | 7 6 5 4 3 2 1 0 |
| LEVELDETECT1 | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:0 | LEVELDETECT1 | 0x0: High-level detection disabled 0x1: High-level detection enabled | RW | 0x0000 0000 |

Table 26-59. Register Call Summary for Register GPIO_LEVELDETECT1

General-Purpose Interface Functional Description

- [Power Management: \[0\] \[1\]](#)

General-Purpose Interface Programming Guide

- [Global Initialization: \[2\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[3\] \[4\]](#)

Table 26-60. GPIO_RISINGDETECT

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0148 | | |
| Physical Address | 0x4A31 0148 0x4805 5148 0x4805 7148 0x4805 9148 0x4805 B148 0x4805 D148 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Detect rising edge register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RISINGDETECT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|-------------|
| 31:0 | RISINGDETECT | 0x0: Rising edge detection disabled 0x1: Rising edge detection enabled | RW | 0x0000 0000 |

Table 26-61. Register Call Summary for Register GPIO_RISINGDETECT

General-Purpose Interface Functional Description

- [Power Management: \[0\] \[1\]](#)

General-Purpose Interface Programming Guide

- [Global Initialization: \[2\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[3\] \[4\]](#)

Table 26-62. GPIO_FALLINGDETECT

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 014C | | |
| Physical Address | 0x4A31 014C 0x4805 514C 0x4805 714C 0x4805 914C 0x4805 B14C 0x4805 D14C | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Detect falling edge register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FALLINGDETECT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-------------|
| 31:0 | FALLINGDETECT | 0x0: Falling edge detection disabled 0x1: Falling edge detection enabled | RW | 0x0000 0000 |

Table 26-63. Register Call Summary for Register GPIO_FALLINGDETECT

General-Purpose Interface Functional Description

- [Power Management: \[0\] \[1\]](#)

General-Purpose Interface Programming Guide

- [Global Initialization: \[2\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[3\] \[4\]](#)

Table 26-64. GPIO DEBOUNCENABLE

| | | |
|-------------------------|--|---|
| Address Offset | 0x0000 0150 | |
| Physical Address | 0x4A31 0150 0x4805 5150 0x4805 7150 0x4805 9150 0x4805 B150 0x4805 D150 | Instance GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Debouncing enable register | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| DEBOUNCEENABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------------|
| 31:0 | DEBOUNCEENABLE | 0x0: No debouncing 0x1: Debouncing activated | RW | 0x0000 0000 |

Table 26-65. Register Call Summary for Register GPIO_DEBOUNCENABLE

General-Purpose Interface Functional Description

- Power Management: [0]

General-Purpose Interface Programming Guide

- Global Initialization: [1]

General-Purpose Interface Register Manual

- General-Purpose Interface Register Summary: [2] [3]

Table 26-66. GPIO_DEBOUNCINGTIME

| Address Offset | 0x0000 0154 | Instance |
|------------------|---------------------------|----------|
| Physical Address | 0x4A31 0154 | GPIO1 |
| | 0x4805 5154 | GPIO2 |
| | 0x4805 7154 | GPIO3 |
| | 0x4805 9154 | GPIO4 |
| | 0x4805 B154 | GPIO5 |
| | 0x4805 D154 | GPIO6 |
| Description | Debouncing value register | |
| Type | RW | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | DEBOUNCETIME | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|--------------|---|------|----------|
| 31:8 | RESERVED | Reserved | R | 0x000000 |
| 7:0 | DEBOUNCETIME | 8-bit values specifying the debouncing time in 31 μ s steps | RW | 0x00 |

Table 26-67. Register Call Summary for Register GPIO_DEBOUNCINGTIME

General-Purpose Interface Functional Description

- Synchronous Path: Interrupt Request Generation: [0] [1]

- Clocking: [2] [3]

- Power Management: [4] [5]

General-Purpose Interface Programming Guide

- Global Initialization: [6]

Table 26-67. Register Call Summary for Register GPIO_DEBOUNCINGTIME (continued)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[7\] \[8\]](#)

Table 26-68. GPIO_CLEARWKUPENA

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0180 | | |
| Physical Address | 0x4A31 0180 0x4805 5180 0x4805 7180 0x4805 9180 0x4805 B180 0x4805 D180 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Clear wake-up-enable register – legacy register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | INTLINE | <p>Caution: This register is kept for backward software compatibility. Use GPIO_IRQWAKEN_0 and GPIO_IRQWAKEN_1 instead.</p> <p>Caution: A wake-up event can be enabled using a legacy register as well as the new one, but it must be disabled only through the register that enabled it.</p> <p>0x0: No effect</p> <p>0x1: Clear the corresponding bit in the wake-up-enable register.</p> | RW | 0x0000 0000 |

Table 26-69. Register Call Summary for Register GPIO_CLEARWKUPENA

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[0\] \[1\]](#)

Table 26-70. GPIO_SETWKUENA

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0184 | | |
| Physical Address | 0x4A31 0184 0x4805 5184 0x4805 7184 0x4805 9184 0x4805 B184 0x4805 D184 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Set wake-up-enable register – legacy register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------------|
| 31:0 | INTLINE | Caution: This register is kept for backward software compatibility. Use GPIO_IRQWAKEN_0 and GPIO_IRQWAKEN_1 instead. Caution: A wake-up event can be enabled using a legacy register as well as the new one, but it must be disabled only through the register that enabled it. 0x0: No effect 0x1: Set the corresponding bit in the wake-up-enable register. | RW | 0x0000 0000 |

Table 26-71. Register Call Summary for Register GPIO_SETWKUENA

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[0\] \[1\]](#)

Table 26-72. GPIO_CLEARDATAOUT

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0190 | | |
| Physical Address | 0x4A31 0190 0x4805 5190 0x4805 7190 0x4805 9190 0x4805 B190 0x4805 D190 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Clear data output register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | INTLINE | 0x0: No effect 0x1: Clear the corresponding bit in the data output register. | RW | 0x0000 0000 |

Table 26-73. Register Call Summary for Register GPIO_CLEARDATAOUT

General-Purpose Interface Functional Description

- [General-Purpose Interface Data Input/Output Capabilities: \[0\]](#)
- [Clear Instruction: \[1\]](#)

General-Purpose Interface Programming Guide

- [General-Purpose Interface Operational Modes Configuration: \[2\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[3\] \[4\]](#)

Table 26-74. GPIO_SETDATAOUT

| | | | |
|-------------------------|--|-----------------|--|
| Address Offset | 0x0000 0194 | | |
| Physical Address | 0x4A31 0194 0x4805 5194 0x4805 7194 0x4805 9194 0x4805 B194 0x4805 D194 | Instance | GPIO1 GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 |
| Description | Set data output register | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| INTLINE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:0 | INTLINE | 0x0: No effect 0x1: Set the corresponding bit in the data output register. | RW | 0x0000 0000 |

Table 26-75. Register Call Summary for Register GPIO_SETDATAOUT

General-Purpose Interface Functional Description

- [General-Purpose Interface Data Input/Output Capabilities: \[0\]](#)
- [Set Instruction: \[1\]](#)

General-Purpose Interface Programming Guide

- [General-Purpose Interface Operational Modes Configuration: \[2\]](#)

General-Purpose Interface Register Manual

- [General-Purpose Interface Register Summary: \[3\] \[4\]](#)

Keyboard Controller

This chapter describes the keyboard module of the device.

| Topic | Page |
|---|------|
| 27.1 Keyboard Controller Overview | 5440 |
| 27.2 Keyboard Controller Environment | 5442 |
| 27.3 Keyboard Controller Integration | 5445 |
| 27.4 Keyboard Controller Functional Description | 5447 |
| 27.5 Keyboard Controller Programming Guide | 5457 |
| 27.6 Keyboard Controller Register Manual | 5461 |

27.1 Keyboard Controller Overview

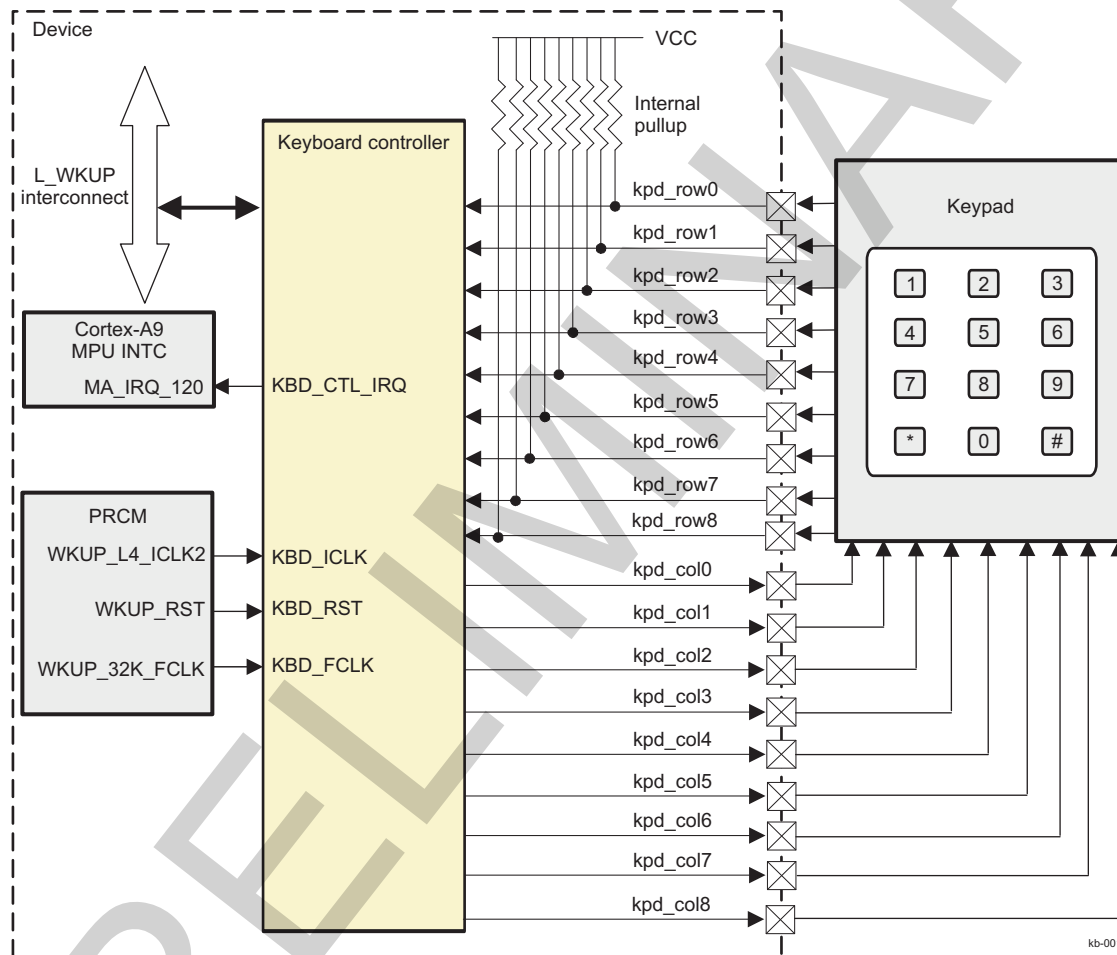
The keyboard controller implements a built-in scanning algorithm for hardware-based key-press decoding and reduces overhead in the microprocessor unit (MPU) software.

The keyboard controller includes a debouncing feature to ensure that only one key combination can be registered in the programmed time.

The keyboard controller can handle up to 9×9 keys, works on a 32-kHz clock, and can generate wake-up events when the chip is in sleep mode.

Figure 27-1 shows the keyboard controller.

Figure 27-1. Keyboard Controller Overview



The keyboard controller includes the following main features:

- Support of multiconfiguration keyboards up to 9 rows \times 9 columns
- Each key coded on 1 bit in two 32-bit registers
- Long-key value or repeat timing reconfigurable on the fly
- Event detection on key press and key release
- Multikey-press detection and decoding
- Long-key detection on prolonged key press
- Integrated timer with four programmable comparison values
- Programmable time-out on permanent key press or after keyboard release
- Programmable interrupt generation on key events
- Software reset capability

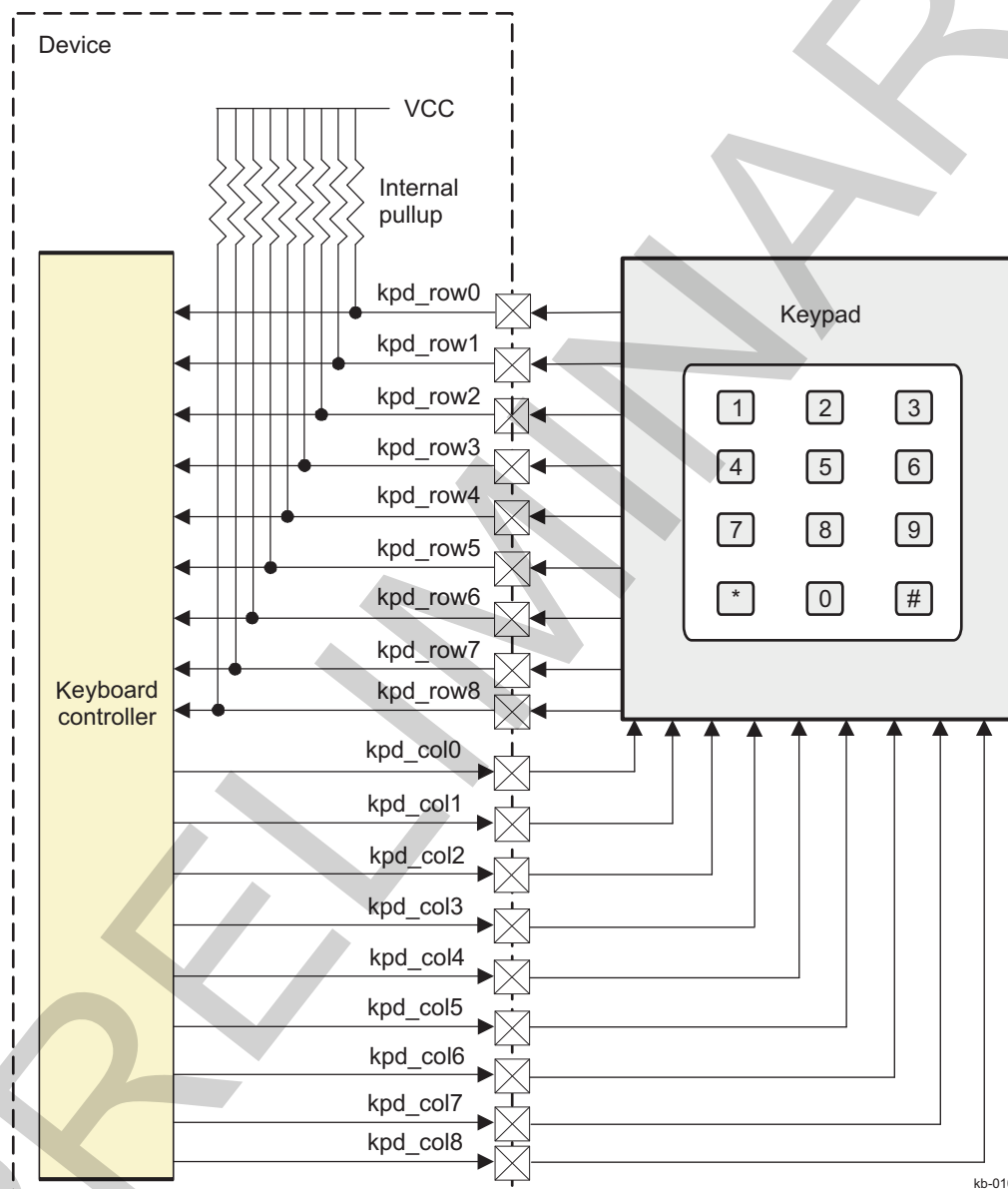
- Read/write-posted register access modes
- 8-/16-/32-bit access supported on the level 4 (L4) interface
- 32-bit data bus
- 7-bit address bus

27.2 Keyboard Controller Environment

The keyboard controller external interface pins map on the device pads when the device general-purpose input/output (GPIO) cells are configured and multiplexed for the keypad function by the control module. For more information, see [Section 19.4.8, Pad Functional Multiplexing and Configuration](#), and [Section 26.2.1, General-Purpose Interface as a Keyboard interface](#).

The external keypad typically connects directly to the keyboard controller of the device (see [Figure 27-2](#)).

Figure 27-2. Typical Keyboard Environment



27.2.1 Keyboard Controller Functions/Modes

The keyboard controller executes two functions:

- Keypad scanning and decoding for input of the external key presses. For more information, see [Section 27.4.5, Keyboard Controller Software Mode](#), and [Section 27.4.6, Keyboard Controller Hardware Decoding Modes](#).
- Device wake-up by interrupt request to the processor when a key is pressed and the device is in idle or sleep mode. For more information, see [Section 27.4.6.4, Keyboard Controller Interrupt Generation](#).

27.2.2 Keyboard Controller Signals

Table 27-1 describes the module signals and specifies their links to functions.

Table 27-1. I/O External Keyboard Signals

| Signal | I/O ⁽¹⁾ | Description | Reset Value ⁽²⁾ | Function | Wake-Up Capability |
|----------|--------------------|----------------------------------|----------------------------|-------------|--------------------|
| kpd_row0 | I | Keypad row 0 feed | hi-Z (pulled up) | Key reading | Yes |
| kpd_row1 | I | Keypad row 1 feed | hi-Z (pulled up) | Key reading | Yes |
| kpd_row2 | I | Keypad row 2 feed | hi-Z (pulled up) | Key reading | Yes |
| kpd_row3 | I | Keypad row 3 feed | hi-Z (pulled up) | Key reading | Yes |
| kpd_row4 | I | Keypad row 4 feed | hi-Z (pulled up) | Key reading | Yes |
| kpd_row5 | I | Keypad row 5 feed | hi-Z (pulled up) | Key reading | Yes |
| kpd_row6 | I | Keypad row 6 feed | hi-Z (pulled up) | Key reading | Yes |
| kpd_row7 | I | Keypad row 7 feed | hi-Z (pulled up) | Key reading | Yes |
| kpd_row8 | I | Keypad row 8 feed | hi-Z (pulled up) | Key reading | Yes |
| kpd_col0 | O | Keypad column 0 feed, active low | hi-Z | Key reading | No |
| kpd_col1 | O | Keypad column 1 feed, active low | hi-Z | Key reading | No |
| kpd_col2 | O | Keypad column 2 feed, active low | hi-Z | Key reading | No |
| kpd_col3 | O | Keypad column 3 feed, active low | hi-Z | Key reading | No |
| kpd_col4 | O | Keypad column 4 feed, active low | hi-Z | Key reading | No |
| kpd_col5 | O | Keypad column 5 feed, active low | hi-Z | Key reading | No |
| kpd_col6 | O | Keypad column 6 feed, active low | hi-Z | Key reading | No |
| kpd_col7 | O | Keypad column 7 feed, active low | hi-Z | Key reading | No |
| kpd_col8 | O | Keypad column 8 feed, active low | hi-Z | Key reading | No |

⁽¹⁾ I = Input; O = Output; I/O = Bidirectional

⁽²⁾ hi-Z = High impedance

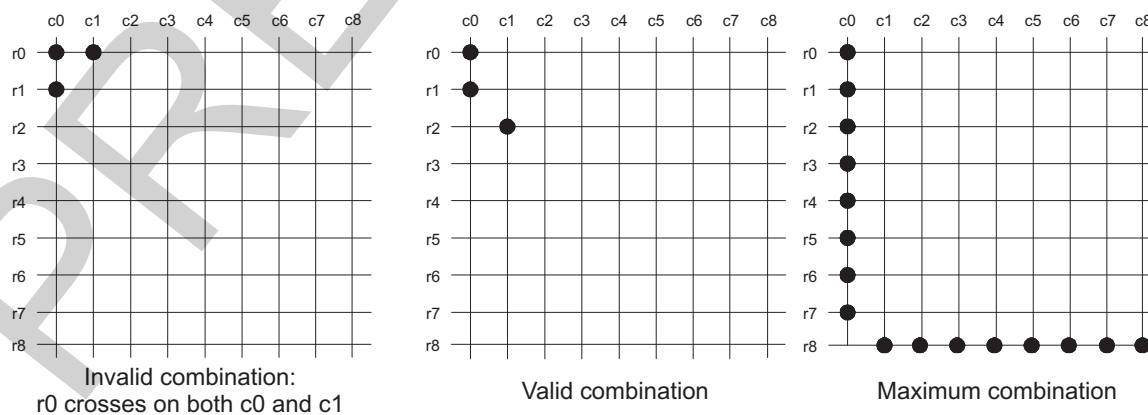
27.2.3 Protocols and Data Formats

The keyboard controller detects and decodes multikey combinations using the following rules:

- Any 2-key combination is valid and can be decoded.
- Combinations using more than two keys are valid only if the rows and columns used do not cross over on another key to be detected. This is caused by equipotent propagation on a row/column (multikey limitations).

Figure 27-3 shows an example of multikey limitation.

Figure 27-3. Multikey Limitation Example



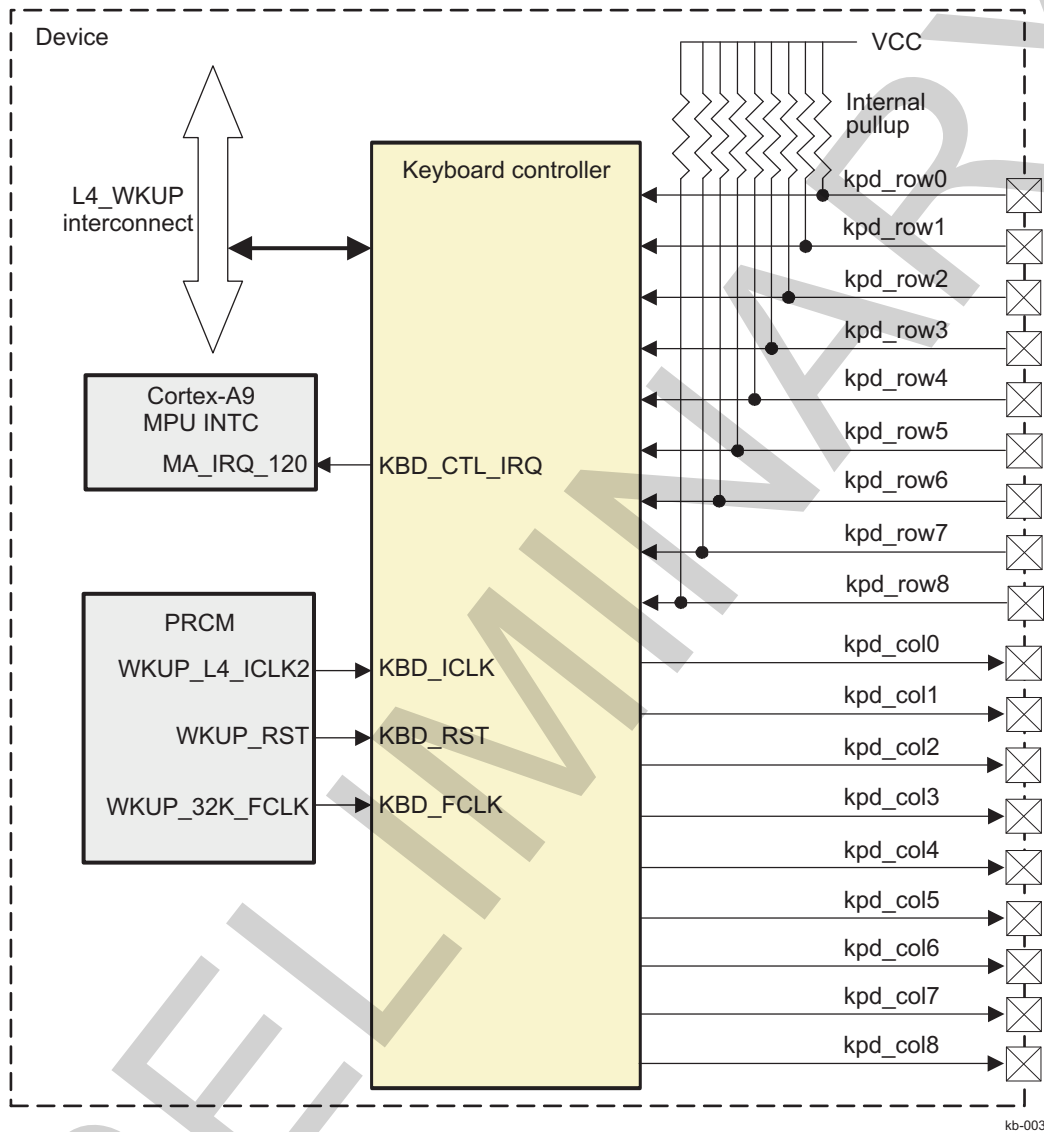
kb-007

NOTE: When using the keyboard controller with a smaller keypad (for example, 5×5), unused rows must be tied high to prevent disturbing the scanning process. Normally, all rows must be pulled up internally at the I/O cells of the device.

27.3 Keyboard Controller Integration

Figure 27-4 shows keyboard controller integration.

Figure 27-4. Keyboard Controller Integration



The control module must enable the internal pullups of the GPIO cells for all keypad rows (for more information about configuration, see [Chapter 19, Control Module](#)).

[Table 27-2](#) through [Table 27-4](#) summarize the integration of the module in the device.

Table 27-2. Integration Attributes

| Module Instance | Attributes | | |
|---------------------|--------------|--------------------|--------------|
| | Power Domain | Wake-Up Capability | Interconnect |
| KEYBOARD CONTROLLER | PD_WKUP | Yes | L4_WKUP |

Table 27-3. Clocks and Resets

| Clocks | | | | |
|-----------------|-------------------------|--------------------|--------|-------------|
| Module Instance | Destination Signal Name | Source Signal Name | Source | Description |
| | | | | |

Table 27-3. Clocks and Resets (continued)

| | | | | |
|---------------------|----------|---------------|------|---|
| KEYBOARD CONTROLLER | KBD_FCLK | WKUP_32K_FCLK | PRCM | 32-kHz functional clock. For information about power, reset, clock management (PRCM) clock gating and management, see Section 3.1.1.1.4, Clock Domain-Level Clock Management , in Chapter 3, Power, Reset, and Clock Management . |
| KEYBOARD CONTROLLER | KBD_ICLK | WKUP_L4_ICLK2 | PRCM | L4-interconnect interface clock. For information about PRCM clock gating and management, see Section 3.1.1.1.4, Clock Domain-Level Clock Management , in Chapter 3, Power, Reset, and Clock Management . |
| Resets | | | | |
| KEYBOARD CONTROLLER | KBD_RST | WKUP_RST | PRCM | Active low asynchronous general reset. For information about PRCM reset sources and distribution, see Section 3.1.1.1.4, Clock Domain-Level Clock Management , in Chapter 3, Power, Reset, and Clock Management . |

Table 27-4. Hardware Requests

| Interrupt Requests | | | | |
|---------------------------|---------------------------|--------------------------------|--------------------|---|
| Module Instance | Source Signal Name | Destination Signal Name | Destination | Description |
| KEYBOARD CONTROLLER | KBD_CTL_IRQ | MA_IRQ_120 | Cortex™-A9 INTC | Interrupt signal to the interrupt controller (INTC) of the MPU. For information about INTC interrupt control, see Chapter 18, Interrupt Controllers . |

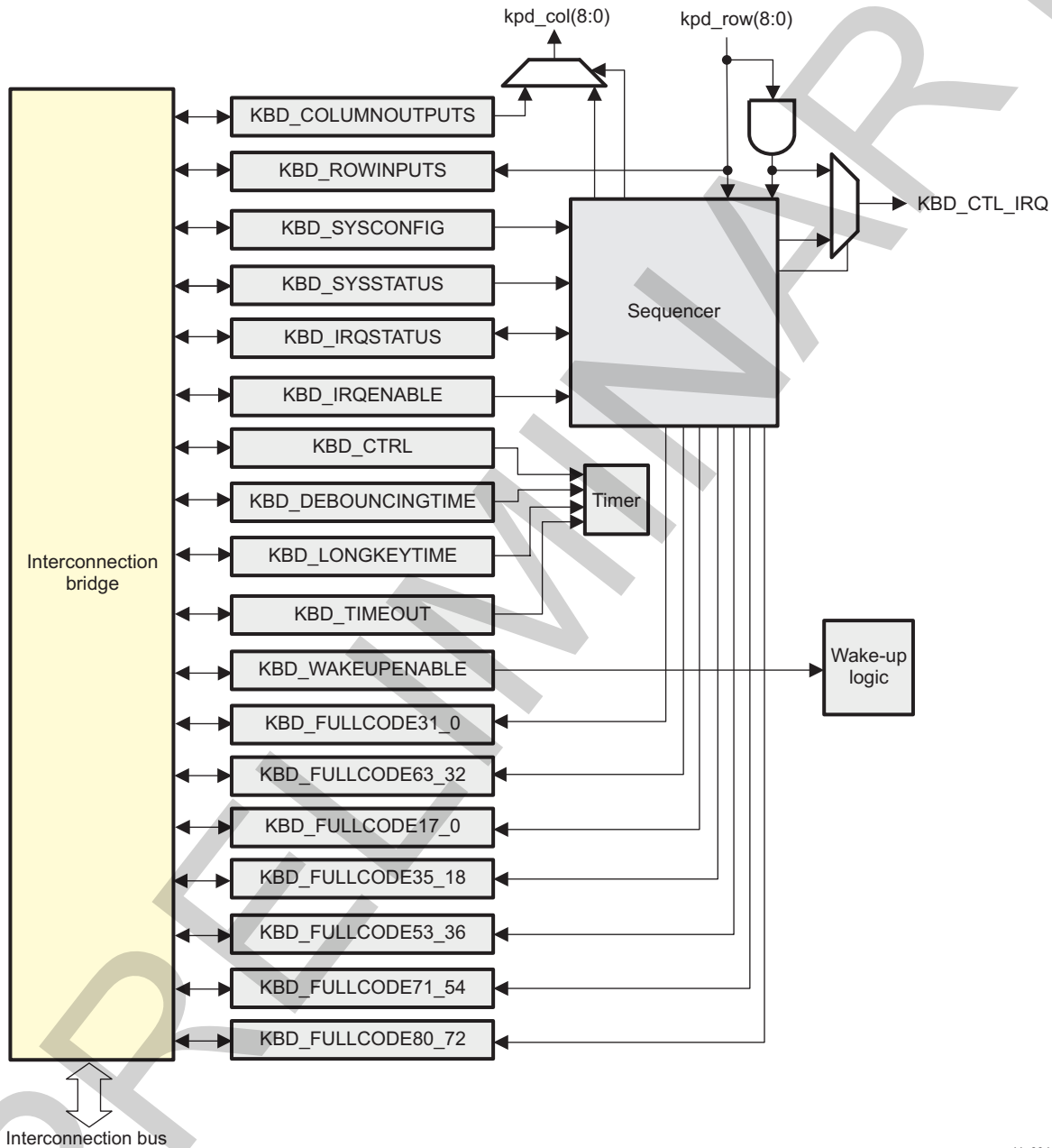
NOTE: For the description of the interrupt source, see [Section 27.4.4, Interrupt Requests](#).

27.4 Keyboard Controller Functional Description

27.4.1 Keyboard Controller Block Diagram

Figure 27-5 shows the functional specification block diagram of the keyboard controller.

Figure 27-5. Keyboard Controller Block Diagram



The keyboard controller detects events issued on any key of the connected keyboard and generates an interrupt to alert the host processor. The built-in hardware-scan algorithm decodes the pressed keys, including multikey combinations.

To reduce MPU software overhead, the hardware performs detecting and decoding in the keyboard controller state-machine. However, hardware decoding can be deactivated so that software handles the scanning algorithm.

The value of the columns output is determined in the [KBD_COLUMNOUTPUTS\[8:0\]](#) KBC_REG bit field. To activate a keypad row-column connection, the corresponding bit must be 0b0.

The following sections describe subfunctions and subfunction interactions (control, data paths).

27.4.2 Keyboard Controller Software Reset

To perform a software reset, set the [KBD_SYSCONFIG\[1\]](#) SOFTRESET bit to 1. The [KBD_SYSSTATUS\[0\]](#) RESETDONE bit indicates that the software reset is complete when its value is 1. When the software reset completes, the [KBD_SYSCONFIG\[1\]](#) SOFTRESET bit is automatically reset. Software must ensure that the software reset completes before performing mailbox operations.

27.4.3 Keyboard Controller Power Management

[Table 27-5](#) describes the power-management features available for the keyboard controller.

NOTE: For information about source clock gating and sleep/wake-up transitions description, see [Section 3.1.1.1.4, Clock Domain-Level Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

Table 27-5. Local Power-Management Features

| Feature | Registers | Description |
|------------------------|---|--|
| Clock autogating | KBD_SYSCONFIG[0] AUTOGATING | This bit allows local power optimization in the module by gating the KBD_ICLK clock upon interface activity, or gating KBD_FCLK upon internal activity. |
| Slave idle modes | KBD_SYSCONFIG[4:3] IDLEMODE | Force-idle, no-idle, and smart-idle modes are available. |
| Clock activity | KBD_SYSCONFIG[9:8] CLOCKACTIVITY | For configuration details, see Table 27-6 . |
| Master standby modes | N/A | N/A |
| Global wake-up enable | KBD_SYSCONFIG[2] ENAWAKEUP | This bit enables the wake-up feature at the module level. If smart-idle mode is selected, this bit provides the option of smart-idle wake-up-capable mode. |
| Wake-up sources enable | KBD_WAKEUPENABLE | This register holds one active-high enable bit per event source able to generate a wake-up signal. |

[Table 27-6](#) lists the clock activity settings.

Table 27-6. Clock Activity Settings

| KBD_SYSCONFIG [9:8] CLOCKACTIVITY Values | Clock State When Module is in IDLE State | | Features Available When Module is in IDLE State | Wake-Up Events |
|---|---|----------|--|---|
| | KBD_ICLK | KBD_FCLK | | |
| 00 | OFF | OFF | None | The wake-up capability of the module is disabled. |
| 10 | OFF | ON | All | Asserting of wake-up signal |
| 01 | ON | OFF | None | The wake-up capability of the module is disabled. |
| 11 | ON | ON | All | Asserting of wake-up signal |

CAUTION

The PRCM module has no hardware means of reading the CLOCKACTIVITY settings. Thus, software must ensure consistent programming between the keyboard controller CLOCKACTIVITY and keyboard controller clock PRCM control bits. For a description of the ClockActivity feature, see [Section 3.1.1.1, Clock Management](#), in [Chapter 3, Power, Reset, and Clock Management](#).

27.4.4 Keyboard Controller Interrupt Requests

[Table 27-7](#) lists the event flags, and their mask, that can cause module interrupts.

Table 27-7. Events

| Event Flag | Event Mask | Description |
|---|--|-------------------------------|
| KBD_IRQSTATUS [3] MISS_EVENT | – | A miss event occurs. |
| KBD_IRQSTATUS [2] IT_TIMEOUT | KBD_IRQENABLE [2] IT_TIMEOUT_EN | A time-out event is detected. |
| KBD_IRQSTATUS [1] IT_LONG_KEY | KBD_IRQENABLE [1] IT_LONG_KEY_EN | A long-key event is detected. |
| KBD_IRQSTATUS [0] IT_EVENT | KBD_IRQENABLE [0] IT_EVENT_EN | An event is detected. |

27.4.5 Keyboard Controller Software Mode

The [KBD_CTRL](#)[1] NSOFTWARE_MODE bit selects software mode when it is set to 0.

In software mode, the keyboard controller internal sequencer, which performs automatic scanning and decoding, is disabled. Consequently, software must manually perform the scanning algorithm.

The scanning sequence is managed using the keyboard controller column outputs register ([KBD_COLUMNOUTPUTS](#)) and the keyboard controller row inputs register ([KBD_ROWINPUTS](#)). In this configuration, the keyboard interrupt is a logical ANDing of all bits of the [KBD_ROWINPUTS](#) register.

For more information about the software scan, see [Section 27.5.1, Keyboard Controller Low-Level Programming Model](#).

27.4.6 Keyboard Controller Hardware Decoding Modes

27.4.6.1 Functional Modes

When running in hardware (default) decoding mode (the [KBD_CTRL](#)[1] NSOFTWARE_MODE bit is set to 1), the keyboard controller offers several functional modes; these modes are summarized in [Table 27-8](#).

The keyboard interrupt depends on the configuration in the keyboard controller interrupt-enable register ([KBD_IRQENABLE](#)). If the event is enabled (bit 0 at 1), an interrupt is generated when the sequencer detects an event. Even if this interrupt is disabled, the flag status of the keyboard controller interrupt-status register ([KBD_IRQSTATUS](#)) is updated.

Table 27-8. Keyboard Controller Functional Modes

| Functional Mode | Associated Interrupt | Associated Timer Value | Description | Control |
|-----------------|----------------------|------------------------|---|---|
| Keyboard event | Event interrupt | Debouncing value | Occurs when a key is pressed or released Always enabled | KBD_CTRL [8:5] bits must be set to 0 to disable all the other features. |
| Long key | Long-key interrupt | Long-key value | Used to detect a key that is pressed for a long time Should be associated with the long-key time-out function or repeat mode | KBD_CTRL [5] LONG_KEY bit |

Table 27-8. Keyboard Controller Functional Modes (continued)

| Functional Mode | Associated Interrupt | Associated Timer Value | Description | Control |
|-------------------|----------------------|-------------------------|--|--|
| Repeat key | Long-key interrupt | Long-key value | Generates an interrupt every long-key delay No time-out can be associated. | KBD_CTRL [8] REPEAT_MODE bit |
| Empty time-out | Time-out interrupt | Empty time-out value | Interrupt generated if no key is pressed during an empty time-out period. | KBD_CTRL [6] TIMEOUT_EMPTY bit |
| Long-key time-out | Time-out interrupt | Long-key time-out value | Associated with the long-key function Generated after a long-key interrupt if no event occurs during a long-key time-out period | KBD_CTRL [7] TIMEOUT_LONG_KEY bit |

Each mode can be activated/deactivated by setting the corresponding bits (5, 6, 7, and 8) in the [KBD_CTRL](#) register with the appropriate values (for more information, see [Section 27.6, Keyboard Controller Register Manual](#)).

27.4.6.2 Keyboard Controller Timer

As described in the previous section, each functional mode is associated with a timer value. Depending on the selected mode, the keyboard controller timer is loaded with the corresponding value as set in the related registers:

- [KBD_DEBOUNCINGTIME](#)
- [KBD_KEYLONGTIME](#)
- [KBD_TIMEOUT](#)

[Table 27-9](#) summarizes the values of the keyboard controller timer.

Table 27-9. Keyboard Controller Timer Values

| Timer Value | Associated Register Field | Description |
|--------------------|--|---|
| Debouncing time | KBD_DEBOUNCINGTIME [5:0] DEBOUNCING_VALUE | To remove the effects of glitches when an event occurs on the keyboard, the controller waits for a debouncing period before taking a snapshot of the current state on the keyboard matrix. The timer is loaded with the debouncing time value after each detected event on the keyboard matrix. An event interrupt is generated after this delay. |
| Long-key time | KBD_KEYLONGTIME [11:0] LONG_KEY_VALUE | This is the delay before generating a long-key interrupt after an event interrupt. If the long-key mode is selected, the timer is loaded with the long-key time value after an event interrupt is generated. In repeat mode, the timer is reloaded with the same value after a long-key interrupt, and starts to count down again. |
| Long-key time-out | KBD_TIMEOUT [15:0] TIMEOUT_VALUE | The timer is loaded with the time-out value and then a long-key interrupt is generated and starts to count down. When it reaches 0, a time-out interrupt is generated and the keyboard controller returns to its IDLE state. This long-key time-out does not work in repeat mode. |
| Empty key time-out | KBD_TIMEOUT [15:0] TIMEOUT_VALUE | The time-out interrupt occurs if no key is pressed during this delay. The keyboard controller then returns to IDLE state. |

The timer countdown period depends on three factors:

- The loaded value as set in:
 - [KBD_DEBOUNCINGTIME](#)
 - [KBD_KEYLONGTIME](#)
 - [KBD_TIMEOUT](#)
- The value of the prescale clock timer as set in the [KBD_CTRL](#)[4:2] PTV bit field. This programmable clock divider allows the reduction of the clock frequency used by the timer.
- The frequency of the keyboard controller functional clock (32 kHz)

The period is calculated as follows:

$$T_{\text{period}} = (T_{\text{value}} + 1) \times 2^{\text{PTV} + 1} \times T_{\text{clk}}$$

Where:

T_{value} is the value stored in the [KBD_DEBOUNCINGTIME](#), [KBD_KEYLONGTIME](#), or [KBD_TIMEOUT](#) register.

PTV is the value of the [KBD_CTRL\[4:2\]](#) register PTV bit field.

T_{clk} is the period of the 32-kHz functional clock; that is, 31.25 μs .

The [KBD_CTRL\[4:2\]](#) PTV bit field determines the division factor of the timer clock. [Table 27-10](#) lists the divider rates.

Table 27-10. Timer Prescale Values

| KBD_CTRL[4:2] PTV Value | Divisor |
|---|---------|
| 0 | 2 |
| 1 | 4 |
| 2 | 8 |
| 3 | 16 |
| 4 | 32 |
| 5 | 64 |
| 6 | 128 |
| 7 | 256 |

NOTE: The timer minimum period is 62.5 μs ; its maximum period is 524.288 seconds.

CAUTION

To prevent undefined results, the [KBD_CTRL\[4:2\]](#) PTV bit field must not be changed when the timer is running.

The timer value registers ([KBD_DEBOUNCINGTIME](#), [KBD_KEYLONGTIME](#), and [KBD_TIMEOUT](#)) can be updated at any time, whether or not the timer is running. Nevertheless, the timer is updated only on the fly for the long-key time value. The new debouncing and time-out values are loaded only on the next load. Depending on the updated register, two cases can occur:

- The [KBD_KEYLONGTIME](#) register is updated; the new value stored in the [KBD_KEYLONGTIME](#) register is loaded into the timer when the register is written. If the timer is already counting down when [KBD_KEYLONGTIME](#) is updated, it counts down from the new value loaded in [KBD_KEYLONGTIME](#).
- The [KBD_DEBOUNCINGTIME](#) or [KBD_TIMEOUT](#) register is updated; the new value is considered only when the next timer loads. If the timer is counting down when the registers are updated, the timer continues counting down from the previous value and is loaded with the new one on the next load.

Regardless of the timer state (stopped, counting down any of the values previously described, etc.), when a new event occurs on the keyboard, the timer is stopped and loaded with the debouncing time value. It then starts counting down.

27.4.6.3 State-Machine Status

To facilitate debugging, each state of the state-machine is coded in a register that indicates the current state of the machine. [Table 27-11](#) lists the corresponding codes.

Table 27-11. State-Machine Values

| KBD_STATEMACHINE[3:0] Value | Description |
|------------------------------------|------------------------------|
| 0x0 | Idle |
| 0x1 | Scanning |
| 0x2 | Load timer debouncing |
| 0x3 | Test timer debouncing |
| 0x4 | Generated interrupt event |
| 0x6 | Load timer long key |
| 0x7 | Test timer long key |
| 0x8 | Generated interrupt long key |
| 0x9 | Load timer time-out |
| 0xA | Test timer time-out |
| 0xB | Generated interrupt time-out |
| 0xF | Other |

27.4.6.4 Keyboard Controller Interrupt Generation

27.4.6.4.1 Interrupt-Generation Scheme

The keyboard controller generates one interrupt signal to external INTC KBD_CTL_IRQ. Each functional mode generates dedicated interrupt events (logged in the [KBD_IRQSTATUS](#) register) that can be masked or unmasked using the [KBD_IRQENABLE](#) register.

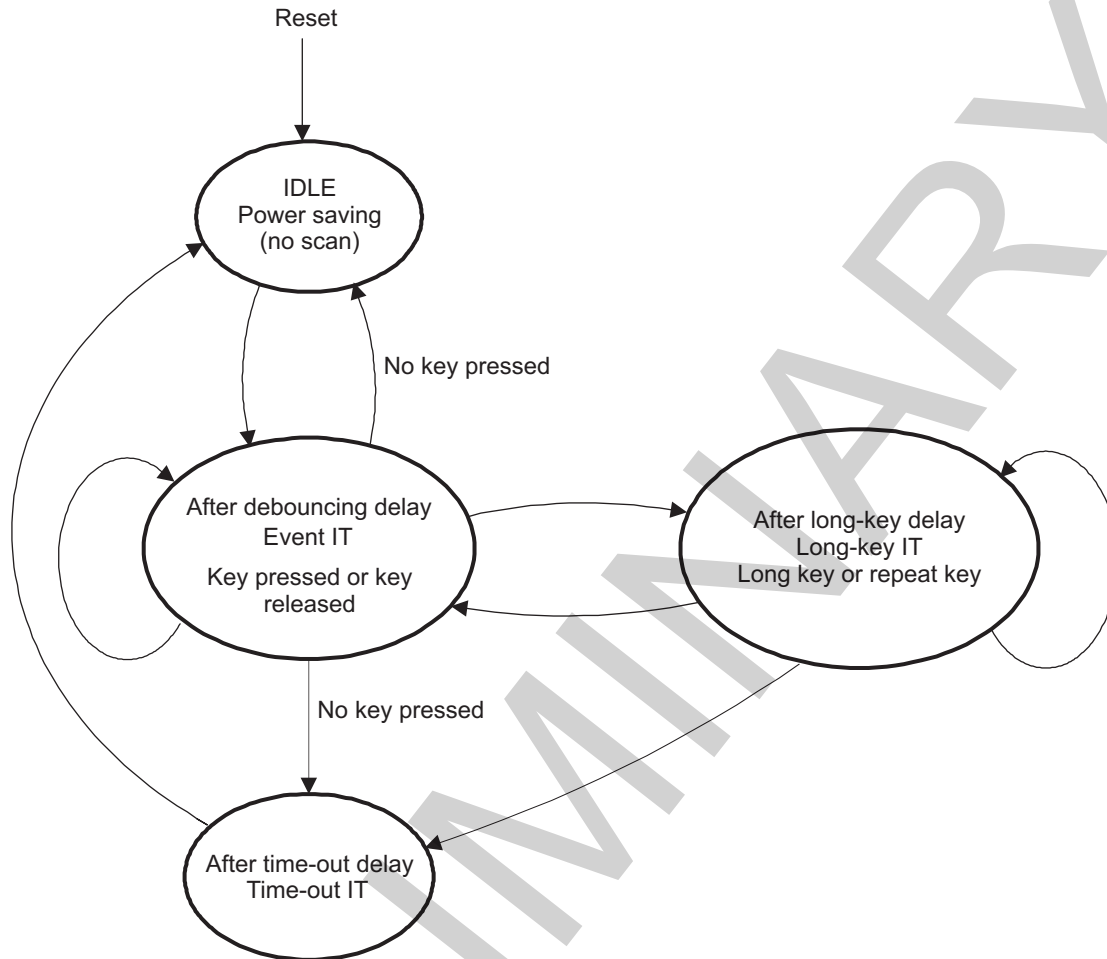
The [KBD_IRQSTATUS](#) register is updated when the selected functional mode generates an interrupt event. However, the KBD_CTL_IRQ signal is asserted on the related event only when the corresponding bit is set in the [KBD_IRQENABLE](#) register.

NOTE: To reset the interrupt status bit, 1 must be written to the appropriate bit of the [KBD_IRQSTATUS](#) read/write register.

[Figure 27-6](#) shows the different interrupt events generated in each keyboard controller functional mode and details the relationships between them.

NOTE: Depending on the selected mode, some interrupt events cannot be generated.

Figure 27-6. Functional Modes and Related Interrupt Events



kb-005

While running in hardware-decoding mode, the keyboard controller performs automatic scans when not in IDLE state. When a key-press event occurs on the keyboard matrix, the keyboard controller leaves IDLE state and an interrupt event (the [KBD_IRQSTATUS\[0\] IT_EVENT](#) bit) is set after the timer counts down the debouncing delay. An IT_EVENT is generated when a key is pressed or released.

NOTE: An IT_EVENT is generated regardless of the selected functional mode. If no time-out is set and no more keys are pressed, the keyboard controller returns to IDLE state.

If long-key detection mode is set when the timer counts down the long-key delay, an interrupt long key (the [KBD_IRQSTATUS\[1\] IT_LONG_KEY](#) bit) is generated. If the repeat mode is set, the IT_LONG_KEY interrupt is generated periodically every long-key delay.

A time-out can also be set in event detection or long-key detection mode. In this case, a time-out interrupt (the [KBD_IRQSTATUS\[2\] IT_TIMEOUT](#) bit) is generated after the time-out delay timer expires. After such an interrupt, the keyboard controller always returns to IDLE state.

NOTE: No time-out can be set in repeat mode. Only a keyboard event can stop the periodic interrupt generation.

27.4.6.4.2 Keyboard Buffer and Missed Events (Overflow Feature)

The keyboard controller has an overrun feature: A dedicated buffer allows the keyboard controller to memorize two successive events. If two successive events occur before a read is performed, the second event is stored and a second interrupt is generated when the first interrupt is cleared, allowing two consecutive key events to be received.

If a third event occurs before the first event is treated, a missed event interrupt (the [KBD_IRQSTATUS\[3\]](#) MISS_EVENT bit) is generated to report the lost event.

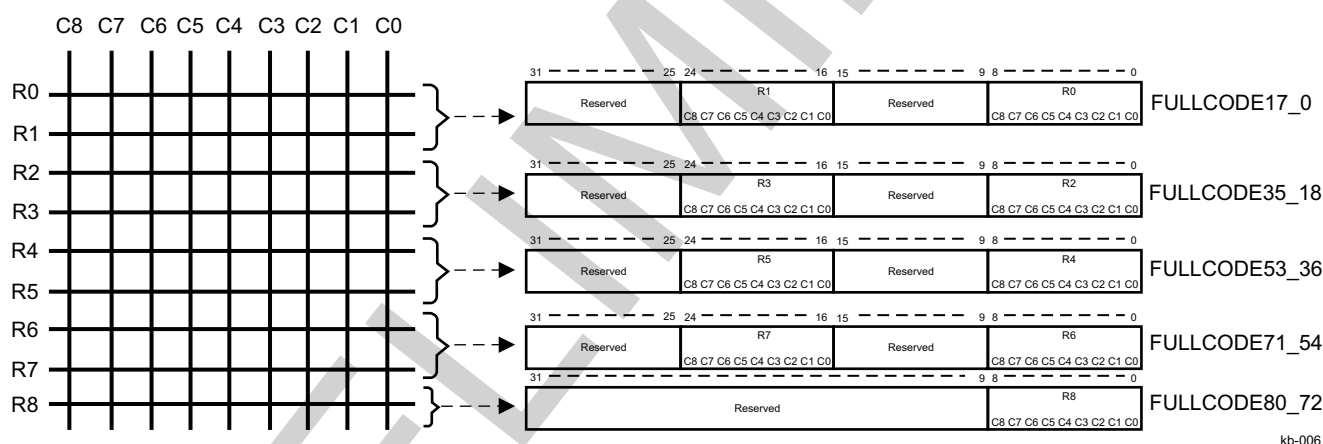
NOTE: The MISS_EVENT interrupt is not routed to the KBD_CTL_IRQ signal; software must check the [KBD_IRQSTATUS\[3\]](#) MISS_EVENT bit to detect any missed events.

27.4.7 Keyboard Controller Key Coding Registers

The keyboard controller matrix pressed keys state (indicating which columns/rows are connected) is reflected in the [KBD_FULLCODE17_0](#) to [KBD_FULLCODE80_72](#) registers, as shown in [Figure 27-7](#). These registers are updated only when interrupt event status is inactive to prevent a lost event.

NOTE: The [KBD_FULLCODE31_0](#) and [KBD_FULLCODE63_32](#) registers, which are limited to supporting keyboards of a maximum 8×8 array size, can be used for back-to-back software compatibility.

Figure 27-7. Key Coding Registers



kb-006

Each of the 9×9 keyboard size supporting registers ([KBD_FULLCODE17_0](#) up to [KBD_FULLCODE71_54](#)) stores the state of two keyboard rows. The [KBD_FULLCODE80_72](#) register stores the state of the last row, R8:

- The [KBD_FULLCODE17_0](#) register code rows 0, 1 (row 0 is coded between bits 0 and 8, row 1 is coded between bits 16 and 24)
- The [KBD_FULLCODE35_18](#) register code rows 2, 3 (row 2 is coded between bits 0 and 8, row 3 is coded between bits 16 and 24)
- The [KBD_FULLCODE53_36](#) register code rows 4, 5 (row 4 is coded between bits 0 and 8, row 5 is coded between bits 16 and 24)
- The [KBD_FULLCODE71_54](#) register code rows 6, 7 (row 6 is coded between bits 0 and 8, row 7 is coded between bits 16 and 24)
- The [KBD_FULLCODE80_72](#) register code row 8 (row 8 is coded between bits 0 and 8)

In each of these registers (excluding [KBD_FULLCODE80_72](#)):

- Bit 0 corresponds to column(0) – row (i) key, ... , bit 8 corresponds to column(8) – row (i) key.
- Bits from 9 to 15 are reserved.

- Bit 16 corresponds to column(0) – row (i+1) key, ... , bit 24 corresponds to column (8) – row (i+1) key.
- Bits 31 to 25 are reserved, where $i = 0, 2, 4, 6$.

In register [KBD_FULLCODE80_72](#) bit 0 corresponds to column (0) – row (8) key, ..., the bit 8 corresponds to column (8) – row (8) key, and the remaining bits (from 9 to 31) are reserved.

Each of the 8×8 -keyboard size supporting registers ([KBD_FULLCODE31_0](#) and [KBD_FULLCODE63_32](#)) stores the state of four keyboard rows:

- The [KBD_FULLCODE31_0](#) register code rows 0, 1, 2, and 3 (row 0 is coded between bits 0 and 7, row 1 is coded between bits 8 and 15, row 2 is coded between bits 16 and 23, and row 3 is coded between bits 24 and 31)
- The [KBD_FULLCODE63_32](#) register code rows 4, 5, 6, and 7 (row 4 is coded between bits 0 and 7, row 5 is coded between bits 8 and 15, row 6 is coded between bits 16 and 23, and row 7 is coded between bits 24 and 31)

In these registers:

- [KBD_FULLCODE31_0](#)[0] corresponds to column (0) – row (0) key,..., [KBD_FULLCODE31_0](#)[7] corresponds to column (7) – row (0).
- [KBD_FULLCODE31_0](#)[8] corresponds to column (0) – row (1) key,..., [KBD_FULLCODE31_0](#)[15] corresponds to column (7) – row (1).
- [KBD_FULLCODE31_0](#)[16] corresponds to column (0) – row (2) key,..., [KBD_FULLCODE31_0](#)[23] corresponds to column (7) – row (2).
- [KBD_FULLCODE31_0](#)[24] corresponds to column (0) – row (3) key,..., [KBD_FULLCODE31_0](#)[31] corresponds to column (7) – row (3).
- [KBD_FULLCODE63_32](#)[0] corresponds to column (0) – row (4) key,..., [KBD_FULLCODE63_32](#)[7] corresponds to column (7) – row (4).
- [KBD_FULLCODE63_32](#)[8] corresponds to column (0) – row (5) key,..., [KBD_FULLCODE63_32](#)[15] corresponds to column (7) – row (5).
- [KBD_FULLCODE63_32](#)[16] corresponds to column (0) – row (6) key,..., [KBD_FULLCODE63_32](#)[23] corresponds to column (7) – row (6).
- [KBD_FULLCODE63_32](#)[24] corresponds to column (0) – row (7) key,..., [KBD_FULLCODE63_32](#)[31] corresponds to column (7) – row (7).

NOTE: The keyboard fullcode registers are not updated in software mode.

NOTE: When using a smaller keyboard (for example, 5×5 or 4×4), the bits of the unused columns/rows are not used either.

27.4.8 Keyboard Controller Register Access

27.4.8.1 Write Registers Access

The keyboard module uses a posted-write scheme to update any internal registers. This means the write transaction is immediately acknowledged on the L4 interface, although the effective write operation occurs later due to a resynchronization in the functional clock domain. This has the advantage of not stalling the interconnect system or the CPU that requested the write transaction. For each functional register, a pending bit is provided that is set if there is a pending write access to this register. The pending bits are accessible in the keyboard pending write register ([KBD_PENDING](#)).

In this mode, it is mandatory that the CPU checks the pending bits before any write access in the functional registers. If a write is attempted to a register with a previous access pending, the previous access is discarded without notice (this can also lead to unexpected results).

A register read following a posted write (on the same register) may not read the previous write value if the write posted process is not complete. Software synchronization must be used to avoid noncoherent read.

This posted period is defined as the interval between the posted write access request and the reset of the pending bit in the [KBD_PENDING](#) register, and can be quantified:

$$T(\text{reset posted bit maximum}) = 3 \times T_{\text{iclk}} + 3 \times T_{\text{funcclk}}$$

The time it takes to accomplish the writing is:

$$T(\text{write accomplish maximum}) = 1 \times T_{\text{iclk}} + 3 \times T_{\text{funcclk}}$$

where:

T_{iclk} is the L4 interface clock period, and T_{funcclk} is the functional clock period.

27.4.8.2 Read Registers Access

The keyboard module uses a posted-read scheme for reading any internal register. The read transaction is immediately acknowledged on the L4 interface. The value of the functional register to be read must be previously synchronized. This has the advantage of not stalling the interconnect system or the CPU that requested the read transaction.

The posted-read scheme can be used only if $\text{Freq}(\text{KBD_FCLK}) < \text{Freq}(\text{KBD_ICLK})/4$.

27.5 Keyboard Controller Programming Guide

27.5.1 Keyboard Controller Low-Level Programming Models

This section describes the low-level hardware programming sequences for the configuration and use of the module.

27.5.1.1 Global Initialization

27.5.1.1.1 Surrounding Modules Global Initialization

This section identifies the requirements for initializing the surrounding modules when the keyboard module is to be used for the first time after a device reset. This initialization of surrounding modules is based on the integration and environment of the keyboard. For more information, see [Section 27.2, Keyboard Controller Environment](#), and [Section 27.3, Keyboard Controller Integration](#).

[Table 27-12](#) describes the global initialization of surrounding modules.

Table 27-12. Global Initialization of Surrounding Modules

| Surrounding Modules | Comments |
|---------------------|---|
| PRCM | The module interface (WKUP_L4_ICLK2) and functional (WKUP_32K_FCLK) clocks must be enabled. See Section 3.10.2.1.2, Clock Management Global Initialization , in Chapter 3, Power, Reset, and Clock Management . |
| Cortex-A9 MPU INTC | Interrupt request KBD_CTL_IRQ from the keyboard must be unmasked. For more information, see Chapter 18, Interrupt Controllers . |
| Control module | The PAD CONFIG registers must be configured in to map the keyboard interface signals on the device pins through the multiplexers (mux mode 0 must be switched on) to determine the signal directions and to enable the internal pullups of the GPIO cells for all the keyboard rows. For more information about configuration, see Section 19.4.8, Pad Functional Multiplexing and Configuration , and Section 26.2.1, General-Purpose Interface as a Keyboard interface . |

27.5.1.1.2 Keyboard Controller Global Initialization

27.5.1.1.2.1 Main Sequence – Keyboard Controller Global Initialization

This procedure initializes the keyboard controller after a POR or software reset (see [Table 27-13](#)).

Table 27-13. Keyboard Controller Global Initialization

| Step | Register/Bit Field/Programming Model | Value |
|---|---|------------|
| Configure the parameters of the L4 interface and enable the clock activity. | KBD_SYSCONFIG | 0x00000– |
| Configure the debouncing time of filtering the glitches on pressing or releasing key. | KBD_DEBOUNCINGTIME [5:0] DEBOUNCING_VALUE | 0x– |
| Configure the duration of a key press to allow shortcut detection (desired value of the long-key interrupt or repeat mode value). | KBD_KEYLONGTIME [11:0] LONG_KEY_VALUE | 0x– |
| Configure the period of the long inactivity on the keyboard (desired value of the time-out interrupt). | KBD_TIMEOUT [15:0] TIMEOUT_VALUE | 0x– |
| Define the logical value of the column outputs (KEYPAD configuration) (logical 0 bit = active column-row). | KBD_COLUMNOUTPUTS [8:0] KBC_REG | 0x– |
| Perform the functional configuration of the keyboard module and the prescale clock timer value. | KBD_CTRL | 0x00000– |
| Clear the interrupt-status register. | KBD_IRQSTATUS | 0x0000000F |
| Enable (0b1)/disable (0b0) certain keyboard events for generating an interrupt request. | KBD_IRQENABLE [2:0] IT_..._EN | 0x– |

Table 27-13. Keyboard Controller Global Initialization (continued)

| Step | Register/Bit Field/Programming Model | Value |
|--|--|-------|
| Unmask (0b1)/mask (0b0) the expected source of wake-up event that generates a wake-up request. | KBD_WAKEUPENABLE [2:0] WUP_..._ENA | 0x– |

27.5.1.2 Operational Modes Configuration

27.5.1.2.1 Keyboard Controller in Hardware Decoding Mode (Default Mode)

27.5.1.2.1.1 Main Sequence – Keyboard Controller Hardware Mode

After reset, all available functional modes are disabled, except detect-event mode, which is always active. [Table 27-14](#) describes the keyboard controller hardware mode.

Table 27-14. Keyboard Controller Hardware Mode

| Step | Register/Bit Field/Programming Model | Value |
|--|--|------------|
| Activate the internal keyboard controller sequencer by setting the bit. | KBD_CTRL [1] NSOFTWARE_MODE | 0b1 |
| Select the functional mode by setting its corresponding bit to 1. | KBD_CTRL [8:5] | 0x– |
| Configure the duration of a key press to allow shortcut detection (desired value of the long-key interrupt or repeat mode value). | KBD_KEYLONGTIME [11:0] LONG_KEY_VALUE | 0x– |
| Configure the period of the long inactivity on the keyboard (desired value of the time-out interrupt). | KBD_TIMEOUT [15:0] TIMEOUT_VALUE | 0x– |
| Configure the debouncing time of filtering the glitches on pressing or releasing key. | KBD_DEBOUNCINGTIME [5:0] DEBOUNCING_VALUE | 0x– |
| Clear the interrupt-status register. | KBD_IRQSTATUS | 0x0000000F |
| Enable (by writing 1)/disable (by writing 0) certain keyboard event for generating an interrupt request | KBD_IRQENABLE [2:0] IT_..._EN | 0x– |
| Unmask (0b1)/mask (0b0) the expected source of wake-up event that generates a wake-up request. | KBD_WAKEUPENABLE [2:0] WUP_..._ENA | 0x– |
| Wait for the KBD_CTL_IRQ interrupt signal assertion. | | |
| Read the interrupt-status register to determine which event caused the interrupt. | KBD_IRQSTATUS | |
| Read the KBD_FULLCODE17_0 to KBD_FULLCODE80_72 registers (or 8 × 8 keyboard-size-supporting KBD_FULLCODE31_0 and KBD_FULLCODE63_32 registers) to determine which key matrix combination was pressed. | KBD_FULLCODE17_0 [ROWi bits] (where i = 0 to 1) up to KBD_FULLCODE71_54 [ROWi bits] (where i = 6 to 7); KBD_FULLCODE80_72 [ROWi bits] (where i = 8); (or KBD_FULLCODE31_0 [j] FULL_CODE_31_0 and KBD_FULLCODE63_32 [k] FULL_CODE_63_32 bits (where j = 0 to 31, k = 32 to 63) | |
| Clear the corresponding bit(s) in the interrupt-status register by writing logical 1. | KBD_IRQSTATUS | 0x1 |

NOTE: The long-key detection mode and the repeat mode cannot be used simultaneously, because they share the same interrupt status bit and are mutually exclusive. Software must ensure that only one of these modes at a time is selected.

NOTE: All interrupts are disabled on reset.

NOTE: When two events occur successively before the first event is read, the second interrupt is generated when the first interrupt is cleared. When more than two events in a row occur, the [KBD_IRQSTATUS\[3\] MISS_EVENT](#) bit is set. Software must check this bit, which is not reflected on the [KBD_CTL_IRQ](#) line.

NOTE: The keyboard controller uses a posted-write scheme to update any internal register. Software must read the pending write status bits to ensure that the next write access is not discarded because of ongoing write synchronization. For more information, see [Section 27.4.8.1, Write Registers Access](#).

27.5.1.2.2 Keyboard Controller Software Scanning Mode

27.5.1.2.2.1 Main Sequence – Keyboard Controller Software Mode

[Table 27-15](#) describes the keyboard controller software mode.

Table 27-15. Keyboard Controller Software Mode

| Step | Register/Bit Field/Programming Model | Value D |
|---|---|---------|
| Deactivate the internal keyboard controller sequencer by clearing the bit. | KBD_CTRL[1] NSOFTWARE_MODE | 0b0 |
| Enable the event interrupt by setting the bit. | KBD_IRQENABLE[0] IT_EVENT_EN | 0b1 |
| Wait for the KBD_CTL_IRQ interrupt signal assertion. Begin the software scan when the interrupt signal is asserted: | | |
| 1) Disable all columns to drive a logical 0 on the kpd_col[8:0] output by writing 0xFF. (logical 1 bit = inactive column-row) | KBD_COLUMNOUTPUTS[8:0] KBC_REG | 0xFF |
| 2) Drive kpd_col(i) output, (where i = 0 to 8), to 0 to capture a pressed-key-event, at the corresponding row input. | KBD_COLUMNOUTPUTS[i] KBC_REG (where i = 0 to 8) | 0b0 |
| 3) Read the KBR_LATCH bit field of the KBD_ROWINPUTS register to determine which is the pressed key. IF: KBR_LATCH k-bit = 0 , where k = 0 to 8 Then, the corresponding k-row is connected to the column being enabled. | KBD_ROWINPUTS[8:0] KBR_LATCH | |
| END IF | | |
| Repeat steps 2) and 3) for all existing columns. | KBD_WAKEUPENABLE[2:0] WUP_..._ENA | 0x– |

NOTE: In software mode, during the manual keyboard scan, an interrupt is generated when a pressed key is detected.

27.5.1.2.3 Using the Timer

For information about programming the keyboard controller timer, see [Section 27.4.6.2, Keyboard Controller Timer](#).

27.5.1.2.4 State-Machine Status Register

To see the state of the state-machine, see [Section 27.4.6.3, State-Machine Status](#).

27.5.1.3 Keyboard Controller Events Servicing

[Table 27-16](#) lists the keyboard controller event servicing.

Table 27-16. Keyboard Controller Event Servicing

| Step | Register/Bit Field/Programming Model | Value |
|--|---|-------------|
| Clear all eventual previous indications of treated interrupts; write the IRQSTATUS register: | KBD_IRQSTATUS | 0x0000000F |
| Enable the desired sources of interrupt by writing in: | KBD_IRQENABLE | 0x00000000– |
| Unmask (enable) the desired sources of interrupt by writing logical 1 in the desired bit fields. | KBD_WAKEUPENABLE | 0x00000000– |
| When event occurs: | | |
| Read the status register. | KBD_IRQSTATUS | |
| IF: KBD_IRQSTATUS [3] MISS_EVENT = 1 | Start the interrupt handler for missed event. | |
| ELSIF: KBD_IRQSTATUS [2] IT_TIMEOUT = 1 | Start the interrupt handler for timeout event. | |
| ELSIF: KBD_IRQSTATUS [1] IT_LONG_KEY = 1 | Start the interrupt handler for long key pressed event. | |
| ELSIF: KBD_IRQSTATUS [0] IT_EVENT = 1 | Start the interrupt handler for pressed key event. | |
| ENDIF | | |
| Wait for the execution of the corresponding interrupt handler. | Interrupt controller of the MPU | |
| Clear the corresponding IRQ status register bits by writing 1 there. | KBD_IRQSTATUS | 0x00000000– |
| Disable the corresponding sources of interrupt if needed by writing 0 at the corresponding bit fields. | KBD_IRQENABLE or KBD_WAKEUPENABLE | 0x00000000– |

27.6 Keyboard Controller Register Manual

27.6.1 Keyboard Controller Instance Summary

Table 27-17 summarizes the keyboard controller instances.

Table 27-17. Keyboard Controller Instance Summary

| Module Name | Base Address | Size |
|---------------------|--------------|------|
| Keyboard controller | 0x4A31 C000 | 4KB |

27.6.2 Keyboard Controller Registers

27.6.2.1 Keyboard Controller Register Summary

Table 27-18 summarizes the keyboard controller register mapping.

Table 27-18. Keyboard Controller Register Mapping Summary

| Register Name | Type | Register Width (Bits) | Address Offset | Keyboard Controller L4_WKUP Base Address |
|--------------------|------|-----------------------|----------------|--|
| KBD_REVISION | R | 32 | 0x0000 0000 | 0x4A31 C000 |
| KBD_SYSCONFIG | RW | 32 | 0x0000 0010 | 0x4A31 C010 |
| KBD_SYSSTATUS | R | 32 | 0x0000 0014 | 0x4A31 C014 |
| KBD_IRQSTATUS | RW | 32 | 0x0000 0018 | 0x4A31 C018 |
| KBD_IRQENABLE | RW | 32 | 0x0000 001C | 0x4A31 C01C |
| KBD_WAKEUPENABLE | RW | 32 | 0x0000 0020 | 0x4A31 C020 |
| KBD_PENDING | R | 32 | 0x0000 0024 | 0x4A31 C024 |
| KBD_CTRL | RW | 32 | 0x0000 0028 | 0x4A31 C028 |
| KBD_DEBOUNCINGTIME | RW | 32 | 0x0000 002C | 0x4A31 C02C |
| KBD_KEYLONGTIME | RW | 32 | 0x0000 0030 | 0x4A31 C030 |
| KBD_TIMEOUT | RW | 32 | 0x0000 0034 | 0x4A31 C034 |
| KBD_STATEMACHINE | R | 32 | 0x0000 0038 | 0x4A31 C038 |
| KBD_ROWINPUTS | R | 32 | 0x0000 003C | 0x4A31 C03C |
| KBD_COLUMNOUTPUTS | RW | 32 | 0x0000 0040 | 0x4A31 C040 |
| KBD_FULLCODE31_0 | R | 32 | 0x0000 0044 | 0x4A31 C044 |
| KBD_FULLCODE63_32 | R | 32 | 0x0000 0048 | 0x4A31 C048 |
| KBD_FULLCODE17_0 | R | 32 | 0x0000 004C | 0x4A31 C04C |
| KBD_FULLCODE35_18 | R | 32 | 0x0000 0050 | 0x4A31 C050 |
| KBD_FULLCODE53_36 | R | 32 | 0x0000 0054 | 0x4A31 C054 |
| KBD_FULLCODE71_54 | R | 32 | 0x0000 0058 | 0x4A31 C058 |
| KBD_FULLCODE80_72 | R | 32 | 0x0000 005C | 0x4A31 C05C |

27.6.2.2 Keyboard Controller Register Description

through describe the individual keyboard module registers.

Table 27-19. KBD_REVISION

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A31 C000 | | | | | | | | | | | | | | | | Instance Keyboard controller | | | | | | | | | | | | | | | |
| Description | This register contains the IP revision code. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| REVISION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|-------------|------|------------------------|
| 31:0 | REVISION | IP revision | R | 0x----- ⁽¹⁾ |

⁽¹⁾ TI internal data**Table 27-20. Register Call Summary for Register KBD_REVISION**

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[0\]](#)

Table 27-21. KBD_SYSCONFIG

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------------|--|
| Address Offset | 0x0000 0010 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A31 C010 | | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | Keyboard controller | |
| Description | This register controls the various parameters of the L4 interface. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----------|----|---------|----|----------|---|-----------|---|-----------|---|------------|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | CLOCKACTIVITY | | RESERVED | | EMUFREE | | IDLEMODE | | ENAWAKEUP | | SOFTRESET | | AUTOGATING | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|---|------|----------|
| 31:10 | RESERVED | Reads return 0. | RW | 0x000000 |
| 9:8 | CLOCKACTIVITY | Clock(s) activity during wake-up mode period. 0x0: Functional clock can be switched off; L4 -nterface clock can be switched-off. 0x1: Functional clock can be switched off; L4 interface clock is maintained during wake-up period. 0x2: Functional clock is maintained during wake-up period; L4 interface clock can be switched off. 0x3: Functional clock is maintained during wake-up period; L4 interface clock is maintained during wake-up period. | RW | 0x0 |
| 7:6 | RESERVED | Write 0s for future compatibility. Reads return 0. | RW | 0x0 |
| 5 | EMUFREE | Emulation mode 0x0: The keyboard module is frozen in emulation mode (PINSUSPENDN signal active). 0x1: The keyboard module runs free, regardless of PINSUSPENDN value. | RW | 0 |

| Bits | Field Name | Description | Type | Reset |
|------|------------|--|------|-------|
| 4:3 | IDLEMODE | Power management, req/ack control 0x0: Force-idle. An idle request is acknowledged unconditionally. 0x1: No-idle. An idle request is never acknowledged. 0x2: Smart-idle. Acknowledgment to an idle request is given based on the internal activity of the module. 0x3: Reserved. Do not use. | RW | 0x0 |
| 2 | ENAWAKEUP | Wake-up feature global control 0x0: No wake-up line assertion in idle mode 0x1: Wake-up line assertion enabled in smart-idle mode | RW | 0 |
| 1 | SOFTRESET | Software reset. This bit is automatically reset by the hardware. During reads, it always return 0. 0x0: Normal mode 0x1: The module is reset. | RW | 0 |
| 0 | AUTOGATING | Internal L4 interface clock gating strategy 0x0: L4 interface clock is free-running. 0x1: Automatic L4 interface clock gating strategy is applied, based on the L4 interface activity. | RW | 1 |

Table 27-22. Register Call Summary for Register KBD_SYSCONFIG

Keyboard Controller Functional Description

- [Keyboard Controller Software Reset: \[0\] \[1\]](#)
- [Keyboard Controller Power Management: \[2\] \[3\] \[4\] \[5\] \[6\]](#)

Keyboard Controller Programming Guide

- [Keyboard Controller Global Initialization: \[7\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[8\]](#)

Table 27-23. KBD_SYSSTATUS

| | | | |
|-------------------------|--|-----------------|---------------------|
| Address Offset | 0x0000 0014 | Instance | Keyboard controller |
| Physical Address | 0x4A31 C014 | | |
| Description | This register controls optional features specific to the timer function. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | RESETDONE |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---|------|-------------|
| 31:1 | RESERVED | Reads return 0. Reserved for L4 interface socket status information. | R | 0x0000 0000 |
| 0 | RESETDONE | Internal reset monitoring Read 0x0: Internal module reset is ongoing. Read 0x1: Reset completed | R | 0 |

Table 27-24. Register Call Summary for Register KBD_SYSSTATUS

Keyboard Controller Functional Description

- [Keyboard Controller Software Reset: \[0\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[1\]](#)

Table 27-25. KBD_IRQSTATUS

| | | | |
|-------------------------|--|-----------------|---------------------|
| Address Offset | 0x0000 0018 | Instance | Keyboard controller |
| Physical Address | 0x4A31 C018 | | |
| Description | The keyboard interrupt-status register is used to determine which of the keyboard events requested an interrupt. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|------------|------------|-------------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | MISS_EVENT | IT_TIMEOUT | IT_LONG_KEY | IT_EVENT |

| Bits | Field Name | Description | Type | Reset |
|------|-------------|---|------|------------|
| 31:4 | RESERVED | Reads return 0. | RW | 0x00000000 |
| 3 | MISS_EVENT | Indicates when a miss event occurs. 0x0: No miss event 0x1: A miss event occurs. | RW | 0 |
| 2 | IT_TIMEOUT | Indicates when a time-out event is detected. 0x0: No time-out event 0x1: A time-out event occurs. | RW | 0 |
| 1 | IT_LONG_KEY | Indicates when a long-key event is detected. 0x0: No long-key event 0x1: A long-key event occurs. | RW | 0 |
| 0 | IT_EVENT | Indicates when an event is detected. 0x0: No event 0x1: An event occurs. | RW | 0 |

Table 27-26. Register Call Summary for Register KBD_IRQSTATUS

Keyboard Controller Functional Description

- [Keyboard Controller Interrupt Requests: \[0\] \[1\] \[2\] \[3\]](#)
- [Functional Modes: \[4\]](#)
- [Interrupt-Generation Scheme: \[5\] \[6\] \[7\] \[8\] \[9\] \[10\]](#)
- [Keyboard Buffer and Missed Events \(Overrun Feature\): \[11\] \[12\]](#)

Keyboard Controller Programming Guide

- [Keyboard Controller Global Initialization: \[13\]](#)
- [Keyboard Controller in Hardware Decoding Mode \(Default Mode\): \[14\] \[15\] \[16\] \[17\]](#)
- [Keyboard Controller Events Servicing: \[18\] \[19\] \[20\] \[21\] \[22\] \[23\] \[24\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[25\]](#)

Table 27-27. KBD_IRQENABLE

| | | | |
|-------------------------|---|-----------------|---------------------|
| Address Offset | 0x0000 001C | Instance | Keyboard controller |
| Physical Address | 0x4A31 C01C | | |
| Description | The keyboard interrupt-enable register lets the user enable certain keyboard event for generating an interrupt request. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----------------|----|-------------|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | IT_TIMEOUT_EN | | IT_LONG_KEY_EN | | IT_EVENT_EN | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|--|------|-------------|
| 31:3 | RESERVED | Reads return 0 | RW | 0x0000 0000 |
| 2 | IT_TIMEOUT_EN | Time-out interrupt enable 0x0: Time-out interrupt disabled 0x1: Time-out interrupt enabled | RW | 0 |
| 1 | IT_LONG_KEY_EN | Long-key interrupt enable 0x0: Long-key interrupt disabled 0x1: Long-key interrupt enabled | RW | 0 |
| 0 | IT_EVENT_EN | Enable event interrupt 0x0: Event interrupt disabled 0x1: Event interrupt enabled | RW | 0 |

Table 27-28. Register Call Summary for Register KBD_IRQENABLE

Keyboard Controller Functional Description

- [Keyboard Controller Interrupt Requests: \[0\] \[1\] \[2\]](#)
- [Functional Modes: \[3\]](#)
- [Interrupt-Generation Scheme: \[4\] \[5\]](#)

Keyboard Controller Programming Guide

- [Keyboard Controller Global Initialization: \[6\]](#)
- [Keyboard Controller in Hardware Decoding Mode \(Default Mode\): \[7\]](#)
- [Keyboard Controller Software Scanning Mode: \[8\]](#)
- [Keyboard Controller Events Servicing: \[9\] \[10\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[11\]](#)

Table 27-29. KBD_WAKEUPENABLE

| | | | |
|-------------------------|--|-----------------|---------------------|
| Address Offset | 0x0000 0020 | Instance | Keyboard controller |
| Physical Address | 0x4A31 C020 | | |
| Description | The keyboard wake-up enable register lets the user mask the expected source of wake-up event that generates a wake-up request. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-----------------|----|----|------------------|----|---------------|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | WUP_TIMEOUT_ENA | | | WUP_LONG_KEY_ENA | | WUP_EVENT_ENA | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|--|------|-------------|
| 31:3 | RESERVED | Reads return 0. | RW | 0x0000 0000 |
| 2 | WUP_TIMEOUT_ENA | Time-out wake-up enable 0x0: Time-out wake-up generation disabled 0x1: Time-out wake-up generation enabled | RW | 0 |
| 1 | WUP_LONG_KEY_ENA | Long-key wake-up enable 0x0: Long-key wake-up generation disabled 0x1: Long-key wake-up generation enabled | RW | 0 |
| 0 | WUP_EVENT_ENA | Event wake-up enable 0x0: Event wake-up generation disabled 0x1: Event wake-up generation enabled | RW | 0 |

Table 27-30. Register Call Summary for Register KBD_WAKEUPENABLE

Keyboard Controller Functional Description

- [Keyboard Controller Power Management: \[0\]](#)

Keyboard Controller Programming Guide

- [Keyboard Controller Global Initialization: \[1\]](#)
- [Keyboard Controller in Hardware Decoding Mode \(Default Mode\): \[2\]](#)
- [Keyboard Controller Software Scanning Mode: \[3\]](#)
- [Keyboard Controller Events Servicing: \[4\] \[5\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[6\]](#)

Table 27-31. KBD_PENDING

| | | | |
|-------------------------|--|-----------------|---------------------|
| Address Offset | 0x0000 0024 | Instance | Keyboard controller |
| Physical Address | 0x4A31 C024 | | |
| Description | Software must read the pending write bits to ensure that following write access is not discarded due to ongoing write synchronization process. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|--------------|---------------|-----------------|-----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | | | | | PEND_TIMEOUT | PEND_LONG_KEY | PEND_DEBOUNCING | PEND_CTRL |

| Bits | Field Name | Description | Type | Reset |
|------|-----------------|---|------|------------|
| 31:4 | RESERVED | Reads return 0. | R | 0x00000000 |
| 3 | PEND_TIMEOUT | Write-pending bit for KBD_TIMEOUT register Read 0x0: No write pending to the KBD_TIMEOUT register Read 0x1: A write is pending to the KBD_TIMEOUT register | R | 0 |
| 2 | PEND_LONG_KEY | Write-pending bit for KBD_KEYLONGTIME register Read 0x0: No write pending to the KBD_KEYLONGTIME register. Read 0x1: A write is pending to the KBD_KEYLONGTIME register | R | 0 |
| 1 | PEND_DEBOUNCING | Write-pending bit for KBD_DEBOUNCINGTIME register Read 0x0: No write pending to the KBD_DEBOUNCINGTIME register Read 0x1: A write is pending to the KBD_DEBOUNCINGTIME register | R | 0 |
| 0 | PEND_CTRL | Write pending bit for KBD_CTRL register Read 0x0: No write pending to the KBD_CTRL register Read 0x1: A write is pending to the KBD_CTRL register | R | 0 |

Table 27-32. Register Call Summary for Register KBD_PENDING

Keyboard Controller Functional Description

- [Write Registers Access: \[0\] \[1\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[2\]](#)

Table 27-33. KBD_CTRL

| | | | |
|------------------|--|----------|---------------------|
| Address Offset | 0x0000 0028 | Instance | Keyboard controller |
| Physical Address | 0x4A31 C028 | | |
| Description | This register sets the functional configuration of the module. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|-------------|------------------|---------------|----------|-----|---|---|----------------|----------|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | REPEAT_MODE | TIMEOUT_LONG_KEY | TIMEOUT_EMPTY | LONG_KEY | PTV | | | NSOFTWARE_MODE | RESERVED |

| Bits | Field Name | Description | Type | Reset |
|------|------------------|---|------|----------|
| 31:9 | RESERVED | Reads return 0. | RW | 0x000000 |
| 8 | REPEAT_MODE | Repeat mode enable 0x0: Repeat mode detection disabled 0x1: Repeat mode detection enabled | RW | 0 |
| 7 | TIMEOUT_LONG_KEY | Time-out long key mode enable 0x0: Time-out long key mode disabled 0x1: Time-out long key mode enabled | RW | 0 |
| 6 | TIMEOUT_EMPTY | Time-out empty mode enable 0x0: Time-out long key mode disabled 0x1: Time-out long key mode enabled | RW | 0 |
| 5 | LONG_KEY | Long-key mode enable. 0x0: Long-key mode disabled 0x1: Long-key mode enabled | RW | 0 |
| 4:2 | PTV | Prescale clock timer value | RW | 0x7 |
| 1 | NSOFTWARE_MODE | Select hardware or software mode for key decoding. 0x0: Enable software mode. 0x1: Enable hardware decoding using internal sequencer. | RW | 1 |
| 0 | RESERVED | Reads return 0. | RW | 0 |

Table 27-34. Register Call Summary for Register KBD_CTRL

Keyboard Controller Functional Description

- [Keyboard Controller Software Mode: \[0\]](#)
- [Functional Modes: \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\]](#)
- [Keyboard Controller Timer: \[8\] \[9\] \[10\] \[11\] \[12\]](#)

Keyboard Controller Programming Guide

- [Keyboard Controller Global Initialization: \[13\]](#)
- [Keyboard Controller in Hardware Decoding Mode \(Default Mode\): \[14\] \[15\]](#)
- [Keyboard Controller Software Scanning Mode: \[16\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[17\]](#)
- [Keyboard Controller Register Description: \[18\] \[19\] \[20\]](#)

Table 27-35. KBD_DEBOUNCINGTIME

| Address Offset | 0x0000 002C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----------|---------------------|----|----|----|---|------|------------------|------------|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|----------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------|--|--|--|--|--|--|--|
| Physical Address | 0x4A31 C02C | | | | | | | | | | | | | | | | Instance | Keyboard controller | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | This register is used to filter glitches on the press key or release key. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | RW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td colspan="24">RESERVED</td><td colspan="8">DEBOUNCING_VALUE</td></tr></table> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | RESERVED | | | | | | | | | | | | | | | | | | | | | | | | DEBOUNCING_VALUE | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | DEBOUNCING_VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | Description | | | | | | | | | | | | | | | | | | | | Type | | Reset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31:6 | RESERVED | | Reads return 0. | | | | | | | | | | | | | | | | | | | | RW | | 0x00000000 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5:0 | DEBOUNCING_VALUE | | This value corresponds to the desired value of debouncing time. | | | | | | | | | | | | | | | | | | | | RW | | 0x00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 27-36. Register Call Summary for Register KBD_DEBOUNCINGTIME

Keyboard Controller Functional Description

- [Keyboard Controller Timer: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\]](#)

Keyboard Controller Programming Guide

- [Keyboard Controller Global Initialization: \[6\]](#)
- [Keyboard Controller in Hardware Decoding Mode \(Default Mode\): \[7\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[8\]](#)
- [Keyboard Controller Register Description: \[9\] \[10\] \[11\]](#)

Table 27-37. KBD_KEYLONGTIME

| | | | |
|-------------------------|---|-----------------|---------------------|
| Address Offset | 0x0000 0030 | Instance | Keyboard controller |
| Physical Address | 0x4A31 C030 | | |
| Description | This register is used to measure duration of a key press to allow shortcut detection. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | LONG_KEY_VALUE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|----------------|---|------|---------|
| 31:12 | RESERVED | Reads return 0. | RW | 0x00000 |
| 11:0 | LONG_KEY_VALUE | This value corresponds to the desired value of the long-key interrupt or repeat mode value. | RW | 0x000 |

Table 27-38. Register Call Summary for Register KBD_KEYLONGTIME

Keyboard Controller Functional Description

- [Keyboard Controller Timer: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\] \[7\] \[8\]](#)

Keyboard Controller Programming Guide

- [Keyboard Controller Global Initialization: \[9\]](#)
- [Keyboard Controller in Hardware Decoding Mode \(Default Mode\): \[10\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[11\]](#)
- [Keyboard Controller Register Description: \[12\] \[13\] \[14\]](#)

Table 27-39. KBD_TIMEOUT

| | | | |
|-------------------------|--|-----------------|---------------------|
| Address Offset | 0x0000 0034 | Instance | Keyboard controller |
| Physical Address | 0x4A31 C034 | | |
| Description | This register is used to detect a long inactivity on the keyboard. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | TIMEOUT_VALUE | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|---------------|--|------|--------|
| 31:16 | RESERVED | Reads return 0. | RW | 0x0000 |
| 15:0 | TIMEOUT_VALUE | This value corresponds to the desired value of the time-out interrupt. | RW | 0x0000 |

Table 27-40. Register Call Summary for Register KBD_TIMEOUT

Keyboard Controller Functional Description

- [Keyboard Controller Timer: \[0\] \[1\] \[2\] \[3\] \[4\] \[5\] \[6\]](#)

Keyboard Controller Programming Guide

- [Keyboard Controller Global Initialization: \[7\]](#)
- [Keyboard Controller in Hardware Decoding Mode \(Default Mode\): \[8\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[9\]](#)
- [Keyboard Controller Register Description: \[10\] \[11\] \[12\]](#)

Table 27-41. KBD_STATEMACHINE

| | | | |
|-------------------------|---|-----------------|---------------------|
| Address Offset | 0x0000 0038 | Instance | Keyboard controller |
| Physical Address | 0x4A31 C038 | | |
| Description | This register indicates the state of the sequencer. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---------------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | STATE_MACHINE | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|---------------|---|------|-----------|
| 31:4 | RESERVED | Reads return 0. | R | 0x0000000 |
| 3:0 | STATE_MACHINE | The state of internal state machine. See Section 27.5.1.2.4, State-Machine Status Register , for details. | R | 0x0 |

Table 27-42. Register Call Summary for Register KBD_STATEMACHINE

Keyboard Controller Functional Description

- [State-Machine Status: \[0\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[1\]](#)

Table 27-43. KBD_ROWINPUTS

| | | | |
|-------------------------|---|-----------------|---------------------|
| Address Offset | 0x0000 003C | Instance | Keyboard controller |
| Physical Address | 0x4A31 C03C | | |
| Description | This register stores the value of the row inputs. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|-----------|---|---|---|---|---|---|---|---|--|--|--|--|--|--|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | KBR_LATCH | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|------------------------------|------|-----------|
| 31:9 | RESERVED | Reads return 0. | R | 0x0000000 |
| 8:0 | KBR_LATCH | The value of the rows input. | R | 0x00 |

Table 27-44. Register Call Summary for Register KBD_ROWINPUTS

| |
|---|
| Keyboard Controller Functional Description |
| • Keyboard Controller Software Mode: [0] [1] |
| Keyboard Controller Programming Guide |
| • Keyboard Controller Software Scanning Mode: [2] [3] |
| Keyboard Controller Register Manual |
| • Keyboard Controller Register Summary: [4] |

Table 27-45. KBD_COLUMNOUTPUTS

| | | | |
|------------------|--|----------|---------------------|
| Address Offset | 0x0000 0040 | Instance | Keyboard controller |
| Physical Address | 0x4A31 C040 | | |
| Description | This register holds the value of the columns output. | | |
| Type | RW | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---------|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | KBC_REG | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|------------|---------------------------------|------|----------|
| 31:9 | RESERVED | Reads return 0. | RW | 0x000000 |
| 8:0 | KBC_REG | The value of the columns output | RW | 0x00 |

Table 27-46. Register Call Summary for Register KBD_COLUMNOUTPUTS

| |
|---|
| Keyboard Controller Functional Description |
| • Keyboard Controller Block Diagram: [0] |
| • Keyboard Controller Software Mode: [1] |
| Keyboard Controller Programming Guide |
| • Keyboard Controller Global Initialization: [2] |
| • Keyboard Controller Software Scanning Mode: [3] [4] |
| Keyboard Controller Register Manual |
| • Keyboard Controller Register Summary: [5] |

Table 27-47. KBD_FULLCODE31_0

| | | | |
|-------------------------|---|-----------------|---------------------|
| Address Offset | 0x0000 0044 | Instance | Keyboard controller |
| Physical Address | 0x4A31 C044 | | |
| Description | The KBD_FULLCODE31_0 register codes the row 0, row 1, row 2, and row 3. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FULL_CODE_31_0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|------|----------------|---|------|-------------|
| 31:0 | FULL_CODE_31_0 | A bit set to 1 indicates that the corresponding key is pressed. | R | 0x0000 0000 |

Table 27-48. Register Call Summary for Register KBD_FULLCODE31_0

| |
|--|
| Keyboard Controller Functional Description |
| • Keyboard Controller Key Coding Registers: [0] [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] |
| Keyboard Controller Programming Guide |
| • Keyboard Controller in Hardware Decoding Mode (Default Mode): [11] [12] |

Keyboard Controller Register Manual

- ## Keyboard Controller Functional Description

- Keyboard Controller Programming Guide

- Keyboard Controller Register Manual

Table 27-52. Register Call Summary for Register KBD_FULLCODE17_0

Keyboard Controller Functional Description

- [Keyboard Controller Key Coding Registers: \[0\] \[1\] \[2\]](#)

Keyboard Controller Programming Guide

- [Keyboard Controller in Hardware Decoding Mode \(Default Mode\): \[3\] \[4\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[5\]](#)
- [Keyboard Controller Register Description: \[6\]](#)

Table 27-53. KBD_FULLCODE35_18

| | | | |
|------------------|---|----------|---------------------|
| Address Offset | 0x0000 0050 | Instance | Keyboard controller |
| Physical Address | 0x4A31 C050 | | |
| Description | The KBD_FULLCODE35_18 register codes row 2 and row 3. Row 2 is coded between bit 0 and 8; row 3 is coded between bit 24 and 16 | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | ROW3 | | | | | | | | RESERVED | | | | | | | | ROW2 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:25 | RESERVED | Reserved. Read returns 0. | RO | 0x00 |
| 24:16 | ROW3 | A bit set to 1 indicates that the corresponding key is pressed. | R | 0x000 |
| 15:9 | RESERVED | Reserved | R | 0x00 |
| 8:0 | ROW2 | A bit set to 1 indicates that the corresponding key is pressed. | R | 0x000 |

Table 27-54. Register Call Summary for Register KBD_FULLCODE35_18

Keyboard Controller Functional Description

- [Keyboard Controller Key Coding Registers: \[0\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[1\]](#)
- [Keyboard Controller Register Description: \[2\]](#)

Table 27-55. KBD_FULLCODE53_36

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--|----|----|----|----|----|----|---|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|------|------|---|---|---|---|---|-------|---|---------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Address Offset | 0x0000 0054 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Address | 0x4A31 C054 | | | | | | | | | | | | | | | Instance | | | | | | | | | | | | | | | | Keyboard controller | | | | | | | | | | | | | | | |
| Description | The KBD_FULLCODE53_36 register codes row 4 and row 5. Row 4 is coded between bit 0 and 8; row 5 is coded between bit 24 and 16. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | | | | | | | | | | | | | | | | |
| RESERVED | | | | | | | | ROW5 | | | | | | | | RESERVED | | | | | | | | ROW4 | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bits | Field Name | | | | | | | Description | | | | | | | | | | | | | | | Type | | | | | | | Reset | | | | | | | | | | | | | | | | | |
| 31:25 | RESERVED | | | | | | | Reserved. Read returns 0. | | | | | | | | | | | | | | | RO | | | | | | | 0x00 | | | | | | | | | | | | | | | | | |
| 24:16 | ROW5 | | | | | | | A bit set to 1 indicates that the corresponding key is pressed. | | | | | | | | | | | | | | | R | | | | | | | 0x000 | | | | | | | | | | | | | | | | | |
| 15:9 | RESERVED | | | | | | | Reserved | | | | | | | | | | | | | | | R | | | | | | | 0x00 | | | | | | | | | | | | | | | | | |
| 8:0 | ROW4 | | | | | | | A bit set to 1 indicates that the corresponding key is pressed. | | | | | | | | | | | | | | | R | | | | | | | 0x000 | | | | | | | | | | | | | | | | | |

Table 27-56. Register Call Summary for Register KBD_FULLCODE53_36

| |
|---|
| Keyboard Controller Functional Description |
| • Keyboard Controller Key Coding Registers: [0] |
| Keyboard Controller Register Manual |
| • Keyboard Controller Register Summary: [1] |
| • Keyboard Controller Register Description: [2] |

Table 27-57. KBD_FULLCODE71_54

| | | | |
|------------------|--|----------|---------------------|
| Address Offset | 0x0000 0058 | Instance | Keyboard controller |
| Physical Address | 0x4A31 C058 | | |
| Description | The KBD_FULLCODE71_54 register codes row 6 and row 7. Row 6 is coded between bit 0 and 8; row 7 is coded between bit 24 and 16. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|----------|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | ROW7 | | | | | | | | RESERVED | | | | | | | | ROW6 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|-------|
| 31:25 | RESERVED | Reserved. Read returns 0. | RO | 0x00 |
| 24:16 | ROW7 | A bit set to 1 indicates that the corresponding key is pressed. | R | 0x000 |
| 15:9 | RESERVED | Reserved | R | 0x00 |
| 8:0 | ROW6 | A bit set to 1 indicates that the corresponding key is pressed. | R | 0x000 |

Table 27-58. Register Call Summary for Register KBD_FULLCODE71_54

| |
|---|
| Keyboard Controller Functional Description |
| • Keyboard Controller Key Coding Registers: [0] [1] |
| Keyboard Controller Programming Guide |
| • Keyboard Controller in Hardware Decoding Mode (Default Mode): [2] |
| Keyboard Controller Register Manual |
| • Keyboard Controller Register Summary: [3] |
| • Keyboard Controller Register Description: [4] |

Table 27-59. KBD_FULLCODE80_72

| | | | |
|------------------|---|----------|---------------------|
| Address Offset | 0x0000 005C | | |
| Physical Address | 0x4A31 C05C | Instance | Keyboard controller |
| Description | The KBD_FULLCODE80_72 register codes row 8. Row 8 is coded between bit 0 and 8. | | |
| Type | R | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|------|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| RESERVED | | | | | | | | | | | | | | | | | | | | | | | | ROW8 | | | | | | | |

| Bits | Field Name | Description | Type | Reset |
|-------|------------|---|------|----------|
| 31: 9 | RESERVED | Reserved. Read returns 0. | RO | 0x000000 |
| 8:0 | ROW8 | A bit set to 1 indicates that the corresponding key is pressed. | R | 0x000 |

Table 27-60. Register Call Summary for Register KBD_FULLCODE80_72

Keyboard Controller Functional Description

- [Keyboard Controller Key Coding Registers: \[0\] \[1\] \[2\] \[3\] \[4\]](#)

Keyboard Controller Programming Guide

- [Keyboard Controller in Hardware Decoding Mode \(Default Mode\): \[5\] \[6\]](#)

Keyboard Controller Register Manual

- [Keyboard Controller Register Summary: \[7\]](#)
 - [Keyboard Controller Register Description: \[8\]](#)
-

PRELIMINARY

Initialization

This chapter introduces the steps in the general-purpose (GP) device initialization.

| Topic | Page |
|--|------|
| 28.1 Initialization Overview | 5478 |
| 28.2 Preinitialization | 5480 |
| 28.3 Reset Sequences | 5497 |
| 28.4 Device Initialization by ROM Code | 5498 |
| 28.5 Services for HLOS Support | 5564 |

28.1 Initialization Overview

This chapter provides an overview of the requirements for initializing the device from power on to OS/application execution. It provides an overview of the overall initialization process, including hardware- and software-related steps, a general overview of the ROM code operational requirements, and the behavior expectations.

28.1.1 Terminology

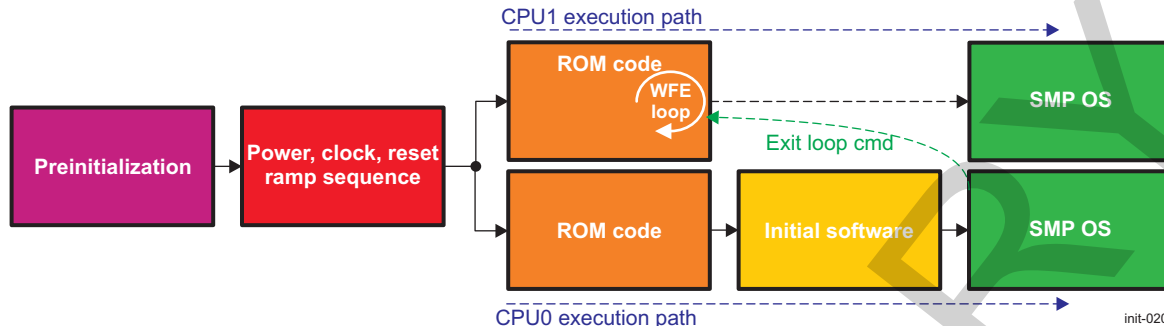
- **Bootstrap:** Initial software launched by the ROM code during the memory booting phase
- **Configuration Header (CH):** Optional structure, that precedes the initial software and allows the redefinition of the ROM code default settings
- **Downloaded software:** Initial software downloaded into the internal static RAM (SRAM) by the ROM code during the peripheral booting phase
- **eFuse:** A one-time programmable memory location usually set at the factory
- **Flash loader:** Downloaded software launched by the ROM code in preflashing. It also programs an image in external memories.
- **GP device:** General-purpose device
- **Initial software:** Software executed by any of the ROM code mechanisms (memory booting or peripheral booting). Initial software is a generic term for bootstrap and downloaded software.
- **Memory booting:** ROM code mechanism that consists of executing initial software from external memory
- **Master CPU:** The ARM® Cortex™-A9 MPCore™ CPU for which CPU-ID is 0. It configures the multicore platform and starts the ROM code to ensure device booting from a mass storage memory (memory booting) or a peripheral interface (peripheral booting).
- **Peripheral booting:** ROM code mechanism that consists of polling selected interfaces, downloading, and executing initial software (in this case, downloaded software) in the internal RAM
- **Permanent booting device:** Memory device containing, by default, the image to be executed during the booting sequence. It is the default memory booting device. The permanent booting device is used after warm reset if no software booting configuration is programmed.
- **Preflashing:** A specific case of peripheral booting where the ROM code mechanism is used to program the external flash memory
- **ROM Code:** The on-chip software in OMAP™ ROM that implements booting
- **Save-And-Restore (SAR RAM) memory:** On-chip RAM memory that is not cleared after warm resets or wakeups from low-power modes
- **Slave CPU:** The ARM Cortex-A9 MPCore CPU for which CPU-ID is 1. It is brought to the wait-for-event (WFE) state by the ROM code, waiting to be woken up by the master CPU.
- **Software booting configuration:** A logical structure stored in the SAR memory that allows the redefinition of the ROM code default settings when booting after a warm reset

28.1.2 Initialization Process

Figure 28-1 is an overview of the initialization process and its steps:

- **Preinitialization:** Power, clock, and control connections must be present, and the boot configuration pins must be held at the desired logical levels.
- **Power, clock, reset ramp sequence:** Specific sequence that is applied by the power-management chip
- **ROM code:** Responsible for finding/downloading and for executing the initial software by using the master CPU
- **Initial software:** Software that prepares and passes control to application software or to the high-level operating system (HLOS)
- **Symmetric multiprocessing (SMP)-capable HLOS** or application (primarily for diagnostics)

Figure 28-1. Initialization Process



The first two steps in the initialization process are hardware-oriented; however, they require understanding of the process of configuring these system interface pins (balls on the device), which have software-configurable functionality. This configuration is an essential part of the chip configuration and is application-dependent. This chapter discusses these pins and the associated configuration registers that are vital to the correct initialization of the device.

28.2 Preinitialization

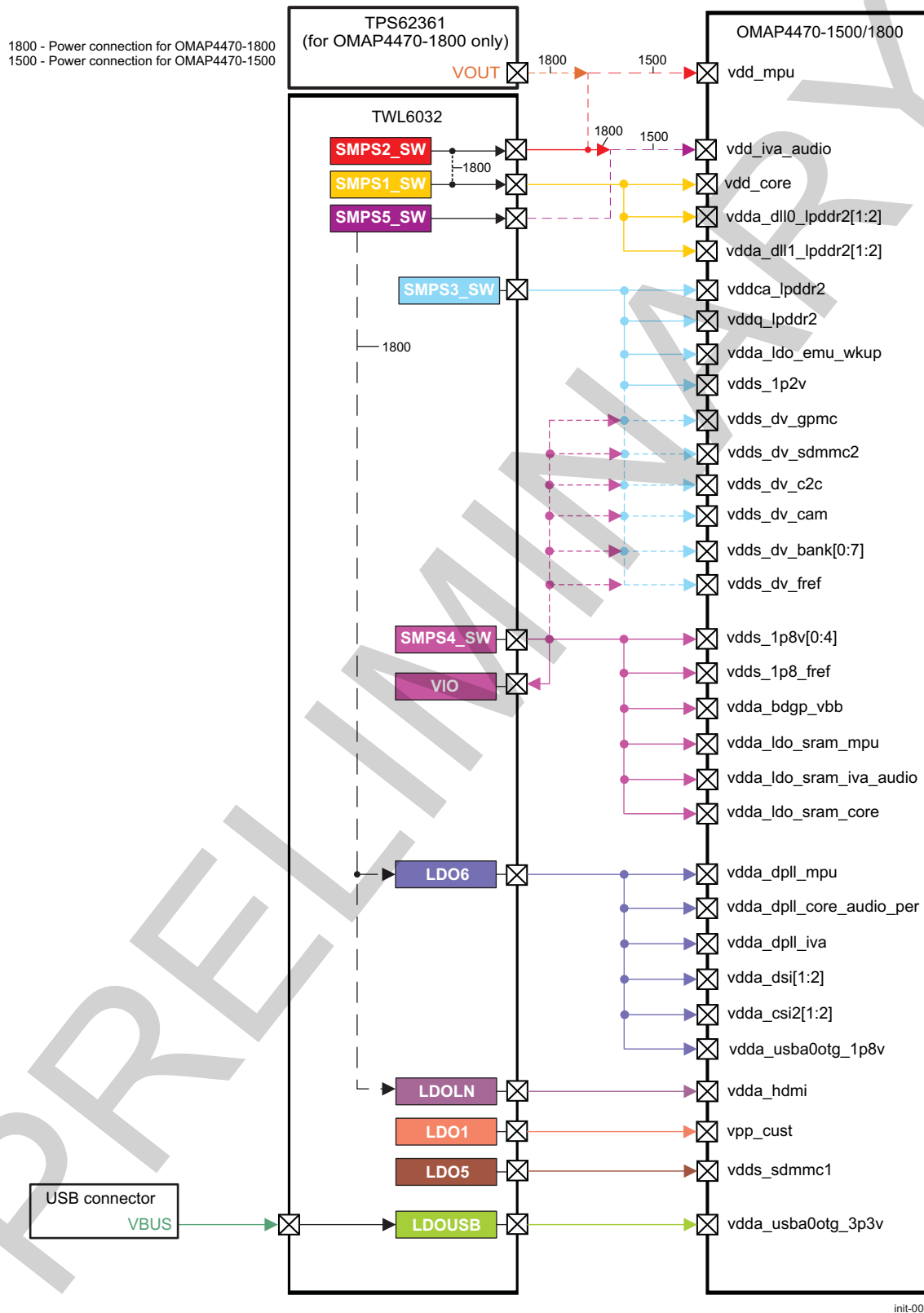
To accomplish a successful boot-up operation with a general-purpose (GP) device, certain hardware configuration settings must be in place. Clock, reset, and power connections, as well as pins involved in setting the boot memory space for the master CPU, must be connected and driven correctly to successfully initialize the device. The following sections describe the specific requirements for the preinitialization stage.

28.2.1 Power Requirements

The device can be supplied by an external power-management integrated circuit (PMIC). TI provides a global solution with the device connected to the TWL6032 power-management/TWL6041 audio codec IC.

[Figure 28-2](#) shows the power connections between the OMAP device and the TWL6032 power IC.

Figure 28-2. Power Supply Connections



NOTE: Figure 28-2 is an example of power connections between the device and the TWL6032. These connections depend on the actual application.

Table 28-1 describes the device power balls.

Table 28-1. OMAP Power Balls ⁽¹⁾

| Voltage Ball Name | Domain |
|--|---|
| vdd_core | <ul style="list-style-type: none"> Core |
| vdd_mpu | <ul style="list-style-type: none"> Dual MPU core NEON |
| vdd_iva_audio | <ul style="list-style-type: none"> IVA HD DSP Audio back-end (ABE) Wake-up logic |
| vdda_ldo_emu_wkup | <ul style="list-style-type: none"> Wakeup Emulation subsystem |
| vddq_lpddr2 | LPDDR2 DQ I/Os (OMAP side only) |
| vddca_lpddr2 | LPDDR2 CA I/Os (OMAP side only) |
| vddq_vref_lpddr21 vddq_vref_lpddr21 | Supplies VDDQ_VREF generator |
| vddca_vref_lpddr21 vddca_vref_lpddr21 | Supplies VDDCA_VREF generator |
| vdda_dli0_lpddr21 vdda_dli0_lpddr22 vdda_dli1_lpddr21 vdda_dli1_lpddr22 | <ul style="list-style-type: none"> LPDDR21 DLL LPDDR22 DLL |
| vdds_1p8v[0:4] | 1.8-V I/O: <ul style="list-style-type: none"> HDMI CEC/DDC/HPD I2C2 and HDQ Sys JTAG DPM |
| vdds_1p2v | 1.2-V I/O: USB3/4_HSIC |
| vdda_dsi1 | DSI1 I/Os + ADPLL |
| vdda_dsi2 | DSI2 I/Os + ADPLL |
| vdda_csi21 | CSI21 I/Os |
| vdda_csi22 | CSI22 I/Os |
| vdda_hdmi | HDMI PHY + ADPLL |
| vdda_usba_otg_1p8v | USB PHY common module + ADPLL |
| vdda_usba0_otg_3p3v | USB PHY core module ⁽²⁾ |
| vpp_cust | Customer eFuse program module |
| vdds_sdmmc1 | SD/MMC1 I/Os |
| vdda_dpll_iva_per | <ul style="list-style-type: none"> ADPLL PER and ADPLL IVA |
| vdda_dpll_core_audio | <ul style="list-style-type: none"> ADPLL CORE and ADPLL ABE |
| vdda_dpll_mpu | <ul style="list-style-type: none"> DPLL MPU |
| vdda_ldo_sram_mpu | Internal MPU SRAM LDO |
| vdda_ldo_sram_iva_audio | Internal IVA and ABE SRAM LDOs |

⁽¹⁾ The package-on-package (POP) device provides feedthroughs from the bottom of the package to the POP interface. Among these feedthroughs (FEEDTHROUGH balls), several provide power to the top memory device. The correct power supply to the feedthroughs must be provided based on memory requirements.

⁽²⁾ Ensure that the USBPHY_PD bit is set to 1 before the 3.3-V power supply (vdda_usba0otg_3p3v) to USB PHY is shut down. If this bit remains at 0 after the 3.3-V power supply is shut down and the 1.8-V supply to USB is on, some leakage might be seen on the 3.3-V supply.

Table 28-1. OMAP Power Balls ⁽¹⁾ (continued)

| Voltage Ball Name | Domain |
|--------------------|---|
| vdda_ldo_sram_core | Internal Core SRAM LDO |
| vdda_bdgp_vbb | Bandgap and Bodybias LDO |
| vdds_dv_gpmc | GPMC I/Os |
| vdds_dv_sdmmc2 | SD/MMC2 I/Os |
| vdds_dv_cam | Camera I/Os: <ul style="list-style-type: none"> fref_clk1_out/fref_clk2_out strobe/shutter/global reset I2C3 |
| vdds_dv_bank0 | Bank 0 of I/Os: usb3_ulpitll, HSI, McBSP4/3 I/Os (modem connectivity) |
| vdds_dv_bank1 | Bank 1 of I/Os: MCBSP1/2, UART2 I/Os (typically used for BT/GPS connectivity) |
| vdds_dv_bank2 | Bank 2 of I/Os: MCPDM, DMIC, I2C1, SmartReflex™ I/Os (TWL6032/TWL6041 connectivity) |
| vdds_dv_bank3 | Bank 3 of I/Os: MCSPI1 I/Os (low bandwidth peripheral connectivity) |
| vdds_dv_bank4 | Bank 4 of I/Os: SDMMC5 I/Os |
| vdds_dv_bank5 | Bank 5 of I/Os: I2C4, MCSPI4, UART4 I/Os |
| vdds_dv_bank6 | Bank 6 of I/Os: USB4 ULPI TLL, SDMMC3, SDMMC4 I/Os |
| vdds_dv_bank7 | Bank 7 of I/Os: Keyboard I/Os |
| vdds_dv_c2c | Chip-to-chip (C2C) I/Os |
| vdds_dv_fref | fref dual voltage I/Os: fref_clk[3:4]_out/fref_clk[3:4]_req |
| vdds_1p8_fref | Oscillator, slicer, fref_clk0_out, and fref_clk_ioreq |

For more information about power management, see *Power Management Functional Description*, in [Chapter 3, Power, Reset, and Clock Management](#).

The OMAP4470 power supply structure is based on the following constraints:

- Because most of the I/Os must be powered before the core, they are supplied on a specific rail (1.2 or 1.8 V).
- For OMAP4470-1800, the MPU is supplied with additional power resource. It is controlled by SmartReflex link and a GPIO pin.
- IVA, ABE, and Core are mapped on dedicated SMPS to allow independent SmartReflex dynamic frequency and voltage scaling for each of them.
- Because the DPLL, DSI, CSI, and USB OTG interfaces are noise-sensitive power domains, they are supplied by a dedicated rail to avoid other power sinks from affecting their power rail.
- Because bandgap, BodyBias LDOs, and SRAM LDOs must be supplied at 1.8 V from the beginning of the power-up sequence up to the end of power down, they are supplied by V1V8. This also applies to the WKUP LDO at 1.2 V.
- HDMI, eFuse VPP, SDMMC, and USB I/Os have specific requirements (sequencing, dual voltage, noise immunity, etc.) that require each of them be supplied by a dedicated power source.

28.2.2 Access to Power-Management IC

The ROM code accesses the power-management chip (PMIC) for the following purposes:

- SD/MMC1 powering:
 - The VMMC LDO is switched on by the ROM code when booting from the SD/MMC1 interface.

NOTE: The power supplies required for SD/MMC interface 2 are not controlled by the ROM code. It is assumed that the PMIC (or the system hardware) properly powers the SD/MMC module attached to this interface.

- USB peripheral booting (internal or external transceiver):
 - PrevStartOk mechanism

This mechanism provides the ability to bypass the USB connection if a specific flag is set in the TWL6032 RTC domain (retained when the system is switched off).

- USB transceiver powering

The TWL6032 LDOUSB is turned on by the ROM code.

NOTE: If TWL6032 is not present and the USB external transceiver boot is chosen, the TWL6032-related operations do not complete without blocking the USB boot procedure.

- USB peripheral booting (internal transceiver):

- VBUS detection

The VBUS power pad is localized on the TWL6032 power IC. As a result, the ROM code must read from a TWL6032 register to get the status reflecting the device attachment to the USB link.

- Gating the TWL6032 USB charging circuitry during a suspend scenario

If this event occurs, the ROM code should detect a suspend event and gate the charge circuitry inside the TWL6032.

NOTE: If TWL6032 and/or VBUS are not detected, the USB boot is blocked when booting from the internal transceiver, except if the USB(2) option is chosen.

28.2.2.1 PMIC Detection

When booting from an SD/MMC card or USB internal transceiver (and only for these two booting options) the ROM code tries to access the power device through the inter-integrated circuit (I²C™). The first access is a read transaction to obtain the TWL6032 version register. If this read access is successful (that is, the I²C transaction is acknowledged), the ROM code considers that a power-management device is attached, assuming it is TWL6032. The version value read is neither used in any computation nor compared to any hardcoded value.

If the first read transaction fails (that is, the I²C transaction times out or is not acknowledged), the ROM code logs it into a flag and does not try any further transaction until the next reset cycle. In this case, the nondetection of the companion chip does not block the SD/MMC1 boot process. However, the MMC card boot procedures do not work as defined in this document. In particular, The ROM code does not ensure that the SD/MMC1 interface is powered when accessing the memory contents.

The nondetection of the power-management IC blocks the USB internal transceiver boot, except when USB(2) booting mode is chosen.

An alternate way to boot from the USB internal transceiver without the TWL6032 and with the USB(1) booting option is to have the alternate power-management IC match (or emulate) at least read the P1, P2, and P8 commands (see [Section 28.2.2.2, Summary of the I²C Transactions](#)).

If TWL6032 is not present, but the USB(2) option is chosen, or registers are emulated, the following functions are not ensured to work:

- The PrevStartOk mechanism is not functional (the specific flag is not checked).
- The ROM code does not ensure that the VUSB power is applied to the USB transceiver.
- Peripheral booting from the internal USB transceiver is not ensured to be functional, because the VBUS state read transaction is not performed.
- The ROM code does not support the suspend scenario during USB peripheral boot from the internal transceiver.

From the ROM code perspective, nothing prevents the use of another power IC together with the OMAP4470. However, special care must be taken if considering the two previously mentioned booting options (SD/MMC1 or USB internal transceiver).

[Table 28-2](#) summarizes the USB booting options according to TWL6032 presence.

Table 28-2. USB Booting Options

| Booting Option | TWL6032 Detected | TWL6032 Emulated | Description |
|----------------|------------------|------------------|---|
| USB(1) | Yes | N/A | Full USB booting |
| USB(1) | No | Yes | ROM code does not ensure VUSB, VBUS, PrevStartOk, or suspend mode. |
| USB(1) | No | No | USB booting is not possible. |
| USB(2) | Yes | N/A | Full USB booting |
| USB(2) | No | Yes | ROM code does not ensure VUSB, VBUS, PrevStartOk, or suspend mode. |
| USB(2) | No | No | ROM code does not ensure VUSB or VBUS. PrevStartOk and suspend mode are not supported. |
| USB-ULPI | Yes | N/A | ROM code does not ensure VUSB or VBUS. PrevStartOk is supported. Suspend mode is not supported. |
| USB-ULPI | No | Yes | ROM code does not ensure VUSB, VBUS, or PrevStartOk. Suspend mode is not supported. |
| USB-ULPI | No | No | ROM does not ensure VUSB or VBUS. PrevStartOk and suspend mode are not supported. |

28.2.2.2 Summary of the I²C Transactions

The ROM code accesses the power-management chip through the I2C1 interface. [Table 28-3](#) summarizes the list of accesses.

Table 28-3. Register Accesses to PMIC

| ID | I ² C Address | Register Address | TWL6032 Register | Access Type | Value | Transaction Condition |
|----|--------------------------|------------------|------------------|-------------------------|----------|--------------------------------------|
| P1 | 0x4A | 0x87 | JTAGVERNUM | R | 0x- | Bootting from MMC1, USB, or USB-ULPI |
| P2 | 0x48 | 0x2B | PHOENIX_SEQ_CFG | R/W | 0x-/0x00 | Bootting from USB or USB-ULPI |
| P3 | 0x48 | 0x9B | VMMC_CFG_VOLTAGE | W (ORed) ⁽¹⁾ | 0x15 | Bootting from MMC1 |
| P4 | 0x48 | 0x9A | VMMC_CFG_STATE | W (ORed) ⁽¹⁾ | 0xE1 | Bootting from MMC1 |
| P5 | 0x48 | 0xA3 | VUSB_CFG_VOLTAGE | W (ORed) ⁽¹⁾ | 0x18 | Bootting from USB or USB-ULPI |
| P6 | 0x48 | 0xE5 | MISC2 | W | 0x08 | Bootting from USB or USB-ULPI |
| P7 | 0x48 | 0xA2 | VUSB_CFG_STATE | W | 0xE1 | Bootting from USB or USB-ULPI |
| P8 | 0x49 | 0xE3 | CONTROLLER_STAT1 | R | 0x- | Bootting from USB or USB-ULPI |
| P9 | 0x49 | 0xE8 | CHARGERUSB_CTRL1 | W | 0x80 | Bootting from USB |

⁽¹⁾ (1) The register is not blindly overwritten but is first read and then ORed with the specified value.

Transaction description

P1: JTAGVERNUM: PMIC detection. There must be a register at this location; however, its value is not used further by ROM code.

P2: PHOENIX_SEQ_CFG: The PrevStartOk flag is checked when performing USB peripheral boot (internal or external transceiver). If the flag is set, the USB peripheral booting procedure is skipped. In any case the full register is cleared (write 0x00) after the read transaction.

P3: VMMC_CFG_VOLTAGE: For the sake of powering the SDMMC1 card cage, the VMMC_CFG_VOLTAGE and VMMC_CFG_STATE registers are configured to set the VMMC LDO to 3 V. The value 0x15 is written to the VMMC_CFG_VOLTAGE register (selects 3-V output).

P4: VMMC_CFG_STATE: The value 0xE1 is written to the VMMC_CFG_STATE register (applies to all register groups, LDO state switched on).

P5: VUSB_CFG_VOLTAGE: The OMAP internal USB transceiver must be powered with a 3.3-V source to ensure its correct functionality. Three registers are used for this purpose. The VUSB_CFG_VOLTAGE register is written the value 0x18 for selecting 3.3 V.

P6: MISC2: The MISC2 register is written the value 0x08 for selecting the VBUS source.

P7: VUSB_CFG_STATE: The VUSB_CFG_STATE register is written the value 0xE1 for switching the VUSB LDO on for all register groups.

P8: CONTROLLER_STAT1: VBUS detection is performed by reading the VBUS_DET bit from the CONTROLLER_STAT1 register. If this bit is set, it reflects that a USB cable is plugged.

P9: CHARGERUSB_CTRL1: This register is written the value 0x80 (SUSPEND_BOOT = 1) for gating the charge circuitry when getting a USB SUSPEND event. If this bit is not set, the USB boot is aborted.

The complete description of the TWL6032 register map is in TWL6032 documentation.

NOTE: No specific action is performed regarding the TWL6032 primary watchdog feature. In particular, if it is active (configurable in EEPROM) in the companion device, a system reset may occur before ROM code completes. The elapse value for the reset must be appropriately tuned so that the ROM code is not interrupted before the full platform start up (that is, before the initial software can take a specific action).

- 12-, 16.8-, 19.2-, 26-, or 38.4-MHz reference clock input from external oscillator or clock supplied using internal crystal oscillator (up to 20 MHz)
- 32-kHz CMOS clock input
- Six configurable output clocks
- Eight input signals to define the boot mode and device system clock source
- Two reset sources
 - Power-on reset (POR) (cold reset)
 - Bidirectional warm reset

28.2.3.2 Clocking Scheme

28.2.3.2.1 Required System Input Clocks

The device operation requires external input clocks, as follows:

- 32k clock: A 32.768-kHz crystal is connected to the TWL6032 device that embeds the 32k-oscillator (a square CMOS clock can also be delivered on the 32k_xtalin pin if the 32k-crystal is connected on another device of the system). The resulting 32k clock is delivered to the entire system on three outputs:
 - CLK32KAO_is always on (meaning that when TWL6032 VIO is on; that is, it is in WAIT-ON or ACTIVE state). It is used to deliver a 32k clock to always-on features, such as the OMAP and modem.
 - CLK32KG is software-controlled and is delivered when requested by the OMAP (this input is on by default at platform boot).
 - CLK32KAUDIO is software-controlled and is delivered to the audio IC (not shown in [Figure 28-3](#)) when requested by the OMAP (this input is on by default at platform boot).
- High-speed clock: The platform high-speed (HS) low-jitter sine clock is provided by the clock driver (CDC3S04) to the audio IC, OMAP, and other peripherals requesting low-jitter sine clock (up to three outputs are available for peripherals). The OMAP device delivers digital clocks to other peripherals. The OMAP supports different flavors of clock sources at several frequencies:
 - Crystal source. An internal oscillator embedded in the OMAP is used. In this mode, the input clock is limited to 20 MHz by oscillator construction. The fref_clk_ioreq is then set as an input to be used by an external device to request the OMAP to deliver the clock on fref_clk0_out. The fref_slicer_in pin can then be used to input an auxiliary clock (mainly for debugging purposes).
 - External oscillator type source. The internal OMAP oscillator is disabled. The external source delivers a sine (slicer active) or square (slicer bypassed) single-ended clock on the fref_slicer_in pin. The external source is enabled by the fref_clk_ioreq output. fref_xtal_in can then be used to input an auxiliary clock (oscillator-bypass mode).
- Audio clock: The audio IC device builds its own clock, either from the 32k clock or the HS clock (depending on the audio scenario). This internal clock is delivered to the ABE subsystem (abe_clks input) for audio flow synchronization.

Clock input modes are selected by the sysboot pin (sys_boot[6:7]) to allow the system to wake up in the proper mode, even after a cold boot (selection of the relevant input pin [fref_slicer_in or fref_xtal_in/out] and slicer/oscillator mode setting [on or bypass]).

The OMAP provides the HS clock to other devices through six fref_clk[0:5]_out pins.

[Table 28-4](#) lists the mapping for the OMAP clock input sources. [Table 28-5](#) lists the TWL6032 clock requirements.

Table 28-4. Mapping for Input Sources

| Input Source | Mapping | Frequency Range/List | Type |
|---------------------|----------------------------|---------------------------------|-----------------------------|
| Internal oscillator | fref_xtal_in/fref_xtal_out | 12, 16.8, or 19.2 MHz | Crystal connection pins |
| External HS clock | fref_slicer_in | 12, 16.8, 19.2, 26, or 38.4 MHz | Sine or square single-ended |
| External 32k clock | sys_32k | 32.768 kHz (nom.) | Square |

Table 28-4. Mapping for Input Sources (continued)

| Input Source | Mapping | Frequency Range/List | Type |
|------------------|----------|----------------------|--------|
| TWL6041 audio IC | abe_clks | 19.2 MHz | Square |

Table 28-5. TWL6032 Clock Requirements

| Input Source | Mapping | Frequencies Range/List | Type |
|---------------------|--------------------|------------------------|-------------------------|
| Internal oscillator | OSC32KIN/OSC32KOUT | 32.768 kHz (nom.) | Crystal connection pins |

CAUTION

Clock configurations depend on core voltage, and maximum clock frequencies may not be applicable to production.

28.2.3.2.2 Optional System Output Clocks

The OMAP device can output six alternate clocks, `fref_clk[0:5]_out`. Output clocks 1 through 4 can be gated or enabled through associated clock-request signals, `fref_clk[1:4]_req`.

The clocks can be managed by software with the appropriate register in the power, reset, and clock management (PRCM) module. For more information, see [Section 3.3, PRCM Subsystem Environment](#).

28.2.3.3 Reset Configuration

28.2.3.3.1 ON/OFF Interconnect and Power-On-Reset

The entire system is typically awakened by an ON/OFF push button connected to the PMIC. This signal is active low (the PMIC has internal pullup). Power up is propagated to the OMAP through `NRESPWRON/sys_nrespwron` signals when the PMIC power-up sequence is achieved.

28.2.3.3.2 Warm Reset

A warm reset can be asserted by the OMAP, by an external button (typically for development platform), or by any other device connected to it. It is mainly used to propagate the OMAP internal reset to the whole platform to set it to a known state.

The OMAP releases `sys_nreswarm` after `NRESPWRON` is deasserted.

28.2.3.3.3 Peripheral Reset by `sys_pwron_reset_out`

`sys_pwron_reset_out` is provided to the system by the OMAP to power on and/or deactivate the reset of system peripherals. This signal is activated by SCRM during the power-up sequence a few milliseconds after the default-on clocks (OMAP – `fref_clk4_out` and CDC3S04 – `CLK[1:4]`) are stabilized. This allows switching on peripherals that require synchronous reset.

`ss_pwron_reset_out` is controllable by software when the system is on. It is not affected by a warm reset.

28.2.3.3.4 Peripheral Reset by GPIO

Most of the peripherals are reset/power on/off by GPIO. By default, under POR, most OMAP signals are in safe mode with a default value driven by the I/O cell. The value is driven by an internal pullup or pulldown. Depending on the peripheral reset active level, users must select one GPIO or another (according to the reset value).

Once POR is released, the value on the pad is driven by the default configuration of control module. Most of time, this configuration is aligned with the default value selected on the I/O cell.

The next step is application-dependent: Users must configure the OMAP registers to validate GPIO use and the default configuration of the control module.

28.2.3.3.5 Warm Reset Impact on GPIOs

When a warm reset event occurs:

- The GPIO controller is reset. Consequently, the GPIO is automatically turned in input mode.
- The control module, which is part of the wake-up domain, is not reset. Information related to signal multiplexing mode and pullup or pulldown configuration is still valid.

Therefore, when a warm reset event happens, the output buffer is disabled. Consequently, two different behaviors can be defined with regard to what is expected by the platform:

- GPIO sensitive to warm reset:

To avoid getting a floating signal during (and after) a warm reset event, users must select a pullup or pulldown (depending on the reset value of the peripheral) and enable the pull.

- GPIO not sensitive to warm reset:

To avoid getting a floating signal during (and after) a warm reset event and to keep the same value that was driven before the reset, users must align the pull value with the drive value each time there is an access to a dedicated GPIO register.

NOTE: To avoid unnecessary consumption, user software must ensure that the internal pull resistor is disabled when the GPIO buffer is driving.

NOTE:

- For more information about device reset management, see [Section 3.5, Reset Management Functional Description](#) in [Chapter 3, Power, Reset, and Clock Management](#).
 - To determine the cause of the last reset, see [Section 3.5.5, Reset Logging](#), in [Chapter 3, Power, Reset, and Clock Management](#).
-

28.2.3.4 PMIC and Audio IC Control

- I²C:

The PMIC and audio IC are controlled by the OMAP I2C1 (HS I²C) interface. Some internal pullup resistors are provided by the OMAP (different values can be selected to adapt the I/O buffer strength to the bus topology). The I²C links must first be started in fast-speed mode. Therefore, the buffer default pullup value must support this mode.

- SmartReflex control:

Some of the TWL6032 power resources are controlled through SmartReflex link (I²C-like). This control allows the host to drive the dynamic voltage frequency scaling (DVFS) and adaptive voltage scaling (AVS) operations of these resources. As with its I²C interfaces, some internal pullup resistors are provided on the OMAP SmartReflex I/Os.

- INT:

Both devices can activate the INT signal at any time when they require the host device to monitor their activity. When receiving such an interruption, the OMAP checks, through the I²C, to determine the source of the interrupt. These INT pins are active low.

- sys_pwr_req:

When exiting off mode, the OMAP ties up the sys_pwr_req pin to wake up the TWL6032 power application group.

28.2.3.5 TWL6032 Power Request Signals

The TWL6032 PMIC drives three external enable-output signals. This allows switching on some external resources at different stages of the power-up sequence:

- REGEN1/2 are driven high at the beginning of the power-up sequence, before any internal power source is turned on. They belong to the VBAT power domain. REGEN1 can typically be used for buck boost control.

- SYSEN is driven high immediately after the VCORE power output is turned on. It allows switching on the additional power regulator to supply the MPU subsystem. SYSEN belongs to the VIO power domain.

TWL6032 also receives five power resource requests: PREQ[1, 2A, 2B, 2C, 3]. These pins allow an external device to request TWL6032 power internal resources. TWL6032 power behavior when pins are activated must be programmed after the first boot (resources and PREQ pins allocated by group, resource behavior upon group activation, etc.). The typical PREQ allocation per group is:

- PREQ1: Application group. Connected to OMAP.
- PREQ2A, PREQ2B, and PREQ2C: Peripheral group. Connected to peripherals A, B, and C (for instance, Bluetooth®/FM/GPS/WLAN device, Wimax device, W-USB device).
- PREQ3: Modem group

NOTE: Powering the clock driver requires PREQ assertion. Therefore, it is advised to connect any peripheral receiving a clock from CDC3S04 to one PREQ.

The use of PREQ[1:3] is especially required when TWL6032 is in sleep mode, because it cannot handle an I²C command. Any device that requires the TWL6032 resource to wake up must first activate its associated PREQ. All TWL6032 power regulators are off or in sleep mode when TWL6032 is in sleep mode.

PREQ1 is used by OMAP when waking up from off mode to wake up the TWL6032.

28.2.4 Boot Configuration

Six external pads (sys_boot[5:0]) are used to select interfaces or devices for the booting list. The sys_boot[7:6] pads select the OMAP clock source configuration.

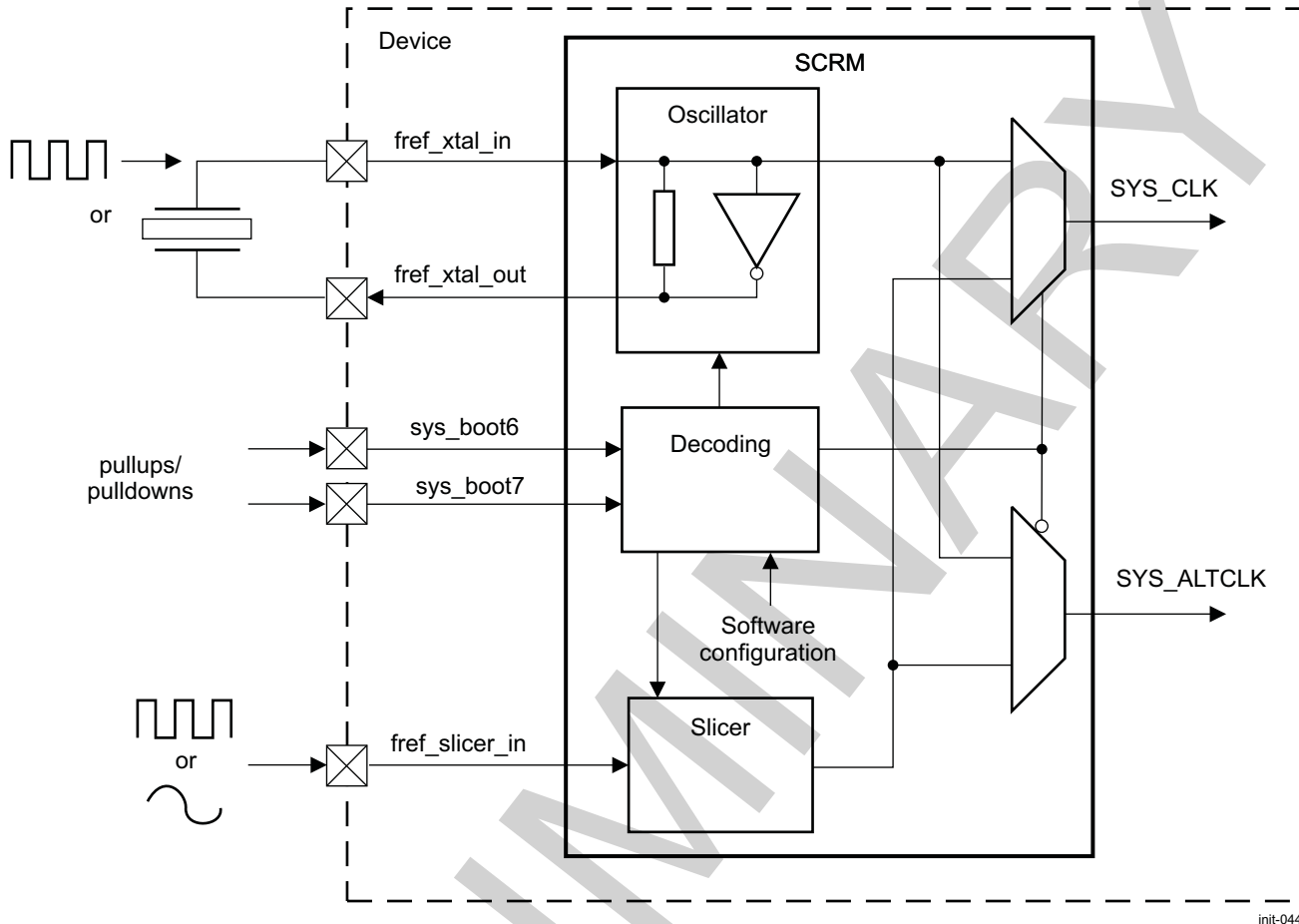
All eight pins are sampled and latched onto the SYSCTRL_GENERAL_CORE.CONTROL_STATUS[7:0] SYS_BOOT register bit field after POR. After booting, these pads can be used for other functions such as GPIOs, and the associated register bit field is not updated by the new functionality. For more information about pad multiplexing configuration, see [Section 19.4.8, Pad Functional Multiplexing and Configuration](#).

NOTE:

- If used as GPIOs, sys_boot[7:0] pads must be used only in output mode to ensure that the input values are selected by the pullups and pulldowns after POR.
 - Unlike sys_boot[5:0] pads, sys_boot[7:6] pads have no internal pullups or pulldowns automatically selected at POR. The sys_boot[5:0] pads have selected pulldowns at that moment. To avoid leakage, care must be taken to disable the pulldown in case the respective pad has external connection to VIO (= 1). See the appropriate register fields in [Chapter 19, Control Module](#).
-

28.2.4.1 System Clock Source Selection

[Figure 28-4](#) is an overview of the system clock selection. [Table 28-6](#) summarizes the selection.

Figure 28-4. System Clock Selection Diagram**Table 28-6. System Clock Selection Summary**

| sys_boot[7:6] | SYS_CLK Source | SYS_ALTCLK Source | Oscillator Mode | Slicer Mode | fref_clk_ioreq Mode |
|---------------|----------------|-------------------|-----------------|-------------|---------------------|
| 0b00 | fref_xtal_in | fref_slicer_in | Active | Power-down | Input |
| 0b01 | fref_xtal_in | fref_slicer_in | Bypass | Power-down | Output |
| 0b10 | fref_slicer_in | fref_xtal_in | Power-down | Active | Output |
| 0b11 | fref_slicer_in | fref_xtal_in | Power-down | Bypass | Output |

OMAP clock source settings description:

- sys_boot[7:6] = 0b00:
 - The system clock source is the on-chip oscillator.
 - The slicer is powered down and its input can be used to provide the OMAP with an alternate clock.
 - fref_clk_ioreq is a clock request input associated to fref_clk0_out by default.
- sys_boot[7:6] = 0b01:
 - The system clock source is external. The internal oscillator is bypassed to inject the system clock.
 - The slicer is powered down and the slicer input can be used to provide the chip with an alternate clock.
 - The fref_clk_ioreq signal is an output that requests the clock to the external clock supplier.
- sys_boot[7:6] = 0b10:
 - The system clock source is the on-chip slicer, supplied by an external oscillator. The internal

oscillator is powered down and the input can be configured to supply the alternate system clock to OMAP device.

- The slicer is active.
- The `fref_clk_ioreq` signal is an output that requests the clock from the external clock supplier.
- `sys_boot[7:6] = 0b11`:
 - The system clock source is external. The internal oscillator is powered down and the input can be configured to supply the alternate system clock to the OMAP device.
 - The slicer is bypassed to inject the system clock.
 - The `fref_clk_ioreq` signal is an output that requests the clock from the external clock supplier.

28.2.4.2 Booting Device Order Selection

The ROM code creates the device list (order) based on information gathered from two locations.

- The first location is the software booting configuration stored in the nonvolatile SAR memory, and used after warm resets.
- The second location is the `sys_boot[5:0]` external configuration pins sensed in the control module.

The SYSBOOT pins are used to index a booting device list from a table with possible booting scenarios. The order of examined booting devices is from the first to the fourth devices.

The following names are used in the tables:

- Memory types:
 - Execute in place (XIP): XIP memory without wait-signal monitoring enabled (NOR flash memory or other XIP device)
 - XIP wait: XIP memory with wait-signal monitoring
 - NAND: NAND flash memories (non-XIP)
 - OneNAND: OneNAND and Flex-OneNAND flash memories
 - MMC1: MMC/SD card or eMMC™/eSD™ device (SD/MMC port 1)
 - MMC2(1): eMMC or eSD memory device, first multiplexing option (SD/MMC port 2). See [Section 28.2.4.3, Boot Peripheral Pin Multiplexing](#).
 - MMC2_BOOT: eMMC on SD/MMC port 2 using boot partition. Pin multiplexing as in MMC2(1).
 - MMC2(2): eMMC or eSD memory device, second multiplexing option (SD/MMC port 2). See [Section 28.2.4.3, Boot Peripheral Pin Multiplexing](#).
- Peripheral interfaces:
 - USB(1): USB A0 from OMAP internal transceiver (USBPHY)
 - USB(2): USB A0 from OMAP internal transceiver (USBPHY). Allows USB booting even when no power-management IC is detected. See [Section 28.2.2.1, PMIC Detection](#).
 - USB-ULPI: USB A0 from external transceiver through ULPI interface
 - Universal asynchronous receiver/transmitter (UART): UART3 interface
- Permanent booting devices listed in [Table 28-7](#) are in **bold**.

NOTE: Only permanent booting devices (in bold) are put on in the list in case of a warm reset, and the device list is taken from the `sys_boot` pins. As a result, peripheral booting devices are skipped when the OMAP restarts from warm resets.

Users can force the execution of the peripheral booting procedure after warm reset by using the software booting configuration feature.

[Table 28-7](#) lists the booting device order when it is preferred to boot from a memory type device. This table is selected by ROM code when the `sys_boot5` pin is tied high (= 1) after reset and before booting completes. If fast XIP booting is selected, the `sys_boot5` pin controls the XIP wait-signal monitoring (that is, a logical high level enables wait-signal monitoring).

Table 28-7. Memory Preferred Booting

| sys_boot[5:0] | Bootting Devices Order | | | |
|----------------------------------|---|-----------------|-----------------|-----------------|
| | 1 st | 2 nd | 3 rd | 4 th |
| 0b100000 | MMC2(1) | USB(1) | | |
| 0b100001 | XIP | USB(1) | | |
| 0b100010 | XIPWAIT | USB(1) | | |
| 0b100011 | NAND | USB(1) | | |
| 0b100100 | MMC2_BOOT | USB(2) | | |
| 0b100101 | MMC1 | USB(1) | | |
| 0b100110 | OneNAND | USB(1) | | |
| 0b100111 | OneNAND | MMC2(1) | USB(1) | |
| 0b101000 | MMC2(1) | UART | | |
| 0b101001 | OneNAND | MMC2(1) | USB(2) | |
| 0b101010 | XIPWAIT | UART | | |
| 0b101011 | NAND | UART | | |
| 0b101100 | MMC2_BOOT | USB(1) | | |
| 0b101101 | MMC1 | UART | | |
| 0b101110 | OneNAND | UART | | |
| 0b101111 | MMC2(1) | USB-ULPI | | |
| 0b110000 | XIP | USB-ULPI | | |
| 0b110001 | XIPWAIT | USB-ULPI | | |
| 0b110010 | NAND | USB-ULPI | | |
| 0b110011 | MMC1 | USB(2) | | |
| 0b110100 | MMC1 | USB-ULPI | | |
| 0b110101 | OneNAND | USB-ULPI | | |
| 0b110110 | MMC2(1) | USB(1) | UART | MMC1 |
| 0b110111 | XIP | USB(1) | UART | MMC1 |
| 0b111000 | MMC2(2) | USB-ULPI | UART | |
| 0b111001 | NAND | USB(1) | UART | MMC1 |
| 0b111010 | MMC2(2) | UART | | |
| 0b111011 | MMC1 | USB(1) | UART | |
| 0b111100 | MMC2(2) | USB(1) | | |
| 0b111101 | MMC2(2) | USB(2) | | |
| 0b111110 | Reserved | | | |
| 0b111111 (Only on GP devices) | Fast XIP booting. Wait monitoring ON | USB(1) | UART | |

Table 28-8 lists the booting device order when it is preferred to boot from a peripheral-type device. This table is selected by ROM code when the sys_boot5 pin is tied low (= 0). If fast XIP booting is selected, the sys_boot5 pin controls the XIP wait-signal monitoring (that is, a logical low level disables wait-signal monitoring).

Table 28-8. Peripheral Preferred Booting

| sys_boot[5:0] | Booting Devices Order | | | |
|----------------------------------|--|-----------------|-----------------|-----------------|
| | 1 st | 2 nd | 3 rd | 4 th |
| 0b000000 | USB(1) | MMC2(1) | | |
| 0b000001 | USB(1) | XIP | | |
| 0b000010 | USB(1) | XIPWAIT | | |
| 0b000011 | USB(1) | NAND | | |
| 0b000100 | USB(2) | MMC2_BOOT | | |
| 0b000101 | USB(1) | MMC1 | | |
| 0b000110 | USB(1) | OneNAND | | |
| 0b000111 | USB(1) | OneNAND | MMC2(1) | |
| 0b001000 | UART | MMC2(1) | | |
| 0b001001 | USB(2) | OneNAND | MMC2(1) | |
| 0b001010 | UART | XIPWAIT | | |
| 0b001011 | UART | NAND | | |
| 0b001100 | USB(1) | MMC2_BOOT | | |
| 0b001101 | UART | MMC1 | | |
| 0b001110 | UART | OneNAND | | |
| 0b001111 | USB-ULPI | MMC2(1) | | |
| 0b010000 | USB-ULPI | XIP | | |
| 0b010001 | USB-ULPI | XIPWAIT | | |
| 0b010010 | USB-ULPI | NAND | | |
| 0b010011 | USB(2) | MMC1 | | |
| 0b010100 | USB-ULPI | MMC1 | | |
| 0b010101 | USB-ULPI | OneNAND | | |
| 0b010110 | USB(1) | UART | MMC1 | MMC2(1) |
| 0b010111 | USB(1) | UART | MMC1 | XIP |
| 0b011000 | USB-ULPI | UART | MMC2(2) | |
| 0b011001 | USB(1) | UART | MMC1 | NAND |
| 0b011010 | UART | MMC2(2) | | |
| 0b011011 | USB(1) | UART | MMC1 | |
| 0b011100 | USB(1) | MMC2(2) | | |
| 0b011101 | USB(2) | MMC2(2) | | |
| 0b011110 | | | Reserved | |
| 0b011111 (Only on GP devices) | Fast XIP booting. Wait monitoring OFF | USB(1) | UART | |

28.2.4.3 Boot Peripheral Pin Multiplexing

Table 28-9 lists the code pin multiplexing configuration supported by ROM according to boot peripheral.

Table 28-9. Pin Multiplexing According to Boot Peripheral

| Boot Device | Boot Interface | Pads |
|-----------------|--|--|
| NAND/OneNAND | GPMC | GPMC pads in mux mode 0, CS0, WAIT0 |
| XIP memory | GPMC | GPMC pads in mux mode 0, CS0, WAIT0 |
| MMC/SD/eMMC/eSD | SDMMC1 | SDMMC1 pads in mux mode 0 |
| eMMC/eSD | SDMMC2 (option 1) SDMMC2 (option 2) | GPMC pads in mux mode 1 SDMMC5 and FREF_CLK pads, all in mux mode 5 |
| UART | UART3 | UART3 pads in mux mode 0 |

Table 28-9. Pin Multiplexing According to Boot Peripheral (continued)

| Boot Device | Boot Interface | Pads |
|-------------------------------|-------------------------|----------------------------------|
| USB from internal transceiver | HSUSBOTG (USBA0-USBPHY) | USBA0_OTG pads in mux mode 0 |
| USB from external transceiver | HSUSBOTG (USBA0-ULPI) | DPM_EMU[2:13] pads in mux mode 1 |

NOTE: The ROM code examines the interfaces that are selected to be searched until a valid bootable interface/device is found. The activities on the pads of the searched interfaces must be considered in case they are connected to any other peripherals for any other purposes (for example, an LED connected to a GPMC pad muxed internally to a GPIO).

28.3 Reset Sequences

For the description of the reset sequences, see [Section 3.5.6, Reset Sequences](#), in [Section 3.5, Reset Management Functional Description](#).

28.4 Device Initialization by ROM Code

This section describes high-level booting concepts and provides basic knowledge for booting on the device.

28.4.1 Booting Overview

28.4.1.1 Booting Types

Bootting is the process of starting a bootstrap from one of the booting devices.

The ROM code has two functions for booting: Peripheral booting and memory booting.

- In peripheral booting, the ROM code polls a selected communication interface such as UART or USB, downloads the executable code over the interface, and executes it in internal RAM. Downloaded software from an external host can be used to program flash memories connected to the device. This special case of peripheral booting is called preflashing; software downloaded for preflashing is called the flash loader. The flash loader burns a new client application image in external flash memory. Initial software is a generic term for bootstrap, downloaded software, and flash loader. After the image is burnt, a software (warm) reset can be performed.
- In memory booting, the ROM code finds the bootstrap in permanent memories such as flash memory or memory cards and executes it. This process is normally performed after a cold or warm device reset.

The ROM code detects whether the device should download software from a peripheral interface (USB or UART) by using the `sys_boot[5:0]` pin configuration. This mechanism encompasses initial flashing in production (external memory is empty) and reflashing in service (external memory is already programmed).

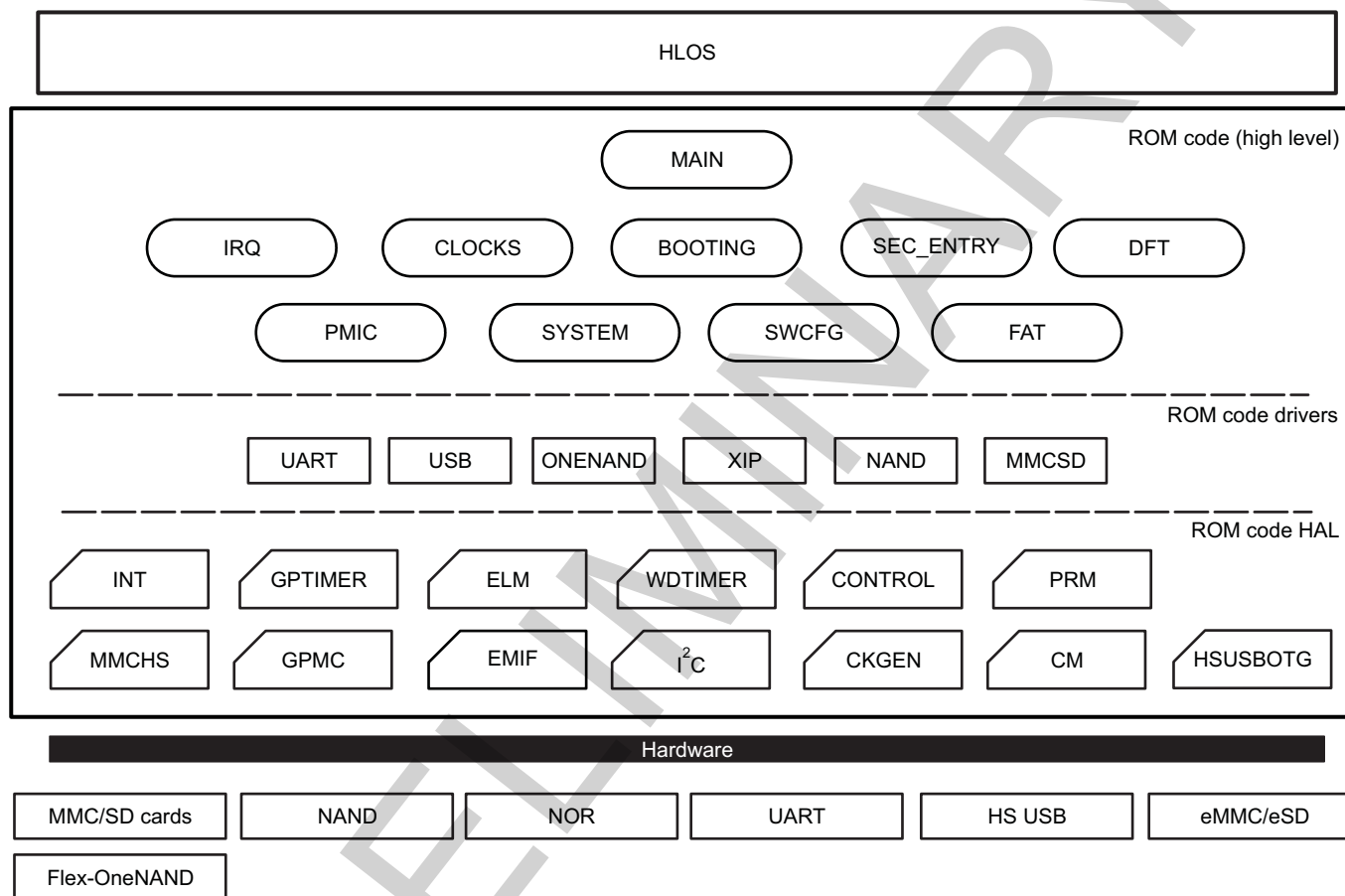
28.4.1.2 ROM Code Architecture

Figure 28-5 shows the ROM code architecture. It is split into three main layers with a top-down approach: high-level, drivers, and hardware abstraction layer (HAL). One layer communicates with a lower-level layer through a unified interface.

- The high-level layer performs the main tasks of the public ROM code: multicore startup, watchdog and clock configurations, interrupt management, interaction with the power-management IC, and main booting routine.
- The driver layer implements the logical and communication protocols for any booting device in accordance with the interface specification.
- The HAL implements the lowest level code for interacting with the hardware infrastructure IPs. End booting devices are attached to the device I/O pads.

Figure 28-5 shows the three layers with their modules.

Figure 28-5. ROM Code Architecture



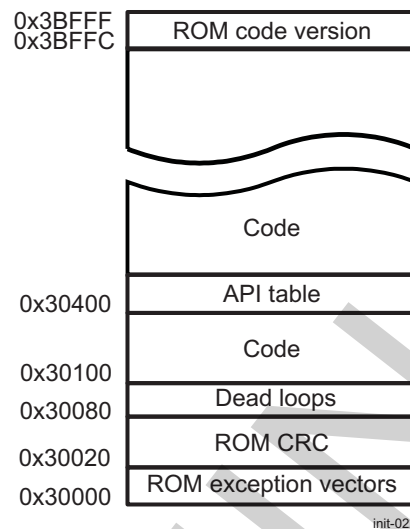
init-006

28.4.2 Memory Maps

28.4.2.1 ROM Memory Map

Figure 28-6 shows the 48-KB ROM memory map.

Figure 28-6. ROM Memory Map



- ROM exception vectors

Exceptions are redirected to ROM exception vectors (see [Table 28-10](#)). The reset exception is redirected to the public ROM code startup. Other exceptions are redirected to RAM handlers by loading appropriate addresses to the PC register.

Table 28-10. ROM Exception Vectors

| Address | Exception | Content |
|---------|--------------------------|--------------------------------|
| 0x30000 | Reset | Branch to the ROM code startup |
| 0x30004 | Undefined | PC = 0x4030 D004 |
| 0x30008 | Software interrupt (SWI) | PC = 0x4030 D008 |
| 0x3000C | Prefetch abort | PC = 0x4030 D00C |
| 0x30010 | Data abort | PC = 0x4030 D010 |
| 0x30014 | Unused | PC = 0x4030 D014 |
| 0x30018 | IRQ | PC = 0x4030 D018 |
| 0x3001C | FIQ | PC = 0x4030 D01C |

- ROM code cyclic redundancy check (CRC)

The ROM code CRC is calculated as 32-bit CRC code (CRC-32-IEEE 802.3) for the address range 0x30000–0x3BFFF. The 4-byte CRC code is stored at location 0x30020.

- Dead loops

Dead loops are branch instructions coded in ARM mode. They have multiple purposes (see [Table 28-11](#)).

Table 28-11. Dead Loops

| Address | Purpose |
|---------|--|
| 0x30080 | Undefined exception default handler |
| 0x30084 | SWI exception default handler |
| 0x30088 | Prefetch abort exception default handler |
| 0x3008C | Data abort exception default handler |
| 0x30090 | Unused exception default handler |
| 0x30094 | IRQ exception default handler |
| 0x30098 | FIQ exception default handler |

The fixed location of these dead loops facilitates debugging and testing. The first seven dead loops are default exception handlers linked to RAM exception vectors.

Dead loops can be called directly from code, but there is also a special function called from ROM code to execute a dead loop. This function is at address 0x300C0. The function is assembly code in ARM mode, which takes the dead loop address from the R0 register. The main purpose of the function is to issue a global software reset before going to a dead loop. In addition, the function clears the global cold reset status before issuing the global software reset.

- Code

This space is used to hold code and constant data.

- API table

The purpose of this table is to allow external code access to system maintenance, utility, and device driver functions which are used for ensuring the ROM code boot functionality. These functions can be reused at run time by calling a fixed address hardcoded in this table.

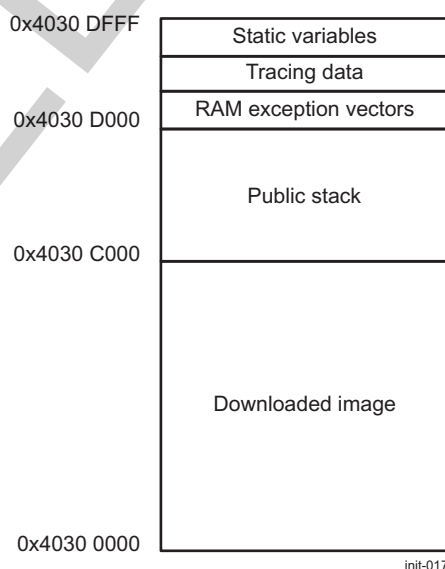
- ROM code version

The ROM code version consists of two decimal numbers: major and minor. It can be used to identify the ROM code release version burnt in a given IC (for example, useful during a debugging session). The ROM code version is a 32-bit hexadecimal value at address 0x3BFFC.

28.4.2.2 RAM Memory Map

The partitioning of the on-chip SRAM (L3 OCM RAM) shown in [Figure 28-7](#) is used during the booting process. Tracing and static variables areas can also be accessed when calling API functions.

Figure 28-7. RAM Memory Map



- Downloaded image

This space is used by the public ROM code to store a downloaded booting image. It can be up to

48KB.

- Public stack
This space is reserved for stack.
- RAM exception vectors

The RAM exception vectors provide an easy way to redirect exceptions to the custom handler. [Table 28-12](#) lists the contents of the RAM space reserved for RAM vectors. The first eight addresses are ARM instructions that load the value in the subsequent eight addresses into the PC. These instructions are executed when an exception occurs because they are called from ROM exception vectors. Undefined, SWI, unused, and FIQ exceptions are redirected to a hardcoded dead loop. Prefetch abort, data abort, and IRQ exception are redirected to predefined ROM handlers. Users can redirect an exception to another handler by writing its address to the appropriate location from 0x4030 D024 to 0x4030 D03C, or by overriding the branch (load into PC) instruction between addresses from 0x4030 D004 to 0x4030 D01C.

Table 28-12. RAM Exception Vectors

| Address | Exception | Content |
|-------------|------------------------------|--|
| 0x4030 D000 | Reserved | Reserved |
| 0x4030 D004 | Undefined | PC = [0x4030D024] |
| 0x4030 D008 | SWI | PC = [0x4030D028] |
| 0x4030 D00C | Prefetch abort | PC = [0x4030D02C] |
| 0x4030 D010 | Data abort | PC = [0x4030D030] |
| 0x4030 D014 | Unused | PC = [0x4030D034] |
| 0x4030 D018 | Interrupt request (IRQ) | PC = [0x4030D038] |
| 0x4030 D01C | Fast interrupt request (FIQ) | PC = [0x4030D03C] |
| 0x4030 D020 | Reserved | 0x30090 |
| 0x4030 D024 | Undefined | 0x30080 |
| 0x4030 D028 | SWI | 0x30084 |
| 0x4030 D02C | Prefetch abort | Address of default prefetch abort handler ⁽¹⁾ |
| 0x4030 D030 | Data abort | Address of default data abort handler ⁽¹⁾ |
| 0x4030 D034 | Unused | 0x30090 |
| 0x4030 D038 | IRQ | Address of default IRQ handler |
| 0x4030 D03C | FIQ | 0x30098 |

⁽¹⁾ The default handlers for prefetch and data abort perform reads from CP15 debug registers to retrieve the reason for the abort:

- In case of prefetch abort: the IFAR register is read from CP15 and stored into R0. The IFSR register is read and stored into the R1 register. Then the ROM code jumps to the prefetch abort dead loop (20088h).
- In case of data abort: the DFAR register is read from CP15 and stored into R0. The DFSR register is read and stored into the R1 register. Then the ROM code jumps to the data abort dead loop (2008Ch).

- Tracing data

This area contains trace vectors reflecting the execution path of the ROM code. The public ROM code tracing data is described in [Table 28-13](#). For more information about ROM code tracing, see [Section 28.4.9, Tracing](#).

Table 28-13. Tracing Data

| Address | Size (Bytes) | Description |
|-------------|--------------|---------------------------------------|
| 0x4030 D040 | 4 | Current tracing vector, word 1 |
| 0x4030 D044 | 4 | Current tracing vector, word 2 |
| 0x4030 D048 | 4 | Current tracing vector, word 3 |
| 0x4030 D04C | 4 | Cold reset run tracing vector, word 1 |
| 0x4030 D050 | 4 | Cold reset run tracing vector, word 2 |
| 0x4030 D054 | 4 | Cold reset run tracing vector, word 3 |

Table 28-13. Tracing Data (continued)

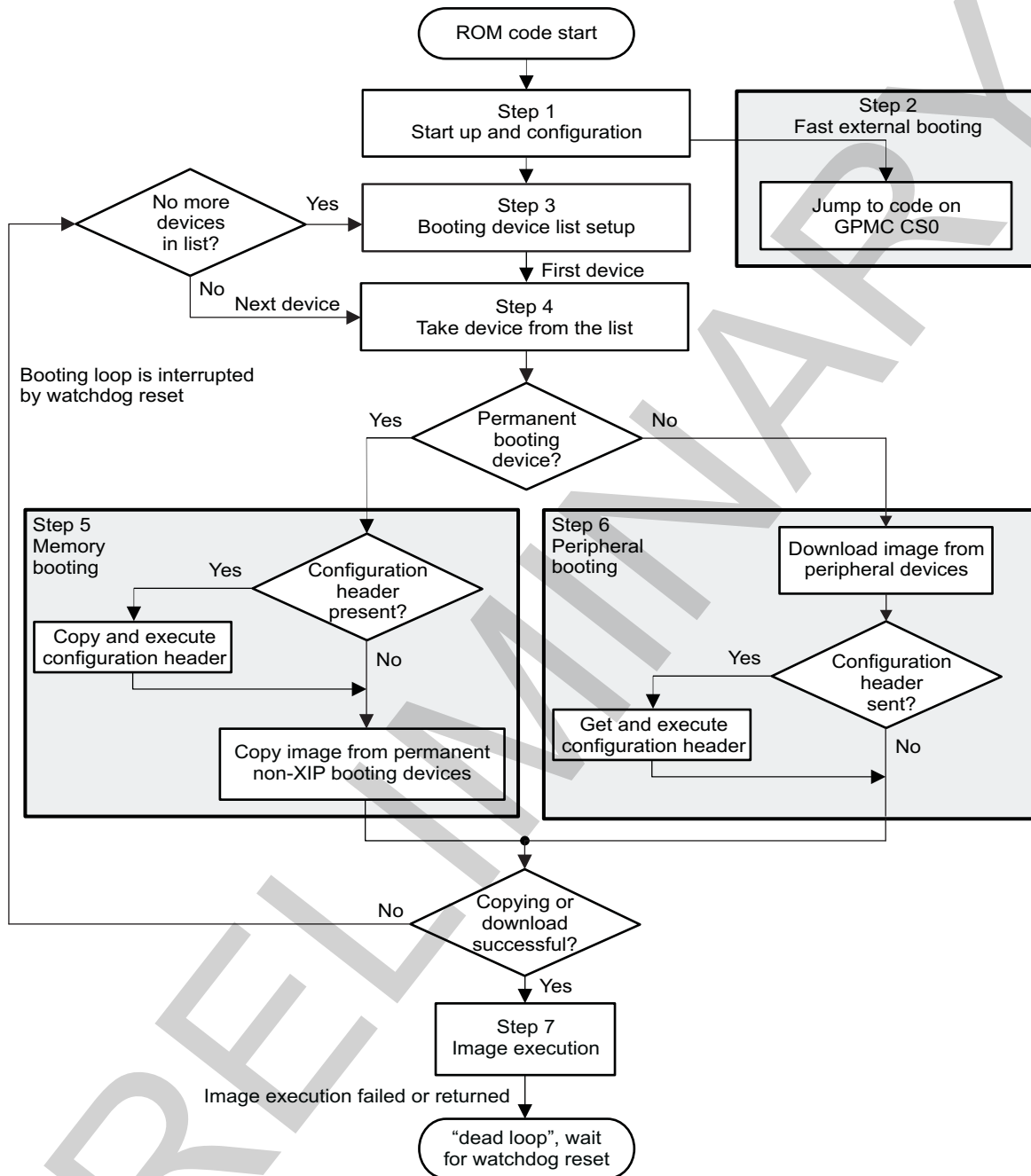
| Address | Size (Bytes) | Description |
|-------------|--------------|--|
| 0x4030 D058 | 4 | Current copy of the PRM_RSTST register (reset reasons) |
| 0x4030 D05C | 4 | Reserved |
| 0x4030 D060 | 4 | Reserved |
| 0x4030 D064 | 4 | Reserved |

- Static variables

ROM code static variables used at boot time (and possibly during run time if calling the ROM API functions).

28.4.3 Overall Booting Sequence

[Figure 28-8](#) shows the ROM code flow chart.

Figure 28-8. Overall Booting Sequence

init-007

The main loop of the booting module goes through the booting device list and tries to get an image from the currently selected booting device. The ROM code performs the following steps:

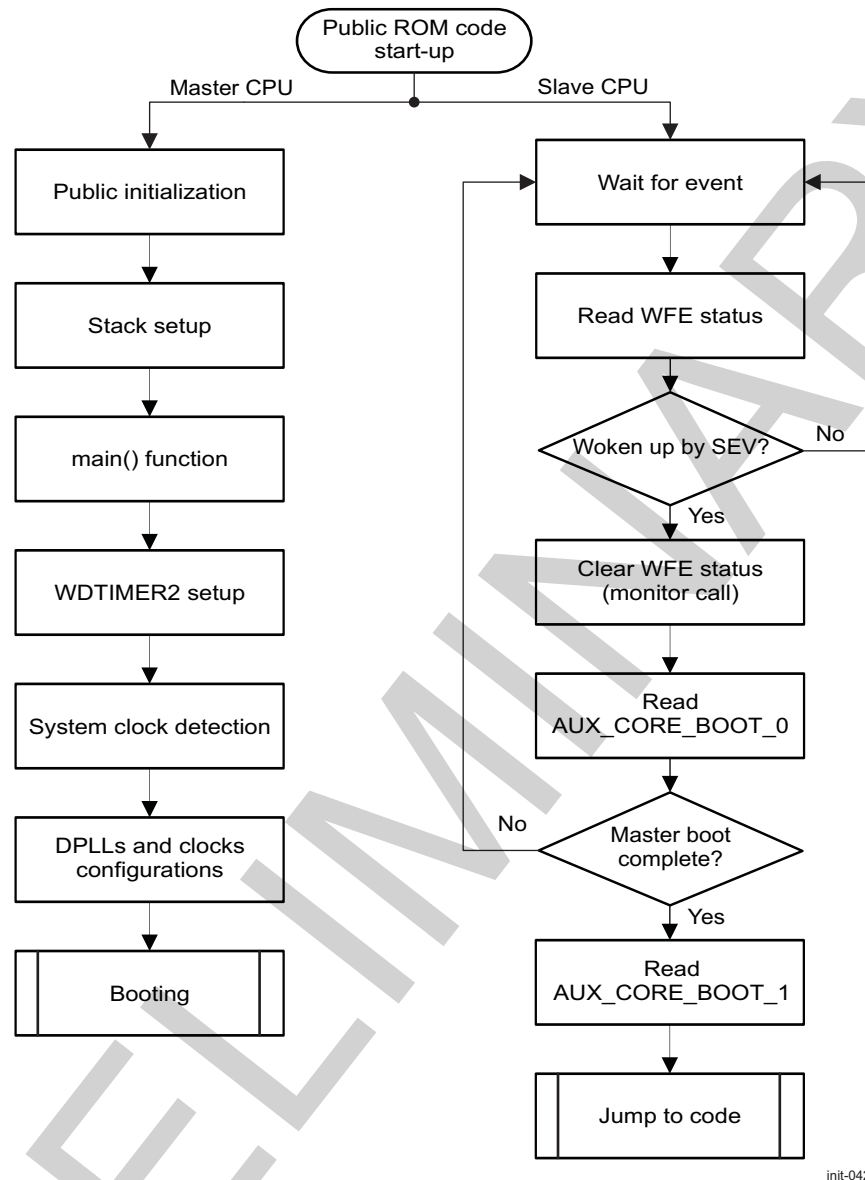
- Step 1. Basic configuration and initialization. Reading of SYSBOOT pins or software booting configuration
- Step 2. The path named fast external boot is a special low-latency boot mode. It consists of a blind jump to an external addressable memory. See [Section 28.4.6, Fast External Booting](#).
- Step 3. A booting device list is created (see [Section 28.4.4.3, Booting Device List Setup](#)). The list consists of all devices to be searched for a booting image. The list is created based on the sys_boot pins or the software booting configuration described in [Section 28.4.4.4, Software Booting Configuration](#). The software booting configuration structure is in the SAR memory and can be written by software before executing a software reset. After a software reset, the software booting configuration has priority over the sys_boot pin configuration.
- Step 4. The main loop of the booting procedure goes through the booting device list and tries to search for an image from the currently selected booting device. This loop is exited if a valid booting image is found and successfully executed or when the watchdog expires. If an image is found, ROM code executes memory booting or peripheral booting, depending on the type of the current booting device:
 - Memory booting is executed when the booting device is XIP memory, NAND, OneNAND/Flex-OneNAND, or eMMC/eSD/MMC/SD.
 - Peripheral booting is executed when the device is a UART or USB.
- Step 5. Memory booting reads data from memory-type devices. Memory booting is described in detail in [Section 28.4.7, Memory Booting](#).
- Step 6. Peripheral booting downloads data from communication interfaces. Peripheral booting is described in [Section 28.4.5, Peripheral Booting](#).
- Step 7. For the GP device, the image is automatically started.

An additional feature of the booting module is the execution of the CH. The CH configures the system for faster and more flexible booting from the selected permanent device. The CH, which is optional, is described in [Section 28.4.8.2, Configuration Header](#).

28.4.4 Startup and Configuration

28.4.4.1 Startup

[Figure 28-9](#) shows the ROM code start-up sequence.

Figure 28-9. ROM Code Multiprocessor Start-Up Sequence

The master CPU L1 instruction cache and branch prediction mechanisms are activated as part of the public boot process. The public vector base address is configured to the reset vector of ROM code (0x30000). The memory management unit (MMU) remains switched off during boot (thus, L1 data cache is off). The master CPU performs the public-side basic initialization and stack setup. Next, it configures WDTIMER2 (set to 3 minutes), performs system clock detection, and configures the system clock. Finally, it jumps to the booting routine.

No specific configuration is performed for the slave CPU, which keeps its default configuration after reset (L1 instruction and data caches off, branch prediction off, MMU off, no remap of public-vector-base address). The slave CPU is rapidly held in wait-for-event state. It stays in this state while the master CPU completes the public boot process and until jumping to the external software (for example, HLOS). At this stage, the external software can wake up the slave CPU by executing an SEV command.

Two internal memory-mapped registers are available to the OS for communicating start-up information. The AUX_CORE_BOOT_0 and AUX_CORE_BOOT_1 registers are in the MPU WakeupGen domain.

- AUX_CORE_BOOT_0 is used as a status register to signal the slave CPU that it must wake up after the send event operation initiated by the master CPU.

- AUX_CORE_BOOT_1 contains the address location to which the slave CPU must jump after wakeup. See the memory mapping of these registers in [Chapter 4, Dual Cortex-A9 Subsystem](#).

28.4.4.2 Clocking Configuration

The ROM code detects the system input clock frequency. The supported frequencies are:

- 12 MHz
- 16.8 MHz
- 19.2 MHz
- 26 MHz
- 38.4 MHz

After detecting the input clock, the ROM code configures the clocks and DPLLs required for ROM code execution.

The configured DPLLs are:

- Peripheral DPLL: Set to provide 192, 128, 96, 48, 24, and 12 MHz for peripheral blocks
- Core DPLL: Set to provide L3/L4 interconnect and MPU and EMIF clocks
- MPU DPLL: Left in bypass, and the MPU internal clock is derived from the core DPLL
- USB DPLL: Locked only in case of USB peripheral booting from internal transceiver. It is left unused in other cases (for example, memory boot or peripheral boot from UART or USB ULPI) to save power.

The multipliers and dividers of the DPLLs are set to values that depend on the input clock detected.

[Table 28-14](#) summarizes the ROM code default settings for key clocks.

Table 28-14. ROM Code Default Clock Settings

| Clock | Frequency [MHz] | Source |
|---------------------------------|-----------------|----------------------|
| FCORE_DPLL | 400 | Derived from SYS_CLK |
| CORE_X2_CLK | 200 | |
| CORE_CLK | 200 | CORE_X2_CLK/1 |
| L3_ICLK | 100 | CORE_CLK/2 |
| L4_ICLK | 50 | L3_ICLK/2 |
| FPER_DPLL | 384 | Derived from SYS_CLK |
| FUNC_192M_CLK | 192 | |
| FUNC_128M_CLK | 128 | |
| FUNC_96M_FCLK | 96 | |
| FUNC_48M_FCLK | 48 | |
| FMPU_DPLL (in bypass) | 200 | CORE_X2_CLK |
| MPU_DPLL_CLK | 200 | FMPU_DPLL/1 |
| FUSB_DPLL ⁽¹⁾ | 960 | Derived from SYS_CLK |
| INIT_960M | 960 | FUSB_DPLL/1 |
| INIT_480M | 480 | FUSB_DPLL/2 |
| INIT_60M | 60 | INIT_480M/8 |

⁽¹⁾ Locked only in case of USB peripheral booting from internal PHY

There are three ways to change DPLLs and all related clock divider, gating, and multiplexer configurations during the boot:

- ROM code default settings, described in [Table 28-14](#). They are always applied at any reset.
- Software booting configuration after a software reset, described in [Section 28.4.4.4, Software Booting Configuration](#)
- The CH, described in [Section 28.4.8.2, Configuration Header](#). The CH lets users have a known configuration (about GPMC and clock registers) after memory booting. This configuration can be blocked by the software booting configuration.

28.4.4.3 Booting Device List Setup

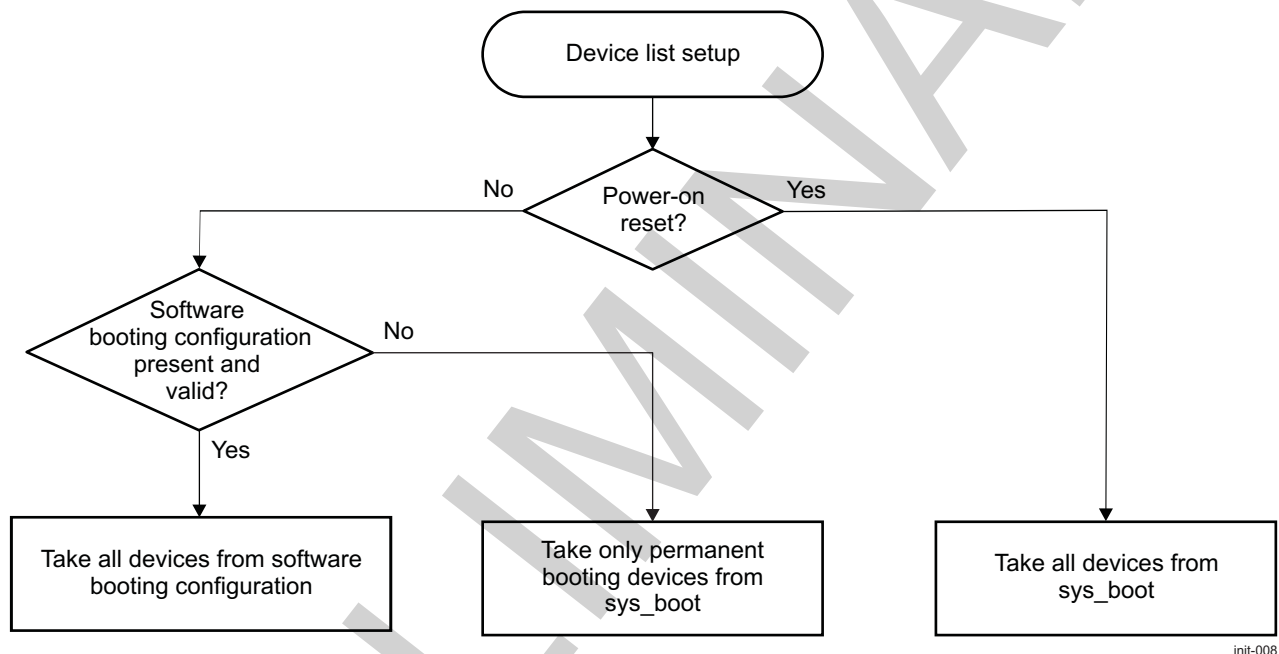
The ROM code creates a device list based on two sources:

- The software booting configuration is stored in nonvolatile RAM SAR memory.
- The sys_boot[5:0] pins sensed in the control module are used to index the device table from which the list of devices is extracted.

Figure 28-10 shows how the ROM code sets up the device list depending on the reset source.

NOTE: Only permanent booting devices are put on the list when reset is not power on and devices are taken from the sys_boot pins. Users can force peripheral booting after software reset using the software booting configuration.

Figure 28-10. Device List Setup



28.4.4.4 Software Booting Configuration

The software booting configuration is a logical structure stored in SAR RAM memory, which is not cleared after warm resets or wakeups from low-power modes.

28.4.4.4.1 Public Use of SAR RAM

At system level, the OMAP SAR RAM memory is divided into four banks. The public ROM code uses only the first bank, which is always public-accessible. More specifically, the software booting configuration structure must be in the upper 1.5 KB of the first bank.

The public ROM code offers some flexibility about the location of the software booting configuration structure. The PUBLIC_SW_BOOT_CFG_ADDR pointer defines the start address of the structure within the SAR RAM bank (see Table 28-15).

Table 28-15. Public Use of SAR RAM

| Logical name | Address | Size (Bytes) | Description |
|-------------------------|-------------|--------------|--|
| PUBLIC_SW_BOOT_CFG_ADDR | 0x4A32 6A00 | 4 | Public software booting configuration pointer. The word value at this location is: - Reset (zero) on a cold reset. - Read on a warm reset. |

Table 28-15. Public Use of SAR RAM (continued)

| Logical name | Address | Size (Bytes) | Description |
|------------------------|-------------|--------------|---|
| CPU0_WAKEUP_NS_PA_ADDR | 0x4A32 6A04 | 4 | CPU0 nonsecure wake-up restoration pointer ⁽¹⁾ |
| CPU1_WAKEUP_NS_PA_ADDR | 0x4A32 6A08 | 4 | CPU1 nonsecure wake-up restoration pointer ⁽¹⁾ |
| PUBLIC_SAR_RAM_1_FREE | 0x4A32 6A0C | ... | Recommended address for start of software booting configuration structure described in Section 28.4.4.2, Software Booting Configuration Structure . |

⁽¹⁾ This pointer is used as part of the restoration procedure from low-power modes.

As mentioned previously, the software booting configuration feature is optional. Hence, the public ROM code decides to use the feature based on the value read on a warm reset at the address pointed to by the PUBLIC_SW_BOOT_CFG_ADDR pointer. If the value matches the range 0x4A32 6A00–0x4A32 6FFF, the ROM code tries to extract the structure at that address. The value pointed to by PUBLIC_SW_BOOT_CFG_ADDR is always overwritten to 0 on a cold reset.

The recommended address for storing the software booting configuration structure described hereafter is defined as PUBLIC_SAR_RAM_1_FREE. It is, however, possible to locate the structure at any location within the 1.5-KB range.

It is moreover possible to use the public SAR RAM area for any other purpose, such as storing traces for HLOS use. Obviously, care must be taken not to overwrite the locations used for low-power modes and/or software booting configuration if used.

28.4.4.2 Software Booting Configuration Structure

[Table 28-16](#) describes the software booting configuration structure. It offers three levels of flexibility for redefining the ROM code defaults after a warm reset:

- Redefining the default device booting list (from ROM code defaults given by SYSBOOT pins configuration)
- Redefining the default clock settings
- Redefining time-outs linked to the peripheral booting mechanism

NOTE: The sections are provided as a linked list; therefore, the order and number of items is not relevant.

The ROM code searches for the next section at the location based on the size filled in the previous section. The clock configuration from software booting configuration overwrites the CH settings.

Table 28-16. Software Booting Configuration Structure

| Field | Size (Bytes) | Description |
|-------------------------------|--------------|---|
| Booting Configuration | | |
| Section 1 key | 4 | Synchronization key for section 1: 0xCF00AA01 |
| Section 1 size | 4 | Size of section 1: 0x0000000C (12) |
| Flags | 2 | Bits [4:1]: Mask the CH; when one of these 4 bits is set to 1, the CH item is not analyzed: [1]: SETTINGS [2]: RAM [3]: FLASH (GPMC) [4]: MMCSD Others: Reserved |
| 1 st device | 2 | Devices to be put into the device list 0x00: Void, no device 0x01: XIP memory 0x02: XIPWAIT memory (wait-signal monitoring on) |
| 2 nd device | 2 | 0x03: NAND 0x04: OneNAND 0x05: MMC1 0x06: MMC2(1) |
| 3 rd device | 2 | 0x07: MMC2(2) 0x08: MMC2_BOOT 0x43: UART 0x45: USB(1) (internal transceiver) |
| 4 th device | 2 | 0x46: USB-ULPI 0x47: USB(2) (internal transceiver) Others: Reserved |
| Padding | 2 | |
| Clock Settings | | |
| Section 2 key | 4 | Synchronization key for section 2: 0xCF00AA02 |
| Section 2 size | 4 | Size of section 2: 0x00000064 (100) |
| Flags | 4 | Bit mask of various switches, active when set to 1: Bit [0]: Clock configuration defined in this structure is applied. Bit [1]: Reserved Bit [2]: Apply general clock settings. Bit [3]: Set and lock PER DPLL. Bit [4]: Set and lock MPU DPLL. Bit [5]: Set and lock Core DPLL. Bit [6]: Set and lock USB DPLL. Bit [7]: Bypass PER DPLL before setting clocks. Bit [8]: Bypass MPU DPLL before setting clocks. Bit [9]: Bypass Core DPLL before setting clocks. Bit [10]: Bypass USB DPLL before setting clocks. Bit [11]: Perform DLL control configuration. Bits [31:12]: Reserved |
| General Clock Settings | | |
| CM_CLKSEL_CORE | 4 | Register value |
| CM_DLL_CTRL | 4 | Register value |
| MPU DPLL Settings | | |
| CM_AUTOIDLE_DPLL_MPU | 4 | Register value |
| CM_CLKSEL_DPLL_MPU | 4 | Register value |

Table 28-16. Software Booting Configuration Structure (continued)

| Field | Size (Bytes) | Description |
|--|--------------|--|
| CM_DIV_M2_DPLL_MPU | 4 | Register value |
| Core DPLL Settings | | |
| CM_AUTOIDLE_DPLL_CORE | 4 | Register value |
| CM_CLKSEL_DPLL_CORE | 4 | Register value |
| CM_DIV_M2_DPLL_CORE | 4 | Register value |
| CM_DIV_M3_DPLL_CORE | 4 | Register value |
| CM_DIV_M4_DPLL_CORE | 4 | Register value |
| CM_DIV_M5_DPLL_CORE | 4 | Register value |
| CM_DIV_M6_DPLL_CORE | 4 | Register value |
| CM_DIV_M7_DPLL_CORE | 4 | Register value |
| PER DPLL Settings | | |
| CM_AUTOIDLE_DPLL_PER | 4 | Register value |
| CM_CLKSEL_DPLL_PER | 4 | Register value |
| CM_DIV_M2_DPLL_PER | 4 | Register value |
| CM_DIV_M3_DPLL_PER | 4 | Register value |
| CM_DIV_M4_DPLL_PER | 4 | Register value |
| CM_DIV_M5_DPLL_PER | 4 | Register value |
| CM_DIV_M6_DPLL_PER | 4 | Register value |
| CM_DIV_M7_DPLL_PER | 4 | Register value |
| USB DPLL Settings | | |
| CM_AUTOIDLE_DPLL_USB | 4 | Register value |
| CM_CLKSEL_DPLL_USB | 4 | Register value |
| CM_DIV_M2_DPLL_USB | 4 | Register value |
| Peripheral Booting Time-out Configuration | | |
| Section 3 key | 4 | Synchronization key for section 3: 0xCF00AA03 |
| Section 3 size | 4 | Size of the section 3: 0x00000008 (8) |
| Flags | 2 | Bit [0]: If cleared (= 0), the time-out USB field is ignored. Bit [1]: If cleared (= 0), the time-out boot message field is ignored. Other bits: Reserved |
| Time-out USB | 2 | Maximum time allowed for the host to complete the USB enumeration. <ul style="list-style-type: none"> 0x0000: OMAP device will wait indefinitely for the host to complete USB enumeration. Others: The value expressed in milliseconds defines the maximum time the OMAP device will wait for the host to complete the USB enumeration (maximum 65.5 s). |
| Time-out boot message | 2 | Maximum time allowed for the host to for the host to send a booting message. <ul style="list-style-type: none"> 0x0000: OMAP device will wait indefinitely for the host to send a booting message. Others: The value expressed in milliseconds defines the maximum time the OMAP device will wait for the host to send a booting message (maximum 65.5 s). |
| Padding | 2 | |

28.4.5 Peripheral Booting

28.4.5.1 Description

The ROM code can boot from two different peripherals:

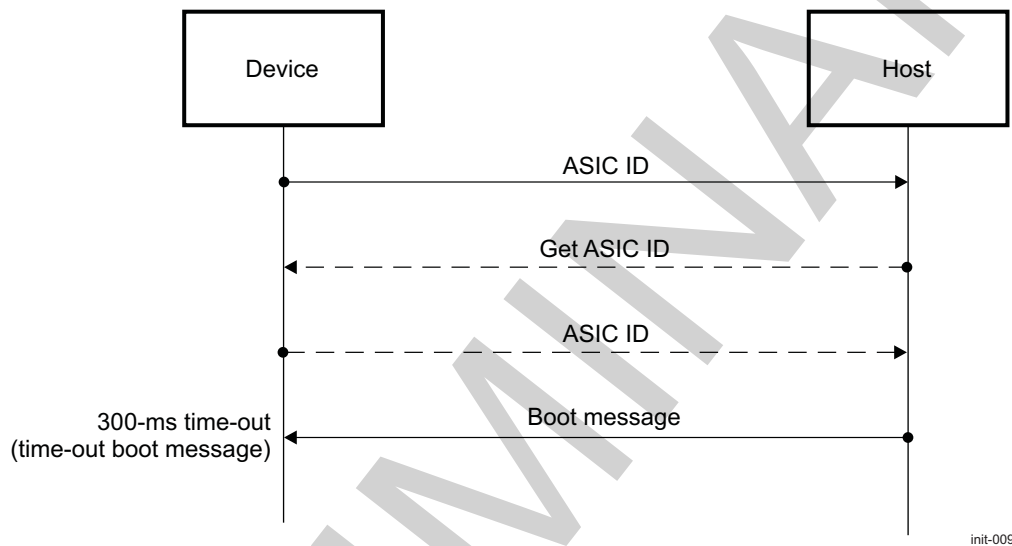
- USB: High-/full-speed USB from internal or external transceiver

- UART3: 115.2 Kbps, 8 bits, even parity, 1 stop-bit

The purpose of booting from a peripheral is to download a flash loader code from an external host. This booting method is used primarily for programming flash memories connected to the OMAP device (for example, in the case of initial flashing, firmware update or servicing). The overall peripheral booting procedure is shown in [Figure 28-13](#). It consists of a synchronization phase (handshake between host and OMAP device) and a transfer phase. The synchronization phase is similar for UART and USB boots. Both transfer phases use the same procedure.

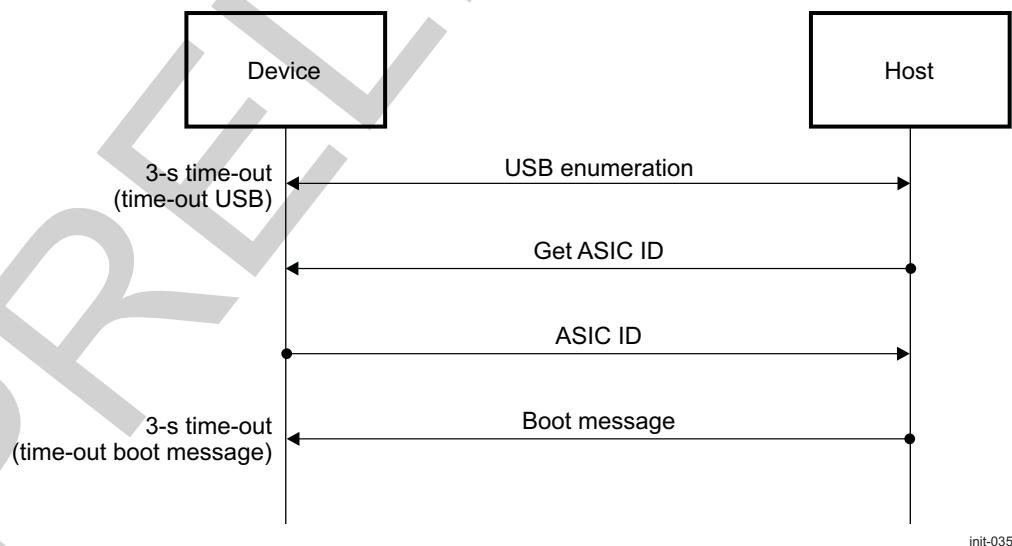
When booting from the UART, the ROM code first initializes the UART3 interface. Then the ROM code sends an ASIC ID block of data. From there, it expects to receive a boot message from the host within 300 ms, by default. [Figure 28-11](#) shows this procedure.

Figure 28-11. Synchronization Phase for UART



[Figure 28-12](#) shows the procedure when booting from the USB.

Figure 28-12. Synchronization Phase for USB



During the synchronization phase (see [Figure 28-11](#) and [Figure 28-12](#)), the OMAP device can provide a small packet of data called the ASIC ID (described in [Table 28-17](#)). It is a simple structure that contains different kinds of information, such as ROM version, checksums, and ID.

The default time-outs involved during the synchronization phase can be redefined after a warm reset by means of the software booting configuration (described in [Section 28.4.4.4, Software Booting Configuration](#)). The host can decide the desired operation by providing a booting message (see [Table 28-21](#)). This message can be: Get ASIC ID, peripheral boot, change device, or next device. If the OMAP device receives the Get ASIC ID boot message, it sends back the ASIC ID contents.

If the change device or next device message is received, the ROM code stops the current peripheral booting procedure and returns to the main booting, which decides about the next booting device according to the boot message received.

If the peripheral boot message is received without a time-out, the OMAP device is entering the transfer phase. From there, the flash loader image size (as a 32-bit word) and the flash loader image itself are expected to be received. The ROM code waits up to 1 minute for completion of image size reception, and up to 1 more minute to download the image. If the download procedure does not complete before this time, the peripheral booting returns with a TIMEOUT status. ROM code continues to examine the devices included in the booting device list. If the download procedure passes, the peripheral booting returns with a SUCCESS status and the image can be executed.

The USB or UART connection is left open at the end of the transfer phase and once exiting the ROM code for the initial software to take over. It means the initial software can reuse the currently established connection. In the case of a USB connection, the endpoints can be reused as such, without closing the connection and performing a full enumeration again.

Table 28-17. ASIC ID Structure

| ASIC ID Item | Size (Bytes) | Description |
|-------------------|--------------|---|
| Items | 1 | Number of subblocks |
| ID subblock | 7 | Device identification information |
| Reserved subblock | 4 | This subblock is transmitted, but does not contain useful information in case of GP device. |
| Reserved subblock | 23 | This subblock is transmitted, but does not contain useful information in case of GP device. |
| Reserved subblock | 35 | This subblock is transmitted, but does not contain useful information in case of GP device. |
| Checksum subblock | 11 | CRC (4 bytes) |

Table 28-18. Items

| Offset | Size (Bytes) | Description |
|--------|--------------|--|
| 0x00 | 1 | 0x05: Number of subblocks USB 0x04: Number of subblocks UART ⁽¹⁾ |

⁽¹⁾ The checksum subblock is not transmitted over the UART.

Table 28-19. ID Subblock

| Offset | Size (Bytes) | Description |
|--------|--------------|---|
| 0x01 | 1 | 0x01: Subblock ID |
| 0x02 | 1 | 0x05: Subblock size |
| 0x03 | 1 | 0x01: Fixed value |
| 0x04 | 2 | 0x44, 0x70: OMAP4470 device |
| 0x06 | 1 | 0x07: CH enabled (read from eFuse) 0x17: CH disabled (read from eFuse) |
| 0x07 | 1 | ROM revision |

Table 28-20. Checksum Subblock⁽¹⁾

| Offset | Size (Bytes) | Description |
|--------|--------------|-------------------|
| 0x46 | 1 | 0x15: Subblock ID |

⁽¹⁾ The checksum subblock is not transmitted over the UART.

Table 28-20. Checksum Subblock⁽¹⁾ (continued)

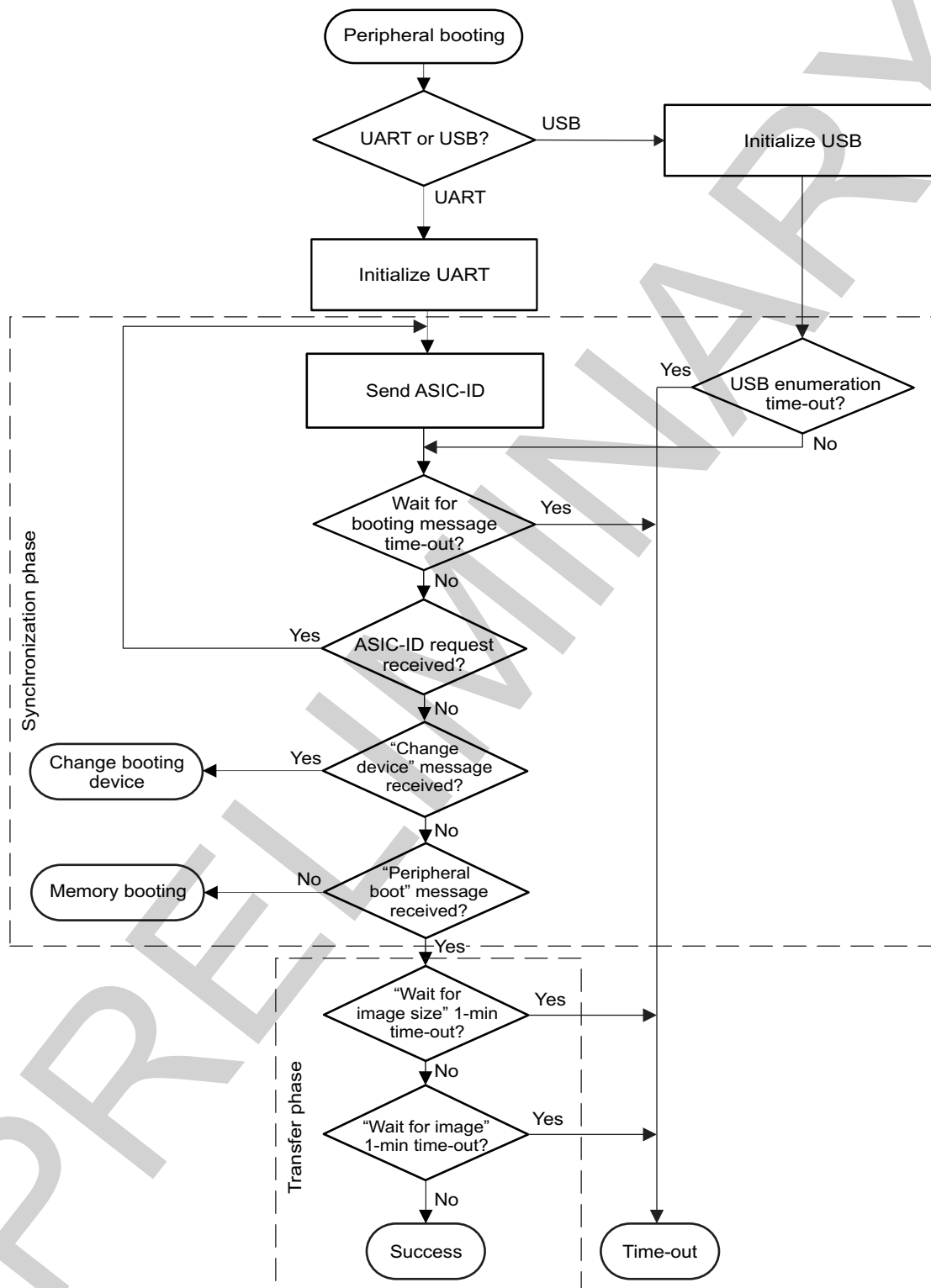
| Offset | Size (Bytes) | Description |
|--------|--------------|---------------------------|
| 0x47 | 1 | 0x09: Subblock size |
| 0x48 | 1 | 0x01: Fixed value |
| 0x49 | 4 | ROM CRC |
| 0x4D | 4 | 0x00000000: For GP device |

Table 28-21. Booting Messages

| Message Name | Value | Description |
|-----------------|-------------|--|
| Peripheral boot | 0xF003 0002 | Continue peripheral booting. |
| Get ASIC ID | 0xF003 0003 | ASIC ID request. The Get ASIC ID request message is optional. If received, the ROM code sends its ASIC ID data to the host in return. The host can issue the Get ASIC ID message multiple times if required. The structure of the ASIC ID is described in Table 28-17 . |
| Change device | 0xF003 xx06 | Skip current peripheral booting and continue booting from device type indicated by xx: <ul style="list-style-type: none"> 0x00: Void, no device 0x01: XIP memory 0x02: XIPWAIT memory (wait-signal monitoring on) 0x03: NAND 0x04: OneNAND 0x05: MMC1 0x06: MMC2(1) 0x07: MMC2(2) 0x08: MMC2_BOOT 0x43: UART 3 0x45: USB(1) (internal transceiver) 0x46: USB-ULPI 0x47: USB(2) (internal transceiver) Others: Reserved |
| Next device | 0xFFFF FFFF | Skip current device and move to the next device on the device list. |
| Memory booting | Others | Skip current peripheral booting and move to the first device for memory booting. |

Figure 28-13 shows the peripheral booting procedure.

Figure 28-13. Peripheral Booting Procedure



init-010

28.4.5.2 UART

The ROM code supports booting from a UART interface with the following characteristics:

- UART interface 3
- Communication parameters set to 115.2 Kbps, 8 bits, even parity, 1 stop-bit
- Two-pin interface: RX/TX
- The boot message default time-out is 300 ms (time-out boot message)

28.4.5.3 USB

The ROM code supports booting from a USB interface with the following characteristics:

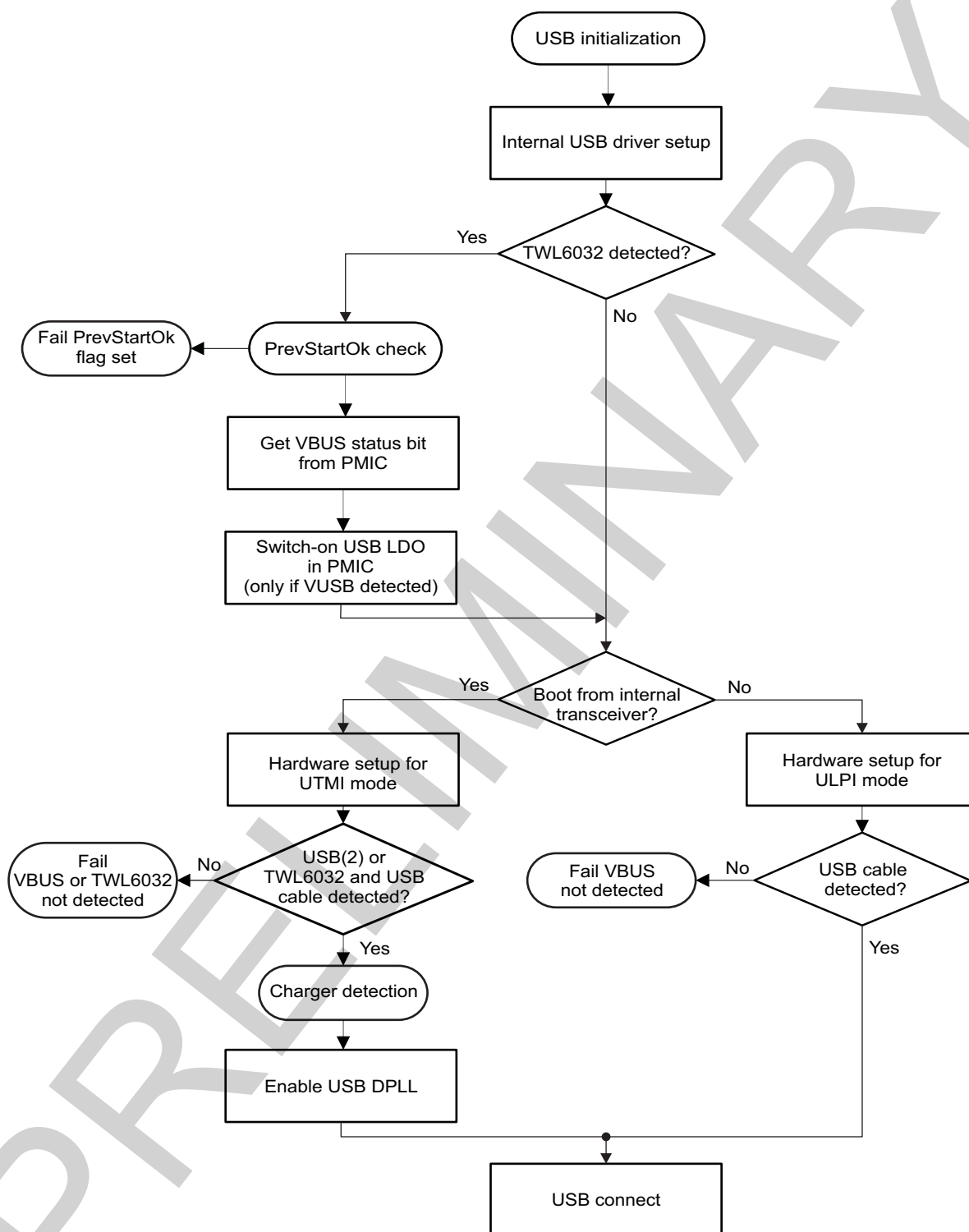
- HSUSBOTG interface (USBA0)
- OMAP integrated transceiver (USBPHY) or external transceiver through the ULPI
- Enumeration default time-out is 3 s (time-out USB)
- The boot message default time-out is 3 s (time-out boot message).

NOTE: Even though using OTG-capable hardware, the ROM code does not handle any OTG-specific features.

28.4.5.3.1 Overview

[Figure 28-14](#) shows the USB initialization procedure.

Figure 28-14. USB Initialization Procedure



init-037

After internal USB module driver setup, the TWL6032 power IC is checked for presence. If found, the following actions are performed using I²C transactions through the I2C1 interface:

- PrevStartOk status flag check, as described in [Section 28.4.5.3.2](#).
- Get the VBUS status reflecting presence (or not) of the USB cable

- If VBUS was detected, then the VUSB regulator is enabled to power the internal OMAP transceiver.

In case of boot from external transceiver in accordance with the chosen SYSBOOT configuration:

- The HSUSBOTG hardware and PRCM clocks are configured for ULPI mode.
- The ROM code continues with the USB procedure only if the USB cable is detected (that is, VBUS is detected at external transceiver level and communicated as such through the ULPI traffic). If not, the initialization procedure is aborted.

NOTE: The OMAP USB DPLL is not set up in case of ULPI mode, for which the 60-MHz clock is driven by the external transceiver.

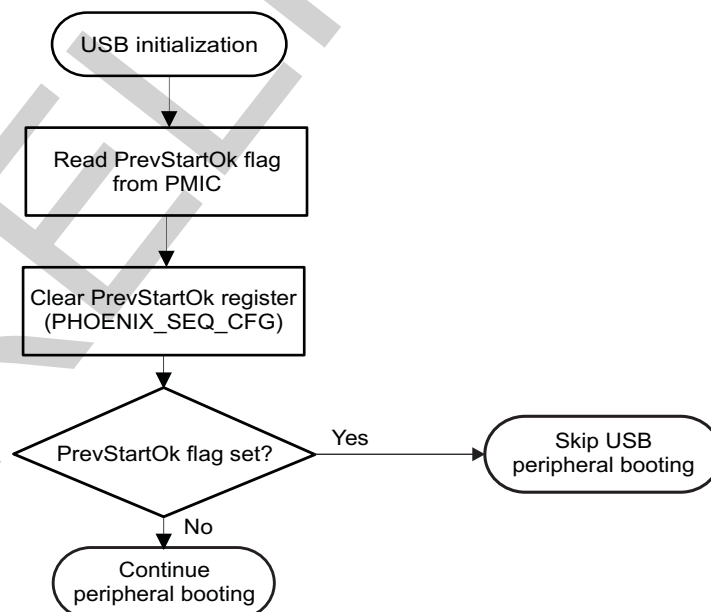
In case of boot from internal transceiver in accordance with the chosen SYSBOOT configuration:

- The USBOTGHS hardware and PRCM clocks are configured for UTMI mode and internal PHY clocks are enabled.
- For USB(1) only: The ROM code continues with the USB procedure only if the TWL6032 is detected and the USB cable is detected as present (that is, VBUS is detected at the TWL6032 level and read as such with a register read through I2C interface). If not, the initialization procedure is aborted.
- For USB(2) only: The ROM code continues with the USB procedure even if the TWL6032 is not detected and the USB cable is not detected as present at the TWL6032 level. This enables a USB boot with internal transceiver even without the TWL6032.
- The ROM code proceeds with charger detection, as described in [Section 28.4.5.3.2](#).
- It enables the USB DPLL for feeding the appropriate 60-MHz clock needed by the internal transceiver.

28.4.5.3.2 PrevStartOk Status Flag Check

The ROM code supports a mechanism for avoiding the boot time spent because of the enumeration time-out (default 3 s) in case the USB cable is attached and the USB option is present in the selected boot list but is not intended to initiate a peripheral booting procedure (for example, firmware update or flashing). This mechanism is jointly handled with the support of the TWL6032 device (not supported if TWL6032 is not detected). This mechanism is supported only for USB and not UART (see [Figure 28-15](#)).

Figure 28-15. PrevStartOk Mechanism



init-038

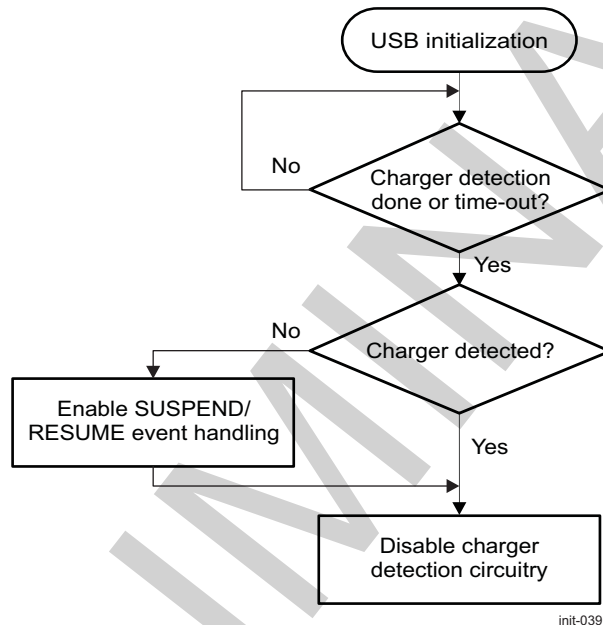
The ROM code first checks the value of a register in the TWL6032 RTC domain (hence, retained by the backup battery when the platform is switched off) by an I²C read access. If the PrevStartOk bit in this register is set, the USB peripheral booting is simply skipped. In any case, the bit is reset (zeroed) by the

ROM code, which means that the USB peripheral boot is re-enabled on the next cold reset (or warm reset if suitable software booting configuration is present). The initial software of the user must reset this bit by an I²C write access to disable USB peripheral booting on a subsequent reset. For more information about the accesses made toward the PrevStartOk bit in the PHOENIX_SEQ_CFG register, see TWL6032 documentation.

28.4.5.3.3 Charger Detection

The ROM code proceeds with charger detection as part of the USB peripheral booting procedure and in compliance with *Battery Charging Specification Revision 1.1*. It uses the specific charger detection hardware embedded in the OMAP device. Figure 28-16 shows the high-level procedure.

Figure 28-16. Charger Detection



The hardware charger detection mechanism should end up within the 500-ms time-out. The main goal of such detection is to gate the charger circuitry in TWL6032 in case a charger is not detected and a suspend event is detected on the OMAP side, for which the power consumption must be reduced.

28.4.5.3.4 SUSPEND and RESUME Handling

The SUSPEND event is detected by the HSUSBOTG module when activity on the bus stops for at least 3 ms. During peripheral booting time, a SUSPEND event is detected by the ROM code and processed by initiating a write into the TWL6032 to gate the charging circuitry. The ROM code releases the TWL6032 charger circuitry upon getting a RESUME event. During run time, SUSPEND and RESUME interrupts can be routed to the initial software to define custom handling.

28.4.5.3.5 USB Driver Descriptors

USB devices report their attributes using descriptors. A descriptor is a data structure with a defined format. Each descriptor begins with a byte-wide field that contains the total number of bytes in the descriptor followed by a byte-wide field that identifies the descriptor type. Using descriptors allows concise storage of the attributes of individual configurations so that each configuration can reuse descriptors or portions of descriptors from other configurations that have the same characteristics. Where appropriate, descriptors contain references to string descriptors. String descriptors contain displayable, human-readable description information. These descriptor details can be used for tool development or debugging:

- Device descriptor

A device descriptor contains general information about a USB device, including global information that applies to the device and all device configurations. A USB device has only one device descriptor. A device-qualifier descriptor is required because the ROM code uses the HS feature of the USB core. [Table 28-22](#) lists the device descriptors.

Table 28-22. Device Descriptor

| Field | Value | Description |
|--------------------|--|---|
| bLength | 0x12 | Size of this descriptor in bytes |
| bDescriptorType | 0x01 | Device descriptor type |
| bcdUSB | 0x0210 | USB specification release number in binary coded decimal (BCD) format |
| bDeviceClass | Vendor-specific (0xFF) | Class code |
| bDeviceSubClass | Vendor-specific (0xFF) | Subclass code |
| bDeviceProtocol | Vendor-specific (0xFF) | Protocol code |
| bMaxPacketSize0 | 0x40 | Maximum packet size for endpoint 0 |
| idVendor | 0x0451 | Vendor ID (Texas Instruments), TI default value |
| idProduct | 0x- | Product ID (OMAP4470), TI default value |
| bcdDevice | 0x0000 | Device release number |
| iManufacturer | See Section 28.4.5.3.6 . | Index of string descriptor describing manufacturer |
| iProduct | See Section 28.4.5.3.6 . | Index of string descriptor describing product |
| iSerialNumber | See Section 28.4.5.3.6 . | Index of string descriptor describing device serial number |
| bNumConfigurations | 0x01 | Number of possible configurations |

- Device-qualifier descriptor

The device-qualifier descriptor contains information about a HS-capable device that changes if the device operates at its other speed. This descriptor is retrieved by the host using the GetDescriptor() request (standard device request). [Table 28-23](#) describes a device-qualifier descriptor.

Table 28-23. Device-Qualifier Descriptor

| Field | Value | Description |
|--------------------|--------|---|
| bLength | 0x0a | Size of this descriptor in bytes |
| bDescriptorType | 0x06 | Device-qualifier descriptor type |
| bcdUSB | 0x0210 | USB specification release number in BCD |
| bDeviceClass | 0xFF | Class code |
| bDeviceSubClass | 0xFF | Subclass code |
| bDeviceProtocol | 0xFF | Protocol code |
| bMaxPacketSize0 | 0x40 | Maximum packet size for endpoint 0 |
| bNumConfigurations | 0x01 | Number of possible configurations |
| bReserved | 0x00 | Reserved for future use |

- Configuration descriptor

This descriptor gives information about a specific device configuration. It describes the number of interfaces supported by the configuration (see [Table 28-24](#)).

Table 28-24. Configuration Descriptor

| Field | Value | Description |
|---------------------|-------|--|
| bLength | 0x09 | Size of this descriptor in bytes |
| bDescriptorType | 0x02 | Configuration descriptor type |
| wTotalLength | – | Combined length of all descriptors |
| bNumInterfaces | 0x01 | Number of interfaces supported |
| bConfigurationValue | 0x01 | Value to use as an argument for the SetConfiguration() request |
| iConfiguration | Index | Index of string descriptor describing this configuration |

Table 28-24. Configuration Descriptor (continued)

| Field | Value | Description |
|--------------|-------|---|
| bmAttributes | 0xC0 | Power setting and remote wakeup |
| bMaxPower | 0x32 | Maximum power consumption of the USB device |

- Other speed configuration descriptor

This descriptor describes the configuration of a HS-capable device if it operates at its other possible speed (see [Table 28-25](#)).

Table 28-25. Other Speed Configuration Descriptor

| Field | Value | Description |
|---------------------|-------|--|
| bLength | 0x09 | Size of this descriptor in bytes |
| bDescriptorType | 0x07 | Other speed configuration descriptor type |
| wTotalLength | – | Combined length of all descriptors |
| bNumInterfaces | 0x01 | Number of interfaces supported |
| bConfigurationValue | 0x01 | Value to use as an argument for the SetConfiguration() request |
| iConfiguration | Index | Index of string descriptor describing this configuration |
| bmAttributes | 0xC0 | Power setting and remote wakeup |
| bMaxPower | 0x32 | Maximum power consumption of the USB device |

- Interface descriptor

This descriptor describes a specific interface in a configuration (see [Table 28-26](#)).

Table 28-26. Interface Descriptor

| Field | Value | Description |
|--------------------|-------|--|
| bLength | 0x09 | Size of this descriptor in bytes |
| bDescriptorType | 0x04 | Interface descriptor type |
| bInterfaceNumber | 0x00 | Number of this descriptor |
| bAlternateSetting | 0x00 | Value to select the alternate setting |
| bNumEndpoints | 0x02 | Number of endpoints used for this interface |
| bInterfaceClass | 0xFF | Class code |
| bInterfaceSubClass | 0xFF | Subclass code |
| bInterfaceProtocol | 0xFF | Protocol code |
| iInterface | Index | Index of string descriptor describing this interface |

- Endpoint descriptor

Each endpoint used for an interface has its own descriptor. This descriptor contains information required by the host to determine the bandwidth requirements of each endpoint. This descriptor is returned as part of the GetDescriptor(Configuration) request (see [Table 28-27](#) and [Table 28-28](#)).

Table 28-27. BULK IN Endpoint Descriptor

| Field | Value | Description |
|------------------|----------------------|---|
| bLength | 0x07 | Size of this descriptor in bytes |
| bDescriptorType | 0x05 | Endpoint descriptor type |
| bEndpointAddress | 0x81 (1 IN) | Address of the endpoint on the USB device |
| bmAttributes | 0x02 (Bulk) | Type of transfer |
| wMaxPacketSize | See ⁽¹⁾ . | Number of endpoints used for this interface |
| bInterval | 0x00 | Maximum NAK rate |

⁽¹⁾ The maximum size is 0x0200 (512 bytes) for HS bulk endpoint and 0x0040 (64 bytes) for FS bulk endpoint.

Table 28-28. BULK OUT Endpoint Descriptor

| Field | Value | Description |
|------------------|----------------------|---|
| bLength | 0x07 | Size of this descriptor in bytes |
| bDescriptorType | 0x05 | Endpoint descriptor type |
| bEndpointAddress | 0x01 (1 OUT) | Address of the endpoint on the USB device |
| bmAttributes | 0x02 (Bulk) | Type of transfer |
| wMaxPacketSize | See ⁽¹⁾ . | Number of endpoints used for this interface |
| bInterval | 0x00 | Maximum NAK rate |

⁽¹⁾ The maximum size is 0x0200 (512 bytes) for HS bulk endpoint and 0x0040 (64 bytes) for FS bulk endpoint.

- String descriptors

String descriptors use UNICODE encoding. The strings in a USB device can support multiple languages. When requesting a string descriptor, the requester specifies the desired language using a 16-bit language ID (LANGID) defined by the USB interface. String index 0 for all languages returns a string descriptor that contains an array of 2-byte LANGID codes supported by the device.

For the description of the different string descriptors, see:

- The language ID string descriptor ([Table 28-29](#))
- The manufacturer ID string descriptor ([Table 28-30](#))
- The product ID string descriptor ([Table 28-31](#))
- The configuration string descriptor ([Table 28-32](#))
- The interface string descriptor ([Table 28-33](#))

Table 28-29. Language ID String Descriptor

| Field | Value | Description |
|-----------------|---------------------|----------------------------------|
| bLength | 0x04 | Size of this descriptor in bytes |
| bDescriptorType | 0x03 | String descriptor type |
| wLangId | 0x0409 (US English) | Language ID code |

Table 28-30. Manufacturer ID String Descriptor

| Field | Value | Description |
|-----------------|-------------------|----------------------------------|
| bLength | 0x24 | Size of this descriptor in bytes |
| bDescriptorType | 0x03 | String descriptor type |
| bString | Texas Instruments | Manufacturer string |

Table 28-31. Product ID String Descriptor

| Field | Value | Description |
|-----------------|----------|----------------------------------|
| bLength | 0x12 | Size of this descriptor in bytes |
| bDescriptorType | 0x03 | String descriptor type |
| bString | OMAP4470 | Product string |

Table 28-32. Configuration String Descriptor

| Field | Value | Description |
|-----------------|-------|----------------------------------|
| bLength | 0x08 | Size of this descriptor in bytes |
| bDescriptorType | 0x03 | String descriptor type |
| bString | pbc | Configuration string |

Table 28-33. Interface String Descriptor

| Field | Value | Description |
|-----------------|-------|----------------------------------|
| bLength | 0x08 | Size of this descriptor in bytes |
| bDescriptorType | 0x03 | String descriptor type |
| bString | pbi | Interface string |

28.4.5.3.6 USB Customized Descriptors

There are two parameters in USB descriptors that customers can define after the chip is created: vendor ID (VID) and product ID (PID). The ROM code uses dedicated eFuses that hold VID and PID values. Other parameters can also be changed based on the VID value. The ROM code has an encoded set of parameters for customers who have defined their requirements before the ROM code has been done.

Table 28-34 lists the parameters that depend on the VID value.

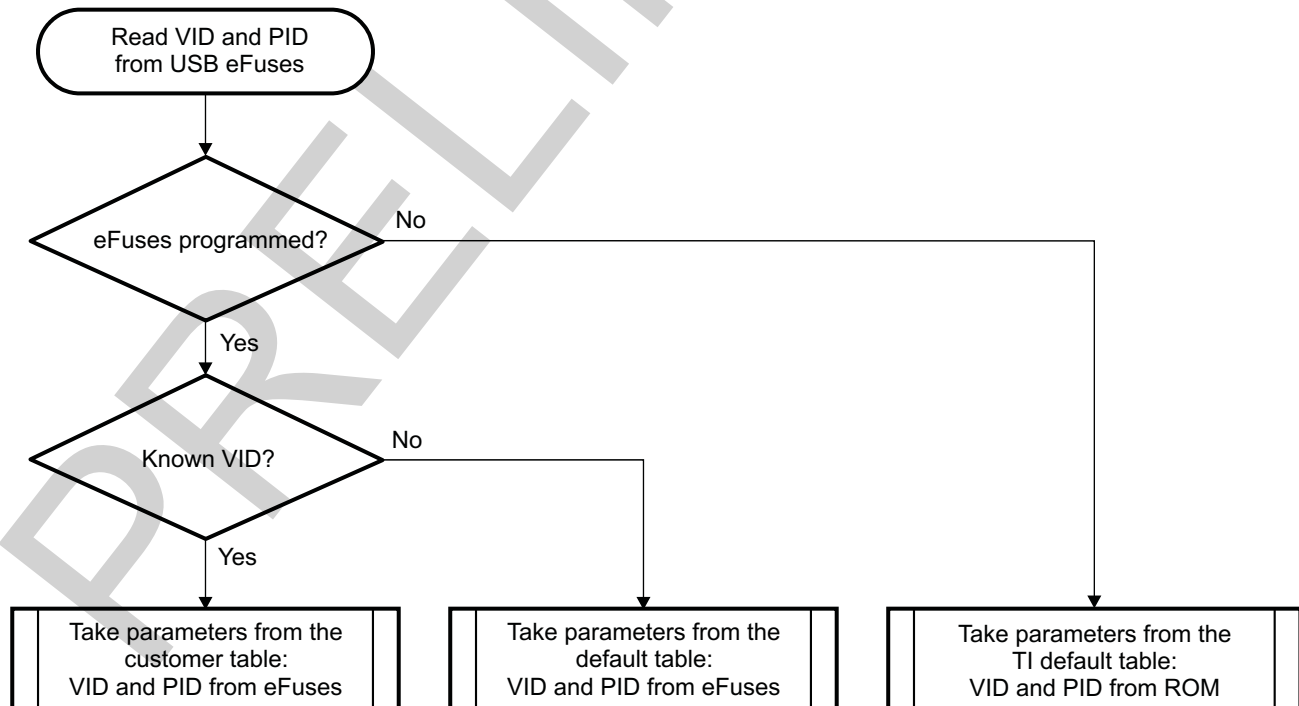
Table 28-34. Customized Descriptor Parameters

| Parameter | Size (Bytes) | Default Values (From eFuses) | TI Default Values (From ROM) |
|-----------------|--------------|------------------------------|------------------------------|
| Device ID code | 2 | 0x0000 | 0x0000 |
| Device class | 1 | 0xFF | 0xFF |
| Device subclass | 1 | 0xFF | 0xFF |
| Device protocol | 1 | 0xFF | 0xFF |
| Manufacturer | String | N/A | Texas Instruments |
| Product | String | OMAP4470 | OMAP4470 |
| Serial number | String | See ⁽¹⁾ . | See ⁽¹⁾ . |

⁽¹⁾ The standard device descriptor indicates that the device has no serial number.

Figure 28-17 shows an additional customer parameter selection method. It is based on the VID burned in the USB eFuses.

Figure 28-17. Customer USB Descriptor Selection

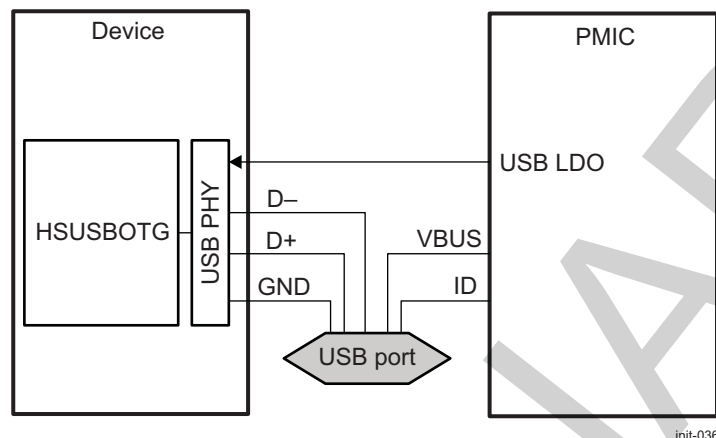


init-011

28.4.5.3.7 System Interconnection – Integrated Transceiver

When SYSBOOT selects the embedded PHY, the USB power/data path can be described as shown in Figure 28-18.

Figure 28-18. USB System Using Internal Transceiver



NOTE: USB(2) booting mode allows an alternate power-management IC to be used. In that case, the internal transceiver must be powered and configured upon startup and does not require any action from the ROM code for its configuration.

28.4.5.3.8 System Interconnection – External Transceiver

The USBOTGHS module uses the ultralow-pin-count interface (ULPI) to interconnect with an external USB transceiver. In this case, the ROM code does not interact with the transceiver. Thus, users must ensure that the transceiver power supply and clock are present and the transceiver is out of reset.

28.4.5.3.9 USB Driver Functionality

- Transactions supported:
 - Control transactions: Used for standard device requests
 - Bulk transactions: Used for data transfer in the image downloading stage. The ASIC ID is sent to the BULK IN endpoint and the image is transferred from the host over the BULK OUT endpoint.

The OMAP USB device first attaches to the host as an FS device. In the reset mechanism, the USB core requests HS operation. If the HS negotiation in the reset phase is successful, further transactions are at HS; otherwise, they are at FS. After reset, the USB driver checks for the speed of the device, whether it is FS or HS. Depending on the speed configured by the host, the standard USB device requests are answered with the corresponding descriptors.

- Standard device request restrictions:

Some standard device requests are not supported by the driver because the USB driver is dedicated for use by the ROM code for peripheral booting. Table 28-35 lists the standard device requests supported by the driver.

Table 28-35. Standard Device Requests Supported

| Request | Description | Support |
|-------------------|--|--|
| CLEAR_FEATURE | Sets/clears a specific feature | Supported only for ENDPOINT_HALT feature |
| GET_CONFIGURATION | Returns the current device configuration value | Yes |
| GET_DESCRIPTOR | Returns the specified descriptor | Yes |
| GET_INTERFACE | Returns the selected alternate setting for the specified interface | Yes |
| GET_STATUS | Returns the status for the specified recipient | Yes |

Table 28-35. Standard Device Requests Supported (continued)

| Request | Description | Support |
|-------------------|--|---|
| SET_ADDRESS | Sets the device address | Yes |
| SET_CONFIGURATION | Sets the device configuration | Yes |
| SET_DESCRIPTOR | Updates existing descriptors or adds new descriptors | Runtime updating of descriptors is not supported. |
| SET_FEATURE | Sets or enables a specific feature | Supported only for ENDPOINT_HALT feature |
| SET_INTERFACE | Selects an alternate setting in an interface | Runtime setting of alternate features is not supported. |
| SYNCH_FRAME | Sets and reports an endpoint synchronization frame | No, because isochronous transfers are not used |

28.4.6 Fast External Booting

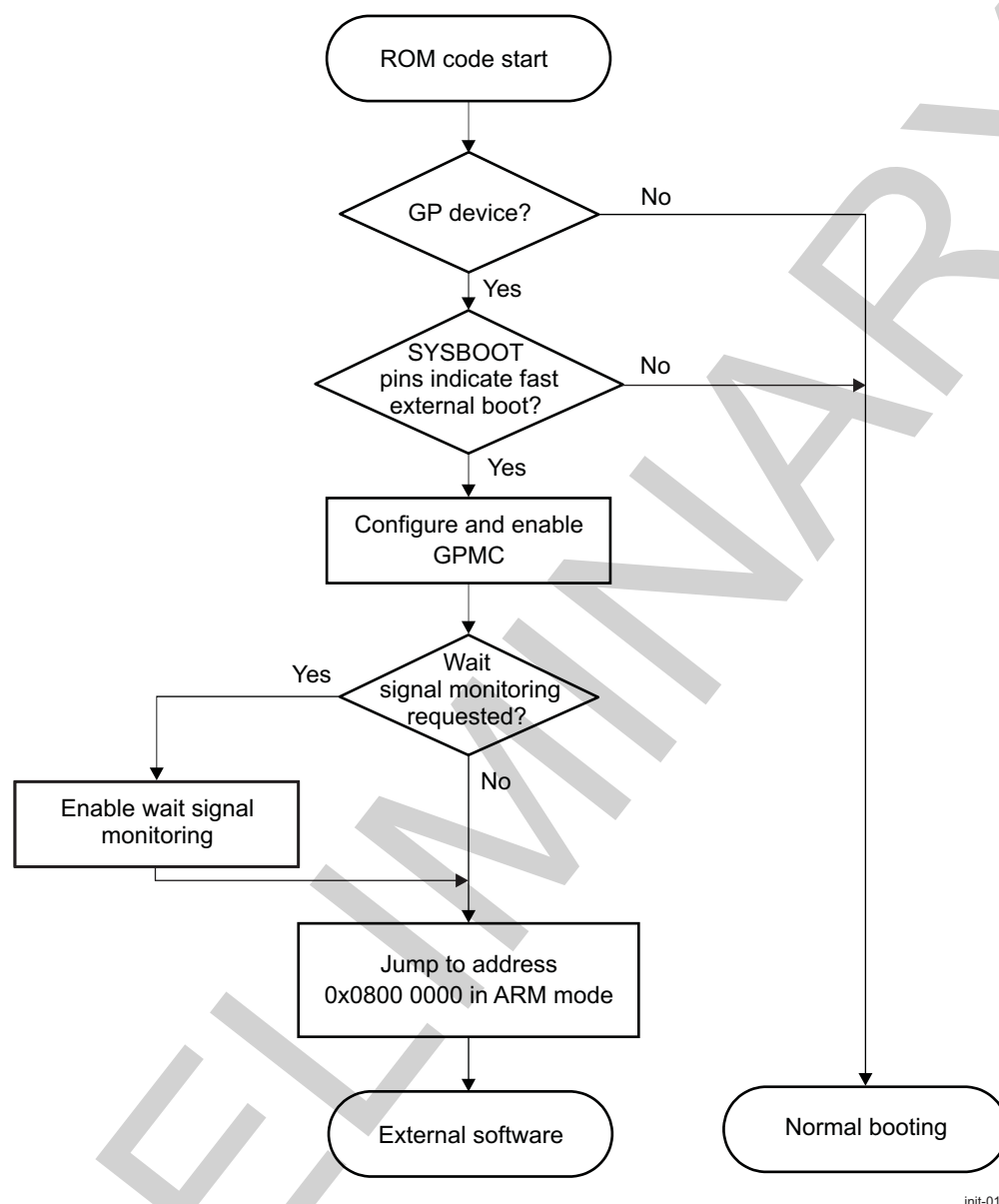
28.4.6.1 Overview

The fast external boot is a special memory booting mode, possible only on GP devices. It consists of a blind jump to a code in an external XIP memory device connected to GPMC CS0. Fast external booting is set up by means of the SYSBOOT configuration pins and lets customers create their own booting code.

The jump is performed with minimum on-chip ROM code execution.

28.4.6.2 Fast External Booting Procedure

[Figure 28-19](#) shows the fast external boot procedure. The code is at the beginning and is written in Assembly Language. The code does not use any RAM and is designed for fast execution.

Figure 28-19. Fast External Boot Procedure

28.4.7 Memory Booting

28.4.7.1 Overview

The memory booting process starts an external code in memory devices. Only memory type of booting devices can be used by ROM code as permanent booting devices (that is, devices examined after both cold (POR) and warm resets). Temporary booting devices are examined only after cold resets. The supported permanent booting devices are:

- NOR flash devices
- NAND flash devices
- OneNAND/Flex-OneNAND devices
- eMMC/eSD embedded flash memories
- SD/MMC flash cards

Two main groups of permanent booting devices are distinguished by code shadowing. Code shadowing means copying code from a nondirectly addressable device (non-XIP) to RAM, where the code can be executed. Directly addressable devices are XIP devices.

[Figure 28-20](#) shows the general memory booting procedure common to all types of devices. First, CH is copied to internal RAM. It is copied even for XIP devices, because the OMAP device can temporarily lose a connection with XIP memory during CH execution. The second step is to shadow the image, if the device is not XIP. The last step is image execution and any return from image results in a dead loop.

If CH copying or shadowing fails, memory booting returns to the main booting procedure, which selects the next device for booting.

During the first read sector (512 bytes) call, sectors are copied to a temporary RAM buffer. Once the image is found and the destination address is known, the content of the temporary buffer is moved to the target RAM location so it is required to reread the first image sector. On a GP device, the GP header is discarded; therefore, only executable code is in RAM, with the first executable instruction at the destination address.

eMMC/eSD embedded memories, MMC/SD cards, NAND, and OneNAND/Flex-OneNAND devices can hold up to four copies of the booting image. Therefore, the ROM code searches for one valid image out of the four, if present, by walking over the first blocks of mass storage space. Other XIP devices (NOR) use only one copy of the booting image.

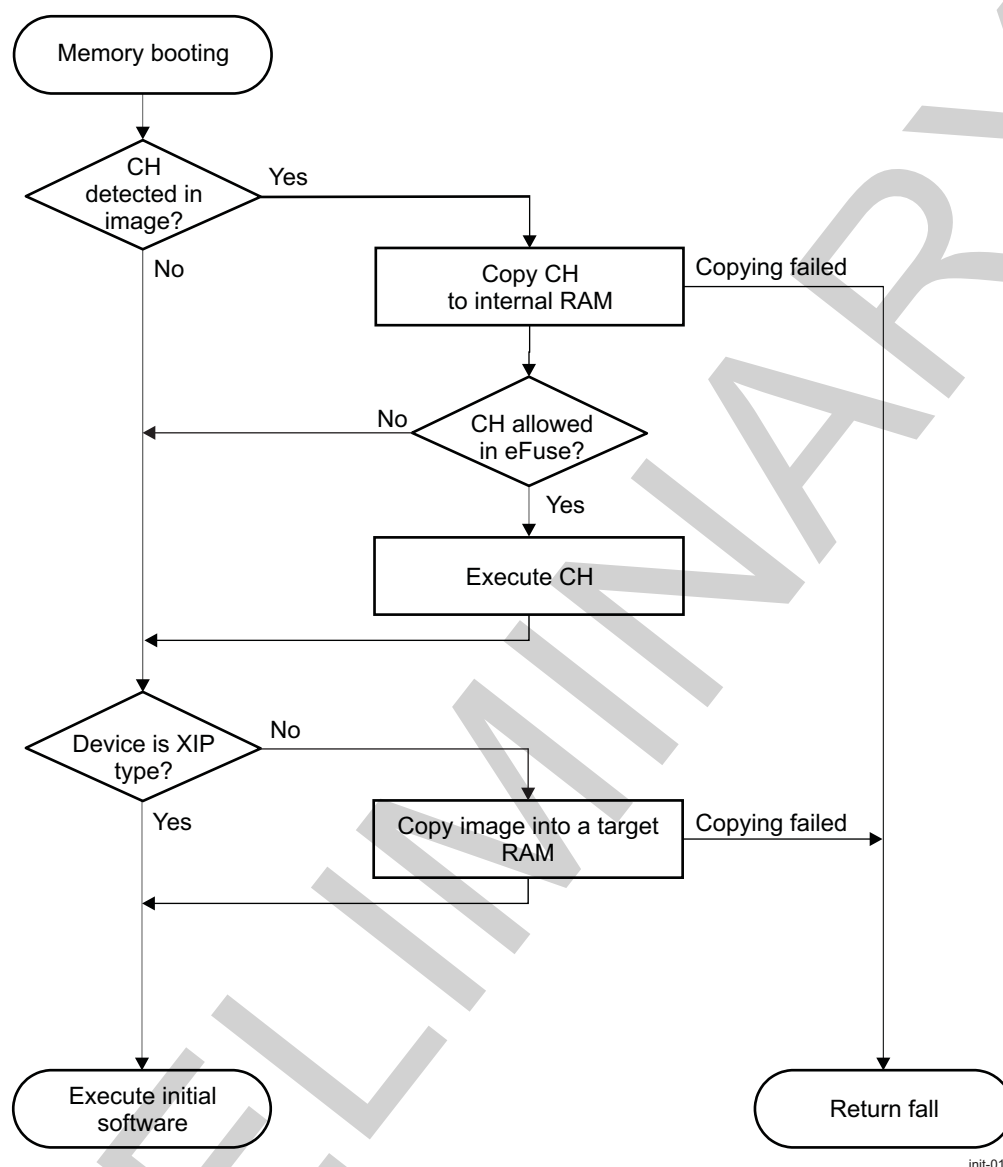
Figure 28-20. Memory Booting Procedure**28.4.7.2 Non-XIP Memory**

Figure 28-21 shows the procedure used when memory booting runs with non-XIP devices. The shaded procedures are specific to each device. NAND and OneNAND/Flex-OneNAND devices use up to four copies of the image in the first four physical blocks. Therefore, the ROM code searches for the image in the first four physical blocks of these devices. Other devices use only one copy of the image and the block loop runs only once.

During image shadowing on a GP device, the CH is expected to be in a separate sector before the initial software.

Figure 28-21. Image Shadowing on GP Device

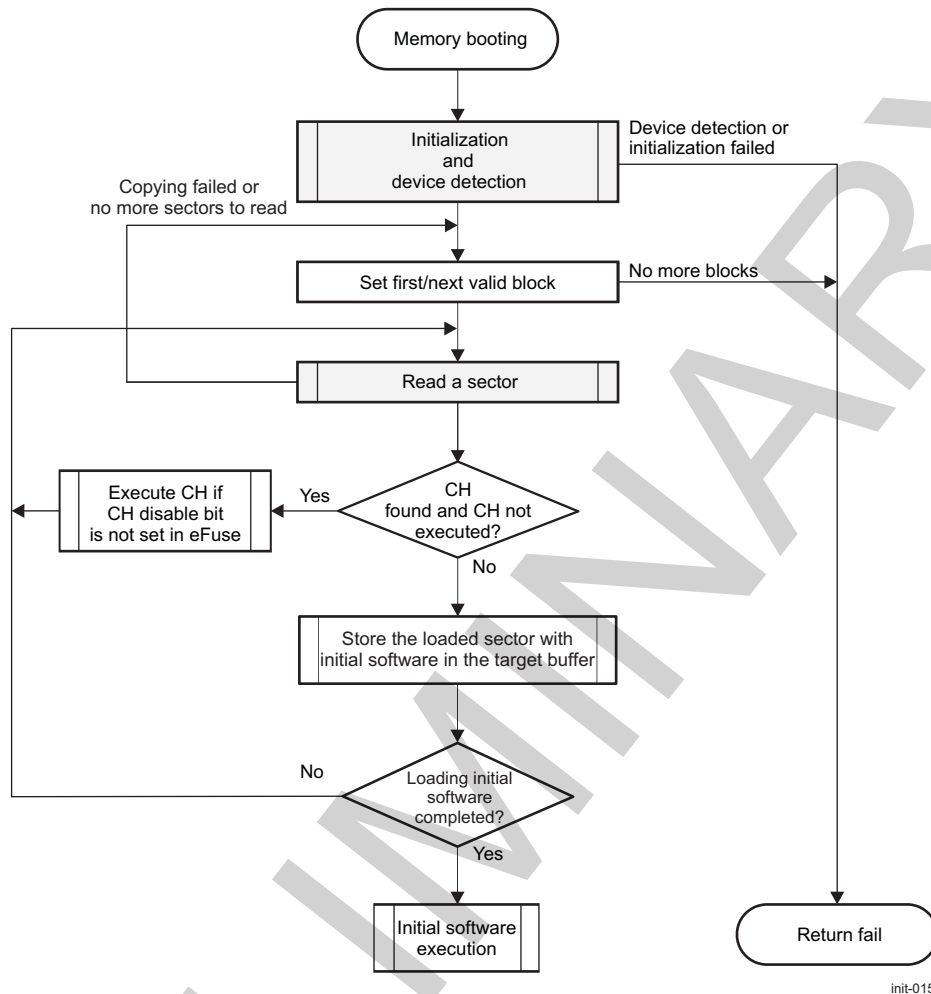


Table 28-36 summarizes the number of blocks and sectors searched during memory booting from devices requiring image shadowing. A sector is assumed to be 512 bytes long. NANDs and OneNAND/Flex-OneNAND are organized with blocks, which are erasable units. MMC/SD/eMMC/eSD + FAT12/16/32 booting consists of reading a file.

Table 28-36. Blocks and Sectors Searched on Non-XIP Memories

| Memory | Maximum Number of Checked Blocks | Number of Sectors Searched |
|-------------------------------|----------------------------------|---|
| NAND | First 4 | Number of sectors in a block ⁽¹⁾ |
| OneNAND/Flex-OneNAND | First 4 | 8 |
| eMMC/eSD raw | First 4 | 1 |
| MMC/SD raw | First 4 | 1 |
| MMC/SD/eMMC/eSD + FAT12/16/32 | 1 File | |

⁽¹⁾ Depends on NAND geometry

For more information about the GPMC module, see [Section 16.4, GPMC Overview](#).

The following sections describe the supported device types.

28.4.7.3 XIP Memory

The ROM code can boot directly from XIP devices, such as NOR flash memories, that have the following characteristics:

- The GPMC is the communication interface.
- Memories up to 1 Gb (128MB) can be connected.
- x16 data bus width only
- Asynchronous protocol and address/data multiplexed mode
- The GPMC clock is 50 MHz.
- The device is connected to CS0 mapped to address 0x0800 0000.
- The wait pin signal gpmc_wait0 is monitored according to the sys_boot configuration pins.

Depending on the SYSBOOT option, the GPMC can be configured to use the wait signal connected to the gpmc_wait0 pin. Wait pin polarity is set to stall accessing memory when gpmc_wait0 is low. Wait-signal monitoring is used with memories that require a long time for initialization after reset, or that must pause while reading data.

For an XIP memory booting, no user intervention is required; the following debugging steps are described. Only the CH, which is not mandatory, lets users change clock settings and GPMC parameters. Failure in CH copying causes a return to the main booting procedure, which selects the next device for booting.

Bootting from an XIP device consists of the following steps:

1. Configure the GPMC for XIP device access.
2. Verify that the CH is present at address 0x0800 0000. If it is, copy the entire sector (512 bytes) to internal RAM and execute the CH.
3. Set the image location:
 - 0x0800 0000 if the CH is not found
 - 0x0800 0200 if the CH is found
4. Verify that a bootable image is at the image location.
5. Execute the image if it is found.
6. If the image is not found, return from XIP booting to the main booting loop.

28.4.7.3.1 GPMC Initialization

[Table 28-37](#) lists the timing settings of the GPMC when set for XIP and other address-data accessible devices, such as OneNAND/Flex-OneNAND. [Table 28-37](#) is included for debug information.

Table 28-37. XIP Timing Parameters

| Parameter | Value [Clock Cycles] (1) | Register Initialization (where i = 0–7) | Reset Value |
|--------------------|--------------------------------|--|-------------|
| Write cycle period | 17 | The GPMC_CONFIG5_i[12:8] WRCYCLETIME bit field is set to 0x11. | 0x11 |
| Read cycle period | 17 | The GPMC_CONFIG5_i[4:0] RDCYCLETIME bit field is set to 0x11. | 0x11 |
| CS low time | 1 | The GPMC_CONFIG2_i[3:0] CSONTIME bit field is set to 0x1. | 0x1 |
| CS high time | 16 | The GPMC_CONFIG2_i[12:8] CSRDOFFTIME bit field is set to 0x10. | 0x10 |
| ADV low time | 1 | The GPMC_CONFIG3_i[3:0] ADVONTIME bit field is set to 0x1. | 0x1 |
| ADV high time | 2 | The GPMC_CONFIG3_i[12:8] ADVRDOFFTIME bit field is set to 0x2. | 0x2 |
| OE low time | 3 | The GPMC_CONFIG4_i[3:0] OEONTIME bit field is set to 0x3. | 0x6 |
| OE high time | 16 | The GPMC_CONFIG4_i[12:8] OEOFFTIME bit field is set to 0x10. | 0x10 |
| WE low time | 3 | The GPMC_CONFIG4_i[19:16] WEONTIME bit field is set to 0x3. | 0x05 |

(1) The one clock cycle is 20 ns, which corresponds to 50-MHz frequency.

Table 28-37. XIP Timing Parameters (continued)

| Parameter | Value [Clock Cycles] (1) | Register Initialization (where i = 0–7) | Reset Value |
|-----------------|--------------------------------|---|-------------|
| WE high time | 15 | The GPMC_CONFIG4_i[28:24] WEOFFTIME bit field is set to 0xF. | 0x10 |
| Data latch time | 15 | The GPMC_CONFIG5_i[20:16] RDACCESSTIME bit field is set to 0xF. | 0x0F |

There is no specific identification routine executed before booting from an XIP device.

28.4.7.4 NAND

NAND flash memory is not an XIP device; it requires shadowing before the code can be executed. ROM code support for the NAND flash devices has the following characteristics:

- The GPMC is the communication interface.
- Device from 512 Mbit (64MB)
- x8 and x16 bus width
- Support for large page size (2048 bytes + 64 spare bytes) or very large page size 4096 bytes + 128/218 spare bytes)
- Chip enable (CE) don't care devices only
- Single-level cell (SLC) and multilevel cell (MLC) devices
- Device identification based on ONFI or ROM table
- ECC correction: 8 bits/sector for most devices (16 bits/sector for devices with large spare area)
- GPMC timings are adjusted for NAND access.
- The GPMC clock is 50 MHz.
- The device is connected to CS0.
- The wait pin signal gpmc_wait0 is connected to the NAND BUSY output.
- Four physical blocks are searched for an image. Block size depends on the device.

For NAND memory booting, no user intervention is needed; the information in the following subsections is included for debugging. Only the CH, which is not mandatory, lets the user change clock settings and GPMC parameters. Failure in CH copying causes a return to the main booting procedure, which selects the next device for booting.

28.4.7.4.1 Initialization and NAND Detection

The initialization routine for NAND consists of three parts: GPMC initialization, device detection with parameter determination, and bad block detection.

- GPMC initialization

The GPMC interface is configured so that it can access NAND. Because NAND memories do not need the address bus, it is released. The data bus width is initially set to 8 bits. If necessary, it is changed to 16 bits after the device parameters are determined. [Table 28-38](#) shows the GPMC configuration used during NAND boot. [Table 28-38](#) is included for debug information.

Table 28-38. NAND Timing Parameters

| Parameter | Value (Clock Cycles) | Register Initialization (where i = 0–7) | Reset Value |
|------------------------|----------------------|---|-------------|
| Write cycle time | 20 | GPMC_CONFIG5_i[12:8] WRCYCLETIME = 0x14 | 0x11 |
| Read cycle time | 20 | GPMC_CONFIG5_i[4:0] RDCYCLETIME = 0x14 | 0x11 |
| CS low time | 0 | GPMC_CONFIG2_i[3:0] CSONTIME = 0x0 | 0x1 |
| CS low to OE low time | 5 | GPMC_CONFIG4_i[3:0] OEONTIME = 0x5 | 0x6 |
| CS low to OE high time | 16 | GPMC_CONFIG4_i[12:8] OEOFFTIME = 0x10 | 0x10 |

Table 28-38. NAND Timing Parameters (continued)

| Parameter | Value (Clock Cycles) | Register Initialization (where i = 0–7) | Reset Value |
|---------------------------|----------------------|--|-------------|
| CS low to WE low time | 1 | GPMC_CONFIG4_i[19:16] WEONTIME = 0x1 | 0x5 |
| CS low to WE high time | 15 | GPMC_CONFIG4_i[28:24] WEOFFTIME = 0xF | 0x10 |
| CS low to data latch time | 14 | GPMC_CONFIG5_i[20:16] RDACCESSTIME = 0xE | 0xF |

- Device detection and parameters

The ROM code first performs an initial wait for device auto initialization (with 250-ms time-out) with polling of the ready information. Then, it must identify the NAND type connected to the GPMC interface. The GPMC is initialized using 8 bits, asynchronous mode. The NAND device is reset (command FFh) and its status is polled until ready for operation (with 100-ms time-out). The ONFI Read ID (command 90h/address 20h) is sent to the NAND device. If it replies with the ONFI signature (4 bytes) then a Read parameters page (command ECh) is sent. The information provided in [Table 28-39](#) is then extracted: page size, spare area size, number of pages per block, and the addressing mode. The remaining data bytes from the parameter page stream are ignored.

Table 28-39. ONFI Parameters Page Description

| Offset | Description | Size (Bytes) |
|--------|--------------------------------|--------------|
| 6 | Features supported | 2 |
| 80 | Number of data bytes per page | 4 |
| 84 | Number of spare bytes per page | 2 |
| 92 | Number of pages per block | 4 |
| 101 | Number of address cycles | 1 |

If the ONFI Read ID command fails (it will be the case with any device not supporting ONFI), then the device is reset again with polling for device to be ready (with 100-ms time-out). Then, the standard Read ID (command 90h/address 00h) is sent. If the Device ID (second byte of the ID byte stream) is recognized as being a supported device, then the device parameters are extracted from an internal ROM code table. [Table 28-40](#) lists the supported devices.

Table 28-40. Supported NAND Devices

| Capacity | Device ID | Bus Width | Page Size in Bytes |
|----------|-----------|-----------|--------------------|
| 512 Mb | F0h | 8 | 2048 |
| 512 Mb | C0h | 16 | 2048 |
| 512 Mb | A0h | 8 | 2048 |
| 512 Mb | B0h | 16 | 2048 |
| 512 Mb | F2h | 8 | 2048 |
| 512 Mb | C2h | 16 | 2048 |
| 512 Mb | A2h | 8 | 2048 |
| 512 Mb | B2h | 16 | 2048 |
| 1 Gb | F1h | 8 | 2048 |
| 1 Gb | C1h | 16 | 2048 |
| 1 Gb | A1h | 8 | 2048 |
| 1 Gb | B1h | 16 | 2048 |
| 2 Gb | DAh | 8 | 2048 (4096) |
| 2 Gb | CAh | 16 | 2048 (4096) |
| 2 Gb | AAh | 8 | 2048 (4096) |
| 2 Gb | BAh | 16 | 2048 (4096) |
| 2 Gb | 83h | 8 | 2048 (4096) |
| 2 Gb | 93h | 16 | 2048 (4096) |

Table 28-40. Supported NAND Devices (continued)

| Capacity | Device ID | Bus Width | Page Size in Bytes |
|----------|-----------|-----------|--------------------|
| 4 Gb | DCh | 8 | 2048 (4096) |
| 4 Gb | CCh | 16 | 2048 (4096) |
| 4 Gb | ACh | 8 | 2048 (4096) |
| 4 Gb | BCh | 16 | 2048 (4096) |
| 4 Gb | 84h | 8 | 2048 (4096) |
| 4 Gb | 94h | 16 | 2048 (4096) |
| 8 Gb | D3h | 8 | 2048 (4096) |
| 8 Gb | C3h | 16 | 2048 (4096) |
| 8 Gb | A3h | 8 | 2048 (4096) |
| 8 Gb | B3h | 16 | 2048 (4096) |
| 8 Gb | 85h | 8 | 2048 (4096) |
| 8 Gb | 95h | 16 | 2048 (4096) |
| 16 Gb | D5h | 8 | 2048 (4096) |
| 16 Gb | C5h | 16 | 2048 (4096) |
| 16 Gb | A5h | 8 | 2048 (4096) |
| 16 Gb | B5h | 16 | 2048 (4096) |
| 16 Gb | 86h | 8 | 2048 (4096) |
| 16 Gb | 96h | 16 | 2048 (4096) |
| 32 Gb | D7h | 8 | 2048 (4096) |
| 32 Gb | C7h | 16 | 2048 (4096) |
| 32 Gb | A7h | 8 | 2048 (4096) |
| 32 Gb | B7h | 16 | 2048 (4096) |
| 32 Gb | 87h | 8 | 2048 (4096) |
| 32 Gb | 97h | 16 | 2048 (4096) |
| 64 Gb | DEh | 8 | 2048 (4096) |
| 64 Gb | CEh | 16 | 2048 (4096) |
| 64 Gb | AEh | 8 | 2048 (4096) |
| 64 Gb | BEh | 16 | 2048 (4096) |

After retrieving parameters from the table, the page size and block size are updated based on the fourth byte of the NAND ID data. Because of inconsistency among manufacturers, only devices recognized to be at least 2Gb have these parameters updated. Therefore, the ROM code supports 4-KB page devices, but only if their size, according to the table, is at least 2Gb. Devices that are smaller than 2Gb have the block size parameter set to 128KB (when the page size is 2KB).

[Table 28-41](#) shows the fourth ID data byte encoding used in the ROM code.

Table 28-41. Fourth NAND ID Data Byte

| Item | Description | I/O Number | | | | | | | |
|--------------------------|-------------|------------|---|---|---|---|---|---|---|
| | | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Page size | 512 bytes | | | | | | | 0 | 0 |
| | 2048 bytes | | | | | | | 0 | 1 |
| | 4096 bytes | | | | | | | 1 | 0 |
| | 8192 bytes | | | | | | | 1 | 1 |
| Cell type ⁽¹⁾ | 2 levels | | | | | 0 | 0 | | |
| | 4 levels | | | | | 0 | 1 | | |
| | 8 levels | | | | | 1 | 0 | | |
| | 16 levels | | | | | 1 | 1 | | |

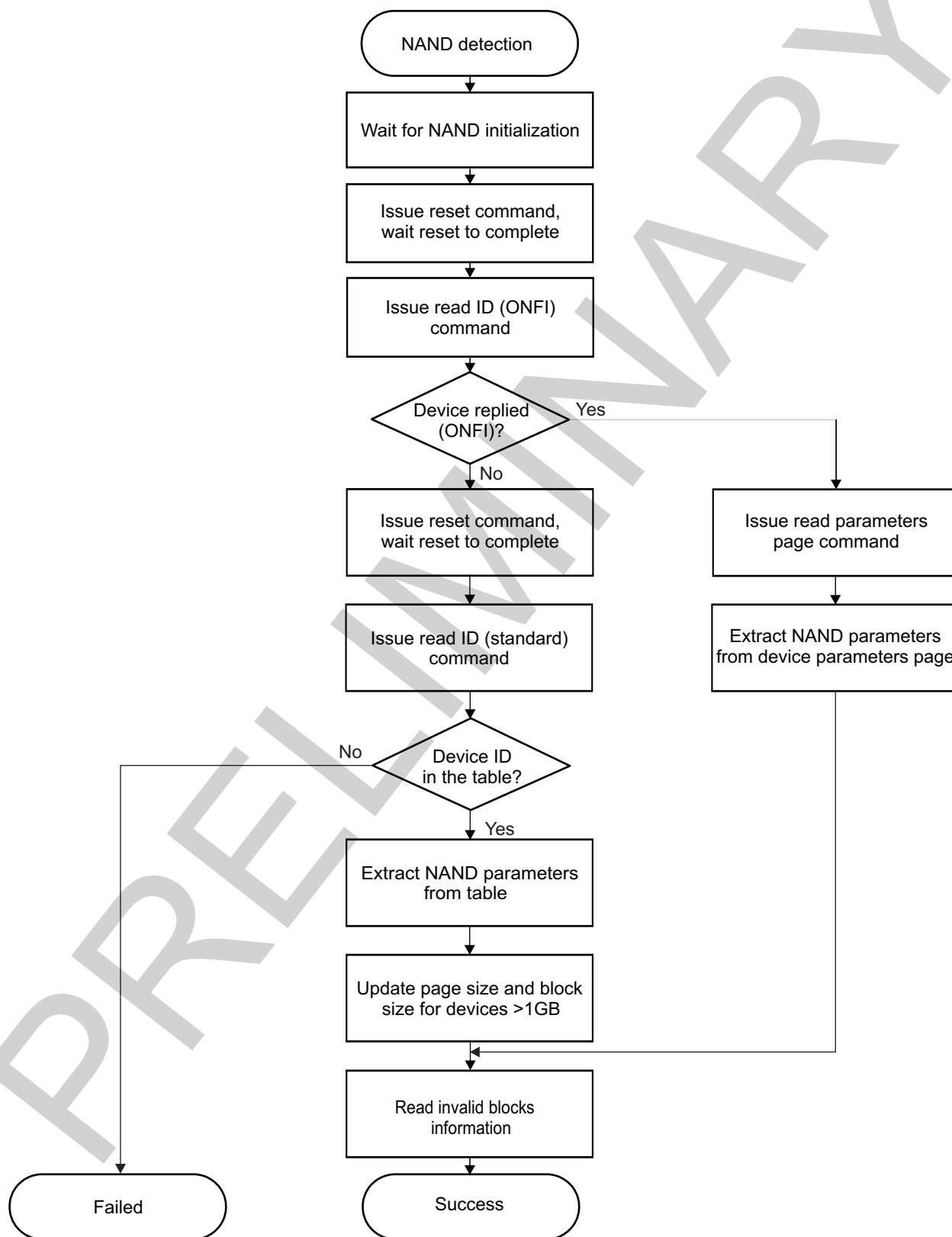
⁽¹⁾ Read by ROM code only when the manufacturer code (first ID byte) is 98h

Table 28-41. Fourth NAND ID Data Byte (continued)

| Item | Description | I/O Number | | | | | | | |
|-------------------|-------------|------------|---|---|---|---|---|---|---|
| | | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Block size | 64KB | | | 0 | 0 | | | | |
| | 128KB | | | 0 | 1 | | | | |
| | 256KB | | | 1 | 0 | | | | |
| | 512KB | | | 1 | 1 | | | | |

Figure 28-22 shows the detection procedure. Once the NAND device is successfully detected, the ROM code changes the GPMC to 16-bit bus width, if necessary.

Figure 28-22. NAND Device Detection



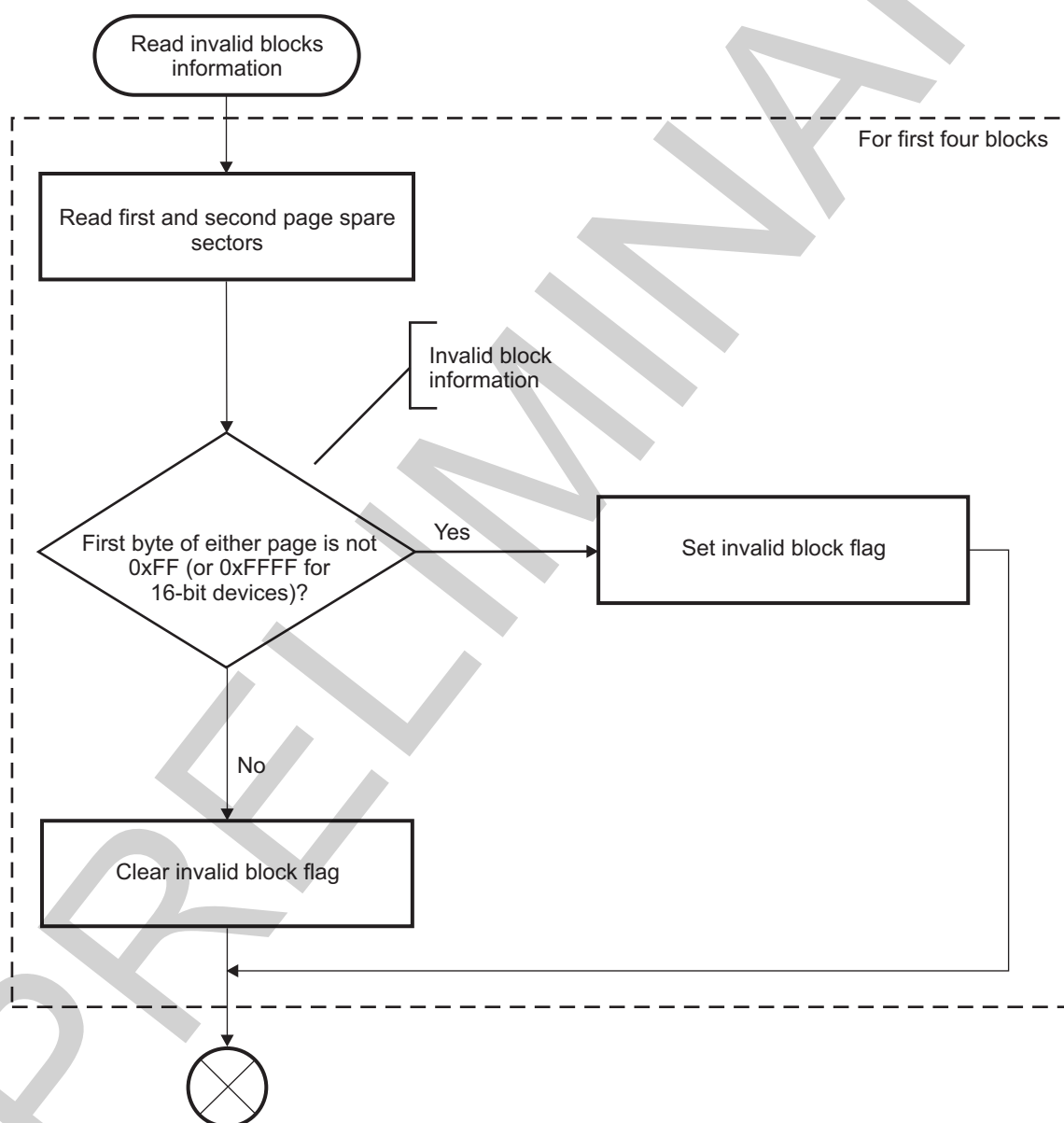
init-023

- Bad block verification

Invalid blocks contain invalid bits whose reliability cannot be ensured by the manufacturer. These bits are identified in the factory or during the programming and reported in the initial invalid block information in the spare area on the first and second page of each block. Because the ROM code looks for an image in the first four blocks, it detects the validity status of these blocks. Blocks detected as invalid are not accessed later. Block validity status is coded in the spare areas of the first two pages of a block (first byte equal to FFh in the first and second pages for an 8-bit device/first word equal to FFFFh in the first and second pages for a 16-bit device).

Figure 28-23 shows the invalid block detection routine. The routine consists in reading spare areas and checking the validity data pattern.

Figure 28-23. Bad NAND Invalid Block Detection



init-033

28.4.7.4.2 Read Sector Procedure

During the booting procedure, the ROM code reads 512-byte sectors from the NAND device. The reading fails in two cases:

- The accessed sector is in a block marked as invalid.
- The accessed sector contains an error that cannot be corrected with ECC.

The ROM code uses normal read (command 00h 30h) for reading NAND page data.

Page data can contain errors caused by memory alteration. The ROM code uses an ECC correction algorithm to detect and possibly correct those errors. The default ECC correction applied is BCH 8b/sector using the GPMC and ELM hardware.

For device ID codes D3h, C3h, D5h, C5h, D7h, C7h, DEh, and CEh when the manufacturer code (first ID byte) is 98h, the cell type information is checked in the fourth byte of ID data. If it is equal to 10b, the ECC correction applied is BCH 16b/sector.

The BCH data is automatically calculated by the GPMC on reading each 512-byte sector. The computed ECC is compared against the ECC stored in the spare area for the corresponding page. Depending on the page size, the amount of ECC data bytes stored in the corresponding spare area is different. Figure 28-24 and Figure 28-25 show the mapping of ECC data inside the spare area for 2KB-page and 4KB- page devices, respectively. If both ECC data are equal, the read sector function returns the read 512-byte sector without error. Otherwise, the ROM code tries to correct error(s) in the corresponding sector (this procedure is assisted by the ELM hardware) and returns the data if successful. If errors are uncorrectable, the function returns with FAIL.

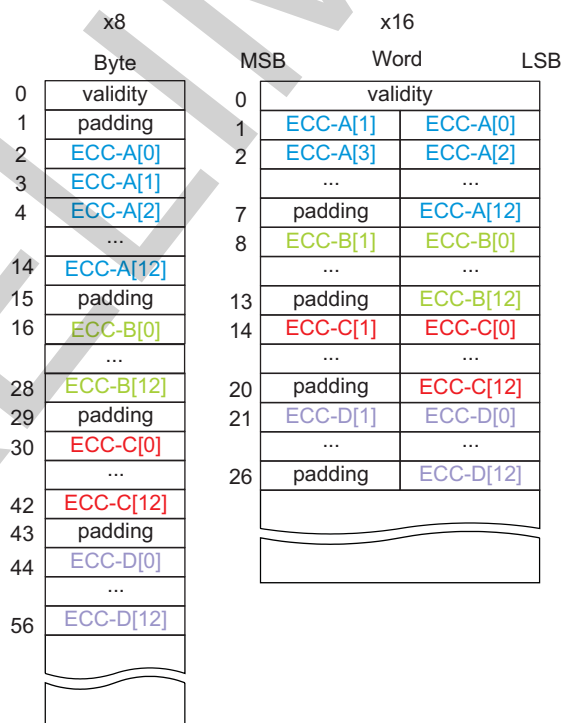
The first two bytes in the spare area are always reserved for block state information:

- First word equal to FFFFh for a 16-bit device to check block validity
- First byte equal to FFh for an 8-bit device to check block validity and the second byte is a padding

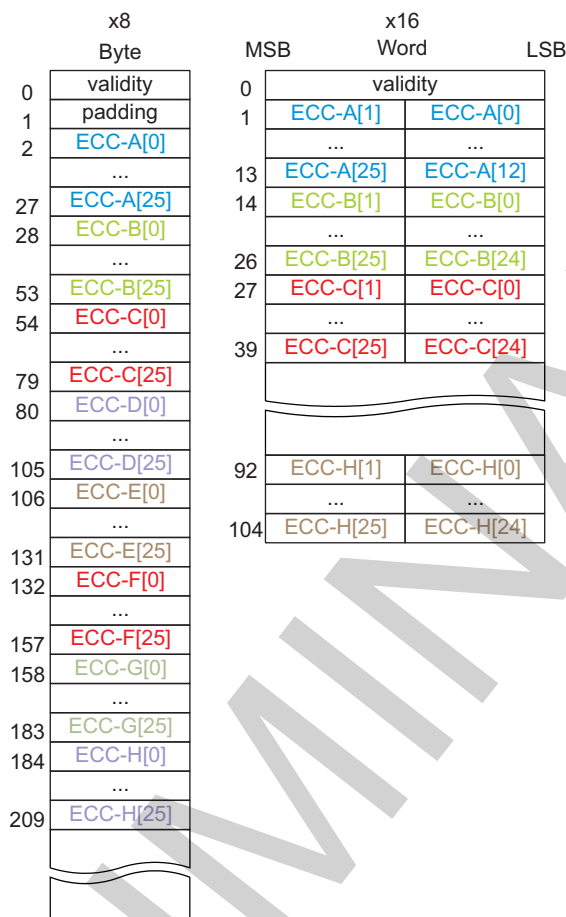
Concerning the length of ECC section in bytes, extra bytes can be added to make the access x16 compatible:

- For 8b BCH, there are 14 bytes ECC for each 512-byte sector (that is, 13 bytes ECC + 1 byte padding)
- For 16b BCH, there are 26 bytes ECC for each 512-byte sector (that is, no padding is needed)

Figure 28-24. ECC Data Mapping for 2-KB Page and 8b BCH Encoding



init-040

Figure 28-25. ECC Data Mapping for 4-KB Page and 16b BCH Encoding

init-041

28.4.7.5 OneNAND/Flex-OneNAND

The ROM code support for OneNAND/Flex-OneNAND devices has the following characteristics:

- Devices from 512 Mbits
- The GPMC is the communication interface.
- x16 data bus width only
- Asynchronous protocol and address/data multiplexed mode
- GPMC reset default timings are used.
- The GPMC clock is 50 MHz.
- The device is connected to GPMC CS0 mapped to address 0x0800 0000.
- The wait pin signal gpmc_wait0 is not monitored.
- Four physical blocks are searched for an image. The block size is 128KB (typically).
- Data correction is fully handled by the OneNAND/FlexOneNAND device

The OneNAND/Flex-OneNAND device is a NAND matrix coupled with RAM buffers and a NOR-type interface. ECC correction handling is done automatically by the internal state-machine. The page to be accessed is first loaded in the RAM buffer using memory-mapped registers. Then, the page is read directly from the buffer using a NOR-type interface.

For OneNAND/Flex-OneNAND memory booting, no user intervention is required. The information in the following sections is included for debugging. Only the CH, which is not mandatory, lets users change clock settings and GPMC parameters. Failure in CH copying causes a return to the main booting procedure, which selects the next device for booting.

28.4.7.5.1 Initialization and OneNAND/Flex-OneNAND Detection

The initialization routine for OneNAND/Flex-OneNAND consists of two parts: GPMC initialization and device detection with parameter determination.

- GPMC initialization

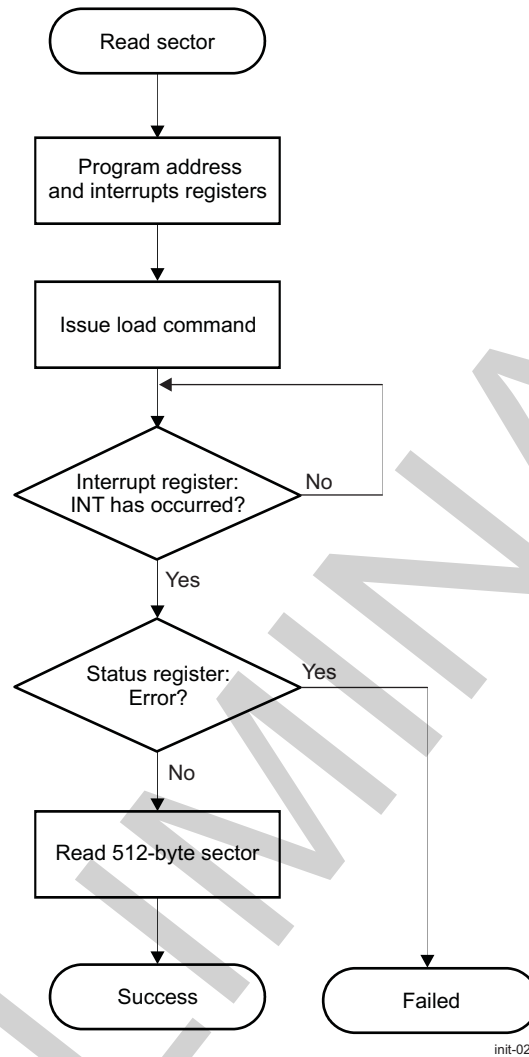
The ROM code first initializes the GPMC interface in XIP mode (that is, asynchronous 16-bit multiplexed mode). Wait signal monitoring is disabled.

- Device detection and parameters

The ROM code identifies a OneNAND/Flex-OneNAND device by reading the device identification data. There are two ways to read identification data: using serial commands and reading from fixed memory-mapped registers. The ROM code reads identification data using both methods and compares the results. When the comparison passes, the ROM code assumes that the OneNAND/Flex-OneNAND device is connected. If the device is successfully recognized, the ROM code reads the device configuration (number and size of data buffers) and configures it for asynchronous mode (default).

28.4.7.5.2 OneNAND/Flex-OneNAND Read Sector Procedure

When booting requests a sector from the OneNAND/Flex-OneNAND device, the ROM code performs the load operation, which transfers the content of the requested sector to the data buffer RAM. The ROM code waits until the operation completes, polling the OneNAND/Flex-OneNAND interrupt register. The status register is then checked and the ROM code returns FAIL if the operation completes with an error. Otherwise, the data buffer RAM is copied to the destination buffer. [Figure 28-26](#) shows this procedure.

Figure 28-26. OneNAND/Flex-OneNAND Read Sector

28.4.7.5.3 OneNAND/Flex-OneNAND Support Limitations

As described in [Section 28.4.7.5.1, Initialization and OneNAND/Flex-OneNAND Detection](#), the ROM code checks only the coherency of the device ID obtained by two different methods. There is no table of supported Flex-OneNANDs in ROM code. This removes any dependency of the ROM code on device IDs from different manufacturers. However, the driver works with the following assumption:

- Page size is assumed to be 2048 bytes, divided into four 512-byte sectors. In case of OneNAND/Flex-OneNAND, with 4096-byte pages, divided into eight sectors, users must program only the first sectors (sectors 0-3) of each page. Sectors 4-7 of each page are not considered by the driver.

28.4.7.6 eMMC/eSD Embedded Memories and MMC/SD Cards

The OMAP device allows booting from eMMC/eSD embedded memories or MMC/SD cards connected to SD/MMC1 or SD/MMC2. The booting interface is selected by configuration of the sys_boot pins.

The HS MMC/SD/SDIO host controllers (MMCHS) handle the physical layer, while the ROM code handles the simplified logical protocol layer (read-only protocol). A limited range of commands is implemented in the ROM code.

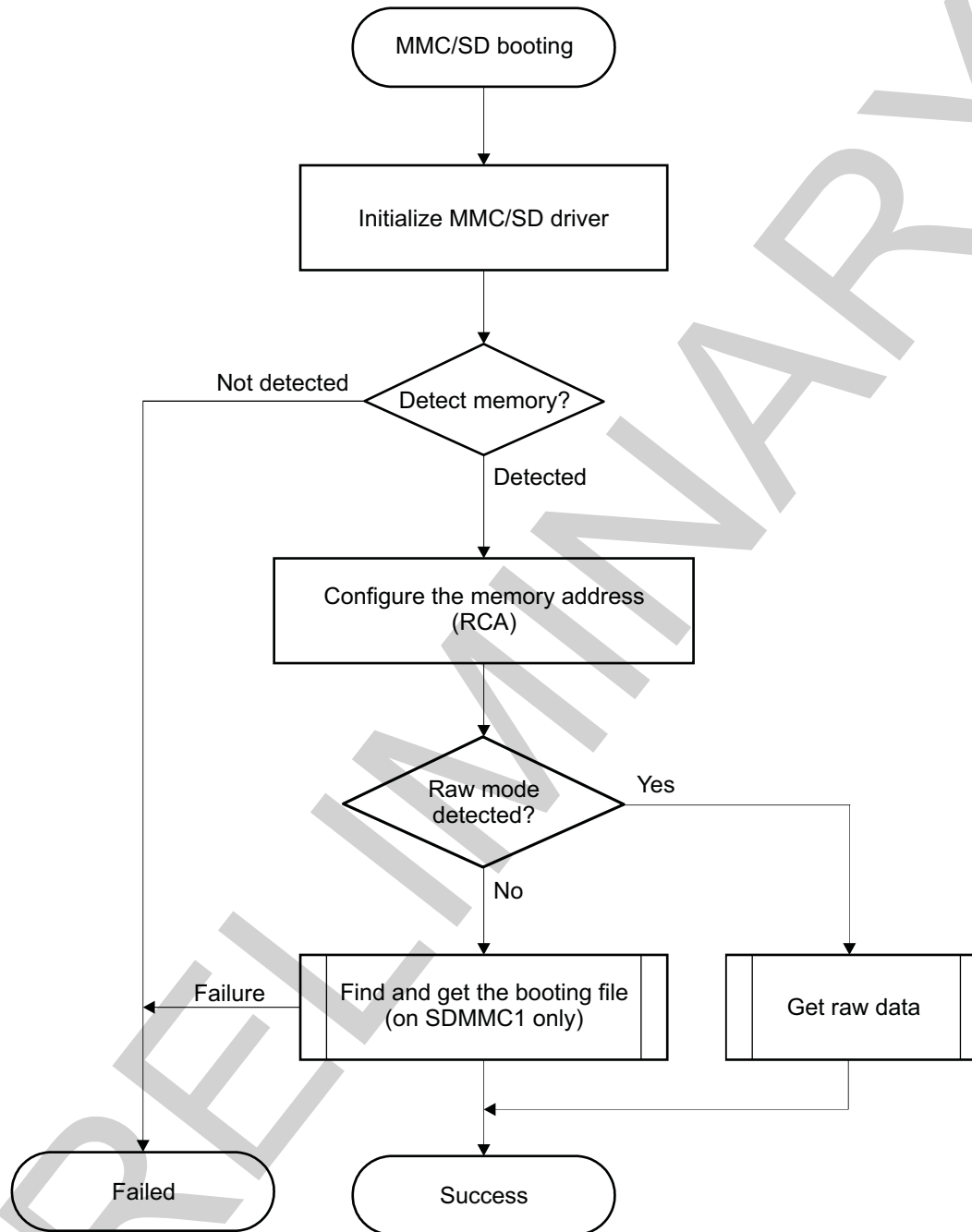
The MMC interface 1 supports 1.8-V/3-V digital I/Os. The selection on I/O voltage level is done using the PBIAS circuitry. The PBIAS reference level is sensed by the ROM code and PBIAS cell voltage setup appropriately before any communication with the device. The MMC interface 2 supports only 1.8-V digital I/Os.

The OMAP device supports two booting modes:

- Raw: The booting image data is read directly from sectors in the user area.
- File system (FAT12/16/32 supported with or without master boot record): The image data is read from a booting file.

When using the SDMMC1 interface, raw and file system modes are supported. When using the SDMMC2 interface, only raw mode is supported. The purpose of this approach is to avoid the boot time penalty of searching for a file system hierarchy when it is not always necessary.

[Figure 28-27](#) shows the complete procedure.

Figure 28-27. eMMC/eSD and MMC/SD Booting

init-016

28.4.7.6.1 eMMC/eSD Memories

The ROM code supports eMMC/eSD cards, with the following conditions:

- eMMC devices compliant with *Embedded MultiMediaCard (eMMC) eMMC/Card Product Standard, High Capacity, including Reliable Write Boot, and Sleep Modes, Dual Data Rate, Multiple Partitions Supports and Security Enhancement v4.41* from the MMCA Technical Committee. The exception is the hardware reset feature. If the user software requires MMC hardware reset, it can be accomplished with a GPIO.
- eSD devices compliant with *SD Specification Part 1 eSD (Embedded SD) Specification Addendum v2.1* from the SD Card Association

- The eMMC/eSD memory device is powered externally by a power-management IC or other power supply.
- Initial 1-bit MMC mode, optional 4-bit or 8-bit modes
- Clock frequency:
 - Identification mode: 400 kHz
 - Data transfer mode: Up to 10 MHz, optionally up to 19.2 MHz
- Only one memory connected to the bus
- TI mode and boot partition mode (eMMC)

28.4.7.6.1.1 System Conditions and Limitations

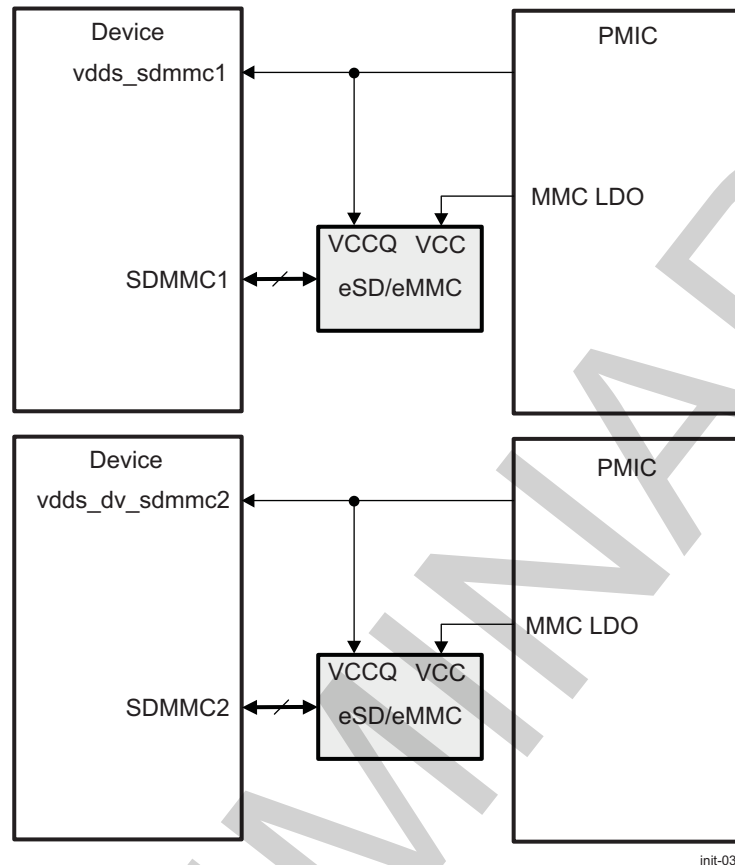
- When using TI mode, the booting image is assumed to be in the User Data Area (no use of boot and/or RPMB partitions). Customers must set up the eMMC device appropriately so that the booting image is in a reliable area within the User Data Area (possibly with the Enhanced User Data Area property).
- The ROM code does not provide a bus direction control signaling in case of using MMC interface 2 with level shifters.
- The ROM code expects that the eMMC device is powered externally and supplies are set and stable upon entering the booting procedure. The ROM code does not perform any software action to the companion device with respect to powering the eMMC/eSD device.

28.4.7.6.1.2 eMMC/eSD Memory Connection

An eMMC/eSD device typically requires two supplies: one for the core memory array (selectable 1.8/2.9 V at TWL6032 BOOT2 pin level) (see TWL6032 documentation), and one for the device interface I/Os and controller (typical VCCQ = 1.8 V). Both memory device supply pins can possibly be merged into one, thus requiring only one power supply.

The SD/MMC2 interface shares the same balls as the GPMC interface. Therefore, the ROM code performs the necessary pin mux configuration to route the MMC signal through the GPMC balls.

[Figure 28-28](#) shows an example of the system connection between the PMIC, memory device, and OMAP device.

Figure 28-28. eMMC/eSD Connection

The ROM code supports the muxing of MMC interface 2 through two paths:

- GPMC pins in configuration mode 1 (Mux1)
- SDMMC5/FREF_CLKx pins in Mux5

The ROM code performs the necessary I/O pin muxing configuration to route the MMC2 signals through the appropriate pins depending on the selected SYSBOOT configuration.

28.4.7.6.1.3 eMMC Boot Partitions

The ROM code supports the *Alternative Boot operation mode* specific to eMMC devices as described in the eMMC standard. It does not support the hardware *Boot operation mode* (CMD line held low for 74 clk cycles) described in the same document.

The Alternative Boot operation mode is selected through MMC2_BOOT option, as described in the , *Booting Device Order Selection*.

To trigger the Alternative Boot operation mode, the ROM code sends a specific CMD0 + Argument 0xFFFFFFFF. Then, the ROM Code waits for up to 50 ms for the eMMC device to send back a boot acknowledge signal. If the timeout elapses, then the ROM code skips the Alternative Boot mode. Booting from eMMC partitions is done in 1-bit mode at 19.2 MHz. This configuration is static and cannot be changed.

For correct handling of eMMC boot partitions, it is necessary to prepare the eMMC device at flashing time with the following settings applied in the device EXT_CSD register:

- The BOOT_ACK and BOOT_PARTITION_ENABLE fields must be updated accordingly (EXT_CSD[179], bit 6 and bits [5:3]) respectively to activate the boot acknowledge signal and select the boot partition from which to boot from.
- RST_N must be enabled for correct handling of the warm reset cases (EXT_CSD[162] bits [1:0] = 0x1).

- Optionally the BOOT_CONFIG_PROT (EXT_CSD[178]) may be updated for altering access permissions to the boot partition(s).

NOTE:

- It is highly recommended to refer to the eMMC standard for details on EXT_CSD handling.
 - The EXT_CSD is updated by using a SWITCH command as detailed in the eMMC standard.
 - The mentioned EXT_CSD fields are retained after a power cycle so only one flashing phase is required
-

If the Alternate Boot operation mode is successful and the booting image is properly retrieved, then the eMMC device state remains in the Boot state even after the execution has been passed to the initial software. It is the responsibility of the initial software to bring the device out of the Boot state.

Once the system has booted and upon triggering a warm reset at OMAP level (it can be triggered by the warm-reset push button, a timer, watchdog, etc.), it is important that the eMMC device is properly brought to its Pre-Idle state so that the next Alternate Boot operation succeeds. This is ensured by the RST_N pin to be connected to OMAP nRESWARM. Otherwise, the boot procedure will fail after a warm reset.

In Raw (Boot) mode, the size of the booting image is determined after the first sector read access. In case of GP device, the boot image size is contained within the GP header. This ensures that the ROM code is only retrieving the necessary size of data and not the full contents of the boot partition.

28.4.7.6.2 MMC/SD Cards

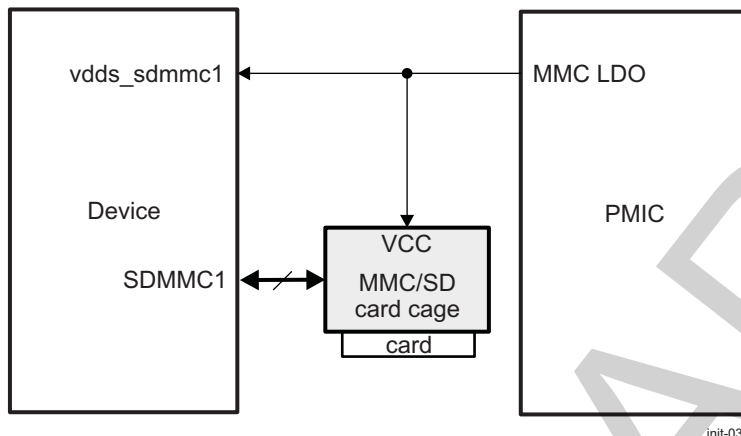
The ROM code supports booting from MMC/SD cards under the following conditions:

- MMC/SD cards compliant with *The MultiMediaCard System Specification* from the MMCA Technical Committee and the *SD Memory Card Specifications, File System Specification* from the SD Association. These include low- and high-capacity cards.
- MMC/SD cards connected to SDMMC interface 1
- 3-V VCC power supply, support for 3-V or 1.8-V I/O voltages
- Initial 1-bit MMC mode, optional 4-bit or 8-bit modes
- Clock frequency:
 - Identification mode: 400 kHz
 - Data transfer mode: Up to 10 MHz (optionally up to 19.2 MHz)
- Only one card connected to the bus

28.4.7.6.2.1 MMC/SD Card Connection

An SD/MMC card can be connected to the MMC1 interface, typically through a card cage. The ROM code sends the appropriate I²C sequence to the power-management IC (PMIC) to set the MMC LDO to 3 V and switch it on.

Figure 28-29 shows the typical connection between the PMIC, the card, and the OMAP device .

Figure 28-29. MMC/SD Card Connection

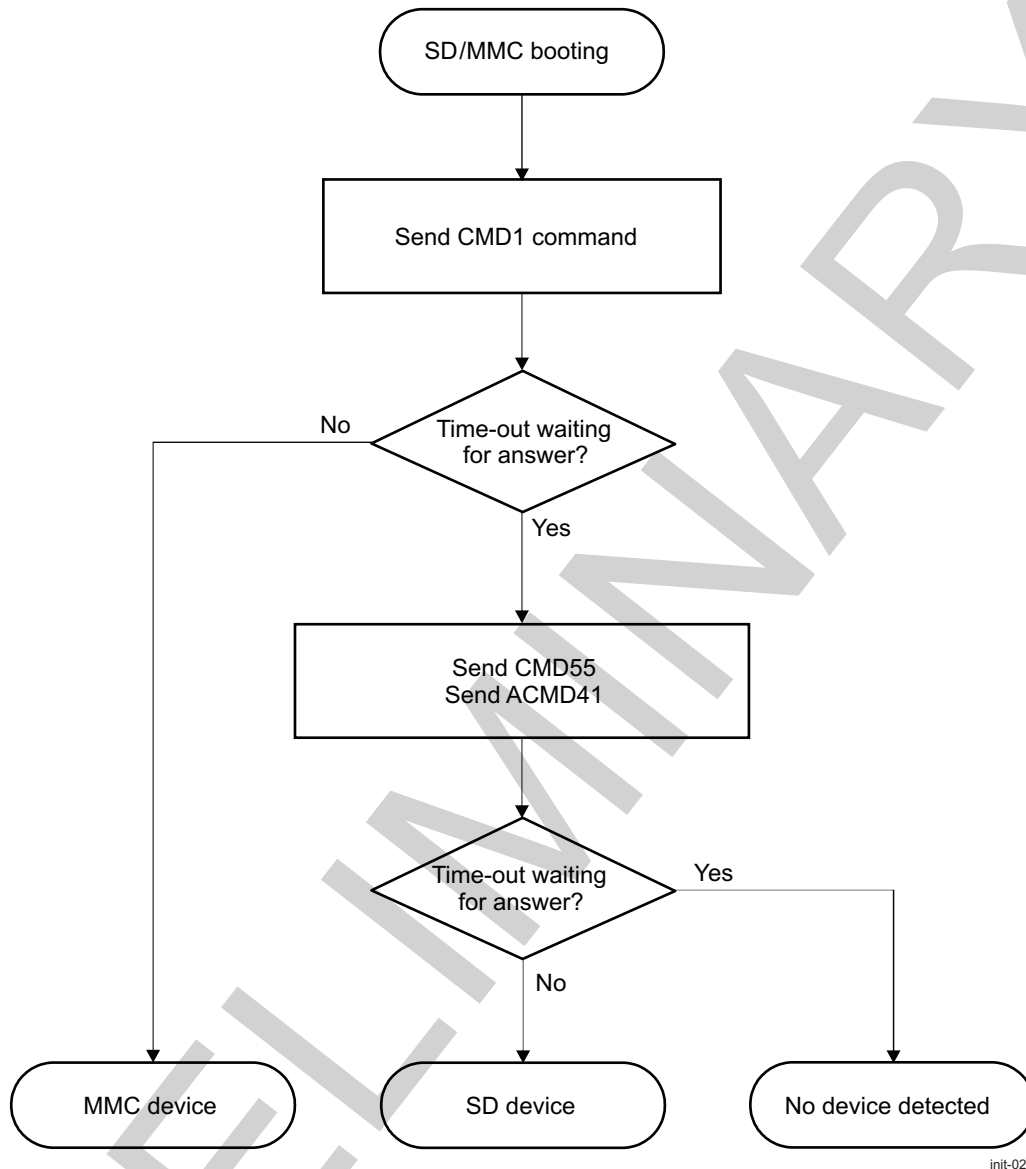
NOTE: The ROM code does not handle the card detection feature on the card cage.

28.4.7.6.3 Initialization and Detection

The ROM code initializes the memory device or card connected on the interface using the standard high-voltage range (3.0 V). If neither a card nor memory device is detected, the ROM code moves to the next booting device. The standard identification process and relative card address (RCA) assignment are used. However, the ROM code assumes that only one memory or card is connected on the bus. This is done using the CMD line common to the SD and MMC memory devices. The MMC and SD standards describe this phase as the initialization phase. They differ in the first commands involved, CMD1 and ACMD41. The ROM code uses this command difference to discriminate between MMC and SD cards; that is, CMD1 is supported only by the MMC standard and ACMD41 is only supported by the SD standard. The ROM code first sends a CMD1 to the device and gets an answer only if an MMC device is connected. If no response is received, ACMD41 (a combination of CMD55 and ACMD41) is sent, and an response is expected from an SD device. If no response is received, no devices are connected and the ROM code exits MMC/SD booting with FAIL.

Figure 28-30 shows the MMC/SD detection procedure.

Figure 28-30. MMC/SD Detection Procedure



init-026

28.4.7.6.4 Read Sector Procedure

- Raw mode

In raw mode, an image can be at one of the four consecutive locations in the main area: offset 0x0 (0KB)/0x20000 (128KB)/0x40000 (256KB)/0x60000 (384KB). For this reason, the size of a booting image must not exceed 128KB. However, a device with an image greater than 128KB can be flash starting at one of the aforementioned locations. Therefore, the ROM code does not check the image size. The only drawback is that the image crosses the subsequent image boundary. Raw mode is detected by reading sectors 0, 256, 512, and 768. The content of these sectors is verified for the presence of a TOC structure. For a GP device, a CH (if used) must be in the first sector followed by a GP header. The CH can be void (containing only a CHSETTINGS item for which the Valid field is 0), as described in [Section 28.4.8.2, Configuration Header](#). Image data is read directly from continuous sectors of a card. If raw mode is not detected, file system mode is assumed.

- File system handling

File system support is available only for the SDMMC1 interface. The sector read procedure uses the standard MMC/SD read data procedure. The sector address is generated based on the booting

memory file map collected during initialization. Thus, the ROM code can freely address sectors in the booting file space.

28.4.7.6.5 File System Handling

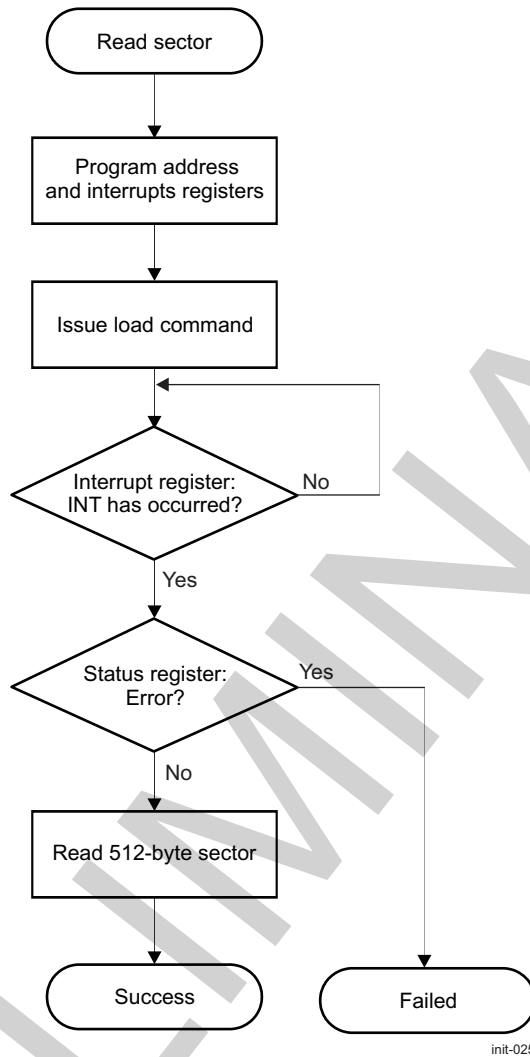
The MMC/SD cards can hold a file system that the ROM code reads. The image used by the booting procedure is taken from a booting file named MLO. This file must be in the root directory on an **active** primary partition of type FAT12/16 or FAT32.

An MMC/SD card can be configured as floppy-like or hard-drive-like:

- When acting like a floppy, the content of the card is a single FAT12/16/32 file system without an MBR holding a partition table.
- When acting like a hard drive, an MBR is present in the first sector of the card. This MBR holds a table of partitions, one of which must be FAT12/16/32, primary, and active.

According to the *MultiMediaCard FAT16 File System Specification* from the MMCA Technical Committee, the card must always hold an MBR, except for MMC cards using a floppy-like file system. However, depending on the operating system used, the MMC/SD card is formatted with or without partition(s) (using an MBR). The ROM code supports both types: floppy-like or hard-drive-like. The ROM code retrieves a map of the booting file from the FAT table. The booting file map is a collection of all FAT table entries related to the booting file (a FAT entry points to a cluster holding part of the file). The booting procedure uses this map to access any 512-byte sector in the booting file without involving the ROM code FAT module. [Figure 28-31](#) shows the complete process.

Figure 28-31. SD/MMC Get Booting File



28.4.7.6.5.1 MBR and FAT File System

This paragraph describes functions used by the ROM code to recognize whether an MBR with a FAT is used. It is not intended to fully describe the MBR and the FAT file system detection and reading procedure. The ROM code can detect FAT12/16/32 allocation table types. It cannot boot on devices with NTFS or Linux® FS partitions. Some memory devices that support file systems can be formatted with or without MBR; therefore, the first task of the ROM code is to detect whether the device is holding an MBR in the first sector.

The MBR is the first sector of a memory device. It consists of executable code, four partition entries, and one signature. The aim of such a structure is to divide the hard disk in partitions used primarily to boot different systems (for instance, Microsoft Windows™). This structure is described in [Table 28-42](#), and the partition table entry is described in [Table 28-43](#).

Table 28-42. Master Boot Record Structure

| Offset | Length (Bytes) | Entry Description |
|--------|----------------|-----------------------|
| 0000h | 446 | Optional code |
| 01BEh | 16 | Partition table entry |
| 01CEh | 16 | Partition table entry |
| 01DEh | 16 | Partition table entry |
| 01EEh | 16 | Partition table entry |
| 01FEh | 2 | Signature (0xAA55) |

Table 28-43. Partition Table Entry

| Offset | Length [Bytes] | Entry Description | Value |
|--------|----------------|--|--|
| 0000h | 1 | Partition state | 00h: Inactive 80h: Active |
| 0001h | 1 | Partition start head | Hs |
| 0002h | 2 | Partition start cylinder and sector | Cs[7:0]–Cs[9:8]–Ss[5:0] |
| 0004h | 1 | Partition type | 01h: FAT12 04h, 06h, 0Eh: FAT16 0Bh, 0Ch, 0Fh: FAT32 |
| 0005h | 16 | Partition end head | He |
| 0006h | 2 | Partition end cylinder and sector | Ce[7:0]–Ce[9:8]–Se[5:0] |
| 0008h | 4 | First sector position relative to the beginning of media | LBAs = Cs.H.S + Hs.S + Ss–1 |
| 000Ch | 4 | Number of sectors in partition | LBAe = Ce.H.S + He.S + Se–1 Nb s= LBAe–LBAs + 1 |

SD/MMC booting consists of the following steps:

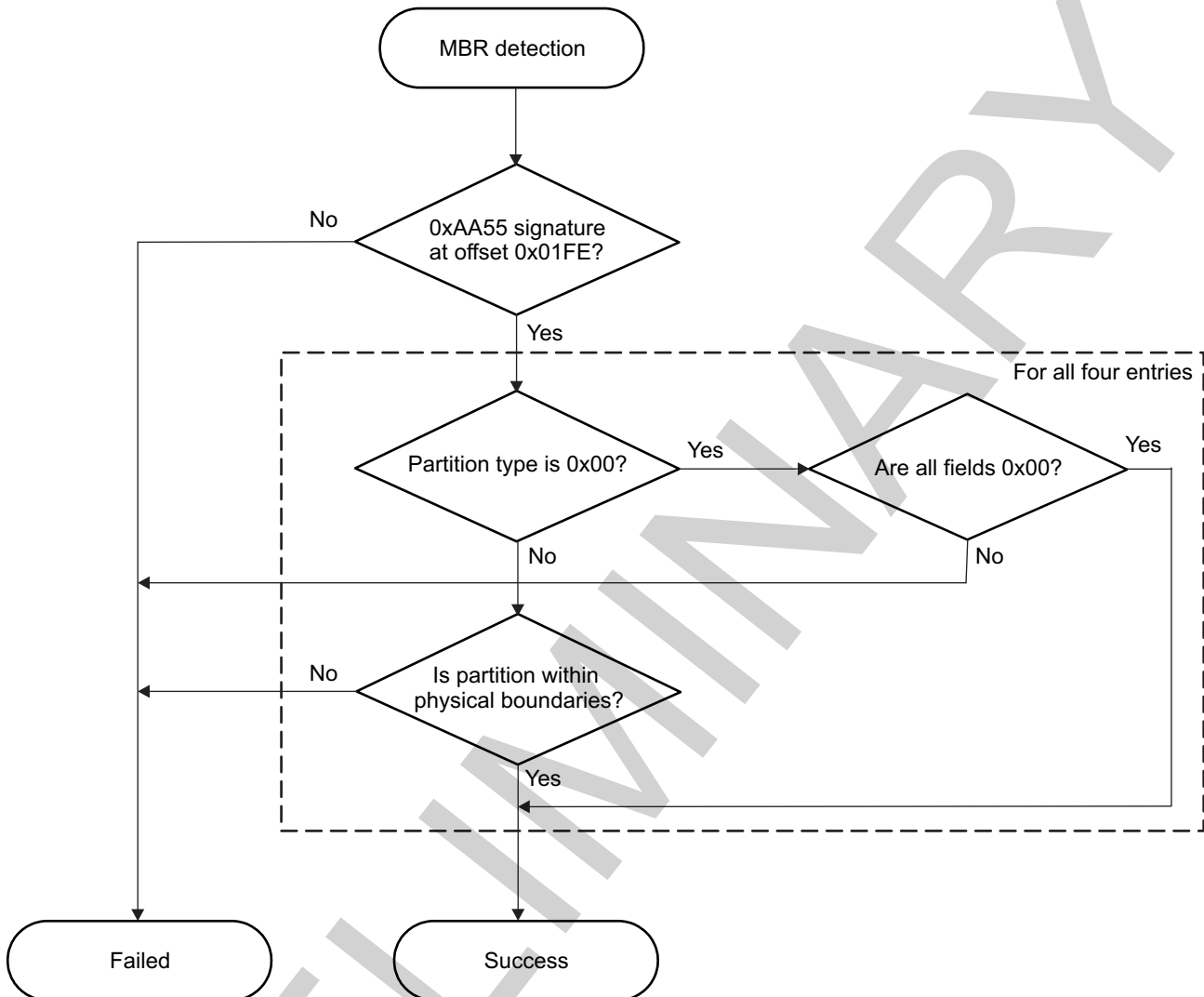
1. MBR detection

The ROM code first checks whether the MBR signature is present, and then it searches an active FAT12/16/32 partition in all four MBR partition entries, based on the Type field. If the MBR entries are not valid, or if no usable partition is found, the ROM code returns to the booting procedure with FAIL. The extended partitions are not checked; the booting file must reside in a primary partition. Each partition entry is checked:

- If its type is set to 00h, all fields in the entry must be 00h.
- The partition is checked to be within physical boundaries (that is, the partition is inside and it fits the total physical sectors).

See [Figure 28-32](#) for more information about MBR detection.

Figure 28-32. MBR Detection Procedure



init-028

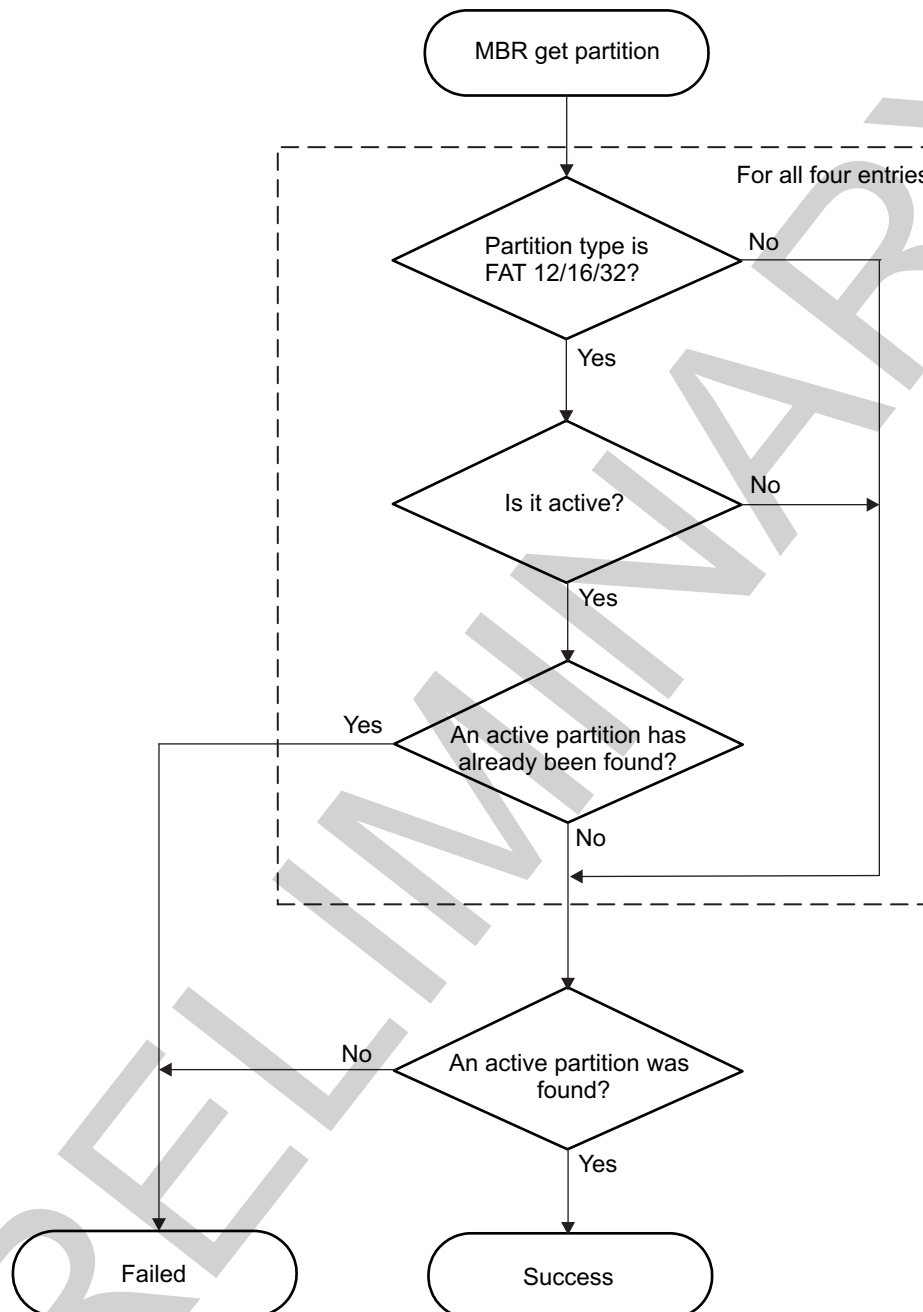
2. Get the MBR partition.

Once identified, the ROM code gets the partition using the procedure described in [Figure 28-32](#). The partition type is checked to be FAT12/16 or FAT32. Its state must be 00h (inactive) or 80h (active.) The ROM code returns with FAIL if no active primary FAT12/16/32 is found, or the test fails if there is more than one active partition. If an active partition is found, its first sector is read and used later. If no MBR is present (in case of a floppy-like system), the first sector of the device is read and used later. The read sector is checked to be a valid FAT12/16 or FAT32 partition. If this fails, the ROM code returns with FAIL if another partition type is used (for instance, Linux FS) or if the partition is not valid.

The FAT file system consists of several parts:

- Boot sector, which holds the BIOS parameter block (BPB). Not all are used by the ROM code.
- FAT, which describes the use of each cluster of the partition
- Data area, which holds the files, directories, and root directory (for FAT12/16, the root directory has a specific fixed location)

To check whether a sector holds a valid FAT12/16/32 partition, many fields of the boot sector (used by all FAT types) that must have specific values are checked. [Figure 28-33](#) shows more about getting the partition.

Figure 28-33. MBR, Get Partition

init-029

3. Find the booting file.

When a partition is found, the root directory entries are searched for a booting file named MLO in the root directory of the FAT12/16/32 file system. The file is not searched in any other location. For a FAT12/16 file system, the root directory has a fixed location, which is cluster 0. For a FAT32 file system, its cluster location is given by BPB_RootClus. The formula to find the sector number (relative to device sector 0, not partition sector 0) of a cluster is given by the following equation:

$$Cluster_{sector} = BPB_HiddSec + BPB_RsvdSecCnt + BPB_NumFATs \cdot BPB_FATSz + Cluster \cdot BPB_SecPerClus$$

init-E001

NOTE: BPB_FatSz is BPB_FatSz16 for FAT12/16, or BPB_FatSz32 for FAT32.

NOTE: The BPB_HiddSec field can contain 0, even though the FAT file system is somewhere other than on sector 0 (floppy-like). The ROM code uses the partition offset taken from the MBR instead of this field, which can be wrong. If no MBR is found (floppy-like), the value 0 is used.

Each entry in the root directory is 32 bytes and holds information about the file (the filename, date of creation, rights, cluster location, etc.). (See [Table 28-44](#).)

Table 28-44. FAT Directory Entry

| Offset | Length [Bytes] | Name | Description |
|--------|----------------|------------------|--|
| 0000h | 11 | DIR_Name | Short Name (8 + 3) |
| 000Bh | 1 | DIR_Attr | File Attributes: 01h – ATTR_READ_ONLY 02h – ATTR_HIDDEN 04h – ATTR_SYSTEM 08h – ATTR_VOLUME_ID 10h – ATTR_DIRECTORY 20h – ATTR_ARCHIVE 0Fh – ATTR_LONG_NAME |
| 000Ch | 1 | DIR_NTRes | Reserved. Set to 00h. |
| 000Dh | 1 | DIR_CrtTimeTenth | Millisecond stamp at file creation |
| 000Eh | 2 | DIR_CrtTime | Time file was created. |
| 0010h | 2 | DIR_CrtDate | Date file was created. |
| 0012h | 2 | DIR_LstAccDate | Last access date |
| 0014h | 2 | DIR_FstClusHi | High word of the first cluster number of this entry |
| 0016h | 2 | DIR_WrtTime | Time of last write |
| 0018h | 2 | DIR_WrtDate | Date of last write |
| 001Ah | 2 | DIR_FstClusLo | Low word of the first cluster number of this entry |
| 001Ch | 4 | DIR_FileSize | File size in bytes |

The ROM code checks each entry in the root directory until either the booting file is found or the entry is empty (first byte is 00h), or when the end of the root directory is reached. Entries with the ATTR_LONG_NAME attribute (LFN) and first byte at E5h (erased file) are ignored. When found, the first cluster offset of the file is read from the DIR_FstClusHi/DIR_FstClusLo fields. There is a slight difference between FAT12/16 and FAT32 when handling the root directory. On FAT12/16, this directory has a fixed location (see [Table 28-44](#)) and length fixed by BPB_RootEntCnt, which is the total of 32-byte entries. Therefore, handling this directory is straightforward. On FAT32, the root directory is like a standard file. The FAT must be used to retrieve each sector of the directory. The way in which the FAT is handled is described in Step 4.

4. Buffer FAT entries in the FAT buffer

When the booting file is found, the ROM code reads the FAT and buffers the singly-linked chain of clusters in a FAT buffer used by booting to access the file directly, sector by sector. For FAT12/16 and for FAT32, multiple copies of the FAT exist (ROM code supports only two copies), after the boot sector.

$$FATn_{sector} = BPB_HiddSec + BPB_RsvdSecCnt + BP_FatSz \cdot n$$

init-E002

The size of the FAT buffer is given by BPB_FATsSz16 or BPB_FATsSz32. The ROM code checks each copy of the FAT if they are identical. If the values are different, the ROM code uses the value from the last FAT copy. With the FAT32 file system, the copy system can be disabled according to a flag in BPB_ExtFlags[7]. If this flag is set, the FAT BPB_ExtFlags[3:0] bit field is used. In this case, no verification is made by the ROM code with other copies of FAT.

The FAT is a simple array of values, each referring to a cluster in the data area. One entry of the array is 12, 16, or 32 bits, depending on the file system in use. The value in an entry defines whether the

cluster is being used or not, and if another cluster must be considered. This creates a singly-linked chain of clusters defining the file. The meaning of an entry is described in [Table 28-45](#).

NOTE: For compatibility, cluster 0 and cluster 1 are not used for files, and these entries must contain:

- FF8h and FFFh (for FAT12)
- FFF8h and FFFFh (for FAT16)
- 0FFFFFFF8h and 0FFFFFFFh (for FAT32)

Table 28-45. FAT Entry Description

| FAT12 | FAT16 | FAT32 | Description |
|-----------|-----------------|---------------------------|--|
| 000h | 0000h | 00000000h | Free cluster |
| 001h | 0001h | 00000001h | Reserved cluster |
| 002h–FEFh | 0002h– FFEFh | 00000002h– 0FFFFFFEFh | Used cluster; value points to next cluster |
| FF0h–FF6h | FFF0h– FFF6h | 0FFFFFFF0h– 0FFFFFFF6h | Reserved values |
| FF7h | FFF7h | 0FFFFFFF7h | Bad cluster |
| FF8h–FFFh | FFF8h– FFFFh | 0FFFFFFF8h– 0FFFFFFFh | Last cluster in file |

NOTE: FAT32 uses only bits [27:0]; the upper 4 bits are usually 0 and must be left untouched.

When accessing the root directory for FAT32, the ROM code starts from the root directory cluster entry and follows the linked chain to retrieve the clusters.

When the booting file has been found, the ROM code buffers each FAT entry corresponding to the file in a sector way. This means each cluster is translated to one or several sectors, depending on how many sectors are in a cluster (BPB_SecPerClus). This buffer is used later by the booting procedure to access the file.

28.4.8 Image Format

28.4.8.1 Overview

An image has two major parts:

- AAn optional CH
- Software to execute

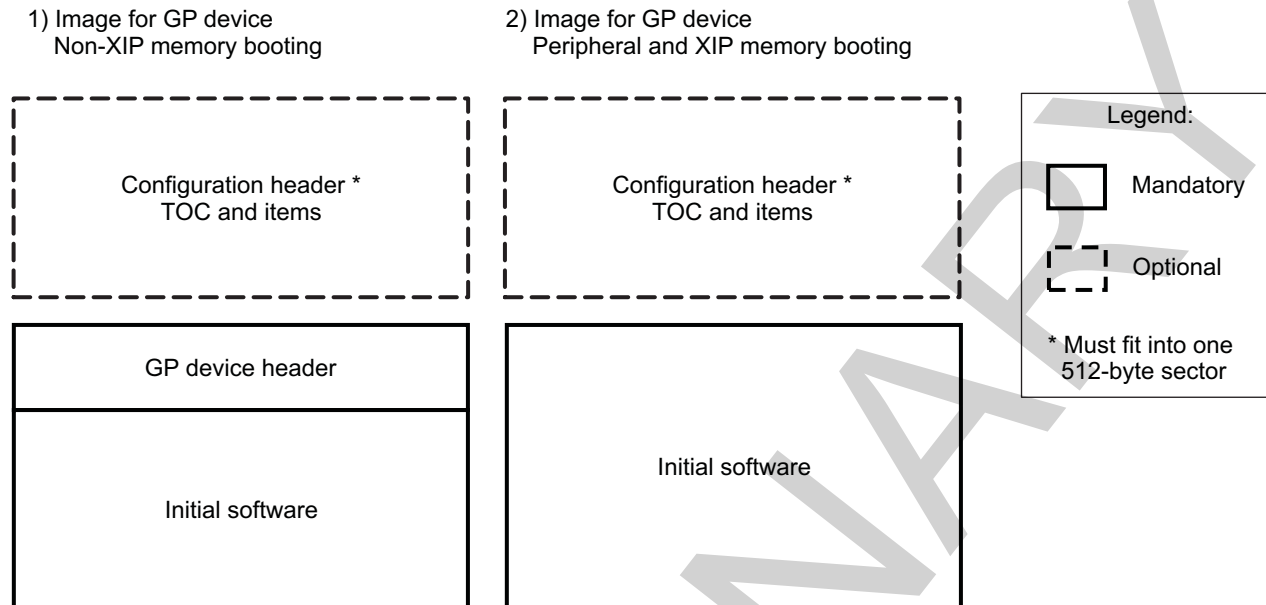
The CH can contain several parameters set by users to speed up booting. It is further described in [Section 28.4.8.2, Configuration Header](#).

The second part contains the software that is loaded into the memory and executed.

[Figure 28-34](#) is an overview of the boot image formats. There are two image types:

1. GP non-XIP memory booting: This image type is used for memories that require shadowing (for example, MMC). An image can contain a CH that includes at least a CHSETTINGS item entry. Next, there must be a small header (referred to as a GP header) that contains information about the size and the destination address.
2. When the memory device is of XIP type (for example, NOR), the GP header is not required, and the image can contain code for direct execution. Optionally, the first sector can contain a CH. The same image format is used for peripheral booting (where the code is transferred to internal RAM).

Figure 28-34. Image Formats



init-018

28.4.8.2 Configuration Header

The ROM code default settings (such as clock frequencies, EMIF, GPMC, or MMCHS interfaces) can be tuned by the user by using the CH.

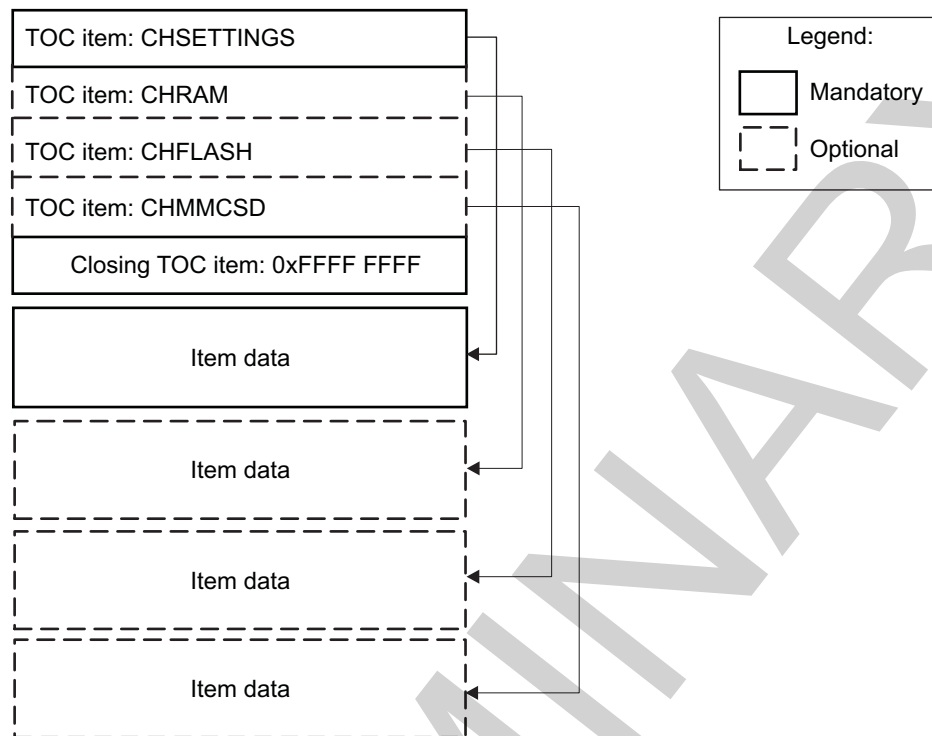
The CH can contain the following parts:

- Settings: Various clock settings (mandatory)
- RAM: EMIF settings
- FLASH: Flash interface (GPMC) settings
- MMC/SD: MMCHS interface settings

The beginning of the CH is a table of contents (TOC), which points to each item. This is described in [Figure 28-35](#). Each TOC item is a simple structure described in [Table 28-46](#). The complete CH (CH TOC and items) should fit in a 512-byte sector.

The ROM code identifies the presence of a CH by reading the first TOC item if it contains a known string (CHSETTINGS, CHRAM, etc.). Next, the TOC is identified and searched until a 0xFFFF FFFF offset is found. The CH is read and parameters are executed sequentially.

For the sake of simplicity, each field represents the content of a register to be modified. Only fields required for the configuration are used; fields for status, for instance, are not modified and therefore are not shown in the tables.

Figure 28-35. CH Format

init-019

Table 28-46. CH TOC Item

| Offset | Field | Size (Bytes) | Description |
|--------|----------|--------------|---|
| 0x0000 | Start | 4 | Offset from the start address of the TOC to the actual address of item contents |
| 0x0004 | Size | 4 | Size of item |
| 0x0008 | Reserved | 4 | Unused |
| 0x000C | Reserved | 4 | Unused |
| 0x0010 | Reserved | 4 | Unused |
| 0x0014 | Filename | 12 | 12-character name of a item, including the zero termination character(\0) |

28.4.8.2.1 CHSETTINGS Item

The CHSETTINGS configuration header contains settings specific to the clock system. The ROM code configures the OMAP clocking to some default settings as described in [Section 28.4.4.2, Clocking Configuration](#). The CH CHSETTINGS section contains a method to override the ROM code default clock settings.

[Table 28-47](#) describes the fields. The clocking procedure and the clocking setting structure are described in [Section 28.4.4.4, Software Booting Configuration](#).

Table 28-47. CHSETTINGS Item

| Offset | Field | Description |
|--------|-------------|---|
| 0000h | Section key | Key used for item verification: C0C0C0C1h |
| 0004h | Valid | Enables/disables the section: 00h: Disable |

Table 28-47. CHSETTINGS Item (continued)

| Offset | Field | Description |
|--------|-------------------|---|
| | | Others: Enable |
| 0005h | Version | Configuration header version 01h Others: Reserved |
| 0006h | Reserved | |
| 0008h | Clocking settings | Described in Table 28-16 starting from the FLAGS field. |

28.4.8.2.2 CHRAM Item

The CHRAM configuration header contains settings specific to the SDRAM memory controller (EMIF). [Table 28-48](#) describes the fields. The ROM code does not configure the EMIF by default, because it cannot assume any external SDRAM type. Therefore, if the ROM code is needed to configure the SDRAM access, the user must provide the appropriate timing details in the CHRAM structure. For more information, see [Section 16.3](#), *EMIF Controller*, and [Section 16.3.6](#), *EMIF Register Manual*.

Table 28-48. CHRAM Item

| Offset | Field | Description |
|--------|----------------------|--|
| 0000h | Section key | Key used for section verification: C0C0C0C2h. |
| 0004h | Valid | Enables/disables the section: 00h: Disable Other: Enable |
| 0005h | Reserved | |
| 0008h | SdramConfig (EMIF1) | SDRAM configuration register (EMIF1.EMIF_SDRAM_CONFIG) |
| 000Ch | SdramRefresh (EMIF1) | SDRAM Refresh control register (EMIF1.EMIF_SDRAM_REF_CTRL) |
| 0010h | SdramTim1 (EMIF1) | SDRAM timing 1 register (EMIF1.EMIF_SDRAM_TIM_1) |
| 0014h | SdramTim2 (EMIF1) | SDRAM timing 2 register (EMIF1.EMIF_SDRAM_TIM_2) |
| 0018h | SdramTim3 (EMIF1) | SDRAM timing 3 register (EMIF1.EMIF_SDRAM_TIM_3) |
| 001Ch | PwrMgtCtrl (EMIF1) | Power-management control register (EMIF1.EMIF_PWR_MGMT_CTRL) |
| 0020h | DdrPhyCtrl1 (EMIF1) | DDR PHY control 1 register (EMIF1.EMIF_DDR_PHY_CTRL_1) |
| 0024h | DdrPhyCtrl2 (EMIF1) | DDR PHY control 2 register (EMIF1.EMIF_DDR_PHY_CTRL_2) |
| 0028h | ModeReg1 (EMIF1) | Mode register MR1 (in the LPDDR2 device) |
| 0029h | ModeReg2 (EMIF1) | Mode register MR2 (in the LPDDR2 device) |
| 002Ah | ModeReg3 (EMIF1) | Mode register MR3 (in the LPDDR2 device) |
| 002Bh | Reserved | |
| 002Ch | SdramConfig (EMIF2) | SDRAM configuration register (EMIF2.EMIF_SDRAM_CONFIG) |
| 0030h | SdramRefresh (EMIF2) | SDRAM refresh control register (EMIF2.EMIF_SDRAM_REF_CTRL) |
| 0034h | SdramTim1 (EMIF2) | SDRAM timing 1 register (EMIF2.EMIF_SDRAM_TIM_1) |
| 0038h | SdramTim2 (EMIF2) | SDRAM timing 2 register (EMIF2.EMIF_SDRAM_TIM_2) |
| 003Ch | SdramTim3 (EMIF2) | SDRAM timing 3 register (EMIF2.EMIF_SDRAM_TIM_3) |
| 0040h | PwrMgtCtrl (EMIF2) | Power-management control register (EMIF2.EMIF_PWR_MGMT_CTRL) |
| 0044h | DdrPhyCtrl1 (EMIF2) | DDR PHY control 1 register (EMIF2.EMIF_DDR_PHY_CTRL_1) |
| 0048h | DdrPhyCtrl2 (EMIF2) | DDR PHY control 2 register (EMIF2.EMIF_DDR_PHY_CTRL_2) |
| 004Ch | ModeReg1 (EMIF2) | Mode register MR1 (in the LPDDR2 device) |
| 004Dh | ModeReg2 (EMIF2) | Mode register MR2 (in the LPDDR2 device) |
| 004Eh | ModeReg3 (EMIF2) | Mode register MR3 (in the LPDDR2 device) |
| 004Fh | Reserved | |
| 0050h | DMM LISA Map 0 | DMM LISA section 0 mapping (see Section 16.2 for more information about the DMM module architecture) |

Table 28-48. CHRAM Item (continued)

| Offset | Field | Description |
|--------|-------|--|
| 0054h | Flags | <p>Setting bits 0 to 3 requests ROM code to configure the appropriate channel/chip select:</p> <p>Bit[0]: Configure EMIF1 CS0</p> <p>Bit[1]: Configure EMIF1 CS1</p> <p>Bit[2]: Configure EMIF2 CS0</p> <p>Bit[3]: Configure EMIF2 CS1</p> <p>Bits[8:11]: EMIF temperature monitoring timeout. If the value is non-zero, the ROM code checks the MR4 register of the EMIF LPDDR2. As long as the SDRAM Refresh Rate field is not 0x3 (Temperature not $\leq 85^{\circ}\text{C}$) it indicates an abnormal EMIF temperature state and the ROM code loops. When the SDRAM Refresh Rate goes back to 0x3, the ROM Code resumes EMIF initialization. The waiting loop cannot exceed the timeout value indicated by this flag. When the timeout expires, the ROM code resumes EMIF initialization.</p> <p>0x0: no temperature monitoring</p> <p>0x1: timeout 1 second</p> <p>0x2: timeout 2 seconds</p> <p>0x3: timeout 3 seconds</p> <p>0x5: timeout 5 seconds</p> <p>0xA: timeout 10 seconds</p> <p>Other bits: Reserved</p> |

NOTE:

- The ROM code supports only the LPDDR2 memory type (as set in the SDRAM configuration register EMIF_SDRAM_CONFIG).
- It is assumed that the same kind of SDRAM (same type and timings) is attached to both CSs when requesting the configuration of both CSs for a given EMIF (for example, if bits 0 and 1 of the Flags field are set, it is assumed that both EMIF1 CSs are attached to the same kind of memory).

28.4.8.2.3 CHFLASH Item

The CHFLASH configuration header contains settings specific to the general-purpose memory controller (GPMC). For more information, see [Section 16.4, GPMC Overview](#). [Table 28-49](#) describes the fields.

Table 28-49. CHFLASH Item

| Offset | Field | Description |
|--------|----------------------------|--|
| 0000h | Section Key | Key used for section verification: C0C0C0C3h. |
| 0004h | Valid | <p>Enables/disables the section:</p> <p>00h: Disable</p> <p>Others: Enable</p> |
| 0005h | Reserved | |
| 0008h | GPMC_SYSCONFIG (LSB) | Register values |
| 000Ah | GPMC_IRQENABLE (LSB) | |
| 000Ch | GPMC_TIMEOUT_CONTROL (LSB) | |
| 000Eh | GPMC_CONFIG (LSB) | |
| 0010h | GPMC_CONFIG1_0 | |
| 0014h | GPMC_CONFIG2_0 | |
| 0018h | GPMC_CONFIG3_0 | |
| 001Ch | GPMC_CONFIG4_0 | |
| 0020h | GPMC_CONFIG5_0 | |
| 0024h | GPMC_CONFIG6_0 | |

Table 28-49. CHFLASH Item (continued)

| Offset | Field | Description |
|--------|-----------------------------|--|
| 0028h | GPMC_CONFIG7_0 | |
| 002Ch | GPMC_PREFETCH_CONFIG1 | |
| 0030h | GPMC_PREFETCH_CONFIG2 (LSB) | |
| 0032h | GPMC_PREFETCH_CONTROL (LSB) | |
| 0034h | GPMC_ECC_CONFIG | |
| 0036h | GPMC_ECC_CONTROL | |
| 0038h | GPMC_ECC_SIZE_CONFIG (LSB) | |
| 003Ch | Enable_A1_A10 | 0: Do not change A1– A10 pads Others: Enable A1– A10 pads |

28.4.8.2.4 CHMMCS D Item

The CHMMCS D configuration header contains settings specific to the high-speed MMC/SD/SDIO host controller (MMCHS). For more information, see [Chapter 25, MMC/SD/SDIO](#). [Table 28-50](#) describes the fields.

Table 28-50. CHMMCS D Item

| Offset | Register Modified | Description |
|--------|---------------------------|---|
| 0000h | Section key | Key used for section verification C0C0C0C4h |
| 0004h | Valid | Enables/disables the section: 00h: Disable Other: Enable |
| 0005h | Reserved | |
| 0008h | MMCHS_SYSCTRL(MSW) | Update MMCHS SYSCTRL interface register with the value specified in these fields. The register is not updated if the value is 0xFFFFFFFF. |
| 000Ah | MMCHS_SYSCTRL(LSW) | |
| 000Ch | MMCHS interface bus width | 1: 1 bit 2: 4 bits 4: 8 bits 0xFFFF FFFF: Do not update bus width. Others: Reserved |

The ROM code provides a booting parameter structure to the initial software (see [Section 28.4.8.4, Image Execution](#)). This structure contains a field that indicates whether the configuration header items have been correctly processed. For a CHMMCS D item, if the MMCHS_SYSCTRL and bus width fields are set to 0xFFFF FFFF, the booting parameters report that the CHMMCS D section has not been executed, regardless of the value of the Valid field.

28.4.8.3 GP Header

When the booting memory device is non-XIP (for example, MMC) the image must contain a small header, located before the executable code, and having the size of the software to load and the destination address of where to store it. [Table 28-51](#) describes the image format. The GP header is not required when booting from an XIP memory device (for example, NOR) or in case of peripheral booting. In this case, the peripheral or memory booting image starts directly with executable code.

Table 28-51. GP Header Format

| Field | Non-XIP Device Offset | XIP Device Offset | Size (Bytes) | Description |
|-------|-----------------------|-------------------|--------------|-------------------|
| Size | 0x0000 | – | 4 | Size of the image |

Table 28-51. GP Header Format (continued)

| Field | Non-XIP Device Offset | XIP Device Offset | Size (Bytes) | Description |
|-------------|-----------------------|-------------------|--------------|--|
| Destination | 0x0004 | – | 4 | Address where to store the image or code entry point |
| Image | 0x0008 | 0x0000 | x | Executable code |

NOTE: The Destination address field stands for:

- Target address for the image copy from the non-XIP storage to the target XIP location (for example, internal RAM or SDRAM)
- Entry point for image code

Users must take care to locate the code entry point to the target address for image copy.

28.4.8.4 Image Execution

The image is executed when the ROM code performs the branch to the first executable instruction in the initial software. For a GP device in non-XIP, the execution address is the first word after the GP header. The branch is performed in public ARM supervisor mode. The R0 register points to the booting parameter structure that contains information about booting execution. [Table 28-52](#) shows the booting parameter structure.

Table 28-52. Booting Parameter Structure

| Offset | Field | Size (Bytes) | Description |
|--------|----------------------------------|--------------|---|
| 0x00 | Booting message | 4 | Last received booting message |
| 0x04 | Memory booting device descriptor | 4 | Pointer to the memory device descriptor that has been used during the memory booting process |
| 0x08 | Current booting device | 1 | Code of device used for booting: <ul style="list-style-type: none"> 0x00: Void, no device 0x02: XIP memory 0x02: XIPWAIT memory (wait-signal monitoring on) 0x03: NAND 0x04: OneNAND 0x05: MMC1 0x06: MMC2(1) 0x07: MMC2(2) 0x08: MMC2_BOOT 0x43: UART3 0x45: USB(1) (internal transceiver) 0x46: USB-ULPI 0x47: USB(2) (internal transceiver) Others: Reserved |
| 0x09 | Reset reason | 1 | Current reset reason bit mask (bit = 1, event present): <ul style="list-style-type: none"> [0]: Power-on reset [1]: Global software warm reset [2]: Reserved [3]: MPU watchdog or WDTIMER2 reset [4]: Reserved [5]: External warm reset [6]: VDD MPU voltage manager reset |

Table 28-52. Booting Parameter Structure (continued)

| Offset | Field | Size (Bytes) | Description |
|--------|----------|-----------------|--|
| | | | [7]: VDD IVA voltage manager reset [8]: VDD Core voltage manager reset [9]: ICEPick reset [10] C2C warm reset Other bits: Reserved |
| 0x0A | CH flags | 1 | Configuration header items flag. Each item is described by 1 bit. A set bit indicates that the item was executed: [0]: CHSETTINGS [1]: CHRAM [2]: CHFLASH [3]: CHMMCSO Other bits: Reserved |

28.4.9 Tracing

Tracing in the public ROM code consists in three 32-bit vectors for which each bit corresponds to a particular way point in the ROM code execution sequence. [Table 28-53](#) through [Table 28-55](#) list the organization of the tracing data in RAM. Tracing vectors are initialized at the beginning of the start-up phase and are updated all along the boot process.

There are two sets of tracing vectors ([Table 28-13](#)). The first set is the current trace information (after a cold or warm reset). The second set holds a copy of trace vectors collected at the first ROM code run after a cold reset. As a result, after a warm reset it is possible to have visibility on the boot scenario that occurred during a cold reset.

[Table 28-53](#) lists the organization of tracing vector 1.

Table 28-53. Tracing Vector 1

| Bit | Group | Meaning |
|-----|-----------------|--|
| 0 | General | Passed the public reset vector |
| 1 | General | Entered main function |
| 2 | General | Running after the cold reset |
| 3 | Boot | Main booting routine entered |
| 4 | Memory boot | Memory booting started |
| 5 | Peripheral boot | Peripheral booting started |
| 6 | Boot | Booting loop reached last device |
| 7 | Boot | GP header (non-XIP) found |
| 8 | Boot | Booting message Skip peripheral booting received |
| 9 | Boot | Booting message Change device received |
| 10 | Peripheral boot | Booting message Peripheral booting received |
| 11 | Peripheral boot | Booting message Get ASIC ID received |
| 12 | Peripheral boot | Device initialized |
| 13 | Peripheral boot | ASIC ID sent |
| 14 | Peripheral boot | Image received |
| 15 | Peripheral boot | Peripheral booting failed |
| 16 | Peripheral boot | Booting message not received (time-out) |
| 17 | Peripheral boot | Image size not received (time-out) |
| 18 | Peripheral boot | Image not received (time-out) |
| 19 | Reserved | |

Table 28-53. Tracing Vector 1 (continued)

| Bit | Group | Meaning |
|-----|--------------------------------|-----------------------------|
| 20 | Configuration header | CHSETTINGS found |
| 21 | Configuration header | CHSETTINGS executed |
| 22 | Configuration header | CHRAM executed |
| 23 | Configuration header | CHFLASH executed |
| 24 | Configuration header | CHMMCSDB clocks executed |
| 25 | Configuration header | CHMMCSDB bus width executed |
| 26 | Reserved | |
| 27 | Reserved | |
| 28 | Software booting configuration | SWCFG general detected |
| 29 | Software booting configuration | SWCFG clocks detected |
| 30 | Software booting configuration | SWCFG time-out detected |
| 31 | Reserved | |

Table 28-54 lists the organization of tracing vector 2.

Table 28-54. Tracing Vector 2

| Bit | Group | Meaning |
|-----|----------------------------|-------------------------------------|
| 0 | Power-management IC | TWL6032 detected |
| 1 | Power-management IC | VBUS detected (in TWL6032) |
| 2 | Power-management IC | VMMC 3 V switched on (in TWL6032) |
| 3 | Power-management IC | VUSB 3.3 V switched on (in TWL6032) |
| 4 | USB | USB connect |
| 5 | USB | USB configured state |
| 6 | USB | USB VBUS valid (in USBOTGHS) |
| 7 | USB | USB session valid |
| 8 | Power-management IC | PrevStartOk set |
| 9 | USB | Suspend event |
| 10 | USB | Resume event |
| 11 | USB | Charger detected |
| 12 | Memory boot | Memory booting trial 0 |
| 13 | Memory boot | Memory booting trial 1 |
| 14 | Memory boot | Memory booting trial 2 |
| 15 | Memory boot | Memory booting trial 3 |
| 16 | Memory and peripheral boot | Execute GP image |
| 17 | Reserved | |
| 18 | Reserved | |
| 19 | Reserved | |
| 20 | Reserved | |
| 21 | Reserved | |
| 22 | Reserved | |
| 23 | Reserved | |
| 24 | Reserved | |
| 25 | Reserved | |
| 26 | Reserved | |
| 27 | Reserved | |
| 28 | Reserved | |

Table 28-54. Tracing Vector 2 (continued)

| Bit | Group | Meaning |
|-----|--------|--|
| 29 | LPDDR2 | Temperature monitoring enter |
| 30 | LPDDR2 | Temperature monitoring timeout expired |
| 31 | MMCSD | MMCSD1 PBIAS configuration is 1.8 V. |

Table 28-55 lists the organization of tracing vector 3.

Table 28-55. Tracing Vector 3

| Bit | Group | Meaning |
|-----|-----------------|------------------------------------|
| 0 | Memory boot | Memory booting device NULL |
| 1 | Memory boot | Memory booting device XIP |
| 2 | Memory boot | Memory booting device XIPWAIT |
| 3 | Memory boot | Memory booting device NAND |
| 4 | Memory boot | Memory booting device OneNAND |
| 5 | Memory boot | Memory booting device MMC1 |
| 6 | Memory boot | Memory booting device MMC2(1) |
| 7 | Memory boot | Memory booting device MMC2(2) |
| 8 | Memory boot | Memory booting device MMC2_BOOT |
| 9 | Reserved | |
| 10 | Reserved | |
| 11 | Reserved | |
| 12 | Reserved | |
| 13 | Reserved | |
| 14 | Reserved | |
| 15 | Reserved | |
| 16 | Reserved | |
| 17 | Reserved | |
| 18 | Peripheral boot | Peripheral booting device UART3 |
| 19 | Reserved | |
| 20 | Peripheral boot | Peripheral booting device USB(1) |
| 21 | Peripheral boot | Peripheral booting device USB-ULPI |
| 22 | Peripheral boot | Peripheral booting device USB(2) |
| 23 | Peripheral boot | Peripheral booting device NULL |
| 24 | Reserved | |
| 25 | Reserved | |
| 26 | Reserved | |
| 27 | Reserved | |
| 28 | Reserved | |
| 29 | Reserved | |
| 30 | Reserved | |
| 31 | Reserved | |

28.5 Services for HLOS Support

The ROM code provides different services that can be called on GP devices for L2 cache maintenance, wake up of slave CPU(s), etc. These services are implemented in monitor mode (the service must be called by writing the function ID into the R12 register and using the SMC instruction) and do not use any resources like RAM/stack or hardware outside the master CPU. The caller must ensure the save and restore of the processor registers before and after calling the monitor service.

The following code example shows how the monitor ROM code functions can be accessed by an application running in public mode:

```

;-----
; FUNCTION: PL310_SetDebugL2Cache
;
; DESCRIPTION: Function calls the Monitor Service to configure the debug
;               control register of the L2 cache.
;
; INPUTS: r0 Value to set in the debug control register
;
; RETURN:
;
;-----
PL310_SetDebugL2Cache FUNCTION
    PUSH {R1-R12, LR}
    LDR R12, =API_MONITOR_L2CACHE_SETDEBUG_INDEX
    SMC 0x1
    POP {R1-R12, PC}
ENDFUNC

```

28.5.1 L2 Cache Maintenance

Table 28-56. L2 Cache Write Debug Register

| Function ID | Description | |
|-------------|--|-----------------------------|
| R12 = 0x100 | This function sets the input parameter value in the L2 Cache Debug register. | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 | Debug register value to set |
| Output | | |
| Return | | |

Table 28-57. L2 Cache Clean and Invalidate Range of Physical Address

| Function ID | Description | |
|-------------|---|--|
| R12 = 0x101 | This function cleans and invalidates a range Physical Addresses. This is a workaround of the clean and invalidate L2 cache. | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 R1 | Physical Start Address of the range Size of the range to invalidate |
| Output | | |
| Return | | |

Table 28-58. Enable/Disable L2 Cache

| Function ID | Description |
|-------------|--|
| R12 = 0x102 | This function sets the given input value in the L2 Cache Control register (enable/disable) |

Table 28-58. Enable/Disable L2 Cache (continued)

| Function ID | Description | |
|-------------|-------------|-------------------------------|
| Parameters | | |
| Type | Location | Description |
| Input | R0 | Control register value to set |
| Output | | |
| Return | | |

Table 28-59. Write Auxiliary Control Register

| Function ID | Description | |
|-------------|---|------------------------------|
| R12 = 0x109 | This function writes the PL310 Auxiliary Control register with the input given value in R0. | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 | Value to set in the register |
| Output | | |
| Return | | |

Table 28-60. Write Tag and Data RAM Latency Control Register

| Function ID | Description | |
|-------------|---|---|
| R12 = 0x112 | This function writes the PL310 Tag and Data RAM Latency Control Register with the input given value in R0 and R1. | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 R1 | Tag RAM latency to set Data RAM latency to set |
| Output | | |
| Return | | |

Table 28-61. Write Prefetch Control Register

| Function ID | Description | |
|-------------|--|------------------------------|
| R12 = 0x113 | This function writes the PL310 prefetch control register with the input given value in R0. | |
| Parameters | | |
| Type | Location | Description |
| Input | RO | Value to set in the register |
| Output | | |
| Return | | |

28.5.2 Multicore Infrastructure Maintenance

Table 28-62. Read AUX_CORE_BOOT_0 and AUX_CORE_BOOT_1 Registers

| Function ID | Description |
|-------------|--|
| R12 = 0x103 | This function reads both AUX_CORE_BOOT_0/1 registers. The function is kept for compatibility with OMAP4430 ES1.0. AUX_CORE_BOOT_0 and AUX_CORE_BOOT_1 have memory-mapped access. See Chapter 4, Dual Cortex-A9 Subsystem . |
| Parameters | |

**Table 28-62. Read AUX_CORE_BOOT_0 and AUX_CORE_BOOT_1 Registers
(continued)**

| Function ID | Description | |
|-------------|-------------|--|
| Type | Location | Description |
| Input | | |
| Output | R0 R1 | AUX_CORE_BOOT_0 register value AUX_CORE_BOOT_1 register value |
| Return | | |

Table 28-63. Modify AUX_CORE_BOOT_0

| Function ID | Description | |
|-------------|--|--------------------------------------|
| R12 = 0x104 | This function modifies the AUX_CORE_BOOT_0 register used as a status bit. The function sets and clears the bit given in the parameter and returns the new register value after operation. This function is kept for compatibility with OMAP4430 ES1.0. AUX_CORE_BOOT_0 has memory-mapped access. See Chapter 4, Dual Cortex-A9 Subsystem . | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 R1 | Bit mask to set Bit mask to clear |
| Output | | |
| Return | R0 | AUX_CORE_BOOT_0 register new value |

Table 28-64. Write AUX_CORE_BOOT_1

| Function ID | Description | |
|-------------|--|------------------------------|
| R12 = 0x105 | This function sets the value of the AUX_CORE_BOOT_1 register value used to give the CPU1 boot address. The given address can be virtual or physical. CPU1 MMU must be enabled before jumping to this address. This function is kept for compatibility with OMAP4430 ES1.0. AUX_CORE_BOOT_1 has memory-mapped access. See Chapter 4, Dual Cortex-A9 Subsystem . | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 | Value to set in the register |
| Output | | |
| Return | | |

Table 28-65. Read WKG_CONTROL_0/1 Register

| Function ID | Description | |
|-------------|--|---------------------------------------|
| R12 = 0x106 | This function returns the value of the WKG_CONTROL_0/1 register (CPU0 or CPU1) depending on the input parameter value. The function is kept for compatibility with OMAP4430 ES1.0. See the memory mapping and description in Chapter 4, Dual Cortex-A9 Subsystem . | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 | CPU ID |
| Output | | |
| Return | R0 | Value of the WKG_CONTROL_0/1 register |

Table 28-66. Clear WKG_CONTROL_0/1 Register

| Function ID | Description | |
|-------------|--|-----------------------------|
| R12 = 0x107 | This function clears the given bit mask of the WKG_CONTROL_0/1 register depending on the CPU ID. | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 R1 | CPU ID Bit mask to clear |
| Output | | |
| Return | | |

28.5.3 Snoop Control Unit (SCU)

Table 28-67. Set Power Status Register

| Function ID | Description | |
|-------------|--|--|
| R12 = 0x108 | This function sets the power status register of the CPU and cleans the full CPU L1 data cache, if the cache will be switched off when CPU enters into low-power state. | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 R1 | CPU power state value to set (0x2: CSWRET, 0x3: OFF) L1 data cache state (0x00: RET, 0xFF: OFF) |
| Output | | |
| Return | | |

28.5.4 Lockdown Translation Lookaside Buffers (TLBs)

Table 28-68. Select the TLB Entry for Read

| Function ID | Description | |
|-------------|---|-------------|
| R12 = 0x10A | This function writes the Select Lockdown TLB Entry for Read register. | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 | TLB entry |
| Output | | |
| Return | | |

Table 28-69. Select the TLB Entry for Write

| Function ID | Description | |
|-------------|--|-------------|
| R12 = 0x10B | This function writes the Select Lockdown TLB Entry for Write register. | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 | TLB entry |
| Output | | |
| Return | | |

Table 28-70. Read the TLB VA Entry

| Function ID | Description | |
|-------------|---|-----------------------|
| R12 = 0x10C | This function reads the Lockdown TLB VA register (Selected TLB Entry for Read). | |
| Parameters | | |
| Type | Location | Description |
| Input | | |
| Output | | |
| Return | R0 | Value of the register |

Table 28-71. Write the TLB VA Entry

| Function ID | Description | |
|-------------|--|----------------|
| R12 = 0x10D | This function writes the Lockdown TLB VA register (Selected TLB Entry for Write). The NS bit is forced to 1. | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 | Value to write |
| Output | | |
| Return | | |

Table 28-72. Read the TLB PA Entry

| Function ID | Description | |
|-------------|---|-----------------------|
| R12 = 0x10E | This function reads the Lockdown TLB PA register (Selected TLB Entry for Read). | |
| Parameters | | |
| Type | Location | Description |
| Input | | |
| Output | | |
| Return | R0 | Value of the register |

Table 28-73. Write the TLB PA Entry

| Function ID | Description | |
|-------------|---|----------------|
| R12 = 0x10F | This function writes the Lockdown TLB PA register (Selected TLB Entry for Write). | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 | Value to write |
| Output | | |
| Return | | |

Table 28-74. Read the TLB Attributes Entry

| Function ID | Description | |
|-------------|---|-------------|
| R12 = 0x110 | This function reads the Lockdown TLB Attributes register (Selected TLB Entry for Read). | |
| Parameters | | |
| Type | Location | Description |
| Input | | |
| Output | | |

Table 28-74. Read the TLB Attributes Entry (continued)

| Function ID | Description | |
|-------------|-------------|-----------------------|
| Return | R0 | Value of the register |

Table 28-75. Write the TLB Attributes Entry

| Function ID | Description | |
|-------------|--|----------------|
| R12 = 0x111 | This function writes the Lockdown TLB Attributes register (Selected TLB Entry for Write). The NS bit is forced to 1. | |
| Parameters | | |
| Type | Location | Description |
| Input | R0 | Value to write |
| Output | | |
| Return | | |

PRELIMINARY

On-Chip Debug Support

This chapter describes the on-chip debug support.

NOTE: The L3 interconnect is instantiation of the NoC interconnect from Arteris, Inc. Arteris is a registered trademark of Arteris, Inc.

This document contains materials that are ©Arteris, Inc., and that constitute proprietary information of Arteris, Inc.

All materials and trademarks are used under license from Arteris, Inc. For additional information, see the Arteris Reference manuals, or contact Arteris, Inc.

NoC is an abbreviation for Network On Chip.

| Topic | Page |
|---|------|
| 29.1 Introduction | 5572 |
| 29.2 Debug Ports | 5573 |
| 29.3 Debugger Connection | 5578 |
| 29.4 Primary Debug Support | 5582 |
| 29.5 Power, Reset, and Clock Management Debug Support | 5587 |
| 29.6 Performance Monitoring | 5588 |
| 29.7 Processor Trace | 5593 |
| 29.8 System Instrumentation | 5594 |
| 29.9 Concurrent Debug Modes | 5604 |
| 29.10 Memory Mapping | 5606 |

29.1 Introduction

Debugging a system containing an embedded processor involves an environment that connects high-level debugging software, executed on a host computer, to a low-level debug interface supported by the target device. In between these levels is a debug and trace controller (DTC) that facilitates communication between the host debugger and the debug support logic on the target chip.

The DTC, a combination of hardware and software that connects the host debugger to the target system, uses one or more hardware interfaces and/or protocols to convert actions dictated by the debugger to JTAG® commands and scans that execute the core hardware.

The debug software and hardware components let the user control multiple central processing unit (CPU) cores embedded in the device in a global or local manner. This environment provides:

- Synchronized global starting and stopping of multiple processors
- Starting and stopping of an individual processor
- Processor-generated triggers that can be used to alter the execution flow of other processors

System topics include but are not limited to:

- System clocking and power-down issues
- Interconnection of multiple devices
- Trigger channels

For easy integration into applications, a set of libraries (APIs) for debug-IP programming and a software message library are being provided. CToolsLib is a collection of embedded target APIs/library to enable easy programmatic access to the chip tools (CTools), which are system-level debug facilities included in the debug subsystem capabilities of TI devices. More information about the APIs, download files, and other useful links for available libraries can be found on the CToolsLib Wiki site:

<http://processors.wiki.ti.com/index.php/CToolsLib>

The previous link(s) connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

29.2 Debug Ports

29.2.1 IEEE1149.1

The target debug interface has the following signals:

- Five standard IEEE1149.1 JTAG signals:
 - nTRST
 - TCK
 - TMS
 - TDI
 - TDO
- A return clock (RTCK) due to the clocking requirements of the ARM968™ processor
- Two EMU [1:0] or five EMU [4:0] TI extensions, depending on the pin count (14 pins or 20 pins) in the JTAG header of the device.

Table 29-1 describes the IEEE1149.1 signals.

Table 29-1. IEEE1149.1 Signals

| Pin Name | Internal Signal Name | Type (1) | Pull Type (3) | Function | Description |
|---------------|----------------------|----------|---------------|------------------------------------|---|
| jtag_nrst | nTRST | I | PD | Test reset | When asserted (active low), causes all test and debug logic in the device to be reset along with the IEEE1149.1 interface |
| jtag_tck | TCK | I | PD | Test clock | This is the test clock used to drive an IEEE1149.1 TAP state-machine and logic. This is a free-running clock or a gated clock, depending on the DTC attached to the device and the RTCK monitoring. |
| jtag_rtck | RTCK | O | N/A | Returned (synchronized) test clock | Depending on the DTC attached to the device, either the JTAG signals are clocked from RTCK or the RTCK is monitored by the DTC to the gate TCK. |
| jtag_tms_tmse | TMS | I | PU | Test mode select | Directs the next state of the IEEE1149.1 TAP state-machine |
| jtag_tdi | TDI | I | PU | Test data input | Scans data input to the device |
| jtag_tdo | TDO | O | PU | Test data output | Scans data output by the device |
| dpm_emu0 | EMU0 | I/O | PU | Emulation 0 | Channel 0 trigger, or boot mode, or trace port |
| dpm_emu1 | EMU1 | I/O | PU | Emulation 1 | Channel 1 trigger, or boot mode, or trace port |
| dpm_emu2(2) | EMU2(2) | O | PD | Emulation 2 | Trace port |
| dpm_emu3(2) | EMU3(2) | O | PD | Emulation 3 | Trace port |
| dpm_emu4(2) | EMU4(2) | O | PD | Emulation 4 | Trace port |

(1) I = Input; O = Output; I/O = Bidirectional

(2) 20-pin JTAG header only

(3) PU = internal pullup; PD = internal pulldown

For information about the JTAG ID code value, see [Chapter 1, Introduction](#).

29.2.2 IEEE1149.7

Besides the standard (legacy) JTAG mode of operation, the target debug interface can also be switched to a compressed JTAG mode of operation, commonly referred to as the IEEE1149.7 standard. An IEEE1149.7 adapter module runs a 2-pin communication protocol on top of an IEEE1149.1 JTAG TAP. The debug-IP logic serializes the IEEE1149.1 transactions, using a variety of compression formats, to reduce the number of pins needed to implement a JTAG debug port. The device implements only a subset of the IEEE1149.7 protocol (see [Table 29-3](#)).

NOTE: At power-on reset (POR), the default debug interface mode is IEEE1149.1. See the IEEE1149.7 specification for the scan sequence required to switch modes.

The IEEE1149.7 communication protocol can switch between serial and parallel formats. The parallel format consists of the IEEE1149.1 signals, TCK, TMS, TDI, TDO, nTRST, and RTCK return clock, if stalls are required. The serial format uses two signals, TCK and TMSC. The values of the TMS, TDI, TDO, and RTCK signals are multiplexed on the bidirectional pin, jtag_tms_tmisc, by the Debug-IP logic. Each TCK of the DTC is serialized into a packet, which is transmitted to the IEEE1149.7 adapter, where it is converted back to parallel. The TDO and RTCK information are returned during the packet transmission.

NOTE: Only MScan, Oscan0, and Oscan4 formats can be used if the device requires stalls.

Table 29-2 describes the IEEE1149.7 signals.

Table 29-2. IEEE1149.7 Signals

| Pin Name | Internal Signal Name | Type (1) | Pull Type (2) | Function | Description |
|----------------|----------------------|----------|---------------|---------------------------------|---|
| jtag_tck | TCK | I | PD | Test clock | This is the test clock used to drive an IEEE1149.1 TAP state-machine and logic. This is a free-running clock or a gated clock, depending on the DTC attached to the device and the TMSC RDY field monitoring. |
| jtag_tms_tmisc | TMSC | I/O | PU | Test mode control and data scan | Compressed JTAG packet. The TMSC signal is driven only when the TCK signal is low. The signal level must be maintained by a keeper while the TCK signal is high. |

(1) I = Input; O = Output; I/O = Bidirectional

(2) PU = internal pullup; PD = internal pulldown

Table 29-3 summarizes the IEEE1149.7 features subset supported by the device.

Table 29-3. IEEE1149.7 Features Subset

| | IEEE1149.7 Feature | Device Support | Comment |
|----------------------------|--------------------|----------------|-------------------------------------|
| Configuration | Class 4 TAP | ✓ | Supports 2-pin operation |
| | Class 5 TAP | – | No BDX or CDX channel |
| Optional Components | FRST | – | Functional reset (done via ICEPick) |
| | TRST | – | Test reset |
| | RDBK capability | ✓ | Read back of register data |
| | Aux Pin Functions | – | Reuse of TDI and TDO pins |
| | TCKWID | ✓ | Programmable TCK width |

Table 29-3. IEEE1149.7 Features Subset (continued)

| | IEEE1149.7 Feature | Device Support | Comment |
|----------------------|--------------------|----------------|-----------------------------------|
| Scan Formats | JScan0 | ✓ | Parallel mode |
| | JScan1 | ✓ | Parallel with firewall |
| | JScan2 | ✓ | Parallel with super-bypass select |
| | JScan3 | ✓ | Parallel with register select |
| | SScan0 | – | Segmented scan |
| | SScan1 | – | Segmented scan plus stalls |
| | SScan2 | – | Segmented scan |
| | SScan3 | – | Segmented scan plus stalls |
| | Oscan0 | ✓ | Support stalls |
| | Oscan1 | ✓ | Nonstall mode |
| | Oscan2 | ✓ | Bidirectional transfers |
| | Oscan3 | ✓ | Host to target only |
| | Oscan4 | ✓ | Support stalls |
| | Oscan5 | ✓ | Pipelined |
| | Oscan6 | ✓ | Bidirectional transfers |
| | Oscan7 | ✓ | Host to target only |
| | Mscan | ✓ | Multi devices mode plus stalls |
| Power Control | Power down logic | – | Handled by ICEMelter |

29.2.3 Trace Port

On-chip debug and trace events can be exported to external equipment through the trace port in the device. The following exportable debug events and trace sources are supported:

- Debug events
 - Triggers. For more information about triggers, see [Section 29.4.2, Cross-Triggering](#).
- Trace sources
 - Processor trace: Cortex-A9 MPU trace supported by program trace macrocell (PTM) and trace port interface unit (TPIU) modules. For more information about processor trace, see [Section 29.7, Processor Trace](#).
 - System trace: Trace coming from various system instrumentation modules and supported by system trace module (STM). For more information about system trace, see [Section 29.8, System Instrumentation](#).

Not all debug and trace features can be supported concurrently due to the limited number of pins allocated for debugging. Thus, multiplexing among debug and trace sources is implemented. The configuration and the debug/trace source selection are done through the DRM module embedded in the debug subsystem.

[Table 29-4](#) describes the trace port signals.

Table 29-4. Trace Port Signals

| Pin Name | Internal Signal Name | I/O ⁽¹⁾ | Pull Type ⁽²⁾ | Description |
|-----------|----------------------|--------------------|--------------------------|-------------------------------|
| dpm_emu19 | EMU19 | O | PD | Debug resource manager pin 19 |
| dpm_emu18 | EMU18 | O | PD | Debug resource manager pin 18 |
| dpm_emu17 | EMU17 | O | PD | Debug resource manager pin 17 |
| dpm_emu16 | EMU16 | O | PD | Debug resource manager pin 16 |
| dpm_emu15 | EMU15 | O | PD | Debug resource manager pin 15 |
| dpm_emu14 | EMU14 | O | PD | Debug resource manager pin 14 |

⁽¹⁾ I = Input; O = Output; I/O = Bidirectional

⁽²⁾ PU = internal pullup; PD = internal pulldown

Table 29-4. Trace Port Signals (continued)

| Pin Name | Internal Signal Name | I/O ⁽¹⁾ | Pull Type ⁽²⁾ | Description |
|-----------|----------------------|--------------------|--------------------------|-------------------------------|
| dpm_emu13 | EMU13 | O | PD | Debug resource manager pin 13 |
| dpm_emu12 | EMU12 | O | PD | Debug resource manager pin 12 |
| dpm_emu11 | EMU11 | O | PD | Debug resource manager pin 11 |
| dpm_emu10 | EMU10 | O | PD | Debug resource manager pin 10 |
| dpm_emu9 | EMU9 | O | PD | Debug resource manager pin 9 |
| dpm_emu8 | EMU8 | O | PD | Debug resource manager pin 8 |
| dpm_emu7 | EMU7 | O | PD | Debug resource manager pin 7 |
| dpm_emu6 | EMU6 | O | PD | Debug resource manager pin 6 |
| dpm_emu5 | EMU5 | O | PD | Debug resource manager pin 5 |
| dpm_emu4 | EMU4 | O | PD | Debug resource manager pin 4 |
| dpm_emu3 | EMU3 | O | PD | Debug resource manager pin 3 |
| dpm_emu2 | EMU2 | O | PD | Debug resource manager pin 2 |
| dpm_emu1 | EMU1 | I/O | PU | Debug resource manager pin 1 |
| dpm_emu0 | EMU0 | I/O | PU | Debug resource manager pin 0 |

NOTE: The dpm_emu[19:0] pins are shared with other functional (application) pins on the device boundary. To use the dpm_emu[19:0] pins, the user must program the device application pin manager (control module) appropriately. For more information, see [Chapter 19, Control Module](#).

For more information about DRM multiplexing and concurrent debug modes, see [Section 29.9, Concurrent Debug Modes](#).

29.2.4 End Product

For an end product phone, there are usually severe connectivity constraints and the standard debug ports may not be available at board level. This could make it difficult to trace and debug software.

To ease the process of tracing and debugging, a narrow interface for debug and test (NIDnT) concept defined by MIPI is used. NIDnT is based on IEEE1149.7 and STM interfaces and re-uses application interface pins. In the context of the device, the application interface that can serve as an NIDnT port is the MMC1 interface. To use the NIDnT port, the relevant MMC1 pins must be set to the appropriate MUX mode through the control module.

[Table 29-5](#) shows the NIDnT port reusing MMC interface pins along with the corresponding MUX modes.

Table 29-5. NIDnT Port Reusing MMC Interface Pins

| Module | Control Module Multiplexing | | |
|----------------------|-----------------------------|------------|-------------------|
| | MUX0 (MMC) | MUX2 (STM) | MUX4 (IEEE1149.7) |
| Extension card (MMC) | sdmmc1_clk | dpm_emu19 | — |
| | sdmmc1_cmd | uart1_rx | — |
| | sdmmc1_dat0 | dpm_emu18 | — |
| | sdmmc1_dat1 | dpm_emu17 | — |
| | sdmmc1_dat2 | dpm_emu16 | jtag_tms_tmisc |
| | sdmmc1_dat3 | dpm_emu15 | jtag_tck |

NOTE: The nTRST signal must be driven high for the MMC1 interface to be used for IEEE1149.7 protocol.

NOTE: uart1_rx is an optional return channel. Depending on the trace receiver, the return channel is implemented by IEEE1149.1/IEEE1149.7.

For more information about how to configure the proper MUX mode, see [Chapter 19](#), *Control Module*.

For more information about the NIDnT concept, see the *MIPI Alliance Test and Debug – NIDnT-Port* specification.

29.2.5 Trace Connector and Board Layout Considerations

Because the device supports processor trace and system trace export, a 60-pin header in place of the traditional TI 14-pin, or a TI 20-pin emulation header, may be required at board level. For more information about the trace connectors and board layout considerations for these high-speed signals, see *Emulation and Trace Headers* (TI literature number SPRU655).

29.3 Debugger Connection

29.3.1 ICEPick Module

The debugger connects to the device through its JTAG interface. The first level of debug interface seen by the debugger is the IEEE1149.7 adapter connected to the ICEPick module embedded in the debug subsystem.

NOTE: ICEPick version D (ICEPick-D) is used in the device.

System-on-chip (SoC) designs typically have multiple processors, each having a JTAG TAP embedded in the processor. The ICEPick module manages these TAPs and the power, reset, and clock controls for modules that have TAPs.

The ICEPick module is visible only from the debugger point of view, and thus cannot be programmed by application software. The debugger can configure ICEPick through its own TAP controller. The ICEPick TAP has an instruction length of 6 bits and is the primary TAP. It is always visible in the scan chain and is used to control and monitor the other secondary TAPs.

ICEPick provides the following debug capabilities:

- Debug connect logic for enabling or disabling most ICEPick instructions
- Dynamic TAP insertion:
 - Serially linking up to 16 TAP controllers
 - Individually selecting one or more of the TAPs for scan without disrupting the instruction register (IR) state of other TAPs
- Power, reset, and clock management:
 - Provides the power and clock states of each domain
 - Provides debugger control of the power domain of a processor. Can force the domain power and clocks on, and prohibit the domain from being clock-gated or powered down while a debugger is connected.
 - Applies system reset
 - Provides wait-in-reset (WIR) boot mode
 - Provides global and local WIR release
 - Provides global and local reset blocking

The ICEPick module implements a connect register, which must be configured with a predefined key to enable the full set of JTAG instructions. When the debug connect key is properly programmed, ICEPick signals and subsystems emulation logics should be turned on.

For more information about ICEPick dynamic TAP insertion, see [Section 29.3.3, Dynamic TAP Insertion](#).

For more information about ICEPick power, reset, and clock management features, see [Section 29.5, Power, Reset, and Clock Management Debug Support](#).

29.3.2 Boot Modes

The initial configuration of ICEPick is determined by the level of the dpm_emu0 and dpm_emu1 pins upon POR release. At POR, dpm_emu0 and dpm_emu1 are automatically configured as inputs. The dpm_emu0 and dpm_emu1 pins are free when POR is released.

[Table 29-6](#) summarizes the ICEPick boot modes.

Table 29-6. ICEPick Boot Modes Upon POR

| dpm_emu1 | dpm_emu0 | TAPs in the TDI → TDO Path | Other Effects/Comments |
|----------|----------|----------------------------|------------------------|
| 0 | 0 | None | Reserved (do not use) |
| 0 | 1 | None | Reserved (do not use) |
| 1 | 0 | ICEPick | TAP only + WIR mode |

Table 29-6. ICEPick Boot Modes Upon POR (continued)

| dpm_emu1 | dpm_emu0 | TAPs in the TDI → TDO Path | Other Effects/Comments |
|----------|----------|----------------------------|-------------------------|
| 1 | 1 | ICEPick | TAP only (default mode) |

29.3.2.1 Default Boot Mode

In ICEPick-only configuration, none of the secondary TAPs are selected. The ICEPick TAP is the only TAP between device-level TDI and TDO pins. This is the recommended boot mode.

29.3.2.2 Wait-In-Reset

The device can boot to invoke WIR mode. If the device is booted in this mode, all processors within the device that support a TAP through ICEPick are held in reset until released. Individual processors may be released from reset (local), or all processors held in the reset state may be released at the same time (global).

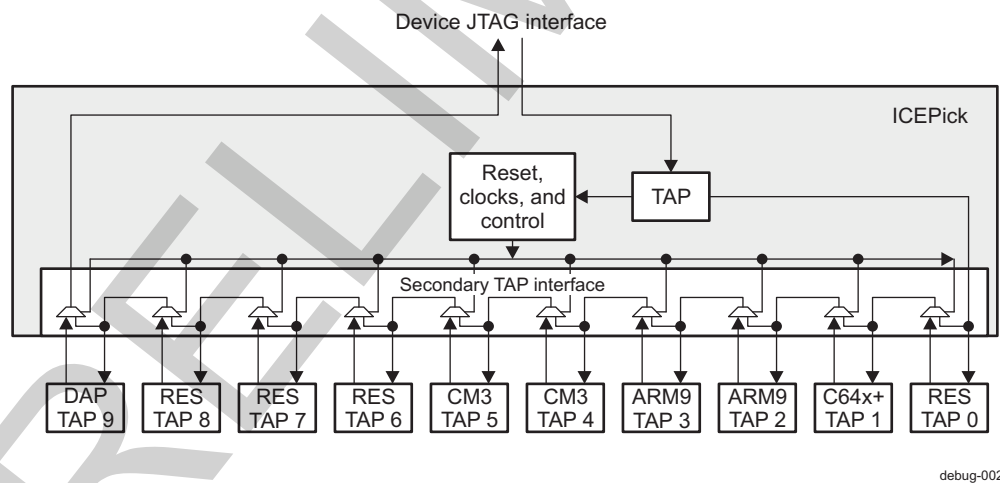
29.3.3 Dynamic TAP Insertion

29.3.3.1 ICEPick Secondary TAPs

To include more or fewer secondary TAPs in the scan chain, the debugger must use the ICEPick TAP router to program the TAPs. At its root, ICEPick is a scan-path linker that lets the DTC selectively choose which subsystem TAPs are accessible through the device-level debug interface. Each secondary TAP can be dynamically included in or excluded from the scan path. From external JTAG interface point of view, secondary TAPs that are not selected appear not to exist.

Figure 29-1 shows the TAPs in the ICEPick scan chain.

Figure 29-1. ICEPick Scan Chain



NOTE: RES = Reserved/not used
CM3 = Cortex™-M3
DAP = Debug access port

Table 29-7 shows the secondary debug TAPs connected to the ICEPick scan chain along with the modules that can be accessed. The TAP number indicates the position of the TAP in the scan chain.

Table 29-7. ICEPick Secondary Debug TAP Mapping

| Secondary JTAG Port | CoreSight | TAP Number | Modules Accessed Through That JTAG Port |
|------------------------------|-----------|------------|---|
| Reserved | No | 0 | – |
| DSP subsystem | No | 1 | C64x+™/ICEMaker |
| IVA-HD ICONT1 | No | 2 | ARM968/ICECrusher™-9 |
| IVA-HD ICONT2 (vDMA) | No | 3 | ARM968/ICECrusher-9 |
| Dual Cortex-M3 MPU subsystem | No | 4 | Cortex-M3 RTOS/ICECrusher-CS |
| | No | 5 | Cortex-M3 ISS CTL/ICECrusher-CS |
| Reserved | No | 6 | – |
| Reserved | No | 7 | – |
| Reserved | No | 8 | – |
| DAP APB-AP | Yes | 9 | Cortex-A9 x2 |
| | Yes | | CS-PTM x2 |
| | Yes | | CS-CTI x2 |
| | Yes | | DAP-PC |
| | Yes | | CS-ETB |
| | Yes | | CS-TF x2 ⁽¹⁾ |
| | Yes | | CS-TPIU |
| | No | | DRM |
| | Yes | | STM |
| DAP AHB-AP | No | 9 | IVA-HD SMSET |
| | No | | IVA-HD hardware accelerators |
| | No | | Statistics collectors (three instances) |
| | No | | OCP-WP |
| | No | | CMI1 |
| | No | | CMI2 |
| | No | | PMI |
| Reserved | No | 10–15 | Reserved |

(1) One instance in Cortex-A9 MPU subsystem; one instance in debug subsystem

For more information about ICEPick scan sequences (adding single or multiple TAP[s] to the scan chain), see:

http://processors.wiki.ti.com/images/3/3c/Router_Scan_Sequence.pdf

The preceding link(s) connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

Besides secondary debug TAPs, ICEPick supports also power, reset, and clock controls for non-JTAG debug cores. The debug cores are accessible through the debug access port (DAP).

[Table 29-8](#) summarizes the ICEPick debug core mapping.

Table 29-8. ICEPick Debug Core Mapping

| Debug Core No. | Module |
|----------------|-------------------------|
| 0 | Cortex-A9 MPU subsystem |
| 1 | IVA-HD ILF3 |
| 2 | IVA-HD IME3 |
| 3 | IVA-HD CALC3 |
| 4 | IVA-HD IPE3 |
| 5 | IVA-HD MC3 |
| 6 | IVA-HD ECD3 |

PRELIMINARY

29.4 Primary Debug Support

29.4.1 Processor Native Debug Support

29.4.1.1 Cortex-A9 MPU

The dual Cortex-A9 processor supports the following native debug features:

- Halt mode and monitor mode debugging
- Six breakpoints and four watch points
- Asynchronous aborts
- Performance monitoring
- Cross-triggering: Allows stopping one CPU upon debug event (for example, breakpoint) detection in the other CPU

For more information about Cortex-A9 native debug support features, see the *Cortex-A9* technical reference manual.

29.4.1.2 Cortex-M3 MPU

The Cortex-M3 processor supports the following native debug features:

- Program halt and stepping
- Hardware breakpoints, breakpoint instruction
- Data watch point on access to data add, add range, and data value
- Register value accesses
- Debug monitor exception
- Memories accesses

For more information about Cortex-M3 native debug support features, see the *Cortex-M3* technical reference manual.

29.4.1.3 DSP

This information is not available in the public domain.

29.4.1.4 IVA-HD ARM968

The ARM968E-S processor supports the following native debug features through its EmbeddedICE-RT logic:

- Two hardware watch points/breakpoints
- Halt mode and monitor mode debugging
- Debug control and status registers
- Debug communications channel

For more information about ARM968 native debug support features, see the *ARM968E-S* technical reference manual.

29.4.1.5 IVA-HD Hardware Accelerators

Hardware accelerators offer the following debug capabilities through their embedded SyncBox module:

- Manual halt: Halt occurs at the SYNCBOX task boundary, when requested by the debugger.
- Single-step execution at SYNCBOX task level (from 1 to n macroblocks depending on the user software)
- Cross-triggering: Hardware accelerator can halt, after the execution of current SYNCBOX task, based on trigger event detection.
- Global run

Table 29-9 summarizes the debug capabilities of the hardware accelerator SYNCBOX.

Table 29-9. Hardware Accelerator Debug Capability Options

| Feature | iME3 | iPE3 | MC3 | CALC3 | iLF3 | ECD3 |
|--------------------------------|------|------|-----|-------|------|------|
| Core reset | – | – | – | – | – | – |
| Execution request | – | – | – | – | – | – |
| Trigger output | – | – | – | – | – | – |
| Trigger input | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Number of trigger channels | 1 | 1 | 1 | 1 | 1 | 1 |
| Number of counters | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of watch points | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of hardware breakpoints | 0 | 0 | 0 | 0 | 0 | 0 |

29.4.2 Cross-Triggering

The device supports a cross-triggering feature, which provides a way to propagate debug (trigger) events from one processor subsystem/module to another. For example, *Sample Subsystem A* can be programmed to generate a debug event, which can then be exported as a global trigger across the device. Another *Sample Subsystem B* can be programmed to be sensitive to the trigger line input and to generate an action upon trigger detection.

Examples of debug events are: processor entering debug state, watch point match, PTM trigger, ETB full, ETB acquisition complete, etc.

Examples of debug actions are: debug request generation, restart (Cortex-A9 synchronous run), interrupt request generation, start/stop trace, etc.

Subsystems cross-triggering is consolidated at the device level by the XTRIGGER module, which is embedded in the debug subsystem.

NOTE: XTRIGGER is not programmatically visible from the JTAG interface or any device processor. Thus, cross-triggering is programmed at the subsystem level.

29.4.2.1 SoC Level Cross-Triggering

Table 29-10 summarizes the device cross-triggering capabilities.

Table 29-10. XTRIGGER

| Subsystem | Module | | Cortex-A9 | PTM/ ETB | Cortex-M3 | Cortex-M3 | Target Core | IVA3- C64x | IVA-HD ARM968 | IVA-HD ARM968 | HWA | PMI | CMI | OCP-WP | EMU0/ EMU1 |
|---------------------------------|-----------------|---|-----------|-------------|-----------|-----------|----------------|---------------|------------------|------------------|-----|-----|-----|--------|---------------|
| | | Trigger Input / Trigger Source | ✓ | ✓ | ✓ | ✓ | – | ✓ | ✓ | ✓ | – | ✓ | ✓ | ✓ | ✓ |
| Cortex-A9 MPU subsystem | Cortex-A9 | ✓ | | ✓ | ✓ | ✓ | – | ✓ | ✓ | ✓ | – | ✓ | ✓ | ✓ | |
| | PTM / ETB | ✓ | ✓ | | ✓ | ✓ | – | – | – | – | – | ✓ | ✓ | ✓ | – |
| Dual Cortex-M3 MPU subsystem | Cortex-M3 | ✓ | ✓ | – | | ✓ | – | ✓ | ✓ | ✓ | – | ✓ | ✓ | ✓ | – |
| | Cortex-M3 | ✓ | ✓ | – | ✓ | | – | ✓ | ✓ | ✓ | – | ✓ | ✓ | ✓ | – |
| ABE subsystem | Target Core | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| DSP subsystem | C64x | ✓ | ✓ | – | ✓ | ✓ | – | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| IVA-HD subsystem | ARM968 ICONT | ✓ | ✓ | – | ✓ | ✓ | – | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | ARM968 vDMA | ✓ | ✓ | – | ✓ | ✓ | – | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | HWA | – | – | – | – | – | – | – | – | – | | – | – | – | – |
| Power manager | PMI | – | – | – | – | – | – | – | – | – | – | | – | – | – |
| Clock manager | CMI | – | – | – | – | – | – | – | – | – | – | – | | – | – |
| Device | OCP-WP | ✓ | ✓ | ✓ | ✓ | ✓ | – | ✓ | ✓ | ✓ | – | ✓ | ✓ | | ✓ |
| | EMU0, EMU1 | ✓ | ✓ | ✓ | ✓ | ✓ | – | ✓ | ✓ | ✓ | – | ✓ | ✓ | ✓ | |

NOTE: The following modules support only trigger inputs:

- IVA-HD hardware accelerators
- IVA-HD SMSET
- PMI
- CMI

29.4.3 Suspend

The device supports a suspend feature, which provides a way to stop a "closely coupled" hardware process running on a peripheral-IP when the host processor enters a debug state. The suspend mechanism is important for debug to ensure that peripheral-IPs operate in a lock-step manner with a host controller processor.

An entry is provided for each peripheral-IP that must consider the suspend signals from a number of processors (MPU or DSP). For each peripheral-IP, sensitivity to the suspend signals is defined within two possibilities (and therefore is coded using 1 bit):

- Peripheral-IP is sensitive to the suspend line request.
- Peripheral-IP ignores the suspend line request.

For more information about how to program the sensitivity, see the corresponding peripheral-IP TRM chapter.

29.4.3.1 Debug Aware Peripherals and Host Processors

Table 29-11 lists the mapping of the device processors to the suspend control input lines.

Table 29-11. Debug Subsystem Suspend Input Lines

| Suspend Input Line | Host Processor |
|--------------------|-------------------|
| 0 | Reserved |
| 1 | DSP C64x |
| 2 | IVAHD ICONT1 |
| 3 | IVAHD ICONT2 |
| 4 | Cortex-M3 RTOS |
| 5 | Cortex-M3 ISS CTL |
| 6 | Cortex-A9 CPU0 |
| 7 | Cortex-A9 CPU1 |

Table 29-12 lists the mapping of the device peripheral-IPs to the suspend control output lines.

Table 29-12. Debug Subsystem Suspend Output Lines

| Suspend Output Line | Peripheral-IP Module |
|---------------------|----------------------|
| 0 | Keyboard controller |
| 1 | MCBSP1 (ABE) |
| 2 | MCBSP2 (ABE) |
| 3 | MCBSP3 (ABE) |
| 4 | WDTIMER3 (ABE) |
| 5 | GPTIMER5 (ABE) |
| 6 | GPTIMER6 (ABE) |
| 7 | GPTIMER7 (ABE) |
| 8 | GPTIMER8 (ABE) |
| 9–15 | Reserved |
| 16 | GPTIMER1 |
| 17 | GPTIMER2 |
| 18 | GPTIMER3 |
| 19 | GPTIMER4 |
| 20 | GPTIMER9 |
| 21 | GPTIMER10 |
| 22 | GPTIMER11 |
| 23 | Reserved |

Table 29-12. Debug Subsystem Suspend Output Lines (continued)

| Suspend Output Line | Peripheral-IP Module |
|---------------------|---------------------------|
| 24 | HSI |
| 25 | I2C1 |
| 26 | I2C2 |
| 27 | I2C3 |
| 28 | I2C4 |
| 29 | Reserved |
| 30 | sDMA |
| 31 | 32-kHz synchronized timer |
| 32–36 | Reserved |
| 37 | WDTIMER2 |

29.5 Power, Reset, and Clock Management Debug Support

The global PRCM module implements facilities to support debug across power and clock domain cycles. The debugger can control or get the status of each power and clock domain associated with an ICEPick secondary TAP.

ICEPick provides a set of directives allowing the debugger to:

- Get visibility on the associated power and clock domains state. This includes:
 - Current power setting indicating whether the power domain is on or off
 - Loss of power detected since software last checked the status
 - Current clock setting indicating whether the clock domain is on or off
 - Sleep desired (PM and CM indicate that the debug settings in ICEPick are changing the application state. If it were not for the ICEPick controls, the power or clock would be turned off.)
 - Subsystem reset state
 - Subsystem has entered a debug state that requires the attention of the host debug software.
- Override power/clock control settings to wake up a power or clock domain or to prevent a power or clock domain from going to sleep once it is in ACTIVE state
- Assert/block/extend reset; release from extended reset (WIR)

ICEPick handles debug power management at the device level. In addition, the device implements a second level of debug power management through the DAP-PC module integrated in the Cortex-A9 MPU subsystem, which provides the same capabilities as ICEPick for the two Cortex-A9 CPUs. Each Cortex-A9 CPU core is in its own independent power domain, which DAP-PC manages. The hierarchical debug power-management approach provided by DAP-PC at the subsystem level and by ICEPick at the device level ensures a theoretically independent debug capability for each Cortex-A9 CPU core.

NOTE: The debugger must properly sequence global ICEPick and local DAP-PC commands:

- To force clocks/power:
 1. The debugger must first force it for the Cortex-A9 MPU subsystem at the ICEPick level.
 2. The debugger must then force it for a specific Cortex-A9 CPU at the DAP-PC level.
 - To release clocks/power:
 1. The debugger must first release it for a specific Cortex-A9 CPU at the DAP-PC level.
 2. The debugger must then release the Cortex-A9 MPU subsystem controls at the ICEPick level.
-

29.6 Performance Monitoring

29.6.1 Cortex-A9 MPU Subsystem Performance Monitoring

29.6.1.1 Performance Monitoring Unit

The Cortex-A9 processor includes a PMU that enables events, such as cache misses and instructions executed, to be counted over a period of time. The PMU provides six counters to gather statistics about the operation of the processor and memory system. Each counter can count any of the events available in Cortex-A9. Upon counter overflow, PMU can generate an interrupt on its PMUIRQ output. This interrupt signal is mapped to the CTI TRIGIN[1] input and routed to a Cortex-A9 MPU interrupt controller input (MA_IRQ_54 for Cortex-A9 CPU0 PMU; MA_IRQ_55 for Cortex-A9 CPU1 PMU).

The Cortex-A9 PMU outputs 52 events (PMUEVENT[51:0]) to PTM (see [Table 29-13](#)).

Table 29-13. PMU Events

| PMU Event | Description |
|-----------|---|
| 0 | Software increment |
| 1 | Instruction fetch that causes a refill |
| 2 | Instruction fetch that causes a TLB refill |
| 3 | Data read or write operation that causes a refill |
| 4 | Data read or write operation that causes a cache access |
| 5 | Data read or write operation that causes a TLB refill |
| 6 | Data read architecturally executed |
| 7 | Data write architecturally executed |
| 8, 9 | Number of instructions renamed: b00 = No instructions renamed b01 = One instruction renamed b10 = Two instructions renamed |
| 10 | Exception taken |
| 11 | Exception return architecturally executed |
| 12 | Change to context ID retired |
| 13 | Software change of PC |
| 14 | Immediate branch architecturally executed |
| 15 | Number of predictable function returns |
| 16 | Unaligned access architecturally executed |
| 17 | Branch mispredicted or not predicted |
| 18 | Branches or other change in program flow |
| 19 | Java byte code executed |
| 20 | Software Java byte code executed |
| 21 | Jazelle® backward branches executed |
| 22 | Coherent line fill request that misses in other uniprocessors |
| 23 | Request for coherent line fill that hits in other uniprocessors |
| 24 | Instruction cache dependent stalls |
| 25 | Data cache dependent stalls |
| 26 | TLB miss dependent stalls |
| 27 | STREX passed |
| 28 | STREX failed |
| 29 | Data eviction |
| 30 | Issue does not dispatch any instruction. |
| 31 | Issue is empty. |
| 32 | Main execution unit pipe |
| 33 | Second execution unit pipe |

Table 29-13. PMU Events (continued)

| PMU Event | Description |
|-----------|--|
| 34 | Load/store pipe |
| 35, 36 | Number of floating-point instructions renamed: b00 = No floating-point instruction renamed b01 = One floating-point instruction renamed b10 = Two floating-point instructions renamed |
| 37, 38 | Number of NEON™ instructions renamed: b00 = No NEON instruction renamed b01 = One NEON instruction renamed b10 = Two NEON instructions renamed |
| 39 | PLD stall |
| 40 | Write stall |
| 41 | Instruction main TLB miss stall |
| 42 | Data main TLB miss stall |
| 43 | Instruction micro TLB miss stall |
| 44 | Data micro TLB miss stall |
| 45 | DMB stall |
| 46 | Integer core clock enabled |
| 47 | Data engine clock enabled |
| 48 | ISB |
| 49 | DSB |
| 50 | DMB |
| 51 | External interrupt |

For more information about Cortex-A9 PMU, see the *ARM Cortex-A9* technical reference manual.

29.6.1.2 Snoop Control Unit

The individual CPU event monitors can be configured to gather statistics about the operation of the snoop control unit (SCU).

29.6.1.3 L2 Cache (PL310)

The Cortex-A9 MPU subsystem includes 512KB of L2 cache and uses PL310 as the L2 cache controller. The PL310 includes logic to support cache event monitoring.

[Table 29-14](#) summarizes the PL310 L2 cache events.

Table 29-14. PL310 L2 Cache Events

| Event | Event Description |
|-------|--|
| 0 | Eviction of a line from the L2 cache |
| 1 | Data read hit in the L2 cache |
| 2 | Data read lookup to the L2 cache. Subsequently results in a hit or miss. |
| 3 | Data write hit in the L2 cache |
| 4 | Data write lookup to the L2 cache. Subsequently results in a hit or miss. |
| 5 | Data write lookup to the L2 cache with Write-Through attribute. Subsequently results in a hit or miss. |
| 6 | Instruction read hit in the L2 cache |
| 7 | Instruction read lookup to the L2 cache. Subsequently results in a hit or miss. |
| 8 | Prefetch line-fill sent to L3 |
| 9 | Allocation into the L2 cache caused by a write (with Write-Allocate attribute) miss |

The PL310 implements two 32-bit event counters. The PL310 can be configured to generate interrupts on error conditions or event counter overflow or increment. The PL310 interrupt is routed to MA_IRQ_0. When an interrupt occurs, software can look at the relevant interrupt status register to determine the source of the interrupt.

For more information about PL310, see the *ARM PrimeCell Level 2 Cache Controller (PL310) Technical Reference Manual*.

29.6.2 Cortex-M3 MPU Subsystem Performance Monitoring

29.6.2.1 Subsystem Counter Timer Module

The dual Cortex-M3 MPU subsystem includes a subsystem counter timer module (SCTM), which is embedded in shared cache and provides additional data to the user timing or profiling capability. The SCTM integrates eight profiling counters that collect:

- Forty-four shared cache events
- Four sleep/deep-sleep events from Cortex-M3 cores (one sleep and one deep-sleep event per core)

[Table 29-15](#) describes the repartition of the Cortex-M3 SCTM counters.

Table 29-15. Cortex-M3 SCTM Counters Repartition

| Counters | Features |
|----------|-------------------------------|
| 0, 1 | Timer and event |
| 2, 3 | 64-bit chained plus shadowing |
| 4, 5 | 64-bit chained plus shadowing |
| 6, 7 | Event |

29.6.2.2 Cache Events

[Table 29-16](#) summarizes the SCTM events for the Cortex-M3 MPU subsystem.

Table 29-16. SCTM Events for Cortex-M3 MPU Subsystem

| Input Index | Event Description |
|-------------|--|
| 1 | Cache locks |
| 2 | Cache line replacements |
| 3 | Cache evictions |
| 4 | Cache maintenance operations (slave 0) |
| 5 | Cache maintenance operations (slave 1) |
| 6 | Cache maintenance operations (slave 2) |
| 7 | Cache maintenance operations (slave 3) |
| 8 | Cache OCP access (slave 0) |
| 9 | Cache OCP access (slave 1) |
| 10 | Cache OCP access (slave 2) |
| 11 | Cache OCP access (slave 3) |
| 12 | Cacheable access (slave 0) |
| 13 | Cacheable access (slave 1) |
| 14 | Cacheable access (slave 2) |
| 15 | Cacheable access (slave 3) |
| 16 | Cache bank conflicts (slave 0) |
| 17 | Cache bank conflicts (slave 1) |
| 18 | Cache bank conflicts (slave 2) |
| 19 | Cache bank conflicts (slave 3) |
| 20 | Cache allocations |

Table 29-16. SCTM Events for Cortex-M3 MPU Subsystem (continued)

| Input Index | Event Description |
|-------------|---------------------------------------|
| 21 | Cache write buffer accesses (slave 0) |
| 22 | Cache write buffer accesses (slave 1) |
| 23 | Cache write buffer accesses (slave 2) |
| 24 | Cache write buffer accesses (slave 3) |
| 25 | Cache line fills (slave 0) |
| 26 | Cache line fills (slave 1) |
| 27 | Cache line fills (slave 2) |
| 28 | Cache line fills (slave 3) |
| 29 | Cache write fills (slave 0) |
| 30 | Cache write fills (slave 1) |
| 31 | Cache write fills (slave 2) |
| 32 | Cache write fills (slave 3) |
| 33 | Cache read fills (slave 0) |
| 34 | Cache read fills (slave 1) |
| 35 | Cache read fills (slave 2) |
| 36 | Cache read fills (slave 3) |
| 37 | Cache misses (slave 0) |
| 38 | Cache misses (slave 1) |
| 39 | Cache misses (slave 2) |
| 40 | Cache misses (slave 3) |
| 41 | Cache hits (slave 0) |
| 42 | Cache hits (slave 1) |
| 43 | Cache hits (slave 2) |
| 44 | Cache hits (slave 3) |
| 45 | Cortex-M3 ISS CTL deep sleep |
| 46 | Cortex-M3 ISS CTL sleep |
| 47 | Cortex-M3 RTOS deep sleep |
| 48 | Cortex-M3 RTOS sleep |

NOTE: Input index [0] is reserved for free-running subsystem clock (used for total cycle profiling).

29.6.3 DSP Subsystem Performance Monitoring

29.6.3.1 Subsystem Counter Timer Module

The DSP subsystem includes an SCTM, which is embedded in the DSP megamodule and provides additional data to the user timing or profiling capability. The SCTM integrates eight profiling counters that collect L1 and L2 events.

Table 29-15 describes the repartition of the DSP SCTM counters.

Table 29-17. DSP SCTM Counters Repartition

| Counters | Features |
|----------|---------------------|
| 0, 1 | Timer and event |
| 2–7 | Event (no chaining) |

29.6.3.2 L1 and L2 Events

Table 29-18 summarizes the SCTM events for the DSP subsystem.

Table 29-18. SCTM Events for DSP Subsystem

| Event | Event Description |
|-------|---|
| 1 | L1 Slave0 (program) tag hit |
| 2 | L1 Slave1 (data) tag hit |
| 3 | L1 Slave0 (program) tag miss |
| 4 | L1 Slave1 (data) tag miss |
| 5 | L1 Slave0 (program) fill buffer hit |
| 6 | L1 Slave1 (data) fill buffer hit |
| 7 | L1 Slave1 (data) write buffer access |
| 8 | L1 allocation FIFO |
| 9 | L1 Slave0 (program) bank conflict |
| 10 | L1 Slave1 (data) bank conflict |
| 11 | L1 Slave0 (program) cached request |
| 12 | L1 Slave1 (data) cached request |
| 13 | L1 Slave0 (program) waiting for fill buffer |
| 14 | L1 Slave1 (data) waiting for fill buffer |
| 15 | L1 Slave0 (program) waiting for maintenance |
| 16 | L1 Slave1 (data) waiting for maintenance |
| 17 | L1 eviction occurred |
| 18 | L1 replacement occurred |
| 19 | L1 allocation failed due to locked lines occurred |
| 20 | L2 tag hit |
| 21 | L2 tag miss |
| 22 | L2 fill buffer hit |
| 23 | L2 write buffer access |
| 24 | L2 allocation FIFO |
| 25 | L2 cached request |
| 26 | L2 waiting for fill buffer |
| 27 | L2 waiting for maintenance |
| 28 | L2 eviction occurred |
| 29 | L2 replacement occurred |
| 30 | L2 allocation failed due to locked lines occurred |
| 31 | Tied-off to 0 |

NOTE: Input index [0] is reserved for the free-running subsystem clock (used for total cycle profiling).

29.7 Processor Trace

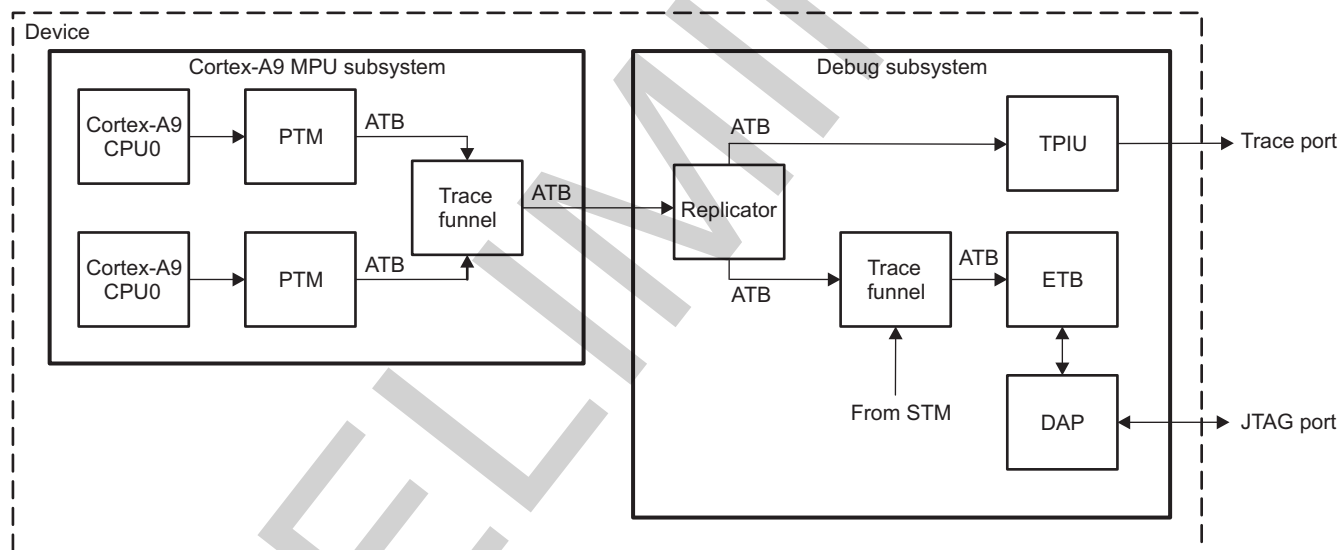
The device supports only Cortex-A9 processor trace. The main Cortex-A9 processor trace characteristics are:

- Program trace only (no data trace)
- Separate PTM for each Cortex-A9 CPU
- Trace can be:
 - Exported off-chip through TPIU in the debug subsystem (maximum number of trace data pins = 18)
 - Stored on-chip to ETB through CS-TF in the debug subsystem
- Trace can be optionally:
 - Cycle accurate useful for profiling sections of code
 - Interleaved dynamically between the two Cortex-A9 CPUs by a CS-TF embedded in the Cortex-A9 MPU subsystem

NOTE: Depending on use case, the device may not be able to interleave two cycle accurate traces without overflow (bandwidth restriction).

Figure 29-2 shows an overview of the processor trace flow.

Figure 29-2. Processor Trace Flow



debug-004

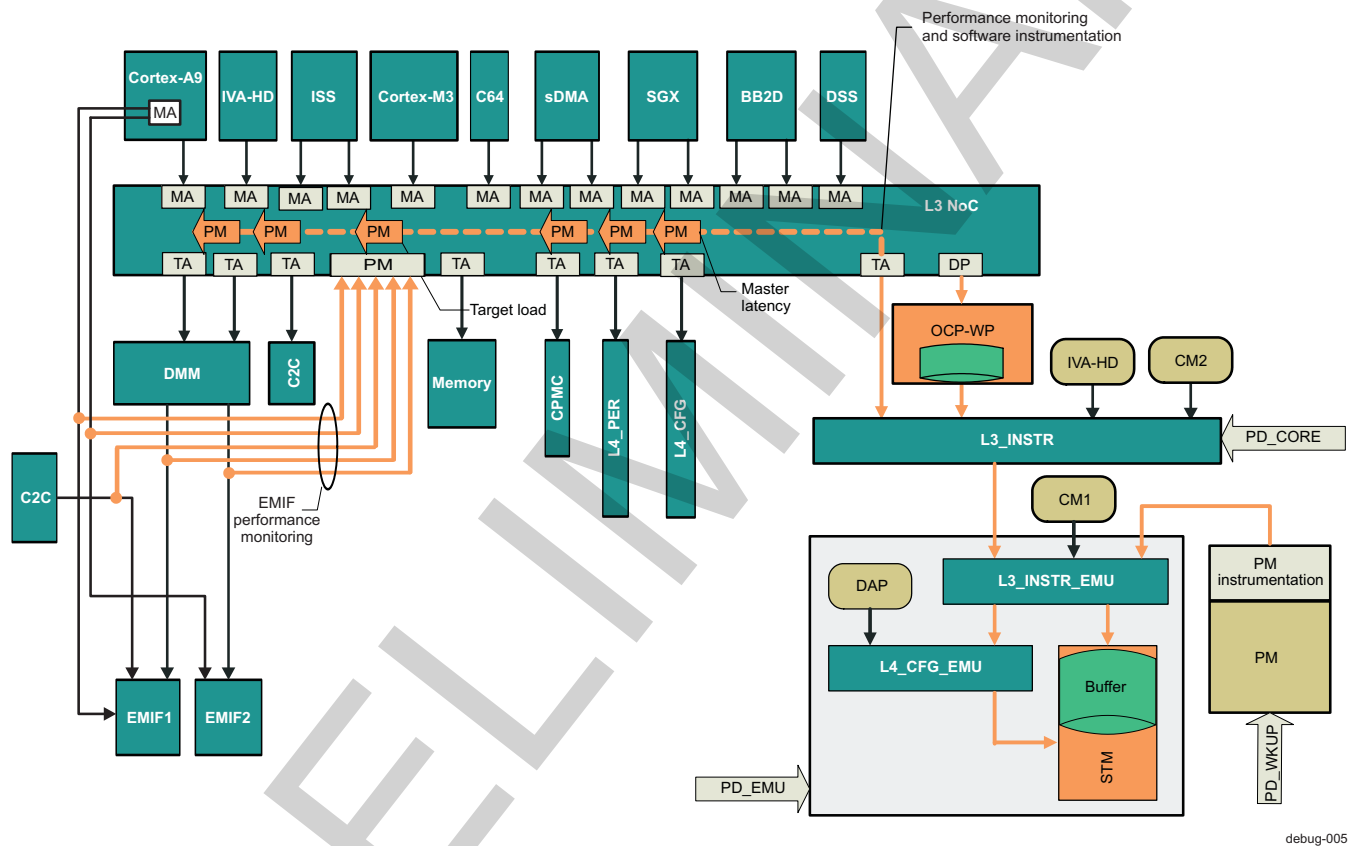
29.8 System Instrumentation

The device supports the following system instrumentation features:

- Real-time software trace (see [Section 29.8.2, Software Instrumentation](#))
- OCP target traffic monitoring (see [Section 29.8.3, OCP Watch-Point](#))
- OCP target load and master latency monitoring (see [Section 29.8.5, NoC Statistics Collector](#))
- HWA load monitoring (see [Section 29.8.4, IVA-HD Pipeline](#))
- PM events trace (see [Section 29.8.6, PM Instrumentation \[PMI\]](#))
- CM events trace (see [Section 29.8.7, CM Instrumentation \[CMI\]](#))

Figure 29-3 is an overview of the device system instrumentation framework.

Figure 29-3. System Instrumentation Framework



debug-005

29.8.1 MIPI STM

MIPI-STM is a trace module that aids in software debugging. The main features of this module are:

- Implements MIPI STP protocol (rev 1.0) with the following characteristics:
 - Highly optimized for software-generated traces
 - Automatic timestamping of messages
 - Support for 8-, 16-, and 32-bit data types
- Collects the following information:
 - Software messages
 - Hardware instrumentation trace from hardware agents:
 - OCP-WP
 - PMI

- CMI
- SMSET
- L3 NoC statistics collectors
- Exports trace data to:
 - External trace receiver
 - On-chip ETB buffer
- Available in 1-, 2-, or 4-pin mode with single- or dual-edge clock, depending on the trace bandwidth requirements and characteristics of the trace receiver
- Dedicated 128 × 32-bit FIFO buffer

A maximum of 255 different bus masters can be connected to the STM trace port through a bus arbiter. STP recognizes two distinct modes of tracing (software and hardware types), which use slightly different message combinations to output different types of data. The bus masters can be configured for either type to optimize the system for the different types of trace data.

29.8.2 Software Instrumentation

The device provides support for real-time software trace through user-defined message writes to specific memory mapped register (MMR) locations. Software masters can transmit trace data from the operating system (OS) processes or tasks on 256 different channels, with each channel being defined by the software protocol implemented. The different channels can be used to group different types of data logically so that it is easy to filter out the data irrelevant to the on-going debugging task. The message structures in STP are optimized to provide an efficient transport for software data through the STM module.

The software masters are:

- Cortex-A9 MPU subsystem
- DAP (for testing purpose)
- DSP subsystem
- Dual Cortex-M3 MPU subsystem
- sDMA controller write port (SDMA_WR)
- IVA-HD subsystem

Each software master has a master-ID assigned to it.

Software messages can be interleaved with other hardware messages.

Software messages are intrusive and use both processor cycles and memory.

29.8.3 OCP Watch-Point

The L3 interconnect provides five functional probes embedded and attached to the following L3 targets:

- GPMC
- L4-PER
- L4-CFG
- DMM1 (DMM target port 1)
- DMM2 (DMM target port 2)

The probes output are muxed together and then sent to the L3 interconnect debug port. A component called OCP-WP is used to collect data from functional probes and then transmit captured data to the STM module. The OCP-WP drives a Probe-ID signal to the L3 interconnect for probe selection. The probe selection is exclusive, meaning that interleaving is not possible.

The OCP-WP provides the following main features:

- Monitoring the OCP traffic originated by all initiators that can access the selected target where the probe is attached
- Filtering OCP monitored bus traffic by:

- Address range
- Initiator-ID (see [Table 29-20](#))
- Transaction type
- Transaction qualifier
- Generating a trigger upon watch-point match
- Starting and stopping OCP traffic monitoring upon:
 - WP address match
 - External trigger
- OCP-WP messages can be interleaved with software messages
- Programming from:
 - Debugger
 - Application

NOTE: The OCP-WP is restricted to monitor request flow.

[Table 29-19](#) summarizes the OCP targets that can be monitored by the OCP-WP and their respective probe-ID.

Table 29-19. L3 Interconnect Functional Probe Mapping

| Probe-ID | L3 OCP Target |
|----------|--------------------------|
| 000 | Reserved |
| 001 | GPMC |
| 010 | L4-PER |
| 011 | L4-CFG |
| 100 | DMM1 (DMM target port 1) |
| 101 | DMM2 (DMM target port 2) |
| 110 | Reserved |
| 111 | Reserved |

[Table 29-20](#) summarizes the ConnID (Initiator-ID) mapping from a debug point of view.

Table 29-20. ConnID Mapping (Debug View)

| ConnID | Initiator |
|--------|--|
| 0x0 | Cortex-A9 MPU subsystem |
| 0x4 | CS-DAP |
| 0x8 | DSP |
| 0xC | IVA-HD |
| 0xD | IVA-HD ICONT1 (software instrumentation) |
| 0xE | IVA-HD ICONT2 (software instrumentation) |
| 0x10 | ISS |
| 0x11 | Dual Cortex-M3 MPU subsystem |
| 0x12 | Face detect |
| 0x14 | sDMA_RD |
| 0x15 | sDMA_WR |
| 0x18 | SGX_M1 |
| 0x19 | SGX_M2 |
| 0x1A | BB2D_M1 |
| 0x1B | BB2D_M2 |
| 0x1C | Display subsystem |

Table 29-20. ConnID Mapping (Debug View) (continued)

| ConnID | Initiator |
|--------------|-----------|
| 0x20 | C2C |
| 0x24 | HSI |
| 0x28 | MMC1 |
| 0x29 | MMC2 |
| 0x30 | HSUSBHOST |
| 0x31 | HSUSBOTG |
| 0x32 | FSUSB |
| Other values | Reserved |

NOTE: For information about ConnID values from a protection/error logging point of view, see [Section 14.2.3.2.3](#), Master NIU Identification, in [Chapter 14](#), Interconnect,

29.8.4 IVA-HD Pipeline

The device takes advantage of the system trace infrastructure to provide visibility to the user regarding IVA-HD micro-task sequencing. This is supported through a SMSET module instantiated in the IVA-HD subsystem. The micro-task boundaries are handled as generic events and encapsulated in STP messages with an event-ID and local timestamp and exported through the MIPI-STM module.

The IVA-HD instrumentation scheme allows the user to understand micro-task dependencies, hardware accelerators load balancing, and potential bottlenecks. DMA transfer boundaries are reported as IVA-HD events. Software messages from ARM968 execution can be interleaved with IVA-HD events.

29.8.5 NoC Statistics Collector

The L3 interconnect supports a built-in performance monitoring feature by implementing a statistics collector (SC) component, which computes traffic statistics within a user-defined window and periodically reports to the user through the MIPI-STM interface. Three SC instances are instantiated in the device:

- One statistics collector dedicated to SDRAM load monitoring – SC_SDRAM (see [Section 29.8.5.1](#), *L3 Target Load Monitoring*, for more information)
- Two statistics collectors dedicated to master latency monitoring – SC_LAT0 and SC_LAT1 (see [Section 29.8.5.2](#), *L3 Master Latency Monitoring*, for more information)

Statistics collectors (SDRAM and LAT0/1) can report:

- Average burst length in bytes/packet per sampling window
- Average throughput in bytes/cycle
- % Link occupancy on the request link (for store transactions) during a sampling window
- % Link occupancy on the response link (for load transactions) during a sampling window
- % Arbitration conflict cycles on the request link
- % Initiator busy cycles on the response link
- Histogram of payload length in bytes (for example, 0–16, 16–32, 32–128) each sampling window.
- Histogram of quality of service (QoS) metric for IVA-HD initiator (for example, low priority, high priority) each sampling window.

The performance metrics are interleaved with software instrumentation data at the L3 interconnect level.

The performance monitoring probes implement three main functions:

- Events detection
- Transactions filtering
- Aggregation

The probes can be configured to detect the events summarized in [Table 29-21](#).

Table 29-21. Performance Monitoring Events Detection

| Event | Definition |
|----------|--|
| NONE | No event selected |
| ANY | Any clock cycles |
| TRANSFER | Word has been accepted by the receiver. |
| WAIT | Transfer has been initiated but the transmitter currently has no data to send. |
| BUSY | Receiver applies flow control |
| PKT | Transfer of a new packet header |
| DATA | Transfer of a payload word |
| IDLES | No communication over the link |
| LATENCY | Debug bit detection |

The probes can be configured to filter the traffic based on the criteria summarized in [Table 29-22](#).

Table 29-22. Performance Filtering Options

| Probe Filtering Options | Comment |
|------------------------------|----------------|
| Master address | Mask and match |
| Slave address ⁽¹⁾ | |
| UserInfo | |
| Read | |
| Write | |
| Error | |
| OCP address ⁽²⁾ | |

⁽¹⁾ SC_LAT0/1 only

⁽²⁾ SC_SDRAM only

The probes implement a user-defined set of counters that aggregate the events sampled by the detector and filtered according to the user setup.

NOTE: Statistics collectors counter values are not accessible by application software.

[Table 29-23](#) summarizes the performance probe aggregation modes.

Table 29-23. Aggregation Modes

| Aggregation Mode | Description |
|------------------|---|
| FILTER_HIT | The counter increments by 1 when the filter hits. |
| MIN_MAX_HIT | The counter increments by 1 when the filter hits and the selected event information is within range. - Payload length (bytes) - Pressure value - Request/response latency (clock cycles) |
| EVT_INFO | The selected event information is added to the counter value when the filter hits. Payload length (bytes) Pressure value Request/response latency (clock cycles) |
| AND_FILTER | The counter increments by 1 when all unit filters hit. |
| OR_FILTER | The counter increments by 1 when at least one unit filter hits. |
| SUM_REQ_EVT | The counter sums the events from any request port. |
| SUM_RSP_EVT | The counter sums the events from any response port. |
| SUM_ALL_EVT | The counter sums the events from any port. |
| EXT_EVT | The counter increments by 1 when selected external event input signal is sampled high. |

29.8.5.1 L3 Target Load Monitoring

The L3 interconnect implements five performance monitoring probes on LPDDR2 memory channels. The traffic statistics are computed within a user-defined window and periodically reported to the user through the MIPI-STM interface.

SC_SDRAM supports the following main features:

- Five probe inputs
 - Probe 0 – EMIF1 (DMM-EMIF1 128-bit port)
 - Probe 1 – EMIF2 (DMM-EMIF2 128-bit port)
 - Probe 2 – Memory Adapter 1 (MA-EMIF1 128-bit port)
 - Probe 3 – Memory Adapter 2 (MA-EMIF2 128-bit port)
 - Probe 4 – EMIF modem (C2C-EMIF1 64-bit port)
- Eight 32-bit counters shared concurrently
 - Counter 0 with two filters
 - Counter 1 with one filter
 - Counter 2 with two filters
 - Counter 3 with one filter
 - Counter 4 with one filter
 - Counter 5 with one filter
 - Counter 6 with one filter
 - Counter 7 with one filter
- Simple (with one element) or complex (with several elements) filters available
- Filtering according to:
 - Initiator of traffic
 - Access priorities
 - OCP address
- No latency counter. Only bandwidth measurement on this collector
- 32-bit collecting window counter
- Dump Identifier is 0x0 (tie-off value)
- Dumps frames at L3 interconnect slave address 0x19 (debug subsystem)

[Table 29-24](#) summarizes the SC_SDRAM configuration.

Table 29-24. SC_SDRAM Configuration

| Counters | Min Max | Filter Elements | L3 Target | | | | |
|-----------|------------|-----------------|-----------|-------|-----|-----|------------|
| Counter 0 | Yes | 2 | EMIF1 | EMIF2 | MA1 | MA2 | EMIF modem |
| Counter 1 | Yes | 1 | EMIF1 | EMIF2 | MA1 | MA2 | EMIF modem |
| Counter 2 | Yes | 2 | EMIF1 | EMIF2 | MA1 | MA2 | EMIF modem |
| Counter 3 | Yes | 1 | EMIF1 | EMIF2 | MA1 | MA2 | EMIF modem |
| Counter 4 | Yes | 1 | EMIF1 | EMIF2 | MA1 | MA2 | EMIF modem |
| Counter 5 | Yes | 1 | EMIF1 | EMIF2 | MA1 | MA2 | EMIF modem |
| Counter 6 | Yes | 1 | No | No | MA1 | MA2 | EMIF modem |
| Counter 7 | Yes | 1 | No | No | MA1 | MA2 | EMIF modem |

29.8.5.2 L3 Master Latency Monitoring

The device L3 interconnect implements twelve performance monitoring probes on the main L3 initiators:

- Cortex-A9 MPU subsystem

- DSP
- sDMA controller read port (SDMA_RD)
- sDMA controller write port (SDMA_WR)
- IVA-HD
- DSS
- ISS
- SGX master port 1 (SGX_M1)
- SGX master port 2 (SGX_M2)
- BB2D master port 1 (BB2D_M1)
- BB2D master port 2 (BB2D_M2)
- Dual Cortex-M3 MPU subsystem

The master latency statistics are computed within a user-defined window and periodically reported to the user through the MIPI-STM interface.

The probes can be configured to filter latencies in four classes and report to the user a latency distribution along execution.

Because the performance metrics and the software events are exported through a unified export channel, it is possible to correlate latency trends with on-going execution and system context.

Because computing latency requires maintaining the state between request and response ports, the probe cannot compute latency statistics on 100 percent of the initiator traffic. Hence, latency histograms must be extracted on large execution windows to be accurate.

29.8.5.2.1 SC_LAT0 Configuration

SC_LAT0 supports the following main features:

- Eight probe inputs:
 - Probe 0: Cortex-A9 MPU subsystem
 - Probe 1: DSP subsystem
 - Probe 2: SDMA_RD
 - Probe 3: SDMA_WR
 - Probe 4: DSS
 - Probe 5: ISS
 - Probe 6: SGX_M1
 - Probe 7: BB2D_M1
- Four 32-bit counters shared concurrently:
 - Counter 0 with one filter
 - Counter 1 with one filter
 - Counter 2 with one filter
 - Counter 3 with one filter
- Filtering according to:
 - L3 target
 - Access priorities
- 10-bit counter for latency measurement
- 32-bit collecting window counter
- Identifier is 0x1 (tie-off value)
- Dumps frames at slave address 0x19 (DEBUGSS)

Table 29-25 summarizes the SC_LAT0 configuration.

Table 29-25. SC_LAT0 Configuration

| Counters | Min Max | Filter Elements | L3 Master | | | | | | | |
|-----------|------------|--------------------|-------------------------------|-----|---------|---------|-----|-----|--------|---------|
| | | | Cortex-A9 MPU subsystem | DSP | SDMA_RD | SDMA_WR | DSS | ISS | SGX_M1 | BB2D_M1 |
| Counter 0 | Yes | 1 | Cortex-A9 MPU subsystem | DSP | SDMA_RD | SDMA_WR | DSS | ISS | SGX_M1 | BB2D_M1 |
| Counter 1 | Yes | 1 | Cortex-A9 MPU subsystem | DSP | SDMA_RD | SDMA_WR | DSS | ISS | SGX_M1 | BB2D_M1 |
| Counter 2 | Yes | 1 | Cortex-A9 MPU subsystem | DSP | SDMA_RD | SDMA_WR | DSS | ISS | SGX_M1 | BB2D_M1 |
| Counter 3 | Yes | 1 | Cortex-A9 MPU subsystem | DSP | SDMA_RD | SDMA_WR | DSS | ISS | SGX_M1 | BB2D_M1 |

29.8.5.2.2 SC_LAT1 Configuration

SC_LAT1 supports the following main features:

- Six probe inputs:
 - Probe 0: IVA-HD
 - Probe 1: Cortex-A9 MPU subsystem
 - Probe 2: SDMA_WR
 - Probe 3: SGX_M2
 - Probe 4: Dual Cortex-M3 MPU subsystem
 - Probe 5: BB2D_M2
- Four 32-bit counters shared concurrently:
 - Counter 0 with one filter
 - Counter 1 with one filter
 - Counter 2 with one filter
 - Counter 3 with one filter
- Filtering according to:
 - L3 target
 - Access priorities
- 10-bit counter for latency measurement
- 32-bit collecting window counter
- Identifier is 0x2 (tie-off value)
- Dumps frames at slave address 0x19 (DEBUGSS)

Table 29-26 summarizes the SC_LAT1 configuration.

Table 29-26. SC_LAT1 Configuration

| Counters | Min Max | Filter Elements | L3 Master | | | | | | | |
|-----------|------------|--------------------|-----------|----------------------------|---------|--------|---------------------------------|---------|--|--|
| | | | IVA-HD | Cortex-A9 MPU subsystem | SDMA_WR | SGX_M2 | Dual Cortex-M3 MPU subsystem | BB2D_M2 | | |
| Counter 0 | Yes | 1 | IVA-HD | Cortex-A9 MPU subsystem | SDMA_WR | SGX_M2 | Dual Cortex-M3 MPU subsystem | BB2D_M2 | | |
| Counter 1 | Yes | 1 | IVA-HD | Cortex-A9 MPU subsystem | SDMA_WR | SGX_M2 | Dual Cortex-M3 MPU subsystem | BB2D_M2 | | |
| Counter 2 | Yes | 1 | IVA-HD | Cortex-A9 MPU subsystem | SDMA_WR | SGX_M2 | Dual Cortex-M3 MPU subsystem | BB2D_M2 | | |
| Counter 3 | Yes | 1 | IVA-HD | Cortex-A9 MPU subsystem | SDMA_WR | SGX_M2 | Dual Cortex-M3 MPU subsystem | BB2D_M2 | | |

29.8.5.3 Statistics Collector Alarm Mode

Statistic collectors can be used to provide the application software with information about the NoC or SDRAM reaching corner cases (for example, too much traffic for a given OPP) while in application mode where for an end product use case the debug subsystem (which is normally exporting the statistic frames) is off. An interrupt-based scheme using a dedicated signal (L3_STAT_ALARM_IRQ) is implemented to avoid CPU polling periodically statistic registers. This interrupt alert is mapped to the MPU_IRQ_16 interrupt line and is fired when a given metric is out of specified range (below the programmed MIN threshold or above the programmed MAX threshold).

NOTE: NTPP statistic collectors (SC_LAT0/1) support latency measurement. However, comparison cannot be done on the latency counter. In case of latency measurement the comparison has to be done on number of latencies in user defined range, not on the latency value itself.

29.8.5.4 Statistics Collector Suspend Mode

The statistics collector module implements a suspend input that is used to avoid statistics collector counters to be updated while the processor has entered the debug state. This avoids triggering false alerts upon execution resume. When the statistics collector is asserted to 1, it freezes the monitoring process. When it goes back to 0, the monitoring resumes.

NOTE: If a frame is being dumped, it will not be stopped by suspend.

Each statistic collector has an ignore suspend register, which can be used to disable the suspend feature.

29.8.6 PM Instrumentation (PMI)

The device takes advantage of the system trace infrastructure to provide visibility to the user about the major power management events. This is supported through a PMI module (PM profiler) instantiated in the PRM module. The PRM state changes are handled as generic events and encapsulated in STP hardware messages and exported through the MIPI-STM module. The nature of the PM events does not require accurate timestamping and thus, timestamping is handled at STM or trace receiver level.

The PM events are organized by class. Any PM state change from a specific class refreshes the entire instrumentation frame associated with that class. The STP message structure includes a PM event-ID indicating the class of the PM events.

The PM event classes supported are:

- Logic voltage domain OPP change
- Memory voltage domain OPP change
- Logic power domain state change
- Memory power domain state change

The PMI has a unique hardware master-ID assigned to it.

The PMI supports the possibility to report on activity in different event classes in the same sampling window. The user has the flexibility to size the capture sampling window.

Software events from the PM routines instrumentation can be interleaved with the PM hardware events. The user can take advantage of that feature to understand latencies for a specific power-management scenario or strategy.

29.8.7 CM Instrumentation (CMI)

The device instantiates two CMI modules (CM profilers), one in CM1 (CMI1), and one in CM2 (CMI2). The CMI1 and CMI2 modules are instantiations of the same debug-IP and can operate concurrently. Each of them has a separate unique hardware master-ID assigned to it.

The CM events profiling is similar to the PM instrumentation. Two exclusive instrumentation modes are supported:

- Clock activity:
 - Exposes to the user a snapshot of the state of all the clock domains derived from the same DPLL when CM detects a state change in the clock domain
 - Exposes to the user a snapshot of the DPLL settings when the CM signals a DPLL programming
- Module activity:
 - Exposes to the user periodically the active cycles count of the target modules
 - Exposes to the user periodically the active cycles count of the initiator modules

It provides visibility to the user about the state of the major clock domains along the application code execution. The STP message reports the effective state of the clock domain and therefore can highlight scenarios where a particular dependency is preventing the clock domain from being switched off.

The CM event classes supported are:

- Events capture mode – four classes:
 - Clock domain state
 - DPLL settings update
 - Clock frequency divider ratio
 - Clock source selection update
- Module activity collection mode – two classes:
 - Target module activity
 - Initiator module activity

When in events capture mode, the CMI supports the possibility of reporting on activity in different event classes in the same sampling window. The user has the flexibility to size the capture sampling window.

29.9 Concurrent Debug Modes

The debugger or application software can program the DRM to route a specific debug function to each device debug port pin.

Because of the limited number of pins allocated to debug, debug and trace source signals are multiplexed.

Table 29-27 summarizes the trace port configuration.

Table 29-27. Trace Port Configuration

| Pin Name | Internal Signal Name | I/O | Trigger | JTAG 20-Pin Header | TPIU PTM (ARM Trace) | | STM (System Trace) | | |
|-----------|----------------------|-----|-----------|--------------------|----------------------|---------------|--------------------|-------------|-------------|
| | | | | | 16-Bit Mode | 18-Bit Mode | Option 1 | Option 2 | Option 3 |
| dpm_emu19 | EMU19 | O | | EMU4 | TRACEDATA[15] | TRACEDATA[17] | | STM_CLK | |
| dpm_emu18 | EMU18 | O | | EMU3 | TRACEDATA[14] | TRACEDATA[16] | | STM_DATA[0] | |
| dpm_emu17 | EMU17 | O | | EMU2 | TRACEDATA[13] | TRACEDATA[15] | | STM_DATA[1] | |
| dpm_emu16 | EMU16 | O | | | TRACEDATA[12] | TRACEDATA[14] | | STM_DATA[2] | |
| dpm_emu15 | EMU15 | O | | | TRACEDATA[11] | TRACEDATA[13] | | STM_DATA[3] | |
| dpm_emu14 | EMU14 | O | | | TRACEDATA[10] | TRACEDATA[12] | | UART1_RX | |
| dpm_emu13 | EMU13 | O | | | TRACEDATA[9] | TRACEDATA[11] | | | |
| dpm_emu12 | EMU12 | O | | | TRACEDATA[8] | TRACEDATA[10] | | | |
| dpm_emu11 | EMU11 | O | | | TRACEDATA[7] | TRACEDATA[9] | | | |
| dpm_emu10 | EMU10 | O | | | TRACEDATA[6] | TRACEDATA[8] | | | |
| dpm_emu9 | EMU9 | O | | | TRACEDATA[5] | TRACEDATA[7] | | | |
| dpm_emu8 | EMU8 | O | | | TRACEDATA[4] | TRACEDATA[6] | | | |
| dpm_emu7 | EMU7 | O | | | TRACEDATA[3] | TRACEDATA[5] | | | |
| dpm_emu6 | EMU6 | O | | | TRACEDATA[2] | TRACEDATA[4] | | | |
| dpm_emu5 | EMU5 | O | | | TRACEDATA[1] | TRACEDATA[3] | | | |
| dpm_emu4 | EMU4 | O | | | TRACEDATA[0] | TRACEDATA[2] | STM_DATA[3] | | |
| dpm_emu3 | EMU3 | O | | | TRACECTL | TRACECTL | STM_DATA[2] | | |
| dpm_emu2 | EMU2 | O | | | TRACECLK | TRACECLK | STM_CLK | | |
| dpm_emu1 | EMU1 | I/O | Trigger 1 | EMU1 | | TRACEDATA[1] | STM_DATA[1] | | STM_CLK |
| dpm_emu0 | EMU0 | I/O | Trigger 0 | EMU0 | | TRACEDATA[0] | STM_DATA[0] | | STM_DATA[0] |

NOTE: The configuration of the trace port must comply with Table 29-27; otherwise, it will be ignored by DRM hardware. For example, if Trigger0 is programmed on EMU10 and Trigger1 is programmed on EMU11, this configuration will be ignored.

Table 29-28 summarizes the concurrent debug and trace in the device.

Table 29-28. Concurrent Debug and Trace

| Debug Use Case | Concurrent Debug Flows | Debug Pins | Trace Pins | | |
|----------------|------------------------|------------|------------|---------|-------|
| | | Triggers | Data | Control | Clock |
| 0 | PTM | | 18 | 1 | 1 |
| | STM | | | | |
| | Triggers | | | | |
| 1 | PTM | | 16 | 1 | 1 |
| | STM | | | | |
| | Triggers | 2 | | | |
| 2 | PTM | | 16 | 1 | 1 |
| | STM | | 1 | – | 1 |
| | Triggers | | | | |
| 3 | PTM | | 8 | 1 | 1 |
| | STM | | 4 | – | 1 |
| | Triggers | 2 | | | |
| 4 | PTM | | 11 | 1 | 1 |
| | STM | | 4 | – | 1 |
| | Triggers | 2 | | | |

29.10 Memory Mapping

Table 29-29 summarizes the memory mapping of the debug modules.

Table 29-29. Debug Modules Memory Mapping

| Memory Space | Module Name | Start Address (hex) | End Address (hex) | Size |
|---------------------------------------|---|---------------------|-------------------|-------|
| L3_EMU | MIPI-STIM (256 × 4K channels) (address space 0) | 0x5400 0000 | 0x540F FFFF | 1MB |
| | MIPI-STIM (256 × 1K channels) (address space 1) | 0x5410 0000 | 0x5413 FFFF | 256KB |
| | Cortex-A9 CPU0 debug/PMU | 0x5414 0000 | 0x5414 1FFF | 8KB |
| | Cortex-A9 CPU1 debug/PMU | 0x5414 2000 | 0x5414 3FFF | 8KB |
| | CTI0 component | 0x5414 8000 | 0x5414 8FFF | 4KB |
| | CTI1 component | 0x5414 9000 | 0x5414 9FFF | 4KB |
| | PTM0 component | 0x5414 C000 | 0x5414 CFFF | 4KB |
| | PTM1 component | 0x5414 D000 | 0x5414 DFFF | 4KB |
| | CS-TF ⁽¹⁾ | 0x5415 8000 | 0x5415 8FFF | 4KB |
| | DAP-PC | 0x5415 9000 | 0x5415 9FFF | 4KB |
| | DRM | 0x5416 0000 | 0x5416 0FFF | 4KB |
| | MIPI-STIM | 0x5416 1000 | 0x5416 1FFF | 4KB |
| | CS-ETB | 0x5416 2000 | 0x5416 2FFF | 4KB |
| | CS-TPIU | 0x5416 3000 | 0x5416 3FFF | 4KB |
| | CS-TF ⁽²⁾ | 0x5416 4000 | 0x5416 4FFF | 4KB |
| L4_CFG | CMI1 | 0x4A00 4F00 | 0x4A00 4FFF | 256B |
| | CMI2 | 0x4A00 9F00 | 0x4A00 9FFF | 256B |
| | OCP-WP | 0x4A10 2000 | 0x4A10 2FFF | 4KB |
| L4_WKUP | PMI | 0x4A30 7F00 | 0x4A30 7FFF | 256B |
| IVA-HD configuration | ICECrusher-9 (ICONT1) | 0x5A04 0000 | 0x5A04 07FF | 2KB |
| | ICECrusher-9 (ICONT2) | 0x5A04 0800 | 0x5A04 0FFF | 2KB |
| | SMSET | 0x5A04 1000 | 0x5A04 1FFF | 4KB |
| L3 configuration | SC_SDRAM | 0x4500 0400 | 0x4500 05FF | 512B |
| | SC_LAT0 | 0x4500 0600 | 0x4500 07FF | 512B |
| | SC_LAT1 | 0x4500 0800 | 0x4500 09FF | 512B |
| DSP configuration | SCTM | 0x01C3 0400 | 0x01C3 05FF | 512B |
| Cortex-M3 MPU subsystem configuration | SCTM | 0x5508 0400 | 0x5508 07FF | 1KB |
| | ICECrusher-CS x 2 ⁽³⁾ | 0xE004 2000 | 0xE004 2FFF | 4KB |

(1) Embedded in Cortex-A9 MPU subsystem

(2) Embedded in debug subsystem

(3) Private memory access per Cortex-M3 core

Glossary

3

3D— Three Dimensional

3G— 3rd Generation of mobile communication systems

A

A/D— Analog to Digital Converter

ABB— Adaptive Body Bias

ABE— Audio Back End

ABEFW— Audio Back End Firewall

ACB— ac-bias frequency

ACBI— ac-bias line transitions per interrupt

ACE— ASIC Compiler Environment.

ACK— Acknowledge

ADC— Analog-to-Digital Converter/Conversion.

ADMA— Audio DMA

ADPLL— All Digital Phase Locked Loop. A closed loop frequency control system whose function is based on the phase-sensitive detection of the phase difference between the input signal and the output signal of the controlled oscillator (CO).

AE— Audio Engine. The AEES own processor.

AES— Advanced Encryption Standard

AEES— Audio Engine Subsystem

AEW— Auto Exposure and Auto White Balance

AF— Auto Focus

AFE— Analog Front End

AHB— Advanced High-performance Bus

ALE— Address Latch Enable

AMMU— Attribute Memory Management Unit

ANSI— American National Standards Institute

AP— Address Protection

APB— Advanced Peripheral Bus

APE— Application Engine

API— Application Programming Interface

AR— Automatic Reload

ARGB— Alpha Red Green Blue

ARM— Advanced RISC Machine

ASCII— American Standard Code for Information Interchange

ASIC— Application-Specific Integrated Circuit. A chip built for a particular application. In the context of this document, this refers to the FPGA that resides on the EVM board.

ASP— Application-Specific Peripheral

ATA— Interface standard for the connection of storage devices

ATB— AMBA Advanced Trace Bus

ATC— Audio Traffic Controller

AVDAC— Audio-Video DAC

AVS— Adaptive Voltage Scaling

AWB— Auto White Balance

B

B— Byte, 8 bits

BAYER— Bayer Filter mosaic. A color filter array (CFA) for arranging RGB color filters on a square grid of photosensors.

BB— Bus Busy

BCD— Binary-Coded Decimal.

BCH— Bose-Chaudhuri-Hocquenghem

BE— Big Endian.

BGA— Ball Grid Array

BGAP— Band Gap

BIOS— Built-In Operating System

BIST— Built-In Self-Test

BL— Buffer Logic

BOF— Beginning of Frame

BPP— Bits Per Pixel

BS— Block Synchronization

BSC— Boundary Scan Chain

BSMEM— Bit Stream Memory

BTA— Bus Turn Around

BTE— Burst Translation Engine

BW— Band Width

Bluetooth— A short-range radio technology aimed at simplifying communications among network devices and between devices and the Internet. It also aims to simplify data synchronization between network devices and other computers.

C

C2C— Chip-to-Chip

CABAC— Context-Adaptive Binary Arithmetic Coding

CALC3— Transform and Quantization Calculation Engine

CAS— Column Address Strobe

CAVLC— Context-Adaptive Variable Length Coder

CB— Copy Back

CBP— Coded Block Pattern

CBUFF— Circular Buffer

CCCR— Card Common Control Registers (SDIO)

CCP— Compact Camera Port

CDP— Coprocessor Data Operation

CDR— Clock Data Recovery

CE— Chip Enable

CEA-861-D— HDMI 1.3 video standard. It defines the video timing requirements, discovery structures, and data transfer structure.

CEC— Consumer Electronics Control

CFA— Color Filter Array

CH— Configuration Header. To use different settings than ROM Code defaults, that is, clock frequencies, SDRAM/DDRAM settings, GPMC settings if the customer wants.

CID— Card Identification Number

CIR— Consumer Infra Red

CLE— Command Latch Enable

CLK— Clock

CLUT— Color Look-Up Table

CM— Clock Management

CMEM— Coefficient Memory

CMOS— Complimentary Metal Oxide Semiconductor

CODEC— Coder/Decoder or Compression/Decompression. A device that codes in one direction of transmission and decodes in another direction of transmission.

CP15— Coprocessor 15. This coprocessor controls the operation and configuration of the TI925T.

CPR— Clock, Power, Reset

CPU— Central Processing Unit.

CRC— Cyclic Redundancy Check

CS— Chip-Select

CS-ETB— CoreSight Embedded Trace Buffer

CS-ETM— CoreSight Embedded Trace Macrocell

CS-TPIU— CoreSight Trace Port Interface Unit

CSI— Camera Serial Interface

CSW— Control Space Width

CSWR— Closed switch retention

CTM— Counter-Timer Module

CTRL— Control

CTS— Clear to Send

CVBS— Composite Video Broadcast Signal

ConnID— Connection Identifier. An Initiator Module Identifier. A ConnID is transmitted in-band with the request and is used for protection and error logging mechanism.

D

D2D— Die-to-Die

DAC— Digital to Analog Converter

DBB— Digital Baseband

DBI— Display Buffer Interface

DCD— Data Carrier Detect

DCO— Digitally Controlled Oscillator

DCS— Display Command Set

DCT— Discrete Cosine Transform.

DDC— Display Data Channel

DDMA— DSP Subsystem Direct Memory Access module

DDR— Double Data Rate

DE— Data Enable

DFF— Digital Flip-Flop

DFT— Design For Test

DI— Data In

DISPC— Display Controller

DL— Data Length

DLB— Data Loopback.

DLL— Delay-Locked Loop

DMA— Direct Memory Access.
DMC— Data Memory Controller
DMEM— Data Memory
DMIC— Digital Microphone Controller
DMM— Dynamic Memory Management
DNL— Differential nonlinearity. It describes the deviation between two analog values corresponding to adjacent input digital values for a DAC.
DO— Data Out
DPC— Defect Pixel Correction
DPCM— Differential Pulse Code Modulation
DPI— Display Parallel Interface
DPLL— Digital Phase-Locked Loop. Digital implementation of PLL.
DPS— Digital Power Switching
DRD— Dual-Role Device (a type of OTG USB device)
DRDY— Data Ready
DRM— Digital Rights Management
DRP— Digital Radio Processor
DSI— Display Serial Interface
DSP— Digital Signal Processor.
DSR— Data Set Ready
DSS— Display Sub-System. Also DISS
DT— Data Type
DTBC— Data Buffer Controller
DTCM— Data Tightly Coupled Memory
DTR— Data Transmit Ready
DVFS— Dynamic Voltage and Frequency Scaling
DVI— Digital Video Interface

E

EA— Enumeration Address
EAV— End of Active Video
ECC— Error Checking and Correction. Also Error Correction Code.
ECD3— Entropy Coder/Decoder
ED— Endpoint Descriptor
EFUSE— Electrical Fuse. A one-time programmable memory location usually set at the factory
EHCI— Enhanced Host Controller Interface

EMC— External Memory Controller
EMI— Electromagnetic interference
EMIF— External Memory Interface
EOB— End of Block
EOF— End of Frame
EOL— End of Line
EOT— End of Transfer
EPM— Emulation Pin Manager
ES— Erase Status
ETB— Embedded Trace Bus
ETM— Embedded Trace Macrocell

F

FAT— File Allocation Table
FCLK— Functional Clock
FCS— Frame Check Sequence
FD— Face Detect
FE— Framing Error.
FEC— Frame End Code
FF— Flip-Flop
FIFO— First In First Out.
FIQ— Fast Interrupt Request. See ISR.
FIR— Fast Infrared
FM— Frequency Modulate
FPS— Frame per Second
FROM— eFuse ROM
FS— Full-Speed
FSC— Frame Start Code. Also Frame Start Count.
FSM— Finite State Machine.
FSR— Fault Status Register
FV— Focus Value
FW— Firewall

G

GBC— Green Balance Correction
GDP— Generic Dot Product

GHB— Global History Buffer
GPIO— Genreal Purpose Input Output
GPMC— General Purpose Memory Controller

H

H.263— Video Codec Standart
H.264— Video Codec Standart
H/W— Hardware
HAL— Hardware Abstraction Layer
HBP— Horizontal Back Porch
HC— Host Controller
HD— High Definition
HDCP— High-bandwidth Digital Content Protection
HDMI— High-Definition Multimedia Interface
HDQ— Single-wire communication interface
HDTV— High-Definition Television
HFP— Horizontal Front Porch
HLOS— High-Level Operating System
HNP— Host Negotiation Protocol (OTG feature)
HPF— High-Pass Filter
HPI— Host Port Interface
HS— High-Speed
HSEC— Horizontal Sync End Code
HSI— High Speed Synchronous Serial Interface
HSSC— Horizontal Sync Start Code
HSSCLL— High-Speed Serial Control Channel
HSW— Horizontal Synchronization Pulse Width
HSYNC— Horizontal Synchronization.
HW— Hardware
HWA— Hardware Accelerators.
HWOBS— Hardware Observability
HWSEQ— Hardware Sequencer

I

I/F— Interface
I/O— Input/Output

I2C— Inter-Integrated Circuit.

I2S— Inter-IC Sound.

IA— Identifier Address

ICE— In-Circuit Emulation

ICEPICK— Generic TAP for emulation control

ICLK— Interface Clock

ICONT— Imaging Controller

ICR— Intersystem Communication Registers

ID— Identification

IDCT— Inverse Discrete Cosine Transform. See DCT.

ILF3— Improved Loop Filter engine

IM— Initiator Module. A module is an initiator whenever it is able to initiate read and write requests to the chip interconnect (typically: processors , DMA...).

IME3— Improved Motion Estimation engine

IMX— Image Extension coprocessor

INL— Integral Nonlinearity. It describes the maximum deviation between the ideal output of a DAC and the actual output level.

INT— Interrupt .

INTC— Interrupt Controller

IP— Intellectual Property

IPC— Interprocessor Communication. (also referred to as mailbox on occasion)

IPE3— Intra Prediction Estimation engine

IPIPE— Image Pipe

IPIPEIF— Image Pipe Interface

IQ— Inverse Quantization

IR— Incremental Redundancy Buffer

IRQ— Interrupt Request.

ISA— Instruction Set Architecture

ISIF— Image Sensor Interface

ISP— Image Signal Processor

ISR— Interrupt Service Routine.

ISS— Image SubSystem

IST— Interrupt Service Thread.

ITCM— Instruction Tightly Coupled Memory

IV— Initialization Vector

IVA— Image and Video Accelerator

IVA-HD— High Definition Image and Video Accelerator

IrDA— Infrared Data Association.

J

JEDEC— Joint Electronic Devices Engineering Council

JPEG— Joint Photographics Experts Group

JTAG— Joint Test Action Group.

K

KB— Kilobyte, 1024 B

KBD— Keyboard

Kbps— Kilobits per second

L

L1— Level 1 cache/memory

L2— Level 2 cache/memory

L3— First level of interconnect

L4— Second level of interconnect

LA— Logical Address

LAN— Local Area Network

LC— Logical Channel

LCD— Liquid Crystal Display.

LCM— Logical Channel to Memory

LCh— Logical DMA Channel. Also LCH

LDC— Load (from memory) to Coprocessor

LDC2— Lens Distortion Correction

LDM— Load Multiple

LDO— Low Dropout

LE— Little Endian.

LEC— Line End Code

LED— Light Emitting Diode.

LF— Loop Filter

LFB— Line-Fill-Buffer

LFN— Long File Name

LH— Local Host

LINK— Link Layer Device

LLP— Low-Level Protocol
LP— Low-Power, operation mode for PHY
LPCM— Linear Pulse Code Modulation
LPDDR— Low Power Double Data Rate
LPF— Loop Filter
LPM— Low-Power Mode
LPP— Lines Per Panel
LRB— Line-Read-Buffer
LS— Low-Speed
LSB— Least Significant Bit
LSC— Line Start Code
LSR— Linear Shift Register
LSW— Least Significant Word
LUT— Look-up Table

M

M2— Micro Memory
MAC— Message Authentication Code
MB— Megabyte, 1024 KB
MBAFF— MB-Level Adaptive Frame/Field
MBR— Master Boot Record
MC3— Motion Compensation Engine
MCSPi— Multichannel Serial Port Interface
MCU— Microcontroller Unit. Refers to the MPU.
ME— Motion Estimation
MEMIF— Memory Interface
MIF— Memory InterFace
MIPI— Mobile Industry Processor Interface
MIR— Medium Infrared
MJPEG— Motion JPEG
MMC— Multimedia Card
MMC/SD— Multimedia Card/SD
MMU— Memory Management Unit.
MP3— MPEG Layer 3.
MPEG— Motion Pictures Expert Group.

MPEG1— The first MPEG compression scheme specification.

MPU— Microprocessor Unit.

MS— Memory Stick

MSB— Most Significant Bit

MSGIF— Message Interface

Mb— Megabit

Mbps— Mega bits per second

McBSP— Multichannel Buffered Serial Port.

Modem— Modulator Demodulator

N

N/A— Not Applicable

NAC— Network Access Control

NAK— Not Acknowledged

NAND— NAND Flash memory.

NC— Not Connected

NIU— Network Interface Unit

NMI— Nonmaskable Interrupt. An interrupt that can be neither masked nor disabled.

NOP— No OPERATION (DSP/CPU instruction)

NOR— A type of flash memory

NRZI— Non-Return-to-Zero Inverted

NSF— Noise Filter

NTSC— National Television System Committee. Television broadcast system.

NVB— Number of Valid Bytes

NVIC— Nested Vectored Interrupt Controller

NVM— Non-volatile Memory

O

OCM— On-chip Memory

OCMC— On-chip Memory Controller

OCP— Open-Core Protocol

OCPI— Open-Core Protocol Interface

OE— Output Enable

OHCI— Open Host Controller Interface. This is an industry standard USB Host Controller Interface.

OMAP— Open Multimedia Application Platform

ON2— Video Codec Standart

OPP— Operating Performance Point
OS— Operating System
OSI— (OSI model) Open Systems Interconnection Basic Reference Model
OTG— On-The-Go (USB 2.0 specification)

P

PA— Program Address
PBIAS— PMOS Bias transistor to provide the bias voltage to extended drain IOs
PC— Program Counter
PCB— Printed Circuit Board
PCI— Peripheral Component Interconnect.
PCLK— Pixel Clock
PCM— Pulse Code Modulation.
PD— Program Data
PDA— Personal Digital Assistant
PDC— Power-down Controller
PDM— Pulse Density Modulation
PDU— Protocol Data Unit
PE— Parity Error
PF— Packet Footer
PFPW— Prefetch and Prewrite posting engine
PH— Packet Header
PHY— Physical Layer Device
PI— Pixel Interpolation
PID— Protocol Identifier. The PID register is used in Windows CE mode only.
PLL— Phase-Locked Loop.
PM— Programming Model
PMC— Program Memory Controller
PMEM— Program Memory
PMP— Power Management Port
POR— Power-On Reset
PPA— Primary Protected Application.
PPC— Palm-size PC
PPI— Physical Layer Protocol Interface
PPL— Pixels per Line

PRCM— Power, Reset, Clock Management module

PRM— Power and Reset manager

PS— Packet Start

PSC— Prescaler Counter

PSS— Program Suspend Status

PT— Packet Type

PTM— Program Trace Macrocell

PTV— Prescale Clock Timer Value. Sets the value of the divisor used in scaling the clock.

PU/PD— Pull-Up / Pull-Down

PWL— Pulse Width Light (modulator). A 4096-bit randomsequence generator that provides control of the LCD backlighting and keypad.

PWM— Pulse Width Modulation

PWR— Power

Q

QIQ— Quantization and Inverse Quantization

QMEM— Quantizer Memory

QMR— Quantizer Matrix

QVGA— Quarter Video Graphics Array. One-fourth the resolution of VGA.

R

R/W— Read/Write. Also RW.

R5— Release 5 of 3GPP specifications on IMS and HSDPA standards

R6— Release 6 of 3GPP specifications on Wireless LAN networks, HSUPA, MBMS and enhancements to IMS standards

RAM— Random Access Memory. A memory element that can be written to, as well as read.

RCA— Relative Card Address

RDR— Receive Data Register

RE— Read Enable

REQ— Request

RF— Radio Frequency

RFB— Remote Frame Buffer

RFBI— Remote Frame Buffer Interface

RFF— Retention Flip-Flop

RGB— Red Green Blue

RGBA— Red Green Blue Alpha

RI— Ring Indicator

RM— Reed-Muller code

RO— Read Only

ROM— Read Only Memory. A semiconductor storage element containing permanent data that cannot be changed.

RST— Reset

RT— Real-Time

RTA— Retention Till Access

RTC— Real-Time Clock. A clock that keeps track of the time even when the device is turned off.

RTL— Register Transfert Level

RTOS— Real-Time Operating System

RTS— Request to Send

RVLC— Reversible Variable Length Coder

RX— Receive/Receiver

RXD— Receive Data

S

S/PDIF— Sony/Philips Digital Interface

S/W— Software

SAM— Signal Amplitude Modulation

SAR— Save and Restore. Hardware context saving for power saving.

SAV— Start of Active Video

SB— Silicon Backplane (Trade Mark)

SBC— Stream Buffer Controller

SCCB— Serial Camera Control Interface. 3-wire and 2-wire serial bus defined and deployed by Omnivision Technologies, Inc.

SCL— Serial Clock. Programmable serial clock used in the I2C interface. Also SCLK.

SCM— System Control Module

SCP— Serial Configuration Port

SCR— SDIO Configuration Registers

SCRM— System Clock and Reset Manager

SCTM— System Counter Timer Module

SCU— Snoop Control Unit

SD— SD card. A non-volatile memory card.

SDA— Serial Data. Serial data bus in the I2C interface.

SDHC— SD High Capacity card

SDIO— SD Input/Output

SDMA— System Direct Memory Access module

SDP— Software Development Platform

SDR— Single Data Rate

SDRAM— Synchronous Dynamic Random Access Memory

SDRC— SDRAM Controller.

SE— Safe Environment. Execution environment inside a device, which is protected against tampering

SFL— Subframe Length

SGX— Accronym for Grafics Accelerator

SIM— Subscriber Identity Module

SIMCOP— Still image coprocessor

SIMD— Single Instruction-Stream, Multiple Data-Stream

SIR— Slow Infrared

SL2— Shared Level 2 (memory/interface)

SLM— Static Leakage Management

SLVS— Scalable Low Voltage Signaling

SMC— Shared Message Channel

SMEM— Sample Memory

SMI— Safe Monitor Interrupt

SMP— Symmetric Multiprocessor Platform

SMPS— Switch Mode Power Supply

SMSET— Software Message and System Event Trace module

SNR— Signal-to-Noise Ratio

SOC— System-On-a-Chip

SOF— Start Of Frame

SP— Serial Port or Small Page

SPI— Serial Port Interface. A signaling protocol for exchanging serial data.

SR— SmartReflex

SRAM— Static Random Access Memory

SRC— Sample Rate Conversion

SRG— Sample Rate Generator

SRP— Session Request Protocol (OTG feature)

SS— Subsystem

SSC— Spread Spectrum Clocking

SSI— Serial Synchronous Interface

ST— Start Timer

STC— Store from Coprocessor (to memory) or System Time Clock, which is the master clock in an MPEG-2 encoder or decoder system.

STM— Synchronous Transfer Mode or Store Multiple.

STN— Super-Twist Nematic. A technique for improving LCD display screens by twisting light rays.

SW— Software

SWI— Software Interrupt

SXGA— Super eXtended Graphics Array

SYSC— System Control Module

SmartReflex— Dynamic voltage sensing module that generates the voltage error signal proportional to the difference in desired voltage and the current voltage

T

TA— Target Agent

TAP— Test Access Port

TC— Traffic Controller. Allows asynchronous operation among the external memory interface, the MPU, and the DSP.

TCK— Test Clock

TCM— Tightly Coupled Memory

TD— Transfer Descriptor

TDI— Test Data Input

TDM— Time Division Multiplex/Multiplexing

TDO— Test Data Output

TFT— Thin Film Transistor. A type of LCD flat panel display screen in which each pixel is controlled by one to four transistors.

TI— Texas Instruments

TL— Transmission Line

TLB— Translation Lookaside Buffer. A cache that contains entries for virtual-to-physical address translation and access permission checking.

TLL— Transceiver Less Link. This is logic which allows the user to connect two USB transceiver interfaces together directly without the use of differential transceivers.

TM— Target Module. A target module cannot generate read/write requests to the chip interconnects, but respond to these requests. However it may generate interrupts or DMA request to the system (typically: peripherals, memory controllers).

TMDS— Transition Minimized Differential Signaling. A technology for transmitting high-speed serial data and is used by the DVI and HDMI video interfaces.

TMS— Test Mode Select

TOC— Table of Contents

TP— Tiny Page

TRM— Technical Reference Manual

TRST— Test Reset

TRX— USB Transceiver. The USB analog driver/receiver.

TSHUT— Temperature Shutdown.

TTB— Translation Table Base. It points to the base of a table in physical memory that contains section and page table descriptors.

TTH— Translation Table Hierarchy

TTL— Transistor Transistor Logic

TWL— Table Walking Logic

TX— Transmit/Transmitter

U

UART— Universal Asynchronous Receiver/Transmitter. Another name for the asynchronous serial port.

UE— Unrecoverable Error

UHS— Definition of SD cards with higher frequency

ULPI— UTMI+ Low Pin Interface (12-pin interface standard for connecting USB core logic to a USB transceiver)

ULPM— Ultralow-Power Mode

ULPS— Ultralow-Power State

UMC— Unified Memory Controller

USB— Universal Serial Bus. An external bus standard that supports data transfer rates of 12M bps (12 million bits per second). A single USB port can be used to connect up to 127 peripheral devices.

USSE— Universal Scalable Shader Engine

UTMI— USB 2.0 Transceiver Macrocell Interface

V

VA— Volt-Amps. A form of power management. A VA rating is the volts rating multiplied by the amps (current) rating, used to indicate the output capacity of an uninterruptible power supply (UPS) or other power source.

VBP— Vertical Back Porch

VC— Virtual Channel

VC-1— Video Codec Standart

VDMA— Video Direct Memory Access module

VENC— Video Encoder

VESA— Video Electronics Standards Association

VFP— Vertical Front Porch

VGA— Video Graphics Array. An industry standard for video cards.

VLC— Variable Length Decoder

VLCD— Variable Length Coding and Decoding coprocessor

VLCDJ— Variable-Length Coder/Decoder for JPEG

VLD— Variable Length Coder

VLIW— Very Long Instruction Word

VMODE— Bi-level voltage control interface

VP— Video Port

VRFB— Virtual Rotation Fixed Buffer

VS— Vertical Synchronization

VSEC— Vertical Sync End Code

VSSC— Vertical Sync Start Code

VSW— Vertical Synchronization Pulse Width

VSYN— Vertical Synchronization. A bidirectional vertical timing signal occurring once per frame with a pulse-width defined as an integral number of lines (half-lines for interlaced mode). Also VS.

W

WB— Write Buffer

WC— Word Count

WD— Watchdog. A timer that requires the user program or OS periodically write to the count register before the counter underflows.

WDT— Watchdog Timer

WE— Write Enable

WFI— Wait For Interrupt

WNP— Write Non-Posted

WP— Write Protect

WSS— Wide-Screen Signaling

WT— Write Through

WTBU— Wireless Terminal Business Unit

WUGEN— Wake-Up Generator

Word16— 16 bits word

X

XGA— eXtended Graphics Array. Also XVGA.

XIP— eXecution In Place

Y

YUV— Luminance-Bandwidth-Chrominance

e

eMMC— Embedded Multimedia Card

eSD— Embedded SD

PRELIMINARY

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

| | |
|------------------------|--|
| Audio | www.ti.com/audio |
| Amplifiers | amplifier.ti.com |
| Data Converters | dataconverter.ti.com |
| DLP® Products | www.dlp.com |
| DSP | dsp.ti.com |
| Clocks and Timers | www.ti.com/clocks |
| Interface | interface.ti.com |
| Logic | logic.ti.com |
| Power Mgmt | power.ti.com |
| Microcontrollers | microcontroller.ti.com |
| RFID | www.ti-rfid.com |
| OMAP Mobile Processors | www.ti.com/omap |
| Wireless Connectivity | www.ti.com/wirelessconnectivity |

Applications

| | |
|-------------------------------|--|
| Communications and Telecom | www.ti.com/communications |
| Computers and Peripherals | www.ti.com/computers |
| Consumer Electronics | www.ti.com/consumer-apps |
| Energy and Lighting | www.ti.com/energy |
| Industrial | www.ti.com/industrial |
| Medical | www.ti.com/medical |
| Security | www.ti.com/security |
| Space, Avionics and Defense | www.ti.com/space-avionics-defense |
| Transportation and Automotive | www.ti.com/automotive |
| Video and Imaging | www.ti.com/video |

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated